HANDBOOK OF STOPPING CROSS-SECTIONS

OF ENERGETIC IONS IN ALL ELEMENTS

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ABSTRACT

Calculations are made of the stopping cross-sections of energetic ions in all elements. Ions evaluated are atomic number 1 through 92, in targets of atomic number 1 through 92. Ion energies range from 200 keV/amu to 2 GeV/amu. Both gaseous and solid targets are presented. Experimental data from all available sources (about 3700 data points) are shown with the theoretical calculations. The theoretical approach is based on Lindhard particle stopping in a free electron gas, with target solid state charge distributions based on those of Moruzzi, Janak and Williams. The theoretical stopping cross-sections appear to have an accuracy of about 5 to 10%.

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HANDBOOK of

STOPPING CROSS-SECTIONS FOR ENERGETIC IONS IN ALL ELEMENTS

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SUMMARY

The stopping of ions in matter is defined here to be the mean energy loss of an ion passing through a thin amorphous elemental target. The term "stopping cross-section" is the ion energy loss per unit target thickness, usually expressed in units of eV/(10^{15} atoms/cm^2), which is about the energy loss per monolayer of target, or in units of keV/(mg/cm^2), which is useful for weighed targets.

The plots in this book show the stopping cross-sections of energetic ions in various elements in both solid and gas phase targets. The ion and target combinations displayed have been chosen to allow accurate linear interpolation between plots for all elemental ions (atomic number $Z_1 = 1 - 92$) and all elemental targets ($Z_2 = 1 - 92$). Also plotted are all existing stopping data so that original experiments can be consulted. Immediately preceding, and also following the plots of stopping are summaries of the experimental data.

Stopping cross-sections are calculated for ion energies from 200 keV/amu to 1 GeV/amu. Simple expressions are included so that calculations may be extended to 2 GeV/amu.

The stopping of ions in matter is complex and many practical considerations must be evaluated. The calculated values of this book may be in significant error for the following special cases:

(a) Many polycrystalline films may contain "texture", in which small crystallites are aligned within a few degrees, and the ion is partially channelled, significantly reducing its stopping.

(b) Some ions may undergo a large angle scattering, and the recoil energy associated with these single events is not included in the calculation (which assumes a straight-through beam with only small-angle beam spreading).

(c) Target thickness may be large enough so that two (or more) large collisions may redirect ions into the beam path. This thickness effect may be quite significant for slow heavy ions.

The accuracy of the stopping cross-section plots can be determined by several criteria:

(a) If data are present, the agreement may indicate accuracy. The plots are not normalized to individual data sets. See Figure 19-21 for plots showing typical accuracy.

(b) For ion velocities above 2 MeV/amu the plots have a double standard error of under 5% (i.e., 95% of the data lies within ± 5%).

(c) For solid targets and for ion velocities from .2-2 MeV/amu the double standard error is about 10%.

(d) For gaseous targets and for ion velocities from .2-2 MeV/amu the double standard error is about 20%.

The stopping of ions in solid compounds can be calculated by summing the stopping in the elements considered separately. Use the stopping values for "solid-phase" for such elements as oxygen, hydrogen, etc. if they are part of the solid compound (above ion energies of 1.6 MeV/amu the difference in stopping between gas and solid targets becomes less than the accuracy of the calculation, and only gas phase values are given).

ELECTRONIC STOPPING OF IONS

For seventy-five years the stopping of energetic ions in matter has been a subject which has received great theoretical and experimental interest. The theoretical treatment of stopping of ions in matter is due greatly to the work of Bohr[1-3], Bethe[4-6], Bloch[7,8], and Lindhard[9-12], and it has been reviewed by Bohr[3], Fano[13], Jackson[14], and Sigmund[15-16].

The total stopping cross-section of ions in matter is divided into two parts: the interaction of the ion with the target electrons (called electronic stopping) and with the target nuclei (called nuclear stopping). The nuclear stopping component can be separated because the heavy recoiling target nucleus can be considered to be unconnected to its lattice during the passage of the ion, and the interaction can be treated simply as the kinetic scattering of two screened particles (see section on Nuclear Stopping).

The electronic stopping of the ion in the target is treated within the local density approximation, wherein each infinitesimal volume element of the solid is considered to be an independent plasma; that is, the ion-target interaction can be treated as that of a particle with a density averaged free electron gas. The basic assumptions of this approximation are:

- The electron density in the target varies slowly with position.
- Available electron energy levels and transition strengths are described by those in a free electron gas.
- There are no significant band-gap effects on electronic stopping.
- The charge of the ion can be reduced to a scalar quantity called the ion's effective charge.

The electronic stopping of an ion, using the local-density approximation, can be simply stated as:

$$S_e = \int I(v,\rho)\ (Z_1^*(v))^2\ \rho\ dV \qquad (1)$$

where S_e is the electronic stopping; I is the stopping interaction function of a particle of unit charge with velocity, v, with a free electron gas of density, ρ; Z_1^* is the effective charge of an ion with atomic number, Z_1, ρ is the electronic density of the target, and the integral is performed over each volume element, dV, of the target. The electronic density of an atom is normalized so that its atomic number $Z_2 = \int \rho\ dV$. Each of the three components of Eq. (1) will be discussed below.

INTERACTION OF A PARTICLE WITH A FREE ELECTRON GAS

The interaction of a particle with a free electron gas has been studied by Lindhard[9] with the following assumptions:

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- The free electron gas consists of electrons at zero temperature (single electrons are described by plane waves) on a fixed uniform positive background with overall charge neutrality.
- The initial electron gas is of constant density.
- The interaction of the charged particle is a perturbation on the electron gas.
- All particles are non-relativistic.

With these assumptions, Lindhard derived the interaction function, I, of Eq. (1) as:

$$I = \frac{4\pi e^4}{mv^2} \bullet \frac{i}{\pi \omega_o^2} \int_o^\infty \frac{dk}{k} \int_{-kv}^{kv} \omega d\omega \left[\frac{1}{\varepsilon^\ell(k,\omega)} - 1 \right] \tag{2}$$

where the longitudinal dielectric constant, ε^ℓ, is derived to be

$$\varepsilon^\ell(k,\omega) = 1 + \frac{2m^2 \omega_o^2}{\hbar^2 k^2} \sum_n \frac{f(E_n)}{N} \times$$
$$\left\{ \frac{1}{k^2 + 2\vec{k} \bullet \vec{k}_n - \frac{2m}{\hbar}(\omega - i\delta)} + \frac{1}{k^2 - 2\vec{k} \bullet \vec{k}_n + \frac{2m}{\hbar}(\omega - i\delta)} \right\} \tag{3}$$

where e and m are the charge and mass of an electron; ω_o is the classical plasma frequency defined as $\omega_o^2 = 4\pi e^2 \rho / m$; E_n is the energy and $\vec{k}_n$ the wave vector of the electron in the n'th state; $f(E_n)$ is the distribution function and is an even function of $\vec{k}_n$, and δ is a small damping factor.

This double integral equation has been used for the interaction term, I, in Eq. (1) for the stopping of ions in matter using the local density approximation. Simple polynominal fits to Eq. (2) can be found in Ref. 17.

Typical results of these calculations can be shown in several ways. In Figure 1 is shown the "Stopping Number" versus free electron gas density. The Stopping Number is defined all but the first term of Eq. (2), which is dimensionless. Each curve has a flat section at low electron densities where the ion is going much faster than the mean electron velocity. Each curve bends down where the ion velocity becomes equal to the Fermi velocity, v_F, of the free electron gas, where

$$v_F = \left(\frac{\hbar}{m}\right) \left(3\pi^2 \rho\right)^{1/3} . \tag{4}$$

At the higher electron densities, the electrons can respond adiabatically because of their higher velocities and stopping is reduced.

In Figure 2 is shown the complete interaction term, I, as defined by Eq. (2). When we include the ion's velocity, the three curves are shifted significantly.

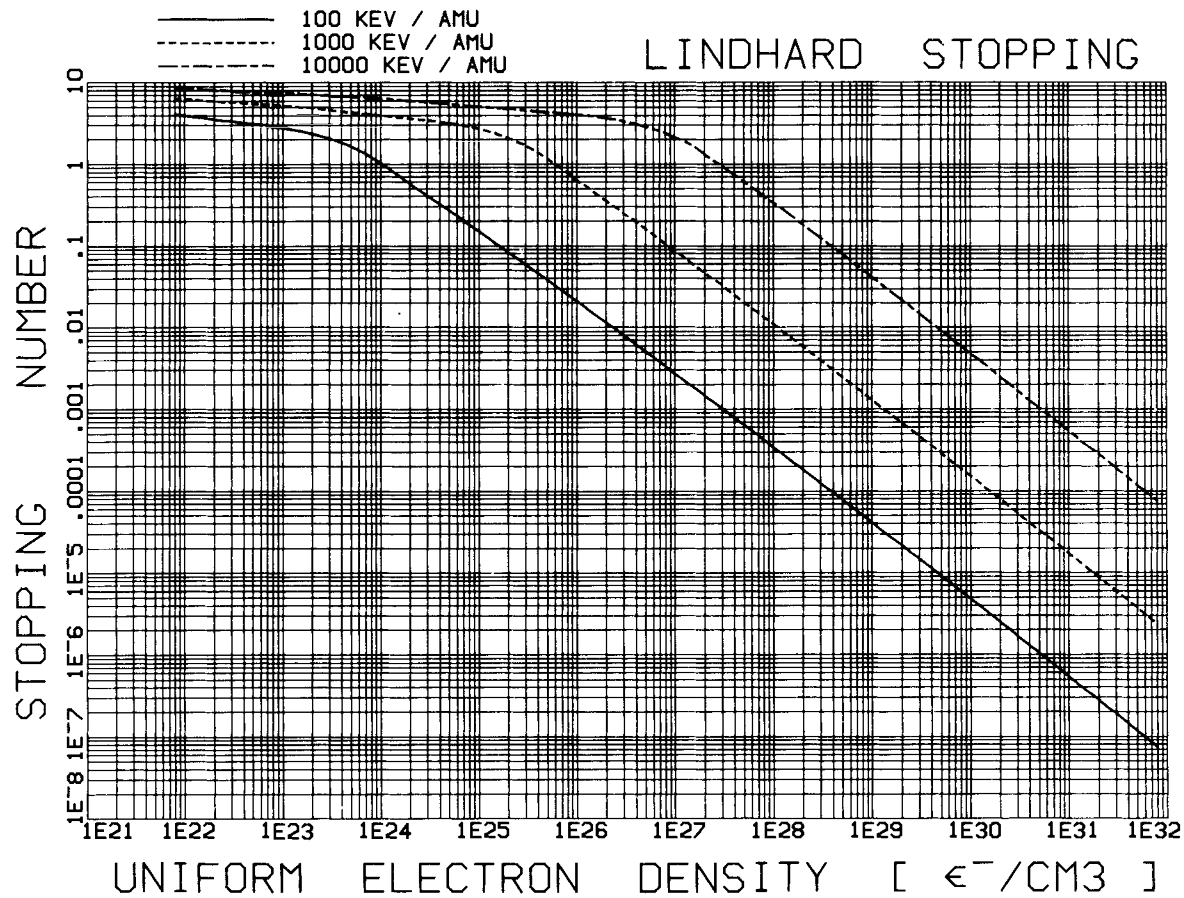

FIGURE 1) The calculation of the stopping of a unit charged particle in a uniform electron gas. Plotted is the Stopping Number, which is the dimensionless integrand of Equation (2), as a function of electron gas density, for three particle velocities. The bend in each curve occurs about where the ion velocity equals the Fermi velocity of the electron gas.

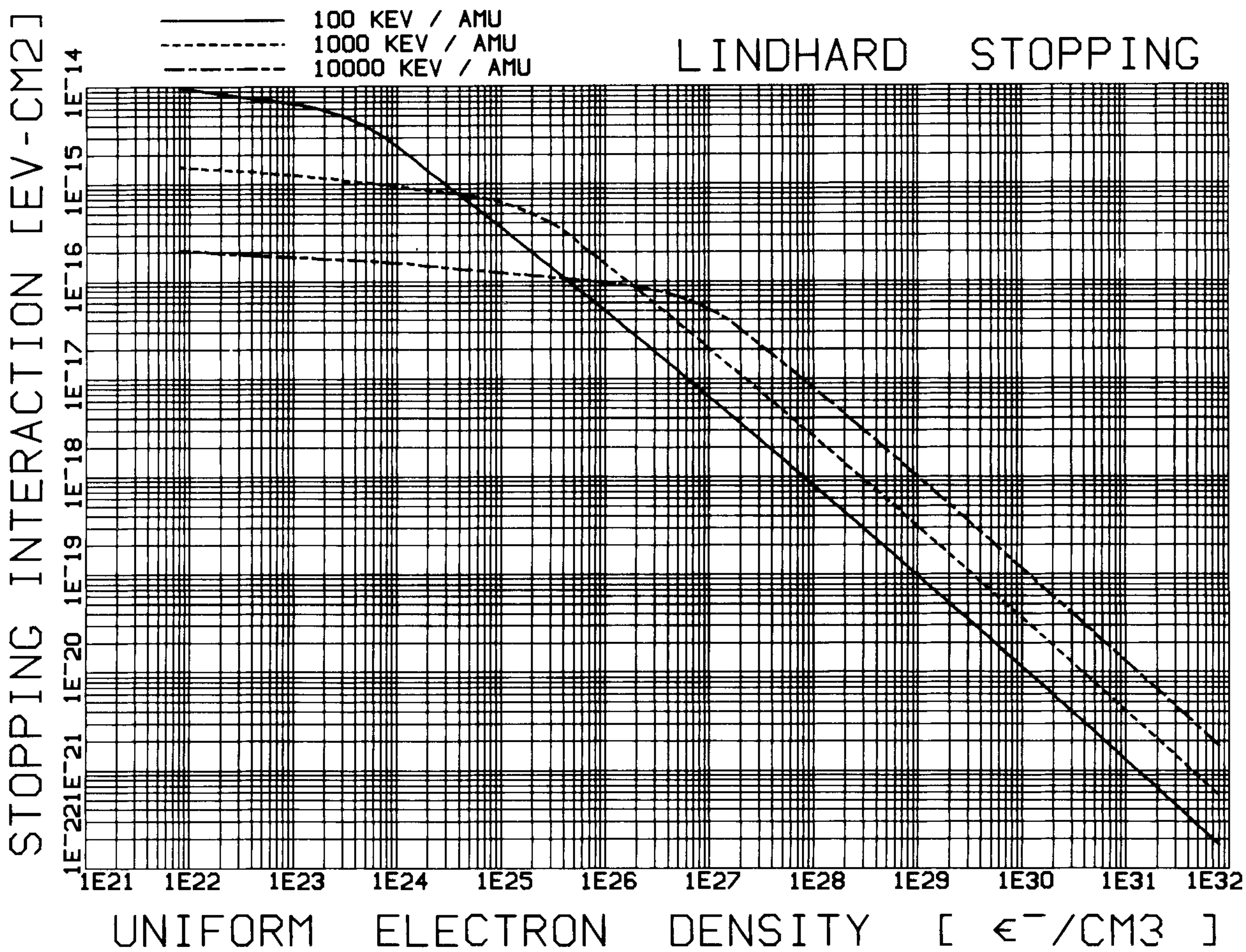

FIGURE 2) Plotted is the Interaction function, I, of a unit charged particle with a uniform electron gas, as defined in Equation (2). For any electron density, the maximum interaction occurs with particles with velocities of about the Fermi velocity of the electron gas. For particle velocities below this value the electrons tend to undergo adiabatic collisions and the interaction is reduced. For velocities above this value the particle-electron interaction time becomes shorter, reducing the interaction magnitude.

For any electron density there is a single ion velocity which has a maximum of interaction (at a velocity about equal to the electron Fermi velocity).

In Figure 3 we show Iρ, the interaction term, I, times the charge density, ρ. If the particle has a unit charge, this plot shows the differential energy loss per unit path length, in units of eV/cm, for a particle in a uniform free electron gas. For a given charge density, the energy loss per path length has two competing processes: a decreasing interaction strength as electron density increases, and an increasing number of electrons per unit volume.

THE EFFECTIVE CHARGE OF ENERGETIC IONS

From the beginning of stopping power theory the charge state of a heavy ion in a solid has been poorly understood. Bohr[3] suggested that the ion might be assumed to be stripped of all electrons with orbital velocities less than the ion velocity. This concept is difficult to evaluate in detail for heavy-ion beams because of the difficulties in assigning velocities to the highly distorted electron orbitals of a partially stripped ion in a dense electron plasma. However, the correlation of light ion energy loss with charge state was noted by Rutherford and Oppenheimer.[18] The active interest in fission fragments in 1938-1941 brought about various attempts to predict heavy ion stopping powers using the concept of effective charge. The concept was to consider all stopping using first order perturbation theory, and to assume the ion charge state to be independent of the ion-solid stopping interaction. This was done empirically by assuming that the ion-target stopping interaction (similar to our I in Eq. (1)) could be represented by experimental proton stopping powers, and that the ratio of a heavy ion stopping power to the proton value/and/and that (for the same velocity in the same material) would be the heavy ion's effective charge (it was assumed the proton charge was unity). This quantity would include not only the charge state of the ion, but also all shielding due to the solid's electrons and due to the ion's wake, etc. (see the review by Brandt for theoretical details[19]).

The relationship of heavy ion to hydrogen ion energy loss may be expressed as

$$\frac{S_{HI}}{S_H} = \left(\frac{Z^*_{HI}}{Z^*_H}\right)^2 \tag{5}$$

where S_{HI} and Z^*_{HI} refer to the stopping and effective charge of a heavy ion, and S_H and Z^*_H refer to the respective values for hydrogen ions in the same material and at the same ion velocity. Solving for the effective charge of the heavy ion:

$$Z^*_{HI} = Z^*_H \left[\frac{S_{HI}}{S_H}\right]^{1/2} \tag{6}$$

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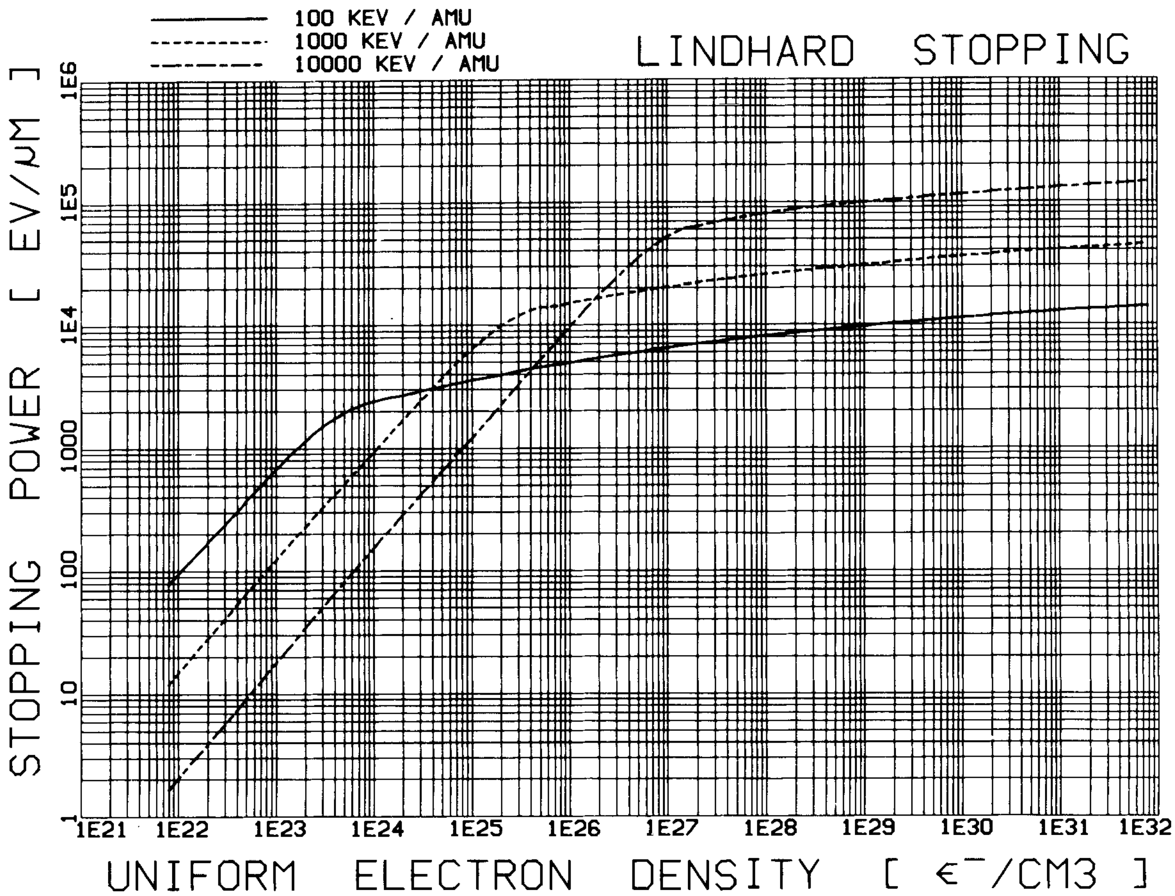

FIGURE 3) The Stopping Power of a particle in a free electron gas. The stopping is shown in units of energy loss per unit path length for various electron gas densities. For any electron density the maximum stopping power occurs for particles with velocities about equal to the Fermi velocity of the electron gas.

We can calculate the theoretical stopping, S_{theory} of a particle with unit charge in a material using Eq. (1), and if we assume that the particle has unit charge at all velocities, then this is related to the stopping of ions by:

$$S_{theory} = \frac{S_H}{(Z_H^*)^2} = \frac{S_{HI}}{(Z_{HI}^*)^2} \tag{7}$$

These quantities can now be evaluated by consideration of theory and various experiments. The hydrogen effective charge has been considered theoretically[20], and we have fitted their numerical results with the function:

$$Z_H^* = 1 - \exp -\left[0.2(E/m_1)^{1/2} + .0012\,(E/M_1) + 1.443\text{x}10^{-5}\,(E/m_1)^2\right] \tag{8}$$

where E is the ion energy in keV and M_1 is its mass in amu. We can calculate for heavy ions the value of (Z_{HI}^*/Z_H^*) by using Eq. (5) and considering the ratio of experimental stopping of various heavy ions to equivalent hydrogen ion stopping. We have derived new expressions for He and Li ions for use in this paper by comparing He or Li stopping data to H stopping at the same velocity and in the same solid targets, as shown in Figures 4 and 5. The analytic forms of the fitted lines in these figures are the square of:

$$Z_{He}^* \,/\, Z_H^* = \gamma\Big[1 - \exp -[.7446 + .1429\,(\ln E/M_1) + .01562\,(\ln E/M_1)^2 - .00267\,(\ln E/M_1)^3 + 1.325\text{x}10^{-6}\,(\ln E/M_1)^8]\Big] \tag{9}$$

and

$$Z_{Li}^* \,/\, Z_H^* = \gamma\,[1 - \exp -[.7138 + .002797\,(E/M_1) + 1.348\text{x}10^{-6}\,(E/M_1)^2]\,] \tag{10}$$

where γ is an empirical parameter which has a maximum correction value of a few percent, and which corrects for Z_1^3 effects. The parameter γ corrects for stopping not included in first order perturbation theory, and has been derived from experimental data[21] to be

$$\gamma = 1 + (.007 + .00005Z_2)\exp\left[-(7.6 - \ln(E/M_1))^2\right] \tag{11}$$

where Z_2 is the target atomic number, E is the ion energy in keV, and M_1 is the ion mass in amu.

For heavy ions there have been scores of proposed empirical scaling formulae, mostly based on a simple empirical formula by Northcliffe:

$$Z_{HI}^* \,/\, Z_H^* \approx 1 - \exp -(v/v_o Z_1^{2/3}) \tag{12}$$

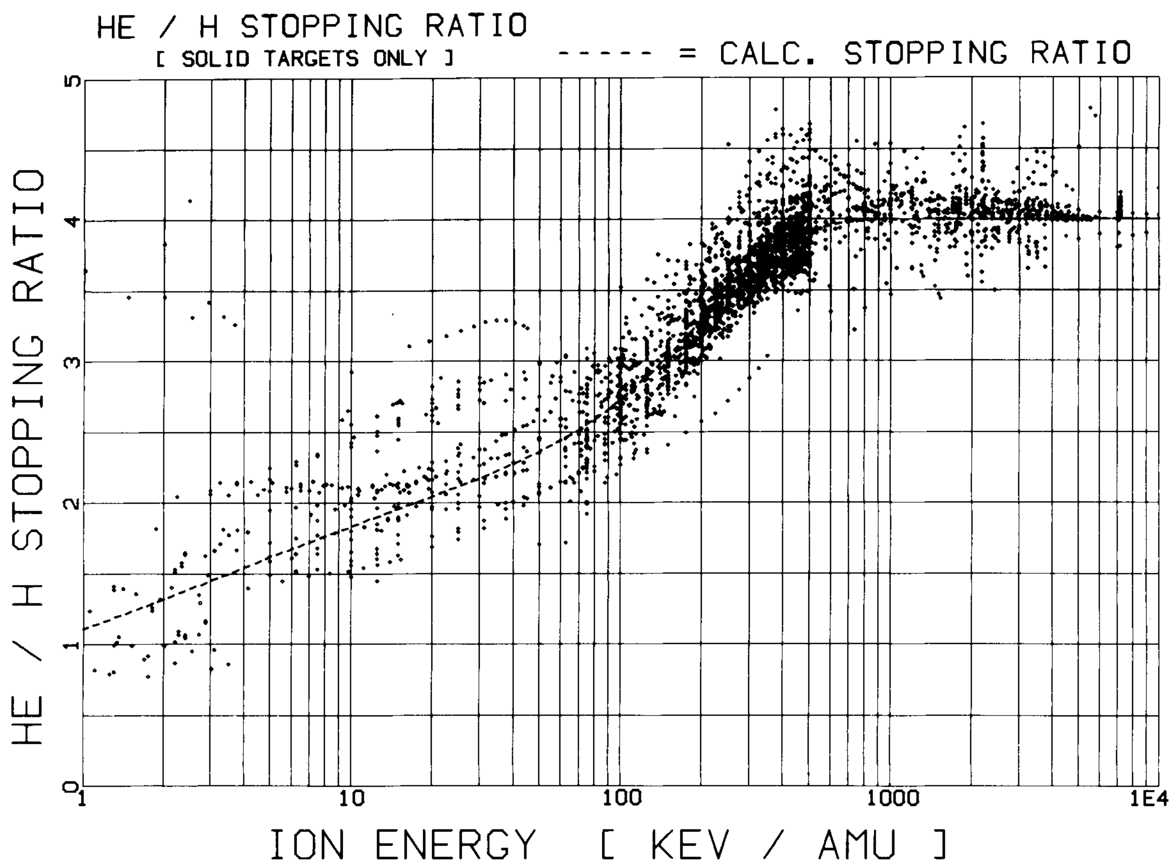

FIGURE 4) The ratio of the stopping of He ions in elemental matter to the stopping of H ions at the same velocity and in the same material. Each point represents an experimental value. The dashed line is a fit through the points and is defined by the square of Equation (9) of the text (without the small target dependent correction factor γ).

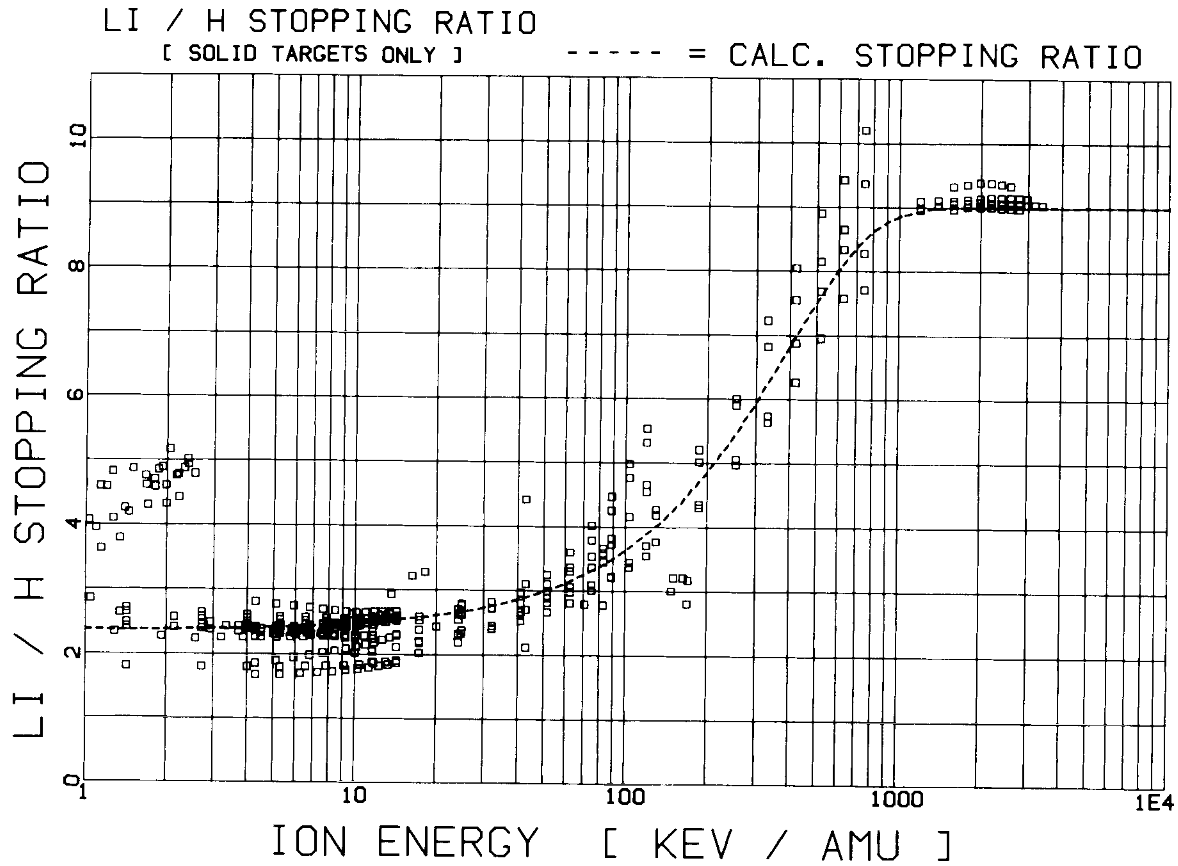

FIGURE 5) The ratio of the stopping of Li ions in elemental matter to the stopping of H ions at the same velocity and in the same material. Each point represents an experimental value. The dashed line is a fit through the points and is defined by the square of Equation (10) in the text (without the small target dependent correction factor, γ).

where $v_o = e^2/\hbar$, the Bohr velocity (2.188×10^8 cm/sec). This expression has been reshaped as thousands of heavy ion stopping powers have been measured. We use the form[22]:

$$Z^*_{HI}/Z^*_H \;=\; 1-(\exp\; -A)\;[1.034-.1777\exp\;(-.08114\;\; Z_1)] \qquad (13)$$

where:

$$\begin{aligned} A &= B + .0378\sin(\pi B/2) \\ B &= .886\;\;(E/25M_1)^{1/2}/Z_1^{2/3} \end{aligned} \qquad (14)$$

where the ion energy E is in keV, and its mass is in amu. The expression was considered accurate to about 5% for ions with atomic numbers 6-92 in solids with atomic numbers 4-79, for energies above 0.2 MeV/amu. We show in Figure 6 the accuracy of Eq. (13) by plotting experimental stopping data from 127 ion/target combinations (reduced by dividing by equivalent hydrogen stopping [23] as in Eq. (5)) versus the square of the empirical formula of Eq. (13).

The formula, Eq. (13), is independent of target, and contains only the ion's atomic number and velocity. The major point is that for energetic heavy ions this effective charge has been obtained independently of any theory, only by comparing heavy ion to proton stopping powers. Hence this formula should give us an effective charge for the ion which is in the spirit of our electronic stopping formalism, Eq. (1).

From Eq. (8)-(13) we can now evaluate the effective charge of heavy ions, which will be used in calculating the electronic stopping of ions in matter using Eq. (1).

THE CHARGE DISTRIBUTIONS OF ELEMENTAL TARGETS

The final component needed for the calculation of the electronic stopping of ions in matter using Eq. (1) is the electronic charge distribution of the target.

The target charge distributions we have used for solid state targets are distributions we have constructed using Hartree-Fock-Slater atomic distributions[24] to make first-order solids by the techniques outlined in Ref. 25. More accurate solid-state charge distributions were used for targets with atomic numbers 3-5, 11-13, 19-31, and 27-49. These were constructed using the local density approximation for exchange and correlation effects[26], and we call these M-J-W distributions after the authors: Moruzzi, Janak, and Williams. In all cases the crystalline structures used for the elements corresponded to those tabulated in Ref. 26 and 27. In the cases where two crystalline structures are possible at room temperature, such as Sn and Pb, the simpler structure was used.

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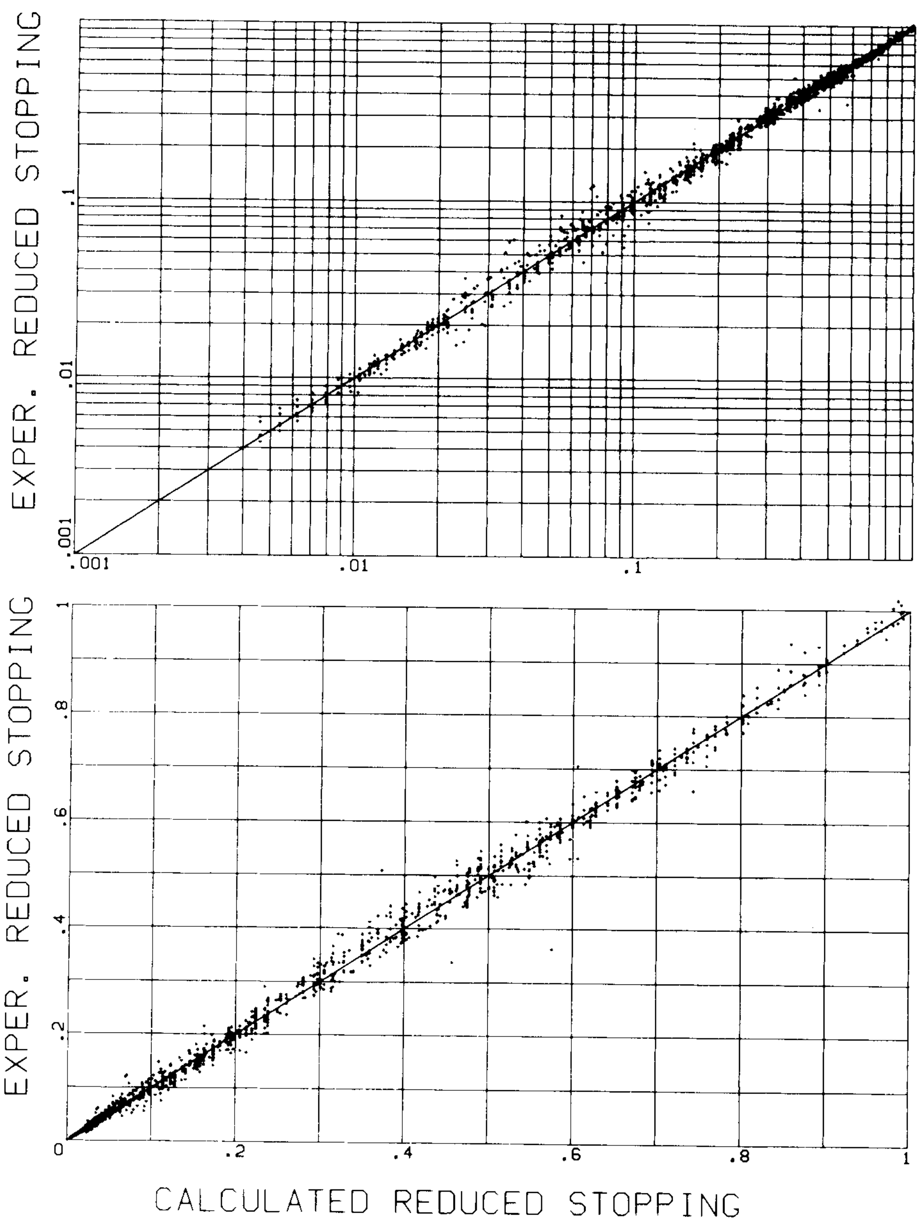

FIGURE 6) Shown are experimental versus calculated values of Heavy Ion stopping to Hydrogen stopping. The experimental values are from 127 ion-target combinations ranging from ions of C to U, in both gaseous and solid targets ranging from Be to Au, at ion energies from 0.22-22 MeV/amu. These experimental heavy ion stopping values are reduced by dividing by equivalent hydrogen ion stopping as in Equation (5). These reduced experimental experimental values are plotted versus calculated values, which are the squares of Equation (13). The experimental and calculated values agree to about 5%.

An example of the resultant charge-distribution is shown in Fig. 7, where the normal isolated-atom charge distribution is shown by a dashed line, and the solid-state distribution by a solid line. The difference between stopping values calculated using each of these charge distributions is significant (about 15% for the case of Al targets shown in Fig. 7, for ions at 250 keV/amu).

One problem in constructing solid-state charge distributions is how to evaluate the interstitial charge region. Once the basic solid is constructed using spherically symmetric atoms in the proper crystalline structure, there is usually about one electron which remains to be distributed in the non-spherically symmetric region between the lattice atoms (which we call the interstitial region). We have tried three standard techniques for distributing this interstitial charge: (a) assuming uniform charge density in the interstitial region, (b) assuming the charge density gradient remains constant from the edge of the muffin-tin atom into the interstitial region until the necessary interstitial electron charge is accounted for, and (c) assuming the charge density remains constant from the edge of the muffin-tin atom into the interstitial region. An interstitial charge distribution of type (a) is shown in Figure 8 for Cu, and is derived by determining the number of electrons per atom not accounted for within the muffin-tin radius (called the Interstitial Charge in Figure 8) and dividing this charge by the unit crystal volume not filled by the muffin tin solid. This interstitial charge is uniform in density, and appears sloped in Figure 7 because we are plotting ($4\pi r^2 \rho$) for the ordinate. This interstitial charge density is discontinuous from the muffin-tin distribution, and it is referred to as DISCONT. in later figures.

An interstitial charge distribution of type (c) is shown in Figure 7 for A1, and is determined by continuing out the last muffin-tin electron density until all electrons are accounted for. This type of distribution is called CONT. (for "continuous") in later figures.

Insight into the physics of the ion stopping process is gained by considering the energy loss of a particle of unit charge in a solid. In Figures 9 and 10 we graphically evaluate the factors of the integrand of the basic stopping equation, Eq. (1). First the dotted curve shows the charge distribution of solid Cu, plotted in units of $4\pi r^2 \rho$ *versus* r. The interstitial charge has been included in a manner similar to that of Figure 7. The area under this curve equals the number of electrons of Cu, 29. The dashed curve is the interaction term, I, evaluated at each radius point by taking the electron density at that point and evaluating the Lindhard stopping for the interaction values (as shown in Figure 2). This curve shows that the interaction strength increases monotonically as the electron charge density decreases. The product of these two curves is the stopping of an energetic unit charge, and is the integrand of Eq. (1). This integrand is shown as the solid line. The area under this curve is the electronic stopping.

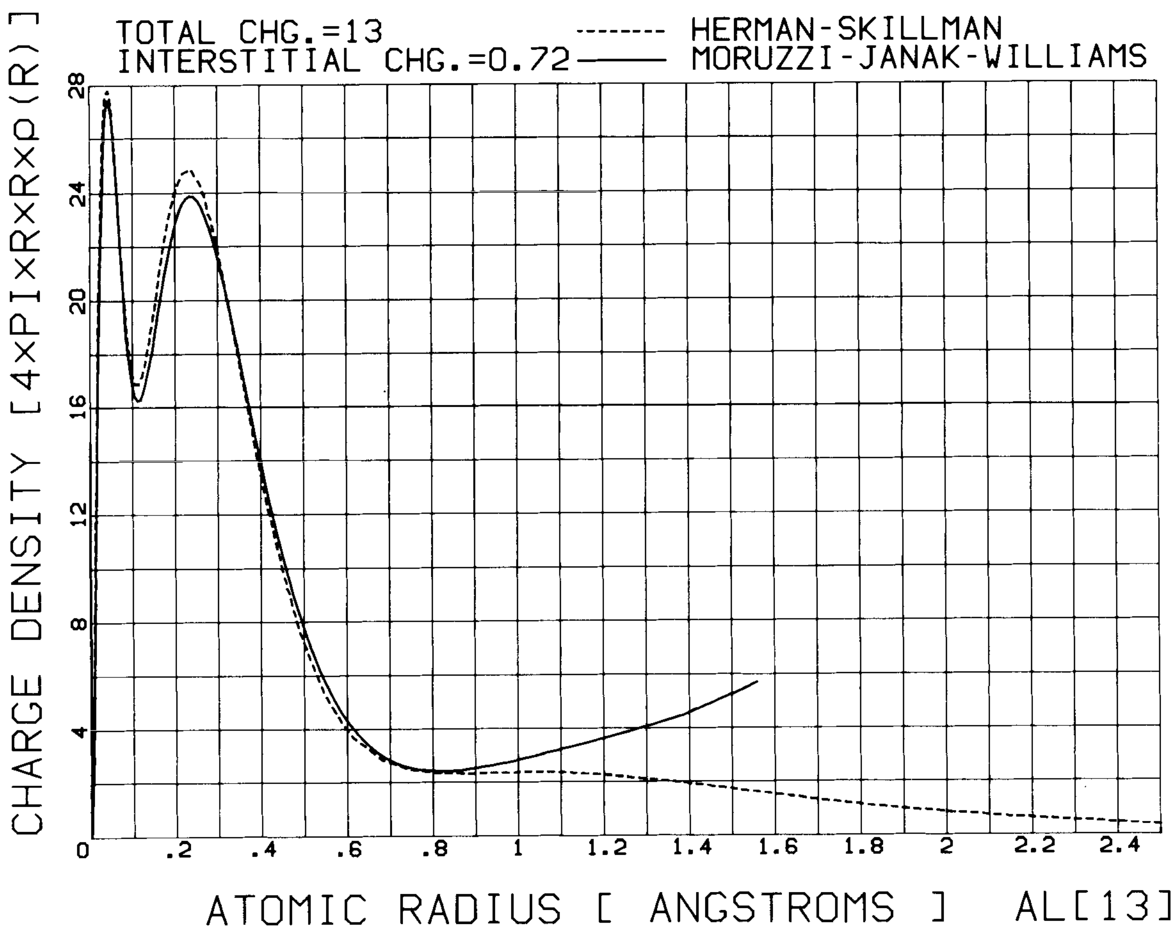

FIGURE 7) The spherically averaged charge distribution for Al (atomic number = 13) is shown for two types of atoms. The density is shown in units of $4\pi r^2\rho$ (electron/Å) versus radius (Å), with the area under the curve being 13 electrons. The dashed line is the calculation of Herman-Skillman (Ref. 24) for the Hartree-Fock-Slater distributions of isolated atoms. The solid line is the solid-state distribution of Al as published by Moruzzi-Janak-Williams (Ref. 26). This latter distribution is missing 0.72 electrons, and this is distributed over the interstitial region by assuming the density remains constant out from the edge of the muffin-tin sphere.

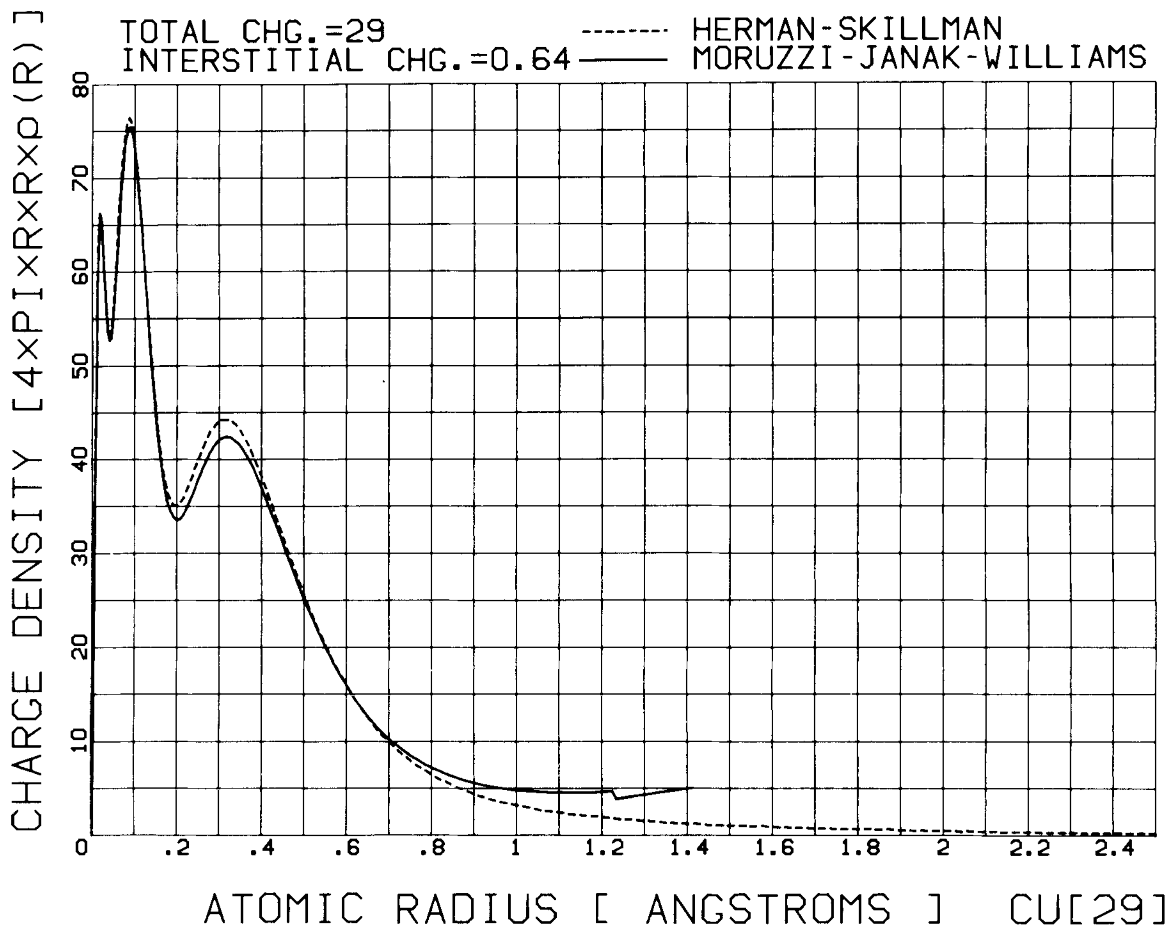

FIGURE 8) The electron distributions of Cu as determined for isolated atoms (dashed line) and for solid-state (solid line) as described in Figure 7. The interstitial region contains 0.64 electrons, and this is distributed using a density determined by dividing the number of missing electrons by the volume unaccounted for in the muffin-tin approximation. When this density is added to the solid-state distribution a discontinuity appears as shown at 1.22 Angstroms.

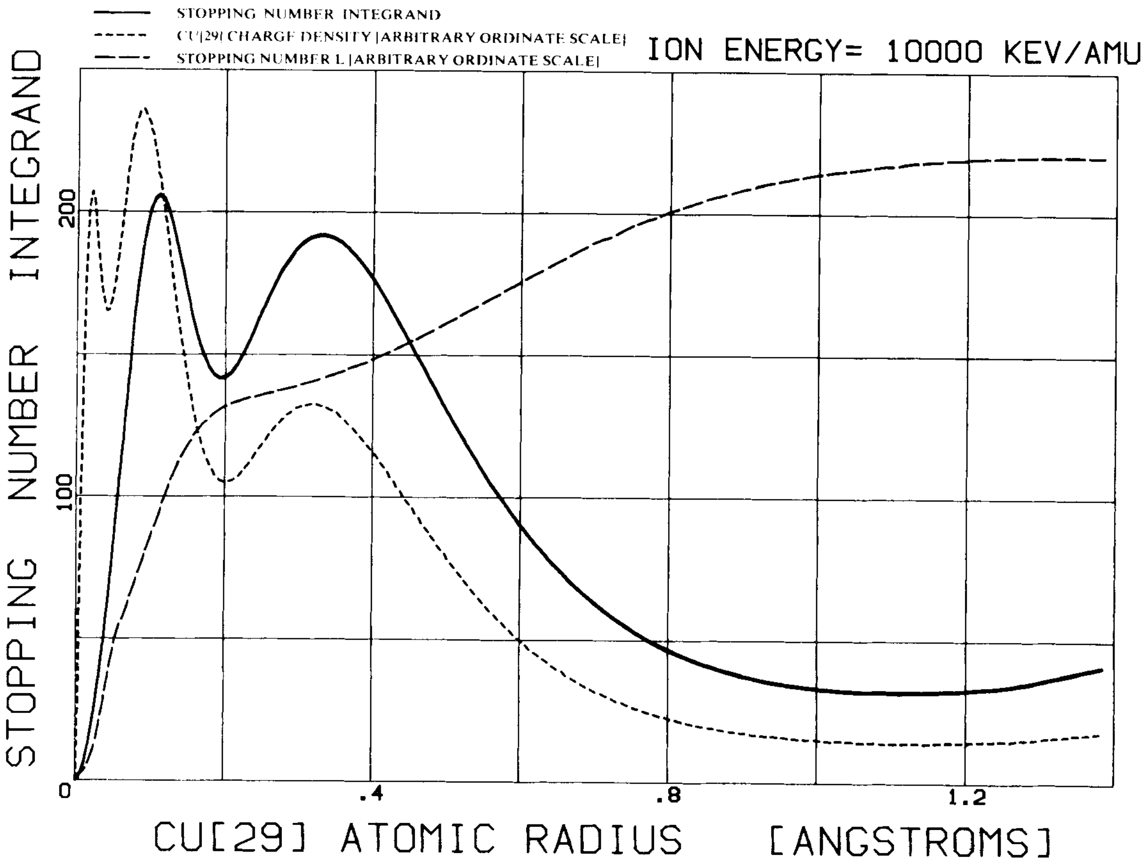

FIGURE 9) The interaction of particles with solid Cu is shown in a manner which isolates the various factors. The dotted line is the Cu solid-state distribution of M-J-W, Ref. 26, with the interstitial region calculated as for Al in Figure 7. The dashed curve shows for each electron charge density, the value of the stopping number of Figure 1. When these two factors are multiplied together, the solid line is determined which is the integrand of the electronic stopping formula, Equation (1), for a unit charge. The area under this solid curve is the stopping. Note the distribution of stopping among the various electron shells of Cu, with the L-shell electrons interacting strongly with the particle.

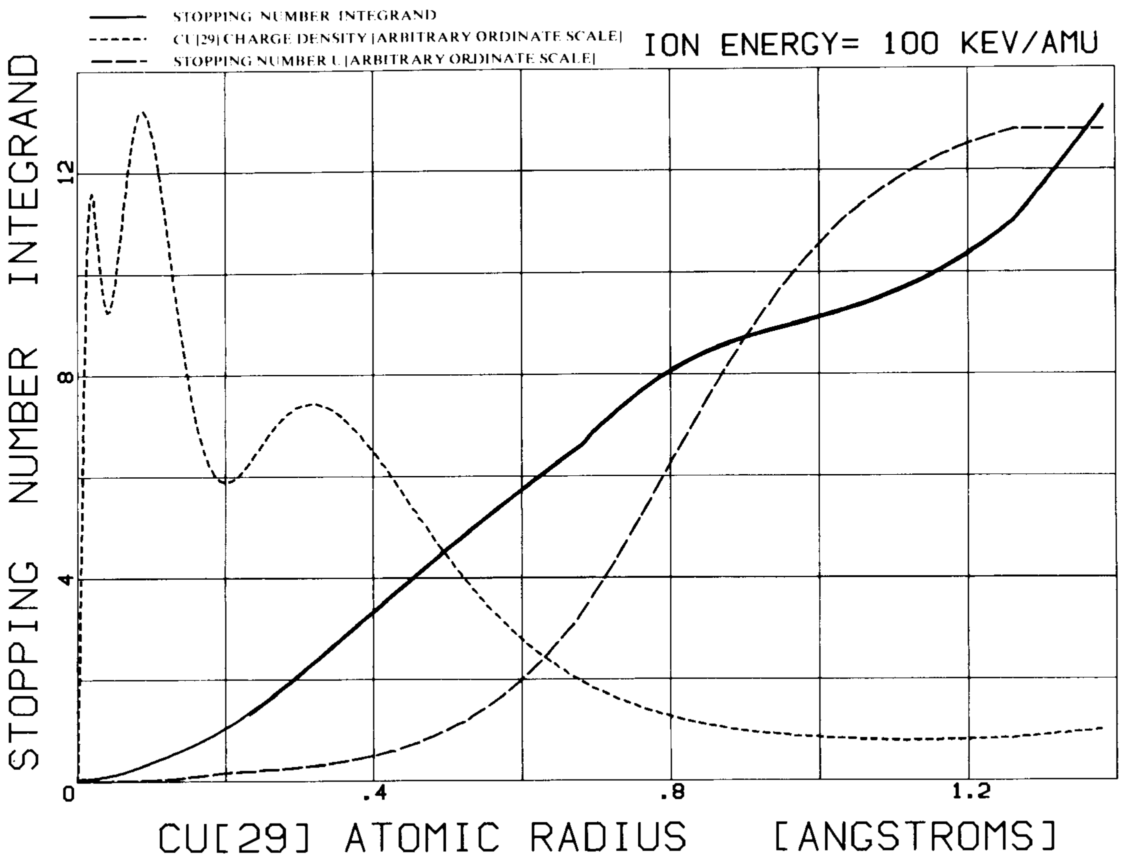

FIGURE 10) The theoretical stopping of low velocity particles with solid Cu, (similar to Figure 9 for high velocity ions). The dotted curve is the M-J-W charge distribution for Cu (Ref. 26). The dashed line is the stopping number for the charge distribution (see Figure 1). The solid line is the electronic stopping integrand, Equation (1), for this low velocity particle. Note how, in comparison to Figure 9, the stopping is now caused mostly by the outer shell and binding electrons of Cu, and little energy is being transferred to the inner electron shells.

Note that for the high velocity ion in Figure 9 there is almost no energy loss to the inner K-shell electrons, but significant loss to the next two shells. For low velocity ions such as shown in Figure 10, the energy loss is quite different with little loss to the inner three shells, and the interaction dominated by the outer-shell and conduction electrons. An accurate description of these electrons is critical in evaluating low velocity stopping.

NUCLEAR STOPPING OF IONS

The total stopping cross-section of ions in matter can be divided into two parts: the interaction of the ion with the target electrons (electronic stopping, discussed above) and with the target nuclei (nuclear stopping).

The nuclear stopping component is very small at ion energies above 200 keV/amu, with a typical value being below 1% of the electronic stopping, and the maximum value for any data of this paper being 24% (for U ions in Au). The basic theory of nuclear stopping was due to Bohr[1-3], which led to a simple formula[11] called LSS nuclear stopping which has been widely used for the last fifteen years. Several significant improvements have been made to the calculation of nuclear stopping both from theoretical considerations[29], and from an empirical approach using experimental studies of ion stopping and ranges.[30,31] A detailed evaluation[22] of these approaches concluded they were more accurate for energetic ions than the LSS formula.

The difference between the various new nuclear stopping values proposed theoretically and experimentally are very small for the energies considered here, amounting to less than 1% of the total stopping for 98% of the data, with a maximum difference of about 5%. We have used the theoretical value (called the Kr-C in Ref. 29) which has the simple reduced stopping form s_n:

$$s_n \;=\; 0.5 \;\; \ln (1 + \varepsilon)/ \, (\varepsilon + .10718\varepsilon^{.37544}) \tag{15}$$

which may be converted to units of eV/(10^{15} atom/cm^2) by

$$S_n \;=\; s_n \, (8.462 \, Z_1 \, Z_2 \, M_1)/ \left[(M_1 + M_2) \, (Z_1^{2/3} + Z_2^{2/3})^{1/2}\right] \tag{16}$$

The reduced energy of an ion, ε, is defined as[11]:

$$\varepsilon \;=\; 32.53 \;\; M_2E/ \left[Z_1Z_2 \, (M_1 + M_2) \;\; (Z_1^{2/3} + Z_2^{2/3})^{1/2}\right] \tag{17}$$

where the ion energy, E, is in keV, Z_1 and Z_2 are the ion and target atomic numbers, and M_1 and M_2 are the ion and target masses in amu.

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where the ion energy, E, is in keV, Z_1 and Z_2 are the ion and target atomic numbers, and M_1 and M_2 are the ion and target masses in amu.

CALCULATIONS: HIGH ENERGY STOPPING CROSS-SECTIONS

The calculation of high energy ion stopping (above 1.5 MeV/amu) proceeds in three steps:

1) Theoretical calculations are made of electronic stopping, Eq. (1), and nuclear stopping, Eq. (16), for every ion, target and energy combination for which there are experimental data.
2) A slight correction is made to the calculation for each target to correct for differences in theoretical free electron gas transition energies and strengths and those found in actual targets.
3) Relativistic corrections are made to the stopping calculations to obtain values valid to 1 GeV/amu.

Examples of each of these three steps will be given for targets of Cu and Ag to illustrate the procedures.

After step one, above, is completed, the next step is initiated by converting the theoretical stopping calculated using the the local-density approximation and Lindhard stopping to the equivalent Bethe stopping. Using Bethe-stopping formalism[4-8] we may extract in a simple way the mean ionization energy of each target (which combines target transition energies and strengths), and modify it to reflect more accurately the characteristics of the actual target. Bethe stopping may be described as

$$S_e = \frac{4\pi e^4 (Z_1^*)^2 Z_2}{mv^2} \left[\ln (2mv^2/\langle I \rangle) - \beta^2 - \ln (1-\beta^2) - \frac{C}{Z_2} \right]$$

which we rearrange as:

$$S_e = \frac{4\pi e^4 (Z_1^*)^2 Z_2}{\beta^2 mc^2} \left[f(\beta) - \ln \langle I \rangle - \frac{C}{Z_2} \right] \tag{18}$$

where e and m are the charge and mass of an electron; Z_1^* is the ion effective charge; Z_2 is the target atomic number; c is the velocity of light;

$$\beta^2 \equiv \left(\frac{v}{c}\right)^2 = 1 - 1 / (1 + E/931189\ M_1)^2 \tag{19}$$

where v is the relativistic ion velocity, E is the ion energy in keV, 931189 is the conversion of amu to keV and M_1 is the ion mass in amu; and

$$f(\beta) \equiv \ln \left[2mc^2\beta^2/(1-\beta^2)\right] - \beta^2 . \tag{20}$$

The two remaining terms are the mean ionization potential, <I>, defined theoretically by

$$\ln \langle I \rangle = \sum_n f_n \ln E_n \tag{21}$$

where E_n and f_n are all possible energy transitions and corresponding oscillator strengths for the target atom; and the last term of Eq. (18) is the shell correction, C/Z_2, which corrects the stopping for the fact that some inner shell electrons have velocities of the order of or greater than the ion velocity.

The Bethe equation is now rearranged to solve for these last two terms:

$$\left(\ln \langle I \rangle + \sum \frac{C}{Z_2} \right) = f(\beta) - \frac{S_e \beta^2 mc^2}{4\pi e^4 Z_2 (Z_1^*)^2} \quad . \tag{22}$$

This expression isolates the two weak parts of the theoretical stopping, and we consider them separately. The mean ionization term, $\langle I \rangle$, is a function of the target only and is independent of the ion velocity. It can be calculated in the local-density approximation with the expression:[10,12,32,33],

$$\ln \langle I \rangle = (1/Z) \int^V \rho \ln (\lambda \hbar \omega_o) \, dV \tag{23}$$

where Z is the total electron charge, ω_o is the classical plasma frequency, $\omega_o = (4\pi\rho e^2/m)^{1/2}$, and λ is some constant of the order of 1 and has been estimated by various theorists to be between 1 and $\sqrt{2}$. We have evaluated this expression for various solid-state charge densities, ρ, and the results are shown in columns 2-5 in Table 1 (with $\lambda = 1$). [There have been scores of papers on the calculation of $\langle I \rangle$, and the reader is referred to a recent review for a summary[34] of various approaches. As shown in Ref. 34, $\langle I \rangle$ can also be calculated by consideration of detailed oscillator models, and the results are similar to those of the local density approximation using Eq. (23).]

Plotted in Figure 11 are calculated mean ionization potentials, similar to those of Table 1 (plotted in units of I/Z_2 for clarity). All these results assume $\lambda = 1$ so that the absolute magnitudes of the various $\langle I \rangle$ values are clear.

Shown in Figure 12 are both experimental and theoretical results of electronic stopping for targets of Cu ($Z_2 = 29$) and Ag ($Z_2 = 47$). They are shown with the stopping reduced by Eq. (22) so that what is displayed is (ln $\langle I \rangle$ + Shell Correction). The upper curved solid line is the theoretical sum of the mean ionization potential and the shell correction calculated from Eq. (22) with S_e calculated using Eq. (1). Also shown are experimental stopping data points for various ions in the targets (1 = Hydrogen ions, 2 = Helium ions, etc., S = Sulphur ions, I = Iodine ions, etc.) also reduced by Eq. (22) after the nuclear stopping has been removed from the total stopping data using Eq. (16).

MEAN IONIZATION POTENTIALS <I>

TARGET ELEMENT	ISOLATED ATOM CHARGE DIST. (EV)	FIRST ORDER SOLIDS (DISC.) (EV)	FIRST ORDER SOLIDS (CONT.) (EV)	M-J-W SOLIDS (DISC.) (EV)	EXPERIMENTAL VALUES (EV)	LAMBDA RUNNING AVERAGE	ADOPTED VALUES (EV)
H [1]	12.14	13.07	12.52	17.11	19 *	1.473 *	19 *
HE [2]	34.57	34.69	34.76		42 *	1.346 *	42 *
LI [3]	27.37	37.76	37.55	36.1	47	1.305	47
BE [4]	32.24	50.26	49.7	49.07	63	1.29	63
B [5]	40.09	56.17	56.07		75	1.303	75
C [6]	50.91	63.36	62.17		79	1.29	79
N [7]	63.82	64.45	64.45		86 *	1.296 *	86 *
O [8]	78.57	79.87	80.1		99 *	1.252 *	99 *
F [9]	95.08	96.13	95.94			1.249 *	118.8 *
NE [10]	113.2	114.3	114.1		135 *	1.248 *	135 *
NA [11]	104.6	112.7	112.7	106.4		1.325	141
MG [12]	105.2	117.2	116.8	112		1.33	149
AL [13]	106.3	122.4	123.1	118.7	162	1.345	162
SI [14]	111.4	123.5	123.5		159	1.331	159
P [15]	118.5	126.1	125.2			1.339	168.9
S [16]	126.9	133.2	132.2			1.345	179.2
CL [17]	136.2	138.7	139.3			1.251 *	170.3 *
AR [18]	146.3	147.6	147.9		180 *	1.227 *	180 *
K [19]	138.9	145.2	145.2	139		1.362	189.4
CA [20]	137.9	147.4	147.9	143.5	195	1.363	195
SC [21]	146.6	159.3	160.7	155.2	215	1.351	215
TI [22]	155.1	172.6	173.2	167.1	228	1.357	228
V [23]	165.7	186.2	186.1	178.8	237	1.349	237
CR [24]	183.6	201.7	201.5	189.9	257	1.351	257
MN [25]	187.8	207.7	207.8	200.1	275	1.354	275
FE [26]	199.5	219.1	219.2	211.2	284	1.352	284
CO [27]	211.9	231.3	231.1	223.1	304	1.353	304
NI [28]	224.5	243.6	243.6	235.1	314	1.336	314
CU [29]	246.7	260.2	260.7	246.2	330	1.326	330
ZN [30]	252.1	266.2	265.5	252.4	323	1.306	323
GA [31]	252.8	266.7	266.7	256.2		1.309	335.4
GE [32]	257.1	276.9	277.8	258.9	323	1.295	323
AS [33]	262.9	273.6	274.3			1.296	354.7
SE [34]	269.4	265.7	274			1.293	343.4
BR [35]	276.7	279.9	280.2			1.226 *	339.3 *
KR [36]	284.6	287.4	286.6		347 *	1.221 *	347 *
RB [37]	275.7	282.6	282.6	273		1.281	349.7
SR [38]	273.1	284.4	284	276.6		1.277	353.3
Y [39]	278	293.7	293.2	285.5	365	1.272	365
ZR [40]	284.2	303.3	302.5	294.9	382	1.276	382
NB [41]	296.6	315.6	315.7	304		1.287	391.3
MO [42]	304.7	326.4	325.4	312.4	393	1.28	393
TC [43]	307.1	330.7	329.6	321.1		1.296	416.2
RU [44]	322.6	342.3	341.5	328.5		1.305	428.6
RH [45]	331.8	349.1	349	336.3	506.7	1.31	436.4
PD [46]	350.7	359.4	359.7	344		1.326	456

* EXPERIMENTAL AND ADOPTED VALUES FOR NORMAL GASES ARE FOR GAS PHASE.
TO CALCULATE STOPPING IN THESE ELEMENTS IN SOLID PHASE, MULTIPLY THEORETICAL SOLID VALUE BY LAMBDA OF FIGURE 14.

TABLE 1

MEAN IONIZATION POTENTIALS <I>

TARGET ELEMENT	ISOLATED ATOM CHARGE DIST. (EV)	FIRST ORDER SOLIDS (DISC.) (EV)	FIRST ORDER SOLIDS (CONT.) (EV)	M-J-W SOLIDS (DISC.) (EV)	EXPERIMENTAL VALUES (EV)	LAMBDA RUNNING AVERAGE	ADOPTED VALUES (EV)
AG [47]	351.8	363.9	364.1	350.2	470	1.338	470
CD [48]	354.3	365.8	366.1	353		1.32	466
IN [49]	353.4	369.2	377.5	354.9	479	1.339	479
SN [50]	355.1	368.5	370.2		511.8	1.347	511.8
SB [51]	358.9	369.2	369.9			1.333	491.9
TE [52]	363.3	370.6	368.4			1.326	491.3
I [53]	367.8	372.6	372.8			1.23 *	452.4 *
XE [54]	373.1	376.4	376.1		459 *	1.227 *	459 *
CS [55]	364.2	371.3	371.4			1.305	484.8
BA [56]	360.6	373.8	373.7			1.299	485.5
LA [57]	364.1	382.2	381.7			1.292	493.8
CE [58]	378.7	398.9	398.6			1.285	512.7
PR [59]	388.3	406.9	407.4			1.278	520.2
ND [60]	398.2	417.4	416.5		540	1.28	540
PM [61]	408.4	426.9	427.5			1.258	537
SM [62]	418.9	437.6	437.8			1.248	545.9
EU [63]	429.6	442.5	443.2			1.237	547.5
GD [64]	434.5	452.2	451.6		567	1.233	567
TB [65]	451.7	470.5	469.7			1.227	577.2
DY [66]	463	481.8	481		578	1.213	578
HO [67]	488.3	498.4	498			1.228	612.2
ER [68]	486.5	505.3	504.5		583.3	1.205	583.3
TM [69]	498.7	517.7	516.8		629.2	1.206	629.2
YB [70]	510.1	524.5	525.1			1.214	637
LU [71]	516.2	534.2	533.5			1.226	655.1
HF [72]	522.5	535.4	542.7			1.238	662.9
TA [73]	529.6	553.3	552.8		682	1.242	682
W [74]	536.8	562.3	562.1	547.3	695	1.256	695
RE [75]	544.1	566.4	568.3			1.26	713.6
OS [76]	551.9	573.9	576			1.266	726.6
IR [77]	560.1	584.6	584			1.272	743.7
PT [78]	575.1	593.3	592.9	576.6	760	1.286	760
AU [79]	583.4	598.7	598.9	581.8	742	1.282	742
HG [80]	585.7	599.9	598.1			1.281	768.4
TL [81]	583.9	597.9	597.6			1.279	764.8
PB [82]	585.6	598.8	599.1		761	1.278	761
BI [83]	587.2	598.6	598.2			1.274	762.9
PO [84]	590.2	599.8	602.3			1.275	765.1
AT [85]	593.8	597.2	597.8			1.275	761.7
RN [86]	597.7	600.8	601.4			1.227 *	733.1 *
FR [87]	583.7	597.6	598.1			1.275	762.3
RA [88]	582.8	595.9	596.3			1.275	760.1
AC [89]	584.5	602	606.4			1.275	767.9
TH [90]	587.1	608.7	610			1.275	776.4
PA [91]	598.7	632.7	667.4			1.275	807
U [92]	606.5	640.3	639.1		808	1.275	808

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TO CALCULATE STOPPING IN THESE ELEMENTS IN SOLID PHASE, MULTIPLY THEORETICAL SOLID VALUE BY LAMBDA OF FIGURE 14.

TABLE 1

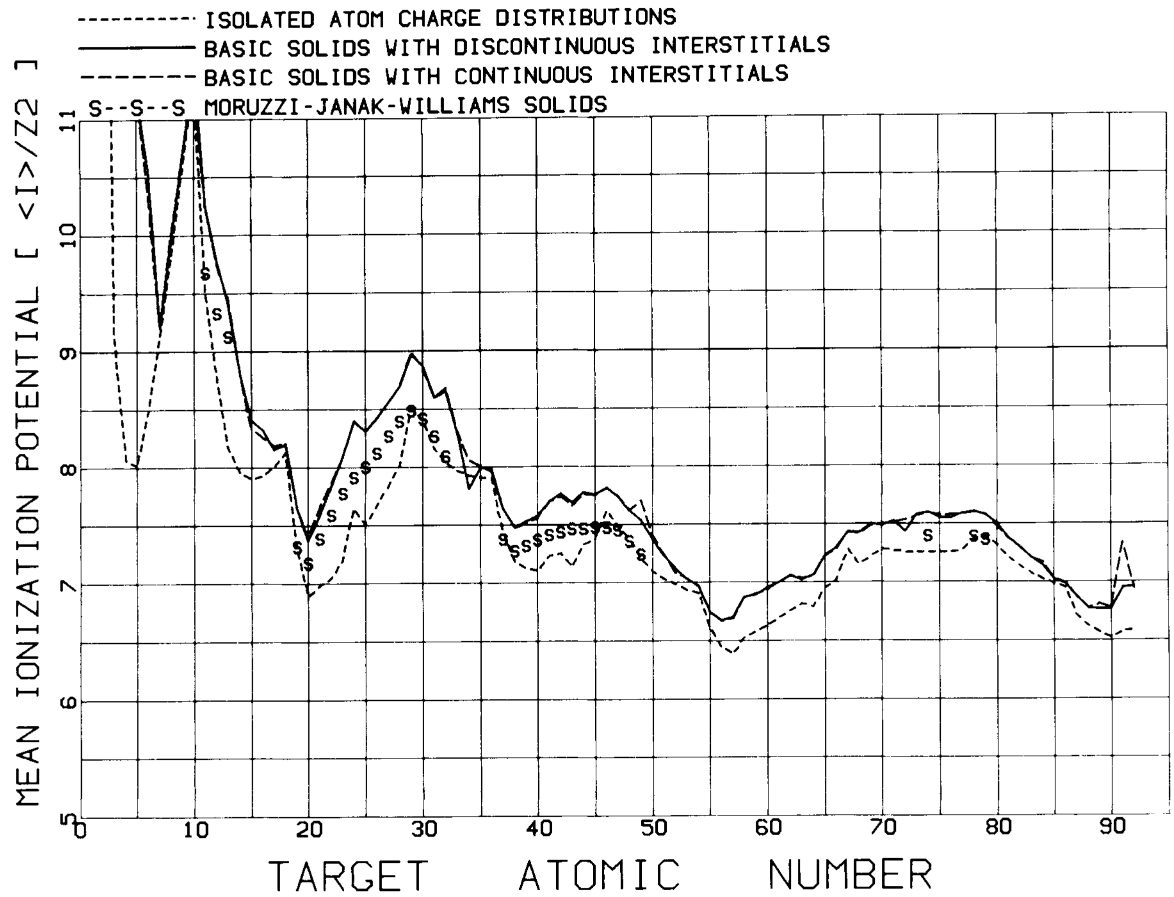

FIGURE 11) Calculations of the mean ionization potentials, <I>, of elements using Eq. 23, with various charge distributions being used for the elemental targets. The plot is in units of $<I>/Z_2$ (eV) for plotting convenience. The isolated atom distributions might be more descriptive of gaseous targets, while the other three distributions describe solids.

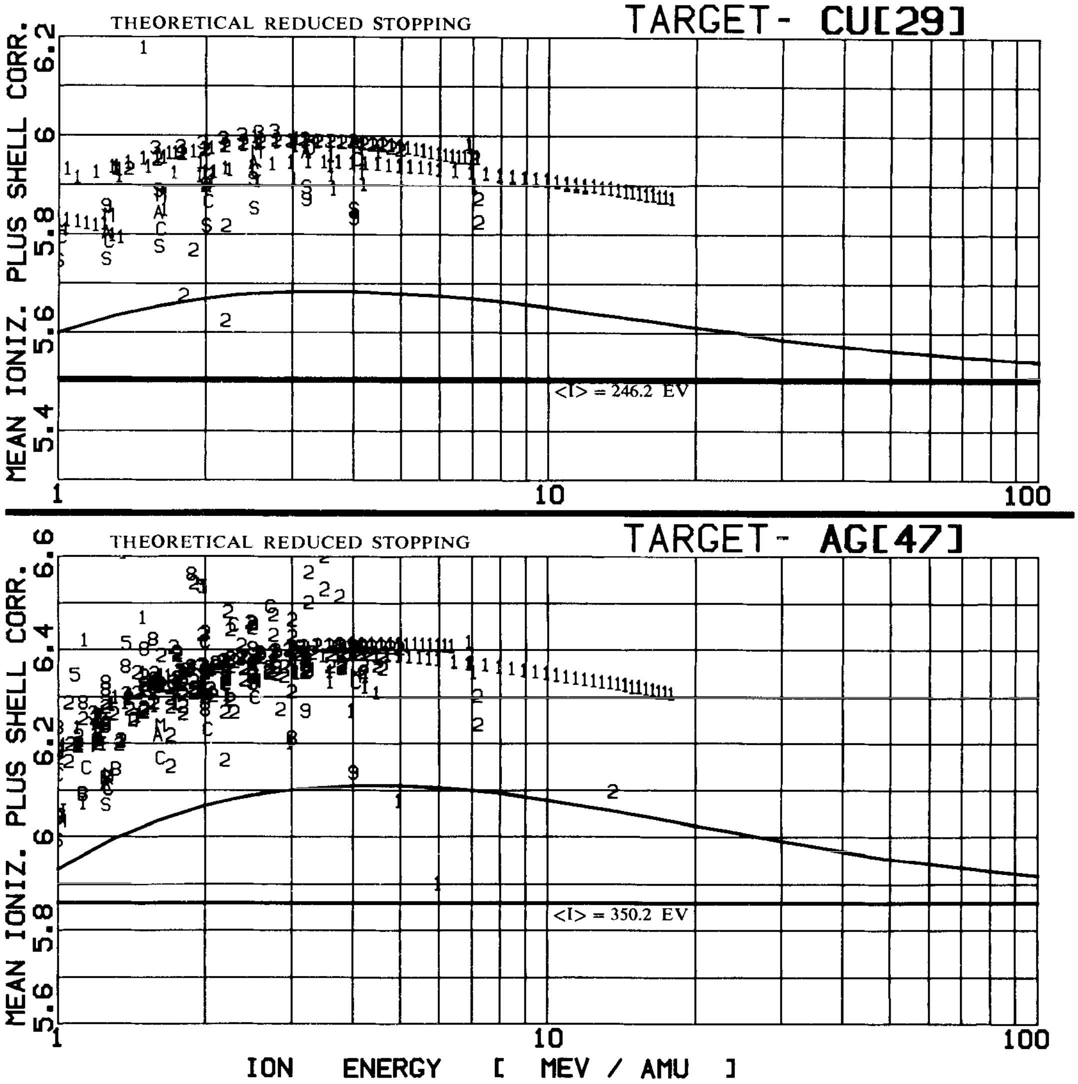

FIGURE 12) The theoretical calculations and experimental data of electronic stopping are shown for targets of Cu and Ag. The theory and experiments are both reduced using Equation (22) so that we show the residual target mean ionization potential, ln <I>, plus the shell correction term. For the experimental data, we have first removed the nuclear stopping component of total stopping using Equation (16). The data symbols are for various heavy ions, and are identified on the respective plots in the back of this book. The theoretical line has been divided into two parts by plotting the ln <I> calculated with Eq. (23) and also the reduced stopping of Eq. (22). The shell correction term is the gap between the upper solid curve and the value of ln <I>.

Also shown is a horizontal thick solid line which is the log of the theoretical mean ionization potential. This term is independent of energy, so by changing it we merely move the summed curved line (ln<I> + Shell Correction) up or down without changing its slope. This vertical motion is done so that the theoretical line goes through the data.

This then adjusts ln<I> from the theoretical value to a realistic value. Typical adjustments are shown in Figure 13. The results for all elements with data are shown in Table I, under the column called Experimental Values.

Since about half the possible elemental targets do not have experimental stopping values, it is necessary to find realistic values of <I> for these also. This is done in Figure 14 where <I> theoretical is compared to <I> experimental for solid targets for which there exist good data. (This ratio gives directly a realistic value of λ in Eq. (23).) In this figure, the large circles indicate realistic experimental data, the small circles indicate sparse data, and the dots indicate questionable data. The dashed line is a running average determined by weighting the experimental data by its reliability. By using a running average through the experimental ratios we can interpolate to obtain realistic corrections, λ, of <I> for all targets. The accuracy of these interpolated values can be estimated by the scatter of nearby experimental points in Figure 14. The final adopted values of <I> are shown in the last column of Table 1 for normal solids.

Similarly, the mean ionization potentials of gas targets can be determined. We have used isolated atom distributions for calculations of <I> for gaseous targets, and these are tabulated in column 2 of Table 1. The ratio of experimental to theoretical <I> for gases is plotted in Figure 15, along with data from stopping measurements on gas targets and this directly gives us values of λ for gases. The dashed line is a running average, weighted by the quality of the data. This dashed line is used to correct the theoretical isolated atom calculations of <I> for targets of atomic number 9, 17, 35 and 53. These corrected values are shown in Table I under Adopted Values. (In Table 1 all numbers marked by asterisks (*) indicate calculations for gas targets.)

It should be noted that <I> values for solid or gaseous targets which are not included in Table 1 can be calculated by multiplying the appropriate value of Table 1 (either isolated atom or solid-state values) by the correction factor of Figure 14 or 15. This might occur, for example, for vapors Cs or Hg, or for solid forms of O or N (perhaps in solid compounds). For example, for oxygen in solid targets, one uses $<I> = 79.9$ eV with $\lambda = 1.32$, obtaining a final value of 105.5 eV, in contrast to 99 eV for a gas phase target.

Finally, the shell corrections, C/Z_2, can be obtained by subtracting ln<I> (theoretical) from the theoretical evaluation of Eq. (22). These depend on the ion velocity and need to be corrected for relativistic effects. We use the procedure of Fano[35] to do this.

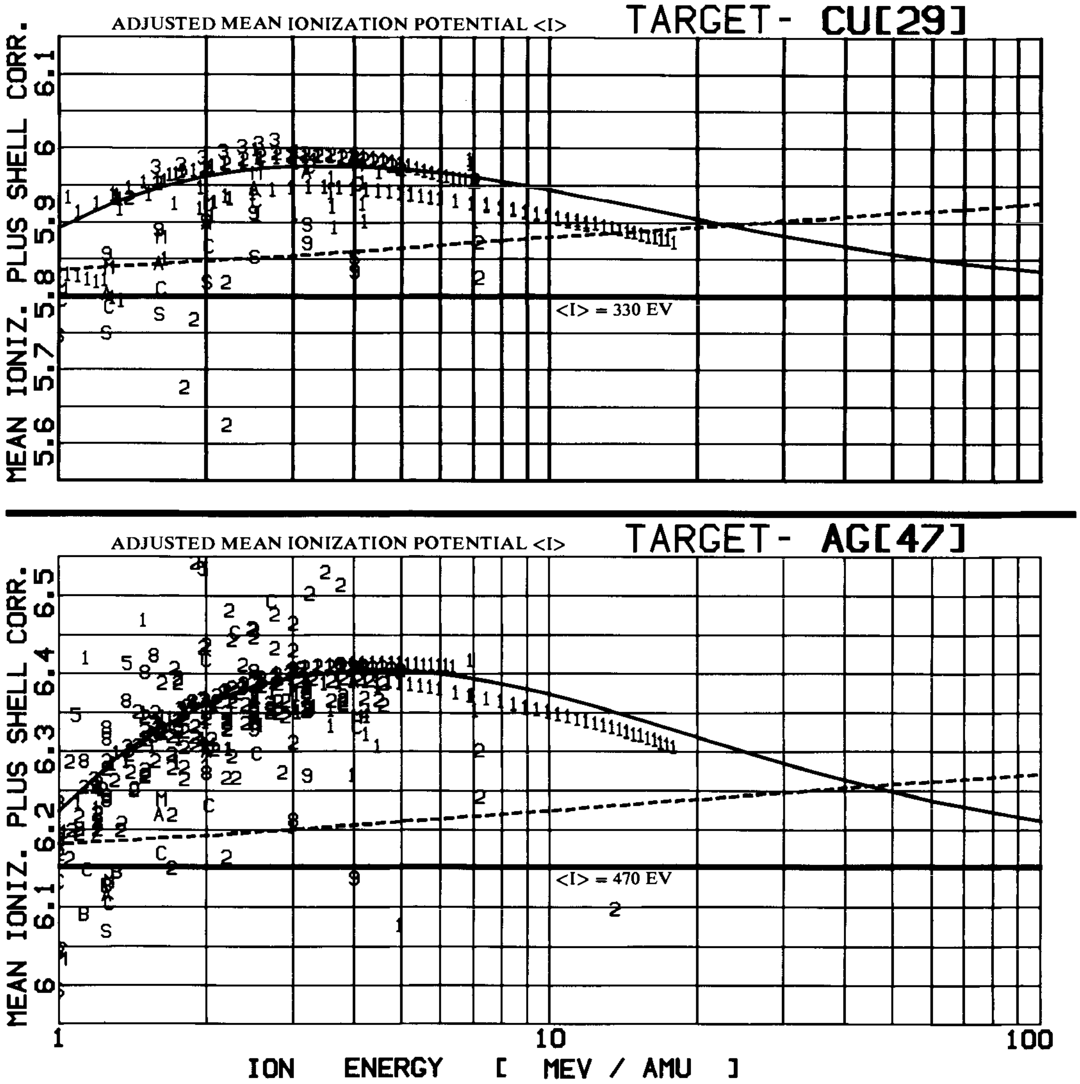

FIGURE 13) The experimental value of ln <I> is determined by moving the shell-correction term to pass through the stopping data points reduced by Equation (22). The heavy solid line is therefore the experimentally determined value of ln <I>. These values are tabulated in Table 1, column 6.

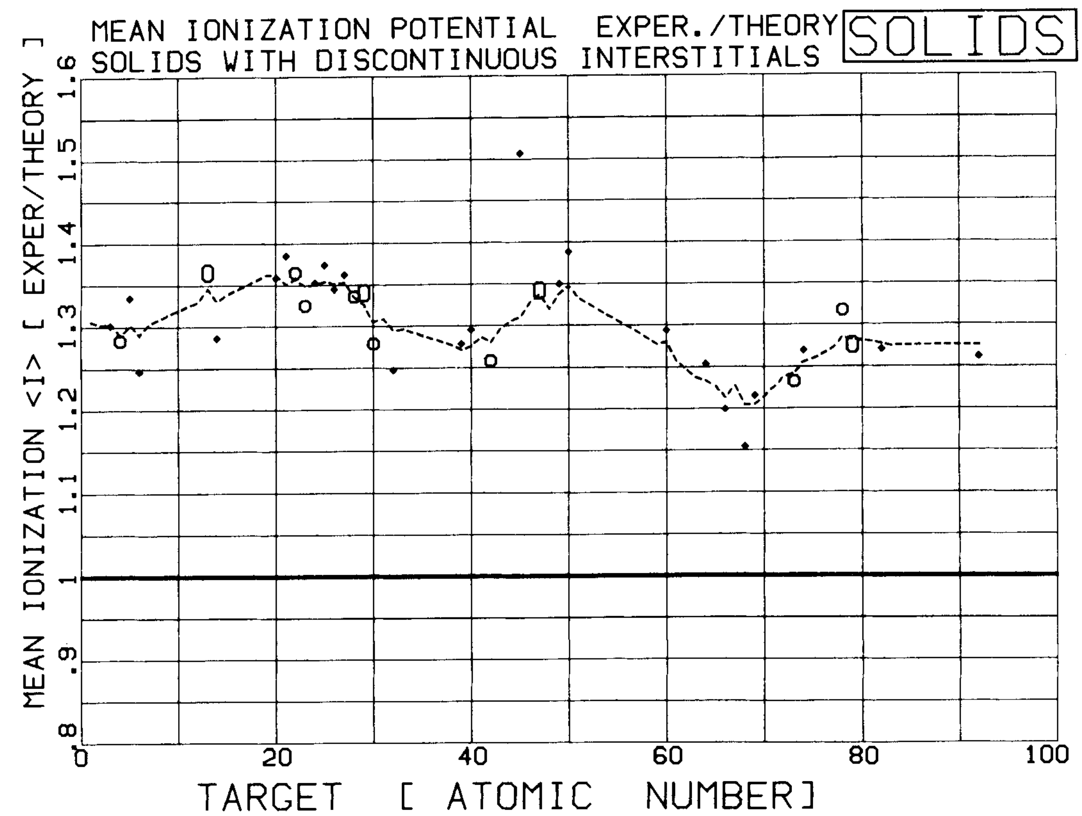

FIGURE 14) The mean ionization potential correction term, λ, determined by dividing experimental values by theoretical values. The large circles represent evaluations from accurate data, the small circles are from sparse data, and the dots from questionable data. The dashed line is a running average, determined by weighting nearby experimental points by their data reliability. This average λ will be used to determine values of <I> for solid targets without experimental data, or for solid forms of normally gaseous targets (such as O or N in living tissue).

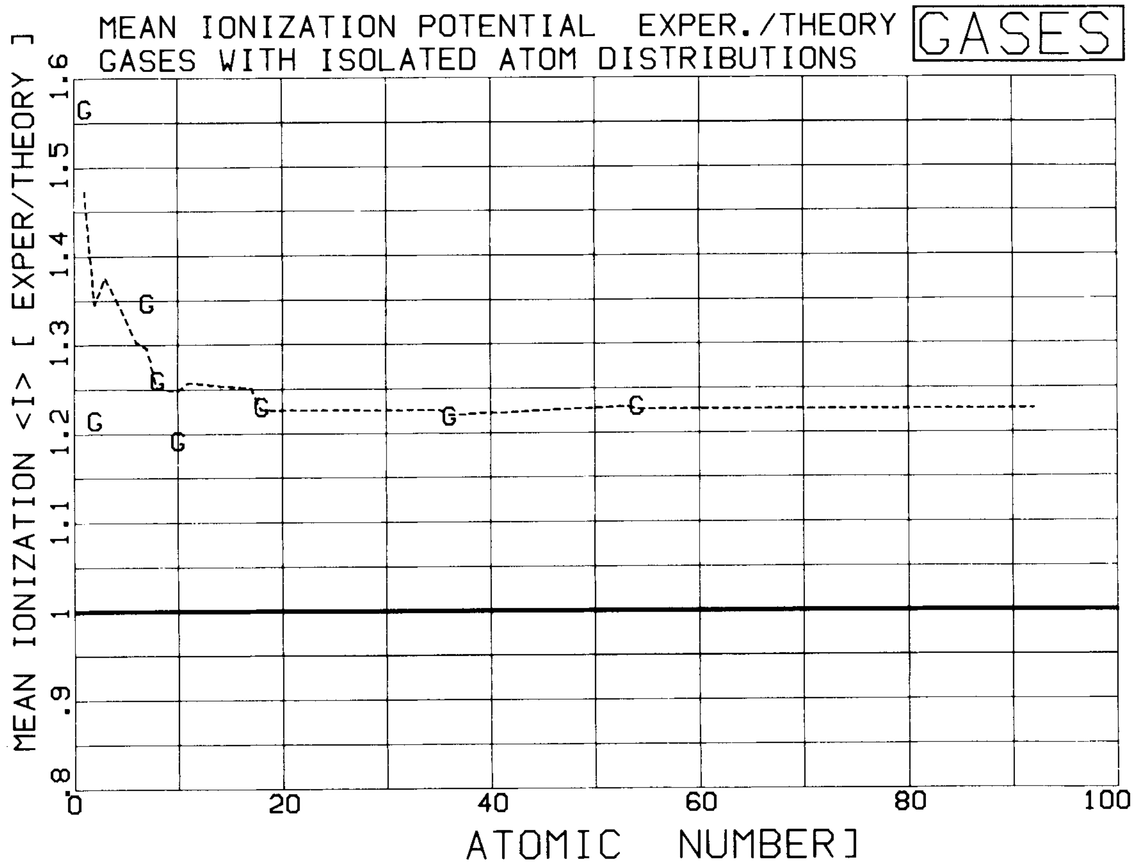

FIGURE 15) The mean ionization correction term, λ, for GAS targets determined by dividing experimental values by theoretical values. The dashed line is a running average which can be used to determine <I> for other gas vapors such as Cl or Br, or for solids in gas phase (such as Cs or Hg, or gaseous compounds such as CH_4).

Final shell correction curves are illustrated in Figure 16 for representative targets. Also shown is a dashed line indicating a value of shell correction which will modify stopping calculations, Eq. (18), by about 2%, so that the importance of the shell correction can be estimated.

It should be noted that our mean ionization potentials are not absolute, but they depend directly on the accuracy of our theoretical shell-corrections. So the arguments about empirical corrections to <I> are somewhat circular, with only modest significance being placed on the final numbers of <I>. What is needed are precise stopping measurements at ion energies of ≈ 100 MeV/amu so that <I> can be evaluated independently of the shell corrections.

The electronic stopping of high energy ions (velocities between 1.5 - 1000 MeV/amu) can now be calculated using Eq. (18), with Z^* specified by Eq. (8)-(13), <I> specified in Table I, and the shell correction as illustrated in Figure 16. The total stopping is formed by adding the nuclear stopping calculated using Eq. (16).

CALCULATIONS — LOW ENERGY STOPPING CROSS-SECTIONS

The stopping of low energy ions (.2–1.5 MeV/amu) is calculated with a procedure similar to that used in Vol. 4 in this series ("He Stopping Powers"). We have estimated the ion's effective charge by assuming it was independent of the target (see Figures 4-6). We now correct this slightly by explicitly determining the effect of the target on the ion's effective charge. (This will correct for any inaccuracies in the theory also.)

The final calculation parameters are found in four steps:

1) All data for all ions in each target are reduced to a common curve by using a reduced stopping defined as

$$\langle S \rangle_{Exp.} \equiv S(Z_1,v,Z_2,)/(Z_1^*)^2 \qquad (24)$$

where $S(Z_1, v, Z_2)$ are experimental data points for ion Z_1 at velocity v in target Z_2. The effective charge term is calculated using Eq (8)-(13). For each target with at least 3 or 4 separate experimental ion stopping data sets a smooth polynomial is fitted from 0.1-2 MeV/amu through the data. This is called the Experimental Reduced Stopping.

2) For each energy, a plot is made of the Ion Fractional Effective Charge, defined as

$$Z^2 \equiv \langle S \rangle_{Exp.}/S_{Theory} \qquad (25)$$

where S is the theoretical stopping defined by Eq. (1) with with $Z_1^* = 1$. Sample plots are shown in Figure 17 (for solid targets)and Figure 18 (for gas targets).

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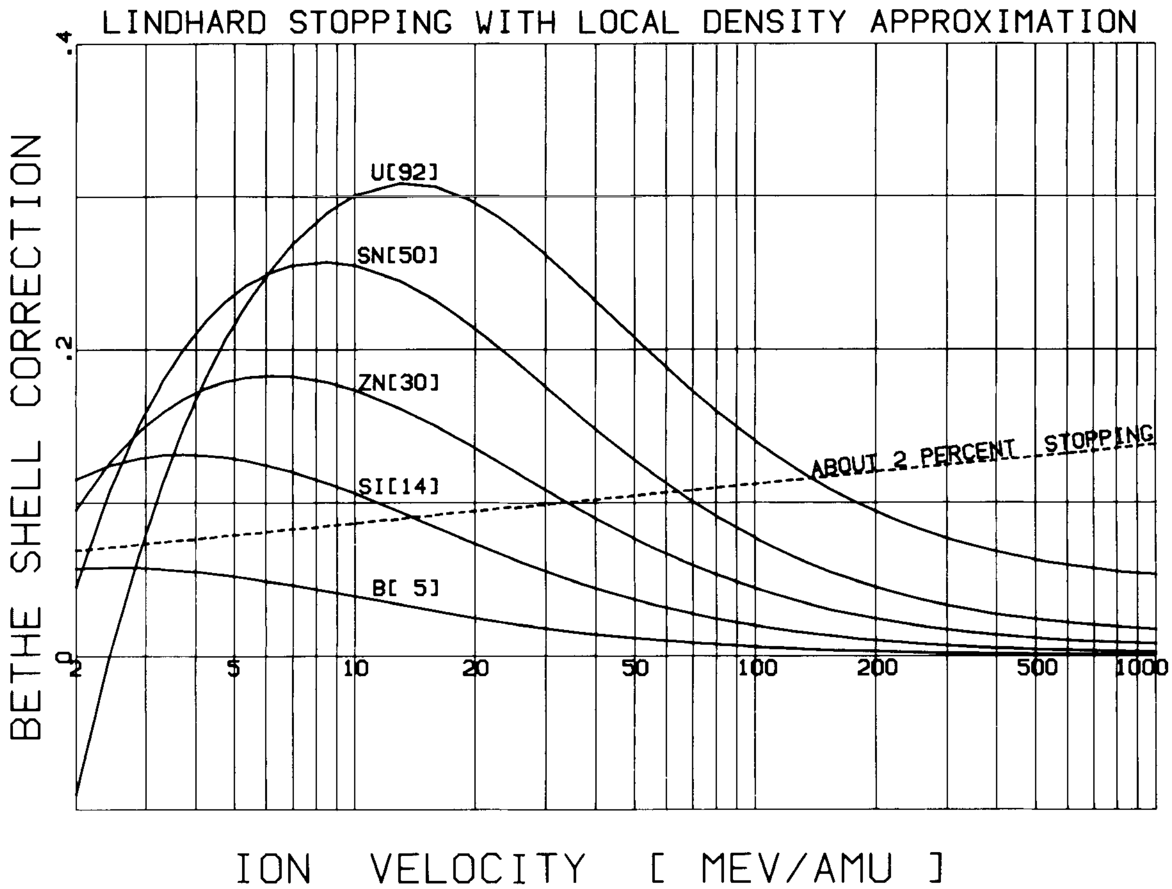
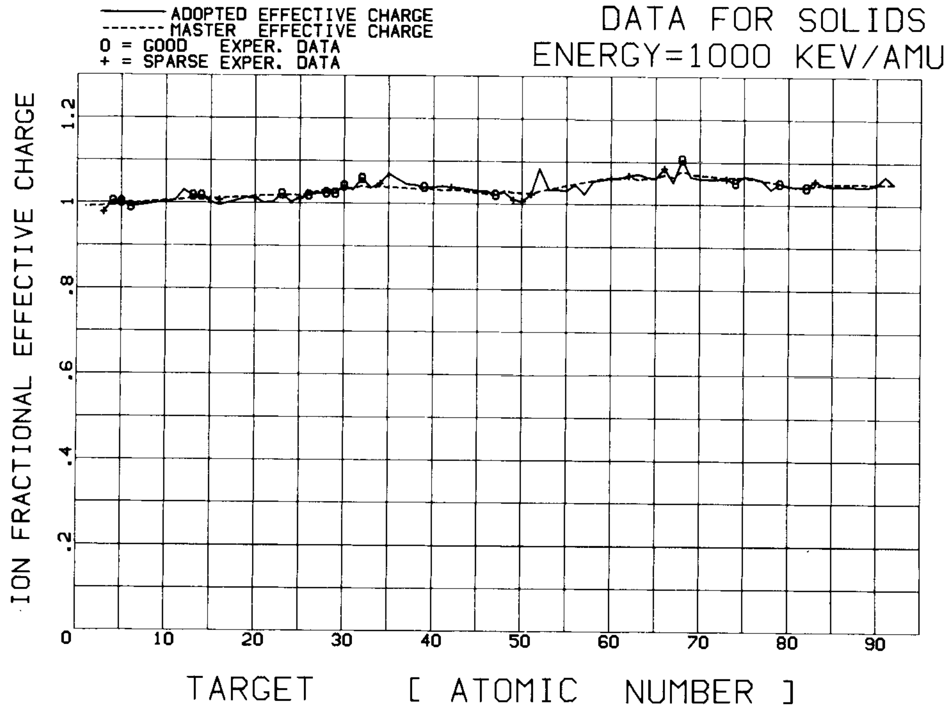


FIGURE 16) Typical shell corrections for various targets determined by subtracting ln <I> from the reduced theoretical stopping of Equation (22). Relativistic corrections have been included using the technique of Fano (Ref. 35).



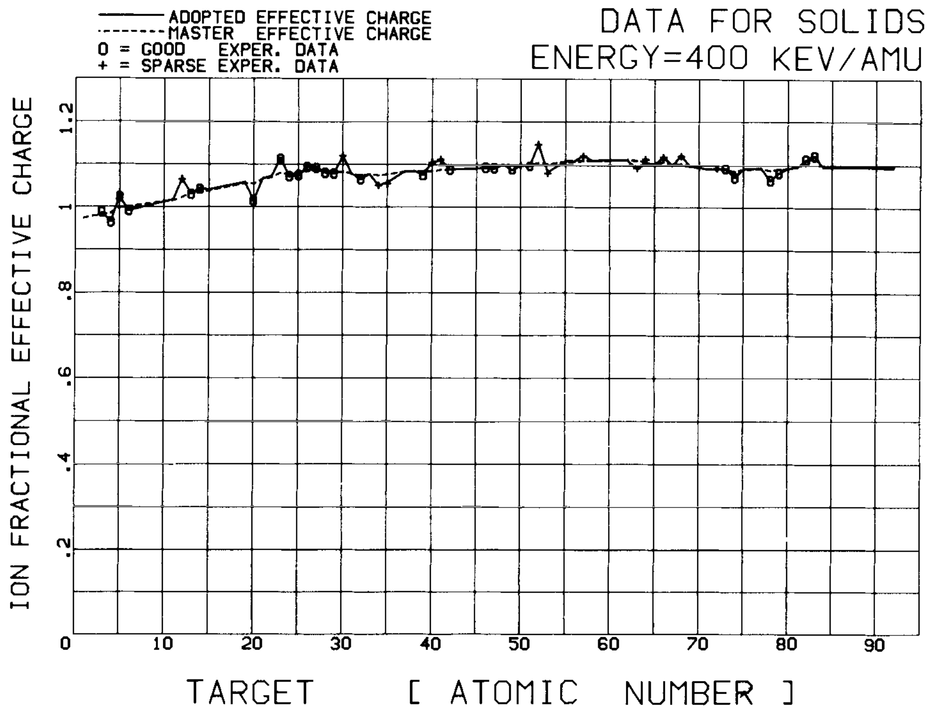
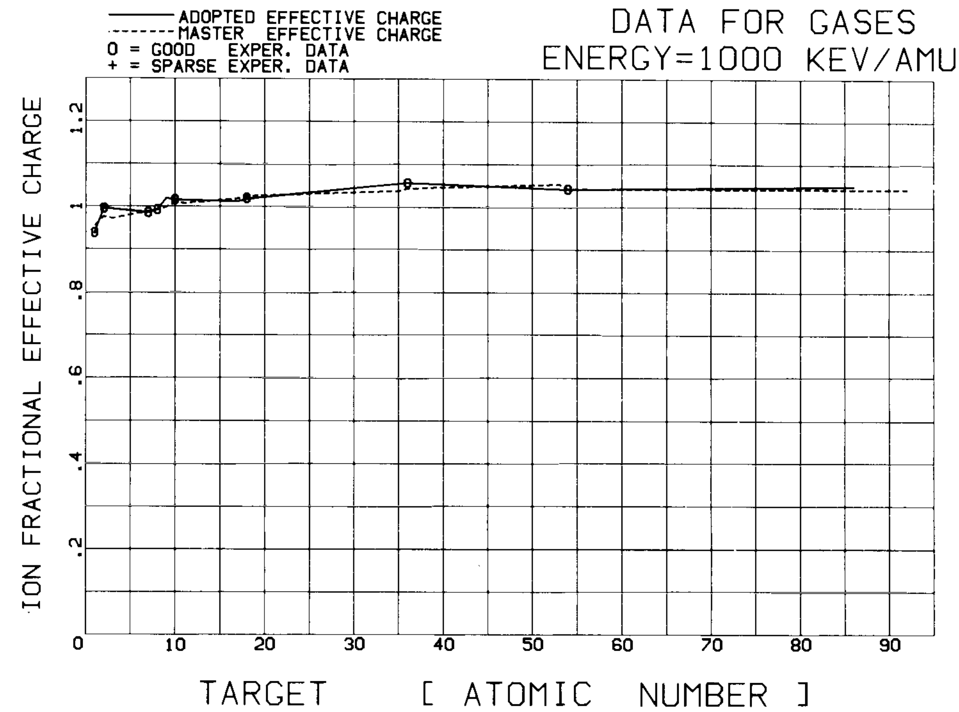


FIGURE 17) Low energy stopping powers in SOLIDS evaluated by taking the ratio of stopping experiment to theory, Equation 25, and calling this the ion's fractional effective charge. This quantity can be interpolated with a running average (dashed line) to determine the low energy stopping for solid targets without data. This correction is the target-dependent term which modifies the previously determined target-independent effective charge estimate of Figures 4-6. The solid line is the adopted effective charge correction (which deviates from the dashed line because of data at other ion energies). The accuracy of the interpolation scheme can be estimated by the data fluctuations about the dashed line.



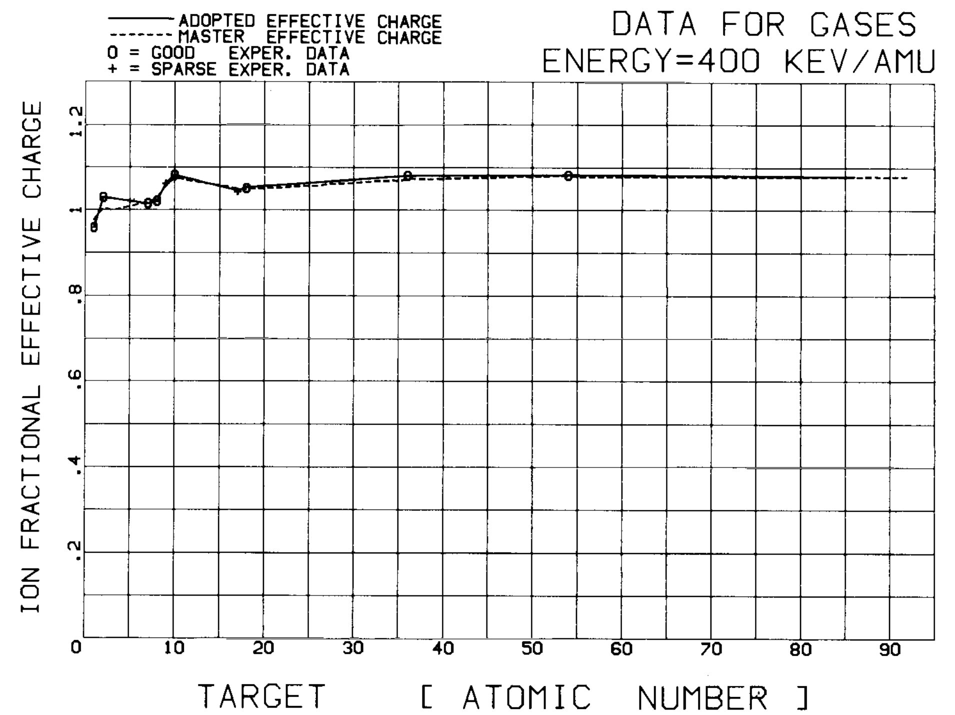


FIGURE 18) Low energy stopping in GASES is evaluated by taking the ratio of experimental to theoretical stopping, Equation 15. This is the target dependent correction term which will be applied to a previously determined target independent effective charge (in a manner similar to Figures 4-5, but not shown in this book).

3) A running average is drawn through the data points in Figures 17 and 18, with the average weighted by the quality of the data. This average is shown by a dotted line, and it corrects the ion's effective charge for each target.

4) A final Effective Charge, Z_1^*, is calculated first using (Eq. (8)-(13), then correcting this Z_1^* for each target and energy by multiplying by step (2) above for good data, step (3) for interpolation where no data exists, and a judicious combination of (2) and (3) for intermediate cases. This last point is not very important because the values obtained both ways do not vary by more than a few percent as shown in Figures 17-18 by the small gap between the solid and dashed lines.

The low energy electronic stopping is now completely specified. The stopping is calculated with Eq. (1) with Z_1^* now specified by the final Effective Charge, Z_1^* of step 4 above. The accuracy of this procedure can be estimated by the scatter of data about the dotted line in Figures 9-11.

The low energy stopping of ions in solid forms of normal gases has been calculated by

$$S_{Solid} = S_{Gas} \ (Z_{Solid} / Z_{Gas})^2 \ (S_{Solid} / S_{Gas}) \qquad (26)$$

where Z is the ion fractional effective charge which is shown in Figure 17 for Z_{Solid} and in Figure 18 for Z_{Gas}. S is the theoretical stopping using Eq. (1), with isolated atom electron distributions used to calculate S_{Gas} , and solid state electron distributions used for S_{Solid} in Eq. (26).

