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SIMULTANEOUS MEASUREMENTS OF THE NEUTRON FISSION AND CAPTURE CROSS SECTIONS FOR ^{235}U FOR INCIDENT NEUTRON ENERGIES FROM 0.4 eV TO 3 keV*

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ABSTRACT

The neutron fission and capture cross sections for ^{235}U have been measured simultaneously for incident neutron energies from 0.4 eV to 3 keV. In addition, the fission cross section has been measured up to a neutron energy of 20 keV. This memorandum contains a brief description of the experimental technique and a discussion of the results. A complete tabulation of the data is given in an appendix.

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I. INTRODUCTION

Accurate values of the capture and fission cross sections for ^{235}U over a wide neutron energy range are needed for reactor design not only because most present-day reactors utilize ^{235}U as the fuel but also because the ^{235}U cross sections are widely used as reference values.

Until recently there has been a persistent discrepancy between the directly measured value of the ratio of the capture resonance integral to the fission resonance integral, α_{RI} , and the value obtained for this ratio by integrating differential cross-section measurements. The integral measurements have given a value 15 to 25% lower than that calculated from differential data.¹⁻⁴

The simultaneous measurements of the capture and fission cross sections presented here cover a neutron energy range that includes more than 95% of the resonance integrals. The value of α_{RI} obtained by integrating these measurements has an accuracy of 4% and is in agreement with the integral measurements.

These measurements were performed in the spring of 1966. The technique used was an extension of that used in 1963 for measurements of the ^{235}U neutron capture-to-fission ratio, α , for incident neutron energies from 3.25 eV to 1.8 keV which are described elsewhere.² Between 1963 and 1966 many improvements were made both in the equipment and in the method, so that the data presented here supersede those of 1963.

II. DESCRIPTION OF THE EXPERIMENT

(a) Principle of the Measurement

The detector consisted of a ^{235}U fission chamber surrounded by a large 4π liquid gamma-ray scintillator. A pulsed-neutron beam was collimated through the fission chamber. The scintillator detected the gamma

¹W. W. Havens, Jr., et al., Phys. Rev. 116, 1538 (1959).

²G. deSaussure et al., Nucl. Sci. Eng. 23, 45 (1965).

³J. Chernick, Nuclear News 8, 33 (August 1965).

⁴F. D. Brooks in Proc. Am. Nucl. Soc. Topical Meeting: Reactor Physics in the Resonance and Thermal Regions, San Diego, February 7-9, 1966, The MIT Press, Cambridge, Mass. (1966), Vol. II, p. 193.

rays following each absorption of a neutron in the uranium of the fission chamber, while the fission chamber detected only the fissions. Thus, in principle, a fission was characterized by a pulse from the scintillator in coincidence with a pulse from the fission chamber, whereas a capture was characterized by a pulse from the scintillator alone. The energy of the neutron absorbed in the uranium was obtained by the time-of-flight technique, and the incident neutron beam spectrum was measured by a thin neutron detector of known relative efficiency placed in front of the fission chamber.

(b) Experimental Arrangement

The electron linear accelerator at Rensselaer Polytechnic Institute⁵ was used to produce a pulsed source of neutrons. Pulses of 50-MeV electrons of 1.6-A intensity were stopped in a water-cooled tantalum target where they produced fast neutrons by the (γ, n) reaction. Some of the neutrons were slowed down to energies of interest for the measurement by a 2.5-cm-thick, 15-cm-diam polyethylene moderator placed near the electron target. The detector was positioned at the end of a 25-m neutron flight path normal to the moderator. Figure 1 shows the relative positions of the LINAC, the target, and the detectors. The electron target was offset from the neutron flight path so as to reduce the intensity of the "gamma flash" at the detector.

(c) The Detectors

The main detector consisted of a fission chamber surrounded by a large scintillator as shown in Fig. 2. The scintillator was constructed by R. C. Block and has been described elsewhere.⁶ The neutron beam was collimated to a diameter of 9 cm at the detector position and traversed the scintillator tank through a cylindrical beam tube lined with a 2-cm-thick, 90-cm-long ⁶LiH liner. The fission chamber was centered in this

⁵E. Gaerttner, M. L. Yeater, and R. R. Fullwood, Neutron Physics, Academic Press, New York (1962), p. 263; also E. Gaerttner et al., IRE Trans. Nucl. Sci. NS-9(5), 23 (1962).

⁶R. C. Block et al., EANDC Symposium on Neutron Time-of-Flight Methods (ed. by J. Spaepen), Euratom, Brussels (1961), p. 203.

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Fig. 1. Diagram Showing the Relative Positions of the RPI LINAC, the Neutron-Producing Target, the Moderator, and the 25-m Flight Path with the Detector.

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Fig. 2. Liquid Scintillator Tank and Fission Chamber.

liner. The purpose of the liner was to decrease the background in the scintillator due to neutrons scattered from the fission chamber and to prevent fast neutrons scattered by the scintillator from coming back to the fission chamber.

The fission chamber, shown in Fig. 3, contained 29 parallel zinc-flashed aluminum discs which were 0.013 cm thick and which, except for the two outer discs, were electroplated on both sides with 2 mg/cm² of ²³⁵U in an area 10 cm in diameter. The two outer discs were plated on one side only. The distance between the two outer discs was 3.2 ± 0.1 cm. The total amount of U₃O₈ in the chamber was 7.65 ± 0.01 g. The isotopic composition of the uranium is given in Table 1. The chamber was filled with a mixture of 90% argon and 10% CO₂ at a pressure of 5 atm.

Table 1. Isotopic Composition of the Uranium Sample*

Isotope	Percent in Sample
²³⁴ U	0.040 ± 0.01
²³⁵ U	99.888 ± 0.03
²³⁶ U	0.006 ± 0.006
²³⁸ U	0.065 ± 0.02

*Obtained by electromagnetic separation.

The neutron detector used to measure the incident neutron beam spectrum was a 12.5-cm-OD, 3-cm-thick parallel-plate ionization chamber that was filled with BF₃ (96% ¹⁰B) to a pressure of 1 atm. This detector was placed between the moderator and the ²³⁵U fission chamber approximately 2 m from the fission chamber.

(d) The Electronics

A block diagram of the electronics associated with the experiment is shown in Fig. 4. The electronics have been described in detail elsewhere.^{2,7}

⁷R. Gwin, L. W. Weston, and R. W. Ingle, IEEE Trans. Nucl. Sci. NS-13(1), 167 (1966).

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Fig. 3. ^{235}U Fission Chamber.

Fig. 4. Block Diagram of Electronics System.

The time-of-flight spectra of the signals from the scintillator in coincidence with the fission chamber, $C(t)$, and not in coincidence with the fission chamber, $A(t)$, were stored in a computer. Simultaneously, the time-of-flight distribution of signals from the BF_3 detector, $S(t)$, was stored in another computer. In addition, the pulse-height distribution of the signals from the scintillator was stored in a pulse-height analyzer. This analyzer was gated on during two time-of-flight intervals corresponding to two resonances of the ^{235}U cross section. The memory of this analyzer was divided into four sections corresponding to the two time-of-flight intervals and to scintillator signals in coincidence and not in coincidence with pulses from the fission chamber. Hence four pulse-height spectra were taken simultaneously. These pulse-height spectra were necessary to perform some efficiency corrections to the data, as will be discussed later.

(e) The Measurements

The measurements were performed in two steps: the neutron energy range from 0.4 to 60 eV was covered by a "low-resolution" run, whereas the region above 15 eV was covered by a "high-resolution" run. Table 2 gives the experimental parameters for both types of runs.

During the low-resolution runs, filters of cadmium and cobalt were kept permanently in the beam so that the background level could be measured in the vicinity of 0.3 to 130 eV, where cadmium and cobalt, respectively, have large resonances. The cadmium also eliminated the overlap of low-energy neutrons in one pulse and fast neutrons in the succeeding pulse by absorbing all the neutrons below 0.3 eV.

Four types of measurements were performed: two with the fission chamber in place and two with a "dummy" chamber in place. In each case one of the two runs was made with a ^{238}U filter in the beam and one was made without the ^{238}U . The dummy chamber was identical to the fission chamber except that the uranium had been replaced by an equivalent amount of lead to mock up the scattering by the uranium. Measurements with the ^{238}U filter were used to obtain a few additional background points at those energies where ^{238}U has large resonances. Measurements with the

Table 2. Experimental Parameters for the ORNL-RPI 1966
Simultaneous Measurement of σ_c and σ_f for ^{235}U

	Low-Resolution Run	High-Resolution Run
Flight path, L	25.45 ± 0.05 m	
Moderator	Polyethylene	
Moderator thickness	2.54 ± 0.5 cm	
Sample composition	U_3O_8	
Sample temperature, T	$298 \pm 5^\circ\text{K}$	
Sample effective thickness, s	3.2 ± 0.1 cm	
Sample weight (U_3O_8)	7.65 ± 0.01 g	
Sample areal density, n	2.66×10^{-4} ^{235}U -atoms/b	
Neutron burst width, τ_b	0.25 μsec	0.10 μsec
Repetition rate	240 pps	250 pps
Variable channel width, τ	0.16-10.4 μsec	0.04-2.56 μsec
Permanent filters	Cd, Co, Na	^{10}B
Background filters	^{238}U	a) Mn, ^{238}U b) Co, Na c) Pb

dummy were used to interpolate the background in between the filters' resonance energies.

Each individual measurement lasted about 3 hr, and the complete set of four measurements was repeated seven times to compensate for possible drifts in the electronics and in the beam spectrum, to obtain good statistics, and to permit some consistency tests on the data.

Figure 5 shows an example of the scintillator count rate not in coincidence with the fission chamber, $A(t)$, and of the associated background, as a function of channel number. Figure 6 shows an example of the coincidence rate $C(t)$ and associated background, as a function of neutron energy, and Fig. 7 shows an example of the count rate of the BF_3 detector, $S(t)$, as a function of neutron energy.

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Fig. 5. Foreground and Background Count Rates of the Gamma-Ray Detector Not in Coincidence with the Fission Chamber.

Fig. 6. Foreground and Background Count Rates of the Gamma-Ray Detector in Coincidence with the Fission Chamber.

Fig. 7. Count Rate of Neutron Detector as a Function of Energy.

During the high-resolution runs, a 90-mg/cm² ¹⁰B filter was kept permanently in the beam to eliminate overlap neutrons. The run consisted of six sets of measurements: measurements with the fission chamber and with the dummy, both with three different sets of filters in the beam, as indicated in Table 2. Each measurement lasted about 2 hr and each of the six sets of measurements was repeated six times.

III. ANALYSIS OF THE DATA

The successive steps to obtain fission and capture cross sections from the count rates $C(t)$, $A(t)$, and $S(t)$, defined previously are listed in Table 3 and briefly discussed below.

Table 3. Successive Steps in Data Reduction

Nature of Correction	Magnitude of Correction		Uncertainty Associated with the Correction
	Maximum	Average	
(a) Dead time correction	40%	2%	0.1%
(b) Background subtraction in:			
$\sigma_f\sqrt{E}$	0.4 b $\text{eV}^{\frac{1}{2}}$	0.2 b $\text{eV}^{\frac{1}{2}}$	0.2 b $\text{eV}^{\frac{1}{2}}$
$\sigma_c\sqrt{E}$	40 b $\text{eV}^{\frac{1}{2}}$	20 b $\text{eV}^{\frac{1}{2}}$	2 b $\text{eV}^{\frac{1}{2}}$
(c) Efficiency correction: affects only $\sigma_c\sqrt{E}$	70% of $\sigma_f\sqrt{E}$		4% of $\sigma_f\sqrt{E}$
(d) Determination of neutron spectrum (self-shielding correction on BF ₃ detector)	4%	0.5%	0.2%
(e) Normalization: $\sigma_f\sqrt{E}$			1%
$\sigma_c\sqrt{E}$			3%
(f) Self-shielding correction	15%	0.5%	0.2%
(g) Correction for isotropic impurities; affects only $\sigma_c\sqrt{E}$	20 b $\text{eV}^{\frac{1}{2}}$	0	0.5 b $\text{eV}^{\frac{1}{2}}$
(h) Single-scattering background $\sigma_f\sqrt{E}$	1 b $\text{eV}^{\frac{1}{2}}$	0.3 b $\text{eV}^{\frac{1}{2}}$	0.1 b $\text{eV}^{\frac{1}{2}}$
$\sigma_c\sqrt{E}$	0.5 b $\text{eV}^{\frac{1}{2}}$	0.2 b $\text{eV}^{\frac{1}{2}}$	0.1 b $\text{eV}^{\frac{1}{2}}$

(a) Dead-Time Correction

All the count rates were corrected for dead time. A fixed dead time of 16 μ sec was artificially imposed on the equipment. This dead time was longer than the dead time of any of the electronic components. The dead-time correction was usually of the order of 2% but never exceeded 40%.

(b) Background Subtraction⁸

The background in the coincidence rate $C(t)$ is almost entirely due to fissions produced by neutrons having energies other than that corresponding to the time of flight of the event. Such neutrons either originate at some time different than the primary burst or reach the detector after one or more scatterings in the collimator or in the detector itself.

The magnitude of this background was obtained from the count rate at time of flights corresponding to energies where the black resonances of the filters placed in the beam were capturing all neutrons of the correct energy. In between the energies of the filters' black resonances, the background was interpolated linearly (see Fig. 6). This background was nearly proportional to $E^{\frac{1}{2}}$, where E is the incident neutron energy, and approximately equal to 0.2 b $\text{eV}^{\frac{1}{2}}$.

The background in the count rate $A(t)$ is, of course, much larger than the background in the coincidence rate $C(t)$. It has a time-of-flight-dependent contribution produced by the prompt gamma rays following the capture of a beam neutron or a scattered neutron in the detector or in any material around the detector, except the uranium of the fission chamber. In addition, it has a time-of-flight-independent contribution produced by cosmic rays and by long-lived radioactivities induced in the detector and surrounding materials, including the uranium of the fission chamber.

The spectrum of the time-of-flight-dependent part of the background in $A(t)$ was obtained from measurements with the dummy fission chamber. The magnitudes of the time-of-flight-dependent and of the constant backgrounds

⁸ An excellent discussion of the types of background arising in neutron time-of-flight experiments is given by O. D. Simpson et al. in Nucl. Instr. Methods 30, 293 (1964).

were determined from the count rates at time of flights corresponding to the beam filters' black resonances (see Fig. 5). The background in $A(t)$ was nearly proportional to $E^{\frac{1}{2}}$ and approximately equal to $20 \text{ b eV}^{\frac{1}{2}}$.

An additional smaller contribution to the background, of essentially the same nature, was subtracted from $C(t)$ and $A(t)$; this contribution will be discussed later under the heading "Single-Scattering Background."

The background associated with the BF_3 detector count rate $S(t)$ was smaller than 1%, as can be seen in Fig. 7. Since only the relative count rate $S(t)$ is used in analyzing the data and since the background was proportional to $S(t)$, it was not subtracted from $S(t)$.

(c) Efficiency Correction

In the thin-sample approximation, the net count rates, $C(t)$ and $A(t)$, are related to the cross sections as a function of time of flight, t , by the following equations:

$$C(t) = \varphi(t) n \epsilon \epsilon_f \sigma_f(t) , \quad (1)$$

$$A(t) = \varphi(t) n [\epsilon_c \sigma_c(t) + (1 - \epsilon) \epsilon_f \sigma_f(t)] , \quad (2)$$

where $\varphi(t)$ represents the neutron flux incident upon the fission chamber, n is the number of uranium nuclei in the fission chamber, ϵ_c and ϵ_f are the scintillator efficiencies for detecting capture and fission events, and ϵ is the efficiency of the fission chamber for detecting fissions. The above two equations can be solved for the cross sections, giving

$$\sigma_f(t) = \frac{N_1}{\varphi(t)} C(t) , \quad (3)$$

$$\sigma_c(t) = \frac{N_2}{\varphi(t)} \left[A(t) - \frac{1 - \epsilon}{\epsilon} C(t) \right] , \quad (4)$$

where N_1 and N_2 are constants that can be obtained by normalizing the cross sections over an energy interval where they are known from other experiments, as will be discussed further.

The fission chamber efficiency, ϵ , can be obtained from an investigation of the pulse-height spectra of the scintillator in coincidence, $C(E)$, and not in coincidence, $A(E)$, with the fission chamber.² Figure 8 shows typical pulse-height spectra, corrected for background, and their ratio $A(E)/C(E)$. Since the total gamma-ray energy associated with a slow neutron capture event is equal to the binding energy of a neutron in ^{235}U , which is 6.3 MeV, the high pulse-height end of the spectra of Fig. 8 is due only to fission events, and the ratio $A(E)/C(E)$ above a pulse height equivalent to 8 MeV is equal to $(1 - \epsilon)/\epsilon$. The pulse-height ratio increases with decreasing pulse height near 8 MeV, rather than 6.3 MeV, because of the poor pulse-height resolution of the gamma-ray scintillator. The efficiency of the fission chamber was determined to be $\epsilon = 0.58 \pm 0.04$.

(d) Determination of the Neutron Beam Spectrum

The following relation was used to obtain the spectrum $\varphi(E)$ of the neutron beam transmitted through the BF_3 detector, and hence incident upon the fission chamber, from the count rate $S(E)$ of the BF_3 detector:

$$\varphi(E) = K * R(E) * S(E) * \sqrt{E} \quad , \quad (5)$$

$$R(E) = x / (e^x - 1) \quad x = n_{10} \sigma_0 E^{-\frac{1}{2}} \quad . \quad (6)$$

Here K is a proportionality constant, $n_{10} = 0.765 \times 10^{-4}$ atoms/b is the ^{10}B areal density, and $\sigma_0 = 610 \text{ beV}^{\frac{1}{2}}$ is the ^{10}B absorption cross section at the reference energy of 1 eV. This cross section is proportional to $E^{-\frac{1}{2}}$ over the neutron energy range covered by this experiment.⁹ The "correction factor," $R(E)$, increases with increasing energy and is equal to 0.966 at 0.4 eV, to 0.975 at 1 eV, and to 1 at high energy. The effect of the scattering of neutrons by the BF_3 detectors on the beam spectrum is not included in deriving the relations above, but this effect was estimated and found to be negligible.

⁹ J. Spaepen in Proc. of the IAEA Symposium on Nuclear Data - Microscopic Cross Sections and Other Data Basic for Reactors, Paris, October 17-21, 1966, IAEA, Vienna, 1967, Paper CN-23/119, Vol. I, p. 241.

Fig. 8. Pulse-Height Spectra of the Gamma-Ray Detector in Coincidence and Not in Coincidence with the Fission Chamber, and Their Ratio.

The beam spectrum, $\phi(E)$, had to be interpolated because of the difference in the flight paths associated with the BF_3 detector and with the fission chamber. For this interpolation and in order to reduce errors associated with statistical fluctuations, the beam spectrum was "fitted" by a smooth function. This function is shown as the solid line in Fig. 7.

(e) Normalization

The ^{235}U fission cross section was normalized by making the fission resonance integral from 0.45 to 10 eV equal to 127.9 b, a value obtained from the data of Bowman et al.¹⁰ The measurement of Bowman et al. itself is normalized to a value of 577.1 b at 0.0253 eV. The capture cross section was normalized by making the absorption resonance integral from 0.45 to 1.0 eV equal to 58.03 b, a value obtained by subtracting an estimated scattering contribution¹¹ from the total cross-section data of Shore and Sailor.¹² The value is in good agreement with the value of 58.04 b reported by Brooks et al.¹³ For the fission resonance integral over this interval, our data led to a value of 52.3 b, whereas Brooks et al. report a value of 52.1 b.

The capture cross section could be normalized with a 10% accuracy relative to the fission cross section by an investigation of the scintillator pulse-height spectra, as has been shown elsewhere;² however, the direct normalization with respect to other data used here is estimated to be accurate to 3% and hence much preferable.

(f) Resonance Self-Shielding Correction

Relations (1) and (2) are valid only in the thin-sample approximation, i.e., for $n\sigma \ll 1$; for a sample of finite thickness, Eq. 1 should be replaced by

¹⁰C. D. Bowman et al. in Proc. Conference on Neutron Cross Section Technology, March 22-24, 1966, Washington, D. C. (AEC-TID-4500 Conf. 660303, 1966), p. 1004; also The Epithermal Fission Cross Section of U-235, UCRL-14606 (1966).

¹¹H. L. Foote, Jr., Phys. Rev. 109, 1641 (1958).

¹²F. J. Shore and V. L. Sailor, Phys. Rev. 112, 191 (1958).

¹³F. D. Brooks et al., Eta and Neutron Cross Sections of U-235 from 0.04 to 200 eV, UKAEA report AERE-M-1670 (1966).

$$C(t) = \varphi(t) \epsilon \epsilon_f \frac{\sigma_f}{\sigma} \frac{1 - e^{-n\sigma}}{1 - \frac{\sigma_s}{\sigma} P_c}, \quad (7)$$

where σ and σ_s represent the total and scattering cross sections of ^{235}U , n the uranium areal density, and P_c the collision probability for a neutron scattered in the uranium. A similar relation should replace Eq. 2. Equation 7 can be approximated by

$$C(t) = \varphi(t) \epsilon \epsilon_f \frac{\sigma_f}{\sigma_f + \sigma_c} \left[1 - e^{-n(\sigma_f + \sigma_c)} \right] \quad (8)$$

since $n \sigma_s \cong 3 * 10^{-3} \ll 1$. Equation 8 and its equivalent for $A(t)$ were used in obtaining the cross sections. The self-shielding correction,

$$n(\sigma_f + \sigma_c) / \left[1 - e^{-n(\sigma_f + \sigma_c)} \right]$$

has its maximum value of 1.15 at 8.75 eV and 19.3 eV.

(g) Correction for Isotopic Impurities

The measured capture cross section had to be corrected for contributions from the impurities of ^{234}U , ^{236}U , and ^{238}U present in the sample (see Table 1). A capture cross section for each of these isotopes was constructed from known resonance parameters.¹⁴ This computed cross section was Doppler and resolution broadened. The energy scale was slightly shifted so that the computed maxima would correspond to those observed in the measurements. The contribution of each isotope to be subtracted from the measurements was computed from the isotopic abundance listed in Table 1. This correction was appreciable only at the major resonance energies of the three isotopic contaminants.

¹⁴J. R. Stehn et al., Neutron Cross Sections, BNL-325, Second Edition, Supplement No. 2 (1965).

(h) Single-Scattering Background

The main contributions to the background for the count rates $C(t)$ and $A(t)$ were obtained by the black-resonance-filter technique, as discussed previously. However this technique does not account for the background associated with neutrons scattered in the 0.005-in.-thick aluminum discs on which the uranium of the fission chamber was plated (see Fig. 3) and then absorbed in the uranium. This is because the filters remove the neutrons which would cause this background from the beam. Approximately 3% of the beam was scattered in these aluminum discs. The background associated with this effect¹⁵ was computed and subtracted from the measured cross sections. This background is approximately proportional to the average of the cross sections over the energy interval

$$(1 - \alpha) E < E' < E, \quad \alpha = 4A/(A + 1)^2 = 0.14 ,$$

where $A = 27$ is the atomic weight of aluminum.

Similar contributions to the background, associated with neutrons scattered in the U_3O_8 , in the argon of the fission chamber, and in the aluminum end windows of the fission chamber, were estimated and found negligible.

IV. RESULTS†

A tabulation of the results obtained from the two series of runs described in Table 2 is given in the appendix. For each time-of-flight channel the tabulation lists an integer, N , from which the width of the channel can be computed ($\tau = 0.04 \times 2^N \mu\text{sec}$); the neutron energy, E , in eV; and the neutron fission and capture cross sections multiplied by $E^{\frac{1}{2}}$, in $\text{b} \cdot \text{eV}^{\frac{1}{2}}$.

The data of the "high-resolution run" were normalized to those of the "low-resolution run" in the overlap energy region from 17 eV to 60 eV.

¹⁵This scattering background is discussed in more detail in ref. 1.

†A preliminary version of these results was discussed at the IAEA Symposium on Nuclear Data - Microscopic Cross Sections and Other Data Basic for Reactors, Paris, October 17-21, 1966, Paper CN-23/48, Vol. II, p. 233, proceedings published by the IAEA, Vienna, 1967. The preliminary version included all the corrections described in section III except the single-scattering-background correction.

In this overlap region the data of the low-resolution run has higher statistical accuracy and a better energy resolution except between 26.5 eV and 27.5 eV where the cross sections of the low-resolution run are somewhat distorted by a flux depression caused by a cadmium resonance. This distortion is not present in the high-resolution run which did not have a permanent cadmium filter (see Table 2).

Before comparing these results with other data, the uncertainties and the energy resolution of the measurements will be briefly discussed, and some preliminary resonance-parameter analysis will be presented.

(a) Neutron Energy Scale

The neutron energy E can be obtained from the time of flight τ and the effective flight path L by the relation

$$E = \mu^2 \frac{L^2}{\tau^2} , \quad (9)$$

where $\mu = 72.3 \text{ eV}^{\frac{1}{2}} \mu\text{sec}/\text{m}$.

If an error δL is made in determining the effective flight path and an error δt in determining the flight time, the resulting error in the neutron energy will be

$$\delta E = \frac{2E}{L} \left[\delta L + \left(\frac{\delta t}{\mu} \right) E^{\frac{1}{2}} \right] , \quad (10)$$

so that the true neutron energy scale E will be related to the apparent neutron energy scale $E^* = E + \delta E$ by¹⁶

$$E = E^* (1 + a + b E^{*\frac{1}{2}}) , \quad (11)$$

where

$$a = 2\delta L/L,$$

$$b = 2\delta\tau/\mu L . \quad (12)$$

¹⁶ S. A. R. Wynchank and W. W. Havens, Jr., Nucl. Sci. Eng. 28, 458 (1967); also S. A. R. Wynchank, Conference on Neutron Cross Section Technology (1966), op. cit., p. 287.

In the measurements described here, the flight path was not measured with adequate precision and the energy scale was "normalized" so as to give a value of 19.3 eV for the appropriate peak in the fission cross section. This is the value obtained in measurements at Columbia¹⁷ and at Dubna¹⁸ (see Table 4). The zero-time uncertainty associated with the determination of an absolute time-of-flight scale is estimated to be $\delta t = 0.1 \mu\text{sec}$. Hence any "realignment" of the energy scale given in the appendix should be done according to Eq. 11 with $|a| \leq 0.01$ and $|b| \leq 10^{-4} \text{ eV}^{-\frac{1}{2}}$. Since the values of a and b in Eq. 12 are inversely proportional to the flight-path length L, the best absolute energy scale for a cross section is probably that determined using the longest flight path.

Table 4. Comparison of the Energies of a Few ²³⁵U Resonances*

ORNL-RPI (25 m)	Dubna ¹⁸ (1000 m)	Columbia ¹⁷ (200 m)
2.03 eV	2.026 $\pm$ 0.004 eV	
8.77 eV	8.77 $\pm$ 0.02 eV	
19.30 eV	19.30 $\pm$ 0.05 eV	19.30 $\pm$ 0.03 eV
29.67 eV	29.69 $\pm$ 0.09 eV	29.63 $\pm$ 0.04 eV

*The flight path used by the three groups is indicated in parentheses. The ORNL resonance energies were obtained by a multilevel fit to the measurements. The other resonance energies are given as shown in ref. 14. No error is given in the ORNL energy scale since this scale was normalized on the other two measurements (see text).

Table 4 compares the values of a few resonance energies as obtained from the normalization just described and as given by the groups at Columbia (using a flight path of 200 m) and at Dubna (using a flight path of 1000 m).

¹⁷J. Rainwater et al. in Proc. of the International Conference on the Study of Nuclear Structure with Neutrons, Antwerp, July 19-23, 1965 (M. Neve de Mevergnies, Ed., North Holland, Amsterdam, 1966), Paper [95], p. 534.

¹⁸Wang Shi-di et al. in Proc. of the Salzburg Symposium on the Physics and Chemistry of Fission, 1965 (IAIA, Vienna, 1965), Vol. I, p. 287. See also Wang Shi-di et al., Interaction of Neutrons with U-235 Nuclei at an Energy 0.002 - 30 keV, P-2024, preprint, Joint Institute for Nuclear Research, Dubna, 1965.

(b) Energy Resolution

The measured cross sections are "broadened" by the thermal motion of the target nuclei and the finite instrumental energy resolution.

The Doppler broadening may be approximated by a Gaussian convolution:¹⁹

$$\sigma_{\Delta}(E) = \frac{1}{\pi^{\frac{1}{2}} \Delta} \int E'^{\frac{1}{2}} \sigma(E') e^{-\frac{(E-E')^2}{\Delta^2}} dE' , \quad (13)$$

$$\Delta^2 = \frac{4kT}{A} E ,$$

where σ_{Δ} is the Doppler-broadened cross section, σ the true cross section, k is Boltzmann's constant, A the mass of the target nucleus, and T the "effective temperature" of the target.²⁰ Michaudon²¹ has shown that for U_3O_8 the effective temperature is within 2% of the physical temperature.

The main causes of instrumental broadening are: the spread in the flight path associated with the effective thicknesses of the detector and of the moderator and the uncertainty in flight time associated with the spread in moderation time and with the widths of the neutron burst and of the time channels at the detector. The broadening due to other effects, such as jitters and the time resolution of the detector, is much smaller and may be neglected.

The instrumental resolution function is a convolution of the partial resolution functions describing the effects mentioned.²² The variance σ_E of the instrumental resolution function is the sum of the variances

¹⁹ A. W. Solbrig, Am. J. Phys. 29, 257 (1961).

²⁰ W. E. Lamb, Jr., Phys. Rev. 55, 190 (1939).

²¹ A. Michaudon, Contribution à l'étude par des méthodes du temps de vol de l'interaction des neutrons lents avec l'U-235, CEA-R-2552 (1964), p. 182.

²² The convolution of resolution functions has been investigated particularly by C. R. Corge, Analyse des Resonances dues aux Neutrons "s" dans les Experiences de Transmission par Temps de Vol. I. Sans Terme d'Interference, CEA-1998 (1961); G. Bianchi and C. R. Corge, Automatisation sur Ordinateur de la Method des Aires Partielle dans l'Analyse des Resonances Induites par les Neutrons "s". I. Sans Terme d'Interference, CEA-2156 (1962); P. Ribon and A. Michaudon, Symposium on Neutron Time-of-Flight Methods, op. cit., p. 357; and D. W. Drawbaugh and G. Gibson, Conference on Neutron Cross Section Technology, op. cit., p. 948.

associated with the partial resolution functions and can be expressed as:^{22,23}

$$\sigma_E = \frac{E^2}{3L^2} \left[s^2 + \ell^2 + \frac{\tau_b^2 + \tau^2}{\mu^2} E \right] , \quad (14)$$

where μ has been defined previously (Eq. 9) and the values of L , s , τ_b , and τ are given in Table 2. ℓ is an equivalent length associated with the "smearing" of the moderator.^{24,25} For a hydrogenous moderator of infinite thickness the equivalent length is approximately equal to six neutron mean free paths. For the thin moderator used here, Monte Carlo computations²⁶ lead to a value of $\ell = 2.5$ cm. A formula used by Frohner and Haddad²³ and attributed to Koppel²⁷ leads to a somewhat larger value for ℓ ($\ell \approx 4.3$ cm).

Below 100 eV the instrumental broadening is small compared to the Doppler broadening and may be approximated by a Gaussian kernel.²⁸ The measured cross section, $\sigma_{\Delta*}$, may then be related to the true cross section σ by a convolution similar to Eq. 13 but with

$$\begin{aligned} \Delta*^2 &= \frac{4kT}{A} E + \frac{2(s^2 + \ell^2)}{3L^2} E^2 + \frac{2(\tau_b^2 + \tau^2)}{3\mu^2 L^2} E^3 \\ &= aE + bE^2 + c(d + 4^N) E^3 . \end{aligned} \quad (15)$$

Table 5 lists the values of a , b , c , and d for the two series of measurements. The value of N for each time-of-flight channel is given in the appendix.

²³F. H. Frohner and E. Haddad, Nucl. Phys. 71, 129 (1965).

²⁴A. Michaudon, Reactor Sci. Technology 17, 168 (1963).

²⁵J. Rainwater et al., Rev. Sci. Instr. 31, 481 (1960).

²⁶P. Ribon and A. Michaudon, ref. 22; J. Stockton and A. Craig, private communication 1966.

²⁷J. Koppel, Nucl. Sci. Eng. 8, 157 (1960).

²⁸A. Michaudon and P. Ribon, J. Phys. Radium 22, 712 (1961).

Table 5. Coefficients of the Resolution Function*

$$E^{\frac{1}{2}} \sigma_{\Delta^*}(E) = \frac{1}{\pi^{\frac{1}{2}} \Delta^*} \int E'^{\frac{1}{2}} \sigma(E') e^{-\left(\frac{E-E'}{\Delta^*}\right)^2}$$

$$\Delta^{*2} = aE + bE^2 + c(d + 4^N) E^3$$

$$a = \frac{4kT}{A} = 4.37 \times 10^{-4} \text{ eV}$$

$$b = \frac{2}{3} \frac{(s^2 + l^2)}{L^2} = 1.71 \times 10^{-6}$$

$$c = \frac{2}{3} \frac{(0.04)^2}{\mu^2 L^2} = 3.15 \times 10^{-10} \text{ eV}^{-1}$$

$$d = \left(\frac{\tau_b}{0.04 \mu\text{sec}} \right)^2 = \begin{cases} 39.1 & \text{for low-resolution run} \\ 6.25 & \text{for high-resolution run} \end{cases}$$

*For a definition of the symbols see text and Table 2.

(c) Uncertainties in the Measurements

Two types of errors in the measurements must be considered: the statistical error, which is uncorrelated from one time-of-flight channel to the next, and the systematic error.

The statistical error should be used in determining weights for a least-squares fit of the data to some theoretical model. This error can be conveniently parameterized as shown in the two relations below:

$$\delta(\sigma_f \sqrt{E}) = \left\{ a_f (\sigma_f \sqrt{E} + b_f) / 2^N \right\}^{\frac{1}{2}}$$

$$\delta(\sigma_c \sqrt{E}) = \left\{ a_c \left[\left(1 + 0.4 \frac{\sigma_f}{\sigma_c} \right) \sigma_c \sqrt{E} + b_c \right] / 2^N \right\}^{\frac{1}{2}},$$

where N is the integer tabulated in the appendix and defined previously and where the numerical values of a_f , b_f , a_c , and b_c for the two types of runs are listed in Table 6.

