

BREMSSTRAHLUNG ENERGY SPECTRA FROM ELECTRONS WITH KINETIC  
ENERGY 1 keV-10 GeV INCIDENT ON SCREENED NUCLEI AND ORBITAL  
ELECTRONS OF NEUTRAL ATOMS WITH  $Z = 1-100^*$

STEPHEN M. SELTZER and MARTIN J. BERGER

National Bureau of Standards†  
Gaithersburg, Maryland 20899

A comprehensive set of bremsstrahlung cross sections (differential in the energy of the emitted photons) is tabulated. The set includes results for electrons with energies from 1 keV to 10 GeV incident on neutral atoms with atomic numbers  $Z = 1$  to 100. For bremsstrahlung in the Coulomb field of the atomic nucleus, use was made of (a) results of Pratt, Tseng, and collaborators based on numerical phase-shift calculations for the screened Coulomb potential at energies below 2 MeV; and (b) the analytical high-energy theory (with Coulomb corrections) of Davies, Bethe, Maximon, and Olsen at energies above 50 MeV, supplemented by the Elwert Coulomb correction factor and the theory of the high-frequency limit given by Jabbur and Pratt. In the high-energy region, the effect of screening was included by the use of Hartree-Fock atomic form factors. A numerical interpolation scheme, applied to suitably scaled cross sections, was used to bridge the gap between the low-energy and high-energy theoretical results, and thus to obtain improved cross sections in the intermediate-energy region 2 to 50 MeV. Bremsstrahlung in the field of the atomic electrons was calculated according to the theory of Haug, combined with screening corrections derived from Hartree-Fock incoherent scattering factors.

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† Ionizing Radiation Division, Center for Radiation Research

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## INTRODUCTION

This paper is concerned with the spectrum of bremsstrahlung photons emitted as the result of Coulomb interactions between electrons and neutral atoms. The singly differential bremsstrahlung cross section  $d\sigma/dk$  depends on the energy  $k$  of the emitted photon, the kinetic energy  $T_1$  of the incident electron, and the atomic number  $Z$  of the target atom. The bremsstrahlung cross section is calculated as the sum of two terms,

$$\frac{d\sigma}{dk} = \frac{d\sigma_n}{dk} + Z \frac{d\sigma_e}{dk}, \quad (1)$$

where  $d\sigma_n/dk$  represents the bremsstrahlung produced in the field of the screened atomic nucleus, and  $Z(d\sigma_e/dk)$  represents the bremsstrahlung produced in the field of the  $Z$  atomic electrons. Pratt and co-workers<sup>1</sup> have published extensive tables of the cross section  $d\sigma_n/dk$  for  $Z$  between 2 and 92, and for  $T_1$  between 1 and 2000 keV. These tables were obtained by interpolation from a smaller set of cross sections that had been derived by the accurate numerical solution of the Dirac equation with a static screened Coulomb potential.

In this paper the tables of Pratt et al.<sup>1</sup> are extended in two respects: (a) the coverage is extended to electron energies  $T_1$  up to 10 GeV; (b) the tables include not only the cross section for bremsstrahlung produced in the field of the screened atomic nucleus, but also those for bremsstrahlung produced in the field of the atomic electrons. These extensions require the use, in combination, of various formulas from different bremsstrahlung theories, and also interpolations which connect the analytical high-energy results to the numerical results of Pratt et al.<sup>1</sup> We use here such a combination-interpolation procedure recently developed,<sup>2</sup> a summary of which is given below. It has been shown in Ref. 2, by extensive comparisons, that the cross sections predicted by the adopted procedure are in good agreement with experimental results. The estimated uncertainties of the cross sections,  $d\sigma/dk$ , given here are (i) 3% to 5% in the high-energy region,  $T_1 \geq 50$  MeV; (ii) 5% to 10% in the intermediate-energy region,  $2 \leq T_1 \leq 50$  MeV; and (iii) about 10%, based on the estimate given by Pratt et al.<sup>1</sup> for their results, in the low-energy region,  $T_1 \leq 2$  MeV.

The principal quantities tabulated in this paper are (a) the total cross section  $d\sigma/dk$ , and (b) the cross-section ratio

$$\eta = \frac{d\sigma_e}{dk} / \left( \frac{1}{Z^2} \frac{d\sigma_n}{dk} \right). \quad (2)$$

The two components of the bremsstrahlung cross section can be recovered using the relations

$$\frac{d\sigma_n}{dk} = \frac{Z}{Z + \eta} \frac{d\sigma}{dk}, \quad (3a)$$

$$\frac{d\sigma_e}{dk} = \frac{\eta}{Z + \eta} \frac{1}{Z} \frac{d\sigma}{dk}. \quad (3b)$$

Away from the soft-photon limit ( $k = 0$ ), the values of  $\eta$  typically range from 0 to 1.2, depending on  $k$ ,  $T_1$ , and  $Z$ .

The mean energy loss of an electron per unit pathlength due to the emission of bremsstrahlung can be expressed in terms of the formula

$$-\frac{1}{\rho} \left( \frac{dE}{dx} \right)_{rad} = \frac{N_A}{A} \alpha r_e^2 Z^2 (T_1 + mc^2) \phi_{rad}. \quad (4)$$

With the pathlength expressed in units of mass per unit area,  $-(1/\rho)(dE/dx)_{rad}$  is the mass radiative stopping power. In Eq. (4),  $\rho$  is the mass density of the medium,  $A$  is the atomic weight of the target atom,  $N_A$  is Avogadro's constant,  $mc^2$  is the electron rest energy,  $\alpha$  is the fine structure constant,  $r_e$  is the classical electron radius, and

$$\phi_{rad} = \int_0^{T_1} k \frac{d\sigma}{dk} dk / [\alpha r_e^2 Z^2 (T_1 + mc^2)] \quad (5)$$

is the scaled dimensionless integrated bremsstrahlung energy-loss cross section. In analogy to Eqs. (1)–(3),  $\phi_{rad}$  can be written as the sum of two components:

$$\phi_{rad} = \phi_{rad}^{(n)} + Z\phi_{rad}^{(e)}. \quad (6)$$

Here,  $\phi_{rad}^{(n)}$  and  $\phi_{rad}^{(e)}$  are, respectively, the energy-loss cross section in the field of the screened atomic nucleus and of a single electron. The ratio of the scaled energy-loss cross sections is customarily expressed in terms of the quantity

$$\bar{\eta} = \phi_{rad}^{(e)} / \left( \frac{1}{Z^2} \phi_{rad}^{(n)} \right), \quad (7)$$

which can be used to calculate

$$\phi_{rad}^{(n)} = \frac{Z}{Z + \bar{\eta}} \phi_{rad} \quad (8a)$$

and

$$\phi_{rad}^{(e)} = \frac{\bar{\eta}}{Z + \bar{\eta}} \frac{1}{Z} \phi_{rad}. \quad (8b)$$

The quantities  $\phi_{rad}$  and  $\bar{\eta}$  are listed in the last columns of Tables I and II.

## Outline of Calculational Procedure

Given below is a brief outline of the methods used to generate the cross sections given in the Tables. Complete details can be found in Ref. 2.

### A. Electron-Nucleus Cross Section, $d\sigma_n/dk$

1.  $T_1 \geq 50$  MeV. The cross section was evaluated using a combination of results from high-energy theory,

$$\frac{d\sigma_n}{dk} = \frac{4\alpha r_e^2 Z^2}{k} \{ \chi_{Born}^{unscr} + \delta_{screen} + \delta_{Coul} \}, \quad (9)$$

where  $\chi_{Born}^{unscr}$  is the Bethe-Heitler, Born-approximation result for an unscreened nucleus with no energy approximations (Eq. (15) of Ref. 3 or formula 3BN in Ref. 4),  $\delta_{screen}$  is a screening correction, and  $\delta_{Coul}$  is a Coulomb correction.

The screening correction is based on the use of Bethe's Born-approximation, high-energy formula for a screened nucleus (Eq. (62) in Ref. 5 or formula 3BSB in Ref. 4).  $\delta_{screen}$  was obtained as the difference between results evaluated (i) with atomic form factors from Hubbell et al. (Ref. 6 for  $Z \leq 6$ , and Ref. 7 for  $Z > 6$ ), and (ii) with the form factors set equal to unity (no screening).

A Coulomb correction was devised which combines (a) knowledge of the high-frequency limit (tip value) of the cross section, that is,  $d\sigma_n/dk$  for  $k = T_1$ ; (b) the Elwert<sup>8</sup> factor in the region near the tip; and (c) the Coulomb correction of Davies et al.<sup>9</sup> away from the tip. The result can be expressed as

$$\delta_{Coul} = \{ f_E \exp[\zeta(1 - \beta_2^2/\beta_1^2)] - 1 \} \chi_{Born}^{unscr} + \omega(T_2) \delta_{Coul}^{DBMO}, \quad (10)$$

where  $f_E$  is the Elwert factor (Eq. (II-6) in Ref. 4) and  $\delta_{Coul}^{DBMO}$  is the result of Davies et al. (Eq. (II-7) in Ref. 4). In Eq. (10),  $\beta_1$  and  $\beta_2$  are the velocities of the incoming and outgoing electrons in units of the velocity of light. The function  $\omega(T_2)$  (Eq. (15) in Ref. 2) switches from the DBMO to the Elwert Coulomb correction for outgoing electron energies  $T_2 = T_1 - k \leq 10-20$  MeV. The exponential factor in Eq. (10) ensures that the cross section goes to the adopted value for the high-frequency limit, which is incorporated in the parameter  $\zeta$  (see Eq. (13) in Ref. 2).

The high-frequency limits of the bremsstrahlung spectrum have been obtained as follows. In the limit of very high incident electron energies,  $\beta_1 = 1$ , the tip value was evaluated according to the analytical theory of Jabbur and Pratt (Eqs. (1), (2), and (4) in Ref. 10). This result, the sum of  $s$ -,  $p$ -, and  $d$ -state contributions, was multiplied by the factor  $1 - 0.41(\alpha Z)^{5.3}$  to bring it into agreement with the results of numerical test calculations done by Jabbur and Pratt<sup>10</sup> which avoid uncertainties in the analytical expansion procedures and include also  $f$ -state

contributions. To obtain tip values at lower energies, the high-energy ( $\beta_1 = 1$ ) results were connected to the tip values from the tables of Pratt et al.<sup>1</sup> for  $T_1 \leq 2$  MeV ( $\beta_1 = 0.98$ ) by fitting least-squares cubic splines<sup>11</sup> to the scaled cross section,  $(\beta_1^2/Z^2)kd\sigma_n/dk$  for  $k = T_1$ , as a function of the energy variable  $\sqrt{1 - \beta_1^2/\beta_1^2}$ .

2.  $T_1 \leq 2$  MeV. In this energy region, the electron-nucleus cross sections given in the tables of Pratt et al.<sup>1</sup> were used. Linear extrapolation was used to extend their results to the cases  $Z = 1$  and  $Z = 93-100$ .

3.  $2 < T_1 < 50$  MeV. Using the least-squares cubic-spline algorithm of Powell,<sup>11</sup> interpolation was carried out on  $\ln[(\beta_1^2/Z^2)kd\sigma_n/dk]$  vs  $\ln[\sqrt{1 - \beta_1^2/\beta_1^2}]$ , for  $0 \leq k/T_1 \leq 1$  and for  $Z = 1-100$ . The reliability of the interpolation procedure is confirmed by the good agreement between the interpolated results and those from the numerical, partial-wave calculations of Tseng and Pratt<sup>12</sup> for Al and U at  $T_1 = 5$  and 10 MeV.

### B. Electron-Electron Cross Section, $d\sigma_e/dk$

This cross section was evaluated according to

$$\frac{d\sigma_e}{dk} = \frac{4\alpha r_e^2 Z^2}{k} \{f_{e-e}\chi^{\text{Haug}} + \delta_{\text{screen}}^e\}, \quad (11)$$

where  $\chi^{\text{Haug}}$  is Haug's Born-approximation result for an unscreened free target electron, including recoil effects (Eqs. (2.15), (A1), and (A2) in Ref. 13),  $f_{e-e}$  is the Coulomb correction of Maxon and Corman (Eq. (48) in Ref. 14), and  $\delta_{\text{screen}}^e$  is a screening correction.

The screening correction was evaluated on the basis of Wheeler and Lamb's<sup>15</sup> high-energy theory (Eq. (III-6) in Ref. 4), in analogy with the nuclear screening correction. That is,  $\delta_{\text{screen}}^e$  was obtained as the difference between the results evaluated (i) with the incoherent scattering factors from Hubbell et al.,<sup>6</sup> and (ii) with the incoherent scattering factor set equal to unity (no screening). The errors associated with extending to low energies the use of the screening correction derived in the high-energy approximation are greatly mitigated by the fact that when such errors become large, the contribution of electron-electron bremsstrahlung to the total cross section is very small.

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## EXPLANATION OF TABLES

**TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections****TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung and Total Integrated Radiative Energy-Loss Cross Sections**

Table I gives values of the total (electron-nucleus plus electron-electron) scaled bremsstrahlung energy-weighted spectrum  $(\beta_1^2/Z^2)kd\sigma/dk$ , in mb and of the scaled total integrated radiative energy-loss cross section  $\phi_{rad}$  [Eq. (5)].

Table II gives values of  $\eta$  [Eq. (2)], the ratio of scaled electron-electron to electron-nucleus cross sections for bremsstrahlung production; and of  $\bar{\eta}$  [Eq. (7)], the ratio of scaled electron-electron to electron-nucleus total integrated radiative cross sections.

T1	Incident electron kinetic energy, $T_1$ , in MeV
$\beta_1$	Incident electron velocity in units of the velocity of light, given by $\beta_1 = [1 - 1/(1 + T_1/mc^2)^2]^{1/2}$
k	Photon energy in MeV
k/T1	Fraction of energy radiated
Z	Atomic number of target atom
PHIRAD	Scaled total integrated radiative energy-loss cross section, $\phi_{rad}$ [Eq. (5)]
ETABAR	Ratio of scaled electron-electron to electron-nucleus total integrated radiative cross sections, $\bar{\eta}$ [Eq. (7)]

Numerical values used in the preparation of the Tables:

$mc^2 = 0.5110034$ MeV	(electron rest energy)
$\alpha = 1/137.03604$	(fine-structure constant)
$r_e = 2.8179380 \times 10^{-13}$ cm	(classical electron radius)
$\alpha r_e^2 = 5.794661 \times 10^{-28}$ cm <sup>2</sup>	
$N_A = 6.022045 \times 10^{23}$ mol <sup>-1</sup>	(Avogadro's constant)

### EXAMPLE OF USE OF TABLES

As an example of the use of these tables, consider the case of silver (Ag, atomic number  $Z = 47$ , atomic weight  $A = 107.868$ , mass density  $\rho = 10.50 \text{ g/cm}^3$ ). For an electron kinetic energy  $T_1 = 5 \text{ MeV}$  ( $\beta_1 = 0.99569$ ) and a photon energy  $k = 2 \text{ MeV}$  ( $k/T_1 = 0.4$ ), the total scaled bremsstrahlung energy-weighted cross section found in Table I is

$$\frac{\beta_1^2}{Z^2} k \frac{d\sigma}{dk} = 6.586 \text{ mb per atom.}$$

Thus, the total energy-weighted cross section is

$$k \frac{d\sigma}{dk} = 1.467 \times 10^4 \text{ mb per atom} = 1.467 \times 10^{-23} \text{ cm}^2 \text{ per atom,}$$

and the total cross section is

$$\frac{d\sigma}{dk} = 7.335 \times 10^{-24} \text{ cm}^2 \text{ MeV}^{-1} \text{ per atom.}$$

Values of the separate cross sections for electron-nucleus and electron-electron interactions can also be determined. In Table II we find for our example  $\eta = 0.737$ . Using Eq. (3a), the electron-nucleus cross section is

$$\begin{aligned} \frac{d\sigma_n}{dk} &= \frac{47}{47 + 0.737} \times 7.335 \times 10^{-24} \text{ cm}^2 \text{ MeV}^{-1} \text{ per atom} \\ &= 7.222 \times 10^{-24} \text{ cm}^2 \text{ MeV}^{-1} \text{ per atom}; \end{aligned}$$

and using Eq. (3b), the electron-electron cross section for the  $Z$  orbital electrons is

$$\begin{aligned} Z \frac{d\sigma_e}{dk} &= \frac{0.737}{47 + 0.737} \times 7.335 \times 10^{-24} \text{ cm}^2 \text{ MeV}^{-1} \text{ per atom} \\ &= 1.132 \times 10^{-25} \text{ cm}^2 \text{ MeV}^{-1} \text{ per atom.} \end{aligned}$$

The initial rate of energy loss due to bremsstrahlung emission for a 5-MeV electron incident on a silver target can be determined from the value of  $\phi_{\text{rad}} = 9.692$  found in Table I. From Eq. (4),

$$\begin{aligned} -\frac{1}{\rho} \left( \frac{dE}{dx} \right)_{\text{rad}} &= \frac{6.022045 \times 10^{23}}{107.868 \text{ g}} \times 5.794661 \times 10^{-28} \text{ cm}^2 \times (47)^2 \\ &\quad \times (5 + 0.5110034) \text{ MeV} \times 9.692 = 0.3817 \text{ MeV cm}^2/\text{g}, \end{aligned}$$

and

$$-\left( \frac{dE}{dx} \right)_{\text{rad}} = 4.008 \text{ MeV/cm.}$$

With the value of  $\bar{\eta} = 0.837$  from Table II, we can use Eq. (8) to find that the fraction  $Z/(Z + \bar{\eta}) = 0.983$  of the initial radiative energy loss is due to electron-nuclear interactions, and  $\bar{\eta}/(Z + \bar{\eta}) = 0.017$  of the loss is due to interactions with the  $Z$  orbital electrons.

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 351  
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K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
T1 (MeV)															
Z = 1															
0.001	7.853	7.746	7.446	7.040	6.586	6.124	5.664	5.230	4.841	4.521	4.400	4.372	4.362	4.360	5.295
0.002	8.805	8.638	8.059	7.377	6.699	6.052	5.431	4.839	4.263	3.682	3.437	3.374	3.326	3.320	5.285
0.005	10.32	9.753	8.703	7.661	6.728	5.899	5.148	4.424	3.697	2.897	2.446	2.286	2.161	2.104	5.303
0.01	11.55	10.55	9.087	7.795	6.711	5.776	4.952	4.172	3.587	2.509	1.982	1.762	1.548	1.439	5.358
0.02	13.07	11.11	9.370	7.915	6.674	5.617	4.734	3.933	3.161	2.239	1.684	1.424	1.129	0.967	5.431
0.05	14.90	11.92	9.620	7.858	6.426	5.295	4.370	3.575	2.777	1.940	1.401	1.112	0.754	0.551	5.552
0.1	16.94	12.51	9.686	7.689	6.107	4.937	3.951	3.179	2.438	1.670	1.180	0.903	0.548	0.343	5.694
0.2	20.31	13.46	9.873	7.509	5.808	4.595	3.549	2.694	2.022	1.362	0.938	0.697	0.380	0.197	6.073
0.5	27.90	15.68	10.84	7.831	5.945	4.555	3.400	2.386	1.634	1.045	0.706	0.505	0.244	0.094	7.512
1.	35.57	18.41	12.21	8.960	6.849	5.241	3.927	2.763	1.732	1.038	0.688	0.483	0.218	0.065	9.813
2.	43.42	21.45	14.61	11.03	8.605	6.744	5.195	3.809	2.472	1.306	0.846	0.587	0.250	0.057	13.35
3.	47.38	23.28	16.38	12.63	10.03	8.000	6.295	4.748	3.225	1.694	1.026	0.703	0.298	0.056	15.92
4.	49.86	24.49	17.78	13.91	11.18	9.022	7.204	5.553	3.918	2.115	1.190	0.815	0.349	0.055	17.90
5.	51.31	25.50	19.00	14.96	12.06	9.828	7.977	6.281	4.555	2.515	1.346	0.927	0.402	0.054	19.50
6.	52.55	26.23	19.88	15.82	12.87	10.57	8.856	6.903	5.104	2.900	1.535	1.034	0.452	0.054	20.81
8.	54.20	27.35	21.25	17.19	14.16	11.78	9.791	7.960	6.056	3.611	1.931	1.236	0.552	0.053	22.91
10.	55.23	28.14	22.26	18.23	15.18	12.75	10.71	8.832	6.861	4.247	2.332	1.443	0.648	0.053	24.53
15.	56.60	29.34	23.94	20.04	16.99	14.52	12.43	10.50	8.445	5.581	3.269	2.048	0.866	0.053	27.42
20.	57.29	30.02	24.98	21.22	18.22	15.76	13.67	11.73	9.652	6.653	4.081	2.625	1.062	0.052	29.39
30.	58.05	30.77	26.20	22.68	19.81	17.43	15.39	13.47	11.40	8.300	5.456	3.697	1.398	0.052	32.02
40.	58.33	31.18	26.91	23.56	20.82	18.53	16.56	14.70	12.66	9.545	6.561	4.617	1.780	0.052	33.75
50.	58.35	31.44	27.37	24.16	21.52	19.32	17.41	15.62	13.64	10.53	7.493	5.447	2.199	0.052	35.01
60.	58.17	31.60	27.70	24.60	22.04	19.91	18.09	16.37	14.43	11.34	8.282	6.143	2.604	0.052	35.97
80.	57.73	31.83	28.13	25.18	22.75	20.76	19.06	17.47	15.68	12.66	9.551	7.328	3.357	0.052	37.59
100.	57.30	31.96	28.41	25.56	23.23	21.33	19.74	18.27	16.61	13.69	10.57	8.294	4.029	0.052	38.60
200.	55.00	32.26	29.04	26.42	24.32	22.68	21.62	20.38	19.20	16.79	15.83	11.48	6.579	0.052	41.01
500.	46.70	32.45	29.46	27.03	25.13	23.71	22.74	22.14	21.65	20.37	18.01	15.83	10.70	0.052	43.26
1000.	42.50	32.52	29.62	27.27	25.44	24.12	23.28	22.88	22.75	22.29	20.74	18.92	14.02	0.052	44.37
2000.	39.55	32.55	29.70	27.39	25.61	24.34	23.58	23.30	23.40	23.35	22.79	21.51	17.28	0.052	45.10
5000.	37.58	32.58	29.76	27.47	25.72	24.49	23.78	23.58	23.84	24.40	24.38	23.88	21.12	0.052	45.68
10000.	36.82	32.58	29.77	27.50	25.76	24.54	23.85	23.68	24.00	24.74	25.03	24.84	23.25	0.052	45.93
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
T1 (MeV)															
Z = 2															
0.001	7.167	7.181	7.001	6.726	6.409	6.077	5.740	5.422	5.150	4.939	4.858	4.837	4.825	4.821	5.239
0.002	8.232	8.120	7.713	7.200	6.666	6.167	5.646	5.173	4.729	4.313	4.165	4.099	4.064	4.053	5.349
0.005	9.678	9.276	8.439	7.568	6.770	6.055	5.397	4.770	4.153	3.510	3.180	3.070	2.986	2.951	5.400
0.01	10.81	10.06	8.834	7.706	6.747	5.914	5.166	4.461	3.762	3.009	2.590	2.430	2.283	2.213	5.420
0.02	12.18	10.55	9.062	7.784	6.678	5.721	4.897	4.148	3.420	2.605	2.151	1.927	1.711	1.600	5.429
0.05	13.47	11.11	9.139	7.592	6.336	5.325	4.473	3.707	2.950	2.148	1.657	1.413	1.130	0.974	5.417
0.1	14.54	11.28	8.928	7.241	5.917	4.892	4.017	3.265	2.544	1.797	1.334	1.093	0.792	0.624	5.390
0.2	16.12	11.49	8.747	6.868	5.470	4.418	3.513	2.751	2.092	1.433	1.023	0.802	0.525	0.365	5.493
0.5	19.94	12.50	9.013	6.783	5.288	4.140	3.184	2.345	1.667	1.080	0.745	0.556	0.315	0.178	6.325
1.	24.04	14.06	9.865	7.470	5.820	4.535	3.479	2.549	1.714	1.060	0.713	0.517	0.266	0.123	7.894
2.	28.11	15.98	11.46	8.864	7.025	5.582	4.375	3.303	2.268	1.320	0.866	0.613	0.292	0.108	10.38
3.	30.06	17.13	12.64	9.947	8.012	6.473	5.169	3.985	2.842	1.662	1.038	0.723	0.338	0.107	12.18
4.	31.28	18.35	13.54	10.81	8.806	7.198	5.832	4.584	3.357	2.001	1.206	0.837	0.387	0.107	13.56
5.	32.10	18.36	14.23	11.50	9.455	7.804	6.396	5.103	3.813	2.319	1.364	0.946	0.439	0.106	14.65
6.	32.67	18.77	14.78	12.06	9.997	8.321	6.887	5.561	4.220	2.614	1.529	1.050	0.491	0.106	15.54
8.	33.42	19.36	15.60	12.94	10.86	9.163	7.702	6.335	4.922	3.148	1.856	1.246	0.592	0.105	16.96
10.	33.81	19.78	16.22	13.59	11.51	9.808	8.348	6.984	5.544	3.607	2.149	1.435	0.698	0.105	18.04
15.	34.51	20.33	17.11	14.66	12.66	11.00	9.551	8.179	6.693	4.582	2.859	1.930	0.919	0.104	19.93
20.	34.70	20.63	17.63	15.31	13.40	11.79	10.39	9.038	7.532	5.360	3.471	2.389	1.436	0.103	21.19
30.	35.01	20.93	18.21	16.07	14.30	12.81	11.50	10.23	8.789	6.556	4.482	3.195	1.436	0.102	22.82
40.	35.13	21.09	18.53	16.50	14.82	13.43	12.21	11.03	9.675	7.447	5.301	3.901	1.754	0.102	23.87
50.	35.11	21.19	18.74	16.78	15.18	13.85	12.71	11.61	10.35	8.162	5.966	4.485	2.079	0.102	24.62
60.	35.01	21.25	18.88	16.99	15.44	14.17	13.09	12.07	10.88	8.752	6.533	4.995	2.386	0.101	25.20
80.	34.77	21.33	19.07	17.25	15.78	14.59	13.61	12.72	11.69	9.684	7.462	5.853	2.945	0.101	26.02
100.	34.55	21.39	19.19	17.43	16.00	14.87	13.97	13.17	12.26	10.40	8.202	6.555	3.440	0.101	26.61
200.	33.40	21.52	19.48	17.82	16.50	15.51	14.79	14.27	13.73	12.46	10.52	8.858	5.315	0.101	28.08
500.	29.25	21.60	19.66	18.08	16.85	15.96	15.38	15.08	14.95	14.49	13.27	11.89	8.291	0.101	29.28
1000.	27.05	21.62	19.72	18.18	16.98	16.13	15.62	15.41	15.44	15.43	14.80	13.84	10.65	0.100	29.84
2000.	25.70	21.63	19.75	18.23	17.06	16.23	15.74	15.57	15.74	16.00	15.80	15.27	12.85	0.100	30.19
5000.	24.69	21.64	19.78	18.26	17.10	16.29	15.82	15.70	15.90	16.36	16.51	16.36	15.10	0.100	30.46
10000.	24.31	21.64	19.79	18.28	17.12	16.31	15.85	15.74	15.97	16.50	16.79	16.80	16.16	0.100	30.57
K/T1	0.00	0.10	0.20	0.30	0.40	0.50</									

352 TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections  
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k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
T1 (MeV)															
Z = 4															
0.001	6.058	6.186	6.197	6.133	6.027	5.898	5.753	5.614	5.502	5.430	5.398	5.386	5.373	5.367	5.050
0.002	7.180	7.251	7.108	6.865	6.577	6.275	5.977	5.705	5.470	5.287	5.214	5.187	5.163	5.152	5.421
0.005	8.671	8.528	8.026	7.439	6.869	6.343	5.856	5.406	4.989	4.618	4.476	4.436	4.402	4.389	5.604
0.01	9.800	9.364	8.500	7.632	6.864	6.190	5.580	5.018	4.484	3.969	3.741	3.674	3.624	3.606	5.603
0.02	10.90	10.04	8.778	7.662	6.734	5.939	5.230	4.585	3.962	3.331	3.009	2.901	2.817	2.782	5.549
0.05	12.35	10.44	8.809	7.470	6.358	5.442	4.665	3.971	3.301	2.571	2.172	2.013	1.857	1.784	5.419
0.1	13.10	10.49	8.533	7.053	5.879	4.950	4.153	3.439	2.761	2.052	1.647	1.466	1.269	1.166	5.291
0.2	14.01	10.44	8.161	6.560	5.352	4.600	3.575	2.860	2.223	1.578	1.198	1.016	0.807	0.693	5.244
0.5	16.12	10.83	8.096	6.277	4.988	3.971	3.117	2.369	1.732	1.150	0.824	0.656	0.454	0.342	5.751
1.	18.48	11.80	8.670	6.723	5.320	4.206	3.282	2.470	1.736	1.105	0.764	0.583	0.362	0.238	6.937
2.	20.89	13.12	9.839	7.767	6.235	5.010	3.981	3.067	2.189	1.352	0.905	0.667	0.374	0.208	8.894
3.	22.04	13.98	10.70	8.576	6.991	5.702	4.606	3.618	2.671	1.663	1.071	0.773	0.418	0.201	10.32
4.	22.78	14.52	11.35	9.216	7.591	6.259	5.123	4.100	3.101	1.961	1.234	0.882	0.465	0.198	11.40
5.	23.08	14.97	11.92	9.732	8.040	6.690	5.559	4.532	3.500	2.221	1.372	0.986	0.521	0.196	12.26
6.	23.44	15.26	12.50	10.14	8.445	7.084	5.938	4.893	3.833	2.471	1.522	1.087	0.571	0.195	12.95
8.	23.98	15.70	12.85	10.73	9.064	7.707	6.555	5.491	4.395	2.938	1.822	1.272	0.657	0.193	14.04
10.	24.18	15.96	13.26	11.21	9.562	8.211	7.057	5.992	4.877	3.304	2.076	1.455	0.760	0.193	14.87
15.	24.52	16.38	13.89	11.95	10.38	9.077	7.956	6.910	5.787	4.100	2.670	1.888	0.967	0.192	16.30
20.	24.68	16.60	14.26	12.41	10.90	9.651	8.571	7.558	6.453	4.725	3.175	2.277	1.149	0.191	17.25
30.	24.83	16.83	14.69	12.97	11.55	10.39	9.383	8.440	7.396	5.675	4.001	2.949	1.461	0.191	18.49
40.	24.88	16.95	14.92	13.29	11.95	10.85	9.908	9.026	8.044	6.382	4.666	3.516	1.742	0.191	19.28
50.	24.85	17.04	15.09	13.51	12.21	11.15	10.26	9.462	8.550	6.933	5.206	4.000	2.018	0.191	19.86
60.	24.80	17.08	15.20	13.67	12.41	11.39	10.54	9.790	8.935	7.385	5.663	4.418	2.277	0.191	20.29
80.	24.67	17.15	15.35	13.88	12.68	11.72	10.94	10.27	9.510	8.089	6.403	5.115	2.744	0.190	20.93
100.	24.55	17.20	15.45	14.02	12.86	11.94	11.22	10.60	9.925	8.618	6.983	5.680	3.154	0.190	21.38
200.	23.99	17.32	15.68	14.34	13.26	12.46	11.87	11.44	11.02	10.11	8.739	7.494	4.678	0.190	22.53
500.	21.93	17.39	15.83	14.56	13.57	12.84	12.37	12.11	11.99	11.61	10.72	9.748	7.062	0.190	23.52
1000.	20.82	17.42	15.89	14.64	13.68	12.99	12.56	12.39	12.40	12.36	11.86	11.15	8.869	0.190	23.99
2000.	20.13	17.43	15.92	14.69	13.74	13.07	12.67	12.54	12.64	12.83	12.66	12.22	10.46	0.190	24.29
5000.	19.64	17.44	15.93	14.71	13.78	13.12	12.74	12.64	12.80	13.16	13.26	13.12	12.08	0.190	24.52
10000.	19.45	17.44	15.94	14.72	13.79	13.14	12.77	12.68	12.86	13.28	13.49	12.92	0.190	24.62	
k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
T1 (MeV)															
Z = 5															
0.001	5.670	5.820	5.871	5.856	5.797	5.713	5.610	5.502	5.411	5.350	5.323	5.311	5.299	5.293	4.874
0.002	6.814	6.932	6.863	6.698	6.486	6.250	6.010	5.789	5.596	5.438	5.366	5.340	5.318	5.306	5.373
0.005	8.325	8.265	7.970	7.382	6.895	6.441	6.020	5.635	5.285	5.987	4.880	4.847	4.814	4.799	5.668
0.01	9.457	9.128	8.584	7.614	6.920	6.310	5.759	5.259	4.795	4.372	4.201	4.150	4.111	4.097	5.692
0.02	10.56	9.819	8.684	7.651	6.784	6.042	5.381	4.785	4.222	3.676	3.414	3.332	3.275	3.252	5.623
0.05	12.00	10.23	8.718	7.455	6.396	5.515	4.765	4.097	3.463	2.785	2.431	2.302	2.185	2.136	5.454
0.1	12.69	10.30	8.452	7.031	5.897	4.996	4.223	3.526	2.867	2.182	1.807	1.650	1.490	1.410	5.299
0.2	13.49	10.22	8.039	6.503	5.341	4.421	3.625	2.914	2.286	1.651	1.212	0.940	0.844	0.844	5.213
0.5	15.27	10.49	7.918	6.188	4.945	3.953	3.121	2.392	1.765	1.185	0.865	0.706	0.521	0.419	5.650
1.	17.23	11.41	8.400	6.550	5.235	4.166	3.260	2.464	1.749	1.131	0.788	0.617	0.409	0.293	6.761
2.	19.34	12.53	9.504	7.545	6.077	4.899	3.908	3.027	2.183	1.368	0.924	0.693	0.414	0.256	8.594
3.	20.29	13.33	10.30	8.300	6.790	5.551	4.496	3.549	2.643	1.668	1.087	0.797	0.457	0.250	9.940
4.	20.90	13.84	10.91	8.906	7.355	6.075	4.982	4.003	3.052	1.954	1.267	0.905	0.503	0.248	10.96
5.	21.15	14.26	11.45	9.390	7.781	6.486	5.396	4.406	3.419	2.204	1.394	1.016	0.554	0.246	11.77
6.	21.45	14.53	11.81	9.772	8.163	6.855	5.750	4.744	3.733	2.444	1.561	1.115	0.602	0.244	12.43
8.	21.84	14.92	12.33	10.35	8.760	7.449	6.331	5.312	4.272	2.871	1.820	1.302	0.695	0.242	13.46
10.	22.08	15.18	12.71	10.78	9.210	7.909	6.794	5.773	4.718	3.242	2.079	1.478	0.784	0.240	14.24
15.	22.38	15.56	13.28	11.47	9.971	8.716	7.652	6.632	5.575	4.000	2.649	1.897	0.985	0.238	15.58
20.	22.51	15.76	13.62	11.89	10.45	9.250	8.208	7.240	6.202	4.593	3.132	2.272	1.161	0.236	16.47
30.	22.64	15.96	13.99	12.38	11.05	9.931	8.969	8.070	7.088	5.490	3.918	2.915	1.467	0.235	17.62
40.	22.68	16.06	14.19	12.66	11.40	10.36	9.461	8.623	7.703	6.154	4.539	3.447	1.749	0.234	18.35
50.	22.65	16.13	14.33	12.86	11.64	10.63	9.797	9.033	8.172	6.677	5.050	3.897	2.012	0.234	18.88
60.	22.61	16.17	14.42	12.99	11.81	10.85	10.06	9.345	8.537	7.094	5.482	4.303	2.261	0.233	19.28
80.	22.51	16.22	14.54	13.17	12.06	11.16	10.43	9.795	9.075	7.753	6.181	4.962	2.702	0.233	19.87
100.	22.44	16.27	14.63	13.29	12.21	11.36	10.68	10.10	9.484	8.250	6.717	5.502	3.094	0.233	20.29
200.	21.97	16.38	14.84	13.58	12.58	11.83	11.28	10.89	10.50	9.649	8.362	7.202	4.553	0.232	21.36
500.	20.32	16.44	14.97	13.77	12.84	12.16	11.72	11.49	11.39	11.06	10.23	9.311	6.802	0.232	22.27
1000.	19.44	16.46	15.01	13.84	12.93	12.29	11.89	11.73	11.76	11.75	11.29	10.63	8.500	0.232	22.69
2000.	18.92	16.47	15.03	13.88	12.98	12.36	11.98	11.84	11.98	12.18	12.01	11.63	9.999	0.231	22.97
5000.	18.49	16.47	15.05	13.90	13.02	12.40	12.04	11.95	12.10	12.45	12.57	12.44	11.49	0.231	23.18
10000.	18.34	16.48	15.06	13.91	13.03	12.41	12.06	11.98	12.15	12.55	12.77	12.78	12.29	0.231	23.27
k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60								

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 353  
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$T_1$ (MeV)	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$Z = 7$															
$Z = 8$															
0.001	5.037	5.197	5.287	5.321	5.313	5.277	5.222	5.154	5.088	5.043	5.026	5.018	5.007	5.002	4.486
0.002	6.216	6.380	6.397	6.326	6.208	6.080	5.894	5.731	5.576	5.436	5.370	5.347	5.328	5.319	5.170
0.005	7.768	7.814	7.572	7.233	6.872	6.525	6.204	5.912	5.542	5.346	5.316	5.282	5.266	5.702	
0.01	8.917	8.739	8.181	7.566	6.996	6.491	6.039	5.641	5.288	4.988	4.875	4.838	4.803	4.788	5.820
0.02	10.28	9.357	8.476	7.665	6.921	6.246	5.645	5.118	4.666	4.277	4.126	4.079	4.009	3.996	5.757
0.05	11.48	9.946	8.595	7.451	6.477	5.658	4.957	4.341	3.776	3.202	2.926	2.838	2.768	2.744	5.546
0.1	12.14	10.05	8.362	7.029	5.954	5.094	4.360	3.696	3.074	2.494	2.124	2.006	1.899	1.850	5.349
0.2	12.82	9.941	7.928	6.471	5.359	4.476	3.714	3.025	2.414	1.801	1.468	1.328	1.191	1.122	5.210
0.5	14.20	10.10	7.729	6.100	4.913	3.959	3.149	2.443	1.830	1.257	0.946	0.805	0.648	0.564	5.555
1.	15.77	10.86	8.140	6.406	5.147	4.118	3.244	2.475	1.788	1.175	0.841	0.682	0.497	0.395	6.563
2.	17.37	11.89	9.089	7.260	5.897	4.786	3.841	2.992	2.187	1.400	0.964	0.746	0.488	0.345	8.251
3.	18.14	12.53	9.822	7.967	6.546	5.378	4.381	3.483	2.620	1.685	1.125	0.850	0.526	0.334	9.488
4.	18.63	12.95	10.38	8.517	7.057	5.869	4.841	3.901	2.993	1.969	1.283	0.950	0.567	0.330	10.43
5.	18.92	13.30	10.78	8.943	7.481	6.263	5.215	4.267	3.335	2.211	1.431	1.053	0.612	0.326	11.17
6.	19.13	13.54	11.11	9.289	7.825	6.599	5.541	4.581	3.629	2.439	1.573	1.148	0.656	0.324	11.78
8.	19.31	13.90	11.62	9.829	8.360	7.136	6.083	5.117	4.135	2.823	1.839	1.343	0.748	0.321	12.73
10.	19.49	14.13	11.95	10.21	8.772	7.559	6.509	5.542	4.546	3.171	2.086	1.514	0.831	0.319	13.44
15.	19.71	14.45	12.46	10.83	9.461	8.296	7.278	6.333	5.338	3.878	2.624	1.913	1.020	0.316	14.67
20.	19.81	14.62	12.74	11.20	9.891	8.778	7.804	6.892	5.917	4.430	3.077	2.267	1.189	0.314	15.48
30.	19.91	14.78	13.04	11.61	10.40	9.383	8.494	7.654	6.737	5.264	3.810	2.869	1.485	0.312	16.51
40.	19.94	14.85	13.20	11.83	10.70	9.753	8.935	8.160	7.306	5.880	4.387	3.366	1.755	0.311	17.17
50.	19.94	14.89	13.29	11.98	10.90	10.00	9.244	8.527	7.732	6.363	4.860	3.789	2.008	0.310	17.63
60.	19.92	14.93	13.36	12.08	11.03	10.17	9.460	8.807	8.087	6.753	5.257	4.167	2.241	0.310	17.99
80.	19.85	14.97	13.46	12.22	11.22	10.42	9.781	9.211	8.591	7.359	5.901	4.786	2.662	0.309	18.51
100.	19.79	15.00	13.52	12.32	11.35	10.59	9.996	9.487	8.950	7.816	6.404	5.284	3.030	0.309	18.87
200.	19.44	15.09	13.70	12.55	11.65	10.97	10.49	10.16	9.853	9.107	7.921	6.854	4.401	0.308	19.81
500.	18.26	15.14	13.79	12.70	11.85	11.23	10.84	10.65	10.59	10.37	9.641	8.801	6.488	0.308	20.60
1000.	17.63	15.15	13.83	12.75	11.92	11.33	10.97	10.84	10.88	10.94	10.59	10.01	8.056	0.308	20.96
2000.	17.26	15.16	13.84	12.78	11.96	11.38	11.04	10.92	11.06	11.28	11.19	10.88	9.433	0.308	21.18
5000.	16.95	15.16	13.86	12.80	11.98	11.41	11.09	11.00	11.15	11.49	11.63	11.56	10.80	0.308	21.36
10000.	16.84	15.17	13.86	12.80	11.99	11.43	11.10	11.19	11.57	11.78	11.81	11.45	11.05	0.308	21.43
$T_1$ (MeV)	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$Z = 8$															
0.001	4.761	4.919	5.017	5.064	5.070	5.052	5.014	4.963	4.912	4.877	4.865	4.859	4.850	4.845	4.294
0.002	5.951	6.125	6.164	6.120	6.030	5.912	5.770	5.632	5.496	5.365	5.304	5.284	5.266	5.258	5.035
0.005	7.564	7.581	7.435	7.152	6.819	6.506	6.225	5.976	5.762	5.539	5.461	5.431	5.399	5.383	5.676
0.01	8.693	8.567	8.083	7.530	7.010	6.550	6.139	5.779	5.465	5.204	5.104	5.070	5.035	5.019	5.856
0.02	10.67	9.221	8.404	7.650	6.957	6.326	5.766	5.276	4.865	4.521	4.400	4.366	4.296	4.281	5.815
0.05	11.28	9.833	8.549	7.454	6.517	5.725	5.048	4.456	4.924	3.396	3.152	3.078	3.021	3.002	5.594
0.1	11.93	9.957	8.335	7.036	5.985	5.146	4.430	3.780	3.174	2.572	2.278	2.173	2.084	2.045	5.582
0.2	12.59	9.845	7.899	6.478	5.386	4.512	3.759	3.080	2.477	1.877	1.558	1.429	1.309	1.250	5.223
0.5	13.85	9.974	7.674	6.080	4.910	3.969	3.169	2.471	1.863	1.293	0.988	0.854	0.709	0.633	5.532
1.	15.29	10.69	8.060	6.361	5.119	4.106	3.246	2.486	1.809	1.198	0.868	0.714	0.539	0.446	6.505
2.	16.78	11.66	8.965	7.186	5.852	4.757	3.823	2.985	2.194	1.416	0.984	0.771	0.524	0.387	8.149
3.	17.49	12.27	9.666	7.865	6.478	5.330	4.347	3.464	2.617	1.695	1.141	0.872	0.559	0.376	9.351
4.	17.77	12.74	10.25	8.399	6.946	5.777	4.790	3.888	2.998	1.953	1.294	0.981	0.602	0.371	10.27
5.	18.06	13.03	10.64	8.810	7.354	6.169	5.161	4.240	3.321	2.195	1.439	1.081	0.645	0.367	10.99
6.	18.26	13.25	10.94	9.140	7.690	6.498	5.478	4.545	3.606	2.416	1.580	1.176	0.688	0.365	11.57
8.	18.52	13.57	11.38	9.641	8.215	7.026	6.000	5.056	4.092	2.808	1.843	1.356	0.772	0.361	12.48
10.	18.67	13.77	11.69	10.00	8.609	7.433	6.413	5.470	4.495	3.147	2.085	1.525	0.852	0.358	13.17
15.	18.86	14.06	12.15	10.58	9.265	8.142	7.159	6.240	5.267	3.838	2.613	1.917	1.036	0.354	14.35
20.	18.94	14.21	12.41	10.92	9.671	8.605	7.668	6.784	5.832	4.377	3.056	2.264	1.202	0.351	15.12
30.	19.01	14.34	12.68	11.31	10.15	9.182	8.332	7.523	6.630	5.191	3.772	2.853	1.494	0.349	16.11
40.	19.03	14.41	12.82	11.51	10.43	9.531	8.754	8.011	7.182	5.792	4.336	3.340	1.760	0.347	16.74
50.	19.03	14.45	12.91	11.65	10.61	9.754	9.034	8.361	7.612	6.263	4.796	3.760	2.008	0.346	17.18
60.	18.99	14.47	12.97	11.74	10.74	9.925	9.250	8.630	7.941	6.642	5.185	4.124	2.238	0.346	17.52
80.	18.92	14.50	13.05	11.87	10.92	10.16	9.549	9.012	8.426	7.233	5.813	4.728	2.650	0.345	18.01
100.	18.86	14.53	13.11	11.96	11.03	10.31	9.747	9.271	8.770	7.679	6.304	5.212	3.010	0.345	18.36
200.	18.56	14.61	13.27	12.17	11.30	10.65	10.20	9.894	9.623	8.926	7.784	6.745	4.350	0.344	19.25
500.	17.53	14.65	13.36	12.30	11.48	10.88	10.51	10.34	10.20	10.12	9.446	8.538	6.387	0.343	19.98
1000.	16.98	14.66	13.39	12.35	11.54	10.97	10.63	10.50	10.56	10.64	10.34	9.800	7.897	0.343	20.31
5000.	16.63	14.67	13.40	12.37	11.58	11.02	10.69	10.59	10.70	10.94	10.90	10.60	9.232	0.343	20.52
10000.	16.39	14.68	13.41	12.39	11.60	11.05	10.73	10.65	10.80	11.13	11.28	11.23	10.55	0.343	20.68
$T_1$ (MeV)	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$Z = 9$															
0.001	4.502	4.656	4												

354 TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 10$															
0.001	4.262	4.410	4.513	4.572	4.599	4.607	4.602	4.592	4.575	4.563	4.561	4.557	4.553	4.549	3.926
0.002	5.464	5.625	5.698	5.691	5.633	5.554	5.462	5.369	5.269	5.172	5.131	5.115	5.101	5.094	4.736
0.005	7.110	7.193	7.112	6.904	6.644	6.395	6.171	5.974	5.786	5.617	5.548	5.519	5.491	5.477	5.559
0.01	8.294	8.261	7.885	7.429	6.991	6.601	6.254	5.955	5.696	5.482	5.395	5.362	5.329	5.312	5.871
0.02	9.476	9.024	8.383	7.662	6.981	6.418	5.956	5.555	5.208	4.910	4.792	4.752	4.718	4.703	5.908
0.05	10.94	9.642	8.475	7.468	6.597	5.855	5.220	4.674	4.199	3.748	3.549	3.492	3.447	3.432	5.687
0.1	11.64	9.823	8.297	7.057	6.046	5.233	4.548	3.942	3.384	2.821	2.565	2.488	2.420	2.393	5.454
0.2	12.27	9.723	7.868	6.496	5.436	4.584	3.851	3.189	2.602	2.028	1.735	1.625	1.531	1.488	5.267
0.5	13.34	9.801	7.609	6.067	4.923	3.999	3.214	2.528	1.928	1.365	1.072	0.950	0.826	0.763	5.519
1.	14.59	10.44	7.955	6.313	5.097	4.103	3.259	2.514	1.850	1.243	0.921	0.777	0.620	0.537	6.435
2.	15.95	11.33	8.786	7.071	5.777	4.716	3.806	2.985	2.213	1.448	1.024	0.821	0.592	0.468	8.007
3.	16.36	11.94	9.501	7.709	6.327	5.232	4.310	3.460	2.628	1.711	1.177	0.925	0.625	0.454	9.153
4.	16.69	12.29	9.958	8.198	6.810	5.688	4.736	3.857	2.986	1.969	1.330	1.028	0.663	0.447	10.01
5.	16.90	12.55	10.30	8.578	7.196	6.063	5.093	4.197	3.297	2.203	1.474	1.126	0.703	0.442	10.69
6.	17.04	12.71	10.57	8.883	7.513	6.378	5.399	4.492	3.572	2.416	1.611	1.220	0.743	0.458	11.24
8.	17.22	12.97	10.96	9.343	8.006	6.880	5.899	4.984	4.040	2.794	1.867	1.395	0.821	0.433	12.09
10.	17.32	13.14	11.23	9.675	8.372	7.266	6.294	5.382	4.428	3.122	2.101	1.559	0.896	0.429	12.74
15.	17.44	13.38	11.64	10.20	8.976	7.929	7.002	6.118	5.170	3.786	2.609	1.937	1.070	0.423	13.84
20.	17.50	13.50	11.86	10.50	9.344	8.355	7.478	6.635	5.712	4.506	3.035	2.270	1.229	0.420	14.56
30.	17.57	13.61	12.09	10.83	9.771	8.877	8.091	7.329	6.475	5.089	3.723	2.836	1.511	0.416	15.48
40.	17.60	13.68	12.22	11.01	10.01	9.173	8.460	7.781	7.016	5.671	4.263	3.306	1.770	0.414	16.06
50.	17.59	13.71	12.29	11.12	10.16	9.378	8.719	8.105	7.413	6.119	4.706	3.710	2.011	0.413	16.47
60.	17.54	13.73	12.35	11.21	10.27	9.522	8.914	8.363	7.706	6.480	5.090	4.058	2.232	0.412	16.78
80.	17.52	13.76	12.41	11.31	10.42	9.722	9.170	8.692	8.173	7.053	5.686	4.641	2.633	0.411	17.23
100.	17.48	13.78	12.46	11.38	10.52	9.851	9.341	8.922	8.489	7.478	6.160	5.108	2.982	0.410	17.55
200.	17.23	13.85	12.59	11.56	10.74	10.14	9.722	9.460	9.245	8.651	7.582	6.593	4.283	0.409	18.34
500.	16.40	13.88	12.66	11.66	10.89	10.33	9.984	9.830	9.816	9.710	9.131	8.401	6.263	0.408	18.99
1000.	15.96	13.89	12.68	11.70	10.94	10.40	10.08	9.969	10.04	10.15	9.928	9.464	7.690	0.408	19.28
2000.	15.71	13.89	12.69	11.72	10.97	10.44	10.15	10.03	10.17	10.40	10.39	10.18	8.962	0.408	19.46
5000.	15.49	13.90	12.70	11.73	10.98	10.46	10.17	10.09	10.23	10.55	10.71	10.69	10.13	0.408	19.59
10000.	15.41	13.90	12.71	11.74	10.99	10.47	10.18	10.11	10.26	10.61	10.83	10.87	10.62	0.408	19.65
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 11$															
0.001	4.038	4.181	4.283	4.346	4.381	4.400	4.409	4.417	4.418	4.420	4.419	4.416	4.414	4.375	
0.002	5.244	5.399	5.472	5.474	5.430	5.368	5.296	5.224	5.146	5.089	5.036	5.011	5.004	4.584	
0.005	6.907	7.007	6.949	6.768	6.535	6.311	6.108	5.931	5.763	5.610	5.545	5.519	5.493	5.480	5.480
0.01	8.118	8.116	7.785	7.368	6.962	6.600	6.279	6.001	5.762	5.561	5.477	5.446	5.415	5.397	5.857
0.02	9.547	8.872	8.216	7.605	7.036	6.514	6.048	5.642	5.306	5.043	4.966	4.946	4.874	4.852	5.933
0.05	10.80	9.561	8.445	7.475	6.635	5.916	5.301	4.776	4.325	3.904	3.720	3.667	3.625	3.609	5.731
0.1	11.53	9.763	8.281	7.072	6.082	5.284	4.612	4.020	3.478	2.940	2.701	2.632	2.571	2.547	5.492
0.2	12.15	9.673	7.860	6.510	5.463	4.621	3.897	3.242	2.663	2.103	1.823	1.721	1.636	1.598	5.292
0.5	13.21	9.743	7.589	6.068	4.935	4.018	3.238	2.557	1.961	1.401	1.114	0.997	0.882	0.854	5.524
1.	14.38	10.35	7.921	6.299	5.094	4.107	3.269	2.529	1.870	1.266	0.998	0.809	0.659	0.581	6.417
2.	15.62	11.20	8.725	7.036	5.755	4.704	3.803	2.989	2.224	1.464	1.044	0.845	0.624	0.505	7.956
3.	16.08	11.81	9.417	7.652	6.290	5.210	4.300	3.459	2.633	1.722	1.193	0.946	0.654	0.489	9.089
4.	16.46	12.17	9.865	8.122	7.554	5.654	4.720	3.853	2.987	1.975	1.343	1.045	0.689	0.481	9.941
5.	16.70	12.43	10.20	8.488	7.126	6.018	5.072	4.189	3.295	2.205	1.484	1.141	0.726	0.475	10.61
6.	16.86	12.62	10.46	8.780	7.431	6.324	5.372	4.481	3.567	2.415	1.619	1.232	0.764	0.471	11.15
8.	17.05	12.88	10.84	9.222	7.905	6.811	5.862	4.967	4.030	2.788	1.870	1.405	0.839	0.465	11.99
10.	17.15	15.04	11.10	9.540	8.258	7.186	6.249	5.558	4.413	3.111	2.101	1.566	0.912	0.460	12.62
15.	17.25	13.26	11.48	10.04	8.340	7.824	6.938	6.079	5.142	3.766	2.601	1.937	1.082	0.554	15.10
20.	17.25	13.36	11.69	10.33	9.197	8.241	7.399	6.581	5.673	4.278	3.022	2.267	1.258	0.450	14.39
30.	17.23	13.44	11.91	10.65	9.614	8.746	7.990	7.253	6.419	5.051	3.702	2.826	1.517	0.466	15.28
40.	17.22	13.49	12.03	10.83	9.843	9.032	8.343	7.689	5.622	4.234	3.292	1.774	0.444	15.83	
50.	17.18	13.50	12.10	10.94	9.996	9.230	8.592	8.000	7.333	6.064	4.672	3.690	2.012	0.443	16.23
60.	17.14	13.52	12.14	11.02	10.11	9.372	8.774	8.234	7.632	6.425	5.042	4.035	2.233	0.442	16.53
80.	17.08	13.54	12.21	11.13	10.25	9.565	9.025	8.563	8.068	6.983	5.640	4.608	2.627	0.441	16.97
100.	17.01	13.56	12.26	11.20	10.35	9.688	9.191	8.798	8.363	7.393	6.108	5.066	2.979	0.440	17.27
200.	16.82	13.63	12.39	11.38	10.57	9.973	9.564	9.306	9.099	8.536	7.504	6.523	4.252	0.439	18.05
500.	16.07	13.67	12.46	11.48	10.72	10.17	9.824	9.672	9.564	9.550	9.010	8.297	6.188	0.438	18.69
1000.	15.67	13.68	12.49	11.52	10.77	10.24	9.926	9.810	9.873	9.981	9.769	9.328	7.611	0.438	18.98
2000.	15.42	13.68	12.50	11.54	10.80	10.28	9.977	9.886	9.992	10.23	10.23	10.000	8.834	0.438	19.16
5000.	15.24	13.69	12.51	11.55	10.82	10.30	10.01	9.934	10.07	10.39	10.34	10.51	9.967	0.438	19.29
10000.	15.17	13.69	12.51	11.56	10.82	10.31	10.02	9.950	10.10	10.44	10.69	10.44	10.44	0.438	19.34
$k/T_1$	0.00	0.10	0.20	0.30											

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 355  
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$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$Z = 13$															
$T_1$ (MeV)															
0.001	3.644	3.776	3.876	3.944	3.991	4.029	4.061	4.099	4.130	4.154	4.163	4.165	4.167	4.167	3.453
0.002	4.843	4.978	5.050	5.065	5.046	5.014	4.976	4.941	4.903	4.866	4.850	4.842	4.833	4.828	4.296
0.005	6.531	6.684	6.629	6.481	6.303	6.126	5.954	5.802	5.667	5.548	5.492	5.471	5.449	5.458	5.307
0.01	7.799	7.850	7.588	7.233	6.880	6.564	6.282	6.058	5.825	5.642	5.563	5.533	5.503	5.488	5.801
0.02	9.256	8.668	8.097	7.559	7.055	6.590	6.170	5.802	5.497	5.256	5.183	5.163	5.093	5.068	5.966
0.05	10.37	9.534	8.416	7.448	6.668	6.023	5.460	4.980	4.551	4.174	4.015	3.963	3.921	3.902	5.813
0.1	11.32	9.659	8.260	7.107	6.156	5.384	4.734	4.166	3.657	3.166	2.954	2.895	2.841	2.819	5.567
0.2	11.96	9.607	7.870	6.554	5.525	4.697	3.988	3.349	2.785	2.250	1.993	1.903	1.831	1.800	5.352
0.5	12.95	9.647	7.558	6.080	4.964	4.055	3.289	2.615	2.025	1.474	1.198	1.091	0.990	0.940	5.540
1.	14.03	10.17	7.878	6.296	5.092	4.111	3.287	2.564	1.913	1.312	1.001	0.870	0.735	0.655	6.391
2.	15.10	11.02	8.643	6.992	5.729	4.693	3.805	3.000	2.248	1.497	1.083	0.893	0.687	0.578	7.891
3.	15.52	11.57	9.277	7.568	6.241	5.183	4.288	3.459	2.644	1.748	1.229	0.989	0.710	0.557	8.981
4.	15.85	11.89	9.683	8.001	6.676	5.606	4.695	3.845	2.993	1.996	1.375	1.084	0.741	0.546	9.797
5.	16.06	12.12	9.986	8.336	7.022	5.952	5.035	4.174	3.296	2.221	1.512	1.176	0.774	0.539	10.43
6.	16.20	12.29	10.22	8.604	7.306	6.242	5.325	4.459	3.563	2.926	1.643	1.264	0.808	0.533	10.95
8.	16.36	12.53	10.56	9.010	7.748	6.703	5.796	4.931	4.016	2.790	1.887	1.431	0.877	0.525	11.75
10.	16.45	12.68	10.80	9.304	8.077	7.057	6.165	5.309	4.388	3.105	2.111	1.588	0.945	0.520	12.36
15.	16.52	12.89	11.17	9.774	8.625	7.664	6.821	6.001	5.096	3.744	2.598	1.949	1.107	0.512	13.39
20.	16.54	12.99	11.37	10.05	8.965	8.055	7.258	6.481	5.607	4.242	3.008	2.268	1.258	0.508	14.06
30.	16.53	13.08	11.59	10.37	9.368	8.537	7.818	7.118	6.322	4.994	3.672	2.814	1.530	0.503	14.91
40.	16.52	13.14	11.72	10.55	9.594	8.811	8.150	7.531	6.832	5.548	4.190	3.270	1.782	0.501	15.46
50.	16.50	13.17	11.80	10.67	9.748	9.004	8.388	7.826	7.198	5.977	4.619	3.659	2.016	0.500	15.85
60.	16.47	13.19	11.85	10.75	9.858	9.163	8.563	8.048	7.682	6.327	4.982	3.997	2.232	0.499	16.14
80.	16.39	13.22	11.93	10.87	10.01	9.329	8.807	8.374	7.886	6.860	5.568	4.555	2.624	0.497	16.57
100.	16.36	13.24	11.98	10.94	10.10	9.454	8.967	8.585	8.173	7.262	6.022	5.004	2.964	0.496	16.87
200.	16.19	13.30	12.09	11.10	10.32	9.731	9.330	9.076	8.674	8.348	7.572	6.425	4.210	0.495	17.62
500.	15.56	13.34	12.16	11.21	10.46	9.924	9.587	9.435	9.416	9.314	8.797	8.155	6.121	0.494	18.24
1000.	15.22	13.35	12.19	11.25	10.51	9.994	9.684	9.574	9.634	9.732	9.525	9.105	7.485	0.494	18.52
2000.	15.01	13.36	12.20	11.26	10.54	10.03	9.737	9.648	9.752	9.976	9.972	9.767	8.645	0.493	18.70
5000.	14.85	13.36	12.21	11.28	10.56	10.06	9.770	9.695	9.827	10.14	10.28	10.25	9.718	0.493	18.83
10000.	14.80	13.36	12.21	11.28	10.56	10.07	9.779	9.712	9.854	10.19	10.40	10.43	10.18	0.493	18.88
$Z = 14$															
$T_1$ (MeV)															
0.001	3.472	3.601	3.700	3.770	3.822	3.866	3.908	3.956	4.000	4.032	4.044	4.048	4.053	4.054	3.319
0.002	4.663	4.792	4.864	4.884	4.874	4.853	4.829	4.810	4.789	4.769	4.760	4.755	4.748	4.744	4.166
0.005	6.366	6.521	6.480	6.349	6.187	6.026	5.868	5.730	5.609	5.504	5.453	5.434	5.414	5.405	5.219
0.01	7.652	7.721	7.489	7.161	6.830	6.533	6.267	6.036	5.834	5.658	5.581	5.552	5.523	5.508	5.763
0.02	9.117	8.572	8.038	7.533	7.058	6.616	6.217	5.864	5.569	5.334	5.261	5.241	5.170	5.146	5.973
0.05	10.25	9.467	8.392	7.454	6.697	6.072	5.528	5.066	4.656	4.295	4.141	4.090	4.046	4.026	5.847
0.1	11.23	9.615	8.252	7.124	6.191	5.432	4.792	4.237	3.744	3.272	3.070	3.015	2.963	2.942	5.603
0.2	11.85	9.579	7.873	6.573	5.554	4.734	4.032	3.401	2.844	2.323	2.076	1.990	1.923	1.894	5.381
0.5	12.84	9.616	7.556	6.089	4.981	4.077	3.315	2.644	2.058	1.511	1.239	1.137	1.041	0.996	5.554
1.	13.90	10.12	7.861	6.293	5.097	4.121	3.300	2.581	1.933	1.336	1.028	0.900	0.771	0.705	6.389
2.	14.95	10.95	8.601	6.970	5.720	4.692	3.808	3.007	2.261	1.513	1.103	0.916	0.717	0.612	7.869
3.	15.48	11.44	9.158	7.528	6.254	5.194	4.281	3.451	2.647	1.766	1.246	1.003	0.735	0.591	8.939
4.	15.66	11.81	9.621	7.955	6.643	5.586	4.686	3.845	2.996	2.005	1.389	1.101	0.765	0.560	9.750
5.	15.86	12.03	9.916	8.282	6.982	5.926	5.020	4.168	3.297	2.227	1.524	1.191	0.797	0.572	10.38
6.	15.99	12.20	10.15	8.543	7.259	6.209	5.305	4.449	3.561	2.430	1.653	1.278	0.830	0.566	10.89
8.	16.14	12.43	10.48	8.939	7.691	6.661	5.767	4.913	4.008	2.790	1.894	1.442	0.896	0.557	11.68
10.	16.22	12.57	10.71	9.226	8.013	7.007	6.130	5.286	4.376	3.102	2.115	1.597	0.962	0.551	12.27
15.	16.28	12.77	11.07	9.686	8.549	7.601	6.772	5.966	5.073	3.733	2.596	1.953	1.120	0.562	13.28
20.	16.29	12.87	11.27	9.959	8.882	7.984	7.200	6.436	5.577	4.226	3.002	2.269	1.268	0.537	13.94
20.	16.27	12.96	11.48	10.27	9.278	8.457	7.748	7.061	6.280	4.969	3.660	2.809	1.537	0.531	14.78
40.	16.24	13.01	11.61	10.46	9.505	8.723	8.073	7.480	6.774	5.508	4.181	3.264	1.784	0.528	15.32
50.	16.20	13.04	11.69	10.57	9.655	8.913	8.308	7.769	7.132	5.933	4.604	3.648	2.018	0.527	15.70
60.	16.17	13.06	11.74	10.65	9.762	9.050	8.581	7.986	7.410	6.279	4.962	3.981	2.234	0.525	15.99
80.	16.12	13.08	11.81	10.76	9.907	9.238	8.721	8.293	7.814	6.811	5.538	4.535	2.621	0.524	16.41
100.	16.09	13.11	11.86	10.85	10.00	9.381	8.879	8.501	8.096	7.206	5.986	4.979	2.958	0.523	16.70
200.	15.95	13.17	11.97	10.99	10.21	9.655	9.237	8.986	8.786	8.270	7.316	6.385	4.192	0.521	17.44
500.	15.35	13.20	12.04	11.10	10.36	9.822	9.491	9.342	9.324	9.219	8.720	8.061	6.064	0.520	18.05
1000.	15.03	13.22	12.07	11.13	10.41	9.894	9.588	9.477	9.537	9.636	9.430	9.019	7.421	0.519	18.33
2000.	14.84	13.22	12.08	11.15	10.44	9.932	9.637	9.551	9.652	9.880	9.870	9.638	8.574	0.519	18.51
5000.	14.70	13.22	12.09	11.16	10.45	9.955	9.671	9.597	9.728	10.03	10.18	10.15	9.619	0.519	18.64
10000.	14.64	13.23	12.09	11.17	10.46	9.963	9.680	9.613	9.754	10.09	10.29	10.33	10.08	0.519	18.69
$Z = 15$															
$T_$															

356 TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 16$															
0.001	3.174	3.295	3.392	3.466	3.526	3.580	3.636	3.700	3.761	3.808	3.826	3.834	3.842	3.867	3.082
0.002	4.340	4.461	4.536	4.569	4.575	4.570	4.564	4.570	4.578	4.585	4.589	4.588	4.584	4.582	3.932
0.005	6.063	6.221	6.208	6.101	5.964	5.831	5.697	5.583	5.486	5.405	5.364	5.348	5.333	5.323	5.048
0.01	7.379	7.481	7.294	7.006	6.716	6.460	6.218	6.010	5.824	5.661	5.588	5.561	5.533	5.520	5.676
0.02	8.611	8.492	8.003	7.483	7.015	6.612	6.270	5.971	5.701	5.463	5.359	5.319	5.280	5.261	5.978
0.05	10.10	9.273	8.376	7.505	6.742	6.136	5.648	5.227	4.843	4.504	4.359	4.305	4.259	4.237	5.905
0.1	11.07	9.537	8.236	7.154	6.257	5.525	4.910	4.378	3.911	3.472	3.286	3.235	3.184	3.161	5.675
0.2	11.70	9.541	7.890	6.615	5.612	4.806	4.119	3.502	2.961	2.464	2.234	2.155	2.095	2.069	5.443
0.5	12.65	9.584	7.547	6.105	5.019	4.130	3.372	2.702	2.122	1.583	1.322	1.226	1.140	1.100	5.588
1.	13.63	10.06	7.816	6.271	5.106	4.149	3.354	2.613	1.974	1.381	1.081	0.960	0.841	0.781	6.390
2.	14.64	10.83	8.549	6.951	5.719	4.697	3.817	3.023	2.286	1.546	1.142	0.962	0.775	0.677	7.841
3.	15.14	11.29	9.100	7.510	6.249	5.192	4.275	3.447	2.655	1.798	1.279	1.041	0.786	0.652	8.891
4.	15.46	11.61	9.477	7.815	6.663	5.593	4.660	3.816	2.993	2.034	1.420	1.130	0.810	0.638	9.678
5.	15.62	11.83	9.766	8.231	6.989	5.919	4.980	4.129	3.285	2.254	1.552	1.215	0.837	0.629	10.29
6.	15.55	12.04	10.06	8.594	7.222	6.171	5.263	4.413	3.562	2.439	1.679	1.311	0.871	0.621	10.79
8.	15.69	12.25	10.38	8.871	7.635	6.605	5.709	4.863	3.978	2.791	1.914	1.469	0.931	0.611	11.55
10.	15.75	12.39	10.59	9.141	7.941	6.937	6.059	5.226	4.338	3.097	2.130	1.619	0.992	0.604	12.13
15.	15.80	12.57	10.92	9.570	8.449	7.506	6.681	5.889	5.022	3.717	2.600	1.966	1.143	0.593	13.10
20.	15.80	12.65	11.10	9.823	8.762	7.873	7.096	6.348	5.516	4.201	2.997	2.275	1.286	0.587	13.74
30.	15.78	12.73	11.29	10.11	9.137	8.327	7.629	6.959	6.204	4.930	3.643	2.804	1.549	0.581	14.55
40.	15.77	12.77	11.40	10.28	9.356	8.602	7.962	7.355	6.672	5.465	4.153	3.244	1.792	0.578	15.07
50.	15.75	12.79	11.47	10.38	9.500	8.787	8.192	7.636	7.017	5.883	4.573	3.620	2.018	0.576	15.44
60.	15.70	12.82	11.53	10.47	9.599	8.903	8.345	7.860	7.301	6.208	4.920	3.955	2.236	0.574	15.72
80.	15.66	12.85	11.60	10.57	9.738	9.083	8.578	8.160	7.692	6.725	5.486	4.500	2.617	0.572	16.13
100.	15.63	12.87	11.65	10.64	9.828	9.202	8.732	8.363	7.966	7.106	5.924	4.938	2.949	0.571	16.42
200.	15.50	12.93	11.75	10.79	10.03	9.468	9.080	8.834	8.638	8.135	7.223	6.327	4.164	0.569	17.73
500.	14.98	12.96	11.82	10.89	10.17	9.648	9.321	9.176	9.162	9.067	8.573	7.947	6.025	0.568	17.73
1000.	14.71	12.97	11.84	10.93	10.22	9.714	9.413	9.306	9.367	9.470	9.272	8.871	7.323	0.567	18.00
2000.	14.54	12.98	11.86	10.95	10.24	9.747	9.460	9.376	9.479	9.698	9.703	9.503	8.442	0.567	18.17
5000.	14.41	12.98	11.86	10.95	10.26	9.770	9.491	9.419	9.548	9.849	9.997	9.973	9.457	0.567	18.29
10000.	14.36	12.98	11.87	10.96	10.26	9.776	9.500	9.435	9.574	9.899	10.10	10.15	9.920	0.567	18.34
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 17$															
0.001	3.058	3.160	3.258	3.334	3.397	3.455	3.515	3.584	3.652	3.705	3.726	3.735	3.745	3.751	2.976
0.002	4.210	4.301	4.373	4.425	4.452	4.457	4.450	4.451	4.469	4.502	4.511	4.506	4.505	4.505	3.825
0.005	5.933	6.073	6.086	5.995	5.859	5.726	5.609	5.512	5.425	5.351	5.319	5.302	5.290	5.283	4.965
0.01	7.270	7.337	7.215	6.956	6.657	6.399	6.182	5.993	5.811	5.649	5.582	5.554	5.529	5.517	5.630
0.02	8.500	8.394	7.948	7.493	7.004	6.619	6.292	6.004	5.761	5.504	5.400	5.361	5.322	5.303	5.970
0.05	10.00	9.215	8.354	7.508	6.766	6.176	5.703	5.297	4.927	4.596	4.452	4.397	4.350	4.327	5.931
0.1	10.98	9.498	8.231	7.173	6.292	5.570	4.964	4.442	3.989	3.565	3.385	3.335	3.284	3.260	5.708
0.2	11.63	9.525	7.900	6.637	5.641	4.842	4.163	3.552	3.018	2.533	2.311	2.176	2.151	5.475	5.475
0.5	12.58	9.564	7.549	6.118	5.039	4.154	3.398	2.732	2.154	1.619	1.363	1.270	1.188	1.150	5.606
1.	13.51	10.03	7.810	6.276	5.115	4.161	3.349	2.631	1.995	1.405	1.108	0.989	0.874	0.818	6.394
2.	14.51	10.78	8.525	6.939	5.715	4.700	3.824	3.032	2.299	1.562	1.161	0.984	0.802	0.708	7.829
3.	15.03	11.20	9.054	7.495	6.240	5.181	4.278	3.455	2.657	1.816	1.291	1.056	0.810	0.681	8.864
4.	15.08	11.59	9.504	7.890	6.604	5.559	4.664	3.830	2.999	2.031	1.431	1.153	0.834	0.666	9.646
5.	15.24	11.79	9.781	8.201	6.928	5.882	4.981	4.139	3.286	2.245	1.561	1.238	0.860	0.655	10.25
6.	15.34	11.94	9.994	8.467	7.191	6.151	5.252	4.407	3.540	2.441	1.685	1.320	0.888	0.647	10.73
8.	15.46	12.14	10.30	8.816	7.596	6.578	5.691	4.852	3.972	2.790	1.917	1.477	0.947	0.636	11.48
10.	15.52	12.27	10.51	9.081	7.897	6.904	6.035	5.209	4.328	3.092	2.131	1.625	1.007	0.628	12.05
15.	15.57	12.55	10.83	9.502	8.396	7.466	6.667	5.862	5.004	3.708	2.598	1.969	1.155	0.617	13.01
20.	15.57	12.53	11.01	9.752	8.704	7.824	7.055	6.315	5.454	4.188	2.993	2.276	1.296	0.611	13.64
30.	15.57	12.62	11.20	10.04	9.072	8.271	7.580	6.917	6.172	4.911	3.635	2.801	1.556	0.604	14.44
40.	15.55	12.66	11.31	10.20	9.288	8.541	7.908	7.308	6.634	5.442	4.141	3.239	1.797	0.600	14.96
50.	15.53	12.69	11.39	10.31	9.427	8.708	8.120	7.596	6.986	5.848	4.554	3.619	2.027	0.598	15.33
60.	15.50	12.71	11.44	10.39	9.527	8.838	8.286	7.806	7.254	6.177	4.903	3.945	2.237	0.597	15.60
80.	15.45	12.74	11.51	10.49	9.662	9.015	8.517	8.104	7.641	6.686	5.462	4.486	2.615	0.595	16.01
100.	15.42	12.76	11.55	10.56	9.751	9.131	8.668	8.304	7.912	7.063	5.896	4.921	2.945	0.594	16.29
200.	15.31	12.82	11.65	10.70	9.952	9.393	9.010	8.767	8.575	8.080	7.180	6.297	4.153	0.591	17.00
500.	14.82	12.85	11.72	10.80	10.08	9.566	9.246	9.102	9.090	9.000	8.520	7.891	5.972	0.590	17.58
1000.	14.56	12.86	11.74	10.83	10.13	9.632	9.334	9.228	9.290	9.397	9.204	8.809	7.280	0.589	17.85
2000.	14.40	12.86	11.75	10.85	10.16	9.666	9.380	9.297	9.396	9.626	9.400	8.385	7.885	0.589	18.01
5000.	14.28	12.87	11.76	10.86	10.17	9.686	9.410	9.338	9.467	9.766	9.915	9.894	9.387	0.589	18.16
10000.	14.24	12.87	11.76	10.87	10.18	9.692	9.419	9.353	9.492	9.814	10.02	10.06	9.843	0.589	18.19
$k/T_1$	0.00	0.10													