Finally the nuclear stopping, Eq. (16), is added to the electronic stopping to obtain the total stopping.

The only exceptions to the calculation of low energy stopping occurs for H ions at energies of .2 – .5 MeV for targets of Z_2 = 1, 2, 18, 36, 47 and 79 where the calculated stopping cross-sections were forced through a large amount of accurate data (a correction of about 5%).

EXPERIMENTAL ION STOPPING DATA

We have discovered a total of 156 papers which present experimental absolute stopping powers for ions in a total of 55 elemental solids with energies above 0.2 MeV/amu. (See Data References at the back of this book.) The data shown in the plots are a few percent more erratic than the original data because most data were interpolated from graphs presented in the papers. If authors presented tabulated "smoothed data", these values were used, but if only a graph was shown, we have used only the data points indicated, not any hand-drawn line

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through the data. Some papers presented electronic-stopping powers, in which the authors had subtracted some form of nuclear stopping from their measured total stopping powers. For these references we have added back the nuclear stopping which they indicate they have used (usually LSS nuclear stopping[11]).

The data are shown on the plots with symbols 1-9 for H-F ions, and with the first letter of the chemical symbol for elements of atomic number 10-92. To prevent confusion between "C" for Cl or Cu or Co ions, the first letter of the ion name on the right-hand edge of the plots is darkened if data are shown for this ion. Also preceding and following the stopping plots are tabulations specifically identifying the data points used in each plot.

Figure 22 shows the matrix of ion/target combinations for which we have experimental data.

If data deviated more than 20% from the calculated stopping they were omitted from the stopping plots to prevent confusion. These omitted data points are clearly identified in the stopping tabulations. Only 7% of the data were omitted.

ACCURACY OF THE STOPPING CALCULATION

The accuracy of the calculated stopping may be summarized in plots of the ratio of Experiment/Calculation for all ions in various targets. Typical plots are shown in Figures 19 and 20 for solid targets, and in Figure 21 for gas targets. The ion symbols are identical to those in the detailed plots in the bulk of this book. From a survey of these plots for all targets we estimate the accuracy of the calculations to be as noted on page 1 of this text.

CALCULATING STOPPING CROSS-SECTIONS TO 2 GeV/amu

The stopping cross-sections presented here may be extended to ion energies of 2 GeV/amu by using Eq. (18)-(20), and (15)-(17). For the term <I> in Eq. (18) use the right-hand column in Table 1. For the term C/Z_2 use zero. These calculations should be accurate to about 2%. For energies above 2 GeV/amu, consult Ref. 36.

CALCULATING STOPPING CROSS-SECTIONS FOR COMPOUNDS

For the stopping of ions in compounds, merely add together the stopping in the individual elements, weighted by their relative abundance (this is called Bragg's Rule). It may be convenient to use stopping cross-section units of $eV/(atom/cm^2)$ and determine an average stopping. For example, for Ti ions (1 MeV/amu) in a target of SiO_2, the mean stopping per target atom is:

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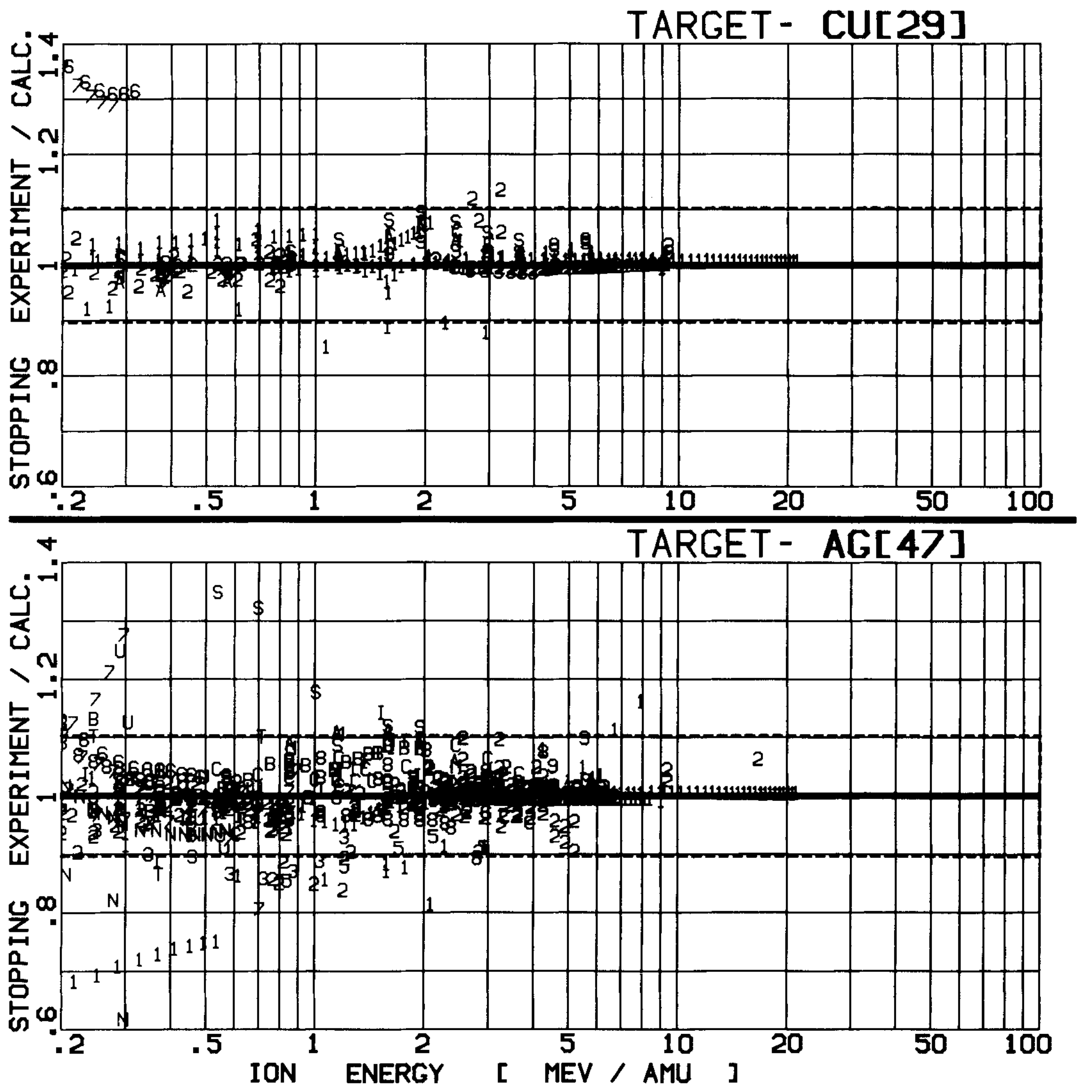


FIGURE 19) The accuracy of the calculated stopping of ions in targets can be evaluated by this plot of experimental stopping divided by calculated stopping. Each different plot symbol represents a different ion, and they can be identified by consulting the detailed stopping plots in the back of this book (1 = H ions, 2 = He, M = Mg, U = Uranium, etc.).

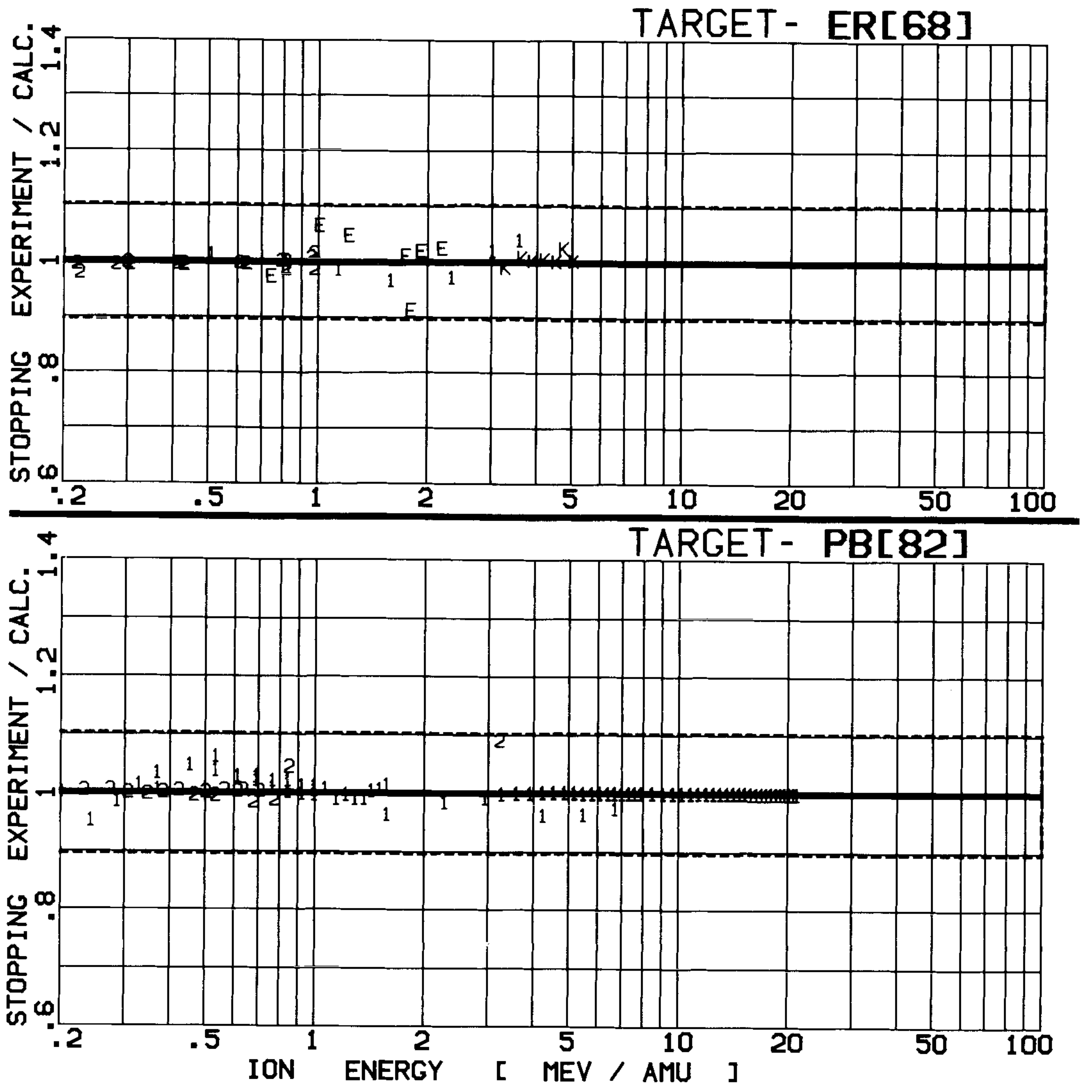
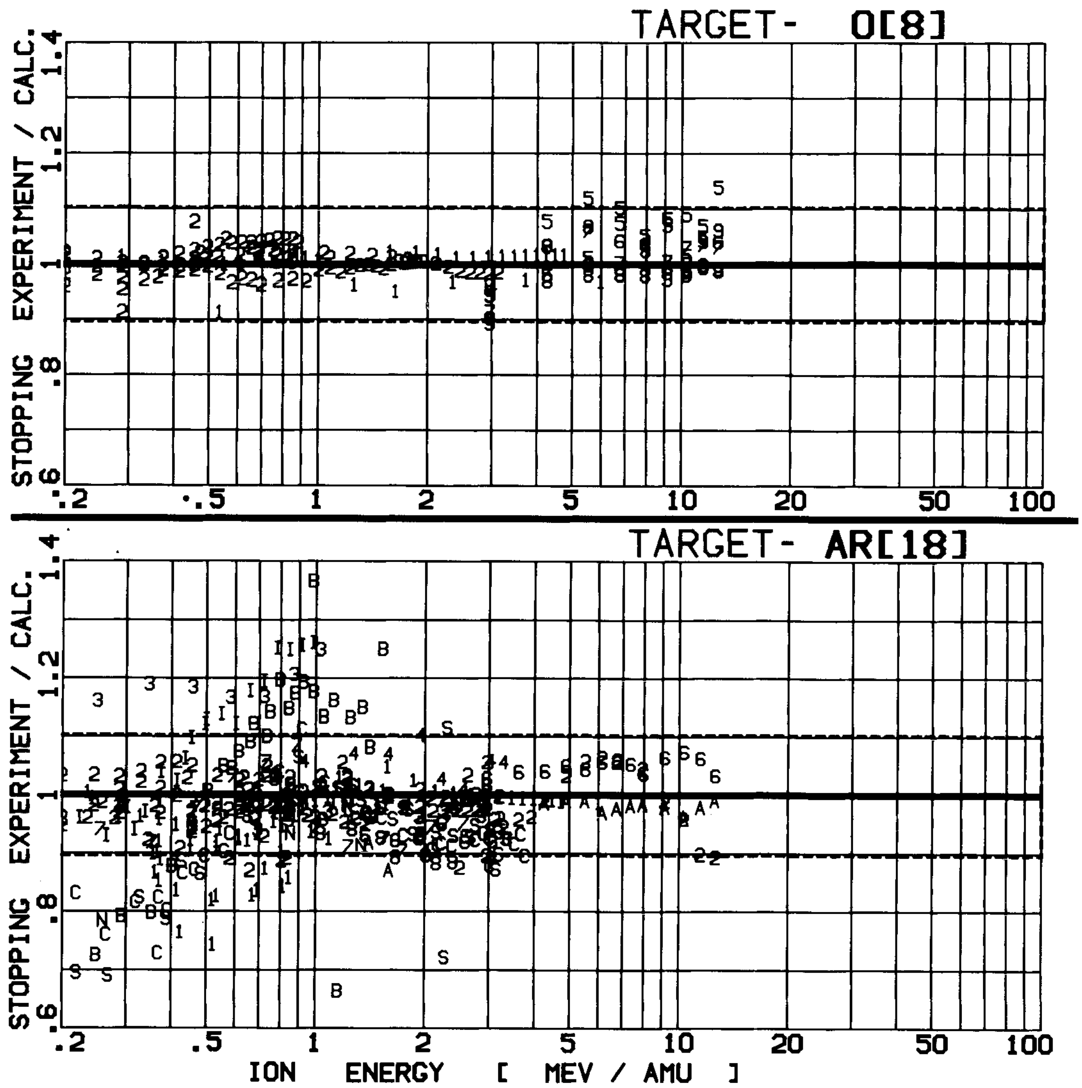


FIGURE 20) The accuracy of the stopping of ions in targets can be evaluated by this plot of experimental stopping divided by calculated stopping. Each different plot symbol represents a different ion, and they can be identified by consulting the detailed stopping plots in the back of this book (1 = H ions, 2 = He, E = Er, K = Kr, etc.).



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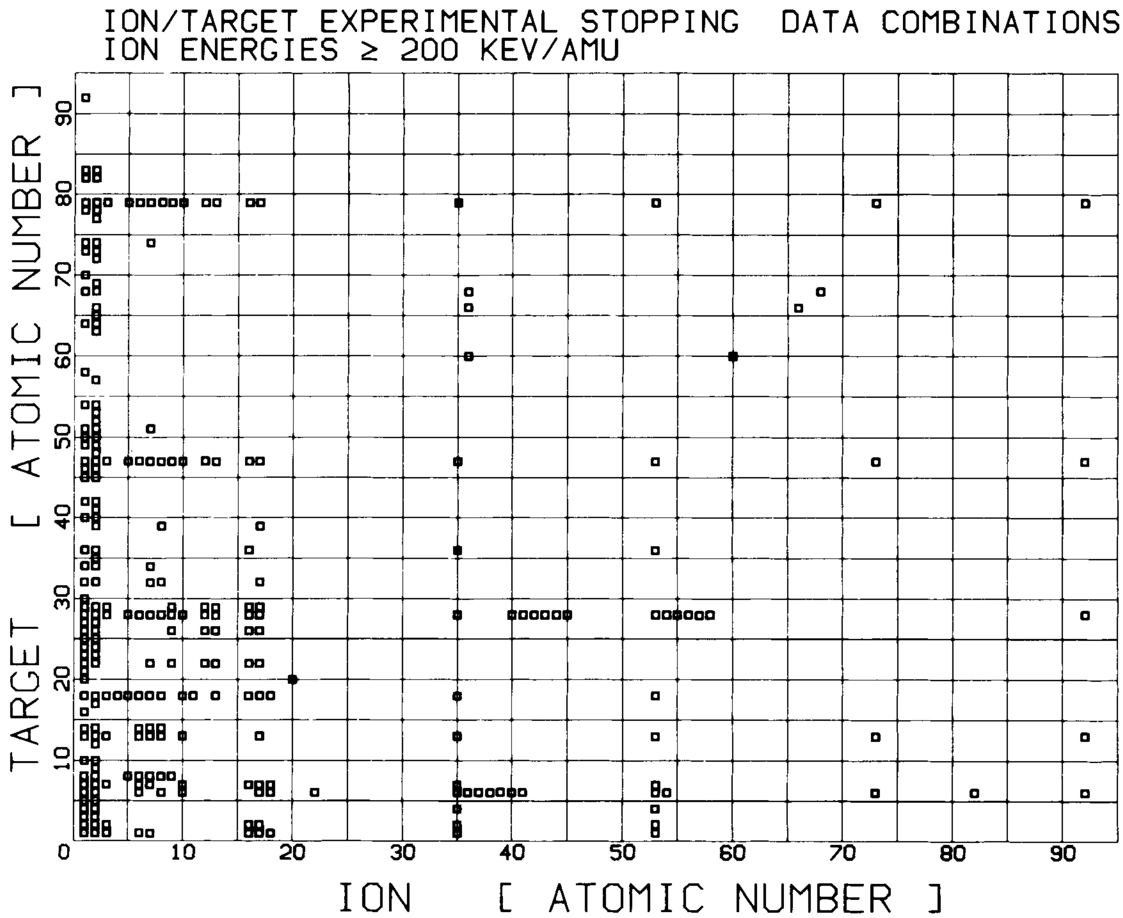
ION/TARGET EXPERIMENTAL STOPPING DATA COMBINATIONS
ION ENERGIES ≥ 200 KEV/AMU
TARGET [ATOMIC NUMBER]
ION [ATOMIC NUMBER]
0
10
20
30
40
50
60
70
80
90

Figure 22

$$\sum(\text{ relative abundance}) (\text{stopping }) \ (\text{conversion to } eV - cm^2) =$$
$$(1/3)\ (23.6)\ (46.64) + (2/3)\ (28.8)\ (26.57) = 877\ eV/(10^{15} atoms/cm^2)$$

where in SiO_2 the relative abundance of Si = 1/3 and 0 = 2/3, the stopping of Ti ions at 1 MeV/amu in Si and O(solid) is 23.6 and 28.8, and the conversion factors are given at the top of the Si and O target plots. We have used the special stopping of Ti in solid oxygen. To convert back to units of $MeV/(mg/cm^2)$ multiply by the conversion:

$$.6023/(\text{ average atomic weight }) = 0.6023 / \sum (\text{relative abundance }) (\text{ atomic weight })$$

For the example of Ti → SiO_2 we have:

$$S = 877\ (.6023) / [\ (1/3)\ (28) + (2/3)\ (16)\ ]$$
$$= 26.41\ MeV / (mg/cm^2)$$

where the atomic weights of Si and O are 28 and 16.

ACKNOWLEDGMENTS

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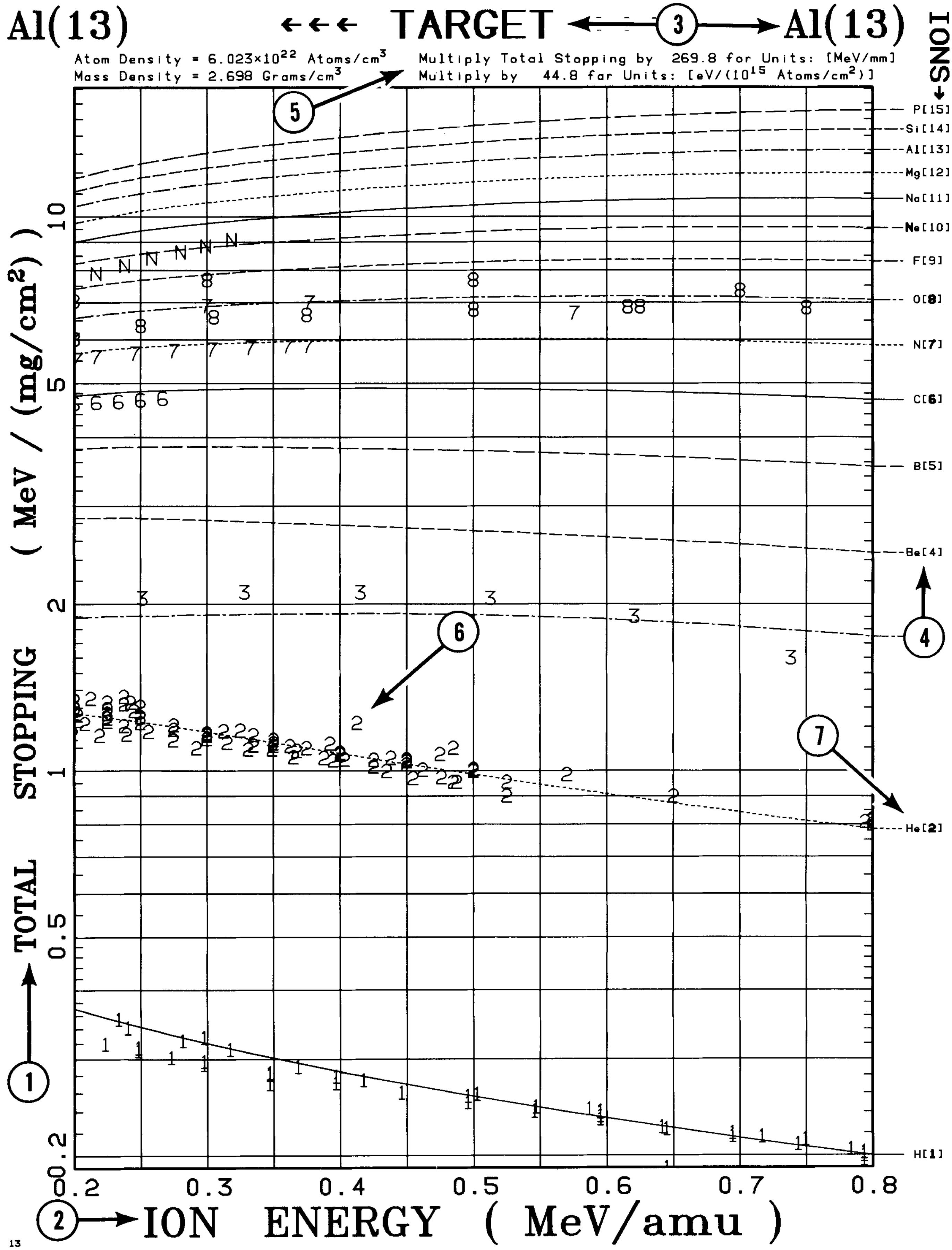

Al(13)
←←← TARGET ← 3 → Al(13)
IONS→
Atom Density = 6.023×10^22 Atoms/cm^3
Mass Density = 2.698 Grams/cm^3
Multiply Total Stopping by 269.8 for Units: [MeV/mm]
Multiply by 44.8 far Units: [eV/(10^15 Atoms/cm^2)]
5
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
4
6
7
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm^2))
1
0.2
0.5
1
2
5
10
0.2
0.3
0.4
0.5
0.6
0.7
0.8
2 → ION ENERGY (MeV/amu)

COMMENTS ON PLOTS

*** See comment Numbers on opposite page.

1) Total stopping is defined as the mean energy loss through a thin amorphous target. It is divided theoretically into energy loss to the target electrons (electronic stopping) and to the target nuclei (nuclear stopping). These two components can be separated by doing the simple calculation of nuclear stopping, Eq. 15-18, and subtracting this from the total stopping shown (note Eq. 15-18 determines stopping in units of eV/[10^{15} atoms/cm^2]). The primary units of the plotted stopping curves, MeV/(mg/cm^2), were chosen to allow accurate interpolation to targets not included in this book. Read the SUMMARY, page 1, for practical limitations on stopping.

2) Ion Energy is plotted in units of MeV/amu so the curves are valid for all isotopes of any ion. There is no variation in stopping for various isotopes of the same ion if they are at the same velocity.

3) The target is assumed to be amorphous with the natural abundance of isotopes.

4) The ions have been selected to allow accurate linear interpolation for the stopping of ions not plotted.

5) The conversion from the plotted stopping units to other convenient units, for example for this Al target: MeV/(mg/cm^2) = 969.8 MeV/mm = 44.8 eV/(10^{15} atoms/cm^2). The conversion to depth units, mm, assumes the target density listed on top of the plot.

6) All data points are plotted so the center of the plot-character is the experimental value. No indication is given of data accuracy. The symbol used for each ion is identified at the right-hand margin where that character is printed in bold (for example the "N" used for the experimental data of neon ions) and also in the data reference listing just before and after the complete collection of stopping plots. Data for all ions are plotted, regardless of whether the theoretical value for that ion is shown.

7) If data exists for a given ion, the plot-character used for that data is shown in bold, for example "8" is used for oxygen experimental data.

DATA REFERENCES

H[1] ---TARGET--- H[1]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AK	1953	8	2	
1	1	1	53AN	1953	6		
1	1	1	55AC	1955		1	
1	1	1	75CI	1975	2*	6	
1	1	1	77AQ	1977	6	1	
2	2	4	34AA	1934		*	
2	2	4	62AB	1962		9	13
2	2	4	66AD	1966	5	13	
2	2	4	71AK	1971	13	1	
2	2	4	71AF	1971	9	3	
2	2	4	72AB	1972	4*	7	
2	2	4	73CN	1973	1	6	
2	2	4	75CI	1975	3	1	
2	2	4	77AC	1977	6		
2	2	4	77CP	1977	7	14	
2	2	4	77BU	1977	3	8	
3	3	7	57AF	1957	*	*	
3	3	7	62AK	1962	2*	*	
3	3	6	65BF	1965	5	2	
6	6	12	62AB	1962		6	7
7	7	14	62AK	1962	2*	*	
S	16	32	68BH	1968	4*	17	
C	17	35	68BH	1968	4*	3*	
A	18	40	62AB	1962		2*	6
B	35	79	68BH	1968	2*	*	
I	53	127	68BH	1968	4*	*	

HE[2] ---TARGET--- HE[2]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AK	1953	8	2	
1	1	1	53AN	1953	6		
1	1	1	55AC	1955		1	
1	1	1	63AR	1963	2		
1	1	1	77AQ	1977	5	1	
2	2	4	34AA	1934		1	
2	2	4	69AN	1969	7*	5*	
2	2	4	71AF	1971	10	3	
2	2	4	71BK	1971	13	1	
2	2	4	72BF	1972		1	
2	2	4	73CN	1973	2*	6*	
2	2	4	77AC	1977	6		
2	2	4	77BR	1977	13*		
2	2	4	77CP	1977	7	14	
3	3	7	62AK	1962	*	*	
3	3	6	65BF	1965	5	2	
S	16	32	68BH	1968	5	16*	
C	17	35	68BH	1968	12*	21*	
B	35	79	68BH	1968	14*	8*	
I	53	127	68BH	1968	15*	6*	

LI[3] ---TARGET--- LI[3]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AA	1953	1		
1	1	1	56AA	1956	10	8	
2	2	4	28AA	1928		*	

BE[4] ---TARGET--- BE[4]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	48AC	1948	4	13	
1	1	1	49AK	1949	5		
1	1	1	53AI	1953	*	*	
1	1	1	53AH	1953	12	17	

(CONTINUED)

* SOME DATA POINTS OMITTED FROM PLOT

BE[4] (CONTINUED)

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	56AA	1956	10	13	
1	1	1	61AC	1961		9	
1	1	1	67AC	1967		12	16
1	1	1	77CR	1977			1
2	2	4	69AH	1969	9		
2	2	4	71AJ	1971			1
2	2	4	73CS	1973			1
B	35	81	66AT	1966	9	11	
I	53	127	66AU	1966	13	7	

B[5] ---TARGET--- B[5]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	62AH	1962	10	18	
2	2	4	62AI	1962	7	8	

C[6] ---TARGET--- C[6]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	61AL	1961		1	
1	1	1	65AU	1965	5		
1	1	1	67AB	1967	9	59	10
2	2	4	61AK	1961	5		
2	2	4	69AH	1969	18		
2	2	4	71AL	1971	13	1	
2	2	4	72AB	1972	3*	7	
2	2	4	76CA	1976	13	1	
2	2	4	76CA	1976	13	1	
6	6	12	61AJ	1961	5		
8	8	16	61AJ	1961	1		
8	8	16	65AD	1965	5	9	
8	8	16	66AP	1966	3	4*	
N	10	20	61AK	1961	*		
N	10	20	75CM	1975	2	2	
C	17	40	65AD	1965	7	6	
A	18	40	75CM	1975	2		
A	18	40	78BO	1978	2*	8	
T	22	50	78BO	1978	6	10	
B	35	81	66AT	1966	9	11	
K	36	91	76BP	1976		3	
K	36	84	78BO	1978	7	9	
R	37	91	76BP	1976		4	
S	38	94	76BP	1976		1	
Y	39	99	76BP	1976		3	
Z	40	100	76BP	1976	2	8	
N	41	101	76BP	1976	1	3	
I	53	127	64BI	1964	9	6	
I	53	127	66AT	1966	13	7	
I	53	127	67AH	1967		15	
X	54	136	78BO	1978	8	11	
T	73	181	69AS	1969	*	*	
P	82	208	78BO	1978	8	11	
U	92	238	72AT	1972	5		
U	92	238	78BO	1978	10	13	

N[7] ---TARGET--- N[7]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AK	1953	8	2	
1	1	1	54AC	1954	10	10	
1	1	1	55AC	1955		1	
1	1	3	63AC	1963	11	7	
1	1	1	70AF	1970		13	
1	1	1	75CI	1975	3	6	
1	1	1	77AQ	1977	7	1	
2	2	4	62AB	1962		11	7
2	2	4	66BL	1966	10	7	

(CONTINUED)

N[7] (CONTINUED)

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	68BU	1968	14	16	
2	2	4	71AK	1971	13	1	
2	2	4	71AF	1971	9	3	
2	2	4	75CI	1975	4	2	
2	2	4	77AC	1977	10		
2	2	4	77CP	1977	7	14	
3	3	6	65BF	1965	5	2	
6	6	12	62AB	1962		6	7
7	7	14	75CM	1975	1	1	
N	10	20	75CM	1975	1	1	
S	16	32	68BH	1968	5	33	
C	17	35	68BH	1968	11*	21*	
A	18	40	62AB	1962		5	6
A	18	40	75CM	1975	*		
B	35	79	68BH	1968	16*	7*	
I	53	127	68BH	1968	11*	2*	

O[8] ←→TARGET ←→ O[8]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AK	1953	8	2	
1	1	1	55AC	1955		1	
1	1	1	70AF	1970		13	
1	1	1	75CI	1975	3	6	
1	1	1	77AQ	1977	14	2	
2	2	4	68BU	1968	17	15	
2	2	4	71AK	1971	13	1	
2	2	4	75CI	1975	5	2	
2	2	4	77CP	1977	7	14	
2	2	4	77AC	1977	11		
2	2	4	78AC	1978	3		
5	5	11	60AE	1960		4	6
5	5	10	60AE	1960		4	6
6	6	12	60AE	1960		4	6
7	7	14	60AE	1960		4	6
8	8	16	60AE	1960		4	6
9	9	19	60AE	1960		4	6

F[9] ←→TARGET ←→ F[9]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	72AP	1972	13	1	

NE[10] ←→TARGET ←→ NE[10]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AK	1953	8	2	
1	1	1	54AC	1954	7	9	
1	1	1	55AC	1955		1	
1	1	1	68BT	1968	3		
1	1	1	70AF	1970		13	
1	1	1	71AD	1971	3		
1	1	1	77AQ	1977	5	1	
2	2	4	34AA	1934		1	
2	2	4	71BK	1971	13	1	
2	2	4	71BN	1971		1	
2	2	4	73CN	1973	3	12	
2	2	4	77CP	1977	7	14	
2	2	4	77AC	1977	9		

NA[11] ←→TARGET ←→ NA[11]

*** NO EXPERIMENTAL DATA ***

MG[12] ←→TARGET ←→ MG[12]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	69AH	1969	16		

AL[13] ←→TARGET ←→ AL[13]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	48AD	1948	2		
1	1	1	49AK	1949	5		
1	1	1	53AI	1953	2	4	
1	1	1	53AH	1953	12	17	
1	1	1	56AA	1956	4	1	
1	1	1	61AC	1961		21	
1	1	2	61AC	1961		7	
1	1	3	63AC	1963	11	9	
1	1	1	67AC	1967		12	15
1	1	1	67BI	1967			2
1	1	2	67BI	1967			2
1	1	1	68BQ	1968	2	10	
1	1	1	71AX	1971		1	
1	1	1	71AI	1971			1
1	1	2	71AI	1971			1
1	1	1	73BA	1973		12	28
1	1	1	74BM	1974	3	13	
1	1	1	74AB	1974			1
1	1	1	77CR	1977			1
1	1	1	77AB	1977	1	28	7
2	2	4	13AB	1913		2	
2	2	4	28AA	1928		1	
2	2	4	59AJ	1959	3		
2	2	4	61AK	1961	8	1	
2	2	4	63AZ	1963		*	
2	2	4	66AX	1966	2	10	
2	2	4	68AL	1968			1
2	2	4	69AH	1969	16		
2	2	4	70AH	1970	3*	7	
2	2	4	71AJ	1971			1
2	2	4	73CS	1973			1
2	2	4	75CH	1975		1	
2	2	4	75BG	1975	6		
2	2	4	75CU	1975	22	2	
2	2	4	75BO	1975	3	46	5
2	2	4	75CF	1975			1
2	2	4	76BF	1976	8	1	
2	2	4	77BV	1977	6		
2	2	4	77AB	1977	1	22	3
3	3	7	62AK	1962	6	3	
3	3	7	77AB	1977		12	
6	6	12	61AJ	1961	5		
7	7	14	61AK	1961	8		
7	7	14	62AK	1962	2*	1	
7	7	14	70AD	1970	2*	*	
8	8	16	61AJ	1961	1		
8	8	16	65AD	1965	5	9	
8	8	16	66AP	1966	3	5	
8	8	16	78AH	1978	2	7	
N	10	20	61AK	1961	6		
N	10	20	62AK	1962	*		
N	10	20	73AU	1973		2	
C	17	40	65AD	1965	7	6	
B	35	80	66AU	1966	9	12	
I	53	127	64BI	1964	9	5	
I	53	127	66AU	1966	13	7	
I	53	127	67AH	1967		6	
T	73	181	69AS	1969	15	7	
U	92	238	72AT	1972	8		

* SOME DATA POINTS OMITTED FROM PLOT

SI[14] ←→TARGET ←→ SI[14]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	77BI	1977	3*		
2	2	4	71BC	1971	10		
2	2	4	72AX	1972	39	47	
2	2	4	73AR	1973	42	12	
2	2	4	73AS	1973		5	6
2	2	4	73AY	1973	53	1	
2	2	4	75CQ	1975	1	1	
2	2	4	77BN	1977			1
6	6	12	73AT	1973		3*	6
7	7	14	73AT	1973		4	6
7	7	14	75CQ	1975	1		
8	8	16	73AT	1973		4*	5

P[15] ←→TARGET ←→ P[15]

*** NO EXPERIMENTAL DATA ***

S[16] ←→TARGET ←→ S[16]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	75CI	1975	2	5	

CL[17] ←→TARGET ←→ CL[17]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	72AP	1972	13	1	

AR[18] ←→TARGET ←→ AR[18]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AN	1953	4		
1	1	1	53AK	1953	8	2	
1	1	1	54AC	1954	7	9	
1	1	1	55AC	1955		1	
1	1	3	63AC	1963	10	7	
1	1	1	68BT	1968	3		
1	1	1	70AF	1970		13	
1	1	1	71AD	1971	3		
1	1	1	77AQ	1977	6*	3	
2	2	4	34AA	1934		1	
2	2	4	62AB	1962		9	6
2	2	4	66BL	1966	10	7	
2	2	4	69AN	1969	8	6	
2	2	4	70BB	1970	6	16	
2	2	4	71BK	1971	13	1	
2	2	4	71BN	1971		1	
2	2	4	71AF	1971	8	1	
2	2	4	72AL	1972	*	*	
2	2	4	77AC	1977	8		
2	2	4	78AC	1978	3		
3	3	7	62AK	1962	3*	*	
3	3	7	69AZ	1969	2	8	
4	4	9	69AZ	1969	2	8	
5	5	1	69AZ	1969			*
6	6	12	62AB	1962		6	7
6	6	12	69AZ	1969	1	8	
7	7	14	62AK	1962	4	1	
7	7	14	69AZ	1969	2	7	
8	8	16	69AZ	1969	2	7	
N	10	20	75CM	1975	1	1	
N	11	23	69AZ	1969	1	1	
A	13	27	69AZ	1969		2	
S	16	32	68BH	1968	10*	24*	
C	17	35	68BH	1968	15	23	
A	18	40	62AB	1962		5	6

(CONTINUED)

* SOME DATA POINTS OMITTED FROM PLOT

AR[18] (CONTINUED)

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
A	18	40	75CM	1975	1		
B	35	79	68BH	1968	18*	8*	
I	53	127	68BH	1968	10*	*	

K[19] ←→TARGET ←→ K[19]

*** NO EXPERIMENTAL DATA ***

CA[20] ←→TARGET ←→ CA[20]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	56AA	1956	4	1	
1	1	1	67AB	1967	10	60	9
1	1	1	68BJ	1968		12	16
C	20	40	69AR	1969	3		

SC[21] ←→TARGET ←→ SC[21]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	68BJ	1968		12	16

TI[22] ←→TARGET ←→ TI[22]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	68BJ	1968		12	16
1	1	1	72BC	1972	2	5	
1	1	1	74AB	1974			1
1	1	1	77CR	1977			1
2	2	4	69AH	1969	9	1	
2	2	4	73CS	1973			1
2	2	4	73BC	1973	2	2	
2	2	4	75BB	1975	4		
2	2	4	75CF	1975			1
2	2	4	76BN	1976	12		
7	7	14	75CG	1975	4	1	
9	9	18.99	76AP	1976	4	9	
M	12	24	76AP	1976	4	9	
A	13	27	76AP	1976	3	8	
S	16	32	76AP	1976	4	9	
C	17	35	76AP	1976	4	9	

V[23] ←→TARGET ←→ V[23]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	56AA	1956	4	1	
1	1	1	68BJ	1968		12	16
1	1	1	68AD	1968	1	3	
1	1	1	77CR	1977			1
2	2	4	69AH	1969	9		
2	2	4	73CS	1973			1
2	2	4	73BC	1973	2	2	
2	2	4	73AI	1973	1	1	

CR[24] ←→TARGET ←→ CR[24]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	56AA	1956	4	1	
1	1	1	68BJ	1968		12	16
2	2	4	69AH	1969	10	1	
2	2	4	76BN	1976	10		

MN[25] ←••TARGET ••→ MN[25]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	55AE	1955	9	10	
1	1	1	56AA	1956	4	1	
1	1	1	68BJ	1968		12	16
2	2	4	69AH	1969	13		

FE[26] ←••TARGET ••→ FE[26]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	56AA	1956	4	1	
1	1	1	68BJ	1968		12	16
1	1	1	74AB	1974			1
1	1	1	77CR	1977			1
2	2	4	28AA	1928		1	
2	2	4	69AH	1969	9		
2	2	4	73CS	1973			1
2	2	4	73AI	1973	1	1	
2	2	4	75CF	1975			1
2	2	4	77AD	1977	21	7	
9	9	19	76AP	1976	3	8	
M	12	24	76AP	1976	4	9	
A	13	27	76AP	1976	3	8	
S	16	32	76AP	1976	4	9	
C	17	35	76AP	1976	4	9	

CO[27] ←••TARGET ••→ CO[27]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	56AA	1956	4	1	
1	1	1	68BJ	1968		12	16
1	1	1	77CR	1977			1
2	2	4	69AH	1969	9		
2	2	4	73CS	1973			1
2	2	4	76BN	1976	13		

NI[28] ←••TARGET ••→ NI[28]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	54AC	1954	7	18	
1	1	1	56AA	1956	4	1	
1	1	1	61AC	1961		21	
1	1	2	61AC	1961		7	
1	1	3	63AC	1963	11	9	
1	1	1	68BJ	1968		12	16
1	1	2	71AI	1971			1
1	1	1	71AI	1971			1
1	1	1	72AU	1972	1		
1	1	1	77CR	1977			1
2	2	4	28AA	1928		1	
2	2	4	59AJ	1959	3		
2	2	4	60AE	1960	1	19	6
2	2	4	61AK	1961	8	1	
2	2	4	63AZ	1963		*	
2	2	4	66AX	1966	1	10	
2	2	4	69AH	1969	9		
2	2	4	70AH	1970	4	8	
2	2	4	72AD	1972	1	13	
2	2	4	72AD	1972	1	12	
2	2	4	73CS	1973			1
2	2	4	73BC	1973	2	2	
2	2	4	75BG	1975	7		
2	2	4	75CF	1975			1
2	2	4	77AD	1977	17	5	
3	3	7	62AK	1962	6	3	
5	5	11	60AE	1960		5	6
5	5	10	60AE	1960		5	6

(CONTINUED)

* SOME DATA POINTS OMITTED FROM PLOT

NI[28] (CONTINUED)

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
5	5	11	65AM	1965	2	3*	
6	6	12	60AE	1960		5	6
6	6	12	61AJ	1961	5		
7	7	14	60AE	1960		5	6
7	7	14	61AK	1961	8		
7	7	14	65AM	1965	2	4	
7	7	14	75CG	1975	5	1	
8	8	16	60AE	1960		5	6
8	8	16	61AJ	1961	1		
8	8	16	65AD	1965	5	9	
8	8	16	66AP	1966	2	5	
8	8	16	72AD	1972	1	9	
8	8	16	74AR	1974	3	9	
8	8	16	75AU	1975	2	4	
9	9	19	60AE	1960		5	6
9	9	19	75AU	1975	1	2	
9	9	19	76AP	1976	3	8	
N	10	20	60AE	1960		5	6
N	10	20	61AK	1961	6		
M	12	24	76AP	1976	4	9	
A	13	27	76AP	1976	3	8	
S	16	32	76AP	1976	4	9	
C	17	40	65AD	1965	7	6	
C	17	35	72AD	1972	4	9	
C	17	35	76AP	1976	4	9	
B	35	80	66AT	1966	9	12	
Z	40	91	75DD	1975		3	
N	41	93	75DD	1975		4	
M	42	96	75DD	1975		4	
T	43	99	75DD	1975		5	
R	44	101	75DD	1975		4	
R	45	103	75DD	1975		3	
I	53	127	64BI	1964	9	6	
I	53	127	66AT	1966	13	7	
I	53	127	67AH	1967		6	
I	53	127	75DD	1975	1*	1*	
X	54	131	75DD	1975	1*	1*	
C	55	133	75DD	1975	4*	4*	
B	56	137	75DD	1975	2*	2*	
L	57	139	75DD	1975	2*	1*	
C	58	140	75DD	1975	1*	1	
U	92	238	72AT	1972	11		

CU[29] ←••TARGET ••→ CU[29]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	49AK	1949	4		
1	1	1	53AI	1953	2	4	
1	1	1	53AH	1953	12	17	
1	1	1	54AC	1954	5	9	
1	1	1	55AE	1955	9	10	
1	1	1	56AA	1956	8	2	
1	1	1	56AA	1956	4	1	
1	1	1	56AA	1956	4	1	
1	1	1	61AC	1961		21	
1	1	2	61AC	1961		10	
1	1	1	67AC	1967		12	16
1	1	1	71AI	1971			1
1	1	2	71AI	1971			1
1	1	1	72AU	1972	1		
1	1	1	73BA	1973		12	28
1	1	1	74AB	1974			1
1	1	1	77AB	1977		25	11
1	1	1	77CR	1977			1
2	2	4	13AB	1913		2	
2	2	4	28AA	1928		1	
2	2	4	67AZ	1967			
2	2	4	68BL	1968	25	17	
2	2	4	68AL	1968			*
2	2	4	69AH	1969	9		
2	2	4	71AJ	1971			1

(CONTINUED)

CU[29] (CONTINUED)

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	73CS	1973			1
2	2	4	75CF	1975			1
2	2	4	75CH	1975		1	
2	2	4	76BF	1976	8	1	
2	2	4	76BN	1976	13		
2	2	4	77AB	1977		19	
3	3	7	77AB	1977		7	
9	9	19	76AP	1976	3	8	
M	12	24	76AP	1976	4	9	
A	13	27	76AP	1976	3	8	
S	16	32	76AP	1976	4	9	
C	17	35	76AP	1976	4	9	

ZN[30] ←→TARGET ←→ ZN[30]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	56AA	1956	4	1	
1	1	1	68BJ	1968		12	16
1	1	1	68BQ	1968	2	10	
1	1	1	77CR	1977			1

GA[31] ←→TARGET ←→ GA[31]

*** NO EXPERIMENTAL DATA ***

GE[32] ←→TARGET ←→ GE[32]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	55AE	1955	9	10	
1	1	1	69AM	1969	9	60	5
1	1	1	76CA	1976	2		
2	2	4	69AH	1969	8*		
2	2	4	72AD	1972		7	
2	2	4	72AD	1972	1	14	
2	2	4	72AD	1972	1	13	
2	2	4	73AI	1973	1	1	
2	2	4	73AY	1973	74	4	
7	7	14	75CG	1975	6	1	
8	8	16	72AD	1972	1	9	
C	17	35	72AD	1972	4	9	

AS[33] ←→TARGET ←→ AS[33]

*** NO EXPERIMENTAL DATA ***

SE[34] ←→TARGET ←→ SE[34]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	55AE	1955	9	10	
1	1	1	71AX	1971	1	3	
1	1	1	76CA	1976	2		
2	2	4	70AH	1970	5	7	
2	2	4	73BB	1973	13	1	
7	7	14	70AH	1970	4	1	

BR[35] ←→TARGET ←→ BR[35]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	72AP	1972	13	1	

KR[36] ←→TARGET ←→ KR[36]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AK	1953	8	2	
1	1	1	54AC	1954	7	9	
1	1	1	55AC	1955		1	
1	1	3	63AC	1963	9	6	
1	1	1	68BT	1968	3		
1	1	1	70AF	1970		8	
1	1	1	71AD	1971	3		
1	1	1	77AQ	1977	9	5	
2	2	4	66BL	1966	10	7	
2	2	4	71BK	1971	13	1	
2	2	4	71BN	1971		1	
2	2	4	77CP	1977	7	14	
2	2	4	77AC	1977	9		
S	16	32	68BH	1968	6*	19*	
B	35	79	68BH	1968	13*	10*	
I	53	127	68BH	1968	18*	4*	

RB[37] ←→TARGET ←→ RB[37]

*** NO EXPERIMENTAL DATA ***

SR[38] ←→TARGET ←→ SR[38]

*** NO EXPERIMENTAL DATA ***

Y[39] ←→TARGET ←→ Y[39]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	72AD	1972	1	14	
2	2	4	72AD	1972	1	13	
2	2	4	73BB	1973	13	1	
8	8	16	72AD	1972	1	9	
C	17	35	72AD	1972	4	9	

ZR[40] ←→TARGET ←→ ZR[40]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	69AX	1969		12	16
2	2	4	73BB	1973	13	1	

NB[41] ←→TARGET ←→ NB[41]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	73BB	1973	13	1	

MO[42] ←→TARGET ←→ MO[42]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	72BC	1972	2	5	
1	1	1	72AZ	1972		6	1
1	1	1	74AB	1974			1
1	1	1	77CR	1977			1
2	2	4	71AJ	1971			1
2	2	4	73BB	1973	13	1	
2	2	4	73AI	1973	1	1	
2	2	4	73CS	1973			1
2	2	4	73BC	1973	2	2	
2	2	4	75CF	1975			1
2	2	4	75BB	1975	4		

* SOME DATA POINTS OMITTED FROM PLOT

TC[43] ←→TARGET ←→ TC[43]

*** NO EXPERIMENTAL DATA ***

RU[44] ←→TARGET ←→ RU[44]

*** NO EXPERIMENTAL DATA ***

RH[45] ←→TARGET ←→ RH[45]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	2	71AI	1971			1
1	1	1	71AI	1971			1
1	1	1	77CR	1977			1
2	2	4	73CS	1973			1

PD[46] ←→TARGET ←→ PD[46]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	76CA	1976	2		
2	2	4	28AA	1928		1	
2	2	4	69AH	1969	12	1	

AG[47] ←→TARGET ←→ AG[47]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	49AK	1949	*		
1	1	1	53AI	1953	2	4	
1	1	1	55AE	1955	9	10	
1	1	2	61AK	1961	7	1	
1	1	1	61AC	1961		15	
1	1	2	61AC	1961		10	
1	1	1	67AC	1967		12	16
1	1	1	68BI	1968		1	
1	1	2	71AI	1971			1
1	1	1	71AX	1971		2	
1	1	1	71AI	1971			1
1	1	1	72AZ	1972		6	1
1	1	1	72AU	1972	1		
1	1	1	73BA	1973		11	28
1	1	1	74AB	1974			1
1	1	1	76CA	1976	2		
1	1	1	77CR	1977			1
1	1	1	77AB	1977	1	28	7
2	2	4	28AA	1928		1	
2	2	4	59AJ	1959	3		
2	2	4	61AK	1961	8	1	
2	2	4	66AX	1966	2	7	
2	2	4	68AL	1968			1
2	2	4	69AH	1969	9		
2	2	4	70AH	1970	6	7	
2	2	4	72AD	1972		7	
2	2	4	72AD	1972	1	13	
2	2	4	72AD	1972	1	14	
2	2	4	72AD	1972		28	
2	2	4	73CS	1973			1
2	2	4	74BS	1974	13	1	
2	2	4	75BO	1975	5	71	
2	2	4	75CF	1975			1
2	2	4	75CH	1975		1	
2	2	4	75BB	1975	4		
2	2	4	76BN	1976	15		
2	2	4	77AB	1977	1	22	
3	3	7	62AK	1962	6	3	
3	3	7	77AB	1977		10	
5	5	11	65AM	1965	2	4	
6	6	12	61AJ	1961	5		
7	7	14	61AK	1961	4		
7	7	14	62AK	1962	2		
7	7	14	65AM	1965	2	4	

(CONTINUED)

* SOME DATA POINTS OMITTED FROM PLOT

AG[47] (CONTINUED)

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
7	7	14	75CG	1975	8	1	
8	8	16	61AJ	1961	1		
8	8	16	65AD	1965	5	9	
8	8	16	66AP	1966	2	5	
8	8	16	68AI	1968	1	5	
8	8	16	72AD	1972	1	9	
9	9	19	76AP	1976	3	8	
N	10	20	61AK	1961	6		
M	12	24	76AP	1976	4	9	
A	13	27	76AP	1976	3	8	
S	16	32	66AP	1966	1*	1	
S	16	32	76AP	1976	4	4	
C	17	40	65AD	1965	7	6	
C	17	35	72AD	1972	4	9	
C	17	35	76AP	1976	4	9	
B	35	80	66AU	1966	9	12	
I	53	127	66AU	1966	13	7	
I	53	127	67AH	1967		8	
T	73	181	69AS	1969	4		
U	92	238	72AT	1972	9		

CD[48] ←→TARGET ←→ CD[48]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	28AA	1928		1	

IN[49] ←→TARGET ←→ IN[49]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	68BQ	1968	2	10	
2	2	4	69AH	1969	13		

SN[50] ←→TARGET ←→ SN[50]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	55AE	1955	9	10	
1	1	1	72AU	1972	1		
1	1	1	74AB	1974			1
1	1	1	77CR	1977			1
2	2	4	28AA	1928		1	
2	2	4	65BD	1965			1
2	2	4	69AH	1969	15		

SB[51] ←→TARGET ←→ SB[51]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	55AE	1955	9	10	
1	1	1	76CA	1976	2		
2	2	4	73BB	1973	13	1	
2	2	4	73AI	1973	1	1	
7	7	14	74AF	1974	4*	1*	

TE[52] ←→TARGET ←→ TE[52]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	73BB	1973	13	1	
2	2	4	73AI	1973	1	1	

I[53] •-•-•TARGET•-•-• I[53]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	72AP	1972	13	1	

XE[54] •-•-•TARGET•-•-• XE[54]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AK	1953	8	2	
1	1	1	54AC	1954	7	7	
1	1	1	55AC	1955		1	
1	1	3	63AC	1963	8	7	
1	1	1	77AQ	1977	6	5	
2	2	4	71BK	1971	13	1	
2	2	4	77AC	1977	7		
2	2	4	77CP	1977	7	14	

CS[55] •-•-•TARGET•-•-• CS[55]

*** NO EXPERIMENTAL DATA ***

BA[56] •-•-•TARGET•-•-• BA[56]

*** NO EXPERIMENTAL DATA ***

LA[57] •-•-•TARGET•-•-• LA[57]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	73BB	1973	13	1	

CE[58] •-•-•TARGET•-•-• CE[58]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	72AZ	1972		*	

PR[59] •-•-•TARGET•-•-• PR[59]

*** NO EXPERIMENTAL DATA ***

ND[60] •-•-•TARGET•-•-• ND[60]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
K	36	84	76BM	1976		7	
N	60	142	76BM	1976	3	7	

PM[61] •-•-•TARGET•-•-• PM[61]

*** NO EXPERIMENTAL DATA ***

SM[62] •-•-•TARGET•-•-• SM[62]

*** NO EXPERIMENTAL DATA ***

EU[63] •-•-•TARGET•-•-• EU[63]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	73BD	1973	4	1	

GD[64] •-•-•TARGET•-•-• GD[64]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	69AX	1969		12	16
2	2	4	73AI	1973	1	1	

TB[65] •-•-•TARGET•-•-• TB[65]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	68AL	1968			*

DY[66] •-•-•TARGET•-•-• DY[66]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	73BB	1973	13	1	
K	36	84	76BM	1976		7	
D	66	163	76BM	1976	3	6	

HO[67] •-•-•TARGET•-•-• HO[67]

*** NO EXPERIMENTAL DATA ***

ER[68] •-•-•TARGET•-•-• ER[68]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	76AE	1976	3	5	
2	2	4	76AE	1976	12	3	
K	36	84	76BM	1976		7	
E	68	167	76BM	1976	3	6	

TM[69] •-•-•TARGET•-•-• TM[69]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	68AL	1968			1

YB[70] •-•-•TARGET•-•-• YB[70]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	72AZ	1972		*	

LU[71] •-•-•TARGET•-•-• LU[71]

*** NO EXPERIMENTAL DATA ***

HF[72] •-•-•TARGET•-•-• HF[72]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	73AI	1973	1	1	

TA[73] •-•-•TARGET•-•-• TA[73]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	56AA	1956	4	1	
1	1	1	69AX	1969		12	16
1	1	1	72BC	1972	2	5	
1	1	1	72AZ	1972		3*	1
1	1	1	74AB	1974			1
1	1	1	77CR	1977			1
2	2	4	71AJ	1971			1
2	2	4	73BB	1973	13	1	
2	2	4	73CS	1973			1
2	2	4	73BC	1973	2	2	
2	2	4	73AI	1973	1	1	
2	2	4	75CF	1975			1
2	2	4	75CH	1975		1	
2	2	4	75BB	1975	4		

* SOME DATA POINTS OMITTED FROM PLOT

V[74] ←→TARGET ←→ V[74]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	72AZ	1972		6	1
1	1	1	72BC	1972	2	5	
2	2	4	72AZ	1972	3	15	3*
2	2	4	73AI	1973	1	1	
2	2	4	73BB	1973	13	1	
2	2	4	74AE	1974	12		
2	2	4	75BB	1975	4		
7	7	14	75CG	1975	10	1	

RE[75] ←→TARGET ←→ RE[75]

*** NO EXPERIMENTAL DATA ***

OS[76] ←→TARGET ←→ OS[76]

*** NO EXPERIMENTAL DATA ***

IR[77] ←→TARGET ←→ IR[77]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	73AI	1973	1	1	

PT[78] ←→TARGET ←→ PT[78]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	67AC	1967		12	16
1	1	1	71AI	1971			1
1	1	2	71AI	1971			1
1	1	1	77CR	1977			1
2	2	4	28AA	1928		1	
2	2	4	73AI	1973	1	1	
2	2	4	73BK	1973	25		
2	2	4	76AF	1976	6		
2	2	4	76AF	1976	54		
2	2	4	77BR	1977	9		
2	2	4	77BV	1977	9		

AU[79] ←→TARGET ←→ AU[79]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	48AD	1948	*		
1	1	2	48AD	1948	3*		
1	1	1	49AG	1949	2	3	
1	1	1	49AK	1949	*		
1	1	1	53AI	1953	2	4	
1	1	1	53AH	1953	8*	15	
1	1	1	55AE	1955	9	10	
1	1	1	56AA	1956	8	2	
1	1	1	61AC	1961		25	
1	1	2	61AC	1961		5	
1	1	1	67AC	1967		12	16
1	1	1	67AB	1967	10	59	9
1	1	1	71AI	1971			1
1	1	2	71AI	1971			1
1	1	1	72AU	1972	1		
1	1	1	73BA	1973		12	28
1	1	1	74AB	1974			1
1	1	1	77CR	1977			1
1	1	1	77CJ	1977		2	
1	1	1	77AB	1977	1	22	11
1	1	1	78BF	1978	4	2	
2	2	4	13AB	1913		2	
2	2	4	28AA	1928		1	
2	2	4	48AD	1948	7		
2	2	4	59AJ	1959	3		
2	2	4	61AK	1961	8	1	

(CONTINUED)

* SOME DATA POINTS OMITTED FROM PLOT

AU[79] (CONTINUED)

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	62AO	1962		3	
2	2	4	63AZ	1963		8	
2	2	4	65BD	1965			1
2	2	4	66AX	1966	1	7	
2	2	4	68BL	1968	16*	17	
2	2	4	68AL	1968			1
2	2	4	70AH	1970	5	8	
2	2	4	71AJ	1971			1
2	2	4	72AM	1972	11		
2	2	4	72AD	1972	1	14	
2	2	4	72AD	1972	1	13	
2	2	4	73BB	1973	13	1	
2	2	4	73CS	1973			1
2	2	4	73AI	1973	1	1	
2	2	4	74BS	1974	13	1	
2	2	4	75CF	1975			1
2	2	4	75BG	1975	10		
2	2	4	76AF	1976	22		
2	2	4	77CJ	1977		2	
2	2	4	77BV	1977	3		
2	2	4	77AB	1977		16	
3	3	7	62AK	1962	6	3	
3	3	7	77CJ	1977		2	
3	3	7	77AB	1977		6	
5	5	11	65AM	1965	2	4	
5	5	11	77CJ	1977		2	
6	6	12	61AJ	1961	5		
6	6	12	77CJ	1977		1	
7	7	14	61AK	1961	4		
7	7	14	62AK	1962	1		
7	7	15	63AF	1963	3		
7	7	15	65AW	1965	1		
7	7	14	65AM	1965	2	4	
7	7	14	75CG	1975	10	1	
7	7	14	77CJ	1977		1	
8	8	16	61AJ	1961	1		
8	8	16	65AD	1965	5	9	
8	8	16	66AP	1966	2	5	
8	8	16	68AI	1968	1	5	
8	8	16	72AD	1972	1	9	
8	8	16	74AR	1974	3	9	
8	8	16	75AU	1975	2	4	
8	8	16	77CJ	1977		1	
9	9	19	76AP	1976	3	8	
9	9	19	77CJ	1977		1	
N	10	20	61AK	1961	6		
M	12	24	76AP	1976	4	9	
A	13	27	76AP	1976	3	8	
S	16	32	66AP	1966	*	*	
S	16	32	68AI	1968	2	5	
S	16	32	75AU	1975	2	2	
S	16	32	76AP	1976	4	9	
C	17	40	65AD	1965	7	6	
C	17	35	72AD	1972	4	9	
C	17	35	76AP	1976	4	9	
B	35	80	66AT	1966	9	12	
B	35	80	72AT	1972	19	10	
I	53	127	64BI	1964	8*	4*	
I	53	127	66AU	1966	13	7	
I	53	127	67AH	1967		4*	
I	53	127	70AA	1970	4		
I	53	127	72AT	1972	14	6	
T	73	181	69AS	1969	3*	*	
U	92	238	72AT	1972	7		

HG[80] ←→TARGET ←→ HG[80]

*** NO EXPERIMENTAL DATA ***

TL[81] ←→TARGET ←→ TL[81]

*** NO EXPERIMENTAL DATA ***

PB[82] ←→TARGET ←→ PB[82]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	55AE	1955	9	10	
1	1	1	56AA	1956	4	1	
1	1	1	56AA	1956	8	2	
1	1	1	72AZ	1972		6	1
1	1	1	73BA	1973		12	28
2	2	4	28AA	1928		1	
2	2	4	73AI	1973	1	1	
2	2	4	74AE	1974	11		

BI[83] ←→TARGET ←→ BI[83]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	55AE	1955	9	10	
1	1	1	76CA	1976	2		
2	2	4	74AE	1974	10		

PO[84] ←→TARGET ←→ PO[84]

*** NO EXPERIMENTAL DATA ***

AT[85] ←→TARGET ←→ AT[85]

*** NO EXPERIMENTAL DATA ***

RN[86] ←→TARGET ←→ RN[86]

*** NO EXPERIMENTAL DATA ***

FR[87] ←→TARGET ←→ FR[87]

*** NO EXPERIMENTAL DATA ***

RA[88] ←→TARGET ←→ RA[88]

*** NO EXPERIMENTAL DATA ***

AC[89] ←→TARGET ←→ AC[89]

*** NO EXPERIMENTAL DATA ***

TH[90] ←→TARGET ←→ TH[90]

*** NO EXPERIMENTAL DATA ***

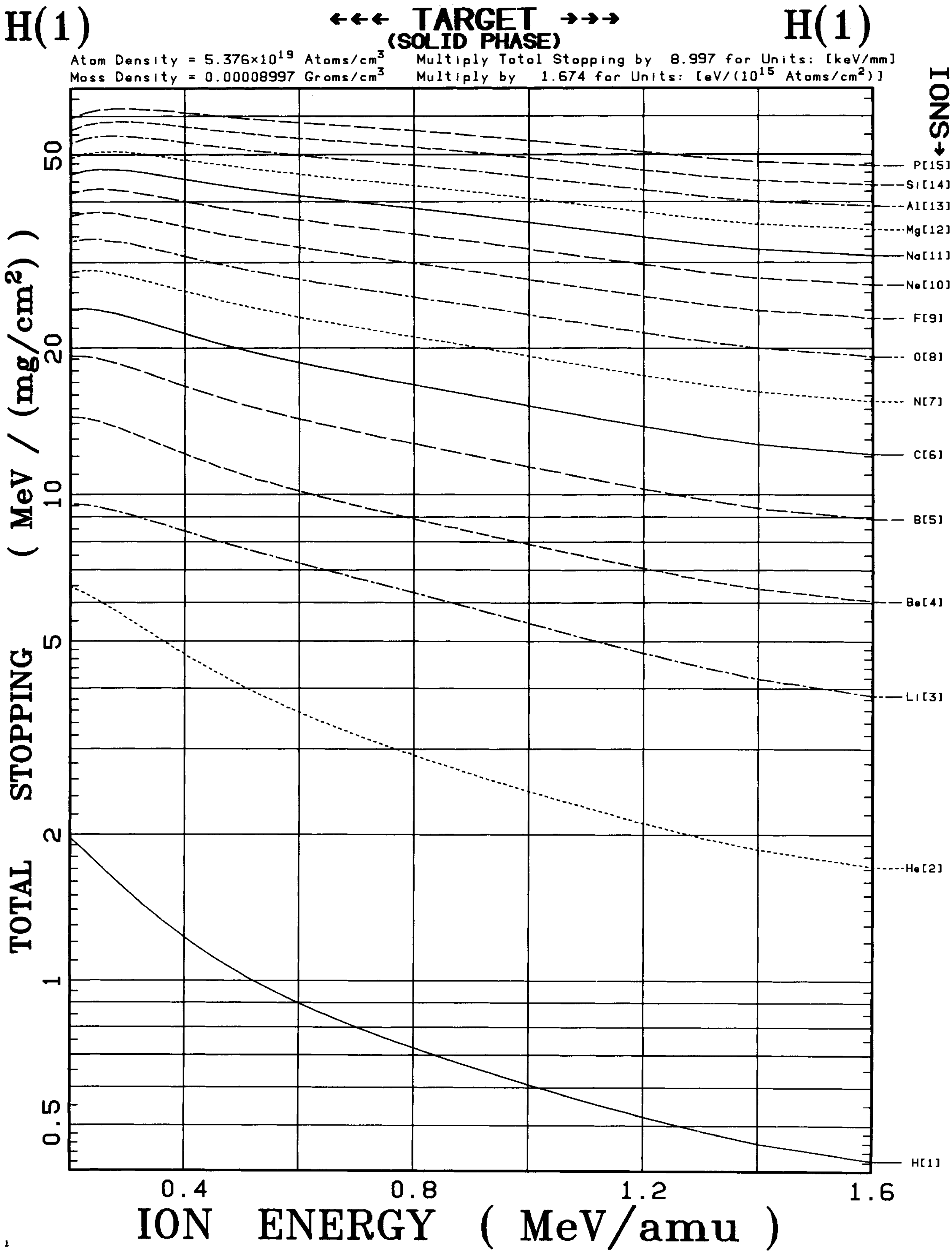
PA[91] ←→TARGET ←→ PA[91]

*** NO EXPERIMENTAL DATA ***

U[92] ←→TARGET ←→ U[92]

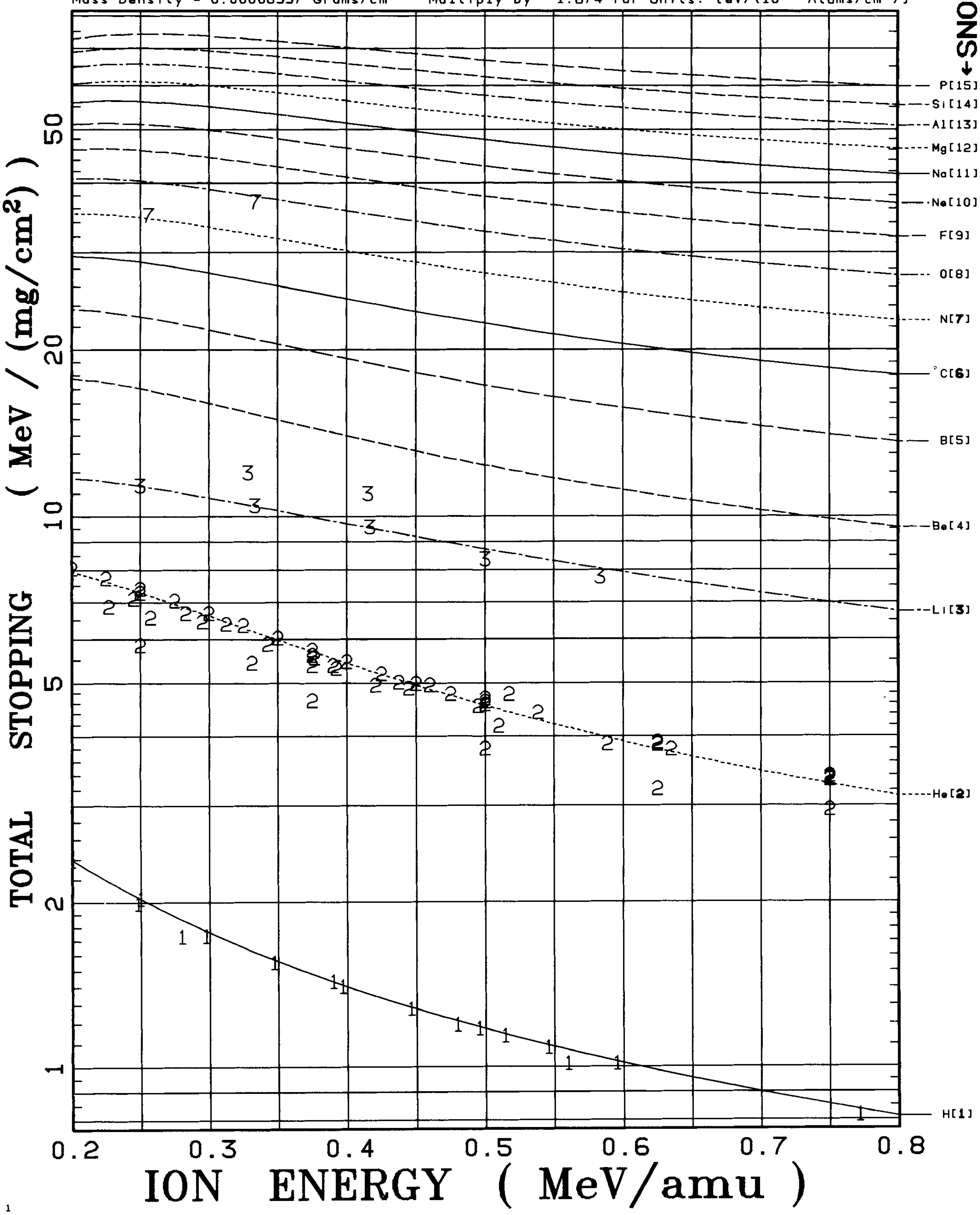
PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	73BA	1973		12	28

* SOME DATA POINTS OMITTED FROM PLOT


H(1)
←←← TARGET →→→
(SOLID PHASE)
H(1)
Atom Density = 5.376×10^19 Atoms/cm^3 Multiply Total Stopping by 8.997 for Units: [keV/mm]
Mass Density = 0.00008997 Grams/cm^3 Multiply by 1.674 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
50
20
10
5
2
1
0.5
TOTAL STOPPING (MeV / (mg/cm²))
0.4
0.8
1.2
1.6
ION ENERGY (MeV/amu)

H(1) ←←← TARGET (GAS PHASE) →→→ H(1)

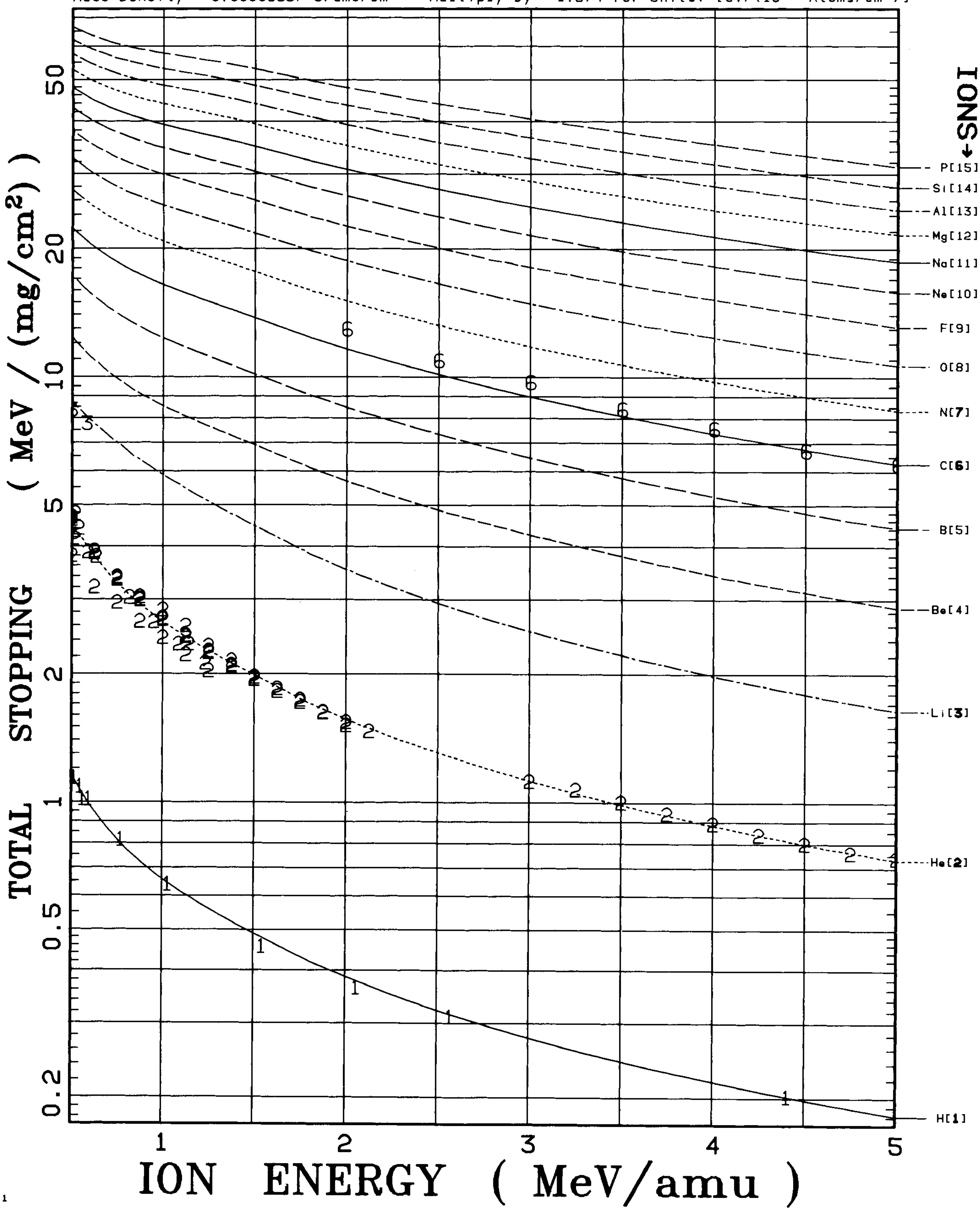
Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 8.997 for Units: [keV/mm]
Mass Density = 0.00008997 Grams/cm^3 Multiply by 1.674 for Units: [eV/(10^{15} Atoms/cm^2)]



1

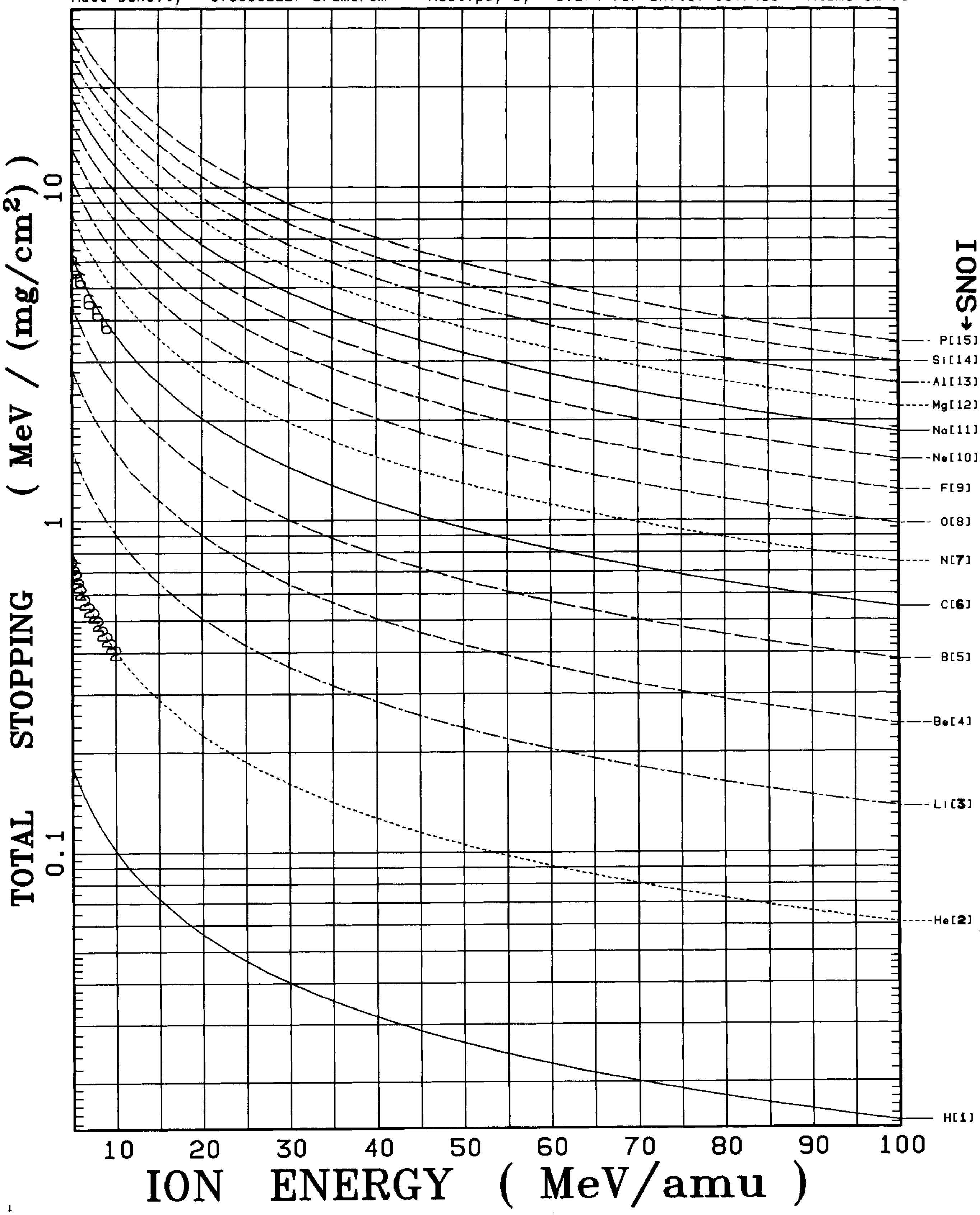
H(1) ←←← TARGET (GAS PHASE) →→→ H(1)

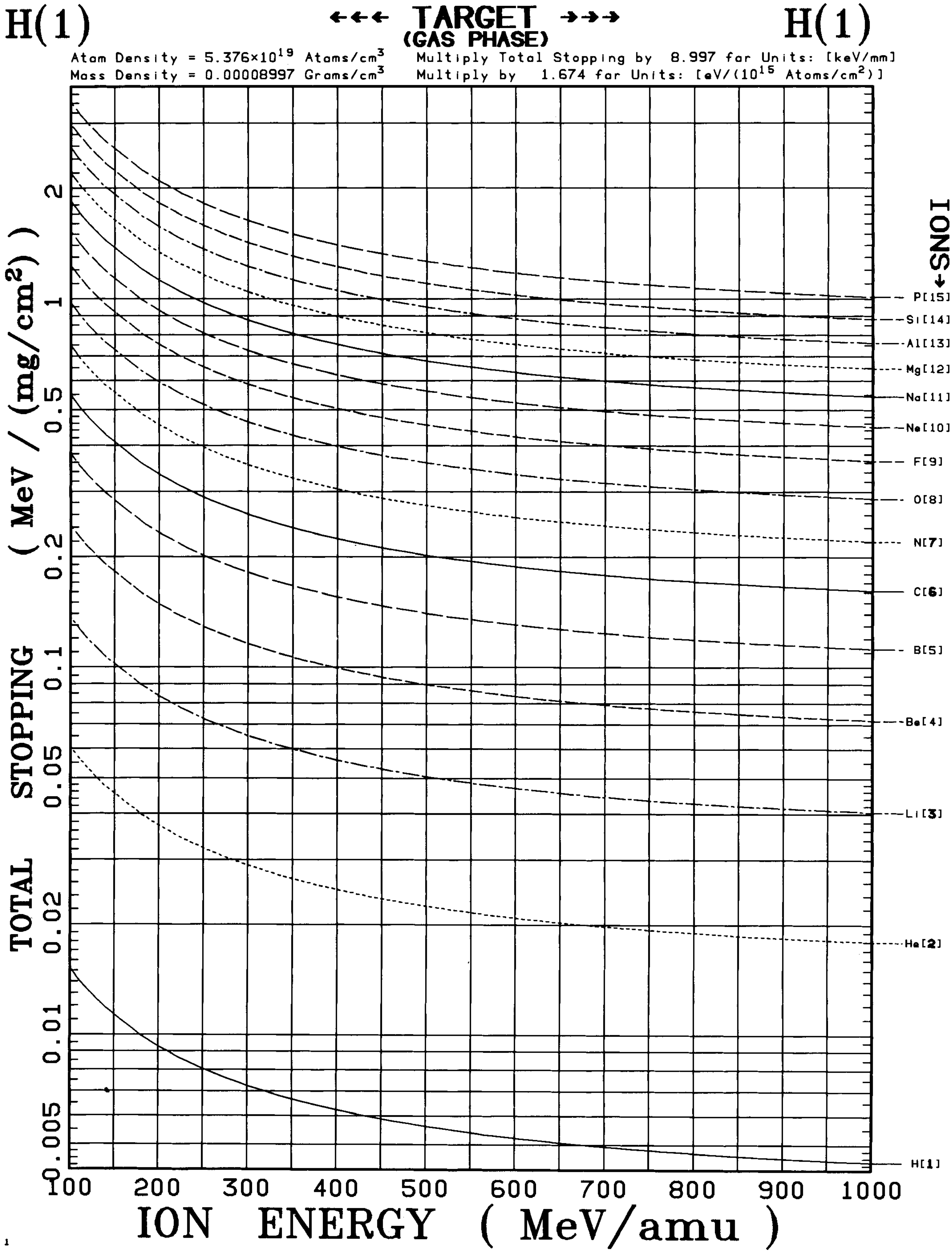
Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 8.997 for Units: [keV/mm]
Mass Density = 0.00008997 Grams/cm^3 Multiply by 1.674 for Units: [eV/(10^{15} Atoms/cm^2)]



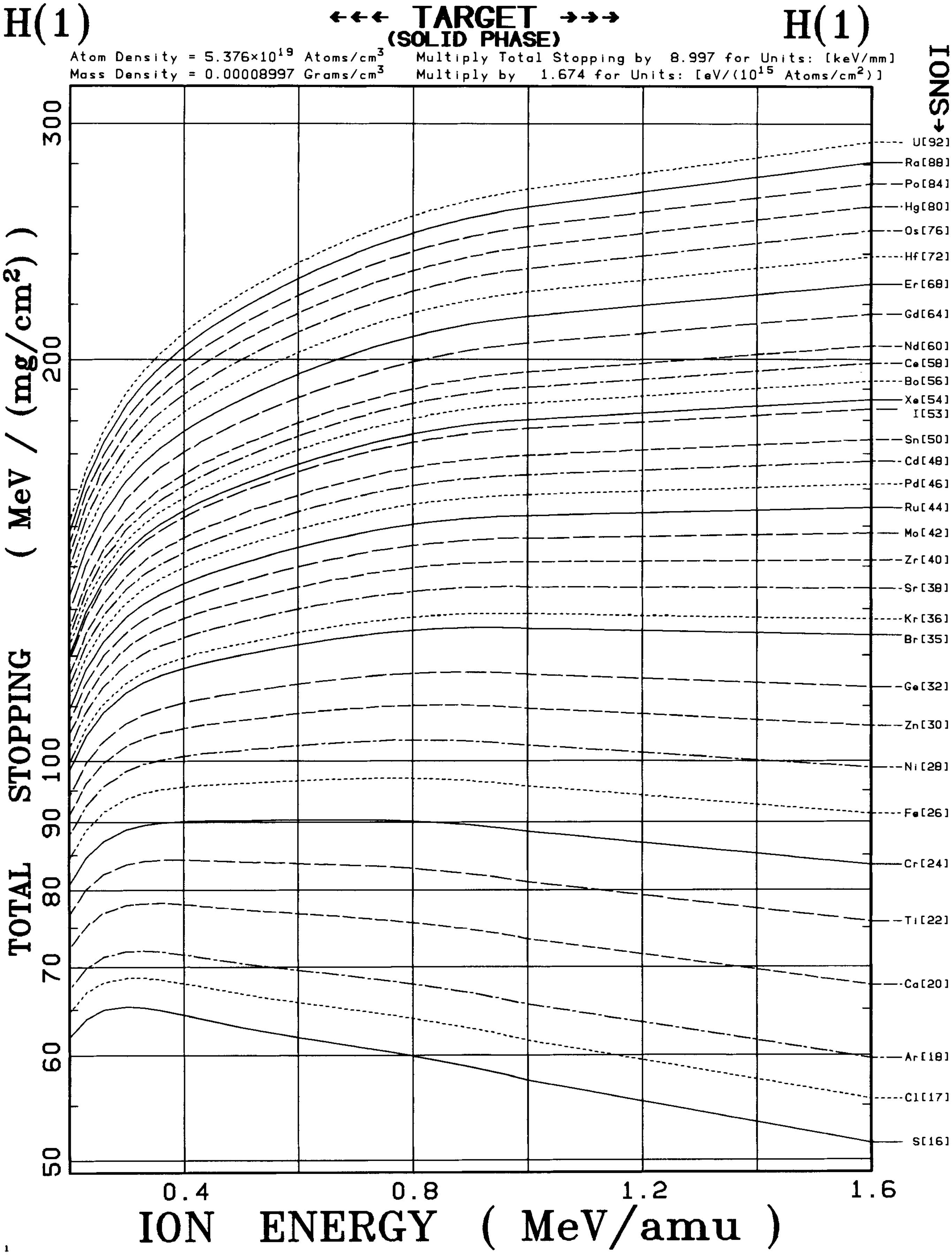
H(1) ←←← TARGET (GAS PHASE) →→→ H(1)

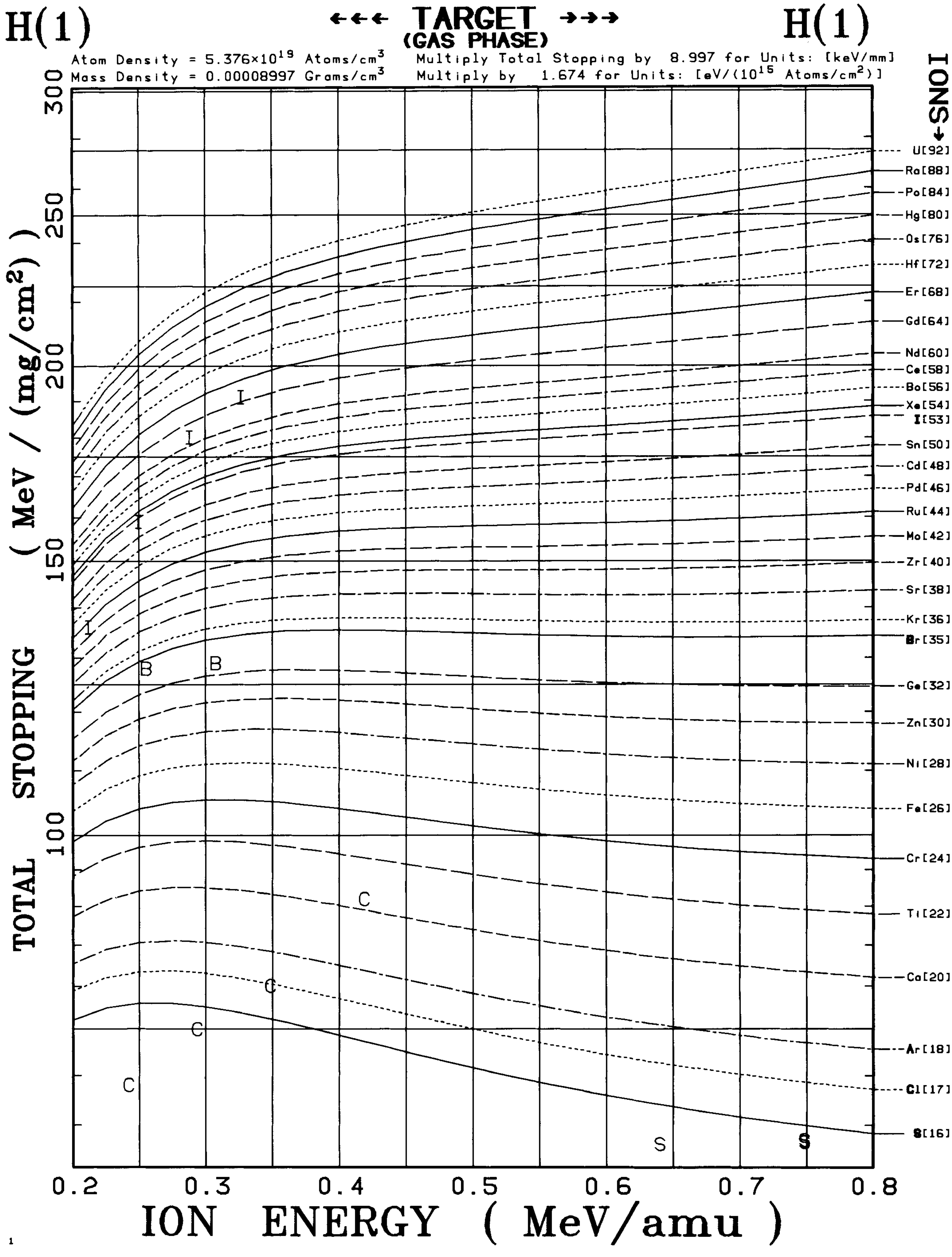
Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 8.997 for Units: [keV/mm]
Mass Density = 0.00008997 Grams/cm^3 Multiply by 1.674 for Units: [eV/(10^{15} Atoms/cm^2)]

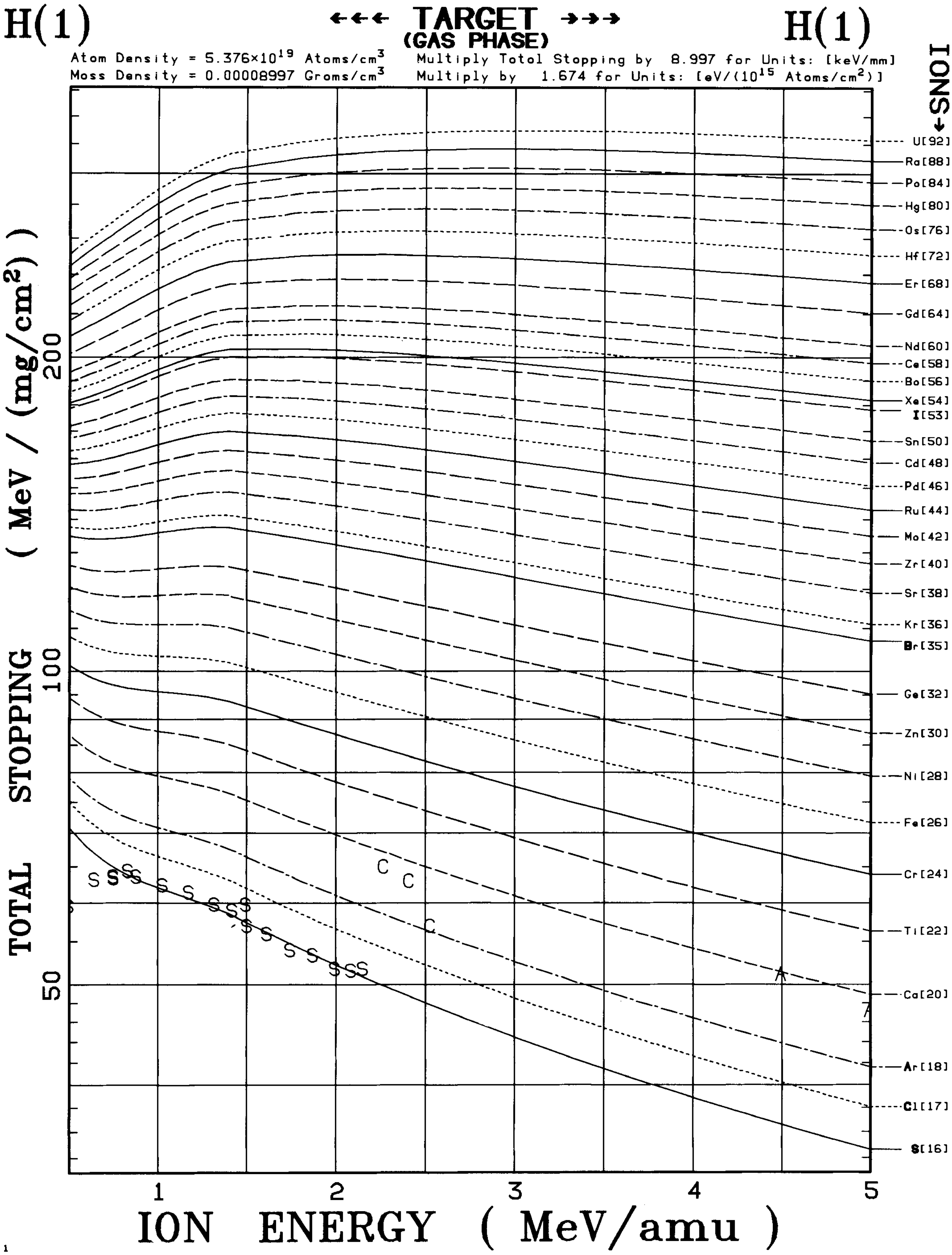



H(1)
←←← TARGET (GAS PHASE) →→→
H(1)
Atom Density = 5.376×10^19 Atoms/cm^3
Multiply Total Stopping by 8.997 for Units: [keV/mm]
Mass Density = 0.00008997 Grams/cm^3
Multiply by 1.674 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
IONS →
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
2
1
0.5
0.2
0.1
0.05
0.02
0.01
0.005
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)

H(1) H(1)

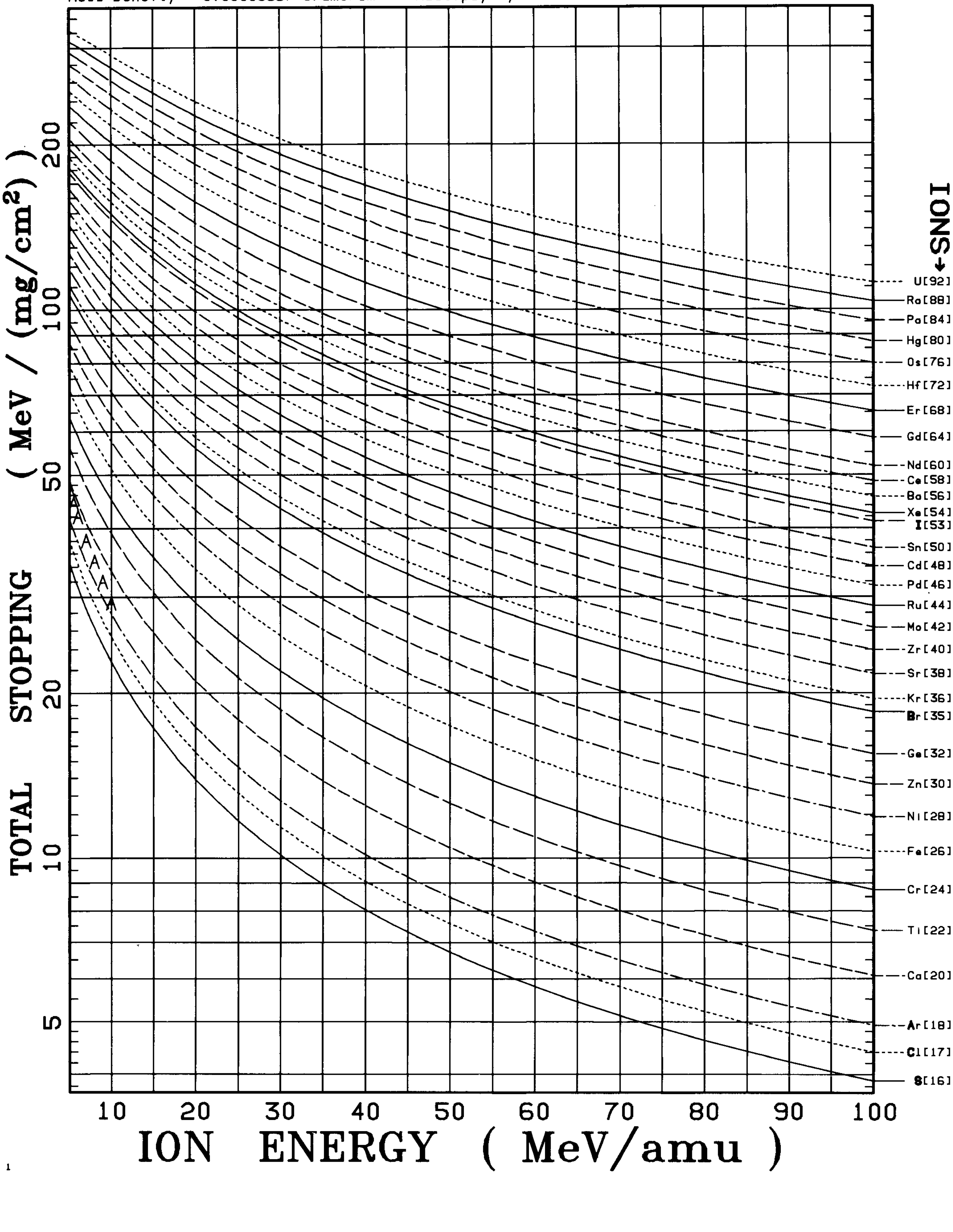

←←← TARGET →→→
(SOLID PHASE)
Atom Density = 5.376×10^19 Atoms/cm^3 Multiply Total Stopping by 8.997 for Units: [keV/mm]
Mass Density = 0.00008997 Grams/cm^3 Multiply by 1.674 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
0.4
0.8
1.2
1.6
50
60
70
80
90
100
200
300
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]


H(1)
←←← TARGET →→→
(GAS PHASE)
H(1)
Atom Density = 5.376×10^19 Atoms/cm^3 Multiply Total Stopping by 8.997 for Units: [keV/mm]
Mass Density = 0.00008997 Grams/cm^3 Multiply by 1.674 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm²))
300
250
200
150
100
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)


H(1)
←←← TARGET →→→
(GAS PHASE)
H(1)
Atom Density = 5.376×10^19 Atoms/cm^3
Mass Density = 0.00008997 Grams/cm^3
Multiply Total Stopping by 8.997 for Units: [keV/mm]
Multiply by 1.674 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm^2))
200
100
50
1
2
3
4
5
ION ENERGY (MeV/amu)

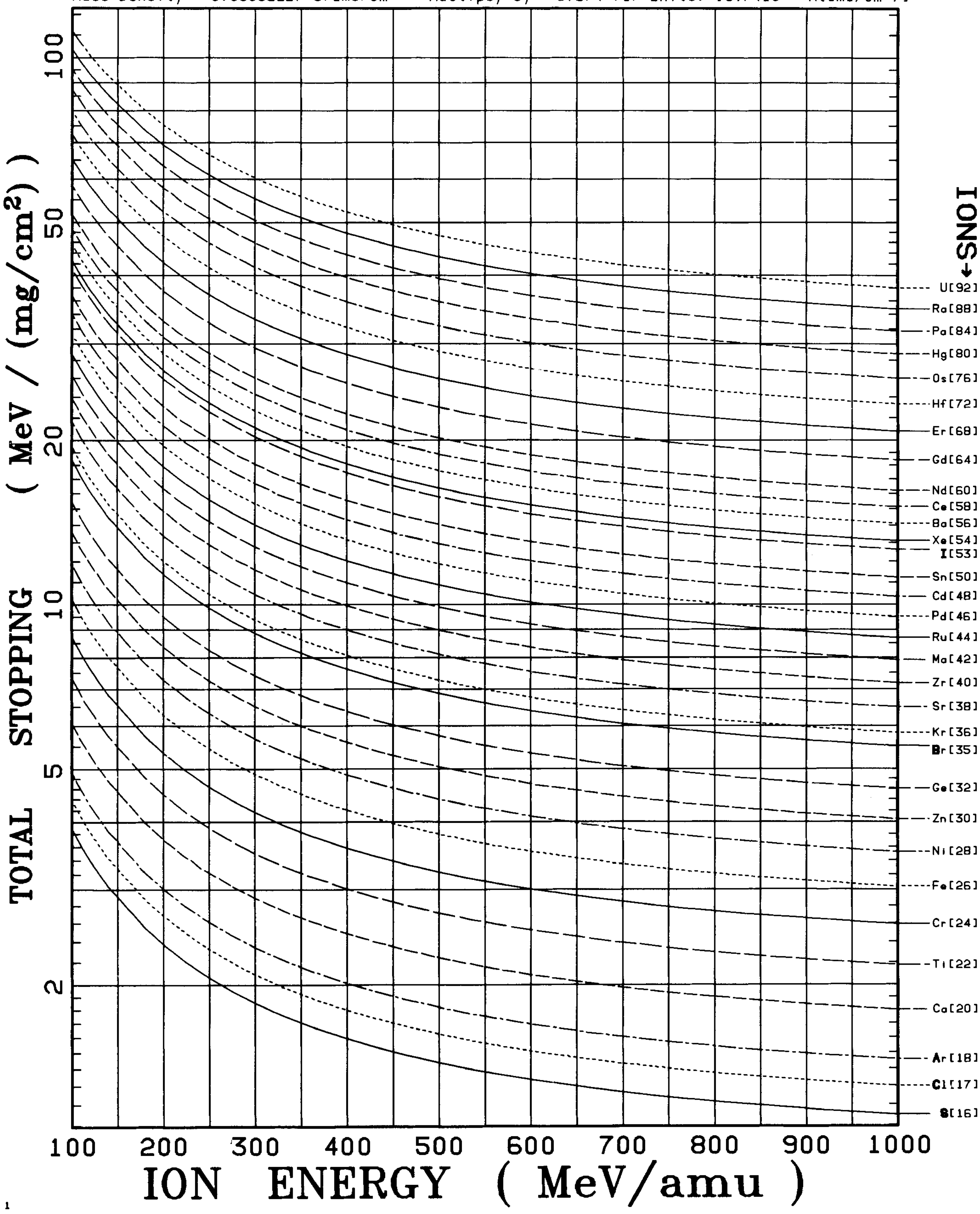
H(1) ←←← TARGET (GAS PHASE) →→→ H(1)

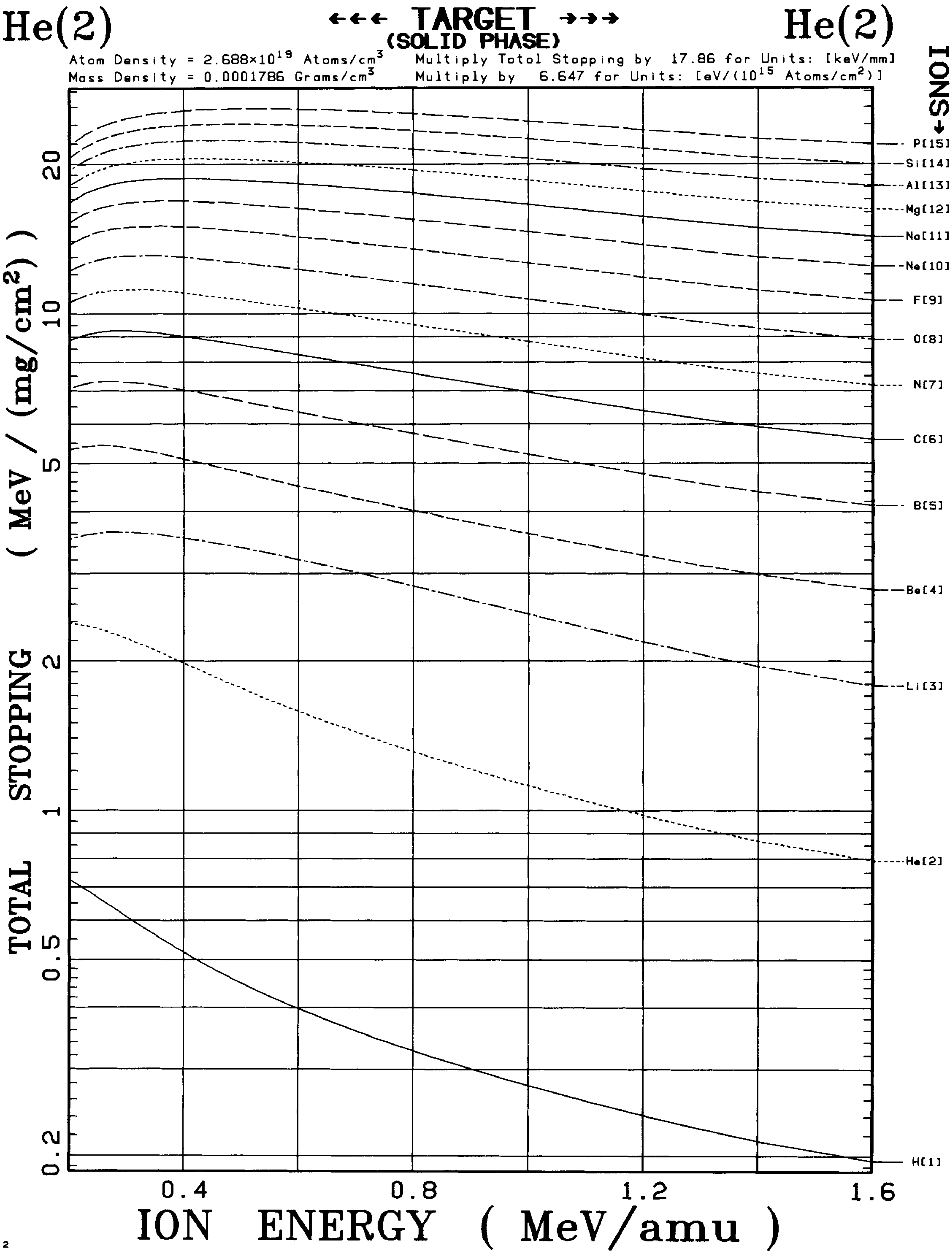
Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 8.997 for Units: [keV/mm]
Mass Density = 0.00008997 Grams/cm^3 Multiply by 1.674 for Units: [eV/(10^{15} Atoms/cm^2)]



