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Non-dipole second order parameters of the photoelectron angular distribution for elements $Z = 1$–100 in the photoelectron energy range 1–10 keV

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Abstract

Presented here are the photoelectron angular distribution non-dipole parameters associated with the terms of the second order $O[(kr)^2]$ (k is the photon energy and r is the radius of the ionized atomic shell) for both unpolarized and linearly polarized radiation. The parameters are given for atomic shells with binding energies lower than 2 keV of all elements $1 \leqslant Z \leqslant 100$ for four values of photoelectron energy in the range 1−10 keV. In this range, the second-order terms are shown to make a significant contribution (up to ~30%) to the angular differential cross section. The inclusion of these terms becomes all the more important in calculations of the differential cross section ratio for the fixed geometry of angles which is measured experimentally in the case of linearly polarized radiation. The Dirac–Fock–Slater potential is used in the calculations. The hole left by the emitted electron is taken into account in the frozen orbital approximation.

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Contents

1. Introduction

In recent publications [1,2], we presented extensive tables of the photoelectron angular distribution parameters β, γ, and δ together with the total photoionization cross section σ_i for all atomic shells with the binding energy $\varepsilon < 2$ keV of all elements $1 \leqslant Z \leqslant 100$ in the photoelectron energy range 0.1–5.0 keV. The parameter β, known popularly as "dipole," allows one to describe the photoelectron angular distribution in the context of the electric dipole approximation. Two non-dipole parameters γ and δ provide a means for the description of the photoelectron angular distribution with regard to the terms of the first order $O(kr)$ where k is the photon energy and r is the average radius of the ionized atomic subshell. In the present work, we supplement these data by the parameters associated with terms of the order $O[(kr)^2]$ in the photoelectron energy range 1–10 keV where the second-order terms may contribute significantly to the angular distribution.

With allowance made for the $O(kr)$ terms, the photoelectron angular distribution is written [3] for unpolarized and circularly polarized radiation as

$$\frac{d\sigma_i}{d\Omega} = \frac{\sigma_i}{4\pi}\left[1 - \frac{\beta}{2}P_2(\cos\underline{\theta}) + \left(\frac{\gamma}{2}\sin^2\underline{\theta} + \delta\right)\cos\underline{\theta}\right] \qquad (1)$$

and for linearly polarized radiation in the form

$$\frac{d\sigma_i}{d\Omega} = \frac{\sigma_i}{4\pi}[1 + \beta P_2(\cos\theta) + (\gamma\cos^2\theta + \delta)\sin\theta\cos\varphi]. \qquad (2)$$

Here $P_2(x)$ is the second order Legendre polynomial and the angles $\underline{\theta}$, θ, and φ are defined in Fig. 1.

The influence of the $O(kr)$ terms on the differential cross section at a low photoelectron energy E, beginning with the photoionization threshold, as well as peculiarities of the parameters β, γ, and δ have been investigated in detail using different atomic models [3–8].

Recently it was found [9] that for the 2p-subshells of Ne, terms of the next order $O[(kr)^2]$ make a noticeable contribution (~10%) to the ratio of differential sections ζ [see Eq. (36)] calculated at the fixed geometry of angles θ and φ even at a fairly low photoelectron energy $E \lesssim 2$ keV. The second order terms are associated mainly with quadrupole (the multipolarity of radiation field $L = 2$) and octupole ($L = 3$) amplitudes. Taking account of these terms requires an additional two parameters $\Delta\beta_{\rm unp}$ and ξ in the case of unpolarized radiation and four parameters $\Delta\beta_{\ell p}$, η, μ, and ξ in the case of linearly polarized radiation. The parameters $\Delta\beta_{\rm unp}$ and $\Delta\beta_{\ell p}$ are the second order corrections to the dipole parameter β.

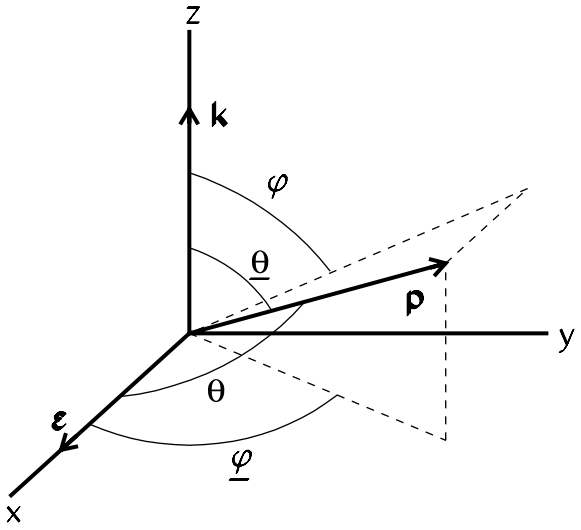

Fig. 1. Notations of angles and directions: **k** is the photon momentum vector; **p** is the direction of the photoelectron; **ε** is the photon polarization vector; $\underline{\theta}$ is the angle between vectors **k** and **p**; $\underline{\varphi}$ is the angle between **ε** and the plane passing through the z-axis and the vector **p**; θ is the angle between **p** and **ε**; and φ is the angle between **k** and the plane passing through **p** and **ε**.

The values of $\Delta\beta_{\ell p}$, η, μ, and ξ for rare gas atoms were presented in [10]. The effect of the $O[(kr)^2]$ terms on the intensity of the X-ray photoelectron spectra for photoionization of the 1s-, 2s-, 2p-, and 3d-shells of atoms with $Z \leqslant 54$ in the photoelectron energy range 1–10 keV was studied in [11–13]. The calculations showed that the effect of the second order terms may be considerable, reaching 14% for the $2p_{1/2}$-shell of the Na atom and 24% for the $3d_{3/2}$-shell of the Zn atom at $E = 10$ keV. For lower energy the contribution may be also noticeable, for example, ~10% for the $3d_{3/2}$-shell of Zn at $E = 5$ keV. Moreover, the ratio ζ which is measured experimentally changes by ~50% at $E = 5$ keV and

a factor of two at $E = 10$ keV for the $3d_{3/2}$-subshell of Zn. Such a considerable contribution has to be taken into account in calculations of the photoelectron angular distribution.

In Table 1 we present results for the parameters $\Delta\beta_{\rm unp}$, $\Delta\beta_{\ell p}$, η, μ, and ξ associated with terms of the order $O[(kr)^2]$ in the photoelectron angular distribution [see Eqs. (24) and (25)]. To prevent too great a bulk of data, we restrict ourselves to only four values of the photoelectron energy $E = 1$, 3, 5, and 10 keV. The energy $E = 10$ keV was not included in [1,2]. Therefore, for this energy, parameters σ_i, β, γ, and δ for all shells and elements under consideration are given in Table 2.

1.1. Basic formulas and method of calculation

The full relativistic treatment of the photoeffect leads to the following expressions for the differential cross section in the ith atomic subshell for unpolarized and linearly polarized radiation, respectively [14]

$$\frac{d\sigma_i}{d\Omega}(\underline{\theta}) = \frac{\sigma_i}{4\pi}\sum_n B_n P_n(\cos\underline{\theta}) \tag{3}$$

and

$$\frac{d\sigma_i}{d\Omega}(\underline{\theta},\underline{\varphi}) = \frac{\sigma_i}{4\pi}\sum_n [B_n P_n(\cos\underline{\theta}) - B_n^{(2)} P_n^{(2)}(\cos\underline{\theta})\cos 2\underline{\varphi}]. \tag{4}$$

Here $P_n(x)$ is the Legendre polynomial, $P_n^{(2)}(x)$ is the associated Legendre polynomial, and the angle $\underline{\varphi}$ is defined in Fig. 1. Coefficients B_n and $B_n^{(2)}$ are double sums over multipoles τL of a radiation field:

$$B_n = \frac{4\pi^2\alpha}{k\sigma_i}\sum_{\tau_1 L_1,\tau_2 L_2} B_n(\tau_1 L_1\,\tau_2 L_2), \tag{5}$$

$$B_n^{(2)} = \frac{4\pi^2\alpha}{k\sigma_i}\sum_{\tau_1 L_1,\tau_2 L_2} B_n^{(2)}(\tau_1 L_1\,\tau_2 L_2), \tag{6}$$

$$B_0 = 1, \quad B_0^{(2)} = B_1^{(2)} = 0, \tag{7}$$

where $\alpha = e^2/\hbar c$ is the fine structure constant, τ is the electric ($\tau = E$) or magnetic ($\tau = M$) type of transition, and $B_n(\tau_1 L_1\,\tau_2 L_2)$ and $B_n^{(2)}(\tau_1 L_1\,\tau_2 L_2)$ result from interference of amplitudes having multipoles $\tau_1 L_1$ and $\tau_2 L_2$. Unless otherwise noted, we use relativistic units, that is, $\hbar = m_0 = c = 1$. The values of $B_n^{(2)}(\tau_1 L_1\,\tau_2 L_2)$ and $B_n(\tau_1 L_1\,\tau_2 L_2)$ are related as

$$B_n^{(2)}(\tau_1 L_1\,\tau_2 L_2) = (-1)^{L_1+\ell_1+\ell_i}\frac{C^{n-2}_{L_1-1\,L_2-1}}{C^{n\,0}_{L_1 1 L_2-1}} \times\sqrt{\frac{(n-2)!}{(n+2)!}}B_n(\tau_1 L_1\tau_2 L_2), \tag{8}$$

where ℓ is the electron orbital momentum and $C^{JM}_{j_1 m_1 j_2 m_2}$ is the Clebsch–Gordan coefficient. The terms $B_n(\tau_1 L_1\tau_2 L_2)$ of the order $O[(kr)^m]$ with $m \leqslant 2$ are written as follows. The dipole electric term of the order $O(1)$ is

$$B_2(E1\,E1) = -\sqrt{6}\sum_{\kappa_1\kappa_2} A_2 W(1\,1 j_1 j_2; 2 j_i) Q_{01}(\kappa_1) Q_{01}(\kappa_2). \tag{9}$$

Terms of the first order $O(kr)$ are:

$$B_1(E1\,M1) = 6\sqrt{3}\sum_{\kappa_1\kappa_2} A_1 W(1\,1 j_1 j_2; 1 j_i) Q_{01}(\kappa_1) Q_{11}(\kappa_2), \tag{10}$$

$$B_1(E1\,E2) = 6\sqrt{3}\sum_{\kappa_1\kappa_2} A_1 W(1\,2 j_1 j_2; 1 j_i) Q_{01}(\kappa_1) Q_{12}(\kappa_2), \tag{11}$$

$$B_3(E1\,E2) = 6\sqrt{2}\sum_{\kappa_1\kappa_2} A_3 W(1\,2 j_1 j_2; 3 j_i) Q_{01}(\kappa_1) Q_{12}(\kappa_2). \tag{12}$$

Terms of the second order $O[(kr)^2]$ are:

$$B_2[\Delta(E1\,E1)] = 2\sqrt{3}\sum_{\kappa_1\kappa_2} A_2 W(1\,1 j_1 j_2; 2 j_i) Q_{01}(\kappa_1) Q_{21}(\kappa_2), \tag{13}$$

$$B_2(M1\,M1) = -3\sqrt{\frac{3}{2}}\sum_{\kappa_1\kappa_2} A_2 W(1\,1 j_1 j_2; 2 j_i) Q_{11}(\kappa_1) Q_{11}(\kappa_2), \tag{14}$$

$$B_2(E1\,M2) = 10\sqrt{3}\sum_{\kappa_1\kappa_2} A_2 W(1\,2 j_1 j_2; 2 j_i) Q_{01}(\kappa_1) Q_{22}(\kappa_2), \tag{15}$$

$$B_2(M1\,E2) = -3\sqrt{30}\sum_{\kappa_1\kappa_2} A_2 W(1\,2 j_1 j_2; 2 j_i) Q_{11}(\kappa_1) Q_{12}(\kappa_2), \tag{16}$$

$$B_2(E2\,E2) = -\frac{15}{\sqrt{14}}\sum_{\kappa_1\kappa_2} A_2 W(2\,2 j_1 j_2; 2 j_i) Q_{12}(\kappa_1) Q_{12}(\kappa_2), \tag{17}$$

$$B_2(E1\,E3) = 8\sqrt{3}\sum_{\kappa_1\kappa_2} A_2 W(1\,3 j_1 j_2; 2 j_i) Q_{01}(\kappa_1) Q_{23}(\kappa_2), \tag{18}$$

$$B_4(E2\,E2) = -6\sqrt{\frac{10}{7}}\sum_{\kappa_1\kappa_2} A_4 W(2\,2 j_1 j_2; 4 j_i) Q_{12}(\kappa_1) Q_{12}(\kappa_2), \tag{19}$$

$$B_4(E1\,E3) = 12\sum_{\kappa_1\kappa_2} A_4 W(1\,3 j_1 j_2; 4 j_i) Q_{01}(\kappa_1) Q_{23}(\kappa_2). \tag{20}$$

In Eqs. (9)–(20), j is the total momentum of the electron, $\kappa = (\ell - j)(2j+1)$ is the relativistic quantum number, and $W(L_1 L_2 j_1 j_2; n j_i)$ is the Racah coefficient. The summation extends over all final states allowed by selection rules. The second order correction to the term $B_2(E1\,E1)$ (Eq. (9)) arising from the interference of electric dipole amplitudes is specified by $B_2[\Delta(E1\,E1)]$. The coefficients $A_n (n = 1, 2, 3, 4)$ can be written as

$$A_n = \frac{4\pi^2\alpha}{k\sigma_i}(-1)^{j_1+j_2+|\kappa_i|}\sqrt{(2j_1+1)(2j_2+1)}C^{n0}_{j_1 1/2 j_2-1/2} \times\begin{cases}\sin(\delta_{\kappa_1}-\delta_{\kappa_2}) & n = 1,3\\ \cos(\delta_{\kappa_1}-\delta_{\kappa_2}) & n = 2,4.\end{cases} \tag{21}$$

Here $\delta_{\kappa_1} - \delta_{\kappa_2}$ is the phase shift for the two final continuum states characterized by κ_1 and κ_2. The reduced matrix element $Q_{\Lambda L}(\kappa)$ has the form:

$$Q_{\Lambda L}(\kappa) = \sqrt{\frac{(2\bar{\ell}_\kappa+1)(2\ell_i+1)}{(2\Lambda+1)}} C^{\Lambda 0}_{\bar{\ell}_\kappa 0 \ell_i 0} \mathscr{A} \begin{pmatrix} \bar{\ell}_\kappa & 1/2 & j_\kappa \\ \ell_i & 1/2 & j_i \\ \Lambda & 1 & L \end{pmatrix} R_{1\Lambda} + \sqrt{\frac{(2\ell_\kappa+1)(2\bar{\ell}_i+1)}{(2\Lambda+1)}} C^{\Lambda 0}_{\ell_\kappa 0 \bar{\ell}_i 0} \mathscr{A} \begin{pmatrix} \ell_\kappa & 1/2 & j_\kappa \\ \bar{\ell}_i & 1/2 & j_i \\ \Lambda & 1 & L \end{pmatrix} R_{2\Lambda}, \tag{22}$$

where $\bar{\ell} = 2j - \ell$ and $\mathscr{A}\begin{pmatrix} \ell_1 & 1/2 & j_1 \\ \ell_2 & 1/2 & j_2 \\ \Lambda & 1 & L \end{pmatrix}$ is the normalized coefficient of recoupling of four angular momenta. The radial integrals $R_{1\Lambda}$ and $R_{2\Lambda}$ are written as:

$$R_{1\Lambda} = \int_0^\infty G_i(r) F_\kappa(r) j_\Lambda(kr)\,\mathrm{d}r, \qquad R_{2\Lambda} = \int_0^\infty G_\kappa(r) F_i(r) j_\Lambda(kr)\,\mathrm{d}r, \tag{23}$$

where $j_\Lambda(kr)$ is the spherical Bessel function of order Λ, and $G(r)$ and $F(r)$ are the large and small components of the Dirac electron wavefunction multiplied by r. The initial bound electron state is denoted by index i as above. The index κ denotes the final continuum state. Methods of calculation of a bound and continuum wavefunction including the phase convention were described in detail in [15].

Furthermore, we keep in the sum (4) the terms of order no more than $O[(kr)^2]$ and go from angles $\underline{\theta}$ and $\underline{\varphi}$ to θ and φ in the case of linearly polarized radiation. Taking into account Eq. (8), one can obtain the convenient expression for the photoelectron angular distribution [9]

$$\frac{\mathrm{d}\sigma_i}{\mathrm{d}\Omega}(\theta,\varphi) = \frac{\sigma_i}{4\pi}\big[1 + (\beta + \Delta\beta_{\ell p})P_2(\cos\theta) + (\gamma\cos^2\theta + \delta)\sin\theta\cos\varphi + \eta P_2(\cos\theta)\cos 2\varphi + \mu\cos 2\varphi + \xi(1+\cos 2\varphi)P_4(\cos\theta)\big]. \tag{24}$$

In a like manner, the following expression for the unpolarized radiation can be obtained:

$$\frac{\mathrm{d}\sigma_i}{\mathrm{d}\Omega}(\underline{\theta}) = \frac{\sigma_i}{4\pi}\left[1 - \frac{1}{2}(\beta + \Delta\beta_{\mathrm{unp}})P_2(\cos\underline{\theta}) + \left(\frac{\gamma}{2}\sin^2\underline{\theta} + \delta\right)\cos\underline{\theta} + \xi P_4(\cos\underline{\theta})\right]. \tag{25}$$

The parameters involved in Eqs. (24) and (25) are the following combinations of the terms $B_n(\tau_1 L_1\, \tau_2 L_2)$. The dipole parameter β is

$$\beta = -2B_2(E1\,E1), \tag{26}$$

the non-dipole first-order parameters γ and δ are:

$$\gamma = -5B_1(E1\,E2), \tag{27}$$

$$\delta = B_1(E1\,M1) + B_1(E1\,E2) + B_3(E1\,E2), \tag{28}$$

the non-dipole second order parameters $\Delta\beta_{\mathrm{unp}}$, $\Delta\beta_{\ell_p}$, η, μ, and ξ are:

$$\Delta\beta_{\mathrm{unp}} = -2\{B_2(M1\,M1) + B_2[\Delta(E1\,E1)] + B_2(E1\,M2) + B_2(M1\,E2) + B_2(E2\,E2) + B_2(E1\,E3)\}, \tag{29}$$

$$\Delta\beta_{\ell p} = B_2(M1\,M1) - 2B_2[\Delta(E1\,E1)] - B_2(M1\,E2) + B_2(E2\,E2) - \tfrac{3}{4}B_2(E1\,E3), \tag{30}$$

$$\eta = -B_2(M1\,M1) - \tfrac{2}{3}B_2(E1\,M2) - \tfrac{1}{3}B_2(M1\,E2) - B_2(E2\,E2) - \tfrac{5}{12}B_2(E1\,E3) - \tfrac{5}{6}B_4(E2\,E2) - \tfrac{5}{6}B_4(E1\,E3), \tag{31}$$

$$\xi = B_4(E2\,E2) + B_4(E1\,E3), \tag{32}$$

$$\mu = -(\eta + \xi). \tag{33}$$

As evident from Eqs. (29)–(33), the parameters are related in the following way:

$$\Delta\beta_{\mathrm{unp}} = \Delta\beta_{\ell p} - \tfrac{1}{2}(5\mu - \eta). \tag{34}$$

It should be noted that the small terms $B_2(M1\,M1)$ and $B_2(M1\,E2)$ have been ignored in papers [9,10]. In addition, there is no clear evidence whether or not the term $B_2[\Delta(E1\,E1)]$ has been included. For reference, the second order terms $B_2(\tau_1 L_1 \tau_2 L_2)$ and $B_4(\tau_1 L_1 \tau_2 L_2)$ are listed in Table A. As seen from this table, the magnitudes of $B_2(E2\,E2)$ and $B_2(E1\,E3)$ are the largest, the dipole–octupole amplitude exceeding the quadrupole–quadrupole one at $E \gtrsim 1$ keV. The magnitude of the term $B_2[\Delta(E1\,E1)]$ is approximately of the same order as $B_2(E1\,M2)$. Of the two second-order terms $B_4(E2\,E2)$ and $B_4(E1\,E3)$, the dipole–octupole term also exceeds the quadrupole–quadrupole one for all energies under consideration.

As revealed by the calculations, the parameters $\Delta\beta_{\mathrm{unp}}$, $\Delta\beta_{\ell_p}$, η, μ, and ξ depend monotonically on the energy at $E \geqslant 1$ keV in many cases, for example, for all s-shells of light atoms with $Z \lesssim 20$, for p-shells of atoms with $Z \lesssim 30$, and for d-shells of atoms with $Z \lesssim 50$. Such E-de-

Table A
Terms $B_2(\tau_1 L_1\, \tau_2 L_2)$ and $B_4(\tau_1 L_1\, \tau_2 L_2)$ of the order $O[(kr)^2]$ [Eqs. (13)–(20)], entering in coefficients B_2 and B_4

Z	Shell	E (keV)	$B_2(\tau_1 L_1\, \tau_2 L_2)$						$B_4(\tau_1 L_1\, \tau_2 L_2)$	
			$\Delta(E1\,E1)$	$M1\,M1$	$E1\,M2$	$M1\,E2$	$E2\,E2$	$E1\,E3$	$E2\,E2$	$E1\,E3$
29	$2p_{1/2}$	1	3.67−4	−1.12−8	6.54−4	−2.63−5	2.06−3	6.32−4	−8.82−4	−1.16−3
		5	2.76−3	2.02−7	2.41−3	5.17−5	1.40−2	3.72−2	−1.71−2	−3.04−2
		10	4.75−3	8.23−7	5.03−3	3.35−4	2.92−2	8.86−2	−3.93−2	−6.12−2
54	$3d_{3/2}$	1	4.16−4	7.52−8	−5.02−4	−7.21−5	2.03−3	−1.52−3	−2.56−4	7.80−4
		5	3.06−3	4.45−7	−1.62−3	2.37−5	1.83−2	3.92−2	−1.68−2	−2.65−2
		10	5.56−3	2.09−6	−3.06−3	5.74−4	4.04−2	1.11−1	−4.64−2	−6.09−2

The decimal order is given to the right of a value. For example, the value 3.67−4 is equal to 0.000367.

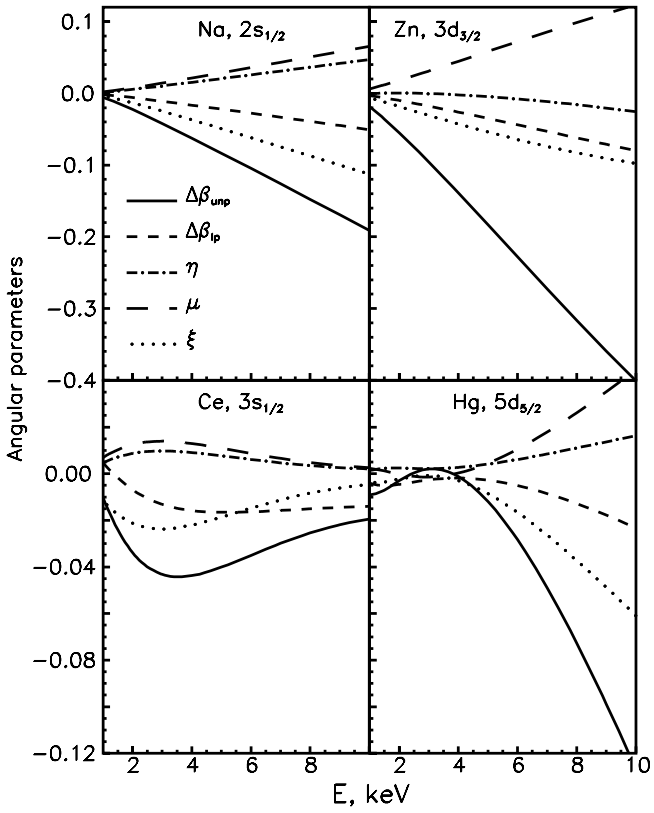

Fig. 2. The dependence of the second order parameters on the photoelectron energy E: $\Delta\beta_{\rm unp}$, solid line; $\Delta\beta_{\ell p}$, short-dashed line; η, dot-dashed line; μ, long-dashed line; and ξ, dot line.

pendence is shown at the top of Fig. 2 for the $2s_{1/2}$-shell of Na and the $3d_{3/2}$-shell of Zn. However sometimes, the E-dependence of some parameters may exhibit maxima and minima in the range $E = 1-5$ keV as for the inner $3s_{1/2}$-shell of Ce and the outer $5d_{5/2}$-shell of Hg presented at the bottom of Fig. 2. Therefore we present the parameters for three values of the photoelectron energy in this region.

Calculations were performed within the one-electron approximation for a free atom with the standard electron configuration. We used the central Dirac–Fock–Slater potential with the coefficient $C = 1$ in the approximate expression for the exchange term [16]. The exact consideration of the exchange interaction between electrons as well as the influence of electron correlations on the photoelectron angular distribution parameters were discussed in papers [4,7,10]. These effects were shown to be important at low photoelectron energies near the ionization threshold ($E \lesssim 100$ eV). For the present calculations of the angular distribution parameters at photoelectron energy $E \geqslant 1$ keV, the independent-particle Dirac–Fock–Slater model is quite adequate. The hole in the atomic subshell from which a photoelectron was emitted was taken into consideration in the framework of the frozen orbital approximation. The method of calculations is discussed at great length in paper [1]. Experimental values of the electron binding energies used in calculations are given in [1,2]. Computations were carried out by the use of the computer code package RAINE [17].

1.2. Influence of second order terms on the photoelectron angular distribution

Let us consider the total effect of terms of the order $O[(kr)^2]$ on the photoelectron angular distribution for photoionization of different atomic shells. Fig. 3 demonstrates the differential cross section normalized to a unit solid angle

$$\frac{d\bar{\sigma}_i}{d\Omega}(\underline{\theta}) = \frac{d\sigma_i}{d\Omega}(\underline{\theta}) \Big/ \frac{\sigma_i}{4\pi} \tag{35}$$

for the case of unpolarized radiation at the energy $E = 10$ keV. Calculations were carried out including the $O[(kr)^2]$ order terms using Eq. (25) (solid curves) and without them using Eq. (1) (dashed curves). As seen in the figure, the solid curves are shifted to the lesser angles with relation to the dashed curves. The difference between corresponding values of $\frac{d\bar{\sigma}_i}{d\Omega}(\underline{\theta})$ reaches 19% for the $1s_{1/2}$-shell of Li, 14% for the $2p_{1/2}$-shell of Na, 21% for the $4d_{3/2}$-shell of Ag, and 33% for the $4f_{5/2}$-shell of Sm.

The angular distribution in the case of linearly polarized radiation is shown in Fig. 4 for $E = 10$ keV. We present the θ-dependence of $\frac{d\bar{\sigma}_i}{d\Omega}(\theta, \varphi)$ for two values of the angle φ ($\varphi = 0$ and $\varphi = \pi/2$). The comparison of the angular distribution calculated with and without including the second order terms also exhibits the considerable effect of these terms. The difference in corresponding differential sections

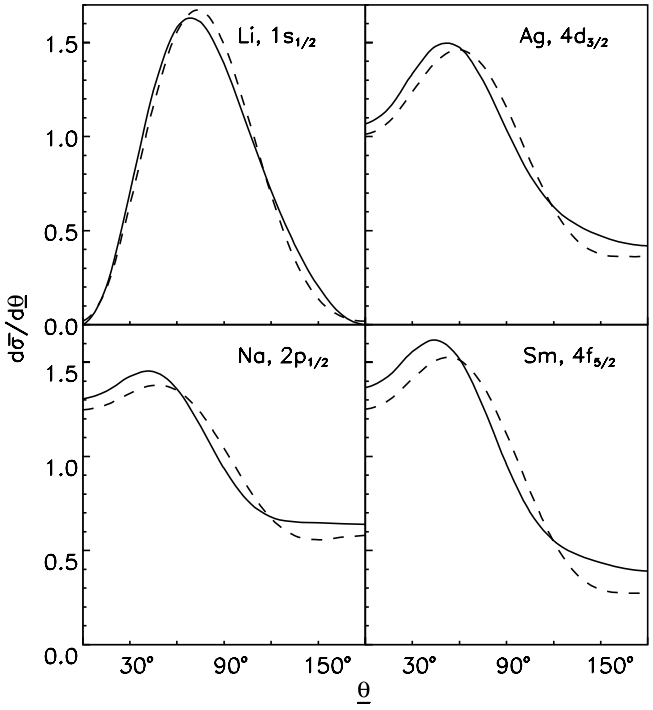

Fig. 3. Photoelectron angular distribution $d\bar{\sigma}_i/d\Omega(\underline{\theta})$ calculated with (solid line) and without (dashed line) regard to the terms of the order $O[(kr)^2]$ in the case of unpolarized radiation at the photoelectron energy $E = 10$ keV.

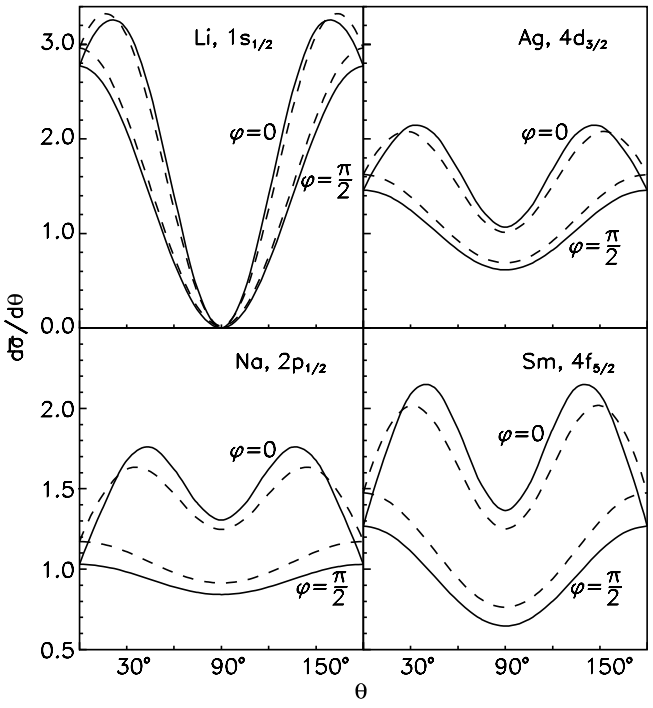

Fig. 4. Photoelectron angular distribution $d\bar{\sigma}_i/d\Omega(\theta,\varphi)$ calculated with (solid line) and without (dashed line) regard to the terms of the order $O[(kr)^2]$ at the photoelectron energy $E = 10$ keV in the case of linearly polarized radiation at two values $\varphi = 0$ and $\varphi = \pi/2$.

reaches $\sim$ 20%. In addition, calculations with regard to these terms using Eq. (24) (solid curves) and without regard for these terms using Eq. (2) (dashed curves) differ in the positions of the maxima at $\varphi = 0$. Calculations showed that the second-order terms make a noticeable contribution to the angular distributions for lower energies also. For example, the contribution is 6% for the $2p_{1/2}$-shell of Na and 8% for the $4d_{3/2}$-shell of Ag at $E = 5$ keV.

The role of the $O[(kr)^2]$ terms becomes of particular importance in calculation of the special non-dipole parameter ζ which is specified for linearly polarized radiation as follows:

$$\zeta = \sqrt{\frac{27}{2}}\left\{\left[\frac{d\sigma_i}{d\Omega}(\theta_m,\varphi=0)\Big/\frac{d\sigma_i}{d\Omega}(\theta_m,\varphi=\pi/2)\right]-1\right\}. \quad (36)$$

Here $\theta_m = 54.7°$ is the magic angle for which $P_2(\cos\theta_m) = 0$, that is, the dipole term vanishes in the differential cross section. The parameter ζ is measured experimentally [9]. The dependence $\zeta(E)$ obtained with and without regard to the $O[(kr)^2]$ terms is shown in Fig. 5 for the $2p_{1/2}$-shell of Na, the $3d_{3/2}$-shell of Zn, and the 7s-shell of U. As seen, for the $2p_{1/2}$- and $3d_{3/2}$-shell, the second order terms increase the value of ζ by $\sim$1.5 times at $E = 5$ keV and a factor of two at $E = 10$ keV. The terms make a noticeable contribution ($\sim$15%) even at the lowest energy under consideration $E = 1$ keV. For the outer 7s-shell, the influence of these terms is even greater. The value of ζ increases by $\sim$2.5 times at $E = 5$ keV and changes from -0.15 to $+0.32$ at $E = 10$ keV if the second-order terms are taken into account. Consequently, the proper allowance must be made for terms of the order $O[(kr)^2]$ in the photoelectron energy range under consideration.

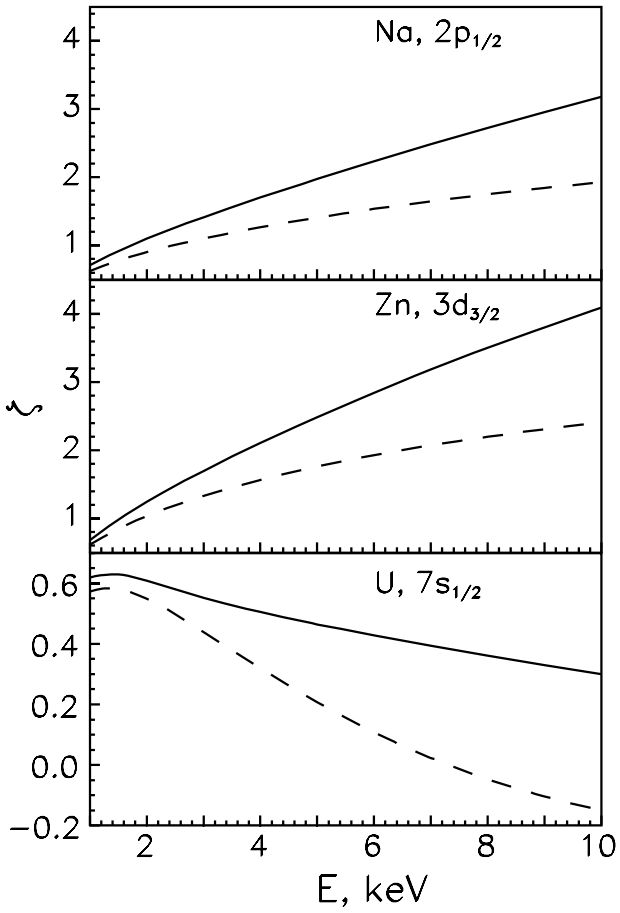

Fig. 5. The non-dipole parameter ζ [Eq. (36)] versus the photoelectron energy E calculated with (solid line) and without (dashed line) regard to the terms of the order $O[(kr)^2]$.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.adt.2005.12.002.

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Explanation of Tables

Table 1. Angular distribution parameters of the second order

Z	Atomic number
Shell	Atomic subshell from which a photoelectron is emitted
E	Photoelectron energy in keV
$\Delta\beta_{\rm unp}$	Correction of the second order $O[(kr)^2]$ to the dipole parameter β in the case of unpolarized or circularly polarized radiation
$\Delta\beta_{\ell p}$	Correction of the second order $O[(kr)^2]$ to the dipole parameter β in the case of linearly polarized radiation
η, μ, ξ	Photoelectron angular distribution parameters of the order $O[(kr)^2]$

The electron configuration of the atom Z is presented in the form of quantum numbers of the additional electrons with respect to the configuration of the nearest rare gas with the atomic number smaller than Z.

Table 2. Subshell photoionization cross section and angular distribution parameters of the zero and first orders for photoelectron energy $E = 10$ keV

σ	Subshell photoionization cross section in kb ($=10^{-21}$ cm^2)
β	Dipole angular distribution parameter
γ, δ	Non-dipole angular distribution parameters of the order $O(kr)$

The photoionization cross sections are presented for completely filled atomic subshells. To obtain σ_i for a partially filled subshell i, the value from the Table should be divided by the factor $(2j_i + 1)$ and multiplied by the actual occupation number of the i-th subshell.

Presented for each value to its right is the decimal order. For example, the value $-1.15-2$ is equal to -0.0115.

Table 1
Angular distribution parameters of the second order. See page 252 for Explanation of Tables

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$Z=1$, H: $1s^1_{1/2}$							$Z=2$, He: $1s^2_{1/2}$						
$1s_{1/2}$	1	−2.28−2	−6.12−3	5.58−3	7.81−3	−1.34−2	$1s_{1/2}$	1	−2.22−2	−6.02−3	5.41−3	7.57−3	−1.30−2
	3	−6.82−2	−1.83−2	1.67−2	2.33−2	−4.00−2		3	−6.93−2	−1.86−2	1.69−2	2.37−2	−4.06−2
	5	−1.13−1	−3.03−2	2.76−2	3.86−2	−6.62−2		5	−1.07−1	−2.77−2	2.64−2	3.68−2	−6.32−2
	10	−2.21−1	−5.89−2	5.44−2	7.59−2	−1.30−1		10	−2.11−1	−5.40−2	5.25−2	7.33−2	−1.26−1
$Z=3$, Li: $1s^2_{1/2}2s^1_{1/2}$							$Z=4$, Be: $1s^2_{1/2}2s^2_{1/2}$						
$1s_{1/2}$	1	−1.97−2	−5.13−3	4.87−3	6.82−3	−1.17−2	$1s_{1/2}$	1	−1.90−2	−4.90−3	4.70−3	6.58−3	−1.13−2
	3	−6.50−2	−1.73−2	1.59−2	2.23−2	−3.82−2		3	−6.31−2	−1.66−2	1.55−2	2.17−2	−3.72−2
	5	−1.10−1	−2.95−2	2.70−2	3.77−2	−6.48−2		5	−1.08−1	−2.86−2	2.65−2	3.70−2	−6.36−2
	10	−2.21−1	−5.93−2	5.42−2	7.56−2	−1.30−1		10	−2.19−1	−5.83−2	5.37−2	7.48−2	−1.29−1
$2s_{1/2}$	1	−1.89−2	−4.93−3	4.65−3	6.51−3	−1.12−2	$2s_{1/2}$	1	−1.86−2	−5.04−3	4.54−3	6.35−3	−1.09−2
	3	−6.52−2	−1.72−2	1.60−2	2.24−2	−3.84−2		3	−6.16−2	−1.62−2	1.52−2	2.12−2	−3.64−2
	5	−1.10−1	−2.91−2	2.70−2	3.78−2	−6.48−2		5	−1.09−1	−2.92−2	2.66−2	3.71−2	−6.36−2
	10	−2.18−1	−5.78−2	5.38−2	7.50−2	−1.29−1		10	−2.19−1	−5.87−2	5.37−2	7.49−2	−1.29−1
$Z=5$, B: $1s^2_{1/2}2s^2_{1/2}2p^1_{1/2}$							$Z=6$, C: $1s^2_{1/2}2s^2_{1/2}2p^2_{1/2}$						
$1s_{1/2}$	1	−1.84−2	−4.63−3	4.58−3	6.41−3	−1.10−2	$1s_{1/2}$	1	−1.74−2	−4.26−3	4.39−3	6.14−3	−1.05−2
	3	−6.15−2	−1.61−2	1.52−2	2.12−2	−3.63−2		3	−6.05−2	−1.57−2	1.49−2	2.09−2	−3.58−2
	5	−1.06−1	−2.80−2	2.61−2	3.64−2	−6.25−2		5	−1.04−1	−2.73−2	2.57−2	3.58−2	−6.15−2
	10	−2.16−1	−5.75−2	5.32−2	7.41−2	−1.27−1		10	−2.14−1	−5.67−2	5.27−2	7.34−2	−1.26−1
$2s_{1/2}$	1	−1.61−2	−4.21−3	3.96−3	5.54−3	−9.50−3	$2s_{1/2}$	1	−1.40−2	−3.63−3	3.46−3	4.84−3	−8.30−3
	3	−6.09−2	−1.64−2	1.49−2	2.08−2	−3.56−2		3	−5.74−2	−1.51−2	1.41−2	1.97−2	−3.38−2
	5	−1.05−1	−2.80−2	2.57−2	3.59−2	−6.16−2		5	−1.02−1	−2.73−2	2.50−2	3.50−2	−6.00−2
	10	−2.15−1	−5.74−2	5.29−2	7.37−2	−1.27−1		10	−2.12−1	−5.64−2	5.20−2	7.25−2	−1.25−1
$2p_{1/2}$	1	−3.08−2	−5.96−3	1.42−4	9.98−3	−1.01−2	$2p_{1/2}$	1	−2.71−2	−4.83−3	1.22−4	8.93−3	−9.06−3
	3	−8.29−2	−1.31−2	−4.41−3	2.70−2	−2.26−2		3	−9.44−2	−1.81−2	−1.65−3	3.02−2	−2.85−2
	5	−1.62−1	−3.20−2	−4.49−3	5.12−2	−4.67−2		5	−1.46−1	−2.49−2	−6.29−3	4.72−2	−4.09−2
	10	−3.01−1	−5.35−2	−1.17−2	9.65−2	−8.49−2		10	−3.05−1	−5.48−2	−1.22−2	9.75−2	−8.53−2
$Z=7$, N: $1s^2_{1/2}2s^2_{1/2}2p^2_{1/2}2p^1_{3/2}$							$Z=8$, O: $1s^2_{1/2}2s^2_{1/2}2p^2_{1/2}2p^2_{3/2}$						
$1s_{1/2}$	1	−1.64−2	−3.90−3	4.18−3	5.85−3	−1.00−2	$1s_{1/2}$	1	−1.55−2	−3.55−3	3.99−3	5.58−3	−9.56−3
	3	−5.92−2	−1.53−2	1.47−2	2.05−2	−3.52−2		3	−5.77−2	−1.47−2	1.44−2	2.01−2	−3.45−2
	5	−1.03−1	−2.68−2	2.54−2	3.54−2	−6.08−2		5	−1.01−1	−2.63−2	2.51−2	3.50−2	−6.00−2
	10	−2.11−1	−5.58−2	5.21−2	7.26−2	−1.25−1		10	−2.09−1	−5.51−2	5.16−2	7.19−2	−1.24−1
$2s_{1/2}$	1	−1.26−2	−3.35−3	3.07−3	4.30−3	−7.37−3	$2s_{1/2}$	1	−1.10−2	−2.96−3	2.67−3	3.73−3	−6.40−3
	3	−5.46−2	−1.45−2	1.34−2	1.87−2	−3.22−2		3	−5.16−2	−1.37−2	1.27−2	1.77−2	−3.04−2
	5	−9.82−2	−2.60−2	2.42−2	3.37−2	−5.79−2		5	−9.56−2	−2.55−2	2.35−2	3.27−2	−5.62−2
	10	−2.08−1	−5.54−2	5.11−2	7.13−2	−1.22−1		10	−2.04−1	−5.43−2	5.02−2	7.00−2	−1.20−1
$2p_{1/2}$	1	−2.53−2	−4.60−3	2.74−4	8.35−3	−8.62−3	$2p_{1/2}$	1	−2.50−2	−4.77−3	6.79−4	8.22−3	−8.90−3
	3	−8.82−2	−1.54−2	−1.66−3	2.88−2	−2.71−2		3	−8.87−2	−1.65−2	−5.28−4	2.88−2	−2.83−2
	5	−1.53−1	−2.85−2	−3.78−3	4.92−2	−4.54−2		5	−1.49−1	−2.67−2	−3.35−3	4.84−2	−4.50−2
	10	−2.98−1	−5.32−2	−1.15−2	9.57−2	−8.42−2		10	−2.96−1	−5.32−2	−1.08−2	9.49−2	−8.41−2
$2p_{3/2}$	1	−2.13−2	−5.13−3	1.81−3	6.81−3	−8.62−3	$2p_{3/2}$	1	−2.12−2	−5.28−3	2.13−3	6.78−3	−8.90−3
	3	−7.42−2	−1.71−2	3.48−3	2.35−2	−2.70−2		3	−7.53−2	−1.83−2	4.46−3	2.37−2	−2.82−2
	5	−1.29−1	−3.15−2	5.03−3	4.00−2	−4.51−2		5	−1.26−1	−2.97−2	5.15−3	3.96−2	−4.47−2
	10	−2.51−1	−5.95−2	5.18−3	7.78−2	−8.30−2		10	−2.49−1	−5.93−2	5.72−3	7.70−2	−8.27−2
$Z=9$, F: $1s^2_{1/2}2s^2_{1/2}2p^2_{1/2}2p^3_{3/2}$							$Z=10$, Ne: $1s^2_{1/2}2s^2_{1/2}2p^2_{1/2}2p^4_{3/2}$						
$1s_{1/2}$	1	−1.46−2	−3.19−3	3.80−3	5.32−3	−9.12−3	$1s_{1/2}$	1	−1.36−2	−2.80−3	3.61−3	5.05−3	−8.66−3
	3	−5.61−2	−1.41−2	1.41−2	1.96−2	−3.37−2		3	−5.45−2	−1.35−2	1.37−2	1.92−2	−3.29−2
	5	−9.94−2	−2.56−2	2.47−2	3.45−2	−5.92−2		5	−9.75−2	−2.49−2	2.43−2	3.39−2	−5.82−2
	10	−2.07−1	−5.44−2	5.13−2	7.14−2	−1.23−1		10	−2.05−1	−5.37−2	5.09−2	7.08−2	−1.22−1
$2s_{1/2}$	1	−9.12−3	−2.46−3	2.22−3	3.10−3	−5.33−3	$2s_{1/2}$	1	−7.26−3	−1.97−3	1.77−3	2.47−3	−4.24−3
	3	−4.79−2	−1.25−2	1.18−2	1.65−2	−2.83−2		3	−4.50−2	−1.19−2	1.11−2	1.55−2	−2.66−2
	5	−9.12−2	−2.41−2	2.25−2	3.13−2	−5.38−2		5	−8.69−2	−2.29−2	2.14−2	2.99−2	−5.13−2
	10	−2.01−1	−5.34−2	4.94−2	6.87−2	−1.18−1		10	−1.96−1	−5.20−2	4.82−2	6.72−2	−1.15−1
$2p_{1/2}$	1	−2.46−2	−4.76−3	1.03−3	8.13−3	−9.16−3	$2p_{1/2}$	1	−2.37−2	−4.55−3	1.23−3	7.90−3	−9.13−3
	3	−8.55−2	−1.56−2	−1.10−5	2.79−2	−2.79−2		3	−8.23−2	−1.49−2	3.21−4	2.70−2	−2.73−2

(continued on next page)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
	5	−1.51−1	−2.80−2	−1.76−3	4.88−2	−4.71−2		5	−1.45−1	−2.60−2	−1.37−3	4.73−2	−4.59−2
	10	−2.98−1	−5.42−2	−8.96−3	9.56−2	−8.67−2		10	−2.96−1	−5.38−2	−7.56−3	9.56−2	−8.80−2
$2p_{3/2}$	1	−2.09−2	−5.26−3	2.43−3	6.74−3	−9.17−3	$2p_{3/2}$	1	−2.01−2	−5.03−3	2.59−3	6.56−3	−9.15−3
	3	−7.22−2	−1.74−2	4.95−3	2.29−2	−2.79−2		3	−6.94−2	−1.66−2	5.13−3	2.21−2	−2.73−2
	5	−1.28−1	−3.10−2	6.65−3	4.01−2	−4.68−2		5	−1.22−1	−2.90−2	6.86−3	3.88−2	−4.56−2
	10	−2.52−1	−6.04−2	7.41−3	7.80−2	−8.54−2		10	−2.51−1	−5.98−2	8.51−3	7.81−2	−8.66−2
$Z=11$, Na: $3s^1_{1/2}$							$Z=12$, Mg: $3s^2_{1/2}$						
$1s_{1/2}$	1	−1.28−2	−2.42−3	3.46−3	4.83−3	−8.29−3	$1s_{1/2}$	1	−1.20−2	−2.03−3	3.32−3	4.64−3	−7.96−3
	3	−5.30−2	−1.29−2	1.34−2	1.87−2	−3.21−2		3	−5.16−2	−1.23−2	1.31−2	1.83−2	−3.15−2
	5	−9.56−2	−2.42−2	2.39−2	3.34−2	−5.73−2		5	−9.38−2	−2.34−2	2.36−2	3.29−2	−5.64−2
	10	−2.03−1	−5.28−2	5.04−2	7.02−2	−1.21−1		10	−2.01−1	−5.20−2	5.00−2	6.96−2	−1.20−1
$2s_{1/2}$	1	−5.80−3	−1.62−3	1.40−3	1.95−3	−3.35−3	$2s_{1/2}$	1	−4.58−3	−1.33−3	1.09−3	1.52−3	−2.60−3
	3	−4.19−2	−1.11−2	1.03−2	1.44−2	−2.47−2		3	−3.89−2	−1.03−2	9.57−3	1.34−2	−2.29−2
	5	−8.34−2	−2.20−2	2.05−2	2.87−2	−4.92−2		5	−7.96−2	−2.10−2	1.96−2	2.73−2	−4.70−2
	10	−1.91−1	−5.06−2	4.71−2	6.56−2	−1.13−1		10	−1.86−1	−4.92−2	4.59−2	6.39−2	−1.10−1
$2p_{1/2}$	1	−2.24−2	−4.23−3	1.27−3	7.51−3	−8.78−3	$2p_{1/2}$	1	−2.16−2	−4.04−3	1.34−3	7.27−3	−8.61−3
	3	−8.16−2	−1.51−2	1.11−3	2.68−2	−2.79−2		3	−8.06−2	−1.51−2	1.75−3	2.66−2	−2.83−2
	5	−1.43−1	−2.62−2	−5.06−4	4.67−2	−4.62−2		5	−1.41−1	−2.59−2	2.98−4	4.61−2	−4.64−2
	10	−2.95−1	−5.35−2	−6.11−3	9.53−2	−8.92−2		10	−2.92−1	−5.31−2	−4.87−3	9.47−2	−8.98−2
$2p_{3/2}$	1	−1.90−2	−4.69−3	2.57−3	6.24−3	−8.81−3	$2p_{3/2}$	1	−1.83−2	−4.49−3	2.61−3	6.03−3	−8.64−3
	3	−6.90−2	−1.68−2	5.81−3	2.21−2	−2.79−2		3	−6.84−2	−1.67−2	6.36−3	2.20−2	−2.83−2
	5	−1.21−1	−2.91−2	7.58−3	3.84−2	−4.59−2		5	−1.20−1	−2.88−2	8.27−3	3.79−2	−4.62−2
	10	−2.50−1	−5.95−2	9.79−3	7.81−2	−8.79−2		10	−2.48−1	−5.90−2	1.09−2	7.77−2	−8.86−2
$3s_{1/2}$	1	−5.70−3	−1.72−3	1.33−3	1.86−3	−3.18−3	$3s_{1/2}$	1	−4.27−3	−1.33−3	9.82−4	1.37−3	−2.35−3
	3	−4.23−2	−1.14−2	1.03−2	1.44−2	−2.47−2		3	−3.84−2	−1.02−2	9.43−3	1.32−2	−2.26−2
	5	−8.27−2	−2.18−2	2.04−2	2.85−2	−4.89−2		5	−7.91−2	−2.09−2	1.95−2	2.71−2	−4.66−2
	10	−1.91−1	−5.06−2	4.70−2	6.54−2	−1.12−1		10	−1.85−1	−4.91−2	4.57−2	6.36−2	−1.09−1
$Z=13$, Al: $3s^2_{1/2}2p^1_{1/2}$							$Z=14$, Si: $3s^2_{1/2}2p^2_{1/2}$						
$1s_{1/2}$	1	−1.12−2	−1.63−3	3.19−3	4.45−3	−7.65−3	$1s_{1/2}$	1	−1.03−2	−1.21−3	3.06−3	4.26−3	−7.33−3
	3	−5.02−2	−1.17−2	1.29−2	1.80−2	−3.09−2		3	−4.89−2	−1.12−2	1.26−2	1.76−2	−3.03−2
	5	−9.20−2	−2.28−2	2.32−2	3.24−2	−5.56−2		5	−9.03−2	−2.20−2	2.29−2	3.19−2	−5.47−2
	10	−1.99−1	−5.10−2	4.95−2	6.89−2	−1.18−1		10	−1.96−1	−5.01−2	4.91−2	6.82−2	−1.17−1
$2s_{1/2}$	1	−3.55−3	−1.11−3	8.18−4	1.14−3	−1.96−3	$2s_{1/2}$	1	−2.70−3	−9.41−4	5.90−4	8.22−4	−1.41−3
	3	−3.58−2	−9.44−3	8.81−3	1.23−2	−2.11−2		3	−3.27−2	−8.65−3	8.06−3	1.12−2	−1.93−2
	5	−7.57−2	−2.00−2	1.87−2	2.60−2	−4.47−2		5	−7.17−2	−1.89−2	1.77−2	2.47−2	−4.24−2
	10	−1.81−1	−4.78−2	4.47−2	6.22−2	−1.07−1		10	−1.76−1	−4.65−2	4.34−2	6.04−2	−1.04−1
$2p_{1/2}$	1	−2.07−2	−3.83−3	1.36−3	7.02−3	−8.37−3	$2p_{1/2}$	1	−2.00−2	−3.67−3	1.36−3	6.81−3	−8.17−3
	3	−7.96−2	−1.49−2	2.35−3	2.63−2	−2.87−2		3	−7.84−2	−1.47−2	2.90−3	2.61−2	−2.90−2
	5	−1.39−1	−2.57−2	1.19−3	4.57−2	−4.69−2		5	−1.38−1	−2.56−2	2.07−3	4.54−2	−4.75−2
	10	−2.89−1	−5.26−2	−3.68−3	9.39−2	−9.03−2		10	−2.87−1	−5.22−2	−2.48−3	9.32−2	−9.07−2
$2p_{3/2}$	1	−1.75−2	−4.28−3	2.61−3	5.80−3	−8.41−3	$2p_{3/2}$	1	−1.68−2	−4.11−3	2.61−3	5.61−3	−8.22−3
	3	−6.76−2	−1.65−2	6.88−3	2.18−2	−2.87−2		3	−6.68−2	−1.63−2	7.35−3	2.17−2	−2.90−2
	5	−1.18−1	−2.86−2	9.05−3	3.77−2	−4.67−2		5	−1.17−1	−2.84−2	9.84−3	3.75−2	−4.74−2
	10	−2.45−1	−5.85−2	1.19−2	7.72−2	−8.91−2		10	−2.43−1	−5.81−2	1.30−2	7.67−2	−8.96−2
$3s_{1/2}$	1	−3.15−3	−1.08−3	6.93−4	9.66−4	−1.66−3	$3s_{1/2}$	1	−2.27−3	−8.94−4	4.61−4	6.43−4	−1.10−3
	3	−3.52−2	−9.49−3	8.61−3	1.20−2	−2.06−2		3	−3.15−2	−8.40−3	7.73−3	1.08−2	−1.85−2
	5	−7.51−2	−1.99−2	1.85−2	2.57−2	−4.42−2		5	−7.06−2	−1.87−2	1.74−2	2.42−2	−4.16−2
	10	−1.80−1	−4.77−2	4.44−2	6.18−2	−1.06−1		10	−1.75−1	−4.63−2	4.31−2	6.00−2	−1.03−1
$3p_{1/2}$	1	−1.95−2	−3.73−3	1.40−3	6.59−3	−7.99−3	$3p_{1/2}$	1	−1.80−2	−3.37−3	1.35−3	6.13−3	−7.47−3
	3	−7.94−2	−1.52−2	2.61−3	2.62−2	−2.88−2		3	−7.64−2	−1.44−2	3.01−3	2.54−2	−2.84−2
	5	−1.38−1	−2.54−2	1.26−3	4.53−2	−4.66−2		5	−1.36−1	−2.54−2	2.22−3	4.49−2	−4.71−2
	10	−2.88−1	−5.23−2	−3.57−3	9.36−2	−9.00−2		10	−2.84−1	−5.18−2	−2.31−3	9.26−2	−9.03−2
$Z=15$, P: $3s^2_{1/2}2p^2_{1/2}2p^1_{3/2}$							$Z=16$, S: $3s^2_{1/2}2p^2_{1/2}2p^2_{3/2}$						
$2s_{1/2}$	1	−2.00−3	−8.11−4	3.98−4	5.55−4	−9.53−4	$2s_{1/2}$	1	−1.46−3	−7.24−4	2.46−4	3.42−4	−5.88−4
	3	−2.97−2	−7.88−3	7.32−3	1.02−2	−1.75−2		3	−2.68−2	−7.14−3	6.60−3	9.20−3	−1.58−2
	5	−6.78−2	−1.79−2	1.67−2	2.33−2	−4.01−2		5	−6.38−2	−1.68−2	1.57−2	2.19−2	−3.77−2
	10	−1.71−1	−4.51−2	4.22−2	5.87−2	−1.01−1		10	−1.65−1	−4.37−2	4.09−2	5.69−2	−9.78−2

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$2p_{1/2}$	1	−1.94−2	−3.50−3	1.35−3	6.64−3	−7.99−3	$2p_{1/2}$	1	−1.88−2	−3.29−3	1.31−3	6.45−3	−7.76−3
	3	−7.73−2	−1.45−2	3.36−3	2.58−2	−2.92−2		3	−7.59−2	−1.42−2	3.72−3	2.54−2	−2.92−2
	5	−1.37−1	−2.55−2	2.96−3	4.52−2	−4.81−2		5	−1.36−1	−2.53−2	3.78−3	4.49−2	−4.87−2
	10	−2.84−1	−5.20−2	−1.23−3	9.26−2	−9.14−2		10	−2.82−1	−5.18−2	6.42−5	9.21−2	−9.22−2
$2p_{3/2}$	1	−1.62−2	−3.94−3	2.60−3	5.44−3	−8.04−3	$2p_{3/2}$	1	−1.55−2	−3.73−3	2.57−3	5.24−3	−7.80−3
	3	−6.59−2	−1.60−2	7.76−3	2.15−2	−2.92−2		3	−6.47−2	−1.57−2	8.06−3	2.12−2	−2.93−2
	5	−1.16−1	−2.82−2	1.06−2	3.74−2	−4.81−2		5	−1.15−1	−2.80−2	1.14−2	3.73−2	−4.86−2
	10	−2.41−1	−5.78−2	1.41−2	7.62−2	−9.03−2		10	−2.40−1	−5.75−2	1.53−2	7.59−2	−9.12−2
$3s_{1/2}$	1	−1.62−3	−7.95−4	2.78−4	3.86−4	−6.64−4	$3s_{1/2}$	1	−1.20−3	−7.77−4	1.42−4	1.98−4	−3.40−4
	3	−2.86−2	−7.76−3	6.98−3	9.74−3	−1.67−2		3	−2.57−2	−7.10−3	6.23−3	8.69−3	−1.49−2
	5	−6.64−2	−1.77−2	1.63−2	2.28−2	−3.91−2		5	−6.21−2	−1.65−2	1.53−2	2.13−2	−3.65−2
	10	−1.69−1	−4.48−2	4.18−2	5.81−2	−9.99−2		10	−1.64−1	−4.34−2	4.04−2	5.62−2	−9.66−2
$3p_{1/2}$	1	−1.66−2	−3.07−3	1.26−3	5.67−3	−6.92−3	$3p_{1/2}$	1	−1.54−2	−2.89−3	1.21−3	5.25−3	−6.46−3
	3	−7.35−2	−1.37−2	3.25−3	2.46−2	−2.79−2		3	−7.21−2	−1.37−2	3.81−3	2.41−2	−2.80−2
	5	−1.34−1	−2.47−2	2.98−3	4.41−2	−4.71−2		5	−1.32−1	−2.48−2	3.99−3	4.37−2	−4.77−2
	10	−2.81−1	−5.15−2	−1.09−3	9.18−2	−9.07−2		10	−2.78−1	−5.11−2	2.74−4	9.09−2	−9.12−2
$3p_{3/2}$	1	−1.36−2	−3.48−3	2.42−3	4.55−3	−6.97−3	$3p_{3/2}$	1	−1.26−2	−3.29−3	2.34−3	4.18−3	−6.52−3
	3	−6.23−2	−1.52−2	7.58−3	2.04−2	−2.79−2		3	−6.12−2	−1.52−2	8.04−3	2.00−2	−2.81−2
	5	−1.13−1	−2.74−2	1.06−2	3.64−2	−4.70−2		5	−1.12−1	−2.74−2	1.15−2	3.62−2	−4.77−2
	10	−2.38−1	−5.71−2	1.42−2	7.53−2	−8.95−2		10	−2.36−1	−5.67−2	1.54−2	7.48−2	−9.02−2
$Z = 17$, Cl: $3s^2_{1/2}2p^2_{1/2}2p^3_{3/2}$							$Z = 18$, Ar: $3s^2_{1/2}2p^2_{1/2}2p^4_{3/2}$						
$2s_{1/2}$	1	−1.09−3	−6.89−4	1.37−4	1.90−4	−3.27−4	$2s_{1/2}$	1	−9.56−4	−7.21−4	8.01−5	1.10−4	−1.90−4
	3	−2.41−2	−6.49−3	5.92−3	8.25−3	−1.42−2		3	−2.16−2	−5.88−3	5.28−3	7.35−3	−1.26−2
	5	−5.97−2	−1.57−2	1.48−2	2.06−2	−3.53−2		5	−5.57−2	−1.47−2	1.38−2	1.92−2	−3.29−2
	10	−1.60−1	−4.22−2	3.96−2	5.51−2	−9.47−2		10	−1.55−1	−4.08−2	3.83−2	5.32−2	−9.15−2
$2p_{1/2}$	1	−1.80−2	−3.04−3	1.23−3	6.24−3	−7.48−3	$2p_{1/2}$	1	−1.73−2	−2.78−3	1.13−3	6.04−3	−7.16−3
	3	−7.45−2	−1.39−2	4.03−3	2.51−2	−2.91−2		3	−7.33−2	−1.36−2	4.29−3	2.48−2	−2.90−2
	5	−1.34−1	−2.50−2	4.54−3	4.46−2	−4.91−2		5	−1.33−1	−2.47−2	5.21−3	4.42−2	−4.94−2
	10	−2.80−1	−5.16−2	1.39−3	9.17−2	−9.31−2		10	−2.78−1	−5.14−2	2.73−3	9.14−2	−9.41−2
$2p_{3/2}$	1	−1.48−2	−3.49−3	2.52−3	5.02−3	−7.54−3	$2p_{3/2}$	1	−1.40−2	−3.22−3	2.44−3	4.79−3	−7.23−3
	3	−6.35−2	−1.54−2	8.32−3	2.09−2	−2.92−2		3	−6.25−2	−1.51−2	8.56−3	2.07−2	−2.92−2
	5	−1.15−1	−2.78−2	1.21−2	3.71−2	−4.92−2		5	−1.13−1	−2.74−2	1.27−2	3.69−2	−4.96−2
	10	−2.38−1	−5.73−2	1.65−2	7.57−2	−9.22−2		10	−2.37−1	−5.71−2	1.77−2	7.56−2	−9.33−2
$3s_{1/2}$	1	−9.13−4	−7.66−4	4.98−5	6.88−5	−1.19−4	$3s_{1/2}$	1	−8.14−4	−7.86−4	9.34−6	1.28−5	−2.22−5
	3	−2.28−2	−6.33−3	5.50−3	7.67−3	−1.32−2		3	−2.03−2	−5.84−3	4.84−3	6.75−3	−1.16−2
	5	−5.78−2	−1.55−2	1.42−2	1.98−2	−3.40−2		5	−5.35−2	−1.44−2	1.31−2	1.83−2	−3.14−2
	10	−1.58−1	−4.19−2	3.90−2	5.42−2	−9.32−2		10	−1.52−1	−4.03−2	3.75−2	5.22−2	−8.97−2
$3p_{1/2}$	1	−1.42−2	−2.66−3	1.14−3	4.85−3	−5.99−3	$3p_{1/2}$	1	−1.28−2	−2.31−3	9.90−4	4.39−3	−5.38−3
	3	−6.91−2	−1.29−2	3.95−3	2.33−2	−2.73−2		3	−6.77−2	−1.28−2	4.33−3	2.28−2	−2.72−2
	5	−1.28−1	−2.38−2	4.52−3	4.28−2	−4.73−2		5	−1.26−1	−2.36−2	5.29−3	4.21−2	−4.74−2
	10	−2.75−1	−5.07−2	1.59−3	9.02−2	−9.18−2		10	−2.72−1	−5.03−2	3.00−3	8.94−2	−9.24−2
$3p_{3/2}$	1	−1.14−2	−3.06−3	2.24−3	3.80−3	−6.05−3	$3p_{3/2}$	1	−1.01−2	−2.70−3	2.07−3	3.37−3	−5.44−3
	3	−5.85−2	−1.43−2	8.10−3	1.93−2	−2.74−2		3	−5.74−2	−1.42−2	8.40−3	1.89−2	−2.73−2
	5	−1.09−1	−2.65−2	1.19−2	3.54−2	−4.73−2		5	−1.07−1	−2.62−2	1.25−2	3.50−2	−4.75−2
	10	−2.34−1	−5.62−2	1.66−2	7.43−2	−9.09−2		10	−2.31−1	−5.59−2	1.79−2	7.38−2	−9.17.−2
$Z = 19$, K: $4s^1_{1/2}$							$Z = 20$, Ca: $4s^2_{1/2}$						
$2s_{1/2}$	1	−1.03−3	−8.09−4	7.50−5	1.04−4	−1.79−4	$2s_{1/2}$	1	−1.34−3	−9.68−4	1.24−4	1.74−4	−2.98−4
	3	−1.92−2	−5.32−3	4.67−3	6.50−3	−1.12−2		3	−1.70−2	−4.79−3	4.10−3	5.70−3	−9.80−3
	5	−5.18−2	−1.37−2	1.28−2	1.78−2	−3.06−2		5	−4.82−2	−1.28−2	1.19−2	1.65−2	−2.84−2
	10	−1.49−1	−3.93−2	3.70−2	5.13−2	−8.83−2		10	−1.43−1	−3.78−2	3.56−2	4.94−2	−8.50−2
$2p_{1/2}$	1	−1.65−2	−2.50−3	1.01−3	5.82−3	−6.83−3	$2p_{1/2}$	1	−1.58−2	−2.20−3	8.65−4	5.60−3	−6.47−3
	3	−7.21−2	−1.33−2	4.52−3	2.44−2	−2.90−2		3	−7.10−2	−1.30−2	4.71−3	2.41−2	−2.89−2
	5	−1.31−1	−2.44−2	5.76−3	4.38−2	−4.96−2		5	−1.29−1	−2.40−2	6.28−3	4.34−2	−4.97−2
	10	−2.77−1	−5.13−2	4.04−3	9.10−2	−9.51−2		10	−2.75−1	−5.11−2	5.33−3	9.07−2	−9.60−2
$2p_{3/2}$	1	−1.32−2	−2.95−3	2.35−3	4.55−3	−6.90−3	$2p_{3/2}$	1	−1.23−2	−2.66−3	2.25−3	4.30−3	−6.55−3
	3	−6.15−2	−1.49−2	8.76−3	2.04−2	−2.92−2		3	−6.05−2	−1.46−2	8.94−3	2.02−2	−2.91−2
	5	−1.12−1	−2.71−2	1.32−2	3.66−2	−4.98−2		5	−1.11−1	−2.67−2	1.36−2	3.63−2	−4.99−2
	10	−2.36−1	−5.69−2	1.90−2	7.55−2	−9.44−2		10	−2.35−1	−5.67−2	2.02−2	7.54−2	−9.55−2

