

# Atomic Form Factors, Incoherent Scattering Functions, and Photon Scattering Cross Sections

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Tabulations are presented of the atomic form factor,  $F(x,Z)$ , and the incoherent scattering function,  $S(x,Z)$ , for values of  $x$  ( $=\sin(\theta/2)/\lambda$ ) from  $0.005 \text{ \AA}^{-1}$  to  $10^9 \text{ \AA}^{-1}$ , for all elements  $Z=1$  to 100. These tables are constructed from available state-of-the-art theoretical data, including the Pirene formulas for  $Z=1$ , configuration-interaction results by Brown using Brown-Fontana and Weiss correlated wavefunctions for  $Z=2$  to 6, non-relativistic Hartree-Fock results by Cromer for  $Z=7$  to 100, and a relativistic  $K$ -shell analytic expression for  $F(x,Z)$  by Bethe and Levinger for  $x > 10 \text{ \AA}^{-1}$  for all elements  $Z=2$  to 100. These tabulated values are graphically compared with available photon scattering angular distribution measurements. Tables of coherent (Rayleigh) and incoherent (Compton) total scattering cross sections, obtained by numerical integration over combinations of  $F^2(x,Z)$  with the Thomson formula and  $S(x,Z)$  with the Klein-Nishina formula, respectively, are presented for all elements  $Z=1$  to 100, for photon energies 100 eV ( $\lambda=124 \text{ \AA}$ ) to 100 MeV ( $0.000124 \text{ \AA}$ ). The incoherent scattering cross sections also include the radiative and double-Compton corrections as given by Mork. Similar tables are presented for the special cases of terminally-bonded hydrogen and for the  $H_2$  molecule, interpolated and extrapolated from values calculated by Stewart et al. and by Bentley and Stewart using Kolos-Roothaan wavefunctions.

Key words: Atomic form factor; Compton scattering; cross sections; gamma rays; incoherent scattering function; photons; Rayleigh scattering; tabulations; x-rays.

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## 1. Introduction and Notation

### 1.1. Introduction

A number of systematic calculations and tabulations of atomic form factor (see, e.g., [1]–[14]<sup>1</sup> and incoherent scattering function (see, e.g., [9], [12], and [14]–[19]) values have been presented in the crystallographic and chemical physics literature. These tabulations, in some cases presented in the form of parameters for simple analytical formulas (see, e.g., [10], [13], and [19]) to facilitate their use in machine computations, are generally limited to momentum transfer arguments<sup>2</sup>  $(1/\lambda) \sin(\phi/2)$  (or  $(1/\lambda) \sin \phi$ , where  $\phi = \theta/2 =$  the angle of incidence and reflection from a crystal lattice plane) below  $\sim 2.0 \text{ \AA}^{-1}$ . A few higher- $x$  exceptions include tabulations by Hanson et al. [7] extending to  $6.0 \text{ \AA}^{-1}$ , by Cromer and Mann [17], Cromer [18] and Tavad et al. [9] extending to  $8.0 \text{ \AA}^{-1}$ , and results by Cromer [20] published by Veigele et al. [12] extending to  $80.0 \text{ \AA}^{-1}$ .

Integral coherent and incoherent scattering cross sections for photon<sup>3</sup> energies up to 24.8, 99.2, and 992.0 keV can be calculated using the above atomic form factor and incoherent scattering function sets extending up to momentum transfer arguments 2, 8, and  $80 \text{ \AA}^{-1}$ , respectively, without extrapolation. For calculating these scattering cross sections for higher photon energies, various ad hoc extrapolation procedures have been employed (see, e.g., refs. [21], [22], [23], and [24]).

The incoherent scattering integrated cross section is relatively insensitive to variations in the high- $x$  extrapolated incoherent scattering function values, all of which approach the free-electron limiting case as  $x$  increases. The coherent scattering cross section, on the other hand, increases its sensitivity to the atomic form factor with increasing  $x$ . Although the asymptotic high- $x$  dependence<sup>4</sup> has recently been shown by Goscinski and Lindner [25] and by Smith [26] to be  $F(x, Z) \sim x^{-4}$ , the differing extrapolation procedures [21]–[24] have led to substantially differing integrated cross section values.

Although the integrated coherent scattering cross section is a small fraction of the total attenuation coefficient in the extrapolation region, it can still result in total attenuation coefficient variations of the order of 1%, or in one extreme case [21] 5–10%. For the present tabulations the atomic form factor was extrapolated to high- $x$  by means of a relativistic theoretical expression given by Bethe and Levinger [29].

Although the form-factor and scattering-function approach is an approximation valid primarily for small angles and neglects electron pre-collision motion effects, the more rigorous theoretical treatments (see, e.g., refs. [30]–[38]) are not sufficiently tractable for extensive systematic calculation and tabulation. Within these limitations, the tables presented in this report fill what the authors consider a present need for an extended-range, state-of-the-art set of evaluated theoretical scattering cross section differential and integral data for use in calculating radiation attenuation, transport and energy deposition in medical physics, reactor shielding, industrial radiography, weapons effects, and in a variety of other applications in addition to x-ray crystallography.

We caution, however, that in some regions of the tables there are large uncertainties, particularly in  $F(x, Z)$  for  $x > 10 \text{ \AA}^{-1}$  where use of the Bethe-Levinger formula forces a smooth  $Z$ -dependence from which the available measurements suggest departures of as much as a factor of two or more for some elements. For  $x > 100 \text{ \AA}^{-1}$ , where no measurements are available for comparison, the combination of the above and other uncertainties may result in departures of  $F(x, Z)$  values (in table I) from physical reality by one or more orders of magnitude.

We caution also that for energies above a few MeV and extending up into the asymptotic region, additional scattering processes such as Delbrück, nuclear resonance and proton Compton, not considered in this work, may become considerably more important than those derived from the  $F(x, Z)$  and  $S(x, Z)$  values described and tabulated in this work.

The specific sources of theoretical data (previous calculations, formulas, normalizations) used in constructing the present  $F(x, Z)$  and  $S(x, Z)$  tabulations (table I), and the  $x$ - and  $Z$ -region in which each is applied, are listed in section 3 of this work.

### 1.2. Physical Constants<sup>5</sup>: Units: Notation: Basic Photon Scattering Formulas

$c$	velocity of light = $2.99792458 \cdot 10^8 \text{ m s}^{-1}$ ,
$e$	elementary charge = $1.6021892 \cdot 10^{-19}$ Coulomb  = $4.803242 \cdot 10^{-10} \text{ cm}^{3/2} \text{ g}^{1/2} \text{ s}^{-1}$ (e.s.u.) = $1.5189186 \cdot 10^{-14} \text{ m}^{3/2} \text{ kg}^{1/2} \text{ s}^{-1}$ ,
$m_e$	electron rest-mass = $9.109534 \cdot 10^{-31} \text{ kg}$ ,

<sup>1</sup>Figures in brackets indicate literature references at the end of this paper. See also section 4, footnote 11, for an explanation of references of the form [70 Ba 01], listed separately in section 8 following the main bibliography.

<sup>2</sup>The momentum transfer argument, most frequently given as  $\sin(\theta/2)/\lambda(\text{\AA})$ , also appears in the literature as  $4\pi \sin(\theta/2)/\lambda(\text{\AA})$ , and as applied in x-ray scattering problems is defined as  $q = (2k/\hbar) \sin(\theta/2) = (2/\hbar) \sin(\theta/2)/\lambda(\text{\AA})$ . To avoid confusion with these definitions, we use the momentum transfer parameter  $x = \sin(\theta/2)/\lambda(\text{\AA})$  throughout this work.

<sup>3</sup>The terms "photon," "x-ray" and "gamma-ray" are used interchangeably throughout this work.

<sup>4</sup>Y.-K. Kim [27] has pointed out to the authors that arguments by Lassette [28] can be generalized to provide high- $x$  expansions for  $F(x, Z)$  and  $S(x, Z)$  which can be truncated and least-squares-fit to presently calculated intermediate- $x$  values, in order to extrapolate into the extreme asymptotic region.

<sup>5</sup>Numerical values given here are those recommended in 1973 by the Task Group on Fundamental Constants, Committee on Data for Science and Technology (CODATA) of the International Council of Scientific Unions (ICSU) [39], taken from an analysis by Cohen and Taylor [40]. An exception is the new higher-precision  $\text{\AA}^2/\text{\AA}$  value determined by Deslattes and Henins [41].

$m_e c^2$	electron rest-mass energy = $5.110034 \cdot 10^5$ eV,	$\phi$	Bragg angle in x-ray crystallography = $\theta/2$ ,
$b$	barn = $10^{-28}$ m <sup>2</sup> ,	$x$	= $\sin(\theta/2)/\lambda$ (Å)
$r_e$	classical electron radius = $e^2/(m_e c^2)$ = $2.8179380 \cdot 10^{-15}$ m,	$\hbar q$	momentum transfer to an atom or electron (or, in vector notation, $\hbar \mathbf{q} = \mathbf{k}_i - \mathbf{k}_f$ , where $k_i$ and $k_f$ are the initial and final momenta of the photon). In units of $m_e c$ , = $2k \sin(\theta/2)$ (1)
$r_e^2$	= $7.940775 \cdot 10^{-30}$ m <sup>2</sup> = $0.07940775$ b,		for coherent scattering, or = $2k \sin(\theta/2) \cdot \sqrt{1 + (k^2 + 2k) \sin^2(\theta/2)} /$ [ $1 + 2k \sin^2(\theta/2)$ ] (2)
$\sigma_T$	cross section for classical Thomson scatter- ing from an electron = $8\pi r_e^2/3 = 6.652448 \cdot 10^{-29}$ m <sup>2</sup> = $0.6652448$ b,		
$\alpha$	fine structure constant = $7.2973506 \cdot 10^{-3} = 1/137.03604 \sim 1/137$ ,		for incoherent scattering = $2k \sin(\theta/2)$ (2a)
$a_0$	first Bohr radius = $r_e/\alpha^2$ = $5.2917706 \cdot 10^{-11}$ m = $0.52917706$ Å,		when $q$ (or $x$ ) is small. Conversion of $q$ - arguments in $m_e c$ units (equations (1)- (2a)) to the $x$ -arguments [ $\lambda(\text{Å})^{-1} \sin(\theta/2)$ ] used in the present tables (tables I and IV) is accomplished by multiplication by the factor 20.60744 = $\frac{1}{2} \cdot 511003.4/12398.52$ ,
$E$	photon energy in eV units (e.g., keV, MeV or GeV),	$Z$	atomic number = electrons/atom,
$k$	photon energy in units of the electron rest- mass energy (i.e., $m_e c^2$ units) = $E(\text{eV})/511003.4$ ,	$d\Omega$	differential solid angle in steradians = $2\pi \sin\theta d\theta$
$\lambda$	photon wavelength in Compton units = $1/k = 511003.4/E(\text{eV})$ ,	$d\sigma_T(\theta)/d\Omega$	differential Thomson scattering cross section per electron = $\frac{r_e^2}{2} (1 + \cos^2\theta)$ (3)
$\lambda(\text{Å})$	photon wavelength in angstroms (1 angstrom = $10^{-10}$ m = 0.1 nm) = $12398.520/E(\text{eV})$ , <sup>6</sup>	$F(x, Z)$	atomic form factor (tables I and IV),
$\theta$	angle between the photon directions of travel prior to and following a scattering interaction	$\sigma_{\text{coh}}$	coherent (Rayleigh) scattering cross sec- tion per atom (table II) = $\int_{\theta=0}^{\theta=\pi} d\sigma_T(\theta) [F(x, Z)]^2$ (4) = $\frac{3}{8} \sigma_T \int_{-1}^{+1} (1 + \cos^2\theta) [F(x, Z)]^2 d(\cos\theta)$ (4a)

<sup>6</sup>In addition to the angstrom, which is based on the meter, two photon wavelength units, Å\* and xu, are in use which are based on characteristic emission wavelengths. The Å\*-unit introduced by Bearden [42] is defined using the tungsten  $K\alpha_1$  emission line as an x-ray wavelength standard, such that

$$\lambda(\text{W } K\alpha_1) = 0.2090100 \text{ Å}^*$$

By means of simultaneous x-ray and visible-region interferometry Deslattes and Henins [41] have recently determined that

$$1 \text{ Å}^* = 1.0000256 \text{ Å (1.8 ppm)}$$

The x-unit (xu), used in much of the older literature and occasionally in the present literature, was intended to be  $10^{-3}$  Å but has taken on a variety of values because of errors and inconsistencies in the various wavelength standards used. If the molybdenum  $K\alpha_1$  emission line is taken as a reference with a "defined" value [42]

$$\lambda(\text{Mo } K\alpha_1) = 707.831 \text{ xu}$$

then from the recent Deslattes-Henins [41] measurement:

$$\lambda(\text{Mo } K\alpha_1) = 0.7093187 \text{ Å (0.6 ppm)}$$

we find

$$1 \text{ xu} = 1.0021017 \cdot 10^{-3} \text{ Å (0.6 ppm)}$$

and

$$\lambda(\text{xu}) = 12.37/(\text{MeV})$$

$d\sigma_{\text{KN}}(\theta)/d\Omega$  differential Klein-Nishina (free-electron Compton) collision cross section per electron

$$= \frac{r_e^2}{2} [1 + k(1 - \cos\theta)]^{-2} \times \left[ 1 + \cos^2\theta + \frac{k^2(1 - \cos\theta)^2}{1 + k(1 - \cos\theta)} \right] \quad (5)$$

$\sigma_{\text{KN}}$  total Compton collision cross section per electron as given by the Klein-Nishina formula (5)

$$\begin{aligned} &= \int_{\theta=0}^{\theta=\pi} d\sigma_{\text{KN}}(\theta) \\ &= 2\pi r_e^2 \left\{ \frac{1+k}{k^2} \left[ \frac{2(1+k)}{1+2k} - \frac{\mathcal{L}n(1+2k)}{k} \right] \right. \\ &\quad \left. + \frac{\mathcal{L}n(1+2k)}{2k} - \frac{1+3k}{(1+2k)^2} \right\} \quad (7)^7 \end{aligned}$$

$S(x, Z)$  incoherent scattering function (tables I and IV)

$\sigma_{\text{inc}}$  total incoherent (bound-electron Compton) scattering cross section per atom

$$= \int_{\theta=0}^{\theta=\pi} d\sigma_{\text{KN}}(\theta) S(x, Z) \quad (8)$$

$\Delta\sigma_{\text{KN}}^{\text{M}}$  radiative and double-Compton correction to the integrated Klein-Nishina formula (7) as given by Mork [44]. Values for  $[1 + \Delta\sigma_{\text{KN}}^{\text{M}}]$  are listed in table III,

$\sigma_{\text{KN}}^{\text{M}}$  Klein-Nishina total cross section per electron including radiative and double-Compton corrections

$$= \sigma_{\text{KN}} \cdot (1 + \Delta\sigma_{\text{KN}}^{\text{M}}) \quad (9)$$

$\sigma_{\text{inc}}^{\text{M}}$  total incoherent scattering cross section per atom including radiative and double-Compton corrections (table II)

$$\approx \sigma_{\text{inc}} \cdot (1 + \Delta\sigma_{\text{KN}}^{\text{M}}) \quad (10)$$

$d_a\sigma_{\text{KN}}(\theta)/d\Omega$  differential Klein-Nishina (free-electron) energy-absorption cross section per electron

$$\begin{aligned} &= \frac{r_e^2}{2} \frac{k(1 - \cos \theta)}{[1 + k(1 - \cos \theta)]^3} \\ &\times \left[ 1 + \cos^2 \theta + \frac{k^2(1 - \cos \theta)^2}{1 + k(1 - \cos \theta)} \right] \quad (11) \end{aligned}$$

<sup>7</sup> Below 100 keV equation (7) becomes unsuitable for computation because of near-cancellation between the logarithmic and purely algebraic terms. In this energy region the expansion [43]

$$\sigma_{\text{KN}} = \frac{8}{3} \pi r_e^2 \frac{1}{(1+2k)^2} \left( 1 + 2k + \frac{6}{5} k^2 - \frac{1}{2} k^3 + \frac{2}{7} k^4 - \frac{6}{35} k^5 + \frac{8}{105} k^6 + \frac{4}{105} k^7 - \dots \right), \quad (7a)$$

may be used.

${}_a\sigma_{\text{KN}}$  total Compton energy-absorption cross section per electron, as given by the Klein-Nishina formula (11)

$$\begin{aligned} &= \int_{\theta=0}^{\theta=\pi} d_a\sigma_{\text{KN}}(\theta) \quad (12) \\ &= 2\pi r_e^2 \left\{ \frac{2(1+k)^2}{k^2(1+2k)} \right. \\ &\quad \left. - \frac{1+3k}{(1+2k)^2} - \frac{(1+k)(2k^2-2k-1)}{k^2(1+2k)} \right. \end{aligned}$$

$$\begin{aligned} &\quad \left. - \frac{4k^2}{3(1+2k)^3} - \left( \frac{1+k}{k^3} - \frac{1}{2k} + \frac{1}{2k^3} \right) \right. \\ &\quad \left. \cdot \mathcal{L}n(1+2k) \right\} \quad (13)^8 \end{aligned}$$

${}_a\sigma_{\text{inc}}$  total incoherent (bound-electron) scattering energy-absorption cross section per atom (ignoring fluorescence and bremsstrahlung escape losses)

$$= \int_{\theta=0}^{\theta=\pi} d_a\sigma_{\text{KN}}(\theta) S(x, Z). \quad (14)$$

### 1.3. Generalized Expressions for the Atomic Form Factor $F(x, Z)$ and the Incoherent Scattering Function $S(x, Z)$

The atomic form factor  ${}^9F(x, Z)$  for an atom of atomic number  $Z$  is defined (see, e.g., Nelms and Oppenheim [4]) as the matrix element

$$F(\mathbf{q}, Z) = \sum_{n=1}^Z \langle \Psi_0 | \exp(i\mathbf{q} \cdot \mathbf{r}_n) | \Psi_0 \rangle, \quad (15)$$

where  $\Psi_0$  is the ground-state wave function of the atom,  $\mathbf{q}$  is the momentum transfer vector with magnitude  $\mathbf{q} = \frac{2k}{\hbar} \sin(\theta/2)$  and  $\mathbf{r}_n$  is the radius vector from the nucleus to the  $n$ th electron.

The atomic form factor may also be expressed as the integral [45], [73]

$$F(\mathbf{q}, Z) = \int \rho(\mathbf{r}) \exp(i\mathbf{q} \cdot \mathbf{r}) d^3r, \quad (16)$$

<sup>8</sup> Analogous to equations (7) and (7a) above, an expression more suitable than (13) for computation below 100 keV is [43].

$$\begin{aligned} \sigma_{\text{KN}} &= \frac{8}{3} \pi r_e^2 \frac{1}{(1+2k)^2} \left( k + \frac{9}{5} k^2 + \frac{3}{2} k^3 \right. \\ &\quad \left. - \frac{13}{35} k^4 + \frac{2}{35} k^5 + \frac{4}{35} k^6 - \frac{4}{15} k^7 + \dots \right). \quad (13a) \end{aligned}$$

<sup>9</sup> Other names for  $F(x, Z)$  have included "atomic structure factor" (see, e.g., Hartree [48] or Compton [49]) and "atomic scattering factor" (see, e.g., James and Brindley [1]).

in which  $\rho(\mathbf{r})$ , the total electron density at  $\mathbf{r}$ , can in turn be written as the inverse Fourier transform of  $F(\mathbf{q}, Z)$

$$\rho(\mathbf{r}) = (2\pi)^{-3} \int F(\mathbf{q}, Z) \exp(i\mathbf{q} \cdot \mathbf{r}) d^3q. \quad (17)$$

For a spherically symmetric atom the angular integrations in equation (16) can be performed, resulting in (see, e.g., Debye [46] and Pirenne [47])

$$F(q, Z) = 4\pi \int_0^\infty \rho(r) \frac{\sin(qr)}{qr} r^2 dr. \quad (18)$$

The incoherent scattering function  $S(x, Z)$  can be expressed in terms of a form factor generalized to include excited states (see, e.g., Grodstein [50], Brown [51] or Veigele [52])

$$F_\epsilon(\mathbf{q}, Z) = \langle \epsilon | \sum_{j=1}^Z \exp(i\mathbf{q} \cdot \mathbf{r}_j) | 0 \rangle, \quad (19)$$

where  $\epsilon$  indicates the energy of an excited (or ionized) stationary state as measured from the ground state. The incoherent scattering function is then

$$S(\mathbf{q}, Z) = \sum_{\epsilon > 0} |F_\epsilon(\mathbf{q}, Z)|^2, \quad (20)$$

where the sum is taken to mean a sum over the discrete states and an integral over the continuum states, excluding the ground state  $\epsilon = 0$ .

To remove the summation over excited states, equation (20) may be rewritten [51]

$$S(\mathbf{q}, Z) = \sum_{\epsilon=0} \left\langle 0 \left| \sum_n \exp(-i\mathbf{q} \cdot \mathbf{r}_n) \right| \epsilon \right\rangle \left\langle \epsilon \left| \sum_m \exp(i\mathbf{q} \cdot \mathbf{r}_m) \right| 0 \right\rangle - \left\langle 0 \left| \sum_j \exp(i\mathbf{q} \cdot \mathbf{r}_j) \right| 0 \right\rangle^2. \quad (21)$$

Employing the closure property (see, e.g., Schiff [53] or Messiah [54])

$$\sum_{\epsilon=0} |\epsilon\rangle \langle \epsilon| = 1, \quad (22)$$

and identifying the last term in equation (21) with  $|F(\mathbf{q}, Z)|^2$  as given in equation (15) we have

$$S(\mathbf{q}, Z) = \sum_{m=1}^Z \sum_{n=1}^Z \left\langle \Psi_0 \left| \exp[i\mathbf{q}(\mathbf{r}_m - \mathbf{r}_n)] \right| \Psi_0 \right\rangle - |F(\mathbf{q}, Z)|^2, \quad (23)$$

in terms of the ground state wave functions only.

We have omitted in equations (20), (21) and (23) the factor  $Z^{-1}$  appearing in the Kim and Inokuti [55] and Brown [56] expressions, to be consistent with equations

(8) and (14) and to correspond to the numerical values in table I (where  $S(0, Z) = 0$  and  $S(\infty, Z) = Z$ ) as they are customarily tabulated.

## 2. Theoretical Models and Approximations for $F(x, Z)$ and $S(x, Z)$

### 2.1. Atomic, Terminally-Bonded, and Molecular Hydrogen

For atomic hydrogen the Schrödinger equation yields a closed-form solution for the ground-state wave function

$$\Psi_0 = (\pi a_0^3)^{-1/2} \exp(-r/a_0), \quad (24)$$

where  $a_0$  is the first Bohr radius (0.52917706 Å). Thus the electron density probability  $\rho(r)$  is

$$\rho(r) = |\Psi_0|^2 = \pi^{-1} a_0^{-3} \exp(-2r/a_0), \quad (25)$$

which when substituted into the integral in equation (18) yields the simple closed-form expression for the atomic-hydrogen atomic form factor (Pirenne [57])

$$F(q, H) = [1 + (\pi a_0 q)^2]^{-2}, \quad (26)$$

in which  $\hbar q = 2k \sin(\theta/2) = 2\lambda^{-1} \sin(\theta/2)$ . In terms of the momentum-transfer variable

$$x = [\sin(\theta/2)]/\lambda (\text{Å}), \quad (27)$$

where  $\lambda(\text{Å}) = 12.398520/E(\text{keV})$ , equation (26) becomes

$$F(x, H) = [1 + 4\pi^2 a_0^2 x^2]^{-2}, \quad (28)$$

shown in figure 1 as the solid curve.

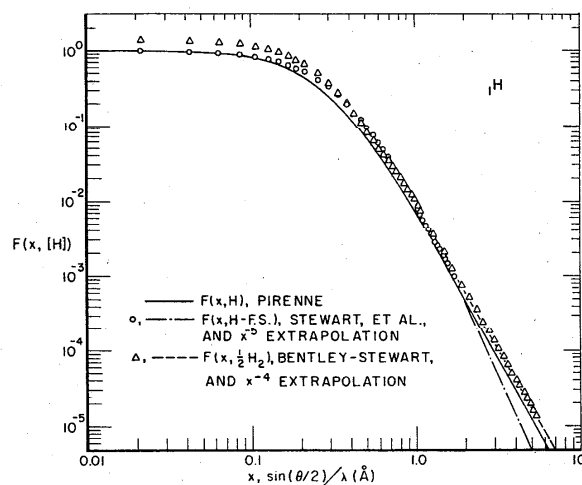


FIGURE 1. Comparison of the floated-sphere bonded-hydrogen Stewart et al. [58] (circles) and  $H_2$  Bentley-Stewart [61] (triangles) form factors with the atomic-hydrogen form factor (Pirenne).

For a one-electron atom the double-summation term in equation (23) reduces to unity, hence the atomic hydrogen incoherent scattering function can be expressed in terms of  $F(x, H)$  as given in equations (26) or (28) as

$$S(x, H) = 1 - [F(x, H)]^2. \quad (29)$$

The values of  $F(x, Z)$  and  $S(x, Z)$  for hydrogen ( $Z = 1$ ) listed in table I were computed by using equations (28) and (29).

However, for practical applications, it should be remembered that the hydrogen atom is unique in that its single 1s electron serves as both core and valence shell, resulting in a substantial distortion (dilation) of the atom (electron density function) in the presence of molecular binding. The effect on  $F(x, Z)$  of this distortion has been quantitatively estimated by Stewart, Davidson and Simpson [58], with specific application to the  $H_2$  molecule by McWeeny [59], Iijima and Bonham [60], and by Bentley and Stewart [61].

For application to terminally-bonded hydrogen (for example H in C-H or N-H bonded situations), Stewart et al. [58] have calculated  $F(x, [H])$  over the range  $x = 0$  to  $1.72 \text{ \AA}^{-1}$  using the Davidson-Jones [62] natural orbital expansion of the Kolos-Roothaan [63]  $H_2$  wavefunction to obtain a one-electron density function. In this calculation, Stewart et al. assume a spherical density for the bonded H-atom, but "float" this spherical distribution  $0.07 \text{ \AA}$  off the proton into the bond. The resulting "floated-sphere" values of  $F(x, H-F.S.)$  are shown as the circles of figure 1, as compared with the Pirenne isolated-atom values (solid curve), and the ratio is shown in figure 2 (circles). A nine-parameter analytic fit to the Stewart et al. [58]  $F(x, H-F.S.)$  values, useful over the range  $0 \leq x \leq 1.72 \text{ \AA}^{-1}$ , is included in reference [14] (table 2.2B).

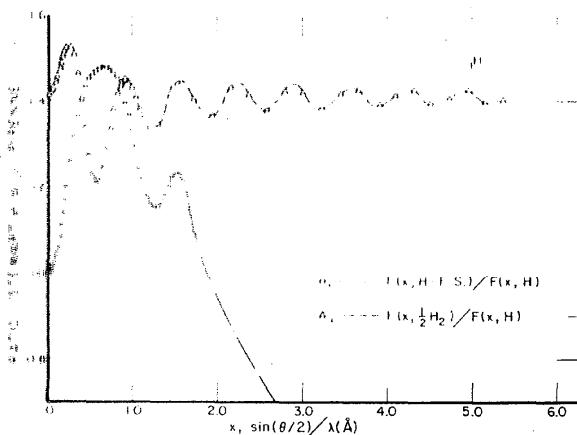


FIGURE 2. Ratios of the Stewart et al. [58] floated-sphere bonded-hydrogen  $F(x, H-F.S.)$  form factor (circles) and Bentley-Stewart [61]  $H_2$   $F(x, \frac{1}{2}H_2)$  form factor (triangles), respectively, to the atomic-hydrogen form factor.

Since these "floated-sphere" results correspond to a charge density  $\partial\rho/\partial r_a = 0$  at  $r_a = 0$ , Stewart [64] conjectures that

$$\lim_{x \rightarrow \infty} F(x, H-F.S.) \propto x^{-5}, \quad (30)$$

which is the basis for the extrapolation curves (dash-dot) in figures 1 and 2, and for the  $F(x, H-F.S.)$  values for  $x \geq 2.0 \text{ \AA}^{-1}$  listed in table IV. The remaining  $F(x, H-F.S.)$  values in table IV, for  $0 \leq x \leq 1.5 \text{ \AA}^{-1}$  were interpolated from Stewart et al. (ref. [58], table II) by means of a least-squares cubic spline fit interpolation procedure derived by Berger and Seltzer [65] from an algorithm given by Powell [66].

For a consistent set of incoherent scattering function values for bonded hydrogen in the floated-sphere approximation, we have arbitrarily assumed the relation

$$S(x, H-F.S.) = 1 - [F(x, H-F.S.)]^2, \quad (31)$$

analogous to equation (29), for purposes of providing a set of  $S(x, H-F.S.)$  values in table IV. Using the values of  $F(x, H-F.S.)$  described above and listed in table IV, values of  $S(x, H-F.S.)$  in table IV were computed using equation (31) over the entire range  $0 \leq x \leq 10^9 \text{ \AA}^{-1}$ . The parentheses are to caution the reader that equation (31) does not necessarily reflect physical reality, particularly for key values of  $x$  where

$$F(x, H-F.S.) \approx 0.5.$$

In addition to the "best floated sphere" Stewart et al. results, there is a recent calculation by Bentley and Stewart [61] of the form factor (squared)  $|F(x, H_2)|^2$  for the  $H_2$  hydrogen molecule, over the range  $0 \leq x \leq 1.61 \text{ \AA}^{-1}$ . In this calculation, Bentley and Stewart represented the two-center scattering potential in prolate spheroidal coordinates, and used the Davidson-Jones [62] natural spin-orbital expansion of the Kolos-Roothaan [63] essentially exact ground-state wavefunction for  $H_2$ .

For purposes of the present tabulations, we have derived from the Bentley-Stewart (ref. [61], table V, also ref. [64])  $|F(x, H_2)|^2$  values the quantity

$$F(x, \frac{1}{2}H_2) = \{\frac{1}{2} |F(x, H_2)|^2\}^{1/2}, \quad (32)$$

shown as triangles in figure 1, to provide a direct comparison with the Pirenne isolated-atom result. The ratio of the Bentley-Stewart results to those of Pirenne, shown as triangles in figure 2, is similar in magnitude ( $\sim 1.4$ ) to that calculated by Cooper [67] for the photoeffect ratio  $\tau_{1/2 H_2} / \tau_H$ . Also, the Bentley-Stewart value  $|F(x, H_2)|^2 = 3.99985$  for  $x = 0$  suggests that the  $H_2$  molecule resembles a helium atom in its coherent scattering properties. Stewart [64] has also supplied the

authors with additional high- $x$   $|F(x, H_2)|^2$  values out to  $x=5.37 \text{ \AA}^{-1}$  which show  $F(x, \frac{1}{2}H_2)$  falling off as  $x^{-3.98}$ , hence the  $x^{-4}$  extrapolation (dashed line)

$$\lim_{x \rightarrow \infty} F(x, \frac{1}{2}H_2) \propto x^{-4}, x > 5.37 \text{ \AA}^{-1}, \quad (33a)$$

similar to the Pirene formula high- $x$  behavior, shown in figures 1 and 2.

In addition to the above-described  $F(x, \frac{1}{2}H_2)$  values, Stewart [64] has kindly calculated and supplied to the authors a consistent set of  $S(x, \frac{1}{2}H_2)$  values over the range  $0 \leq x \leq 1.07 \text{ \AA}^{-1}$ . An examination of the complement of these  $S(x, \frac{1}{2}H_2)$  values vs  $x$  on a log-log graph suggested an extrapolation function

$$1 - S(x, \frac{1}{2}H_2) \propto x^{-7.59}, x > 1.07 \text{ \AA}^{-1} \quad (33b)$$

which we have used in this work.

From the above Bentley-Stewart and Stewart  $F(x, \frac{1}{2}H_2)$  and  $S(x, \frac{1}{2}H_2)$  values we again used the Berger-Seltzer [65] least-squares cubic spline-fit interpolation procedure, also the extrapolation formulas in equations (33a) and (33b), respectively, to derive the standard-grid values of  $F(x, \frac{1}{2}H_2)$  and  $S(x, \frac{1}{2}H_2)$  listed in the last two columns of table IV.

## 2.2. Pauling and Sherman Method

For many-electron atoms, exact solutions for the atomic form factor and incoherent scattering function are not obtainable, so a variety of approximations have been used. Among these approaches is the treatment by Pauling [68] who has calculated approximate atomic wave functions by assuming each electron of the atom to move in a hydrogen-like field reduced from the nuclear Coulomb field by a screening constant, with the screening constant different for each electron group. Using this method, Pauling and Sherman [69] computed  $F(x, Z)$  tables for 66 atoms over the range  $Z=1$  to 92 and for 20 ions, over the range  $0 \leq x \leq 1.4 \text{ \AA}^{-1}$ . These values are realistic for small-angle scattering in all elements and for intermediate angles in low- $Z$  elements but otherwise exaggerate shell-structure effects and depart systematically from the more accurate self-consistent-field results.

## 2.3. Thomas-Fermi Statistical Model

In a method developed independently by Thomas [70] and Fermi [71], the atomic electrons are treated as a degenerate gas obeying Fermi-Dirac statistics and the Pauli principle, with the ground-state energy of the atom equal to the zero-point energy of this gas. The average charge-density  $\rho(r)$  then becomes the radial function

$$\rho(r) = \frac{8\pi e}{3h^3} [2 m e V(r)]^{3/2} \quad (34)$$

of the potential  $V(r)$  which in turn can be substituted in Poisson's equation  $\nabla^2 V(r) = 4\pi\rho(r)$ , to give

$$\frac{1}{r^2} \frac{d}{dr} \left( r^2 \frac{dV(r)}{dr} \right) = \frac{32\pi^2 e}{3h^3} [2 m e V(r)]^{3/2}, \quad (35)$$

which is to be solved for  $V(r)$  under the conditions that  $\lim_{r \rightarrow \infty} V(r) = 0$  and that  $\lim_{r \rightarrow 0} r V(r) = Ze$ . Thomas [70] solved equation (35) numerically for the case of cesium ( $Z=55$ ) and obtained  $V(r)$  from which, in turn,  $\rho(r)$  is obtained by using equation (34) and thence  $F(x, Z)$  by using equation (18), again with assumed spherical symmetry.

The Thomas-Fermi charge distributions for different atoms are related to each other such that, once  $F(x, Z_0)$  has been calculated for a "standard" atom  $Z_0$  (c.g., Cs:  $Z_0=55$ ),  $F(x, Z)$  for any other atom  $Z$  is given by

$$F(x, Z) = (Z/Z_0) F(x', Z_0), \quad (36)$$

where  $x$  is the desired argument  $[\sin(\theta/2)]/[\lambda(\text{\AA})]$  and, if  $x$  is the tabulated argument for  $Z_0$ ,

$$x' = x(Z/Z_0)^{1/3}. \quad (37)$$

Similarly for incoherent scattering, Heisenberg [72] has shown that in the Thomas-Fermi approximation the incoherent scattering function  $S(x, Z)$  can be written in terms of a "universal" function  $S(v)$  where (see, e.g., James [73] and Bewilogua [74])

$$v = 4\pi x a \cdot (6\pi Z)^{-1/3} \quad (38)$$

where  $x = [\sin(\theta/2)]/[\lambda(\text{\AA})]$  and

$$\begin{aligned} a &= [3/(32\pi^2)]^{2/3} \cdot [h^2/(2me^2)] \cdot Z^{-1/3} \\ &= a_0 \cdot [(6\pi)^{1/3}/3] \cdot Z^{-1/3} \\ &= 0.46944 Z^{-1/3} \text{ \AA} \end{aligned} \quad (39)$$

using the recent value  $a_0 = 0.52917706 \text{ \AA}$  for the Bohr radius, from which

$$\begin{aligned} v &= 4\pi x \cdot (a_0/3) \cdot Z^{-2/3} \\ &= 2.2166 \cdot x \cdot Z^{-2/3} \end{aligned} \quad (40)$$

Numerical values of  $S(v)$  were calculated and tabulated by Bewilogua for  $v=0.05$  to 0.1 and this tabulation was extended to  $v=0.001$  by Grodstein using the low- $v$  extrapolation formula

$$S(v) = 13.8v - 55.4v^{3/2} \quad (41)$$

given by Wheeler and Lamb [75].

Extensive calculations of  $d\sigma_{\text{coh}}/dr$ ,  $\sigma_{\text{coh}}$ ,  $d\sigma_{\text{inc}}/dr$  and  $\sigma_{\text{inc}}$  with the Thomas-Fermi model were given by Veigele et al. [52], [76], and by Brown [45] and [51].

Also, exchange effects have been incorporated into the Thomas-Fermi model by Dirac [88], taking into account the fact that electrons are identical particles which must be described by a totally antisymmetric wavefunction. Extensive tables of the resulting Thomas-Fermi-Dirac (TFD) values of  $F(x, Z)$  are given by Ibers [6] for 103 atoms and ions from  $Z=20$  to 104 over the range  $0 \leq x \leq 1.50 \text{ \AA}^{-1}$ .

#### 2.4. Hartree-Fock Model

The most accurate extensive computations of wavefunctions of many-electron atoms are based on the self-consistent-field (SCF) method of Hartree [77]. This is an independent-particle model in which each electron is assumed to be in the field of the nucleus and in an average field due to the other electrons. Thus the charge distribution  $\rho(r)$  can be written

$$\rho(r) = \sum_{j=1}^Z \rho_j(r) = \sum_{j=1}^Z \psi_j^*(r) \psi_j(r), \quad (42)$$

where  $\rho_j(r)$  is the charge-density distribution of the  $j$ th electron and  $\psi_j(r)$  is its wave function. The Hartree scheme has been generalized by Fock [78], [79] to include the effects of exchange, and Slater [80] has shown that the Hartree and Hartree-Fock wave functions arise out of variational treatments in which the wave function of the many-electron atom is assumed to be a product of individual electron wave functions.

James and Brindley [1] used Hartree wave functions (without exchange) to calculate values of the atomic form factor  $F(x, Z)$  for 8 atoms from He ( $Z=2$ ) to Cl ( $Z=17$ ) and 15 ions from  $\text{Li}^+$  to  $\text{Rb}^+$  and, by an interpolation scheme, obtained  $F(x, Z)$  values for 23 additional atoms and ions, for  $x$  from 0 to  $1.1 \text{ \AA}^{-1}$ . Viervoll and Ogrim [2] extended the James and Brindley results to include 22 elements from Li ( $Z=3$ ) to Cu ( $Z=29$ ), for  $x$  values from 0 to  $2.4 \text{ \AA}^{-1}$ . Subsequent Hartree and Hartree-Fock calculations of  $F(x, Z)$  through 1961 including, among others, the extensive results of Berghuis et al. [5] and Freeman [81], are reviewed by Ibers [6] who includes tables of SCF  $F(x, Z)$  values for  $x$  from 0 to  $1.9 \text{ \AA}^{-1}$ , for 38 atoms from He ( $Z=2$ ) to Hg ( $Z=80$ ) and for 85 ions from  $\text{H}^{-1}$  to  $\text{U}^{+6}$ . Subsequent to the Ibers [6] review article, Hanson et al. [7] used the non-relativistic SCF Hartree-Fock-Slater wavefunctions of Herman and Skillman [82] to calculate  $F(x, Z)$  for all neutral atoms  $Z=2$  to 100 over the range  $x=0$  to  $6.0 \text{ \AA}^{-1}$ .

More recently, Cromer and Mann [10] have used non-relativistic Hartree-Fock wave functions (computed by Mann [83]) to compute  $F(x, Z)$  values for all atoms

from He ( $Z=2$ ) to Lr ( $Z=103$ ) for  $x$  from 0 to  $1.5 \text{ \AA}^{-1}$ . To enable Veigele et al. [84], [85] to compute coherent scattering cross sections for photons with energies up to 1 MeV ( $80.655 \text{ \AA}^{-1}$ ) without arbitrary extrapolation from available  $F(x, Z)$  values, Cromer [20] subsequently extended his calculations of these non-relativistic Hartree-Fock  $F(x, Z)$  values to cover the range  $x$  from 0 to  $80.0 \text{ \AA}^{-1}$ . The Tavard et al. [9] results for all elements from He ( $Z=2$ ) to Kr ( $Z=36$ ) for  $x$  from 0 to  $7.96 \text{ \AA}^{-1}$  (or  $4\pi[\sin(\theta/2)]/[\lambda(\text{\AA}^{-1})]$ ) from 0 to  $100.0 \text{ \AA}^{-1}$  were calculated from Clementi [86], [87] wave functions equivalent to those of Cromer and Mann [10].

In addition to the above non-relativistic results, Cromer and Waber [8] have used relativistic Dirac-Slater [88], [80] wavefunctions to compute  $F(x, Z)$  values for all elements He ( $Z=2$ ) to No ( $Z=102$ ) plus 105 ions from  $\text{H}^{-1}$  to  $\text{Am}^{+3}$  for  $x$  from 0 to  $2.0 \text{ \AA}^{-1}$ .

Finally, Cromer and Waber [14] have compiled a table of relativistic Hartree-Fock values of  $F(x, Z)$  for Vol. 4 of the *International Tables for X-Ray Crystallography* (table 2.2A) for the range  $x=0$  to  $2.0 \text{ \AA}^{-1}$  and for all free atoms from He ( $Z=2$ ) to Cf ( $Z=98$ ). This latter compilation, from which we give a sampling of values in table VI, is taken primarily from the relativistic Hartree-Fock  $F(x, Z)$  values calculated by Doyle and Turner [11] using wavefunctions of Coulthard [89] for 54 elements from He ( $Z=2$ ) to U ( $Z=92$ ) (plus 22 ions) for  $x$  from 0 to  $6.0 \text{ \AA}^{-1}$ . Values of  $F(x, Z)$  for the remaining elements in the above compilation were calculated by Cromer and Waber using relativistic Hartree-Fock wave functions of Mann [90] differing from those of Coulthard in that they assume a finite rather than a point nucleus for the potential.

In extending the Hartree method to calculation of the incoherent scattering function  $S(x, Z)$ , one again assumes the independent particle picture in which the excitation or ionization involves one electron only, leaving the other electrons undisturbed. Thus the incoherent scattering function for an element of atomic number  $Z$  represents an average of the incoherent scattering functions for its separate electrons and can be written

$$S(q, Z) = Z - \sum_{i=1}^Z |f_0^{(i)}(q)|^2, \quad (43)$$

where  $f_0^{(i)}$  indicates the probability that the  $i$ th electron gets neither excited nor detached even though it has received the recoil momentum  $q$ . The quantity  $f_0^{(i)}$  differs from the ordinary form factor  $f^{(i)}(q)$  in that the Pauli exclusion principle may forbid excitation of an electron from one orbit to another.

Since information on form factor data  $f^{(i)}(q)$  is considerably more extensive than on  $f_0^{(i)}$ , the incoherent scattering function  $S(q, Z)$  is usually cast in the form



$$S(q, Z) = Z - \left\{ \sum_{i=1}^Z |f^{(i)}(q)|^2 \right\} \quad (44)$$

$$- \left\{ \sum_{i=1}^Z |f_0^{(i)}|^2 - \sum_{i=1}^Z |f^{(i)}|^2 \right\},$$

in which the last term in brackets has been treated by Waller and Hartree [91] and indicated as a corrective term by Pirenne [57].

Cromer and Mann [17] and Cromer [18] have used Hartree-Fock self-consistent-field wave functions by Mann [83] and the complete Waller-Hartree theory with exchange terms to calculate non-relativistic values of  $S(x, Z)$  for all elements He ( $Z=2$ ) to No ( $Z=102$ ) for  $x$  from 0.005 to 8.0  $\text{\AA}^{-1}$ . This set of  $S(x, Z)$  values was extended to  $x$  arguments up to 80.0  $\text{\AA}^{-1}$  to enable Veigele et al. [84], [85] to calculate photon incoherent scattering cross sections up to 1 MeV (80.655  $\text{\AA}^{-1}$ ) without extrapolation.

### 2.5. Configuration-Interaction Calculations for $Z=2$ to 6

Electron correlation effects can produce substantial corrections to the Hartree independent-particle model, particularly for low- $Z$  elements. Configuration-interaction wave functions are given by Brown and Fontana [92] for  $Z=2$  and 3 and by Weiss [93] for  $Z=2-6$ . Using the  $Z=2$  correlated ground-state wave functions of Brown and Fontana and those for  $Z=3-6$  of Weiss, Brown [56], [94] has calculated both  $F(x, Z)$  and  $S(x, Z)$  for the five elements He ( $Z=2$ ) to C ( $Z=6$ ) over the following ranges of  $x$ : He: 0 to 2.0  $\text{\AA}^{-1}$ ; Li: 0 to 3.4  $\text{\AA}^{-1}$ ; Be: 0 to 4.4  $\text{\AA}^{-1}$   $F(x, Z)$  and 0 to 3.6  $\text{\AA}^{-1}$   $S(x, Z)$ ; B: 0 to 6.0  $\text{\AA}^{-1}$ ; and C: 0 to 6.0  $\text{\AA}^{-1}$   $F(x, Z)$  and 0 to 4.4  $\text{\AA}^{-1}$   $S(x, Z)$ . Kim and Inokuti [55] have obtained similar results for both  $F(x, Z)$  and  $S(x, Z)$  for He ( $Z=2$ ) for  $x$  from 0 to 1.5  $\text{\AA}^{-1}$  using Hylleraas 2-, 3-, 6-, and 20-term correlated ground-state wave functions.<sup>10</sup>

For He this correction to the Hartree-Fock model is less than 1% for  $F(x, Z)$  and 5% for  $S(x, Z)$  at small momentum transfers. However, for Be and C this correction to  $S(x, Z)$  can be as much as 30% and 20%, respectively, producing corrections of similar magnitude in the photon incoherent scattering cross section at 1 keV.

### 2.6. Bethe-Levinger Relativistic $K$ -Shell Formula for $F(x, Z)$

In all the above models  $S(x, Z)$  approaches the value  $Z$  as  $x$  becomes large, and in the above calculated results usually has nearly attained this value within the highest  $x$ -argument calculated, so that little or no extrapolation is required for application to photon incoherent scattering calculations up into the MeV region. However, the asymptotic behavior of  $F(x, Z)$

for high  $x$  is not as well defined, resulting in large differences between calculated coherent scattering cross sections depending on the choice of extrapolation procedure.

The extended-range (up to 80.0  $\text{\AA}^{-1}$ )  $F(x, Z)$  values of Cromer [20] would eliminate most of the need for such extrapolation, except that these values have large roundoff oscillations in the region of  $x$  from 10 to 80  $\text{\AA}^{-1}$ , particularly for  $Z=2$  to 56, leading to difficulties in interpolation and integration in computation of the coherent scattering cross section.

Since the contribution to  $F(x, Z)$  for  $x > 10 \text{\AA}^{-1}$  is primarily from the two  $K$ -shell electrons, the relativistic Bethe-Levinger [29] (see also Smend and Schumacher [98], and Tseng et al. [99]) closed-form  $K$ -shell expression

$$F_{rel}(x, Z) = [\sin(2\gamma \tan^{-1} Q)] / [\gamma Q(1+Q^2)^\gamma], \quad (45)$$

where  $Q = qa$  ( $q$  in mc units),  $\gamma = (1-a^2)^{1/2}$  and  $a = \alpha Z = Z/137$ , provides a well-behaved extension of  $F(x, Z)$  from 10  $\text{\AA}^{-1}$  to arbitrarily high  $x$ -values as shown in figures 3-10.

Also, as was mentioned in section 1.1, Kim [27] has derived from the work of Goscinski and Lindner [25], Smith [26], and Lasettre [28] a power-series expression for  $F(x, Z)$  suitable for intermediate as well as high  $x$  values:

$$F(x, Z) = [1 + (x/\alpha)^2]^{-2}$$

$$\left\{ Z + \sum_{n=1}^{\infty} A_n (x/\alpha)^{2n} / [1 + (x/\alpha)^2]^n \right\}, \quad (45a)$$

in which  $\alpha = (E_{tot} - Z^2)^{1/2}$  and  $E_{tot}$  is the total energy of the atom in Rydbergs. Application of this formula requires least-squares fitting of the  $A_n$  power-series (appropriately truncated) coefficients to a selected inter-

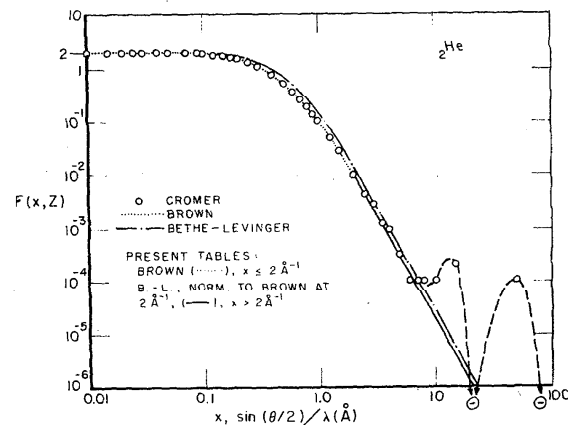


FIGURE 3. Comparison of the Cromer [10], [20]  $F(x, Z)$  values for He with the Bethe-Levinger [29] relativistic  $K$ -shell formula, also the Brown [56] configuration-interaction results. The dashed arrows indicate negative values in the Cromer-Veigele [12], [20] tables.

<sup>10</sup> Kim [27] has pointed out to the authors the further configuration-interaction results by Tanaka and Sasaki [95] for  $Z=4-11$  and by Naon and Cornille [96], [97], for  $Z=4-10, 17$ .

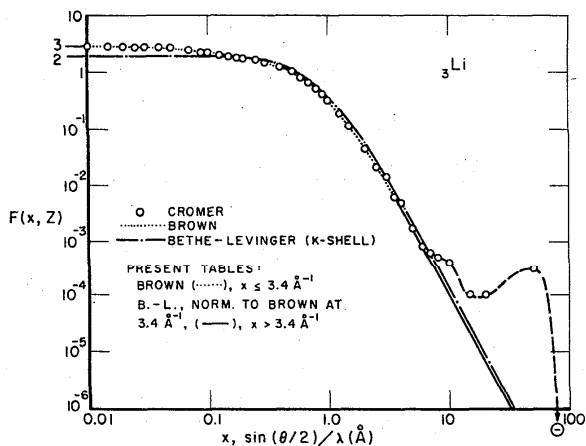


FIGURE 4. Comparison of the Cromer [10], [20]  $F(x, Z)$  values for Li with the Bethe-Levinger [29] relativistic  $K$ -shell formula, also the Brown [56] configuration-interaction results. The dashed arrow indicates a negative  $F(x, Z)$  value in the Cromer-Veigele [12], [20] tables at  $x = 80.0 \text{ \AA}^{-1}$ .

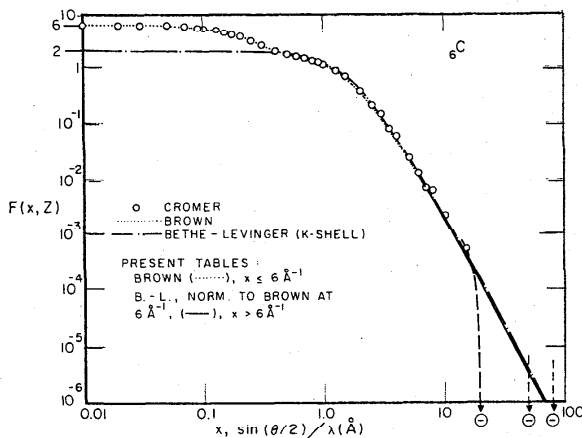


FIGURE 5. Comparison of Cromer [10], [20]  $F(x, Z)$  values for C with the Bethe-Levinger [29] relativistic  $K$ -shell formula, also the Brown [94] configuration-interaction results. The dashed arrows indicate negative values in the Cromer-Veigele [12], [20] tables.

mediate- $x$  range of  $F(x, Z)$  (from Cromer-Veigele or other available set) for each element  $Z$ . Both equations (45) (used in this work) and (45a) reduce to  $x^{-4}$  behavior in the high- $x$  limit.

### 3. Composition of the present $F(x, Z)$ and $S(x, Z)$ Tables

The atomic hydrogen  $F(x, Z)$  and  $S(x, Z)$  values in table I were computed from the Pirene [57] formulas [equations (28) and (29)] and the bonded hydrogen values in table IV were interpolated and extrapolated from the Stewart et al. [58], Bentley and Stewart [61] and Stewart [64] numerical results as discussed in section 2.1.

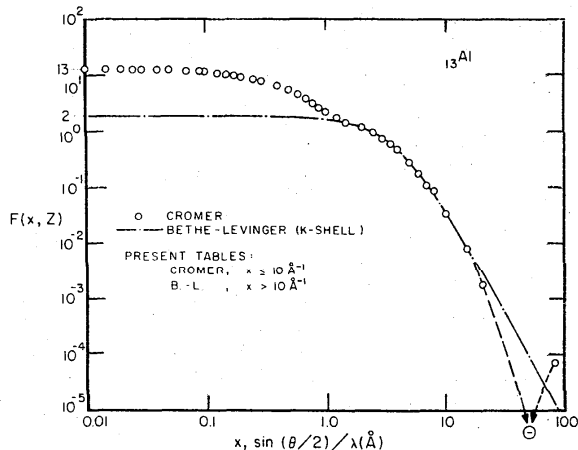


FIGURE 6. Comparison of Cromer [10], [20]  $F(x, Z)$  values for Al with the Bethe-Levinger [29] relativistic  $K$ -shell formula. The dashed arrows indicate a negative value in the Cromer-Veigele [12], [20] tables at  $x = 50.0 \text{ \AA}^{-1}$ .

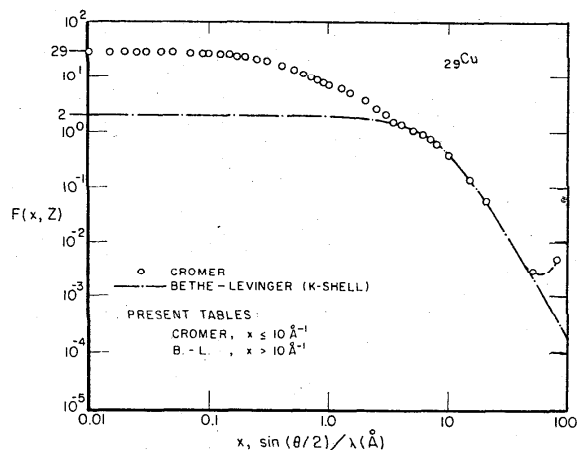


FIGURE 7. Comparison of Cromer [10], [20]  $F(x, Z)$  values for Cu with the Bethe-Levinger [29] relativistic  $K$ -shell formula.

For the remaining elements  $Z = 2$  to 100 in table I a primary consideration in our selection of  $F(x, Z)$  and  $S(x, Z)$  values from the various available calculated tabulations, none of which covers the entire  $x$ - and/or  $Z$ -range of table I, was that both  $F(x, Z)$  and  $S(x, Z)$  should preferably be derived from the same theoretical model in order to provide an internally consistent data set. Hence in table I we have not used the Cromer-Waber [14] relativistic Hartree-Fock (RHF) values of  $F(x, Z)$  (see sample table VI) since a complementary RHF set of  $S(x, Z)$  is not presently available. Percent deviations of the present (table I)  $F(x, Z)$  values from Cromer-Waber [14] RHF values are listed in table VII.

For elements He ( $Z = 2$ ) through C ( $Z = 6$ ) Brown's [56], [94] configuration-interaction  $F(x, Z)$  and  $S(x, Z)$  values (see section 2.5) are used in table I. For each of these elements Brown's  $S(x, Z)$  values have effectively reached the asymptotic value ( $Z$ ) within his range of  $x$ -values. For these elements  $Z = 2$  to 6 Brown's  $F(x, Z)$

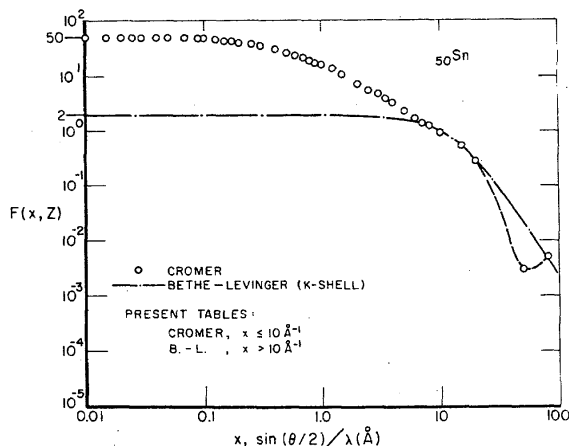


FIGURE 8. Comparison of Cromer [10], [20]  $F(x, Z)$  values for Sn with the Bethe-Levinger [29] relativistic  $K$ -shell formula.

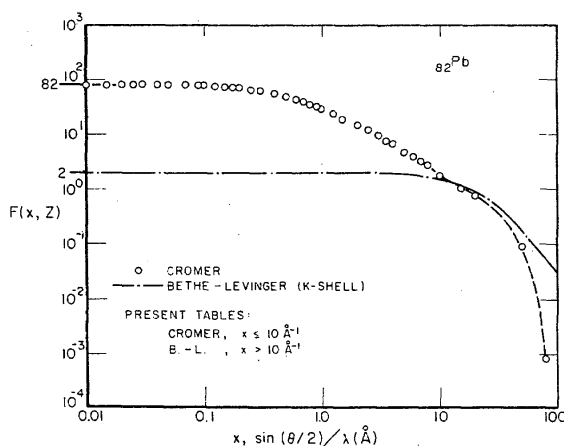


FIGURE 9. Comparison of Cromer [10], [20]  $F(x, Z)$  values for Pb with the Bethe-Levinger [29] relativistic  $K$ -shell formula.

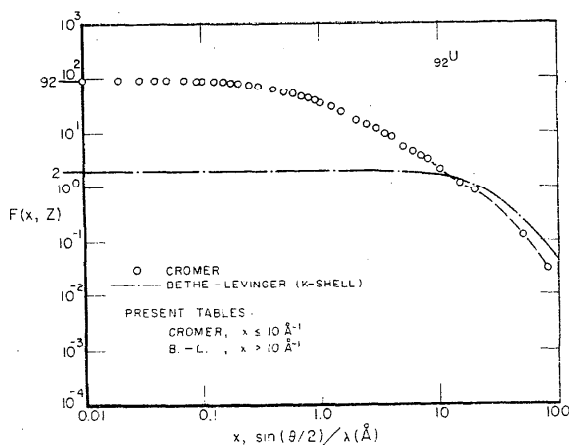


FIGURE 10. Comparison of Cromer [10], [20]  $F(x, Z)$  values for U with the Bethe-Levinger [29] relativistic  $K$ -shell formula.

values are used in table I up to his highest  $x$ -value (2.0, 3.4, 4.4, 6.0, and  $6.0 \text{ \AA}^{-1}$ , respectively), above which the Bethe-Levinger relativistic  $K$ -shell formula [equation (45)] is used, normalized to Brown's highest  $x$ -value for each element.

For elements  $Z=7$  to 100 the Cromer-Mann [10], [20] non-relativistic Hartree-Fock (HF)  $F(x, Z)$  values (see section 2.4) are used in table I up to  $x=10 \text{ \AA}^{-1}$ . Above  $10 \text{ \AA}^{-1}$ , where the Cromer [20]  $F(x, Z)$  values tend to oscillate from round-off in the calculations, the Bethe-Levinger formula [equation (45)] is used directly without normalization to complete the  $F(x, Z)$  tables out to  $10^9 \text{ \AA}^{-1}$ .

The corresponding Cromer-Mann [17] and Cromer [18], [20] non-relativistic Hartree-Fock (HF)  $S(x, Z)$  values, consistent with the above Cromer-Mann [10], [29] set of HF  $F(x, Z)$  values, are used in table I for all elements  $Z=7$  to 100 over the range  $x=0$  to  $80 \text{ \AA}^{-1}$ , above which  $S(x, Z)$  is effectively equal to the asymptotic value ( $Z$ ) over the balance of the range up to  $x=10^9 \text{ \AA}^{-1}$ .