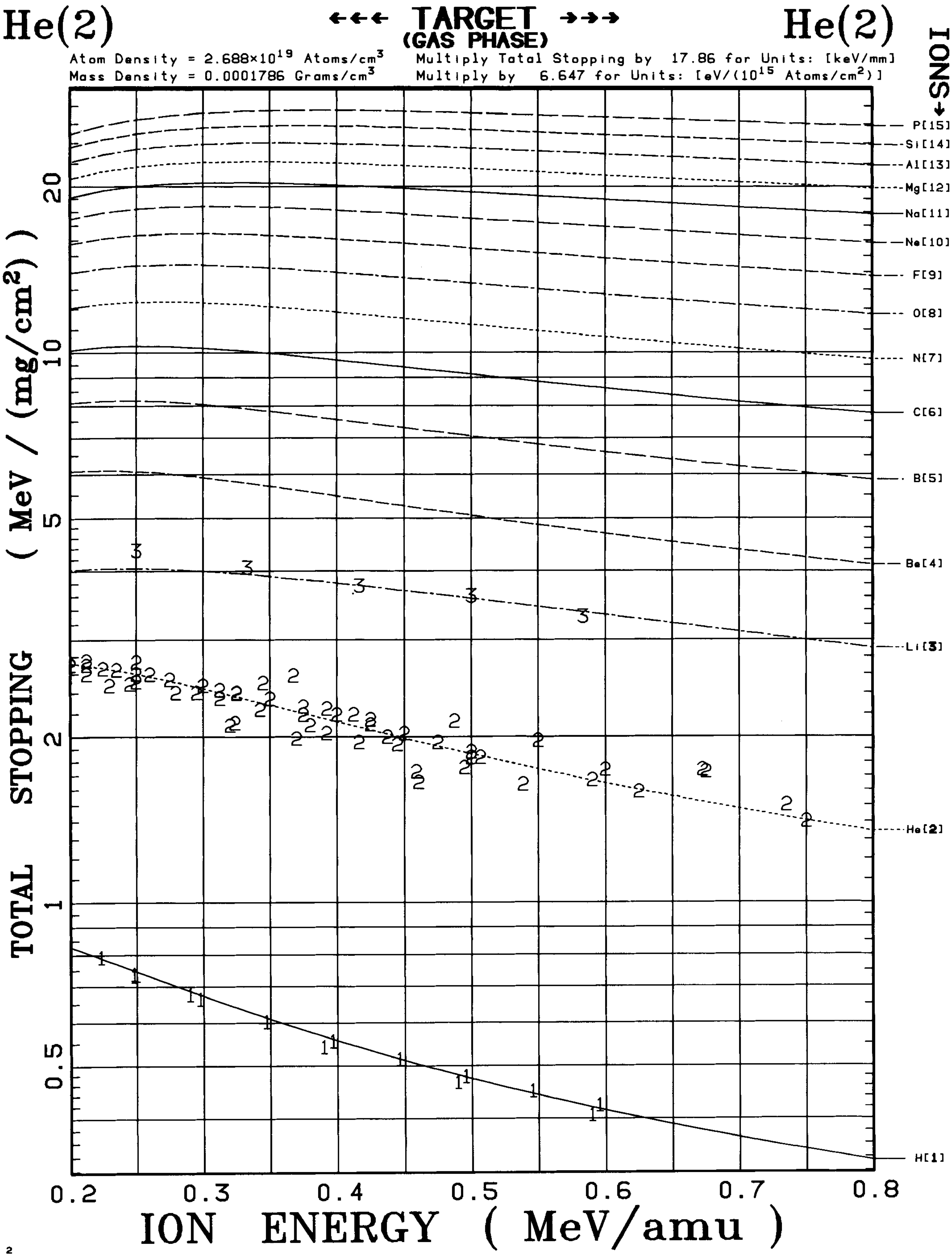
H(1) ←←← TARGET (GAS PHASE) →→→ H(1)

Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 8.997 for Units: [keV/mm]
Mass Density = 0.00008997 Grams/cm^3 Multiply by 1.674 for Units: [eV/(10^{15} Atoms/cm^2)]

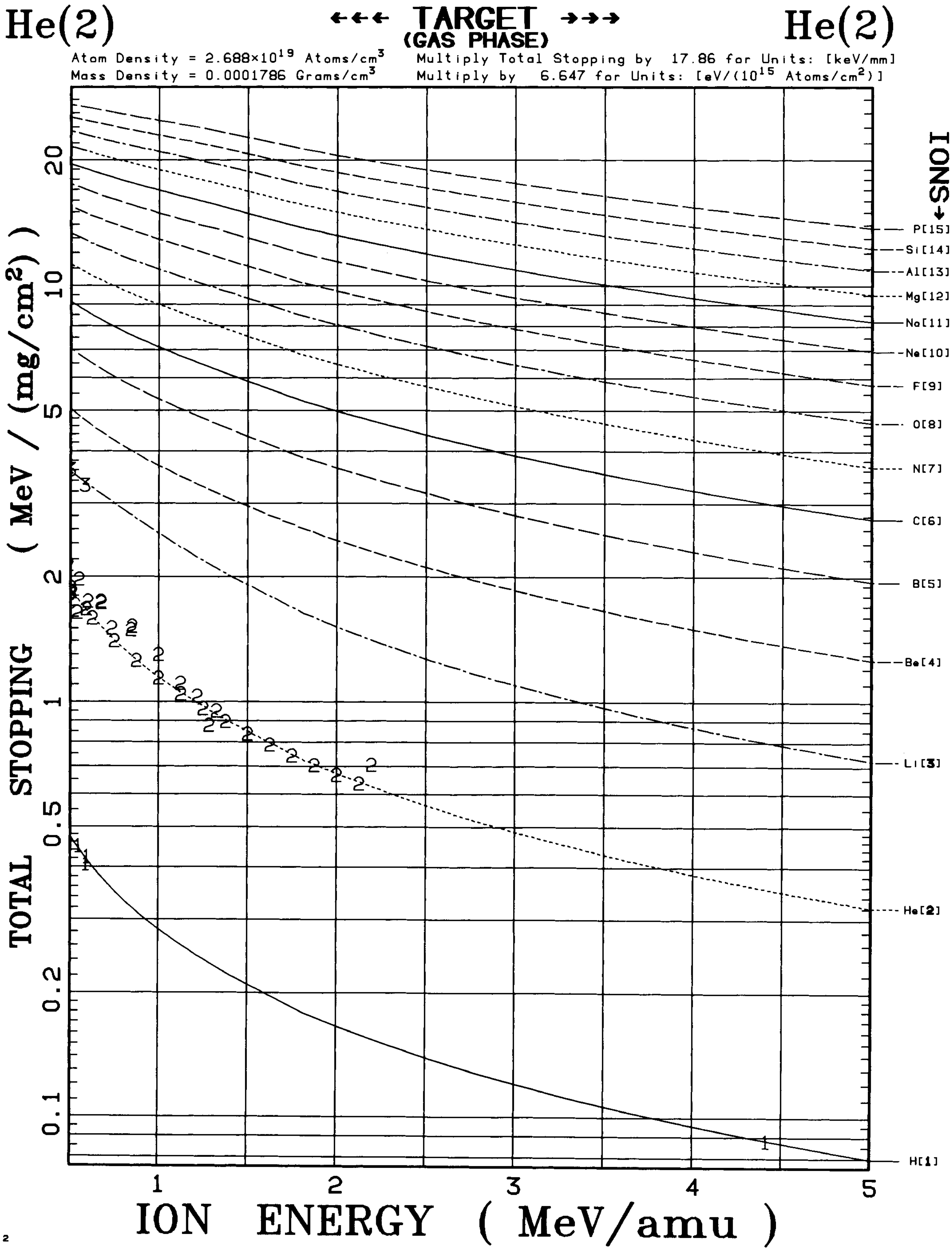


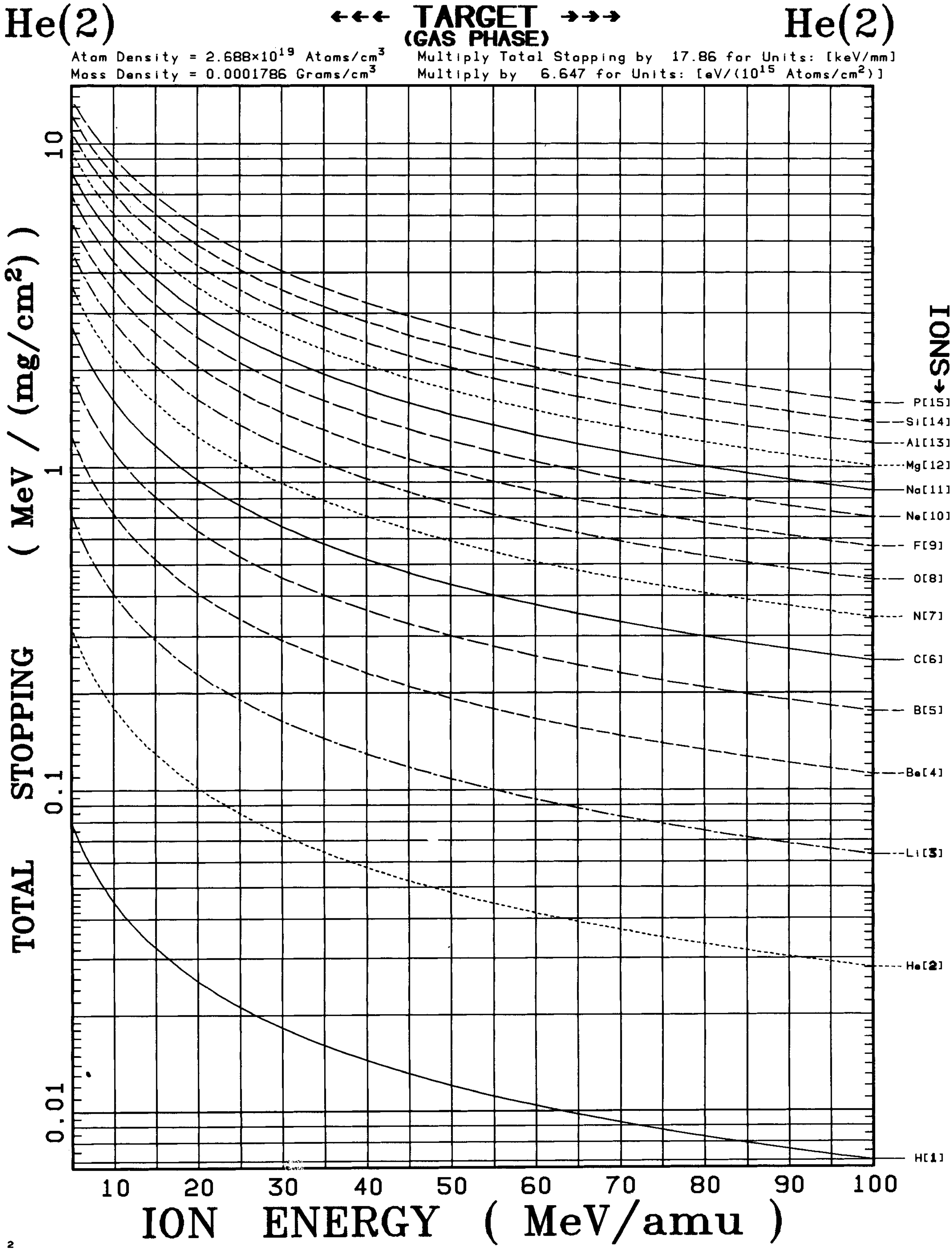

He(2)
←←← TARGET →→→
(SOLID PHASE)
He(2)
Atom Density = 2.688×10^19 Atoms/cm^3
Multiply Total Stopping by 17.86 for Units: [keV/mm]
Mass Density = 0.0001786 Grams/cm^3
Multiply by 6.647 for Units: [eV/(10^15 Atoms/cm^2)]
IONS
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm^2))
20
10
5
2
1
0.5
0.2
0.4
0.8
1.2
1.6
ION ENERGY (MeV/amu)

2

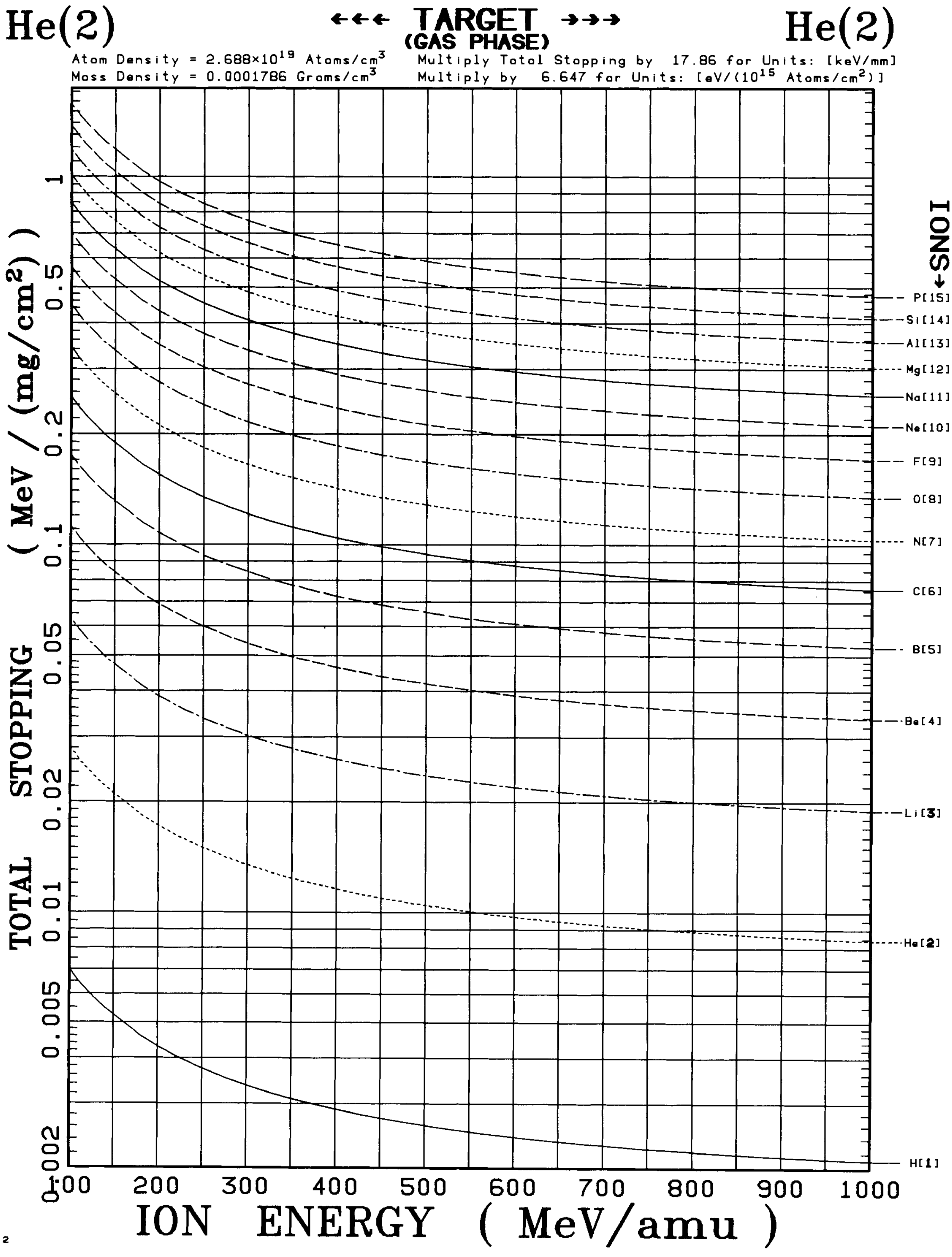

He(2)
←←← TARGET →→→
(GAS PHASE)
He(2)
IONS→
Atom Density = 2.688×10^19 Atoms/cm^3
Mass Density = 0.0001786 Grams/cm^3
Multiply Total Stopping by 17.86 for Units: [keV/mm]
Multiply by 6.647 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.5
1
2
5
10
20
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]

2


He(2)
←←← TARGET →→→
(GAS PHASE)
He(2)
Atom Density = 2.688×10^19 Atoms/cm^3
Multiply Total Stopping by 17.86 for Units: [keV/mm]
Mass Density = 0.0001786 Grams/cm^3
Multiply by 6.647 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]

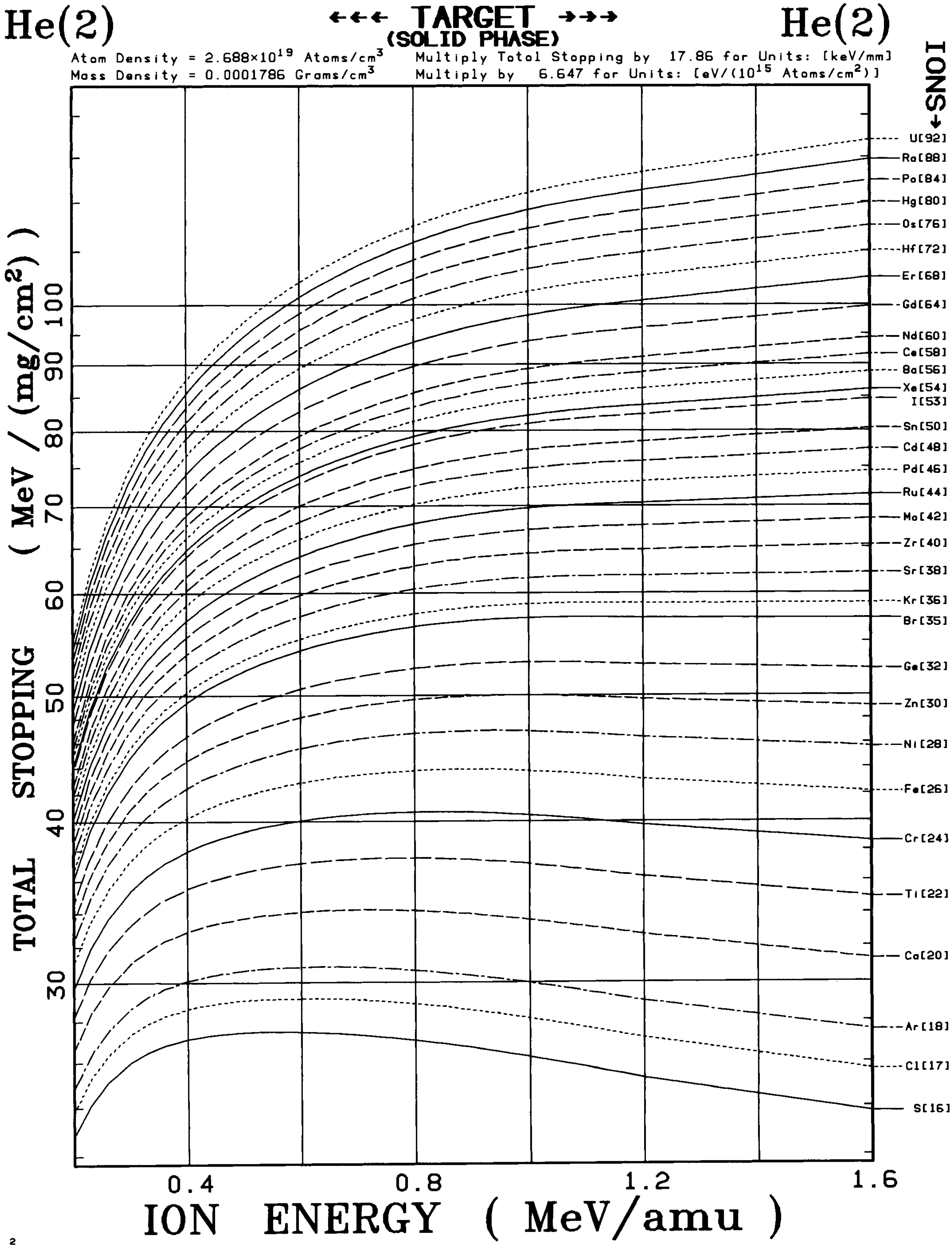

He(2)
←←← TARGET →→→
(GAS PHASE)
He(2)
Atom Density = 2.688×10^19 Atoms/cm^3
Mass Density = 0.0001786 Grams/cm^3
Multiply Total Stopping by 17.86 for Units: [keV/mm]
Multiply by 6.647 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
10
1
0.1
0.01
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
10
20
30
40
50
60
70
80
90
100
ION ENERGY (MeV/amu)

2



He(2)
←←← TARGET →→→
(GAS PHASE)
He(2)
Atom Density = 2.688×10^19 Atoms/cm^3
Mass Density = 0.0001786 Grams/cm^3
Multiply Total Stopping by 17.86 for Units: [keV/mm]
Multiply by 6.647 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]

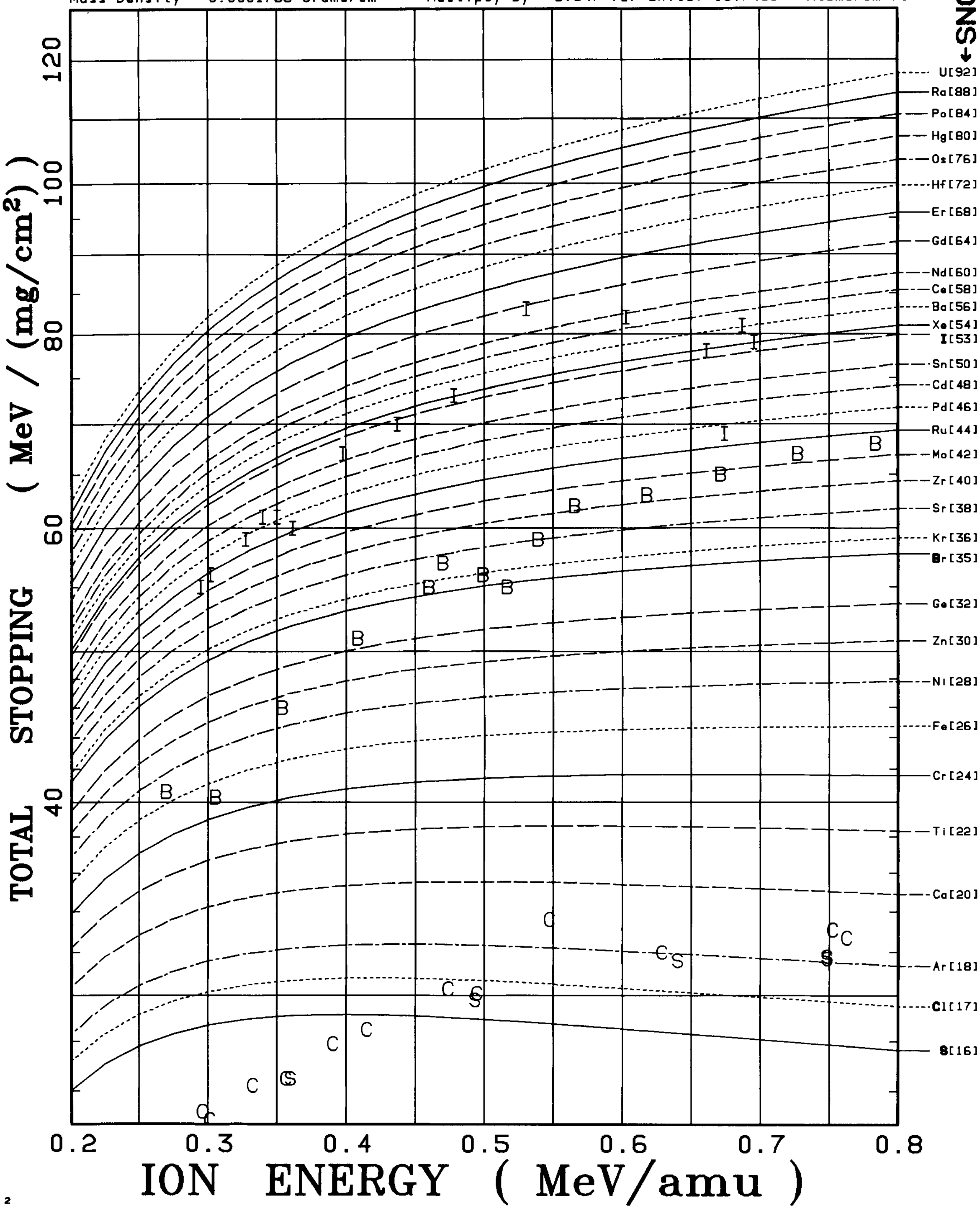
2


He(2)
←←← TARGET →→→
(SOLID PHASE)
He(2)
Atom Density = 2.688×10^19 Atoms/cm^3
Multiply Total Stopping by 17.86 for Units: [keV/mm]
Mass Density = 0.0001786 Grams/cm^3
Multiply by 6.647 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm²))
30
40
50
60
70
80
90
100
0.4
0.8
1.2
1.6
ION ENERGY (MeV/amu)

2

He(2) ←←← TARGET (GAS PHASE) →→→ He(2)

Atom Density = 2.688×10[19] Atoms/cm^3 Multiply Total Stopping by 17.86 for Units: [keV/mm]
Mass Density = 0.0001786 Grams/cm^3 Multiply by 6.647 for Units: [eV/(10^{15} Atoms/cm^2)]

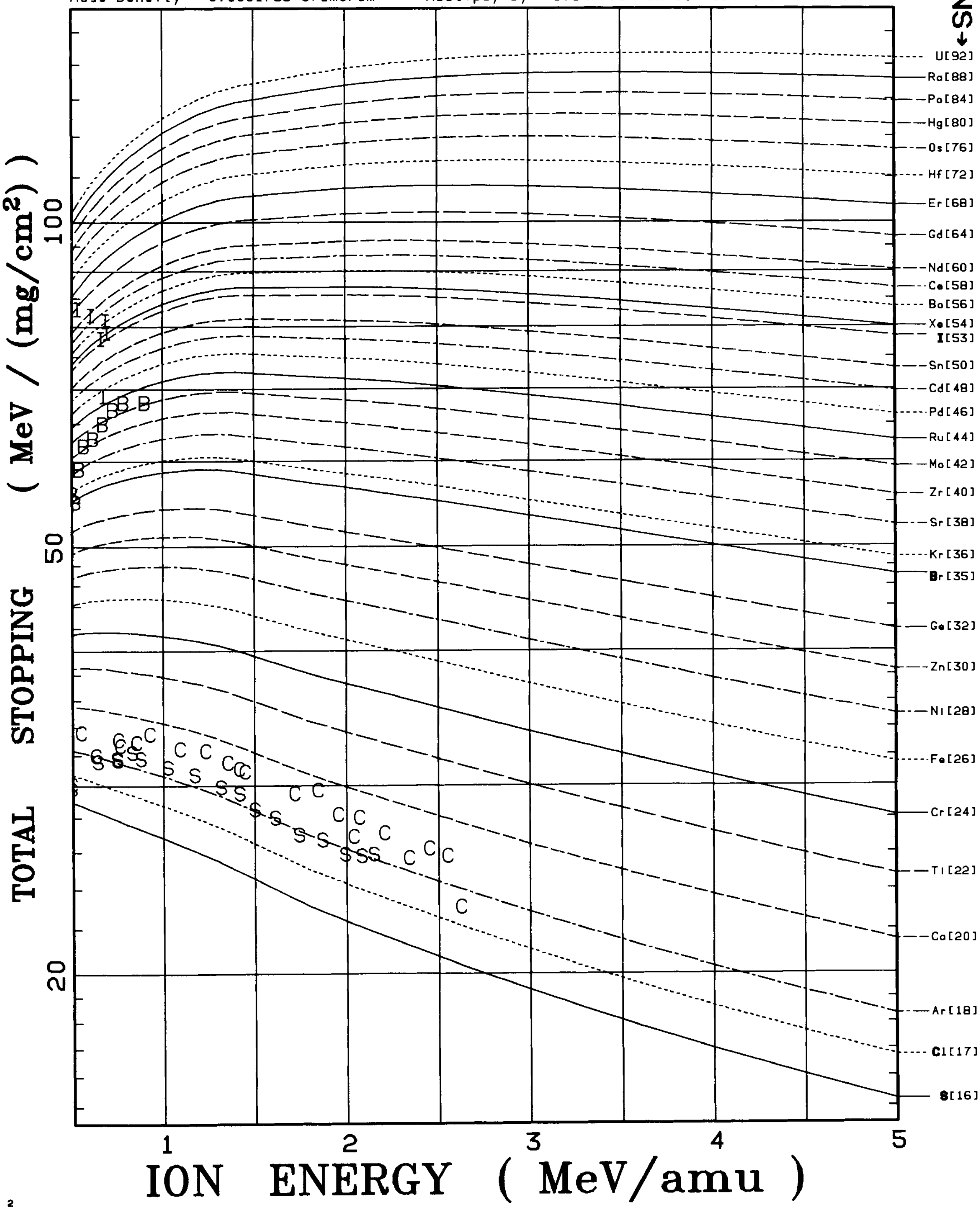


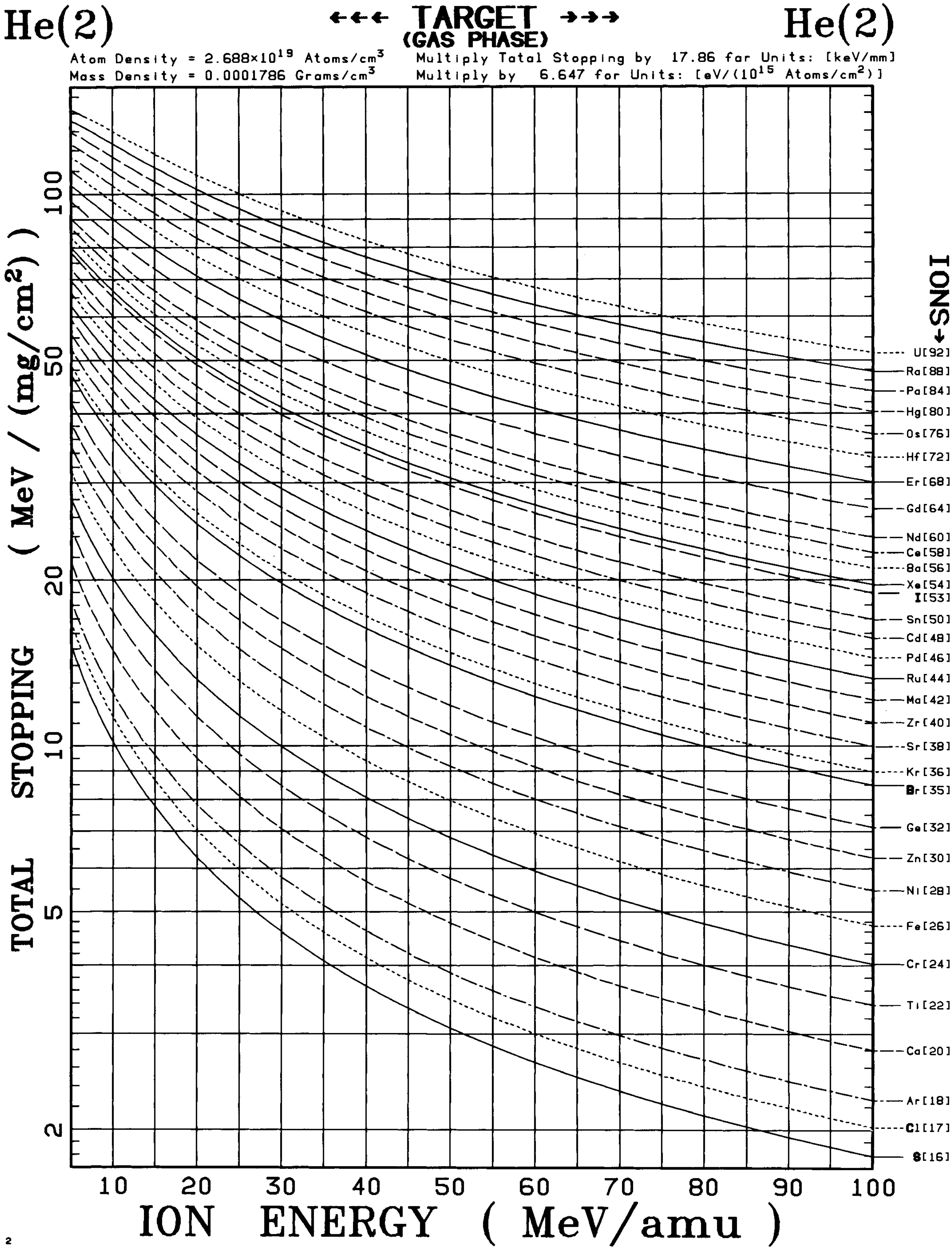
2

He(2) ←←← TARGET (GAS PHASE) →→→ He(2)

Atom Density = 2.688×10^{19} Atoms/cm^3 Multiply Total Stopping by 17.86 for Units: [keV/mm]

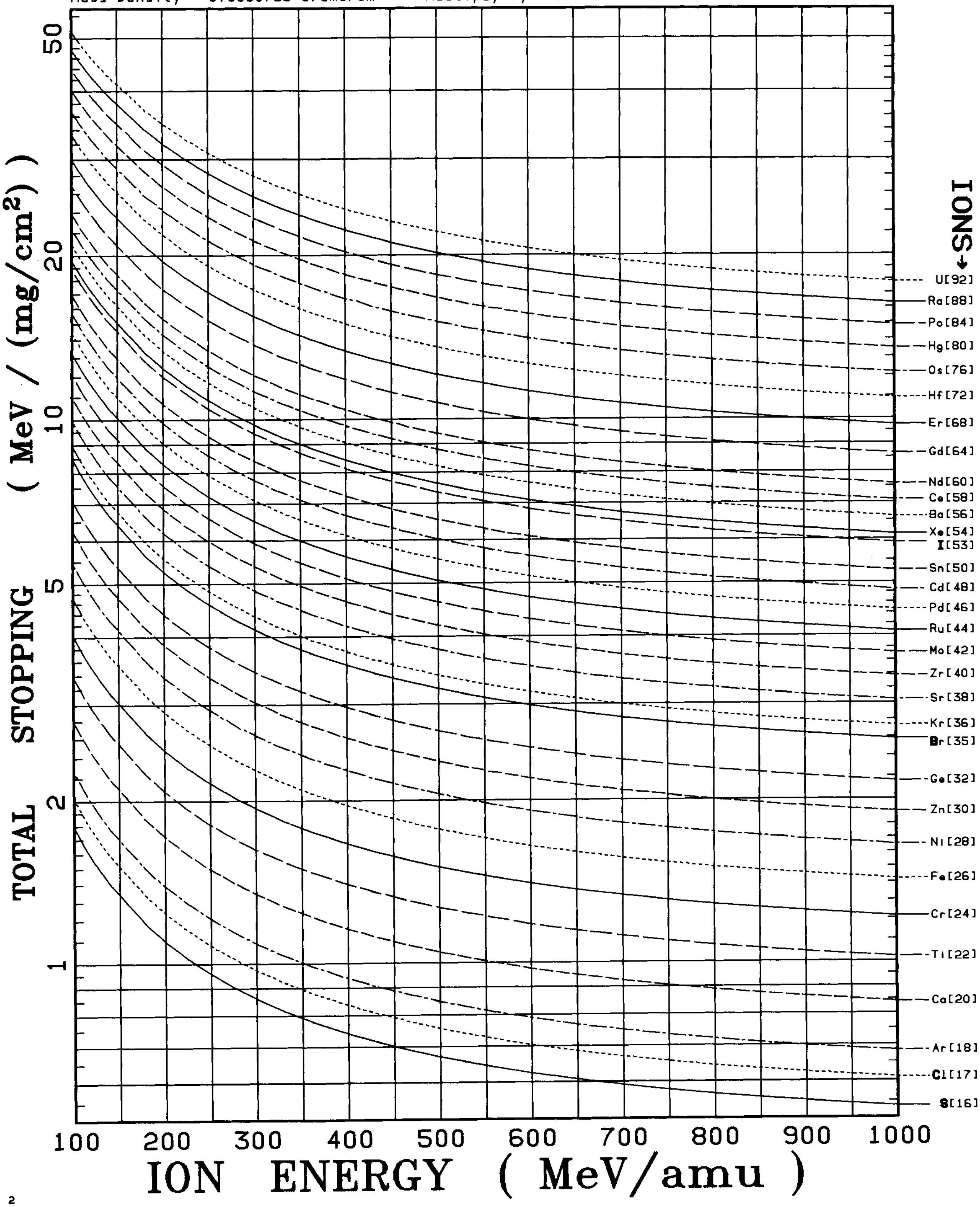
Mass Density = 0.0001786 Grams/cm^3 Multiply by 6.647 for Units: [eV/(10^{15} Atoms/cm^2)]



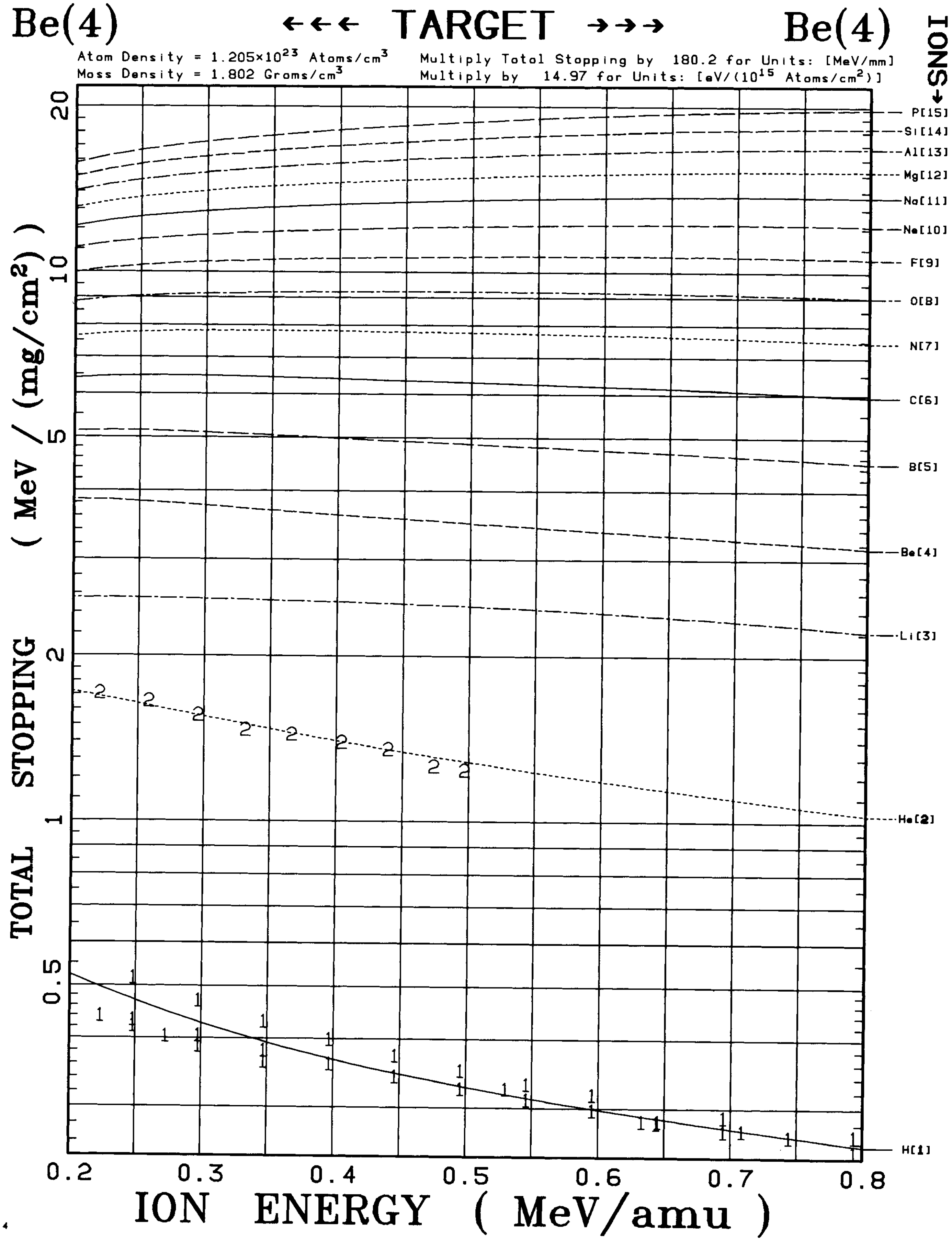

He(2)
←←← TARGET →→→
(GAS PHASE)
He(2)
Atom Density = 2.688×10^19 Atoms/cm^3
Multiply Total Stopping by 17.86 for Units: [keV/mm]
Mass Density = 0.0001786 Grams/cm^3
Multiply by 6.647 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
100
50
20
10
5
2
IONS→
U[92]
Ra[88]
Pa[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
10 20 30 40 50 60 70 80 90 100
ION ENERGY (MeV/amu)

He(2) ←←← TARGET (GAS PHASE) →→→ He(2)

Atom Density = 2.688×10^{19} Atoms/cm^3 Multiply Total Stopping by 17.86 for Units: [keV/mm]
Mass Density = 0.0001786 Grams/cm^3 Multiply by 6.647 for Units: [eV/(10^{15} Atoms/cm^2)]



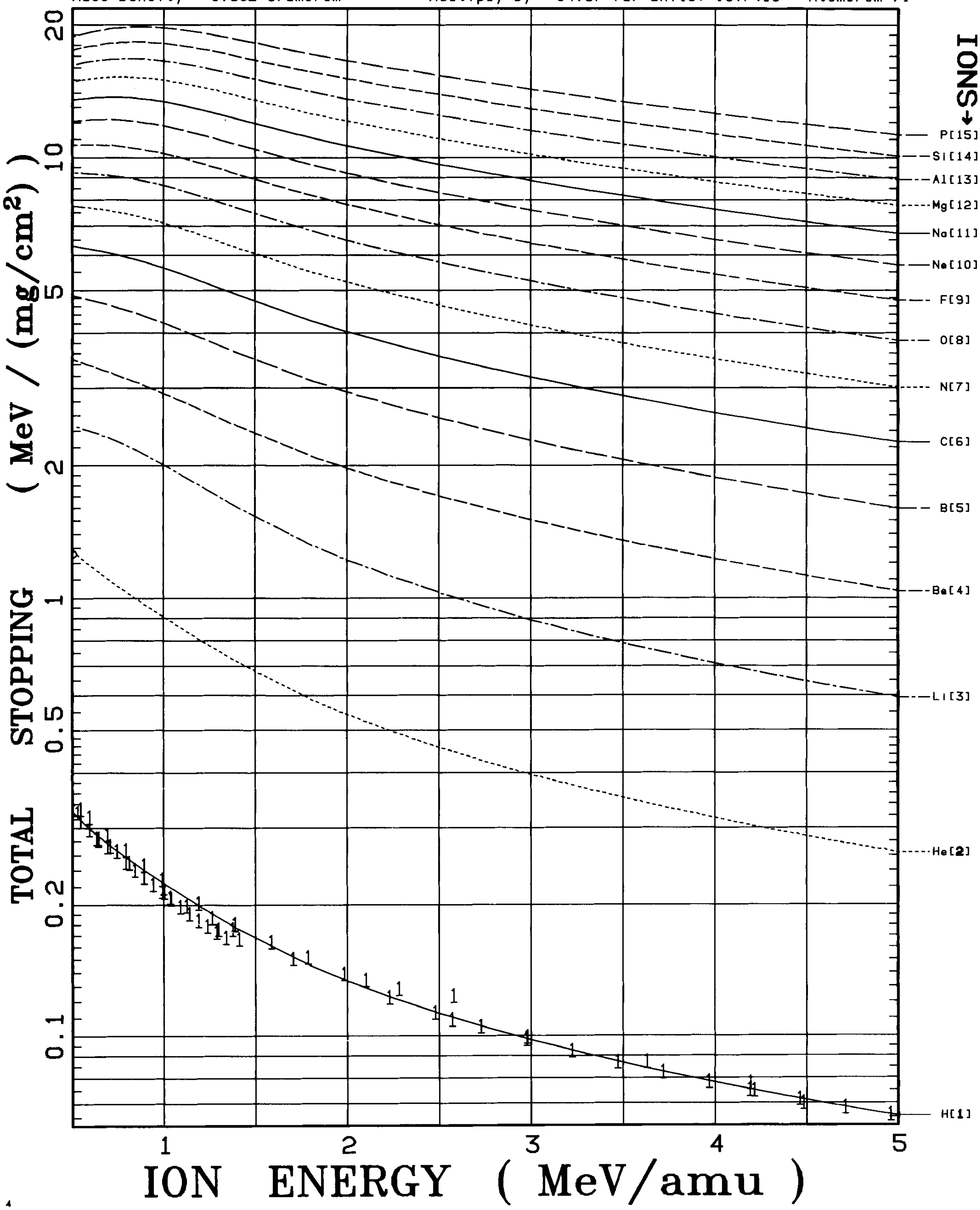
2



Be(4)
←←← TARGET →→→
Be(4)
Atom Density = 1.205×10^23 Atoms/cm^3
Mass Density = 1.802 Grams/cm^3
Multiply Total Stopping by 180.2 for Units: [MeV/mm]
Multiply by 14.97 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
TOTAL STOPPING (MeV / (mg/cm²))
ION ENERGY (MeV/amu)
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.5
1
2
5
10
20

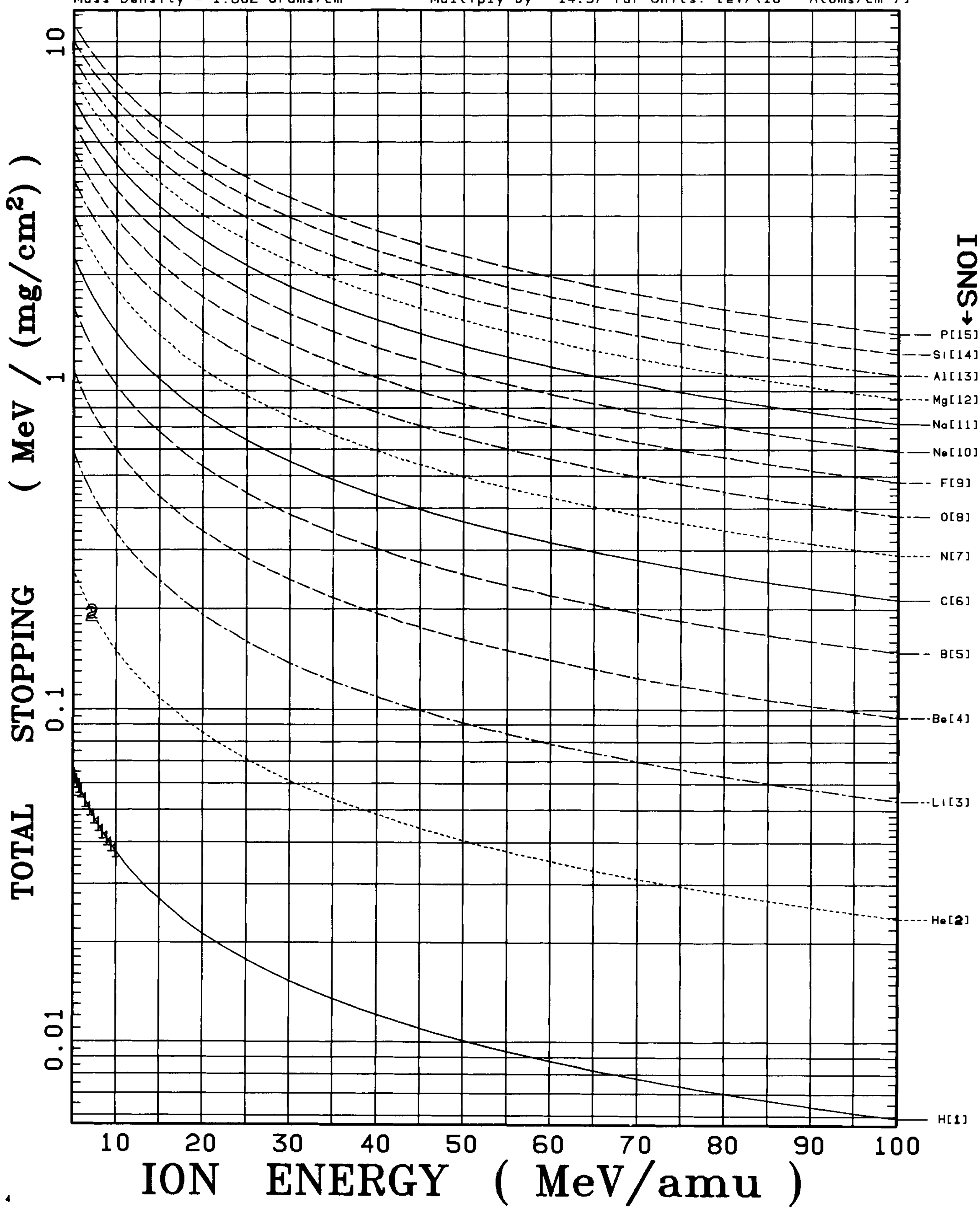
Be(4) ←←← TARGET →→→ Be(4)

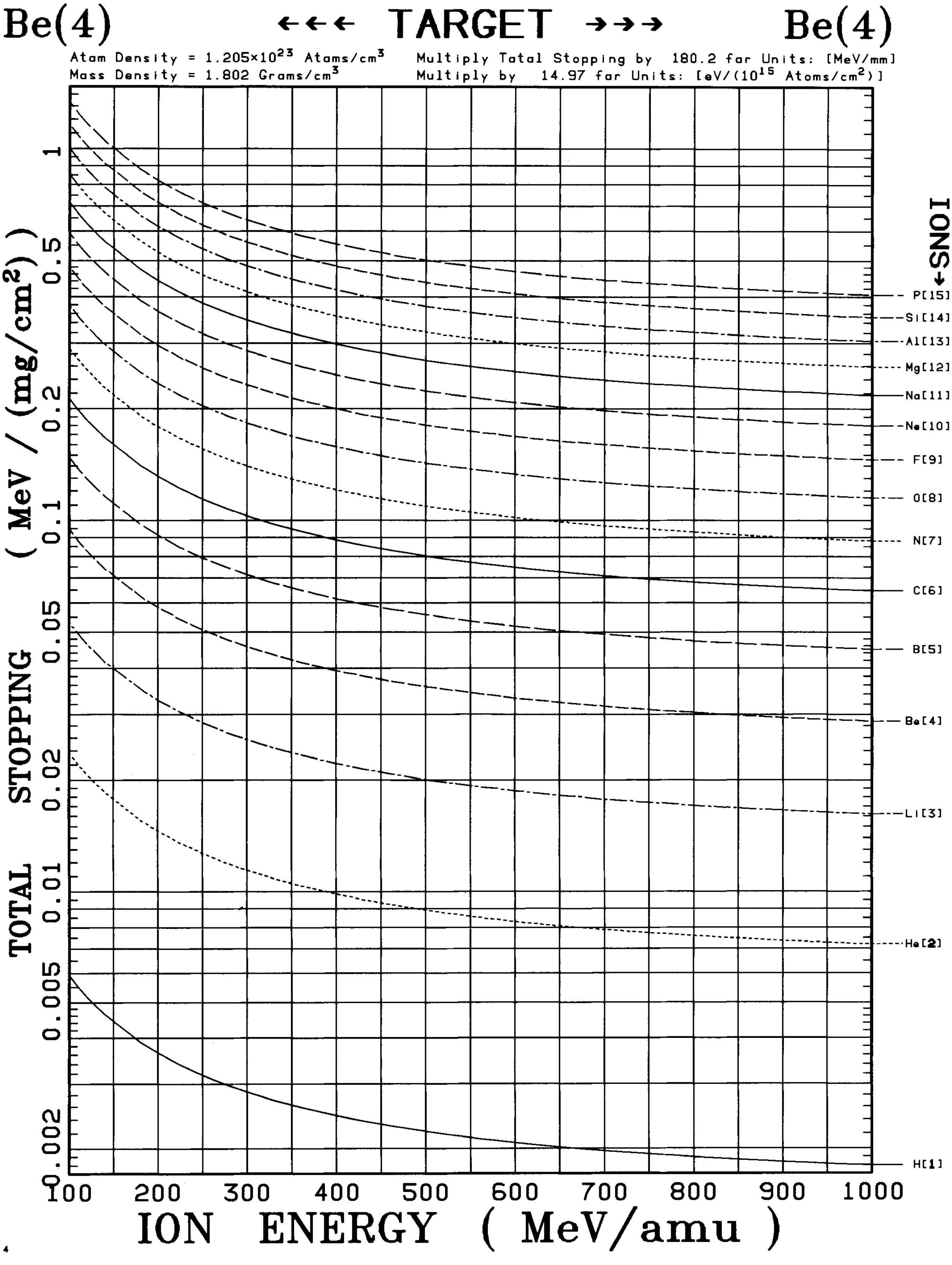
Atom Density = 1.205×10^{23} Atoms/cm^3 Multiply Total Stopping by 180.2 for Units: [MeV/mm]
Mass Density = 1.802 Grams/cm^3 Multiply by 14.97 for Units: [eV/(10^{15} Atoms/cm^2)]

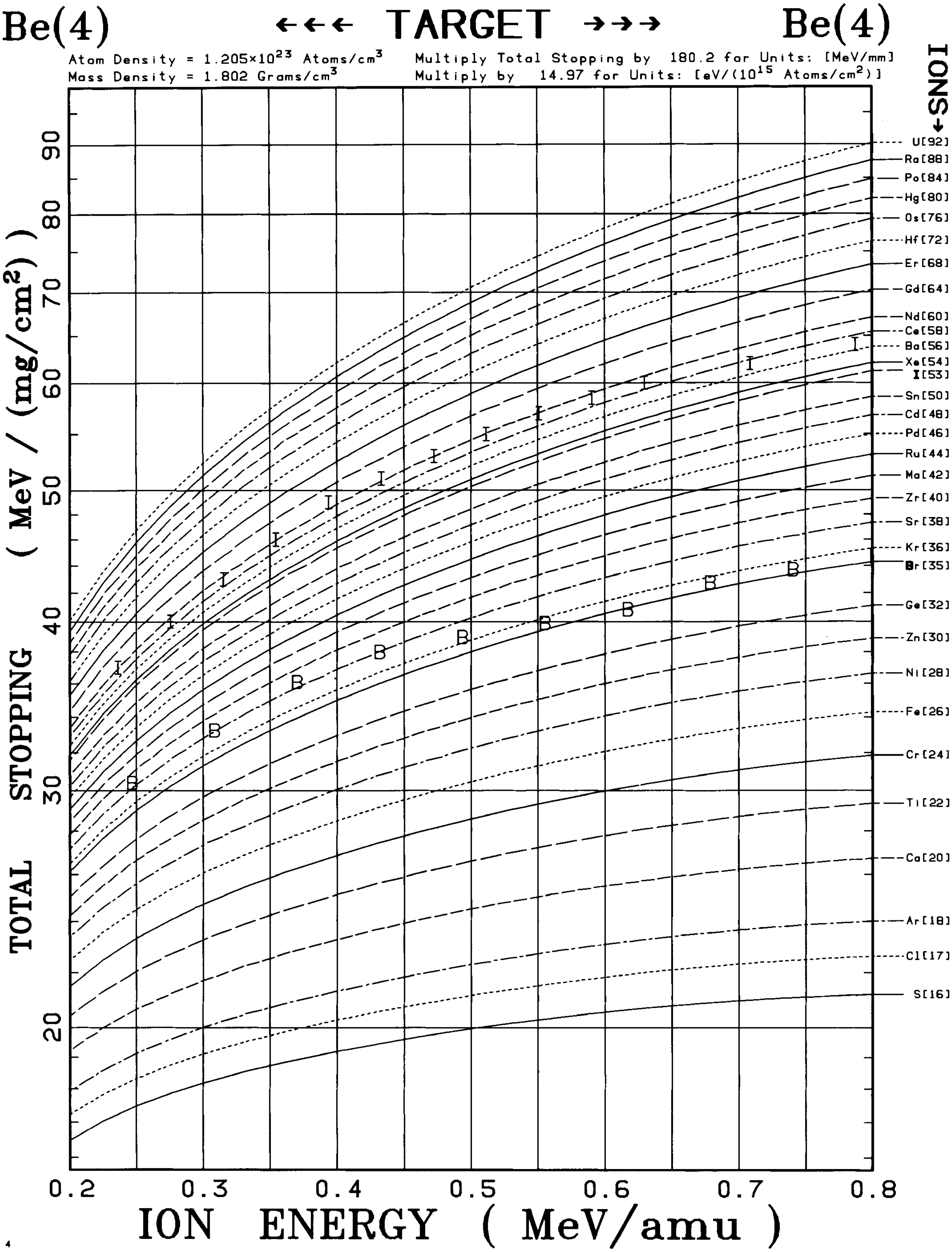


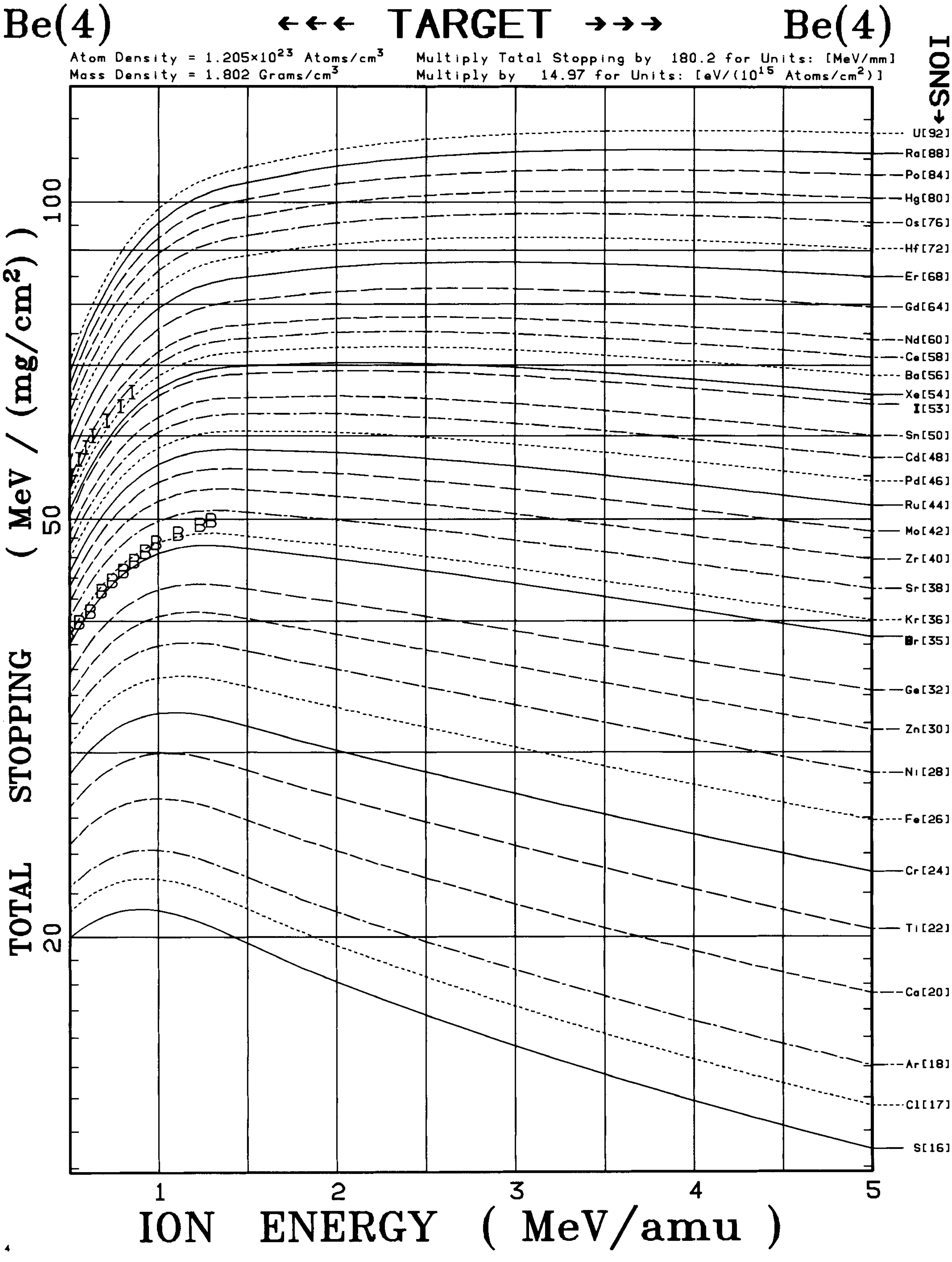
Be(4) ←←← TARGET →→→ Be(4)

Atom Density = 1.205×10^{23} Atoms/cm^3 Multiply Total Stopping by 180.2 for Units: [MeV/mm]
Mass Density = 1.802 Grams/cm^3 Multiply by 14.97 for Units: [eV/(10^{15} Atoms/cm^2)]



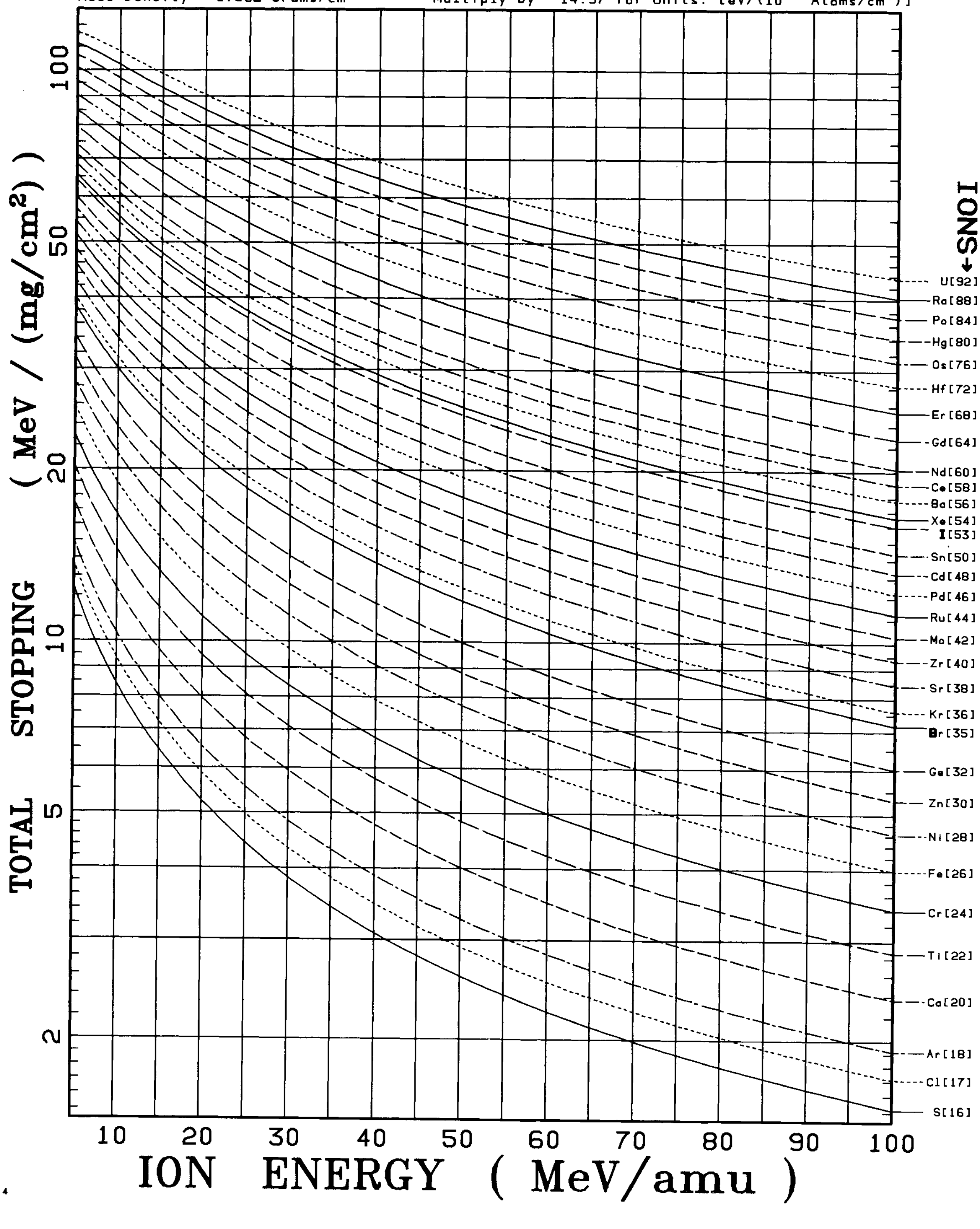

Be(4)
←←← TARGET →→→
Be(4)
Atom Density = 1.205×10^23 Atoms/cm^3
Mass Density = 1.802 Grams/cm^3
Multiply Total Stopping by 180.2 for Units: [MeV/mm]
Multiply by 14.97 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
1
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)


Be(4)
←←← TARGET →→→
Be(4)
Atom Density = 1.205×10^23 Atoms/cm^3
Mass Density = 1.802 Grams/cm^3
Multiply Total Stopping by 180.2 for Units: [MeV/mm]
Multiply by 14.97 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm^2))
20
30
40
50
60
70
80
90
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)


Be(4)
←←← TARGET →→→
Be(4)
Atom Density = 1.205×10^{23} Atoms/cm^3
Mass Density = 1.802 Grams/cm^3
Multiply Total Stopping by 180.2 for Units: [MeV/mm]
Multiply by 14.97 for Units: [eV/(10^{15} Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm^2))
100
50
20
1
2
3
4
5
ION ENERGY (MeV/amu)

Be(4) ←←← TARGET →→→ Be(4)

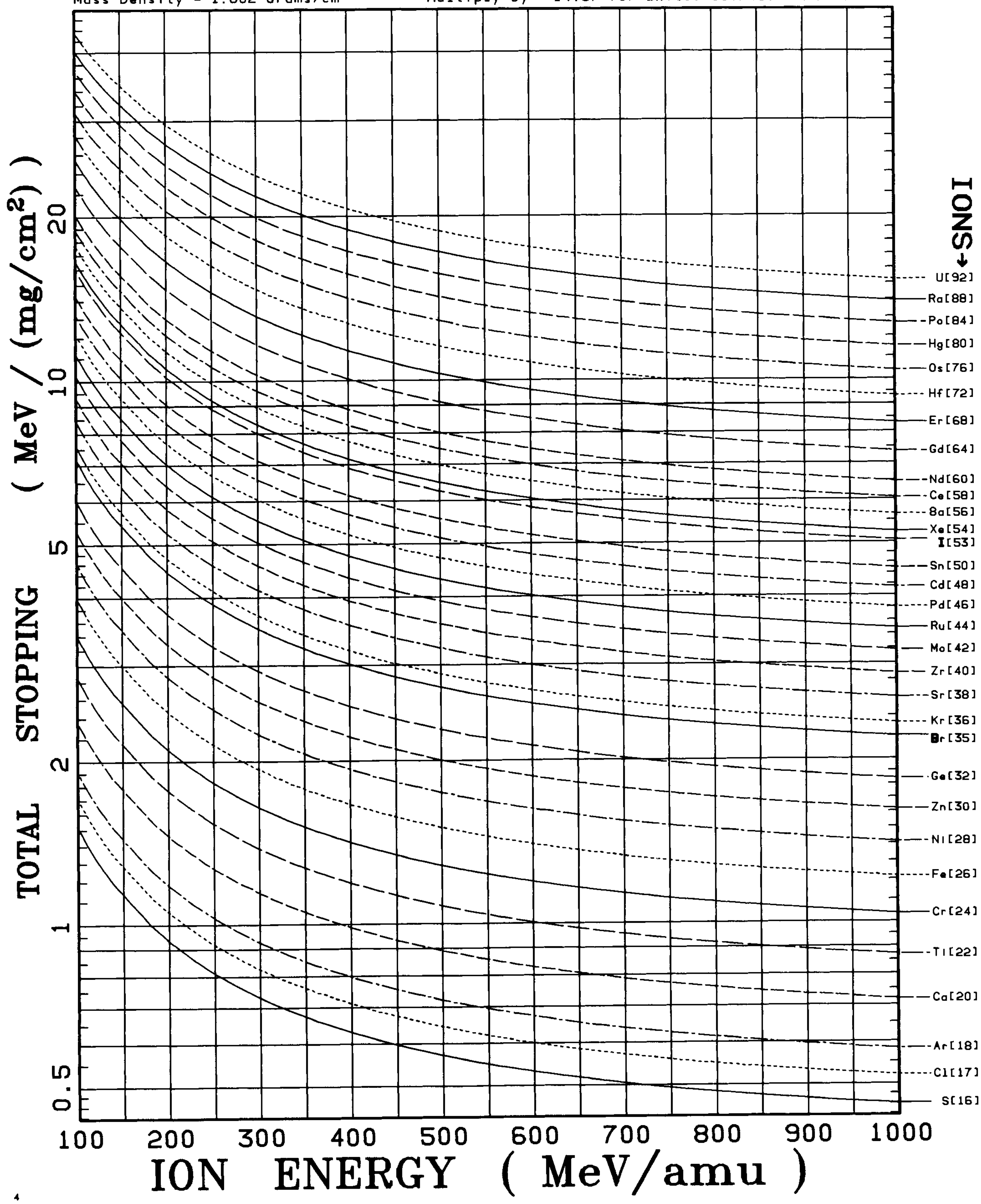
Atom Density = 1.205×10^{23} Atoms/cm^3
Mass Density = 1.802 Grams/cm^3
Multiply Total Stopping by 180.2 for Units: [MeV/mm]
Multiply by 14.97 for Units: [eV/(10^{15} Atoms/cm^2)]

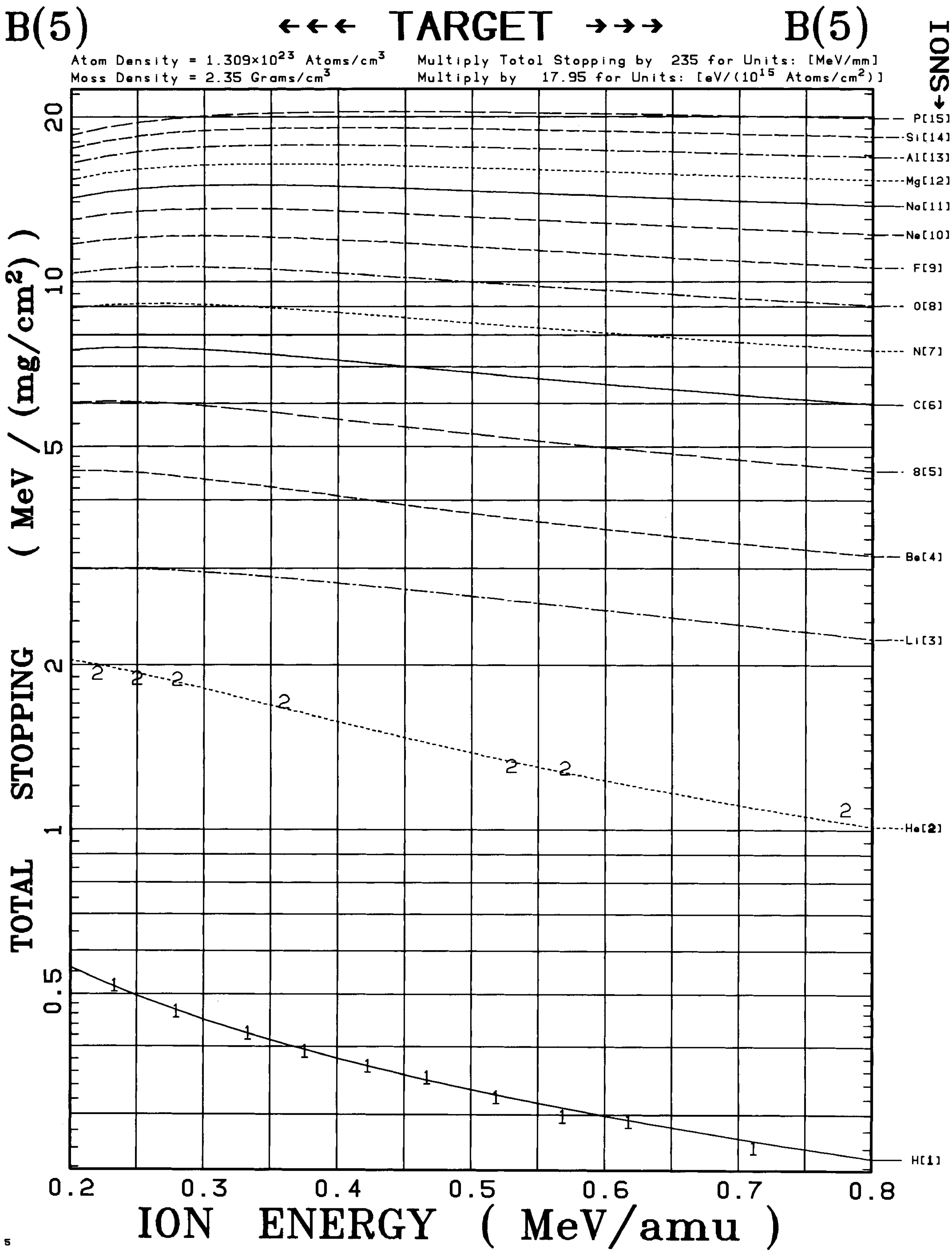


Be(4) ←←← TARGET →→→ Be(4)

Atom Density = 1.205×10^{23} Atoms/cm^3
Mass Density = 1.802 Grams/cm^3

Multiply Total Stopping by 180.2 for Units: [MeV/mm]
Multiply by 14.97 for Units: [eV/(10^{15} Atoms/cm^2)]

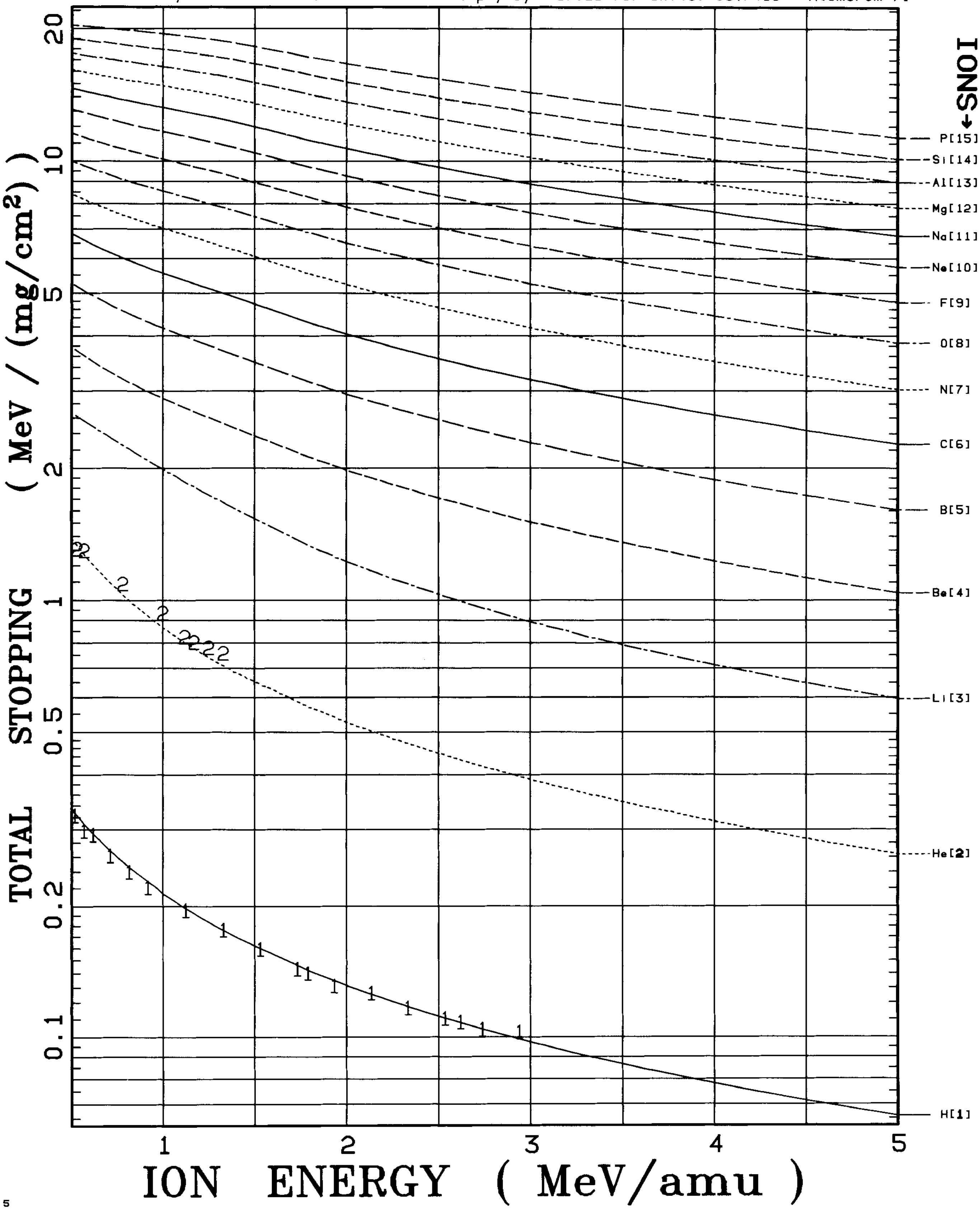



B(5)
←←← TARGET →→→
B(5)
IONS→
Atom Density = 1.309×10^23 Atoms/cm^3
Mass Density = 2.35 Grams/cm^3
Multiply Total Stopping by 235 for Units: [MeV/mm]
Multiply by 17.95 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.5
1
2
5
10
20
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]

5

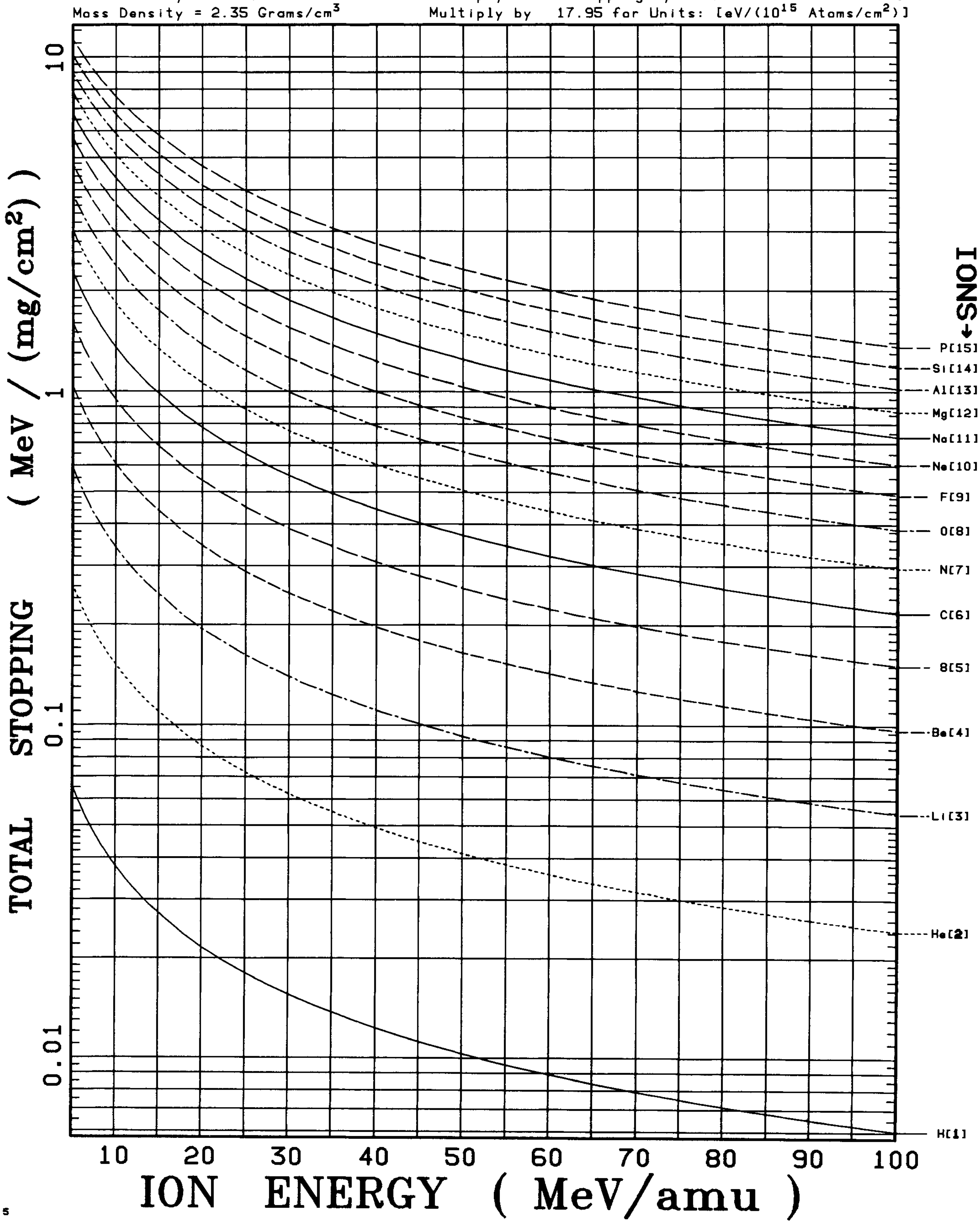
B(5) ←←← TARGET →→→ B(5)

Atom Density = 1.309×10^{23} Atoms/cm^3 Multiply Total Stopping by 235 for Units: [MeV/mm]
Mass Density = 2.35 Grams/cm^3 Multiply by 17.95 for Units: [eV/(10^{15} Atoms/cm^2)]

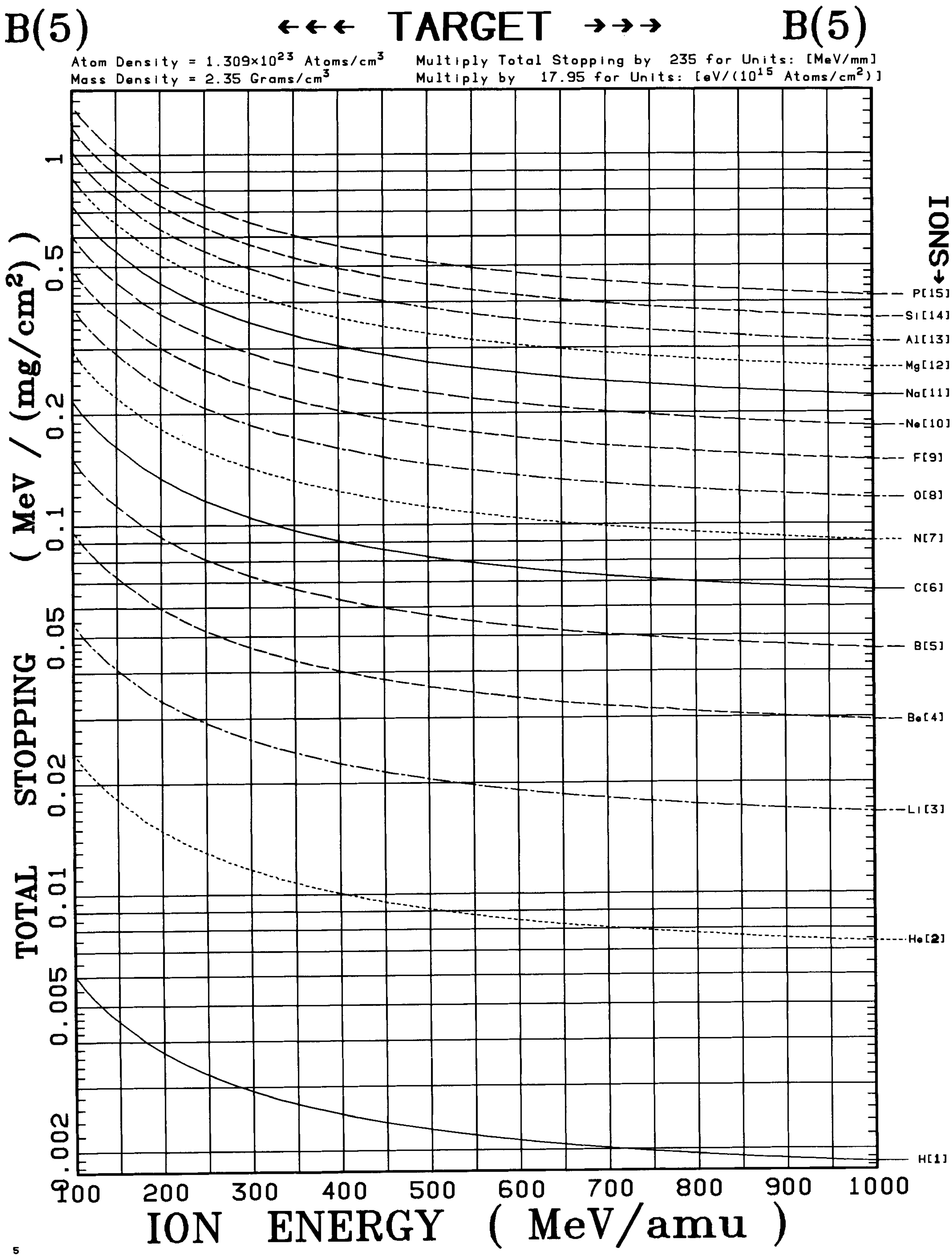


B(5) ←←← TARGET →→→ B(5)

Atom Density = 1.309×10^{23} Atoms/cm^3 Multiply Total Stopping by 235 for Units: [MeV/mm]
Mass Density = 2.35 Grams/cm^3 Multiply by 17.95 for Units: [eV/(10^{15} Atoms/cm^2)]

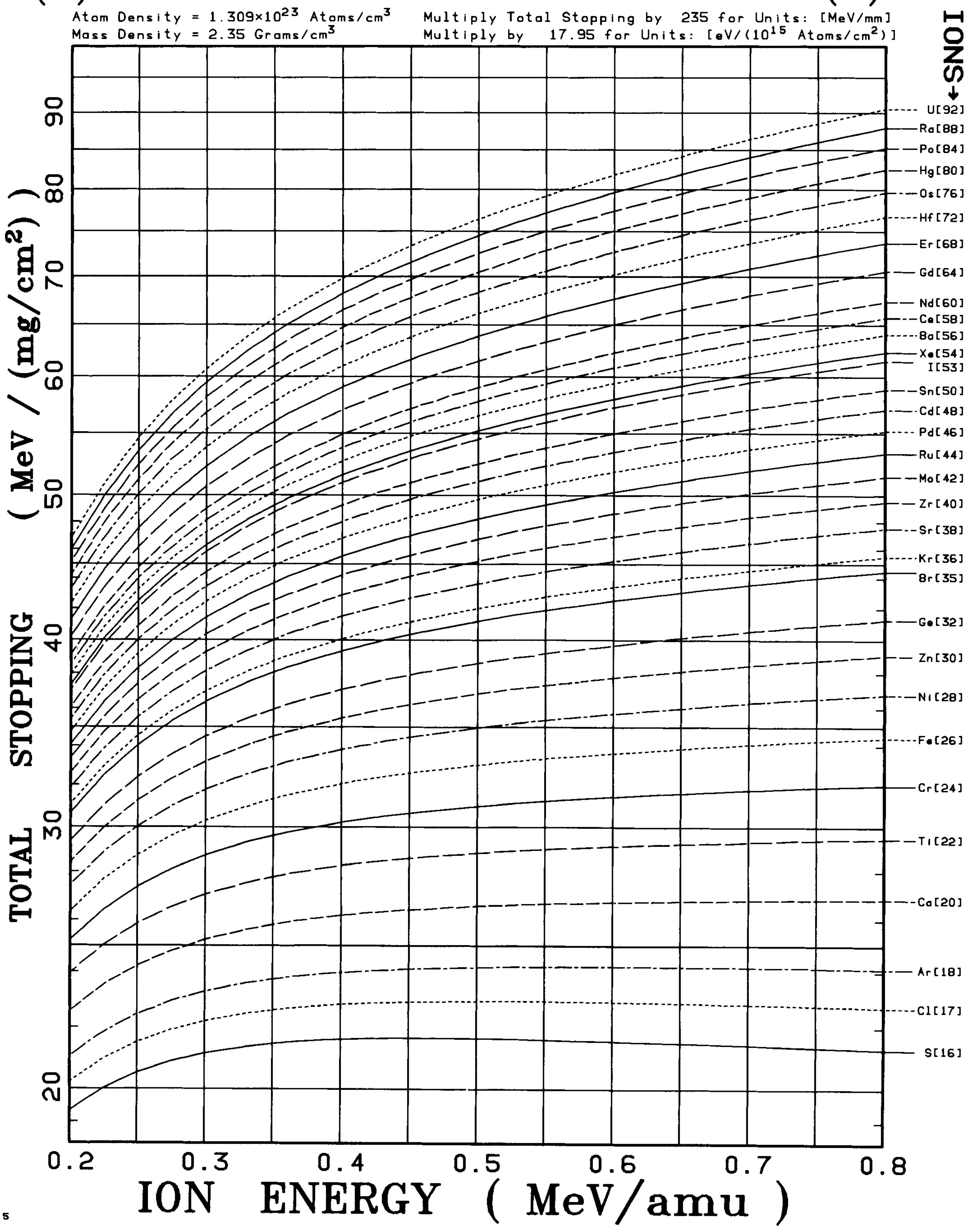


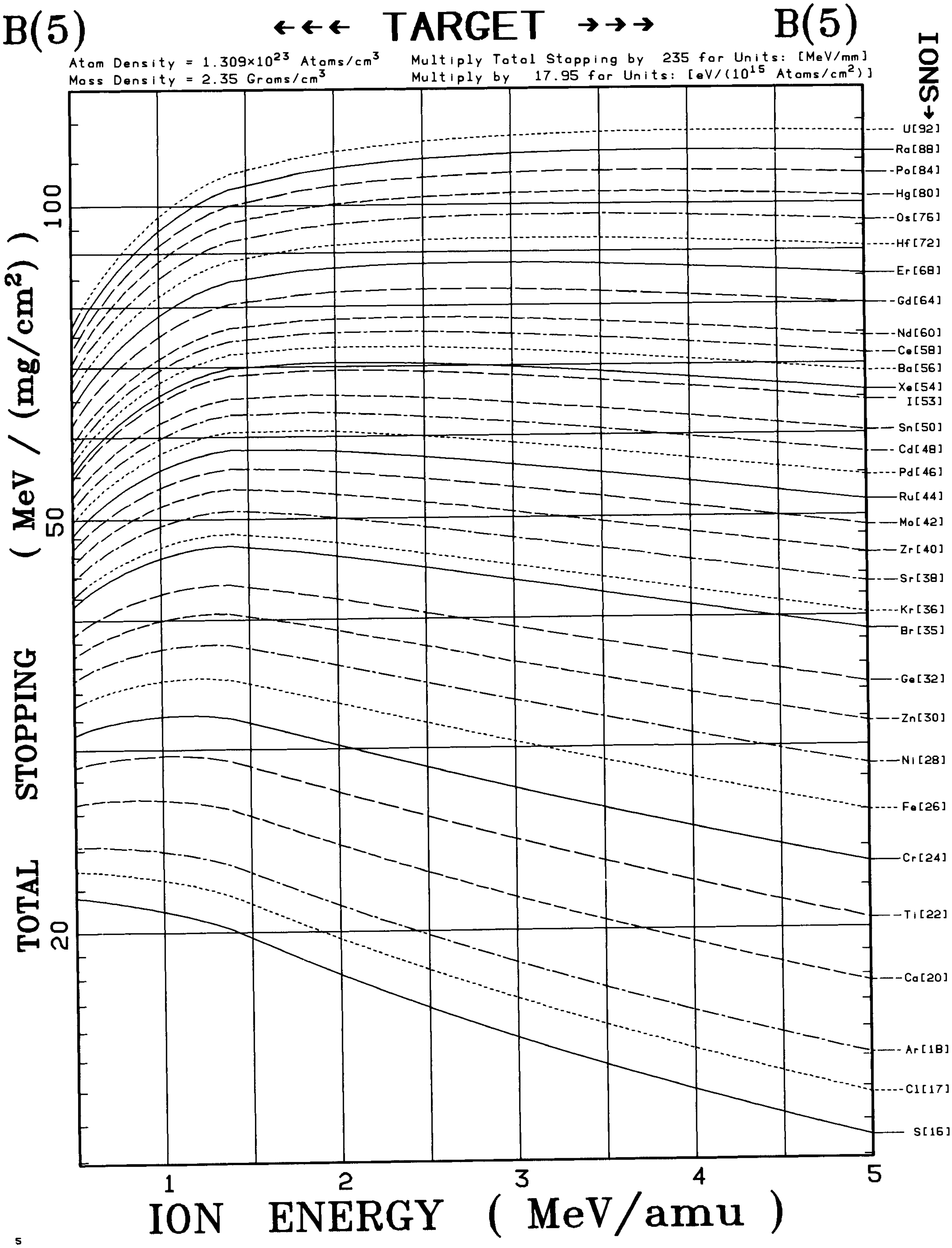
s


B(5)
←←← TARGET →→→
B(5)
Atom Density = 1.309×10^{23} Atoms/cm^3
Mass Density = 2.35 Grams/cm^3
Multiply Total Stopping by 235 for Units: [MeV/mm]
Multiply by 17.95 for Units: [eV/(10^{15} Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
1
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)

B(5) ←←← TARGET →→→ B(5)

Atom Density = 1.309×10^{23} Atoms/cm^3 Multiply Total Stopping by 235 for Units: [MeV/mm]
Mass Density = 2.35 Grams/cm^3 Multiply by 17.95 for Units: [eV/(10^{15} Atoms/cm^2)]



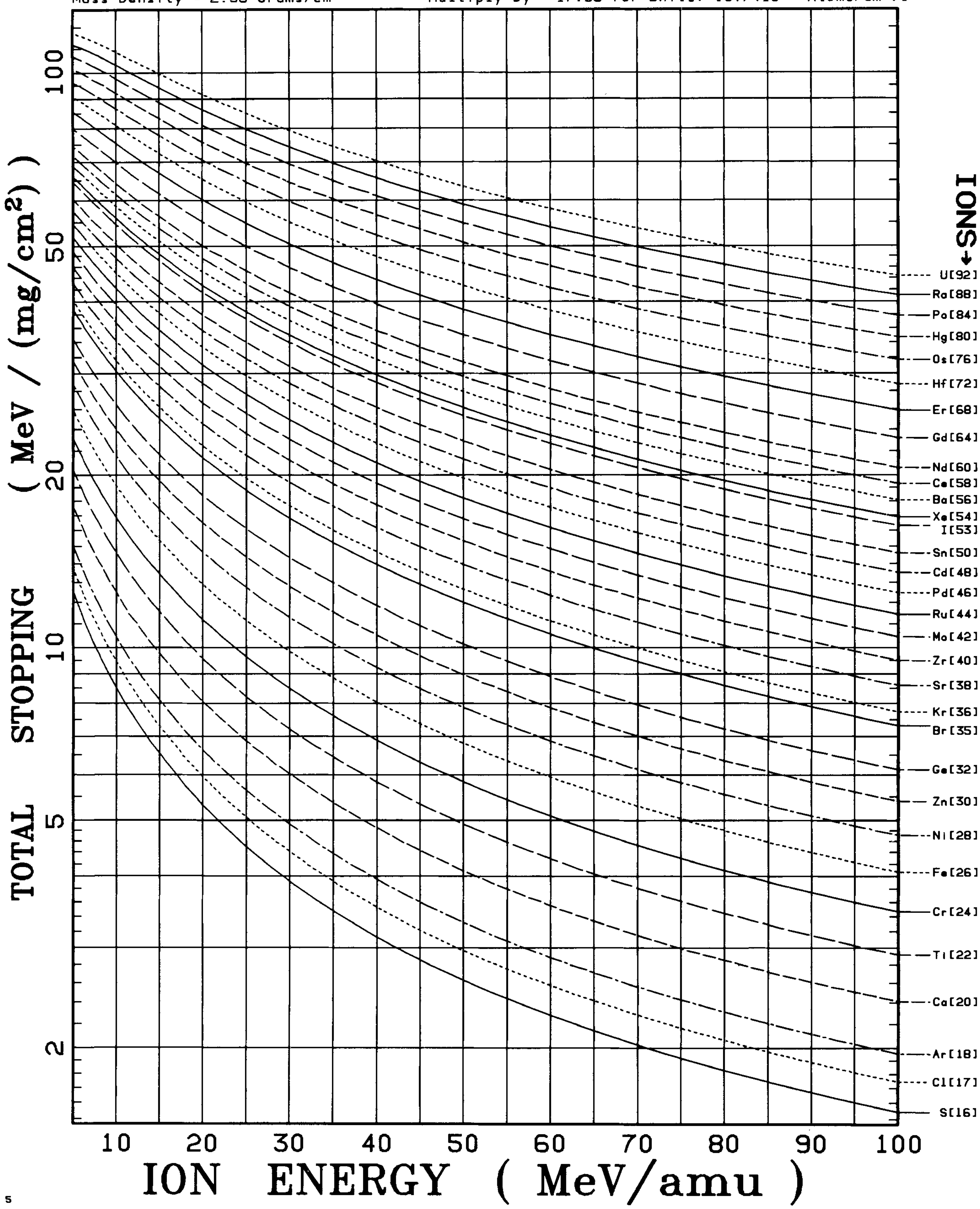


B(5)
←←← TARGET →→→
B(5)
Atom Density = 1.309×10^23 Atoms/cm^3
Mass Density = 2.35 Grams/cm^3
Multiply Total Stopping by 235 for Units: [MeV/mm]
Multiply by 17.95 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
100
50
20
TOTAL STOPPING (MeV / (mg/cm^2))
1
2
3
4
5
ION ENERGY (MeV/amu)

s

B(5) ←←← TARGET →→→ B(5)

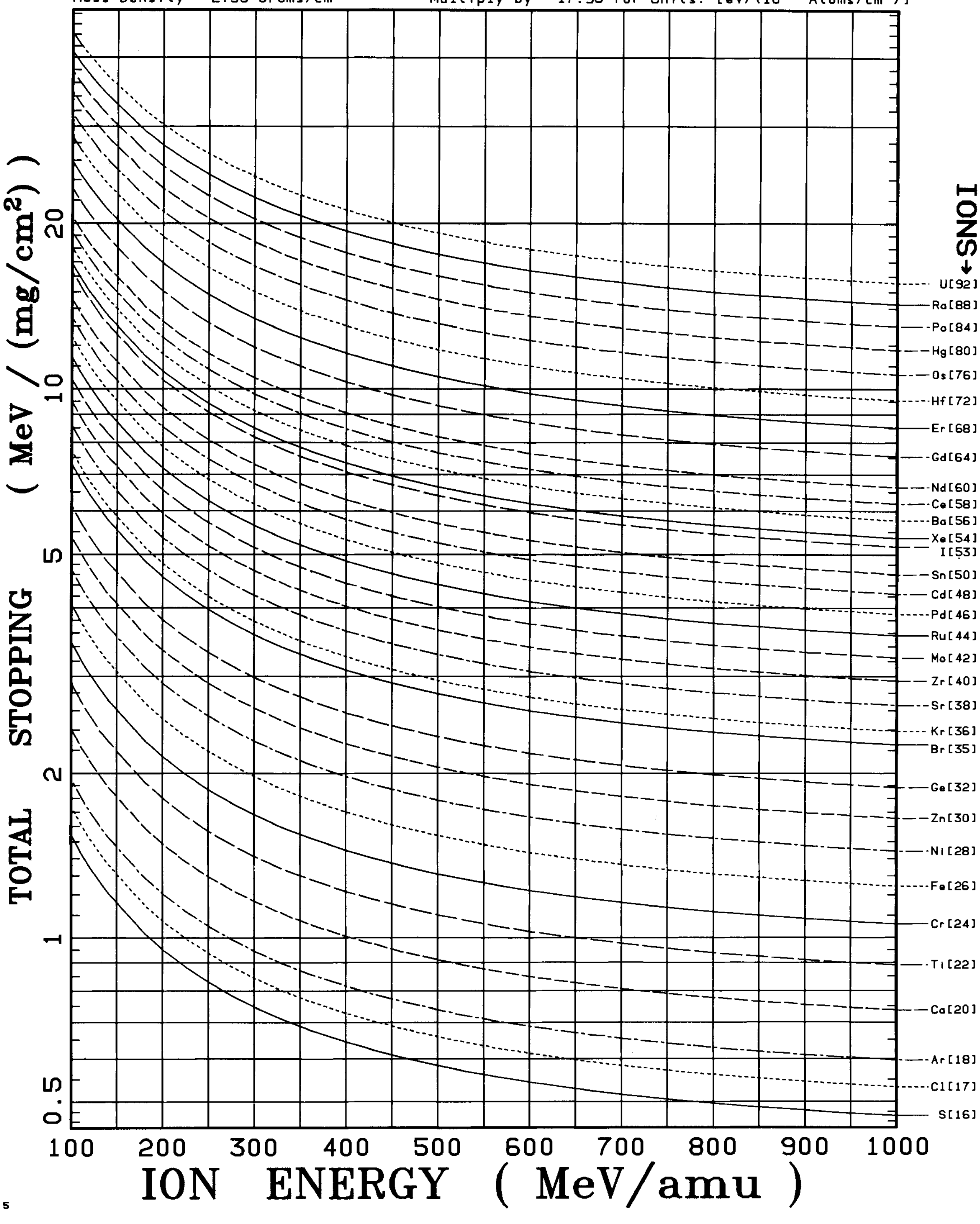
Atom Density = 1.309×10^{23} Atoms/cm^3 Multiply Total Stopping by 235 for Units: [MeV/mm]
Mass Density = 2.35 Grams/cm^3 Multiply by 17.95 for Units: [eV/(10^{15} Atoms/cm^2)]

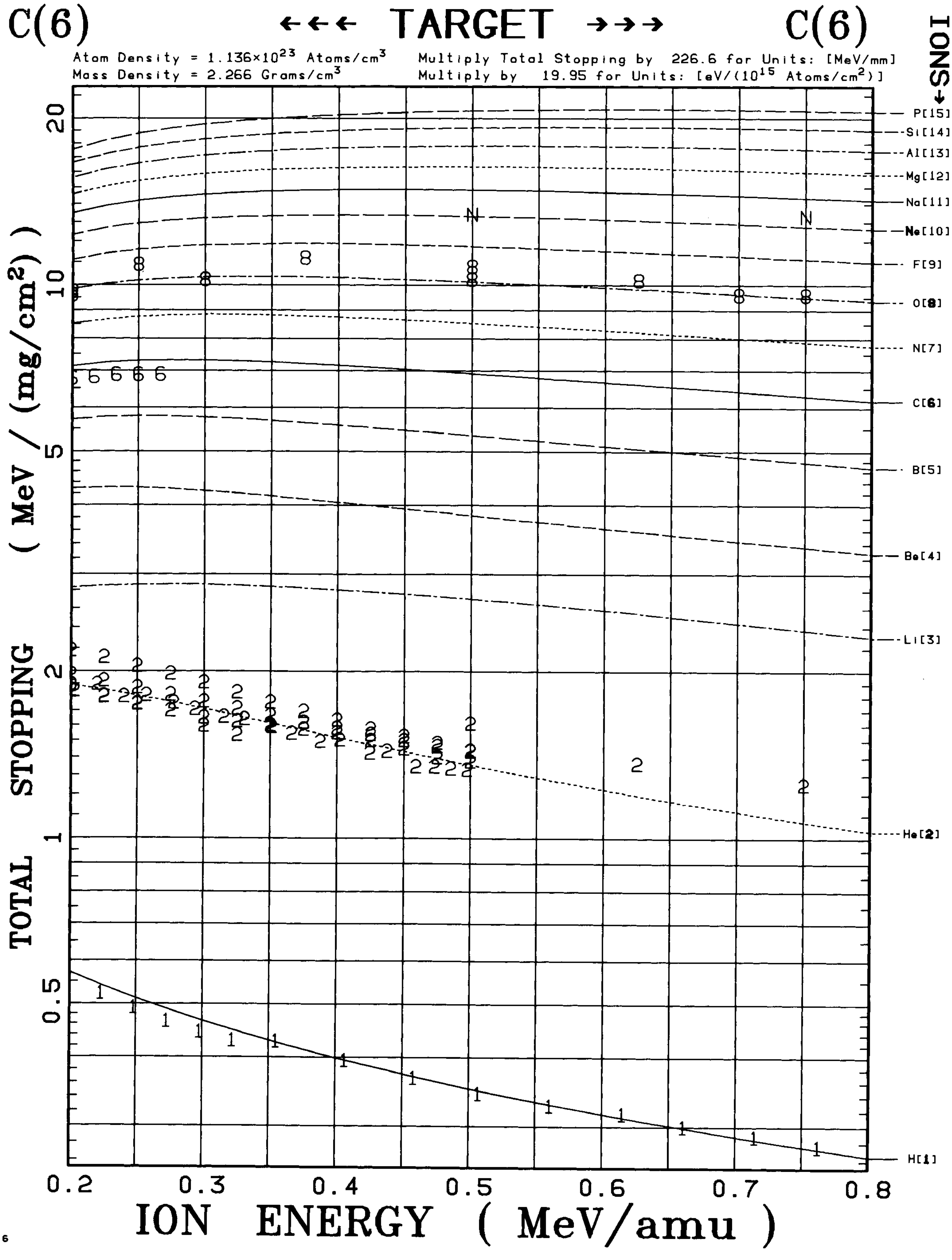


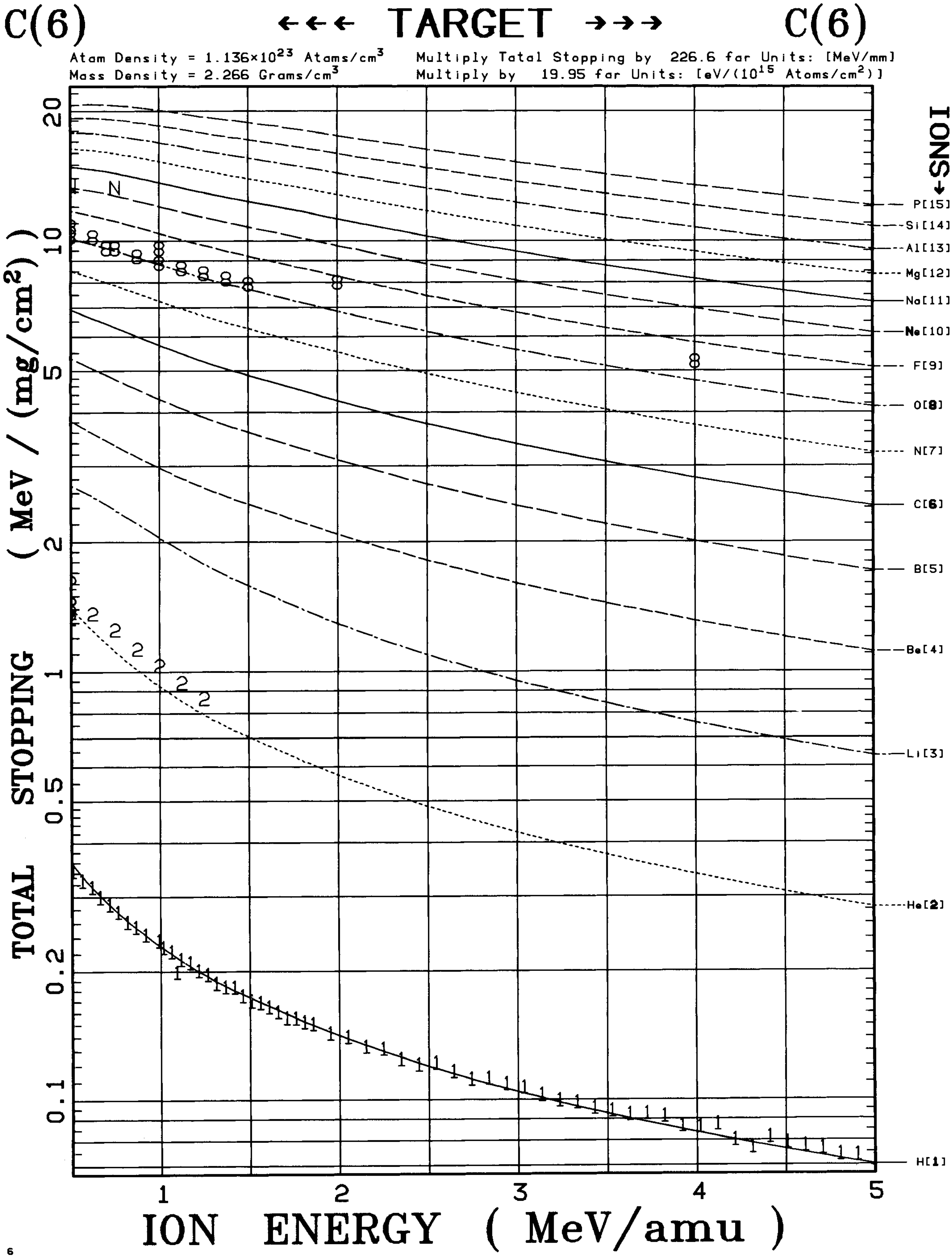
s

B(5) ←←← TARGET →→→ B(5)