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 357  
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K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
T1 (MeV)															
Z = 19															
0.001	2.802	2.921	3.020	3.100	3.168	3.232	3.298	3.374	3.450	3.513	3.538	3.550	3.564	3.571	2.787
0.002	3.942	4.033	4.109	4.167	4.206	4.225	4.234	4.252	4.286	4.358	4.356	4.356	4.360	3.632	
0.005	5.657	5.837	5.836	5.757	5.656	5.554	5.451	5.366	5.298	5.249	5.222	5.211	5.202	5.197	4.808
0.01	7.022	7.119	7.031	6.805	6.557	6.304	6.109	5.938	5.769	5.617	5.555	5.529	5.507	5.496	5.534
0.02	8.286	8.210	7.827	7.384	6.973	6.621	6.319	6.050	5.799	5.566	5.461	5.422	5.383	5.364	5.945
0.05	9.832	9.106	8.504	7.509	6.807	6.248	5.802	5.422	5.075	4.757	4.613	4.557	4.507	4.483	5.975
0.1	10.86	9.441	8.227	7.207	6.355	5.654	5.066	4.565	4.136	3.737	3.566	3.518	3.465	3.440	5.774
0.2	11.51	9.503	7.925	6.683	5.699	4.913	4.248	3.650	3.130	2.666	2.456	2.384	2.328	2.303	5.538
0.5	12.44	9.530	7.561	6.150	5.080	4.201	3.452	2.791	2.217	1.691	1.444	1.356	1.280	1.245	5.644
1.	13.33	9.968	7.801	6.288	5.135	4.188	3.381	2.667	2.036	1.451	1.160	1.047	0.940	0.887	6.407
2.	14.29	10.70	8.490	6.924	5.712	4.706	3.838	3.051	2.326	1.595	1.199	1.028	0.855	0.768	7.815
3.	14.78	11.11	8.990	7.455	6.221	5.176	4.282	3.464	2.674	1.844	1.324	1.093	0.857	0.737	8.828
4.	14.83	11.47	9.425	7.836	6.570	5.561	4.658	3.834	3.010	2.052	1.461	1.187	0.876	0.720	9.592
5.	14.97	11.66	9.689	8.135	6.883	5.855	4.968	4.157	3.292	2.262	1.587	1.268	0.899	0.708	10.18
6.	15.06	11.80	9.692	8.371	7.156	6.116	5.232	4.399	3.541	2.454	1.708	1.348	0.924	0.699	10.65
8.	15.16	11.99	10.18	8.726	7.528	6.530	5.659	4.833	3.964	2.796	1.935	1.500	0.978	0.686	11.38
10.	15.20	12.11	10.38	8.980	7.819	6.846	5.994	5.182	4.513	3.093	2.144	1.644	1.035	0.677	11.93
15.	15.23	12.27	10.69	9.386	8.301	7.389	6.588	5.818	4.974	3.697	2.602	1.981	1.177	0.663	12.87
20.	15.23	12.35	10.86	9.627	8.600	7.739	6.985	6.259	5.452	4.169	2.990	2.282	1.314	0.656	13.48
30.	15.22	12.43	11.05	9.905	8.958	8.172	7.495	6.845	6.116	4.879	3.622	2.799	1.569	0.648	14.27
40.	15.21	12.48	11.15	10.06	9.167	8.435	7.814	7.226	6.567	5.400	4.121	3.230	1.806	0.644	14.77
50.	15.19	12.51	11.23	10.17	9.304	8.598	8.021	7.507	6.908	5.799	4.528	3.605	2.032	0.641	15.13
60.	15.16	12.53	11.28	10.25	9.401	8.724	8.182	7.712	7.171	6.121	4.871	3.926	2.240	0.640	15.40
80.	15.15	12.57	11.34	10.34	9.534	8.899	8.404	7.988	7.561	6.624	5.418	4.464	2.608	0.637	15.80
100.	15.13	12.59	11.39	10.41	9.621	9.013	8.551	8.183	7.826	6.992	5.844	4.893	2.932	0.636	16.08
200.	15.00	12.64	11.50	10.56	9.816	9.264	8.888	8.650	8.464	7.981	7.105	6.243	4.132	0.633	16.77
500.	14.56	12.67	11.56	10.65	9.946	9.436	9.117	8.977	8.666	8.883	8.407	7.806	5.949	0.631	17.35
1000.	14.33	12.69	11.58	10.68	9.991	9.499	9.206	9.101	9.162	9.268	9.083	8.697	7.204	0.631	17.60
2000.	14.18	12.69	11.59	10.70	10.02	9.534	9.251	9.169	9.266	9.493	9.494	9.275	8.285	0.631	17.77
5000.	14.08	12.69	11.60	10.71	10.03	9.554	9.281	9.210	9.336	9.631	9.777	9.757	9.263	0.630	17.89
10000.	14.04	12.69	11.60	10.72	10.04	9.560	9.289	9.225	9.362	9.679	9.880	9.923	9.708	0.630	17.94
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
T1 (MeV)															
Z = 20															
0.001	2.697	2.814	2.914	2.995	3.065	3.132	3.200	3.278	3.358	3.425	3.451	3.464	3.479	3.488	2.701
0.002	3.820	3.912	3.990	4.051	4.094	4.119	4.135	4.160	4.201	4.260	4.283	4.284	4.290	3.563	
0.005	5.544	5.697	5.731	5.668	5.560	5.458	5.370	5.300	5.240	5.195	5.176	5.165	5.158	4.733	
0.01	6.905	7.015	6.941	6.730	6.476	6.255	6.070	5.906	5.743	5.597	5.538	5.513	5.492	5.485	
0.02	8.181	8.128	7.769	7.347	6.953	6.616	6.325	6.063	5.818	5.587	5.485	5.444	5.405	5.386	5.929
0.05	9.748	9.056	8.282	7.509	6.824	6.279	5.846	5.478	5.140	4.827	4.683	4.626	4.575	4.550	5.993
0.1	10.80	9.413	8.224	7.224	6.385	5.694	5.115	4.623	4.205	3.817	3.649	3.601	3.548	3.521	5.804
0.2	11.47	9.493	7.935	6.705	5.728	4.949	4.290	3.699	3.185	2.730	2.525	2.454	2.399	2.374	5.570
0.5	12.40	9.521	7.568	6.166	5.100	4.225	3.479	2.821	2.249	1.726	1.483	1.398	1.324	1.290	5.666
1.	13.26	9.945	7.800	6.295	5.147	4.202	3.397	2.686	2.057	1.474	1.186	1.075	0.971	0.921	6.417
2.	14.20	10.66	8.473	6.917	5.712	4.711	3.846	3.062	2.339	1.612	1.219	1.050	0.881	0.796	7.811
3.	14.71	11.08	8.960	7.437	6.214	5.172	4.286	3.471	2.682	1.857	1.340	1.113	0.881	0.762	8.817
4.	15.00	11.34	9.305	7.828	6.605	5.563	4.656	3.821	2.995	2.096	1.469	1.187	0.894	0.763	9.565
5.	15.15	11.56	9.552	8.089	6.907	5.872	4.953	4.118	3.293	2.285	1.599	1.272	0.915	0.729	10.15
6.	15.00	11.77	9.854	8.335	7.107	6.057	5.222	4.395	3.541	2.461	1.720	1.363	0.943	0.720	10.62
8.	15.10	11.95	10.14	8.684	7.493	6.504	5.644	4.825	3.960	2.799	1.945	1.512	0.995	0.706	11.35
10.	15.13	12.07	10.34	8.935	7.780	6.816	5.974	5.163	4.306	3.094	2.151	1.655	1.049	0.696	11.89
15.	15.14	12.23	10.64	9.336	8.256	7.352	6.560	5.798	4.961	3.693	2.605	1.987	1.188	0.683	12.81
20.	15.13	12.30	10.81	9.575	8.552	7.698	6.952	6.233	5.434	4.161	2.989	2.285	1.323	0.675	13.42
30.	15.11	12.38	10.99	9.851	8.908	8.128	7.456	6.813	6.091	4.866	3.616	2.798	1.575	0.667	14.19
40.	15.09	12.42	11.10	10.01	9.116	8.388	7.772	7.189	6.537	5.382	4.111	3.225	1.810	0.663	14.69
50.	15.07	12.45	11.17	10.12	9.253	8.550	7.977	7.468	6.874	5.777	4.517	3.599	2.034	0.660	15.05
60.	15.04	12.47	11.22	10.19	9.350	8.676	8.137	7.671	7.135	6.096	4.857	3.918	2.241	0.659	15.32
80.	15.03	12.50	11.29	10.29	9.483	8.851	8.357	7.944	7.521	6.594	5.400	4.453	2.607	0.656	15.72
100.	15.00	12.52	11.33	10.35	9.571	8.964	8.504	8.137	7.784	6.959	5.822	4.879	2.929	0.655	15.99
200.	14.88	12.58	11.46	10.51	9.766	9.216	8.840	8.602	8.416	7.938	7.071	6.218	4.122	0.652	16.68
500.	14.46	12.61	11.50	10.60	9.895	9.389	9.071	8.930	8.918	8.832	8.361	7.676	5.929	0.651	17.26
1000.	14.24	12.62	11.53	10.63	9.942	9.453	9.160	9.055	9.114	9.217	9.032	8.649	7.170	0.650	17.52
2000.	14.11	12.63	11.54	10.65	9.967	9.487	9.207	9.123	9.222	9.438	9.444	9.257	8.229	0.650	17.68
5000.	14.01	12.63	11.54	10.66	9.982	9.508	9.236	9.165	9.290	9.583	9.726	9.705	9.210	0.650	17.80
10000.	13.97	12.63	11.55	10.67	9.988	9.513	9.244	9.180	9.316	9.631	9.830	9.871	9.653	0.650	17.85
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70							

358 TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections  
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K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
T1 (MeV)															
Z = 22															
0.001	2.503	2.619	2.720	2.805	2.880	2.950	3.022	3.102	3.186	3.258	3.288	3.303	3.321	3.331	2.544
0.002	3.601	3.708	3.790	3.847	3.886	3.917	3.949	3.995	4.050	4.111	4.140	4.148	4.153	4.155	3.384
0.005	5.293	5.480	5.499	5.450	5.379	5.305	5.226	5.165	5.121	5.096	5.082	5.076	5.071	5.068	4.589
0.01	6.649	6.840	6.732	6.543	6.355	6.175	5.991	5.833	5.686	5.556	5.497	5.477	5.457	5.448	5.384
0.02	8.815	7.937	7.675	7.296	6.905	6.581	6.317	6.083	5.844	5.614	5.513	5.473	5.435	5.417	5.891
0.05	9.594	8.973	8.251	7.514	6.855	6.333	5.921	5.576	5.254	4.948	4.803	4.745	4.693	4.667	6.027
0.1	10.66	9.346	8.209	7.248	6.438	5.770	5.209	4.735	4.335	3.965	3.802	3.753	3.699	3.671	5.858
0.2	11.36	9.456	7.942	6.741	5.785	5.020	4.374	3.793	3.291	2.853	2.658	2.589	2.533	2.508	5.626
0.5	12.30	9.520	7.601	6.208	5.145	4.273	3.532	2.880	2.312	1.796	1.561	1.480	1.408	1.377	5.714
1.	13.12	9.917	7.808	6.315	5.171	4.250	3.430	2.723	2.098	1.520	1.238	1.131	1.032	0.985	6.441
2.	14.00	10.58	8.435	6.905	5.715	4.723	3.864	3.083	2.366	1.644	1.256	1.092	0.931	0.850	7.799
3.	14.49	10.94	8.916	7.421	6.203	5.171	4.293	3.482	2.700	1.883	1.371	1.148	0.924	0.813	8.784
4.	14.79	11.18	9.263	7.813	6.584	5.531	4.655	3.825	3.005	2.116	1.495	1.217	0.933	0.792	9.519
5.	14.64	11.52	9.594	8.070	6.840	5.827	4.953	4.132	3.298	2.286	1.624	1.312	0.954	0.777	10.10
6.	14.73	11.66	9.791	8.300	7.085	6.079	5.207	4.384	3.539	2.472	1.741	1.387	0.975	0.766	10.57
8.	14.82	11.84	10.08	8.644	7.464	6.478	5.618	4.803	3.949	2.804	1.960	1.533	1.023	0.751	11.28
10.	14.86	11.96	10.27	8.890	7.745	6.782	5.940	5.140	4.288	3.094	2.163	1.672	1.074	0.760	11.81
15.	14.88	12.11	10.56	9.278	8.207	7.504	6.513	5.756	4.931	3.683	2.608	1.998	1.208	0.724	12.72
20.	14.87	12.18	10.72	9.506	8.492	7.640	6.895	6.183	5.396	4.144	2.987	2.291	1.340	0.716	13.31
30.	14.86	12.25	10.89	9.763	8.830	8.056	7.388	6.752	6.043	4.839	3.606	2.797	1.588	0.706	14.06
40.	14.82	12.28	10.98	9.907	9.026	8.306	7.697	7.122	6.482	5.348	4.094	3.219	1.819	0.701	14.55
50.	14.79	12.30	11.05	10.01	9.155	8.461	7.897	7.398	6.816	5.734	4.495	3.587	2.040	0.698	14.89
60.	14.76	12.32	11.09	10.08	9.245	8.582	8.054	7.598	7.070	6.049	4.830	3.904	2.245	0.696	15.16
80.	14.74	12.34	11.14	10.16	9.371	8.752	8.269	7.865	7.451	6.540	5.365	4.432	2.606	0.694	15.54
100.	14.72	12.36	11.18	10.22	9.455	8.861	8.411	8.054	7.709	6.898	5.782	4.853	2.925	0.692	15.80
200.	14.60	12.41	11.29	10.37	9.644	9.104	8.735	8.505	8.328	7.861	7.011	6.173	4.105	0.689	16.48
500.	14.23	12.45	11.35	10.46	9.767	9.269	8.956	8.820	8.812	8.737	8.278	7.697	5.890	0.687	17.04
1000.	14.03	12.45	11.37	10.49	9.811	9.328	9.040	8.940	9.001	9.109	8.934	8.559	7.118	0.686	17.29
2000.	13.90	12.46	11.39	10.51	9.836	9.360	9.085	9.004	9.104	9.318	9.355	9.155	8.161	0.686	17.45
5000.	13.81	12.46	11.39	10.52	9.849	9.381	9.113	9.043	9.168	9.458	9.603	9.587	9.112	0.686	17.57
10000.	13.78	12.46	11.39	10.53	9.855	9.386	9.121	9.057	9.192	9.504	9.703	9.747	9.540	0.685	17.61
T1 (MeV)															
Z = 23															
0.001	2.415	2.531	2.633	2.720	2.796	2.868	2.940	3.021	3.106	3.180	3.211	3.227	3.247	3.257	2.473
0.002	3.505	3.599	3.681	3.749	3.802	3.839	3.869	3.909	3.966	4.043	4.075	4.080	4.087	4.091	3.308
0.005	5.184	5.371	5.398	5.357	5.294	5.228	5.156	5.103	5.066	5.047	5.038	5.033	5.029	5.027	4.522
0.01	6.545	6.743	6.648	6.471	6.293	6.125	5.948	5.797	5.656	5.531	5.477	5.458	5.439	5.430	5.335
0.02	7.897	7.902	7.595	7.227	6.881	6.581	6.319	6.078	5.847	5.625	5.523	5.484	5.446	5.428	5.870
0.05	9.527	8.928	8.229	7.511	6.867	6.357	5.954	5.618	5.304	5.001	4.856	4.797	4.744	4.718	6.039
0.1	10.61	9.324	8.208	7.262	6.465	5.805	5.253	4.787	4.396	4.033	3.872	3.823	3.768	3.740	5.885
0.2	11.32	9.449	7.953	6.763	5.814	5.055	4.415	3.839	3.343	2.913	2.720	2.652	2.596	2.571	5.657
0.5	12.25	9.513	7.612	6.227	5.166	4.297	3.559	2.909	2.363	1.831	1.599	1.519	1.449	1.418	5.736
1.	13.04	9.898	7.812	6.325	5.183	4.245	3.466	2.742	2.119	1.543	1.263	1.158	1.062	1.016	6.452
2.	13.92	10.55	8.425	6.903	5.717	4.729	3.873	3.094	2.379	1.661	1.275	1.113	0.954	0.876	7.799
3.	14.42	10.92	8.892	7.408	6.199	5.172	4.299	3.488	2.708	1.896	1.388	1.167	0.945	0.837	8.776
4.	14.72	11.16	9.231	7.794	6.576	5.528	4.658	3.828	3.009	2.128	1.511	1.234	0.952	0.816	9.506
5.	14.90	11.32	9.486	8.089	6.872	5.817	4.957	4.117	3.274	2.337	1.630	1.306	0.967	0.801	10.07
6.	15.01	11.45	9.684	8.322	7.112	6.058	5.209	4.369	3.509	2.527	1.746	1.378	0.985	0.789	10.53
8.	14.77	11.81	10.04	8.610	7.437	6.460	5.609	4.800	3.947	2.808	1.970	1.546	1.038	0.773	11.25
10.	14.81	11.93	10.23	8.852	7.713	6.761	5.928	5.133	4.284	3.095	2.171	1.683	1.088	0.761	11.78
15.	14.86	12.09	10.51	9.220	8.154	7.264	6.487	5.737	4.921	3.709	2.613	1.983	1.213	0.744	12.67
20.	14.83	12.15	10.67	9.467	8.437	7.596	6.864	6.161	5.385	4.161	2.989	2.279	1.345	0.735	13.26
30.	14.74	12.18	10.83	9.709	8.784	8.018	7.359	6.729	6.024	4.827	3.601	2.797	1.595	0.725	14.00
40.	14.70	12.21	10.91	9.850	8.978	8.266	7.664	7.095	6.460	5.332	4.087	3.216	1.824	0.719	14.47
50.	14.66	12.22	10.98	9.950	9.105	8.419	7.860	7.367	6.789	5.715	4.486	3.583	2.044	0.716	14.81
60.	14.62	12.24	11.02	10.02	9.194	8.537	8.015	7.564	7.042	6.028	4.819	3.898	2.247	0.714	15.07
80.	14.60	12.26	11.07	10.10	9.317	8.704	8.226	7.827	7.419	6.515	5.350	4.423	2.606	0.711	15.45
100.	14.58	12.27	11.11	10.16	9.399	8.811	8.366	8.013	7.676	6.872	5.763	4.811	2.923	0.709	15.71
200.	14.47	12.33	11.22	10.31	9.584	9.048	8.684	8.458	8.285	7.826	6.984	6.153	4.097	0.706	16.38
500.	14.12	12.36	11.28	10.39	9.703	9.206	8.899	8.766	8.760	8.690	8.249	7.653	5.845	0.704	16.93
1000.	13.92	12.37	11.30	10.42	9.746	9.268	8.982	8.881	8.944	9.056	8.889	8.522	7.082	0.703	17.18
2000.	13.80	12.37	11.31	10.44	9.770	9.298	9.024	8.944	9.045	9.259	9.281	9.106	8.125	0.703	17.33
5000.	13.72	12.38	11.31	10.45	9.782	9.318	9.052	8.982	9.106	9.396	9.542	9.528	9.065	0.702	17.45
10000.	13.68	12.38	11.32	10.45	9.788	9.323	9.059	8.996	9.130	9.440	9.639	9.485	0.702	17.49	
T1 (MeV)															
Z = 24															

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 359  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$Z = 25$															
$T_1$ (MeV)															
0.001	2.257	2.371	2.473	2.562	2.641	2.716	2.790	2.872	2.957	3.033	3.067	3.085	3.106	3.118	2.341
0.002	3.294	3.408	3.499	3.569	3.623	3.669	3.712	3.765	3.832	3.908	3.944	3.955	3.964	3.968	3.166
0.005	4.979	5.174	5.204	5.178	5.134	5.032	5.024	4.984	4.959	4.953	4.950	4.948	4.947	4.945	4.394
0.01	6.383	6.524	6.504	6.359	6.170	6.004	5.862	5.731	5.598	5.481	5.435	5.416	5.400	5.393	5.240
0.02	7.713	7.741	7.479	7.145	6.824	6.547	6.300	6.072	5.850	5.636	5.535	5.497	5.461	5.443	5.822
0.05	9.573	8.832	8.181	7.501	6.886	6.397	6.012	5.692	5.391	5.093	4.948	4.888	4.836	4.809	6.056
0.1	10.53	9.287	8.208	7.290	6.515	5.873	5.336	4.885	4.510	4.159	4.000	3.951	3.895	3.865	5.937
0.2	11.26	9.447	7.982	6.807	5.870	5.123	4.694	3.930	3.466	3.027	2.840	2.772	2.716	2.690	5.719
0.5	12.16	9.500	7.634	6.265	5.211	4.347	3.613	2.968	2.405	1.900	1.674	1.597	1.529	1.498	5.780
1.	12.94	9.873	7.817	6.345	5.211	4.276	3.481	2.779	2.180	1.589	1.314	1.212	1.119	1.075	6.478
2.	13.79	10.50	8.408	6.900	5.724	4.743	3.892	3.116	2.406	1.693	1.313	1.154	1.001	0.926	7.804
3.	14.23	10.85	8.857	7.389	6.193	5.175	4.309	3.503	2.727	1.922	1.419	1.201	0.986	0.883	8.760
4.	14.22	11.20	9.258	7.734	6.514	5.516	4.658	3.851	3.044	2.115	1.544	1.282	0.992	0.859	9.484
5.	14.33	11.37	9.498	8.009	6.804	5.909	4.948	4.136	3.310	2.311	1.661	1.354	1.005	0.842	10.04
6.	14.39	11.49	9.681	8.227	7.039	6.053	5.194	4.381	3.564	2.492	1.773	1.426	1.022	0.829	10.48
8.	14.45	11.65	9.945	8.554	7.403	6.438	5.593	4.789	3.944	2.816	1.986	1.565	1.064	0.811	11.17
10.	14.45	11.75	10.13	8.792	7.675	6.731	5.903	5.119	4.283	3.094	2.168	1.689	1.122	0.798	11.68
15.	14.52	11.90	10.39	9.140	8.099	7.222	6.451	5.707	4.899	3.703	2.618	1.992	1.230	0.779	12.55
20.	14.49	11.96	10.54	9.357	8.371	7.544	6.820	6.123	5.355	4.148	2.989	2.285	1.359	0.769	13.12
30.	14.41	12.01	10.70	9.611	8.704	7.968	7.298	6.684	6.002	4.810	3.569	2.767	1.607	0.758	13.86
40.	14.41	12.03	10.78	9.741	8.888	8.190	7.599	7.040	6.415	5.303	4.072	3.210	1.833	0.752	14.32
50.	14.38	12.06	10.84	9.837	9.008	8.335	7.789	7.308	6.740	5.680	4.468	3.575	2.049	0.749	14.66
60.	14.36	12.07	10.89	9.900	9.092	8.448	7.941	7.500	6.987	5.990	4.799	3.886	2.249	0.746	14.91
80.	14.35	12.10	10.93	9.979	9.210	8.609	8.143	7.755	7.359	6.471	5.321	4.406	2.605	0.743	15.28
100.	14.33	12.12	10.97	10.04	9.288	8.712	8.277	7.936	7.609	6.823	5.730	4.819	2.919	0.741	15.54
200.	14.23	12.17	11.07	10.17	9.466	8.938	8.582	8.365	8.203	7.760	6.935	6.115	4.081	1.738	16.19
500.	13.90	12.20	11.13	10.25	9.577	9.090	8.787	8.657	8.657	8.602	8.168	7.609	5.841	0.735	16.72
1000.	13.72	12.21	11.15	10.28	9.617	9.146	8.865	8.767	8.831	8.951	8.798	8.454	7.032	0.734	16.96
2000.	13.61	12.21	11.16	10.30	9.640	9.176	8.904	8.827	8.923	9.151	9.171	8.973	8.059	0.734	17.11
5000.	13.53	12.21	11.16	10.31	9.651	9.193	8.930	8.862	8.985	9.273	9.421	9.412	8.972	0.734	17.22
10000.	13.50	12.21	11.17	10.31	9.657	9.198	8.937	8.875	9.007	9.314	9.513	9.562	9.380	0.734	17.26
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$Z = 26$															
$T_1$ (MeV)															
0.001	2.182	2.296	2.398	2.489	2.571	2.646	2.721	2.802	2.888	2.964	2.998	3.017	3.039	3.052	2.279
0.002	3.222	3.321	3.410	3.487	3.550	3.599	3.641	3.692	3.758	3.846	3.885	3.891	3.902	3.908	3.101
0.005	4.875	5.069	5.114	5.096	5.057	5.012	4.961	4.927	4.908	4.907	4.908	4.907	4.906	4.906	4.332
0.01	6.245	6.464	6.403	6.261	6.115	5.974	5.821	5.690	5.457	5.457	5.413	5.397	5.381	5.373	5.193
0.02	7.627	7.677	7.422	7.100	6.795	6.527	6.287	6.065	5.848	5.638	5.539	5.502	5.466	5.449	5.798
0.05	9.318	8.796	8.161	7.495	6.891	6.413	6.038	5.725	5.428	5.134	4.989	4.929	4.876	4.850	6.064
0.1	10.46	9.256	8.203	7.304	6.541	5.907	5.376	4.931	4.563	4.218	4.059	4.010	3.953	3.924	5.959
0.2	11.21	9.433	7.990	6.829	5.899	5.157	4.533	3.974	3.494	3.081	2.897	2.829	2.773	2.746	5.766
0.5	12.15	9.508	7.647	6.283	5.233	4.371	3.641	2.997	2.436	1.934	1.711	1.634	1.556	1.537	5.806
1.	12.90	9.865	7.823	6.356	5.224	4.292	3.498	2.798	2.181	1.612	1.339	1.238	1.147	1.104	6.493
2.	13.67	10.47	8.404	6.904	5.729	4.750	3.901	3.128	2.420	1.710	1.331	1.173	1.023	0.949	7.803
3.	14.09	10.84	8.836	7.367	6.193	5.189	4.309	3.513	2.749	1.920	1.438	1.223	1.004	0.904	8.755
4.	14.31	11.09	9.150	7.717	6.557	5.546	4.653	3.841	3.051	2.136	1.555	1.286	1.005	0.879	9.464
5.	14.44	11.26	9.385	7.986	6.842	5.835	4.939	4.121	3.315	2.335	1.670	1.353	1.015	0.861	10.01
6.	14.51	11.39	9.567	8.199	7.073	6.075	5.181	4.364	3.548	2.517	1.781	1.421	1.030	0.848	10.46
8.	14.37	11.62	9.918	8.534	7.389	6.428	5.586	4.786	3.945	2.820	1.993	1.574	1.076	0.828	11.15
10.	14.38	11.71	10.10	8.768	7.656	6.717	5.893	5.113	4.281	3.096	2.173	1.696	1.333	1.133	11.65
15.	14.46	11.86	10.35	9.107	8.071	7.200	6.455	5.696	4.892	3.701	2.620	1.996	1.596	1.239	12.52
20.	14.40	11.91	10.49	9.317	8.338	7.517	6.799	6.107	5.344	4.142	2.988	2.287	1.366	0.785	13.08
30.	14.31	11.94	10.65	9.565	8.664	7.914	7.271	6.663	5.986	4.800	3.564	2.767	1.613	0.774	13.80
40.	14.29	11.97	10.72	9.690	8.844	8.152	7.567	7.014	6.394	5.290	4.065	3.207	1.837	0.768	14.25
50.	14.26	11.99	10.78	9.782	8.960	8.294	7.754	7.279	6.717	5.663	4.459	3.571	2.052	0.766	14.58
60.	14.26	12.00	10.81	9.836	9.042	8.410	7.901	7.454	6.972	5.978	4.782	3.883	2.249	0.762	14.83
80.	14.23	12.02	10.87	9.919	9.158	8.563	8.102	7.720	7.330	6.450	5.308	4.398	2.605	0.758	15.20
100.	14.21	12.04	10.90	9.975	9.234	8.663	8.234	7.898	7.578	6.799	5.714	4.809	2.918	0.756	15.45
200.	14.11	12.09	11.00	10.11	9.405	8.884	8.532	8.319	8.162	7.729	6.912	6.098	4.074	0.753	16.09
500.	13.79	12.12	11.05	10.19	9.515	9.033	8.732	8.604	8.607	8.558	8.134	7.581	5.826	0.750	16.62
1000.	13.62	12.13	11.07	10.22	9.554	9.087	8.808	8.711	8.777	8.900	8.754	8.407	7.008	0.749	16.85
2000.	13.51	12.13	11.08	10.23	9.575	9.115	8.847	8.768	8.868	9.089	9.121	8.966	8.013	0.749	17.00
5000.	13.44	12.13	11.09	10.24	9.587	9.132	8.871	8.804	8.925	9.212	9.362	9.356	8.927	0.749	17.10
10000.	13.41	12.13	11.09	10.25	9.593	9.137	8.878	8.816	8.947	9.252	9.451	9.501	9.326	0.749	17.15
$k/T_1$	0.00	0.1													

360 TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 28$															
0.001	2.051	2.160	2.261	2.353	2.438	2.517	2.593	2.672	2.756	2.834	2.871	2.889	2.913	2.927	2.165
0.002	3.032	3.152	3.252	3.331	3.396	3.452	3.504	3.565	3.638	3.722	3.763	3.775	3.787	3.793	2.977
0.005	4.698	4.872	4.951	4.950	4.911	4.872	4.840	4.821	4.812	4.818	4.826	4.827	4.828	4.829	4.216
0.01	6.102	6.262	6.270	6.156	5.997	5.857	5.736	5.624	5.508	5.408	5.370	5.355	5.342	5.336	5.102
0.02	7.469	7.525	7.309	7.016	6.732	6.482	6.257	6.046	5.839	5.638	5.542	5.507	5.473	5.456	5.766
0.05	9.179	8.704	8.111	7.479	6.902	6.442	6.080	5.780	5.493	5.204	5.061	5.002	4.950	4.923	6.072
0.1	10.38	9.222	8.202	7.329	6.586	5.967	5.450	5.017	4.662	4.325	4.168	4.119	4.062	4.032	6.004
0.2	11.16	9.355	8.019	6.873	5.954	5.223	4.610	4.060	3.589	3.187	3.005	2.937	2.880	2.852	5.806
0.5	12.10	9.503	7.669	6.320	5.279	4.422	3.695	3.055	2.497	2.001	1.782	1.708	1.640	1.610	5.853
1.	12.82	9.848	7.831	6.378	5.253	4.324	3.533	2.836	2.222	1.657	1.388	1.289	1.201	1.159	6.523
2.	13.50	10.43	8.398	6.907	5.736	4.764	3.921	3.151	2.446	1.742	1.368	1.212	1.066	0.994	7.807
3.	13.82	10.77	8.817	7.360	6.188	5.190	4.319	3.527	2.767	1.946	1.470	1.257	1.040	0.943	8.735
4.	13.98	10.99	9.118	7.700	6.541	5.540	4.656	3.849	3.062	2.157	1.583	1.315	1.037	0.914	9.425
5.	14.08	11.14	9.341	7.960	6.819	5.822	4.937	4.124	3.320	2.351	1.694	1.379	1.044	0.894	9.960
6.	13.98	11.30	9.578	8.178	7.017	6.040	5.184	4.376	3.549	2.513	1.804	1.460	1.062	0.879	10.40
8.	14.03	11.44	9.824	8.486	7.364	6.411	5.571	4.773	3.939	2.828	2.010	1.594	1.099	0.859	11.06
10.	14.04	11.54	9.996	8.710	7.622	6.693	5.872	5.095	4.270	3.098	2.185	1.712	1.154	0.845	11.56
15.	14.12	11.68	10.23	9.031	8.020	7.163	6.403	5.669	4.871	3.696	2.626	2.006	1.255	0.825	12.40
20.	14.10	11.74	10.37	9.231	8.275	7.468	6.759	6.074	5.318	4.132	2.989	2.293	1.380	0.814	12.96
30.	14.04	11.78	10.52	9.486	8.585	7.850	7.218	6.620	5.953	4.780	3.555	2.765	1.625	0.802	13.66
40.	14.04	11.81	10.59	9.584	8.755	7.506	6.964	6.355	5.265	4.052	3.202	1.845	0.796	14.11	
50.	14.02	11.83	10.65	9.672	8.866	8.214	7.686	7.223	6.673	5.633	4.443	3.564	2.057	0.792	14.44
60.	14.00	11.85	10.69	9.730	8.945	8.319	7.831	7.408	6.913	5.938	4.770	3.869	2.253	0.790	14.68
80.	13.99	11.87	10.73	9.802	9.054	8.471	8.022	7.651	7.274	6.411	5.283	4.383	2.605	0.786	15.04
100.	13.97	11.89	10.77	9.856	9.127	8.567	8.148	7.823	7.516	6.755	5.685	4.790	2.915	0.784	15.28
200.	13.88	11.93	10.86	9.984	9.290	8.778	8.434	8.228	8.082	7.667	6.867	6.065	4.061	0.780	15.91
500.	13.58	11.96	10.91	10.06	9.394	8.919	8.623	8.499	8.507	8.471	8.066	7.529	5.798	0.778	16.42
1000.	13.42	11.97	10.93	10.08	9.431	8.970	8.695	8.601	8.668	8.797	8.667	8.336	6.963	0.777	16.64
2000.	13.33	11.97	10.94	10.10	9.452	8.997	8.731	8.657	8.753	8.983	9.013	8.832	7.964	0.777	16.78
5000.	13.26	11.97	10.94	10.11	9.462	9.013	8.755	8.689	8.809	9.094	9.246	9.245	8.838	0.776	16.88
10000.	13.23	11.97	10.95	10.11	9.467	9.017	8.762	8.701	8.830	9.132	9.329	9.379	9.219	0.776	16.92
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 29$															
0.001	1.988	2.095	2.196	2.290	2.376	2.456	2.533	2.611	2.694	2.772	2.809	2.828	2.853	2.866	2.111
0.002	2.950	3.080	3.185	3.264	3.327	3.384	3.440	3.503	3.578	3.664	3.705	3.718	3.731	3.737	2.920
0.005	4.611	4.780	4.863	4.871	4.841	4.810	4.784	4.769	4.765	4.776	4.786	4.788	4.791	4.792	4.160
0.01	6.020	6.170	6.182	6.083	5.941	5.811	5.696	5.587	5.479	5.384	5.348	5.335	5.323	5.317	5.055
0.02	7.389	7.456	7.255	6.975	6.699	6.458	6.239	6.034	5.831	5.636	5.542	5.507	5.475	5.458	5.720
0.05	9.109	8.675	8.103	7.478	6.904	6.451	6.097	5.804	5.521	5.235	5.094	5.035	4.983	4.957	6.078
0.1	10.34	9.197	8.193	7.336	6.603	5.995	5.485	5.059	4.708	4.375	4.219	4.169	4.112	4.083	6.023
0.2	11.15	9.418	8.014	6.885	5.981	5.257	4.648	4.101	3.635	3.237	3.056	2.989	2.931	2.903	5.830
0.5	12.06	9.515	7.694	6.345	5.302	4.446	3.721	3.084	2.527	2.034	1.818	1.743	1.676	1.646	5.880
1.	12.78	9.845	7.841	6.391	5.267	4.340	3.551	2.855	2.242	1.679	1.413	1.315	1.227	1.184	6.539
2.	13.45	10.40	8.389	6.906	5.741	4.772	3.931	3.163	2.459	1.758	1.386	1.087	1.016	1.016	7.810
3.	13.74	10.75	8.819	7.361	6.187	5.191	4.324	3.536	2.777	1.957	1.484	1.272	1.058	0.964	8.736
4.	13.78	11.02	9.179	7.711	6.515	5.524	4.665	3.863	3.067	2.156	1.596	1.339	1.056	0.935	9.430
5.	13.86	11.17	9.405	7.975	6.795	5.807	4.964	4.136	3.322	2.344	1.706	1.404	1.064	0.915	9.963
6.	13.91	11.28	9.577	8.182	7.021	6.041	5.181	4.372	3.549	2.518	1.813	1.471	1.076	0.900	10.39
8.	13.94	11.42	9.824	8.494	7.370	6.409	5.563	4.768	3.941	2.825	2.005	1.596	1.123	0.878	11.05
10.	13.95	11.51	9.989	8.710	7.622	6.688	5.862	5.084	4.263	3.099	2.190	1.720	1.166	0.863	11.54
15.	14.01	11.64	10.22	9.023	8.012	7.149	6.385	5.652	4.863	3.693	2.628	2.012	1.264	0.842	12.38
20.	13.99	11.69	10.34	9.212	8.259	7.449	6.737	6.054	5.306	4.126	2.989	2.296	1.388	0.830	12.92
30.	13.92	11.72	10.47	9.430	8.555	7.822	7.191	6.597	5.936	4.771	3.551	2.766	1.632	0.817	13.61
40.	13.91	11.74	10.54	9.540	8.716	8.040	7.470	6.941	5.317	4.024	3.168	1.845	0.811	14.05	
50.	13.91	11.74	10.59	9.627	8.817	8.163	7.657	7.198	6.650	5.620	4.440	3.557	2.058	0.807	14.36
60.	13.88	11.76	10.62	9.671	8.893	8.275	7.794	7.379	6.891	5.922	4.761	3.864	2.255	0.804	14.60
80.	13.87	11.78	10.66	9.737	8.997	8.423	7.981	7.618	7.248	6.392	5.272	4.376	2.606	0.800	14.95
100.	13.85	11.80	10.69	9.787	9.067	8.516	8.195	7.787	7.486	6.734	5.672	4.781	2.914	0.798	15.19
200.	13.76	11.85	10.79	9.914	9.227	8.720	8.381	8.181	8.041	7.638	6.847	6.049	4.055	0.794	15.81
500.	13.47	11.87	10.83	9.984	9.326	8.855	8.564	8.442	8.454	8.427	8.033	7.504	5.784	0.791	16.30
1000.	13.32	11.88	10.85	10.01	9.362	8.904	8.633	8.540	8.609	8.743	8.622	8.298	6.943	0.790	16.52
2000.	13.23	11.88	10.86	10.02	9.382	8.930	8.667	8.593	8.690	8.922	8.958	8.784	7.935	0.790	16.66
5000.	13.18	11.88	10.85	10.03	9.392	8.947	8.687	8.610	8.757	9.035	9.172	9.182	8.800	0.790	16.76
10000.	13.13	11.88	10.86	10.03	9.397	8.951	8.696	8.635	8.762	9.067	9.263	9.303	9.140	0.789	16.80
$k/T_1$	0.00	0.10	0.20	0.30</th											

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 361  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$Z = 31$															
0.001	1.866	1.972	2.075	2.173	2.264	2.345	2.420	2.496	2.574	2.656	2.696	2.713	2.737	2.752	2.011
0.002	2.814	2.940	3.045	3.128	3.195	3.257	3.317	3.386	3.464	3.552	3.594	3.608	3.622	3.629	2.811
0.005	4.419	4.627	4.694	4.713	4.713	4.700	4.678	4.669	4.674	4.695	4.708	4.713	4.717	4.719	4.054
0.01	5.802	6.043	6.012	5.929	5.840	5.734	5.614	5.514	5.421	5.338	5.306	5.296	5.285	5.280	4.968
0.02	7.240	7.330	7.145	6.887	6.633	6.407	6.200	6.006	5.815	5.631	5.541	5.507	5.476	5.461	5.667
0.05	9.013	8.604	8.058	7.458	6.905	6.470	6.131	5.846	5.570	5.291	5.152	5.093	5.043	5.017	6.082
0.1	10.07	9.271	8.195	7.310	6.627	6.060	5.554	5.142	4.792	4.460	4.319	4.265	4.205	4.177	6.064
0.2	11.07	9.403	8.036	6.928	6.036	5.322	4.721	4.183	3.724	3.333	3.155	3.087	3.028	3.000	5.883
0.5	12.03	9.526	7.725	6.585	5.346	4.495	3.775	3.141	2.588	2.100	1.886	1.813	1.745	1.715	5.930
1.	12.72	9.837	7.856	6.416	5.297	4.373	3.586	2.893	2.283	1.724	1.461	1.365	1.279	1.238	6.572
2.	13.35	10.36	8.377	6.908	5.751	4.737	3.951	3.186	2.486	1.790	1.422	1.270	1.128	1.059	7.818
3.	13.63	10.70	8.791	7.345	6.181	5.196	4.337	3.552	2.796	1.983	1.514	1.305	1.094	1.004	8.729
4.	13.68	10.96	9.137	7.682	6.499	5.520	4.671	3.875	3.083	2.177	1.622	1.367	1.089	0.973	9.412
5.	13.76	11.11	9.355	7.936	6.770	5.796	4.945	4.145	3.355	2.362	1.729	1.430	1.093	0.952	9.936
6.	13.81	11.22	9.520	8.136	6.988	6.024	5.177	4.378	3.558	2.533	1.833	1.494	1.104	0.935	10.36
8.	13.84	11.35	9.758	8.435	7.325	6.382	5.552	4.767	3.944	2.834	2.020	1.615	1.148	0.912	11.01
10.	13.85	11.44	9.916	8.644	7.570	6.653	5.844	5.077	4.262	3.103	2.202	1.737	1.189	0.896	11.49
15.	13.90	11.56	10.13	8.944	7.946	7.101	6.355	5.634	4.852	3.690	2.633	2.023	1.283	0.872	12.30
20.	13.87	11.60	10.25	9.128	8.186	7.392	6.697	6.027	5.288	4.117	2.989	2.304	1.904	0.859	12.83
30.	13.77	11.61	10.38	9.340	8.476	7.756	7.138	6.557	5.908	4.754	3.544	2.766	1.646	0.845	13.50
40.	13.75	11.63	10.44	9.497	8.632	7.967	7.409	6.891	6.316	5.241	4.012	3.164	1.856	0.838	13.93
50.	13.73	11.63	10.49	9.530	8.732	8.088	7.590	7.142	6.607	5.593	4.426	3.550	2.064	0.833	14.23
60.	13.69	11.64	10.51	9.574	8.805	8.197	7.723	7.318	6.843	5.891	4.744	3.855	2.259	0.830	14.47
80.	13.68	11.66	10.55	9.638	8.905	8.341	7.905	7.550	7.192	6.355	5.249	4.363	2.607	0.826	14.81
100.	13.64	11.67	10.59	9.693	8.978	8.428	8.026	7.728	7.416	6.687	5.646	4.765	2.923	0.824	15.05
200.	13.58	11.72	10.67	9.812	9.132	8.631	8.296	8.099	7.965	7.577	6.805	6.019	4.044	0.819	15.65
500.	13.31	11.75	10.72	9.881	9.230	8.764	8.475	8.355	8.368	8.345	7.966	7.452	5.758	0.816	16.14
1000.	13.17	11.76	10.73	9.904	9.264	8.812	8.543	8.451	8.520	8.654	8.540	8.226	6.900	0.815	16.35
2000.	13.08	11.76	10.75	9.921	9.284	8.836	8.577	8.503	8.603	8.822	8.870	8.734	7.871	0.815	16.49
5000.	13.04	11.76	10.74	9.922	9.294	8.853	8.596	8.519	8.665	8.941	9.076	9.087	8.716	0.814	16.58
10000.	12.99	11.76	10.75	9.932	9.299	8.856	8.605	8.545	8.671	8.969	9.164	9.216	9.069	0.814	16.62
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$Z = 32$															
0.001	1.810	1.916	2.019	2.118	2.209	2.291	2.367	2.443	2.520	2.600	2.641	2.657	2.682	2.698	1.963
0.002	2.745	2.871	2.977	3.062	3.134	3.199	3.262	3.331	3.409	3.498	3.541	3.555	3.569	3.576	2.759
0.005	4.339	4.547	4.619	4.644	4.650	4.643	4.627	4.622	4.631	4.655	4.671	4.676	4.681	4.683	4.003
0.01	5.721	5.966	5.943	5.888	5.787	5.687	5.575	5.480	5.392	5.315	5.286	5.276	5.267	5.262	4.926
0.02	7.165	7.265	7.090	6.845	6.600	6.381	6.179	5.991	5.805	5.627	5.540	5.507	5.477	5.463	5.640
0.05	8.957	8.565	8.035	7.447	6.904	6.477	6.143	5.863	5.591	5.316	5.178	5.121	5.071	5.046	6.081
0.1	10.03	9.253	8.193	7.320	6.644	6.085	5.585	5.178	4.832	4.504	4.363	4.309	4.249	4.221	6.081
0.2	11.04	9.400	8.048	6.949	6.063	5.353	4.757	4.223	3.768	3.580	3.202	3.154	3.075	3.046	5.910
0.5	12.01	9.527	7.740	6.405	5.369	4.520	3.802	3.170	2.618	2.132	1.920	1.847	1.779	1.748	5.954
1.	12.68	9.831	7.864	6.428	5.311	4.389	3.604	2.913	2.303	1.746	1.485	1.390	1.304	1.263	6.588
2.	13.29	10.35	8.374	6.910	5.755	4.795	3.961	3.198	2.500	1.806	1.439	1.288	1.147	1.079	7.822
3.	13.55	10.68	8.780	7.340	6.179	5.198	4.343	3.561	2.807	1.996	1.528	1.319	1.110	1.020	8.724
4.	13.61	10.92	9.115	7.670	6.493	5.519	4.674	3.881	3.091	2.188	1.634	1.379	1.102	0.987	9.400
5.	13.69	11.07	9.328	7.919	6.760	5.792	4.946	4.148	3.341	2.370	1.739	1.440	1.105	0.964	9.920
6.	13.74	11.17	9.491	8.115	6.976	6.017	5.175	4.379	3.562	2.540	1.842	1.503	1.115	0.947	10.34
8.	13.77	11.31	9.725	8.410	7.307	6.371	5.566	4.765	3.966	3.339	2.027	1.623	1.157	0.923	10.98
10.	13.78	11.40	9.880	8.615	7.548	6.638	5.835	5.073	4.262	3.106	2.207	1.743	1.197	0.907	11.46
15.	13.83	11.52	10.09	9.910	7.918	7.079	6.338	5.624	4.848	3.689	2.635	2.026	1.289	0.883	12.26
20.	13.79	11.55	10.21	9.090	8.154	7.366	6.676	6.013	5.280	4.114	2.989	2.306	1.409	0.870	12.78
30.	13.69	11.56	10.33	9.300	8.440	7.725	7.112	6.536	5.894	4.766	3.541	2.765	1.651	0.856	13.45
40.	13.66	11.57	10.39	9.404	8.595	7.933	7.580	6.867	6.298	5.230	4.006	3.161	1.860	0.849	13.87
50.	13.65	11.59	10.43	9.472	8.692	8.065	7.554	7.097	6.597	5.587	4.409	3.552	2.069	0.845	14.18
60.	13.61	10.96	9.146	8.765	8.160	7.690	7.288	6.820	5.876	4.736	3.850	2.261	0.842	14.41	
80.	13.59	11.60	10.50	9.593	8.867	8.303	7.870	7.518	7.164	6.337	5.239	4.356	2.607	0.838	14.74
100.	13.56	11.61	10.53	9.647	8.936	8.390	7.990	7.694	7.386	6.666	5.633	4.757	2.922	0.836	14.98
200.	13.52	11.67	10.62	9.761	9.089	8.592	8.254	8.048	7.941	7.558	6.774	5.992	4.033	0.831	15.58
500.	13.24	11.69	10.67	9.834	9.186	8.722	8.435	8.316	8.329	8.307	7.933	7.427	5.745	0.828	16.06
1000.	13.10	11.70	10.68	9.857	9.220	8.769	8.502	8.411	8.479	8.613	8.501	8.191	6.879	0.827	16.27
2000.	13.02	11.70	10.69	9.872	9.239	8.795	8.535	8.463	8.558	8.787	8.824	8.658	7.845	0.827	16.41
5000.	12.98	11.70	10.69	9.875	9.249	8.811	8.595	8.478	8.623	8.898	9.033	9.044	8.677	0.826	16.50
10000.	12.93	11.70	10.70	9.884	9.254	8.912	8.596	8.464	8.503	8.629	8.926	9.120	9.171	9.026	16.54
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$Z = 33$															
0.001	1.756	1.862	1.965	2.0											

362 TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections  
See page 349 for Explanation of Tables

k/T <sub>1</sub>	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD	
<b>T<sub>1</sub></b> (MeV)																
<b>Z = 34</b>																
0.001	1.707	1.812	1.914	2.011	2.102	2.186	2.264	2.342	2.421	2.495	2.535	2.554	2.579	2.593	1.874	
0.002	2.614	2.719	2.846	2.950	3.019	3.075	3.158	3.227	3.304	3.395	3.436	3.452	3.467	3.474	2.657	
0.005	4.202	4.381	4.486	4.524	4.528	4.527	4.527	4.527	4.535	4.549	4.577	4.597	4.604	4.610	4.613	
0.01	5.610	5.784	5.832	5.776	5.675	5.582	5.498	5.417	5.336	5.269	5.247	5.238	5.231	5.228	4.845	
0.02	7.021	7.130	6.985	6.761	6.532	6.326	6.136	5.958	5.783	5.619	5.536	5.505	5.478	5.464	5.585	
0.05	8.833	8.478	7.983	7.624	6.903	6.489	6.164	5.892	5.627	5.360	5.227	5.171	5.123	5.098	6.076	
0.1	10.15	9.107	8.181	7.381	6.695	6.120	5.638	5.237	4.910	4.592	4.439	4.391	4.335	4.305	6.111	
0.2	11.02	9.408	8.076	6.989	6.116	5.415	4.828	4.301	3.852	3.469	3.293	3.224	3.166	3.134	5.965	
0.5	11.95	9.528	7.767	6.946	5.415	4.570	3.855	3.227	2.678	2.195	1.986	1.913	1.845	1.813	6.001	
1.	12.62	9.824	7.879	6.494	5.341	4.422	3.640	2.951	2.544	1.791	1.532	1.438	1.352	1.312	6.622	
2.	13.21	10.32	8.367	6.914	5.766	4.811	3.982	3.222	2.527	1.838	1.474	1.324	1.185	1.118	7.835	
3.	13.43	10.62	8.754	7.330	6.178	5.204	4.355	3.576	2.827	2.021	1.556	1.349	1.142	1.055	8.717	
4.	13.45	10.85	9.073	7.649	6.486	5.520	4.679	3.890	3.105	2.207	1.657	1.405	1.130	1.019	9.377	
5.	13.50	10.97	9.274	7.891	6.747	5.787	4.945	4.152	3.349	2.386	1.759	1.463	1.131	0.995	9.883	
6.	13.53	11.07	9.427	8.080	6.957	6.007	5.170	4.378	3.567	2.552	1.859	1.523	1.138	0.976	10.29	
8.	13.54	11.18	9.648	8.365	7.280	6.353	5.532	4.756	3.944	2.846	2.040	1.639	1.178	0.951	10.91	
10.	13.53	11.26	9.795	8.563	7.514	6.613	5.814	5.058	4.254	3.105	2.217	1.757	1.216	0.954	11.38	
15.	13.58	11.37	10.00	8.847	7.872	7.040	6.304	5.597	4.832	3.685	2.638	2.035	1.304	0.908	12.17	
20.	13.55	11.41	10.11	9.022	8.100	7.319	6.634	5.978	5.258	4.104	2.988	2.311	1.423	0.895	12.68	
30.	13.48	11.44	10.23	9.223	8.376	7.669	7.061	6.493	5.861	4.728	3.533	2.765	1.663	0.880	13.34	
40.	13.48	11.46	10.29	9.325	8.525	7.871	7.323	6.818	6.260	5.206	3.994	3.157	1.870	0.873	13.76	
50.	13.47	11.46	10.34	9.406	8.619	7.985	7.497	7.061	6.544	5.553	4.405	3.541	2.072	0.868	14.06	
60.	13.44	11.49	10.37	9.445	8.690	8.095	7.628	7.229	6.768	5.850	4.721	3.842	2.260	0.865	14.29	
80.	13.42	11.50	10.41	9.514	8.791	8.228	7.804	7.471	7.102	6.297	5.221	4.343	2.614	0.861	14.62	
100.	13.41	11.51	10.44	9.562	8.857	8.317	7.922	7.630	7.328	6.626	5.608	4.740	2.920	0.858	14.86	
200.	13.35	11.56	10.53	9.678	9.008	8.514	8.185	7.991	7.861	7.489	6.762	5.975	4.028	0.853	15.44	
500.	13.10	11.58	10.57	9.745	9.103	8.644	8.359	8.261	8.235	8.235	8.780	7.376	5.720	0.850	15.92	
1000.	12.97	11.59	10.59	9.768	9.137	8.690	8.425	8.335	8.403	8.537	8.427	8.124	6.838	0.849	16.13	
2000.	12.89	11.60	10.60	9.782	9.156	8.715	8.458	8.386	8.480	8.708	8.746	8.582	7.787	0.849	16.26	
5000.	12.86	11.60	10.59	9.785	9.165	8.731	8.477	8.401	8.545	8.817	8.951	8.962	8.602	0.849	16.35	
10000.	12.81	11.60	10.60	9.794	9.170	8.733	8.485	8.426	8.550	8.844	9.037	9.089	8.945	0.849	16.39	
k/T <sub>1</sub>	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD	
<b>T<sub>1</sub></b> (MeV)																
<b>Z = 35</b>																
0.001	1.656	1.762	1.864	1.962	2.053	2.137	2.216	2.294	2.372	2.445	2.483	2.504	2.529	2.543	1.831	
0.002	2.541	2.669	2.780	2.875	2.957	3.032	3.102	3.176	3.256	3.344	3.387	3.401	3.416	3.426	2.609	
0.005	4.129	4.309	4.417	4.462	4.472	4.475	4.479	4.491	4.509	4.540	4.561	4.568	4.575	4.574	3.860	
0.01	5.533	5.714	5.772	5.726	5.632	5.540	5.457	5.384	5.310	5.247	5.227	5.213	5.208	5.207	4.807	
0.02	6.950	7.068	6.955	6.722	6.499	6.298	6.114	5.941	5.772	5.614	5.534	5.504	5.477	5.474	5.558	
0.05	8.784	8.439	7.852	7.403	6.892	6.490	6.174	5.904	5.642	5.380	5.249	5.194	5.146	5.130	6.071	
0.1	10.12	9.094	8.182	7.393	6.714	6.164	5.666	5.269	4.945	4.630	4.477	4.430	4.374	4.328	6.128	
0.2	11.01	9.420	8.101	7.021	6.143	5.436	4.850	4.343	3.907	3.510	3.351	3.269	3.207	3.186	5.995	
0.5	11.92	9.528	7.778	6.960	5.432	4.593	3.883	3.256	2.707	2.227	2.018	1.945	1.876	1.862	6.022	
1.	12.59	9.820	7.887	6.467	5.357	4.439	3.658	2.970	2.364	1.813	1.555	1.462	1.376	1.337	6.638	
2.	13.18	10.31	8.367	6.920	5.774	4.820	3.992	3.234	2.541	1.854	1.491	1.342	1.203	1.137	7.844	
3.	13.40	10.60	8.734	7.313	6.168	5.203	4.360	3.585	2.837	2.034	1.570	1.363	1.157	1.073	8.712	
4.	13.43	10.81	9.035	7.224	7.843	6.711	5.767	4.942	4.158	3.359	2.395	1.668	1.416	1.143	1.037	9.358
5.	13.48	10.93	9.224	7.843	6.711	5.767	4.942	4.158	3.359	2.395	1.668	1.416	1.142	1.012	9.854	
6.	13.50	11.02	9.368	8.024	6.914	5.982	5.163	4.383	3.575	2.559	1.866	1.531	1.149	0.993	10.25	
8.	13.49	11.13	9.578	8.299	7.228	6.321	5.521	4.758	3.949	2.851	2.045	1.646	1.188	0.967	10.87	
10.	13.48	11.19	9.720	8.692	7.458	6.577	5.800	5.056	4.258	3.112	2.221	1.762	1.225	0.949	11.32	
15.	13.52	11.30	9.922	8.774	7.814	7.002	6.286	5.591	4.830	3.684	2.639	2.037	1.312	0.923	12.10	
20.	13.48	11.34	10.04	8.953	8.044	7.280	6.612	5.968	5.258	4.101	2.987	2.312	1.430	0.908	12.62	
30.	13.40	11.37	10.17	9.166	8.328	7.631	7.035	6.475	5.850	4.721	3.530	2.765	1.669	0.893	13.28	
40.	13.40	11.40	10.24	9.275	8.482	7.835	7.295	6.796	6.244	5.196	3.988	3.156	1.875	0.885	13.70	
50.	13.37	11.42	10.30	9.351	8.578	7.962	7.468	7.031	6.520	5.545	4.398	3.539	2.073	0.880	14.00	
60.	13.36	11.44	10.33	9.404	8.653	8.062	7.598	7.202	6.745	5.836	4.713	3.838	2.263	0.877	14.23	
80.	13.35	11.45	10.37	9.476	8.756	8.195	7.773	7.442	7.076	6.279	5.211	4.337	2.615	0.872	14.56	
100.	13.34	11.47	10.40	9.525	8.823	8.284	7.889	7.599	7.300	6.605	5.596	4.733	2.920	0.870	14.80	
200.	13.29	11.51	10.48	9.632	8.970	8.480	8.146	7.944	7.481	7.472	6.712	5.948	4.018	0.865	15.38	
500.	13.04	11.53	10.53	9.702	9.063	8.606	8.323	8.206	8.220	8.201	7.840	7.351	5.707	0.861	15.85	
1000.	12.91	11.54	10.54	9.726	9.097	8.652	8.388	8.299	8.367	8.501	8.393	8.092	6.818	0.860	16.06	
2000.	12.83	11.55	10.55	9.739	9.115	8.677	8.422	8.348	8.445	8.665	8.712	8.584	7.742	0.860	16.19	
5000.	12.80	11.55	10.55	9.743	9.125	8.693	8.440	8.364	8.507	8.778	8.912	8.824	8.566	0.859	16.28	
10000.	12.75	11.55	10.56	9.749	9.129	8.696	8.450	8.388	8.511	8.807	8.996	9.049	8.902	0.859	16.32	
k/T <sub>1&lt;/</sub>																

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 363  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 37$															
0.001	1.563	1.666	1.768	1.868	1.961	2.067	2.125	2.202	2.276	2.350	2.390	2.407	2.432	2.446	1.750
0.002	2.424	2.543	2.655	2.760	2.854	2.955	3.006	3.079	3.153	3.248	3.292	3.303	3.318	3.328	2.517
0.005	3.968	4.183	4.279	4.331	4.363	4.380	4.390	4.406	4.432	4.468	4.491	4.500	4.507	4.511	3.771
0.01	5.380	5.583	5.656	5.619	5.554	5.453	5.383	5.321	5.257	5.204	5.189	5.184	5.179	5.176	4.732
0.02	6.842	6.927	6.853	6.659	6.430	6.231	6.062	5.910	5.751	5.600	5.531	5.500	5.477	5.464	5.505
0.05	8.693	8.356	7.891	7.369	6.882	6.494	6.187	5.923	5.668	5.416	5.290	5.238	5.192	5.169	6.061
0.1	10.04	9.058	8.179	7.413	6.750	6.189	5.717	5.327	5.011	4.701	4.550	4.505	4.450	4.420	6.157
0.2	10.97	9.426	8.135	7.071	6.202	5.699	4.916	4.414	3.986	3.594	3.415	3.352	3.289	3.259	6.049
0.5	11.91	9.527	7.795	6.494	5.478	4.644	3.937	3.312	2.766	2.289	2.082	2.009	1.939	1.907	6.068
1.	12.55	9.815	7.901	6.491	5.387	4.472	3.694	3.008	2.405	1.857	1.601	1.508	1.423	1.383	6.672
2.	13.08	10.28	8.367	6.928	5.786	4.836	4.012	3.257	2.568	1.886	1.525	1.377	1.240	1.175	7.857
3.	13.29	10.54	8.699	7.297	6.166	5.209	4.372	3.600	2.856	2.059	1.599	1.393	1.189	1.106	8.701
4.	13.30	10.74	8.981	7.580	6.443	5.502	4.683	3.908	3.129	2.238	1.692	1.443	1.173	1.067	9.330
5.	13.34	10.84	9.156	7.795	6.681	5.753	4.900	4.164	3.368	2.411	1.789	1.496	1.169	1.041	9.812
6.	13.36	10.92	9.291	7.966	6.875	5.961	5.158	4.385	3.581	2.572	1.885	1.553	1.174	1.021	10.20
8.	13.36	11.02	9.488	8.226	7.176	6.290	5.508	4.754	3.950	2.858	2.060	1.664	1.210	0.992	10.80
10.	13.35	11.09	9.624	8.412	7.397	6.539	5.780	5.048	4.255	3.115	2.232	1.777	1.246	0.974	11.25
15.	13.39	11.20	9.820	8.685	7.743	6.953	6.257	5.574	4.817	3.681	2.645	2.048	1.328	0.946	12.02
20.	13.36	11.24	9.940	8.863	7.970	7.226	6.576	5.943	5.232	4.092	2.989	2.319	1.443	0.931	12.52
30.	13.28	11.28	10.08	9.081	8.254	7.570	6.988	6.439	5.822	4.704	3.524	2.767	1.681	0.915	13.18
40.	13.27	11.30	10.15	9.195	8.410	7.773	7.242	6.753	6.209	5.174	3.978	3.153	1.885	0.907	13.60
50.	13.26	11.32	10.20	9.269	8.514	7.910	7.418	6.974	6.492	5.540	4.355	3.487	2.075	0.901	13.90
60.	13.23	11.34	10.24	9.329	8.586	8.000	7.561	7.149	6.701	5.807	4.698	3.830	2.267	0.898	14.13
80.	13.22	11.36	10.29	9.405	8.689	8.131	7.711	7.386	7.027	6.244	5.191	4.325	2.616	0.893	14.46
100.	13.20	11.38	10.32	9.454	8.755	8.218	7.826	7.541	7.247	6.565	5.571	4.717	2.919	0.891	14.69
200.	13.15	11.42	10.40	9.559	8.898	8.411	8.085	7.894	7.418	6.670	5.909	4.027	0.885	15.26	
500.	12.92	11.45	10.44	9.627	8.993	8.539	8.258	8.141	8.155	8.781	7.303	5.683	0.882	15.73	
1000.	12.80	11.45	10.46	9.651	9.026	8.585	8.323	8.253	8.300	8.432	8.326	8.030	6.778	0.881	15.93
2000.	12.73	11.46	10.47	9.664	9.044	8.609	8.357	8.283	8.378	8.596	8.643	8.515	7.686	0.880	16.06
5000.	12.70	11.46	10.47	9.668	9.055	8.625	8.374	8.299	8.440	8.709	8.841	8.852	8.498	0.880	16.16
10000.	12.66	11.46	10.47	9.674	9.058	8.629	8.384	8.323	8.444	8.738	8.924	8.977	8.830	0.880	16.19
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 38$															
0.001	1.517	1.620	1.722	1.821	1.916	2.002	2.081	2.158	2.232	2.305	2.344	2.361	2.385	2.400	1.711
0.002	2.464	2.608	2.709	2.798	2.880	2.957	3.034	3.115	3.201	3.242	3.256	3.272	3.283	3.297	2.475
0.005	3.901	4.114	4.211	4.271	4.309	4.351	4.347	4.366	4.394	4.432	4.456	4.466	4.474	4.472	3.727
0.01	5.316	5.508	5.583	5.558	5.485	5.413	5.347	5.289	5.231	5.183	5.171	5.166	5.162	5.157	4.692
0.02	6.779	6.867	6.800	6.617	6.397	6.204	6.040	5.891	5.738	5.595	5.529	5.499	5.477	5.477	5.478
0.05	8.637	8.529	7.880	7.363	6.878	6.494	6.192	5.932	5.680	5.433	5.309	5.257	5.213	5.199	6.060
0.1	10.01	9.038	8.170	7.413	6.760	6.207	5.741	5.355	5.043	4.734	4.585	4.540	4.486	4.439	6.168
0.2	10.95	9.414	8.135	7.081	6.222	5.527	4.950	4.451	4.024	3.633	3.455	3.393	3.329	3.309	6.070
0.5	11.87	9.542	7.825	6.528	5.500	4.667	3.963	3.341	2.795	2.319	2.040	1.970	1.934	6.095	6.095
1.	12.52	9.815	7.913	6.506	5.402	4.489	3.712	3.028	2.425	1.879	1.624	1.532	1.466	1.407	6.690
2.	13.06	10.27	8.360	6.927	5.791	4.845	4.022	3.269	2.581	1.901	1.542	1.395	1.258	1.193	7.863
3.	13.26	10.54	8.702	7.299	6.167	5.212	4.377	3.608	2.866	2.071	1.613	1.408	1.204	1.122	8.706
4.	13.27	10.73	8.983	7.584	6.446	5.505	4.685	3.911	3.136	2.249	1.705	1.456	1.186	1.082	9.334
5.	13.31	10.84	9.158	7.799	6.684	5.754	4.939	4.164	3.373	2.420	1.801	1.508	1.182	1.055	9.814
6.	13.33	10.91	9.291	7.966	6.877	5.960	5.154	4.383	3.583	2.580	1.896	1.564	1.186	1.034	10.20
8.	13.31	11.01	9.485	8.226	7.174	6.285	5.500	4.748	3.949	2.865	2.069	1.674	1.220	1.005	10.79
10.	13.30	11.07	9.616	8.407	7.392	6.538	5.769	5.039	4.251	3.120	2.240	1.786	1.255	0.986	11.24
15.	13.33	11.17	9.804	8.673	7.730	6.938	6.239	5.558	4.810	3.684	2.650	2.053	1.336	0.958	11.99
20.	13.29	11.21	9.917	8.845	7.952	7.206	6.555	5.924	5.222	4.093	2.992	2.322	1.450	0.942	12.49
30.	13.21	11.24	10.05	9.056	8.230	7.546	6.963	6.418	5.808	5.324	2.769	1.687	0.926	13.14	
40.	13.20	11.27	10.12	9.166	8.383	7.746	7.216	6.729	6.192	5.166	3.975	3.153	1.890	0.917	13.55
50.	13.18	11.29	10.18	9.243	8.480	7.872	7.386	6.957	6.459	5.510	4.381	3.531	2.082	0.912	13.85
60.	13.18	11.33	10.21	9.288	8.554	7.967	7.509	7.125	6.685	5.790	4.686	3.831	2.278	0.908	14.08
80.	13.18	11.35	10.25	9.366	8.556	8.104	7.683	7.344	7.011	6.230	5.177	4.321	2.612	0.904	14.41
100.	13.15	11.34	10.29	9.420	8.724	8.188	7.797	7.513	7.221	6.544	5.558	4.718	2.918	0.901	14.64
200.	13.11	11.38	10.36	9.524	8.868	8.383	8.053	7.852	7.511	7.391	6.653	5.906	4.003	0.895	15.21
500.	12.87	11.41	10.41	9.595	8.962	8.509	8.230	8.113	8.124	8.105	7.761	7.257	5.639	0.892	15.67
1000.	12.76	11.42	10.43	9.619	8.996	8.556	8.295	8.205	8.271	8.401	8.294	8.000	6.758	0.891	15.88
2000.	12.69	11.42	10.43	9.632	9.014	8.581	8.329	8.255	8.350	8.566	8.610	8.483	7.659	0.890	16.01
5000.	12.66	11.42	10.43	9.636	9.025	8.597	8.346	8.271	8.412	8.679	8.810	8.820	8.965	0.890	16.10
10000.	12.61	11.42	10.44	9.642	9.028	8.600	8.356	8.296	8.416	8.709	8.894	8.946	8.797	0.890	16.14
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0									