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$3s_{1/2}$	1	−9.41−4	−8.94−4	1.54−5	2.21−5	−3.75−5	$3s_{1/2}$	1	−1.21−3	−1.03−3	5.91−5	8.40−5	−1.43−4
	3	−1.76−2	−5.16−3	4.17−3	5.81−3	−9.98−3		3	−1.52−2	−4.58−3	3.55−3	4.94−3	−8.50−3
	5	−4.97−2	−1.35−2	1.21−2	1.69−2	−2.91−2		5	−4.59−2	−1.26−2	1.12−2	1.56−2	−2.68−2
	10	−1.46−1	−3.88−2	3.61−2	5.01−2	−8.62−2		10	−1.40−1	−3.71−2	3.46−2	4.80−2	−8.26−2
$3p_{1/2}$	1	−1.15−2	−2.06−3	8.63−4	3.97−3	−4.83−3	$3p_{1/2}$	1	−1.05−2	−1.85−3	7.59−4	3.62−3	−4.38−3
	3	−6.52−2	−1.23−2	4.54−3	2.21−2	−2.66−2		3	−6.29−2	−1.18−2	4.67−3	2.14−2	−2.61−2
	5	−1.23−1	−2.30−2	5.78−3	4.12−2	−4.70−2		5	−1.21−1	−2.26−2	6.37−3	4.05−2	−4.69−2
	10	−2.69−1	−4.99−2	4.36−3	8.87−2	−9.30−2		10	−2.66−1	−4.94−2	5.66−3	8.79−2	−9.35−2
$3p_{3/2}$	1	−8.95−3	−2.44−3	1.91−3	2.99−3	−4.90−3	$3p_{3/2}$	1	−7.97−3	−2.23−3	1.80−3	2.66−3	−4.45−3
	3	−5.53−2	−1.37−2	8.52−3	1.83−2	−2.69−2		3	−5.32−2	−1.32−2	8.59−3	1.77−2	−2.63−2
	5	−1.05−1	−2.56−2	1.29−2	3.43−2	−4.72−2		5	−1.03−1	−2.52−2	1.34−2	3.37−2	−4.71−2
	10	−2.29−1	−5.54−2	1.91−2	7.33−2	−9.24−2		10	−2.27−1	−5.49−2	2.02−2	7.28−2	−9.31−2
$4s_{1/2}$	1	−1.10−3	−1.04−3	1.96−5	2.82−5	−4.77−5	$4s_{1/2}$	1	−1.25−3	−1.06−3	6.01−5	8.59−5	−1.46−4
	3	−1.73−2	−5.12−3	4.10−3	5.71−3	−9.81−3		3	−1.52−2	−4.71−3	3.54−3	4.92−3	−8.46−3
	5	−4.95−2	−1.35−2	1.21−2	1.68−2	−2.89−2		5	−4.58−2	−1.26−2	1.11−2	1.55−2	−2.66−2
	10	−1.46−1	−3.88−2	3.61−2	5.01−2	−8.61−2		10	−1.40−1	−3.72−2	3.45−2	4.80−2	−8.25−2
$Z = 21$, Sc: $4s^2_{1/2}3d^1_{3/2}$							$Z = 22$, Ti: $4s^2_{1/2}3d^2_{3/2}$						
$2s_{1/2}$	1	−1.88−3	−1.20−3	2.27−4	3.19−4	−5.46−4	$2s_{1/2}$	1	−2.65−3	−1.49−3	3.86−4	5.42−4	−9.28−4
	3	−1.48−2	−4.27−3	3.54−3	4.91−3	−8.45−3		3	−1.27−2	−3.79−3	3.00−3	4.16−3	−7.17−3
	5	−4.46−2	−1.19−2	1.10−2	1.53−2	−2.63−2		5	−4.10−2	−1.10−2	1.01−2	1.40−2	−2.41−2
	10	−1.38−1	−3.62−2	3.42−2	4.74−2	−8.16−2		10	−1.32−1	−3.47−2	3.28−2	4.54−2	−7.82−2
$2p_{1/2}$	1	−1.49−2	−1.88−3	6.96−4	5.35−3	−6.05−3	$2p_{1/2}$	1	−1.40−2	−1.55−3	5.09−4	5.08−3	−5.59−3
	3	−6.98−2	−1.27−2	4.86−3	2.38−2	−2.87−2		3	−6.85−2	−1.23−2	4.93−3	2.35−2	−2.84−2
	5	−1.28−1	−2.36−2	6.76−3	4.30−2	−4.98−2		5	−1.26−1	−2.33−2	7.20−3	4.26−2	−4.98−2
	10	−2.73−1	−5.08−2	6.58−3	9.04−2	−9.69−2		10	−2.71−1	−5.04−2	7.75−3	8.99−2	−9.77−2
$2p_{3/2}$	1	−1.13−2	−2.35−3	2.13−3	4.01−3	−6.14−3	$2p_{3/2}$	1	−1.03−2	−2.03−3	1.99−3	3.70−3	−5.69−3
	3	−5.95−2	−1.42−2	9.08−3	1.99−2	−2.90−2		3	−5.82−2	−1.38−2	9.16−3	1.96−2	−2.88−2
	5	−1.09−1	−2.64−2	1.41−2	3.60−2	−5.01−2		5	−1.08−1	−2.60−2	1.45−2	3.58−2	−5.02−2
	10	−2.34−1	−5.64−2	2.13−2	7.53−2	−9.66−2		10	−2.33−1	−5.61−2	2.25−2	7.51−2	−9.76−2
$3s_{1/2}$	1	−1.63−3	−1.20−3	1.41−4	2.00−4	−3.41−4	$3s_{1/2}$	1	−2.18−3	−1.39−3	2.60−4	3.68−4	−6.29−4
	3	−1.30−2	−4.10−3	2.98−3	4.14−3	−7.12−3		3	−1.10−2	−3.68−3	2.46−3	3.41−3	−5.87−3
	5	−4.20−2	−1.16−2	1.02−2	1.42−2	−2.44−2		5	−3.82−2	−1.07−2	9.26−3	1.29−2	−2.21−2
	10	−1.34−1	−3.55−2	3.31−2	4.59−2	−7.90−2		10	−1.28−1	−3.40−2	3.16−2	4.38−2	−7.54−2
$3p_{1/2}$	1	−9.38−3	−1.61−3	6.21−4	3.23−3	−3.85−3	$3p_{1/2}$	1	−8.28−3	−1.37−3	4.76−4	2.86−3	−3.33−3
	3	−6.03−2	−1.12−2	4.71−3	2.06−2	−2.53−2		3	−5.77−2	−1.06−2	4.69−3	1.98−2	−2.44−2
	5	−1.18−1	−2.21−2	6.88−3	3.98−2	−4.66−2		5	−1.15−1	−2.16−2	7.31−3	3.90−2	−4.63−2
	10	−2.63−1	−4.88−2	6.84−3	8.70−2	−9.38−2		10	−2.59−1	−4.81−2	7.95−3	8.60−2	−9.40−2
$3p_{3/2}$	1	−6.89−3	−1.98−3	1.64−3	2.29−3	−3.94−3	$3p_{3/2}$	1	−5.83−3	−1.74−3	1.48−3	1.93−3	−3.41−3
	3	−5.09−2	−1.26−2	8.56−3	1.70−2	−2.56−2		3	−4.85−2	−1.20−2	8.48−3	1.63−2	−2.48−2
	5	−1.01−1	−2.47−2	1.38−2	3.31−2	−4.70−2		5	−9.82−2	−2.41−2	1.42−2	3.25−2	−4.67−2
	10	−2.24−1	−5.42−2	2.13−2	7.22−2	−9.35−2		10	−2.21−1	−5.35−2	2.23−2	7.15−2	−9.38−2
$3d_{3/2}$	1	−2.92−2	−5.54−3	−1.22−4	9.44−3	−9.32−3	$3d_{3/2}$	1	−2.81−2	−5.29−3	−9.61−6	9.12−3	−9.11−3
	3	−1.20−1	−2.35−2	−4.87−3	3.75−2	−3.26−2		3	−1.17−1	−2.29−2	−4.11−3	3.70−2	−3.29−2
	5	−2.06−1	−4.12−2	−1.54−2	6.28−2	−4.73−2		5	−2.05−1	−4.12−2	−1.37−2	6.30−2	−4.93−2
	10	−4.31−1	−8.76−2	−4.70−2	1.28−1	−8.10−2		10	−4.25−1	−8.56−2	−4.45−2	1.27−1	−8.23−2
$4s_{1/2}$	1	−1.81−3	−1.34−3	1.54−4	2.18−4	−3.71−4	$4s_{1/2}$	1	−2.37−3	−1.50−3	2.85−4	4.03−4	−6.88−4
	3	−1.27−2	−4.05−3	2.90−3	4.03−3	−6.93−3		3	−1.09−2	−3.75−3	2.42−3	3.35−3	−5.77−3
	5	−4.19−2	−1.16−2	1.02−2	1.41−2	−2.43−2		5	−3.79−2	−1.07−2	9.17−3	1.27−2	−2.19−2
	10	−1.34−1	−3.55−2	3.30−2	4.58−2	−7.88−2		10	−1.28−1	−3.40−2	3.15−2	4.37−2	−7.52−2
$Z = 23$, V: $4s^2_{1/2}3d^3_{3/2}$							$Z = 24$, Cr: $4s^1_{1/2}3d^4_{3/2}3d^1_{5/2}$						
$2s_{1/2}$	1	−3.65−3	−1.84−3	5.98−4	8.42−4	−1.44−3	$2s_{1/2}$	1	−4.96−3	−2.29−3	8.87−4	1.25−3	−2.13−3
	3	−1.08−2	−3.37−3	2.51−3	3.47−3	−5.97−3		3	−9.03−3	−3.00−3	2.04−3	2.82−3	−4.86−3
	5	−3.75−2	−1.01−2	9.22−3	1.28−2	−2.20−2		5	−3.40−2	−9.29−3	8.35−3	1.16−2	−1.99−2
	10	−1.26−1	−3.31−2	3.13−2	4.34−2	−7.48−2		10	−1.20−1	−3.16−2	2.99−2	4.15−2	−7.14−2
$2p_{1/2}$	1	−1.31−2	−1.21−3	3.09−4	4.80−3	−5.11−3	$2p_{1/2}$	1	−1.22−2	−8.81−4	8.32−5	4.53−3	−4.61−3
	3	−6.70−2	−1.18−2	4.94−3	2.31−2	−2.80−2		3	−6.55−2	−1.13−2	4.89−3	2.27−2	−2.75−2
	5	−1.25−1	−2.29−2	7.59−3	4.22−2	−4.98−2		5	−1.23−1	−2.25−2	7.92−3	4.18−2	−4.98−2
	10	−2.69−1	−5.00−2	8.84−3	8.95−2	−9.83−2		10	−2.67−1	−4.96−2	9.88−3	8.90−2	−9.89−2

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$2p_{3/2}$	1	−9.21−3	−1.71−3	1.85−3	3.37−3	−5.22−3	$2p_{3/2}$	1	−8.14−3	−1.39−3	1.68−3	3.04−3	−4.72−3
	3	−5.68−2	−1.34−2	9.19−3	1.92−2	−2.84−2		3	−5.54−2	−1.29−2	9.17−3	1.88−2	−2.80−2
	5	−1.07−1	−2.56−2	1.49−2	3.55−2	−5.03−2		5	−1.06−1	−2.52−2	1.52−2	3.52−2	−5.04−2
	10	−2.31−1	−5.57−2	2.35−2	7.49−2	−9.84−2		10	−2.30−1	−5.53−2	2.45−2	7.46−2	−9.91−2
$3s_{1/2}$	1	−2.85−3	−1.60−3	4.12−4	5.81−4	−9.93−4	$3s_{1/2}$	1	−3.69−3	−1.85−3	6.08−4	8.58−4	−1.47−3
	3	−9.23−3	−3.34−3	1.99−3	2.75−3	−4.74−3		3	−7.69−3	−3.07−3	1.56−3	2.16−3	−3.72−3
	5	−3.45−2	−9.79−3	8.32−3	1.15−2	−1.99−2		5	−3.09−2	−8.94−3	7.40−3	1.03−2	−1.77−2
	10	−1.22−1	−3.25−2	3.01−2	4.17−2	−7.18−2		10	−1.16−1	−3.11−2	2.86−2	3.96−2	−6.82−2
$3p_{1/2}$	1	−7.21−3	−1.15−3	3.25−4	2.49−3	−2.81−3	$3p_{1/2}$	1	−6.18−3	−9.49−4	1.64−4	2.13−3	−2.29−3
	3	−5.50−2	−1.00−2	4.61−3	1.89−2	−2.35−2		3	−5.24−2	−9.46−3	4.50−3	1.81−2	−2.26−2
	5	−1.12−1	−2.09−2	7.63−3	3.80−2	−4.57−2		5	−1.09−1	−2.02−2	7.88−3	3.71−2	−4.50−2
	10	−2.56−1	−4.75−2	9.02−3	8.50−2	−9.40−2		10	−2.52−1	−4.69−2	1.01−2	8.41−2	−9.42−2
$3p_{3/2}$	1	−4.81−3	−1.52−3	1.32−3	1.58−3	−2.90−3	$3p_{3/2}$	1	−3.81−3	−1.31−3	1.15−3	1.23−3	−2.38−3
	3	−4.61−2	−1.14−2	8.35−3	1.55−2	−2.39−2		3	−4.37−2	−1.09−2	8.19−3	1.48−2	−2.30−2
	5	−9.56−2	−2.34−2	1.44−2	3.18−2	−4.62−2		5	−9.29−2	−2.27−2	1.46−2	3.10−2	−4.56−2
	10	−2.18−1	−5.29−2	2.32−2	7.08−2	−9.40−2		10	−2.16−1	−5.23−2	2.42−2	7.02−2	−9.44−2
$3d_{3/2}$	1	−2.70−2	−5.06−3	7.88−5	8.81−3	−8.89−3	$3d_{3/2}$	1	−2.60−2	−4.78−3	1.28−4	8.51−3	−8.64−3
	3	−1.14−1	−2.20−2	−3.49−3	3.62−2	−3.27−2		3	−1.11−1	−2.11−2	−2.96−3	3.54−2	−3.24−2
	5	−2.05−1	−4.09−2	−1.21−2	6.31−2	−5.10−2		5	−2.03−1	−4.03−2	−1.07−2	6.30−2	−5.24−2
	10	−4.19−1	−8.39−2	−4.24−2	1.26−1	−8.32−2		10	−4.15−1	−8.28−2	−4.01−2	1.25−1	−8.45−2
$4s_{1/2}$	1	−2.94−3	−1.61−3	4.37−4	6.17−4	−1.05−3	$3d_{5/2}$	1	−2.31−2	−5.18−3	1.23−3	7.41−3	−8.65−3
	3	−9.17−3	−3.44−3	1.93−3	2.68−3	−4.61−3		3	−1.02−1	−2.26−2	6.40−4	3.19−2	−3.25−2
	5	−3.42−2	−9.78−3	8.22−3	1.14−2	−1.96−2		5	−1.88−1	−4.30−2	−4.60−3	5.72−2	−5.26−2
	10	−1.22−1	−3.26−2	3.00−2	4.16−2	−7.16−2		10	−3.88−1	−8.92−2	−2.83−2	1.14−1	−8.57−2
							$4s_{1/2}$	1	−3.83−3	−1.95−3	6.19−4	8.74−4	−1.49−3
								3	−7.42−3	−3.05−3	1.48−3	2.04−3	−3.53−3
								5	−3.05−2	−8.89−3	7.28−3	1.01−2	−1.74−2
								10	−1.15−1	−3.11−2	2.85−2	3.95−2	−6.80−2
$Z = 25$, Mn: $4s^2_{1/2}3d^4_{3/2}3d^1_{5/2}$							$Z = 26$, Fe: $4s^2_{1/2}3d^4_{3/2}3d^2_{5/2}$						
$2s_{1/2}$	1	−6.25−3	−2.70−3	1.17−3	1.65−3	−2.83−3	$2s_{1/2}$	1	−7.84−3	−3.20−3	1.54−3	2.16−3	−3.70−3
	3	−7.58−3	−2.72−3	1.65−3	2.27−3	−3.93−3		3	−6.33−3	−2.51−3	1.31−3	1.79−3	−3.10−3
	5	−3.07−2	−8.49−3	7.52−3	1.04−2	−1.79−2		5	−2.75−2	−7.72−3	6.70−3	9.26−3	−1.60−2
	10	−1.15−1	−3.02−2	2.85−2	3.95−2	−6.80−2		10	−1.09−1	−2.87−2	2.71−2	3.75−2	−6.46−2
$2p_{1/2}$	1	−1.12−2	−5.36−4	−1.15−4	4.25−3	−4.13−3	$2p_{1/2}$	1	−1.03−2	−1.87−4	−3.38−4	3.97−3	−3.63−3
	3	−6.37−2	−1.07−2	4.80−3	2.22−2	−2.70−2		3	−6.20−2	−1.02−2	4.66−3	2.17−2	−2.63−2
	5	−1.21−1	−2.20−2	8.19−3	4.14−2	−4.96−2		5	−1.19−1	−2.15−2	8.37−3	4.09−2	−4.92−2
	10	−2.65−1	−4.91−2	1.08−2	8.85−2	−9.93−2		10	−2.63−1	−4.87−2	1.17−2	8.79−2	−9.97−2
$2p_{3/2}$	1	−7.04−3	−1.06−3	1.54−3	2.70−3	−4.24−3	$2p_{3/2}$	1	−5.92−3	−7.32−4	1.39−3	2.35−3	−3.74−3
	3	−5.36−2	−1.23−2	9.10−3	1.83−2	−2.74−2		3	−5.19−2	−1.18−2	9.00−3	1.78−2	−2.68−2
	5	−1.04−1	−2.48−2	1.54−2	3.48−2	−5.03−2		5	−1.02−1	−2.43−2	1.56−2	3.44−2	−5.00−2
	10	−2.28−1	−5.48−2	2.54−2	7.43−2	−9.97−2		10	−2.26−1	−5.44−2	2.63−2	7.40−2	−1.00−1
$3s_{1/2}$	1	−4.42−3	−2.04−3	7.86−4	1.11−3	−1.89−3	$3s_{1/2}$	1	−5.28−3	−2.26−3	1.00−3	1.41−3	−2.41−3
	3	−6.44−3	−2.87−3	1.21−3	1.67−3	−2.88−3		3	−5.39−3	−2.74−3	9.07−4	1.24−3	−2.15−3
	5	−2.76−2	−8.17−3	6.55−3	9.06−3	−1.56−2		5	−2.44−2	−7.48−3	5.74−3	7.93−3	−1.37−2
	10	−1.10−1	−2.96−2	2.71−2	3.75−2	−6.47−2		10	−1.04−1	−2.81−2	2.56−2	3.54−2	−6.11−2
$3p_{1/2}$	1	−5.29−3	−7.77−4	3.68−5	1.81−3	−1.85−3	$3p_{1/2}$	1	−4.47−3	−6.27−4	−9.09−5	1.52−3	−1.43−3
	3	−4.97−2	−8.88−3	4.37−3	1.72−2	−2.16−2		3	−4.71−2	−8.32−3	4.19−3	1.63−2	−2.05−2
	5	−1.06−1	−1.95−2	8.01−3	3.60−2	−4.40−2		5	−1.02−1	−1.87−2	8.07−3	3.49−2	−4.30−2
	10	−2.48−1	−4.63−2	1.11−2	8.31−2	−9.41−2		10	−2.45−1	−4.57−2	1.20−2	8.21−2	−9.41−2
$3p_{3/2}$	1	−2.95−3	−1.14−3	1.01−3	9.26−4	−1.93−3	$3p_{3/2}$	1	−2.15−3	−9.85−4	8.69−4	6.38−4	−1.51−3
	3	−4.13−2	−1.03−2	8.00−3	1.40−2	−2.20−2		3	−3.89−2	−9.70−3	7.78−3	1.32−2	−2.10−2
	5	−8.98−2	−2.20−2	1.46−2	3.01−2	−4.47−2		5	−8.68−2	−2.12−2	1.46−2	2.91−2	−4.38−2
	10	−2.13−1	−5.17−2	2.50−2	6.95−2	−9.45−2		10	−2.10−1	−5.10−2	2.59−2	6.88−2	−9.46−2
$3d_{3/2}$	1	−2.47−2	−4.48−3	1.60−4	8.14−3	−8.30−3	$3d_{3/2}$	1	−2.35−2	−4.16−3	1.45−4	7.75−3	−7.89−3
	3	−1.08−1	−2.05−2	−2.45−3	3.46−2	−3.22−2		3	−1.06−1	−1.99−2	−1.96−3	3.39−2	−3.19−2
	5	−2.01−1	−3.95−2	−9.40−3	6.26−2	−5.32−2		5	−1.97−1	−3.85−2	−8.25−3	6.19−2	−5.37−2
	10	−4.11−1	−8.21−2	−3.77−2	1.24−1	−8.61−2		10	−4.09−1	−8.19−2	−3.53−2	1.24−1	−8.83−2

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$3d_{5/2}$	1	−2.19−2	−4.88−3	1.25−3	7.06−3	−8.31−3	$3d_{5/2}$	1	−2.07−2	−4.54−3	1.22−3	6.69−3	−7.91−3
	3	−9.92−2	−2.20−2	1.11−3	3.11−2	−3.22−2		3	−9.65−2	−2.14−2	1.56−3	3.04−2	−3.19−2
	5	−1.86−1	−4.22−2	−3.36−3	5.69−2	−5.35−2		5	−1.83−1	−4.12−2	−2.28−3	5.62−2	−5.39−2
	10	−3.85−1	−8.86−2	−2.62−2	1.13−1	−8.72−2		10	−3.83−1	−8.83−2	−2.37−2	1.13−1	−8.95−2
$4s_{1/2}$	1	−4.34−3	−1.99−3	7.77−4	1.10−3	−1.87−3	$4s_{1/2}$	1	−5.22−3	−2.25−3	9.80−4	1.38−3	−2.36−3
	3	−6.31−3	−2.90−3	1.16−3	1.60−3	−2.75−3		3	−5.43−3	−2.89−3	8.68−4	1.19−3	−2.06−3
	5	−2.73−2	−8.18−3	6.44−3	8.92−3	−1.54−2		5	−2.42−2	−7.52−3	5.63−3	7.79−3	−1.34−2
	10	−1.09−1	−2.96−2	2.70−2	3.73−2	−6.43−2		10	−1.03−1	−2.81−2	2.55−2	3.52−2	−6.07−2
$Z = 27$, Co: $4s^2_{1/2}3d^4_{3/2}3d^3_{5/2}$							$Z = 28$, Ni: $4s^2_{1/2}3d^4_{3/2}3d^4_{5/2}$						
$2s_{1/2}$	1	−9.62−3	−3.74−3	1.95−3	2.74−3	−4.68−3	$2s_{1/2}$	1	−1.16−2	−4.32−3	2.40−3	3.37−3	−5.77−3
	3	−5.35−3	−2.39−3	1.02−3	1.39−3	−2.41−3		3	−4.63−3	−2.34−3	7.97−4	1.08−3	−1.87−3
	5	−2.45−2	−7.01−3	5.93−3	8.17−3	−1.41−2		5	−2.16−2	−6.37−3	5.20−3	7.14−3	−1.23−2
	10	−1.03−1	−2.72−2	2.57−2	3.55−2	−6.12−2		10	−9.75−2	−2.58−2	2.43−2	3.36−2	−5.79−2
$2p_{1/2}$	1	−9.31−3	1.63−4	−5.65−4	3.68−3	−3.11−3	$2p_{1/2}$	1	−8.37−3	5.11−4	−7.94−4	3.39−3	−2.60−3
	3	−6.02−2	−9.57−3	4.46−3	2.11−2	−2.56−2		3	−5.83−2	−8.95−3	4.24−3	2.06−2	−2.48−2
	5	−1.17−1	−2.08−2	8.47−3	4.03−2	−4.88−2		5	−1.15−1	−2.02−2	8.51−3	3.97−2	−4.82−2
	10	−2.60−1	−4.82−2	1.26−2	8.74−2	−1.00−1		10	−2.58−1	−4.77−2	1.34−2	8.68−2	−1.00−1
$2p_{3/2}$	1	−4.78−3	−4.02−4	1.23−3	2.00−3	−3.23−3	$2p_{3/2}$	1	−3.65−3	−7.54−5	1.08−3	1.64−3	−2.73−3
	3	−5.01−2	−1.12−2	8.84−3	1.73−2	−2.62−2		3	−4.82−2	−1.06−2	8.67−3	1.68−2	−2.54−2
	5	−1.01−1	−2.37−2	1.58−2	3.39−2	−4.97−2		5	−9.86−2	−2.30−2	1.58−2	3.34−2	−4.92−2
	10	−2.25−1	−5.39−2	2.71−2	7.37−2	−1.01−1		10	−2.23−1	−5.35−2	2.79−2	7.34−2	−1.01−1
$3s_{1/2}$	1	−6.13−3	−2.45−3	1.22−3	1.72−3	−2.93−3	$3s_{1/2}$	1	−6.98−3	−2.62−3	1.44−3	2.03−3	−3.47−3
	3	−4.58−3	−2.66−3	6.58−4	8.97−4	−1.56−3		3	−4.00−3	−2.65−3	4.68−4	6.33−4	−1.10−3
	5	−2.15−2	−6.86−3	4.97−3	6.86−3	−1.18−2		5	−1.89−2	−6.31−3	4.27−3	5.88−3	−1.01−2
	10	−9.79−2	−2.66−2	2.41−2	3.33−2	−5.74−2		10	−9.19−2	−2.51−2	2.26−2	3.12−2	−5.39−2
$3p_{1/2}$	1	−3.76−3	−5.11−4	−2.02−4	1.26−3	−1.06−3	$3p_{1/2}$	1	−3.17−3	−4.29−4	−2.94−4	1.04−3	−7.42−4
	3	−4.45−2	−7.76−3	3.98−3	1.55−2	−1.95−2		3	−4.19−2	−7.19−3	3.75−3	1.46−2	−1.84−2
	5	−9.85−2	−1.79−2	8.08−3	3.38−2	−4.19−2		5	−9.49−2	−1.72−2	8.03−3	3.27−2	−4.07−2
	10	−2.41−1	−4.49−2	1.29−2	8.10−2	−9.39−2		10	−2.37−1	−4.41−2	1.36−2	7.98−2	−9.35−2
$3p_{3/2}$	1	−1.45−3	−8.66−4	7.53−4	3.83−4	−1.14−3	$3p_{3/2}$	1	−8.58−4	−7.81−4	6.57−4	1.62−4	−8.19−4
	3	−3.65−2	−9.15−3	7.53−3	1.25−2	−2.00−2		3	−3.41−2	−8.58−3	7.26−3	1.17−2	−1.89−2
	5	−8.37−2	−2.04−2	1.46−2	2.82−2	−4.28−2		5	−8.05−2	−1.97−2	1.44−2	2.72−2	−4.17−2
	10	−2.07−1	−5.03−2	2.67−2	6.80−2	−9.47−2		10	−2.04−1	−4.95−2	2.73−2	6.72−2	−9.45−2
$3d_{3/2}$	1	−2.21−2	−3.83−3	1.05−4	7.35−3	−7.45−3	$3d_{3/2}$	1	−2.09−2	−3.52−3	4.66−5	6.95−3	−7.00−3
	3	−1.03−1	−1.93−2	−1.50−3	3.31−2	−3.16−2		3	−1.00−1	−1.88−2	−1.09−3	3.24−2	−3.13−2
	5	−1.94−1	−3.75−2	−7.22−3	6.11−2	−5.39−2		5	−1.90−1	−3.65−2	−6.30−3	6.02−2	−5.39−2
	10	−4.07−1	−8.17−2	−3.29−2	1.24−1	−9.08−2		10	−4.06−1	−8.13−2	−3.04−2	1.24−1	−9.33−2
$3d_{5/2}$	1	−1.94−2	−4.21−3	1.17−3	6.30−3	−7.47−3	$3d_{5/2}$	1	−1.81−2	−3.90−3	1.11−3	5.92−3	−7.02−3
	3	−9.39−2	−2.07−2	1.98−3	2.97−2	−3.16−2		3	−9.15−2	−2.02−2	2.35−3	2.90−2	−3.14−2
	5	−1.79−1	−4.02−2	−1.34−3	5.54−2	−5.41−2		5	−1.76−1	−3.92−2	−4.84−4	5.46−2	−5.41−2
	10	−3.82−1	−8.81−2	−2.14−2	1.13−1	−9.20−2		10	−3.81−1	−8.77−2	−1.90−2	1.13−1	−9.45−2
$4s_{1/2}$	1	−6.10−3	−2.48−3	1.19−3	1.69−3	−2.88−3	$4s_{1/2}$	1	−6.92−3	−2.65−3	1.41−3	1.99−3	−3.40−3
	3	−4.57−3	−2.79−3	6.12−4	8.35−4	−1.45−3		3	−3.85−3	−2.66−3	4.15−4	5.62−4	−9.78−4
	5	−2.12−2	−6.86−3	4.85−3	6.70−3	−1.15−2		5	−1.84−2	−6.24−3	4.13−3	5.69−3	−9.82−3
	10	−9.73−2	−2.66−2	2.40−2	3.31−2	−5.71−2		10	−9.13−2	−2.50−2	2.24−2	3.10−2	−5.34−2
$Z = 29$, Cu: $4s^1_{1/2}3d^4_{3/2}3d^6_{5/2}$							$Z = 30$, Zn: $4s^2_{1/2}3d^4_{3/2}3d^6_{5/2}$						
$2s_{1/2}$	1	−1.39−2	−4.99−3	2.95−3	4.15−3	−7.09−3	$2s_{1/2}$	1	−1.59−2	−5.57−3	3.43−3	4.83−3	−8.26−3
	3	−4.19−3	−2.38−3	6.31−4	8.47−4	−1.48−3		3	−4.04−3	−2.50−3	5.41−4	7.24−4	−1.26−3
	5	−1.90−2	−5.79−3	4.50−3	6.17−3	−1.07−2		5	−1.66−2	−5.30−3	3.88−3	5.30−3	−9.18−3
	10	−9.19−2	−2.44−2	2.29−2	3.16−2	−5.45−2		10	−8.64−2	−2.30−2	2.16−2	2.97−2	−5.12−2
$2p_{1/2}$	1	−7.38−3	8.81−4	−1.05−3	3.09−3	−2.05−3	$2p_{1/2}$	1	−6.62−3	1.19−3	−1.26−3	2.87−3	−1.61−3
	3	−5.64−2	−8.30−3	3.97−3	2.00−2	−2.40−2		3	−5.45−2	−7.67−3	3.70−3	1.95−2	−2.32−2
	5	−1.13−1	−1.95−2	8.49−3	3.91−2	−4.76−2		5	−1.11−1	−1.88−2	8.41−3	3.85−2	−4.69−2
	10	−2.56−1	−4.71−2	1.41−2	8.63−2	−1.00−1		10	−2.53−1	−4.65−2	1.48−2	8.57−2	−1.00−1
$2p_{3/2}$	1	−2.42−3	2.69−4	9.15−4	1.26−3	−2.17−3	$2p_{3/2}$	1	−1.44−3	5.51−4	7.91−4	9.53−4	−1.74−3
	3	−4.62−2	−1.00−2	8.46−3	1.62−2	−2.47−2		3	−4.43−2	−9.41−3	8.26−3	1.56−2	−2.39−2
	5	−9.66−2	−2.24−2	1.59−2	3.29−2	−4.87−2		5	−9.45−2	−2.17−2	1.58−2	3.23−2	−4.81−2
	10	−2.21−1	−5.30−2	2.87−2	7.31−2	−1.02−1		10	−2.20−1	−5.24−2	2.93−2	7.28−2	−1.02−1

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$3s_{1/2}$	1	−7.91−3	−2.78−3	1.69−3	2.39−3	−4.08−3	$3s_{1/2}$	1	−8.60−3	−2.89−3	1.89−3	2.66−3	−4.55−3
	3	−3.65−3	−2.70−3	3.31−4	4.46−4	−7.77−4		3	−3.56−3	−2.81−3	2.62−4	3.52−4	−6.14−4
	5	−1.64−2	−5.84−3	3.61−3	4.95−3	−8.56−3		5	−1.43−2	−5.45−3	3.03−3	4.14−3	−7.17−3
	10	−8.59−2	−2.36−2	2.11−2	2.92−2	−5.03−2		10	−8.02−2	−2.22−2	1.97−2	2.71−2	−4.68−2
$3p_{1/2}$	1	−2.67−3	−3.75−4	−3.76−4	8.42−4	−4.66−4	$3p_{1/2}$	1	−2.38−3	−3.67−4	−4.20−4	7.20−4	−3.00−4
	3	−3.93−2	−6.62−3	3.48−3	1.38−2	−1.72−2		3	−3.68−2	−6.07−3	3.21−3	1.29−2	−1.61−2
	5	−9.14−2	−1.64−2	7.93−3	3.16−2	−3.95−2		5	−8.79−2	−1.56−2	7.80−3	3.05−2	−3.83−2
	10	−2.33−1	−4.33−2	1.43−2	7.86−2	−9.29−2		10	−2.28−1	−4.23−2	1.48−2	7.74−2	−9.22−2
$3p_{3/2}$	1	−3.40−4	−7.26−4	5.77−4	−3.90−5	−5.38−4	$3p_{3/2}$	1	−3.11−5	−7.15−4	5.33−4	−1.67−4	−3.66−4
	3	−3.17−2	−8.01−3	6.96−3	1.09−2	−1.78−2		3	−2.94−2	−7.46−3	6.64−3	1.01−2	−1.67−2
	5	−7.74−2	−1.89−2	1.43−2	2.62−2	−4.05−2		5	−7.43−2	−1.82−2	1.41−2	2.53−2	−3.94−2
	10	−2.00−1	−4.87−2	2.79−2	6.63−2	−9.42−2		10	−1.97−1	−4.77−2	2.84−2	6.53−2	−9.37−2
$3d_{3/2}$	1	−1.98−2	−3.30−3	−3.80−5	6.61−3	−6.57−3	$3d_{3/2}$	1	−1.84−2	−2.97−3	−9.87−5	6.17−3	−6.07−3
	3	−9.83−2	−1.83−2	−7.03−4	3.18−2	−3.11−2		3	−9.58−2	−1.78−2	−3.52−4	3.12−2	−3.08−2
	5	−1.87−1	−3.57−2	−5.45−3	5.94−2	−5.39−2		5	−1.83−1	−3.48−2	−4.62−3	5.84−2	−5.38−2
	10	−4.04−1	−8.07−2	−2.80−2	1.24−1	−9.57−2		10	−4.01−1	−7.98−2	−2.57−2	1.23−1	−9.77−2
$3d_{5/2}$	1	−1.71−2	−3.67−3	1.02−3	5.57−3	−6.59−3	$3d_{5/2}$	1	−1.57−2	−3.33−3	9.52−4	5.14−3	−6.09−3
	3	−8.94−2	−1.97−2	2.71−3	2.84−2	−3.11−2		3	−8.71−2	−1.91−2	3.01−3	2.78−2	−3.08−2
	5	−1.73−1	−3.83−2	3.33−4	5.38−2	−5.41−2		5	−1.69−1	−3.74−2	1.09−3	5.28−2	−5.39−2
	10	−3.79−1	−8.71−2	−1.68−2	1.14−1	−9.68−2		10	−3.77−1	−8.61−2	−1.46−2	1.13−1	−9.87−2
$4s_{1/2}$	1	−7.21−3	−2.46−3	1.57−3	2.21−3	−3.78−3	$4s_{1/2}$	1	−8.10−3	−2.72−3	1.78−3	2.51−3	−4.29−3
	3	−3.58−3	−2.75−3	2.91−4	3.91−4	−6.81−4		3	−3.52−3	−2.84−3	2.37−4	3.19−4	−5.56−4
	5	−1.60−2	−5.81−3	3.49−3	4.79−3	−8.27−3		5	−1.41−2	−5.52−3	2.92−3	4.00−3	−6.92−3
	10	−8.53−2	−2.36−2	2.09−2	2.89−2	−4.98−2		10	−7.95−2	−2.22−2	1.95−2	2.68−2	−4.63−2
$Z = 31$, Ga: $4s^2_{1/2}3d^4_{3/2}3d^6_{5/2}4p^1_{1/2}$							$Z = 32$, Ge: $4s^2_{1/2}3d^4_{3/2}3d^6_{5/2}4p^2_{1/2}$						
$2s_{1/2}$	1	−1.81−2	−6.17−3	3.94−3	5.55−3	−9.49−3	$2s_{1/2}$	1	−2.03−2	−6.80−3	4.48−3	6.31−3	−1.08−2
	3	−4.16−3	−2.70−3	5.13−4	6.86−4	−1.20−3		3	−4.57−3	−2.99−3	5.52−4	7.44−4	−1.30−3
	5	−1.45−2	−4.90−3	3.32−3	4.52−3	−7.85−3		5	−1.27−2	−4.58−3	2.83−3	3.83−3	−6.66−3
	10	−8.10−2	−2.16−2	2.02−2	2.78−2	−4.80−2		10	−7.58−2	−2.03−2	1.89−2	2.60−2	−4.49−2
$2p_{1/2}$	1	−5.88−3	1.51−3	−1.48−3	2.66−3	−1.19−3	$2p_{1/2}$	1	−5.17−3	1.84−3	−1.69−3	2.46−3	−7.72−4
	3	−5.27−2	−7.01−3	3.41−3	1.90−2	−2.24−2		3	−5.09−2	−6.36−3	3.11−3	1.84−2	−2.15−2
	5	−1.09−1	−1.80−2	8.30−3	3.79−2	−4.62−2		5	−1.06−1	−1.73−2	8.11−3	3.73−2	−4.54−2
	10	−2.51−1	−4.59−2	1.53−2	8.51−2	−1.00−1		10	−2.49−1	−4.52−2	1.58−2	8.45−2	−1.00−1
$2p_{3/2}$	1	−4.46−4	8.42−4	6.75−4	6.50−4	−1.33−3	$2p_{3/2}$	1	5.46−4	1.14−3	5.66−4	3.49−4	−9.15−4
	3	−4.24−2	−8.79−3	8.05−3	1.51−2	−2.31−2		3	−4.05−2	−8.17−3	7.83−3	1.45−2	−2.23−2
	5	−9.24−2	−2.10−2	1.58−2	3.17−2	−4.75−2		5	−9.03−2	−2.04−2	1.57−2	3.11−2	−4.68−2
	10	−2.18−1	−5.19−2	3.00−2	7.24−2	−1.02−1		10	−2.16−1	−5.13−2	3.05−2	7.20−2	−1.02−1
$3s_{1/2}$	1	−9.29−3	−2.99−3	2.08−3	2.94−3	−5.02−3	$3s_{1/2}$	1	−9.95−3	−3.07−3	2.27−3	3.20−3	−5.47−3
	3	−3.68−3	−2.98−3	2.45−4	3.31−4	−5.76−4		3	−4.03−3	−3.20−3	2.84−4	3.89−4	−6.73−4
	5	−1.24−2	−5.14−3	2.51−3	3.43−3	−5.94−3		5	−1.09−2	−4.90−3	2.06−3	2.80−3	−4.86−3
	10	−7.47−2	−2.09−2	1.83−2	2.52−2	−4.35−2		10	−6.94−2	−1.97−2	1.69−2	2.33−2	−4.02−2
$3p_{1/2}$	1	−2.22−3	−3.92−4	−4.47−4	6.43−4	−1.96−4	$3p_{1/2}$	1	−2.18−3	−4.49−4	−4.58−4	6.03−4	−1.45−4
	3	−3.44−2	−5.53−3	2.93−3	1.21−2	−1.51−2		3	−3.20−2	−5.01−3	2.63−3	1.13−2	−1.40−2
	5	−8.45−2	−1.49−2	7.63−3	2.94−2	−3.70−2		5	−8.12−2	−1.42−2	7.41−3	2.83−2	−3.57−2
	10	−2.24−1	−4.14−2	1.53−2	7.60−2	−9.13−2		10	−2.19−1	−4.04−2	1.57−2	7.47−2	−9.03−2
$3p_{3/2}$	1	1.59−4	−7.39−4	5.13−4	−2.57−4	−2.57−4	$3p_{3/2}$	1	2.46−4	−7.95−4	5.13−4	−3.14−4	−1.99−4
	3	−2.71−2	−6.93−3	6.34−3	9.34−3	−1.57−2		3	−2.49−2	−6.41−3	6.02−3	8.59−3	−1.46−2
	5	−7.12−2	−1.74−2	1.39−2	2.43−2	−3.82−2		5	−6.82−2	−1.67−2	1.36−2	2.33−2	−3.69−2
	10	−1.93−1	−4.68−2	2.88−2	6.42−2	−9.31−2		10	−1.89−1	−4.59−2	2.91−2	6.32−2	−9.23−2
$3d_{3/2}$	1	−1.74−2	−2.72−3	−1.57−4	5.84−3	−5.69−3	$3d_{3/2}$	1	−1.65−2	−2.50−3	−2.15−4	5.56−3	−5.34−3
	3	−9.37−2	−1.72−2	−5.71−5	3.06−2	−3.05−2		3	−9.17−2	−1.67−2	2.01−4	3.00−2	−3.02−2
	5	−1.80−1	−3.41−2	−3.86−3	5.76−2	−5.37−2		5	−1.77−1	−3.34−2	−3.12−3	5.68−2	−5.37−2
	10	−3.98−1	−7.88−2	−2.35−2	1.23−1	−9.94−2		10	−3.95−1	−7.77−2	−2.15−2	1.22−1	−1.01−1
$3d_{5/2}$	1	−1.47−2	−3.08−3	8.98−4	4.82−3	−5.72−3	$3d_{5/2}$	1	−1.38−2	−2.87−3	8.51−4	4.53−3	−5.38−3
	3	−8.50−2	−1.86−2	3.28−3	2.72−2	−3.05−2		3	−8.31−2	−1.81−2	3.52−3	2.67−2	−3.02−2
	5	−1.66−1	−3.66−2	1.78−3	5.20−2	−5.38−2		5	−1.63−1	−3.60−2	2.47−3	5.13−2	−5.38−2
	10	−3.74−1	−8.51−2	−1.25−2	1.13−1	−1.00−1		10	−3.71−1	−8.40−2	−1.06−2	1.12−1	−1.02−1

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4s_{1/2}$	1	−8.39−3	−2.71−3	1.88−3	2.65−3	−4.53−3	$4s_{1/2}$	1	−8.77−3	−2.70−3	2.00−3	2.83−3	−4.84−3
	3	−3.72−3	−3.07−3	2.24−4	3.05−4	−5.29−4		3	−3.99−3	−3.22−3	2.61−4	3.60−4	−6.21−4
	5	−1.22−2	−5.19−3	2.40−3	3.28−3	−5.68−3		5	−1.06−2	−4.94−3	1.95−3	2.65−3	−4.60−3
	10	−7.39−2	−2.09−2	1.81−2	2.48−2	−4.29−2		10	−6.86−2	−1.96−2	1.67−2	2.29−2	−3.96−2
$4p_{1/2}$	1	−2.00−3	−5.05−4	−3.64−4	5.24−4	−1.60−4	$4p_{1/2}$	1	−1.93−3	−5.29−4	−3.66−4	4.89−4	−1.22−4
	3	−3.29−2	−5.43−3	2.85−3	1.16−2	−1.44−2		3	−3.02−2	−4.80−3	2.51−3	1.07−2	−1.32−2
	5	−8.26−2	−1.47−2	7.57−3	2.87−2	−3.63−2		5	−7.89−2	−1.39−2	7.38−3	2.75−2	−3.49−2
	10	−2.22−1	−4.10−2	1.54−2	7.53−2	−9.07−2		10	−2.17−1	−4.00−2	1.57−2	7.38−2	−8.95−2
$Z = 33$, As: $4s^2_{1/2}3d^4_{3/2}3d^6_{5/2}4p^2_{1/2}4p^1_{3/2}$							$Z = 34$, Se: $4s^2_{1/2}3d^4_{3/2}3d^6_{5/2}4p^2_{1/2}4p^2_{3/2}$						
$2s_{1/2}$	1	−2.27−2	−7.44−3	5.05−3	7.11−3	−1.22−2	$2s_{1/2}$	1	−2.52−2	−8.11−3	5.64−3	7.95−3	−1.36−2
	3	−5.25−3	−3.35−3	6.54−4	8.90−4	−1.54−3		3	−6.19−3	−3.79−3	8.18−4	1.12−3	−1.94−3
	5	−1.12−2	−4.35−3	2.40−3	3.22−3	−5.62−3		5	−9.94−3	−4.20−3	2.02−3	2.70−3	−4.72−3
	10	−7.07−2	−1.91−2	1.76−2	2.42−2	−4.18−2		10	−6.58−2	−1.79−2	1.64−2	2.24−2	−3.89−2
$2p_{1/2}$	1	−4.43−3	2.19−3	−1.91−3	2.26−3	−3.51−4	$2p_{1/2}$	1	−3.79−3	2.51−3	−2.13−3	2.09−3	3.98−5
	3	−4.92−2	−5.71−3	2.78−3	1.79−2	−2.07−2		3	−4.75−2	−5.07−3	2.44−3	1.74−2	−1.99−2
	5	−1.04−1	−1.66−2	7.92−3	3.66−2	−4.46−2		5	−1.02−1	−1.58−2	7.71−3	3.60−2	−4.38−2
	10	−2.46−1	−4.45−2	1.63−2	8.39−2	−1.00−1		10	−2.44−1	−4.38−2	1.66−2	8.33−2	−9.99−2
$2p_{3/2}$	1	1.58−3	1.45−3	4.62−4	3.89−5	−5.01−4	$2p_{3/2}$	1	2.51−3	1.72−3	3.62−4	−2.46−4	−1.16−4
	3	−3.86−2	−7.57−3	7.60−3	1.39−2	−2.15−2		3	−3.67−2	−6.95−3	7.34−3	1.34−2	−2.07−2
	5	−8.82−2	−1.97−2	1.56−2	3.05−2	−4.61−2		5	−8.59−2	−1.89−2	1.54−2	2.99−2	−4.53−2
	10	−2.14−1	−5.07−2	3.10−2	7.16−2	−1.03−1		10	−2.12−1	−4.99−2	3.14−2	7.10−2	−1.02−1
$3s_{1/2}$	1	−1.06−2	−3.14−3	2.45−3	3.46−3	−5.91−3	$3s_{1/2}$	1	−1.12−2	−3.18−3	2.63−3	3.72−3	−6.35−3
	3	−4.58−3	−3.47−3	3.71−4	5.16−4	−8.87−4		3	−5.30−3	−3.79−3	5.04−4	7.07−4	−1.21−3
	5	−9.54−3	−4.74−3	1.67−3	2.25−3	−3.92−3		5	−8.44−3	−4.64−3	1.33−3	1.78−3	−3.12−3
	10	−6.43−2	−1.85−2	1.56−2	2.14−2	−3.71−2		10	−5.94−2	−1.74−2	1.44−2	1.97−2	−3.41−2
$3p_{1/2}$	1	−2.27−3	−5.39−4	−4.54−4	6.00−4	−1.46−4	$3p_{1/2}$	1	−2.43−3	−6.48−4	−4.37−4	6.24−4	−1.88−4
	3	−2.98−2	−4.52−3	2.33−3	1.06−2	−1.29−2		3	−2.76−2	−4.06−3	2.02−3	9.84−3	−1.19−2
	5	−7.78−2	−1.34−2	7.17−3	2.72−2	−3.44−2		5	−7.45−2	−1.27−2	6.92−3	2.61−2	−3.30−2
	10	−2.15−1	−3.94−2	1.60−2	7.33−2	−8.93−2		10	−2.10−1	−3.84−2	1.62−2	7.18−2	−8.81−2
$3p_{3/2}$	1	2.24−4	−8.84−4	5.30−4	−3.38−4	−1.92−4	$3p_{3/2}$	1	1.28−4	−9.93−4	5.61−4	−3.36−4	−2.25−4
	3	−2.28−2	−5.93−3	5.70−3	7.87−3	−1.36−2		3	−2.07−2	−5.47−3	5.37−3	7.17−3	−1.25−2
	5	−6.52−2	−1.60−2	1.34−2	2.23−2	−3.57−2		5	−6.22−2	−1.53−2	1.31−2	2.14−2	−3.44−2
	10	−1.85−1	−4.49−2	2.94−2	6.21−2	−9.14−2		10	−1.81−1	−4.40−2	2.96−2	6.09−2	−9.05−2
$3d_{3/2}$	1	−1.56−2	−2.29−3	−2.71−4	5.28−3	−5.01−3	$3d_{3/2}$	1	−1.49−2	−2.10−3	−3.25−4	5.04−3	−4.71−3
	3	−8.96−2	−1.62−2	4.29−4	2.95−2	−2.99−2		3	−8.76−2	−1.57−2	6.17−4	2.89−2	−2.95−2
	5	−1.74−1	−3.27−2	−2.43−3	5.61−2	−5.37−2		5	−1.71−1	−3.20−2	−1.80−3	5.54−2	−5.36−2
	10	−3.91−1	−7.66−2	−1.96−2	1.22−1	−1.02−1		10	−3.87−1	−7.55−2	−1.78−2	1.21−1	−1.03−1
$3d_{5/2}$	1	−1.29−2	−2.65−3	8.06−4	4.25−3	−5.05−3	$3d_{5/2}$	1	−1.21−2	−2.47−3	7.69−4	4.00−3	−4.77−3
	3	−8.11−2	−1.76−2	3.73−3	2.62−2	−2.99−2		3	−7.91−2	−1.70−2	3.90−3	2.56−2	−2.95−2
	5	−1.60−1	−3.53−2	3.10−3	5.06−2	−5.37−2		5	−1.58−1	−3.46−2	3.70−3	4.99−2	−5.36−2
	10	−3.67−1	−8.29−2	−8.82−3	1.12−1	−1.03−1		10	−3.63−1	−8.17−2	−7.14−3	1.11−1	−1.04−1
$4s_{1/2}$	1	−9.13−3	−2.70−3	2.12−3	3.00−3	−5.12−3	$4s_{1/2}$	1	−9.44−3	−2.69−3	2.22−3	3.15−3	−5.37−3
	3	−4.53−3	−3.49−3	3.48−4	4.86−4	−8.34−4		3	−5.28−3	−3.83−3	4.80−4	6.76−4	−1.16−3
	5	−9.29−3	−4.79−3	1.56−3	2.11−3	−3.68−3		5	−8.26−3	−4.73−3	1.24−3	1.66−3	−2.90−3
	10	−6.34−2	−1.84−2	1.54−2	2.11−2	−3.64−2		10	−5.85−2	−1.73−2	1.41−2	1.93−2	−3.34−2
$4p_{1/2}$	1	−2.03−3	−6.32−4	−3.28−4	4.95−4	−1.67−4	$4p_{1/2}$	1	−2.26−3	−7.77−4	−2.70−4	5.39−4	−2.69−4
	3	−2.78−2	−4.34−3	2.21−3	9.83−3	−1.20−2		3	−2.57−2	−3.98−3	1.94−3	9.06−3	−1.10−2
	5	−7.52−2	−1.31−2	7.10−3	2.63−2	−3.34−2		5	−7.16−2	−1.24−2	6.82−3	2.51−2	−3.19−2
	10	−2.11−1	−3.89−2	1.60−2	7.22−2	−8.82−2		10	−2.06−1	−3.78−2	1.62−2	7.06−2	−8.68−2
$4p_{3/2}$	1	1.01−4	−9.48−4	5.15−4	−3.17−4	−1.99−4	$4p_{3/2}$	1	−1.29−4	−1.09−3	5.63−4	−2.72−4	−2.91−4
	3	−2.12−2	−5.71−3	5.44−3	7.27−3	−1.27−2		3	−1.92−2	−5.35−3	5.13−3	6.55−3	−1.17−2
	5	−6.29−2	−1.56−2	1.31−2	2.15−2	−3.47−2		5	−5.97−2	−1.49−2	1.28−2	2.05−2	−3.33−2
	10	−1.83−1	−4.44−2	2.93−2	6.11−2	−9.04−2		10	−1.78−1	−4.33−2	2.94−2	5.98−2	−8.92−2
$Z = 35$, Br: $4s^2_{1/2}3d^4_{3/2}3d^6_{5/2}4p^2_{1/2}4p^3_{3/2}$							$Z = 36$, Kr: $4s^2_{1/2}3d^4_{3/2}3d^6_{5/2}4p^2_{1/2}4p^4_{3/2}$						
$2s_{1/2}$	1	−2.77−2	−8.78−3	6.25−3	8.81−3	−1.51−2	$2s_{1/2}$	1	−3.03−2	−9.48−3	6.90−3	9.73−3	−1.66−2
	3	−7.40−3	−4.31−3	1.04−3	1.44−3	−2.49−3		3	−8.88−3	−4.91−3	1.33−3	1.85−3	−3.18−3
	5	−8.94−3	−4.14−3	1.71−3	2.26−3	−3.97−3		5	−8.23−3	−4.16−3	1.46−3	1.92−3	−3.38−3
	10	−6.11−2	−1.68−2	1.52−2	2.08−2	−3.60−2		10	−5.65−2	−1.57−2	1.41−2	1.91−2	−3.32−2

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$2p_{1/2}$	1	−3.13−3	2.85−3	−2.36−3	1.92−3	4.38−4	$2p_{1/2}$	1	−2.48−3	3.19−3	−2.58−3	1.75−3	8.31−4
	3	−4.57−2	−4.41−3	2.09−3	1.70−2	−1.90−2		3	−4.40−2	−3.74−3	1.72−3	1.65−2	−1.82−2
	5	−9.98−2	−1.50−2	7.45−3	3.54−2	−4.29−2		5	−9.76−2	−1.42−2	7.15−3	3.48−2	−4.19−2
	10	−2.41−1	−4.30−2	1.69−2	8.26−2	−9.95−2		10	−2.38−1	−4.22−2	1.71−2	8.19−2	−9.90−2
$2p_{3/2}$	1	3.52−3	2.02−3	2.71−4	−5.46−4	2.74−4	$2p_{3/2}$	1	4.52−3	2.32−3	1.84−4	−8.43−4	6.59−4
	3	−3.49−2	−6.36−3	7.11−3	1.28−2	−1.99−2		3	−3.30−2	−5.74−3	6.85−3	1.23−2	−1.91−2
	5	−8.39−2	−1.82−2	1.53−2	2.93−2	−4.46−2		5	−8.16−2	−1.75−2	1.51−2	2.87−2	−4.37−2
	10	−2.10−1	−4.93−2	3.18−2	7.06−2	−1.02−1		10	−2.08−1	−4.85−2	3.22−2	7.01−2	−1.02−1
$3s_{1/2}$	1	−1.17−2	−3.19−3	2.80−3	3.96−3	−6.76−3	$3s_{1/2}$	1	−1.22−2	−3.17−3	2.97−3	4.20−3	−7.17−3
	3	−6.20−3	−4.14−3	6.80−4	9.58−4	−1.64−3		3	−7.25−3	−4.53−3	8.94−4	1.26−3	−2.16−3
	5	−7.60−3	−4.62−3	1.06−3	1.41−3	−2.47−3		5	−7.02−3	−4.66−3	8.47−4	1.11−3	−1.96−3
	10	−5.47−2	−1.64−2	1.32−2	1.80−2	−3.12−2		10	−5.03−2	−1.54−2	1.20−2	1.64−2	−2.84−2
$3p_{1/2}$	1	−2.70−3	−7.86−4	−4.08−4	6.84−4	−2.77−4	$3p_{1/2}$	1	−3.07−3	−9.46−4	−3.67−4	7.76−4	−4.09−4
	3	−2.56−2	−3.62−3	1.71−3	9.13−3	−1.08−2		3	−2.36−2	−3.22−3	1.40−3	8.44−3	−9.84−3
	5	−7.12−2	−1.19−2	6.62−3	2.50−2	−3.17−2		5	−6.79−2	−1.12−2	6.29−3	2.39−2	−3.02−2
	10	−2.05−1	−3.73−2	1.64−2	7.04−2	−8.68−2		10	−2.00−1	−3.63−2	1.65−2	6.89−2	−8.54−2
$3p_{3/2}$	1	−6.72−5	−1.13−3	6.07−4	−3.04−4	−3.03−4	$3p_{3/2}$	1	−3.49−4	−1.29−3	6.66−4	−2.44−4	−4.22−4
	3	−1.87−2	−5.04−3	5.04−3	6.49−3	−1.15−2		3	−1.69−2	−4.65−3	4.73−3	5.83−3	−1.06−2
	5	−5.92−2	−1.46−2	1.27−2	2.04−2	−3.31−2		5	−5.62−2	−1.39−2	1.24−2	1.94−2	−3.18−2
	10	−1.77−1	−4.30−2	2.97−2	5.97−2	−8.94−2		10	−1.73−1	−4.20−2	2.98−2	5.85−2	−8.83−2
$3d_{3/2}$	1	−1.41−2	−1.90−3	−3.80−4	4.80−3	−4.42−3	$3d_{3/2}$	1	−1.34−2	−1.71−3	−4.37−4	4.58−3	−4.14−3
	3	−8.55−2	−1.51−2	7.63−4	2.83−2	−2.91−2		3	−8.34−2	−1.45−2	8.70−4	2.77−2	−2.86−2
	5	−1.69−1	−3.13−2	−1.20−3	5.47−2	−5.35−2		5	−1.66−1	−3.07−2	−6.38−4	5.40−2	−5.34−2
	10	−3.83−1	−7.43−2	−1.61−2	1.20−1	−1.04−1		10	−3.79−1	−7.32−2	−1.45−2	1.19−1	−1.05−1
$3d_{5/2}$	1	−1.13−2	−2.27−3	7.32−4	3.75−3	−4.48−3	$3d_{5/2}$	1	−1.05−2	−2.08−3	6.97−4	3.51−3	−4.21−3
	3	−7.71−2	−1.65−2	4.04−3	2.50−2	−2.91−2		3	−7.50−2	−1.59−2	4.14−3	2.45−2	−2.86−2
	5	−1.55−1	−3.39−2	4.26−3	4.93−2	−5.35−2		5	−1.52−1	−3.32−2	4.78−3	4.86−2	−5.34−2
	10	−3.59−1	−8.05−2	−5.54−3	1.10−1	−1.05−1		10	−3.55−1	−7.94−2	−4.02−3	1.10−1	−1.06−1
$4s_{1/2}$	1	−9.70−3	−2.65−3	2.32−3	3.28−3	−5.60−3	$4s_{1/2}$	1	−9.83−3	−2.56−3	2.39−3	3.39−3	−5.78−3
	3	−6.16−3	−4.18−3	6.52−4	9.22−4	−1.57−3		3	−7.13−3	−4.53−3	8.56−4	1.21−3	−2.07−3
	5	−7.45−3	−4.70−3	9.73−4	1.29−3	−2.26−3		5	−6.82−3	−4.71−3	7.58−4	9.96−4	−1.75−3
	10	−5.38−2	−1.63−2	1.29−2	1.76−2	−3.04−2		10	−4.93−2	−1.54−2	1.17−2	1.59−2	−2.76−2
$4p_{1/2}$	1	−2.59−3	−9.47−4	−1.99−4	6.16−4	−4.17−4	$4p_{1/2}$	1	−2.97−3	−1.11−3	−1.24−4	7.17−4	−5.93−4
	3	−2.35−2	−3.60−3	1.66−3	8.30−3	−9.96−3		3	−2.14−2	−3.19−3	1.35−3	7.57−3	−8.92−3
	5	−6.80−2	−1.16−2	6.52−3	2.39−2	−3.04−2		5	−6.44−2	−1.08−2	6.15−3	2.27−2	−2.88−2
	10	−2.01−1	−3.67−2	1.63−2	6.90−2	−8.53−2		10	−1.96−1	−3.56−2	1.64−2	6.73−2	−8.38−2
$4p_{3/2}$	1	−4.47−4	−1.26−3	6.27−4	−1.99−4	−4.29−4	$4p_{3/2}$	1	−8.06−4	−1.42−3	6.97−4	−1.05−4	−5.91−4
	3	−1.72−2	−4.96−3	4.81−3	5.85−3	−1.07−2		3	−1.52−2	−4.55−3	4.45−3	5.15−3	−9.61−3
	5	−5.65−2	−1.42−2	1.24−2	1.94−2	−3.19−2		5	−5.32−2	−1.34−2	1.20−2	1.83−2	−3.03−2
	10	−1.74−1	−4.23−2	2.95−2	5.85−2	−8.80−2		10	−1.69−1	−4.13−2	2.95−2	5.72−2	−8.67−2
$Z = 37$, Rb: $5s^1_{1/2}$							$Z = 38$, Sr: $5s^2_{1/2}$						
$2p_{1/2}$	1	−1.83−3	3.55−3	−2.80−3	1.59−3	1.21−3	$2p_{3/2}$	1	6.41−3	2.91−3	3.93−5	−1.39−3	1.35−3
	3	−4.24−2	−3.08−3	1.34−3	1.60−2	−1.73−2		3	−2.92−2	−4.51−3	6.34−3	1.12−2	−1.75−2
	5	−9.53−2	−1.34−2	6.82−3	3.41−2	−4.10−2		5	−7.71−2	−1.60−2	1.46−2	2.74−2	−4.20−2
	10	−2.36−1	−4.13−2	1.72−2	8.11−2	−9.84−2		10	−2.03−1	−4.70−2	3.26−2	6.89−2	−1.02−1
$2p_{3/2}$	1	5.52−3	2.63−3	1.06−4	−1.13−3	1.03−3	$3s_{1/2}$	1	−1.29−2	−3.07−3	3.25−3	4.60−3	−7.85−3
	3	−3.11−2	−5.14−3	6.59−3	1.17−2	−1.83−2		3	−9.65−3	−5.38−3	1.40−3	1.99−3	−3.39−3
	5	−7.93−2	−1.67−2	1.49−2	2.80−2	−4.29−2		5	−6.57−3	−4.92−3	6.01−4	7.79−4	−1.38−3
	10	−2.05−1	−4.78−2	3.24−2	6.95−2	−1.02−1		10	−4.22−2	−1.37−2	9.88−3	1.34−2	−2.33−2
$3s_{1/2}$	1	−1.26−2	−3.14−3	3.11−3	4.40−3	−7.51−3	$3p_{1/2}$	1	−4.02−3	−1.31−3	−2.71−4	1.03−3	−7.61−4
	3	−8.42−3	−4.95−3	1.14−3	1.62−3	−2.76−3		3	−2.02−2	−2.55−3	8.41−4	7.22−3	−8.06−3
	5	−6.73−3	−4.78−3	7.06−4	9.21−4	−1.63−3		5	−6.15−2	−9.75−3	5.58−3	2.18−2	−2.74−2
	10	−4.61−2	−1.45−2	1.09−2	1.48−2	−2.58−2		10	−1.91−1	−3.42−2	1.65−2	6.59−2	−8.24−2
$3p_{1/2}$	1	−3.53−3	−1.13−3	−3.21−4	8.97−4	−5.77−4	$3p_{3/2}$	1	−1.11−3	−1.65−3	8.04−4	−5.74−5	−7.47−4
	3	−2.18−2	−2.86−3	1.11−3	7.81−3	−8.92−3		3	−1.35−2	−3.99−3	4.15−3	4.65−3	−8.80−3
	5	−6.46−2	−1.05−2	5.93−3	2.29−2	−2.88−2		5	−5.03−2	−1.25−2	1.16−2	1.75−2	−2.91−2
	10	−1.96−1	−3.53−2	1.65−2	6.74−2	−8.39−2		10	−1.65−1	−4.01−2	2.98−2	5.61−2	−8.59−2

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$3p_{3/2}$	1	−7.19−4	−1.47−3	7.31−4	−1.55−4	−5.76−4	$3d_{3/2}$	1	−1.20−2	−1.33−3	−5.51−4	4.18−3	−3.63−3
	3	−1.51−2	−4.30−3	4.43−3	5.22−3	−9.65−3		3	−7.92−2	−1.34−2	9.82−4	2.65−2	−2.75−2
	5	−5.32−2	−1.31−2	1.20−2	1.84−2	−3.04−2		5	−1.61−1	−2.93−2	3.30−4	5.26−2	−5.30−2
	10	−1.69−1	−4.10−2	2.98−2	5.73−2	−8.71−2		10	−3.70−1	−7.10−2	−1.14−2	1.17−1	−1.06−1
$3d_{3/2}$	1	−1.27−2	−1.53−3	−4.98−4	4.38−3	−3.88−3	$3d_{5/2}$	1	−9.10−3	−1.70−3	6.26−4	3.08−3	−3.71−3
	3	−8.13−2	−1.40−2	9.39−4	2.71−2	−2.81−2		3	−7.08−2	−1.47−2	4.25−3	2.33−2	−2.75−2
	5	−1.64−1	−3.00−2	−1.30−4	5.34−2	−5.32−2		5	−1.47−1	−3.18−2	5.68−3	4.73−2	−5.30−2
	10	−3.75−1	−7.21−2	−1.29−2	1.18−1	−1.05−1		10	−3.47−1	−7.72−2	−1.20−3	1.08−1	−1.07−1
$3d_{5/2}$	1	−9.81−3	−1.90−3	6.56−4	3.30−3	−3.95−3	$4s_{1/2}$	1	−9.81−3	−2.29−3	2.47−3	3.50−3	−5.96−3
	3	−7.29−2	−1.53−2	4.20−3	2.39−2	−2.81−2		3	−9.35−3	−5.32−3	1.32−3	1.88−3	−3.20−3
	5	−1.50−1	−3.26−2	5.25−3	4.80−2	−5.33−2		5	−6.45−3	−5.00−3	5.30−4	6.88−4	−1.22−3
	10	−3.51−1	−7.83−2	−2.58−3	1.09−1	−1.06−1		10	−4.13−2	−1.37−2	9.54−3	1.29−2	−2.25−2
$4s_{1/2}$	1	−9.77−3	−2.40−3	2.42−3	3.43−3	−5.86−3	$4p_{1/2}$	1	−3.69−3	−1.34−3	7.96−6	9.38−4	−9.46−4
	3	−8.23−3	−4.93−3	1.08−3	1.53−3	−2.61−3		3	−1.80−2	−2.64−3	8.33−4	6.29−3	−7.13−3
	5	−6.57−3	−4.84−3	6.26−4	8.17−4	−1.44−3		5	−5.74−2	−9.35−3	5.41−3	2.03−2	−2.57−2
	10	−4.52−2	−1.45−2	1.06−2	1.44−2	−2.50−2		10	−1.85−1	−3.34−2	1.64−2	6.40−2	−8.04−2
$p_{1/2}$	1	−3.27−3	−1.19−3	−7.17−5	8.16−4	−7.44−4	$4p_{3/2}$	1	−1.50−3	−1.64−3	8.08−4	1.05−4	−9.14−4
	3	−1.96−2	−2.90−3	1.09−3	6.90−3	−7.98−3		3	−1.20−2	−3.98−3	3.86−3	3.97−3	−7.83−3
	5	−6.08−2	−1.01−2	5.78−3	2.14−2	−2.72−2		5	−4.69−2	−1.20−2	1.12−2	1.62−2	−2.74−2
	10	−1.90−1	−3.45−2	1.64−2	6.56−2	−8.21−2		10	−1.60−1	−3.91−2	2.94−2	5.44−2	−8.38−2
$4p_{3/2}$	1	−1.10−3	−1.49−3	7.34−4	−7.99−6	−7.26−4	$5s_{1/2}$	1	−9.49−3	−2.12−3	2.42−3	3.43−3	−5.85−3
	3	−1.35−2	−4.25−3	4.14−3	4.54−3	−8.68−3		3	−9.44−3	−5.36−3	1.34−3	1.90−3	−3.24−3
	5	−4.99−2	−1.27−2	1.16−2	1.72−2	−2.88−2		5	−6.49−3	−5.05−3	5.22−4	6.77−4	−1.20−3
	10	−1.65−1	−4.02−2	2.95−2	5.58−2	−8.52−2		10	−4.12−2	−1.37−2	9.51−3	1.29−2	−2.24−2
$5s_{1/2}$	1	−9.59−3	−2.33−3	2.38−3	3.38−3	−5.76−3							
	3	−8.09−3	−4.80−3	1.08−3	1.53−3	−2.61−3							
	5	−6.53−3	−4.84−3	6.13−4	8.00−4	−1.41−3							
	10	−4.51−2	−1.45−2	1.06−2	1.43−2	−2.49−2							
$Z = 39$, Y: $5s^2_{1/2}4d^1_{3/2}$							$Z = 40$, Zr: $5s^2_{1/2}4d^2_{3/2}$						
$3s_{1/2}$	1	−1.33−2	−2.96−3	3.38−3	4.79−3	−8.17−3	$3s_{1/2}$	1	−1.35−2	−2.82−3	3.50−3	4.97−3	−8.47−3
	3	−1.10−2	−5.85−3	1.71−3	2.42−3	−4.13−3		3	−1.26−2	−6.35−3	2.04−3	2.90−3	−4.94−3
	5	−6.69−3	−5.15−3	5.62−4	7.29−4	−1.29−3		5	−7.04−3	−5.44−3	5.76−4	7.57−4	−1.33−3
	10	−3.85−2	−1.30−2	8.89−3	1.20−2	−2.09−2		10	−3.51−2	−1.23−2	7.96−3	1.07−2	−1.86−2
$3p_{1/2}$	1	−4.62−3	−1.52−3	−2.08−4	1.20−3	−9.92−4	$3p_{1/2}$	1	−5.34−3	−1.76−3	−1.34−4	1.40−3	−1.27−3
	3	−1.86−2	−2.27−3	5.75−4	6.66−3	−7.23−3		3	−1.72−2	−2.03−3	3.16−4	6.13−3	−6.44−3
	5	−5.84−2	−9.04−3	5.20−3	2.08−2	−2.60−2		5	−5.53−2	−8.36−3	4.79−3	1.97−2	−2.45−2
	10	−1.86−1	−3.31−2	1.64−2	6.44−2	−8.08−2		10	−1.81−1	−3.21−2	1.63−2	6.28−2	−7.91−2
$3p_{3/2}$	1	−1.59−3	−1.86−3	8.92−4	6.71−5	−9.59−4	$3p_{3/2}$	1	−2.18−3	−2.11−3	9.90−4	2.26−4	−1.22−3
	3	−1.20−2	−3.72−3	3.88−3	4.10−3	−7.98−3		3	−1.06−2	−3.49−3	3.62−3	3.58−3	−7.20−3
	5	−4.74−2	−1.18−2	1.12−2	1.65−2	−2.77−2		5	−4.45−2	−1.11−2	1.08−2	1.55−2	−2.63−2
	10	−1.61−1	−3.91−2	2.97−2	5.48−2	−8.45−2		10	−1.57−1	−3.81−2	2.95−2	5.35−2	−8.31−2
$3d_{3/2}$	1	−1.13−2	−1.10−3	−6.07−4	3.96−3	−3.36−3	$3d_{3/2}$	1	−1.06−2	−8.95−4	−6.74−4	3.76−3	−3.09−3
	3	−7.71−2	−1.28−2	1.00−3	2.59−2	−2.69−2		3	−7.51−2	−1.23−2	1.01−3	2.53−2	−2.63−2
	5	−1.58−1	−2.85−2	7.45−4	5.19−2	−5.27−2		5	−1.55−1	−2.78−2	1.11−3	5.12−2	−5.23−2
	10	−3.67−1	−7.00−2	−1.00−2	1.17−1	−1.07−1		10	−3.63−1	−6.90−2	−8.63−3	1.16−1	−1.07−1
$3d_{5/2}$	1	−8.31−3	−1.48−3	5.99−4	2.85−3	−3.45−3	$3d_{5/2}$	1	−7.56−3	−1.28−3	5.60−4	2.63−3	−3.19−3
	3	−6.88−2	−1.42−2	4.28−3	2.27−2	−2.70−2		3	−6.68−2	−1.37−2	4.29−3	2.21−2	−2.64−2
	5	−1.45−1	−3.11−2	6.06−3	4.67−2	−5.27−2		5	−1.42−1	−3.03−2	6.40−3	4.59−2	−5.23−2
	10	−3.44−1	−7.62−2	1.26−4	1.07−1	−1.07−1		10	−3.40−1	−7.51−2	1.40−3	1.06−1	−1.08−1
$4s_{1/2}$	1	−9.83−3	−2.17−3	2.51−3	3.57−3	−6.08−3	$4s_{1/2}$	1	−9.77−3	−2.01−3	2.54−3	3.61−3	−6.16−3
	3	−1.06−2	−5.75−3	1.60−3	2.27−3	−3.87−3		3	−1.20−2	−6.18−3	1.90−3	2.70−3	−4.60−3
	5	−6.61−3	−5.24−3	4.97−4	6.48−4	−1.14−3		5	−6.99−3	−5.54−3	5.16−4	6.82−4	−1.20−3
	10	−3.76−2	−1.30−2	8.56−3	1.16−2	−2.01−2		10	−3.42−2	−1.24−2	7.62−3	1.03−2	−1.79−2
$4p_{1/2}$	1	−4.18−3	−1.51−3	9.74−5	1.09−3	−1.18−3	$4p_{1/2}$	1	−4.74−3	−1.69−3	1.95−4	1.26−3	−1.46−3
	3	−1.64−2	−2.42−3	5.94−4	5.73−3	−6.32−3		3	−1.50−2	−2.22−3	3.57−4	5.19−3	−5.55−3
	5	−5.41−2	−8.68−3	5.02−3	1.92−2	−2.42−2		5	−5.08−2	−8.04−3	4.62−3	1.80−2	−2.27−2
	10	−1.80−1	−3.23−2	1.63−2	6.23−2	−7.86−2		10	−1.75−1	−3.12−2	1.62−2	6.06−2	−7.68−2