Atom Density = 1.309×10^{23} Atoms/cm^3 Multiply Total Stopping by 235 for Units: [MeV/mm]
Mass Density = 2.35 Grams/cm^3 Multiply by 17.95 for Units: [eV/(10^{15} Atoms/cm^2)]



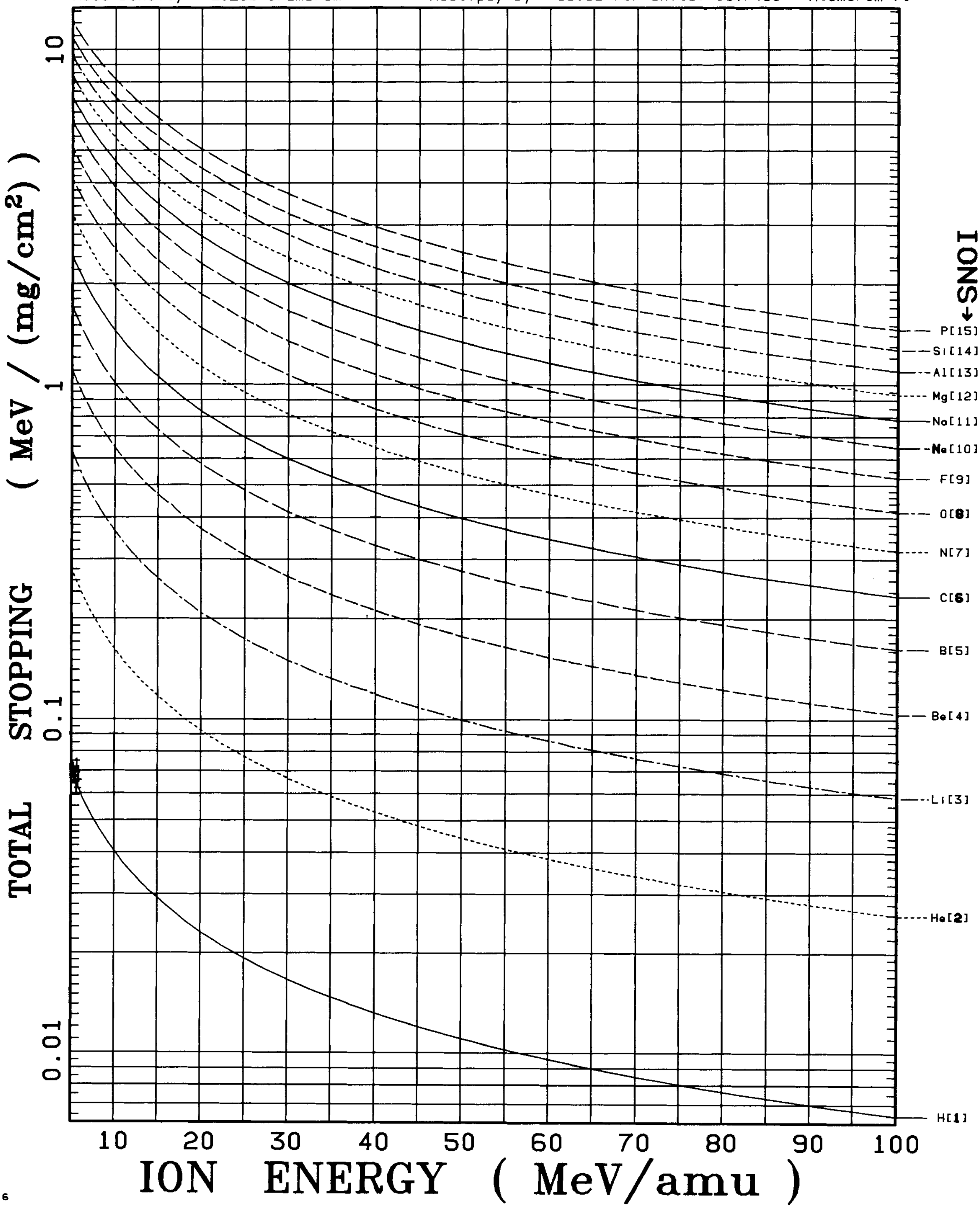

C(6)
←←← TARGET →→→
C(6)
IONS→
Atom Density = 1.136×10^23 Atoms/cm^3
Mass Density = 2.266 Grams/cm^3
Multiply Total Stopping by 226.6 for Units: [MeV/mm]
Multiply by 19.95 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
0.2
0.3
0.4
0.5
0.6
0.7
0.8
20
10
5
2
1
0.5



C(6)
←←← TARGET →→→
C(6)
Atom Density = 1.136×10^23 Atoms/cm^3
Mass Density = 2.266 Grams/cm^3
Multiply Total Stopping by 226.6 for Units: [MeV/mm]
Multiply by 19.95 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]

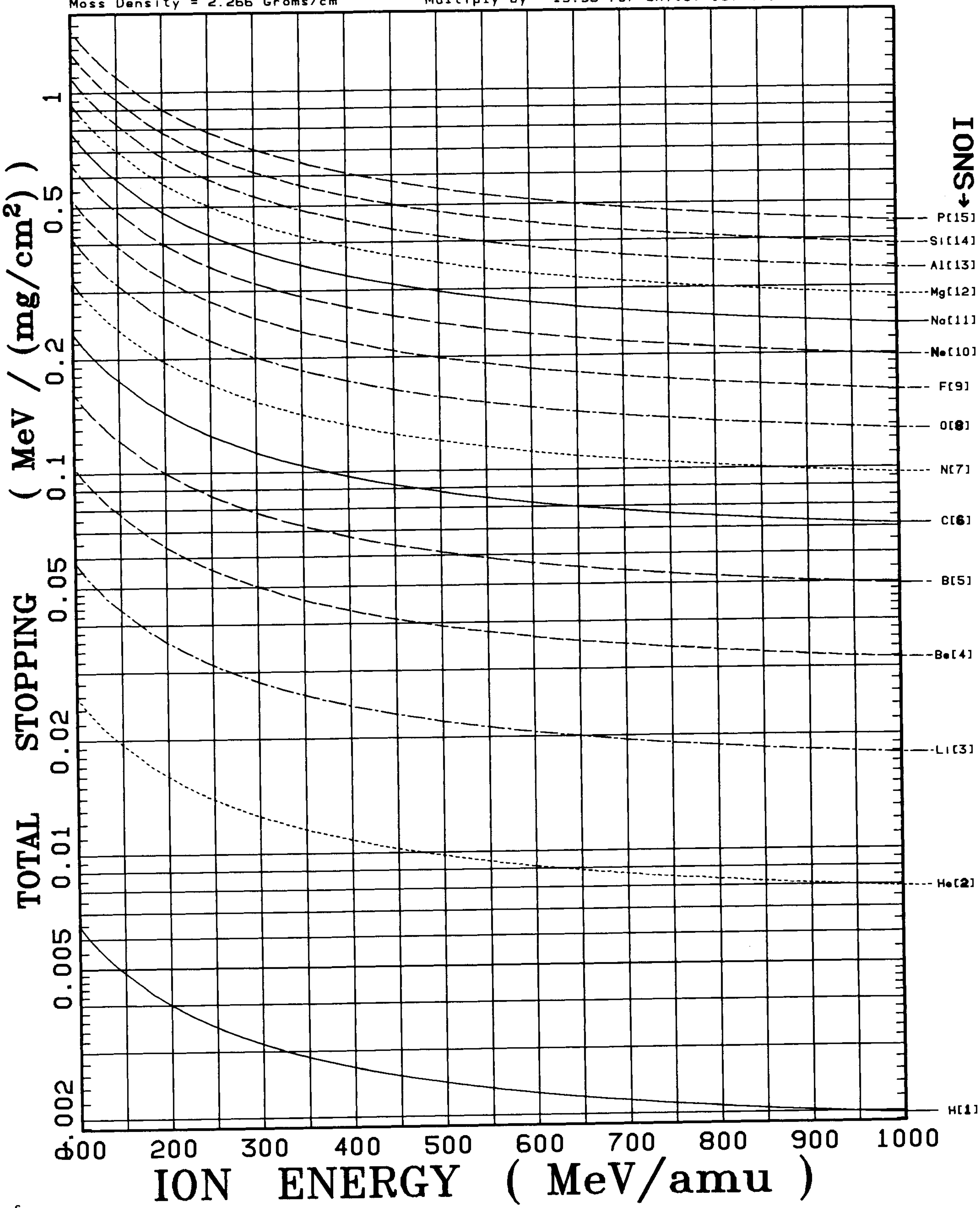
C(6) ←←← TARGET →→→ C(6)

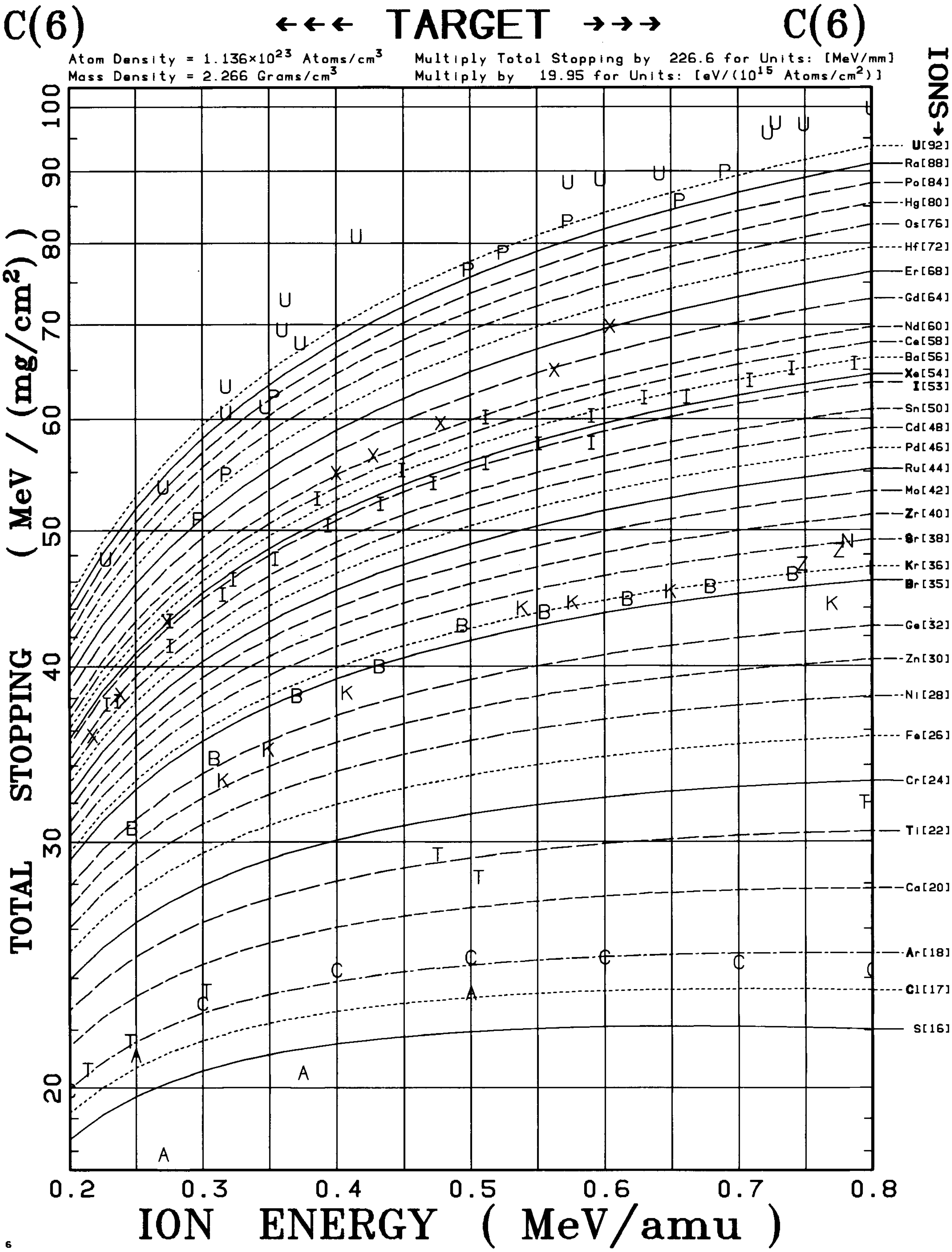
Atom Density = 1.136×10^{23} Atoms/cm^3 Multiply Total Stopping by 226.6 for Units: [MeV/mm]
Mass Density = 2.266 Grams/cm^3 Multiply by 19.95 for Units: [eV/(10^{15} Atoms/cm^2)]



C(6) ←←← TARGET →→→ C(6)

Atom Density = 1.136×10^23 Atoms/cm^3 Multiply Total Stopping by 226.6 for Units: [MeV/mm]
Mass Density = 2.266 Grams/cm^3 Multiply by 19.95 for Units: [eV/(10^15 Atoms/cm^2)]

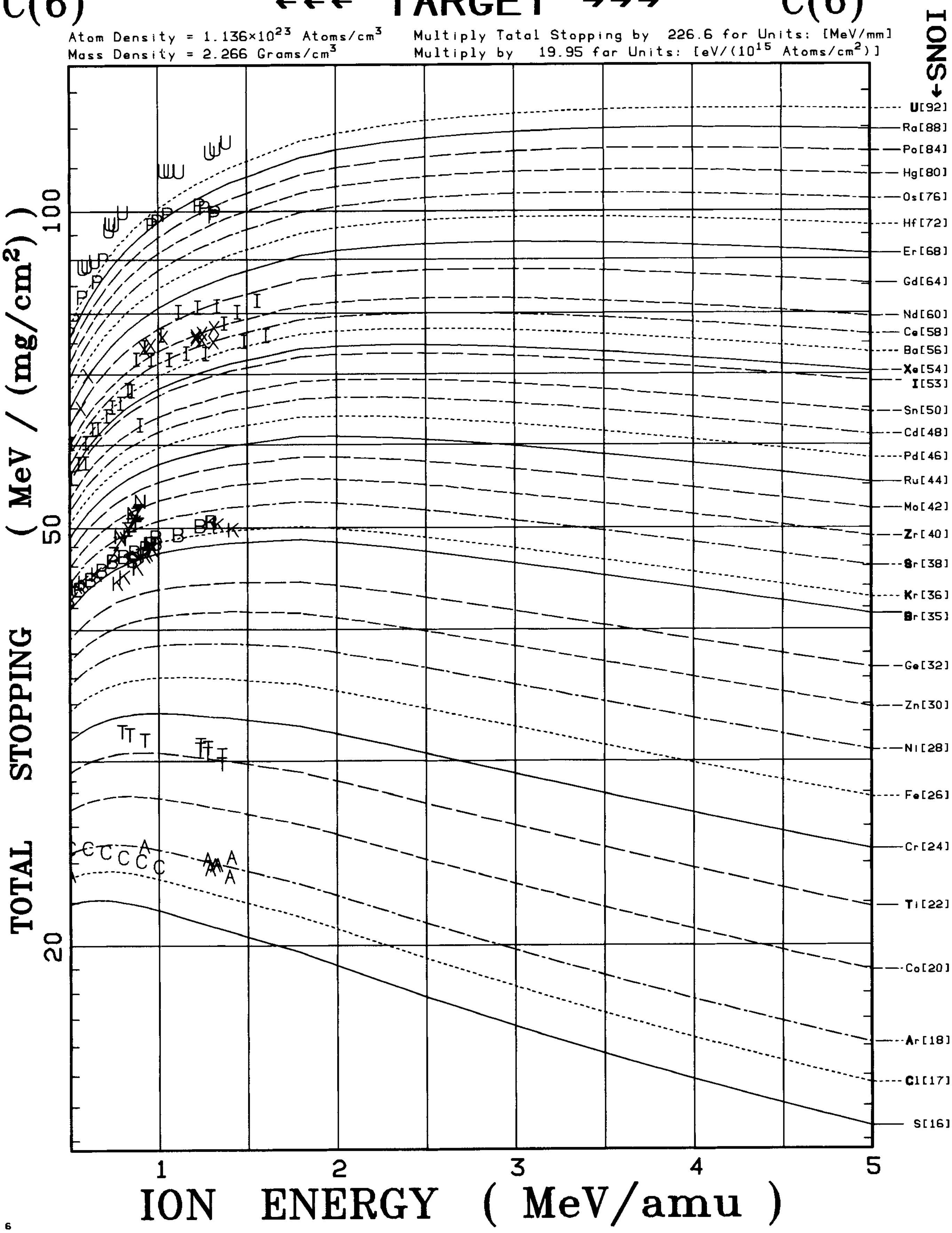




C(6)
←←← TARGET →→→
C(6)
Atom Density = 1.136×10^23 Atoms/cm^3
Mass Density = 2.266 Grams/cm^3
Multiply Total Stopping by 226.6 for Units: [MeV/mm]
Multiply by 19.95 for Units: [eV/(10^15 Atoms/cm^2)]
IONS↓
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]

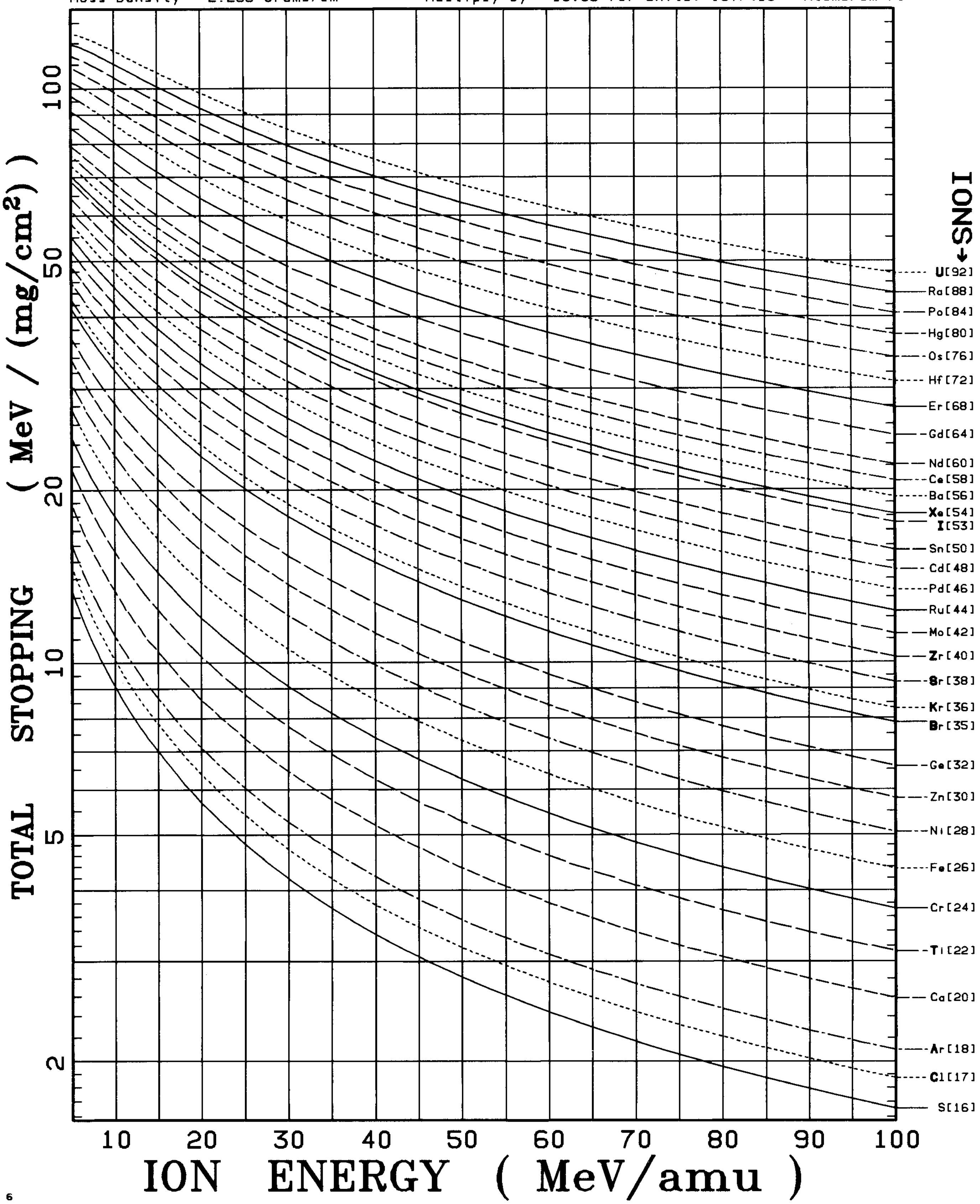
C(6) ←←← TARGET →→→ C(6)

Atom Density = 1.136×10^{23} Atoms/cm^3 Multiply Total Stopping by 226.6 for Units: [MeV/mm]
Mass Density = 2.266 Grams/cm^3 Multiply by 19.95 for Units: [eV/(10^{15} Atoms/cm^2)]



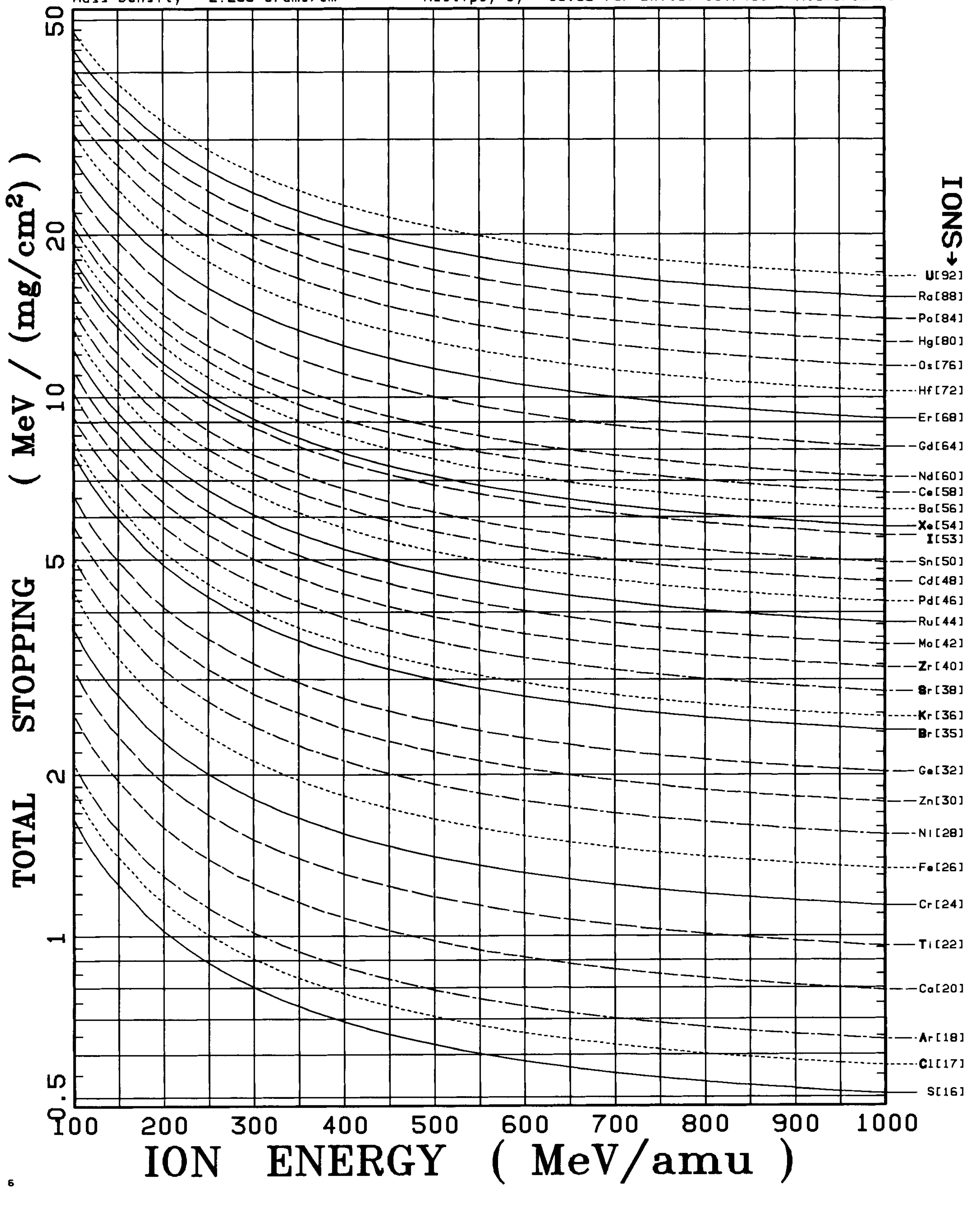
C(6) ←←← TARGET →→→ C(6)

Atom Density = 1.136×10^{23} Atoms/cm^3 Multiply Total Stopping by 226.6 for Units: [MeV/mm]
Mass Density = 2.266 Grams/cm^3 Multiply by 19.95 for Units: [eV/(10^{15} Atoms/cm^2)]



C(6) ←←← TARGET →→→ C(6)

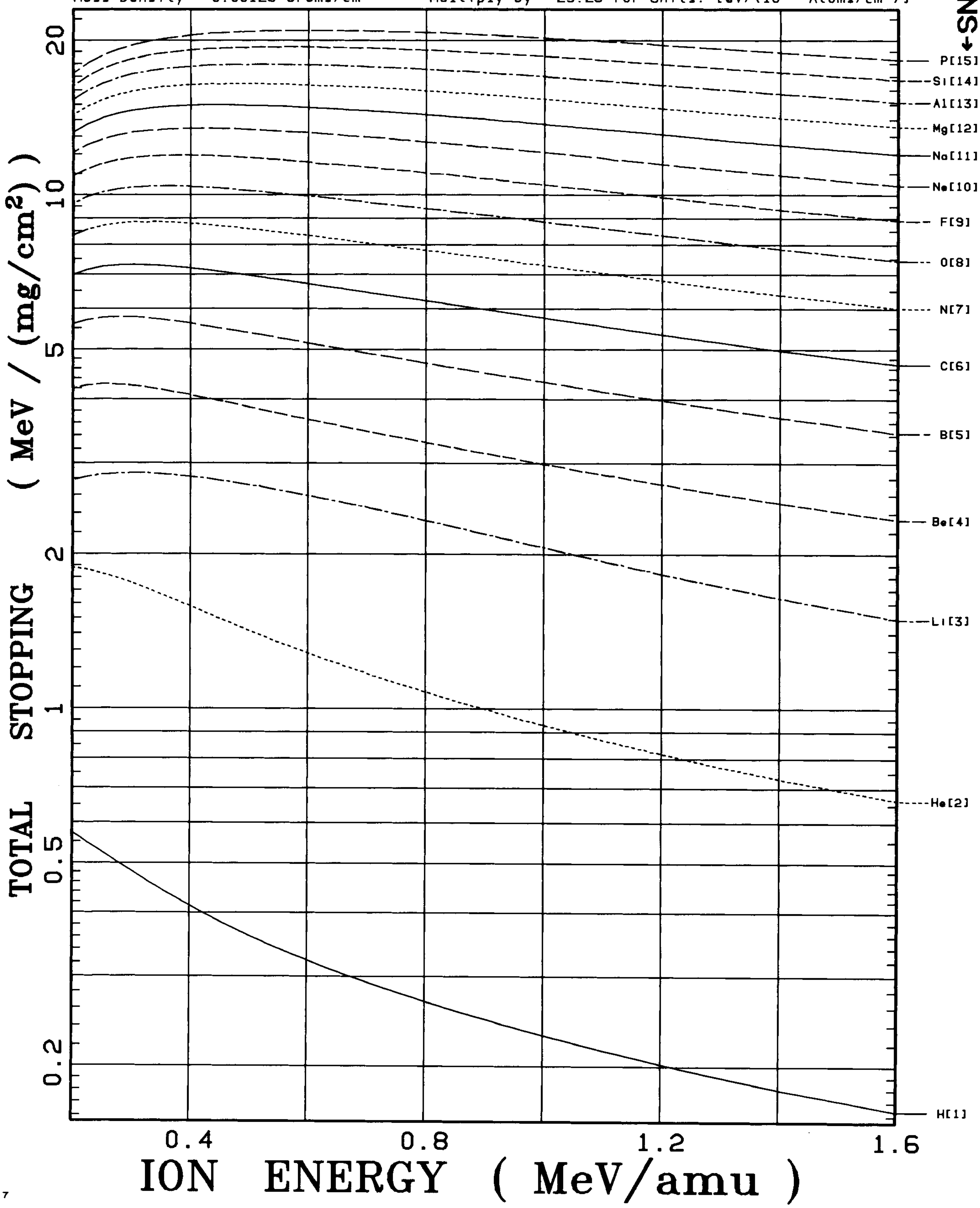
Atom Density = 1.136×10^{23} Atoms/cm^3 Multiply Total Stopping by 226.6 for Units: [MeV/mm]
Mass Density = 2.266 Grams/cm^3 Multiply by 19.95 for Units: [eV/(10^{15} Atoms/cm^2)]

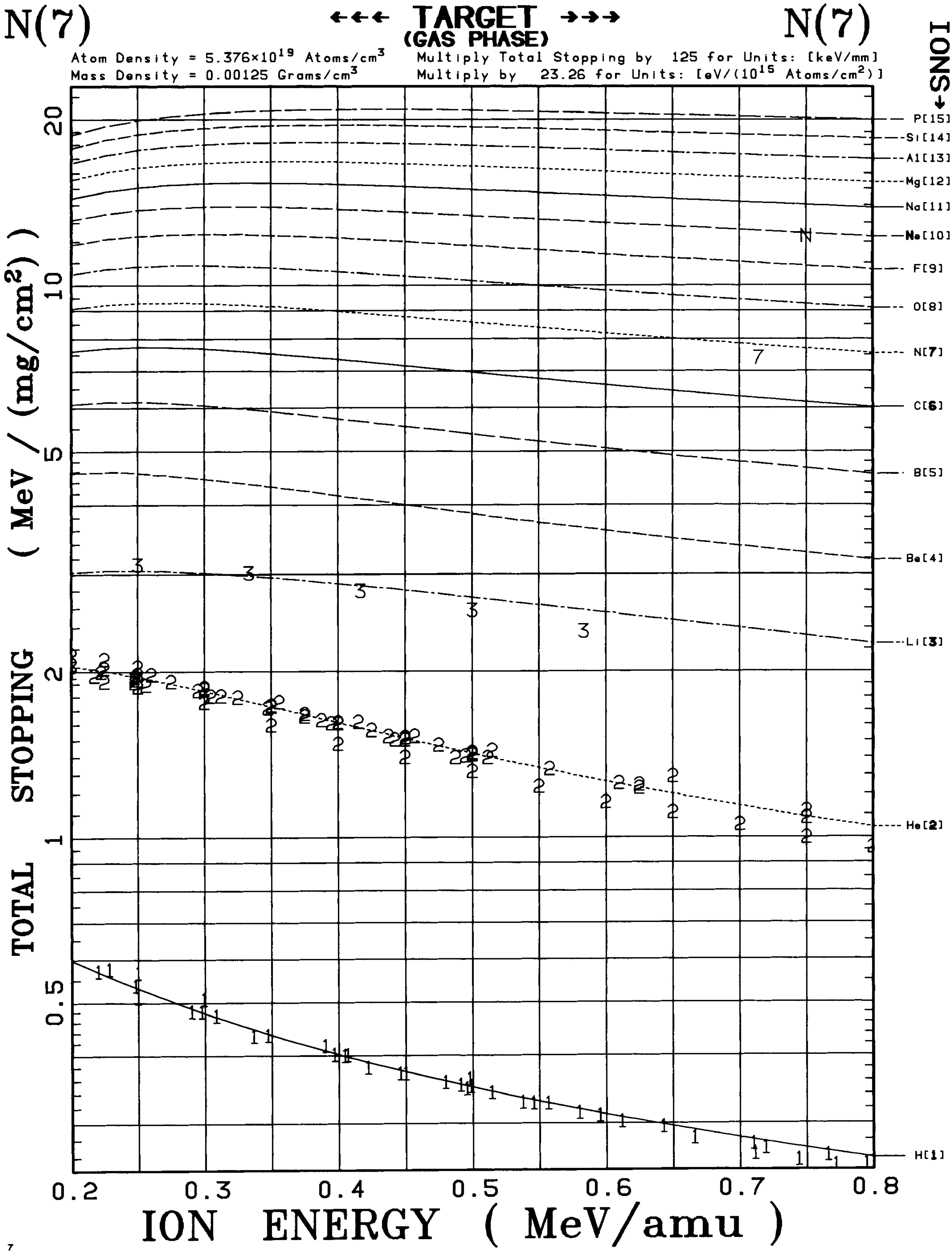


6

N(7) ←←← TARGET →→→ N(7)
(SOLID PHASE)

Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 125 for Units: [keV/mm]
Mass Density = 0.00125 Grams/cm^3 Multiply by 23.26 for Units: [eV/(10^{15} Atoms/cm^2)]



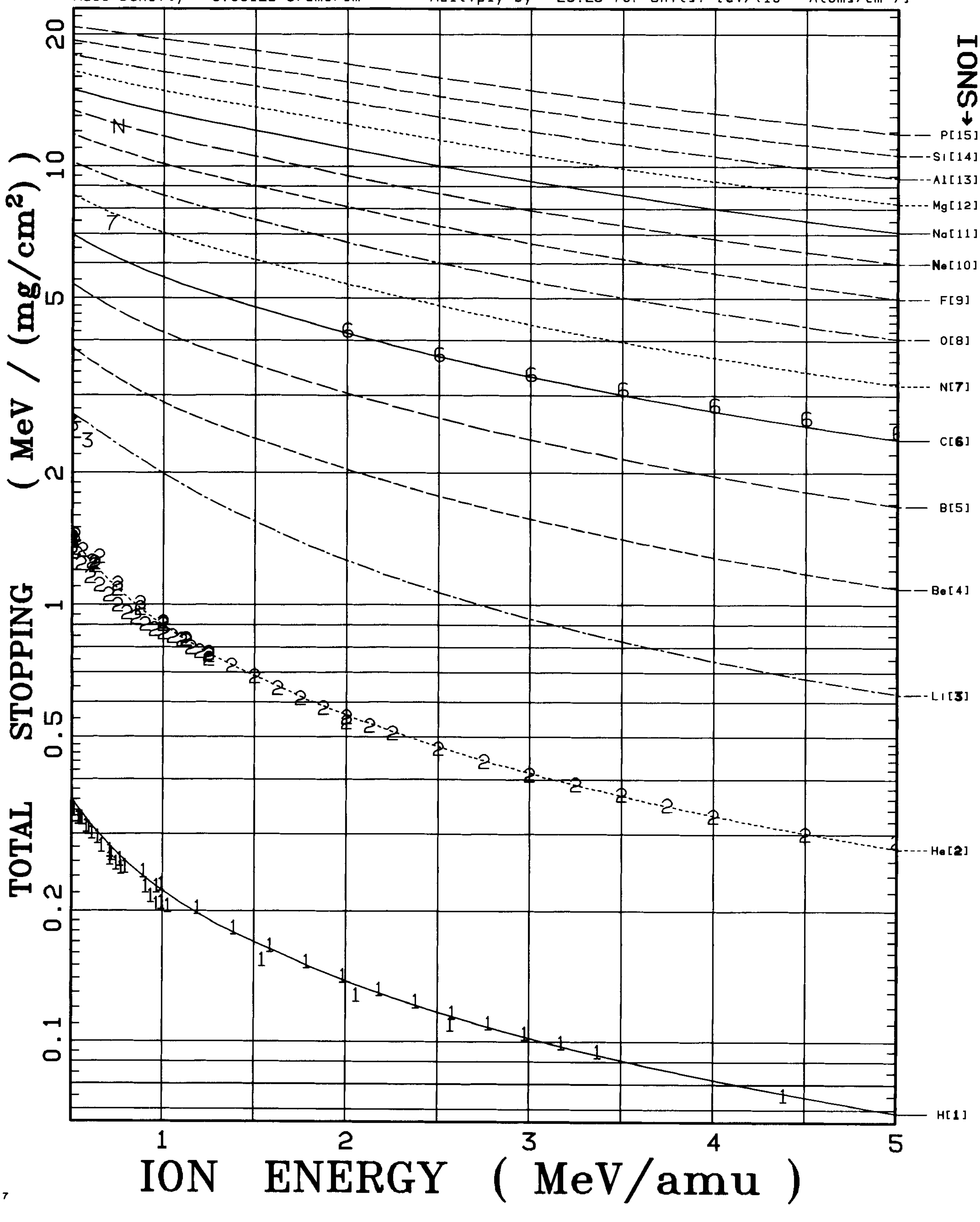

N(7)
←←← TARGET →→→
(GAS PHASE)
N(7)
IONS→
Atom Density = 5.376×10^19 Atoms/cm^3
Mass Density = 0.00125 Grams/cm^3
Multiply Total Stopping by 125 for Units: [keV/mm]
Multiply by 23.26 for Units: [eV/(10^15 Atoms/cm^2)]
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)

N(7) ←←← TARGET →→→ N(7)

(GAS PHASE)

Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 125 for Units: [keV/mm]

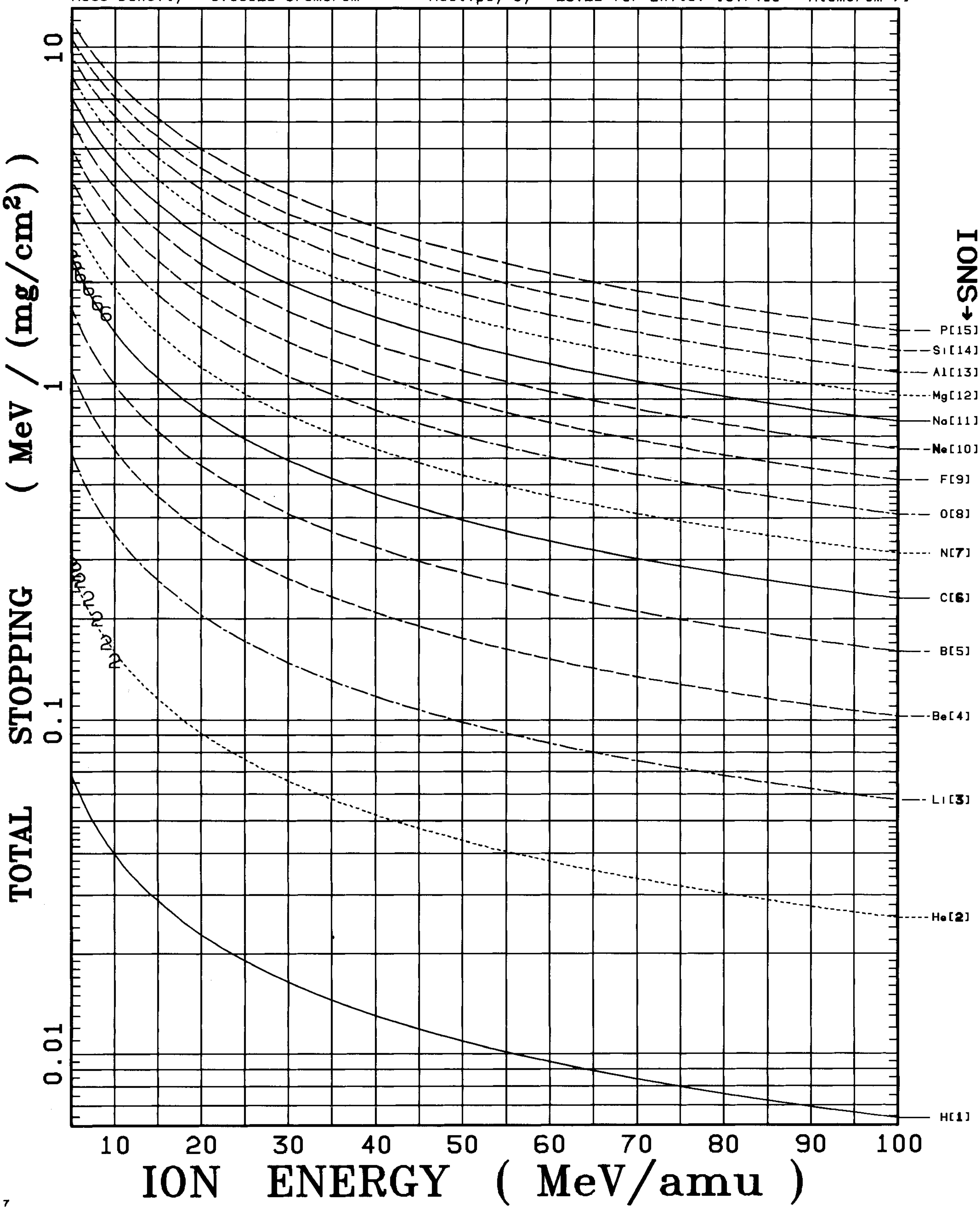
Mass Density = 0.00125 Grams/cm^3 Multiply by 23.26 for Units: [eV/(10^{15} Atoms/cm^2)]



7

N(7) ←←← TARGET (GAS PHASE) →→→ N(7)

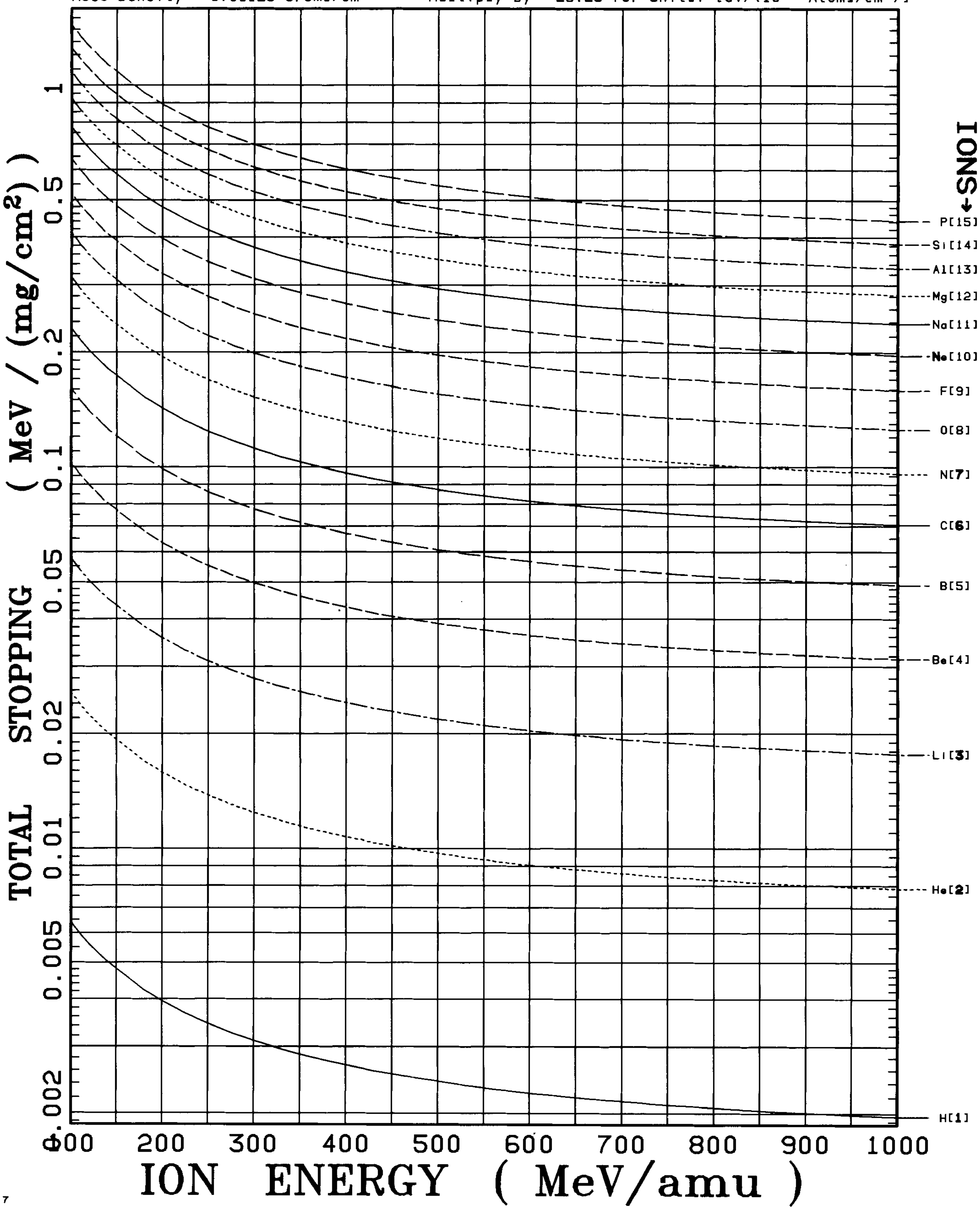
Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 125 for Units: [keV/mm]
Mass Density = 0.00125 Grams/cm^3 Multiply by 23.26 for Units: [eV/(10^{15} Atoms/cm^2)]



7

N(7) ←←← TARGET (GAS PHASE) →→→ N(7)

Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 125 for Units: [keV/mm]
Mass Density = 0.00125 Grams/cm^3 Multiply by 23.26 for Units: [eV/(10^{15} Atoms/cm^2)]



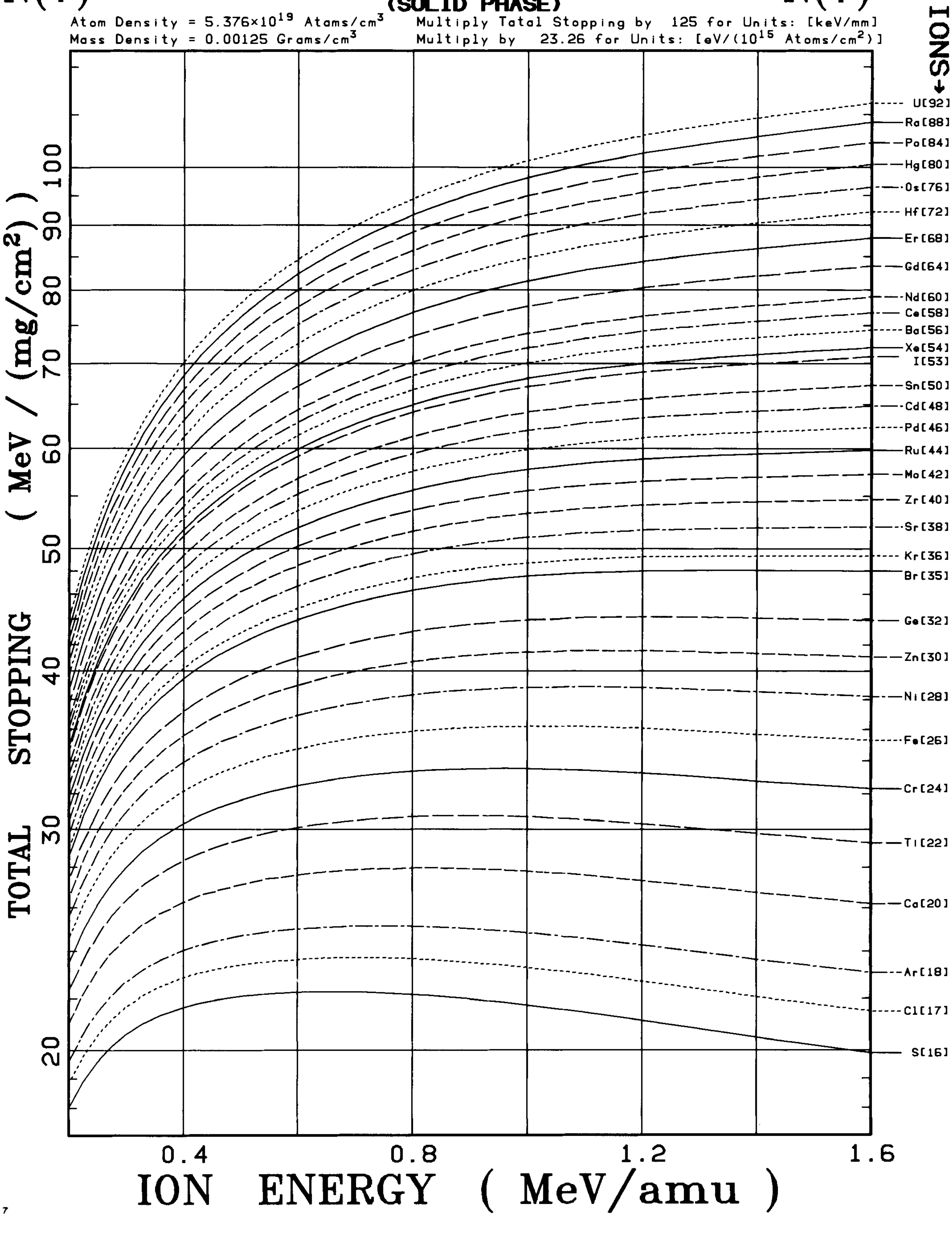
7

N(7) ←←← TARGET →→→ N(7)

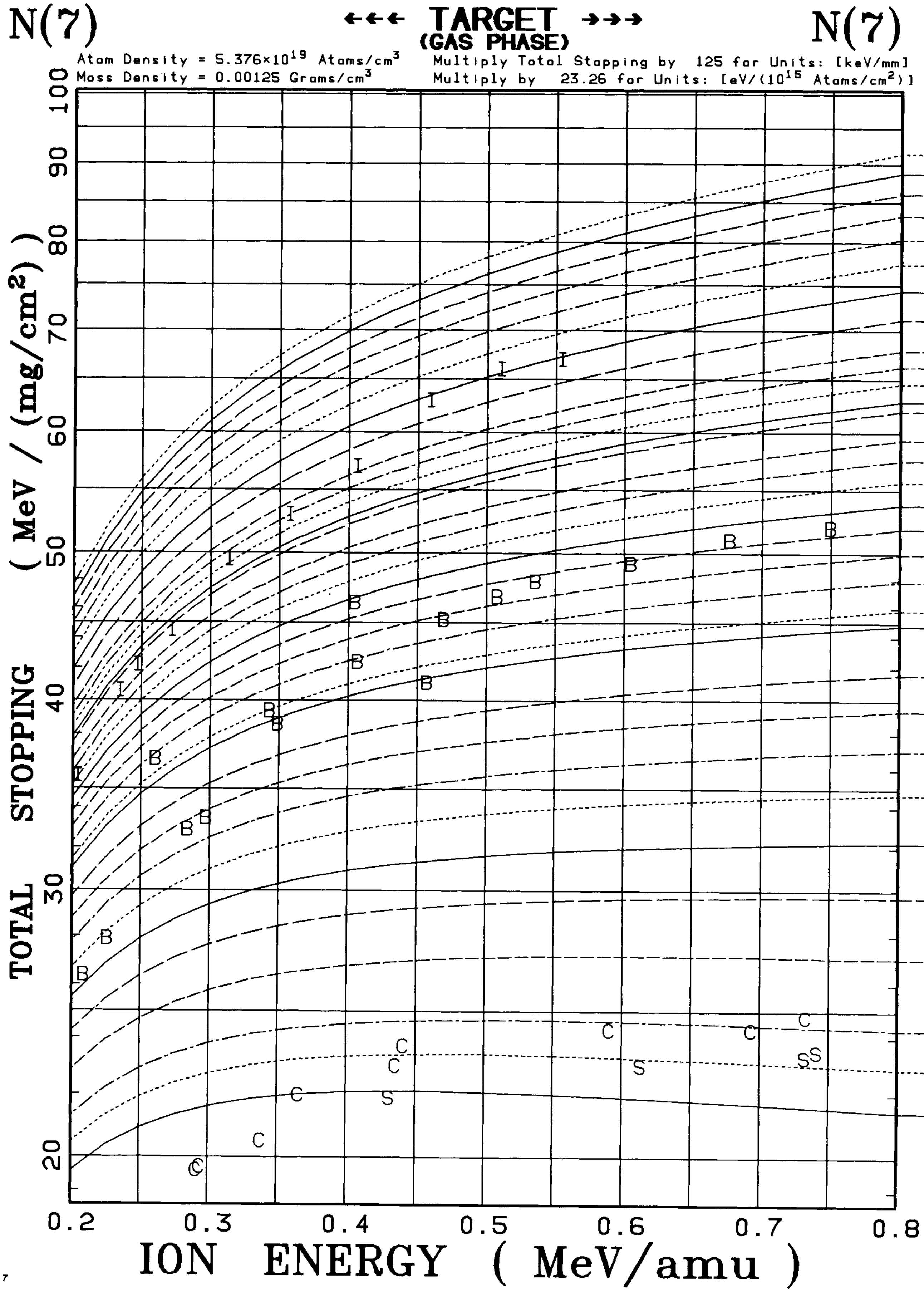
(SOLID PHASE)

Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 125 for Units: [keV/mm]

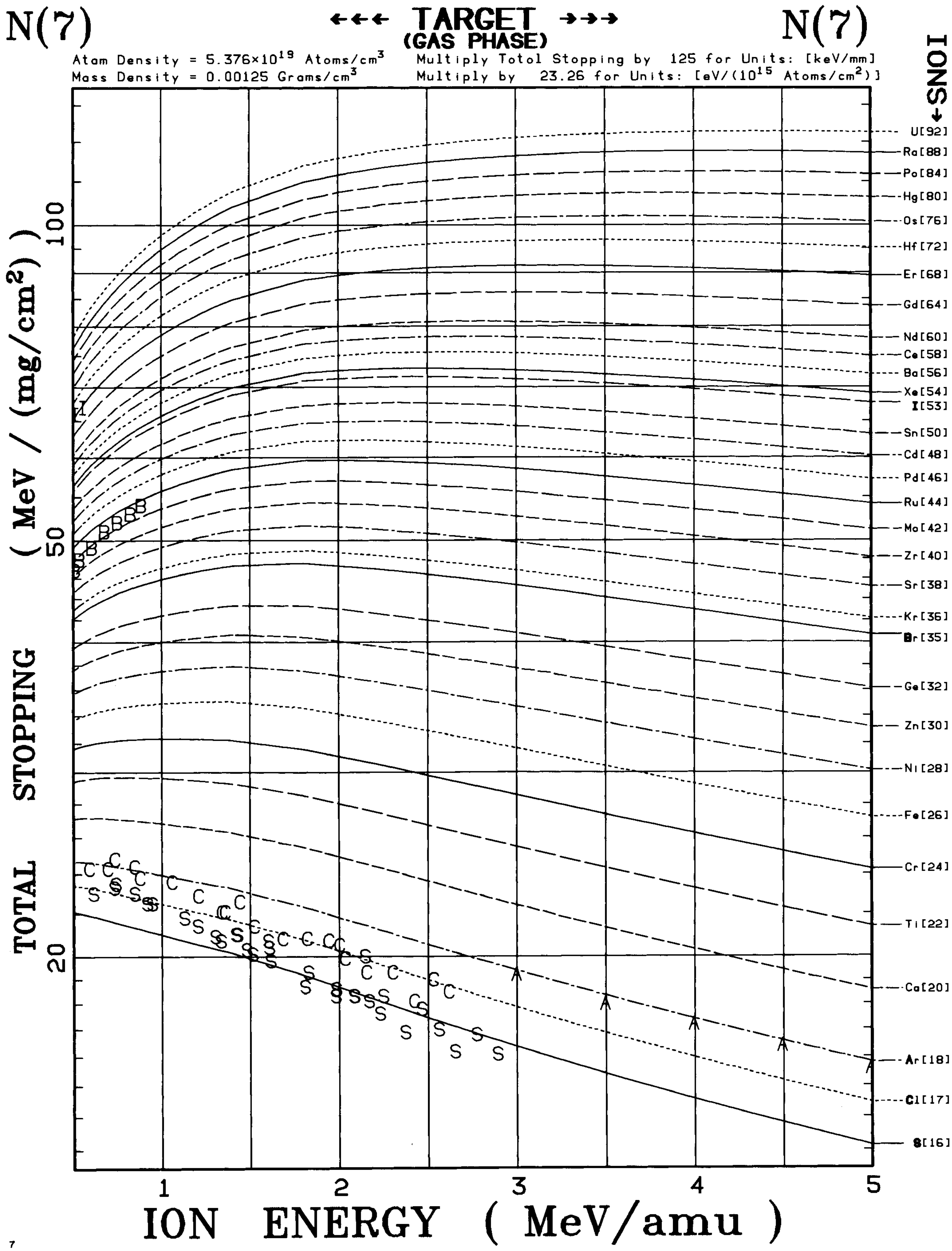
Mass Density = 0.00125 Grams/cm^3 Multiply by 23.26 for Units: [eV/(10^{15} Atoms/cm^2)]



7


N(7)
←←← TARGET →→→
(GAS PHASE)
N(7)
Atom Density = 5.376×10^19 Atoms/cm^3
Mass Density = 0.00125 Grams/cm^3
Multiply Total Stopping by 125 for Units: [keV/mm]
Multiply by 23.26 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm²))
100
90
80
70
60
50
40
30
20
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

7

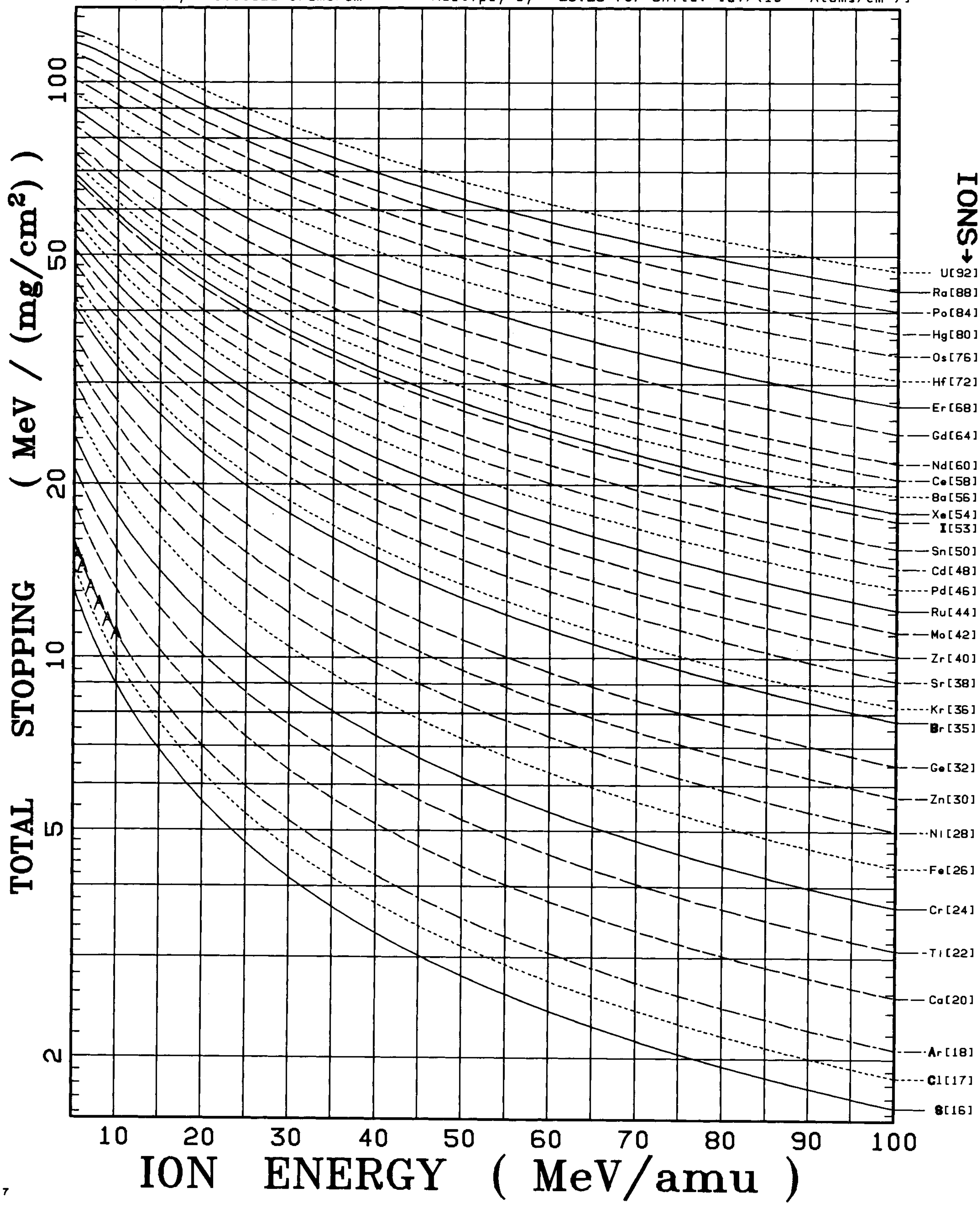

N(7)
←←← TARGET →→→
(GAS PHASE)
N(7)
Atom Density = 5.376×10^19 Atoms/cm^3
Mass Density = 0.00125 Grams/cm^3
Multiply Total Stopping by 125 for Units: [keV/mm]
Multiply by 23.26 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm²))
100
50
20
1
2
3
4
5
ION ENERGY (MeV/amu)

7

N(7) ←←← TARGET (GAS PHASE) →→→ N(7)

Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 125 for Units: [keV/mm]

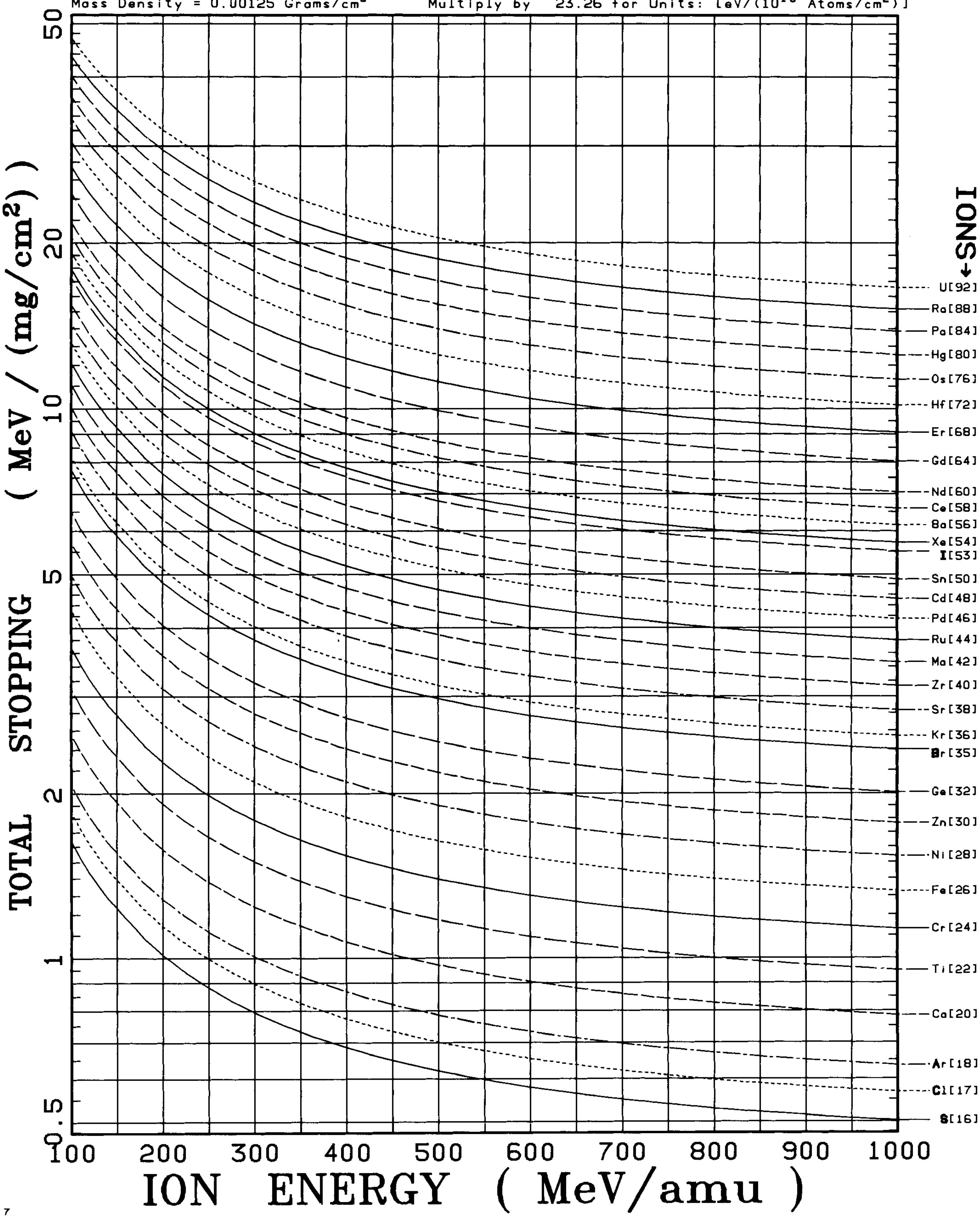
Mass Density = 0.00125 Grams/cm^3 Multiply by 23.26 for Units: [eV/(10^{15} Atoms/cm^2)]



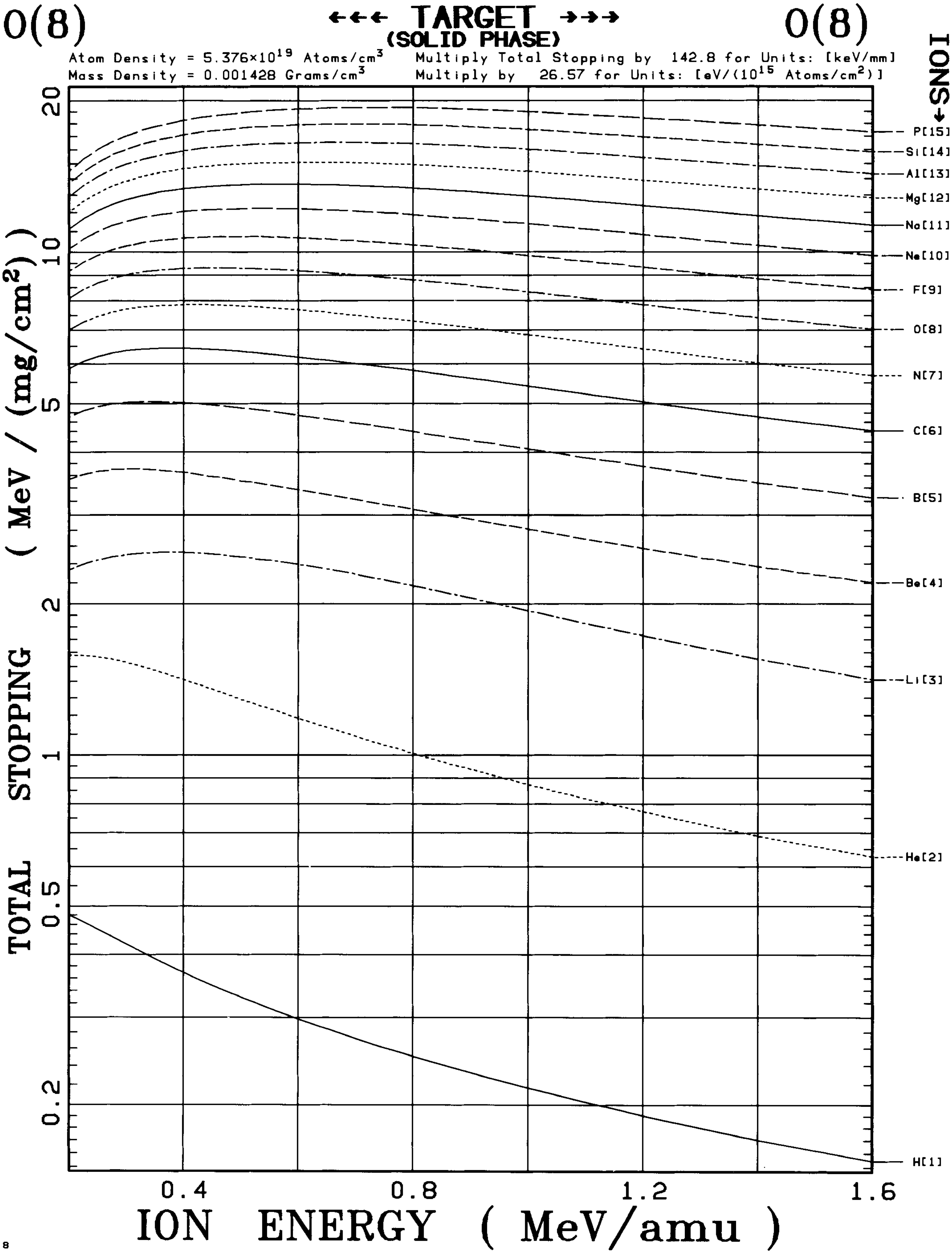
7

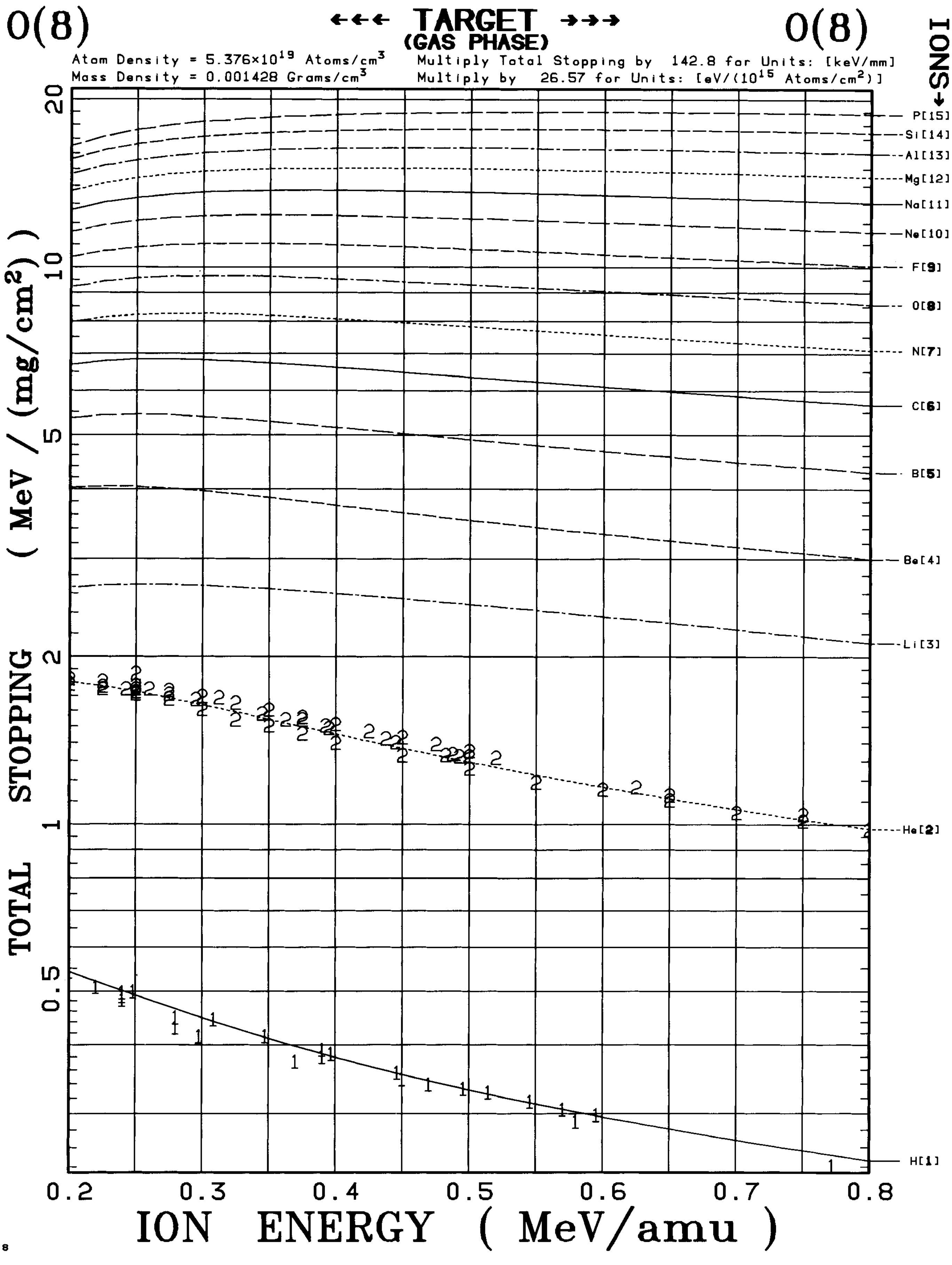
N(7) ←←← TARGET (GAS PHASE) →→→ N(7)

Atom Density = 5.376×10[19] Atoms/cm[3] Multiply Total Stopping by 125 for Units: [keV/mm]
Mass Density = 0.00125 Grams/cm[3] Multiply by 23.26 for Units: [eV/(10[15] Atoms/cm[2])]



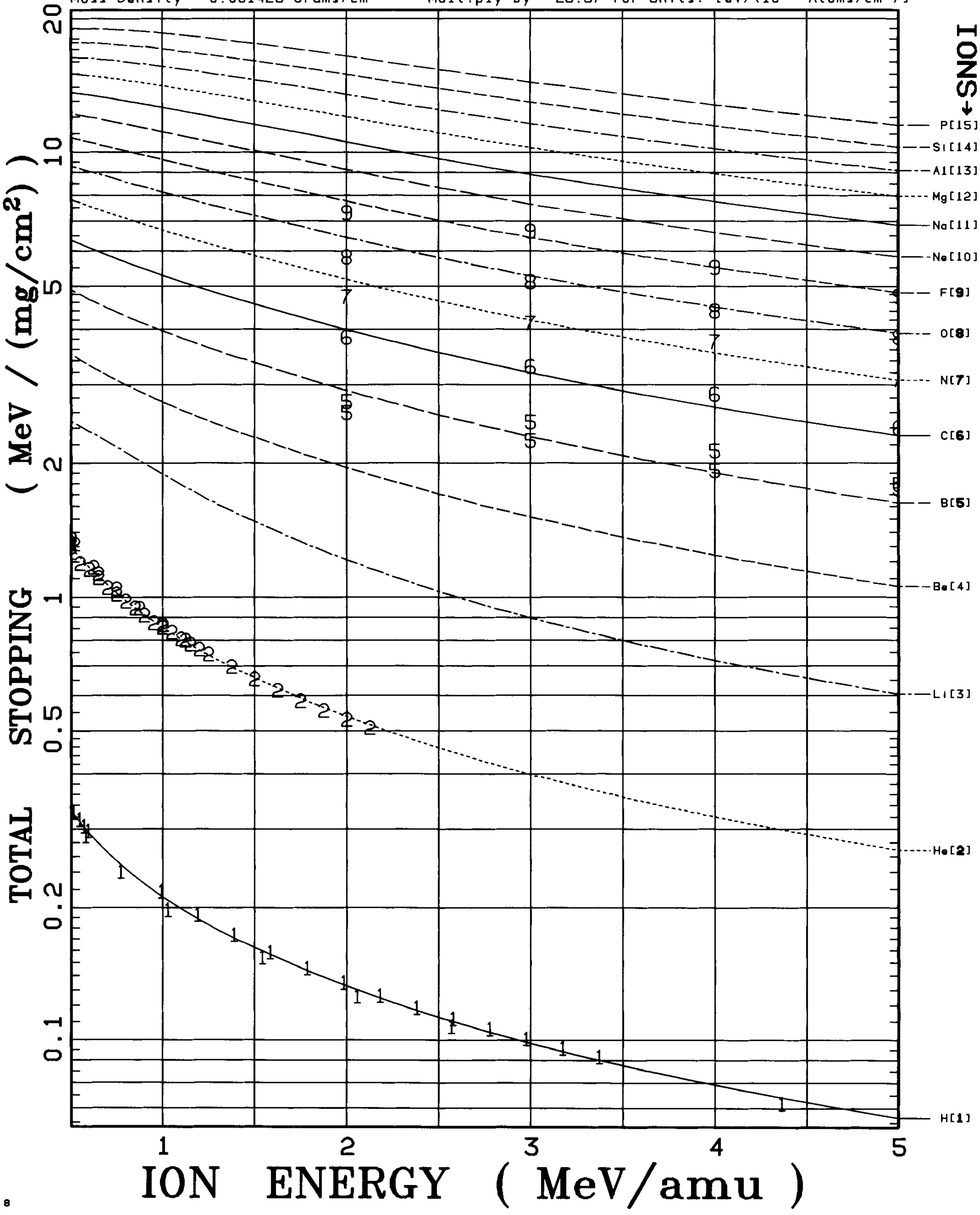
7


O(8)
←←← TARGET →→→
(SOLID PHASE)
O(8)
Atom Density = 5.376×10^19 Atoms/cm^3
Multiply Total Stopping by 142.8 for Units: [keV/mm]
Mass Density = 0.001428 Grams/cm^3
Multiply by 26.57 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
TOTAL STOPPING (MeV / (mg/cm^2))
20
10
5
2
1
0.5
0.2
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
0.4
0.8
1.2
1.6
ION ENERGY (MeV/amu)


O(8)
←←← TARGET →→→
(GAS PHASE)
O(8)
IONS→
Atom Density = 5.376×10^19 Atoms/cm^3
Mass Density = 0.001428 Grams/cm^3
Multiply Total Stopping by 142.8 for Units: [keV/mm]
Multiply by 26.57 for Units: [eV/(10^15 Atoms/cm^2)]
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm^2))
20
10
5
2
1
0.5
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

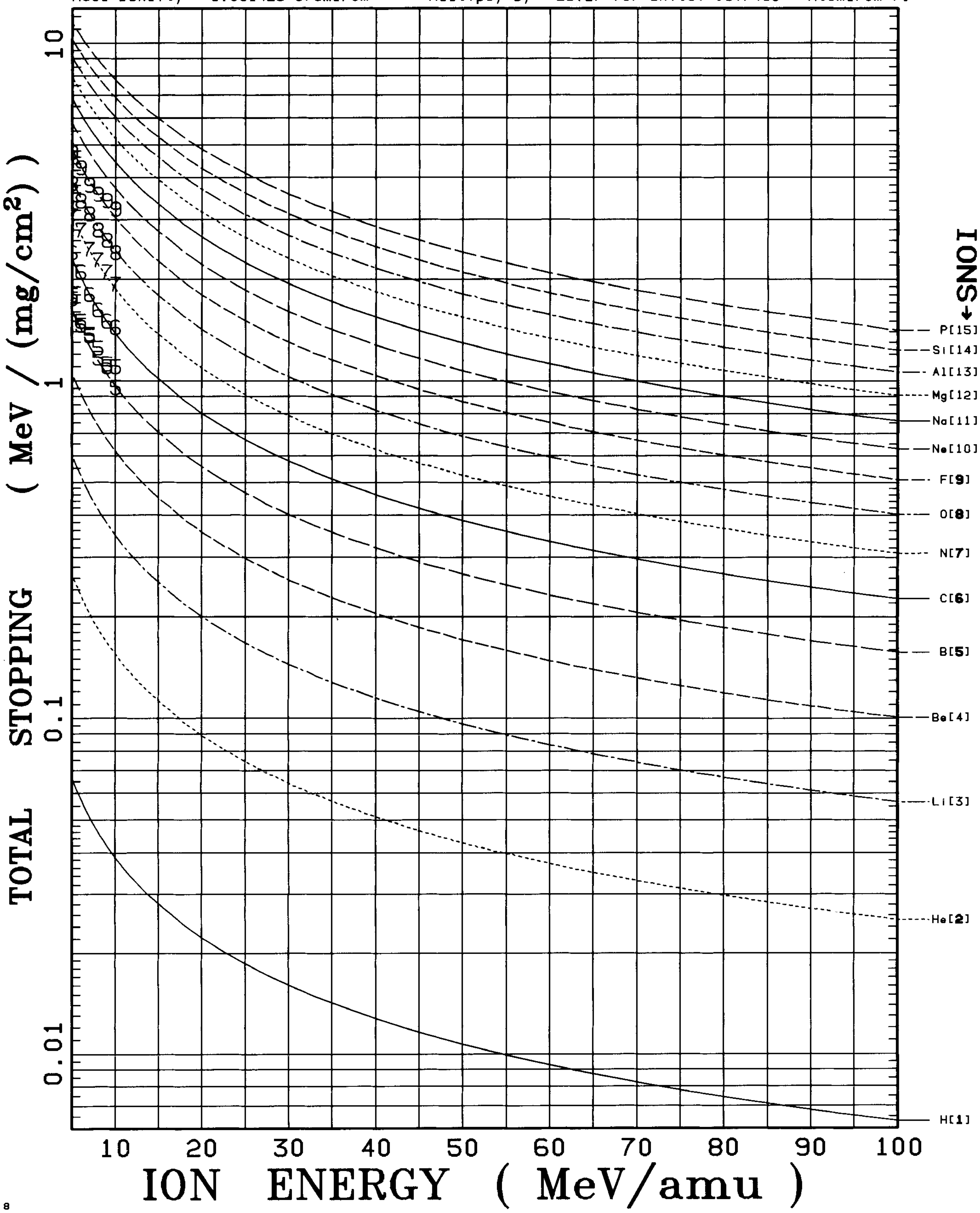
O(8) ←←← TARGET (GAS PHASE) →→→ O(8)

Atom Density = 5.376×10[19] Atoms/cm[3] Multiply Total Stopping by 142.8 for Units: [keV/mm]
Mass Density = 0.001428 Grams/cm[3] Multiply by 26.57 for Units: [eV/(10[15] Atoms/cm[2])]



O(8) ←←← **TARGET** (GAS PHASE) →→→ O(8)

Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 142.8 for Units: [keV/mm]
Mass Density = 0.001428 Grams/cm^3 Multiply by 26.57 for Units: [eV/(10^{15} Atoms/cm^2)]

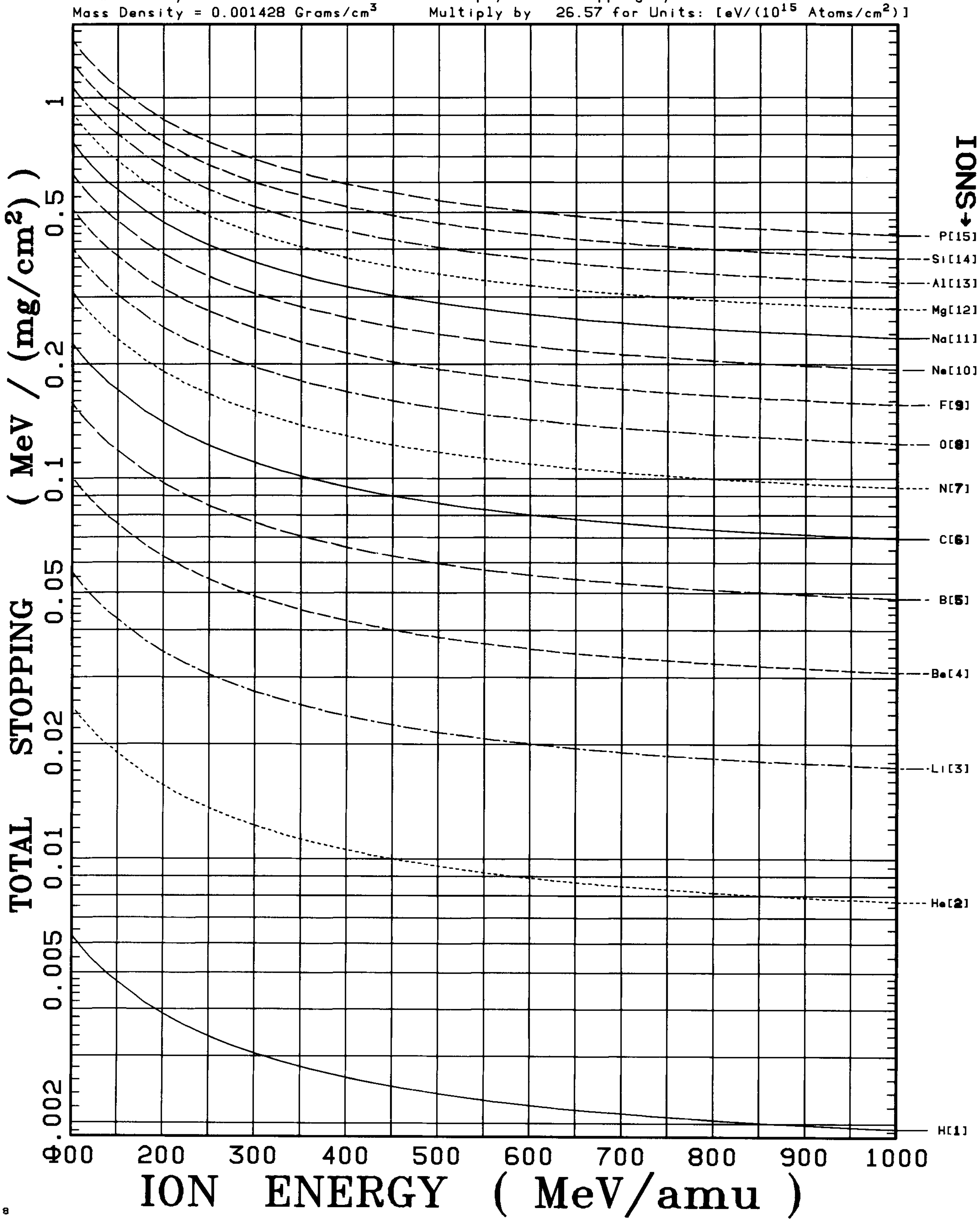


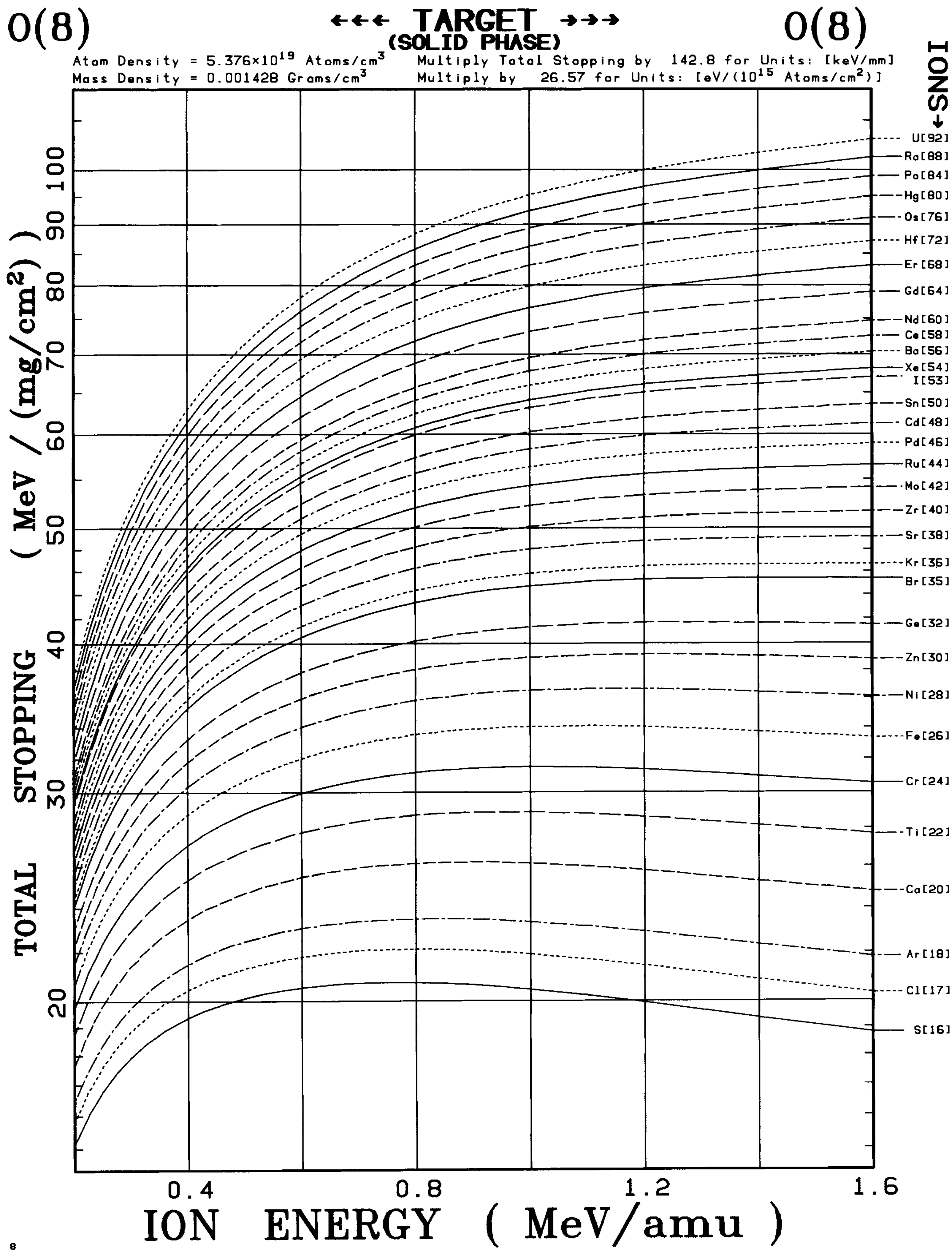
0(8) ←←← **TARGET** →→→ 0(8)

(GAS PHASE)

Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 142.8 for Units: [keV/mm]

Mass Density = 0.001428 Grams/cm^3 Multiply by 26.57 for Units: [eV/(10^{15} Atoms/cm^2)]



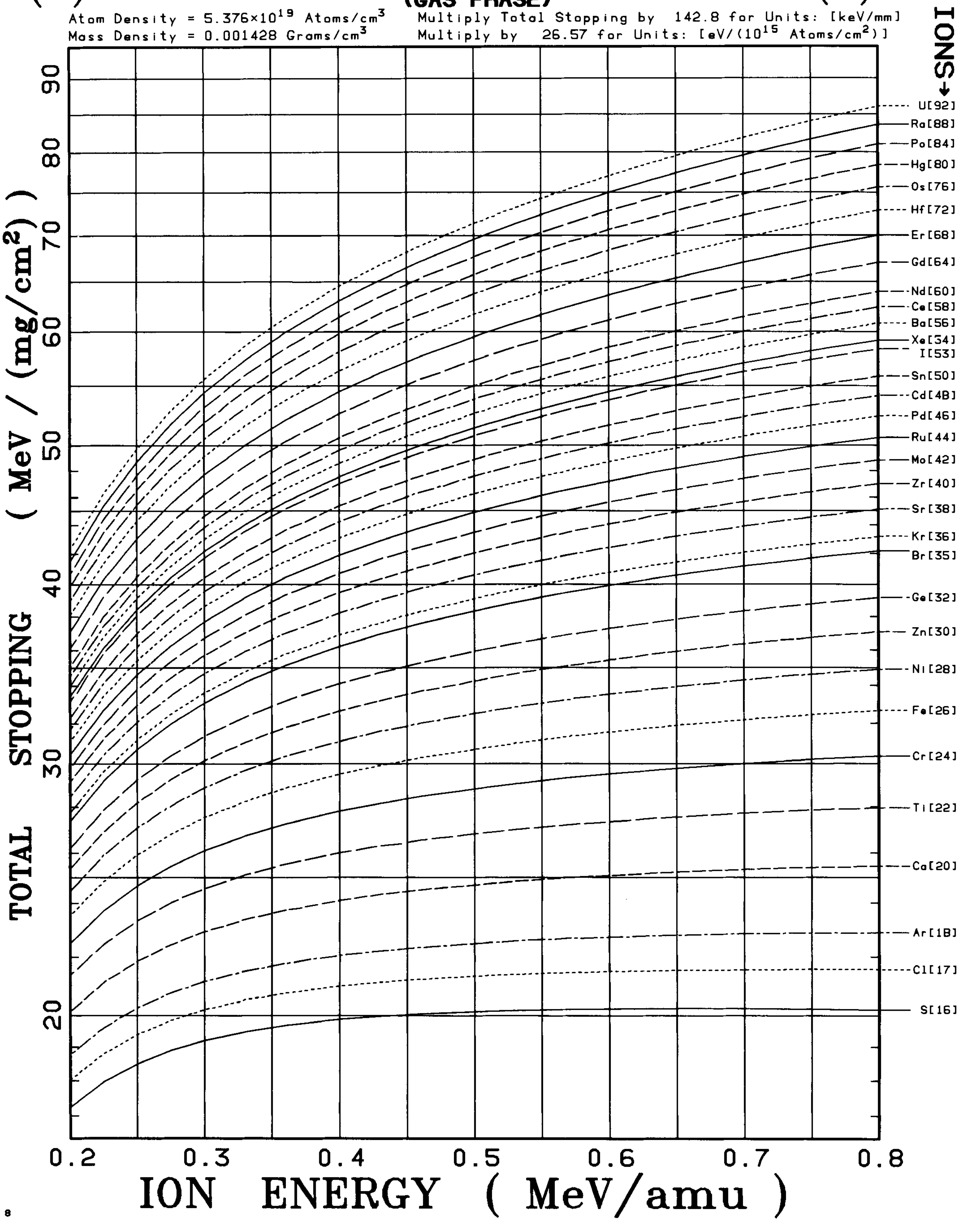

O(8)
←←← TARGET →→→
(SOLID PHASE)
O(8)
Atom Density = 5.376×10^19 Atoms/cm^3
Multiply Total Stopping by 142.8 for Units: [keV/mm]
Mass Density = 0.001428 Grams/cm^3
Multiply by 26.57 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm^2))
100
90
80
70
60
50
40
30
20
0.4
0.8
1.2
1.6
ION ENERGY (MeV/amu)

O(8) ←←← TARGET →→→ O(8)

(GAS PHASE)

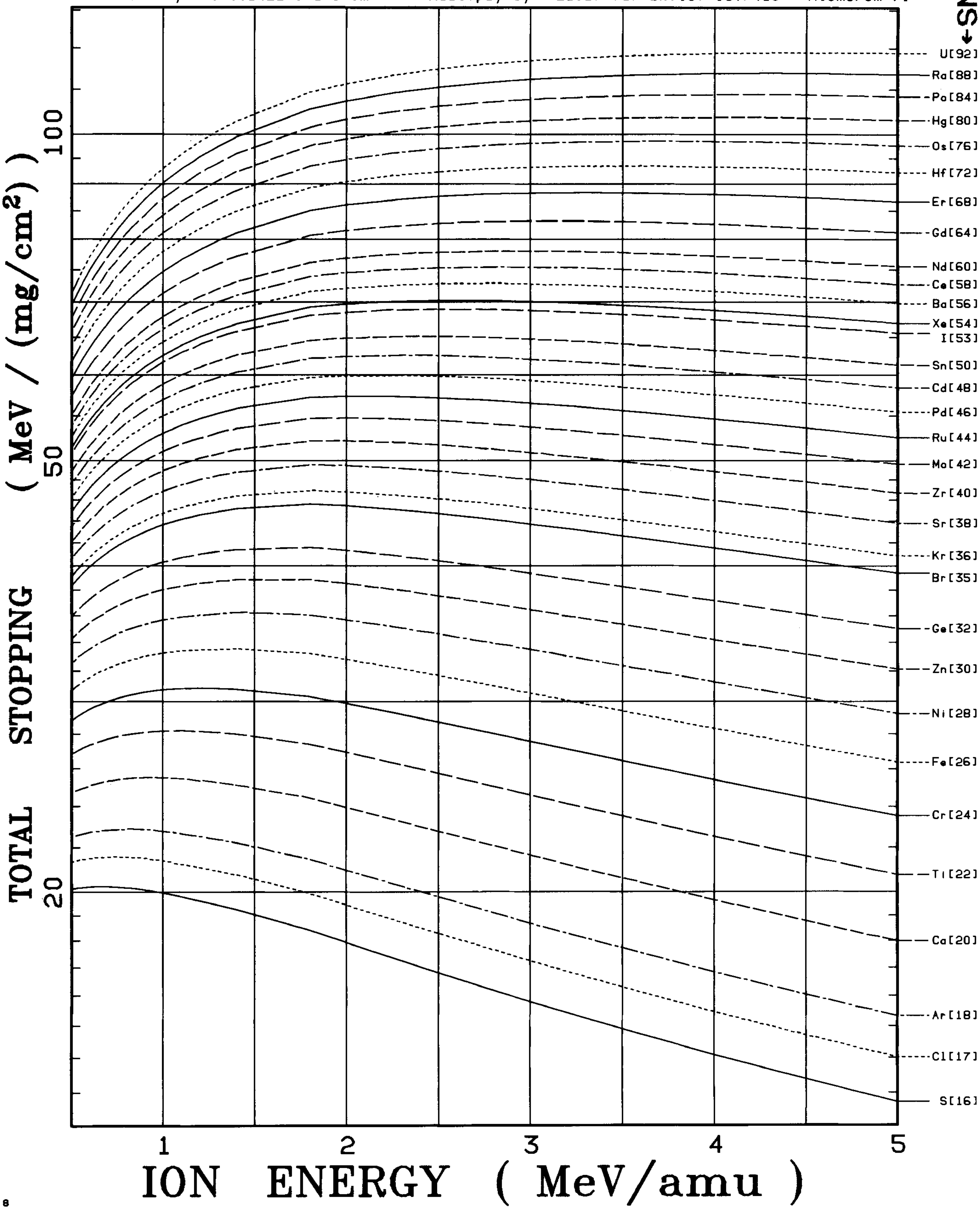
Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 142.8 for Units: [keV/mm]

Mass Density = 0.001428 Grams/cm^3 Multiply by 26.57 for Units: [eV/(10^{15} Atoms/cm^2)]



O(8) ←←← TARGET (GAS PHASE) →→→ O(8)

Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 142.8 for Units: [keV/mm]
Mass Density = 0.001428 Grams/cm^3 Multiply by 26.57 for Units: [eV/(10^{15} Atoms/cm^2)]

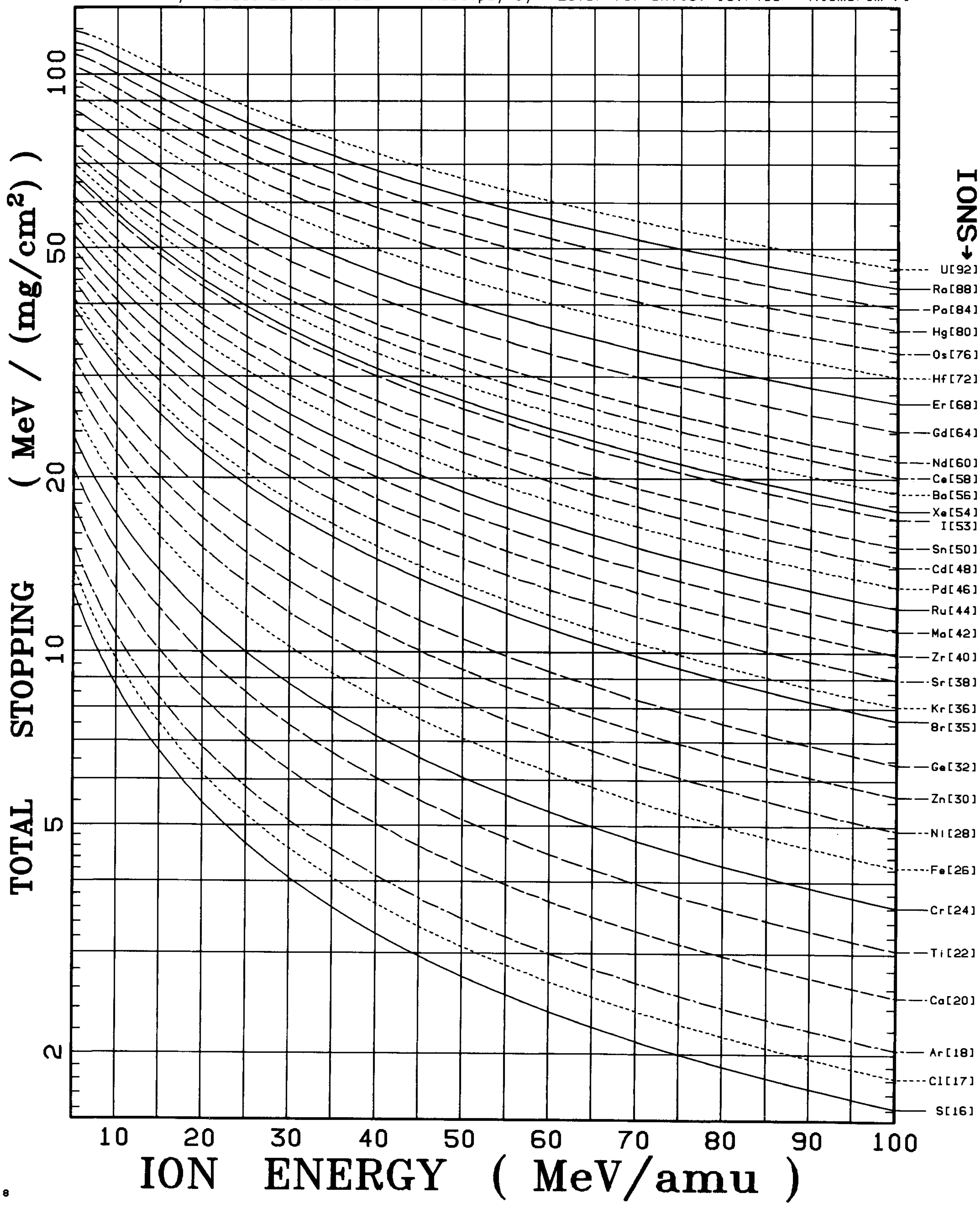


O(8) ←←← TARGET →→→ O(8)

(GAS PHASE)

Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 142.8 for Units: [keV/mm]

Mass Density = 0.001428 Grams/cm^3 Multiply by 26.57 for Units: [eV/(10^{15} Atoms/cm^2)]