#### 4. Comparison of Theoretical $F(x, Z)$ and $S(x, Z)$ Values with Available Experiments

In figures 11–41 we compare theoretical  $F(x, Z)$  values obtained from the various models with available experimental points obtained from photon coherent scattering angular distribution measurements for 31 elements from Be ( $Z=4$ ) to U ( $Z=92$ ). The experimental data do not as yet suggest any single theoretical model as clearly superior to the others.

Some of the high- $x$  measurements of  $F(x, Z)$ , particularly those of Basavaraju and Kane [70 Ba 01]<sup>11</sup> (1.12, 1.33 MeV;  $\theta=90^\circ, 124.5^\circ$ ; Cu, Zr, Mo, Ag, Ta, W, Hg, Pb) and of Eberhard et al. [59 Eb 01] (2.62 MeV;  $\theta=26^\circ\text{--}126^\circ$ ; Pb, Bi, U) suggest the onset of additional elastic scattering processes, such as Delbrück scattering, for  $x \geq 100 \text{ \AA}^{-1}$ .

Significant temperature effects on  $F(x, Z)$  have been observed in the range  $0.2 \text{ \AA}^{-1} \leq x \leq 1.4 \text{ \AA}^{-1}$ , by Brill and Chopra [62 Br 01] for Mg and Ru (figures 13 and 26). Such temperature effects may account for similar discrepancies for Si and Ni (figures 15 and 19) in which a number of  $F(x, Z)$  measurement points are systematically lower than the present (table I)  $F(x, Z)$  values which ignore zero-point-energy and thermal-vibration effects (see, e.g., Lonsdale [100]).

In figures 42 and 43 we compare the Brown configuration-interaction and the Cromer non-relativistic Hartree-Fock  $S(x, Z)$  values with available measurements for Be and C. For carbon, at least, the Laval [42 La 01] data tend to favor the Brown results as used in table I for elements  $Z=2$  to 6. Comparisons of table I Cromer

<sup>11</sup> Reference-symbols of the form [70 Ba 01] for measured data are composed of (a) the year, (b) the first two letters of the first-author's last name and (c) an additional number for uniqueness. These references, ordered by year and author, are listed separately in section 8 following the main bibliography.

$S(x, Z)$  values with available measurements for elements  $Z=13, 26, 29,$  and  $82$  are given in figures 44 to 47. The agreement is within the experimental error-bars except for Al ( $Z=13$ ) and Pb ( $Z=82$ ) at low momentum transfers where the Cromer values are systematically higher.

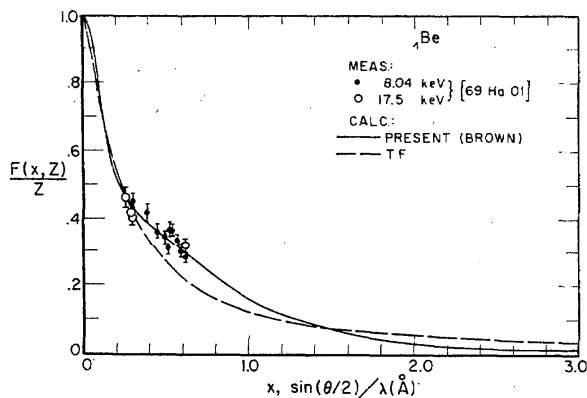


FIGURE 11. Comparison of Thomas-Fermi (TF) and present (Brown [56] in this  $x$ -range) tabulated  $F(x, Z)$  values for Be with available measurements.

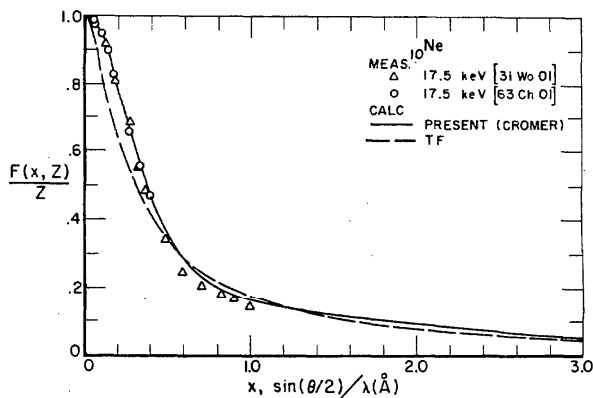


FIGURE 12. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] in this  $x$ -range) tabulated  $F(x, Z)$  values for Ne with available measurements.

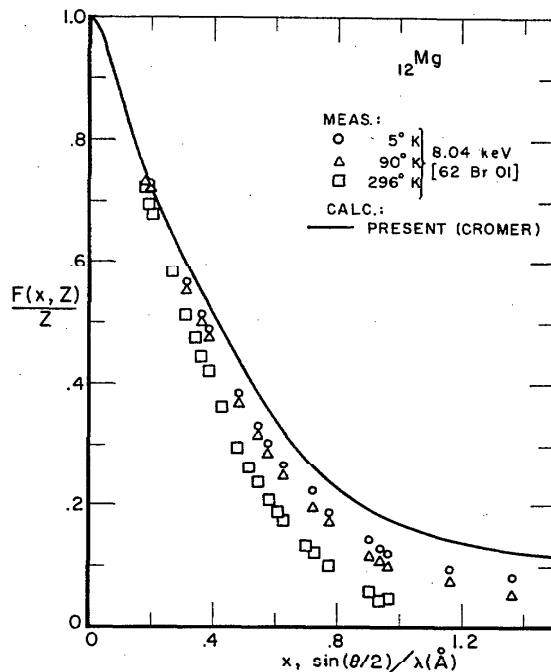


FIGURE 13. Comparison of present (Cromer [10], [20] in this  $x$ -range) values of  $F(x, Z)$  for Mg with the Brill and Chopra [62Br01] measurements of metallic Mg showing the effect of thermal motion on the scattering centers.

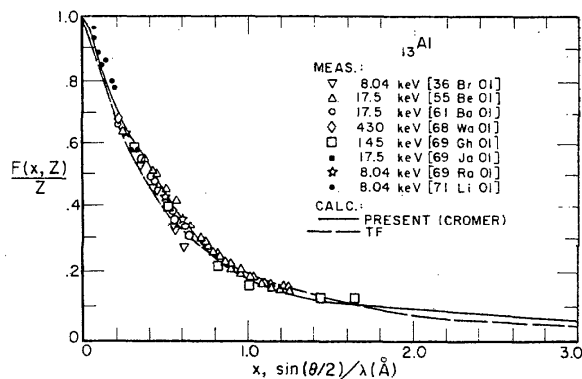


FIGURE 14. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] in this  $x$ -range) tabulated  $F(x, Z)$  values for Al with available measurements.

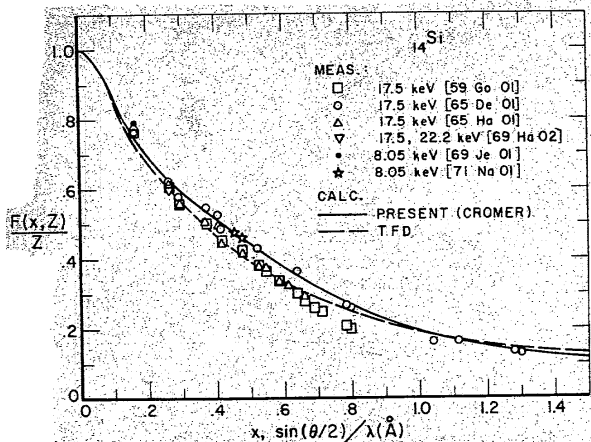


FIGURE 15. Comparison of Thomas-Fermi-Dirac (TFD) (from ref. [6], table 3.3.1B) and present (Cromer [10], [20] in this  $x$ -range) tabulated  $F(x, Z)$  values for Si with available measurements.

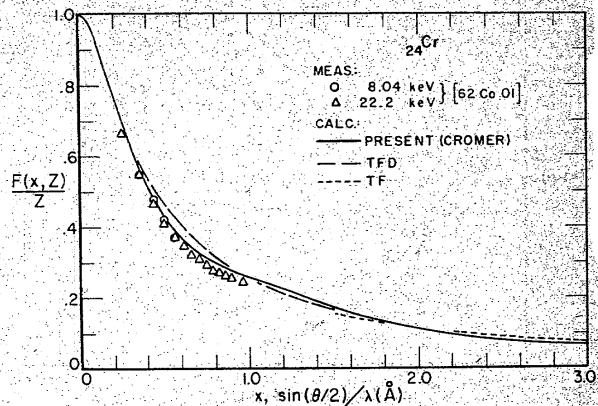


FIGURE 17. Comparison of Thomas-Fermi (TF), Thomas-Fermi-Dirac (TFD) (from ref. [6], table 3.3.1B) and present (Cromer [10], [20] in this  $x$ -range) tabulated  $F(x, Z)$  values for Cr with available measurements.

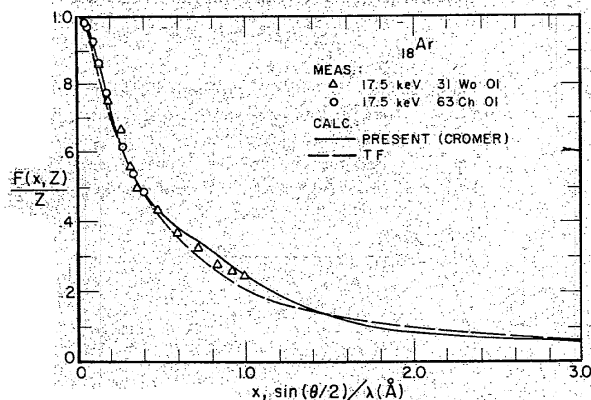


FIGURE 16. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] in this  $x$ -range) tabulated  $F(x, Z)$  values for Ar with available measurements.

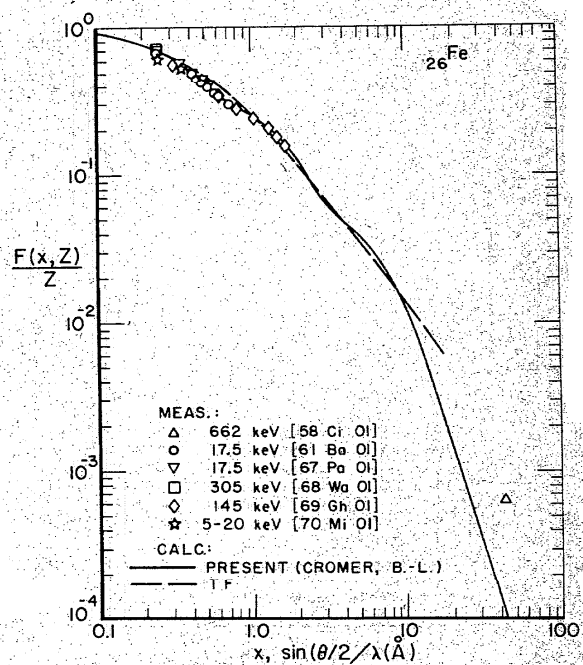


FIGURE 18. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$  and Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for Fe with available measurements.

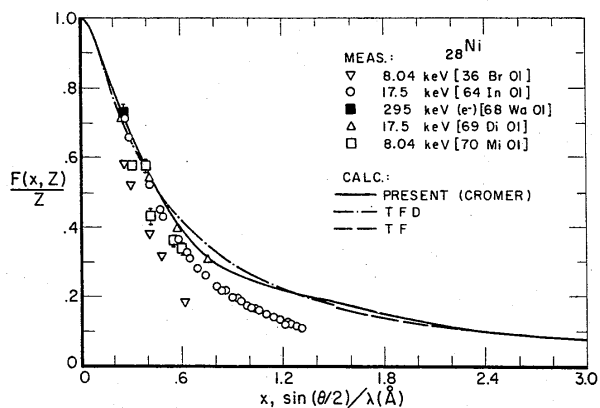


FIGURE 19. Comparison of Thomas-Fermi (TF), Thomas-Fermi-Dirac (TFD) (from ref. [6], table 3.3.1B) and present (Cromer [10], [20] in this  $x$ -range) tabulated  $F(x, Z)$  values for Ni with available measurements.

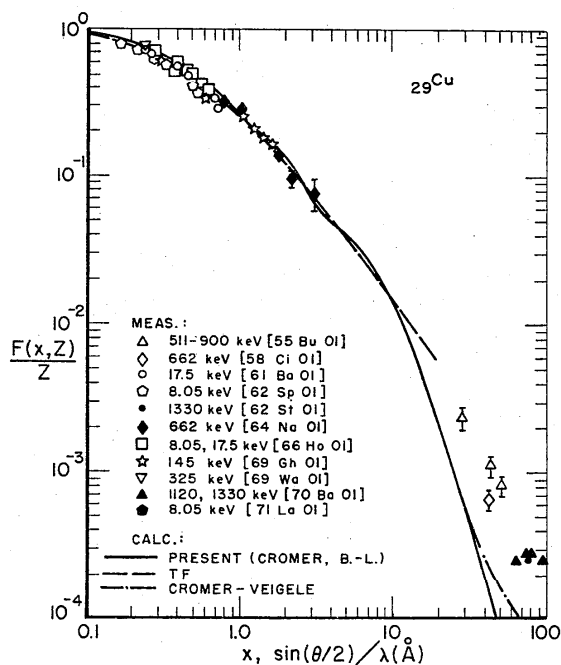


FIGURE 20. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for Cu, also the high- $x$  Cromer-Veigele [12], [20] values, with available measurements.

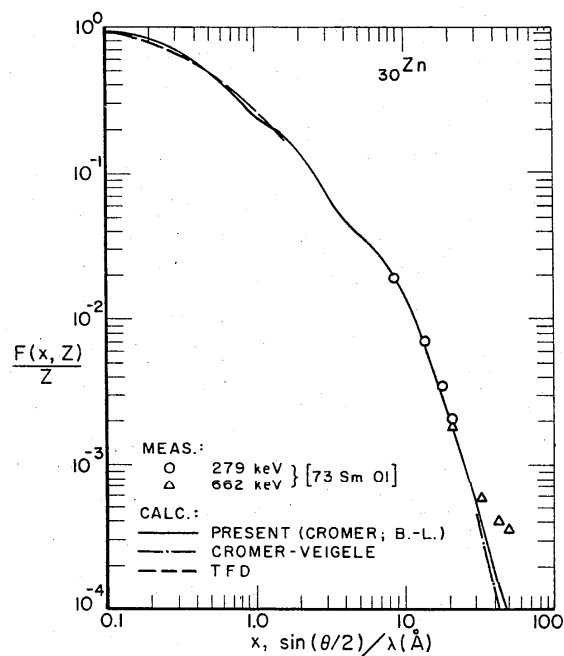


FIGURE 21. Comparison of Thomas-Fermi-Dirac (TFD) (from ref. [6], table 3.3.1B) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for Zn, also the high- $x$  Cromer-Veigele [12], [20] values, with available measurements.

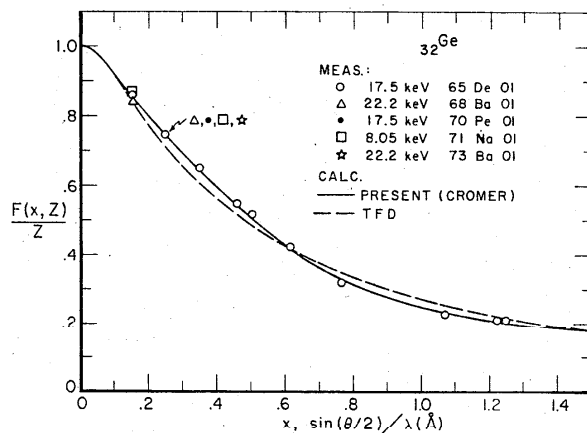


FIGURE 22. Comparison of Thomas-Fermi-Dirac (TFD) (from ref. [6], table 3.3.1B) and present (Cromer [10], [20] in this  $x$ -range) tabulated  $F(x, Z)$  values for Ge with available measurements.

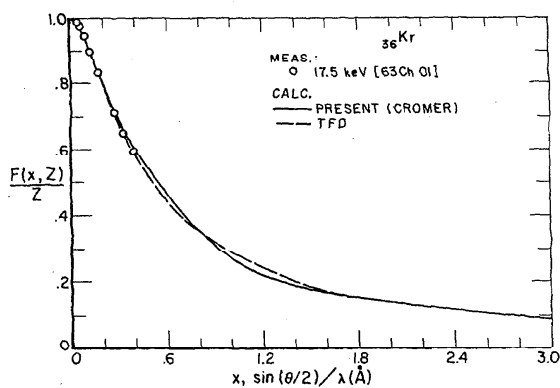


FIGURE 23. Comparison of Thomas-Fermi-Dirac (TFD) (from ref. [6], table 3.3.1B) and present (Cromer [10], [20] in this  $x$ -range) tabulated  $F(x, z)$  values for Kr with available measurements.

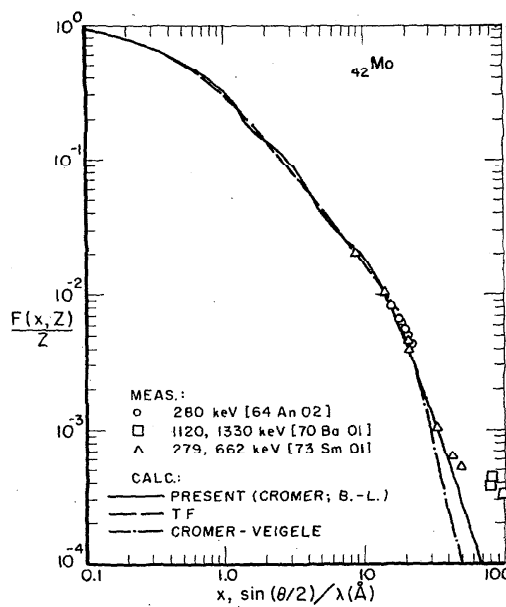


FIGURE 25. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for Mo, also the high- $x$  Cromer-Veigle [12], [20] values, with available measurements.

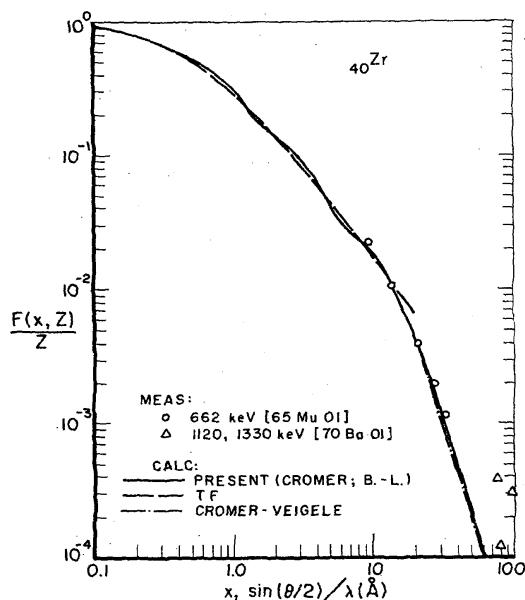


FIGURE 24. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for Zr, also the high- $x$  Cromer-Veigle [12], [20] values, with available measurements.

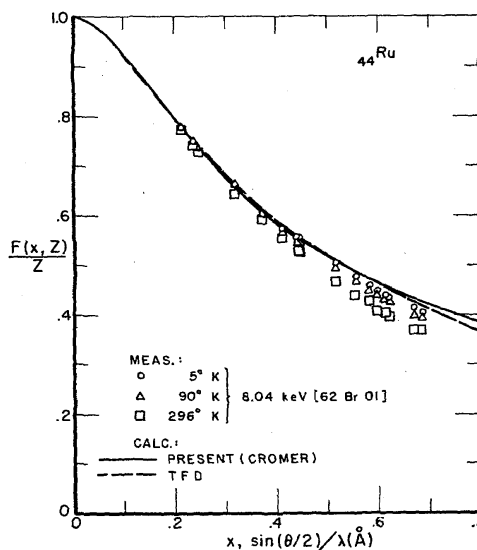


FIGURE 26. Comparison of Thomas-Fermi-Dirac (TFD) and present (Cromer [10], [20] in this  $x$ -range) tabulated  $F(x, Z)$  values for Ru with the Brill and Chopra [62 Br 01] measurements of Ru powder showing the effect of thermal motion on the scattering centers.

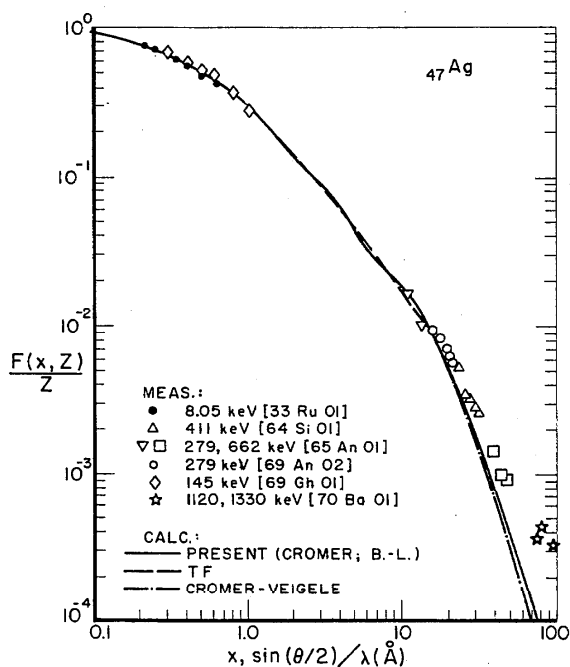


FIGURE 27. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for Ag, also the high- $x$  Cromer-Veigele [12], [20] values, with available measurements.

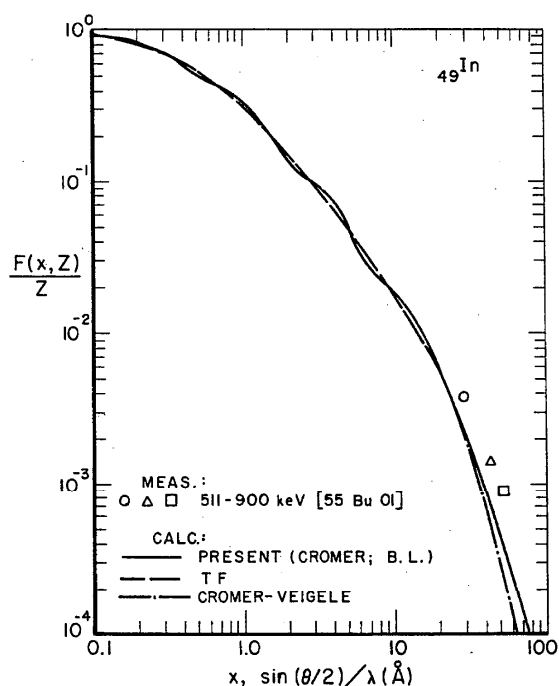


FIGURE 29. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for In, also the high- $x$  Cromer-Veigele [12], [20] values, with available measurements.

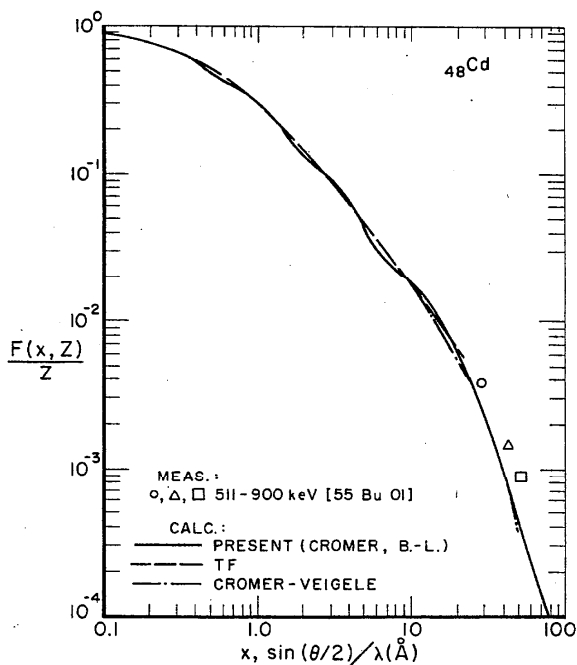


FIGURE 28. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for Cd, also the high- $x$  Cromer-Veigele [12], [20] values, with available measurements.

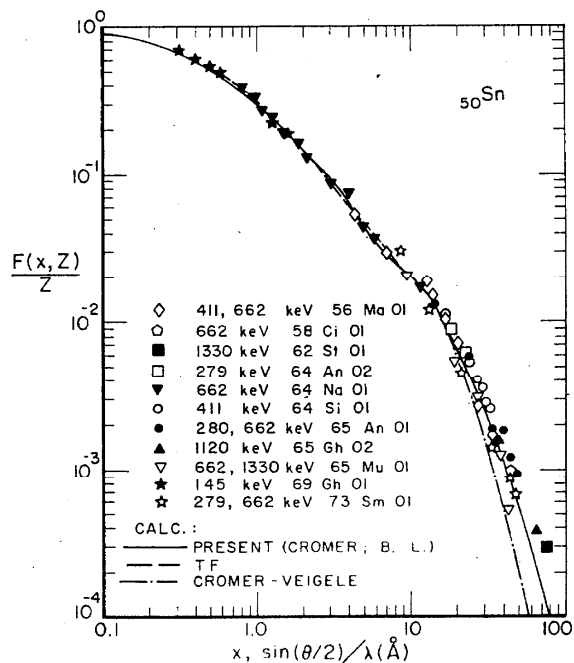


FIGURE 30. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for Sn, also the high- $x$  Cromer-Veigele [12], [20] values, with available measurements.



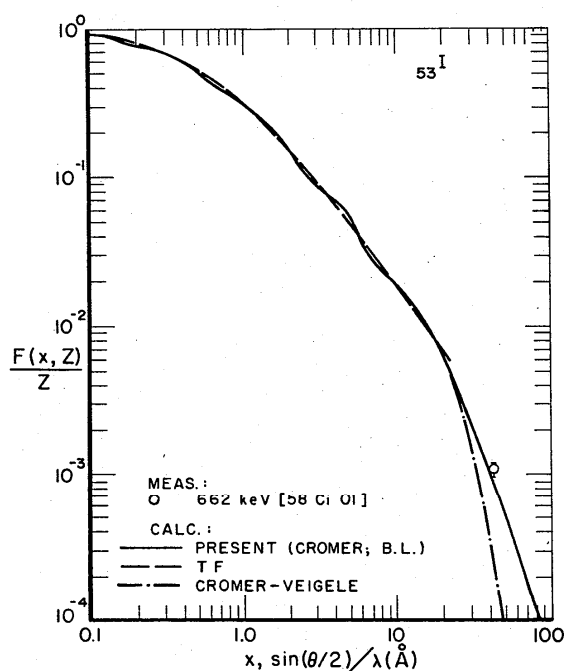


FIGURE 31. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for I, also the high- $x$  Cromer-Veigele [12], [20] values, with available measurements.

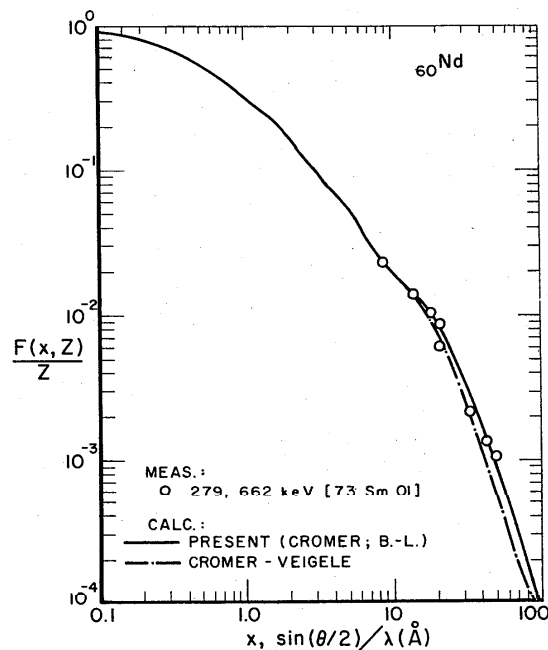


FIGURE 33. Comparison of the present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for Nd, also the high- $x$  Cromer-Veigele [12], [20] values, with available measurements.

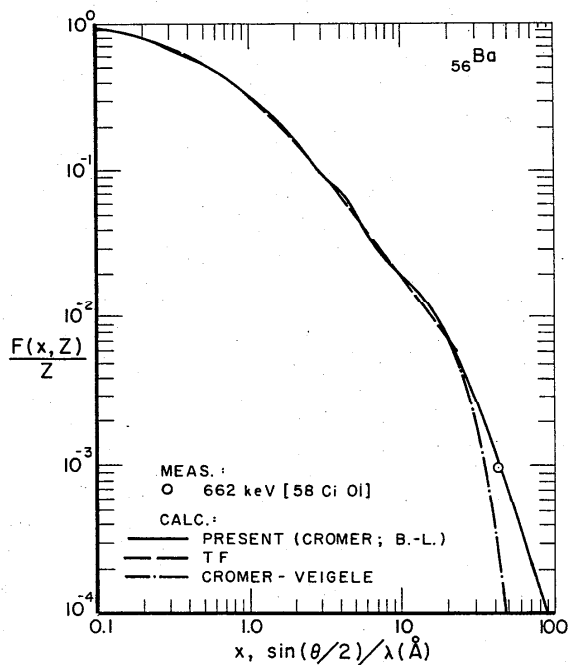


FIGURE 32. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for Ba, also the high- $x$  Cromer-Veigele [12], [20] values, with available measurements.

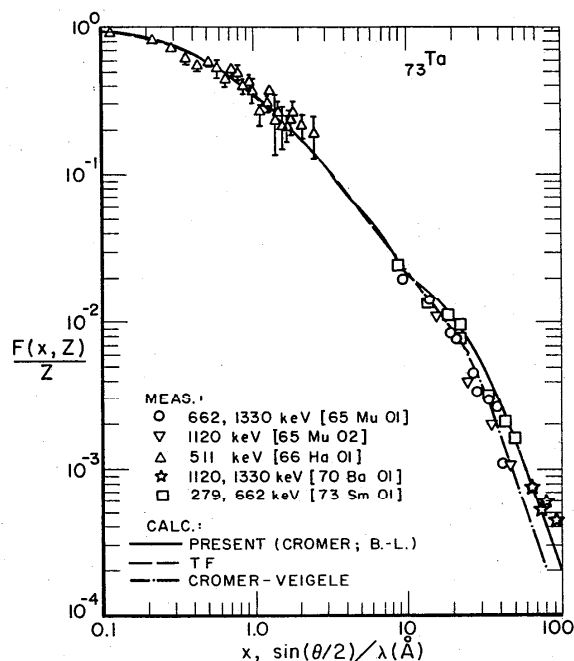


FIGURE 34. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for Ta, also the high- $x$  Cromer-Veigele [12], [20] values, with available measurements.

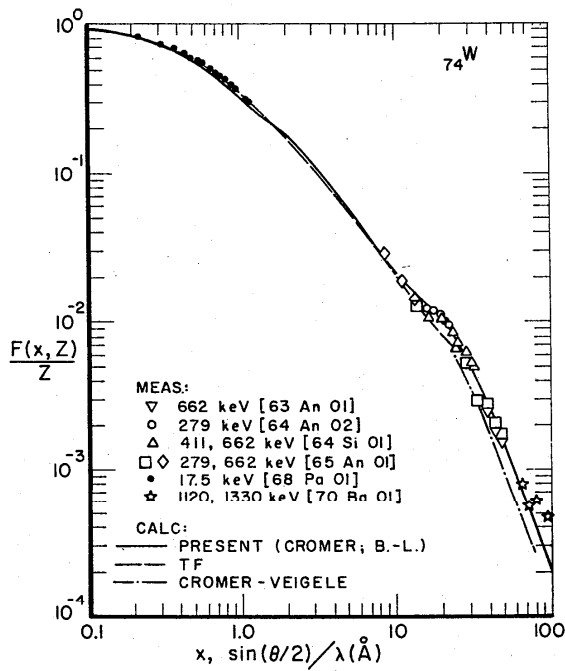


FIGURE 35. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for W, also the high- $x$  Cromer-Veigele [12], [20] values, with available measurements.

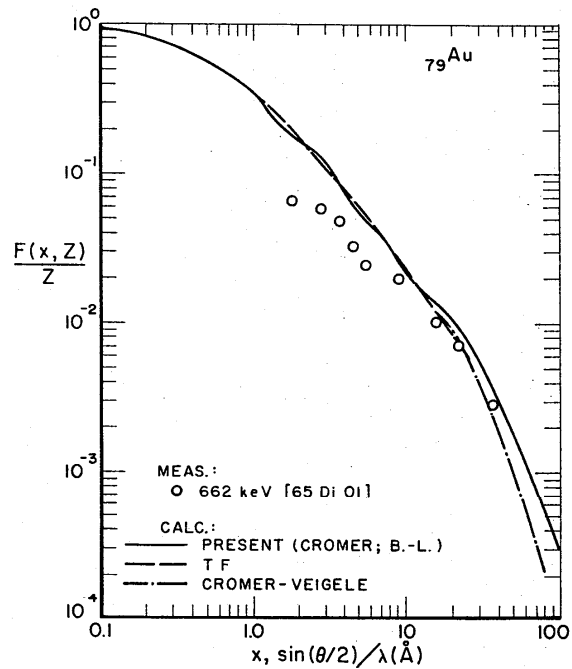


FIGURE 37. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for Au, also the high- $x$  Cromer-Veigele [12], [20] values, with available measurements.

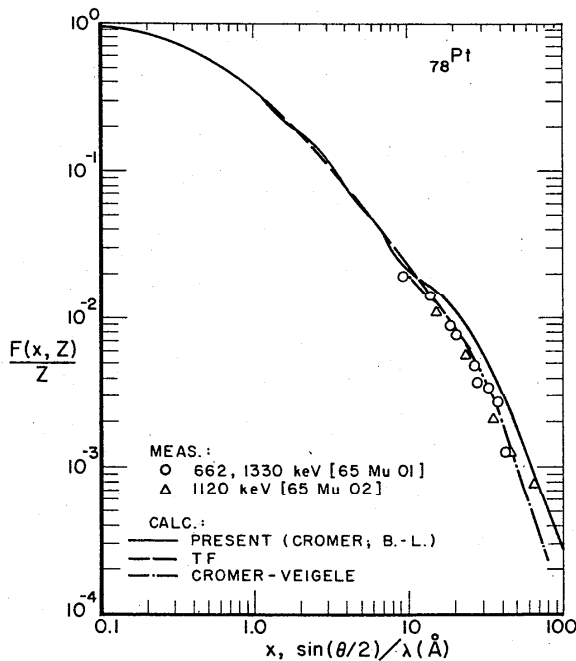


FIGURE 36. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for Pt, also the high- $x$  Cromer-Veigele [12], [20] values, with available measurements.

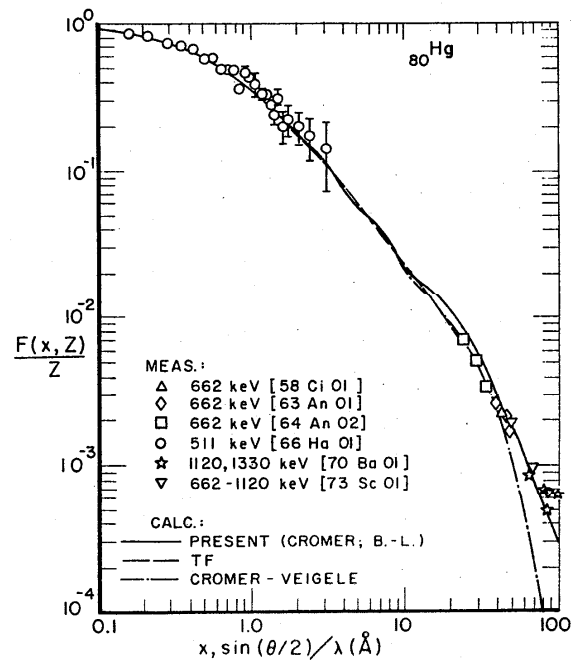


FIGURE 38. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for Hg, also the high- $x$  Cromer-Veigele [12], [20] values, with available measurements.

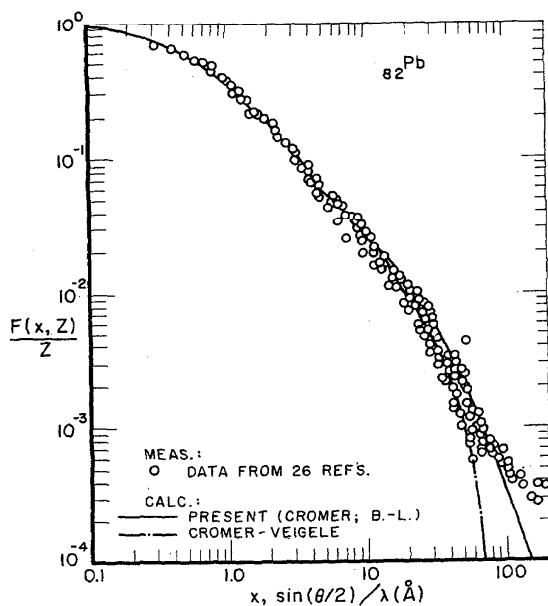


FIGURE 39. Comparison of present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for Pb, also the high- $x$  Cromer-Veigele [12], [20] values, with available measurements.

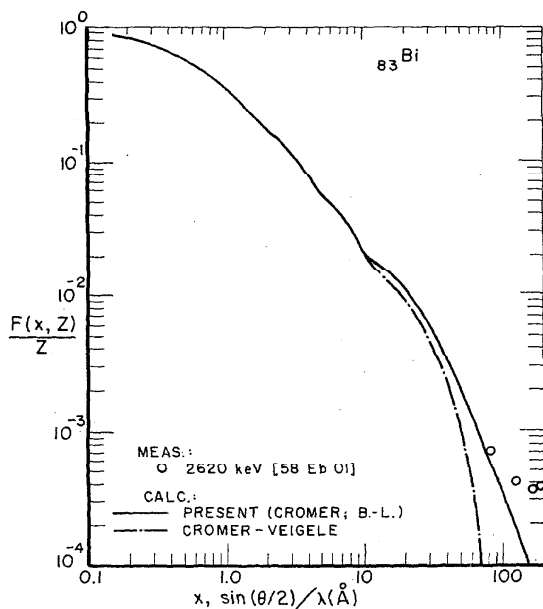


FIGURE 40. Comparison of present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for Bi, also the high- $x$  Cromer-Veigele [12], [20] values, with available measurements.

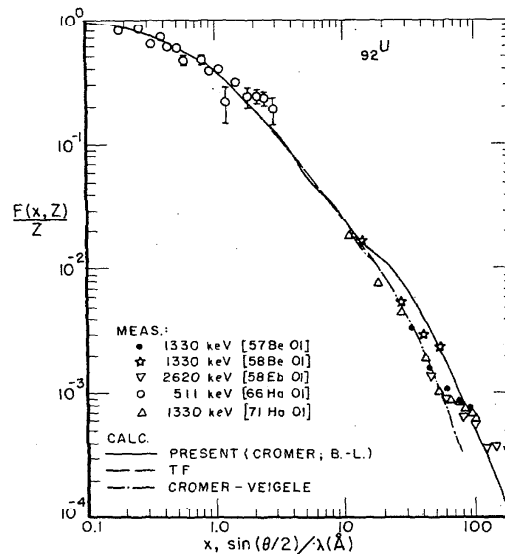


FIGURE 41. Comparison of Thomas-Fermi (TF) and present (Cromer [10], [20] for  $x \leq 10 \text{ \AA}^{-1}$ , Bethe-Levinger [29] for  $x > 10 \text{ \AA}^{-1}$ ) tabulated  $F(x, Z)$  values for U, also the high- $x$  Cromer-Veigele [12], [20] values with available measurements.

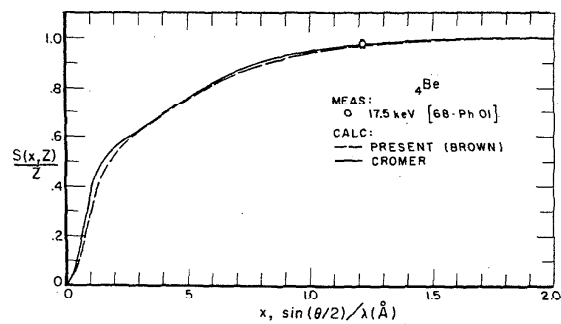


FIGURE 42. Comparison of the Cromer-Mann [17], [20] non-relativistic Hartree-Fock and the Brown [56] configuration-interaction (present tabulation) calculated  $S(x, Z)$  values for Be with the measurement by Phillips and Weiss [68 Ph 01].

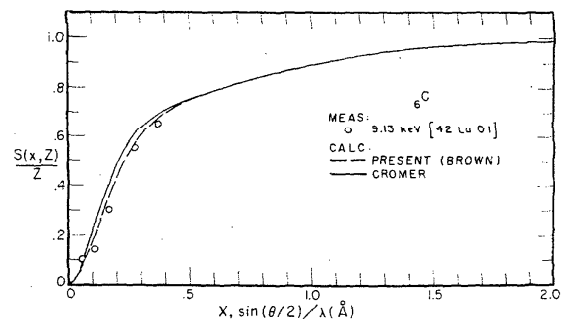


FIGURE 43. Comparison of the Cromer [18], [20] non-relativistic Hartree-Fock and the Brown [56] configuration-interaction (present tabulation) calculated  $S(x, Z)$  values for C with the measurement by Laval [42 La 01].

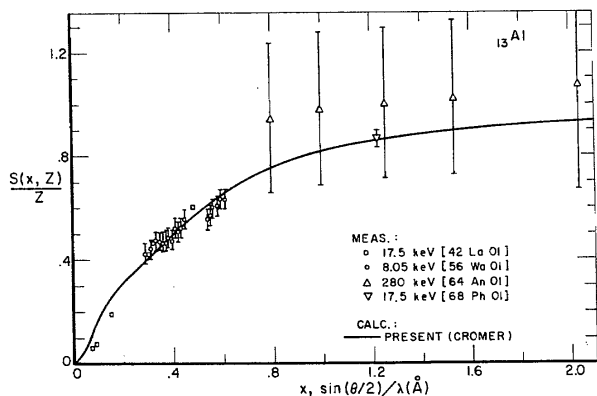


FIGURE 44. Comparison of the (present tabulation) Cromer [18], [20] non-relativistic Hartree-Fock calculated  $S(x, Z)$  values for Al with available measurements.

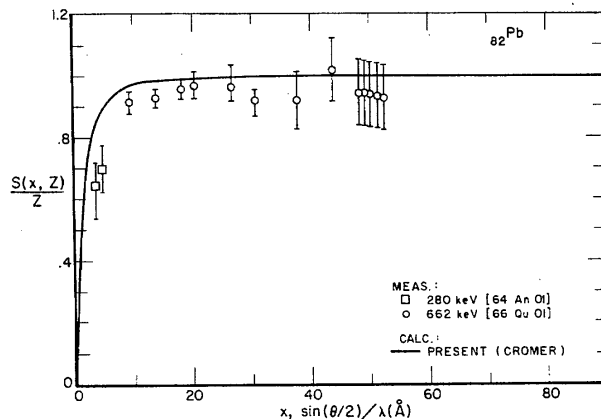


FIGURE 47. Comparison of the (present tabulation) Cromer [18], [20] non-relativistic Hartree-Fock calculated  $S(x, Z)$  values for Pb with available measurements.

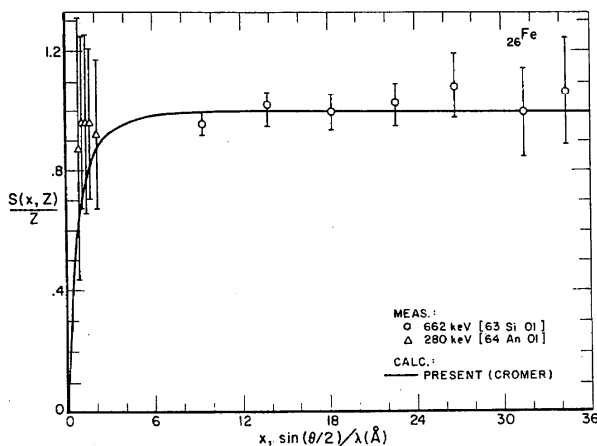


FIGURE 45. Comparison of the (present tabulation) Cromer [18], [20] non-relativistic Hartree-Fock calculated  $S(x, Z)$  values for Fe with available measurements.

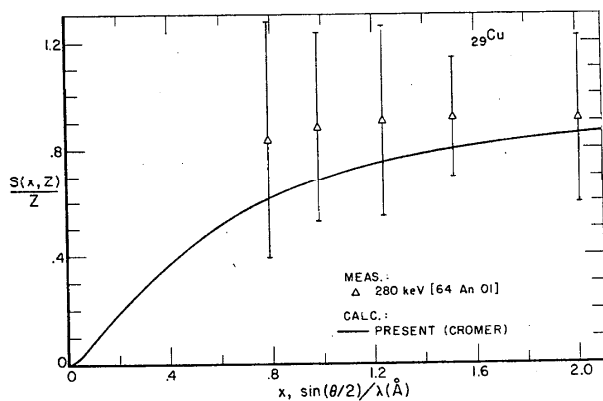


FIGURE 46. Comparison of the (present tabulation) Cromer-Mann [17], [20] non-relativistic Hartree-Fock calculated  $S(x, Z)$  values for Cu with available measurements.

## 5. Total Cross Sections for Coherent (Rayleigh) and Incoherent (Compton) Scattering of Photons by Atomic Electrons

### 5.1. Integration Procedures

Values for the coherent scattering cross section  $\sigma_{\text{coh}}$  and the incoherent scattering cross section  $\sigma_{\text{inc}}$  in table II and V were obtained by numerically performing the integrations indicated in equations (4) and (8), respectively, using  $F(x, Z)$  and  $S(x, Z)$  values from table I and IV. The  $\sigma_{\text{inc}}$  values also include the Mork [44] radiative and double-Compton correction as discussed in the following section 5.2. In table V the free-electron Klein-Nishina Compton cross section (also including the Mork correction) is listed for comparison.

Because of the extreme forward peaking of the coherent scattering angular distribution for the higher photon energies, considerable care was required in the numerical integration. For example, at 100 MeV for hydrogen, iron and plutonium, the entire integrated  $\sigma_{\text{coh}}$  cross section (to four figures) is contained within the angular range  $\theta=0^\circ$  to  $0.015^\circ$  ( $1-\cos\theta=3.4\times 10^{-8}$ ), to  $0.3^\circ$  ( $1-\cos\theta=1.3\times 10^{-5}$ ) and to  $4^\circ$  ( $1-\cos\theta=2.2\times 10^{-3}$ ), respectively. In addition, interpolation of  $F(x, Z)$  and  $S(x, Z)$  values from table I to the integration mesh-points was found to be sensitive by as much as 1% to the fitting-scheme used (e.g., log-log linear vs. log-log quadratic).

The integration variable was taken as  $1-\cos\theta$ , from which the values  $x = \sin(\theta/2)/\lambda(\text{\AA}) = [(1-\cos\theta)/2]^{1/2}/\lambda(\text{\AA})$  could be computed arbitrarily close to  $\theta=0^\circ$  without loss of significance. For the incoherent scattering integrations the values for  $x$  were modified by the factor  $[1+(k^2+2k)\sin^2(\theta/2)]^{1/2}/[1+2k\sin^2(\theta/2)]$  as given in equation (2). The integration range used was from  $1-\cos\theta=10^{-12}$  to 2.0 ( $\theta=0.000081^\circ$  to  $180^\circ$ ), divided into intervals equally spaced in the logarithm

of  $1 - \cos\theta$ . Values of  $F(x, Z)$  and  $S(x, Z)$  at the integration mesh-points were obtained by log-log quadratic ( $\log f(x) = a + b \log x + c \log^2 x$ ) interpolation from values listed in table I, with the zero-values (first entry in the  $x$  list and the  $S(x, Z)$  lists) replaced by  $10^{-30}$  for purposes of this interpolation.<sup>12</sup>

A modified Simpson-rule procedure given by Spencer [101] was then used to perform the integrations. With this procedure, 1000 integration points (999 intervals) were found adequate for four-place accuracy in computing the total coherent and incoherent scattering cross sections in table II, requiring a total of 80 minutes on the NBS Univac 1108 computer. Figures 48 and 49 give these results as a function of  $Z$  for a few constant energies.

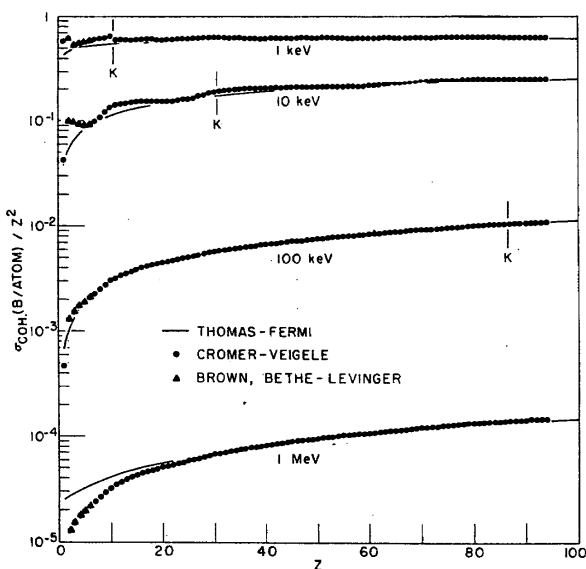


FIGURE 48. Comparison of integrated coherent (Rayleigh) scattering cross sections using  $F(x, Z)$  values from (a) the Thomas-Fermi model (solid curves), (b) the Cromer-Veigele [12], [20] tables (circles) and (c) the configuration-interaction results of Brown [56], [94] (triangles) as a function of  $Z$  for photon energies of 1, 10, 100, and 1000 keV.

<sup>12</sup>In the present Evaluated Nuclear Data File (ENDF) processing codes, no provision is made for log-log quadratic interpolation as used in the present integration procedure. However, the ENDF log-log linear and linear-linear interpolation provisions can be used as follows: An additional arbitrarily small value  $x' = \epsilon$  (e.g.,  $\epsilon = 10^{-20}$ ) may be inserted between  $x_1 = 0$  and  $x_2 = 0.005$ , for which  $F(x', Z) \approx F(x_1, Z)$ , and, making use of the  $x^2$  dependence of  $S(x, Z)$  for small  $x$ ,  $S(x', Z) = (x'/x_2)S(x_2, Z)$ . Log-log linear interpolation can then be used for  $x' \leq x \leq 10^9$  to obtain  $F(x, Z)$  and  $S(x, Z)$  values with accuracies of the order of 1% or better. In the remaining small interval  $0 \leq x \leq x'$ , linear-linear interpolation will introduce negligible error in practical calculations. With the present table, linear-linear interpolation in the first interval  $x = 0$  to 0.005 results in a 5% error in the integrated  $\sigma_{inc}$  at 0.1 keV.

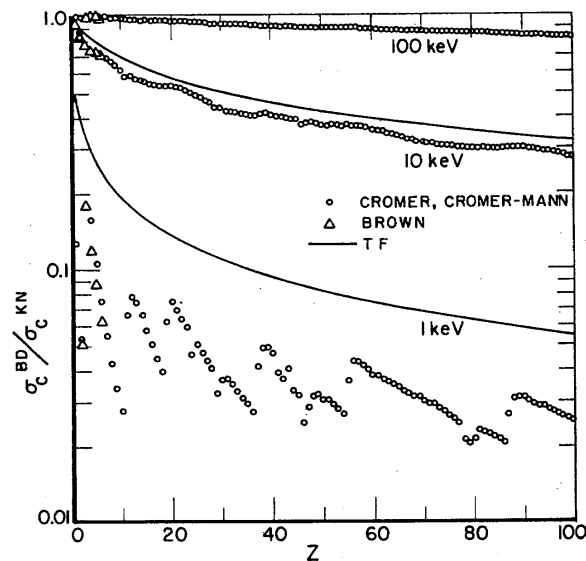


FIGURE 49. Comparison (as ratios to the Klein-Nishina free-electron Compton cross section  $\sigma_C^{KN}$ ) of the integrated incoherent (bound-electron Compton) cross section  $\sigma_C^{BD}$  calculated using (a) the Cromer-Mann-Veigele [12], [17], [18], [20] non-relativistic Hartree-Fock  $S(x, Z)$  values (circles); (b) the Brown [56], [94] configuration-interaction  $S(x, Z)$  values (triangles); and (c) the Thomas-Fermi model (solid curves) as a function of  $Z$  for photon energies of 1, 10, and 100 keV.

## 5.2. Radiative and Double-Compton Corrections to the Incoherent Scattering Cross Section

The radiative correction (of the order  $1/137$ ) is associated with emission and reabsorption of virtual photons, whereas in the double Compton effect an additional real photon, usually very low in energy, is emitted. Differential formulas (Brown and Feynman [102], Mandl and Skyrme [103]) for these two effects contain infrared divergencies, each of opposite sign.

Mork [44] has combined these two corrections to calculate a physically meaningful correction  $\Delta\sigma_{KN}^M$  to the free-electron Klein-Nishina Compton scattering total cross section  $\sigma_{KN}$ . This combined correction  $\Delta\sigma_{KN}^M$  is listed in table III and was included in the NSRDS-NBS 29 [43] photon cross section compilation, also in the Storm-Israel [23] compilation. The double-Compton scattering portion of this correction has also been treated by Ram and Wang [104].

Ideally, an angle-dependent combined correction  $\Delta\sigma_{inc}^M(\theta)$  should be included in the integration in equation (8). Since this is not readily available we apply the correction to the total cross section as

$$\sigma_{inc}(\text{CORR.}) = \sigma_{inc} \cdot [1 + \Delta\sigma_{KN}^M] \quad (46)$$

to generate the incoherent scattering cross section values listed in table II.

## 6. Discussion

Although we offer this tabulation as an evaluated "state of the art" data set describing differential and integral scattering of photons by atomic electrons, we acknowledge that there are a number of additional theoretical developments, as discussed and evaluated by Tseng, Gavrilu, and Pratt [99], which have yet to be exploited. These more sophisticated treatments, including the impulse approximation, the effects of atomic-electron velocities (particularly for backward-hemisphere incoherent scattering), and a more complete treatment of relativistic effects are not yet sufficiently available in numerical or analytical form for generating a data set such as the present all- $Z$ , extended  $q$ - and energy-range general-purpose tabulations.

We again caution, as discussed in section 1.1 and as indicated in the comparisons with measurements (figures 11-47), that table I contains substantial uncertainties, particularly  $F(x, Z)$  for high- $x$  and high- $Z$ , also that additional elastic photon scattering processes (e.g., Delbrück and nuclear resonance scattering) may become much more important than Rayleigh (coherent) scattering for  $x \geq 100 \text{ \AA}^{-1}$ .

Also, we emphasize that in order to provide a consistent set of  $F(x, Z)$  and  $S(x, Z)$  values, some accuracy in  $F(x, Z)$  has been sacrificed, as discussed in section 3, by neglecting relativistic effects for  $Z = 7$  to 100,  $x = 0$  to  $10 \text{ \AA}^{-1}$ . These relativistic corrections, as indicated in table VII, can be as much as 6% for the highest- $Z$  elements at  $x = 2 \text{ \AA}^{-1}$ .

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## 7. References

- [1] James, R. W., and Brindley, G. W., *Phil. Mag.* **12**, 81-112 (1931); *Z. Kristallogr.* **78**, 470-476 (1931).
- [2] Viervoll, H., and Ögrim, O., *Acta Crystallogr.* **2**, 277-279 (1949).
- [3] McWeeny, R., *Acta Crystallogr.* **4**, 513-519 (1951).
- [4] Nelms, A. T., and Oppenheim, I., *J. Res. Nat. Bur. Stand. (U.S.)* **55**, 53-62 (1955).
- [5] Berghuis, J., Haanappel, I. M., Potters, M., Loopstra, B. O., MacGillavry, C. H., and Veenendaal, A. L., *Acta Crystallogr.* **8**, 478-483 (1955).
- [6] Ibers, J. A., Sec. 3.3.1 of *International Tables for X-Ray Crystallography*, Vol. III, MacGillavry, Rieck and Lonsdale, eds., (Kynoch Press, Birmingham, England, 1962) pages 201-212.
- [7] Hanson, H. P., Herman, F., Lea, J. D., and Skillman, S., *Acta Crystallogr.* **17**, 1040-1044 (1964).
- [8] Cromer, D. T., and Waber, J. T., *Acta Crystallogr.* **18**, 104-109 (1965).
- [9] Tavard, C., Nicolas, D., and Rouault, M., *J. Chim. Phys.* **64**, 540-554 (1967).
- [10] Cromer, D. T., and Mann, J. B., *Acta Crystallogr. A* **24**, Part 2, 321-324 (1968).
- [11] Doyle, P. A., and Turner, P. S., *Acta Crystallogr. A* **24**, Part 3, 390-397 (1968).
- [12] Veigele, Wm. J., Briggs, E., Bates, L., Henry, E. M., and Bracewell, B., Kaman Sciences Corp. (Colorado Springs, Colo.) Report KN-71-431(R), Vol. II, Rev. I., (1971), 81 pages.
- [13] Hajdu, F., *Acta Crystallogr. A* **28**, 250-252 (1972).
- [14] Cromer, D. T., and Waber, J. T., Sec. 2.2 of *International Tables for X-Ray Crystallography*, Vol. IV, Ibers and Hamilton, eds. (Kynoch Press, Birmingham, England, 1974) pages 71-147.
- [15] Franz, W., *Z. Phys.* **95**, 652-668 (1935); **98**, 314-320 (1936).
- [16] Curien, H., Sec. 3.4 of *International Tables for X-Ray Crystallography*, Vol. III, MacGillavry, Rieck and Lonsdale, eds. (Kynoch Press, Birmingham, England 1962) pages 247-253.
- [17] Cromer, D. T., and Mann, J. B., *J. Chem. Phys.* **47**, 1892-1893 (1967).
- [18] Cromer, D. T., *J. Chem. Phys.* **50**, 4857-4859 (1969).
- [19] Hajdu, F., *Acta Crystallogr. A* **27**, 73-74 (1971).
- [20] Cromer, D. T., personal communication to Wm. J. Veigele.
- [21] Marrotta, C. R., Air Force Weapons Lab. (Kirtland AFB, New Mexico) Report AFWL-TR-67-11 (1967) 34 pages.
- [22] McMaster, W. H., Del Grande, N. K., Mallett, J. H., and Hubbell, J. H., Lawrence Livermore Laboratory (Livermore, Calif.) Report UCRL-50174, Sec. 2, Rev. 1 (1969), 216 pages.
- [23] Storm, E., and Israel, H. I., *Nuclear Data A* **7**, 565-681 (1970).
- [24] Biggs, F., and Lighthill, R., Sandia Labs. (Albuquerque, N. Mexico) Report SC-RR-702685 (1972) 134 pages.
- [25] Goscinski, O., and Lindner, P., *J. Chem. Phys.* **52**, 2539-2540 (1970).
- [26] Smith, V. H., *Chem. Phys. Lett.* **7**, 226-228 (1970).
- [27] Kim, Y.-K., personal comm.
- [28] Lassetre, E. N., *J. Chem. Phys.* **43**, 4479-4486 (1965).
- [29] Levinger, J. S., *Phys. Rev.* **87**, 656-662 (1952).
- [30] Brown, G. E., and Woodward, J. B., *Proc. Phys. Soc. Lond. A* **65**, 977-980 (1952).
- [31] Brown, G. E., Peierls, R. E., and Woodward, J. B., *Proc. R. Soc. Lond. A* **227**, 51-58 (1954).
- [32] Brenner, S., Brown, G. E., and Woodward, J. B., *Proc. R. Soc. Lond. A* **227**, 59-72 (1954).
- [33] Brown, G. E., and Mayers, D. F., *Proc. R. Soc. Lond. A* **234**, 387-390 (1956); **242**, 89-95 (1957).
- [34] Bonham, R. A., *J. Chem. Phys.* **43**, 1460-1464 (1956).
- [35] Henry, E. M., Thesis, Univ. Colo., Boulder, Colo. (1969) 180 pages.
- [36] Eisenberger, P., and Platzman, P. M., *Phys. Rev. A* **2**, 415-423 (1970).
- [37] Gavrilu, M., *Phys. Rev. A* **6**, 1348-1359 (1972); **6**, 1360-1367 (1972).
- [38] Florescu, V., and Gavrilu, M., paper presented at the 4th Internatl. Conf. on Atomic Physics, Heidelberg (1974).
- [39] CODATA Task Group on Fundamental Constants (E. R. Cohen, Chmn.), CODATA (ICSU CODATA Central Office, Frankfurt am Main, Germany) Bulletin No. 11 (Dec. 1973) 8 pages.
- [40] Cohen, E. R., and Taylor, B. N., *J. Phys. Chem. Ref. Data* **2**, 663-734 (1973).
- [41] Deslattes, R. D. and Henins, A., *Phys. Rev. Lett.* **31**, 972-975 (1973).
- [42] Bearden, J. A., *Rev. Mod. Phys.* **39**, 78-124 (1967); *Natl. Stand. Ref. Data Ser. NSRDS-NBS 14* (1967), 66 pages.
- [43] Hubbell, J. H., *Natl. Stand. Ref. Data Ser. NSRDS-NBS 29* (1969), 80 pages.
- [44] Mork, K. J., *Phys. Rev. A* **4**, 917-927 (1971).
- [45] Brown, W. D., *Boring Co. (Seattle, Wash.) Report D2-125136-1* (1966), 269 pgs.
- [46] Debye, P., *Phys. Z.* **31**, 419-428 (1930).
- [47] Pirene, M. H., *The Diffraction of X Rays and Electrons by Free Molecules* (Cambridge Univ. Press, London 1946) page 9.