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4p_{3/2}$	1	−1.96−3	−1.81−3	8.96−4	2.40−4	−1.14−3	$4p_{3/2}$	1	−2.49−3	−1.99−3	9.86−4	4.00−4	−1.39−3
	3	−1.06−2	−3.76−3	3.59−3	3.44−3	−7.03−3		3	−9.24−3	−3.56−3	3.32−3	2.94−3	−6.25−3
	5	−4.39−2	−1.13−2	1.07−2	1.52−2	−2.59−2		5	−4.09−2	−1.07−2	1.03−2	1.41−2	−2.44−2
	10	−1.56−1	−3.81−2	2.92−2	5.30−2	−8.22−2		10	−1.52−1	−3.71−2	2.90−2	5.16−2	−8.06−2
$4d_{3/2}$	1	−8.62−3	−1.23−3	−3.17−4	2.89−3	−2.57−3	$4d_{3/2}$	1	−7.71−3	−1.05−3	−3.44−4	2.60−3	−2.25−3
	3	−7.16−2	−1.22−2	1.31−3	2.40−2	−2.53−2		3	−6.89−2	−1.16−2	1.34−3	2.32−2	−2.45−2
	5	−1.52−1	−2.75−2	1.18−3	4.99−2	−5.11−2		5	−1.48−1	−2.66−2	1.55−3	4.88−2	−5.03−2
	10	−3.60−1	−6.89−2	−9.38−3	1.15−1	−1.05−1		10	−3.55−1	−6.77−2	−7.93−3	1.13−1	−1.06−1
$5s_{1/2}$	1	−9.36−3	−1.96−3	2.43−3	3.45−3	−5.87−3	$5s_{1/2}$	1	−9.55−3	−1.98−3	2.48−3	3.52−3	−6.00−3
	3	−1.06−2	−5.72−3	1.60−3	2.27−3	−3.87−3		3	−1.21−2	−6.28−3	1.90−3	2.70−3	−4.60−3
	5	−6.66−3	−5.31−3	4.90−4	6.41−4	−1.13−3		5	−7.05−3	−5.61−3	5.12−4	6.78−4	−1.19−3
	10	−3.75−2	−1.30−2	8.51−3	1.15−2	−2.00−2		10	−3.41−2	−1.24−2	7.57−3	1.02−2	−1.78−2
$Z = 41$, Nb: $5s^1_{1/2}4d^4_{3/2}$							$Z = 42$, Mo: $5s^1_{1/2}4d^4_{3/2}4d^1_{5/2}$						
$3s_{1/2}$	1	−1.37−2	−2.62−3	3.62−3	5.14−3	−8.76−3	$3s_{1/2}$	1	−1.37−2	−2.39−3	3.71−3	5.28−3	−8.99−3
	3	−1.42−2	−6.84−3	2.40−3	3.40−3	−5.80−3		3	−1.58−2	−7.35−3	2.77−3	3.93−3	−6.70−3
	5	−7.63−3	−5.79−3	6.46−4	8.62−4	−1.51−3		5	−8.41−3	−6.20−3	7.65−4	1.04−3	−1.80−3
	10	−3.19−2	−1.18−2	7.07−3	9.46−3	−1.65−2		10	−2.89−2	−1.13−2	6.25−3	8.31−3	−1.46−2
$3p_{1/2}$	1	−6.21−3	−2.05−3	−4.63−5	1.66−3	−1.61−3	$3p_{1/2}$	1	−7.06−3	−2.32−3	4.31−5	1.91−3	−1.95−3
	3	−1.58−2	−1.81−3	7.33−5	5.63−3	−5.70−3		3	−1.46−2	−1.63−3	−1.56−4	5.16−3	−5.00−3
	5	−5.23−2	−7.70−3	4.38−3	1.87−2	−2.31−2		5	−4.93−2	−7.07−3	3.96−3	1.77−2	−2.16−2
	10	−1.76−1	−3.10−2	1.61−2	6.13−2	−7.74−2		10	−1.71−1	−2.98−2	1.59−2	5.96−2	−7.55−2
$3p_{3/2}$	1	−2.89−3	−2.39−3	1.11−3	4.20−4	−1.53−3	$3p_{3/2}$	1	−3.61−3	−2.67−3	1.22−3	6.24−4	−1.85−3
	3	−9.29−3	−3.27−3	3.38−3	3.08−3	−6.46−3		3	−8.09−3	−3.10−3	3.15−3	2.63−3	−5.77−3
	5	−4.17−2	−1.05−2	1.04−2	1.46−2	−2.49−2		5	−3.89−2	−9.87−3	9.91−3	1.36−2	−2.35−2
	10	−1.53−1	−3.70−2	2.93−2	5.22−2	−8.16−2		10	−1.49−1	−3.60−2	2.91−2	5.09−2	−8.00−2
$3d_{3/2}$	1	−9.87−3	−6.56−4	−7.42−4	3.54−3	−2.80−3	$3d_{3/2}$	1	−9.11−3	−4.26−4	−8.05−4	3.31−3	−2.51−3
	3	−7.31−2	−1.18−2	9.92−4	2.47−2	−2.57−2		3	−7.11−2	−1.12−2	9.63−4	2.41−2	−2.51−2
	5	−1.52−1	−2.70−2	1.42−3	5.05−2	−5.19−2		5	−1.49−1	−2.62−2	1.68−3	4.96−2	−5.13−2
	10	−3.59−1	−6.80−2	−7.30−3	1.15−1	−1.08−1		10	−3.55−1	−6.70−2	−6.02−3	1.14−1	−1.08−1
$3d_{5/2}$	1	−6.73−3	−1.04−3	5.27−4	2.38−3	−2.91−3	$3d_{5/2}$	1	−5.92−3	−8.15−4	4.93−4	2.14−3	−2.63−3
	3	−6.48−2	−1.31−2	4.30−3	2.15−2	−2.58−2		3	−6.28−2	−1.26−2	4.28−3	2.09−2	−2.52−2
	5	−1.39−1	−2.95−2	6.70−3	4.52−2	−5.19−2		5	−1.36−1	−2.87−2	6.94−3	4.44−2	−5.14−2
	10	−3.36−1	−7.41−2	2.63−3	1.05−1	−1.08−1		10	−3.32−1	−7.31−2	3.80−3	1.04−1	−1.08−1
$4s_{1/2}$	1	−9.65−3	−1.81−3	2.56−3	3.65−3	−6.21−3	$4s_{1/2}$	1	−9.44−3	−1.58−3	2.57−3	3.66−3	−6.22−3
	3	−1.33−2	−6.58−3	2.21−3	3.14−3	−5.36−3		3	−1.47−2	−6.98−3	2.53−3	3.60−3	−6.14−3
	5	−7.59−3	−5.91−3	5.86−4	7.88−4	−1.37−3		5	−8.36−3	−6.31−3	7.02−4	9.59−4	−1.66−3
	10	−3.10−2	−1.18−2	6.74−3	9.02−3	−1.58−2		10	−2.81−2	−1.13−2	5.93−3	7.88−3	−1.38−2
$4p_{1/2}$	1	−5.39−3	−1.89−3	3.06−4	1.46−3	−1.77−3	$4p_{1/2}$	1	−6.00−3	−2.05−3	4.11−4	1.66−3	−2.07−3
	3	−1.37−2	−2.05−3	1.35−4	4.68−3	−4.82−3		3	−1.25−2	−1.91−3	−7.22−5	4.22−3	−4.15−3
	5	−4.77−2	−7.45−3	4.22−3	1.70−2	−2.12−2		5	−4.47−2	−6.90−3	3.83−3	1.59−2	−1.97−2
	10	−1.69−1	−3.00−2	1.60−2	5.88−2	−7.48−2		10	−1.64−1	−2.89−2	1.57−2	5.71−2	−7.28−2
$4p_{3/2}$	1	−3.11−3	−2.19−3	1.09−3	5.86−4	−1.68−3	$4p_{3/2}$	1	−3.69−3	−2.36−3	1.19−3	7.69−4	−1.96−3
	3	−7.99−3	−3.38−3	3.07−3	2.46−3	−5.52−3		3	−6.87−3	−3.23−3	2.82−3	2.02−3	−4.84−3
	5	−3.81−2	−1.01−2	9.80−3	1.32−2	−2.29−2		5	−3.53−2	−9.54−3	9.34−3	1.22−2	−2.15−2
	10	−1.47−1	−3.60−2	2.88−2	5.01−2	−7.89−2		10	−1.42−1	−3.49−2	2.85−2	4.86−2	−7.71−2
$4d_{3/2}$	1	−6.91−3	−9.42−4	−3.39−4	2.32−3	−1.98−3	$4d_{3/2}$	1	−6.12−3	−8.00−4	−3.56−4	2.06−3	−1.70−3
	3	−6.61−2	−1.10−2	1.35−3	2.23−2	−2.37−2		3	−6.36−2	−1.04−2	1.37−3	2.15−2	−2.29−2
	5	−1.44−1	−2.57−2	1.88−3	4.76−2	−4.95−2		5	−1.40−1	−2.48−2	2.15−3	4.65−2	−4.87−2
	10	−3.50−1	−6.66−2	−6.52−3	1.12−1	−1.06−1		10	−3.46−1	−6.54−2	−5.13−3	1.11−1	−1.06−1
$5s_{1/2}$	1	−8.94−3	−1.48−3	2.44−3	3.47−3	−5.91−3	$4d_{5/2}$	1	−3.52−3	−1.14−3	7.09−4	1.09−3	−1.80−3
	3	−1.36−2	−6.78−3	2.24−3	3.19−3	−5.43−3		3	−5.57−2	−1.17−2	4.54−3	1.85−2	−2.30−2
	5	−7.75−3	−6.01−3	6.05−4	8.16−4	−1.42−3		5	−1.27−1	−2.72−2	7.29−3	4.15−2	−4.87−2
	10	−3.09−2	−1.18−2	6.69−3	8.95−3	−1.56−2		10	−3.23−1	−7.14−2	4.59−3	1.02−1	−1.06−1
							$5s_{1/2}$	1	−8.71−3	−1.29−3	2.42−3	3.45−3	−5.87−3
								3	−1.47−2	−6.91−3	2.54−3	3.61−3	−6.16−3
								5	−8.57−3	−6.45−3	7.25−4	9.94−4	−1.72−3
								10	−2.79−2	−1.13−2	5.87−3	7.81−3	−1.37−2

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$Z=43$, Tc: $5s^2_{1/2}4d^4_{3/2}4d^1_{5/2}$							$Z=44$, Ru: $5s^1_{1/2}4d^4_{3/2}4d^3_{5/2}$						
$3s_{1/2}$	1	−1.37−2	−2.15−3	3.79−3	5.39−3	−9.18−3	$3s_{1/2}$	1	−1.37−2	−1.81−3	3.87−3	5.52−3	−9.38−3
	3	−1.75−2	−7.84−3	3.16−3	4.48−3	−7.64−3		3	−1.93−2	−8.35−3	3.57−3	5.08−3	−8.65−3
	5	−9.37−3	−6.64−3	9.30−4	1.28−3	−2.21−3		5	−1.06−2	−7.16−3	1.15−3	1.59−3	−2.74−3
	10	−2.62−2	−1.08−2	5.50−3	7.26−3	−1.28−2		10	−2.38−2	−1.05−2	4.80−3	6.28−3	−1.11−2
$3p_{1/2}$	1	−7.91−3	−2.58−3	1.29−4	2.16−3	−2.29−3	$3p_{1/2}$	1	−9.02−3	−2.91−3	2.37−4	2.49−3	−2.73−3
	3	−1.35−2	−1.49−3	−3.68−4	4.74−3	−4.37−3		3	−1.25−2	−1.37−3	−5.74−4	4.35−3	−3.77−3
	5	−4.64−2	−6.48−3	3.54−3	1.67−2	−2.02−2		5	−4.37−2	−5.92−3	3.13−3	1.57−2	−1.88−2
	10	−1.66−1	−2.87−2	1.56−2	5.80−2	−7.36−2		10	−1.61−1	−2.76−2	1.53−2	5.64−2	−7.17−2
$3p_{3/2}$	1	−4.33−3	−2.93−3	1.33−3	8.27−4	−2.16−3	$3p_{3/2}$	1	−5.25−3	−3.26−3	1.47−3	1.09−3	−2.57−3
	3	−7.02−3	−2.96−3	2.93−3	2.21−3	−5.14−3		3	−5.99−3	−2.84−3	2.73−3	1.81−3	−4.54−3
	5	−3.63−2	−9.31−3	9.47−3	1.27−2	−2.22−2		5	−3.37−2	−8.77−3	9.04−3	1.18−2	−2.08−2
	10	−1.44−1	−3.50−2	2.88−2	4.95−2	−7.83−2		10	−1.40−1	−3.39−2	2.84−2	4.81−2	−7.66−2
$3d_{3/2}$	1	−8.41−3	−2.08−4	−8.64−4	3.11−3	−2.25−3	$3d_{3/2}$	1	−7.58−3	5.59−5	−9.30−4	2.87−3	−1.94−3
	3	−6.92−2	−1.07−2	9.27−4	2.36−2	−2.45−2		3	−6.72−2	−1.02−2	8.66−4	2.30−2	−2.39−2
	5	−1.46−1	−2.54−2	1.89−3	4.88−2	−5.07−2		5	−1.44−1	−2.46−2	2.08−3	4.80−2	−5.01−2
	10	−3.51−1	−6.60−2	−4.79−3	1.13−1	−1.08−1		10	−3.47−1	−6.50−2	−3.60−3	1.12−1	−1.09−1
$3d_{5/2}$	1	−5.14−3	−5.98−4	4.62−4	1.91−3	−2.37−3	$3d_{5/2}$	1	−4.22−3	−3.38−4	4.35−4	1.64−3	−2.08−3
	3	−6.08−2	−1.20−2	4.26−3	2.04−2	−2.46−2		3	−5.89−2	−1.15−2	4.23−3	1.98−2	−2.40−2
	5	−1.33−1	−2.79−2	7.13−3	4.36−2	−5.07−2		5	−1.30−1	−2.71−2	7.31−3	4.28−2	−5.01−2
	10	−3.29−1	−7.21−2	4.92−3	1.04−1	−1.09−1		10	−3.25−1	−7.11−2	6.01−3	1.03−1	−1.09−1
$4s_{1/2}$	1	−9.17−3	−1.34−3	2.55−3	3.64−3	−6.19−3	$4s_{1/2}$	1	−8.83−3	−1.02−3	2.54−3	3.63−3	−6.17−3
	3	−1.61−2	−7.35−3	2.86−3	4.06−3	−6.92−3		3	−1.75−2	−7.72−3	3.20−3	4.55−3	−7.75−3
	5	−9.29−3	−6.75−3	8.60−4	1.19−3	−2.05−3		5	−1.04−2	−7.24−3	1.07−3	1.49−3	−2.56−3
	10	−2.54−2	−1.09−2	5.18−3	6.84−3	−1.20−2		10	−2.30−2	−1.06−2	4.49−3	5.88−3	−1.04−2
$4p_{1/2}$	1	−6.57−3	−2.20−3	5.09−4	1.85−3	−2.36−3	$4p_{1/2}$	1	−7.25−3	−2.35−3	6.23−4	2.08−3	−2.71−3
	3	−1.14−2	−1.81−3	−2.63−4	3.80−3	−3.54−3		3	−1.05−2	−1.74−3	−4.39−4	3.42−3	−2.98−3
	5	−4.19−2	−6.39−3	3.44−3	1.49−2	−1.83−2		5	−3.91−2	−5.90−3	3.05−3	1.39−2	−1.69−2
	10	−1.58−1	−2.77−2	1.54−2	5.53−2	−7.07−2		10	−1.53−1	−2.65−2	1.50−2	5.34−2	−6.85−2
$4p_{3/2}$	1	−4.22−3	−2.51−3	1.28−3	9.42−4	−2.22−3	$4p_{3/2}$	1	−4.88−3	−2.68−3	1.39−3	1.16−3	−2.55−3
	3	−5.89−3	−3.11−3	2.60−3	1.63−3	−4.23−3		3	−4.99−3	−3.03−3	2.39−3	1.26−3	−3.65−3
	5	−3.28−2	−9.04−3	8.90−3	1.13−2	−2.02−2		5	−3.02−2	−8.56−3	8.45−3	1.04−2	−1.88−2
	10	−1.38−1	−3.38−2	2.81−2	4.71−2	−7.52−2		10	−1.33−1	−3.27−2	2.77−2	4.56−2	−7.33−2
$4d_{3/2}$	1	−5.39−3	−6.82−4	−3.65−4	1.81−3	−1.45−3	$4d_{3/2}$	1	−4.60−3	−5.32−4	−3.88−4	1.55−3	−1.16−3
	3	−6.08−2	−9.80−3	1.35−3	2.07−2	−2.20−2		3	−5.81−2	−9.19−3	1.30−3	1.98−2	−2.11−2
	5	−1.36−1	−2.40−2	2.41−3	4.54−2	−4.78−2		5	−1.33−1	−2.31−2	2.64−3	4.43−2	−4.69−2
	10	−3.41−1	−6.42−2	−3.81−3	1.10−1	−1.06−1		10	−3.36−1	−6.30−2	−2.56−3	1.08−1	−1.06−1
$4d_{5/2}$	1	−2.83−3	−1.02−3	6.89−4	8.61−4	−1.55−3	$4d_{5/2}$	1	−2.03−3	−8.65−4	6.65−4	6.01−4	−1.27−3
	3	−5.30−2	−1.11−2	4.51−3	1.77−2	−2.22−2		3	−5.04−2	−1.04−2	4.46−3	1.69−2	−2.13−2
	5	−1.24−1	−2.64−2	7.51−3	4.04−2	−4.79−2		5	−1.20−1	−2.55−2	7.71−3	3.93−2	−4.70−2
	10	−3.19−1	−7.02−2	5.78−3	1.00−1	−1.06−1		10	−3.14−1	−6.90−2	6.91−3	9.93−2	−1.06−1
$5s_{1/2}$	1	−8.54−3	−1.11−3	2.42−3	3.46−3	−5.88−3	$5s_{1/2}$	1	−8.60−3	−1.10−3	2.44−3	3.49−3	−5.93−3
	3	−1.62−2	−7.49−3	2.86−3	4.06−3	−6.92−3		3	−1.77−2	−7.89−3	3.20−3	4.56−3	−7.76−3
	5	−9.46−3	−6.83−3	8.85−4	1.23−3	−2.11−3		5	−1.07−2	−7.42−3	1.09−3	1.53−3	−2.62−3
	10	−2.53−2	−1.09−2	5.12−3	6.77−3	−1.19−2		10	−2.29−2	−1.06−2	4.43−3	5.81−3	−1.02−2
$Z=45$, Rh: $5s^1_{1/2}4d^4_{3/2}4d^4_{5/2}$							$Z=46$, Pd: $4d^4_{3/2}4d^6_{5/2}$						
$3s_{1/2}$	1	−1.35−2	−1.47−3	3.93−3	5.61−3	−9.54−3	$3s_{1/2}$	1	−1.33−2	−1.05−3	3.98−3	5.70−3	−9.68−3
	3	−2.10−2	−8.84−3	3.99−3	5.68−3	−9.67−3		3	−2.29−2	−9.32−3	4.43−3	6.30−3	−1.07−2
	5	−1.19−2	−7.71−3	1.41−3	1.96−3	−3.37−3		5	−1.35−2	−8.34−3	1.73−3	2.43−3	−4.16−3
	10	−2.16−2	−1.02−2	4.17−3	5.40−3	−9.57−3		10	−1.98−2	−1.00−2	3.60−3	4.61−3	−8.21−3
$3p_{1/2}$	1	−1.01−2	−3.23−3	3.40−4	2.82−3	−3.16−3	$3p_{1/2}$	1	−1.13−2	−3.57−3	4.52−4	3.20−3	−3.65−3
	3	−1.17−2	−1.30−3	−7.62−4	3.99−3	−3.23−3		3	−1.09−2	−1.25−3	−9.38−4	3.68−3	−2.74−3
	5	−4.10−2	−5.41−3	2.72−3	1.48−2	−1.75−2		5	−3.86−2	−4.96−3	2.30−3	1.39−2	−1.62−2
	10	−1.56−1	−2.64−2	1.49−2	5.47−2	−6.96−2		10	−1.51−1	−2.52−2	1.45−2	5.30−2	−6.75−2
$3p_{3/2}$	1	−6.17−3	−3.59−3	1.61−3	1.36−3	−2.96−3	$3p_{3/2}$	1	−7.19−3	−3.94−3	1.76−3	1.65−3	−3.41−3
	3	−5.09−3	−2.76−3	2.55−3	1.44−3	−3.99−3		3	−4.28−3	−2.71−3	2.38−3	1.11−3	−3.48−3
	5	−3.13−2	−8.28−3	8.61−3	1.09−2	−1.95−2		5	−2.90−2	−7.86−3	8.17−3	1.01−2	−1.83−2
	10	−1.36−1	−3.28−2	2.80−2	4.67−2	−7.47−2		10	−1.31−1	−3.18−2	2.76−2	4.53−2	−7.29−2

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$3d_{3/2}$	1	−6.82−3	2.90−4	−9.92−4	2.65−3	−1.66−3	$3d_{3/2}$	1	−6.10−3	5.09−4	−1.06−3	2.43−3	−1.38−3
	3	−6.53−2	−9.64−3	7.96−4	2.24−2	−2.32−2		3	−6.33−2	−9.08−3	7.11−4	2.18−2	−2.26−2
	5	−1.41−1	−2.38−2	2.22−3	4.72−2	−4.94−2		5	−1.38−1	−2.31−2	2.36−3	4.64−2	−4.87−2
	10	−3.43−1	−6.40−2	−2.47−3	1.11−1	−1.09−1		10	−3.39−1	−6.30−2	−1.40−3	1.10−1	−1.09−1
$3d_{5/2}$	1	−3.38−3	−1.08−4	4.07−4	1.39−3	−1.80−3	$3d_{5/2}$	1	−2.57−3	1.06−4	3.84−4	1.15−3	−1.53−3
	3	−5.69−2	−1.10−2	4.19−3	1.92−2	−2.34−2		3	−5.50−2	−1.04−2	4.14−3	1.86−2	−2.28−2
	5	−1.28−1	−2.63−2	7.45−3	4.20−2	−4.95−2		5	−1.25−1	−2.55−2	7.60−3	4.12−2	−4.88−2
	10	−3.21−1	−7.01−2	7.04−3	1.02−1	−1.09−1		10	−3.18−1	−6.90−2	8.01−3	1.01−1	−1.09−1
$4s_{1/2}$	1	−8.41−3	−6.97−4	2.51−3	3.59−3	−6.09−3	$4s_{1/2}$	1	−7.91−3	−3.06−4	2.46−3	3.54−3	−6.00−3
	3	−1.89−2	−8.06−3	3.54−3	5.03−3	−8.57−3		3	−2.03−2	−8.39−3	3.88−3	5.52−3	−9.40−3
	5	−1.17−2	−7.74−3	1.31−3	1.84−3	−3.15−3		5	−1.32−2	−8.30−3	1.61−3	2.27−3	−3.89−3
	10	−2.09−2	−1.03−2	3.87−3	5.03−3	−8.90−3		10	−1.91−2	−1.01−2	3.32−3	4.26−3	−7.58−3
$4p_{1/2}$	1	−7.90−3	−2.49−3	7.28−4	2.31−3	−3.04−3	$4p_{1/2}$	1	−8.58−3	−2.61−3	8.40−4	2.55−3	−3.39−3
	3	−9.73−3	−1.71−3	−5.88−4	3.09−3	−2.50−3		3	−9.09−3	−1.73−3	−7.18−4	2.80−3	−2.08−3
	5	−3.65−2	−5.45−3	2.66−3	1.29−2	−1.56−2		5	−3.40−2	−5.05−3	2.25−3	1.20−2	−1.43−2
	10	−1.47−1	−2.53−2	1.46−2	5.16−2	−6.62−2		10	−1.41−1	−2.41−2	1.42−2	4.98−2	−6.39−2
$4p_{3/2}$	1	−5.48−3	−2.83−3	1.49−3	1.36−3	−2.85−3	$4p_{3/2}$	1	−6.13−3	−2.97−3	1.60−3	1.58−3	−3.18−3
	3	−4.25−3	−2.99−3	2.21−3	9.46−4	−3.16−3		3	−3.62−3	−2.99−3	2.05−3	6.63−4	−2.72−3
	5	−2.78−2	−8.11−3	8.01−3	9.49−3	−1.75−2		5	−2.56−2	−7.73−3	7.54−3	8.66−3	−1.62−2
	10	−1.28−1	−3.15−2	2.72−2	4.40−2	−7.12−2		10	−1.23−1	−3.04−2	2.67−2	4.25−2	−6.91−2
$4d_{3/2}$	1	−3.97−3	−4.44−4	−3.92−4	1.33−3	−9.40−4	$4d_{3/2}$	1	−3.46−3	−4.19−4	−3.72−4	1.14−3	−7.68−4
	3	−5.54−2	−8.60−3	1.25−3	1.90−2	−2.02−2		3	−5.27−2	−8.00−3	1.16−3	1.81−2	−1.93−2
	5	−1.29−1	−2.23−2	2.84−3	4.32−2	−4.61−2		5	−1.25−1	−2.15−2	3.02−3	4.21−2	−4.52−2
	10	−3.30−1	−6.18−2	−1.40−3	1.07−1	−1.06−1		10	−3.25−1	−6.04−2	−3.06−4	1.06−1	−1.05−1
$4d_{5/2}$	1	−1.41−3	−7.73−4	6.56−4	3.86−4	−1.04−3	$4d_{5/2}$	1	−8.90−4	−7.44−4	6.76−4	1.94−4	−8.69−4
	3	−4.78−2	−9.83−3	4.41−3	1.61−2	−2.05−2		3	−4.51−2	−9.21−3	4.32−3	1.52−2	−1.95−2
	5	−1.16−1	−2.47−2	7.89−3	3.83−2	−4.62−2		5	−1.13−1	−2.38−2	8.05−3	3.73−2	−4.53−2
	10	−3.09−1	−6.77−2	7.97−3	9.80−2	−1.06−1		10	−3.04−1	−6.63−2	8.95−3	9.67−2	−1.06−1
$5s_{1/2}$	1	−8.18−3	−7.83−4	2.40−3	3.44−3	−5.84−3							
	3	−1.90−2	−8.18−3	3.55−3	5.06−3	−8.61−3							
	5	−1.19−2	−7.86−3	1.34−3	1.88−3	−3.22−3							
	10	−2.08−2	−1.03−2	3.82−3	4.95−3	−8.77−3							
$Z = 47$, Ag: $5s^1_{1/2}4d^4_{3/2}4d^6_{5/2}$							$Z = 48$, Cd: $5s^2_{1/2}4d^4_{3/2}4d^6_{5/2}$						
$3s_{1/2}$	1	−1.31−2	−6.67−4	4.03−3	5.78−3	−9.81−3	$3s_{1/2}$	1	−1.29−2	−2.74−4	4.09−3	5.87−3	−9.95−3
	3	−2.46−2	−9.77−3	4.87−3	6.92−3	−1.18−2		3	−2.64−2	−1.02−2	5.31−3	7.55−3	−1.29−2
	5	−1.51−2	−8.91−3	2.05−3	2.89−3	−4.94−3		5	−1.69−2	−9.56−3	2.42−3	3.42−3	−5.85−3
	10	−1.82−2	−9.91−3	3.11−3	3.93−3	−7.04−3		10	−1.69−2	−9.89−3	2.69−3	3.35−3	−6.04−3
$3p_{1/2}$	1	−1.25−2	−3.91−3	5.49−4	3.56−3	−4.11−3	$3p_{1/2}$	1	−1.38−2	−4.25−3	6.42−4	3.94−3	−4.58−3
	3	−1.03−2	−1.24−3	−1.09−3	3.41−3	−2.32−3		3	−9.88−3	−1.27−3	−1.23−3	3.20−3	−1.96−3
	5	−3.62−2	−4.48−3	1.93−3	1.31−2	−1.50−2		5	−3.40−2	−4.08−3	1.55−3	1.23−2	−1.38−2
	10	−1.45−1	−2.41−2	1.40−2	5.14−2	−6.54−2		10	−1.40−1	−2.29−2	1.35−2	4.97−2	−6.32−2
$3p_{3/2}$	1	−8.20−3	−4.28−3	1.89−3	1.94−3	−3.83−3	$3p_{3/2}$	1	−9.22−3	−4.63−3	2.02−3	2.24−3	−4.26−3
	3	−3.63−3	−2.69−3	2.23−3	8.22−4	−3.05−3		3	−3.09−3	−2.71−3	2.11−3	5.74−4	−2.68−3
	5	−2.67−2	−7.40−3	7.78−3	9.28−3	−1.71−2		5	−2.47−2	−7.02−3	7.40−3	8.53−3	−1.59−2
	10	−1.27−1	−3.07−2	2.71−2	4.38−2	−7.10−2		10	−1.22−1	−2.97−2	2.66−2	4.24−2	−6.90−2
$3d_{3/2}$	1	−5.34−3	7.56−4	−1.11−3	2.21−3	−1.10−3	$3d_{3/2}$	1	−4.70−3	9.67−4	−1.17−3	2.03−3	−8.63−4
	3	−6.15−2	−8.55−3	6.15−4	2.13−2	−2.19−2		3	−5.97−2	−8.02−3	5.07−4	2.08−2	−2.13−2
	5	−1.35−1	−2.23−2	2.43−3	4.56−2	−4.80−2		5	−1.32−1	−2.16−2	2.51−3	4.48−2	−4.73−2
	10	−3.35−1	−6.19−2	−4.04−4	1.09−1	−1.09−1		10	−3.32−1	−6.08−2	5.24−4	1.08−1	−1.09−1
$3d_{5/2}$	1	−1.71−3	3.49−4	3.66−4	8.99−4	−1.26−3	$3d_{5/2}$	1	−9.70−4	5.54−4	3.51−4	6.80−4	−1.03−3
	3	−5.31−2	−9.88−3	4.08−3	1.81−2	−2.22−2		3	−5.12−2	−9.35−3	4.01−3	1.76−2	−2.16−2
	5	−1.22−1	−2.48−2	7.67−3	4.04−2	−4.81−2		5	−1.19−1	−2.41−2	7.76−3	3.97−2	−4.75−2
	10	−3.14−1	−6.79−2	8.91−3	1.00−1	−1.09−1		10	−3.10−1	−6.68−2	9.75−3	9.92−2	−1.09−1
$4s_{1/2}$	1	−7.42−3	4.89−5	2.41−3	3.47−3	−5.88−3	$4s_{1/2}$	1	−6.94−3	4.10−4	2.37−3	3.42−3	−5.78−3
	3	−2.16−2	−8.69−3	4.21−3	5.99−3	−1.02−2		3	−2.29−2	−8.98−3	4.53−3	6.46−3	−1.10−2
	5	−1.46−2	−8.79−3	1.90−3	2.69−3	−4.59−3		5	−1.61−2	−9.32−3	2.24−3	3.17−3	−5.41−3
	10	−1.77−2	−1.01−2	2.85−3	3.61−3	−6.46−3		10	−1.65−2	−1.01−2	2.45−3	3.06−3	−5.51−3

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4p_{1/2}$	1	−9.13−3	−2.69−3	9.24−4	2.76−3	−3.68−3	$4p_{1/2}$	1	−9.68−3	−2.76−3	1.00−3	2.97−3	−3.97−3
	3	−8.62−3	−1.79−3	−8.15−4	2.57−3	−1.76−3		3	−8.30−3	−1.88−3	−8.93−4	2.39−3	−1.50−3
	5	−3.16−2	−4.62−3	1.89−3	1.12−2	−1.30−2		5	−2.93−2	−4.27−3	1.52−3	1.03−2	−1.18−2
	10	−1.36−1	−2.30−2	1.37−2	4.79−2	−6.16−2		10	−1.31−1	−2.19−2	1.32−2	4.62−2	−5.94−2
$4p_{3/2}$	1	−6.67−3	−3.08−3	1.67−3	1.77−3	−3.45−3	$4p_{3/2}$	1	−7.18−3	−3.17−3	1.75−3	1.95−3	−3.71−3
	3	−3.17−3	−3.04−3	1.93−3	4.41−4	−2.37−3		3	−2.84−3	−3.11−3	1.83−3	2.58−4	−2.09−3
	5	−2.33−2	−7.29−3	7.13−3	7.85−3	−1.50−2		5	−2.13−2	−6.94−3	6.70−3	7.09−3	−1.38−2
	10	−1.19−1	−2.94−2	2.61−2	4.09−2	−6.70−2		10	−1.14−1	−2.83−2	2.55−2	3.94−2	−6.49−2
$4d_{3/2}$	1	−2.88−3	−3.25−4	−3.81−4	9.46−4	−5.64−4	$4d_{3/2}$	1	−2.43−3	−2.77−4	−3.78−4	7.85−4	−4.07−4
	3	−5.04−2	−7.55−3	1.10−3	1.74−2	−1.85−2		3	−4.78−2	−6.99−3	9.98−4	1.65−2	−1.75−2
	5	−1.22−1	−2.07−2	3.18−3	4.11−2	−4.42−2		5	−1.18−1	−1.98−2	3.29−3	3.99−2	−4.32−2
	10	−3.20−1	−5.91−2	6.82−4	1.04−1	−1.05−1		10	−3.14−1	−5.77−2	1.60−3	1.03−1	−1.04−1
$4d_{5/2}$	1	−3.24−4	−6.45−4	6.57−4	3.31−6	−6.60−4	$4d_{5/2}$	1	1.30−4	−5.89−4	6.54−4	−1.57−4	−4.98−4
	3	−4.28−2	−8.75−3	4.27−3	1.45−2	−1.88−2		3	−4.03−2	−8.17−3	4.17−3	1.37−2	−1.79−2
	5	−1.09−1	−2.30−2	8.19−3	3.62−2	−4.44−2		5	−1.06−1	−2.21−2	8.28−3	3.52−2	−4.35−2
	10	−2.98−1	−6.49−2	9.84−3	9.53−2	−1.05−1		10	−2.93−1	−6.36−2	1.06−2	9.39−2	−1.05−1
$5s_{1/2}$	1	−6.63−3	2.51−4	2.22−3	3.19−3	−5.41−3	$5s_{1/2}$	1	−6.42−3	3.77−4	2.19−3	3.16−3	−5.34−3
	3	−2.11−2	−8.41−3	4.14−3	5.89−3	−1.00−2		3	−2.28−2	−9.04−3	4.51−3	6.43−3	−1.09−2
	5	−1.46−2	−8.82−3	1.92−3	2.71−3	−4.63−3		5	−1.63−2	−9.41−3	2.26−3	3.21−3	−5.47−3
	10	−1.76−2	−1.01−2	2.80−3	3.55−3	−6.35−3		10	−1.65−2	−1.02−2	2.40−3	3.00−3	−5.40−3
$Z = 49$, In: $5s^2_{1/2}4d^4_{3/2}4d^6_{5/2}5p^1_{1/2}$							$Z = 50$, Sn: $5s^2_{1/2}4d^4_{3/2}4d^6_{5/2}5p^2_{1/2}$						
$3s_{1/2}$	1	−1.27−2	1.18−4	4.15−3	5.96−3	−1.01−2	$3s_{1/2}$	1	−1.25−2	5.34−4	4.21−3	6.06−3	−1.03−2
	3	−2.82−2	−1.06−2	5.75−3	8.19−3	−1.39−2		3	−3.00−2	−1.10−2	6.20−3	8.83−3	−1.50−2
	5	−1.88−2	−1.02−2	2.83−3	4.00−3	−6.83−3		5	−2.09−2	−1.09−2	3.27−3	4.63−3	−7.90−3
	10	−1.60−2	−9.96−3	2.34−3	2.87−3	−5.20−3		10	−1.53−2	−1.01−2	2.05−3	2.48−3	−4.53−3
$3p_{1/2}$	1	−1.50−2	−4.60−3	7.31−4	4.32−3	−5.06−3	$3p_{1/2}$	1	−1.64−2	−4.95−3	8.16−4	4.73−3	−5.54−3
	3	−9.57−3	−1.33−3	−1.36−3	3.02−3	−1.67−3		3	−9.38−3	−1.43−3	−1.46−3	2.89−3	−1.42−3
	5	−3.19−2	−3.72−3	1.18−3	1.15−2	−1.27−2		5	−3.00−2	−3.39−3	8.25−4	1.08−2	−1.16−2
	10	−1.36−1	−2.18−2	1.30−2	4.81−2	−6.11−2		10	−1.31−1	−2.08−2	1.25−2	4.65−2	−5.90−2
$3p_{3/2}$	1	−1.03−2	−4.99−3	2.15−3	2.54−3	−4.69−3	$3p_{3/2}$	1	−1.13−2	−5.36−3	2.29−3	2.85−3	−5.13−3
	3	−2.67−3	−2.77−3	2.00−3	3.63−4	−2.37−3		3	−2.36−3	−2.85−3	1.92−3	1.85−4	−2.10−3
	5	−2.27−2	−6.67−3	7.03−3	7.82−3	−1.49−2		5	−2.09−2	−6.36−3	6.67−3	7.14−3	−1.38−2
	10	−1.18−1	−2.86−2	2.61−2	4.10−2	−6.71−2		10	−1.14−1	−2.77−2	2.55−2	3.96−2	−6.51−2
$3d_{3/2}$	1	−3.98−3	1.22−3	−1.22−3	1.84−3	−6.13−4	$3d_{3/2}$	1	−3.38−3	1.43−3	−1.28−3	1.67−3	−3.91−4
	3	−5.80−2	−7.50−3	3.90−4	2.03−2	−2.07−2		3	−5.63−2	−6.96−3	2.70−4	1.98−2	−2.01−2
	5	−1.30−1	−2.09−2	2.56−3	4.41−2	−4.67−2		5	−1.28−1	−2.02−2	2.59−3	4.35−2	−4.61−2
	10	−3.28−1	−5.97−2	1.38−3	1.07−1	−1.09−1		10	−3.24−1	−5.86−2	2.17−3	1.06−1	−1.09−1
$3d_{5/2}$	1	−1.38−4	7.98−4	3.46−4	4.44−4	−7.89−4	$3d_{5/2}$	1	5.88−4	1.00−3	3.41−4	2.34−4	−5.75−4
	3	−4.95−2	−8.84−3	3.94−3	1.71−2	−2.10−2		3	−4.77−2	−8.29−3	3.88−3	1.65−2	−2.04−2
	5	−1.17−1	−2.34−2	7.84−3	3.90−2	−4.69−2		5	−1.15−1	−2.27−2	7.90−3	3.83−2	−4.63−2
	10	−3.06−1	−6.57−2	1.05−2	9.83−2	−1.09−1		10	−3.02−1	−6.46−2	1.12−2	9.74−2	−1.09−1
$4s_{1/2}$	1	−6.50−3	7.63−4	2.33−3	3.37−3	−5.70−3	$4s_{1/2}$	1	−6.04−3	1.13−3	2.29−3	3.32−3	−5.62−3
	3	−2.42−2	−9.26−3	4.86−3	6.93−3	−1.18−2		3	−2.54−2	−9.51−3	5.18−3	7.39−3	−1.26−2
	5	−1.78−2	−9.87−3	2.60−3	3.69−3	−6.29−3		5	−1.95−2	−1.04−2	2.98−3	4.24−3	−7.22−3
	10	−1.57−2	−1.02−2	2.12−3	2.60−3	−4.72−3		10	−1.51−2	−1.04−2	1.85−3	2.24−3	−4.09−3
$4p_{1/2}$	1	−1.02−2	−2.82−3	1.08−3	3.17−3	−4.25−3	$4p_{1/2}$	1	−1.07−2	−2.85−3	1.15−3	3.36−3	−4.50−3
	3	−8.12−3	−2.00−3	−9.49−4	2.26−3	−1.31−3		3	−8.05−3	−2.16−3	−9.83−4	2.16−3	−1.18−3
	5	−2.73−2	−3.95−3	1.17−3	9.56−3	−1.07−2		5	−2.54−2	−3.68−3	8.26−4	8.84−3	−9.66−3
	10	−1.26−1	−2.09−2	1.27−2	4.44−2	−5.71−2		10	−1.21−1	−1.99−2	1.22−2	4.27−2	−5.49−2
$4p_{3/2}$	1	−7.67−3	−3.26−3	1.82−3	2.13−3	−3.95−3	$4p_{3/2}$	1	−8.12−3	−3.33−3	1.89−3	2.29−3	−4.18−3
	3	−2.64−3	−3.22−3	1.75−3	1.18−4	−1.87−3		3	−2.54−3	−3.36−3	1.70−3	1.27−5	−1.71−3
	5	−1.94−2	−6.62−3	6.30−3	6.38−3	−1.27−2		5	−1.76−2	−6.35−3	5.92−3	5.70−3	−1.16−2
	10	−1.10−1	−2.74−2	2.50−2	3.79−2	−6.28−2		10	−1.05−1	−2.65−2	2.44−2	3.64−2	−6.08−2
$4d_{3/2}$	1	−2.07−3	−2.59−4	−3.62−4	6.53−4	−2.92−4	$4d_{3/2}$	1	−1.78−3	−2.55−4	−3.47−4	5.42−4	−1.95−4
	3	−4.56−2	−6.53−3	9.08−4	1.58−2	−1.67−2		3	−4.34−2	−6.07−3	8.18−4	1.51−2	−1.59−2
	5	−1.15−1	−1.90−2	3.34−3	3.89−2	−4.22−2		5	−1.11−1	−1.82−2	3.39−3	3.78−2	−4.12−2
	10	−3.09−1	−5.65−2	2.45−3	1.01−1	−1.04−1		10	−3.04−1	−5.52−2	3.25−3	1.00−1	−1.03−1

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4d_{5/2}$	1	5.02−4	−5.68−4	6.71−4	−2.94−4	−3.77−4	$4d_{5/2}$	1	8.14−4	−5.61−4	6.87−4	−4.13−4	−2.74−4
	3	−3.82−2	−7.71−3	4.09−3	1.30−2	−1.71−2		3	−3.60−2	−7.24−3	4.01−3	1.23−2	−1.63−2
	5	−1.03−1	−2.13−2	8.33−3	3.42−2	−4.25−2		5	−9.92−2	−2.04−2	8.38−3	3.32−2	−4.15−2
	10	−2.88−1	−6.22−2	1.14−2	9.26−2	−1.04−1		10	−2.83−1	−6.10−2	1.21−2	9.12−2	−1.03−1
$5s_{1/2}$	1	−5.36−3	1.03−3	2.05−3	2.97−3	−5.02−3	$5s_{1/2}$	1	−5.03−3	1.25−3	2.01−3	2.91−3	−4.92−3
	3	−2.39−2	−9.20−3	4.80−3	6.85−3	−1.16−2		3	−2.51−2	−9.46−3	5.09−3	7.26−3	−1.23−2
	5	−1.79−2	−9.93−3	2.60−3	3.70−3	−6.31−3		5	−1.95−2	−1.04−2	2.97−3	4.23−3	−7.20−3
	10	−1.56−2	−1.03−2	2.07−3	2.55−3	−4.62−3		10	−1.51−2	−1.05−2	1.81−3	2.19−3	−3.99−3
$5p_{1/2}$	1	−9.47−3	−2.41−3	1.10−3	3.04−3	−4.15−3	$5p_{1/2}$	1	−1.01−2	−2.54−3	1.20−3	3.24−3	−4.44−3
	3	−8.07−3	−2.17−3	−8.87−4	2.18−3	−1.29−3		3	−8.13−3	−2.42−3	−8.77−4	2.11−3	−1.23−3
	5	−2.68−2	−4.06−3	1.15−3	9.31−3	−1.05−2		5	−2.48−2	−3.75−3	7.94−4	8.56−3	−9.36−3
	10	−1.24−1	−2.07−2	1.26−2	4.39−2	−5.66−2		10	−1.19−1	−1.98−2	1.21−2	4.22−2	−5.43−2
$Z = 51$, Sb: $5s^2_{1/2}4d^4_{3/2}4d^6_{5/2}5p^2_{1/2}5p^1_{3/2}$							$Z = 52$, Te: $5s^2_{1/2}4d^4_{3/2}4d^6_{5/2}5p^2_{1/2}5p^2_{3/2}$						
$3s_{1/2}$	1	−1.23−2	9.69−4	4.27−3	6.17−3	−1.04−2	$3s_{1/2}$	1	−1.21−2	1.42−3	4.34−3	6.28−3	−1.06−2
	3	−3.18−2	−1.14−2	6.65−3	9.47−3	−1.61−2		3	−3.35−2	−1.17−2	7.09−3	1.01−2	−1.72−2
	5	−2.30−2	−1.16−2	3.74−3	5.31−3	−9.04−3		5	−2.53−2	−1.23−2	4.24−3	6.03−3	−1.03−2
	10	−1.49−2	−1.04−2	1.84−3	2.18−3	−4.02−3		10	−1.48−2	−1.07−2	1.68−3	1.98−3	−3.66−3
$3p_{1/2}$	1	−1.77−2	−5.31−3	8.97−4	5.14−3	−6.04−3	$3p_{1/2}$	1	−1.91−2	−5.67−3	9.73−4	5.57−3	−6.54−3
	3	−9.31−3	−1.55−3	−1.55−3	2.79−3	−1.24−3		3	−9.38−3	−1.72−3	−1.63−3	2.74−3	−1.11−3
	5	−2.82−2	−3.09−3	4.75−4	1.01−2	−1.06−2		5	−2.66−2	−2.85−3	1.30−4	9.53−3	−9.66−3
	10	−1.26−1	−1.97−2	1.19−2	4.49−2	−5.68−2		10	−1.21−1	−1.87−2	1.14−2	4.33−2	−5.47−2
$3p_{3/2}$	1	−1.24−2	−5.73−3	2.42−3	3.16−3	−5.58−3	$3p_{3/2}$	1	−1.35−2	−6.11−3	2.55−3	3.48−3	−6.03−3
	3	−2.14−3	−2.97−3	1.86−3	3.86−5	−1.90−3		3	−2.03−3	−3.13−3	1.82−3	−7.50−5	−1.74−3
	5	−1.91−2	−6.07−3	6.32−3	6.49−3	−1.28−2		5	−1.76−2	−5.85−3	5.97−3	5.89−3	−1.19−2
	10	−1.10−1	−2.67−2	2.50−2	3.82−2	−6.32−2		10	−1.06−1	−2.58−2	2.44−2	3.69−2	−6.13−2
$3d_{3/2}$	1	−2.72−3	1.67−3	−1.33−3	1.49−3	−1.58−4	$3d_{3/2}$	1	−2.05−3	1.92−3	−1.38−3	1.31−3	7.19−5
	3	−5.45−2	−6.40−3	1.32−4	1.93−2	−1.94−2		3	−5.28−2	−5.82−3	−8.12−6	1.88−2	−1.88−2
	5	−1.25−1	−1.95−2	2.60−3	4.28−2	−4.54−2		5	−1.23−1	−1.88−2	2.62−3	4.21−2	−4.47−2
	10	−3.20−1	−5.75−2	2.89−3	1.05−1	−1.08−1		10	−3.16−1	−5.64−2	3.55−3	1.05−1	−1.08−1
$3d_{5/2}$	1	1.38−3	1.23−3	3.43−4	8.21−6	−3.51−4	$3d_{5/2}$	1	2.19−3	1.47−3	3.49−4	−2.20−4	−1.29−4
	3	−4.60−2	−7.75−3	3.80−3	1.60−2	−1.98−2		3	−4.41−2	−7.16−3	3.72−3	1.55−2	−1.92−2
	5	−1.12−1	−2.20−2	7.95−3	3.77−2	−4.56−2		5	−1.10−1	−2.12−2	8.01−3	3.70−2	−4.50−2
	10	−2.99−1	−6.34−2	1.19−2	9.65−2	−1.08−1		10	−2.95−1	−6.23−2	1.25−2	9.55−2	−1.08−1
$4s_{1/2}$	1	−5.58−3	1.49−3	2.26−3	3.28−3	−5.54−3	$4s_{1/2}$	1	−5.12−3	1.87−3	2.22−3	3.24−3	−5.46−3
	3	−2.66−2	−9.73−3	5.49−3	7.84−3	−1.33−2		3	−2.77−2	−9.92−3	5.80−3	8.28−3	−1.41−2
	5	−2.13−2	−1.10−2	3.38−3	4.82−3	−8.20−3		5	−2.32−2	−1.16−2	3.81−3	5.43−3	−9.24−3
	10	−1.48−2	−1.07−2	1.64−3	1.96−3	−3.60−3		10	−1.47−2	−1.10−2	1.50−3	1.77−3	−3.27−3
$4p_{1/2}$	1	−1.11−2	−2.86−3	1.20−3	3.54−3	−4.74−3	$4p_{1/2}$	1	−1.15−2	−2.86−3	1.26−3	3.71−3	−4.97−3
	3	−8.10−3	−2.34−3	−9.97−4	2.11−3	−1.11−3		3	−8.27−3	−2.54−3	−9.94−4	2.09−3	−1.10−3
	5	−2.36−2	−3.45−3	5.04−4	8.15−3	−8.66−3		5	−2.20−2	−3.29−3	1.99−4	7.53−3	−7.73−3
	10	−1.16−1	−1.89−2	1.16−2	4.10−2	−5.26−2		10	−1.11−1	−1.80−2	1.11−2	3.93−2	−5.04−2
$4p_{3/2}$	1	−8.53−3	−3.38−3	1.95−3	2.45−3	−4.39−3	$4p_{3/2}$	1	−8.93−3	−3.43−3	2.00−3	2.60−3	−4.60−3
	3	−2.55−3	−3.53−3	1.67−3	−5.61−5	−1.61−3		3	−2.66−3	−3.72−3	1.66−3	−9.26−5	−1.56−3
	5	−1.60−2	−6.11−3	5.55−3	5.07−3	−1.06−2		5	−1.46−2	−5.95−3	5.20−3	4.50−3	−9.70−3
	10	−1.01−1	−2.56−2	2.38−2	3.50−2	−5.87−2		10	−9.70−2	−2.47−2	2.32−2	3.35−2	−5.67−2
$4d_{3/2}$	1	−1.55−3	−2.68−4	−3.25−4	4.48−4	−1.22−4	$4d_{3/2}$	1	−1.39−3	−3.04−4	−2.98−4	3.74−4	−7.64−5
	3	−4.13−2	−5.63−3	7.19−4	1.44−2	−1.51−2		3	−3.92−2	−5.18−3	6.21−4	1.37−2	−1.43−2
	5	−1.08−1	−1.74−2	3.40−3	3.68−2	−4.02−2		5	−1.04−1	−1.66−2	3.40−3	3.57−2	−3.91−2
	10	−2.98−1	−5.40−2	4.01−3	9.86−2	−1.03−1		10	−2.93−1	−5.29−2	4.74−3	9.72−2	−1.02−1
$4d_{5/2}$	1	1.08−3	−5.71−4	7.10−4	−5.17−4	−1.93−4	$4d_{5/2}$	1	1.27−3	−6.03−4	7.40−4	−6.02−4	−1.38−4
	3	−3.39−2	−6.78−3	3.94−3	1.16−2	−1.56−2		3	−3.18−2	−6.32−3	3.86−3	1.10−2	−1.48−2
	5	−9.58−2	−1.96−2	8.40−3	3.22−2	−4.06−2		5	−9.24−2	−1.88−2	8.41−3	3.11−2	−3.96−2
	10	−2.78−1	−5.97−2	1.28−2	8.99−2	−1.03−1		10	−2.73−1	−5.85−2	1.34−2	8.86−2	−1.02−1
$5s_{1/2}$	1	−4.61−3	1.53−3	1.95−3	2.85−3	−4.80−3	$5s_{1/2}$	1	−4.11−3	1.86−3	1.89−3	2.77−3	−4.66−3
	3	−2.61−2	−9.61−3	5.37−3	7.66−3	−1.30−2		3	−2.71−2	−9.77−3	5.65−3	8.07−3	−1.37−2
	5	−2.12−2	−1.10−2	3.35−3	4.78−3	−8.13−3		5	−2.30−2	−1.15−2	3.76−3	5.36−3	−9.12−3
	10	−1.48−2	−1.08−2	1.60−3	1.92−3	−3.52−3		10	−1.47−2	−1.11−2	1.46−3	1.73−3	−3.19−3

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$5p_{1/2}$	1	−1.04−2	−2.54−3	1.26−3	3.38−3	−4.64−3	$5p_{1/2}$	1	−1.05−2	−2.44−3	1.30−3	3.49−3	−4.79−3
	3	−8.11−3	−2.55−3	−8.96−4	2.04−3	−1.15−3		3	−8.32−3	−2.78−3	−8.72−4	2.04−3	−1.17−3
	5	−2.30−2	−3.54−3	4.96−4	7.87−3	−8.36−3		5	−2.13−2	−3.36−3	1.96−4	7.22−3	−7.42−3
	10	−1.14−1	−1.88−2	1.16−2	4.05−2	−5.20−2		10	−1.09−1	−1.79−2	1.10−2	3.87−2	−4.98−2
$5p_{3/2}$	1	−8.19−3	−3.10−3	1.92−3	2.42−3	−4.33−3	$5p_{3/2}$	1	−8.39−3	−3.05−3	1.94−3	2.52−3	−4.46−3
	3	−2.78−3	−3.72−3	1.67−3	−4.46−5	−1.63−3		3	−2.95−3	−3.94−3	1.67−3	−6.18−5	−1.61−3
	5	−1.56−2	−6.16−3	5.45−3	4.86−3	−1.03−2		5	−1.41−2	−5.96−3	5.08−3	4.26−3	−9.34−3
	10	−9.99−2	−2.55−2	2.36−2	3.45−2	−5.82−2		10	−9.57−2	−2.46−2	2.30−2	3.30−2	−5.60−2
$Z = 53$, I: $5s^2_{1/2}4d^4_{3/2}4d^6_{5/2}5p^2_{1/2}5p^3_{3/2}$							$Z = 54$, Xe: $5s^2_{1/2}4d^4_{3/2}4d^6_{5/2}5p^2_{1/2}5p^4_{3/2}$						
$3s_{1/2}$	1	−1.19−2	1.90−3	4.41−3	6.39−3	−1.08−2	$3s_{1/2}$	1	−1.16−2	2.41−3	4.49−3	6.52−3	−1.10−2
	3	−3.52−2	−1.21−2	7.54−3	1.08−2	−1.83−2		3	−3.69−2	−1.24−2	8.00−3	1.14−2	−1.94−2
	5	−2.76−2	−1.30−2	4.76−3	6.77−3	−1.15−2		5	−3.00−2	−1.38−2	5.31−3	7.56−3	−1.29−2
	10	−1.49−2	−1.11−2	1.59−3	1.86−3	−3.45−3		10	−1.53−2	−1.15−2	1.57−3	1.83−3	−3.40−3
$3p_{1/2}$	1	−2.05−2	−6.03−3	1.04−3	6.01−3	−7.05−3	$3p_{1/2}$	1	−2.20−2	−6.40−3	1.11−3	6.46−3	−7.57−3
	3	−9.57−3	−1.92−3	−1.69−3	2.72−3	−1.04−3		3	−9.90−3	−2.16−3	−1.73−3	2.75−3	−1.02−3
	5	−2.50−2	−2.61−3	−1.98−4	8.93−3	−8.73−3		5	−2.36−2	−2.41−3	−5.14−4	8.37−3	−7.86−3
	10	−1.17−1	−1.77−2	1.08−2	4.17−2	−5.26−2		10	−1.12−1	−1.67−2	1.02−2	4.02−2	−5.04−2
$3p_{3/2}$	1	−1.47−2	−6.49−3	2.67−3	3.81−3	−6.48−3	$3p_{3/2}$	1	−1.58−2	−6.88−3	2.79−3	4.14−3	−6.94−3
	3	−2.03−3	−3.31−3	1.79−3	−1.55−4	−1.64−3		3	−2.13−3	−3.53−3	1.79−3	−2.03−4	−1.59−3
	5	−1.61−2	−5.63−3	5.65−3	5.30−3	−1.09−2		5	−1.46−2	−5.43−3	5.34−3	4.74−3	−1.01−2
	10	−1.02−1	−2.49−2	2.38−2	3.55−2	−5.93−2		10	−9.79−2	−2.40−2	2.32−2	3.42−2	−5.74−2
$3d_{3/2}$	1	−1.38−3	2.16−3	−1.43−3	1.13−3	2.99−4	$3d_{3/2}$	1	−7.13−4	2.41−3	−1.48−3	9.55−4	5.23−4
	3	−5.11−2	−5.25−3	−1.69−4	1.83−2	−1.81−2		3	−4.93−2	−4.68−3	−3.39−4	1.78−2	−1.75−2
	5	−1.20−1	−1.80−2	2.59−3	4.14−2	−4.40−2		5	−1.18−1	−1.73−2	2.53−3	4.08−2	−4.33−2
	10	−3.12−1	−5.53−2	4.16−3	1.04−1	−1.08−1		10	−3.08−1	−5.42−2	4.73−3	1.03−1	−1.07−1
$3d_{5/2}$	1	3.01−3	1.70−3	3.59−4	−4.50−4	9.06−5	$3d_{5/2}$	1	3.84−3	1.95−3	3.75−4	−6.82−4	3.07−4
	3	−4.23−2	−6.60−3	3.63−3	1.50−2	−1.86−2		3	−4.05−2	−6.03−3	3.54−3	1.45−2	−1.80−2
	5	−1.07−1	−2.05−2	8.03−3	3.64−2	−4.44−2		5	−1.05−1	−1.98−2	8.03−3	3.57−2	−4.37−2
	10	−2.91−1	−6.12−2	1.31−2	9.45−2	−1.08−1		10	−2.87−1	−6.01−2	1.36−2	9.36−2	−1.07−1
$4s_{1/2}$	1	−4.67−3	2.25−3	2.19−3	3.21−3	−5.40−3	$4s_{1/2}$	1	−4.22−3	2.64−3	2.16−3	3.18−3	−5.34−3
	3	−2.88−2	−1.01−2	6.11−3	8.73−3	−1.48−2		3	−2.99−2	−1.02−2	6.41−3	9.16−3	−1.56−2
	5	−2.51−2	−1.21−2	4.24−3	6.05−3	−1.03−2		5	−2.71−2	−1.27−2	4.69−3	6.70−3	−1.14−2
	10	−1.49−2	−1.14−2	1.41−3	1.66−3	−3.08−3		10	−1.53−2	−1.19−2	1.39−3	1.64−3	−3.03−3
$4p_{1/2}$	1	−1.19−2	−2.83−3	1.30−3	3.88−3	−5.18−3	$4p_{1/2}$	1	−1.23−2	−2.80−3	1.34−3	4.05−3	−5.40−3
	3	−8.55−3	−2.78−3	−9.73−4	2.11−3	−1.14−3		3	−8.94−3	−3.03−3	−9.36−4	2.18−3	−1.24−3
	5	−2.06−2	−3.16−3	−7.84−5	6.95−3	−6.87−3		5	−1.93−2	−3.06−3	−3.33−4	6.42−3	−6.09−3
	10	−1.06−1	−1.70−2	1.05−2	3.77−2	−4.82−2		10	−1.01−1	−1.61−2	9.95−3	3.61−2	−4.60−2
$4p_{3/2}$	1	−9.32−3	−3.47−3	2.05−3	2.75−3	−4.80−3	$4p_{3/2}$	1	−9.69−3	−3.50−3	2.10−3	2.90−3	−5.00−3
	3	−2.87−3	−3.94−3	1.66−3	−9.49−5	−1.57−3		3	−3.18−3	−4.19−3	1.69−3	−6.58−5	−1.62−3
	5	−1.32−2	−5.81−3	4.88−3	3.95−3	−8.83−3		5	−1.20−2	−5.71−3	4.59−3	3.45−3	−8.04−3
	10	−9.29−2	−2.39−2	2.25−2	3.21−2	−5.46−2		10	−8.89−2	−2.30−2	2.19−2	3.07−2	−5.26−2
$4d_{3/2}$	1	−1.29−3	−3.60−4	−2.64−4	3.20−4	−5.67−5	$4d_{3/2}$	1	−1.27−3	−4.38−4	−2.25−4	2.87−4	−6.18−5
	3	−3.72−2	−4.77−3	5.11−4	1.31−2	−1.36−2		3	−3.52−2	−4.37−3	3.96−4	1.24−2	−1.28−2
	5	−1.01−1	−1.58−2	3.36−3	3.47−2	−3.80−2		5	−9.75−2	−1.50−2	3.30−3	3.36−2	−3.69−2
	10	−2.89−1	−5.17−2	5.42−3	9.58−2	−1.01−1		10	−2.84−1	−5.06−2	6.07−3	9.44−2	−1.01−1
$4d_{5/2}$	1	1.40−3	−6.56−4	7.76−4	−6.68−4	−1.08−4	$4d_{5/2}$	1	1.47−3	−7.30−4	8.18−4	−7.16−4	−1.02−4
	3	−2.98−2	−5.90−3	3.77−3	1.03−2	−1.41−2		3	−2.79−2	−5.48−3	3.68−3	9.68−3	−1.34−2
	5	−8.91−2	−1.80−2	8.39−3	3.01−2	−3.85−2		5	−8.58−2	−1.72−2	8.35−3	2.91−2	−3.75−2
	10	−2.68−1	−5.74−2	1.41−2	8.73−2	−1.01−1		10	−2.64−1	−5.62−2	1.46−2	8.60−2	−1.01−1
$5s_{1/2}$	1	−3.55−3	2.22−3	1.82−3	2.67−3	−4.49−3	$5s_{1/2}$	1	−3.05−3	2.55−3	1.76−3	2.59−3	−4.35−3
	3	−2.81−2	−9.88−3	5.92−3	8.46−3	−1.44−2		3	−2.88−2	−9.86−3	6.15−3	8.80−3	−1.50−2
	5	−2.49−2	−1.21−2	4.18−3	5.97−3	−1.02−2		5	−2.67−2	−1.26−2	4.61−3	6.58−3	−1.12−2
	10	−1.49−2	−1.15−2	1.38−3	1.63−3	−3.01−3		10	−1.53−2	−1.19−2	1.35−3	1.61−3	−2.96−3
$5p_{1/2}$	1	−1.06−2	−2.28−3	1.31−3	3.58−3	−4.89−3	$5p_{1/2}$	1	−1.07−2	−2.14−3	1.34−3	3.67−3	−5.01−3
	3	−8.63−3	−3.03−3	−8.37−4	2.07−3	−1.24−3		3	−8.88−3	−3.18−3	−8.21−4	2.12−3	−1.30−3
	5	−1.99−2	−3.28−3	−5.46−5	6.65−3	−6.59−3		5	−1.87−2	−3.22−3	−3.02−4	6.12−3	−5.82−3
	10	−1.04−1	−1.69−2	1.05−2	3.70−2	−4.75−2		10	−9.95−2	−1.60−2	9.89−3	3.54−2	−4.53−2

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$5p_{3/2}$	1	−8.47−3	−2.95−3	1.94−3	2.60−3	−4.54−3	$5p_{3/2}$	1	−8.59−3	−2.87−3	1.96−3	2.68−3	−4.64−3
	3	−3.22−3	−4.17−3	1.68−3	−4.31−5	−1.64−3		3	−3.39−3	−4.29−3	1.67−3	−2.56−5	−1.64−3
	5	−1.28−2	−5.88−3	4.77−3	3.73−3	−8.50−3		5	−1.17−2	−5.81−3	4.47−3	3.24−3	−7.71−3
	10	−9.15−2	−2.37−2	2.23−2	3.16−2	−5.39−2		10	−8.75−2	−2.29−2	2.17−2	3.02−2	−5.18−2
$Z = 55$, Cs: $6s^1_{1/2}$							$Z = 56$, Ba: $6s^2_{1/2}$						
$3s_{1/2}$	1	−1.15−2	2.84−3	4.56−3	6.64−3	−1.12−2	$3s_{1/2}$	1	−1.13−2	3.29−3	4.64−3	6.78−3	−1.14−2
	3	−3.85−2	−1.26−2	8.42−3	1.20−2	−2.05−2		3	−4.00−2	−1.28−2	8.85−3	1.27−2	−2.15−2
	5	−3.24−2	−1.45−2	5.86−3	8.36−3	−1.42−2		5	−3.48−2	−1.51−2	6.41−3	9.15−3	−1.56−2
	10	−1.60−2	−1.21−2	1.60−3	1.89−3	−3.49−3		10	−1.69−2	−1.26−2	1.69−3	2.03−3	−3.72−3
$3p_{1/2}$	1	−2.34−2	−6.74−3	1.16−3	6.88−3	−8.03−3	$3p_{1/2}$	1	−2.48−2	−7.10−3	1.20−3	7.32−3	−8.51−3
	3	−1.03−2	−2.42−3	−1.75−3	2.82−3	−1.07−3		3	−1.09−2	−2.71−3	−1.76−3	2.92−3	−1.16−3
	5	−2.23−2	−2.25−3	−8.14−4	7.86−3	−7.04−3		5	−2.11−2	−2.11−3	−1.09−3	7.38−3	−6.29−3
	10	−1.08−1	−1.58−2	9.65−3	3.87−2	−4.84−2		10	−1.03−1	−1.49−2	9.06−3	3.72−2	−4.63−2
$3p_{3/2}$	1	−1.69−2	−7.24−3	2.90−3	4.44−3	−7.34−3	$3p_{3/2}$	1	−1.80−2	−7.63−3	3.00−3	4.75−3	−7.76−3
	3	−2.34−3	−3.78−3	1.81−3	−2.14−4	−1.59−3		3	−2.64−3	−4.05−3	1.84−3	−1.98−4	−1.64−3
	5	−1.33−2	−5.27−3	5.05−3	4.22−3	−9.27−3		5	−1.20−2	−5.13−3	4.78−3	3.72−3	−8.51−3
	10	−9.41−2	−2.32−2	2.26−2	3.29−2	−5.55−2		10	−9.04−2	−2.24−2	2.20−2	3.16−2	−5.36−2
$3d_{3/2}$	1	−9.57−5	2.66−3	−1.52−3	7.97−4	7.24−4	$3d_{3/2}$	1	6.02−4	2.93−3	−1.56−3	6.20−4	9.38−4
	3	−4.76−2	−4.08−3	−5.07−4	1.73−2	−1.68−2		3	−4.59−2	−3.51−3	−6.86−4	1.68−2	−1.61−2
	5	−1.16−1	−1.66−2	2.44−3	4.01−2	−4.26−2		5	−1.13−1	−1.58−2	2.34−3	3.94−2	−4.18−2
	10	−3.04−1	−5.32−2	5.24−3	1.02−1	−1.07−1		10	−3.01−1	−5.21−2	5.72−3	1.01−1	−1.06−1
$3d_{5/2}$	1	4.60−3	2.18−3	3.92−4	−8.92−4	5.00−4	$3d_{5/2}$	1	5.46−3	2.44−3	4.16−4	−1.12−3	7.08−4
	3	−3.86−2	−5.43−3	3.45−3	1.40−2	−1.74−2		3	−3.69−2	−4.87−3	3.35−3	1.35−2	−1.68−2
	5	−1.03−1	−1.91−2	8.00−3	3.51−2	−4.31−2		5	−1.00−1	−1.83−2	7.97−3	3.44−2	−4.23−2
	10	−2.84−1	−5.91−2	1.41−2	9.26−2	−1.07−1		10	−2.80−1	−5.80−2	1.45−2	9.17−2	−1.06−1
$4s_{1/2}$	1	−3.82−3	2.98−3	2.13−3	3.15−3	−5.28−3	$4s_{1/2}$	1	−3.43−3	3.32−3	2.11−3	3.12−3	−5.23−3
	3	−3.08−2	−1.03−2	6.67−3	9.54−3	−1.62−2		3	−3.17−2	−1.03−2	6.93−3	9.92−3	−1.68−2
	5	−2.90−2	−1.32−2	5.14−3	7.34−3	−1.25−2		5	−3.09−2	−1.37−2	5.58−3	7.97−3	−1.35−2
	10	−1.59−2	−1.23−2	1.42−3	1.70−3	−3.12−3		10	−1.67−2	−1.29−2	1.51−3	1.84−3	−3.34−3
$4p_{1/2}$	1	−1.25−2	−2.74−3	1.37−3	4.18−3	−5.55−3	$4p_{1/2}$	1	−1.28−2	−2.68−3	1.39−3	4.32−3	−5.71−3
	3	−9.40−3	−3.29−3	−8.85−4	2.27−3	−1.38−3		3	−9.94−3	−3.56−3	−8.21−4	2.39−3	−1.57−3
	5	−1.82−2	−3.01−3	−5.64−4	5.95−3	−5.38−3		5	−1.72−2	−3.00−3	−7.64−4	5.52−3	−4.76−3
	10	−9.67−2	−1.52−2	9.37−3	3.45−2	−4.38−2		10	−9.22−2	−1.44−2	8.77−3	3.29−2	−4.17−2
$4p_{3/2}$	1	−9.97−3	−3.52−3	2.14−3	3.01−3	−5.15−3	$4p_{3/2}$	1	−1.02−2	−3.52−3	2.16−3	3.12−3	−5.28−3
	3	−3.55−3	−4.44−3	1.73−3	−7.15−6	−1.72−3		3	−3.99−3	−4.70−3	1.78−3	7.44−5	−1.86−3
	5	−1.10−2	−5.64−3	4.32−3	2.99−3	−7.31−3		5	−1.00−2	−5.61−3	4.08−3	2.58−3	−6.66−3
	10	−8.50−2	−2.22−2	2.12−2	2.94−2	−5.06−2		10	−8.12−2	−2.15−2	2.06−2	2.80−2	−4.86−2
$4d_{3/2}$	1	−1.30−3	−5.22−4	−1.89−4	2.75−4	−8.62−5	$4d_{3/2}$	1	−1.40−3	−6.25−4	−1.52−4	2.81−4	−1.29−4
	3	−3.32−2	−3.96−3	2.82−4	1.18−2	−1.21−2		3	−3.14−2	−3.59−3	1.60−4	1.12−2	−1.13−2
	5	−9.42−2	−1.43−2	3.21−3	3.26−2	−3.58−2		5	−9.09−2	−1.36−2	3.11−3	3.16−2	−3.47−2
	10	−2.79−1	−4.94−2	6.67−3	9.31−2	−9.97−2		10	−2.74−1	−4.83−2	7.23−3	9.17−2	−9.89−2
$4d_{5/2}$	1	1.47−3	−8.10−4	8.55−4	−7.40−4	−1.15−4	$4d_{5/2}$	1	1.41−3	−9.08−4	8.93−4	−7.47−4	−1.46−4
	3	−2.59−2	−5.06−3	3.59−3	9.06−3	−1.27−2		3	−2.41−2	−4.68−3	3.49−3	8.47−3	−1.20−2
	5	−8.27−2	−1.65−2	8.28−3	2.81−2	−3.64−2		5	−7.94−2	−1.57−2	8.21−3	2.71−2	−3.54−2
	10	−2.59−1	−5.50−2	1.52−2	8.47−2	−9.98−2		10	−2.54−1	−5.38−2	1.57−2	8.34−2	−9.90−2
$5s_{1/2}$	1	−2.71−3	2.76−3	1.71−3	2.53−3	−4.24−3	$5s_{1/2}$	1	−2.30−3	3.05−3	1.66−3	2.47−3	−4.14−3
	3	−2.95−2	−9.89−3	6.37−3	9.11−3	−1.55−2		3	−3.02−2	−9.88−3	6.58−3	9.42−3	−1.60−2
	5	−2.85−2	−1.31−2	5.01−3	7.16−3	−1.22−2		5	−3.03−2	−1.36−2	5.44−3	7.79−3	−1.32−2
	10	−1.59−2	−1.24−2	1.39−3	1.67−3	−3.06−3		10	−1.67−2	−1.29−2	1.47−3	1.81−3	−3.28−3
$5p_{1/2}$	1	−1.08−2	−2.09−3	1.37−3	3.74−3	−5.11−3	$5p_{1/2}$	1	−1.07−2	−1.93−3	1.37−3	3.79−3	−5.17−3
	3	−9.38−3	−3.47−3	−7.33−4	2.21−3	−1.48−3		3	−9.92−3	−3.74−3	−6.52−4	2.34−3	−1.69−3
	5	−1.76−2	−3.19−3	−5.11−4	5.65−3	−5.13−3		5	−1.66−2	−3.22−3	−6.95−4	5.23−3	−4.53−3
	10	−9.48−2	−1.52−2	9.30−3	3.37−2	−4.30−2		10	−9.03−2	−1.43−2	8.70−3	3.21−2	−4.08−2
$5p_{3/2}$	1	−8.78−3	−2.88−3	1.98−3	2.75−3	−4.73−3	$5p_{3/2}$	1	−8.81−3	−2.79−3	1.97−3	2.80−3	−4.77−3
	3	−3.86−3	−4.58−3	1.73−3	5.69−5	−1.78−3		3	−4.33−3	−4.84−3	1.78−3	1.54−4	−1.94−3
	5	−1.06−2	−5.74−3	4.21−3	2.79−3	−7.00−3		5	−9.77−3	−5.75−3	3.97−3	2.40−3	−6.37−3
	10	−8.35−2	−2.21−2	2.10−2	2.87−2	−4.97−2		10	−7.95−2	−2.13−2	2.03−2	2.74−2	−4.77−2