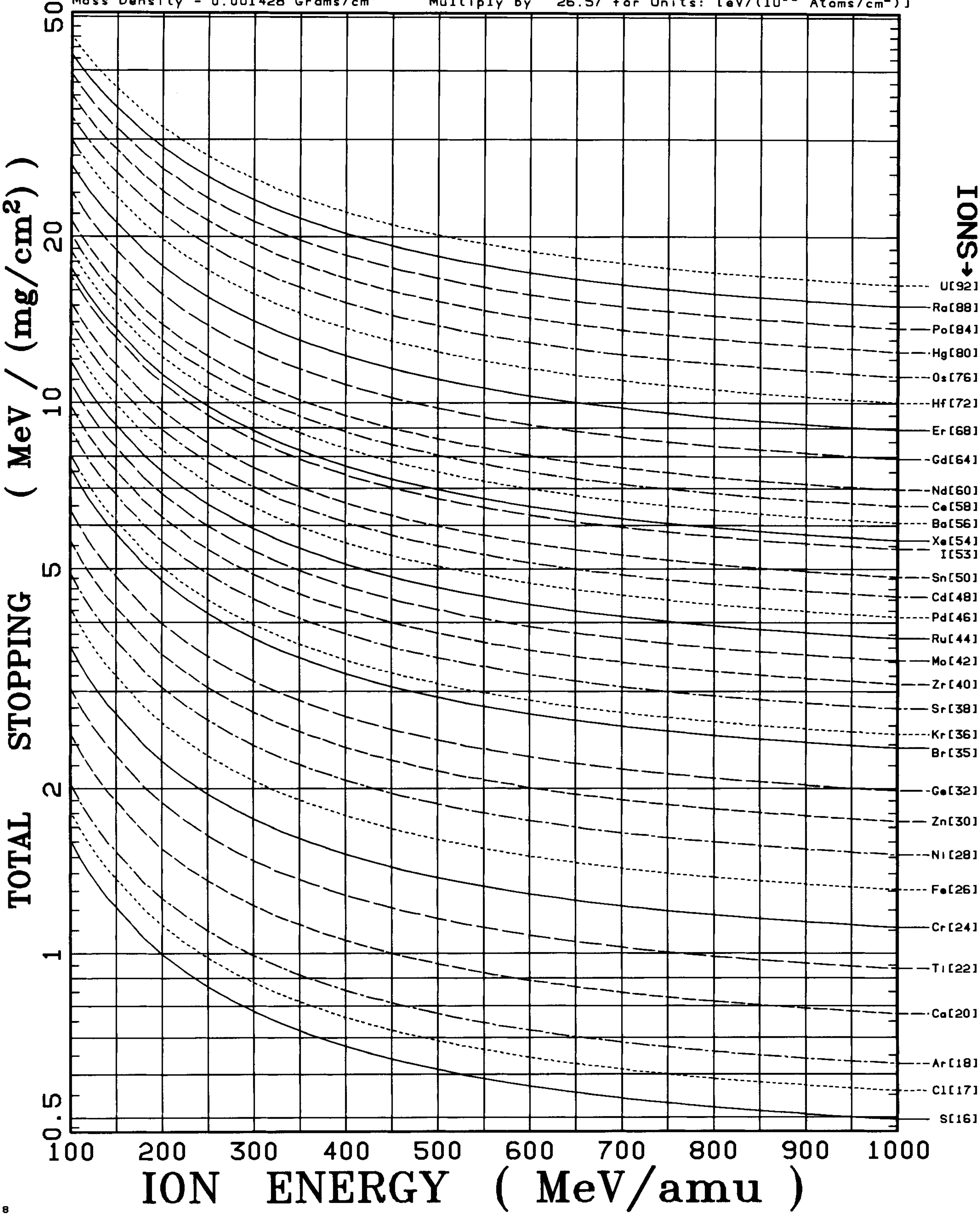


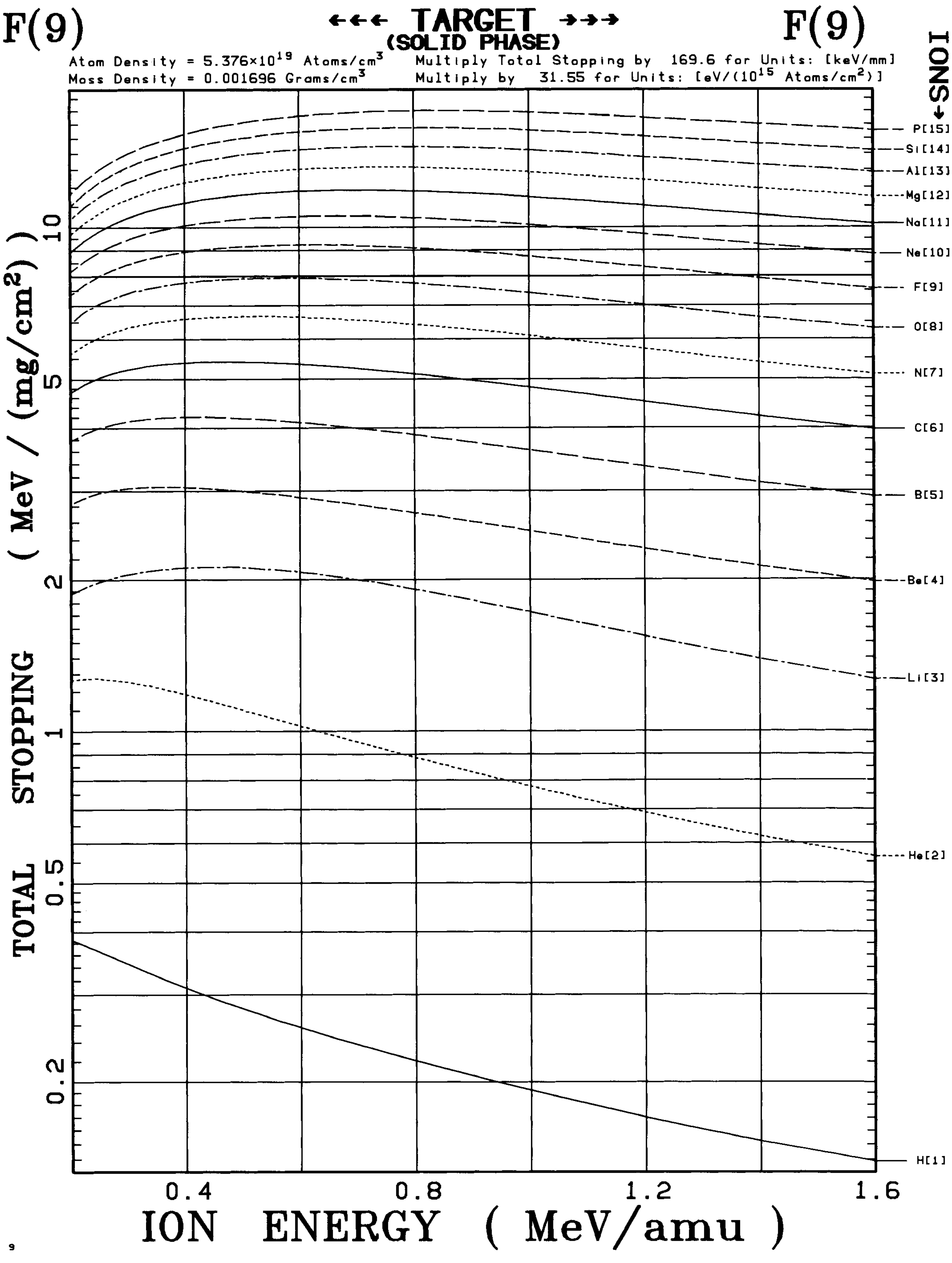
O(8) ←←← **TARGET** →→→ O(8)

(GAS PHASE)

Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 142.8 for Units: [keV/mm]

Mass Density = 0.001428 Grams/cm^3 Multiply by 26.57 for Units: [eV/(10^{15} Atoms/cm^2)]



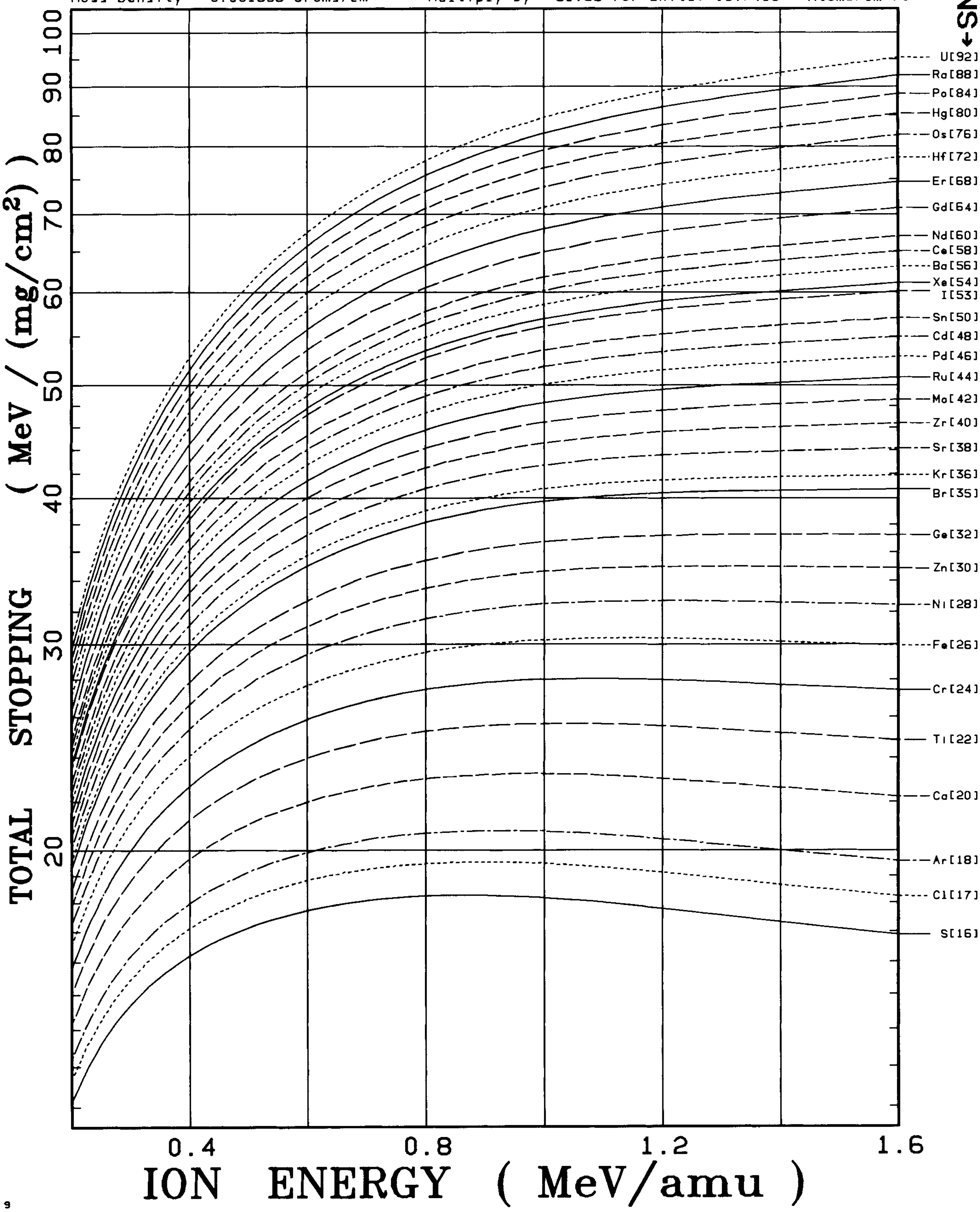

F(9)
←←← TARGET →→→
(SOLID PHASE)
F(9)
IONS→
Atom Density = 5.376×10^19 Atoms/cm^3
Mass Density = 0.001696 Grams/cm^3
Multiply Total Stopping by 169.6 for Units: [keV/mm]
Multiply by 31.55 for Units: [eV/(10^15 Atoms/cm^2)]
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
10
5
2
1
0.5
0.2
TOTAL STOPPING (MeV / (mg/cm²))
0.4
0.8
1.2
1.6
ION ENERGY (MeV/amu)

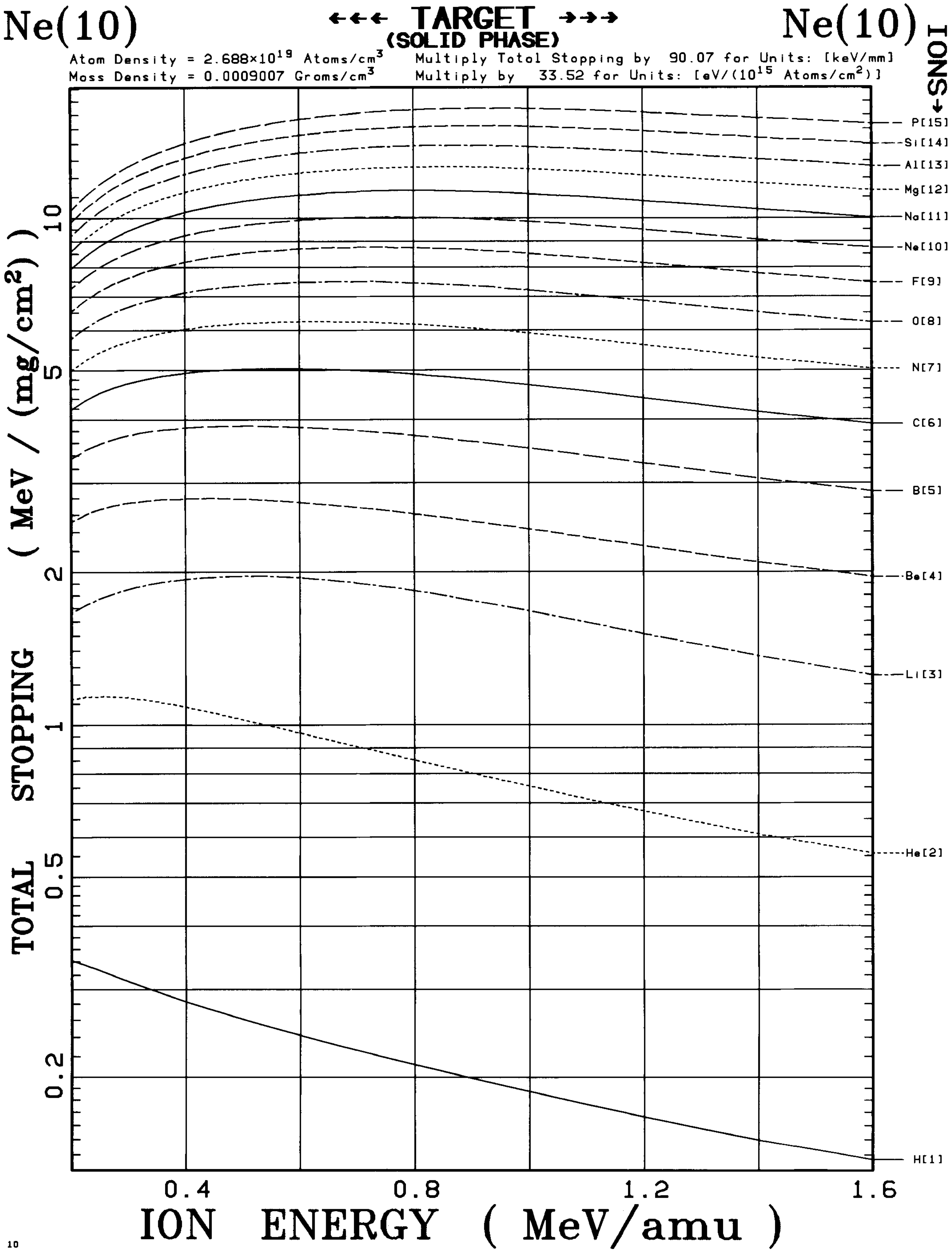
F(9) ←←← TARGET →→→ F(9)

(SOLID PHASE)

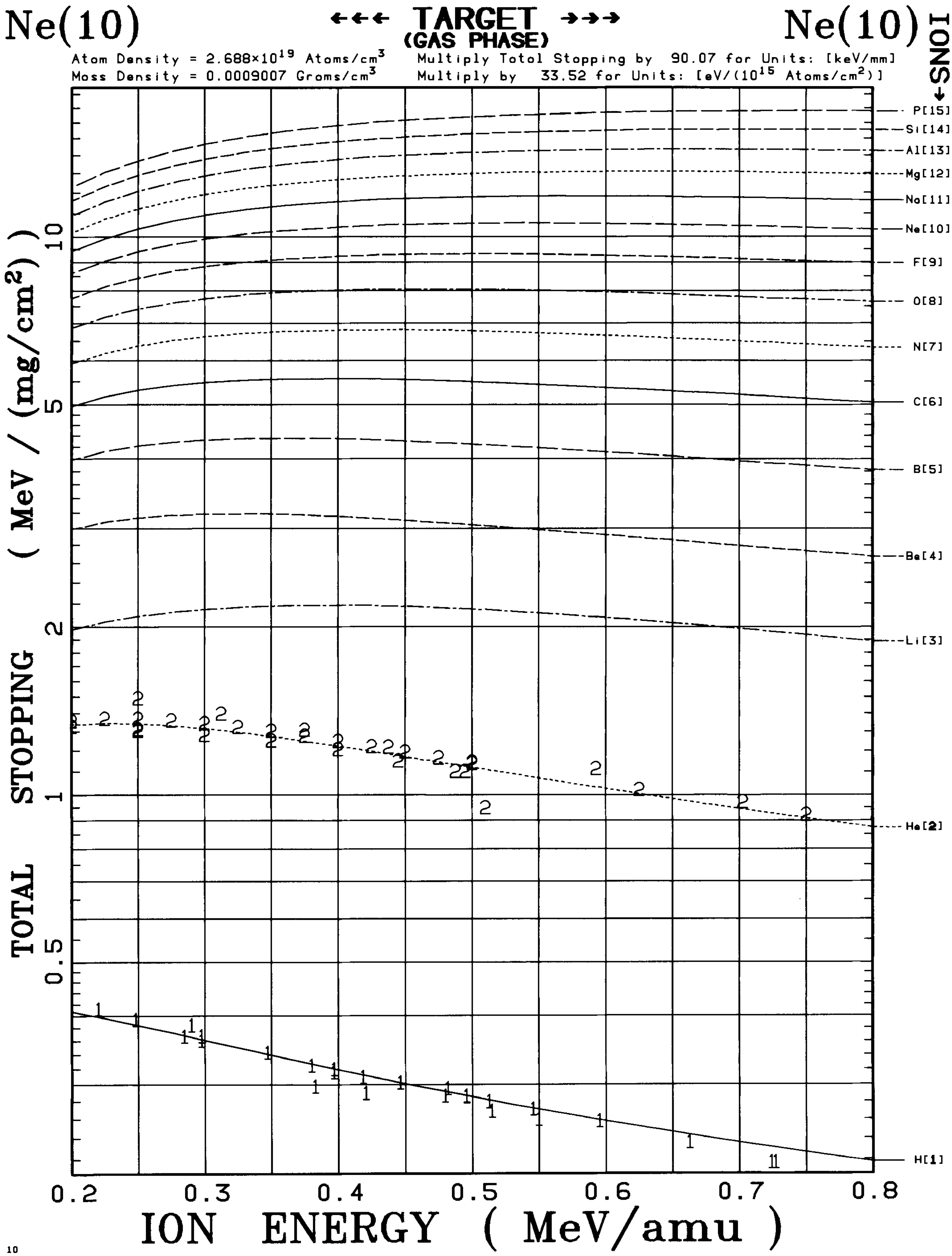
Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 169.6 for Units: [keV/mm]

Mass Density = 0.001696 Grams/cm^3 Multiply by 31.55 for Units: [eV/(10^{15} Atoms/cm^2)]



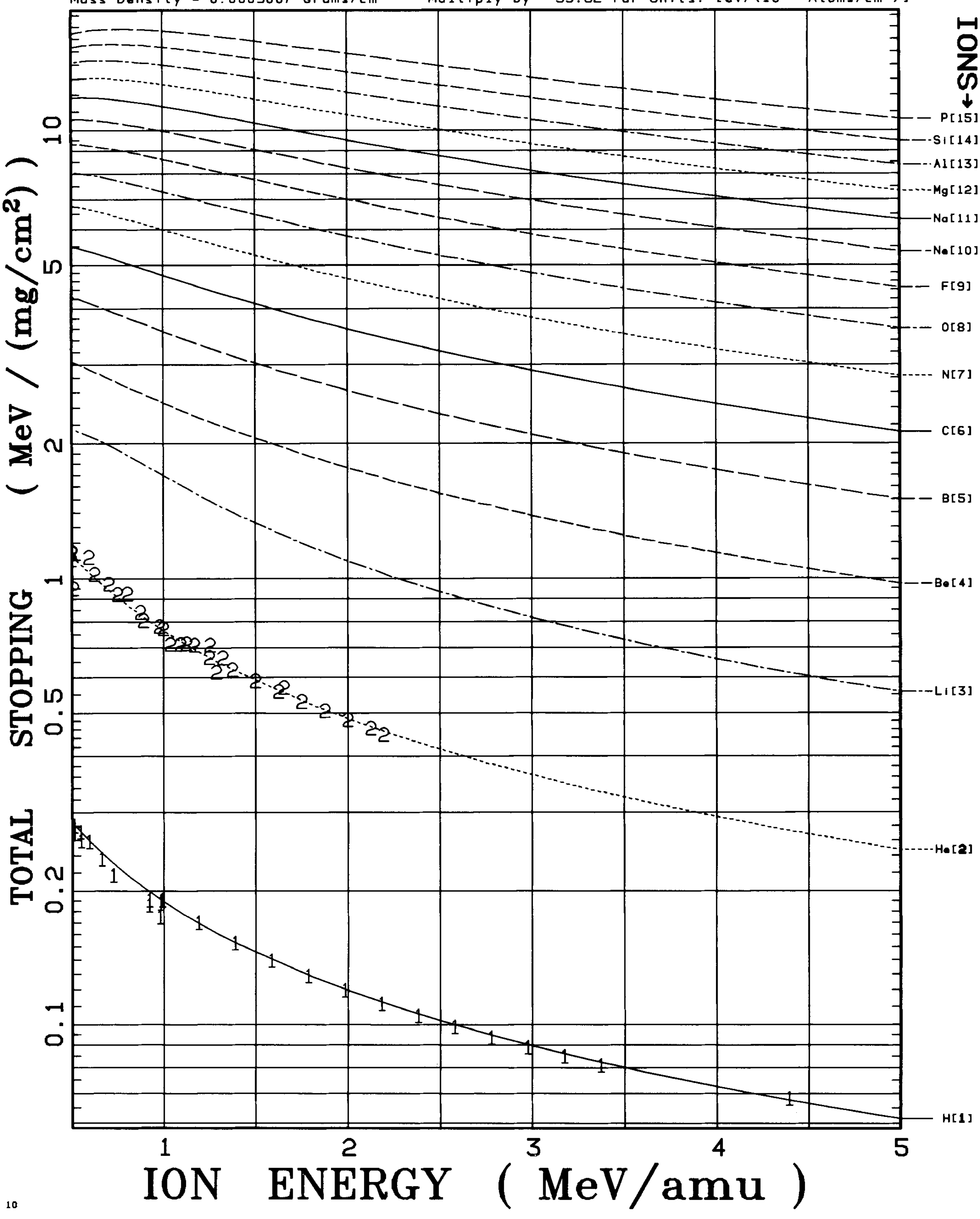


Ne(10)
←←← TARGET →→→
(SOLID PHASE)
Ne(10)
IONS→
Atom Density = 2.688×10^19 Atoms/cm^3
Multiply Total Stopping by 90.07 for Units: [keV/mm]
Mass Density = 0.0009007 Grams/cm^3
Multiply by 33.52 for Units: [eV/(10^15 Atoms/cm^2)]
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
10
5
2
1
0.5
0.2
TOTAL STOPPING (MeV / (mg/cm²))
0.4
0.8
1.2
1.6
ION ENERGY (MeV/amu)


Ne(10)
←←← TARGET →→→
(GAS PHASE)
Ne(10)
IONS→
Atom Density = 2.688×10^19 Atoms/cm^3
Mass Density = 0.0009007 Grams/cm^3
Multiply Total Stopping by 90.07 for Units: [keV/mm]
Multiply by 33.52 for Units: [eV/(10^15 Atoms/cm^2)]
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm^2))
0.5
1
2
5
10
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

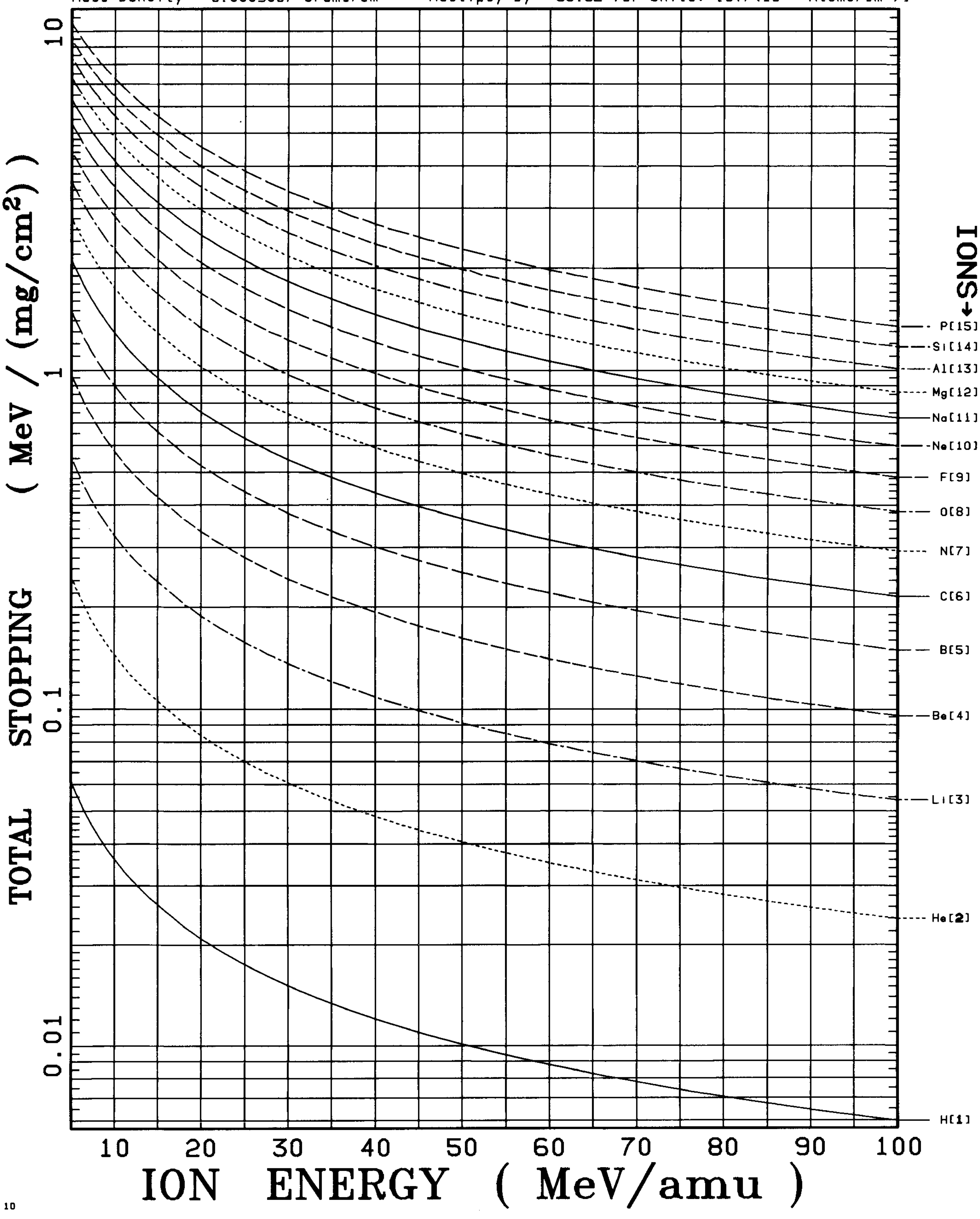
Ne(10) ←←← TARGET (GAS PHASE) →→→ Ne(10)

Atom Density = 2.688×10^{19} Atoms/cm^3 Multiply Total Stopping by 90.07 for Units: [keV/mm]
Mass Density = 0.0009007 Grams/cm^3 Multiply by 33.52 for Units: [eV/(10^{15} Atoms/cm^2)]



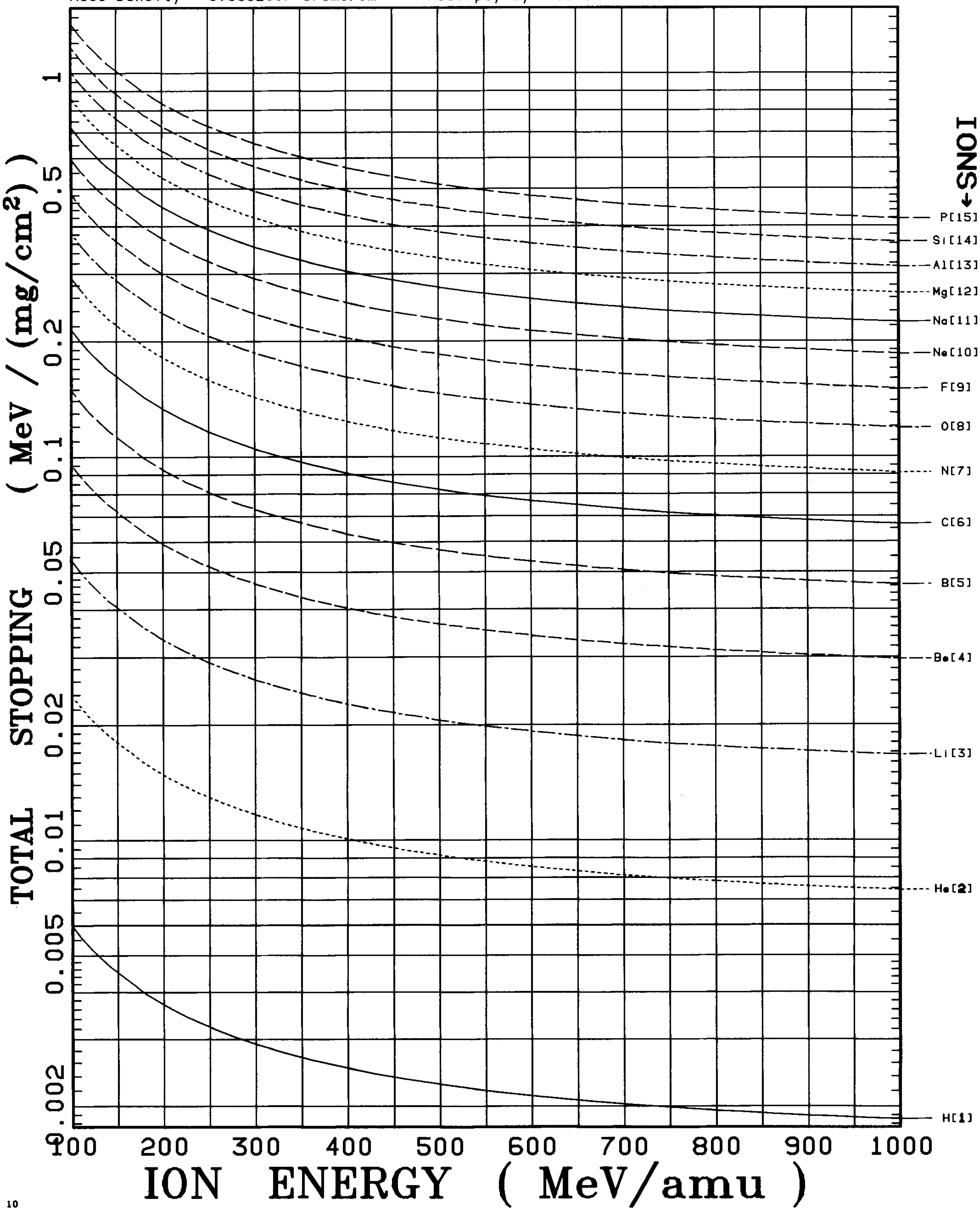
Ne(10) ←←← TARGET (GAS PHASE) →→→ Ne(10)

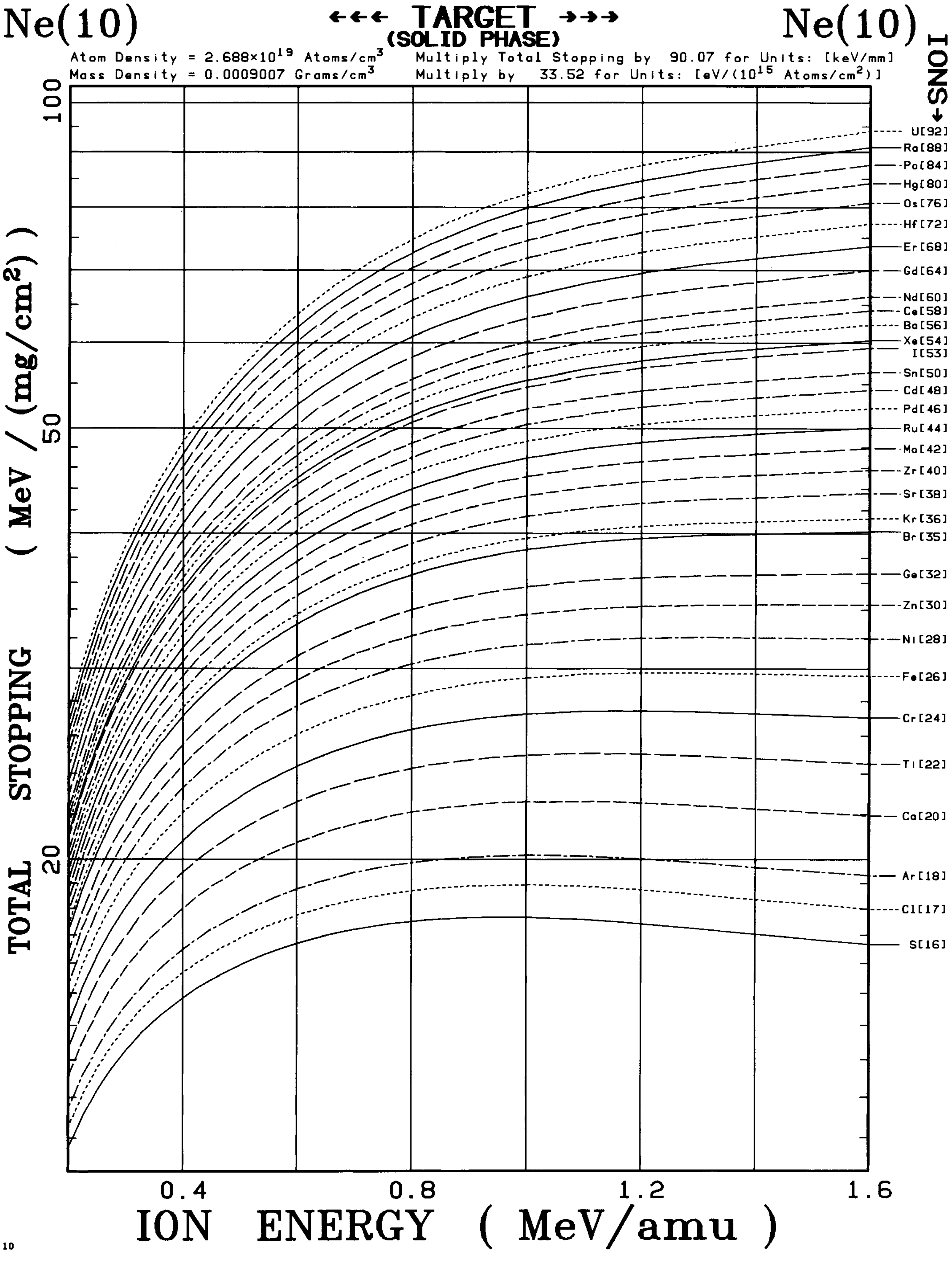
Atom Density = 2.688×10^{19} Atoms/cm^3 Multiply Total Stopping by 90.07 for Units: [keV/mm]
Mass Density = 0.0009007 Grams/cm^3 Multiply by 33.52 for Units: [eV/(10^{15} Atoms/cm^2)]

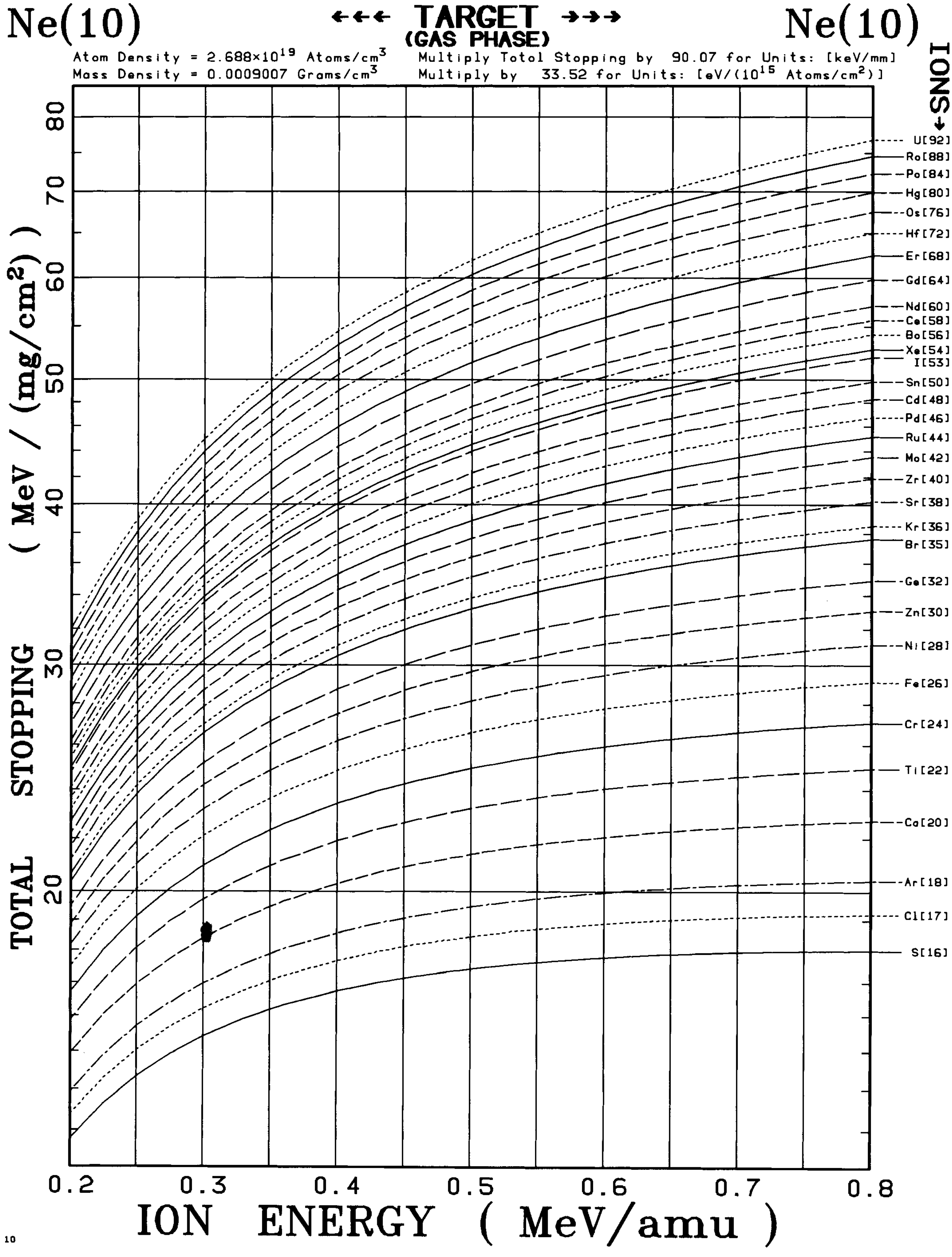


Ne(10) ←←← TARGET (GAS PHASE) →→→ Ne(10)

Atom Density = 2.688×10^{19} Atoms/cm^3 Multiply Total Stopping by 90.07 for Units: [keV/mm]
Mass Density = 0.0009007 Grams/cm^3 Multiply by 33.52 for Units: [eV/(10^{15} Atoms/cm^2)]



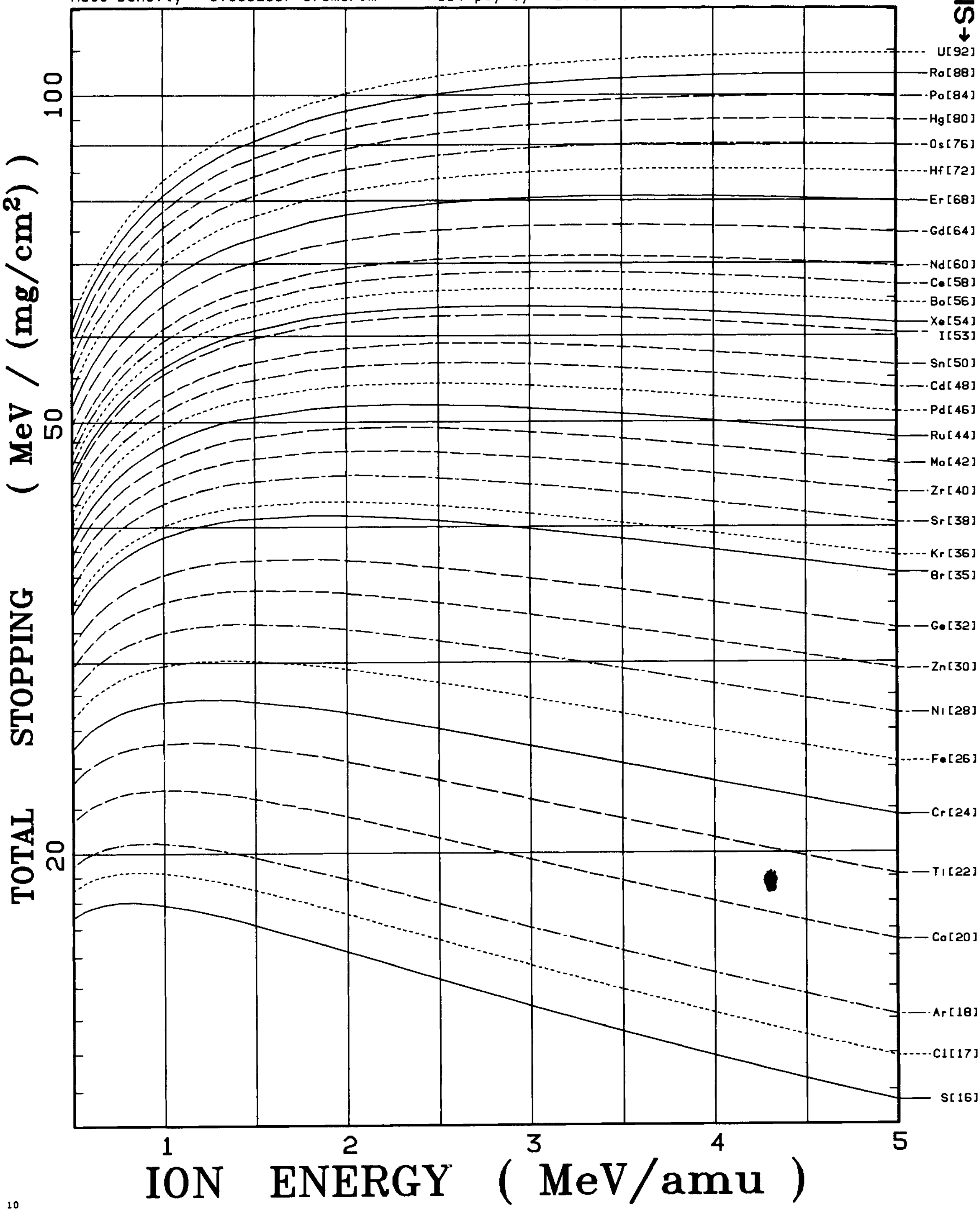

Ne(10)
←←← TARGET →→→
(SOLID PHASE)
Ne(10)
IONS→
Atom Density = 2.688×10^19 Atoms/cm^3
Mass Density = 0.0009007 Grams/cm^3
Multiply Total Stopping by 90.07 for Units: [keV/mm]
Multiply by 33.52 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
100
50
20
10
0.4
0.8
1.2
1.6
ION ENERGY (MeV/amu)
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]



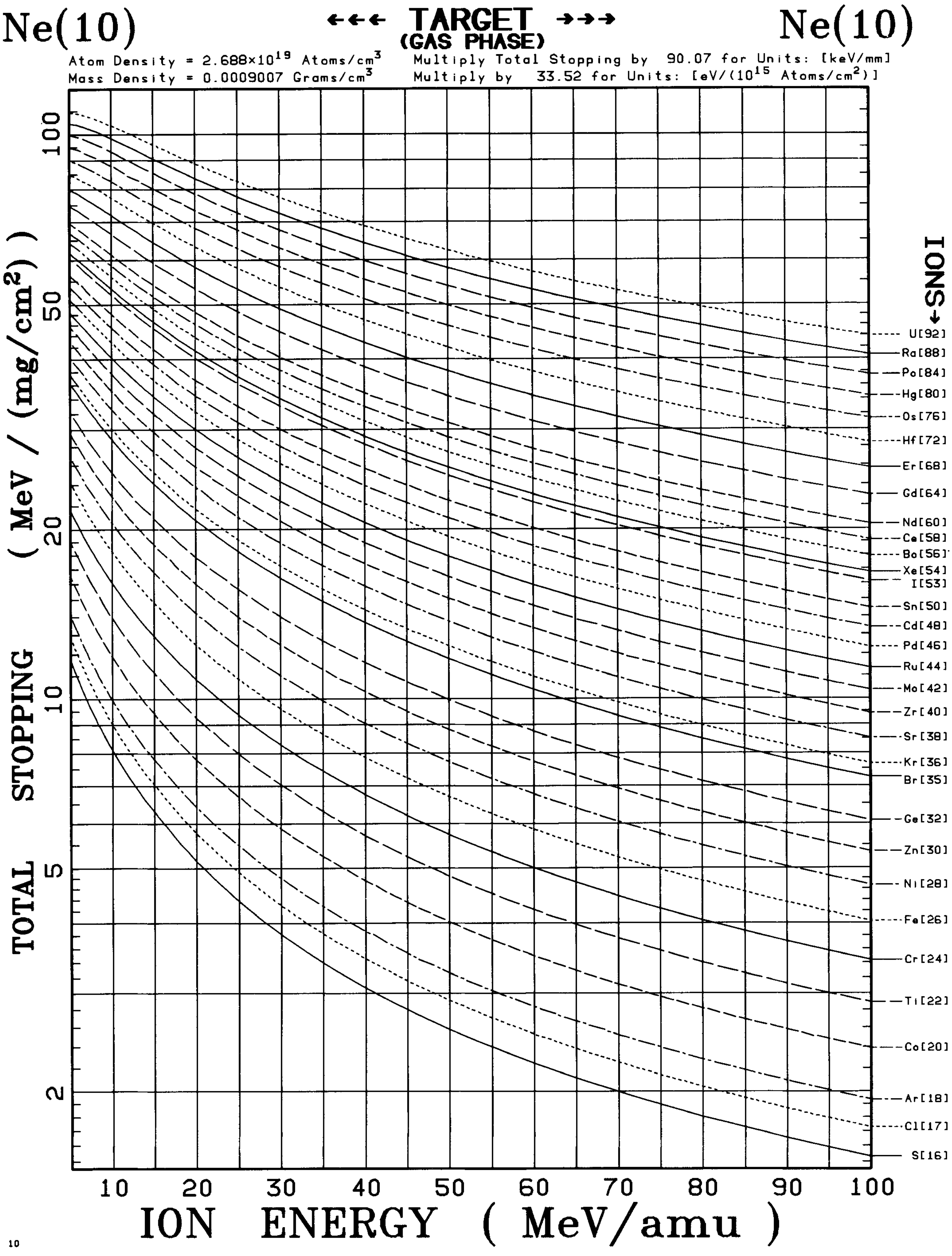
Ne(10)
←←← TARGET →→→
(GAS PHASE)
Ne(10)
Atom Density = 2.688×10^19 Atoms/cm^3
Mass Density = 0.0009007 Grams/cm^3
Multiply Total Stopping by 90.07 for Units: [keV/mm]
Multiply by 33.52 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm²))
20
30
40
50
60
70
80
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

Ne(10) ←←← TARGET (GAS PHASE) →→→ Ne(10)

Atom Density = 2.688×10[19] Atoms/cm[3] Multiply Total Stopping by 90.07 for Units: [keV/mm]
Mass Density = 0.0009007 Grams/cm[3] Multiply by 33.52 for Units: [eV/(10[15] Atoms/cm[2])]



10

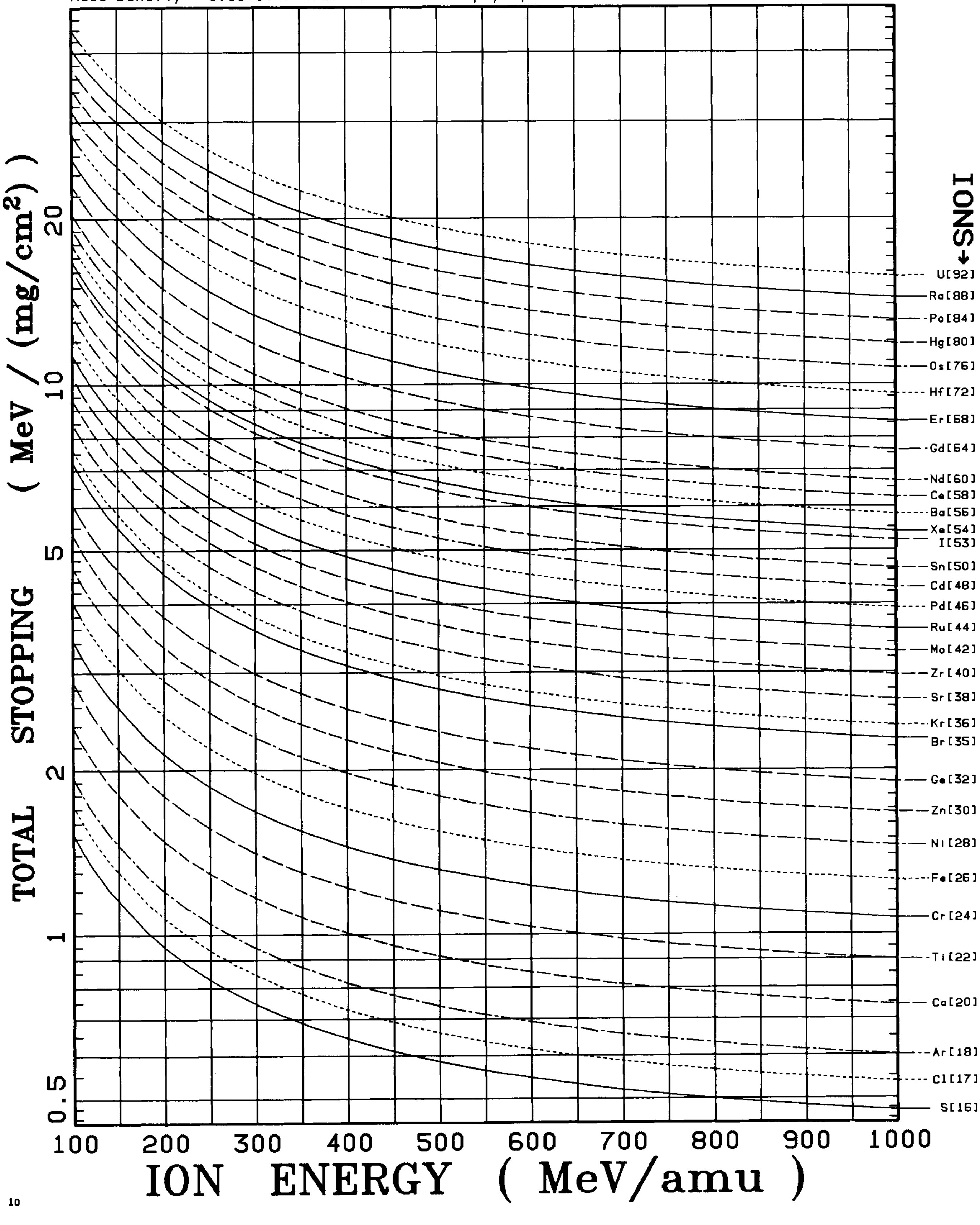


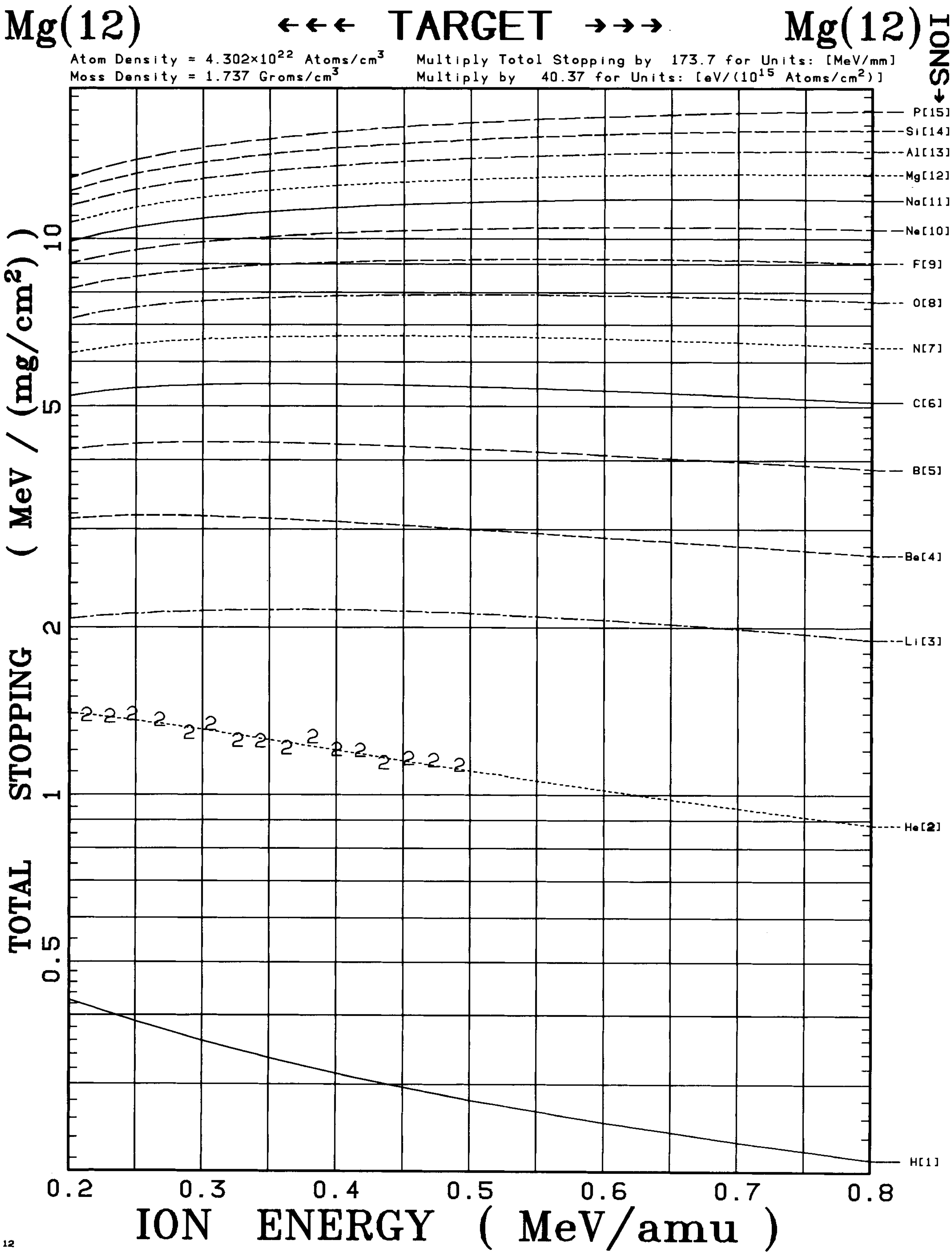
Ne(10)
←←← TARGET →→→
(GAS PHASE)
Ne(10)
Atom Density = 2.688×10^19 Atoms/cm^3
Mass Density = 0.0009007 Grams/cm^3
Multiply Total Stopping by 90.07 for Units: [keV/mm]
Multiply by 33.52 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
100
50
20
10
5
2
10
20
30
40
50
60
70
80
90
100
ION ENERGY (MeV/amu)
←IONS
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]

Ne(10) ←←← TARGET (GAS PHASE) →→→ Ne(10)

Atom Density = 2.688×10^{19} Atoms/cm^3 Multiply Total Stopping by 90.07 for Units: [keV/mm]

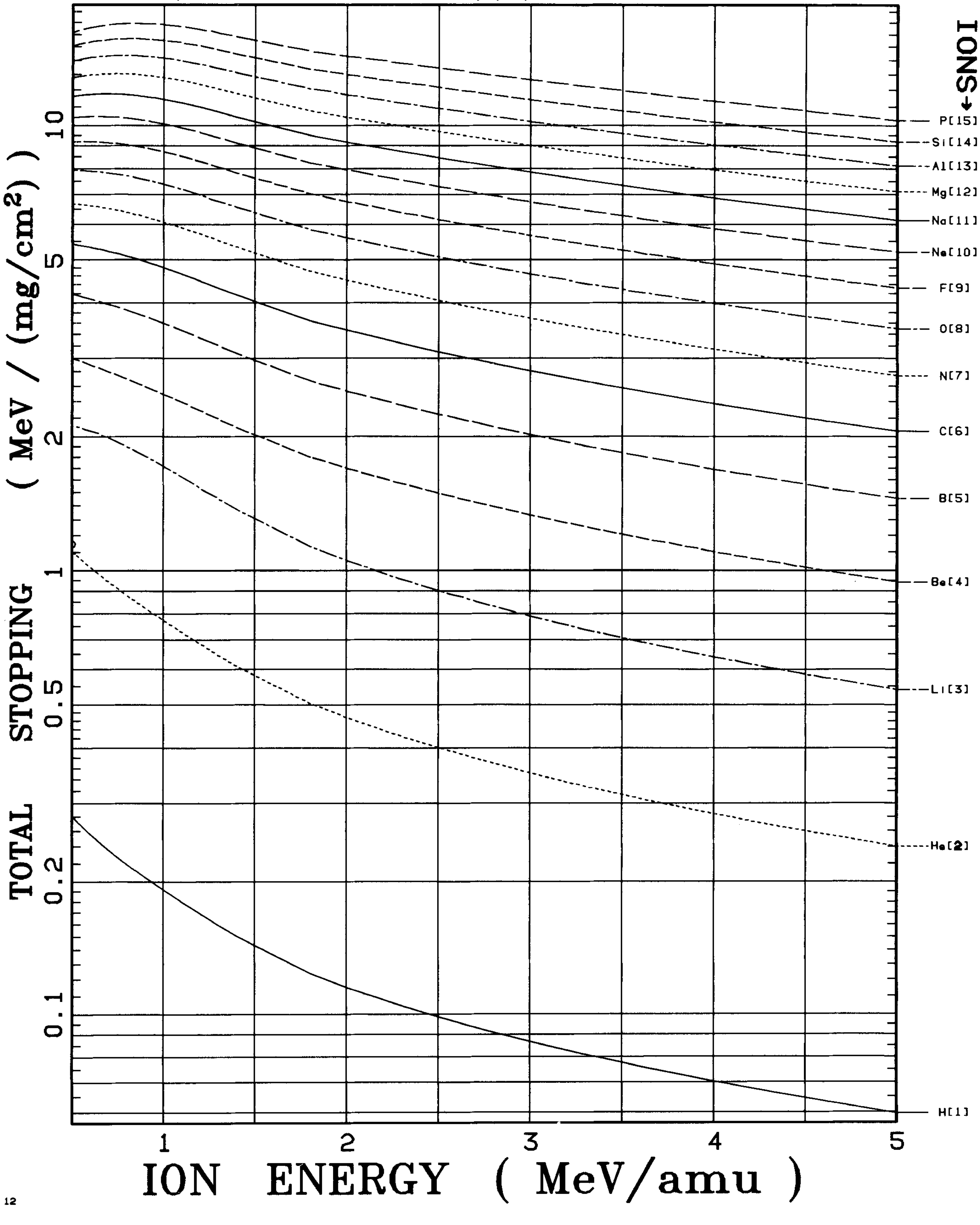
Mass Density = 0.0009007 Grams/cm^3 Multiply by 33.52 for Units: [eV/(10^{15} Atoms/cm^2)]




Mg(12)
←←← TARGET →→→
Mg(12)
IONS→
Atom Density = 4.302×10^22 Atoms/cm^3
Mass Density = 1.737 Grams/cm^3
Multiply Total Stopping by 173.7 for Units: [MeV/mm]
Multiply by 40.37 for Units: [eV/(10^15 Atoms/cm^2)]
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm²))
10
5
2
1
0.5
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

Mg(12) ←←← TARGET →→→ Mg(12)

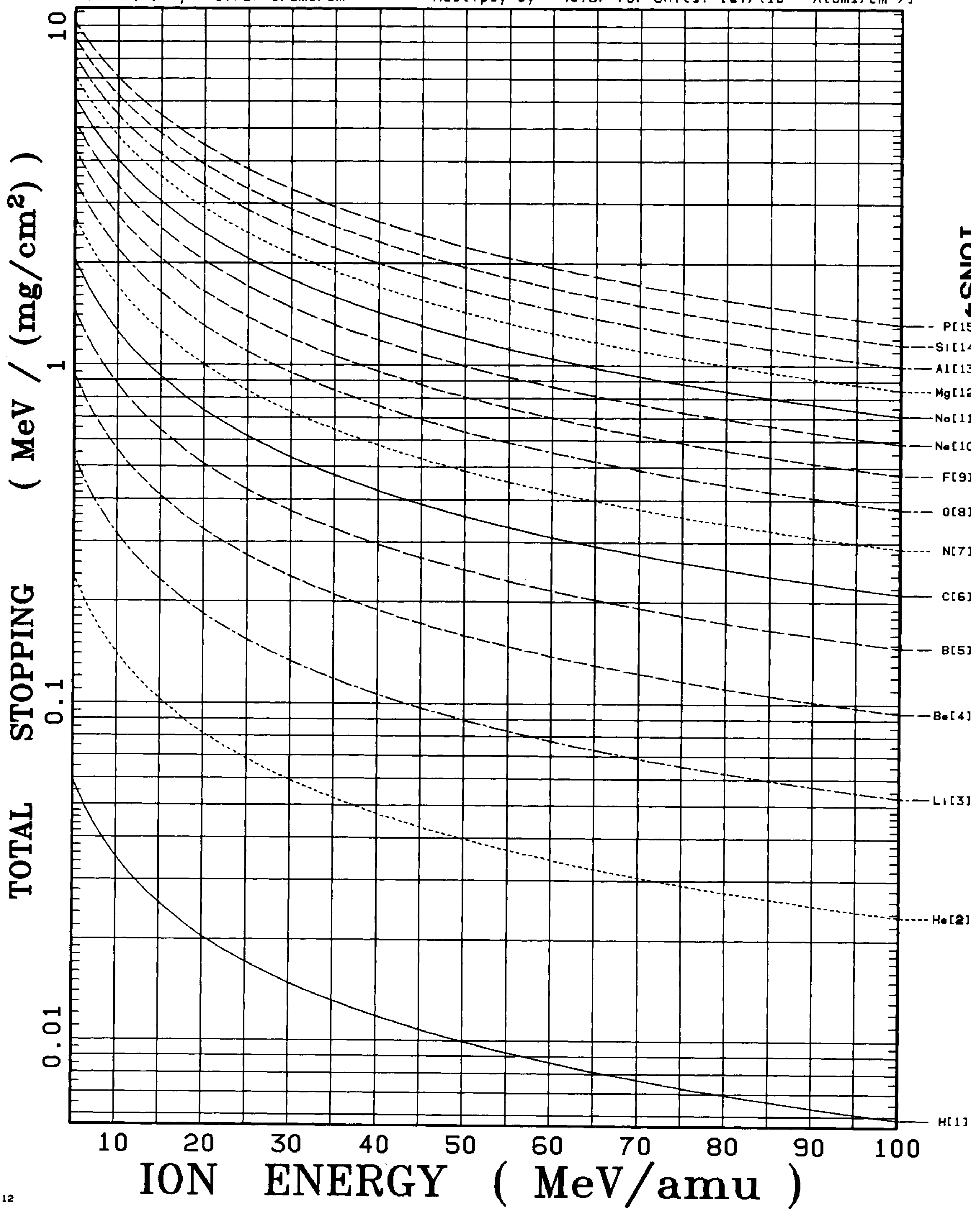
Atom Density = 4.302×10^{22} Atoms/cm^3 Multiply Total Stopping by 173.7 for Units: [MeV/mm]
Mass Density = 1.737 Grams/cm^3 Multiply by 40.37 for Units: [eV/(10^{15} Atoms/cm^2)]



Mg(12) ←←← TARGET →→→ Mg(12)

Atom Density = 4.302×10^{22} Atoms/cm^3 Multiply Total Stopping by 173.7 for Units: [MeV/mm]

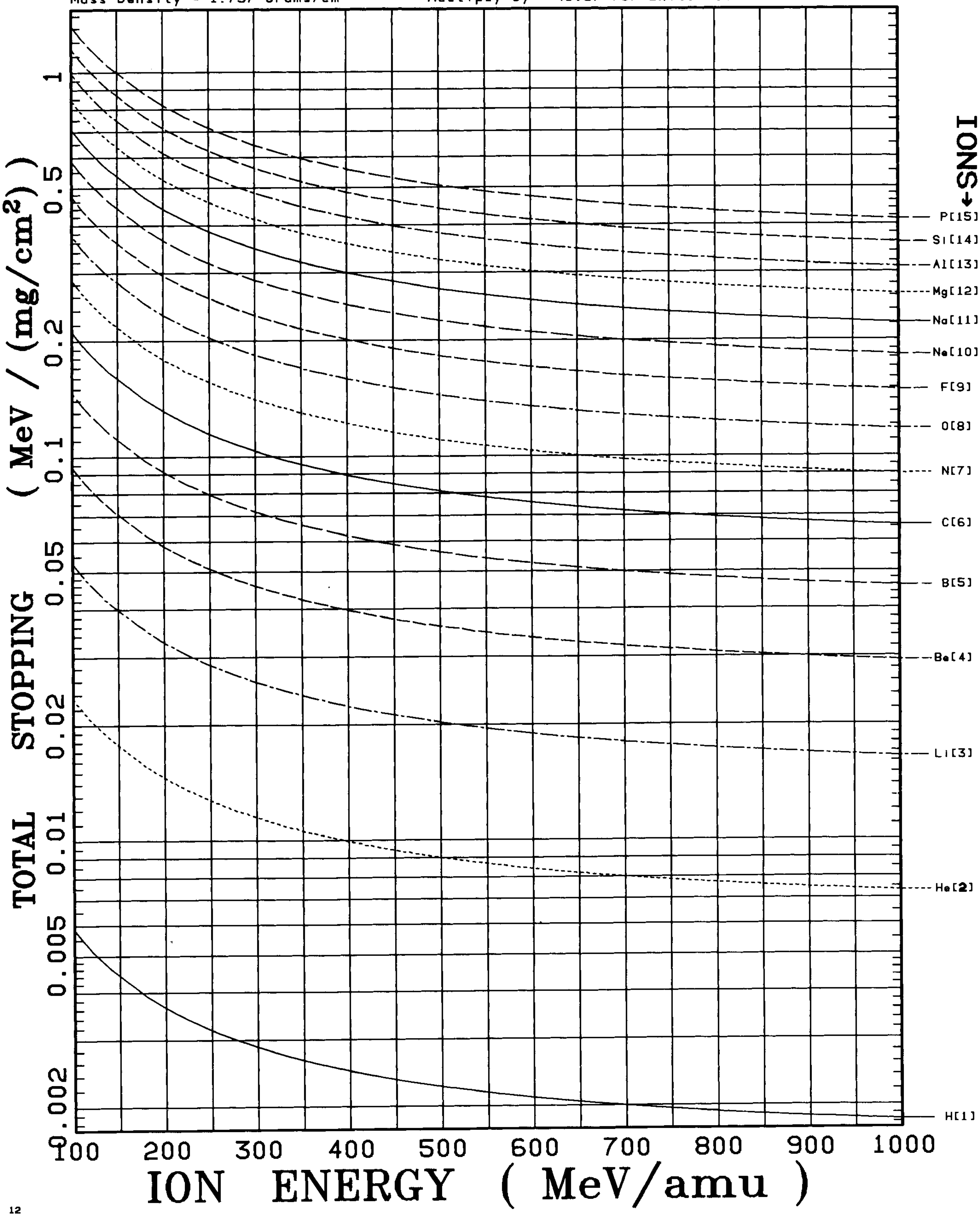
Mass Density = 1.737 Grams/cm^3 Multiply by 40.37 for Units: [eV/(10^{15} Atoms/cm^2)]

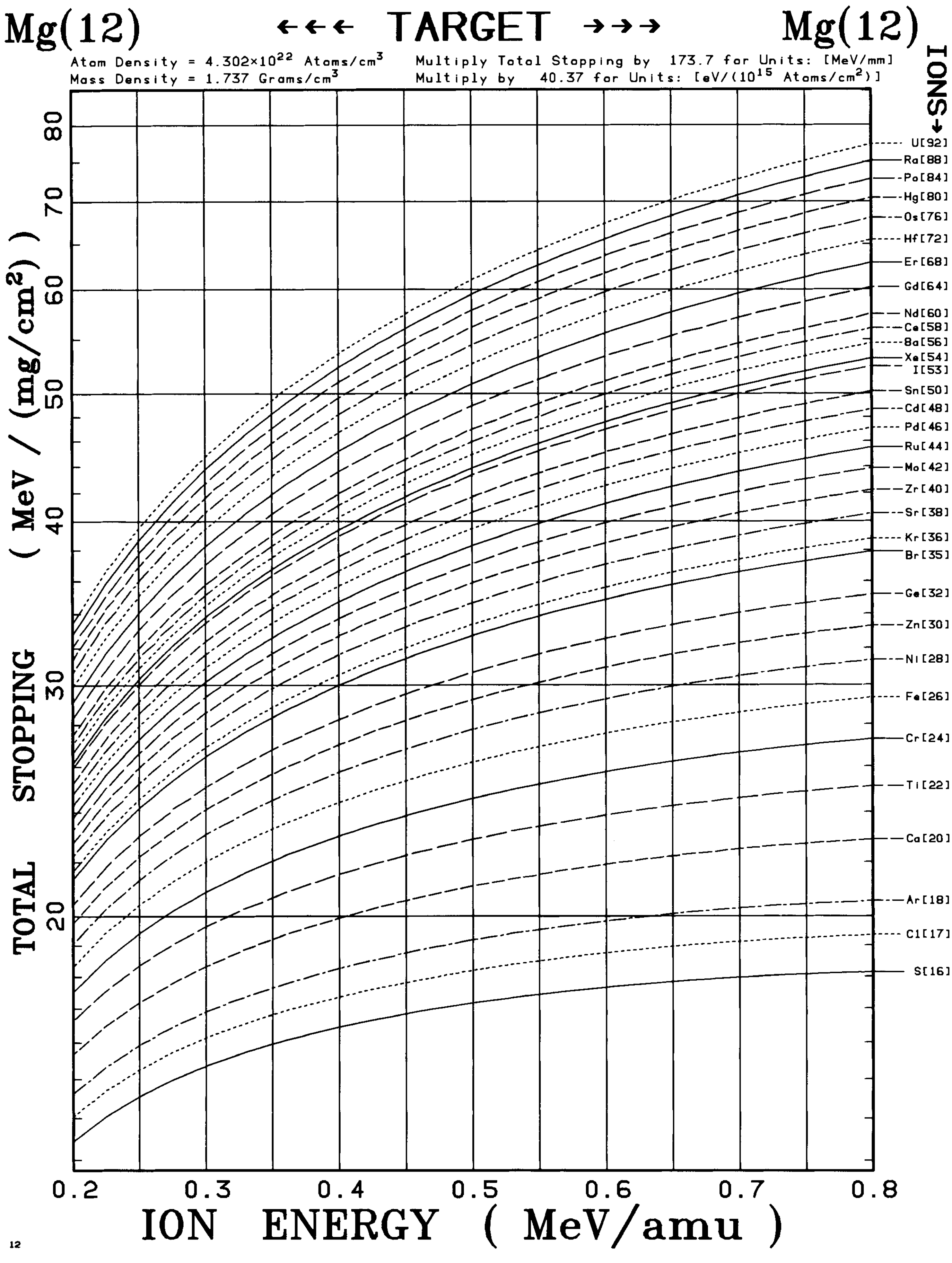


Mg(12) ←←← TARGET →→→ Mg(12)

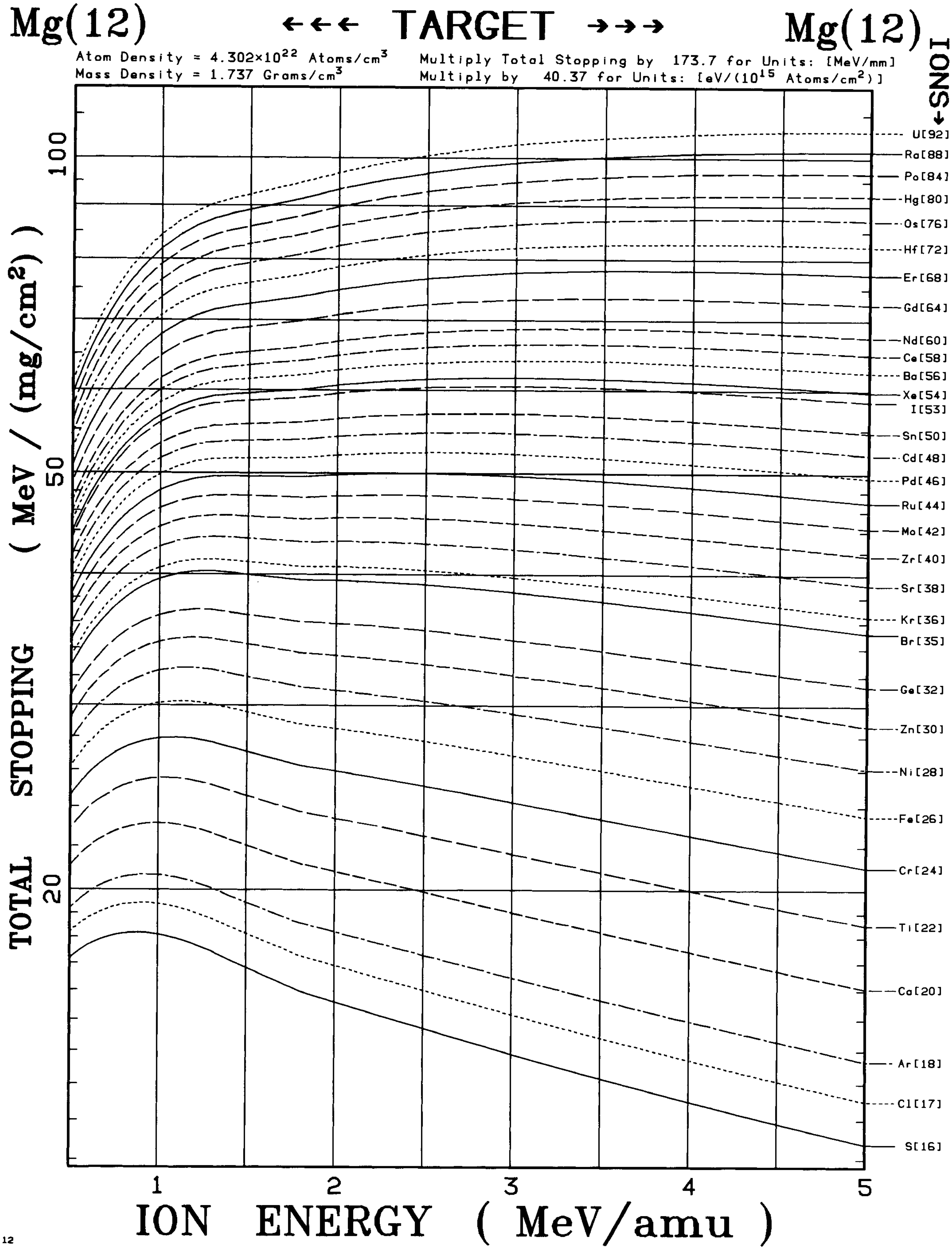
Atom Density = 4.302×10^{22} Atoms/cm^3 Multiply Total Stopping by 173.7 for Units: [MeV/mm]

Mass Density = 1.737 Grams/cm^3 Multiply by 40.37 for Units: [eV/(10^{15} Atoms/cm^2)]



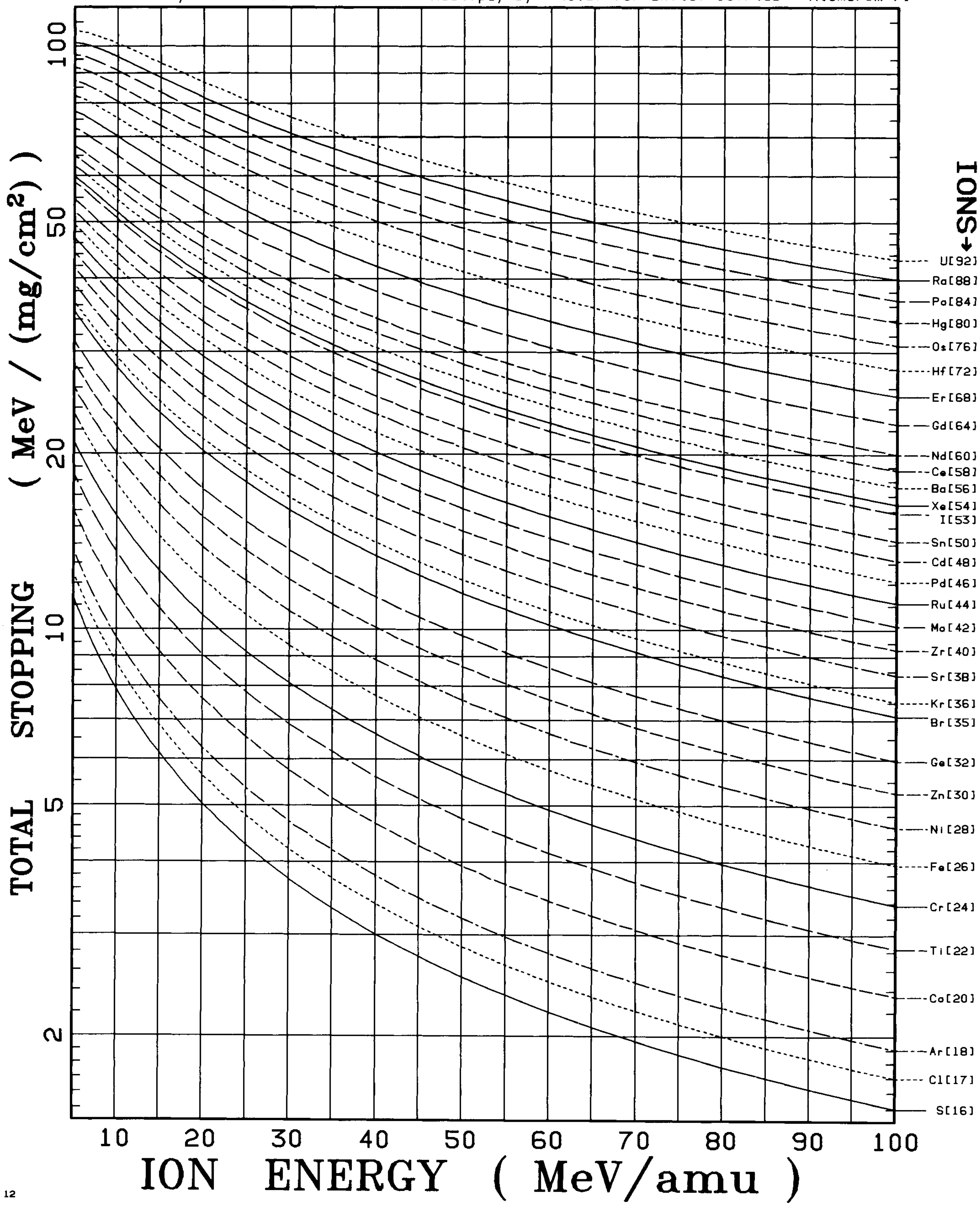


Mg(12)
←←← TARGET →→→
Mg(12)
Atom Density = 4.302×10^{22} Atoms/cm^3
Mass Density = 1.737 Grams/cm^3
Multiply Total Stopping by 173.7 for Units: [MeV/mm]
Multiply by 40.37 for Units: [eV/(10^{15} Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm^2))
20
30
40
50
60
70
80
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)


Mg(12) ←←← TARGET →→→ Mg(12)
Atom Density = 4.302×10^{22} Atoms/cm^{3}
Mass Density = 1.737 Grams/cm^{3}
Multiply Total Stopping by 173.7 for Units: [MeV/mm]
Multiply by 40.37 for Units: [eV/(10^{15} Atoms/cm^{2})]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
100
50
20
TOTAL STOPPING (MeV / (mg/cm^{2}))
1
2
3
4
5
ION ENERGY (MeV/amu)

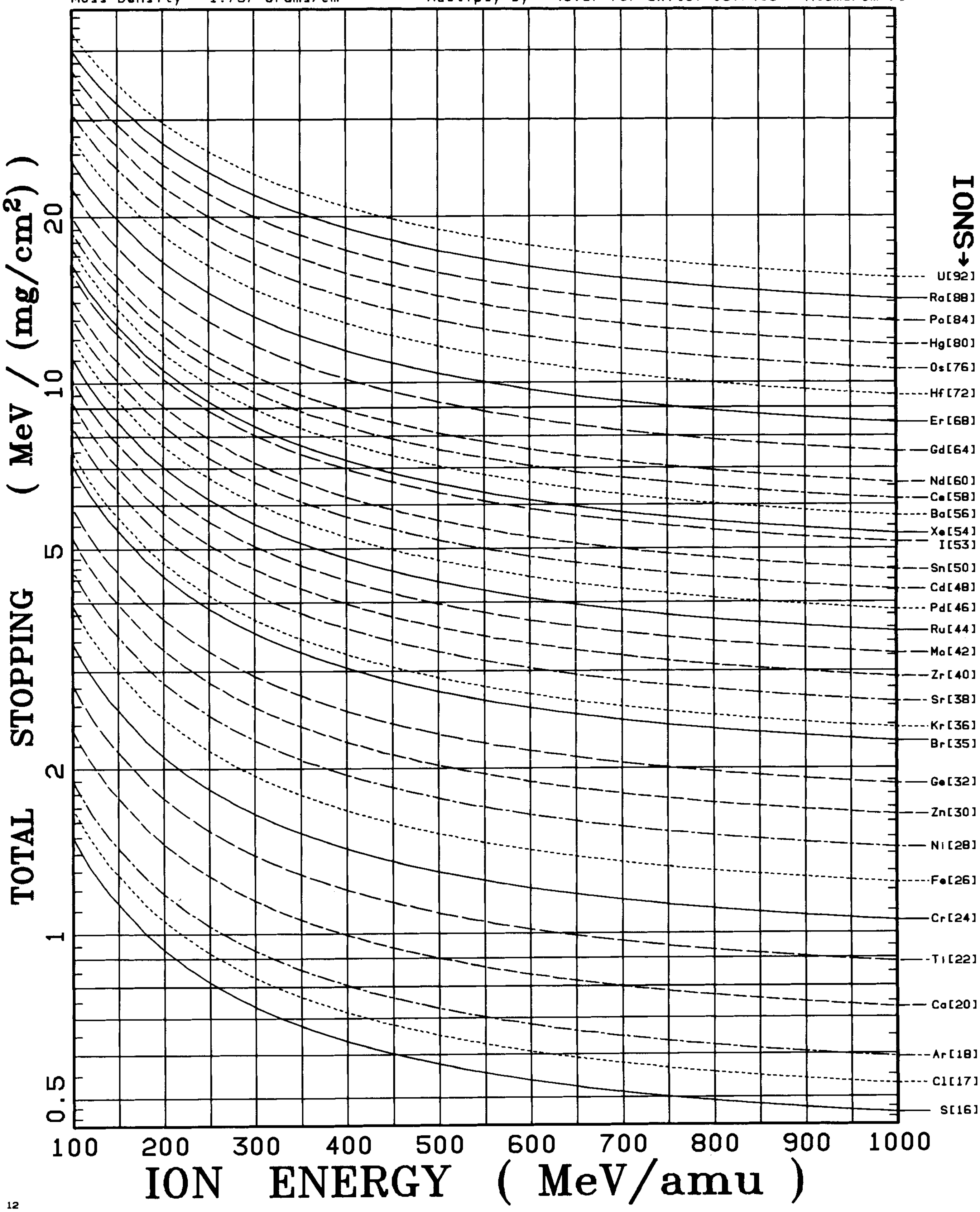
Mg(12) ←←← TARGET →→→ Mg(12)

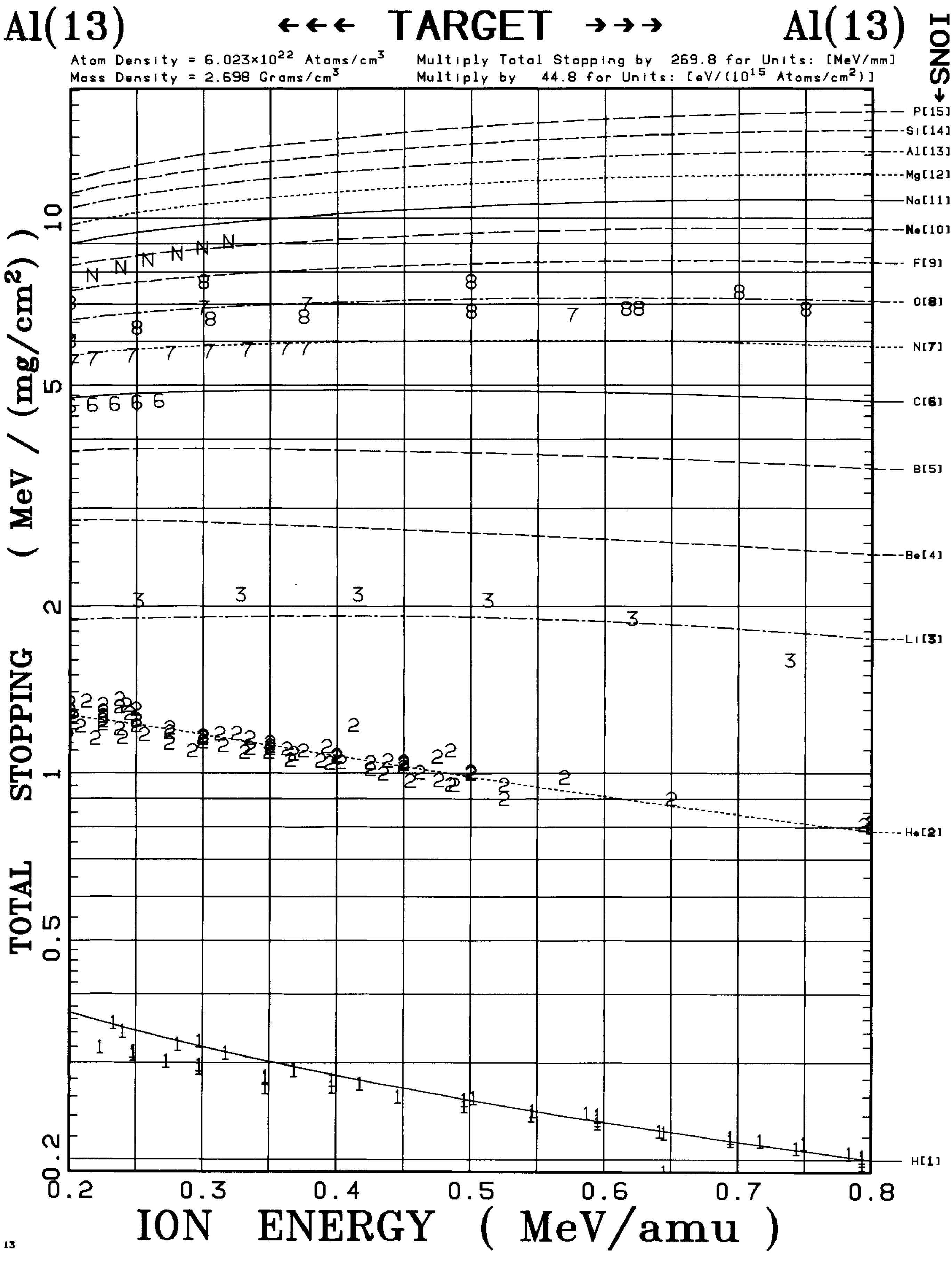
Atom Density = 4.302×10^{22} Atoms/cm^3 Multiply Total Stopping by 173.7 for Units: [MeV/mm]
Mass Density = 1.737 Grams/cm^3 Multiply by 40.37 for Units: [eV/(10^{15} Atoms/cm^2)]



Mg(12) ←←← TARGET →→→ Mg(12)

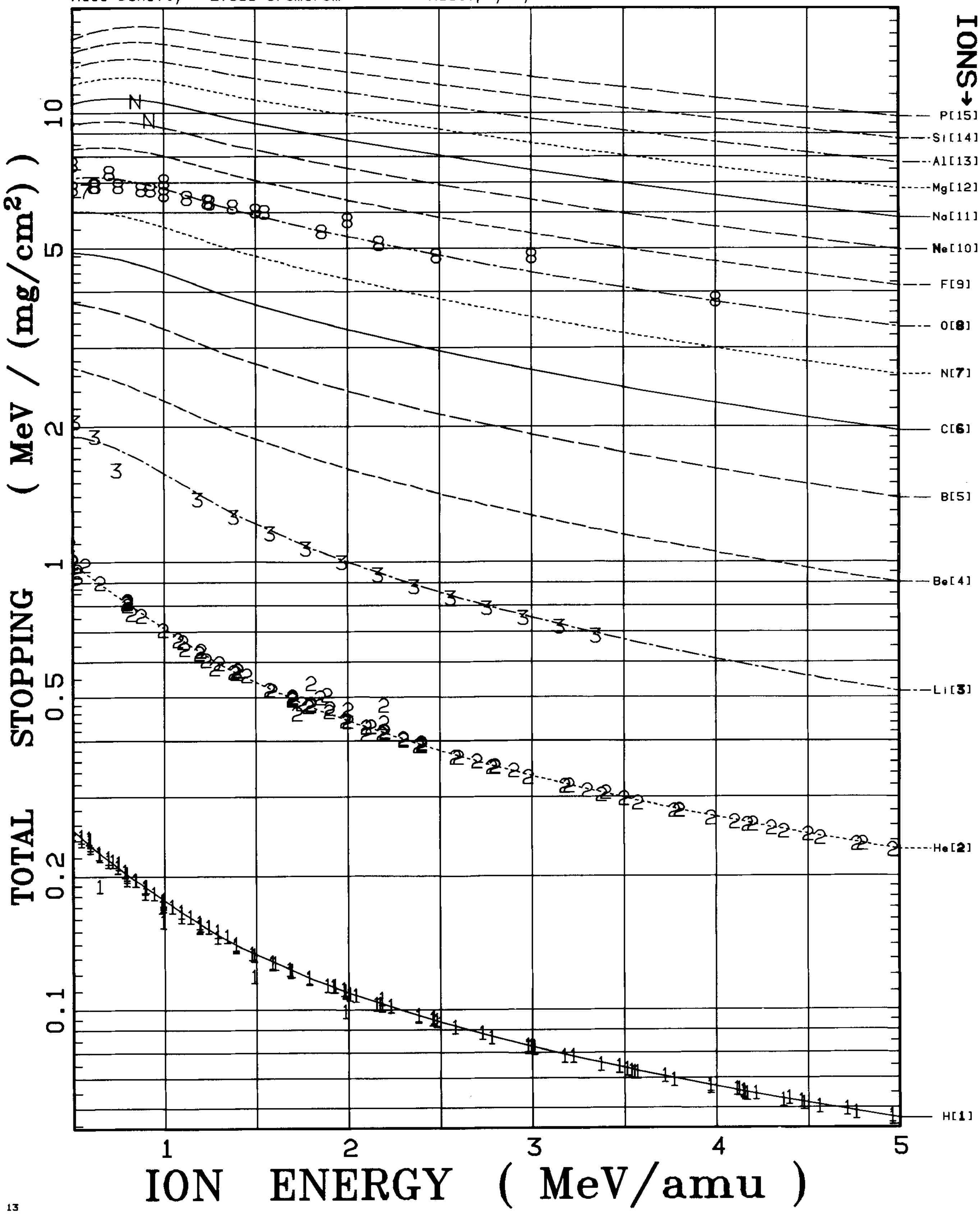
Atom Density = 4.302×10^{22} Atoms/cm^3 Multiply Total Stopping by 173.7 for Units: [MeV/mm]
Mass Density = 1.737 Grams/cm^3 Multiply by 40.37 for Units: [eV/(10^{15} Atoms/cm^2)]




Al(13) ←←← TARGET →→→ Al(13)
IONS→
Atom Density = 6.023×10^22 Atoms/cm^3
Mass Density = 2.698 Grams/cm^3
Multiply Total Stopping by 269.8 for Units: [MeV/mm]
Multiply by 44.8 for Units: [eV/(10^15 Atoms/cm^2)]
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm^2))
0.2
0.5
1
2
5
10
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

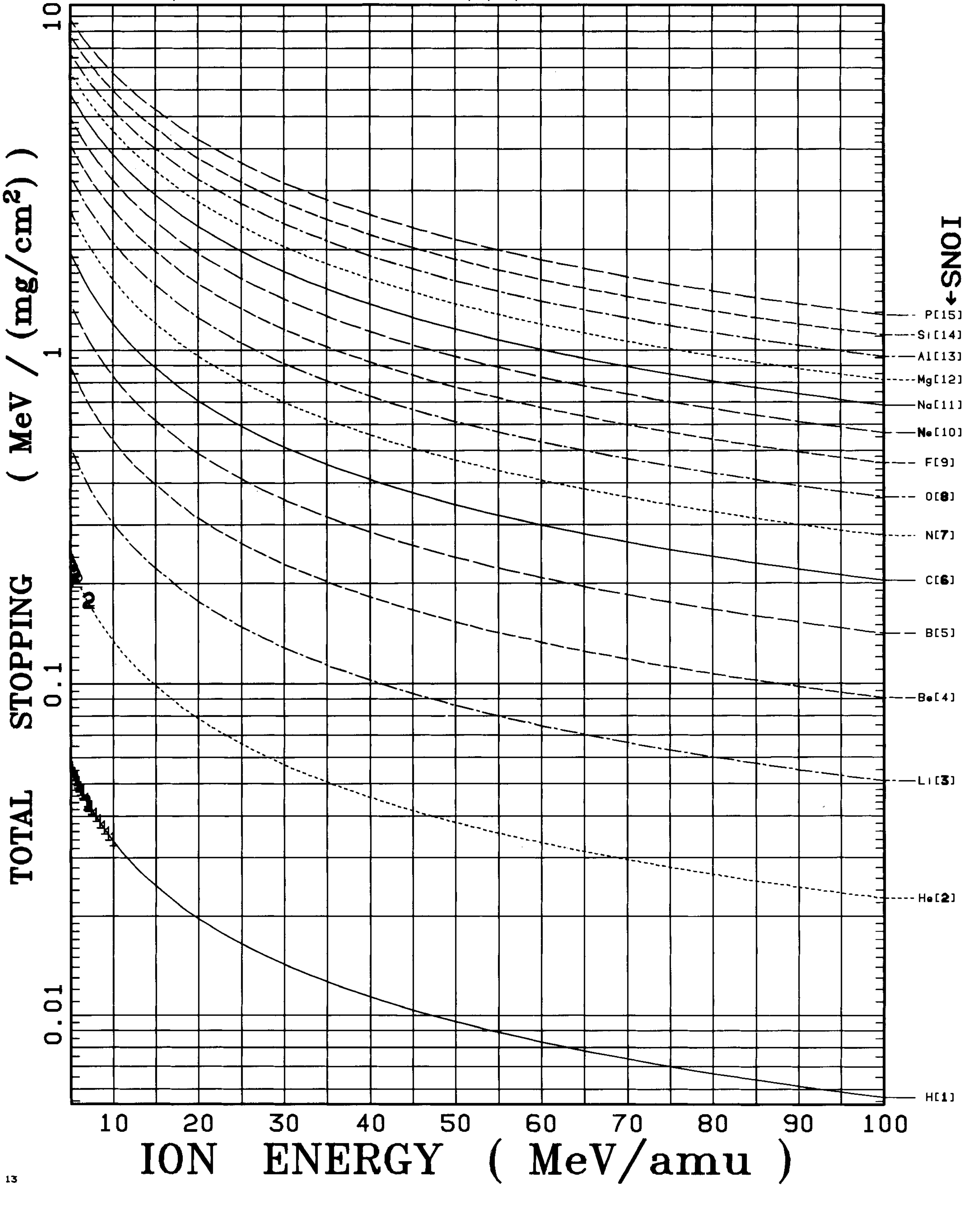
Al(13) ←←← TARGET →→→ Al(13)

Atom Density = 6.023×10[22] Atoms/cm[3] Multiply Total Stopping by 269.8 for Units: [MeV/mm]
Mass Density = 2.698 Grams/cm[3] Multiply by 44.8 for Units: [eV/(10[15] Atoms/cm[2])]



Al(13) ←←← TARGET →→→ Al(13)

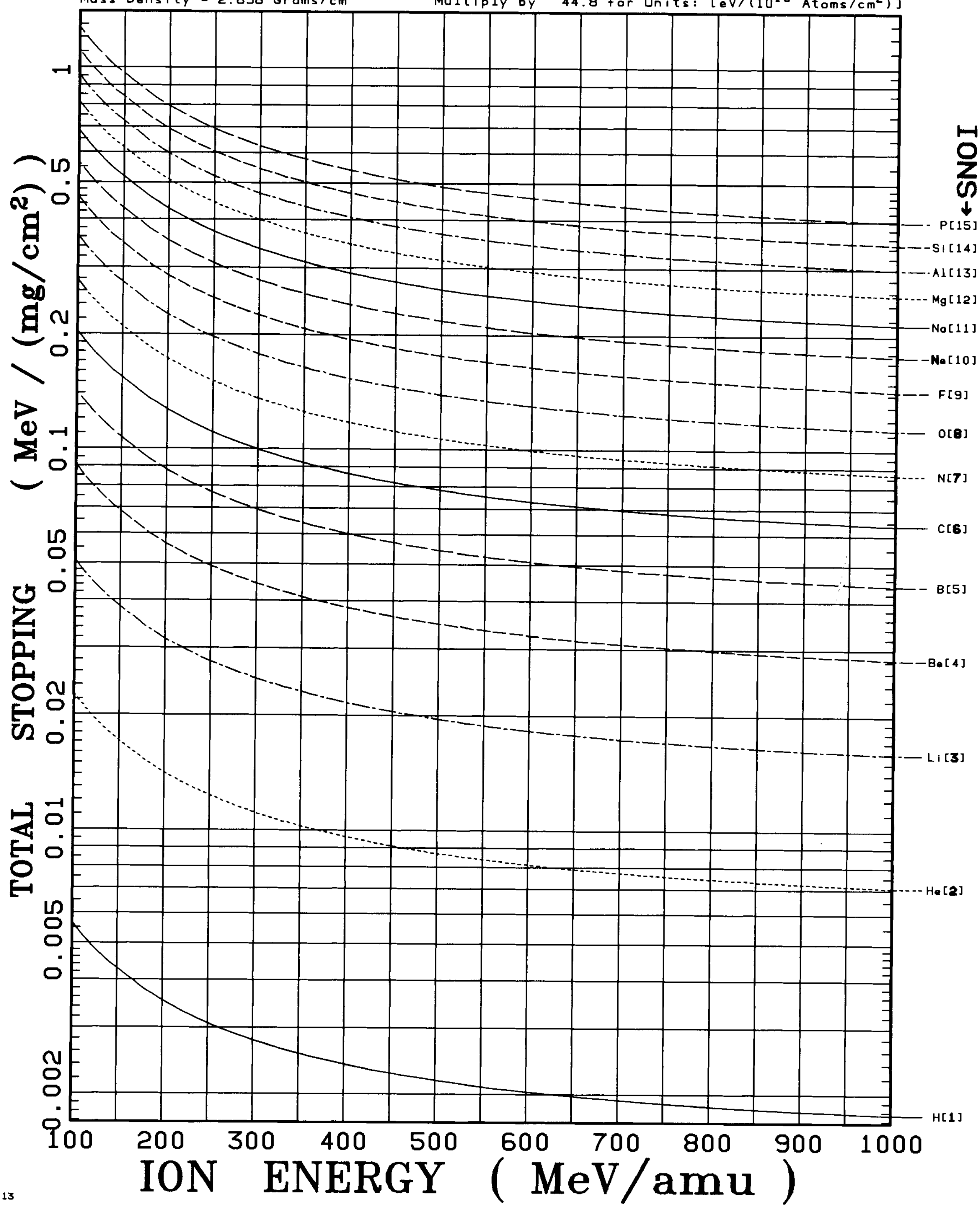
Atom Density = 6.023×10[22] Atoms/cm[3] Multiply Total Stopping by 269.8 for Units: [MeV/mm]
Mass Density = 2.698 Grams/cm[3] Multiply by 44.8 for Units: [eV/(10[15] Atoms/cm[2])]



Al(13) ←←← TARGET →→→ Al(13)

Atom Density = 6.023×10^{22} Atoms/cm^3
Mass Density = 2.698 Grams/cm^3

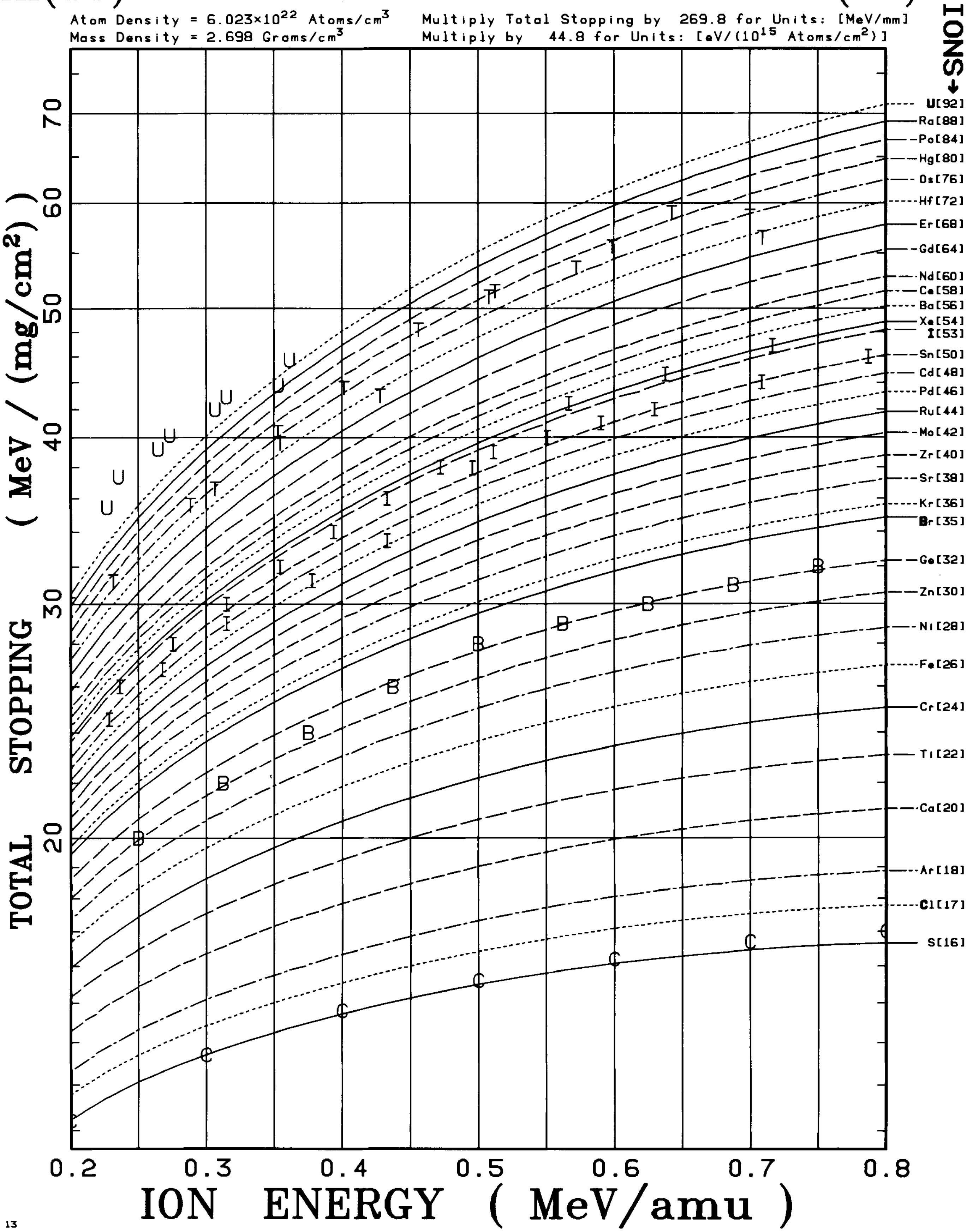
Multiply Total Stopping by 269.8 for Units: [MeV/mm]
Multiply by 44.8 for Units: [eV/(10^{15} Atoms/cm^2)]