- [48] Hartree, D. R., *Philos. Mag.* **50**, 289–306 (1925).
- [49] Compton, A. H., *Phys. Rev.* **35**, 925–938 (1930).
- [50] Grodstein, G. W., *Natl. Bur. Stand. Circ.* 583 (1957), 54 pages (particularly Section 5, Appendix, pages 51–53).
- [51] Brown, W. D., Boeing Co. (Seattle, Wash.) Report D2–125137–1 (1966) 263 pgs.
- [52] Veigele, Wm. J., Kaman Sciences Corp. (Colorado Springs, Colo.) Report KN–378–67–9(R) (1967) 126 p.
- [53] Schiff, L. I., *Quantum Mechanics*, 2nd ed. (McGraw-Hill, New York 1955) p. 46.
- [54] Messiah, A., *Quantum Mechanics*, Vol. I. (North-Holland, Amsterdam 1965), pages 268–271.
- [55] Kim, Y.-K., and Inokuti, M., *Phys. Rev.* **165**, 39–43 (1968).
- [56] Brown, R. T., *Phys. Rev. A* **1** 1342–1347 (1970); **2**, 614–620 (1970); **5**, 2141–2144 (1972); **10**, 438–439 (1974).
- [57] Pirene, M. H., *The Diffraction of X-Rays and Electrons by Free Molecules* (Cambridge Univ. Press, London 1946), page 12.
- [58] Stewart, R. F., Davidson, E. R., and Simpson, W. T., *J. Chem. Phys.* **42**, 3175–3187 (1965).
- [59] McWeeny, R., *Acta Crystallogr.* **5**, 463–468 (1952).
- [60] Iijima, T., and Bonham, R. A., *Acta Crystallogr.* **16**, 1061–1062 (1963).
- [61] Bentley, J. J., and Stewart, R. F., *J. Comput. Phys.* **11**, 127–145 (1973); *J. Chem. Phys.* **62**, 875–878 (1975).
- [62] Davidson, E. R., and Jones, L. L., *J. Chem. Phys.* **37**, 2966–2971 (1962).
- [63] Kolos, W., and Roothaan, C. C. J., *Rev. Mod. Phys.* **32**, 219–232 (1960).
- [64] Stewart, R. F., personal communication.
- [65] Berger, M. J., and Seltzer, S. M., personal communication.
- [66] Powell, M. J. D., Atomic Energy Research Establishment (Harwell, England) Report TP 307 (1967).
- [67] Cooper, J. W., *Phys. Rev. A* **9**, 2236–2237 (1974).
- [68] Pauling, L., *Proc. R. Soc. Lond. A* **114**, 181–211 (1927).
- [69] Pauling, L., and Sherman, J., *Z. Kristallogr.* **81**, 1–29 (1932).
- [70] Thomas, L. H., *Proc. Camb. Philos. Soc.* **23**, 542–548 (1927).
- [71] Fermi, E., *Z. Phys.* **48**, 73–79 (1928).
- [72] Heisenberg, W., *Phys. Z.* **32**, 737–740 (1931).
- [73] James, R. W., *The Optical Principles of the Diffraction of X-Rays* (G. Bell and Sons, London 1948) page 462.
- [74] Bewilogua, L., *Phys. Z.* **32**, 740–744 (1931).
- [75] Wheeler, J. A., and Lamb, W. E., *Phys. Rev.* **55**, 858–862 (1939); **101**, 1836 (1956).
- [76] Donaldson, M. E., Henry, E. M., and Veigele, Wm. J., Kaman Sciences Corp. (Colorado Springs, Colo.) Report KN–65–138(R) (1965).
- [77] Hartree, D. R., *Proc. Camb. Philos. Soc.* **24**, 89–110 (1928); **24**, 111–132 (1928).
- [78] Fock, V., *Z. Phys.* **61**, 126–148 (1930).
- [79] Fock, V., and Petrashen, M. J., *Phys. Z. Sowjetunion* **6**, 638–414 (1934).
- [80] Slater, J. C., *Phys. Rev.* **81**, 385–390 (1951).
- [81] Freeman, A. J., *Acta Crystallogr.* **12**, Part 4, 261–271 (1959).
- [82] Herman, F., and Skillman, S., *Bull. Am. Phys. Soc.* **7**, 214 (1962).
- [83] Mann, J. B., Los Alamos Scientific Laboratory (Los Alamos, N. Mex.) Report LA–3690 (1967) 77 pages.
- [84] Veigele, Wm. J., Briggs, E., Bates, L., Henry, E. M., and Bracewell, B., Kaman Sciences Corp. (Colorado Springs, Colo.) Report KN–71–431(R), Vol. 1, Rev. 1. (1971), 234 pages.
- [85] Veigele, Wm. J., *Atomic Data* **5**, 51 111 (1973).
- [86] Clementi, E., and Raimondi, D. L., *J. Chem. Phys.* **38**, 2686–2689 (1963).
- [87] Clementi, E., *IBM J. Res. Dev. Suppl.* **9**, 2–19 (1965).
- [88] Dirac, P. A. M., *Proc. Camb. Philos. Soc.* **26**, 376–385 (1930).
- [89] Coulthard, M. A., *Proc. Phys. Soc. Lond.* **91**, 44–49 (1967).
- [90] Mann, J. B., unpublished work.
- [91] Waller, I., and Hartree, D. R., *Proc. R. Soc. Lond. A* **124**, 119–142 (1929).
- [92] Brown, R. T., and Fontana, P. R., *J. Chem. Phys.* **45**, 4248–4255 (1966); **47**, 3077–3078 (1967).
- [93] Weiss, A. W., *Phys. Rev.* **122**, 1826–1836 (1961); **162**, 71–80 (1967); and **188**, 119–130 (1969).
- [94] Brown, R. T., *J. Chem. Phys.* **55**, 353–355 (1971).
- [95] Tanaka, K., and Sasaki, F., *Int. J. Quantum Chem.* **5**, 157–175 (1971).
- [96] Naon, M., and Cornille, M., *J. Phys. B* **5**, 1965–1974 (1972); **6**, 1347–1356 (1973).
- [97] Naon, M., Cornille, M., and Kim, Y. K., *J. Phys. B* **8**, 864–868 (1975).
- [98] Smend, F., and Schumacher, M., *Nucl. Phys. A* **223**, 423–428 (1974).
- [99] Tseng, H. K., Gavril, M., and Pratt, R. H., unpublished work (Report No. 2) sponsored at the Univ. of Pittsburgh by the NBS (May 1973).
- [100] Lonsdale, K., Sec. 3.3.5 of *International Tables for X-Ray Crystallography*, Vol. III, MacGillavry, Rieck and Lonsdale, eds., (Kynoch Press, Birmingham, England, 1962) pages 232–246.
- [101] Spencer, L. V., Vol. I of *Radiation Shielding*, Kimel, W. R., ed., Office of Civil Defence and Kansas State Univ. Rep. TR–40 (1966), page 1–265.
- [102] Brown, L. M., and Fcynman, R. P., *Phys. Rev.* **85**, 231–244 (1952).
- [103] Mandl, F., and Skyrme, T. H. R., *Proc. R. Soc. Lond. A* **215**, 497–507 (1952).
- [104] Ram, M., and Wang, P. Y., *Phys. Rev. Lett.* **26**, 476–479 (1971); **26**, 1210 (1971).

## 8. Measurement References (Whole—Atoms)

- [31 Wo 01] Wollan, E. O., *Phys. Rev.* **37**, 862–872 (1931).
- [33 Ru 01] Rusterholz, A. A., *Helv. Phys. Acta* **6**, 565–569 (1933).
- [36 Br 01] Brindley, G. W., *Philos. Mag.* **21**, 778–790 (1936); also **20**, 865–881 (1935).
- [42 La 01] Laval, J., *C. R. Acad. Sci. (Paris)* **215**, 278–279 (1942).
- [53 Wi 01] Wilson, R. R., *Phys. Rev.* **90**, 720–721 (1953).
- [55 Be 01] Bensch, H., Witte, H., and Wölfel, E., *Z. Phys. Chem. (Frankf. a. M.)* **4**, 65–88 (1955).
- [55 Bu 01] Burkhardt, J. L., *Phys. Rev.* **100**, 192–198 (1955).
- [56 Ma 01] Mann, A. K., *Phys. Rev.* **101**, 4–8 (1956).
- [56 Me 01] Messelt, S., and Storruste, A., *Proc. Phys. Soc. Lond. A* **69**, 381–387 (1956).
- [56 Wa 01] Walker, C. B., *Phys. Rev.* **103**, 558–561 (1956).
- [57 Go 01] Goldzahl, L., and Eberhard, P., *J. Phys. Radium* **18**, 33–43 (1957).
- [58 Be 01] Bernstein, A. M., and Mann, A. K., *Phys. Rev.* **110**, 805–814 (1958).
- [58 Ci 01] Cindro, N., and Ilakovac, K., *Nucl. Phys.* **5**, 647–652 (1958).
- [58 Eb 01] Eberhard, P., Goldzahl, L., and Hara, E., *J. Phys. Radium* **19**, 658–667 (1958).
- [58 St 01] Storruste, A., and Tjóm, P. O., *Nucl. Phys.* **6**, 151–156 (1958).
- [59 Go 01] Göttlicher, S., and Wölfel, E., *Z. Elektrochem.* **63**, 891–901 (1959).
- [61 Ba 01] Batterman, B. W., Chipman, D. R., and Demarco, J. J., *Phys. Rev.* **122**, 60–74 (1961).
- [62 Br 01] Brill, R., and Chopra, K. L., *Z. Kristallogr.* **117**, 321–330 (1962).
- [62 Co 01] Cooper, M. J., *Philos. Mag.* **7**, 2059–2064 (1962); erratum in **10**, 177 (1964).
- [62 Sp 01] Sparks, C. J., and Borie, B. S., *Adv. X-Ray Anal.* **6**, 177–184 (1963).
- [62 St 01] Standing, K. G., and Jovanovich, J. V., *Can. J. Phys.* **40**, 662–653 (1962).

- [63 An 01] Anand, S., Singh, M., and Sood, B. S., *Curr. Sci.* **32**, 401-402 (1963).
- [63 Ch 01] Chipman, D. R., and Jennings, L. D., *Phys. Rev.* **132**, 728-734 (1963).
- [63 Si 01] Singh, M., Anand, S., and Sood, B. S., *Indian J. Pure Appl. Phys.* **1**, 305-307 (1963).
- [64 An 01] Anand, S., Singh, M., and Sood, B. S., *Curr. Sci.* **33**, 139-140 (1964).
- [64 An 02] Anand, S., Singh, M., and Sood, B. S., *Curr. Sci.* **33**, 333-334 (1964).
- [64 In 01] Inkinen, O., and Suortti, P., *Ann. Acad. Sci. Fenn. A4*, No. 147, 1-15 (1964).
- [64 Na 01] Nath, A., and Ghose, A. M., *Nucl. Phys.* **57**, 547-564 (1964).
- [64 Si 01] Singh, M., Anand, S., and Sood, B. S., *Curr. Sci.* **33**, 77-78 (1964); **33**, 487 (1964).
- [65 An 01] Anand, S., and Sood, B. S., *Nucl. Phys.* **73**, 368-378 (1965).
- [65 Da 01] Dahn, E., *Atomkernenergie* **10**, 39-40 (1965).
- [65 De 01] DeMarco, J. J., and Weiss, R. J., *Phys. Rev. A* **137**, 1869-1871 (1965).
- [65 Di 01] DiLazzaro, M. A., and Missoni, G., *Ann. Ist. Super. Sanita* **1**, 1-60 (1965).
- [65 Ha 01] Hattori, H., Kuriyama, H., Katagawa, T., and Kato, N., *J. Phys. Soc. Jap.* **20**, 988-996 (1965).
- [65 Mu 01] Murty, V. A. N., Lakshminarayana, V., and Jnanananda, S., *Proc. Phys. Soc. Lond.* **85**, 1075-1080 (1965); also *Indian J. Pure Appl. Phys.* **3**, 366-369 (1965).
- [65 Mu 02] Murty, V. A. N., Lakshminarayana, V., and Jnanananda, S., *Nucl. Phys.* **62**, 296-304 (1965).
- [66 Ha 01] Hauser, U., and Mussgnug, B., *Z. Phys.* **22**, 252-272 (1966).
- [66 Ho 01] Hosoya, S., and Yamagishi, T., *J. Phys. Soc. Jap.* **21**, 2638-2644 (1966).
- [66 Qu 01] Quivy, R., *Nucl. Phys.* **76**, 362-368 (1966).
- [67 Pa 01] Paakkari, T., and Suortti, P., *Acta Crystallogr.* **22**, 755-758 (1967).
- [67 Qu 01] Quivy, R., *Nucl. Phys. A* **101**, 417-423 (1967).
- [68 Ba 01] Batterman, B. W., and Patel, J. R., *J. Appl. Phys.* **39**, 1882-1887 (1968).
- [68 Di 01] Dixon, W. R., and Storey, R. S., *Can. J. Phys.* **46**, 1153-1162 (1968).
- [68 Pa 01] Paakkari, T., and Suortti, P., *Phys. Status Solidi* **28**, 539-545 (1968).
- [68 Ph 01] Phillips, W. C., and Weiss, R. J., *Phys. Rev.* **171**, 790-800 (1968).
- [68 Wa 01] Watanabe, D., Uyeda, R., and Fukuhara, A., *Acta Crystallogr. A* **24**, 580-581 (1968).
- [69 Di 01] Diana, M., Mazzone, G., and DeMarco, J. J., *Phys. Rev.* **187**, 973-979 (1969).
- [69 Gh 01] Ghumman, B. S., and Sood, B. S., *Indian J. Pure Appl. Phys.* **7**, 7-9 (1969).
- [69 Ha 01] Halliday, F. O., Stanford Research Inst. (Menlo Park, Calif.) Report AFWI-TR-68-133 (1969).
- [69 Ha 02] Hart, M., and Milne, A. D., *Acta Crystallogr. A* **25**, 134-138 (1969).
- [69 Ja 01] Järvinen, M., Merisalo, M., and Inkinen, O., *Phys. Rev.* **178**, 1108-1110 (1969).
- [69 Je 01] Jennings, L. D., *J. Appl. Phys.* **40**, 5038-5044 (1969).
- [69 Ma 01] Mamedov, K. P., *Kristallografiya* **14**, 135-137 (1969).
- [69 Mi 01] Middleton, R. M., and Gazzara, C. P., *Phys. Rev.* **185**, 1230 (1969).
- [69 Ra 01] Raccah, P. M., and Henrich, V. E., *Phys. Rev.* **184**, 607-613 (1969).
- [69 Sc 01] Schumacher, M., *Phys. Rev.* **182**, 7-14 (1969).
- [69 Wa 01] Watanabe, D., Uyeda, R., and Fukuhara, A., *Acta Crystallogr. A* **25**, 138-140 (1969).
- [70 Ba 01] Basavaraju, G., and Kane, P. P., *Nucl. Phys. A* **149**, 49-62 (1970).
- [70 Mi 01] Miller, G. G. S., and Black, P. J., *Acta Crystallogr. A* **26**, 527-532 (1970).
- [70 Pe 01] Persson, E., Zielińska-Rohozińska, E., and Gerward, L., *Acta Crystallogr. A* **26**, 514-518 (1970).
- [70 Sa 01] Sahota, H. S., and Sood, B. S., *Indian J. Phys.* **44**, 415-418 (1970).
- [71 Ha 01] Hardie, G., Merrow, W. J., and Schwandt, D. R., *Phys. Rev. C* **1**, 714-720 (1970); also Hardie, G., DeVries, J. S., and Chiang, C. K., *Phys. Rev. C* **3**, 1287-1293 (1971).
- [71 Li 01] Linkoaho, M., and Servomaa, A., *Phys. Scr.* **4**, 125-126 (1971).
- [71 Na 01] Nakayuma, K., Kikuta, S., and Kohra, K., *Phys. Lett. A* **37**, 29-30 (1971).
- [73 Ba 01] Baker, J. F. C., Hart, M., and Helliard, J., *Z. Naturforsch. A* **28**, 553-557 (1973).
- [73 Sc 01] Schumacher, M., Smend, F., and Borchert, I., *Nucl. Phys. A* **206**, 531-544 (1973).
- [73 Sm 01] Smend, F., Schumacher, M., and Borchert, I., *Nucl. Phys. A* **213**, 309-316 (1973).



TABLE I. ATOMIC FORM FACTOR,  $F(X,Z)$ , AND INCOHERENT SCATTERING FUNCTION,  $S(X,Z)$ 

$X$ , $\lambda$ (Å)	1 H		2 HE		3 LI		4 BE		5 B	
	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$
0.00	1.0000+00	0.0000	2.0000+00	0.0000	3.0000+00	0.0000	4.0000+00	0.0000	5.0000+00	0.0000
0.00-03	9.9945-01	1.1047-03	1.9995+00	2.1000-03	2.9966+00	6.6000-03	3.9970+00	4.3000-03	4.9971+00	3.9000-03
1.00-02	9.9779-01	4.4098-03	1.9982+00	5.0000-03	2.9865+00	2.6500-02	3.9880+00	1.7700-02	4.9885+00	1.5650-02
1.50-02	9.9504-01	9.8880-03	1.9960+00	8.8000-03	2.9699+00	5.8475-02	3.9732+00	3.9679-02	4.9742+00	3.5033-02
2.00-02	9.9121-01	1.7494-02	1.9930+00	1.4100-02	2.9472+00	1.0220-01	3.9525+00	7.0200-02	4.9542+00	6.2000-02
2.50-02	9.8632-01	2.7167-02	1.9891+00	2.0590-02	2.9190+00	1.5449-01	3.9264+00	1.0834-01	4.9289+00	9.5926-02
3.00-02	9.8039-01	3.8828-02	1.9844+00	2.9900-02	2.8850+00	2.1640-01	3.8947+00	1.5440-01	4.8981+00	1.3702-01
4.00-02	9.6554-01	6.7731-02	1.9724+00	5.1900-02	2.8044+00	3.5410-01	3.8168+00	2.6560-01	4.8217+00	2.3761-01
5.00-02	9.4693-01	1.0332-01	1.9569+00	8.0540-02	2.7106+00	4.9980-01	3.7215+00	3.9810-01	4.7270+00	3.5989-01
7.00-02	8.9967-01	1.9024-01	1.9169+00	1.5347-01	2.5071+00	7.6520-01	3.4924+00	6.9980-01	4.4934+00	6.5072-01
9.00-02	8.4238-01	2.9039-01	1.8660+00	2.4502-01	2.3090+00	9.6290-01	3.2325+00	1.0165+00	4.2169+00	9.7789-01
1.00-01	8.1082-01	3.4257-01	1.8364+00	2.9575-01	2.2190+00	1.0328+00	3.0976+00	1.1706+00	4.0680+00	1.1474+00
1.25-01	7.2711-01	4.7131-01	1.7551+00	4.3215-01	2.0358+00	1.1721+00	2.7844+00	1.5028+00	3.7006+00	1.5485+00
1.50-01	6.4129-01	5.8874-01	1.6612+00	5.8352-01	1.9060+00	1.2458+00	2.4921+00	1.7742+00	3.3280+00	1.9314+00
1.75-01	5.5811-01	6.8851-01	1.5603+00	7.3603-01	1.8184+00	1.3297+00	2.2629+00	1.9657+00	2.9974+00	2.2558+00
2.00-01	4.8078-01	7.6885-01	1.4585+00	8.8056-01	1.7425+00	1.4176+00	2.0771+00	2.1207+00	2.7113+00	2.5308+00
2.50-01	3.4974-01	8.7768-01	1.2522+00	1.1457+00	1.6258+00	1.6052+00	1.8354+00	2.3215+00	2.2731+00	2.9329+00
3.00-01	2.5127-01	9.3687-01	1.0586+00	1.3624+00	1.5115+00	1.7953+00	1.6951+00	2.4705+00	1.9853+00	3.1899+00
4.00-01	1.3044-01	9.8258-01	7.3794-01	1.6566+00	1.2688+00	2.1428+00	1.5195+00	2.7437+00	1.6831+00	3.4991+00
5.00-01	7.0592-02	9.9502-01	5.0953-01	1.8175+00	1.0313+00	2.4166+00	1.3603+00	3.0053+00	1.5262+00	3.7318+00
6.00-01	4.0325-02	9.9837-01	3.5416-01	1.9023+00	8.2550-01	2.6129+00	1.1930+00	3.2374+00	1.4003+00	3.9476+00
7.00-01	2.4285-02	9.9941-01	2.4952-01	1.9467+00	6.5000-01	2.7462+00	1.0277+00	3.4291+00	1.2741+00	4.1462+00
8.00-01	1.5335-02	9.9977-01	1.7860-01	1.9702+00	5.1230-01	2.8339+00	8.7430-01	3.5794+00	1.1454+00	4.3202+00
9.00-01	1.0091-02	9.9990-01	1.2995-01	1.9829+00	4.0437-01	2.8909+00	7.3812-01	3.6931+00	1.0187+00	4.4689+00
1.00+00	6.8811-03	9.9995-01	9.6120-02	1.9899+00	3.2046-01	2.9278+00	6.2060-01	3.7771+00	8.9873-01	4.5896+00
1.25+00	2.9947-03	9.9999-01	4.8400-02	1.9971+00	1.8375-01	2.9732+00	4.2798-01	3.9000+00	6.4332-01	4.7918+00
1.50+00	1.4937-03	1.0000+00	2.6510-02	1.9990+00	1.1020-01	2.9892+00	2.6235-01	3.9538+00	4.5565-01	4.8955+00
2.00+00	4.8903-04	1.0000+00	9.6400-03	1.9999+00	4.4810-02	2.9978+00	1.1962-01	3.9890+00	2.3265-01	4.9729+00
2.50+00	2.0353-04	1.0000+00	4.1962-03	2.0000+00	2.0891-02	2.9994+00	5.9945-02	3.9970+00	1.2506-01	4.9922+00
3.00+00	9.9016-05	1.0000+00	2.0934-03	2.0000+00	1.0920-02	2.9998+00	3.2720-02	3.9990+00	7.1540-02	4.9974+00
3.50+00	5.3730-05	1.0000+00	1.1537-03	2.0000+00	6.1907-03	2.9999+00	1.9065-02	3.9997+00	4.3127-02	4.9991+00
4.00+00	3.1604-05	1.0000+00	6.8559-04	2.0000+00	3.7383-03	3.0000+00	1.1810-02	3.9999+00	2.7320-02	4.9996+00
5.00+00	1.2597-05	1.0000+00	2.8543-04	2.0000+00	1.5869-03	3.0000+00	5.1521-03	4.0000+00	1.2310-02	4.9999+00
6.00+00	6.2819-06	1.0000+00	1.3890-04	2.0000+00	7.8063-04	3.0000+00	2.5717-03	4.0000+00	6.2700-03	5.0000+00
7.00+00	3.3553-06	1.0000+00	7.5398-05	2.0000+00	4.2656-04	3.0000+00	1.4160-03	4.0000+00	3.4963-03	5.0000+00
8.00+00	1.9920-06	1.0000+00	4.4363-05	2.0000+00	2.5209-04	3.0000+00	8.4309-04	4.0000+00	2.0943-03	5.0000+00
1.00+01	8.1675-07	1.0000+00	1.8256-05	2.0000+00	1.0430-04	3.0000+00	3.5136-04	4.0000+00	8.8081-04	5.0000+00
1.50+01	1.6150-07	1.0000+00	3.6259-06	2.0000+00	2.0835-05	3.0000+00	7.0738-05	4.0000+00	1.7906-04	5.0000+00
2.00+01	5.1116-08	1.0000+00	1.1505-06	2.0000+00	6.6279-06	3.0000+00	2.2575-05	4.0000+00	5.7373-05	5.0000+00
5.00+01	1.3091-09	1.0000+00	2.9749-08	2.0000+00	1.7245-07	3.0000+00	5.9153-07	4.0000+00	1.5152-06	5.0000+00
8.00+01	1.9976-10	1.0000+00	4.5780-09	2.0000+00	2.6652-08	3.0000+00	9.1828-08	4.0000+00	2.3627-07	5.0000+00
1.00+02	8.1622-11	1.0000+00	1.8855-09	2.0000+00	1.1007-08	3.0000+00	3.8027-08	4.0000+00	9.8106-08	5.0000+00
1.00+03	8.1623-15	1.0000+00	2.3461-13	2.0000+00	1.4995-12	3.0000+00	5.6157-12	4.0000+00	1.5611-11	5.0000+00
1.00+06	8.1823-27	1.0000+00	5.1312-23	2.0000+00	4.4404-22	3.0000+00	2.0249-21	4.0000+00	6.4746-21	5.0000+00
1.00+09	8.1823-39	1.0000+00	5.1205-32	2.0000+00	4.4444-31	3.0000+00	2.0332-30	4.0000+00	6.5251-30	5.0000+00

TABLE I.. CONT. ATOMIC FORM FACTOR, F(X,Z), AND INCOHERENT SCATTERING FUNCTION, S(X,Z)

X, SIN(THETA/2) /LAMRDA	6 C		7 N		8 O		9 F		10 NE	
	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)
0.00	6.0000+00	0.0000	7.0000+00	0.0000	8.0000+00	0.0000	9.0000+00	0.0000	1.0000+01	0.0000
0.00-03	5.9974+00	3.7900-03	6.9938+00	3.0000-03	7.9974+00	3.0000-03	8.9976+00	2.0000-03	9.9978+00	2.0000-03
1.00-02	5.9898+00	1.2990-02	6.9870+00	1.3000-02	7.9912+00	1.1000-02	8.9919+00	1.0000-02	9.9926+00	9.0000-03
1.50-02	5.9771+00	2.9534-02	6.9793+00	2.9200-02	7.9814+00	2.5300-02	8.9831+00	2.2400-02	9.9845+00	2.0100-02
2.00-02	5.9594+00	5.1640-02	6.9533+00	5.1700-02	7.9669+00	4.4800-02	8.9699+00	3.9700-02	9.9724+00	3.5700-02
2.50-02	5.9368+00	8.0494-02	6.9428+00	8.0400-02	7.9484+00	6.9800-02	8.9531+00	6.1900-02	9.9570+00	5.5600-02
3.00-02	5.9093+00	1.1570-01	6.9179+00	1.1510-01	7.9259+00	1.0010-01	8.9326+00	8.8800-02	9.9382+00	7.9900-02
4.00-02	5.8406+00	2.0150-02	6.8553+00	2.0170-01	7.8692+00	1.7610-01	8.8808+00	1.5650-01	9.8906+00	1.4190-01
5.00-02	5.7544+00	3.0860-01	6.7760+00	3.1000-01	7.7974+00	2.7100-01	8.8150+00	2.4200-01	9.8300+00	2.1800-01
7.00-02	5.5369+00	5.6877-01	6.5741+00	5.7970-01	7.6117+00	5.1370-01	8.6441+00	4.6100-01	9.6719+00	4.1770-01
9.00-02	5.2702+00	8.7559-01	6.3217+00	9.0420-01	7.3767+00	8.1180-01	8.4255+00	7.3490-01	9.4682+00	6.6940-01
1.00-01	5.1225+00	1.0392+00	6.1844+00	1.0800+00	7.2441+00	9.7700-01	8.3011+00	8.8800-01	9.3515+00	8.1200-01
1.25-01	4.7407+00	1.4476+00	5.7961+00	1.5397+00	6.8748+00	1.4199+00	7.9501+00	1.3084+00	9.0193+00	1.2051+00
1.50-01	4.3310+00	1.8662+00	5.3873+00	2.0030+00	6.4698+00	1.8850+00	7.5573+00	1.7610+00	8.6427+00	1.6376+00
1.75-01	3.9371+00	2.2532+00	4.9692+00	2.4468+00	6.0466+00	2.3497+00	7.1384+00	2.2271+00	8.2330+00	2.0885+00
2.00-01	3.5775+00	2.6041+00	4.5604+00	2.8580+00	5.6197+00	2.7990+00	6.7055+00	2.6910+00	7.8031+00	2.5470+00
2.50-01	2.9614+00	3.1979+00	3.8251+00	3.5586+00	4.8047+00	3.6135+00	5.8475+00	3.5693+00	6.9254+00	3.4417+00
3.00-01	2.5015+00	3.6426+00	3.2184+00	4.0970+00	4.0858+00	4.2930+00	5.0499+00	4.3470+00	6.0764+00	4.2590+00
4.00-01	1.9512+00	4.1837+00	2.3939+00	4.7920+00	3.0031+00	5.2570+00	3.7550+00	5.5520+00	4.6139+00	5.6440+00
5.00-01	1.6856+00	4.4777+00	1.9378+00	5.1820+00	2.3351+00	5.8280+00	2.8701+00	6.3390+00	3.5310+00	6.6400+00
6.00-01	1.5353+00	4.6903+00	1.6948+00	5.4370+00	1.9445+00	6.1750+00	2.3062+00	6.8320+00	2.7864+00	7.3200+00
7.00-01	1.4245+00	4.8778+00	1.5522+00	5.6350+00	1.7132+00	6.4110+00	1.9545+00	7.1510+00	2.2929+00	7.7740+00
8.00-01	1.2064+00	5.0511+00	1.4464+00	5.8090+00	1.5667+00	6.5960+00	1.7326+00	7.3760+00	1.9688+00	8.0850+00
9.00-01	1.2165+00	5.2085+00	1.3521+00	5.9680+00	1.4623+00	6.7550+00	1.5863+00	7.5520+00	1.7540+00	8.3120+00
1.00+00	1.1121+00	5.3485+00	1.2620+00	6.1130+00	1.3763+00	6.9010+00	1.4810+00	7.7030+00	1.6073+00	8.4900+00
1.25+00	8.6482-01	5.6153+00	1.0456+00	6.4157+00	1.1820+00	7.2159+00	1.2872+00	8.0243+00	1.3789+00	8.8361+00
1.50+00	6.5652-01	5.7806+00	8.3780-01	6.6300+00	9.9610-01	7.4620+00	1.1192+00	8.2880+00	1.2174+00	9.1130+00
2.00+00	3.7202-01	5.9302+00	5.2370-01	6.8599+00	6.7200-01	7.7642+00	8.0800-01	8.6479+00	9.2660-01	9.5175+00
2.50+00	2.1465-01	5.9770+00	3.2340-01	6.9470+00	4.4170-01	7.8999+00	5.6210-01	8.8345+00	6.7810-01	9.7522+00
3.00+00	1.2832-01	5.9917+00	2.2750-01	6.9790+00	3.1840-01	7.9570+00	4.1543-01	8.9230+00	5.1360-01	9.8750+00
3.50+00	8.0452-02	5.9968+00	1.3170-01	6.9913+00	1.9510-01	7.9807+00	2.6870-01	8.9631+00	3.4910-01	9.9368+00
4.00+00	5.2330-02	5.9986+00	1.0200-01	6.9960+00	1.5240-01	7.9910+00	2.1190-01	8.9820+00	2.7820-01	9.9670+00
5.00+00	2.4330-02	5.9997+00	4.2500-02	6.9991+00	6.6900-02	7.9977+00	9.8200-02	8.9951+00	1.3630-01	9.9906+00
6.00+00	1.2650-02	5.9999+00	2.2500-02	6.9998+00	3.6500-02	7.9993+00	5.4700-02	8.9985+00	7.7900-02	9.9969+00
7.00+00	7.1471-03	6.0000+00	1.3100-02	6.9999+00	2.1100-02	7.9998+00	3.2500-02	8.9995+00	4.6900-02	9.9989+00
8.00+00	4.3194-03	6.0001+00	1.0100-02	7.0000+00	1.5800-02	8.0000+00	2.4700-02	9.0000+00	3.5800-02	1.0000+01
1.00+01	1.8364-03	6.0000+00	4.1000-03	7.0000+00	5.2000-03	8.0000+00	9.1000-03	9.0000+00	1.3600-02	1.0000+01
1.50+01	3.7767-04	6.0000+00	7.6112-04	7.0000+00	1.2872-03	8.0000+00	2.0493-03	9.0000+00	3.0746-03	1.0000+01
2.00+01	1.2157-04	6.0000+00	2.4632-04	7.0000+00	4.1908-04	8.0000+00	6.6893-04	9.0000+00	1.0151-03	1.0000+01
5.00+01	3.2336-06	6.0000+00	6.6244-06	7.0000+00	1.1387-05	8.0000+00	1.8379-05	9.0000+00	2.8225-05	1.0000+01
8.00+01	5.0734-07	6.0000+00	1.0425-06	7.0000+00	1.8006-06	8.0000+00	2.9203-06	9.0000+00	4.5067-06	1.0000+01
1.00+02	2.1123-07	6.0000+00	4.3523-07	7.0000+00	7.5371-07	8.0000+00	1.2256-06	9.0000+00	1.8966-06	1.0000+01
1.00+03	3.5964-11	6.0000+00	7.8875-11	7.0000+00	1.4474-10	8.0000+00	2.4844-10	9.0000+00	4.0445-10	1.0000+01
1.00+05	1.6609-20	6.0000+00	3.9694-20	7.0000+00	7.8204-20	8.0000+00	1.4260-19	9.0000+00	2.4468-19	1.0000+01
1.00+09	1.6810-29	6.0000+00	4.0375-29	7.0000+00	7.9997-29	8.0000+00	1.4680-28	9.0000+00	2.5368-28	1.0000+01

TABLE I.. CONT. ATOMIC FORM FACTOR, F(X,Z), AND INCOHERENT SCATTERING FUNCTION, S(X,Z)

X. SIN(THETA/2) /LAMBDA	11 NA		12 MG		13 AL		14 SI		15 P	
	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)
0.00	1.1000+01	0.0000	1.2000+01	0.0000	1.3000+01	0.0000	1.4000+01	0.0000	1.5000+01	0.0000
5.00-03	1.0989+01	9.0000-03	1.1991+01	1.0000-02	1.2992+01	1.0000-02	1.3993+01	9.0000-03	1.4993+01	8.0000-03
1.00-02	1.0975+01	3.6000-02	1.1975+01	4.0000-02	1.2974+01	3.9000-02	1.3975+01	3.5000-02	1.4976+01	3.2000-02
1.50-02	1.0956+01	7.9300-02	1.1951+01	8.9700-02	1.2945+01	8.7100-02	1.3946+01	7.9000-02	1.4949+01	7.1200-02
2.00-02	1.0922+01	1.3780-01	1.1914+01	1.5720-01	1.2903+01	1.5300-01	1.3905+01	1.3910-01	1.4909+01	1.2560-01
2.50-02	1.0880+01	2.0920-01	1.1867+01	2.4110-01	1.2849+01	2.3530-01	1.3852+01	2.1480-01	1.4859+01	1.9440-01
3.00-02	1.0829+01	2.9120-01	1.1811+01	3.3930-01	1.2785+01	3.3250-01	1.3788+01	3.0490-01	1.4798+01	2.7660-01
4.00-02	1.0709+01	4.7640-01	1.1673+01	5.7020-01	1.2628+01	5.6420-01	1.3631+01	5.2290-01	1.4646+01	4.7730-01
5.00-02	1.0573+01	6.7400-01	1.1505+01	8.3100-01	1.2439+01	8.3200-01	1.3439+01	7.8200-01	1.4458+01	7.1930-01
7.00-02	1.0248+01	1.0490+00	1.1114+01	1.3721+00	1.1984+01	1.4192+00	1.2966+01	1.3724+00	1.3989+01	1.2840+00
9.00-02	9.9188+00	1.3642+00	1.0685+01	1.8578+00	1.1481+01	1.9967+00	1.2423+01	1.9915+00	1.3433+01	1.8986+00
1.00-01	9.7560+00	1.5030+00	1.0454+01	2.0660+00	1.1225+01	2.2640+00	1.2139+01	2.2930+00	1.3135+01	2.2060+00
1.25-01	9.3796+00	1.8282+00	9.9571+00	2.4913+00	1.0610+01	2.8508+00	1.1432+01	2.9884+00	1.2371+01	2.9435+00
1.50-01	9.0209+00	2.1600+00	9.4723+00	2.8290+00	1.0054+01	3.3240+00	1.0769+01	3.5870+00	1.1623+01	3.6110+00
1.75-01	8.6804+00	2.5155+00	9.0948+00	3.1355+00	9.5711+00	3.7123+00	1.0179+01	4.0921+00	1.0934+01	4.2057+00
2.00-01	8.3376+00	2.8910+00	8.7133+00	3.4440+00	9.1552+00	4.0470+00	9.6693+00	4.5200+00	1.0320+01	4.7320+00
2.50-01	7.6159+00	3.6672+00	8.0746+00	4.0957+00	8.4606+00	4.6534+00	8.8521+00	5.2175+00	9.3268+00	5.6106+00
3.00-01	6.8774+00	4.4310+00	7.4307+00	4.7710+00	7.8674+00	5.2500+00	8.2232+00	5.8080+00	8.5909+00	6.3120+00
4.00-01	5.4647+00	5.8040+00	6.1879+00	6.0640+00	6.7617+00	6.4350+00	7.1977+00	6.9330+00	7.5406+00	7.4350+00
5.00-01	4.2890+00	6.9030+00	5.0315+00	7.1810+00	5.6864+00	7.5230+00	6.2324+00	7.9370+00	6.6672+00	8.4190+00
6.00-01	3.3942+00	7.7240+00	4.0519+00	8.0860+00	4.7049+00	8.4590+00	5.3031+00	8.6700+00	5.8182+00	9.3230+00
7.00-01	2.7488+00	8.3130+00	3.2864+00	8.7840+00	3.8742+00	9.2250+00	4.4610+00	9.6670+00	5.0079+00	1.0131+01
8.00-01	2.2994+00	8.7290+00	2.7203+00	9.3040+00	3.2115+00	9.8300+00	3.7411+00	1.0330+01	4.2732+00	1.0827+01
9.00-01	1.9924+00	9.0280+00	2.3132+00	9.6890+00	2.7041+00	1.0296+01	3.1541+00	1.0864+01	3.6377+00	1.1411+01
1.00+00	1.7819+00	9.2520+00	2.0213+00	9.9750+00	2.3248+00	1.0652+01	2.6922+00	1.1286+01	3.1100+00	1.1888+01
1.25+00	1.4761+00	9.6465+00	1.5958+00	1.0449+01	1.7537+00	1.1233+01	1.9595+00	1.1990+01	2.2160+00	1.2716+01
1.50+00	1.3052+00	9.9390+00	1.3933+00	1.0766+01	1.4812+00	1.1592+01	1.5925+00	1.2408+01	1.7379+00	1.3209+01
2.00+00	1.0300+00	1.0376+01	1.1178+00	1.1229+01	1.1924+00	1.2083+01	1.2604+00	1.2937+01	1.3287+00	1.3790+01
2.50+00	7.8800-01	1.0654+01	8.8840-01	1.1543+01	9.7550-01	1.2425+01	1.0513+00	1.3302+01	1.1174+00	1.4177+01
3.00+00	6.1170-01	1.0813+01	7.0600-01	1.1738+01	7.9310-01	1.2652+01	8.7250-01	1.3558+01	9.4450-01	1.4457+01
3.50+00	4.3540-01	1.0900+01	5.2360-01	1.1852+01	6.1070-01	1.2794+01	6.9360-01	1.3726+01	7.7170-01	1.4650+01
4.00+00	3.5040-01	1.0946+01	4.2650-01	1.1916+01	5.0250-01	1.2879+01	5.7740-01	1.3832+01	6.5000-01	1.4778+01
5.00+00	1.8030-01	1.0983+01	2.3240-01	1.1972+01	2.8600-01	1.2957+01	3.4500-01	1.3937+01	4.0650-01	1.4911+01
6.00+00	1.0600-01	1.0994+01	1.3950-01	1.1990+01	1.7660-01	1.2984+01	2.1890-01	1.3975+01	2.6380-01	1.4963+01
7.00+00	6.5300-02	1.0998+01	8.7100-02	1.1996+01	1.1300-01	1.2993+01	1.4160-01	1.3990+01	1.7410-01	1.4984+01
8.00+00	4.5900-02	1.0995+01	6.7000-02	1.1998+01	8.7000-02	1.2997+01	1.0960-01	1.3995+01	1.3540-01	1.4993+01
1.00+01	1.9000-02	1.1000+01	2.6800-02	1.2000+01	3.4900-02	1.2999+01	4.5600-02	1.3999+01	5.7900-02	1.4998+01
1.50+01	4.4431-03	1.1000+01	6.2022-03	1.2000+01	8.4081-03	1.3000+01	1.1116-02	1.4000+01	1.4380-02	1.5000+01
2.00+01	1.4786-03	1.1000+01	2.0816-03	1.2000+01	2.8477-03	1.3000+01	3.8011-03	1.4000+01	4.9671-03	1.5000+01
5.00+01	4.1635-05	1.1000+01	5.9409-05	1.2000+01	8.2435-05	1.3000+01	1.1169-04	1.4000+01	1.4826-04	1.5000+01
8.00+01	6.6813-06	1.1000+01	9.5822-06	1.2000+01	1.3365-06	1.3000+01	1.8205-05	1.4000+01	2.4296-05	1.5000+01
1.00+02	2.8192-06	1.1000+01	4.0541-06	1.2000+01	5.6698-06	1.3000+01	7.7437-06	1.4000+01	1.0362-05	1.5000+01
1.00+03	6.3068-10	1.1000+01	9.4897-10	1.2000+01	1.3856-09	1.3000+01	1.9718-09	1.4000+01	2.7444-09	1.5000+01
1.00+06	3.9979-19	1.1000+01	6.2746-19	1.2000+01	9.5230-19	1.3000+01	1.4048-18	1.4000+01	2.0226-18	1.5000+01
1.00+09	4.1774-28	1.1000+01	6.6127-28	1.2000+01	1.0130-27	1.3000+01	1.5094-27	1.4000+01	2.1966-27	1.5000+01

TABLE I.. CONT. ATOMIC FORM FACTOR,  $F(X,Z)$ , AND INCOHERENT SCATTERING FUNCTION,  $S(X,Z)$ 

$X, \lambda$ / $\lambda$	16 S		17 CL		18 AR		19 K		20 CA	
	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$
0.00	1.6000+01	0.0000	1.7000+01	0.0000	1.8000+01	0.0000	1.9000+01	0.0000	2.0000+01	0.0000
5.00-03	1.5994+01	7.0000-03	1.6994+01	7.0000-03	1.7994+01	6.0000-03	1.8994+01	1.6000-02	1.9988+01	1.8000-02
1.00-02	1.5978+01	2.9000-02	1.6979+01	2.6000-02	1.7980+01	2.4000-02	1.8961+01	6.2000-02	1.9957+01	7.2000-02
1.50-02	1.5952+01	6.4600-02	1.6954+01	5.9000-02	1.7957+01	5.4200-02	1.8916+01	1.3770-01	1.9907+01	1.5980-01
2.00-02	1.5914+01	1.1420-01	1.6919+01	1.0430-01	1.7924+01	9.5900-02	1.8853+01	2.3780-01	1.9837+01	2.7810-01
2.50-02	1.5866+01	1.7700-01	1.6874+01	1.6200-01	1.7881+01	1.4910-01	1.8774+01	3.5840-01	1.9748+01	4.2300-01
3.00-02	1.5808+01	2.5260-01	1.6819+01	2.3160-01	1.7829+01	2.1330-01	1.8681+01	4.9460-01	1.9643+01	5.8970-01
4.00-02	1.5664+01	4.3880-01	1.6682+01	4.0410-01	1.7699+01	3.7310-01	1.8459+01	7.9450-01	1.9388+01	9.6850-01
5.00-02	1.5483+01	6.6600-01	1.6510+01	6.1700-01	1.7535+01	5.7100-01	1.8202+01	1.1050+00	1.9088+01	1.3750+00
7.00-02	1.5027+01	1.2127+00	1.6070+01	1.1378+00	1.7111+01	1.0626+00	1.7625+01	1.6922+00	1.8398+01	2.1575+00
9.00-02	1.4474+01	1.8313+00	1.5528+01	1.7444+00	1.6588+01	1.6445+00	1.7026+01	2.2326+00	1.7675+01	2.8172+00
1.00-01	1.4172+01	2.1510+00	1.5229+01	2.0650+00	1.6295+01	1.9560+00	1.6725+01	2.5000+00	1.7319+01	3.1050+00
1.25-01	1.3378+01	2.9397+00	1.4425+01	2.8770+00	1.5494+01	2.7602+00	1.5983+01	3.1897+00	1.6483+01	3.7618+00
1.50-01	1.2574+01	3.6800+00	1.3587+01	3.6650+00	1.4639+01	3.5800+00	1.5237+01	3.9050+00	1.5714+01	4.4010+00
1.75-01	1.1805+01	4.3545+00	1.2762+01	4.4002+00	1.3776+01	4.3202+00	1.4477+01	4.6163+00	1.4990+01	5.0477+00
2.00-01	1.1099+01	4.9600+00	1.1980+01	5.0740+00	1.2937+01	5.0330+00	1.3715+01	5.3010+00	1.4293+01	5.6900+00
2.50-01	9.9162+00	5.9838+00	1.0621+01	6.2395+00	1.1428+01	6.3030+00	1.2254+01	6.5550+00	1.2947+01	6.8993+00
3.00-01	9.0285+00	6.7950+00	9.5646+00	7.1820+00	1.0204+01	7.3770+00	1.0963+01	7.6520+00	1.1689+01	7.9810+00
4.00-01	7.8477+00	8.0020+00	8.1686+00	8.5530+00	8.5424+00	8.9980+00	9.0418+00	9.4050+00	9.6295+00	9.7900+00
5.00-01	7.0114+00	8.9600+00	7.2976+00	9.5390+00	7.5635+00	1.0106+01	7.8720+00	1.0650+01	8.2524+00	1.1157+01
6.00-01	6.2418+00	9.8290+00	6.5848+00	1.0382+01	6.8649+00	1.0967+01	7.1166+00	1.1568+01	7.3767+00	1.2163+01
7.00-01	5.4892+00	1.0626+01	5.8982+00	1.1158+01	6.2366+00	1.1726+01	6.5109+00	1.2329+01	6.7498+00	1.2953+01
8.00-01	4.7754+00	1.1336+01	5.2273+00	1.1867+01	5.6196+00	1.2424+01	5.9399+00	1.3014+01	6.2055+00	1.3635+01
9.00-01	4.1262+00	1.1952+01	4.5915+00	1.2499+01	5.0165+00	1.3061+01	5.3789+00	1.3645+01	5.6909+00	1.4256+01
1.00+00	3.5583+00	1.2472+01	4.0097+00	1.3050+01	4.4433+00	1.3629+01	4.8543+00	1.4220+01	5.1814+00	1.4830+01
1.25+00	2.5200+00	1.3414+01	2.8628+00	1.4088+01	3.2318+00	1.4745+01	3.6100+00	1.5393+01	3.9821+00	1.6038+01
1.50+00	1.9280+00	1.3990+01	2.1551+00	1.4750+01	2.4170+00	1.5489+01	2.6907+00	1.6212+01	3.0020+00	1.6921+01
2.00+00	1.4044+00	1.4641+01	1.4941+00	1.5487+01	1.6034+00	1.6324+01	1.7353+00	1.7152+01	1.8918+00	1.7970+01
2.50+00	1.1769+00	1.5051+01	1.2340+00	1.5924+01	1.2929+00	1.6795+01	1.3577+00	1.7664+01	1.4319+00	1.8531+01
3.00+00	1.0101+00	1.5351+01	1.0711+00	1.6243+01	1.1298+00	1.7132+01	1.1899+00	1.8020+01	1.2501+00	1.8906+01
3.50+00	8.4330-01	1.5567+01	9.0820-01	1.6479+01	9.6680-01	1.7386+01	1.0201+00	1.8290+01	1.0664+00	1.9191+01
4.00+00	7.1810-01	1.5716+01	7.8160-01	1.6648+01	8.4090-01	1.7573+01	8.9610-01	1.8494+01	9.4730-01	1.9411+01
5.00+00	4.6780-01	1.5880+01	5.2830-01	1.6843+01	5.8900-01	1.7800+01	6.4820-01	1.8524+01	7.0510-01	1.9698+01
6.00+00	3.0980-01	1.5948+01	3.6140-01	1.6930+01	4.1250-01	1.7907+01	4.8880+01	1.8880+01	5.1450-01	1.9849+01
7.00+00	2.0980-01	1.5977+01	2.4680-01	1.6968+01	2.8730-01	1.7956+01	3.2960-01	1.8941+01	3.7220-01	1.9924+01
8.00+00	1.6410-01	1.5989+01	1.9360-01	1.6985+01	2.2680-01	1.7978+01	2.6140-01	1.8970+01	2.9720-01	1.9961+01
1.00+01	7.2600-02	1.5997+01	8.7300-02	1.6996+01	1.0570-01	1.7994+01	1.2510-01	1.8992+01	1.4720-01	1.9999+01
1.50+01	1.8250-02	1.6000+01	2.2774-02	1.7000+01	2.7995-02	1.8000+01	3.3951-02	1.8999+01	4.0674-02	1.9999+01
2.00+01	6.3710-03	1.6000+01	8.0384-03	1.7000+01	9.9948-03	1.8000+01	1.2265-02	1.9000+01	1.4874-02	2.0000+01
5.00+01	1.9331-04	1.6000+01	2.4812-04	1.7000+01	3.1404-04	1.8000+01	3.9257-04	1.9000+01	4.8526-04	2.0000+01
8.00+01	3.1852-05	1.6000+01	4.1111-05	1.7000+01	5.2330-05	1.8000+01	6.5794-05	1.9000+01	8.1809-05	2.0000+01
1.00+02	1.3622-05	1.6000+01	1.7629-05	1.7000+01	2.2502-05	1.8000+01	2.8363-05	1.9000+01	3.5572-05	2.0000+01
1.00+03	3.7466-09	1.6000+01	5.0284-09	1.7000+01	6.6477-09	1.8000+01	8.6710-09	1.9000+01	1.1174-08	2.0000+01
1.00+06	2.8515-18	1.6000+01	3.9472-18	1.7000+01	5.3767-18	1.8000+01	7.2206-18	1.9000+01	9.5751-18	2.0000+01
1.00+09	3.1327-27	1.6000+01	4.3899-27	1.7000+01	6.0580-27	1.8000+01	8.2482-27	1.9000+01	1.1098-26	2.0000+01

TABLE I.. CONT. ATOMIC FORM FACTOR, F(X,Z), AND INCOHERENT SCATTERING FUNCTION, S(X,Z)

X, SIN(THETA/2) /LAMBDA	21 SC		22 TI		23 V		24 CR		25 MN	
	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)
0.00	2.1000+01	0.0000	2.2000+01	0.0000	2.3000+01	0.0000	2.4000+01	0.0000	2.5000+01	0.0000
5.00-03	2.0987+01	1.7000-02	2.1986+01	1.6000-02	2.2985+01	1.5000-02	2.3985+01	1.2000-02	2.4984+01	1.3000-02
1.00-02	2.0958+01	6.7000-02	2.1959+01	6.3000-02	2.2959+01	5.9000-02	2.3964+01	4.6000-02	2.4961+01	5.2000-02
1.50-02	2.0913+01	1.4880-01	2.1918+01	1.3910-01	2.2922+01	1.3070-01	2.3934+01	1.0350-01	2.4929+01	1.1670-01
2.00-02	2.0846+01	2.5970-01	2.1855+01	2.4320-01	2.2862+01	2.2870-01	2.3884+01	1.8140-01	2.4875+01	2.0470-01
2.50-02	2.0762+01	3.9630-01	2.1775+01	3.7200-01	2.2786+01	3.5060-01	2.3820+01	2.7840-01	2.4806+01	3.1460-01
3.00-02	2.0662+01	5.5670-01	2.1680+01	5.2300-01	2.2695+01	4.9320-01	2.3744+01	3.9220-01	2.4723+01	4.4410-01
4.00-02	2.0418+01	9.2000-01	2.1447+01	8.7210-01	2.2473+01	8.2790-01	2.3555+01	6.6090-01	2.4518+01	7.5130-01
5.00-02	2.0130+01	1.3210+00	2.1171+01	1.2630+00	2.2208+01	1.2060+00	2.3331+01	9.6900-01	2.4274+01	1.1040+00
7.00-02	1.9446+01	2.1220+00	2.0501+01	2.0626+00	2.1557+01	1.9964+00	2.2765+01	1.6312+00	2.3660+01	1.8663+00
9.00-02	1.8712+01	2.8255+00	1.9769+01	2.7890+00	2.0833+01	2.7329+00	2.2121+01	2.2908+00	2.2962+01	2.6055+00
1.00-01	1.8341+01	3.1360+00	1.9395+01	3.1140+00	2.0460+01	3.0670+00	2.1783+01	2.5090+00	2.2598+01	2.9490+00
1.25-01	1.7458+01	3.8342+00	1.8485+01	3.8456+00	1.9535+01	3.8196+00	2.0902+01	3.372+00	2.1665+01	3.7283+00
1.50-01	1.6632+01	4.4920+00	1.7618+01	4.5230+00	1.8639+01	4.5100+00	2.0005+01	4.1230+00	2.0739+01	4.4350+00
1.75-01	1.5859+01	5.1478+00	1.6806+01	5.1927+00	1.7798+01	5.1849+00	1.9125+01	4.8573+00	1.9859+01	5.1155+00
2.00-01	1.5125+01	5.8010+00	1.6035+01	5.8600+00	1.6993+01	5.8580+00	1.8254+01	5.5770+00	1.9000+01	5.7910+00
2.50-01	1.3716+01	7.0456+00	1.4555+01	7.1436+00	1.5447+01	7.1673+00	1.6546+01	6.9475+00	1.7349+01	7.1216+00
3.00-01	1.2402+01	8.1690+00	1.3174+01	8.3120+00	1.4001+01	8.3750+00	1.4943+01	8.2060+00	1.5786+01	8.3800+00
4.00-01	1.0206+01	1.0071+01	1.0829+01	1.0304+01	1.1503+01	1.0454+01	1.2196+01	1.0415+01	1.2997+01	1.0604+01
5.00-01	8.6621+00	1.1561+01	9.1224+00	1.1901+01	9.6340+00	1.2154+01	1.0153+01	1.2264+01	1.0809+01	1.2486+01
6.00-01	7.6596+00	1.2684+01	7.9786+00	1.3140+01	8.3415+00	1.3514+01	8.7237+00	1.3770+01	9.2101+00	1.4062+01
7.00-01	6.9801+00	1.3545+01	7.2173+00	1.4093+01	7.4767+00	1.4574+01	7.7597+00	1.4960+01	8.0983+00	1.5346+01
8.00-01	6.4429+00	1.4256+01	6.6571+00	1.4856+01	6.8683+00	1.5413+01	7.0886+00	1.5902+01	7.3331+00	1.6376+01
9.00-01	5.9519+00	1.4885+01	6.1785+00	1.5509+01	6.3834+00	1.6111+01	6.5814+00	1.6670+01	6.7782+00	1.7211+01
1.00+00	5.4734+00	1.5460+01	5.7254+00	1.6095+01	5.9460+00	1.6721+01	6.1459+00	1.7323+01	6.3312+00	1.7910+01
1.25+00	4.3195+00	1.6694+01	4.6267+00	1.7353+01	4.9020+00	1.8010+01	5.1422+00	1.8668+01	5.3640+00	1.9312+01
1.50+00	3.3155+00	1.7630+01	3.6237+00	1.8334+01	3.9191+00	1.9032+01	4.1894+00	1.9730+01	4.4528+00	2.0411+01
2.00+00	2.0692+00	1.8782+01	2.2651+00	1.9585+01	2.4755+00	2.2037+01	2.6915+00	2.1168+01	2.9220+00	2.1938+01
2.50+00	1.5185+00	1.9397+01	1.6190+00	2.0259+01	1.7340+00	2.1116+01	1.8618+00	2.1970+01	2.0055+00	2.2812+01
3.00+00	1.3165+00	1.9794+01	1.3893+00	2.0682+01	1.4691+00	2.1569+01	1.5562+00	2.2456+01	1.6531+00	2.3337+01
3.50+00	1.1145+00	2.0093+01	1.1596+00	2.0994+01	1.2042+00	2.1896+01	1.2507+00	2.2798+01	1.3007+00	2.3698+01
4.00+00	9.9580-01	2.0326+01	1.0424+00	2.1239+01	1.0879+00	2.2152+01	1.1335+00	2.3065+01	1.1806+00	2.3976+01
5.00+00	7.5850-01	2.0641+01	8.0800-01	2.1580+01	6.5540-01	2.2515+01	8.9940-01	2.3449+01	9.4040-01	2.4380+01
6.00+00	5.6670-01	2.0813+01	6.1520-01	2.1774+01	6.6180-01	2.2732+01	7.0863-01	2.3686+01	7.5350-01	2.4636+01
7.00+00	4.1560-01	2.0903+01	4.6030-01	2.1879+01	5.0510-01	2.2853+01	5.4760-01	2.3823+01	5.9030-01	2.4790+01
8.00+00	3.3380-01	2.0949+01	3.7120-01	2.1935+01	4.0990-01	2.2919+01	4.4730-01	2.3900+01	4.8470-01	2.4879+01
1.00+01	1.7030-01	2.0985+01	1.9310-01	2.1980+01	2.1950-01	2.2974+01	2.4660-01	2.3967+01	2.7360-01	2.4959+01
1.50+01	4.8192-02	2.0699+01	5.6526-02	2.1998+01	6.5692-02	2.2998+01	7.5698-02	2.3997+01	8.6549-02	2.4996+01
2.00+01	1.7845-02	2.1000+01	2.1201-02	2.2000+01	2.4962-02	2.3000+01	2.9150-02	2.4000+01	3.3781-02	2.5000+01
5.00+01	5.9379-04	2.1000+01	7.1996-04	2.2000+01	8.5565-04	2.3000+01	1.0329-03	2.4000+01	1.2237-03	2.5000+01
8.00+01	1.0071-04	2.1000+01	1.2285-04	2.2000+01	1.4863-04	2.3000+01	1.7847-04	2.4000+01	2.1283-04	2.5000+01
1.00+02	4.3665-05	2.1000+01	5.3415-05	2.2000+01	6.4806-05	2.3000+01	7.8034-05	2.4000+01	9.3312-05	2.5000+01
1.00+03	1.4245-08	2.1000+01	1.7980-08	2.2000+01	2.2492-08	2.3000+01	2.7906-08	2.4000+01	3.3465-08	2.5000+01
1.00+06	1.2555-17	2.1000+01	1.6297-17	2.2000+01	2.0962-17	2.3000+01	2.6742-17	2.4000+01	3.3862-17	2.5000+01
1.00+09	1.4775-26	2.1000+01	1.9489-26	2.2000+01	2.5492-26	2.3000+01	3.3097-26	2.4000+01	4.2685-26	2.5000+01