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$6s_{1/2}$	1	−2.51−3	2.86−3	1.67−3	2.48−3	−4.16−3	$6s_{1/2}$	1	−2.40−3	2.95−3	1.66−3	2.47−3	−4.14−3
	3	−2.95−2	−9.84−3	6.38−3	9.13−3	−1.55−2		3	−3.03−2	−9.91−3	6.61−3	9.46−3	−1.61−2
	5	−2.87−2	−1.32−2	5.06−3	7.23−3	−1.23−2		5	−3.05−2	−1.36−2	5.47−3	7.83−3	−1.33−2
	10	−1.59−2	−1.24−2	1.39−3	1.68−3	−3.06−3		10	−1.68−2	−1.30−2	1.48−3	1.82−3	−3.29−3
$Z = 57$, La: $5d^1_{3/2}6s^2_{1/2}$							$Z = 58$, Ce: $4f^2_{5/2}6s^2_{1/2}$						
$3s_{1/2}$	1	−1.11−2	3.78−3	4.71−3	6.89−3	−1.16−2	$3s_{1/2}$	1	−1.04−2	4.63−3	4.73−3	6.95−3	−1.17−2
	3	−4.15−2	−1.30−2	9.26−3	1.33−2	−2.25−2		3	−4.32−2	−1.31−2	9.75−3	1.40−2	−2.37−2
	5	−3.73−2	−1.58−2	7.00−3	9.99−3	−1.70−2		5	−4.01−2	−1.65−2	7.66−3	1.09−2	−1.86−2
	10	−1.80−2	−1.33−2	1.84−3	2.26−3	−4.10−3		10	−1.95−2	−1.40−2	2.06−3	2.59−3	−4.65−3
$3p_{1/2}$	1	−2.62−2	−7.44−3	1.23−3	7.75−3	−8.99−3	$3p_{1/2}$	1	−2.80−2	−7.81−3	1.27−3	8.34−3	−9.61−3
	3	−1.16−2	−3.04−3	−1.75−3	3.06−3	−1.31−3		3	−1.25−2	−3.47−3	−1.72−3	3.27−3	−1.55−3
	5	−2.01−2	−2.02−3	−1.36−3	6.94−3	−5.58−3		5	−1.91−2	−1.97−3	−1.64−3	6.51−3	−4.87−3
	10	−9.92−2	−1.40−2	8.45−3	3.58−2	−4.42−2		10	−9.49−2	−1.31−2	7.82−3	3.43−2	−4.21−2
$3p_{3/2}$	1	−1.91−2	−7.99−3	3.09−3	5.06−3	−8.15−3	$3p_{3/2}$	1	−2.05−2	−8.41−3	3.20−3	5.48−3	−8.68−3
	3	−3.04−3	−4.36−3	1.89−3	−1.49−4	−1.74−3		3	−3.61−3	−4.75−3	1.97−3	−6.18−5	−1.91−3
	5	−1.09−2	−5.03−3	4.52−3	3.26−3	−7.79−3		5	−9.81−3	−4.97−3	4.26−3	2.79−3	−7.04−3
	10	−8.67−2	−2.16−2	2.14−2	3.03−2	−5.17−2		10	−8.30−2	−2.08−2	2.07−2	2.90−2	−4.97−2
$3d_{3/2}$	1	1.25−3	3.18−3	−1.59−3	4.54−4	1.14−3	$3d_{3/2}$	1	1.96−3	3.41−3	−1.62−3	2.54−4	1.36−3
	3	−4.41−2	−2.92−3	−8.76−4	1.63−2	−1.54−2		3	−4.23−2	−2.30−3	−1.12−3	1.58−2	−1.47−2
	5	−1.11−1	−1.51−2	2.22−3	3.87−2	−4.09−2		5	−1.08−1	−1.42−2	2.05−3	3.80−2	−4.00−2
	10	−2.97−1	−5.10−2	6.17−3	9.95−2	−1.06−1		10	−2.93−1	−5.00−2	6.60−3	9.86−2	−1.05−1
$3d_{5/2}$	1	6.25−3	2.68−3	4.41−4	−1.34−3	9.00−4	$3d_{5/2}$	1	7.18−3	2.90−3	4.91−4	−1.62−3	1.12−3
	3	−3.50−2	−4.27−3	3.24−3	1.29−2	−1.62−2		3	−3.30−2	−3.66−3	3.09−3	1.24−2	−1.55−2
	5	−9.77−2	−1.75−2	7.91−3	3.36−2	−4.16−2		5	−9.50−2	−1.67−2	7.84−3	3.29−2	−4.08−2
	10	−2.76−1	−5.69−2	1.49−2	9.07−2	−1.06−1		10	−2.73−1	−5.59−2	1.54−2	8.98−2	−1.05−1
$4s_{1/2}$	1	−2.98−3	3.69−3	2.07−3	3.08−3	−5.16−3	$4s_{1/2}$	1	−2.17−3	4.33−3	2.00−3	3.00−3	−5.00−3
	3	−3.24−2	−1.03−2	7.17−3	1.03−2	−1.74−2		3	−3.33−2	−1.02−2	7.46−3	1.07−2	−1.82−2
	5	−3.28−2	−1.42−2	6.04−3	8.64−3	−1.47−2		5	−3.50−2	−1.48−2	6.57−3	9.41−3	−1.60−2
	10	−1.77−2	−1.34−2	1.65−3	2.06−3	−3.70−3		10	−1.91−2	−1.41−2	1.86−3	2.37−3	−4.23−3
$4p_{1/2}$	1	−1.30−2	−2.58−3	1.40−3	4.44−3	−5.85−3	$4p_{1/2}$	1	−1.31−2	−2.33−3	1.41−3	4.60−3	−6.01−3
	3	−1.06−2	−3.85−3	−7.39−4	2.54−3	−1.80−3		3	−1.14−2	−4.21−3	−6.29−4	2.76−3	−2.13−3
	5	−1.64−2	−3.04−3	−9.51−4	5.14−3	−4.19−3		5	−1.56−2	−3.11−3	−1.14−3	4.78−3	−3.64−3
	10	−8.78−2	−1.35−2	8.15−3	3.13−2	−3.95−2		10	−8.34−2	−1.27−2	7.51−3	2.98−2	−3.73−2
$4p_{3/2}$	1	−1.04−2	−3.49−3	2.17−3	3.21−3	−5.38−3	$4p_{3/2}$	1	−1.06−2	−3.35−3	2.18−3	3.33−3	−5.51−3
	3	−4.51−3	−4.97−3	1.85−3	1.85−4	−2.04−3		3	−5.19−3	−5.32−3	1.96−3	3.39−4	−2.30−3
	5	−9.21−3	−5.62−3	3.86−3	2.21−3	−6.06−3		5	−8.44−3	−5.67−3	3.64−3	1.83−3	−5.47−3
	10	−7.74−2	−2.07−2	1.99−2	2.67−2	−4.65−2		10	−7.36−2	−1.99−2	1.91−2	2.53−2	−4.44−2
$4d_{3/2}$	1	−1.55−3	−7.44−4	−1.09−4	3.02−4	−1.93−4	$4d_{3/2}$	1	−1.78−3	−9.10−4	−4.43−5	3.37−4	−2.93−4
	3	−2.96−2	−3.21−3	3.16−5	1.05−2	−1.06−2		3	−2.77−2	−2.85−3	−1.30−4	9.91−3	−9.78−3
	5	−8.77−2	−1.29−2	2.99−3	3.05−2	−3.35−2		5	−8.44−2	−1.21−2	2.84−3	2.95−2	−3.23−2
	10	−2.69−1	−4.71−2	7.73−3	9.02−2	−9.79−2		10	−2.64−1	−4.58−2	8.19−3	8.88−2	−9.70−2
$4d_{5/2}$	1	1.29−3	−1.02−3	9.35−4	−7.39−4	−1.96−4	$4d_{5/2}$	1	1.15−3	−1.19−3	1.01−3	−7.32−4	−2.76−4
	3	−2.23−2	−4.28−3	3.39−3	7.87−3	−1.13−2		3	−2.04−2	−3.90−3	3.26−3	7.23−3	−1.05−2
	5	−7.63−2	−1.50−2	8.13−3	2.62−2	−3.43−2		5	−7.30−2	−1.42−2	8.03−3	2.51−2	−3.32−2
	10	−2.49−1	−5.26−2	1.61−2	8.20−2	−9.81−2		10	−2.45−1	−5.13−2	1.66−2	8.07−2	−9.72−2
$5s_{1/2}$	1	−1.88−3	3.34−3	1.62−3	2.41−3	−4.03−3	$4f_{5/2}$	1	−1.61−2	−1.64−3	−1.22−3	5.55−3	−4.33−3
	3	−3.08−2	−9.84−3	6.79−3	9.73−3	−1.65−2		3	−1.03−1	−1.65−2	−3.92−3	3.37−2	−2.97−2
	5	−3.22−2	−1.41−2	5.89−3	8.43−3	−1.43−2		5	−2.11−1	−3.67−2	−9.18−3	6.78−2	−5.86−2
	10	−1.77−2	−1.35−2	1.62−3	2.03−3	−3.64−3		10	−4.84−1	−9.25−2	−3.33−2	1.50−1	−1.17−1
$5p_{1/2}$	1	−1.07−2	−1.76−3	1.37−3	3.85−3	−5.22−3	$5s_{1/2}$	1	−1.19−3	3.80−3	1.53−3	2.30−3	−3.83−3
	3	−1.06−2	−4.04−3	−5.50−4	2.50−3	−1.95−3		3	−3.14−2	−9.71−3	7.02−3	1.01−2	−1.71−2
	5	−1.59−2	−3.29−3	−8.67−4	4.86−3	−3.99−3		5	−3.42−2	−1.45−2	6.38−3	9.14−3	−1.55−2
	10	−8.58−2	−1.35−2	8.09−3	3.05−2	−3.86−2		10	−1.91−2	−1.41−2	1.82−3	2.34−3	−4.16−3
$5p_{3/2}$	1	−8.82−3	−2.69−3	1.96−3	2.84−3	−4.80−3	$5p_{1/2}$	1	−1.05−2	−1.44−3	1.35−3	3.90−3	−5.25−3
	3	−4.88−3	−5.12−3	1.86−3	2.79−4	−2.14−3		3	−1.14−2	−4.36−3	−4.26−4	2.72−3	−2.29−3
	5	−9.04−3	−5.80−3	3.75−3	2.04−3	−5.79−3		5	−1.52−2	−3.37−3	−1.04−3	4.51−3	−3.46−3
	10	−7.57−2	−2.05−2	1.96−2	2.60−2	−4.56−2		10	−8.13−2	−1.26−2	7.43−3	2.89−2	−3.64−2

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$5d_{3/2}$	1	−1.73−3	−9.98−4	6.58−5	3.08−4	−3.73−4	$5p_{3/2}$	1	−8.74−3	−2.48−3	1.93−3	2.89−3	−4.82−3
	3	−2.79−2	−3.27−3	1.09−4	9.89−3	−1.00−2		3	−5.57−3	−5.44−3	1.97−3	4.45−4	−2.41−3
	5	−8.51−2	−1.26−2	3.13−3	2.96−2	−3.27−2		5	−8.33−3	−5.86−3	3.53−3	1.69−3	−5.22−3
	10	−2.66−1	−4.66−2	7.98−3	8.92−2	−9.72−2		10	−7.18−2	−1.98−2	1.88−2	2.46−2	−4.34−2
$6s_{1/2}$	1	−1.83−3	3.31−3	1.59−3	2.37−3	−3.96−3	$6s_{1/2}$	1	−1.08−3	3.78−3	1.48−3	2.24−3	−3.72−3
	3	−3.09−2	−9.90−3	6.81−3	9.76−3	−1.66−2		3	−3.14−2	−9.75−3	7.02−3	1.01−2	−1.71−2
	5	−3.23−2	−1.41−2	5.92−3	8.47−3	−1.44−2		5	−3.43−2	−1.46−2	6.40−3	9.18−3	−1.56−2
	10	−1.78−2	−1.36−2	1.62−3	2.03−3	−3.65−3		10	−1.91−2	−1.42−2	1.83−3	2.35−3	−4.18−3
$Z = 59$, Pr: $4f^3_{5/2}6s^2_{1/2}$							$Z = 60$, Nd: $4f^4_{5/2}6s^2_{1/2}$						
$3s_{1/2}$	1	−9.83−3	5.35−3	4.77−3	7.02−3	−1.18−2	$3s_{1/2}$	1	−9.23−3	6.09−3	4.79−3	7.08−3	−1.19−2
	3	−4.46−2	−1.32−2	1.02−2	1.46−2	−2.48−2		3	−4.59−2	−1.32−2	1.06−2	1.52−2	−2.58−2
	5	−4.28−2	−1.72−2	8.31−3	1.19−2	−2.02−2		5	−4.54−2	−1.78−2	8.95−3	1.28−2	−2.17−2
	10	−2.11−2	−1.48−2	2.34−3	3.00−3	−5.34−3		10	−2.30−2	−1.56−2	2.68−3	3.49−3	−6.17−3
$3p_{1/2}$	1	−2.96−2	−8.11−3	1.28−3	8.84−3	−1.01−2	$3p_{1/2}$	1	−3.10−2	−8.37−3	1.27−3	9.31−3	−1.06−2
	3	−1.35−2	−3.90−3	−1.66−3	3.50−3	−1.84−3		3	−1.46−2	−4.37−3	−1.59−3	3.79−3	−2.20−3
	5	−1.82−2	−1.97−3	−1.89−3	6.13−3	−4.24−3		5	−1.75−2	−2.01−3	−2.11−3	5.79−3	−3.68−3
	10	−9.07−2	−1.22−2	7.18−3	3.28−2	−4.00−2		10	−8.65−2	−1.14−2	6.53−3	3.13−2	−3.79−2
$3p_{3/2}$	1	−2.17−2	−8.78−3	3.28−3	5.84−3	−9.11−3	$3p_{3/2}$	1	−2.29−2	−9.10−3	3.33−3	6.17−3	−9.49−3
	3	−4.28−3	−5.16−3	2.08−3	6.17−5	−2.14−3		3	−5.05−3	−5.59−3	2.19−3	2.22−4	−2.42−3
	5	−8.85−3	−4.95−3	4.02−3	2.37−3	−6.39−3		5	−8.05−3	−4.97−3	3.81−3	1.99−3	−5.80−3
	10	−7.93−2	−2.01−2	2.01−2	2.77−2	−4.78−2		10	−7.57−2	−1.93−2	1.94−2	2.64−2	−4.58−2
$3d_{3/2}$	1	2.61−3	3.62−3	−1.63−3	7.80−5	1.55−3	$3d_{3/2}$	1	3.22−3	3.81−3	−1.63−3	−9.01−5	1.72−3
	3	−4.03−2	−1.66−3	−1.34−3	1.52−2	−1.38−2		3	−3.83−2	−1.02−3	−1.57−3	1.46−2	−1.30−2
	5	−1.05−1	−1.34−2	1.87−3	3.72−2	−3.90−2		5	−1.02−1	−1.24−2	1.69−3	3.63−2	−3.80−2
	10	−2.89−1	−4.89−2	6.98−3	9.75−2	−1.04−1		10	−2.85−1	−4.78−2	7.31−3	9.64−2	−1.04−1
$3d_{5/2}$	1	7.98−3	3.10−3	5.37−4	−1.85−3	1.31−3	$3d_{5/2}$	1	8.76−3	3.28−3	5.91−4	−2.07−3	1.48−3
	3	−3.09−2	−3.01−3	2.96−3	1.17−2	−1.47−2		3	−2.88−2	−2.37−3	2.82−3	1.11−2	−1.39−2
	5	−9.22−2	−1.58−2	7.74−3	3.21−2	−3.98−2		5	−8.92−2	−1.49−2	7.65−3	3.13−2	−3.89−2
	10	−2.69−1	−5.47−2	1.57−2	8.88−2	−1.05−1		10	−2.65−1	−5.36−2	1.60−2	8.78−2	−1.04−1
$4s_{1/2}$	1	−1.51−3	4.83−3	1.94−3	2.93−3	−4.87−3	$4s_{1/2}$	1	−8.58−4	5.32−3	1.88−3	2.85−3	−4.72−3
	3	−3.39−2	−1.01−2	7.70−3	1.11−2	−1.87−2		3	−3.43−2	−9.88−3	7.90−3	1.14−2	−1.93−2
	5	−3.71−2	−1.53−2	7.07−3	1.01−2	−1.72−2		5	−3.90−2	−1.57−2	7.56−3	1.08−2	−1.84−2
	10	−2.06−2	−1.48−2	2.11−3	2.75−3	−4.87−3		10	−2.23−2	−1.55−2	2.42−3	3.21−3	−5.63−3
$4p_{1/2}$	1	−1.31−2	−2.07−3	1.38−3	4.68−3	−6.06−3	$4p_{1/2}$	1	−1.29−2	−1.77−3	1.35−3	4.74−3	−6.09−3
	3	−1.23−2	−4.55−3	−5.05−4	3.00−3	−2.49−3		3	−1.32−2	−4.89−3	−3.65−4	3.26−3	−2.90−3
	5	−1.51−2	−3.21−3	−1.29−3	4.48−3	−3.18−3		5	−1.46−2	−3.35−3	−1.42−3	4.21−3	−2.79−3
	10	−7.90−2	−1.19−2	6.86−3	2.82−2	−3.51−2		10	−7.48−2	−1.12−2	6.21−3	2.67−2	−3.29−2
$4p_{3/2}$	1	−1.06−2	−3.20−3	2.16−3	3.39−3	−5.55−3	$4p_{3/2}$	1	−1.05−2	−3.02−3	2.12−3	3.42−3	−5.54−3
	3	−5.91−3	−5.65−3	2.07−3	5.16−4	−2.59−3		3	−6.69−3	−5.99−3	2.20−3	7.20−4	−2.92−3
	5	−7.83−3	−5.75−3	3.44−3	1.52−3	−4.96−3		5	−7.34−3	−5.86−3	3.28−3	1.25−3	−4.52−3
	10	−6.98−2	−1.92−2	1.84−2	2.39−2	−4.24−2		10	−6.62−2	−1.85−2	1.77−2	2.26−2	−4.03−2
$4d_{3/2}$	1	−2.06−3	−1.08−3	1.58−5	3.96−4	−4.11−4	$4d_{3/2}$	1	−2.40−3	−1.25−3	7.78−5	4.72−4	−5.50−4
	3	−2.58−2	−2.49−3	−2.77−4	9.27−3	−8.99−3		3	−2.39−2	−2.14−3	−4.25−4	8.63−3	−8.20−3
	5	−8.11−2	−1.14−2	2.68−3	2.84−2	−3.11−2		5	−7.77−2	−1.07−2	2.52−3	2.73−2	−2.99−2
	10	−2.59−1	−4.46−2	8.58−3	8.73−2	−9.59−2		10	−2.53−1	−4.33−2	8.90−3	8.57−2	−9.46−2
$4d_{5/2}$	1	9.08−4	−1.35−3	1.07−3	−6.89−4	−3.76−4	$4d_{5/2}$	1	6.07−4	−1.52−3	1.12−3	−6.26−4	−4.97−4
	3	−1.85−2	−3.52−3	3.13−3	6.60−3	−9.73−3		3	−1.66−2	−3.16−3	3.00−3	5.97−3	−8.98−3
	5	−6.98−2	−1.35−2	7.90−3	2.41−2	−3.20−2		5	−6.65−2	−1.27−2	7.79−3	2.31−2	−3.09−2
	10	−2.40−1	−5.00−2	1.69−2	7.92−2	−9.62−2		10	−2.34−1	−4.86−2	1.72−2	7.78−2	−9.50−2
$4f_{5/2}$	1	−1.50−2	−1.39−3	−1.22−3	5.21−3	−3.99−3	$4f_{5/2}$	1	−1.40−2	−1.16−3	−1.22−3	4.88−3	−3.66−3
	3	−1.00−1	−1.58−2	−3.76−3	3.30−2	−2.92−2		3	−9.76−2	−1.52−2	−3.62−3	3.22−2	−2.86−2
	5	−2.07−1	−3.57−2	−8.82−3	6.67−2	−5.79−2		5	−2.03−1	−3.47−2	−8.47−3	6.56−2	−5.71−2
	10	−4.81−1	−9.16−2	−3.16−2	1.49−1	−1.18−1		10	−4.78−1	−9.06−2	−3.01−2	1.49−1	−1.19−1
$5s_{1/2}$	1	−6.52−4	4.15−3	1.46−3	2.21−3	−3.67−3	$5s_{1/2}$	1	−1.36−4	4.49−3	1.39−3	2.13−3	−3.52−3
	3	−3.18−2	−9.52−3	7.20−3	1.03−2	−1.75−2		3	−3.20−2	−9.27−3	7.36−3	1.06−2	−1.79−2
	5	−3.61−2	−1.50−2	6.85−3	9.81−3	−1.67−2		5	−3.79−2	−1.53−2	7.31−3	1.05−2	−1.78−2
	10	−2.06−2	−1.48−2	2.08−3	2.72−3	−4.79−3		10	−2.22−2	−1.55−2	2.38−3	3.17−3	−5.55−3

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$5p_{1/2}$	1	−1.03−2	−1.15−3	1.32−3	3.91−3	−5.23−3	$5p_{1/2}$	1	−9.93−3	−8.19−4	1.27−3	3.90−3	−5.17−3
	3	−1.22−2	−4.68−3	−2.87−4	2.96−3	−2.67−3		3	−1.31−2	−5.00−3	−1.33−4	3.22−3	−3.09−3
	5	−1.46−2	−3.48−3	−1.18−3	4.21−3	−3.03−3		5	−1.42−2	−3.64−3	−1.29−3	3.97−3	−2.68−3
	10	−7.70−2	−1.19−2	6.79−3	2.74−2	−3.42−2		10	−7.27−2	−1.11−2	6.14−3	2.59−2	−3.20−2
$5p_{3/2}$	1	−8.59−3	−2.29−3	1.89−3	2.90−3	−4.79−3	$5p_{3/2}$	1	−8.36−3	−2.07−3	1.84−3	2.89−3	−4.72−3
	3	−6.29−3	−5.75−3	2.08−3	6.32−4	−2.72−3		3	−7.07−3	−6.07−3	2.22−3	8.44−4	−3.06−3
	5	−7.77−3	−5.95−3	3.34−3	1.40−3	−4.74−3		5	−7.34−3	−6.07−3	3.18−3	1.14−3	−4.33−3
	10	−6.81−2	−1.90−2	1.81−2	2.32−2	−4.13−2		10	−6.44−2	−1.83−2	1.74−2	2.19−2	−3.93−2
$6s_{1/2}$	1	−4.42−4	4.18−3	1.40−3	2.13−3	−3.52−3	$6s_{1/2}$	1	2.35−4	4.60−3	1.31−3	2.01−3	−3.31−3
	3	−3.19−2	−9.59−3	7.21−3	1.04−2	−1.76−2		3	−3.23−2	−9.40−3	7.39−3	1.06−2	−1.80−2
	5	−3.62−2	−1.50−2	6.87−3	9.84−3	−1.67−2		5	−3.79−2	−1.53−2	7.33−3	1.05−2	−1.78−2
	10	−2.06−2	−1.49−2	2.09−3	2.73−3	−4.82−3		10	−2.23−2	−1.56−2	2.39−3	3.18−3	−5.58−3
$Z = 61$, Pm: $4f^5_{5/2}6s^2_{1/2}$							$Z = 62$, Sm: $4f^6_{5/2}6s^2_{1/2}$						
$3s_{1/2}$	1	−8.61−3	6.86−3	4.82−3	7.15−3	−1.20−2	$3s_{1/2}$	1	−7.96−3	7.65−3	4.85−3	7.22−3	−1.21−2
	3	−4.71−2	−1.31−2	1.10−2	1.58−2	−2.68−2		3	−4.82−2	−1.30−2	1.14−2	1.64−2	−2.77−2
	5	−4.80−2	−1.84−2	9.61−3	1.38−2	−2.34−2		5	−5.07−2	−1.90−2	1.03−2	1.47−2	−2.50−2
	10	−2.51−2	−1.65−2	3.07−3	4.07−3	−7.14−3		10	−2.74−2	−1.74−2	3.52−3	4.73−3	−8.25−3
$3p_{1/2}$	1	−3.24−2	−8.60−3	1.25−3	9.77−3	−1.10−2	$3p_{1/2}$	1	−3.38−2	−8.80−3	1.20−3	1.02−2	−1.14−2
	3	−1.59−2	−4.88−3	−1.50−3	4.11−3	−2.62−3		3	−1.73−2	−5.42−3	−1.39−3	4.49−3	−3.10−3
	5	−1.70−2	−2.09−3	−2.32−3	5.50−3	−3.18−3		5	−1.66−2	−2.22−3	−2.50−3	5.26−3	−2.76−3
	10	−8.24−2	−1.06−2	5.87−3	2.99−2	−3.58−2		10	−7.84−2	−9.78−3	5.22−3	2.85−2	−3.37−2
$3p_{3/2}$	1	−2.39−2	−9.40−3	3.36−3	6.48−3	−9.84−3	$3p_{3/2}$	1	−2.49−2	−9.67−3	3.38−3	6.79−3	−1.02−2
	3	−5.94−3	−6.06−3	2.33−3	4.18−4	−2.75−3		3	−6.94−3	−6.56−3	2.49−3	6.50−4	−3.14−3
	5	−7.32−3	−5.02−3	3.62−3	1.64−3	−5.26−3		5	−6.72−3	−5.12−3	3.45−3	1.33−3	−4.79−3
	10	−7.21−2	−1.86−2	1.87−2	2.51−2	−4.38−2		10	−6.86−2	−1.79−2	1.80−2	2.39−2	−4.19−2
$3d_{3/2}$	1	3.80−3	3.99−3	−1.63−3	−2.50−4	1.88−3	$3d_{3/2}$	1	4.35−3	4.16−3	−1.62−3	−4.00−4	2.02−3
	3	−3.63−2	−3.75−4	−1.80−3	1.40−2	−1.22−2		3	−3.42−2	2.64−4	−2.03−3	1.34−2	−1.14−2
	5	−9.95−2	−1.16−2	1.47−3	3.55−2	−3.69−2		5	−9.66−2	−1.07−2	1.22−3	3.46−2	−3.59−2
	10	−2.81−1	−4.66−2	7.59−3	9.54−2	−1.03−1		10	−2.77−1	−4.55−2	7.83−3	9.43−2	−1.02−1
$3d_{5/2}$	1	9.50−3	3.45−3	6.53−4	−2.29−3	1.64−3	$3d_{5/2}$	1	1.02−2	3.61−3	7.24−4	−2.50−3	1.78−3
	3	−2.66−2	−1.73−3	2.67−3	1.05−2	−1.32−2		3	−2.45−2	−1.09−3	2.53−3	9.86−3	−1.24−2
	5	−8.63−2	−1.40−2	7.52−3	3.04−2	−3.79−2		5	−8.34−2	−1.31−2	7.37−3	2.96−2	−3.70−2
	10	−2.61−1	−5.24−2	1.63−2	8.67−2	−1.03−1		10	−2.57−1	−5.12−2	1.66−2	8.57−2	−1.02−1
$4s_{1/2}$	1	−2.16−4	5.81−3	1.81−3	2.77−3	−4.58−3	$4s_{1/2}$	1	4.06−4	6.29−3	1.76−3	2.71−3	−4.46−3
	3	−3.47−2	−9.61−3	8.08−3	1.16−2	−1.97−2		3	−3.49−2	−9.28−3	8.25−3	1.19−2	−2.01−2
	5	−4.09−2	−1.61−2	8.05−3	1.16−2	−1.96−2		5	−4.28−2	−1.64−2	8.55−3	1.23−2	−2.08−2
	10	−2.42−2	−1.63−2	2.78−3	3.74−3	−6.52−3		10	−2.63−2	−1.71−2	3.19−3	4.34−3	−7.53−3
$4p_{1/2}$	1	−1.27−2	−1.43−3	1.30−3	4.77−3	−6.07−3	$4p_{1/2}$	1	−1.24−2	−1.05−3	1.24−3	4.78−3	−6.02−3
	3	−1.42−2	−5.23−3	−2.08−4	3.56−3	−3.35−3		3	−1.53−2	−5.59−3	−3.66−5	3.88−3	−3.85−3
	5	−1.43−2	−3.52−3	−1.52−3	4.00−3	−2.48−3		5	−1.41−2	−3.72−3	−1.61−3	3.85−3	−2.24−3
	10	−7.07−2	−1.04−2	5.57−3	2.52−2	−3.08−2		10	−6.68−2	−9.77−3	4.93−3	2.38−2	−2.87−2
$4p_{3/2}$	1	−1.04−2	−2.80−3	2.07−3	3.44−3	−5.51−3	$4p_{3/2}$	1	−1.02−2	−2.57−3	2.02−3	3.45−3	−5.46−3
	3	−7.54−3	−6.34−3	2.35−3	9.49−4	−3.30−3		3	−8.46−3	−6.71−3	2.51−3	1.20−3	−3.71−3
	5	−6.97−3	−6.00−3	3.13−3	1.01−3	−4.15−3		5	−6.72−3	−6.18−3	3.02−3	8.19−4	−3.84−3
	10	−6.26−2	−1.78−2	1.69−2	2.13−2	−3.82−2		10	−5.92−2	−1.72−2	1.62−2	2.01−2	−3.63−2
$4d_{3/2}$	1	−2.79−3	−1.44−3	1.40−4	5.67−4	−7.07−4	$4d_{3/2}$	1	−3.25−3	−1.65−3	2.02−4	6.81−4	−8.82−4
	3	−2.21−2	−1.82−3	−5.69−4	8.01−3	−7.44−3		3	−2.04−2	−1.53−3	−7.10−4	7.41−3	−6.70−3
	5	−7.45−2	−9.96−3	2.33−3	2.63−2	−2.86−2		5	−7.12−2	−9.28−3	2.12−3	2.52−2	−2.73−2
	10	−2.48−1	−4.20−2	9.16−3	8.41−2	−9.33−2		10	−2.42−1	−4.07−2	9.37−3	8.25−2	−9.19−2
$4d_{5/2}$	1	2.49−4	−1.70−3	1.18−3	−5.45−4	−6.36−4	$4d_{5/2}$	1	−1.62−4	−1.90−3	1.24−3	−4.49−4	−7.94−4
	3	−1.48−2	−2.81−3	2.87−3	5.36−3	−8.23−3		3	−1.31−2	−2.50−3	2.74−3	4.78−3	−7.52−3
	5	−6.32−2	−1.20−2	7.63−3	2.20−2	−2.97−2		5	−6.01−2	−1.13−2	7.47−3	2.10−2	−2.85−2
	10	−2.29−1	−4.73−2	1.75−2	7.62−2	−9.37−2		10	−2.24−1	−4.59−2	1.77−2	7.47−2	−9.24−2
$4f_{5/2}$	1	−1.30−2	−9.51−4	−1.22−3	4.58−3	−3.36−3	$4f_{5/2}$	1	−1.21−2	−7.64−4	−1.22−3	4.28−3	−3.07−3
	3	−9.52−2	−1.46−2	−3.50−3	3.16−2	−2.81−2		3	−9.28−2	−1.40−2	−3.40−3	3.09−2	−2.75−2
	5	−1.99−1	−3.37−2	−8.13−3	6.46−2	−5.64−2		5	−1.96−1	−3.28−2	−7.79−3	6.36−2	−5.58−2
	10	−4.74−1	−8.94−2	−2.88−2	1.48−1	−1.19−1		10	−4.70−1	−8.82−2	−2.75−2	1.47−1	−1.20−1

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$5s_{1/2}$	1	3.53−4	4.80−3	1.32−3	2.04−3	−3.37−3	$5s_{1/2}$	1	8.11−4	5.10−3	1.26−3	1.97−3	−3.23−3
	3	−3.22−2	−8.95−3	7.49−3	1.08−2	−1.83−2		3	−3.22−2	−8.58−3	7.60−3	1.10−2	−1.86−2
	5	−3.97−2	−1.57−2	7.77−3	1.11−2	−1.89−2		5	−4.14−2	−1.60−2	8.22−3	1.18−2	−2.00−2
	10	−2.41−2	−1.63−2	2.74−3	3.69−3	−6.43−3		10	−2.62−2	−1.70−2	3.14−3	4.28−3	−7.42−3
$5p_{1/2}$	1	−9.50−3	−4.61−4	1.21−3	3.86−3	−5.07−3	$5p_{1/2}$	1	−9.02−3	−7.92−5	1.14−3	3.80−3	−4.95−3
	3	−1.41−2	−5.31−3	3.83−5	3.51−3	−3.55−3		3	−1.51−2	−5.63−3	2.22−4	3.83−3	−4.06−3
	5	−1.40−2	−3.82−3	−1.38−3	3.78−3	−2.40−3		5	−1.39−2	−4.04−3	−1.45−3	3.64−3	−2.19−3
	10	−6.87−2	−1.05−2	5.50−3	2.44−2	−2.99−2		10	−6.47−2	−9.82−3	4.87−3	2.29−2	−2.78−2
$5p_{3/2}$	1	−8.05−3	−1.82−3	1.77−3	2.85−3	−4.62−3	$5p_{3/2}$	1	−7.69−3	−1.55−3	1.69−3	2.80−3	−4.49−3
	3	−7.93−3	−6.40−3	2.37−3	1.08−3	−3.45−3		3	−8.81−3	−6.73−3	2.52−3	1.34−3	−3.86−3
	5	−7.02−3	−6.21−3	3.04−3	9.30−4	−3.97−3		5	−6.83−3	−6.40−3	2.94−3	7.60−4	−3.70−3
	10	−6.09−2	−1.77−2	1.66−2	2.06−2	−3.72−2		10	−5.75−2	−1.71−2	1.59−2	1.93−2	−3.52−2
$6s_{1/2}$	1	6.90−4	4.91−3	1.25−3	1.94−3	−3.18−3	$6s_{1/2}$	1	1.17−3	5.23−3	1.19−3	1.86−3	−3.05−3
	3	−3.21−2	−8.92−3	7.48−3	1.08−2	−1.83−2		3	−3.20−2	−8.49−3	7.58−3	1.09−2	−1.85−2
	5	−3.97−2	−1.57−2	7.79−3	1.12−2	−1.90−2		5	−4.14−2	−1.60−2	8.24−3	1.18−2	−2.01−2
	10	−2.42−2	−1.63−2	2.75−3	3.71−3	−6.46−3		10	−2.63−2	−1.71−2	3.16−3	4.30−3	−7.46−3
$Z = 63$, Eu: $4f^6_{5/2}4f^1_{7/2}6s^2_{1/2}$							$Z = 64$, Gd: $4f^6_{5/2}4f^1_{7/2}5d^1_{3/2}6s^2_{1/2}$						
$3s_{1/2}$	1	−7.32−3	8.46−3	4.88−3	7.29−3	−1.22−2	$3s_{1/2}$	1	−6.89−3	9.14−3	4.94−3	7.40−3	−1.23−2
	3	−4.93−2	−1.29−2	1.17−2	1.69−2	−2.87−2		3	−5.02−2	−1.26−2	1.21−2	1.74−2	−2.95−2
	5	−5.33−2	−1.96−2	1.09−2	1.57−2	−2.66−2		5	−5.58−2	−2.00−2	1.16−2	1.66−2	−2.82−2
	10	−3.00−2	−1.83−2	4.03−3	5.46−3	−9.49−3		10	−3.26−2	−1.93−2	4.58−3	6.26−3	−1.08−2
$3p_{1/2}$	1	−3.51−2	−8.96−3	1.13−3	1.07−2	−1.18−2	$3p_{1/2}$	1	−3.63−2	−9.10−3	1.05−3	1.11−2	−1.21−2
	3	−1.89−2	−6.00−3	−1.26−3	4.91−3	−3.65−3		3	−2.05−2	−6.56−3	−1.13−3	5.33−3	−4.21−3
	5	−1.64−2	−2.39−3	−2.66−3	5.07−3	−2.41−3		5	−1.64−2	−2.61−3	−2.79−3	4.94−3	−2.15−3
	10	−7.45−2	−9.03−3	4.56−3	2.71−2	−3.17−2		10	−7.08−2	−8.33−3	3.92−3	2.58−2	−2.97−2
$3p_{3/2}$	1	−2.59−2	−9.92−3	3.37−3	7.08−3	−1.04−2	$3p_{3/2}$	1	−2.67−2	−1.01−2	3.36−3	7.30−3	−1.07−2
	3	−8.05−3	−7.10−3	2.67−3	9.18−4	−3.59−3		3	−9.17−3	−7.61−3	2.86−3	1.19−3	−4.05−3
	5	−6.26−3	−5.26−3	3.32−3	1.06−3	−4.38−3		5	−5.94−3	−5.42−3	3.21−3	8.49−4	−4.06−3
	10	−6.52−2	−1.72−2	1.73−2	2.26−2	−3.99−2		10	−6.19−2	−1.65−2	1.66−2	2.15−2	−3.80−2
$3d_{3/2}$	1	4.85−3	4.31−3	−1.60−3	−5.38−4	2.14−3	$3d_{3/2}$	1	5.34−3	4.48−3	−1.59−3	−6.62−4	2.25−3
	3	−3.23−2	8.61−4	−2.28−3	1.28−2	−1.05−2		3	−3.03−2	1.51−3	−2.49−3	1.22−2	−9.73−3
	5	−9.37−2	−9.77−3	9.48−4	3.38−2	−3.47−2		5	−9.09−2	−8.89−3	6.79−4	3.29−2	−3.36−2
	10	−2.73−1	−4.43−2	8.02−3	9.31−2	−1.01−1		10	−2.69−1	−4.31−2	8.17−3	9.20−2	−1.00−1
$3d_{5/2}$	1	1.09−2	3.74−3	8.00−4	−2.70−3	1.90−3	$3d_{5/2}$	1	1.15−2	3.90−3	8.71−4	−2.88−3	2.01−3
	3	−2.24−2	−4.86−4	2.38−3	9.25−3	−1.16−2		3	−2.03−2	1.66−4	2.26−3	8.63−3	−1.09−2
	5	−8.04−2	−1.22−2	7.21−3	2.87−2	−3.59−2		5	−7.75−2	−1.13−2	7.04−3	2.79−2	−3.49−2
	10	−2.53−1	−5.00−2	1.68−2	8.46−2	−1.01−1		10	−2.49−1	−4.88−2	1.70−2	8.35−2	−1.01−1
$4s_{1/2}$	1	9.95−4	6.76−3	1.70−3	2.65−3	−4.35−3	$4s_{1/2}$	1	1.42−3	7.11−3	1.67−3	2.61−3	−4.28−3
	3	−3.50−2	−8.89−3	8.40−3	1.21−2	−2.05−2		3	−3.49−2	−8.47−3	8.50−3	1.23−2	−2.08−2
	5	−4.47−2	−1.67−2	9.03−3	1.30−2	−2.20−2		5	−4.63−2	−1.69−2	9.48−3	1.36−2	−2.31−2
	10	−2.86−2	−1.79−2	3.65−3	5.00−3	−8.65−3		10	−3.09−2	−1.87−2	4.14−3	5.71−3	−9.85−3
$4p_{1/2}$	1	−1.20−2	−6.45−4	1.17−3	4.79−3	−5.96−3	$4p_{1/2}$	1	−1.16−2	−3.00−4	1.11−3	4.76−3	−5.86−3
	3	−1.65−2	−5.95−3	1.48−4	4.24−3	−4.39−3		3	−1.75−2	−6.25−3	3.29−4	4.58−3	−4.91−3
	5	−1.42−2	−3.97−3	−1.66−3	3.74−3	−2.08−3		5	−1.43−2	−4.22−3	−1.69−3	3.68−3	−1.99−3
	10	−6.30−2	−9.16−3	4.30−3	2.24−2	−2.67−2		10	−5.94−2	−8.59−3	3.70−3	2.11−2	−2.48−2
$4p_{3/2}$	1	−9.87−3	−2.30−3	1.95−3	3.42−3	−5.37−3	$4p_{3/2}$	1	−9.59−3	−2.08−3	1.88−3	3.38−3	−5.26−3
	3	−9.44−3	−7.07−3	2.68−3	1.48−3	−4.17−3		3	−1.04−2	−7.40−3	2.85−3	1.75−3	−4.60−3
	5	−6.59−3	−6.39−3	2.93−3	6.68−4	−3.60−3		5	−6.59−3	−6.61−3	2.87−3	5.66−4	−3.43−3
	10	−5.59−2	−1.66−2	1.55−2	1.88−2	−3.43−2		10	−5.28−2	−1.60−2	1.48−2	1.76−2	−3.24−2
$4d_{3/2}$	1	−3.74−3	−1.85−3	2.62−4	8.08−4	−1.07−3	$4d_{3/2}$	1	−4.23−3	−2.05−3	3.05−4	9.35−4	−1.24−3
	3	−1.88−2	−1.27−3	−8.49−4	6.84−3	−5.99−3		3	−1.73−2	−1.02−3	−9.64−4	6.30−3	−5.34−3
	5	−6.81−2	−8.61−3	1.90−3	2.42−2	−2.61−2		5	−6.50−2	−7.97−3	1.68−3	2.31−2	−2.48−2
	10	−2.37−1	−3.94−2	9.52−3	8.09−2	−9.04−2		10	−2.31−1	−3.81−2	9.62−3	7.92−2	−8.89−2
$4d_{5/2}$	1	−6.11−4	−2.11−3	1.30−3	−3.38−4	−9.64−4	$4d_{5/2}$	1	−1.08−3	−2.29−3	1.34−3	−2.20−4	−1.12−3
	3	−1.14−2	−2.22−3	2.62−3	4.21−3	−6.83−3		3	−9.88−3	−1.94−3	2.51−3	3.68−3	−6.19−3
	5	−5.69−2	−1.06−2	7.30−3	2.00−2	−2.73−2		5	−5.39−2	−9.88−3	7.12−3	1.90−2	−2.61−2
	10	−2.19−1	−4.46−2	1.79−2	7.32−2	−9.10−2		10	−2.13−1	−4.32−2	1.80−2	7.16−2	−8.96−2

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4f_{5/2}$	1	−1.11−2	−5.69−4	−1.20−3	3.96−3	−2.77−3	$4f_{5/2}$	1	−1.02−2	−4.00−4	−1.17−3	3.68−3	−2.52−3
	3	−9.02−2	−1.33−2	−3.30−3	3.01−2	−2.68−2		3	−8.75−2	−1.26−2	−3.21−3	2.93−2	−2.61−2
	5	−1.92−1	−3.19−2	−7.46−3	6.25−2	−5.50−2		5	−1.88−1	−3.10−2	−7.13−3	6.14−2	−5.43−2
	10	−4.66−1	−8.68−2	−2.62−2	1.46−1	−1.20−1		10	−4.61−1	−8.54−2	−2.50−2	1.45−1	−1.20−1
$4f_{7/2}$	1	−8.51−3	−9.29−4	−1.58−4	3.00−3	−2.84−3	$4f_{7/2}$	1	−7.64−3	−7.55−4	−1.41−4	2.73−3	−2.59−3
	3	−8.29−2	−1.46−2	2.54−6	2.73−2	−2.73−2		3	−8.02−2	−1.39−2	9.19−5	2.65−2	−2.66−2
	5	−1.80−1	−3.44−2	−2.51−3	5.80−2	−5.54−2		5	−1.77−1	−3.34−2	−2.16−3	5.69−2	−5.48−2
	10	−4.48−1	−9.27−2	−1.93−2	1.38−1	−1.19−1		10	−4.43−1	−9.13−2	−1.81−2	1.37−1	−1.19−1
$5s_{1/2}$	1	1.23−3	5.39−3	1.21−3	1.91−3	−3.12−3	$5s_{1/2}$	1	1.52−3	5.60−3	1.18−3	1.87−3	−3.05−3
	3	−3.21−2	−8.17−3	7.71−3	1.11−2	−1.88−2		3	−3.20−2	−7.74−3	7.77−3	1.12−2	−1.90−2
	5	−4.30−2	−1.62−2	8.67−3	1.25−2	−2.11−2		5	−4.45−2	−1.64−2	9.08−3	1.31−2	−2.21−2
	10	−2.84−2	−1.78−2	3.59−3	4.93−3	−8.52−3		10	−3.07−2	−1.87−2	4.06−3	5.63−3	−9.69−3
$5p_{1/2}$	1	−8.48−3	3.24−4	1.07−3	3.74−3	−4.80−3	$5p_{1/2}$	1	−7.99−3	6.59−4	1.01−3	3.66−3	−4.67−3
	3	−1.62−2	−5.94−3	4.18−4	4.18−3	−4.59−3		3	−1.72−2	−6.21−3	6.13−4	4.50−3	−5.12−3
	5	−1.39−2	−4.28−3	−1.48−3	3.55−3	−2.06−3		5	−1.41−2	−4.55−3	−1.49−3	3.51−3	−2.02−3
	10	−6.10−2	−9.23−3	4.25−3	2.16−2	−2.58−2		10	−5.75−2	−8.71−3	3.66−3	2.02−2	−2.39−2
$5p_{3/2}$	1	−7.29−3	−1.27−3	1.61−3	2.73−3	−4.34−3	$5p_{3/2}$	1	−6.93−3	−1.04−3	1.54−3	2.66−3	−4.20−3
	3	−9.75−3	−7.06−3	2.70−3	1.62−3	−4.31−3		3	−1.06−2	−7.36−3	2.87−3	1.88−3	−4.75−3
	5	−6.76−3	−6.61−3	2.86−3	6.31−4	−3.49−3		5	−6.82−3	−6.85−3	2.80−3	5.51−4	−3.36−3
	10	−5.42−2	−1.65−2	1.51−2	1.81−2	−3.33−2		10	−5.12−2	−1.60−2	1.44−2	1.70−2	−3.14−2
$6s_{1/2}$	1	1.54−3	5.51−3	1.15−3	1.82−3	−2.97−3	$5d_{3/2}$	1	−4.60−3	−2.20−3	5.33−4	1.07−3	−1.60−3
	3	−3.17−2	−7.94−3	7.65−3	1.10−2	−1.87−2		3	−1.59−2	−1.35−3	−8.12−4	5.65−3	−4.83−3
	5	−4.31−2	−1.62−2	8.69−3	1.25−2	−2.12−2		5	−6.22−2	−7.96−3	1.74−3	2.20−2	−2.38−2
	10	−2.85−2	−1.79−2	3.60−3	4.96−3	−8.57−3		10	−2.27−1	−3.75−2	9.83−3	7.77−2	−8.75−2
							$6s_{1/2}$	1	1.74−3	5.67−3	1.13−3	1.80−3	−2.93−3
								3	−3.15−2	−7.51−3	7.71−3	1.12−2	−1.89−2
								5	−4.47−2	−1.65−2	9.12−3	1.31−2	−2.23−2
								10	−3.08−2	−1.87−2	4.08−3	5.66−3	−9.74−3
$Z = 65$, Tb: $4f^6_{5/2}4f^3_{7/2}6s^2_{1/2}$							$Z = 66$, Dy: $4f^6_{5/2}4f^4_{7/2}6s^2_{1/2}$						
$3s_{1/2}$	1	−6.04−3	1.02−2	4.97−3	7.48−3	−1.25−2	$3p_{1/2}$	1	−3.88−2	−9.21−3	7.86−4	1.20−2	−1.28−2
	3	−5.11−2	−1.23−2	1.25−2	1.80−2	−3.05−2		3	−2.44−2	−7.92−3	−7.86−4	6.44−3	−5.65−3
	5	−5.86−2	−2.05−2	1.23−2	1.77−2	−3.00−2		5	−1.68−2	−3.22−3	−2.99−3	4.83−3	−1.84−3
	10	−3.57−2	−2.04−2	5.21−3	7.18−3	−1.24−2		10	−6.36−2	−7.00−3	2.60−3	2.32−2	−2.58−2
$3p_{1/2}$	1	−3.77−2	−9.18−3	9.25−4	1.16−2	−1.25−2	$3p_{3/2}$	1	−2.85−2	−1.05−2	3.24−3	7.84−3	−1.11−2
	3	−2.24−2	−7.25−3	−9.59−4	5.88−3	−4.93−3		3	−1.20−2	−8.89−3	3.33−3	1.92−3	−5.25−3
	5	−1.65−2	−2.90−3	−2.91−3	4.86−3	−1.95−3		5	−5.67−3	−5.93−3	3.07−3	5.08−4	−3.58−3
	10	−6.71−2	−7.64−3	3.25−3	2.45−2	−2.77−2		10	−5.54−2	−1.53−2	1.52−2	1.91−2	−3.43−2
$3p_{3/2}$	1	−2.77−2	−1.03−2	3.31−3	7.61−3	−1.09−2	$3d_{3/2}$	1	6.20−3	4.70−3	−1.51−3	−9.02−4	2.41−3
	3	−1.06−2	−8.26−3	3.10−3	1.55−3	−4.65−3		3	−2.63−2	2.75−3	−2.99−3	1.10−2	−8.05−3
	5	−5.73−3	−5.67−3	3.13−3	6.51−4	−3.78−3		5	−8.50−2	−7.05−3	3.93−5	3.12−2	−3.12−2
	10	−5.86−2	−1.59−2	1.59−2	2.02−2	−3.61−2		10	−2.61−1	−4.07−2	8.32−3	8.97−2	−9.80−2
$3d_{3/2}$	1	5.79−3	4.59−3	−1.55−3	−7.91−4	2.34−3	$3d_{5/2}$	1	1.28−2	4.09−3	1.08−3	−3.27−3	2.19−3
	3	−2.83−2	2.12−3	−2.75−3	1.16−2	−8.88−3		3	−1.60−2	1.41−3	1.97−3	7.35−3	−9.33−3
	5	−8.79−2	−7.96−3	3.58−4	3.21−2	−3.24−2		5	−7.14−2	−9.43−3	6.66−3	2.61−2	−3.28−2
	10	−2.65−1	−4.19−2	8.27−3	9.09−2	−9.91−2		10	−2.41−1	−4.63−2	1.73−2	8.14−2	−9.86−2
$3d_{5/2}$	1	1.22−2	3.99−3	9.80−4	−3.09−3	2.11−3	$4s_{1/2}$	1	2.61−3	8.21−3	1.61−3	2.56−3	−4.17−3
	3	−1.81−2	7.80−4	2.11−3	7.99−3	−1.01−2		3	−3.47−2	−7.38−3	8.74−3	1.27−2	−2.14−2
	5	−7.44−2	−1.03−2	6.86−3	2.70−2	−3.39−2		5	−4.98−2	−1.73−2	1.05−2	1.51−2	−2.56−2
	10	−2.45−1	−4.76−2	1.72−2	8.25−2	−9.96−2		10	−3.64−2	−2.05−2	5.29−3	7.39−3	−1.27−2
$4s_{1/2}$	1	2.10−3	7.73−3	1.63−3	2.58−3	−4.21−3	$4p_{1/2}$	1	−1.05−2	8.05−4	9.25−4	4.71−3	−5.64−3
	3	−3.49−2	−7.95−3	8.65−3	1.25−2	−2.12−2		3	−2.02−2	−6.98−3	7.69−4	5.46−3	−6.23−3
	5	−4.82−2	−1.72−2	1.00−2	1.44−2	−2.44−2		5	−1.51−2	−4.88−3	−1.68−3	3.73−3	−2.05−3
	10	−3.36−2	−1.96−2	4.70−3	6.54−3	−1.12−2		10	−5.27−2	−7.61−3	2.50−3	1.85−2	−2.10−2
$4p_{1/2}$	1	−1.10−2	2.85−4	1.01−3	4.73−3	−5.74−3	$4p_{3/2}$	1	−8.65−3	−1.35−3	1.69−3	3.26−3	−4.95−3
	3	−1.89−2	−6.63−3	5.51−4	5.02−3	−5.57−3		3	−1.26−2	−8.19−3	3.28−3	2.42−3	−5.70−3
	5	−1.46−2	−4.54−3	−1.70−3	3.68−3	−1.98−3		5	−6.93−3	−7.19−3	2.83−3	4.61−4	−3.29−3
	10	−5.59−2	−8.07−3	3.08−3	1.98−2	−2.28−2		10	−4.68−2	−1.51−2	1.34−2	1.53−2	−2.87−2

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4p_{3/2}$	1	−9.13−3	−1.69−3	1.79−3	3.33−3	−5.12−3	$4d_{3/2}$	1	−5.52−3	−2.53−3	4.14−4	1.28−3	−1.70−3
	3	−1.15−2	−7.82−3	3.07−3	2.09−3	−5.16−3		3	−1.44−2	−6.27−4	−1.21−3	5.26−3	−4.05−3
	5	−6.71−3	−6.90−3	2.83−3	4.90−4	−3.32−3		5	−5.89−2	−6.70−3	1.16−3	2.11−2	−2.23−2
	10	−4.97−2	−1.55−2	1.41−2	1.65−2	−3.05−2		10	−2.21−1	−3.56−2	9.67−3	7.60−2	−8.56−2
$4d_{3/2}$	1	−4.89−3	−2.30−3	3.69−4	1.11−3	−1.48−3	$4d_{5/2}$	1	−2.23−3	−2.78−3	1.47−3	7.62−5	−1.55−3
	3	−1.58−2	−8.13−4	−1.10−3	5.76−3	−4.66−3		3	−6.92−3	−1.51−3	2.29−3	2.62−3	−4.92−3
	5	−6.19−2	−7.32−3	1.42−3	2.21−2	−2.35−2		5	−4.78−2	−8.54−3	6.73−3	1.71−2	−2.38−2
	10	−2.26−1	−3.68−2	9.67−3	7.76−2	−8.73−2		10	−2.03−1	−4.06−2	1.81−2	6.85−2	−8.67−2
$4d_{5/2}$	1	−1.66−3	−2.55−3	1.42−3	−7.38−5	−1.35−3	$4f_{5/2}$	1	−8.72−3	−1.82−4	−1.14−3	3.19−3	−2.05−3
	3	−8.35−3	−1.72−3	2.39−3	3.13−3	−5.52−3		3	−8.27−2	−1.14−2	−3.14−3	2.79−2	−2.48−2
	5	−5.08−2	−9.20−3	6.93−3	1.80−2	−2.50−2		5	−1.82−1	−2.93−2	−6.60−3	5.96−2	−5.30−2
	10	−2.08−1	−4.19−2	1.81−2	7.01−2	−8.82−2		10	−4.51−1	−8.24−2	−2.30−2	1.43−1	−1.20−1
$4f_{5/2}$	1	−9.45−3	−2.93−4	−1.16−3	3.43−3	−2.27−3	$4f_{7/2}$	1	−6.14−3	−5.39−4	−1.03−4	2.22−3	−2.12−3
	3	−8.52−2	−1.20−2	−3.18−3	2.86−2	−2.55−2		3	−7.55−2	−1.27−2	1.86−4	2.52−2	−2.54−2
	5	−1.85−1	−3.02−2	−6.87−3	6.05−2	−5.37−2		5	−1.70−1	−3.17−2	−1.53−3	5.51−2	−5.36−2
	10	−4.56−1	−8.39−2	−2.40−2	1.44−1	−1.20−1		10	−4.34−1	−8.83−2	−1.60−2	1.35−1	−1.19−1
$4f_{7/2}$	1	−6.88−3	−6.51−4	−1.26−4	2.47−3	−2.34−3	$5s_{1/2}$	1	2.28−3	6.20−3	1.10−3	1.79−3	−2.89−3
	3	−7.80−2	−1.33−2	1.42−4	2.59−2	−2.60−2		3	−3.12−2	−6.58−3	7.88−3	1.14−2	−1.93−2
	5	−1.74−1	−3.26−2	−1.84−3	5.61−2	−5.42−2		5	−4.75−2	−1.66−2	9.95−3	1.43−2	−2.43−2
	10	−4.39−1	−8.98−2	−1.70−2	1.36−1	−1.19−1		10	−3.60−2	−2.04−2	5.18−3	7.26−3	−1.24−2
$5s_{1/2}$	1	1.97−3	5.95−3	1.13−3	1.82−3	−2.95−3	$5p_{1/2}$	1	−6.56−3	1.65−3	8.21−4	3.44−3	−4.27−3
	3	−3.17−2	−7.16−3	7.84−3	1.14−2	−1.92−2		3	−1.95−2	−6.76−3	1.06−3	5.30−3	−6.36−3
	5	−4.61−2	−1.65−2	9.53−3	1.37−2	−2.33−2		5	−1.49−2	−5.20−3	−1.44−3	3.59−3	−2.16−3
	10	−3.33−2	−1.95−2	4.61−3	6.43−3	−1.10−2		10	−5.08−2	−7.78−3	2.48−3	1.77−2	−2.02−2
$5p_{1/2}$	1	−7.24−3	1.19−3	9.07−4	3.55−3	−4.46−3	$5p_{3/2}$	1	−5.79−3	−3.32−4	1.33−3	2.45−3	−3.78−3
	3	−1.84−2	−6.50−3	8.37−4	4.91−3	−5.75−3		3	−1.27−2	−8.00−3	3.27−3	2.52−3	−5.79−3
	5	−1.44−2	−4.85−3	−1.48−3	3.52−3	−2.04−3		5	−7.29−3	−7.42−3	2.78−3	5.01−4	−3.28−3
	10	−5.40−2	−8.22−3	3.05−3	1.89−2	−2.20−2		10	−4.53−2	−1.51−2	1.30−2	1.47−2	−2.77−2
$5p_{3/2}$	1	−6.34−3	−6.56−4	1.43−3	2.56−3	−3.99−3	$6s_{1/2}$	1	2.20−3	6.03−3	1.08−3	1.75−3	−2.83−3
	3	−1.17−2	−7.70−3	3.07−3	2.21−3	−5.28−3		3	−3.10−2	−6.50−3	7.83−3	1.14−2	−1.92−2
	5	−7.01−3	−7.13−3	2.77−3	5.06−4	−3.28−3		5	−4.75−2	−1.66−2	9.97−3	1.44−2	−2.43−2
	10	−4.81−2	−1.55−2	1.37−2	1.58−2	−2.95−2		10	−3.61−2	−2.05−2	5.20−3	7.29−3	−1.25−2
$6s_{1/2}$	1	2.04−3	5.90−3	1.10−3	1.76−3	−2.86−3							
	3	−3.12−2	−6.95−3	7.77−3	1.13−2	−1.90−2							
	5	−4.62−2	−1.65−2	9.56−3	1.38−2	−2.33−2							
	10	−3.34−2	−1.96−2	4.63−3	6.46−3	−1.11−2							
$Z = 67$, Ho: $4f^6_{5/2}4f^5_{7/2}6s^2_{1/2}$							$Z = 68$, Er: $4f^6_{5/2}4f^6_{7/2}6s^2_{1/2}$						
$3p_{1/2}$	1	−3.98−2	−9.19−3	6.23−4	1.24−2	−1.30−2	$3p_{3/2}$	1	−2.98−2	−1.07−2	3.05−3	8.24−3	−1.13−2
	3	−2.65−2	−8.62−3	−5.99−4	7.03−3	−6.43−3		3	−1.52−2	−1.02−2	3.85−3	2.74−3	−6.60−3
	5	−1.73−2	−3.61−3	−3.05−3	4.87−3	−1.82−3		5	−5.98−3	−6.62−3	3.05−3	3.56−4	−3.41−3
	10	−6.03−2	−6.40−3	1.97−3	2.19−2	−2.39−2		10	−4.94−2	−1.43−2	1.39−2	1.68−2	−3.07−2
$3p_{3/2}$	1	−2.92−2	−1.06−2	3.16−3	8.05−3	−1.12−2	$3d_{3/2}$	1	6.92−3	4.89−3	−1.42−3	−1.10−3	2.51−3
	3	−1.35−2	−9.55−3	3.58−3	2.32−3	−5.90−3		3	−2.24−2	3.97−3	−3.45−3	9.86−3	−6.41−3
	5	−5.77−3	−6.26−3	3.04−3	4.12−4	−3.46−3		5	−7.96−2	−5.38−3	−6.85−4	2.95−2	−2.88−2
	10	−5.23−2	−1.48−2	1.45−2	1.79−2	−3.25−2		10	−2.52−1	−3.82−2	8.28−3	8.73−2	−9.56−2
$3d_{3/2}$	1	6.58−3	4.80−3	−1.47−3	−1.00−3	2.47−3	$3d_{5/2}$	1	1.39−2	4.25−3	1.31−3	−3.60−3	2.30−3
	3	−2.44−2	3.36−3	−3.22−3	1.04−2	−7.22−3		3	−1.17−2	2.64−3	1.72−3	6.09−3	−7.81−3
	5	−8.25−2	−6.29−3	−3.40−4	3.04−2	−3.01−2		5	−6.57−2	−7.73−3	6.21−3	2.44−2	−3.06−2
	10	−2.57−1	−3.95−2	8.32−3	8.85−2	−9.69−2		10	−2.33−1	−4.38−2	1.74−2	7.91−2	−9.65−2
$3d_{5/2}$	1	1.34−2	4.17−3	1.19−3	−3.44−3	2.25−3	$4s_{1/2}$	1	3.49−3	9.10−3	1.58−3	2.56−3	−4.14−3
	3	−1.39−2	2.02−3	1.84−3	6.72−3	−8.56−3		3	−3.39−2	−6.08−3	8.86−3	1.29−2	−2.18−2
	5	−6.87−2	−8.65−3	6.41−3	2.53−2	−3.17−2		5	−5.29−2	−1.74−2	1.14−2	1.64−2	−2.78−2
	10	−2.37−1	−4.51−2	1.74−2	8.02−2	−9.76−2		10	−4.22−2	−2.24−2	6.57−3	9.26−3	−1.58−2
$4s_{1/2}$	1	3.08−3	8.68−3	1.59−3	2.56−3	−4.15−3	$4p_{1/2}$	1	−9.19−3	1.95−3	7.32−4	4.60−3	−5.33−3
	3	−3.44−2	−6.77−3	8.82−3	1.28−2	−2.17−2		3	−2.29−2	−7.62−3	1.23−3	6.38−3	−7.60−3
	5	−5.15−2	−1.75−2	1.10−2	1.58−2	−2.68−2		5	−1.64−2	−5.65−3	−1.56−3	4.00−3	−2.44−3
	10	−3.93−2	−2.14−2	5.91−3	8.31−3	−1.42−2		10	−4.67−2	−6.84−3	1.39−3	1.62−2	−1.76−2

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4p_{1/2}$	1	−9.89−3	1.36−3	8.31−4	4.67−3	−5.50−3	$4p_{3/2}$	1	−7.55−3	−6.05−4	1.50−3	3.08−3	−4.58−3
	3	−2.16−2	−7.31−3	9.95−4	5.91−3	−6.91−3		3	−1.49−2	−8.92−3	3.72−3	3.12−3	−6.84−3
	5	−1.57−2	−5.27−3	−1.63−3	3.85−3	−2.21−3		5	−7.78−3	−7.89−3	2.90−3	5.35−4	−3.43−3
	10	−4.96−2	−7.20−3	1.93−3	1.74−2	−1.93−2		10	−4.14−2	−1.43−2	1.21−2	1.32−2	−2.53−2
$4p_{3/2}$	1	−8.13−3	−9.86−4	1.60−3	3.18−3	−4.77−3	$4d_{3/2}$	1	−6.89−3	−2.99−3	4.84−4	1.66−3	−2.14−3
	3	−1.37−2	−8.56−3	3.50−3	2.76−3	−6.26−3		3	−1.19−2	−3.44−4	−1.40−3	4.33−3	−2.94−3
	5	−7.32−3	−7.54−3	2.85−3	4.83−4	−3.33−3		5	−5.33−2	−5.60−3	6.02−4	1.92−2	−1.98−2
	10	−4.40−2	−1.47−2	1.27−2	1.43−2	−2.70−2		10	−2.10−1	−3.31−2	9.54−3	7.27−2	−8.22−2
$4d_{3/2}$	1	−6.19−3	−2.76−3	4.53−4	1.46−3	−1.92−3	$4d_{5/2}$	1	−3.47−3	−3.24−3	1.57−3	4.05−4	−1.97−3
	3	−1.31−2	−4.70−4	−1.31−3	4.78−3	−3.47−3		3	−4.32−3	−1.18−3	2.12−3	1.68−3	−3.80−3
	5	−5.62−2	−6.18−3	8.69−4	2.02−2	−2.10−2		5	−4.22−2	−7.38−3	6.29−3	1.52−2	−2.15−2
	10	−2.15−1	−3.43−2	9.62−3	7.43−2	−8.39−2		10	−1.92−1	−3.80−2	1.81−2	6.54−2	−8.35−2
$4d_{5/2}$	1	−2.84−3	−3.01−3	1.52−3	2.36−4	−1.76−3	$4f_{5/2}$	1	−7.41−3	−7.44−6	−1.08−3	2.74−3	−1.67−3
	3	−5.57−3	−1.33−3	2.20−3	2.14−3	−4.34−3		3	−7.77−2	−1.01−2	−3.12−3	2.64−2	−2.33−2
	5	−4.51−2	−8.00−3	6.49−3	1.61−2	−2.26−2		5	−1.75−1	−2.75−2	−6.09−3	5.76−2	−5.15−2
	10	−1.98−1	−3.93−2	1.81−2	6.70−2	−8.51−2		10	−4.41−1	−7.93−2	−2.12−2	1.40−1	−1.19−1
$4f_{5/2}$	1	−8.04−3	−8.71−5	−1.11−3	2.96−3	−1.85−3	$4f_{7/2}$	1	−4.81−3	−3.63−4	−4.85−5	1.77−3	−1.72−3
	3	−8.02−2	−1.07−2	−3.12−3	2.72−2	−2.40−2		3	−7.06−2	−1.14−2	2.31−4	2.37−2	−2.40−2
	5	−1.78−1	−2.84−2	−6.32−3	5.86−2	−5.23−2		5	−1.64−1	−2.99−2	−9.42−4	5.33−2	−5.23−2
	10	−4.46−1	−8.09−2	−2.21−2	1.42−1	−1.20−1		10	−4.23−1	−8.52−2	−1.42−2	1.32−1	−1.18−1
$4f_{7/2}$	1	−5.45−3	−4.44−4	−7.74−5	1.99−3	−1.91−3	$5s_{1/2}$	1	2.79−3	6.65−3	1.07−3	1.76−3	−2.83−3
	3	−7.30−2	−1.20−2	2.16−4	2.45−2	−2.47−2		3	−3.01−2	−5.27−3	7.89−3	1.15−2	−1.94−2
	5	−1.67−1	−3.08−2	−1.21−3	5.42−2	−5.30−2		5	−5.00−2	−1.66−2	1.07−2	1.55−2	−2.63−2
	10	−4.29−1	−8.68−2	−1.51−2	1.34−1	−1.19−1		10	−4.16−2	−2.22−2	6.43−3	9.08−3	−1.55−2
$5s_{1/2}$	1	2.56−3	6.43−3	1.08−3	1.77−3	−2.85−3	$5p_{1/2}$	1	−5.09−3	2.59−3	6.51−4	3.20−3	−3.85−3
	3	−3.07−2	−5.95−3	7.89−3	1.15−2	−1.94−2		3	−2.17−2	−7.20−3	1.51−3	6.11−3	−7.62−3
	5	−4.88−2	−1.66−2	1.04−2	1.50−2	−2.53−2		5	−1.62−2	−5.91−3	−1.27−3	3.86−3	−2.59−3
	10	−3.87−2	−2.13−2	5.79−3	8.14−3	−1.39−2		10	−4.49−2	−7.08−3	1.39−3	1.54−2	−1.68−2
$5p_{1/2}$	1	−5.83−3	2.11−3	7.36−4	3.33−3	−4.06−3	$5p_{3/2}$	1	−4.62−3	3.35−4	1.14−3	2.21−3	−3.36−3
	3	−2.06−2	−6.99−3	1.28−3	5.70−3	−6.98−3		3	−1.47−2	−8.58−3	3.67−3	3.17−3	−6.85−3
	5	−1.55−2	−5.55−3	−1.37−3	3.70−3	−2.33−3		5	−8.16−3	−8.08−3	2.86−3	6.05−4	−3.47−3
	10	−4.78−2	−7.41−3	1.92−3	1.65−2	−1.85−2		10	−4.00−2	−1.44−2	1.17−2	1.26−2	−2.43−2
$5p_{3/2}$	1	−5.22−3	−1.39−6	1.24−3	2.33−3	−3.57−3	$6s_{1/2}$	1	2.50−3	6.32−3	1.06−3	1.74−3	−2.79−3
	3	−1.37−2	−8.30−3	3.47−3	2.85−3	−6.31−3		3	−2.99−2	−5.22−3	7.85−3	1.14−2	−1.93−2
	5	−7.68−3	−7.74−3	2.81−3	5.34−4	−3.34−3		5	−4.99−2	−1.65−2	1.07−2	1.55−2	−2.62−2
	10	−4.26−2	−1.47−2	1.24−2	1.36−2	−2.60−2		10	−4.18−2	−2.22−2	6.45−3	9.11−3	−1.56−2
$6s_{1/2}$	1	2.36−3	6.18−3	1.07−3	1.74−3	−2.81−3							
	3	−3.05−2	−5.90−3	7.85−3	1.14−2	−1.93−2							
	5	−4.88−2	−1.66−2	1.04−2	1.49−2	−2.53−2							
	10	−3.89−2	−2.14−2	5.81−3	8.18−3	−1.40−2							
$Z = 69$, Tm: $4f^6_{5/2}4f^7_{7/2}6s^2_{1/2}$							$Z = 70$, Yb: $4f^6_{5/2}4f^8_{7/2}6s^2_{1/2}$						
$3p_{3/2}$	1	−3.03−2	−1.08−2	2.91−3	8.39−3	−1.13−2	$3p_{3/2}$	1	−3.07−2	−1.08−2	2.75−3	8.51−3	−1.13−2
	3	−1.69−2	−1.09−2	4.13−3	3.20−3	−7.33−3		3	−1.86−2	−1.17−2	4.42−3	3.68−3	−8.10−3
	5	−6.33−3	−7.02−3	3.09−3	3.43−4	−3.43−3		5	−6.82−3	−7.46−3	3.16−3	3.73−4	−3.53−3
	10	−4.66−2	−1.38−2	1.32−2	1.58−2	−2.90−2		10	−4.38−2	−1.33−2	1.26−2	1.47−2	−2.73−2
$3d_{3/2}$	1	7.23−3	4.96−3	−1.36−3	−1.18−3	2.54−3	$3d_{3/2}$	1	7.50−3	5.02−3	−1.30−3	−1.25−3	2.55−3
	3	−2.05−2	4.58−3	−3.68−3	9.28−3	−5.60−3		3	−1.85−2	5.17−3	−3.90−3	8.70−3	−4.80−3
	5	−7.66−2	−4.47−3	−1.04−3	2.87−2	−2.76−2		5	−7.37−2	−3.55−3	−1.41−3	2.78−2	−2.64−2
	10	−2.48−1	−3.69−2	8.19−3	8.61−2	−9.43−2		10	−2.44−1	−3.56−2	8.05−3	8.49−2	−9.29−2
$3d_{5/2}$	1	1.44−2	4.30−3	1.43−3	−3.76−3	2.33−3	$3d_{5/2}$	1	1.49−2	4.35−3	1.56−3	−3.91−3	2.35−3
	3	−9.63−3	3.24−3	1.60−3	5.47−3	−7.06−3		3	−7.53−3	3.84−3	1.48−3	4.84−3	−6.33−3
	5	−6.27−2	−6.80−3	5.99−3	2.36−2	−2.95−2		5	−5.96−2	−5.88−3	5.78−3	2.27−2	−2.84−2
	10	−2.29−1	−4.25−2	1.74−2	7.79−2	−9.54−2		10	−2.24−1	−4.12−2	1.74−2	7.68−2	−9.42−2
$4s_{1/2}$	1	3.87−3	9.54−3	1.58−3	2.59−3	−4.17−3	$4s_{1/2}$	1	4.19−3	9.96−3	1.60−3	2.63−3	−4.22−3
	3	−3.34−2	−5.34−3	8.90−3	1.30−2	−2.19−2		3	−3.27−2	−4.55−3	8.91−3	1.30−2	−2.20−2
	5	−5.42−2	−1.74−2	1.18−2	1.71−2	−2.89−2		5	−5.53−2	−1.72−2	1.22−2	1.77−2	−2.99−2
	10	−4.54−2	−2.33−2	7.27−3	1.03−2	−1.75−2		10	−4.86−2	−2.42−2	7.99−3	1.13−2	−1.93−2