Table 6. Statistical Error Associated with the ^{235}U Data*

$$\delta(\sigma_f \sqrt{E}) = \left\{ b_f \quad (\sigma_f \sqrt{E} + b_f)/2^N \right\}^{\frac{1}{2}}$$

$$\delta(\sigma_c \sqrt{E}) = \left\{ a_c \quad \left[(1 + 0.4 \frac{\sigma_f}{\sigma_c}) \sigma_c \sqrt{E} + b_c \right] / 2^N \right\}^{\frac{1}{2}}$$

	Low-Resolution Run	High-Resolution Run
a_f	0.4	8
b_f	0.5	0.6
a_c	0.25	5
b_c	35	40

*The numerical values are all in $\text{b}\cdot\text{eV}^{\frac{1}{2}}$ and are for one standard deviation.

When the data are used to obtain resonance parameters or parameters of use in reactor computations, the relevant quantities are functions of the cross sections in a large number of time-of-flight channels, and the uncorrelated systematic error becomes negligible compared to the systematic errors.

The major systematic errors in $\sigma_f \sqrt{E}$ are estimated to be 1% associated with the normalization and $0.2 \text{ b}\cdot\text{eV}^{\frac{1}{2}}$ associated with the background subtraction. In the values of $\sigma_c \sqrt{E}$, the major systematic errors are 3% for the normalization $2 \text{ b}\cdot\text{eV}^{\frac{1}{2}}$ for the background subtraction, and $0.04 \sigma_f \sqrt{E}$ for the uncertainty in ϵ when solving Eq. 4. However, the magnitude of the systematic errors is very difficult to appreciate realistically and the

only decisive test of the precision of the data must come from a careful comparison with results obtained independently, and when possible, by other techniques.

(d) Resonance Parameter Analysis of the Data

Gibson and Drawbaugh²⁹ and Lubitz et al.³⁰ have presented single-level analysis of the data given in the appendix or, more exactly, of a preliminary version that included all the corrections except the single-scattering-background correction discussed in Section III.h above.

Adler and Adler³¹ have performed a multichannel, multilevel analysis of the fission and capture cross sections using these same data.

However, to obtain the best possible parameters from the simultaneous measurement of the capture and fission cross sections, it is desirable to fit simultaneously the two cross sections. A computer program has been written that minimizes the quantity,

$$S = \sum_i \left\{ \left[(\sigma_f \sqrt{E})_{\text{exp}} - (\sigma_f \sqrt{E})_{\text{comp}} \right]^2 w_{fi} + \left[(\sigma_c \sqrt{E})_{\text{exp}} - (\sigma_c \sqrt{E})_{\text{comp}} \right]^2 w_{ci} \right\} ,$$

where σ_f and σ_c represent the fission and capture cross sections, respectively, w_{fi} and w_{ci} are statistical weights appropriate to the *i*th channel of the fission or capture measurement, and the subscripts exp and comp refer to the experimental data and the computed values, respectively.

²⁹D. W. Drawbaugh and G. Gibson in Proc. of the IAEA Symposium on Nuclear Data - Microscopic Cross Sections and Other Data Basic for Reactors, op. cit., Paper CN-23/44; G. Gibson and D. W. Drawbaugh, A Single Level Analysis of ²³⁵U Based on Recent σ_t , σ_f , and σ_c Measurements; A n + ²³⁵U Multigroup Cross Section Library, WANL-TME-1586 (1967).

³⁰N. C. Francis et al., in Proc. of the IAEA Symposium on Nuclear Data - Microscopic Cross Sections and Other Data Basic for Reactors, op. cit., Paper CN-23/47, Vol. II, p. 267.

³¹D. B. Adler and F. T. Adler, Multilevel Analysis of the Low Energy Level Structure of ²³⁵U, Final Report AEC BNL-006977 (1966); also private communication.

Adler and Adler³² have shown that a reaction cross section may be represented as

$$\sigma^{(x)}(E) \sqrt{E} = \sum_k \frac{G_k^{(x)} v_k + H_k^{(x)} (\mu_k - E)}{(\mu_k - E)^2 + v_k^2}, \quad (16)$$

where $\sigma^{(x)}(E)$ is the cross section for reaction x as a function of neutron energy E and G , H , μ , and v are resonance parameters which have only a weak energy dependence and are treated here as constants.

The cross sections must be Doppler and resolution broadened, as discussed in b above. If the broadening is approximated by a Gaussian of width Δ^* , we obtain from Eqs. 13 and 16

$$\sigma_{\Delta^*}^{(x)}(E) E^{\frac{1}{2}} = \sum_k \frac{1}{v_k} \left\{ G_k^{(x)} \psi(\beta_k, x_k) + H_k^{(x)} \varphi(\beta_k, x_k) \right\}, \quad (17)$$

where $\beta = \frac{\Delta^*}{v}$, $x = \frac{E - \mu}{v}$, and ψ and φ are the usual Voigt profiles.^{19,33}

The data of the low-resolution run were fitted in the energy range 0.4 eV to 30 eV using the trial function (17) and the values of Table 5 for the Doppler width. The parameters obtained are listed in Table 7. In Fig. 9 the computed cross sections are compared to the experimental data.

The parameters of Table 7 approximate the cross sections only in the neutron energy range 0.4 eV to 30 eV, but this analysis will be extended to higher energies and will be discussed in more detail in a subsequent report. Fluharty et al.³⁴ have performed a similar type of analysis and published a set of parameters to approximate the ²³⁵U cross sections below 0.5 eV.

³²D. B. Adler and F. T. Adler, p. 695 in Proc. of the Conference on Breeding, Economics, and Safety in Large Fast Power Reactors, October 7-10, 1963, ANL-6792.

³³W. Voigt, S. B. Bayer Akad Wiss. (1912), p. 603.

³⁴R. G. Fluharty, N. H. Marshall, and O. D. Simpson, p. 985 in Proc. of Conference on Neutron Cross Section Technology, op. cit.

Table 7. Resonance Parameters Used in Computing the Cross Sections of Fig. 9^{a,b}

μ (eV)	ν (eV)	G_c (b.eV ^{3/2})	H_c (b.eV ^{3/2})	G_f (b.eV ^{3/2})	H_f (b.eV ^{3/2})
- 1.45000	0.05500	893.13238	19.61002	4522.17000	37.95514
0.28400	0.07500	1.14682	0.01023	3.33885	1.40441
1.13915	0.07039	2.17246	- 0.23281	6.08399	2.71602
2.03155	0.02457	2.79780	0.08109	0.80814	0.06782
2.76913	0.06627	0.27139	0.10566	- 0.32033	- 0.92809
3.15216	0.07344	2.08833	0.13003	5.75755	1.80215
3.61314	0.04842	6.50607	0.11928	9.78062	3.00342
4.84207	0.02319	16.18406	0.17300	1.78122	0.10649
5.41816	0.18008	0.60017	- 0.24967	3.60854	- 2.34353
6.22267	0.10144	1.79695	- 0.92686	10.43957	5.28920
6.38077	0.02854	55.57479	1.72564	16.50689	0.65613
7.08002	0.03758	16.91900	0.25308	14.19033	1.04464
7.84117	0.19216	- 0.25064	- 0.11453	- 2.21497	0.96438
8.76646	0.07347	62.65936	0.46872	180.16674	-15.07703
9.28835	0.05565	9.33914	2.20732	17.37515	1.43641
9.93765	0.23898	0.01115	3.81976	- 2.18779	20.32533
10.15493	0.08905	6.53584	- 0.56131	12.89976	- 3.90901
10.75671	0.44269	- 1.63570	- 0.28964	11.46461	2.81991
11.65924	0.03085	97.29833	3.25607	13.87101	3.66998
12.39766	0.04480	133.45099	5.32419	103.52660	14.11270
12.84814	0.09170	3.32796	- 0.88877	10.41058	0.78917
13.29414	0.09813	2.06389	0.30018	7.82968	2.28287
13.64601	0.13810	3.17307	- 1.71910	9.17629	- 6.91654
14.00493	0.25473	3.38493	- 0.34861	79.36343	3.68590
14.55149	0.04357	12.51745	0.12096	6.15746	4.29759
15.41595	0.05813	17.57609	0.52005	22.85527	5.19540
16.09148	0.04415	38.92666	1.51488	24.11245	3.34965
16.65427	0.08558	10.87099	0.45470	35.45922	- 5.71649
18.04168	0.08963	11.38078	1.30520	41.64059	- 4.09670
18.98076	0.07572	8.87928	- 2.17550	6.90569	0.60294
19.29905	0.06591	167.32568	7.00618	291.51891	9.42385
20.20778	0.12556	4.00425	- 0.76512	7.68833	7.74322
20.61610	0.07113	9.63231	- 3.76673	15.44412	1.81148
21.07246	0.05123	114.96440	8.46966	91.17323	5.85199
22.94148	0.06413	26.41626	2.15875	36.79262	2.05616
23.42561	0.04821	90.62710	10.47250	27.29141	3.45643
23.63107	0.11852	14.23693	- 6.15078	84.65104	-10.45207
24.23344	0.08194	28.11202	- 2.09359	22.45163	-17.03852
25.65578	0.34725	8.85289	- 0.69568	135.75344	88.12762
26.45423	0.16570	13.21284	0.11055	75.52755	-26.62721
27.12611	0.15158	5.23513	- 2.41873	11.24833	- 0.33729
27.83361	0.08650	18.30800	- 1.40394	51.90012	- 1.95123
28.31732	0.16705	8.08287	- 1.57138	23.52001	-10.18037
29.67241	0.07008	13.45407	0.80348	9.76468	1.11064
30.59000	0.07500	11.46512	0	12.72551	0
32.06000	0.05900	98.35293	0	100.04437	0
35.21000	0.08500	174.60982	0	312.06174	0

^aSee Eq. 17 for definition of parameters.

^bThe format in this table is associated with a computer output, and no more than three figures are significant.

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Fig. 9. Least-Squares Fit to the ^{235}U Capture and Fission Cross Sections Over the Neutron Energy Range from 0.4 eV to 30 eV.

The parameters of Table 7 should be useful in removing from the cross sections the broadening due to the instrumental resolution, in interpolating the cross sections in between the energies of the data points, and in computing the Doppler-broadened cross sections for temperatures higher than that of the measurement. The statistical properties of the resonance parameters are being investigated and will be discussed in a later report.

V. COMPARISON WITH OTHER DATA AND DISCUSSION

Although there are many recent good measurements of the ^{235}U fission and total cross sections over the resonance energy region, there is only one other direct high-resolution measurement of the capture cross section known to the authors.¹⁸ The capture cross section, however, can be obtained indirectly by subtracting the fission and scattering contributions from the total cross section, as has been shown by Shore and Sailor¹² and by Uttley,³⁵ or from a knowledge of the fission cross section, η , and ν , as shown by Brooks.^{4,13}

The good qualitative agreement between recent measurements of the fission cross section is illustrated in Figs. 10-12. Figure 10 shows a comparison up to 30 eV of the fission cross-section data of the low-resolution run and those of Bowman et al.¹⁰ The solid line was obtained by joining our data at each time-of-flight channel by a straight segment. There are five data points near 13 eV in the data of Bowman et al. that are probably too high due to an instrumental pileup effect.³⁶ As was explained in Section IV. our data are somewhat distorted between 26.5 eV and 27.5 eV by a flux depression caused by a cadmium filter in the neutron beam.

In Fig. 11 our fission cross section is compared in the range from 30 to 60 eV to that obtained by Brown et al.³⁷ with neutrons from an underground

³⁵C. A. Uttley, The Average Neutron Total Cross Section of U-235 from 0.1 to 70 keV, AERE-M 1272 (1963).

³⁶C. D. Bowman, private communication (1966).

³⁷W. K. Brown, D. W. Bergen, and J. D. Cramer, p. 971 in Proc. of Conference on Neutron Cross Section Technology, op. cit.

Fig. 10. Fission Cross Sections for ^{235}U Up to 30 eV, ORNL-RPI and Bowman et al.^{10,36}

Fig. 11. Fission Cross Sections for ^{235}U from 30 to 60 eV, ORNL-RPI and Brown et al.³⁷

Fig. 12. Fission Cross Sections for ^{235}U from 1 to 10 keV, ORNL-RPI and Brown *et al.*³⁷

nuclear explosion. In this figure the solid line was obtained by joining the digital data points listed by Brown et al. by straight segments. In some of the "valleys" between resonances the cross section of Brown et al. is considerably lower than ours and lower than that of Bowman et al. (not shown in the figure). This discrepancy is not understood. Fortunately, the cross section in these valleys contributes almost nothing to the resonance integral or to the fission rate in a reactor. In Fig. 12 the same two sets of data are compared in the range from 1 to 10 keV.

In Fig. 13 our capture cross section up to 15 eV is compared to that of Brooks et al.^{4,13} The solid line was obtained in the same manner as that shown in Fig. 10. Discrepancies are apparent both in the "valleys" and in some of the "peaks."

For a quantitative determination of the discrepancies between various sets of data, it is useful to compare integrals of the cross sections over selected energy intervals. Tables 8-13 illustrate such comparisons.

In Table 8 the fission integrals over various energy intervals, obtained from eight different measurements, are compared. The results are all within a few percent of each other except those obtained from the data of Brooks et al.^{4,13} above 2 eV, which are systematically lower than all the others, with the discrepancy increasing to about 15% in the vicinity of 100 eV.

In Table 9 the same eight fission measurements integrated over six wide energy intervals are compared. The table also shows a comparison of absorption integrals from three different measurements. The percent discrepancy with respect to our measurement is indicated in parentheses below each entry. These discrepancies increase with increasing energy and decrease with increasing width of the integration interval. For the two intervals above 200 eV, which are a few keV wide, all the fission integrals but one are within 3% of those based on our data. The table also shows that the absorption cross sections obtained by Brooks et al.^{4,13} and by us are in much better agreement than the respective fission cross sections.

Fig. 13. Capture Cross Sections for ^{235}U up to 15 eV, ORNL-RPI and Brooks et al.¹³

Table 8. Comparison of Fission Integrals

Energy Interval (eV)	$\int \sigma_f dE$ (b.eV)						
	ORNL-RPI	Brooks et al. ¹³	Bowman et al. ¹⁰	Brown et al. ³⁷	Shore and Sailor ¹²	Michaudon et al. ³⁹	Wang Shi-di et al. ¹⁸
0.35-0.45		11.91	11.55		11.91		
0.45-0.50	4.36	4.34	4.32		4.37	4.47	
0.50-0.55	3.808	3.695	3.780		3.831	3.937	
0.55-0.70	9.64	9.39	9.47		9.42	9.98	
0.70-1.0	17.09	16.26	16.96		16.92	17.35	
1.0-1.3	20.88	20.85	20.78		21.09	21.14	
1.3-1.8	8.21	7.85	8.16		9.06	8.87	
1.8-4.5	46.56	42.66	43.28		48.15	46.51	
4.5-5.0	4.17	3.55	3.87		4.11	3.80	
5.0-10.0	284.1	257.0	292.1		272.4	275.0	
10.0-15.0	215.6	197.5	220.0			213.0	
15.0-20.5	320.0	278.85	332.6			287.3	
20.5-33.0	442.9	417.5	457.7	416		427.2	
33.0-41.0	498.4	415.2	517.5	465		445.3	
41.0-60.0	923.5	834.1	968.6	924		841.5	
60.0-73.0	305.1	245.7	302.6	318		299.5	
73.0-100.0	662.1	580.5		682		632.0	
100.0-113.0	214.7	185.9		226		228.2	
113.0-200.0	1874.8	1600.8		1930		1809.3	
200.0-300.0	2076.5			2175		2052.5	1980
300.0-1000.0	8099.1			8159		8122.4	7975
1000.0-2000.0	7552			7656		7545	7546
2000.0-3000.0	5656			5461		5761	5560
3000.0-4000.0	5159			4678		4887	4880
4000.0-5000.0	4638			4010		4502	4470
5000.0-10000.0	17654			15920		18537	17460
							5040
							4270
							18030

⁴⁵G. D. James, p. 16 in Proc. of the International Conference on Fast Critical Experiments and Their Analysis, October 10-13, 1966, ANL-7320.

Table 9. Comparison of Fission Integrals and Absorption Integrals for ^{235}U

Energy Interval (eV)	$\int \sigma_f dE$ (b.eV)					$\int \sigma_a dE$ (b.eV)	
	ORNL-RPI	Michaudon <u>et al.</u> ³⁹	Bowman <u>et al.</u> ¹⁰	Shore and Sailor ¹²	Brooks <u>et al.</u> ¹³	ORNL-RPI	Brooks <u>et al.</u> ¹³
0.45-10	399	391.1 (-2.0%)	402.7 (+0.9%)	389.35 (-2.5%)	365.6 (-9%)	631.1	634.7 (+0.5%)
10-33	979	927 (-5.6%)	1010 (+3.2%)		894 (-9.5%)	1692	1685 (-0.4%)
				Brown <u>et al.</u> ³⁷			
33-73	1727	1586 (-9%)	1789 (+3.6%)	1707 (-1.2%)	1495 (-16%)	2548	2407 (-5.9%)
73-200	2752	2669.6 (-3.1%)		2838 (+3.1%)	2367 (-16%)	4258	4340 (+1.9%)
			Wang Shi-di <u>et al.</u> ¹⁸				Wang Shi-di <u>et al.</u> ¹⁸
200-3000	23384	23481 (+0.4%)	23061 (-1.4%)	23451 (+0.3%)		32989	32438 (-1.7%)
					James ⁴⁵		
3000-10000	27451	27926 (+1.7%)	26810 (-2.4%)	24603 (-12%)	27340 (-0.4%)		

Table 10. Comparison of Resonance Integrals

Energy Interval (eV)	$\int \sigma_f \frac{dE}{E} \text{ (b)}$		$\int \sigma_c \frac{dE}{E} \text{ (b)}$		$\int \sigma_a \frac{dE}{E} \text{ (b)}$		Difference	
	ORNL-RPI	Brooks et al. ¹³	ORNL-RPI	Brooks et al. ¹³	ORNL-RPI	Brooks et al. ¹³	(%)	(b)
0.35-0.45		29.7		5.4		35.1		
0.45-0.5	9.21	10.4	1.10	1.29	10.31	11.69	13.4	-1.38
0.5-0.55	7.3	7.0	0.85	0.85	8.15	7.85	3.8	0.30
0.55-0.7	15.6	15.2	1.6	1.6	17.2	16.8	2.4	0.4
0.7-1.0	20.3	19.5	2.2	2.2	22.5	21.7	3.7	0.8
1.0-1.3	18.7	18.6	4.8	5.6	23.5	24.2	3.0	-0.7
1.3-1.8	5.4	5.2	1.3	1.8	6.7	7.0	4.5	-0.3
1.8-4.5	15.8	14.7	8.3	9.3	24.1	24.0	0.4	0.1
4.5-5.0	0.87	0.73	4.6	4.6	5.47	5.33	2.6	0.1
5.0-10.0	34.9	31.7	23.8	27.9	58.7	59.6	1.5	-0.9
10.0-15.0	17.1	15.6	18.9	19.0	36.0	34.6	4.0	1.4
15.0-20.5	17.3	15.2	10.5	12.0	27.8	27.2	2.2	0.6
20.5-33.0	17.3	16.3	11.9	13.9	29.2	30.2	3.4	-1.0
33.0-41.0	13.9	11.6	7.7	8.4	21.6	20.0	8.0	1.6
41.0-60.0	18.1	16.3	8.7	9.9	26.8	26.2	2.3	0.6
60.0-73.0	4.5	3.7	1.7	1.8	6.2	5.5	12.7	0.7
73.0-100.0	7.8	6.8	4.2	5.1	12.0	11.9	0.8	0.1
100.0-113.0	2.0	1.7	1.8	3.0	3.8	4.7	23.7	-0.9
113.0-200.0	12.5	10.8	6.3	7.8	18.8	18.6	1.1	0.2
0.45-200.0	238.46	221.03	120.0	136.04	358	357	0.3	1.0

Table 11. Comparison of Fission Resonance Integrals over GAM ($\frac{1}{4}$ lethargy) Intervals

GAM Intervals (eV)	$\int_{E_1}^{E_2} \sigma_f \frac{dE}{E} \text{ (b)}$		Difference		$\int_{E_1}^{E_2} \sigma_f \frac{dE}{E} \text{ (b)}$		Difference	
	ORNL-RPI April 1966	Bowman et al. ¹⁰ 1966			Michaudon et al., ³⁹ 1963			
			(b)	(%)			(b)	(%)
0.414-0.532	22.41 $\pm$ 0.05	22.13	0.28	1.3	23.00	-0.59	-2.6	
0.532-0.683	16.57 $\pm$ 0.05	16.27	0.30	1.8	17.14	-0.57	-3.4	
0.683-0.876	13.94 $\pm$ 0.05	13.755	0.185	1.3	14.28	-0.34	-2.4	
0.876-1.13	18.26 $\pm$ 0.08	17.98	0.28	1.6	18.05	0.21	1.2	
1.13-1.44	10.30 $\pm$ 0.06	10.47	-0.17	-1.7	11.03	-0.73	-7.1	
1.44-1.86	3.74 $\pm$ 0.06	3.70	0.04	1.1	3.90	-0.16	-4.3	
1.86-2.38	3.67 $\pm$ 0.06	3.67	0.0	0.0	3.68	-0.01	-0.3	
2.38-3.06	3.41 $\pm$ 0.06	3.26	0.15	4.6	3.29	0.12	3.6	
3.06-3.93	7.93 $\pm$ 0.07	8.00	-0.07	-0.9	7.83	0.10	1.3	
3.93-5.04	1.28 $\pm$ 0.07	1.23	0.05	4.0	1.33	-0.05	-3.9	
5.04-6.48	7.07 $\pm$ 0.07	7.01	0.06	0.9	6.55	0.52	7.9	
6.48-8.32	3.37 $\pm$ 0.08	3.60	-0.23	-6.8	3.88	-0.51	-15.1	
8.32-10.7	25.70 $\pm$ 0.10	26.55	-0.85	-3.3	24.86	0.84	3.4	
10.7-13.7	11.68 $\pm$ 0.09	11.86	-0.18	-1.5	11.11	0.57	5.1	
13.7-17.6	8.13 $\pm$ 0.09	8.38	-0.25	-3.1	8.15	-0.02	-0.2	
17.6-22.6	16.64 $\pm$ 0.09	17.32	-0.68	-4.1	15.19	1.45	9.5	
22.6-29.0	10.92 $\pm$ 0.10	11.35	-0.43	-3.9	10.17	0.75	7.4	
29.0-37.3	13.69 $\pm$ 0.10	14.09	-0.40	-2.9	12.01	1.68	14.0	
37.3-47.9	8.36 $\pm$ 0.11	8.95	-0.59	-7.1	8.03	0.33	4.1	
47.9-61.4	13.78 $\pm$ 0.15	14.17	-0.39	-2.8	12.56	1.22	9.8	
0.414-61.4	221.0 $\pm$ 1.5	224.0	-3.0	-1.4	216.0	5.0	2.3	
Average Difference			0.28	2.7		0.54	5.3	

Table 12. Comparison of Fission Resonance Integrals

Energy Interval (eV)	$\int_{E_1}^{E_2} \sigma_f \frac{dE}{E} \text{ (b)}$		Difference	
	ORNL-RPI	Michaudon et al. ³⁹	(b)	(%)
61.4-78.9	5.65	5.50	0.15	2.7
78.9-101	6.01	5.74	0.27	4.7
101-130	5.37	5.31	0.06	1.1
130-167	5.41	5.27	0.14	2.7
167-214	4.92	4.76	0.16	3.4
214-275	5.87	5.63	0.24	4.3
275-354	3.74	4.02	-0.28	-7.5
354-454	3.08	3.24	-0.16	-5.2
454-583	3.72	3.54	0.18	5.1
583-749	2.96	2.97	-0.01	-0.3
749-961	2.30	2.27	0.03	1.3
961-1234	2.14	2.08	0.06	2.9
1234-1585	1.85	1.90	-0.05	-2.7
1585-2035	1.68	1.74	-0.06	-3.6
2035-2613	1.49	1.47	0.02	1.4
2613-3355	1.33	1.33	0.0	0.0
3355-4307	1.27	1.18	0.09	7.6
4307-5531	1.08	1.08	0.0	0.0
5531-7102	0.94	1.00	-0.06	-6.4
7102-9118	0.85	0.88	-0.03	-3.5
9118-11709	0.79	0.82	-0.03	-3.8
11709-15034	1.61	0.72	0.89	100
15034-19305	1.04	0.66	0.38	58
61.4-19305	65.07	63.11	1.96	3.1

Table 13. Comparison of Capture Integrals

Energy Interval (eV)	$\int \sigma_c dE$ (b.eV)		
	ORNL-RPI	Wang Shi-di et al. ¹⁸	Uttley ³⁵
100-200	1145	1910	1315
200-300	903	1210	1215
300-400	656	610	443
400-500	503	510	429
500-600	504	360	436
600-700	481	486	330
700-800	507	420	546
800-900	433	410	288
900-1000	536	328	461
100-1000	5668	6244	5463
1000-1100	518	142	600
1100-1200	392	290	355
1200-1300	335	152	278
1300-1400	299	245	376
1400-1500	326	292	162
1500-1600	304	362	282
1600-1700	254	326	283
1700-1800	241	325	189
1800-1900	270	340	154
1900-2000	317	369	429
1000-2000	3256	2843	3108
2000-3000	1826	2200	2010
100-3000	10750	11287	10581

The fission, capture, and absorption partial-resonance integrals obtained from our data and from the data of Brooks et al.^{4,13} are compared in Table 10. Although the absorption resonance integrals from 0.5 eV to 200 eV obtained from the two sets of data agree to better than 1%, the discrepancies in the fission and capture resonance integrals are 8% and 13%, respectively. The ratio, α_{RI} , of the capture resonance integral to the fission resonance integral over the energy interval 0.5 eV - 200 eV is 20% larger when the data of Brooks et al. are used than when our data are used. The partial-resonance integrals to 200 eV represent more than 85% of the total-resonance integrals.

The fission resonance integrals over GAM quarter-lethargy intervals³⁸ were computed using our data, the data of Bowman et al.,¹⁰ and the data of Michaudon et al.^{21,39} Table 11 shows a detailed comparison of these integrals in the energy range from 0.4 eV to 61.4 eV. The first column of the table lists the energy limits of the GAM intervals, rounded off to three significant figures. The average discrepancy for one-quarter-lethargy interval is 3% between our data and those of Bowman et al., and 5% between our data and those of Michaudon et al. This represents four and eight times, respectively, our estimated uncertainty! The discrepancies are not randomly distributed, as would be expected if they were due to counting statistics, but they are clearly systematic. Yet, over the range from 0.4 to 61.4 eV, the resonance integral based on our data is within 2% of those based on the two other sets of data.

Table 12 shows a similar comparison of fission resonance integrals over GAM quarter-lethargy intervals in the neutron energy range from 60 eV to 20 keV.

In Table 13 we compare our values of the capture cross-section integrals over various energy intervals with values obtained by a somewhat similar technique by Wang Shi-di et al.¹⁸ and with values computed by Uttley,³⁵ using his total cross-section measurement, the fission cross

³⁸These lethargy intervals are used by the reactor codes GAM, of General Atomic, and MUFT, of Westinghouse Bettis Atomic Power Laboratory; see, for instance, H. Bowl, Jr., E. M. Gelbard, and H. G. Ryan, MUFT-4, Fast Neutron Spectrum Code for the IBM-704, WAPD-TM-72 (1957).

³⁹A. Michaudon, H. Derrien, P. Ribon, and M. Sanche, Nucl. Phys. 69, 545 (1965) and private communication (1964). These data are at the Sigma Center and are described in ref. 14.

section measured by Michaudon et al.,³⁹ and a value of 12.3 b for the sum of the potential scattering (11.7 b), and the resonance scattering (0.6 b). The large discrepancies over intervals of 100 eV are probably due, in part, to the different energy resolutions and energy scales of the various measurements. The discrepancies tend to cancel when the data are integrated over large energy intervals, and for the integral from 100 eV to 3 keV our value agrees to better than 5% with the other two values.

In Table 14 we compare the fission and capture resonance integrals above 0.5 eV and their ratio, α_{RI} , as obtained from our data up to a few keV and other data at higher energies, with direct measurements of these quantities. The two sets of values are in good agreement.

It is interesting here to consider the reasons for which some previous evaluations of α_{RI} , based on differential cross-section measurements, led to values about 20% larger than that given in Table 14. The values of α_{RI} or of $\bar{\alpha}$, the average of α in the resonance region, may be obtained in two different ways: (1) the statistical properties of the resonance parameters may be determined, and $\bar{\alpha}$ is then given by $\langle \Gamma_Y \rangle / \langle \Gamma_f \rangle$, where $\langle \Gamma_Y \rangle$ and $\langle \Gamma_f \rangle$ are suitable averages of the capture and fission widths,^{1,40} or (2) $\bar{\alpha}$ or α_{RI} can be obtained by numerically integrating the cross sections or their ratio.^{4,41}

The main problem with the first method is that of obtaining a reliable value of the average fission width. First, because of the complexity of the structure of the fission cross section of ^{235}U , even a careful analysis of the cross section will miss some of the resonances. This has been demonstrated by Michaudon et al.⁴² Those resonances which have a large value of Γ_f are most likely to be missed because of their large width.

⁴⁰S. Oleksa, J. Nucl. Energy 5, 16 (1957).

⁴¹R. G. Freemantle, The Reactions of Neutrons with U^{235} - An Interim Revision of the File in the U.K. Nuclear Data Library, AEEW-M-502 (1965); J. J. Schmidt, Neutron Cross Sections for Fast Reactor Materials, KFK 120, Part 1, D 75 (1966). This reference contains a very complete list of the evaluations and measurements of the ^{235}U resonance integrals up to February, 1966.

⁴²A. Michaudon et al., Phys. Letters 7, 3, 211 (1963).

Table 14. Comparison of Resonance Integrals Above 0.5 eV

VALUES COMPUTED FROM CROSS SECTIONS

$\int_{0.5 \text{ eV}}^{10 \text{ keV}}$	$\sigma_f \frac{dE}{E} = 265 \pm 3 \text{ b}$	ORNL-RPI (1% uncertainty from normalization)
$\int_{10 \text{ keV}}^{10 \text{ MeV}}$	$\sigma_f \frac{dE}{E} = 11.5 \pm 1 \text{ b}$	W. G. Davey ⁴⁶ (estimated uncertainty)
$\int_{0.5 \text{ eV}}^{3 \text{ keV}}$	$\sigma_c \frac{dE}{E} = 132 \pm 5 \text{ b}$	ORNL-RPI (3% uncertainty in normalization)
$\int_{3 \text{ keV}}^{30 \text{ keV}}$	$\sigma_c \frac{dE}{E} = 3.0 \pm 0.5 \text{ b}$	Wang Shi-di <i>et al.</i> , ¹⁸ Uttley ³⁵ (estimated uncertainty)
$\int_{30 \text{ keV}}^{10 \text{ MeV}}$	$\sigma_c \frac{dE}{E} = 1.65 \pm 0.05 \text{ b}$	ORNL values of α , ⁴⁷ Davey ⁴⁶

Thus, $I_F = 276.5 \pm 4 \text{ b}$, $I_c = 137 \pm 5 \text{ b}$, and $\alpha_{RI} = 0.50 \pm 0.02$

VALUES OBTAINED BY DIRECT MEASUREMENTS

a) Evaluation of Feiner and Esh⁴⁸

$$I_F = 280 \pm 10 \text{ b}, \quad I_c = 140 \pm 8 \text{ b}, \quad \text{and} \quad \alpha_{RI} = 0.50 \pm 0.02$$

b) Redman and Bretscher⁴⁹

$$\alpha_{RI} = 0.501 \pm 0.022$$

⁴⁶W. G. Davey, Nucl. Sci. Eng. 26, 149 (1966).

⁴⁷L. W. Weston, G. deSaussure, and R. Gwin, Nucl. Sci. Eng. 20, 80 (1964).

⁴⁸F. Feiner and L. J. Esh, p. 299 in Proc. Am. Nucl. Soc. Topical Meeting: Reactor Physics in the Resonance and Thermal Regions, *op. cit.*

⁴⁹W. C. Redman and M. M. Bretscher, Trans. Am. Nucl. Soc. 9, 1, 245 (1966). This result was presented in June, 1966, and therefore is not included in the review of Feiner and Esh (ref. 48).

This will result in an apparent average fission width which is too small and therefore in an apparent value of $\bar{\alpha}$ which is too large.

Secondly, most investigations of the statistical distribution of the resonance parameters of ^{235}U so far were made using parameters obtained by a single-level Breit-Wigner dispersion formula and hence neglecting interference effects between neighboring levels.^{21,29,30} Lynn⁴³ has shown how, in some extreme cases at least, the single-level analysis may lead to an erroneous interpretation of the cross-section structure.

Schmidt⁴¹ discusses some other problems in determining the value of $\langle\Gamma_f\rangle$. The existence of such problems is best demonstrated by the wide spread in recently published values of $\langle\Gamma_f\rangle$ for ^{235}U :

Shore and Sailor ¹² (1955)	$\langle\Gamma_f\rangle = 71 \pm 6$ mV
Havens <u>et al.</u> ¹ (1959)	$\langle\Gamma_f\rangle = 24.9$ mV
Gibson and Drawbaugh ²⁹ (1967)	$\langle\Gamma_f\rangle = 105$ mV

For the reasons just discussed, the best method of obtaining α_{RI} or $\bar{\alpha}$ is probably by a direct numerical integration of the cross sections. However, this method may also be subject to large systematic errors. In particular, if the capture cross section is obtained as the difference of the absorption and fission cross section, a relatively small error in the fission cross section will lead to a large error in α_{RI} . This is illustrated in Table 10 where an 8% discrepancy in fission resonance integrals between our data and those of Brooks et al. leads to a 20% discrepancy in α_{RI} . In addition, if the absorption cross section is obtained by subtracting the scattering contribution from the total cross section, an error of ± 1 b in the potential scattering will lead to a 10% error in α_{RI} .