364 TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections  
See page 349 for Explanation of Tables

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
T1 (MeV)															
Z = 40															
0.001	1.434	1.534	1.634	1.733	1.827	1.915	1.997	2.075	2.148	2.218	2.255	2.274	2.296	2.310	1.637
0.002	2.255	2.384	2.501	2.605	2.699	2.785	2.866	2.946	3.028	3.111	3.150	3.165	3.180	3.191	2.391
0.005	3.768	3.983	4.088	4.156	4.205	4.237	4.262	4.289	4.322	4.363	4.389	4.400	4.409	4.407	3.643
0.01	5.180	5.378	5.463	5.451	5.392	5.332	5.276	5.228	5.179	5.142	5.134	5.131	5.129	5.125	4.619
0.02	6.656	6.753	6.702	6.536	6.331	6.149	5.993	5.853	5.713	5.583	5.522	5.494	5.475	5.477	5.426
0.05	8.539	8.279	7.822	7.312	6.863	6.513	6.203	5.939	5.698	5.466	5.343	5.296	5.254	5.241	6.050
0.1	9.948	9.005	8.161	7.423	6.785	6.243	5.787	5.409	5.102	4.798	4.650	4.607	4.554	4.508	6.192
0.2	10.92	9.413	8.157	7.120	6.272	5.585	5.015	4.521	4.099	3.711	3.533	3.470	3.406	3.386	6.118
0.5	11.85	9.595	7.855	6.560	5.545	4.716	4.016	3.597	2.854	2.380	2.174	2.101	2.050	1.993	6.145
1.	12.48	9.814	7.931	6.532	5.433	4.923	3.746	3.066	2.465	1.922	1.670	1.577	1.492	1.452	6.725
2.	12.97	10.24	8.357	6.934	5.802	4.860	4.043	3.293	2.608	1.933	1.576	1.430	1.294	1.228	7.876
3.	13.15	10.49	8.685	7.293	6.167	5.218	4.388	3.623	2.884	2.096	1.641	1.437	1.234	1.153	8.703
4.	13.16	10.68	8.953	7.569	6.441	5.505	4.689	3.918	3.148	2.268	1.729	1.481	1.213	1.110	9.319
5.	13.19	10.78	9.122	7.778	6.673	5.743	4.937	4.166	3.380	2.436	1.821	1.530	1.206	1.081	9.790
6.	13.20	10.85	9.250	7.943	6.860	5.949	5.147	4.380	3.587	2.593	1.914	1.584	1.208	1.059	10.17
8.	13.19	10.94	9.437	8.192	7.149	6.265	5.485	4.738	3.947	2.872	2.083	1.690	1.240	1.029	10.75
10.	13.17	11.00	9.563	8.367	7.360	6.504	5.748	5.024	4.244	3.124	2.251	1.800	1.273	1.009	11.19
15.	13.21	11.09	9.744	8.625	7.688	6.901	6.208	5.534	4.794	3.682	2.656	2.061	1.351	0.979	11.93
20.	13.18	11.13	9.854	8.790	7.904	7.164	6.517	5.893	5.201	4.087	2.994	2.328	1.463	0.963	12.42
30.	13.09	11.16	9.982	8.996	8.176	7.497	6.919	6.379	5.779	4.685	3.520	2.771	1.699	0.946	13.06
40.	13.08	11.19	10.05	9.104	8.326	7.694	7.167	6.686	6.158	5.146	3.966	3.151	1.900	0.937	13.47
50.	13.07	11.21	10.11	9.179	8.422	7.818	7.335	6.910	6.419	5.486	4.370	3.526	2.088	0.932	13.76
60.	13.06	11.23	10.14	9.233	8.495	7.912	7.457	7.076	6.643	5.762	4.671	3.825	2.283	0.928	13.98
80.	13.06	11.23	10.18	9.301	8.596	8.048	7.629	7.293	6.964	6.196	5.158	4.310	2.614	0.923	14.31
100.	13.03	11.26	10.22	9.354	8.662	8.130	7.742	7.460	7.171	6.505	5.534	4.695	3.918	0.920	14.54
200.	13.00	11.30	10.29	9.456	8.805	8.324	7.996	7.797	7.696	7.340	6.614	5.879	5.994	0.915	15.10
500.	12.77	11.33	10.34	9.527	8.900	8.450	8.171	8.055	8.067	8.047	7.698	7.233	5.647	0.911	15.56
1000.	12.66	11.34	10.35	9.551	8.933	8.495	8.236	8.147	8.341	8.235	7.943	7.619	0.910	0.910	15.77
2000.	12.59	11.34	10.36	9.564	8.950	8.520	8.270	8.196	8.290	8.505	8.422	7.607	0.909	15.90	
5000.	12.56	11.34	10.36	9.568	8.961	8.536	8.287	8.212	8.352	8.617	8.747	8.757	8.404	0.909	15.99
10000.	12.52	11.34	10.37	9.574	8.964	8.539	8.297	8.236	8.356	8.646	8.830	8.882	8.734	0.909	16.02
T1 (MeV)															
Z = 41															
0.001	1.395	1.493	1.592	1.690	1.784	1.873	1.956	2.036	2.110	2.178	2.213	2.230	2.252	2.266	1.601
0.002	2.200	2.329	2.449	2.557	2.655	2.739	2.820	2.904	2.987	3.068	3.106	3.120	3.135	3.146	2.350
0.005	3.717	3.908	4.038	4.111	4.152	4.187	4.219	4.253	4.288	4.329	4.356	4.367	4.376	4.374	3.602
0.01	5.116	5.316	5.405	5.399	5.346	5.292	5.242	5.198	5.154	5.121	5.115	5.114	5.112	5.108	4.584
0.02	6.573	6.721	6.637	6.476	6.300	6.133	5.974	5.830	5.696	5.580	5.517	5.494	5.475	5.478	5.399
0.05	8.501	8.222	7.806	7.320	6.860	6.492	6.200	5.950	5.709	5.477	5.362	5.314	5.272	5.260	6.043
0.1	9.925	8.994	8.159	7.429	6.796	6.261	5.809	5.434	5.130	4.828	4.682	4.640	4.589	4.540	6.205
0.2	10.90	9.411	8.167	7.140	6.298	5.614	5.046	4.555	4.136	3.749	3.571	3.509	3.443	3.423	6.141
0.5	11.83	9.560	7.871	6.581	5.568	4.741	4.043	3.425	2.883	2.410	2.205	2.131	2.059	2.022	6.169
1.	12.44	9.812	7.940	6.546	5.448	4.540	3.766	3.086	2.486	1.944	1.692	1.600	1.514	1.475	6.742
2.	12.93	10.23	8.355	6.936	5.807	4.868	4.053	3.305	2.621	1.948	1.592	1.446	1.310	1.245	7.882
3.	13.09	10.47	8.675	7.289	6.166	5.219	4.392	3.630	2.894	2.107	1.653	1.449	1.247	1.168	8.700
4.	13.09	10.64	8.934	7.560	6.437	5.503	4.689	3.921	3.154	2.277	1.738	1.490	1.223	1.126	9.308
5.	13.12	10.74	9.099	7.766	6.665	5.743	4.934	4.166	3.384	2.443	1.829	1.538	1.215	1.097	9.774
6.	13.13	10.81	9.225	7.927	6.850	5.942	5.141	4.378	3.589	2.599	1.920	1.591	1.216	1.075	10.15
8.	13.11	10.89	9.408	8.173	7.136	6.254	5.476	4.732	3.946	2.876	2.088	1.696	1.249	1.044	10.72
10.	13.09	10.95	9.532	8.346	7.344	6.490	5.736	5.015	4.241	3.126	2.254	1.805	1.281	1.023	11.16
15.	13.13	11.05	9.710	8.598	7.667	6.883	6.193	5.521	4.784	3.683	2.658	2.064	1.357	0.992	11.89
20.	13.10	11.09	9.819	8.762	7.881	7.142	6.498	5.878	5.191	4.087	2.995	2.329	1.469	0.975	12.38
30.	13.02	11.12	9.946	8.966	8.150	7.472	6.896	6.361	5.767	4.680	3.519	2.772	1.705	0.957	13.01
40.	13.02	11.14	10.01	9.072	8.298	7.667	7.143	6.665	6.142	5.137	3.963	3.151	1.905	0.948	13.42
50.	13.00	11.17	10.07	9.146	8.392	7.791	7.310	6.888	6.401	5.476	4.365	3.523	2.092	0.942	13.71
60.	12.99	11.18	10.10	9.199	8.464	7.884	7.432	7.053	6.622	5.748	4.665	3.821	2.286	0.938	13.94
80.	13.00	11.20	10.14	9.266	8.564	8.019	7.602	7.268	6.941	6.178	5.148	4.305	2.616	0.933	14.26
100.	12.97	11.22	10.18	9.318	8.630	8.101	7.715	7.434	7.147	6.484	5.522	4.688	2.918	0.930	14.48
200.	12.94	11.26	10.24	9.419	8.771	8.292	7.966	7.769	7.669	7.315	6.595	5.865	3.990	0.924	15.04
500.	12.71	11.28	10.29	9.489	8.864	8.417	8.139	8.024	8.037	8.018	7.672	7.210	5.635	0.921	15.50
1000.	12.60	11.29	10.31	9.513	8.897	8.461	8.203	8.115	8.180	8.310	8.205	7.915	6.700	0.919	15.70
2000.	12.54	11.29	10.32	9.525	8.914	8.485	8.236	8.163	8.257	8.471	8.517	8.392	7.581	0.919	15.83
5000.	12.51	11.29	10.32	9.529	8.925	8.501	8.253	8.179	8.318	8.582	8.713	8.574	8.174	0.918	15.92
10000.	12.47	11.29	10.32	9.535	8.928	8.504	8.263	8.203	8.322	8.611	8.794	8.847	8.702	0.918	15.96
T1 (MeV)															
Z = 42															

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 365  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 43$															
0.001	1.318	1.414	1.511	1.608	1.702	1.792	1.877	1.959	2.033	2.100	2.132	2.148	2.170	2.182	1.532
0.002	2.107	2.228	2.346	2.459	2.562	2.655	2.738	2.820	2.900	2.984	3.022	3.032	3.046	3.059	2.272
0.005	3.591	3.783	3.919	4.003	4.056	4.100	4.139	4.180	4.220	4.263	4.291	4.302	4.312	4.310	3.523
0.01	4.995	5.183	5.283	5.309	5.277	5.216	5.157	5.140	5.111	5.080	5.080	5.080	5.076	5.076	4.514
0.02	6.477	6.595	6.564	6.419	6.232	6.105	5.922	5.796	5.673	5.564	5.514	5.489	5.472	5.477	5.349
0.05	8.417	8.160	7.761	7.289	6.841	6.484	6.202	5.958	5.724	5.502	5.394	5.347	5.308	5.299	6.031
0.1	9.853	8.956	8.198	7.438	6.821	6.295	5.851	5.482	5.182	4.885	4.742	4.701	4.652	4.604	6.225
0.2	10.86	9.409	8.191	7.180	6.349	5.672	5.108	4.622	4.207	3.823	3.644	3.581	3.516	3.496	6.188
0.5	11.81	9.572	7.901	6.619	5.612	4.791	4.096	3.481	2.961	2.469	2.264	2.190	2.118	2.079	6.217
1.	12.41	9.813	7.960	6.572	5.478	4.573	3.803	3.124	2.526	1.987	1.736	1.644	1.558	1.518	6.778
2.	12.86	10.20	8.350	6.942	5.819	4.885	4.073	3.329	2.648	1.979	1.626	1.480	1.344	1.279	7.895
3.	12.95	10.46	8.686	7.278	6.143	5.210	4.606	3.651	2.916	2.129	1.681	1.483	1.278	1.198	8.700
4.	13.02	10.60	8.901	7.537	6.423	5.498	4.692	3.930	3.168	2.298	1.763	1.516	1.250	1.154	9.293
5.	13.04	10.69	9.059	7.735	6.644	5.731	4.931	4.170	3.394	2.461	1.851	1.561	1.240	1.123	9.750
6.	13.05	10.75	9.180	7.891	6.823	5.924	5.133	4.377	3.595	2.614	1.940	1.612	1.240	1.100	10.12
8.	13.02	10.84	9.358	8.130	7.102	6.229	5.459	4.724	3.947	2.886	2.104	1.714	1.270	1.067	10.68
10.	13.00	10.89	9.478	8.299	7.305	6.460	5.714	5.002	4.237	3.133	2.268	1.821	1.301	1.045	11.11
15.	13.03	10.98	9.651	8.545	7.621	6.844	6.160	5.497	4.774	3.684	2.666	2.074	1.373	1.013	11.83
20.	13.00	11.02	9.756	8.706	7.831	7.099	6.461	5.848	5.171	4.082	2.999	2.336	1.482	0.995	12.31
30.	12.91	11.04	9.880	8.907	8.097	7.424	6.853	6.324	5.739	4.666	3.515	2.775	1.717	0.977	12.94
40.	12.90	11.07	9.945	9.011	8.243	7.616	7.096	6.624	6.109	5.118	3.954	3.150	1.915	0.967	13.34
50.	12.90	11.08	9.987	9.080	8.340	7.747	7.265	6.837	6.379	5.468	4.319	3.474	2.100	0.961	13.62
60.	12.88	11.11	10.03	9.135	8.406	7.831	7.382	7.007	6.581	5.721	4.651	3.815	2.291	0.957	13.86
80.	12.88	11.13	10.07	9.201	8.505	7.964	7.551	7.219	6.896	6.145	5.129	4.295	2.618	0.952	14.16
100.	12.87	11.14	10.10	9.248	8.569	8.048	7.662	7.370	7.108	6.451	5.498	4.675	2.909	0.949	14.38
200.	12.85	11.18	10.17	9.355	8.710	8.234	7.911	7.714	7.616	7.267	6.558	5.838	3.981	0.943	14.94
500.	12.61	11.20	10.22	9.423	8.801	8.356	8.083	7.968	7.979	7.964	7.628	7.141	5.581	0.939	15.39
1000.	12.51	11.21	10.24	9.445	8.854	8.402	8.145	8.057	8.123	8.252	8.184	7.861	6.662	0.937	15.59
2000.	12.45	11.21	10.25	9.458	8.851	8.425	8.178	8.105	8.199	8.411	8.458	8.333	7.531	0.937	15.72
5000.	12.42	11.21	10.24	9.462	8.862	8.441	8.195	8.120	8.259	8.521	8.651	8.662	8.315	0.936	15.81
10000.	12.38	11.21	10.25	9.467	8.865	8.444	8.205	8.144	8.263	8.550	8.732	8.784	8.641	0.936	15.85
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 44$															
0.001	1.282	1.376	1.472	1.568	1.663	1.753	1.839	1.922	1.997	2.062	2.093	2.108	2.129	2.141	1.499
0.002	2.059	2.180	2.298	2.412	2.517	2.611	2.697	2.781	2.861	2.944	2.979	2.989	3.003	3.016	2.234
0.005	3.532	3.724	3.863	3.952	4.009	4.057	4.100	4.145	4.187	4.231	4.259	4.270	4.280	4.278	3.485
0.01	4.934	5.122	5.229	5.260	5.234	5.178	5.124	5.112	5.086	5.060	5.062	5.063	5.063	5.060	4.480
0.02	6.421	6.543	6.518	6.580	6.199	6.038	5.899	5.776	5.659	5.557	5.510	5.486	5.471	5.477	5.324
0.05	8.374	8.126	7.737	7.273	6.832	6.480	6.202	5.961	5.730	5.513	5.409	5.363	5.325	5.316	6.024
0.1	9.823	8.940	8.143	7.462	6.832	6.311	5.870	5.504	5.207	4.913	4.771	4.732	4.683	4.634	6.235
0.2	10.84	9.408	8.201	7.198	6.373	5.700	5.139	4.655	4.241	3.859	3.680	3.616	3.551	3.531	6.211
0.5	11.80	9.580	7.916	6.639	5.635	4.816	4.123	3.509	2.969	2.499	2.293	2.219	2.146	2.107	6.242
1.	12.39	9.815	7.968	6.585	5.493	4.590	3.821	3.143	2.547	2.009	1.759	1.667	1.580	1.540	6.796
2.	12.83	10.19	8.347	6.943	5.824	4.893	4.083	3.341	2.661	1.994	1.642	1.496	1.360	1.295	7.902
3.	12.92	10.44	8.675	7.272	6.141	5.211	4.409	3.658	2.925	2.140	1.693	1.495	1.291	1.212	8.699
4.	12.98	10.58	8.885	7.526	6.416	5.496	4.693	3.934	3.174	2.306	1.772	1.526	1.262	1.166	9.286
5.	13.00	10.66	9.040	7.720	6.634	5.726	4.929	4.171	3.397	2.466	1.858	1.569	1.250	1.134	9.738
6.	13.00	10.73	9.158	7.874	6.811	5.916	5.129	4.376	3.596	2.617	1.946	1.619	1.249	1.111	10.10
8.	12.98	10.80	9.332	8.109	7.085	6.218	5.452	4.720	3.944	2.887	2.108	1.720	1.279	1.077	10.66
10.	12.95	10.86	9.450	8.276	7.287	6.446	5.704	4.995	4.232	3.132	2.271	1.826	1.309	1.055	11.08
12.98	10.94	9.618	8.518	7.600	6.826	6.146	5.486	4.765	3.682	2.667	2.076	1.379	1.022	11.80	
20.	12.94	10.98	9.722	8.677	7.807	7.079	6.444	5.834	5.159	4.078	2.999	2.337	1.688	1.005	12.28
30.	12.85	11.00	9.844	8.877	8.070	7.401	6.832	6.306	5.725	4.658	3.513	2.776	1.722	0.986	12.89
40.	12.84	11.02	9.908	8.980	8.215	7.591	7.074	6.604	6.093	5.108	3.950	3.149	1.920	0.976	13.29
50.	12.84	11.04	9.949	9.047	8.311	7.721	7.262	6.816	6.361	5.456	4.312	3.472	2.104	0.970	13.58
60.	12.82	11.06	9.993	9.102	8.376	7.804	7.358	6.985	6.561	5.708	4.644	3.812	2.293	0.966	13.80
80.	12.82	11.08	10.03	9.166	8.474	7.936	7.525	7.195	6.875	6.129	5.119	4.290	2.619	0.961	14.11
100.	12.81	11.09	10.06	9.213	8.537	8.019	7.636	7.345	7.085	6.433	5.486	4.668	2.909	0.958	14.33
200.	12.76	11.13	10.13	9.316	8.676	8.203	7.881	7.687	7.590	7.243	6.539	5.824	3.977	0.952	14.88
500.	12.56	11.16	10.18	9.384	8.766	8.324	8.050	7.936	7.951	7.935	7.595	7.144	5.600	0.948	15.33
1000.	12.45	11.16	10.19	9.406	8.798	8.367	8.112	8.025	8.091	8.221	8.120	7.835	6.644	0.946	15.53
2000.	12.39	11.17	10.20	9.419	8.814	8.391	8.144	8.072	8.166	8.378	8.427	8.304	7.507	0.946	15.66
5000.	12.37	11.17	10.20	9.422	8.825	8.406	8.161	8.087	8.225	8.466	8.617	8.629	8.286	0.945	15.75
10000.	12.33	11.17	10.21	9.428	8.828	8.409	8.170	8.110	8.228	8.514	8.696	8.749	8.609	0.945	15.72
$k/T_1$	0.00	0.10	0												

366 TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 46$															
0.001	1.210	1.304	1.399	1.493	1.586	1.676	1.764	1.853	1.930	1.986	2.017	2.036	2.052	2.062	1.436
0.002	1.974	2.087	2.200	2.312	2.421	2.523	2.619	2.709	2.789	2.864	2.897	2.907	2.920	2.931	2.159
0.005	3.411	3.613	3.759	3.854	3.918	3.074	4.025	4.075	4.120	4.167	4.195	4.207	4.217	4.215	3.411
0.01	4.783	5.024	5.148	5.168	5.137	5.103	5.055	5.054	5.033	5.021	5.026	5.028	5.031	5.028	4.417
0.02	6.292	6.468	6.418	6.285	6.137	5.996	5.854	5.739	5.632	5.547	5.500	5.482	5.469	5.477	5.275
0.05	8.447	8.023	7.608	7.214	6.844	6.503	6.196	5.932	5.718	5.539	5.462	5.430	5.356	5.350	6.002
0.1	9.599	9.016	8.172	7.427	6.824	6.335	5.917	5.557	5.251	4.953	4.835	4.791	4.738	4.693	6.260
0.2	10.77	9.402	8.235	7.256	6.441	5.768	5.203	4.714	4.299	3.930	3.754	3.685	3.620	3.601	6.259
0.5	11.79	9.579	7.928	6.668	5.678	4.867	4.178	3.563	3.026	2.557	2.352	2.277	2.203	2.164	6.286
1.	12.36	9.810	7.980	6.607	5.522	4.623	3.858	3.183	2.588	2.051	1.802	1.710	1.623	1.582	6.850
2.	12.77	10.18	8.349	6.951	5.835	4.907	4.303	3.564	2.688	2.025	1.675	1.529	1.393	1.327	7.918
3.	12.95	10.37	8.602	7.248	6.154	5.230	4.420	3.669	2.943	2.168	1.720	1.518	1.316	1.238	8.690
4.	13.03	10.49	8.784	7.473	6.410	5.502	4.698	3.942	3.190	2.335	1.794	1.540	1.281	1.188	9.260
5.	13.07	10.57	8.921	7.649	6.613	5.724	4.930	4.176	3.411	2.496	1.877	1.577	1.266	1.154	9.700
6.	13.08	10.63	9.028	7.791	6.779	5.907	5.125	4.378	3.608	2.648	1.963	1.622	1.263	1.129	10.05
8.	13.07	10.71	9.189	8.008	7.037	6.197	5.440	4.713	3.946	2.924	2.132	1.720	1.278	1.095	10.60
10.	12.92	10.78	9.355	8.183	7.213	6.402	5.690	4.998	4.240	3.140	2.282	1.840	1.325	1.072	11.02
15.	12.85	10.85	9.533	8.445	7.541	6.785	6.126	5.490	4.778	3.661	2.649	2.100	1.421	1.039	11.73
20.	12.87	10.89	9.626	8.585	7.731	7.027	6.417	5.819	5.147	4.071	3.002	2.345	1.501	1.022	12.19
30.	12.75	10.91	9.758	8.796	8.000	7.346	6.794	6.278	5.702	4.644	3.509	2.779	1.733	1.003	12.81
40.	12.73	10.94	9.827	8.905	8.149	7.537	7.030	6.569	6.063	5.088	3.942	3.148	1.929	0.993	13.20
50.	12.72	10.96	9.872	8.977	8.249	7.667	7.195	6.776	6.327	5.432	4.300	3.468	2.112	0.987	13.49
60.	12.70	10.98	9.915	9.033	8.317	7.754	7.313	6.939	6.516	5.685	4.635	3.799	2.289	0.983	13.70
80.	12.70	11.00	9.956	9.101	8.415	7.881	7.474	7.148	6.832	6.097	5.100	4.279	2.622	0.978	14.02
100.	12.67	11.01	9.994	9.151	8.476	7.961	7.587	7.309	7.026	6.393	5.471	4.651	2.907	0.975	14.23
200.	12.63	11.05	10.06	9.249	8.611	8.141	7.828	7.646	7.526	7.187	6.512	5.809	3.975	0.969	14.77
500.	12.45	11.07	10.10	9.311	8.698	8.259	7.989	7.877	7.891	7.882	7.553	7.074	5.544	0.965	15.22
1000.	12.35	11.08	10.11	9.334	8.729	8.302	8.049	7.963	8.029	8.162	8.064	7.783	6.607	0.964	15.41
2000.	12.29	11.08	10.12	9.345	8.746	8.325	8.081	8.009	8.102	8.314	8.366	8.248	7.460	0.963	15.53
5000.	12.27	11.08	10.12	9.349	8.756	8.340	8.097	8.023	8.160	8.420	8.551	8.564	8.229	0.963	15.62
10000.	12.23	11.08	10.13	9.354	8.759	8.343	8.106	8.047	8.163	8.447	8.629	8.684	8.543	0.963	15.66
$T_1$ (MeV)															
$Z = 47$															
0.001	1.179	1.268	1.360	1.454	1.549	1.641	1.731	1.817	1.893	1.956	1.982	1.994	2.013	2.023	1.405
0.002	1.920	2.038	2.155	2.271	2.381	2.484	2.579	2.670	2.752	2.826	2.857	2.866	2.879	2.890	2.124
0.005	3.365	3.560	3.705	3.803	3.872	3.933	3.988	4.041	4.089	4.136	4.164	4.176	4.186	4.183	3.375
0.01	4.758	4.959	5.081	5.126	5.113	5.069	5.027	5.027	5.014	5.001	5.009	5.012	5.014	5.012	4.384
0.02	6.261	6.411	6.373	6.299	6.106	5.969	5.831	5.720	5.618	5.540	5.496	5.479	5.467	5.476	5.250
0.05	8.254	8.016	7.651	7.218	6.803	6.466	6.196	5.964	5.751	5.546	5.467	5.408	5.372	5.366	5.998
0.1	9.739	8.899	8.135	7.459	6.865	6.356	5.923	5.564	5.274	4.990	4.855	4.817	4.770	4.722	6.264
0.2	10.78	9.405	8.241	7.266	6.457	5.792	5.234	4.748	4.333	3.963	3.788	3.655	3.636	3.620	6.280
0.5	11.75	9.591	9.955	6.693	5.700	4.800	4.204	3.591	3.054	2.586	2.380	2.305	2.231	2.192	6.311
1.	12.32	9.809	7.993	6.622	5.537	4.639	4.375	3.820	2.608	2.073	1.824	1.732	1.645	1.604	6.847
2.	12.74	10.17	8.344	6.952	5.840	4.915	4.115	3.576	2.702	2.040	1.691	1.545	1.409	1.344	7.925
3.	12.90	10.35	8.599	7.246	6.152	5.230	4.624	3.677	2.953	2.180	1.732	1.530	1.330	1.254	8.689
4.	12.88	10.50	8.818	7.474	6.383	5.483	4.699	3.953	3.201	2.336	1.804	1.559	1.296	1.204	9.257
5.	12.89	10.57	8.955	7.651	6.586	5.702	4.928	4.185	3.419	2.492	1.885	1.598	1.282	1.170	9.692
6.	12.89	10.62	9.061	7.792	6.752	5.884	5.122	4.386	3.614	2.639	1.970	1.645	1.279	1.145	10.04
8.	12.85	10.69	9.219	8.012	7.012	6.173	5.434	4.720	3.954	2.902	2.128	1.742	1.305	1.110	10.58
10.	12.81	10.73	9.330	8.171	7.206	6.393	5.678	4.988	4.235	3.142	2.286	1.846	1.334	1.086	10.99
15.	12.75	10.79	9.504	8.428	7.528	6.772	6.110	5.475	4.769	3.639	2.651	2.104	1.429	1.052	11.69
20.	12.78	10.85	9.595	8.563	7.713	7.009	6.397	5.802	5.136	4.069	3.002	2.347	1.508	1.034	12.16
30.	12.69	10.87	9.724	8.768	7.976	7.326	6.772	6.239	5.688	4.637	3.508	2.780	1.740	1.014	12.77
40.	12.67	10.90	9.792	8.875	8.122	7.512	6.007	5.548	4.047	3.078	2.938	2.148	1.935	1.004	13.16
50.	12.67	10.92	9.836	8.945	8.220	7.640	7.170	6.753	6.308	5.420	4.294	3.466	2.117	0.997	13.44
60.	12.64	10.94	9.879	9.001	8.287	7.728	7.288	6.915	6.495	5.672	4.628	3.796	2.292	0.993	13.66
80.	12.65	10.96	9.919	9.068	8.384	7.853	7.448	7.123	6.809	6.080	5.090	4.274	2.623	0.988	13.97
100.	12.63	10.97	9.949	9.114	8.446	7.934	7.555	7.270	7.016	6.378	5.451	4.647	2.910	0.984	14.18
200.	12.59	11.00	10.02	9.211	8.579	8.112	7.795	7.604	7.512	7.172	6.485	5.786	3.966	0.978	14.72
500.	12.40	11.03	10.06	9.277	8.666	8.229	7.958	7.847	7.864	7.852	7.519	7.078	5.563	0.974	15.16
1000.	12.30	11.03	10.08	9.299	8.697	8.271	8.019	7.933	7.999	8.131	8.035	7.755	6.588	0.972	15.36
2000.	12.24	11.04	10.08	9.310	8.713	8.294	8.050	7.979	8.072	8.283	8.335	8.218	7.435	0.972	15.48
5000.	12.22	11.04	10.08	9.314	8.723	8.309	8.066	7.993	8.129	8.388	8.518	8.532	8.199	0.971	15.56
10000.	12.19	11.04	10.09	9.319	8.726	8.312	8.075	8.016	8.132	8.415	8.596	8.511	0.971	15.60	
$T_1$ (MeV)															
$Z = 48$ </td															

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 367  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 49$															
0.001	1.113	1.201	1.291	1.383	1.475	1.557	1.659	1.755	1.834	1.882	1.912	1.928	1.942	1.949	1.346
0.002	1.855	1.956	2.063	2.174	2.288	2.403	2.514	2.614	2.747	2.763	2.769	2.800	2.808	2.056	
0.005	3.250	3.449	3.601	3.708	3.786	3.854	3.916	3.977	4.028	4.074	4.102	4.114	4.124	4.121	3.303
0.01	4.615	4.851	4.986	5.028	5.018	5.000	4.981	4.972	4.963	4.963	4.973	4.978	4.982	4.980	4.320
0.02	6.132	6.320	6.288	6.175	6.044	5.916	5.785	5.677	5.587	5.527	5.487	5.473	5.464	5.473	5.201
0.05	8.338	7.936	7.540	7.165	6.812	6.485	6.191	5.937	5.732	5.564	5.497	5.470	5.400	5.396	5.980
0.1	9.575	8.902	8.179	7.468	6.846	6.356	5.966	5.629	5.318	5.030	4.912	4.872	4.822	4.777	6.283
0.2	10.72	9.390	8.256	7.301	6.505	5.846	5.291	4.808	4.396	4.029	3.855	3.786	3.722	3.703	6.319
0.5	11.76	9.613	7.987	6.733	5.745	4.939	4.257	3.648	3.112	2.544	2.438	2.362	2.287	2.247	6.363
1.	12.31	9.817	6.011	6.647	5.967	4.673	3.912	3.240	2.649	2.116	1.868	1.776	1.687	1.645	6.885
2.	12.69	10.14	8.337	6.955	5.850	4.930	4.131	3.400	2.729	2.071	1.723	1.577	1.440	1.375	7.938
3.	12.84	10.33	8.582	7.236	6.148	5.232	4.430	3.688	2.970	2.204	1.758	1.557	1.356	1.280	8.688
4.	12.84	10.47	8.795	7.455	6.369	5.474	4.695	3.955	3.210	2.355	1.827	1.582	1.319	1.227	9.245
5.	12.85	10.54	8.928	7.626	6.564	5.685	4.916	4.180	3.423	2.507	1.905	1.619	1.303	1.192	9.673
6.	12.85	10.60	9.031	7.763	6.725	5.861	5.104	4.375	3.613	2.651	1.988	1.664	1.298	1.166	10.02
8.	12.81	10.66	9.185	7.976	6.978	6.142	5.410	4.703	3.967	2.909	2.142	1.759	1.323	1.129	10.55
10.	12.78	10.70	9.292	8.130	7.166	6.358	5.699	4.966	4.223	3.145	2.298	1.860	1.350	1.105	10.95
15.	12.78	10.77	9.444	8.356	7.462	6.721	6.073	5.436	4.732	3.679	2.683	2.099	1.615	1.070	11.64
20.	12.72	10.79	9.543	8.512	7.664	6.965	6.359	5.769	5.112	4.063	3.006	2.353	1.520	1.052	12.09
30.	12.60	10.81	9.666	8.714	7.926	7.277	6.729	6.222	5.660	4.622	3.505	2.784	1.751	1.032	12.69
40.	12.58	10.83	9.730	8.818	8.070	7.463	6.962	6.508	6.014	5.059	3.930	3.147	1.944	1.021	13.08
50.	12.57	10.84	9.772	8.887	8.166	7.590	7.124	6.711	6.273	5.397	4.283	3.462	2.125	1.015	13.36
60.	12.54	10.86	9.815	8.941	8.232	7.675	7.240	6.872	6.457	5.646	4.614	3.790	2.298	1.010	13.57
80.	12.55	10.88	9.853	9.007	8.328	7.800	7.398	7.077	6.767	6.048	5.071	4.264	2.627	1.005	13.88
100.	12.53	10.90	9.883	9.052	8.389	7.881	7.505	7.222	6.542	5.628	4.634	3.910	1.002	14.09	
200.	12.49	10.93	9.949	9.149	8.522	8.058	7.743	7.553	7.461	7.126	6.449	5.759	3.958	0.995	14.62
500.	12.31	10.95	9.996	9.215	8.608	8.173	7.906	7.795	7.809	7.800	7.478	7.009	5.510	0.991	15.06
1000.	12.22	10.96	10.01	9.237	8.639	8.216	7.965	7.880	7.945	8.076	7.981	7.704	6.552	0.989	15.25
2000.	12.16	10.96	10.02	9.248	8.655	8.238	7.996	7.925	8.017	8.227	8.278	8.162	7.388	0.989	15.37
5000.	12.14	10.96	10.02	9.252	8.665	8.253	8.012	7.939	8.074	8.331	8.461	8.476	8.143	0.988	15.46
10000.	12.11	10.97	10.02	9.257	8.667	8.256	8.021	7.962	8.077	8.358	8.538	8.592	8.453	0.988	15.49
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 50$															
0.001	1.086	1.171	1.259	1.348	1.440	1.532	1.626	1.723	1.802	1.852	1.878	1.895	1.906	1.913	1.317
0.002	1.787	1.903	2.020	2.138	2.252	2.362	2.465	2.563	2.649	2.717	2.741	2.749	2.760	2.769	2.019
0.005	3.203	3.408	3.561	3.664	3.741	3.813	3.881	3.946	3.998	4.044	4.071	4.083	4.093	4.091	3.271
0.01	4.586	4.824	4.954	4.989	4.976	4.962	4.952	4.946	4.939	4.943	4.955	4.960	4.965	4.964	4.294
0.02	6.094	6.263	6.244	6.141	6.013	5.889	5.762	5.658	5.573	5.519	5.482	5.469	5.461	5.471	5.176
0.05	8.122	7.935	7.550	7.137	6.768	6.463	6.192	5.962	5.756	5.577	5.482	5.466	5.414	5.410	5.970
0.1	9.498	8.979	8.157	7.436	6.859	6.388	5.983	5.641	5.342	5.050	4.939	4.898	4.848	4.803	6.297
0.2	10.75	9.617	8.281	7.326	6.530	5.872	5.318	4.837	4.428	4.062	3.888	3.819	3.755	3.736	6.347
0.5	11.74	9.601	7.998	6.749	5.769	4.965	4.283	3.675	3.140	2.672	2.466	2.390	2.315	2.274	6.382
1.	12.28	9.807	8.019	6.661	5.584	4.691	3.946	3.260	2.670	2.137	1.889	1.797	1.708	1.666	6.900
2.	12.66	10.14	8.338	6.958	5.854	4.936	4.141	3.412	2.742	2.086	1.739	1.593	1.456	1.390	7.946
3.	12.79	10.29	8.556	7.224	6.146	5.235	4.436	3.695	2.978	2.216	1.772	1.570	1.369	1.291	8.679
4.	12.83	10.38	8.712	7.428	6.383	5.490	4.697	3.950	3.210	2.373	1.839	1.585	1.328	1.237	9.218
5.	12.84	10.44	8.832	7.590	6.574	5.699	4.915	4.170	3.420	2.527	1.916	1.617	1.309	1.200	9.636
6.	12.83	10.48	8.928	7.721	6.730	5.872	5.101	4.362	3.608	2.673	1.998	1.658	1.302	1.173	9.974
8.	12.79	10.54	9.074	7.926	6.975	6.148	5.401	4.683	3.934	3.260	2.160	1.751	1.314	1.137	10.50
10.	12.75	10.58	9.181	8.075	7.158	6.359	5.638	4.943	4.206	3.178	2.318	1.851	1.337	1.112	10.89
15.	12.66	10.65	9.364	8.326	7.465	6.726	6.065	5.619	4.708	3.676	2.695	2.106	1.615	1.077	11.58
20.	12.61	10.70	9.477	8.483	7.659	6.961	6.367	5.753	5.085	4.058	3.019	2.356	1.518	1.059	12.04
30.	12.51	10.75	9.622	8.681	7.900	7.255	6.710	6.205	5.646	4.615	3.503	2.785	1.756	1.039	12.65
40.	12.51	10.78	9.694	8.786	8.040	7.436	6.939	6.487	5.976	5.059	3.962	3.162	1.930	1.029	13.03
50.	12.51	10.81	9.743	8.858	8.136	7.559	7.097	6.699	6.238	5.369	4.317	3.510	2.122	1.023	13.31
60.	12.49	10.83	9.780	8.910	8.205	7.649	7.215	6.852	6.440	5.631	4.608	3.789	2.297	1.018	13.53
80.	12.50	10.85	9.822	8.978	8.301	7.775	7.374	7.054	6.746	6.033	5.062	4.259	2.628	1.013	13.83
100.	12.49	10.86	9.852	9.024	8.362	7.855	7.480	7.198	6.949	6.524	5.416	4.627	2.911	1.010	14.05
200.	12.45	10.90	9.918	9.121	8.494	8.031	7.717	7.528	7.437	7.103	6.431	5.746	3.954	1.003	14.58
500.	12.26	10.92	9.964	9.185	8.580	8.148	7.879	7.769	7.785	7.733	7.446	7.014	5.529	0.999	15.01
1000.	12.18	10.93	9.978	9.207	8.611	8.189	7.939	7.854	7.919	8.049	7.954	7.679	6.534	0.998	15.20
2000.	12.12	10.93	9.985	9.218	8.627	8.212	7.970	7.899	7.991	8.200	8.251	8.135	7.364	0.997	15.32
5000.	12.10	10.93	9.984	9.222	8.637	8.227	7.986	7.913	8.048	8.304	8.433	8.446	8.116	0.997	15.41
10000.	12.07	10.93	9.991	9.227	8.639	8.230	7.995	7.936	8.051	8.331	8.510	8.564	8.424	0.997	15.44
$k/T_1$	0.00	0.10	0.20</th												

368 TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections  
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k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
T1 (MeV)															
Z = 52															
0.001	1.025	1.109	1.194	1.282	1.371	1.464	1.561	1.663	1.743	1.790	1.814	1.829	1.838	1.843	1.262
0.002	1.726	1.833	1.942	2.055	2.169	2.283	2.393	2.496	2.584	2.648	2.667	2.673	2.683	2.691	1.955
0.005	3.099	3.502	3.460	3.572	3.659	3.738	3.812	3.882	3.938	3.984	4.011	4.023	4.052	4.030	3.202
0.01	4.452	4.710	4.857	4.905	4.902	4.895	4.892	4.894	4.893	4.904	4.920	4.926	4.931	4.930	4.231
0.02	5.997	6.159	6.181	6.090	5.952	5.823	5.713	5.623	5.549	5.498	5.475	5.460	5.455	5.466	5.130
0.05	8.214	7.835	7.462	7.107	6.772	6.462	6.182	5.939	5.744	5.587	5.528	5.504	5.438	5.436	5.952
0.1	9.446	8.925	8.142	7.442	6.874	6.411	6.013	5.677	5.383	5.096	4.988	4.948	4.900	4.854	6.308
0.2	10.69	9.401	8.295	7.360	6.576	5.924	5.374	4.896	4.489	4.127	3.954	3.885	3.820	3.801	6.385
0.5	11.74	9.621	8.022	6.789	5.814	5.015	4.336	3.730	3.197	2.730	2.523	2.446	2.370	2.329	6.432
1.	12.27	9.816	8.033	6.684	5.612	4.724	3.967	3.299	2.711	2.180	1.933	1.840	1.750	1.708	6.937
2.	12.61	10.11	8.331	6.961	5.863	4.951	4.160	3.434	2.770	2.117	1.770	1.624	1.487	1.421	7.959
3.	12.74	10.26	8.539	7.213	6.141	5.235	4.441	3.707	2.997	2.240	1.796	1.595	1.396	1.319	8.678
4.	12.80	10.35	8.691	7.409	6.368	5.480	4.694	3.956	3.223	2.392	1.859	1.605	1.350	1.263	9.209
5.	12.81	10.41	8.807	7.564	6.551	5.682	4.906	4.169	3.428	2.542	1.933	1.635	1.329	1.226	9.620
6.	12.81	10.46	8.900	7.691	6.702	5.850	5.086	4.357	3.613	2.685	2.013	1.674	1.321	1.198	9.953
8.	12.78	10.52	9.042	7.888	6.939	6.119	5.381	4.672	3.933	2.948	2.171	1.764	1.331	1.160	10.47
10.	12.62	10.59	9.196	8.051	7.103	6.310	5.615	4.944	4.214	3.151	2.314	1.880	1.375	1.135	10.86
15.	12.63	10.65	9.344	8.271	7.391	6.664	6.029	5.403	4.710	3.677	2.691	2.111	1.436	1.099	11.54
20.	12.57	10.68	9.443	8.425	7.590	6.903	6.308	5.728	5.082	4.054	3.010	2.362	1.559	1.079	11.99
30.	12.45	10.70	9.570	8.629	7.850	7.210	6.670	6.171	5.620	4.601	3.500	2.789	1.769	1.059	12.58
40.	12.43	10.72	9.636	8.734	7.993	7.393	6.898	6.452	5.967	5.030	3.919	3.147	1.959	1.048	12.96
50.	12.42	10.74	9.680	8.803	8.089	7.519	7.057	6.651	6.221	5.362	4.266	3.457	2.138	1.041	13.24
60.	12.40	10.76	9.722	8.857	8.155	7.603	7.172	6.808	6.400	5.607	4.594	3.782	2.306	1.037	13.45
80.	12.41	10.78	9.761	8.923	8.250	7.727	7.328	7.010	6.705	6.001	5.046	4.249	2.632	1.031	13.75
100.	12.37	10.80	9.799	8.972	8.309	7.805	7.438	7.166	6.893	6.286	5.402	4.610	2.909	1.028	1.23
200.	12.34	10.83	9.862	9.068	8.442	7.980	7.673	7.495	7.378	7.051	6.404	5.729	3.951	1.021	14.49
500.	12.18	10.85	9.903	9.129	8.528	8.097	7.831	7.720	7.736	7.724	7.399	6.973	5.506	1.016	14.92
1000.	12.10	10.86	9.917	9.150	8.558	8.139	7.890	7.805	7.869	7.998	7.903	7.630	6.498	1.015	15.11
2000.	12.04	10.86	9.924	9.161	8.574	8.161	7.921	7.850	7.941	8.149	8.198	8.083	7.318	1.014	15.23
5000.	12.03	10.86	9.923	9.165	8.584	8.176	7.937	7.864	7.998	8.252	8.380	8.393	8.063	1.014	15.32
10000.	11.99	10.86	9.929	9.170	8.586	8.179	7.946	7.887	8.001	8.279	8.457	8.510	8.371	1.014	15.35
k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
T1 (MeV)															
Z = 53															
0.001	0.998	1.079	1.164	1.250	1.339	1.431	1.529	1.634	1.714	1.760	1.783	1.797	1.805	1.809	1.236
0.002	1.689	1.791	1.898	2.011	2.129	2.248	2.366	2.473	2.558	2.613	2.618	2.666	2.654	2.694	1.924
0.005	3.051	3.254	3.413	3.528	3.618	3.700	3.778	3.852	3.909	3.955	3.981	3.993	4.003	4.000	3.169
0.01	4.401	4.661	4.812	4.864	4.885	4.862	4.868	4.871	4.884	4.909	4.915	4.914	4.920	4.920	4.202
0.02	5.949	6.114	6.141	6.056	5.922	5.798	5.690	5.604	5.535	5.490	5.469	5.455	5.451	5.464	5.107
0.05	8.177	7.805	7.438	7.089	6.760	6.454	6.178	5.939	5.748	5.594	5.537	5.514	5.450	5.484	5.943
0.1	9.423	8.910	8.137	7.444	6.880	6.421	6.028	5.694	5.402	5.118	5.012	4.972	4.924	4.879	6.315
0.2	10.68	9.401	8.305	7.377	6.597	5.949	5.401	4.926	4.520	4.159	3.985	3.916	3.852	3.833	6.406
0.5	11.73	9.628	8.038	6.808	5.836	5.039	4.362	3.758	3.226	2.759	2.551	2.474	2.398	2.356	6.457
1.	12.25	9.816	8.042	6.696	5.627	4.740	3.985	3.519	2.732	2.202	1.954	1.861	1.771	1.728	6.955
2.	12.57	10.10	8.329	6.962	5.867	4.957	4.169	3.446	2.783	2.133	1.786	1.640	1.503	1.436	7.965
3.	12.70	10.24	8.529	7.207	6.138	5.236	4.445	3.714	3.007	2.252	1.810	1.608	1.408	1.330	8.675
4.	12.75	10.33	8.675	7.398	6.361	5.477	4.694	3.957	3.230	2.403	1.871	1.617	1.361	1.272	9.200
5.	12.76	10.39	8.788	7.551	6.541	5.675	4.903	4.170	3.432	2.551	1.944	1.645	1.339	1.234	9.607
6.	12.75	10.43	8.879	7.675	6.689	5.841	5.082	4.355	3.615	2.693	2.022	1.684	1.330	1.205	9.935
8.	12.71	10.49	9.018	7.869	6.923	6.106	5.372	4.667	3.932	2.953	2.179	1.773	1.339	1.167	10.45
10.	12.56	10.55	9.168	8.030	7.086	6.296	5.604	4.937	4.211	3.155	2.321	1.887	1.383	1.142	10.84
15.	12.56	10.61	9.313	8.247	7.371	6.647	6.014	5.390	4.703	3.678	2.696	2.115	1.543	1.105	11.31
20.	12.51	10.64	9.412	8.400	7.569	6.883	6.290	5.713	5.071	4.052	3.012	2.365	1.543	1.086	11.95
30.	12.39	10.66	9.538	8.602	7.826	7.188	6.649	6.153	5.606	4.595	3.499	2.790	1.774	1.066	12.54
40.	12.38	10.69	9.604	8.706	7.968	7.370	6.876	6.432	5.951	5.021	3.916	3.147	1.964	1.055	12.92
50.	12.37	10.70	9.648	8.775	8.064	7.495	7.035	6.630	6.203	5.350	4.261	3.456	2.141	1.049	13.20
60.	12.36	10.73	9.691	8.828	8.128	7.578	7.149	6.786	6.381	5.594	4.588	3.779	2.309	1.044	13.40
80.	12.34	10.75	9.736	8.897	8.221	7.699	7.307	7.002	6.674	5.982	5.039	4.236	2.634	1.039	13.71
100.	12.33	10.76	9.767	8.943	8.282	7.779	7.414	7.143	6.870	6.268	5.390	4.603	2.910	1.036	13.92
200.	12.30	10.79	9.829	9.038	8.414	7.954	7.648	7.470	7.353	7.028	6.386	5.715	3.947	1.029	14.44
500.	12.14	10.82	9.870	9.099	8.500	8.071	7.805	7.695	7.711	7.698	7.375	6.952	5.494	1.025	14.87
1000.	12.06	10.82	9.885	9.121	8.530	8.112	7.864	7.780	7.843	7.972	7.877	7.605	6.480	1.023	15.06
2000.	12.00	10.83	9.891	9.132	8.546	8.134	7.895	7.825	7.915	8.122	8.171	8.056	7.295	1.023	15.18
5000.	11.99	10.83	9.891	9.135	8.556	8.149	7.911	7.838	7.972	8.225	8.352	8.365	8.036	1.022	15.27
10000.	11.95	10.83	9.897	9.140	8.558	8.152	7.920	7.861	7.975	8.251	8.429	8.482	8.343	1.022	15.30
k/T1	0.00	0.10	0.20	0.30	0.40	0.50</									

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 369  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 55$															
0.001	0.945	1.024	1.105	1.189	1.276	1.369	1.469	1.577	1.659	1.702	1.723	1.736	1.741	1.744	1.185
0.002	1.616	1.717	1.824	1.936	2.054	2.175	2.295	2.405	2.494	2.550	2.552	2.547	2.572	2.581	1.863
0.005	2.959	3.162	3.323	3.443	3.538	3.627	3.712	3.791	3.851	3.897	3.923	3.935	3.944	3.961	3.105
0.01	4.302	4.566	4.724	4.783	4.793	4.798	4.804	4.816	4.825	4.845	4.866	4.874	4.881	4.881	4.144
0.02	5.854	6.027	6.064	5.988	5.864	5.746	5.645	5.566	5.507	5.472	5.457	5.445	5.443	5.457	5.061
0.05	8.104	7.744	7.390	7.052	6.733	6.437	6.170	5.938	5.753	5.607	5.554	5.534	5.472	5.471	5.925
0.1	9.373	8.880	8.125	7.446	6.893	6.442	6.055	5.727	5.440	5.162	5.059	5.020	4.973	4.927	6.328
0.2	10.65	9.401	8.324	7.410	6.640	5.999	5.455	4.983	4.581	4.222	4.069	3.980	3.916	3.897	6.446
0.5	11.72	9.644	8.069	6.848	5.881	5.088	4.415	3.816	3.283	2.816	2.608	2.530	2.453	2.412	6.506
1.	12.23	9.820	8.059	6.720	5.656	4.774	4.022	3.358	2.773	2.245	1.998	1.904	1.813	1.770	6.992
2.	12.54	10.08	8.321	6.963	5.875	4.970	4.187	3.470	2.811	2.163	1.817	1.671	1.553	1.467	7.978
3.	12.64	10.21	8.507	7.193	6.131	5.235	4.452	3.727	3.026	2.276	1.834	1.632	1.433	1.358	8.672
4.	12.68	10.29	8.644	7.375	6.343	5.466	4.692	3.964	3.244	2.421	1.890	1.637	1.384	1.299	9.184
5.	12.68	10.34	8.752	7.521	6.517	5.658	4.894	4.171	3.442	2.566	1.960	1.663	1.360	1.259	9.581
6.	12.67	10.38	8.839	7.641	6.661	5.819	5.068	4.352	3.621	2.705	2.036	1.699	1.350	1.230	9.903
8.	12.63	10.43	8.973	7.829	6.888	6.077	5.352	4.657	3.933	2.961	2.190	1.786	1.357	1.191	10.40
10.	12.47	10.49	9.116	7.987	7.050	6.266	5.580	4.921	4.205	3.159	2.330	1.900	1.400	1.165	10.79
15.	12.47	10.55	9.259	8.200	7.330	6.610	5.982	5.366	4.689	3.677	2.700	2.123	1.458	1.127	11.45
20.	12.42	10.58	9.356	8.351	7.524	6.843	6.255	5.684	5.052	4.047	3.014	2.370	1.559	1.107	11.89
30.	12.31	10.60	9.481	8.551	7.779	7.145	6.610	6.119	5.579	4.581	3.496	2.794	1.786	1.085	12.47
40.	12.29	10.62	9.547	8.654	7.920	7.325	6.835	6.394	5.920	5.002	3.909	3.147	1.974	1.074	12.85
50.	12.29	10.64	9.591	8.722	8.015	7.449	6.991	6.590	6.169	5.327	4.250	3.453	2.151	1.067	13.12
60.	12.27	10.66	9.633	8.776	8.079	7.529	7.102	6.748	6.350	5.562	4.571	3.782	2.323	1.063	13.35
80.	12.26	10.69	9.678	8.843	8.172	7.652	7.262	6.958	6.633	5.951	5.021	4.226	2.638	1.057	13.63
100.	12.25	10.70	9.709	8.889	8.232	7.732	7.368	7.099	6.828	6.233	5.368	4.589	2.911	1.053	13.84
200.	12.21	10.73	9.772	8.985	8.364	7.907	7.601	7.424	7.307	6.984	6.350	5.689	3.940	1.046	14.35
500.	12.06	10.75	9.813	9.046	8.449	8.022	7.759	7.649	7.661	7.337	6.882	5.442	4.042	1.042	14.78
1000.	11.98	10.76	9.827	9.068	8.480	8.065	7.816	7.733	7.796	7.922	7.827	7.556	6.444	1.040	14.97
2000.	11.93	10.76	9.834	9.079	8.496	8.087	7.849	7.778	7.868	8.072	8.121	8.005	7.249	1.040	15.09
5000.	11.92	10.76	9.833	9.082	8.506	8.102	7.864	7.792	7.925	8.175	8.302	8.314	7.985	1.039	15.18
10000.	11.88	10.77	9.840	9.088	8.509	8.105	7.874	7.815	7.928	8.203	8.379	8.431	8.291	1.039	15.21
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 56$															
0.001	0.921	0.997	1.077	1.159	1.246	1.339	1.440	1.549	1.634	1.673	1.696	1.706	1.711	1.713	1.160
0.002	1.584	1.685	1.791	1.903	2.021	2.142	2.262	2.373	2.463	2.520	2.519	2.513	2.537	2.545	1.834
0.005	2.916	3.115	3.276	3.399	3.499	3.593	3.680	3.758	3.822	3.868	3.904	3.915	3.911	3.073	
0.01	4.260	4.511	4.667	4.736	4.757	4.769	4.778	4.789	4.802	4.826	4.846	4.855	4.866	4.866	4.114
0.02	5.810	5.982	6.023	5.954	5.835	5.720	5.623	5.555	5.495	5.465	5.446	5.438	5.453	5.039	
0.05	8.077	7.722	7.373	7.039	6.724	6.431	6.167	5.938	5.756	5.614	5.566	5.546	5.683	5.681	5.919
0.1	9.352	8.861	8.110	7.444	6.901	6.452	6.069	5.739	5.452	5.185	5.070	5.035	4.999	4.951	6.331
0.2	10.65	9.395	8.322	7.412	6.648	6.013	5.478	5.016	4.622	4.255	4.050	3.916	3.949	3.929	6.463
0.5	11.70	9.662	8.096	6.873	5.903	5.112	4.441	3.860	3.310	2.843	2.634	2.557	2.481	2.439	6.532
1.	12.21	9.825	8.072	6.735	5.671	4.789	4.040	3.379	2.794	2.267	2.020	1.926	1.835	1.790	7.011
2.	12.51	10.07	8.315	6.963	5.878	4.977	4.196	3.481	2.824	2.179	1.833	1.687	1.548	1.482	7.983
3.	12.59	10.20	8.511	7.195	6.128	5.233	4.454	3.734	3.037	2.289	1.848	1.646	1.445	1.371	8.674
4.	12.56	10.31	8.683	7.380	6.322	5.449	4.692	3.975	3.256	2.425	1.904	1.660	1.398	1.310	9.187
5.	12.55	10.36	8.793	7.528	6.495	5.639	4.893	4.181	3.453	2.566	1.974	1.690	1.375	1.270	9.583
6.	12.54	10.39	8.880	7.649	6.639	5.799	5.065	4.362	3.631	2.701	2.051	1.730	1.366	1.240	9.904
8.	12.49	10.44	9.010	7.837	6.868	6.057	5.347	4.665	3.940	2.952	2.206	1.822	1.371	1.200	10.40
10.	12.51	10.49	9.093	7.956	7.023	6.248	5.568	4.903	4.191	3.217	2.360	1.882	1.380	1.174	10.78
15.	12.43	10.53	9.245	8.189	7.320	6.598	5.968	5.353	4.683	3.686	2.715	2.135	1.665	1.136	11.43
20.	12.38	10.55	9.338	8.336	7.511	6.829	6.238	5.668	5.042	4.052	3.024	2.381	1.565	1.116	11.87
30.	12.26	10.57	9.460	8.532	7.761	7.126	6.590	6.100	5.566	4.579	3.501	2.800	1.793	1.094	12.44
40.	12.25	10.59	9.523	8.633	7.900	7.304	6.814	6.375	5.905	3.908	3.150	1.980	1.083	12.82	
50.	12.25	10.61	9.566	8.699	7.993	7.427	6.970	6.570	6.151	5.317	4.246	3.453	2.155	1.076	13.09
60.	12.23	10.63	9.607	8.751	8.055	7.506	7.081	6.727	6.331	5.549	4.565	3.779	2.326	1.071	13.29
80.	12.22	10.66	9.651	8.818	8.148	7.629	7.239	6.957	6.613	5.935	5.010	4.220	2.640	1.066	13.59
100.	12.21	10.67	9.681	8.863	8.209	7.709	7.346	7.077	6.807	6.215	5.354	4.581	2.912	1.062	13.80
200.	12.19	10.70	9.740	8.956	8.340	7.885	7.575	7.388	7.297	6.971	6.326	5.668	3.931	1.055	14.31
500.	12.03	10.73	9.787	9.022	8.426	8.000	7.738	7.627	7.639	7.628	7.314	6.862	5.430	1.050	14.74
1000.	11.95	10.73	9.801	9.044	8.457	8.043	7.797	7.712	7.774	7.899	7.803	7.532	6.427	1.049	14.93
2000.	11.90	10.74	9.808	9.055	8.473	8.055	7.828	7.757	7.846	8.049	8.096	7.980	7.227	1.048	15.05
5000.	11.89	10.74	9.807	9.059	8.483	8.080	7.843	7.771	7.903	8.153	8.278	8.290	7.960	1.048	15.14
10000.	11.85	10.74	9.814	9.063	8.486	8.083	7.853	7.794	7.906	8.180	8.355	8.407	8.265	1.048	15.17
$k/T_1$	0.00	0.10	0.20	0.3											

370 TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections  
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$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 58$															
0.001	0.877	0.949	1.024	1.104	1.190	1.282	1.384	1.497	1.581	1.621	1.639	1.650	1.652	1.654	1.114
0.002	1.511	1.611	1.717	1.830	1.949	2.072	2.195	2.310	2.403	2.459	2.455	2.447	2.469	2.477	1.775
0.005	2.825	3.031	3.196	3.321	3.423	3.522	3.616	3.703	3.768	3.812	3.835	3.847	3.858	3.855	3.013
0.01	4.171	4.433	4.596	4.666	4.688	4.704	4.720	4.741	4.759	4.786	4.810	4.820	4.830	4.830	4.061
0.02	5.732	5.904	5.969	5.889	5.779	5.671	5.579	5.511	5.463	5.447	5.442	5.432	5.429	5.444	4.994
0.05	8.000	7.658	7.320	6.998	6.693	6.410	6.154	5.934	5.760	5.625	5.581	5.563	5.501	5.501	5.897
0.1	9.302	8.836	8.107	7.448	6.910	6.471	6.094	5.773	5.493	5.224	5.113	5.082	5.044	4.997	6.345
0.2	10.62	9.405	8.356	7.457	6.698	6.064	5.527	5.067	4.678	4.316	4.142	4.078	4.012	3.991	6.505
0.5	11.69	9.665	8.115	6.907	5.947	5.161	4.494	3.896	3.368	2.901	2.691	2.613	2.537	2.494	6.578
1.	12.18	9.823	8.085	6.757	5.699	4.823	4.077	3.548	2.836	2.311	2.064	1.970	1.877	1.832	7.045
2.	12.45	10.05	8.312	6.965	5.885	4.989	4.214	3.504	2.851	2.209	1.865	1.718	1.579	1.511	7.996
3.	12.53	10.15	8.477	7.175	6.120	5.233	4.459	3.744	3.053	2.313	1.874	1.672	1.470	1.394	8.663
4.	12.55	10.22	8.602	7.342	6.319	5.451	4.686	3.969	3.260	2.452	1.927	1.673	1.416	1.329	9.157
5.	12.55	10.26	8.701	7.479	6.482	5.633	4.880	4.168	3.451	2.593	1.995	1.696	1.389	1.287	9.542
6.	12.55	10.30	8.782	7.593	6.619	5.787	5.047	4.342	3.624	2.729	2.069	1.731	1.377	1.257	9.855
8.	12.40	10.37	8.947	7.782	6.823	6.023	5.323	4.650	3.934	2.959	2.221	1.858	1.588	1.216	10.35
10.	12.43	10.41	9.026	7.897	6.975	6.212	5.542	4.885	4.178	3.222	2.372	1.894	1.396	1.190	10.72
15.	12.55	10.46	9.177	8.129	7.268	6.557	5.937	5.329	4.664	3.685	2.722	2.145	1.479	1.152	11.36
20.	12.29	10.48	9.272	8.277	7.459	6.786	6.204	5.640	5.019	4.046	3.029	2.588	1.578	1.131	11.80
30.	12.17	10.50	9.396	8.475	7.711	7.081	6.552	6.067	5.540	4.565	3.499	2.804	1.804	1.110	12.37
40.	12.16	10.52	9.461	8.577	7.849	7.259	6.773	6.339	5.874	4.976	3.901	3.150	1.990	1.099	12.74
50.	12.15	10.54	9.504	8.644	7.942	7.381	6.928	6.532	6.118	5.295	4.235	3.450	2.163	1.093	13.01
60.	12.14	10.56	9.565	8.696	8.005	7.460	7.037	6.687	6.295	5.523	4.552	3.774	2.332	1.088	13.21
80.	12.13	10.59	9.591	8.764	8.097	7.583	7.197	6.893	6.571	5.905	4.995	4.212	2.637	1.082	13.51
100.	12.12	10.60	9.620	8.808	8.157	7.661	7.300	7.033	6.766	6.181	5.332	4.567	3.913	1.079	13.71
200.	12.11	10.64	9.679	8.900	8.288	7.835	7.527	7.342	7.231	6.929	6.293	5.643	3.923	1.072	14.22
500.	11.95	10.66	9.724	8.964	8.373	7.950	7.687	7.578	7.578	7.261	6.850	5.437	3.068	1.068	14.65
1000.	11.87	10.66	9.738	8.986	8.403	7.991	7.746	7.662	7.724	7.848	7.753	7.485	6.392	1.066	14.83
2000.	11.82	10.67	9.745	8.997	8.419	8.013	7.777	7.707	7.795	7.997	8.044	7.929	7.183	1.066	14.95
5000.	11.81	10.67	9.744	9.000	8.429	8.028	7.793	7.721	7.852	8.100	8.225	8.236	7.910	1.065	15.04
10000.	11.77	10.67	9.751	9.005	8.432	8.031	7.802	7.744	7.855	8.127	8.301	8.352	8.212	1.065	15.07
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 59$															
0.001	0.856	0.926	0.999	1.078	1.162	1.254	1.357	1.471	1.557	1.593	1.614	1.622	1.626	1.625	1.092
0.002	1.476	1.576	1.684	1.798	1.919	2.043	2.167	2.282	2.374	2.429	2.423	2.414	2.437	2.444	1.749
0.005	2.790	2.989	3.150	3.277	3.384	3.488	3.586	3.671	3.738	3.785	3.806	3.819	3.830	3.826	2.982
0.01	4.112	4.338	4.455	4.625	4.665	4.675	4.675	4.715	4.766	4.774	4.785	4.796	4.813	4.813	4.035
0.02	5.699	5.867	5.913	5.857	5.752	5.647	5.557	5.499	5.452	5.436	5.436	5.426	5.423	5.439	4.974
0.05	7.808	7.657	7.377	7.018	6.663	6.372	6.161	5.955	5.783	5.636	5.569	5.554	5.505	5.505	5.894
0.1	9.335	8.764	8.125	7.483	6.913	6.464	6.103	5.788	5.506	5.244	5.134	5.036	5.019	5.019	6.348
0.2	10.65	9.396	8.331	7.634	6.786	6.073	5.303	4.611	3.939	3.226	2.720	2.275	2.175	2.175	6.515
0.5	11.67	9.684	8.149	7.804	7.406	6.786	6.159	5.595	5.011	4.322	3.722	3.226	2.725	2.725	6.608
0.1	12.16	9.831	8.696	8.116	7.497	6.797	6.114	5.581	5.031	4.375	3.875	3.322	2.875	2.875	7.088
0.2	12.43	10.04	8.299	6.956	5.884	4.998	4.232	3.527	2.879	2.240	1.896	1.749	1.542	1.542	7.998
3.	12.49	10.15	8.484	7.177	6.117	5.230	4.461	3.752	3.065	2.324	1.885	1.683	1.482	1.482	8.667
4.	12.45	10.24	8.646	7.358	6.308	5.440	4.687	3.979	3.272	2.453	1.935	1.692	1.431	1.344	9.166
5.	12.43	10.29	8.753	7.504	6.478	5.623	4.879	4.176	3.461	2.588	2.001	1.718	1.406	1.302	9.553
6.	12.40	10.32	8.837	7.622	6.619	5.779	5.045	4.355	3.633	2.719	2.075	1.755	1.395	1.271	9.865
8.	12.34	10.36	8.937	7.858	6.824	6.016	5.308	4.636	3.932	2.970	2.235	1.854	1.405	1.278	10.33
10.	12.31	10.37	9.015	7.899	6.974	6.199	5.520	4.866	4.175	3.231	2.383	1.907	1.412	1.209	10.69
15.	12.22	10.40	9.154	8.119	7.258	6.538	5.908	5.302	4.652	3.687	2.729	2.154	1.493	1.171	11.32
20.	12.16	10.42	9.238	8.257	7.441	6.761	6.172	5.609	5.001	4.043	3.032	2.394	1.591	1.150	11.75
30.	12.05	10.43	9.347	8.438	7.678	7.048	6.516	6.033	5.513	4.553	3.497	2.808	1.816	1.129	12.30
40.	12.04	10.45	9.402	8.529	7.807	7.219	6.733	6.301	5.844	4.958	3.895	3.151	2.000	1.117	12.67
50.	12.04	10.46	9.439	8.588	7.893	7.336	6.885	6.492	6.085	5.273	4.225	3.447	2.172	1.111	12.93
60.	12.04	10.48	9.476	8.635	7.950	7.410	6.647	6.261	5.498	4.539	3.769	2.338	1.311	13.12	
80.	12.05	10.50	9.509	8.693	8.038	7.531	7.145	6.838	6.547	5.878	4.968	4.210	2.647	1.100	13.41
100.	12.04	10.52	9.537	8.735	8.095	7.607	7.246	6.976	6.740	6.151	5.302	4.559	3.916	1.097	13.61
200.	12.00	10.55	9.602	8.831	8.224	7.776	7.472	7.289	7.203	6.887	6.259	5.617	5.916	1.090	14.12
500.	11.85	10.57	9.647	8.893	8.307	7.888	7.627	7.520	7.336	7.526	7.216	6.812	5.415	4.866	14.54
1000.	11.77	10.58	9.661	8.914	8.336	7.928	7.665	7.602	7.684	7.791	7.701	7.438	6.359	5.084	14.72
2000.	11.73	10.58	9.667	8.925	8.352	7.949	7.715	7.646	7.753	7.935	7.986	7.874	7.140	5.083	14.83
5000.	11.71	10.58	9.666	8.928	8.361	7.963	7.730	7.659	7.808	8.035	8.160	8.174	7.856	5.083	14.92
10000.	11.68	10.58	9.673	8.933	8.365	7.967	7.738	7.682	7.792	8.061	8.239	8.273	8.131	5.083	14.95

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 371  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD	
$T_1$ (MeV)																
$Z = 61$																
0.001	0.812	0.881	0.953	1.029	1.111	1.202	1.306	1.422	1.508	1.546	1.562	1.571	1.570	1.570	1.050	
0.002	1.416	1.515	1.620	1.733	1.852	1.976	2.102	2.220	2.317	2.374	2.365	2.352	2.373	2.380	1.695	
0.005	2.714	2.911	3.073	3.201	3.312	3.420	3.524	3.614	3.683	3.731	3.752	3.764	3.775	3.771	2.924	
0.01	4.051	4.314	4.478	4.552	4.582	4.611	4.641	4.666	4.690	4.728	4.755	4.767	4.779	4.779	3.982	
0.02	5.599	5.789	5.848	5.798	5.696	5.596	5.513	5.461	5.424	5.416	5.420	5.412	5.411	5.428	4.931	
0.05	7.739	7.605	7.303	6.961	6.637	6.363	6.134	5.945	5.783	5.648	5.580	5.549	5.521	5.527	5.871	
0.1	9.247	8.793	8.092	7.456	6.929	6.495	6.128	5.812	5.537	5.284	5.176	5.144	5.110	5.062	6.361	
0.2	10.63	9.402	8.355	7.470	6.731	6.120	5.605	5.156	4.769	4.605	4.232	4.171	4.105	4.083	6.555	
0.5	11.65	9.692	8.172	6.976	6.021	5.236	4.571	3.977	3.453	2.987	2.777	2.698	2.621	2.579	6.654	
1.	12.13	9.850	8.123	6.809	5.754	4.876	4.130	3.479	2.901	2.577	2.130	2.055	1.942	1.896	7.105	
2.	12.37	10.02	8.296	6.959	5.888	5.004	4.241	3.558	2.892	2.255	1.912	1.765	1.624	1.558	8.010	
3.	12.41	10.12	8.465	7.165	6.110	5.229	4.466	3.764	3.082	2.347	1.910	1.709	1.508	1.437	8.661	
4.	12.37	10.19	8.612	7.335	6.293	5.431	4.684	3.982	3.282	2.471	1.957	1.715	1.455	1.371	9.147	
5.	12.34	10.23	8.711	7.474	6.456	5.609	4.871	4.174	3.467	2.603	2.021	1.739	1.427	1.327	9.523	
6.	12.30	10.25	8.790	7.587	6.593	5.760	5.033	4.344	3.635	2.731	2.092	1.774	1.415	1.296	9.828	
8.	12.23	10.29	8.909	7.764	6.809	6.005	5.300	4.631	3.929	2.971	2.240	1.860	1.416	1.254	10.30	
10.	12.25	10.33	8.984	7.876	6.957	6.186	5.510	4.858	4.170	3.230	2.386	1.912	1.423	1.226	10.66	
15.	12.16	10.36	9.121	8.094	7.239	6.522	5.895	5.291	4.644	3.684	2.730	2.158	1.503	1.186	11.29	
20.	12.10	10.37	9.204	8.230	7.419	6.743	6.156	5.596	4.991	4.038	3.033	2.398	1.600	1.164	11.71	
30.	11.99	10.38	9.313	8.410	7.654	7.027	6.497	6.017	5.500	4.545	3.496	2.811	1.823	1.141	12.27	
40.	11.99	10.41	9.368	8.500	7.782	7.196	6.713	6.284	5.829	4.949	3.892	3.152	2.007	1.129	12.62	
50.	11.99	10.43	9.412	8.559	7.860	7.301	6.861	6.484	6.050	5.245	4.270	3.489	2.161	1.122	12.88	
60.	11.98	10.45	9.442	8.605	7.923	7.386	6.970	6.627	6.243	5.486	4.533	3.767	2.342	1.117	15.08	
80.	11.97	10.46	9.482	8.666	8.009	7.504	7.126	6.829	6.514	5.862	4.968	4.198	2.644	1.111	15.37	
100.	11.97	10.48	9.509	8.707	8.066	7.579	7.226	6.965	6.705	6.133	5.299	4.547	2.916	1.107	15.57	
200.	11.95	10.51	9.567	8.798	8.194	7.748	7.445	7.264	7.179	6.866	6.242	5.605	3.912	1.100	14.07	
500.	11.80	10.53	9.611	8.859	8.276	7.858	7.599	7.492	7.168	6.509	7.501	7.194	6.792	5.404	1.095	14.48
1000.	11.73	10.54	9.624	8.880	8.305	7.988	7.656	7.574	7.636	7.763	7.675	7.615	6.342	1.093	14.66	
2000.	11.68	10.54	9.631	8.891	8.321	7.919	7.686	7.617	7.705	7.906	7.957	7.848	7.118	1.093	14.78	
5000.	11.67	10.54	9.630	8.894	8.330	7.933	7.701	7.630	7.759	8.005	8.130	8.144	7.830	1.092	14.86	
10000.	11.64	10.54	9.636	8.900	8.333	7.937	7.708	7.652	7.762	8.031	8.208	8.242	8.102	1.092	14.83	
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD	
$T_1$ (MeV)																
$Z = 62$																
0.001	0.793	0.861	0.931	1.006	1.087	1.177	1.281	1.398	1.484	1.521	1.537	1.546	1.544	1.544	1.030	
0.002	1.390	1.488	1.592	1.703	1.822	1.946	2.071	2.190	2.289	2.347	2.336	2.323	2.342	2.350	1.670	
0.005	2.675	2.866	3.028	3.162	3.279	3.390	3.493	3.584	3.657	3.705	3.725	3.737	3.748	3.745	2.895	
0.01	4.008	4.268	4.435	4.515	4.550	4.583	4.614	4.641	4.669	4.708	4.737	4.769	4.761	4.762	3.954	
0.02	5.561	5.761	5.823	5.770	5.666	5.569	5.492	5.444	5.409	5.406	5.411	5.404	5.421	4.911		
0.05	7.701	7.592	7.289	6.941	6.621	6.355	6.127	5.942	5.783	5.652	5.587	5.555	5.528	5.534	5.864	
0.1	9.226	8.766	8.084	7.457	6.934	6.503	6.139	5.825	5.554	5.303	5.196	5.166	5.132	5.083	6.365	
0.2	10.59	9.387	8.353	7.479	6.747	6.142	5.631	5.184	4.797	4.434	4.263	4.201	4.135	4.114	6.569	
0.5	11.64	9.708	8.196	6.999	6.041	5.259	4.597	4.005	3.481	3.016	2.806	2.727	2.649	2.606	6.680	
1.	12.12	9.841	8.159	6.823	5.767	4.891	4.148	3.499	2.923	2.399	2.152	2.057	1.963	1.917	7.126	
2.	12.33	10.000	8.278	6.952	5.014	4.245	3.549	2.906	2.272	1.926	1.781	1.640	1.573	8.012		
3.	12.35	10.11	8.447	7.144	6.101	5.236	4.474	3.764	3.086	2.367	1.921	1.717	1.519	1.447	8.655	
4.	12.34	10.16	8.586	7.324	6.291	5.427	4.677	3.981	3.289	2.489	1.966	1.714	1.461	1.379	9.135	
5.	12.31	10.20	8.690	7.460	6.446	5.597	4.859	4.170	3.472	2.623	2.028	1.732	1.430	1.334	9.509	
6.	12.28	10.24	8.772	7.572	6.577	5.743	5.017	4.337	3.639	2.753	2.098	1.764	1.416	1.302	9.813	
8.	12.22	10.28	8.895	7.746	6.787	5.982	5.281	4.621	3.930	2.997	2.246	1.844	1.414	1.259	10.29	
10.	12.22	10.31	8.969	7.862	6.962	6.171	5.496	4.847	4.168	3.234	2.391	1.917	1.429	1.232	10.66	
12.	12.13	10.34	9.104	8.077	7.221	6.503	5.877	5.278	4.637	3.684	2.733	2.162	1.509	1.192	11.27	
20.	12.07	10.35	9.186	8.211	7.400	6.723	6.137	5.581	4.982	4.036	3.034	2.400	1.606	1.171	11.69	
30.	11.96	10.38	9.300	8.382	7.617	6.994	6.475	5.998	5.467	4.562	3.528	2.814	1.802	1.149	12.23	
40.	11.94	10.39	9.353	8.473	7.746	7.163	6.690	6.265	5.793	4.953	3.924	3.164	1.990	1.137	12.59	
50.	11.94	10.40	9.385	8.532	7.832	7.276	6.838	6.465	6.035	5.233	4.259	3.499	2.172	1.130	12.84	
60.	11.93	10.41	9.410	8.575	7.895	7.361	6.948	6.607	6.226	5.474	4.526	3.764	2.345	1.125	13.04	
80.	11.92	10.42	9.446	8.634	7.981	7.478	7.102	6.807	6.494	5.847	4.959	4.193	2.646	1.119	13.32	
100.	11.92	10.44	9.471	8.674	8.038	7.553	7.202	6.942	6.684	5.289	4.540	2.916	1.116	13.52		
200.	11.89	10.47	9.534	8.767	8.163	7.718	7.421	7.251	7.143	6.849	6.218	5.578	3.937	1.108	14.02	
500.	11.75	10.49	9.575	8.826	8.244	7.828	7.572	7.466	7.480	7.477	7.179	6.743	5.365	1.104	14.43	
1000.	11.68	10.50	9.588	8.847	8.273	7.868	7.628	7.545	7.607	7.735	7.649	7.391	6.325	1.102	14.61	
2000.	11.64	10.50	9.594	8.857	8.290	7.890	7.655	7.589	7.674	7.882	7.924	7.788	7.121	1.102	14.72	
5000.	11.62	10.50	9.593	8.861	8.298	7.903	7.671	7.601	7.729	7.974	8.100	8.114	7.804	1.101	14.80	
10000.	11.59	10.50	9.599	8.866	8.302	7.907	7.679	7.623	7.732	8.000	8.177	8.211	8.073	1.101	14.83	
$k/T_1$	0.00	0.10	0.20</													