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4p_{1/2}$	1	−8.42−3	2.56−3	6.31−4	4.52−3	−5.15−3	$4p_{1/2}$	1	−7.60−3	3.20−3	5.30−4	4.43−3	−4.96−3
	3	−2.43−2	−7.90−3	1.46−3	6.85−3	−8.32−3		3	−2.57−2	−8.16−3	1.70−3	7.34−3	−9.04−3
	5	−1.73−2	−6.06−3	−1.46−3	4.19−3	−2.73−3		5	−1.82−2	−6.48−3	−1.33−3	4.44−3	−3.10−3
	10	−4.40−2	−6.53−3	8.59−4	1.52−2	−1.60−2		10	−4.15−2	−6.28−3	3.56−4	1.41−2	−1.45−2
$4p_{3/2}$	1	−6.93−3	−2.06−4	1.39−3	2.97−3	−4.36−3	$4p_{3/2}$	1	−6.25−3	2.07−4	1.29−3	2.84−3	−4.13−3
	3	−1.60−2	−9.27−3	3.94−3	3.48−3	−7.43−3		3	−1.72−2	−9.61−3	4.17−3	3.85−3	−8.02−3
	5	−8.34−3	−8.27−3	2.98−3	6.24−4	−3.60−3		5	−9.01−3	−8.67−3	3.08−3	7.51−4	−3.83−3
	10	−3.89−2	−1.40−2	1.15−2	1.23−2	−2.37−2		10	−3.66−2	−1.38−2	1.09−2	1.13−2	−2.22−2
$4d_{3/2}$	1	−7.61−3	−3.22−3	5.05−4	1.86−3	−2.36−3	$4d_{3/2}$	1	−8.36−3	−3.45−3	5.17−4	2.07−3	−2.58−3
	3	−1.08−2	−2.49−4	−1.47−3	3.91−3	−2.44−3		3	−9.76−3	−1.86−4	−1.53−3	3.52−3	−1.99−3
	5	−5.04−2	−5.04−3	3.32−4	1.82−2	−1.86−2		5	−4.77−2	−4.51−3	5.92−5	1.73−2	−1.73−2
	10	−2.05−1	−3.19−2	9.41−3	7.10−2	−8.04−2		10	−1.99−1	−3.07−2	9.25−3	6.94−2	−7.86−2
$4d_{5/2}$	1	−4.13−3	−3.48−3	1.61−3	5.83−4	−2.19−3	$4d_{5/2}$	1	−4.80−3	−3.71−3	1.65−3	7.67−4	−2.41−3
	3	−3.15−3	−1.06−3	2.05−3	1.24−3	−3.29−3		3	−2.07−3	−9.73−4	1.99−3	8.36−4	−2.83−3
	5	−3.94−2	−6.78−3	6.08−3	1.43−2	−2.03−2		5	−3.66−2	−6.21−3	5.87−3	1.33−2	−1.92−2
	10	−1.87−1	−3.67−2	1.81−2	6.39−2	−8.20−2		10	−1.82−1	−3.55−2	1.80−2	6.23−2	−8.03−2
$4f_{5/2}$	1	−6.84−3	5.85−5	−1.05−3	2.55−3	−1.50−3	$4f_{5/2}$	1	−6.31−3	1.13−4	−1.02−3	2.36−3	−1.35−3
	3	−7.52−2	−9.49−3	−3.12−3	2.57−2	−2.26−2		3	−7.28−2	−8.88−3	−3.14−3	2.49−2	−2.18−2
	5	−1.71−1	−2.66−2	−5.88−3	5.67−2	−5.08−2		5	−1.68−1	−2.58−2	−5.70−3	5.57−2	−5.00−2
	10	−4.36−1	−7.79−2	−2.04−2	1.39−1	−1.19−1		10	−4.30−1	−7.64−2	−1.96−2	1.38−1	−1.18−1
$4f_{7/2}$	1	−4.23−3	−2.98−4	−1.70−5	1.57−3	−1.55−3	$4f_{7/2}$	1	−3.68−3	−2.43−4	1.66−5	1.38−3	−1.39−3
	3	−6.82−2	−1.08−2	2.35−4	2.30−2	−2.32−2		3	−6.57−2	−1.01−2	2.27−4	2.23−2	−2.25−2
	5	−1.60−1	−2.91−2	−6.93−4	5.23−2	−5.16−2		5	−1.57−1	−2.82−2	−4.65−4	5.14−2	−5.09−2
	10	−4.18−1	−8.37−2	−1.33−2	1.31−1	−1.18−1		10	−4.13−1	−8.22−2	−1.24−2	1.30−1	−1.17−1
$5s_{1/2}$	1	2.98−3	6.85−3	1.06−3	1.76−3	−2.82−3	$5s_{1/2}$	1	3.12−3	7.03−3	1.06−3	1.78−3	−2.84−3
	3	−2.94−2	−4.54−3	7.86−3	1.15−2	−1.94−2		3	−2.85−2	−3.78−3	7.82−3	1.15−2	−1.93−2
	5	−5.10−2	−1.64−2	1.11−2	1.61−2	−2.72−2		5	−5.19−2	−1.62−2	1.14−2	1.66−2	−2.80−2
	10	−4.46−2	−2.30−2	7.10−3	1.01−2	−1.72−2		10	−4.77−2	−2.39−2	7.80−3	1.11−2	−1.89−2
$5p_{1/2}$	1	−4.32−3	3.07−3	5.71−4	3.07−3	−3.64−3	$5p_{1/2}$	1	−3.55−3	3.54−3	4.96−4	2.94−3	−3.43−3
	3	−2.28−2	−7.37−3	1.74−3	6.53−3	−8.27−3		3	−2.39−2	−7.52−3	1.97−3	6.94−3	−8.91−3
	5	−1.70−2	−6.29−3	−1.15−3	4.06−3	−2.91−3		5	−1.80−2	−6.68−3	−1.00−3	4.31−3	−3.31−3
	10	−4.23−2	−6.80−3	8.84−4	1.44−2	−1.52−2		10	−3.98−2	−6.58−3	4.01−4	1.34−2	−1.38−2
$5p_{3/2}$	1	−4.00−3	6.73−4	1.05−3	2.08−3	−3.13−3	$5p_{3/2}$	1	−3.37−3	1.01−3	9.61−4	1.95−3	−2.91−3
	3	−1.57−2	−8.85−3	3.87−3	3.51−3	−7.38−3		3	−1.67−2	−9.10−3	4.08−3	3.84−3	−7.92−3
	5	−8.75−3	−8.43−3	2.94−3	7.13−4	−3.66−3		5	−9.42−3	−8.81−3	3.06−3	8.56−4	−3.91−3
	10	−3.76−2	−1.41−2	1.11−2	1.16−2	−2.28−2		10	−3.54−2	−1.39−2	1.05−2	1.07−2	−2.12−2
$6s_{1/2}$	1	2.63−3	6.46−3	1.05−3	1.74−3	−2.79−3	$6s_{1/2}$	1	2.80−3	6.63−3	1.04−3	1.74−3	−2.79−3
	3	−2.91−2	−4.47−3	7.81−3	1.14−2	−1.92−2		3	−2.80−2	−3.58−3	7.73−3	1.13−2	−1.91−2
	5	−5.09−2	−1.63−2	1.11−2	1.60−2	−2.71−2		5	−5.17−2	−1.61−2	1.14−2	1.65−2	−2.79−2
	10	−4.48−2	−2.31−2	7.12−3	1.01−2	−1.72−2		10	−4.79−2	−2.40−2	7.82−3	1.11−2	−1.89−2
$Z = 71$, Lu: $4f^6_{5/2}4f^8_{7/2}5d^1_{3/2}6s^2_{1/2}$							$Z = 72$, Hf: $4f^6_{5/2}4f^8_{7/2}5d^2_{3/2}6s^2_{1/2}$						
$3d_{3/2}$	1	7.77−3	5.11−3	−1.25−3	−1.32−3	2.57−3	$3d_{3/2}$	1	8.06−3	5.21−3	−1.20−3	−1.38−3	2.58−3
	3	−1.67−2	5.73−3	−4.10−3	8.17−3	−4.07−3		3	−1.49−2	6.33−3	−4.31−3	7.64−3	−3.33−3
	5	−7.09−2	−2.68−3	−1.76−3	2.69−2	−2.52−2		5	−6.81−2	−1.81−3	−2.12−3	2.61−2	−2.40−2
	10	−2.39−1	−3.44−2	7.87−3	8.36−2	−9.15−2		10	−2.35−1	−3.31−2	7.66−3	8.24−2	−9.01−2
$3d_{5/2}$	1	1.54−2	4.42−3	1.68−3	−4.05−3	2.37−3	$3d_{5/2}$	1	1.59−2	4.50−3	1.81−3	−4.20−3	2.39−3
	3	−5.57−3	4.41−3	1.39−3	4.27−3	−5.66−3		3	−3.53−3	5.02−3	1.30−3	3.68−3	−4.98−3
	5	−5.67−2	−5.00−3	5.57−3	2.18−2	−2.74−2		5	−5.39−2	−4.11−3	5.37−3	2.10−2	−2.64−2
	10	−2.20−1	−3.99−2	1.74−2	7.56−2	−9.30−2		10	−2.16−1	−3.86−2	1.73−2	7.45−2	−9.18−2
$4s_{1/2}$	1	4.40−3	1.03−2	1.63−3	2.69−3	−4.32−3	$4s_{1/2}$	1	4.58−3	1.07−2	1.68−3	2.78−3	−4.46−3
	3	−3.20−2	−3.79−3	8.92−3	1.31−2	−2.20−2		3	−3.14−2	−3.00−3	8.93−3	1.31−2	−2.21−2
	5	−5.64−2	−1.71−2	1.26−2	1.82−2	−3.08−2		5	−5.73−2	−1.68−2	1.29−2	1.88−2	−3.17−2
	10	−5.18−2	−2.51−2	8.73−3	1.24−2	−2.12−2		10	−5.51−2	−2.60−2	9.50−3	1.36−2	−2.31−2
$4p_{1/2}$	1	−6.92−3	3.69−3	4.50−4	4.34−3	−4.79−3	$4p_{1/2}$	1	−6.34−3	4.24−3	3.81−4	4.31−3	−4.69−3
	3	−2.68−2	−8.35−3	1.92−3	7.77−3	−9.69−3		3	−2.82−2	−8.57−3	2.14−3	8.26−3	−1.04−2
	5	−1.92−2	−6.89−3	−1.19−3	4.70−3	−3.52−3		5	−2.04−2	−7.33−3	−1.02−3	5.03−3	−4.00−3
	10	−3.91−2	−6.07−3	−1.09−4	1.32−2	−1.31−2		10	−3.71−2	−5.93−3	−5.48−4	1.23−2	−1.18−2

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4p_{3/2}$	1	−5.73−3	5.15−4	1.21−3	2.74−3	−3.94−3	$4p_{3/2}$	1	−5.24−3	8.24−4	1.14−3	2.65−3	−3.79−3
	3	−1.82−2	−9.91−3	4.37−3	4.19−3	−8.56−3		3	−1.93−2	−1.02−2	4.59−3	4.54−3	−9.13−3
	5	−9.72−3	−9.06−3	3.21−3	9.06−4	−4.11−3		5	−1.05−2	−9.49−3	3.36−3	1.09−3	−4.45−3
	10	−3.45−2	−1.35−2	1.03−2	1.04−2	−2.07−2		10	−3.25−2	−1.34−2	9.79−3	9.61−3	−1.94−2
$4d_{3/2}$	1	−9.01−3	−3.65−3	5.14−4	2.25−3	−2.76−3	$4d_{3/2}$	1	−9.75−3	−3.87−3	5.05−4	2.45−3	−2.96−3
	3	−8.90−3	−1.53−4	−1.57−3	3.18−3	−1.61−3		3	−8.14−3	−1.41−4	−1.61−3	2.88−3	−1.27−3
	5	−4.51−2	−4.01−3	−1.99−4	1.64−2	−1.62−2		5	−4.26−2	−3.55−3	−4.55−4	1.55−2	−1.51−2
	10	−1.94−1	−2.95−2	9.05−3	6.77−2	−7.68−2		10	−1.89−1	−2.84−2	8.83−3	6.62−2	−7.50−2
$4d_{5/2}$	1	−5.41−3	−3.91−3	1.66−3	9.32−4	−2.60−3	$4d_{5/2}$	1	−6.06−3	−4.14−3	1.68−3	1.10−3	−2.79−3
	3	−1.15−3	−9.16−4	1.95−3	4.84−4	−2.43−3		3	−3.03−4	−8.78−4	1.92−3	1.53−4	−2.07−3
	5	−3.40−2	−5.68−3	5.67−3	1.25−2	−1.81−2		5	−3.15−2	−5.17−3	5.47−3	1.16−2	−1.71−2
	10	−1.77−1	−3.42−2	1.79−2	6.08−2	−7.87−2		10	−1.72−1	−3.31−2	1.78−2	5.93−2	−7.71−2
$4f_{5/2}$	1	−5.77−3	2.05−4	−9.83−4	2.19−3	−1.21−3	$4f_{5/2}$	1	−5.27−3	2.99−4	−9.52−4	2.04−3	−1.08−3
	3	−7.04−2	−8.27−3	−3.14−3	2.42−2	−2.11−2		3	−6.81−2	−7.70−3	−3.16−3	2.35−2	−2.04−2
	5	−1.65−1	−2.49−2	−5.52−3	5.48−2	−4.92−2		5	−1.61−1	−2.40−2	−5.37−3	5.39−2	−4.85−2
	10	−4.25−1	−7.49−2	−1.89−2	1.36−1	−1.17−1		10	−4.20−1	−7.36−2	−1.82−2	1.35−1	−1.17−1
$4f_{7/2}$	1	−3.13−3	−1.50−4	5.22−5	1.20−3	−1.26−3	$4f_{7/2}$	1	−2.61−3	−5.63−5	8.98−5	1.04−3	−1.13−3
	3	−6.33−2	−9.53−3	2.29−4	2.16−2	−2.18−2		3	−6.11−2	−8.96−3	2.18−4	2.09−2	−2.11−2
	5	−1.54−1	−2.73−2	−2.47−4	5.05−2	−5.02−2		5	−1.50−1	−2.64−2	−4.90−5	4.96−2	−4.96−2
	10	−4.08−1	−8.08−2	−1.16−2	1.29−1	−1.17−1		10	−4.03−1	−7.94−2	−1.08−2	1.27−1	−1.16−1
$5s_{1/2}$	1	3.19−3	7.16−3	1.07−3	1.80−3	−2.88−3	$5s_{1/2}$	1	3.24−3	7.31−3	1.10−3	1.85−3	−2.94−3
	3	−2.77−2	−3.06−3	7.77−3	1.14−2	−1.92−2		3	−2.69−2	−2.32−3	7.72−3	1.14−2	−1.91−2
	5	−5.26−2	−1.60−2	1.17−2	1.70−2	−2.88−2		5	−5.33−2	−1.56−2	1.20−2	1.75−2	−2.95−2
	10	−5.08−2	−2.48−2	8.51−3	1.21−2	−2.06−2		10	−5.39−2	−2.56−2	9.24−3	1.32−2	−2.24−2
$5p_{1/2}$	1	−2.94−3	3.91−3	4.47−4	2.83−3	−3.28−3	$5p_{1/2}$	1	−2.36−3	4.29−3	4.07−4	2.74−3	−3.15−3
	3	−2.48−2	−7.63−3	2.19−3	7.32−3	−9.51−3		3	−2.58−2	−7.72−3	2.40−3	7.71−3	−1.01−2
	5	−1.89−2	−7.06−3	−8.36−4	4.58−3	−3.75−3		5	−2.00−2	−7.46−3	−6.47−4	4.90−3	−4.25−3
	10	−3.75−2	−6.42−3	−4.30−5	1.24−2	−1.24−2		10	−3.55−2	−6.31−3	−4.59−4	1.16−2	−1.11−2
$5p_{3/2}$	1	−2.89−3	1.25−3	8.93−4	1.84−3	−2.73−3	$5p_{3/2}$	1	−2.43−3	1.49−3	8.35−4	1.74−3	−2.57−3
	3	−1.75−2	−9.31−3	4.26−3	4.14−3	−8.40−3		3	−1.84−2	−9.54−3	4.45−3	4.45−3	−8.89−3
	5	−1.02−2	−9.19−3	3.19−3	1.03−3	−4.21−3		5	−1.10−2	−9.59−3	3.34−3	1.23−3	−4.57−3
	10	−3.33−2	−1.37−2	9.98−3	9.85−3	−1.98−2		10	−3.14−2	−1.35−2	9.47−3	9.04−3	−1.85−2
$5d_{3/2}$	1	−8.33−3	−3.12−3	6.63−4	2.22−3	−2.88−3	$5d_{3/2}$	1	−8.81−3	−3.22−3	6.52−4	2.37−3	−3.02−3
	3	−7.99−3	−7.24−4	−1.29−3	2.65−3	−1.36−3		3	−7.40−3	−8.17−4	−1.27−3	2.38−3	−1.11−3
	5	−4.18−2	−4.12−3	−8.01−5	1.51−2	−1.50−2		5	−3.93−2	−3.70−3	−3.19−4	1.42−2	−1.39−2
	10	−1.89−1	−2.89−2	9.19−3	6.57−2	−7.49−2		10	−1.83−1	−2.78−2	8.96−3	6.40−2	−7.29−2
$6s_{1/2}$	1	2.83−3	6.74−3	1.06−3	1.78−3	−2.84−3	$6s_{1/2}$	1	2.87−3	6.84−3	1.07−3	1.80−3	−2.87−3
	3	−2.74−2	−2.94−3	7.69−3	1.13−2	−1.90−2		3	−2.60−2	−1.95−3	7.56−3	1.11−2	−1.87−2
	5	−5.24−2	−1.59−2	1.17−2	1.70−2	−2.87−2		5	−5.31−2	−1.56−2	1.20−2	1.74−2	−2.94−2
	10	−5.09−2	−2.48−2	8.53−3	1.22−2	−2.07−2		10	−5.41−2	−2.56−2	9.26−3	1.32−2	−2.25−2
$Z = 73$, Ta: $4f^6_{5/2}4f^8_{7/2}5d^3_{3/2}6s^2_{1/2}$							$Z = 74$, W: $4f^6_{5/2}4f^8_{7/2}5d^4_{3/2}6s^2_{1/2}$						
$3d_{3/2}$	1	8.34−3	5.31−3	−1.15−3	−1.44−3	2.59−3	$3d_{3/2}$	1	8.62−3	5.41−3	−1.09−3	−1.50−3	2.59−3
	3	−1.32−2	6.90−3	−4.51−3	7.14−3	−2.63−3		3	−1.15−2	7.45−3	−4.70−3	6.65−3	−1.95−3
	5	−6.55−2	−9.42−4	−2.49−3	2.53−2	−2.28−2		5	−6.28−2	−7.63−5	−2.87−3	2.45−2	−2.16−2
	10	−2.31−1	−3.19−2	7.41−3	8.12−2	−8.87−2		10	−2.27−1	−3.06−2	7.13−3	8.00−2	−8.72−2
$3d_{5/2}$	1	1.64−2	4.59−3	1.94−3	−4.35−3	2.41−3	$3d_{5/2}$	1	1.70−2	4.67−3	2.08−3	−4.50−3	2.41−3
	3	−1.62−3	5.58−3	1.22−3	3.12−3	−4.34−3		3	2.80−4	6.15−3	1.14−3	2.58−3	−3.72−3
	5	−5.11−2	−3.24−3	5.17−3	2.02−2	−2.53−2		5	−4.83−2	−2.36−3	4.97−3	1.94−2	−2.43−2
	10	−2.12−1	−3.73−2	1.72−2	7.33−2	−9.06−2		10	−2.08−1	−3.60−2	1.72−2	7.22−2	−8.93−2
$4s_{1/2}$	1	4.73−3	1.11−2	1.74−3	2.89−3	−4.62−3	$4s_{1/2}$	1	4.83−3	1.14−2	1.80−3	3.00−3	−4.81−3
	3	−3.06−2	−2.17−3	8.92−3	1.32−2	−2.21−2		3	−2.98−2	−1.31−3	8.91−3	1.32−2	−2.21−2
	5	−5.82−2	−1.65−2	1.33−2	1.93−2	−3.26−2		5	−5.89−2	−1.61−2	1.36−2	1.98−2	−3.34−2
	10	−5.85−2	−2.69−2	1.03−2	1.47−2	−2.50−2		10	−6.19−2	−2.77−2	1.11−2	1.59−2	−2.70−2
$4p_{1/2}$	1	−5.74−3	4.80−3	3.15−4	4.28−3	−4.59−3	$4p_{1/2}$	1	−5.13−3	5.35−3	2.53−4	4.24−3	−4.50−3
	3	−2.94−2	−8.76−3	2.37−3	8.74−3	−1.11−2		3	−3.07−2	−8.92−3	2.59−3	9.22−3	−1.18−2
	5	−2.17−2	−7.78−3	−8.37−4	5.39−3	−4.55−3		5	−2.30−2	−8.23−3	−6.31−4	5.78−3	−5.15−3
	10	−3.52−2	−5.84−3	−9.60−4	1.15−2	−1.06−2		10	−3.34−2	−5.78−3	−1.35−3	1.08−2	−9.45−3

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4p_{3/2}$	1	−4.75−3	1.13−3	1.07−3	2.57−3	−3.63−3	$4p_{3/2}$	1	−4.25−3	1.44−3	9.99−4	2.47−3	−3.47−3
	3	−2.04−2	−1.05−2	4.80−3	4.89−3	−9.70−3		3	−2.14−2	−1.08−2	5.01−3	5.24−3	−1.02−2
	5	−1.14−2	−9.93−3	3.53−3	1.31−3	−4.84−3		5	−1.24−2	−1.04−2	3.72−3	1.55−3	−5.27−3
	10	−3.07−2	−1.33−2	9.30−3	8.84−3	−1.81−2		10	−2.90−2	−1.32−2	8.84−3	8.10−3	−1.69−2
$4d_{3/2}$	1	−1.05−2	−4.09−3	4.86−4	2.65−3	−3.14−3	$4d_{3/2}$	1	−1.12−2	−4.30−3	4.57−4	2.85−3	−3.31−3
	3	−7.49−3	−1.66−4	−1.62−3	2.61−3	−9.84−4		3	−6.94−3	−2.18−4	−1.63−3	2.36−3	−7.36−4
	5	−4.02−2	−3.11−3	−7.06−4	1.47−2	−1.40−2		5	−3.79−2	−2.69−3	−9.52−4	1.39−2	−1.29−2
	10	−1.84−1	−2.73−2	8.57−3	6.46−2	−7.31−2		10	−1.79−1	−2.62−2	8.28−3	6.30−2	−7.12−2
$4d_{5/2}$	1	−6.71−3	−4.36−3	1.70−3	1.28−3	−2.97−3	$4d_{5/2}$	1	−7.38−3	−4.58−3	1.70−3	1.46−3	−3.16−3
	3	4.29−4	−8.78−4	1.90−3	−1.43−4	−1.75−3		3	1.07−3	−9.06−4	1.89−3	−4.13−4	−1.48−3
	5	−2.91−2	−4.69−3	5.28−3	1.08−2	−1.61−2		5	−2.67−2	−4.24−3	5.09−3	1.00−2	−1.51−2
	10	−1.67−1	−3.19−2	1.77−2	5.78−2	−7.55−2		10	−1.63−1	−3.07−2	1.76−2	5.63−2	−7.38−2
$4f_{5/2}$	1	−4.78−3	3.94−4	−9.21−4	1.89−3	−9.66−4	$4f_{5/2}$	1	−4.30−3	4.91−4	−8.88−4	1.74−3	−8.52−4
	3	−6.59−2	−7.13−3	−3.18−3	2.29−2	−1.97−2		3	−6.37−2	−6.57−3	−3.20−3	2.22−2	−1.90−2
	5	−1.58−1	−2.32−2	−5.23−3	5.29−2	−4.77−2		5	−1.55−1	−2.23−2	−5.12−3	5.20−2	−4.69−2
	10	−4.15−1	−7.22−2	−1.75−2	1.34−1	−1.16−1		10	−4.10−1	−7.08−2	−1.68−2	1.32−1	−1.16−1
$4f_{7/2}$	1	−2.09−3	3.86−5	1.29−4	8.78−4	−1.01−3	$4f_{7/2}$	1	−1.58−3	1.34−4	1.69−4	7.20−4	−8.89−4
	3	−5.88−2	−8.38−3	2.11−4	2.02−2	−2.04−2		3	−5.65−2	−7.81−3	2.02−4	1.95−2	−1.97−2
	5	−1.47−1	−2.55−2	1.30−4	4.87−2	−4.88−2		5	−1.44−1	−2.46−2	2.92−4	4.78−2	−4.81−2
	10	−3.98−1	−7.80−2	−1.01−2	1.26−1	−1.16−1		10	−3.93−1	−7.66−2	−9.31−3	1.25−1	−1.15−1
$5s_{1/2}$	1	3.27−3	7.46−3	1.12−3	1.90−3	−3.02−3	$5s_{1/2}$	1	3.29−3	7.60−3	1.16−3	1.96−3	−3.11−3
	3	−2.60−2	−1.56−3	7.66−3	1.13−2	−1.90−2		3	−2.51−2	−7.83−4	7.59−3	1.13−2	−1.88−2
	5	−5.38−2	−1.53−2	1.23−2	1.79−2	−3.02−2		5	−5.42−2	−1.48−2	1.25−2	1.83−2	−3.08−2
	10	−5.71−2	−2.64−2	9.99−3	1.43−2	−2.43−2		10	−6.04−2	−2.72−2	1.08−2	1.54−2	−2.62−2
$5p_{1/2}$	1	−1.79−3	4.67−3	3.75−4	2.66−3	−3.03−3	$5p_{1/2}$	1	−1.23−3	5.05−3	3.51−4	2.58−3	−2.93−3
	3	−2.67−2	−7.78−3	2.61−3	8.10−3	−1.07−2		3	−2.76−2	−7.80−3	2.82−3	8.48−3	−1.13−2
	5	−2.12−2	−7.86−3	−4.37−4	5.25−3	−4.81−3		5	−2.24−2	−8.26−3	−2.06−4	5.63−3	−5.42−3
	10	−3.37−2	−6.25−3	−8.48−4	1.08−2	−9.95−3		10	−3.20−2	−6.23−3	−1.21−3	1.01−2	−8.86−3
$5p_{3/2}$	1	−1.98−3	1.73−3	7.82−4	1.64−3	−2.42−3	$5p_{3/2}$	1	−1.53−3	1.96−3	7.34−4	1.54−3	−2.28−3
	3	−1.93−2	−9.74−3	4.62−3	4.75−3	−9.37−3		3	−2.01−2	−9.92−3	4.79−3	5.04−3	−9.83−3
	5	−1.19−2	−9.99−3	3.51−3	1.45−3	−4.97−3		5	−1.28−2	−1.04−2	3.71−3	1.70−3	−5.41−3
	10	−2.97−2	−1.34−2	8.98−3	8.28−3	−1.73−2		10	−2.81−2	−1.34−2	8.52−3	7.57−3	−1.61−2
$5d_{3/2}$	1	−9.34−3	−3.35−3	6.41−4	2.53−3	−3.17−3	$5d_{3/2}$	1	−9.84−3	−3.45−3	6.17−4	2.68−3	−3.30−3
	3	−6.84−3	−8.79−4	−1.26−3	2.13−3	−8.65−4		3	−6.36−3	−9.65−4	−1.24−3	1.91−3	−6.67−4
	5	−3.69−2	−3.33−3	−5.48−4	1.33−2	−1.28−2		5	−3.46−2	−2.98−3	−7.65−4	1.25−2	−1.17−2
	10	−1.78−1	−2.67−2	8.70−3	6.23−2	−7.10−2		10	−1.73−1	−2.56−2	8.42−3	6.06−2	−6.90−2
$6s_{1/2}$	1	3.08−3	7.09−3	1.07−3	1.82−3	−2.89−3	$6s_{1/2}$	1	3.21−3	7.31−3	1.09−3	1.86−3	−2.95−3
	3	−2.54−2	−1.38−3	7.52−3	1.11−2	−1.87−2		3	−2.48−2	−7.64−4	7.48−3	1.11−2	−1.86−2
	5	−5.35−2	−1.51−2	1.22−2	1.78−2	−3.00−2		5	−5.38−2	−1.47−2	1.25−2	1.81−2	−3.06−2
	10	−5.72−2	−2.64−2	1.00−2	1.43−2	−2.43−2		10	−6.04−2	−2.72−2	1.08−2	1.55−2	−2.62−2
$Z = 75$, Re: $4f^6_{5/2}4f^8_{7/2}5d^4_{3/2}5d^1_{5/2}6s^2_{1/2}$							$Z = 76$, Os: $4f^6_{5/2}4f^8_{7/2}5d^4_{3/2}5d^2_{5/2}6s^2_{1/2}$						
$3d_{3/2}$	1	8.87−3	5.51−3	−1.03−3	−1.55−3	2.58−3	$3d_{5/2}$	1	1.79−2	4.82−3	2.37−3	−4.77−3	2.40−3
	3	−9.86−3	8.01−3	−4.89−3	6.17−3	−1.28−3		3	4.03−3	7.25−3	1.02−3	1.49−3	−2.51−3
	5	−6.01−2	7.87−4	−3.24−3	2.37−2	−2.05−2		5	−4.26−2	−6.08−4	4.58−3	1.77−2	−2.23−2
	10	−2.23−1	−2.93−2	6.80−3	7.88−2	−8.56−2		10	−2.00−1	−3.34−2	1.69−2	6.99−2	−8.68−2
$3d_{5/2}$	1	1.75−2	4.75−3	2.22−3	−4.64−3	2.41−3	$4s_{1/2}$	1	4.91−3	1.22−2	1.98−3	3.30−3	−5.27−3
	3	2.16−3	6.70−3	1.08−3	2.03−3	−3.11−3		3	−2.80−2	4.94−4	8.85−3	1.32−2	−2.20−2
	5	−4.54−2	−1.48−3	4.77−3	1.85−2	−2.33−2		5	−5.99−2	−1.52−2	1.42−2	2.07−2	−3.50−2
	10	−2.04−1	−3.47−2	1.70−2	7.10−2	−8.81−2		10	−6.88−2	−2.93−2	1.28−2	1.84−2	−3.12−2
$4s_{1/2}$	1	4.91−3	1.18−2	1.88−3	3.14−3	−5.02−3	$4p_{1/2}$	1	−3.93−3	6.49−3	1.43−4	4.19−3	−4.34−3
	3	−2.89−2	−4.26−4	8.88−3	1.32−2	−2.21−2		3	−3.31−2	−9.14−3	3.01−3	1.02−2	−1.32−2
	5	−5.95−2	−1.57−2	1.39−2	2.03−2	−3.42−2		5	−2.59−2	−9.15−3	−1.60−4	6.68−3	−6.52−3
	10	−6.54−2	−2.85−2	1.19−2	1.71−2	−2.91−2		10	−3.06−2	−5.83−3	−2.03−3	9.49−3	−7.46−3
$4p_{1/2}$	1	−4.52−3	5.91−3	1.98−4	4.21−3	−4.41−3	$4p_{3/2}$	1	−3.25−3	2.05−3	8.71−4	2.29−3	−3.16−3
	3	−3.19−2	−9.04−3	2.80−3	9.70−3	−1.25−2		3	−2.35−2	−1.14−2	5.40−3	5.92−3	−1.13−2
	5	−2.44−2	−8.69−3	−4.05−4	6.21−3	−5.81−3		5	−1.45−2	−1.13−2	4.17−3	2.11−3	−6.28−3
	10	−3.19−2	−5.78−3	−1.70−3	1.01−2	−8.41−3		10	−2.61−2	−1.31−2	8.01−3	6.78−3	−1.48−2

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4p_{3/2}$	1	−3.75−3	1.75−3	9.35−4	2.38−3	−3.32−3	$4d_{3/2}$	1	−1.27−2	−4.72−3	3.69−4	3.26−3	−3.62−3
	3	−2.24−2	−1.11−2	5.21−3	5.58−3	−1.08−2		3	−6.11−3	−4.05−4	−1.60−3	1.96−3	−3.65−4
	5	−1.34−2	−1.08−2	3.94−3	1.82−3	−5.75−3		5	−3.35−2	−1.95−3	−1.42−3	1.23−2	−1.09−2
	10	−2.75−2	−1.31−2	8.41−3	7.42−3	−1.58−2		10	−1.70−1	−2.40−2	7.62−3	5.98−2	−6.74−2
$4d_{3/2}$	1	−1.20−2	−4.52−3	4.18−4	3.06−3	−3.48−3	$4d_{5/2}$	1	−8.69−3	−5.01−3	1.69−3	1.81−3	−3.50−3
	3	−6.48−3	−2.98−4	−1.62−3	2.15−3	−5.30−4		3	2.09−3	−1.04−3	1.90−3	−8.73−4	−1.03−3
	5	−3.57−2	−2.31−3	−1.19−3	1.31−2	−1.19−2		5	−2.22−2	−3.41−3	4.73−3	8.46−3	−1.32−2
	10	−1.75−1	−2.51−2	7.96−3	6.14−2	−6.93−2		10	−1.53−1	−2.84−2	1.72−2	5.33−2	−7.05−2
$4d_{5/2}$	1	−8.05−3	−4.80−3	1.70−3	1.64−3	−3.34−3	$4f_{5/2}$	1	−3.37−3	6.78−4	−8.19−4	1.46−3	−6.37−4
	3	1.63−3	−9.60−4	1.89−3	−6.56−4	−1.24−3		3	−5.92−2	−5.46−3	−3.23−3	2.09−2	−1.76−2
	5	−2.44−2	−3.81−3	4.91−3	9.22−3	−1.41−2		5	−1.48−1	−2.05−2	−4.94−3	5.01−2	−4.52−2
	10	−1.58−1	−2.96−2	1.74−2	5.48−2	−7.22−2		10	−4.00−1	−6.82−2	−1.56−2	1.30−1	−1.14−1
$4f_{5/2}$	1	−3.83−3	5.89−4	−8.54−4	1.60−3	−7.42−4	$4f_{7/2}$	1	−6.08−4	3.21−4	2.50−4	4.22−4	−6.71−4
	3	−6.15−2	−6.01−3	−3.22−3	2.15−2	−1.83−2		3	−5.21−2	−6.70−3	1.83−4	1.82−2	−1.84−2
	5	−1.52−1	−2.14−2	−5.02−3	5.11−2	−4.61−2		5	−1.38−1	−2.28−2	5.58−4	4.60−2	−4.65−2
	10	−4.05−1	−6.95−2	−1.62−2	1.31−1	−1.15−1		10	−3.84−1	−7.40−2	−7.86−3	1.22−1	−1.14−1
$4f_{7/2}$	1	−1.08−3	2.32−4	2.10−4	5.67−4	−7.76−4	$5s_{1/2}$	1	3.23−3	7.87−3	1.24−3	2.10−3	−3.34−3
	3	−5.43−2	−7.25−3	1.93−4	1.89−2	−1.91−2		3	−2.32−2	8.30−4	7.43−3	1.11−2	−1.85−2
	5	−1.41−1	−2.37−2	4.34−4	4.69−2	−4.73−2		5	−5.47−2	−1.38−2	1.30−2	1.89−2	−3.19−2
	10	−3.88−1	−7.53−2	−8.58−3	1.24−1	−1.15−1		10	−6.68−2	−2.86−2	1.23−2	1.78−2	−3.01−2
$5s_{1/2}$	1	3.28−3	7.74−3	1.19−3	2.02−3	−3.21−3	$5p_{1/2}$	1	−1.57−4	5.81−3	3.28−4	2.45−3	−2.78−3
	3	−2.42−2	1.32−5	7.51−3	1.12−2	−1.87−2		3	−2.92−2	−7.75−3	3.21−3	9.22−3	−1.24−2
	5	−5.45−2	−1.44−2	1.28−2	1.86−2	−3.14−2		5	−2.51−2	−9.05−3	3.12−4	6.48−3	−6.80−3
	10	−6.36−2	−2.79−2	1.16−2	1.66−2	−2.81−2		10	−2.93−2	−6.35−3	−1.84−3	8.82−3	−6.98−3
$5p_{1/2}$	1	−6.87−4	5.43−3	3.36−4	2.51−3	−2.85−3	$5p_{3/2}$	1	−6.51−4	2.42−3	6.54−4	1.36−3	−2.01−3
	3	−2.84−2	−7.79−3	3.02−3	8.85−3	−1.19−2		3	−2.17−2	−1.02−2	5.12−3	5.60−3	−1.07−2
	5	−2.37−2	−8.66−3	4.38−5	6.04−3	−6.08−3		5	−1.49−2	−1.13−2	4.15−3	2.27−3	−6.43−3
	10	−3.06−2	−6.26−3	−1.54−3	9.41−3	−7.87−3		10	−2.53−2	−1.34−2	7.71−3	6.30−3	−1.40−2
$5p_{3/2}$	1	−1.09−3	2.19−3	6.92−4	1.45−3	−2.14−3	$5d_{3/2}$	1	−1.06−2	−3.53−3	5.27−4	2.94−3	−3.47−3
	3	−2.09−2	−1.01−2	4.96−3	5.32−3	−1.03−2		3	−5.82−3	−1.30−3	−1.12−3	1.59−3	−4.61−4
	5	−1.38−2	−1.08−2	3.92−3	1.98−3	−5.90−3		5	−3.02−2	−2.39−3	−1.17−3	1.09−2	−9.73−3
	10	−2.66−2	−1.34−2	8.10−3	6.91−3	−1.50−2		10	−1.62−1	−2.35−2	7.75−3	5.72−2	−6.49−2
$5d_{3/2}$	1	−1.03−2	−3.51−3	5.79−4	2.82−3	−3.40−3	$5d_{5/2}$	1	−7.79−3	−3.92−3	1.55−3	1.86−3	−3.41−3
	3	−6.01−3	−1.09−3	−1.20−3	1.73−3	−5.27−4		3	1.74−3	−1.86−3	2.00−3	−1.04−3	−9.64−4
	5	−3.23−2	−2.66−3	−9.76−4	1.17−2	−1.07−2		5	−1.95−2	−3.75−3	4.68−3	7.24−3	−1.19−2
	10	−1.68−1	−2.45−2	8.10−3	5.89−2	−6.70−2		10	−1.46−1	−2.77−2	1.72−2	5.09−2	−6.81−2
$5d_{5/2}$	1	−7.43−3	−3.89−3	1.58−3	1.73−3	−3.32−3	$6s_{1/2}$	1	3.02−3	7.44−3	1.19−3	2.01−3	−3.19−3
	3	1.51−3	−1.68−3	1.96−3	−8.85−4	−1.08−3		3	−2.24−2	1.05−3	7.24−3	1.08−2	−1.81−2
	5	−2.16−2	−4.07−3	4.84−3	8.00−3	−1.28−2		5	−5.42−2	−1.36−2	1.28−2	1.88−2	−3.16−2
	10	−1.51−1	−2.89−2	1.74−2	5.25−2	−6.99−2		10	−6.68−2	−2.86−2	1.23−2	1.78−2	−3.01−2
$6s_{1/2}$	1	3.22−3	7.46−3	1.13−3	1.92−3	−3.05−3							
	3	−2.40−2	−6.37−5	7.42−3	1.10−2	−1.85−2							
	5	−5.41−2	−1.42−2	1.27−2	1.85−2	−3.11−2							
	10	−6.36−2	−2.79−2	1.16−2	1.66−2	−2.82−2							
$Z = 77$, Ir: $4f^6_{5/2}4f^8_{7/2}5d^4_{3/2}5d^3_{5/2}6s^2_{1/2}$							$Z = 78$, Pt: $4f^6_{5/2}4f^8_{7/2}5d^4_{3/2}5d^5_{5/2}6s^1_{1/2}$						
$4s_{1/2}$	1	4.92−3	1.25−2	2.08−3	3.47−3	−5.54−3	$4s_{1/2}$	1	4.88−3	1.30−2	2.20−3	3.67−3	−5.87−3
	3	−2.71−2	1.45−3	8.82−3	1.32−2	−2.20−2		3	−2.61−2	2.47−3	8.78−3	1.32−2	−2.19−2
	5	−6.03−2	−1.46−2	1.45−2	2.12−2	−3.57−2		5	−6.06−2	−1.39−2	1.47−2	2.16−2	−3.64−2
	10	−7.23−2	−3.00−2	1.37−2	1.96−2	−3.33−2		10	−7.59−2	−3.08−2	1.45−2	2.10−2	−3.55−2
$4p_{1/2}$	1	−3.34−3	7.08−3	1.02−4	4.19−3	−4.29−3	$4p_{1/2}$	1	−2.69−3	7.74−3	6.54−5	4.19−3	−4.25−3
	3	−3.42−2	−9.20−3	3.22−3	1.07−2	−1.39−2		3	−3.54−2	−9.23−3	3.42−3	1.12−2	−1.46−2
	5	−2.75−2	−9.61−3	1.03−4	7.18−3	−7.28−3		5	−2.92−2	−1.01−2	3.88−4	7.73−3	−8.11−3
	10	−2.94−2	−5.92−3	−2.32−3	8.94−3	−6.61−3		10	−2.85−2	−6.06−3	−2.59−3	8.44−3	−5.85−3
$4p_{3/2}$	1	−2.75−3	2.36−3	8.17−4	2.21−3	−3.02−3	$4p_{3/2}$	1	−2.19−3	2.71−3	7.62−4	2.11−3	−2.87−3
	3	−2.44−2	−1.16−2	5.59−3	6.25−3	−1.18−2		3	−2.55−2	−1.19−2	5.78−3	6.59−3	−1.24−2
	5	−1.57−2	−1.18−2	4.42−3	2.42−3	−6.84−3		5	−1.69−2	−1.23−2	4.69−3	2.76−3	−7.46−3
	10	−2.48−2	−1.32−2	7.65−3	6.19−3	−1.38−2		10	−2.37−2	−1.33−2	7.32−3	5.64−3	−1.30−2

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4d_{3/2}$	1	−1.34−2	−4.93−3	3.08−4	3.47−3	−3.77−3	$4d_{3/2}$	1	−1.43−2	−5.18−3	2.30−4	3.71−3	−3.94−3
	3	−5.83−3	−5.37−4	−1.56−3	1.80−3	−2.40−4		3	−5.65−3	−7.04−4	−1.52−3	1.67−3	−1.55−4
	5	−3.14−2	−1.63−3	−1.64−3	1.16−2	−9.96−3		5	−2.95−2	−1.33−3	−1.85−3	1.09−2	−9.04−3
	10	−1.65−1	−2.30−2	7.24−3	5.82−2	−6.55−2		10	−1.60−1	−2.20−2	6.85−3	5.67−2	−6.35−2
$4d_{5/2}$	1	−9.40−3	−5.24−3	1.68−3	2.00−3	−3.68−3	$4d_{5/2}$	1	−1.02−2	−5.50−3	1.66−3	2.21−3	−3.87−3
	3	2.48−3	−1.15−3	1.93−3	−1.06−3	−8.65−4		3	2.79−3	−1.29−3	1.97−3	−1.24−3	−7.32−4
	5	−2.01−2	−3.05−3	4.57−3	7.73−3	−1.23−2		5	−1.80−2	−2.71−3	4.41−3	7.00−3	−1.14−2
	10	−1.48−1	−2.73−2	1.70−2	5.18−2	−6.88−2		10	−1.44−1	−2.62−2	1.68−2	5.04−2	−6.72−2
$4f_{5/2}$	1	−2.92−3	7.80−4	−7.86−4	1.32−3	−5.35−4	$4f_{5/2}$	1	−2.50−3	8.64−4	−7.54−4	1.19−3	−4.41−4
	3	−5.71−2	−4.93−3	−3.25−3	2.02−2	−1.70−2		3	−5.50−2	−4.38−3	−3.26−3	1.96−2	−1.63−2
	5	−1.45−1	−1.96−2	−4.88−3	4.92−2	−4.43−2		5	−1.42−1	−1.87−2	−4.83−3	4.83−2	−4.34−2
	10	−3.96−1	−6.69−2	−1.50−2	1.28−1	−1.13−1		10	−3.91−1	−6.56−2	−1.44−2	1.27−1	−1.13−1
$4f_{7/2}$	1	−1.13−4	4.22−4	2.93−4	2.73−4	−5.65−4	$4f_{7/2}$	1	3.46−4	5.03−4	3.38−4	1.30−4	−4.68−4
	3	−5.00−2	−6.17−3	1.74−4	1.76−2	−1.77−2		3	−4.78−2	−5.62−3	1.73−4	1.69−2	−1.71−2
	5	−1.34−1	−2.19−2	6.66−4	4.51−2	−4.57−2		5	−1.31−1	−2.11−2	7.57−4	4.41−2	−4.49−2
	10	−3.79−1	−7.27−2	−7.15−3	1.21−1	−1.14−1		10	−3.74−1	−7.14−2	−6.45−3	1.20−1	−1.13−1
$5s_{1/2}$	1	3.19−3	8.01−3	1.29−3	2.19−3	−3.48−3	$5s_{1/2}$	1	3.13−3	8.19−3	1.35−3	2.29−3	−3.64−3
	3	−2.22−2	1.67−3	7.34−3	1.10−2	−1.83−2		3	−2.11−2	2.55−3	7.25−3	1.09−2	−1.82−2
	5	−5.48−2	−1.32−2	1.31−2	1.93−2	−3.24−2		5	−5.48−2	−1.26−2	1.33−2	1.96−2	−3.29−2
	10	−7.00−2	−2.93−2	1.32−2	1.89−2	−3.21−2		10	−7.33−2	−2.99−2	1.40−2	2.02−2	−3.41−2
$5p_{1/2}$	1	3.61−4	6.19−3	3.34−4	2.40−3	−2.73−3	$5p_{1/2}$	1	9.22−4	6.62−3	3.54−4	2.35−3	−2.70−3
	3	−2.99−2	−7.67−3	3.40−3	9.57−3	−1.30−2		3	−3.06−2	−7.53−3	3.58−3	9.93−3	−1.35−2
	5	−2.65−2	−9.44−3	5.96−4	6.95−3	−7.55−3		5	−2.80−2	−9.83−3	9.02−4	7.46−3	−8.36−3
	10	−2.82−2	−6.46−3	−2.10−3	8.28−3	−6.18−3		10	−2.73−2	−6.63−3	−2.34−3	7.82−3	−5.48−3
$5p_{3/2}$	1	−2.22−4	2.65−3	6.25−4	1.27−3	−1.90−3	$5p_{3/2}$	1	2.59−4	2.91−3	6.00−4	1.18−3	−1.78−3
	3	−2.24−2	−1.04−2	5.26−3	5.87−3	−1.11−2		3	−2.31−2	−1.05−2	5.40−3	6.13−3	−1.15−2
	5	−1.60−2	−1.17−2	4.40−3	2.59−3	−6.99−3		5	−1.72−2	−1.22−2	4.67−3	2.93−3	−7.59−3
	10	−2.41−2	−1.35−2	7.36−3	5.74−3	−1.31−2		10	−2.31−2	−1.36−2	7.04−3	5.21−3	−1.22−2
$5d_{3/2}$	1	−1.09−2	−3.55−3	4.67−4	3.05−3	−3.52−3	$5d_{3/2}$	1	−1.13−2	−3.54−3	3.92−4	3.18−3	−3.57−3
	3	−5.69−3	−1.49−3	−1.05−3	1.47−3	−4.20−4		3	−5.57−3	−1.66−3	−9.82−4	1.37−3	−3.84−4
	5	−2.82−2	−2.15−3	−1.35−3	1.02−2	−8.80−3		5	−2.62−2	−1.92−3	−1.53−3	9.42−3	−7.89−3
	10	−1.57−1	−2.24−2	7.38−3	5.55−2	−6.28−2		10	−1.52−1	−2.14−2	6.98−3	5.38−2	−6.08−2
$5d_{5/2}$	1	−8.15−3	−3.95−3	1.51−3	1.98−3	−3.49−3	$5d_{5/2}$	1	−8.52−3	−3.97−3	1.46−3	2.11−3	−3.57−3
	3	1.92−3	−2.03−3	2.04−3	−1.17−3	−8.68−4		3	2.11−3	−2.18−3	2.07−3	−1.30−3	−7.63−4
	5	−1.75−2	−3.46−3	4.52−3	6.50−3	−1.10−2		5	−1.54−2	−3.17−3	4.35−3	5.78−3	−1.01−2
	10	−1.41−1	−2.66−2	1.70−2	4.93−2	−6.64−2		10	−1.37−1	−2.55−2	1.68−2	4.78−2	−6.45−2
$6s_{1/2}$	1	2.79−3	7.41−3	1.24−3	2.10−3	−3.34−3	$6s_{1/2}$	1	2.61−3	7.37−3	1.27−3	2.16−3	−3.43−3
	3	−2.12−2	1.96−3	7.11−3	1.07−2	−1.78−2		3	−2.07−2	2.45−3	7.10−3	1.07−2	−1.78−2
	5	−5.41−2	−1.30−2	1.30−2	1.91−2	−3.21−2		5	−5.44−2	−1.25−2	1.32−2	1.94−2	−3.26−2
	10	−7.00−2	−2.92−2	1.31−2	1.89−2	−3.21−2		10	−7.32−2	−2.98−2	1.40−2	2.01−2	−3.41−2
$Z = 79$, Au: $4f^6_{5/2}4f^8_{7/2}5d^4_{3/2}5d^6_{5/2}6s^1_{1/2}$							$Z = 80$, Hg: $4f^6_{5/2}4f^8_{7/2}5d^4_{3/2}5d^6_{5/2}6s^2_{1/2}$						
$4s_{1/2}$	1	4.81−3	1.33−2	2.33−3	3.88−3	−6.21−3	$4s_{1/2}$	1	4.75−3	1.38−2	2.47−3	4.12−3	−6.59−3
	3	−2.50−2	3.49−3	8.74−3	1.32−2	−2.19−2		3	−2.41−2	4.53−3	8.71−3	1.32−2	−2.19−2
	5	−6.08−2	−1.32−2	1.50−2	2.20−2	−3.70−2		5	−6.09−2	−1.25−2	1.52−2	2.24−2	−3.76−2
	10	−7.94−2	−3.14−2	1.54−2	2.23−2	−3.77−2		10	−8.29−2	−3.20−2	1.63−2	2.36−2	−3.99−2
$4p_{1/2}$	1	−2.13−3	8.37−3	4.26−5	4.21−3	−4.25−3	$4p_{1/2}$	1	−1.66−3	8.97−3	3.44−5	4.26−3	−4.29−3
	3	−3.65−2	−9.23−3	3.62−3	1.16−2	−1.53−2		3	−3.76−2	−9.20−3	3.80−3	1.21−2	−1.59−2
	5	−3.09−2	−1.05−2	6.84−4	8.30−3	−8.98−3		5	−3.27−2	−1.10−2	9.90−4	8.88−3	−9.87−3
	10	−2.77−2	−6.24−3	−2.82−3	8.02−3	−5.20−3		10	−2.71−2	−6.47−3	−3.02−3	7.67−3	−4.65−3
$4p_{3/2}$	1	−1.69−3	3.02−3	7.19−4	2.03−3	−2.75−3	$4p_{3/2}$	1	−1.28−3	3.30−3	6.87−4	1.97−3	−2.66−3
	3	−2.64−2	−1.21−2	5.96−3	6.91−3	−1.29−2		3	−2.73−2	−1.23−2	6.12−3	7.23−3	−1.33−2
	5	−1.82−2	−1.28−2	4.98−3	3.12−3	−8.10−3		5	−1.95−2	−1.34−2	5.27−3	3.49−3	−8.76−3
	10	−2.27−2	−1.34−2	7.03−3	5.14−3	−1.22−2		10	−2.19−2	−1.36−2	6.78−3	4.69−3	−1.15−2
$4d_{3/2}$	1	−1.51−2	−5.39−3	1.44−4	3.93−3	−4.07−3	$4d_{3/2}$	1	−1.60−2	−5.62−3	5.53−5	4.15−3	−4.21−3
	3	−5.55−3	−8.89−4	−1.46−3	1.57−3	−1.08−4		3	−5.55−3	−1.09−3	−1.41−3	1.50−3	−9.66−5
	5	−2.76−2	−1.07−3	−2.04−3	1.02−2	−8.17−3		5	−2.59−2	−8.45−4	−2.22−3	9.59−3	−7.36−3
	10	−1.56−1	−2.09−2	6.42−3	5.51−2	−6.16−2		10	−1.51−1	−2.00−2	5.99−3	5.37−2	−5.96−2

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4d_{5/2}$	1	−1.09−2	−5.74−3	1.63−3	2.41−3	−4.04−3	$4d_{5/2}$	1	−1.17−2	−5.98−3	1.61−3	2.59−3	−4.21−3
	3	3.01−3	−1.45−3	2.02−3	−1.38−3	−6.34−4		3	3.16−3	−1.63−3	2.07−3	−1.50−3	−5.72−4
	5	−1.61−2	−2.40−3	4.27−3	6.32−3	−1.06−2		5	−1.43−2	−2.13−3	4.14−3	5.68−3	−9.82−3
	10	−1.39−1	−2.51−2	1.66−2	4.90−2	−6.55−2		10	−1.35−1	−2.41−2	1.63−2	4.76−2	−6.39−2
$4f_{5/2}$	1	−2.05−3	9.69−4	−7.20−4	1.07−3	−3.45−4	$4f_{5/2}$	1	−1.58−3	1.10−3	−6.86−4	9.33−4	−2.47−4
	3	−5.30−2	−3.88−3	−3.28−3	1.90−2	−1.57−2		3	−5.11−2	−3.39−3	−3.30−3	1.84−2	−1.51−2
	5	−1.39−1	−1.78−2	−4.80−3	4.73−2	−4.25−2		5	−1.35−1	−1.70−2	−4.78−3	4.64−2	−4.16−2
	10	−3.86−1	−6.43−2	−1.39−2	1.26−1	−1.12−1		10	−3.82−1	−6.31−2	−1.34−2	1.25−1	−1.11−1
$4f_{7/2}$	1	8.38−4	6.06−4	3.85−4	−1.56−5	−3.70−4	$4f_{7/2}$	1	1.37−3	7.33−4	4.35−4	−1.66−4	−2.70−4
	3	−4.58−2	−5.11−3	1.65−4	1.63−2	−1.65−2		3	−4.39−2	−4.62−3	1.61−4	1.57−2	−1.59−2
	5	−1.28−1	−2.02−2	8.36−4	4.32−2	−4.41−2		5	−1.25−1	−1.93−2	9.06−4	4.24−2	−4.33−2
	10	−3.70−1	−7.01−2	−5.78−3	1.19−1	−1.13−1		10	−3.65−1	−6.89−2	−5.13−3	1.18−1	−1.12−1
$5s_{1/2}$	1	3.04−3	8.32−3	1.42−3	2.39−3	−3.81−3	$5s_{1/2}$	1	2.96−3	8.50−3	1.49−3	2.51−3	−4.00−3
	3	−2.00−2	3.43−3	7.15−3	1.08−2	−1.79−2		3	−1.89−2	4.31−3	7.06−3	1.07−2	−1.78−2
	5	−5.46−2	−1.19−2	1.35−2	1.98−2	−3.33−2		5	−5.45−2	−1.11−2	1.36−2	2.01−2	−3.37−2
	10	−7.64−2	−3.04−2	1.48−2	2.14−2	−3.62−2		10	−7.96−2	−3.09−2	1.56−2	2.26−2	−3.82−2
$5p_{1/2}$	1	1.40−3	6.99−3	3.87−4	2.31−3	−2.70−3	$5p_{1/2}$	1	1.79−3	7.35−3	4.31−4	2.31−3	−2.74−3
	3	−3.11−2	−7.36−3	3.75−3	1.03−2	−1.40−2		3	−3.17−2	−7.16−3	3.90−3	1.06−2	−1.45−2
	5	−2.95−2	−1.02−2	1.22−3	7.98−3	−9.19−3		5	−3.10−2	−1.05−2	1.54−3	8.51−3	−1.00−2
	10	−2.66−2	−6.83−3	−2.54−3	7.42−3	−4.88−3		10	−2.61−2	−7.06−3	−2.70−3	7.09−3	−4.39−3
$5p_{3/2}$	1	6.65−4	3.12−3	5.86−4	1.10−3	−1.69−3	$5p_{3/2}$	1	1.00−3	3.32−3	5.81−4	1.04−3	−1.62−3
	3	−2.37−2	−1.06−2	5.53−3	6.38−3	−1.19−2		3	−2.43−2	−1.07−2	5.64−3	6.60−3	−1.22−2
	5	−1.84−2	−1.26−2	4.94−3	3.28−3	−8.21−3		5	−1.96−2	−1.31−2	5.22−3	3.63−3	−8.85−3
	10	−2.22−2	−1.37−2	6.75−3	4.74−3	−1.15−2		10	−2.15−2	−1.39−2	6.51−3	4.33−3	−1.08−2
$5d_{3/2}$	1	−1.16−2	−3.55−3	3.21−4	3.29−3	−3.61−3	$5d_{3/2}$	1	−1.19−2	−3.54−3	2.47−4	3.39−3	−3.63−3
	3	−5.65−3	−1.93−3	−8.76−4	1.31−3	−4.38−4		3	−5.75−3	−2.16−3	−7.86−4	1.28−3	−4.94−4
	5	−2.45−2	−1.76−3	−1.67−3	8.75−3	−7.08−3		5	−2.28−2	−1.63−3	−1.81−3	8.13−3	−6.32−3
	10	−1.47−1	−2.04−2	6.55−3	5.21−2	−5.87−2		10	−1.43−1	−1.94−2	6.12−3	5.05−2	−5.66−2
$5d_{5/2}$	1	−8.90−3	−4.01−3	1.42−3	2.24−3	−3.66−3	$5d_{5/2}$	1	−9.14−3	−4.00−3	1.37−3	2.33−3	−3.69−3
	3	2.09−3	−2.42−3	2.14−3	−1.38−3	−7.57−4		3	2.07−3	−2.62−3	2.18−3	−1.44−3	−7.45−4
	5	−1.36−2	−2.97−3	4.22−3	5.11−3	−9.34−3		5	−1.19−2	−2.77−3	4.09−3	4.48−3	−8.58−3
	10	−1.32−1	−2.44−2	1.65−2	4.62−2	−6.27−2		10	−1.27−1	−2.33−2	1.63−2	4.47−2	−6.09−2
$6s_{1/2}$	1	2.67−3	7.58−3	1.31−3	2.23−3	−3.54−3	$6s_{1/2}$	1	2.42−3	7.54−3	1.38−3	2.32−3	−3.70−3
	3	−1.91−2	3.61−3	6.91−3	1.05−2	−1.74−2		3	−1.84−2	4.18−3	6.86−3	1.04−2	−1.73−2
	5	−5.39−2	−1.16−2	1.33−2	1.96−2	−3.29−2		5	−5.37−2	−1.09−2	1.34−2	1.98−2	−3.32−2
	10	−7.63−2	−3.03−2	1.48−2	2.13−2	−3.61−2		10	−7.93−2	−3.08−2	1.56−2	2.25−2	−3.81−2
$Z = 81$, Tl: $4f^6_{5/2}4f^8_{7/2}5d^4_{3/2}5d^6_{5/2}6s^2_{1/2}6p^1_{1/2}$							$Z = 82$, Pb: $4f^6_{5/2}4f^8_{7/2}5d^4_{3/2}5d^6_{5/2}6s^2_{1/2}6p^2_{1/2}$						
$4s_{1/2}$	1	4.61−3	1.42−2	2.64−3	4.38−3	−7.01−3	$4s_{1/2}$	1	4.52−3	1.47−2	2.80−3	4.64−3	−7.44−3
	3	−2.31−2	5.57−3	8.69−3	1.32−2	−2.19−2		3	−2.21−2	6.66−3	8.67−3	1.32−2	−2.19−2
	5	−6.10−2	−1.17−2	1.55−2	2.28−2	−3.82−2		5	−6.10−2	−1.09−2	1.57−2	2.32−2	−3.89−2
	10	−8.63−2	−3.26−2	1.72−2	2.49−2	−4.22−2		10	−8.97−2	−3.30−2	1.81−2	2.63−2	−4.44−2
$4p_{1/2}$	1	−1.27−3	9.58−3	3.21−5	4.35−3	−4.38−3	$4p_{1/2}$	1	−8.83−4	1.02−2	4.63−5	4.45−3	−4.49−3
	3	−3.87−2	−9.15−3	3.98−3	1.26−2	−1.66−2		3	−3.97−2	−9.06−3	4.15−3	1.31−2	−1.73−2
	5	−3.46−2	−1.15−2	1.31−3	9.52−3	−1.08−2		5	−3.65−2	−1.19−2	1.64−3	1.02−2	−1.18−2
	10	−2.68−2	−6.73−3	−3.18−3	7.38−3	−4.21−3		10	−2.66−2	−7.03−3	−3.31−3	7.17−3	−3.86−3
$4p_{3/2}$	1	−9.21−4	3.55−3	6.62−4	1.92−3	−2.58−3	$4p_{3/2}$	1	−5.71−4	3.82−3	6.46−4	1.89−3	−2.53−3
	3	−2.83−2	−1.26−2	6.28−3	7.54−3	−1.38−2		3	−2.92−2	−1.28−2	6.44−3	7.85−3	−1.43−2
	5	−2.08−2	−1.39−2	5.58−3	3.88−3	−9.47−3		5	−2.22−2	−1.45−2	5.91−3	4.28−3	−1.02−2
	10	−2.12−2	−1.38−2	6.57−3	4.30−3	−1.09−2		10	−2.07−2	−1.40−2	6.41−3	3.95−3	−1.04−2
$4d_{3/2}$	1	−1.68−2	−5.84−3	−4.23−5	4.36−3	−4.32−3	$4d_{3/2}$	1	−1.76−2	−6.07−3	−1.47−4	4.58−3	−4.43−3
	3	−5.63−3	−1.31−3	−1.34−3	1.46−3	−1.18−4		3	−5.79−3	−1.56−3	−1.27−3	1.44−3	−1.71−4
	5	−2.42−2	−5.99−4	−2.39−3	8.96−3	−6.57−3		5	−2.27−2	−4.39−4	−2.54−3	8.40−3	−5.86−3
	10	−1.47−1	−1.90−2	5.53−3	5.22−2	−5.77−2		10	−1.42−1	−1.81−2	5.05−3	5.07−2	−5.58−2
$4d_{5/2}$	1	−1.23−2	−6.21−3	1.58−3	2.77−3	−4.35−3	$4d_{5/2}$	1	−1.31−2	−6.45−3	1.55−3	2.95−3	−4.50−3
	3	3.23−3	−1.82−3	2.13−3	−1.59−3	−5.39−4		3	3.23−3	−2.04−3	2.20−3	−1.67−3	−5.36−4
	5	−1.24−2	−1.84−3	4.03−3	5.03−3	−9.06−3		5	−1.08−2	−1.63−3	3.92−3	4.45−3	−8.37−3
	10	−1.30−1	−2.30−2	1.61−2	4.62−2	−6.23−2		10	−1.26−1	−2.20−2	1.58−2	4.48−2	−6.06−2

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4f_{5/2}$	1	−1.20−3	1.21−3	−6.61−4	8.29−4	−1.69−4	$4f_{5/2}$	1	−7.16−4	1.35−3	−6.27−4	7.02−4	−7.45−5
	3	−4.94−2	−2.94−3	−3.33−3	1.79−2	−1.46−2		3	−4.77−2	−2.47−3	−3.35−3	1.74−2	−1.41−2
	5	−1.33−1	−1.63−2	−4.81−3	4.56−2	−4.08−2		5	−1.30−1	−1.54−2	−4.81−3	4.48−2	−4.00−2
	10	−3.78−1	−6.19−2	−1.29−2	1.24−1	−1.11−1		10	−3.73−1	−6.07−2	−1.24−2	1.23−1	−1.10−1
$4f_{7/2}$	1	1.81−3	8.36−4	4.81−4	−2.93−4	−1.88−4	$4f_{7/2}$	1	2.36−3	9.80−4	5.37−4	−4.46−4	−9.12−5
	3	−4.22−2	−4.18−3	1.48−4	1.52−2	−1.54−2		3	−4.04−2	−3.71−3	1.46−4	1.47−2	−1.49−2
	5	−1.22−1	−1.86−2	9.26−4	4.16−2	−4.25−2		5	−1.19−1	−1.78−2	9.76−4	4.08−2	−4.17−2
	10	−3.61−1	−6.77−2	−4.50−3	1.17−1	−1.12−1		10	−3.57−1	−6.65−2	−3.89−3	1.15−1	−1.12−1
$5s_{1/2}$	1	2.86−3	8.69−3	1.57−3	2.65−3	−4.22−3	$5s_{1/2}$	1	2.76−3	8.86−3	1.64−3	2.77−3	−4.41−3
	3	−1.79−2	5.19−3	6.98−3	1.06−2	−1.76−2		3	−1.69−2	6.08−3	6.89−3	1.06−2	−1.74−2
	5	−5.42−2	−1.03−2	1.37−2	2.03−2	−3.41−2		5	−5.38−2	−9.47−3	1.39−2	2.05−2	−3.44−2
	10	−8.26−2	−3.13−2	1.64−2	2.38−2	−4.02−2		10	−8.56−2	−3.17−2	1.72−2	2.50−2	−4.23−2
$5p_{1/2}$	1	2.14−3	7.72−3	4.89−4	2.33−3	−2.82−3	$5p_{1/2}$	1	2.48−3	8.10−3	5.60−4	2.36−3	−2.92−3
	3	−3.22−2	−6.95−3	4.05−3	1.09−2	−1.50−2		3	−3.27−2	−6.68−3	4.20−3	1.12−2	−1.54−2
	5	−3.26−2	−1.09−2	1.87−3	9.08−3	−1.09−2		5	−3.42−2	−1.12−2	2.21−3	9.65−3	−1.19−2
	10	−2.58−2	−7.34−3	−2.82−3	6.83−3	−4.01−3		10	−2.57−2	−7.66−3	−2.91−3	6.64−3	−3.73−3
$5p_{3/2}$	1	1.31−3	3.50−3	5.85−4	9.94−4	−1.58−3	$5p_{3/2}$	1	1.59−3	3.68−3	5.95−4	9.54−4	−1.55−3
	3	−2.49−2	−1.07−2	5.75−3	6.83−3	−1.26−2		3	−2.55−2	−1.08−2	5.85−3	7.04−3	−1.29−2
	5	−2.08−2	−1.35−2	5.51−3	4.00−3	−9.50−3		5	−2.21−2	−1.40−2	5.81−3	4.39−3	−1.02−2
	10	−2.09−2	−1.41−2	6.32−3	3.96−3	−1.03−2		10	−2.04−2	−1.44−2	6.16−3	3.64−3	−9.80−3
$5d_{3/2}$	1	−1.22−2	−3.54−3	1.74−4	3.49−3	−3.66−3	$5d_{3/2}$	1	−1.24−2	−3.52−3	9.75−5	3.57−3	−3.67−3
	3	−6.00−3	−2.45−3	−6.74−4	1.29−3	−6.11−4		3	−6.27−3	−2.72−3	−5.63−4	1.30−3	−7.42−4
	5	−2.14−2	−1.54−3	−1.92−3	7.56−3	−5.63−3		5	−1.99−2	−1.44−3	−2.03−3	6.98−3	−4.95−3
	10	−1.38−1	−1.85−2	5.67−3	4.89−2	−5.46−2		10	−1.33−1	−1.76−2	5.19−3	4.73−2	−5.25−2
$5d_{5/2}$	1	−9.46−3	−4.04−3	1.33−3	2.43−3	−3.76−3	$5d_{5/2}$	1	−9.71−3	−4.05−3	1.28−3	2.52−3	−3.80−3
	3	1.90−3	−2.89−3	2.26−3	−1.46−3	−8.00−4		3	1.71−3	−3.14−3	2.33−3	−1.47−3	−8.61−4
	5	−1.04−2	−2.64−3	3.99−3	3.91−3	−7.90−3		5	−8.83−3	−2.47−3	3.89−3	3.32−3	−7.21−3
	10	−1.22−1	−2.23−2	1.60−2	4.32−2	−5.92−2		10	−1.18−1	−2.13−2	1.57−2	4.17−2	−5.74−2
$6s_{1/2}$	1	2.42−3	7.71−3	1.43−3	2.40−3	−3.83−3	$6s_{1/2}$	1	2.33−3	7.82−3	1.48−3	2.49−3	−3.98−3
	3	−1.68−2	5.26−3	6.67−3	1.02−2	−1.68−2		3	−1.60−2	5.96−3	6.59−3	1.01−2	−1.67−2
	5	−5.31−2	−1.00−2	1.35−2	1.99−2	−3.34−2		5	−5.26−2	−9.21−3	1.36−2	2.01−2	−3.36−2
	10	−8.22−2	−3.11−2	1.63−2	2.37−2	−4.00−2		10	−8.50−2	−3.15−2	1.71−2	2.49−2	−4.20−2
$6p_{1/2}$	1	2.48−3	7.48−3	5.74−4	2.11−3	−2.69−3	$6p_{1/2}$	1	3.00−3	7.87−3	6.34−4	2.08−3	−2.71−3
	3	−3.12−2	−6.46−3	4.06−3	1.07−2	−1.48−2		3	−3.18−2	−6.35−3	4.25−3	1.10−2	−1.53−2
	5	−3.26−2	−1.08−2	1.98−3	9.09−3	−1.11−2		5	−3.41−2	−1.11−2	2.33−3	9.65−3	−1.20−2
	10	−2.58−2	−7.47−3	−2.79−3	6.76−3	−3.97−3		10	−2.56−2	−7.78−3	−2.85−3	6.56−3	−3.71−3
$Z = 83$, Bi: $4f^6_{5/2}4f^8_{7/2}5d^4_{3/2}5d^6_{5/2}6s^2_{1/2}6p^2_{1/2}6p^1_{3/2}$							$Z = 84$, Po: $4f^6_{5/2}4f^8_{7/2}5d^4_{3/2}5d^6_{5/2}6s^2_{1/2}6p^2_{1/2}6p^2_{3/2}$						
$4s_{1/2}$	1	4.35−3	1.52−2	2.97−3	4.92−3	−7.89−3	$4s_{1/2}$	1	4.15−3	1.56−2	3.16−3	5.23−3	−8.39−3
	3	−2.10−2	7.77−3	8.65−3	1.32−2	−2.19−2		3	−1.99−2	8.92−3	8.62−3	1.33−2	−2.19−2
	5	−6.08−2	−9.97−3	1.59−2	2.35−2	−3.94−2		5	−6.06−2	−8.99−3	1.61−2	2.39−2	−3.99−2
	10	−9.31−2	−3.35−2	1.90−2	2.76−2	−4.67−2		10	−9.64−2	−3.38−2	2.00−2	2.90−2	−4.90−2
$4p_{1/2}$	1	−5.44−4	1.08−2	6.61−5	4.56−3	−4.63−3	$4p_{1/2}$	1	−2.30−4	1.14−2	9.56−5	4.69−3	−4.78−3
	3	−4.07−2	−8.93−3	4.31−3	1.36−2	−1.79−2		3	−4.17−2	−8.74−3	4.46−3	1.41−2	−1.85−2
	5	−3.84−2	−1.23−2	1.98−3	1.08−2	−1.28−2		5	−4.04−2	−1.27−2	2.33−3	1.15−2	−1.38−2
	10	−2.66−2	−7.37−3	−3.40−3	7.01−3	−3.61−3		10	−2.68−2	−7.75−3	−3.45−3	6.92−3	−3.47−3
$4p_{3/2}$	1	−2.41−4	4.06−3	6.30−4	1.85−3	−2.48−3	$4p_{3/2}$	1	7.94−5	4.28−3	6.14−4	1.80−3	−2.42−3
	3	−3.01−2	−1.30−2	6.58−3	8.14−3	−1.47−2		3	−3.08−2	−1.31−2	6.69−3	8.40−3	−1.51−2
	5	−2.36−2	−1.50−2	6.23−3	4.69−3	−1.09−2		5	−2.50−2	−1.55−2	6.55−3	5.10−3	−1.17−2
	10	−2.03−2	−1.43−2	6.28−3	3.64−3	−9.91−3		10	−1.99−2	−1.46−2	6.18−3	3.37−3	−9.55−3
$4d_{3/2}$	1	−1.84−2	−6.29−3	−2.61−4	4.79−3	−4.53−3	$4d_{3/2}$	1	−1.92−2	−6.50−3	−3.86−4	4.99−3	−4.60−3
	3	−6.01−3	−1.82−3	−1.19−3	1.44−3	−2.53−4		3	−6.31−3	−2.10−3	−1.10−3	1.46−3	−3.64−4
	5	−2.13−2	−3.10−4	−2.68−3	7.88−3	−5.19−3		5	−2.00−2	−2.09−4	−2.80−3	7.38−3	−4.57−3
	10	−1.38−1	−1.71−2	4.56−3	4.93−2	−5.38−2		10	−1.34−1	−1.62−2	4.05−3	4.78−2	−5.19−2
$4d_{5/2}$	1	−1.37−2	−6.69−3	1.51−3	3.12−3	−4.64−3	$4d_{5/2}$	1	−1.44−2	−6.93−3	1.47−3	3.30−3	−4.77−3
	3	3.16−3	−2.27−3	2.28−3	−1.72−3	−5.59−4		3	3.03−3	−2.53−3	2.36−3	−1.75−3	−6.08−4
	5	−9.29−3	−1.46−3	3.83−3	3.90−3	−7.73−3		5	−7.86−3	−1.31−3	3.75−3	3.37−3	−7.12−3
	10	−1.22−1	−2.10−2	1.56−2	4.34−2	−5.90−2		10	−1.18−1	−2.00−2	1.53−2	4.21−2	−5.74−2