Some recent evaluations⁴¹ of α_{RI} by direct integration of the cross sections are based on the data of Brooks et al. in the neutron energy range below 100 eV and hence lead to values around 0.6 for this parameter, as indicated in Table 10.

⁴³J. E. Lynn, p. 125 in Proc. of the Conference on the Study of Nuclear Structure with Neutrons, op. cit.; also Phys. Rev. Letters 13, 412 (1964); see also A. R. Musgrove Aust. J. Phys. 20, 73 (1967).

VI. CONCLUSIONS

Reactor designers have requested the fission cross section of ^{235}U in the range from thermal to 100 keV to 2% accuracy and the capture cross section in the range up to 30 keV to an accuracy of 3%.⁴⁴ It is clear from an inspection of Tables 8-12 that over small energy intervals the discrepancies between various recent measurements of σ_f for ^{235}U are at least of the order of 5%. The discrepancies between values of σ_c are even larger. On the other hand, if the cross sections are averaged over large energy intervals, the agreement between different measurements becomes comparable with the accuracy required: the fission resonance integral from 0.4 to 61 eV computed from our data is within 2% of the values obtained from the data of Bowman et al.¹⁰ and Michaudon et al.³⁹ The integral of the fission cross section from 100 eV to 10 keV obtained with our data is within 2% of that obtained from the data of Michaudon et al.³⁹ or Wang Shi-di et al.¹⁸ In the range from 100 eV to 3 keV, our integrated capture cross section is within 5% of that measured by Wang Shi-di et al. Finally, the computed values of the fission and capture resonance integrals above 0.5 eV and of their ratio α_{RI} are in very good agreement with the measured values of those quantities.

⁴⁴Compilation of EANDC Requests, EANDC 55 "U" (1966).

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APPENDIX

TABULATED VALUES OF $\sigma_f\sqrt{E}$ AND $\sigma_c\sqrt{E}$

N	E	$\sigma_r \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_r \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_r \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_r \sqrt{E}$	$\sigma_c \sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
8	404	71,900	9,700	8	407	71,600	9,400	8	410	71,400	11,200	8	413	69,900	7,800
8	416	68,900	9,900	8	419	69,100	9,000	8	422	67,700	9,400	8	425	67,900	9,800
8	428	67,100	9,000	8	431	66,100	7,800	8	435	65,500	7,800	8	438	65,800	7,600
8	441	64,600	8,500	8	444	64,600	7,800	8	448	63,800	9,200	8	451	63,900	9,000
8	454	62,900	7,600	8	458	61,900	8,800	8	461	62,100	7,400	8	465	60,600	7,700
8	468	61,300	7,800	8	472	59,900	7,400	8	476	59,500	6,500	8	479	59,300	6,800
8	483	59,400	5,600	8	487	58,900	6,100	8	490	58,200	5,800	8	494	58,100	7,300
8	498	57,300	6,900	8	502	57,700	6,600	8	506	56,800	7,000	8	510	55,500	7,000
8	514	56,100	6,500	8	518	55,600	6,500	8	523	54,700	6,600	8	527	55,200	6,400
8	531	55,000	6,200	8	535	54,300	6,500	8	540	54,000	6,000	8	544	53,400	5,800
8	549	53,600	6,200	8	553	52,900	5,900	8	558	53,200	5,400	8	563	52,400	5,800
8	567	53,300	4,500	8	572	51,900	5,300	8	577	52,400	4,800	8	582	51,900	5,300
8	587	52,300	5,600	8	592	51,900	5,000	8	597	51,400	5,500	8	602	50,800	4,800
8	607	51,200	5,500	8	615	50,800	5,500	8	618	50,600	5,400	8	624	50,600	5,000
8	629	50,100	4,900	8	635	50,100	6,000	8	640	49,800	6,200	8	646	49,400	5,000
8	652	49,800	5,600	8	658	49,500	4,900	8	664	49,300	5,400	8	670	49,500	4,900
8	676	49,300	4,700	8	682	48,700	5,300	8	689	49,700	4,300	8	695	49,000	4,700
8	701	49,300	4,300	8	708	48,900	4,900	8	715	48,500	4,800	8	721	48,800	4,100
8	728	48,400	5,500	8	735	48,300	5,100	8	742	49,000	4,200	8	750	47,700	5,200
8	757	48,300	5,200	8	764	48,300	4,500	8	772	48,900	5,000	8	779	48,600	5,300
8	787	48,500	5,200	7	795	48,200	5,800	7	799	48,200	4,400	7	803	49,500	4,900
7	807	48,500	5,200	7	811	47,900	5,000	7	815	48,200	5,300	7	819	48,700	5,400
7	823	49,300	5,700	7	827	48,600	5,700	7	832	49,700	4,800	7	836	50,400	4,500
7	840	49,800	5,100	7	845	49,600	5,700	7	849	50,100	4,800	7	853	50,400	4,300
7	858	50,500	4,800	7	862	50,600	5,200	7	867	51,400	4,400	7	871	50,900	5,100
7	876	50,500	5,600	7	880	51,900	4,200	7	885	51,800	5,100	7	890	51,700	4,800
7	894	52,300	4,800	7	899	52,800	5,600	7	904	53,600	5,900	7	908	53,600	6,500
7	913	53,800	6,800	7	918	55,300	6,300	7	923	54,400	6,500	7	928	55,300	5,900
7	933	56,500	6,700	7	938	56,600	6,500	7	943	57,000	7,100	7	948	57,700	7,100
7	954	59,000	7,600	7	959	59,600	7,600	7	964	60,900	8,100	7	969	61,000	8,400
7	974	61,800	8,000	7	980	63,400	8,000	7	985	63,700	8,000	7	991	64,800	8,600
7	996	66,600	9,400	7	1,002	67,200	9,200	7	1,008	68,900	8,900	7	1,013	71,100	10,100
7	1,019	72,800	12,100	7	1,025	74,300	12,000	7	1,030	76,900	11,700	7	1,036	78,700	12,000
7	1,042	81,000	13,300	7	1,048	83,800	14,000	7	1,054	86,600	16,400	7	1,060	90,800	16,000
7	1,066	93,200	18,100	7	1,073	95,700	19,300	7	1,079	100,300	18,700	7	1,085	102,200	22,100
7	1,091	107,100	21,500	7	1,098	109,400	24,100	7	1,104	112,400	24,400	7	1,111	113,200	27,500
7	1,117	114,800	27,800	7	1,124	117,000	28,800	7	1,130	114,900	31,100	7	1,137	114,400	29,400
7	1,144	110,600	30,800	7	1,151	105,300	30,800	7	1,158	100,400	30,400	7	1,165	95,300	30,900
7	1,172	87,200	27,900	7	1,179	79,900	27,400	7	1,186	73,200	25,400	7	1,193	69,700	25,200
7	1,200	60,100	22,600	7	1,208	54,900	20,300	7	1,215	48,900	18,400	7	1,223	44,800	18,600
7	1,230	39,800	17,400	7	1,238	36,700	16,300	7	1,246	33,800	15,300	7	1,253	31,500	13,900
7	1,261	30,500	13,400	7	1,269	28,500	13,600	7	1,277	27,400	11,900	7	1,285	27,600	11,300
7	1,293	26,400	10,600	7	1,302	26,200	9,800	7	1,310	25,700	10,200	7	1,318	25,300	9,500
7	1,327	25,100	8,300	7	1,335	24,500	8,200	7	1,344	24,100	8,100	7	1,353	23,700	6,300
7	1,361	23,300	6,900	7	1,370	23,300	6,700	7	1,379	22,500	6,100	7	1,388	22,400	5,500
7	1,398	21,900	5,900	6	1,407	21,500	5,700	6	1,411	21,900	6,800	6	1,416	21,600	5,600
6	1,421	21,100	5,800	6	1,426	21,300	5,300	6	1,430	21,100	5,800	6	1,435	21,100	5,700
6	1,440	20,800	4,000	6	1,445	20,700	4,100	6	1,450	20,500	4,800	6	1,454	20,500	6,800
6	1,459	20,900	4,600	6	1,464	21,000	4,900	6	1,469	20,000	4,100	6	1,474	20,300	3,500
6	1,479	20,200	3,600	6	1,484	20,100	5,300	6	1,489	19,900	4,100	6	1,494	20,200	4,400
6	1,500	20,500	4,100	6	1,505	20,000	3,500	6	1,510	20,400	3,800	6	1,515	19,700	4,100
6	1,520	19,400	4,200	6	1,525	20,100	4,800	6	1,531	19,900	4,000	6	1,536	19,500	4,500
6	1,541	19,900	4,000	6	1,547	19,600	3,500	6	1,552	19,500	4,400	6	1,557	19,800	4,200
6	1,563	19,300	4,700	6	1,568	18,700	3,800	6	1,574	19,000	3,500	6	1,579	19,400	4,600
6	1,585	18,500	5,000	6	1,590	19,100	3,800	6	1,596	18,900	4,000	6	1,602	19,200	2,900
6	1,607	19,200	4,600	6	1,613	18,600	3,200	6	1,619	18,800	3,000	6	1,624	18,800	4,200
6	1,630	19,100	2,600	6	1,636	18,800	4,100	6	1,642	18,700	4,100	6	1,648	18,700	4,400

N	E	$\sigma_F/\sqrt{E}$	$\sigma_C/\sqrt{E}$	N	E	$\sigma_F/\sqrt{E}$	$\sigma_C/\sqrt{E}$	N	E	$\sigma_F/\sqrt{E}$	$\sigma_C/\sqrt{E}$	N	E	$\sigma_F/\sqrt{E}$	$\sigma_C/\sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
6	1,654	19,000	4,700	6	1,660	18,800	4,700	6	1,666	18,900	3,100	6	1,671	18,400	3,800
6	1,678	18,400	3,700	6	1,684	18,600	3,900	6	1,690	18,200	3,600	6	1,696	18,900	3,000
6	1,702	18,900	3,400	6	1,708	18,800	3,400	6	1,715	18,700	3,600	6	1,721	19,400	4,400
6	1,727	18,300	3,300	6	1,733	18,500	3,900	6	1,740	18,700	5,200	6	1,746	18,400	4,100
6	1,753	18,300	3,800	6	1,759	18,300	4,200	6	1,766	18,100	4,300	6	1,772	18,600	3,900
6	1,779	18,100	4,500	6	1,785	17,900	3,600	6	1,792	18,500	5,200	6	1,799	18,100	3,400
6	1,805	18,400	4,400	6	1,812	18,500	3,900	6	1,819	18,600	3,900	6	1,826	18,600	3,600
6	1,833	18,000	4,500	6	1,840	18,600	5,000	6	1,847	18,300	5,100	6	1,854	18,400	5,300
6	1,861	18,200	6,700	6	1,868	18,300	6,300	6	1,875	18,000	7,100	6	1,882	18,900	7,000
6	1,889	19,500	6,200	6	1,897	19,400	5,900	6	1,904	19,500	6,800	6	1,911	19,300	7,700
6	1,919	20,300	9,300	6	1,926	20,300	8,000	6	1,934	20,400	10,800	6	1,941	20,700	12,600
6	1,949	21,100	13,800	6	1,956	22,400	17,100	6	1,964	22,600	19,600	6	1,972	24,400	24,500
6	1,979	26,200	30,200	6	1,987	28,100	38,300	6	1,995	30,200	47,000	6	2,003	33,000	57,500
6	2,011	35,700	70,300	6	2,019	38,100	78,400	6	2,027	39,900	81,400	6	2,035	37,600	83,300
6	2,043	36,900	75,600	6	2,051	35,100	68,200	6	2,059	31,600	57,800	6	2,067	28,700	45,700
6	2,076	25,900	37,000	6	2,084	23,500	28,400	6	2,092	22,000	22,300	6	2,101	20,600	18,700
6	2,109	19,300	15,400	6	2,118	19,100	12,600	6	2,127	18,300	11,200	6	2,135	18,600	8,900
6	2,144	17,800	7,300	6	2,153	17,500	8,000	6	2,161	17,500	5,700	6	2,170	16,500	5,900
6	2,179	17,200	7,000	6	2,188	16,900	4,300	6	2,197	16,800	4,800	6	2,206	16,700	5,600
6	2,216	16,100	5,300	6	2,225	16,500	4,700	6	2,234	16,400	5,200	6	2,243	16,200	4,300
6	2,253	16,600	3,900	6	2,262	16,900	2,800	6	2,272	16,500	3,900	6	2,281	15,900	2,700
6	2,291	16,100	1,200	6	2,301	15,700	3,300	6	2,310	15,900	1,200	6	2,320	16,200	2,800
6	2,330	15,900	3,600	6	2,340	16,200	2,800	6	2,350	15,700	3,200	6	2,360	15,700	3,500
6	2,370	16,200	2,800	6	2,380	15,400	2,600	6	2,391	16,100	2,800	6	2,401	15,500	2,300
6	2,411	15,800	2,100	6	2,422	15,600	2,400	6	2,432	15,300	2,500	6	2,443	15,400	2,900
6	2,454	15,200	2,100	6	2,464	15,300	1,900	6	2,475	15,500	1,700	6	2,486	15,300	2,600
6	2,497	14,400	2,900	6	2,508	14,400	2,800	6	2,519	14,900	3,600	6	2,530	14,500	2,700
6	2,542	13,900	3,600	6	2,553	14,000	3,800	6	2,564	13,900	3,200	6	2,576	13,300	3,200
6	2,587	13,500	3,100	6	2,599	13,200	3,400	6	2,611	12,700	4,000	6	2,622	13,000	3,100
6	2,634	12,400	3,300	6	2,646	12,100	4,100	6	2,658	11,900	4,000	6	2,670	11,900	4,500
6	2,683	12,000	5,300	6	2,695	11,300	6,000	6	2,707	12,000	6,400	6	2,720	12,600	6,500
6	2,732	12,700	6,200	6	2,745	14,400	7,100	6	2,758	16,500	7,700	6	2,770	18,600	7,600
6	2,783	20,700	6,400	6	2,796	22,800	6,400	6	2,809	25,400	7,000	6	2,822	27,300	6,500
6	2,836	28,500	5,700	6	2,849	30,200	5,500	6	2,862	38,500	5,100	6	2,876	31,300	5,400
6	2,890	33,100	5,300	6	2,903	34,200	6,600	6	2,917	34,200	6,100	6	2,931	35,300	6,300
6	2,945	37,500	5,800	6	2,959	37,900	6,200	6	2,974	40,600	8,400	6	2,988	42,200	8,600
6	3,002	45,700	7,400	6	3,017	49,500	10,300	6	3,031	53,500	9,600	6	3,046	58,000	12,000
6	3,061	64,300	15,100	6	3,076	72,500	18,200	6	3,091	78,800	21,500	6	3,106	85,700	25,000
6	3,122	91,700	25,300	6	3,137	92,000	27,900	6	3,152	92,400	29,500	6	3,167	92,500	27,600
5	3,180	90,100	27,200	5	3,196	84,800	27,600	5	3,212	80,900	27,900	5	3,228	77,200	27,000
5	3,192	73,800	23,400	5	3,208	66,100	24,800	5	3,224	63,300	20,900	5	3,240	57,300	22,100
5	3,224	53,400	18,500	5	3,232	50,100	16,600	5	3,240	46,500	14,800	5	3,248	42,300	15,800
5	3,256	41,000	14,900	5	3,265	38,400	13,100	5	3,273	35,800	14,500	5	3,281	35,200	11,300
5	3,289	33,700	11,700	5	3,298	33,300	8,900	5	3,306	31,700	10,000	5	3,314	31,800	10,000
5	3,323	30,800	10,200	5	3,331	30,800	10,700	5	3,340	31,200	10,100	5	3,348	31,400	9,200
5	3,357	32,100	10,000	5	3,365	31,600	10,100	5	3,374	33,200	8,700	5	3,383	33,300	11,700
5	3,391	33,800	10,300	5	3,400	35,600	10,800	5	3,409	35,700	12,800	5	3,418	37,500	11,900
5	3,426	39,600	13,900	5	3,435	42,800	14,000	5	3,444	42,900	14,400	5	3,453	46,300	15,800
5	3,462	47,900	17,000	5	3,471	52,400	16,700	5	3,480	56,600	21,200	5	3,489	63,300	20,400
5	3,498	66,600	26,600	5	3,507	72,000	29,700	5	3,516	81,200	33,900	5	3,526	90,400	40,100
5	3,535	102,300	45,900	5	3,544	113,600	53,100	5	3,553	125,500	65,100	5	3,563	139,500	71,400
5	3,572	154,900	85,700	5	3,582	165,700	93,800	5	3,591	170,700	105,500	5	3,601	177,500	107,100
5	3,610	174,900	113,600	5	3,620	164,600	111,200	5	3,629	152,100	102,600	5	3,639	136,700	96,000
5	3,649	155,600	87,000	5	3,658	98,500	77,900	5	3,668	82,200	66,000	5	3,678	66,500	58,500
5	3,688	53,100	50,000	5	3,698	42,300	40,400	5	3,708	33,000	35,500	5	3,718	27,800	27,700
5	3,727	21,100	26,100	5	3,737	18,200	21,500	5	3,748	14,700	20,100	5	3,758	13,100	17,300
5	3,768	11,700	12,900	5	3,778	9,800	12,500	5	3,788	8,300	12,400	5	3,799	7,600	10,600
5	3,809	7,400	9,200	5	3,819	6,700	8,700	5	3,830	6,000	9,100	5	3,840	6,000	7,900
5	3,851	5,300	9,200	5	3,861	5,000	8,400	5	3,872	5,100	6,200	5	3,883	4,700	6,200
5	3,893	4,400	6,600	5	3,904	4,900	5,900	5	3,915	4,300	5,100	5	3,925	4,600	5,700

N	E	$\sigma_c \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_c \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_c \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_c \sqrt{E}$	$\sigma_c \sqrt{E}$
(eV)	(b eV ^{1/2})	(b eV ^{1/2})	(b eV ^{1/2})	(eV)	(b eV ^{1/2})	(b eV ^{1/2})	(b eV ^{1/2})	(eV)	(b eV ^{1/2})	(b eV ^{1/2})	(b eV ^{1/2})	(eV)	(b eV ^{1/2})	(b eV ^{1/2})	(b eV ^{1/2})
5	3.936	4.700	4.500	5	3.947	4.400	3.500	5	3.958	4.100	5.700	5	3.969	4.300	3.500
5	3.980	4.100	7.000	5	3.991	4.800	3.500	5	4.002	4.200	5.000	5	4.014	4.400	4.600
5	4.025	4.300	4.300	5	4.036	4.700	4.300	5	4.047	4.500	2.700	5	4.059	4.300	4.400
5	4.070	5.200	3.000	5	4.082	4.700	3.700	5	4.093	4.800	4.600	5	4.105	4.900	4.300
5	4.116	5.200	4.400	5	4.128	5.200	4.900	5	4.140	5.300	2.400	5	4.151	5.200	1.600
5	4.163	4.900	4.600	5	4.175	5.200	3.700	5	4.187	5.400	4.000	5	4.199	5.600	2.700
5	4.211	5.800	3.600	5	4.223	5.500	3.900	5	4.235	5.900	3.900	5	4.247	6.100	3.900
5	4.259	5.500	3.200	5	4.272	6.100	2.600	5	4.284	6.200	4.800	5	4.296	5.700	2.600
5	4.309	6.100	6.300	5	4.321	6.300	5.200	5	4.334	6.300	4.900	5	4.346	6.400	4.900
5	4.359	6.600	5.500	5	4.372	6.200	5.400	5	4.385	6.600	3.200	5	4.397	6.800	4.900
5	4.410	7.000	4.600	5	4.423	6.400	6.400	5	4.436	6.500	4.100	5	4.449	6.700	4.000
5	4.462	6.900	6.200	5	4.475	7.200	4.800	5	4.489	7.000	5.400	5	4.502	7.100	6.900
5	4.515	7.000	8.100	5	4.529	7.700	6.900	5	4.542	7.200	5.900	5	4.556	7.100	7.400
5	4.569	7.100	9.100	5	4.583	7.700	8.300	5	4.596	7.800	9.100	5	4.610	7.600	9.800
5	4.624	8.100	11.800	5	4.638	8.600	14.400	5	4.652	8.300	15.000	5	4.666	9.300	16.500
5	4.680	9.300	19.400	5	4.694	10.200	23.300	5	4.708	10.500	30.900	5	4.723	11.800	37.900
5	4.737	13.300	50.600	5	4.751	16.500	73.600	5	4.766	20.300	105.000	5	4.780	26.100	152.700
5	4.795	33.500	218.700	5	4.809	40.500	291.200	5	4.824	48.200	354.800	5	4.839	51.000	386.000
5	4.854	49.400	368.400	5	4.869	41.800	315.800	5	4.884	33.100	240.300	5	4.899	26.100	173.200
5	4.914	20.300	117.900	5	4.929	16.400	81.200	5	4.944	13.200	54.600	5	4.960	11.600	40.500
5	4.975	11.300	28.100	5	4.991	10.700	22.900	5	5.006	10.500	19.000	5	5.022	10.300	18.100
5	5.037	10.700	13.600	5	5.053	10.700	12.000	5	5.069	11.600	11.000	5	5.085	11.200	11.400
5	5.101	12.200	6.800	5	5.117	11.900	6.000	5	5.133	13.300	3.400	5	5.150	13.700	2.800
5	5.166	14.300	2.900	5	5.182	15.400	1.400	5	5.199	15.700	3.900	5	5.215	17.000	3.800
5	5.232	17.700	4.900	5	5.249	19.200	6.500	5	5.265	20.700	5.700	5	5.282	22.300	6.700
5	5.299	23.200	7.500	5	5.316	25.100	5.700	5	5.333	26.300	8.400	5	5.350	28.600	8.600
5	5.368	29.000	10.200	5	5.385	32.200	10.200	5	5.403	32.200	11.900	5	5.420	33.800	14.500
5	5.438	35.900	16.500	5	5.455	35.700	15.900	5	5.473	38.400	13.700	5	5.491	37.300	13.600
5	5.509	37.900	10.400	5	5.527	38.400	8.600	5	5.545	37.600	8.000	5	5.563	37.900	7.600
5	5.582	37.600	7.800	5	5.600	36.800	8.800	5	5.619	37.300	5.300	5	5.637	35.900	8.400
5	5.656	37.100	8.200	5	5.675	35.800	7.300	5	5.694	36.000	7.000	5	5.713	35.800	8.100
5	5.732	35.800	8.700	5	5.751	35.900	7.400	5	5.770	36.300	9.700	5	5.789	36.100	9.200
5	5.809	36.600	12.500	5	5.828	37.200	8.900	5	5.848	38.400	8.800	5	5.868	39.600	11.200
5	5.888	42.700	9.900	5	5.907	41.700	13.800	5	5.928	45.500	15.800	5	5.948	47.300	14.700
5	5.968	51.300	15.100	5	5.988	55.200	16.800	5	6.009	58.000	21.100	5	6.029	63.500	22.000
5	6.050	70.200	27.700	5	6.071	79.200	31.000	5	6.092	85.700	33.700	5	6.113	96.600	41.700
5	6.134	108.400	46.100	5	6.155	118.400	56.700	5	6.176	126.900	65.700	5	6.198	130.700	80.500
5	6.219	130.800	104.000	5	6.241	132.900	133.700	5	6.263	132.800	194.300	5	6.285	148.600	287.700
5	6.307	185.100	455.200	5	6.329	246.800	699.900	5	6.351	313.600	963.500	5	6.373	349.900	1113.400
5	6.396	329.600	1060.000	5	6.418	255.900	837.200	5	6.441	174.900	559.100	5	6.464	108.400	344.000
5	6.487	67.100	203.300	5	6.510	42.900	125.200	5	6.533	29.600	82.600	4	6.556	24.100	63.500
4	6.568	22.600	52.400	4	6.580	20.200	47.200	4	6.591	19.200	38.500	4	6.603	16.600	40.700
4	6.615	16.200	35.700	4	6.627	15.400	29.500	4	6.639	14.900	26.700	4	6.651	13.700	22.500
4	6.663	13.400	23.500	4	6.675	13.800	20.300	4	6.687	13.900	17.100	4	6.699	12.600	21.100
4	6.711	14.000	21.000	4	6.723	13.600	19.900	4	6.735	14.200	18.600	4	6.747	14.800	19.300
4	6.760	14.100	19.600	4	6.772	15.100	22.900	4	6.784	16.000	19.400	4	6.797	16.100	21.900
4	6.809	17.700	21.600	4	6.821	18.200	22.100	4	6.834	19.500	21.100	4	6.846	21.100	23.200
4	6.859	22.100	25.100	4	6.871	22.600	27.300	4	6.884	25.700	29.900	4	6.896	29.400	32.100
4	6.909	33.000	35.100	4	6.922	36.200	40.500	4	6.934	43.800	45.500	4	6.947	51.200	54.200
4	6.960	62.500	66.200	4	6.973	75.000	82.500	4	6.985	91.400	100.000	4	6.998	112.400	128.600
4	7.011	140.900	158.400	4	7.024	164.500	195.600	4	7.037	199.900	222.800	4	7.050	223.400	260.100
4	7.063	242.900	281.400	4	7.076	243.300	299.200	4	7.089	242.400	285.900	4	7.103	224.200	270.600
4	7.116	200.100	238.900	4	7.129	168.900	208.800	4	7.142	133.100	171.500	4	7.155	111.100	135.600
4	7.169	82.800	106.900	4	7.182	62.600	85.900	4	7.196	50.400	66.700	4	7.209	38.600	53.600
4	7.223	32.000	42.200	4	7.236	26.600	38.100	4	7.250	22.400	30.700	4	7.263	18.600	26.600
4	7.277	18.300	22.100	4	7.291	16.100	18.400	4	7.304	14.700	18.900	4	7.318	13.200	15.700
4	7.332	12.800	15.900	4	7.346	11.200	14.600	4	7.360	12.400	11.100	4	7.374	11.400	10.800
4	7.388	9.700	13.700	4	7.402	10.100	9.200	4	7.416	10.000	11.100	4	7.430	10.400	12.000
4	7.444	10.400	11.000	4	7.458	10.200	9.400	4	7.472	10.300	7.500	4	7.486	10.400	9.600
4	7.501	9.700	12.200	4	7.515	9.200	9.700	4	7.529	9.600	10.300	4	7.544	9.100	11.300

N	E	$\sigma_E \sqrt{E}$	$\sigma_E \sqrt{E}$	N	E	$\sigma_E \sqrt{E}$	$\sigma_E \sqrt{E}$	N	E	$\sigma_E \sqrt{E}$	$\sigma_E \sqrt{E}$	N	E	$\sigma_E \sqrt{E}$	$\sigma_E \sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
4	7,558	9,200	12,100	4	7,573	10,300	11,600	4	7,587	9,900	10,500	4	7,602	9,100	8,500
4	7,616	9,300	9,500	4	7,631	8,700	13,000	4	7,646	7,500	12,400	4	7,660	7,500	12,200
4	7,675	6,100	11,700	4	7,690	6,900	11,900	4	7,705	6,400	9,300	4	7,720	5,500	13,600
4	7,735	4,700	10,100	4	7,750	4,400	11,500	4	7,765	4,700	11,000	4	7,780	5,100	11,600
4	7,795	4,700	8,800	4	7,810	4,500	10,400	4	7,826	5,000	11,400	4	7,841	5,100	10,100
4	7,856	5,600	14,500	4	7,872	5,600	12,000	4	7,887	7,300	10,000	4	7,902	7,100	13,300
4	7,918	7,600	12,100	4	7,933	8,900	12,000	4	7,949	8,900	11,600	4	7,965	10,000	13,000
4	7,980	9,500	11,700	4	7,996	10,300	15,300	4	8,012	11,100	14,700	4	8,028	11,300	14,800
4	8,043	14,000	15,000	4	8,059	13,400	13,700	4	8,075	15,200	15,200	4	8,091	15,600	14,700
4	8,107	17,600	18,900	4	8,123	17,900	16,500	4	8,140	19,000	20,800	4	8,156	22,200	20,000
4	8,172	23,000	18,500	4	8,188	24,900	21,100	4	8,205	27,200	20,500	4	8,221	29,500	23,100
4	8,237	33,000	25,200	4	8,254	35,100	23,900	4	8,270	38,100	23,700	4	8,287	39,400	30,100
4	8,304	44,100	29,500	4	8,320	48,900	32,400	4	8,337	52,500	34,500	4	8,354	57,900	37,700
4	8,371	63,900	39,600	4	8,387	71,700	40,900	4	8,404	79,800	45,100	4	8,421	89,900	45,100
4	8,438	101,800	50,600	4	8,456	112,300	57,300	4	8,473	127,700	61,300	4	8,490	145,600	70,100
4	8,507	173,300	77,100	4	8,525	196,000	90,100	4	8,542	230,000	102,400	4	8,559	272,500	115,800
4	8,577	320,700	138,500	4	8,594	386,300	165,800	4	8,612	477,500	194,500	4	8,629	591,200	245,800
4	8,647	734,700	291,000	4	8,665	917,300	353,700	4	8,683	1,233,000	431,100	4	8,701	1,357,500	514,900
4	8,718	1,596,300	581,900	4	8,736	1,813,000	639,700	4	8,754	1,958,200	666,900	4	8,772	1,996,100	689,700
4	8,790	1,941,600	671,300	4	8,809	1,795,400	617,200	4	8,827	1,601,200	536,300	4	8,845	1,373,100	451,700
4	8,863	1,133,300	377,600	4	8,882	950,400	304,000	4	8,900	786,900	246,600	4	8,919	659,600	192,700
4	8,938	560,000	161,200	4	8,956	480,900	139,300	4	8,975	422,500	113,200	4	8,994	371,900	108,300
4	9,012	337,600	94,700	4	9,031	306,100	83,500	4	9,050	282,900	76,100	4	9,069	258,900	72,000
4	9,088	246,800	75,200	4	9,107	230,700	73,400	4	9,126	220,900	70,600	4	9,146	214,900	81,400
4	9,165	223,800	88,100	4	9,184	239,900	105,200	4	9,204	257,100	117,300	4	9,223	287,100	133,400
4	9,243	312,900	146,100	4	9,262	336,200	149,400	4	9,282	337,200	152,200	4	9,302	331,500	129,300
4	9,322	305,300	114,100	4	9,341	266,800	94,400	4	9,361	232,500	78,600	4	9,381	195,200	66,500
4	9,401	187,900	49,700	4	9,421	151,000	40,400	4	9,441	136,200	31,500	4	9,462	121,300	28,200
4	9,482	112,000	24,800	4	9,502	103,600	23,500	4	9,523	98,800	21,000	4	9,543	93,500	20,100
4	9,564	92,800	16,700	4	9,585	89,600	20,100	4	9,605	89,000	17,100	4	9,626	86,000	20,600
4	9,647	86,000	17,800	4	9,668	92,200	16,100	4	9,689	83,300	21,200	4	9,710	87,200	18,500
4	9,731	87,400	18,600	4	9,752	81,200	27,500	4	9,773	76,500	15,800	4	9,795	73,100	18,100
4	9,816	66,100	16,400	4	9,837	63,700	14,700	4	9,859	54,600	15,400	4	9,880	53,700	15,200
4	9,902	49,900	11,800	4	9,924	45,100	12,900	4	9,946	42,900	14,600	4	9,968	40,700	14,200
4	9,989	44,400	17,600	4	10,011	44,000	21,700	4	10,033	46,200	24,400	4	10,056	55,300	30,700
4	10,078	67,500	39,100	4	10,100	80,400	48,200	4	10,123	98,900	57,600	4	10,145	113,100	61,900
4	10,168	122,000	60,600	4	10,190	122,200	57,500	4	10,213	112,800	48,900	4	10,236	102,300	40,500
4	10,258	86,380	34,200	4	10,281	74,800	26,200	4	10,304	65,900	18,400	4	10,327	56,300	15,500
4	10,351	54,200	13,400	4	10,374	50,200	9,900	4	10,397	45,900	11,200	4	10,421	44,600	10,100
4	10,444	42,400	9,200	4	10,468	42,700	9,500	4	10,491	41,400	9,600	4	10,515	41,200	6,200
4	10,539	40,200	6,300	4	10,563	39,800	9,500	4	10,586	38,900	5,300	4	10,610	38,600	8,700
4	10,635	38,300	8,700	4	10,659	39,500	7,900	4	10,683	40,700	8,700	4	10,707	40,800	9,800
4	10,732	43,200	6,600	4	10,756	43,100	8,800	4	10,781	42,200	11,300	4	10,806	43,600	12,700
4	10,830	42,700	9,300	4	10,855	41,300	11,700	4	10,880	42,000	10,700	4	10,905	40,800	11,900
4	10,930	38,600	11,800	4	10,955	39,200	12,100	4	10,981	38,600	14,300	4	11,006	38,100	12,400
4	11,032	36,700	15,900	4	11,057	37,700	14,800	4	11,083	37,100	13,200	4	11,109	39,600	15,200
4	11,134	37,300	19,700	4	11,160	39,900	21,700	4	11,186	38,600	20,400	4	11,212	41,000	21,100
4	11,239	41,400	25,400	4	11,265	41,800	33,700	4	11,291	45,400	32,800	4	11,318	45,600	38,500
4	11,344	47,100	47,900	4	11,371	49,600	53,300	4	11,398	52,000	66,800	4	11,424	59,300	84,400
4	11,451	63,100	111,100	4	11,478	73,800	156,900	4	11,506	84,700	232,300	4	11,533	110,100	363,900
4	11,560	147,000	592,700	4	11,588	189,800	909,000	4	11,615	238,700	1269,800	4	11,643	257,200	1533,900
4	11,670	250,000	138,600	4	11,698	201,200	1295,300	4	11,726	144,500	923,800	4	11,754	96,700	59,100
4	11,782	66,000	346,400	4	11,810	53,500	200,500	4	11,839	49,900	128,900	4	11,867	48,800	92,100
4	11,896	52,300	73,800	4	11,924	55,400	69,400	4	11,953	60,400	61,300	4	11,982	67,200	59,900
4	12,011	76,600	65,900	4	12,040	84,700	69,800	4	12,069	96,200	84,200	4	12,098	115,700	96,900
4	12,127	135,500	116,900	4	12,157	166,800	157,500	4	12,187	208,200	205,500	3	12,216	265,500	264,600
3	12,231	311,400	317,000	3	12,246	363,500	393,600	3	12,261	439,000	486,100	3	12,276	535,500	606,700
3	12,291	691,800	741,900	3	12,306	792,500	908,800	3	12,321	943,100	1109,800	3	12,336	1095,400	1306,900
3	12,351	1226,900	1492,000	3	12,366	1339,600	1664,600	3	12,381	1406,000	1764,700	3	12,397	1418,200	1789,300
3	12,412	1361,300	1726,800	3	12,427	1250,000	1628,100	3	12,442	1101,500	1459,500	3	12,458	918,600	1268,000