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
<b>T1 (MeV)</b>															
								Z = 64							
0.001	0.756	0.821	0.890	0.962	1.041	1.130	1.234	1.352	1.438	1.475	1.489	1.498	1.495	1.493	0.991
0.002	1.336	1.432	1.534	1.645	1.762	1.886	2.012	2.133	2.234	2.293	2.281	2.265	2.283	2.291	1.620
0.005	2.602	2.793	2.956	3.091	3.210	3.325	3.433	3.529	3.605	3.653	3.672	3.685	3.696	3.692	2.840
0.01	3.926	4.190	4.361	4.445	4.485	4.523	4.561	4.593	4.623	4.670	4.700	4.713	4.726	4.728	3.903
0.02	5.480	5.684	5.753	5.708	5.612	5.521	5.449	5.407	5.380	5.385	5.393	5.387	5.390	5.408	4.866
0.05	7.636	7.550	7.240	6.906	6.596	6.335	6.114	5.935	5.784	5.660	5.597	5.566	5.540	5.548	5.843
0.1	9.180	8.737	8.070	7.455	6.941	6.517	6.160	5.852	5.584	5.340	5.236	5.205	5.172	5.124	6.373
0.2	10.58	9.392	8.374	7.511	6.787	6.186	5.678	5.235	4.853	4.933	4.322	4.261	4.196	4.175	6.607
0.5	11.63	9.717	8.220	7.035	6.086	5.308	4.649	4.060	3.539	3.074	2.864	2.785	2.707	6.727	6.225
1.	12.10	9.838	8.149	6.844	5.796	4.925	4.186	3.540	2.967	2.444	2.197	2.102	2.007	1.960	7.161
2.	12.31	9.977	8.276	6.956	5.898	5.021	4.265	3.572	2.934	2.302	1.958	1.811	1.670	1.603	8.025
3.	12.32	10.06	8.426	7.141	6.097	5.225	4.471	3.780	3.110	2.383	1.947	1.746	1.566	1.473	8.650
4.	12.26	10.12	8.561	7.298	6.267	5.414	4.677	3.986	3.300	2.500	1.988	1.747	1.488	1.402	9.117
5.	12.22	10.15	8.652	7.428	6.621	5.582	4.854	4.169	3.476	2.626	2.048	1.768	1.458	1.356	9.481
6.	12.18	10.17	8.725	7.535	6.551	5.727	5.009	4.333	3.639	2.750	2.116	1.800	1.494	1.323	9.776
8.	12.11	10.20	8.836	7.704	6.759	5.963	5.267	4.611	3.923	2.983	2.259	1.883	1.443	1.279	10.24
10.	12.05	10.22	8.917	7.830	6.919	6.148	5.475	4.839	4.166	3.194	2.402	1.975	1.460	1.251	10.59
15.	12.02	10.26	9.037	8.021	7.174	6.465	5.846	5.254	4.622	3.683	2.739	2.171	1.525	1.211	11.20
20.	11.96	10.27	9.116	8.153	7.351	6.682	6.103	5.553	4.962	4.030	3.037	2.408	1.620	1.190	11.61
30.	11.85	10.28	9.220	8.328	7.581	6.961	6.438	5.966	5.461	4.526	3.492	2.817	1.841	1.167	12.16
40.	11.85	10.30	9.272	8.415	7.706	7.127	6.650	6.229	5.784	4.922	3.882	3.152	2.022	1.156	12.51
50.	11.84	10.32	9.316	8.473	7.781	7.250	6.795	6.425	6.003	5.212	4.249	3.497	2.180	1.149	12.76
60.	11.84	10.33	9.344	8.516	7.843	7.312	6.903	6.567	6.191	5.449	4.514	3.759	2.352	1.146	12.96
80.	11.83	10.35	9.381	8.575	7.927	7.428	7.056	6.764	6.456	5.818	4.942	4.184	2.650	1.138	13.26
100.	11.83	10.36	9.407	8.615	7.983	7.502	7.156	6.898	6.644	6.084	5.267	4.527	2.918	1.136	13.43
200.	11.81	10.40	9.464	8.704	8.107	7.666	7.367	7.189	7.107	6.803	6.192	5.568	3.902	1.127	13.92
500.	11.66	10.42	9.507	8.764	8.186	7.773	7.519	7.414	7.428	7.427	7.134	6.704	5.343	1.123	14.33
1000.	11.59	10.42	9.520	8.784	8.215	7.813	7.574	7.492	7.554	7.682	7.598	7.343	6.292	1.121	14.51
2000.	11.55	10.43	9.526	8.795	8.230	7.833	7.602	7.534	7.621	7.821	7.874	7.768	7.053	1.120	14.62
5000.	11.54	10.43	9.525	8.798	8.239	7.847	7.617	7.546	7.674	7.917	8.042	8.057	7.752	1.120	14.70
10000.	11.51	10.43	9.531	8.803	8.243	7.850	7.624	7.568	7.677	7.943	8.118	8.152	8.017	1.120	14.73
<b>T1 (MeV)</b>															
								Z = 65							
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
<b>T1 (MeV)</b>															
								Z = 65							
0.001	0.739	0.803	0.870	0.941	1.019	1.108	1.211	1.329	1.416	1.453	1.466	1.474	1.471	1.469	0.973
0.002	1.310	1.405	1.507	1.617	1.734	1.857	1.983	2.105	2.207	2.267	2.254	2.238	2.255	2.263	1.596
0.005	2.566	2.757	2.921	3.057	3.178	3.295	3.404	3.501	3.578	3.627	3.647	3.660	3.670	3.666	2.814
0.01	3.886	4.151	4.324	4.411	4.454	4.495	4.534	4.569	4.603	4.650	4.682	4.695	4.709	4.710	3.878
0.02	5.439	5.647	5.719	5.678	5.584	5.496	5.428	5.389	5.365	5.373	5.384	5.379	5.382	5.400	4.847
0.05	7.604	7.502	7.219	6.886	6.578	6.326	6.107	5.932	5.784	5.663	5.602	5.571	5.566	5.554	5.832
0.1	9.158	8.723	8.062	7.451	6.941	6.524	6.171	5.864	5.599	5.358	5.255	5.192	5.144	5.177	6.377
0.2	10.56	9.393	8.389	7.533	6.812	6.212	5.703	5.260	4.879	4.522	4.353	4.291	4.226	4.204	6.627
0.5	11.62	9.723	8.233	7.050	6.104	5.330	4.675	4.088	3.568	3.104	2.893	2.814	2.736	2.693	6.750
1.	12.09	9.839	8.155	6.851	5.805	4.939	4.205	3.561	2.988	2.467	2.220	2.124	2.029	1.982	7.178
2.	12.28	9.963	8.273	6.960	5.904	5.028	4.273	3.584	2.948	2.317	1.974	1.827	1.686	1.618	8.032
3.	12.25	10.05	8.430	7.131	6.980	5.217	4.476	3.788	3.120	2.391	1.960	1.764	1.559	1.483	8.646
4.	12.22	10.09	8.536	7.280	6.255	5.407	4.675	3.989	3.306	2.509	1.998	1.757	1.498	1.410	9.103
5.	12.18	10.12	8.621	7.403	6.403	5.571	4.849	4.169	3.481	2.633	2.056	1.776	1.466	1.363	9.460
6.	12.13	10.13	8.690	7.507	6.529	5.713	5.002	4.331	3.642	2.756	2.123	1.808	1.452	1.330	9.751
8.	12.06	10.16	8.796	7.670	6.733	5.945	5.257	4.607	3.925	2.987	2.265	1.889	1.450	1.286	10.21
10.	12.00	10.17	8.874	7.794	6.890	6.128	5.463	4.833	4.165	3.197	2.407	1.980	1.466	1.258	10.55
15.	11.97	10.21	8.992	7.982	7.143	6.442	5.832	5.246	4.618	3.681	2.741	2.176	1.531	1.218	11.16
20.	11.91	10.22	9.071	8.113	7.318	6.657	6.087	5.543	4.956	4.027	3.037	2.411	1.626	1.197	11.57
30.	11.80	10.23	9.176	8.289	7.548	6.935	6.420	5.953	5.451	4.519	3.491	2.818	1.846	1.175	12.11
40.	11.79	10.25	9.231	8.378	7.674	7.101	6.630	5.753	5.771	4.913	3.878	3.152	2.027	1.164	12.46
50.	11.79	10.28	9.278	8.437	7.748	7.203	6.774	6.408	5.987	5.201	4.244	3.495	2.184	1.157	12.72
60.	11.78	10.29	9.305	8.482	7.812	7.286	6.880	6.547	6.174	5.637	4.507	3.757	2.355	1.153	12.91
80.	11.78	10.31	9.343	8.541	7.897	7.421	7.031	6.741	6.437	5.804	4.933	4.179	2.652	1.147	13.19
100.	11.77	10.32	9.368	8.581	7.952	7.474	7.127	6.874	6.623	6.068	5.256	4.521	2.919	1.144	13.38
200.	11.74	10.35	9.427	8.670	8.073	7.634	7.342	7.175	7.070	6.775	6.184	5.562	3.903	1.136	13.87
500.	11.61	10.37	9.466	8.726	8.152	7.741	7.486	7.382	7.400	7.398	7.103	6.714	5.360	1.132	14.27
1000.	11.54	10.38	9.478	8.746	8.179	7.779	7.541	7.460	7.522	7.651	7.571	7.319	6.275	1.131	14.45
5000.	11.49	10.38	9.483	8.759	8.203	7.812	7.583	7.513	7.640	7.883	8.008	8.024	7.724	1.130	14.64
10000.	11.46	10.38	9.489	8.764	8.206	7.816	7.590	7.643	7.643	7.907	8.083	8.117	7.985	1.129	14.66
<b>T1 (MeV)</b>															
								Z = 66							
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
<b>T1 (MeV)</b>															
								Z = 66							
0.001	0.722	0.785	0.851	0.921	0.998	1.086	1.189	1.307	1.395	1.431	1.444	1.451	1.448	1.446	0.955
0.002	1.286	1.379	1.480	1.589	1.706	1.829	1.955	2.078	2.181	2.242	2.228	2.211	2.227	2.236	1.573
0.005	2.532	2.722	2.886	3.023	3.145	3.263	3.375	3.474	3.553	3.602	3.621	3.634	3.645	3.641	2.787
0.01	3.847	4.113	4.288	4.377	4.423	4.466	4.508	4.545	4.581	4.630					

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 373  
See page 349 for Explanation of Tables

k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
T1 (MeV)															
Z = 67															
0.001	0.706	0.768	0.833	0.902	0.978	1.065	1.168	1.286	1.373	1.410	1.422	1.429	1.425	1.424	0.938
0.002	1.262	1.355	1.455	1.563	1.679	1.802	1.928	2.050	2.155	2.217	2.202	2.185	2.200	2.209	1.551
0.005	2.499	2.687	2.850	2.989	3.113	3.234	3.347	3.447	3.527	3.577	3.596	3.610	3.621	3.617	2.761
0.01	3.810	4.074	4.250	4.342	4.392	4.438	4.482	4.521	4.560	4.610	4.645	4.659	4.674	4.675	3.828
0.02	5.363	5.576	5.654	5.618	5.550	5.448	5.386	5.353	5.335	5.350	5.364	5.360	5.364	5.384	4.805
0.05	7.541	7.450	7.178	6.853	6.551	6.305	6.093	5.924	5.783	5.669	5.610	5.580	5.556	5.565	5.813
0.1	9.112	8.693	8.048	7.449	6.947	6.537	6.190	5.888	5.629	5.393	5.292	5.262	5.231	5.183	6.384
0.2	10.52	9.383	8.397	7.555	6.845	6.252	5.750	5.311	4.933	4.579	4.411	4.351	4.286	4.265	6.659
0.5	11.60	9.741	8.267	7.089	6.145	5.576	4.727	4.146	3.625	3.163	2.952	2.873	2.795	2.752	6.799
1.	12.05	9.843	8.174	6.875	5.833	4.972	4.245	3.603	3.033	2.512	2.265	2.169	2.074	2.027	7.215
2.	12.24	9.942	8.261	6.957	5.910	5.039	4.289	3.606	2.977	2.349	2.006	1.858	1.717	1.649	8.043
3.	12.24	10.01	8.394	7.117	6.081	5.218	4.475	3.797	3.139	2.419	1.985	1.784	1.583	1.509	8.642
4.	12.20	10.06	8.506	7.257	6.238	5.392	4.663	3.990	3.320	2.537	2.018	1.768	1.516	1.433	9.090
5.	12.15	10.09	8.593	7.376	6.378	5.551	4.836	4.166	3.488	2.650	2.076	1.795	1.487	1.385	9.440
6.	12.10	10.10	8.659	7.475	6.500	5.688	4.984	4.323	3.645	2.770	2.140	1.826	1.471	1.351	9.726
8.	12.03	10.12	8.760	7.634	6.698	5.915	5.234	4.592	3.923	2.997	2.279	1.904	1.467	1.306	10.17
10.	11.96	10.13	8.834	7.754	6.852	6.094	5.435	4.815	4.159	3.203	2.418	1.994	1.483	1.278	10.51
15.	11.92	10.16	8.945	7.936	7.099	6.403	5.798	5.221	4.605	3.682	2.748	2.185	1.546	1.238	11.11
20.	11.85	10.17	9.019	8.064	7.272	6.615	6.050	5.513	4.937	4.022	3.041	2.418	1.640	1.217	11.51
30.	11.72	10.19	9.132	8.231	7.482	6.878	6.377	5.917	5.405	4.530	3.523	2.823	1.832	1.195	12.04
40.	11.69	10.20	9.183	8.321	7.610	7.044	6.586	6.175	5.720	4.909	3.908	3.165	2.015	1.184	12.39
50.	11.69	10.21	9.215	8.379	7.695	7.154	6.730	6.368	5.954	5.180	4.235	3.493	2.192	1.177	12.63
60.	11.69	10.22	9.240	8.422	7.757	7.236	6.835	6.506	6.138	5.413	4.495	3.752	2.362	1.172	12.83
80.	11.68	10.23	9.275	8.480	7.842	7.350	6.984	6.698	6.398	5.775	4.915	4.169	2.658	1.167	13.10
100.	11.68	10.24	9.299	8.519	7.896	7.422	7.079	6.828	6.581	6.035	5.235	4.508	2.921	1.163	13.29
200.	11.65	10.27	9.358	8.606	8.014	7.578	7.282	7.123	7.023	6.743	6.135	5.516	3.920	1.156	13.77
500.	11.52	10.30	9.397	8.662	8.091	7.683	7.432	7.329	7.345	7.065	6.645	6.311	5.152	1.152	14.17
1000.	11.46	10.30	9.409	8.682	8.119	7.721	7.485	7.405	7.467	7.596	7.518	7.271	6.242	1.150	14.34
2000.	11.41	10.31	9.415	8.692	8.134	7.741	7.513	7.445	7.532	7.731	7.786	7.685	6.987	1.150	14.45
5000.	11.41	10.31	9.414	8.695	8.142	7.755	7.527	7.457	7.583	7.824	7.949	7.966	7.671	1.149	14.53
10000.	11.37	10.30	9.421	8.701	8.146	7.756	7.534	7.479	7.588	7.846	8.020	8.071	7.953	1.149	14.56
k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
T1 (MeV)															
Z = 68															
0.001	0.695	0.752	0.815	0.884	0.959	1.045	1.147	1.265	1.354	1.385	1.404	1.407	1.403	1.402	0.921
0.002	1.223	1.326	1.432	1.540	1.652	1.770	1.896	2.033	2.137	2.174	2.180	2.182	2.183	2.183	1.528
0.005	2.474	2.656	2.816	2.954	3.080	3.233	3.319	3.421	3.501	3.552	3.572	3.585	3.597	3.592	2.736
0.01	3.827	4.058	4.199	4.294	4.363	4.418	4.460	4.494	4.537	4.592	4.626	4.641	4.656	4.657	3.805
0.02	5.355	5.565	5.602	5.567	5.510	5.462	5.362	5.332	5.318	5.352	5.350	5.355	5.374	4.786	
0.05	7.450	7.389	7.175	6.861	6.540	6.280	6.081	5.925	5.785	5.669	5.615	5.584	5.560	5.570	5.799
0.1	9.059	8.681	8.042	7.448	6.953	6.564	6.198	5.900	5.643	5.410	5.310	5.281	5.250	5.202	6.387
0.2	10.55	9.398	8.404	7.560	6.853	6.267	5.771	5.357	4.961	4.607	4.461	4.381	4.317	4.295	6.677
0.5	11.62	9.745	8.275	7.108	6.171	5.403	4.752	4.170	3.655	3.193	2.983	2.903	2.824	2.782	6.824
1.	12.04	9.839	8.180	6.891	5.853	4.991	4.261	3.624	3.056	2.536	2.289	2.193	2.096	2.049	7.234
2.	12.20	9.931	8.260	6.956	5.908	5.042	4.297	3.618	2.990	2.364	2.022	1.875	1.733	1.665	8.047
3.	12.19	9.983	8.377	7.109	6.078	5.218	4.477	3.801	3.147	2.431	1.997	1.797	1.596	1.524	8.634
4.	12.12	10.03	8.489	7.245	6.229	5.390	4.667	3.992	3.322	2.537	2.031	1.790	1.533	1.448	9.076
5.	12.08	10.05	8.567	7.360	6.369	5.545	4.832	4.164	3.490	2.656	2.085	1.806	1.499	1.400	9.421
6.	12.03	10.06	8.630	7.457	6.489	5.681	4.979	4.320	3.645	2.774	2.148	1.835	1.483	1.366	9.703
8.	11.95	10.08	8.728	7.612	6.684	5.904	5.226	4.587	3.921	2.999	2.285	1.912	1.478	1.320	10.15
10.	11.89	10.09	8.801	7.730	6.835	6.082	5.426	4.808	4.155	3.204	2.423	2.001	1.493	1.292	10.48
15.	11.86	10.12	8.910	7.909	7.079	6.387	5.787	5.211	4.596	3.680	2.751	2.189	1.554	1.251	11.08
20.	11.79	10.13	8.984	8.035	7.249	6.597	6.036	5.502	4.927	4.019	3.042	2.421	1.648	1.229	11.48
30.	11.67	10.13	9.083	8.206	7.474	6.869	6.361	5.904	5.413	4.500	3.488	2.825	1.866	1.207	12.00
40.	11.66	10.14	9.133	8.290	7.595	6.567	5.657	5.727	4.887	3.869	3.154	2.045	1.195	12.35	
50.	11.65	10.16	9.174	8.346	7.669	7.130	6.707	6.348	5.938	5.170	4.230	3.492	2.197	1.188	12.59
60.	11.64	10.17	9.200	8.388	7.728	7.210	6.811	6.485	6.121	5.401	4.489	3.750	2.366	1.183	12.78
80.	11.62	10.19	9.236	8.445	7.810	7.321	6.958	6.675	6.378	5.760	4.907	4.165	2.659	1.177	13.05
100.	11.62	10.20	9.260	8.483	7.863	7.392	7.052	6.804	6.560	6.019	5.224	4.501	2.922	1.174	13.24
200.	11.61	10.23	9.314	8.567	7.981	7.548	7.256	7.084	7.008	6.718	6.127	5.518	3.887	1.166	13.72
500.	11.47	10.25	9.356	8.626	8.056	7.649	7.399	7.299	7.315	7.322	7.042	6.625	5.300	1.162	14.11
1000.	11.40	10.26	9.367	8.643	8.083	7.687	7.453	7.373	7.435	7.565	7.491	7.246	6.224	1.160	14.28
2000.	11.36	10.26	9.373	8.653	8.097	7.707	7.480	7.412	7.499	7.698	7.755	7.656	6.965	1.160	14.39
5000.	11.35	10.26	9.372	8.656	8.106	7.720	7.493	7.426	7.549	7.790	7.914	7.931	7.641	1.159	14.46
10000.	11.32	10.26	9.378	8.660	8.108	7.723	7.502	7.445	7.551	7.813	8.037	7.924	1.159	14.49	
k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.7							

374 TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 70$															
0.001	0.662	0.721	0.783	0.849	0.923	1.007	1.108	1.224	1.311	1.348	1.360	1.367	1.362	1.360	0.889
0.002	1.196	1.286	1.384	1.490	1.604	1.725	1.850	1.973	2.080	2.143	2.129	2.111	2.125	2.134	1.487
0.005	2.404	2.590	2.753	2.892	3.018	3.143	3.262	3.368	3.451	3.503	3.524	3.539	3.550	3.545	2.685
0.01	3.700	3.967	4.146	4.263	4.298	4.352	4.405	4.451	4.495	4.551	4.589	4.605	4.620	4.622	3.754
0.02	5.251	5.467	5.554	5.550	5.453	5.379	5.322	5.298	5.289	5.313	5.332	5.328	5.334	5.356	4.742
0.05	7.458	7.366	7.119	6.820	6.517	6.265	6.066	5.914	5.782	5.673	5.621	5.591	5.569	5.579	5.781
0.1	9.046	8.648	8.026	7.445	6.957	6.555	6.216	5.922	5.670	5.462	5.345	5.316	5.286	5.238	6.394
0.2	10.50	9.583	8.414	7.588	6.890	6.308	5.815	5.384	5.013	4.664	4.498	4.439	4.376	4.354	6.708
0.5	11.58	9.755	8.305	7.145	6.212	5.449	4.805	4.226	3.713	3.254	3.043	2.964	2.885	2.842	6.871
1.	12.03	9.841	8.193	6.913	5.881	5.024	4.299	3.666	3.101	2.583	2.356	2.239	2.143	2.095	7.271
2.	12.18	9.913	8.248	6.953	5.913	5.052	4.313	3.640	3.018	2.396	2.054	1.906	1.764	1.695	8.060
3.	12.16	9.953	8.352	7.091	6.067	5.214	4.479	3.811	3.165	2.455	2.022	1.821	1.621	1.549	8.629
4.	12.07	9.989	8.457	7.218	6.209	5.376	4.660	3.994	3.333	2.556	2.051	1.811	1.554	1.472	9.057
5.	12.01	9.999	8.527	7.327	6.342	5.526	4.820	4.160	3.495	2.671	2.102	1.824	1.518	1.423	9.392
6.	11.96	10.00	8.585	7.420	6.458	5.657	4.962	4.312	3.647	2.786	2.163	1.851	1.500	1.388	9.667
8.	11.87	10.01	8.675	7.569	6.647	5.875	5.204	4.574	3.917	3.007	2.297	1.926	1.694	1.342	10.10
10.	11.80	10.01	8.743	7.683	6.796	6.049	5.400	4.791	4.147	3.208	2.433	2.013	1.508	1.312	10.43
15.	11.75	10.06	8.846	7.856	7.035	6.350	5.755	5.187	4.583	3.679	2.757	2.199	1.568	1.271	11.01
20.	11.68	10.04	8.917	7.980	7.202	6.557	6.001	5.474	4.908	4.013	3.045	2.429	1.660	1.249	11.40
30.	11.56	10.04	9.014	8.147	7.423	6.824	6.322	5.870	5.388	4.487	3.486	2.829	1.878	1.227	11.92
40.	11.55	10.06	9.063	8.230	7.542	6.983	6.121	5.697	4.869	3.863	3.154	2.055	1.216	1.226	
50.	11.54	10.08	9.105	8.284	7.612	7.080	6.662	6.309	5.905	5.149	4.221	3.490	2.206	1.209	12.50
60.	11.53	10.09	9.130	8.326	7.672	7.159	6.765	6.444	6.086	5.377	4.476	3.745	2.374	1.204	12.69
80.	11.53	10.11	9.164	8.381	7.752	7.268	6.909	6.630	6.339	5.732	4.889	4.155	2.664	1.198	12.96
100.	11.52	10.12	9.188	8.418	7.804	7.337	7.001	6.757	6.518	5.987	5.203	4.488	2.925	1.194	13.15
200.	11.49	10.15	9.246	8.503	7.918	7.488	7.203	7.042	6.950	6.675	6.089	5.482	3.900	1.187	13.61
500.	11.38	10.17	9.282	8.558	7.993	7.588	7.341	7.242	7.259	7.269	6.996	6.586	5.279	1.183	14.00
1000.	11.31	10.17	9.292	8.576	8.019	7.626	7.393	7.315	7.377	7.508	7.437	7.197	6.191	1.181	14.17
2000.	11.27	10.18	9.298	8.586	8.033	7.646	7.420	7.353	7.439	7.637	7.696	7.600	6.921	1.181	14.27
5000.	11.26	10.18	9.297	8.587	8.041	7.658	7.433	7.364	7.489	7.728	7.851	7.869	7.587	1.180	14.35
10000.	11.23	10.18	9.303	8.591	8.043	7.661	7.385	7.490	7.750	7.919	7.974	7.862	1.180	1.180	14.38
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 71$															
0.001	0.653	0.706	0.767	0.833	0.906	0.989	1.089	1.204	1.293	1.325	1.343	1.346	1.342	1.341	0.874
0.002	1.160	1.260	1.362	1.469	1.579	1.695	1.821	1.959	2.065	2.101	2.108	2.110	2.110	2.111	1.466
0.005	2.381	2.561	2.721	2.860	2.988	3.115	3.236	3.341	3.422	3.478	3.502	3.515	3.527	3.523	2.661
0.01	3.720	3.951	4.096	4.196	4.272	4.334	4.383	4.423	4.470	4.533	4.569	4.586	4.602	4.604	3.732
0.02	5.259	5.440	5.514	5.496	5.430	5.358	5.301	5.281	5.302	5.318	5.323	5.345	5.323	5.345	4.726
0.05	7.354	7.308	7.109	6.810	6.500	6.249	6.058	5.913	5.784	5.674	5.623	5.594	5.572	5.582	5.769
0.1	8.992	8.636	8.019	7.441	6.958	6.562	6.225	5.930	5.677	5.457	5.363	5.333	5.303	5.256	6.395
0.2	10.52	9.393	8.422	7.596	6.901	6.324	5.837	5.410	5.042	4.693	4.526	4.468	4.405	4.384	6.727
0.5	11.60	9.764	8.316	7.161	6.234	5.473	4.829	4.253	3.741	3.283	3.074	2.994	2.916	2.873	6.895
1.	12.01	9.841	8.202	6.924	5.895	5.041	4.318	3.688	3.125	2.607	2.360	2.263	2.166	2.119	7.290
2.	12.14	9.899	8.245	6.953	5.915	5.057	4.321	3.652	3.033	2.412	2.070	1.922	1.780	1.711	8.064
3.	12.12	9.930	8.339	7.083	6.062	5.211	4.480	3.817	3.176	2.466	2.033	1.832	1.634	1.562	8.623
4.	12.03	9.961	8.438	7.205	6.200	5.371	4.658	3.995	3.339	2.565	2.060	1.820	1.565	1.484	9.046
5.	11.97	9.970	8.505	7.310	6.330	5.516	4.814	4.160	3.500	2.678	2.110	1.832	1.528	1.434	9.377
6.	11.92	9.976	8.562	7.401	6.443	5.645	4.955	4.309	3.650	2.792	2.170	1.858	1.510	1.399	9.648
8.	11.83	9.983	8.650	7.566	6.628	5.860	5.193	4.568	3.917	3.010	2.302	1.932	1.503	1.352	10.08
10.	11.83	10.01	8.709	7.640	6.756	6.020	5.381	4.775	4.141	3.255	2.435	1.971	1.504	1.323	10.40
15.	11.72	10.01	8.819	7.830	7.010	6.328	5.758	5.176	4.578	3.678	2.759	2.202	1.575	1.282	10.98
20.	11.65	10.02	8.889	7.952	7.176	6.534	5.982	5.460	4.908	4.013	3.046	2.431	1.667	1.260	11.37
30.	11.54	10.03	8.988	8.112	7.385	6.792	6.239	5.850	5.354	4.505	3.518	2.830	1.857	1.238	11.89
40.	11.52	10.04	9.058	8.197	7.505	6.949	6.502	6.111	5.656	4.857	3.912	3.194	2.031	1.226	
50.	11.50	10.05	9.072	8.255	7.587	7.056	6.640	6.289	5.888	5.138	4.216	3.489	2.210	1.219	12.46
60.	11.49	10.06	9.097	8.296	7.645	7.134	6.742	6.423	6.068	5.365	4.470	3.743	2.377	1.214	12.65
80.	11.48	10.07	9.132	8.352	7.725	7.243	6.886	6.609	6.319	5.717	4.881	4.151	2.667	1.209	12.92
100.	11.48	10.08	9.156	8.389	7.776	7.312	6.977	6.735	6.497	5.970	5.192	4.482	2.927	1.205	13.10
200.	11.45	10.11	9.212	8.472	7.890	7.462	7.176	7.017	6.926	6.652	6.073	5.484	3.899	1.198	13.57
500.	11.35	10.13	9.243	8.522	7.964	7.564	7.314	7.203	7.245	7.250	6.962	6.570	5.273	1.193	13.95
1000.	11.27	10.14	9.259	8.544	7.991	7.599	7.367	7.289	7.350	7.481	7.411	7.173	6.174	6.192	14.12
2000.	11.23	10.14	9.265	8.553	8.005	7.619	7.392	7.328	7.410	7.615	7.663	7.544	6.923	1.191	14.22
5000.	11.22	10.14	9.264	8.556	8.013	7.631	7.407	7.338	7.462	7.700	7.823	7.841	7.561	1.191	14.30
10000.	11.19	10.14	9.270	8.561	8.015	7.633	7.415	7.358	7.464	7.722	7.890	7.945	7.834	1.191	14.33
$k/T_1$	0.00	0.10	0.20												

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 375  
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$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 73$															
0.001	0.627	0.679	0.738	0.803	0.874	0.955	1.053	1.166	1.254	1.288	1.305	1.309	1.305	1.305	0.845
0.002	1.123	1.219	1.320	1.424	1.533	1.650	1.776	1.912	2.016	2.057	2.062	2.068	2.066	2.067	1.427
0.005	2.324	2.501	2.660	2.801	2.930	3.057	3.177	3.285	3.373	3.432	3.453	3.465	3.481	3.478	2.612
0.01	3.652	3.882	4.029	4.132	4.212	4.278	4.330	4.376	4.427	4.494	4.530	4.565	4.568	4.568	3.684
0.02	5.188	5.372	5.450	5.435	5.377	5.319	5.272	5.247	5.268	5.276	5.299	5.306	5.303	5.323	4.684
0.05	7.291	7.256	7.067	6.776	6.473	6.230	6.045	5.903	5.780	5.674	5.632	5.611	5.580	5.588	5.768
0.1	8.944	8.607	8.003	7.437	6.962	6.569	6.236	5.949	5.703	5.489	5.387	5.353	5.332	5.291	6.398
0.2	10.49	9.389	8.432	7.618	6.932	6.362	5.880	5.458	5.093	4.747	4.586	4.552	4.466	4.462	6.758
0.5	11.59	9.776	8.342	7.197	6.275	5.518	4.878	4.307	3.800	3.346	3.136	3.056	2.978	2.936	6.942
1.	11.98	9.841	8.217	6.947	5.923	5.074	4.558	5.731	5.172	2.655	2.409	2.312	2.214	2.165	7.327
2.	12.07	9.883	8.234	6.948	5.920	5.069	4.333	5.674	5.062	2.443	2.102	1.955	1.811	1.744	8.074
3.	12.02	9.905	8.328	7.064	6.041	5.204	4.488	3.828	3.189	2.486	2.062	1.868	1.663	1.590	8.615
4.	11.96	9.910	8.398	7.175	6.179	5.358	4.653	3.997	3.347	2.583	2.087	1.850	1.593	1.508	9.023
5.	11.90	9.914	8.458	7.273	6.302	5.498	4.804	4.156	3.502	2.693	2.137	1.863	1.556	1.456	9.345
6.	11.85	9.916	8.509	7.357	6.409	5.622	4.941	4.301	3.648	2.805	2.197	1.891	1.538	1.421	9.610
8.	11.75	9.917	8.593	7.499	6.590	5.831	5.174	4.556	3.912	3.015	2.321	1.963	1.545	1.374	10.03
10.	11.68	9.920	8.657	7.607	6.732	5.999	5.363	4.768	4.138	3.212	2.452	2.046	1.561	1.345	10.35
15.	11.64	9.944	8.756	7.773	6.961	6.288	5.707	5.154	4.565	3.670	2.784	2.246	1.603	1.304	10.92
20.	11.58	9.950	8.825	7.893	7.124	6.490	5.947	5.433	4.881	3.999	3.066	2.469	1.692	1.282	11.31
30.	11.47	9.959	8.923	8.052	7.332	6.746	6.260	5.817	5.327	4.492	3.527	2.849	1.875	1.259	11.82
40.	11.44	9.972	8.972	8.137	7.452	6.901	6.461	6.074	5.625	4.840	3.916	3.193	2.043	1.248	12.15
50.	11.42	9.979	9.008	8.197	7.534	7.008	6.596	6.249	5.856	5.116	4.210	3.493	2.220	1.241	12.39
60.	11.41	9.987	9.034	8.239	7.593	7.086	6.697	6.381	6.032	5.340	4.458	3.739	2.385	1.256	12.57
80.	11.39	10.00	9.068	8.293	7.672	7.193	6.837	6.567	6.283	5.686	4.861	4.140	2.668	1.230	12.83
100.	11.40	10.01	9.087	8.329	7.725	7.264	6.926	6.677	6.468	5.940	5.160	4.471	2.932	1.227	13.02
200.	11.36	10.04	9.148	8.415	7.834	7.409	7.128	6.969	6.876	6.614	6.056	5.446	3.899	1.220	13.47
500.	11.27	10.06	9.178	8.463	7.908	7.511	7.262	7.153	7.194	7.199	6.916	6.530	5.251	1.215	13.85
1000.	11.19	10.07	9.194	8.484	7.934	7.546	7.315	7.237	7.298	7.428	7.359	7.122	6.140	1.214	14.02
2000.	11.15	10.07	9.200	8.493	7.948	7.564	7.341	7.275	7.359	7.556	7.615	7.521	6.854	1.213	14.12
5000.	11.14	10.07	9.199	8.496	7.956	7.577	7.354	7.286	7.409	7.645	7.768	7.786	7.508	1.213	14.20
10000.	11.11	10.07	9.205	8.501	7.958	7.580	7.362	7.306	7.410	7.667	7.833	7.888	7.779	1.213	14.22
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 74$															
0.001	0.613	0.666	0.724	0.788	0.859	0.940	1.036	1.147	1.233	1.273	1.285	1.291	1.287	1.286	0.831
0.002	1.115	1.203	1.299	1.403	1.515	1.635	1.758	1.880	1.986	2.050	2.039	2.023	2.037	2.046	1.410
0.005	2.293	2.469	2.629	2.771	2.902	3.030	3.150	3.259	3.348	3.409	3.430	3.443	3.460	3.457	2.588
0.01	3.620	3.807	3.972	4.108	4.208	4.269	4.304	4.341	4.393	4.476	4.518	4.526	4.550	4.550	3.657
0.02	5.137	5.333	5.418	5.408	5.352	5.296	5.251	5.229	5.232	5.262	5.286	5.293	5.291	5.311	4.663
0.05	7.468	7.214	6.960	6.716	6.482	6.262	6.063	5.890	5.754	5.662	5.647	5.643	5.590	5.590	5.737
0.1	8.924	8.594	7.994	7.433	6.963	6.574	6.263	5.958	5.715	5.503	5.403	5.368	5.307	5.400	6.768
0.2	10.45	9.364	8.426	7.624	6.946	6.381	5.901	5.481	5.117	4.774	4.615	4.560	4.495	4.471	6.966
0.5	11.58	9.783	8.355	7.215	6.295	5.541	4.003	4.335	3.830	3.377	3.167	3.086	3.010	2.968	7.347
1.	11.97	9.846	8.226	6.226	6.958	5.936	5.091	4.377	3.753	3.195	2.680	2.434	2.337	2.189	7.347
2.	12.05	9.852	8.228	6.954	5.925	5.083	4.340	3.688	3.077	2.459	2.119	1.971	1.827	1.759	8.076
3.	11.96	9.871	8.311	7.057	6.039	5.204	4.490	3.833	3.198	2.499	2.075	1.880	1.675	1.600	8.608
4.	11.88	9.868	8.376	7.165	6.175	5.356	4.651	3.997	3.352	2.593	2.098	1.861	1.603	1.516	9.007
5.	11.81	9.864	8.433	7.261	6.296	5.493	4.799	4.153	3.504	2.701	2.146	1.872	1.565	1.463	9.324
6.	11.75	9.862	8.481	7.344	6.402	5.616	4.933	4.296	3.648	2.811	2.206	1.899	1.547	1.427	9.585
8.	11.65	9.858	8.562	7.483	6.581	5.823	5.164	4.548	3.909	3.019	2.328	1.970	1.553	1.380	9.999
10.	11.57	9.859	8.625	7.591	6.722	5.988	5.351	4.757	4.133	3.214	2.458	2.053	1.569	1.352	10.32
15.	11.53	9.883	8.722	7.755	6.948	6.274	5.691	5.139	4.555	3.670	2.787	2.250	1.610	1.311	10.88
20.	11.48	9.892	8.791	7.873	7.109	6.476	5.929	5.417	4.870	3.996	3.067	2.472	1.699	1.290	11.27
30.	11.38	9.898	8.885	8.033	7.322	6.735	6.243	5.802	5.334	4.665	3.492	2.849	1.910	1.268	11.78
40.	11.37	9.916	8.935	8.115	7.439	6.890	6.460	5.636	4.835	3.856	3.163	2.081	1.257	12.11	
50.	11.37	9.940	8.976	8.170	7.510	6.985	6.574	6.229	5.839	5.105	4.205	3.492	2.224	1.251	12.34
60.	11.36	9.951	9.003	8.211	7.567	7.062	6.675	6.361	6.014	5.328	4.452	3.737	2.388	1.246	12.53
80.	11.35	9.968	9.039	8.266	7.645	7.169	6.816	6.543	6.260	5.674	4.852	4.133	2.673	1.241	12.79
100.	11.37	9.980	9.056	8.299	7.697	7.238	6.902	6.655	6.447	5.923	5.149	4.465	2.933	1.237	12.97
200.	11.32	10.01	9.116	8.383	7.807	7.385	7.102	6.944	6.855	6.587	6.023	5.450	3.890	1.231	13.43
500.	11.21	10.03	9.151	8.436	7.881	7.483	7.239	7.140	7.157	7.168	6.903	6.505	5.236	1.226	13.80
1000.	11.15	10.03	9.162	8.454	7.906	7.519	7.289	7.212	7.273	7.402	7.333	7.099	6.124	1.225	13.97
2000.	11.11	10.03	9.168	8.463	7.920	7.538	7.315	7.249	7.333	7.529	7.588	7.495	6.832	1.224	14.07
5000.	11.10	10.03	9.167	8.466	7.928	7.551	7.328	7.260	7.382	7.617	7.740	7.759	7.484	1.224	14.15
10000.	11.07	10.04	9.141	8.441	7.903	7.526	7.310	7.255	7.358	7.613	7.778	7.831	7.716	1.235	14.12
$k/T_1$	0.00	0.10</													

376 TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections  
 See page 349 for Explanation of Tables

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
<b>T1 (MeV)</b>															
Z = 76															
0.001	0.592	0.663	0.700	0.762	0.831	0.910	1.003	1.111	1.197	1.235	1.252	1.255	1.253	1.252	0.805
0.002	1.070	1.165	1.263	1.364	1.471	1.586	1.711	1.844	1.946	1.991	2.000	2.005	2.004	2.007	1.373
0.005	2.244	2.418	2.573	2.714	2.847	2.975	3.094	3.205	3.298	3.365	3.389	3.400	3.420	3.416	2.563
0.01	3.555	3.781	3.930	4.039	4.126	4.197	4.252	4.305	4.363	4.434	4.473	4.490	4.511	4.514	3.614
0.02	5.071	5.292	5.351	5.339	5.300	5.257	5.220	5.200	5.202	5.233	5.260	5.269	5.263	5.287	4.625
0.05	7.175	7.221	6.988	6.701	6.436	6.213	6.029	5.884	5.770	5.675	5.632	5.615	5.585	5.594	5.719
0.1	8.877	8.568	7.977	7.425	6.966	6.583	6.253	5.973	5.737	5.533	5.432	5.396	5.382	5.339	6.403
0.2	10.45	9.374	8.440	7.643	6.972	6.614	5.942	5.527	5.167	4.827	4.670	4.617	4.553	4.529	6.800
0.5	11.57	9.791	8.380	7.248	6.335	5.585	4.952	4.390	3.890	3.461	3.232	3.151	3.075	3.034	7.013
1.	11.94	9.842	8.238	6.980	5.965	5.126	4.418	3.798	3.243	2.730	2.484	2.387	2.288	2.239	7.384
2.	12.01	9.834	8.219	6.952	5.928	4.355	3.710	3.106	2.491	2.152	2.004	1.860	1.793	8.088	
3.	11.92	9.845	8.289	7.039	6.026	5.196	4.489	3.840	3.216	2.524	2.102	1.907	1.703	1.630	8.601
4.	11.85	9.838	8.345	7.136	6.149	5.335	4.639	3.996	3.363	2.614	2.121	1.885	1.629	1.544	8.989
5.	11.79	9.842	8.403	7.224	6.254	5.452	4.770	4.149	3.520	2.728	2.163	1.880	1.586	1.491	9.298
6.	11.73	9.841	8.450	7.301	6.352	5.567	4.899	4.288	3.661	2.839	2.221	1.902	1.565	1.454	9.553
8.	11.63	9.840	8.526	7.429	6.519	5.765	5.123	4.532	3.913	3.051	2.349	1.971	1.557	1.407	9.958
10.	11.56	9.839	8.584	7.530	6.653	5.927	5.309	4.737	4.129	3.247	2.481	2.052	1.568	1.378	10.27
15.	11.50	9.836	8.666	7.696	6.892	6.226	5.653	5.114	4.543	3.672	2.795	2.262	1.630	1.337	10.82
20.	11.43	9.838	8.731	7.812	7.052	6.424	5.889	5.387	4.853	3.993	3.071	2.481	1.716	1.315	11.20
30.	11.31	9.851	8.833	7.968	7.252	6.674	6.198	5.766	5.289	4.474	3.525	2.856	1.896	1.293	11.70
40.	11.29	9.863	8.883	8.055	7.374	6.832	6.395	6.009	5.585	4.831	3.887	3.177	2.070	1.281	12.03
50.	11.28	9.874	8.915	8.112	7.455	6.937	6.531	6.190	5.805	5.084	4.196	3.490	2.236	1.275	12.27
60.	11.28	9.886	8.939	8.151	7.514	7.016	6.632	6.319	5.977	5.304	4.440	3.733	2.397	1.270	12.45
80.	11.27	9.899	8.976	8.210	7.595	7.122	6.771	6.500	6.220	5.644	4.835	4.124	2.679	1.265	12.71
100.	11.28	9.911	8.995	8.244	7.646	7.190	6.856	6.610	6.405	5.890	5.128	4.452	2.936	1.261	12.89
200.	11.24	9.940	9.053	8.326	7.754	7.333	7.053	6.896	6.808	6.544	5.990	5.424	3.884	1.254	13.54
500.	11.15	9.956	9.082	8.374	7.826	7.433	7.187	7.078	7.119	7.125	6.847	6.469	5.216	1.250	13.71
1000.	11.07	9.962	9.098	8.395	7.852	7.467	7.258	7.161	7.222	7.351	7.283	7.050	6.090	1.248	13.87
2000.	11.03	9.964	9.104	8.405	7.865	7.486	7.263	7.199	7.280	7.481	7.530	7.415	6.813	1.248	13.97
5000.	11.03	9.965	9.103	8.407	7.873	7.498	7.277	7.209	7.330	7.564	7.686	7.705	7.432	1.247	14.05
10000.	11.00	9.967	9.109	8.412	7.876	7.501	7.284	7.229	7.332	7.586	7.755	7.789	7.668	1.247	14.03
<b>T1 (MeV)</b>															
<b>Z = 77</b>															
0.001	0.582	0.631	0.688	0.750	0.818	0.896	0.988	1.093	1.178	1.218	1.238	1.237	1.236	1.236	0.792
0.002	1.054	1.168	1.245	1.346	1.451	1.565	1.690	1.821	1.923	1.970	1.980	1.985	1.985	1.989	1.356
0.005	2.219	2.392	2.546	2.687	2.820	2.949	3.068	3.180	3.274	3.341	3.367	3.379	3.400	3.396	2.521
0.01	3.523	3.749	3.899	4.009	4.097	4.170	4.227	4.282	4.342	4.414	4.454	4.471	4.492	4.496	3.591
0.02	5.036	5.260	5.320	5.311	5.275	5.234	5.200	5.182	5.186	5.218	5.246	5.255	5.249	5.273	6.605
0.05	7.144	7.196	6.967	6.685	6.423	6.203	6.021	5.878	5.767	5.674	5.632	5.615	5.586	5.595	7.009
0.1	8.857	8.553	7.969	7.422	6.966	6.587	6.259	5.983	5.748	5.566	5.447	5.411	5.397	5.354	6.405
0.2	10.44	9.371	8.443	7.652	6.985	6.430	5.961	5.549	5.192	4.854	4.698	4.581	4.558	4.816	
0.5	11.56	9.793	8.389	7.263	6.354	5.608	4.977	4.617	3.920	3.473	3.265	3.184	3.108	3.066	7.055
1.	11.93	9.840	8.243	6.990	5.979	5.143	4.438	3.821	3.268	2.756	2.510	2.413	2.344	2.425	7.403
2.	11.99	9.825	8.215	6.951	5.930	5.083	4.363	3.722	3.120	2.508	2.169	2.020	1.876	1.808	8.095
3.	11.90	9.831	8.277	7.030	6.020	5.194	4.490	3.845	3.224	2.535	2.113	1.919	1.715	1.642	8.598
4.	11.83	9.819	8.329	7.122	6.158	5.328	4.635	3.996	3.367	2.621	2.129	1.893	1.639	1.557	8.979
5.	11.76	9.818	8.382	7.207	6.261	5.442	4.763	4.146	3.522	2.733	2.168	1.886	1.595	1.503	9.282
6.	11.70	9.815	8.427	7.282	6.357	5.555	4.889	4.283	3.660	2.842	2.225	1.908	1.573	1.466	9.534
8.	11.60	9.810	8.499	7.407	6.500	5.750	5.111	4.524	3.910	3.052	2.352	1.975	1.565	1.418	9.934
10.	11.52	9.807	8.555	7.506	6.633	5.910	5.294	4.727	4.124	3.246	2.483	2.056	1.576	1.388	10.24
15.	11.40	9.807	8.655	7.679	6.868	6.203	5.639	5.108	4.526	3.662	2.806	2.269	1.622	1.347	10.79
20.	11.34	9.809	8.719	7.794	7.026	6.400	5.874	5.380	4.832	3.982	3.083	2.486	1.712	1.326	11.17
30.	11.28	9.818	8.800	7.939	7.227	6.652	6.179	5.749	5.276	4.467	3.523	2.858	1.903	1.304	11.67
40.	11.25	9.829	8.851	8.026	7.349	6.809	6.375	5.990	5.570	4.822	3.884	3.177	2.076	1.293	11.99
50.	11.24	9.840	8.884	8.083	7.430	6.913	6.510	6.170	5.788	5.073	4.192	3.489	2.239	1.286	12.23
60.	11.23	9.851	8.909	8.124	7.489	6.992	6.610	6.298	5.959	5.291	4.434	3.731	2.401	1.281	12.41
80.	11.22	9.864	8.946	8.183	7.569	7.098	6.748	6.478	6.200	5.629	4.826	4.120	2.682	1.276	12.67
100.	11.24	9.875	8.964	8.216	7.621	7.166	6.833	6.588	6.384	5.873	5.117	4.446	2.938	1.273	12.85
200.	11.20	9.905	9.023	8.299	7.727	7.307	7.028	6.873	6.785	6.523	5.972	5.399	3.880	1.266	13.29
500.	11.11	9.921	9.050	8.345	7.798	7.407	7.162	7.053	7.094	7.101	6.824	6.468	5.205	1.262	13.66
1000.	11.03	9.927	9.067	8.366	7.824	7.441	7.213	7.136	7.196	7.325	7.258	7.027	6.073	1.261	13.82
2000.	10.99	9.930	9.072	8.375	7.838	7.459	7.237	7.174	7.255	7.455	7.304	7.190	6.791	1.260	13.92
5000.	10.99	9.930	9.071	8.378	7.845	7.471	7.251	7.184	7.305	7.537	7.659	7.678	7.406	1.259	14.00
10000.	10.96	9.933	9.077	8.383	7.848	7.474	7.259	7.204	7.306	7.559	7.724	7.776	7.662	1.259	14.03
<b>T1 (MeV)</b>															
Z = 78															
0.001	0.572	0.621	0.677	0.738	0.805	0.882	0.973	1.076	1.160	1.201	1.218	1.222	1.221	1.221	0.780
0.002	1.038	1.132	1.228	1.328	1.433	1.546	1.668	1.799	1.900	1.949	1.961	1.967	1.971	1.971	1.340
0.005	2.194	2.366	2.519	2.660	2.794	2.922	3.043	3.155	3.249	3.318	3.347	3.361	3.377	3.377	2.699
0.01	3.493	3.718	3.868	3.979	4.068	4.143	4.202	4.259	4.321	4.394	4.435	4.452	4.473	4.478	3.568
0.02	5.003	5.228	5.290	5.283	5.249	5.211	5.180	5.164	5.170	5.204	5.232	5.240	5.238	5.260	4.584
0.05	7.116	7.172	6.947	6.669	6.410	6.193	6.014	5.873	5.764	5.672	5.632	5.614	5		

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 377  
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$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$Z = 79$															
$T_1$ (MeV)															
0.001	0.562	0.611	0.666	0.727	0.793	0.869	0.938	1.059	1.143	1.185	1.202	1.206	1.206	1.206	0.769
0.002	1.024	1.116	1.212	1.311	1.415	1.526	1.648	1.776	1.878	1.929	1.942	1.948	1.949	1.954	1.323
0.005	2.170	2.341	2.494	2.634	2.768	2.897	3.016	3.129	3.225	3.297	3.326	3.340	3.360	3.358	2.478
0.01	3.463	3.687	3.838	3.949	4.040	4.116	4.177	4.236	4.299	4.375	4.416	4.434	4.455	4.459	3.545
0.02	4.971	5.195	5.260	5.255	5.224	5.189	5.160	5.146	5.154	5.189	5.217	5.226	5.223	5.246	4.564
0.05	7.088	7.146	6.927	6.653	6.398	6.183	6.006	5.868	5.760	5.671	5.632	5.615	5.591	5.596	5.688
0.1	8.810	8.524	7.953	7.415	6.967	6.595	6.272	6.000	5.770	5.571	5.474	5.441	5.421	5.385	6.407
0.2	10.41	9.362	8.449	7.669	7.010	6.461	5.996	5.590	5.238	4.906	4.752	4.700	4.641	4.615	6.840
0.5	11.55	9.802	8.411	7.295	6.393	5.652	5.026	4.472	3.981	3.539	3.332	3.252	3.176	3.136	7.082
1.	11.91	9.845	8.259	7.014	6.009	5.177	4.476	3.865	3.317	2.808	2.562	2.465	2.366	2.315	7.494
2.	11.95	9.804	8.207	6.952	5.936	5.093	4.377	3.743	3.150	2.541	2.202	2.054	1.909	1.843	8.106
3.	11.83	9.787	8.252	7.016	6.013	5.191	4.491	3.853	3.241	2.559	2.140	1.945	1.741	1.671	8.589
4.	11.75	9.763	8.291	7.100	6.121	5.307	4.615	3.997	3.587	2.846	2.146	1.904	1.657	1.581	8.954
5.	11.67	9.751	8.334	7.177	6.220	5.424	4.747	4.139	3.527	2.748	2.187	1.906	1.612	1.526	9.248
6.	11.61	9.742	8.373	7.246	6.312	5.533	4.869	4.271	3.662	2.855	2.242	1.926	1.588	1.489	9.492
8.	11.51	9.730	8.437	7.365	6.471	5.723	5.085	4.506	3.905	3.061	2.366	1.990	1.577	1.441	9.883
10.	11.43	9.724	8.489	7.460	6.600	5.881	5.265	4.705	4.115	3.252	2.495	2.068	1.585	1.412	10.19
15.	11.32	9.724	8.585	7.629	6.831	6.170	5.605	5.080	4.510	3.661	2.814	2.281	1.635	1.371	10.73
20.	11.25	9.728	8.650	7.742	6.986	6.364	5.837	5.349	4.812	3.976	3.088	2.495	1.720	1.350	11.10
30.	11.19	9.742	8.734	7.886	7.184	6.612	6.139	5.713	5.249	4.956	3.523	2.862	1.912	1.328	11.59
40.	11.17	9.756	8.784	7.971	7.301	6.764	6.334	5.961	5.536	4.786	3.897	3.211	2.076	1.317	11.92
50.	11.16	9.769	8.821	8.029	7.581	6.868	6.467	6.131	5.754	5.052	4.183	3.487	2.248	1.311	12.15
60.	11.15	9.779	8.847	8.070	7.639	6.944	6.565	6.259	5.923	5.266	4.422	3.726	2.609	1.306	12.33
80.	11.14	9.796	8.884	8.126	7.517	7.049	6.703	6.436	6.161	5.599	4.808	4.110	2.689	1.301	12.58
100.	11.16	9.806	8.901	8.159	7.567	7.117	6.786	6.544	6.343	5.805	4.433	2.943	1.298	12.76	
200.	11.11	9.835	8.960	8.240	7.673	7.255	6.979	6.825	6.739	6.481	5.937	5.374	5.874	1.291	13.20
500.	11.01	9.851	8.991	8.289	7.743	7.354	7.113	7.014	7.039	7.035	6.788	6.458	5.200	1.287	13.57
1000.	10.95	9.857	9.002	8.306	7.768	7.388	7.162	7.085	7.145	7.274	7.208	6.979	6.038	1.285	13.73
2000.	10.92	9.860	9.008	8.316	7.781	7.406	7.187	7.122	7.204	7.397	7.456	7.366	6.722	1.285	13.83
5000.	10.91	9.860	9.007	8.318	7.790	7.418	7.199	7.132	7.252	7.483	7.604	7.624	7.356	1.284	13.90
10000.	10.88	9.862	9.012	8.323	7.792	7.420	7.207	7.152	7.253	7.504	7.668	7.720	7.607	1.284	13.88
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$Z = 80$															
$T_1$ (MeV)															
0.001	0.552	0.601	0.656	0.716	0.782	0.857	0.944	1.043	1.125	1.169	1.186	1.191	1.191	1.192	0.757
0.002	1.009	1.101	1.196	1.294	1.397	1.508	1.628	1.754	1.856	1.910	1.924	1.931	1.931	1.938	1.307
0.005	2.147	2.316	2.469	2.609	2.742	2.871	2.991	3.104	3.201	3.275	3.307	3.320	3.344	3.340	2.457
0.01	3.433	3.656	3.807	3.920	4.012	4.090	4.152	4.213	4.278	4.355	4.397	4.414	4.437	4.441	3.523
0.02	4.958	5.163	5.230	5.228	5.199	5.166	5.139	5.128	5.138	5.174	5.202	5.212	5.203	5.231	4.564
0.05	7.059	7.122	6.907	6.637	6.385	6.173	5.999	5.862	5.756	5.668	5.630	5.616	5.588	5.595	5.677
0.1	8.788	8.509	7.944	7.411	6.967	6.598	6.278	6.009	5.780	5.583	5.487	5.453	5.439	5.398	6.408
0.2	10.40	9.359	8.452	7.677	7.022	6.475	6.013	5.610	5.262	4.932	4.779	4.728	4.667	4.644	6.853
0.5	11.54	9.803	8.422	7.314	6.415	5.673	5.048	4.500	4.013	3.572	3.367	3.287	3.211	3.170	7.105
1.	11.90	9.842	8.265	7.025	6.023	5.194	4.497	3.889	3.342	2.834	2.589	2.491	2.392	2.343	7.463
2.	11.92	9.793	8.203	6.951	5.937	5.097	4.385	3.755	3.164	2.557	2.219	2.071	1.927	1.858	8.112
3.	11.80	9.768	8.240	7.008	6.008	5.188	4.491	3.856	3.249	2.572	2.153	1.959	1.757	1.683	8.584
4.	11.72	9.740	8.274	7.087	6.110	5.298	4.610	3.996	3.391	2.657	2.158	1.916	1.674	1.594	8.943
5.	11.64	9.724	8.314	7.160	6.207	5.412	4.737	4.134	3.529	2.757	2.197	1.917	1.630	1.539	9.231
6.	11.57	9.713	8.349	7.227	6.297	5.519	4.858	4.264	3.661	2.862	2.251	1.936	1.606	1.501	9.472
8.	11.47	9.699	8.410	7.342	6.452	5.707	5.071	4.496	3.902	3.065	2.373	2.000	1.596	1.453	9.858
10.	11.39	9.691	8.460	7.436	6.580	5.162	5.250	4.693	4.110	3.255	2.501	2.078	1.606	1.423	10.16
15.	11.27	9.689	8.555	7.602	6.809	6.150	5.587	5.065	4.501	3.662	2.817	2.285	1.654	1.382	10.70
20.	11.21	9.693	8.619	7.715	6.963	6.343	5.819	5.333	4.801	3.975	3.089	2.498	1.737	1.361	11.07
30.	11.15	9.707	8.703	7.858	7.159	6.590	6.119	5.696	5.236	4.499	3.521	2.865	1.924	1.340	11.56
40.	11.13	9.722	8.754	7.943	7.277	6.742	6.313	5.942	5.478	4.778	3.894	3.211	2.084	1.330	11.88
50.	11.12	9.735	8.791	8.001	7.357	6.845	6.446	6.111	5.737	5.062	4.178	3.486	2.254	1.323	12.11
60.	11.11	9.747	8.818	8.043	7.414	6.921	6.543	6.238	5.905	5.254	4.416	3.724	2.413	1.319	12.29
80.	11.10	9.764	8.855	8.099	7.492	7.026	6.681	6.414	5.848	4.799	4.106	2.690	1.313	12.54	
100.	11.12	9.774	8.872	8.132	7.542	7.093	6.764	6.522	6.322	5.805	4.427	2.963	1.310	12.72	
200.	11.07	9.802	8.930	8.213	7.647	7.231	6.956	6.802	6.716	6.459	5.920	5.361	3.871	1.303	13.16
500.	10.97	9.818	8.961	8.261	7.717	7.329	7.089	6.990	7.015	7.011	6.765	6.438	5.189	1.299	13.52
1000.	10.91	9.824	8.972	8.279	7.743	7.363	7.138	7.061	7.121	7.249	7.183	6.955	6.021	1.298	13.68
2000.	10.88	9.827	8.975	8.288	7.755	7.381	7.163	7.098	7.180	7.372	7.431	7.341	6.700	1.297	13.78
5000.	10.87	9.827	8.977	8.291	7.763	7.393	7.175	7.108	7.227	7.457	7.578	7.598	7.350	1.297	13.85
10000.	10.84	9.792	8.943	8.252	7.717	7.339	7.114	7.038	7.225	7.461	7.642	7.694	7.581	1.297	13.88
$k/T_1$	0.00	0.10	0.20	0.30	0.										

378 TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections  
See page 349 for Explanation of Tables

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
<b>T1</b> (MeV)															
<b>Z = 82</b>															
0.001	0.535	0.583	0.636	0.696	0.761	0.834	0.917	1.011	1.091	1.138	1.156	1.161	1.164	1.165	0.736
0.002	0.983	1.073	1.166	1.264	1.366	1.473	1.589	1.711	1.812	1.871	1.898	1.905	1.908	1.277	
0.005	2.102	2.270	2.420	2.559	2.691	2.819	3.042	3.055	3.156	3.233	3.268	3.283	3.297	3.305	2.415
0.01	3.375	3.597	3.748	3.862	3.954	4.034	4.104	4.168	4.235	4.315	4.358	4.376	4.394	4.404	3.478
0.02	4.884	5.084	5.180	5.186	5.150	5.116	5.094	5.095	5.107	5.141	5.171	5.181	5.194	5.200	4.504
0.05	7.002	7.073	6.865	6.607	6.364	6.155	5.983	5.850	5.747	5.663	5.626	5.612	5.600	5.594	5.656
0.1	8.745	8.680	7.924	7.402	6.969	6.605	6.290	6.025	5.799	5.605	5.513	5.477	5.442	5.426	6.409
0.2	10.39	9.353	8.455	7.687	7.038	6.499	6.044	5.647	5.307	4.983	4.832	4.783	4.728	4.688	6.877
0.5	11.54	9.815	8.444	7.343	6.452	5.718	5.099	4.555	4.074	3.640	3.437	3.357	3.279	3.243	7.153
1.	11.89	9.838	8.273	7.046	6.054	5.252	4.558	3.935	3.393	2.888	2.644	2.547	2.448	2.396	7.503
2.	11.87	9.774	8.196	6.948	5.937	5.103	4.399	3.777	3.195	2.592	2.254	2.105	1.961	1.893	8.123
3.	11.74	9.730	8.215	6.992	5.997	5.182	4.491	3.864	3.267	2.598	2.180	1.984	1.780	1.715	8.575
4.	11.63	9.690	8.241	7.060	6.092	5.293	4.612	3.992	3.391	2.671	2.185	1.948	1.692	1.621	8.920
5.	11.56	9.668	8.270	7.127	6.181	5.390	4.721	4.127	3.536	2.776	2.216	1.932	1.639	1.564	9.199
6.	11.49	9.651	8.300	7.188	6.265	5.493	4.837	4.252	3.664	2.878	2.267	1.948	1.611	1.526	9.432
8.	11.38	9.630	8.353	7.296	6.414	5.675	5.044	4.479	3.900	3.079	2.386	2.007	1.595	1.478	9.807
10.	11.31	9.619	8.399	7.385	6.537	5.826	5.220	4.672	4.103	3.266	2.512	2.082	1.601	1.449	10.10
15.	11.19	9.614	8.489	7.566	6.760	6.108	5.553	5.039	4.487	3.665	2.826	2.289	1.646	1.409	10.63
20.	11.12	9.620	8.553	7.657	6.912	6.299	5.781	5.303	4.782	3.973	3.094	2.500	1.731	1.388	10.99
30.	11.07	9.638	8.640	7.801	7.107	6.544	6.079	5.662	5.210	4.440	3.520	2.864	1.926	1.366	11.48
40.	11.04	9.656	8.690	7.888	7.226	6.697	6.271	5.897	5.493	4.780	3.869	3.177	2.100	1.355	11.80
50.	11.04	9.670	8.732	7.947	7.306	6.799	6.405	6.072	5.704	5.020	4.170	3.484	2.262	1.349	12.03
60.	11.03	9.683	8.760	7.990	7.364	6.875	6.500	6.198	5.869	5.229	4.404	3.720	2.423	1.345	12.21
80.	11.02	9.701	8.798	8.047	7.443	6.980	6.636	6.372	6.102	5.554	4.782	4.099	2.700	1.340	12.46
100.	11.04	9.712	8.815	8.080	7.494	7.047	6.719	6.478	6.280	5.789	5.063	4.416	2.951	1.336	12.64
200.	11.00	9.738	8.871	8.159	7.598	7.184	6.910	6.756	6.671	6.417	5.886	5.335	3.861	1.330	13.07
500.	10.90	9.754	8.903	8.207	7.666	7.281	7.042	6.944	6.968	6.963	6.720	6.396	5.164	1.326	13.43
1000.	10.84	9.760	8.914	8.225	7.692	7.315	7.091	7.015	7.074	7.200	7.134	6.909	5.991	1.325	13.59
2000.	10.81	9.763	8.920	8.234	7.705	7.333	7.115	7.051	7.132	7.322	7.380	7.292	6.661	1.324	13.69
5000.	10.80	9.763	8.918	8.237	7.713	7.345	7.128	7.061	7.179	7.408	7.527	7.545	7.278	1.323	13.76
10000.	10.77	9.765	8.924	8.241	7.715	7.347	7.136	7.081	7.181	7.429	7.591	7.643	7.533	1.323	13.79
<b>T1</b> (MeV)															
<b>Z = 83</b>															
0.001	0.526	0.574	0.628	0.687	0.751	0.823	0.905	0.995	1.074	1.123	1.141	1.147	1.151	1.152	0.726
0.002	0.970	1.059	1.152	1.249	1.350	1.456	1.570	1.690	1.790	1.853	1.873	1.883	1.890	1.893	1.263
0.005	2.080	2.267	2.397	2.535	2.667	2.795	2.917	3.030	3.130	3.212	3.250	3.265	3.280	3.288	2.395
0.01	3.347	3.567	3.719	3.833	3.927	4.008	4.074	4.145	4.214	4.295	4.339	4.357	4.376	4.386	3.456
0.02	4.852	5.053	5.150	5.159	5.125	5.093	5.074	5.076	5.090	5.125	5.155	5.165	5.178	5.185	4.483
0.05	6.976	7.049	8.486	8.646	8.760	8.844	8.924	8.992	9.059	9.138	9.183	9.193	9.199	9.208	5.646
0.1	8.726	8.466	7.917	7.399	6.967	6.608	6.295	6.032	5.800	5.639	5.524	5.489	5.455	5.439	6.410
0.2	10.37	9.348	8.456	7.693	7.049	6.512	6.059	5.666	5.724	5.824	5.924	5.984	5.858	5.826	6.888
0.5	11.53	9.816	8.455	7.361	6.473	5.758	5.758	5.758	5.758	5.758	5.758	5.758	5.758	5.758	7.176
1.	11.87	9.840	8.283	7.058	6.088	5.248	4.559	3.959	3.419	2.916	2.672	2.275	2.074	1.729	8.570
2.	11.85	9.761	8.190	6.946	5.946	5.101	4.407	3.789	3.210	2.699	2.271	1.978	1.913	1.827	8.127
3.	11.70	9.709	8.200	6.982	5.992	5.180	4.491	3.868	3.275	2.609	2.192	1.997	1.793	1.729	8.570
4.	11.61	9.669	8.223	7.047	6.079	5.274	4.595	3.995	3.408	2.868	2.189	1.946	1.700	1.634	8.908
5.	11.51	9.642	8.252	7.111	6.166	5.379	4.716	4.124	3.538	2.781	2.224	1.942	1.649	1.576	9.182
6.	11.44	9.624	8.280	7.248	6.268	5.492	4.824	4.224	3.652	2.875	2.287	1.984	1.638	1.552	9.393
8.	11.33	9.600	8.331	7.276	6.395	5.602	4.924	4.324	3.572	2.779	2.239	1.967	1.666	1.590	9.167
10.	11.25	9.583	8.376	7.573	6.760	5.904	5.204	4.604	3.804	3.004	2.424	1.904	1.645	1.573	9.432
15.	11.14	9.553	8.425	7.487	6.709	6.066	5.516	5.008	4.480	3.671	2.821	2.293	1.675	1.433	10.05
20.	11.08	9.557	8.486	7.596	6.861	6.255	5.742	5.268	4.772	3.974	3.085	2.504	1.760	1.413	10.93
30.	10.97	9.562	8.580	7.755	7.070	6.507	6.041	5.632	5.206	4.402	3.482	2.869	1.973	1.592	11.42
40.	10.97	9.593	8.638	7.836	7.178	6.653	6.230	5.860	4.763	3.863	3.178	2.113	1.382	1.173	11.73
50.	10.97	9.608	8.674	7.894	7.258	6.755	6.362	6.034	5.670	4.999	4.161	3.483	2.272	1.376	11.96
60.	10.96	9.621	8.703	7.938	7.316	6.830	6.458	6.158	5.833	5.204	4.392	3.716	2.432	1.372	12.14
80.	10.95	9.640	8.741	7.995	7.395	6.935	6.593	6.330	5.663	5.524	4.764	4.090	2.707	1.367	12.39
100.	10.97	9.652	8.760	8.028	7.445	7.001	6.675	6.436	5.239	5.755	5.091	4.403	2.954	1.365	12.56
200.	10.93	9.677	8.814	8.107	7.549	7.137	6.864	6.712	6.626	6.374	5.310	3.855	3.157	2.997	12.99
500.	10.83	9.696	8.848	8.155	7.644	7.268	7.045	6.969	6.707	6.027	5.755	5.140	3.852	3.155	13.35
1000.	10.78	9.704	8.861	8.175	7.644	7.268	7.045	6.969	6.707	6.027	5.755	5.140	3.862	3.155	13.50
2000.	10.74	9.706	8.867	8.185	7.659	7.287	7.070	7.005	7.086	7.274	7.331	7.242	6.617	1.351	13.60
5000.	10.74	9.707	8.866	8.189	7.668	7.301	7.085	7.017	7.133	7.359	7.478	7.496	7.228	1.351	13.68
10000.	10.71	9.709	8.873	8.193	7.670	7.304	7.093	7.038	7.137	7.381	7.541	7.592	7.483	1.351	13.71