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4f_{5/2}$	1	−2.78−4	1.49−3	−5.97−4	5.87−4	1.03−5	$4f_{5/2}$	1	1.65−4	1.62−3	−5.64−4	4.70−4	9.41−5
	3	−4.61−2	−2.04−3	−3.37−3	1.69−2	−1.36−2		3	−4.44−2	−1.57−3	−3.39−3	1.64−2	−1.30−2
	5	−1.27−1	−1.46−2	−4.82−3	4.40−2	−3.92−2		5	−1.24−1	−1.38−2	−4.83−3	4.32−2	−3.83−2
	10	−3.69−1	−5.94−2	−1.20−2	1.21−1	−1.09−1		10	−3.65−1	−5.82−2	−1.16−2	1.20−1	−1.09−1
$4f_{7/2}$	1	2.86−3	1.11−3	5.89−4	−5.86−4	−3.30−6	$4f_{7/2}$	1	3.38−3	1.24−3	6.44−4	−7.28−4	8.37−5
	3	−3.88−2	−3.28−3	1.35−4	1.42−2	−1.44−2		3	−3.70−2	−2.81−3	1.35−4	1.37−2	−1.38−2
	5	−1.16−1	−1.70−2	1.02−3	3.99−2	−4.09−2		5	−1.13−1	−1.62−2	1.06−3	3.91−2	−4.02−2
	10	−3.53−1	−6.52−2	−3.31−3	1.14−1	−1.11−1		10	−3.49−1	−6.40−2	−2.74−3	1.13−1	−1.11−1
$5s_{1/2}$	1	2.63−3	9.01−3	1.72−3	2.90−3	−4.62−3	$5s_{1/2}$	1	2.48−3	9.19−3	1.82−3	3.04−3	−4.86−3
	3	−1.58−2	6.97−3	6.80−3	1.05−2	−1.73−2		3	−1.47−2	7.89−3	6.72−3	1.04−2	−1.71−2
	5	−5.33−2	−8.57−3	1.39−2	2.07−2	−3.46−2		5	−5.27−2	−7.61−3	1.40−2	2.09−2	−3.49−2
	10	−8.85−2	−3.19−2	1.80−2	2.62−2	−4.42−2		10	−9.13−2	−3.22−2	1.88−2	2.74−2	−4.63−2
$5p_{1/2}$	1	2.78−3	8.47−3	6.44−4	2.41−3	−3.05−3	$5p_{1/2}$	1	3.05−3	8.83−3	7.41−4	2.46−3	−3.20−3
	3	−3.31−2	−6.38−3	4.33−3	1.15−2	−1.59−2		3	−3.34−2	−6.03−3	4.45−3	1.18−2	−1.63−2
	5	−3.58−2	−1.15−2	2.55−3	1.02−2	−1.28−2		5	−3.74−2	−1.17−2	2.90−3	1.08−2	−1.37−2
	10	−2.58−2	−8.01−3	−2.96−3	6.52−3	−3.56−3		10	−2.60−2	−8.39−3	−2.97−3	6.45−3	−3.49−3
$5p_{3/2}$	1	1.86−3	3.85−3	6.09−4	9.16−4	−1.53−3	$5p_{3/2}$	1	2.11−3	4.00−3	6.29−4	8.82−4	−1.51−3
	3	−2.60−2	−1.08−2	5.93−3	7.24−3	−1.32−2		3	−2.64−2	−1.09−2	6.00−3	7.42−3	−1.34−2
	5	−2.33−2	−1.44−2	6.10−3	4.77−3	−1.09−2		5	−2.46−2	−1.49−2	6.40−3	5.16−3	−1.16−2
	10	−2.01−2	−1.47−2	6.05−3	3.37−3	−9.42−3		10	−1.99−2	−1.50−2	5.97−3	3.14−3	−9.11−3
$5d_{3/2}$	1	−1.26−2	−3.49−3	1.51−5	3.64−3	−3.66−3	$5d_{3/2}$	1	−1.27−2	−3.44−3	−7.16−5	3.70−3	−3.63−3
	3	−6.61−3	−3.02−3	−4.45−4	1.35−3	−9.04−4		3	−7.02−3	−3.33−3	−3.17−4	1.41−3	−1.10−3
	5	−1.87−2	−1.41−3	−2.11−3	6.47−3	−4.36−3		5	−1.75−2	−1.41−3	−2.18−3	6.00−3	−3.81−3
	10	−1.29−1	−1.67−2	4.71−3	4.57−2	−5.04−2		10	−1.24−1	−1.58−2	4.21−3	4.42−2	−4.84−2
$5d_{5/2}$	1	−9.93−3	−4.04−3	1.23−3	2.60−3	−3.83−3	$5d_{5/2}$	1	−1.01−2	−4.02−3	1.18−3	2.67−3	−3.84−3
	3	1.45−3	−3.41−3	2.42−3	−1.46−3	−9.54−4		3	1.11−3	−3.71−3	2.50−3	−1.43−3	−1.08−3
	5	−7.49−3	−2.39−3	3.81−3	2.80−3	−6.61−3		5	−6.25−3	−2.34−3	3.73−3	2.31−3	−6.04−3
	10	−1.13−1	−2.03−2	1.54−2	4.02−2	−5.56−2		10	−1.09−1	−1.94−2	1.51−2	3.87−2	−5.39−2
$6s_{1/2}$	1	2.16−3	7.85−3	1.54−3	2.58−3	−4.12−3	$6s_{1/2}$	1	1.97−3	7.89−3	1.61−3	2.69−3	−4.29−3
	3	−1.51−2	6.70−3	6.50−3	1.00−2	−1.65−2		3	−1.40−2	7.58−3	6.39−3	9.89−3	−1.63−2
	5	−5.19−2	−8.27−3	1.36−2	2.02−2	−3.38−2		5	−5.13−2	−7.31−3	1.36−2	2.03−2	−3.39−2
	10	−8.78−2	−3.17−2	1.79−2	2.60−2	−4.39−2		10	−9.05−2	−3.19−2	1.87−2	2.72−2	−4.58−2
$6p_{1/2}$	1	3.20−3	8.05−3	7.32−4	2.09−3	−2.82−3	$6p_{1/2}$	1	3.35−3	8.25−3	8.46−4	2.13−3	−2.97−3
	3	−3.22−2	−6.13−3	4.40−3	1.13−2	−1.57−2		3	−3.23−2	−5.68−3	4.49−3	1.15−2	−1.60−2
	5	−3.54−2	−1.13−2	2.67−3	1.02−2	−1.29−2		5	−3.70−2	−1.16−2	3.03−3	1.08−2	−1.38−2
	10	−2.57−2	−8.14−3	−2.89−3	6.44−3	−3.55−3		10	−2.59−2	−8.53−3	−2.88−3	6.38−3	−3.50−3
$6p_{3/2}$	1	2.35−3	3.92−3	5.97−4	7.49−4	−1.35−3	$6p_{3/2}$	1	2.48−3	3.99−3	6.31−4	7.29−4	−1.36−3
	3	−2.58−2	−1.07−2	5.91−3	7.21−3	−1.31−2		3	−2.60−2	−1.06−2	5.94−3	7.34−3	−1.33−2
	5	−2.33−2	−1.44−2	6.12−3	4.81−3	−1.09−2		5	−2.46−2	−1.48−2	6.41−3	5.19−3	−1.16−2
	10	−2.01−2	−1.48−2	6.02−3	3.31−3	−9.33−3		10	−1.99−2	−1.51−2	5.94−3	3.09−3	−9.03−3
$Z = 85$, At: $4f^6_{5/2}4f^8_{7/2}5d^4_{3/2}5d^6_{5/2}6s^2_{1/2}6p^2_{1/2}6p^3_{3/2}$							$Z = 86$, Rn: $4f^6_{5/2}4f^8_{7/2}5d^4_{3/2}5d^6_{5/2}6s^2_{1/2}6p^2_{1/2}6p^4_{3/2}$						
$4s_{1/2}$	1	3.89−3	1.60−2	3.36−3	5.54−3	−8.90−3	$4s_{1/2}$	1	3.59−3	1.65−2	3.58−3	5.88−3	−9.46−3
	3	−1.88−2	1.01−2	8.59−3	1.33−2	−2.19−2		3	−1.76−2	1.13−2	8.56−3	1.33−2	−2.19−2
	5	−6.02−2	−7.94−3	1.62−2	2.41−2	−4.04−2		5	−5.98−2	−6.83−3	1.64−2	2.45−2	−4.08−2
	10	−9.95−2	−3.40−2	2.08−2	3.04−2	−5.12−2		10	−1.03−1	−3.42−2	2.17−2	3.17−2	−5.35−2
$4p_{1/2}$	1	5.57−5	1.21−2	1.35−4	4.83−3	−4.96−3	$4p_{1/2}$	1	3.09−4	1.27−2	1.86−4	4.99−3	−5.18−3
	3	−4.25−2	−8.51−3	4.59−3	1.45−2	−1.91−2		3	−4.33−2	−8.23−3	4.73−3	1.50−2	−1.97−2
	5	−4.23−2	−1.31−2	2.68−3	1.22−2	−1.49−2		5	−4.43−2	−1.34−2	3.04−3	1.29−2	−1.60−2
	10	−2.71−2	−8.16−3	−3.47−3	6.89−3	−3.42−3		10	−2.77−2	−8.60−3	−3.45−3	6.93−3	−3.48−3
$4p_{3/2}$	1	3.89−4	4.50−3	6.04−4	1.77−3	−2.37−3	$4p_{3/2}$	1	6.86−4	4.72−3	5.96−4	1.73−3	−2.33−3
	3	−3.16−2	−1.33−2	6.80−3	8.66−3	−1.55−2		3	−3.22−2	−1.34−2	6.89−3	8.91−3	−1.58−2
	5	−2.64−2	−1.61−2	6.88−3	5.53−3	−1.24−2		5	−2.78−2	−1.66−2	7.21−3	5.94−3	−1.32−2
	10	−1.98−2	−1.49−2	6.13−3	3.15−3	−9.27−3		10	−1.97−2	−1.53−2	6.11−3	2.96−3	−9.08−3
$4d_{3/2}$	1	−1.99−2	−6.71−3	−5.21−4	5.19−3	−4.67−3	$4d_{3/2}$	1	−2.07−2	−6.90−3	−6.65−4	5.38−3	−4.71−3
	3	−6.67−3	−2.40−3	−1.00−3	1.51−3	−5.02−4		3	−7.10−3	−2.72−3	−9.04−4	1.57−3	−6.66−4
	5	−1.88−2	−1.37−4	−2.91−3	6.90−3	−3.99−3		5	−1.78−2	−1.32−4	−3.00−3	6.48−3	−3.49−3
	10	−1.30−1	−1.53−2	3.52−3	4.64−2	−4.99−2		10	−1.25−1	−1.45−2	2.99−3	4.50−2	−4.80−2

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4d_{5/2}$	1	−1.51−2	−7.15−3	1.42−3	3.46−3	−4.88−3	$4d_{5/2}$	1	−1.57−2	−7.37−3	1.36−3	3.62−3	−4.98−3
	3	2.83−3	−2.80−3	2.45−3	−1.76−3	−6.82−4		3	2.58−3	−3.09−3	2.54−3	−1.76−3	−7.80−4
	5	−6.52−3	−1.19−3	3.68−3	2.87−3	−6.54−3		5	−5.38−3	−1.14−3	3.61−3	2.42−3	−6.04−3
	10	−1.13−1	−1.90−2	1.50−2	4.07−2	−5.57−2		10	−1.09−1	−1.81−2	1.47−2	3.94−2	−5.41−2
$4f_{5/2}$	1	6.14−4	1.76−3	−5.31−4	3.54−4	1.77−4	$4f_{5/2}$	1	1.07−3	1.91−3	−4.96−4	2.37−4	2.59−4
	3	−4.27−2	−1.11−3	−3.41−3	1.60−2	−1.26−2		3	−4.11−2	−6.45−4	−3.42−3	1.55−2	−1.21−2
	5	−1.21−1	−1.31−2	−4.85−3	4.24−2	−3.75−2		5	−1.18−1	−1.22−2	−4.83−3	4.15−2	−3.67−2
	10	−3.60−1	−5.69−2	−1.12−2	1.19−1	−1.08−1		10	−3.56−1	−5.56−2	−1.09−2	1.18−1	−1.07−1
$4f_{7/2}$	1	3.91−3	1.38−3	7.05−4	−8.75−4	1.70−4	$4f_{7/2}$	1	4.45−3	1.51−3	7.66−4	−1.02−3	2.56−4
	3	−3.54−2	−2.35−3	1.37−4	1.32−2	−1.34−2		3	−3.37−2	−1.89−3	1.39−4	1.27−2	−1.29−2
	5	−1.11−1	−1.54−2	1.09−3	3.83−2	−3.94−2		5	−1.08−1	−1.45−2	1.16−3	3.75−2	−3.87−2
	10	−3.45−1	−6.27−2	−2.20−3	1.12−1	−1.10−1		10	−3.40−1	−6.14−2	−1.69−3	1.11−1	−1.09−1
$5s_{1/2}$	1	2.31−3	9.35−3	1.91−3	3.20−3	−5.11−3	$5s_{1/2}$	1	2.12−3	9.52−3	2.02−3	3.37−3	−5.38−3
	3	−1.36−2	8.81−3	6.63−3	1.03−2	−1.69−2		3	−1.26−2	9.76−3	6.55−3	1.02−2	−1.68−2
	5	−5.20−2	−6.59−3	1.41−2	2.10−2	−3.51−2		5	−5.13−2	−5.52−3	1.41−2	2.11−2	−3.53−2
	10	−9.40−2	−3.23−2	1.96−2	2.86−2	−4.83−2		10	−9.67−2	−3.24−2	2.04−2	2.98−2	−5.02−2
$5p_{1/2}$	1	3.28−3	9.18−3	8.51−4	2.53−3	−3.38−3	$5p_{1/2}$	1	3.50−3	9.54−3	9.78−4	2.61−3	−3.59−3
	3	−3.36−2	−5.63−3	4.56−3	1.21−2	−1.67−2		3	−3.38−2	−5.19−3	4.66−3	1.24−2	−1.70−2
	5	−3.89−2	−1.19−2	3.26−3	1.15−2	−1.47−2		5	−4.04−2	−1.21−2	3.62−3	1.21−2	−1.57−2
	10	−2.64−2	−8.81−3	−2.93−3	6.46−3	−3.53−3		10	−2.70−2	−9.26−3	−2.86−3	6.53−3	−3.67−3
$5p_{3/2}$	1	2.34−3	4.14−3	6.51−4	8.51−4	−1.50−3	$5p_{3/2}$	1	2.56−3	4.29−3	6.81−4	8.26−4	−1.51−3
	3	−2.68−2	−1.09−2	6.05−3	7.58−3	−1.36−2		3	−2.71−2	−1.09−2	6.10−3	7.74−3	−1.38−2
	5	−2.58−2	−1.53−2	6.70−3	5.54−3	−1.22−2		5	−2.70−2	−1.57−2	6.99−3	5.92−3	−1.29−2
	10	−1.98−2	−1.54−2	5.94−3	2.95−3	−8.89−3		10	−1.98−2	−1.58−2	5.95−3	2.81−3	−8.76−3
$5d_{3/2}$	1	−1.28−2	−3.38−3	−1.62−4	3.76−3	−3.59−3	$5d_{3/2}$	1	−1.29−2	−3.30−3	−2.54−4	3.80−3	−3.54−3
	3	−7.49−3	−3.65−3	−1.84−4	1.50−3	−1.32−3		3	−8.02−3	−3.99−3	−4.62−5	1.60−3	−1.56−3
	5	−1.64−2	−1.44−3	−2.24−3	5.55−3	−3.32−3		5	−1.56−2	−1.53−3	−2.27−3	5.16−3	−2.90−3
	10	−1.20−1	−1.50−2	3.71−3	4.26−2	−4.63−2		10	−1.15−1	−1.42−2	3.20−3	4.11−2	−4.43−2
$5d_{5/2}$	1	−1.02−2	−3.98−3	1.12−3	2.72−3	−3.84−3	$5d_{5/2}$	1	−1.04−2	−3.94−3	1.06−3	2.78−3	−3.84−3
	3	7.16−4	−4.01−3	2.59−3	−1.37−3	−1.22−3		3	2.62−4	−4.33−3	2.69−3	−1.30−3	−1.39−3
	5	−5.11−3	−2.32−3	3.67−3	1.85−3	−5.52−3		5	−4.15−3	−2.35−3	3.61−3	1.44−3	−5.06−3
	10	−1.04−1	−1.85−2	1.48−2	3.73−2	−5.21−2		10	−9.99−2	−1.76−2	1.45−2	3.59−2	−5.04−2
$6s_{1/2}$	1	1.80−3	7.97−3	1.68−3	2.80−3	−4.48−3	$6s_{1/2}$	1	1.62−3	8.07−3	1.76−3	2.93−3	−4.69−3
	3	−1.29−2	8.43−3	6.29−3	9.79−3	−1.61−2		3	−1.18−2	9.32−3	6.19−3	9.69−3	−1.59−2
	5	−5.05−2	−6.31−3	1.37−2	2.04−2	−3.41−2		5	−4.97−2	−5.27−3	1.37−2	2.05−2	−3.42−2
	10	−9.31−2	−3.20−2	1.94−2	2.83−2	−4.78−2		10	−9.57−2	−3.21−2	2.02−2	2.95−2	−4.97−2
$6p_{1/2}$	1	3.53−3	8.49−3	9.68−4	2.18−3	−3.15−3	$6p_{1/2}$	1	3.68−3	8.71−3	1.10−3	2.23−3	−3.34−3
	3	−3.24−2	−5.27−3	4.60−3	1.18−2	−1.64−2		3	−3.24−2	−4.76−3	4.68−3	1.20−2	−1.67−2
	5	−3.85−2	−1.17−2	3.39−3	1.14−2	−1.48−2		5	−3.99−2	−1.19−2	3.76−3	1.20−2	−1.57−2
	10	−2.64−2	−8.97−3	−2.84−3	6.40−3	−3.56−3		10	−2.70−2	−9.42−3	−2.75−3	6.47−3	−3.73−3
$6p_{3/2}$	1	2.68−3	4.09−3	6.58−4	6.98−4	−1.36−3	$6p_{3/2}$	1	2.86−3	4.21−3	6.90−4	6.76−4	−1.37−3
	3	−2.63−2	−1.06−2	5.98−3	7.49−3	−1.35−2		3	−2.66−2	−1.05−2	6.01−3	7.61−3	−1.36−2
	5	−2.58−2	−1.52−2	6.70−3	5.58−3	−1.23−2		5	−2.71−2	−1.56−2	7.00−3	5.98−3	−1.30−2
	10	−1.98−2	−1.55−2	5.91−3	2.92−3	−8.83−3		10	−1.99−2	−1.59−2	5.93−3	2.78−3	−8.71−3
$Z = 87$, Fr: $7s^1_{1/2}$							$Z = 88$, Ra: $7s^2_{1/2}$						
$4s_{1/2}$	1	3.20−3	1.69−2	3.83−3	6.27−3	−1.01−2	$4s_{1/2}$	1	2.86−3	1.74−2	4.07−3	6.64−3	−1.07−2
	3	−1.66−2	1.25−2	8.55−3	1.33−2	−2.19−2		3	−1.55−2	1.38−2	8.55−3	1.34−2	−2.19−2
	5	−5.93−2	−5.68−3	1.65−2	2.47−2	−4.13−2		5	−5.87−2	−4.47−3	1.67−2	2.50−2	−4.17−2
	10	−1.06−1	−3.43−2	2.26−2	3.31−2	−5.57−2		10	−1.09−1	−3.43−2	2.35−2	3.44−2	−5.79−2
$4p_{1/2}$	1	4.33−4	1.33−2	2.33−4	5.19−3	−5.42−3	$4p_{1/2}$	1	5.53−4	1.40−2	2.97−4	5.43−3	−5.72−3
	3	−4.41−2	−7.93−3	4.84−3	1.54−2	−2.03−2		3	−4.49−2	−7.60−3	4.97−3	1.59−2	−2.09−2
	5	−4.63−2	−1.38−2	3.40−3	1.37−2	−1.71−2		5	−4.84−2	−1.41−2	3.77−3	1.45−2	−1.82−2
	10	−2.84−2	−9.07−3	−3.39−3	7.04−3	−3.65−3		10	−2.92−2	−9.57−3	−3.30−3	7.21−3	−3.91−3
$4p_{3/2}$	1	8.92−4	4.87−3	5.88−4	1.71−3	−2.30−3	$4p_{3/2}$	1	1.08−3	5.05−3	5.86−4	1.70−3	−2.29−3
	3	−3.29−2	−1.35−2	6.98−3	9.14−3	−1.61−2		3	−3.36−2	−1.37−2	7.06−3	9.37−3	−1.64−2
	5	−2.92−2	−1.71−2	7.55−3	6.37−3	−1.39−2		5	−3.07−2	−1.76−2	7.88−3	6.81−3	−1.47−2
	10	−1.97−2	−1.57−2	6.14−3	2.83−3	−8.97−3		10	−1.99−2	−1.62−2	6.21−3	2.73−3	−8.94−3

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4d_{3/2}$	1	−2.14−2	−7.11−3	−8.07−4	5.55−3	−4.74−3	$4d_{3/2}$	1	−2.21−2	−7.32−3	−9.50−4	5.74−3	−4.79−3
	3	−7.56−3	−3.04−3	−8.05−4	1.65−3	−8.44−4		3	−8.10−3	−3.38−3	−7.03−4	1.75−3	−1.05−3
	5	−1.68−2	−7.58−5	−3.08−3	6.06−3	−2.98−3		5	−1.59−2	−8.16−5	−3.14−3	5.68−3	−2.54−3
	10	−1.21−1	−1.36−2	2.45−3	4.36−2	−4.60−2		10	−1.17−1	−1.28−2	1.91−3	4.22−2	−4.41−2
$4d_{5/2}$	1	−1.64−2	−7.60−3	1.32−3	3.76−3	−5.08−3	$4d_{5/2}$	1	−1.70−2	−7.83−3	1.27−3	3.91−3	−5.18−3
	3	2.28−3	−3.38−3	2.63−3	−1.74−3	−8.94−4		3	1.93−3	−3.69−3	2.73−3	−1.70−3	−1.03−3
	5	−4.12−3	−1.02−3	3.57−3	1.95−3	−5.53−3		5	−3.05−3	−9.76−4	3.54−3	1.54−3	−5.07−3
	10	−1.05−1	−1.72−2	1.44−2	3.81−2	−5.25−2		10	−1.01−1	−1.63−2	1.42−2	3.68−2	−5.09−2
$4f_{5/2}$	1	1.44−3	2.03−3	−4.68−4	1.42−4	3.26−4	$4f_{5/2}$	1	1.89−3	2.19−3	−4.34−4	3.09−5	4.03−4
	3	−3.96−2	−2.13−4	−3.43−3	1.51−2	−1.16−2		3	−3.80−2	2.42−4	−3.45−3	1.46−2	−1.12−2
	5	−1.16−1	−1.14−2	−4.87−3	4.07−2	−3.59−2		5	−1.13−1	−1.07−2	−4.89−3	4.00−2	−3.51−2
	10	−3.52−1	−5.44−2	−1.05−2	1.17−1	−1.06−1		10	−3.47−1	−5.31−2	−1.02−2	1.16−1	−1.05−1
$4f_{7/2}$	1	4.89−3	1.63−3	8.16−4	−1.14−3	3.25−4	$4f_{7/2}$	1	5.42−3	1.78−3	8.76−4	−1.28−3	4.05−4
	3	−3.21−2	−1.46−3	1.41−4	1.23−2	−1.24−2		3	−3.05−2	−1.01−3	1.46−4	1.18−2	−1.20−2
	5	−1.05−1	−1.38−2	1.17−3	3.67−2	−3.79−2		5	−1.02−1	−1.30−2	1.19−3	3.59−2	−3.71−2
	10	−3.36−1	−6.02−2	−1.21−3	1.10−1	−1.09−1		10	−3.32−1	−5.88−2	−7.50−4	1.09−1	−1.08−1
$5s_{1/2}$	1	1.89−3	9.69−3	2.14−3	3.55−3	−5.68−3	$5s_{1/2}$	1	1.69−3	9.91−3	2.26−3	3.74−3	−5.99−3
	3	−1.15−2	1.07−2	6.48−3	1.02−2	−1.67−2		3	−1.05−2	1.16−2	6.42−3	1.01−2	−1.66−2
	5	−5.04−2	−4.42−3	1.42−2	2.12−2	−3.54−2		5	−4.96−2	−3.27−3	1.42−2	2.14−2	−3.56−2
	10	−9.92−2	−3.24−2	2.12−2	3.10−2	−5.22−2		10	−1.02−1	−3.23−2	2.19−2	3.22−2	−5.41−2
$5p_{1/2}$	1	3.64−3	9.86−3	1.10−3	2.71−3	−3.81−3	$5p_{1/2}$	1	3.78−3	1.02−2	1.24−3	2.82−3	−4.06−3
	3	−3.39−2	−4.72−3	4.75−3	1.26−2	−1.74−2		3	−3.40−2	−4.22−3	4.83−3	1.29−2	−1.77−2
	5	−4.19−2	−1.22−2	3.97−3	1.27−2	−1.66−2		5	−4.34−2	−1.23−2	4.33−3	1.33−2	−1.76−2
	10	−2.78−2	−9.73−3	−2.75−3	6.67−3	−3.92−3		10	−2.87−2	−1.02−2	−2.60−3	6.86−3	−4.26−3
$5p_{3/2}$	1	2.73−3	4.39−3	7.09−4	8.05−4	−1.51−3	$5p_{3/2}$	1	2.88−3	4.49−3	7.37−4	7.92−4	−1.53−3
	3	−2.74−2	−1.08−2	6.13−3	7.87−3	−1.40−2		3	−2.77−2	−1.08−2	6.15−3	7.98−3	−1.41−2
	5	−2.82−2	−1.61−2	7.28−3	6.30−3	−1.36−2		5	−2.93−2	−1.64−2	7.57−3	6.67−3	−1.42−2
	10	−2.00−2	−1.62−2	6.00−3	2.72−3	−8.72−3		10	−2.03−2	−1.66−2	6.08−3	2.66−3	−8.75−3
$5d_{3/2}$	1	−1.30−2	−3.23−3	−3.42−4	3.83−3	−3.49−3	$5d_{3/2}$	1	−1.31−2	−3.17−3	−4.26−4	3.87−3	−3.44−3
	3	−8.57−3	−4.32−3	8.81−5	1.72−3	−1.81−3		3	−9.18−3	−4.66−3	2.25−4	1.85−3	−2.08−3
	5	−1.47−2	−1.59−3	−2.29−3	4.78−3	−2.49−3		5	−1.40−2	−1.70−3	−2.29−3	4.45−3	−2.16−3
	10	−1.11−1	−1.34−2	2.69−3	3.96−2	−4.23−2		10	−1.07−1	−1.27−2	2.18−3	3.82−2	−4.04−2
$5d_{5/2}$	1	−1.05−2	−3.91−3	1.01−3	2.82−3	−3.82−3	$5d_{5/2}$	1	−1.06−2	−3.89−3	9.61−4	2.86−3	−3.82−3
	3	−2.13−4	−4.64−3	2.79−3	−1.22−3	−1.57−3		3	−7.42−4	−4.98−3	2.89−3	−1.12−3	−1.78−3
	5	−3.15−3	−2.36−3	3.58−3	1.03−3	−4.61−3		5	−2.31−3	−2.41−3	3.55−3	6.71−4	−4.23−3
	10	−9.57−2	−1.67−2	1.42−2	3.45−2	−4.87−2		10	−9.17−2	−1.59−2	1.40−2	3.31−2	−4.71−2
$6s_{1/2}$	1	1.39−3	8.16−3	1.86−3	3.08−3	−4.93−3	$6s_{1/2}$	1	1.21−3	8.28−3	1.95−3	3.22−3	−5.16−3
	3	−1.08−2	1.02−2	6.11−3	9.61−3	−1.57−2		3	−9.78−3	1.11−2	6.04−3	9.55−3	−1.56−2
	5	−4.88−2	−4.19−3	1.37−2	2.06−2	−3.43−2		5	−4.79−2	−3.07−3	1.37−2	2.07−2	−3.44−2
	10	−9.82−2	−3.20−2	2.09−2	3.06−2	−5.16−2		10	−1.01−1	−3.19−2	2.17−2	3.18−2	−5.35−2
$6p_{1/2}$	1	3.69−3	8.88−3	1.25−3	2.32−3	−3.57−3	$6p_{1/2}$	1	3.80−3	9.14−3	1.40−3	2.42−3	−3.82−3
	3	−3.23−2	−4.21−3	4.76−3	1.22−2	−1.69−2		3	−3.22−2	−3.67−3	4.84−3	1.24−2	−1.72−2
	5	−4.13−2	−1.20−2	4.12−3	1.25−2	−1.67−2		5	−4.27−2	−1.20−2	4.48−3	1.31−2	−1.76−2
	10	−2.77−2	−9.90−3	−2.62−3	6.62−3	−4.00−3		10	−2.87−2	−1.04−2	−2.45−3	6.82−3	−4.37−3
$6p_{3/2}$	1	2.87−3	4.20−3	7.32−4	6.82−4	−1.41−3	$6p_{3/2}$	1	3.00−3	4.29−3	7.71−4	6.70−4	−1.44−3
	3	−2.67−2	−1.04−2	6.01−3	7.69−3	−1.37−2		3	−2.68−2	−1.03−2	6.01−3	7.79−3	−1.38−2
	5	−2.82−2	−1.60−2	7.28−3	6.33−3	−1.36−2		5	−2.93−2	−1.63−2	7.56−3	6.70−3	−1.43−2
	10	−2.01−2	−1.63−2	5.98−3	2.70−3	−8.68−3		10	−2.04−2	−1.68−2	6.08−3	2.66−3	−8.73−3
$7s_{1/2}$	1	1.09−3	7.80−3	1.84−3	3.05−3	−4.89−3	$7s_{1/2}$	1	9.33−4	7.90−3	1.92−3	3.17−3	−5.09−3
	3	−1.02−2	1.04−2	6.01−3	9.46−3	−1.55−2		3	−9.55−3	1.11−2	5.96−3	9.44−3	−1.54−2
	5	−4.86−2	−4.09−3	1.37−2	2.05−2	−3.42−2		5	−4.75−2	−2.96−3	1.37−2	2.06−2	−3.42−2
	10	−9.82−2	−3.20−2	2.09−2	3.07−2	−5.16−2		10	−1.00−1	−3.19−2	2.17−2	3.18−2	−5.34−2
$Z = 89$, Ac: $6d^1_{3/2}7s^2_{1/2}$							$Z = 90$, Th: $6d^2_{3/2}7s^2_{1/2}$						
$4s_{1/2}$	1	2.56−3	1.80−2	4.32−3	7.04−3	−1.14−2	$4s_{1/2}$	1	2.09−3	1.85−2	4.59−3	7.46−3	−1.21−2
	3	−1.43−2	1.51−2	8.55−3	1.35−2	−2.20−2		3	−1.31−2	1.64−2	8.55−3	1.35−2	−2.21−2
	5	−5.81−2	−3.17−3	1.68−2	2.53−2	−4.21−2		5	−5.73−2	−1.79−3	1.69−2	2.56−2	−4.25−2
	10	−1.11−1	−3.42−2	2.44−2	3.58−2	−6.02−2		10	−1.14−1	−3.40−2	2.53−2	3.71−2	−6.24−2

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$4p_{1/2}$	1	6.82−4	1.47−2	3.85−4	5.67−3	−6.06−3	$4p_{1/2}$	1	7.60−4	1.53−2	4.78−4	5.93−3	−6.41−3
	3	−4.56−2	−7.20−3	5.08−3	1.64−2	−2.15−2		3	−4.63−2	−6.74−3	5.17−3	1.69−2	−2.20−2
	5	−5.04−2	−1.44−2	4.15−3	1.52−2	−1.94−2		5	−5.24−2	−1.46−2	4.53−3	1.60−2	−2.06−2
	10	−3.03−2	−1.01−2	−3.16−3	7.45−3	−4.28−3		10	−3.15−2	−1.07−2	−2.99−3	7.75−3	−4.76−3
$4p_{3/2}$	1	1.30−3	5.25−3	5.94−4	1.70−3	−2.29−3	$4p_{3/2}$	1	1.51−3	5.44−3	5.98−4	1.69−3	−2.29−3
	3	−3.43−2	−1.38−2	7.14−3	9.60−3	−1.67−2		3	−3.49−2	−1.39−2	7.19−3	9.82−3	−1.70−2
	5	−3.21−2	−1.82−2	8.23−3	7.24−3	−1.55−2		5	−3.36−2	−1.87−2	8.57−3	7.68−3	−1.62−2
	10	−2.02−2	−1.67−2	6.32−3	2.68−3	−9.00−3		10	−2.06−2	−1.72−2	6.48−3	2.66−3	−9.13−3
$4d_{3/2}$	1	−2.29−2	−7.52−3	−1.10−3	5.92−3	−4.81−3	$4d_{3/2}$	1	−2.36−2	−7.71−3	−1.27−3	6.08−3	−4.81−3
	3	−8.70−3	−3.74−3	−5.93−4	1.87−3	−1.27−3		3	−9.36−3	−4.12−3	−4.80−4	2.00−3	−1.52−3
	5	−1.51−2	−1.48−4	−3.19−3	5.35−3	−2.16−3		5	−1.44−2	−2.04−4	−3.22−3	5.02−3	−1.80−3
	10	−1.14−1	−1.20−2	1.36−3	4.09−2	−4.22−2		10	−1.10−1	−1.13−2	8.13−4	3.95−2	−4.03−2
$4d_{5/2}$	1	−1.76−2	−8.06−3	1.21−3	4.06−3	−5.27−3	$4d_{5/2}$	1	−1.82−2	−8.26−3	1.15−3	4.19−3	−5.33−3
	3	1.52−3	−4.03−3	2.84−3	−1.65−3	−1.19−3		3	1.05−3	−4.37−3	2.95−3	−1.58−3	−1.37−3
	5	−2.16−3	−9.97−4	3.51−3	1.17−3	−4.68−3		5	−1.22−3	−9.96−4	3.50−3	7.88−4	−4.28−3
	10	−9.72−2	−1.54−2	1.39−2	3.55−2	−4.94−2		10	−9.32−2	−1.45−2	1.36−2	3.42−2	−4.78−2
$4f_{5/2}$	1	2.39−3	2.35−3	−3.91−4	−9.32−5	4.84−4	$4f_{5/2}$	1	2.84−3	2.50−3	−3.49−4	−2.07−4	5.57−4
	3	−3.64−2	7.07−4	−3.45−3	1.41−2	−1.07−2		3	−3.47−2	1.17−3	−3.45−3	1.37−2	−1.02−2
	5	−1.10−1	−9.81−3	−4.87−3	3.92−2	−3.43−2		5	−1.07−1	−9.01−3	−4.89−3	3.83−2	−3.34−2
	10	−3.43−1	−5.17−2	−9.98−3	1.14−1	−1.04−1		10	−3.38−1	−5.04−2	−9.74−3	1.13−1	−1.03−1
$4f_{7/2}$	1	5.99−3	1.94−3	9.42−4	−1.43−3	4.91−4	$4f_{7/2}$	1	6.52−3	2.09−3	1.00−3	−1.57−3	5.68−4
	3	−2.88−2	−5.41−4	1.53−4	1.13−2	−1.15−2		3	−2.71−2	−7.26−5	1.61−4	1.08−2	−1.10−2
	5	−9.94−2	−1.22−2	1.24−3	3.51−2	−3.64−2		5	−9.66−2	−1.14−2	1.26−3	3.43−2	−3.56−2
	10	−3.27−1	−5.75−2	−3.18−4	1.08−1	−1.07−1		10	−3.23−1	−5.62−2	8.99−5	1.07−1	−1.07−1
$5s_{1/2}$	1	1.51−3	1.01−2	2.37−3	3.92−3	−6.30−3	$5s_{1/2}$	1	1.25−3	1.03−2	2.50−3	4.12−3	−6.62−3
	3	−9.46−3	1.26−2	6.36−3	1.01−2	−1.65−2		3	−8.38−3	1.36−2	6.30−3	1.01−2	−1.63−2
	5	−4.86−2	−2.06−3	1.42−2	2.15−2	−3.57−2		5	−4.75−2	−7.87−4	1.42−2	2.15−2	−3.58−2
	10	−1.04−1	−3.21−2	2.27−2	3.33−2	−5.60−2		10	−1.06−1	−3.18−2	2.34−2	3.45−2	−5.79−2
$5p_{1/2}$	1	3.92−3	1.06−2	1.41−3	2.94−3	−4.35−3	$5p_{1/2}$	1	4.00−3	1.09−2	1.58−3	3.07−3	−4.65−3
	3	−3.40−2	−3.65−3	4.91−3	1.31−2	−1.80−2		3	−3.39−2	−3.03−3	4.96−3	1.33−2	−1.83−2
	5	−4.48−2	−1.24−2	4.69−3	1.39−2	−1.86−2		5	−4.62−2	−1.23−2	5.05−3	1.45−2	−1.96−2
	10	−2.97−2	−1.07−2	−2.41−3	7.12−3	−4.71−3		10	−3.09−2	−1.13−2	−2.18−3	7.44−3	−5.26−3
$5p_{3/2}$	1	3.05−3	4.62−3	7.75−4	7.83−4	−1.56−3	$5p_{3/2}$	1	3.19−3	4.71−3	8.13−4	7.69−4	−1.58−3
	3	−2.79−2	−1.07−2	6.16−3	8.09−3	−1.43−2		3	−2.80−2	−1.06−2	6.14−3	8.18−3	−1.43−2
	5	−3.05−2	−1.68−2	7.85−3	7.04−3	−1.49−2		5	−3.16−2	−1.71−2	8.12−3	7.41−3	−1.55−2
	10	−2.06−2	−1.71−2	6.21−3	2.65−3	−8.86−3		10	−2.11−2	−1.76−2	6.38−3	2.66−3	−9.04−3
$5d_{3/2}$	1	−1.31−2	−3.08−3	−5.13−4	3.90−3	−3.39−3	$5d_{3/2}$	1	−1.30−2	−2.96−3	−6.04−4	3.90−3	−3.30−3
	3	−9.85−3	−5.02−3	3.67−4	2.00−3	−2.37−3		3	−1.05−2	−5.38−3	5.10−4	2.17−3	−2.68−3
	5	−1.34−2	−1.85−3	−2.27−3	4.15−3	−1.88−3		5	−1.28−2	−2.02−3	−2.24−3	3.87−3	−1.64−3
	10	−1.03−1	−1.21−2	1.68−3	3.68−2	−3.85−2		10	−9.92−2	−1.14−2	1.17−3	3.54−2	−3.65−2
$5d_{5/2}$	1	−1.06−2	−3.83−3	9.07−4	2.89−3	−3.80−3	$5d_{5/2}$	1	−1.06−2	−3.75−3	8.46−4	2.91−3	−3.75−3
	3	−1.33−3	−5.32−3	3.00−3	−9.99−4	−2.00−3		3	−1.95−3	−5.67−3	3.10−3	−8.67−4	−2.24−3
	5	−1.64−3	−2.53−3	3.54−3	3.53−4	−3.89−3		5	−9.70−4	−2.63−3	3.53−3	4.12−5	−3.57−3
	10	−8.77−2	−1.51−2	1.37−2	3.18−2	−4.54−2		10	−8.37−2	−1.43−2	1.34−2	3.04−2	−4.38−2
$6s_{1/2}$	1	1.04−3	8.44−3	2.04−3	3.36−3	−5.40−3	$6s_{1/2}$	1	8.12−4	8.56−3	2.14−3	3.53−3	−5.67−3
	3	−8.78−3	1.20−2	5.97−3	9.49−3	−1.55−2		3	−7.76−3	1.29−2	5.90−3	9.44−3	−1.53−2
	5	−4.69−2	−1.90−3	1.37−2	2.07−2	−3.45−2		5	−4.58−2	−6.68−4	1.37−2	2.08−2	−3.45−2
	10	−1.03−1	−3.17−2	2.24−2	3.29−2	−5.53−2		10	−1.05−1	−3.14−2	2.31−2	3.40−2	−5.72−2
$6p_{1/2}$	1	3.92−3	9.47−3	1.59−3	2.54−3	−4.13−3	$6p_{1/2}$	1	4.00−3	9.76−3	1.80−3	2.67−3	−4.47−3
	3	−3.22−2	−3.08−3	4.93−3	1.26−2	−1.76−2		3	−3.20−2	−2.43−3	5.00−3	1.28−2	−1.78−2
	5	−4.41−2	−1.21−2	4.86−3	1.38−2	−1.86−2		5	−4.55−2	−1.20−2	5.24−3	1.44−2	−1.97−2
	10	−2.98−2	−1.09−2	−2.25−3	7.10−3	−4.85−3		10	−3.10−2	−1.15−2	−2.01−3	7.43−3	−5.43−3
$6p_{3/2}$	1	3.15−3	4.40−3	8.18−4	6.65−4	−1.48−3	$6p_{3/2}$	1	3.27−3	4.49−3	8.70−4	6.61−4	−1.53−3
	3	−2.70−2	−1.03−2	6.02−3	7.89−3	−1.39−2		3	−2.71−2	−1.02−2	6.01−3	7.98−3	−1.40−2
	5	−3.04−2	−1.67−2	7.84−3	7.08−3	−1.49−2		5	−3.16−2	−1.70−2	8.12−3	7.45−3	−1.56−2
	10	−2.08−2	−1.73−2	6.21−3	2.65−3	−8.86−3		10	−2.13−2	−1.78−2	6.39−3	2.68−3	−9.07−3
$6d_{3/2}$	1	−1.18−2	−2.39−3	−4.89−4	3.66−3	−3.17−3	$6d_{3/2}$	1	−1.16−2	−2.25−3	−5.54−4	3.64−3	−3.08−3
	3	−1.02−2	−5.28−3	5.33−4	2.08−3	−2.61−3		3	−1.09−2	−5.63−3	6.79−4	2.24−3	−2.92−3

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
	5	−1.32−2	−2.13−3	−2.15−3	3.99−3	−1.84−3		5	−1.26−2	−2.32−3	−2.09−3	3.71−3	−1.62−3
	10	−1.02−1	−1.21−2	1.69−3	3.62−2	−3.79−2		10	−9.77−2	−1.14−2	1.20−3	3.48−2	−3.60−2
$7s_{1/2}$	1	7.99−4	7.97−3	1.98−3	3.27−3	−5.24−3	$7s_{1/2}$	1	6.65−4	8.10−3	2.06−3	3.39−3	−5.45−3
	3	−8.59−3	1.19−2	5.88−3	9.36−3	−1.52−2		3	−7.71−3	1.26−2	5.82−3	9.30−3	−1.51−2
	5	−4.64−2	−1.79−3	1.36−2	2.06−2	−3.42−2		5	−4.53−2	−5.79−4	1.36−2	2.06−2	−3.42−2
	10	−1.03−1	−3.16−2	2.24−2	3.29−2	−5.52−2		10	−1.05−1	−3.13−2	2.31−2	3.39−2	−5.70−2
$Z = 91$, Pa: $5f^2_{5/2}6d^1_{3/2}7s^2_{1/2}$							$Z = 92$, U: $5f^3_{5/2}6d^1_{3/2}7s^2_{1/2}$						
$4s_{1/2}$	1	1.27−3	1.89−2	4.96−3	8.03−3	−1.30−2	$4s_{1/2}$	1	5.45−4	1.92−2	5.29−3	8.54−3	−1.38−2
	3	−1.17−2	1.79−2	8.52−3	1.36−2	−2.21−2		3	−1.04−2	1.94−2	8.50−3	1.36−2	−2.21−2
	5	−5.62−2	−2.26−4	1.70−2	2.58−2	−4.28−2		5	−5.50−2	1.37−3	1.71−2	2.60−2	−4.31−2
	10	−1.17−1	−3.37−2	2.62−2	3.85−2	−6.46−2		10	−1.19−1	−3.33−2	2.70−2	3.98−2	−6.68−2
$4p_{1/2}$	1	9.08−4	1.62−2	6.11−4	6.23−3	−6.84−3	$4p_{1/2}$	1	9.50−4	1.69−2	7.61−4	6.54−3	−7.30−3
	3	−4.69−2	−6.15−3	5.26−3	1.74−2	−2.26−2		3	−4.74−2	−5.52−3	5.32−3	1.78−2	−2.31−2
	5	−5.46−2	−1.48−2	4.94−3	1.69−2	−2.18−2		5	−5.67−2	−1.50−2	5.33−3	1.78−2	−2.31−2
	10	−3.30−2	−1.13−2	−2.77−3	8.13−3	−5.37−3		10	−3.46−2	−1.19−2	−2.51−3	8.58−3	−6.07−3
$4p_{3/2}$	1	1.92−3	5.75−3	6.08−4	1.65−3	−2.26−3	$4p_{3/2}$	1	2.21−3	5.97−3	6.22−4	1.63−3	−2.25−3
	3	−3.55−2	−1.40−2	7.24−3	1.01−2	−1.73−2		3	−3.60−2	−1.40−2	7.26−3	1.02−2	−1.75−2
	5	−3.52−2	−1.93−2	8.93−3	8.17−3	−1.71−2		5	−3.67−2	−1.98−2	9.26−3	8.63−3	−1.79−2
	10	−2.11−2	−1.77−2	6.67−3	2.68−3	−9.35−3		10	−2.17−2	−1.83−2	6.90−3	2.73−3	−9.63−3
$4d_{3/2}$	1	−2.43−2	−7.87−3	−1.51−3	6.28−3	−4.77−3	$4d_{3/2}$	1	−2.50−2	−8.01−3	−1.73−3	6.45−3	−4.72−3
	3	−1.02−2	−4.57−3	−3.44−4	2.17−3	−1.83−3		3	−1.10−2	−5.01−3	−2.13−4	2.34−3	−2.13−3
	5	−1.36−2	−2.95−4	−3.23−3	4.68−3	−1.45−3		5	−1.30−2	−4.12−4	−3.23−3	4.38−3	−1.16−3
	10	−1.06−1	−1.05−2	2.42−4	3.81−2	−3.84−2		10	−1.02−1	−9.75−3	−3.18−4	3.68−2	−3.64−2
$4d_{5/2}$	1	−1.89−2	−8.48−3	1.03−3	4.37−3	−5.40−3	$4d_{5/2}$	1	−1.94−2	−8.64−3	9.31−4	4.50−3	−5.43−3
	3	4.50−4	−4.80−3	3.08−3	−1.48−3	−1.59−3		3	−1.58−4	−5.20−3	3.20−3	−1.38−3	−1.82−3
	5	−2.77−4	−1.03−3	3.49−3	3.96−4	−3.89−3		5	5.47−4	−1.09−3	3.49−3	4.47−5	−3.54−3
	10	−8.92−2	−1.37−2	1.33−2	3.29−2	−4.62−2		10	−8.53−2	−1.28−2	1.30−2	3.16−2	−4.46−2
$4f_{5/2}$	1	3.27−3	2.61−3	−3.03−4	−3.22−4	6.25−4	$4f_{5/2}$	1	3.71−3	2.74−3	−2.54−4	−4.38−4	6.92−4
	3	−3.30−2	1.65−3	−3.46−3	1.32−2	−9.72−3		3	−3.14−2	2.11−3	−3.46−3	1.27−2	−9.24−3
	5	−1.05−1	−8.22−3	−4.93−3	3.75−2	−3.26−2		5	−1.02−1	−7.42−3	−4.96−3	3.67−2	−3.17−2
	10	−3.34−1	−4.91−2	−9.54−3	1.12−1	−1.02−1		10	−3.29−1	−4.77−2	−9.35−3	1.11−1	−1.01−1
$4f_{7/2}$	1	7.04−3	2.19−3	1.08−3	−1.72−3	6.39−4	$4f_{7/2}$	1	7.57−3	2.32−3	1.16−3	−1.87−3	7.10−4
	3	−2.53−2	4.04−4	1.65−4	1.03−2	−1.05−2		3	−2.36−2	8.66−4	1.77−4	9.84−3	−1.00−2
	5	−9.37−2	−1.06−2	1.26−3	3.35−2	−3.48−2		5	−9.09−2	−9.76−3	1.26−3	3.27−2	−3.40−2
	10	−3.18−1	−5.49−2	4.78−4	1.05−1	−1.06−1		10	−3.14−1	−5.35−2	8.40−4	1.04−1	−1.05−1
$5s_{1/2}$	1	7.92−4	1.05−2	2.70−3	4.42−3	−7.12−3	$5s_{1/2}$	1	3.89−4	1.06−2	2.86−3	4.67−3	−7.53−3
	3	−7.17−3	1.47−2	6.23−3	1.00−2	−1.62−2		3	−6.00−3	1.58−2	6.16−3	9.96−3	−1.61−2
	5	−4.63−2	6.23−4	1.42−2	2.16−2	−3.58−2		5	−4.50−2	2.05−3	1.42−2	2.16−2	−3.58−2
	10	−1.08−1	−3.14−2	2.42−2	3.56−2	−5.98−2		10	−1.10−1	−3.09−2	2.49−2	3.68−2	−6.17−2
$5p_{1/2}$	1	4.12−3	1.13−2	1.85−3	3.25−3	−5.10−3	$5p_{1/2}$	1	4.15−3	1.17−2	2.11−3	3.43−3	−5.54−3
	3	−3.38−2	−2.29−3	5.03−3	1.36−2	−1.86−2		3	−3.35−2	−1.51−3	5.07−3	1.38−2	−1.89−2
	5	−4.77−2	−1.23−2	5.44−3	1.53−2	−2.07−2		5	−4.91−2	−1.22−2	5.82−3	1.59−2	−2.17−2
	10	−3.24−2	−1.18−2	−1.91−3	7.84−3	−5.93−3		10	−3.39−2	−1.24−2	−1.59−3	8.30−3	−6.71−3
$5p_{3/2}$	1	3.47−3	4.90−3	8.77−4	7.49−4	−1.63−3	$5p_{3/2}$	1	3.64−3	5.02−3	9.34−4	7.37−4	−1.67−3
	3	−2.82−2	−1.05−2	6.13−3	8.28−3	−1.44−2		3	−2.82−2	−1.04−2	6.09−3	8.34−3	−1.44−2
	5	−3.28−2	−1.75−2	8.42−3	7.81−3	−1.62−2		5	−3.40−2	−1.78−2	8.68−3	8.19−3	−1.69−2
	10	−2.17−2	−1.82−2	6.58−3	2.72−3	−9.30−3		10	−2.24−2	−1.87−2	6.83−3	2.81−3	−9.64−3
$5d_{3/2}$	1	−1.29−2	−2.74−3	−7.38−4	3.91−3	−3.17−3	$5d_{3/2}$	1	−1.27−2	−2.53−3	−8.46−4	3.89−3	−3.04−3
	3	−1.14−2	−5.81−3	6.73−4	2.37−3	−3.05−3		3	−1.22−2	−6.20−3	8.27−4	2.57−3	−3.40−3
	5	−1.23−2	−2.22−3	−2.18−3	3.61−3	−1.43−3		5	−1.19−2	−2.44−3	−2.10−3	3.38−3	−1.27−3
	10	−9.52−2	−1.07−2	6.50−4	3.39−2	−3.46−2		10	−9.14−2	−1.01−2	1.48−4	3.25−2	−3.27−2
$5d_{5/2}$	1	−1.05−2	−3.57−3	7.54−4	2.92−3	−3.67−3	$5d_{5/2}$	1	−1.03−2	−3.39−3	6.71−4	2.90−3	−3.57−3
	3	−2.72−3	−6.09−3	3.23−3	−7.01−4	−2.53−3		3	−3.45−3	−6.46−3	3.34−3	−5.34−4	−2.81−3
	5	−3.37−4	−2.78−3	3.54−3	−2.70−4	−3.27−3		5	1.74−4	−2.95−3	3.56−3	−5.38−4	−3.02−3
	10	−7.97−2	−1.36−2	1.31−2	2.91−2	−4.21−2		10	−7.58−2	−1.28−2	1.28−2	2.77−2	−4.05−2
$5f_{5/2}$	1	5.57−4	−2.18−4	3.14−4	−2.47−4	−6.73−5	$5f_{5/2}$	1	4.59−4	−3.31−4	3.54−4	−2.45−4	−1.09−4
	3	−2.56−2	1.77−4	−2.17−3	9.89−3	−7.73−3		3	−2.39−2	4.36−4	−2.09−3	9.33−3	−7.24−3

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
	5	−9.12−2	−8.00−3	−3.60−3	3.26−2	−2.90−2		5	−8.78−2	−7.29−3	−3.56−3	3.15−2	−2.79−2
	10	−3.15−1	−4.69−2	−7.91−3	1.06−1	−9.79−2		10	−3.10−1	−4.55−2	−7.65−3	1.04−1	−9.65−2
$6s_{1/2}$	1	4.03−4	8.63−3	2.29−3	3.75−3	−6.04−3	$6s_{1/2}$	1	5.04−5	8.69−3	2.41−3	3.94−3	−6.35−3
	3	−6.59−3	1.39−2	5.82−3	9.37−3	−1.52−2		3	−5.46−3	1.49−2	5.75−3	9.30−3	−1.50−2
	5	−4.45−2	6.98−4	1.37−2	2.08−2	−3.45−2		5	−4.32−2	2.08−3	1.36−2	2.08−2	−3.45−2
	10	−1.07−1	−3.10−2	2.39−2	3.52−2	−5.90−2		10	−1.09−1	−3.05−2	2.45−2	3.62−2	−6.08−2
$6p_{1/2}$	1	4.03−3	1.00−2	2.08−3	2.82−3	−4.91−3	$6p_{1/2}$	1	3.99−3	1.02−2	2.36−3	2.97−3	−5.32−3
	3	−3.18−2	−1.65−3	5.06−3	1.31−2	−1.81−2		3	−3.13−2	−8.37−4	5.09−3	1.32−2	−1.83−2
	5	−4.69−2	−1.20−2	5.63−3	1.51−2	−2.07−2		5	−4.81−2	−1.18−2	6.01−3	1.57−2	−2.17−2
	10	−3.25−2	−1.20−2	−1.72−3	7.85−3	−6.13−3		10	−3.40−2	−1.26−2	−1.39−3	8.31−3	−6.92−3
$6p_{3/2}$	1	3.49−3	4.63−3	9.44−4	6.48−4	−1.59−3	$6p_{3/2}$	1	3.62−3	4.72−3	1.01−3	6.45−4	−1.66−3
	3	−2.72−2	−1.00−2	5.98−3	8.06−3	−1.40−2		3	−2.72−2	−9.88−3	5.94−3	8.12−3	−1.41−2
	5	−3.28−2	−1.74−2	8.40−3	7.84−3	−1.62−2		5	−3.39−2	−1.77−2	8.67−3	8.21−3	−1.69−2
	10	−2.20−2	−1.84−2	6.60−3	2.75−3	−9.35−3		10	−2.27−2	−1.90−2	6.85−3	2.86−3	−9.71−3
$6d_{3/2}$	1	−1.13−2	−1.97−3	−6.64−4	3.59−3	−2.93−3	$6d_{3/2}$	1	−1.09−2	−1.70−3	−7.51−4	3.54−3	−2.78−3
	3	−1.17−2	−6.02−3	8.46−4	2.45−3	−3.29−3		3	−1.26−2	−6.42−3	1.01−3	2.66−3	−3.67−3
	5	−1.22−2	−2.54−3	−2.02−3	3.45−3	−1.43−3		5	−1.18−2	−2.79−3	−1.93−3	3.23−3	−1.30−3
	10	−9.36−2	−1.07−2	6.87−4	3.33−2	−3.40−2		10	−8.97−2	−1.01−2	1.91−4	3.19−2	−3.21−2
$7s_{1/2}$	1	3.94−4	8.15−3	2.16−3	3.53−3	−5.69−3	$7s_{1/2}$	1	9.18−5	8.17−3	2.25−3	3.68−3	−5.94−3
	3	−6.47−3	1.36−2	5.70−3	9.18−3	−1.49−2		3	−5.31−3	1.46−2	5.61−3	9.08−3	−1.47−2
	5	−4.38−2	7.88−4	1.35−2	2.06−2	−3.41−2		5	−4.25−2	2.14−3	1.34−2	2.05−2	−3.40−2
	10	−1.06−1	−3.08−2	2.37−2	3.50−2	−5.87−2		10	−1.08−1	−3.03−2	2.44−2	3.60−2	−6.04−2
$Z = 93$, Np: $5f^4_{5/2}6d^1_{3/2}7s^2_{1/2}$							$Z = 94$, Pu: $5f^6_{5/2}7s^2_{1/2}$						
$4s_{1/2}$	1	−2.74−4	1.96−2	5.65−3	9.08−3	−1.47−2	$4s_{1/2}$	1	−1.32−3	2.00−2	6.08−3	9.73−3	−1.58−2
	3	−9.00−3	2.09−2	8.48−3	1.36−2	−2.21−2		3	−7.53−3	2.25−2	8.47−3	1.37−2	−2.22−2
	5	−5.38−2	3.06−3	1.71−2	2.62−2	−4.33−2		5	−5.24−2	4.88−3	1.72−2	2.63−2	−4.35−2
	10	−1.22−1	−3.27−2	2.78−2	4.11−2	−6.89−2		10	−1.24−1	−3.20−2	2.87−2	4.24−2	−7.11−2
$4p_{1/2}$	1	9.24−4	1.77−2	9.36−4	6.88−3	−7.82−3	$4p_{1/2}$	1	8.46−4	1.85−2	1.17−3	7.28−3	−8.45−3
	3	−4.77−2	−4.81−3	5.37−3	1.82−2	−2.36−2		3	−4.80−2	−3.98−3	5.41−3	1.87−2	−2.41−2
	5	−5.88−2	−1.51−2	5.73−3	1.86−2	−2.44−2		5	−6.09−2	−1.51−2	6.14−3	1.95−2	−2.57−2
	10	−3.63−2	−1.25−2	−2.20−3	9.09−3	−6.88−3		10	−3.83−2	−1.32−2	−1.85−3	9.69−3	−7.84−3
$4p_{3/2}$	1	2.49−3	6.19−3	6.42−4	1.61−3	−2.25−3	$4p_{3/2}$	1	2.84−3	6.46−3	6.76−4	1.58−3	−2.26−3
	3	−3.64−2	−1.40−2	7.25−3	1.04−2	−1.76−2		3	−3.68−2	−1.40−2	7.22−3	1.06−2	−1.78−2
	5	−3.82−2	−2.03−2	9.59−3	9.08−3	−1.87−2		5	−3.97−2	−2.08−2	9.91−3	9.56−3	−1.95−2
	10	−2.24−2	−1.89−2	7.17−3	2.82−3	−9.99−3		10	−2.32−2	−1.95−2	7.49−3	2.95−3	−1.04−2
$4d_{3/2}$	1	−2.56−2	−8.13−3	−1.96−3	6.60−3	−4.64−3	$4d_{3/2}$	1	−2.63−2	−8.22−3	−2.23−3	6.77−3	−4.54−3
	3	−1.19−2	−5.47−3	−8.20−5	2.54−3	−2.46−3		3	−1.29−2	−5.98−3	6.05−5	2.77−3	−2.83−3
	5	−1.24−2	−5.57−4	−3.20−3	4.11−3	−9.11−4		5	−1.20−2	−7.40−4	−3.16−3	3.86−3	−7.04−4
	10	−9.80−2	−9.03−3	−8.72−4	3.54−2	−3.45−2		10	−9.42−2	−8.32−3	−1.43−3	3.41−2	−3.26−2
$4d_{5/2}$	1	−1.99−2	−8.79−3	8.19−4	4.62−3	−5.44−3	$4d_{5/2}$	1	−2.05−2	−8.93−3	6.77−4	4.76−3	−5.44−3
	3	−8.59−4	−5.63−3	3.33−3	−1.24−3	−2.08−3		3	−1.65−3	−6.11−3	3.47−3	−1.09−3	−2.38−3
	5	1.29−3	−1.17−3	3.51−3	−2.83−4	−3.22−3		5	1.98−3	−1.30−3	3.54−3	−6.01−4	−2.94−3
	10	−8.14−2	−1.20−2	1.27−2	3.03−2	−4.30−2		10	−7.75−2	−1.12−2	1.24−2	2.90−2	−4.14−2
$4f_{5/2}$	1	4.14−3	2.86−3	−2.03−4	−5.51−4	7.54−4	$4f_{5/2}$	1	4.59−3	2.98−3	−1.46−4	−6.70−4	8.17−4
	3	−2.97−2	2.58−3	−3.45−3	1.22−2	−8.76−3		3	−2.80−2	3.05−3	−3.45−3	1.17−2	−8.29−3
	5	−9.88−2	−6.63−3	−4.99−3	3.59−2	−3.09−2		5	−9.60−2	−5.85−3	−5.03−3	3.51−2	−3.00−2
	10	−3.24−1	−4.64−2	−9.19−3	1.09−1	−1.00−1		10	−3.20−1	−4.50−2	−9.07−3	1.08−1	−9.89−2
$4f_{7/2}$	1	8.09−3	2.44−3	1.23−3	−2.01−3	7.77−4	$4f_{7/2}$	1	8.63−3	2.55−3	1.32−3	−2.17−3	8.41−4
	3	−2.19−2	1.34−3	1.84−4	9.33−3	−9.52−3		3	−2.02−2	1.80−3	1.96−4	8.82−3	−9.02−3
	5	−8.80−2	−8.97−3	1.26−3	3.19−2	−3.31−2		5	−8.52−2	−8.18−3	1.26−3	3.11−2	−3.23−2
	10	−3.09−1	−5.21−2	1.18−3	1.03−1	−1.04−1		10	−3.04−1	−5.08−2	1.49−3	1.02−1	−1.03−1
$5s_{1/2}$	1	−6.27−5	1.08−2	3.03−3	4.93−3	−7.97−3	$5s_{1/2}$	1	−6.35−4	1.09−2	3.24−3	5.25−3	−8.49−3
	3	−4.82−3	1.69−2	6.10−3	9.91−3	−1.60−2		3	−3.57−3	1.81−2	6.04−3	9.87−3	−1.59−2
	5	−4.35−2	3.55−3	1.42−2	2.17−2	−3.58−2		5	−4.20−2	5.15−3	1.41−2	2.17−2	−3.58−2
	10	−1.12−1	−3.03−2	2.56−2	3.79−2	−6.35−2		10	−1.14−1	−2.95−2	2.63−2	3.90−2	−6.53−2
$5p_{1/2}$	1	4.12−3	1.20−2	2.40−3	3.62−3	−6.02−3	$5p_{1/2}$	1	4.04−3	1.23−2	2.77−3	3.87−3	−6.63−3
	3	−3.31−2	−6.57−4	5.09−3	1.40−2	−1.91−2		3	−3.26−2	3.10−4	5.11−3	1.42−2	−1.93−2

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
	5	−5.04−2	−1.21−2	6.19−3	1.66−2	−2.28−2		5	−5.18−2	−1.18−2	6.57−3	1.73−2	−2.39−2
	10	−3.56−2	−1.29−2	−1.24−3	8.82−3	−7.58−3		10	−3.75−2	−1.35−2	−8.36−4	9.42−3	−8.59−3
$5p_{3/2}$	1	3.80−3	5.12−3	9.98−4	7.31−4	−1.73−3	$5p_{3/2}$	1	3.98−3	5.27−3	1.09−3	7.32−4	−1.82−3
	3	−2.82−2	−1.02−2	6.03−3	8.39−3	−1.44−2		3	−2.81−2	−1.00−2	5.96−3	8.44−3	−1.44−2
	5	−3.51−2	−1.81−2	8.93−3	8.55−3	−1.75−2		5	−3.62−2	−1.85−2	9.19−3	8.94−3	−1.81−2
	10	−2.31−2	−1.93−2	7.11−3	2.94−3	−1.00−2		10	−2.40−2	−1.99−2	7.43−3	3.11−3	−1.05−2
$5d_{3/2}$	1	−1.24−2	−2.29−3	−9.53−4	3.85−3	−2.90−3	$5d_{3/2}$	1	−1.20−2	−1.98−3	−1.07−3	3.81−3	−2.73−3
	3	−1.31−2	−6.61−3	9.78−4	2.80−3	−3.77−3		3	−1.41−2	−7.05−3	1.14−3	3.04−3	−4.18−3
	5	−1.16−2	−2.69−3	−2.01−3	3.18−3	−1.17−3		5	−1.14−2	−2.98−3	−1.89−3	3.01−3	−1.11−3
	10	−8.76−2	−9.53−3	−3.48−4	3.12−2	−3.08−2		10	−8.39−2	−8.96−3	−8.46−4	2.98−2	−2.89−2
$5d_{5/2}$	1	−1.01−2	−3.19−3	5.89−4	2.87−3	−3.46−3	$5d_{5/2}$	1	−9.78−3	−2.94−3	4.93−4	2.84−3	−3.33−3
	3	−4.28−3	−6.87−3	3.46−3	−3.43−4	−3.12−3		3	−5.18−3	−7.31−3	3.59−3	−1.31−4	−3.46−3
	5	5.93−4	−3.15−3	3.59−3	−7.78−4	−2.81−3		5	9.37−4	−3.38−3	3.63−3	−1.00−3	−2.63−3
	10	−7.20−2	−1.21−2	1.25−2	2.64−2	−3.89−2		10	−6.81−2	−1.15−2	1.22−2	2.51−2	−3.73−2
$5f_{5/2}$	1	3.13−4	−4.57−4	3.91−4	−2.30−4	−1.62−4	$5f_{5/2}$	1	1.18−4	−6.05−4	4.31−4	−2.03−4	−2.28−4
	3	−2.23−2	6.81−4	−2.02−3	8.79−3	−6.77−3		3	−2.07−2	9.09−4	−1.95−3	8.27−3	−6.31−3
	5	−8.45−2	−6.61−3	−3.52−3	3.05−2	−2.69−2		5	−8.13−2	−5.95−3	−3.49−3	2.94−2	−2.59−2
	10	−3.04−1	−4.41−2	−7.41−3	1.02−1	−9.50−2		10	−2.98−1	−4.27−2	−7.21−3	1.01−1	−9.36−2
$6s_{1/2}$	1	−3.36−4	8.69−3	2.53−3	4.12−3	−6.65−3	$6s_{1/2}$	1	−8.16−4	8.70−3	2.68−3	4.34−3	−7.02−3
	3	−4.32−3	1.59−2	5.67−3	9.22−3	−1.49−2		3	−3.09−3	1.70−2	5.59−3	9.16−3	−1.47−2
	5	−4.17−2	3.52−3	1.36−2	2.08−2	−3.44−2		5	−4.01−2	5.05−3	1.35−2	2.08−2	−3.43−2
	10	−1.10−1	−2.98−2	2.52−2	3.73−2	−6.25−2		10	−1.12−1	−2.90−2	2.59−2	3.83−2	−6.42−2
$6p_{1/2}$	1	3.91−3	1.04−2	2.66−3	3.13−3	−5.79−3	$6p_{1/2}$	1	3.73−3	1.05−2	3.02−3	3.32−3	−6.34−3
	3	−3.08−2	4.69−5	5.11−3	1.34−2	−1.85−2		3	−3.01−2	1.06−3	5.11−3	1.35−2	−1.86−2
	5	−4.94−2	−1.16−2	6.39−3	1.64−2	−2.28−2		5	−5.05−2	−1.13−2	6.76−3	1.70−2	−2.38−2
	10	−3.58−2	−1.31−2	−1.01−3	8.85−3	−7.83−3		10	−3.76−2	−1.37−2	−6.01−4	9.45−3	−8.85−3
$6p_{3/2}$	1	3.73−3	4.80−3	1.09−3	6.45−4	−1.73−3	$6p_{3/2}$	1	3.85−3	4.89−3	1.18−3	6.53−4	−1.83−3
	3	−2.71−2	−9.69−3	5.88−3	8.15−3	−1.40−2		3	−2.70−2	−9.45−3	5.79−3	8.17−3	−1.40−2
	5	−3.49−2	−1.80−2	8.91−3	8.57−3	−1.75−2		5	−3.61−2	−1.83−2	9.16−3	8.97−3	−1.81−2
	10	−2.35−2	−1.95−2	7.14−3	3.00−3	−1.01−2		10	−2.43−2	−2.01−2	7.47−3	3.17−3	−1.06−2
$6d_{3/2}$	1	−1.04−2	−1.38−3	−8.35−4	3.45−3	−2.61−3	$7s_{1/2}$	1	−8.93−4	7.91−3	2.49−3	4.02−3	−6.50−3
	3	−1.35−2	−6.85−3	1.18−3	2.90−3	−4.08−3		3	−2.63−3	1.67−2	5.38−3	8.83−3	−1.42−2
	5	−1.16−2	−3.05−3	−1.82−3	3.04−3	−1.22−3		5	−3.94−2	5.03−3	1.33−2	2.04−2	−3.37−2
	10	−8.59−2	−9.59−3	−2.97−4	3.05−2	−3.02−2		10	−1.11−1	−2.87−2	2.57−2	3.81−2	−6.37−2
$7s_{1/2}$	1	−3.15−4	8.09−3	2.36−3	3.83−3	−6.19−3							
	3	−3.93−3	1.57−2	5.49−3	8.94−3	−1.44−2							
	5	−4.10−2	3.53−3	1.34−2	2.05−2	−3.38−2							
	10	−1.10−1	−2.96−2	2.50−2	3.71−2	−6.21−2							
$Z = 95$, Am: $5f^6_{5/2}5f^1_{7/2}7s^2_{1/2}$							$Z = 96$, Cm: $5f^6_{5/2}5f^1_{7/2}6d^1_{3/2}7s^2_{1/2}$						
$4s_{1/2}$	1	−2.38−3	2.03−2	6.50−3	1.04−2	−1.69−2	$4s_{1/2}$	1	−3.34−3	2.06−2	6.89−3	1.09−2	−1.78−2
	3	−6.15−3	2.40−2	8.48−3	1.38−2	−2.22−2		3	−4.88−3	2.55−2	8.49−3	1.39−2	−2.24−2
	5	−5.08−2	6.74−3	1.72−2	2.65−2	−4.37−2		5	−4.93−2	8.62−3	1.72−2	2.66−2	−4.38−2
	10	−1.26−1	−3.12−2	2.94−2	4.37−2	−7.31−2		10	−1.27−1	−3.02−2	3.02−2	4.49−2	−7.51−2
$4p_{1/2}$	1	6.53−4	1.92−2	1.40−3	7.70−3	−9.10−3	$4p_{1/2}$	1	3.43−4	1.99−2	1.63−3	8.15−3	−9.77−3
	3	−4.82−2	−3.11−3	5.43−3	1.91−2	−2.46−2		3	−4.84−2	−2.21−3	5.44−3	1.95−2	−2.50−2
	5	−6.29−2	−1.51−2	6.53−3	2.04−2	−2.70−2		5	−6.48−2	−1.50−2	6.90−3	2.13−2	−2.82−2
	10	−4.04−2	−1.38−2	−1.47−3	1.03−2	−8.87−3		10	−4.26−2	−1.45−2	−1.04−3	1.10−2	−1.00−2
$4p_{3/2}$	1	3.10−3	6.64−3	7.10−4	1.56−3	−2.27−3	$4p_{3/2}$	1	3.23−3	6.76−3	7.32−4	1.56−3	−2.29−3
	3	−3.71−2	−1.40−2	7.17−3	1.07−2	−1.79−2		3	−3.73−2	−1.39−2	7.11−3	1.08−2	−1.79−2
	5	−4.11−2	−2.12−2	1.02−2	1.00−2	−2.02−2		5	−4.24−2	−2.16−2	1.05−2	1.04−2	−2.09−2
	10	−2.40−2	−2.02−2	7.83−3	3.11−3	−1.09−2		10	−2.50−2	−2.08−2	8.20−3	3.30−3	−1.15−2
$4d_{3/2}$	1	−2.68−2	−8.30−3	−2.48−3	6.90−3	−4.41−3	$4d_{3/2}$	1	−2.72−2	−8.37−3	−2.70−3	7.00−3	−4.29−3
	3	−1.39−2	−6.47−3	1.93−4	3.01−3	−3.20−3		3	−1.49−2	−6.95−3	3.14−4	3.24−3	−3.55−3
	5	−1.16−2	−9.43−4	−3.10−3	3.65−3	−5.49−4		5	−1.13−2	−1.16−3	−3.03−3	3.47−3	−4.43−4
	10	−9.05−2	−7.67−3	−1.97−3	3.28−2	−3.08−2		10	−8.70−2	−7.06−3	−2.49−3	3.15−2	−2.90−2
$4d_{5/2}$	1	−2.09−2	−9.04−3	5.51−4	4.86−3	−5.41−3	$4d_{5/2}$	1	−2.13−2	−9.14−3	4.41−4	4.93−3	−5.37−3
	3	−2.46−3	−6.58−3	3.60−3	−9.28−4	−2.67−3		3	−3.26−3	−7.02−3	3.72−3	−7.59−4	−2.96−3