N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$
	(eV)	(b eV ^{1/2})	(t eV ^{1/2})		(eV)	(b eV ^{1/2})	(t eV ^{1/2})		(eV)	(b eV ^{1/2})	(t eV ^{1/2})		(eV)	(b eV ^{1/2})	(t eV ^{1/2})
3	12,473	755,600	1052,800	3	12,488	601,100	853,700	3	12,504	466,400	675,800	3	12,519	349,200	521,900
3	12,534	266,100	413,500	3	12,550	208,600	318,400	3	12,565	160,600	252,100	3	12,581	126,400	199,000
3	12,596	102,700	157,200	3	12,612	90,900	133,900	3	12,628	79,200	117,000	3	12,643	73,400	94,600
3	12,659	67,600	83,700	3	12,675	68,800	79,100	3	12,690	68,800	83,500	3	12,706	70,000	82,800
3	12,722	69,000	97,200	3	12,738	75,800	49,200	3	12,754	81,700	47,200	3	12,769	87,100	47,100
3	12,785	91,400	47,200	3	12,801	95,000	48,900	3	12,817	103,600	46,600	3	12,833	105,300	47,700
3	12,849	106,300	47,900	3	12,865	106,400	48,900	3	12,881	101,400	49,900	3	12,897	98,500	40,400
3	12,914	91,100	42,600	3	12,930	82,800	37,900	3	12,946	74,900	31,500	3	12,962	67,800	33,300
3	12,978	63,000	31,000	3	12,995	60,000	28,800	3	13,011	53,300	24,000	3	13,027	52,400	22,500
3	13,044	50,100	21,000	3	13,060	50,700	21,100	3	13,077	51,800	21,700	3	13,093	52,100	22,000
3	13,110	55,200	24,400	3	13,126	59,400	14,100	3	13,143	63,600	19,300	3	13,159	66,700	17,300
3	13,176	72,400	18,400	3	13,193	77,600	21,500	3	13,209	82,900	20,400	3	13,226	87,100	20,800
3	13,243	90,700	22,400	3	13,260	92,200	23,300	3	13,276	99,200	22,500	3	13,293	96,800	23,000
3	13,310	95,300	21,600	3	13,327	93,700	17,800	3	13,344	88,900	20,200	3	13,361	87,800	22,400
3	13,378	84,200	18,700	3	13,395	79,900	16,200	3	13,412	82,500	14,700	3	13,429	76,400	16,700
3	13,447	78,700	14,400	3	13,464	79,400	13,100	3	13,481	85,400	15,200	3	13,498	90,700	14,000
3	13,515	93,900	15,600	3	13,533	99,500	18,500	3	13,550	108,600	20,300	3	13,567	122,100	21,400
3	13,585	129,600	23,900	3	13,602	143,600	19,700	3	13,620	157,500	25,300	3	13,637	166,400	26,900
3	13,655	182,100	28,300	3	13,672	192,700	28,700	3	13,690	201,400	34,600	3	13,708	217,300	25,700
3	13,725	222,900	29,100	3	13,743	226,400	30,900	3	13,761	233,400	30,700	3	13,779	246,700	27,600
3	13,796	256,100	24,800	3	13,814	259,700	26,600	3	13,832	266,300	27,300	3	13,850	281,900	25,000
3	13,868	288,300	29,700	3	13,886	297,800	29,700	3	13,904	311,600	29,100	3	13,922	324,900	22,600
3	13,940	323,600	25,600	3	13,958	331,800	28,900	3	13,977	333,500	25,500	3	13,995	334,700	21,200
3	14,013	327,200	26,900	3	14,031	327,500	24,500	3	14,050	316,800	20,000	3	14,068	306,100	23,600
3	14,086	297,300	24,400	3	14,105	288,700	19,900	3	14,123	270,100	21,500	3	14,142	267,400	17,900
3	14,160	251,100	15,400	3	14,179	229,300	26,100	3	14,197	224,600	21,000	3	14,216	210,300	23,000
3	14,235	202,200	20,700	3	14,254	184,500	25,600	3	14,272	180,900	21,200	3	14,291	171,300	21,200
3	14,310	164,200	20,400	3	14,329	159,900	23,600	3	14,348	151,500	27,800	3	14,367	153,600	32,200
3	14,386	148,200	41,000	3	14,404	150,700	50,700	3	14,424	150,600	57,600	3	14,443	147,200	80,100
3	14,462	156,100	95,100	3	14,481	159,600	17,300	3	14,500	166,100	137,400	3	14,519	158,400	158,400
3	14,539	151,700	170,900	3	14,558	139,400	76,000	3	14,577	123,200	161,500	3	14,597	101,300	144,800
3	14,616	83,100	121,000	3	14,636	69,800	103,100	3	14,655	53,100	80,300	3	14,675	45,800	59,200
3	14,694	44,200	46,900	3	14,714	37,000	37,800	3	14,734	35,600	30,400	3	14,753	35,300	21,400
3	14,773	32,900	21,300	3	14,793	33,000	18,800	3	14,813	29,100	18,100	3	14,833	31,600	18,100
3	14,852	32,800	15,100	3	14,872	31,800	15,000	3	14,892	32,900	16,100	3	14,912	32,000	14,500
3	14,933	32,400	13,100	3	14,953	33,200	13,500	3	14,973	34,300	11,400	3	14,993	33,600	16,700
3	15,013	33,900	16,600	3	15,033	36,200	17,300	3	15,054	35,700	18,900	3	15,074	41,600	20,700
3	15,094	41,600	18,800	3	15,115	45,700	20,200	3	15,135	48,300	23,200	3	15,156	55,100	26,000
3	15,177	61,200	28,500	3	15,197	65,000	32,500	3	15,218	76,400	42,300	3	15,238	88,900	50,600
3	15,259	110,100	34,100	3	15,280	132,700	76,100	3	15,301	154,600	103,200	3	15,322	190,800	127,100
3	15,343	216,900	153,700	3	15,363	242,600	177,600	3	15,384	262,800	174,100	3	15,405	266,800	209,900
3	15,427	261,200	211,600	3	15,448	235,100	90,100	3	15,469	199,800	74,400	3	15,490	165,600	140,500
3	15,511	126,000	114,400	3	15,532	100,100	85,800	3	15,554	72,500	71,200	3	15,575	52,500	63,700
3	15,597	421,400	50,200	3	15,618	33,900	41,800	3	15,640	27,700	39,700	3	15,661	22,300	39,500
3	15,683	21,500	33,400	3	15,704	17,900	35,600	3	15,726	17,000	34,900	3	15,748	17,600	29,700
3	15,770	20,200	34,500	3	15,791	20,100	40,900	3	15,813	23,300	41,200	3	15,835	29,400	47,000
3	15,857	35,700	55,200	3	15,879	43,500	65,400	3	15,901	54,700	92,500	3	15,923	71,400	109,800
3	15,945	98,600	145,100	3	15,968	127,300	92,200	3	15,990	167,900	256,300	3	16,012	213,200	318,300
3	16,035	252,300	395,900	3	16,057	286,100	454,800	3	16,079	302,800	494,300	3	16,102	301,400	494,700
3	16,124	267,400	492,300	3	16,147	227,500	379,000	3	16,169	177,300	308,400	3	16,192	127,100	235,200
3	16,215	87,800	173,100	3	16,237	59,400	125,800	3	16,260	43,800	90,400	3	16,283	29,400	69,800
3	16,306	24,200	92,300	3	16,329	22,200	48,900	3	16,352	21,600	45,800	3	16,375	27,000	35,900
3	16,398	30,400	37,300	3	16,421	40,100	36,800	3	16,445	50,100	41,800	3	16,468	69,800	45,100
3	16,491	85,900	57,500	3	16,514	114,700	62,500	3	16,538	152,200	68,000	3	16,561	187,800	73,400
3	16,585	231,200	89,800	3	16,608	267,400	97,300	3	16,632	296,900	98,000	3	16,655	316,900	96,900
3	16,679	306,800	97,500	3	16,703	298,400	90,900	3	16,727	271,500	79,200	3	16,751	236,700	68,000
3	16,774	202,500	94,800	3	16,798	164,100	46,600	3	16,822	143,000	34,300	3	16,846	114,300	33,200
3	16,871	95,900	26,900	3	16,895	81,700	21,800	3	16,919	69,900	18,500	3	16,943	62,500	17,400
3	16,967	54,800	20,300	3	16,992	49,400	19,100	3	17,016	47,500	14,900	3	17,041	42,000	14,700
3	17,065	42,400	10,900	3	17,090	34,600	18,000	3	17,114	33,300	11,000	3	17,139	31,100	10,200

N	E	$\sigma_f \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_f \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_f \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_f \sqrt{E}$	$\sigma_c \sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
3	17,164	30,500	14,900	3	17,189	28,900	12,700	3	17,213	29,000	11,200	3	17,238	27,200	10,000
3	17,263	27,300	13,700	3	17,288	24,800	10,600	3	17,313	26,200	9,500	3	17,338	26,000	16,600
3	17,363	24,800	13,600	3	17,389	22,100	10,600	3	17,414	23,600	9,000	3	17,439	23,500	9,600
3	17,465	24,600	10,300	3	17,490	27,200	18,500	3	17,516	26,000	13,400	3	17,541	26,400	16,000
3	17,567	30,000	13,400	3	17,592	29,800	15,500	3	17,618	33,600	20,100	3	17,644	32,700	19,100
3	17,670	40,000	19,900	3	17,696	41,800	22,900	3	17,721	48,200	22,800	3	17,748	56,700	24,700
3	17,774	63,100	30,300	3	17,800	76,300	36,900	3	17,826	97,600	32,600	3	17,852	120,200	41,100
3	17,878	148,300	53,400	3	17,905	183,800	64,400	3	17,931	223,400	72,500	3	17,958	270,200	87,300
3	17,984	319,200	100,900	3	18,011	357,200	101,400	3	18,037	373,500	99,500	3	18,064	374,600	102,300
3	18,091	353,600	97,100	3	18,118	329,000	83,400	3	18,144	281,700	72,100	3	18,171	239,000	57,800
3	18,198	203,400	50,200	3	18,225	167,000	39,900	3	18,253	139,100	34,300	3	18,280	119,800	38,300
3	18,307	106,800	28,400	3	18,334	99,500	23,200	3	18,362	89,800	28,500	3	18,389	83,600	32,600
3	18,416	80,100	29,200	3	18,444	82,100	24,200	3	18,472	80,500	30,700	3	18,499	81,700	25,300
3	18,527	79,100	32,400	3	18,555	84,700	29,200	3	18,583	85,200	31,700	3	18,611	86,400	36,800
3	18,639	93,700	40,000	3	18,667	100,000	45,600	3	18,695	103,500	44,800	3	18,723	118,100	52,400
3	18,751	126,400	56,200	3	18,780	137,700	62,700	3	18,808	154,000	76,200	3	18,836	169,800	95,200
3	18,865	194,100	108,500	3	18,893	222,100	137,500	3	18,922	250,100	162,300	3	18,951	287,500	191,200
3	18,979	319,900	224,000	3	19,008	362,400	257,600	3	19,037	428,400	290,700	3	19,066	520,100	345,200
3	19,095	670,000	431,900	3	19,124	892,100	536,000	3	19,153	1,194,700	695,900	3	19,183	1,569,500	925,600
3	19,212	2,043,900	1,733,000	3	19,241	2,469,500	1,431,400	3	19,271	2,800,600	1,587,900	3	19,300	2,881,800	1,670,400
3	19,329	2,739,100	1,586,100	3	19,359	2,362,800	1,344,100	3	19,389	1,884,500	1,083,200	3	19,419	1,423,800	803,000
3	19,448	1,021,900	979,200	3	19,478	742,800	399,500	3	19,508	533,100	286,800	3	19,538	395,200	202,300
3	19,568	306,900	156,700	3	19,599	245,400	120,300	3	19,629	205,700	96,400	3	19,659	169,700	85,400
3	19,689	146,300	70,500	3	19,720	131,900	55,300	3	19,751	121,800	53,800	3	19,781	105,300	44,200
3	19,812	100,000	42,300	3	19,842	96,800	38,300	3	19,873	88,000	40,400	3	19,904	85,700	36,000
3	19,935	87,400	28,000	3	19,966	85,500	33,000	3	19,997	91,200	30,500	3	20,028	96,200	32,400
3	20,060	98,200	39,400	3	20,091	104,000	38,200	3	20,122	108,900	38,600	3	20,154	106,500	43,700
3	20,185	98,800	46,400	3	20,217	92,000	47,500	3	20,249	84,100	44,800	3	20,280	69,700	45,400
3	20,312	63,100	44,000	3	20,344	60,600	40,700	3	20,376	61,700	43,400	3	20,408	66,500	45,800
3	20,440	80,600	54,700	3	20,473	97,500	66,800	3	20,505	115,600	78,600	3	20,537	137,900	96,200
3	20,570	158,200	122,100	3	20,602	180,000	140,300	3	20,635	182,500	155,600	3	20,667	171,000	155,000
3	20,700	149,000	155,500	3	20,733	131,700	154,500	3	20,766	119,300	156,000	3	20,799	123,700	174,000
3	20,832	151,500	212,000	3	20,865	198,300	272,100	3	20,898	280,800	379,500	3	20,931	403,800	529,800
3	20,965	566,800	743,600	3	20,998	751,800	870,600	3	21,032	921,000	1,163,700	3	21,066	880,500	1,250,800
3	21,099	931,200	1,202,000	3	21,133	784,800	981,800	3	21,167	561,200	726,500	3	21,201	386,500	483,600
3	21,235	246,300	363,800	3	21,269	145,600	193,100	3	21,303	93,600	119,700	3	21,337	63,200	83,800
3	21,372	46,600	98,900	3	21,406	34,700	44,300	3	21,441	31,000	32,700	3	21,475	25,100	33,300
3	21,510	19,000	24,400	3	21,545	18,600	20,700	3	21,580	16,700	20,900	3	21,615	13,600	15,900
3	21,649	10,700	15,700	3	21,685	9,400	15,800	3	21,720	10,800	11,900	3	21,755	7,200	9,900
3	21,791	6,300	11,600	3	21,826	5,700	12,800	3	21,862	8,200	9,800	3	21,897	6,000	12,400
3	21,933	7,200	6,400	3	21,969	6,700	10,500	3	22,004	6,300	10,300	3	22,041	6,700	11,000
3	22,076	8,200	5,600	3	22,113	8,800	10,400	3	22,149	8,800	10,200	3	22,185	10,100	12,000
3	22,222	11,400	15,200	3	22,258	13,200	11,700	3	22,295	12,200	17,500	3	22,331	15,100	16,900
3	22,368	17,000	16,700	3	22,405	18,600	13,300	3	22,442	20,400	17,900	3	22,479	25,500	21,900
3	22,516	26,600	23,100	3	22,554	32,800	26,800	3	22,591	40,000	32,500	3	22,628	48,300	38,300
3	22,666	59,700	45,500	3	22,703	76,900	63,800	3	22,741	108,100	84,100	3	22,779	151,200	114,700
3	22,817	206,100	162,300	3	22,855	278,000	213,500	3	22,893	344,400	255,000	3	22,931	375,900	283,100
3	22,969	366,500	271,600	3	23,008	313,200	241,700	3	23,046	243,900	199,500	3	23,085	181,400	163,300
3	23,123	145,100	141,900	3	23,162	127,700	150,000	3	23,201	129,200	195,500	3	23,240	159,100	272,200
3	23,279	210,100	408,000	3	23,318	284,000	600,000	3	23,357	363,100	813,800	3	23,397	442,200	958,800
3	23,436	496,300	974,400	3	23,476	531,100	826,300	3	23,515	546,100	628,500	3	23,555	571,100	414,700
3	23,595	800,400	281,700	3	23,635	609,700	199,900	3	23,675	97,100	160,900	3	23,715	506,800	124,000
3	23,755	428,500	97,700	3	23,796	341,000	72,400	3	23,836	270,300	63,500	3	23,877	208,400	58,000
3	23,917	169,100	48,300	3	23,958	137,000	61,900	3	23,999	117,400	69,600	3	24,040	117,000	83,200
3	24,081	123,300	113,600	3	24,122	152,800	152,400	3	24,164	201,800	198,800	3	24,205	262,000	214,600
3	24,247	304,600	231,700	3	24,288	327,100	210,700	3	24,330	307,300	178,800	3	24,372	269,500	141,700
3	24,414	234,200	105,600	3	24,456	203,700	73,800	3	24,498	192,600	45,400	3	24,540	178,400	31,600
3	24,583	168,080	19,600	3	24,625	169,400	13,700	3	24,668	168,400	10,800	3	24,710	167,700	13,200
3	24,753	70,800	12,500	3	24,796	179,600	13,100	3	24,839	180,800	12,300	3	24,882	188,700	13,700
3	24,925	197,700	4,400	3	24,969	202,500	7,900	3	25,012	212,200	8,900	3	25,056	229,400	15,900

N	E	$\sigma_e/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_e/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_e/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_e/\sqrt{E}$	$\sigma_c/\sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
3	25,100	240,800	12,500	3	25,143	255,200	12,500	3	25,188	272,800	14,400	3	25,232	289,000	13,700
3	25,278	315,000	10,000	3	25,320	326,700	12,700	3	25,364	353,400	16,800	3	25,409	373,200	12,900
3	25,454	384,800	28,700	3	25,498	399,200	16,700	3	25,543	409,500	23,100	3	25,588	399,500	18,600
3	25,633	387,400	16,500	3	25,679	364,800	20,900	3	25,724	316,500	23,100	3	25,769	272,300	23,700
3	25,815	229,400	25,900	3	25,861	184,600	24,000	3	25,907	149,300	19,700	3	25,953	110,700	24,000
3	25,999	90,400	25,000	3	26,045	69,600	31,500	3	26,091	65,600	25,500	3	26,138	67,000	28,400
3	26,184	84,900	36,700	3	26,231	112,700	32,200	3	26,278	156,900	41,600	3	26,325	213,100	47,200
3	26,372	273,200	58,600	3	26,419	326,800	66,100	3	26,466	372,300	70,200	3	26,514	377,600	59,900
3	26,561	351,000	59,100	3	26,609	293,600	49,400	3	26,657	239,500	35,100	3	26,705	195,300	26,900
3	26,753	161,300	23,400	3	26,801	139,900	19,200	3	26,850	121,800	14,900	3	26,898	107,100	15,100
3	26,947	97,000	19,900	3	26,996	93,400	20,600	3	27,044	98,500	23,200	3	27,093	94,400	30,500
3	27,143	99,300	36,200	3	27,192	86,100	40,000	3	27,241	73,000	33,800	3	27,291	61,300	30,300
3	27,341	51,500	23,300	3	27,390	44,000	19,100	3	27,440	44,000	21,500	3	27,490	54,600	28,000
3	27,541	70,000	31,500	2	27,591	94,000	39,000	2	27,641	107,000	44,100	2	27,692	137,300	54,500
2	27,667	169,800	63,900	2	27,692	213,000	83,000	2	27,718	258,100	96,100	2	27,743	296,600	114,100
2	27,769	347,600	120,000	2	27,794	369,800	141,900	2	27,820	389,500	153,900	2	27,845	413,500	139,200
2	27,871	39,400	139,400	2	27,896	360,000	147,100	2	27,922	321,300	124,600	2	27,948	274,300	107,300
2	27,973	226,500	104,000	2	27,999	192,400	82,200	2	28,025	161,400	67,800	2	28,051	139,000	62,600
2	28,107	127,100	49,100	2	28,133	115,300	50,400	2	28,159	113,600	43,300	2	28,185	111,700	47,000
2	28,241	106,800	50,000	2	28,267	107,000	53,900	2	28,293	113,700	54,800	2	28,319	121,300	54,000
2	28,385	127,700	54,100	2	28,411	135,500	57,700	2	28,437	140,900	53,500	2	28,463	147,100	55,200
2	28,520	140,700	51,000	2	28,546	139,200	41,900	2	28,572	121,500	45,100	2	28,598	123,500	34,400
2	28,656	108,100	31,700	2	28,682	96,200	31,200	2	28,708	82,900	24,000	2	28,734	76,900	20,400
2	28,802	63,800	27,500	2	28,829	62,900	23,100	2	28,855	58,400	25,000	2	28,882	56,900	29,700
2	28,949	51,100	18,200	2	28,975	50,300	27,800	2	28,962	46,400	25,300	2	28,989	45,800	19,100
2	29,096	38,800	20,300	2	29,123	34,900	16,000	2	29,150	31,800	15,300	2	29,177	30,500	12,600
2	29,244	25,200	8,000	2	29,271	25,700	12,600	2	29,298	22,300	14,200	2	29,325	18,200	12,400
2	29,393	19,200	17,100	2	29,420	18,000	9,300	2	29,447	18,900	11,200	2	29,474	17,600	12,900
2	29,542	17,000	15,800	2	29,569	15,600	10,500	2	29,596	17,200	8,800	2	29,623	15,200	15,700
2	29,722	15,600	18,200	2	29,749	17,200	15,700	2	29,776	18,400	17,700	2	29,803	18,000	24,000
2	29,862	22,600	20,000	2	29,889	24,500	24,200	2	29,916	27,700	27,300	2	29,943	31,500	30,900
2	29,973	38,000	46,500	2	29,999	44,300	46,500	2	30,026	50,000	69,800	2	30,053	66,100	74,000
2	30,125	74,300	94,500	2	30,151	84,500	107,600	2	30,178	87,000	112,700	2	30,205	86,000	122,800
2	30,277	86,500	119,300	2	30,303	75,500	107,500	2	30,330	67,200	89,500	2	30,357	50,500	69,600
2	30,429	37,800	55,900	2	30,455	30,400	47,900	2	30,482	25,600	37,200	2	30,509	19,400	33,300
2	30,581	17,500	27,300	2	30,607	14,800	25,800	2	30,634	15,400	21,000	2	30,661	11,800	21,900
2	30,733	16,100	17,400	2	30,759	14,900	21,200	2	30,786	13,900	17,200	2	30,813	14,500	21,000
2	30,885	17,300	22,100	2	30,911	20,700	14,400	2	30,938	22,000	24,600	2	30,965	26,300	18,900
2	31,037	29,400	19,900	2	31,063	36,400	24,800	2	31,090	38,300	32,900	2	31,117	47,400	32,700
2	31,189	59,500	40,400	2	31,215	65,600	39,100	2	31,242	78,100	53,700	2	31,269	95,300	49,000
2	31,341	118,300	64,500	2	31,367	126,900	76,300	2	31,394	146,800	87,200	2	31,421	162,100	98,100
2	31,493	171,000	109,300	2	31,519	182,700	113,600	2	31,546	182,800	149,300	2	31,573	189,700	168,000
2	31,645	188,000	212,600	2	31,671	208,900	247,700	2	31,698	217,600	306,200	2	31,725	237,000	345,900
2	31,797	239,400	389,200	2	31,823	241,200	404,500	2	31,850	220,700	393,200	2	31,877	192,300	346,700
2	31,949	158,700	291,300	2	31,975	119,100	239,500	2	32,002	89,100	171,900	2	32,029	60,200	131,900
2	32,101	39,800	91,600	2	32,127	28,700	70,300	2	32,154	22,400	54,200	2	32,181	18,700	12,700
2	32,253	15,500	37,200	2	32,279	14,000	31,600	2	32,306	18,000	21,000	2	32,333	18,800	29,900
2	32,405	18,300	20,500	2	32,431	20,900	24,600	2	32,458	21,400	21,300	2	32,485	24,700	17,900
2	32,557	29,000	28,300	2	32,583	31,300	28,800	2	32,610	38,200	33,500	2	32,637	41,500	46,600
2	32,709	47,700	36,400	2	32,735	61,700	40,700	2	32,762	67,400	53,700	2	32,789	85,400	59,800
2	32,861	99,800	64,900	2	32,887	124,900	81,100	2	32,914	147,200	105,100	2	32,941	197,000	117,600
2	32,993	252,000	148,700	2	33,019	326,000	201,300	2	33,046	413,700	249,200	2	33,073	527,400	310,800
2	33,145	652,400	393,600	2	33,171	793,900	457,100	2	33,198	935,300	536,300	2	33,225	1018,100	620,800
2	33,297	1090,600	655,600	2	33,323	1024,400	646,300	2	33,350	929,700	602,400	2	33,377	794,700	523,700
2	33,449	639,200	435,900	2	33,475	476,500	350,000	2	33,502	354,900	241,900	2	33,529	257,500	175,900
2	33,601	172,400	138,300	2	33,627	127,300	76,200	2	33,654	95,400	79,700	2	33,681	73,900	64,900
2	33,753	57,600	52,800	2	33,779	44,700	49,100	2	33,806	40,000	33,500	2	33,833	35,000	30,500
2	33,905	28,700	33,000	2	33,931	28,500	33,700	2	33,958	23,600	32,000	2	33,985	22,500	29,800
2	34,057	22,000	32,600	2	34,083	18,900	36,000	2	34,110	22,600	39,200	2	34,137	21,000	35,800
2	34,209	20,100	44,900	2	34,235	19,800	41,100	2	34,262	24,300	43,100	2	34,289	25,400	41,400

N	E	$\sigma_f \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_f \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_f \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_f \sqrt{E}$	$\sigma_c \sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
2	32,990	32,700	53,400	2	33,023	30,100	60,400	2	33,056	38,200	61,500	2	33,090	40,200	70,600
2	33,123	45,500	79,500	2	33,156	57,700	101,900	2	33,189	74,200	113,900	2	33,223	91,800	143,400
2	33,256	125,100	179,100	2	33,289	158,500	234,100	2	33,323	220,900	310,100	2	33,356	284,000	416,500
2	33,390	384,900	534,300	2	33,423	500,900	682,600	2	33,457	620,400	827,700	2	33,491	720,200	971,100
2	33,525	792,500	1050,200	2	33,558	811,700	1078,400	2	33,592	758,600	970,900	2	33,626	656,300	838,000
2	33,660	520,100	641,700	2	33,694	407,700	486,000	2	33,728	299,000	354,400	2	33,762	220,200	248,500
2	33,797	177,100	176,100	2	33,831	140,100	140,100	2	33,865	127,600	123,300	2	33,899	116,300	110,400
2	33,934	115,700	115,800	2	33,968	124,800	108,600	2	34,003	134,900	125,300	2	34,037	160,400	150,500
2	34,072	181,900	185,900	2	34,106	228,300	223,300	2	34,141	276,900	290,900	2	34,176	360,300	382,200
2	34,211	458,100	496,100	2	34,246	588,100	631,200	2	34,280	738,900	786,300	2	34,315	898,400	979,200
2	34,350	1022,200	1017,300	2	34,385	1107,600	1051,700	2	34,421	1106,200	990,800	2	34,456	1067,600	852,400
2	34,491	970,600	712,100	2	34,526	892,300	554,700	2	34,562	778,500	406,200	2	34,597	703,800	326,500
2	34,632	682,900	277,100	2	34,668	690,200	253,300	2	34,703	720,000	270,400	2	34,739	758,100	305,200
2	34,775	835,100	343,400	2	34,810	939,400	376,500	2	34,846	1022,500	442,300	2	34,882	1108,800	499,300
2	34,918	202,500	526,700	2	34,954	1288,000	556,200	2	34,990	1377,200	587,100	2	35,026	1532,200	636,400
2	35,062	899,400	702,000	2	35,098	1948,500	788,500	2	35,134	2158,100	911,700	2	35,171	2337,300	959,300
2	35,207	2438,300	964,100	2	35,243	2340,200	929,400	2	35,280	2143,500	803,400	2	35,316	1864,300	680,200
2	35,353	1516,500	534,000	2	35,390	1248,300	408,400	2	35,426	1000,100	293,300	2	35,463	801,800	208,500
2	35,500	639,300	172,800	2	35,537	547,900	124,900	2	35,573	463,800	98,700	2	35,611	389,200	81,500
2	35,647	338,100	65,100	2	35,685	308,300	44,300	2	35,722	272,500	45,900	2	35,759	243,700	37,700
2	35,796	219,800	28,400	2	35,833	201,500	27,500	2	35,871	181,200	26,800	2	35,908	169,000	20,800
2	35,946	162,000	24,600	2	35,983	145,400	21,500	2	36,021	138,700	13,400	2	36,059	131,900	12,900
2	36,096	117,300	20,500	2	36,134	114,100	18,100	2	36,172	108,300	19,900	2	36,210	107,000	7,200
2	36,248	96,900	13,700	2	36,286	96,600	5,300	2	36,324	85,800	15,800	2	36,362	85,400	12,000
2	36,400	83,200	9,600	2	36,438	81,000	9,300	2	36,477	73,800	9,300	2	36,515	73,300	10,400
2	36,554	70,800	7,000	2	36,592	72,800	2,500	2	36,630	67,400	9,000	2	36,669	66,100	8,500
2	36,708	62,700	3,500	2	36,747	64,100	6,700	2	36,785	60,900	3,300	2	36,824	57,800	5,400
2	36,863	56,200	2,600	2	36,902	58,700	1,000	2	36,941	52,700	8,700	2	36,980	47,400	12,300
2	37,020	50,600	8,600	2	37,059	46,600	4,400	2	37,098	44,600	12,600	2	37,137	42,800	15,500
2	37,177	48,400	7,400	2	37,216	46,100	8,200	2	37,256	51,700	3,000	2	37,296	50,700	17,400
2	37,335	52,300	9,900	2	37,375	54,700	11,000	2	37,415	51,600	5,000	2	37,455	63,200	4,900
2	37,495	53,000	10,200	2	37,535	61,700	6,700	2	37,575	57,300	7,100	2	37,615	56,100	9,400
2	37,655	62,200	9,100	2	37,695	63,300	11,900	2	37,735	72,100	1,100	2	37,776	70,200	3,300
2	37,816	68,700	11,900	2	37,857	78,300	8,600	2	37,897	74,300	14,200	2	37,938	90,300	11,200
2	37,979	91,800	10,200	2	38,019	99,000	19,300	2	38,060	108,700	18,000	2	38,101	117,200	11,900
2	38,142	129,400	16,300	2	38,183	144,400	17,900	2	38,224	157,800	17,100	2	38,265	156,200	30,200
2	38,307	172,100	16,100	2	38,348	170,800	29,800	2	38,389	165,500	29,800	2	38,431	153,600	20,600
2	38,472	141,800	21,400	2	38,514	116,400	26,800	2	38,555	104,400	25,200	2	38,597	93,300	21,300
2	38,639	76,000	35,000	2	38,681	63,800	33,500	2	38,723	64,500	33,000	2	38,765	63,000	35,000
2	38,807	58,600	37,800	2	38,849	62,000	43,900	2	38,891	73,500	51,000	2	38,933	75,600	59,800
2	38,976	91,300	63,600	2	39,018	113,800	83,300	2	39,060	147,100	111,500	2	39,103	193,300	124,500
2	39,146	269,100	179,500	2	39,188	368,900	226,000	2	39,231	493,900	312,000	2	39,274	665,900	406,200
2	39,317	844,100	524,400	2	39,360	1052,400	615,300	2	39,403	1203,100	690,900	2	39,446	1222,100	709,400
2	39,489	1134,600	659,000	2	39,532	967,300	545,400	2	39,575	752,000	411,200	2	39,619	545,600	286,600
2	39,662	386,700	205,600	2	39,706	283,300	138,600	2	39,749	221,300	107,300	2	39,793	200,800	89,700
2	39,837	194,500	70,500	2	39,880	186,800	64,400	2	39,924	185,500	62,500	2	39,968	172,900	57,800
2	40,012	159,100	55,700	2	40,056	143,400	37,800	2	40,100	116,100	45,900	2	40,145	100,400	37,100
2	40,189	91,400	33,600	2	40,234	85,100	36,400	2	40,278	93,100	43,000	2	40,322	108,700	37,800
2	40,367	130,500	36,300	2	40,412	192,600	42,600	2	40,457	186,700	46,600	2	40,501	201,200	49,900
2	40,546	217,500	47,300	2	40,591	216,500	46,800	2	40,636	213,200	36,200	2	40,681	198,800	30,100
2	40,727	177,280	18,000	2	40,772	159,400	23,700	2	40,817	143,700	28,300	2	40,863	142,800	26,000
2	40,908	133,600	32,400	2	40,954	136,600	22,900	2	40,999	139,400	30,100	2	41,045	145,700	37,900
2	41,091	154,100	39,200	2	41,137	165,700	41,500	2	41,183	190,800	52,100	2	41,229	214,000	45,000
2	41,275	227,700	60,000	2	41,321	244,800	59,600	2	41,367	258,200	77,900	2	41,414	271,300	78,100
2	41,460	278,500	98,000	2	41,507	294,100	113,000	2	41,553	291,300	144,300	2	41,600	299,800	172,400
2	41,647	304,800	229,500	2	41,694	299,700	306,500	2	41,740	314,300	421,100	2	41,787	336,500	537,300
2	41,834	859,900	668,800	2	41,882	388,700	749,300	2	41,929	390,300	764,500	2	41,976	376,300	658,900
2	42,023	319,800	512,500	2	42,071	280,600	360,400	2	42,118	248,900	252,900	2	42,166	242,200	195,500
2	42,214	239,100	153,000	2	42,262	232,100	137,000	2	42,309	229,800	115,600	2	42,357	198,000	100,500
2	42,405	170,600	92,200	2	42,453	147,600	83,400	2	42,502	134,000	92,100	2	42,550	116,900	106,600