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 379  
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$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 85$															
0.001	0.511	0.558	0.611	0.669	0.732	0.802	0.880	0.965	1.041	1.095	1.113	1.119	1.125	1.128	0.706
0.002	0.946	1.034	1.126	1.221	1.320	1.424	1.533	1.649	1.748	1.817	1.841	1.852	1.861	1.858	1.235
0.005	2.039	2.203	2.352	2.489	2.620	2.747	2.869	2.982	3.084	3.171	3.213	3.229	3.246	3.269	2.356
0.01	3.291	3.510	3.662	3.777	3.872	3.956	4.031	4.099	4.172	4.255	4.300	4.319	4.339	4.355	3.412
0.02	4.789	4.991	5.092	5.105	5.076	5.049	5.034	5.041	5.057	5.093	5.122	5.133	5.146	5.125	4.443
0.05	6.922	7.000	6.807	6.560	6.327	6.126	5.961	5.833	5.732	5.652	5.618	5.606	5.595	5.580	5.625
0.1	8.688	8.456	7.898	7.389	6.965	6.612	6.306	6.048	5.626	5.636	5.567	5.513	5.480	5.485	6.409
0.2	10.35	9.340	8.461	7.707	7.069	6.557	6.090	5.702	5.373	5.058	4.911	4.864	4.810	4.776	6.912
0.5	11.51	9.825	8.477	7.391	6.509	5.780	5.169	4.639	4.169	3.745	3.547	3.468	3.391	3.357	7.223
1.	11.85	9.837	8.292	7.077	6.095	5.283	4.600	4.006	3.472	2.972	2.729	2.632	2.534	2.482	7.563
2.	11.81	9.744	8.183	6.944	5.941	5.115	4.421	3.811	3.240	2.644	2.306	2.157	2.013	1.947	8.140
3.	11.66	9.680	8.180	6.968	5.981	5.174	4.490	3.875	3.292	2.635	2.219	2.023	1.821	1.756	8.564
4.	11.54	9.639	8.202	7.025	6.055	5.253	4.582	3.994	3.420	2.706	2.210	1.967	1.724	1.661	8.890
5.	11.45	9.609	8.227	7.083	6.136	5.551	4.694	4.117	3.544	2.797	2.241	1.960	1.671	1.603	9.156
6.	11.37	9.587	8.252	7.139	6.216	5.647	4.804	4.236	3.667	2.895	2.289	1.973	1.641	1.564	9.379
8.	11.26	9.559	8.298	7.239	6.354	5.620	5.003	4.454	3.894	3.089	2.404	2.029	1.624	1.515	9.742
10.	11.17	9.543	8.339	7.322	6.472	5.767	5.173	4.641	4.092	3.271	2.526	2.101	1.628	1.486	10.03
15.	11.10	9.528	8.404	7.468	6.690	6.046	5.497	4.992	4.472	3.672	2.823	2.296	1.683	1.446	10.54
20.	11.04	9.530	8.465	7.575	6.840	6.235	5.722	5.251	4.762	3.972	3.086	2.507	1.768	1.426	10.90
30.	10.94	9.547	8.561	7.726	7.034	6.476	6.019	5.611	5.172	4.421	3.517	2.871	1.948	1.406	11.38
40.	10.92	9.564	8.614	7.812	7.153	6.629	6.209	5.842	5.448	4.754	3.860	3.179	2.120	1.396	11.70
50.	10.92	9.578	8.649	7.869	7.233	6.732	6.341	6.014	5.553	4.988	4.156	3.482	2.277	1.390	11.92
60.	10.92	9.590	8.676	7.913	7.292	6.807	6.437	6.138	5.815	5.192	4.386	3.714	2.436	1.386	12.10
80.	10.91	9.608	8.713	7.970	7.371	6.912	6.571	6.309	6.043	5.509	4.755	4.085	2.710	1.380	12.35
100.	10.93	9.620	8.731	8.002	7.422	6.978	6.653	6.415	6.219	5.738	5.030	4.397	2.956	1.377	12.52
200.	10.89	9.645	8.786	8.081	7.525	7.114	6.842	6.690	6.604	6.353	5.835	5.297	3.852	1.371	12.95
500.	10.79	9.661	8.818	8.128	7.592	7.210	6.974	6.876	6.899	6.893	6.653	6.336	5.129	1.368	13.30
1000.	10.74	9.667	8.829	8.146	7.618	7.245	7.022	6.946	7.004	7.129	7.062	6.839	5.940	1.366	13.46
2000.	10.70	9.670	8.834	8.156	7.631	7.262	7.047	6.982	7.063	7.250	7.307	7.218	6.595	1.366	13.56
5000.	10.67	9.670	8.833	8.158	7.639	7.274	7.059	6.993	7.110	7.355	7.454	7.471	7.203	1.365	13.63
10000.	10.67	9.671	8.839	8.162	7.642	7.277	7.066	7.013	7.111	7.357	7.521	7.554	7.437	1.365	13.65
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 86$															
0.001	0.503	0.550	0.603	0.660	0.723	0.792	0.868	0.950	1.026	1.081	1.099	1.106	1.113	1.116	0.696
0.002	0.934	1.022	1.113	1.208	1.306	1.408	1.516	1.629	1.728	1.799	1.826	1.837	1.848	1.844	1.221
0.005	2.019	2.182	2.330	2.467	2.597	2.724	2.845	2.958	3.061	3.151	3.195	3.212	3.230	3.254	2.337
0.01	3.264	3.482	3.634	3.750	3.846	3.931	4.007	4.077	4.151	4.235	4.281	4.300	4.320	4.336	3.391
0.02	4.758	6.961	5.063	5.078	5.052	5.027	5.015	5.023	5.040	5.076	5.106	5.116	5.129	5.107	4.424
0.05	6.894	6.977	6.788	5.545	5.314	6.116	5.954	5.827	5.726	5.648	5.615	5.604	5.593	5.579	5.614
0.1	8.663	8.419	7.889	7.384	6.963	6.615	6.311	6.035	5.835	5.645	5.558	5.524	5.492	5.497	6.409
0.2	10.34	9.336	8.462	7.713	7.079	6.550	6.104	5.720	5.394	5.083	4.936	4.890	4.837	4.803	6.923
0.5	11.51	9.831	8.487	7.406	6.527	5.801	5.193	4.666	4.201	3.781	3.584	3.506	3.430	3.396	7.247
1.	11.84	9.837	8.298	7.087	6.109	5.300	4.621	4.031	3.499	3.001	2.758	2.662	2.564	2.512	7.583
2.	11.79	9.733	8.177	6.943	5.942	5.119	4.429	3.823	3.255	2.661	2.324	2.175	2.032	1.965	8.145
3.	11.63	9.662	8.167	6.959	5.976	5.170	4.490	3.878	3.300	2.647	2.232	2.037	1.835	1.771	8.559
4.	11.51	9.608	8.178	7.010	6.052	5.261	4.591	3.988	3.408	2.708	2.227	1.991	1.739	1.675	8.878
5.	11.41	9.572	8.197	7.066	6.133	5.359	4.701	4.108	3.530	2.793	2.257	1.986	1.687	1.616	9.139
6.	11.33	9.548	8.219	7.121	6.210	5.453	4.808	4.225	3.651	2.887	2.303	2.002	1.659	1.577	9.360
8.	11.21	9.515	8.265	7.222	6.352	5.624	5.004	4.464	3.880	3.068	2.407	2.057	1.656	1.528	9.718
10.	11.13	9.499	8.306	7.306	6.469	5.768	5.170	4.631	4.082	3.244	2.523	2.129	1.663	1.499	10.00
15.	11.08	9.504	8.377	7.441	6.666	6.025	5.480	4.979	4.464	3.671	2.827	2.301	1.692	1.459	10.51
20.	11.02	9.504	8.435	7.548	6.815	6.212	5.706	5.236	4.762	3.970	3.088	2.511	1.776	1.439	10.87
40.	10.89	9.535	8.586	7.786	7.129	6.607	6.189	5.823	5.433	4.743	3.857	3.179	2.126	1.410	11.66
50.	10.89	9.569	8.621	7.843	7.209	6.710	6.320	5.995	5.636	4.977	4.152	3.481	2.283	1.404	11.89
60.	10.88	9.560	8.648	7.887	7.268	6.785	6.416	6.118	5.797	5.179	4.380	3.712	2.461	1.400	12.06
80.	10.87	9.577	8.686	7.944	7.348	6.890	6.550	6.288	6.024	5.494	4.747	4.081	2.713	1.395	12.31
100.	10.89	9.588	8.703	7.977	7.398	6.956	6.631	6.393	6.198	5.721	5.019	4.391	2.958	1.392	12.48
200.	10.85	9.614	8.758	8.055	7.501	7.091	6.820	6.667	6.582	6.332	5.818	5.284	3.849	1.386	12.91
500.	10.75	9.630	8.789	8.102	7.568	7.187	6.951	6.854	6.877	6.870	6.630	6.316	5.117	1.382	13.26
1000.	10.70	9.636	8.800	8.120	7.594	7.222	6.999	6.924	6.981	7.108	7.028	6.824	5.961	1.381	13.42
2000.	10.67	9.639	8.806	8.130	7.607	7.239	7.024	6.960	7.040	7.227	7.283	7.194	6.573	1.380	13.51
5000.	10.66	9.639	8.805	8.132	7.614	7.251	7.037	6.970	7.087	7.311	7.429	7.446	7.179	1.380	13.58
10000.	10.64	9.641	8.811	8.136	7.617	7.253	7.044	6.990	7.088	7.333	7.492	7.543	7.433	1.380	13.61
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
<b>T1 (MeV)</b>															
<b>Z = 88</b>															
0.001	0.489	0.535	0.587	0.645	0.706	0.773	0.846	0.922	0.995	1.056	1.073	1.080	1.089	1.094	0.678
0.002	0.912	0.998	1.089	1.182	1.279	1.379	1.482	1.589	1.687	1.765	1.796	1.809	1.822	1.833	1.195
0.005	1.980	2.141	2.288	2.423	2.550	2.676	2.798	2.911	3.016	3.112	3.160	3.179	3.199	3.202	2.299
0.01	3.212	3.427	3.579	3.695	3.791	3.878	3.959	4.033	4.110	4.196	4.243	4.263	4.283	4.348	3.348
0.02	4.699	4.901	5.006	5.026	5.005	4.989	4.976	4.987	5.007	5.044	5.072	5.083	5.096	5.108	4.384
0.05	6.842	6.930	6.749	6.514	6.293	6.101	5.939	5.815	5.716	5.639	5.609	5.599	5.588	5.594	5.594
0.1	8.623	8.388	7.870	7.374	6.961	6.620	6.321	6.070	5.851	5.663	5.579	5.547	5.515	5.505	6.409
0.2	10.32	9.327	8.463	7.722	7.093	6.570	6.130	5.753	5.437	5.132	4.988	4.943	4.891	4.841	6.944
0.5	11.50	9.839	8.508	7.435	6.563	5.844	5.242	4.722	4.266	3.855	3.661	3.584	3.509	3.480	7.295
1.	11.83	9.836	8.308	7.107	6.138	5.337	4.664	4.080	3.554	3.060	2.819	2.722	2.624	2.575	7.625
2.	11.76	9.716	8.167	6.939	5.127	4.443	3.846	3.286	2.697	2.360	2.212	2.070	2.003	1.818	1.158
3.	11.60	9.635	8.146	6.940	5.962	5.164	4.491	3.887	3.318	2.672	2.260	2.066	1.867	1.805	8.556
4.	11.49	9.586	8.151	6.982	6.021	5.228	4.567	3.993	3.436	2.754	2.242	2.004	1.769	1.707	8.861
5.	11.39	9.549	8.167	7.050	6.091	5.315	4.669	4.107	3.553	2.818	2.270	1.995	1.715	1.648	9.113
6.	11.31	9.525	8.187	7.078	6.160	5.403	4.772	4.220	3.669	2.911	2.315	2.007	1.686	1.608	9.327
8.	11.20	9.494	8.227	7.168	6.289	5.565	4.962	4.430	3.888	3.099	2.427	2.062	1.666	1.558	9.677
10.	11.11	9.477	8.265	7.246	6.399	5.705	5.127	4.612	4.080	3.275	2.548	2.135	1.671	1.529	9.954
15.	11.04	9.456	8.323	7.385	6.612	5.977	5.441	4.953	4.453	3.666	2.836	2.326	1.729	1.489	10.46
20.	10.97	9.455	8.380	7.491	6.760	6.163	5.663	5.207	4.735	3.960	3.094	2.532	1.810	1.469	10.81
30.	10.85	9.471	8.483	7.643	6.953	6.403	5.958	5.561	5.133	4.399	3.518	2.888	1.981	1.450	11.28
40.	10.83	9.483	8.535	7.732	7.076	6.558	6.147	5.788	5.403	4.725	3.853	3.187	2.145	1.440	11.59
50.	10.82	9.496	8.569	7.792	7.158	6.663	6.279	5.957	5.603	4.956	4.142	3.481	2.298	1.434	11.82
60.	10.81	9.503	8.596	7.836	7.220	6.740	6.374	6.079	5.761	5.154	4.368	3.708	2.650	1.430	11.99
80.	10.80	9.522	8.630	7.894	7.303	6.846	6.506	6.250	5.986	5.467	4.730	4.063	2.709	1.425	12.23
100.	10.82	9.530	8.651	7.929	7.353	6.913	6.589	6.351	6.157	5.689	4.997	4.375	2.959	1.422	12.41
200.	10.78	9.556	8.705	8.007	7.456	7.048	6.777	6.624	6.539	6.290	5.783	5.260	3.847	1.416	12.83
500.	10.69	9.573	8.737	8.053	7.521	7.143	6.908	6.811	6.833	6.824	6.277	5.097	1.412	13.18	1.412
1000.	10.64	9.579	8.748	8.072	7.548	7.177	6.957	6.881	6.938	7.059	6.991	6.769	5.883	1.411	13.33
2000.	10.60	9.582	8.752	8.083	7.569	7.208	6.994	6.928	7.044	7.266	7.383	7.400	7.133	1.410	13.50
5000.	10.60	9.582	8.752	8.083	7.571	7.210	7.002	6.948	7.045	7.288	7.446	7.495	7.381	1.410	13.53
10000.	10.57	9.584	8.759	8.088	7.571	7.210	7.002	6.948	7.045	7.288	7.446	7.495	7.381	1.410	13.53
<b>T1 (MeV)</b>															
<b>Z = 89</b>															
0.001	0.482	0.528	0.580	0.637	0.698	0.764	0.835	0.909	0.981	1.061	1.060	1.067	1.078	1.083	0.670
0.002	0.902	0.987	1.077	1.170	1.266	1.365	1.465	1.570	1.668	1.750	1.782	1.795	1.809	1.821	1.182
0.005	1.961	2.121	2.267	2.401	2.529	2.654	2.775	2.888	2.993	3.090	3.142	3.163	3.183	3.187	2.280
0.01	3.185	3.400	3.552	3.669	3.765	3.853	3.935	4.011	4.089	4.174	4.224	4.244	4.265	4.268	3.327
0.02	4.669	4.872	4.978	5.000	4.981	4.964	4.957	4.969	4.991	5.029	5.056	5.065	5.079	5.092	4.365
0.05	6.817	6.908	6.730	6.499	6.281	6.092	5.931	5.809	5.709	5.640	5.606	5.595	5.586	5.591	5.583
0.1	8.605	8.374	7.861	7.369	6.959	6.621	6.326	6.078	5.858	5.682	5.589	5.558	5.527	5.517	6.409
0.2	10.30	9.322	8.465	7.727	7.103	6.582	6.145	5.771	5.457	5.150	5.011	4.972	4.921	4.872	6.954
0.5	11.50	9.843	8.519	7.450	6.581	5.864	5.266	4.751	4.299	3.891	3.700	3.624	3.550	3.521	7.318
1.	11.81	9.835	8.315	7.118	6.151	5.354	4.685	4.105	3.583	3.093	2.851	2.753	2.655	2.607	7.646
2.	11.74	9.706	8.163	6.937	5.945	5.131	4.451	3.858	3.301	2.713	2.377	2.231	2.088	2.021	8.164
3.	11.58	9.618	8.129	6.929	5.956	5.161	4.492	3.891	3.322	2.678	2.269	2.078	1.881	1.817	8.568
4.	11.46	9.564	8.133	6.966	6.008	5.220	4.564	3.993	3.453	2.730	2.246	2.014	1.781	1.716	8.847
5.	11.36	9.526	8.146	7.010	6.074	5.304	4.663	4.104	3.545	2.808	2.270	2.003	1.726	1.655	9.094
6.	11.28	9.500	8.163	7.056	6.142	5.390	4.764	4.216	3.658	2.896	2.312	2.014	1.697	1.615	9.303
8.	11.16	9.467	8.201	7.143	6.267	5.550	4.953	4.423	3.871	3.077	2.421	2.067	1.676	1.566	9.647
10.	11.08	9.449	8.237	7.219	6.376	5.688	5.116	4.603	4.249	3.490	2.540	2.140	1.681	1.538	9.921
15.	10.95	9.432	8.314	7.367	6.584	5.951	5.427	4.952	4.435	3.618	2.824	2.339	1.742	1.500	10.42
20.	10.88	9.431	8.373	7.473	6.731	6.136	5.647	5.203	4.714	3.917	3.080	2.537	1.821	1.481	10.77
30.	10.82	9.441	8.455	7.616	6.928	6.382	5.942	5.546	5.111	4.371	3.506	2.889	1.989	1.462	11.24
40.	10.80	9.454	8.505	7.704	7.050	6.534	6.130	5.781	5.379	4.683	3.863	3.221	2.141	1.453	11.55
50.	10.79	9.465	8.542	7.767	7.135	6.640	6.258	5.940	5.583	4.935	4.134	3.482	2.303	1.447	11.78
60.	10.78	9.474	8.569	7.812	7.197	6.718	6.353	6.060	5.742	5.138	4.360	3.707	2.654	1.443	11.95
80.	10.77	9.493	8.604	7.870	7.280	6.824	6.485	6.229	5.967	5.455	4.722	4.058	2.712	1.439	12.20
100.	10.78	9.501	8.625	7.905	7.331	6.891	6.568	6.331	6.139	5.677	4.989	4.368	2.960	1.436	12.37
200.	10.75	9.527	8.679	7.983	7.433	7.026	6.755	6.502	6.518	6.273	5.767	5.247	3.844	1.431	12.79
500.	10.65	9.544	8.711	8.028	7.498	7.121	6.887	6.790	6.811	6.799	6.563	6.258	5.086	1.427	13.14
1000.	10.60	9.550	8.722	8.047	7.526	7.156	6.935	6.860	6.916	7.039	6.958	6.755	5.906	1.426	13.29
2000.	10.57	9.553	8.727	8.057	7.540	7.174	6.959	6.897	6.973	7.164	7.208	7.097	6.530	1.426	13.39
5000.	10.57	9.553	8.726	8.059	7.546	7.186	6.973	6.907	7.022	7.243	7.359	7.376	7.109	1.426	13.46
10000.	10.54	9.555	8.732	8.063	7.548	7.188	6.981	6.926	7.024	7.265	7.423	7.472	7.357	1.425	13.49
<b>T1 (MeV)</b>															
<b>Z = 90</b>															
0.001	0.473	0.521	0.573	0.630	0.690	0.755	0.824	0.895	0.966	1.027	1.049	1.056	1.065	1.072	0.661
0.002	0.902	0.981	1.066	1.156	1.251	1.349	1.450	1.552	1.648	1.732	1.778	1.795	1.810	1.810	1.170
0.005	1.934	2.099	2.249	2.383	2.507	2.630	2.751	2.867	2.970	3.074	3.132	3.153	3.167	3.172	2.262
0.01	3.121	3.362	3.538	3.652	3.736	3.822	3.909	3.993	4.068	4.155	4.208	4.228	4.246	4.250	3.305
0.02	4.617	4.840	4.955	4.977	4.957	4.941	4.937	4.951	4.977	5.007	5.026	5.038	5.064	5.075	4.344
0.05	6.876	6.857	6.721	6.503	6.269	6.073	5.919	5.805	5.708</td						

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 381  
See page 349 for Explanation of Tables

k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
<b>T1 (MeV)</b>															
Z = 91															
0.001	0.467	0.514	0.566	0.622	0.683	0.746	0.813	0.883	0.952	1.014	1.057	1.044	1.054	1.062	0.653
0.002	0.895	0.969	1.052	1.143	1.240	1.338	1.436	1.531	1.630	1.719	1.750	1.764	1.785	1.799	1.158
0.005	1.916	2.080	2.229	2.362	2.486	2.608	2.728	2.844	2.947	3.052	3.114	3.137	3.152	3.157	2.244
0.01	3.096	3.336	3.512	3.626	3.711	3.797	3.886	3.971	4.047	4.132	4.188	4.210	4.228	4.231	3.284
0.02	4.588	4.811	4.928	4.952	4.933	4.919	4.918	4.934	4.962	4.993	5.010	5.021	5.047	5.059	4.325
0.05	6.850	6.835	6.702	6.488	6.257	6.064	5.912	5.798	5.704	5.630	5.601	5.587	5.581	5.586	5.564
0.1	8.575	8.341	7.842	7.359	6.955	6.624	6.336	6.090	5.880	5.706	5.621	5.582	5.569	5.539	6.409
0.2	10.19	9.312	8.496	7.757	7.117	6.591	6.167	5.823	5.488	5.184	5.065	5.023	4.975	4.931	6.973
0.5	11.48	9.851	8.540	7.479	6.616	5.906	5.315	4.808	4.364	3.966	3.781	3.708	3.635	3.604	7.366
1.	11.81	9.838	8.325	7.136	6.178	5.388	4.728	4.156	3.643	3.159	2.917	2.817	2.719	2.671	7.691
2.	11.70	9.686	8.153	6.935	5.949	5.140	4.466	3.880	3.331	2.746	2.413	2.268	2.127	2.060	8.176
3.	11.53	9.589	8.110	6.911	5.937	5.141	4.477	3.895	3.351	2.698	2.280	2.095	1.914	1.848	8.535
4.	11.39	9.514	8.094	6.935	5.986	5.207	4.556	3.979	3.430	2.734	2.254	2.031	1.810	1.745	8.816
5.	11.25	9.471	8.110	6.977	6.043	5.281	4.650	4.095	3.528	2.794	2.276	2.023	1.754	1.684	9.050
6.	11.17	9.460	8.123	7.018	6.105	5.365	4.748	4.202	3.633	2.869	2.312	2.051	1.724	1.643	9.251
8.	11.04	9.402	8.155	7.098	6.224	5.317	4.932	4.404	3.835	3.035	2.411	2.080	1.702	1.594	9.583
10.	10.96	9.382	8.188	7.171	6.330	5.653	5.093	4.581	4.017	3.196	2.521	2.148	1.709	1.566	9.850
15.	10.83	9.364	8.261	7.315	6.534	5.912	5.400	4.924	4.384	3.556	2.800	2.344	1.765	1.528	10.34
20.	10.78	9.362	8.315	7.419	6.680	6.091	5.617	5.188	4.652	3.843	3.080	2.555	1.815	1.510	10.69
30.	10.72	9.376	8.400	7.563	6.878	6.340	5.908	5.511	5.061	4.319	3.485	2.889	2.007	1.492	11.16
40.	10.70	9.390	8.452	7.654	7.002	6.494	6.092	5.734	5.336	4.660	3.826	3.186	2.168	1.483	11.48
50.	10.70	9.403	8.489	7.716	7.088	6.600	6.220	5.893	5.541	4.923	4.104	3.440	2.319	1.478	11.70
60.	10.70	9.412	8.513	7.761	7.150	6.674	6.312	6.022	5.703	5.108	4.348	3.703	2.464	1.474	11.88
80.	10.70	9.429	8.551	7.822	7.233	6.779	6.441	6.188	5.937	5.424	4.704	4.068	2.735	1.470	12.12
100.	10.70	9.439	8.573	7.859	7.285	6.844	6.525	6.301	6.095	5.651	4.976	4.392	2.966	1.468	12.29
200.	10.68	9.466	8.623	7.931	7.385	6.981	6.711	6.558	6.479	6.233	5.731	5.222	3.839	1.462	12.71
500.	10.58	9.481	8.654	7.978	7.450	7.073	6.842	6.746	6.760	6.755	6.521	6.190	5.056	1.459	13.05
1000.	10.53	9.488	8.665	7.995	7.477	7.109	6.889	6.815	6.869	6.992	6.913	6.711	5.871	1.458	13.21
2000.	10.50	9.491	8.670	8.004	7.490	7.128	6.914	6.851	6.928	7.117	7.160	7.051	6.487	1.458	13.30
5000.	10.50	9.491	8.669	8.007	7.497	7.139	6.927	6.862	6.976	7.196	7.311	7.327	7.061	1.458	13.37
10000.	10.47	9.493	8.675	8.011	7.499	7.141	6.935	6.881	6.976	7.215	7.372	7.422	7.308	1.457	13.40
k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
<b>T1 (MeV)</b>															
Z = 92															
0.001	0.460	0.508	0.560	0.615	0.675	0.738	0.803	0.871	0.938	1.001	1.025	1.031	1.044	1.052	0.645
0.002	0.881	0.960	1.044	1.133	1.226	1.322	1.420	1.519	1.616	1.702	1.740	1.755	1.774	1.768	1.147
0.005	1.898	2.062	2.210	2.341	2.464	2.586	2.704	2.818	2.924	3.034	3.094	3.117	3.136	3.168	2.226
0.01	3.072	3.311	3.486	3.600	3.685	3.771	3.860	3.947	4.024	4.113	4.167	4.187	4.208	4.229	3.263
0.02	4.560	4.783	4.901	4.927	4.911	4.901	4.902	4.918	4.947	4.977	4.994	5.007	5.032	4.999	4.308
0.05	6.814	6.830	6.674	6.458	6.246	6.067	5.915	5.793	5.699	5.628	5.598	5.590	5.573	5.556	4.556
0.1	8.555	8.327	7.833	7.354	6.952	6.625	6.341	6.099	5.893	5.712	5.633	5.600	5.563	5.562	6.409
0.2	10.23	9.295	8.467	7.748	7.133	6.615	6.179	5.811	5.509	5.218	5.083	5.044	4.996	4.973	6.980
0.5	11.47	9.854	8.550	7.494	6.634	5.928	5.341	4.837	4.398	4.005	3.823	3.751	3.678	3.645	7.391
1.	11.80	9.839	8.331	7.145	6.190	5.406	4.751	4.184	3.675	3.191	2.948	2.851	2.755	2.703	7.713
2.	11.68	9.674	8.148	6.934	5.951	5.145	4.474	3.891	3.346	2.764	2.434	2.290	2.146	2.081	8.182
3.	11.50	9.568	8.096	6.903	5.932	5.139	4.477	3.895	3.352	2.706	2.300	2.121	1.925	1.867	8.529
4.	11.33	9.490	8.084	6.926	5.974	5.195	4.548	3.980	3.416	2.730	2.280	2.062	1.816	1.766	8.800
5.	11.21	9.442	8.088	6.959	6.028	5.268	4.637	4.077	3.509	2.792	2.297	2.049	1.758	1.702	9.026
6.	11.12	9.409	8.098	6.997	6.087	5.345	4.729	4.178	3.608	2.867	2.333	2.056	1.728	1.662	9.220
8.	11.00	9.369	8.128	7.073	6.201	5.493	4.904	4.370	3.800	3.029	2.432	2.105	1.705	1.613	9.543
10.	10.91	9.347	8.159	7.144	6.302	5.623	5.059	4.540	3.976	3.188	2.543	2.173	1.708	1.584	9.803
15.	10.79	9.328	8.231	7.285	6.503	5.810	5.359	4.817	4.338	3.545	2.818	2.365	1.764	1.546	10.29
20.	10.73	9.328	8.288	7.390	6.649	6.060	5.576	5.124	4.616	3.842	3.069	2.555	1.842	1.528	10.63
30.	10.68	9.342	8.370	7.334	6.847	6.306	5.869	5.469	5.022	4.305	3.490	2.897	2.009	1.510	11.11
40.	10.66	9.358	8.423	7.626	6.974	6.464	6.059	5.699	5.305	4.646	3.825	3.188	2.171	1.500	11.43
50.	10.66	9.371	8.461	7.690	7.062	6.573	6.192	5.864	5.515	4.909	4.099	3.439	2.323	1.495	11.66
60.	10.66	9.383	8.488	7.736	7.126	6.655	6.290	5.989	5.677	5.119	4.328	3.657	2.465	1.491	11.84
80.	10.66	9.402	8.521	7.794	7.210	6.760	6.423	6.170	5.915	5.419	4.698	4.043	2.723	1.487	12.09
100.	10.67	9.411	8.543	7.830	7.261	6.826	6.507	6.275	6.089	5.639	4.960	4.349	2.968	1.486	12.26
200.	10.64	9.433	8.592	7.904	7.362	6.962	6.696	6.543	6.450	6.211	5.739	5.222	3.801	1.479	12.67
500.	10.54	9.449	8.626	7.951	7.425	7.049	6.818	6.722	6.736	6.732	6.499	6.169	5.045	1.476	13.01
1000.	10.50	9.457	8.637	7.968	7.451	7.085	6.867	6.792	6.845	6.967	6.899	6.677	5.815	1.475	13.16
2000.	10.47	9.459	8.641	7.977	7.466	7.104	6.891	6.829	6.905	7.092	7.136	7.028	6.466	1.474	13.26
5000.	10.46	9.459	8.641	7.980	7.472	7.115	6.904	6.839	6.953	7.172	7.286	7.302	7.038	1.474	13.33
10000.	10.44	9.461	8.646	7.984	7.474	7.117	6.911	6.858	6.951	7.191	7.347	7.297	7.282	1.474	13.35
k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.								

382 TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 94$															
0.001	0.448	0.495	0.546	0.601	0.660	0.721	0.783	0.844	0.911	0.977	0.999	1.008	1.022	1.032	0.628
0.002	0.864	0.938	1.019	1.109	1.203	1.300	1.394	1.484	1.578	1.674	1.718	1.756	1.756	1.744	1.125
0.005	1.863	2.024	2.170	2.301	2.422	2.540	2.656	2.770	2.880	2.993	3.053	3.077	3.100	3.140	2.189
0.01	3.024	3.260	3.434	3.549	3.635	3.720	3.808	3.897	3.982	4.073	4.125	4.145	4.166	4.194	3.221
0.02	4.504	4.727	4.846	4.875	4.865	4.861	4.870	4.891	4.914	4.950	4.977	4.988	5.004	4.964	4.272
0.05	6.761	6.785	6.637	6.428	6.222	6.052	5.909	5.790	5.691	5.618	5.593	5.586	5.579	5.571	5.537
0.1	8.514	8.297	7.816	7.344	6.948	6.625	6.347	6.116	5.910	5.727	5.648	5.620	5.594	5.585	6.408
0.2	10.20	9.286	8.473	7.762	7.150	6.632	6.197	5.835	5.546	5.272	5.139	5.096	5.050	5.030	6.999
0.5	11.45	9.860	8.571	7.523	6.570	5.970	5.391	4.896	4.466	4.083	3.905	3.833	3.762	3.733	7.439
1.	11.77	9.838	8.345	7.166	6.217	5.440	4.793	4.235	3.732	3.014	2.918	2.825	2.770	2.756	
2.	11.63	9.652	8.140	6.933	5.955	5.156	4.493	3.918	3.378	2.803	2.474	2.330	2.184	2.123	8.196
3.	11.42	9.524	8.072	6.891	5.925	5.136	4.481	3.910	3.360	2.725	2.329	2.144	1.948	1.904	8.519
4.	11.25	9.439	8.049	6.900	5.953	5.178	4.535	3.972	3.418	2.743	2.292	2.073	1.837	1.801	8.771
5.	11.12	9.583	8.046	6.927	6.000	5.241	4.609	4.054	3.501	2.799	2.503	2.053	1.777	1.740	8.982
6.	11.03	9.346	8.052	6.961	6.053	5.309	4.689	4.142	3.591	2.870	2.336	2.058	1.744	1.700	9.165
8.	10.89	9.297	8.075	7.032	6.159	5.443	4.845	4.314	3.770	3.026	2.432	2.104	1.720	1.650	9.470
10.	10.80	9.271	8.104	7.099	6.256	5.564	4.986	4.471	3.937	3.183	2.541	2.172	1.725	1.621	9.718
15.	10.68	9.249	8.172	7.238	6.451	5.807	5.271	4.791	4.287	3.536	2.817	2.365	1.781	1.582	10.19
20.	10.62	9.250	8.230	7.342	6.596	5.988	5.486	5.036	4.561	3.832	3.068	2.556	1.859	1.563	10.53
30.	10.58	9.269	8.312	7.485	6.795	6.240	5.788	5.389	4.968	4.292	3.489	2.898	2.025	1.545	11.01
40.	10.57	9.288	8.366	7.576	6.923	6.404	5.990	5.631	5.256	4.629	3.820	3.188	2.186	1.536	11.34
50.	10.59	9.303	8.400	7.638	7.012	6.517	6.133	5.819	5.471	4.864	4.108	3.477	2.330	1.530	11.57
60.	10.59	9.317	8.428	7.684	7.077	6.602	6.240	5.952	5.641	5.071	4.328	3.693	2.479	1.526	11.76
80.	10.59	9.358	8.465	7.742	7.163	6.717	6.386	6.135	5.885	5.382	4.672	4.051	2.749	1.522	12.01
100.	10.59	9.346	8.487	7.781	7.216	6.785	6.474	6.255	6.049	5.602	4.939	4.330	2.975	1.519	12.19
200.	10.56	9.369	8.535	7.851	7.512	6.916	6.653	6.504	6.423	6.172	5.685	5.192	3.831	1.513	12.59
500.	10.47	9.385	8.567	7.897	7.374	6.999	6.768	6.672	6.688	6.457	6.131	5.022	1.510	12.92	
1000.	10.42	9.392	8.577	7.914	7.400	7.036	6.819	6.745	6.798	6.920	6.852	6.631	5.781	1.509	13.07
2000.	10.39	9.394	8.582	7.923	7.414	7.056	6.846	6.783	6.859	7.040	7.093	7.005	6.396	1.508	13.17
5000.	10.39	9.395	8.581	7.925	7.420	7.065	6.856	6.791	6.905	7.122	7.236	7.252	6.991	1.508	13.24
10000.	10.37	9.396	8.587	7.929	7.422	7.067	6.863	6.809	6.902	7.141	7.298	7.347	7.232	1.508	13.26
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)															
$Z = 95$															
0.001	0.442	0.488	0.539	0.594	0.652	0.713	0.773	0.831	0.897	0.965	0.987	0.996	1.011	1.022	0.620
0.002	0.850	0.928	1.011	1.098	1.190	1.283	1.377	1.470	1.560	1.656	1.707	1.724	1.743	1.732	1.113
0.005	1.845	2.005	2.151	2.281	2.401	2.518	2.634	2.748	2.858	2.974	3.037	3.061	3.085	3.126	2.171
0.01	3.000	3.234	3.408	3.523	3.609	3.696	3.785	3.876	3.962	4.054	4.106	4.127	4.169	4.177	3.201
0.02	4.475	4.699	4.819	4.850	4.862	4.840	4.851	4.874	4.898	4.934	4.961	4.972	4.988	4.946	4.253
0.05	6.735	6.762	6.619	6.413	6.209	6.042	5.902	5.784	5.686	5.613	5.589	5.582	5.576	5.569	5.527
0.1	8.494	8.285	7.807	7.339	6.945	6.625	6.330	6.122	5.917	5.735	5.658	5.630	5.604	5.596	6.407
0.2	10.19	9.281	8.474	7.768	7.160	6.645	6.212	5.853	5.570	5.300	5.168	5.126	5.080	5.059	7.011
0.5	11.44	9.865	8.582	7.538	6.687	5.991	5.415	4.924	4.500	4.122	3.946	3.875	3.885	3.777	7.464
1.	11.75	9.837	8.351	7.177	6.230	5.456	4.813	4.259	3.760	3.284	3.046	2.950	2.858	2.804	7.776
2.	11.60	9.641	8.136	6.932	5.957	5.162	4.502	3.931	3.395	2.822	2.494	2.350	2.205	2.143	8.203
3.	11.38	9.505	8.060	6.882	5.919	5.133	4.482	3.915	3.369	2.737	2.342	2.157	1.963	1.924	8.514
4.	11.21	9.415	8.032	6.885	5.942	5.170	4.531	3.972	3.423	2.751	2.301	2.083	1.849	1.821	8.759
5.	11.09	9.356	8.025	6.909	5.985	5.229	4.601	4.051	3.502	2.804	2.309	2.060	1.787	1.759	8.965
6.	10.99	9.315	8.028	6.941	6.036	5.295	4.678	4.136	3.589	2.873	2.341	2.064	1.753	1.719	9.143
8.	10.85	9.265	8.049	7.009	6.139	5.425	4.831	4.304	3.765	3.026	2.435	2.109	1.729	1.669	9.443
10.	10.76	9.258	8.075	7.075	6.234	5.545	4.970	4.659	3.929	3.181	2.543	2.175	1.732	1.640	9.688
15.	10.63	9.215	8.143	7.211	6.427	5.786	5.252	4.776	4.275	3.531	2.816	2.367	1.788	1.601	10.16
20.	10.58	9.217	8.200	7.315	6.571	5.966	5.466	5.019	4.548	3.825	3.068	2.558	2.032	1.582	10.50
30.	10.54	9.236	8.283	7.458	6.770	6.217	5.767	5.371	4.953	4.283	3.486	2.899	2.032	1.363	10.98
40.	10.53	9.256	8.337	7.550	6.899	6.382	5.962	5.416	5.240	4.618	3.816	3.188	2.192	1.354	11.30
50.	10.55	9.272	8.372	7.613	6.989	6.495	6.112	5.800	5.454	4.853	4.103	3.476	2.336	1.548	11.54
60.	10.55	9.286	8.401	7.659	7.054	6.580	6.219	5.932	5.564	5.058	4.322	3.691	2.484	1.544	11.72
80.	10.56	9.308	8.437	7.717	7.160	6.695	6.365	6.116	5.867	5.368	4.664	4.047	2.754	1.540	11.98
100.	10.56	9.316	8.460	7.756	7.193	6.763	6.454	6.236	6.030	5.587	4.929	4.324	2.978	1.537	12.15
200.	10.52	9.338	8.507	7.825	7.288	6.894	6.632	6.483	6.402	6.152	5.669	5.180	3.829	1.531	12.55
500.	10.44	9.353	8.538	7.870	7.349	6.975	6.745	6.500	6.665	6.436	6.112	5.011	1.528	12.87	
1000.	10.39	9.360	8.549	7.887	7.376	7.013	6.795	6.722	6.775	6.899	6.818	6.620	5.804	1.527	13.03
2000.	10.36	9.363	8.554	7.896	7.389	7.032	6.823	6.760	6.836	6.799	6.706	6.692	5.376	1.526	13.12
5000.	10.34	9.364	8.558	7.901	7.395	7.040	6.836	6.779	6.872	7.092	7.218	7.230	6.965	1.526	13.19
10000.	10.33	9.365	8.561	7.903	7.398	7.044	6.840	6.786	6.879	7.117	7.273	7.322	7.208	1.526	13.22
$k/T_1$	0.00	0.10	0.20	0.3											

TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections 383  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$Z = 97$															
$(\text{MeV})$															
0.001	0.429	0.475	0.525	0.580	0.637	0.696	0.752	0.806	0.871	0.940	0.963	0.972	0.990	1.002	0.604
0.002	0.831	0.907	0.988	1.073	1.162	1.252	1.342	1.433	1.523	1.624	1.679	1.699	1.721	1.708	1.088
0.005	1.816	1.961	2.104	2.243	2.373	2.489	2.595	2.701	2.808	2.940	3.008	3.028	3.055	3.099	2.138
0.01	2.953	3.182	3.355	3.474	3.564	3.655	3.744	3.832	3.921	4.019	4.070	4.090	4.113	4.142	3.162
0.02	4.415	4.646	4.767	4.794	4.782	4.784	4.806	4.842	4.867	4.900	4.928	4.939	4.955	4.911	4.212
0.05	6.688	6.703	6.593	6.395	6.181	6.006	5.875	5.777	5.678	5.599	5.582	5.575	5.569	5.567	5.504
0.1	8.491	8.205	7.810	7.363	6.946	6.617	6.359	6.139	5.931	5.746	5.676	5.650	5.625	5.619	6.405
0.2	10.16	9.271	8.478	7.783	7.182	6.674	6.247	5.894	5.616	5.355	5.226	5.184	5.141	5.116	7.037
0.5	11.43	9.870	8.603	7.567	6.722	6.031	5.462	4.981	4.568	4.203	4.030	3.957	3.889	3.865	7.512
1.	11.73	9.834	8.363	7.200	6.262	5.494	4.856	4.308	3.815	3.346	3.111	3.017	2.924	2.872	7.819
2.	11.55	9.621	8.128	6.928	5.956	5.167	4.517	3.956	3.429	2.860	2.531	2.387	2.245	2.185	8.215
3.	11.33	9.457	8.024	6.862	5.917	5.144	4.495	3.917	3.378	2.767	2.373	2.184	1.989	1.962	8.507
4.	11.16	9.349	7.985	6.865	5.944	5.183	4.539	3.966	3.423	2.770	3.224	2.107	1.878	1.859	8.741
5.	11.00	9.279	7.973	6.890	5.991	5.283	4.607	4.041	3.499	2.817	3.235	2.080	1.816	1.798	8.941
6.	10.90	9.231	7.974	6.924	6.045	5.310	4.683	4.125	3.586	2.882	3.351	2.081	1.784	1.757	9.117
8.	10.75	9.173	7.992	6.996	6.154	5.443	4.834	4.292	3.763	3.028	3.455	2.121	1.762	1.707	9.414
10.	10.65	9.142	8.019	7.064	6.252	5.563	4.972	4.447	3.930	3.177	3.535	2.183	1.769	1.678	9.658
15.	10.52	9.119	8.086	7.201	6.444	5.800	5.250	4.764	4.281	3.518	3.795	2.369	1.830	1.639	10.12
20.	10.52	9.130	8.129	7.286	6.575	5.973	5.457	4.993	4.538	3.845	3.063	2.557	1.872	1.619	10.46
30.	10.48	9.157	8.217	7.423	6.760	6.211	5.751	5.341	4.935	4.291	3.480	2.884	2.039	1.600	10.93
40.	10.47	9.185	8.276	7.510	6.876	6.364	5.945	5.579	5.215	4.615	3.809	3.177	2.202	1.591	11.24
50.	10.47	9.208	8.517	7.569	6.956	6.469	6.082	5.754	5.425	4.864	4.076	3.429	2.353	1.585	11.48
60.	10.48	9.226	8.348	7.612	7.014	6.566	6.185	5.886	5.588	5.062	4.299	3.647	2.494	1.581	11.65
80.	10.48	9.248	8.385	7.669	7.092	6.647	6.320	6.078	5.833	5.332	4.653	4.050	2.761	1.576	11.90
100.	10.48	9.260	8.409	7.704	7.140	6.712	6.406	6.196	5.995	5.544	4.908	4.329	2.993	1.573	12.07
200.	10.45	9.278	8.452	7.774	7.238	6.844	6.585	6.442	6.360	6.110	5.630	5.167	3.822	1.568	12.46
500.	10.38	9.293	8.478	7.816	7.302	6.933	6.700	6.596	6.631	6.637	6.386	6.056	4.982	1.566	12.79
1000.	10.32	9.300	8.494	7.836	7.328	6.968	6.751	6.678	6.731	6.853	6.775	6.581	5.772	1.563	12.95
2000.	10.29	9.302	8.498	7.845	7.341	6.986	6.777	6.717	6.790	6.972	7.016	6.910	6.362	1.562	13.04
5000.	10.29	9.303	8.498	7.848	7.348	6.996	6.789	6.724	6.836	7.051	7.164	7.180	6.921	1.562	13.11
10000.	10.26	9.304	8.503	7.851	7.350	6.998	6.796	6.742	6.834	7.070	7.226	7.275	7.160	1.562	13.15
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$Z = 98$															
$(\text{MeV})$															
0.001	0.420	0.468	0.520	0.574	0.629	0.685	0.741	0.798	0.856	0.924	0.956	0.960	0.977	0.992	0.595
0.002	0.826	0.900	0.979	1.062	1.148	1.237	1.327	1.417	1.505	1.608	1.665	1.686	1.709	1.696	1.077
0.005	1.795	1.940	2.084	2.223	2.352	2.468	2.573	2.678	2.787	2.921	2.992	3.013	3.040	3.085	2.120
0.01	2.213	3.148	3.326	3.448	3.541	3.631	3.721	3.810	3.901	4.000	4.052	4.071	4.095	4.124	3.140
0.02	4.380	6.614	4.758	4.768	4.759	4.783	4.786	4.825	4.852	4.884	4.912	4.922	4.937	4.893	4.192
0.05	6.819	6.662	6.500	6.341	6.186	6.035	5.894	5.765	5.657	5.585	5.582	5.590	5.572	5.565	5.492
0.1	8.470	8.190	7.801	7.358	6.944	6.618	6.363	6.145	5.958	5.755	5.685	5.660	5.637	5.630	6.405
0.2	10.01	9.337	8.497	7.760	7.169	6.688	6.267	5.925	5.634	5.376	5.259	5.215	5.171	5.145	7.050
0.5	11.42	9.873	8.613	7.582	6.740	6.052	5.486	5.009	4.602	4.243	4.071	3.999	3.932	3.909	7.536
1.	11.72	9.836	8.371	7.210	6.275	5.511	4.877	4.332	3.843	3.377	3.144	3.050	2.957	2.905	7.841
2.	11.52	9.609	8.124	6.927	5.957	5.172	4.525	3.969	3.445	2.879	2.551	2.407	2.265	2.206	8.221
3.	11.29	9.432	8.008	6.853	5.913	5.143	4.497	3.922	3.387	2.780	2.386	2.198	2.002	1.981	8.500
4.	11.10	9.317	7.963	6.850	5.934	5.176	4.535	3.965	3.427	2.783	2.336	2.114	1.875	1.878	8.726
5.	10.95	9.242	7.957	6.873	5.979	5.234	4.601	4.037	3.499	2.823	2.334	2.089	1.819	1.817	8.921
6.	10.84	9.191	7.946	6.904	6.031	5.299	4.674	4.118	3.583	2.886	2.359	2.089	1.786	1.777	9.093
8.	10.69	9.131	7.962	6.973	6.136	5.429	4.822	4.283	3.757	3.030	2.441	2.127	1.763	1.727	9.385
10.	10.59	9.100	7.987	7.039	6.232	5.567	4.958	4.435	3.921	3.177	2.541	2.189	1.697	1.679	9.626
15.	10.46	9.077	8.054	7.175	6.423	5.782	5.233	4.649	4.269	3.515	2.978	2.374	1.852	1.658	10.09
20.	10.45	9.113	8.094	7.237	6.346	5.976	5.450	4.966	4.504	3.859	3.068	2.555	1.867	1.639	10.42
30.	10.44	9.121	8.186	7.398	6.738	6.191	5.752	5.323	4.920	4.282	3.479	2.888	2.048	1.619	10.89
40.	10.43	9.151	8.247	7.484	6.854	6.363	5.925	5.561	5.199	4.605	3.806	3.180	2.210	1.610	11.21
50.	10.43	9.176	8.289	7.544	6.933	6.448	6.063	5.735	5.408	4.852	4.072	3.429	2.361	1.604	11.44
60.	10.44	9.195	8.320	7.587	6.991	6.525	6.165	5.867	5.571	5.049	4.293	3.646	2.501	1.600	11.62
80.	10.45	9.218	8.358	7.644	7.069	6.626	6.300	6.059	5.815	5.318	4.645	4.047	2.765	1.595	11.87
100.	10.45	9.230	8.382	7.679	7.117	6.690	6.386	6.176	5.976	5.528	4.898	4.323	2.994	1.592	12.03
200.	10.43	9.246	8.419	7.745	7.216	6.825	6.563	6.410	6.345	6.091	5.621	5.144	3.792	1.586	12.42
500.	10.35	9.262	8.449	7.790	7.278	6.910	6.678	6.574	6.609	6.614	6.366	6.037	4.974	1.583	12.75
1000.	10.29	9.269	8.465	7.810	7.304	6.955	6.729	6.655	6.708	6.830	6.753	6.559	5.756	1.582	12.90
2000.	10.26	9.271	8.470	7.819	7.317	6.962	6.754	6.694	6.767	6.902	6.887	6.340	1.581	12.99	13.06
5000.	10.26	9.272	8.469	7.822	7.323	6.973	6.766	6.701	6.813	7.028	7.139	7.154	6.896	1.581	13.06
10000.	10.23	9.273	8.474	7.825	7.326	6.975	6.772	6.719	6.811	7.046	7.205	7.239	7.125	1.581	13.09
$k/T_1$	0.00	0.10													

384 TABLE I. Scaled Bremsstrahlung Energy Spectra and Total Integrated Radiative Energy-Loss Cross Sections  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	PHIRAD
$T_1$ (MeV)	Z = 100														
0.001	0.408	0.455	0.505	0.559	0.615	0.670	0.722	0.768	0.829	0.903	0.927	0.937	0.957	0.972	0.579
0.002	0.807	0.880	0.957	1.038	1.122	1.207	1.294	1.381	1.469	1.576	1.639	1.661	1.683	1.672	1.052
0.005	1.761	1.904	2.045	2.182	2.311	2.426	2.531	2.636	2.744	2.883	2.959	2.981	3.013	3.057	2.086
0.01	2.864	3.096	3.274	3.398	3.494	3.586	3.677	3.768	3.861	3.962	4.014	4.035	4.062	4.090	3.101
0.02	4.316	4.557	4.685	4.717	4.710	4.717	4.746	4.790	4.820	4.851	4.879	4.890	4.903	4.857	4.153
0.05	6.638	6.650	6.541	6.348	6.150	5.974	5.851	5.759	5.662	5.585	5.569	5.564	5.560	5.563	5.474
0.1	8.418	8.207	7.757	7.320	6.950	6.643	6.377	6.151	5.951	5.712	5.703	5.681	5.658	5.653	6.406
0.2	9.981	9.528	8.501	7.773	7.186	6.708	6.299	5.965	5.682	5.428	5.316	5.275	5.231	5.202	7.073
0.5	11.38	9.879	8.637	7.610	6.770	6.084	5.530	5.063	4.681	4.324	4.146	4.083	4.022	3.997	7.583
1.	11.68	9.851	8.386	7.235	6.306	5.549	4.921	4.582	3.899	3.440	3.209	3.115	3.022	2.973	7.884
2.	11.54	9.607	8.113	6.915	5.951	5.175	4.558	3.987	3.487	2.920	2.585	2.447	2.307	2.247	8.237
3.	11.30	9.421	7.989	6.833	5.897	5.135	4.498	3.933	3.405	2.803	2.411	2.226	2.042	2.020	8.500
4.	11.09	9.301	7.938	6.825	5.912	5.162	4.530	3.968	3.437	2.797	2.355	2.136	1.916	1.917	8.716
5.	10.94	9.219	7.918	6.843	5.954	5.217	4.592	4.035	3.504	2.836	2.349	2.105	1.850	1.856	8.903
6.	10.81	9.161	7.913	6.873	6.006	5.281	4.664	4.114	3.583	2.894	2.372	2.104	1.815	1.816	9.070
8.	10.63	9.085	7.924	6.943	6.114	5.414	4.813	4.277	3.751	3.026	2.446	2.142	1.804	1.766	9.354
10.	10.51	9.054	7.945	7.009	6.212	5.534	4.950	4.428	3.912	3.169	2.543	2.202	1.811	1.737	9.590
15.	10.40	9.066	7.974	7.097	6.395	5.800	5.236	4.704	4.216	3.570	2.816	2.346	1.826	1.697	10.04
20.	10.33	9.067	8.043	7.186	6.524	5.984	5.434	4.952	4.463	3.858	3.073	2.550	1.877	1.678	10.37
30.	10.30	9.075	8.132	7.328	6.702	6.201	5.722	5.297	4.865	4.276	3.493	2.904	2.046	1.658	10.83
40.	10.31	9.101	8.191	7.421	6.814	6.334	5.906	5.534	5.153	4.581	3.819	3.206	2.212	1.649	11.15
50.	10.34	9.121	8.233	7.486	6.890	6.424	6.035	5.707	5.370	4.816	4.079	3.464	2.368	1.643	11.37
60.	10.36	9.138	8.262	7.533	6.947	6.489	6.131	5.837	5.533	5.017	4.290	3.657	2.509	1.639	11.54
80.	10.38	9.158	8.303	7.593	7.021	6.581	6.257	6.020	5.789	5.290	4.629	4.040	2.772	1.634	11.79
100.	10.38	9.174	8.328	7.626	7.067	6.646	6.346	6.129	5.925	5.524	4.884	4.271	2.970	1.631	11.95
200.	10.36	9.185	8.363	7.693	7.166	6.778	6.518	6.367	6.304	6.053	5.590	5.121	3.786	1.625	12.34
500.	10.28	9.200	8.393	7.739	7.230	6.865	6.634	6.531	6.565	6.571	6.325	6.000	4.954	1.621	12.66
1000.	10.22	9.208	8.409	7.758	7.255	6.898	6.685	6.611	6.662	6.783	6.718	6.506	5.682	1.620	12.81
2000.	10.19	9.208	8.415	7.768	7.267	6.914	6.708	6.649	6.723	6.897	6.951	6.859	6.282	1.620	12.91
5000.	10.17	9.211	8.417	7.772	7.274	6.925	6.723	6.667	6.757	6.975	7.097	7.109	6.847	1.619	12.98
10000.	10.16	9.211	8.418	7.773	7.276	6.928	6.727	6.674	6.764	6.998	7.151	7.204	7.101	1.619	13.00

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
<b>Z = 1</b>															
<b>T1 (MeV)</b>															
0.001	0.002	0.003	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.004	0.006	0.004	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.005	0.012	0.014	0.011	0.008	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.025	0.026	0.020	0.015	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.02	0.050	0.050	0.040	0.030	0.018	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.027
0.05	0.130	0.114	0.094	0.072	0.043	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.066
0.1	0.259	0.212	0.176	0.135	0.078	0.043	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.129
0.2	0.490	0.371	0.309	0.228	0.166	0.099	0.043	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.238
0.5	0.977	0.659	0.509	0.369	0.293	0.239	0.167	0.063	0.000	0.000	0.000	0.000	0.000	0.000	0.451
1.	1.436	0.856	0.620	0.498	0.433	0.380	0.311	0.202	0.048	0.000	0.000	0.000	0.000	0.000	0.622
2.	1.862	0.974	0.736	0.640	0.581	0.531	0.469	0.375	0.215	0.003	0.000	0.000	0.000	0.000	0.763
3.	2.062	1.004	0.804	0.720	0.662	0.616	0.562	0.481	0.333	0.062	0.000	0.000	0.000	0.000	0.827
4.	2.171	1.022	0.846	0.767	0.714	0.673	0.626	0.554	0.416	0.137	0.000	0.000	0.000	0.000	0.865
5.	2.274	1.027	0.866	0.800	0.759	0.720	0.673	0.604	0.476	0.206	0.005	0.000	0.000	0.000	0.889
6.	2.318	1.040	0.891	0.826	0.786	0.750	0.708	0.665	0.527	0.266	0.034	0.000	0.000	0.000	0.908
8.	2.374	1.059	0.926	0.864	0.825	0.793	0.757	0.705	0.602	0.363	0.104	0.002	0.000	0.000	0.935
10.	2.405	1.073	0.952	0.892	0.854	0.823	0.791	0.745	0.655	0.436	0.175	0.019	0.000	0.000	0.953
15.	2.441	1.091	0.992	0.939	0.901	0.870	0.842	0.807	0.738	0.560	0.318	0.130	0.000	0.000	0.983
20.	2.462	1.101	1.017	0.969	0.932	0.901	0.874	0.843	0.785	0.636	0.422	0.233	0.000	0.000	1.003
30.	2.488	1.114	1.048	1.007	0.972	0.942	0.914	0.885	0.840	0.727	0.554	0.383	0.000	0.000	1.029
40.	2.497	1.122	1.067	1.031	0.999	0.969	0.940	0.912	0.872	0.779	0.634	0.482	0.059	0.000	1.045
50.	2.493	1.127	1.080	1.048	1.019	0.989	0.960	0.932	0.893	0.814	0.686	0.547	0.140	0.000	1.057
60.	2.487	1.131	1.089	1.060	1.032	1.005	0.976	0.946	0.910	0.839	0.724	0.600	0.211	0.000	1.066
80.	2.457	1.136	1.102	1.078	1.054	1.028	1.001	0.972	0.931	0.871	0.779	0.673	0.324	0.000	1.079
100.	2.432	1.140	1.111	1.089	1.068	1.045	1.019	0.990	0.949	0.893	0.813	0.721	0.408	0.000	1.088
200.	2.299	1.167	1.130	1.116	1.103	1.087	1.068	1.041	1.004	0.948	0.891	0.836	0.628	0.000	1.111
500.	1.801	1.151	1.143	1.137	1.130	1.121	1.111	1.095	1.069	1.015	0.963	0.924	0.808	0.000	1.125
1000.	1.538	1.153	1.148	1.145	1.141	1.145	1.141	1.136	1.127	1.100	1.061	0.976	0.888	0.000	1.134
2000.	1.372	1.154	1.151	1.149	1.147	1.145	1.141	1.136	1.127	1.100	1.061	1.029	0.947	0.000	1.140
5000.	1.255	1.154	1.153	1.152	1.152	1.151	1.149	1.147	1.143	1.131	1.109	1.084	1.013	0.000	1.147
10000.	1.208	1.154	1.154	1.153	1.153	1.153	1.152	1.151	1.149	1.142	1.130	1.118	1.061	0.000	1.150
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
<b>Z = 2</b>															
<b>T1 (MeV)</b>															
0.001	0.001	0.003	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.003	0.006	0.004	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.005	0.009	0.016	0.011	0.008	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.020	0.026	0.021	0.015	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.02	0.042	0.050	0.040	0.030	0.018	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.026
0.05	0.112	0.116	0.094	0.072	0.042	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.064
0.1	0.229	0.215	0.177	0.135	0.078	0.043	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.126
0.2	0.447	0.376	0.307	0.226	0.145	0.098	0.043	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.234
0.5	0.919	0.661	0.509	0.369	0.292	0.238	0.166	0.062	0.000	0.000	0.000	0.000	0.000	0.000	0.445
1.	1.365	0.857	0.620	0.498	0.432	0.379	0.309	0.200	0.047	0.000	0.000	0.000	0.000	0.000	0.614
2.	1.803	0.974	0.739	0.642	0.581	0.530	0.468	0.373	0.213	0.003	0.000	0.000	0.000	0.000	0.756
3.	2.030	1.005	0.808	0.723	0.665	0.616	0.561	0.480	0.331	0.062	0.000	0.000	0.000	0.000	0.821
4.	2.161	1.023	0.853	0.774	0.719	0.674	0.624	0.551	0.414	0.136	0.000	0.000	0.000	0.000	0.861
5.	2.250	1.037	0.886	0.811	0.759	0.716	0.670	0.603	0.477	0.204	0.005	0.000	0.000	0.000	0.888
6.	2.315	1.050	0.910	0.840	0.789	0.748	0.705	0.644	0.527	0.264	0.033	0.000	0.000	0.000	0.908
8.	2.403	1.070	0.947	0.882	0.834	0.794	0.754	0.702	0.601	0.360	0.103	0.002	0.000	0.000	0.937
10.	2.468	1.083	0.970	0.912	0.868	0.829	0.790	0.740	0.649	0.435	0.176	0.019	0.000	0.000	0.957
15.	2.538	1.105	1.013	0.962	0.921	0.883	0.847	0.804	0.732	0.560	0.320	0.130	0.000	0.000	0.992
20.	2.577	1.117	1.040	0.994	0.955	0.919	0.883	0.846	0.782	0.636	0.423	0.231	0.000	0.000	1.015
30.	2.624	1.132	1.071	1.033	0.999	0.965	0.930	0.894	0.841	0.727	0.555	0.361	0.200	0.000	1.045
40.	2.641	1.140	1.090	1.057	0.996	0.963	0.927	0.876	0.800	0.632	0.477	0.358	0.200	0.000	1.063
50.	2.644	1.146	1.103	1.073	1.046	1.018	0.987	0.951	0.901	0.815	0.686	0.547	0.139	0.000	1.077
60.	2.636	1.150	1.112	1.085	1.061	1.034	1.005	0.970	0.920	0.840	0.725	0.600	0.210	0.000	1.086
80.	2.609	1.155	1.124	1.102	1.080	1.057	1.031	0.999	0.950	0.875	0.779	0.673	0.325	0.000	1.100
100.	2.581	1.158	1.131	1.112	1.093	1.073	1.049	1.019	0.971	0.899	0.813	0.722	0.409	0.000	1.110
200.	2.433	1.161	1.166	1.135	1.124	1.111	1.094	1.071	1.035	0.967	0.898	0.837	0.627	0.000	1.132
500.	1.882	1.164	1.157	1.152	1.146	1.140	1.132	1.119	1.098	1.047	0.985	0.937	0.810	0.000	1.145
1000.	1.590	1.166	1.162	1.159	1.155	1.152	1.147	1.140	1.127	1.094	1.044	1.001	0.896	0.000	1.151
2000.	1.405	1.166	1.164	1.163	1.161	1.159	1.157	1.155	1.146	1.125	1.093	1.057	0.964	0.000	1.156
5000.	1.277	1.166	1.165	1.164	1.163	1.163	1.163	1.161	1.158	1.149	1.132	1.112	1.043	0.000	1.161
10000.	1.226	1.166	1.166	1.165	1.165	1.165	1.165	1.164	1.163	1.158	1.148	1.136	1.090	0.000	1.163
K															

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 4															
0.001	0.002	0.003	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.004	0.006	0.005	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.005	0.011	0.015	0.011	0.008	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.023	0.027	0.021	0.015	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.048	0.051	0.041	0.030	0.017	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.025
0.05	0.121	0.118	0.095	0.072	0.042	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.063
0.1	0.246	0.217	0.177	0.134	0.077	0.042	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.123
0.2	0.475	0.377	0.307	0.225	0.143	0.097	0.042	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.230
0.5	0.977	0.662	0.508	0.367	0.290	0.234	0.163	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.442
1.	1.467	0.858	0.620	0.498	0.431	0.375	0.305	0.197	0.046	0.000	0.000	0.000	0.000	0.000	0.612
2.	1.890	0.974	0.739	0.642	0.581	0.528	0.465	0.370	0.210	0.003	0.000	0.000	0.000	0.000	0.755
3.	2.108	1.005	0.808	0.724	0.666	0.617	0.561	0.477	0.327	0.061	0.000	0.000	0.000	0.000	0.822
4.	2.233	1.024	0.852	0.776	0.723	0.678	0.626	0.549	0.409	0.134	0.000	0.000	0.000	0.000	0.863
5.	2.347	1.034	0.878	0.813	0.768	0.726	0.675	0.600	0.469	0.203	0.005	0.000	0.000	0.000	0.890
6.	2.406	1.049	0.905	0.842	0.800	0.759	0.711	0.642	0.519	0.263	0.035	0.000	0.000	0.000	0.912
8.	2.471	1.072	0.945	0.888	0.848	0.810	0.766	0.705	0.595	0.356	0.102	0.002	0.000	0.000	0.944
10.	2.533	1.092	0.973	0.917	0.878	0.843	0.803	0.747	0.647	0.432	0.174	0.019	0.000	0.000	0.966
15.	2.600	1.119	1.020	0.969	0.933	0.900	0.864	0.816	0.733	0.557	0.319	0.129	0.000	0.000	1.004
20.	2.638	1.134	1.050	1.003	0.967	0.936	0.902	0.859	0.787	0.634	0.422	0.230	0.000	0.000	1.029
30.	2.685	1.153	1.086	1.045	1.012	0.981	0.950	0.912	0.852	0.728	0.554	0.380	0.000	0.000	1.061
40.	2.704	1.165	1.108	1.072	1.041	1.010	0.980	0.946	0.893	0.783	0.632	0.478	0.058	0.000	1.082
50.	2.709	1.171	1.122	1.090	1.062	1.034	1.004	0.969	0.918	0.821	0.686	0.548	0.138	0.000	1.096
60.	2.701	1.176	1.133	1.103	1.077	1.050	1.021	0.987	0.940	0.849	0.725	0.600	0.210	0.000	1.107
80.	2.673	1.183	1.147	1.121	1.098	1.073	1.046	1.016	0.970	0.888	0.780	0.673	0.324	0.000	1.121
100.	2.645	1.186	1.155	1.133	1.112	1.090	1.065	1.034	0.992	0.915	0.817	0.722	0.408	0.000	1.132
200.	2.491	1.192	1.173	1.160	1.147	1.132	1.113	1.088	1.052	0.987	0.912	0.843	0.627	0.000	1.156
500.	1.927	1.196	1.187	1.181	1.174	1.166	1.156	1.141	1.116	1.065	1.005	0.956	0.814	0.000	1.171
1000.	1.630	1.198	1.193	1.189	1.185	1.181	1.175	1.166	1.150	1.112	1.062	1.020	0.909	0.000	1.179
2000.	1.445	1.198	1.196	1.194	1.192	1.189	1.186	1.181	1.172	1.147	1.109	1.075	0.983	0.000	1.186
5000.	1.312	1.199	1.198	1.197	1.197	1.196	1.194	1.192	1.188	1.176	1.155	1.131	1.061	0.000	1.192
10000.	1.260	1.199	1.198	1.198	1.198	1.198	1.197	1.197	1.194	1.188	1.176	1.161	1.109	0.000	1.195
k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 5															
0.001	0.001	0.004	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.004	0.007	0.005	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.005	0.011	0.015	0.011	0.008	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.023	0.028	0.021	0.015	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.047	0.052	0.041	0.030	0.017	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.024
0.05	0.120	0.119	0.096	0.072	0.041	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.062
0.1	0.243	0.218	0.177	0.133	0.076	0.041	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.122
0.2	0.471	0.378	0.307	0.224	0.142	0.096	0.041	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.228
0.5	0.973	0.661	0.507	0.366	0.288	0.233	0.161	0.059	0.000	0.000	0.000	0.000	0.000	0.000	0.439
1.	1.449	0.851	0.622	0.500	0.429	0.372	0.303	0.196	0.045	0.000	0.000	0.000	0.000	0.000	0.609
2.	1.888	0.977	0.739	0.641	0.580	0.527	0.464	0.368	0.209	0.003	0.000	0.000	0.000	0.000	0.754
3.	2.112	1.009	0.808	0.723	0.666	0.617	0.560	0.476	0.325	0.060	0.000	0.000	0.000	0.000	0.821
4.	2.240	1.027	0.852	0.775	0.722	0.678	0.627	0.549	0.408	0.134	0.000	0.000	0.000	0.000	0.862
5.	2.352	1.037	0.878	0.811	0.766	0.725	0.675	0.601	0.470	0.203	0.005	0.000	0.000	0.000	0.890
6.	2.412	1.051	0.904	0.840	0.797	0.759	0.712	0.644	0.521	0.263	0.033	0.000	0.000	0.000	0.911
8.	2.491	1.074	0.943	0.883	0.843	0.808	0.767	0.707	0.596	0.359	0.102	0.002	0.000	0.000	0.942
10.	2.539	1.091	0.971	0.914	0.876	0.843	0.806	0.751	0.650	0.432	0.173	0.019	0.000	0.000	0.965
15.	2.605	1.115	1.017	0.966	0.930	0.900	0.867	0.821	0.738	0.557	0.317	0.128	0.000	0.000	1.003
20.	2.642	1.129	1.046	1.000	0.966	0.936	0.905	0.865	0.792	0.635	0.419	0.228	0.000	0.000	1.028
30.	2.688	1.147	1.082	1.043	1.011	0.982	0.953	0.917	0.857	0.729	0.551	0.378	0.000	0.000	1.060
40.	2.707	1.157	1.103	1.069	1.040	1.012	0.983	0.950	0.897	0.785	0.632	0.477	0.058	0.000	1.080
50.	2.711	1.163	1.116	1.087	1.061	1.035	1.006	0.972	0.923	0.823	0.686	0.549	0.138	0.000	1.094
60.	2.701	1.168	1.127	1.100	1.075	1.051	1.023	0.990	0.944	0.852	0.726	0.600	0.209	0.000	1.104
80.	2.672	1.174	1.140	1.117	1.096	1.073	1.047	1.017	0.974	0.892	0.782	0.674	0.324	0.000	1.119
100.	2.640	1.177	1.149	1.129	1.109	1.089	1.065	1.037	0.993	0.919	0.821	0.723	0.408	0.000	1.129
200.	2.488	1.181	1.164	1.152	1.140	1.127	1.110	1.087	1.054	0.990	0.916	0.847	0.627	0.000	1.151
500.	1.921	1.184	1.177	1.171	1.165	1.158	1.149	1.136	1.113	1.065	1.008	0.960	0.817	0.000	1.164
1000.	1.622	1.186	1.182	1.178	1.175	1.171	1.166	1.158	1.144	1.110	1.064	1.023	0.912	0.000	1.170
2000.	1.432	1.186	1.185	1.183	1.181	1.178	1.176	1.173	1.162	1.140	1.110	1.077	0.985	0.000	1.176
5000.	1.300	1.187	1.186	1.185	1.184	1.180	1.183	1.181	1.177	1.167	1.148	1.130	1.065	0.000	1.181
10000.	1.248	1.186	1.186	1.186	1.186	1.185	1.185	1.185	1.183	1.177	1.167	1.154	1.107	0.000	1.183
k/T1	0.00														

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

k/T <sub>1</sub>	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T <sub>1</sub> (MeV)															
Z = 7															
0.001	0.001	0.004	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.003	0.007	0.005	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.005	0.010	0.015	0.011	0.008	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
0.01	0.021	0.028	0.021	0.015	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.044	0.053	0.041	0.030	0.017	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023
0.05	0.115	0.121	0.096	0.071	0.041	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060
0.1	0.235	0.219	0.176	0.132	0.075	0.040	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.118
0.2	0.458	0.377	0.305	0.222	0.140	0.094	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.223
0.5	0.959	0.658	0.504	0.363	0.285	0.229	0.158	0.058	0.000	0.000	0.000	0.000	0.000	0.000	0.432
1.	1.439	0.850	0.617	0.496	0.426	0.369	0.299	0.193	0.044	0.000	0.000	0.000	0.000	0.000	0.602
2.	1.897	0.973	0.739	0.642	0.579	0.525	0.460	0.365	0.206	0.003	0.000	0.000	0.000	0.000	0.748
3.	2.120	1.011	0.807	0.722	0.665	0.616	0.558	0.473	0.322	0.060	0.000	0.000	0.000	0.000	0.817
4.	2.250	1.032	0.851	0.774	0.722	0.676	0.624	0.547	0.407	0.132	0.000	0.000	0.000	0.000	0.859
5.	2.344	1.043	0.885	0.812	0.762	0.721	0.673	0.602	0.470	0.200	0.005	0.000	0.000	0.000	0.888
6.	2.409	1.056	0.911	0.841	0.794	0.755	0.711	0.645	0.521	0.259	0.032	0.000	0.000	0.000	0.909
8.	2.512	1.075	0.945	0.883	0.841	0.806	0.766	0.707	0.598	0.358	0.100	0.002	0.000	0.000	0.940
10.	2.564	1.090	0.972	0.913	0.874	0.840	0.804	0.752	0.653	0.432	0.170	0.018	0.000	0.000	0.963
15.	2.633	1.112	1.015	0.965	0.928	0.898	0.866	0.823	0.742	0.558	0.314	0.126	0.000	0.000	1.000
20.	2.671	1.124	1.043	0.998	0.964	0.934	0.905	0.866	0.796	0.637	0.417	0.226	0.000	0.000	1.025
30.	2.716	1.140	1.076	1.039	1.009	0.981	0.952	0.919	0.861	0.733	0.551	0.376	0.000	0.000	1.057
40.	2.734	1.149	1.097	1.065	1.037	1.010	0.983	0.951	0.900	0.789	0.633	0.477	0.057	0.000	1.077
50.	2.734	1.155	1.111	1.082	1.057	1.031	1.005	0.975	0.927	0.827	0.689	0.548	0.137	0.000	1.091
60.	2.721	1.158	1.120	1.095	1.072	1.049	1.023	0.993	0.945	0.856	0.730	0.600	0.209	0.000	1.101
80.	2.691	1.163	1.132	1.112	1.092	1.071	1.047	1.019	0.974	0.895	0.787	0.675	0.323	0.000	1.115
100.	2.662	1.166	1.140	1.122	1.104	1.085	1.064	1.037	0.995	0.922	0.825	0.726	0.408	0.000	1.124
200.	2.507	1.169	1.153	1.142	1.132	1.105	1.085	1.053	0.992	0.920	0.852	0.628	0.000	0.145	1.145
500.	1.926	1.172	1.164	1.159	1.154	1.148	1.140	1.129	1.109	1.064	1.010	0.963	0.821	0.000	1.155
1000.	1.619	1.173	1.169	1.166	1.163	1.159	1.155	1.148	1.136	1.106	1.063	1.025	0.915	0.000	1.160
2000.	1.424	1.173	1.172	1.170	1.168	1.166	1.164	1.162	1.152	1.133	1.106	1.075	0.988	0.000	1.164
5000.	1.289	1.173	1.172	1.172	1.171	1.171	1.170	1.168	1.166	1.157	1.141	1.122	1.062	0.000	1.168
10000.	1.236	1.173	1.173	1.172	1.172	1.172	1.172	1.172	1.170	1.166	1.157	1.145	1.103	0.000	1.170
k/T <sub>1</sub>	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T <sub>1</sub> (MeV)															
Z = 8															
0.001	0.001	0.004	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.003	0.007	0.005	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.005	0.009	0.016	0.011	0.008	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
0.01	0.020	0.029	0.021	0.015	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.042	0.054	0.041	0.030	0.017	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023
0.05	0.112	0.121	0.096	0.071	0.040	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.059
0.1	0.229	0.219	0.176	0.131	0.075	0.040	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.117
0.2	0.449	0.377	0.304	0.221	0.139	0.093	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.220
0.5	0.968	0.657	0.502	0.362	0.284	0.228	0.157	0.057	0.000	0.000	0.000	0.000	0.000	0.000	0.428
1.	1.428	0.849	0.615	0.495	0.425	0.367	0.297	0.191	0.044	0.000	0.000	0.000	0.000	0.000	0.598
2.	1.885	0.972	0.738	0.640	0.577	0.523	0.459	0.363	0.204	0.003	0.000	0.000	0.000	0.000	0.745
3.	2.109	1.010	0.806	0.721	0.663	0.614	0.557	0.471	0.320	0.059	0.000	0.000	0.000	0.000	0.814
4.	2.269	1.023	0.846	0.772	0.724	0.678	0.623	0.544	0.403	0.133	0.000	0.000	0.000	0.000	0.855
5.	2.358	1.038	0.880	0.811	0.764	0.722	0.672	0.599	0.468	0.201	0.005	0.000	0.000	0.000	0.885
6.	2.423	1.051	0.907	0.840	0.796	0.756	0.710	0.643	0.520	0.261	0.032	0.000	0.000	0.000	0.907
8.	2.509	1.072	0.945	0.884	0.842	0.806	0.766	0.707	0.597	0.358	0.100	0.002	0.000	0.000	0.939
10.	2.563	1.087	0.972	0.915	0.875	0.841	0.804	0.752	0.653	0.432	0.170	0.018	0.000	0.000	0.961
15.	2.635	1.108	1.015	0.967	0.931	0.899	0.866	0.823	0.742	0.558	0.314	0.125	0.008	0.000	0.999
20.	2.675	1.120	1.042	0.999	0.966	0.936	0.905	0.866	0.797	0.638	0.417	0.225	0.000	0.000	1.024
30.	2.724	1.135	1.074	1.039	1.010	0.982	0.953	0.919	0.862	0.734	0.551	0.376	0.000	0.000	1.056
40.	2.744	1.144	1.094	1.064	1.037	1.011	0.983	0.952	0.901	0.791	0.634	0.477	0.057	0.000	1.075
50.	2.744	1.149	1.107	1.081	1.057	1.033	1.007	0.975	0.926	0.829	0.690	0.548	0.137	0.000	1.089
60.	2.735	1.153	1.116	1.092	1.071	1.048	1.025	0.993	0.946	0.857	0.731	0.601	0.208	0.000	1.099
80.	2.706	1.158	1.128	1.108	1.089	1.069	1.047	1.019	0.975	0.896	0.788	0.676	0.323	0.000	1.112
100.	2.677	1.160	1.135	1.118	1.101	1.083	1.063	1.038	0.995	0.923	0.827	0.727	0.408	0.000	1.121
200.	2.520	1.163	1.147	1.137	1.128	1.117	1.103	1.083	1.052	0.993	0.921	0.853	0.629	0.000	1.141
500.	1.929	1.165	1.158	1.153	1.148	1.143	1.136	1.125	1.107	1.064	1.010	0.963	0.822	0.000	1.150
1000.	1.618	1.166	1.162	1.160	1.157	1.154	1.150	1.144	1.133	1.104	1.062	1.025	0.919	0.000	1.155
2000.	1.424	1.166	1.164	1.163	1.161	1.160	1.158	1.155	1.155	1.148	1.131	1.102	1.076	0.991	0.000
5000.	1.284	1.166	1.166	1.165	1.165	1.164	1.163	1.162	1.159	1.151	1.137	1.120	1.062	0.000	1.162
10000.	1.230	1.166	1.166	1.166	1.166	1.165	1.166	1.164	1.164	1.151	1.142	1.104	0.000	0.000</	

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 10															
0.001	0.001	0.004	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.002	0.007	0.005	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.005	0.008	0.016	0.012	0.008	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
0.01	0.018	0.029	0.022	0.015	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.040	0.054	0.041	0.029	0.016	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.05	0.105	0.122	0.096	0.071	0.040	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.057
0.1	0.217	0.219	0.175	0.130	0.074	0.039	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.114
0.2	0.430	0.376	0.301	0.218	0.137	0.091	0.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.215
0.5	0.924	0.654	0.498	0.358	0.281	0.225	0.154	0.056	0.000	0.000	0.000	0.000	0.000	0.000	0.420
1.	1.406	0.846	0.611	0.491	0.421	0.364	0.294	0.188	0.043	0.000	0.000	0.000	0.000	0.000	0.590
2.	1.860	0.967	0.736	0.638	0.575	0.520	0.455	0.360	0.202	0.003	0.000	0.000	0.000	0.000	0.737
3.	2.118	0.999	0.799	0.720	0.666	0.616	0.554	0.466	0.316	0.059	0.000	0.000	0.000	0.000	0.807
4.	2.262	1.020	0.867	0.773	0.723	0.676	0.620	0.541	0.401	0.131	0.000	0.000	0.000	0.000	0.850
5.	2.361	1.035	0.882	0.812	0.764	0.720	0.669	0.596	0.466	0.199	0.005	0.000	0.000	0.000	0.881
6.	2.432	1.049	0.908	0.842	0.796	0.754	0.707	0.640	0.518	0.259	0.031	0.000	0.000	0.000	0.903
8.	2.529	1.070	0.946	0.886	0.843	0.805	0.763	0.704	0.596	0.356	0.098	0.002	0.000	0.000	0.936
10.	2.590	1.085	0.973	0.917	0.876	0.840	0.802	0.749	0.652	0.431	0.168	0.018	0.000	0.000	0.959
15.	2.670	1.105	1.014	0.967	0.931	0.898	0.865	0.821	0.742	0.558	0.312	0.123	0.000	0.000	0.997
20.	2.712	1.116	1.040	0.998	0.966	0.935	0.904	0.865	0.797	0.639	0.416	0.223	0.000	0.000	1.022
30.	2.761	1.129	1.070	1.036	1.008	0.981	0.952	0.919	0.862	0.735	0.551	0.374	0.000	0.000	1.053
40.	2.777	1.136	1.088	1.059	1.035	1.011	0.984	0.953	0.900	0.791	0.635	0.476	0.057	0.000	1.072
50.	2.778	1.141	1.100	1.075	1.053	1.031	1.006	0.976	0.926	0.830	0.692	0.548	0.136	0.000	1.085
60.	2.775	1.144	1.107	1.085	1.066	1.045	1.021	0.992	0.968	0.859	0.732	0.602	0.208	0.000	1.094
80.	2.736	1.148	1.119	1.101	1.084	1.065	1.045	1.019	0.975	0.898	0.790	0.677	0.322	0.000	1.107
100.	2.705	1.150	1.125	1.110	1.095	1.079	1.060	1.036	0.996	0.924	0.828	0.729	0.407	0.000	1.116
200.	2.564	1.151	1.137	1.128	1.119	1.109	1.097	1.080	1.051	0.994	0.922	0.853	0.629	0.000	1.135
500.	1.939	1.153	1.167	1.142	1.138	1.133	1.127	1.118	1.101	1.062	1.011	0.964	0.821	0.000	1.142
1000.	1.619	1.154	1.150	1.148	1.145	1.143	1.139	1.134	1.124	1.099	1.061	1.025	0.921	0.000	1.145
2000.	1.416	1.154	1.153	1.151	1.150	1.148	1.147	1.146	1.136	1.122	1.099	1.072	0.990	0.000	1.148
5000.	1.275	1.154	1.153	1.153	1.152	1.152	1.151	1.150	1.148	1.141	1.129	1.114	1.060	0.000	1.151
10000.	1.220	1.154	1.153	1.153	1.153	1.153	1.153	1.153	1.152	1.148	1.141	1.132	1.098	0.000	1.152
k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 11															
0.001	0.001	0.004	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.003	0.007	0.005	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.005	0.009	0.016	0.012	0.008	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
0.01	0.019	0.029	0.022	0.015	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.040	0.055	0.042	0.030	0.016	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.05	0.108	0.122	0.096	0.070	0.039	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.056
0.1	0.222	0.219	0.175	0.129	0.073	0.039	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.112
0.2	0.437	0.375	0.300	0.217	0.156	0.090	0.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.213
0.5	0.934	0.652	0.496	0.356	0.279	0.223	0.153	0.055	0.000	0.000	0.000	0.000	0.000	0.000	0.417
1.	1.421	0.843	0.609	0.469	0.419	0.362	0.292	0.187	0.042	0.000	0.000	0.000	0.000	0.000	0.587
2.	1.884	0.965	0.734	0.636	0.573	0.518	0.453	0.358	0.200	0.003	0.000	0.000	0.000	0.000	0.735
3.	2.132	0.995	0.797	0.719	0.665	0.614	0.552	0.464	0.315	0.058	0.000	0.000	0.000	0.000	0.805
4.	2.265	1.014	0.844	0.773	0.723	0.675	0.618	0.538	0.399	0.131	0.000	0.000	0.000	0.000	0.848
5.	2.356	1.028	0.879	0.812	0.765	0.720	0.667	0.594	0.464	0.199	0.005	0.000	0.000	0.000	0.878
6.	2.422	1.040	0.905	0.843	0.798	0.755	0.706	0.637	0.516	0.258	0.031	0.000	0.000	0.000	0.901
8.	2.513	1.062	0.963	0.887	0.845	0.805	0.761	0.701	0.594	0.356	0.098	0.002	0.000	0.000	0.933
10.	2.573	1.077	0.970	0.918	0.879	0.841	0.801	0.747	0.650	0.431	0.168	0.018	0.000	0.000	0.957
15.	2.657	1.101	1.012	0.968	0.933	0.900	0.864	0.819	0.741	0.559	0.312	0.123	0.000	0.000	0.996
20.	2.708	1.115	1.059	0.999	0.968	0.937	0.904	0.864	0.796	0.639	0.416	0.223	0.000	0.000	1.022
30.	2.770	1.134	1.073	1.038	1.010	0.982	0.953	0.919	0.862	0.735	0.552	0.375	0.000	0.000	1.055
40.	2.796	1.143	1.092	1.062	1.037	1.012	0.985	0.953	0.900	0.792	0.636	0.476	0.057	0.000	1.075
50.	2.803	1.150	1.106	1.079	1.055	1.031	1.006	0.976	0.927	0.831	0.693	0.548	0.136	0.000	1.089
60.	2.796	1.155	1.116	1.091	1.069	1.046	1.023	0.994	0.947	0.859	0.734	0.602	0.207	0.000	1.099
80.	2.767	1.161	1.128	1.107	1.087	1.067	1.045	1.019	0.976	0.898	0.791	0.678	0.322	0.000	1.113
100.	2.741	1.164	1.135	1.117	1.099	1.082	1.061	1.035	0.997	0.926	0.829	0.730	0.406	0.000	1.122
200.	2.572	1.167	1.150	1.138	1.128	1.116	1.101	1.082	1.052	0.994	0.923	0.855	0.630	0.000	1.143
500.	1.962	1.170	1.162	1.156	1.151	1.145	1.136	1.125	1.105	1.063	1.011	0.965	0.825	0.000	1.153
1000.	1.640	1.171	1.167	1.164	1.160	1.156	1.152	1.145	1.132	1.103	1.061	1.025	0.921	0.000	1.158
2000.	1.438	1.171	1.169	1.167	1.166	1.164	1.161	1.157	1.150	1.131	1.101	1.074	0.992	0.000	1.162
5000.	1.294	1.171	1.171	1.170	1.169	1.169	1.168	1.166	1.163	1.153	1.137	1.119	1.061	0.000	1.166
10000.	1.238	1.171	1.171	1.171	1.171	1.170	1.170	1.168	1.163	1.153	1.142	1.102	0.000	0.000	1.168
k/T1	0.														

TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
<b>T1 (MeV)</b>															
Z = 13															
0.001	0.001	0.005	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.002	0.003	0.008	0.006	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.005	0.009	0.017	0.012	0.008	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
0.01	0.020	0.030	0.022	0.015	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.042	0.055	0.042	0.029	0.016	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.113	0.121	0.096	0.070	0.039	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.055
0.1	0.226	0.219	0.174	0.128	0.072	0.038	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.110
0.2	0.442	0.373	0.297	0.214	0.134	0.089	0.037	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.208
0.5	0.941	0.648	0.493	0.353	0.276	0.220	0.150	0.056	0.000	0.000	0.000	0.000	0.000	0.000	0.412
1.	1.431	0.842	0.604	0.484	0.416	0.360	0.289	0.183	0.041	0.000	0.000	0.000	0.000	0.000	0.582
2.	1.907	0.960	0.728	0.632	0.570	0.515	0.430	0.355	0.197	0.003	0.000	0.000	0.000	0.000	0.730
3.	2.156	0.994	0.794	0.716	0.662	0.611	0.548	0.461	0.312	0.057	0.000	0.000	0.000	0.000	0.802
4.	2.293	1.015	0.843	0.772	0.722	0.673	0.615	0.535	0.396	0.129	0.000	0.000	0.000	0.000	0.846
5.	2.387	1.031	0.879	0.813	0.765	0.719	0.665	0.590	0.461	0.197	0.005	0.000	0.000	0.000	0.878
6.	2.455	1.046	0.907	0.844	0.799	0.754	0.703	0.634	0.513	0.256	0.031	0.000	0.000	0.000	0.902
8.	2.549	1.070	0.947	0.890	0.847	0.806	0.760	0.698	0.591	0.354	0.097	0.002	0.000	0.000	0.936
10.	2.609	1.087	0.975	0.922	0.882	0.843	0.800	0.744	0.647	0.429	0.166	0.017	0.000	0.000	0.960
15.	2.695	1.113	1.020	0.973	0.937	0.902	0.865	0.818	0.739	0.557	0.311	0.122	0.000	0.000	1.001
20.	2.744	1.128	1.048	1.005	0.971	0.939	0.905	0.864	0.795	0.638	0.415	0.222	0.000	0.000	1.028
30.	2.804	1.145	1.082	1.045	1.014	0.984	0.954	0.920	0.863	0.736	0.552	0.374	0.000	0.000	1.061
40.	2.828	1.154	1.101	1.069	1.041	1.014	0.987	0.954	0.900	0.793	0.636	0.476	0.056	0.000	1.081
50.	2.832	1.161	1.114	1.085	1.060	1.035	1.008	0.978	0.928	0.832	0.693	0.548	0.135	0.000	0.095
60.	2.824	1.165	1.124	1.097	1.074	1.050	1.025	0.995	0.948	0.860	0.734	0.603	0.207	0.000	1.105
80.	2.798	1.170	1.136	1.113	1.093	1.072	1.048	1.019	0.978	0.900	0.791	0.679	0.531	0.000	1.119
100.	2.767	1.173	1.144	1.124	1.106	1.087	1.065	1.038	0.999	0.927	0.829	0.731	0.606	0.000	1.128
200.	2.597	1.178	1.160	1.148	1.136	1.124	1.108	1.087	1.055	0.996	0.924	0.856	0.631	0.000	1.151
500.	1.981	1.181	1.173	1.167	1.161	1.154	1.145	1.133	1.112	1.066	1.013	0.966	0.823	0.000	1.162
1000.	1.655	1.182	1.178	1.174	1.171	1.167	1.162	1.154	1.141	1.109	1.064	1.027	0.922	0.000	1.168
2000.	1.452	1.182	1.180	1.178	1.177	1.175	1.172	1.168	1.160	1.139	1.107	1.076	0.994	0.000	1.173
5000.	1.306	1.183	1.182	1.181	1.180	1.179	1.177	1.174	1.174	1.164	1.126	1.064	0.999	0.000	1.177
10000.	1.249	1.183	1.182	1.182	1.182	1.182	1.182	1.181	1.179	1.174	1.163	1.152	1.108	0.000	1.179
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
<b>T1 (MeV)</b>															
Z = 14															
0.001	0.001	0.005	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.003	0.008	0.006	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.005	0.009	0.017	0.012	0.008	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
0.01	0.020	0.030	0.022	0.015	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.042	0.055	0.042	0.029	0.016	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.112	0.122	0.096	0.070	0.059	0.034	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050
0.1	0.225	0.219	0.174	0.127	0.071	0.037	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.109
0.2	0.441	0.372	0.296	0.213	0.133	0.088	0.037	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.208
0.5	0.939	0.645	0.491	0.351	0.274	0.218	0.148	0.053	0.000	0.000	0.000	0.000	0.000	0.000	0.408
1.	1.428	0.840	0.602	0.482	0.414	0.358	0.287	0.182	0.041	0.000	0.000	0.000	0.000	0.000	0.573
2.	1.902	0.958	0.727	0.631	0.568	0.513	0.448	0.354	0.196	0.003	0.000	0.000	0.000	0.000	0.727
3.	2.130	0.998	0.799	0.715	0.657	0.607	0.547	0.461	0.311	0.057	0.000	0.000	0.000	0.000	0.802
4.	2.290	1.013	0.842	0.771	0.721	0.672	0.614	0.533	0.395	0.128	0.000	0.000	0.000	0.000	0.846
5.	2.384	1.030	0.878	0.812	0.765	0.718	0.664	0.589	0.460	0.196	0.004	0.000	0.000	0.000	0.876
6.	2.452	1.045	0.906	0.844	0.798	0.754	0.703	0.633	0.512	0.255	0.030	0.000	0.000	0.000	0.900
8.	2.547	1.069	0.946	0.889	0.847	0.806	0.760	0.698	0.590	0.353	0.097	0.002	0.000	0.000	0.935
10.	2.608	1.086	0.975	0.922	0.882	0.843	0.800	0.744	0.646	0.428	0.166	0.017	0.000	0.000	0.966
20.	2.695	1.112	1.020	0.974	0.937	0.903	0.865	0.818	0.738	0.557	0.310	0.122	0.000	0.000	1.001
40.	2.745	1.127	1.048	1.006	0.972	0.940	0.906	0.864	0.795	0.638	0.415	0.222	0.000	0.000	1.028
50.	2.806	1.145	1.082	1.046	1.015	0.985	0.955	0.920	0.863	0.736	0.552	0.374	0.000	0.000	1.061
1000.	1.983	1.180	1.172	1.166	1.160	1.154	1.145	1.133	1.112	1.068	1.014	0.967	0.826	0.000	1.161
2000.	1.656	1.180	1.176	1.173	1.170	1.166	1.161	1.154	1.141	1.110	1.066	1.028	0.923	0.000	1.162
5000.	1.451	1.181	1.179	1.177	1.175	1.174	1.171	1.167	1.160	1.139	1.108	1.081	0.994	0.000	1.172
10000.	1.305	1.181	1.180	1.179	1.178	1.178	1.178	1.176	1.173	1.163	1.146	1.127	1.066	0.000	1.178
12.	1.248	1.181	1.181	1.180	1.180	1.180	1.180	1.179	1.178	1.173	1.152	1.109	0.000	0.000	1.179
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
<b>T1 (MeV)</b>															
Z = 15															
0.001	0.001	0.005	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.003	0.006	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.005	0.009	0.017	0.012	0.008	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
0.01	0.020	0.030	0.022	0.015	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.042	0.055	0.042	0.029	0.016	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.111	0.122	0.096	0.070	0.058	0.034	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050
0.1	0.223	0.219	0.173	0.127	0.071	0.037	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.109
0.2	0.438	0.371	0.295	0.212	0.132	0.087	0.036	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.208
0.5	0.934	0.643	0.489	0.350	0.272	0.217	0.147	0.053	0.000	0.000	0.000	0.000	0.000	0.000	0.403
1.	1.425	0.835	0.602	0.482	0.413	0.355	0.285	0.181	0.040	0.000	0.000	0.000</td			

**TABLE II.** Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung and Total Integrated Radiative Energy-Loss Cross Sections  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)								Z = 16							
0.001	0.001	0.005	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.003	0.009	0.006	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.005	0.009	0.017	0.013	0.008	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
0.01	0.020	0.031	0.023	0.015	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.042	0.055	0.042	0.029	0.016	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.110	0.123	0.095	0.069	0.038	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.053
0.1	0.221	0.219	0.173	0.126	0.070	0.037	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.106
0.2	0.436	0.370	0.294	0.211	0.131	0.086	0.036	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.202
0.5	0.932	0.640	0.487	0.348	0.271	0.215	0.166	0.052	0.000	0.000	0.000	0.000	0.000	0.000	0.402
1.	1.423	0.833	0.600	0.480	0.411	0.353	0.283	0.179	0.040	0.000	0.000	0.000	0.000	0.000	0.572
2.	1.897	0.955	0.722	0.626	0.563	0.509	0.445	0.350	0.193	0.002	0.000	0.000	0.000	0.000	0.721
3.	2.125	0.996	0.793	0.709	0.652	0.602	0.544	0.459	0.309	0.056	0.000	0.000	0.000	0.000	0.794
4.	2.262	1.016	0.843	0.766	0.711	0.665	0.613	0.534	0.393	0.126	0.000	0.000	0.000	0.000	0.840
5.	2.357	1.031	0.879	0.807	0.755	0.712	0.664	0.591	0.459	0.193	0.004	0.000	0.000	0.000	0.872
6.	2.459	1.041	0.900	0.837	0.793	0.751	0.702	0.633	0.512	0.254	0.030	0.000	0.000	0.000	0.896
8.	2.555	1.066	0.942	0.884	0.843	0.804	0.760	0.699	0.591	0.352	0.095	0.002	0.000	0.000	0.932
10.	2.617	1.084	0.971	0.917	0.878	0.842	0.801	0.746	0.648	0.427	0.165	0.017	0.000	0.000	0.957
15.	2.705	1.110	1.018	0.971	0.935	0.902	0.867	0.821	0.740	0.556	0.309	0.121	0.000	0.000	1.000
20.	2.756	1.125	1.047	1.004	0.971	0.940	0.907	0.867	0.797	0.638	0.414	0.221	0.000	0.000	1.027
30.	2.818	1.142	1.081	1.045	1.015	0.986	0.956	0.922	0.864	0.736	0.551	0.373	0.000	0.000	1.061
40.	2.844	1.152	1.100	1.069	1.042	1.015	0.987	0.956	0.905	0.794	0.635	0.477	0.056	0.000	1.081
50.	2.847	1.158	1.113	1.085	1.060	1.035	1.009	0.980	0.933	0.833	0.692	0.550	0.135	0.000	1.095
60.	2.842	1.161	1.121	1.096	1.074	1.052	1.027	0.996	0.952	0.863	0.734	0.603	0.206	0.000	1.105
80.	2.811	1.165	1.132	1.112	1.093	1.073	1.050	1.022	0.981	0.902	0.792	0.680	0.321	0.000	1.118
100.	2.780	1.167	1.139	1.121	1.105	1.088	1.067	1.040	1.002	0.929	0.831	0.732	0.406	0.000	1.128
200.	2.608	1.171	1.154	1.143	1.133	1.122	1.107	1.088	1.058	0.999	0.925	0.856	0.631	0.000	1.149
500.	1.983	1.173	1.166	1.161	1.155	1.149	1.142	1.131	1.112	1.069	1.016	0.968	0.824	0.000	1.158
1000.	1.653	1.174	1.170	1.167	1.164	1.161	1.156	1.150	1.138	1.109	1.067	1.030	0.925	0.000	1.163
2000.	1.447	1.174	1.172	1.170	1.169	1.168	1.166	1.162	1.155	1.137	1.108	1.079	0.995	0.000	1.166
5000.	1.299	1.174	1.174	1.173	1.173	1.172	1.171	1.170	1.167	1.159	1.143	1.125	1.067	0.000	1.170
10000.	1.242	1.175	1.174	1.173	1.174	1.174	1.174	1.173	1.171	1.167	1.158	1.147	1.107	0.000	1.172

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)	Z = 17														
0.001	0.000	0.005	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.002	0.009	0.006	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.005	0.009	0.018	0.013	0.008	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.019	0.031	0.023	0.016	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.042	0.056	0.042	0.029	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.109	0.123	0.095	0.069	0.038	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.053
0.1	0.220	0.219	0.173	0.126	0.070	0.036	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.105
0.2	0.433	0.369	0.292	0.209	0.130	0.085	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.200
0.5	0.927	0.638	0.485	0.346	0.269	0.213	0.164	0.051	0.000	0.000	0.000	0.000	0.000	0.000	0.389
1.	1.421	0.831	0.597	0.478	0.409	0.352	0.281	0.178	0.060	0.000	0.000	0.000	0.000	0.000	0.569
2.	1.894	0.953	0.720	0.624	0.562	0.507	0.443	0.349	0.192	0.002	0.000	0.000	0.000	0.000	0.719
3.	2.117	0.998	0.792	0.707	0.650	0.601	0.543	0.457	0.309	0.055	0.000	0.000	0.000	0.000	0.793
4.	2.295	1.011	0.835	0.764	0.714	0.667	0.610	0.531	0.392	0.126	0.000	0.000	0.000	0.000	0.838
5.	2.393	1.028	0.872	0.805	0.758	0.714	0.661	0.587	0.458	0.194	0.004	0.000	0.000	0.000	0.871
6.	2.466	1.043	0.901	0.837	0.792	0.750	0.701	0.632	0.511	0.253	0.030	0.000	0.000	0.000	0.896
8.	2.565	1.068	0.943	0.884	0.842	0.804	0.760	0.699	0.590	0.351	0.095	0.002	0.000	0.000	0.932
10.	2.628	1.086	0.972	0.917	0.878	0.841	0.801	0.745	0.647	0.427	0.164	0.017	0.000	0.000	0.957
15.	2.716	1.111	1.019	0.972	0.936	0.902	0.867	0.821	0.740	0.556	0.309	0.121	0.000	0.000	1.000
20.	2.766	1.125	1.047	1.005	0.972	0.940	0.907	0.867	0.797	0.638	0.414	0.221	0.000	0.000	1.027
30.	2.825	1.142	1.080	1.045	1.015	0.987	0.957	0.923	0.865	0.736	0.551	0.373	0.000	0.000	1.061
40.	2.849	1.150	1.100	1.069	1.042	1.015	0.988	0.957	0.906	0.794	0.635	0.476	0.056	0.000	1.081
50.	2.856	1.155	1.111	1.084	1.061	1.037	1.011	0.979	0.932	0.834	0.693	0.548	0.134	0.000	1.096
60.	2.846	1.159	1.119	1.095	1.074	1.052	1.028	0.997	0.952	0.863	0.735	0.603	0.206	0.000	1.104
80.	2.816	1.163	1.130	1.110	1.093	1.073	1.051	1.022	0.982	0.903	0.793	0.680	0.320	0.000	1.118
100.	2.785	1.165	1.137	1.120	1.105	1.087	1.067	1.041	1.003	0.930	0.831	0.732	0.406	0.000	1.127
200.	2.610	1.169	1.152	1.142	1.132	1.120	1.107	1.088	1.058	1.000	0.926	0.856	0.631	0.000	1.148
500.	1.984	1.170	1.163	1.158	1.153	1.147	1.140	1.129	1.111	1.070	1.016	0.969	0.828	0.000	1.156
1000.	1.653	1.171	1.167	1.165	1.162	1.159	1.154	1.148	1.137	1.109	1.068	1.030	0.926	0.000	1.161
2000.	1.445	1.171	1.169	1.168	1.167	1.165	1.163	1.159	1.153	1.135	1.108	1.083	0.996	0.000	1.164
5000.	1.297	1.172	1.171	1.170	1.170	1.169	1.167	1.167	1.165	1.156	1.141	1.124	1.068	0.000	1.167
10000.	1.239	1.172	1.171	1.171	1.171	1.171	1.171	1.170	1.169	1.165	1.156	1.146	1.107	0.000	1.169

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)								Z = 18							
0.001	0.000	0.005	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.002	0.009	0.006	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.005	0.009	0.018	0.013	0.009	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.01	0.019	0.031	0.023	0.016	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.041	0.056	0.042	0.029	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.108	0.124	0.095	0.069	0.038	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.052
0.1	0.218	0.219	0.172	0.125	0.069	0.036	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.104
0.2	0.429	0.368	0.291	0.208	0.129	0.085	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.199
0.5	0.922	0.636	0.483	0.344	0.267	0.211	0.143	0.051	0.000	0.000	0.000	0.000	0.000	0.000	0.396
1.	1.416	0.830	0.595	0.476	0.407	0.350	0.280	0.176	0.059	0.000	0.000	0.000	0.000	0.000	0.566
2.	1.885	0.951	0.718	0.623	0.560	0.505	0.441	0.347	0.191	0.002	0.000	0.000	0.000	0.000	0.716
3.	2.106	0.996	0.792	0.706	0.648	0.600	0.541	0.455	0.307	0.054	0.000	0.000	0.000	0.000	0.790
4.	2.285	1.008	0.834	0.763	0.714	0.666	0.609	0.529	0.391	0.126	0.000	0.000	0.000	0.000	0.836
5.	2.385	1.025	0.872	0.805	0.758	0.713	0.660	0.586	0.457	0.193	0.004	0.000	0.000	0.000	0.869
6.	2.459	1.041	0.901	0.837	0.792	0.749	0.700	0.631	0.510	0.252	0.029	0.000	0.000	0.000	0.894
8.	2.560	1.066	0.943	0.884	0.842	0.803	0.759	0.698	0.589	0.351	0.095	0.002	0.000	0.000	0.930
10.	2.626	1.084	0.972	0.918	0.878	0.841	0.800	0.745	0.647	0.426	0.164	0.017	0.000	0.000	0.956
15.	2.717	1.109	1.019	0.972	0.936	0.902	0.867	0.821	0.740	0.556	0.308	0.120	0.000	0.000	0.999
20.	2.769	1.124	1.047	1.005	0.972	0.941	0.908	0.867	0.797	0.638	0.414	0.220	0.000	0.000	1.027
30.	2.850	1.139	1.079	1.045	1.016	0.987	0.957	0.923	0.865	0.736	0.551	0.373	0.000	0.000	1.060
40.	2.854	1.148	1.098	1.068	1.042	1.015	0.988	0.957	0.906	0.795	0.635	0.476	0.056	0.000	1.080
50.	2.857	1.153	1.109	1.083	1.060	1.037	1.011	0.980	0.933	0.834	0.693	0.548	0.134	0.000	1.093
60.	2.850	1.156	1.117	1.094	1.073	1.052	1.028	0.997	0.953	0.864	0.735	0.603	0.205	0.000	1.103
80.	2.819	1.159	1.127	1.108	1.091	1.072	1.050	1.023	0.982	0.904	0.793	0.680	0.320	0.000	1.116
100.	2.788	1.161	1.134	1.117	1.103	1.086	1.066	1.041	1.003	0.931	0.832	0.732	0.406	0.000	1.125
200.	2.611	1.165	1.149	1.138	1.129	1.118	1.105	1.087	1.058	1.000	0.927	0.857	0.631	0.000	1.145
500.	1.983	1.166	1.159	1.154	1.149	1.144	1.137	1.127	1.109	1.069	1.018	0.970	0.825	0.000	1.153
1000.	1.651	1.167	1.163	1.161	1.158	1.155	1.151	1.145	1.134	1.107	1.068	1.031	0.926	0.000	1.157
2000.	1.442	1.167	1.165	1.164	1.162	1.161	1.159	1.155	1.150	1.133	1.106	1.083	0.997	0.000	1.160
5000.	1.293	1.167	1.168	1.166	1.165	1.165	1.164	1.163	1.161	1.153	1.139	1.122	1.068	0.000	1.163
10000.	1.235	1.167	1.167	1.166	1.166	1.167	1.166	1.166	1.165	1.161	1.153	1.143	1.105	0.000	1.165

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
$Z = 19$															
$(\text{MeV})$															
0.001	0.000	0.006	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.003	0.009	0.007	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.009	0.018	0.013	0.009	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.020	0.032	0.023	0.016	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.042	0.056	0.042	0.030	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.110	0.124	0.095	0.069	0.037	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.052
0.1	0.221	0.219	0.172	0.125	0.069	0.036	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.104
0.2	0.435	0.367	0.290	0.207	0.128	0.084	0.034	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.197
0.5	0.930	0.635	0.481	0.342	0.266	0.210	0.142	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.394
1.	1.427	0.828	0.593	0.474	0.405	0.348	0.278	0.175	0.059	0.000	0.000	0.000	0.000	0.000	0.564
2.	1.901	0.950	0.716	0.621	0.558	0.504	0.439	0.345	0.190	0.002	0.000	0.000	0.000	0.000	0.714
3.	2.126	0.994	0.790	0.704	0.647	0.598	0.539	0.454	0.306	0.054	0.000	0.000	0.000	0.000	0.789
4.	2.503	1.008	0.834	0.762	0.712	0.665	0.608	0.528	0.389	0.125	0.000	0.000	0.000	0.000	0.835
5.	2.403	1.026	0.871	0.804	0.757	0.712	0.659	0.585	0.455	0.192	0.004	0.000	0.000	0.000	0.868
6.	2.477	1.042	0.900	0.836	0.791	0.749	0.699	0.630	0.508	0.251	0.029	0.000	0.000	0.000	0.894
8.	2.579	1.067	0.943	0.884	0.842	0.802	0.758	0.697	0.588	0.350	0.094	0.002	0.000	0.000	0.931
10.	2.644	1.086	0.972	0.918	0.878	0.841	0.800	0.744	0.646	0.425	0.163	0.017	0.000	0.000	0.957
15.	2.735	1.112	1.019	0.972	0.936	0.903	0.867	0.821	0.740	0.556	0.308	0.120	0.000	0.000	1.001
20.	2.786	1.127	1.048	1.006	0.972	0.941	0.908	0.867	0.797	0.638	0.413	0.220	0.000	0.000	1.028
30.	2.846	1.144	1.081	1.045	1.016	0.987	0.958	0.923	0.866	0.737	0.551	0.373	0.000	0.000	1.062
40.	2.869	1.153	1.100	1.069	1.042	1.016	0.989	0.958	0.907	0.795	0.635	0.476	0.055	0.000	1.082
50.	2.873	1.159	1.112	1.084	1.061	1.038	1.012	0.980	0.934	0.835	0.693	0.548	0.134	0.000	1.096
60.	2.865	1.162	1.121	1.096	1.074	1.053	1.028	0.998	0.954	0.864	0.735	0.603	0.205	0.000	1.106
80.	2.828	1.167	1.133	1.112	1.093	1.073	1.051	1.025	0.982	0.903	0.794	0.680	0.521	0.000	1.120
100.	2.796	1.169	1.141	1.122	1.105	1.087	1.067	1.043	1.003	0.931	0.833	0.732	0.406	0.000	1.129
200.	2.625	1.173	1.156	1.144	1.133	1.121	1.107	1.088	1.059	1.001	0.927	0.857	0.632	0.000	1.150
500.	1.995	1.176	1.168	1.163	1.156	1.150	1.142	1.131	1.111	1.070	1.019	0.970	0.825	0.000	1.159
1000.	1.662	1.177	1.173	1.170	1.167	1.163	1.158	1.151	1.138	1.109	1.068	1.032	0.927	0.000	1.164
2000.	1.453	1.177	1.175	1.173	1.172	1.170	1.168	1.163	1.156	1.136	1.108	1.083	0.997	0.000	1.169
5000.	1.304	1.177	1.176	1.176	1.175	1.175	1.172	1.169	1.160	1.143	1.125	1.099	1.069	0.000	1.172
10000.	1.246	1.177	1.177	1.176	1.176	1.176	1.176	1.176	1.174	1.169	1.159	1.148	1.107	0.000	1.174
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
$Z = 20$															
$(\text{MeV})$															
0.001	0.000	0.006	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.003	0.010	0.007	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.009	0.019	0.013	0.009	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.021	0.032	0.023	0.016	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.043	0.057	0.043	0.030	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.112	0.124	0.095	0.068	0.037	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.052
0.1	0.224	0.219	0.171	0.124	0.068	0.035	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.103
0.2	0.438	0.366	0.289	0.206	0.128	0.083	0.034	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.195
0.5	0.934	0.633	0.479	0.341	0.264	0.208	0.140	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.391
1.	1.433	0.826	0.591	0.472	0.403	0.346	0.276	0.174	0.058	0.000	0.000	0.000	0.000	0.000	0.561
2.	1.907	0.949	0.715	0.619	0.557	0.502	0.437	0.343	0.188	0.002	0.000	0.000	0.000	0.000	0.712
3.	2.130	0.992	0.789	0.703	0.646	0.597	0.537	0.452	0.304	0.054	0.000	0.000	0.000	0.000	0.787
4.	2.264	1.016	0.841	0.760	0.706	0.662	0.606	0.528	0.391	0.122	0.000	0.000	0.000	0.000	0.834
5.	2.362	1.031	0.880	0.805	0.751	0.707	0.659	0.586	0.454	0.190	0.004	0.000	0.000	0.000	0.868
6.	2.476	1.040	0.899	0.836	0.791	0.748	0.698	0.629	0.507	0.251	0.029	0.000	0.000	0.000	0.893
8.	2.578	1.066	0.942	0.884	0.842	0.803	0.758	0.696	0.588	0.349	0.094	0.002	0.000	0.000	0.930
10.	2.644	1.085	0.972	0.918	0.878	0.841	0.799	0.744	0.645	0.425	0.162	0.016	0.000	0.000	0.957
15.	2.738	1.113	1.019	0.973	0.935	0.903	0.867	0.821	0.740	0.555	0.307	0.119	0.000	0.000	1.001
20.	2.791	1.129	1.048	1.006	0.973	0.942	0.908	0.867	0.797	0.637	0.413	0.219	0.000	0.000	1.029
30.	2.853	1.147	1.083	1.047	1.017	0.988	0.958	0.924	0.866	0.737	0.551	0.372	0.000	0.000	1.064
40.	2.878	1.157	1.103	1.071	1.043	1.017	0.989	0.958	0.907	0.795	0.635	0.476	0.055	0.000	1.084
50.	2.882	1.163	1.116	1.087	1.062	1.038	1.013	0.981	0.935	0.835	0.693	0.548	0.134	0.000	1.098
60.	2.875	1.167	1.124	1.098	1.076	1.053	1.029	0.999	0.955	0.865	0.735	0.603	0.205	0.000	1.108
80.	2.838	1.172	1.137	1.115	1.095	1.074	1.052	1.026	0.983	0.904	0.794	0.680	0.320	0.000	1.122
100.	2.806	1.175	1.145	1.125	1.107	1.089	1.068	1.044	1.003	0.931	0.833	0.732	0.406	0.000	1.132
200.	2.635	1.179	1.161	1.149	1.137	1.125	1.109	1.089	1.059	1.002	0.928	0.858	0.632	0.000	1.154
500.	2.004	1.182	1.174	1.168	1.162	1.155	1.146	1.134	1.114	1.071	1.019	0.971	0.825	0.000	1.164
1000.	1.670	1.183	1.179	1.176	1.173	1.168	1.163	1.155	1.142	1.111	1.069	1.033	0.928	0.000	1.170
2000.	1.460	1.183	1.181	1.180	1.178	1.176	1.173	1.169	1.161	1.140	1.109	1.080	1.000	0.000	1.174
5000.	1.310	1.184	1.183	1.182	1.181	1.181	1.180	1.178	1.175	1.165	1.147	1.127	1.070	0.000	1.178
10000.	1.252	1.184	1.183	1.183	1.183	1.183	1.182	1.180	1.175	1.164	1.152	1.109	1.064	0.00	

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 22															
0.001	0.000	0.006	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.002	0.010	0.007	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.009	0.019	0.014	0.009	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.020	0.033	0.024	0.016	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.042	0.058	0.043	0.030	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.110	0.124	0.095	0.068	0.037	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.051
0.1	0.221	0.219	0.171	0.123	0.067	0.035	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.101
0.2	0.432	0.365	0.287	0.204	0.126	0.082	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.192
0.5	0.924	0.628	0.474	0.337	0.261	0.205	0.138	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.385
1.	1.424	0.822	0.586	0.468	0.400	0.343	0.273	0.171	0.037	0.000	0.000	0.000	0.000	0.000	0.555
2.	1.905	0.948	0.713	0.616	0.553	0.498	0.434	0.340	0.186	0.002	0.000	0.000	0.000	0.000	0.707
3.	2.127	0.994	0.787	0.700	0.643	0.594	0.534	0.449	0.302	0.053	0.000	0.000	0.000	0.000	0.783
4.	2.260	1.019	0.838	0.755	0.703	0.660	0.604	0.526	0.388	0.121	0.000	0.000	0.000	0.000	0.831
5.	2.409	1.022	0.868	0.800	0.753	0.708	0.656	0.582	0.452	0.189	0.004	0.000	0.000	0.000	0.864
6.	2.482	1.038	0.897	0.833	0.788	0.746	0.696	0.628	0.506	0.249	0.029	0.000	0.000	0.000	0.890
8.	2.583	1.063	0.938	0.880	0.839	0.800	0.756	0.696	0.587	0.347	0.093	0.002	0.000	0.000	0.927
10.	2.648	1.081	0.967	0.914	0.875	0.839	0.799	0.744	0.645	0.423	0.161	0.016	0.000	0.000	0.954
15.	2.741	1.108	1.015	0.968	0.934	0.902	0.867	0.821	0.740	0.555	0.306	0.119	0.000	0.000	0.998
20.	2.793	1.123	1.044	1.002	0.970	0.940	0.909	0.869	0.798	0.637	0.412	0.218	0.000	0.000	1.026
30.	2.856	1.142	1.078	1.043	1.014	0.987	0.959	0.925	0.867	0.737	0.551	0.371	0.000	0.000	1.061
40.	2.882	1.152	1.099	1.068	1.041	1.016	0.990	0.959	0.909	0.796	0.636	0.475	0.055	0.000	1.082
50.	2.888	1.158	1.111	1.084	1.060	1.038	1.013	0.981	0.935	0.837	0.693	0.548	0.133	0.000	1.096
60.	2.881	1.162	1.121	1.096	1.074	1.052	1.029	0.999	0.956	0.866	0.736	0.603	0.204	0.000	1.106
80.	2.845	1.167	1.134	1.112	1.093	1.073	1.051	1.026	0.983	0.905	0.795	0.680	0.320	0.000	1.120
100.	2.813	1.170	1.161	1.122	1.105	1.087	1.067	1.043	1.004	0.933	0.834	0.732	0.406	0.000	1.130
200.	2.642	1.174	1.156	1.145	1.134	1.122	1.107	1.088	1.059	1.003	0.929	0.859	0.632	0.000	1.151
500.	2.004	1.176	1.169	1.163	1.157	1.150	1.142	1.131	1.111	1.070	1.020	0.972	0.826	0.000	1.160
1000.	1.667	1.177	1.173	1.170	1.167	1.163	1.158	1.151	1.138	1.109	1.069	1.033	0.928	0.000	1.165
2000.	1.456	1.177	1.175	1.173	1.172	1.171	1.168	1.164	1.156	1.137	1.107	1.079	0.999	0.000	1.169
5000.	1.305	1.177	1.177	1.176	1.176	1.175	1.174	1.173	1.170	1.160	1.143	1.125	1.069	0.000	1.173
10000.	1.247	1.178	1.177	1.176	1.177	1.177	1.177	1.176	1.174	1.170	1.159	1.148	1.107	0.000	1.171
k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 23															
0.001	0.000	0.006	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.002	0.010	0.007	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.009	0.019	0.014	0.009	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.020	0.033	0.024	0.016	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.042	0.058	0.043	0.030	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.109	0.125	0.095	0.068	0.037	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.051
0.1	0.218	0.219	0.171	0.123	0.067	0.034	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100
0.2	0.428	0.365	0.286	0.203	0.125	0.081	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.190
0.5	0.919	0.626	0.472	0.335	0.259	0.204	0.137	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.382
1.	1.420	0.820	0.584	0.466	0.398	0.341	0.271	0.170	0.037	0.000	0.000	0.000	0.000	0.000	0.552
2.	1.900	0.946	0.711	0.615	0.552	0.497	0.432	0.339	0.185	0.002	0.000	0.000	0.000	0.000	0.705
3.	2.121	0.991	0.786	0.699	0.641	0.592	0.532	0.447	0.301	0.052	0.000	0.000	0.000	0.000	0.781
4.	2.251	1.016	0.837	0.755	0.702	0.659	0.602	0.526	0.387	0.120	0.000	0.000	0.000	0.000	0.829
5.	2.341	1.034	0.876	0.795	0.747	0.708	0.654	0.583	0.455	0.185	0.004	0.000	0.000	0.000	0.863
6.	2.409	1.050	0.902	0.827	0.782	0.746	0.694	0.629	0.510	0.243	0.029	0.000	0.000	0.000	0.889
8.	2.570	1.058	0.936	0.880	0.839	0.800	0.756	0.695	0.586	0.346	0.092	0.000	0.000	0.000	0.925
10.	2.636	1.076	0.966	0.914	0.875	0.839	0.798	0.743	0.645	0.423	0.161	0.016	0.000	0.000	0.952
15.	2.719	1.101	1.013	0.969	0.936	0.903	0.868	0.822	0.740	0.550	0.305	0.120	0.000	0.000	0.996
20.	2.776	1.117	1.042	1.003	0.972	0.942	0.910	0.869	0.798	0.634	0.411	0.219	0.000	0.000	1.025
30.	2.852	1.137	1.076	1.042	1.014	0.987	0.959	0.925	0.867	0.737	0.550	0.371	0.000	0.000	1.059
40.	2.882	1.148	1.096	1.066	1.040	0.989	0.950	0.914	0.867	0.796	0.636	0.475	0.055	0.000	1.081
50.	2.890	1.155	1.109	1.082	1.059	1.037	1.012	0.981	0.936	0.837	0.693	0.548	0.133	0.000	1.095
60.	2.884	1.159	1.118	1.094	1.072	1.051	1.028	0.999	0.956	0.866	0.736	0.603	0.204	0.000	1.105
80.	2.849	1.164	1.131	1.110	1.091	1.071	1.050	1.025	0.984	0.906	0.795	0.680	0.320	0.000	1.119
100.	2.818	1.167	1.139	1.120	1.103	1.085	1.066	1.043	1.004	0.933	0.835	0.732	0.406	0.000	1.128
200.	2.644	1.170	1.153	1.141	1.131	1.119	1.105	1.086	1.058	1.003	0.930	0.859	0.632	0.000	1.149
500.	2.003	1.172	1.165	1.159	1.154	1.148	1.140	1.128	1.110	1.069	1.019	0.974	0.831	0.000	1.157
1000.	1.666	1.173	1.169	1.166	1.163	1.160	1.155	1.148	1.136	1.107	1.068	1.033	0.929	0.000	1.162
2000.	1.453	1.174	1.171	1.169	1.168	1.167	1.164	1.160	1.153	1.135	1.106	1.078	1.000	0.000	1.165
5000.	1.302	1.173	1.173	1.172	1.171	1.170	1.169	1.166	1.157	1.141	1.123	1.068	0.000	0.000	1.169
10000.	1.243	1.174	1.173	1.173	1.172	1.173	1.172	1.170	1.166	1.156	1.145	1.105	0.000	0.000	1.171
k/T1	0.0														

**TABLE II.** Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung and Total Integrated Radiative Energy-Loss Cross Sections  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR	
<b>T<sub>1</sub> (MeV)</b>																
	Z = 25															
0.001	0.000	0.006	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
0.002	0.002	0.010	0.007	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	
0.005	0.008	0.020	0.014	0.009	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	
0.01	0.019	0.033	0.024	0.016	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	
0.02	0.041	0.058	0.043	0.030	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021	
0.05	0.106	0.125	0.095	0.068	0.036	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050	
0.1	0.213	0.218	0.170	0.122	0.066	0.034	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.099	
0.2	0.419	0.362	0.284	0.201	0.123	0.080	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.187	
0.5	0.908	0.623	0.468	0.332	0.256	0.201	0.134	0.047	0.000	0.000	0.000	0.000	0.000	0.000	0.377	
1.	1.406	0.815	0.580	0.462	0.394	0.337	0.268	0.167	0.036	0.000	0.000	0.000	0.000	0.000	0.545	
2.	1.886	0.940	0.707	0.611	0.549	0.493	0.429	0.335	0.182	0.002	0.000	0.000	0.000	0.000	0.698	
3.	2.116	0.986	0.783	0.696	0.639	0.590	0.529	0.444	0.298	0.052	0.000	0.000	0.000	0.000	0.776	
4.	2.299	0.999	0.827	0.755	0.705	0.657	0.599	0.519	0.382	0.121	0.000	0.000	0.000	0.000	0.823	
5.	2.404	1.017	0.864	0.798	0.750	0.705	0.652	0.578	0.449	0.187	0.004	0.000	0.000	0.000	0.858	
6.	2.482	1.033	0.893	0.830	0.785	0.743	0.693	0.624	0.503	0.246	0.028	0.000	0.000	0.000	0.884	
8.	2.589	1.058	0.935	0.878	0.837	0.798	0.754	0.693	0.585	0.345	0.092	0.002	0.000	0.000	0.923	
10.	2.662	1.077	0.964	0.911	0.873	0.837	0.797	0.742	0.642	0.422	0.161	0.016	0.000	0.000	0.950	
15.	2.745	1.102	1.011	0.967	0.933	0.902	0.867	0.822	0.740	0.549	0.304	0.119	0.000	0.000	0.995	
20.	2.801	1.116	1.039	1.000	0.969	0.940	0.909	0.869	0.798	0.634	0.410	0.218	0.000	0.000	1.023	
30.	2.875	1.135	1.072	1.038	1.011	0.985	0.958	0.925	0.866	0.737	0.554	0.374	0.000	0.000	1.057	
40.	2.897	1.144	1.092	1.063	1.037	1.013	0.988	0.959	0.909	0.797	0.636	0.475	0.055	0.000	1.078	
50.	2.903	1.150	1.104	1.078	1.055	1.034	1.011	0.981	0.936	0.838	0.694	0.548	0.132	0.000	1.092	
60.	2.893	1.153	1.113	1.089	1.069	1.049	1.026	0.998	0.957	0.867	0.736	0.603	0.204	0.000	1.102	
80.	2.856	1.157	1.125	1.107	1.087	1.068	1.048	1.024	0.983	0.907	0.796	0.680	0.319	0.000	1.115	
100.	2.823	1.160	1.132	1.114	1.098	1.082	1.063	1.041	1.003	0.934	0.836	0.733	0.405	0.000	1.124	
200.	2.649	1.163	1.146	1.135	1.125	1.114	1.101	1.083	1.056	1.003	0.931	0.860	0.633	0.000	1.164	
500.	2.004	1.165	1.157	1.152	1.147	1.141	1.134	1.123	1.105	1.067	1.019	0.972	0.827	0.000	1.151	
1000.	1.662	1.165	1.161	1.159	1.156	1.153	1.148	1.142	1.130	1.103	1.085	1.032	0.930	0.000	1.155	
2000.	1.448	1.165	1.163	1.162	1.161	1.159	1.157	1.153	1.147	1.129	1.102	1.080	0.999	0.000	1.158	
5000.	1.295	1.166	1.165	1.164	1.163	1.163	1.161	1.159	1.150	1.135	1.118	1.066	0.000	0.000	1.162	
10000.	1.236	1.166	1.165	1.165	1.165	1.165	1.165	1.164	1.163	1.159	1.150	1.139	1.101	0.000	1.163	
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR	
<b>T<sub>1</sub> (MeV)</b>																
	Z = 26															
0.001	0.000	0.006	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
0.002	0.002	0.011	0.007	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	
0.005	0.008	0.020	0.015	0.009	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	
0.01	0.019	0.034	0.025	0.017	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	
0.02	0.040	0.059	0.044	0.030	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021	
0.05	0.105	0.125	0.095	0.068	0.036	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050	
0.1	0.211	0.218	0.170	0.121	0.066	0.033	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.098	
0.2	0.416	0.362	0.283	0.200	0.123	0.079	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.186	
0.5	0.900	0.620	0.466	0.330	0.254	0.200	0.133	0.046	0.000	0.000	0.000	0.000	0.000	0.000	0.374	
1.	1.401	0.813	0.578	0.460	0.392	0.335	0.266	0.166	0.036	0.000	0.000	0.000	0.000	0.000	0.542	
2.	1.890	0.939	0.705	0.610	0.547	0.492	0.427	0.334	0.181	0.002	0.000	0.000	0.000	0.000	0.696	
3.	2.124	0.982	0.782	0.696	0.637	0.587	0.528	0.462	0.295	0.052	0.000	0.000	0.000	0.000	0.773	
4.	2.267	1.004	0.833	0.755	0.698	0.652	0.599	0.520	0.381	0.119	0.000	0.000	0.000	0.000	0.822	
5.	2.367	1.021	0.871	0.797	0.744	0.700	0.652	0.579	0.448	0.185	0.004	0.000	0.000	0.000	0.857	
6.	2.442	1.036	0.900	0.830	0.779	0.758	0.693	0.626	0.502	0.244	0.028	0.000	0.000	0.000	0.883	
8.	2.586	1.055	0.933	0.876	0.836	0.797	0.753	0.692	0.584	0.344	0.091	0.002	0.000	0.000	0.921	
10.	2.658	1.073	0.962	0.910	0.872	0.836	0.796	0.741	0.642	0.421	0.160	0.016	0.000	0.000	0.948	
15.	2.741	1.098	1.009	0.966	0.933	0.901	0.866	0.821	0.740	0.549	0.304	0.119	0.000	0.000	0.993	
20.	2.799	1.113	1.037	0.999	0.969	0.940	0.909	0.869	0.798	0.633	0.410	0.218	0.000	0.000	1.022	
30.	2.876	1.132	1.071	1.037	1.010	0.985	0.958	0.925	0.866	0.737	0.554	0.374	0.000	0.000	1.056	
40.	2.901	1.142	1.091	1.061	1.037	1.013	0.988	0.959	0.910	0.797	0.636	0.475	0.054	0.000	1.077	
50.	2.907	1.147	1.102	1.076	1.055	1.034	1.010	0.981	0.937	0.839	0.694	0.548	0.132	0.000	1.091	
60.	2.894	1.151	1.112	1.089	1.068	1.048	1.026	1.000	0.955	0.867	0.737	0.603	0.203	0.000	1.101	
80.	2.862	1.156	1.123	1.104	1.086	1.067	1.048	1.024	0.983	0.907	0.796	0.680	0.319	0.000	1.114	
100.	2.829	1.158	1.131	1.103	1.097	1.081	1.063	1.041	1.003	0.934	0.836	0.733	0.405	0.000	1.123	
200.	2.654	1.161	1.144	1.133	1.123	1.113	1.100	1.082	1.055	1.003	0.931	0.860	0.633	0.000	1.162	
500.	2.005	1.162	1.155	1.150	1.145	1.139	1.132	1.122	1.104	1.066	1.019	0.973	0.827	0.000	1.150	
1000.	1.662	1.163	1.159	1.156	1.154	1.150	1.146	1.140	1.129	1.102	1.065	1.031	0.931	0.000	1.153	
2000.	1.447	1.163	1.161	1.160	1.158	1.157	1.155	1.151	1.145	1.128	1.101	1.075	1.001	0.000	1.156	
5000.	1.293	1.163	1.162	1.162	1.161	1.161	1.160	1.162	1.162	1.160	1.157	1.148	1.117	1.066	0.000	1.159
10000.	1.234	1.163	1.163	1.162	1.162	1.163	1.162	1.162	1.162	1.160	1.157	1.137	1.100	0.000	1.161	
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR	
<b>T<sub>1</sub> (MeV)</b>																
	Z = 27															
0.001	0.000	0.007	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
0.002	0.001	0.011	0.008	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	
0.005	0.008	0.020	0.015	0.009	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	
0.01	0.018	0.034	0.025	0.017	0.008	0.001	0.000	0.000	0.000	0.000	0.00					

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
<i>Z = 28</i>															
0.001	0.000	0.007	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.001	0.011	0.008	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.007	0.020	0.015	0.010	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.018	0.034	0.025	0.017	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.039	0.059	0.044	0.030	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.103	0.126	0.095	0.067	0.036	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050
0.1	0.206	0.218	0.169	0.121	0.065	0.033	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.097
0.2	0.408	0.360	0.281	0.198	0.121	0.078	0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.183
0.5	0.888	0.616	0.463	0.327	0.251	0.197	0.131	0.045	0.000	0.000	0.000	0.000	0.000	0.000	0.368
1.	1.388	0.808	0.574	0.457	0.389	0.332	0.263	0.163	0.035	0.000	0.000	0.000	0.000	0.000	0.536
2.	1.889	0.935	0.701	0.606	0.544	0.489	0.424	0.330	0.179	0.002	0.000	0.000	0.000	0.000	0.691
3.	2.138	0.980	0.778	0.693	0.635	0.584	0.526	0.439	0.293	0.051	0.000	0.000	0.000	0.000	0.769
4.	2.293	1.003	0.830	0.752	0.697	0.650	0.596	0.518	0.378	0.118	0.000	0.000	0.000	0.000	0.819
5.	2.400	1.021	0.868	0.794	0.742	0.698	0.650	0.577	0.446	0.183	0.004	0.000	0.000	0.000	0.854
6.	2.509	1.033	0.891	0.826	0.781	0.739	0.690	0.622	0.500	0.244	0.028	0.000	0.000	0.000	0.881
8.	2.618	1.058	0.933	0.874	0.833	0.795	0.752	0.692	0.583	0.342	0.090	0.002	0.000	0.000	0.920
10.	2.691	1.076	0.961	0.908	0.869	0.834	0.795	0.741	0.641	0.420	0.159	0.016	0.000	0.000	0.947
15.	2.771	1.100	1.009	0.964	0.931	0.899	0.866	0.821	0.740	0.548	0.302	0.118	0.000	0.000	0.993
20.	2.824	1.114	1.037	0.997	0.967	0.938	0.908	0.869	0.799	0.633	0.409	0.217	0.000	0.000	1.021
30.	2.895	1.131	1.069	1.035	1.009	0.984	0.958	0.925	0.866	0.738	0.554	0.373	0.000	0.000	1.055
40.	2.916	1.139	1.089	1.060	1.035	1.011	0.987	0.959	0.910	0.798	0.636	0.474	0.054	0.000	1.076
50.	2.921	1.144	1.100	1.074	1.053	1.033	1.010	0.980	0.937	0.840	0.694	0.547	0.132	0.000	1.090
60.	2.911	1.148	1.108	1.085	1.066	1.047	1.025	0.997	0.957	0.869	0.737	0.603	0.203	0.000	1.099
80.	2.874	1.152	1.120	1.101	1.083	1.066	1.046	1.023	0.983	0.908	0.797	0.681	0.318	0.000	1.112
100.	2.841	1.154	1.127	1.110	1.095	1.079	1.061	1.040	1.003	0.935	0.837	0.734	0.405	0.000	1.121
200.	2.664	1.156	1.160	1.130	1.120	1.110	1.097	1.080	1.056	1.003	0.932	0.861	0.633	0.000	1.140
500.	2.009	1.158	1.151	1.146	1.141	1.135	1.129	1.119	1.102	1.065	1.019	0.973	0.828	0.000	1.146
1000.	1.662	1.158	1.154	1.152	1.149	1.146	1.142	1.136	1.126	1.100	1.064	1.031	0.952	0.000	1.150
2000.	1.445	1.158	1.156	1.155	1.154	1.152	1.150	1.147	1.141	1.124	1.099	1.079	1.000	0.000	1.152
5000.	1.290	1.158	1.158	1.157	1.157	1.156	1.156	1.155	1.152	1.144	1.130	1.115	1.065	0.000	1.155
10000.	1.229	1.159	1.158	1.157	1.158	1.158	1.158	1.157	1.156	1.152	1.144	1.134	1.099	0.000	1.156
k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
<i>Z = 29</i>															
0.001	0.000	0.007	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.001	0.011	0.008	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.007	0.021	0.015	0.010	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.017	0.035	0.025	0.017	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.037	0.059	0.044	0.030	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020
0.05	0.100	0.125	0.095	0.067	0.036	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.049
0.1	0.202	0.218	0.169	0.120	0.065	0.033	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.096
0.2	0.401	0.359	0.280	0.197	0.120	0.077	0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.181
0.5	0.879	0.613	0.460	0.325	0.250	0.195	0.130	0.045	0.000	0.000	0.000	0.000	0.000	0.000	0.365
1.	1.377	0.805	0.572	0.455	0.387	0.330	0.261	0.162	0.035	0.000	0.000	0.000	0.000	0.000	0.533
2.	1.878	0.932	0.700	0.605	0.543	0.487	0.422	0.329	0.178	0.002	0.000	0.000	0.000	0.000	0.688
3.	2.131	0.975	0.774	0.691	0.634	0.583	0.524	0.438	0.291	0.051	0.000	0.000	0.000	0.000	0.766
4.	2.309	0.994	0.826	0.749	0.698	0.650	0.594	0.515	0.377	0.118	0.000	0.000	0.000	0.000	0.815
5.	2.419	1.012	0.858	0.790	0.743	0.699	0.648	0.574	0.445	0.184	0.004	0.000	0.000	0.000	0.850
6.	2.500	1.027	0.886	0.823	0.778	0.737	0.689	0.622	0.500	0.243	0.027	0.000	0.000	0.000	0.877
8.	2.614	1.052	0.927	0.870	0.829	0.793	0.751	0.691	0.582	0.342	0.091	0.002	0.000	0.000	0.916
10.	2.686	1.070	0.956	0.903	0.866	0.833	0.795	0.741	0.641	0.419	0.159	0.016	0.000	0.000	0.943
15.	2.769	1.093	1.003	0.959	0.927	0.898	0.866	0.822	0.740	0.548	0.302	0.117	0.000	0.000	0.989
20.	2.824	1.107	1.031	0.993	0.964	0.937	0.908	0.870	0.799	0.633	0.409	0.217	0.000	0.000	1.018
30.	2.897	1.125	1.065	1.033	1.007	0.983	0.957	0.924	0.866	0.738	0.554	0.373	0.000	0.000	1.053
40.	2.920	1.133	1.083	1.055	1.033	1.011	0.987	0.958	0.797	0.640	0.479	0.054	0.000	0.000	1.073
50.	2.921	1.140	1.095	1.069	1.051	1.032	1.008	0.979	0.937	0.840	0.694	0.548	0.131	0.000	1.087
60.	2.914	1.142	1.103	1.082	1.063	1.045	1.023	0.996	0.957	0.869	0.737	0.603	0.202	0.000	1.096
80.	2.877	1.146	1.115	1.097	1.080	1.063	1.045	1.022	0.983	0.908	0.797	0.681	0.318	0.000	1.109
100.	2.844	1.148	1.122	1.106	1.091	1.076	1.056	1.038	1.002	0.935	0.837	0.734	0.405	0.000	1.118
200.	2.666	1.150	1.134	1.124	1.115	1.106	1.094	1.078	1.053	1.002	0.932	0.862	0.633	0.000	1.136
500.	2.007	1.151	1.146	1.139	1.135	1.130	1.124	1.115	1.099	1.063	1.018	0.972	0.828	0.000	1.141
1000.	1.658	1.151	1.168	1.145	1.143	1.140	1.136	1.131	1.121	1.097	1.062	1.030	0.932	0.000	1.144
5000.	1.281	1.152	1.151	1.150	1.149	1.146	1.144	1.141	1.135	1.127	1.111	1.062	0.000	0.000	1.148
10000.	1.223	1.151	1.151	1.151	1.151	1.151	1.150	1.149	1.146	1.138	1.131	1.121	1.099	0.000	1.150
k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1<br/															

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

k/T <sub>1</sub>	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T <sub>1</sub> (MeV)															
Z = 31															
0.001	0.000	0.007	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.001	0.011	0.008	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.007	0.021	0.015	0.010	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.017	0.035	0.026	0.017	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.037	0.060	0.045	0.031	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020
0.05	0.100	0.126	0.095	0.067	0.036	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.049
0.1	0.205	0.214	0.168	0.120	0.064	0.032	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.095
0.2	0.400	0.357	0.279	0.196	0.119	0.076	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.178
0.5	0.874	0.609	0.456	0.322	0.247	0.193	0.128	0.044	0.000	0.000	0.000	0.000	0.000	0.000	0.360
1.	1.374	0.800	0.568	0.451	0.384	0.327	0.258	0.159	0.034	0.000	0.000	0.000	0.000	0.000	0.527
2.	1.879	0.928	0.696	0.602	0.540	0.484	0.419	0.326	0.175	0.002	0.000	0.000	0.000	0.000	0.683
3.	2.134	0.972	0.771	0.689	0.631	0.581	0.521	0.435	0.289	0.050	0.000	0.000	0.000	0.000	0.762
4.	2.308	0.991	0.818	0.746	0.696	0.648	0.592	0.512	0.375	0.117	0.000	0.000	0.000	0.000	0.811
5.	2.418	1.008	0.855	0.789	0.742	0.697	0.645	0.572	0.442	0.182	0.004	0.000	0.000	0.000	0.847
6.	2.498	1.023	0.884	0.821	0.777	0.736	0.687	0.619	0.497	0.241	0.027	0.000	0.000	0.000	0.874
8.	2.611	1.049	0.925	0.869	0.829	0.792	0.750	0.689	0.580	0.361	0.090	0.002	0.000	0.000	0.913
10.	2.683	1.067	0.954	0.903	0.866	0.832	0.794	0.739	0.640	0.418	0.158	0.015	0.000	0.000	0.941
15.	2.769	1.091	1.002	0.959	0.928	0.898	0.865	0.821	0.739	0.547	0.301	0.117	0.000	0.000	0.988
20.	2.828	1.106	1.031	0.993	0.964	0.937	0.908	0.869	0.799	0.633	0.408	0.216	0.000	0.000	1.017
30.	2.906	1.125	1.064	1.032	1.006	0.982	0.957	0.925	0.867	0.738	0.554	0.372	0.000	0.000	1.053
40.	2.934	1.135	1.084	1.056	1.033	1.010	0.987	0.959	0.908	0.797	0.640	0.479	0.054	0.000	1.074
50.	2.937	1.141	1.096	1.071	1.051	1.032	1.008	0.980	0.937	0.861	0.694	0.548	0.131	0.000	1.088
60.	2.931	1.144	1.105	1.083	1.064	1.045	1.024	0.997	0.957	0.870	0.737	0.603	0.202	0.000	1.098
80.	2.895	1.149	1.117	1.098	1.081	1.064	1.045	1.022	0.983	0.909	0.798	0.681	0.317	0.000	1.111
100.	2.866	1.151	1.124	1.107	1.092	1.077	1.060	1.037	1.003	0.937	0.838	0.734	0.403	0.000	1.119
200.	2.682	1.153	1.157	1.126	1.117	1.107	1.095	1.079	1.053	0.933	0.862	0.633	0.000	0.000	1.158
500.	2.017	1.154	1.147	1.142	1.138	1.132	1.126	1.116	1.100	1.064	1.019	0.973	0.829	0.000	1.144
1000.	1.666	1.154	1.151	1.148	1.146	1.143	1.139	1.133	1.123	1.099	1.063	1.030	0.933	0.000	1.147
2000.	1.445	1.155	1.152	1.151	1.150	1.149	1.147	1.144	1.137	1.123	1.097	1.073	1.000	0.000	1.149
5000.	1.285	1.155	1.154	1.154	1.153	1.152	1.152	1.153	1.147	1.140	1.129	1.113	1.063	0.000	1.151
10000.	1.227	1.155	1.154	1.154	1.154	1.154	1.154	1.153	1.152	1.149	1.141	1.132	1.097	0.000	1.153
k/T <sub>1</sub>	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T <sub>1</sub> (MeV)															
Z = 32															
0.001	0.000	0.007	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.002	0.000	0.011	0.008	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.007	0.021	0.015	0.010	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.017	0.035	0.026	0.017	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.037	0.060	0.045	0.031	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020
0.05	0.099	0.126	0.095	0.067	0.036	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.049
0.1	0.204	0.214	0.168	0.120	0.064	0.032	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.096
0.2	0.399	0.356	0.278	0.195	0.118	0.075	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.177
0.5	0.873	0.607	0.455	0.320	0.246	0.192	0.126	0.043	0.000	0.000	0.000	0.000	0.000	0.000	0.358
1.	1.373	0.798	0.566	0.449	0.382	0.325	0.256	0.158	0.033	0.000	0.000	0.000	0.000	0.000	0.524
2.	1.882	0.927	0.694	0.600	0.538	0.482	0.417	0.324	0.174	0.002	0.000	0.000	0.000	0.000	0.681
3.	2.138	0.970	0.769	0.687	0.630	0.579	0.520	0.433	0.287	0.049	0.000	0.000	0.000	0.000	0.760
4.	2.312	0.990	0.817	0.743	0.695	0.647	0.590	0.511	0.373	0.116	0.000	0.000	0.000	0.000	0.810
5.	2.422	1.008	0.854	0.788	0.741	0.696	0.644	0.570	0.441	0.181	0.004	0.000	0.000	0.000	0.846
6.	2.503	1.023	0.883	0.821	0.776	0.735	0.686	0.618	0.496	0.240	0.027	0.000	0.000	0.000	0.873
8.	2.615	1.049	0.925	0.868	0.829	0.791	0.749	0.688	0.579	0.340	0.089	0.002	0.000	0.000	0.913
10.	2.687	1.067	0.954	0.902	0.866	0.832	0.793	0.738	0.639	0.417	0.157	0.015	0.000	0.000	0.941
15.	2.772	1.091	1.002	0.959	0.928	0.898	0.865	0.821	0.739	0.566	0.300	0.116	0.000	0.000	0.988
20.	2.832	1.106	1.031	0.993	0.964	0.937	0.908	0.869	0.798	0.633	0.408	0.215	0.000	0.000	1.017
30.	2.912	1.125	1.065	1.032	1.007	0.983	0.957	0.925	0.867	0.738	0.554	0.372	0.000	0.000	1.053
40.	2.940	1.135	1.085	1.057	1.034	1.011	0.987	0.959	0.909	0.798	0.640	0.479	0.054	0.000	1.074
50.	2.963	1.141	1.098	1.073	1.052	1.031	1.009	0.983	0.936	0.840	0.696	0.547	0.131	0.000	1.088
60.	2.939	1.145	1.084	1.065	1.046	1.024	0.997	0.957	0.907	0.738	0.603	0.202	0.000	0.000	1.098
80.	2.903	1.150	1.118	1.099	1.082	1.065	1.046	1.023	0.984	0.910	0.798	0.681	0.317	0.000	1.112
100.	2.873	1.152	1.125	1.108	1.093	1.078	1.060	1.037	1.004	0.937	0.838	0.734	0.402	0.000	1.120
200.	2.683	1.153	1.138	1.128	1.118	1.108	1.097	1.082	1.052	1.002	0.934	0.865	0.634	0.000	1.139
500.	2.021	1.155	1.148	1.143	1.138	1.133	1.127	1.117	1.101	1.065	1.019	0.973	0.829	0.000	1.144
1000.	1.666	1.155	1.151	1.149	1.147	1.144	1.140	1.134	1.124	1.100	1.063	1.031	0.933	0.000	1.147
2000.	1.447	1.155	1.153	1.151	1.150	1.149	1.147	1.144	1.139	1.125	1.099	1.078	1.000	0.000	1.150
5000.	1.287	1.155	1.155	1.154	1.153	1.153	1.152	1.151	1.147	1.141	1.130	1.114	1.064	0.000	1.152
10000.	1.227	1.155	1.154	1.154	1.154	1.154	1.154	1.153	1.152	1.149	1.141	1.133	1.099	0.00	

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 34															
0.001	0.000	0.007	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.012	0.008	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.007	0.022	0.016	0.010	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.017	0.036	0.026	0.017	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.037	0.061	0.045	0.031	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.099	0.126	0.095	0.067	0.036	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.048
0.1	0.199	0.216	0.167	0.118	0.063	0.032	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.093
0.2	0.395	0.356	0.275	0.193	0.117	0.074	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.175
0.5	0.869	0.603	0.451	0.317	0.243	0.189	0.126	0.042	0.000	0.000	0.000	0.000	0.000	0.000	0.353
1.	1.369	0.793	0.562	0.446	0.379	0.322	0.253	0.156	0.033	0.000	0.000	0.000	0.000	0.000	0.519
2.	1.879	0.923	0.691	0.597	0.535	0.479	0.414	0.321	0.172	0.002	0.000	0.000	0.000	0.000	0.676
3.	2.142	0.969	0.767	0.684	0.628	0.577	0.517	0.450	0.285	0.049	0.000	0.000	0.000	0.000	0.757
4.	2.323	0.991	0.815	0.743	0.692	0.645	0.588	0.508	0.371	0.115	0.000	0.000	0.000	0.000	0.807
5.	2.439	1.010	0.854	0.786	0.738	0.694	0.642	0.568	0.439	0.180	0.003	0.000	0.000	0.000	0.844
6.	2.524	1.026	0.883	0.819	0.774	0.733	0.685	0.616	0.494	0.239	0.026	0.000	0.000	0.000	0.872
8.	2.643	1.053	0.926	0.867	0.827	0.790	0.748	0.687	0.578	0.338	0.089	0.002	0.000	0.000	0.913
10.	2.718	1.072	0.956	0.902	0.864	0.830	0.792	0.738	0.638	0.416	0.156	0.015	0.000	0.000	0.942
15.	2.806	1.097	1.004	0.960	0.927	0.897	0.865	0.821	0.739	0.566	0.300	0.116	0.000	0.000	0.989
20.	2.863	1.112	1.033	0.994	0.964	0.937	0.908	0.870	0.799	0.633	0.407	0.215	0.000	0.000	1.019
30.	2.937	1.129	1.067	1.034	1.008	0.983	0.958	0.926	0.868	0.739	0.554	0.372	0.000	0.000	1.055
40.	2.960	1.138	1.087	1.058	1.035	1.012	0.989	0.960	0.910	0.799	0.641	0.479	0.053	0.000	1.076
50.	2.960	1.144	1.098	1.073	1.054	1.035	1.010	0.981	0.939	0.862	0.694	0.567	0.130	0.000	1.090
60.	2.954	1.146	1.107	1.085	1.066	1.047	1.025	0.999	0.959	0.871	0.738	0.603	0.201	0.000	1.100
80.	2.918	1.150	1.119	1.100	1.084	1.067	1.048	1.022	0.986	0.911	0.798	0.682	0.316	0.000	1.115
100.	2.884	1.152	1.125	1.109	1.095	1.080	1.062	1.039	1.005	0.938	0.839	0.735	0.402	0.000	1.121
200.	2.699	1.154	1.138	1.128	1.119	1.110	1.098	1.081	1.056	1.005	0.934	0.864	0.654	0.000	1.140
500.	2.027	1.155	1.148	1.144	1.139	1.134	1.128	1.118	1.103	1.067	1.021	0.974	0.830	0.000	1.145
1000.	1.672	1.155	1.152	1.149	1.147	1.144	1.140	1.135	1.125	1.101	1.065	1.033	0.934	0.000	1.148
2000.	1.449	1.155	1.153	1.152	1.151	1.150	1.148	1.145	1.139	1.124	1.100	1.080	1.001	0.000	1.150
5000.	1.288	1.156	1.155	1.155	1.154	1.153	1.154	1.148	1.141	1.131	1.115	1.065	1.000	0.000	1.152
10000.	1.228	1.156	1.155	1.155	1.155	1.155	1.155	1.154	1.153	1.150	1.142	1.134	1.100	0.000	1.154
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 35															
0.001	0.000	0.007	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.012	0.008	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.006	0.022	0.016	0.010	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.017	0.036	0.026	0.017	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.037	0.061	0.045	0.031	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.099	0.126	0.096	0.067	0.035	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.048
0.1	0.198	0.216	0.167	0.118	0.063	0.031	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.093
0.2	0.393	0.353	0.274	0.192	0.116	0.074	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.173
0.5	0.866	0.601	0.449	0.316	0.242	0.188	0.123	0.042	0.000	0.000	0.000	0.000	0.000	0.000	0.351
1.	1.367	0.791	0.560	0.444	0.377	0.320	0.252	0.155	0.032	0.000	0.000	0.000	0.000	0.000	0.516
2.	1.877	0.921	0.689	0.595	0.533	0.478	0.412	0.320	0.171	0.002	0.000	0.000	0.000	0.000	0.674
3.	2.140	0.968	0.766	0.684	0.627	0.576	0.515	0.429	0.284	0.068	0.000	0.000	0.000	0.000	0.755
4.	2.319	0.991	0.816	0.744	0.694	0.645	0.587	0.507	0.369	0.114	0.000	0.000	0.000	0.000	0.807
5.	2.435	1.010	0.856	0.786	0.741	0.695	0.641	0.567	0.437	0.179	0.003	0.000	0.000	0.000	0.845
6.	2.521	1.028	0.886	0.822	0.777	0.734	0.684	0.615	0.493	0.238	0.026	0.000	0.000	0.000	0.873
8.	2.642	1.056	0.930	0.872	0.831	0.792	0.748	0.686	0.576	0.337	0.088	0.001	0.000	0.000	0.915
10.	2.719	1.075	0.960	0.907	0.868	0.833	0.793	0.737	0.637	0.415	0.156	0.015	0.000	0.000	0.944
15.	2.810	1.100	1.009	0.965	0.931	0.900	0.865	0.820	0.738	0.555	0.299	0.115	0.000	0.000	0.992
20.	2.868	1.115	1.038	0.998	0.968	0.939	0.909	0.870	0.798	0.632	0.407	0.214	0.000	0.000	1.021
30.	2.944	1.132	1.070	1.037	1.010	0.985	0.959	0.926	0.868	0.739	0.554	0.371	0.000	0.000	1.057
40.	2.968	1.140	1.089	1.060	1.037	1.014	0.990	0.961	0.910	0.799	0.641	0.478	0.053	0.000	1.077
50.	2.973	1.143	1.099	1.075	1.055	1.036	1.011	0.983	0.939	0.862	0.695	0.567	0.130	0.000	1.091
60.	2.961	1.147	1.108	1.087	1.068	1.049	1.027	1.000	0.961	0.872	0.738	0.603	0.201	0.000	1.101
80.	2.929	1.150	1.119	1.100	1.084	1.068	1.049	1.024	0.988	0.912	0.799	0.682	0.315	0.000	1.116
100.	2.895	1.152	1.125	1.109	1.095	1.081	1.064	1.041	1.007	0.959	0.840	0.735	0.401	0.000	1.122
200.	2.706	1.154	1.139	1.129	1.120	1.110	1.085	1.056	1.005	0.937	0.866	0.635	0.141	0.000	1.141
500.	2.053	1.155	1.148	1.144	1.140	1.134	1.128	1.119	1.104	1.069	1.022	0.978	0.836	0.000	1.146
1000.	1.675	1.155	1.152	1.149	1.147	1.145	1.136	1.126	1.103	1.067	1.035	0.935	0.000	0.000	1.149
2000.	1.451	1.155	1.153	1.152	1.151	1.150	1.148	1.146	1.140	1.126	1.102	1.077	1.005	0.000	1.151
5000.	1.291	1.156	1.155	1.154	1.153	1.153	1.152	1.151	1.150	1.143	1.124	1.106	1.066	0.000	1.153
10000.	1.229	1.155	1.155	1.155	1.155	1.155	1.155	1.154	1.154	1.150	1.143	1.134	1.102	0.000	1.154
K/T1															