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
	5	2.55−3	−1.44−3	3.57−3	−8.79−4	−2.70−3		5	3.02−3	−1.59−3	3.62−3	−1.12−3	−2.50−3
	10	−7.37−2	−1.04−2	1.21−2	2.77−2	−3.99−2		10	−7.01−2	−9.72−3	1.19−2	2.65−2	−3.84−2
$4f_{5/2}$	1	5.01−3	3.10−3	−9.03−5	−7.81−4	8.72−4	$4f_{5/2}$	1	5.37−3	3.20−3	−4.20−5	−8.75−4	9.17−4
	3	−2.64−2	3.50−3	−3.44−3	1.13−2	−7.82−3		3	−2.47−2	3.95−3	−3.42−3	1.08−2	−7.37−3
	5	−9.32−2	−5.06−3	−5.06−3	3.42−2	−2.92−2		5	−9.04−2	−4.29−3	−5.08−3	3.34−2	−2.83−2
	10	−3.15−1	−4.37−2	−8.94−3	1.07−1	−9.77−2		10	−3.10−1	−4.23−2	−8.83−3	1.05−1	−9.64−2
$4f_{7/2}$	1	9.14−3	2.66−3	1.41−3	−2.31−3	9.01−4	$4f_{7/2}$	1	9.60−3	2.78−3	1.48−3	−2.43−3	9.52−4
	3	−1.84−2	2.27−3	2.10−4	8.32−3	−8.53−3		3	−1.68−2	2.72−3	2.24−4	7.86−3	−8.08−3
	5	−8.23−2	−7.39−3	1.25−3	3.02−2	−3.15−2		5	−7.96−2	−6.61−3	1.24−3	2.94−2	−3.07−2
	10	−3.00−1	−4.94−2	1.79−3	1.00−1	−1.02−1		10	−2.95−1	−4.81−2	2.07−3	9.92−2	−1.01−1
$5s_{1/2}$	1	−1.20−3	1.09−2	3.43−3	5.54−3	−8.97−3	$5s_{1/2}$	1	−1.71−3	1.09−2	3.60−3	5.78−3	−9.38−3
	3	−2.39−3	1.92−2	5.98−3	9.84−3	−1.58−2		3	−1.30−3	2.03−2	5.94−3	9.82−3	−1.58−2
	5	−4.04−2	6.76−3	1.40−2	2.17−2	−3.57−2		5	−3.87−2	8.37−3	1.40−2	2.16−2	−3.56−2
	10	−1.15−1	−2.86−2	2.69−2	4.00−2	−6.70−2		10	−1.16−1	−2.76−2	2.75−2	4.10−2	−6.86−2
$5p_{1/2}$	1	3.89−3	1.26−2	3.13−3	4.11−3	−7.24−3	$5p_{1/2}$	1	3.66−3	1.28−2	3.48−3	4.36−3	−7.84−3
	3	−3.21−2	1.31−3	5.11−3	1.44−2	−1.95−2		3	−3.15−2	2.32−3	5.10−3	1.45−2	−1.96−2
	5	−5.30−2	−1.15−2	6.93−3	1.80−2	−2.49−2		5	−5.41−2	−1.12−2	7.28−3	1.86−2	−2.59−2
	10	−3.95−2	−1.41−2	−4.01−4	1.01−2	−9.67−3		10	−4.15−2	−1.46−2	6.60−5	1.08−2	−1.08−2
$5p_{3/2}$	1	4.10−3	5.35−3	1.16−3	7.34−4	−1.90−3	$5p_{3/2}$	1	4.12−3	5.38−3	1.22−3	7.49−4	−1.97−3
	3	−2.80−2	−9.82−3	5.87−3	8.45−3	−1.43−2		3	−2.78−2	−9.60−3	5.77−3	8.43−3	−1.42−2
	5	−3.72−2	−1.87−2	9.42−3	9.29−3	−1.87−2		5	−3.82−2	−1.90−2	9.62−3	9.60−3	−1.92−2
	10	−2.49−2	−2.05−2	7.77−3	3.30−3	−1.11−2		10	−2.59−2	−2.11−2	8.14−3	3.52−3	−1.17−2
$5d_{3/2}$	1	−1.16−2	−1.70−3	−1.17−3	3.75−3	−2.58−3	$5d_{3/2}$	1	−1.13−2	−1.46−3	−1.24−3	3.67−3	−2.43−3
	3	−1.50−2	−7.46−3	1.28−3	3.29−3	−4.57−3		3	−1.59−2	−7.84−3	1.41−3	3.52−3	−4.94−3
	5	−1.13−2	−3.28−3	−1.76−3	2.87−3	−1.11−3		5	−1.13−2	−3.59−3	−1.62−3	2.77−3	−1.15−3
	10	−8.03−2	−8.45−3	−1.32−3	2.85−2	−2.72−2		10	−7.69−2	−7.98−3	−1.76−3	2.72−2	−2.54−2
$5d_{5/2}$	1	−9.46−3	−2.70−3	4.13−4	2.79−3	−3.20−3	$5d_{5/2}$	1	−9.10−3	−2.49−3	3.46−4	2.72−3	−3.06−3
	3	−6.07−3	−7.72−3	3.71−3	8.27−5	−3.80−3		3	−6.92−3	−8.09−3	3.81−3	2.94−4	−4.11−3
	5	1.17−3	−3.63−3	3.69−3	−1.18−3	−2.51−3		5	1.30−3	−3.89−3	3.75−3	−1.33−3	−2.42−3
	10	−6.45−2	−1.08−2	1.19−2	2.38−2	−3.58−2		10	−6.10−2	−1.02−2	1.16−2	2.26−2	−3.43−2
$5f_{5/2}$	1	−1.30−4	−7.56−4	4.59−4	−1.59−4	−3.00−4	$5f_{5/2}$	1	−3.95−4	−8.98−4	4.77−4	−1.06−4	−3.71−4
	3	−1.92−2	1.12−3	−1.88−3	7.76−3	−5.88−3		3	−1.78−2	1.31−3	−1.80−3	7.27−3	−5.47−3
	5	−7.84−2	−5.43−3	−3.49−3	2.85−2	−2.50−2		5	−7.53−2	−4.81−3	−3.44−3	2.75−2	−2.41−2
	10	−2.93−1	−4.14−2	−7.01−3	9.91−2	−9.21−2		10	−2.87−1	−4.00−2	−6.80−3	9.74−2	−9.06−2
$5f_{7/2}$	1	2.86−3	−1.02−3	1.49−3	−1.25−3	−2.36−4	$5f_{7/2}$	1	2.60−3	−1.16−3	1.51−3	−1.20−3	−3.05−4
	3	−1.22−2	1.27−4	1.25−3	5.16−3	−6.41−3		3	−1.08−2	3.20−4	1.29−3	4.69−3	−5.98−3
	5	−6.84−2	−7.51−3	2.37−3	2.48−2	−2.72−2		5	−6.53−2	−6.87−3	2.40−3	2.38−2	−2.62−2
	10	−2.78−1	−4.69−2	3.56−3	9.32−2	−9.68−2		10	−2.73−1	−4.55−2	3.90−3	9.16−2	−9.55−2
$6s_{1/2}$	1	−1.27−3	8.65−3	2.81−3	4.53−3	−7.34−3	$6s_{1/2}$	1	−1.69−3	8.60−3	2.92−3	4.70−3	−7.62−3
	3	−1.95−3	1.80−2	5.52−3	9.09−3	−1.46−2		3	−9.16−4	1.90−2	5.47−3	9.05−3	−1.45−2
	5	−3.85−2	6.59−3	1.34−2	2.07−2	−3.41−2		5	−3.69−2	8.13−3	1.33−2	2.07−2	−3.40−2
	10	−1.13−1	−2.81−2	2.65−2	3.93−2	−6.58−2		10	−1.14−1	−2.70−2	2.70−2	4.03−2	−6.73−2
$6p_{1/2}$	1	3.52−3	1.06−2	3.38−3	3.50−3	−6.88−3	$6p_{1/2}$	1	3.25−3	1.06−2	3.71−3	3.70−3	−7.41−3
	3	−2.94−2	2.10−3	5.11−3	1.36−2	−1.87−2		3	−2.86−2	3.15−3	5.10−3	1.37−2	−1.88−2
	5	−5.17−2	−1.10−2	7.13−3	1.77−2	−2.48−2		5	−5.27−2	−1.06−2	7.48−3	1.83−2	−2.58−2
	10	−3.96−2	−1.42−2	−1.49−4	1.01−2	−9.96−3		10	−4.16−2	−1.48−2	3.37−4	1.08−2	−1.11−2
$6p_{3/2}$	1	3.92−3	4.94−3	1.26−3	6.62−4	−1.93−3	$6p_{3/2}$	1	3.89−3	4.94−3	1.33−3	6.83−4	−2.01−3
	3	−2.68−2	−9.20−3	5.70−3	8.17−3	−1.39−2		3	−2.65−2	−8.95−3	5.59−3	8.14−3	−1.37−2
	5	−3.71−2	−1.85−2	9.38−3	9.31−3	−1.87−2		5	−3.80−2	−1.87−2	9.58−3	9.62−3	−1.92−2
	10	−2.53−2	−2.08−2	7.82−3	3.37−3	−1.12−2		10	−2.63−2	−2.14−2	8.20−3	3.60−3	−1.18−2
$7s_{1/2}$	1	−1.37−3	7.75−3	2.58−3	4.16−3	−6.75−3	$6d_{3/2}$	1	−8.71−3	−3.57−4	−1.03−3	3.13−3	−2.10−3
	3	−1.77−3	1.76−2	5.34−3	8.80−3	−1.41−2		3	−1.63−2	−8.03−3	1.61−3	3.64−3	−5.26−3
	5	−3.77−2	6.56−3	1.32−2	2.03−2	−3.35−2		5	−1.14−2	−4.02−3	−1.39−3	2.68−3	−1.29−3
	10	−1.12−1	−2.78−2	2.63−2	3.90−2	−6.53−2		10	−7.52−2	−8.10−3	−1.68−3	2.65−2	−2.48−2
							$7s_{1/2}$	1	−1.68−3	7.70−3	2.67−3	4.29−3	−6.95−3
								3	−6.93−4	1.85−2	5.28−3	8.74−3	−1.40−2
								5	−3.61−2	8.06−3	1.31−2	2.03−2	−3.33−2
								10	−1.13−1	−2.67−2	2.68−2	3.99−2	−6.67−2

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$Z=97$, Bk: $5f^6_{5/2}5f^2_{7/2}6d^1_{3/2}7s^2_{1/2}$							$Z=98$, Cf: $5f^6_{5/2}5f^4_{7/2}7s^2_{1/2}$						
$4s_{1/2}$	1	−4.58−3	2.08−2	7.35−3	1.16−2	−1.90−2	$4s_{1/2}$	1	−6.21−3	2.10−2	7.92−3	1.25−2	−2.04−2
	3	−3.52−3	2.71−2	8.51−3	1.40−2	−2.25−2		3	−2.09−3	2.89−2	8.56−3	1.41−2	−2.26−2
	5	−4.75−2	1.06−2	1.72−2	2.67−2	−4.40−2		5	−4.57−2	1.28−2	1.72−2	2.68−2	−4.41−2
	10	−1.29−1	−2.91−2	3.09−2	4.61−2	−7.71−2		10	−1.30−1	−2.78−2	3.17−2	4.74−2	−7.91−2
$4p_{1/2}$	1	−5.31−5	2.07−2	1.93−3	8.68−3	−1.06−2	$4p_{1/2}$	1	−6.04−4	2.15−2	2.31−3	9.32−3	−1.16−2
	3	−4.85−2	−1.19−3	5.44−3	2.00−2	−2.54−2		3	−4.85−2	2.87−6	5.43−3	2.05−2	−2.59−2
	5	−6.70−2	−1.49−2	7.29−3	2.23−2	−2.96−2		5	−6.91−2	−1.47−2	7.69−3	2.33−2	−3.10−2
	10	−4.50−2	−1.51−2	−5.75−4	1.18−2	−1.13−2		10	−4.77−2	−1.58−2	−5.65−5	1.27−2	−1.27−2
$4p_{3/2}$	1	3.43−3	6.94−3	7.73−4	1.56−3	−2.33−3	$4p_{3/2}$	1	3.69−3	7.16−3	8.36−4	1.55−3	−2.39−3
	3	−3.75−2	−1.38−2	7.03−3	1.09−2	−1.79−2		3	−3.76−2	−1.37−2	6.93−3	1.10−2	−1.79−2
	5	−4.39−2	−2.21−2	1.07−2	1.09−2	−2.16−2		5	−4.54−2	−2.26−2	1.10−2	1.13−2	−2.23−2
	10	−2.60−2	−2.15−2	8.61−3	3.53−3	−1.21−2		10	−2.72−2	−2.23−2	9.07−3	3.79−3	−1.29−2
$4d_{3/2}$	1	−2.76−2	−8.40−3	−2.97−3	7.09−3	−4.13−3	$4d_{3/2}$	1	−2.80−2	−8.39−3	−3.28−3	7.20−3	−3.92−3
	3	−1.60−2	−7.47−3	4.41−4	3.50−3	−3.94−3		3	−1.73−2	−8.05−3	5.71−4	3.81−3	−4.38−3
	5	−1.11−2	−1.42−3	−2.94−3	3.30−3	−3.68−4		5	−1.10−2	−1.72−3	−2.82−3	3.17−3	−3.48−4
	10	−8.35−2	−6.46−3	−3.00−3	3.02−2	−2.72−2		10	−8.00−2	−5.88−3	−3.51−3	2.90−2	−2.55−2
$4d_{5/2}$	1	−2.15−2	−9.19−3	3.02−4	5.00−3	−5.30−3	$4d_{5/2}$	1	−2.18−2	−9.21−3	1.28−4	5.08−3	−5.20−3
	3	−4.17−3	−7.51−3	3.85−3	−5.64−4	−3.29−3		3	−5.22−3	−8.06−3	4.00−3	−3.35−4	−3.66−3
	5	3.46−3	−1.78−3	3.67−3	−1.36−3	−2.31−3		5	3.79−3	−2.01−3	3.75−3	−1.57−3	−2.17−3
	10	−6.65−2	−9.02−3	1.16−2	2.53−2	−3.69−2		10	−6.28−2	−8.33−3	1.14−2	2.41−2	−3.54−2
$4f_{5/2}$	1	5.78−3	3.32−3	1.40−5	−9.81−4	9.67−4	$4f_{5/2}$	1	6.21−3	3.43−3	7.89−5	−1.09−3	1.01−3
	3	−2.32−2	4.41−3	−3.42−3	1.04−2	−6.94−3		3	−2.15−2	4.91−3	−3.41−3	9.89−3	−6.48−3
	5	−8.82−2	−3.70−3	−5.17−3	3.28−2	−2.76−2		5	−8.55−2	−2.92−3	−5.21−3	3.20−2	−2.68−2
	10	−3.05−1	−4.10−2	−8.74−3	1.04−1	−9.53−2		10	−3.01−1	−3.97−2	−8.68−3	1.03−1	−9.41−2
$4f_{7/2}$	1	1.01−2	2.87−3	1.57−3	−2.57−3	1.00−3	$4f_{7/2}$	1	1.06−2	2.98−3	1.68−3	−2.73−3	1.05−3
	3	−1.51−2	3.18−3	2.41−4	7.37−3	−7.61−3		3	−1.33−2	3.68−3	2.63−4	6.86−3	−7.13−3
	5	−7.73−2	−6.01−3	1.17−3	2.87−2	−2.99−2		5	−7.46−2	−5.23−3	1.16−3	2.80−2	−2.91−2
	10	−2.90−1	−4.67−2	2.33−3	9.79−2	−1.00−1		10	−2.86−1	−4.54−2	2.58−3	9.67−2	−9.93−2
$5s_{1/2}$	1	−2.37−3	1.10−2	3.81−3	6.09−3	−9.90−3	$5s_{1/2}$	1	−3.20−3	1.09−2	4.05−3	6.45−3	−1.05−2
	3	−1.60−4	2.14−2	5.91−3	9.81−3	−1.57−2		3	1.04−3	2.26−2	5.87−3	9.80−3	−1.57−2
	5	−3.70−2	1.01−2	1.39−2	2.16−2	−3.55−2		5	−3.50−2	1.19−2	1.38−2	2.15−2	−3.53−2
	10	−1.17−1	−2.64−2	2.81−2	4.20−2	−7.01−2		10	−1.18−1	−2.51−2	2.87−2	4.30−2	−7.17−2
$5p_{1/2}$	1	3.36−3	1.31−2	3.92−3	4.67−3	−8.59−3	$5p_{1/2}$	1	2.96−3	1.33−2	4.48−3	5.04−3	−9.52−3
	3	−3.08−2	3.46−3	5.09−3	1.47−2	−1.98−2		3	−2.99−2	4.77−3	5.07−3	1.49−2	−2.00−2
	5	−5.53−2	−1.08−2	7.63−3	1.94−2	−2.70−2		5	−5.65−2	−1.02−2	8.00−3	2.01−2	−2.81−2
	10	−4.37−2	−1.52−2	5.80−4	1.15−2	−1.21−2		10	−4.61−2	−1.57−2	1.14−3	1.24−2	−1.35−2
$5p_{3/2}$	1	4.17−3	5.44−3	1.31−3	7.68−4	−2.08−3	$5p_{3/2}$	1	4.24−3	5.51−3	1.42−3	7.93−4	−2.21−3
	3	−2.75−2	−9.34−3	5.66−3	8.42−3	−1.41−2		3	−2.72−2	−9.04−3	5.53−3	8.39−3	−1.39−2
	5	−3.92−2	−1.93−2	9.81−3	9.96−3	−1.98−2		5	−4.02−2	−1.95−2	1.00−2	1.03−2	−2.03−2
	10	−2.69−2	−2.18−2	8.55−3	3.77−3	−1.23−2		10	−2.81−2	−2.25−2	9.00−3	4.06−3	−1.31−2
$5d_{3/2}$	1	−1.08−2	−1.15−3	−1.32−3	3.59−3	−2.26−3	$5d_{3/2}$	1	−1.02−2	−7.43−4	−1.41−3	3.49−3	−2.08−3
	3	−1.69−2	−8.24−3	1.54−3	3.78−3	−5.33−3		3	−1.81−2	−8.69−3	1.67−3	4.08−3	−5.76−3
	5	−1.14−2	−3.94−3	−1.46−3	2.69−3	−1.23−3		5	−1.16−2	−4.33−3	−1.28−3	2.65−3	−1.37−3
	10	−7.35−2	−7.52−3	−2.20−3	2.59−2	−2.37−2		10	−7.01−2	−7.09−3	−2.63−3	2.47−2	−2.21−2
$5d_{5/2}$	1	−8.69−3	−2.22−3	2.71−4	2.64−3	−2.91−3	$5d_{5/2}$	1	−8.16−3	−1.87−3	1.87−4	2.56−3	−2.74−3
	3	−7.86−3	−8.50−3	3.93−3	5.29−4	−4.46−3		3	−8.93−3	−8.97−3	4.06−3	7.98−4	−4.86−3
	5	1.36−3	−4.19−3	3.82−3	−1.46−3	−2.36−3		5	1.33−3	−4.53−3	3.91−3	−1.57−3	−2.35−3
	10	−5.75−2	−9.66−3	1.14−2	2.14−2	−3.28−2		10	−5.41−2	−9.11−3	1.11−2	2.02−2	−3.13−2
$5f_{5/2}$	1	−7.16−4	−1.06−3	4.96−4	−3.99−5	−4.56−4	$5f_{5/2}$	1	−1.11−3	−1.26−3	5.14−4	4.31−5	−5.57−4
	3	−1.64−2	1.49−3	−1.72−3	6.80−3	−5.07−3		3	−1.49−2	1.67−3	−1.65−3	6.32−3	−4.67−3
	5	−7.22−2	−4.21−3	−3.39−3	2.65−2	−2.31−2		5	−6.92−2	−3.62−3	−3.35−3	2.56−2	−2.22−2
	10	−2.81−1	−3.86−2	−6.64−3	9.58−2	−8.91−2		10	−2.76−1	−3.73−2	−6.49−3	9.41−2	−8.76−2
$5f_{7/2}$	1	2.30−3	−1.32−3	1.53−3	−1.14−3	−3.87−4	$5f_{7/2}$	1	1.95−3	−1.51−3	1.56−3	−1.07−3	−4.86−4
	3	−9.35−3	5.18−4	1.33−3	4.21−3	−5.54−3		3	−7.89−3	7.22−4	1.38−3	3.72−3	−5.10−3
	5	−6.22−2	−6.24−3	2.42−3	2.29−2	−2.53−2		5	−5.92−2	−5.62−3	2.44−3	2.19−2	−2.44−2
	10	−2.67−1	−4.41−2	4.22−3	9.01−2	−9.43−2		10	−2.62−1	−4.27−2	4.53−3	8.85−2	−9.30−2

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$6s_{1/2}$	1	−2.20−3	8.51−3	3.06−3	4.90−3	−7.95−3	$6s_{1/2}$	1	−2.84−3	8.38−3	3.22−3	5.13−3	−8.35−3
	3	1.90−4	2.00−2	5.42−3	9.01−3	−1.44−2		3	1.35−3	2.11−2	5.37−3	8.98−3	−1.44−2
	5	−3.51−2	9.77−3	1.32−2	2.06−2	−3.38−2		5	−3.32−2	1.15−2	1.31−2	2.05−2	−3.36−2
	10	−1.15−1	−2.58−2	2.76−2	4.12−2	−6.88−2		10	−1.16−1	−2.45−2	2.81−2	4.21−2	−7.02−2
$6p_{1/2}$	1	2.92−3	1.07−2	4.13−3	3.92−3	−8.05−3	$6p_{1/2}$	1	2.48−3	1.06−2	4.61−3	4.16−3	−8.77−3
	3	−2.77−2	4.34−3	5.08−3	1.38−2	−1.89−2		3	−2.66−2	5.67−3	5.04−3	1.39−2	−1.90−2
	5	−5.36−2	−1.01−2	7.83−3	1.90−2	−2.68−2		5	−5.44−2	−9.47−3	8.18−3	1.96−2	−2.78−2
	10	−4.38−2	−1.53−2	8.67−4	1.16−2	−1.25−2		10	−4.62−2	−1.58−2	1.45−3	1.24−2	−1.39−2
$6p_{3/2}$	1	3.88−3	4.94−3	1.41−3	7.06−4	−2.12−3	$6p_{3/2}$	1	3.87−3	4.95−3	1.52−3	7.35−4	−2.26−3
	3	−2.61−2	−8.65−3	5.47−3	8.09−3	−1.36−2		3	−2.57−2	−8.29−3	5.33−3	8.03−3	−1.34−2
	5	−3.89−2	−1.89−2	9.76−3	9.93−3	−1.97−2		5	−3.98−2	−1.91−2	9.93−3	1.03−2	−2.02−2
	10	−2.74−2	−2.20−2	8.61−3	3.86−3	−1.25−2		10	−2.85−2	−2.27−2	9.06−3	4.16−3	−1.32−2
$6d_{3/2}$	1	−8.08−3	−3.66−6	−1.08−3	3.02−3	−1.94−3	$7s_{1/2}$	1	−2.82−3	7.26−3	2.89−3	4.61−3	−7.50−3
	3	−1.73−2	−8.39−3	1.74−3	3.90−3	−5.64−3		3	1.49−3	2.05−2	5.16−3	8.63−3	−1.38−2
	5	−1.15−2	−4.39−3	−1.21−3	2.62−3	−1.41−3		5	−3.23−2	1.14−2	1.28−2	2.00−2	−3.29−2
	10	−7.18−2	−7.68−3	−2.11−3	2.52−2	−2.31−2		10	−1.14−1	−2.42−2	2.79−2	4.17−2	−6.96−2
$7s_{1/2}$	1	−2.18−3	7.51−3	2.77−3	4.43−3	−7.20−3							
	3	2.50−4	1.94−2	5.24−3	8.71−3	−1.39−2							
	5	−3.43−2	9.67−3	1.29−2	2.02−2	−3.31−2							
	10	−1.14−1	−2.55−2	2.73−2	4.08−2	−6.82−2							
$Z = 99$, Es: $5f^6_{5/2}5f^5_{7/2}7s^2_{1/2}$							$Z = 100$, Fm: $5f^6_{5/2}5f^6_{7/2}7s^2_{1/2}$						
$4s_{1/2}$	1	−7.75−3	2.11−2	8.45−3	1.32−2	−2.17−2	$4s_{1/2}$	1	−9.41−3	2.12−2	9.01−3	1.40−2	−2.30−2
	3	−7.90−4	3.05−2	8.62−3	1.42−2	−2.29−2		3	4.59−4	3.21−2	8.70−3	1.44−2	−2.31−2
	5	−4.37−2	1.50−2	1.72−2	2.69−2	−4.42−2		5	−4.17−2	1.73−2	1.72−2	2.70−2	−4.43−2
	10	−1.32−1	−2.64−2	3.24−2	4.85−2	−8.10−2		10	−1.32−1	−2.48−2	3.31−2	4.97−2	−8.28−2
$4p_{1/2}$	1	−1.28−3	2.23−2	2.69−3	9.97−3	−1.27−2	$4p_{1/2}$	1	−2.11−3	2.31−2	3.13−3	1.07−2	−1.38−2
	3	−4.84−2	1.22−3	5.40−3	2.09−2	−2.63−2		3	−4.83−2	2.55−3	5.37−3	2.14−2	−2.68−2
	5	−7.10−2	−1.43−2	8.06−3	2.43−2	−3.23−2		5	−7.30−2	−1.40−2	8.44−3	2.53−2	−3.37−2
	10	−5.04−2	−1.65−2	4.96−4	1.37−2	−1.42−2		10	−5.34−2	−1.72−2	1.09−3	1.47−2	−1.58−2
$4p_{3/2}$	1	3.84−3	7.31−3	8.89−4	1.57−3	−2.46−3	$4p_{3/2}$	1	3.97−3	7.47−3	9.50−4	1.59−3	−2.54−3
	3	−3.77−2	−1.36−2	6.81−3	1.10−2	−1.78−2		3	−3.78−2	−1.34−2	6.69−3	1.11−2	−1.78−2
	5	−4.67−2	−2.30−2	1.13−2	1.17−2	−2.30−2		5	−4.80−2	−2.34−2	1.15−2	1.21−2	−2.36−2
	10	−2.84−2	−2.30−2	9.55−3	4.08−3	−1.36−2		10	−2.97−2	−2.37−2	1.01−2	4.40−3	−1.45−2
$4d_{3/2}$	1	−2.83−2	−8.36−3	−3.55−3	7.27−3	−3.72−3	$4d_{3/2}$	1	−2.85−2	−8.30−3	−3.82−3	7.31−3	−3.49−3
	3	−1.85−2	−8.60−3	6.86−4	4.10−3	−4.79−3		3	−1.98−2	−9.16−3	7.94−4	4.41−3	−5.20−3
	5	−1.10−2	−2.03−3	−2.69−3	3.06−3	−3.73−4		5	−1.11−2	−2.37−3	−2.55−3	2.99−3	−4.41−4
	10	−7.67−2	−5.34−3	−3.98−3	2.77−2	−2.38−2		10	−7.34−2	−4.83−3	−4.44−3	2.65−2	−2.21−2
$4d_{5/2}$	1	−2.21−2	−9.26−3	−2.25−5	5.14−3	−5.11−3	$4d_{5/2}$	1	−2.23−2	−9.28−3	−1.78−4	5.18−3	−5.00−3
	3	−6.25−3	−8.60−3	4.14−3	−1.09−4	−4.03−3		3	−7.33−3	−9.14−3	4.28−3	1.31−4	−4.41−3
	5	4.03−3	−2.27−3	3.83−3	−1.75−3	−2.08−3		5	4.19−3	−2.55−3	3.92−3	−1.91−3	−2.02−3
	10	−5.94−2	−7.69−3	1.11−2	2.29−2	−3.40−2		10	−5.60−2	−7.08−3	1.09−2	2.18−2	−3.27−2
$4f_{5/2}$	1	6.58−3	3.53−3	1.38−4	−1.19−3	1.05−3	$4f_{5/2}$	1	6.94−3	3.63−3	1.98−4	−1.29−3	1.09−3
	3	−1.99−2	5.37−3	−3.39−3	9.45−3	−6.05−3		3	−1.84−2	5.83−3	−3.37−3	9.01−3	−5.63−3
	5	−8.29−2	−2.15−3	−5.24−3	3.12−2	−2.60−2		5	−8.02−2	−1.39−3	−5.26−3	3.05−2	−2.52−2
	10	−2.96−1	−3.83−2	−8.62−3	1.01−1	−9.28−2		10	−2.92−1	−3.70−2	−8.58−3	1.00−1	−9.16−2
$4f_{7/2}$	1	1.11−2	3.07−3	1.78−3	−2.87−3	1.09−3	$4f_{7/2}$	1	1.16−2	3.16−3	1.88−3	−3.01−3	1.13−3
	3	−1.17−2	4.15−3	2.83−4	6.39−3	−6.68−3		3	−1.00−2	4.61−3	3.07−4	5.92−3	−6.23−3
	5	−7.19−2	−4.46−3	1.15−3	2.72−2	−2.83−2		5	−6.92−2	−3.69−3	1.13−3	2.64−2	−2.76−2
	10	−2.81−1	−4.41−2	2.81−3	9.55−2	−9.83−2		10	−2.77−1	−4.28−2	3.03−3	9.43−2	−9.73−2
$5s_{1/2}$	1	−3.96−3	1.08−2	4.26−3	6.75−3	−1.10−2	$5s_{1/2}$	1	−4.77−3	1.06−2	4.47−3	7.05−3	−1.15−2
	3	2.12−3	2.37−2	5.86−3	9.81−3	−1.57−2		3	3.15−3	2.48−2	5.85−3	9.83−3	−1.57−2
	5	−3.31−2	1.37−2	1.37−2	2.15−2	−3.51−2		5	−3.11−2	1.56−2	1.36−2	2.14−2	−3.49−2
	10	−1.19−1	−2.36−2	2.93−2	4.39−2	−7.31−2		10	−1.19−1	−2.19−2	2.98−2	4.47−2	−7.45−2
$5p_{1/2}$	1	2.48−3	1.35−2	5.01−3	5.40−3	−1.04−2	$5p_{1/2}$	1	1.91−3	1.36−2	5.59−3	5.80−3	−1.14−2
	3	−2.90−2	6.09−3	5.04−3	1.51−2	−2.01−2		3	−2.80−2	7.50−3	5.01−3	1.52−2	−2.02−2
	5	−5.74−2	−9.61−3	8.34−3	2.08−2	−2.91−2		5	−5.83−2	−8.89−3	8.67−3	2.15−2	−3.02−2
	10	−4.86−2	−1.62−2	1.74−3	1.33−2	−1.50−2		10	−5.12−2	−1.67−2	2.37−3	1.43−2	−1.66−2

(*continued on next page*)

Table 1 (*continued*)

Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ	Shell	E	$\Delta\beta_{\rm unp}$	$\Delta\beta_{lp}$	η	μ	ξ
$5p_{3/2}$	1	4.25−3	5.56−3	1.52−3	8.29−4	−2.35−3	$5p_{3/2}$	1	4.22−3	5.59−3	1.62−3	8.72−4	−2.49−3
	3	−2.69−2	−8.74−3	5.40−3	8.35−3	−1.37−2		3	−2.65−2	−8.42−3	5.25−3	8.29−3	−1.35−2
	5	−4.11−2	−1.97−2	1.02−2	1.06−2	−2.08−2		5	−4.20−2	−1.99−2	1.03−2	1.09−2	−2.12−2
	10	−2.93−2	−2.31−2	9.47−3	4.36−3	−1.38−2		10	−3.06−2	−2.38−2	9.96−3	4.69−3	−1.47−2
$5d_{3/2}$	1	−9.65−3	−3.96−4	−1.47−3	3.41−3	−1.93−3	$5d_{3/2}$	1	−9.10−3	−3.27−5	−1.53−3	3.32−3	−1.79−3
	3	−1.92−2	−9.12−3	1.79−3	4.37−3	−6.17−3		3	−2.03−2	−9.54−3	1.90−3	4.67−3	−6.57−3
	5	−1.19−2	−4.73−3	−1.08−3	2.63−3	−1.55−3		5	−1.22−2	−5.16−3	−8.78−4	2.65−3	−1.77−3
	10	−6.70−2	−6.70−3	−3.03−3	2.35−2	−2.05−2		10	−6.40−2	−6.36−3	−3.40−3	2.24−2	−1.90−2
$5d_{5/2}$	1	−7.65−3	−1.56−3	1.20−4	2.46−3	−2.58−3	$5d_{5/2}$	1	−7.10−3	−1.24−3	6.06−5	2.35−3	−2.42−3
	3	−9.93−3	−9.38−3	4.17−3	1.05−3	−5.22−3		3	−1.10−2	−9.80−3	4.28−3	1.32−3	−5.60−3
	5	1.21−3	−4.88−3	4.01−3	−1.64−3	−2.37−3		5	1.01−3	−5.26−3	4.12−3	−1.68−3	−2.43−3
	10	−5.08−2	−8.60−3	1.09−2	1.90−2	−3.00−2		10	−4.76−2	−8.14−3	1.07−2	1.79−2	−2.86−2
$5f_{5/2}$	1	−1.51−3	−1.44−3	5.22−4	1.33−4	−6.55−4	$5f_{5/2}$	1	−1.95−3	−1.63−3	5.23−4	2.34−4	−7.57−4
	3	−1.36−2	1.82−3	−1.57−3	5.87−3	−4.30−3		3	−1.24−2	1.95−3	−1.50−3	5.44−3	−3.95−3
	5	−6.63−2	−3.06−3	−3.30−3	2.46−2	−2.13−2		5	−6.34−2	−2.51−3	−3.24−3	2.37−2	−2.05−2
	10	−2.70−1	−3.59−2	−6.35−3	9.24−2	−8.61−2		10	−2.65−1	−3.46−2	−6.22−3	9.08−2	−8.46−2
$5f_{7/2}$	1	1.58−3	−1.68−3	1.57−3	−9.90−4	−5.82−4	$5f_{7/2}$	1	1.16−3	−1.87−3	1.58−3	−8.97−4	−6.83−4
	3	−6.58−3	8.91−4	1.42−3	3.27−3	−4.69−3		3	−5.31−3	1.04−3	1.46−3	2.83−3	−4.29−3
	5	−5.63−2	−5.04−3	2.46−3	2.10−2	−2.35−2		5	−5.34−2	−4.47−3	2.48−3	2.01−2	−2.26−2
	10	−2.56−1	−4.13−2	4.81−3	8.69−2	−9.17−2		10	−2.51−1	−4.00−2	5.08−3	8.53−2	−9.04−2
$6s_{1/2}$	1	−3.40−3	8.17−3	3.33−3	5.29−3	−8.63−3	$6s_{1/2}$	1	−3.97−3	7.93−3	3.44−3	5.45−3	−8.89−3
	3	2.38−3	2.21−2	5.33−3	8.95−3	−1.43−2		3	3.37−3	2.30−2	5.31−3	8.93−3	−1.42−2
	5	−3.12−2	1.32−2	1.30−2	2.04−2	−3.34−2		5	−2.92−2	1.50−2	1.28−2	2.03−2	−3.31−2
	10	−1.16−1	−2.30−2	2.86−2	4.29−2	−7.16−2		10	−1.16−1	−2.13−2	2.91−2	4.37−2	−7.28−2
$6p_{1/2}$	1	2.00−3	1.04−2	5.06−3	4.39−3	−9.44−3	$6p_{1/2}$	1	1.51−3	1.05−2	5.63−3	4.71−3	−1.03−2
	3	−2.55−2	7.01−3	4.99−3	1.40−2	−1.90−2		3	−2.44−2	8.49−3	4.98−3	1.41−2	−1.91−2
	5	−5.52−2	−8.78−3	8.51−3	2.03−2	−2.88−2		5	−5.60−2	−8.01−3	8.86−3	2.10−2	−2.98−2
	10	−4.85−2	−1.62−2	2.06−3	1.33−2	−1.54−2		10	−5.11−2	−1.67−2	2.71−3	1.43−2	−1.70−2
$6p_{3/2}$	1	3.79−3	4.91−3	1.61−3	7.70−4	−2.38−3	$6p_{3/2}$	1	3.69−3	4.87−3	1.70−3	8.10−4	−2.51−3
	3	−2.52−2	−7.94−3	5.18−3	7.95−3	−1.31−2		3	−2.47−2	−7.56−3	5.02−3	7.86−3	−1.29−2
	5	−4.06−2	−1.93−2	1.01−2	1.05−2	−2.06−2		5	−4.13−2	−1.94−2	1.02−2	1.08−2	−2.10−2
	10	−2.97−2	−2.33−2	9.53−3	4.47−3	−1.40−2		10	−3.10−2	−2.40−2	1.00−2	4.81−3	−1.48−2
$7s_{1/2}$	1	−3.29−3	7.12−3	3.00−3	4.76−3	−7.76−3	$7s_{1/2}$	1	−3.80−3	6.94−3	3.10−3	4.92−3	−8.02−3
	3	2.64−3	2.15−2	5.11−3	8.57−3	−1.37−2		3	3.80−3	2.26−2	5.06−3	8.53−3	−1.36−2
	5	−3.04−2	1.31−2	1.27−2	1.99−2	−3.26−2		5	−2.85−2	1.48−2	1.26−2	1.98−2	−3.24−2
	10	−1.15−1	−2.27−2	2.83−2	4.25−2	−7.09−2		10	−1.15−1	−2.11−2	2.88−2	4.33−2	−7.21−2

Table 2
Subshell photoionization cross section and angular distribution parameters of the zero and first orders for photoelectron energy $E = 10$ keV. See page 252 for Explanation of Tables

Z	Shell	σ	β	γ	δ
1	$1s_{1/2}$	9.083−6	1.960+0	2.322+0	5.716−5
2	$1s_{1/2}$	1.913−4	1.959+0	2.302+0	6.133−5
3	$1s_{1/2}$	1.495−3	1.961+0	2.312+0	6.368−5
	$2s_{1/2}$	4.488−5	1.960+0	2.312+0	6.618−5
4	$1s_{1/2}$	5.755−3	1.961+0	2.302+0	6.741−5
	$2s_{1/2}$	2.356−4	1.961+0	2.302+0	6.492−5
5	$1s_{1/2}$	1.577−2	1.961+0	2.293+0	7.146−5
	$2s_{1/2}$	8.198−4	1.962+0	2.287+0	6.443−5
	$2p_{1/2}$	2.424−6	3.623−2	7.881−1	3.690−1
6	$1s_{1/2}$	3.493−2	1.961+0	2.280+0	7.620−5
	$2s_{1/2}$	2.025−3	1.962+0	2.268+0	6.547−5
	$2p_{1/2}$	1.031−5	5.031−2	8.007−1	3.633−1
7	$1s_{1/2}$	6.682−2	1.961+0	2.268+0	8.100−5
	$2s_{1/2}$	4.154−3	1.963+0	2.247+0	6.616−5
	$2p_{1/2}$	3.202−5	6.716−2	8.089−1	3.590−1
	$2p_{3/2}$	6.258−5	4.686−2	7.819−1	3.667−1
8	$1s_{1/2}$	1.148−1	1.961+0	2.256+0	8.597−5
	$2s_{1/2}$	7.542−3	1.963+0	2.227+0	6.686−5
	$2p_{1/2}$	8.153−5	8.339−2	8.192−1	3.542−1
	$2p_{3/2}$	1.589−4	6.229−2	7.912−1	3.616−1
9	$1s_{1/2}$	1.820−1	1.961+0	2.247+0	9.097−5
	$2s_{1/2}$	1.255−2	1.964+0	2.207+0	6.670−5
	$2p_{1/2}$	1.813−4	1.067−1	8.515−1	3.481−1
	$2p_{3/2}$	3.521−4	8.497−2	8.232−1	3.554−1
10	$1s_{1/2}$	2.705−1	1.961+0	2.237+0	9.552−5
	$2s_{1/2}$	1.956−2	1.965+0	2.183+0	6.667−5
	$2p_{1/2}$	3.648−4	1.380−1	8.902−1	3.409−1
	$2p_{3/2}$	7.065−4	1.158−1	8.613−1	3.481−1
11	$1s_{1/2}$	3.803−1	1.961+0	2.228+0	9.988−5
	$2s_{1/2}$	3.052−2	1.965+0	2.157+0	6.663−5
	$2p_{1/2}$	7.602−4	1.725−1	9.269−1	3.334−1
	$2p_{3/2}$	1.469−3	1.499−1	8.979−1	3.407−1
	$3s_{1/2}$	9.546−4	1.965+0	2.156+0	6.352−5
12	$1s_{1/2}$	5.116−1	1.961+0	2.218+0	1.037−4
	$2s_{1/2}$	4.531−2	1.966+0	2.130+0	6.650−5
	$2p_{1/2}$	1.431−3	2.073−1	9.600−1	3.258−1
	$2p_{3/2}$	2.760−3	1.844−1	9.310−1	3.331−1
	$3s_{1/2}$	2.336−3	1.966+0	2.127+0	6.367−5
13	$1s_{1/2}$	6.631−1	1.961+0	2.207+0	1.072−4
	$2s_{1/2}$	6.444−2	1.967+0	2.102+0	6.627−5
	$2p_{1/2}$	2.505−3	2.416−1	9.898−1	3.182−1
	$2p_{3/2}$	4.817−3	2.184−1	9.610−1	3.256−1
	$3s_{1/2}$	4.781−3	1.967+0	2.096+0	6.307−5
	$3p_{1/2}$	1.023−4	2.391−1	9.863−1	3.176−1
14	$1s_{1/2}$	8.328−1	1.961+0	2.196+0	1.103−4
	$2s_{1/2}$	8.836−2	1.968+0	2.072+0	6.590−5
	$2p_{1/2}$	4.130−3	2.753−1	1.019+0	3.106−1
	$2p_{3/2}$	7.918−3	2.520−1	9.902−1	3.180−1
	$3s_{1/2}$	7.836−3	1.968+0	2.065+0	6.231−5
	$3p_{1/2}$	2.392−4	2.720−1	1.014+0	3.096−1
15	$2s_{1/2}$	1.174−1	1.969+0	2.043+0	6.535−5
	$2p_{1/2}$	6.481−3	3.086−1	1.048+0	3.030−1
	$2p_{3/2}$	1.239−2	2.854−1	1.020+0	3.103−1
	$3s_{1/2}$	1.170−2	1.969+0	2.032+0	6.177−5
	$3p_{1/2}$	4.615−4	3.049−1	1.041+0	3.013−1
	$3p_{3/2}$	8.808−4	2.815−1	1.013+0	3.083−1
16	$2s_{1/2}$	1.520−1	1.969+0	2.012+0	6.458−5
	$2p_{1/2}$	9.762−3	3.422−1	1.078+0	2.953−1
	$2p_{3/2}$	1.861−2	3.192−1	1.051+0	3.024−1
	$3s_{1/2}$	1.649−2	1.970+0	1.999+0	6.051−5
	$3p_{1/2}$	8.004−4	3.377−1	1.070+0	2.930−1
	$3p_{3/2}$	1.523−3	3.145−1	1.042+0	2.997−1
17	$2s_{1/2}$	1.922−1	1.970+0	1.980+0	6.357−5
	$2p_{1/2}$	1.420−2	3.763−1	1.110+0	2.875−1
	$2p_{3/2}$	2.698−2	3.535−1	1.084+0	2.945−1
	$3s_{1/2}$	2.229−2	1.971+0	1.965+0	5.889−5
	$3p_{1/2}$	1.293−3	3.712−1	1.099+0	2.845−1
	$3p_{3/2}$	2.452−3	3.483−1	1.072+0	2.912−1
18	$2s_{1/2}$	2.384−1	1.971+0	1.948+0	6.229−5
	$2p_{1/2}$	2.004−2	4.110−1	1.143+0	2.798−1
	$2p_{3/2}$	3.796−2	3.887−1	1.117+0	2.866−1
	$3s_{1/2}$	2.918−2	1.972+0	1.929+0	5.735−5
	$3p_{1/2}$	1.983−3	4.054−1	1.129+0	2.762−1
	$3p_{3/2}$	3.746−3	3.829−1	1.104+0	2.826−1
19	$2s_{1/2}$	2.901−1	1.972+0	1.914+0	6.095−5
	$2p_{1/2}$	2.750−2	4.457−1	1.175+0	2.720−1
	$2p_{3/2}$	5.193−2	4.240−1	1.151+0	2.787−1
	$3s_{1/2}$	3.898−2	1.973+0	1.892+0	5.569−5
	$3p_{1/2}$	3.229−3	4.396−1	1.159+0	2.675−1
	$3p_{3/2}$	6.091−3	4.176−1	1.135+0	2.738−1
	$4s_{1/2}$	1.918−3	1.973+0	1.891+0	5.397−5
20	$2s_{1/2}$	3.477−1	1.973+0	1.879+0	5.934−5
	$2p_{1/2}$	3.688−2	4.804−1	1.208+0	2.644−1
	$2p_{3/2}$	6.942−2	4.595−1	1.185+0	2.708−1
	$3s_{1/2}$	5.069−2	1.974+0	1.853+0	5.366−5
	$3p_{1/2}$	4.900−3	4.740−1	1.189+0	2.591−1
	$3p_{3/2}$	9.223−3	4.527−1	1.166+0	2.651−1
	$4s_{1/2}$	3.912−3	1.974+0	1.853+0	5.288−5
21	$2s_{1/2}$	4.116−1	1.974+0	1.843+0	5.723−5
	$2p_{1/2}$	4.861−2	5.156−1	1.241+0	2.568−1
	$2p_{3/2}$	9.121−2	4.956−1	1.220+0	2.629−1
	$3s_{1/2}$	6.248−2	1.975+0	1.814+0	5.116−5
	$3p_{1/2}$	6.817−3	5.090−1	1.218+0	2.506−1
	$3p_{3/2}$	1.279−2	4.885−1	1.197+0	2.564−1
	$3d_{3/2}$	7.014−5	2.122−1	7.377−1	5.461−1
	$4s_{1/2}$	4.843−3	1.976+0	1.812+0	5.003−5
22	$2s_{1/2}$	4.813−1	1.975+0	1.806+0	5.476−5
	$2p_{1/2}$	6.291−2	5.507−1	1.273+0	2.492−1
	$2p_{3/2}$	1.177−1	5.316−1	1.254+0	2.552−1
	$3s_{1/2}$	7.552−2	1.977+0	1.773+0	4.838−5
	$3p_{1/2}$	9.209−3	5.438−1	1.245+0	2.423−1
	$3p_{3/2}$	1.721−2	5.244−1	1.226+0	2.478−1
	$3d_{3/2}$	1.213−4	2.270−1	7.720−1	5.359−1
	$4s_{1/2}$	5.755−3	1.977+0	1.771+0	4.723−5
23	$2s_{1/2}$	5.565−1	1.976+0	1.767+0	5.189−5
	$2p_{1/2}$	8.007−2	5.854−1	1.303+0	2.419−1
	$2p_{3/2}$	1.493−1	5.675−1	1.286+0	2.475−1
	$3s_{1/2}$	8.986−2	1.978+0	1.732+0	4.544−5
	$3p_{1/2}$	1.215−2	5.784−1	1.271+0	2.342−1
	$3p_{3/2}$	2.263−2	5.601−1	1.253+0	2.394−1
	$3d_{3/2}$	1.975−4	2.405−1	8.000−1	5.258−1
	$4s_{1/2}$	6.675−3	1.978+0	1.729+0	4.441−5
24	$2s_{1/2}$	6.378−1	1.977+0	1.729+0	4.843−5
	$2p_{1/2}$	1.006−1	6.199−1	1.333+0	2.347−1
	$2p_{3/2}$	1.869−1	6.034−1	1.318+0	2.401−1
	$3s_{1/2}$	1.041−1	1.979+0	1.691+0	4.177−5
	$3p_{1/2}$	1.540−2	6.127−1	1.296+0	2.262−1

(continued on next page)

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
	$3p_{3/2}$	2.855−2	5.957−1	1.281+0	2.311−1
	$3d_{3/2}$	2.679−4	2.523−1	8.258−1	5.165−1
	$3d_{5/2}$	3.838−4	2.672−1	8.444−1	5.224−1
	$4s_{1/2}$	5.713−3	1.979+0	1.687+0	4.063−5
25	$2s_{1/2}$	7.224−1	1.978+0	1.689+0	4.479−5
	$2p_{1/2}$	1.241−1	6.532−1	1.360+0	2.278−1
	$2p_{3/2}$	2.299−1	6.381−1	1.347+0	2.328−1
	$3s_{1/2}$	1.226−1	1.980+0	1.648+0	3.809−5
	$3p_{1/2}$	2.002−2	6.459−1	1.319+0	2.183−1
	$3p_{3/2}$	3.700−2	6.303−1	1.306+0	2.229−1
	$3d_{3/2}$	4.603−4	2.628−1	8.503−1	5.076−1
	$3d_{5/2}$	6.595−4	2.770−1	8.682−1	5.139−1
	$4s_{1/2}$	8.580−3	1.980+0	1.644+0	3.649−5
26	$2s_{1/2}$	8.125−1	1.979+0	1.649+0	4.044−5
	$2p_{1/2}$	1.515−1	6.861−1	1.386+0	2.210−1
	$2p_{3/2}$	2.798−1	6.725−1	1.376+0	2.258−1
	$3s_{1/2}$	1.410−1	1.981+0	1.605+0	3.378−5
	$3p_{1/2}$	2.512−2	6.790−1	1.342+0	2.106−1
	$3p_{3/2}$	4.624−2	6.649−1	1.331+0	2.148−1
	$3d_{3/2}$	6.707−4	2.737−1	8.789−1	4.991−1
	$3d_{5/2}$	9.587−4	2.870−1	8.959−1	5.057−1
	$4s_{1/2}$	9.570−3	1.981+0	1.600+0	3.270−5
27	$2s_{1/2}$	9.067−1	1.980+0	1.608+0	3.542−5
	$2p_{1/2}$	1.829−1	7.181−1	1.411+0	2.145−1
	$2p_{3/2}$	3.367−1	7.062−1	1.403+0	2.189−1
	$3s_{1/2}$	1.609−1	1.982+0	1.560+0	2.895−5
	$3p_{1/2}$	3.111−2	7.115−1	1.364+0	2.030−1
	$3p_{3/2}$	5.704−2	6.990−1	1.355+0	2.069−1
	$3d_{3/2}$	9.541−4	2.857−1	9.103−1	4.908−1
	$3d_{5/2}$	1.360−3	2.980−1	9.265−1	4.976−1
	$4s_{1/2}$	1.059−2	1.983+0	1.555+0	2.807−5
28	$2s_{1/2}$	1.005+0	1.981+0	1.567+0	2.966−5
	$2p_{1/2}$	2.185−1	7.493−1	1.434+0	2.081−1
	$2p_{3/2}$	4.009−1	7.392−1	1.430+0	2.122−1
	$3s_{1/2}$	1.821−1	1.983+0	1.515+0	2.351−5
	$3p_{1/2}$	3.808−2	7.433−1	1.383+0	1.955−1
	$3p_{3/2}$	6.956−2	7.327−1	1.378+0	1.991−1
	$3d_{3/2}$	1.329−3	2.991−1	9.440−1	4.823−1
	$3d_{5/2}$	1.891−3	3.104−1	9.593−1	4.895−1
	$4s_{1/2}$	1.163−2	1.984+0	1.509+0	2.211−5
29	$2s_{1/2}$	1.108+0	1.982+0	1.525+0	2.285−5
	$2p_{1/2}$	2.591−1	7.800−1	1.458+0	2.020−1
	$2p_{3/2}$	4.738−1	7.718−1	1.456+0	2.058−1
	$3s_{1/2}$	2.029−1	1.984+0	1.469+0	1.727−5
	$3p_{1/2}$	4.555−2	7.750−1	1.402+0	1.882−1
	$3p_{3/2}$	8.280−2	7.663−1	1.400+0	1.915−1
	$3d_{3/2}$	1.680−3	3.144−1	9.793−1	4.737−1
	$3d_{5/2}$	2.378−3	3.246−1	9.934−1	4.812−1
	$4s_{1/2}$	9.584−3	1.985+0	1.462+0	1.646−5
30	$2s_{1/2}$	1.210+0	1.983+0	1.483+0	1.550−5
	$2p_{1/2}$	3.030−1	8.090−1	1.479+0	1.962−1
	$2p_{3/2}$	5.524−1	8.029−1	1.480+0	1.996−1
	$3s_{1/2}$	2.286−1	1.986+0	1.422+0	1.064−5
	$3p_{1/2}$	5.535−2	8.051−1	1.418+0	1.812−1
	$3p_{3/2}$	1.003−1	7.984−1	1.418+0	1.841−1
	$3d_{3/2}$	2.449−3	3.301−1	1.013+0	
	$3d_{5/2}$	3.466−3	3.392−1	1.026+0	4.728−1
	$4s_{1/2}$	1.379−2	1.986+0	1.415+0	9.382−6
31	$2s_{1/2}$	1.314+0	1.984+0	1.441+0	7.189−6
	$2p_{1/2}$	3.511−1	8.370−1	1.498+0	1.906−1
	$2p_{3/2}$	6.380−1	8.330−1	1.503+0	1.936−1
	$3s_{1/2}$	2.563−1	1.987+0	1.376+0	3.279−6

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
	$3p_{1/2}$	6.674−2	8.343−1	1.431+0	1.744−1
	$3p_{3/2}$	1.205−1	8.297−1	1.435+0	1.770−1
	$3d_{3/2}$	3.477−3	3.466−1	1.045+0	4.563−1
	$3d_{5/2}$	4.918−3	3.545−1	1.057+0	4.646−1
	$4s_{1/2}$	2.027−2	1.987+0	1.367+0	2.372−6
	$4p_{1/2}$	2.379−3	8.352−1	1.427+0	1.728−1
32	$2s_{1/2}$	1.419+0	1.985+0	1.399+0	−2.252−6
	$2p_{1/2}$	4.034−1	8.640−1	1.517+0	1.852−1
	$2p_{3/2}$	7.308−1	8.622−1	1.525+0	1.879−1
	$3s_{1/2}$	2.863−1	1.988+0	1.330+0	−4.911−6
	$3p_{1/2}$	7.991−2	8.627−1	1.443+0	1.679−1
	$3p_{3/2}$	1.439−1	8.603−1	1.450+0	1.701−1
	$3d_{3/2}$	4.815−3	3.636−1	1.076+0	4.478−1
	$3d_{5/2}$	6.804−3	3.702−1	1.087+0	4.565−1
	$4s_{1/2}$	2.645−2	1.988+0	1.320+0	−5.157−6
	$4p_{1/2}$	4.083−3	8.636−1	1.437+0	1.660−1
33	$2s_{1/2}$	1.524+0	1.986+0	1.356+0	−1.295−5
	$2p_{1/2}$	4.601−1	8.903−1	1.533+0	1.802−1
	$2p_{3/2}$	8.308−1	8.908−1	1.545+0	1.825−1
	$3s_{1/2}$	3.183−1	1.989+0	1.283+0	−1.401−5
	$3p_{1/2}$	9.497−2	8.905−1	1.453+0	1.616−1
	$3p_{3/2}$	1.706−1	8.904−1	1.463+0	1.635−1
	$3d_{3/2}$	6.528−3	3.810−1	1.106+0	4.392−1
	$3d_{5/2}$	9.215−3	3.863−1	1.115+0	4.484−1
	$4s_{1/2}$	3.306−2	1.989+0	1.272+0	−1.445−5
	$4p_{1/2}$	6.107−3	8.914−1	1.446+0	1.594−1
	$4p_{3/2}$	1.077−2	8.913−1	1.456+0	1.612−1
34	$2s_{1/2}$	1.629+0	1.987+0	1.314+0	−2.498−5
	$2p_{1/2}$	5.209−1	9.154−1	1.549+0	1.753−1
	$2p_{3/2}$	9.384−1	9.184−1	1.564+0	1.772−1
	$3s_{1/2}$	3.523−1	1.990+0	1.236+0	−2.407−5
	$3p_{1/2}$	1.120−1	9.173−1	1.461+0	1.555−1
	$3p_{3/2}$	2.006−1	9.195−1	1.474+0	1.571−1
	$3d_{3/2}$	8.687−3	3.985−1	1.134+0	4.308−1
	$3d_{5/2}$	1.225−2	4.023−1	1.142+0	4.405−1
	$4s_{1/2}$	4.018−2	1.990+0	1.225+0	−2.412−5
	$4p_{1/2}$	8.479−3	9.184−1	1.452+0	1.530−1
	$4p_{3/2}$	1.493−2	9.206−1	1.465+0	1.545−1
35	$2s_{1/2}$	1.734+0	1.987+0	1.271+0	−3.849−5
	$2p_{1/2}$	5.860−1	9.397−1	1.563+0	1.706−1
	$2p_{3/2}$	1.052+0	9.452−1	1.582+0	1.723−1
	$3s_{1/2}$	3.883−1	1.991+0	1.190+0	−3.521−5
	$3p_{1/2}$	1.312−1	9.435−1	1.468+0	1.496−1
	$3p_{3/2}$	2.342−1	9.482−1	1.484+0	1.509−1
	$3d_{3/2}$	1.137−2	4.160−1	1.161+0	4.225−1
	$3d_{5/2}$	1.601−2	4.182−1	1.167+0	4.327−1
	$4s_{1/2}$	4.786−2	1.991+0	1.177+0	−3.478−5
	$4p_{1/2}$	1.126−2	9.447−1	1.457+0	1.469−1
	$4p_{3/2}$	1.977−2	9.495−1	1.473+0	1.481−1
36	$2s_{1/2}$	1.837+0	1.988+0	1.229+0	−5.361−5
	$2p_{1/2}$	6.550−1	9.630−1	1.576+0	1.662−1
	$2p_{3/2}$	1.172+0	9.710−1	1.599+0	1.674−1
	$3s_{1/2}$	4.261−1	1.992+0	1.143+0	−4.750−5
	$3p_{1/2}$	1.525−1	9.687−1	1.472+0	1.440−1
	$3p_{3/2}$	2.716−1	9.760−1	1.492+0	1.449−1
	$3d_{3/2}$	1.466−2	4.334−1	1.186+0	4.144−1
	$3d_{5/2}$	2.061−2	4.340−1	1.190+0	4.250−1
	$4s_{1/2}$	5.612−2	1.992+0	1.129+0	−4.638−5
	$4p_{1/2}$	1.448−2	9.703−1	1.460+0	1.409−1
	$4p_{3/2}$	2.535−2	9.776−1	1.480+0	1.418−1
37	$2p_{1/2}$	7.269−1	9.851−1	1.586+0	1.620−1
	$2p_{3/2}$	1.297+0	9.958−1	1.613+0	1.629−1

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
	$3s_{1/2}$	4.653−1	1.992+0	1.098+0	−6.093−5
	$3p_{1/2}$	1.759−1	9.929−1	1.475+0	1.385−1
	$3p_{3/2}$	3.124−1	1.003+0	1.499+0	1.392−1
	$3d_{3/2}$	1.863−2	4.507−1	1.210+0	4.065−1
	$3d_{5/2}$	2.615−2	4.494−1	1.212+0	4.176−1
	$4s_{1/2}$	6.748−2	1.993+0	1.082+0	−5.894−5
	$4p_{1/2}$	1.994−2	9.947−1	1.460+0	1.351−1
	$4p_{3/2}$	3.511−2	1.005+0	1.484+0	1.357−1
	$5s_{1/2}$	3.805−3	1.993+0	1.081+0	−5.872−5
38	$2p_{3/2}$	1.427+0	1.020+0	1.627+0	1.586−1
	$3s_{1/2}$	5.061−1	1.993+0	1.052+0	−7.573−5
	$3p_{1/2}$	2.017−1	1.016+0	1.477+0	1.333−1
	$3p_{3/2}$	3.571−1	1.029+0	1.504+0	1.338−1
	$3d_{3/2}$	2.339−2	4.678−1	1.233+0	3.986−1
	$3d_{5/2}$	3.278−2	4.647−1	1.233+0	4.103−1
	$4s_{1/2}$	7.995−2	1.994+0	1.036+0	−7.312−5
	$4p_{1/2}$	2.602−2	1.019+0	1.460+0	1.296−1
	$4p_{3/2}$	4.583−2	1.031+0	1.487+0	1.300−1
	$5s_{1/2}$	6.959−3	1.994+0	1.034+0	−7.325−5
39	$3s_{1/2}$	5.486−1	1.994+0	1.007+0	−9.209−5
	$3p_{1/2}$	2.299−1	1.039+0	1.477+0	1.283−1
	$3p_{3/2}$	4.061−1	1.054+0	1.508+0	1.284−1
	$3d_{3/2}$	2.907−2	4.849−1	1.256+0	3.910−1
	$3d_{5/2}$	4.066−2	4.798−1	1.254+0	4.033−1
	$4s_{1/2}$	9.209−2	1.995+0	9.899−1	−8.877−5
	$4p_{1/2}$	3.219−2	1.042+0	1.459+0	1.242−1
	$4p_{3/2}$	5.656−2	1.057+0	1.489+0	1.244−1
	$4d_{3/2}$	1.826−3	4.835−1	1.249+0	3.869−1
	$5s_{1/2}$	8.623−3	1.995+0	9.879−1	−8.896−5
40	$3s_{1/2}$	5.928−1	1.995+0	9.619−1	−1.100−4
	$3p_{1/2}$	2.608−1	1.061+0	1.476+0	1.234−1
	$3p_{3/2}$	4.594−1	1.079+0	1.510+0	1.233−1
	$3d_{3/2}$	3.575−2	5.020−1	1.277+0	3.834−1
	$3d_{5/2}$	4.994−2	4.949−1	1.274+0	3.963−1
	$4s_{1/2}$	1.046−1	1.995+0	9.441−1	−1.059−4
	$4p_{1/2}$	3.897−2	1.064+0	1.455+0	1.190−1
	$4p_{3/2}$	6.827−2	1.082+0	1.489+0	1.189−1
	$4d_{3/2}$	2.701−3	5.006−1	1.269+0	3.787−1
	$5s_{1/2}$	9.996−3	1.996+0	9.418−1	−1.055−4
41	$3s_{1/2}$	6.387−1	1.996+0	9.169−1	−1.298−4
	$3p_{1/2}$	2.943−1	1.082+0	1.473+0	1.186−1
	$3p_{3/2}$	5.173−1	1.103+0	1.511+0	1.183−1
	$3d_{3/2}$	4.361−2	5.191−1	1.299+0	3.760−1
	$3d_{5/2}$	6.081−2	5.098−1	1.293+0	3.895−1
	$4s_{1/2}$	1.166−1	1.996+0	8.982−1	−1.243−4
	$4p_{1/2}$	4.570−2	1.086+0	1.451+0	1.139−1
	$4p_{3/2}$	7.968−2	1.107+0	1.488+0	1.136−1
	$4d_{3/2}$	3.351−3	5.178−1	1.289+0	3.706−1
	$5s_{1/2}$	9.175−3	1.996+0	8.955−1	−1.247−4
42	$3s_{1/2}$	6.857−1	1.996+0	8.723−1	−1.514−4
	$3p_{1/2}$	3.304−1	1.103+0	1.469+0	1.140−1
	$3p_{3/2}$	5.792−1	1.127+0	1.511+0	1.135−1
	$3d_{3/2}$	5.269−2	5.362−1	1.319+0	3.686−1
	$3d_{5/2}$	7.334−2	5.247−1	1.311+0	3.827−1
	$4s_{1/2}$	1.301−1	1.997+0	8.527−1	−1.448−4
	$4p_{1/2}$	5.383−2	1.107+0	1.445+0	1.089−1
	$4p_{3/2}$	9.357−2	1.131+0	1.485+0	1.085−1
	$4d_{3/2}$	4.581−3	5.350−1	1.309+0	3.625−1
	$4d_{5/2}$	6.293−3	5.229−1	1.301+0	3.765−1
	$5s_{1/2}$	1.006−2	1.997+0	8.496−1	−1.430−4
43	$3s_{1/2}$	7.337−1	1.997+0	8.283−1	−1.750−4
	$3p_{1/2}$	3.689−1	1.123+0	1.463+0	1.096−1
	$3p_{3/2}$	6.451−1	1.150+0	1.508+0	1.089−1

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
	$3d_{3/2}$	6.308−2	5.532−1	1.339+0	3.615−1
	$3d_{5/2}$	8.767−2	5.394−1	1.329+0	3.761−1
	$4s_{1/2}$	1.453−1	1.997+0	8.079−1	−1.668−4
	$4p_{1/2}$	6.361−2	1.127+0	1.437+0	1.041−1
	$4p_{3/2}$	1.104−1	1.154+0	1.481+0	1.036−1
	$4d_{3/2}$	6.626−3	5.521−1	1.327+0	3.545−1
	$4d_{5/2}$	9.123−3	5.376−1	1.317+0	3.691−1
	$5s_{1/2}$	1.343−2	1.998+0	8.047−1	−1.651−4
44	$3s_{1/2}$	7.834−1	1.997+0	7.844−1	−2.009−4
	$3p_{1/2}$	4.106−1	1.142+0	1.456+0	1.052−1
	$3p_{3/2}$	7.163−1	1.172+0	1.505+0	1.044−1
	$3d_{3/2}$	7.511−2	5.706−1	1.359+0	3.544−1
	$3d_{5/2}$	1.042−1	5.543−1	1.346+0	3.697−1
	$4s_{1/2}$	1.586−1	1.998+0	7.631−1	−1.911−4
	$4p_{1/2}$	7.247−2	1.147+0	1.428+0	9.943−2
	$4p_{3/2}$	1.251−1	1.177+0	1.475+0	9.873−2
	$4d_{3/2}$	7.852−3	5.697−1	1.346+0	3.467−1
	$4d_{5/2}$	1.075−2	5.526−1	1.333+0	3.619−1
	$5s_{1/2}$	1.164−2	1.998+0	7.595−1	−1.904−4
45	$3s_{1/2}$	8.339−1	1.998+0	7.410−1	−2.291−4
	$3p_{1/2}$	4.547−1	1.161+0	1.448+0	1.010−1
	$3p_{3/2}$	7.915−1	1.194+0	1.500+0	1.001−1
	$3d_{3/2}$	8.873−2	5.877−1	1.377+0	3.474−1
	$3d_{5/2}$	1.229−1	5.689−1	1.363+0	3.634−1
	$4s_{1/2}$	1.737−1	1.998+0	7.190−1	−2.175−4
	$4p_{1/2}$	8.303−2	1.167+0	1.417+0	9.492−2
	$4p_{3/2}$	1.429−1	1.200+0	1.468+0	9.413−2
	$4d_{3/2}$	9.970−3	5.872−1	1.363+0	3.389−1
	$4d_{5/2}$	1.361−2	5.676−1	1.348+0	3.548−1
	$5s_{1/2}$	1.237−2	1.998+0	7.152−1	−2.168−4
46	$3s_{1/2}$	8.857−1	1.998+0	6.980−1	−2.600−4
	$3p_{1/2}$	5.020−1	1.179+0	1.439+0	9.698−2
	$3p_{3/2}$	8.718−1	1.215+0	1.494+0	9.591−2
	$3d_{3/2}$	1.043−1	6.050−1	1.396+0	3.406−1
	$3d_{5/2}$	1.442−1	5.836−1	1.379+0	3.572−1
	$4s_{1/2}$	1.885−1	1.999+0	6.754−1	−2.462−4
	$4p_{1/2}$	9.371−2	1.185+0	1.405+0	9.055−2
	$4p_{3/2}$	1.605−1	1.222+0	1.459+0	8.969−2
	$4d_{3/2}$	1.159−2	6.050−1	1.379+0	3.313−1
	$4d_{5/2}$	1.570−2	5.827−1	1.362+0	3.477−1
47	$3s_{1/2}$	9.373−1	1.998+0	6.561−1	−2.935−4
	$3p_{1/2}$	5.510−1	1.196+0	1.428+0	9.311−2
	$3p_{3/2}$	9.548−1	1.236+0	1.487+0	9.197−2
	$3d_{3/2}$	1.215−1	6.221−1	1.413+0	3.339−1
	$3d_{5/2}$	1.677−1	5.981−1	1.394+0	3.512−1
	$4s_{1/2}$	2.054−1	1.999+0	6.332−1	−2.772−4
	$4p_{1/2}$	1.068−1	1.204+0	1.391+0	8.637−2
	$4p_{3/2}$	1.825−1	1.243+0	1.449+0	8.548−2
	$4d_{3/2}$	1.538−2	6.226−1	1.394+0	3.238−1
	$4d_{5/2}$	2.090−2	5.975−1	1.375+0	3.408−1
	$5s_{1/2}$	1.372−2	1.999+0	6.289−1	−2.737−4
48	$3s_{1/2}$	9.893−1	1.999+0	6.151−1	−3.299−4
	$3p_{1/2}$	6.023−1	1.212+0	1.416+0	8.941−2
	$3p_{3/2}$	1.042+0	1.255+0	1.479+0	8.822−2
	$3d_{3/2}$	1.406−1	6.392−1	1.430+0	3.274−1
	$3d_{5/2}$	1.938−1	6.124−1	1.409+0	3.454−1
	$4s_{1/2}$	2.235−1	1.999+0	5.922−1	−3.108−4
	$4p_{1/2}$	1.213−1	1.221+0	1.377+0	8.237−2
	$4p_{3/2}$	2.069−1	1.264+0	1.438+0	8.148−2
	$4d_{3/2}$	1.984−2	6.400−1	1.408+0	3.163−1
	$4d_{5/2}$	2.700−2	6.122−1	1.386+0	3.340−1
	$5s_{1/2}$	1.819−2	1.999+0	5.878−1	−3.079−4