N	E	$\sigma_c \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_c \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_c \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_c \sqrt{E}$	$\sigma_c \sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
2	42,898	113,100	142,700	2	42,847	113,900	142,600	2	42,695	110,500	202,200	2	42,744	102,700	215,700
2	42,793	91,000	177,200	2	42,841	76,000	70,500	2	42,890	70,200	125,400	2	42,939	84,400	83,200
2	42,988	61,100	73,700	2	43,037	68,600	66,200	2	43,086	73,000	70,300	2	43,136	90,300	86,400
2	43,185	100,000	117,300	2	43,234	120,100	167,600	2	43,284	149,900	226,600	2	43,333	189,800	266,000
2	43,383	219,300	342,200	2	43,433	231,600	361,400	2	43,483	234,200	321,800	2	43,533	212,700	267,400
2	43,583	184,300	174,600	2	43,633	168,100	120,600	2	43,683	197,800	76,000	2	43,734	164,000	69,700
2	43,784	186,400	91,100	2	43,834	216,700	66,700	2	43,885	231,900	76,300	2	43,936	273,600	75,500
2	43,986	287,400	70,700	2	44,037	277,800	71,000	2	44,088	266,300	60,300	2	44,139	242,800	53,000
2	44,190	226,800	91,500	2	44,241	224,100	44,800	2	44,293	218,100	49,700	2	44,344	249,000	49,000
2	44,395	274,900	80,100	2	44,447	324,400	72,400	2	44,498	368,900	102,600	2	44,550	432,200	122,700
2	44,602	469,900	131,800	2	44,654	490,100	134,800	2	44,706	472,700	139,300	2	44,758	436,000	97,600
2	44,810	390,700	91,600	2	44,862	341,200	64,300	2	44,915	314,900	45,900	2	44,967	284,300	43,500
2	45,020	267,800	30,700	2	45,072	247,300	15,100	2	45,125	226,500	17,700	2	45,178	184,400	23,900
2	45,231	173,000	19,300	2	45,284	150,900	18,700	2	45,337	131,800	19,700	2	45,390	112,300	18,600
2	45,443	103,900	16,200	2	45,497	97,400	23,800	2	45,550	92,700	16,600	2	45,604	95,200	29,400
2	45,657	100,100	32,900	2	45,711	112,900	33,600	2	45,765	119,900	42,600	2	45,819	124,900	40,700
2	45,873	107,600	44,900	2	45,927	98,800	42,300	2	45,981	84,100	37,100	2	46,036	66,500	28,000
2	46,090	49,900	24,800	2	46,145	43,600	27,500	2	46,199	42,900	26,100	2	46,254	48,900	27,000
2	46,309	51,300	29,400	2	46,363	62,600	36,700	2	46,418	78,700	36,300	2	46,474	103,700	37,900
2	46,529	127,300	59,800	2	46,584	186,400	67,800	2	46,639	246,900	95,000	2	46,695	330,300	112,700
2	46,751	417,000	136,700	2	46,806	491,700	168,000	2	46,862	564,700	184,300	2	46,918	590,900	186,900
2	46,974	574,600	267,900	2	47,030	548,100	194,500	2	47,086	473,700	199,800	2	47,143	395,500	164,700
2	47,199	289,700	146,600	2	47,255	215,600	99,600	2	47,312	146,200	84,800	2	47,369	109,800	59,100
2	47,425	92,100	48,300	2	47,482	83,200	47,900	2	47,539	92,500	43,400	2	47,596	96,300	61,200
2	47,654	114,600	70,600	2	47,711	143,700	99,000	2	47,768	186,100	126,900	2	47,826	234,800	185,000
2	47,884	324,900	234,400	2	47,941	366,000	299,900	2	47,999	425,400	329,400	2	48,057	443,700	323,900
2	48,115	445,900	275,600	2	48,173	440,600	211,900	2	48,231	444,700	155,700	2	48,290	439,400	133,000
2	48,348	423,900	113,500	2	48,407	415,000	103,200	2	48,465	374,600	102,200	2	48,524	316,300	115,000
2	48,583	262,800	134,700	2	48,642	258,200	155,500	2	48,701	279,500	181,300	2	48,760	320,200	197,400
2	48,820	364,100	200,400	2	48,879	367,300	179,200	2	48,939	329,700	154,300	2	48,998	272,200	120,800
2	49,058	225,000	106,400	2	49,118	182,500	115,600	2	49,178	176,400	142,100	2	49,238	161,000	193,700
2	49,298	184,300	264,900	2	49,359	204,000	378,000	2	49,419	237,800	459,200	2	49,480	230,600	523,800
2	49,540	217,600	435,000	2	49,601	174,400	386,100	2	49,662	130,900	247,400	2	49,723	97,600	156,500
2	49,784	80,800	103,200	2	49,845	82,800	76,900	2	49,906	85,800	87,300	2	49,968	100,800	100,200
2	50,029	131,000	126,000	2	50,091	162,600	161,100	2	50,153	196,600	178,400	2	50,214	234,300	198,600
2	50,276	278,200	216,400	2	50,339	322,200	234,600	2	50,401	382,400	252,000	2	50,463	456,100	304,500
2	50,526	479,100	290,900	2	50,588	456,200	263,000	2	50,651	424,500	194,300	2	50,714	364,700	147,700
2	50,777	355,800	111,100	2	50,840	365,100	101,500	2	50,903	416,900	135,800	2	50,966	516,200	139,000
2	51,030	644,700	166,600	2	51,093	790,600	251,700	2	51,157	981,800	323,200	2	51,220	1,139,300	413,100
2	51,284	1,275,900	482,400	2	51,348	1,272,800	521,900	2	51,412	1,163,700	475,700	2	51,476	938,500	415,400
2	51,541	729,500	320,700	2	51,605	580,200	240,800	2	51,670	493,900	235,400	2	51,735	461,700	156,600
2	51,799	426,600	117,800	2	51,864	431,400	98,900	2	51,929	468,600	70,300	2	51,995	531,200	66,800
2	52,060	624,900	64,500	2	52,126	691,800	81,600	2	52,191	755,900	80,200	2	52,257	782,000	76,800
2	52,322	753,300	62,100	2	52,389	670,400	69,400	2	52,454	582,200	54,400	2	52,521	472,500	36,300
2	52,587	370,600	27,300	2	52,654	277,100	40,800	2	52,720	214,400	35,900	2	52,787	176,800	25,400
2	52,854	139,200	30,200	2	52,921	120,500	29,900	2	52,988	105,700	25,500	2	53,055	104,200	22,000
2	53,122	106,000	35,700	2	53,190	123,800	39,100	2	53,257	141,300	64,200	2	53,325	181,900	61,100
2	53,393	229,400	77,100	2	53,461	252,400	79,900	2	53,529	254,000	74,700	2	53,597	220,500	64,800
2	53,665	195,600	44,700	2	53,734	148,000	41,100	2	53,803	120,000	29,400	2	53,871	108,000	28,200
2	53,940	106,000	24,700	2	54,009	107,500	32,800	2	54,078	117,700	37,300	2	54,148	118,700	47,900
2	54,217	118,900	48,100	2	54,287	110,200	51,700	2	54,356	103,600	54,600	2	54,426	100,700	61,700
2	54,496	103,600	84,200	2	54,566	129,100	74,400	2	54,636	164,400	97,800	2	54,707	226,500	132,700
2	54,777	314,300	185,800	2	54,848	426,300	272,800	2	54,919	582,400	391,600	2	54,990	751,700	537,000
2	55,060	916,300	685,200	2	55,132	976,300	754,300	2	55,203	901,000	711,300	2	55,275	703,100	546,900
2	55,346	507,200	365,300	2	55,418	383,700	229,900	2	55,490	345,400	162,000	2	55,562	426,700	115,900
2	55,634	528,500	116,100	2	55,706	680,400	143,900	2	55,779	860,800	148,600	2	55,851	1,001,500	169,500
2	55,924	1,069,700	193,200	2	55,997	1,096,300	196,700	2	56,070	1,084,300	204,100	2	56,143	1,043,100	221,300
2	56,216	1,047,100	260,800	2	56,290	1,084,300	363,900	2	56,363	1,264,300	488,300	2	56,437	1,461,300	656,300
2	56,511	1,631,300	787,700	2	56,585	1,630,900	796,600	2	56,659	1,338,800	685,300	2	56,733	947,300	465,000
2	56,808	586,100	282,900	2	56,882	346,700	164,100	2	56,957	222,800	98,000	2	57,032	157,200	64,500

N	E	$\sigma_f/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_f/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_f/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_f/\sqrt{E}$	$\sigma_c/\sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
2	57,107	120,400	54,400	2	57,182	99,700	50,400	2	57,258	93,000	49,600	2	57,333	104,700	53,200
2	57,409	125,100	48,600	2	57,485	162,600	67,800	2	57,560	211,300	67,400	2	57,637	287,400	93,200
2	57,713	371,600	131,300	2	57,789	485,600	155,600	2	57,866	552,700	204,600	2	57,942	614,300	257,200
2	58,019	634,200	326,000	2	58,096	598,900	404,900	2	58,173	524,900	389,700	2	58,251	392,000	332,500
2	58,328	290,000	234,500	2	58,406	242,600	162,900	2	58,484	270,300	129,300	2	58,561	353,900	120,500
2	58,639	455,000	136,100	2	58,718	500,600	191,000	2	58,796	460,300	132,400	2	58,875	373,200	100,800
2	58,953	260,400	65,000	2	59,032	172,800	40,100	2	59,111	114,000	31,500	2	59,190	90,100	16,100
2	59,270	73,100	22,500	2	59,349	68,000	21,200	2	59,429	81,300	13,600	2	59,509	92,200	18,700
2	59,589	113,100	24,000	2	59,669	135,000	27,300	2	59,749	162,200	33,400	2	59,830	195,800	37,100
2	59,910	226,000	46,800	2	59,991	265,900	99,000	2	60,072	321,300	59,000	2	60,153	362,000	66,700
2	60,235	390,700	57,100	2	60,316	368,200	48,700	2	60,398	308,500	57,700	2	60,479	249,600	37,900
2	60,561	203,500	39,000	2	60,644	192,900	45,400	2	60,726	192,800	55,800	2	60,808	221,600	56,400
2	60,891	244,400	70,900	2	60,974	252,500	66,400	2	61,057	237,600	71,200	2	61,140	211,300	66,700
2	61,223	194,100	74,600	2	61,306	160,200	45,600	2	61,390	139,800	25,200	2	61,474	126,300	10,500
2	61,558	107,600	12,500	2	61,642	100,000	7,000	2	61,726	98,800	5,400	2	61,811	93,500	6,800
2	61,895	87,600	13,100	2	61,980	88,200	8,100	2	62,065	82,400	6,600	2	62,151	91,700	2,500
2	62,236	87,400	7,900	2	62,321	84,900	10,700	2	62,407	86,500	10,600	2	62,493	88,200	15,700
2	62,579	85,500	15,800	2	62,666	78,100	17,800	2	62,752	72,300	15,800	2	62,838	70,500	14,200

N	E	$\sigma_p/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_p/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_p/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_p/\sqrt{E}$	$\sigma_c/\sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
4	17,489	32,500	6,800	4	17,540	31,200	20,300	4	17,591	34,700	13,500	4	17,643	41,300	19,800
4	17,695	44,300	13,500	4	17,746	57,600	29,000	4	17,799	83,300	29,800	4	17,851	120,600	52,200
4	17,903	187,500	52,500	4	17,956	266,600	84,800	4	18,009	364,500	93,400	4	18,063	372,900	106,400
4	18,116	332,400	36,700	4	18,170	251,300	59,200	4	18,224	175,700	43,800	4	18,278	124,000	32,400
4	18,333	98,800	23,200	4	18,387	86,100	32,900	4	18,442	83,300	30,700	4	18,498	84,800	29,800
4	18,553	86,700	38,300	4	18,609	91,500	32,100	4	18,665	100,900	46,400	4	18,721	117,000	43,200
4	18,777	138,300	74,000	4	18,834	174,600	91,900	4	18,891	220,500	131,200	4	18,948	284,200	194,200
4	19,006	371,500	256,400	4	19,064	533,800	343,300	4	19,122	883,800	543,800	4	19,180	1552,400	914,500
4	19,239	2353,500	1430,900	4	19,297	2793,000	1667,500	4	19,356	2293,700	1386,600	4	19,416	1434,900	819,800
4	19,475	742,000	412,700	4	19,535	414,800	193,600	4	19,596	252,000	113,600	4	19,656	169,000	85,100
4	19,717	132,800	54,200	4	19,778	109,700	42,400	4	19,839	91,300	38,200	4	19,901	84,600	29,600
4	19,963	84,800	23,500	4	20,025	92,800	27,000	4	20,087	96,800	31,500	4	20,150	103,100	43,400
4	20,213	93,500	34,100	4	20,277	70,100	43,600	4	20,340	61,900	37,700	4	20,404	71,600	42,700
4	20,469	87,100	68,300	4	20,533	142,600	87,800	4	20,598	170,100	135,000	4	20,663	172,200	137,300
4	20,729	131,100	149,100	4	20,795	126,500	172,400	4	20,861	201,600	272,900	4	20,927	304,900	515,500
4	20,994	710,200	947,900	4	21,061	933,300	1250,000	4	21,128	761,700	985,400	4	21,196	398,700	490,100
4	21,264	197,000	199,400	4	21,332	69,700	75,000	4	21,401	40,000	43,400	4	21,470	25,000	25,800
4	21,540	19,000	15,000	4	21,609	13,700	10,500	4	21,679	12,600	3,600	4	21,750	10,800	7,200
4	21,820	8,500	5,900	4	21,892	6,300	6,600	4	21,963	10,300	9,500	3	22,035	8,100	1,200
3	22,107	9,300	4,900	3	22,107	10,500	6,600	3	22,143	8,700	11,900	3	22,179	12,000	12,300
3	22,216	12,500	4,400	3	22,252	10,400	5,500	3	22,289	14,300	9,800	3	22,325	15,100	10,000
3	22,362	18,900	4,100	3	22,399	15,600	8,200	3	22,436	19,800	14,300	3	22,473	24,800	19,000
3	22,510	28,900	21,300	3	22,547	30,800	20,500	3	22,584	35,000	27,900	3	22,622	47,400	31,500
3	22,659	52,600	40,500	3	22,697	68,900	60,500	3	22,735	89,400	67,700	3	22,772	125,100	102,100
3	22,810	173,100	153,300	3	22,848	241,200	183,000	3	22,886	305,200	233,800	3	22,924	399,300	282,600
3	22,962	378,500	284,100	3	23,001	346,600	268,800	3	23,039	278,200	227,000	3	23,078	204,900	185,500
3	23,116	166,600	155,200	3	23,155	123,100	154,900	3	23,194	128,300	180,000	3	23,233	146,700	218,800
3	23,272	173,800	348,500	3	23,311	240,700	489,700	3	23,350	318,900	691,400	3	23,389	393,100	910,000
3	23,429	465,000	974,800	3	23,468	526,700	904,200	3	23,508	531,800	753,600	3	23,547	540,100	526,200
3	23,587	572,400	345,600	3	23,627	595,900	232,700	3	23,667	590,900	181,700	3	23,707	533,400	130,800
3	23,747	452,800	114,800	3	23,788	388,500	77,900	3	23,828	301,700	76,200	3	23,869	230,200	99,800
3	23,909	193,500	41,400	3	23,950	150,200	49,500	3	23,991	130,300	56,100	3	24,032	120,200	74,300
3	24,073	120,500	91,800	3	24,114	137,300	126,800	3	24,155	177,400	166,800	3	24,197	236,400	201,600
3	24,238	280,200	222,500	3	24,280	316,700	212,800	3	24,321	322,400	190,800	3	24,363	291,900	157,100
3	24,405	263,600	109,700	3	24,447	226,300	77,000	3	24,489	200,700	50,400	3	24,531	182,600	29,700
3	24,573	175,100	16,900	3	24,616	178,200	3,200	3	24,658	159,100	13,600	3	24,701	164,900	2,300
3	24,744	68,000	2,900	3	24,787	170,900	1,000	3	24,830	187,500	5,100	3	24,873	182,900	1,800
3	24,916	189,600	4,600	3	24,959	191,200	2,800	3	25,003	209,300	7,500	3	25,046	212,600	13,000
3	25,090	222,400	1,600	3	25,134	249,900	5,800	3	25,178	265,800	4,800	3	25,222	291,100	11,300
3	25,266	298,300	7,300	3	25,310	318,400	15,200	3	25,354	336,200	14,600	3	25,399	365,500	11,200
3	25,443	370,600	12,000	3	25,488	385,800	24,100	3	25,533	402,300	9,100	3	25,578	406,900	7,700
3	25,623	387,700	19,500	3	25,668	375,500	15,800	3	25,713	334,200	23,600	3	25,759	291,000	22,900
3	25,811	246,200	29,000	3	25,856	215,700	9,600	3	25,896	172,700	21,000	3	25,942	129,300	18,000
3	25,988	97,900	20,400	3	26,034	74,500	13,800	3	26,080	67,600	30,000	3	26,126	65,200	31,800
3	26,173	80,900	22,200	3	26,220	98,700	19,100	3	26,266	129,100	36,600	3	26,313	176,200	37,100
3	26,360	237,600	55,300	3	26,407	367,500	48,700	3	26,455	344,400	60,900	3	26,502	384,100	61,700
3	26,546	368,500	52,900	3	26,597	331,600	35,900	3	26,645	272,500	34,000	3	26,693	214,600	14,100
3	26,741	180,400	4,900	3	26,789	160,300	5,400	3	26,837	124,500	24,600	3	26,886	114,200	12,500
3	26,934	101,400	19,100	3	26,983	99,300	20,100	3	27,032	93,500	32,900	3	27,081	96,900	26,000
3	27,130	101,300	30,500	3	27,179	103,000	39,600	3	27,228	90,200	32,400	3	27,278	82,900	29,600
3	27,327	74,000	22,500	3	27,377	67,700	21,500	3	27,427	71,000	18,300	3	27,477	85,800	22,900
3	27,527	106,000	36,900	3	27,578	144,800	47,400	3	27,628	206,100	74,900	3	27,679	297,800	106,500
3	27,729	382,800	191,800	3	27,780	476,300	161,700	3	27,831	494,500	172,300	3	27,882	436,100	152,400
3	27,934	325,200	120,900	3	27,985	230,500	78,400	3	28,037	169,000	58,500	3	28,088	122,000	51,000
3	28,140	111,800	45,100	3	28,192	111,900	38,900	3	28,244	117,900	43,100	3	28,297	131,600	43,900
3	28,349	149,200	33,400	3	28,402	152,800	46,000	3	28,454	121,900	44,300	3	28,507	102,100	25,000
3	28,560	79,200	27,500	3	28,613	60,900	18,900	3	28,667	55,500	25,900	3	28,721	53,600	20,900

N	E	$\sigma_f/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_f/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_f/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_f/\sqrt{E}$	$\sigma_c/\sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
3	28,774	41,600	11,100	3	28,828	33,500	17,100	3	28,881	27,900	13,500	3	28,936	24,100	11,000
3	28,990	20,400	8,700	3	29,044	21,500	7,400	3	29,099	16,300	3,200	3	29,153	15,800	7,100
3	29,208	17,800	12,200	3	29,263	16,300	20,000	3	29,318	18,200	7,500	3	29,374	20,900	22,200
3	29,429	29,200	21,500	3	29,485	37,800	45,400	3	29,540	63,100	62,400	3	29,596	73,900	104,900
3	29,652	87,000	112,300	3	29,709	80,400	102,800	3	29,765	55,800	85,300	3	29,822	34,800	53,100
3	29,878	21,000	31,400	3	29,935	16,900	20,000	3	29,992	15,300	20,300	3	30,049	16,900	12,600
3	30,107	16,500	16,200	3	30,164	21,000	17,300	3	30,222	26,900	24,200	3	30,280	33,600	24,100
3	30,338	40,200	26,600	3	30,396	62,100	41,500	3	30,455	88,600	45,800	3	30,513	122,200	71,000
3	30,572	144,600	95,200	3	30,631	174,200	117,300	3	30,690	195,300	154,900	3	30,749	205,300	215,000
3	30,808	212,400	316,300	3	30,868	240,800	307,700	3	30,928	207,300	373,000	3	30,988	153,700	265,400
3	31,048	80,100	162,700	3	31,108	36,600	101,800	3	31,168	22,300	50,500	3	31,229	15,400	42,000
3	31,290	15,300	30,600	3	31,351	20,800	18,500	3	31,412	24,300	23,900	3	31,473	33,700	15,900
3	31,535	43,100	32,200	3	31,596	56,400	49,400	3	31,658	73,200	62,000	3	31,720	108,200	76,600
3	31,783	169,000	122,900	3	31,845	276,000	191,200	3	31,908	461,000	299,700	3	31,970	725,400	431,000
3	32,033	975,800	577,200	3	32,096	1041,500	681,700	3	32,160	878,800	618,300	3	32,223	978,000	412,900
3	32,287	324,700	219,400	3	32,351	159,000	128,800	3	32,415	89,300	74,100	3	32,479	55,000	50,600
3	32,544	39,900	43,700	3	32,608	29,400	39,200	3	32,673	24,000	40,400	3	32,738	26,200	38,800
3	32,804	23,700	44,200	3	32,869	22,700	43,300	3	32,935	24,900	47,800	3	33,001	30,100	62,300
3	33,067	33,000	79,800	3	33,133	50,900	88,300	3	33,199	82,600	137,500	3	33,266	133,800	224,400
3	33,333	248,600	368,900	3	33,400	431,000	618,900	3	33,467	655,000	906,100	3	33,535	815,600	1048,200
3	33,602	729,300	945,300	3	33,670	481,700	599,300	3	33,738	263,200	332,100	3	33,806	162,700	180,600
3	33,875	129,100	119,500	3	33,943	123,300	120,900	3	34,012	151,500	149,700	3	34,081	207,500	214,700
3	34,151	316,200	334,000	3	34,220	514,100	547,200	3	34,290	808,800	840,900	3	34,360	1051,100	1031,600
3	34,430	1091,600	966,600	3	34,501	899,100	668,000	3	34,571	744,500	391,100	3	34,642	685,800	263,800
3	34,713	728,900	293,600	3	34,784	882,300	339,600	3	34,856	1052,800	474,300	3	34,927	1222,800	518,200
3	34,999	1422,400	610,100	3	35,071	1774,300	722,200	3	35,144	2128,400	929,900	3	35,216	2281,500	988,000
3	35,289	1952,600	787,600	3	35,362	1371,000	485,400	3	35,435	931,300	257,400	3	35,509	596,000	149,700
3	35,563	416,800	73,000	3	35,637	328,300	48,700	3	35,711	299,600	30,300	3	35,785	212,200	33,400
3	35,880	180,000	17,400	3	35,955	156,900	9,000	3	36,030	136,900	10,200	3	36,105	110,400	19,300
3	36,181	103,600	13,600	3	36,256	99,200	8,700	3	36,333	84,300	10,400	3	36,409	82,500	6,400
3	36,485	69,200	14,300	3	36,562	65,600	7,400	3	36,639	65,400	9,900	3	36,716	58,600	11,500
3	36,794	53,600	2,100	3	36,872	55,000	12,400	3	36,950	53,100	7,100	3	37,028	49,200	7,300
3	37,106	42,480	8,500	3	37,185	48,500	5,500	3	37,264	48,800	8,800	3	37,343	51,500	11,100
3	37,423	67,300	1,100	3	37,503	56,600	5,700	3	37,583	60,400	4,000	3	37,663	60,800	2,900
3	37,743	69,900	7,200	3	37,824	75,100	10,500	3	37,905	85,800	10,400	3	37,987	98,500	18,500
3	38,068	111,400	15,100	3	38,150	141,900	16,600	3	38,232	154,800	21,200	3	38,314	172,000	18,500
3	38,397	168,900	22,900	3	38,480	127,900	30,400	3	38,563	95,600	25,200	3	38,647	78,600	25,400
3	38,730	65,900	37,800	3	38,814	61,300	38,700	3	38,898	77,800	51,400	3	38,983	101,600	71,000
3	39,068	161,800	109,300	3	39,153	289,000	189,900	3	39,238	551,000	351,500	3	39,324	926,900	563,000
3	39,410	1190,900	701,700	3	39,498	1651,800	634,100	3	39,582	883,500	373,600	3	39,669	350,400	190,200
3	39,756	215,700	103,800	3	39,844	189,000	69,300	3	39,931	183,200	57,800	3	40,019	154,700	51,300
3	40,107	114,000	28,200	3	40,196	87,400	36,600	3	40,285	100,200	42,900	3	40,374	139,400	43,300
3	40,463	197,700	33,600	3	40,553	235,000	36,400	3	40,643	206,800	24,700	3	40,733	174,300	32,700
3	40,824	147,800	20,100	3	40,914	137,600	26,400	3	41,006	150,100	31,400	3	41,097	165,600	31,500
3	41,189	200,200	46,700	3	41,281	234,400	63,200	3	41,373	270,300	70,500	3	41,466	285,800	103,200
3	41,559	303,900	148,000	3	41,653	296,400	297,800	3	41,746	314,600	480,600	3	41,840	372,900	719,600
3	41,934	377,900	731,900	3	42,029	308,000	458,600	3	42,124	251,500	234,000	3	42,219	235,900	145,000
3	42,315	213,400	110,900	3	42,411	170,100	82,800	3	42,507	126,400	100,300	3	42,604	109,700	152,400
3	42,700	190,800	205,700	3	42,798	86,300	191,900	3	42,895	73,900	106,700	3	42,993	65,900	66,100
3	43,091	78,700	76,800	3	43,190	105,900	142,400	3	43,289	164,800	254,000	3	43,388	211,400	358,200
3	43,488	222,600	291,000	3	43,587	167,400	160,600	3	43,688	155,500	87,400	3	43,788	202,700	52,300
3	43,889	293,900	86,100	3	43,991	280,100	71,400	3	44,092	263,100	64,800	3	44,194	230,700	44,300
3	44,297	243,400	44,700	3	44,399	295,800	58,600	3	44,502	400,100	99,000	3	44,606	471,400	141,700
3	44,710	497,900	113,100	3	44,814	374,000	76,400	3	44,918	302,100	49,100	3	45,023	254,500	29,400
3	45,129	215,900	28,900	3	45,234	159,000	20,400	3	45,340	125,100	21,400	3	45,447	108,300	20,200
3	45,553	103,700	27,800	3	45,660	103,600	36,500	3	45,768	119,500	38,700	3	45,876	104,700	47,400
3	45,984	68,780	41,800	3	46,093	47,800	28,700	3	46,202	52,100	34,600	3	46,311	61,400	29,200
3	46,421	92,900	37,700	3	46,531	155,400	97,700	3	46,642	271,300	105,500	3	46,753	447,600	162,400
3	46,864	586,900	180,400	3	46,976	581,000	204,700	3	47,088	437,800	196,600	3	47,201	271,700	128,000
3	47,314	131,780	73,500	3	47,427	96,000	46,100	3	47,541	96,800	97,700	3	47,655	129,600	87,400

N	E	$\sigma_e/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_e/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_e/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_e/\sqrt{E}$	$\sigma_c/\sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
3	47,770	215,400	157,900	3	47,885	339,900	264,100	3	48,000	435,700	336,100	3	48,116	453,000	244,800
3	48,233	438,700	153,700	3	48,349	431,400	114,400	3	48,466	336,700	114,200	3	48,584	257,400	143,100
3	48,702	301,300	192,200	3	48,820	356,800	213,100	3	48,939	312,200	142,300	3	49,059	219,700	111,900
3	49,178	168,200	169,100	3	49,299	198,900	313,300	3	49,419	237,000	488,900	3	49,540	206,500	460,500
3	49,662	121,200	221,700	3	49,784	84,000	92,500	3	49,906	105,000	95,500	3	50,029	153,700	140,700
3	50,152	219,100	203,700	3	50,276	301,500	227,100	3	50,400	414,900	280,600	3	50,525	474,700	276,900
3	50,650	403,100	170,900	3	50,776	363,400	116,300	3	50,902	473,000	116,100	3	51,028	704,400	204,200
3	51,155	1026,200	384,700	3	51,283	1297,800	483,000	3	51,411	1067,600	475,300	3	51,539	680,500	299,500
3	51,668	490,900	170,100	3	51,798	440,400	130,900	3	51,928	486,700	78,700	3	52,058	637,000	175,200
3	52,189	761,000	82,500	3	52,320	739,800	61,400	3	52,452	537,900	47,100	3	52,585	329,500	46,700
3	52,717	203,200	31,100	3	52,851	127,100	40,900	3	52,985	108,100	38,300	3	53,119	110,400	43,700
3	53,254	156,000	61,000	3	53,389	239,000	75,400	3	53,525	246,200	80,300	3	53,662	181,900	37,000
3	53,799	118,800	27,200	3	53,936	110,000	34,400	3	54,074	123,800	45,700	3	54,213	116,000	54,000
3	54,352	107,800	55,800	3	54,492	123,800	82,400	3	54,632	196,700	17,300	3	54,773	371,900	211,000
3	54,914	655,400	449,700	3	55,056	902,600	734,800	3	55,198	808,000	672,700	3	55,341	463,500	321,600
3	55,484	394,700	138,600	3	55,629	603,500	126,300	3	55,773	927,700	145,100	3	55,918	1090,700	178,200
3	56,064	1064,400	203,500	3	56,210	1047,600	308,200	3	56,357	1331,100	565,900	3	56,505	1640,800	823,400
3	56,653	1213,100	589,900	3	56,801	502,200	252,700	3	56,950	199,300	79,900	3	57,100	120,800	50,500
3	57,251	99,200	43,400	3	57,402	138,900	66,500	3	57,553	239,300	82,800	3	57,705	419,900	133,400
3	57,858	569,700	222,000	3	58,011	613,300	363,800	3	58,165	470,900	370,900	3	58,320	271,000	202,300
3	58,475	302,800	109,400	3	58,631	460,500	132,700	3	58,788	437,800	105,100	3	58,945	221,800	60,900
3	59,102	101,800	24,700	3	59,261	73,000	17,200	3	59,420	80,600	25,600	3	59,579	124,600	14,800
3	59,740	180,700	27,000	3	59,901	244,400	40,100	3	60,062	334,800	59,500	3	60,224	367,000	58,600
3	60,387	278,400	47,300	3	60,551	201,200	43,900	3	60,715	217,200	45,300	3	60,880	242,700	70,100
3	61,046	220,200	79,000	3	61,212	173,800	51,100	3	61,379	130,800	24,200	3	61,546	102,900	14,900
3	61,715	96,200	4,000	3	61,884	88,600	13,400	3	62,053	92,900	2,900	3	62,224	91,800	11,200
3	62,395	88,200	4,200	3	62,566	84,400	14,200	3	62,739	72,800	4,500	3	62,912	83,500	18,500
3	63,086	109,300	18,900	3	63,261	146,100	23,600	3	63,436	183,700	19,100	3	63,612	212,000	33,000
3	63,789	191,400	62,300	3	63,967	166,900	132,100	3	64,145	148,300	319,600	3	64,324	138,800	516,500
3	64,504	80,500	292,500	3	64,684	39,700	60,200	3	64,866	28,600	12,100	3	65,048	21,500	16,700
3	65,231	26,900	9,200	3	65,414	33,700	32,300	3	65,599	60,800	64,900	3	65,784	99,200	106,600
3	65,970	91,300	81,900	3	66,157	76,000	61,800	3	66,344	181,900	92,300	3	66,533	77,200	88,400
3	66,722	29,000	38,200	3	66,912	15,000	16,400	3	67,103	23,000	12,000	3	67,294	27,200	20,300
2	67,487	21,500	15,200	2	67,583	15,700	5,600	2	67,680	15,800	8,400	2	67,777	17,200	4,800
2	67,874	17,500	4,900	2	67,971	17,700	15,700	2	68,069	19,600	16,600	2	68,167	27,100	16,500
2	68,265	34,700	20,200	2	68,363	42,700	18,000	2	68,461	47,200	42,500	2	68,560	53,000	31,700
2	68,659	60,300	23,400	2	68,758	54,600	37,000	2	68,857	64,500	24,600	2	68,956	73,300	39,300
2	69,056	112,100	50,100	2	69,156	163,400	29,400	2	69,256	210,200	47,900	2	69,356	253,800	41,300
2	69,457	239,100	53,900	2	69,558	215,600	32,500	2	69,659	182,500	26,600	2	69,760	182,800	28,400
2	69,861	180,700	44,100	2	69,963	240,700	68,900	2	70,065	320,600	90,900	2	70,167	459,900	138,900
2	70,269	619,800	236,300	2	70,372	834,700	280,400	2	70,475	951,000	321,500	2	70,578	1007,800	322,100
2	70,681	978,500	251,300	2	70,784	845,700	198,700	2	70,888	733,000	131,100	2	70,992	520,800	101,900
2	71,096	326,300	92,400	2	71,201	211,500	56,200	2	71,305	153,300	31,600	2	71,410	126,400	41,500
2	71,515	138,700	38,700	2	71,620	145,200	47,000	2	71,726	151,100	38,700	2	71,832	146,500	43,800
2	71,938	156,600	65,700	2	72,044	215,100	81,900	2	72,150	345,500	111,900	2	72,257	522,300	152,400
2	72,364	722,600	213,600	2	72,471	785,700	234,600	2	72,579	691,500	169,000	2	72,686	461,100	122,700
2	72,794	283,300	62,700	2	72,902	170,200	35,300	2	73,011	138,000	23,800	2	73,119	117,100	24,000
2	73,228	84,100	17,200	2	73,337	65,000	20,800	2	73,447	56,600	17,600	2	73,556	52,300	28,300
2	73,666	53,600	20,300	2	73,776	57,900	32,300	2	73,886	67,100	40,400	2	73,997	85,700	66,000
2	74,108	128,800	83,200	2	74,219	216,600	121,900	2	74,330	328,400	212,100	2	74,442	516,800	305,700
2	74,554	693,900	416,200	2	74,666	730,600	407,600	2	74,778	604,600	290,500	2	74,891	453,000	182,500
2	75,003	362,100	94,100	2	75,117	337,800	87,100	2	75,230	381,600	71,800	2	75,344	407,000	76,200
2	75,457	430,100	73,700	2	75,572	433,000	70,100	2	75,686	384,700	54,600	2	75,801	280,200	59,000
2	75,915	153,600	53,800	2	76,031	86,560	42,100	2	76,146	52,700	6,800	2	76,262	33,000	20,600
2	76,1378	27,800	17,200	2	76,494	32,000	6,400	2	76,610	40,900	24,500	2	76,727	51,100	22,000
2	76,844	60,900	17,600	2	76,961	62,900	33,700	2	77,079	77,400	21,000	2	77,197	98,500	41,700
2	77,315	135,100	57,900	2	77,433	201,400	79,700	2	77,552	256,100	120,300	2	77,671	255,800	116,300
2	77,790	237,600	93,400	2	77,909	214,000	94,000	2	78,029	257,700	115,600	2	78,149	316,900	137,700
2	78,269	294,700	132,100	2	78,390	194,600	101,300	2	78,511	138,000	65,200	2	78,632	103,600	32,800
2	78,753	82,400	12,200	2	78,875	77,100	25,200	2	78,997	63,700	19,600	2	79,119	64,500	25,600