TABLE I.. CONT. ATOMIC FORM FACTOR, F(X,Z), AND INCOHERENT SCATTERING FUNCTION, S(X,Z)

X, SIN(THETA/2) /LAMBDA	31 GA		32 GE		33 AS		34 SE		35 BR	
	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)
0.00	3.1000+01	0.0000	3.2000+01	0.0000	3.3000+01	0.0000	3.4000+01	0.0000	3.5000+01	0.0000
0.00-03	3.0979+01	1.1000-02	3.1983+01	1.1000-02	3.2986+01	1.0000-02	3.3989+01	1.0000-02	3.4990+01	9.0000-03
1.00-02	3.0957+01	4.4000-02	3.1960+01	4.2000-02	3.2963+01	4.0000-02	3.3936+01	3.8000-02	3.4967+01	3.6000-02
1.50-02	3.0932+01	9.8200-02	3.1931+01	9.4900-02	3.2931+01	9.0300-02	3.3932+01	8.5000-02	3.4933+01	8.1700-02
2.00-02	3.0881+01	1.7270-01	3.1877+01	1.6710-01	3.2877+01	1.5930-01	3.3879+01	1.5170-01	3.4881+01	1.4450-01
3.00-02	3.0815+01	2.6630-01	3.1809+01	2.5820-01	3.2809+01	2.4630-01	3.3811+01	2.3500-01	3.4815+01	2.2410-01
4.00-02	3.0735+01	3.7730-01	3.1727+01	3.6670-01	3.2726+01	3.5040-01	3.3730+01	3.3500-01	3.4735+01	3.2000-01
5.00-02	3.0639+01	6.4440-01	3.1523+01	6.3000-01	3.2521+01	6.0410-01	3.3525+01	5.8060-01	3.4534+01	5.5660-01
6.00-02	3.0530+01	9.5900-01	3.1275+01	9.4400-01	3.2268+01	9.0900-01	3.3272+01	8.7900-01	3.4283+01	8.4600-01
7.00-02	2.9706+01	1.6724+00	3.0645+01	1.6691+00	3.1625+01	1.6212+00	3.2628+01	1.5904+00	3.3642+01	1.5477+00
8.00-02	2.9016+01	2.4218+00	2.9907+01	2.4486+00	3.0859+01	2.3995+00	3.1847+01	2.3883+00	3.2856+01	2.3509+00
1.00-01	2.8657+01	2.7910+00	2.9519+01	2.8390+00	3.0450+01	2.7930+00	3.1424+01	2.7990+00	3.2425+01	2.7710+00
1.25-01	2.7703+01	3.6726+00	2.8491+01	3.7810+00	2.9361+01	3.7577+00	3.0290+01	3.8175+00	3.1260+01	3.8262+00
1.50-01	2.6740+01	4.4830+00	2.7460+01	4.6590+00	2.8260+01	4.6750+00	2.9127+01	4.7940+00	3.0047+01	4.8510+00
1.75-01	2.5819+01	5.2326+00	2.6478+01	5.4723+00	2.7201+01	5.5432+00	2.7993+01	5.7172+00	2.8846+01	5.8261+00
2.00-01	2.4907+01	5.9390+00	2.5527+01	6.2290+00	2.6187+01	6.3650+00	2.6908+01	6.5890+00	2.7690+01	6.7480+00
2.50-01	2.3157+01	7.2874+00	2.3761+01	7.6188+00	2.4346+01	7.8777+00	2.4953+01	8.1861+00	2.5601+01	8.4425+00
3.00-01	2.1473+01	8.5990+00	2.2118+01	8.9120+00	2.2695+01	9.2360+00	2.3249+01	9.6010+00	2.3808+01	9.9400+00
4.00-01	1.8246+01	1.1082+01	1.9014+01	1.1338+01	1.9691+01	1.1658+01	2.0289+01	1.2033+01	2.0829+01	1.2440+01
5.00-01	1.5374+01	1.3290+01	1.6192+01	1.3538+01	1.6951+01	1.3828+01	1.7642+01	1.4168+01	1.8262+01	1.4552+01
6.00-01	1.2951+01	1.5233+01	1.3723+01	1.5886+01	1.4485+01	1.5775+01	1.5216+01	1.6098+01	1.5902+01	1.6456+01
7.00-01	1.1011+01	1.6947+01	1.1679+01	1.7215+01	1.2374+01	1.7511+01	1.3075+01	1.7835+01	1.3765+01	1.8185+01
8.00-01	9.5351+00	1.8445+01	1.0077+01	1.8741+01	1.0663+01	1.9056+01	1.1281+01	1.9391+01	1.1918+01	1.9747+01
9.00-01	8.4473+00	1.9734+01	8.8673+00	2.0074+01	9.3346+00	2.0420+01	9.8452+00	2.0778+01	1.0391+01	2.1149+01
1.00+00	7.6499+00	2.0831+01	7.9681+00	2.1224+01	8.3277+00	2.1612+01	8.7306+00	2.2003+01	9.1754+00	2.2399+01
1.25+00	6.3821+00	2.2907+01	6.5559+00	2.3430+01	6.7470+00	2.3938+01	6.9608+00	2.4434+01	7.2023+00	2.4920+01
1.50+00	5.5837+00	2.4370+01	5.7274+00	2.4983+01	5.8649+00	2.5583+01	6.0025+00	2.6171+01	6.1467+00	2.6747+01
2.00+00	4.1907+00	2.6400+01	4.3732+00	2.7109+01	4.5438+00	2.7810+01	4.7024+00	2.8504+01	4.8492+00	2.9190+01
2.50+00	3.0276+00	2.7710+01	3.2108+00	2.8492+01	3.3924+00	2.9264+01	3.5702+00	3.0028+01	3.7426+00	3.0785+01
3.00+00	2.3274+00	2.8536+01	2.5178+00	2.9377+01	2.6608+00	3.0209+01	2.8054+00	3.1034+01	2.9508+00	3.1850+01
3.50+00	1.7272+00	2.9067+01	1.8247+00	2.9947+01	1.9292+00	3.0822+01	2.0407+00	3.1691+01	2.1591+00	3.2554+01
4.00+00	1.5348+00	2.9436+01	1.6112+00	3.0340+01	1.6926+00	3.1241+01	1.7793+00	3.2137+01	1.8714+00	3.3030+01
5.00+00	1.1500+00	2.9947+01	1.1843+00	3.0872+01	1.2564+00	3.1796+01	1.2564+00	3.2719+01	1.2961+00	3.3641+01
6.00+00	9.7330-01	3.0297+01	1.0039+00	3.1236+01	1.0330+00	3.2173+01	1.0618+00	3.3109+01	1.0902+00	3.4045+01
7.00+00	8.1820-01	3.0541+01	8.5260-01	3.1492+01	8.8600-01	3.2442+01	9.1610-01	3.3390+01	9.4180-01	3.4337+01
8.00+00	6.9690-01	3.0705+01	7.3070-01	3.1668+01	7.6290-01	3.2629+01	7.9300-01	3.3589+01	8.2020-01	3.4547+01
1.00+01	4.5420-01	3.0879+01	4.8680-01	3.1860+01	5.1660-01	3.2840+01	5.4680-01	3.3818+01	5.7690-01	3.4794+01
1.50+01	1.6889-01	3.0985+01	1.8530-01	3.1982+01	2.0242-01	3.2979+01	2.2019-01	3.3975+01	2.3858-01	3.4970+01
2.00+01	7.1690-02	3.0998+01	7.9786-02	3.1997+01	8.8404-02	3.2996+01	9.7545-02	3.3996+01	1.0721-01	3.4995+01
3.00+01	2.9958-03	3.1000+01	3.4198-03	3.2000+01	3.8880-03	3.3000+01	4.4035-03	3.4000+01	4.9695-03	3.5000+01
4.00+01	5.4266-04	3.1000+01	6.2392-04	3.2000+01	7.1454-04	3.3000+01	8.1530-04	3.4000+01	9.2702-04	3.5000+01
5.00+01	2.4219-04	3.1000+01	2.7930-04	3.2000+01	3.2084-04	3.3000+01	3.6722-04	3.4003+01	4.1884-04	3.5000+01
1.00+03	1.0543-07	3.1000+01	1.2488-07	3.2000+01	1.4732-07	3.3000+01	1.7312-07	3.4000+01	2.0271-07	3.5000+01
1.00+06	1.2343-16	3.1000+01	1.5066-16	3.2000+01	1.8324-16	3.3000+01	2.2213-16	3.4000+01	2.6843-16	3.5000+01
1.00+09	1.7654-25	3.1000+01	2.2069-25	3.2000+01	2.7511-25	3.3000+01	3.4207-25	3.4000+01	4.2437-25	3.5000+01

TABLE I., CONT. ATOMIC FORM FACTOR, F(X,Z), AND INCOHERENT SCATTERING FUNCTION, S(X,Z)

X <sub>h</sub> /LAMRDA	36 KR		37 RB		38 SR		39 Y		40 ZR	
	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)
0.00	3.6000+01	0.0000	3.7000+01	0.0000	3.8000+01	0.0000	3.9000+01	0.0000	4.0000+01	0.0000
5.00-03	3.5990+01	9.0000-03	3.6973+01	2.0000-02	3.7972+01	2.3000-02	3.8976+01	2.2000-02	3.9982+01	2.1000-02
1.00-02	3.5969+01	3.5000-02	3.6938+01	7.8000-02	3.7932+01	9.1000-02	3.8937+01	8.7000-02	3.9944+01	8.3000-02
1.50-02	3.5935+01	7.7900-02	3.6889+01	1.7180-01	3.7876+01	2.0230-01	3.8880+01	1.3380-01	3.9884+01	1.8430-01
2.00-02	3.5884+01	1.3770-01	3.6805+01	2.9640-01	3.7781+01	3.5120-01	3.8788+01	3.3770-01	3.9796+01	3.2180-01
2.50-02	3.5819+01	2.1390-01	3.6699+01	4.4620-01	3.7682+01	5.3260-01	3.8672+01	5.1440-01	3.9683+01	4.9160-01
3.00-02	3.5741+01	3.0560-01	3.6575+01	6.1490-01	3.7521+01	7.4000-01	3.8534+01	7.1850-01	3.9545+01	6.8910-01
4.00-02	3.5544+01	5.3270-01	3.6278+01	9.8600-01	3.7180+01	1.2064+00	3.8198+01	1.1857+00	3.9221+01	1.1467+00
5.00-02	3.5297+01	8.1200-01	3.5948+01	1.3720+00	3.6793+01	1.7010+00	3.7807+01	1.5940+00	3.8831+01	1.6540+00
7.00-02	3.4663+01	1.4945+00	3.5146+01	2.1219+00	3.5862+01	2.6420+00	3.6858+01	2.7007+00	3.7889+01	2.6881+00
9.00-02	3.3878+01	2.2858+00	3.4306+01	2.8525+00	3.4894+01	3.4571+00	3.5840+01	3.5939+00	3.6845+01	3.6332+00
1.00-01	3.3444+01	2.7030+00	3.3861+01	3.2250+00	3.4406+01	3.8310+00	3.5322+01	3.9990+00	3.6313+01	4.0640+00
1.25-01	3.2260+01	3.7635+00	3.2775+01	4.1893+00	3.3247+01	4.7378+00	3.4069+01	4.9485+00	3.4995+01	5.0647+00
1.50-01	3.1009+01	4.8050+00	3.1632+01	5.1720+00	3.2113+01	5.6530+00	3.2853+01	5.8740+00	3.3715+01	6.0190+00
1.75-01	2.9752+01	5.8050+00	3.0474+01	6.1346+00	3.1022+01	6.5695+00	3.1708+01	6.7965+00	3.2496+01	6.9586+00
2.00-01	2.8530+01	6.7600+00	2.9327+01	7.0620+00	2.9942+01	7.4640+00	3.0594+01	7.7000+00	3.1322+01	7.8790+00
2.50-01	2.6300+01	8.5457+00	2.7079+01	8.8125+00	2.7794+01	9.1593+00	2.8421+01	9.4127+00	2.9078+01	9.6206+00
3.00-01	2.4394+01	1.0157+01	2.5079+01	1.0431+01	2.5797+01	1.0746+01	2.6399+01	1.1010+01	2.7008+01	1.1236+01
4.00-01	2.1334+01	1.2828+01	2.1862+01	1.3206+01	2.2438+01	1.3576+01	2.2993+01	1.3899+01	2.3518+01	1.4176+01
5.00-01	1.8820+01	1.4969+01	1.9346+01	1.5410+01	1.9859+01	1.5860+01	2.0338+01	1.6279+01	2.0800+01	1.6658+01
6.00-01	1.6535+01	1.6849+01	1.7112+01	1.7282+01	1.7636+01	1.7745+01	1.8134+01	1.8215+01	1.8614+01	1.8672+01
7.00-01	1.4430+01	1.8562+01	1.5044+01	1.8974+01	1.5624+01	1.8420+01	1.6167+01	1.8991+01	1.6688+01	2.0373+01
8.00-01	1.2558+01	2.0123+01	1.3174+01	2.0526+01	1.3776+01	2.0956+01	1.4358+01	2.1416+01	1.4911+01	2.1895+01
9.00-01	1.0963+01	2.1535+01	1.1546+01	2.1940+01	1.2125+01	2.2367+01	1.2709+01	2.2820+01	1.3265+01	2.3294+01
1.00+00	9.6573+00	2.2804+01	1.0174+01	2.3221+01	1.0699+01	2.3654+01	1.1242+01	2.4110+01	1.1778+01	2.4583+01
1.25+00	7.4750+00	2.5401+01	7.7817+00	2.5880+01	8.1220+00	2.6361+01	8.4922+00	2.6849+01	8.8895+00	2.7347+01
1.50+00	6.3025+00	2.7313+01	6.4893+00	2.7871+01	6.6766+00	2.8423+01	6.9156+00	2.8970+01	7.1491+00	2.9517+01
2.00+00	4.9853+00	2.9870+01	5.1121+00	3.0543+01	5.2316+00	3.1210+01	5.3463+00	3.1870+01	5.4595+00	3.2522+01
2.50+00	3.9082+00	3.1534+01	4.0652+00	3.2277+01	4.2129+00	3.3014+01	4.3495+00	3.3745+01	4.4766+00	3.4470+01
3.00+00	3.0959+00	3.2659+01	3.2392+00	3.3461+01	3.3794+00	3.4255+01	3.5145+00	3.5043+01	3.6453+00	3.5825+01
3.50+00	2.2836+00	3.3410+01	2.4132+00	3.4259+01	2.5459+00	3.5103+01	2.6796+00	3.5940+01	2.8139+00	3.6771+01
4.00+00	1.9688+00	3.3919+01	2.0706+00	3.4803+01	2.1758+00	3.5682+01	2.2827+00	3.5557+01	2.3913+00	3.7426+01
5.00+00	1.3391+00	3.5462+01	1.3853+00	3.5482+01	1.4355+00	3.6399+01	1.4890+00	3.7316+01	1.5461+00	3.8230+01
6.00+00	1.1182+00	3.4980+01	1.1464+00	3.5915+01	1.1750+00	3.6848+01	1.2063+00	3.7782+01	1.2386+00	3.8715+01
7.00+00	9.6620-01	3.5283+01	9.9220-01	3.6228+01	1.0188+00	3.7172+01	1.0450+00	3.8116+01	1.0701+00	3.9059+01
8.00+00	8.4600-01	3.5504+01	8.7330-01	3.6459+01	9.0080-01	3.7413+01	9.2710-01	3.8366+01	9.5260-01	3.9318+01
1.00+01	6.0570-01	3.5769+01	6.3560-01	3.6742+01	6.6470-01	3.7713+01	6.9140-01	3.8684+01	7.1750-01	3.9653+01
1.50+01	2.5757-01	3.5965+01	2.7710-01	3.6959+01	2.9713-01	3.7953+01	3.1763-01	3.8946+01	3.3856-01	3.9938+01
2.00+01	1.1739-01	3.5694+01	1.2809-01	3.6992+01	1.3929-01	3.7991+01	1.5099-01	3.8989+01	1.6319-01	3.9987+01
5.00+01	5.5892-03	3.6000+01	6.2659-03	3.7000+01	7.0031-03	3.8000+01	7.8042-03	3.9000+01	8.6730-03	4.0000+01
8.00+01	1.0506-03	3.6000+01	1.1869-03	3.7000+01	1.3370-03	3.8000+01	1.5019-03	3.9000+01	1.6826-03	4.0000+01
1.00+02	4.7617-04	3.6000+01	5.3967-04	3.7000+01	6.0987-04	3.8000+01	6.8728-04	3.9000+01	7.7249-04	4.0000+01
1.00+03	3.2655-07	3.6000+01	2.7517-07	3.7000+01	3.1914-07	3.8000+01	3.6908-07	3.9000+01	4.2572-07	4.0000+01
1.00+06	3.2348-16	3.6000+01	3.8881-16	3.7000+01	4.6621-16	3.8000+01	5.5781-15	3.9000+01	6.6606-16	4.0000+01
1.00+09	5.2541-25	3.6000+01	6.4936-25	3.7000+01	8.0130-25	3.8000+01	9.8745-25	3.9000+01	1.2154-24	4.0000+01



TABLE I. CONT. ATOMIC FORM FACTOR,  $F(X,Z)$ , AND INCOHERENT SCATTERING FUNCTION,  $S(X,Z)$ 

$X/\lambda$	41 NB		42 MO		43 TC		44 RU		45 RH	
	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$
0.00	4.1000+01	0.0000	4.2000+01	0.0000	4.3000+01	0.0000	4.4000+01	0.0000	4.5000+01	0.0000
5.00-03	4.0985+01	1.7000-02	4.1986+01	1.6000-02	4.2985+01	1.8000-02	4.3987+01	1.5000-02	4.4987+01	1.4000-02
1.00-02	4.0951+01	6.8000-02	4.1954+01	6.5000-02	4.2951+01	7.2000-02	4.3957+01	5.9000-02	4.4958+01	5.6000-02
1.50-02	4.0899+01	1.5160-01	4.1902+01	1.4390-01	4.2896+01	1.6000-01	4.3893+01	1.3130-01	4.4892+01	1.2590-01
2.00-02	4.0821+01	2.6520-01	4.1827+01	2.5210-01	4.2816+01	2.8050-01	4.3839+01	2.3050-01	4.4844+01	2.2120-01
2.50-02	4.0722+01	4.0610-01	4.1732+01	3.8680-01	4.2714+01	4.3070-01	4.3749+01	3.5450-01	4.4757+01	3.4050-01
3.00-02	4.0604+01	5.7100-01	4.1618+01	5.4480-01	4.2592+01	6.0720-01	4.3642+01	5.0090-01	4.4652+01	4.8170-01
4.00-02	4.0312+01	9.5760-01	4.1335+01	9.1770-01	4.2291+01	1.0245+00	4.3375+01	8.5020-01	4.4393+01	8.1960-01
5.00-02	3.9960+01	1.3950+00	4.0991+01	1.3440+00	4.1924+01	1.5020+00	4.3048+01	1.2560+00	4.4075+01	1.2150+00
7.00-02	3.9095+01	2.3251+00	4.0141+01	2.2641+00	4.1022+01	2.5267+00	4.2232+01	2.1600+00	4.3275+01	2.1027+00
9.00-02	3.8104+01	3.2356+00	3.9155+01	3.1813+00	3.9982+01	3.5216+00	4.1267+01	3.0961+00	4.2324+01	3.0345+00
1.00-01	3.7578+01	3.6277+01	3.8627+01	3.6250+00	3.9430+01	3.9870+00	4.0744+01	3.5590+00	4.1806+01	3.4990+00
1.25-01	3.6238+01	4.7217+00	3.7267+01	4.6925+00	3.8023+01	5.0656+00	3.9371+01	4.6897+00	4.0436+01	4.6419+00
1.50-01	3.4887+01	5.7350+00	3.5879+01	5.7200+00	3.6613+01	6.0670+00	3.7943+01	5.7830+00	3.8995+01	5.7530+00
1.75-01	3.3557+01	6.7235+00	3.4502+01	6.7197+00	3.5234+01	7.0353+00	3.6497+01	6.8398+00	3.7530+01	6.8283+00
2.00-01	3.2266+01	7.6840+00	3.3156+01	7.6900+00	3.3897+01	7.9840+00	3.5066+01	7.8570+00	3.6069+01	7.8630+00
2.50-01	2.9815+01	9.5075+00	3.0599+01	9.5324+00	3.1353+01	9.8065+00	3.2308+01	9.7646+00	3.3224+01	9.8021+00
3.00-01	2.7604+01	1.1213+01	2.8288+01	1.1260+01	2.9024+01	1.1512+01	2.9786+01	1.1531+01	3.0599+01	1.1591+01
4.00-01	2.3980+01	1.4317+01	2.4506+01	1.4440+01	2.5120+01	1.4825+01	2.5633+01	1.4782+01	2.6244+01	1.4883+01
5.00-01	2.1242+01	1.6949+01	2.1682+01	1.7196+01	2.2161+01	1.7456+01	2.2567+01	1.7685+01	2.3029+01	1.7858+01
6.00-01	1.9072+01	1.9081+01	1.9494+01	1.9455+01	1.9904+01	1.9816+01	2.0284+01	2.0150+01	2.0666+01	2.0428+01
7.00-01	1.7187+01	2.0844+01	1.7637+01	2.1300+01	1.8047+01	2.1748+01	1.8447+01	2.2173+01	1.8815+01	2.2557+01
8.00-01	1.5442+01	2.2386+01	1.5932+01	2.2877+01	1.6377+01	2.3370+01	1.6816+01	2.3855+01	1.7212+01	2.4318+01
9.00-01	1.3811+01	2.3787+01	1.4329+01	2.4288+01	1.4810+01	2.4797+01	1.5285+01	2.5312+01	1.5720+01	2.5819+01
1.00+00	1.2313+01	2.5077+01	1.2837+01	2.5581+01	1.3339+01	2.6093+01	1.3834+01	2.6621+01	1.4300+01	2.7148+01
1.25+00	9.3098+00	2.7860+01	9.7497+00	2.8378+01	1.0204+01	2.8901+01	1.0665+01	2.9444+01	1.1129+01	2.9991+01
1.50+00	7.4077+00	3.0067+01	7.6940+00	3.0620+01	8.0082+00	3.1173+01	8.3463+00	3.1740+01	8.7069+00	3.2309+01
2.00+00	5.5763+00	3.3167+01	5.6982+00	3.3808+01	5.8283+00	3.447+01	5.9707+00	3.5081+01	6.1262+00	3.5715+01
2.50+00	4.5937+00	3.5188+01	4.7043+00	3.5901+01	4.8096+00	3.6610+01	4.9087+00	3.7311+01	5.0061+00	3.8009+01
3.00+00	3.7700+00	3.6601+01	3.8911+00	3.7370+01	4.0091+00	3.8134+01	4.1209+00	3.8891+01	4.2306+00	3.9643+01
3.50+00	2.9463+00	3.7596+01	3.0780+00	3.8415+01	3.2087+00	3.9226+01	3.3332+00	4.0033+01	3.4552+00	4.0833+01
4.00+00	2.5001+00	3.8291+01	2.6100+00	3.9150+01	2.7206+00	4.0003+01	2.8281+00	4.0851+01	2.9352+00	4.1693+01
5.00+00	1.6078+00	3.9142+01	1.6740+00	4.0051+01	1.7445+00	4.0958+01	1.8183+00	4.1861+01	1.8953+00	4.2761+01
6.00+00	1.2728+00	3.9647+01	1.3093+00	4.0578+01	1.3475+00	4.1509+01	1.3882+00	4.2438+01	1.4324+00	4.3366+01
7.00+00	1.0953+00	4.0002+01	1.1206+00	4.0945+01	1.1460+00	4.1886+01	1.1715+00	4.2828+01	1.1975+00	4.3769+01
8.00+00	9.7790-01	4.0270+01	1.0029+00	4.1221+01	1.0279+00	4.2171+01	1.0531+00	4.3121+01	1.0784+00	4.4070+01
1.00+01	7.4310-01	4.0621+01	7.6750-01	4.1587+01	7.9170-01	4.2553+01	8.1640-01	4.3518+01	8.4010-01	4.4481+01
1.50+01	3.5986-01	4.0930+01	3.8152-01	4.1920+01	4.0348-01	4.2911+01	4.2570-01	4.3900+01	4.4815-01	4.4889+01
2.00+01	1.7586-01	4.0985+01	1.8901-01	4.1983+01	2.0260-01	4.2989+01	2.1664-01	4.3978+01	2.3110-01	4.4975+01
5.00+01	9.6131-03	4.1000+01	1.0628-02	4.2000+01	1.1722-02	4.3000+01	1.2899-02	4.4000+01	1.4163-02	4.5000+01
8.00+01	1.8802-03	4.1000+01	2.0961-03	4.2000+01	2.3313-03	4.3000+01	2.5872-03	4.4000+01	2.8652-03	4.5000+01
1.00+02	8.6610-04	4.1000+01	9.6875-04	4.2000+01	1.0811-03	4.3000+01	1.2309-03	4.4000+01	1.3378-03	4.5000+01
1.00+03	4.8981-07	4.1000+01	5.6221-07	4.2000+01	6.4388-07	4.3000+01	7.3585-07	4.4000+01	8.3927-07	4.5000+01
1.00+06	7.9386-16	4.1000+01	9.4459-16	4.2000+01	1.1222-15	4.3000+01	1.3314-15	4.4000+01	1.5775-15	4.5000+01
1.00+09	1.4945-24	4.1000+01	1.8362-24	4.2000+01	2.2544-24	4.3000+01	2.7664-24	4.4000+01	3.3933-24	4.5000+01

TABLE I. CONT. ATOMIC FORM FACTOR, F(X,Z), AND INCOHERENT SCATTERING FUNCTION, S(X,Z)

X, SIN(THETA/2) /LAMBDA	46 PD		47 AG		48 CD		49 IN		50 SN	
	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)
0.00	4.6000+01	0.0000	4.7000+01	0.0000	4.8000+01	0.0000	4.9000+01	0.0000	5.0000+01	0.0000
0.00-03	4.5992+01	1.0000-02	4.6987+01	1.3000-02	4.7985+01	1.5000-02	4.8983+01	1.5000-02	4.9981+01	1.5000-02
1.00-02	4.5965+01	3.9000-02	4.6959+01	5.2000-02	4.7956+01	5.9000-02	4.8947+01	6.2000-02	4.9946+01	6.0000-02
1.50-02	4.5930+01	8.8100-02	4.6917+01	1.1660-01	4.7910+01	1.3210-01	4.8899+01	1.3750-01	4.9895+01	1.3440-01
2.00-02	4.5875+01	1.5590-01	4.6852+01	2.0510-01	4.7841+01	2.3240-01	4.8821+01	2.4170-01	4.9814+01	2.3650-01
2.50-02	4.5805+01	2.4210-01	4.6770+01	3.1610-01	4.7753+01	3.5820-01	4.8722+01	3.7220-01	4.9712+01	3.6480-01
3.00-02	4.5720+01	3.4620-01	4.6672+01	4.4780-01	4.7647+01	5.0750-01	4.8603+01	5.2690-01	4.9588+01	5.1750-01
4.00-02	4.5507+01	6.0430-01	4.6425+01	7.6490-01	4.7383+01	8.5650-01	4.8308+01	8.9820-01	4.9280+01	8.8610-01
5.00-02	4.5238+01	9.2300-01	4.6123+01	1.1390+00	4.7059+01	1.2880+00	4.7952+01	1.3340+00	4.8906+01	1.3230+00
7.00-02	4.4545+01	1.7050+00	4.5356+01	1.9902+00	4.6239+01	2.2373+00	4.7054+01	2.3160+00	4.7964+01	2.3215+00
9.00-02	4.3675+01	2.6188+00	4.4435+01	2.9013+00	4.5263+01	3.2201+00	4.6010+01	3.3444+00	4.6862+01	3.3857+00
1.00-01	4.3185+01	3.1030+00	4.3930+01	3.3620+00	4.4733+01	3.7000+00	4.5453+01	3.8520+00	4.6274+01	3.9170+00
1.25-01	4.1838+01	4.3342+00	4.2576+01	4.5059+00	4.3329+01	4.8433+00	4.4400+01	5.0700+00	4.4743+01	5.2044+00
1.50-01	4.0366+01	5.5360+00	4.1131+01	5.6310+00	4.1859+01	5.9210+00	4.2510+01	6.2070+00	4.3192+01	6.4160+00
1.75-01	3.8829+01	6.6685+00	3.9643+01	6.7268+00	4.0376+01	6.9607+00	4.1037+01	7.2757+00	4.1683+01	7.5495+00
2.00-01	3.7274+01	7.7250+00	3.8137+01	7.7850+00	3.8890+01	7.9800+00	3.9579+01	8.2970+00	4.0212+01	8.6150+00
2.50-01	3.4239+01	9.6545+00	3.5153+01	9.7703+00	3.5964+01	9.9556+00	3.6719+01	1.0244+01	3.7388+01	1.0589+01
3.00-01	3.1444+01	1.1441+01	3.2341+01	1.1598+01	3.3184+01	1.1812+01	3.3989+01	1.2083+01	3.4719+01	1.2415+01
4.00-01	2.6836+01	1.4824+01	2.7576+01	1.4969+01	2.8343+01	1.5185+01	2.9125+01	1.5444+01	2.9894+01	1.5746+01
5.00-01	2.3472+01	1.7943+01	2.4019+01	1.8082+01	2.4619+01	1.8263+01	2.5260+01	1.8489+01	2.5932+01	1.8760+01
6.00-01	2.1036+01	2.0653+01	2.1440+01	2.0858+01	2.1883+01	2.1064+01	2.2360+01	2.1288+01	2.2881+01	2.1541+01
7.00-01	1.9169+01	2.2904+01	1.9509+01	2.3212+01	1.9857+01	2.3501+01	2.0220+01	2.3779+01	2.0611+01	2.4059+01
8.00-01	1.7589+01	2.4756+01	1.7927+01	2.5162+01	1.8243+01	2.5546+01	1.8855+01	2.5906+01	1.8885+01	2.6252+01
9.00-01	1.6134+01	2.6316+01	1.6504+01	2.6792+01	1.6845+01	2.7252+01	1.7165+01	2.7691+01	1.7469+01	2.8113+01
1.00+00	1.4747+01	2.7677+01	1.5156+01	2.8195+01	1.5533+01	2.8705+01	1.5882+01	2.9203+01	1.6205+01	2.9687+01
1.25+00	1.1591+01	3.0549+01	1.2045+01	3.1106+01	1.2484+01	3.1666+01	1.2905+01	3.2229+01	1.3304+01	3.2794+01
1.50+00	9.0843+00	3.2888+01	9.4790+00	3.3465+01	9.8830+00	3.4046+01	1.0292+01	3.4634+01	1.0699+01	3.5226+01
2.00+00	6.2974+00	3.6349+01	6.4852+00	3.6983+01	6.6907+00	3.7618+01	6.9144+00	3.8255+01	7.1560+00	3.8894+01
2.50+00	5.1029+00	3.8703+01	5.2013+00	3.9395+01	5.3031+00	4.0085+01	5.4102+00	4.0774+01	5.5243+00	4.1462+01
3.00+00	4.3373+00	4.0389+01	4.4433+00	4.1131+01	4.5486+00	4.1870+01	4.6541+00	4.2605+01	4.7606+00	4.3338+01
3.50+00	3.5716+00	4.1627+01	3.6852+00	4.2415+01	3.7941+00	4.3198+01	3.8979+00	4.3977+01	3.9969+00	4.4751+01
4.00+00	3.0394+00	4.2529+01	3.1430+00	4.3359+01	3.2442+00	4.4184+01	3.3429+00	4.5003+01	3.4392+00	4.5817+01
4.50+00	1.9751+00	4.3658+01	2.0585+00	4.4550+01	2.1445+00	4.5437+01	2.2330+00	4.6321+01	2.3238+00	4.7200+01
5.00+00	1.4789+00	4.4293+01	1.5278+00	4.5217+01	1.5803+00	4.6139+01	1.6352+00	4.7060+01	1.6924+00	4.7977+01
7.00+00	1.2248+00	4.4710+01	1.2543+00	4.5650+01	1.2859+00	4.6589+01	1.3196+00	4.7526+01	1.3552+00	4.8463+01
8.00+00	1.1038+00	4.5019+01	1.1303+00	4.5968+01	1.1580+00	4.6915+01	1.1870+00	4.7863+01	1.2170+00	4.8810+01
1.00+01	8.6180-01	4.5444+01	8.8220-01	4.6406+01	9.0210-01	4.7368+01	9.2180-01	4.8328+01	9.4070-01	4.9288+01
1.50+01	4.7080-01	4.5877+01	4.9360-01	4.6864+01	5.1653-01	4.7850+01	5.3954-01	4.8835+01	5.6262-01	4.9820+01
2.00+01	2.4597-01	4.5971+01	2.6123-01	4.6967+01	2.7687-01	4.7963+01	2.9287-01	4.8959+01	3.0921-01	4.9954+01
5.00+01	1.5518-02	4.6000+01	1.6968-02	4.7000+01	1.8518-02	4.8000+01	2.0171-02	4.9000+01	2.1932-02	5.0000+01
8.00+01	3.1668-03	4.6000+01	3.4933-03	4.7000+01	3.8464-03	4.8000+01	4.2277-03	4.9000+01	4.6388-03	5.0000+01
1.00+02	1.4838-03	4.6000+01	1.6425-03	4.7000+01	1.8150-03	4.8000+01	2.0020-03	4.9000+01	2.2047-03	5.0000+01
1.00+03	9.5540-07	4.6000+01	1.0857-06	4.7000+01	1.2316-06	4.8000+01	1.3948-06	4.9000+01	1.5773-06	5.0000+01
1.00+06	1.8670-15	4.6000+01	2.2074-15	4.7000+01	2.6074-15	4.8000+01	3.0773-15	4.9000+01	3.6293-15	5.0000+01
1.00+09	4.1612-24	4.6000+01	5.1019-24	4.7000+01	6.2552-24	4.8000+01	7.6697-24	4.9000+01	9.4057-24	5.0000+01

TABLE I.. CONT. ATOMIC FORM FACTOR, F(X,Z), AND INCOHERENT SCATTERING FUNCTION, S(X,Z)

X, SIN(THETA/Z) /LAMBDA	51 SB		52 TE		53 I		54 XE		55 CS	
	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)
0.00	5.1000+01	0.0000	5.2000+01	0.0000	5.3000+01	0.0000	5.4000+01	0.0000	5.5000+01	0.0000
5.00-03	5.0983+01	1.5000-02	5.1985+01	1.4000-02	5.2986+01	1.3000-02	5.3988+01	1.2000-02	5.4971+01	2.7000-02
1.00-02	5.0948+01	5.8000-02	5.1950+01	5.6000-02	5.2952+01	5.4000-02	5.3953+01	5.2000-02	5.4920+01	1.0500-01
1.50-02	5.0894+01	1.2970-01	5.1894+01	1.2500-01	5.2895+01	1.2050-01	5.3897+01	1.1620-01	5.4840+01	2.3070-01
2.00-02	5.0812+01	2.2840-01	5.1813+01	2.2050-01	5.2814+01	2.1280-01	5.3817+01	2.0530-01	5.4720+01	3.9640-01
2.50-02	5.0708+01	3.5270-01	5.1709+01	3.4120-01	5.2711+01	3.2960-01	5.3714+01	3.1830-01	5.4570+01	5.9400-01
3.00-02	5.0583+01	5.0080-01	5.1583+01	4.8540-01	5.2586+01	4.6960-01	5.3531+01	4.5390-01	5.4393+01	8.1480-01
4.00-02	5.0270+01	8.5980-01	5.1269+01	8.3740-01	5.2273+01	8.1320-01	5.3230+01	7.8750-01	5.3970+01	1.2955+00
5.00-02	4.9886+01	1.2870+00	5.0881+01	1.2610+00	5.1884+01	1.2300+00	5.2892+01	1.1940+00	5.3491+01	1.7930+00
7.00-02	4.8920+01	2.2731+00	4.9902+01	2.2554+00	5.0900+01	2.2213+00	5.1939+01	2.1679+00	5.2361+01	2.7816+00
9.00-02	4.7775+01	3.3358+00	4.8728+01	3.3494+00	4.9707+01	3.3314+00	5.0706+01	3.2695+00	5.1147+01	3.7941+00
1.00-01	4.7161+01	3.8710+00	4.8093+01	3.9070+00	4.9057+01	3.9030+00	5.0044+01	3.8410+00	5.0499+01	4.3200+00
1.25-01	4.5555+01	5.1866+00	4.6423+01	5.2839+00	4.7335+01	5.3281+00	4.8232+01	5.2747+00	4.8874+01	5.6723+00
1.50-01	4.3930+01	6.4530+00	4.4724+01	6.6100+00	4.5568+01	6.7090+00	4.6455+01	6.6770+00	4.7172+01	7.0230+00
1.75-01	4.2357+01	7.6627+00	4.3075+01	7.8759+00	4.3842+01	8.0300+00	4.4635+01	8.0325+00	4.5434+01	8.3392+00
2.00-01	4.0843+01	8.8110+00	4.1500+01	9.0760+00	4.2195+01	9.2870+00	4.2934+01	9.3400+00	4.3741+01	9.6150+00
2.50-01	3.8005+01	1.0908+01	3.8601+01	1.1260+01	3.9199+01	1.1579+01	3.9814+01	1.1771+01	4.0542+01	1.2035+01
3.00-01	3.5378+01	1.2777+01	3.5983+01	1.3171+01	3.6555+01	1.3564+01	3.7110+01	1.3892+01	3.7727+01	1.4217+01
4.00-01	3.0628+01	1.6088+01	3.1314+01	1.6466+01	3.1950+01	1.6876+01	3.2538+01	1.7307+01	3.3099+01	1.7753+01
5.00-01	2.6619+01	1.9067+01	2.7304+01	1.9407+01	2.7973+01	1.9777+01	2.8615+01	2.0175+01	2.9218+01	2.0612+01
6.00-01	2.3440+01	2.1823+01	2.4029+01	2.2134+01	2.4636+01	2.2471+01	2.5250+01	2.2833+01	2.5849+01	2.3228+01
7.00-01	2.1036+01	2.4349+01	2.1496+01	2.4655+01	2.1930+01	2.4980+01	2.2511+01	2.5324+01	2.3043+01	2.5691+01
8.00-01	1.9218+01	2.6590+01	1.9574+01	2.6927+01	1.9956+01	2.7269+01	2.0388+01	2.7619+01	2.0806+01	2.7981+01
9.00-01	1.7766+01	2.8518+01	1.8065+01	2.8912+01	1.8374+01	2.9298+01	1.8730+01	2.9680+01	1.9051+01	3.0064+01
1.00+00	1.6507+01	3.0157+01	1.6795+01	3.0613+01	1.7076+01	3.1056+01	1.7357+01	3.1488+01	1.7651+01	3.1914+01
1.25+00	1.3678+01	3.3358+01	1.4028+01	3.3918+01	1.4354+01	3.4474+01	1.4638+01	3.5023+01	1.4941+01	3.5565+01
1.50+00	1.1100+01	3.5822+01	1.1491+01	3.6422+01	1.1867+01	3.7024+01	1.2227+01	3.7628+01	1.2574+01	3.8232+01
2.00+00	7.4147+00	3.9536+01	7.6893+00	4.0181+01	7.9779+00	4.0827+01	8.2735+00	4.1477+01	8.5886+00	4.2129+01
2.50+00	5.6471+00	4.2151+01	5.7801+00	4.2840+01	5.9245+00	4.3529+01	6.0813+00	4.4220+01	6.2508+00	4.4912+01
3.00+00	4.8691+00	4.4069+01	4.9804+00	4.4798+01	5.0953+00	4.5526+01	5.2147+00	4.6254+01	5.3389+00	4.6981+01
3.50+00	4.0911+00	4.5522+01	4.1807+00	4.6290+01	4.2662+00	4.7054+01	4.3481+00	4.7817+01	4.4271+00	4.8577+01
4.00+00	3.5329+00	4.6626+01	3.6239+00	4.7431+01	3.7244+00	4.8233+01	3.7935+00	4.9030+01	3.8823+00	4.9824+01
5.00+00	2.4165+00	4.8075+01	2.5104+00	4.8945+01	2.6408+00	4.9811+01	2.6932+00	5.0673+01	2.7926+00	5.1530+01
6.00+00	1.7531+00	4.8892+01	1.8172+00	4.9804+01	1.8841+00	5.0714+01	1.9537+00	5.1620+01	2.0251+00	5.2523+01
7.00+00	1.3922+00	4.9399+01	1.4309+00	5.0333+01	1.4721+00	5.1266+01	1.5151+00	5.2197+01	1.5626+00	5.3127+01
8.00+00	1.2478+00	4.9756+01	1.2799+00	5.0702+01	1.3138+00	5.1647+01	1.3495+00	5.2591+01	1.3864+00	5.3534+01
1.00+01	9.5910-01	5.0248+01	9.7790-01	5.1207+01	9.9730-01	5.2165+01	1.0163+00	5.3123+01	1.0339+00	5.4081+01
1.50+01	5.8573-01	5.0804+01	6.0884-01	5.1787+01	6.3193-01	5.2770+01	6.5497-01	5.3751+01	6.7795-01	5.4732+01
2.00+01	3.2587-01	5.0949+01	3.4283-01	5.1943+01	3.6008-01	5.2937+01	3.7759-01	5.3931+01	3.9535-01	5.4924+01
5.00+01	2.3805-02	5.1000+01	2.5795-02	5.1999+01	2.7907-02	5.2999+01	3.0144-02	5.3999+01	3.2511-02	5.5000+01
8.00+01	5.0817-03	5.1000+01	5.5581-03	5.2000+01	6.0699-03	5.3000+01	6.6192-03	5.4000+01	7.2081-03	5.5000+01
1.00+02	2.4240-03	5.1000+01	2.6611-03	5.2000+01	2.9170-03	5.3000+01	3.1933-03	5.4000+01	3.4903-03	5.5000+01
1.00+03	1.7811-06	5.1000+01	2.0084-06	5.2000+01	2.2617-06	5.3000+01	2.5438-06	5.4000+01	2.8577-06	5.5000+01
1.00+06	4.2776-15	5.1000+01	5.0389-15	5.2000+01	5.9330-15	5.3000+01	6.9831-15	5.4000+01	8.2165-15	5.5000+01
1.00+09	1.1538-23	5.1000+01	1.4159-23	5.2000+01	1.7383-23	5.3000+01	2.1353-23	5.4000+01	2.6247-23	5.5000+01

TABLE I., CONT. ATOMIC FORM FACTOR, F(X,Z), AND INCOHERENT SCATTERING FUNCTION, S(X,Z)

X, /LAMBDA	56 BA		57 LA		58 CE		59 PR		60 ND	
	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)
0.00	5.6000+01	0.0000	5.7000+01	0.0000	5.8000+01	0.0000	5.9000+01	0.0000	6.0000+01	0.0000
5.00-03	5.5970+01	3.1000-02	5.6964+01	3.0000-02	5.7963+01	2.9000-02	5.8968+01	2.9000-02	5.9967+01	2.9000-02
1.00-02	5.5912+01	1.2400-01	5.6909+01	1.1900-01	5.7909+01	1.1600-01	5.8914+01	1.1600-01	5.9914+01	1.1600-01
1.50-02	5.5823+01	2.7230-01	5.6827+01	2.6220-01	5.7831+01	2.5620-01	5.8834+01	2.5690-01	5.9837+01	2.5210-01
2.00-02	5.5688+01	4.7070-01	5.6695+01	4.5500-01	5.7702+01	4.4490-01	5.8707+01	4.4500-01	5.9713+01	4.3700-01
2.50-02	5.5519+01	7.0990-01	5.6530+01	6.8950-01	5.7540+01	6.7470-01	5.8549+01	6.7330-01	5.9557+01	6.6160-01
3.00-02	5.5320+01	9.8060-01	5.6333+01	9.5750-01	5.7346+01	9.3770-01	5.8360+01	9.3310-01	5.9372+01	9.1760-01
4.00-02	5.4841+01	1.5778+00	5.5856+01	1.5596+00	5.6878+01	1.5304+00	5.7906+01	1.5131+00	5.8926+01	1.4910+00
5.00-02	5.4292+01	2.1960+00	5.5309+01	2.1990+00	5.6342+01	2.1620+00	5.7386+01	2.1240+00	5.8415+01	2.0970+00
7.00-02	5.3013+01	3.3564+00	5.3989+01	3.4326+00	5.5036+01	3.3896+00	5.6144+01	3.2963+00	5.7186+01	3.2673+00
9.00-02	5.1679+01	4.3976+00	5.2587+01	4.5424+00	5.3645+01	4.4987+00	5.4832+01	4.3619+00	5.5885+01	4.3340+00
1.00-01	5.1000+01	4.9020+00	5.1867+01	5.0680+00	5.2929+01	5.0250+00	5.4157+01	4.8760+00	5.5213+01	4.8490+00
1.25-01	4.9357+01	6.1754+00	5.0125+01	6.3669+00	5.1188+01	6.3245+00	5.2509+01	6.1714+00	5.3570+01	6.1436+00
1.50-01	4.7715+01	7.4680+00	4.8400+01	7.6710+00	4.9454+01	7.5340+00	5.0841+01	7.4890+00	5.1900+01	7.4630+00
1.75-01	4.6068+01	8.7405+00	4.6171+01	8.9565+00	4.7763+01	8.9301+00	4.9163+01	8.7906+00	5.0225+01	8.7696+00
2.00-01	4.4439+01	9.9760+00	4.5074+01	1.0204+01	4.6103+01	1.0190+01	4.7493+01	1.0051+01	4.8542+01	1.0036+01
2.50-01	4.1277+01	1.2343+01	4.1887+01	1.2583+01	4.2862+01	1.2592+01	4.4169+01	1.2447+01	4.5180+01	1.2439+01
3.00-01	3.8407+01	1.4544+01	3.8997+01	1.4814+01	3.9900+01	1.4844+01	4.1087+01	1.4688+01	4.2039+01	1.4688+01
4.00-01	3.3652+01	1.8201+01	3.4207+01	1.8609+01	3.4951+01	1.8713+01	3.5882+01	1.8554+01	3.6691+01	1.8603+01
5.00-01	2.9775+01	2.1078+01	3.0345+01	2.1555+01	3.0981+01	2.1737+01	3.1703+01	2.1644+01	3.2395+01	2.1759+01
6.00-01	2.6431+01	2.3654+01	2.7010+01	2.4109+01	2.7573+01	2.4334+01	2.8144+01	2.4331+01	2.8749+01	2.4493+01
7.00-01	2.3590+01	2.6083+01	2.4133+01	2.6502+01	2.4626+01	2.6750+01	2.5088+01	2.6818+01	2.5614+01	2.7012+01
8.00-01	2.1269+01	2.8359+01	2.1740+01	2.8759+01	2.2163+01	2.9025+01	2.2543+01	2.9145+01	2.2991+01	2.9364+01
9.00-01	1.9424+01	3.0453+01	1.9812+01	3.0854+01	2.0169+01	3.1143+01	2.0491+01	3.1311+01	2.0866+01	3.1556+01
1.00+00	1.7954+01	3.2336+01	1.8273+01	3.2758+01	1.8576+01	3.3083+01	1.8958+01	3.3304+01	1.9171+01	3.3581+01
1.25+00	1.5210+01	3.6100+01	1.5469+01	3.6622+01	1.5714+01	3.7075+01	1.5950+01	3.7451+01	1.6184+01	3.7848+01
1.50+00	1.2894+01	3.8836+01	1.3202+01	3.9438+01	1.3483+01	4.0001+01	1.3741+01	4.0515+01	1.3992+01	4.1033+01
2.00+00	8.9052+00	4.2784+01	9.2253+00	4.3443+01	9.5267+00	4.4104+01	9.8083+00	4.4757+01	1.0100+01	4.5404+01
2.50+00	6.436+00	4.5605+01	6.6302+00	4.6301+01	6.8321+00	4.7006+01	7.0355+00	4.7716+01	7.2521+00	4.8419+01
3.00+00	5.4686+00	4.7709+01	5.6045+00	4.8436+01	5.7439+00	4.9175+01	5.8954+00	4.9921+01	6.0336+00	5.0660+01
3.50+00	4.5036+00	4.9336+01	4.5788+00	5.0094+01	4.6557+00	5.0860+01	4.7353+00	5.1634+01	4.8151+00	5.2400+01
4.00+00	3.9642+00	5.0615+01	4.0446+00	5.1403+01	4.1253+00	5.2197+01	4.2071+00	5.2996+01	4.2886+00	5.3788+01
5.00+00	2.3854+00	5.2383+01	2.9761+00	5.323+01	3.0644+00	5.4083+01	3.1506+00	5.4934+01	3.2357+00	5.5779+01
6.00+00	2.0990+00	5.3424+01	2.1731+00	5.4320+01	2.2471+00	5.5217+01	2.3221+00	5.6113+01	2.3991+00	5.7003+01
7.00+00	1.5106+00	5.4055+01	1.6608+00	5.4981+01	1.7128+00	5.5906+01	1.7656+00	5.6832+01	1.8203+00	5.7753+01
8.00+00	1.4241+00	5.4477+01	1.4633+00	5.5419+01	1.5038+00	5.6361+01	1.5450+00	5.7303+01	1.5874+00	5.8243+01
1.00+01	1.0512+00	5.5038+01	1.0883+00	5.5995+01	1.0898+00	5.6951+01	1.1037+00	5.7908+01	1.1217+00	5.8865+01
1.50+01	7.3083-01	5.5713+01	7.2360-01	5.6692+01	7.4625-01	5.7671+01	7.6875-01	5.8650+01	7.9109-01	5.9627+01
2.00+01	4.1335-01	5.5917+01	4.3155-01	5.6909+01	4.4995-01	5.7901+01	4.6852-01	5.8892+01	4.8726-01	5.9884+01
5.00+01	3.5014-02	5.6000+01	3.7656-02	5.7000+01	4.0442-02	5.8000+01	4.3377-02	5.9000+01	4.6466-02	5.9999+01
8.00+01	7.387-03	5.6000+01	8.5133-03	5.7000+01	9.243-03	5.8000+01	1.0204-02	5.9000+01	1.0825-02	6.0000+01
1.00+02	3.3103-03	5.6000+01	4.1543-03	5.7000+01	4.5238-03	5.8000+01	4.9004-03	5.9000+01	5.3457-03	6.0000+01
1.00+03	3.2068-06	5.6000+01	3.5947-06	5.7000+01	4.0254-06	5.8000+01	4.5034-06	5.9000+01	5.0337-06	6.0000+01
1.00+06	9.6556-15	5.6000+01	1.1368-14	5.7000+01	1.3370-14	5.8000+01	1.5723-14	5.9000+01	1.8492-14	6.0000+01
			3.9747-23	5.7000+01	4.8975-23	5.8000+01	6.0404-23	5.9000+01	7.4577-23	6.0000+01

TABLE I. CONT. ATOMIC FORM FACTOR, F(X,Z), AND INCOMPLETE SCATTERING FUNCTION, S(X,Z)

X, SIN(THETA/2) /LAMBDA	61 PM		62 SM		63 EU		64 GD		65 TB	
	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)
0.00	6.1000+01	0.0000	6.2000+01	0.0000	6.3000+01	0.0000	6.4000+01	0.0000	6.5000+01	0.0000
5.00-03	6.0967+01	2.8000-02	6.1966+01	2.8000-02	6.2866+01	2.7000-01	6.3960+01	2.6000-02	6.4960+01	2.6000-02
1.00-02	6.0915+01	1.1200-01	6.1916+01	1.1000-01	6.2917+01	1.0800-01	6.3912+01	1.0400-01	6.4913+01	1.0200-01
1.50-02	6.0840+01	2.4750-01	6.1843+01	2.4310-01	6.2846+01	2.3890-01	6.3849+01	2.2990-01	6.4851+01	2.2630-01
2.00-02	6.0718+01	4.2930-01	6.1724+01	4.2180-01	6.2728+01	4.1470-01	6.3733+01	4.0030-01	6.4738+01	3.9410-01
2.50-02	6.0565+01	6.5030-01	6.1573+01	6.3950-01	6.2581+01	6.2900-01	6.3588+01	6.0920-01	6.4595+01	6.0020-01
3.00-02	6.0384+01	9.0270-01	6.1395+01	8.8830-01	6.2405+01	8.7440-01	6.3414+01	8.5030-01	6.4423+01	8.3810-01
4.00-02	5.9945+01	1.4694+00	6.0963+01	1.4483+00	6.1980+01	1.4278+00	6.2990+01	1.4013+00	6.4006+01	1.3831+00
5.00-02	5.9442+01	2.0710+00	6.0468+01	2.0450+00	6.1493+01	2.0200+00	6.2504+01	2.0010+00	6.3527+01	1.9780+00
7.00-02	5.8228+01	3.2373+00	5.9268+01	3.2067+00	6.0307+01	3.1762+00	6.1287+01	3.2003+00	6.2325+01	3.1726+00
9.00-02	5.6937+01	4.3038+00	5.7988+01	4.2721+00	5.9037+01	4.2398+00	5.9967+01	4.3070+00	6.1016+01	4.2783+00
1.00-01	5.6269+01	4.8180+00	5.7325+01	4.7860+00	5.8379+01	4.7540+00	5.9284+01	4.8310+00	6.0338+01	4.8020+00
1.25-01	5.4632+01	6.1117+00	5.5694+01	6.0762+00	5.6756+01	6.0394+00	5.7577+01	6.1196+00	5.8639+01	6.0883+00
1.50-01	5.2962+01	7.4320+00	5.4026+01	7.3950+00	5.5091+01	7.3590+00	5.5842+01	7.4200+00	5.6910+01	7.3870+00
1.75-01	5.1287+01	8.7425+00	5.2353+01	8.7080+00	5.3422+01	8.6712+00	5.4151+01	8.7259+00	5.5222+01	8.6936+00
2.00-01	4.9598+01	1.0014+01	5.0659+01	9.9840+00	5.1725+01	9.9540+00	5.2446+01	1.0007+01	5.3515+01	9.9790+00
2.50-01	4.6204+01	1.2426+01	4.7240+01	1.2401+01	4.8285+01	1.2374+01	4.9026+01	1.2452+01	5.0083+01	1.2436+01
3.00-01	4.3012+01	1.4682+01	4.4002+01	1.4661+01	4.5005+01	1.4663+01	4.5768+01	1.4749+01	4.6793+01	1.4748+01
4.00-01	3.7526+01	1.8641+01	3.8384+01	1.8652+01	3.9264+01	1.8662+01	4.0004+01	1.8869+01	4.0919+01	1.8914+01
5.00-01	3.3111+01	2.1856+01	3.3849+01	2.1919+01	3.4609+01	2.1976+01	3.5310+01	2.2269+01	3.6105+01	2.2377+01
6.00-01	2.9374+01	2.4634+01	3.0017+01	2.4741+01	3.0680+01	2.4840+01	3.1346+01	2.5155+01	3.2042+01	2.5315+01
7.00-01	2.6156+01	2.7183+01	2.6716+01	2.7325+01	2.7292+01	2.7456+01	2.7912+01	2.7766+01	2.8520+01	2.7961+01
8.00-01	2.3453+01	2.9559+01	2.3930+01	2.9730+01	2.4423+01	2.9889+01	2.4977+01	3.0194+01	2.5501+01	3.0414+01
9.00-01	2.1252+01	3.1776+01	2.1652+01	3.1975+01	2.2066+01	3.2159+01	2.2540+01	3.2463+01	2.2984+01	3.2703+01
1.00+00	1.9493+01	3.3832+01	1.9826+01	3.4062+01	2.0170+01	3.4275+01	2.0562+01	3.4583+01	2.0932+01	3.4842+01
1.25+00	1.6415+01	3.8212+01	1.6646+01	3.8554+01	1.6878+01	3.8866+01	1.7119+01	3.9224+01	1.7359+01	3.9553+01
1.50+00	1.4232+01	4.1523+01	1.4460+01	4.1953+01	1.4679+01	4.2432+01	1.4892+01	4.2884+01	1.5097+01	4.3315+01
2.00+00	1.0386+01	4.6040+01	1.0664+01	4.6669+01	1.0933+01	4.7281+01	1.1206+01	4.7891+01	1.1456+01	4.8494+01
2.50+00	7.4747+00	4.9119+01	7.7021+00	4.9816+01	7.9330+00	5.0508+01	8.1760+00	5.1193+01	8.4103+00	5.1880+01
3.00+00	6.1860+00	5.1398+01	6.3423+00	5.2136+01	6.5020+00	5.2872+01	6.6695+00	5.3600+01	6.8354+00	5.4335+01
3.50+00	4.8974+00	5.2166+01	4.9825+00	5.3932+01	5.0710+00	5.4698+01	5.1630+00	5.5456+01	5.2601+00	5.6222+01
4.00+00	4.3712+00	5.4579+01	4.4548+00	5.5369+01	4.5399+00	5.6159+01	4.6266+00	5.6942+01	4.7153+00	5.7731+01
5.00+00	3.3188+00	5.6621+01	3.3995+00	5.7461+01	3.4777+00	5.8298+01	3.5538+00	5.9130+01	3.6272+00	5.9964+01
6.00+00	2.4764+00	5.7892+01	2.5535+00	5.8777+01	2.6301+00	5.9660+01	2.7074+00	6.0538+01	2.7837+00	6.1415+01
7.00+00	1.8776+00	5.8674+01	1.9374+00	5.9592+01	1.9984+00	6.0508+01	2.0603+00	6.1420+01	2.1230+00	6.2332+01
8.00+00	1.6318+00	5.9181+01	1.6783+00	6.0119+01	1.7260+00	6.1056+01	1.7747+00	6.1990+01	1.8243+00	6.2924+01
1.00+01	1.1402+00	5.9821+01	1.1601+00	6.0777+01	1.1811+00	6.1732+01	1.2034+00	6.2687+01	1.2263+00	6.3641+01
1.50+01	8.1325-01	6.0605+01	8.3523-01	6.1581+01	8.5701-01	6.2557+01	8.7858-01	6.3533+01	8.9993-01	6.4508+01
2.00+01	5.0614-01	6.0874+01	5.2514-01	6.1864+01	5.4426-01	6.2854+01	5.6345-01	6.3843+01	5.8275-01	6.4832+01
5.00+01	4.9713-02	6.0999+01	5.3123-02	6.1999+01	5.6701-02	6.2999+01	6.0451-02	6.3999+01	6.4379-02	6.4999+01
8.00+01	1.1700-02	6.1000+01	1.2632-02	6.2000+01	1.3624-02	6.3000+01	1.4678-02	6.4000+01	1.5798-02	6.5000+01
1.00+02	5.8012-03	6.1000+01	6.2889-03	6.2000+01	6.8105-03	6.3000+01	7.3680-03	6.4000+01	7.9635-03	6.5000+01
1.00+03	5.6215-06	6.1000+01	6.2729-06	6.2000+01	6.9944-06	6.3000+01	7.7932-06	6.4000+01	8.6772-06	6.5000+01
1.00+06	2.1751-14	6.1000+01	2.5587-14	6.2000+01	3.0108-14	6.3000+01	3.5437-14	6.4000+01	4.1723-14	6.5000+01
1.00+09	9.2179-23	6.1000+01	1.1407-22	6.2000+01	1.4134-22	6.3000+01	1.7536-22	6.4000+01	2.1788-22	6.5000+01