13

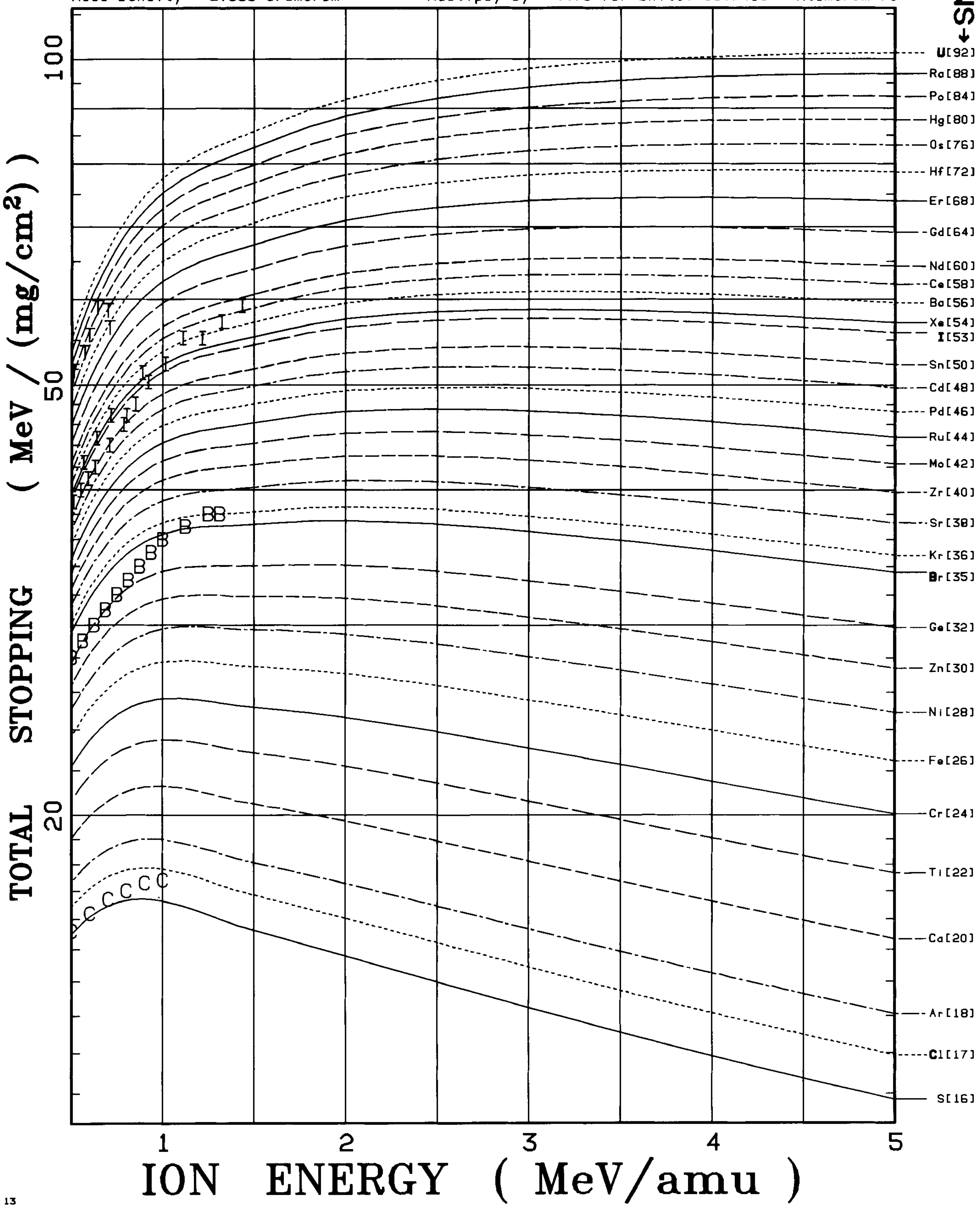
Al(13) ←←← TARGET →→→ Al(13)

Atom Density = 6.023×10^{22} Atoms/cm^3 Multiply Total Stopping by 269.8 for Units: [MeV/mm]
Mass Density = 2.698 Grams/cm^3 Multiply by 44.8 for Units: [eV/(10^{15} Atoms/cm^2)]



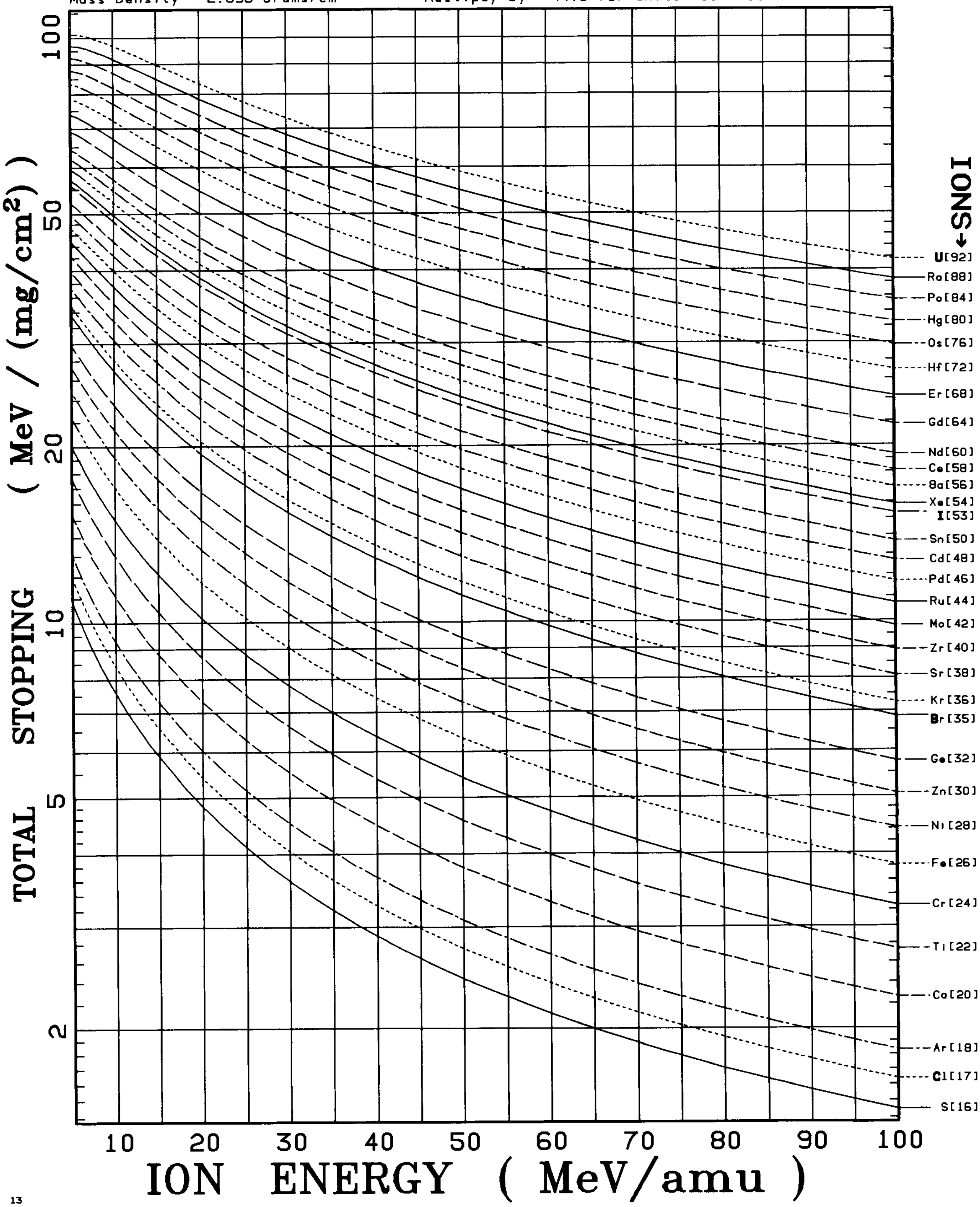
Al(13) ←←← TARGET →→→ Al(13)

Atom Density = 6.023×10^{22} Atoms/cm^3 Multiply Total Stopping by 269.8 for Units: [MeV/mm]
Mass Density = 2.698 Grams/cm^3 Multiply by 44.8 for Units: [eV/(10^{15} Atoms/cm^2)]



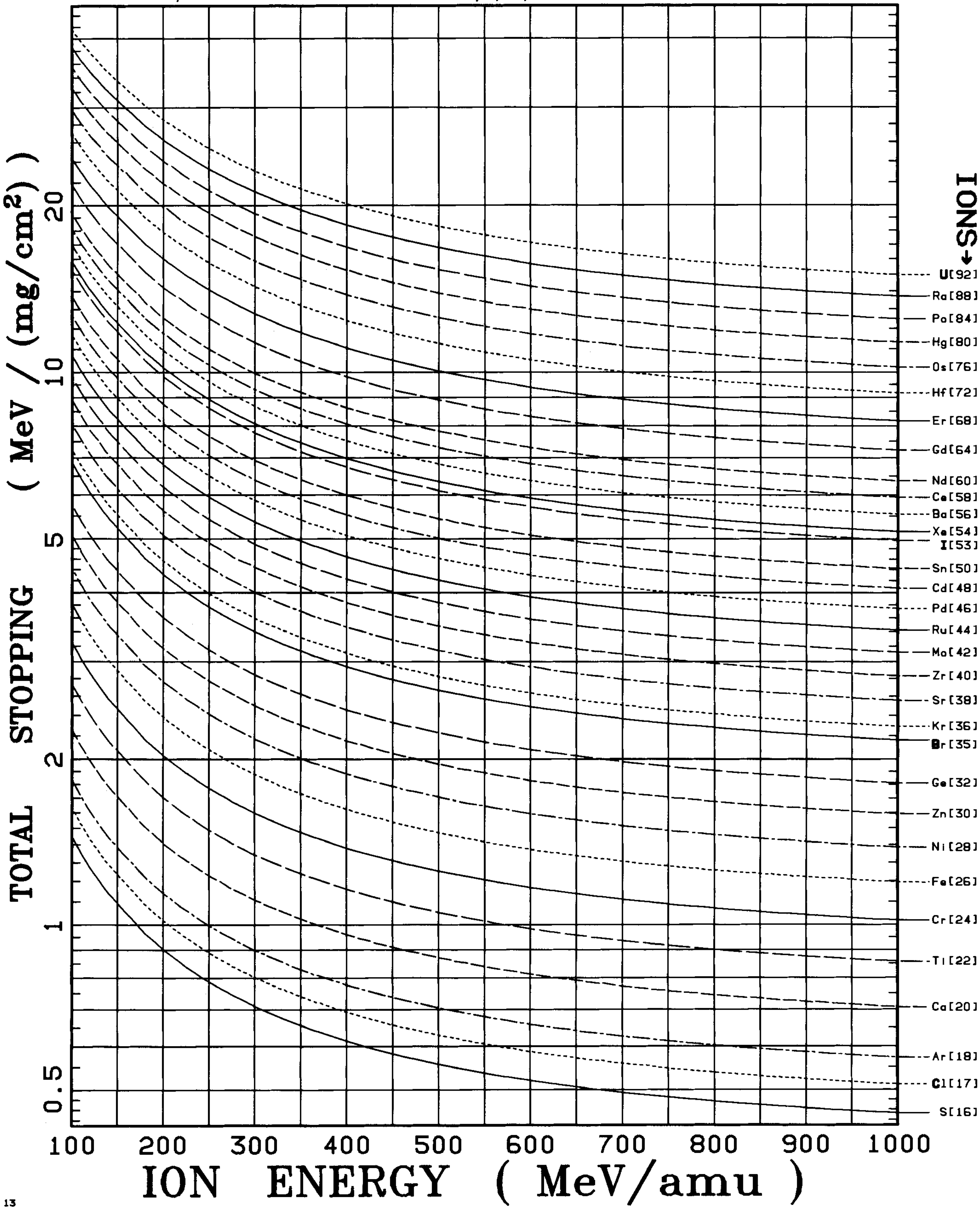
Al(13) ←←← TARGET →→→ Al(13)

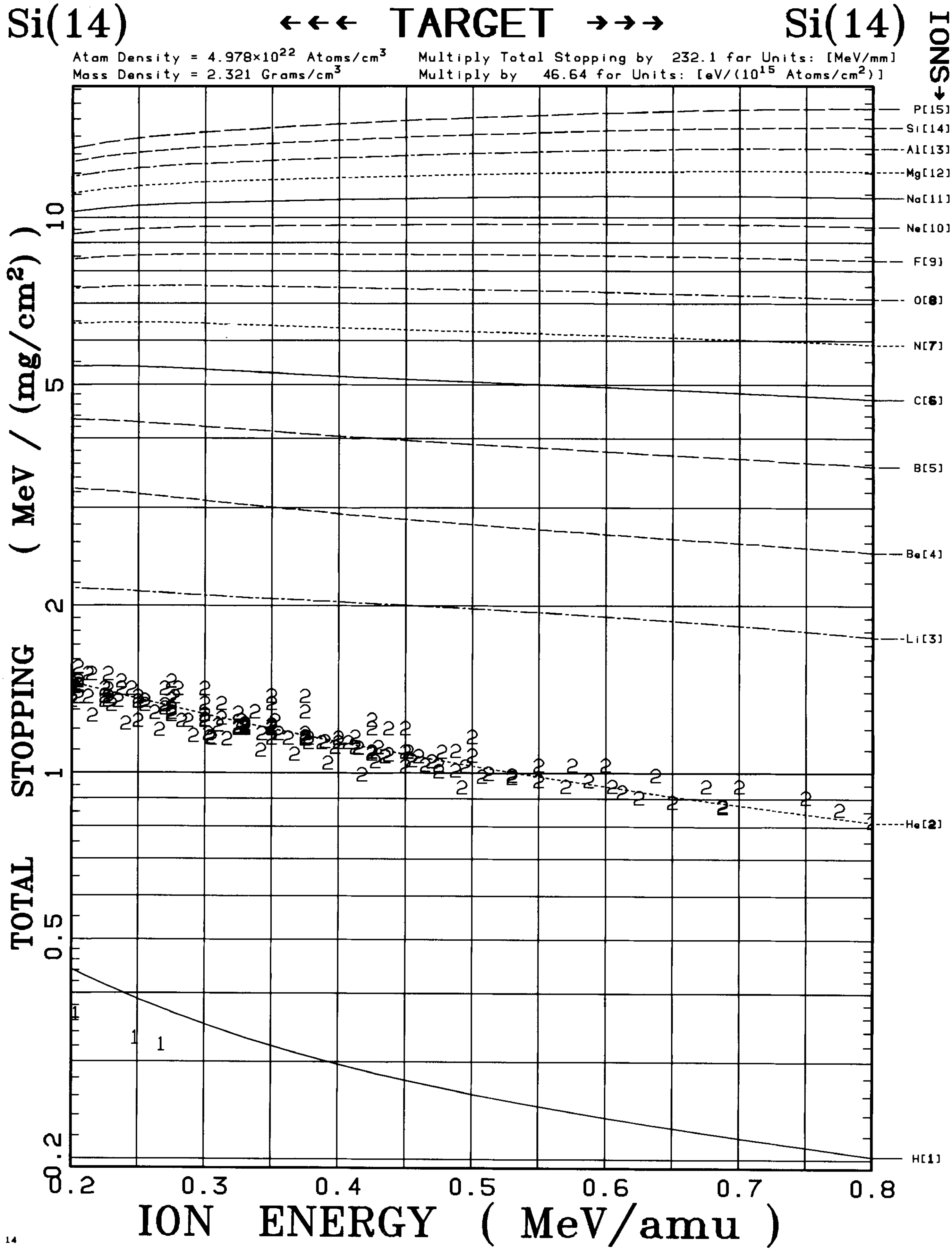
Atom Density = 6.023×10^{22} Atoms/cm^3 Multiply Total Stopping by 269.8 for Units: [MeV/mm]
Mass Density = 2.698 Grams/cm^3 Multiply by 44.8 for Units: [eV/(10^{15} Atoms/cm^2)]



Al(13) ←←← TARGET →→→ Al(13)

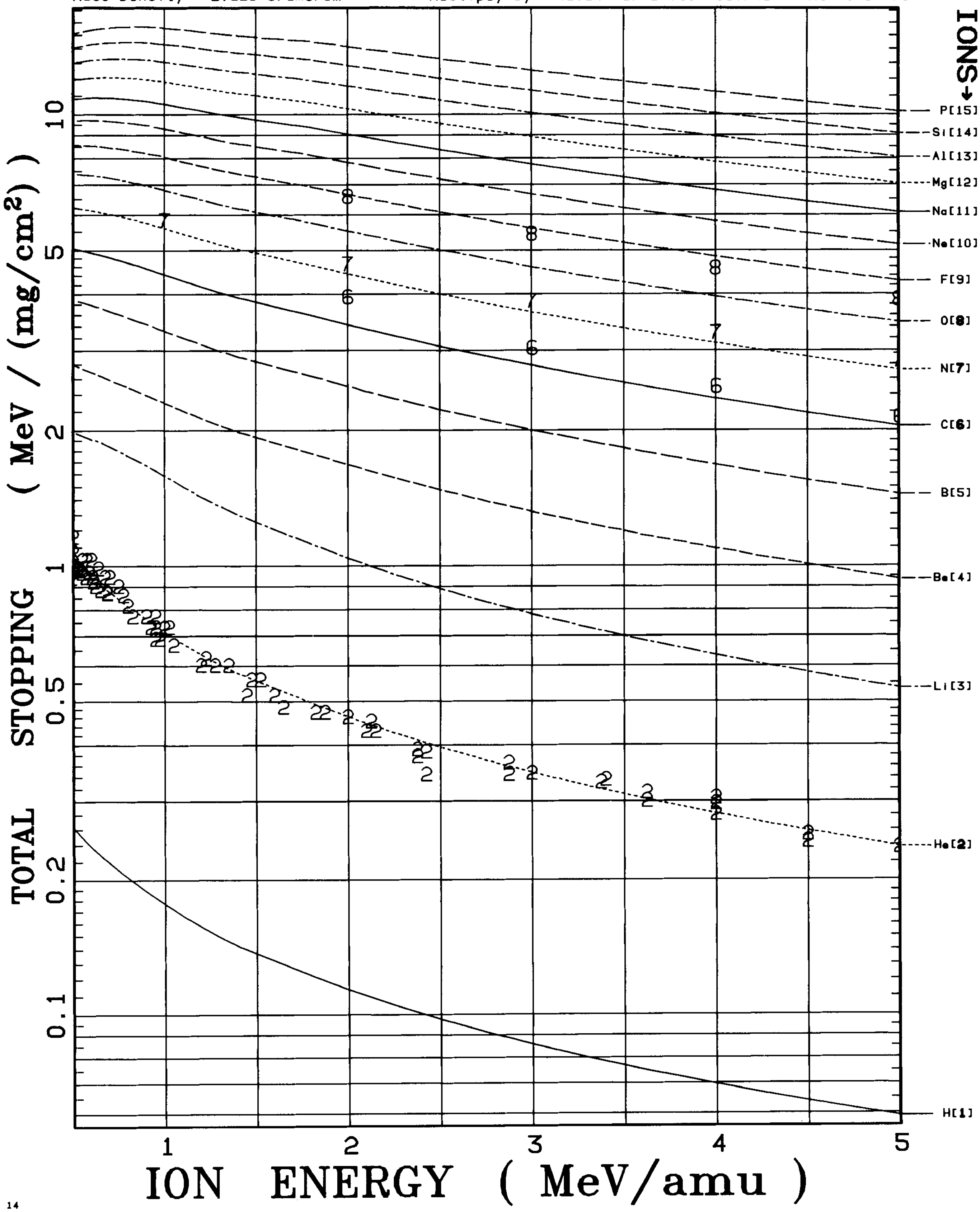
Atom Density = 6.023×10^{22} Atoms/cm^3 Multiply Total Stopping by 269.8 for Units: [MeV/mm]
Mass Density = 2.698 Grams/cm^3 Multiply by 44.8 for Units: [eV/(10^{15} Atoms/cm^2)]




Si(14)
←←← TARGET →→→
Si(14)
IONS→
Atom Density = 4.978×10²² Atoms/cm³
Mass Density = 2.321 Grams/cm³
Multiply Total Stopping by 232.1 for Units: [MeV/mm]
Multiply by 46.64 for Units: [eV/(10¹⁵ Atoms/cm²)]
TOTAL STOPPING (MeV / (mg/cm²))
ION ENERGY (MeV/amu)
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
0.2
0.3
0.4
0.5
0.6
0.7
0.8
10
5
2
1
0.5
0.2

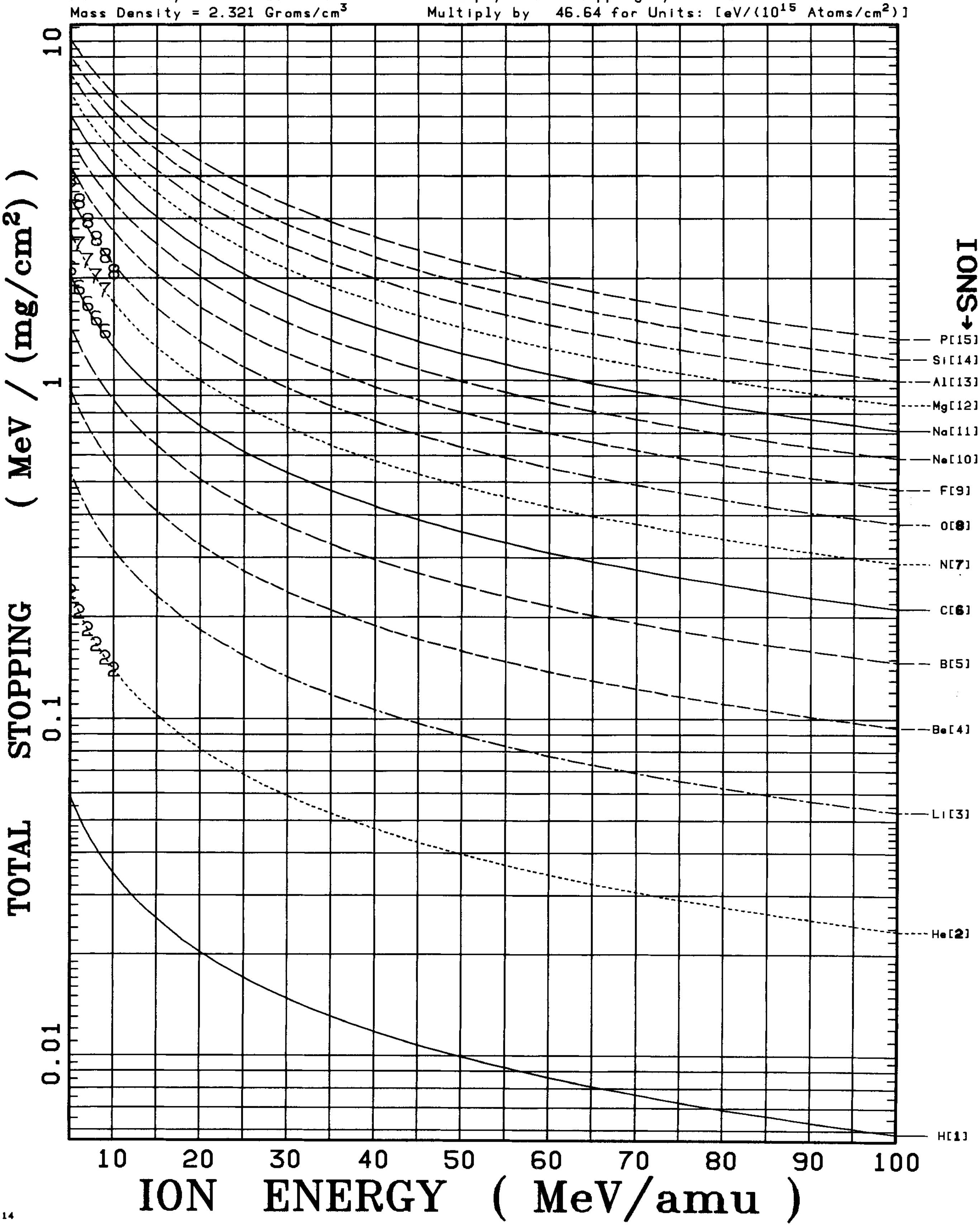
Si(14) ←←← TARGET →→→ Si(14)

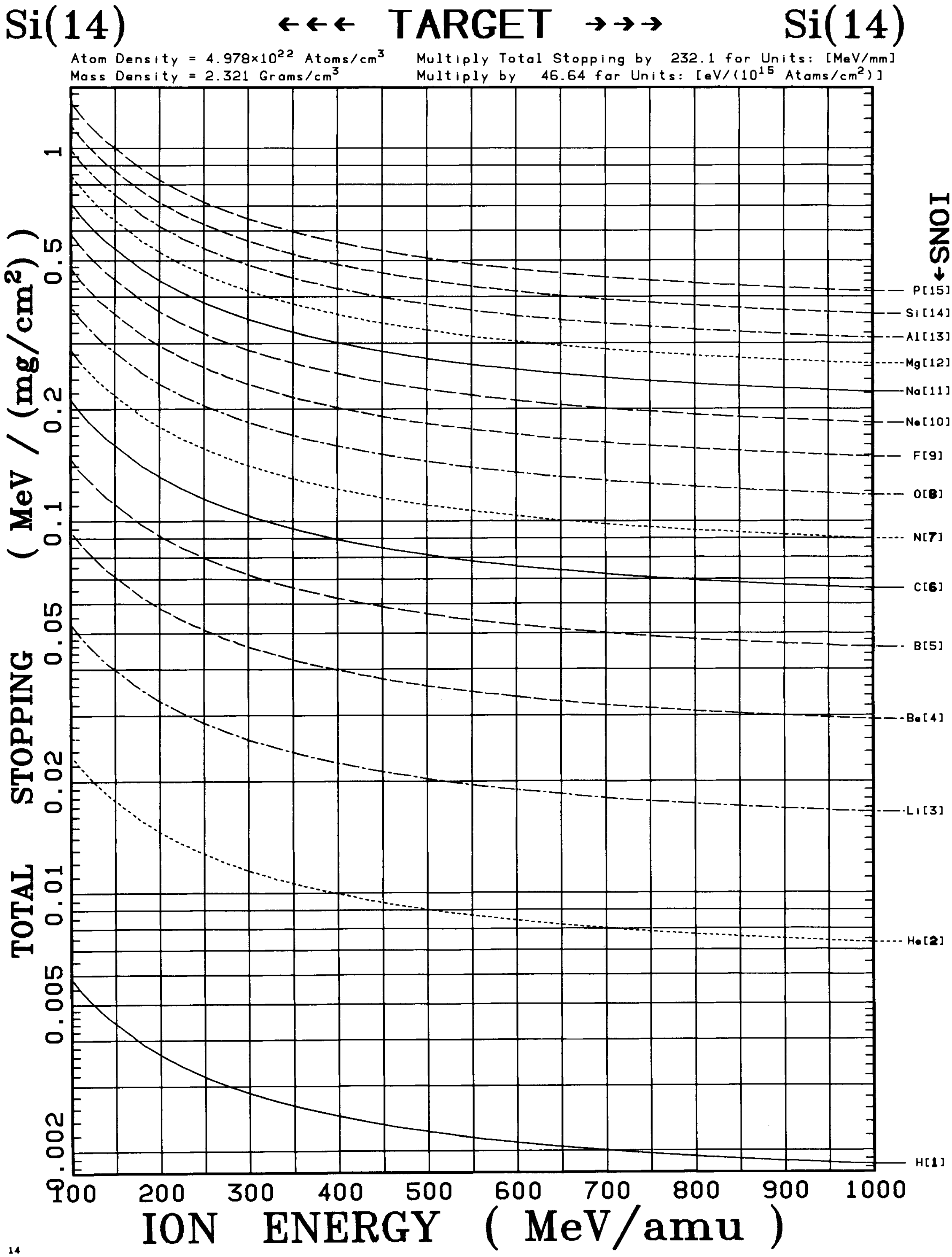
Atom Density = 4.978×10^{22} Atoms/cm^3 Multiply Total Stopping by 232.1 for Units: [MeV/mm]
Mass Density = 2.321 Grams/cm^3 Multiply by 46.64 for Units: [eV/(10^{15} Atoms/cm^2)]

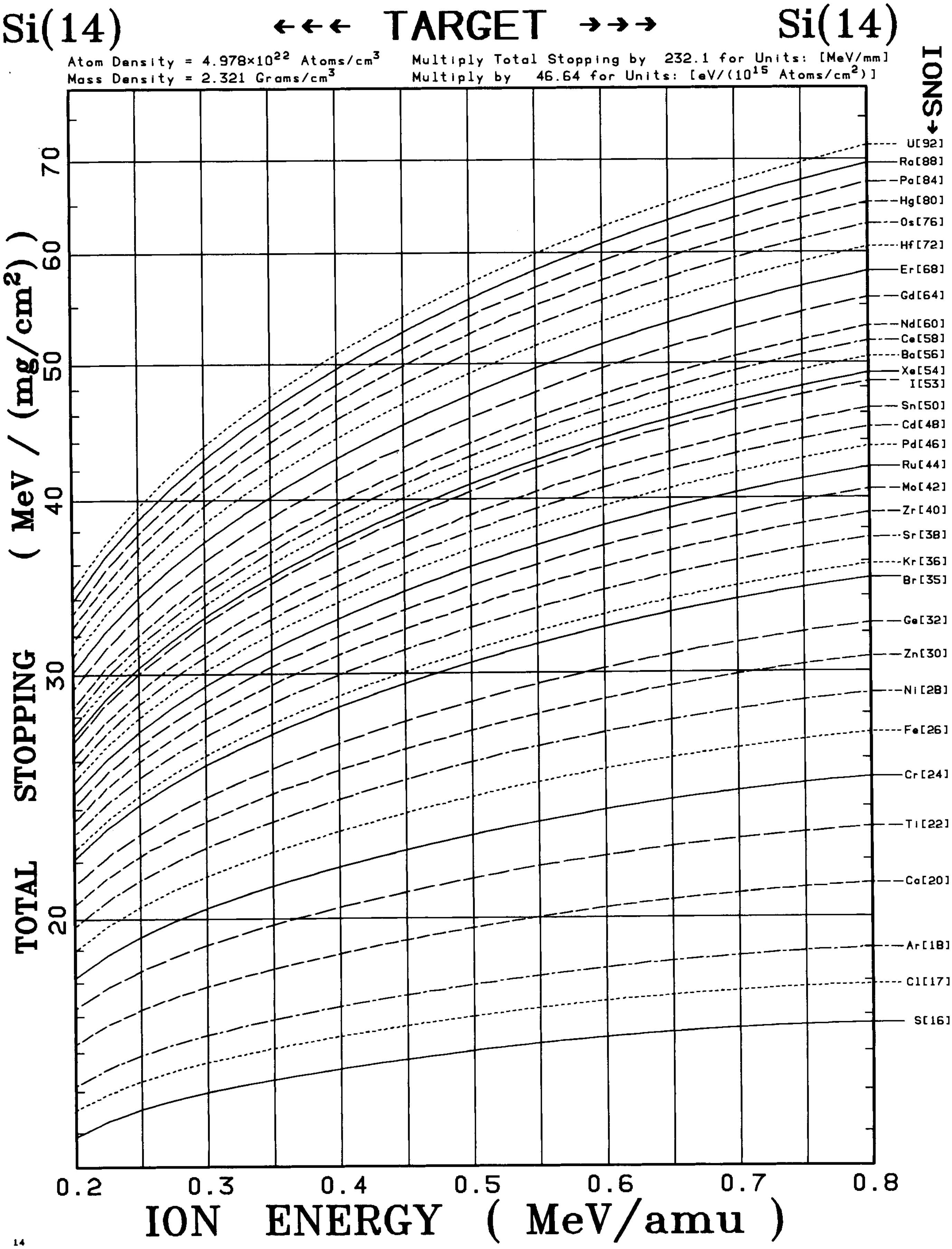


Si(14) ←←← TARGET →→→ Si(14)

Atom Density = 4.978×10^{22} Atoms/cm^3 Multiply Total Stopping by 232.1 for Units: [MeV/mm]
Mass Density = 2.321 Grams/cm^3 Multiply by 46.64 for Units: [eV/(10^{15} Atoms/cm^2)]



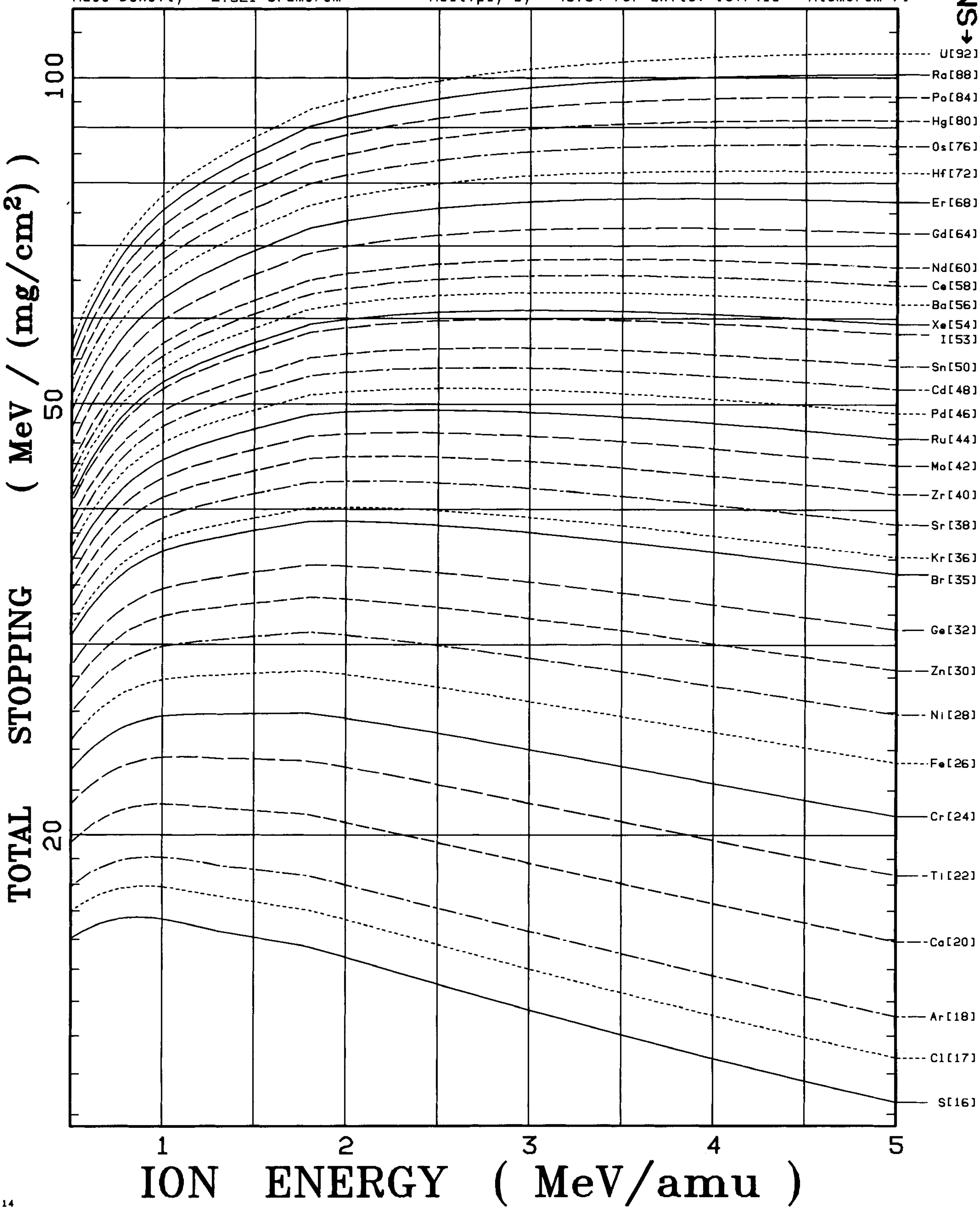

Si(14)
←←← TARGET →→→
Si(14)
Atom Density = 4.978×10^22 Atoms/cm^3
Mass Density = 2.321 Grams/cm^3
Multiply Total Stopping by 232.1 for Units: [MeV/mm]
Multiply by 46.64 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
1
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
100
200
300
400
500
600
700
800
900
1000



Si(14)
←←← TARGET →→→
Si(14)
Atom Density = 4.978×10^22 Atoms/cm^3
Mass Density = 2.321 Grams/cm^3
Multiply Total Stopping by 232.1 for Units: [MeV/mm]
Multiply by 46.64 for Units: [eV/(10^15 Atoms/cm^2)]
IONS↓
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm2))
20
30
40
50
60
70
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

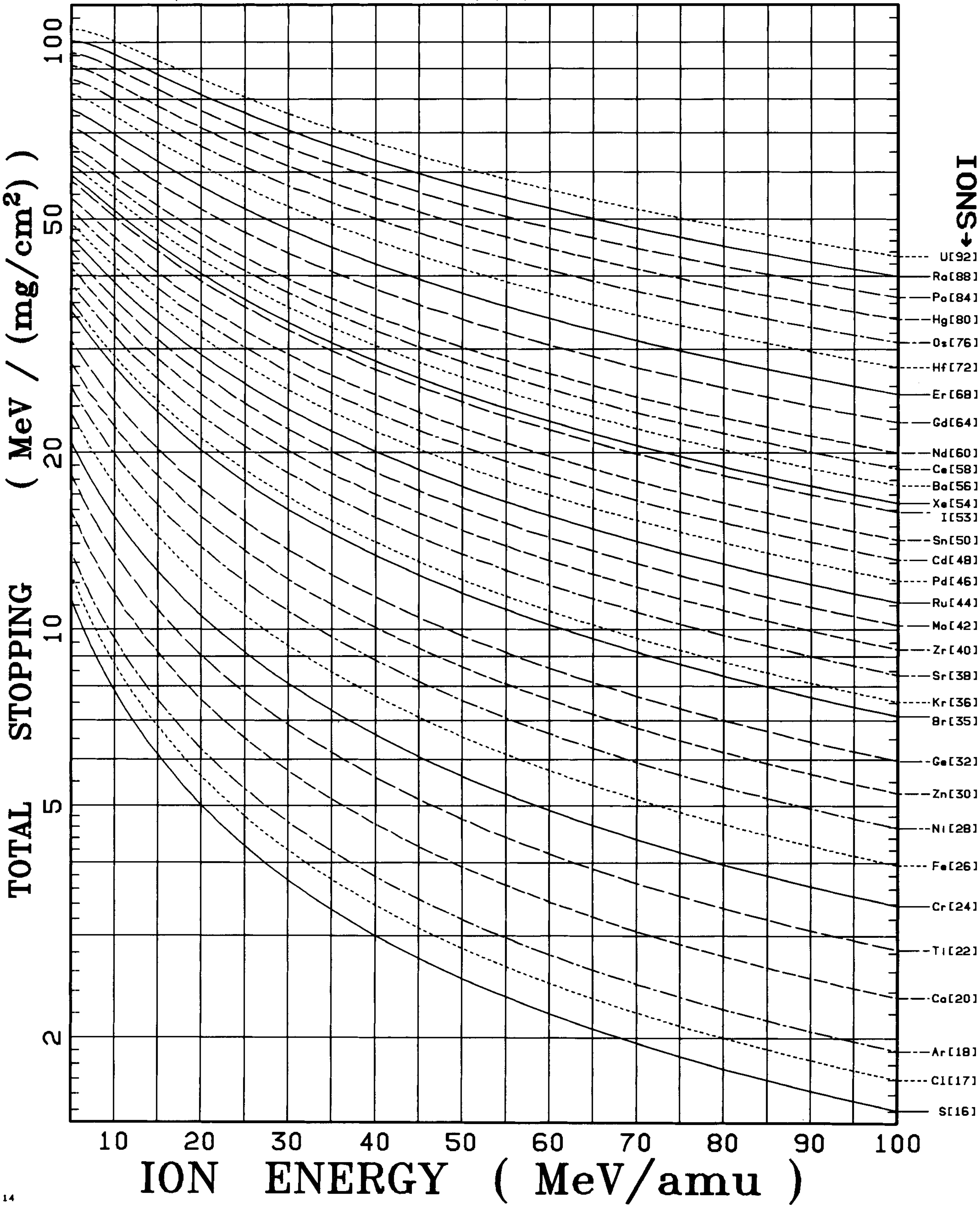
Si(14) ←←← TARGET →→→ Si(14)

Atom Density = 4.978×10^{22} Atoms/cm^3 Multiply Total Stopping by 232.1 for Units: [MeV/mm]
Mass Density = 2.321 Grams/cm^3 Multiply by 46.64 for Units: [eV/(10^{15} Atoms/cm^2)]



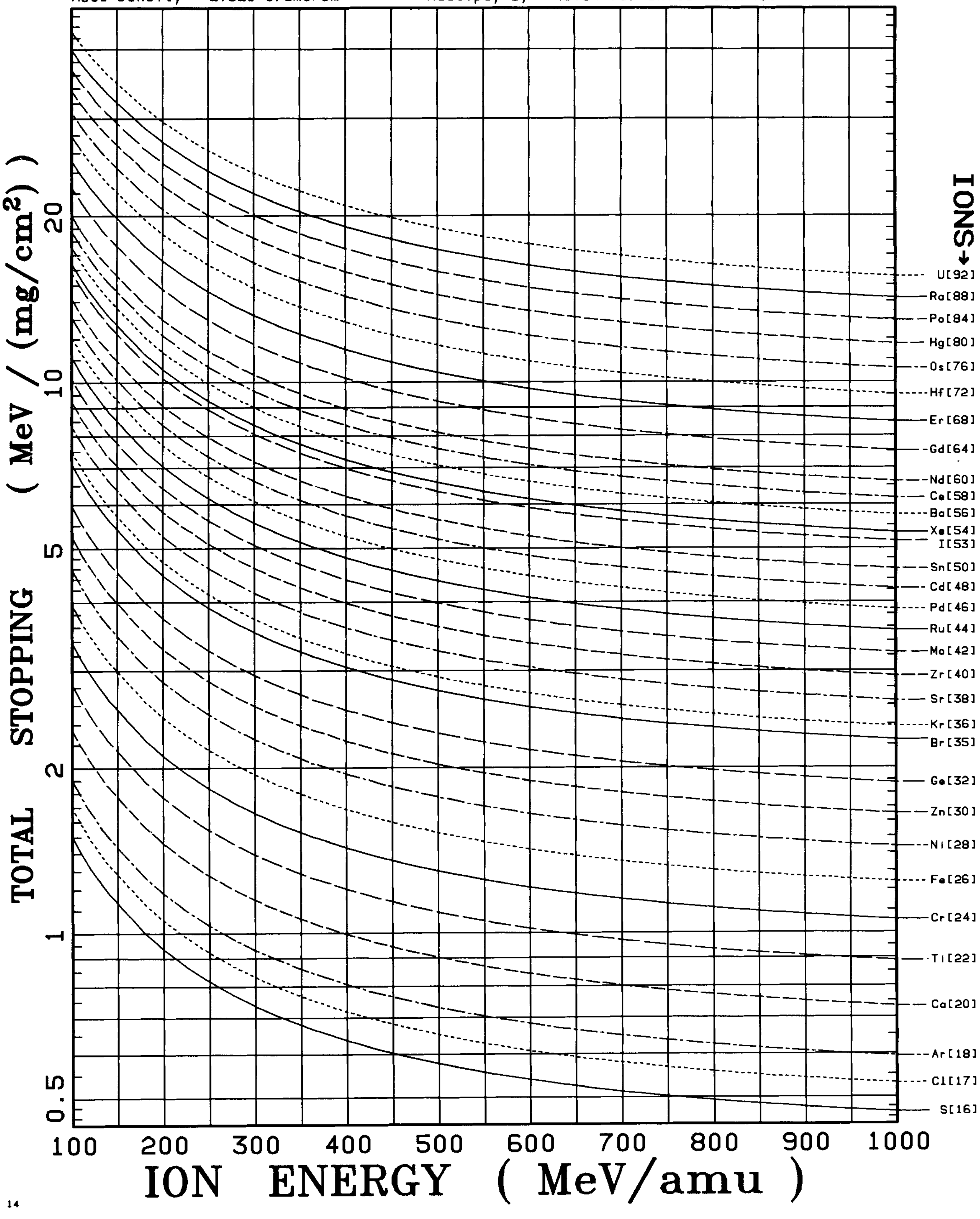
Si(14) ←←← TARGET →→→ Si(14)

Atom Density = 4.978×10^{22} Atoms/cm^3 Multiply Total Stopping by 232.1 for Units: [MeV/mm]
Mass Density = 2.321 Grams/cm^3 Multiply by 46.64 for Units: [eV/(10^{15} Atoms/cm^2)]



Si(14) ←←← TARGET →→→ Si(14)

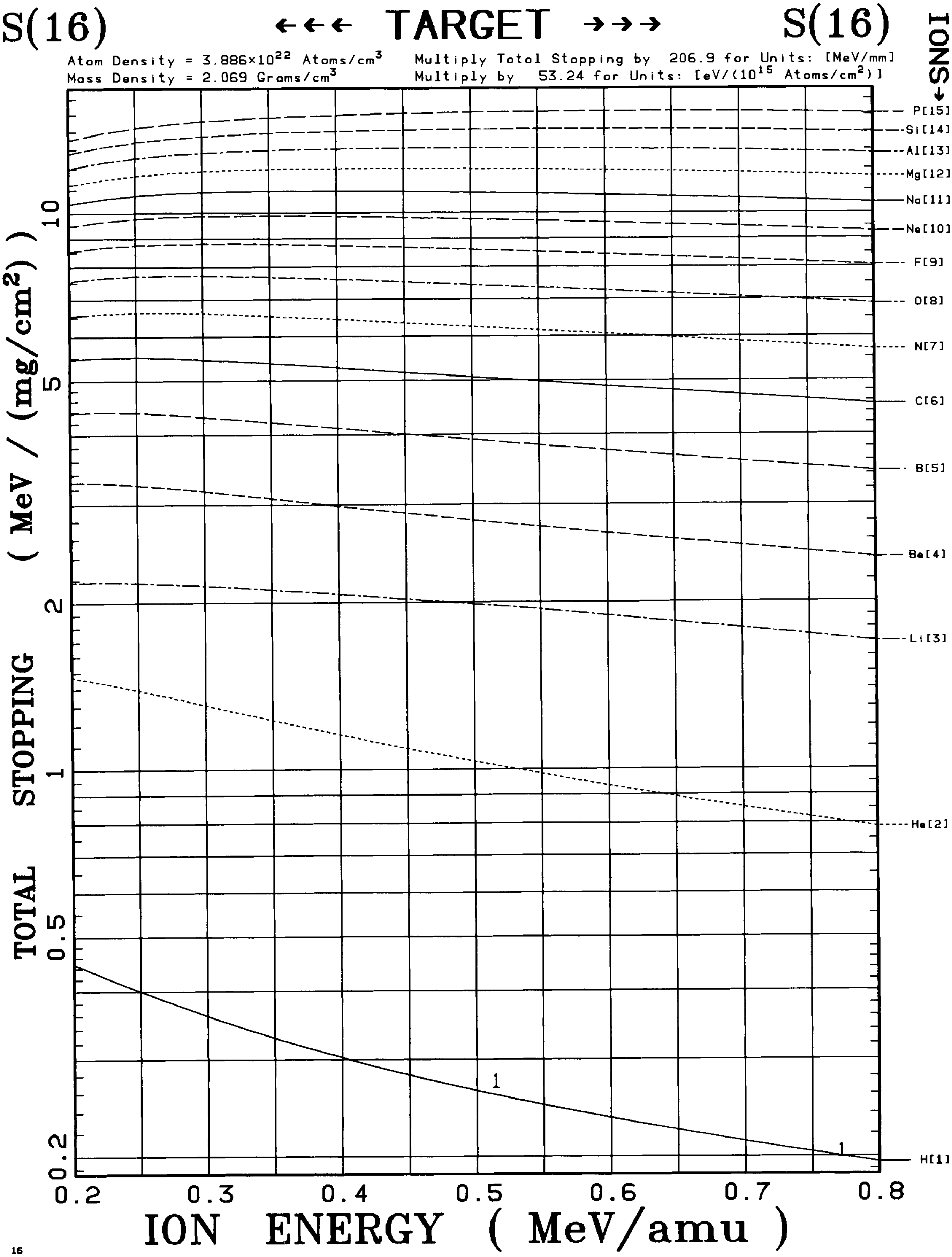
Atom Density = 4.978×10²² Atoms/cm³ Multiply Total Stopping by 232.1 for Units: [MeV/mm]
Mass Density = 2.321 Grams/cm³ Multiply by 46.64 for Units: [eV/(10¹⁵ Atoms/cm²)]



S(16) ←←← TARGET →→→ S(16)

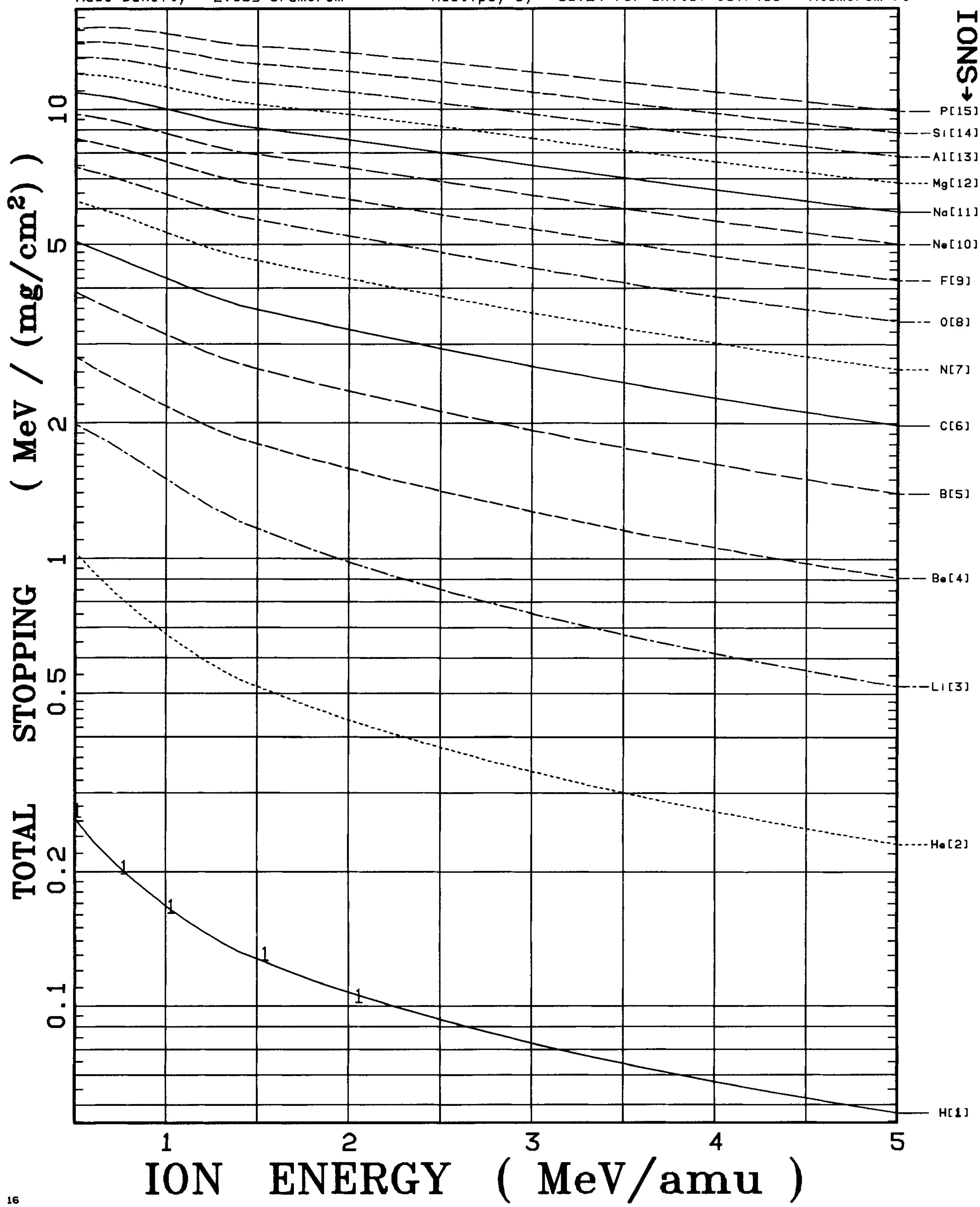
Atom Density = 3.886×10^{22} Atoms/cm^3 Multiply Total Stopping by 206.9 for Units: [MeV/mm]

Mass Density = 2.069 Grams/cm^3 Multiply by 53.24 for Units: [eV/(10^{15} Atoms/cm^2)]



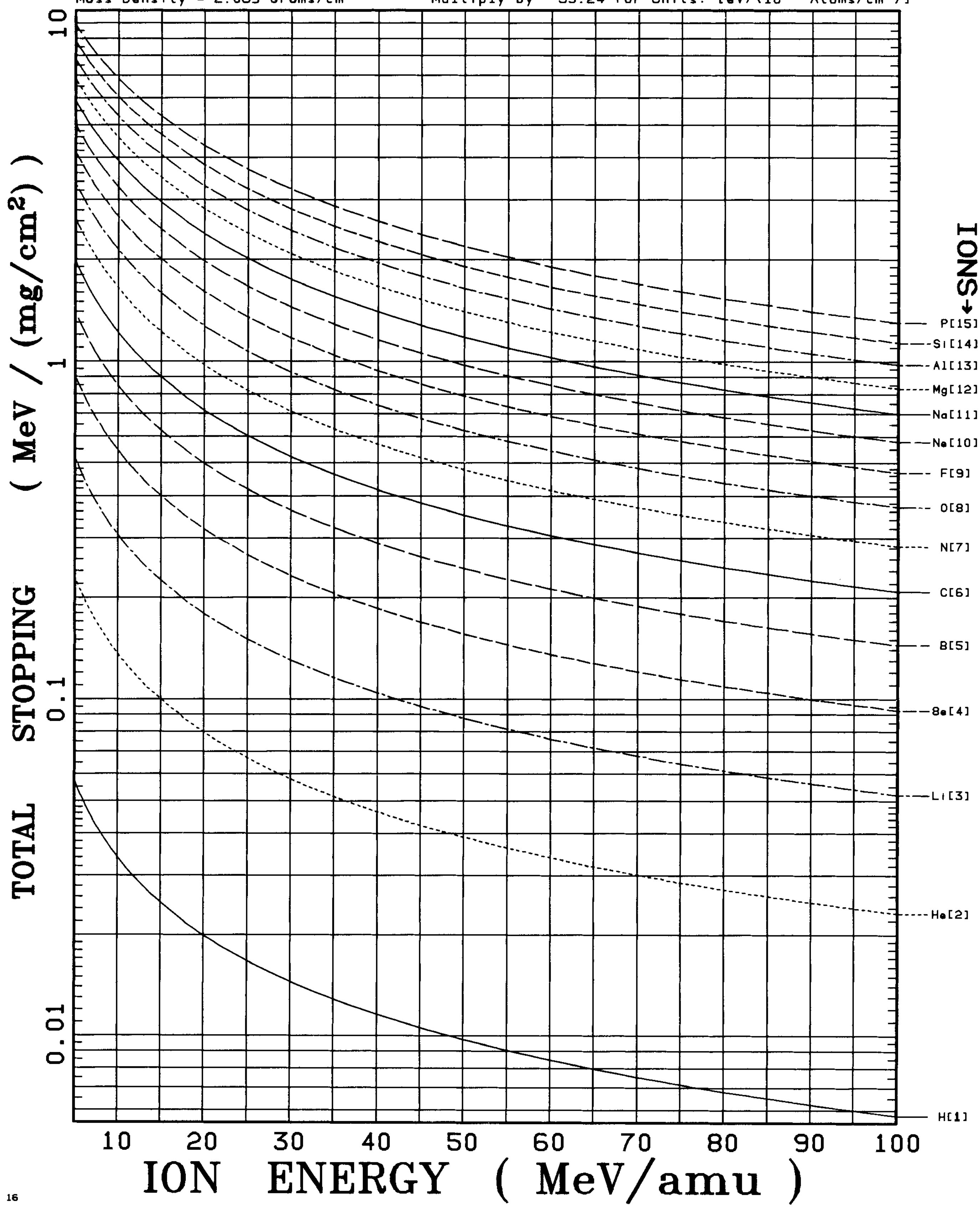
S(16) ←←← TARGET →→→ S(16)

Atom Density = 3.886×10^{22} Atoms/cm^3 Multiply Total Stopping by 206.9 for Units: [MeV/mm]
Mass Density = 2.069 Grams/cm^3 Multiply by 53.24 for Units: [eV/(10^{15} Atoms/cm^2)]



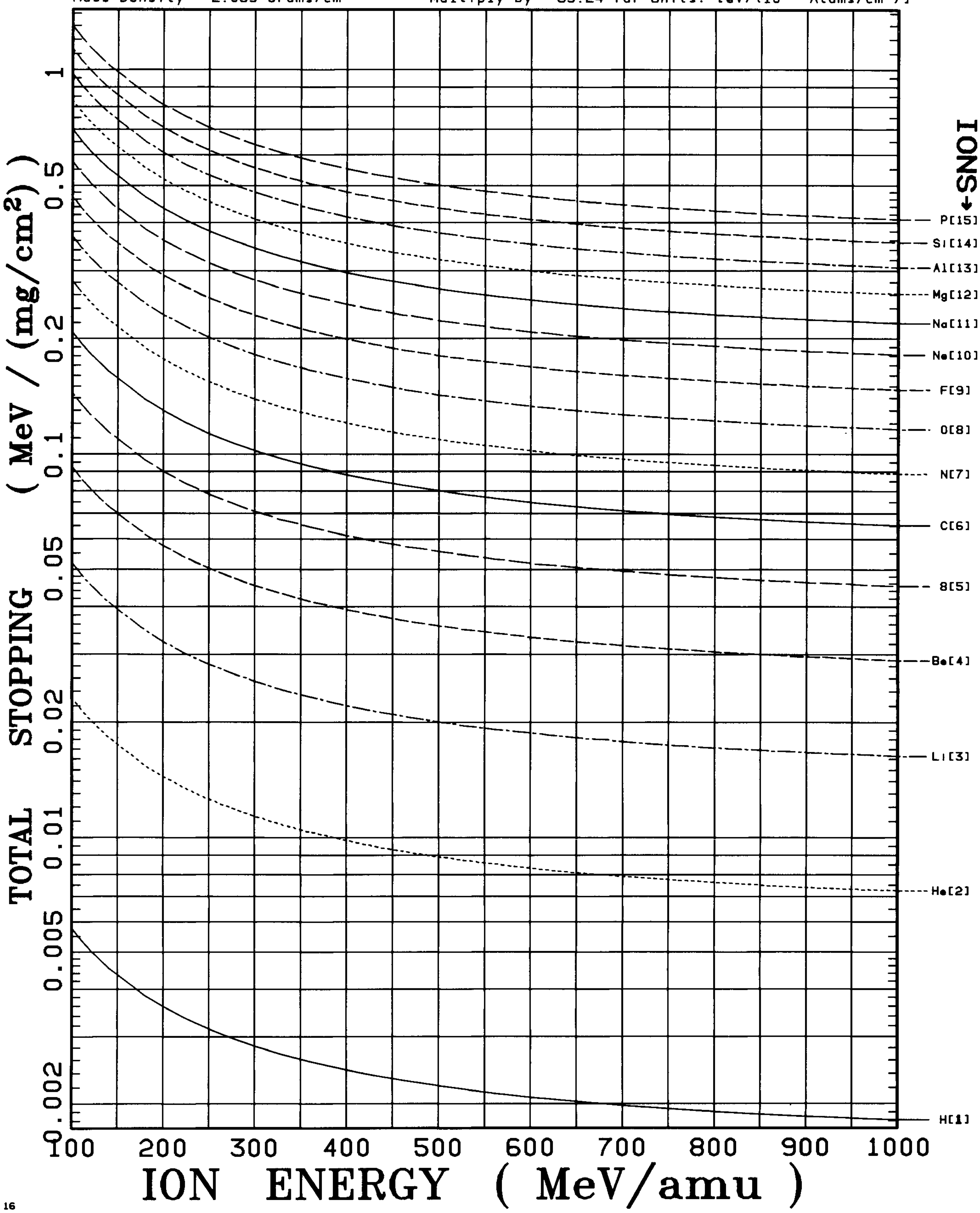
S(16) ←←← TARGET →→→ S(16)

Atom Density = 3.886×10^{22} Atoms/cm^3 Multiply Total Stopping by 206.9 for Units: [MeV/mm]
Mass Density = 2.069 Grams/cm^3 Multiply by 53.24 for Units: [eV/(10^{15} Atoms/cm^2)]



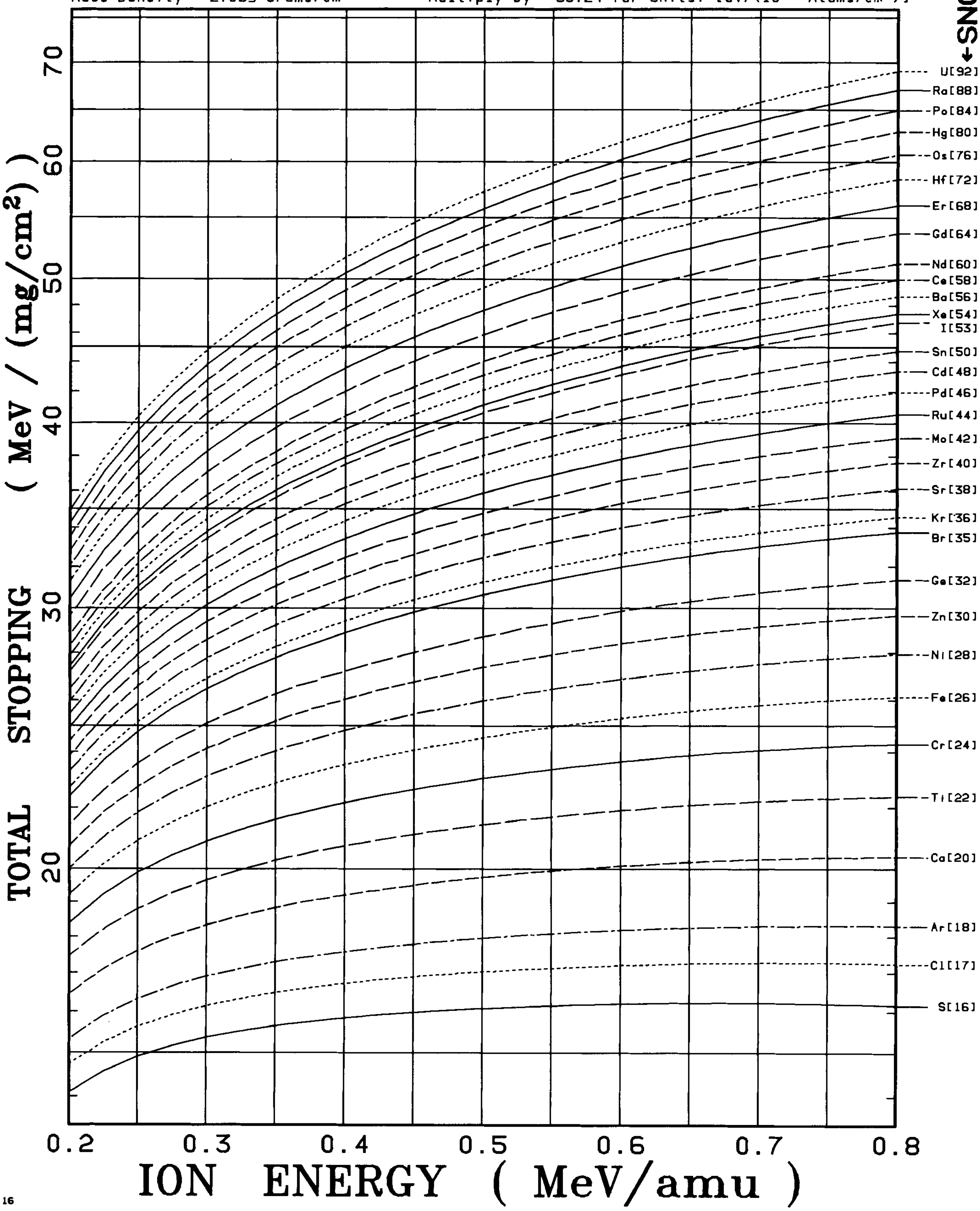
S(16) ←←← TARGET →→→ S(16)

Atom Density = 3.886×10^{22} Atoms/cm^3 Multiply Total Stopping by 206.9 for Units: [MeV/mm]
Mass Density = 2.069 Grams/cm^3 Multiply by 53.24 for Units: [eV/(10^{15} Atoms/cm^2)]



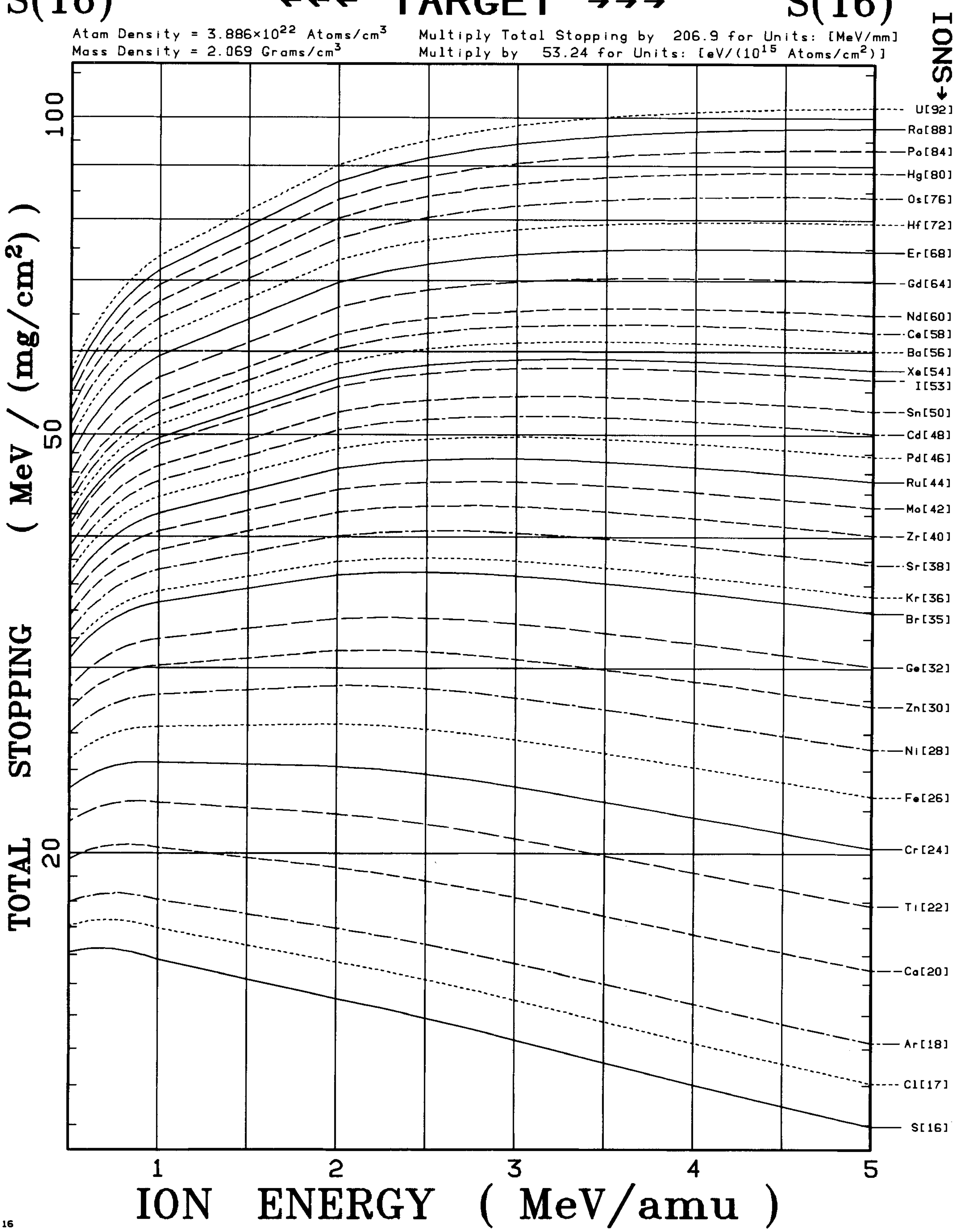
S(16) ←←← TARGET →→→ S(16)

Atom Density = 3.886×10^{22} Atoms/cm^3 Multiply Total Stopping by 206.9 for Units: [MeV/mm]
Mass Density = 2.069 Grams/cm^3 Multiply by 53.24 for Units: [eV/(10^{15} Atoms/cm^2)]



S(16) ←←← TARGET →→→ S(16)

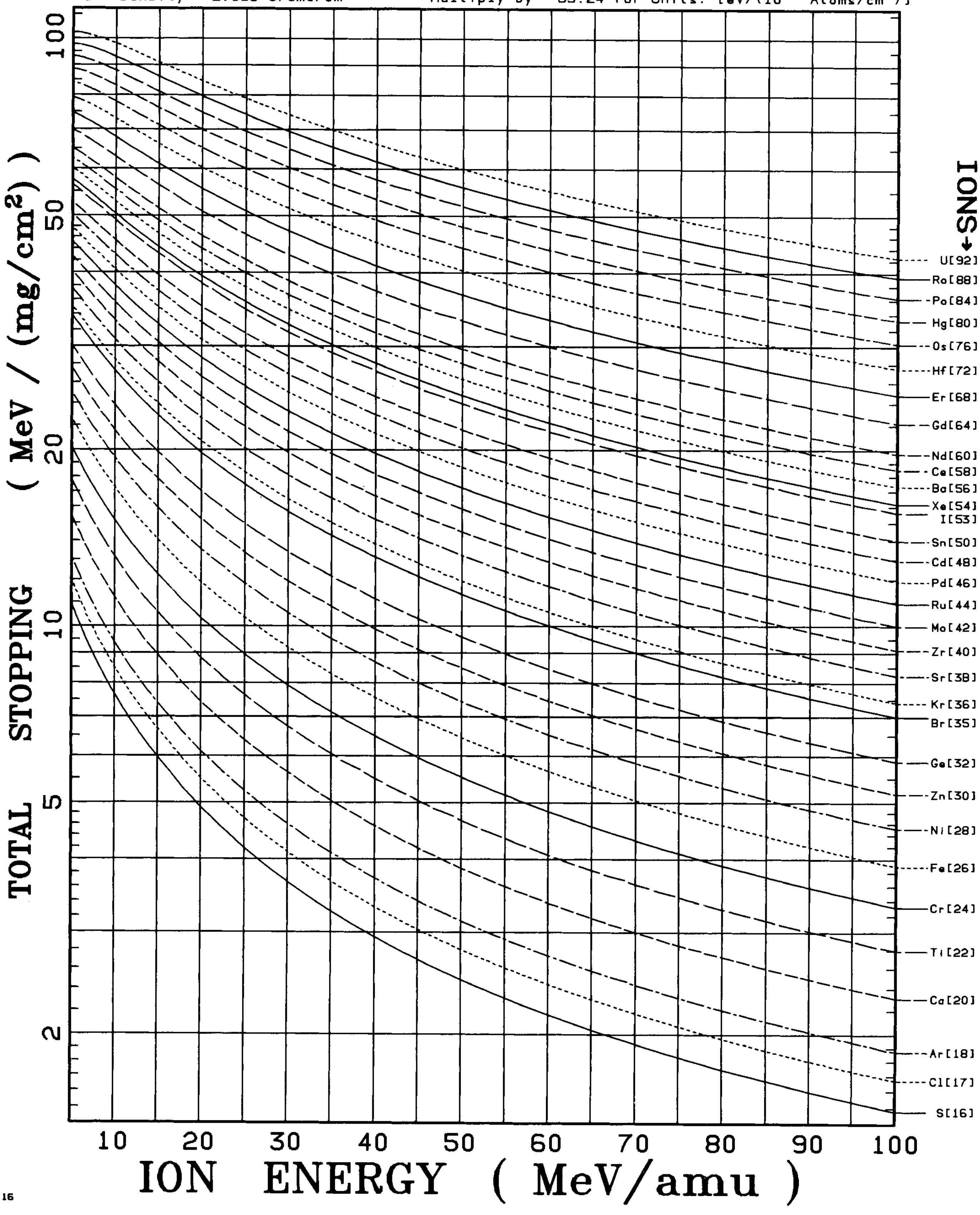
Atom Density = 3.886×10^{22} Atoms/cm^3 Multiply Total Stopping by 206.9 for Units: [MeV/mm]
Mass Density = 2.069 Grams/cm^3 Multiply by 53.24 for Units: [eV/(10^{15} Atoms/cm^2)]



S(16) ←←← TARGET →→→ S(16)

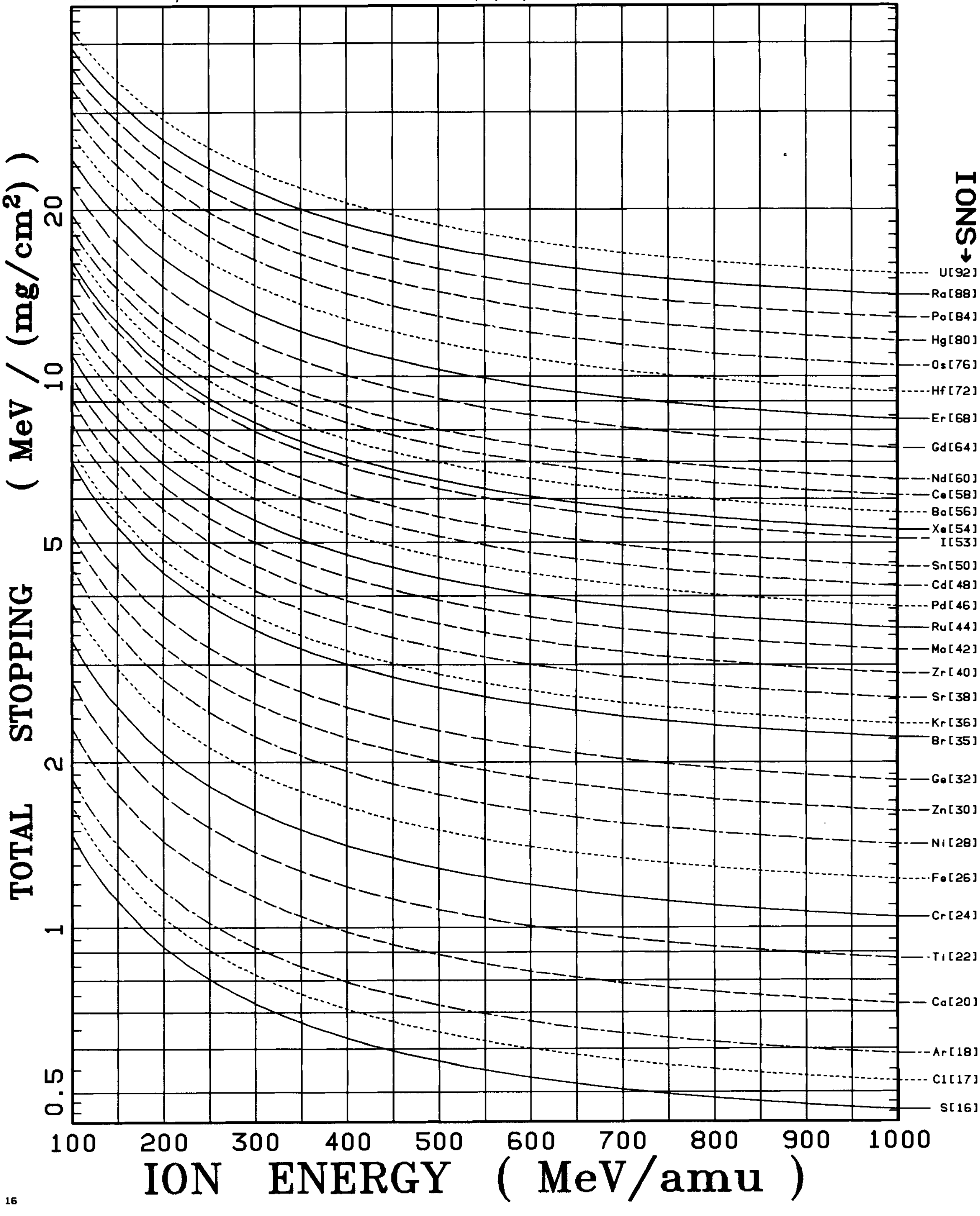
Atom Density = 3.886×10^{22} Atoms/cm^3
Mass Density = 2.069 Grams/cm^3

Multiply Total Stopping by 206.9 for Units: [MeV/mm]
Multiply by 53.24 for Units: [eV/(10^{15} Atoms/cm^2)]



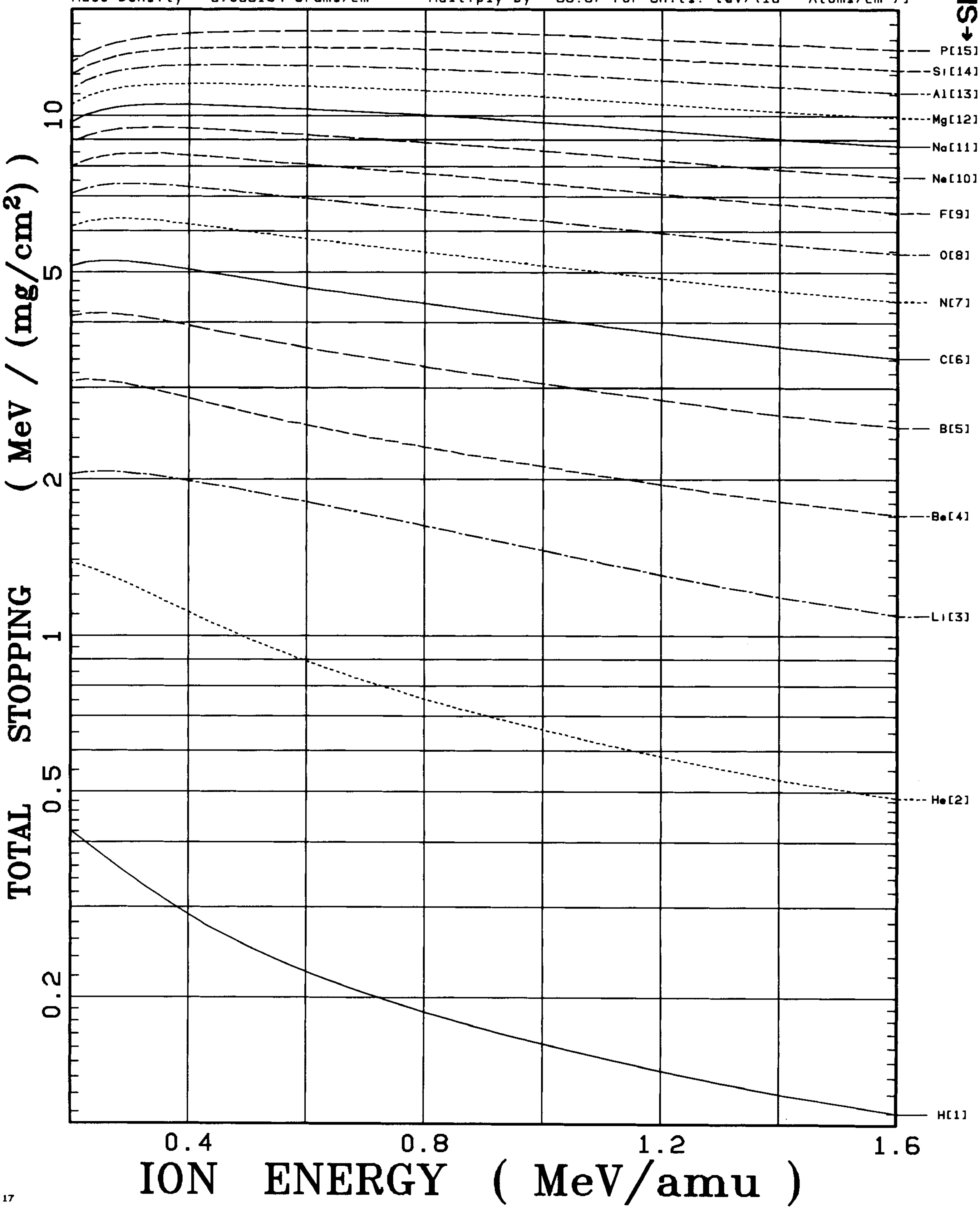
S(16) ←←← TARGET →→→ S(16)

Atom Density = 3.886×10[22] Atoms/cm[3] Multiply Total Stopping by 206.9 for Units: [MeV/mm]
Mass Density = 2.069 Grams/cm[3] Multiply by 53.24 for Units: [eV/(10[15] Atoms/cm[2])]



Cl(17) ←←← TARGET →→→ Cl(17)
(SOLID PHASE)

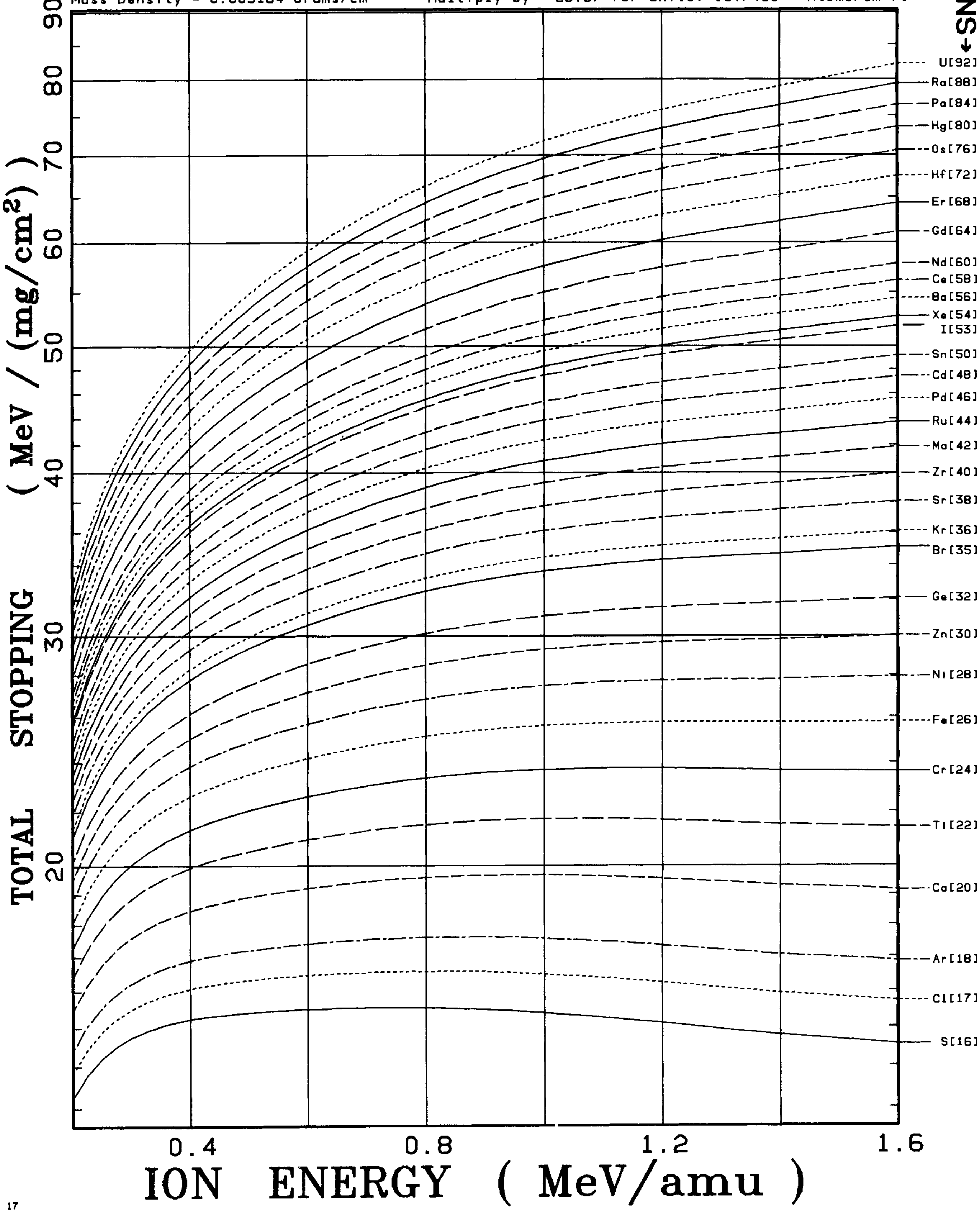
Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 316.4 for Units: [keV/mm]
Mass Density = 0.003164 Grams/cm^3 Multiply by 58.87 for Units: [eV/(10^{15} Atoms/cm^2)]



Cl(17) ←←← TARGET →→→ Cl(17)

(SOLID PHASE)

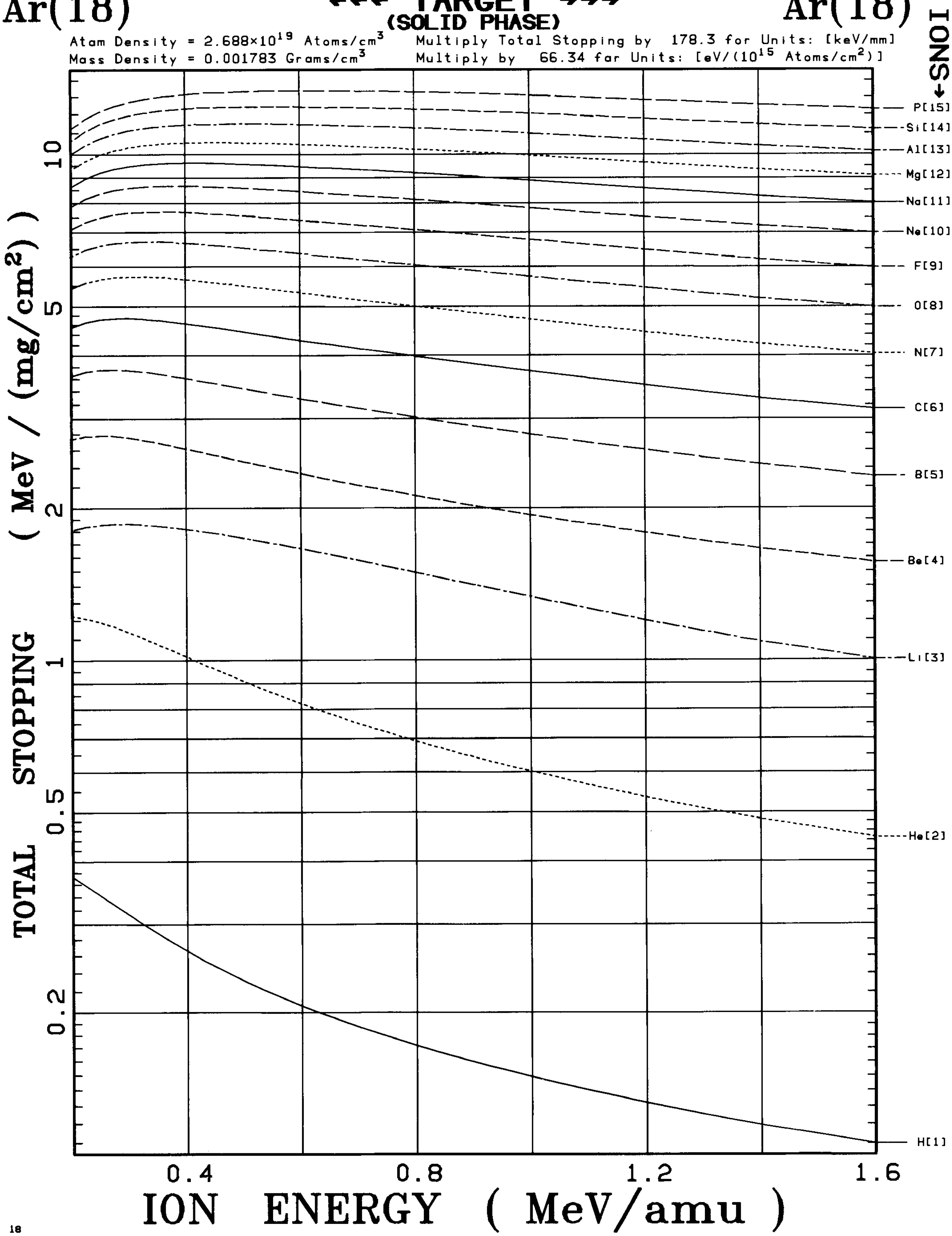
Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 316.4 for Units: [keV/mm]
Mass Density = 0.003164 Grams/cm^3 Multiply by 58.87 for Units: [eV/(10^{15} Atoms/cm^2)]



Ar(18) ←←← TARGET →→→ Ar(18)
(SOLID PHASE)

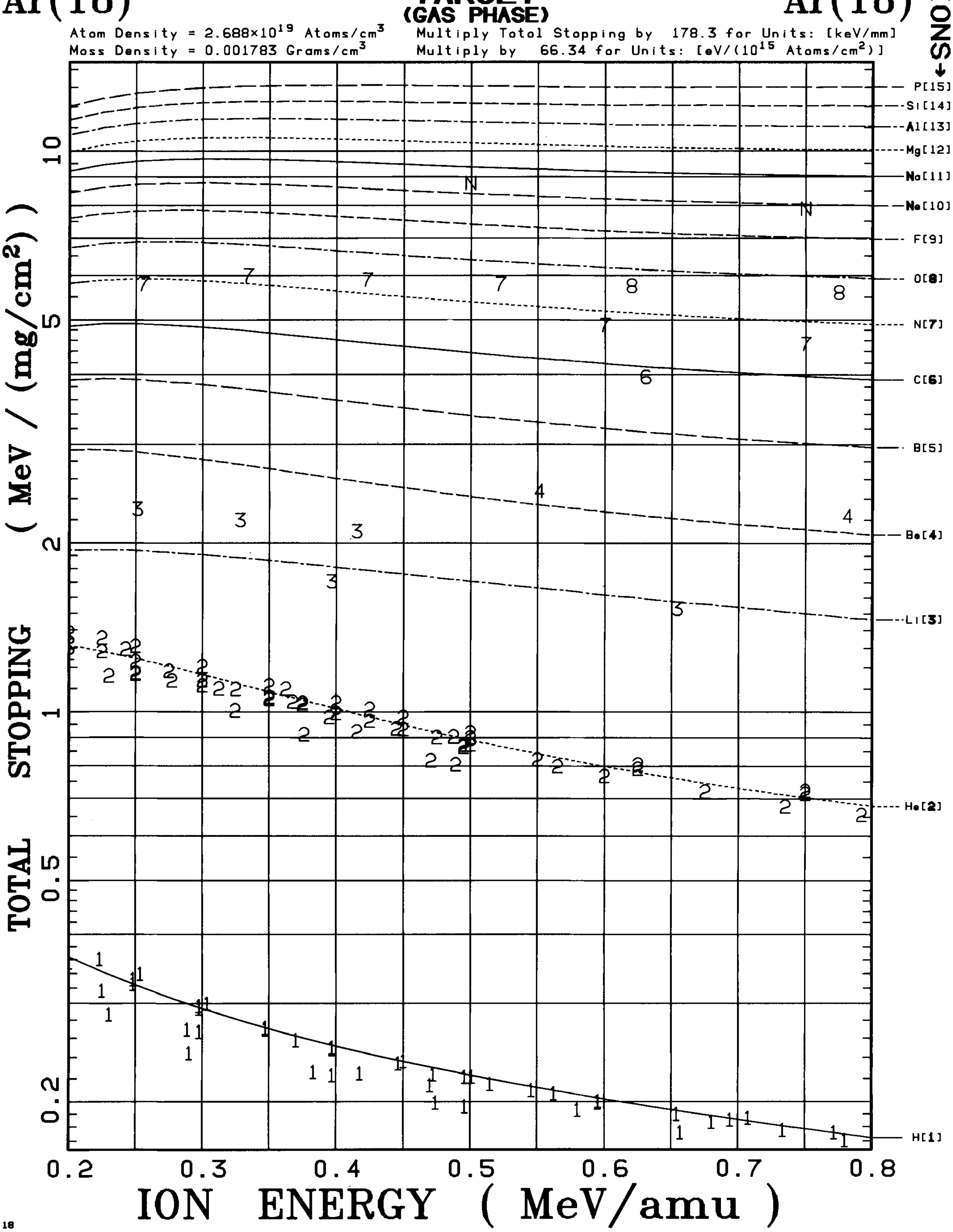
Atom Density = 2.688×10^{19} Atoms/cm^3 Multiply Total Stopping by 178.3 for Units: [keV/mm]

Mass Density = 0.001783 Grams/cm^3 Multiply by 66.34 for Units: [eV/(10^{15} Atoms/cm^2)]



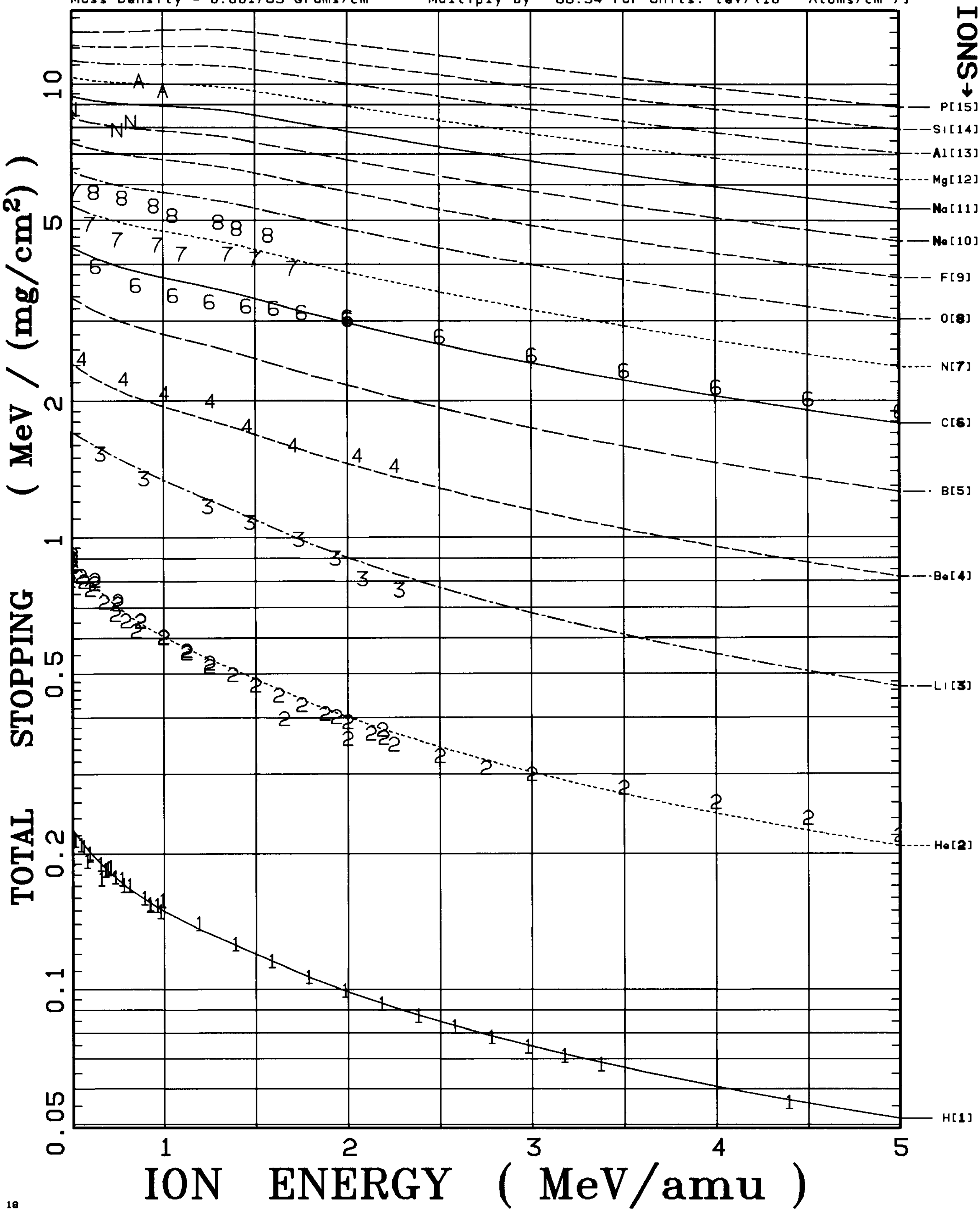
Ar(18) ←←← TARGET (GAS PHASE) →→→ Ar(18)

Atom Density = 2.688×10^19 Atoms/cm^3 Multiply Total Stopping by 178.3 for Units: [keV/mm]
Mass Density = 0.001783 Grams/cm^3 Multiply by 66.34 for Units: [eV/(10^15 Atoms/cm^2)]



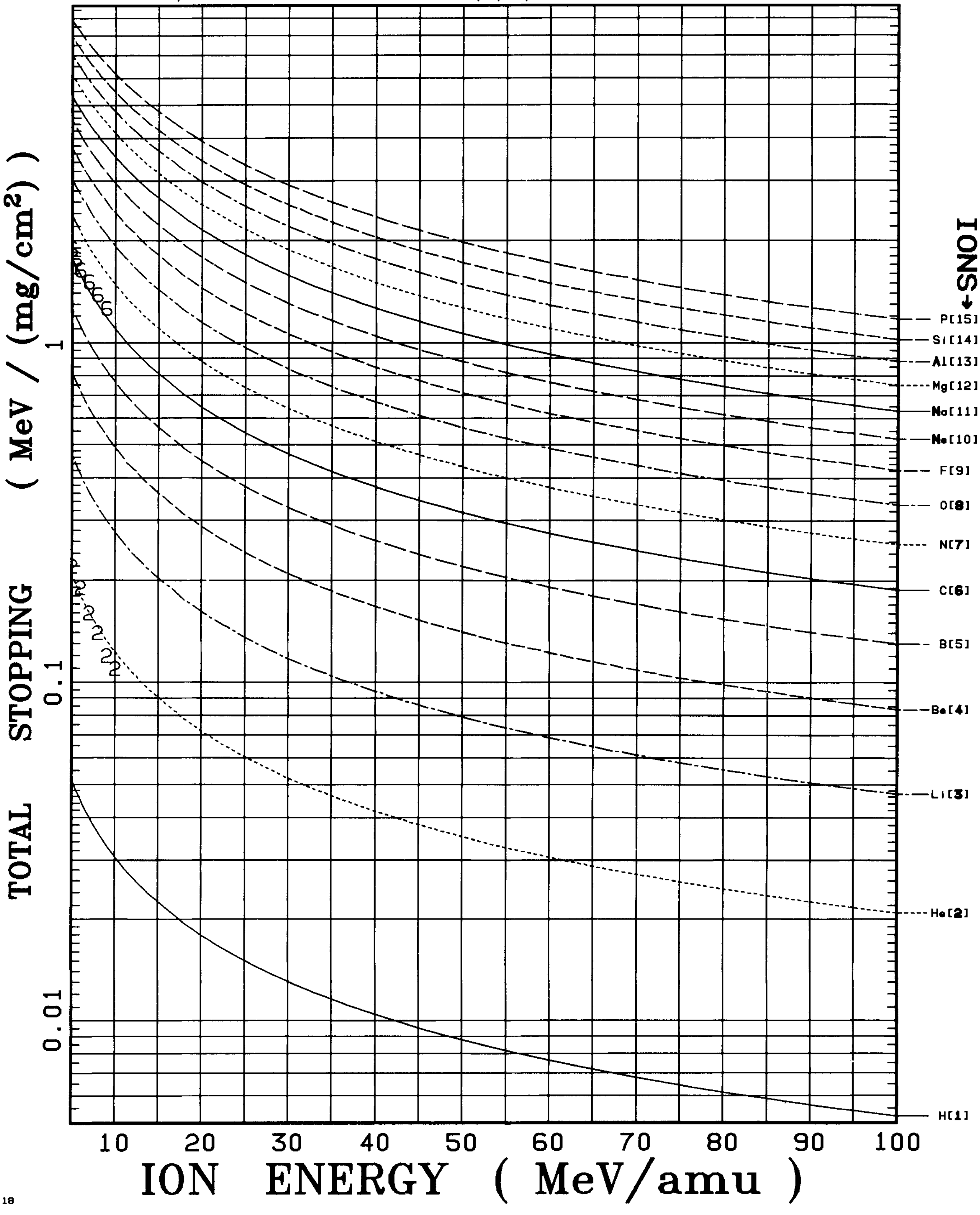
Ar(18) ←←← TARGET (GAS PHASE) →→→ Ar(18)

Atom Density = 2.688×10^19 Atoms/cm^3 Multiply Total Stopping by 178.3 for Units: [keV/mm]
Mass Density = 0.001783 Grams/cm^3 Multiply by 66.34 for Units: [eV/(10^15 Atoms/cm^2)]



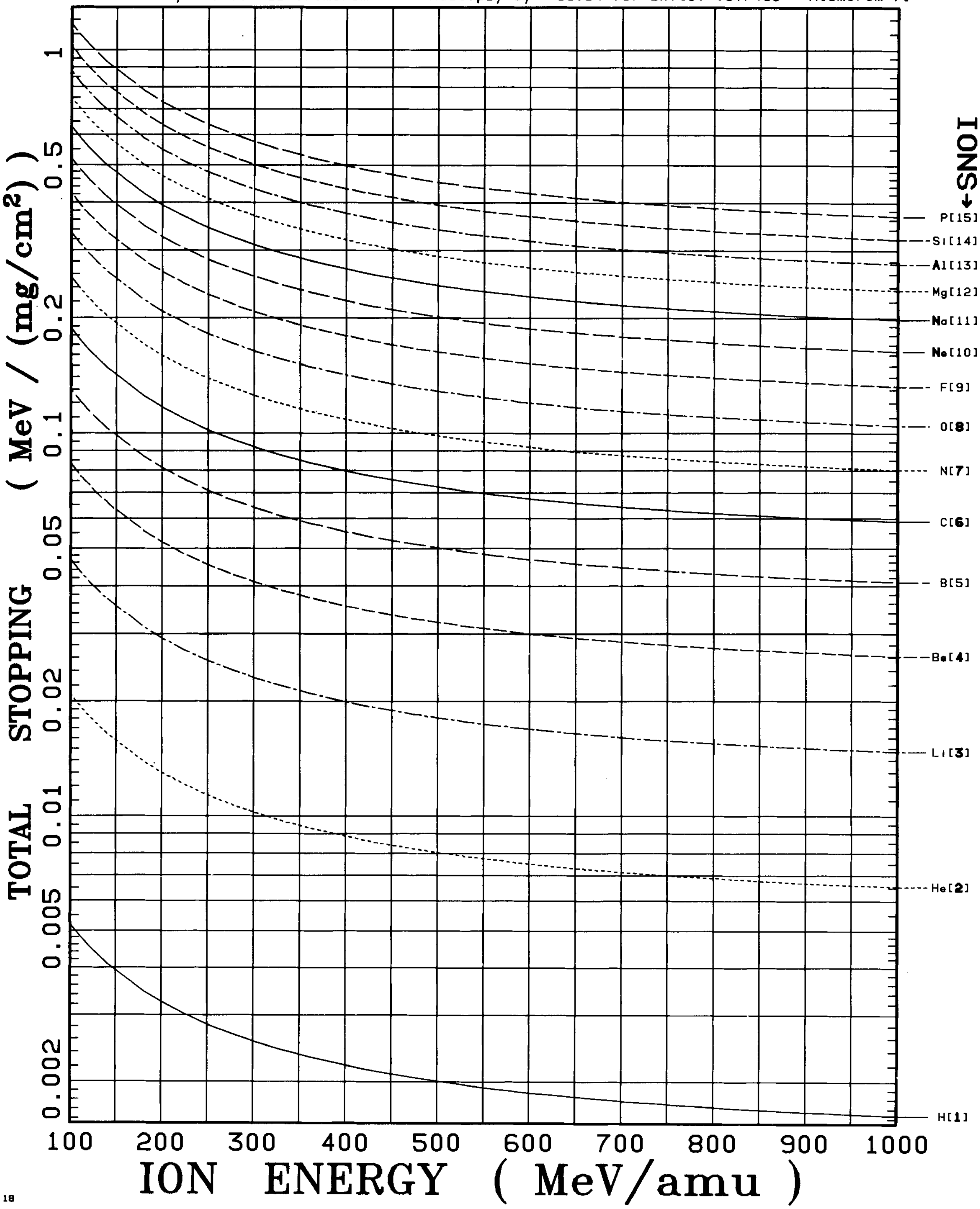
Ar(18) ←←← TARGET (GAS PHASE) →→→ Ar(18)

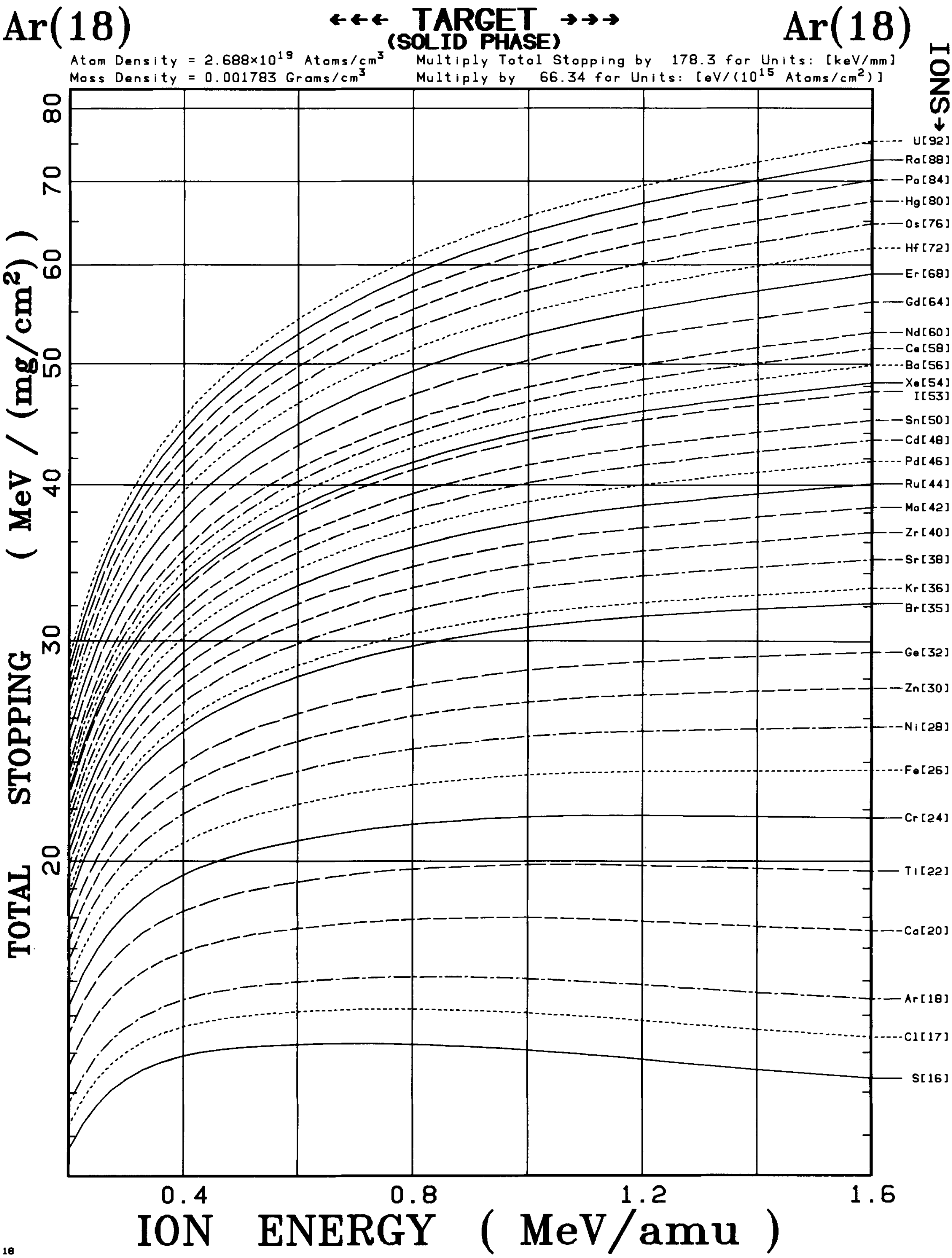
Atom Density = 2.688×10[19] Atoms/cm[3] Multiply Total Stopping by 178.3 for Units: [keV/mm]
Mass Density = 0.001783 Grams/cm[3] Multiply by 66.34 for Units: [eV/(10[15] Atoms/cm[2])]