N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
2	79,242	76,200	35,300	2	79,365	102,600	37,100	2	79,488	130,900	47,400	2	79,611	163,900	74,700
2	79,735	206,800	104,200	2	79,859	185,700	90,100	2	79,983	162,000	66,100	2	80,108	192,700	56,100
2	80,232	176,500	55,000	2	80,358	220,200	72,200	2	80,483	215,100	58,800	2	80,609	155,300	65,000
2	80,735	115,900	59,700	2	80,861	86,900	60,400	2	80,986	88,700	64,900	2	81,115	110,200	49,200
2	81,242	151,900	63,300	2	81,369	207,400	97,800	2	81,497	252,100	109,200	2	81,625	220,900	100,300
2	81,754	145,200	65,300	2	81,882	76,000	51,600	2	82,011	61,200	50,700	2	82,141	57,900	75,600
2	82,270	77,300	96,900	2	82,400	104,600	191,000	2	82,530	168,500	279,900	2	82,661	212,800	391,600
2	82,792	242,100	412,300	2	82,923	248,200	279,000	2	83,054	213,500	170,000	2	83,186	198,100	116,800
2	83,318	223,200	107,800	2	83,451	289,300	157,800	2	83,584	389,100	221,600	2	83,717	469,900	239,600
2	83,890	553,800	183,800	2	83,984	659,400	119,800	2	84,118	752,700	136,800	2	84,252	806,100	136,800
2	84,387	786,100	125,600	2	84,522	658,700	98,600	2	84,657	515,600	81,900	2	84,793	430,600	56,200
2	84,929	405,400	46,000	2	85,065	384,100	60,100	2	85,201	379,100	29,600	2	85,338	329,700	33,700
2	85,476	284,700	21,800	2	85,613	227,400	28,100	2	85,751	185,000	24,600	2	85,889	144,600	19,000
2	86,028	99,100	23,600	2	86,167	68,400	19,900	2	86,306	56,800	26,600	2	86,446	58,900	27,800
2	86,586	72,400	38,200	2	86,726	105,600	38,500	2	86,867	134,700	51,800	2	87,008	145,000	60,800
2	87,149	143,400	32,900	2	87,291	135,800	25,400	2	87,433	147,500	32,800	2	87,575	70,100	44,300
2	87,718	182,000	37,000	2	87,861	166,300	35,500	2	88,004	177,900	40,600	2	88,148	199,300	32,400
2	88,292	246,900	26,400	2	88,437	338,000	21,400	2	88,581	430,900	42,800	2	88,726	511,700	60,900
2	88,872	537,800	70,200	2	89,018	445,300	83,100	2	89,164	349,200	91,400	2	89,311	266,800	94,200
2	89,458	189,700	81,100	2	89,605	182,600	116,600	2	89,753	231,900	157,400	2	89,901	242,300	278,000
2	90,049	231,000	423,000	2	90,198	255,000	691,400	2	90,347	326,600	1121,100	2	90,497	368,500	1245,600
2	90,647	340,100	628,400	2	90,797	287,200	320,900	2	90,948	323,100	129,800	2	91,099	429,300	89,200
2	91,250	567,500	94,600	2	91,402	556,900	102,900	2	91,554	443,200	100,600	2	91,706	306,400	95,700
2	91,859	242,400	90,600	2	92,013	243,000	135,800	2	92,166	289,300	172,600	2	92,320	311,800	217,700
2	92,475	370,600	312,900	2	92,630	417,400	400,900	2	92,785	346,000	381,900	2	92,941	202,700	218,700
2	93,097	110,200	118,100	2	93,253	92,800	93,400	2	93,410	84,700	106,000	2	93,567	72,000	157,000
2	93,725	74,000	266,900	2	93,883	103,900	491,100	2	94,041	163,300	817,800	2	94,200	208,700	973,500
2	94,359	180,900	873,900	2	94,519	110,300	286,400	2	94,679	127,300	117,700	2	94,839	152,600	70,600
2	95,000	150,800	99,400	2	95,161	138,600	35,000	2	95,323	168,700	28,700	2	95,485	207,400	10,900
2	95,647	229,700	26,200	2	95,810	231,600	62,400	2	95,974	207,800	10,700	2	96,137	192,100	9,500
2	96,302	183,400	15,700	2	96,466	184,000	21,900	2	96,631	164,200	20,300	2	96,796	134,300	16,400
2	96,962	83,000	16,300	2	97,129	66,900	14,600	2	97,295	53,200	19,700	2	97,462	86,200	27,300
2	97,630	146,200	25,000	2	97,798	231,800	55,700	2	97,966	380,600	92,500	2	98,135	513,700	101,500
2	98,304	474,700	95,000	2	98,474	287,100	61,100	2	98,644	140,500	23,200	2	98,815	86,300	25,900
2	98,986	60,500	22,200	2	99,158	60,500	19,600	2	99,329	73,700	30,700	2	99,502	98,600	33,800
2	99,675	112,400	50,900	2	99,848	101,500	45,100	2	100,022	88,500	47,000	2	100,196	99,600	67,600
2	100,371	130,900	106,500	2	100,546	131,600	95,400	2	100,721	113,300	98,900	2	100,897	126,200	118,800
2	101,074	142,500	164,100	2	101,251	102,700	125,900	2	101,428	63,200	82,300	2	101,606	60,700	47,400
2	101,784	84,400	57,500	2	101,963	105,600	51,700	2	102,143	94,700	54,000	2	102,322	109,900	54,800
2	102,503	163,400	86,100	2	102,683	251,300	143,400	2	102,864	451,300	191,500	2	103,046	517,700	269,600
2	103,228	445,700	221,800	2	103,411	336,200	237,800	2	103,594	341,200	264,500	2	103,778	287,100	240,700
2	103,962	192,100	120,000	2	104,146	192,700	48,800	2	104,331	122,900	35,000	2	104,517	124,300	37,400
2	104,703	140,200	47,300	2	104,890	244,900	56,300	2	105,077	381,400	83,800	2	105,264	504,100	118,400
2	105,452	442,700	114,400	2	105,641	294,400	103,000	2	105,830	213,900	72,300	2	106,020	228,400	71,800
2	106,210	225,700	91,100	2	106,400	188,400	74,200	2	106,592	132,600	55,500	2	106,783	103,000	65,800
2	106,975	99,900	96,200	2	107,168	111,900	178,200	2	107,361	169,700	341,600	2	107,555	276,700	627,000
2	107,749	334,800	810,000	2	107,944	260,400	564,200	2	108,139	141,700	259,400	2	108,335	89,100	127,000
2	108,532	79,400	109,500	2	108,728	99,600	163,500	2	108,926	144,700	240,900	2	109,124	126,400	250,200
2	109,322	94,500	164,000	2	109,521	98,500	193,900	2	109,721	116,600	322,400	2	109,921	172,500	465,300
2	110,722	200,100	355,100	2	110,923	165,600	121,700	2	110,525	99,200	45,100	2	110,727	63,500	23,600
2	110,930	46,500	35,500	2	111,134	63,900	36,500	2	111,338	79,300	68,600	2	111,542	124,800	121,000
2	111,747	153,800	163,700	2	111,953	119,800	143,300	2	112,159	98,400	72,700	2	112,366	42,100	39,900
2	112,574	41,200	80,000	2	112,782	58,200	120,900	2	112,990	87,400	125,900	2	113,200	134,900	91,500
2	113,409	197,800	70,200	2	113,620	256,500	58,500	2	113,831	210,900	37,100	2	114,042	114,700	22,800
2	114,254	65,900	27,000	2	114,467	68,700	14,700	2	114,680	69,200	36,500	2	114,894	91,500	60,400
2	115,109	134,700	90,900	2	115,324	183,300	85,100	2	115,539	262,900	60,200	2	115,756	373,900	62,300
2	115,972	516,100	84,000	2	116,190	477,100	61,500	2	116,408	301,300	37,800	2	116,627	190,900	18,800
2	116,846	132,100	27,600	2	117,086	115,600	22,700	2	117,287	135,200	37,000	2	117,508	186,800	39,400
2	117,730	271,700	33,700	2	117,952	382,600	76,700	2	118,175	506,400	99,300	2	118,399	559,000	184,800
2	118,623	525,800	299,700	2	118,848	429,400	308,100	2	119,074	288,800	173,800	2	119,300	210,900	54,800

N	E	$\sigma_r \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_r \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_r \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_r \sqrt{E}$	$\sigma_c \sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
2	19,527	170,900	31,300	2	19,755	144,300	22,800	2	19,983	129,100	31,300	2	20,212	119,400	15,400
2	20,442	127,100	37,100	2	20,672	124,300	30,000	2	20,903	148,400	51,600	2	21,134	191,400	58,200
2	21,366	273,900	97,900	2	21,599	464,800	132,900	2	21,833	759,300	243,100	2	22,067	919,600	319,800
2	22,302	556,100	239,800	2	22,538	186,500	110,700	2	22,774	69,800	131,600	2	23,011	69,800	137,800
2	23,248	78,600	105,200	2	23,487	109,800	50,000	2	23,726	140,900	36,000	2	23,965	136,500	50,800
2	24,194	145,300	51,600	2	24,447	209,800	90,600	2	24,689	322,500	150,900	2	24,931	406,600	168,300
2	25,174	366,200	233,900	2	25,418	382,600	336,200	2	25,663	537,600	478,100	2	25,908	730,800	386,700
2	26,154	804,300	218,000	2	26,401	745,800	192,200	2	26,649	597,700	121,000	2	26,897	352,900	75,700
2	27,146	186,200	40,700	2	27,395	156,000	45,900	2	27,646	194,800	65,700	2	27,897	226,400	73,300
2	28,149	263,500	104,300	2	28,402	231,900	90,300	2	28,655	139,300	49,900	2	28,909	89,900	41,800
2	29,164	98,200	61,300	2	29,420	152,600	100,100	2	29,676	190,000	195,400	2	29,933	176,300	310,000
2	30,191	125,900	262,100	2	30,450	112,700	109,800	2	30,710	164,600	61,100	2	30,970	280,800	51,500
2	31,231	421,600	81,100	2	31,493	496,000	77,500	2	31,755	475,900	60,800	2	32,019	444,500	92,300
2	32,283	453,100	90,800	2	32,548	448,200	129,700	2	32,814	478,000	169,800	2	33,080	462,200	175,800
2	33,348	446,300	276,500	2	33,616	533,600	466,300	2	33,885	422,900	436,200	2	34,155	213,600	184,200
2	34,426	216,800	74,200	2	34,697	384,000	83,900	2	34,969	691,300	95,100	2	35,242	907,500	126,200
2	35,516	883,800	154,300	2	35,791	584,600	177,700	2	36,067	333,000	276,200	2	36,343	303,300	412,200
2	36,620	227,400	309,300	2	36,899	131,200	145,900	2	37,178	135,900	184,900	2	37,457	222,500	321,100
2	37,738	243,500	350,300	2	38,020	111,200	158,600	2	38,302	31,900	56,900	2	38,585	29,900	41,000
2	38,870	37,800	50,900	2	39,155	69,100	88,400	2	39,441	85,000	80,000	2	39,727	104,800	52,600
2	40,015	131,400	58,700	2	40,304	184,900	58,900	2	40,593	174,200	51,900	2	40,884	122,100	34,000
2	41,175	131,900	60,400	2	41,467	198,400	105,300	2	41,760	341,600	248,400	2	42,054	502,900	432,100
2	42,349	483,000	364,400	2	42,645	243,700	157,400	2	42,942	118,000	33,000	2	43,239	86,300	24,800
2	43,538	76,900	13,500	2	43,837	69,000	29,700	2	44,138	75,300	31,100	2	44,439	93,900	48,000
2	44,742	134,600	51,600	2	45,045	239,800	100,900	2	45,349	429,500	214,500	2	45,654	615,800	374,800
2	45,961	437,400	343,000	2	46,268	179,000	162,400	2	46,576	130,800	66,500	2	46,885	160,700	80,600
2	47,195	263,500	184,700	2	47,506	305,000	213,700	2	47,818	160,500	118,900	2	48,131	97,300	47,100
2	48,445	153,200	54,500	2	48,760	314,100	78,700	2	49,076	491,500	138,500	2	49,394	458,900	134,100
2	49,712	310,500	109,500	2	50,031	277,300	81,600	2	50,351	201,800	96,400	2	50,672	98,600	85,500
2	50,994	62,700	75,400	2	51,317	49,800	105,200	2	51,642	59,700	132,700	2	51,967	54,300	140,800
2	52,293	58,800	64,100	2	52,621	86,800	79,100	2	52,949	183,400	147,700	2	53,278	387,200	313,600
2	53,609	485,600	398,100	2	53,941	243,800	197,000	2	54,273	127,800	66,700	2	54,607	158,100	93,200
2	54,942	246,800	152,500	2	55,278	269,500	156,700	2	55,615	275,200	245,100	2	55,953	275,000	295,600
2	56,292	293,900	302,800	2	56,633	371,800	317,400	2	56,974	364,300	361,600	2	57,317	211,000	212,100
2	57,661	118,500	134,900	2	58,005	129,900	67,800	2	58,351	213,800	58,400	2	58,699	304,900	76,400
2	59,047	325,200	71,200	2	59,396	287,800	78,300	2	59,747	190,200	134,900	2	60,099	138,400	218,600
2	60,451	150,900	276,500	2	60,805	245,800	511,200	2	61,161	316,200	676,900	2	61,517	182,800	279,800
2	61,875	134,000	98,600	2	62,233	193,500	26,600	2	62,593	235,800	49,200	2	62,955	283,000	51,800
1	63,317	323,500	88,200	1	63,499	409,900	98,400	1	63,681	508,700	129,700	1	63,863	580,000	141,600
1	64,045	481,400	136,000	1	64,228	287,900	103,500	1	64,411	143,900	66,900	1	64,595	87,100	52,300
1	64,779	81,000	34,400	1	64,963	83,600	84,600	1	65,147	130,700	84,800	1	65,332	158,700	148,400
1	65,517	239,100	229,500	1	65,702	328,300	319,400	1	65,888	384,900	336,300	1	66,074	394,800	299,700
1	66,260	413,600	190,300	1	66,447	373,900	97,800	1	66,633	366,500	53,300	1	66,821	288,700	51,200
1	67,008	231,600	44,500	1	67,196	212,400	31,100	1	67,384	203,700	32,500	1	67,573	268,300	28,900
1	67,761	305,200	77,800	1	67,951	413,600	84,000	1	68,140	491,800	111,400	1	68,330	491,100	119,100
1	68,520	417,800	99,000	1	68,710	334,400	87,200	1	68,901	266,400	82,100	1	69,092	237,500	70,500
1	69,283	264,700	58,000	1	69,475	308,800	70,300	1	69,667	292,900	70,600	1	69,859	234,300	68,500
1	70,052	170,200	49,100	1	70,245	122,300	54,500	1	70,438	134,900	71,400	1	70,632	140,400	88,300
1	70,826	145,800	80,800	1	71,020	134,000	57,300	1	71,215	110,800	62,200	1	71,410	111,100	55,400
1	71,605	142,100	74,200	1	71,801	197,500	94,600	1	71,997	154,800	112,500	1	72,193	155,000	63,700
1	72,390	108,700	53,800	1	72,587	95,300	33,700	1	72,784	96,700	28,600	1	72,982	102,300	29,600
1	73,180	129,300	20,800	1	73,378	162,300	12,700	1	73,577	216,200	56,800	1	73,776	265,500	60,800
1	73,975	366,700	100,500	1	74,175	423,000	129,000	1	74,375	514,300	140,800	1	74,575	539,000	130,400
1	74,776	526,200	155,300	1	74,977	474,800	111,900	1	75,179	378,900	116,200	1	75,380	298,100	75,600
1	75,583	249,400	67,400	1	75,785	244,400	50,500	1	75,988	285,400	59,300	1	76,191	334,000	69,300
1	76,395	395,900	65,300	1	76,598	467,500	89,600	1	76,803	565,700	111,200	1	77,007	608,700	123,700
1	77,212	645,300	208,300	1	77,418	780,600	283,100	1	77,623	1036,700	413,100	1	77,829	1104,300	452,800
1	78,036	852,300	380,200	1	78,242	524,800	302,300	1	78,450	298,100	303,900	1	78,657	269,600	396,800
1	78,865	245,500	455,600	1	79,073	225,000	407,800	1	79,282	177,100	308,100	1	79,491	173,000	323,200
1	79,700	204,200	357,400	1	79,909	212,100	330,500	1	80,120	282,700	276,700	1	80,330	379,700	268,000

N	E	$\sigma_F \sqrt{E}$	$\sigma_C \sqrt{E}$	N	E	$\sigma_F \sqrt{E}$	$\sigma_C \sqrt{E}$	N	E	$\sigma_F \sqrt{E}$	$\sigma_C \sqrt{E}$	N	E	$\sigma_F \sqrt{E}$	$\sigma_C \sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
180,541	451,300	297,800		180,752	404,500	261,900		180,963	306,700	185,500		181,175	226,900	138,600	
181,367	229,700	91,900		181,600	251,000	93,400		181,813	279,900	91,700		182,026	329,300	89,300	
182,240	348,100	162,700		182,454	311,000	219,300		182,669	255,900	215,700		182,884	175,500	149,000	
183,099	123,900	90,400		183,314	107,900	52,900		183,530	104,100	58,800		183,747	93,700	62,700	
183,964	67,700	93,300		184,181	53,900	135,100		184,398	52,700	135,500		184,616	34,100	86,400	
184,835	27,100	67,300		185,053	32,400	26,100		185,272	32,200	32,200		185,492	40,500	41,600	
185,712	72,100	56,800		185,932	87,700	65,600		186,153	95,800	77,600		186,374	104,900	62,600	
186,595	126,200	23,500		186,817	139,400	25,600		187,039	158,200	28,400		187,262	137,000	41,800	
187,465	126,600	19,300		187,708	100,600	25,500		187,932	102,600	33,100		188,156	90,400	50,200	
188,381	77,800	65,900		188,606	79,000	95,900		188,832	112,400	129,700		189,057	162,500	173,500	
189,284	220,200	237,900		189,510	340,700	342,900		189,737	404,500	416,700		189,965	374,300	341,200	
190,193	276,300	189,500		190,421	166,800	132,700		190,650	124,600	35,900		190,879	101,200	50,700	
191,108	99,900	66,000		191,338	143,100	81,200		191,569	201,600	115,800		191,799	246,800	152,300	
192,031	348,500	231,000		192,262	507,200	366,600		192,494	645,000	471,200		192,727	643,700	441,300	
192,959	425,300	289,600		193,193	198,200	135,200		193,426	132,900	54,900		193,661	152,400	49,100	
193,895	214,700	59,000		194,130	302,800	71,500		194,366	369,700	91,900		194,601	345,700	89,600	
194,838	249,400	84,700		195,074	137,900	73,800		195,312	88,100	59,800		195,549	74,200	57,600	
195,767	78,900	37,600		196,026	96,700	15,200		196,264	114,100	30,500		196,504	139,100	33,700	
196,744	153,300	69,300		196,984	158,300	82,500		197,224	196,700	107,900		197,465	284,800	147,400	
197,707	343,700	99,600		197,949	411,700	100,200		198,191	469,300	60,000		198,434	522,400	62,600	
198,677	613,400	56,200		198,921	614,000	48,800		199,165	536,200	63,700		199,410	481,800	78,300	
199,655	464,100	94,100		199,901	495,600	163,200		200,147	668,300	235,900		200,393	866,600	353,600	
200,164	896,000	392,500		200,887	608,700	312,600		201,135	331,300	193,300		201,383	186,800	128,300	
201,632	138,800	104,300		201,881	150,000	199,800		202,131	209,600	174,400		202,381	197,500	172,800	
202,632	158,600	122,200		202,883	148,900	52,900		203,134	189,600	71,300		203,386	270,500	56,100	
203,639	310,100	91,500		203,892	376,100	73,900		204,145	330,300	108,300		204,399	223,000	99,800	
204,653	135,300	73,000		204,908	90,900	46,400		205,163	69,100	60,400		205,419	89,500	81,800	
205,675	117,500	112,200		205,932	146,000	126,600		206,189	166,000	136,300		206,447	166,400	110,700	
206,705	251,500	76,500		206,964	355,900	142,700		207,223	452,900	155,700		207,483	410,500	152,500	
207,743	241,800	139,600		208,003	114,800	77,800		208,265	60,100	94,300		208,526	49,600	114,000	
208,788	57,900	186,600		209,051	66,600	279,600		209,314	73,900	418,800		209,577	99,100	635,800	
209,842	138,600	820,000		210,106	133,000	722,000		210,371	150,200	390,100		210,637	184,700	201,500	
210,903	243,200	152,600		211,169	273,700	168,400		211,437	283,500	220,700		211,704	263,400	231,400	
211,972	256,600	194,300		212,241	215,900	126,600		212,510	232,100	56,900		212,780	243,200	63,900	
213,050	288,300	61,600		213,320	399,000	112,100		213,592	579,100	145,200		213,863	715,200	169,400	
214,136	641,400	149,800		214,408	426,800	93,600		214,682	230,500	57,400		214,955	184,000	28,600	
215,230	159,700	15,100		215,504	143,700	19,100		215,780	151,600	17,100		216,056	137,400	26,000	
216,332	166,700	38,200		216,609	201,300	26,400		216,887	243,800	69,300		217,165	343,500	45,900	
217,443	350,900	52,800		217,722	290,000	71,600		218,002	217,400	54,200		218,282	187,800	27,200	
218,563	174,100	43,000		218,844	175,600	37,200		219,126	216,700	42,800		219,408	265,600	46,600	
219,691	317,900	60,100		219,974	426,900	86,600		220,258	567,700	129,100		220,543	781,500	195,300	
220,828	933,100	202,500		221,114	923,400	139,100		221,400	759,700	108,200		221,687	668,500	123,000	
221,974	609,000	73,800		222,262	495,400	149,200		222,550	388,100	136,200		222,839	339,600	170,400	
223,129	431,900	221,400		223,419	550,100	307,700		223,709	559,400	317,600		224,001	448,600	363,000	
224,292	374,800	439,500		224,585	482,400	642,000		224,878	607,500	930,600		225,171	642,400	876,300	
225,465	486,900	669,900		225,760	320,900	439,900		226,055	271,900	297,200		226,351	301,100	355,100	
226,648	335,100	466,600		226,945	388,400	359,500		227,242	372,900	214,400		227,540	278,800	101,800	
227,839	198,100	76,000		228,138	177,200	52,900		228,438	174,200	84,400		228,739	201,900	120,400	
229,040	259,600	142,000		229,342	309,100	159,000		229,644	295,100	150,400		229,947	227,600	176,400	
230,250	208,900	185,000		230,555	288,300	268,000		230,859	485,000	455,900		231,165	628,400	602,500	
231,471	811,300	616,600		231,777	769,100	468,000		232,084	656,700	291,200		232,392	456,200	183,100	
232,700	422,300	166,200		233,009	530,200	96,700		233,319	589,000	213,400		233,629	524,800	120,100	
233,940	402,400	150,700		234,251	370,300	149,700		234,563	257,800	123,000		234,876	131,600	78,000	
235,190	74,600	45,800		235,503	64,200	29,400		235,818	65,200	29,500		236,133	55,300	41,000	
236,449	64,100	46,500		236,766	97,200	100,400		237,083	133,300	113,700		237,400	132,300	90,800	
237,719	130,300	33,000		238,038	182,400	51,100		238,356	244,000	17,500		238,678	281,300	38,400	
238,999	298,700	19,100		239,320	335,800	33,400		239,643	370,000	46,800		239,966	425,000	26,000	
240,289	414,200	48,600		240,613	510,300	38,100		240,938	576,000	77,500		241,264	736,200	96,500	
241,590	764,400	95,200		241,917	557,600	78,600		242,244	370,800	48,900		242,573	276,600	49,200	
242,901	256,100	36,100		243,231	229,900	21,900		243,561	191,200	33,300		243,892	159,600	36,200	

N	E	$\sigma_c \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_c \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_c \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_c \sqrt{E}$	$\sigma_c \sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
	244,224	155,900	31,700		244,556	164,800	47,100		244,889	170,900	68,900		245,222	243,600	60,200
	245,557	313,900	75,300		245,891	358,100	86,400		246,227	312,800	93,500		246,583	293,600	105,000
	246,900	261,200	117,800		247,238	214,200	145,700		247,577	250,000	230,400		247,916	346,500	366,000
	248,255	418,000	406,400		248,596	401,300	298,500		248,937	382,200	203,600		249,279	417,400	185,500
	249,622	303,400	143,700		249,965	171,300	48,100		250,309	110,400	34,000		250,654	107,500	27,500
	250,999	148,900	39,000		251,345	207,400	19,200		251,692	278,600	23,200		252,040	331,500	35,400
	252,388	379,500	31,000		252,737	419,100	61,700		253,087	505,300	123,700		253,437	598,100	88,600
	253,788	555,700	133,700		254,140	422,000	112,300		254,493	294,500	76,400		254,846	199,600	75,600
	255,200	174,200	89,400		255,555	215,000	100,100		255,911	323,900	142,100		256,267	394,000	178,100
	256,624	314,900	119,300		256,982	170,000	84,100		257,341	96,700	40,100		257,700	90,700	46,400
	258,060	95,800	92,300		258,421	130,100	59,400		258,783	131,500	57,400		259,145	154,400	69,500
	259,508	222,200	75,700		259,872	355,000	102,200		260,237	490,600	114,400		260,602	598,000	191,800
	260,969	733,500	289,800		261,336	934,300	433,500		261,703	1158,600	503,700		262,072	1226,300	424,100
	262,441	860,900	234,300		262,811	442,200	92,200		263,182	231,700	62,000		263,554	134,500	78,100
	263,926	110,200	99,300		264,299	111,700	103,000		264,673	157,100	142,000		265,048	204,000	144,600
	265,424	267,500	128,100		265,800	372,000	65,900		266,178	510,600	62,300		266,556	612,600	88,600
	266,934	596,500	71,000		267,314	429,000	75,600		267,695	350,100	78,600		268,076	389,200	96,300
	268,458	429,700	105,400		268,841	492,600	66,200		269,224	443,600	90,700		269,609	535,700	132,500
	269,994	596,600	190,800		270,381	639,300	171,400		270,768	602,600	154,400		271,155	489,700	148,300
	271,544	390,400	195,100		271,934	349,600	231,000		272,324	446,700	378,400		272,715	693,800	578,000
	273,107	797,900	660,700		273,500	595,400	476,300		273,894	387,700	161,400		274,288	225,100	80,500
	274,684	170,200	94,100		275,080	181,600	92,800		275,477	216,900	59,300		275,875	273,000	85,800
	276,274	394,000	95,300		276,674	589,200	162,900		277,075	759,500	228,100		277,476	594,900	206,100
	277,878	305,600	146,900		278,282	193,400	98,500		278,686	238,300	74,500		279,091	359,900	55,800
	279,497	500,600	33,000		279,903	583,200	20,600		280,311	576,700	73,200		280,720	438,900	45,800
	281,129	269,000	41,200		281,539	172,000	43,900		281,951	122,900	48,500		282,363	79,300	52,800
	282,776	52,900	24,600		283,190	35,000	19,300		283,605	42,400	-5,600		284,020	51,700	27,800
	284,437	62,900	24,300		284,855	83,900	33,000		285,273	116,600	30,400		285,693	160,100	47,200
	286,113	188,000	23,300		286,534	182,400	46,600		286,956	194,200	31,400		287,380	249,600	44,500
	287,804	301,100	70,700		288,229	304,800	65,600		288,655	317,300	82,500		289,082	424,600	121,300
	289,510	634,400	133,500		289,938	661,000	165,200		290,368	557,900	100,500		290,799	372,900	97,000
	291,231	212,900	64,100		291,663	145,600	36,400		292,097	148,200	44,200		292,531	142,200	43,000
	292,967	105,400	41,200		293,404	90,700	49,400		293,841	74,400	54,900		294,280	84,900	45,200
	294,719	81,800	34,700		295,159	123,900	44,000		295,601	169,000	68,400		296,043	217,200	76,200
	296,487	215,300	99,700		296,931	196,500	96,600		297,377	162,200	135,400		297,823	178,200	163,000
	298,270	227,800	273,700		298,719	346,000	363,300		299,168	318,300	317,600		299,619	170,900	146,400
	300,070	94,700	55,800		300,523	98,500	42,800		300,976	113,600	36,400		301,431	127,100	31,100
	301,887	127,500	48,000		302,343	147,800	42,500		302,801	177,800	34,200		303,260	204,300	47,200
	303,719	174,800	48,700		304,180	162,500	60,900		304,642	197,500	27,000		305,105	242,200	48,200
	305,569	297,900	48,000		306,034	213,700	65,500		306,500	59,000	21,100		306,967	106,600	48,700
	307,435	115,700	66,600		307,904	130,300	61,200		308,375	132,500	108,500		308,846	139,100	179,100
	309,319	132,000	217,900		309,792	86,400	183,000		310,267	64,900	61,700		310,743	74,200	44,700
	311,220	101,800	40,000		311,698	146,400	70,100		312,177	176,600	91,600		312,657	234,200	145,800
	313,138	260,700	249,100		313,621	281,900	272,300		314,104	249,300	210,400		314,589	262,400	128,300
	315,074	362,400	130,100		315,561	485,100	179,300		316,049	490,200	149,600		316,539	349,200	103,000
	317,029	214,200	81,200		317,520	168,000	64,600		318,013	174,700	63,600		318,507	150,200	51,000
	319,001	146,200	80,400		319,497	201,900	76,400		319,995	216,100	85,700		320,493	176,200	86,700
	320,992	132,900	74,000		321,493	172,600	95,200		321,995	246,900	158,000		322,498	378,100	243,100
	323,002	514,500	333,300		323,508	608,700	314,000		324,014	649,600	335,200		324,522	606,800	355,500
	325,031	511,800	269,100		325,541	402,900	229,500		326,052	376,000	223,300		326,565	306,400	230,600
	327,079	232,000	239,100		327,594	213,500	269,000		328,110	171,100	173,600		328,627	159,600	106,600
	329,146	239,900	47,100		329,666	238,100	62,700		330,187	200,000	65,200		330,709	204,400	72,300
	331,233	199,200	79,000		331,758	204,400	86,900		332,284	264,900	177,400		332,811	385,900	279,000
	333,340	472,700	384,900		333,869	422,000	360,900		334,401	405,200	142,500		334,933	306,800	69,900
	335,467	204,100	50,400		336,002	222,100	38,200		336,538	306,500	57,900		337,075	362,000	71,900
	337,614	281,600	73,100		338,154	243,200	57,400		338,695	285,100	54,600		339,238	374,700	83,900
	339,782	548,500	124,600		340,327	746,800	175,600		340,874	622,900	148,400		341,422	364,800	116,200
	341,971	228,700	143,700		342,522	292,800	186,800		343,074	331,800	311,900		343,627	405,700	351,000
	344,181	466,100	338,500		344,737	360,300	247,300		345,295	203,600	101,400		345,853	158,000	81,800
	346,413	238,400	55,000		346,975	331,600	109,900		347,537	408,200	132,200		348,101	326,200	106,500