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 37															
0.001	0.000	0.008	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.012	0.009	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.007	0.023	0.016	0.010	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.017	0.037	0.027	0.018	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.038	0.062	0.046	0.031	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.100	0.127	0.096	0.067	0.035	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.048
0.1	0.200	0.216	0.166	0.117	0.062	0.031	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.092
0.2	0.394	0.351	0.272	0.190	0.114	0.073	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.171
0.5	0.868	0.598	0.447	0.313	0.239	0.185	0.121	0.041	0.000	0.000	0.000	0.000	0.000	0.000	0.347
1.	1.369	0.788	0.556	0.441	0.374	0.317	0.249	0.152	0.032	0.000	0.000	0.000	0.000	0.000	0.512
2.	1.886	0.919	0.685	0.591	0.530	0.475	0.409	0.317	0.169	0.001	0.000	0.000	0.000	0.000	0.670
3.	2.152	0.968	0.765	0.682	0.625	0.573	0.513	0.426	0.281	0.048	0.000	0.000	0.000	0.000	0.753
4.	2.335	0.992	0.816	0.744	0.692	0.643	0.585	0.504	0.367	0.113	0.000	0.000	0.000	0.000	0.806
5.	2.453	1.013	0.857	0.789	0.741	0.694	0.640	0.565	0.435	0.178	0.003	0.000	0.000	0.000	0.845
6.	2.539	1.031	0.889	0.824	0.778	0.734	0.683	0.613	0.491	0.236	0.026	0.000	0.000	0.000	0.874
8.	2.661	1.060	0.933	0.875	0.832	0.792	0.747	0.684	0.575	0.336	0.087	0.001	0.000	0.000	0.916
10.	2.738	1.080	0.964	0.911	0.871	0.834	0.792	0.736	0.636	0.414	0.155	0.015	0.000	0.000	0.946
15.	2.826	1.105	1.014	0.969	0.935	0.901	0.865	0.820	0.738	0.545	0.298	0.115	0.000	0.000	0.995
20.	2.885	1.120	1.042	1.003	0.972	0.941	0.909	0.869	0.799	0.632	0.406	0.213	0.000	0.000	1.024
30.	2.962	1.137	1.074	1.041	1.014	0.988	0.960	0.927	0.868	0.740	0.554	0.371	0.000	0.000	1.060
40.	2.986	1.145	1.093	1.064	1.040	1.016	0.991	0.962	0.911	0.800	0.641	0.478	0.053	0.000	1.081
50.	2.987	1.149	1.105	1.079	1.057	1.035	1.012	0.985	0.939	0.839	0.700	0.554	0.130	0.000	1.094
60.	2.979	1.152	1.112	1.089	1.070	1.050	1.028	1.002	0.961	0.872	0.739	0.603	0.200	0.000	1.104
80.	2.943	1.156	1.123	1.103	1.087	1.070	1.051	1.025	0.989	0.913	0.799	0.682	0.315	0.000	1.117
100.	2.909	1.159	1.130	1.113	1.098	1.083	1.066	1.042	1.008	0.940	0.840	0.756	0.401	0.000	1.126
200.	2.721	1.161	1.145	1.134	1.125	1.114	1.102	1.085	1.059	1.006	0.938	0.869	0.632	0.000	1.145
500.	2.043	1.163	1.155	1.151	1.146	1.140	1.133	1.123	1.106	1.070	1.024	0.976	0.832	0.000	1.151
1000.	1.685	1.163	1.159	1.157	1.151	1.154	1.147	1.141	1.130	1.105	1.069	1.036	0.936	0.000	1.155
2000.	1.460	1.163	1.161	1.160	1.159	1.157	1.155	1.152	1.145	1.129	1.104	1.079	1.086	0.000	1.157
5000.	1.297	1.163	1.163	1.162	1.161	1.161	1.161	1.155	1.148	1.136	1.119	1.069	1.000	0.000	1.160
10000.	1.237	1.163	1.163	1.163	1.163	1.162	1.162	1.162	1.161	1.157	1.149	1.104	0.000	0.000	1.161
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 38															
0.001	0.000	0.008	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.013	0.009	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.007	0.023	0.016	0.010	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.017	0.037	0.027	0.018	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.038	0.062	0.046	0.031	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.101	0.127	0.096	0.067	0.035	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.048
0.1	0.202	0.216	0.166	0.117	0.062	0.031	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.092
0.2	0.397	0.350	0.271	0.189	0.114	0.072	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.170
0.5	0.872	0.596	0.444	0.311	0.238	0.184	0.120	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.345
1.	1.374	0.786	0.554	0.439	0.372	0.316	0.267	0.151	0.031	0.000	0.000	0.000	0.000	0.000	0.510
2.	1.890	0.918	0.684	0.590	0.529	0.473	0.408	0.315	0.168	0.001	0.000	0.000	0.000	0.000	0.668
3.	2.157	0.966	0.763	0.681	0.624	0.572	0.511	0.425	0.280	0.047	0.000	0.000	0.000	0.000	0.751
4.	2.339	0.990	0.814	0.742	0.691	0.642	0.584	0.503	0.366	0.112	0.000	0.000	0.000	0.000	0.804
5.	2.457	1.011	0.855	0.787	0.739	0.693	0.639	0.564	0.434	0.177	0.003	0.000	0.000	0.000	0.843
6.	2.545	1.030	0.886	0.822	0.776	0.732	0.682	0.612	0.490	0.235	0.026	0.000	0.000	0.000	0.872
8.	2.668	1.059	0.931	0.873	0.830	0.791	0.747	0.684	0.574	0.335	0.087	0.001	0.000	0.000	0.915
10.	2.747	1.080	0.963	0.909	0.869	0.833	0.792	0.736	0.636	0.413	0.154	0.015	0.000	0.000	0.945
15.	2.838	1.104	1.014	0.968	0.934	0.901	0.866	0.820	0.738	0.564	0.297	0.114	0.000	0.000	0.995
20.	2.897	1.122	1.043	1.003	0.971	0.942	0.910	0.870	0.799	0.631	0.405	0.213	0.000	0.000	1.025
30.	2.975	1.140	1.076	1.042	1.014	0.989	0.962	0.928	0.869	0.739	0.553	0.370	0.000	0.000	1.062
40.	2.998	1.149	1.096	1.067	1.042	1.018	0.994	0.964	0.912	0.800	0.641	0.478	0.052	0.000	1.083
50.	3.002	1.153	1.109	1.083	1.060	1.038	1.015	0.988	0.941	0.840	0.700	0.554	0.129	0.000	1.098
60.	2.996	1.158	1.117	1.093	1.073	1.051	1.031	1.004	0.962	0.874	0.740	0.602	0.199	0.000	1.108
80.	2.962	1.163	1.128	1.108	1.091	1.073	1.053	1.028	0.991	0.916	0.801	0.683	0.316	0.000	1.121
100.	2.926	1.166	1.136	1.118	1.102	1.087	1.069	1.055	1.010	0.942	0.861	0.736	0.401	0.000	1.130
200.	2.733	1.168	1.152	1.140	1.130	1.119	1.106	1.090	1.060	1.003	0.939	0.868	0.635	0.000	1.151
500.	2.056	1.170	1.162	1.157	1.152	1.146	1.139	1.128	1.111	1.073	1.026	0.978	0.832	0.000	1.157
1000.	1.695	1.170	1.164	1.161	1.158	1.153	1.147	1.136	1.109	1.072	1.038	0.938	0.800	0.000	1.161
2000.	1.469	1.170	1.168	1.167	1.166	1.164	1.162	1.159	1.152	1.134	1.108	1.082	1.008	0.000	1.164
5000.	1.305	1.170	1.170	1.170	1.170	1.170	1.170	1.169	1.162	1.154	1.141	1.124	1.072	0.000	1.167
10000.	1.244	1.171	1.170	1.170	1.170	1.170	1.170	1.169	1.168	1.164	1.155	1.144	1.108	0.000	1.168

**TABLE II.** Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung and Total Integrated Radiative Energy-Loss Cross Sections  
 See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR	
$T_1$ (MeV)																
	$Z = 40$															
0.001	0.000	0.008	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	
0.002	0.000	0.013	0.009	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	
0.005	0.007	0.023	0.017	0.010	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	
0.01	0.018	0.038	0.027	0.018	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	
0.02	0.038	0.063	0.046	0.031	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021	
0.05	0.101	0.127	0.096	0.067	0.035	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.048	
0.1	0.201	0.216	0.166	0.117	0.062	0.030	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.091	
0.2	0.395	0.349	0.270	0.187	0.113	0.071	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.168	
0.5	0.869	0.593	0.440	0.308	0.235	0.182	0.119	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.361	
1.	1.372	0.782	0.550	0.435	0.369	0.312	0.244	0.149	0.031	0.000	0.000	0.000	0.000	0.000	0.505	
2.	1.894	0.916	0.681	0.587	0.526	0.470	0.405	0.312	0.166	0.001	0.000	0.000	0.000	0.000	0.664	
3.	2.165	0.966	0.761	0.678	0.621	0.570	0.509	0.422	0.278	0.046	0.000	0.000	0.000	0.000	0.748	
4.	2.348	0.991	0.813	0.740	0.688	0.640	0.582	0.501	0.366	0.111	0.000	0.000	0.000	0.000	0.802	
5.	2.468	1.012	0.854	0.785	0.737	0.691	0.637	0.562	0.433	0.175	0.003	0.000	0.000	0.000	0.842	
6.	2.556	1.031	0.886	0.821	0.774	0.731	0.681	0.611	0.489	0.234	0.025	0.000	0.000	0.000	0.871	
8.	2.680	1.061	0.932	0.872	0.830	0.790	0.746	0.684	0.573	0.334	0.086	0.001	0.000	0.000	0.915	
10.	2.759	1.082	0.964	0.909	0.869	0.833	0.792	0.736	0.635	0.412	0.153	0.014	0.000	0.000	0.946	
15.	2.849	1.109	1.015	0.969	0.935	0.902	0.867	0.821	0.738	0.543	0.296	0.114	0.008	0.000	0.996	
20.	2.908	1.124	1.045	1.004	0.973	0.943	0.911	0.871	0.800	0.631	0.404	0.212	0.000	0.000	1.027	
30.	2.986	1.143	1.078	1.043	1.016	0.990	0.963	0.929	0.870	0.740	0.553	0.369	0.000	0.000	1.063	
40.	3.010	1.151	1.098	1.067	1.043	1.019	0.995	0.965	0.912	0.801	0.641	0.477	0.052	0.000	1.085	
50.	3.014	1.156	1.109	1.083	1.062	1.040	1.016	0.988	0.966	0.844	0.695	0.567	0.129	0.000	1.099	
60.	3.002	1.159	1.118	1.094	1.075	1.055	1.033	1.005	0.963	0.874	0.740	0.602	0.199	0.000	1.109	
80.	2.961	1.164	1.130	1.110	1.092	1.074	1.055	1.031	0.916	0.801	0.682	0.514	0.314	0.000	1.122	
100.	2.931	1.166	1.136	1.119	1.103	1.088	1.070	1.046	1.012	0.942	0.842	0.736	0.400	0.000	1.151	
200.	2.738	1.169	1.153	1.141	1.131	1.120	1.107	1.092	1.061	1.009	0.940	0.869	0.635	0.000	1.152	
500.	2.059	1.170	1.163	1.158	1.153	1.147	1.140	1.129	1.112	1.075	1.027	0.979	0.833	0.000	1.158	
1000.	1.697	1.171	1.167	1.164	1.162	1.159	1.154	1.147	1.137	1.110	1.073	1.040	0.938	0.000	1.162	
2000.	1.470	1.171	1.169	1.167	1.166	1.165	1.163	1.159	1.152	1.135	1.109	1.083	1.010	0.000	1.164	
5000.	1.306	1.171	1.171	1.170	1.170	1.170	1.170	1.170	1.169	1.163	1.155	1.142	1.125	1.073	0.000	1.167
10000.	1.245	1.171	1.171	1.170	1.170	1.170	1.170	1.170	1.169	1.165	1.156	1.145	1.109	0.000	1.169	
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR	
$T_1$ (MeV)																
	$Z = 41$															
0.001	0.000	0.008	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	
0.002	0.000	0.013	0.009	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	
0.005	0.007	0.024	0.017	0.011	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	
0.01	0.017	0.038	0.027	0.018	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	
0.02	0.038	0.063	0.047	0.031	0.016	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021	
0.05	0.099	0.128	0.096	0.067	0.035	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.048	
0.1	0.198	0.215	0.166	0.116	0.061	0.030	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.090	
0.2	0.391	0.348	0.268	0.187	0.112	0.071	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.167	
0.5	0.864	0.591	0.439	0.307	0.234	0.180	0.118	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.339	
1.	1.367	0.781	0.546	0.433	0.367	0.311	0.243	0.148	0.030	0.000	0.000	0.000	0.000	0.000	0.502	
2.	1.890	0.914	0.679	0.586	0.525	0.469	0.403	0.311	0.165	0.001	0.000	0.000	0.000	0.000	0.662	
3.	2.164	0.965	0.760	0.677	0.620	0.569	0.508	0.421	0.277	0.046	0.000	0.000	0.000	0.000	0.747	
4.	2.349	0.991	0.813	0.739	0.687	0.639	0.581	0.500	0.363	0.111	0.000	0.000	0.000	0.000	0.801	
5.	2.470	1.013	0.854	0.785	0.736	0.690	0.637	0.562	0.432	0.175	0.003	0.000	0.000	0.000	0.841	
6.	2.560	1.031	0.886	0.820	0.774	0.731	0.681	0.611	0.488	0.233	0.025	0.000	0.000	0.000	0.871	
8.	2.685	1.061	0.932	0.872	0.830	0.790	0.746	0.684	0.573	0.333	0.086	0.001	0.000	0.000	0.915	
10.	2.764	1.082	0.964	0.909	0.869	0.833	0.792	0.736	0.635	0.411	0.153	0.014	0.000	0.000	0.945	
15.	2.856	1.108	1.015	0.969	0.935	0.902	0.867	0.822	0.738	0.543	0.296	0.113	0.000	0.000	0.995	
20.	2.912	1.123	1.044	1.004	0.973	0.944	0.912	0.872	0.800	0.630	0.404	0.212	0.000	0.000	1.026	
30.	2.990	1.141	1.077	1.043	1.016	0.991	0.964	0.930	0.870	0.740	0.553	0.369	0.000	0.000	1.063	
40.	3.013	1.149	1.096	1.067	1.043	1.020	0.995	0.967	0.914	0.801	0.641	0.477	0.052	0.000	1.084	
50.	3.016	1.153	1.107	1.082	1.061	1.040	1.017	0.989	0.945	0.844	0.695	0.547	0.128	0.000	1.098	
60.	3.006	1.156	1.116	1.093	1.074	1.055	1.033	1.006	0.964	0.875	0.740	0.602	0.198	0.000	1.108	
80.	2.962	1.160	1.127	1.108	1.091	1.074	1.055	1.032	0.992	0.915	0.802	0.682	0.314	0.000	1.121	
100.	2.932	1.162	1.134	1.117	1.102	1.087	1.070	1.047	1.013	0.944	0.842	0.737	0.400	0.000	1.130	
200.	2.739	1.165	1.149	1.138	1.128	1.118	1.106	1.091	1.062	1.010	0.941	0.869	0.635	0.000	1.150	
500.	2.057	1.166	1.159	1.154	1.149	1.144	1.137	1.127	1.111	1.075	1.028	0.980	0.833	0.000	1.155	
1000.	1.694	1.166	1.163	1.160	1.158	1.155	1.151	1.144	1.134	1.109	1.073	1.041	0.939	0.000	1.158	
2000.	1.467	1.166	1.164	1.162	1.161	1.160	1.158	1.155	1.152	1.149	1.134	1.108	1.083	1.011	0.000	1.161
5000.	1.302	1.167	1.166	1.166	1.165	1.164	1.164	1.164	1.164	1.164	1.164	1.164	1.140	1.074	0.000	1.163
10000.	1.241	1.167	1.166	1.166	1.166	1.166	1.166	1.165	1.165	1.165	1.165	1.165	1.143	1.109	0.000	1.165
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR	
$T_1$ (MeV)																
	$Z = 42$															
0.001	0.000	0.009	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	
0.002	0.000	0.013	0.009	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	
0.005	0.006	0.024	0.017	0.011	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	
0.01	0.017	0.038	0.028	0.018	0.009	0.000	0.000	0.000</td								

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung and Total Integrated Radiative Energy-Loss Cross Sections**  
 See page 349 for Explanation of Tables

k/T <sub>1</sub>	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T <sub>1</sub> (MeV)															
Z = 43															
0.001	0.000	0.009	0.006	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.014	0.009	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.006	0.024	0.017	0.011	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.017	0.039	0.028	0.018	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.038	0.064	0.047	0.032	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.099	0.128	0.096	0.067	0.035	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.048
0.1	0.198	0.215	0.165	0.116	0.061	0.030	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.090
0.2	0.390	0.347	0.267	0.185	0.111	0.070	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.165
0.5	0.861	0.588	0.435	0.304	0.231	0.178	0.116	0.038	0.000	0.000	0.000	0.000	0.000	0.000	0.335
1.	1.365	0.777	0.565	0.430	0.364	0.308	0.240	0.146	0.090	0.000	0.000	0.000	0.000	0.000	0.498
2.	1.893	0.913	0.677	0.583	0.522	0.466	0.400	0.308	0.163	0.001	0.000	0.000	0.000	0.000	0.659
3.	2.178	0.961	0.755	0.675	0.620	0.568	0.505	0.418	0.274	0.046	0.000	0.000	0.000	0.000	0.744
4.	2.352	0.990	0.812	0.738	0.686	0.637	0.579	0.498	0.361	0.109	0.000	0.000	0.000	0.000	0.799
5.	2.474	1.012	0.854	0.784	0.736	0.689	0.635	0.560	0.430	0.173	0.003	0.000	0.000	0.000	0.839
6.	2.564	1.031	0.886	0.820	0.774	0.730	0.680	0.609	0.486	0.232	0.025	0.000	0.000	0.000	0.870
8.	2.691	1.061	0.932	0.873	0.830	0.791	0.746	0.683	0.572	0.331	0.085	0.001	0.000	0.000	0.914
10.	2.771	1.082	0.964	0.910	0.870	0.834	0.793	0.736	0.634	0.410	0.152	0.014	0.000	0.000	0.946
15.	2.863	1.109	1.016	0.971	0.936	0.904	0.868	0.822	0.738	0.541	0.295	0.113	0.008	0.000	0.997
20.	2.923	1.125	1.045	1.005	0.974	0.945	0.914	0.873	0.801	0.630	0.403	0.211	0.000	0.000	1.028
30.	3.002	1.143	1.079	1.044	1.018	0.993	0.966	0.932	0.871	0.740	0.552	0.368	0.000	0.000	1.065
40.	3.026	1.151	1.098	1.068	1.044	1.022	0.997	0.967	0.915	0.802	0.641	0.476	0.051	0.000	1.086
50.	3.026	1.156	1.110	1.084	1.062	1.041	1.019	0.992	0.944	0.842	0.701	0.554	0.128	0.000	1.100
60.	3.017	1.159	1.129	1.110	1.095	1.076	1.057	1.035	1.008	0.966	0.876	0.741	0.602	0.197	0.000
80.	2.975	1.163	1.136	1.119	1.100	1.093	1.076	1.057	1.034	0.994	0.917	0.802	0.682	0.313	0.000
100.	2.940	1.165	1.156	1.136	1.119	1.104	1.089	1.072	1.051	1.014	0.945	0.843	0.737	0.401	0.000
200.	2.751	1.167	1.182	1.141	1.131	1.20	1.108	1.083	1.064	1.013	0.943	0.870	0.636	0.000	1.152
500.	2.065	1.168	1.161	1.157	1.152	1.160	1.157	1.139	1.129	1.113	1.077	1.030	0.986	0.839	0.000
1000.	1.700	1.169	1.165	1.163	1.160	1.161	1.161	1.153	1.147	1.137	1.111	1.075	1.043	0.941	0.000
2000.	1.471	1.169	1.167	1.166	1.165	1.165	1.161	1.158	1.152	1.136	1.110	1.085	1.013	0.900	1.163
5000.	1.305	1.169	1.169	1.168	1.167	1.167	1.167	1.167	1.161	1.154	1.142	1.126	1.076	0.000	1.166
10000.	1.244	1.169	1.169	1.168	1.168	1.168	1.168	1.168	1.167	1.163	1.155	1.145	1.111	0.000	1.164
k/T <sub>1</sub>	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T <sub>1</sub> (MeV)															
Z = 44															
0.001	0.000	0.009	0.006	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.014	0.009	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.006	0.025	0.017	0.011	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.017	0.039	0.028	0.018	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.02	0.037	0.064	0.047	0.032	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.098	0.128	0.096	0.067	0.035	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.068
0.1	0.196	0.215	0.165	0.116	0.061	0.030	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.089
0.2	0.386	0.346	0.266	0.184	0.110	0.069	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.164
0.5	0.855	0.586	0.434	0.302	0.230	0.177	0.115	0.038	0.000	0.000	0.000	0.000	0.000	0.000	0.333
1.	1.359	0.776	0.543	0.429	0.363	0.306	0.239	0.145	0.029	0.000	0.000	0.000	0.000	0.000	0.495
2.	1.887	0.911	0.676	0.582	0.521	0.465	0.399	0.307	0.162	0.001	0.000	0.000	0.000	0.000	0.656
3.	2.173	0.960	0.755	0.675	0.619	0.567	0.504	0.417	0.273	0.045	0.000	0.000	0.000	0.000	0.762
4.	2.349	0.990	0.811	0.738	0.686	0.637	0.578	0.497	0.360	0.109	0.000	0.000	0.000	0.000	0.798
5.	2.471	1.012	0.854	0.784	0.735	0.689	0.635	0.559	0.429	0.173	0.003	0.000	0.000	0.000	0.838
6.	2.562	1.031	0.886	0.821	0.774	0.730	0.679	0.609	0.486	0.231	0.025	0.000	0.000	0.000	0.869
8.	2.690	1.061	0.932	0.873	0.830	0.791	0.746	0.683	0.572	0.331	0.085	0.001	0.000	0.000	0.914
10.	2.771	1.082	0.965	0.910	0.870	0.834	0.793	0.736	0.634	0.410	0.151	0.014	0.000	0.000	0.945
15.	2.864	1.109	1.016	0.971	0.937	0.904	0.869	0.823	0.739	0.561	0.294	0.112	0.000	0.000	0.996
20.	2.925	1.124	1.045	1.006	0.975	0.946	0.914	0.874	0.801	0.630	0.402	0.211	0.000	0.000	1.028
30.	3.005	1.141	1.078	1.044	1.018	0.993	0.967	0.933	0.872	0.740	0.552	0.368	0.000	0.000	1.064
40.	3.029	1.149	1.097	1.068	1.045	1.022	0.998	0.968	0.916	0.802	0.641	0.476	0.051	0.000	1.086
50.	3.029	1.154	1.109	1.084	1.063	1.042	1.019	0.993	0.945	0.843	0.701	0.554	0.127	0.000	1.100
60.	3.020	1.156	1.116	1.094	1.076	1.057	1.036	1.009	0.967	0.877	0.741	0.602	0.197	0.000	1.110
80.	2.978	1.160	1.128	1.109	1.092	1.076	1.057	1.035	0.995	0.918	0.803	0.683	0.313	0.000	1.123
100.	2.943	1.162	1.134	1.118	1.103	1.088	1.072	1.051	1.015	0.946	0.844	0.737	0.401	0.000	1.132
200.	2.753	1.164	1.149	1.138	1.129	1.119	1.108	1.093	1.064	1.014	0.944	0.871	0.636	0.000	1.151
500.	2.065	1.165	1.158	1.154	1.149	1.144	1.137	1.128	1.112	1.077	1.032	0.983	0.835	0.000	1.156
1000.	1.698	1.165	1.162	1.159	1.157	1.154	1.151	1.145	1.135	1.111	1.076	1.044	0.942	0.000	1.158
2000.	1.469	1.166	1.164	1.162	1.161	1.160	1.158	1.155	1.149	1.134	1.110	1.086	1.014	0.000	1.161
5000.	1.302	1.166	1.165	1.164	1.164	1.163	1.163	1.164	1.164	1.164	1.160	1.153	1.141	0.000	1.163
10000.	1.241	1.166	1.165	1.165	1.165	1.165	1.165	1.165	1.165	1.164	1.160	1.153	1.143	0.000	

TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung and Total Integrated Radiative Energy-Loss Cross Sections

**See page 349 for Explanation of Tables**

**TABLE II.** Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung and Total Integrated Radiative Energy-Loss Cross Sections  
See page 349 for Explanation of Tables

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung and Total Integrated Radiative Energy-Loss Cross Sections**  
 See page 349 for Explanation of Tables

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 52															
0.001	0.000	0.010	0.006	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.016	0.011	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.005	0.027	0.019	0.011	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.016	0.061	0.030	0.019	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.037	0.067	0.049	0.032	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.095	0.131	0.098	0.068	0.035	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.047
0.1	0.196	0.212	0.163	0.114	0.059	0.029	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.087
0.2	0.380	0.341	0.260	0.178	0.105	0.066	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.157
0.5	0.841	0.575	0.423	0.292	0.220	0.168	0.108	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.318
1.	1.349	0.764	0.531	0.417	0.351	0.295	0.228	0.137	0.027	0.000	0.000	0.000	0.000	0.000	0.479
2.	1.890	0.904	0.667	0.572	0.511	0.455	0.388	0.296	0.155	0.001	0.000	0.000	0.000	0.000	0.643
3.	2.169	0.961	0.754	0.671	0.612	0.558	0.496	0.408	0.265	0.043	0.000	0.000	0.000	0.000	0.734
4.	2.344	0.994	0.816	0.739	0.682	0.631	0.573	0.491	0.352	0.104	0.000	0.000	0.000	0.000	0.794
5.	2.467	1.018	0.862	0.789	0.735	0.686	0.631	0.555	0.422	0.166	0.002	0.000	0.000	0.000	0.837
6.	2.559	1.038	0.896	0.827	0.776	0.729	0.678	0.606	0.480	0.224	0.023	0.000	0.000	0.000	0.870
8.	2.687	1.070	0.946	0.883	0.836	0.793	0.747	0.683	0.569	0.322	0.082	0.001	0.000	0.000	0.917
10.	2.799	1.089	0.974	0.920	0.880	0.840	0.796	0.736	0.632	0.405	0.147	0.013	0.000	0.000	0.950
15.	2.897	1.117	1.027	0.983	0.948	0.913	0.874	0.826	0.740	0.558	0.290	0.110	0.000	0.000	1.003
20.	2.963	1.135	1.056	1.018	0.986	0.955	0.921	0.879	0.805	0.629	0.399	0.207	0.000	0.000	1.036
30.	3.053	1.151	1.088	1.055	1.028	1.003	0.975	0.940	0.878	0.743	0.551	0.366	0.000	0.000	1.073
40.	3.080	1.159	1.106	1.078	1.054	1.032	1.007	0.977	0.923	0.806	0.642	0.474	0.050	0.000	1.095
50.	3.081	1.163	1.118	1.093	1.072	1.051	1.028	1.001	0.953	0.849	0.704	0.552	0.124	0.000	1.109
60.	3.072	1.165	1.125	1.103	1.084	1.066	1.044	1.018	0.978	0.883	0.742	0.603	0.195	0.000	1.119
80.	3.029	1.168	1.136	1.117	1.101	1.084	1.067	1.044	1.005	0.926	0.807	0.684	0.310	0.000	1.132
100.	3.000	1.170	1.142	1.126	1.112	1.097	1.081	1.059	1.026	0.956	0.848	0.740	0.399	0.000	1.141
200.	2.804	1.172	1.157	1.146	1.137	1.128	1.116	1.100	1.076	1.026	0.951	0.876	0.635	0.000	1.160
500.	2.094	1.173	1.166	1.162	1.157	1.152	1.146	1.137	1.121	1.087	1.042	0.993	0.841	0.000	1.165
1000.	1.718	1.173	1.169	1.167	1.165	1.162	1.159	1.153	1.144	1.120	1.086	1.054	0.951	0.000	1.167
2000.	1.484	1.173	1.171	1.170	1.169	1.168	1.166	1.164	1.158	1.143	1.119	1.096	1.025	0.000	1.169
5000.	1.313	1.173	1.173	1.172	1.172	1.171	1.171	1.172	1.166	1.160	1.150	1.134	1.087	0.000	1.171
10000.	1.250	1.173	1.173	1.173	1.173	1.173	1.173	1.173	1.172	1.168	1.161	1.152	1.121	0.000	1.174
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 53															
0.001	0.000	0.011	0.007	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.016	0.011	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.005	0.027	0.019	0.012	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.016	0.062	0.030	0.019	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.037	0.067	0.049	0.033	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.095	0.131	0.099	0.068	0.034	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.047
0.1	0.196	0.212	0.163	0.114	0.059	0.029	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.086
0.2	0.380	0.341	0.259	0.177	0.105	0.065	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.157
0.5	0.841	0.574	0.421	0.291	0.219	0.167	0.107	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.317
1.	1.349	0.762	0.530	0.415	0.349	0.294	0.227	0.136	0.027	0.000	0.000	0.000	0.000	0.000	0.477
2.	1.892	0.903	0.666	0.571	0.510	0.454	0.387	0.295	0.154	0.001	0.000	0.000	0.000	0.000	0.641
3.	2.173	0.962	0.754	0.670	0.611	0.558	0.495	0.407	0.264	0.042	0.000	0.000	0.000	0.000	0.733
4.	2.351	0.995	0.816	0.738	0.682	0.631	0.572	0.490	0.351	0.104	0.000	0.000	0.000	0.000	0.793
5.	2.475	1.019	0.862	0.789	0.735	0.686	0.631	0.554	0.422	0.166	0.002	0.000	0.000	0.000	0.837
6.	2.568	1.040	0.897	0.828	0.776	0.729	0.677	0.606	0.480	0.223	0.023	0.000	0.000	0.000	0.870
8.	2.697	1.072	0.947	0.884	0.836	0.794	0.747	0.683	0.568	0.322	0.081	0.001	0.000	0.000	0.918
10.	2.808	1.091	0.975	0.921	0.880	0.841	0.796	0.736	0.631	0.404	0.147	0.013	0.000	0.000	0.951
15.	2.907	1.120	1.029	0.984	0.949	0.914	0.875	0.827	0.741	0.538	0.289	0.109	0.000	0.000	1.005
20.	2.973	1.135	1.058	1.019	0.987	0.956	0.922	0.880	0.806	0.629	0.398	0.207	0.000	0.000	1.037
30.	3.062	1.153	1.090	1.057	1.030	1.004	0.977	0.941	0.879	0.743	0.550	0.364	0.000	0.000	1.075
40.	3.089	1.161	1.108	1.080	1.056	1.033	1.009	0.978	0.924	0.807	0.642	0.473	0.049	0.000	1.097
50.	3.089	1.165	1.120	1.095	1.073	1.052	1.030	1.003	0.955	0.849	0.704	0.552	0.124	0.000	1.111
60.	3.080	1.167	1.127	1.105	1.086	1.067	1.046	1.020	0.979	0.884	0.743	0.603	0.195	0.000	1.121
80.	3.042	1.170	1.137	1.119	1.103	1.087	1.068	1.044	1.008	0.928	0.807	0.685	0.310	0.000	1.134
100.	3.007	1.172	1.143	1.128	1.114	1.099	1.082	1.061	1.028	0.957	0.849	0.741	0.398	0.000	1.143
200.	2.810	1.174	1.158	1.148	1.139	1.130	1.118	1.102	1.078	1.027	0.953	0.877	0.636	0.000	1.162
500.	2.098	1.175	1.168	1.163	1.159	1.154	1.148	1.139	1.123	1.089	1.044	0.995	0.842	0.000	1.167
1000.	1.722	1.175	1.171	1.169	1.167	1.164	1.161	1.155	1.146	1.122	1.088	1.056	0.953	0.000	1.169
2000.	1.486	1.175	1.173	1.172	1.171	1.170	1.168	1.165	1.160	1.145	1.121	1.098	1.026	0.000	1.171
5000.	1.315	1.175	1.175	1.174	1.173	1.173	1.174	1.168	1.162	1.152	1.136	1.109	1.089	0.000	1.172
10000.	1.252	1.175	1.175	1.174	1.174	1.174	1.174	1.173	1.170	1.163	1.154	1.123	1.000	0.000	1.174
K/T1	0.														

**TABLE II.** Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung and Total Integrated Radiative Energy-Loss Cross Sections

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$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)	Z = 55														
0.001	0.000	0.011	0.007	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.017	0.011	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
0.005	0.006	0.028	0.019	0.012	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.01	0.017	0.042	0.030	0.019	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.038	0.068	0.049	0.033	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.096	0.131	0.099	0.068	0.034	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.047
0.1	0.197	0.212	0.162	0.113	0.059	0.028	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.086
0.2	0.382	0.340	0.258	0.176	0.104	0.065	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.155
0.5	0.842	0.571	0.418	0.288	0.217	0.165	0.106	0.034	0.000	0.000	0.000	0.000	0.000	0.000	0.313
1.	1.351	0.760	0.527	0.412	0.347	0.291	0.224	0.134	0.026	0.000	0.000	0.000	0.000	0.000	0.473
2.	1.897	0.902	0.664	0.569	0.508	0.451	0.385	0.293	0.152	0.001	0.000	0.000	0.000	0.000	0.639
3.	2.181	0.962	0.753	0.669	0.610	0.556	0.493	0.405	0.262	0.042	0.000	0.000	0.000	0.000	0.732
4.	2.361	0.996	0.816	0.738	0.682	0.630	0.571	0.488	0.349	0.103	0.000	0.000	0.000	0.000	0.793
5.	2.487	1.021	0.863	0.789	0.735	0.686	0.630	0.553	0.420	0.164	0.002	0.000	0.000	0.000	0.837
6.	2.582	1.042	0.898	0.829	0.777	0.730	0.678	0.605	0.478	0.222	0.023	0.000	0.000	0.000	0.871
8.	2.713	1.075	0.948	0.885	0.838	0.795	0.748	0.683	0.567	0.320	0.081	0.001	0.000	0.000	0.919
10.	2.825	1.095	0.978	0.923	0.882	0.843	0.798	0.737	0.631	0.403	0.146	0.013	0.000	0.000	0.955
15.	2.925	1.124	1.032	0.987	0.951	0.916	0.87	0.828	0.741	0.537	0.288	0.109	0.000	0.000	1.008
20.	2.992	1.140	1.062	1.022	0.990	0.959	0.925	0.882	0.807	0.628	0.398	0.206	0.000	0.000	1.040
30.	3.081	1.158	1.094	1.060	1.033	1.107	0.980	0.944	0.881	0.744	0.550	0.363	0.000	0.000	1.079
40.	3.107	1.166	1.112	1.083	1.059	1.036	1.012	0.981	0.926	0.808	0.642	0.473	0.049	0.000	1.101
50.	3.107	1.171	1.124	1.099	1.077	1.056	1.033	1.006	0.957	0.851	0.704	0.552	0.123	0.000	1.115
60.	3.096	1.173	1.132	1.109	1.090	1.071	1.050	1.022	0.981	0.886	0.744	0.602	0.193	0.000	1.125
80.	3.059	1.177	1.142	1.123	1.107	1.090	1.072	1.047	1.011	0.930	0.808	0.686	0.309	0.000	1.139
100.	3.023	1.179	1.149	1.132	1.118	1.103	1.086	1.064	1.031	0.960	0.851	0.742	0.398	0.000	1.148
200.	2.826	1.181	1.165	1.154	1.144	1.134	1.122	1.106	1.081	1.051	0.955	0.879	0.636	0.000	1.168
500.	2.111	1.182	1.175	1.170	1.166	1.160	1.153	1.144	1.128	1.093	1.046	1.002	0.848	0.000	1.173
1000.	1.732	1.182	1.178	1.176	1.174	1.171	1.167	1.161	1.151	1.127	1.092	1.060	0.955	0.000	1.179
2000.	1.495	1.182	1.180	1.179	1.178	1.177	1.175	1.172	1.166	1.150	1.125	1.101	1.030	0.000	1.177
5000.	1.323	1.183	1.182	1.182	1.181	1.180	1.181	1.181	1.175	1.169	1.157	1.161	1.093	0.000	1.189
10000.	1.260	1.183	1.182	1.182	1.182	1.182	1.182	1.182	1.177	1.169	1.159	1.127	0.000	0.000	1.181

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)	Z = 56														
0.001	0.000	0.011	0.007	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.017	0.011	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.006	0.028	0.020	0.012	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.017	0.063	0.030	0.019	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.038	0.068	0.049	0.033	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023
0.05	0.097	0.132	0.099	0.068	0.034	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.047
0.1	0.199	0.212	0.163	0.113	0.059	0.028	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.086
0.2	0.383	0.339	0.258	0.176	0.103	0.064	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.152
0.5	0.845	0.569	0.416	0.287	0.216	0.164	0.105	0.034	0.000	0.000	0.000	0.000	0.000	0.000	0.312
1.	1.355	0.758	0.525	0.411	0.345	0.289	0.223	0.133	0.026	0.000	0.000	0.000	0.000	0.000	0.471
2.	1.903	0.902	0.663	0.569	0.507	0.450	0.384	0.291	0.151	0.001	0.000	0.000	0.000	0.000	0.638
3.	2.192	0.961	0.752	0.668	0.610	0.556	0.492	0.404	0.261	0.041	0.000	0.000	0.000	0.000	0.731
4.	2.385	0.993	0.811	0.737	0.683	0.632	0.570	0.486	0.347	0.102	0.000	0.000	0.000	0.000	0.792
5.	2.515	1.018	0.857	0.787	0.737	0.688	0.630	0.551	0.418	0.164	0.002	0.000	0.000	0.000	0.836
6.	2.611	1.039	0.893	0.826	0.778	0.732	0.677	0.603	0.476	0.222	0.023	0.000	0.000	0.000	0.870
8.	2.745	1.073	0.943	0.883	0.839	0.797	0.748	0.681	0.566	0.321	0.080	0.001	0.000	0.000	0.919
10.	2.816	1.094	0.979	0.925	0.884	0.844	0.798	0.739	0.633	0.395	0.144	0.013	0.000	0.000	0.953
15.	2.936	1.126	1.032	0.987	0.951	0.916	0.878	0.829	0.741	0.535	0.287	0.108	0.000	0.000	1.008
20.	3.003	1.143	1.063	1.023	0.991	0.959	0.926	0.884	0.808	0.627	0.396	0.205	0.000	0.000	1.042
30.	3.092	1.162	1.096	1.061	1.034	1.009	0.981	0.945	0.882	0.744	0.549	0.362	0.000	0.000	1.081
40.	3.118	1.171	1.115	1.085	1.061	1.038	1.014	0.983	0.928	0.809	0.641	0.472	0.049	0.000	1.103
50.	3.118	1.176	1.128	1.101	1.079	1.058	1.035	1.008	0.959	0.852	0.704	0.552	0.123	0.000	1.118
60.	3.107	1.178	1.135	1.112	1.093	1.073	1.052	1.024	0.983	0.887	0.744	0.602	0.193	0.000	1.128
80.	3.069	1.182	1.147	1.127	1.110	1.093	1.074	1.049	1.012	0.931	0.809	0.686	0.308	0.000	1.142
100.	3.033	1.184	1.154	1.136	1.121	1.106	1.088	1.066	1.033	0.961	0.852	0.742	0.397	0.000	1.151
200.	2.831	1.187	1.171	1.159	1.148	1.138	1.126	1.111	1.082	1.031	0.958	0.881	0.637	0.000	1.172
500.	2.119	1.188	1.180	1.176	1.171	1.165	1.157	1.147	1.131	1.095	1.048	1.004	0.849	0.000	1.177
1000.	1.739	1.188	1.184	1.182	1.179	1.176	1.172	1.166	1.155	1.129	1.094	1.062	0.957	0.000	1.180
2000.	1.502	1.188	1.186	1.185	1.184	1.182	1.180	1.177	1.171	1.154	1.128	1.104	1.031	0.000	1.183
5000.	1.329	1.188	1.188	1.187	1.187	1.186	1.186	1.187	1.181	1.173	1.161	1.144	1.095	0.000	1.185
10000.	1.266	1.188	1.188	1.188	1.188	1.188	1.188	1.187	1.186	1.183	1.174	1.163	1.129	0.000	1.186

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)	Z = 57														
0.001	0.000	0.012	0.007	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.017	0.012	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.006	0.028	0.020	0.012	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.017	0.043	0.031	0.020	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.038	0.068	0.050	0.033	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.098	0.132	0.099	0.068	0.034	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.047
0.1	0.199	0.212	0.162	0.113	0.058	0.028	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.086
0.2	0.383	0.338	0.257	0.175	0.103	0.064	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.156
0.5	0.845	0.569	0.416	0.286	0.215	0.163	0.104	0.053	0.000	0.000	0.000	0.000	0.000	0.000	0.310
1.	1.355	0.758	0.524	0.410	0.344	0.288	0.222	0.132	0.026	0.000	0.000	0.000	0.000	0.000	0.470
2.	1.906	0.902	0.663	0.568	0.506	0.449	0.382	0.290	0.150	0.001	0.000	0.000	0.000	0.000	0.637
3.	2.194	0.963	0.753	0.669	0.609	0.555	0.492	0.403	0.260	0.041	0.000	0.000	0.000	0.000	0.731
4.	2.376	0.998	0.817	0.739	0.682	0.630	0.570	0.486	0.347	0.101	0.000	0.000	0.000	0.000	0.793
5.	2.503	1.026	0.864	0.790	0.736	0.686	0.630	0.551	0.418	0.163	0.002	0.000	0.000	0.000	0.857
6.	2.599	1.065	0.900	0.830	0.778	0.731	0.678	0.604	0.476	0.220	0.022	0.000	0.000	0.000	0.872
8.	2.731	1.079	0.951	0.888	0.840	0.797	0.749	0.683	0.566	0.318	0.080	0.001	0.000	0.000	0.923
10.	2.821	1.097	0.983	0.929	0.887	0.845	0.799	0.738	0.632	0.393	0.144	0.013	0.000	0.000	0.955
15.	2.941	1.129	1.036	0.990	0.954	0.918	0.879	0.830	0.742	0.535	0.286	0.108	0.000	0.000	1.010
20.	3.007	1.145	1.066	1.026	0.993	0.961	0.927	0.884	0.808	0.627	0.395	0.205	0.000	0.000	1.044
30.	3.097	1.164	1.098	1.064	1.037	1.011	0.983	0.947	0.883	0.744	0.549	0.361	0.000	0.000	1.082
40.	3.124	1.173	1.117	1.088	1.063	1.040	1.015	0.984	0.929	0.809	0.641	0.472	0.048	0.000	1.105
50.	3.124	1.178	1.130	1.103	1.081	1.060	1.037	1.009	0.960	0.853	0.705	0.551	0.123	0.000	1.120
60.	3.113	1.180	1.137	1.114	1.095	1.075	1.054	1.026	0.984	0.889	0.745	0.602	0.192	0.000	1.130
80.	3.076	1.184	1.148	1.128	1.112	1.095	1.075	1.051	1.015	0.933	0.809	0.686	0.309	0.000	1.140
100.	3.040	1.186	1.156	1.138	1.123	1.108	1.090	1.068	1.035	0.963	0.853	0.743	0.397	0.000	1.150
200.	2.841	1.189	1.172	1.161	1.150	1.140	1.127	1.111	1.085	1.034	0.958	0.881	0.636	0.000	1.170
500.	2.122	1.190	1.182	1.177	1.173	1.167	1.159	1.169	1.133	1.097	1.050	1.005	0.850	0.000	1.180
1000.	1.742	1.190	1.186	1.184	1.181	1.178	1.174	1.168	1.157	1.131	1.096	1.064	0.958	0.000	1.182
2000.	1.505	1.190	1.188	1.187	1.186	1.184	1.182	1.179	1.173	1.150	1.130	1.106	1.033	0.000	1.185
5000.	1.332	1.190	1.190	1.189	1.189	1.188	1.188	1.189	1.183	1.176	1.163	1.146	1.097	0.000	1.188
10000.	1.268	1.190	1.190	1.190	1.190	1.190	1.190	1.189	1.185	1.176	1.165	1.152	1.132	0.000	1.189

**TABLE II.** Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung and Total Integrated Radiative Energy-Loss Cross Sections  
See page 349 for Explanation of Tables

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
<b>T1 (MeV)</b>															
															Z = 58
0.001	0.000	0.012	0.007	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.018	0.012	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.006	0.029	0.020	0.012	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.017	0.043	0.031	0.020	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.038	0.069	0.050	0.033	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.097	0.132	0.099	0.068	0.034	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.047
0.1	0.198	0.212	0.162	0.113	0.058	0.028	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.085
0.2	0.382	0.338	0.256	0.174	0.102	0.063	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.153
0.5	0.842	0.567	0.414	0.284	0.214	0.162	0.104	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.309
1.	1.353	0.756	0.523	0.408	0.343	0.287	0.221	0.131	0.025	0.000	0.000	0.000	0.000	0.000	0.468
2.	1.906	0.901	0.662	0.567	0.505	0.448	0.381	0.289	0.149	0.001	0.000	0.000	0.000	0.000	0.635
3.	2.195	0.962	0.752	0.668	0.609	0.555	0.491	0.402	0.259	0.041	0.000	0.000	0.000	0.000	0.729
4.	2.378	0.998	0.816	0.738	0.682	0.630	0.570	0.486	0.347	0.101	0.000	0.000	0.000	0.000	0.792
5.	2.507	1.023	0.864	0.790	0.736	0.687	0.630	0.552	0.418	0.162	0.002	0.000	0.000	0.000	0.837
6.	2.603	1.045	0.900	0.830	0.778	0.731	0.678	0.605	0.476	0.219	0.022	0.000	0.000	0.000	0.872
8.	2.755	1.076	0.946	0.887	0.842	0.799	0.749	0.682	0.566	0.320	0.079	0.001	0.000	0.000	0.921
10.	2.825	1.098	0.983	0.929	0.888	0.846	0.800	0.740	0.634	0.394	0.143	0.013	0.000	0.000	0.956
15.	2.947	1.129	1.036	0.991	0.955	0.919	0.880	0.831	0.743	0.535	0.286	0.107	0.000	0.000	1.011
20.	3.014	1.146	1.066	1.026	0.994	0.962	0.928	0.886	0.810	0.627	0.395	0.204	0.000	0.000	1.045
30.	3.106	1.165	1.099	1.064	1.037	1.012	0.984	0.948	0.884	0.744	0.548	0.361	0.000	0.000	1.083
40.	3.132	1.174	1.118	1.088	1.064	1.041	1.016	0.985	0.930	0.810	0.642	0.471	0.046	0.000	1.106
50.	3.132	1.178	1.130	1.104	1.082	1.061	1.038	1.010	0.961	0.854	0.705	0.551	0.122	0.000	1.120
60.	3.120	1.181	1.138	1.114	1.095	1.076	1.054	1.027	0.985	0.890	0.745	0.601	0.192	0.000	1.131
80.	3.082	1.184	1.149	1.129	1.112	1.095	1.076	1.052	1.016	0.934	0.810	0.686	0.308	0.000	1.145
100.	3.045	1.186	1.156	1.139	1.124	1.109	1.091	1.069	1.036	0.964	0.854	0.743	0.397	0.000	1.154
200.	2.842	1.189	1.173	1.162	1.151	1.140	1.128	1.114	1.084	1.034	0.960	0.883	0.637	0.000	1.174
500.	2.126	1.190	1.183	1.178	1.173	1.167	1.160	1.150	1.133	1.098	1.052	1.002	0.846	0.000	1.180
1000.	1.744	1.190	1.186	1.184	1.181	1.179	1.175	1.168	1.157	1.132	1.097	1.065	0.959	0.000	1.183
2000.	1.506	1.190	1.188	1.187	1.186	1.184	1.180	1.173	1.157	1.131	1.107	1.034	0.000	1.185	
5000.	1.332	1.190	1.190	1.189	1.188	1.186	1.184	1.179	1.176	1.163	1.147	1.098	0.000	1.187	
10000.	1.268	1.190	1.190	1.190	1.190	1.190	1.190	1.189	1.185	1.177	1.166	1.132	0.000	1.189	
<b>T1 (MeV)</b>															
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
															Z = 59
0.001	0.000	0.012	0.007	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.018	0.012	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.005	0.029	0.020	0.012	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.017	0.044	0.031	0.020	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.037	0.069	0.050	0.033	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.098	0.132	0.098	0.068	0.034	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.047
0.1	0.195	0.213	0.162	0.112	0.058	0.028	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.085
0.2	0.378	0.338	0.257	0.175	0.102	0.063	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.152
0.5	0.839	0.565	0.412	0.283	0.212	0.161	0.103	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.307
1.	1.349	0.754	0.521	0.406	0.341	0.285	0.220	0.130	0.025	0.000	0.000	0.000	0.000	0.000	0.465
2.	1.902	0.900	0.661	0.567	0.505	0.447	0.380	0.288	0.148	0.001	0.000	0.000	0.000	0.000	0.633
3.	2.197	0.960	0.750	0.667	0.608	0.554	0.490	0.401	0.258	0.040	0.000	0.000	0.000	0.000	0.728
4.	2.392	0.992	0.810	0.735	0.682	0.630	0.569	0.485	0.345	0.101	0.000	0.000	0.000	0.000	0.789
5.	2.526	1.018	0.856	0.786	0.736	0.687	0.630	0.550	0.416	0.163	0.002	0.000	0.000	0.000	0.834
6.	2.625	1.039	0.891	0.825	0.777	0.731	0.678	0.603	0.475	0.220	0.022	0.000	0.000	0.000	0.869
8.	2.762	1.073	0.942	0.882	0.838	0.797	0.749	0.682	0.565	0.319	0.079	0.001	0.000	0.000	0.918
10.	2.835	1.095	0.978	0.924	0.883	0.844	0.800	0.741	0.633	0.394	0.143	0.013	0.000	0.000	0.953
15.	2.958	1.127	1.031	0.986	0.951	0.917	0.881	0.832	0.743	0.534	0.285	0.107	0.000	0.000	1.009
20.	3.026	1.144	1.062	1.022	0.991	0.961	0.929	0.887	0.810	0.627	0.394	0.204	0.000	0.000	1.043
30.	3.116	1.163	1.096	1.062	1.035	1.010	0.984	0.949	0.885	0.745	0.548	0.360	0.000	0.000	1.082
40.	3.141	1.172	1.116	1.086	1.062	1.040	1.017	0.986	0.931	0.811	0.642	0.471	0.048	0.000	1.105
50.	3.140	1.176	1.128	1.102	1.082	1.062	1.039	1.009	0.965	0.857	0.697	0.544	0.123	0.000	1.120
60.	3.127	1.180	1.137	1.114	1.095	1.076	1.055	1.027	0.986	0.890	0.746	0.601	0.192	0.000	1.131
80.	3.082	1.183	1.149	1.129	1.112	1.095	1.077	1.054	1.014	0.934	0.812	0.685	0.307	0.000	1.145
100.	3.046	1.185	1.156	1.139	1.124	1.108	1.092	1.071	1.034	0.964	0.856	0.743	0.396	0.000	1.154
200.	2.848	1.188	1.172	1.161	1.150	1.140	1.128	1.113	1.085	1.035	0.962	0.884	0.637	0.000	1.174
500.	2.128	1.189	1.182	1.177	1.172	1.166	1.159	1.150	1.133	1.098	1.053	1.003	0.847	0.000	1.179
1000.	1.745	1.189	1.185	1.183	1.180	1.178	1.174	1.168	1.157	1.132	1.097	1.065	0.960	0.000	1.182
2000.	1.506	1.189	1.187	1.186	1.185	1.183	1.182	1.179	1.175	1.156	1.131	1.107	1.035	0.000	1.184
5000.	1.332	1.189	1.189	1.189	1.188	1.187	1.187	1.186	1.185	1.175	1.163	1.146	1.098	0.000	1.186
10000.	1.268	1.189	1.189	1.189	1.189	1.189	1.189	1.189	1.189	1.184	1.175	1.167	1.136	0.000	1.188
<b>T1 (MeV)</b>															
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
															Z = 60
0.001	0.000	0.012	0.007	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.018	0.012	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.005	0.029	0.020	0.012	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.016	0.044	0.031	0.020	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.037	0.069	0.050	0.033	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.097	0.132	0.099	0.068	0.034	0.011	0.0								

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 61															
0.001	0.000	0.012	0.007	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.018	0.012	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.005	0.029	0.020	0.012	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.016	0.044	0.031	0.020	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.037	0.069	0.050	0.033	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.097	0.132	0.099	0.068	0.034	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.047
0.1	0.194	0.212	0.162	0.112	0.058	0.028	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.085
0.2	0.374	0.336	0.255	0.173	0.101	0.063	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.151
0.5	0.834	0.562	0.410	0.280	0.210	0.159	0.101	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.303
1.	1.345	0.751	0.518	0.404	0.338	0.283	0.217	0.128	0.090	0.064	0.000	0.000	0.000	0.000	0.461
2.	1.902	0.898	0.659	0.565	0.503	0.445	0.378	0.285	0.167	0.000	0.000	0.000	0.000	0.000	0.630
3.	2.200	0.959	0.749	0.666	0.607	0.553	0.489	0.399	0.256	0.040	0.000	0.000	0.000	0.000	0.725
4.	2.397	0.992	0.810	0.735	0.682	0.630	0.568	0.483	0.343	0.100	0.000	0.000	0.000	0.000	0.788
5.	2.533	1.018	0.856	0.786	0.736	0.687	0.629	0.549	0.415	0.161	0.002	0.000	0.000	0.000	0.834
6.	2.634	1.040	0.892	0.825	0.778	0.732	0.678	0.603	0.474	0.219	0.022	0.000	0.000	0.000	0.868
8.	2.775	1.075	0.943	0.883	0.839	0.798	0.750	0.683	0.565	0.318	0.078	0.001	0.000	0.000	0.919
10.	2.849	1.096	0.979	0.925	0.885	0.846	0.802	0.742	0.633	0.393	0.142	0.012	0.000	0.000	0.954
15.	2.974	1.129	1.033	0.987	0.952	0.919	0.882	0.834	0.744	0.536	0.284	0.106	0.000	0.000	1.010
20.	3.042	1.146	1.064	1.025	0.992	0.962	0.930	0.889	0.812	0.627	0.393	0.283	0.000	0.000	1.044
30.	3.131	1.165	1.097	1.063	1.036	1.012	0.986	0.951	0.887	0.746	0.548	0.359	0.000	0.000	1.084
40.	3.156	1.173	1.117	1.087	1.064	1.042	1.018	0.988	0.933	0.812	0.642	0.470	0.048	0.000	1.107
50.	3.155	1.177	1.129	1.103	1.083	1.063	1.040	1.011	0.967	0.859	0.697	0.544	0.122	0.000	1.122
60.	3.141	1.188	1.138	1.114	1.096	1.077	1.056	1.029	0.988	0.892	0.746	0.601	0.191	0.000	1.132
80.	3.101	1.184	1.149	1.129	1.113	1.097	1.078	1.054	1.019	0.937	0.812	0.687	0.307	0.000	1.146
100.	3.064	1.186	1.156	1.139	1.125	1.110	1.092	1.071	1.039	0.967	0.856	0.744	0.396	0.000	1.155
200.	2.859	1.188	1.172	1.161	1.151	1.141	1.129	1.115	1.086	1.037	0.964	0.886	0.637	0.000	1.175
500.	2.135	1.189	1.182	1.177	1.173	1.167	1.160	1.150	1.134	1.100	1.055	1.006	0.848	0.000	1.180
1000.	1.749	1.189	1.185	1.183	1.181	1.178	1.174	1.168	1.158	1.133	1.099	1.067	0.963	0.000	1.182
2000.	1.508	1.189	1.187	1.186	1.185	1.186	1.182	1.179	1.173	1.157	1.132	1.108	1.038	0.000	1.184
5000.	1.333	1.190	1.189	1.188	1.187	1.187	1.188	1.182	1.176	1.163	1.147	1.100	0.000	0.000	1.187
10000.	1.268	1.189	1.189	1.189	1.189	1.189	1.189	1.188	1.184	1.176	1.168	1.136	0.000	0.000	1.188
k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 62															
0.001	0.000	0.012	0.007	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.018	0.012	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.005	0.030	0.021	0.012	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.016	0.044	0.031	0.020	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.036	0.069	0.050	0.033	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.096	0.132	0.099	0.068	0.034	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.047
0.1	0.193	0.212	0.162	0.112	0.058	0.027	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.084
0.2	0.373	0.336	0.255	0.173	0.101	0.062	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.150
0.5	0.831	0.560	0.408	0.279	0.209	0.159	0.101	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.302
1.	1.342	0.749	0.516	0.402	0.337	0.282	0.216	0.128	0.090	0.064	0.000	0.000	0.000	0.000	0.459
2.	1.904	0.898	0.659	0.564	0.502	0.444	0.377	0.284	0.146	0.000	0.000	0.000	0.000	0.000	0.629
3.	2.206	0.957	0.749	0.666	0.608	0.552	0.487	0.399	0.255	0.040	0.000	0.000	0.000	0.000	0.725
4.	2.396	0.993	0.811	0.735	0.681	0.630	0.568	0.483	0.342	0.099	0.000	0.000	0.000	0.000	0.788
5.	2.532	1.018	0.857	0.786	0.736	0.688	0.630	0.550	0.414	0.160	0.002	0.000	0.000	0.000	0.835
6.	2.633	1.039	0.892	0.826	0.778	0.733	0.679	0.603	0.473	0.217	0.022	0.000	0.000	0.000	0.868
8.	2.772	1.072	0.942	0.883	0.841	0.800	0.752	0.684	0.565	0.315	0.078	0.001	0.000	0.000	0.918
10.	2.850	1.095	0.978	0.924	0.885	0.847	0.803	0.742	0.633	0.392	0.142	0.012	0.000	0.000	0.954
15.	2.974	1.127	1.032	0.987	0.952	0.920	0.884	0.835	0.744	0.533	0.284	0.106	0.000	0.000	1.010
20.	3.062	1.144	1.063	1.023	0.992	0.963	0.932	0.890	0.812	0.627	0.393	0.203	0.000	0.000	1.044
30.	3.132	1.162	1.095	1.063	1.039	1.015	0.987	0.953	0.891	0.742	0.542	0.359	0.000	0.000	1.084
40.	3.161	1.171	1.115	1.087	1.066	1.044	1.020	0.990	0.935	0.813	0.636	0.468	0.048	0.000	1.107
50.	3.161	1.177	1.128	1.103	1.084	1.064	1.041	1.012	0.968	0.860	0.699	0.542	0.122	0.000	1.122
60.	3.148	1.180	1.138	1.115	1.096	1.078	1.057	1.030	0.989	0.893	0.747	0.601	0.191	0.000	1.132
80.	3.108	1.184	1.149	1.130	1.114	1.097	1.078	1.055	1.020	0.938	0.813	0.687	0.307	0.000	1.146
100.	3.071	1.186	1.157	1.139	1.125	1.110	1.093	1.072	1.040	0.968	0.857	0.745	0.395	0.000	1.156
200.	2.869	1.188	1.172	1.161	1.151	1.141	1.129	1.113	1.089	1.037	0.966	0.890	0.633	0.000	1.176
500.	2.139	1.189	1.182	1.177	1.173	1.167	1.160	1.151	1.135	1.100	1.055	1.011	0.854	0.000	1.180
1000.	1.751	1.189	1.185	1.183	1.181	1.178	1.174	1.168	1.158	1.134	1.099	1.068	0.964	0.000	1.183
2000.	1.509	1.189	1.187	1.186	1.185	1.182	1.179	1.173	1.157	1.133	1.104	1.055	1.035	0.000	1.185
5000.	1.333	1.189	1.189	1.188	1.188	1.187	1.187	1.188	1.182	1.176	1.164	1.148	1.100	0.000	1.187
10000.	1.268	1.189	1.189	1.189	1.189	1.189	1.189	1.188	1.184	1.176	1.168	1.137	0.000	0.000	1.188
k/T1	0.0														

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**

See page 349 for Explanation of Tables

k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 64															
0.001	0.000	0.013	0.008	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.019	0.013	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.004	0.030	0.021	0.012	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.015	0.045	0.032	0.020	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.036	0.070	0.051	0.034	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.095	0.132	0.099	0.068	0.034	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.047
0.1	0.191	0.212	0.161	0.112	0.057	0.027	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.084
0.2	0.370	0.335	0.254	0.172	0.100	0.062	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.149
0.5	0.826	0.558	0.405	0.277	0.207	0.157	0.099	0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.298
1.	1.337	0.746	0.514	0.400	0.335	0.279	0.214	0.126	0.024	0.000	0.000	0.000	0.000	0.000	0.455
2.	1.900	0.896	0.657	0.562	0.500	0.442	0.375	0.282	0.144	0.000	0.000	0.000	0.000	0.000	0.626
3.	2.203	0.958	0.748	0.664	0.606	0.552	0.487	0.396	0.253	0.039	0.000	0.000	0.000	0.000	0.723
4.	2.404	0.992	0.810	0.735	0.682	0.630	0.568	0.482	0.341	0.099	0.000	0.000	0.000	0.000	0.787
5.	2.542	1.019	0.857	0.787	0.736	0.688	0.630	0.559	0.413	0.160	0.002	0.000	0.000	0.000	0.833
6.	2.644	1.041	0.893	0.826	0.779	0.733	0.679	0.603	0.472	0.217	0.021	0.000	0.000	0.000	0.868
8.	2.787	1.075	0.944	0.884	0.841	0.800	0.752	0.684	0.564	0.316	0.077	0.001	0.000	0.000	0.919
10.	2.879	1.099	0.979	0.924	0.885	0.847	0.804	0.742	0.632	0.396	0.141	0.012	0.000	0.000	0.955
15.	2.990	1.130	1.034	0.989	0.955	0.922	0.886	0.837	0.745	0.533	0.283	0.106	0.000	0.000	1.012
20.	3.060	1.147	1.066	1.026	0.995	0.966	0.934	0.892	0.814	0.627	0.392	0.202	0.000	0.000	1.046
30.	3.151	1.167	1.099	1.065	1.039	1.015	0.989	0.954	0.890	0.747	0.547	0.358	0.000	0.000	1.086
40.	3.176	1.175	1.119	1.089	1.066	1.045	1.022	0.992	0.936	0.814	0.642	0.469	0.047	0.000	1.109
50.	3.176	1.179	1.131	1.105	1.085	1.066	1.044	1.015	0.970	0.862	0.699	0.542	0.121	0.000	1.124
60.	3.162	1.182	1.139	1.116	1.098	1.080	1.059	1.032	0.992	0.895	0.748	0.601	0.190	0.000	1.135
80.	3.122	1.185	1.151	1.131	1.115	1.099	1.080	1.057	1.022	0.940	0.814	0.688	0.306	0.000	1.148
100.	3.083	1.187	1.158	1.141	1.127	1.112	1.095	1.074	1.042	0.970	0.859	0.746	0.395	0.000	1.157
200.	2.877	1.189	1.174	1.163	1.152	1.143	1.131	1.117	1.089	1.041	0.967	0.889	0.638	0.000	1.177
500.	2.146	1.190	1.183	1.178	1.174	1.169	1.161	1.152	1.137	1.102	1.057	1.014	0.856	0.000	1.182
1000.	1.756	1.190	1.186	1.184	1.182	1.179	1.176	1.170	1.160	1.156	1.102	1.071	0.966	0.000	1.184
2000.	1.912	1.190	1.188	1.187	1.186	1.185	1.183	1.180	1.175	1.159	1.134	1.111	1.041	0.000	1.186
5000.	1.335	1.191	1.190	1.189	1.189	1.188	1.189	1.185	1.177	1.165	1.150	1.103	0.000	0.000	1.188
10000.	1.270	1.191	1.190	1.190	1.190	1.190	1.190	1.189	1.185	1.177	1.170	1.139	0.000	0.000	1.189
k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 65															
0.001	0.000	0.013	0.008	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.019	0.013	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.004	0.030	0.021	0.013	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.015	0.045	0.032	0.020	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.036	0.070	0.051	0.034	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.095	0.133	0.099	0.068	0.034	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.047
0.1	0.191	0.212	0.161	0.112	0.057	0.027	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.084
0.2	0.369	0.334	0.253	0.171	0.100	0.061	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.148
0.5	0.824	0.556	0.404	0.276	0.206	0.156	0.099	0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.297
1.	1.336	0.745	0.512	0.399	0.334	0.278	0.212	0.125	0.024	0.000	0.000	0.000	0.000	0.000	0.455
2.	1.900	0.895	0.656	0.561	0.499	0.441	0.374	0.281	0.144	0.000	0.000	0.000	0.000	0.000	0.624
3.	2.211	0.956	0.746	0.664	0.607	0.552	0.486	0.395	0.252	0.039	0.000	0.000	0.000	0.000	0.722
4.	2.408	0.993	0.810	0.735	0.682	0.630	0.567	0.481	0.340	0.098	0.000	0.000	0.000	0.000	0.786
5.	2.547	1.020	0.858	0.788	0.737	0.688	0.630	0.548	0.412	0.159	0.002	0.000	0.000	0.000	0.833
6.	2.650	1.042	0.894	0.828	0.780	0.734	0.679	0.602	0.472	0.216	0.021	0.000	0.000	0.000	0.869
8.	2.794	1.077	0.966	0.886	0.843	0.801	0.753	0.684	0.564	0.315	0.077	0.001	0.000	0.000	0.920
10.	2.887	1.101	0.982	0.927	0.887	0.848	0.804	0.742	0.632	0.396	0.140	0.012	0.000	0.000	0.956
15.	2.998	1.132	1.037	0.992	0.958	0.924	0.887	0.837	0.745	0.533	0.282	0.105	0.000	0.000	1.014
20.	3.067	1.149	1.068	1.028	0.997	0.966	0.936	0.893	0.814	0.627	0.392	0.201	0.000	0.000	1.048
30.	3.159	1.168	1.101	1.067	1.041	1.017	0.991	0.956	0.891	0.748	0.567	0.357	0.000	0.000	1.088
40.	3.184	1.177	1.121	1.091	1.068	1.046	1.023	0.992	0.937	0.815	0.642	0.469	0.047	0.000	1.110
50.	3.186	1.180	1.132	1.107	1.087	1.067	1.045	1.016	0.971	0.863	0.699	0.541	0.121	0.000	1.125
60.	3.171	1.183	1.140	1.118	1.100	1.082	1.061	1.034	0.994	0.897	0.749	0.601	0.189	0.000	1.136
80.	3.130	1.187	1.152	1.132	1.117	1.100	1.082	1.058	1.023	0.941	0.815	0.688	0.305	0.000	1.150
100.	3.092	1.188	1.159	1.142	1.128	1.113	1.096	1.075	1.043	0.972	0.860	0.746	0.394	0.000	1.159
200.	2.890	1.191	1.174	1.164	1.154	1.144	1.132	1.117	1.092	1.043	0.967	0.889	0.637	0.000	1.179
500.	2.151	1.191	1.184	1.180	1.175	1.170	1.163	1.154	1.138	1.104	1.060	1.010	0.852	0.000	1.183
1000.	1.759	1.191	1.188	1.185	1.183	1.180	1.177	1.171	1.161	1.137	1.103	1.072	0.968	0.000	1.185
2000.	1.515	1.192	1.189	1.188	1.187	1.186	1.184	1.182	1.176	1.168	1.136	1.112	1.043	0.000	1.187
5000.	1.337	1.192	1.191	1.191	1.190	1.190	1.190	1.189	1.185	1.185	1.178	1.167	1.151	1.104	0.000
10000.	1.272	1.192	1.191	1.191	1.191	1.191	1.191	1.191	1.187	1.178	1.171	1.140	0.000	0	

**TABLE II.** Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung and Total Integrated Radiative Energy-Loss Cross Sections  
See page 349 for Explanation of Tables