TABLE I. CONT. ATOMIC FORM FACTOR,  $F(X,Z)$ , AND INCOHERENT SCATTERING FUNCTION,  $S(X,Z)$ 

$X_s$ / $\lambda$	66 DY		67 HD		68 EF		69 TM		70 YB	
	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$
0.00	6.6000+01	0.0000	6.7000+01	0.0000	6.8000+01	0.0000	6.9000+01	0.0000	7.0000+01	0.0000
0.00-03	6.5966+01	2.6000-02	6.6966+01	2.5000-02	6.7966+01	2.5000-02	6.8966+01	2.5000-02	6.9966+01	2.4000-02
1.00-02	6.5919+01	1.0300-01	6.6920+01	1.0100-01	6.7921+01	9.9000-02	6.8922+01	9.8000-02	6.9923+01	9.6000-02
1.50-02	6.5854+01	2.2720-01	6.6856+01	2.2360-01	6.7858+01	2.2020-01	6.8861+01	2.1650-01	6.9863+01	2.1370-01
2.00-02	6.5742+01	3.9500-01	6.6746+01	3.8890-01	6.7750+01	3.8310-01	6.8754+01	3.7740-01	6.9758+01	3.7200-01
2.50-02	6.5602+01	6.0000-01	6.6608+01	5.9110-01	6.7614+01	5.8240-01	6.8620+01	5.7410-01	6.9626+01	5.6600-01
3.00-02	6.5434+01	8.3560-01	6.6443+01	8.2360-01	6.7452+01	8.1190-01	6.8460+01	8.0070-01	6.9468+01	7.8990-01
4.00-02	6.5028+01	1.3701+00	6.6043+01	1.3521+00	6.7057+01	1.3346+00	6.8071+01	1.3176+00	6.9085+01	1.3012+00
5.00-02	6.4562+01	1.9460+00	6.5584+01	1.9230+00	6.6604+01	1.9010+00	6.7624+01	1.8790+00	6.8643+01	1.8590+00
7.00-02	6.3416+01	3.0873+00	6.4450+01	3.0585+00	6.5483+01	3.0302+00	6.6516+01	3.0025+00	6.7547+01	2.9754+00
9.00-02	6.2180+01	4.1444+00	6.3225+01	4.1128+00	6.4270+01	4.0815+00	6.5313+01	4.0507+00	6.6355+01	4.0204+00
1.00-01	6.1538+01	4.6540+00	6.2589+01	4.6210+00	6.3638+01	4.5880+00	6.4686+01	4.5550+00	6.5733+01	4.5270+00
1.25-01	6.0999+01	5.8937+00	6.2057+01	5.8565+00	6.3115+01	5.8255+00	6.4152+01	5.7925+00	6.4711+01	5.7825+00
1.50-01	6.0290+01	7.2040+00	6.1321+01	7.1640+00	6.2422+01	7.1640+00	6.3688+01	7.1220+00	6.2552+01	7.0880+00
1.75-01	5.6635+01	8.5686+00	5.7707+01	8.5283+00	5.8779+01	8.4875+00	5.9851+01	8.4450+00	6.0922+01	8.4027+00
2.00-01	5.4938+01	9.8670+00	5.6012+01	9.8300+00	5.7086+01	9.7920+00	5.8161+01	9.7510+00	5.9237+01	9.7200+00
2.50-01	5.1458+01	1.2335+01	5.2525+01	1.2308+01	5.3595+01	1.2279+01	5.4668+01	1.2245+01	5.5743+01	1.2211+01
3.00-01	4.8079+01	1.4647+01	4.9120+01	1.4628+01	5.0168+01	1.4609+01	5.1221+01	1.4581+01	5.2278+01	1.4565+01
4.00-01	4.2011+01	1.8799+01	4.2957+01	1.8810+01	4.3916+01	1.8817+01	4.4886+01	1.8809+01	4.5867+01	1.8810+01
5.00-01	3.7007+01	2.2282+01	3.7842+01	2.2338+01	3.8693+01	2.2387+01	3.9560+01	2.2412+01	4.0440+01	2.2443+01
6.00-01	3.2779+01	2.5284+01	3.3514+01	2.5383+01	3.4265+01	2.5471+01	3.5033+01	2.5532+01	3.5817+01	2.5996+01
7.00-01	2.9124+01	2.8001+01	2.9768+01	2.8137+01	3.0430+01	2.8258+01	3.1107+01	2.8352+01	3.1800+01	2.8446+01
8.00-01	2.5999+01	3.0512+01	2.6557+01	3.0678+01	2.7131+01	3.0830+01	2.7722+01	3.0954+01	2.8329+01	3.1077+01
9.00-01	2.3396+01	3.2845+01	2.3871+01	3.3039+01	2.4362+01	3.3216+01	2.4868+01	3.3369+01	2.5390+01	3.3519+01
1.00+00	2.1277+01	3.5021+01	2.1674+01	3.5240+01	2.2086+01	3.5440+01	2.2513+01	3.5620+01	2.2954+01	3.5794+01
1.25+00	1.7595+01	3.9832+01	1.7846+01	4.0121+01	1.8105+01	4.0387+01	1.8372+01	4.0637+01	1.8650+01	4.0869+01
1.50+00	1.5296+01	4.3713+01	1.5493+01	4.4101+01	1.5688+01	4.4463+01	1.5883+01	4.4808+01	1.6079+01	4.5131+01
2.00+00	1.1686+01	4.9082+01	1.1918+01	4.9656+01	1.2141+01	5.0210+01	1.2354+01	5.0752+01	1.2558+01	5.1270+01
2.50+00	8.6356+00	5.2567+01	8.8695+00	5.3241+01	9.1017+00	5.3906+01	9.3314+00	5.4565+01	9.5576+00	5.5210+01
3.00+00	6.9987+00	5.5073+01	7.1689+00	5.5803+01	7.3408+00	5.6528+01	7.5138+00	5.7250+01	7.6875+00	5.7966+01
3.50+00	5.3619+00	5.6993+01	5.4684+00	5.7756+01	5.5798+00	5.8518+01	5.6922+00	5.9278+01	5.8175+00	6.0035+01
4.00+00	4.8073+00	5.8526+01	4.9013+00	5.9314+01	4.9979+00	6.0101+01	5.0972+00	6.0887+01	5.1992+00	6.1672+01
5.00+00	3.6980+00	6.0800+01	3.7670+00	6.1631+01	3.8340+00	6.2460+01	3.8991+00	6.3288+01	3.9762+00	6.4115+01
6.00+00	2.8583+00	6.2293+01	2.9323+00	6.3166+01	3.0049+00	6.4037+01	3.0762+00	6.4905+01	3.1465+00	6.5771+01
7.00+00	2.1867+00	6.3244+01	2.2520+00	6.4151+01	2.3168+00	6.5057+01	2.3808+00	6.5950+01	2.4457+00	6.6861+01
8.00+00	1.8746+00	6.3858+01	1.9259+00	6.4789+01	1.9772+00	6.5519+01	2.0280+00	6.6647+01	2.0795+00	6.7573+01
1.00+01	1.2503+00	6.4596+01	1.2738+00	6.5550+01	1.2979+00	6.6504+01	1.3223+00	6.7457+01	1.3472+00	6.8409+01
1.50+01	9.2106-01	6.5483+01	9.4193-01	6.6458+01	9.6260-01	6.7432+01	9.8300-01	6.8405+01	1.0032+00	6.9378+01
2.00+01	6.0211-01	6.5820+01	6.2152-01	6.6808+01	6.4096-01	6.7795+01	6.6043-01	6.8783+01	6.7992-01	6.9769+01
5.00+01	6.8488-02	6.5999+01	7.2785-02	6.6999+01	7.7273-02	6.7999+01	8.1957-02	6.8999+01	8.6843-02	6.9999+01
8.00+01	1.6986-02	6.6000+01	1.8247-02	6.7000+01	1.9583-02	6.8000+01	2.0998-02	6.9000+01	2.2496-02	7.0000+01
1.00+02	8.5990-03	6.6000+01	9.2769-03	6.7000+01	9.9994-03	6.8000+01	1.0769-02	6.9000+01	1.1588-02	7.0000+01
1.00+03	9.6554-06	6.6000+01	1.0737-05	6.7000+01	1.1934-05	6.8000+01	1.3256-05	6.9000+01	1.4718-05	7.0000+01
1.00+06	4.9144-14	6.6000+01	5.7910-14	6.7000+01	6.8275-14	6.8000+01	6.0540-14	6.9000+01	9.5067-14	7.0000+01
1.00+09	2.7110-22	6.6000+01	3.3785-22	6.7000+01	4.2171-22	6.8000+01	5.9777-22	6.9000+01	6.6041-22	7.0000+01

TABLE I.. CONT. ATOMIC FORM FACTOR, F(X,Z), AND INCOHERENT SCATTERING FUNCTION, S(X,Z)

X. /LAMBDA	71 LU		72 HF		73 TA		74 W		75 RE	
	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)
0.00	7.1000+01	0.0000	7.2000+01	0.0000	7.3000+01	0.0000	7.4000+01	0.0000	7.5000+01	0.0000
5.00-03	7.0962+01	2.3000-02	7.1959+01	2.3000-02	7.2959+01	2.3000-02	7.3963+01	2.1000-02	7.4962+01	2.0000-02
1.00-02	7.0919+01	9.3000-02	7.1917+01	9.3000-02	7.2917+01	8.7000-02	7.3919+01	8.3000-02	7.4922+01	8.1000-02
1.50-02	7.0865+01	2.0740-01	7.1867+01	1.9980-01	7.2870+01	1.9260-01	7.3873+01	1.8590-01	7.4875+01	1.7970-01
2.00-02	7.0761+01	3.6200-01	7.1766+01	3.4950-01	7.2771+01	3.3730-01	7.3775+01	3.2590-01	7.4760+01	3.1530-01
2.50-02	7.0630+01	5.5270-01	7.1637+01	5.3480-01	7.2644+01	5.1700-01	7.3651+01	5.0010-01	7.4658+01	4.8450-01
3.00-02	7.0473+01	7.7420-01	7.1482+01	7.5110-01	7.2492+01	7.2750-01	7.3502+01	7.0490-01	7.4511+01	6.8370-01
4.00-02	7.0090+01	1.2865+00	7.1102+01	1.2560+00	7.2117+01	1.2221+00	7.3132+01	1.1884+00	7.4148+01	1.1562+00
5.00-02	6.9646+01	1.8540+00	7.0660+01	1.8230+00	7.1678+01	1.7830+00	7.2697+01	1.7410+00	7.3715+01	1.7000+00
7.00-02	6.8521+01	3.0186+00	6.9528+01	3.0089+00	7.0547+01	2.9742+00	7.1572+01	2.9291+00	7.2600+01	2.8814+00
9.00-02	6.7280+01	4.1145+00	6.8259+01	4.1424+00	6.9262+01	4.1285+00	7.0280+01	4.0946+00	7.1366+01	4.0544+00
1.00-01	6.6635+01	4.6340+00	6.7601+01	4.6790+00	6.8595+01	4.6760+00	6.9606+01	4.6490+00	7.0626+01	4.6150+00
1.25-01	6.4989+01	5.9002+00	6.5888+01	5.9695+00	6.6832+01	5.9827+00	6.7805+01	5.9666+00	6.8800+01	5.9450+00
1.50-01	6.3301+01	7.1760+00	6.4135+01	7.2450+00	6.5024+01	7.2570+00	6.5953+01	7.2380+00	6.6912+01	7.2190+00
1.75-01	6.1646+01	8.4711+00	6.2434+01	8.5318+00	6.3271+01	8.5350+00	6.4149+01	8.5057+00	6.5060+01	8.4784+00
2.00-01	5.9951+01	9.7620+00	6.0701+01	9.8150+00	6.1491+01	9.8110+00	6.2321+01	9.7730+00	6.3186+01	9.7390+00
2.50-01	5.6495+01	1.2254+01	5.7229+01	1.2305+01	5.7971+01	1.2304+01	5.8733+01	1.2268+01	5.9519+01	1.2222+01
3.00-01	5.3079+01	1.4607+01	5.3828+01	1.4667+01	5.4554+01	1.4683+01	5.5275+01	1.4671+01	5.6003+01	1.4635+01
4.00-01	4.6693+01	1.8919+01	4.7460+01	1.9037+01	4.8183+01	1.9123+01	4.8877+01	1.9193+01	4.9550+01	1.9217+01
5.00-01	4.1239+01	2.2640+01	4.2003+01	2.2850+01	4.2731+01	2.3042+01	4.3424+01	2.3224+01	4.4088+01	2.3361+01
6.00-01	3.6575+01	2.5838+01	3.3225+01	2.6110+01	3.4043+01	2.6385+01	3.4740+01	2.6662+01	3.5499+01	2.6914+01
7.00-01	3.2513+01	2.8699+01	3.0225+01	2.8989+01	3.0930+01	2.9298+01	3.1621+01	2.9621+01	3.2524+01	2.9945+01
8.00-01	2.8983+01	3.1332+01	2.9647+01	3.1624+01	3.0317+01	3.1938+01	3.0986+01	3.2273+01	3.1651+01	3.2624+01
9.00-01	2.5972+01	3.3778+01	2.6572+01	3.4070+01	2.7188+01	3.4385+01	2.7813+01	3.4719+01	2.8446+01	3.5075+01
1.00+00	2.3454+01	3.6059+01	2.3978+01	3.6354+01	2.4522+01	3.6669+01	2.5083+01	3.7003+01	2.5658+01	3.7357+01
1.25+00	1.8957+01	4.1159+01	1.9282+01	4.1465+01	1.9628+01	4.1786+01	1.9994+01	4.2123+01	2.0382+01	4.2474+01
1.50+00	1.6279+01	4.5471+01	1.6488+01	4.5817+01	1.6705+01	4.6168+01	1.6932+01	4.6526+01	1.7171+01	4.6895+01
2.00+00	1.2759+01	5.1782+01	1.2952+01	5.2285+01	1.3138+01	5.2777+01	1.3315+01	5.3262+01	1.3486+01	5.3739+01
2.50+00	9.7896+00	5.5846+01	1.0019+01	5.6475+01	1.0243+01	5.7095+01	1.0464+01	5.7707+01	1.0678+01	5.8311+01
3.00+00	7.8673+00	5.8672+01	8.0485+00	5.9375+01	8.2304+00	6.0072+01	8.4128+00	6.0764+01	8.5951+00	6.1452+01
3.50+00	5.9450+00	6.0785+01	6.0784+00	6.1532+01	6.2174+00	6.2277+01	6.3621+00	6.3018+01	6.5123+00	6.3756+01
4.00+00	5.3048+00	6.2451+01	5.4138+00	6.3227+01	5.5263+00	6.4002+01	5.6424+00	6.4775+01	5.7621+00	6.5546+01
5.00+00	4.0243+00	6.4936+01	4.0846+00	6.5755+01	4.1461+00	6.6572+01	4.2031+00	6.7388+01	4.2618+00	6.8201+01
6.00+00	3.2161+00	6.6633+01	3.2842+00	6.7492+01	3.3505+00	6.8348+01	3.4150+00	6.9201+01	3.4778+00	7.0053+01
7.00+00	2.5134+00	6.7759+01	2.5806+00	6.8653+01	2.6457+00	6.9545+01	2.7103+00	7.0435+01	2.7750+00	7.1322+01
8.00+00	2.1334+00	6.8497+01	2.1874+00	6.9419+01	2.2404+00	7.0339+01	2.2933+00	7.1256+01	2.3471+00	7.2172+01
1.00+01	1.3734+00	6.9361+01	1.4010+00	7.0311+01	1.4498+00	7.1261+01	1.4598+00	7.2210+01	1.4912+00	7.3158+01
1.50+01	1.0230+00	7.0351+01	1.0427+00	7.1323+01	1.0621+00	7.2296+01	1.0812+00	7.3267+01	1.1001+00	7.4239+01
2.00+01	6.9841-01	7.0755+01	7.1889-01	7.1741+01	7.3834-01	7.2726+01	7.5777-01	7.3711+01	7.7716-01	7.4696+01
5.00+01	9.1934-02	7.0998+01	9.7236-02	7.1998+01	1.0275-01	7.2998+01	1.0849-01	7.3998+01	1.1445-01	7.4998+01
8.00+01	2.4081-02	7.1000+01	2.5756-02	7.2000+01	2.7526-02	7.3000+01	2.9394-02	7.4000+01	3.1367-02	7.5000+01
1.00+02	1.2460-02	7.1000+01	1.3387-02	7.2000+01	1.4372-02	7.3000+01	1.5418-02	7.4000+01	1.6529-02	7.5000+01
1.00+03	1.6333-05	7.1000+01	1.8118-05	7.2000+01	2.0090-05	7.3000+01	2.2268-05	7.4000+01	2.4675-05	7.5000+01
1.00+06	1.1229-13	7.1000+01	1.3272-13	7.2000+01	1.5700-13	7.3000+01	1.8587-13	7.4000+01	2.2023-13	7.5000+01
1.00+09	8.2867-22	7.1000+01	1.0418-21	7.2000+01	1.3123-21	7.3000+01	1.6564-21	7.4000+01	2.0951-21	7.5000+01

TABLE I.. CONT. ATOMIC FORM FACTOR,  $F(X,Z)$ , AND INCOHERENT SCATTERING FUNCTION,  $S(X,Z)$

$X, \lambda/\Lambda$	76 OS		77 IR		78 PT		79 AU		80 HG	
	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$
0.00	7.6000+01	0.0000	7.7000+01	0.0000	7.8000+01	0.0000	7.9000+01	0.0000	8.0000+01	0.0000
5.00-03	7.5965+01	2.0000-02	7.6969+01	1.9000-02	7.7972+01	1.6000-02	7.8976+01	1.6000-02	7.9977+01	1.7000-02
1.00-02	7.5926+01	7.8000-02	7.6930+01	7.6000-02	7.7937+01	6.4000-02	7.8941+01	6.2000-02	7.9940+01	6.9000-02
1.50-02	7.5878+01	1.7410-01	7.6880+01	1.6880-01	7.7892+01	1.4200-01	7.8894+01	1.3800-01	7.9837+01	1.5520-01
2.00-02	7.5784+01	3.0560-01	7.6788+01	2.9660-01	7.7809+01	2.4980-01	7.8812+01	2.4280-01	7.9800+01	2.7310-01
2.50-02	7.5665+01	4.7000-01	7.6671+01	4.5660-01	7.7702+01	3.8520-01	7.8708+01	3.7460-01	7.9638+01	4.2120-01
3.00-02	7.5520+01	6.6400-01	7.6529+01	6.4570-01	7.7574+01	5.4590-01	7.8581+01	5.3120-01	7.9554+01	5.9690-01
4.00-02	7.5163+01	1.1262+00	7.6177+01	1.0977+00	7.7253+01	9.3300-01	7.8266+01	9.0930-01	7.9218+01	1.0202+00
5.00-02	7.4734+01	1.6610+00	7.5753+01	1.6240+00	7.6865+01	1.3900+00	7.7882+01	1.3570+00	7.8807+01	1.5190+00
7.00-02	7.3630+01	2.8368+00	7.4661+01	2.7909+00	7.5854+01	2.4347+00	7.6884+01	2.3876+00	7.7755+01	2.6468+00
9.00-02	7.2338+01	4.0201+00	7.3373+01	3.9804+00	7.4638+01	3.5557+00	7.5677+01	3.5019+00	7.6490+01	3.8275+00
1.00-01	7.1653+01	4.5900+00	7.2686+01	4.5800+00	7.3976+01	4.1230+00	7.5016+01	4.0680+00	7.5802+01	4.4090+00
1.25-01	6.9810+01	5.9469+00	7.0832+01	5.9381+00	7.2162+01	5.5222+00	7.3205+01	5.4827+00	7.3942+01	5.8147+00
1.50-01	6.7893+01	7.2440+00	6.8893+01	7.2580+00	7.0212+01	6.9170+00	7.1247+01	6.8750+00	7.1965+01	7.1590+00
1.75-01	6.5999+01	8.5207+00	6.6961+01	8.5262+00	6.8220+01	8.2699+00	6.9232+01	8.2364+00	6.9951+01	8.4708+00
2.00-01	6.4083+01	9.7910+00	6.5006+01	9.8410+00	6.6180+01	9.5890+00	6.7164+01	9.5600+00	6.7903+01	9.7660+00
2.50-01	6.0331+01	1.2294+01	6.1170+01	1.2367+01	6.2139+01	1.2130+01	6.3044+01	1.2102+01	6.3833+01	1.2310+01
3.00-01	5.6745+01	1.4715+01	5.7504+01	1.4803+01	5.8291+01	1.4583+01	5.9108+01	1.4551+01	5.9918+01	1.4772+01
4.00-01	5.0213+01	1.9321+01	5.0873+01	1.9427+01	5.1466+01	1.9337+01	5.2138+01	1.9321+01	5.2890+01	1.9489+01
5.00-01	4.4725+01	2.3533+01	4.5342+01	2.3694+01	4.5893+01	2.3766+01	4.6480+01	2.3828+01	4.7122+01	2.3960+01
6.00-01	4.0049+01	2.7177+01	4.0663+01	2.7429+01	4.1237+01	2.7638+01	4.1801+01	2.7815+01	4.2373+01	2.8005+01
7.00-01	3.5947+01	3.0274+01	3.6577+01	3.0620+01	3.7192+01	3.0910+01	3.7775+01	3.1197+01	3.8333+01	3.1480+01
8.00-01	3.2306+01	3.2981+01	3.2949+01	3.3349+01	3.3589+01	3.3713+01	3.4196+01	3.4072+01	3.4769+01	3.4429+01
9.00-01	2.9079+01	3.5437+01	2.9711+01	3.5817+01	3.0347+01	3.6204+01	3.0961+01	3.6597+01	3.1545+01	3.6994+01
1.00+00	2.6244+01	3.7719+01	2.6836+01	3.8100+01	2.7439+01	3.8491+01	2.8033+01	3.8896+01	2.8613+01	3.9307+01
1.25+00	2.0790+01	4.2839+01	2.1219+01	4.3217+01	2.1664+01	4.3610+01	2.2129+01	4.4011+01	2.2610+01	4.4422+01
1.50+00	1.7422+01	4.7266+01	1.7687+01	4.7651+01	1.7965+01	4.8049+01	1.8260+01	4.8456+01	1.8574+01	4.8866+01
2.00+00	1.3651+01	5.4211+01	1.3812+01	5.4678+01	1.3970+01	5.5142+01	1.4125+01	5.5605+01	1.4279+01	5.6066+01
2.50+00	1.0886+01	5.8908+01	1.1087+01	5.9496+01	1.1282+01	6.0077+01	1.1469+01	6.0651+01	1.1648+01	6.1218+01
3.00+00	8.7769+00	6.2134+01	8.9578+00	6.2811+01	9.1378+00	6.3483+01	9.3158+00	6.4149+01	9.4913+00	6.4808+01
3.50+00	6.6678+00	6.4491+01	6.8282+00	6.5223+01	6.9934+00	6.5953+01	7.1623+00	6.6678+01	7.3344+00	6.7399+01
4.00+00	5.8853+00	6.6314+01	6.0117+00	6.7081+01	6.1414+00	6.7847+01	6.2738+00	6.8610+01	6.4087+00	6.9370+01
5.00+00	4.3203+00	6.9013+01	4.3788+00	6.9824+01	4.4374+00	7.0633+01	4.4969+00	7.1441+01	4.5574+00	7.2248+01
6.00+00	3.5388+00	7.0902+01	3.5981+00	7.1749+01	3.6582+00	7.2593+01	3.7110+00	7.3436+01	3.7658+00	7.4278+01
7.00+00	2.8399+00	7.2206+01	2.9030+00	7.3068+01	2.9635+00	7.3968+01	3.0236+00	7.4845+01	3.0833+00	7.5720+01
8.00+00	2.4014+00	7.3085+01	2.4551+00	7.3997+01	2.5077+00	7.4906+01	2.5607+00	7.5813+01	2.6137+00	7.6718+01
1.00+01	1.5244+00	7.4106+01	1.5594+00	7.5052+01	1.5962+00	7.5997+01	1.6350+00	7.6941+01	1.6746+00	7.7884+01
1.50+01	1.1186+00	7.5210+01	1.1370+00	7.6181+01	1.1550+00	7.7152+01	1.1728+00	7.8123+01	1.1903+00	7.9093+01
2.00+01	7.9650-01	7.5680+01	8.1579-01	7.6663+01	8.3501-01	7.7647+01	8.5415-01	7.8630+01	8.7322-01	7.9612+01
5.00+01	1.2064-01	7.5998+01	1.2707-01	7.6997+01	1.3374-01	7.7997+01	1.4064-01	7.8997+01	1.4780-01	7.9997+01
8.00+01	3.3446-02	7.6000+01	3.5639-02	7.7000+01	3.7949-02	7.8000+01	4.0382-02	7.9000+01	4.2943-02	8.0000+01
1.00+02	1.7707-02	7.6000+01	1.8957-02	7.7000+01	2.0282-02	7.8000+01	2.1686-02	7.9000+01	2.3174-02	8.0000+01
1.00+03	2.7333-05	7.6000+01	3.0269-05	7.7000+01	3.3512-05	7.8000+01	3.7094-05	7.9000+01	4.1052-05	8.0000+01
1.00+06	2.6120-13	7.6000+01	3.1009-13	7.7000+01	3.6351-13	7.8000+01	4.3841-13	7.9000+01	5.2217-13	8.0000+01
1.00+09	2.6558-21	7.6000+01	3.3741-21	7.7000+01	4.2969-21	7.8000+01	5.4851-21	7.9000+01	7.0194-21	8.0000+01



TABLE I.- CONT. ATOMIC FORM FACTOR,  $F(X,Z)$ , AND INCOHERENT SCATTERING FUNCTION,  $S(X,Z)$ 

$X$ , $\sin(\theta/\lambda)/2$	81 TL		82 PB		83 BI		84 PO		85 AT	
	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$
0.00	8.1000+01	0.0000	8.2000+01	0.0000	8.3000+01	0.0000	8.4000+01	0.0000	8.5000+01	0.0000
0.00-03	8.0973+01	1.8000-02	8.1932+01	1.8000-02	8.2977+01	1.7000-02	8.3983+01	1.7000-02	8.4983+01	1.7600-02
1.00-02	8.0932+01	7.3000-02	8.1932+01	7.2000-02	8.2933+01	7.0000-02	8.3936+01	6.8000-02	8.4938+01	6.6000-02
1.50-02	8.0873+01	1.6200-01	8.1868+01	1.5980-01	8.2866+01	1.5580-01	8.3855+01	1.5170-01	8.4865+01	1.4760-01
2.00-02	8.0776+01	2.8480-01	8.1767+01	2.8130-01	8.2763+01	2.7440-01	8.3761+01	2.6740-01	8.4761+01	2.6050-01
2.50-02	8.0652+01	4.3870-01	8.1638+01	4.3390-01	8.2632+01	4.2350-01	8.3629+01	4.1350-01	8.4629+01	4.0320-01
3.00-02	8.0503+01	6.2100-01	8.1482+01	6.1520-01	8.2473+01	6.0100-01	8.3469+01	5.8790-01	8.4468+01	5.7400-01
4.00-02	8.0133+01	1.0589+00	8.1096+01	1.0528+00	8.2078+01	1.0304+00	8.3069+01	1.0126+00	8.4067+01	9.9210-01
5.00-02	7.9687+01	1.5730+00	8.0626+01	1.5710+00	8.1592+01	1.5400+00	8.2575+01	1.5220+00	8.3568+01	1.4970+00
7.00-02	7.3549+01	2.7370+00	7.6435+01	2.7554+00	8.0368+01	2.7146+00	8.1328+01	2.7120+00	8.2307+01	2.6909+00
9.00-02	7.7214+01	3.9647+00	7.6034+01	4.0221+00	7.8914+01	3.9811+00	7.9834+01	4.0170+00	8.0783+01	4.0193+00
1.00-01	7.5495+01	4.5750+00	7.7282+01	4.6580+00	7.8131+01	4.6220+00	7.9025+01	4.6820+00	7.9952+01	4.7020+00
1.25-01	7.4593+01	6.0563+00	7.5302+01	6.2119+00	7.6070+01	6.2096+00	7.6890+01	6.3350+00	7.7752+01	6.4082+00
1.50-01	7.2604+01	7.4600+00	7.3259+01	7.6940+00	7.3956+01	7.7570+00	7.4703+01	7.9450+00	7.5487+01	8.0760+00
1.75-01	7.3608+01	8.7999+00	7.1236+01	9.0990+00	7.1377+01	9.2502+00	7.2548+01	9.4960+00	7.3256+01	9.6870+00
2.00-01	6.8596+01	1.0096+01	6.9223+01	1.0437+01	6.9835+01	1.0676+01	7.0456+01	1.0976+01	7.1101+01	1.1229+01
2.50-01	6.4590+01	1.2608+01	6.5270+01	1.2964+01	6.5395+01	1.3314+01	6.6488+01	1.3694+01	6.7068+01	1.4056+01
3.00-01	6.0712+01	1.5041+01	6.1453+01	1.5368+01	6.2135+01	1.5734+01	6.2765+01	1.6133+01	6.3355+01	1.6546+01
4.00-01	5.3657+01	1.9702+01	5.4423+01	1.9964+01	5.5173+01	2.0268+01	5.5893+01	2.0606+01	5.6577+01	2.0978+01
5.00-01	4.7780+01	2.4127+01	4.8459+01	2.4337+01	4.9154+01	2.4586+01	4.9855+01	2.4863+01	5.0553+01	2.5171+01
6.00-01	4.2944+01	2.8197+01	4.3529+01	2.8408+01	4.4131+01	2.8642+01	4.4750+01	2.8893+01	4.5385+01	2.9169+01
7.00-01	3.8876+01	3.1750+01	3.9415+01	3.2020+01	3.9954+01	3.2292+01	4.0501+01	3.2568+01	4.1059+01	3.2854+01
8.00-01	3.5322+01	3.4777+01	3.5856+01	3.5121+01	3.6377+01	3.5462+01	3.6889+01	3.5795+01	3.7399+01	3.6127+01
9.00-01	3.2114+01	3.7390+01	3.2662+01	3.7790+01	3.3190+01	3.8190+01	3.3701+01	3.8581+01	3.4198+01	3.8971+01
1.00+00	2.9185+01	3.9724+01	2.9741+01	4.0151+01	3.0281+01	4.0585+01	3.0804+01	4.1016+01	3.1310+01	4.1450+01
1.25+00	2.3103+01	4.4844+01	2.3604+01	4.5277+01	2.4109+01	4.5722+01	2.4615+01	4.6177+01	2.5119+01	4.6643+01
1.50+00	1.8908+01	4.9283+01	1.9260+01	4.9713+01	1.9628+01	5.0156+01	2.0013+01	5.0502+01	2.0411+01	5.1062+01
2.00+00	1.4434+01	5.6529+01	1.4592+01	5.6993+01	1.4754+01	5.7459+01	1.4923+01	5.7930+01	1.5099+01	5.8404+01
2.50+00	1.1819+01	6.1779+01	1.1984+01	6.2335+01	1.2140+01	6.2887+01	1.2291+01	6.3435+01	1.2435+01	6.3979+01
3.00+00	9.5644+00	6.5461+01	9.6351+00	6.6108+01	1.0003+01	6.6751+01	1.0168+01	6.7387+01	1.0330+01	6.8018+01
3.50+00	7.5094+00	6.8116+01	7.6867+00	6.8829+01	7.8655+00	6.9538+01	8.0452+00	7.0242+01	8.2252+00	7.0943+01
4.00+00	6.5460+00	7.0129+01	6.6853+00	7.0885+01	6.8261+00	7.1638+01	6.9683+00	7.2389+01	7.1115+00	7.3137+01
5.00+00	4.6192+00	7.3053+01	4.6825+00	7.3858+01	4.7474+00	7.4682+01	4.8144+00	7.5465+01	4.8842+00	7.6266+01
6.00+00	3.3192+00	7.5117+01	3.3871+00	7.5956+01	3.4622+00	7.6793+01	3.5371+00	7.7623+01	4.0233+00	7.8463+01
7.00+00	3.1425+00	7.6592+01	3.2009+00	7.7463+01	3.2579+00	7.8332+01	3.3136+00	7.9199+01	3.3681+00	8.0064+01
8.00+00	2.5664+00	7.7620+01	2.7184+00	7.8521+01	2.7695+00	7.9419+01	2.8196+00	8.0315+01	2.8688+00	8.1210+01
1.00+01	1.7142+00	7.8826+01	1.7534+00	7.9767+01	1.7927+00	8.0706+01	1.8317+00	8.1644+01	1.8702+00	8.2588+01
1.50+01	1.2076+00	8.0063+01	1.2246+00	8.1033+01	1.2414+00	8.2002+01	1.2579+00	8.2972+01	1.2741+00	8.3941+01
2.00+01	8.9221-01	8.0594+01	9.1110-01	8.1576+01	9.2989-01	8.2558+01	9.4859-01	8.3539+01	9.6717-01	8.4520+01
5.00+01	1.5521-01	8.0996+01	1.6288-01	8.1996+01	1.7081-01	8.2996+01	1.7501-01	8.3995+01	1.8749-01	8.4995+01
8.00+01	4.5637-02	8.1000+01	4.8470-02	8.2000+01	5.1448-02	8.3000+01	5.4578-02	8.4000+01	5.7865-02	8.5000+01
1.00+02	2.4749-02	8.1000+01	2.6415-02	8.2000+01	2.8179-02	8.3000+01	3.0044-02	8.4000+01	3.2016-02	8.5000+01
1.00+03	4.5425-05	8.1000+01	5.0257-05	8.2000+01	5.5597-05	8.3000+01	6.1501-05	8.4000+01	6.8029-05	8.5000+01
1.00+06	6.2268-13	8.1000+01	7.4347-13	8.2000+01	8.8885-13	8.3000+01	1.0641-12	8.4000+01	1.2758-12	8.5000+01
1.00+09	9.0060-21	8.1000+01	1.1586-20	8.2000+01	1.4945-20	8.3000+01	1.9333-20	8.4000+01	2.5084-20	8.5000+01

TABLE I. CONT. ATOMIC FORM FACTOR,  $F(X,Z)$ , AND INCOHERENT SCATTERING FUNCTION,  $S(X,Z)$ 

$X$ , $\sin(\theta/\lambda)/2\theta$	86 RN		87 FR		88 PA		89 AC		90 TH	
	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$	$F(X,Z)$	$S(X,Z)$
0.00	8.6000+01	0.0000	8.7000+01	0.0000	8.8000+01	0.0000	8.9000+01	0.0000	9.0000+01	0.0000
0.00-03	8.5984+01	1.6000-02	8.6969+01	3.1000-02	8.7968+01	3.6000-02	8.8963+01	3.5000-02	8.9959+01	3.4000-02
1.00-02	8.5940+01	6.4000-02	8.6905+01	1.2200-01	8.7897+01	1.4400-01	8.8893+01	1.4000-01	8.9891+01	1.3500-01
1.50-02	8.5866+01	1.4360-01	8.6804+01	2.6840-01	8.7783+01	3.1700-01	8.8787+01	3.0830-01	8.9791+01	2.9860-01
2.00-02	8.5762+01	2.5360-01	8.6657+01	4.6070-01	8.7619+01	5.4700-01	8.8624+01	5.3400-01	8.9631+01	5.1870-01
2.50-02	8.5630+01	3.9280-01	8.6472+01	6.8950-01	8.7413+01	8.2340-01	8.8420+01	8.0770-01	8.9430+01	7.8730-01
3.00-02	8.5469+01	5.5960-01	8.6255+01	9.4480-01	8.7170+01	1.1346+00	8.8178+01	1.1192+00	8.9190+01	1.0953+00
4.00-02	8.5068+01	9.6880-01	8.5735+01	1.5005+00	8.6585+01	1.8169+00	8.7592+01	1.8144+00	8.8606+01	1.7920+00
5.00-02	8.4567+01	1.4650+00	8.5138+01	2.0780+00	8.5910+01	2.5200+00	8.6912+01	2.5480+00	8.7927+01	2.5400+00
7.00-02	8.3298+01	2.6449+00	8.3735+01	3.2516+00	8.4351+01	3.8479+00	8.5293+01	3.9624+00	8.6275+01	4.0165+00
9.00-02	8.1753+01	3.9684+00	8.2198+01	4.4821+00	8.2700+01	5.0824+00	8.3557+01	5.2647+00	8.4478+01	5.3826+00
1.00-01	8.0904+01	4.6520+00	8.1375+01	5.1240+00	8.1853+01	5.6960+00	8.2659+01	5.8980+00	8.3542+01	6.0390+00
1.25-01	7.8649+01	6.3706+00	7.9263+01	6.7708+00	7.9750+01	7.2665+00	8.0454+01	7.4878+00	8.1238+01	7.6634+00
1.50-01	7.6314+01	8.0650+00	7.7046+01	8.4150+00	7.7611+01	8.8580+00	7.8241+01	9.0920+00	7.8934+01	9.2890+00
1.75-01	7.4003+01	9.7216+00	7.4775+01	1.0030+01	7.5431+01	1.0427+01	7.6034+01	1.0674+01	7.6674+01	1.0889+01
2.00-01	7.1776+01	1.1329+01	7.2551+01	1.1609+01	7.3259+01	1.1964+01	7.3862+01	1.2220+01	7.4471+01	1.2446+01
2.50-01	6.7648+01	1.4317+01	6.8332+01	1.4614+01	6.9044+01	1.4934+01	6.9642+01	1.5203+01	7.0214+01	1.5442+01
3.00-01	6.3917+01	1.6929+01	6.4512+01	1.7303+01	6.5162+01	1.7672+01	6.5751+01	1.7992+01	6.6313+01	1.8271+01
4.00-01	5.7222+01	2.1382+01	5.7829+01	2.1816+01	5.8406+01	2.2270+01	5.9006+01	2.2715+01	5.9585+01	2.3139+01
5.00-01	5.1241+01	2.5507+01	5.1898+01	2.5878+01	5.2522+01	2.6289+01	5.3154+01	2.6712+01	5.3774+01	2.7162+01
6.00-01	4.6031+01	2.9469+01	4.6671+01	2.9791+01	4.7309+01	3.0139+01	4.7937+01	3.0511+01	4.8563+01	3.0909+01
7.00-01	4.1630+01	3.3153+01	4.2210+01	3.3463+01	4.2802+01	3.3790+01	4.3385+01	3.4133+01	4.3974+01	3.4496+01
8.00-01	3.7911+01	3.6460+01	3.8543+01	3.6795+01	3.8963+01	3.7136+01	3.9491+01	3.7483+01	4.0023+01	3.7842+01
9.00-01	3.4686+01	3.9358+01	3.5175+01	3.9740+01	3.5661+01	4.0121+01	3.6147+01	4.0498+01	3.6634+01	4.0879+01
1.00+00	3.1801+01	4.1885+01	3.2282+01	4.2315+01	3.2752+01	4.2744+01	3.3219+01	4.3164+01	3.3681+01	4.3582+01
1.25+00	2.5618+01	4.7118+01	2.6109+01	4.7602+01	2.6590+01	4.8093+01	2.7064+01	4.8588+01	2.7527+01	4.9085+01
1.50+00	2.0821+01	5.1533+01	2.1244+01	5.2013+01	2.1669+01	5.2502+01	2.2104+01	5.3000+01	2.2541+01	5.3510+01
2.00+00	1.5285+01	5.8884+01	1.5482+01	5.9368+01	1.5689+01	5.9858+01	1.5909+01	6.0356+01	1.6141+01	6.0860+01
2.50+00	1.2574+01	6.4521+01	1.2709+01	6.5062+01	1.2842+01	6.5602+01	1.2972+01	6.6142+01	1.3102+01	6.6682+01
3.00+00	1.0490+01	6.8646+01	1.0646+01	6.9268+01	1.0801+01	6.9885+01	1.0954+01	7.0497+01	1.1105+01	7.1107+01
3.50+00	8.4049+00	7.1639+01	8.5835+00	7.2331+01	8.7605+00	7.3018+01	8.9353+00	7.3702+01	9.1074+00	7.4381+01
4.00+00	7.2557+00	7.3882+01	7.4006+00	7.4624+01	7.5453+00	7.5363+01	7.6897+00	7.6099+01	7.8336+00	7.6832+01
5.00+00	4.9574+00	7.7067+01	5.0348+00	7.7866+01	5.1150+00	7.8664+01	5.1984+00	7.9461+01	5.2859+00	8.0257+01
6.00+00	4.0733+00	7.9296+01	4.1235+00	8.0128+01	4.1737+00	8.0960+01	4.2238+00	8.1790+01	4.2743+00	8.2619+01
7.00+00	3.4218+00	8.0927+01	3.4742+00	8.1789+01	3.5255+00	8.2649+01	3.5753+00	8.3508+01	3.6231+00	8.4365+01
8.00+00	2.9173+00	8.2102+01	2.9655+00	8.2992+01	3.0135+00	8.3881+01	3.0615+00	8.4767+01	3.1089+00	8.5652+01
1.50+01	1.9084+00	8.3515+01	1.9480+00	8.4449+01	1.9896+00	8.5381+01	2.0340+00	8.6311+01	2.0806+00	8.7241+01
2.00+01	1.2901+00	8.4910+01	1.3059+00	8.5879+01	1.3214+00	8.6847+01	1.3366+00	8.7816+01	1.3516+00	8.8784+01
2.00+01	9.8565-01	8.5501+01	1.0040+00	8.6481+01	1.0223+00	8.7461+01	1.0404+00	8.8441+01	1.0584+00	8.9421+01
5.00+01	1.9623-01	8.5995+01	2.0527-01	8.6994+01	2.1458-01	8.7994+01	2.2419-01	8.8993+01	2.3410-01	8.9993+01
8.00+01	6.1316-02	8.6000+01	6.4938-02	8.7000+01	6.8739-02	8.8000+01	7.2725-02	8.9000+01	7.6906-02	9.0000+01
1.00+02	3.4100-02	8.6000+01	3.6302-02	8.7000+01	3.8629-02	8.8000+01	4.1085-02	8.9000+01	4.3679-02	9.0000+01
1.00+03	7.5248-05	8.6000+01	8.3234-05	8.7000+01	9.2072-05	8.8000+01	1.0186-04	8.9000+01	1.1269-04	9.0000+01
1.00+06	1.5318-12	8.6000+01	1.8421-12	8.7000+01	2.2189-12	8.8000+01	2.6773-12	8.9000+01	3.2361-12	9.0000+01
1.00+09	3.2642-20	8.6000+01	4.2611-20	8.7000+01	5.5805-20	8.8000+01	7.3326-20	8.9000+01	9.6681-20	9.0000+01

TABLE I.. CONT. ATOMIC FORM FACTOR, F(X,Z), AND INCOHERENT SCATTERING FUNCTION, S(X,Z)

X /LAMBDA	91 PA		92 U		93 NP		94 PU		95 AM	
	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)
0.00	9.1000+01	0.0000	9.2000+01	0.0000	9.3000+01	0.0000	9.4000+01	0.0000	9.5000+01	0.0000
0.00-03	9.0960+01	3.4000-02	9.1959+01	3.3000-02	9.2958+01	3.3000-02	9.3963+01	3.3000-02	9.4962+01	3.3000-02
1.00-02	9.0893+01	1.3400-01	9.1894+01	1.3200-01	9.2894+01	1.3000-01	9.3899+01	1.3100-01	9.4900+01	1.2900-01
1.50-02	9.0794+01	2.9610-01	9.1797+01	2.9100-01	9.2800+01	2.8710-01	9.3804+01	2.9030-01	9.4807+01	2.8600-01
2.00-02	9.0637+01	5.1370-01	9.1643+01	5.0510-01	9.2648+01	4.9860-01	9.3654+01	5.0330-01	9.4659+01	4.9600-01
2.50-02	9.0439+01	7.7840-01	9.1448+01	7.6590-01	9.2457+01	7.5650-01	9.3466+01	7.6200-01	9.4474+01	7.5140-01
3.00-02	9.0204+01	1.0807+00	9.1216+01	1.0643+00	9.2228+01	1.0521+00	9.3243+01	1.0572+00	9.4254+01	1.0431+00
4.00-02	8.9634+01	1.7650+00	9.0654+01	1.7371+00	9.1673+01	1.7203+00	9.2702+01	1.7194+00	9.3719+01	1.6990+00
5.00-02	8.8974+01	2.4850+00	9.0003+01	2.4570+00	9.1031+01	2.4380+00	9.2077+01	2.4240+00	9.3102+01	2.3990+00
7.00-02	8.7374+01	3.9044+00	8.8415+01	3.8752+00	8.9456+01	3.8595+00	9.0567+01	3.8106+00	9.1605+01	3.7815+00
9.00-02	8.5643+01	5.2277+00	8.6690+01	5.2029+00	8.7739+01	5.1947+00	8.8929+01	5.1243+00	8.9976+01	5.0943+00
1.00-01	8.4740+01	5.8730+00	8.5788+01	5.8510+00	8.6839+01	5.8460+00	8.8068+01	5.7740+00	8.9118+01	5.7450+00
1.25-01	8.2507+01	7.4975+00	8.3549+01	7.4819+00	8.4597+01	7.4833+00	8.5909+01	7.4222+00	8.6962+01	7.3919+00
1.50-01	8.0239+01	9.1430+00	8.1264+01	9.1360+00	8.2298+01	9.1143+00	8.3658+01	9.0890+00	8.4708+01	9.0650+00
1.75-01	7.7974+01	1.0767+01	7.8978+01	1.0771+01	7.9958+01	1.0784+01	8.1352+01	1.0720+01	8.2396+01	1.0700+01
2.00-01	7.5730+01	1.2345+01	7.6706+01	1.2358+01	7.7701+01	1.2375+01	7.9152+01	1.2288+01	8.0043+01	1.2277+01
2.50-01	7.1323+01	1.5364+01	7.2221+01	1.5397+01	7.3144+01	1.5403+01	7.4325+01	1.5254+01	7.5299+01	1.5246+01
3.00-01	6.7246+01	1.8185+01	6.8050+01	1.8222+01	6.8887+01	1.8242+01	6.9907+01	1.8039+01	7.0806+01	1.8033+01
4.00-01	6.0221+01	2.3062+01	6.0864+01	2.3157+01	6.1532+01	2.3230+01	6.2263+01	2.3007+01	6.2991+01	2.3027+01
5.00-01	5.4276+01	2.7163+01	5.4841+01	2.7321+01	5.5416+01	2.7456+01	5.5970+01	2.7315+01	5.6575+01	2.7380+01
6.00-01	4.9034+01	3.0988+01	4.9568+01	3.1178+01	5.0099+01	3.1349+01	5.0571+01	3.1301+01	5.1106+01	3.1401+01
7.00-01	4.4448+01	3.4631+01	4.4961+01	3.4842+01	4.5464+01	3.5038+01	4.5908+01	3.5059+01	4.6398+01	3.5190+01
8.00-01	4.0510+01	3.8032+01	4.1002+01	3.8270+01	4.1484+01	3.8495+01	4.1926+01	3.8580+01	4.2386+01	3.8740+01
9.00-01	3.7131+01	4.1137+01	3.7609+01	4.1418+01	3.8077+01	4.1683+01	3.8528+01	4.1840+01	3.8972+01	4.2040+01
1.00+00	3.4185+01	4.3916+01	3.4655+01	4.4254+01	3.5117+01	4.4573+01	3.5579+01	4.4812+01	3.6018+01	4.5067+01
1.25+00	2.8018+01	4.9565+01	2.8488+01	5.0036+01	2.8952+01	5.0496+01	2.9427+01	5.0924+01	2.9876+01	5.1338+01
1.50+00	2.2986+01	5.4030+01	2.3433+01	5.4551+01	2.3881+01	5.5072+01	2.4334+01	5.5593+01	2.4783+01	5.6106+01
2.00+00	1.6379+01	6.1374+01	1.6833+01	6.1894+01	1.6898+01	6.2420+01	1.7172+01	6.2956+01	1.7461+01	6.3495+01
2.50+00	1.3229+01	6.7219+01	1.3359+01	6.7760+01	1.3491+01	6.8304+01	1.3625+01	6.8849+01	1.3767+01	6.9399+01
3.00+00	1.1248+01	7.1707+01	1.1393+01	7.2306+01	1.1536+01	7.2902+01	1.1677+01	7.3494+01	1.1820+01	7.4088+01
3.50+00	9.2669+00	7.5050+01	9.4265+00	7.5717+01	9.5815+00	7.6380+01	9.7281+00	7.7035+01	9.8736+00	7.7688+01
4.00+00	7.9698+00	7.7558+01	8.1074+00	7.8282+01	8.2429+00	7.9001+01	8.3731+00	7.9714+01	8.5037+00	8.0425+01
5.00+00	5.3757+00	8.1053+01	5.4692+00	8.1846+01	5.5656+00	8.2637+01	5.6630+00	8.3426+01	5.7638+00	8.4213+01
6.00+00	4.3259+00	8.3451+01	4.3781+00	8.4280+01	4.4312+00	8.5108+01	4.4856+00	8.5937+01	4.5411+00	8.6763+01
7.00+00	3.6696+00	8.5224+01	3.7151+00	8.6081+01	3.7603+00	8.6936+01	3.8056+00	8.7792+01	3.8505+00	8.8646+01
8.00+00	3.1555+00	8.6537+01	3.2016+00	8.7420+01	3.2478+00	8.8302+01	3.2943+00	8.9183+01	3.3404+00	9.0062+01
1.00+01	2.1272+00	8.8170+01	2.1746+00	8.9097+01	2.2229+00	9.0023+01	2.2716+00	9.0948+01	2.3202+00	9.1870+01
1.50+01	1.3664+00	8.9752+01	1.3810+00	9.0719+01	1.3953+00	9.1687+01	1.4094+00	9.2465+01	1.4233+00	9.3622+01
2.00+01	1.0763+00	9.0400+01	1.0940+00	9.1379+01	1.1116+00	9.2358+01	1.1291+00	9.3337+01	1.1465+00	9.4316+01
5.00+01	2.4431-01	9.0999+01	2.5483-01	9.1992+01	2.6566-01	9.2991+01	2.7681-01	9.3990+01	2.8828-01	9.4990+01
8.00+01	8.1287-02	9.1000+01	8.5879-02	9.2000+01	9.0690-02	9.3000+01	9.5730-02	9.4000+01	1.0101-01	9.5000+01
1.00+02	4.6418-02	9.1000+01	4.9307-02	9.2000+01	5.2357-02	9.3000+01	5.5573-02	9.4000+01	5.8967-02	9.5000+01
1.00+03	1.2469-04	9.1000+01	1.3800-04	9.2000+01	1.5275-04	9.3000+01	1.6912-04	9.4000+01	1.8730-04	9.5000+01
1.00+06	3.9187-12	9.1000+01	4.7543-12	9.2000+01	5.7797-12	9.3000+01	7.0407-12	9.4000+01	8.5956-12	9.5000+01
1.00+09	1.2793-19	9.1000+01	1.6990-19	9.2000+01	2.2649-19	9.3000+01	3.0314-19	9.4000+01	4.0737-19	9.5000+01

TABLE I.. CONT. ATOMIC FORM FACTOR, F(X,Z), AND INCOHERENT SCATTERING FUNCTION, S(X,Z)

X, SIN(THETA/2) /LAMBDA	96 CM		97 BK		98 CF		99 ES		100 FM	
	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)	F(X,Z)	S(X,Z)
0.00	9.6000+01	0.0000	9.7000+01	0.0000	9.8000+01	0.0000	9.9000+01	0.0000	1.0000+02	0.0000
0.00-03	9.5956+01	3.1800-02	9.6956+01	3.1400-02	9.7962+01	3.1600-02	9.8962+01	3.1200-02	9.9962+01	3.0700-02
1.00-02	9.5895+01	1.2430-01	9.6895+01	1.2260-01	9.7902+01	1.2350-01	9.8903+01	1.2180-01	9.9903+01	1.2010-01
1.50-02	9.5809+01	2.7560-01	9.6812+01	2.7190-01	9.7815+01	2.7380-01	9.8817+01	2.7000-01	9.9819+01	2.6630-01
2.00-02	9.5664+01	4.7920-01	9.6668+01	4.7300-01	9.7673+01	4.7540-01	9.8678+01	4.6890-01	9.9682+01	4.6270-01
2.50-02	9.5480+01	7.2830-01	9.6487+01	7.1920-01	9.7495+01	7.2120-01	9.8502+01	7.1170-01	9.9509+01	7.0240-01
3.00-02	9.5261+01	1.0148+00	9.6271+01	1.0027+00	9.7283+01	1.0028+00	9.8293+01	9.9000-01	9.9302+01	9.7760-01
4.00-02	9.4726+01	1.6663+00	9.5743+01	1.6489+00	9.6769+01	1.6395+00	9.7784+01	1.6203+00	9.8799+01	1.6016+00
5.00-02	9.4109+01	2.3813+00	9.5133+01	2.3605+00	9.6174+01	2.3288+00	9.7196+01	2.3054+00	9.8217+01	2.2824+00
7.00-02	9.2573+01	3.7915+00	9.3611+01	3.7660+00	9.4715+01	3.6901+00	9.5750+01	3.6585+00	9.6784+01	3.6270+00
9.00-02	9.0886+01	5.1346+00	9.1934+01	5.1096+00	9.3116+01	4.9958+00	9.4162+01	4.9596+00	9.5207+01	4.9229+00
1.00-01	8.9998+01	5.7832+00	9.1051+01	5.7589+00	9.2271+01	5.6436+00	9.3322+01	5.6053+00	9.4372+01	5.5666+00
1.25-01	8.7761+01	7.4322+00	8.8819+01	7.4096+00	9.0134+01	7.2905+00	9.1193+01	7.2476+00	9.2252+01	7.2031+00
1.50-01	8.5442+01	9.1157+00	8.6499+01	9.1003+00	8.7881+01	8.9942+00	8.8943+01	8.9535+00	9.0007+01	8.9103+00
1.75-01	8.3117+01	1.0744+01	8.4170+01	1.0741+01	8.5563+01	1.0647+01	8.6627+01	1.0609+01	8.7694+01	1.0567+01
2.00-01	8.0766+01	1.2350+01	8.1807+01	1.2360+01	8.3182+01	1.2264+01	8.4240+01	1.2233+01	8.5304+01	1.2199+01
2.50-01	7.6041+01	1.5380+01	7.7038+01	1.5408+01	7.8314+01	1.5308+01	7.9343+01	1.5292+01	8.0380+01	1.5272+01
3.00-01	7.1555+01	1.8189+01	7.2488+01	1.8246+01	7.3624+01	1.8181+01	7.4598+01	1.8195+01	7.5585+01	1.8202+01
4.00-01	6.3690+01	2.3222+01	6.4458+01	2.3331+01	6.5315+01	2.3332+01	6.6134+01	2.3397+01	6.6973+01	2.3453+01
5.00-01	5.7217+01	2.7609+01	5.7851+01	2.7763+01	5.8491+01	2.7820+01	5.9165+01	2.7931+01	5.9859+01	2.8029+01
6.00-01	5.1701+01	3.1662+01	5.2480+01	3.1857+01	5.2753+01	3.1967+01	5.3323+01	3.2119+01	5.3904+01	3.2257+01
7.00-01	4.6943+01	3.5480+01	4.7433+01	3.5715+01	4.7867+01	3.5874+01	4.8363+01	3.6066+01	4.8865+01	3.6240+01
8.00-01	4.2878+01	3.9058+01	4.3331+01	3.9330+01	4.3737+01	3.9535+01	4.4182+01	3.9764+01	4.4627+01	3.9973+01
9.00-01	3.9421+01	4.2384+01	3.9851+01	4.2690+01	4.0253+01	4.2938+01	4.0667+01	4.3201+01	4.1076+01	4.3442+01
1.00+00	3.6440+01	4.5435+01	3.6862+01	4.5772+01	3.7272+01	4.6059+01	3.7673+01	4.6354+01	3.8065+01	4.6625+01
1.25+00	3.0298+01	5.1755+01	3.0729+01	5.2158+01	3.1169+01	5.2527+01	3.1581+01	5.2886+01	3.1981+01	5.3218+01
1.50+00	2.5221+01	5.6572+01	2.5664+01	5.7033+01	2.6111+01	5.7476+01	2.6545+01	5.7915+01	2.6973+01	5.8337+01
2.00+00	1.7765+01	6.4037+01	1.8076+01	6.4888+01	1.8395+01	6.5147+01	1.8726+01	6.5707+01	1.9066+01	6.6270+01
2.50+00	1.3914+01	6.9951+01	1.4076+01	7.0508+01	1.4227+01	7.1070+01	1.4395+01	7.1635+01	1.4571+01	7.2204+01
3.00+00	1.1966+01	7.4697+01	1.2110+01	7.5304+01	1.2253+01	7.5910+01	1.2400+01	7.6517+01	1.2549+01	7.7125+01
3.50+00	1.0018+01	7.8340+01	1.0153+01	7.8986+01	1.0280+01	7.9626+01	1.0406+01	8.0266+01	1.0527+01	8.0904+01
4.00+00	8.365+00	8.1132+01	8.7598+00	8.1836+01	8.8799+00	8.2534+01	9.0003+00	8.3231+01	9.1184+00	8.3926+01
5.00+00	5.8682+00	8.4998+01	5.9734+00	8.5780+01	6.0794+00	8.6559+01	6.1893+00	8.7355+01	6.3014+00	8.8109+01
6.00+00	4.5979+00	8.7587+01	4.6564+00	8.8411+01	4.7165+00	8.9236+01	4.7785+00	9.0057+01	4.8425+00	9.0877+01
7.00+00	3.8949+00	8.9497+01	3.9391+00	9.0348+01	3.9832+00	9.1200+01	4.0269+00	9.2050+01	4.0707+00	9.2899+01
8.00+00	3.3861+00	9.0944+01	3.4314+00	9.1825+01	3.4762+00	9.2146+01	3.5203+00	9.3586+01	3.5641+00	9.4465+01
1.00+01	2.3684+00	9.2791+01	2.4159+00	9.3711+01	2.4621+00	9.4631+01	2.5071+00	9.5548+01	2.5509+00	9.6464+01
1.50+01	1.4370+00	9.4589+01	1.4504+00	9.5555+01	1.4637+00	9.6522+01	1.4768+00	9.7488+01	1.4896+00	9.8453+01
2.00+01	1.1637+00	9.5294+01	1.1808+00	9.6272+01	1.1977+00	9.7250+01	1.2146+00	9.8228+01	1.2313+00	9.9206+01
3.00+01	3.0009-01	9.5989+01	3.1223-01	9.6988+01	3.2471-01	9.7988+01	3.3763-01	9.8999+01	3.5073-01	9.9986+01
4.00+01	6.2546-02	9.6000+01	6.320-02	9.7000+01	6.4000-02	9.8000+01	6.4971-02	9.9000+01	7.8923-02	1.0000+02
1.00+03	2.0748-04	9.6000+01	2.2992-04	9.7000+01	2.5488-04	9.8000+01	2.8266-04	9.9000+01	3.1361-04	1.0000+02
1.00+06	1.0517-11	9.6000+01	1.2899-11	9.7000+01	1.5859-11	9.8000+01	1.9548-11	9.9000+01	2.4159-11	1.0000+02
1.00+09	5.4975-19	9.6000+01	7.4515-19	9.7000+01	1.0146-18	9.8000+01	1.3880-18	9.9000+01	1.9081-18	1.0000+02