N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
1	348.667	224.900	107.500	1	349.234	213.000	56.000	1	349.802	193.100	33.200	1	350.371	200.700	72.600
1	350.942	222.600	74.800	1	351.515	248.700	138.100	1	352.089	268.300	113.800	1	352.664	261.000	121.000
1	353.240	273.400	106.900	1	353.818	251.800	84.100	1	354.398	194.200	67.100	1	354.979	210.200	97.400
1	355.561	285.600	167.600	1	356.145	295.500	256.300	1	356.730	298.000	208.800	1	357.316	201.900	84.100
1	357.904	152.200	25.300	1	358.494	129.000	31.200	1	359.085	143.500	37.500	1	359.677	196.900	53.900
1	360.271	245.700	64.600	1	360.867	261.800	72.500	1	361.463	300.800	70.900	1	362.062	308.800	77.900
1	362.662	249.000	52.400	1	363.263	184.400	60.000	1	363.866	198.600	79.200	1	364.470	244.400	101.700
1	365.076	289.400	108.900	1	365.683	299.100	99.700	1	366.292	251.000	51.600	1	366.902	130.400	72.600
1	367.514	92.800	85.600	1	368.128	103.300	44.400	1	368.743	120.900	86.700	1	369.359	145.300	118.300
1	369.977	191.100	192.000	1	370.597	255.500	252.900	1	371.218	239.400	227.000	1	371.841	191.100	140.600
1	372.465	151.300	174.100	1	373.091	148.200	218.900	1	373.718	155.100	192.100	1	374.347	112.600	82.600
1	374.978	90.000	42.500	1	375.610	72.900	29.400	1	376.244	93.000	39.700	1	376.879	126.400	38.900
1	377.516	194.200	55.600	1	378.155	269.400	84.100	1	378.795	286.600	98.900	1	379.437	405.300	138.700
1	380.081	485.300	237.600	1	380.726	414.900	280.200	1	381.373	286.800	270.400	1	382.021	266.000	304.100
1	382.671	249.700	196.600	1	383.323	269.000	122.700	1	383.976	258.000	110.200	1	384.631	166.500	130.600
1	385.288	135.600	113.600	1	385.947	141.300	97.100	1	386.607	170.600	127.700	1	387.269	284.300	204.500
1	387.932	411.600	258.600	1	388.598	280.200	183.300	1	389.265	139.500	135.600	1	389.933	77.700	75.800
1	390.604	94.100	44.200	1	391.276	131.800	67.700	1	391.950	264.600	64.400	1	392.625	354.800	82.100
1	393.303	276.100	50.500	1	393.982	173.100	46.800	1	394.663	152.100	33.900	1	395.345	186.100	38.500
1	396.030	248.800	73.500	1	396.716	343.100	124.500	1	397.404	313.400	167.300	1	398.094	180.400	126.300
1	398.785	94.400	64.400	1	399.479	89.700	72.900	1	400.174	113.800	109.100	1	400.871	153.900	98.300
1	401.570	180.600	99.600	1	402.270	203.700	72.600	1	402.973	203.800	50.600	1	403.677	179.600	80.300
1	404.384	227.700	74.100	1	405.092	332.000	77.000	1	405.801	345.400	123.900	1	406.513	260.300	86.300
1	407.227	201.000	53.500	1	407.942	200.800	60.700	1	408.660	238.900	45.900	1	409.379	175.800	59.100
1	410.100	102.300	40.100	1	410.824	105.300	49.600	1	411.549	97.600	63.300	1	412.276	86.200	12.900
1	413.004	105.800	47.700	1	413.735	152.000	71.000	1	414.468	239.100	77.100	1	415.203	202.500	125.600
1	415.939	288.400	143.000	1	416.678	249.800	66.500	1	417.419	261.500	110.400	1	418.161	413.600	149.200
1	418.908	480.300	198.600	1	419.652	370.600	169.900	1	420.401	279.000	109.600	1	421.151	211.300	71.700
1	421.904	196.600	33.900	1	422.658	292.400	62.500	1	423.415	447.100	83.900	1	424.174	443.400	101.300
1	424.934	394.500	178.800	1	425.697	423.900	190.400	1	426.482	377.600	158.800	1	427.229	510.600	166.900
1	427.998	308.800	111.500	1	428.769	329.900	106.700	1	429.542	326.300	122.300	1	430.317	387.200	94.700
1	431.094	405.000	85.400	1	431.874	333.900	75.000	1	432.655	349.700	65.200	1	433.439	492.400	137.200
1	434.224	634.100	161.000	1	435.012	490.600	145.900	1	435.802	269.000	110.800	1	436.595	149.700	63.800
1	437.389	158.200	76.400	1	437.767	196.700	69.700	1	438.185	253.000	100.900	1	438.584	296.600	111.500
1	438.984	363.400	142.800	1	439.384	416.600	157.600	1	439.785	473.300	198.700	1	440.186	516.200	212.000
1	440.588	539.400	192.800	1	440.990	578.200	152.200	1	441.393	487.800	163.600	1	441.797	454.100	118.800
1	442.201	490.600	55.400	1	442.605	441.600	60.900	1	443.011	404.300	45.500	1	443.416	331.600	37.000
1	443.822	220.900	50.200	1	444.229	144.100	50.400	1	444.637	130.300	5.900	1	445.045	117.100	47.100
1	445.453	108.900	58.700	1	445.862	105.900	48.800	1	446.272	91.100	81.800	1	446.682	102.400	50.700
1	447.093	105.400	87.300	1	447.504	120.100	90.700	1	447.916	148.700	76.400	1	448.328	189.300	108.000
1	448.741	236.700	158.600	1	449.155	278.200	150.700	1	449.569	302.300	150.200	1	449.984	321.900	137.700
1	450.399	277.600	144.100	1	450.815	261.600	140.600	1	451.231	256.900	89.600	1	451.648	201.300	93.700
1	452.066	170.900	84.600	1	452.484	172.400	55.600	1	452.903	178.700	58.400	1	453.322	212.600	120.100
1	453.742	268.000	133.000	1	454.163	289.400	160.100	1	454.584	243.900	156.400	1	455.006	206.700	190.800
1	455.428	169.100	119.900	1	455.851	136.000	109.600	1	456.274	100.600	95.900	1	456.698	124.100	74.600
1	457.123	133.300	62.800	1	457.548	153.400	56.000	1	457.974	172.500	68.900	1	458.400	224.200	87.300
1	458.827	275.500	63.200	1	459.255	335.600	93.800	1	459.683	360.400	129.100	1	460.112	322.600	113.000
1	460.541	287.900	169.200	1	460.971	302.200	145.100	1	461.402	323.100	198.000	1	461.833	388.900	272.000
1	462.265	494.900	294.100	1	462.698	544.100	321.200	1	463.131	603.600	276.600	1	463.564	589.700	223.300
1	463.998	631.200	181.000	1	464.433	629.900	124.000	1	464.869	511.000	95.000	1	465.305	324.300	122.000
1	465.742	242.300	22.700	1	466.179	169.200	41.700	1	466.617	176.500	38.500	1	467.055	201.900	46.700
1	467.495	218.300	50.400	1	467.934	205.500	59.600	1	468.375	239.700	65.000	1	468.816	270.900	43.500
1	469.257	300.100	55.100	1	469.700	319.600	60.000	1	470.143	315.200	75.400	1	470.586	292.100	59.800
1	471.030	271.300	101.600	1	471.475	296.700	31.200	1	471.920	355.800	117.400	1	472.367	371.000	134.800
1	472.813	327.600	119.900	1	473.261	247.600	88.600	1	473.708	181.000	68.700	1	474.157	132.400	88.500
1	474.606	118.200	79.800	1	475.056	117.300	92.600	1	475.507	113.500	108.400	1	475.958	120.300	136.200
1	476.410	148.500	147.100	1	476.862	177.900	168.200	1	477.315	225.700	187.000	1	477.769	289.800	153.500
1	478.223	271.600	157.000	1	478.678	326.000	157.400	1	479.134	389.800	192.200	1	479.590	494.000	148.200
1	480.047	548.700	143.700	1	480.505	542.100	153.400	1	480.963	495.400	155.700	1	481.422	555.200	165.500
1	481.882	567.600	148.100	1	482.342	547.700	166.300	1	482.803	466.300	125.100	1	483.264	363.100	93.500

N	E	$\sigma_f/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_f/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_f/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_f/\sqrt{E}$	$\sigma_c/\sqrt{E}$
(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})	
0	483,727	252,700	128,800	0	484,189	256,100	110,800	0	484,653	259,200	92,900	0	485,117	218,400	72,000
0	487,582	227,600	84,500	0	486,048	227,300	77,500	0	486,514	206,700	65,300	0	486,981	193,700	104,400
0	487,448	235,300	66,600	0	487,917	260,100	41,300	0	488,386	273,200	98,900	0	488,855	275,700	73,400
0	489,325	302,800	72,700	0	489,796	367,200	80,200	0	490,268	398,500	89,500	0	490,740	410,500	117,800
0	491,213	399,800	80,700	0	491,687	333,700	88,000	0	492,161	258,800	78,400	0	492,637	227,800	78,500
0	493,112	190,800	137,900	0	493,589	186,800	150,300	0	494,066	207,400	148,200	0	494,544	230,500	123,400
0	495,022	252,700	147,500	0	495,501	296,000	131,800	0	495,981	351,200	165,600	0	496,462	371,100	183,800
0	496,943	360,000	203,900	0	497,425	290,700	231,400	0	497,908	292,000	186,100	0	498,391	301,000	124,900
0	498,875	357,800	104,000	0	499,360	387,300	60,400	0	499,846	499,800	59,000	0	500,332	574,500	50,500
0	500,819	610,300	57,200	0	501,307	568,800	88,500	0	501,795	565,900	60,100	0	502,284	510,700	103,900
0	502,774	533,900	68,200	0	503,264	517,400	92,400	0	503,756	512,600	74,100	0	504,247	429,800	102,700
0	504,740	372,600	111,900	0	505,234	343,900	84,300	0	505,728	320,200	67,000	0	506,222	360,200	69,500
0	506,718	370,800	47,800	0	507,214	377,400	76,900	0	507,711	378,500	76,500	0	508,209	384,000	73,900
0	508,708	385,100	81,400	0	509,207	393,400	74,100	0	509,707	432,600	72,200	0	510,207	479,300	85,500
0	510,709	588,200	87,400	0	511,211	707,600	153,300	0	511,714	828,000	120,500	0	512,218	819,900	147,700
0	512,722	854,800	148,400	0	513,227	856,600	67,600	0	513,733	804,900	54,200	0	514,240	766,000	30,700
0	514,747	584,500	51,800	0	515,255	417,700	17,400	0	515,764	260,500	27,500	0	516,274	182,500	52,600
0	516,784	138,600	28,700	0	517,295	147,500	80,000	0	517,807	161,100	47,300	0	518,320	185,600	97,500
0	518,833	221,900	84,900	0	519,348	301,100	138,400	0	519,863	377,900	201,000	0	520,378	445,000	219,200
0	520,895	424,300	196,700	0	521,412	332,400	155,100	0	521,930	220,800	141,100	0	522,449	172,000	97,900
0	522,969	158,500	96,600	0	523,489	185,200	135,000	0	524,010	208,200	176,800	0	524,532	271,200	197,900
0	525,055	290,500	234,100	0	525,978	237,900	225,900	0	526,102	184,200	198,900	0	526,628	184,100	144,300
0	527,153	220,300	109,800	0	527,680	323,500	161,500	0	528,207	403,200	203,700	0	528,736	401,500	214,700
0	529,300	404,700	232,400	0	529,860	398,500	202,900	0	530,300	443,100	97,900	0	530,900	468,000	128,800
0	531,400	453,300	132,900	0	531,900	368,800	122,700	0	532,500	291,400	107,800	0	533,000	230,000	57,600
0	533,500	171,700	92,600	0	534,100	196,300	79,700	0	534,600	225,800	73,100	0	535,100	279,900	75,000
0	535,700	211,300	117,600	0	536,200	286,300	105,900	0	536,800	298,900	96,400	0	537,300	347,600	80,600
0	537,800	386,800	96,200	0	538,400	431,400	82,300	0	538,900	390,800	106,700	0	539,500	342,800	82,300
0	540,000	261,700	114,300	0	540,600	269,000	97,100	0	541,100	281,100	111,700	0	541,700	271,700	195,600
0	542,200	372,400	240,600	0	542,800	434,400	298,600	0	543,300	532,100	235,500	0	543,900	531,400	188,500
0	544,400	514,200	157,800	0	545,000	484,600	132,100	0	545,500	401,400	152,700	0	546,100	428,000	136,800
0	546,600	412,400	197,400	0	547,200	396,700	164,600	0	547,700	295,900	161,500	0	548,300	168,700	101,900
0	548,900	108,900	67,900	0	549,400	107,600	38,900	0	550,000	108,000	48,500	0	550,500	127,100	77,100
0	551,100	151,800	94,000	0	551,700	187,400	88,800	0	552,200	200,000	128,600	0	552,800	184,700	135,900
0	553,400	139,600	113,700	0	553,900	125,900	78,800	0	554,500	111,600	74,300	0	555,100	130,500	71,200
0	555,600	188,200	63,400	0	556,200	255,600	89,700	0	556,800	354,000	64,200	0	557,300	427,100	72,900
0	557,900	464,900	70,000	0	558,500	439,000	90,900	0	559,100	422,000	92,400	0	559,600	327,600	84,100
0	560,200	282,100	78,100	0	560,800	262,900	97,800	0	561,400	280,500	93,200	0	561,900	308,300	109,700
0	562,500	272,500	122,500	0	563,100	227,600	115,700	0	563,700	209,000	95,200	0	564,300	230,800	51,700
0	564,800	261,000	60,000	0	565,400	265,300	114,700	0	566,000	262,800	82,900	0	566,600	239,200	80,400
0	567,200	285,000	77,300	0	567,800	262,200	58,300	0	568,400	251,100	44,700	0	569,000	270,100	98,200
0	569,500	289,600	121,300	0	570,100	376,000	120,700	0	570,700	436,000	154,200	0	571,300	523,000	201,400
0	571,900	640,300	177,300	0	572,500	722,900	232,900	0	573,100	729,000	283,100	0	573,700	655,300	261,400
0	574,300	529,600	191,300	0	574,900	472,300	161,800	0	575,500	465,500	105,300	0	576,100	481,300	88,200
0	576,700	505,900	172,800	0	577,300	511,800	144,500	0	577,900	511,800	136,800	0	578,500	444,100	117,400
0	579,100	376,500	99,800	0	579,700	237,400	118,600	0	580,300	204,700	83,000	0	580,900	193,300	64,300
0	581,500	151,900	54,600	0	582,200	174,600	53,300	0	582,800	184,700	135,200	0	583,400	191,200	110,000
0	584,000	272,100	145,100	0	584,600	327,400	116,400	0	585,200	394,300	161,100	0	585,800	418,100	170,200
0	586,500	393,300	185,300	0	587,100	363,900	184,900	0	587,700	340,700	196,000	0	588,300	315,500	186,600
0	588,900	401,700	112,100	0	589,600	429,100	128,500	0	590,200	493,800	113,400	0	590,800	587,900	112,400
0	591,400	636,200	79,100	0	592,100	596,200	80,400	0	592,700	454,700	93,100	0	593,300	354,500	108,600
0	593,900	329,400	108,300	0	594,600	344,900	73,600	0	595,200	358,800	148,700	0	595,800	373,200	174,900
0	596,500	343,000	194,000	0	597,100	268,300	169,900	0	597,700	213,200	170,300	0	598,400	204,300	156,500
0	599,000	235,400	137,100	0	599,600	314,700	150,100	0	600,300	310,800	153,300	0	600,900	338,000	111,800
0	601,600	306,000	92,700	0	602,200	367,700	40,800	0	602,800	422,900	63,400	0	603,500	481,200	79,100
0	604,100	499,700	87,700	0	604,800	536,500	99,300	0	605,400	452,800	95,100	0	606,100	349,500	80,200
0	606,700	260,800	36,600	0	607,400	216,200	62,600	0	608,000	255,300	57,900	0	608,700	285,200	77,400
0	609,300	313,600	89,300	0	610,000	391,500	89,400	0	610,600	472,200	105,600	0	611,300	473,200	110,500
0	612,000	404,000	85,100	0	612,600	342,700	93,400	0	613,300	275,400	50,600	0	613,900	223,600	78,600
0	614,600	219,200	67,600	0	615,300	229,600	94,700	0	615,900	298,400	95,200	0	616,600	254,100	104,000

N	E	$\sigma_r/\bar{E}$	$\sigma_c/\bar{E}$	N	E	$\sigma_r/\bar{E}$	$\sigma_c/\bar{E}$	N	E	$\sigma_r/\bar{E}$	$\sigma_c/\bar{E}$	N	E	$\sigma_r/\bar{E}$	$\sigma_c/\bar{E}$
(eV)	(b eV ^{1/2})	(b eV ^{1/2})	(b eV ^{1/2})	(eV)	(b eV ^{1/2})	(b eV ^{1/2})	(b eV ^{1/2})	(eV)	(b eV ^{1/2})	(b eV ^{1/2})	(b eV ^{1/2})	(eV)	(b eV ^{1/2})	(b eV ^{1/2})	(b eV ^{1/2})
0	617,300	259,300	116,100	0	617,900	272,200	107,400	0	618,600	285,000	172,700	0	619,300	313,100	189,600
0	619,900	308,300	215,800	0	620,600	189,800	158,500	0	621,300	141,800	68,600	0	622,000	86,500	27,400
0	622,600	81,500	46,900	0	623,300	81,600	82,000	0	624,000	104,400	92,900	0	624,700	121,900	81,900
0	625,300	144,800	133,200	0	626,000	173,500	136,200	0	626,700	235,300	159,000	0	627,400	265,500	196,200
0	628,100	287,100	168,300	0	628,800	330,700	101,500	0	629,400	382,200	93,800	0	630,100	384,200	115,600
0	630,800	321,700	140,300	0	631,500	305,300	174,600	0	632,200	305,200	132,000	0	632,900	301,900	151,900
0	633,600	272,900	220,900	0	634,300	271,200	280,900	0	635,000	260,300	351,400	0	635,700	234,300	377,200
0	636,400	251,300	349,600	0	637,100	234,000	282,400	0	637,800	190,800	208,300	0	638,500	186,600	119,900
0	639,200	201,200	112,500	0	639,900	213,800	100,400	0	640,600	221,300	178,700	0	641,300	204,600	182,700
0	642,000	201,500	261,000	0	642,700	181,500	180,400	0	643,400	179,200	198,200	0	644,100	188,800	250,400
0	644,800	222,000	339,000	0	645,500	245,600	378,500	0	646,200	281,100	334,900	0	647,000	261,600	271,800
0	647,700	257,400	132,000	0	648,400	211,700	80,200	0	649,100	143,800	61,000	0	649,800	114,100	58,200
0	650,600	102,000	43,600	0	651,300	98,800	71,000	0	652,000	89,600	58,500	0	652,700	106,900	57,000
0	653,400	153,000	80,200	0	654,200	163,300	48,800	0	654,900	158,700	65,200	0	655,600	168,700	83,500
0	656,400	202,600	52,600	0	657,100	197,900	83,700	0	657,800	249,100	91,100	0	658,600	328,800	129,100
0	659,300	298,400	105,900	0	660,000	272,300	157,400	0	660,800	235,700	109,800	0	661,500	194,800	108,500
0	662,300	211,400	96,200	0	663,000	258,800	65,300	0	663,700	324,400	62,400	0	664,500	391,100	51,900
0	665,200	410,600	94,200	0	666,000	449,900	84,500	0	666,700	447,900	133,600	0	667,500	415,000	124,500
0	668,200	294,800	88,000	0	669,000	246,200	97,100	0	669,700	202,600	75,800	0	670,500	222,300	91,500
0	671,200	253,100	86,600	0	672,000	313,900	126,000	0	672,700	374,500	164,300	0	673,500	465,700	148,400
0	674,300	462,900	163,600	0	675,000	496,600	184,700	0	675,800	537,000	145,900	0	676,600	609,800	150,800
0	677,300	695,800	185,200	0	678,100	678,100	208,600	0	678,900	611,400	191,800	0	679,600	521,000	126,000
0	680,400	426,700	113,700	0	681,200	433,000	73,400	0	681,900	452,500	65,900	0	682,700	497,000	38,800
0	683,500	430,300	30,500	0	684,300	300,800	23,200	0	685,100	270,800	41,800	0	685,800	221,900	92,100
0	686,600	187,000	85,700	0	687,400	195,700	79,100	0	688,200	204,300	103,700	0	689,000	256,000	44,700
0	689,800	292,500	94,400	0	690,500	367,300	120,200	0	691,300	355,000	116,300	0	692,100	399,200	104,700
0	692,900	438,400	93,800	0	693,700	419,600	126,600	0	694,500	341,600	86,100	0	695,300	259,100	67,800
0	698,100	228,400	96,300	0	696,900	275,900	94,200	0	697,700	265,500	115,700	0	698,500	292,500	124,900
0	699,300	285,600	154,700	0	700,100	315,500	146,700	0	700,900	304,800	98,400	0	701,700	290,300	90,000
0	702,500	272,200	74,500	0	703,300	288,100	71,300	0	704,200	300,400	65,400	0	705,000	292,500	35,700
0	705,800	217,200	77,500	0	706,600	187,900	57,700	0	707,400	178,600	79,300	0	708,200	193,600	86,300
0	709,100	260,900	80,900	0	709,900	304,900	104,200	0	710,700	352,000	106,500	0	711,500	301,700	127,400
0	712,300	232,300	88,100	0	713,200	166,300	91,700	0	714,000	203,000	84,700	0	714,800	246,400	77,000
0	715,700	291,800	122,000	0	716,500	312,700	118,400	0	717,300	318,600	136,200	0	718,200	334,200	141,800
0	719,000	345,400	151,900	0	719,800	329,600	171,500	0	720,700	320,400	130,800	0	721,500	304,400	117,600
0	722,400	358,900	84,000	0	723,200	317,500	99,600	0	724,100	294,700	104,200	0	724,900	272,100	68,500
0	725,800	254,100	109,200	0	726,600	267,300	73,900	0	727,500	259,600	123,300	0	728,300	320,400	155,200
0	729,200	361,700	200,700	0	730,000	356,200	216,600	0	730,900	395,900	216,600	0	731,700	496,300	228,400
0	732,600	561,700	335,800	0	733,500	627,000	367,200	0	734,300	562,200	378,500	0	735,200	379,500	308,000
0	736,100	279,400	185,000	0	736,900	246,500	159,800	0	737,800	277,100	150,400	0	738,700	274,600	191,200
0	739,600	270,400	187,900	0	740,400	245,700	227,300	0	741,300	230,600	239,400	0	742,200	190,500	208,700
0	743,100	173,200	219,600	0	743,900	190,200	168,200	0	744,800	228,000	181,600	0	745,700	291,800	156,500
0	746,600	287,600	168,300	0	747,500	271,000	144,500	0	748,400	245,100	193,700	0	749,300	234,700	158,800
0	750,200	219,800	149,200	0	751,100	222,300	174,800	0	752,000	243,300	168,800	0	752,900	253,200	141,700
0	753,700	244,200	114,600	0	754,600	283,400	105,000	0	755,600	276,400	92,500	0	756,600	293,800	69,900
0	757,400	290,100	63,100	0	758,300	376,600	90,200	0	759,200	433,200	182,300	0	760,100	468,200	126,700
0	761,000	393,300	193,700	0	761,900	351,300	141,600	0	762,800	329,400	123,300	0	763,700	336,200	84,900
0	764,700	319,000	86,400	0	765,600	359,300	84,700	0	766,500	393,700	62,500	0	767,400	341,000	72,500
0	768,400	272,000	117,100	0	769,300	221,200	94,200	0	770,200	201,500	63,000	0	771,100	230,100	111,700
0	772,100	259,700	57,200	0	773,000	233,400	95,700	0	773,900	243,400	103,800	0	774,900	246,800	141,600
0	775,800	325,900	115,600	0	776,800	381,600	180,000	0	777,700	449,000	229,200	0	778,600	554,500	291,500
0	779,600	576,700	250,000	0	780,500	503,100	279,300	0	781,500	581,700	228,900	0	782,400	343,100	142,900
0	783,400	302,100	112,600	0	784,300	345,000	117,700	0	785,300	408,700	77,500	0	786,300	392,800	81,500
0	787,200	305,100	104,300	0	788,200	241,100	102,100	0	789,100	210,000	97,700	0	790,100	247,400	132,000
0	791,100	280,000	126,700	0	792,000	286,300	91,200	0	793,000	282,300	84,900	0	794,000	305,200	109,000
0	795,000	309,400	117,700	0	795,900	348,500	161,800	0	796,900	362,500	174,900	0	797,900	293,800	174,900
0	798,900	260,800	158,100	0	799,800	304,200	148,700	0	800,800	350,400	207,400	0	801,800	367,700	191,700
0	802,800	356,900	225,900	0	803,800	349,200	212,600	0	804,800	277,200	195,600	0	805,800	307,900	144,500
0	806,800	313,400	123,800	0	807,800	291,900	68,500	0	808,800	243,700	85,300	0	809,800	190,800	74,200
0	810,800	174,500	47,400	0	811,800	194,800	99,400	0	812,800	228,100	83,800	0	813,800	239,700	88,400

N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
0	814,800	263,300	111,700	0	815,800	241,500	122,700	0	816,800	226,100	115,500	0	817,800	231,500	117,800
0	818,900	251,700	112,200	0	819,900	262,200	138,500	0	820,900	200,700	171,700	0	821,900	168,900	142,400
0	823,000	181,900	150,100	0	824,000	155,400	127,900	0	825,000	146,600	107,700	0	826,000	137,100	61,200
0	827,100	119,800	60,800	0	828,100	107,400	52,400	0	829,200	109,200	59,400	0	830,200	128,300	57,200
0	831,200	114,900	112,400	0	832,300	123,300	81,100	0	833,300	131,400	105,800	0	834,400	156,000	113,500
0	835,400	166,200	82,800	0	836,500	188,300	133,200	0	837,500	234,500	137,200	0	838,600	253,100	197,900
0	839,600	202,200	208,100	0	840,700	223,500	121,400	0	841,800	235,000	115,800	0	842,800	289,300	116,100
0	843,900	273,500	150,900	0	844,900	311,300	77,500	0	846,000	340,400	112,900	0	847,100	398,300	124,600
0	848,200	339,200	157,300	0	849,200	254,700	134,000	0	850,300	183,400	108,000	0	851,400	161,100	123,000
0	852,500	139,100	94,500	0	853,600	128,000	65,800	0	854,600	134,700	171,700	0	855,700	153,100	79,600
0	856,800	162,600	80,500	0	857,900	180,600	110,800	0	859,000	233,900	117,900	0	860,100	312,900	138,100
0	861,200	472,700	153,500	0	862,300	473,400	165,200	0	863,400	419,300	175,700	0	864,500	349,200	211,700
0	865,600	328,400	214,000	0	866,700	393,800	203,100	0	867,800	375,700	272,100	0	868,900	338,200	211,700
0	870,100	264,400	136,300	0	871,200	192,500	113,900	0	872,300	131,800	106,200	0	873,400	149,400	82,000
0	874,500	168,000	99,400	0	875,700	216,600	97,500	0	876,800	217,500	127,800	0	877,900	212,700	72,900
0	879,000	232,700	125,300	0	880,100	297,100	116,600	0	881,200	272,200	95,500	0	882,300	306,500	108,700
0	883,600	302,000	81,700	0	884,700	304,000	105,400	0	885,900	257,900	79,400	0	887,000	209,300	80,400
0	888,200	141,100	50,000	0	889,300	132,200	72,100	0	890,400	125,900	53,600	0	891,500	148,300	65,200
0	892,800	183,800	60,100	0	894,000	188,600	95,300	0	895,100	301,400	115,100	0	896,300	355,100	197,000
0	897,500	434,300	246,800	0	898,600	427,000	297,700	0	899,800	346,300	292,100	0	900,900	309,600	300,000
0	902,200	285,900	267,400	0	903,300	285,200	199,700	0	904,500	282,800	203,200	0	905,700	271,300	157,000
0	906,900	251,600	154,300	0	908,100	265,400	65,300	0	909,300	244,700	172,500	0	910,500	248,700	131,000
0	911,700	230,200	127,800	0	912,900	219,200	111,500	0	914,100	238,400	149,600	0	915,300	288,000	211,400
0	916,500	320,600	240,200	0	917,700	294,900	247,300	0	918,900	247,300	230,400	0	920,100	241,200	155,000
0	921,300	282,700	163,100	0	922,500	346,200	211,200	0	923,700	404,500	219,800	0	925,000	415,000	214,100
0	926,200	357,500	148,600	0	927,400	281,900	162,500	0	928,600	229,500	209,100	0	929,900	241,000	206,200
0	931,100	268,000	214,700	0	932,300	221,200	247,500	0	933,600	205,400	212,400	0	934,800	158,400	170,500
0	936,100	145,100	117,900	0	937,300	135,100	146,500	0	938,600	137,500	116,500	0	939,800	182,700	132,900
0	941,100	254,500	140,700	0	942,300	320,600	159,600	0	943,600	306,400	198,000	0	944,800	303,400	128,000
0	946,100	295,700	171,800	0	947,400	312,500	134,200	0	948,600	302,000	168,300	0	949,900	277,900	157,300
0	951,200	258,100	136,500	0	952,500	221,200	127,700	0	953,800	232,800	76,600	0	955,000	209,800	123,100
0	956,300	235,200	129,800	0	957,600	236,600	160,700	0	958,900	235,200	168,400	0	960,200	191,100	204,200
0	961,500	172,300	217,500	0	962,800	119,800	203,200	0	964,100	105,700	165,800	0	965,400	119,600	195,100
0	966,700	146,300	165,200	0	968,000	160,100	152,300	0	969,300	151,200	136,200	0	970,600	161,900	200,000
0	971,900	198,100	129,900	0	973,300	209,400	111,200	0	974,600	229,200	94,200	0	975,900	237,700	142,400
0	977,200	268,100	105,400	0	978,600	278,900	146,400	0	979,900	318,100	142,100	0	981,200	287,700	168,800
0	982,600	270,500	172,000	0	983,900	268,300	142,600	0	985,200	255,800	140,500	0	986,600	227,700	123,400
0	987,900	167,600	98,300	0	989,300	192,100	132,100	0	990,600	169,500	138,800	0	992,000	177,000	168,200
0	993,400	197,900	139,500	0	994,700	150,000	126,900	0	996,100	155,100	101,700	0	997,500	177,700	173,600
0	998,800	225,700	183,800	0	1000,200	291,200	213,200	0	1001,600	318,700	217,200	0	1003,000	288,000	221,300
0	1004,300	268,700	216,900	0	1005,700	268,600	252,800	0	1007,100	295,900	213,400	0	1008,500	277,800	261,400
0	1009,900	235,800	251,900	0	1011,300	230,500	222,600	0	1012,700	232,600	209,800	0	1014,100	210,000	242,300
0	1015,500	225,400	243,400	0	1016,900	213,300	257,100	0	1018,300	187,800	250,000	0	1019,700	177,900	193,300
0	1021,200	196,600	188,300	0	1022,600	208,200	194,600	0	1024,000	207,400	178,900	0	1025,400	195,400	168,600
0	1026,900	197,800	136,300	0	1028,300	179,300	106,300	0	1029,700	158,000	86,400	0	1031,200	182,000	133,800
0	1032,600	224,100	108,900	0	1034,300	236,000	115,200	0	1035,900	202,000	101,900	0	1036,900	168,600	82,600
0	1038,400	148,000	88,300	0	1039,900	117,700	109,300	0	1041,300	159,600	156,400	0	1042,800	189,200	194,700
0	1044,200	235,700	174,400	0	1045,700	287,400	132,600	0	1047,200	245,000	151,500	0	1048,700	237,300	102,800
0	1050,100	271,600	152,600	0	1051,600	278,400	137,000	0	1053,100	292,600	170,500	0	1054,600	327,200	160,500
0	1056,100	338,900	159,800	0	1057,600	247,100	189,200	0	1059,200	223,900	163,100	0	1060,600	233,200	159,800
0	1062,100	244,600	203,400	0	1063,600	271,500	171,900	0	1065,100	232,900	181,300	0	1066,600	296,500	137,800
0	1068,100	329,800	165,400	0	1069,600	302,500	188,400	0	1071,200	276,100	198,100	0	1072,700	285,700	138,100
0	1074,200	356,600	186,800	0	1075,700	462,300	246,900	0	1077,300	587,800	224,900	0	1078,800	536,500	193,800
0	1080,400	423,500	176,500	0	1081,900	400,600	198,800	0	1083,900	349,200	128,000	0	1085,000	373,800	178,200
0	1086,600	304,900	140,000	0	1088,100	274,100	81,800	0	1089,700	274,900	135,600	0	1091,300	313,300	71,600
0	1092,800	334,500	111,200	0	1094,400	318,600	159,300	0	1096,000	348,400	171,400	0	1097,500	342,000	128,100
0	1099,100	334,000	187,200	0	1100,700	364,500	214,800	0	1102,300	370,900	180,700	0	1103,900	349,700	164,200
0	1105,500	263,900	155,900	0	1107,100	238,500	120,000	0	1108,700	183,000	128,100	0	1110,300	189,800	147,000
0	1111,900	193,900	162,100	0	1113,500	189,000	121,600	0	1115,100	208,500	151,600	0	1116,800	228,000	172,500
0	1118,400	262,200	123,100	0	1120,000	254,400	123,400	0	1121,700	245,000	151,100	0	1123,300	269,800	124,500