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 70															
0.001	0.000	0.013	0.008	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.020	0.013	0.007	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.002	0.031	0.022	0.013	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.014	0.046	0.033	0.021	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.034	0.071	0.052	0.034	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.091	0.134	0.100	0.068	0.034	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.185	0.211	0.161	0.111	0.057	0.027	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.082
0.2	0.360	0.331	0.250	0.169	0.098	0.060	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.145
0.5	0.811	0.549	0.398	0.271	0.202	0.152	0.095	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.289
1.	1.322	0.737	0.506	0.393	0.327	0.272	0.207	0.121	0.022	0.000	0.000	0.000	0.000	0.000	0.443
2.	1.892	0.890	0.652	0.557	0.495	0.437	0.369	0.276	0.140	0.000	0.000	0.000	0.000	0.000	0.616
3.	2.203	0.954	0.745	0.662	0.604	0.550	0.483	0.391	0.248	0.038	0.000	0.000	0.000	0.000	0.716
4.	2.411	0.990	0.809	0.735	0.682	0.630	0.567	0.479	0.336	0.096	0.000	0.000	0.000	0.000	0.783
5.	2.554	1.018	0.857	0.788	0.739	0.690	0.630	0.547	0.409	0.156	0.001	0.000	0.000	0.000	0.831
6.	2.661	1.041	0.894	0.829	0.782	0.736	0.681	0.603	0.469	0.213	0.021	0.000	0.000	0.000	0.868
8.	2.811	1.077	0.967	0.888	0.846	0.805	0.756	0.686	0.563	0.312	0.076	0.001	0.000	0.000	0.921
10.	2.908	1.102	0.983	0.929	0.890	0.852	0.808	0.745	0.632	0.395	0.138	0.011	0.000	0.000	0.957
15.	3.026	1.134	1.039	0.995	0.961	0.928	0.891	0.841	0.748	0.551	0.280	0.104	0.000	0.000	1.016
20.	3.099	1.151	1.070	1.031	1.001	0.972	0.940	0.898	0.818	0.627	0.390	0.199	0.000	0.000	1.051
30.	3.195	1.170	1.103	1.070	1.044	1.021	0.995	0.960	0.895	0.750	0.546	0.355	0.000	0.000	1.091
40.	3.222	1.179	1.123	1.094	1.071	1.050	1.027	0.998	0.942	0.818	0.643	0.467	0.000	0.000	1.114
50.	3.224	1.182	1.134	1.110	1.090	1.071	1.049	1.021	0.977	0.867	0.701	0.541	0.119	0.000	1.129
60.	3.209	1.185	1.143	1.120	1.103	1.085	1.065	1.039	0.998	0.901	0.750	0.601	0.187	0.000	1.140
80.	3.168	1.188	1.154	1.135	1.120	1.104	1.086	1.063	1.029	0.947	0.818	0.689	0.303	0.000	1.153
100.	3.129	1.190	1.161	1.144	1.131	1.116	1.100	1.080	1.048	0.977	0.864	0.749	0.392	0.000	1.163
200.	2.923	1.192	1.176	1.166	1.156	1.147	1.136	1.121	1.097	1.048	0.975	0.897	0.636	0.000	1.182
500.	2.170	1.193	1.185	1.181	1.177	1.172	1.165	1.156	1.142	1.108	1.064	0.861	0.000	0.000	1.186
1000.	1.771	1.193	1.189	1.187	1.184	1.182	1.179	1.173	1.163	1.141	1.108	1.078	0.976	0.000	1.187
2000.	1.522	1.193	1.191	1.189	1.187	1.186	1.181	1.183	1.178	1.163	1.139	1.117	1.049	0.000	1.189
5000.	1.361	1.193	1.193	1.192	1.191	1.191	1.192	1.186	1.180	1.169	1.154	1.109	0.000	0.000	1.190
10000.	1.274	1.193	1.192	1.192	1.192	1.192	1.192	1.192	1.188	1.181	1.171	1.140	0.000	0.000	1.192
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 71															
0.001	0.000	0.014	0.008	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.020	0.013	0.007	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.002	0.032	0.022	0.013	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.013	0.046	0.033	0.021	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.033	0.071	0.052	0.034	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
0.05	0.092	0.134	0.100	0.068	0.034	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.185	0.211	0.161	0.111	0.057	0.027	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.082
0.2	0.358	0.330	0.250	0.168	0.097	0.060	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.144
0.5	0.808	0.548	0.397	0.270	0.201	0.151	0.095	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.287
1.	1.322	0.736	0.504	0.391	0.326	0.271	0.206	0.120	0.022	0.000	0.000	0.000	0.000	0.000	0.441
2.	1.896	0.890	0.651	0.556	0.494	0.436	0.368	0.274	0.139	0.000	0.000	0.000	0.000	0.000	0.615
3.	2.207	0.955	0.745	0.662	0.604	0.549	0.483	0.390	0.247	0.037	0.000	0.000	0.000	0.000	0.716
4.	2.416	0.991	0.809	0.735	0.682	0.630	0.566	0.478	0.335	0.095	0.000	0.000	0.000	0.000	0.783
5.	2.559	1.019	0.858	0.789	0.739	0.690	0.631	0.547	0.408	0.156	0.001	0.000	0.000	0.000	0.831
6.	2.666	1.042	0.895	0.830	0.783	0.737	0.681	0.602	0.469	0.213	0.020	0.000	0.000	0.000	0.868
8.	2.815	1.078	0.948	0.889	0.847	0.806	0.756	0.686	0.563	0.312	0.075	0.001	0.000	0.000	0.921
10.	2.895	1.101	0.985	0.933	0.894	0.855	0.810	0.747	0.633	0.387	0.138	0.011	0.000	0.000	0.958
15.	3.029	1.134	1.040	0.996	0.963	0.930	0.893	0.842	0.748	0.531	0.280	0.103	0.000	0.000	1.017
20.	3.102	1.151	1.071	1.033	1.003	0.974	0.941	0.899	0.818	0.627	0.390	0.199	0.000	0.000	1.052
30.	3.195	1.170	1.104	1.072	1.048	1.024	0.998	0.963	0.897	0.750	0.544	0.355	0.000	0.000	1.092
40.	3.226	1.179	1.123	1.096	1.074	1.053	1.029	0.998	0.948	0.819	0.634	0.461	0.000	0.000	1.116
50.	3.229	1.184	1.136	1.111	1.092	1.073	1.051	1.022	0.978	0.868	0.701	0.540	0.119	0.000	1.131
60.	3.217	1.187	1.144	1.122	1.104	1.087	1.066	1.040	0.999	0.902	0.751	0.601	0.187	0.000	1.141
80.	3.177	1.190	1.156	1.137	1.121	1.105	1.087	1.065	1.030	0.948	0.819	0.690	0.303	0.000	1.155
100.	3.138	1.192	1.163	1.146	1.132	1.118	1.102	1.081	1.050	0.979	0.865	0.749	0.392	0.000	1.164
200.	2.930	1.193	1.177	1.167	1.157	1.148	1.137	1.122	1.098	0.949	0.876	0.744	0.302	0.000	1.184
500.	2.170	1.194	1.187	1.183	1.178	1.173	1.167	1.160	1.141	1.109	1.067	1.022	0.861	0.000	1.187
1000.	1.775	1.194	1.190	1.188	1.186	1.183	1.180	1.175	1.165	1.142	1.109	1.079	0.975	0.000	1.189
2000.	1.525	1.194	1.192	1.191	1.190	1.189	1.188	1.185	1.180	1.164	1.142	1.123	1.047	0.000	1.190
5000.	1.343	1.194	1.194	1.193	1.193	1.192	1.192	1.193	1.188	1.182	1.171	1.156	1.111	0.000	1.192
10000.	1.276	1.194	1.194	1.194	1.194	1.194	1.194	1.194	1.194	1.193	1.173	1.142	0.000	0.000	1.193
K/T1	0.0														

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung and Total Integrated Radiative Energy-Loss Cross Sections**

See page 349 for Explanation of Tables

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)	Z = 73														
0.001	0.000	0.014	0.008	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.021	0.014	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.001	0.032	0.022	0.013	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.013	0.046	0.033	0.021	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.033	0.072	0.052	0.035	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.05	0.091	0.135	0.100	0.068	0.034	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.184	0.211	0.161	0.111	0.056	0.026	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.082
0.2	0.356	0.329	0.249	0.167	0.097	0.059	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.143
0.5	0.804	0.545	0.396	0.267	0.199	0.149	0.094	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.284
1.	1.320	0.733	0.502	0.389	0.324	0.268	0.204	0.118	0.022	0.000	0.000	0.000	0.000	0.000	0.438
2.	1.900	0.888	0.649	0.555	0.493	0.434	0.366	0.272	0.137	0.000	0.000	0.000	0.000	0.000	0.612
3.	2.218	0.956	0.743	0.662	0.604	0.549	0.481	0.389	0.245	0.037	0.000	0.000	0.000	0.000	0.714
4.	2.423	0.992	0.810	0.736	0.682	0.630	0.566	0.477	0.334	0.095	0.000	0.000	0.000	0.000	0.782
5.	2.567	1.021	0.860	0.790	0.740	0.691	0.631	0.547	0.407	0.155	0.001	0.000	0.000	0.000	0.831
6.	2.675	1.044	0.897	0.832	0.785	0.738	0.682	0.602	0.468	0.211	0.020	0.000	0.000	0.000	0.869
8.	2.827	1.081	0.951	0.892	0.849	0.807	0.757	0.686	0.562	0.311	0.075	0.001	0.000	0.000	0.923
10.	2.924	1.106	0.987	0.933	0.894	0.856	0.811	0.746	0.632	0.392	0.137	0.011	0.000	0.000	0.960
15.	3.041	1.137	1.043	1.000	0.966	0.933	0.895	0.844	0.749	0.532	0.277	0.101	0.000	0.000	1.019
20.	3.114	1.154	1.074	1.036	1.006	0.977	0.944	0.901	0.819	0.627	0.387	0.196	0.000	0.000	1.054
30.	3.207	1.172	1.107	1.076	1.051	1.027	1.000	0.965	0.902	0.747	0.539	0.352	0.000	0.000	1.095
40.	3.239	1.181	1.127	1.099	1.078	1.057	1.032	1.001	0.950	0.821	0.632	0.461	0.046	0.000	1.118
50.	3.243	1.186	1.139	1.114	1.095	1.076	1.056	1.025	0.981	0.869	0.701	0.539	0.118	0.000	1.134
60.	3.232	1.189	1.167	1.125	1.107	1.090	1.069	1.043	1.002	0.904	0.752	0.601	0.186	0.000	1.164
80.	3.193	1.192	1.159	1.139	1.124	1.108	1.091	1.068	1.033	0.950	0.821	0.691	0.302	0.000	1.158
100.	3.149	1.194	1.166	1.149	1.135	1.120	1.105	1.086	1.051	0.981	0.869	0.750	0.391	0.000	1.167
200.	2.944	1.196	1.180	1.170	1.160	1.151	1.140	1.125	1.102	1.052	0.980	0.900	0.634	0.000	1.187
500.	2.179	1.196	1.190	1.185	1.181	1.176	1.170	1.165	1.144	1.112	1.071	1.025	0.863	0.000	1.190
1000.	1.781	1.197	1.193	1.190	1.188	1.186	1.183	1.178	1.168	1.145	1.113	1.083	0.978	0.000	1.192
2000.	1.529	1.197	1.194	1.193	1.192	1.191	1.190	1.187	1.182	1.168	1.144	1.122	1.054	0.000	1.193
5000.	1.346	1.197	1.196	1.196	1.195	1.195	1.196	1.196	1.190	1.184	1.174	1.159	1.114	0.000	1.194
10000.	1.279	1.197	1.196	1.196	1.196	1.196	1.196	1.196	1.192	1.185	1.176	1.145	0.000	0.000	1.195
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)	Z = 74														
0.001	0.000	0.014	0.008	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.021	0.014	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.001	0.032	0.022	0.013	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.013	0.047	0.034	0.021	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.033	0.072	0.053	0.035	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.05	0.088	0.135	0.101	0.069	0.034	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.183	0.211	0.160	0.111	0.056	0.026	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.082
0.2	0.356	0.329	0.248	0.167	0.096	0.059	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.142
0.5	0.803	0.544	0.393	0.266	0.198	0.148	0.093	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.283
1.	1.318	0.732	0.500	0.388	0.323	0.267	0.202	0.118	0.021	0.000	0.000	0.000	0.000	0.000	0.436
2.	1.900	0.888	0.649	0.554	0.492	0.434	0.365	0.271	0.137	0.000	0.000	0.000	0.000	0.000	0.611
3.	2.226	0.955	0.743	0.661	0.604	0.548	0.481	0.388	0.244	0.037	0.000	0.000	0.000	0.000	0.714
4.	2.435	0.995	0.811	0.736	0.682	0.629	0.566	0.477	0.333	0.094	0.000	0.000	0.000	0.000	0.782
5.	2.583	1.024	0.861	0.790	0.740	0.690	0.631	0.546	0.407	0.154	0.001	0.000	0.000	0.000	0.832
6.	2.694	1.048	0.898	0.832	0.784	0.738	0.682	0.603	0.468	0.211	0.020	0.000	0.000	0.000	0.870
8.	2.849	1.085	0.952	0.892	0.849	0.807	0.758	0.687	0.563	0.310	0.074	0.001	0.000	0.000	0.924
10.	2.948	1.110	0.989	0.934	0.894	0.856	0.812	0.747	0.632	0.391	0.136	0.011	0.000	0.000	0.961
15.	3.066	1.142	1.045	1.000	0.966	0.933	0.896	0.845	0.750	0.531	0.276	0.101	0.000	0.000	1.021
20.	3.137	1.158	1.076	1.037	1.007	0.978	0.946	0.902	0.820	0.627	0.386	0.195	0.000	0.000	1.056
30.	3.229	1.177	1.110	1.076	1.051	1.027	1.001	0.966	0.899	0.751	0.544	0.352	0.000	0.000	1.097
40.	3.255	1.185	1.129	1.100	1.077	1.056	1.034	1.004	0.947	0.821	0.642	0.465	0.045	0.000	1.120
50.	3.255	1.188	1.140	1.115	1.096	1.077	1.056	1.027	0.982	0.870	0.701	0.539	0.118	0.000	1.155
60.	3.241	1.191	1.148	1.126	1.109	1.091	1.071	1.055	1.004	0.905	0.752	0.601	0.186	0.000	1.165
80.	3.200	1.194	1.159	1.140	1.125	1.110	1.092	1.070	1.035	0.951	0.822	0.691	0.301	0.000	1.169
100.	3.155	1.195	1.167	1.150	1.136	1.122	1.107	1.088	1.053	0.982	0.870	0.750	0.390	0.000	1.169
200.	2.950	1.197	1.181	1.171	1.162	1.153	1.142	1.127	1.103	1.055	0.980	0.898	0.635	0.000	1.188
500.	2.188	1.197	1.190	1.186	1.182	1.177	1.171	1.162	1.148	1.115	1.071	1.028	0.864	0.000	1.192
1000.	1.784	1.197	1.194	1.191	1.189	1.187	1.184	1.179	1.169	1.147	1.115	1.085	0.979	0.000	1.193
2000.	1.531	1.197	1.195	1.194	1.193	1.192	1.191	1.189	1.183	1.169	1.146	1.123	1.056	0.000	1.194
5000.	1.348	1.198	1.197	1.197	1.196	1.196	1.196	1.197	1.191	1.186	1.175	1.160	1.115	0.000	1.195
10000.	1.280	1.197	1.197	1.197	1.197	1.197	1.197	1.197	1.197	1.193	1.186	1.177	1.148	0.000	1.196
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)	Z = 75														
0.001	0.000	0.014	0.008	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.021	0.014	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.001	0.033	0.023	0.013	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.01	0.012	0.047	0.034	0.021	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.02	0.032	0.072	0.053	0.035	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.05	0.091	0.134	0.101	0.069	0.034	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.183	0.211	0.160	0.111	0.056	0.026	0.002	0.000							

**TABLE II.** Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung and Total Integrated Radiative Energy-Loss Cross Sections

**See page 349 for Explanation of Tables**

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 79															
0.001	0.000	0.015	0.008	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.022	0.014	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.000	0.034	0.023	0.014	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
0.01	0.011	0.048	0.034	0.021	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.02	0.031	0.073	0.054	0.035	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.05	0.089	0.135	0.101	0.069	0.034	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.180	0.211	0.160	0.110	0.056	0.026	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.081
0.2	0.349	0.327	0.246	0.165	0.095	0.058	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.160
0.5	0.793	0.539	0.388	0.262	0.194	0.145	0.090	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.276
1.	1.309	0.726	0.495	0.382	0.317	0.262	0.197	0.114	0.020	0.000	0.000	0.000	0.000	0.000	0.427
2.	1.899	0.886	0.645	0.550	0.488	0.430	0.360	0.266	0.133	0.000	0.000	0.000	0.000	0.000	0.605
3.	2.232	0.955	0.743	0.660	0.603	0.547	0.478	0.384	0.260	0.035	0.000	0.000	0.000	0.000	0.710
4.	2.442	0.996	0.812	0.737	0.683	0.631	0.567	0.475	0.329	0.092	0.000	0.000	0.000	0.000	0.781
5.	2.594	1.026	0.863	0.793	0.744	0.695	0.634	0.546	0.403	0.151	0.001	0.000	0.000	0.000	0.853
6.	2.706	1.051	0.902	0.837	0.790	0.744	0.687	0.604	0.465	0.207	0.019	0.000	0.000	0.000	0.872
8.	2.861	1.088	0.958	0.900	0.857	0.816	0.765	0.690	0.561	0.305	0.073	0.001	0.000	0.000	0.928
10.	2.962	1.114	0.995	0.942	0.904	0.866	0.820	0.752	0.633	0.386	0.134	0.011	0.000	0.000	0.966
15.	3.102	1.148	1.051	1.008	0.975	0.943	0.904	0.850	0.754	0.531	0.273	0.099	0.000	0.000	1.027
20.	3.176	1.164	1.083	1.045	1.016	0.987	0.954	0.908	0.826	0.628	0.382	0.193	0.000	0.000	1.063
30.	3.258	1.181	1.116	1.085	1.061	1.038	1.011	0.974	0.909	0.749	0.537	0.349	0.000	0.000	1.104
40.	3.288	1.189	1.135	1.108	1.087	1.067	1.043	1.011	0.958	0.825	0.633	0.456	0.045	0.000	1.127
50.	3.291	1.193	1.146	1.123	1.104	1.085	1.064	1.036	0.990	0.875	0.702	0.538	0.116	0.000	1.142
60.	3.278	1.196	1.154	1.133	1.116	1.099	1.079	1.054	1.012	0.911	0.754	0.601	0.184	0.000	1.153
80.	3.238	1.198	1.165	1.146	1.132	1.117	1.100	1.078	1.044	0.958	0.825	0.693	0.299	0.000	1.166
100.	3.192	1.199	1.172	1.156	1.142	1.129	1.115	1.097	1.062	0.990	0.874	0.753	0.388	0.000	1.175
200.	2.984	1.201	1.185	1.176	1.167	1.159	1.149	1.135	1.112	1.064	0.988	0.906	0.836	0.000	1.195
500.	2.208	1.201	1.194	1.190	1.186	1.182	1.176	1.169	1.154	1.125	1.081	1.028	0.866	0.000	1.197
1000.	1.797	1.201	1.197	1.195	1.193	1.191	1.188	1.184	1.175	1.154	1.124	1.094	0.987	0.000	1.198
2000.	1.540	1.201	1.199	1.198	1.197	1.196	1.195	1.193	1.188	1.175	1.153	1.132	1.065	0.000	1.199
5000.	1.354	1.201	1.201	1.200	1.200	1.200	1.201	1.201	1.195	1.191	1.181	1.167	1.125	0.000	1.200
10000.	1.285	1.201	1.201	1.201	1.201	1.201	1.201	1.201	1.198	1.191	1.183	1.156	0.000	1.200	
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 80															
0.001	0.000	0.015	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.022	0.014	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.000	0.034	0.023	0.014	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
0.01	0.011	0.048	0.034	0.022	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.02	0.031	0.074	0.054	0.035	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.05	0.089	0.135	0.101	0.069	0.034	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.180	0.211	0.160	0.110	0.056	0.026	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.081
0.2	0.349	0.326	0.246	0.165	0.094	0.057	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.139
0.5	0.793	0.538	0.387	0.261	0.193	0.144	0.090	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.275
1.	1.311	0.725	0.493	0.381	0.316	0.260	0.196	0.113	0.020	0.000	0.000	0.000	0.000	0.000	0.425
2.	1.902	0.886	0.645	0.549	0.487	0.429	0.359	0.265	0.132	0.000	0.000	0.000	0.000	0.000	0.604
3.	2.237	0.956	0.743	0.660	0.602	0.546	0.478	0.384	0.239	0.035	0.000	0.000	0.000	0.000	0.710
4.	2.448	0.997	0.813	0.737	0.684	0.632	0.567	0.475	0.328	0.091	0.000	0.000	0.000	0.000	0.781
5.	2.601	1.028	0.864	0.794	0.744	0.696	0.635	0.546	0.402	0.150	0.001	0.000	0.000	0.000	0.853
6.	2.714	1.052	0.904	0.838	0.791	0.745	0.688	0.604	0.464	0.206	0.019	0.000	0.000	0.000	0.873
8.	2.876	1.091	0.959	0.901	0.859	0.818	0.767	0.691	0.561	0.305	0.072	0.001	0.000	0.000	0.929
10.	2.971	1.116	0.997	0.944	0.905	0.868	0.821	0.753	0.633	0.385	0.134	0.010	0.000	0.000	0.968
15.	3.112	1.151	1.054	1.010	0.977	0.944	0.906	0.852	0.754	0.530	0.272	0.099	0.000	0.000	1.029
20.	3.186	1.167	1.085	1.047	1.018	0.989	0.956	0.910	0.827	0.628	0.382	0.192	0.000	0.000	1.065
30.	3.268	1.184	1.119	1.088	1.063	1.040	1.013	0.976	0.910	0.750	0.537	0.348	0.000	0.000	1.106
40.	3.298	1.192	1.138	1.111	1.089	1.069	1.045	1.013	0.960	0.826	0.633	0.456	0.045	0.000	1.130
50.	3.302	1.197	1.149	1.125	1.106	1.088	1.064	1.038	0.992	0.876	0.703	0.538	0.116	0.000	1.145
60.	3.288	1.199	1.157	1.135	1.118	1.101	1.081	1.056	0.912	0.754	0.601	0.183	0.000	0.000	1.155
80.	3.248	1.202	1.168	1.149	1.135	1.119	1.102	1.080	1.046	0.960	0.826	0.693	0.299	0.000	1.169
100.	3.203	1.203	1.175	1.159	1.145	1.131	1.117	1.099	1.064	0.992	0.875	0.753	0.388	0.000	1.178
200.	2.993	1.204	1.188	1.179	1.170	1.162	1.151	1.137	1.114	1.066	0.990	0.866	0.738	0.000	1.198
500.	2.215	1.205	1.198	1.194	1.190	1.185	1.180	1.172	1.157	1.128	1.083	1.030	0.867	0.000	1.200
1000.	1.803	1.205	1.201	1.199	1.197	1.195	1.192	1.187	1.178	1.157	1.126	1.097	0.989	0.000	1.201
2000.	1.545	1.205	1.203	1.202	1.201	1.200	1.199	1.196	1.192	1.178	1.156	1.134	1.067	0.000	1.202
5000.	1.358	1.205	1.205	1.204	1.203	1.203	1.205	1.205	1.204	1.201	1.195	1.170	1.127	0.000	1.203
10000.	1.289	1.205	1.204	1.204	1.204	1.205	1.205	1.204	1.204	1.195	1.186	1.158	0.000	1.204	
K/T1	0.00	0.1													

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

k/T <sub>1</sub>	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T <sub>1</sub> (MeV)															
Z = 82															
0.001	0.000	0.015	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.022	0.015	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.000	0.034	0.024	0.014	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
0.01	0.011	0.049	0.035	0.022	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.02	0.031	0.074	0.054	0.035	0.017	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.05	0.090	0.136	0.101	0.069	0.034	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.181	0.211	0.160	0.110	0.055	0.026	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080
0.2	0.349	0.326	0.245	0.164	0.094	0.057	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.138
0.5	0.792	0.536	0.385	0.259	0.191	0.143	0.089	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.272
1.	1.311	0.724	0.492	0.379	0.314	0.258	0.194	0.111	0.020	0.000	0.000	0.000	0.000	0.000	0.422
2.	1.908	0.886	0.643	0.548	0.486	0.428	0.358	0.263	0.131	0.000	0.000	0.000	0.000	0.000	0.601
3.	2.246	0.957	0.743	0.660	0.602	0.546	0.477	0.382	0.238	0.035	0.000	0.000	0.000	0.000	0.709
4.	2.465	1.000	0.814	0.738	0.684	0.631	0.566	0.474	0.328	0.091	0.000	0.000	0.000	0.000	0.782
5.	2.615	1.031	0.866	0.796	0.746	0.697	0.636	0.546	0.401	0.149	0.001	0.000	0.000	0.000	0.834
6.	2.730	1.057	0.906	0.840	0.793	0.747	0.690	0.605	0.463	0.205	0.019	0.000	0.000	0.000	0.874
8.	2.888	1.096	0.963	0.904	0.862	0.820	0.769	0.692	0.561	0.303	0.072	0.001	0.000	0.000	0.932
10.	2.991	1.122	1.002	0.948	0.909	0.871	0.824	0.755	0.633	0.383	0.133	0.010	0.000	0.000	0.971
15.	3.133	1.157	1.059	1.015	0.981	0.948	0.909	0.854	0.755	0.529	0.271	0.098	0.000	0.000	1.033
20.	3.208	1.174	1.091	1.052	1.023	0.993	0.959	0.913	0.829	0.628	0.381	0.192	0.000	0.000	1.070
30.	3.290	1.191	1.125	1.093	1.068	1.044	1.017	0.980	0.913	0.750	0.537	0.348	0.000	0.000	1.111
40.	3.321	1.199	1.143	1.116	1.094	1.073	1.049	1.018	0.963	0.824	0.636	0.461	0.044	0.000	1.135
50.	3.322	1.203	1.155	1.131	1.111	1.092	1.070	1.042	0.995	0.878	0.703	0.538	0.115	0.000	1.150
60.	3.308	1.205	1.163	1.161	1.123	1.106	1.086	1.060	1.018	0.914	0.755	0.601	0.182	0.000	1.160
80.	3.266	1.208	1.173	1.154	1.140	1.124	1.107	1.085	1.050	0.963	0.828	0.693	0.297	0.000	1.174
100.	3.220	1.209	1.181	1.164	1.150	1.137	1.122	1.103	1.068	0.995	0.877	0.754	0.386	0.000	1.183
200.	3.010	1.211	1.195	1.185	1.176	1.167	1.157	1.142	1.119	1.070	0.994	0.910	0.637	0.000	1.204
500.	2.227	1.211	1.204	1.200	1.196	1.191	1.186	1.177	1.162	1.133	1.088	1.034	0.870	0.000	1.206
1000.	1.813	1.211	1.207	1.205	1.203	1.201	1.198	1.193	1.184	1.162	1.131	1.101	0.991	0.000	1.207
2000.	1.554	1.211	1.209	1.208	1.207	1.206	1.205	1.203	1.198	1.184	1.161	1.139	1.071	0.000	1.208
5000.	1.365	1.211	1.211	1.210	1.210	1.209	1.210	1.211	1.205	1.200	1.190	1.176	1.132	0.000	1.209
10000.	1.296	1.211	1.211	1.211	1.211	1.211	1.211	1.211	1.208	1.201	1.192	1.163	0.000	0.000	1.210
k/T <sub>1</sub>	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T <sub>1</sub> (MeV)															
Z = 83															
0.001	0.000	0.015	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.023	0.015	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.000	0.035	0.026	0.014	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
0.01	0.011	0.049	0.035	0.022	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.02	0.031	0.075	0.054	0.035	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.05	0.090	0.136	0.102	0.069	0.034	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.180	0.211	0.160	0.110	0.055	0.025	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080
0.2	0.348	0.325	0.245	0.164	0.094	0.057	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.138
0.5	0.792	0.535	0.384	0.298	0.190	0.142	0.088	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.271
1.	1.311	0.723	0.490	0.378	0.313	0.257	0.193	0.110	0.019	0.000	0.000	0.000	0.000	0.000	0.421
2.	1.910	0.886	0.643	0.548	0.485	0.427	0.357	0.262	0.130	0.000	0.000	0.000	0.000	0.000	0.600
3.	2.250	0.958	0.743	0.660	0.602	0.545	0.477	0.382	0.237	0.035	0.000	0.000	0.000	0.000	0.709
4.	2.467	1.001	0.814	0.738	0.685	0.633	0.568	0.474	0.326	0.090	0.000	0.000	0.000	0.000	0.782
5.	2.623	1.033	0.867	0.796	0.746	0.698	0.636	0.546	0.400	0.149	0.001	0.000	0.000	0.000	0.835
6.	2.739	1.059	0.907	0.841	0.794	0.748	0.691	0.605	0.463	0.204	0.019	0.000	0.000	0.000	0.875
8.	2.899	1.098	0.965	0.906	0.863	0.822	0.770	0.693	0.561	0.303	0.072	0.001	0.000	0.000	0.933
10.	3.003	1.125	1.004	0.950	0.911	0.873	0.826	0.756	0.633	0.383	0.132	0.010	0.000	0.000	0.973
15.	3.135	1.160	1.063	1.018	0.984	0.950	0.911	0.856	0.755	0.528	0.272	0.098	0.000	0.000	1.035
20.	3.209	1.177	1.095	1.056	1.023	0.996	0.962	0.915	0.828	0.627	0.382	0.192	0.000	0.000	1.072
30.	3.301	1.194	1.127	1.096	1.071	1.047	1.019	0.981	0.914	0.751	0.537	0.368	0.000	0.000	1.113
40.	3.332	1.201	1.146	1.118	1.097	1.075	1.051	1.020	0.964	0.825	0.636	0.460	0.044	0.000	1.137
50.	3.332	1.205	1.157	1.133	1.114	1.095	1.073	1.044	0.997	0.879	0.703	0.537	0.115	0.000	1.152
60.	3.317	1.208	1.165	1.143	1.126	1.108	1.088	1.062	1.020	0.916	0.758	0.601	0.182	0.000	1.163
80.	3.275	1.210	1.176	1.157	1.142	1.127	1.109	1.087	1.052	0.964	0.828	0.693	0.297	0.000	1.177
100.	3.228	1.211	1.183	1.166	1.153	1.139	1.124	1.104	1.070	0.997	0.879	0.754	0.386	0.000	1.186
200.	3.018	1.213	1.197	1.187	1.179	1.170	1.160	1.145	1.121	1.073	0.995	0.911	0.637	0.000	1.206
500.	2.233	1.214	1.206	1.202	1.199	1.194	1.188	1.180	1.165	1.135	1.090	1.036	0.871	0.000	1.209
1000.	1.817	1.213	1.210	1.207	1.206	1.203	1.200	1.196	1.187	1.165	1.133	1.104	0.993	0.000	1.210
2000.	1.557	1.213	1.211	1.210	1.209	1.209	1.207	1.205	1.200	1.187	1.164	1.142	1.073	0.000	1.211
5000.	1.368	1.214	1.213	1.213	1.212	1.212	1.212	1.213	1.208	1.203	1.193	1.179	1.135	0.000	1.212
10000.	1.299	1.213	1.213	1.213	1.213	1.213	1.213	1.214	1.210	1.204	1.195	1.166	0.000	0.000</	

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 85															
0.001	0.000	0.016	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.023	0.015	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.000	0.035	0.024	0.014	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
0.01	0.011	0.050	0.035	0.022	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.02	0.032	0.075	0.055	0.036	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.05	0.090	0.136	0.102	0.069	0.034	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.181	0.211	0.160	0.110	0.055	0.025	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080
0.2	0.348	0.325	0.244	0.163	0.093	0.056	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.137
0.5	0.792	0.533	0.382	0.256	0.189	0.141	0.087	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.269
1.	1.312	0.721	0.488	0.376	0.310	0.255	0.191	0.109	0.019	0.000	0.000	0.000	0.000	0.000	0.417
2.	1.914	0.885	0.642	0.546	0.484	0.425	0.355	0.260	0.128	0.000	0.000	0.000	0.000	0.000	0.598
3.	2.256	0.959	0.743	0.660	0.601	0.545	0.476	0.381	0.236	0.036	0.000	0.000	0.000	0.000	0.708
4.	2.478	1.002	0.815	0.739	0.686	0.636	0.568	0.473	0.324	0.089	0.000	0.000	0.000	0.000	0.782
5.	2.636	1.034	0.868	0.798	0.748	0.700	0.638	0.546	0.399	0.148	0.001	0.000	0.000	0.000	0.836
6.	2.753	1.061	0.908	0.843	0.797	0.751	0.693	0.606	0.462	0.203	0.019	0.000	0.000	0.000	0.877
8.	2.916	1.101	0.967	0.908	0.867	0.825	0.773	0.694	0.560	0.301	0.071	0.001	0.000	0.000	0.935
10.	3.021	1.128	1.006	0.953	0.915	0.877	0.829	0.758	0.633	0.382	0.132	0.010	0.000	0.000	0.976
15.	3.151	1.165	1.067	1.022	0.988	0.955	0.916	0.860	0.756	0.527	0.271	0.098	0.008	0.000	1.039
20.	3.226	1.182	1.100	1.060	1.030	1.000	0.966	0.919	0.830	0.626	0.381	0.191	0.000	0.000	1.076
30.	3.321	1.199	1.132	1.101	1.076	1.052	1.023	0.985	0.917	0.751	0.536	0.347	0.000	0.000	1.118
40.	3.352	1.207	1.151	1.124	1.102	1.081	1.056	1.024	0.967	0.826	0.636	0.460	0.044	0.000	1.142
50.	3.351	1.211	1.163	1.139	1.119	1.100	1.077	1.048	1.001	0.881	0.704	0.537	0.114	0.000	1.157
60.	3.336	1.214	1.171	1.149	1.131	1.116	1.093	1.066	1.024	0.918	0.757	0.601	0.181	0.000	1.168
80.	3.293	1.216	1.182	1.163	1.148	1.132	1.114	1.092	1.056	0.967	0.850	0.694	0.296	0.000	1.182
100.	3.246	1.217	1.189	1.172	1.158	1.145	1.130	1.111	1.075	1.001	0.881	0.755	0.385	0.000	1.191
200.	3.035	1.219	1.203	1.193	1.184	1.176	1.165	1.151	1.127	1.077	0.999	0.914	0.637	0.000	1.212
500.	2.245	1.219	1.212	1.208	1.204	1.200	1.194	1.186	1.171	1.141	1.095	1.040	0.873	0.000	1.215
1000.	1.827	1.219	1.215	1.215	1.211	1.209	1.206	1.202	1.203	1.193	1.139	1.109	0.997	0.000	1.216
2000.	1.565	1.219	1.217	1.216	1.215	1.214	1.213	1.211	1.206	1.193	1.170	1.148	1.078	0.000	1.217
5000.	1.375	1.219	1.219	1.219	1.218	1.218	1.218	1.219	1.214	1.209	1.199	1.185	1.140	0.000	1.218
10000.	1.305	1.219	1.219	1.219	1.219	1.219	1.220	1.219	1.219	1.216	1.209	1.203	1.175	0.000	1.219
k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 86															
0.001	0.000	0.016	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.023	0.015	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.000	0.035	0.024	0.014	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
0.01	0.011	0.050	0.036	0.022	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.02	0.032	0.076	0.055	0.036	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.05	0.090	0.137	0.102	0.069	0.034	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.181	0.211	0.160	0.110	0.055	0.025	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080
0.2	0.348	0.324	0.244	0.163	0.093	0.056	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.137
0.5	0.791	0.532	0.381	0.255	0.188	0.140	0.087	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.268
1.	1.311	0.720	0.487	0.374	0.309	0.256	0.190	0.108	0.019	0.000	0.000	0.000	0.000	0.000	0.416
2.	1.916	0.885	0.641	0.546	0.483	0.424	0.354	0.259	0.128	0.000	0.000	0.000	0.000	0.000	0.597
3.	2.259	0.960	0.743	0.660	0.601	0.545	0.476	0.380	0.235	0.034	0.000	0.000	0.000	0.000	0.707
4.	2.483	1.005	0.816	0.739	0.685	0.632	0.567	0.473	0.325	0.089	0.000	0.000	0.000	0.000	0.782
5.	2.642	1.037	0.870	0.798	0.748	0.698	0.636	0.547	0.401	0.148	0.001	0.000	0.000	0.000	0.837
6.	2.760	1.064	0.911	0.844	0.796	0.749	0.691	0.607	0.464	0.204	0.018	0.000	0.000	0.000	0.878
8.	2.925	1.105	0.969	0.909	0.866	0.824	0.772	0.695	0.562	0.303	0.071	0.001	0.000	0.000	0.937
10.	3.031	1.133	1.009	0.954	0.914	0.876	0.829	0.759	0.634	0.385	0.132	0.010	0.000	0.000	0.977
15.	3.155	1.167	1.069	1.025	0.991	0.957	0.917	0.861	0.757	0.527	0.270	0.098	0.000	0.000	1.041
20.	3.230	1.184	1.102	1.063	1.033	1.005	0.968	0.921	0.831	0.626	0.381	0.191	0.000	0.000	1.078
30.	3.327	1.201	1.135	1.103	1.079	1.054	1.025	0.987	0.918	0.752	0.536	0.346	0.000	0.000	1.120
40.	3.359	1.209	1.153	1.126	1.105	1.083	1.058	1.026	0.969	0.827	0.636	0.459	0.043	0.000	1.144
50.	3.359	1.214	1.165	1.141	1.122	1.103	1.080	1.050	1.003	0.882	0.704	0.537	0.114	0.000	1.159
60.	3.365	1.216	1.173	1.151	1.134	1.116	1.096	1.069	1.026	0.919	0.757	0.600	0.180	0.000	1.170
80.	3.302	1.219	1.184	1.165	1.150	1.135	1.117	1.095	1.059	0.969	0.831	0.694	0.295	0.000	1.184
100.	3.256	1.220	1.192	1.175	1.161	1.147	1.132	1.113	1.077	1.003	0.882	0.756	0.385	0.000	1.194
200.	3.043	1.221	1.205	1.196	1.187	1.176	1.168	1.153	1.129	1.080	1.001	0.915	0.637	0.000	1.215
500.	2.250	1.222	1.215	1.211	1.207	1.202	1.197	1.189	1.173	1.144	1.097	1.042	0.875	0.000	1.217
1000.	1.831	1.222	1.218	1.216	1.214	1.212	1.209	1.204	1.195	1.173	1.143	1.110	0.992	0.000	1.218
2000.	1.568	1.222	1.220	1.219	1.218	1.217	1.216	1.214	1.209	1.195	1.173	1.150	1.080	0.000	1.219
5000.	1.378	1.222	1.222	1.221	1.220	1.222	1.221	1.222	1.221	1.219	1.201	1.187	1.143	0.000	1.220
10000.	1.308	1.222	1.221	1.221	1.221	1.222	1.222	1.222	1.221	1.221	1.212	1.203	1.175	0.000	1.221
k/T1															

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

K/T <sub>1</sub>	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T <sub>1</sub> (MeV)															
Z = 88															
0.001	0.000	0.016	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.024	0.015	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.000	0.036	0.025	0.014	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
0.01	0.012	0.051	0.036	0.022	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.02	0.033	0.076	0.055	0.036	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.05	0.092	0.137	0.102	0.069	0.034	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.184	0.212	0.160	0.109	0.055	0.025	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080
0.2	0.352	0.324	0.243	0.162	0.092	0.056	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.136
0.5	0.795	0.531	0.379	0.254	0.186	0.139	0.086	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.265
1.	1.317	0.719	0.486	0.372	0.307	0.251	0.188	0.107	0.018	0.000	0.000	0.000	0.000	0.000	0.413
2.	1.924	0.885	0.640	0.545	0.482	0.423	0.352	0.257	0.126	0.000	0.000	0.000	0.000	0.000	0.595
3.	2.269	0.961	0.744	0.660	0.601	0.544	0.475	0.378	0.233	0.033	0.000	0.000	0.000	0.000	0.707
4.	2.491	1.005	0.817	0.741	0.687	0.635	0.569	0.472	0.322	0.088	0.000	0.000	0.000	0.000	0.783
5.	2.650	1.038	0.871	0.801	0.751	0.702	0.639	0.546	0.397	0.146	0.001	0.000	0.000	0.000	0.838
6.	2.768	1.065	0.913	0.847	0.801	0.755	0.695	0.600	0.461	0.202	0.018	0.000	0.000	0.000	0.880
8.	2.932	1.106	0.972	0.914	0.873	0.831	0.777	0.696	0.560	0.300	0.070	0.001	0.000	0.000	0.940
10.	3.038	1.134	1.012	0.960	0.922	0.883	0.834	0.760	0.634	0.381	0.130	0.010	0.000	0.000	0.981
15.	3.169	1.172	1.075	1.030	0.997	0.963	0.922	0.864	0.757	0.527	0.269	0.096	0.000	0.000	1.046
20.	3.246	1.191	1.108	1.069	1.039	1.008	0.973	0.924	0.832	0.627	0.380	0.189	0.000	0.000	1.083
30.	3.349	1.209	1.141	1.110	1.086	1.061	1.030	0.991	0.921	0.753	0.535	0.344	0.000	0.000	1.126
40.	3.382	1.218	1.160	1.133	1.112	1.089	1.063	1.030	0.972	0.829	0.636	0.458	0.043	0.000	1.151
50.	3.384	1.226	1.173	1.148	1.129	1.109	1.085	1.055	1.006	0.884	0.705	0.536	0.113	0.000	1.166
60.	3.370	1.227	1.182	1.159	1.141	1.122	1.101	1.074	1.030	0.922	0.758	0.600	0.179	0.000	1.177
80.	3.327	1.230	1.194	1.173	1.157	1.141	1.123	1.099	1.063	0.972	0.832	0.696	0.295	0.000	1.192
100.	3.281	1.231	1.202	1.183	1.168	1.153	1.138	1.119	1.082	1.006	0.884	0.758	0.384	0.000	1.202
200.	3.066	1.233	1.217	1.206	1.196	1.186	1.175	1.160	1.135	1.085	1.005	0.918	0.657	0.000	1.224
500.	2.269	1.234	1.227	1.222	1.218	1.213	1.206	1.197	1.181	1.150	1.103	1.047	0.876	0.000	1.228
1000.	1.847	1.234	1.230	1.228	1.226	1.223	1.220	1.215	1.204	1.181	1.148	1.117	1.003	0.000	1.229
2000.	1.583	1.234	1.232	1.231	1.230	1.229	1.228	1.225	1.220	1.203	1.180	1.161	1.081	0.000	1.231
5000.	1.391	1.234	1.234	1.233	1.233	1.232	1.233	1.234	1.228	1.222	1.210	1.195	1.149	0.000	1.232
10000.	1.321	1.234	1.234	1.234	1.234	1.234	1.234	1.234	1.231	1.223	1.213	1.182	1.182	0.000	1.233
K/T <sub>1</sub>	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T <sub>1</sub> (MeV)															
Z = 89															
0.001	0.000	0.016	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.024	0.015	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.000	0.036	0.025	0.014	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
0.01	0.012	0.051	0.036	0.022	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.02	0.033	0.077	0.055	0.036	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.05	0.092	0.137	0.102	0.069	0.034	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.184	0.212	0.160	0.109	0.055	0.025	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080
0.2	0.352	0.324	0.243	0.162	0.092	0.055	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.136
0.5	0.795	0.530	0.378	0.253	0.186	0.138	0.085	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.264
1.	1.318	0.718	0.485	0.371	0.306	0.250	0.187	0.106	0.018	0.000	0.000	0.000	0.000	0.000	0.411
2.	1.927	0.885	0.640	0.544	0.481	0.422	0.351	0.256	0.126	0.000	0.000	0.000	0.000	0.000	0.594
3.	2.272	0.962	0.744	0.660	0.601	0.544	0.474	0.378	0.233	0.033	0.000	0.000	0.000	0.000	0.707
4.	2.496	1.007	0.818	0.741	0.688	0.635	0.568	0.472	0.322	0.088	0.000	0.000	0.000	0.000	0.783
5.	2.656	1.040	0.873	0.802	0.752	0.703	0.640	0.546	0.398	0.147	0.001	0.000	0.000	0.000	0.839
6.	2.775	1.067	0.915	0.849	0.802	0.756	0.696	0.607	0.462	0.203	0.018	0.000	0.000	0.000	0.881
8.	2.939	1.109	0.974	0.916	0.875	0.832	0.778	0.697	0.562	0.302	0.070	0.001	0.000	0.000	0.942
10.	3.046	1.137	1.015	0.962	0.925	0.885	0.835	0.761	0.636	0.384	0.131	0.010	0.000	0.000	0.983
15.	3.194	1.175	1.075	1.032	1.000	0.966	0.923	0.863	0.760	0.534	0.270	0.096	0.000	0.000	1.048
20.	3.273	1.193	1.109	1.071	1.043	1.012	0.975	0.924	0.835	0.633	0.381	0.188	0.000	0.000	1.086
30.	3.359	1.212	1.144	1.113	1.089	1.063	1.032	0.993	0.924	0.758	0.537	0.344	0.000	0.000	1.129
40.	3.390	1.222	1.164	1.137	1.115	1.092	1.065	1.030	0.976	0.836	0.634	0.452	0.043	0.000	1.154
50.	3.393	1.227	1.176	1.151	1.132	1.111	1.088	1.057	1.009	0.887	0.706	0.536	0.112	0.000	1.169
60.	3.379	1.230	1.185	1.162	1.144	1.125	1.104	1.076	1.032	0.924	0.759	0.600	0.179	0.000	1.180
80.	3.337	1.233	1.197	1.176	1.160	1.144	1.126	1.102	1.065	0.973	0.833	0.697	0.295	0.000	1.195
100.	3.290	1.235	1.205	1.186	1.171	1.156	1.141	1.122	1.085	1.007	0.885	0.758	0.384	0.000	1.205
200.	3.074	1.237	1.220	1.209	1.199	1.189	1.178	1.163	1.138	1.087	1.007	0.919	0.637	0.000	1.227
500.	2.275	1.238	1.230	1.226	1.222	1.216	1.210	1.200	1.184	1.153	1.105	1.049	0.878	0.000	1.231
1000.	1.852	1.238	1.234	1.231	1.229	1.227	1.224	1.218	1.207	1.183	1.152	1.118	0.998	0.000	1.232
2000.	1.587	1.238	1.235	1.234	1.233	1.232	1.231	1.228	1.223	1.206	1.183	1.164	1.084	0.000	1.234
5000.	1.395	1.237	1.237	1.236	1.236	1.236	1.237	1.237	1.232	1.226	1.214	1.198	1.152	0.000	1.236
10000.	1.324	1.241	1.241	1.240	1.240	1.241	1.241	1.241	1.240	1.237	1.230	1.220	1.189	0.000	

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 91															
0.001	0.000	0.017	0.009	0.002	0.000	0.300	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.024	0.015	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.000	0.037	0.025	0.014	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
0.01	0.012	0.052	0.036	0.023	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.02	0.033	0.077	0.056	0.036	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.05	0.091	0.158	0.103	0.069	0.034	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.183	0.212	0.160	0.109	0.054	0.025	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.079
0.2	0.354	0.323	0.241	0.161	0.092	0.055	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.135
0.5	0.794	0.528	0.376	0.251	0.184	0.137	0.084	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.262
1.	1.315	0.717	0.483	0.370	0.304	0.248	0.185	0.104	0.018	0.000	0.000	0.000	0.000	0.000	0.408
2.	1.929	0.885	0.639	0.543	0.480	0.421	0.350	0.254	0.124	0.000	0.000	0.000	0.000	0.000	0.592
3.	2.278	0.962	0.744	0.660	0.602	0.545	0.475	0.377	0.230	0.033	0.000	0.000	0.000	0.000	0.706
4.	2.506	1.010	0.820	0.743	0.689	0.635	0.569	0.473	0.322	0.088	0.000	0.000	0.000	0.000	0.785
5.	2.677	1.044	0.874	0.804	0.755	0.705	0.640	0.547	0.400	0.167	0.001	0.000	0.000	0.000	0.841
6.	2.799	1.072	0.917	0.852	0.806	0.758	0.697	0.608	0.465	0.204	0.018	0.000	0.000	0.000	0.884
8.	2.967	1.114	0.977	0.920	0.879	0.836	0.780	0.699	0.567	0.306	0.071	0.001	0.000	0.000	0.946
10.	3.075	1.142	1.018	0.967	0.929	0.889	0.837	0.764	0.642	0.390	0.131	0.010	0.000	0.000	0.988
15.	3.223	1.180	1.079	1.037	1.005	0.970	0.926	0.866	0.767	0.543	0.272	0.095	0.000	0.000	1.054
20.	3.297	1.199	1.113	1.076	1.048	1.017	0.978	0.924	0.845	0.645	0.381	0.187	0.000	0.000	1.092
30.	3.584	1.217	1.149	1.118	1.094	1.068	1.036	0.997	0.931	0.766	0.539	0.343	0.000	0.000	1.135
40.	3.414	1.226	1.168	1.141	1.120	1.096	1.069	1.037	0.982	0.839	0.640	0.457	0.042	0.000	1.159
50.	3.415	1.231	1.180	1.156	1.136	1.115	1.092	1.063	1.015	0.888	0.710	0.542	0.111	0.000	1.174
60.	3.397	1.234	1.189	1.166	1.148	1.130	1.108	1.080	1.037	0.928	0.760	0.600	0.178	0.000	1.185
80.	3.352	1.237	1.201	1.180	1.164	1.148	1.130	1.107	1.068	0.977	0.835	0.694	0.292	0.000	1.199
100.	3.310	1.239	1.209	1.189	1.175	1.161	1.146	1.124	1.090	1.010	0.886	0.760	0.383	0.000	1.209
200.	3.089	1.241	1.224	1.213	1.203	1.194	1.183	1.168	1.142	1.091	1.011	0.922	0.637	0.000	1.231
500.	2.286	1.242	1.234	1.229	1.226	1.221	1.214	1.204	1.189	1.158	1.110	1.058	0.881	0.000	1.235
1000.	1.860	1.242	1.237	1.235	1.233	1.231	1.228	1.222	1.212	1.188	1.157	1.123	1.002	0.000	1.237
2000.	1.593	1.241	1.239	1.238	1.237	1.236	1.235	1.233	1.228	1.211	1.188	1.168	1.089	0.000	1.238
5000.	1.400	1.242	1.241	1.241	1.240	1.240	1.241	1.236	1.230	1.218	1.203	1.197	1.000	0.000	1.240
10000.	1.329	1.241	1.241	1.241	1.241	1.242	1.242	1.242	1.238	1.231	1.221	1.190	0.000	0.000	1.241
k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
Z = 92															
0.001	0.000	0.017	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.024	0.016	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.000	0.037	0.025	0.014	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
0.01	0.012	0.052	0.037	0.023	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.02	0.033	0.078	0.056	0.036	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
0.05	0.091	0.138	0.103	0.070	0.034	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.183	0.212	0.160	0.109	0.054	0.025	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.079
0.2	0.351	0.324	0.242	0.161	0.091	0.055	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.135
0.5	0.793	0.528	0.375	0.250	0.184	0.136	0.084	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.261
1.	1.314	0.716	0.482	0.369	0.303	0.247	0.183	0.104	0.018	0.000	0.000	0.000	0.000	0.000	0.406
2.	1.931	0.885	0.639	0.542	0.479	0.420	0.349	0.253	0.124	0.000	0.000	0.000	0.000	0.000	0.591
3.	2.282	0.963	0.744	0.660	0.602	0.545	0.474	0.377	0.230	0.033	0.000	0.000	0.000	0.000	0.706
4.	2.518	1.011	0.820	0.743	0.690	0.636	0.569	0.472	0.323	0.088	0.000	0.000	0.000	0.000	0.785
5.	2.684	1.045	0.876	0.805	0.756	0.706	0.642	0.549	0.401	0.147	0.001	0.000	0.000	0.000	0.843
6.	2.807	1.074	0.918	0.853	0.807	0.760	0.699	0.611	0.468	0.204	0.018	0.000	0.000	0.000	0.886
8.	2.977	1.116	0.979	0.922	0.881	0.838	0.783	0.704	0.571	0.306	0.070	0.001	0.000	0.000	0.969
10.	3.086	1.145	1.020	0.969	0.932	0.892	0.842	0.770	0.648	0.391	0.130	0.009	0.000	0.000	0.992
15.	3.234	1.183	1.082	1.040	1.009	0.975	0.932	0.874	0.775	0.564	0.270	0.096	0.000	0.000	1.058
20.	3.312	1.201	1.115	1.079	1.052	1.021	0.984	0.935	0.851	0.645	0.382	0.187	0.000	0.000	1.096
30.	3.394	1.220	1.151	1.121	1.098	1.072	1.042	1.003	0.938	0.768	0.538	0.342	0.000	0.000	1.139
40.	3.424	1.229	1.170	1.144	1.123	1.100	1.074	1.042	0.987	0.841	0.639	0.456	0.042	0.000	1.162
50.	3.425	1.233	1.182	1.158	1.136	1.118	1.095	1.067	1.018	0.890	0.710	0.542	0.111	0.000	1.177
60.	3.409	1.236	1.191	1.168	1.150	1.132	1.111	1.085	1.041	0.925	0.763	0.607	0.178	0.000	1.187
80.	3.362	1.239	1.203	1.182	1.166	1.150	1.132	1.108	1.071	0.977	0.835	0.698	0.293	0.000	1.201
100.	3.315	1.240	1.211	1.191	1.177	1.162	1.147	1.127	1.090	1.011	0.888	0.760	0.382	0.000	1.210
200.	3.097	1.243	1.226	1.215	1.205	1.195	1.184	1.169	1.146	1.094	1.009	0.921	0.643	0.000	1.233
500.	2.291	1.243	1.236	1.231	1.228	1.223	1.216	1.206	1.192	1.160	1.112	1.061	0.883	0.000	1.238
1000.	1.864	1.243	1.239	1.237	1.235	1.233	1.229	1.224	1.214	1.191	1.157	1.127	1.011	0.000	1.239
2000.	1.596	1.243	1.241	1.240	1.239	1.237	1.234	1.229	1.213	1.190	1.170	1.150	1.091	0.000	1.240
5000.	1.402	1.243	1.243	1.242	1.242	1.242	1.242	1.243	1.237	1.220	1.205	1.159	1.000	0.000	1.241
10000.	1.331	1.243	1.243	1.243	1.243	1.243	1.243	1.244	1.244	1.233	1.223	1.192	0.000	0.000	1.243
k/T1															

TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung and Total Integrated Radiative Energy-Loss Cross Sections

**See page 349 for Explanation of Tables**

K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR	
<b>T1 (MeV)</b>																
									Z = 94							
0.001	0.000	0.017	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	
0.002	0.000	0.025	0.016	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	
0.005	0.000	0.037	0.025	0.015	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	
0.01	0.011	0.053	0.037	0.023	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	
0.02	0.032	0.078	0.056	0.037	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022	
0.05	0.090	0.139	0.103	0.070	0.034	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046	
0.1	0.182	0.212	0.160	0.109	0.054	0.025	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.079	
0.2	0.350	0.323	0.241	0.160	0.091	0.055	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.134	
0.5	0.790	0.526	0.374	0.249	0.182	0.135	0.083	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.258	
1.	1.313	0.714	0.480	0.367	0.301	0.245	0.182	0.102	0.017	0.000	0.000	0.000	0.000	0.000	0.403	
2.	1.933	0.885	0.638	0.541	0.478	0.418	0.347	0.251	0.122	0.000	0.000	0.000	0.000	0.000	0.589	
3.	2.292	0.965	0.745	0.660	0.601	0.544	0.473	0.375	0.229	0.032	0.000	0.000	0.000	0.000	0.705	
4.	2.530	1.013	0.821	0.744	0.691	0.637	0.570	0.473	0.323	0.087	0.000	0.000	0.000	0.000	0.786	
5.	2.699	1.068	0.878	0.807	0.758	0.708	0.644	0.551	0.402	0.147	0.001	0.000	0.000	0.000	0.844	
6.	2.825	1.077	0.921	0.855	0.810	0.763	0.704	0.615	0.469	0.204	0.018	0.000	0.000	0.000	0.889	
8.	2.998	1.121	0.982	0.925	0.885	0.844	0.792	0.712	0.575	0.306	0.070	0.001	0.000	0.000	0.954	
10.	3.110	1.150	1.024	0.972	0.937	0.900	0.853	0.780	0.654	0.391	0.150	0.009	0.000	0.000	0.998	
15.	3.261	1.188	1.085	1.043	1.014	0.984	0.946	0.888	0.783	0.545	0.270	0.094	0.000	0.000	1.065	
20.	3.338	1.206	1.119	1.082	1.057	1.031	0.998	0.950	0.860	0.645	0.382	0.186	0.000	0.000	1.104	
30.	3.419	1.224	1.154	1.124	1.102	1.080	1.054	1.016	0.946	0.769	0.538	0.342	0.000	0.000	1.145	
40.	3.446	1.232	1.173	1.147	1.127	1.107	1.083	1.052	0.994	0.842	0.639	0.456	0.042	0.000	1.167	
50.	3.441	1.237	1.185	1.161	1.143	1.124	1.102	1.072	1.024	0.896	0.708	0.535	0.111	0.000	1.181	
60.	3.423	1.239	1.194	1.171	1.154	1.136	1.116	1.089	1.045	0.932	0.762	0.601	0.177	0.000	1.191	
80.	3.376	1.241	1.206	1.185	1.169	1.153	1.135	1.111	1.074	0.982	0.839	0.696	0.290	0.000	1.204	
100.	3.332	1.243	1.213	1.194	1.179	1.165	1.149	1.127	1.094	1.016	0.890	0.762	0.381	0.000	1.213	
200.	3.113	1.245	1.228	1.218	1.208	1.198	1.186	1.171	1.146	1.098	1.016	0.925	0.637	0.000	1.236	
500.	2.301	1.246	1.238	1.234	1.230	1.226	1.219	1.210	1.195	1.163	1.116	1.065	0.885	0.000	1.241	
1000.	1.870	1.266	1.242	1.239	1.238	1.235	1.232	1.227	1.217	1.194	1.161	1.132	1.015	0.000	1.242	
2000.	1.601	1.246	1.244	1.242	1.241	1.240	1.239	1.237	1.232	1.216	1.193	1.170	1.100	0.000	1.243	
5000.	1.406	1.246	1.246	1.244	1.244	1.245	1.246	1.246	1.246	1.240	1.235	1.223	1.208	1.163	0.000	1.244
10000.	1.334	1.246	1.245	1.245	1.246	1.246	1.246	1.246	1.246	1.243	1.235	1.226	1.206	1.196	0.000	1.247
<b>T1 (MeV)</b>																
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR	
<b>T1 (MeV)</b>																
									Z = 95							
0.001	0.000	0.017	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	
0.002	0.000	0.025	0.016	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	
0.005	0.000	0.037	0.026	0.015	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	
0.01	0.011	0.053	0.037	0.023	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	
0.02	0.032	0.079	0.057	0.037	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022	
0.05	0.090	0.139	0.103	0.070	0.034	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.044	
0.1	0.181	0.212	0.160	0.109	0.054	0.025	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.079	
0.2	0.349	0.323	0.241	0.160	0.091	0.054	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.133	
0.5	0.789	0.525	0.373	0.248	0.181	0.134	0.082	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.257	
1.	1.312	0.713	0.479	0.366	0.300	0.244	0.181	0.101	0.017	0.000	0.000	0.000	0.000	0.000	0.402	
2.	1.935	0.885	0.637	0.541	0.477	0.417	0.346	0.250	0.122	0.000	0.000	0.000	0.000	0.000	0.589	
3.	2.296	0.965	0.745	0.660	0.601	0.544	0.473	0.374	0.229	0.032	0.000	0.000	0.000	0.000	0.705	
4.	2.535	1.014	0.821	0.745	0.691	0.637	0.570	0.472	0.322	0.087	0.000	0.000	0.000	0.000	0.786	
5.	2.705	1.050	0.879	0.808	0.759	0.709	0.645	0.551	0.401	0.146	0.001	0.000	0.000	0.000	0.845	
6.	2.832	1.079	0.922	0.857	0.811	0.765	0.705	0.615	0.469	0.204	0.018	0.000	0.000	0.000	0.895	
8.	3.007	1.123	0.984	0.927	0.887	0.846	0.793	0.713	0.576	0.306	0.070	0.001	0.000	0.000	0.955	
10.	3.119	1.152	1.026	0.974	0.939	0.902	0.855	0.782	0.655	0.391	0.150	0.009	0.000	0.000	1.005	
15.	3.270	1.190	1.087	1.045	1.016	0.987	0.948	0.890	0.784	0.545	0.270	0.094	0.000	0.000	1.067	
20.	3.348	1.208	1.121	1.084	1.059	1.033	1.001	0.952	0.862	0.646	0.382	0.186	0.000	0.000	1.106	
30.	3.428	1.226	1.156	1.126	1.105	1.083	1.056	1.019	0.948	0.770	0.538	0.342	0.000	0.000	1.147	
40.	3.455	1.234	1.175	1.149	1.129	1.109	1.086	1.054	0.996	0.844	0.640	0.456	0.042	0.000	1.169	
50.	3.449	1.238	1.187	1.163	1.144	1.126	1.105	1.075	1.026	0.898	0.708	0.535	0.110	0.000	1.183	
60.	3.431	1.261	1.196	1.173	1.155	1.138	1.118	1.091	1.067	0.934	0.762	0.600	0.176	0.000	1.193	
80.	3.384	1.243	1.207	1.186	1.171	1.155	1.136	1.113	1.076	0.983	0.840	0.696	0.289	0.000	1.206	
100.	3.340	1.245	1.215	1.195	1.181	1.167	1.150	1.129	1.096	1.017	0.891	0.763	0.380	0.000	1.215	
200.	3.120	1.247	1.230	1.220	1.210	1.199	1.188	1.173	1.148	1.100	1.018	0.926	0.637	0.000	1.238	
500.	2.305	1.247	1.240	1.235	1.232	1.227	1.221	1.212	1.197	1.165	1.119	1.067	0.886	0.000	1.242	
1000.	1.873	1.247	1.243	1.241	1.239	1.237	1.234	1.229	1.219	1.195	1.165	1.132	1.010	0.000	1.243	
2000.	1.604	1.247	1.245	1.244	1.243	1.242	1.240	1.238	1.233	1.218	1.194	1.172	1.102	0.000	1.244	
5000.	1.410	1.247	1.246	1.246	1.246	1.246	1.246	1.245	1.243	1.237	1.224	1.209	1.165	0.000	1.246	
10000.	1.336	1.247	1.247	1.247	1.247	1.247	1.248	1.248	1.246	1.244	1.237	1.227	1.198	0.000	1.247	
<b>T1 (MeV)</b>																
K/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR	
<b>T1 (MeV)</b>																
									Z = 96							
0.001	0.000	0.017	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	
0.002	0.000	0.025	0.016	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	
0.005	0.000	0.038	0.026	0.015	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	
0.01	0.011	0.053	0.037	0.023	0.009	0.000	0									

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
$T_1$ (MeV)															
$Z = 97$															
0.001	0.000	0.017	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.025	0.016	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.000	0.038	0.026	0.015	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
0.01	0.011	0.053	0.038	0.023	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.02	0.032	0.079	0.057	0.037	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023
0.05	0.089	0.140	0.103	0.070	0.034	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.180	0.214	0.159	0.108	0.054	0.024	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.079
0.2	0.348	0.322	0.240	0.159	0.090	0.054	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.133
0.5	0.788	0.524	0.371	0.246	0.180	0.133	0.081	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.255
1.	1.312	0.712	0.477	0.364	0.298	0.242	0.179	0.100	0.017	0.000	0.000	0.000	0.000	0.000	0.398
2.	1.940	0.884	0.636	0.540	0.476	0.416	0.344	0.248	0.120	0.000	0.000	0.000	0.000	0.000	0.585
3.	2.302	0.968	0.746	0.660	0.600	0.542	0.471	0.373	0.228	0.032	0.000	0.000	0.000	0.000	0.704
4.	2.566	1.019	0.824	0.745	0.689	0.635	0.568	0.472	0.322	0.086	0.000	0.000	0.000	0.000	0.786
5.	2.721	1.056	0.882	0.808	0.756	0.706	0.643	0.552	0.401	0.145	0.001	0.000	0.000	0.000	0.846
6.	2.851	1.086	0.926	0.857	0.808	0.761	0.703	0.616	0.469	0.203	0.017	0.000	0.000	0.000	0.891
8.	3.031	1.131	0.969	0.926	0.883	0.842	0.791	0.713	0.575	0.305	0.069	0.001	0.000	0.000	0.956
10.	3.147	1.161	1.031	0.973	0.934	0.897	0.853	0.783	0.654	0.391	0.130	0.009	0.000	0.000	1.001
15.	3.301	1.200	1.092	1.044	1.011	0.982	0.947	0.891	0.782	0.546	0.272	0.094	0.000	0.000	1.069
20.	3.559	1.217	1.128	1.086	1.056	1.030	1.000	0.955	0.862	0.642	0.382	0.187	0.000	0.000	1.107
30.	3.441	1.233	1.162	1.129	1.104	1.081	1.057	1.022	0.950	0.767	0.538	0.343	0.000	0.000	1.150
40.	3.470	1.240	1.180	1.152	1.130	1.110	1.088	1.058	0.999	0.843	0.640	0.457	0.041	0.000	1.172
50.	5.469	1.244	1.192	1.166	1.147	1.128	1.107	1.081	1.030	0.894	0.712	0.542	0.109	0.000	1.187
60.	3.451	1.245	1.200	1.177	1.159	1.141	1.122	1.097	1.052	0.932	0.765	0.607	0.175	0.000	1.197
80.	3.401	1.247	1.211	1.191	1.175	1.160	1.142	1.118	1.080	0.988	0.840	0.694	0.288	0.000	1.210
100.	3.359	1.248	1.218	1.200	1.187	1.173	1.156	1.134	1.100	1.023	0.893	0.761	0.378	0.000	1.220
200.	3.136	1.251	1.234	1.224	1.214	1.204	1.193	1.177	1.153	1.105	1.023	0.931	0.637	0.000	1.242
500.	2.312	1.252	1.245	1.240	1.236	1.231	1.226	1.218	1.200	1.168	1.125	1.075	0.890	0.000	1.247
1000.	1.882	1.251	1.267	1.245	1.243	1.241	1.238	1.233	1.223	1.200	1.170	1.136	1.014	0.000	1.248
2000.	1.610	1.251	1.249	1.248	1.247	1.246	1.245	1.242	1.238	1.222	1.200	1.181	1.102	0.000	1.249
5000.	1.413	1.252	1.251	1.251	1.250	1.250	1.250	1.252	1.246	1.241	1.230	1.215	1.170	0.000	1.250
10000.	1.340	1.251	1.251	1.251	1.251	1.251	1.252	1.252	1.249	1.241	1.232	1.203	0.000	0.000	1.251
$k/T_1$	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
$T_1$ (MeV)															
$Z = 98$															
0.001	0.000	0.017	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.025	0.016	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.000	0.038	0.026	0.015	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
0.01	0.010	0.054	0.038	0.023	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.02	0.032	0.079	0.057	0.037	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023
0.05	0.087	0.140	0.105	0.070	0.034	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.179	0.214	0.159	0.108	0.054	0.024	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.078
0.2	0.352	0.320	0.259	0.159	0.090	0.054	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.132
0.5	0.786	0.523	0.370	0.246	0.179	0.132	0.081	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.254
1.	1.310	0.711	0.476	0.363	0.297	0.241	0.178	0.099	0.016	0.000	0.000	0.000	0.000	0.000	0.397
2.	1.941	0.884	0.636	0.539	0.476	0.415	0.343	0.247	0.119	0.000	0.000	0.000	0.000	0.000	0.584
3.	2.307	0.969	0.747	0.660	0.600	0.541	0.470	0.372	0.227	0.032	0.000	0.000	0.000	0.000	0.703
4.	2.554	1.020	0.825	0.746	0.690	0.635	0.567	0.472	0.321	0.086	0.000	0.000	0.000	0.000	0.786
5.	2.731	1.056	0.884	0.809	0.757	0.706	0.643	0.551	0.401	0.145	0.001	0.000	0.000	0.000	0.846
6.	2.863	1.089	0.928	0.858	0.809	0.762	0.703	0.616	0.469	0.202	0.017	0.000	0.000	0.000	0.892
8.	3.045	1.134	0.991	0.928	0.884	0.843	0.792	0.714	0.575	0.305	0.069	0.001	0.000	0.000	0.958
10.	3.161	1.164	1.033	0.975	0.936	0.899	0.854	0.784	0.654	0.390	0.130	0.009	0.000	0.000	1.002
15.	3.315	1.203	1.095	1.046	1.013	0.984	0.949	0.893	0.783	0.546	0.271	0.094	0.000	0.000	1.071
20.	3.378	1.216	1.130	1.056	1.028	1.000	0.959	0.909	0.868	0.639	0.381	0.187	0.000	0.000	1.109
30.	3.452	1.235	1.164	1.130	1.105	1.083	1.059	1.024	0.952	0.768	0.538	0.342	0.000	0.000	1.151
40.	3.479	1.242	1.182	1.153	1.131	1.111	1.089	1.060	0.999	0.844	0.640	0.456	0.041	0.000	1.174
50.	3.677	1.245	1.193	1.168	1.148	1.130	1.109	1.083	1.032	0.895	0.712	0.541	0.109	0.000	1.188
60.	3.459	1.246	1.201	1.178	1.160	1.143	1.123	1.099	1.054	0.933	0.766	0.607	0.175	0.000	1.198
80.	3.409	1.248	1.212	1.192	1.177	1.161	1.143	1.119	1.082	0.990	0.841	0.694	0.288	0.000	1.212
100.	3.366	1.249	1.219	1.201	1.188	1.174	1.158	1.135	1.102	1.025	0.894	0.761	0.378	0.000	1.221
200.	3.139	1.252	1.236	1.226	1.215	1.205	1.195	1.181	1.154	1.107	1.024	0.930	0.642	0.000	1.244
500.	2.316	1.253	1.246	1.241	1.237	1.232	1.227	1.220	1.202	1.170	1.127	1.077	0.891	0.000	1.248
1000.	1.884	1.252	1.248	1.246	1.244	1.242	1.239	1.235	1.225	1.202	1.172	1.138	1.016	0.000	1.249
2000.	1.612	1.252	1.250	1.249	1.248	1.247	1.246	1.244	1.239	1.224	1.202	1.183	1.105	0.000	1.250
5000.	1.415	1.252	1.252	1.252	1.251	1.251	1.251	1.247	1.242	1.231	1.216	1.172	1.126	0.000	1.251
10000.	1.342	1.252	1.252	1.252	1.252	1.252	1.253	1.253	1.253	1.250	1.242	1.235	1.206		

**TABLE II. Ratios of Electron-Electron to Electron-Nucleus Scaled Bremsstrahlung  
and Total Integrated Radiative Energy-Loss Cross Sections**  
See page 349 for Explanation of Tables

k/T1	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.97	0.99	1.00	ETABAR
T1 (MeV)															
<i>Z</i> = 100															
0.001	0.000	0.017	0.009	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
0.002	0.000	0.025	0.016	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.005	0.000	0.039	0.027	0.015	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
0.01	0.010	0.054	0.038	0.025	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
0.02	0.031	0.080	0.058	0.037	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023
0.05	0.088	0.140	0.104	0.070	0.034	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046
0.1	0.179	0.213	0.160	0.109	0.054	0.024	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.078
0.2	0.350	0.319	0.239	0.159	0.090	0.053	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.131
0.5	0.786	0.521	0.368	0.244	0.178	0.131	0.080	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.251
1.	1.311	0.709	0.474	0.361	0.295	0.239	0.176	0.098	0.016	0.000	0.000	0.000	0.000	0.000	0.394
2.	1.934	0.882	0.635	0.539	0.475	0.414	0.342	0.246	0.118	0.000	0.000	0.000	0.000	0.000	0.582
3.	2.301	0.968	0.747	0.661	0.600	0.541	0.469	0.371	0.225	0.031	0.000	0.000	0.000	0.000	0.702
4.	2.569	1.020	0.826	0.747	0.691	0.636	0.567	0.471	0.320	0.085	0.000	0.000	0.000	0.000	0.785
5.	2.728	1.058	0.885	0.811	0.759	0.707	0.643	0.551	0.400	0.144	0.001	0.000	0.000	0.000	0.846
6.	2.864	1.089	0.930	0.860	0.811	0.763	0.704	0.616	0.468	0.201	0.017	0.000	0.000	0.000	0.893
8.	3.055	1.137	0.993	0.930	0.886	0.844	0.792	0.714	0.576	0.305	0.069	0.001	0.000	0.000	0.959
10.	3.178	1.168	1.055	0.977	0.937	0.899	0.854	0.784	0.655	0.391	0.129	0.009	0.000	0.000	1.004
15.	3.330	1.203	1.102	1.055	1.015	0.979	0.946	0.900	0.792	0.537	0.269	0.095	0.000	0.000	1.073
20.	3.412	1.221	1.134	1.096	1.060	1.024	1.001	0.960	0.875	0.639	0.380	0.186	0.000	0.000	1.112
30.	3.493	1.237	1.168	1.138	1.108	1.078	1.058	1.027	0.961	0.768	0.535	0.340	0.000	0.000	1.155
40.	3.513	1.244	1.186	1.160	1.135	1.110	1.090	1.063	1.008	0.847	0.637	0.452	0.041	0.000	1.178
50.	3.504	1.248	1.197	1.173	1.152	1.131	1.112	1.086	1.037	0.901	0.710	0.535	0.108	0.000	1.192
60.	3.480	1.250	1.205	1.183	1.164	1.146	1.127	1.102	1.059	0.937	0.765	0.604	0.174	0.000	1.202
80.	3.424	1.252	1.216	1.196	1.181	1.166	1.148	1.124	1.086	0.993	0.843	0.695	0.287	0.000	1.216
100.	3.382	1.252	1.223	1.205	1.193	1.178	1.161	1.141	1.109	1.024	0.896	0.769	0.380	0.000	1.225
200.	3.155	1.256	1.249	1.230	1.220	1.209	1.199	1.185	1.158	1.112	1.028	0.933	0.642	0.000	1.248
500.	2.327	1.256	1.249	1.245	1.241	1.236	1.231	1.224	1.206	1.174	1.132	1.081	0.893	0.000	1.252
1000.	1.892	1.256	1.252	1.250	1.248	1.246	1.243	1.238	1.229	1.206	1.175	1.145	1.027	0.000	1.253
2000.	1.618	1.256	1.256	1.252	1.252	1.251	1.250	1.247	1.243	1.229	1.205	1.185	1.113	0.000	1.254
5000.	1.422	1.256	1.255	1.255	1.255	1.255	1.255	1.254	1.252	1.247	1.234	1.220	1.177	0.000	1.255
10000.	1.346	1.256	1.256	1.256	1.256	1.256	1.256	1.257	1.257	1.254	1.247	1.237	1.206	0.000	1.256