TABLE II. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM

PHOTON ENERGY, EV	1 H		2 HE		3 LI		4 BE		5 B	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	6.650-01	9.552-04	2.660+00	1.524-03	5.982+00	5.741-03	1.064+01	3.773-03	1.662+01	3.361+03
1.5+02	6.635-01	2.144-03	2.658+00	2.559-03	5.955+00	1.285-02	1.061+01	8.574-03	1.659+01	7.603-03
2.0+02	6.617-01	3.802-03	2.655+00	3.793-03	5.922+00	2.260-02	1.057+01	1.524-02	1.654+01	1.347-02
3.0+02	6.569-01	8.494-03	2.648+00	7.081-03	5.724+00	4.944-02	1.046+01	3.401-02	1.641+01	3.007-02
4.0+02	6.603-01	1.496-02	2.637+00	1.183-02	5.724+00	8.462-02	1.032+01	5.961-02	1.624+01	5.283-02
5.0+02	6.421-01	2.310-02	2.624+00	1.796-02	5.589+00	1.261-01	1.015+01	9.138-02	1.603+01	8.133-02
6.0+02	6.323-01	3.279-02	2.608+00	2.543-02	5.436+00	1.714-01	9.948+00	1.285-01	1.578+01	1.150-01
8.0+02	6.687-01	5.629-02	2.567+00	4.426-02	5.096+00	2.656-01	9.474+00	2.153-01	1.518+01	1.955-01
1.0+03	5.806-01	8.424-02	2.517+00	6.767-02	4.744+00	3.549-01	8.935+00	3.129-01	1.448+01	2.893-01
1.5+03	4.584-01	1.650-01	2.356+00	1.419-01	3.952+00	5.273-01	7.518+00	5.675-01	1.252+01	5.537-01
2.0+03	4.142-01	2.478-01	2.162+00	2.317-01	3.375+00	6.578-01	6.247+00	7.907-01	1.059+01	8.201-01
3.0+03	2.764-01	3.822-01	1.743+00	4.230-01	2.675+00	7.970-01	4.507+00	1.100+00	7.594+00	1.264+00
4.0+03	1.891-01	4.675-01	1.369+00	5.948-01	2.234+00	9.361-01	3.524+00	1.291+00	5.721+00	1.568+00
5.0+03	1.341-01	5.187-01	1.072+00	7.328-01	1.890+00	1.063+00	2.918+00	1.431+00	4.553+00	1.773+00
6.0+03	9.587-02	5.503-01	8.492-01	8.385-01	1.602+00	1.177+00	2.493+00	1.548+00	3.782+00	1.924+00
8.0+03	6.126-02	5.840-01	5.592-01	9.785-01	1.164+00	1.357+00	1.891+00	1.740+00	2.618+00	2.146+00
1.0+04	4.121-02	5.993-01	3.921-01	1.059+00	6.631-01	1.483+00	1.468+00	1.888+00	2.213+00	2.312+00
1.5+04	1.943-02	6.095-01	1.962-01	1.145+00	4.627-01	1.644+00	8.417-01	2.112+00	1.321+00	2.581+00
2.0+04	1.119-02	6.068-01	1.166-01	1.168+00	2.852-01	1.702+00	5.344-01	2.210+00	8.582-01	2.714+00
3.0+04	5.062-03	5.924-01	5.432-02	1.163+00	1.383-01	1.718+00	2.671-01	2.256+00	4.383-01	2.790+00
4.0+04	2.666-03	5.759-01	3.113-02	1.139+00	6.079-02	1.692+00	1.591-01	2.235+00	2.642-01	2.774+00
5.0+04	1.840-03	5.597-01	2.010-02	1.111+00	5.273-02	1.656+00	1.050-01	2.193+00	1.760-01	2.727+00
6.0+04	1.280-03	5.444-01	1.463-02	1.083+00	3.703-02	1.617+00	7.430-02	2.145+00	1.253-01	2.671+00
8.0+04	7.211-04	5.166-01	7.933-03	1.030+00	2.107-02	1.540+00	4.262-02	2.047+00	7.242-02	2.553+00
1.0+05	4.619-04	4.923-01	5.089-03	9.825-01	1.356-02	1.471+00	2.755-02	1.957+00	4.699-02	2.442+00
1.5+05	2.054-04	4.435-01	2.267-03	8.860-01	6.062-03	1.528+00	1.237-02	1.768+00	2.119-02	2.209+00
2.0+05	1.156-04	4.064-01	1.276-03	8.124-01	3.417-03	1.218+00	6.980-03	1.623+00	1.958-02	2.027+00
3.0+05	5.138-05	3.535-01	5.676-04	7.068-01	1.521-03	1.060+00	3.110-03	1.413+00	5.345-03	1.765+00
4.0+05	2.890-05	3.168-01	3.194-04	6.334-01	8.558-04	9.499-01	1.751-03	1.266+00	3.010-03	1.583+00
5.0+05	1.850-05	2.893-01	2.044-04	5.785-01	5.478-04	8.676-01	1.121-03	1.157+00	1.928-03	1.446+00
6.0+05	1.285-05	2.676-01	1.420-04	5.352-01	3.805-04	8.028-01	7.788-04	1.070+00	1.539-03	1.338+00
8.0+05	7.226-06	2.351-01	7.986-05	4.702-01	2.141-04	7.053-01	4.382-04	9.403-01	7.535-04	1.175+00
1.0+06	4.625-06	2.114-01	5.111-05	4.228-01	1.370-04	6.341-01	2.805-04	8.455-01	4.824-04	1.057+00
1.5+06	2.056-06	1.718-01	2.272-05	3.436-01	6.090-05	5.154-01	1.247-04	6.272-01	2.144-04	8.589-01
2.0+06	1.156-06	1.466-01	1.278-05	2.932-01	3.425-05	4.398-01	7.011-05	5.864-01	1.206-04	7.330-01
3.0+06	5.139-07	1.153-01	5.679-06	2.307-01	1.522-05	3.460-01	3.116-05	4.613-01	5.261-05	5.766-01
4.0+06	2.891-07	9.620-02	3.194-06	1.924-01	6.563-06	2.886-01	1.753-05	3.848-01	3.015-05	4.810-01
5.0+06	1.850-07	8.308-02	2.044-06	1.662-01	5.481-06	2.492-01	1.122-05	3.323-01	1.930-05	4.154-01
6.0+06	1.285-07	7.343-02	1.420-06	1.469-01	3.806-06	2.203-01	7.791-06	2.937-01	1.340-05	3.671-01
8.0+06	7.227-08	6.607-02	7.986-07	1.201-01	2.141-06	1.802-01	4.382-06	2.403-01	7.539-06	3.003-01
1.0+07	4.625-08	5.116-02	5.111-07	1.023-01	1.370-06	1.535-01	2.805-06	2.346-01	4.825-06	2.558-01
1.5+07	2.056-08	3.786-02	2.272-07	7.573-02	6.090-07	1.136-01	1.247-06	1.315-01	2.144-06	1.893-01
2.0+07	1.156-08	3.039-02	1.278-07	6.078-02	3.425-07	9.117-02	7.013-07	1.216-01	1.206-06	1.519-01
3.0+07	5.139-09	2.212-02	5.679-08	4.425-02	1.522-07	6.637-02	3.117-07	8.349-02	5.361-07	1.105-01
4.0+07	2.890-09	1.758-02	3.194-08	3.516-02	8.563-08	5.274-02	1.753-07	7.332-02	3.015-07	8.790-02
5.0+07	1.850-09	1.467-02	2.044-08	2.935-02	5.480-08	4.402-02	1.122-07	5.870-02	1.930-07	7.337-02
6.0+07	1.284-09	1.264-02	1.420-08	2.529-02	3.805-08	3.793-02	7.788-08	5.958-02	1.340-07	6.327-02
8.0+07	7.222-10	9.972-03	7.984-09	1.994-02	2.140-08	2.991-02	4.382-08	3.369-02	7.538-08	4.986-02
1.0+08	4.620-10	8.276-03	5.109-09	1.655-02	1.370-08	2.483-02	2.803-08	3.311-02	4.824-08	4.138-02

TABLE II. CONT. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM

PHOTON ENERGY, EV	6 C		7 N		8 O		9 F		10 NE	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	2.394+01	3.044-03	3.255+01	2.698-03	4.256+01	2.479-03	5.387+01	1.935-03	6.651+01	1.835-03
1.5+02	2.390+01	6.469-03	3.251+01	6.260-03	4.252+01	5.433-03	5.385+01	4.736-03	6.646+01	4.309-03
2.0+02	2.385+01	1.140-02	3.247+01	1.118-02	4.246+01	9.695-03	5.377+01	8.533-03	6.641+01	7.696-03
3.0+02	2.372+01	2.518-02	3.234+01	2.508-02	4.232+01	2.175-02	5.362+01	1.925-02	6.626+01	1.731-02
4.0+02	2.353+01	4.448-02	3.215+01	4.848-02	4.212+01	3.847-02	5.342+01	3.410-02	6.605+01	3.067-02
5.0+02	2.331+01	6.870-02	3.191+01	6.856-02	4.187+01	5.970-02	5.315+01	5.598-02	6.579+01	4.770-02
6.0+02	2.303+01	9.764-02	3.162+01	9.770-02	4.157+01	8.522-02	5.285+01	7.579-02	6.547+01	6.825-02
8.0+02	2.237+01	1.680-01	3.090+01	1.692-01	4.082+01	1.484-01	5.207+01	1.325-01	6.467+01	1.196-01
1.0+03	2.157+01	2.519-01	3.003+01	2.560-01	3.989+01	2.262-01	5.111+01	2.029-01	6.367+01	1.836-01
1.5+03	1.921+01	5.001-01	2.735+01	5.198-01	3.697+01	4.697-01	4.803+01	4.270-01	6.042+01	3.902-01
2.0+03	1.669+01	7.702-01	2.433+01	8.165-01	3.355+01	7.560-01	4.425+01	6.987-01	5.640+01	6.452-01
3.0+03	1.230+01	1.278+00	1.861+01	1.392+00	2.661+01	1.352+00	3.622+01	1.293+00	4.741+01	1.221+00
4.0+03	9.244+00	1.685+00	1.421+01	1.866+00	2.079+01	1.893+00	2.903+01	1.861+00	3.884+01	1.796+00
5.0+03	7.219+00	1.984+00	1.110+01	2.225+00	1.640+01	2.323+00	2.322+01	2.354+00	3.163+01	2.323+00
6.0+03	5.858+00	2.202+00	8.926+00	2.494+00	1.321+01	2.665+00	1.883+01	2.762+00	2.591+01	2.774+00
8.0+03	4.205+00	2.497+00	6.244+00	2.858+00	9.145+00	3.139+00	1.304+01	3.353+00	1.808+01	3.473+00
1.0+04	3.248+00	2.697+00	4.722+00	3.093+00	6.805+00	3.439+00	9.630+00	3.753+00	1.333+01	3.949+00
1.5+04	1.938+00	3.012+00	2.803+00	3.449+00	3.942+00	3.864+00	5.459+00	4.257+00	7.447+00	4.603+00
2.0+04	1.295+00	3.182+00	1.867+00	3.645+00	2.623+00	4.092+00	3.604+00	4.524+00	4.868+00	4.926+00
3.0+04	6.720-01	3.300+00	9.811-01	3.800+00	1.389+00	4.286+00	1.913+00	4.608+00	2.583+00	5.214+00
4.0+04	4.032-01	3.296+00	6.015-01	3.811+00	8.552-01	4.315+00	1.182+00	4.808+00	1.597+00	5.287+00
5.0+04	2.736-01	3.250+00	4.043-01	3.766+00	5.761-01	4.275+00	7.971-01	4.775+00	1.078+00	5.264+00
6.0+04	1.957-01	3.188+00	2.903-01	3.700+00	4.145-01	4.207+00	5.741-01	4.707+00	7.768-01	5.198+00
8.0+04	1.139-01	3.054+00	1.699-01	3.551+00	2.433-01	4.044+00	3.375-01	4.533+00	4.569-01	5.017+00
1.0+05	7.418-02	2.524+00	1.111-01	3.403+00	1.595-01	3.880+00	2.217-01	4.354+00	3.005-01	4.823+00
1.5+05	3.350-02	2.647+00	5.057-02	3.084+00	7.289-02	3.521+00	1.015-01	3.955+00	1.380-01	4.368+00
2.0+05	1.903-02	2.431+00	2.870-02	2.834+00	4.143-02	3.236+00	5.784-02	3.637+00	7.867-02	4.038+00
3.0+05	8.522-03	2.118+00	1.284-02	2.469+00	1.856-02	2.821+00	2.594-02	3.172+00	3.532-02	3.523+00
4.0+05	4.791-03	1.899+00	7.239-03	2.215+00	1.047-02	2.530+00	1.464-02	2.846+00	1.994-02	3.161+00
5.0+05	3.059-03	1.734+00	4.639-03	2.023+00	6.710-03	2.312+00	9.386-03	2.600+00	1.279-02	2.869+00
6.0+05	2.132-03	1.605+00	3.224-03	1.872+00	4.664-03	2.139+00	6.525-03	2.406+00	8.889-03	2.673+00
8.0+05	1.200-03	1.410+00	1.814-03	1.645+00	2.626-03	1.880+00	3.673-03	2.115+00	5.005-03	2.350+00
1.0+06	7.681-04	1.268+00	1.162-03	1.479+00	1.681-03	1.691+00	2.352-03	1.902+00	3.205-03	2.113+00
1.5+06	3.414-04	1.031+00	5.163-04	1.202+00	7.471-04	1.374+00	1.045-03	1.846+00	1.424-03	1.718+00
2.0+06	1.921-04	8.795-01	2.904-04	1.026+00	4.203-04	1.173+00	5.881-04	1.319+00	8.014-04	1.466+00
3.0+06	8.537-05	6.920-01	1.291-04	8.073-01	1.868-04	9.226-01	2.614-04	1.038+00	3.562-04	1.153+00
4.0+06	4.802-05	5.772-01	7.261-05	6.734-01	1.051-04	7.696-01	1.470-04	8.658-01	2.004-04	9.620-01
5.0+06	3.073-05	4.985-01	4.647-05	5.815-01	6.725-05	6.646-01	9.411-05	7.877-01	1.282-04	8.308-01
6.0+06	2.134-05	4.406-01	3.228-05	5.140-01	4.671-05	5.874-01	6.537-05	6.609-01	8.908-05	7.343-01
8.0+06	1.201-05	3.604-01	1.815-05	4.205-01	2.627-05	4.805-01	3.676-05	5.406-01	5.010-05	6.006-01
1.0+07	7.683-06	3.069-01	1.162-05	3.581-01	1.682-05	4.093-01	2.353-05	4.604-01	3.207-05	5.116-01
1.5+07	3.414-06	2.272-01	5.164-06	2.650-01	7.474-06	3.029-01	1.046-05	3.408-01	1.425-05	3.780-01
2.0+07	1.921-06	1.823-01	2.905-06	2.127-01	4.204-06	2.431-01	5.883-06	2.735-01	8.017-06	3.039-01
3.0+07	8.537-07	1.327-01	1.291-06	1.549-01	1.868-06	1.770-01	2.618-06	1.991-01	3.563-06	2.212-01
4.0+07	4.802-07	1.055-01	7.263-07	1.231-01	1.051-06	1.406-01	1.471-06	1.882-01	2.004-06	1.758-01
5.0+07	3.073-07	8.805-02	4.648-07	1.027-01	6.726-07	1.174-01	9.412-07	1.321-01	1.283-06	1.264-01
6.0+07	2.134-07	7.586-02	3.227-07	8.851-02	4.670-07	1.012-01	6.535-07	1.138-01	8.905-07	1.264-01
8.0+07	1.200-07	5.983-02	1.816-07	6.980-02	2.628-07	7.977-02	3.677-07	8.974-02	5.011-07	9.972-02
1.0+08	7.682-08	4.966-02	1.162-07	5.793-02	1.681-07	6.621-02	2.353-07	7.449-02	3.206-07	8.276-02

TABLE II., CONT. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM

PHOTON ENERGY, EV	11 NA		12 MG		13 AL		14 SI		15 P	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	8.037+01	7.817-03	9.569+01	8.654-03	1.124+02	8.557-03	1.303+02	7.674-03	1.496+02	6.934-03
1.5+02	8.024+01	1.747-02	9.553+01	1.946-02	1.121+02	1.902-02	1.301+02	1.710-02	1.494+02	1.554-02
2.0+02	8.010+01	3.867-02	9.534+01	3.850-02	1.119+02	3.357-02	1.298+02	3.036-02	1.491+02	2.744-02
3.0+02	7.965+01	6.689-02	9.479+01	7.626-02	1.112+02	7.427-02	1.291+02	6.731-02	1.484+02	6.101-02
4.0+02	7.904+01	1.142-01	9.404+01	1.320-01	1.103+02	1.290-01	1.281+02	1.180-01	1.474+02	1.069-01
5.0+02	7.828+01	1.698-01	9.312+01	1.994-01	1.091+02	1.905-01	1.269+02	1.893-01	1.461+02	1.640-01
6.0+02	7.743+01	2.308-01	9.202+01	2.759-01	1.078+02	2.730-01	1.254+02	2.531-01	1.446+02	2.311-01
8.0+02	7.545+01	3.592-01	8.946+01	4.458-01	1.046+02	4.485-01	1.220+02	4.230-01	1.409+02	3.899-01
1.0+03	7.327+01	4.848-01	8.659+01	6.228-01	1.010+02	6.394-01	1.175+02	6.191-01	1.366+02	5.723-01
1.5+03	6.773+01	7.613-01	7.885+01	1.023+00	9.135+01	1.110+00	1.066+02	1.116+00	1.241+02	1.070+00
2.0+03	6.264+01	1.007+00	7.170+01	1.336+00	8.231+01	1.512+00	9.557+01	1.580+00	1.113+02	1.556+00
3.0+03	5.354+01	1.507+00	6.037+01	1.841+00	6.818+01	2.120+00	7.762+01	2.314+00	8.965+01	2.385+00
4.0+03	4.522+01	2.017+00	5.146+01	2.311+00	5.798+01	2.693+00	6.544+01	2.851+00	7.439+01	3.027+00
5.0+03	3.786+01	2.503+00	4.391+01	2.762+00	4.994+01	3.041+00	5.632+01	3.316+00	6.356+01	3.538+00
6.0+03	3.167+01	2.946+00	3.743+01	3.183+00	4.314+01	3.448+00	4.895+01	3.723+00	5.529+01	3.970+00
8.0+03	2.261+01	3.674+00	2.739+01	3.907+00	3.234+01	4.163+00	3.744+01	4.434+00	4.278+01	4.698+00
1.0+04	1.680+01	4.203+00	2.058+01	4.467+00	2.465+01	4.740+00	2.897+01	5.020+00	3.356+01	5.297+00
1.5+04	9.412+00	4.963+00	1.160+01	5.318+00	1.402+01	5.668+00	1.669+01	6.010+00	1.962+01	6.342+00
2.0+04	6.142+00	5.335+00	5.741+00	5.741+00	9.146+00	6.142+00	1.085+01	6.538+00	1.283+01	6.923+00
3.0+04	3.272+00	5.666+00	4.043+00	6.115+00	4.895+00	6.561+00	5.835+00	7.002+00	6.875+00	7.439+00
4.0+04	2.033+00	5.761+00	2.524+00	6.230+00	3.067+00	6.695+00	3.668+00	7.185+00	4.333+00	7.611+00
5.0+04	1.377+00	5.749+00	1.716+00	6.228+00	2.094+00	6.702+00	2.813+00	7.172+00	2.978+00	7.637+00
6.0+04	9.938-01	5.685+00	1.241+00	6.167+00	1.517+00	6.645+00	1.825+00	7.118+00	2.168+00	7.587+00
8.0+04	5.856-01	5.497+00	7.328-01	5.974+00	8.975-01	6.447+00	1.082+00	6.918+00	1.289+00	7.384+00
1.0+05	3.857-01	5.291+00	4.834-01	5.756+00	5.929-01	6.218+00	7.157-01	6.678+00	8.532-01	7.135+00
1.5+05	1.777-01	4.819+00	2.232-01	5.249+00	2.744-01	5.678+00	3.320-01	6.105+00	3.965-01	6.531+00
2.0+05	1.014-01	4.437+00	1.276-01	4.836+00	1.571-01	5.233+00	1.904-01	5.620+00	2.277-01	6.026+00
3.0+05	4.560-02	3.873+00	5.747-02	4.223+00	7.084-02	4.573+00	8.594-02	4.922+00	1.029-01	5.270+00
4.0+05	2.576-02	3.476+00	3.248-02	3.791+00	4.006-02	4.105+00	4.864-02	4.419+00	5.828-02	4.733+00
5.0+05	1.652-02	3.177+00	2.084-02	3.465+00	2.571-02	3.752+00	3.122-02	4.040+00	3.742-02	4.328+00
6.0+05	1.149-02	2.940+00	1.449-02	3.207+00	1.788-02	3.474+00	2.171-02	3.740+00	2.603-02	4.006+00
8.0+05	6.468-03	2.584+00	8.161-03	2.819+00	1.007-02	3.053+00	1.223-02	3.288+00	1.467-02	3.522+00
1.0+06	4.142-03	2.324+00	5.226-03	2.535+00	6.450-03	2.746+00	7.835-03	2.957+00	9.396-03	3.168+00
1.5+06	1.841-03	1.889+00	2.324-03	2.661+00	2.868-03	2.253+00	3.885-03	2.404+00	4.179-03	2.576+00
2.0+06	1.036-03	1.612+00	1.307-03	1.759+00	1.614-03	1.905+00	1.961-03	2.052+00	2.351-03	2.198+00
3.0+06	4.605-04	1.269+00	5.812-04	1.384+00	7.173-04	1.459+00	8.715-04	1.614+00	1.048-03	1.730+00
4.0+06	2.590-04	1.058+00	3.269-04	1.154+00	4.035-04	1.251+00	4.903-04	1.347+00	5.880-04	1.443+00
5.0+06	1.658-04	9.138-01	2.092-04	9.969-01	2.583-04	1.080+00	3.136-04	1.163+00	3.764-04	1.246+00
6.0+06	1.151-04	8.077-01	1.453-04	8.811-01	1.794-04	9.545-01	2.175-04	1.028+00	2.614-04	1.101+00
8.0+06	6.476-05	6.607-01	8.173-05	7.208-01	1.009-04	7.808-01	1.226-04	8.409-01	1.470-04	9.010-01
1.0+07	4.145-05	5.627-01	5.232-05	6.139-01	6.458-05	6.650-01	7.846-05	7.162-01	9.410-05	7.673-01
1.5+07	1.842-05	4.165-01	2.325-05	4.543-01	2.870-05	4.922-01	3.487-05	5.301-01	4.182-05	5.679-01
2.0+07	1.036-05	3.343-01	1.308-05	3.647-01	1.614-05	3.951-01	1.961-05	4.254-01	2.352-05	4.558-01
3.0+07	4.605-06	2.434-01	5.812-06	2.655-01	7.174-06	2.876-01	8.716-06	3.097-01	1.048-05	3.319-01
4.0+07	2.591-06	1.934-01	3.270-06	2.110-01	4.036-06	2.285-01	4.903-06	2.461-01	5.881-06	2.637-01
5.0+07	1.658-06	1.614-01	2.092-06	1.761-01	2.583-06	1.908-01	3.136-06	2.054-01	3.764-06	2.201-01
6.0+07	1.151-06	1.391-01	1.453-06	1.517-01	1.793-06	1.644-01	2.175-06	1.770-01	2.613-06	1.897-01
8.0+07	6.477-07	1.097-01	8.174-07	1.197-01	1.009-06	1.236-01	1.226-06	1.396+01	1.470-06	1.496-01
1.0+08	4.144-07	9.104-02	5.230-07	9.932-02	6.456-07	1.076-01	7.844-07	1.159-01	9.408-07	1.241-01

TABLE II., CONT. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM

PHOTON ENERGY, EV	16 S		17 CL		18 AR		19 K		20 CA	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	1.702+02	6.170+03	1.922+02	5.835+03	2.155+02	5.185+03	2.400+02	1.366+02	2.659+02	1.561+02
1.5+02	1.700+02	1.402+02	1.920+02	1.279+02	2.152+02	1.168+02	2.395+02	3.028+02	2.654+02	3.459+02
2.0+02	1.697+02	2.485+02	1.917+02	2.268+02	2.150+02	2.080+02	2.390+02	5.321+02	2.647+02	6.166+02
3.0+02	1.690+02	5.543+02	1.909+02	5.065+02	2.142+02	4.655+02	2.375+02	1.154+01	2.630+02	1.349+01
4.0+02	1.680+02	9.741+02	1.899+02	8.920+02	2.132+02	8.210+02	2.355+02	1.950+01	2.606+02	2.309+01
5.0+02	1.667+02	1.500+01	1.886+02	1.378+01	2.119+02	1.270+01	2.331+02	2.868+01	2.577+02	3.441+01
6.0+02	1.651+02	2.124+01	1.870+02	1.957+01	2.103+02	1.806+01	2.303+02	3.855+01	2.544+02	4.690+01
8.0+02	1.614+02	3.623+01	1.832+02	3.362+01	2.065+02	3.117+01	2.241+02	5.892+01	2.467+02	7.336+01
1.0+03	1.569+02	5.383+01	1.786+02	5.038+01	2.017+02	4.696+01	2.173+02	7.892+01	2.383+02	9.944+01
1.5+03	1.435+02	1.039+00	1.645+02	9.956+01	1.871+02	9.421+01	1.988+02	1.271+00	2.167+02	1.568+00
2.0+03	1.291+02	1.553+00	1.489+02	1.522+00	1.704+02	1.462+00	1.828+02	1.755+00	1.970+02	2.064+00
3.0+03	1.037+02	2.469+00	1.198+02	2.501+00	1.380+02	2.466+00	1.509+02	2.702+00	1.636+02	2.982+00
4.0+03	8.509+01	3.196+00	9.769+01	3.309+00	1.122+02	3.332+00	1.242+02	3.547+00	1.362+02	3.804+00
5.0+03	7.198+01	3.766+00	8.184+01	3.950+00	9.331+01	4.046+00	1.036+02	4.270+00	1.142+02	4.522+00
6.0+03	6.232+01	4.231+00	7.034+01	4.463+00	7.958+01	4.625+00	8.813+01	4.874+00	9.721+01	5.139+00
8.0+03	4.842+01	4.983+00	5.452+01	5.260+00	6.122+01	5.501+00	6.748+01	5.799+00	7.408+01	6.105+00
1.0+04	3.841+01	5.592+00	4.355+01	5.887+00	4.905+01	6.161+00	5.416+01	6.481+00	5.940+01	6.814+00
1.5+04	2.284+01	6.677+00	2.633+01	7.010+00	3.011+01	7.350+00	3.379+01	7.674+00	3.755+01	8.028+00
2.0+04	1.498+01	7.306+00	1.734+01	7.683+00	1.993+01	8.048+00	2.253+01	8.423+00	2.528+01	8.801+00
3.0+04	8.024+00	7.874+00	9.287+00	8.304+00	1.067+01	8.727+00	1.209+01	9.152+00	1.359+01	9.576+00
4.0+04	5.066+00	8.065+00	5.870+00	8.515+00	6.751+00	8.961+00	7.651+00	9.408+00	8.615+00	9.853+00
5.0+04	3.942+00	8.099+00	4.055+00	8.558+00	4.671+00	9.013+00	5.391+00	9.468+00	5.976+00	9.922+00
6.0+04	2.548+00	8.053+00	2.964+00	8.516+00	3.421+00	8.975+00	3.891+00	9.432+00	4.394+00	9.889+00
8.0+04	1.518+00	7.848+00	1.771+00	8.309+00	2.050+00	8.767+00	2.339+00	9.223+00	2.650+00	9.677+00
1.0+05	1.006+00	7.590+00	1.176+00	8.043+00	1.363+00	8.493+00	1.557+00	8.941+00	1.767+00	9.388+00
1.5+05	4.585+01	6.956+00	5.481+01	7.379+00	6.362+01	7.801+00	7.231+01	8.221+00	8.280+01	8.641+00
2.0+05	2.593+01	6.421+00	3.154+01	6.816+00	3.665+01	7.209+00	4.199+01	7.602+00	4.779+01	7.994+00
3.0+05	1.219+01	5.618+00	1.430+01	5.966+00	1.663+01	6.314+00	1.928+01	6.660+00	2.175+01	7.007+00
4.0+05	6.908+02	5.047+00	8.105+02	5.361+00	9.435+02	5.674+00	1.033+01	5.987+00	1.235+01	6.299+00
5.0+05	4.436+02	4.615+00	5.207+02	4.902+00	6.063+02	5.189+00	6.951+02	5.476+00	7.942+02	5.763+00
6.0+05	3.086+02	4.273+00	3.623+02	4.539+00	4.220+02	4.805+00	4.846+02	5.071+00	5.453+02	5.337+00
8.0+05	1.740+02	3.757+00	2.042+02	3.991+00	2.379+02	4.225+00	2.733+02	4.459+00	3.119+02	4.653+00
1.0+06	1.114+02	3.379+00	1.308+02	3.590+00	1.524+02	3.801+00	1.751+02	4.011+00	1.999+02	4.222+00
1.5+06	4.957+03	2.747+00	5.821+03	2.919+00	6.782+03	3.090+00	7.791+03	3.262+00	8.893+03	3.433+00
2.0+06	2.789+03	2.345+00	3.276+03	2.491+00	3.816+03	2.638+00	4.394+03	2.784+00	5.005+03	2.931+00
3.0+06	1.240+03	1.845+00	1.456+03	1.960+00	1.697+03	2.075+00	1.949+03	2.191+00	2.225+03	2.306+00
4.0+06	6.975+04	1.539+00	8.191+04	1.635+00	9.453+04	1.731+00	1.036+03	1.828+00	1.252+03	1.924+00
5.0+06	4.464+04	1.329+00	5.243+04	1.412+00	6.108+04	1.495+00	7.017+04	1.578+00	8.011+04	1.661+00
6.0+06	3.100+04	1.175+00	3.641+04	1.248+00	4.242+04	1.322+00	4.874+04	1.395+00	5.564+04	1.468+00
8.0+06	1.744+04	9.610+01	2.048+04	1.021+00	2.586+04	1.081+00	2.742+04	1.141+00	3.130+04	1.201+00
1.0+07	1.116+04	8.185+01	1.311+04	8.696+01	1.527+04	9.208+01	1.755+04	9.719+01	2.003+04	1.023+00
1.5+07	4.961+05	6.058+01	5.826+05	6.437+01	6.768+05	6.815+01	7.799+05	7.194+01	8.903+05	7.572+01
2.0+07	2.790+05	4.862+01	3.270+05	5.166+01	3.818+05	5.470+01	4.387+05	5.774+01	5.008+05	6.078+01
3.0+07	1.240+05	3.540+01	1.456+05	3.761+01	1.697+05	3.982+01	1.950+05	4.203+01	2.226+05	4.425+01
4.0+07	6.976+06	2.813+01	8.193+06	2.989+01	9.545+06	3.164+01	1.097+05	3.340+01	1.252+05	3.516+01
5.0+07	4.464+06	2.348+01	5.243+06	2.495+01	6.109+06	2.641+01	7.019+06	2.788+01	8.013+06	2.935+01
6.0+07	3.100+06	2.023+01	3.641+06	2.149+01	4.242+06	2.276+01	4.873+06	2.402+01	5.564+06	2.529+01
8.0+07	1.744+06	1.595+01	2.048+06	1.695+01	2.386+06	1.795+01	2.742+06	1.895+01	3.130+06	1.994+01
1.0+08	1.116+06	1.324+01	1.311+06	1.407+01	1.527+06	1.490+01	1.754+06	1.573+01	2.003+06	1.655+01



TABLE II., CONT. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM

PHOTON ENERGY, EV	21 SC		22 TI		23 V		24 CR		25 MN	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	2.932+02	1.464-02	3.217+02	1.379-02	3.516+02	1.291-02	3.828+02	1.017-02	4.154+02	1.125-02
1.5+02	2.926+02	3.262-02	3.212+02	3.064-02	3.511+02	2.871-02	3.824+02	2.252-02	4.149+02	2.530-02
2.0+02	2.920+02	5.744-02	3.206+02	5.378-02	3.505+02	5.049-02	3.819+02	3.985-02	4.143+02	4.487-02
3.0+02	2.903+02	1.260-01	3.189+02	1.181-01	3.488+02	1.111-01	3.804+02	8.803-02	4.127+02	9.932-02
4.0+02	2.879+02	2.166-01	3.165+02	2.036-01	3.465+02	1.928-01	3.784+02	1.529-01	4.104+02	1.724-01
5.0+02	2.853+02	3.247-01	3.137+02	3.064-01	3.436+02	2.898-01	3.759+02	2.307-01	4.075+02	2.615-01
6.0+02	2.817+02	4.454-01	3.103+02	4.222-01	3.403+02	4.007-01	3.729+02	3.199-01	4.042+02	3.635-01
8.0+02	2.738+02	7.066-01	3.024+02	6.767-01	3.323+02	6.473-01	3.658+02	5.210-01	3.961+02	5.943-01
1.0+03	2.650+02	9.713-01	2.934+02	9.397-01	3.231+02	9.062-01	3.573+02	7.377-01	3.866+02	8.426-01
1.5+03	2.419+02	1.570+00	2.690+02	1.550+00	2.978+02	1.520+00	3.334+02	1.287+00	3.598+02	1.451+00
2.0+03	2.202+02	2.087+00	2.456+02	2.082+00	2.728+02	2.059+00	3.083+02	1.818+00	3.322+02	1.998+00
3.0+03	1.831+02	3.032+00	2.049+02	3.051+00	2.286+02	3.041+00	2.603+02	2.832+00	2.816+02	2.989+00
4.0+03	1.527+02	3.681+00	1.712+02	3.923+00	1.917+02	3.936+00	2.183+02	3.762+00	2.380+02	3.904+00
5.0+03	1.281+02	4.627+00	1.438+02	4.702+00	1.613+02	4.734+00	1.834+02	4.600+00	2.013+02	4.736+00
6.0+03	1.089+02	5.277+00	1.221+02	5.382+00	1.369+02	5.442+00	1.554+02	5.351+00	1.713+02	5.486+00
8.0+03	8.239+01	6.314+00	9.189+01	6.486+00	1.026+02	6.610+00	1.158+02	6.612+00	1.279+02	6.764+00
1.0+04	6.574+01	7.077+00	7.289+01	7.309+00	8.091+01	7.497+00	9.067+01	7.585+00	9.986+01	7.775+00
1.5+04	4.175+01	8.354+00	4.628+01	8.664+00	5.150+01	8.950+00	5.691+01	9.179+00	6.238+01	9.455+00
2.0+04	2.833+01	9.162+00	3.163+01	9.512+00	3.519+01	9.846+00	3.920+01	1.014+01	4.314+01	1.047+01
3.0+04	1.527+01	9.592+00	1.710+01	1.040+01	1.908+01	1.080+01	2.131+01	1.117+01	2.358+01	1.156+01
4.0+04	9.679+00	1.029+01	1.084+01	1.073+01	1.289+01	1.116+01	1.350+01	1.159+01	1.494+01	1.200+01
5.0+04	6.716+00	1.037+01	7.518+00	1.082+01	8.386+00	1.126+01	9.349+00	1.170+01	1.034+01	1.213+01
6.0+04	4.945+00	1.034+01	5.541+00	1.079+01	6.184+00	1.124+01	6.895+00	1.168+01	7.629+00	1.213+01
8.0+04	2.991+00	1.013+01	3.359+00	1.058+01	3.757+00	1.103+01	4.195+00	1.147+01	4.648+00	1.191+01
1.0+05	1.997+00	9.633+00	2.247+00	1.028+01	2.517+00	1.072+01	2.814+00	1.115+01	3.122+00	1.159+01
1.5+05	9.376-01	9.059+00	1.056+00	9.476+00	1.185+00	9.891+00	1.327+00	1.030+01	1.474+00	1.072+01
2.0+05	5.416-01	8.385+00	6.107-01	8.775+00	6.856-01	9.164+00	7.679-01	9.552+00	8.539-01	9.940+00
3.0+05	2.467-01	7.353+00	2.785-01	7.699+00	3.129-01	8.044+00	3.508-01	8.389+00	3.904-01	8.733+00
4.0+05	1.402-01	6.612+00	1.583-01	6.924+00	1.780-01	7.236+00	1.996-01	7.548+00	2.223-01	7.859+00
5.0+05	9.019-02	6.049+00	1.019-01	6.335+00	1.146-01	6.622+00	1.285-01	6.907+00	1.432-01	7.193+00
6.0+05	6.281-02	5.602+00	7.096-02	5.869+00	7.983-02	6.133+00	8.957-02	6.399+00	9.979-02	6.664+00
8.0+05	3.544-02	4.928+00	4.004-02	5.161+00	4.506-02	5.395+00	5.056-02	5.629+00	5.634-02	5.863+00
1.0+06	2.271-02	4.453+00	2.566-02	4.644+00	2.888-02	4.854+00	3.241-02	5.065+00	3.612-02	5.275+00
1.5+06	1.010-02	3.605+00	1.142-02	3.776+00	1.285-02	3.948+00	1.442-02	4.119+00	1.608-02	4.291+00
2.0+06	5.687-03	3.077+00	6.428-03	3.223+00	7.234-03	3.370+00	8.120-03	3.516+00	9.050-03	3.663+00
3.0+06	2.529-03	2.421+00	2.858-03	2.537+00	3.217-03	2.652+00	3.610-03	2.767+00	4.024-03	2.882+00
4.0+06	1.422-03	2.020+00	1.608-03	2.116+00	1.809-03	2.212+00	2.031-03	2.308+00	2.264-03	2.404+00
5.0+06	9.103-04	1.744+00	1.029-03	1.827+00	1.158-03	1.911+00	1.300-03	1.994+00	1.449-03	2.077+00
6.0+06	6.323-04	1.542+00	7.147-04	1.615+00	8.044-04	1.689+00	9.029-04	1.762+00	1.006-03	1.836+00
8.0+06	3.556-04	1.261+00	4.019-04	1.321+00	4.524-04	1.381+00	5.078-04	1.441+00	5.659-04	1.502+00
1.0+07	2.276-04	1.074+00	2.573-04	1.125+00	2.896-04	1.177+00	3.250-04	1.228+00	3.623-04	1.279+00
1.5+07	1.012-04	7.951-01	1.144-04	8.329-01	1.287-04	8.708-01	1.445-04	9.107-01	1.610-04	9.465-01
2.0+07	5.692-05	6.382-01	6.433-05	6.686-01	7.240-05	6.989-01	8.127-05	7.293-01	9.058-05	7.597-01
3.0+07	2.529-05	4.646-01	2.859-05	4.867-01	3.218-05	5.088-01	3.612-05	5.310-01	4.025-05	5.531-01
4.0+07	1.423-05	3.692-01	1.608-05	3.868-01	1.810-05	4.043-01	2.032-05	4.219-01	2.265-05	4.355-01
5.0+07	9.106-06	3.082-01	1.029-05	3.228-01	1.158-05	3.375-01	1.300-05	3.522-01	1.449-05	3.669-01
6.0+07	6.322-06	2.655-01	7.146-06	2.782-01	8.043-06	2.908-01	9.028-06	3.035-01	1.006-05	3.161-01
8.0+07	3.557-06	2.094-01	4.020-06	2.194-01	4.523-06	2.293-01	5.079-06	2.393-01	5.662-06	2.493-01
1.0+08	2.276-06	1.738-01	2.572-06	1.821-01	2.895-06	1.904-01	3.250-06	1.986-01	3.622-06	2.069-01

TABLE II., CONT. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM

PHOTON ENERGY, EV	26 FE		27 CO		28 NI		29 CU		30 ZN	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	4.493+02	1.622-02	4.845+02	1.628-02	5.211+02	9.623-03	5.590+02	7.777-03	5.982+02	8.745-03
1.5+02	4.488+02	2.415-02	4.840+02	2.293-02	5.206+02	2.183-02	5.586+02	1.753-02	5.977+02	1.991-02
2.0+02	4.483+02	4.270-02	4.835+02	4.963-02	5.201+02	3.876-02	5.581+02	3.120-02	5.972+02	3.549-02
3.0+02	4.466+02	9.451-02	4.819+02	9.007-02	5.185+02	8.607-02	5.567+02	6.936-02	5.957+02	7.908-02
4.0+02	4.444+02	1.642-01	4.796+02	1.568-01	5.162+02	1.500-01	5.548+02	1.210-01	5.934+02	1.362-01
5.0+02	4.415+02	2.496-01	4.768+02	2.386-01	5.134+02	2.286-01	5.522+02	1.847-01	5.906+02	2.111-01
6.0+02	4.381+02	3.476-01	4.734+02	3.330-01	5.104+02	3.197-01	5.492+02	2.586-01	5.872+02	2.959-01
8.0+02	4.300+02	5.711-01	4.653+02	5.595-01	5.018+02	5.295-01	5.420+02	4.306-01	5.790+02	4.932-01
1.0+03	4.204+02	8.139-01	4.555+02	7.869-01	4.920+02	7.613-01	5.331+02	6.241-01	5.690+02	7.145-01
1.5+03	3.930+02	1.419+00	4.276+02	1.387+00	4.636+02	1.356+00	5.069+02	1.146+00	5.397+02	1.294+00
2.0+03	3.642+02	1.970+00	3.978+02	1.941+00	4.328+02	1.910+00	4.772+02	1.679+00	5.072+02	1.846+00
3.0+03	3.106+02	2.973+00	3.413+02	2.955+00	3.736+02	2.927+00	4.163+02	2.730+00	4.429+02	2.664+00
4.0+03	2.638+02	3.906+00	2.913+02	3.903+00	3.205+02	3.883+00	3.586+02	3.722+00	3.838+02	3.825+00
5.0+03	2.239+02	4.760+00	2.482+02	4.777+00	2.742+02	4.771+00	3.071+02	4.633+00	3.311+02	4.728+00
6.0+03	1.909+02	5.533+00	2.121+02	5.571+00	2.350+02	5.581+00	2.633+02	5.467+00	2.855+02	5.562+00
8.0+03	1.425+02	6.858+00	1.585+02	6.941+00	1.759+02	6.990+00	1.970+02	6.932+00	2.151+02	7.032+00
1.0+04	1.109+02	7.921+00	1.231+02	8.052+00	1.364+02	8.146+00	1.524+02	8.152+00	1.667+02	8.268+00
1.5+04	6.875+01	9.708+00	7.571+01	9.945+00	8.333+01	1.015+01	9.233+01	1.030+01	1.007+02	1.049+01
2.0+04	4.758+01	1.078+01	5.237+01	1.108+01	5.753+01	1.135+01	6.548+01	1.159+01	6.912+01	1.185+01
3.0+04	2.611+01	1.193+01	2.884+01	1.230+01	3.179+01	1.266+01	3.512+01	1.299+01	3.838+01	1.333+01
4.0+04	1.654+01	1.241+01	1.827+01	1.282+01	2.014+01	1.322+01	2.224+01	1.360+01	2.433+01	1.399+01
5.0+04	1.144+01	1.257+01	1.262+01	1.300+01	1.390+01	1.342+01	1.533+01	1.383+01	1.677+01	1.424+01
6.0+04	8.438+00	1.257+01	9.310+00	1.300+01	1.025+01	1.343+01	1.129+01	1.386+01	1.235+01	1.428+01
8.0+04	5.145+00	1.235+01	5.680+00	1.279+01	6.253+00	1.323+01	6.686+00	1.366+01	7.255+00	1.409+01
1.0+05	3.460+00	1.203+01	3.823+00	1.246+01	4.213+00	1.289+01	4.641+00	1.332+01	5.075+00	1.374+01
1.5+05	1.636+00	1.113+01	1.810+00	1.154+01	1.998+00	1.195+01	2.203+00	1.236+01	2.412+00	1.276+01
2.0+05	9.483-01	1.033+01	1.050+00	1.071+01	1.159+00	1.110+01	1.278+00	1.148+01	1.400+00	1.186+01
3.0+05	4.339-01	9.077+00	4.805-01	9.420+00	5.309-01	9.763+00	5.857-01	1.011+01	6.419-01	1.045+01
4.0+05	2.472-01	8.170+00	2.739-01	8.481+00	3.027-01	8.791+00	3.340-01	9.102+00	3.662-01	9.411+00
5.0+05	1.593-01	7.479+00	1.765-01	7.764+00	1.951-01	8.050+00	2.154-01	8.335+00	2.362-01	8.619+00
6.0+05	1.110-01	6.929+00	1.230-01	7.194+00	1.361-01	7.459+00	1.502-01	7.723+00	1.647-01	7.988+00
8.0+05	6.270-02	6.097+00	6.950-02	6.330+00	7.686-02	6.564+00	8.487-02	6.797+00	9.310-02	7.031+00
1.0+06	4.020-02	5.486+00	4.456-02	5.696+00	4.929-02	5.906+00	5.443-02	6.117+00	5.971-02	6.327+00
1.5+06	1.789-02	4.462+00	1.984-02	4.633+00	2.194-02	4.805+00	2.423-02	4.976+00	2.659-02	5.147+00
2.0+06	1.007-02	3.809+00	1.117-02	3.955+00	1.235-02	4.102+00	1.364-02	4.248+00	1.497-02	4.394+00
3.0+06	4.479-03	2.997+00	4.966-03	3.113+00	5.493-03	3.228+00	6.067-03	3.343+00	6.657-03	3.458+00
4.0+06	2.520-03	2.501+00	2.794-03	2.597+00	3.490-03	2.693+00	3.413-03	2.789+00	3.745-03	2.885+00
5.0+06	1.612-03	2.160+00	1.788-03	2.243+00	1.978-03	2.326+00	2.184-03	2.409+00	2.397-03	2.492+00
6.0+06	1.120-03	1.909+00	1.242-03	1.982+00	1.374-03	2.056+00	1.517-03	2.129+00	1.665-03	2.203+00
8.0+06	6.299-04	1.562+00	6.984-04	1.622+00	7.727-04	1.682+00	8.534-04	1.742+00	9.364-04	1.802+00
1.0+07	4.032-04	1.330+00	4.471-04	1.381+00	4.946-04	1.432+00	5.463-04	1.483+00	5.994-04	1.535+00
1.5+07	1.792-04	9.844-01	1.987-04	1.022+00	2.198-04	1.060+00	2.428-04	1.098+00	2.664-04	1.136+00
2.0+07	1.008-04	7.901-01	1.118-04	8.205-01	1.237-04	8.509-01	1.366-04	8.813-01	1.499-04	9.117-01
3.0+07	4.481-05	5.752-01	4.968-05	5.973-01	5.496-05	6.194-01	6.070-05	6.416-01	6.660-05	6.637-01
4.0+07	2.521-05	4.571-01	2.795-05	4.747-01	3.092-05	4.922-01	3.415-05	5.098-01	3.747-05	5.274-01
5.0+07	1.613-05	3.815-01	1.789-05	3.962-01	1.979-05	4.109-01	2.185-05	4.256-01	2.398-05	4.402-01
6.0+07	1.120-05	3.287-01	1.242-05	3.414-01	1.374-05	3.540-01	1.517-05	3.667-01	1.665-05	3.793-01
8.0+07	6.302-06	2.593-01	6.987-06	2.692-01	7.730-06	2.792-01	8.537-06	2.892-01	9.368-06	2.991-01
1.0+08	4.032-06	2.152-01	4.471-06	2.235-01	4.946-06	2.317-01	5.462-06	2.400-01	5.994-06	2.483-01

TABLE II. CONT. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM

PHOTON ENERGY, EV	31 GA		32 GE		33 AS		34 SE		35 BR	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	6.386+02	9.528+03	6.4806+02	9.297+03	7.240+02	8.642+03	7.687+02	8.432+03	8.146+02	7.773+03
1.5+02	6.380+02	2.138+02	6.800+02	2.058+02	7.234+02	1.948+02	7.680+02	1.663+02	8.140+02	1.754+02
2.0+02	6.375+02	3.781+02	6.794+02	3.649+02	7.226+02	3.465+02	7.672+02	3.503+02	8.131+02	3.130+02
3.0+02	6.356+02	8.385+02	6.773+02	8.112+02	7.205+02	7.727+02	7.650+02	7.364+02	8.109+02	7.008+02
4.0+02	6.339+02	1.462+01	6.744+02	1.418+01	7.175+02	1.354+01	7.619+02	1.293+01	8.078+02	1.233+01
5.0+02	6.295+02	2.229+01	6.708+02	2.170+01	7.137+02	2.076+01	7.581+02	1.988+01	8.039+02	1.901+01
6.0+02	6.255+02	3.119+01	6.664+02	3.049+01	7.092+02	2.924+01	7.534+02	2.810+01	7.992+02	2.694+01
8.0+02	6.158+02	5.185+01	6.559+02	5.113+01	6.982+02	4.928+01	7.421+02	4.776+01	7.876+02	4.605+01
1.0+03	6.042+02	7.498+01	6.433+02	7.458+01	6.849+02	7.229+01	7.284+02	7.069+01	7.735+02	6.863+01
1.5+03	5.709+02	1.362+00	6.067+02	1.361+00	6.435+02	1.356+00	6.869+02	1.355+00	7.304+02	1.338+00
2.0+03	5.352+02	1.953+00	5.673+02	2.008+00	6.027+02	1.996+00	6.410+02	2.024+00	6.817+02	2.028+00
3.0+03	4.675+02	3.013+00	4.937+02	3.138+00	5.224+02	3.186+00	5.535+02	3.279+00	5.873+02	3.340+00
4.0+03	4.070+02	3.971+00	4.304+02	4.126+00	4.548+02	4.235+00	4.806+02	4.381+00	5.083+02	4.501+00
5.0+03	3.535+02	4.865+00	3.756+02	5.025+00	3.979+02	5.165+00	4.207+02	5.342+00	4.444+02	5.505+00
6.0+03	3.059+02	5.696+00	3.279+02	5.856+00	3.489+02	6.008+00	3.699+02	6.198+00	3.914+02	6.384+00
8.0+03	2.331+02	7.167+00	2.514+02	7.328+00	2.697+02	7.493+00	2.883+02	7.690+00	3.070+02	7.892+00
1.0+04	1.813+02	8.412+00	1.962+02	8.579+00	2.116+02	8.753+00	2.274+02	8.554+00	2.436+02	9.163+00
1.5+04	1.093+02	1.070+01	1.183+02	1.091+01	1.277+02	1.112+01	1.375+02	1.135+01	1.478+02	1.158+01
2.0+04	7.493+01	1.212+01	8.096+01	1.238+01	8.723+01	1.265+01	9.376+01	1.292+01	1.006+02	1.319+01
3.0+04	4.176+01	1.367+01	4.527+01	1.400+01	4.891+01	1.434+01	5.270+01	1.467+01	5.662+01	1.500+01
4.0+04	2.651+01	1.437+01	2.879+01	1.475+01	3.117+01	1.512+01	3.366+01	1.550+01	3.625+01	1.587+01
5.0+04	1.827+01	1.465+01	1.984+01	1.505+01	2.149+01	1.545+01	2.322+01	1.585+01	2.503+01	1.635+01
6.0+04	1.345+01	1.470+01	1.460+01	1.512+01	1.581+01	1.554+01	1.708+01	1.595+01	1.841+01	1.636+01
8.0+04	8.195+00	1.452+01	8.896+00	1.494+01	9.630+00	1.537+01	1.040+01	1.579+01	1.120+01	1.621+01
1.0+05	5.530+00	1.417+01	6.007+00	1.459+01	6.506+00	1.501+01	7.028+00	1.543+01	7.572+00	1.585+01
1.5+05	2.632+00	1.317+01	2.863+00	1.397+01	3.104+00	1.397+01	3.357+00	1.437+01	3.622+00	1.478+01
2.0+05	1.528+00	1.225+01	1.664+00	1.263+01	1.805+00	1.301+01	1.953+00	1.339+01	2.109+00	1.376+01
3.0+05	7.011+01	1.079+01	7.635+01	1.113+01	8.289+01	1.147+01	8.974+01	1.181+01	9.691+01	1.215+01
4.0+05	4.001+01	9.721+00	4.359+01	1.003+01	4.734+01	1.034+01	5.127+01	1.065+01	5.539+01	1.096+01
5.0+05	2.531+01	8.904+00	2.813+01	9.188+00	3.055+01	9.473+00	3.310+01	9.757+00	3.576+01	1.004+01
6.0+05	1.801+01	8.252+00	1.963+01	8.517+00	2.132+01	8.781+00	2.310+01	9.045+00	2.497+01	9.309+00
8.0+05	1.018+01	7.264+00	1.110+01	7.497+00	1.206+01	7.730+00	1.307+01	7.963+00	1.412+01	8.196+00
1.0+06	6.529+02	6.537+00	7.118+02	6.747+00	7.736+02	6.958+00	8.384+02	7.168+00	9.063+02	7.378+00
1.5+06	2.907+02	5.319+00	3.170+02	5.490+00	3.446+02	5.661+00	3.735+02	5.832+00	4.038+02	6.004+00
2.0+06	1.637+02	4.541+00	1.785+02	4.687+00	1.940+02	4.833+00	2.103+02	4.979+00	2.274+02	5.126+00
3.0+06	7.280+03	3.574+00	7.939+03	3.689+00	8.629+03	3.804+00	9.354+03	3.519+00	1.011+02	4.034+00
4.0+06	4.095+03	2.981+00	4.466+03	3.077+00	4.855+03	3.174+00	5.263+03	3.270+00	5.690+03	3.366+00
5.0+06	2.621+03	2.575+00	2.859+03	2.658+00	3.107+03	2.741+00	3.369+03	2.824+00	3.642+03	2.907+00
6.0+06	1.821+03	2.276+00	1.986+03	2.349+00	2.158+03	2.423+00	2.340+03	2.496+00	2.530+03	2.569+00
8.0+06	1.024+03	1.862+00	1.117+03	1.922+00	1.214+03	1.982+00	1.316+03	2.402+00	1.423+03	2.102+00
1.0+07	6.555+04	1.586+00	7.149+04	1.637+00	7.771+04	1.688+00	8.424+04	1.739+00	9.108+04	1.790+00
1.5+07	2.913+04	1.174+00	3.177+04	1.212+00	3.453+04	1.249+00	3.744+04	1.287+00	4.048+04	1.325+00
2.0+07	1.639+04	9.420+01	1.787+04	9.724+01	1.943+04	1.003+00	2.106+04	1.033+00	2.277+04	1.064+00
3.0+07	7.283+05	6.858+01	7.943+05	7.079+01	8.633+05	7.301+01	9.359+05	7.522+01	1.012+04	7.743+01
4.0+07	4.097+05	5.450+01	4.468+05	5.626+01	4.857+05	5.801+01	5.265+05	5.977+01	5.693+05	6.153+01
5.0+07	2.622+05	4.549+01	2.860+05	4.696+01	3.108+05	4.843+01	3.369+05	4.989+01	3.643+05	5.136+01
6.0+07	1.821+05	3.920+01	1.985+05	4.046+01	2.158+05	4.172+01	2.369+05	4.299+01	2.529+05	4.425+01
8.0+07	1.024+05	3.091+01	1.117+05	3.191+01	1.214+05	3.291+01	1.316+05	3.390+01	1.423+05	3.490+01
1.0+08	6.555+06	2.566+01	7.148+06	2.648+01	7.770+06	2.731+01	8.423+06	2.814+01	9.107+06	2.897+01

TABLE II.. CONT. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS. BARNs/ATOM

PHOTON ENERGY, EV	36 KR		37 RB		38 SR		39 Y		40 ZR	
	CDH	INCOH	CDH	INCOH	CDH	INCOH	CDH	INCOH	CDH	INCOH
1.0+02	8.619+02	7.666-03	9.097+02	1.716-02	9.596+02	1.983-02	1.011+03	1.896-02	1.064+03	1.811-02
1.5+02	8.612+02	1.705-02	9.086+02	3.801-02	9.583+02	4.431-02	1.010+03	4.236-02	1.062+03	4.039-02
2.0+02	8.604+02	3.005-02	9.074+02	6.653-02	9.568+02	7.806-02	1.008+03	7.473-02	1.061+03	7.113-02
3.0+02	8.581+02	6.694-02	9.036+02	1.439-01	9.525+02	1.704-01	1.004+03	1.638-01	1.056+03	1.562-01
4.0+02	8.550+02	1.178-01	8.985+02	2.427-01	9.465+02	2.904-01	9.977+02	2.809-01	1.050+03	2.689-01
5.0+02	8.510+02	1.818-01	8.922+02	3.564-01	9.391+02	4.309-01	9.903+02	4.199-01	1.043+03	4.038-01
6.0+02	8.463+02	2.579-01	8.851+02	4.788-01	9.307+02	5.845-01	9.818+02	5.741-01	1.034+03	5.552-01
8.0+02	8.346+02	4.424-01	8.686+02	7.332-01	9.112+02	9.068-01	9.616+02	9.055-01	1.014+03	8.860-01
1.0+03	8.202+02	6.620-01	8.502+02	9.885-01	8.893+02	1.223+00	9.387+02	1.240+00	9.905+02	1.227+00
1.5+03	7.757+02	1.304+00	8.008+02	1.631+00	8.322+02	1.941+00	8.774+02	2.008+00	9.263+02	2.027+00
2.0+03	7.247+02	1.995+00	7.501+02	2.291+00	7.774+02	2.604+00	8.178+02	2.700+00	8.626+02	2.748+00
3.0+03	6.236+02	3.334+00	6.510+02	3.581+00	6.772+02	3.867+00	7.102+02	3.993+00	7.472+02	4.077+00
4.0+03	5.381+02	4.548+00	5.635+02	4.769+00	5.889+02	5.027+00	6.174+02	5.171+00	6.485+02	5.278+00
5.0+03	4.695+02	5.610+00	4.919+02	5.835+00	5.149+02	6.084+00	5.399+02	6.245+00	5.667+02	6.372+00
6.0+03	4.136+02	6.532+00	4.337+02	6.770+00	4.541+02	7.026+00	4.763+02	7.211+00	4.996+02	7.363+00
8.0+03	3.259+02	8.078+00	3.434+02	8.330+00	3.608+02	8.601+00	3.789+02	8.829+00	3.979+02	9.032+00
1.0+04	2.601+02	9.364+00	2.757+02	9.615+00	2.912+02	9.886+00	3.072+02	1.013+01	3.236+02	1.037+01
1.5+04	1.585+02	1.181+01	1.692+02	1.207+01	1.801+02	1.234+01	1.915+02	1.261+01	2.032+02	1.287+01
2.0+04	1.077+02	1.346+01	1.149+02	1.374+01	1.223+02	1.803+01	1.301+02	1.432+01	1.382+02	1.461+01
3.0+04	6.070+01	1.533+01	6.482+01	1.567+01	6.901+01	1.601+01	7.342+01	1.634+01	7.794+01	1.667+01
4.0+04	3.894+01	1.623+01	4.169+01	1.660+01	4.449+01	1.697+01	4.744+01	1.734+01	5.045+01	1.779+01
5.0+04	2.693+01	1.664+01	2.887+01	1.703+01	3.086+01	1.742+01	3.296+01	1.781+01	3.512+01	1.820+01
6.0+04	1.980+01	1.677+01	2.123+01	1.718+01	2.270+01	1.758+01	2.426+01	1.798+01	2.585+01	1.839+01
8.0+04	1.204+01	1.663+01	1.291+01	1.705+01	1.380+01	1.746+01	1.474+01	1.788+01	1.570+01	1.829+01
1.0+05	8.141+00	1.627+01	8.728+00	1.669+01	9.331+00	1.710+01	9.960+00	1.752+01	1.063+01	1.793+01
1.5+05	3.899+00	1.571+01	4.185+00	1.557+01	4.480+00	1.597+01	4.790+00	1.637+01	5.108+00	1.676+01
2.0+05	2.271+00	1.414+01	2.440+00	1.452+01	2.613+00	1.490+01	2.796+00	1.527+01	2.984+00	1.565+01
3.0+05	1.044+00	1.249+01	1.122+00	1.283+01	1.203+00	1.316+01	1.288+00	1.350+01	1.375+00	1.388+01
4.0+05	5.970-01	1.126+01	6.419-01	1.157+01	6.882-01	1.188+01	7.370-01	1.219+01	7.873-01	1.249+01
5.0+05	3.855-01	1.032+01	4.146-01	1.061+01	4.446-01	1.089+01	4.762-01	1.117+01	5.088-01	1.146+01
6.0+05	2.692-01	9.572+00	2.895-01	9.836+00	3.105-01	1.010+01	3.327-01	1.036+01	3.555-01	1.063+01
8.0+05	1.523-01	8.429+00	1.638-01	8.662+00	1.758-01	8.895+00	1.863-01	9.127+00	2.013-01	9.360+00
1.0+06	9.774-02	7.588+00	1.052-01	7.797+00	1.128-01	8.007+00	1.209-01	8.217+00	1.293-01	8.427+00
1.5+06	4.356-02	6.175+00	4.688-02	6.346+00	5.030-02	6.517+00	5.391-02	6.688+00	5.764-02	6.859+00
2.0+06	2.453-02	5.273+00	2.639-02	5.418+00	2.833-02	5.564+00	3.036-02	5.711+00	3.246-02	5.857+00
3.0+06	1.091-02	4.149+00	1.174-02	4.285+00	1.260-02	4.380+00	1.351-02	4.495+00	1.444-02	4.610+00
4.0+06	6.138-03	3.462+00	6.606-03	3.558+00	7.089-03	3.654+00	7.599-03	3.750+00	8.125-03	3.846+00
5.0+06	3.929-03	2.990+00	4.229-03	3.073+00	4.538-03	3.156+00	4.865-03	3.239+00	5.201-03	3.322+00
6.0+06	2.729-03	2.643+00	2.937-03	2.716+00	3.152-03	2.790+00	3.379-03	2.863+00	3.613-03	2.936+00
8.0+06	1.535-03	2.162+00	1.652-03	2.222+00	1.773-03	2.282+00	1.900-03	2.342+00	2.032-03	2.402+00
1.0+07	9.826-04	1.841+00	1.057-03	1.893+00	1.135-03	1.944+00	1.216-03	1.995+00	1.301-03	2.046+00
1.5+07	4.366-04	1.363+00	4.699-04	1.401+00	5.043-04	1.439+00	5.406-04	1.477+00	5.780-04	1.514+00
2.0+07	2.456-04	1.094+00	2.643-04	1.124+00	2.837-04	1.155+00	3.041-04	1.185+00	3.251-04	1.216+00
3.0+07	1.092-04	7.964-01	1.175-04	8.185-01	1.261-04	8.407-01	1.351-04	8.628-01	1.445-04	8.849-01
4.0+07	6.141-05	6.328-01	6.609-05	6.585-01	7.093-05	6.680-01	7.603-05	6.856-01	8.129-05	7.032-01
5.0+07	3.930-05	5.283-01	4.229-05	4.430-01	4.539-05	5.876-01	4.865-05	5.723-01	5.202-05	5.870-01
6.0+07	2.729-05	4.552-01	2.937-05	4.678-01	3.152-05	4.805-01	3.378-05	4.931-01	3.612-05	5.058-01
8.0+07	1.535-05	3.590-01	1.652-05	3.689-01	1.773-05	3.789-01	1.901-05	3.889-01	2.032-05	3.989-01
1.0+08	9.825-06	2.979-01	1.057-05	3.062-01	1.135-05	3.145-01	1.216-05	3.228-01	1.301-05	3.311-01