(*continued on next page*)

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
49	$3s_{1/2}$	1.041+0	1.999+0	5.751−1	−3.694−4
	$3p_{3/2}$	1.132+0	1.275+0	1.470+0	8.467−2
	$3d_{3/2}$	1.618−1	6.561−1	1.446+0	3.211−1
	$3p_{1/2}$	6.557−1	1.229+0	1.404+0	8.587−2
	$3d_{5/2}$	2.226−1	6.266−1	1.422+0	3.397−1
	$4s_{1/2}$	2.423−1	1.999+0	5.524−1	−3.471−4
	$4p_{1/2}$	1.370−1	1.238+0	1.362+0	7.855−2
	$4p_{3/2}$	2.335−1	1.284+0	1.426+0	7.768−2
	$4d_{3/2}$	2.519−2	6.575−1	1.420+0	3.092−1
	$4d_{5/2}$	3.428−2	6.268−1	1.397+0	3.275−1
	$5s_{1/2}$	2.459−2	1.999+0	5.478−1	−3.440−4
	$5p_{1/2}$	6.957−3	1.240+0	1.356+0	7.742−2
50	$3s_{1/2}$	1.094+0	1.999+0	5.361−1	−4.123−4
	$3p_{1/2}$	7.114−1	1.244+0	1.390+0	8.248−2
	$3p_{3/2}$	1.225+0	1.293+0	1.460+0	8.129−2
	$3d_{3/2}$	1.852−1	6.730−1	1.461+0	3.150−1
	$3d_{5/2}$	2.543−1	6.407−1	1.435+0	3.343−1
	$4s_{1/2}$	2.621−1	1.999+0	5.136−1	−3.862−4
	$4p_{1/2}$	1.542−1	1.254+0	1.345+0	7.485−2
	$4p_{3/2}$	2.624−1	1.303+0	1.413+0	7.406−2
	$4d_{3/2}$	3.138−2	6.750−1	1.433+0	3.021−1
	$4d_{5/2}$	4.271−2	6.413−1	1.407+0	3.211−1
	$5s_{1/2}$	3.024−2	2.000+0	5.087−1	−3.818−4
	$5p_{1/2}$	1.054−2	1.257+0	1.340+0	7.363−2
51	$3s_{1/2}$	1.146+0	1.999+0	4.981−1	−4.588−4
	$3p_{1/2}$	7.693−1	1.259+0	1.375+0	7.921−2
	$3p_{3/2}$	1.322+0	1.312+0	1.448+0	7.808−2
	$3d_{3/2}$	2.109−1	6.898−1	1.475+0	3.090−1
	$3d_{5/2}$	2.891−1	6.546−1	1.447+0	3.290−1
	$4s_{1/2}$	2.828−1	1.999+0	4.758−1	−4.288−4
	$4p_{1/2}$	1.728−1	1.270+0	1.328+0	7.128−2
	$4p_{3/2}$	2.936−1	1.323+0	1.399+0	7.059−2
	$4d_{3/2}$	3.854−2	6.925−1	1.444+0	2.952−1
	$4d_{5/2}$	5.241−2	6.557−1	1.416+0	3.149−1
	$5s_{1/2}$	3.607−2	1.999+0	4.708−1	−4.223−4
	$5p_{1/2}$	1.443−2	1.273+0	1.322+0	6.996−2
	$5p_{3/2}$	2.313−2	1.325+0	1.393+0	6.936−2
52	$3s_{1/2}$	1.198+0	1.998+0	4.610−1	−5.090−4
	$3p_{1/2}$	8.292−1	1.273+0	1.360+0	7.608−2
	$3p_{3/2}$	1.423+0	1.329+0	1.436+0	7.504−2
	$3d_{3/2}$	2.390−1	7.065−1	1.489+0	3.032−1
	$3d_{5/2}$	3.271−1	6.684−1	1.458+0	3.238−1
	$4s_{1/2}$	3.043−1	1.999+0	4.389−1	−4.747−4
	$4p_{1/2}$	1.927−1	1.286+0	1.310+0	6.783−2
	$4p_{3/2}$	3.271−1	1.341+0	1.384+0	6.729−2
	$4d_{3/2}$	4.673−2	7.099−1	1.455+0	2.885−1
	$4d_{5/2}$	6.350−2	6.700−1	1.425+0	3.087−1
	$5s_{1/2}$	4.208−2	1.999+0	4.338−1	−4.671−4
	$5p_{1/2}$	1.855−2	1.288+0	1.303+0	6.639−2
	$5p_{3/2}$	2.989−2	1.344+0	1.377+0	6.596−2
53	$3s_{1/2}$	1.250+0	1.998+0	4.250−1	−5.635−4
	$3p_{1/2}$	8.911−1	1.287+0	1.344+0	7.307−2
	$3p_{3/2}$	1.527+0	1.346+0	1.423+0	7.215−2
	$3d_{3/2}$	2.695−1	7.230−1	1.501+0	2.975−1
	$3d_{5/2}$	3.683−1	6.820−1	1.469+0	3.187−1
	$4s_{1/2}$	3.266−1	1.999+0	4.031−1	−5.243−4
	$4p_{1/2}$	2.140−1	1.301+0	1.292+0	6.449−2
	$4p_{3/2}$	3.628−1	1.359+0	1.369+0	6.414−2
	$4d_{3/2}$	5.604−2	7.272−1	1.465+0	2.818−1
	$4d_{5/2}$	7.607−2	6.841−1	1.434+0	3.027−1
	$5s_{1/2}$	4.835−2	1.999+0	3.977−1	−5.153−4
	$5p_{1/2}$	2.299−2	1.304+0	1.284+0	6.294−2
	$5p_{3/2}$	3.712−2	1.362+0	1.361+0	6.268−2

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
54	$3s_{1/2}$	1.302+0	1.998+0	3.900−1	−6.225−4
	$3p_{1/2}$	9.548−1	1.301+0	1.327+0	7.016−2
	$3p_{3/2}$	1.633+0	1.363+0	1.409+0	6.941−2
	$3d_{3/2}$	3.027−1	7.396−1	1.513+0	2.919−1
	$3d_{5/2}$	4.129−1	6.954−1	1.479+0	3.138−1
	$4s_{1/2}$	3.495−1	1.999+0	3.681−1	−5.777−4
	$4p_{1/2}$	2.367−1	1.315+0	1.273+0	6.125−2
	$4p_{3/2}$	4.007−1	1.377+0	1.353+0	6.112−2
	$4d_{3/2}$	6.656−2	7.446−1	1.476+0	2.752−1
	$4d_{5/2}$	9.024−2	6.982−1	1.442+0	2.968−1
	$5s_{1/2}$	5.488−2	1.999+0	3.626−1	−5.673−4
	$5p_{1/2}$	2.779−2	1.319+0	1.264+0	5.959−2
	$5p_{3/2}$	4.489−2	1.380+0	1.343+0	5.957−2
55	$3s_{1/2}$	1.353+0	1.998+0	3.563−1	−6.860−4
	$3p_{1/2}$	1.019+0	1.313+0	1.310+0	6.740−2
	$3p_{3/2}$	1.741+0	1.379+0	1.395+0	6.684−2
	$3d_{3/2}$	3.381−1	7.557−1	1.524+0	2.864−1
	$3d_{5/2}$	4.603−1	7.084−1	1.487+0	3.091−1
	$4s_{1/2}$	3.731−1	1.998+0	3.345−1	−6.352−4
	$4p_{1/2}$	2.606−1	1.329+0	1.253+0	5.814−2
	$4p_{3/2}$	4.406−1	1.394+0	1.336+0	5.828−2
	$4d_{3/2}$	7.835−2	7.616−1	1.485+0	2.687−1
	$4d_{5/2}$	1.061−1	7.118−1	1.449+0	2.909−1
	$5s_{1/2}$	6.393−2	1.998+0	3.286−1	−6.240−4
	$5p_{1/2}$	3.577−2	1.333+0	1.243+0	5.637−2
	$5p_{3/2}$	5.880−2	1.398+0	1.325+0	5.662−2
	$6s_{1/2}$	4.155−3	1.998+0	3.273−1	−6.217−4
56	$3s_{1/2}$	1.404+0	1.997+0	3.235−1	−7.547−4
	$3p_{1/2}$	1.085+0	1.326+0	1.292+0	6.473−2
	$3p_{3/2}$	1.851+0	1.395+0	1.380+0	6.441−2
	$3d_{3/2}$	3.760−1	7.718−1	1.534+0	2.812−1
	$3d_{5/2}$	5.110−1	7.214−1	1.496+0	3.044−1
	$4s_{1/2}$	3.973−1	1.998+0	3.016−1	−6.972−4
	$4p_{1/2}$	2.859−1	1.343+0	1.232+0	5.514−2
	$4p_{3/2}$	4.829−1	1.411+0	1.318+0	5.556−2
	$4d_{3/2}$	9.157−2	7.788−1	1.493+0	2.624−1
	$4d_{5/2}$	1.238−1	7.255−1	1.456+0	2.853−1
	$5s_{1/2}$	7.352−2	1.998+0	2.959−1	−6.845−4
	$5p_{1/2}$	4.401−2	1.347+0	1.222+0	5.324−2
	$5p_{3/2}$	7.278−2	1.415+0	1.306+0	5.379−2
	$6s_{1/2}$	7.245−3	1.998+0	2.945−1	−6.842−4
57	$3s_{1/2}$	1.455+0	1.996+0	2.913−1	−8.287−4
	$3p_{1/2}$	1.154+0	1.338+0	1.273+0	6.213−2
	$3p_{3/2}$	1.965+0	1.410+0	1.364+0	6.207−2
	$3d_{3/2}$	4.170−1	7.879−1	1.544+0	2.760−1
	$3d_{5/2}$	5.658−1	7.343−1	1.503+0	2.999−1
	$4s_{1/2}$	4.224−1	1.997+0	2.695−1	−7.639−4
	$4p_{1/2}$	3.127−1	1.356+0	1.211+0	5.219−2
	$4p_{3/2}$	5.279−1	1.428+0	1.299+0	5.295−2
	$4d_{3/2}$	1.064−1	7.961−1	1.501+0	2.561−1
	$4d_{5/2}$	1.437−1	7.393−1	1.462+0	2.796−1
	$5s_{1/2}$	8.253−2	1.997+0	2.638−1	−7.488−4
	$5p_{1/2}$	5.172−2	1.360+0	1.200+0	5.019−2
	$5p_{3/2}$	8.553−2	1.432+0	1.287+0	5.109−2
	$5d_{3/2}$	8.863−3	7.979−1	1.498+0	2.534−1
	$6s_{1/2}$	8.759−3	1.997+0	2.624−1	−7.465−4
58	$3s_{1/2}$	1.510+0	1.996+0	2.587−1	−9.094−4
	$3p_{1/2}$	1.228+0	1.350+0	1.253+0	5.948−2
	$3p_{3/2}$	2.090+0	1.426+0	1.347+0	5.973−2
	$3d_{3/2}$	4.643−1	8.046−1	1.554+0	2.708−1
	$3d_{5/2}$	6.289−1	7.477−1	1.512+0	2.954−1
	$4s_{1/2}$	4.429−1	1.996+0	2.369−1	−8.363−4
	$4p_{1/2}$	3.360−1	1.370+0	1.188+0	4.923−2

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
	$4p_{3/2}$	5.653−1	1.444+0	1.279+0	5.037−2
	$4d_{3/2}$	1.189−1	8.140−1	1.509+0	2.499−1
	$4d_{5/2}$	1.602−1	7.537−1	1.468+0	2.740−1
	$4f_{5/2}$	2.051−3	4.420−1	1.206+0	5.099−1
	$5s_{1/2}$	8.205−2	1.996+0	2.311−1	−8.200−4
	$5p_{1/2}$	5.154−2	1.374+0	1.176+0	4.718−2
	$5p_{3/2}$	8.448−2	1.448+0	1.266+0	4.849−2
	$6s_{1/2}$	7.735−3	1.996+0	2.296−1	−8.167−4
59	$3s_{1/2}$	1.562+0	1.995+0	2.276−1	−9.959−4
	$3p_{1/2}$	1.302+0	1.362+0	1.232+0	5.696−2
	$3p_{3/2}$	2.214+0	1.441+0	1.329+0	5.758−2
	$3d_{3/2}$	5.137−1	8.209−1	1.563+0	2.657−1
	$3d_{5/2}$	6.947−1	7.607−1	1.519+0	2.909−1
	$4s_{1/2}$	4.660−1	1.995+0	2.058−1	−9.135−4
	$4p_{1/2}$	3.626−1	1.383+0	1.165+0	4.640−2
	$4p_{3/2}$	6.086−1	1.460+0	1.258+0	4.796−2
	$4d_{3/2}$	1.344−1	8.317−1	1.516+0	2.438−1
	$4d_{5/2}$	1.806−1	7.677−1	1.473+0	2.684−1
	$4f_{5/2}$	2.614−3	4.496−1	1.224+0	5.042−1
	$5s_{1/2}$	8.612−2	1.995+0	2.001−1	−8.950−4
	$5p_{1/2}$	5.528−2	1.387+0	1.152+0	4.431−2
	$5p_{3/2}$	9.020−2	1.465+0	1.244+0	4.605−2
	$6s_{1/2}$	7.941−3	1.995+0	1.985−1	−8.913−4
60	$3s_{1/2}$	1.615+0	1.994+0	1.973−1	−1.089−3
	$3p_{1/2}$	1.378+0	1.373+0	1.211+0	5.450−2
	$3p_{3/2}$	2.342+0	1.456+0	1.310+0	5.553−2
	$3d_{3/2}$	5.665−1	8.371−1	1.571+0	2.607−1
	$3d_{5/2}$	7.649−1	7.735−1	1.525+0	2.865−1
	$4s_{1/2}$	4.895−1	1.994+0	1.757−1	−9.961−4
	$4p_{1/2}$	3.901−1	1.395+0	1.140+0	4.367−2
	$4p_{3/2}$	6.534−1	1.476+0	1.235+0	4.569−2
	$4d_{3/2}$	1.512−1	8.494−1	1.521+0	2.378−1
	$4d_{5/2}$	2.028−1	7.817−1	1.477+0	2.629−1
	$4f_{5/2}$	3.279−3	4.576−1	1.241+0	4.985−1
	$5s_{1/2}$	9.013−2	1.994+0	1.701−1	−9.744−4
	$5p_{1/2}$	5.906−2	1.400+0	1.127+0	4.153−2
	$5p_{3/2}$	9.592−2	1.481+0	1.221+0	4.375−2
	$6s_{1/2}$	8.136−3	1.994+0	1.686−1	−9.706−4
61	$3s_{1/2}$	1.667+0	1.992+0	1.680−1	−1.189−3
	$3p_{1/2}$	1.456+0	1.384+0	1.189+0	5.213−2
	$3p_{3/2}$	2.472+0	1.470+0	1.290+0	5.360−2
	$3d_{3/2}$	6.230−1	8.532−1	1.578+0	2.559−1
	$3d_{5/2}$	8.398−1	7.862−1	1.531+0	2.822−1
	$4s_{1/2}$	5.132−1	1.993+0	1.466−1	−1.085−3
	$4p_{1/2}$	4.186−1	1.407+0	1.115+0	4.104−2
	$4p_{3/2}$	6.997−1	1.491+0	1.212+0	4.355−2
	$4d_{3/2}$	1.694−1	8.670−1	1.525+0	2.318−1
	$4d_{5/2}$	2.267−1	7.956−1	1.479+0	2.575−1
	$4f_{5/2}$	4.061−3	4.660−1	1.258+0	4.929−1
	$5s_{1/2}$	9.411−2	1.993+0	1.412−1	−1.061−3
	$5p_{1/2}$	6.289−2	1.413+0	1.101+0	3.884−2
	$5p_{3/2}$	1.017−1	1.496+0	1.197+0	4.158−2
	$6s_{1/2}$	8.320−3	1.993+0	1.397−1	−1.056−3
62	$3s_{1/2}$	1.718+0	1.991+0	1.396−1	−1.296−3
	$3p_{1/2}$	1.535+0	1.394+0	1.166+0	4.983−2
	$3p_{3/2}$	2.604+0	1.484+0	1.269+0	5.179−2
	$3d_{3/2}$	6.831−1	8.692−1	1.585+0	2.511−1
	$3d_{5/2}$	9.193−1	7.988−1	1.536+0	2.780−1
	$4s_{1/2}$	5.371−1	1.991+0	1.187−1	−1.179−3
	$4p_{1/2}$	4.480−1	1.419+0	1.089+0	3.850−2
	$4p_{3/2}$	7.473−1	1.506+0	1.189+0	4.157−2
	$4d_{3/2}$	1.891−1	8.846−1	1.528+0	2.261−1
	$4d_{5/2}$	2.525−1	8.094−1	1.481+0	2.522−1

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
	$4f_{5/2}$	4.977−3	4.748−1	1.275+0	4.873−1
	$5s_{1/2}$	9.806−2	1.991+0	1.135−1	−1.153−3
	$5p_{1/2}$	6.678−2	1.425+0	1.074+0	3.627−2
	$5p_{3/2}$	1.075−1	1.512+0	1.172+0	3.956−2
	$6s_{1/2}$	8.498−3	1.991+0	1.120−1	−1.147−3
63	$3s_{1/2}$	1.769+0	1.990+0	1.121−1	−1.411−3
	$3p_{1/2}$	1.615+0	1.405+0	1.142+0	4.761−2
	$3p_{3/2}$	2.739+0	1.497+0	1.248+0	5.010−2
	$3d_{3/2}$	7.470−1	8.850−1	1.591+0	2.465−1
	$3d_{5/2}$	1.004+0	8.112−1	1.540+0	2.739−1
	$4s_{1/2}$	5.613−1	1.990+0	9.184−2	−1.281−3
	$4p_{1/2}$	4.784−1	1.431+0	1.063+0	3.607−2
	$4p_{3/2}$	7.967−1	1.521+0	1.164+0	3.971−2
	$4d_{3/2}$	2.103−1	9.021−1	1.530+0	2.205−1
	$4d_{5/2}$	2.802−1	8.232−1	1.482+0	2.471−1
	$4f_{5/2}$	6.054−3	4.838−1	1.290+0	4.817−1
	$4f_{7/2}$	7.459−3	4.782−1	1.264+0	4.988−1
	$5s_{1/2}$	1.020−1	1.990+0	8.686−2	−1.250−3
	$5p_{1/2}$	7.077−2	1.437+0	1.047+0	3.380−2
	$5p_{3/2}$	1.133−1	1.527+0	1.147+0	3.769−2
	$6s_{1/2}$	8.675−3	1.990+0	8.543−2	−1.249−3
64	$3s_{1/2}$	1.817+0	1.988+0	8.638−2	−1.535−3
	$3p_{1/2}$	1.693+0	1.414+0	1.119+0	4.551−2
	$3p_{3/2}$	2.871+0	1.510+0	1.226+0	4.857−2
	$3d_{3/2}$	8.122−1	9.004−1	1.595+0	2.420−1
	$3d_{5/2}$	1.090+0	8.232−1	1.544+0	2.700−1
	$4s_{1/2}$	5.872−1	1.988+0	6.673−2	−1.388−3
	$4p_{1/2}$	5.115−1	1.442+0	1.036+0	3.376−2
	$4p_{3/2}$	8.511−1	1.535+0	1.139+0	3.802−2
	$4d_{3/2}$	2.349−1	9.192−1	1.531+0	2.150−1
	$4d_{5/2}$	3.125−1	8.365−1	1.482+0	2.420−1
	$4f_{5/2}$	7.834−3	4.928−1	1.304+0	4.760−1
	$4f_{7/2}$	9.669−3	4.864−1	1.278+0	4.934−1
	$5s_{1/2}$	1.109−1	1.988+0	6.202−2	−1.354−3
	$5p_{1/2}$	7.979−2	1.448+0	1.020+0	3.144−2
	$5p_{3/2}$	1.280−1	1.541+0	1.122+0	3.596−2
	$5d_{3/2}$	1.505−2	9.228−1	1.524+0	2.112−1
	$6s_{1/2}$	1.035−2	1.988+0	6.058−2	−1.349−3
65	$3s_{1/2}$	1.868+0	1.986+0	6.043−2	−1.668−3
	$3p_{1/2}$	1.777+0	1.424+0	1.094+0	4.340−2
	$3p_{3/2}$	3.014+0	1.523+0	1.204+0	4.710−2
	$3d_{3/2}$	8.862−1	9.162−1	1.600+0	2.377−1
	$3d_{5/2}$	1.187+0	8.355−1	1.548+0	2.661−1
	$4s_{1/2}$	6.100−1	1.986+0	4.162−2	−1.505−3
	$4p_{1/2}$	5.421−1	1.453+0	1.008+0	3.147−2
	$4p_{3/2}$	8.995−1	1.549+0	1.113+0	3.641−2
	$4d_{3/2}$	2.576−1	9.369−1	1.531+0	2.097−1
	$4d_{5/2}$	3.417−1	8.503−1	1.482+0	2.371−1
	$4f_{5/2}$	8.744−3	5.026−1	1.318+0	4.706−1
	$4f_{7/2}$	1.073−2	4.954−1	1.291+0	4.883−1
	$5s_{1/2}$	1.100−1	1.986+0	3.717−2	−1.467−3
	$5p_{1/2}$	7.896−2	1.460+0	9.915−1	2.917−2
	$5p_{3/2}$	1.253−1	1.555+0	1.095+0	3.437−2
	$6s_{1/2}$	9.019−3	1.986+0	3.580−2	−1.465−3
66	$3p_{1/2}$	1.860+0	1.434+0	1.069+0	4.140−2
	$3p_{3/2}$	3.154+0	1.536+0	1.180+0	4.577−2
	$3d_{3/2}$	9.617−1	9.315−1	1.604+0	2.334−1
	$3d_{5/2}$	1.286+0	8.475−1	1.550+0	2.623−1
	$4s_{1/2}$	6.346−1	1.984+0	1.826−2	−1.628−3
	$4p_{1/2}$	5.750−1	1.464+0	9.809−1	2.932−2
	$4p_{3/2}$	9.532−1	1.563+0	1.087+0	3.495−2
	$4d_{3/2}$	2.838−1	9.541−1	1.530+0	2.045−1
	$4d_{5/2}$	3.756−1	8.638−1	1.481+0	2.323−1

(*continued on next page*)

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
	$4f_{5/2}$	1.040−2	5.122−1	1.331+0	4.651−1
	$4f_{7/2}$	1.273−2	5.042−1	1.303+0	4.830−1
	$5s_{1/2}$	1.140−1	1.984+0	1.410−2	−1.585−3
	$5p_{1/2}$	8.318−2	1.471+0	9.630−1	2.698−2
	$5p_{3/2}$	1.314−1	1.569+0	1.068+0	3.289−2
	$6s_{1/2}$	9.188−3	1.984+0	1.277−2	−1.583−3
67	$3p_{1/2}$	1.942+0	1.443+0	1.044+0	3.947−2
	$3p_{3/2}$	3.295+0	1.548+0	1.157+0	4.456−2
	$3d_{3/2}$	1.041+0	9.467−1	1.606+0	2.294−1
	$3d_{5/2}$	1.391+0	8.592−1	1.552+0	2.586−1
	$4s_{1/2}$	6.593−1	1.982+0	−3.920−3	−1.760−3
	$4p_{1/2}$	6.090−1	1.475+0	9.529−1	2.724−2
	$4p_{3/2}$	1.008+0	1.576+0	1.060+0	3.362−2
	$4d_{3/2}$	3.117−1	9.712−1	1.528+0	1.995−1
	$4d_{5/2}$	4.117−1	8.771−1	1.478+0	2.276−1
	$4f_{5/2}$	1.230−2	5.219−1	1.342+0	4.597−1
	$4f_{7/2}$	1.502−2	5.130−1	1.314+0	4.778−1
	$5s_{1/2}$	1.180−1	1.982+0	−7.755−3	−1.711−3
	$5p_{1/2}$	8.748−2	1.482+0	9.342−1	2.488−2
	$5p_{3/2}$	1.375−1	1.583+0	1.041+0	3.155−2
	$6s_{1/2}$	9.354−3	1.982+0	−9.038−3	−1.709−3
68	$3p_{3/2}$	3.438+0	1.560+0	1.132+0	4.349−2
	$3d_{3/2}$	1.125+0	9.616−1	1.608+0	2.254−1
	$3d_{5/2}$	1.500+0	8.707−1	1.554+0	2.551−1
	$4s_{1/2}$	6.844−1	1.980+0	−2.488−2	−1.899−3
	$4p_{1/2}$	6.438−1	1.485+0	9.246−1	2.528−2
	$4p_{3/2}$	1.065+0	1.589+0	1.033+0	3.243−2
	$4d_{3/2}$	3.415−1	9.881−1	1.525+0	1.946−1
	$4d_{5/2}$	4.500−1	8.902−1	1.475+0	2.231−1
	$4f_{5/2}$	1.445−2	5.316−1	1.353+0	4.542−1
	$4f_{7/2}$	1.762−2	5.218−1	1.325+0	4.726−1
	$5s_{1/2}$	1.220−1	1.980+0	−2.839−2	−1.846−3
	$5p_{1/2}$	9.186−2	1.493+0	9.050−1	2.286−2
	$5p_{3/2}$	1.437−1	1.596+0	1.013+0	3.032−2
	$6s_{1/2}$	9.519−3	1.980+0	−2.965−2	−1.839−3
69	$3p_{3/2}$	3.581+0	1.571+0	1.107+0	4.250−2
	$3d_{3/2}$	1.212+0	9.763−1	1.609+0	2.216−1
	$3d_{5/2}$	1.614+0	8.821−1	1.554+0	2.516−1
	$4s_{1/2}$	7.095−1	1.977+0	−4.464−2	−2.048−3
	$4p_{1/2}$	6.794−1	1.495+0	8.958−1	2.336−2
	$4p_{3/2}$	1.122+0	1.602+0	1.005+0	3.134−2
	$4d_{3/2}$	3.732−1	1.005+0	1.521+0	1.899−1
	$4d_{5/2}$	4.907−1	9.032−1	1.472+0	2.187−1
	$4f_{5/2}$	1.690−2	5.413−1	1.363+0	4.490−1
	$4f_{7/2}$	2.055−2	5.307−1	1.334+0	4.675−1
	$5s_{1/2}$	1.261−1	1.977+0	−4.780−2	−1.989−3
	$5p_{1/2}$	9.633−2	1.503+0	8.755−1	2.092−2
	$5p_{3/2}$	1.500−1	1.608+0	9.842−1	2.921−2
	$6s_{1/2}$	9.683−3	1.977+0	−4.900−2	−1.982−3
70	$3p_{3/2}$	3.726+0	1.582+0	1.082+0	4.162−2
	$3d_{3/2}$	1.304+0	9.909−1	1.609+0	2.179−1
	$3d_{5/2}$	1.734+0	8.933−1	1.554+0	2.482−1
	$4s_{1/2}$	7.346−1	1.974+0	−6.314−2	−2.206−3
	$4p_{1/2}$	7.159−1	1.504+0	8.668−1	2.152−2
	$4p_{3/2}$	1.182+0	1.614+0	9.772−1	3.036−2
	$4d_{3/2}$	4.069−1	1.022+0	1.517+0	1.854−1
	$4d_{5/2}$	5.337−1	9.161−1	1.467+0	2.143−1
	$4f_{5/2}$	1.966−2	5.511−1	1.372+0	4.438−1
	$4f_{7/2}$	2.385−2	5.396−1	1.343+0	4.624−1
	$5s_{1/2}$	1.301−1	1.974+0	−6.595−2	−2.141−3
	$5p_{1/2}$	1.009−1	1.513+0	8.458−1	1.906−2
	$5p_{3/2}$	1.564−1	1.621+0	9.554−1	2.822−2
	$6s_{1/2}$	9.842−3	1.974+0	−6.709−2	−2.134−3

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
71	$3d_{3/2}$	1.395+0	1.005+0	1.608+0	2.144−1
	$3d_{5/2}$	1.853+0	9.040−1	1.554+0	2.450−1
	$4s_{1/2}$	7.606−1	1.971+0	−8.000−2	−2.374−3
	$4p_{1/2}$	7.544−1	1.514+0	8.378−1	1.978−2
	$4p_{3/2}$	1.245+0	1.625+0	9.492−1	2.952−2
	$4d_{3/2}$	4.443−1	1.038+0	1.511+0	1.810−1
	$4d_{5/2}$	5.818−1	9.286−1	1.462+0	2.101−1
	$4f_{5/2}$	2.383−2	5.606−1	1.380+0	4.387−1
	$4f_{7/2}$	2.896−2	5.482−1	1.351+0	4.574−1
	$5s_{1/2}$	1.395−1	1.971+0	−8.244−2	−2.302−3
	$5p_{1/2}$	1.117−1	1.522+0	8.166−1	1.730−2
	$5p_{3/2}$	1.739−1	1.633+0	9.269−1	2.735−2
	$5d_{3/2}$	2.108−2	1.044+0	1.498+0	1.762−1
	$6s_{1/2}$	1.194−2	1.971+0	−8.352−2	−2.298−3
72	$3d_{3/2}$	1.490+0	1.019+0	1.606+0	2.111−1
	$3d_{5/2}$	1.975+0	9.145−1	1.552+0	2.420−1
	$4s_{1/2}$	7.866−1	1.968+0	−9.563−2	−2.553−3
	$4p_{1/2}$	7.933−1	1.523+0	8.095−1	1.813−2
	$4p_{3/2}$	1.310+0	1.637+0	9.215−1	2.879−2
	$4d_{3/2}$	4.842−1	1.054+0	1.505+0	1.768−1
	$4d_{5/2}$	6.332−1	9.409−1	1.457+0	2.061−1
	$4f_{5/2}$	2.859−2	5.700−1	1.388+0	4.338−1
	$4f_{7/2}$	3.478−2	5.567−1	1.359+0	4.527−1
	$5s_{1/2}$	1.493−1	1.968+0	−9.771−2	−2.473−3
	$5p_{1/2}$	1.232−1	1.532+0	7.873−1	1.560−2
	$5p_{3/2}$	1.924−1	1.644+0	8.983−1	2.657−2
	$5d_{3/2}$	2.803−2	1.060+0	1.490+0	1.717−1
	$6s_{1/2}$	1.361−2	1.968+0	−9.876−2	−2.462−3
73	$3d_{3/2}$	1.587+0	1.032+0	1.604+0	2.079−1
	$3d_{5/2}$	2.102+0	9.248−1	1.551+0	2.390−1
	$4s_{1/2}$	8.130−1	1.965+0	−1.100−1	−2.743−3
	$4p_{1/2}$	8.333−1	1.531+0	7.811−1	1.655−2
	$4p_{3/2}$	1.377+0	1.648+0	8.936−1	2.817−2
	$4d_{3/2}$	5.270−1	1.070+0	1.498+0	1.728−1
	$4d_{5/2}$	6.880−1	9.530−1	1.451+0	2.022−1
	$4f_{5/2}$	3.400−2	5.794−1	1.395+0	4.289−1
	$4f_{7/2}$	4.139−2	5.651−1	1.367+0	4.479−1
	$5s_{1/2}$	1.596−1	1.965+0	−1.117−1	−2.654−3
	$5p_{1/2}$	1.353−1	1.541+0	7.581−1	1.398−2
	$5p_{3/2}$	2.119−1	1.655+0	8.695−1	2.590−2
	$5d_{3/2}$	3.531−2	1.077+0	1.482+0	1.674−1
	$6s_{1/2}$	1.507−2	1.965+0	−1.127−1	−2.640−3
74	$3d_{3/2}$	1.688+0	1.046+0	1.601+0	2.050−1
	$3d_{5/2}$	2.231+0	9.349−1	1.549+0	2.362−1
	$4s_{1/2}$	8.396−1	1.961+0	−1.232−1	−2.944−3
	$4p_{1/2}$	8.744−1	1.540+0	7.525−1	1.503−2
	$4p_{3/2}$	1.446+0	1.658+0	8.653−1	2.764−2
	$4d_{3/2}$	5.725−1	1.086+0	1.489+0	1.689−1
	$4d_{5/2}$	7.464−1	9.651−1	1.444+0	1.984−1
	$4f_{5/2}$	4.014−2	5.887−1	1.402+0	4.241−1
	$4f_{7/2}$	4.886−2	5.735−1	1.374+0	4.432−1
	$5s_{1/2}$	1.702−1	1.961+0	−1.245−1	−2.846−3
	$5p_{1/2}$	1.481−1	1.550+0	7.288−1	1.242−2
	$5p_{3/2}$	2.323−1	1.666+0	8.405−1	2.532−2
	$5d_{3/2}$	4.311−2	1.093+0	1.473+0	1.632−1
	$6s_{1/2}$	1.642−2	1.961+0	−1.255−1	−2.830−3
75	$3d_{3/2}$	1.791+0	1.059+0	1.598+0	2.021−1
	$3d_{5/2}$	2.364+0	9.448−1	1.546+0	2.335−1
	$4s_{1/2}$	8.663−1	1.957+0	−1.350−1	−3.157−3
	$4p_{1/2}$	9.162−1	1.548+0	7.239−1	1.357−2
	$4p_{3/2}$	1.518+0	1.668+0	8.369−1	2.720−2
	$4d_{3/2}$	6.209−1	1.101+0	1.481+0	1.652−1
	$4d_{5/2}$	8.082−1	9.770−1	1.437+0	1.946−1

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
	$4f_{5/2}$	4.706−2	5.979−1	1.409+0	4.194−1
	$4f_{7/2}$	5.728−2	5.818−1	1.381+0	4.385−1
	$5s_{1/2}$	1.812−1	1.957+0	−1.360−1	−3.049−3
	$5p_{1/2}$	1.615−1	1.559+0	6.995−1	1.093−2
	$5p_{3/2}$	2.540−1	1.677+0	8.114−1	2.484−2
	$5d_{3/2}$	5.187−2	1.109+0	1.462+0	1.592−1
	$5d_{5/2}$	6.442−2	9.832−1	1.421+0	1.883−1
	$6s_{1/2}$	1.780−2	1.957+0	−1.369−1	−3.033−3
76	$3d_{5/2}$	2.500+0	9.546−1	1.543+0	2.308−1
	$4s_{1/2}$	8.930−1	1.953+0	−1.456−1	−3.383−3
	$4p_{1/2}$	9.587−1	1.556+0	6.954−1	1.217−2
	$4p_{3/2}$	1.591+0	1.678+0	8.084−1	2.685−2
	$4d_{3/2}$	6.721−1	1.117+0	1.471+0	1.616−1
	$4d_{5/2}$	8.737−1	9.887−1	1.429+0	1.910−1
	$4f_{5/2}$	5.483−2	6.072−1	1.415+0	4.147−1
	$4f_{7/2}$	6.671−2	5.900−1	1.388+0	4.339−1
	$5s_{1/2}$	1.925−1	1.953+0	−1.462−1	−3.263−3
	$5p_{1/2}$	1.755−1	1.567+0	6.703−1	9.495−3
	$5p_{3/2}$	2.765−1	1.687+0	7.823−1	2.445−2
	$5d_{3/2}$	6.132−2	1.125+0	1.451+0	1.553−1
	$5d_{5/2}$	7.619−2	9.954−1	1.412+0	1.844−1
	$6s_{1/2}$	1.909−2	1.953+0	−1.470−1	−3.248−3
77	$4s_{1/2}$	9.197−1	1.948+0	−1.550−1	−3.622−3
	$4p_{1/2}$	1.002+0	1.563+0	6.670−1	1.083−2
	$4p_{3/2}$	1.666+0	1.687+0	7.799−1	2.659−2
	$4d_{3/2}$	7.261−1	1.132+0	1.461+0	1.582−1
	$4d_{5/2}$	9.426−1	1.000+0	1.421+0	1.875−1
	$4f_{5/2}$	6.351−2	6.163−1	1.421+0	4.101−1
	$4f_{7/2}$	7.724−2	5.982−1	1.394+0	4.294−1
	$5s_{1/2}$	2.041−1	1.948+0	−1.552−1	−3.490−3
	$5p_{1/2}$	1.900−1	1.576+0	6.412−1	8.122−3
	$5p_{3/2}$	2.999−1	1.696+0	7.530−1	2.414−2
	$5d_{3/2}$	7.154−2	1.141+0	1.439+0	1.515−1
	$5d_{5/2}$	8.884−2	1.007+0	1.402+0	1.805−1
	$6s_{1/2}$	2.031−2	1.948+0	−1.559−1	−3.473−3
78	$4s_{1/2}$	9.466−1	1.943+0	−1.631−1	−3.875−3
	$4p_{1/2}$	1.046+0	1.571+0	6.384−1	9.527−3
	$4p_{3/2}$	1.743+0	1.696+0	7.511−1	2.641−2
	$4d_{3/2}$	7.835−1	1.147+0	1.450+0	1.549−1
	$4d_{5/2}$	1.016+0	1.012+0	1.412+0	1.841−1
	$4f_{5/2}$	7.323−2	6.255−1	1.427+0	4.056−1
	$4f_{7/2}$	8.901−2	6.063−1	1.401+0	4.249−1
	$5s_{1/2}$	2.150−1	1.943+0	−1.630−1	−3.730−3
	$5p_{1/2}$	2.037−1	1.584+0	6.120−1	6.796−3
	$5p_{3/2}$	3.209−1	1.706+0	7.234−1	2.390−2
	$5d_{3/2}$	7.835−2	1.157+0	1.427+0	1.479−1
	$5d_{5/2}$	9.630−2	1.020+0	1.392+0	1.767−1
	$6s_{1/2}$	1.891−2	1.943+0	−1.635−1	−3.713−3
79	$4s_{1/2}$	9.729−1	1.938+0	−1.698−1	−4.143−3
	$4p_{1/2}$	1.090+0	1.578+0	6.103−1	8.287−3
	$4p_{3/2}$	1.821+0	1.704+0	7.225−1	2.631−2
	$4d_{3/2}$	8.433−1	1.161+0	1.438+0	1.518−1
	$4d_{5/2}$	1.092+0	1.023+0	1.403+0	1.808−1
	$4f_{5/2}$	8.395−2	6.345−1	1.432+0	4.012−1
	$4f_{7/2}$	1.020−1	6.143−1	1.407+0	4.206−1
	$5s_{1/2}$	2.269−1	1.938+0	−1.693−1	−3.982−3
	$5p_{1/2}$	2.192−1	1.591+0	5.831−1	5.534−3
	$5p_{3/2}$	3.459−1	1.714+0	6.941−1	2.375−2
	$5d_{3/2}$	8.995−2	1.172+0	1.413+0	1.445−1
	$5d_{5/2}$	1.105−1	1.031+0	1.381+0	1.730−1
	$6s_{1/2}$	1.987−2	1.938+0	−1.698−1	−3.962−3

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
80	$4s_{1/2}$	9.983−1	1.932+0	−1.753−1	−4.427−3
	$4p_{1/2}$	1.134+0	1.585+0	5.827−1	7.105−3
	$4p_{3/2}$	1.900+0	1.712+0	6.944−1	2.630−2
	$4d_{3/2}$	9.050−1	1.175+0	1.425+0	1.489−1
	$4d_{5/2}$	1.170+0	1.034+0	1.394+0	1.776−1
	$4f_{5/2}$	9.570−2	6.435−1	1.438+0	3.970−1
	$4f_{7/2}$	1.162−1	6.222−1	1.413+0	4.163−1
	$5s_{1/2}$	2.396−1	1.932+0	−1.744−1	−4.249−3
	$5p_{1/2}$	2.364−1	1.599+0	5.548−1	4.333−3
	$5p_{3/2}$	3.750−1	1.723+0	6.652−1	2.367−2
	$5d_{3/2}$	1.071−1	1.187+0	1.399+0	1.412−1
	$5d_{5/2}$	1.325−1	1.043+0	1.370+0	1.694−1
	$6s_{1/2}$	2.369−2	1.932+0	−1.746−1	−4.224−3
81	$4s_{1/2}$	1.023+0	1.927+0	−1.794−1	−4.727−3
	$4p_{1/2}$	1.177+0	1.592+0	5.556−1	5.974−3
	$4p_{3/2}$	1.978+0	1.720+0	6.666−1	2.636−2
	$4d_{3/2}$	9.691−1	1.189+0	1.412+0	1.461−1
	$4d_{5/2}$	1.251+0	1.045+0	1.384+0	1.745−1
	$4f_{5/2}$	1.085−1	6.523−1	1.443+0	3.929−1
	$4f_{7/2}$	1.317−1	6.300−1	1.419+0	4.122−1
	$5s_{1/2}$	2.526−1	1.927+0	−1.781−1	−4.532−3
	$5p_{1/2}$	2.542−1	1.606+0	5.271−1	3.190−3
	$5p_{3/2}$	4.057−1	1.730+0	6.368−1	2.368−2
	$5d_{3/2}$	1.265−1	1.202+0	1.384+0	1.381−1
	$5d_{5/2}$	1.576−1	1.054+0	1.359+0	1.660−1
	$6s_{1/2}$	2.936−2	1.926+0	−1.781−1	−4.499−3
	$6p_{1/2}$	1.540−2	1.609+0	5.218−1	2.723−3
82	$4s_{1/2}$	1.047+0	1.920+0	−1.822−1	−5.044−3
	$4p_{1/2}$	1.220+0	1.598+0	5.287−1	4.883−3
	$4p_{3/2}$	2.058+0	1.727+0	6.390−1	2.648−2
	$4d_{3/2}$	1.036+0	1.203+0	1.399+0	1.435−1
	$4d_{5/2}$	1.336+0	1.055+0	1.374+0	1.715−1
	$4f_{5/2}$	1.226−1	6.610−1	1.448+0	3.888−1
	$4f_{7/2}$	1.487−1	6.377−1	1.425+0	4.082−1
	$5s_{1/2}$	2.660−1	1.920+0	−1.804−1	−4.828−3
	$5p_{1/2}$	2.728−1	1.613+0	4.996−1	2.094−3
	$5p_{3/2}$	4.381−1	1.738+0	6.085−1	2.374−2
	$5d_{3/2}$	1.473−1	1.216+0	1.368+0	1.351−1
	$5d_{5/2}$	1.841−1	1.066+0	1.347+0	1.626−1
	$6s_{1/2}$	3.429−2	1.920+0	−1.802−1	−4.791−3
	$6p_{1/2}$	2.109−2	1.616+0	4.939−1	1.609−3
83	$4s_{1/2}$	1.071+0	1.914+0	−1.835−1	−5.378−3
	$4p_{1/2}$	1.263+0	1.604+0	5.021−1	3.833−3
	$4p_{3/2}$	2.139+0	1.733+0	6.114−1	2.667−2
	$4d_{3/2}$	1.105+0	1.216+0	1.384+0	1.410−1
	$4d_{5/2}$	1.424+0	1.066+0	1.364+0	1.686−1
	$4f_{5/2}$	1.380−1	6.697−1	1.452+0	3.849−1
	$4f_{7/2}$	1.672−1	6.454−1	1.430+0	4.042−1
	$5s_{1/2}$	2.795−1	1.914+0	−1.813−1	−5.141−3
	$5p_{1/2}$	2.919−1	1.620+0	4.725−1	1.044−3
	$5p_{3/2}$	4.719−1	1.745+0	5.804−1	2.386−2
	$5d_{3/2}$	1.697−1	1.230+0	1.352+0	1.323−1
	$5d_{5/2}$	2.128−1	1.077+0	1.334+0	1.593−1
	$6s_{1/2}$	3.966−2	1.914+0	−1.810−1	−5.094−3
	$6p_{1/2}$	2.762−2	1.623+0	4.664−1	5.416−4
	$6p_{3/2}$	3.640−2	1.747+0	5.742−1	2.341−2
84	$4s_{1/2}$	1.094+0	1.906+0	−1.835−1	−5.727−3
	$4p_{1/2}$	1.307+0	1.610+0	4.757−1	2.822−3
	$4p_{3/2}$	2.221+0	1.739+0	5.837−1	2.690−2
	$4d_{3/2}$	1.177+0	1.229+0	1.369+0	1.387−1
	$4d_{5/2}$	1.515+0	1.076+0	1.353+0	1.659−1
	$4f_{5/2}$	1.547−1	6.783−1	1.456+0	3.810−1

(*continued on next page*)

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
	$4f_{7/2}$	1.873−1	6.529−1	1.436+0	4.003−1
	$5s_{1/2}$	2.933−1	1.907+0	−1.808−1	−5.466−3
	$5p_{1/2}$	3.115−1	1.627+0	4.456−1	3.999−5
	$5p_{3/2}$	5.071−1	1.751+0	5.523−1	2.403−2
	$5d_{3/2}$	1.937−1	1.244+0	1.335+0	1.297−1
	$5d_{5/2}$	2.434−1	1.088+0	1.321+0	1.562−1
	$6s_{1/2}$	4.494−2	1.906+0	−1.804−1	−5.416−3
	$6p_{1/2}$	3.385−2	1.630+0	4.393−1	−4.835−4
	$6p_{3/2}$	4.637−2	1.753+0	5.460−1	2.356−2
85	$4s_{1/2}$	1.117+0	1.899+0	−1.820−1	−6.096−3
	$4p_{1/2}$	1.349+0	1.615+0	4.497−1	1.841−3
	$4p_{3/2}$	2.305+0	1.745+0	5.563−1	2.718−2
	$4d_{3/2}$	1.252+0	1.242+0	1.353+0	1.366−1
	$4d_{5/2}$	1.609+0	1.086+0	1.341+0	1.632−1
	$4f_{5/2}$	1.729−1	6.869−1	1.460+0	3.772−1
	$4f_{7/2}$	2.091−1	6.604−1	1.441+0	3.965−1
	$5s_{1/2}$	3.072−1	1.899+0	−1.790−1	−5.811−3
	$5p_{1/2}$	3.317−1	1.633+0	4.192−1	−9.267−4
	$5p_{3/2}$	5.437−1	1.757+0	5.245−1	2.425−2
	$5d_{3/2}$	2.192−1	1.258+0	1.316+0	1.272−1
	$5d_{5/2}$	2.759−1	1.099+0	1.308+0	1.531−1
	$6s_{1/2}$	5.027−2	1.899+0	−1.785−1	−5.754−3
	$6p_{1/2}$	4.009−2	1.636+0	4.127−1	−1.467−3
	$6p_{3/2}$	5.628−2	1.759+0	5.180−1	2.375−2
86	$4s_{1/2}$	1.139+0	1.891+0	−1.791−1	−6.485−3
	$4p_{1/2}$	1.392+0	1.621+0	4.241−1	8.878−4
	$4p_{3/2}$	2.389+0	1.750+0	5.292−1	2.751−2
	$4d_{3/2}$	1.330+0	1.255+0	1.336+0	1.345−1
	$4d_{5/2}$	1.707+0	1.096+0	1.329+0	1.605−1
	$4f_{5/2}$	1.926−1	6.953−1	1.464+0	3.735−1
	$4f_{7/2}$	2.328−1	6.678−1	1.446+0	3.927−1
	$5s_{1/2}$	3.212−1	1.891+0	−1.757−1	−6.172−3
	$5p_{1/2}$	3.523−1	1.639+0	3.934−1	−1.860−3
	$5p_{3/2}$	5.814−1	1.762+0	4.972−1	2.452−2
	$5d_{3/2}$	2.463−1	1.271+0	1.297+0	1.248−1
	$5d_{5/2}$	3.102−1	1.109+0	1.293+0	1.501−1
	$6s_{1/2}$	5.566−2	1.891+0	−1.750−1	−6.104−3
	$6p_{1/2}$	4.646−2	1.643+0	3.865−1	−2.413−3
	$6p_{3/2}$	6.633−2	1.765+0	4.904−1	2.398−2
87	$4s_{1/2}$	1.160+0	1.882+0	−1.748−1	−6.896−3
	$4p_{1/2}$	1.433+0	1.626+0	3.993−1	−2.825−5
	$4p_{3/2}$	2.472+0	1.754+0	5.028−1	2.789−2
	$4d_{3/2}$	1.408+0	1.266+0	1.319+0	1.327−1
	$4d_{5/2}$	1.806+0	1.106+0	1.316+0	1.580−1
	$4f_{5/2}$	2.136−1	7.037−1	1.467+0	3.698−1
	$4f_{7/2}$	2.580−1	6.751−1	1.450+0	3.890−1
	$5s_{1/2}$	3.351−1	1.882+0	−1.711−1	−6.552−3
	$5p_{1/2}$	3.730−1	1.645+0	3.683−1	−2.752−3
	$5p_{3/2}$	6.201−1	1.767+0	4.706−1	2.483−2
	$5d_{3/2}$	2.751−1	1.284+0	1.278+0	1.226−1
	$5d_{5/2}$	3.468−1	1.120+0	1.279+0	1.472−1
	$6s_{1/2}$	6.261−2	1.882+0	−1.703−1	−6.478−3
	$6p_{1/2}$	5.605−2	1.649+0	3.613−1	−3.311−3
	$6p_{3/2}$	8.487−2	1.770+0	4.635−1	2.426−2
	$7s_{1/2}$	4.405−3	1.882+0	−1.702−1	−6.480−3
88	$4s_{1/2}$	1.179+0	1.873+0	−1.691−1	−7.325−3
	$4p_{1/2}$	1.472+0	1.631+0	3.751−1	−9.146−4
	$4p_{3/2}$	2.554+0	1.758+0	4.768−1	2.831−2
	$4d_{3/2}$	1.489+0	1.278+0	1.301+0	1.310−1
	$4d_{5/2}$	1.907+0	1.116+0	1.304+0	1.556−1
	$4f_{5/2}$	2.362−1	7.119−1	1.469+0	3.663−1
	$4f_{7/2}$	2.850−1	6.823−1	1.454+0	3.853−1
	$5s_{1/2}$	3.489−1	1.873+0	−1.651−1	−6.950−3

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
	$5p_{1/2}$	3.940−1	1.650+0	3.438−1	−3.610−3
	$5p_{3/2}$	6.601−1	1.771+0	4.443−1	2.517−2
	$5d_{3/2}$	3.057−1	1.297+0	1.258+0	1.207−1
	$5d_{5/2}$	3.856−1	1.130+0	1.265+0	1.445−1
	$6s_{1/2}$	6.981−2	1.873+0	−1.642−1	−6.869−3
	$6p_{1/2}$	6.555−2	1.655+0	3.367−1	−4.185−3
	$6p_{3/2}$	1.020−1	1.774+0	4.371−1	2.457−2
	$7s_{1/2}$	7.188−3	1.873+0	−1.639−1	−6.859−3
89	$4s_{1/2}$	1.198+0	1.864+0	−1.618−1	−7.780−3
	$4p_{1/2}$	1.511+0	1.635+0	3.512−1	−1.792−3
	$4p_{3/2}$	2.638+0	1.762+0	4.511−1	2.877−2
	$4d_{3/2}$	1.573+0	1.289+0	1.282+0	1.295−1
	$4d_{5/2}$	2.012+0	1.125+0	1.291+0	1.533−1
	$4f_{5/2}$	2.606−1	7.202−1	1.470+0	3.627−1
	$4f_{7/2}$	3.142−1	6.895−1	1.457+0	3.817−1
	$5s_{1/2}$	3.629−1	1.864+0	−1.575−1	−7.369−3
	$5p_{1/2}$	4.154−1	1.656+0	3.197−1	−4.455−3
	$5p_{3/2}$	7.014−1	1.775+0	4.184−1	2.554−2
	$5d_{3/2}$	3.381−1	1.309+0	1.237+0	1.188−1
	$5d_{5/2}$	4.267−1	1.140+0	1.250+0	1.418−1
	$6s_{1/2}$	7.662−2	1.864+0	−1.565−1	−7.277−3
	$6p_{1/2}$	7.430−2	1.660+0	3.126−1	−5.037−3
	$6p_{3/2}$	1.172−1	1.778+0	4.111−1	2.491−2
	$6d_{3/2}$	2.688−2	1.312+0	1.231+0	1.172−1
	$7s_{1/2}$	8.853−3	1.864+0	−1.562−1	−7.265−3
90	$4s_{1/2}$	1.216+0	1.853+0	−1.529−1	−8.255−3
	$4p_{1/2}$	1.550+0	1.639+0	3.278−1	−2.657−3
	$4p_{3/2}$	2.722+0	1.765+0	4.257−1	2.926−2
	$4d_{3/2}$	1.659+0	1.300+0	1.262+0	1.280−1
	$4d_{5/2}$	2.121+0	1.134+0	1.277+0	1.509−1
	$4f_{5/2}$	2.868−1	7.284−1	1.471+0	3.592−1
	$4f_{7/2}$	3.454−1	6.966−1	1.460+0	3.780−1
	$5s_{1/2}$	3.769−1	1.854+0	−1.485−1	−7.807−3
	$5p_{1/2}$	4.370−1	1.661+0	2.962−1	−5.282−3
	$5p_{3/2}$	7.441−1	1.778+0	3.928−1	2.592−2
	$5d_{3/2}$	3.722−1	1.321+0	1.215+0	1.170−1
	$5d_{5/2}$	4.700−1	1.150+0	1.234+0	1.391−1
	$6s_{1/2}$	8.333−2	1.853+0	−1.474−1	−7.707−3
	$6p_{1/2}$	8.300−2	1.666+0	2.891−1	−5.874−3
	$6p_{3/2}$	1.324−1	1.781+0	3.855−1	2.527−2
	$6d_{3/2}$	3.496−2	1.324+0	1.208+0	1.153−1
	$7s_{1/2}$	1.023−2	1.853+0	−1.469−1	−7.681−3
91	$4s_{1/2}$	1.235+0	1.842+0	−1.422−1	−8.755−3
	$4p_{1/2}$	1.589+0	1.644+0	3.042−1	−3.549−3
	$4p_{3/2}$	2.811+0	1.767+0	3.998−1	2.975−2
	$4d_{3/2}$	1.752+0	1.311+0	1.241+0	1.267−1
	$4d_{5/2}$	2.237+0	1.143+0	1.262+0	1.486−1
	$4f_{5/2}$	3.157−1	7.368−1	1.472+0	3.558−1
	$4f_{7/2}$	3.800−1	7.039−1	1.462+0	3.744−1
	$5s_{1/2}$	3.897−1	1.843+0	−1.377−1	−8.268−3
	$5p_{1/2}$	4.569−1	1.666+0	2.727−1	−6.130−3
	$5p_{3/2}$	7.819−1	1.781+0	3.668−1	2.632−2
	$5d_{3/2}$	4.011−1	1.332+0	1.192+0	1.154−1
	$5d_{5/2}$	5.052−1	1.161+0	1.217+0	1.364−1
	$5f_{5/2}$	3.392−2	7.447−1	1.451+0	3.435−1
	$6s_{1/2}$	8.432−2	1.842+0	−1.364−1	−8.158−3
	$6p_{1/2}$	8.381−2	1.671+0	2.655−1	−6.715−3
	$6p_{3/2}$	1.323−1	1.784+0	3.595−1	2.564−2
	$6d_{3/2}$	3.172−2	1.336+0	1.184+0	1.136−1
	$7s_{1/2}$	9.353−3	1.842+0	−1.358−1	−8.126−3
92	$4s_{1/2}$	1.252+0	1.831+0	−1.299−1	−9.276−3
	$4p_{1/2}$	1.627+0	1.647+0	2.815−1	−4.420−3
	$4p_{3/2}$	2.899+0	1.769+0	3.745−1	3.024−2

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
	$4d_{3/2}$	1.846+0	1.321+0	1.219+0	1.255−1
	$4d_{5/2}$	2.355+0	1.153+0	1.247+0	1.464−1
	$4f_{5/2}$	3.463−1	7.450−1	1.472+0	3.523−1
	$4f_{7/2}$	4.165−1	7.111−1	1.464+0	3.708−1
	$5s_{1/2}$	4.028−1	1.831+0	−1.253−1	−8.747−3
	$5p_{1/2}$	4.775−1	1.670+0	2.501−1	−6.953−3
	$5p_{3/2}$	8.229−1	1.783+0	3.417−1	2.671−2
	$5d_{3/2}$	4.343−1	1.343+0	1.168+0	1.139−1
	$5d_{5/2}$	5.464−1	1.171+0	1.200+0	1.338−1
	$5f_{5/2}$	4.036−2	7.537−1	1.449+0	3.394−1
	$6s_{1/2}$	8.781−2	1.831+0	−1.239−1	−8.628−3
	$6p_{1/2}$	8.818−2	1.676+0	2.428−1	−7.535−3
	$6p_{3/2}$	1.391−1	1.786+0	3.344−1	2.601−2
	$6d_{3/2}$	3.373−2	1.347+0	1.160+0	1.120−1
	$7s_{1/2}$	9.529−3	1.831+0	−1.232−1	−8.598−3
93	$4s_{1/2}$	1.268+0	1.818+0	−1.157−1	−9.823−3
	$4p_{1/2}$	1.663+0	1.651+0	2.594−1	−5.290−3
	$4p_{3/2}$	2.988+0	1.770+0	3.496−1	3.075−2
	$4d_{3/2}$	1.943+0	1.331+0	1.196+0	1.244−1
	$4d_{5/2}$	2.476+0	1.161+0	1.231+0	1.442−1
	$4f_{5/2}$	3.790−1	7.532−1	1.471+0	3.490−1
	$4f_{7/2}$	4.554−1	7.182−1	1.465+0	3.673−1
	$5s_{1/2}$	4.157−1	1.818+0	−1.112−1	−9.249−3
	$5p_{1/2}$	4.980−1	1.675+0	2.282−1	−7.773−3
	$5p_{3/2}$	8.643−1	1.784+0	3.170−1	2.711−2
	$5d_{3/2}$	4.686−1	1.354+0	1.143+0	1.125−1
	$5d_{5/2}$	5.887−1	1.180+0	1.183+0	1.313−1
	$5f_{5/2}$	4.731−2	7.626−1	1.447+0	3.353−1
	$6s_{1/2}$	9.114−2	1.818+0	−1.098−1	−9.119−3
	$6p_{1/2}$	9.236−2	1.680+0	2.210−1	−8.354−3
	$6p_{3/2}$	1.457−1	1.788+0	3.097−1	2.639−2
	$6d_{3/2}$	3.555−2	1.358+0	1.134+0	1.106−1
	$7s_{1/2}$	9.675−3	1.818+0	−1.090−1	−9.083−3
94	$4s_{1/2}$	1.284+0	1.805+0	−9.966−2	−1.040−2
	$4p_{1/2}$	1.699+0	1.654+0	2.376−1	−6.190−3
	$4p_{3/2}$	3.080+0	1.770+0	3.247−1	3.124−2
	$4d_{3/2}$	2.044+0	1.340+0	1.172+0	1.234−1
	$4d_{5/2}$	2.603+0	1.170+0	1.215+0	1.419−1
	$4f_{5/2}$	4.145−1	7.615−1	1.471+0	3.458−1
	$4f_{7/2}$	4.976−1	7.254−1	1.467+0	3.638−1
	$5s_{1/2}$	4.280−1	1.805+0	−9.517−2	−9.775−3
	$5p_{1/2}$	5.177−1	1.679+0	2.069−1	−8.618−3
	$5p_{3/2}$	9.040−1	1.785+0	2.926−1	2.749−2
	$5d_{3/2}$	5.013−1	1.364+0	1.117+0	1.112−1
	$5d_{5/2}$	6.282−1	1.190+0	1.164+0	1.288−1
	$5f_{5/2}$	5.113−2	7.717−1	1.444+0	3.313−1
	$6s_{1/2}$	9.161−2	1.805+0	−9.366−2	−9.632−3
	$6p_{1/2}$	9.238−2	1.685+0	1.996−1	−9.181−3
	$6p_{3/2}$	1.435−1	1.788+0	2.853−1	2.675−2
	$7s_{1/2}$	8.449−3	1.805+0	−9.276−2	−9.588−3
95	$4s_{1/2}$	1.298+0	1.790+0	−8.181−2	−1.100−2
	$4p_{1/2}$	1.733+0	1.657+0	2.169−1	−7.076−3
	$4p_{3/2}$	3.170+0	1.770+0	3.008−1	3.174−2
	$4d_{3/2}$	2.146+0	1.349+0	1.147+0	1.226−1
	$4d_{5/2}$	2.731+0	1.179+0	1.198+0	1.399−1
	$4f_{5/2}$	4.517−1	7.696−1	1.469+0	3.425−1
	$4f_{7/2}$	5.417−1	7.324−1	1.467+0	3.604−1
	$5s_{1/2}$	4.403−1	1.791+0	−7.749−2	−1.032−2
	$5p_{1/2}$	5.377−1	1.683+0	1.867−1	−9.448−3
	$5p_{3/2}$	9.465−1	1.785+0	2.691−1	2.787−2
	$5d_{3/2}$	5.381−1	1.374+0	1.091+0	1.101−1
	$5d_{5/2}$	6.735−1	1.200+0	1.146+0	1.264−1
	$5f_{5/2}$	5.926−2	7.806−1	1.440+0	3.274−1
	$5f_{7/2}$	6.850−2	7.418−1	1.441+0	3.449−1

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
	$6s_{1/2}$	9.468−2	1.790+0	−7.592−2	−1.016−2
	$6p_{1/2}$	9.627−2	1.689+0	1.794−1	−1.000−2
	$6p_{3/2}$	1.495−1	1.788+0	2.619−1	2.711−2
	$7s_{1/2}$	8.535−3	1.790+0	−7.498−2	−1.012−2
96	$4s_{1/2}$	1.310+0	1.775+0	−6.225−2	−1.162−2
	$4p_{1/2}$	1.764+0	1.660+0	1.975−1	−7.963−3
	$4p_{3/2}$	3.259+0	1.769+0	2.778−1	3.223−2
	$4d_{3/2}$	2.247+0	1.357+0	1.123+0	1.219−1
	$4d_{5/2}$	2.858+0	1.187+0	1.182+0	1.379−1
	$4f_{5/2}$	4.904−1	7.775−1	1.466+0	3.394−1
	$4f_{7/2}$	5.875−1	7.392−1	1.467+0	3.571−1
	$5s_{1/2}$	4.525−1	1.776+0	−5.819−2	−1.089−2
	$5p_{1/2}$	5.577−1	1.686+0	1.677−1	−1.028−2
	$5p_{3/2}$	9.915−1	1.784+0	2.468−1	2.824−2
	$5d_{3/2}$	5.788−1	1.383+0	1.065+0	1.091−1
	$5d_{5/2}$	7.242−1	1.209+0	1.128+0	1.241−1
	$5f_{5/2}$	7.198−2	7.894−1	1.436+0	3.235−1
	$5f_{7/2}$	8.375−2	7.493−1	1.440+0	3.407−1
	$6s_{1/2}$	1.003−1	1.775+0	−5.660−2	−1.072−2
	$6p_{1/2}$	1.041−1	1.693+0	1.605−1	−1.083−2
	$6p_{3/2}$	1.641−1	1.788+0	2.396−1	2.744−2
	$6d_{3/2}$	4.026−2	1.388+0	1.055+0	1.070−1
	$7s_{1/2}$	1.004−2	1.775+0	−5.565−2	−1.067−2
97	$4s_{1/2}$	1.322+0	1.759+0	−4.046−2	−1.227−2
	$4p_{1/2}$	1.794+0	1.662+0	1.785−1	−8.893−3
	$4p_{3/2}$	3.349+0	1.768+0	2.552−1	3.270−2
	$4d_{3/2}$	2.354+0	1.365+0	1.097+0	1.214−1
	$4d_{5/2}$	2.992+0	1.196+0	1.165+0	1.359−1
	$4f_{5/2}$	5.320−1	7.853−1	1.464+0	3.364−1
	$4f_{7/2}$	6.369−1	7.461−1	1.467+0	3.537−1
	$5s_{1/2}$	4.642−1	1.759+0	−3.677−2	−1.148−2
	$5p_{1/2}$	5.769−1	1.689+0	1.494−1	−1.115−2
	$5p_{3/2}$	1.035+0	1.783+0	2.247−1	2.857−2
	$5d_{3/2}$	6.183−1	1.392+0	1.038+0	1.083−1
	$5d_{5/2}$	7.724−1	1.219+0	1.109+0	1.218−1
	$5f_{5/2}$	8.171−2	7.982−1	1.432+0	3.196−1
	$5f_{7/2}$	9.494−2	7.570−1	1.438+0	3.366−1
	$6s_{1/2}$	1.032−1	1.759+0	−3.515−2	−1.129−2
	$6p_{1/2}$	1.078−1	1.696+0	1.423−1	−1.168−2
	$6p_{3/2}$	1.701−1	1.786+0	2.176−1	2.774−2
	$6d_{3/2}$	4.163−2	1.397+0	1.027+0	1.061−1
	$7s_{1/2}$	1.014−2	1.759+0	−3.421−2	−1.124−2
98	$4s_{1/2}$	1.333+0	1.742+0	−1.630−2	−1.295−2
	$4p_{1/2}$	1.823+0	1.664+0	1.602−1	−9.874−3
	$4p_{3/2}$	3.442+0	1.765+0	2.327−1	3.314−2
	$4d_{3/2}$	2.465+0	1.372+0	1.070+0	1.209−1
	$4d_{5/2}$	3.132+0	1.204+0	1.147+0	1.340−1
	$4f_{5/2}$	5.770−1	7.932−1	1.462+0	3.335−1
	$4f_{7/2}$	6.902−1	7.529−1	1.467+0	3.506−1
	$5s_{1/2}$	4.754−1	1.742+0	−1.307−2	−1.209−2
	$5p_{1/2}$	5.951−1	1.692+0	1.318−1	−1.207−2
	$5p_{3/2}$	1.077+0	1.780+0	2.030−1	2.887−2
	$5d_{3/2}$	6.564−1	1.400+0	1.009+0	1.075−1
	$5d_{5/2}$	8.180−1	1.228+0	1.090+0	1.196−1
	$5f_{5/2}$	8.786−2	8.071−1	1.427+0	3.159−1
	$5f_{7/2}$	1.013−1	7.647−1	1.436+0	3.326−1
	$6s_{1/2}$	1.032−1	1.741+0	−1.144−2	−1.189−2
	$6p_{1/2}$	1.071−1	1.699+0	1.248−1	−1.258−2
	$6p_{3/2}$	1.662−1	1.784+0	1.959−1	2.801−2
	$7s_{1/2}$	8.719−3	1.741+0	−1.049−2	−1.183−2
99	$4s_{1/2}$	1.342+0	1.723+0	9.758−3	−1.366−2
	$4p_{1/2}$	1.848+0	1.666+0	1.432−1	−1.087−2
	$4p_{3/2}$	3.533+0	1.762+0	2.113−1	3.355−2

(*continued on next page*)

Table 2 (*continued*)

Z	Shell	σ	β	γ	δ
	$4d_{3/2}$	2.577+0	1.378+0	1.043+0	1.206−1
	$4d_{5/2}$	3.270+0	1.212+0	1.129+0	1.321−1
	$4f_{5/2}$	6.236−1	8.009−1	1.458+0	3.307−1
	$4f_{7/2}$	7.452−1	7.596−1	1.466+0	3.475−1
	$5s_{1/2}$	4.865−1	1.723+0	1.241−2	−1.273−2
	$5p_{1/2}$	6.133−1	1.695+0	1.156−1	−1.300−2
	$5p_{3/2}$	1.121+0	1.777+0	1.825−1	2.914−2
	$5d_{3/2}$	6.982−1	1.408+0	9.814−1	1.069−1
	$5d_{5/2}$	8.691−1	1.237+0	1.070+0	1.174−1
	$5f_{5/2}$	9.895−2	8.158−1	1.422+0	3.122−1
	$5f_{7/2}$	1.139−1	7.722−1	1.433+0	3.285−1
	$6s_{1/2}$	1.058−1	1.723+0	1.402−2	−1.251−2
	$6p_{1/2}$	1.105−1	1.702+0	1.088−1	−1.349−2
	$6p_{3/2}$	1.715−1	1.781+0	1.755−1	2.824−2
	$7s_{1/2}$	8.762−3	1.723+0	1.492−2	−1.245−2
100	$4s_{1/2}$	1.350+0	1.704+0	3.807−2	−1.439−2
	$4p_{1/2}$	1.871+0	1.667+0	1.273−1	−1.192−2
	$4p_{3/2}$	3.622+0	1.758+0	1.908−1	3.394−2
	$4d_{3/2}$	2.690+0	1.384+0	1.015+0	1.204−1
	$4d_{5/2}$	3.411+0	1.220+0	1.111+0	1.303−1
	$4f_{5/2}$	6.729−1	8.085−1	1.455+0	3.279−1
	$4f_{7/2}$	8.033−1	7.662−1	1.465+0	3.444−1
	$5s_{1/2}$	4.971−1	1.703+0	4.002−2	−1.339−2
	$5p_{1/2}$	6.309−1	1.697+0	1.007−1	−1.398−2
	$5p_{3/2}$	1.166+0	1.774+0	1.628−1	2.936−2
	$5d_{3/2}$	7.412−1	1.415+0	9.528−1	1.065−1
	$5d_{5/2}$	9.216−1	1.246+0	1.051+0	1.153−1
	$5f_{5/2}$	1.109−1	8.245−1	1.416+0	3.085−1
	$5f_{7/2}$	1.274−1	7.797−1	1.430+0	3.245−1
	$6s_{1/2}$	1.084−1	1.703+0	4.157−2	−1.314−2
	$6p_{1/2}$	1.137−1	1.705+0	9.405−2	−1.447−2
	$6p_{3/2}$	1.766−1	1.777+0	1.560−1	2.842−2
	$7s_{1/2}$	8.798−3	1.703+0	4.243−2	−1.307−2