N	E	$\sigma_p \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_p \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_p \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_p \sqrt{E}$	$\sigma_c \sqrt{E}$
(eV)	(b eV ^{1/2})	(b eV ^{1/2})	(b eV ^{1/2})	(eV)	(b eV ^{1/2})	(b eV ^{1/2})	(b eV ^{1/2})	(eV)	(b eV ^{1/2})	(b eV ^{1/2})	(b eV ^{1/2})	(eV)	(b eV ^{1/2})	(b eV ^{1/2})	(b eV ^{1/2})
0	124,900	268,200	147,300	0	126,600	271,800	125,900	0	128,200	305,100	125,200	0	129,900	326,100	66,800
0	131,500	384,400	128,400	0	133,200	440,300	105,400	0	134,800	392,600	130,300	0	136,500	362,600	103,400
0	138,200	393,300	91,400	0	139,800	400,500	98,200	0	141,500	380,500	135,500	0	143,200	400,600	149,800
0	144,900	398,900	181,900	0	146,600	379,200	124,100	0	148,200	310,500	112,000	0	149,900	245,100	100,900
0	151,600	220,200	102,700	0	153,300	219,800	74,400	0	155,000	252,900	110,900	0	156,800	327,600	113,500
0	158,500	401,300	136,700	0	160,200	527,100	213,400	0	161,900	598,500	184,100	0	163,600	658,800	196,800
0	165,400	693,100	147,400	0	167,100	572,100	177,800	0	168,800	502,400	136,100	0	170,600	473,700	136,300
0	172,300	449,600	140,200	0	174,100	426,800	116,700	0	175,800	375,500	90,900	0	177,600	315,700	95,100
0	179,300	249,300	97,900	0	181,100	263,700	109,700	0	182,800	275,400	167,900	0	184,600	308,900	150,900
0	186,400	307,700	151,900	0	188,200	311,700	138,900	0	190,000	286,700	129,000	0	191,700	251,000	108,400
0	193,500	242,800	107,600	0	195,300	272,500	77,700	0	197,100	297,400	147,900	0	198,900	333,300	169,400
0	200,700	364,000	154,800	0	202,500	350,200	148,800	0	204,400	258,400	176,100	0	206,200	221,000	178,200
0	208,000	204,500	113,200	0	209,800	207,000	88,000	0	211,700	262,600	90,600	0	213,500	379,300	52,100
0	215,300	366,100	90,900	0	217,200	302,300	72,700	0	219,000	244,300	110,500	0	220,900	214,200	154,200
0	222,700	264,700	99,000	0	224,600	278,200	156,800	0	226,500	296,800	132,400	0	228,300	250,400	152,100
0	230,200	299,700	153,000	0	232,100	289,900	151,500	0	234,000	253,200	143,400	0	235,900	238,800	181,900
0	237,700	253,000	214,100	0	239,600	249,700	216,500	0	241,500	252,300	128,100	0	243,400	226,800	146,900
0	245,400	224,300	147,600	0	247,300	246,600	62,900	0	249,200	247,900	115,800	0	251,100	236,000	99,000
0	253,000	211,900	108,200	0	255,000	233,500	104,600	0	256,900	223,600	93,100	0	258,800	228,500	59,700
0	260,800	236,700	93,400	0	262,700	227,900	98,100	0	264,700	207,000	98,500	0	266,600	227,300	71,900
0	268,600	267,100	111,700	0	270,600	301,100	119,300	0	272,500	395,200	133,400	0	274,500	370,500	155,500
0	276,500	338,200	165,000	0	278,500	297,300	124,500	0	280,500	260,700	104,100	0	282,500	248,600	159,600
0	284,500	234,100	57,800	0	286,500	204,800	115,800	0	288,500	219,800	86,300	0	290,500	248,000	74,100
0	292,500	274,300	137,700	0	294,500	339,900	65,700	0	296,600	399,100	107,100	0	298,600	388,100	81,900
0	300,600	349,400	80,300	0	302,700	313,800	62,200	0	304,700	304,400	108,400	0	306,800	325,000	59,300
0	308,800	268,300	101,200	0	310,900	221,300	65,000	0	313,000	200,600	90,800	0	315,000	176,500	98,600
0	317,100	221,400	101,200	0	319,200	279,200	59,800	0	321,300	291,000	118,300	0	323,400	313,400	96,400
0	325,500	287,800	134,700	0	327,600	294,700	144,500	0	329,700	269,400	152,400	0	331,800	320,300	108,000
0	333,900	330,900	138,800	0	336,000	321,100	156,300	0	338,100	319,100	140,300	0	340,300	321,300	143,700
0	342,400	370,500	132,200	0	344,500	390,800	143,000	0	346,700	429,700	142,400	0	348,800	392,300	128,900
0	351,000	326,800	151,800	0	353,200	267,900	178,800	0	355,300	223,900	147,800	0	357,500	282,300	168,500
0	359,700	372,300	77,200	0	361,900	392,700	98,200	0	364,000	328,700	59,900	0	366,200	288,600	122,200
0	368,400	264,100	72,200	0	370,600	303,100	108,000	0	372,800	306,900	151,600	0	375,100	272,100	107,900
0	377,300	289,800	105,400	0	379,900	337,100	110,000	0	381,700	376,900	122,700	0	384,000	422,700	84,800
0	386,200	416,200	76,200	0	388,500	378,400	113,100	0	390,700	346,000	92,400	0	393,000	278,100	109,900
0	395,200	247,200	73,400	0	397,500	269,900	55,100	0	399,800	257,200	59,400	0	402,100	245,600	89,400
0	404,300	261,500	113,800	0	406,600	252,700	138,200	0	408,900	269,900	121,100	0	411,200	259,800	132,300
0	413,500	244,200	135,600	0	415,900	275,500	74,900	0	418,200	342,700	181,100	0	420,500	382,000	227,700
0	422,800	359,400	234,400	0	425,200	348,400	221,500	0	427,500	435,400	224,900	0	429,900	425,200	214,800
0	432,200	393,300	239,500	0	434,600	304,700	121,800	0	436,900	194,900	111,500	0	439,300	215,100	119,100
0	441,700	273,500	66,000	0	444,100	341,100	73,200	0	446,500	411,100	56,300	0	448,800	433,300	78,900
0	451,200	367,000	91,000	0	453,700	324,100	91,000	0	456,100	310,500	118,800	0	458,500	254,200	125,500
0	460,900	290,200	126,300	0	463,300	268,500	163,600	0	465,800	272,100	190,000	0	468,200	217,200	168,400
0	470,700	163,700	148,100	0	473,100	151,700	68,700	0	475,600	140,000	40,900	0	478,100	160,700	79,100
0	480,500	197,900	79,700	0	483,000	202,600	81,800	0	485,500	156,700	108,400	0	488,000	162,900	43,500
0	490,500	146,400	48,700	0	493,000	147,700	65,900	0	495,500	173,700	107,400	0	498,000	175,400	142,000
0	500,500	211,000	136,000	0	503,100	239,900	136,000	0	505,600	258,000	125,200	0	508,200	230,300	155,900
0	510,700	209,200	147,500	0	513,300	191,100	81,600	0	515,800	155,300	58,800	0	518,400	140,400	78,300
0	521,000	181,900	78,300	0	523,500	221,600	136,500	0	526,100	227,900	148,100	0	528,700	249,700	120,800
0	531,300	302,100	193,800	0	533,900	308,300	128,500	0	536,600	271,800	159,300	0	539,200	275,700	146,900
0	541,800	254,000	113,300	0	544,400	236,700	86,500	0	547,100	238,200	116,500	0	549,700	279,500	126,900
0	552,400	242,300	172,700	0	555,100	241,900	102,500	0	557,700	209,300	93,200	0	560,400	223,300	58,700
0	563,100	241,400	72,500	0	565,800	309,800	107,800	0	568,500	357,000	97,000	0	571,200	332,600	121,900
0	573,900	301,900	110,100	0	576,600	294,600	164,300	0	579,300	304,500	127,100	0	582,100	283,800	123,700
0	584,800	234,500	164,000	0	587,600	261,000	105,300	0	590,300	308,300	96,800	0	593,100	360,100	178,400
0	595,800	338,600	109,400	0	598,600	296,400	109,900	0	601,400	230,100	145,000	0	604,200	232,300	156,800
0	607,000	237,600	91,700	0	609,800	219,400	104,300	0	612,600	188,400	70,400	0	615,400	177,400	84,800
0	618,200	212,300	113,300	0	621,100	271,900	85,000	0	623,900	291,800	134,600	0	626,800	341,600	122,500
0	629,600	320,300	194,600	0	632,500	321,100	127,300	0	635,400	284,000	55,400	0	638,200	274,100	95,200
0	641,100	269,300	143,500	0	644,000	326,100	102,100	0	646,900	348,700	94,600	0	649,800	318,500	94,400

N	E	$\sigma_r \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_r \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_r \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_r \sqrt{E}$	$\sigma_c \sqrt{E}$								
(eV)	(b eV ^{1/2})	(b eV ^{1/2})	(b eV ^{1/2})	(eV)	(b eV ^{1/2})	(b eV ^{1/2})	(b eV ^{1/2})	(eV)	(b eV ^{1/2})	(b eV ^{1/2})	(b eV ^{1/2})	(eV)	(b eV ^{1/2})	(b eV ^{1/2})	(b eV ^{1/2})								
0 1692,700	313,100	105,200	0 1655,700	310,500	103,100	0 1658,600	280,700	103,500	0 1661,500	289,100	128,100	0 1664,900	344,200	126,500	0 1667,900	321,400	104,100	0 1670,400	366,700	156,600	0 1673,400	322,700	131,800
0 1676,400	341,800	171,200	0 1679,400	368,100	109,200	0 1682,400	390,800	100,800	0 1685,400	382,200	14,100	0 1688,400	320,300	48,600	0 1691,400	313,900	84,700	0 1694,400	287,000	76,700	0 1697,500	317,000	89,800
0 1700,500	329,300	84,500	0 1703,600	251,900	104,200	0 1706,600	214,600	87,000	0 1709,700	183,700	78,700	0 1712,800	210,800	65,300	0 1715,800	230,500	79,200	0 1718,900	250,700	40,900	0 1722,000	274,500	116,000
0 1725,200	299,100	79,900	0 1728,300	288,000	123,800	0 1731,400	288,300	88,400	0 1734,500	272,800	146,100	0 1737,700	256,500	131,100	0 1740,800	303,100	133,600	0 1744,000	286,900	102,400	0 1747,200	280,600	113,200
0 1750,400	276,000	69,000	0 1753,500	238,800	68,400	0 1756,700	254,400	53,100	0 1759,900	264,600	80,300	0 1763,200	293,600	67,300	0 1766,400	273,600	74,600	0 1769,600	277,300	121,000	0 1772,900	312,000	121,500
0 1776,100	360,000	82,000	0 1779,400	335,000	134,100	0 1782,600	297,500	100,000	0 1785,900	257,500	158,000	0 1789,200	272,400	162,500	0 1792,500	289,200	136,800	0 1795,800	260,700	112,500	0 1799,100	243,500	82,700
0 1802,400	243,700	90,800	0 1805,800	239,700	106,400	0 1809,100	245,400	66,000	0 1812,500	260,000	61,800	0 1815,800	289,300	82,700	0 1819,200	325,900	150,400	0 1822,600	332,400	117,300	0 1825,900	313,200	101,200
0 1829,300	250,000	157,000	0 1832,700	262,200	144,600	0 1836,200	264,300	151,400	0 1839,600	305,300	101,600	0 1843,000	313,100	123,700	0 1846,500	339,200	181,100	0 1849,900	359,700	109,000	0 1853,400	318,400	80,500
0 1856,900	279,100	99,000	0 1860,300	276,000	156,000	0 1863,800	247,400	97,800	0 1867,300	244,600	129,500	0 1870,900	228,500	127,300	0 1874,400	255,300	131,500	0 1877,900	268,000	134,800	0 1881,500	268,600	158,900
0 1885,000	258,000	101,700	0 1888,600	241,600	178,100	0 1892,100	219,400	105,800	0 1895,700	231,200	90,300	0 1899,300	230,600	71,500	0 1902,900	258,300	44,500	0 1906,500	284,200	79,600	0 1910,200	309,500	110,500
0 1913,800	352,900	119,600	0 1917,400	389,800	126,700	0 1921,100	358,600	141,400	0 1924,800	311,600	100,400	0 1928,400	307,000	134,800	0 1932,100	335,800	159,100	0 1935,800	348,400	186,200	0 1939,500	346,800	196,000
0 1943,300	314,700	200,800	0 1947,000	272,400	218,800	0 1950,700	295,400	153,300	0 1954,500	285,500	166,100	0 1958,200	353,700	143,800	0 1962,000	367,500	132,200	0 1965,800	396,700	123,700	0 1969,600	351,800	129,100
0 1973,400	345,100	173,800	0 1977,200	326,900	128,800	0 1981,000	331,600	115,600	0 1984,900	284,200	175,500	0 1988,700	273,800	141,300	0 1992,600	273,300	134,800	0 1996,500	301,100	132,700	0 2000,400	278,300	111,900
0 2004,300	255,600	143,500	0 2008,200	213,400	146,900	0 2012,100	177,600	101,300	0 2016,000	179,900	105,300	0 2019,900	144,000	155,800	0 2023,900	183,300	91,800	0 2027,900	149,500	109,100	0 2031,800	175,000	127,800
0 2035,800	180,800	139,500	0 2039,800	224,400	165,700	0 2043,800	272,300	150,700	0 2047,900	320,900	206,100	0 2051,900	329,500	180,200	0 2055,900	294,000	141,800	0 2060,000	260,700	149,200	0 2064,100	252,100	148,600
0 2068,200	274,200	110,400	0 2072,300	250,700	72,700	0 2076,400	267,200	159,600	0 2080,500	278,400	142,700	0 2084,600	310,100	107,100	0 2088,800	328,700	171,300	0 2092,900	295,000	152,100	0 2097,100	243,200	132,100
0 2101,300	172,800	117,800	0 2105,500	172,600	120,200	0 2109,700	180,400	124,400	0 2113,900	199,300	99,400	0 2118,100	228,200	110,800	0 2122,400	264,000	97,500	0 2126,600	282,600	81,400	0 2130,900	331,800	114,700
0 2135,200	311,300	179,200	0 2139,500	307,700	178,100	0 2143,800	313,400	163,000	0 2148,100	269,400	164,700	0 2152,400	219,600	191,700	0 2156,800	205,300	96,200	0 2161,100	228,100	81,400	0 2165,500	224,000	78,800
0 2169,900	200,900	80,700	0 2174,300	233,500	62,600	0 2178,700	274,000	88,300	0 2183,200	288,300	97,500	0 2187,600	278,000	95,500	0 2192,100	254,100	100,400	0 2196,500	255,400	113,800	0 2201,000	267,900	137,500
0 2205,500	250,300	98,100	0 2210,000	340,900	95,000	0 2214,500	328,600	108,900	0 2219,100	329,800	95,300	0 2223,600	272,700	195,300	0 2228,200	278,400	96,500	0 2232,800	213,300	54,700	0 2237,400	236,700	119,000
0 2242,000	250,100	143,300	0 2246,600	276,000	82,000	0 2251,200	295,700	155,800	0 2255,900	290,500	118,900	0 2260,500	277,700	86,700	0 2265,200	251,700	136,300	0 2269,900	293,500	99,100	0 2274,600	281,200	82,900
0 2279,400	301,000	124,400	0 2284,100	282,600	126,400	0 2288,800	246,600	125,300	0 2293,600	231,400	141,600	0 2298,400	232,100	104,900	0 2303,200	274,100	82,600	0 2308,000	290,200	55,100	0 2312,800	302,500	92,100
0 2317,700	227,600	107,800	0 2322,500	226,000	94,800	0 2327,400	307,500	21,200	0 2332,300	338,200	92,900	0 2337,200	419,400	95,700	0 2342,100	403,700	86,000	0 2347,100	351,500	24,700	0 2352,000	363,000	144,800
0 2357,000	308,500	135,600	0 2362,000	286,300	150,300	0 2367,000	202,100	96,100	0 2372,000	170,800	47,400	0 2377,000	201,900	72,800	0 2382,100	210,000	49,100	0 2387,100	214,700	25,100	0 2392,200	205,500	38,800
0 2397,300	241,200	86,700	0 2402,400	273,200	102,300	0 2407,500	325,300	59,400	0 2412,700	327,700	53,100	0 2417,800	337,500	101,700	0 2423,000	307,200	51,600	0 2428,200	348,800	98,600	0 2433,400	354,800	79,700
0 2438,700	339,000	160,100	0 2443,900	358,000	127,700	0 2449,200	383,000	151,300	0 2454,400	322,100	129,700	0 2459,700	268,000	131,500	0 2465,000	271,600	98,000	0 2470,400	302,900	39,800	0 2475,700	349,500	49,000
0 2481,100	343,400	2,100	0 2486,500	317,900	92,400	0 2491,900	328,900	7,000	0 2497,300	283,500	106,000	0 2502,700	273,200	81,900	0 2508,200	275,600	89,000	0 2513,600	284,000	128,100	0 2519,100	265,200	82,300
0 2524,600	288,100	94,000	0 2530,200	335,800	73,300	0 2535,700	328,400	58,500	0 2541,300	352,000	146,800	0 2546,800	363,000	140,100	0 2552,400	346,100	116,300	0 2558,100	369,500	146,000	0 2563,700	435,400	121,100
0 2569,300	398,000	173,100	0 2575,000	345,700	120,400	0 2580,700	319,300	117,400	0 2586,400	272,400	149,400	0 2592,100	238,500	68,600	0 2597,900	287,300	33,200	0 2603,700	317,900	119,300	0 2609,400	339,300	90,500
0 2615,300	330,700	60,100	0 2621,100	291,600	65,200	0 2626,900	278,000	41,400	0 2632,800	278,600	13,400	0 2638,700	285,500	72,400	0 2644,600	225,500	59,200	0 2650,500	216,800	56,700	0 2656,400	230,800	26,000

N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$	N	E	$\sigma_r/\sqrt{E}$	$\sigma_c/\sqrt{E}$
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})
0	2662.400	272.900	53.600	0	2668.400	245.500	86.500	0	2674.400	256.300	62.700	0	2680.400	225.100	73.700
0	2686.500	225.800	33.900	0	2692.500	175.500	49.300	0	2698.600	182.800	53.800	0	2704.700	198.400	67.600
0	2710.800	229.100	35.100	0	2717.000	250.400	86.500	0	2723.100	296.300	79.300	0	2729.300	342.200	67.300
0	2735.900	347.100	69.800	0	2741.800	381.500	127.600	0	2748.000	370.400	146.400	0	2754.300	394.100	86.800
0	2760.600	372.800	63.600	0	2766.900	342.200	72.300	0	2773.300	306.200	72.600	0	2779.600	295.700	72.400
0	2786.000	327.900	109.000	0	2792.400	321.900	70.000	0	2798.800	294.300	18.300	0	2805.300	267.300	84.000
0	2811.700	275.900	89.300	0	2818.200	260.300	97.600	0	2824.800	254.100	11.500	0	2831.300	279.300	43.700
0	2837.900	317.100	41.300	0	2844.400	285.300	83.600	0	2851.100	319.300	50.400	0	2857.700	344.900	92.200
0	2864.300	315.500	94.400	0	2871.000	366.100	32.500	0	2877.700	294.400	38.900	0	2884.400	250.800	50.000
0	2891.200	246.500	64.800	0	2898.000	244.200	43.300	0	2904.700	266.600	73.500	0	2911.600	290.900	104.500
0	2918.400	315.700	111.800	0	2925.300	378.200	57.000	0	2932.200	318.800	28.900	0	2939.100	233.600	39.300
0	2946.000	219.500	69.900	0	2953.000	218.500	75.000	0	2960.000	213.800	49.700	0	2967.000	197.200	82.400
0	2974.000	249.000	42.900	0	2981.100	244.700	27.300	0	2988.200	275.000	46.000	0	2995.300	324.500	27.800
0	3002.400	328.600	111.400	0	3009.600	353.200	133.100	0	3016.800	334.400	70.600	0	3024.000	294.800	88.700
0	3031.300	310.400	-0	0	3038.500	314.600	-0	0	3045.800	307.400	-0	0	3053.100	268.200	-0
0	3060.500	313.800	-0	0	3067.900	346.700	-0	0	3075.300	336.600	-0	0	3082.700	290.700	-0
0	3090.200	285.100	-0	0	3097.600	277.600	-0	0	3105.100	254.400	-0	0	3112.700	245.500	-0
0	3120.200	271.600	-0	0	3127.800	308.100	-0	0	3135.500	312.300	-0	0	3143.100	253.400	-0
0	3150.800	229.000	-0	0	3158.500	223.300	-0	0	3166.200	222.000	-0	0	3174.000	240.800	-0
0	3181.800	293.800	-0	0	3189.600	275.800	-0	0	3197.400	276.100	-0	0	3205.300	252.300	-0
0	3213.200	253.900	-0	0	3221.100	287.300	-0	0	3229.100	341.900	-0	0	3237.100	326.400	-0
0	3245.100	327.800	-0	0	3253.200	325.500	-0	0	3261.300	320.700	-0	0	3269.400	329.300	-0
0	3277.500	353.800	-0	0	3285.700	417.200	-0	0	3293.900	403.900	-0	0	3302.100	407.500	-0
0	3310.400	347.300	-0	0	3318.700	294.500	-0	0	3327.000	279.800	-0	0	3335.400	282.500	-0
0	3343.800	263.900	-0	0	3352.200	227.700	-0	0	3360.600	198.900	-0	0	3369.100	182.800	-0
0	3377.600	256.300	-0	0	3386.200	288.600	-0	0	3394.800	345.800	-0	0	3403.400	301.900	-0
0	3412.000	328.500	-0	0	3420.700	322.700	-0	0	3429.400	263.400	-0	0	3438.200	221.800	-0
0	3447.000	238.800	-0	0	3455.600	244.800	-0	0	3464.600	303.600	-0	0	3473.500	287.100	-0
0	3482.400	300.900	-0	0	3491.400	349.300	-0	0	3500.400	344.900	-0	0	3509.400	349.600	-0
0	3518.500	291.300	-0	0	3527.500	286.200	-0	0	3536.700	345.100	-0	0	3545.800	296.200	-0
0	3555.000	289.800	-0	0	3564.300	300.500	-0	0	3573.500	324.200	-0	0	3582.800	344.900	-0
0	3592.200	322.400	-0	0	3601.600	342.500	-0	0	3611.000	312.100	-0	0	3620.400	295.500	-0
0	3629.900	262.200	-0	0	3639.500	282.000	-0	0	3649.000	280.200	-0	0	3658.600	265.100	-0
0	3668.300	268.500	-0	0	3677.900	291.700	-0	0	3687.700	298.300	-0	0	3697.400	305.800	-0
0	3707.200	273.600	-0	0	3717.000	279.800	-0	0	3726.900	244.500	-0	0	3736.800	273.900	-0
0	3746.800	300.800	-0	0	3756.800	347.100	-0	0	3766.800	339.200	-0	0	3776.900	337.300	-0
0	3787.000	340.900	-0	0	3797.100	339.400	-0	0	3807.300	334.600	-0	0	3817.600	357.400	-0
0	3827.800	354.700	-0	0	3838.200	342.300	-0	0	3848.500	333.300	-0	0	3858.900	306.500	-0
0	3869.400	279.300	-0	0	3879.800	251.000	-0	0	3890.400	274.000	-0	0	3900.900	278.600	-0
0	3911.800	302.900	-0	0	3922.200	327.500	-0	0	3932.900	349.500	-0	0	3943.700	411.900	-0
0	3954.500	400.700	-0	0	3965.300	413.900	-0	0	3976.200	334.600	-0	0	3987.100	301.700	-0
0	3998.100	319.000	-0	0	4009.100	294.900	-0	0	4020.100	347.100	-0	0	4031.200	321.000	-0
0	4042.400	312.500	-0	0	4053.600	309.400	-0	0	4064.800	296.500	-0	0	4076.100	305.100	-0
0	4087.500	289.000	-0	0	4098.900	287.200	-0	0	4110.300	261.800	-0	0	4121.800	294.300	-0
0	4133.300	262.900	-0	0	4144.900	299.500	-0	0	4156.500	296.800	-0	0	4168.200	293.000	-0
0	4179.900	336.500	-0	0	4191.700	382.400	-0	0	4203.500	372.200	-0	0	4215.400	354.900	-0
0	4227.300	387.300	-0	0	4239.300	424.900	-0	0	4251.300	391.700	-0	0	4263.400	382.900	-0
0	4275.500	335.200	-0	0	4287.700	337.300	-0	0	4299.900	343.600	-0	0	4312.200	336.500	-0
0	4324.900	320.000	-0	0	4336.900	303.900	-0	0	4349.400	314.000	-0	0	4361.900	359.400	-0
0	4374.400	351.800	-0	0	4387.000	315.100	-0	0	4399.700	295.700	-0	0	4412.400	297.700	-0
0	4425.200	329.200	-0	0	4438.000	375.600	-0	0	4450.900	335.100	-0	0	4463.800	368.200	-0
0	4476.800	375.600	-0	0	4489.900	337.500	-0	0	4503.000	341.100	-0	0	4516.200	317.800	-0
0	4529.400	305.300	-0	0	4542.700	275.700	-0	0	4556.000	283.300	-0	0	4569.400	327.800	-0
0	4582.900	333.900	-0	0	4596.400	322.600	-0	0	4610.000	322.400	-0	0	4623.600	267.300	-0
0	4637.300	264.400	-0	0	4651.100	280.700	-0	0	4664.900	313.200	-0	0	4678.800	318.400	-0
0	4692.700	264.400	-0	0	4706.700	244.500	-0	0	4720.800	258.500	-0	0	4734.900	272.900	-0
0	4749.100	280.700	-0	0	4763.400	290.700	-0	0	4777.700	288.200	-0	0	4792.100	259.000	-0
0	4808.600	295.800	-0	0	4821.100	264.900	-0	0	4835.700	286.000	-0	0	4850.300	307.000	-0
0	4865.000	339.000	-0	0	4879.800	332.900	-0	0	4894.700	335.700	-0	0	4909.600	290.400	-0
0	4924.600	232.300	-0	0	4939.700	240.100	-0	0	4954.800	231.300	-0	0	4970.000	271.200	-0

N	E	$\sigma_c \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_c \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_c \sqrt{E}$	$\sigma_c \sqrt{E}$	N	E	$\sigma_c \sqrt{E}$	$\sigma_c \sqrt{E}$	
	(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})		(eV)	(b eV ^{1/2})	(b eV ^{1/2})	
0 4985,200	299,400	-0	0 5000,600	306,900	-0	0 5016,000	340,300	-0	0 5031,500	310,300	-0	0 5047,000	323,700	-0	0 5062,700	309,800
0 5047,000	323,700	-0	0 5062,700	309,800	-0	0 5078,400	274,800	-0	0 5094,100	288,100	-0	0 5110,000	285,100	-0	0 5125,900	307,300
0 5110,000	285,100	-0	0 5125,900	307,300	-0	0 5141,900	247,300	-0	0 5158,000	281,200	-0	0 5174,100	256,900	-0	0 5190,300	277,300
0 5174,100	256,900	-0	0 5190,300	277,300	-0	0 5206,600	268,700	-0	0 5223,000	296,200	-0	0 5239,400	269,900	-0	0 5256,000	289,400
0 5239,400	269,900	-0	0 5256,000	289,400	-0	0 5272,600	307,300	-0	0 5289,300	304,800	-0	0 5306,000	298,500	-0	0 5322,900	333,700
0 5306,000	298,500	-0	0 5322,900	333,700	-0	0 5339,800	315,900	-0	0 5356,800	291,400	-0	0 5373,900	289,300	-0	0 5391,100	297,500
0 5373,900	289,300	-0	0 5391,100	297,500	-0	0 5408,300	282,000	-0	0 5425,600	273,600	-0	0 5443,100	284,900	-0	0 5460,600	282,000
0 5443,100	284,900	-0	0 5460,600	282,000	-0	0 5478,100	314,000	-0	0 5495,800	315,200	-0	0 5513,600	360,900	-0	0 5531,400	354,000
0 5513,600	360,900	-0	0 5531,400	354,000	-0	0 5549,300	316,600	-0	0 5567,400	323,000	-0	0 5585,500	280,700	-0	0 5603,700	266,800
0 5585,500	280,700	-0	0 5603,700	266,800	-0	0 5621,900	294,600	-0	0 5640,300	300,900	-0	0 5658,800	267,400	-0	0 5677,300	262,900
0 5658,800	267,400	-0	0 5677,300	262,900	-0	0 5696,000	256,900	-0	0 5714,700	274,900	-0	0 5733,500	264,100	-0	0 5752,500	304,100
0 5733,500	264,100	-0	0 5752,500	304,100	-0	0 5771,500	312,600	-0	0 5790,600	328,300	-0	0 5809,800	332,600	-0	0 5829,100	283,500
0 5809,800	332,600	-0	0 5829,100	283,500	-0	0 5848,900	268,200	-0	0 5868,000	234,400	-0	0 5887,600	208,400	-0	0 5907,300	212,400
0 5887,600	208,400	-0	0 5907,300	212,400	-0	0 5927,100	252,700	-0	0 5947,000	266,800	-0	0 5966,900	275,600	-0	0 5987,000	285,800
0 5966,900	275,600	-0	0 5987,000	285,800	-0	0 6007,200	288,700	-0	0 6027,500	284,800	-0	0 6047,900	283,600	-0	0 6068,400	287,900
0 6047,900	283,600	-0	0 6068,400	287,900	-0	0 6089,000	270,500	-0	0 6109,700	229,700	-0	0 6130,600	238,100	-0	0 6151,900	241,900
0 6130,600	238,100	-0	0 6151,900	241,900	-0	0 6172,500	280,000	-0	0 6193,600	274,700	-0	0 6214,900	288,900	-0	0 6236,300	288,700
0 6214,900	288,900	-0	0 6236,300	288,700	-0	0 6257,700	296,900	-0	0 6279,300	290,600	-0	0 6301,000	280,100	-0	0 6322,800	300,900
0 6301,000	280,100	-0	0 6322,800	300,900	-0	0 6344,700	279,400	-0	0 6366,700	320,600	-0	0 6388,900	319,400	-0	0 6411,100	307,700
0 6388,900	319,400	-0	0 6411,100	307,700	-0	0 6433,500	306,600	-0	0 6456,000	279,600	-0	0 6478,600	305,800	-0	0 6501,400	267,000
0 6478,600	305,800	-0	0 6501,400	267,000	-0	0 6524,200	303,200	-0	0 6547,200	302,200	-0	0 6570,300	299,600	-0	0 6593,500	307,000
0 6570,300	299,600	-0	0 6593,500	307,000	-0	0 6616,800	291,600	-0	0 6640,300	290,700	-0	0 6663,900	277,700	-0	0 6687,600	310,300
0 6663,900	277,700	-0	0 6687,600	310,300	-0	0 6711,400	296,500	-0	0 6735,400	316,700	-0	0 6759,500	312,500	-0	0 6783,700	313,000
0 6759,500	312,500	-0	0 6783,700	313,000	-0	0 6808,100	288,200	-0	0 6832,600	308,200	-0	0 6857,200	343,800	-0	0 6882,000	347,400
0 6857,200	343,800	-0	0 6882,000	347,400	-0	0 6906,900	368,800	-0	0 6931,900	368,700	-0	0 6957,000	344,000	-0	0 6982,300	368,500
0 6957,000	344,000	-0	0 6982,300	368,500	-0	0 7007,800	392,600	-0	0 7033,400	397,000	-0	0 7059,100	384,300	-0	0 7084,900	326,300
0 7059,100	384,300	-0	0 7084,900	326,300	-0	0 7110,900	319,900	-0	0 7137,100	327,000	-0	0 7163,400	312,400	-0	0 7189,800	348,200
0 7163,400	312,400	-0	0 7189,800	348,200	-0	0 7216,400	351,900	-0	0 7243,100	333,400	-0	0 7270,000	331,300	-0	0 7324,200	370,300
0 7270,000	331,300	-0	0 7324,200	370,300	-0	0 7379,000	357,500	-0	0 7434,400	322,800	-0	0 7490,500	344,200	-0	0 7547,200	306,300
0 7490,500	344,200	-0	0 7547,200	306,300	-0	0 7604,900	337,500	-0	0 7662,500	314,400	-0	0 7721,200	315,500	-0	0 7780,500	334,000
0 7721,200	315,500	-0	0 7780,500	334,000	-0	0 7840,500	319,500	-0	0 7901,200	290,600	-0	0 7962,700	287,300	-0	0 8024,800	283,300
0 7962,700	287,300	-0	0 8024,800	283,300	-0	0 8087,700	271,200	-0	0 8151,300	241,600	-0	0 8219,700	254,500	-0	0 8280,800	278,700
0 8219,700	254,500	-0	0 8280,800	278,700	-0	0 8346,700	292,800	-0	0 8413,400	299,000	-0	0 8481,000	291,500	-0	0 8549,300	295,700
0 8481,000	291,500	-0	0 8549,300	295,700	-0	0 8618,400	316,500	-0	0 8688,400	297,600	-0	0 8759,300	303,100	-0	0 8831,000	256,700
0 8759,300	303,100	-0	0 8831,000	256,700	-0	0 8903,600	228,300	-0	0 8977,100	273,600	-0	0 9051,500	323,700	-0	0 9126,900	339,900
0 9051,500	323,700	-0	0 9126,900	339,900	-0	0 9203,200	302,400	-0	0 9280,400	309,600	-0	0 9358,700	310,600	-0	0 9437,900	320,800
0 9358,700	310,600	-0	0 9437,900	320,800	-0	0 9518,100	305,900	-0	0 9599,400	291,300	-0	0 9681,700	319,300	-0	0 9765,100	316,400
0 9681,700	319,300	-0	0 9765,100	316,400	-0	0 9849,500	303,000	-0	0 9935,100	282,500	-0	1 0021,800	311,900	-0	1 0109,600	303,100
1 0021,800	311,900	-0	1 0109,600	303,100	-0	1 0198,600	281,300	-0	1 0288,700	287,500	-0	1 0380,100	296,400	-0	1 0472,900	299,400
1 0380,100	296,400	-0	1 0472,900	299,400	-0	1 0566,500	339,700	-0	1 0661,500	321,900	-0	1 0757,900	304,800	-0	1 0855,500	320,800
1 0757,900	304,800	-0	1 0855,500	320,800	-0	1 0954,600	330,900	-0	1 1055,000	375,300	-0	1 1156,800	372,800	-0	1 1260,000	370,900
1 1156,800	372,800	-0	1 1260,000	370,900	-0	1 1364,600	355,500	-0	1 1470,700	330,400	-0	1 1578,300	345,500	-0	1 1687,400	376,100
1 1578,300	345,500	-0	1 1687,400	376,100	-0	1 1798,000	390,300	-0	1 1910,200	411,500	-0	1 2024,100	424,300	-0	1 2139,400	406,900
1 2024,100	424,300	-0	1 2139,400	406,900	-0	1 2256,700	445,200	-0	1 2375,600	425,200	-0	1 2496,100	553,500	-0	1 2616,500	607,900
1 2496,100	553,500	-0	1 2616,500	607,900	-0	1 2742,700	563,500	-0	1 2868,700	758,800	-0	1 2996,600	820,200	-0	1 3126,400	888,000
1 2996,600	820,200	-0	1 3126,400	888,000	-0	1 3258,100	907,200	-0	1 3391,900	910,600	-0	1 3527,700	911,700	-0	1 3665,500	914,200
1 3527,700	911,700	-0	1 3665,500	914,200	-0	1 3805,500	905,400	-0	1 3947,600	913,400	-0	1 4092,000	910,200	-0	1 4238,600	917,300
1 4092,000	910,200	-0	1 4238,600	917,300	-0	1 4387,500	917,700	-0	1 4538,700	917,300	-0	1 4692,400	922,300	-0	1 4848,500	917,100
1 4692,400	922,300	-0	1 4848,500	917,100	-0	1 5007,100	339,500	-0	1 5168,200	860,800	-0	1 5332,000	818,500	-0	1 5498,400	837,000
1 5332,000	818,500	-0	1 5498,400	837,000	-0	1 5667,500	796,900	-0	1 5839,500	784,200	-0	1 6014,300	730,700	-0	1 6191,900	691,300
1 6014,300	730,700	-0	1 6191,900	691,300	-0	1 6372,600	625,000	-0	1 6556,300	554,100	-0	1 6743,100	493,200	-0	1 6933,100	458,100
1 6743,100	493,200	-0	1 6933,100	458,100	-0	1 7128,400	398,100	-0	1 7322,900	367,500	-0	1 7522,900	367,500	-0	1 7726,400	356,700
1 7522,900	367,500	-0	1 7726,400	356,700	-0	1 7933,400	355,500	-0	1 8144,100	359,100	-0	1 8358,500	373,500	-0	1 8576,700	379,680
1 8358,500	373,500	-0	1 8576,700	379,680	-0	1 8798,800	401,000	-0	1 9025,000	402,300	-0	1 9255,200	400,200	-0	1 9489,700	429,500
1 9255,200	400,200	-0	1 9489,700	429,500	-0	1 9728,500	449,900	-0	1 9997,100	425,700	-0			-0		

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