Ar(18) ←←← TARGET (GAS PHASE) →→→ Ar(18)

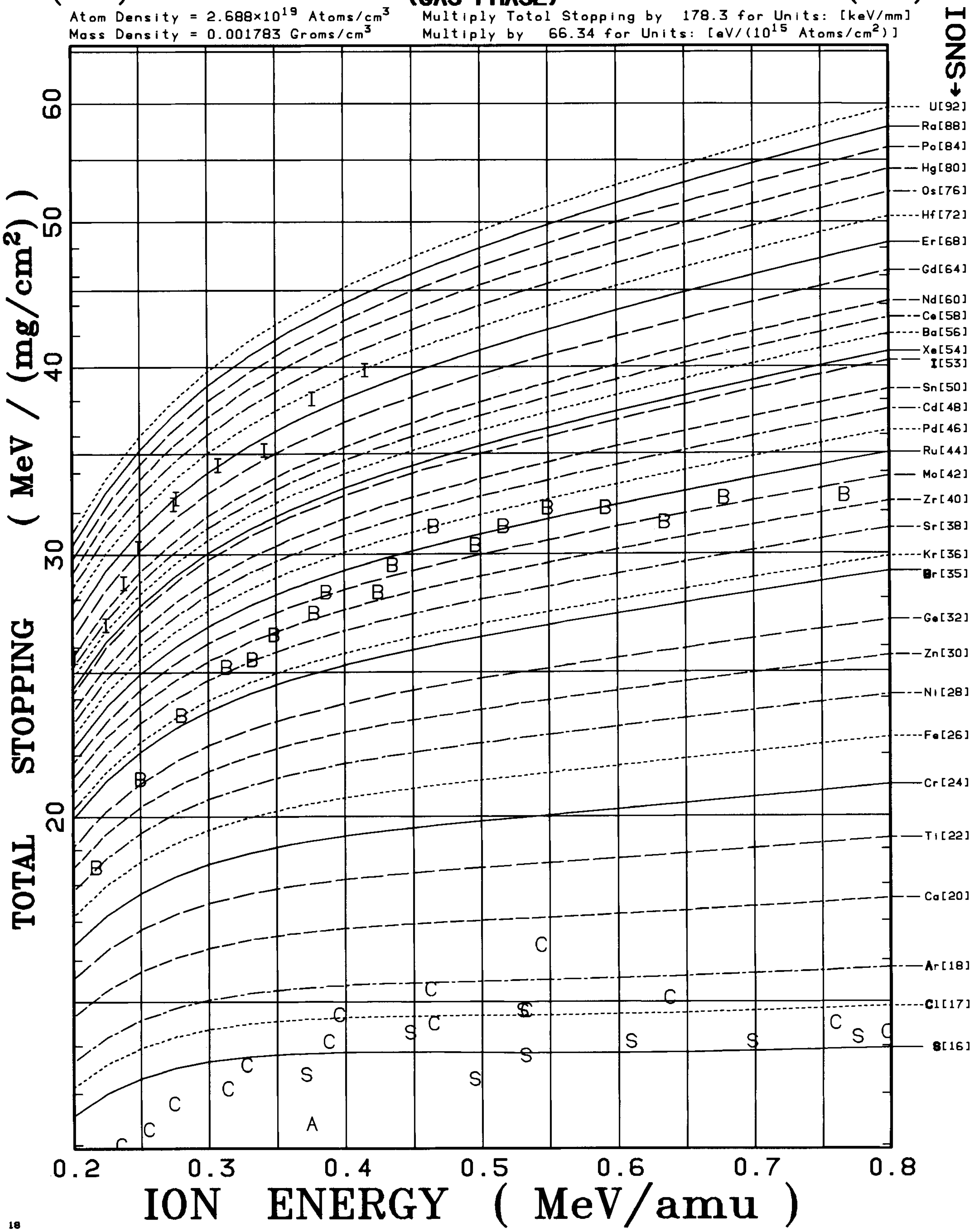
Atom Density = 2.688×10^{19} Atoms/cm^3 Multiply Total Stopping by 178.3 for Units: [keV/mm]
Mass Density = 0.001783 Grams/cm^3 Multiply by 66.34 for Units: [eV/(10^{15} Atoms/cm^2)]




Ar(18)
←←← TARGET →→→
(SOLID PHASE)
Ar(18)
Atom Density = 2.688×10^19 Atoms/cm^3
Mass Density = 0.001783 Grams/cm^3
Multiply Total Stopping by 178.3 for Units: [keV/mm]
Multiply by 66.34 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
80
70
60
50
40
30
20
TOTAL STOPPING (MeV / (mg/cm²))
0.4
0.8
1.2
1.6
ION ENERGY (MeV/amu)

Ar(18) ←←← TARGET (GAS PHASE) →→→ Ar(18)

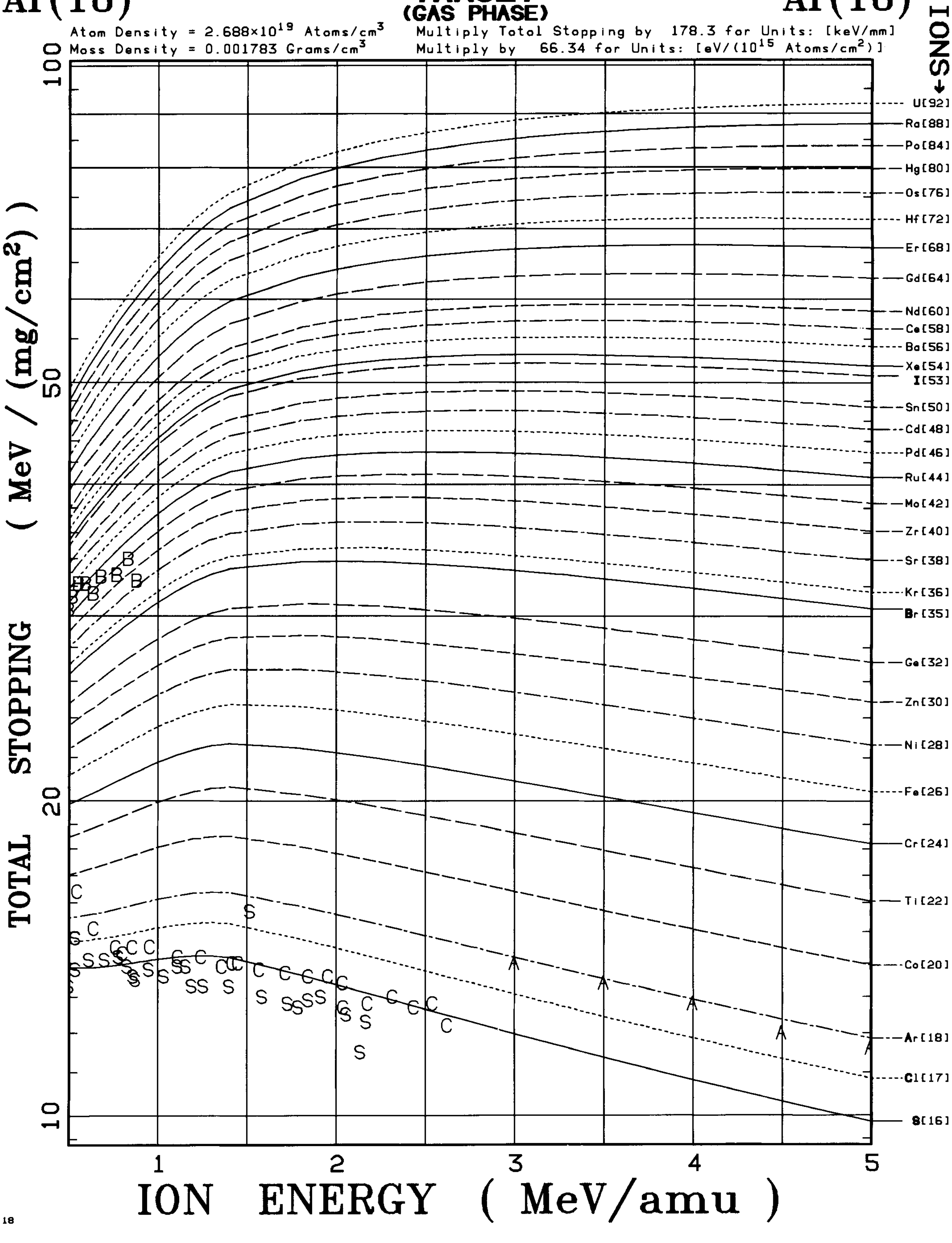
Atom Density = 2.688×10^{19} Atoms/cm^3 Multiply Total Stopping by 178.3 for Units: [keV/mm]
Mass Density = 0.001783 Grams/cm^3 Multiply by 66.34 for Units: [eV/(10^{15} Atoms/cm^2)]

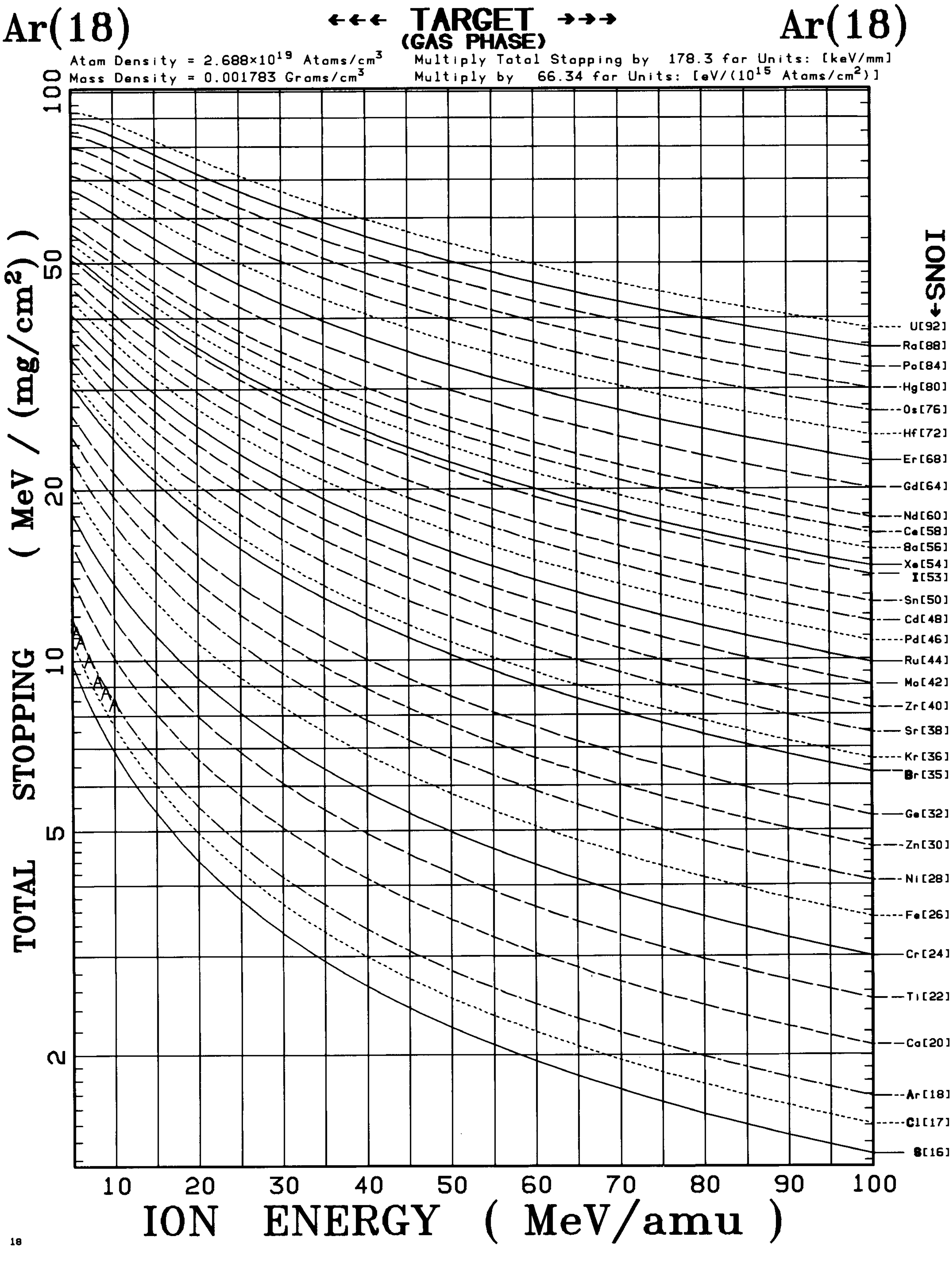


Ar(18) ←←← TARGET (GAS PHASE) →→→ Ar(18)

Atom Density = 2.688×10[19] Atoms/cm[3] — Multiply Total Stopping by 178.3 for Units: [keV/mm]

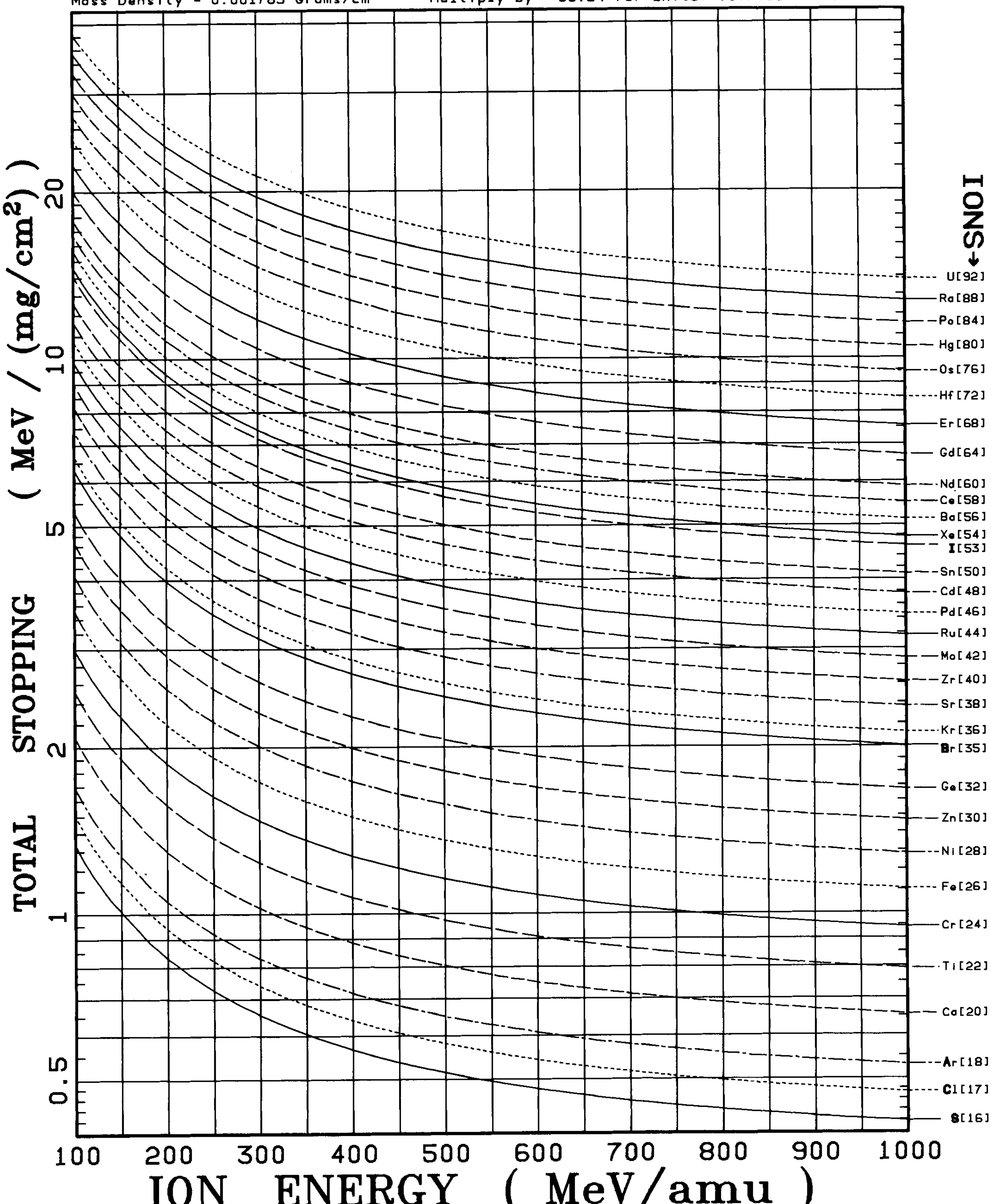
Mass Density = 0.001783 Grams/cm[3] — Multiply by 66.34 for Units: [eV/(10[15] Atoms/cm[2])]

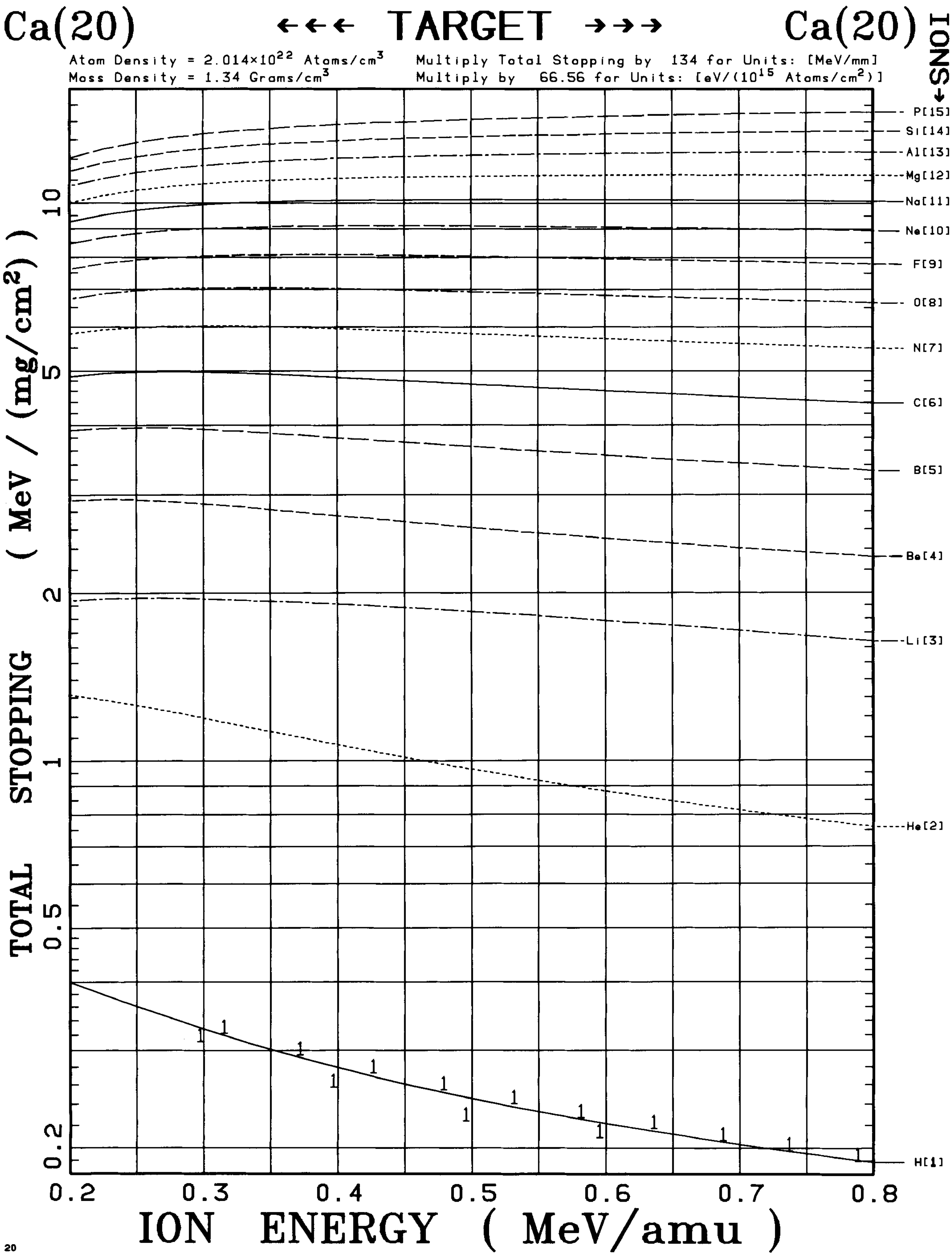



Ar(18)
←←← TARGET →→→
(GAS PHASE)
Ar(18)
Atom Density = 2.688×10^19 Atoms/cm^3
Multiply Total Stopping by 178.3 for Units: [keV/mm]
Mass Density = 0.001783 Grams/cm^3
Multiply by 66.34 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
100
50
20
10
5
2
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
10
20
30
40
50
60
70
80
90
100
ION ENERGY (MeV/amu)

Ar(18) ←←← TARGET (GAS PHASE) →→→ Ar(18)

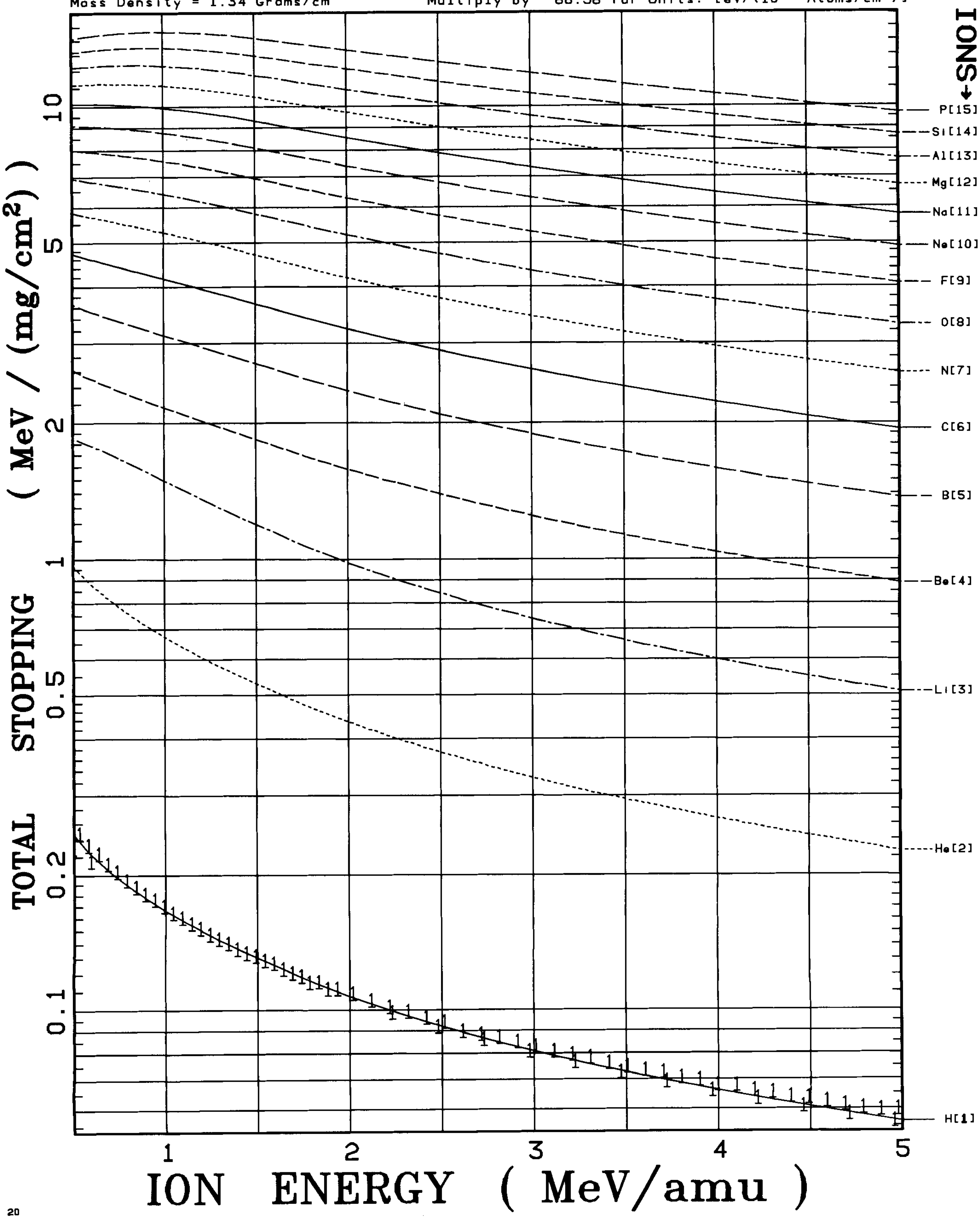
Atom Density = 2.688×10^{19} Atoms/cm^3 Multiply Total Stopping by 178.3 for Units: [keV/mm]
Mass Density = 0.001783 Grams/cm^3 Multiply by 66.34 for Units: [eV/(10^{15} Atoms/cm^2)]

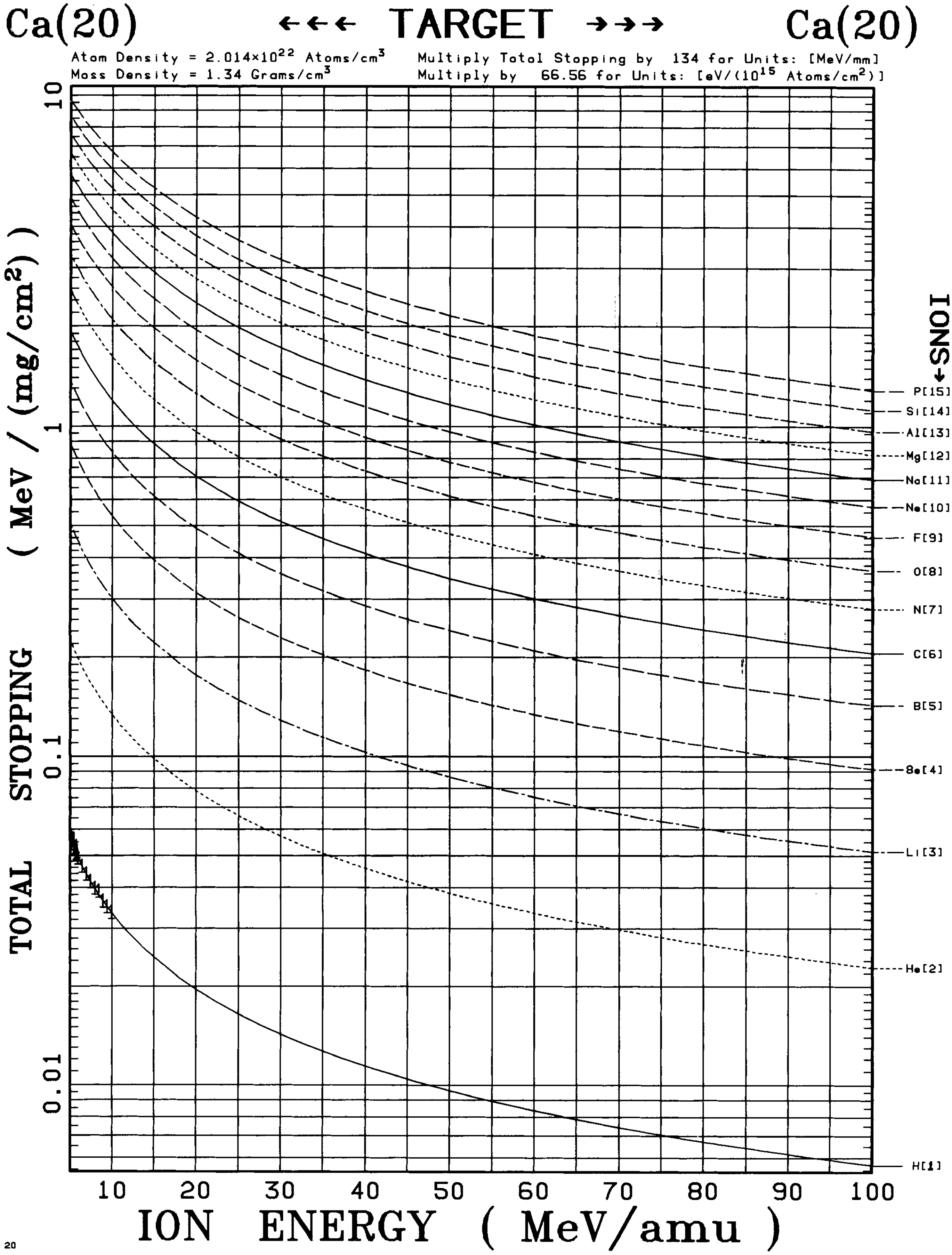



Ca(20) ←←← TARGET →→→ Ca(20)
Atom Density = 2.014×10^22 Atoms/cm^3
Mass Density = 1.34 Grams/cm^3
Multiply Total Stopping by 134 for Units: [MeV/mm]
Multiply by 66.56 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm²))
10
5
2
1
0.5
0.2
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

Ca(20) ←←← TARGET →→→ Ca(20)

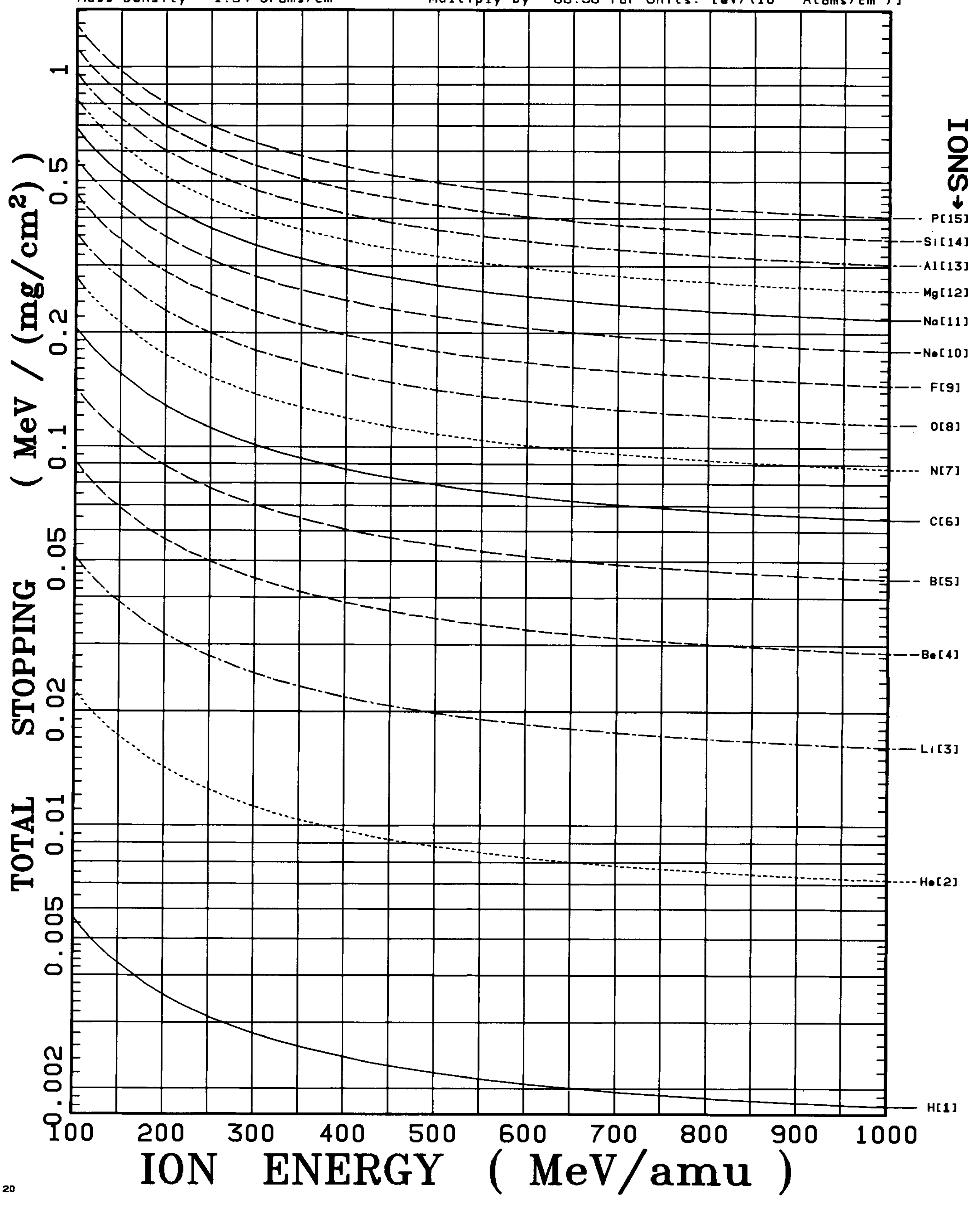
Atom Density = 2.014×10^{22} Atoms/cm^3 Multiply Total Stopping by 134 for Units: [MeV/mm]
Mass Density = 1.34 Grams/cm^3 Multiply by 66.56 for Units: [eV/(10^{15} Atoms/cm^2)]




Ca(20)
←←← TARGET →→→
Ca(20)
Atom Density = 2.014×10^22 Atoms/cm^3
Mass Density = 1.34 Grams/cm^3
Multiply Total Stopping by 134 for Units: [MeV/mm]
Multiply by 66.56 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
10
1
0.1
0.01
10
20
30
40
50
60
70
80
90
100
ION ENERGY (MeV/amu)
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]

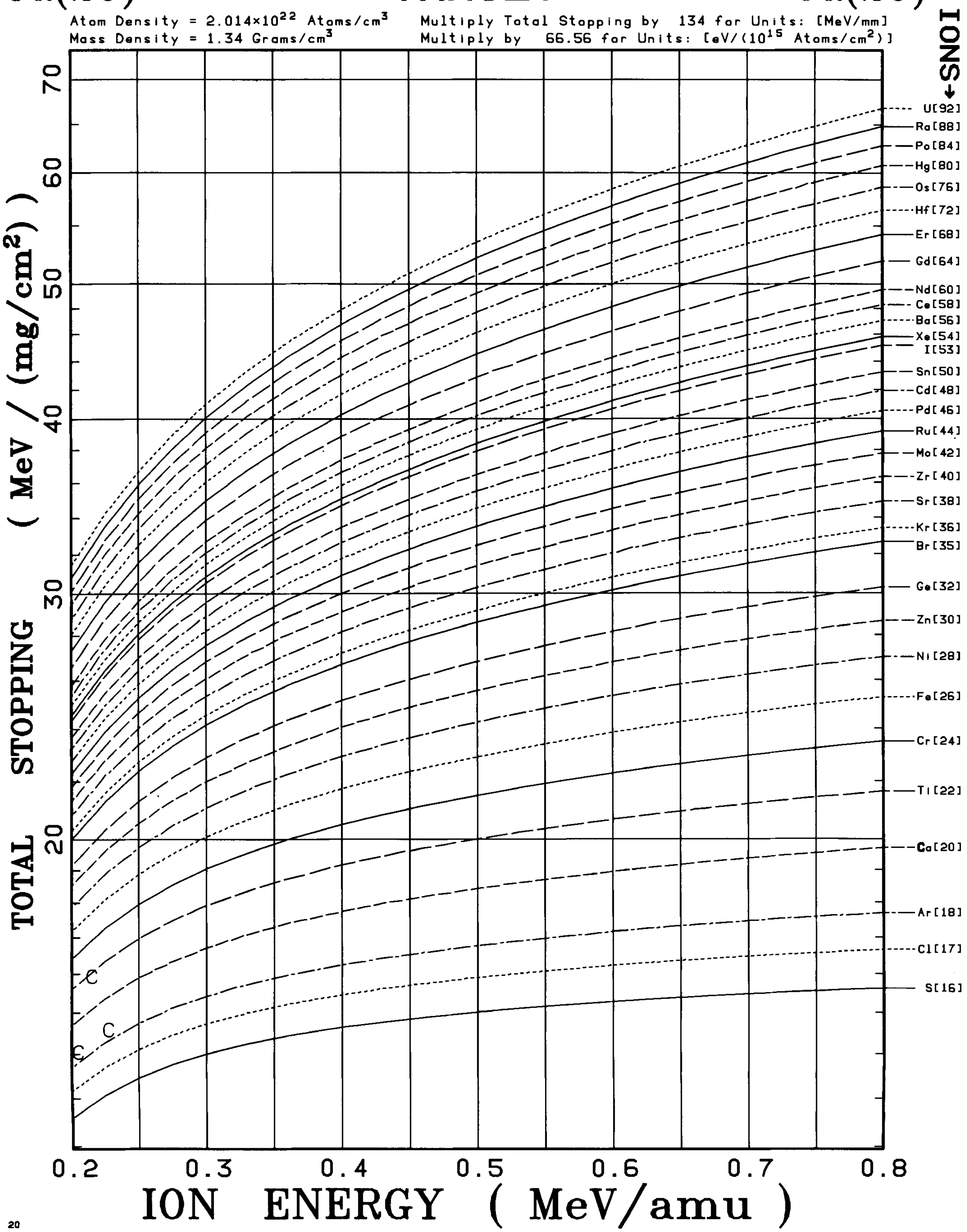
Ca(20) ←←← TARGET →→→ Ca(20)

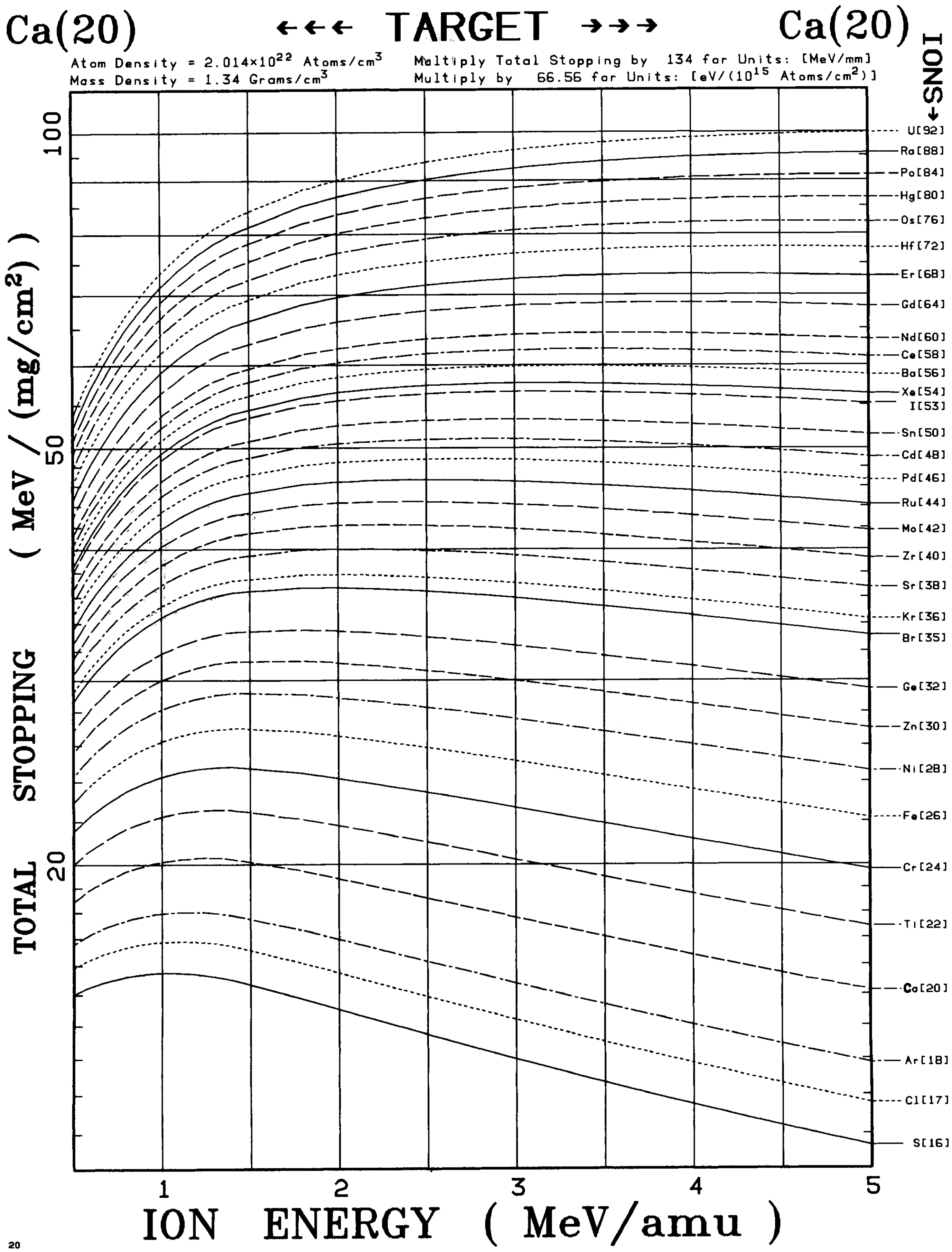
Atom Density = 2.014×10^{22} Atoms/cm^3 Multiply Total Stopping by 134 for Units: [MeV/mm]
Mass Density = 1.34 Grams/cm^3 Multiply by 66.56 for Units: [eV/(10^{15} Atoms/cm^2)]



Ca(20) ←←← TARGET →→→ Ca(20)

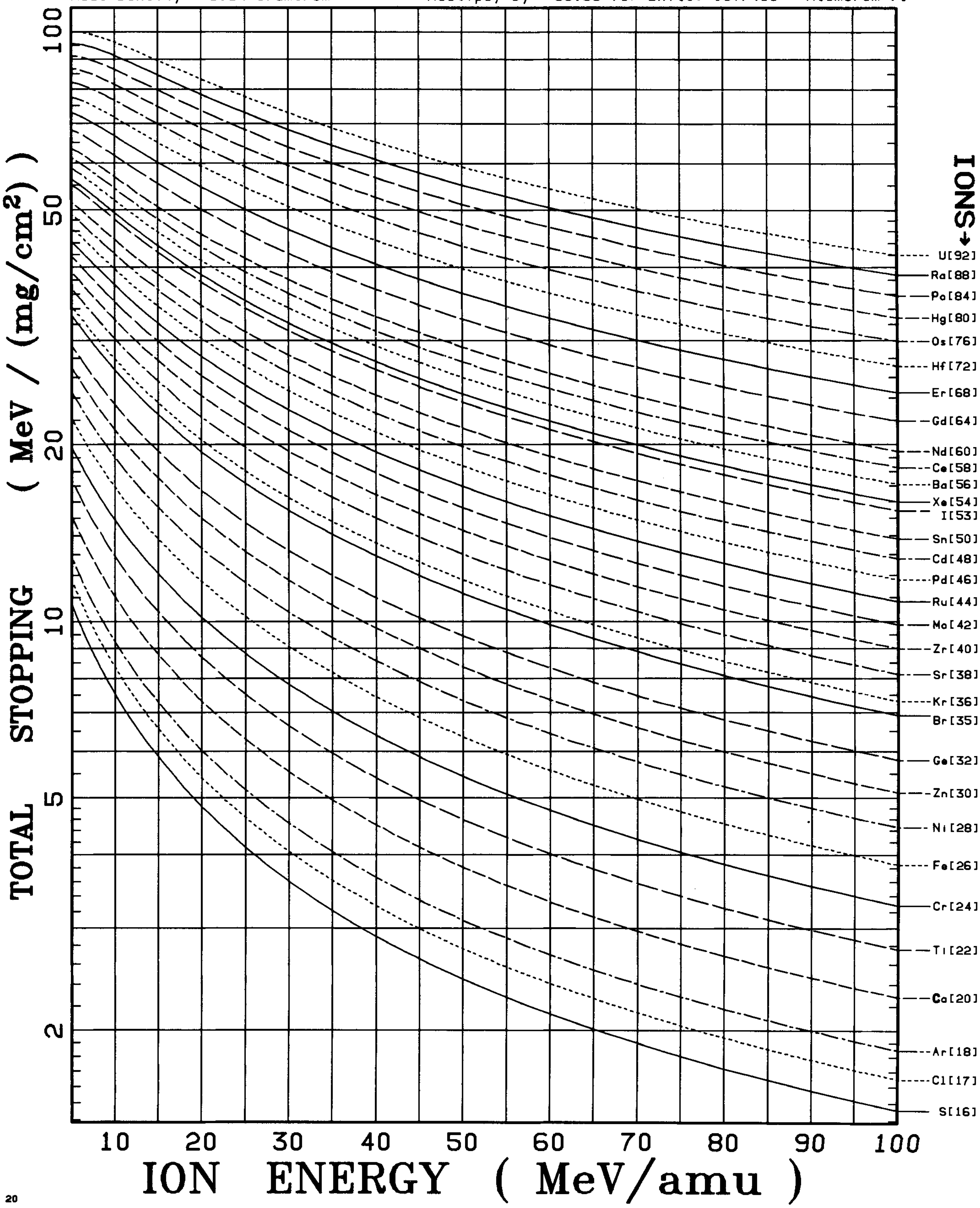
Atom Density = 2.014×10^{22} Atoms/cm^3 Multiply Total Stopping by 134 for Units: [MeV/mm]
Mass Density = 1.34 Grams/cm^3 Multiply by 66.56 for Units: [eV/(10^{15} Atoms/cm^2)]




Ca(20) ←←← TARGET →→→ Ca(20)
Atom Density = 2.014×10^22 Atoms/cm^3
Mass Density = 1.34 Grams/cm^3
Multiply Total Stopping by 134 for Units: [MeV/mm]
Multiply by 66.56 for Units: [eV/(10^15 Atoms/cm^2)]
IONS↓
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm²))
100
50
20
1
2
3
4
5
ION ENERGY (MeV/amu)

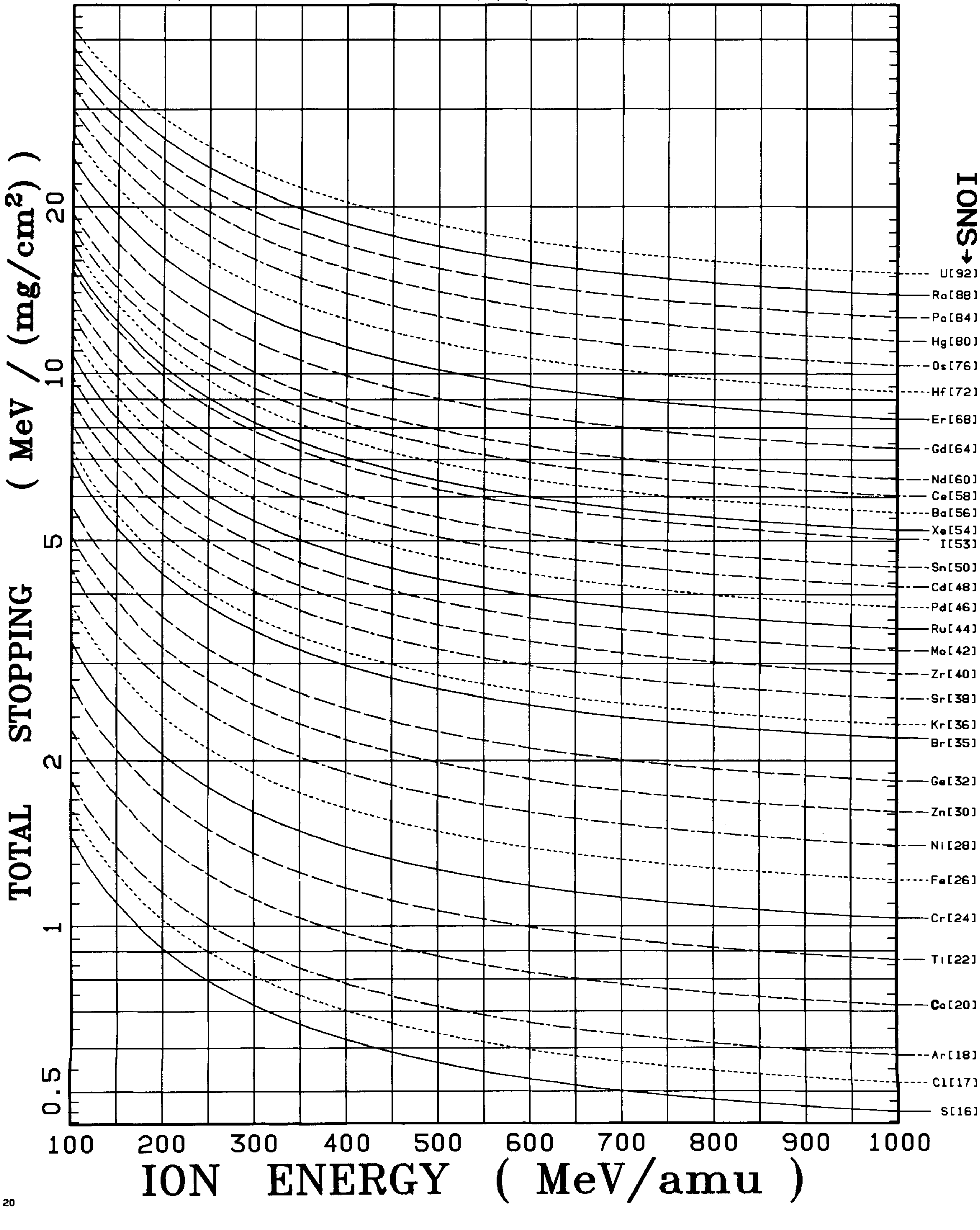
Ca(20) ←←← TARGET →→→ Ca(20)

Atom Density = 2.014×10^{22} Atoms/cm^3 Multiply Total Stopping by 134 for Units: [MeV/mm]
Mass Density = 1.34 Grams/cm^3 Multiply by 66.56 for Units: [eV/(10^{15} Atoms/cm^2)]



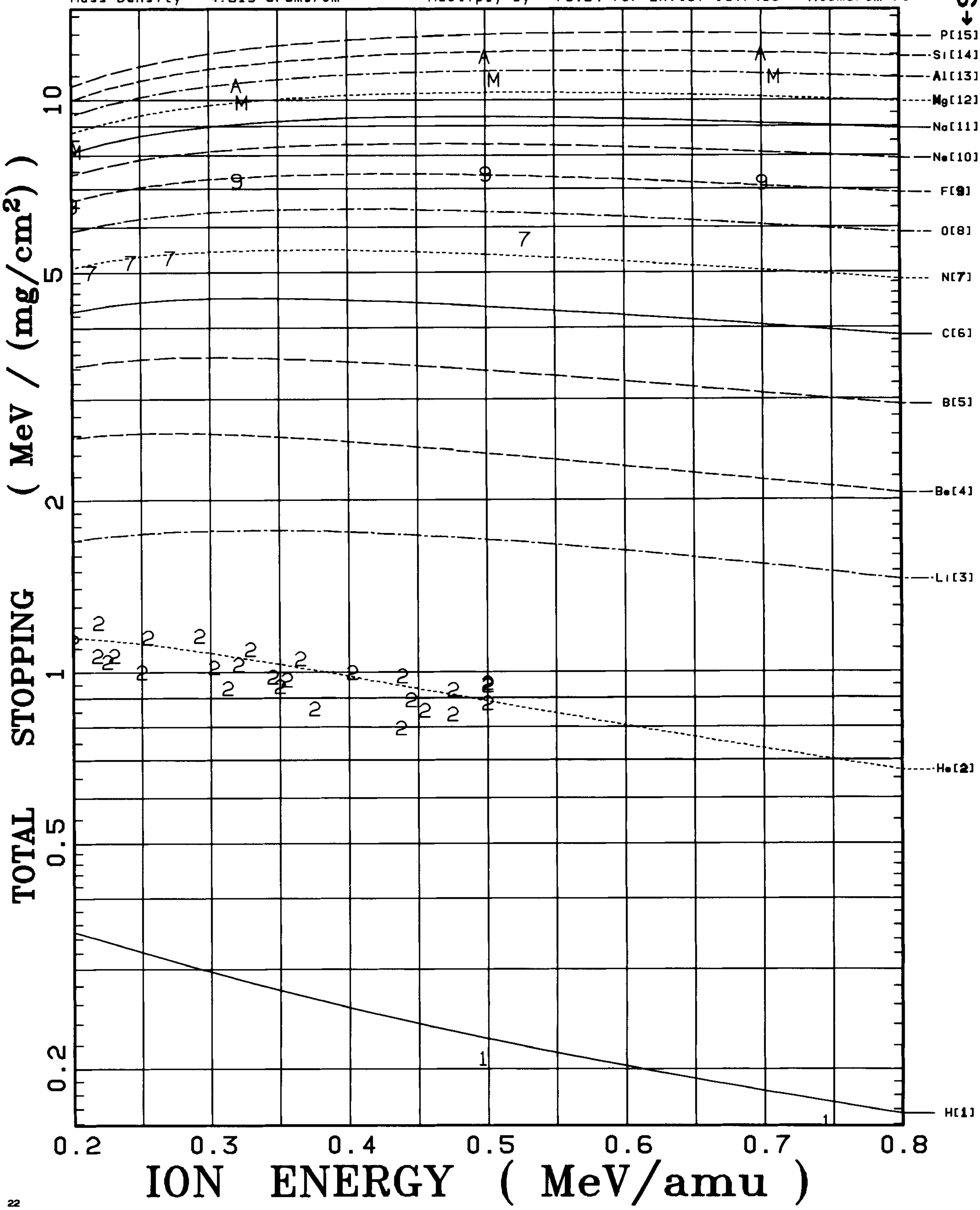
Ca(20) ←←← TARGET →→→ Ca(20)

Atom Density = 2.014×10^{22} Atoms/cm^3 Multiply Total Stopping by 134 for Units: [MeV/mm]
Mass Density = 1.34 Grams/cm^3 Multiply by 66.56 for Units: [eV/(10^{15} Atoms/cm^2)]



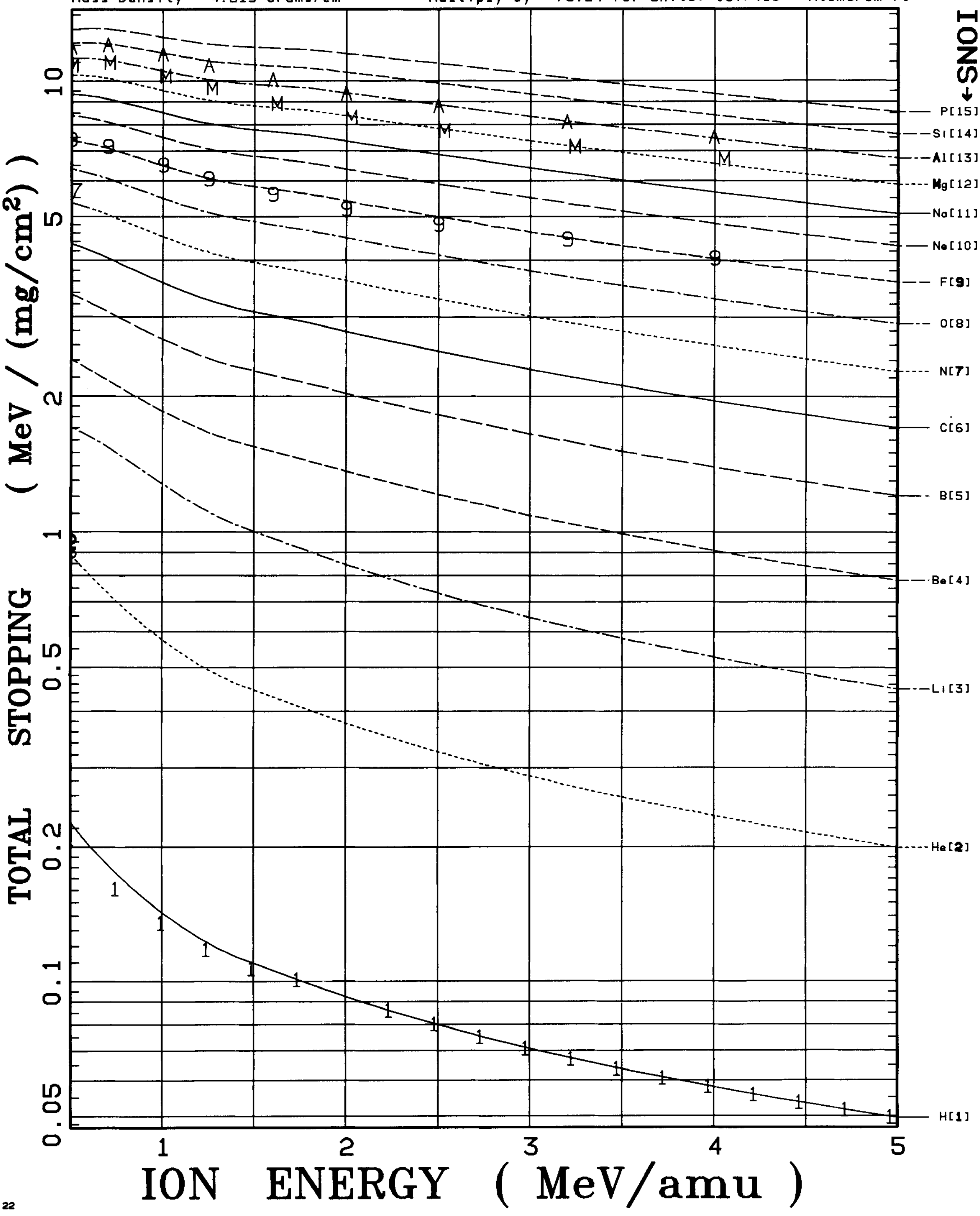
Ti(22) ←←← TARGET →→→ Ti(22)

Atom Density = 5.682×10²² Atoms/cm³ Multiply Total Stopping by 451.9 for Units: [MeV/mm]
Mass Density = 4.519 Grams/cm³ Multiply by 79.54 for Units: [eV/(10¹⁵ Atoms/cm²)]



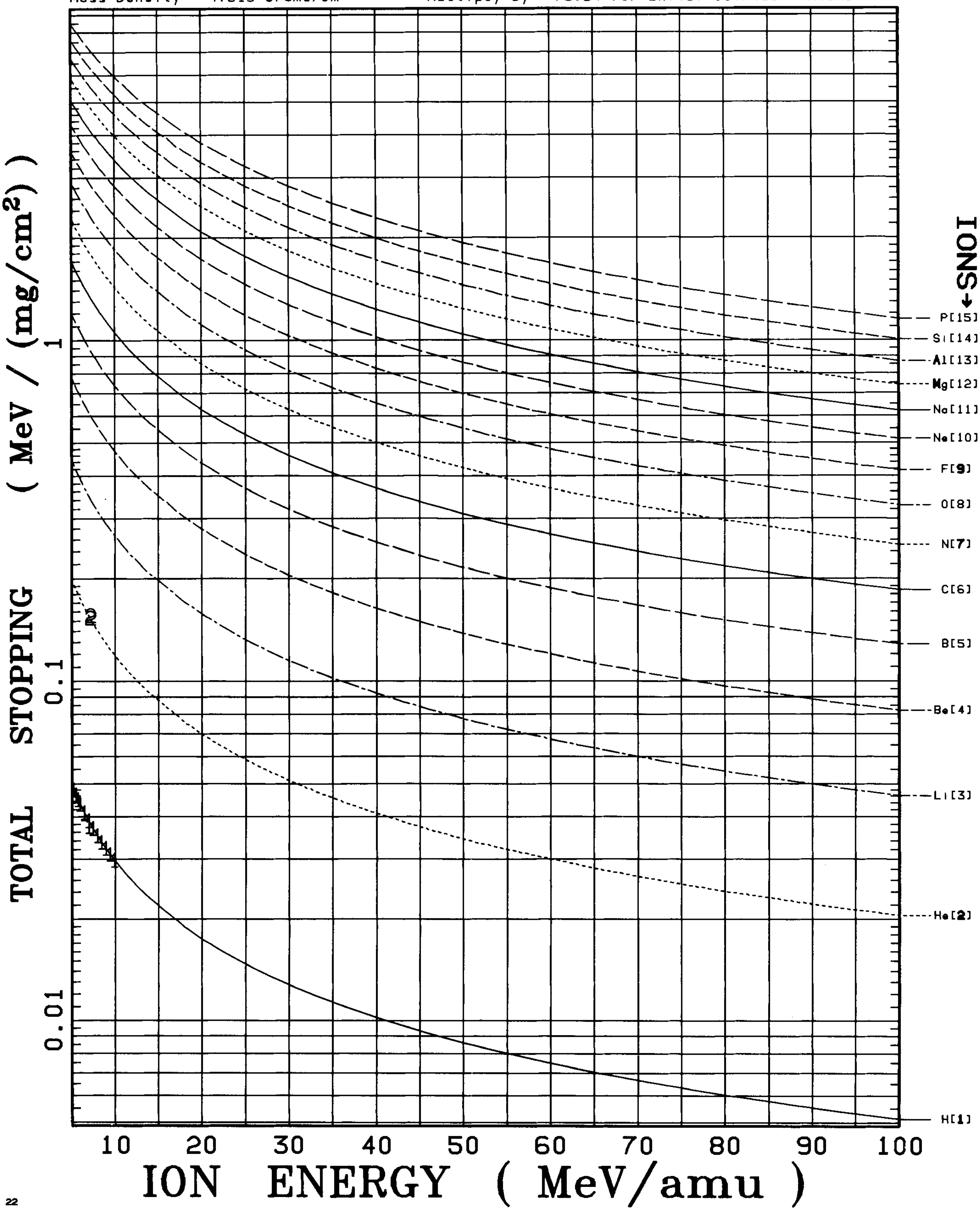
Ti(22) ←←← TARGET →→→ Ti(22)

Atom Density = 5.682×10[22] Atoms/cm[3] Multiply Total Stopping by 451.9 for Units: [MeV/mm]
Mass Density = 4.519 Grams/cm[3] Multiply by 79.54 for Units: [eV/(10[15] Atoms/cm[2])]



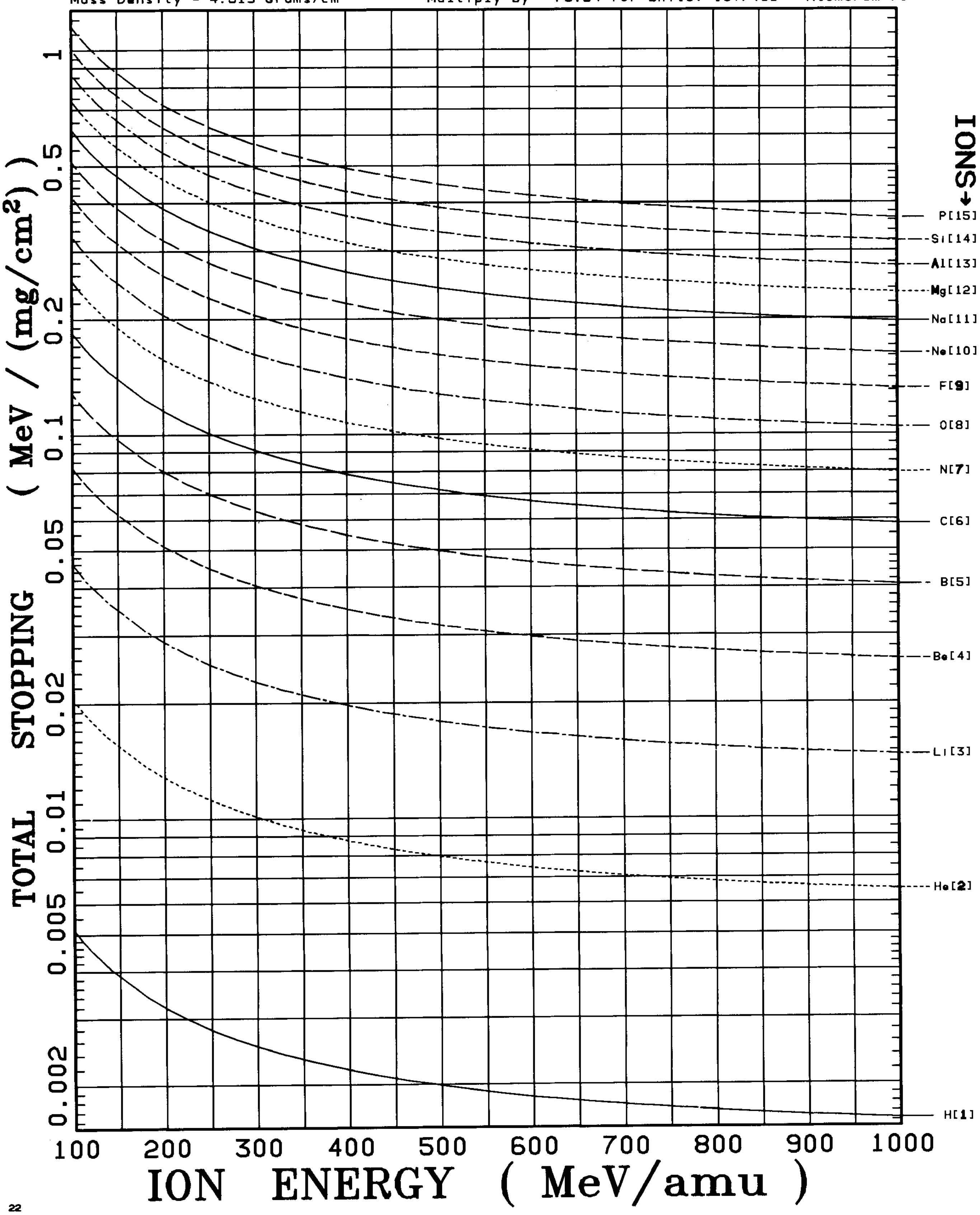
Ti(22) ←←← TARGET →→→ Ti(22)

Atom Density = 5.682×10^{22} Atoms/cm^3 Multiply Total Stopping by 451.9 for Units: [MeV/mm]
Mass Density = 4.519 Grams/cm^3 Multiply by 79.54 for Units: [eV/(10^{15} Atoms/cm^2)]



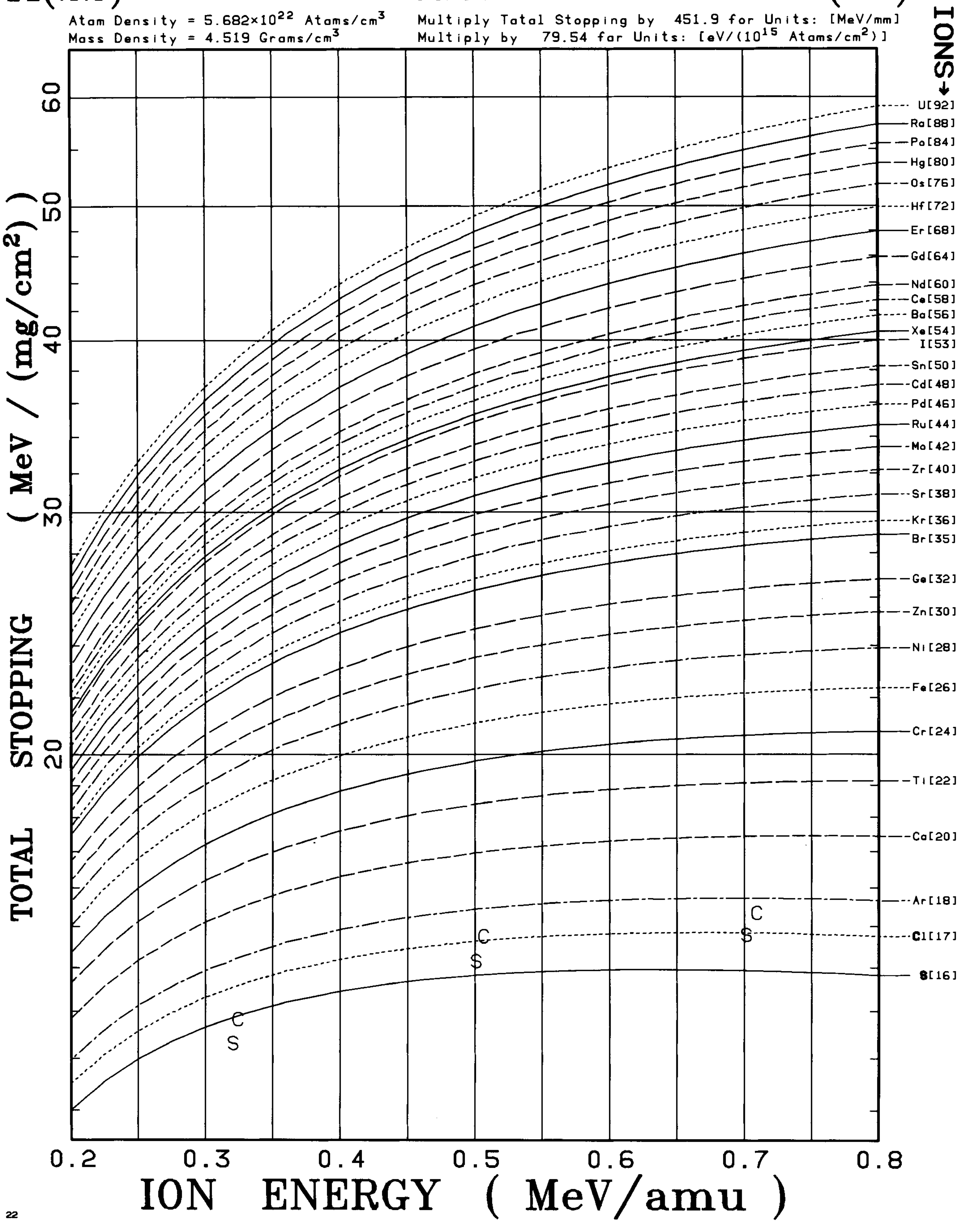
Ti(22) ←←← TARGET →→→ Ti(22)

Atom Density = 5.682×10^{22} Atoms/cm^3 Multiply Total Stopping by 451.9 for Units: [MeV/mm]
Mass Density = 4.519 Grams/cm^3 Multiply by 79.54 for Units: [eV/(10^{15} Atoms/cm^2)]



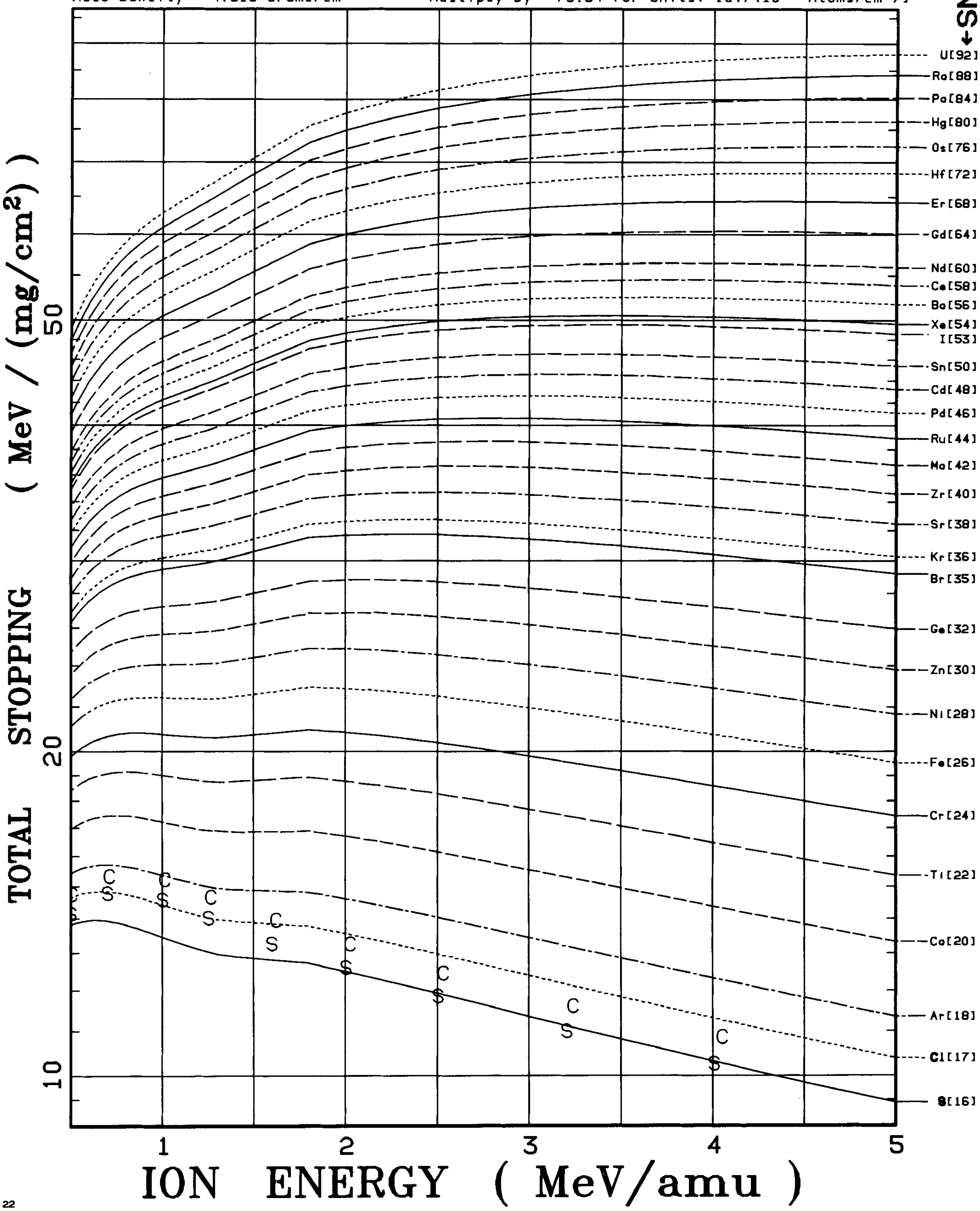
Ti(22) ←←← TARGET →→→ Ti(22)

Atom Density = 5.682×10^{22} Atoms/cm^3 Multiply Total Stopping by 451.9 for Units: [MeV/mm]
Mass Density = 4.519 Grams/cm^3 Multiply by 79.54 for Units: [eV/(10^{15} Atoms/cm^2)]



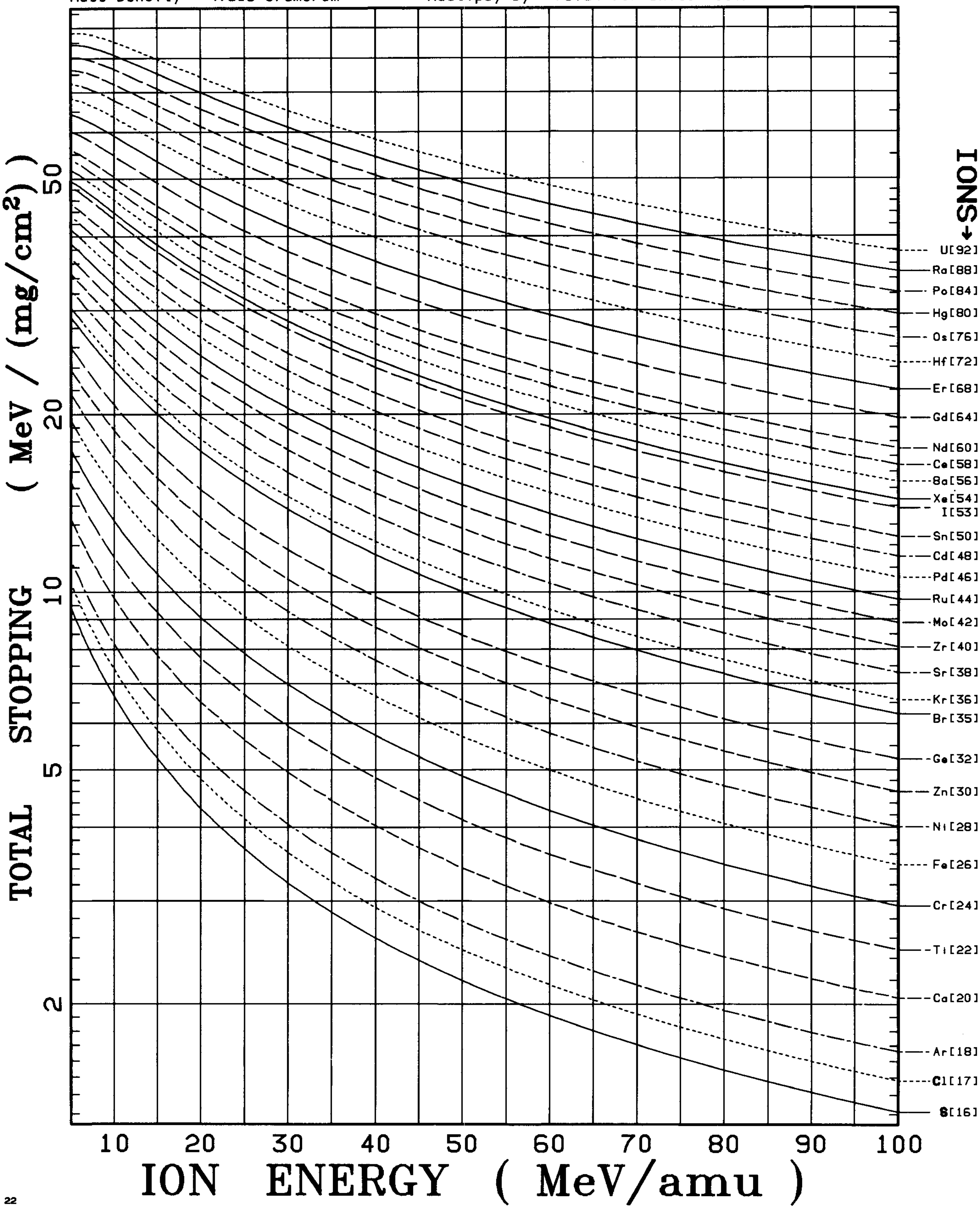
Ti(22) ←←← TARGET →→→ Ti(22)

Atom Density = 5.682×10^{22} Atoms/cm^3 Multiply Total Stopping by 451.9 for Units: [MeV/mm]
Mass Density = 4.519 Grams/cm^3 Multiply by 79.54 for Units: [eV/(10^{15} Atoms/cm^2)]



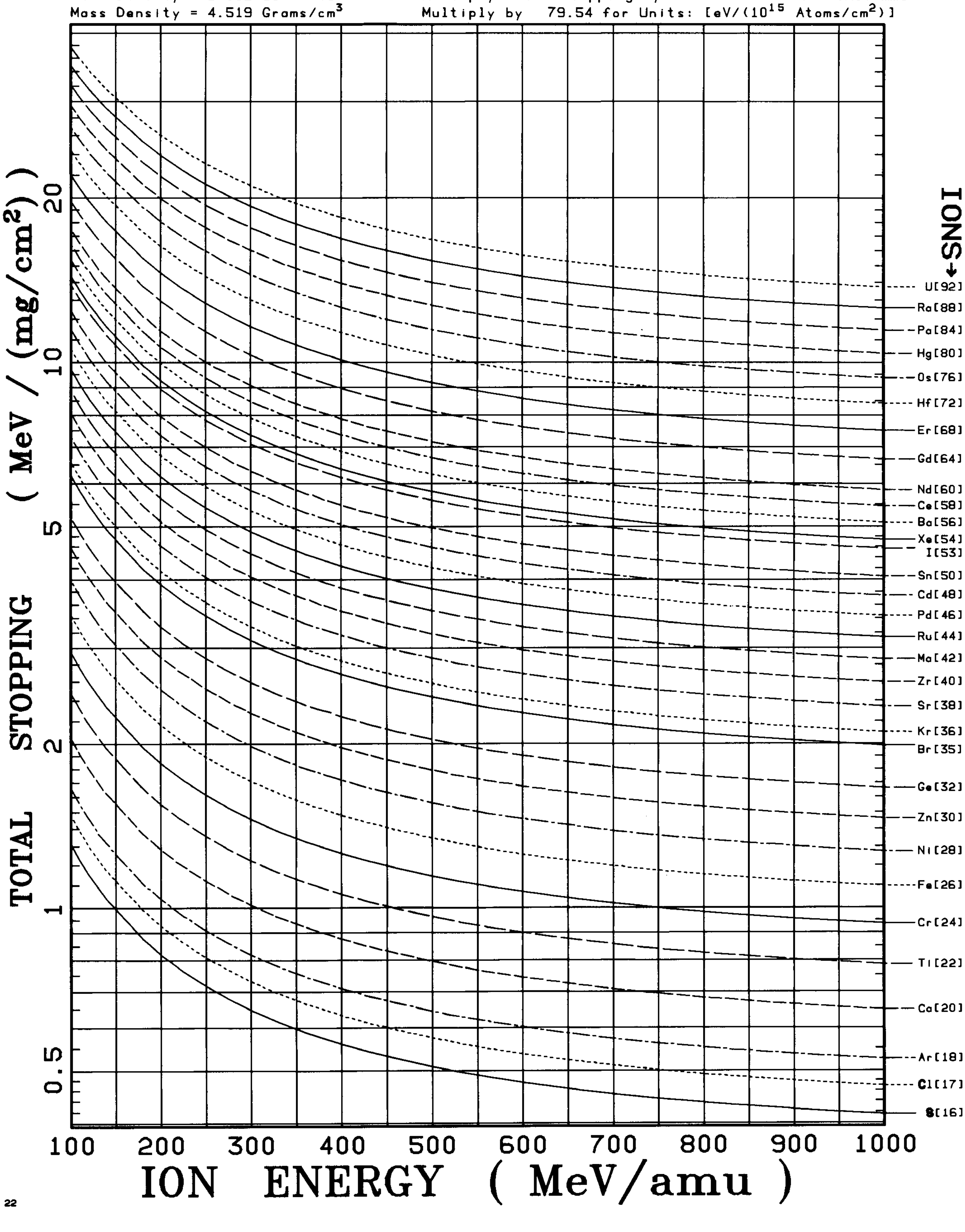
Ti(22) ←←← TARGET →→→ Ti(22)

Atom Density = 5.682×10^{22} Atoms/cm^3 Multiply Total Stopping by 451.9 for Units: [MeV/mm]
Mass Density = 4.519 Grams/cm^3 Multiply by 79.54 for Units: [eV/(10^{15} Atoms/cm^2)]



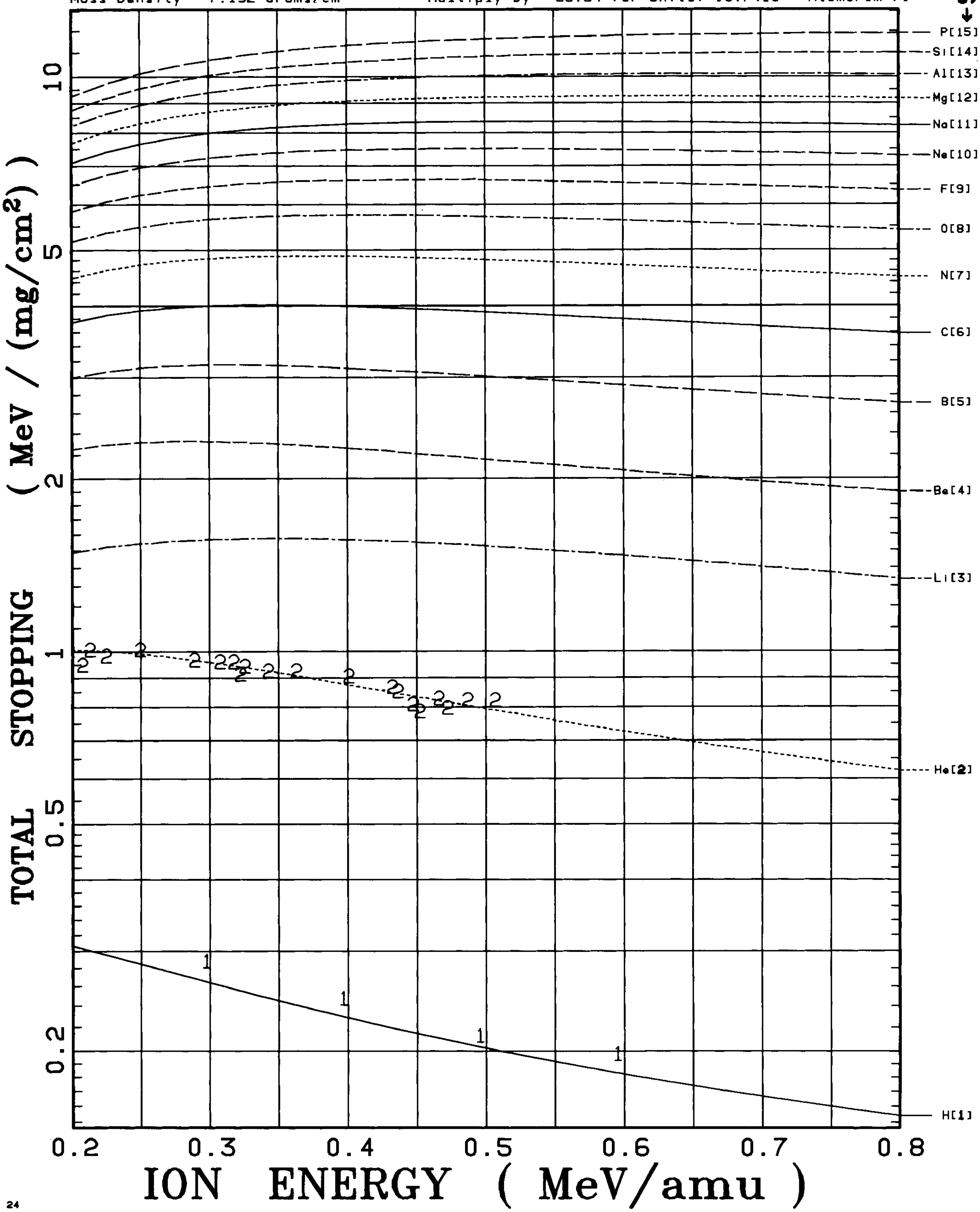
Ti(22) ←←← TARGET →→→ Ti(22)

Atom Density = 5.682×10^{22} Atoms/cm^3 Multiply Total Stopping by 451.9 for Units: [MeV/mm]
Mass Density = 4.519 Grams/cm^3 Multiply by 79.54 for Units: [eV/(10^{15} Atoms/cm^2)]



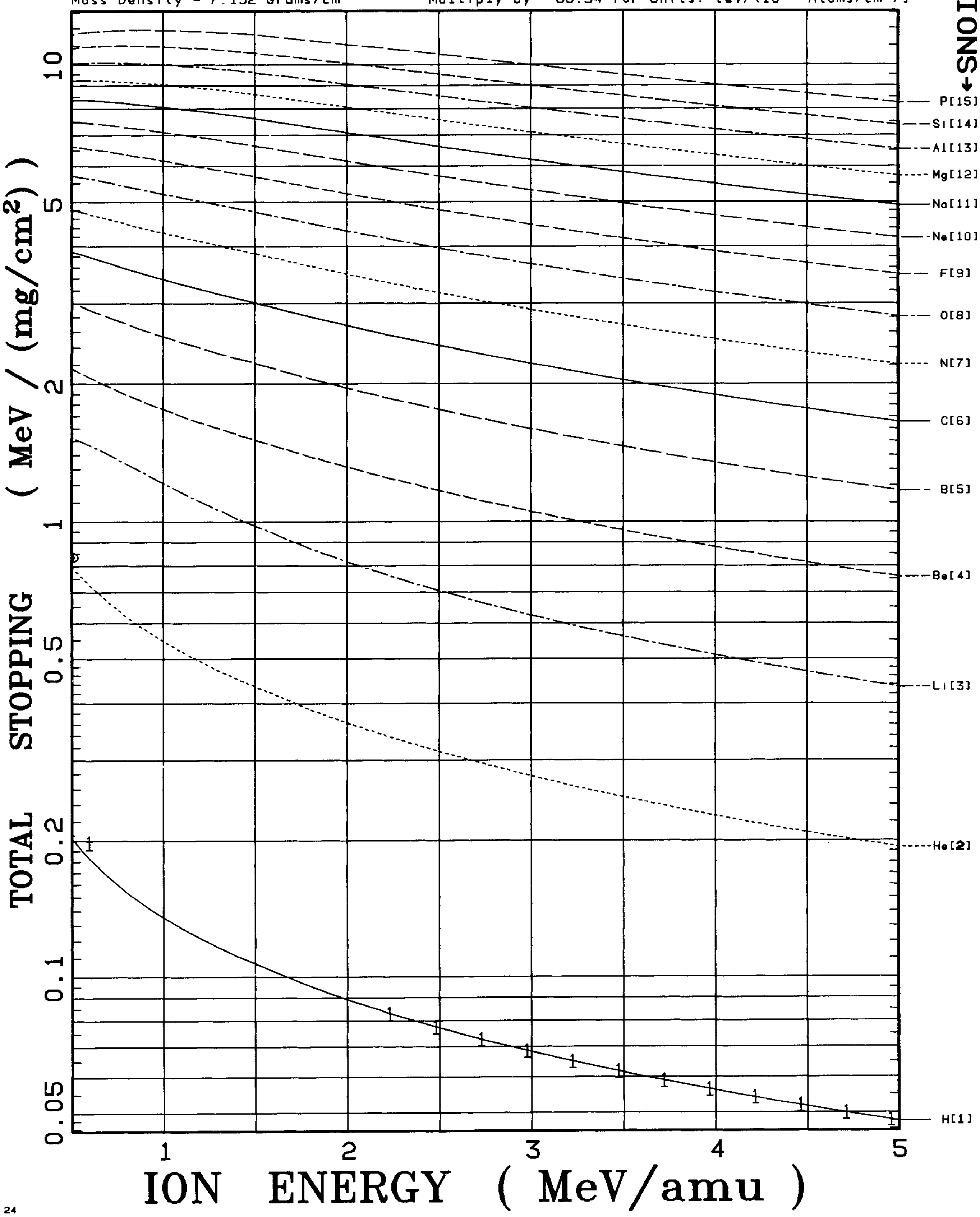
Cr(24) ←←← TARGET →→→ Cr(24)

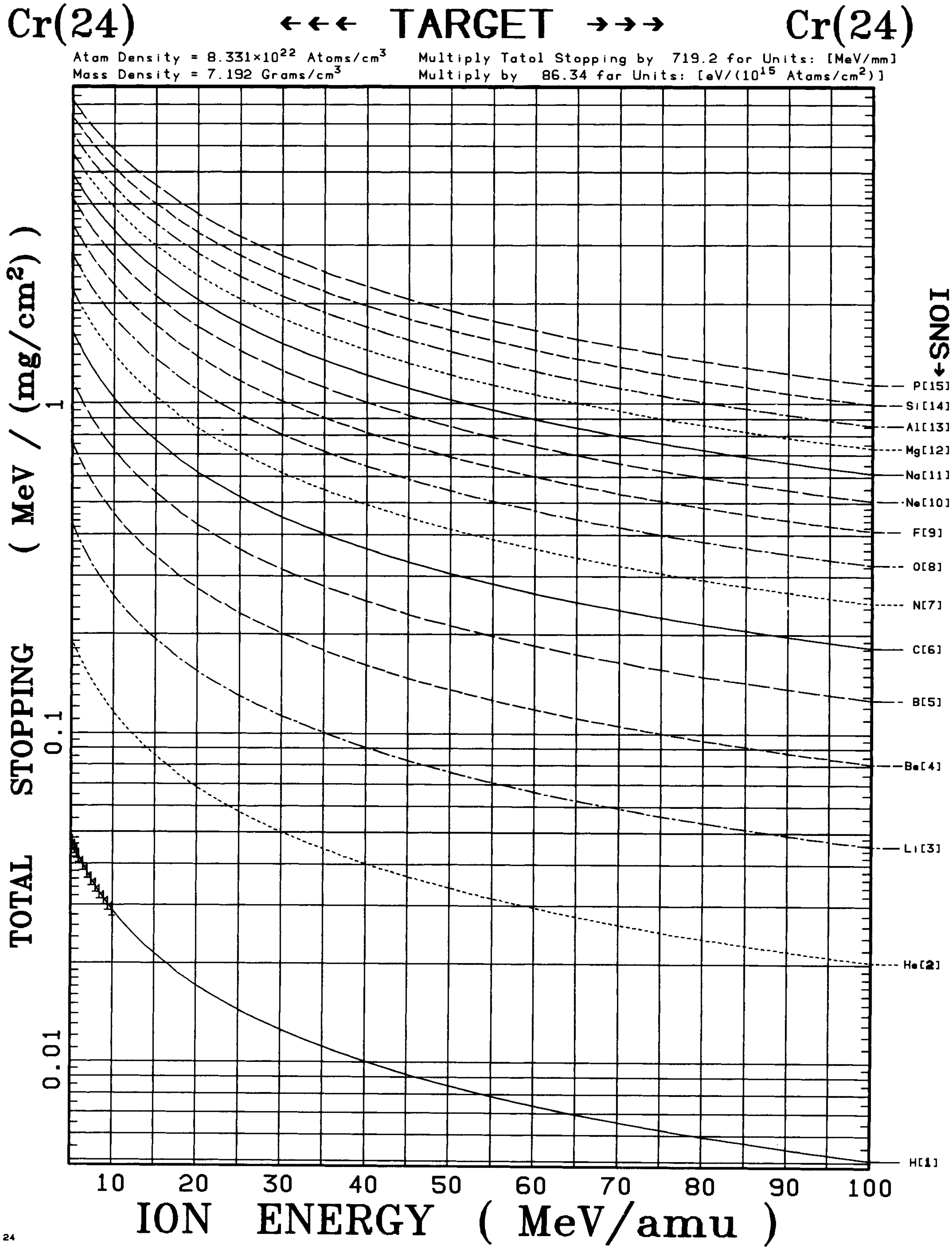
Atom Density = 8.331×10^{22} Atoms/cm^3 Multiply Total Stopping by 719.2 for Units: [MeV/mm]
Mass Density = 7.192 Grams/cm^3 Multiply by 86.34 for Units: [eV/(10^{15} Atoms/cm^2)]



Cr(24) ←←← TARGET →→→ Cr(24)

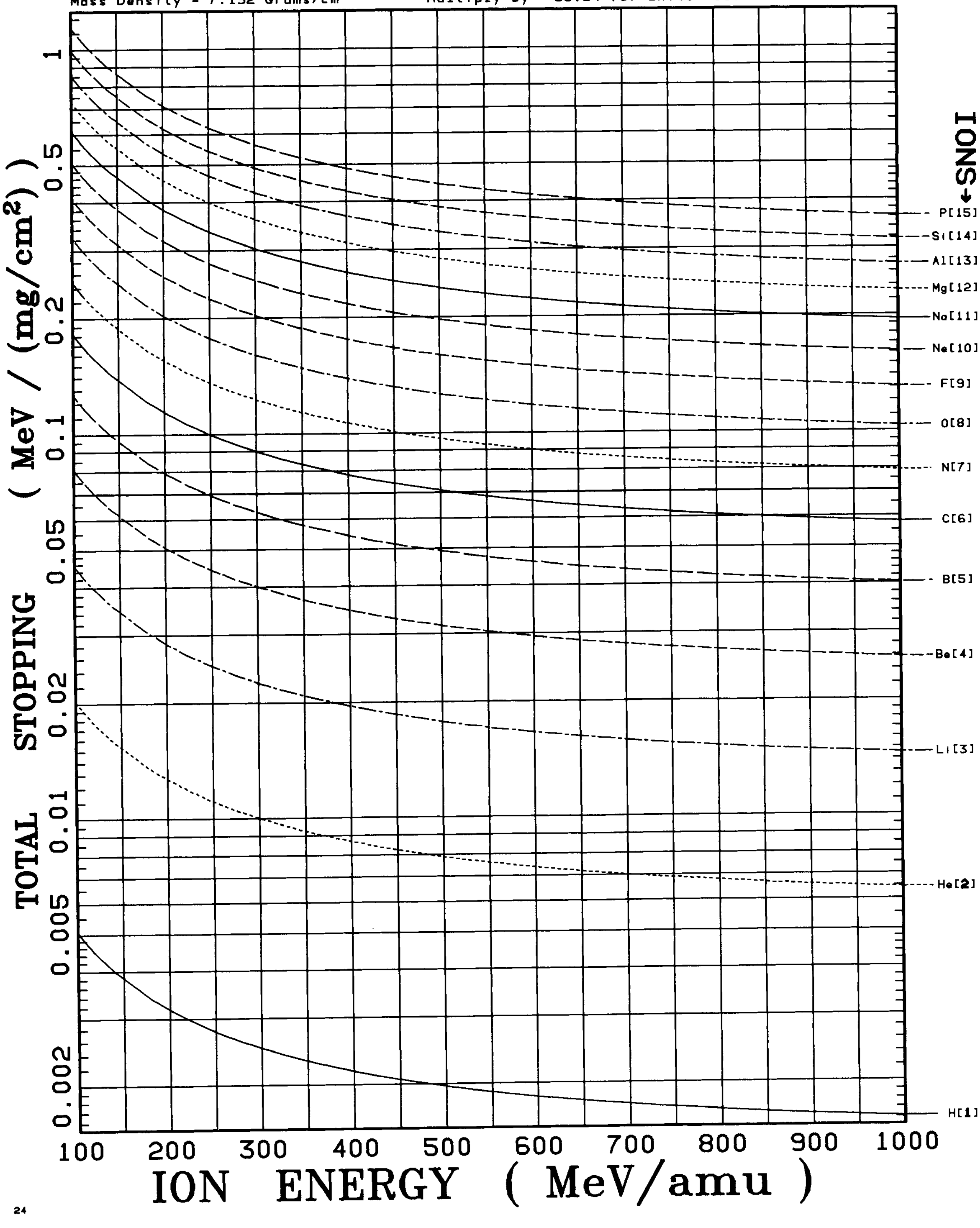
Atom Density = 8.331×10^{22} Atoms/cm^3 Multiply Total Stopping by 719.2 for Units: [MeV/mm]
Mass Density = 7.192 Grams/cm^3 Multiply by 86.34 for Units: [eV/(10^{15} Atoms/cm^2)]

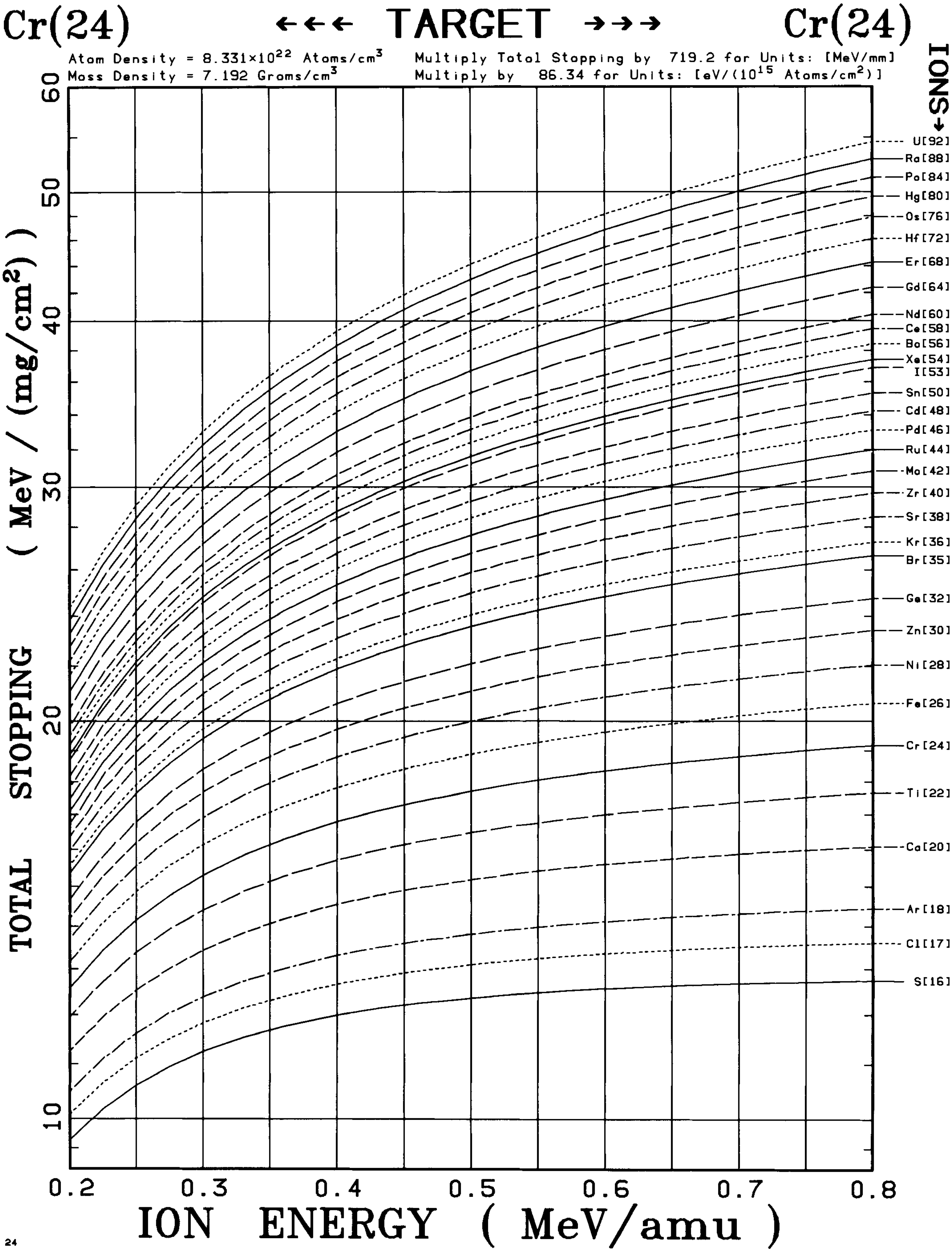



Cr(24) ←←← TARGET →→→ Cr(24)
Atom Density = 8.331×10^22 Atoms/cm^3
Mass Density = 7.192 Grams/cm^3
Multiply Total Stopping by 719.2 for Units: [MeV/mm]
Multiply by 86.34 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
1
0.1
0.01
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
10
20
30
40
50
60
70
80
90
100
ION ENERGY (MeV/amu)

Cr(24) ←←← TARGET →→→ Cr(24)

Atom Density = 8.331×10^{22} Atoms/cm^3 Multiply Total Stopping by 719.2 for Units: [MeV/mm]
Mass Density = 7.192 Grams/cm^3 Multiply by 86.34 for Units: [eV/(10^{15} Atoms/cm^2)]



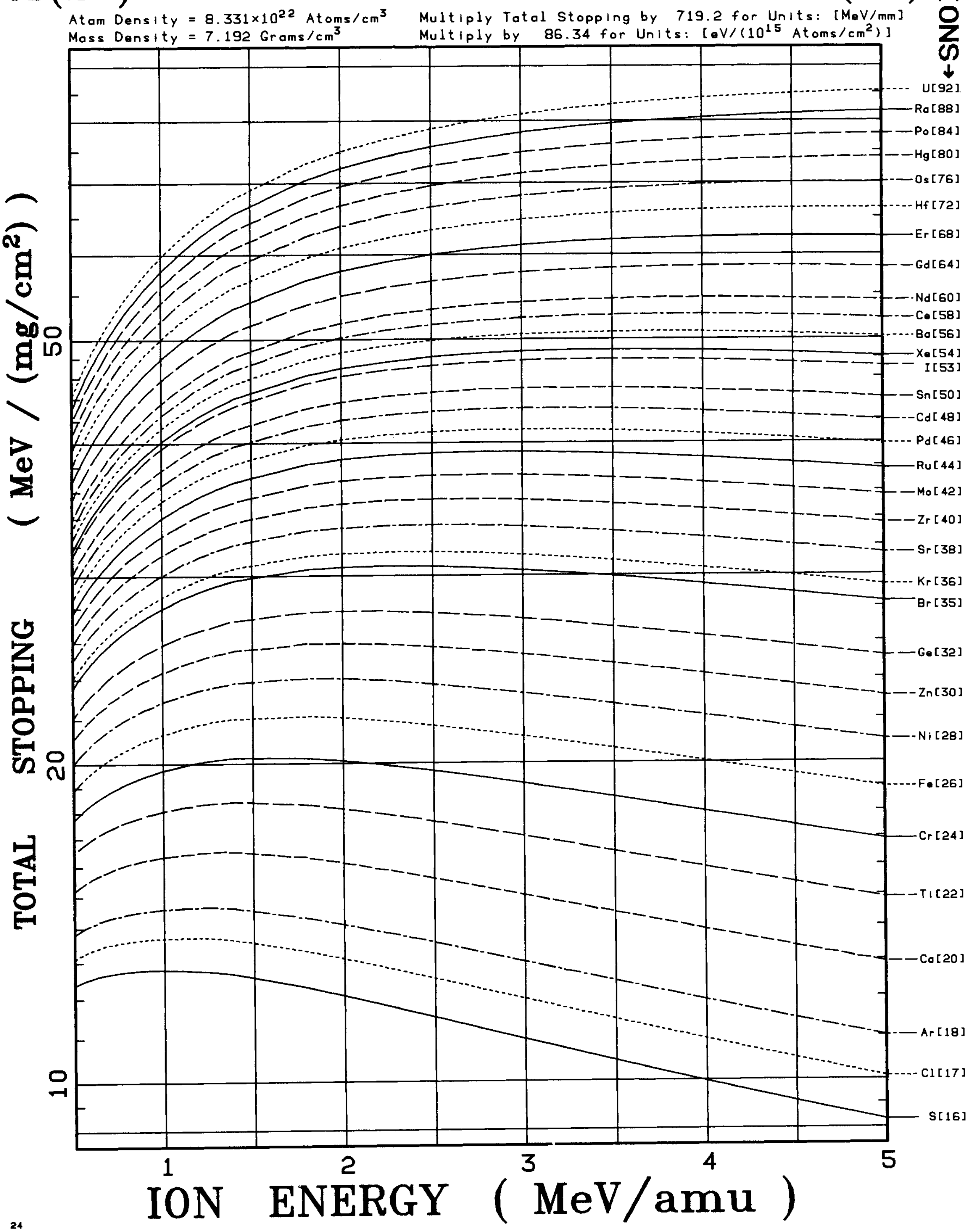


Cr(24)
←←← TARGET →→→
Cr(24)
Atom Density = 8.331×10²² Atoms/cm³
Mass Density = 7.192 Grams/cm³
Multiply Total Stopping by 719.2 for Units: [MeV/mm]
Multiply by 86.34 for Units: [eV/(10¹⁵ Atoms/cm²)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm²))
60
50
40
30
20
10
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