TABLE II.. CONT. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM

PHOTON ENERGY, EV	41 NB		42 MO		43 TC		44 RU		45 RH	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	1.119+03	1.473-02	1.173+03	1.399-02	1.230+03	1.561-02	1.287+03	1.290-02	1.347+03	1.211-02
1.5+02	1.117+03	3.306-02	1.172+03	3.149-02	1.228+03	3.497-02	1.286+03	2.672-02	1.346+03	2.726-02
2.0+02	1.115+03	5.841-02	1.170+03	5.551-02	1.227+03	6.170-02	1.285+03	5.065-02	1.344+03	4.838-02
3.0+02	1.111+03	1.287-01	1.166+03	1.224-01	1.222+03	1.362-01	1.281+03	1.119-01	1.340+03	1.073-01
4.0+02	1.106+03	2.223-01	1.161+03	2.119-01	1.217+03	2.360-01	1.276+03	1.544-01	1.335+03	1.868-01
5.0+02	1.099+03	3.354-01	1.154+03	3.205-01	1.209+03	3.573-01	1.269+03	2.954-01	1.329+03	2.842-01
6.0+02	1.091+03	4.636-01	1.147+03	4.443-01	1.201+03	4.959-01	1.261+03	4.116-01	1.321+03	3.968-01
8.0+02	1.072+03	7.498-01	1.128+03	7.233-01	1.180+03	8.080-01	1.242+03	6.779-01	1.302+03	6.562-01
1.0+03	1.050+03	1.055+00	1.105+03	1.024+00	1.156+03	1.142+00	1.122+03	9.720-01	1.279+03	9.448-01
1.5+03	9.857+02	1.817+00	1.041+03	1.787+00	1.086+03	1.966+00	1.153+03	1.745+00	1.212+03	1.713+00
2.0+03	9.203+02	2.546+00	9.715+02	2.523+00	1.013+03	2.721+00	1.080+03	2.512+00	1.137+03	2.484+00
3.0+03	7.946+02	3.917+00	8.387+02	3.909+00	8.760+02	4.103+00	9.343+02	3.961+00	8.855+02	3.952+00
4.0+03	6.885+02	5.171+00	7.236+02	5.177+00	7.574+02	5.361+00	8.051+02	5.275+00	8.494+02	5.284+00
5.0+03	5.977+02	6.319+00	6.289+02	6.344+00	6.588+02	6.515+00	6.977+02	6.476+00	7.353+02	6.500+00
6.0+03	5.258+02	7.363+00	5.524+02	7.415+00	5.785+02	7.581+00	6.108+02	7.584+00	6.427+02	7.625+00
8.0+03	4.185+02	9.128+00	4.391+02	9.248+00	4.594+02	9.435+00	4.834+02	9.516+00	5.072+02	9.605+00
1.0+04	3.412+02	1.053+01	3.586+02	1.070+01	3.757+02	1.093+01	3.952+02	1.107+01	4.144+02	1.122+01
1.5+04	2.157+02	1.310+01	2.283+02	1.334+01	2.409+02	1.361+01	2.546+02	1.384+01	2.684+02	1.408+01
2.0+04	1.458+02	1.488+01	1.556+02	1.515+01	1.646+02	1.544+01	1.744+02	1.571+01	1.844+02	1.599+01
3.0+04	8.269+01	1.699+01	8.757+01	1.732+01	9.254+01	1.765+01	9.791+01	1.797+01	1.034+02	1.829+01
4.0+04	5.351+01	1.806+01	5.685+01	1.841+01	6.014+01	1.877+01	6.368+01	1.913+01	6.728+01	1.948+01
5.0+04	3.738+01	1.858+01	3.971+01	1.896+01	4.209+01	1.934+01	4.482+01	1.971+01	4.722+01	2.009+01
6.0+04	2.753+01	1.878+01	2.925+01	1.918+01	3.103+01	1.957+01	3.292+01	1.996+01	3.485+01	2.035+01
8.0+04	1.672+01	1.870+01	1.777+01	1.911+01	1.884+01	1.952+01	1.999+01	1.992+01	2.117+01	2.033+01
1.0+05	1.131+01	1.834+01	1.201+01	1.875+01	1.274+01	1.916+01	1.352+01	1.957+01	1.431+01	1.997+01
1.5+05	5.42+00	1.716+01	5.787+00	1.755+01	6.142+00	1.795+01	6.519+00	1.834+01	6.907+00	1.873+01
2.0+05	3.182+00	1.602+01	3.386+00	1.639+01	3.597+00	1.677+01	3.820+00	1.714+01	4.050+00	1.751+01
3.0+05	1.467+00	1.418+01	1.562+00	1.451+01	1.660+00	1.485+01	1.764+00	1.518+01	1.871+00	1.582+01
4.0+05	8.400-01	1.286+01	8.947-01	1.311+01	9.512-01	1.341+01	1.011+00	1.372+01	1.073+00	1.402+01
5.0+05	5.430-01	1.174+01	5.785-01	1.202+01	6.151-01	1.230+01	6.541-01	1.259+01	6.942-01	1.287+01
6.0+05	3.795-01	1.089+01	4.043-01	1.115+01	4.300-01	1.142+01	4.573-01	1.168+01	4.854-01	1.194+01
8.0+05	2.149-01	9.593+00	2.290-01	9.825+00	2.436-01	1.006+01	2.591-01	1.029+01	2.752-01	1.052+01
1.0+06	1.380-01	8.637+00	1.471-01	8.846+00	1.565-01	9.056+00	1.665-01	9.266+00	1.768-01	9.475+00
1.5+06	6.156-02	7.030+00	6.562-02	7.201+00	6.982-02	7.372+00	7.429-02	7.543+00	7.890-02	7.714+00
2.0+06	3.467-02	6.003+00	3.695-02	6.149+00	3.932-02	6.295+00	4.184-02	6.441+00	4.444-02	6.587+00
3.0+06	1.542-02	4.725+00	1.644-02	4.840+00	1.750-02	4.956+00	1.862-02	5.071+00	1.978-02	5.186+00
4.0+06	8.677-03	3.492+00	9.251-03	4.038+00	9.844-03	4.135+00	1.047-02	4.231+00	1.113-02	4.327+00
5.0+06	5.555-03	3.405+00	5.922-03	3.488+00	6.302-03	3.571+00	6.706-03	3.654+00	7.123-03	3.737+00
6.0+06	3.858-03	3.010+00	4.113-03	3.083+00	4.378-03	3.157+00	4.658-03	3.230+00	4.948-03	3.303+00
8.0+06	2.170-03	2.462+00	2.314-03	2.522+00	2.462-03	2.582+00	2.620-03	2.642+00	2.783-03	2.702+00
1.0+07	1.389-03	2.097+00	1.481-03	2.148+00	1.576-03	2.199+00	1.677-03	2.251+00	1.782-03	2.302+00
1.5+07	6.173-04	1.552+00	6.581-04	1.590+00	7.004-04	1.628+00	7.453-04	1.666+00	7.917-04	1.704+00
2.0+07	3.472-04	1.246+00	3.702-04	1.276+00	3.940-04	1.307+00	4.192-04	1.337+00	4.454-04	1.367+00
3.0+07	1.543-04	9.070-01	1.645-04	9.292-01	1.751-04	9.513-01	1.863-04	9.734-01	1.979-04	9.955-01
4.0+07	8.682-05	7.208-01	9.256-05	7.384-01	9.850-05	7.559-01	1.048-04	7.755-01	1.113-04	7.911-01
5.0+07	5.556-05	6.017-01	5.923-05	6.163-01	6.304-05	6.310-01	6.708-05	6.457-01	7.126-05	6.604-01
6.0+07	3.858-05	5.184-01	4.113-05	5.310-01	4.377-05	5.437-01	4.657-05	5.563-01	4.947-05	5.690-01
8.0+07	2.170-05	4.088-01	2.314-05	4.188-01	2.462-05	4.288-01	2.620-05	4.387-01	2.783-05	4.487-01
1.0+08	1.389-05	3.393-01	1.481-05	3.476-01	1.576-05	3.559-01	1.677-05	3.642-01	1.781-05	3.724-01

TABLE II., CONT. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM

PHOTON ENERGY, EV	46 PD		47 A6		48 CD		49 IN		50 SN	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	1.407+03	8.537-03	1.469+03	1.125-02	1.532+03	1.288-02	1.596+03	1.322-02	1.662+03	1.298-02
1.5+02	1.406+03	1.905-02	1.468+03	2.529-02	1.531+03	2.875-02	1.595+03	2.998-02	1.661+03	2.918-02
2.0+02	1.405+03	3.384-02	1.467+03	4.484-02	1.529+03	5.086-02	1.593+03	5.297-02	1.659+03	5.170-02
3.0+02	1.402+03	7.567-02	1.463+03	9.952-02	1.525+03	1.128+01	1.589+03	1.173-01	1.654+03	1.148-01
4.0+02	1.398+03	1.333-01	1.458+03	1.735-01	1.520+03	1.966-01	1.582+03	2.043-01	1.647+03	2.003-01
5.0+02	1.392+03	2.059-01	1.451+03	2.646-01	1.513+03	2.998-01	1.574+03	3.111-01	1.639+03	3.060-01
6.0+02	1.386+03	2.926-01	1.443+03	3.703-01	1.504+03	4.193-01	1.565+03	4.348-01	1.628+03	4.289-01
8.0+02	1.369+03	5.231-01	1.425+03	6.159-01	1.484+03	6.959-01	1.541+03	7.207-01	1.604+03	7.158-01
1.0+03	1.349+03	7.546-01	1.402+03	8.922-01	1.459+03	1.004+00	1.514+03	1.040+00	1.574+03	1.039+03
1.5+03	1.286+03	1.896+00	1.333+03	1.642+00	1.385+03	1.808+00	1.434+03	1.882+00	1.488+03	1.909+00
2.0+03	1.210+03	2.594+00	1.255+03	2.410+00	1.303+03	2.585+00	1.347+03	2.702+00	1.395+03	2.770+00
3.0+03	1.050+03	3.808+00	1.094+03	3.892+00	1.137+03	4.044+00	1.177+03	4.202+00	1.219+03	4.341+00
4.0+03	9.027+02	5.156+00	9.446+02	5.248+00	9.852+02	5.395+00	1.024+03	5.560+00	1.062+03	5.728+00
5.0+03	7.792+02	6.395+00	8.169+02	6.488+00	8.542+02	6.635+00	8.994+02	6.802+00	9.264+02	6.980+00
6.0+03	6.792+02	7.553+00	7.122+02	7.643+00	7.454+02	7.783+00	7.783+02	7.947+00	8.115+02	8.126+00
8.0+03	5.339+02	9.512+00	5.588+02	9.715+00	5.843+02	9.849+00	6.101+02	1.001+01	6.366+02	1.018+01
1.0+04	4.355+02	1.130+01	4.553+02	1.144+01	4.754+02	1.160+01	4.957+02	1.177+01	5.166+02	1.196+01
1.5+04	2.830+02	1.428+01	2.970+02	1.451+01	3.110+02	1.475+01	3.251+02	1.499+01	3.392+02	1.523+01
2.0+04	1.950+02	1.524+01	2.054+02	1.651+01	2.160+02	1.679+01	2.268+02	1.707+01	2.377+02	1.736+01
3.0+04	1.092+02	1.560+01	1.150+02	1.892+01	1.210+02	1.924+01	1.271+02	1.957+01	1.333+02	1.989+01
4.0+04	7.107+01	1.283+01	7.468+01	2.017+01	7.878+01	2.052+01	8.277+01	2.087+01	8.686+01	2.123+01
5.0+04	4.994+01	2.045+01	5.268+01	2.082+01	5.549+01	2.119+01	5.836+01	2.156+01	6.129+01	2.193+01
6.0+04	3.689+01	2.073+01	3.895+01	2.112+01	4.106+01	2.150+01	4.322+01	2.188+01	4.544+01	2.226+01
8.0+04	2.242+01	2.073+01	2.366+01	2.113+01	2.498+01	2.153+01	2.631+01	2.193+01	2.769+01	2.232+01
1.0+05	1.515+01	2.038+01	1.600+01	2.078+01	1.688+01	2.118+01	1.778+01	2.158+01	1.871+01	2.198+01
1.5+05	7.313+00	1.912+01	7.726+00	1.951+01	8.152+00	1.990+01	8.591+00	2.029+01	9.042+00	2.068+01
2.0+05	4.291+00	1.788+01	4.537+00	1.825+01	4.791+00	1.862+01	5.052+00	1.899+01	5.322+00	1.936+01
3.0+05	1.984+00	1.585+01	2.099+00	1.619+01	2.218+00	1.652+01	2.340+00	1.685+01	2.467+00	1.719+01
4.0+05	1.138+00	1.533+01	1.204+00	1.464+01	1.273+00	1.494+01	1.344+00	1.524+01	1.417+00	1.555+01
5.0+05	7.364-01	1.315+01	7.794-01	1.343+01	8.240-01	1.371+01	8.700-01	1.399+01	9.175-01	1.428+01
6.0+05	5.150-01	1.220+01	5.451-01	1.247+01	5.764-01	1.273+01	6.087-01	1.299+01	6.421-01	1.325+01
8.0+05	2.920-01	1.075+01	3.092-01	1.099+01	3.269-01	1.122+01	3.453-01	1.145+01	3.644-01	1.168+01
1.0+06	1.876-01	9.585+00	1.987-01	9.894+00	2.101-01	1.010+01	2.220-01	1.031+01	2.342-01	1.052+01
1.5+06	8.374-02	7.885+00	8.870-02	8.056+00	9.383-02	8.227+00	9.913-02	8.398+00	1.046-01	8.569+00
2.0+06	4.717-02	6.734+00	4.996-02	6.880+00	5.286-02	7.026+00	5.585-02	7.172+00	5.895-02	7.318+00
3.0+06	2.099-02	5.301+00	2.224-02	5.416+00	2.353-02	5.513+00	2.486-02	5.646+00	2.624-02	5.701+00
4.0+06	1.181-02	4.423+00	1.251-02	4.519+00	1.324-02	4.615+00	1.399-02	4.711+00	1.476-02	4.807+00
5.0+06	7.561-03	3.820+00	8.009-03	3.903+00	8.403-03	3.986+00	8.954-03	4.069+00	9.451-03	4.152+00
6.0+06	5.252-03	3.377+00	5.564-03	3.450+00	5.886-03	3.523+00	6.220-03	3.597+00	6.566-03	3.670+00
8.0+06	2.954-03	2.762+00	3.130-03	2.822+00	3.311-03	2.882+00	3.499-03	2.943+00	3.693-03	3.003+00
1.0+07	1.891-03	2.353+00	2.003-03	2.404+00	2.119-03	2.455+00	2.240-03	2.506+00	2.364-03	2.557+00
1.5+07	8.404-04	1.742+00	8.902-04	1.779+00	9.419-04	1.817+00	9.963-04	1.855+00	1.051-03	1.893+00
2.0+07	4.728-04	1.398+00	5.008-04	1.428+00	5.299-04	1.474+00	5.599-04	1.489+00	5.910-04	1.519+00
3.0+07	2.101-04	1.018+00	2.225-04	1.040+00	2.355-04	1.062+00	2.488-04	1.084+00	2.626-04	1.106+00
4.0+07	1.182-04	8.087-01	1.252-04	8.263-01	1.325-04	8.438-01	1.400-04	8.614-01	1.478-04	8.790-01
5.0+07	7.564-05	6.750-01	8.012-05	6.897-01	8.477-05	7.044-01	8.958-05	7.190-01	9.456-05	7.337-01
6.0+07	5.252-05	5.816-01	5.563-05	5.943-01	5.886-05	6.069-01	6.220-05	6.195-01	6.565-05	6.322-01
8.0+07	2.955-05	4.587-01	3.130-05	4.687-01	3.311-05	4.786-01	3.499-05	4.886-01	3.694-05	4.986-01
1.0+08	1.891-05	3.807-01	2.003-05	3.890-01	2.119-05	3.973-01	2.239-05	4.055-01	2.363-05	4.138-01

TABLE II., CONT. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM

PHOTON ENERGY, EV	51 SB		52 TE		53 I		54 XE		55 CS	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	1.730+03	1.278-02	1.798+03	1.213-02	1.868+03	1.147-02	1.939+03	1.125-02	2.011+03	2.315-02
1.5+02	1.728+03	2.832-02	1.797+03	2.721-02	1.867+03	2.611-02	1.938+03	2.527-02	2.008+03	5.118-02
2.0+02	1.728+03	4.959-02	1.795+03	4.813-02	1.865+03	4.632-02	1.936+03	4.472-02	2.006+03	8.943-02
3.0+02	1.721+03	1.109-01	1.789+03	1.071-01	1.859+03	1.033-01	1.930+03	9.970-02	1.997+03	1.924-01
4.0+02	1.714+03	1.938-01	1.782+03	1.875-01	1.852+03	1.812-01	1.923+03	1.751-01	1.986+03	3.227-01
5.0+02	1.705+03	2.964-01	1.773+03	2.877-01	1.843+03	2.787-01	1.914+03	2.695-01	1.973+03	4.712-01
6.0+02	1.694+03	4.182-01	1.762+03	4.054-01	1.831+03	3.936-01	1.902+03	3.612-01	1.958+03	6.301-01
8.0+02	1.669+03	6.970-01	1.736+03	6.841-01	1.804+03	6.682-01	1.875+03	6.491-01	1.923+03	9.607-01
1.0+03	1.638+03	1.016+00	1.704+03	1.005+00	1.772+03	5.878-01	1.841+03	9.629-01	1.884+03	1.598+00
1.5+03	1.546+03	1.885+00	1.608+03	1.896+00	1.673+03	1.890+00	1.740+03	1.858+00	1.777+03	2.177+00
2.0+03	1.448+03	2.763+00	1.504+03	2.809+00	1.563+03	2.823+00	1.626+03	2.801+00	1.666+03	3.068+00
3.0+03	1.262+03	4.411+00	1.307+03	4.527+00	1.355+03	4.614+00	1.406+03	4.628+00	1.448+03	4.863+00
4.0+03	1.100+03	5.860+00	1.140+03	6.029+00	1.180+03	6.178+00	1.222+03	6.265+00	1.260+03	6.490+00
5.0+03	9.623+02	7.140+00	9.983+02	7.333+00	1.035+03	7.519+00	1.072+03	7.664+00	1.105+03	7.905+00
6.0+03	8.448+02	8.297+00	8.782+02	8.499+00	9.118+02	8.700+00	9.457+02	8.876+00	9.770+02	9.129+00
8.0+03	6.637+02	1.035+01	6.914+02	1.056+01	7.196+02	1.076+01	7.483+02	1.096+01	7.756+02	1.121+01
1.0+04	5.381+02	1.214+01	5.603+02	1.234+01	5.831+02	1.255+01	6.066+02	1.275+01	6.295+02	1.300+01
1.5+04	3.535+02	1.548+01	3.680+02	1.572+01	3.826+02	1.597+01	3.976+02	1.621+01	4.124+02	1.647+01
2.0+04	2.488+02	1.764+01	2.600+02	1.793+01	2.713+02	1.822+01	2.828+02	1.858+01	2.942+02	1.880+01
3.0+04	1.398+02	2.022+01	1.464+02	2.055+01	1.532+02	2.088+01	1.601+02	2.121+01	1.671+02	2.154+01
4.0+04	9.105+01	2.158+01	9.536+01	2.193+01	9.978+01	2.228+01	1.043+02	2.264+01	1.089+02	2.299+01
5.0+04	6.430+01	2.230+01	6.737+01	2.267+01	7.053+01	2.303+01	7.374+01	2.340+01	7.701+01	2.377+01
6.0+04	4.772+01	2.265+01	5.006+01	2.303+01	5.249+01	2.340+01	5.490+01	2.378+01	5.739+01	2.416+01
8.0+04	2.911+01	2.272+01	3.056+01	2.311+01	3.209+01	2.350+01	3.360+01	2.390+01	3.518+01	2.429+01
1.0+05	1.967+01	2.238+01	2.065+01	2.278+01	2.169+01	2.318+01	2.272+01	2.357+01	2.379+01	2.397+01
1.5+05	9.508+00	2.106+01	9.987+00	2.145+01	1.049+01	2.183+01	1.099+01	2.222+01	1.151+01	2.260+01
2.0+05	5.600+00	1.973+01	5.886+00	2.009+01	6.169+00	2.046+01	6.466+00	2.083+01	6.797+00	2.119+01
3.0+05	2.598+00	1.752+01	2.733+00	1.785+01	2.876+00	1.818+01	3.016+00	1.852+01	3.163+00	1.885+01
4.0+05	1.492+00	1.585+01	1.570+00	1.616+01	1.653+00	1.646+01	1.734+00	1.676+01	1.819+00	1.707+01
5.0+05	9.666-01	1.456+01	1.017+00	1.484+01	1.071+00	1.512+01	1.124+00	1.540+01	1.180+00	1.568+01
6.0+05	6.765-01	1.351+01	7.122-01	1.377+01	7.501-01	1.404+01	7.872-01	1.430+01	8.263-01	1.456+01
8.0+05	3.840-01	1.191+01	4.044-01	1.215+01	4.260-01	1.238+01	4.472-01	1.261+01	4.694-01	1.284+01
1.0+06	2.469-01	1.073+01	2.600-01	1.094+01	2.740-01	1.115+01	2.877-01	1.136+01	3.020-01	1.157+01
1.5+06	1.103-01	8.739+00	1.162-01	8.910+00	1.224-01	5.081+00	1.285-01	9.252+00	1.350-01	9.422+00
2.0+06	6.215-02	7.464+00	6.547-02	7.610+00	6.900-02	7.756+00	7.246-02	7.902+00	7.610-02	8.048+00
3.0+06	2.767-02	5.876+00	2.914-02	5.991+00	3.071-02	6.107+00	3.226-02	6.224+00	3.388-02	6.337+00
4.0+06	1.557-02	4.903+00	1.640-02	4.999+00	1.728-02	5.093+00	1.815-02	5.191+00	1.906-02	5.287+00
5.0+06	9.965-03	4.235+00	1.050-02	4.318+00	1.106-02	4.401+00	1.162-02	4.484+00	1.220-02	4.567+00
6.0+06	6.923-03	3.744+00	7.293-03	3.817+00	7.687-03	3.890+00	8.073-03	3.964+00	8.480-03	4.037+00
8.0+06	3.894-03	3.063+00	4.102-03	3.123+00	4.323-03	3.183+00	4.541-03	3.243+00	4.769-03	3.303+00
1.0+07	2.493-03	2.609+00	2.626-03	2.660+00	2.768-03	2.711+00	2.907-03	2.762+00	3.053-03	2.813+00
1.5+07	1.108-03	1.931+00	1.167-03	1.969+00	1.230-03	2.006+00	1.292-03	2.044+00	1.357-03	2.082+00
2.0+07	6.232-04	1.550+00	6.566-04	1.580+00	6.920-04	1.611+00	7.269-04	1.641+00	7.634-04	1.671+00
3.0+07	2.769-04	1.128+00	2.917-04	1.150+00	3.075-04	1.172+00	3.225-04	1.195+00	3.392-04	1.217+00
4.0+07	1.558-04	8.966-01	1.641-04	9.141-01	1.730-04	5.317-01	1.817-04	9.493-01	1.908-04	9.669-01
5.0+07	9.970-05	7.484-01	1.050-04	7.631-01	1.107-04	7.777-01	1.163-04	7.924-01	1.221-04	8.071-01
6.0+07	6.923-05	6.448-01	7.293-05	6.575-01	7.687-05	6.701-01	8.073-05	6.828-01	8.480-05	6.954-01
8.0+07	3.895-05	5.085-01	4.103-05	5.185-01	4.325-05	5.285-01	4.542-05	5.385-01	4.771-05	5.484-01
1.0+08	2.492-05	4.221-01	2.625-05	4.304-01	2.767-05	4.386-01	2.906-05	4.469-01	3.053-05	4.552-01

TABLE II.. CONT. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM

PHOTON ENERGY, EV	56 BA		57 LA		58 CE		59 PR		60 ND	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	2.085+03	2.694-02	2.159+03	2.595-02	2.236+03	2.517-02	2.314+03	2.516-02	2.393+03	2.496-02
1.5+02	2.082+03	6.018-02	2.157+03	5.783-02	2.233+03	5.633-02	2.311+03	5.638-02	2.390+03	5.551-02
2.0+02	2.079+03	1.054-01	2.154+03	1.014-01	2.230+03	9.900-02	2.308+03	9.920-02	2.387+03	9.747-02
3.0+02	2.069+03	2.284-01	2.144+03	2.209-01	2.221+03	2.159-01	2.299+03	2.159-01	2.378+03	2.121-01
4.0+02	2.057+03	3.864-01	2.132+03	3.759-01	2.208+03	3.679-01	2.286+03	3.668-01	2.366+03	3.606-01
5.0+02	2.041+03	5.689-01	2.116+03	5.575-01	2.193+03	5.463-01	2.271+03	5.425-01	2.350+03	5.339-01
6.0+02	2.024+03	7.654-01	2.099+03	7.559-01	2.175+03	7.416-01	2.254+03	7.336-01	2.333+03	7.228-01
8.0+02	1.983+03	1.170+00	2.057+03	1.174+00	2.134+03	1.154+00	2.213+03	1.133+00	2.292+03	1.119+00
1.0+03	1.939+03	1.565+00	2.011+03	1.588+00	2.087+03	1.566+00	2.167+03	1.529+00	2.246+03	1.513+00
1.5+03	1.822+03	2.494+00	1.896+03	2.561+00	1.961+03	2.536+00	2.045+03	2.469+00	2.123+03	2.452+00
2.0+03	1.765+03	3.396+00	1.783+03	3.488+00	1.836+03	3.463+00	1.923+03	3.386+00	1.999+03	3.369+00
3.0+03	1.489+03	5.133+00	1.536+03	5.254+00	1.602+03	5.239+00	1.688+03	5.154+00	1.758+03	5.141+00
4.0+03	1.298+03	6.738+00	1.338+03	6.880+00	1.398+03	6.877+00	1.475+03	6.786+00	1.539+03	6.778+00
5.0+03	1.139+03	8.164+00	1.175+03	8.338+00	1.227+03	8.354+00	1.295+03	8.258+00	1.352+03	8.259+00
6.0+03	1.038+03	9.400+00	1.041+03	9.608+00	1.087+03	9.646+00	1.146+03	9.554+00	1.196+03	9.571+00
8.0+03	8.027+02	1.148+01	8.307+02	1.172+01	8.671+02	1.180+01	9.121+02	1.174+01	9.521+02	1.179+01
1.0+04	6.525+02	1.326+01	6.765+02	1.350+01	7.058+02	1.360+01	7.408+02	1.358+01	7.730+02	1.365+01
1.5+04	4.274+02	1.674+01	4.428+02	1.700+01	4.610+02	1.716+01	4.819+02	1.722+01	5.018+02	1.735+01
2.0+04	3.055+02	1.916+01	3.171+02	1.940+01	3.302+02	1.962+01	3.448+02	1.977+01	3.588+02	1.996+01
3.0+04	1.743+02	2.188+01	1.816+02	2.222+01	1.896+02	2.252+01	1.983+02	2.278+01	2.069+02	2.306+01
4.0+04	1.135+02	2.335+01	1.185+02	2.371+01	1.237+02	2.404+01	1.293+02	2.436+01	1.349+02	2.466+01
5.0+04	8.032+01	2.414+01	8.374+01	2.451+01	8.739+01	2.487+01	9.129+01	2.521+01	9.519+01	2.556+01
6.0+04	5.922+01	2.454+01	6.252+01	2.492+01	6.629+01	2.529+01	6.923+01	2.565+01	7.117+01	2.601+01
8.0+04	3.678+01	2.468+01	3.843+01	2.507+01	4.018+01	2.545+01	4.202+01	2.583+01	4.389+01	2.621+01
1.0+05	2.489+01	2.436+01	2.600+01	2.476+01	2.719+01	2.515+01	2.845+01	2.553+01	2.972+01	2.592+01
1.5+05	1.249+01	2.299+01	1.259+01	2.337+01	1.316+01	2.375+01	1.377+01	2.413+01	1.438+01	2.452+01
2.0+05	7.115+00	2.156+01	7.443+00	2.193+01	7.788+00	2.229+01	8.150+00	2.265+01	8.518+00	2.302+01
3.0+05	3.314+00	1.918+01	3.470+00	1.951+01	3.633+00	1.984+01	3.805+00	2.017+01	3.979+00	2.050+01
4.0+05	1.907+00	1.737+01	1.997+00	1.767+01	2.092+00	1.797+01	2.191+00	1.828+01	2.293+00	1.858+01
5.0+05	1.237+00	1.596+01	1.295+00	1.624+01	1.357+00	1.652+01	1.422+00	1.680+01	1.488+00	1.708+01
6.0+05	8.663-01	1.482+01	9.077-01	1.508+01	9.512-01	1.534+01	9.968-01	1.560+01	1.043+00	1.586+01
8.0+05	4.923-01	1.307+01	5.160-01	1.330+01	5.408-01	1.353+01	5.668-01	1.376+01	5.934-01	1.400+01
1.0+06	3.168-01	1.178+01	3.321-01	1.199+01	3.481-01	1.219+01	3.649-01	1.240+01	3.821-01	1.261+01
1.5+06	1.415-01	9.593+00	1.485-01	9.764+00	1.557-01	9.934+00	1.632-01	1.011+01	1.739-01	1.028+01
2.0+06	7.984-02	8.194+00	8.371-02	8.340+00	8.778-02	8.486+00	9.205-02	8.632+00	9.640-02	8.778+00
3.0+06	3.555-02	6.452+00	3.727-02	6.567+00	3.908-02	6.682+00	4.098-02	6.797+00	4.293-02	6.912+00
4.0+06	2.003-02	5.383+00	2.098-02	5.479+00	2.200-02	5.576+00	2.307-02	5.672+00	2.416-02	5.788+00
5.0+06	1.281-02	4.650+00	1.343-02	4.733+00	1.408-02	4.816+00	1.477-02	4.899+00	1.547-02	4.982+00
6.0+06	8.897-03	4.110+00	9.330-03	4.184+00	9.784-03	4.257+00	1.026-02	4.330+00	1.075-02	4.404+00
8.0+06	5.004-03	3.363+00	5.247-03	3.423+00	5.503-03	3.483+00	5.771-03	3.543+00	6.045-03	3.603+00
1.0+07	3.204-03	2.864+00	3.359-03	2.915+00	3.523-03	2.966+00	3.694-03	3.018+00	3.870-03	3.069+00
1.5+07	1.424-03	2.120+00	1.493-03	2.158+00	1.566-03	2.196+00	1.642-03	2.234+00	1.720-03	2.271+00
2.0+07	8.010-04	1.702+00	8.400-04	1.732+00	8.809-04	1.762+00	9.238-04	1.793+00	9.676-04	1.823+00
3.0+07	3.559-04	1.239+00	3.732-04	1.261+00	3.914-04	1.283+00	4.105-04	1.305+00	4.299-04	1.327+00
4.0+07	2.002-04	9.845-01	2.099-04	1.002+00	2.202-04	1.020+00	2.309-04	1.037+00	2.419-04	1.055+00
5.0+07	1.281-04	8.218-01	1.344-04	8.364-01	1.409-04	8.511-01	1.478-04	8.658-01	1.548-04	8.805-01
6.0+07	8.898-05	7.080-01	9.331-05	7.207-01	9.785-05	7.333-01	1.026-04	7.460-01	1.075-04	7.586-01
8.0+07	5.005-05	5.584-01	5.250-05	5.684-01	5.505-05	5.783-01	5.774-05	5.883-01	6.048-05	5.983-01
1.0+08	3.203-05	4.635-01	3.359-05	4.717-01	3.523-05	4.800-01	3.694-05	4.883-01	3.870-05	4.966-01



TABLE II., CONT. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNs/ATOM

PHOTON ENERGY, EV	61 PM		62 SM		63 EU		64 GD		65 TB	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	2.473+03	2.430-02	2.555+03	2.409-02	2.636+03	2.343-02	2.722+03	2.256-02	2.808+03	2.234-02
1.5+02	2.471+03	5.440-02	2.552+03	5.355-02	2.636+03	5.247-02	2.720+03	5.050-02	2.805+03	4.968-02
2.0+02	2.468+03	9.563-02	2.549+03	9.400-02	2.633+03	9.227-02	2.717+03	8.881-02	2.803+03	8.740-02
3.0+02	2.459+03	2.083-01	2.540+03	2.047-01	2.624+03	2.012-01	2.708+03	1.943-01	2.794+03	1.913-01
4.0+02	2.446+03	3.545-01	2.528+03	3.487-01	2.611+03	3.430-01	2.696+03	3.327-01	2.781+03	3.276-01
5.0+02	2.431+03	5.255-01	2.513+03	5.173-01	2.596+03	5.094-01	2.680+03	4.968-01	2.766+03	4.899-01
6.0+02	2.413+03	7.123-01	2.495+03	7.030-01	2.578+03	6.921-01	2.663+03	6.788-01	2.748+03	6.699-01
8.0+02	2.373+03	1.106+00	2.454+03	1.092+00	2.537+03	1.079+00	2.621+03	1.070+00	2.706+03	1.058+00
1.0+03	2.326+03	1.498+00	2.408+03	1.482+00	2.491+03	1.466+00	2.572+03	1.459+00	2.658+03	1.455+00
1.5+03	2.202+03	2.434+00	2.282+03	2.415+00	2.364+03	2.396+00	2.439+03	2.423+00	2.524+03	2.486+00
2.0+03	2.076+03	3.350+00	2.155+03	3.329+00	2.225+03	3.308+00	2.303+03	3.340+00	2.385+03	3.321+00
3.0+03	1.830+03	5.125+00	1.904+03	5.103+00	1.980+03	5.085+00	2.039+03	5.120+00	2.117+03	5.103+00
4.0+03	1.605+03	6.766+00	1.673+03	6.749+00	1.742+03	6.731+00	1.796+03	6.780+00	1.869+03	6.769+00
5.0+03	1.411+03	8.257+00	1.472+03	8.245+00	1.535+03	8.234+00	1.584+03	8.304+00	1.650+03	8.303+00
6.0+03	1.248+03	9.582+00	1.303+03	9.580+00	1.359+03	9.579+00	1.404+03	9.676+00	1.464+03	9.690+00
8.0+03	5.939+02	1.183+01	1.037+03	1.185+01	1.083+03	1.187+01	1.121+03	1.201+01	1.170+03	1.206+01
1.0+04	8.068+02	1.372+01	8.419+02	1.376+01	8.785+02	1.381+01	9.113+02	1.396+01	9.506+02	1.403+01
1.5+04	5.225+02	1.746+01	5.441+02	1.756+01	5.666+02	1.785+01	5.878+02	1.792+01	6.121+02	1.794+01
2.0+04	3.732+02	2.013+01	3.882+02	2.030+01	4.037+02	2.045+01	4.184+02	2.055+01	4.350+02	2.082+01
3.0+04	2.157+02	2.333+01	2.248+02	2.358+01	2.343+02	2.383+01	2.435+02	2.411+01	2.535+02	2.437+01
4.0+04	1.407+02	2.500+01	1.467+02	2.531+01	1.529+02	2.561+01	1.590+02	2.593+01	1.656+02	2.624+01
5.0+04	9.923+01	2.590+01	1.034+02	2.624+01	1.077+02	2.658+01	1.120+02	2.692+01	1.165+02	2.726+01
6.0+04	7.421+01	2.637+01	7.735+01	2.673+01	8.058+01	2.708+01	8.380+01	2.744+01	8.722+01	2.779+01
8.0+04	4.561+01	2.659+01	4.779+01	2.696+01	4.982+01	2.733+01	5.186+01	2.771+01	5.402+01	2.808+01
1.0+05	3.103+01	2.630+01	3.238+01	2.669+01	3.378+01	2.707+01	3.518+01	2.745+01	3.666+01	2.783+01
1.5+05	1.801+01	2.489+01	1.867+01	2.527+01	1.934+01	2.565+01	1.702+01	2.602+01	1.774+01	2.640+01
2.0+05	8.897+00	2.338+01	9.289+00	2.374+01	9.693+00	2.410+01	1.010+01	2.446+01	1.053+01	2.482+01
3.0+05	4.159+00	2.083+01	4.346+00	2.116+01	4.538+00	2.148+01	4.732+00	2.181+01	4.936+00	2.214+01
4.0+05	2.397+00	1.888+01	2.506+00	1.918+01	2.618+00	1.948+01	2.731+00	1.978+01	2.850+00	2.008+01
5.0+05	1.557+00	1.735+01	1.627+00	1.763+01	1.700+00	1.791+01	1.774+00	1.819+01	1.852+00	1.847+01
6.0+05	1.091+00	1.612+01	1.141+00	1.638+01	1.192+00	1.664+01	1.245+00	1.690+01	1.299+00	1.716+01
8.0+05	6.209-01	1.423+01	6.493-01	1.446+01	6.787-01	1.469+01	7.085-01	1.492+01	7.398-01	1.515+01
1.0+06	3.998-01	1.282+01	4.182-01	1.303+01	4.372-01	1.324+01	4.565-01	1.345+01	4.767-01	1.365+01
1.5+06	1.789-01	1.045+01	1.872-01	1.062+01	1.957-01	1.079+01	2.044-01	1.096+01	2.135-01	1.113+01
2.0+06	1.009-01	8.923+00	1.056-01	9.069+00	1.104-01	9.215+00	1.153-01	9.361+00	1.205-01	9.507+00
3.0+06	4.494-02	7.027+00	4.710-02	7.142+00	4.917-02	7.257+00	5.136-02	7.372+00	5.366-02	7.487+00
4.0+06	2.530-02	5.864+00	2.647-02	5.960+00	2.768-02	6.056+00	2.892-02	6.152+00	3.021-02	6.248+00
5.0+06	1.619-02	5.065+00	1.695-02	5.148+00	1.772-02	5.231+00	1.851-02	5.314+00	1.934-02	5.397+00
6.0+06	1.125-02	4.477+00	1.177-02	4.551+00	1.231-02	4.624+00	1.286-02	4.697+00	1.344-02	4.771+00
8.0+06	6.328-03	3.663+00	6.622-03	3.723+00	6.926-03	3.783+00	7.235-03	3.843+00	7.559-03	3.903+00
1.0+07	4.051-03	3.120+00	4.240-03	3.171+00	4.434-03	3.222+00	4.632-03	3.273+00	4.839-03	3.324+00
1.5+07	1.801-03	2.309+00	1.884-03	2.347+00	1.971-03	2.385+00	2.059-03	2.423+00	2.151-03	2.461+00
2.0+07	1.013-03	1.854+00	1.060-03	1.884+00	1.109-03	1.914+00	1.158-03	1.945+00	1.210-03	1.975+00
3.0+07	4.501-04	1.349+00	4.710-04	1.372+00	4.926-04	1.394+00	5.146-04	1.416+00	5.376-04	1.438+00
4.0+07	2.532-04	1.072+00	2.650-04	1.090+00	2.771-04	1.108+00	2.895-04	1.125+00	3.024-04	1.143+00
5.0+07	1.620-04	8.951-01	1.696-04	9.098-01	1.773-04	9.245-01	1.853-04	9.392-01	1.936-04	9.538-01
6.0+07	1.125-04	7.713-01	1.178-04	7.839-01	1.232-04	7.965-01	1.287-04	8.092-01	1.344-04	8.218-01
8.0+07	6.332-05	6.083-01	6.626-05	6.182-01	6.929-05	6.282-01	7.238-05	6.382-01	7.563-05	6.481-01
1.0+08	4.051-05	5.049-01	4.240-05	5.131-01	4.434-05	5.214-01	4.632-05	5.297-01	4.839-05	5.380-01

TABLE II., CONT. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM

PHOTON ENERGY, EV	66 DY		67 HO		68 ER		69 TM		70 YR	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	2.896+03	2.247-02	2.984+03	2.179-02	3.074+03	2.157-02	3.165+03	2.148-02	3.257+03	2.080-02
1.5+02	2.893+03	5.007-02	2.981+03	4.900-02	3.071+03	4.819-02	3.162+03	4.772-02	3.255+03	4.668-02
2.0+02	2.890+03	8.786-02	2.978+03	8.630-02	3.068+03	8.495-02	3.159+03	8.394-02	3.252+03	8.238-02
3.0+02	2.881+03	1.917-01	2.957+03	3.225-01	3.059+03	1.859-01	3.150+03	1.832-01	3.243+03	1.805-01
4.0+02	2.869+03	3.275-01	2.957+03	3.226-01	3.047+03	3.179-01	3.138+03	3.135-01	3.231+03	3.091-01
5.0+02	2.854+03	4.875-01	2.942+03	4.806-01	3.032+03	4.740-01	3.123+03	4.676-01	3.215+03	4.614-01
6.0+02	2.836+03	6.639-01	2.924+03	6.551-01	3.014+03	6.466-01	3.105+03	6.383-01	3.198+03	6.304-01
8.0+02	2.795+03	1.040+00	2.883+03	1.028+00	2.973+03	1.017+00	3.064+03	1.005+00	3.156+03	9.943-01
1.0+03	2.747+03	1.421+00	2.836+03	1.407+00	2.925+03	1.393+00	3.016+03	1.379+00	3.108+03	1.366+00
1.5+03	2.618+03	2.340+00	2.705+03	2.322+00	2.794+03	2.304+00	2.884+03	2.286+00	2.975+03	2.269+00
2.0+03	2.484+03	3.245+00	2.570+03	3.223+00	2.657+03	3.202+00	2.746+03	3.180+00	2.836+03	3.161+00
3.0+03	2.216+03	5.029+00	2.298+03	5.007+00	2.382+03	4.984+00	2.466+03	4.961+00	2.553+03	4.940+00
4.0+03	1.961+03	6.697+00	2.038+03	6.679+00	2.116+03	6.660+00	2.195+00	6.638+00	2.277+03	6.621+00
5.0+03	1.734+03	8.231+00	1.804+03	8.219+00	1.876+03	8.206+00	1.949+00	8.188+00	2.024+03	8.175+00
6.0+03	1.539+03	9.618+00	1.602+03	9.615+00	1.667+03	9.611+00	1.734+03	9.600+00	1.893+03	9.593+00
8.0+03	1.528+03	1.200+01	1.580+03	1.202+01	1.533+03	1.204+01	1.589+03	1.205+01	1.445+03	1.206+01
1.0+04	5.970+02	1.401+01	1.039+03	1.405+01	1.083+03	1.409+01	1.129+03	1.412+01	1.176+03	1.415+01
1.5+04	6.399+02	1.799+01	6.663+02	1.808+01	6.938+02	1.816+01	7.222+02	1.824+01	7.518+02	1.831+01
2.0+04	4.537+02	2.093+01	4.716+02	2.107+01	4.901+02	2.120+01	5.093+02	2.132+01	5.292+02	2.143+01
3.0+04	2.644+02	2.459+01	2.750+02	2.482+01	2.860+02	2.505+01	2.973+02	2.526+01	3.089+02	2.547+01
4.0+04	1.726+02	2.653+01	1.797+02	2.692+01	1.869+02	2.710+01	1.944+02	2.738+01	2.021+02	2.765+01
5.0+04	1.214+02	2.758+01	1.263+02	2.790+01	1.314+02	2.822+01	1.366+02	2.854+01	1.419+02	2.895+01
6.0+04	9.088+01	2.814+01	9.452+01	2.848+01	9.828+01	2.882+01	1.022+02	2.916+01	1.061+02	2.949+01
8.0+04	5.630+01	2.845+01	5.859+01	2.881+01	6.094+01	2.917+01	6.336+01	2.953+01	6.584+01	2.989+01
1.0+05	3.822+01	2.820+01	3.979+01	2.858+01	4.141+01	2.895+01	4.306+01	2.932+01	4.477+01	2.969+01
1.5+05	1.849+01	2.678+01	1.925+01	2.715+01	2.003+01	2.752+01	2.083+01	2.789+01	2.166+01	2.826+01
2.0+05	1.098+01	2.518+01	1.143+01	2.554+01	1.190+01	2.590+01	1.238+01	2.626+01	1.287+01	2.661+01
3.0+05	5.150+00	2.247+01	5.366+00	2.279+01	5.588+00	2.312+01	5.816+00	2.345+01	6.050+00	2.377+01
4.0+05	2.974+00	2.038+01	3.100+00	2.068+01	3.230+00	2.098+01	3.363+00	2.128+01	3.500+00	2.158+01
5.0+05	1.933+00	1.875+01	2.015+00	1.902+01	2.100+00	1.930+01	2.187+00	1.958+01	2.276+00	1.986+01
6.0+05	1.356+00	1.742+01	1.414+00	1.768+01	1.474+00	1.794+01	1.535+00	1.820+01	1.598+00	1.846+01
8.0+05	7.726-01	1.538+01	8.058-01	1.561+01	8.400-01	1.584+01	8.751-01	1.607+01	9.113-01	1.630+01
1.0+06	4.980-01	1.386+01	5.194-01	1.407+01	5.416-01	1.428+01	5.643-01	1.449+01	5.877-01	1.465+01
1.5+06	2.531-01	1.130+01	2.527-01	1.147+01	2.627-01	1.164+01	2.729-01	1.181+01	2.835-01	1.198+01
2.0+06	1.259-01	9.653+00	1.313-01	9.798+00	1.370-01	9.944+00	1.428-01	1.009+01	1.487-01	1.024+01
3.0+06	5.607-02	7.602+00	5.851-02	7.717+00	6.103-02	7.832+00	6.362-02	7.947+00	6.629-02	8.062+00
4.0+06	3.157-02	6.344+00	3.294-02	6.440+00	3.436-02	6.536+00	3.582-02	6.632+00	3.732-02	6.728+00
5.0+06	2.021-02	5.460+00	2.109-02	5.563+00	2.200-02	5.645+00	2.294-02	5.728+00	2.390-02	5.811+00
6.0+06	1.404-02	4.844+00	1.466-02	4.917+00	1.529-02	4.991+00	1.594-02	5.064+00	1.661-02	5.137+00
8.0+06	7.898-03	3.963+00	8.243-03	4.023+00	8.598-03	4.083+00	8.964-03	4.143+00	9.340-03	4.203+00
1.0+07	5.057-03	3.375+00	5.278-03	3.427+00	5.505-03	3.478+00	5.739-03	3.529+00	5.980-03	3.580+00
1.5+07	2.247-03	2.499+00	2.346-03	2.536+00	2.447-03	2.574+00	2.551-03	2.612+00	2.658-03	2.650+00
2.0+07	1.264-03	2.005+00	1.320-03	2.036+00	1.376-03	2.066+00	1.435-03	2.097+00	1.495-03	2.127+00
3.0+07	5.613-04	1.460+00	5.863-04	1.482+00	6.116-04	1.504+00	6.376-04	1.526+00	6.644-04	1.549+00
4.0+07	3.160-04	1.160+00	3.298-04	1.178+00	3.440-04	1.195+00	3.586-04	1.213+00	3.737-04	1.231+00
5.0+07	2.023-04	9.685-01	2.111-04	9.832-01	2.262-04	9.979-01	2.395-04	1.013+00	2.392-04	1.027+00
6.0+07	1.405-04	8.345-01	1.466-04	8.471-01	1.529-04	8.598-01	1.594-04	8.724-01	1.661-04	8.851-01
8.0+07	7.903-05	6.581-01	8.248-05	6.681-01	8.603-05	6.781-01	8.968-05	6.880-01	9.345-05	6.980-01
1.0+08	5.057-05	5.462-01	5.278-05	5.545-01	5.505-05	5.628-01	5.739-05	5.711-01	5.980-05	5.793-01

COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM

TABLE II.. CCNT.

PHOTON ENERGY, EV	71 LU		72 HF		73 TA		74 W		75 RE	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	3.351+03	2.948-02	3.445+03	1.974-02	3.542+03	1.898-02	3.639+03	1.807-02	3.739+03	1.745-02
1.5+02	3.348+03	4.541-02	3.440+03	4.384-02	3.539+03	4.230-02	3.637+03	4.044-02	3.736+03	3.927-02
2.0+02	3.345+03	8.002-02	3.440+03	7.715-02	3.537+03	7.439-02	3.635+03	7.156-02	3.734+03	6.928-02
3.0+02	3.337+03	1.757-01	3.432+03	1.697-01	3.528+03	1.638-01	3.626+03	1.581-01	3.725+03	1.531-01
4.0+02	3.324+03	3.022-01	3.419+03	2.927-01	3.516+03	2.831-01	3.614+03	2.749-01	3.713+03	2.656-01
5.0+02	3.309+03	4.535-01	3.404+03	4.408-01	3.501+03	4.276-01	3.599+03	4.147-01	3.698+03	4.026-01
6.0+02	3.291+03	6.529-01	3.386+03	6.081-01	3.483+03	5.916-01	3.581+03	5.752-01	3.680+03	5.596-01
8.0+02	3.249+03	9.936-01	3.343+03	9.785-01	3.439+03	9.582-01	3.537+03	9.368-01	3.637+03	9.154-01
1.0+03	3.199+03	1.378+00	3.292+03	1.368+00	3.388+03	1.348+00	3.485+03	1.325+00	3.584+03	1.301+00
1.5+03	3.059+03	2.311+00	3.148+03	2.323+00	3.240+03	2.313+00	3.334+03	2.294+00	3.430+03	2.271+00
2.0+03	2.912+03	3.209+00	2.994+03	3.253+00	3.080+03	3.230+00	3.169+03	3.213+00	3.261+03	3.194+00
3.0+03	2.619+03	4.979+00	2.690+03	5.008+00	2.765+03	5.005+00	2.842+03	4.983+00	2.923+03	4.961+00
4.0+03	2.339+03	6.856+00	2.403+03	6.689+00	2.470+03	6.691+00	2.538+03	6.675+00	2.609+03	6.652+00
5.0+03	2.083+03	8.219+00	2.143+03	8.262+00	2.203+03	8.277+00	2.265+03	8.276+00	2.328+03	8.262+00
6.0+03	1.859+03	9.654+00	1.914+03	9.716+00	1.970+03	9.754+00	2.026+03	9.777+00	2.083+03	9.782+00
8.0+03	1.494+03	1.215+01	1.542+03	1.226+01	1.590+03	1.234+01	1.639+03	1.242+01	1.687+03	1.248+01
1.0+04	1.217+03	1.426+01	1.259+03	1.439+01	1.301+03	1.451+01	1.343+03	1.463+01	1.386+03	1.474+01
1.5+04	7.794+02	1.844+01	8.076+02	1.860+01	8.362+02	1.876+01	8.653+02	1.892+01	8.950+02	1.908+01
2.0+04	5.488+02	2.159+01	5.763+02	2.176+01	6.049+02	2.194+01	6.330+02	2.211+01	6.617+02	2.230+01
3.0+04	3.202+02	2.570+01	3.316+02	2.593+01	3.432+02	2.616+01	3.550+02	2.639+01	3.670+02	2.663+01
4.0+04	2.096+02	2.793+01	2.173+02	2.822+01	2.252+02	2.850+01	2.331+02	2.878+01	2.413+02	2.906+01
5.0+04	1.474+02	2.916+01	1.527+02	2.948+01	1.582+02	2.980+01	1.639+02	3.011+01	1.697+02	3.043+01
6.0+04	1.101+02	2.983+01	1.141+02	3.016+01	1.183+02	3.050+01	1.225+02	3.083+01	1.268+02	3.117+01
8.0+04	6.832+01	3.025+01	7.084+01	3.061+01	7.341+01	3.096+01	7.604+01	3.132+01	7.871+01	3.167+01
1.0+05	4.648+01	3.005+01	4.822+01	3.042+01	5.000+01	3.079+01	5.181+01	3.115+01	5.366+01	3.152+01
1.5+05	2.248+01	2.863+01	2.333+01	2.900+01	2.420+01	2.936+01	2.508+01	2.973+01	2.598+01	3.010+01
2.0+05	1.336+01	2.697+01	1.387+01	2.733+01	1.438+01	2.768+01	1.491+01	2.800+01	1.545+01	2.839+01
3.0+05	6.287+00	2.410+01	6.528+00	2.442+01	6.775+00	2.475+01	7.027+00	2.507+01	7.284+00	2.539+01
4.0+05	3.638+00	2.188+01	3.779+00	2.218+01	3.923+00	2.247+01	4.071+00	2.277+01	4.232+00	2.307+01
5.0+05	2.367+00	2.013+01	2.459+00	2.041+01	2.554+00	2.069+01	2.650+00	2.094+01	2.749+00	2.124+01
6.0+05	1.662+00	1.872+01	1.727+00	1.892+01	1.794+00	1.923+01	1.862+00	1.949+01	1.932+00	1.975+01
8.0+05	9.478-01	1.653+01	9.853-01	1.676+01	1.024+00	1.699+01	1.063+00	1.722+01	1.103+00	1.745+01
1.0+06	6.114-01	1.490+01	6.356-01	1.511+01	6.605-01	1.532+01	6.859-01	1.552+01	7.119-01	1.573+01
1.5+06	2.742-01	1.215+01	2.851-01	1.232+01	2.964-01	1.249+01	3.078-01	1.268+01	3.196-01	1.283+01
2.0+06	1.548-01	1.038+01	1.610-01	1.053+01	1.674-01	1.067+01	1.739-01	1.082+01	1.805-01	1.096+01
3.0+06	6.899-02	8.176+00	7.176-02	8.231+00	7.460-02	8.406+00	7.751-02	8.521+00	8.049-02	8.636+00
4.0+06	3.884-02	6.824+00	4.041-02	6.920+00	4.201-02	7.015+00	4.365-02	7.111+00	4.533-02	7.207+00
5.0+06	2.487-02	5.894+00	2.587-02	5.977+00	2.690-02	6.060+00	2.795-02	6.143+00	2.903-02	6.226+00
6.0+06	1.728-02	5.211+00	1.798-02	5.284+00	1.869-02	5.357+00	1.942-02	5.431+00	2.017-02	5.504+00
8.0+06	9.722-03	4.263+00	1.011-02	4.323+00	1.051-02	4.383+00	1.093-02	4.443+00	1.135-02	4.503+00
1.0+07	6.224-03	3.631+00	6.475-03	3.682+00	6.732-03	3.733+00	6.995-03	3.784+00	7.265-03	3.836+00
1.5+07	2.766-03	2.688+00	2.878-03	2.726+00	2.992-03	2.763+00	3.109-03	2.801+00	3.229-03	2.839+00
2.0+07	1.555-03	2.157+00	1.619-03	2.188+00	1.683-03	2.218+00	1.749-03	2.249+00	1.816-03	2.279+00
3.0+07	6.915-04	1.571+00	7.193-04	1.593+00	7.479-04	1.615+00	7.771-04	1.637+00	8.071-04	1.659+00
4.0+07	3.890-04	1.248+00	4.046-04	1.266+00	4.207-04	1.283+00	4.371-04	1.301+00	4.540-04	1.318+00
5.0+07	2.489-04	1.042+00	2.590-04	1.057+00	2.692-04	1.071+00	2.798-04	1.088+00	2.906-04	1.101+00
6.0+07	1.729-04	8.977-01	1.799-04	9.103-01	1.870-04	9.230-01	1.943-04	9.356-01	2.018-04	9.483-01
8.0+07	9.727-05	7.060-01	1.012-04	7.179-01	1.052-04	7.279-01	1.093-04	7.379-01	1.135-04	7.479-01
1.0+08	6.225-05	5.876-01	6.475-05	5.959-01	6.732-05	6.042-01	6.995-05	6.124-01	7.265-05	6.207-01

COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM

PHOTON ENERGY, EV	76 GS		77 IR		78 PT		79 AU		80 HG	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	3.840+03	1.712-02	3.942+03	1.647-02	4.045+03	1.388-02	4.150+03	1.366-02	4.256+03	1.481-02
1.5+02	3.637+03	3.804-02	3.939+03	3.691-02	4.043+03	3.107-02	4.148+03	3.024-02	4.253+03	3.352-02
2.0+02	3.834+03	6.712-02	3.936+03	6.509-02	4.040+03	5.477-02	4.145+03	5.326-02	4.250+03	5.959-02
3.0+02	3.826+03	1.484-01	3.928+03	1.440-01	4.033+03	1.213-01	4.137+03	1.179-01	4.242+03	1.325-01
4.0+02	3.814+03	2.577-01	3.916+03	2.505-01	4.021+03	2.115-01	4.126+03	2.057-01	4.230+03	2.311-01
5.0+02	3.799+03	3.914-01	3.901+03	3.809-01	4.008+03	3.226-01	4.112+03	3.141-01	4.215+03	3.527-01
6.0+02	3.781+03	5.451-01	3.883+03	5.313-01	3.991+03	4.517-01	4.096+03	4.402-01	4.197+03	4.938-01
8.0+02	3.737+03	8.954-01	3.839+03	8.761-01	3.956+03	7.520-01	4.055+03	7.347-01	4.153+03	8.209-01
1.0+03	3.684+03	1.278+00	3.786+03	1.255+00	3.900+03	1.091+00	4.005+03	1.069+00	4.100+03	1.187+00
1.5+03	3.529+03	2.254+00	3.629+03	2.234+00	3.749+03	2.012+00	3.852+03	1.984+00	3.938+03	2.154+00
2.0+03	3.355+03	3.190+00	3.452+03	3.181+00	3.573+03	2.957+00	3.674+03	2.929+00	3.754+03	3.105+00
3.0+03	3.007+03	4.377+00	3.093+03	4.590+00	3.202+03	4.796+00	3.295+03	4.772+00	3.368+03	4.929+00
4.0+03	2.682+03	6.682+00	2.758+03	6.711+00	2.849+03	6.534+00	2.930+03	6.511+00	3.000+03	6.664+00
5.0+03	2.392+03	8.302+00	2.459+03	8.342+00	2.535+03	8.195+00	2.607+03	8.174+00	2.671+03	8.317+00
6.0+03	2.144+03	9.835+00	2.200+03	9.887+00	2.264+03	9.781+00	2.329+03	9.770+00	2.398+03	9.898+00
8.0+03	1.736+03	1.258+01	1.786+03	1.267+01	1.838+03	1.265+01	1.889+03	1.268+01	1.938+03	1.281+01
1.0+04	1.428+03	1.487+01	1.471+03	1.500+01	1.517+03	1.506+01	1.561+03	1.514+01	1.603+03	1.529+01
1.5+04	9.252+02	1.925+01	9.559+02	1.943+01	9.830+02	1.958+01	1.020+03	1.974+01	1.051+03	1.994+01
2.0+04	6.482+02	2.499+01	6.695+02	2.269+01	6.917+02	2.287+01	7.141+02	2.307+01	7.363+02	2.328+01
3.0+04	3.792+02	2.586+01	3.916+02	2.710+01	4.043+02	2.733+01	4.171+02	2.756+01	4.299+02	2.781+01
4.0+04	2.496+02	2.935+01	2.580+02	2.963+01	2.666+02	2.991+01	2.754+02	3.018+01	2.841+02	3.047+01
5.0+04	1.756+02	3.074+01	1.816+02	3.105+01	1.878+02	3.136+01	1.941+02	3.167+01	2.004+02	3.198+01
6.0+04	1.312+02	3.150+01	1.356+02	3.184+01	1.403+02	3.217+01	1.449+02	3.250+01	1.496+02	3.283+01
8.0+04	8.144+01	3.203+01	8.422+01	3.238+01	8.708+01	3.273+01	8.996+01	3.308+01	9.287+01	3.343+01
1.0+05	5.555+01	3.188+01	5.748+01	3.224+01	5.945+01	3.260+01	6.145+01	3.296+01	6.346+01	3.332+01
1.5+05	2.690+01	3.046+01	2.784+01	3.082+01	2.831+01	3.119+01	2.979+01	3.155+01	3.078+01	3.191+01
2.0+05	1.600+01	2.874+01	1.656+01	2.910+01	1.713+01	2.945+01	1.772+01	2.980+01	1.831+01	3.015+01
3.0+05	7.547+00	2.572+01	7.816+00	2.604+01	8.092+00	2.636+01	8.371+00	2.669+01	8.654+00	2.701+01
4.0+05	4.376+00	2.337+01	4.534+00	2.366+01	4.696+00	2.396+01	4.860+00	2.426+01	5.027+00	2.455+01
5.0+05	2.851+00	2.151+01	2.954+00	2.179+01	3.051+00	2.207+01	3.159+00	2.234+01	3.278+00	2.262+01
6.0+05	2.004+00	2.001+01	2.077+00	2.027+01	2.152+00	2.052+01	2.228+00	2.078+01	2.306+00	2.104+01
8.0+05	1.144+00	1.768+01	1.186+00	1.790+01	1.229+00	1.813+01	1.273+00	1.836+01	1.318+00	1.859+01
1.0+06	7.386-01	1.594+01	7.659-01	1.615+01	7.940-01	1.635+01	8.226-01	1.656+01	8.516-01	1.677+01
1.5+06	3.317-01	1.300+01	3.441-01	1.317+01	3.568-01	1.334+01	3.697-01	1.351+01	3.829-01	1.368+01
2.0+06	1.874-01	1.111+01	1.944-01	1.125+01	2.016-01	1.140+01	2.089-01	1.155+01	2.164-01	1.169+01
3.0+06	8.355-02	8.751+00	8.669-02	8.866+00	8.992-02	8.981+00	9.320-02	9.096+00	9.654-02	9.210+00
4.0+06	4.705-02	7.303+00	4.882-02	7.399+00	5.054-02	7.4695+00	5.249-02	7.591+00	5.437-02	7.687+00
5.0+06	3.015-02	6.309+00	3.127-02	6.392+00	3.243-02	6.475+00	3.362-02	6.558+00	3.448-02	6.641+00
6.0+06	2.094-02	5.577+00	2.173-02	5.650+00	2.254-02	5.724+00	2.336-02	5.797+00	2.420-02	5.870+00
8.0+06	1.178-02	4.563+00	1.222-02	4.623+00	1.268-02	4.683+00	1.314-02	4.743+00	1.362-02	4.803+00
1.0+07	7.542-03	3.887+00	7.826-03	3.938+00	8.118-03	3.989+00	8.415-03	4.040+00	8.718-03	4.091+00
1.5+07	3.352-03	2.877+00	3.478-03	2.915+00	3.608-03	2.953+00	3.740-03	2.991+00	3.874-03	3.028+00
2.0+07	1.686-03	2.309+00	1.957-03	2.340+00	2.030-03	2.370+00	2.104-03	2.400+00	2.180-03	2.431+00
3.0+07	8.379-04	1.681+00	8.694-04	1.703+00	9.019-04	1.725+00	9.350-04	1.748+00	9.686-04	1.770+00
4.0+07	4.713-04	1.336+00	4.891-04	1.354+00	5.073-04	1.371+00	5.259-04	1.389+00	5.449-04	1.406+00
5.0+07	3.016-04	1.115+00	3.130-04	1.130+00	3.247-04	1.145+00	3.366-04	1.159+00	3.487-04	1.174+00
6.0+07	2.095-04	9.609-01	2.174-04	9.736-01	2.255-04	9.862-01	2.337-04	9.988-01	2.421-04	1.011+00
8.0+07	1.179-04	7.578-01	1.223-04	7.678-01	1.259-04	7.778-01	1.315-04	7.877-01	1.362-04	7.977-01
1.0+08	7.542-05	6.290-01	7.826-05	6.373-01	8.118-05	6.455-01	8.416-05	6.538-01	8.719-05	6.621-01

TABLE II.. CONT. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM

PHOTON ENERGY, EV	61 TL			82 PB			83 BI			84 PO			85 AT		
	COH	INCOH	INCOH	COH	INCOH	INCOH	COH	INCOH	INCOH	COH	INCOH	INCOH	COH	INCOH	
1.0+02	4.363+03	1.571-02	4.471+03	1.561-02	4.581+03	1.494-02	4.693+03	1.473-02	4.606+03	1.198+00	4.805+03	1.478-02	4.802+03	3.234-02	
1.5+02	4.360+03	3.538-02	4.468+03	3.495-02	4.578+03	3.388-02	4.689+03	3.304-02	4.689+03	3.280+00	4.802+03	3.234-02	4.802+03	5.697-02	
2.0+02	4.356+03	6.245-02	4.465+03	6.163-02	4.574+03	5.996-02	4.685+03	5.842-02	4.685+03	5.842-02	4.798+03	5.697-02	4.798+03	1.266-01	
3.0+02	4.347+03	1.383-01	4.454+03	1.366-01	4.564+03	1.332-01	4.675+03	1.299-01	4.675+03	1.299-01	4.787+03	1.266-01	4.787+03	2.217-01	
4.0+02	4.333+03	2.407-01	4.440+03	2.362-01	4.549+03	2.326-01	4.660+03	2.272-01	4.660+03	2.272-01	4.772+03	2.217-01	4.772+03	3.405-01	
5.0+02	4.317+03	3.667-01	4.422+03	3.637-01	4.531+03	3.555-01	4.641+03	3.483-01	4.641+03	3.483-01	4.753+03	3.405-01	4.753+03	4.803-01	
6.0+02	4.297+03	5.126-01	4.401+03	5.097-01	4.509+03	4.987-01	4.618+03	4.987-01	4.618+03	4.987-01	4.730+03	4.803-01	4.730+03	8.127-01	
8.0+02	4.248+03	8.503-01	4.350+03	8.459-01	4.456+03	8.338-01	4.564+03	8.252-01	4.564+03	8.252-01	4.674+03	8.127-01	4.674+03	1.198+00	
1.0+03	4.190+03	1.228+00	4.289+03	1.234+00	4.391+03	1.214+00	4.497+03	1.210+00	4.497+03	1.210+00	4.606+03	1.198+00	4.606+03	2.280+00	
1.5+03	4.018+03	2.235+00	4.106+03	2.271+00	4.200+03	2.252+00	4.299+03	2.275+00	4.299+03	2.275+00	4.401+03	2.280+00	4.401+03	3.409+00	
2.0+03	3.826+03	3.230+00	3.905+03	3.310+00	3.990+03	3.313+00	4.079+03	3.374+00	4.079+03	3.374+00	4.172+03	3.409+00	4.172+03	5.577+00	
3.0+03	3.436+03	5.095+00	3.505+03	5.246+00	3.575+03	5.335+00	3.648+03	5.469+00	3.648+03	5.469+00	3.724+03	5.577+00	3.724+03	7.504+00	
4.0+03	3.067+03	6.834+00	3.132+03	7.009+00	3.197+03	7.154+00	3.262+03	7.335+00	3.262+03	7.335+00	3.328+03	7.504+00	3.328+03	9.207+00	
5.0+03	2.929+02	3.075+01	2.797+03	8.655+00	2.859+03	8.818+00	2.921+03	9.014+00	2.921+03	9.014+00	2.983+03	9.207+00	2.983+03	1.077+01	
6.0+03	2.446+03	1.005+01	2.505+03	1.022+01	2.583+03	1.038+01	2.621+03	1.057+01	2.621+03	1.057+01	2.680+03	1.077+01	2.680+03	2.185+03	
8.0+03	1.987+03	1.295+01	2.036+03	1.310+01	2.095+03	1.326+01	2.135+03	1.344+01	2.135+03	1.344+01	2.185+03	1.363+01	2.185+03	1.617+01	
1.0+04	1.645+03	1.545+01	1.686+03	1.562+01	1.728+03	1.579+01	1.771+03	1.598+01	1.771+03	1.598+01	1.814+03	1.617+01	1.814+03	2.105+01	
1.5+04	1.082+03	2.015+01	1.113+03	2.037+01	1.145+03	2.059+01	1.176+03	2.082+01	1.176+03	2.082+01	1.208+03	2.105+01	1.208+03	2.446+01	
2.0+04	7.588+02	2.350+01	7.816+02	2.373+01	8.047+02	2.397+01	8.281+02	2.421+01	8.281+02	2.421+01	8.518+02	2.446+01	8.518+02	2.908+01	
3.0+04	4.428+02	2.806+01	4.558+02	2.831+01	4.690+02	2.856+01	4.824+02	2.882+01	4.824+02	2.882+01	4.959+02	2.908+01	4.959+02	3.189+01	
4.0+04	2.929+02	3.075+01	3.018+02	3.103+01	3.108+02	3.132+01	3.199+02	3.160+01	3.199+02	3.160+01	3.291+02	3.189+01	3.291+02	3.354+01	
5.0+04	2.068+02	3.229+01	2.133+02	3.261+01	2.199+02	3.224+01	2.266+02	3.233+01	2.266+02	3.233+01	2.334+02	3.354+01	2.334+02	3.448+01	
6.0+04	1.544+02	3.316+01	1.592+02	3.349+01	1.641+02	3.382+01	1.691+02	3.415+01	1.691+02	3.415+01	1.742+02	3.448+01	1.742+02	3.519+01	
8.0+04	9.581+01	3.378+01	9.880+01	3.414+01	1.018+02	3.449+01	1.049+02	3.484+01	1.049+02	3.484+01	1.080+02	3.519+01	1.080+02	3.519+01	
1.0+05	6.550+01	3.368+01	6.757+01	3.404+01	6.967+01	3.440+01	7.180+01	3.475+01	7.180+01	3.475+01	7.397+01	3.511+01	7.397+01	3.511+01	
1.5+05	3.179+01	3.227+01	3.281+01	3.263+01	3.385+01	3.299+01	3.490+01	3.335+01	3.490+01	3.335+01	3.597+01	3.371+01	3.597+01	3.371+01	
2.0+05	1.890+01	3.050+01	1.951+01	3.085+01	2.013+01	3.120+01	2.075+01	3.155+01	2.075+01	3.155+01	2.139+01	3.190+01	2.139+01	2.861+01	
3.0+05	8.941+00	2.733+01	9.232+00	2.765+01	9.528+00	2.797+01	9.828+00	2.829+01	9.828+00	2.829+01	1.013+01	2.861+01	1.013+01	2.861+01	
4.0+05	5.196+00	2.485+01	5.368+00	2.515+01	5.642+00	2.544+01	5.719+00	2.574+01	5.719+00	2.574+01	5.899+00	2.603+01	5.899+00	2.603+01	
5.0+05	3.389+00	2.289+01	3.502+00	2.316+01	3.617+00	2.344+01	3.734+00	2.371+01	3.734+00	2.371+01	3.853+00	2.399+01	3.853+00	2.399+01	
6.0+05	2.385+00	2.130+01	2.465+00	2.155+01	2.586+00	2.181+01	2.629+00	2.207+01	2.629+00	2.207+01	2.713+00	2.232+01	2.713+00	2.232+01	
8.0+05	1.363+00	1.882+01	1.410+00	1.905+01	1.457+00	1.928+01	1.504+00	1.951+01	1.504+00	1.951+01	1.553+00	1.973+01	1.553+00	1.973+01	
1.0+06	8.811-01	1.698+01	9.111-01	1.718+01	9.416-01	1.739+01	9.727-01	1.760+01	9.727-01	1.760+01	1.004+00	1.780+01	1.004+00	1.780+01	
1.5+06	3.962-01	1.585+01	4.099-01	1.602+01	4.238-01	1.619+01	4.379-01	1.636+01	4.379-01	1.636+01	4.523-01	1.653+01	4.523-01	1.653+01	
2.0+06	2.240-01	1.184+01	2.317-01	1.198+01	2.396-01	1.213+01	2.476-01	1.227+01	2.476-01	1.227+01	2.558-01	1.242+01	2.558-01	1.242+01	
3.0+06	9.995-02	9.325+00	1.034-01	9.440+00	1.070-01	9.555+00	1.105-01	9.670+00	1.105-01	9.670+00	1.142-01	9.785+00	1.142-01	9.785+00	
4.0+06	5.630-02	7.783+00	5.825-02	7.879+00	6.025-02	7.975+00	6.228-02	8.071+00	6.228-02	8.071+00	6.435-02	8.167+00	6.435-02	8.167+00	
5.0+06	3.606-02	6.723+00	3.731-02	6.806+00	3.859-02	6.889+00	3.990-02	6.972+00	3.990-02	6.972+00	4.123-02	7.055+00	4.123-02	7.055+00	
6.0+06	2.506-02	5.944+00	2.593-02	6.017+00	2.682-02	6.090+00	2.773-02	6.164+00	2.773-02	6.164+00	2.865-02	6.237+00	2.865-02	6.237+00	
8.0+06	1.410-02	4.863+00	1.459-02	4.923+00	1.509-02	4.983+00	1.560-02	5.043+00	1.560-02	5.043+00	1.612-02	5.103+00	1.612-02	5.103+00	
1.0+07	9.026-03	4.142+00	9.341-03	4.193+00	9.662-03	4.243+00	9.989-03	4.296+00	9.989-03	4.296+00	1.032-02	4.347+00	1.032-02	4.347+00	
1.5+07	4.012-03	3.066+00	4.151-03	3.104+00	4.294-03	3.142+00	4.439-03	3.180+00	4.439-03	3.180+00	4.588-03	3.218+00	4.588-03	3.218+00	
2.0+07	2.257-03	2.461+00	2.336-03	2.492+00	2.416-03	2.522+00	2.498-03	2.552+00	2.498-03	2.552+00	2.581-03	2.583+00	2.581-03	2.583+00	
3.0+07	1.003-03	1.792+00	1.038-03	1.814+00	1.074-03	1.836+00	1.110-03	1.858+00	1.110-03	1.858+00	1.147-03	1.880+00	1.147-03	1.880+00	
4.0+07	5.642-04	1.424+00	5.838-04	1.441+00	6.039-04	1.459+00	6.244-04	1.477+00	6.244-04	1.477+00	6.452-04	1.494+00	6.452-04	1.494+00	
5.0+07	3.611-04	1.189+00	3.736-04	1.203+00	3.865-04	1.218+00	3.996-04	1.233+00	3.996-04	1.233+00	4.129-04	1.247+00	4.129-04	1.247+00	
6.0+07	2.507-04	1.024+00	2.595-04	1.037+00	2.684-04	1.049+00	2.774-04	1.062+00	2.774-04	1.062+00	2.867-04	1.075+00	2.867-04	1.075+00	
8.0+07	1.411-04	8.077-01	1.460-04	8.177-01	1.510-04	8.276-01	1.561-04	8.376-01	1.561-04	8.376-01	1.613-04	8.476-01	1.613-04	8.476-01	
1.0+08	9.027-05	6.704-01	9.342-05	6.787-01	9.663-05	6.869-01	9.990-05	6.952-01	9.990-05	6.952-01	1.032-04	7.035-01	1.032-04	7.035-01	

TABLE II. CONT. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM

PHOTON ENERGY, EV	86 RN		87 FR		88 RA		89 AC		90 TH	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	4.919+03	1.384-02	5.033+03	2.672-02	5.150+03	3.127-02	5.267+03	3.040-02	5.385+03	2.940-02
1.5+02	4.916+03	3.112-02	5.028+03	5.939-02	5.144+03	6.993-02	5.261+03	6.797-02	5.380+03	6.564-02
2.0+02	4.912+03	5.526-02	5.022+03	1.040-01	5.137+03	1.226-01	5.255+03	1.192-01	5.374+03	1.154-01
3.0+02	4.911+03	1.231-01	5.006+03	2.235-01	5.119+03	2.654-01	5.237+03	2.592-01	5.356+03	2.517-01
4.0+02	4.885+03	2.160-01	4.985+03	3.745-01	5.095+03	4.478-01	5.213+03	4.401-01	5.332+03	4.295-01
5.0+02	4.866+03	3.320-01	4.959+03	5.463-01	5.066+03	6.573-01	5.183+03	6.507-01	5.302+03	6.385-01
6.0+02	4.843+03	4.690-01	4.929+03	7.302-01	5.032+03	8.820-01	5.149+03	8.799-01	5.268+03	8.684-01
8.0+02	4.786+03	7.958-01	4.866+03	1.116+00	4.954+03	1.344+00	5.059+03	1.360+00	5.186+03	1.358+00
1.0+03	4.717+03	1.176+00	4.783+03	1.516+00	4.867+03	1.798+00	4.978+03	1.837+00	5.093+03	1.852+00
1.5+03	4.506+03	2.254+00	4.567+03	2.574+00	4.635+03	2.895+00	4.733+03	2.982+00	4.838+03	3.038+00
2.0+03	4.269+03	3.389+00	4.335+03	3.678+00	4.399+03	3.989+00	4.485+03	4.101+00	4.578+03	4.184+00
3.0+03	3.804+03	5.613+00	3.871+03	5.852+00	3.937+03	6.123+00	4.009+03	6.264+00	4.085+03	6.380+00
4.0+03	3.396+03	7.618+00	3.457+03	7.857+00	3.519+03	8.116+00	3.583+03	8.281+00	3.649+03	8.421+00
5.0+03	3.044+03	9.368+00	3.101+03	9.620+00	3.158+03	9.889+00	3.217+03	1.009+01	3.277+03	1.027+01
6.0+03	2.738+03	1.095+01	2.792+03	1.120+01	2.846+03	1.147+01	2.901+03	1.170+01	2.957+03	1.190+01
8.0+03	2.236+03	1.382+01	2.285+03	1.405+01	2.334+03	1.430+01	2.383+03	1.453+01	2.433+03	1.476+01
1.0+04	1.837+03	1.636+01	1.899+03	1.658+01	1.942+03	1.682+01	1.985+03	1.705+01	2.028+03	1.727+01
1.5+04	1.239+03	2.128+01	1.270+03	2.153+01	1.302+03	2.178+01	1.333+03	2.203+01	1.365+03	2.228+01
2.0+04	8.758+02	2.471+01	8.998+02	2.498+01	9.238+02	2.525+01	9.482+02	2.551+01	9.728+02	2.578+01
3.0+04	5.056+02	2.935+01	5.234+02	2.962+01	5.373+02	2.990+01	5.515+02	3.018+01	5.659+02	3.046+01
4.0+04	3.364+02	3.218+01	3.478+02	3.247+01	3.573+02	3.276+01	3.669+02	3.306+01	3.766+02	3.335+01
5.0+04	2.402+02	3.386+01	2.472+02	3.417+01	2.542+02	3.449+01	2.613+02	3.480+01	2.685+02	3.512+01
6.0+04	1.794+02	3.481+01	1.846+02	3.514+01	1.898+02	3.548+01	1.952+02	3.581+01	2.006+02	3.614+01
8.0+04	1.112+02	3.554+01	1.144+02	3.588+01	1.177+02	3.623+01	1.210+02	3.658+01	1.244+02	3.693+01
1.0+05	7.617+01	3.547+01	7.839+01	3.582+01	8.064+01	3.618+01	8.293+01	3.654+01	8.525+01	3.689+01
1.5+05	3.706+01	3.407+01	3.816+01	3.442+01	3.927+01	3.478+01	4.042+01	3.514+01	4.158+01	3.549+01
2.0+05	2.303+01	3.224+01	2.269+01	3.259+01	2.335+01	3.294+01	2.402+01	3.309+01	2.471+01	3.363+01
3.0+05	1.644+01	2.893+01	1.676+01	2.925+01	1.708+01	2.957+01	1.740+01	2.989+01	1.773+01	3.021+01
4.0+05	6.082+00	2.633+01	6.267+00	2.662+01	6.452+00	2.692+01	6.648+00	2.721+01	6.844+00	2.751+01
5.0+05	3.973+00	2.426+01	4.096+00	2.454+01	4.220+00	2.481+01	4.348+00	2.508+01	4.477+00	2.536+01
6.0+05	2.798+00	2.258+01	2.885+00	2.283+01	2.974+00	2.309+01	3.064+00	2.335+01	3.157+00	2.360+01
8.0+05	1.603+00	1.996+01	1.653+00	2.019+01	1.704+00	2.042+01	1.757+00	2.065+01	1.810+00	2.087+01
1.0+06	1.037+00	1.801+01	1.069+00	1.822+01	1.103+00	1.842+01	1.137+00	1.863+01	1.172+00	1.884+01
1.5+06	4.670+01	1.470+01	4.812+01	1.487+01	4.972+01	1.504+01	5.128+01	1.521+01	5.288+01	1.538+01
2.0+06	2.642+01	1.256+01	2.727+01	1.271+01	2.814+01	1.286+01	2.903+01	1.300+01	2.994+01	1.315+01
3.0+06	1.180+01	1.089+00	1.218+01	1.031+01	1.257+01	1.013+01	1.297+01	1.024+01	1.338+01	1.036+01
4.0+06	6.647-02	8.263+00	6.863-02	8.359+00	7.083-02	8.454+00	7.310-02	8.550+00	7.541-02	8.646+00
5.0+06	4.259-02	7.138+00	4.397-02	7.221+00	4.538-02	7.304+00	4.684-02	7.387+00	4.832-02	7.463+00
6.0+06	2.960-02	6.310+00	3.056-02	6.384+00	3.154-02	6.457+00	3.255-02	6.530+00	3.358-02	6.603+00
8.0+06	1.665-02	5.163+00	1.720-02	5.223+00	1.775-02	5.285+00	1.832-02	5.343+00	1.890-02	5.403+00
1.0+07	1.066-02	4.398+00	1.101-02	4.449+00	1.137-02	4.500+00	1.173-02	4.551+00	1.210-02	4.602+00
1.5+07	4.739-03	3.255+00	4.894-03	3.293+00	5.051-03	3.331+00	5.213-03	3.369+00	5.379-03	3.407+00
2.0+07	2.666-03	2.613+00	2.753-03	2.643+00	2.842-03	2.674+00	2.933-03	2.704+00	3.026-03	2.735+00
3.0+07	1.185-03	1.902+00	1.223-03	1.925+00	1.267-03	1.947+00	1.303-03	1.969+00	1.345-03	1.991+00
4.0+07	6.665-04	1.512+00	6.883-04	1.529+00	7.105-04	1.547+00	7.333-04	1.565+00	7.566-04	1.582+00
5.0+07	4.266-04	1.262+00	4.405-04	1.277+00	4.547-04	1.291+00	4.693-04	1.306+00	4.842-04	1.321+00
6.0+07	2.962-04	1.087+00	3.058-04	1.100+00	3.157-04	1.113+00	3.258-04	1.125+00	3.362-04	1.138+00
8.0+07	1.666-04	8.575-01	1.721-04	8.675-01	1.776-04	8.775-01	1.833-04	8.874-01	1.892-04	8.974-01
1.0+08	1.066-04	7.118-01	1.101-04	7.200-01	1.137-04	7.283-01	1.173-04	7.366-01	1.210-04	7.449-01

PHOTON ENERGY, EV	COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNS/ATOM											
	91 PA		92 U		93 NP		94 PU		95 AM			
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	5.506+03	2.930-02	5.627+03	2.856-02	5.750+03	2.844-02	5.875+03	2.852-02	6.001+03	2.831-02	6.001+03	2.831-02
1.5+02	5.500+03	6.521-02	5.622+03	6.469-02	5.745+03	6.325-02	5.870+03	6.373-02	5.995+03	6.288-02	5.995+03	6.288-02
2.0+02	5.494+03	1.145-01	5.616+03	1.125-01	5.739+03	1.110-01	5.864+03	1.121-01	5.989+03	1.105-01	5.989+03	1.105-01
3.0+02	5.477+03	2.493-01	5.598+03	2.452-01	5.722+03	2.420-01	5.846+03	2.442-01	5.972+03	2.407-01	5.972+03	2.407-01
4.0+02	5.453+03	4.244-01	5.575+03	4.177-01	5.698+03	4.127-01	5.823+03	4.153-01	5.949+03	4.096-01	5.949+03	4.096-01
5.0+02	5.423+03	6.292-01	5.545+03	6.200-01	5.669+03	6.133-01	5.794+03	6.152-01	5.920+03	6.073-01	5.920+03	6.073-01
6.0+02	5.389+03	8.535-01	5.511+03	8.421-01	5.635+03	8.338-01	5.760+03	8.337-01	5.886+03	8.238-01	5.886+03	8.238-01
8.0+02	5.309+03	1.328+00	5.431+03	1.313+00	5.555+03	1.303+00	5.682+03	1.296+00	5.808+03	1.282+00	5.808+03	1.282+00
1.0+03	5.218+03	1.804+00	5.340+03	1.789+00	5.463+03	1.779+00	5.593+03	1.762+00	5.719+03	1.747+00	5.719+03	1.747+00
1.5+03	4.958+03	2.960+00	5.088+03	2.946+00	5.209+03	2.940+00	5.346+03	2.909+00	5.471+03	2.891+00	5.471+03	2.891+00
2.0+03	4.711+03	4.099+00	4.827+03	4.088+00	4.945+03	4.086+00	5.087+03	4.055+00	5.209+03	4.037+00	5.209+03	4.037+00
3.0+03	4.212+03	6.306+00	4.318+03	6.305+00	4.426+03	6.309+00	4.563+03	6.259+00	4.677+03	6.247+00	4.677+03	6.247+00
4.0+03	3.759+03	8.355+00	3.853+03	8.363+00	3.949+03	8.370+00	4.070+03	8.290+00	4.173+03	8.280+00	4.173+03	8.280+00
5.0+03	3.370+03	1.020+01	3.451+03	1.023+01	3.535+03	1.024+01	3.639+03	1.014+01	3.730+03	1.014+01	3.730+03	1.014+01
6.0+03	3.036+03	1.185+01	3.108+03	1.189+01	3.182+03	1.192+01	3.270+03	1.182+01	3.350+03	1.182+01	3.350+03	1.182+01
8.0+03	2.494+03	1.474+01	2.552+03	1.481+01	2.611+03	1.487+01	2.679+03	1.480+01	2.742+03	1.482+01	2.742+03	1.482+01
1.0+04	2.079+03	1.729+01	2.127+03	1.738+01	2.177+03	1.747+01	2.238+03	1.742+01	2.284+03	1.747+01	2.284+03	1.747+01
1.5+04	1.401+03	2.240+01	1.435+03	2.255+01	1.470+03	2.270+01	1.508+03	2.276+01	1.544+03	2.286+01	1.544+03	2.286+01
2.0+04	9.999+02	2.558+01	1.026+03	2.619+01	1.053+03	2.640+01	1.082+03	2.655+01	1.110+03	2.673+01	1.110+03	2.673+01
3.0+04	5.814+02	3.070+01	5.969+02	3.036+01	6.126+02	3.121+01	6.292+02	3.144+01	6.457+02	3.166+01	6.457+02	3.166+01
4.0+04	3.870+02	3.362+01	3.973+02	3.390+01	4.078+02	3.418+01	4.188+02	3.444+01	4.298+02	3.471+01	4.298+02	3.471+01
5.0+04	2.751+02	3.541+01	2.837+02	3.571+01	2.914+02	3.601+01	2.994+02	3.630+01	3.074+02	3.660+01	3.074+02	3.660+01
6.0+04	2.054+02	3.646+01	2.121+02	3.678+01	2.179+02	3.710+01	2.240+02	3.741+01	2.301+02	3.772+01	2.301+02	3.772+01
8.0+04	1.279+02	3.727+01	1.315+02	3.762+01	1.351+02	3.796+01	1.388+02	3.830+01	1.426+02	3.863+01	1.426+02	3.863+01
1.0+05	8.758+01	3.724+01	9.012+01	3.759+01	9.261+01	3.795+01	9.518+01	3.829+01	9.776+01	3.864+01	9.776+01	3.864+01
1.5+05	4.279+01	3.584+01	4.401+01	3.620+01	4.525+01	3.655+01	4.653+01	3.690+01	4.783+01	3.725+01	4.783+01	3.725+01
2.0+05	2.543+01	3.398+01	2.615+01	3.432+01	2.688+01	3.466+01	2.764+01	3.501+01	2.840+01	3.535+01	2.840+01	3.535+01
3.0+05	1.207+01	3.053+01	1.242+01	3.085+01	1.277+01	3.117+01	1.314+01	3.148+01	1.350+01	3.180+01	1.350+01	3.180+01
4.0+05	7.087+00	2.780+01	7.253+00	2.809+01	7.462+00	2.839+01	7.677+00	2.868+01	7.894+00	2.897+01	7.894+00	2.897+01
5.0+05	4.612+00	2.563+01	4.748+00	2.590+01	4.887+00	2.618+01	5.030+00	2.645+01	5.174+00	2.672+01	5.174+00	2.672+01
6.0+05	3.253+00	2.386+01	3.349+00	2.411+01	3.448+00	2.437+01	3.550+00	2.462+01	3.653+00	2.488+01	3.653+00	2.488+01
8.0+05	1.856+00	2.110+01	1.922+00	2.133+01	1.980+00	2.156+01	2.039+00	2.179+01	2.099+00	2.201+01	2.099+00	2.201+01
1.0+06	1.208+00	1.905+01	1.245+00	1.925+01	1.283+00	1.946+01	1.321+00	1.966+01	1.361+00	1.987+01	1.361+00	1.987+01
1.5+06	5.453-01	1.555+01	5.621-01	1.572+01	5.793-01	1.589+01	5.971-01	1.606+01	6.151-01	1.623+01	6.151-01	1.623+01
2.0+06	3.088-01	1.329+01	3.184-01	1.344+01	3.282-01	1.358+01	3.384-01	1.373+01	3.486-01	1.387+01	3.486-01	1.387+01
3.0+06	1.331-01	1.047+01	1.424-01	1.059+01	1.468-01	1.070+01	1.514-01	1.082+01	1.560-01	1.093+01	1.560-01	1.093+01
4.0+06	7.782-02	8.742+00	8.026-02	8.838+00	8.276-02	8.934+00	8.535-02	9.030+00	8.798-02	9.126+00	8.798-02	9.126+00
5.0+06	4.986-02	7.552+00	5.143-02	7.635+00	5.304-02	7.718+00	5.470-02	7.801+00	5.639-02	7.884+00	5.639-02	7.884+00
6.0+06	3.456-02	6.677+00	3.575-02	6.750+00	3.687-02	6.823+00	3.802-02	6.897+00	3.920-02	6.970+00	3.920-02	6.970+00
8.0+06	1.951-02	5.463+00	2.012-02	5.523+00	2.075-02	5.583+00	2.149-02	5.643+00	2.206-02	5.703+00	2.206-02	5.703+00
1.0+07	1.249-02	4.653+00	1.288-02	4.705+00	1.329-02	4.756+00	1.370-02	4.807+00	1.413-02	4.858+00	1.413-02	4.858+00
1.5+07	5.551-03	3.445+00	5.727-03	3.482+00	5.906-03	3.520+00	6.092-03	3.558+00	6.281-03	3.596+00	6.281-03	3.596+00
2.0+07	3.153-03	2.765+00	3.222-03	2.795+00	3.323-03	2.826+00	3.427-03	2.856+00	3.534-03	2.886+00	3.534-03	2.886+00
3.0+07	1.388-03	2.013+00	1.432-03	2.035+00	1.477-03	2.057+00	1.520-03	2.079+00	1.570-03	2.102+00	1.570-03	2.102+00
4.0+07	7.809-04	1.600+00	8.056-04	1.617+00	8.308-04	1.635+00	8.570-04	1.652+00	8.835-04	1.670+00	8.835-04	1.670+00
5.0+07	4.997-04	1.335+00	5.155-04	1.350+00	5.317-04	1.365+00	5.484-04	1.379+00	5.654-04	1.394+00	5.654-04	1.394+00
6.0+07	3.470-04	1.151+00	3.579-04	1.163+00	3.691-04	1.176+00	3.808-04	1.188+00	3.926-04	1.201+00	3.926-04	1.201+00
8.0+07	1.952-04	9.074-01	2.014-04	9.174-01	2.077-04	9.273-01	2.142-04	9.373-01	2.209-04	9.473-01	2.209-04	9.473-01
1.0+08	1.249-04	7.531-01	1.289-04	7.614-01	1.329-04	7.697-01	1.371-04	7.780-01	1.413-04	7.862-01	1.413-04	7.862-01

TABLE II., CONT. COHERENT AND INCOHERENT SCATTERING CROSS SECTIONS, BARNs/ATOM

PHOTON ENERGY, eV	96 CM		97 BK		98 CF		99 ES		100 FM	
	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH	COH	INCOH
1.0+02	6.127+03	2.728-02	6.255+03	2.692-02	6.385+03	2.711-02	6.516+03	2.675-02	6.649+03	2.535-02
1.5+02	6.122+03	6.058-02	6.244+03	5.976-02	6.380+03	6.020-02	6.511+03	5.937-02	6.644+03	5.853-02
2.0+02	6.116+03	1.065-01	6.244+03	1.051-01	6.375+03	1.058-01	6.506+03	1.043-01	6.638+03	1.029-01
3.0+02	6.099+03	2.326-01	6.228+03	2.296-01	6.358+03	2.307-01	6.489+03	2.276-01	6.621+03	2.245-01
4.0+02	6.076+03	3.975-01	6.204+03	3.926-01	6.334+03	3.934-01	6.466+03	3.882-01	6.598+03	3.832-01
5.0+02	6.047+03	5.923-01	6.175+03	5.854-01	6.306+03	5.845-01	6.437+03	5.772-01	6.570+03	5.701-01
6.0+02	6.013+03	8.084-01	6.142+03	7.999-01	6.273+03	7.952-01	6.404+03	7.859-01	6.537+03	7.769-01
8.0+02	5.933+03	1.272+00	6.062+03	1.261+00	6.194+03	1.244+00	6.326+03	1.232+00	6.458+03	1.219+00
1.0+03	5.841+03	1.744+00	5.969+03	1.731+00	6.104+03	1.701+00	6.236+03	1.686+00	6.368+03	1.670+00
1.5+03	5.833+03	2.902+00	5.710+03	2.888+00	5.853+03	2.835+00	5.983+03	2.814+00	6.115+03	2.793+00
2.0+03	5.711+03	4.055+00	5.436+03	4.042+00	5.586+03	3.983+00	5.713+03	3.960+00	5.843+03	3.936+00
3.0+03	4.766+03	6.286+00	4.883+03	6.283+00	5.031+03	6.221+00	5.153+03	6.201+00	5.276+03	6.178+00
4.0+03	4.255+03	8.344+00	4.362+03	8.355+00	4.492+03	8.299+00	4.608+03	8.289+00	4.722+03	8.276+00
5.0+03	3.805+03	1.022+01	3.900+03	1.025+01	4.017+03	1.020+01	4.118+03	1.021+01	4.221+03	1.021+01
6.0+03	3.419+03	1.192+01	3.503+03	1.196+01	3.605+03	1.194+01	3.694+03	1.196+01	3.786+03	1.197+01
8.0+03	2.801+03	1.944+01	2.867+03	1.902+01	2.944+03	1.903+01	3.018+03	1.907+01	3.088+03	1.911+01
1.0+04	2.333+03	1.761+01	2.388+03	1.771+01	2.449+03	1.775+01	2.505+03	1.783+01	2.566+03	1.789+01
1.5+04	1.579+03	2.305+01	1.617+03	2.321+01	1.657+03	2.332+01	1.696+03	2.345+01	1.735+03	2.357+01
2.0+04	1.137+03	2.695+01	1.166+03	2.715+01	1.196+03	2.731+01	1.226+03	2.749+01	1.256+03	2.765+01
3.0+04	6.619+02	3.194+01	6.791+02	3.220+01	6.971+02	3.244+01	7.150+02	3.268+01	7.332+02	3.292+01
4.0+04	4.406+02	3.500+01	4.520+02	3.528+01	4.639+02	3.555+01	4.757+02	3.582+01	4.877+02	3.609+01
5.0+04	3.154+02	3.690+01	3.236+02	3.720+01	3.322+02	3.749+01	3.407+02	3.778+01	3.494+02	3.807+01
6.0+04	2.561+02	3.804+01	2.424+02	3.836+01	2.489+02	3.867+01	2.554+02	3.898+01	2.620+02	3.929+01
8.0+04	1.464+02	3.897+01	1.503+02	3.931+01	1.543+02	3.965+01	1.584+02	3.998+01	1.625+02	4.032+01
1.0+05	1.003+02	3.899+01	1.030+02	3.934+01	1.058+02	3.969+01	1.086+02	4.003+01	1.114+02	4.037+01
1.5+05	4.912+01	3.760+01	5.046+01	3.795+01	5.184+01	3.829+01	5.322+01	3.865+01	5.463+01	3.900+01
2.0+05	2.917+01	3.569+01	2.996+01	3.603+01	3.077+01	3.636+01	3.158+01	3.672+01	3.241+01	3.705+01
3.0+05	1.367+01	3.212+01	1.425+01	3.243+01	1.464+01	3.274+01	1.503+01	3.307+01	1.543+01	3.338+01
4.0+05	8.113+00	2.927+01	8.338+00	2.956+01	8.568+00	2.984+01	8.800+00	3.014+01	9.037+00	3.044+01
5.0+05	5.319+00	2.699+01	5.469+00	2.727+01	5.622+00	2.753+01	5.777+00	2.781+01	5.934+00	2.808+01
6.0+05	3.757+00	2.513+01	3.863+00	2.539+01	3.973+00	2.564+01	4.084+00	2.590+01	4.196+00	2.615+01
8.0+05	2.159+00	2.224+01	2.222+00	2.247+01	2.286+00	2.269+01	2.350+00	2.292+01	2.416+00	2.315+01
1.0+06	1.400+00	2.008+01	1.441+00	2.028+01	1.483+00	2.049+01	1.526+00	2.070+01	1.569+00	2.090+01
1.5+06	6.333-01	1.639+01	6.521-01	1.656+01	6.713-01	1.673+01	6.909-01	1.690+01	7.109-01	1.707+01
2.0+06	3.591-01	1.402+01	3.698-01	1.416+01	3.809-01	1.431+01	3.921-01	1.445+01	4.036-01	1.460+01
3.0+06	1.607-01	1.105+01	1.656-01	1.116+01	1.706-01	1.128+01	1.757-01	1.139+01	1.809-01	1.151+01
4.0+06	9.064-02	9.222+00	9.340-02	9.317+00	9.624-02	9.413+00	9.912-02	9.509+00	1.021-01	9.605+00
5.0+06	5.810-02	7.967+00	5.987-02	8.050+00	6.169-02	8.133+00	6.354-02	8.215+00	6.544-02	8.298+00
6.0+06	4.039-02	7.043+00	4.162-02	7.116+00	4.289-02	7.190+00	4.418-02	7.263+00	4.550-02	7.336+00
8.0+06	2.274-02	5.763+00	2.343-02	5.823+00	2.415-02	5.883+00	2.487-02	5.943+00	2.562-02	6.003+00
1.0+07	1.456-02	4.909+00	1.500-02	4.966+00	1.546-02	5.011+00	1.593-02	5.062+00	1.640-02	5.113+00
1.5+07	6.472-03	3.634+00	6.670-03	3.672+00	6.874-03	3.710+00	7.082-03	3.747+00	7.295-03	3.785+00
2.0+07	3.641-03	2.917+00	3.753-03	2.947+00	3.896-03	2.978+00	3.985-03	3.908+00	4.104-03	3.938+00
3.0+07	1.618-03	2.124+00	1.668-03	2.146+00	1.719-03	2.168+00	1.771-03	2.190+00	1.824-03	2.212+00
4.0+07	9.105-04	1.688+00	9.384-04	1.705+00	9.671-04	1.723+00	9.964-04	1.740+00	1.026-03	1.758+00
5.0+07	5.827-04	1.409+00	6.005-04	1.423+00	6.189-04	1.438+00	6.376-04	1.453+00	6.568-04	1.467+00
6.0+07	4.045-04	1.214+00	4.169-04	1.226+00	4.297-04	1.239+00	4.427-04	1.252+00	4.560-04	1.264+00
8.0+07	2.276-04	9.572-01	2.346-04	9.672-01	2.418-04	9.772-01	2.491-04	9.872-01	2.566-04	9.971-01
1.0+08	1.457-04	7.945-01	1.501-04	8.028-01	1.547-04	8.111-01	1.594-04	8.193-01	1.642-04	8.276-01



TABLE III. Mork radiative and double-Compton corrections

Photon energy, eV	Mork correction factor	Photon energy, eV	Mork correction factor
1.0+04	(1.00001)	1.0+06	1.00095
1.5+04	(1.00002)	1.5+06	1.00134
2.0+04	(1.00002)	2.0+06	1.00166
3.0+04	(1.00003)	3.0+06	1.00211
4.0+04	(1.00004)	4.0+06	1.00239
5.0+04	(1.00005)	5.0+06	1.00259
6.0+04	(1.00006)	6.0+06	1.00275
8.0+04	(1.00008)	8.0+06	1.00305
1.0+05	(1.00010)	1.0+07	1.00332
1.5+05	(1.00015)	1.5+07	1.00400
2.0+05	(1.00020)	2.0+07	1.00462
3.0+05	(1.00030)	3.0+07	1.00571
4.0+05	1.00040	4.0+07	1.00665
5.0+05	1.00050	5.0+07	1.00742
6.0+05	1.00059	6.0+07	1.00810
8.0+05	1.00077	8.0+07	1.00910
		1.0+08	1.00950

TABLE IV. ATOMIC FORM FACTOR, F, AND INCOHERENT SCATTERING FUNCTION, S, VS. X IN INVERSE ANGSTROMS, FOR ATOMIC AND BONDED HYDROGEN

X, SIN(THETA/2) /LAMBDA	H-ATOM, PIRENNE, FROM TABLE I.		BONDED H, FLICATED SPHERE, STEWART, ET AL (1965)		H IN H2 MOLECULE, BENTLEY AND STEWART (1973)	
	F(X,H)	S(X,H)	F(X,H-F.S.)	S(X,H-F.S.)	F(X,(1/2)H2)	S(X,(1/2)H2)
0.00	1.0000+00	0.0000	1.0000+00	(0.0000 )	1.4142+00	0.0000
5.00-03	9.9945-01	1.1047-03	9.9959-01	(8.2851-04)	1.4135+00	1.0431-03
1.00-02	9.9779-01	4.4098-03	9.9835-01	(3.3072-03)	1.4115+00	3.6668-03
1.50-02	9.9504-01	9.8880-03	9.9628-01	(7.4157-03)	1.4082+00	7.8799-03
2.00-02	9.9121-01	1.7494-02	9.9342-01	(1.3120-02)	1.4036+00	1.3679-02
2.50-02	9.8632-01	2.7167-02	9.8976-01	(2.0374-02)	1.3977+00	2.1062-02
3.00-02	9.8039-01	3.8828-02	9.8533-01	(2.9110-02)	1.3905+00	2.9984-02
4.00-02	9.6554-01	6.7731-02	9.7419-01	(5.0960-02)	1.3724+00	5.2185-02
5.00-02	9.4693-01	1.0332-01	9.6012-01	(7.8170-02)	1.3497+00	7.9745-02
7.00-02	8.9987-01	1.9024-01	9.2417-01	(1.4591-01)	1.2920+00	1.4820-01
9.00-02	8.4238-01	2.9039-01	8.7938-01	(2.2670-01)	1.2200+00	2.2929-01
1.00-01	8.1082-01	3.4257-01	8.5424-01	(2.7028-01)	1.1797+00	2.7262-01
1.25-01	7.2711-01	4.7131-01	7.8605-01	(3.8213-01)	1.0712+00	3.8332-01
1.50-01	6.4129-01	5.8874-01	7.1338-01	(4.9108-01)	9.5645-01	4.9029-01
1.75-01	5.5811-01	6.8851-01	6.3981-01	(5.9065-01)	8.4148-01	5.8738-01
2.00-01	4.8078-01	7.6885-01	5.6794-01	(6.7744-01)	7.3058-01	6.7154-01
2.50-01	3.4974-01	8.7768-01	4.3794-01	(8.0821-01)	5.3430-01	7.9947-01
3.00-01	2.5127-01	9.3687-01	3.3123-01	(8.9028-01)	3.7899-01	8.8169-01
4.00-01	1.3044-01	9.8298-01	1.8443-01	(9.6599-01)	1.8091-01	9.6111-01
5.00-01	7.0592-02	9.9502-01	1.0306-01	(9.8938-01)	6.7875-02	9.8770-01
6.00-01	4.0325-02	9.9837-01	5.9542-02	(9.9645-01)	4.9088-02	9.9612-01
7.00-01	2.4285-02	9.9941-01	3.5945-02	(9.9871-01)	3.1675-02	9.9872-01
8.00-01	1.5335-02	9.9977-01	2.2377-02	(9.9950-01)	2.1575-02	9.9954-01
9.00-01	1.0091-02	9.9990-01	1.4109-02	(9.9980-01)	1.4659-02	9.9981-01
1.00+00	6.8811-03	9.9995-01	9.1052-03	(9.9992-01)	9.8266-03	9.9991-01
1.25+00	2.9947-03	9.9999-01	3.4502-03	(9.9999-01)	3.9957-03	9.9998-01
1.50+00	1.4937-03	1.0000+00	1.8306-03	(1.0000+00)	2.1507-03	1.0000+00
2.00+00	4.8903-04	1.0000+00	4.5462-04	(1.0000+00)	6.7610-04	1.0000+00
2.50+00	2.0353-04	1.0000+00	1.4897-04	(1.0000+00)	2.8184-04	1.0000+00
3.00+00	9.9016-05	1.0000+00	5.9868-05	(1.0000+00)	1.4089-04	1.0000+00
3.50+00	5.3730-05	1.0000+00	2.7698-05	(1.0000+00)	7.6712-05	1.0000+00
4.00+00	3.1604-05	1.0000+00	1.4207-05	(1.0000+00)	4.4276-05	1.0000+00
5.00+00	1.2997-05	1.0000+00	4.6554-06	(1.0000+00)	1.8489-05	1.0000+00
6.00+00	6.2819-06	1.0000+00	1.8709-06	(1.0000+00)	8.8275-06	1.0000+00
7.00+00	3.3953-06	1.0000+00	8.6559-07	(1.0000+00)	4.7648-06	1.0000+00
8.00+00	1.9920-06	1.0000+00	4.4397-07	(1.0000+00)	2.7931-06	1.0000+00
1.00+01	8.1675-07	1.0000+00	1.4548-07	(1.0000+00)	1.1440-06	1.0000+00
1.50+01	1.6150-07	1.0000+00	1.9158-08	(1.0000+00)	2.2598-07	1.0000+00
2.00+01	5.1116-08	1.0000+00	4.5462-09	(1.0000+00)	7.1502-08	1.0000+00
5.00+01	1.3091-09	1.0000+00	4.6554-11	(1.0000+00)	1.8305-09	1.0000+00
8.00+01	1.9976-10	1.0000+00	4.4397-12	(1.0000+00)	2.7931-10	1.0000+00
1.00+02	8.1822-11	1.0000+00	1.4548-12	(1.0000+00)	1.1440-10	1.0000+00
1.00+03	8.1823-15	1.0000+00	1.4548-17	(1.0000+00)	1.1440-14	1.0000+00
1.00+06	8.1823-27	1.0000+00	1.4548-32	(1.0000+00)	1.1440-26	1.0000+00
1.00+09	8.1823-39	1.0000+00	0.0000	(1.0000+00)	1.1440-38	1.0000+00

TABLE V. CROSS SECTIONS (BARN/ATOM) FOR COHERENT AND INCOHERENT SCATTERING OF PHOTONS BY ATOMIC AND BONDED HYDROGEN, ALSO THE FREE-ELECTRON COMPTON SCATTERING CROSS SECTION (BARN/ELECTRON)

PHOTON ENERGY EV	H-ATOM, PIRENNE, FROM TABLE II.		BONDED-H, FLOATED SPHERE, STEWART, ET AL (1965)		H IN H <sub>2</sub> MOLECULE, BENTLEY AND STEWART (1973)		FREE ELECTRON, KLEIN-NISHINA
	COH	INCOH	COH	INCOH	COH	INCOH	COMPTON
1.0+02	6.650-01	9.552-04	6.650-01	(7.163-04)	1.330+00	8.558-04	6.650-01
1.5+02	6.635-01	2.144-03	6.639-01	(1.608-03)	1.327+00	1.802-03	6.649-01
2.0+02	6.617-01	3.802-03	6.626-01	(2.851-03)	1.324+00	3.088-03	6.647-01
3.0+02	6.569-01	8.494-03	6.590-01	(6.370-03)	1.316+00	6.685-03	6.645-01
4.0+02	6.503-01	1.496-02	6.540-01	(1.122-02)	1.305+00	1.163-02	6.642-01
5.0+02	6.421-01	2.310-02	6.479-01	(1.734-02)	1.291+00	1.787-02	6.639-01
6.0+02	6.323-01	3.279-02	6.405-01	(2.469-02)	1.274+00	2.533-02	6.637-01
8.0+02	6.087-01	5.629-02	6.224-01	(4.268-02)	1.233+00	4.357-02	6.632-01
1.0+03	5.806-01	8.424-02	6.005-01	(6.445-02)	1.183+00	6.557-02	6.627-01
1.5+03	4.984-01	1.650-01	5.338-01	(1.300-01)	1.035+00	1.313-01	6.614-01
2.0+03	4.142-01	2.478-01	4.606-01	(2.018-01)	8.750-01	2.024-01	6.601-01
3.0+03	2.764-01	3.822-01	3.278-01	(3.313-01)	5.968-01	3.295-01	6.575-01
4.0+03	1.881-01	4.675-01	2.320-01	(4.239-01)	4.083-01	4.206-01	6.550-01
5.0+03	1.341-01	5.187-01	1.687-01	(4.842-01)	2.905-01	4.809-01	6.526-01
6.0+03	9.987-02	5.503-01	1.271-01	(5.231-01)	2.160-01	5.202-01	6.501-01
8.0+03	6.126-02	5.840-01	7.899-02	(5.663-01)	1.327-01	5.643-01	6.452-01
1.0+04	4.121-02	5.993-01	5.362-02	(5.868-01)	8.934-02	5.855-01	6.405-01
1.5+04	1.943-02	6.095-01	2.561-02	(6.033-01)	4.211-02	6.026-01	6.290-01
2.0+04	1.119-02	6.068-01	1.484-02	(6.031-01)	2.423-02	6.027-01	6.180-01
3.0+04	5.062-03	5.924-01	6.745-03	(5.908-01)	1.096-02	5.905-01	5.975-01
4.0+04	2.866-03	5.759-01	3.826-03	(5.749-01)	6.202-03	5.748-01	5.788-01
5.0+04	1.840-03	5.597-01	2.458-03	(5.591-01)	3.981-03	5.590-01	5.615-01
6.0+04	1.280-03	5.444-01	1.711-03	(5.439-01)	2.769-03	5.439-01	5.457-01
8.0+04	7.211-04	5.166-01	9.643-04	(5.164-01)	1.560-03	5.163-01	5.173-01
1.0+05	4.619-04	4.923-01	6.178-04	(4.922-01)	9.993-04	4.922-01	4.928-01
1.5+05	2.054-04	4.435-01	2.748-04	(4.434-01)	4.444-04	4.434-01	4.437-01
2.0+05	1.156-04	4.064-01	1.546-04	(4.064-01)	2.501-04	4.064-01	4.066-01
3.0+05	5.138-05	3.535-01	6.875-05	(3.535-01)	1.112-04	3.535-01	3.536-01
4.0+05	2.890-05	3.168-01	3.867-05	(3.168-01)	6.253-05	3.168-01	3.168-01
5.0+05	1.850-05	2.893-01	2.475-05	(2.893-01)	4.002-05	2.893-01	2.893-01
6.0+05	1.285-05	2.676-01	1.719-05	(2.676-01)	2.779-05	2.676-01	2.677-01
8.0+05	7.226-06	2.351-01	9.669-06	(2.351-01)	1.563-05	2.351-01	2.351-01
1.0+06	4.625-06	2.114-01	6.186-06	(2.114-01)	1.001-05	2.114-01	2.114-01
1.5+06	2.056-06	1.718-01	2.750-06	(1.718-01)	4.447-06	1.718-01	1.718-01
2.0+06	1.156-06	1.466-01	1.547-06	(1.466-01)	2.501-06	1.466-01	1.466-01
3.0+06	5.139-07	1.153-01	6.876-07	(1.153-01)	1.112-06	1.153-01	1.153-01
4.0+06	2.891-07	9.620-02	3.868-07	(9.620-02)	6.254-07	9.620-02	9.620-02
5.0+06	1.850-07	8.308-02	2.475-07	(8.308-02)	4.002-07	8.308-02	8.308-02
6.0+06	1.285-07	7.343-02	1.719-07	(7.343-02)	2.780-07	7.343-02	7.343-02
8.0+06	7.227-08	6.007-02	9.670-08	(6.007-02)	1.564-07	6.007-02	6.007-02
1.0+07	4.625-08	5.116-02	6.188-08	(5.116-02)	1.001-07	5.116-02	5.116-02
1.5+07	2.056-08	3.786-02	2.759-08	(3.786-02)	4.447-08	3.786-02	3.786-02
2.0+07	1.156-08	3.039-02	1.547-08	(3.039-02)	2.501-08	3.039-02	3.039-02
3.0+07	5.139-09	2.212-02	6.876-09	(2.212-02)	1.112-08	2.212-02	2.212-02
4.0+07	2.890-09	1.758-02	3.867-09	(1.758-02)	6.253-09	1.758-02	1.758-02
5.0+07	1.850-09	1.467-02	2.475-09	(1.467-02)	4.001-09	1.467-02	1.467-02
6.0+07	1.284-09	1.264-02	1.719-09	(1.264-02)	2.779-09	1.264-02	1.264-02
8.0+07	7.222-10	9.972-03	9.664-10	(9.972-03)	1.562-09	9.972-03	9.972-03
1.0+08	4.620-10	8.276-03	6.183-10	(8.276-03)	9.996-10	8.276-03	8.276-03

TABLE VI. Abbreviated table of Cromer-Waber relativistic Hartree-Fock (RHF) atomic form factors  $F(x, Z)$  abstracted from the extensive tabulation (all elements  $Z=1$  to 98, 112 ions, valence-state C and Si;  $x=0$  to  $2.0 \text{ \AA}^{-1}$ ) in the *International Tables for X-Ray Crystallography* (reference [14], table 2.2A).

$x \backslash Z$	$_2\text{He}$	$_3\text{Li}$	$_4\text{Be}$	$_5\text{B}$	$_6\text{C}$	$_7\text{N}$	$_8\text{O}$	$_{13}\text{Al}$	$_{29}\text{Cu}$	$_{50}\text{Sn}$	$_{74}\text{W}$	$_{82}\text{Pb}$	$_{92}\text{U}$	$_{98}\text{Cf}$
$\text{\AA}^{-1}$	$F(x, Z)_{\text{RHF}}$													
0.0	2.000	3.000	4.000	5.000	6.000	7.000	8.000	13.000	29.000	50.000	74.000	82.000	92.000	98.000
0.01	1.988	2.986	3.987	4.988	5.990	6.991	7.992	12.976	28.977	49.955	73.948	81.949	91.922	97.929
.02	1.993	2.947	3.950	4.954	5.958	6.963	7.967	12.903	28.908	49.821	73.793	81.792	91.687	97.718
.05	1.957	2.708	3.707	4.724	5.749	6.776	7.798	12.439	28.448	48.934	72.767	80.750	90.180	96.344
.10	1.837	2.215	3.065	4.060	5.107	6.180	7.245	11.230	27.084	46.361	69.778	77.607	86.130	92.486
.2	1.460	1.742	2.060	2.699	3.560	4.563	5.623	9.158	23.540	40.302	62.519	69.530	77.080	83.210
.5	.509	1.033	1.362	1.526	1.685	1.942	2.338	5.692	13.707	26.096	43.691	48.969	55.410	59.078
1.0	.095	.320	.622	.900	1.114	1.265	1.377	2.330	7.166	16.384	25.576	30.252	35.458	38.361
2.0	.010	.044	.120	.233	.373	.525	.674	1.195	3.855	7.367	13.871	15.317	17.713	19.655

TABLE VII. Percent deviations of present (table I)  $F(x, Z)$  values [configuration-interaction (CI) for  $Z=2$  to 6, non-relativistic Hartree-Fock (HF) for  $Z=7$  to 100] from Cromer-Waber [14] relativistic Hartree-Fock (RHF)  $F(x, Z)$  values listed in table VI. [Percent]

$x \backslash Z$	$_2\text{He}$	$_3\text{Li}$	$_4\text{Be}$	$_5\text{B}$	$_6\text{C}$	$_7\text{N}$	$_8\text{O}$	$_{13}\text{Al}$	$_{29}\text{Cu}$	$_{50}\text{Sn}$	$_{74}\text{W}$	$_{82}\text{Pb}$	$_{92}\text{U}$	$_{98}\text{Cf}$
$\text{\AA}^{-1}$	$[F(x, Z)_{\text{CI}}/F(x, Z)_{\text{RHF}} - 1.0] \times 100\%$					$[F(x, Z)_{\text{HF}}/F(x, Z)_{\text{RHF}} - 1.0] \times 100\%$								
0.0														
0.01	0	+0.02	+0.03	0	0	-0.17	-0.01	-0.02	-0.03	-0.02	-0.04	-0.02	-0.03	-0.03
0.02	0	0	+0.06	0	+0.02	0	0	0	-0.01	-0.01	-0.02	-0.03	-0.05	-0.05
0.05	0	+0.10	+0.39	+0.06	+0.09	0	-0.01	0	0	-0.06	-0.10	-0.15	-0.20	-0.18
0.10	-0.03	+0.18	+1.06	+0.20	+0.30	+0.07	-0.01	-0.04	-0.01	-0.19	-0.25	-0.42	-0.40	-0.23
.2	-0.10	+0.03	+0.83	+0.46	+0.49	+0.06	-0.06	-0.03	-0.01	-0.22	-0.32	-0.44	-0.49	-0.03
.5	+0.10	-0.16	-0.10	0	+0.04	-0.22	-0.12	-0.10	-0.29	-0.63	-0.61	-1.04	-1.03	-0.99
1.0	+1.18	0	-0.23	-0.14	-0.17	-0.24	-0.05	-0.22	-0.59	-1.09	-1.93	-1.69	-2.26	-2.84
2.0	0	+1.84	0	0	-0.26	-0.25	-0.30	-0.22	-1.60	-2.86	-4.01	-4.73	-6.10	-6.41