Cr(24) ←←← TARGET →→→ Cr(24)

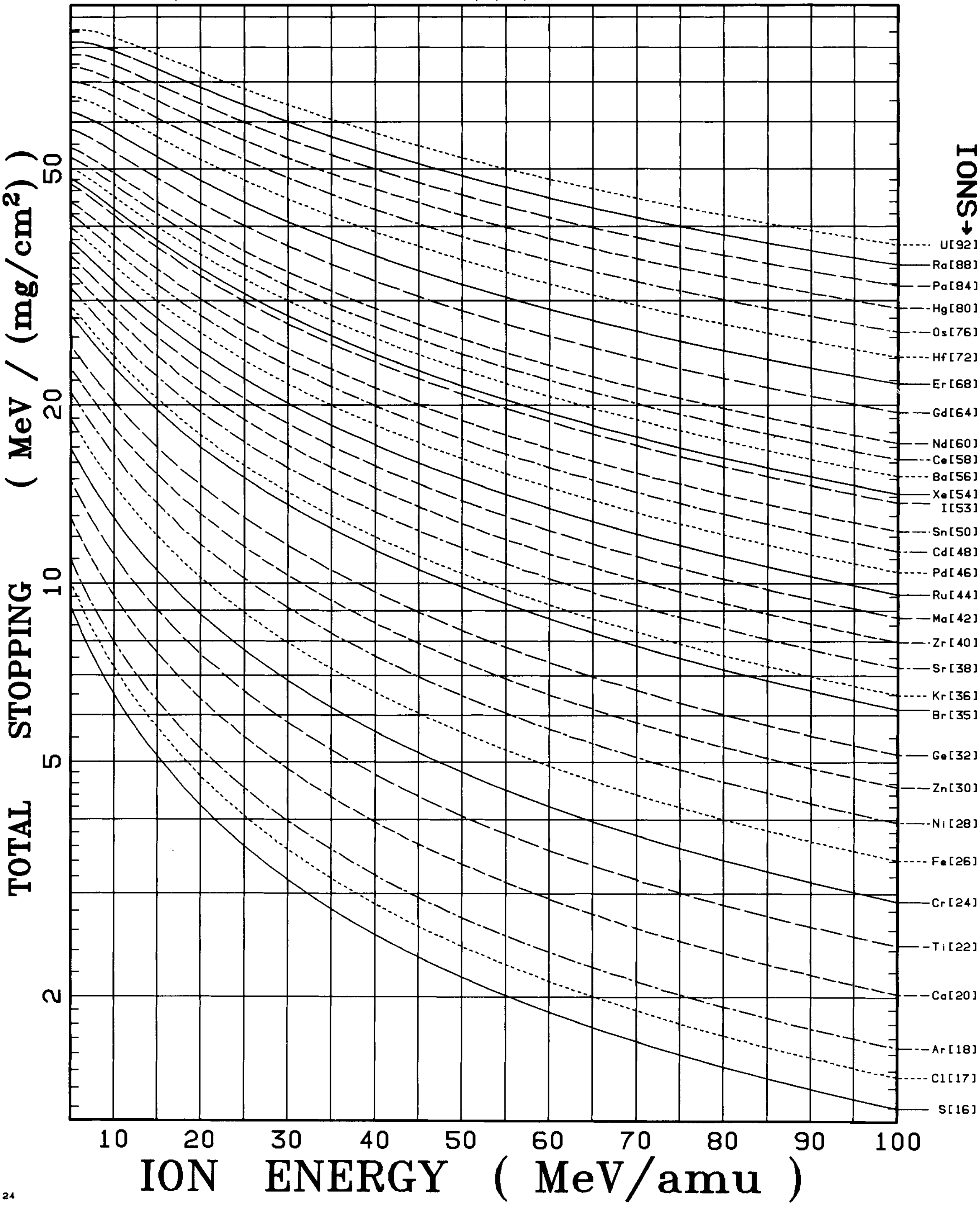
Atom Density = 8.331×10^{22} Atoms/cm^3 Multiply Total Stopping by 719.2 for Units: [MeV/mm]

Mass Density = 7.192 Grams/cm^3 Multiply by 86.34 for Units: [eV/(10^{15} Atoms/cm^2)]



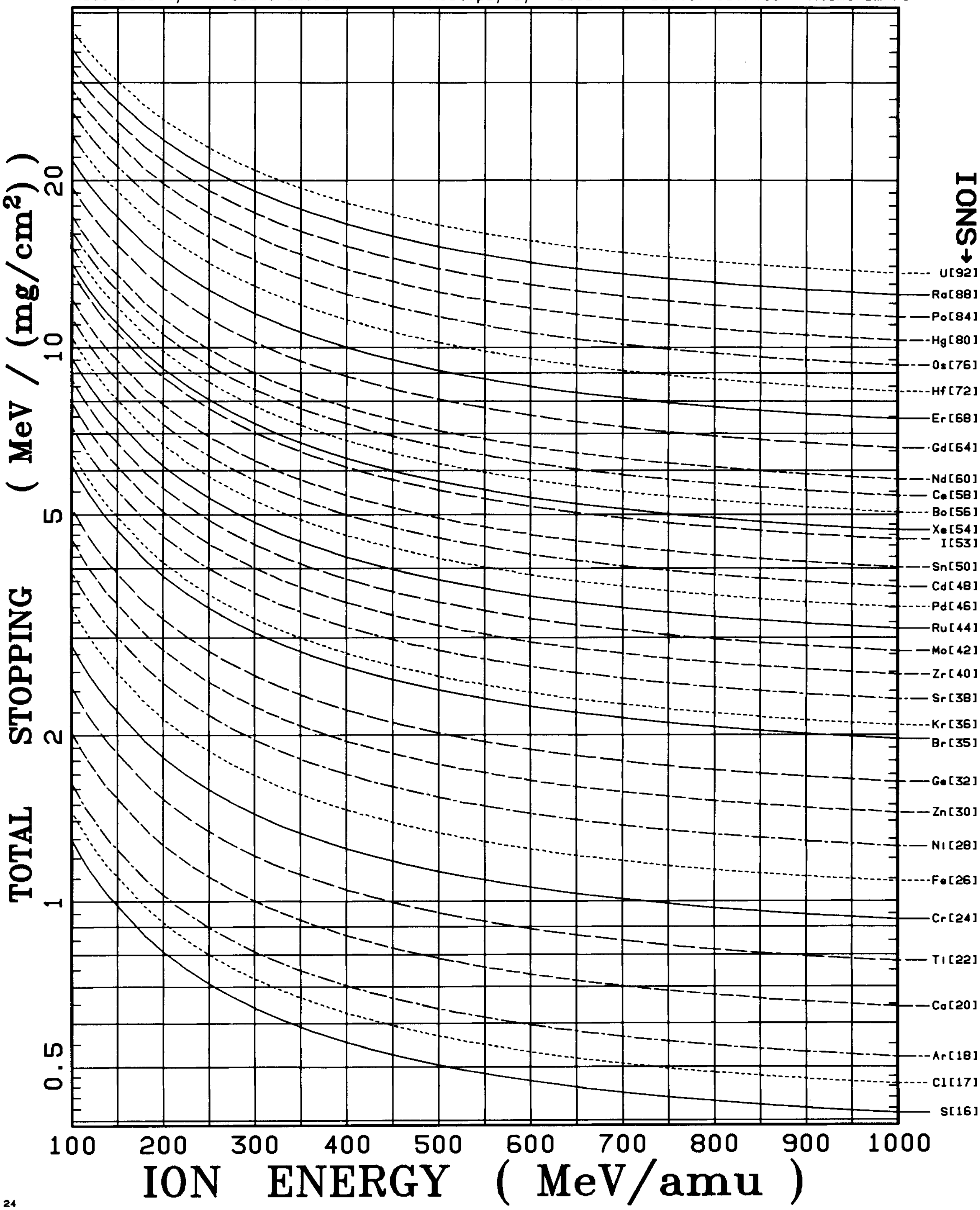
Cr(24) ←←← TARGET →→→ Cr(24)

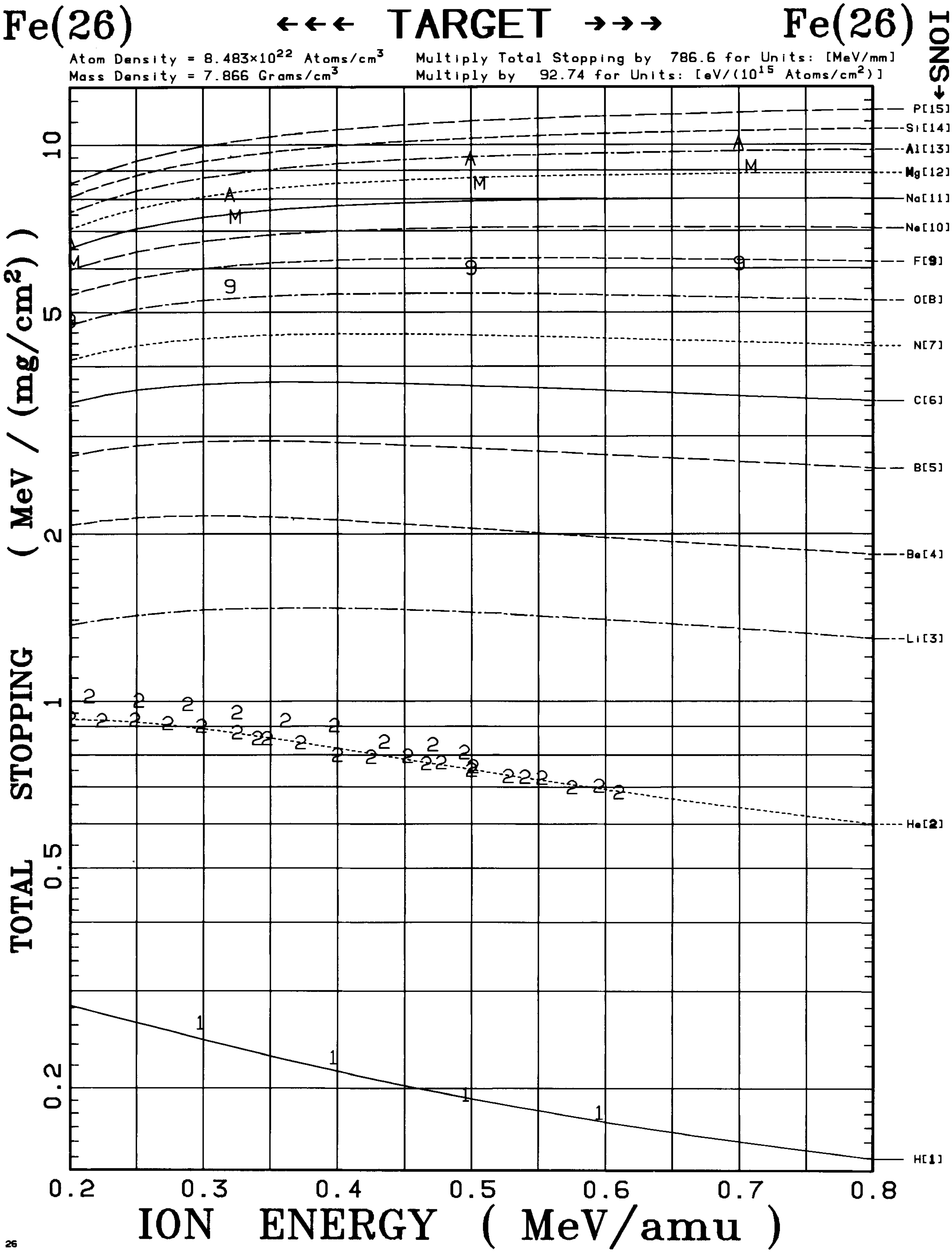
Atom Density = 8.331×10^{22} Atoms/cm^3 Multiply Total Stopping by 719.2 for Units: [MeV/mm]
Mass Density = 7.192 Grams/cm^3 Multiply by 86.34 for Units: [eV/(10^{15} Atoms/cm^2)]



Cr(24) ←←← TARGET →→→ Cr(24)

Atom Density = 8.331×10^{22} Atoms/cm^3 Multiply Total Stopping by 719.2 for Units: [MeV/mm]
Mass Density = 7.192 Grams/cm^3 Multiply by 86.34 for Units: [eV/(10^{15} Atoms/cm^2)]

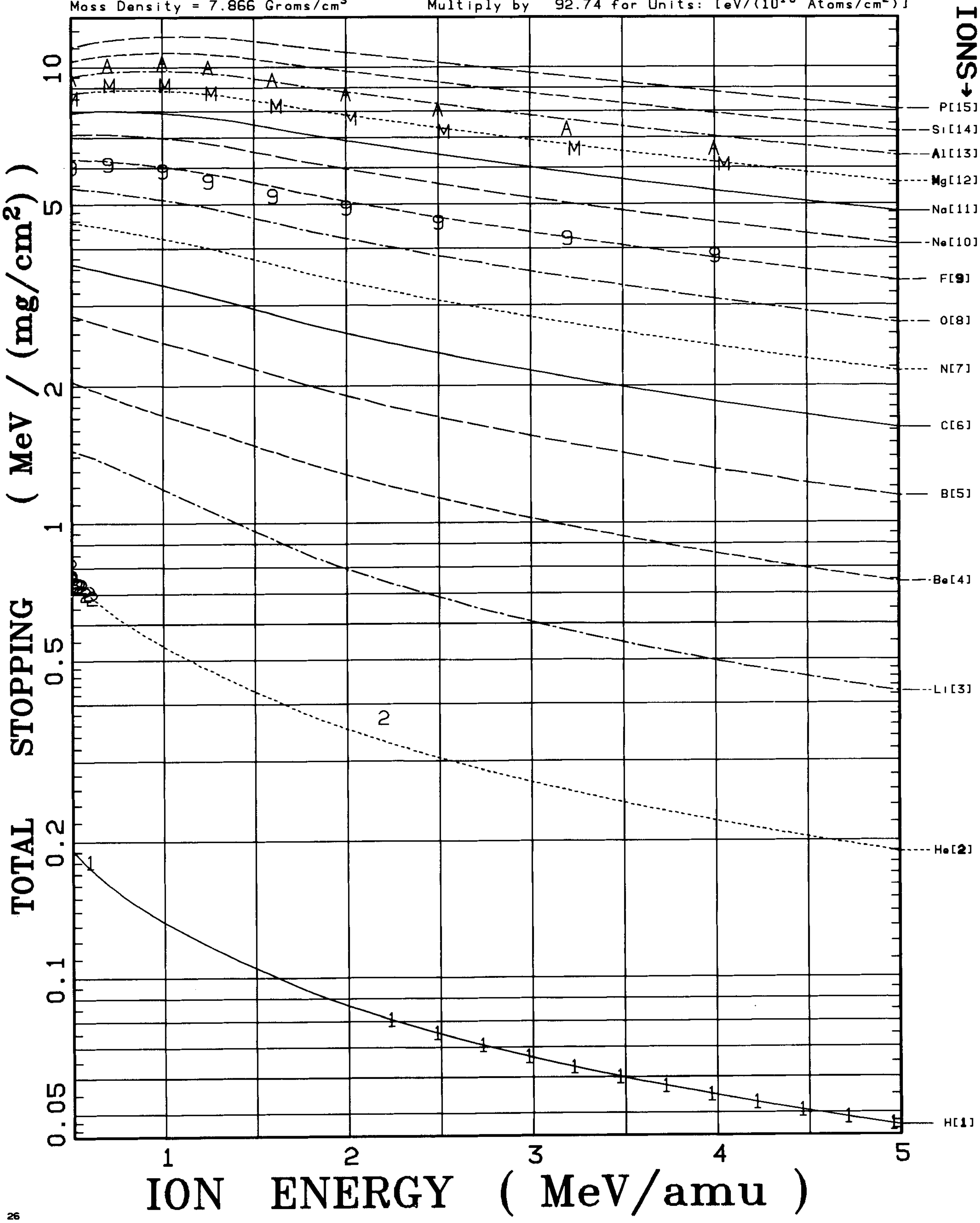




Fe(26)
←←← TARGET →→→
Fe(26)
IONS→
Atom Density = 8.483×10^22 Atoms/cm^3
Mass Density = 7.866 Grams/cm^3
Multiply Total Stopping by 786.6 for Units: [MeV/mm]
Multiply by 92.74 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
10
5
2
1
0.5
0.2
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

Fe(26) ←←← TARGET →→→ Fe(26)

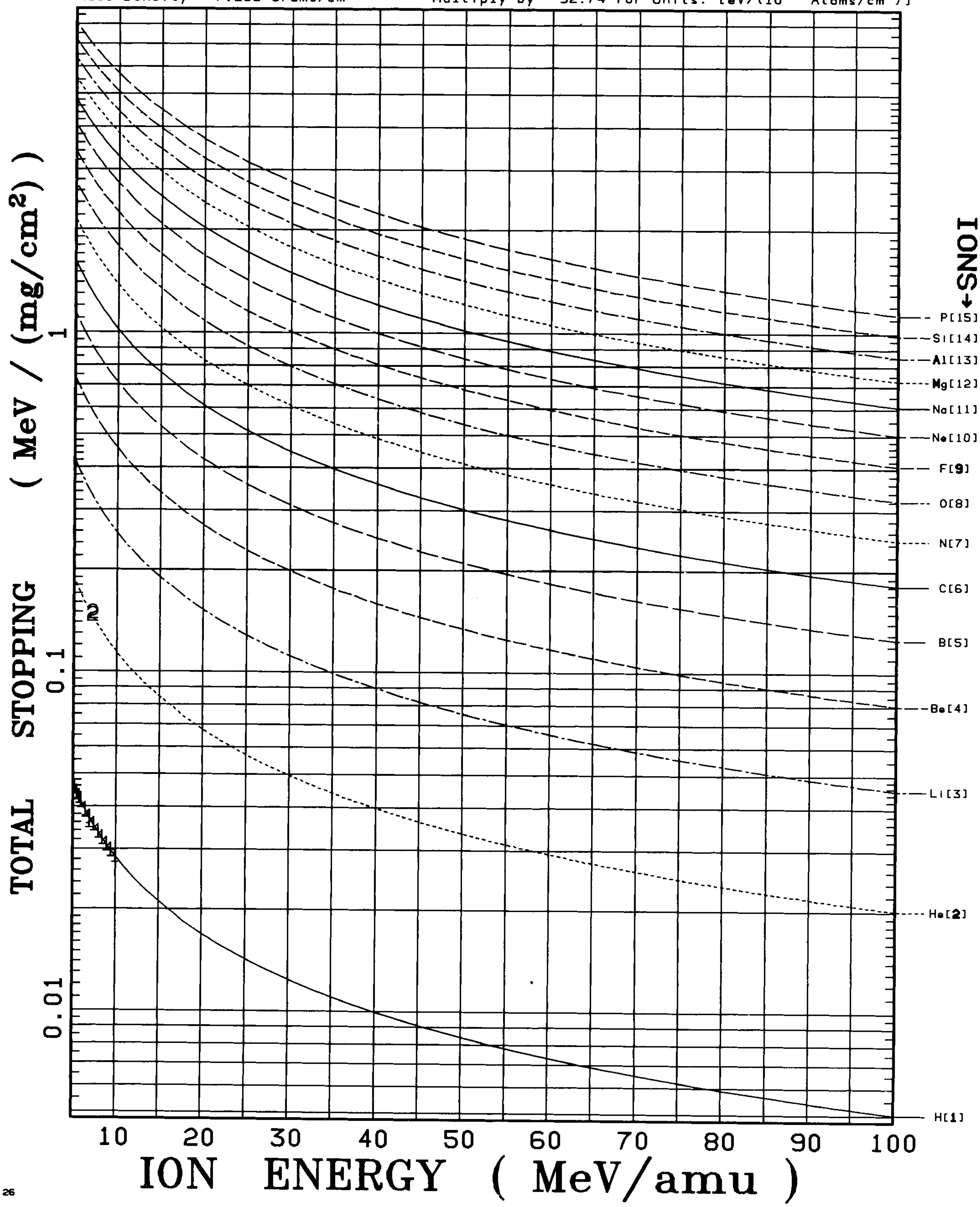
Atom Density = 8.483×10^{22} Atoms/cm^3 Multiply Total Stopping by 786.6 for Units: [MeV/mm]
Mass Density = 7.866 Grams/cm^3 Multiply by 92.74 for Units: [eV/(10^{15} Atoms/cm^2)]



Fe(26) ←←← TARGET →→→ Fe(26)

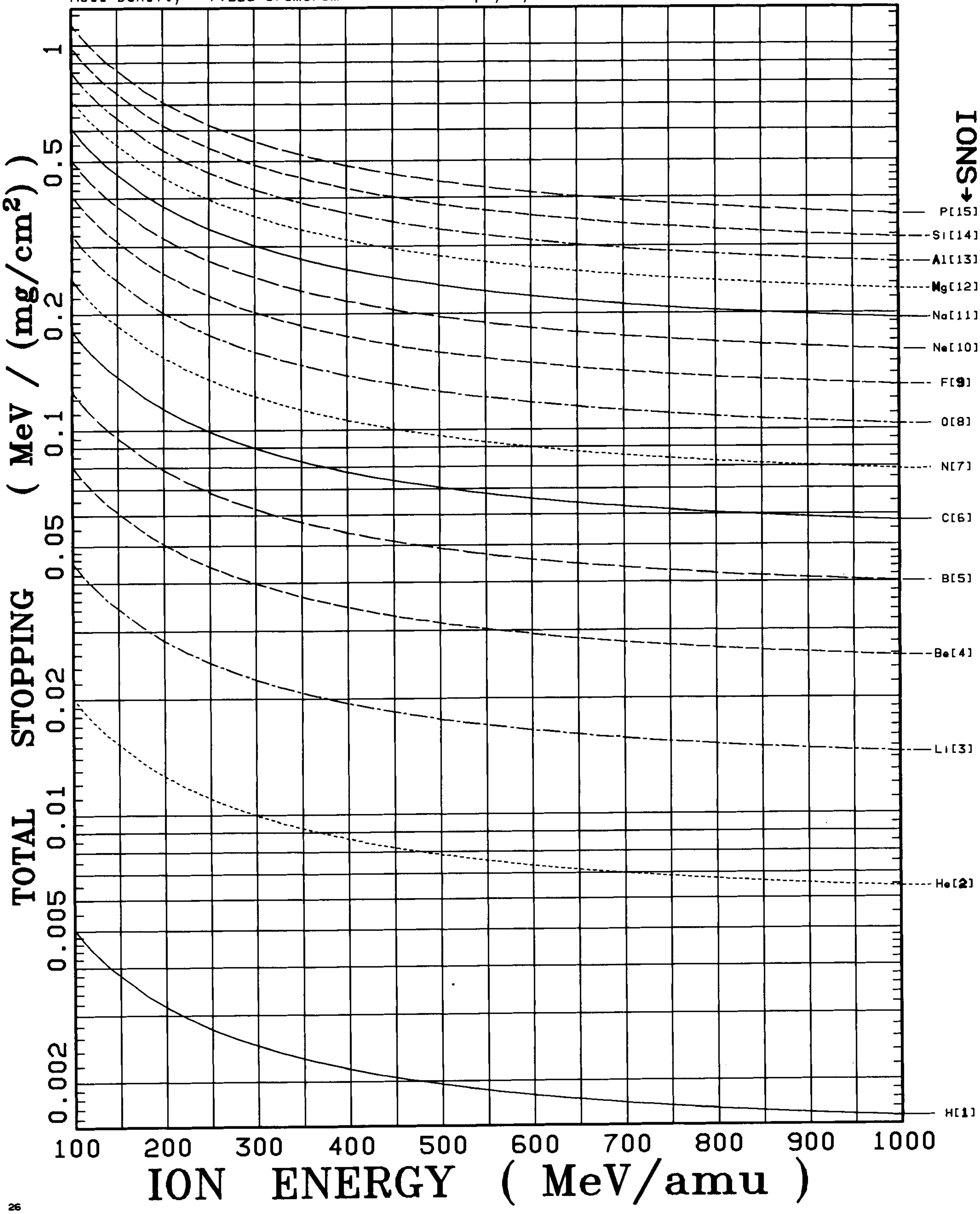
Atom Density = 8.483×10^{22} Atoms/cm^3
Mass Density = 7.866 Grams/cm^3

Multiply Total Stopping by 786.6 for Units: [MeV/mm]
Multiply by 92.74 for Units: [eV/(10^{15} Atoms/cm^2)]



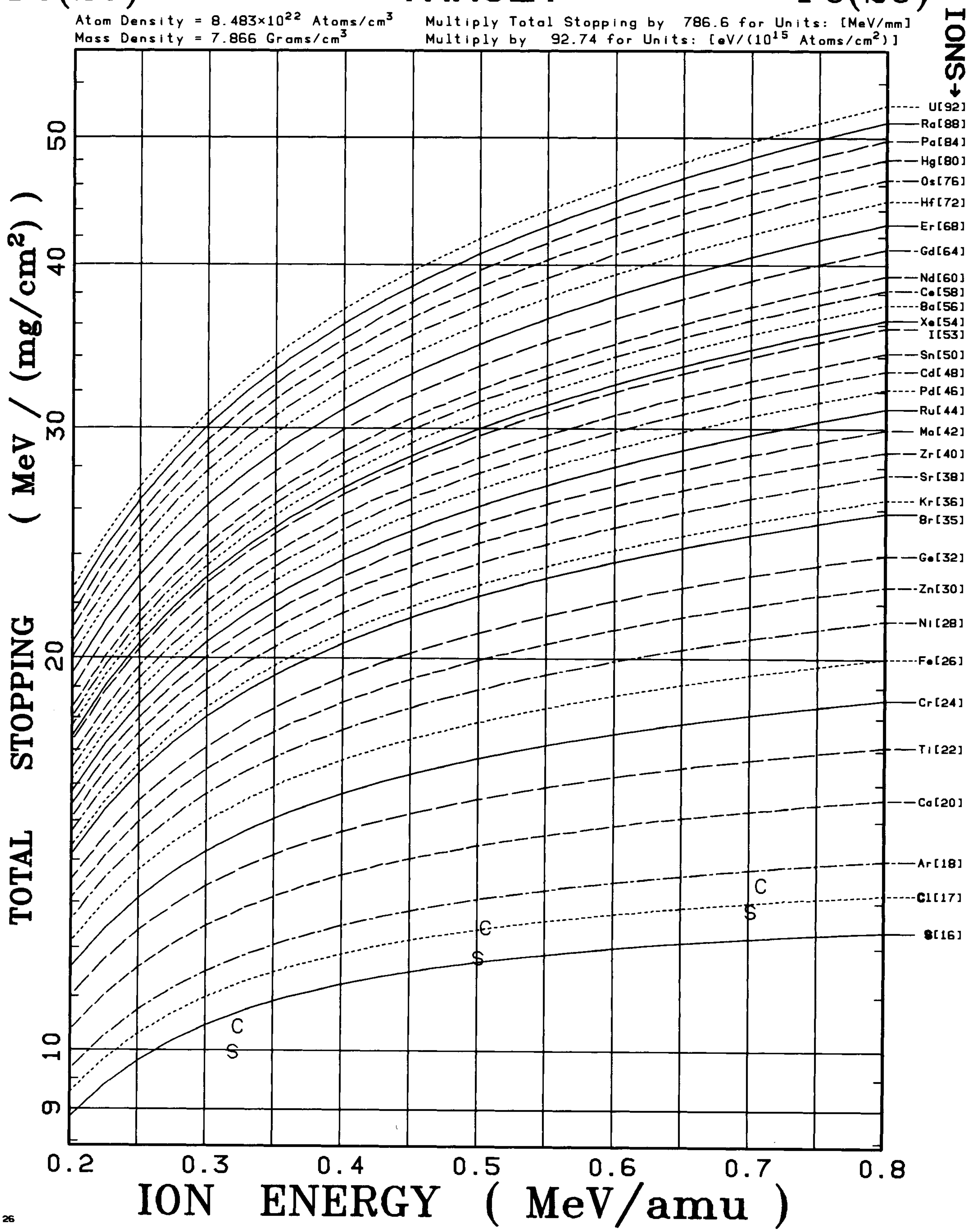
Fe(26) ←←← TARGET →→→ Fe(26)

Atom Density = 8.483×10[22] Atoms/cm[3]   Multiply Total Stopping by 786.6 for Units: [MeV/mm]
Mass Density = 7.866 Grams/cm[3]   Multiply by 92.74 for Units: [eV/(10[15] Atoms/cm[2])]



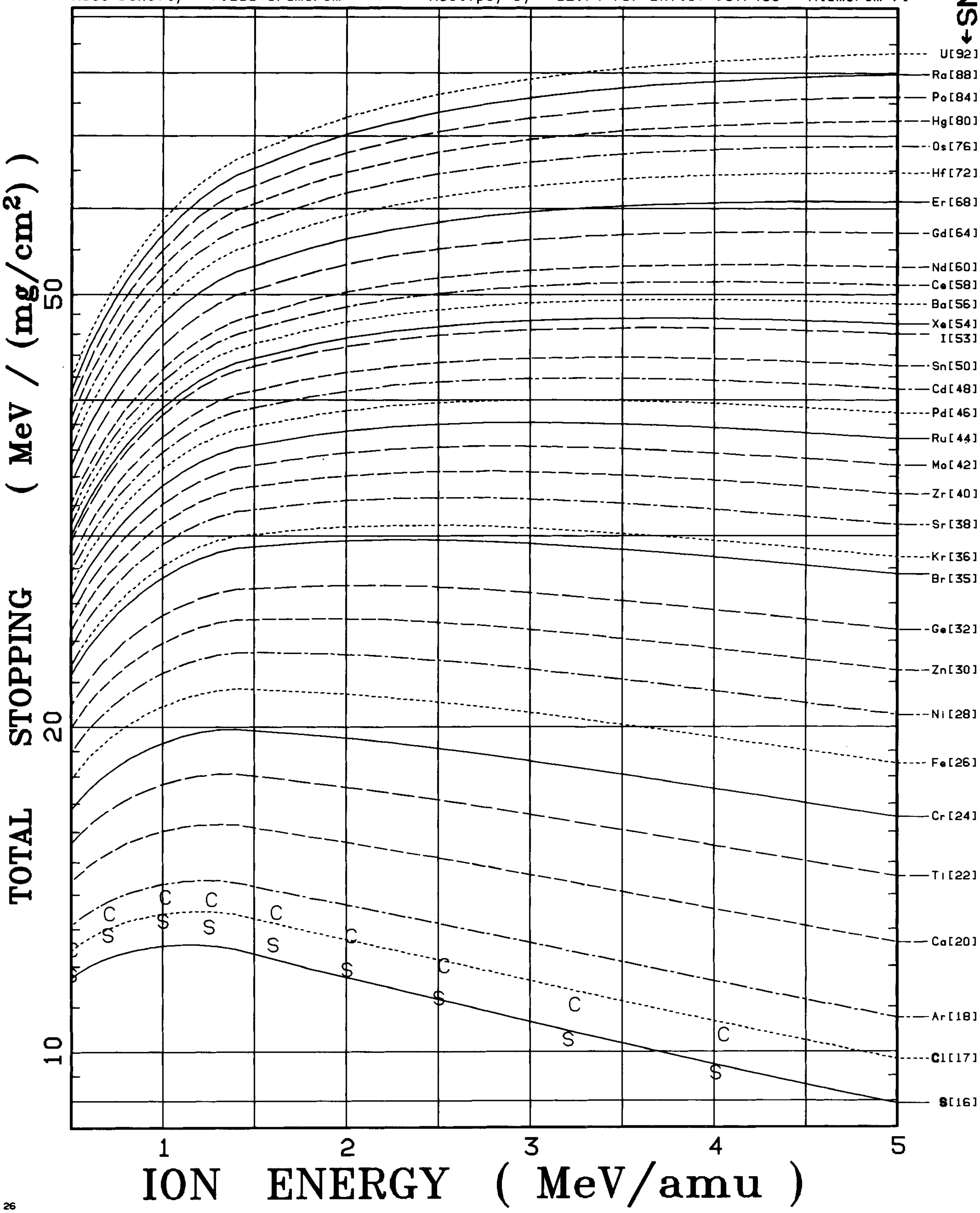
Fe(26) ←←← TARGET →→→ Fe(26)

Atom Density = 8.483×10^{22} Atoms/cm^3
Mass Density = 7.866 Grams/cm^3
Multiply Total Stopping by 786.6 for Units: [MeV/mm]
Multiply by 92.74 for Units: [eV/(10^{15} Atoms/cm^2)]



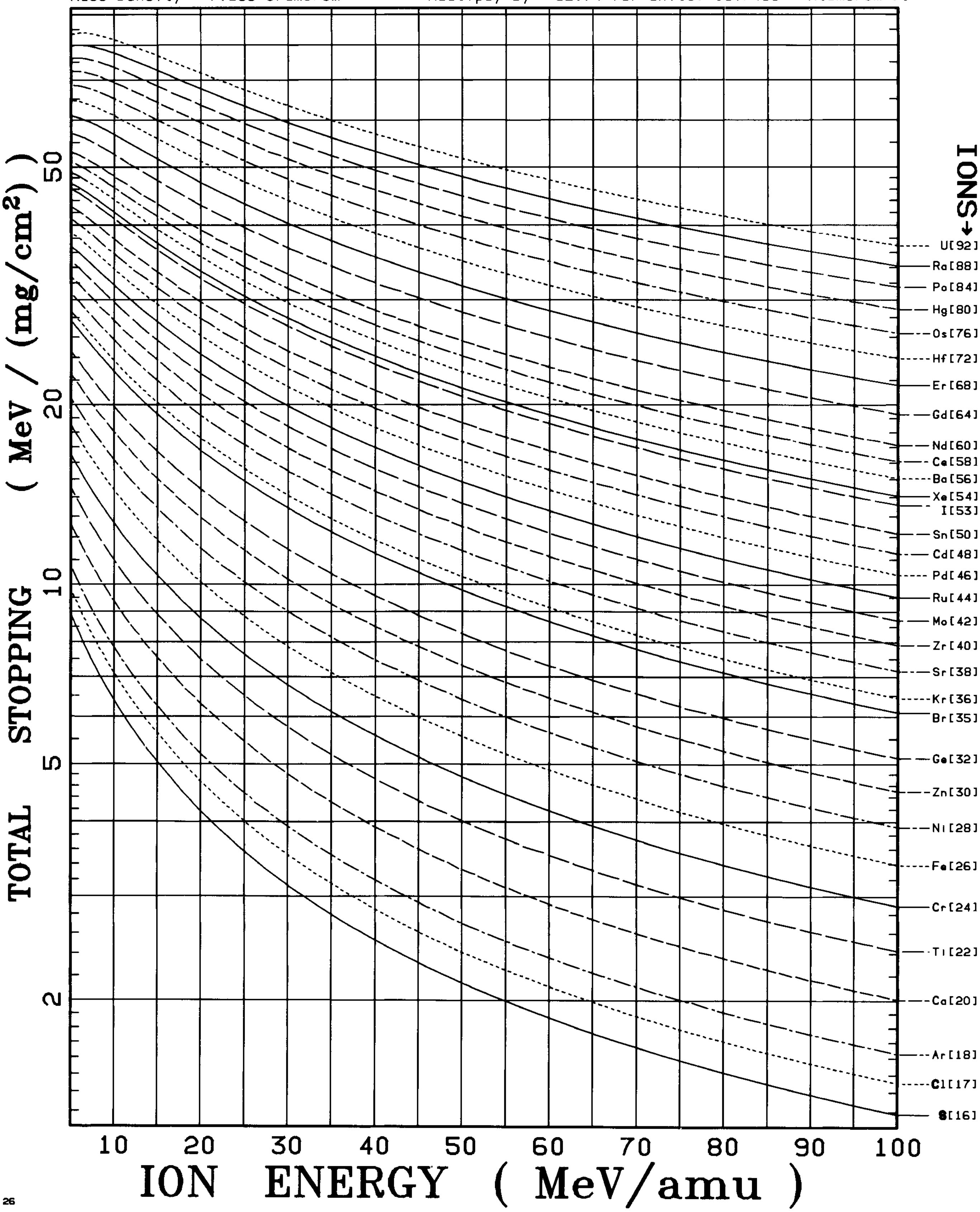
Fe(26) ←←← TARGET →→→ Fe(26)

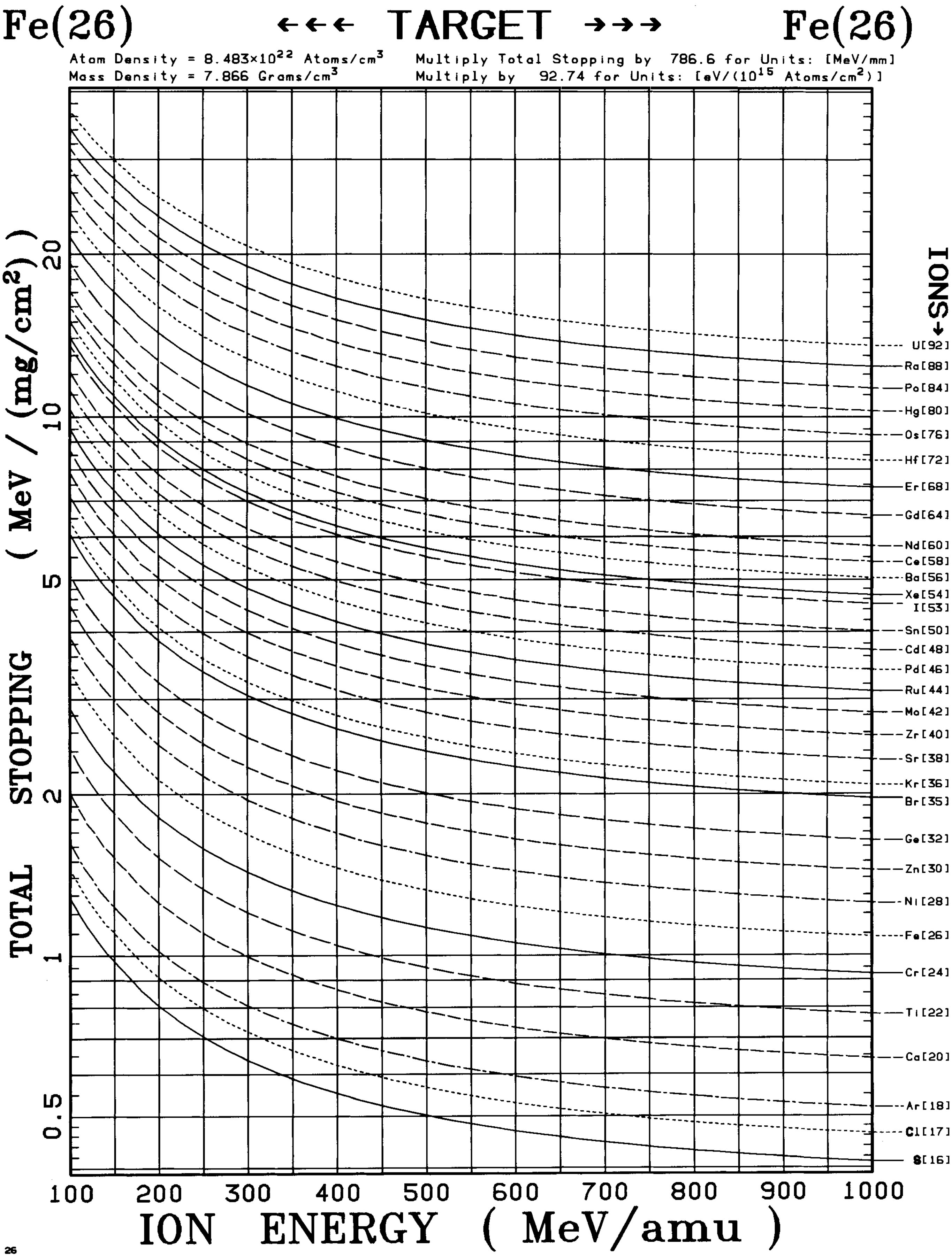
Atom Density = 8.483×10^{22} Atoms/cm^3 Multiply Total Stopping by 786.6 for Units: [MeV/mm]
Mass Density = 7.866 Grams/cm^3 Multiply by 92.74 for Units: [eV/(10^{15} Atoms/cm^2)]

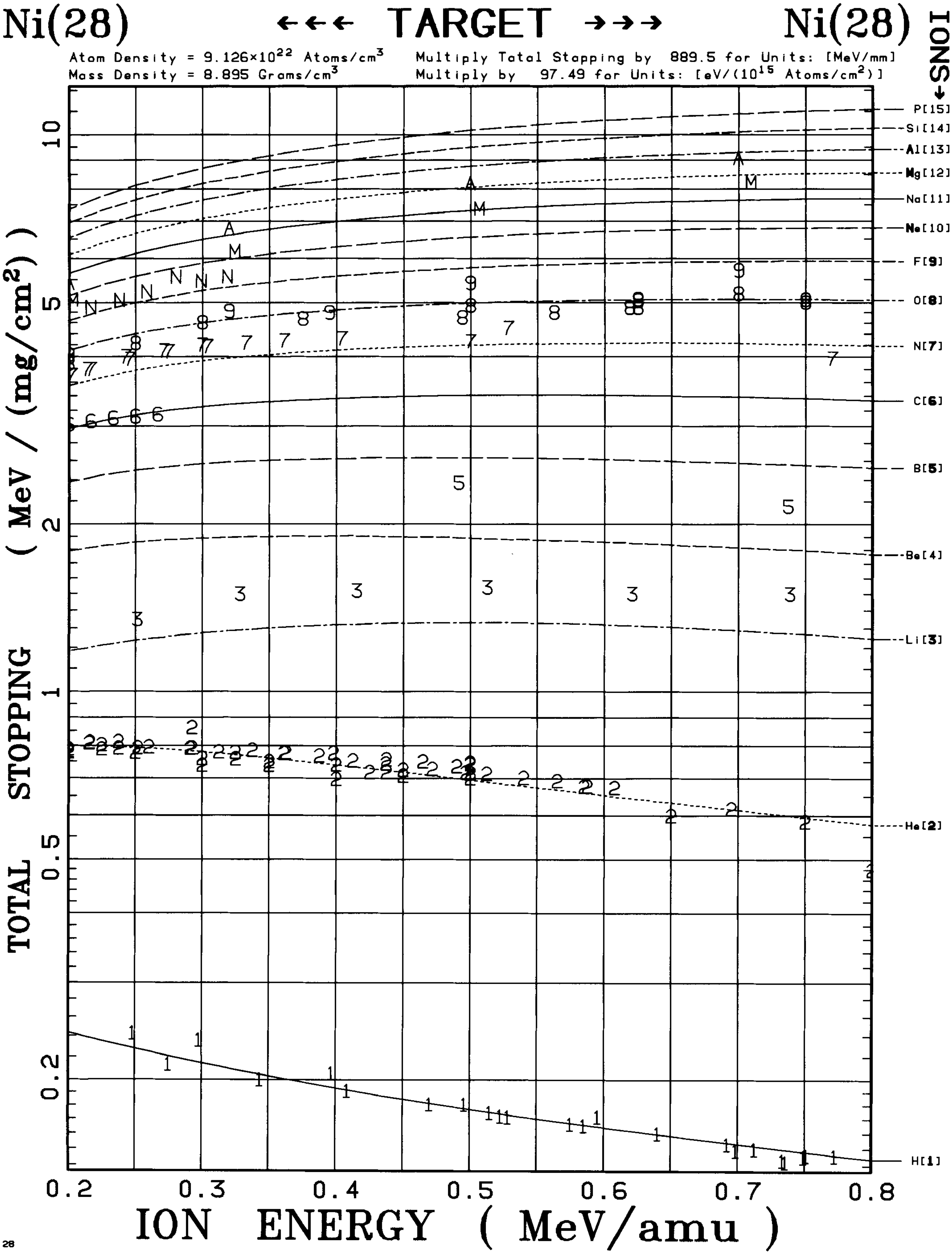


Fe(26) ←←← TARGET →→→ Fe(26)

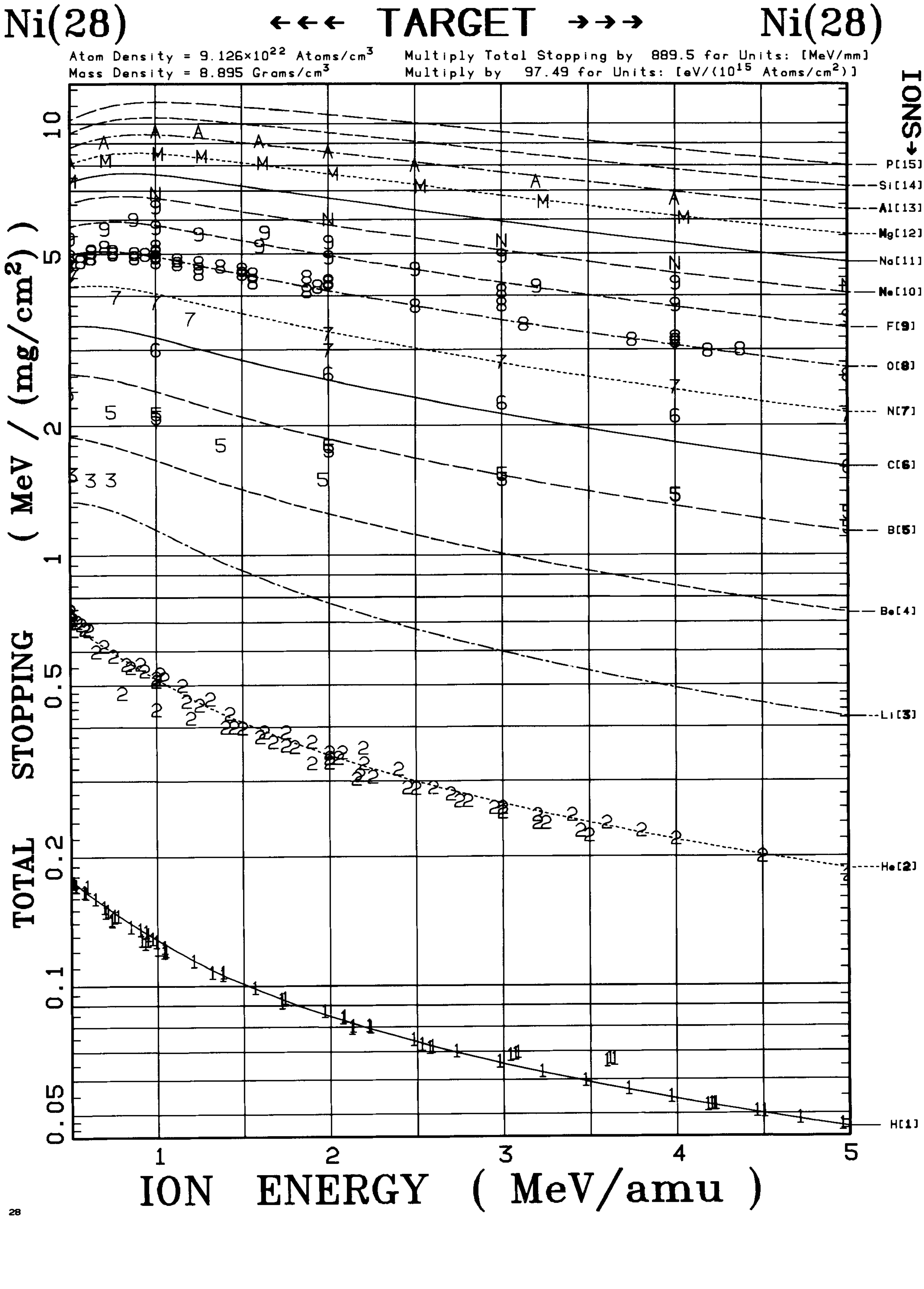
Atom Density = 8.483×10^{22} Atoms/cm^3 Multiply Total Stopping by 786.6 for Units: [MeV/mm]
Mass Density = 7.866 Grams/cm^3 Multiply by 92.74 for Units: [eV/(10^{15} Atoms/cm^2)]




Fe(26) ←←← TARGET →→→ Fe(26)
Atom Density = 8.483×10^22 Atoms/cm^3
Mass Density = 7.866 Grams/cm^3
Multiply Total Stopping by 786.6 for Units: [MeV/mm]
Multiply by 92.74 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
20
10
5
2
1
0.5
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)

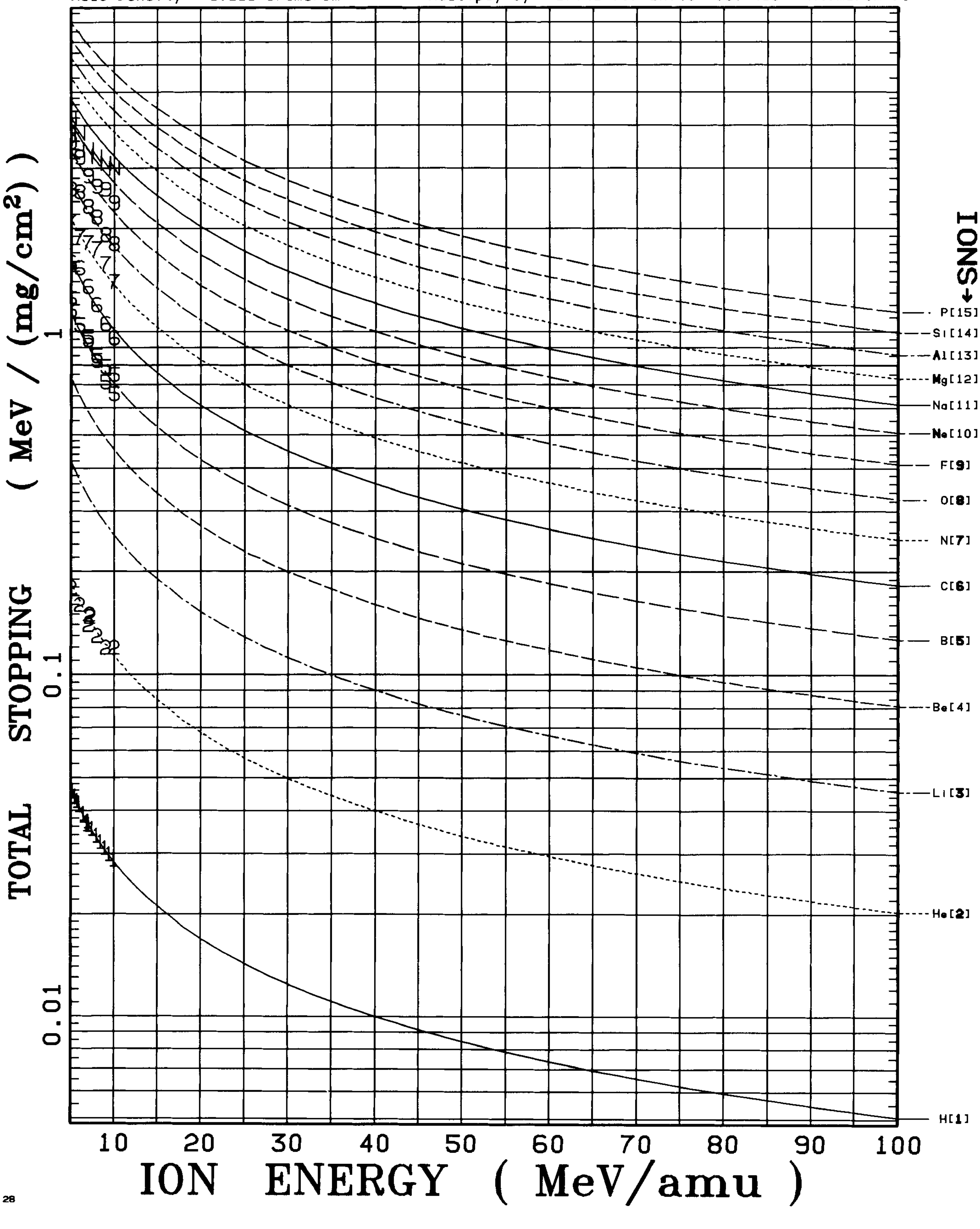


Ni(28) ←←← TARGET →→→ Ni(28)
IONS ↓
Atom Density = 9.126×10^22 Atoms/cm^3
Mass Density = 8.895 Grams/cm^3
Multiply Total Stopping by 889.5 for Units: [MeV/mm]
Multiply by 97.49 for Units: [eV/(10^15 Atoms/cm^2)]
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm^2))
10
5
2
1
0.5
0.2
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)


Ni(28) ←←← TARGET →→→ Ni(28)
Atom Density = 9.126×10^22 Atoms/cm^3
Mass Density = 8.895 Grams/cm^3
Multiply Total Stopping by 889.5 for Units: [MeV/mm]
Multiply by 97.49 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)

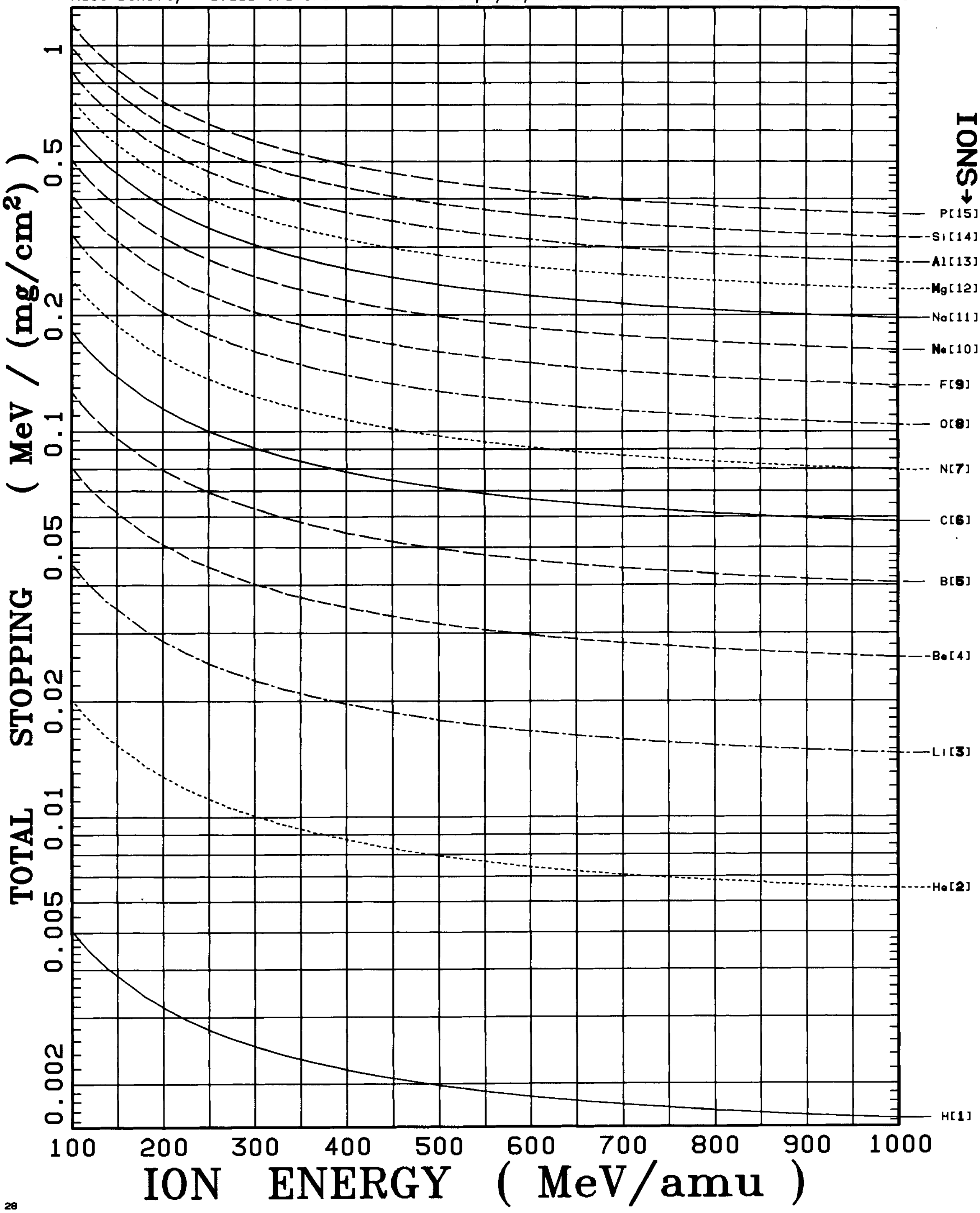
Ni(28) ←←← TARGET →→→ Ni(28)

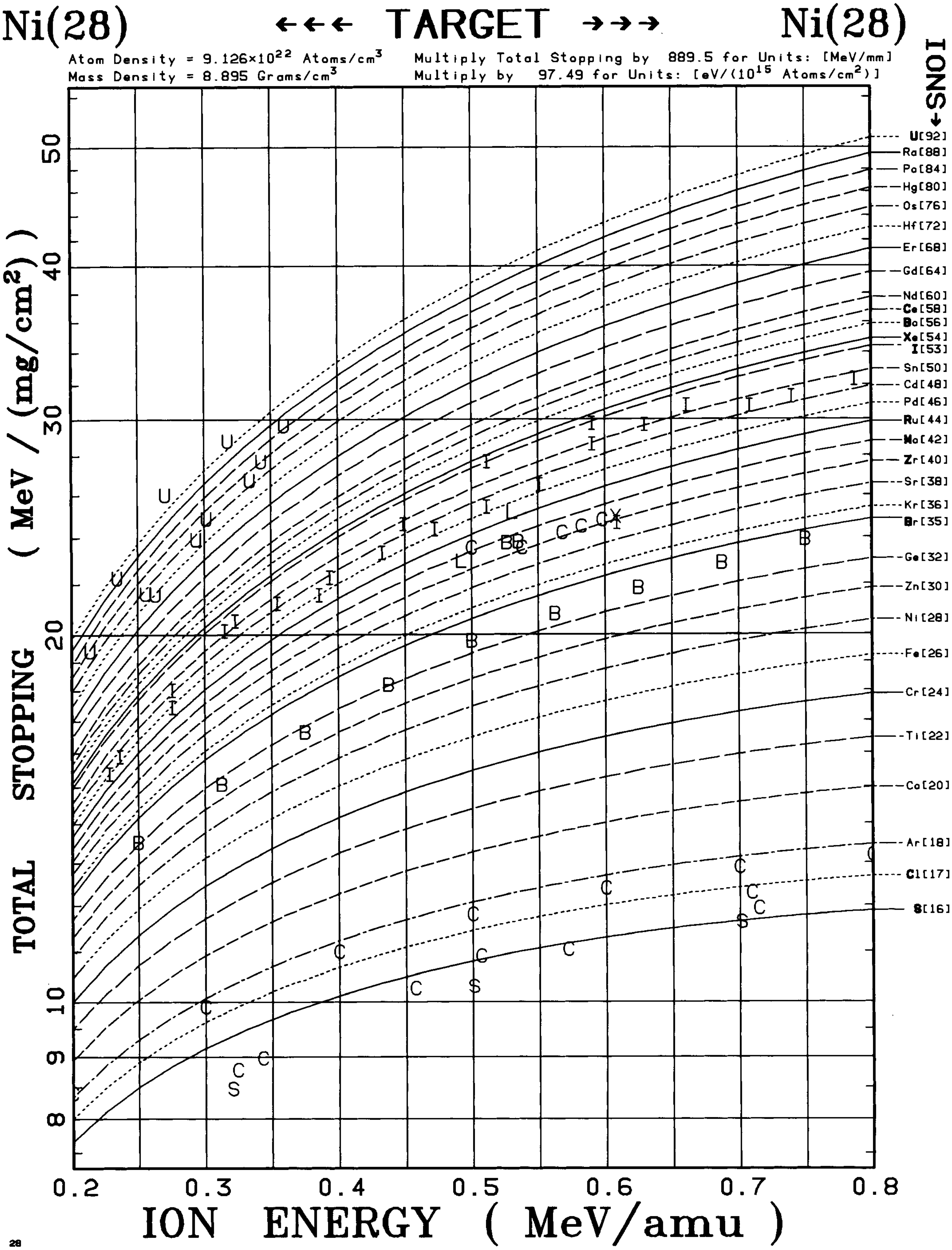
Atom Density = 9.126×10^{22} Atoms/cm^3 Multiply Total Stopping by 889.5 for Units: [MeV/mm]
Mass Density = 8.895 Grams/cm^3 Multiply by 97.49 for Units: [eV/(10^{15} Atoms/cm^2)]



Ni(28) ←←← TARGET →→→ Ni(28)

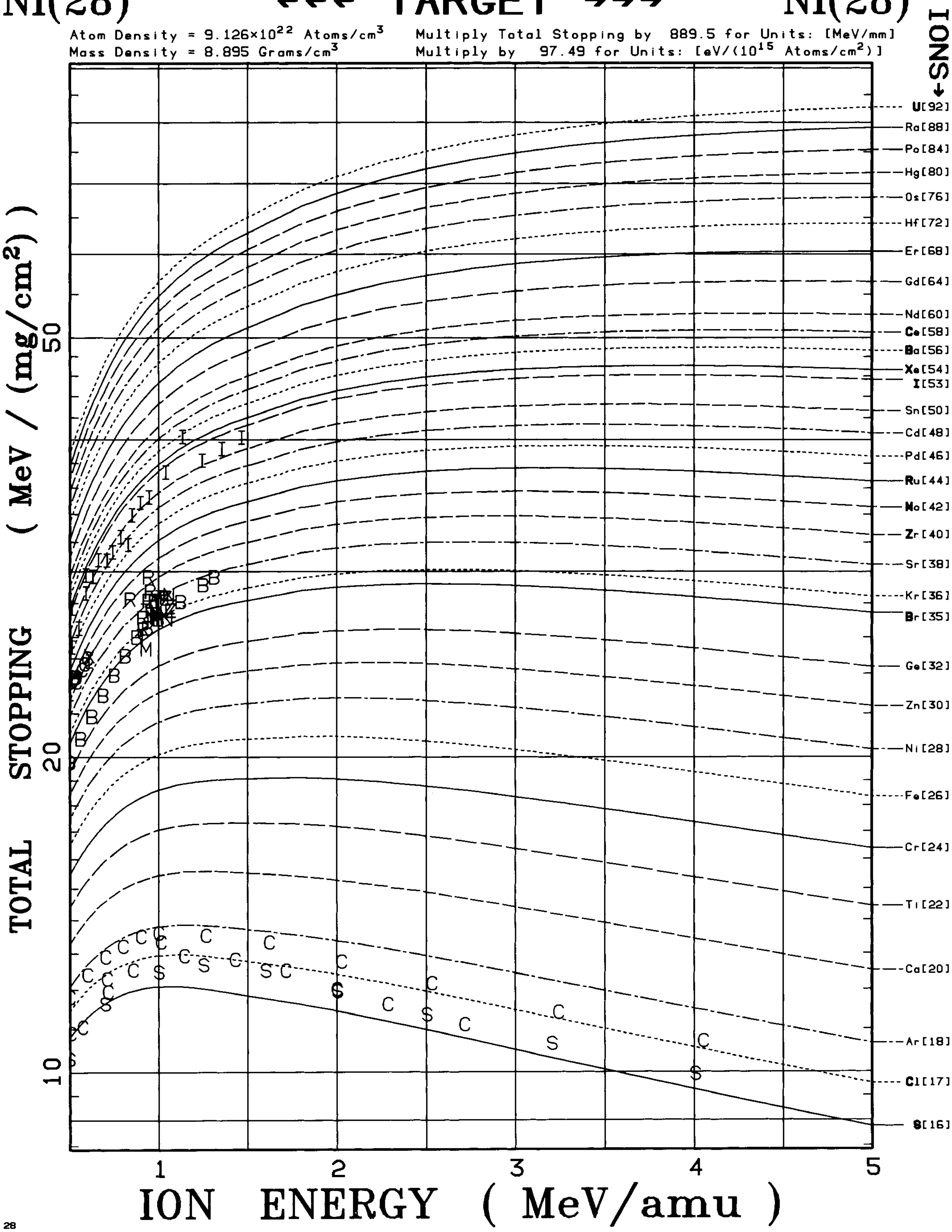
Atom Density = 9.126×10^{22} Atoms/cm^3 Multiply Total Stopping by 889.5 for Units: [MeV/mm]
Mass Density = 8.895 Grams/cm^3 Multiply by 97.49 for Units: [eV/(10^{15} Atoms/cm^2)]




Ni(28)
←←← TARGET →→→
Ni(28)
Atom Density = 9.126×10^22 Atoms/cm^3
Mass Density = 8.895 Grams/cm^3
Multiply Total Stopping by 889.5 for Units: [MeV/mm]
Multiply by 97.49 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm²))
ION ENERGY (MeV/amu)
0.2
0.3
0.4
0.5
0.6
0.7
0.8
8
9
10
20
30
40
50

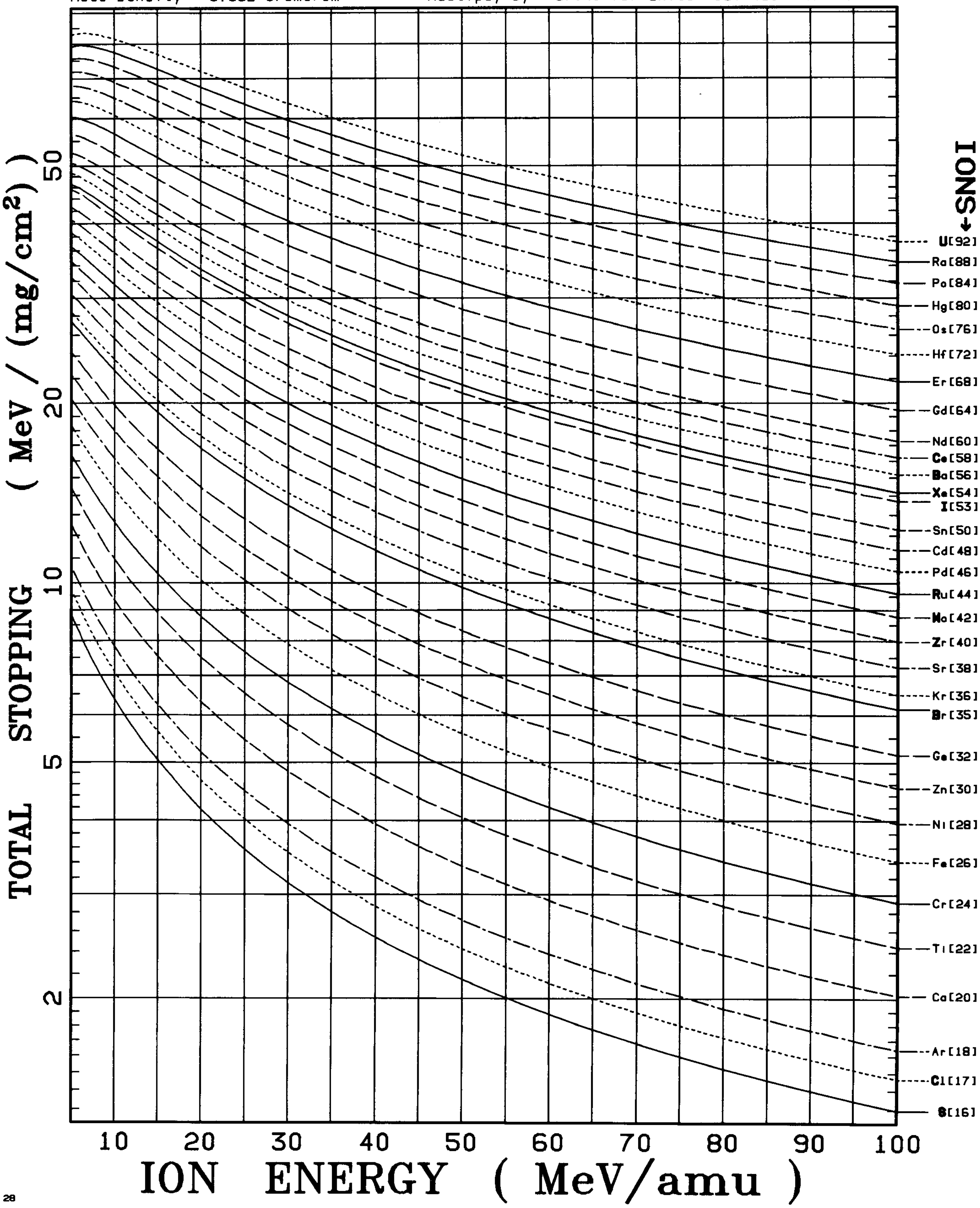
Ni(28) ←←← TARGET →→→ Ni(28)

Atom Density = 9.126×10^{22} Atoms/cm^3 Multiply Total Stopping by 889.5 for Units: [MeV/mm]
Mass Density = 8.895 Grams/cm^3 Multiply by 97.49 for Units: [eV/(10^{15} Atoms/cm^2)]



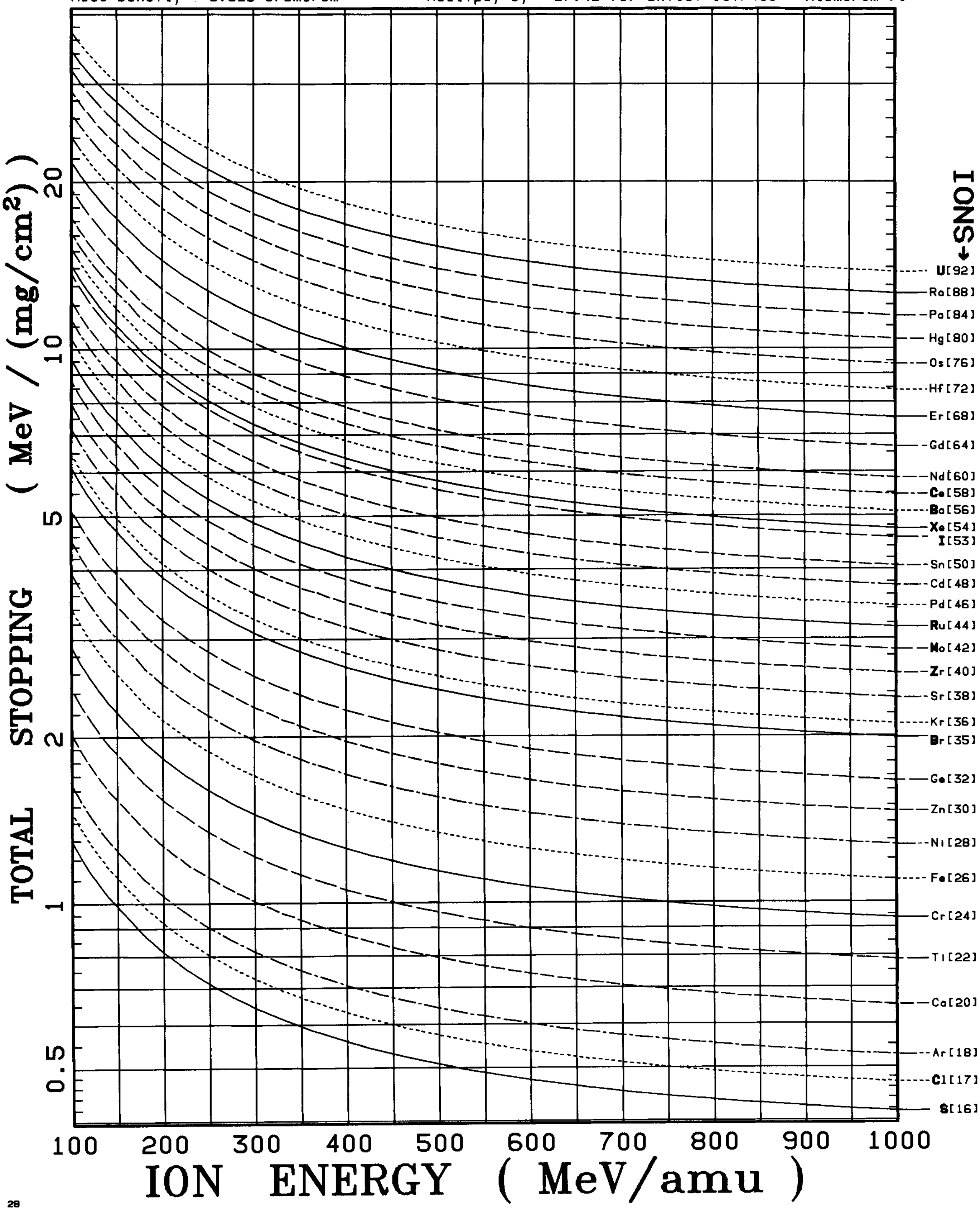
Ni(28) ←←← TARGET →→→ Ni(28)

Atom Density = 9.126×10^{22} Atoms/cm^3 Multiply Total Stopping by 889.5 for Units: [MeV/mm]
Mass Density = 8.895 Grams/cm^3 Multiply by 97.49 for Units: [eV/(10^{15} Atoms/cm^2)]



Ni(28) ←←← TARGET →→→ Ni(28)

Atom Density = 9.126×10[22] Atoms/cm[3]   Multiply Total Stopping by 889.5 for Units: [MeV/mm]
Mass Density = 8.895 Grams/cm[3]   Multiply by 97.49 for Units: [eV/(10[15] Atoms/cm[2])]

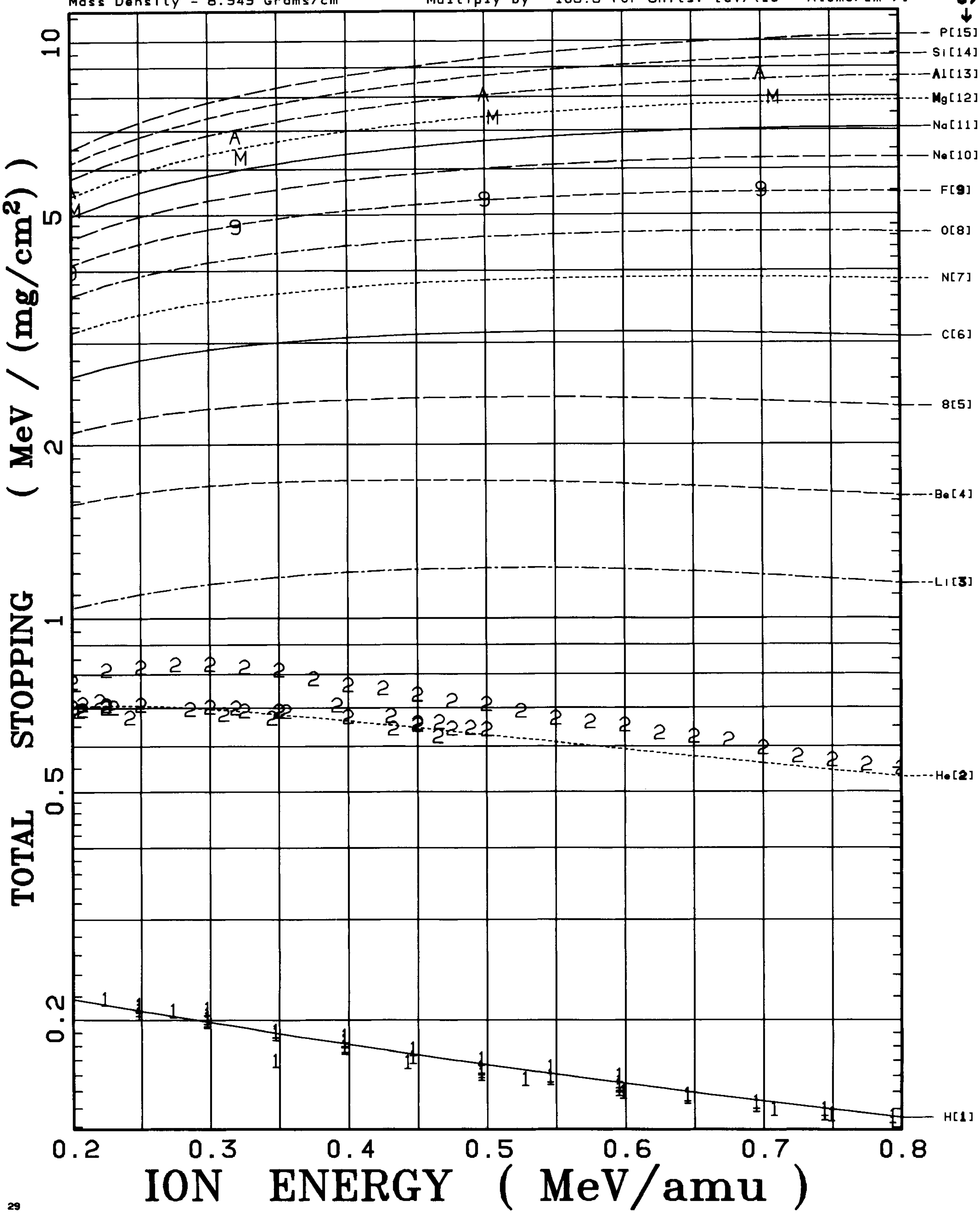


Cu(29) ←←← TARGET →→→ Cu(29)

IONS→

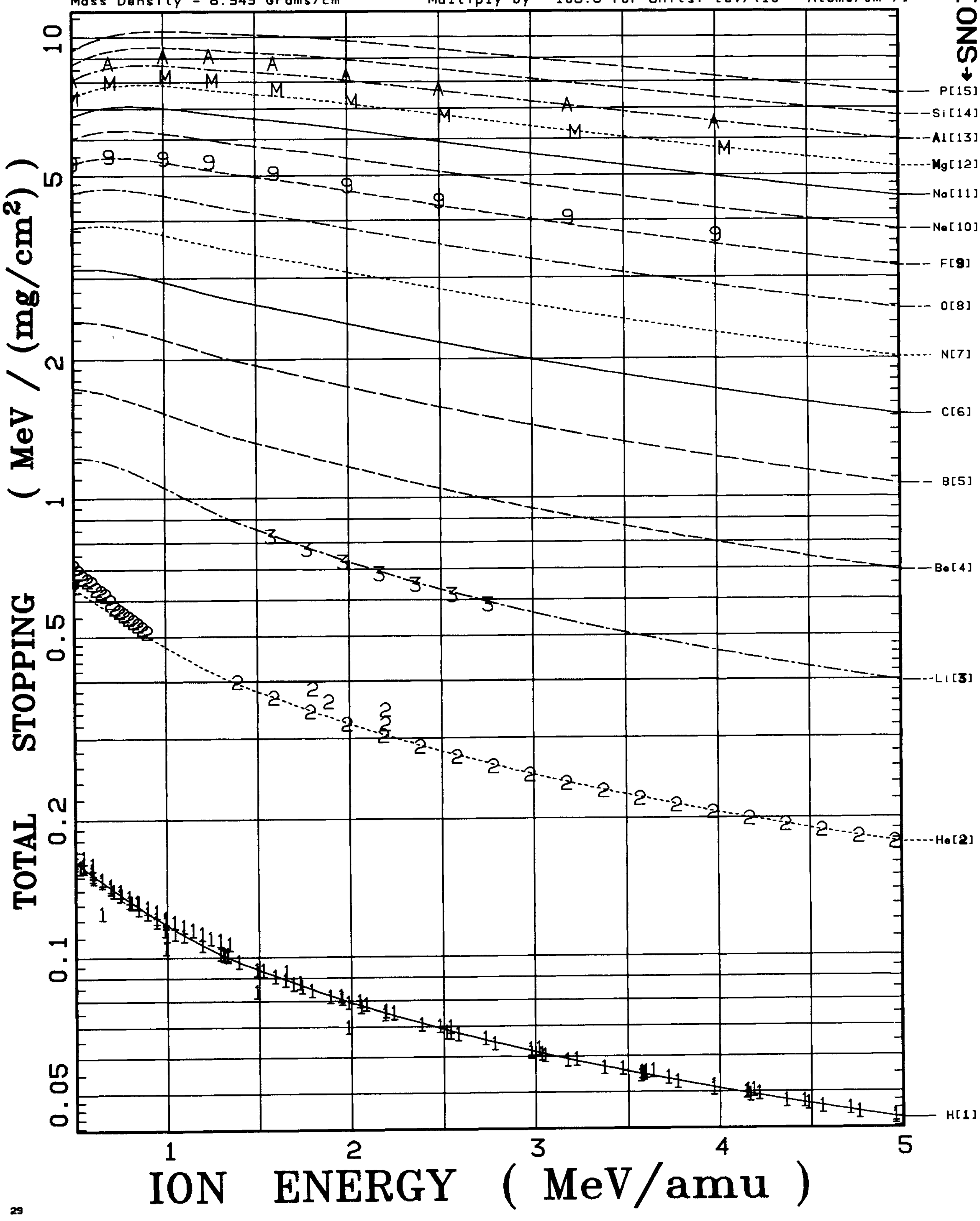
Atom Density = 8.483×10^{22} Atoms/cm^3 Multiply Total Stopping by 894.9 for Units: [MeV/mm]

Mass Density = 8.949 Grams/cm^3 Multiply by 105.5 for Units: [eV/(10^{15} Atoms/cm^2)]



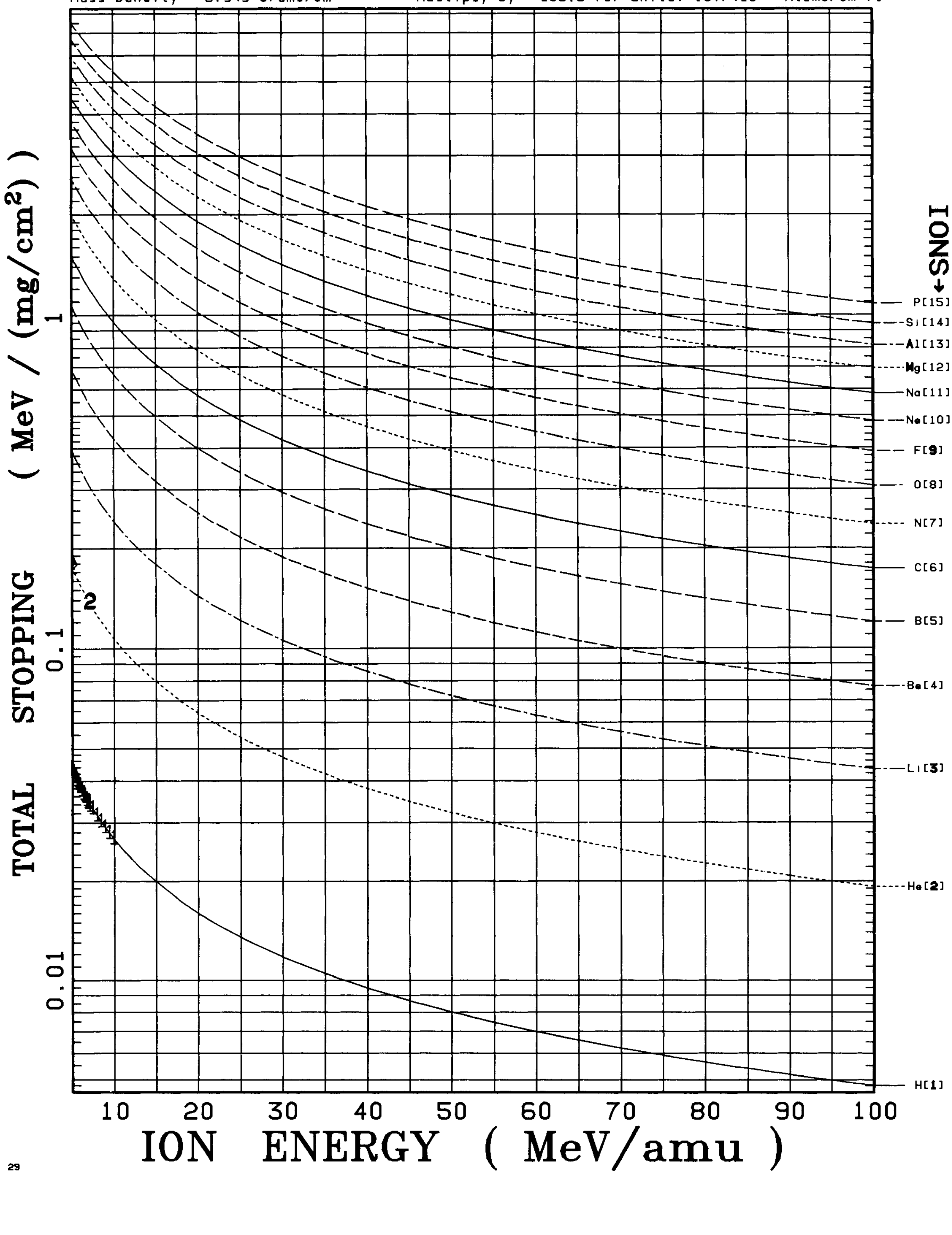
Cu(29) ←←← TARGET →→→ Cu(29)

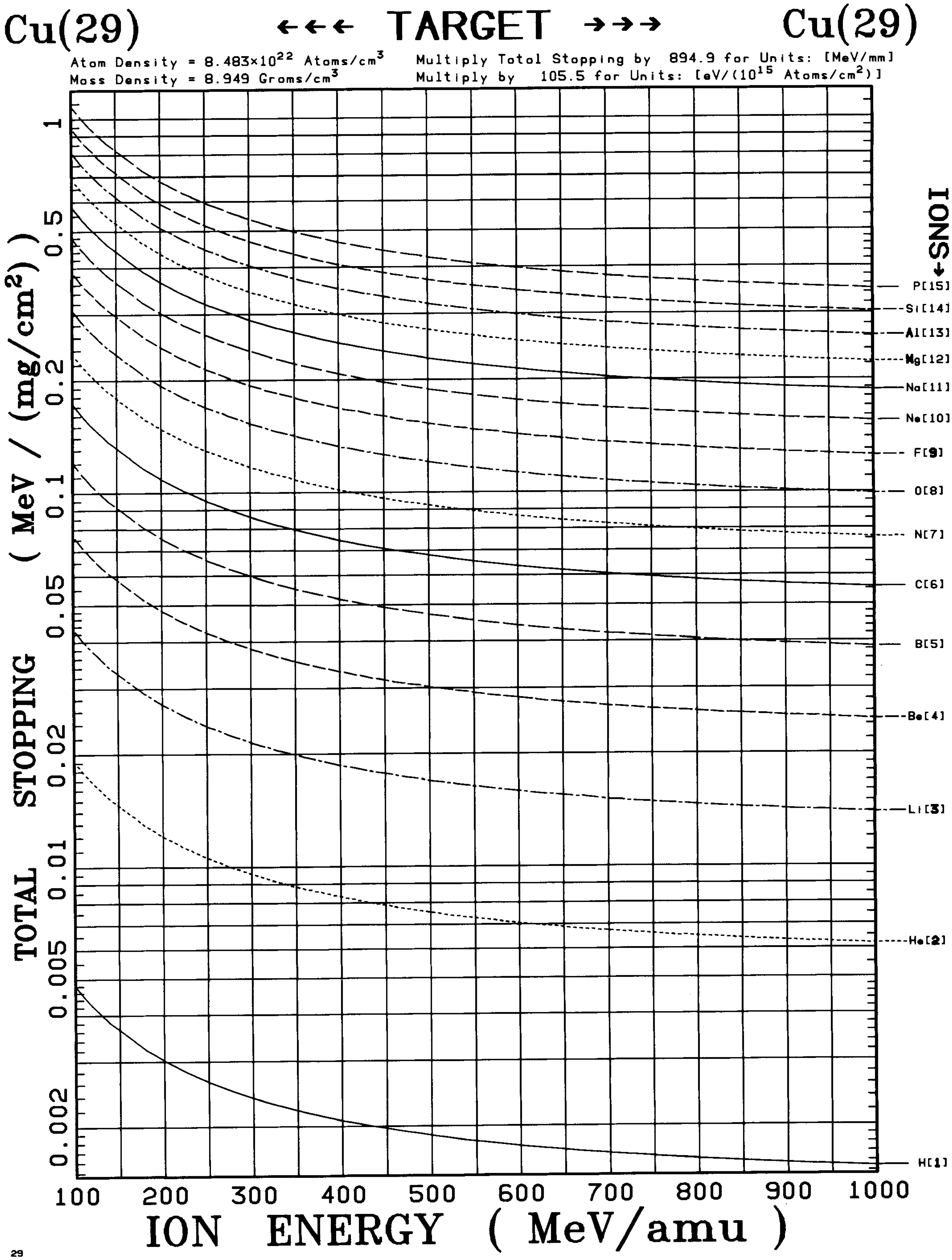
Atom Density = 8.483×10^22 Atoms/cm^3 Multiply Total Stopping by 894.9 for Units: [MeV/mm]
Mass Density = 8.949 Grams/cm^3 Multiply by 105.5 for Units: [eV/(10^15 Atoms/cm^2)]



Cu(29) ←←← TARGET →→→ Cu(29)

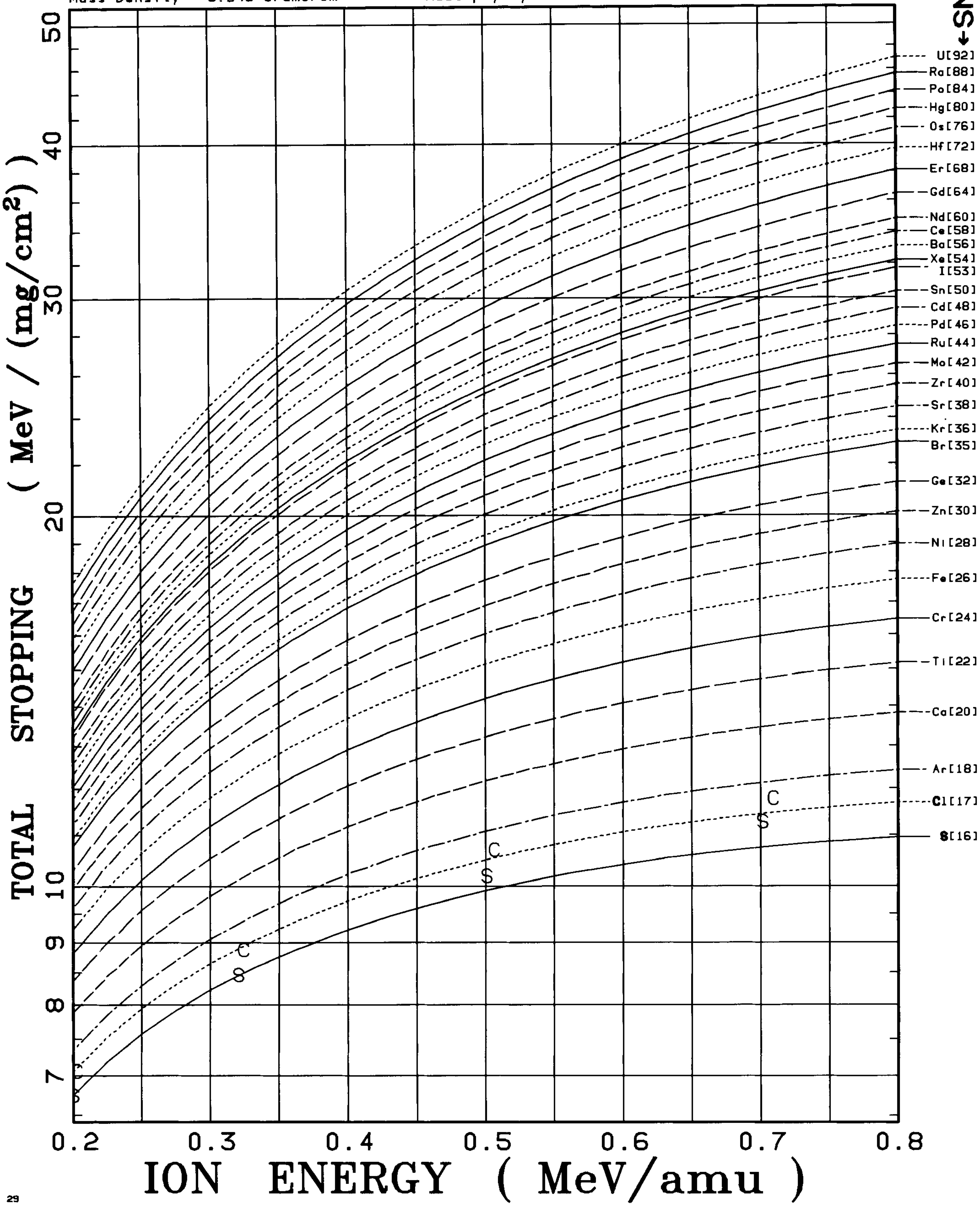
Atom Density = 8.483×10^{22} Atoms/cm^3 Multiply Total Stopping by 894.9 for Units: [MeV/mm]
Mass Density = 8.949 Grams/cm^3 Multiply by 105.5 for Units: [eV/(10^{15} Atoms/cm^2)]




Cu(29) ←←← TARGET →→→ Cu(29)
Atom Density = 8.483×10^22 Atoms/cm^3
Mass Density = 8.949 Grams/cm^3
Multiply Total Stopping by 894.9 for Units: [MeV/mm]
Multiply by 105.5 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
1
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)

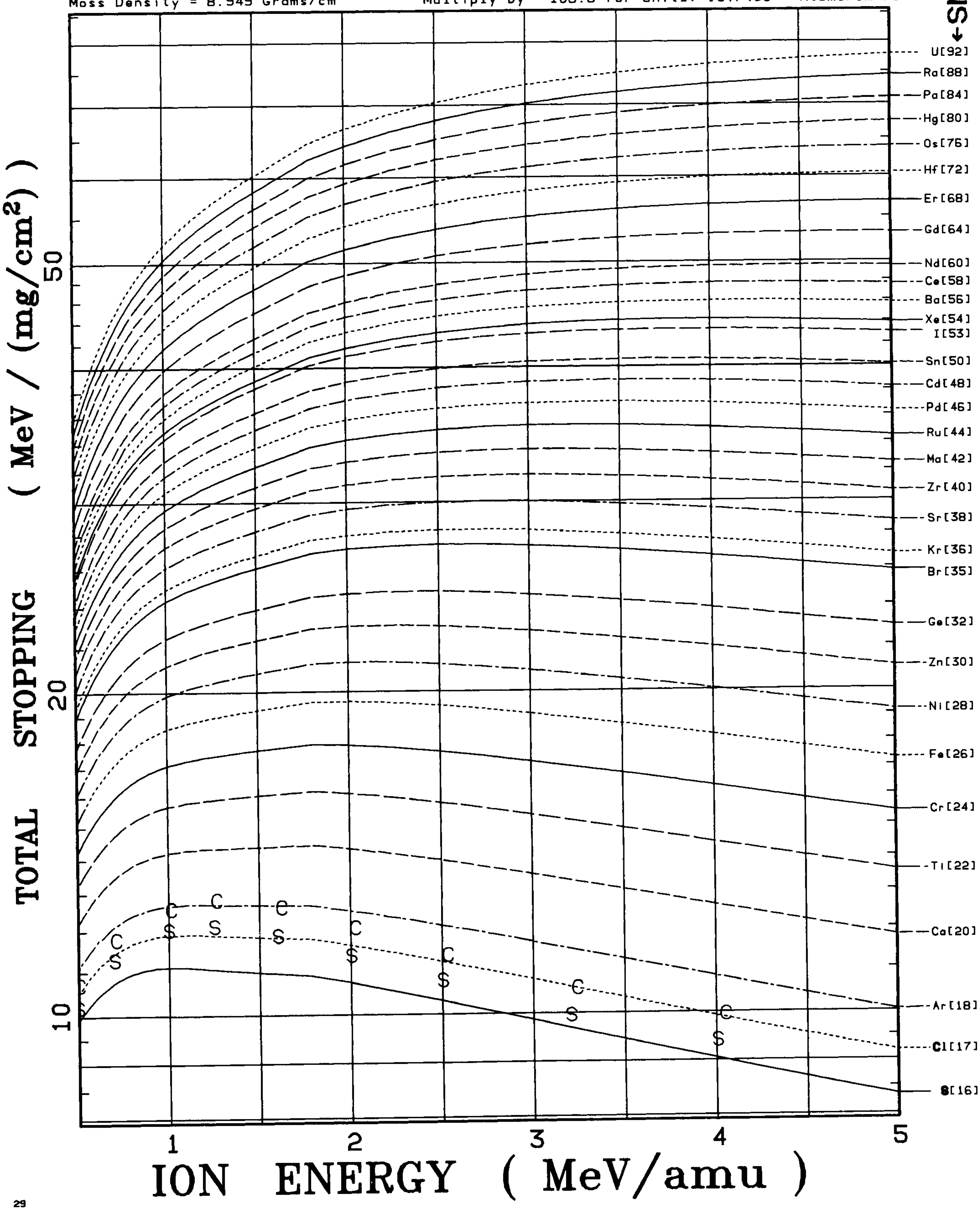
Cu(29) ←←← TARGET →→→ Cu(29)

Atom Density = 8.483×10^{22} Atoms/cm^3 Multiply Total Stopping by 894.9 for Units: [MeV/mm]
Mass Density = 8.949 Grams/cm^3 Multiply by 105.5 for Units: [eV/(10^{15} Atoms/cm^2)]



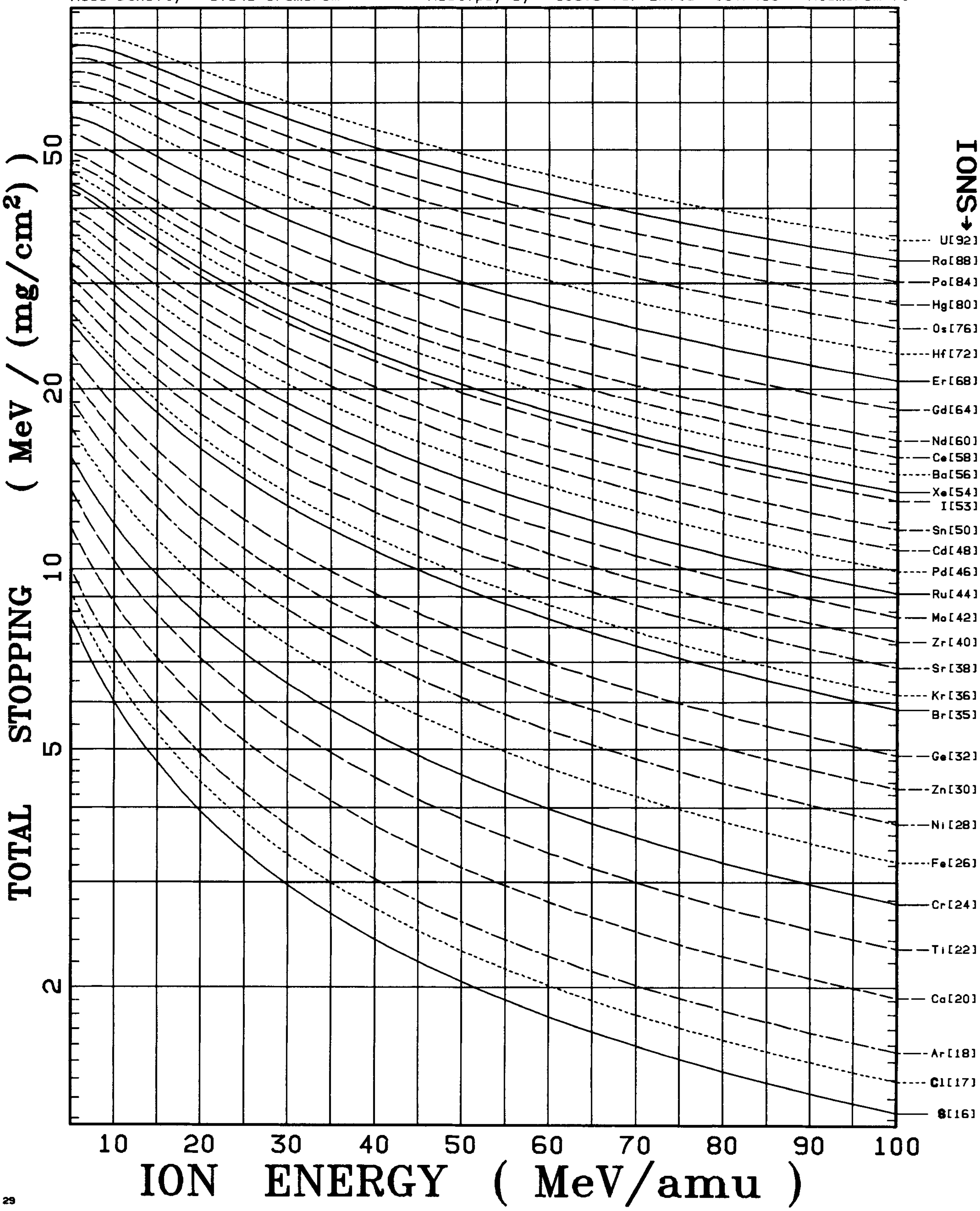
Cu(29) ←←← TARGET →→→ Cu(29)

Atom Density = 8.483×10^{22} Atoms/cm^3 Multiply Total Stopping by 894.9 for Units: [MeV/mm]
Mass Density = 8.949 Grams/cm^3 Multiply by 105.5 for Units: [eV/(10^{15} Atoms/cm^2)]



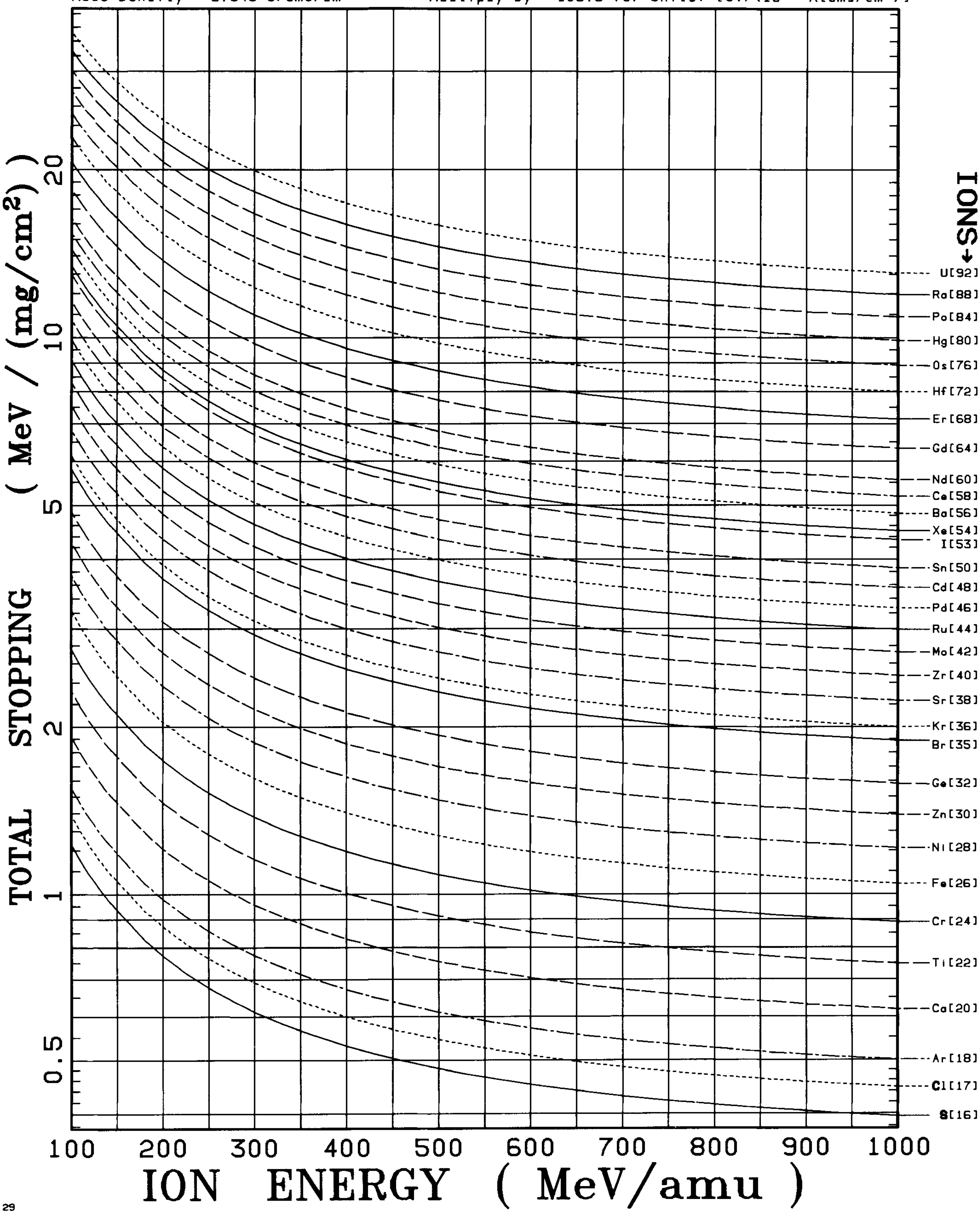
Cu(29) ←←← TARGET →→→ Cu(29)

Atom Density = 8.483×10^{22} Atoms/cm^3 Multiply Total Stopping by 894.9 for Units: [MeV/mm]
Mass Density = 8.949 Grams/cm^3 Multiply by 105.5 for Units: [eV/(10^{15} Atoms/cm^2)]



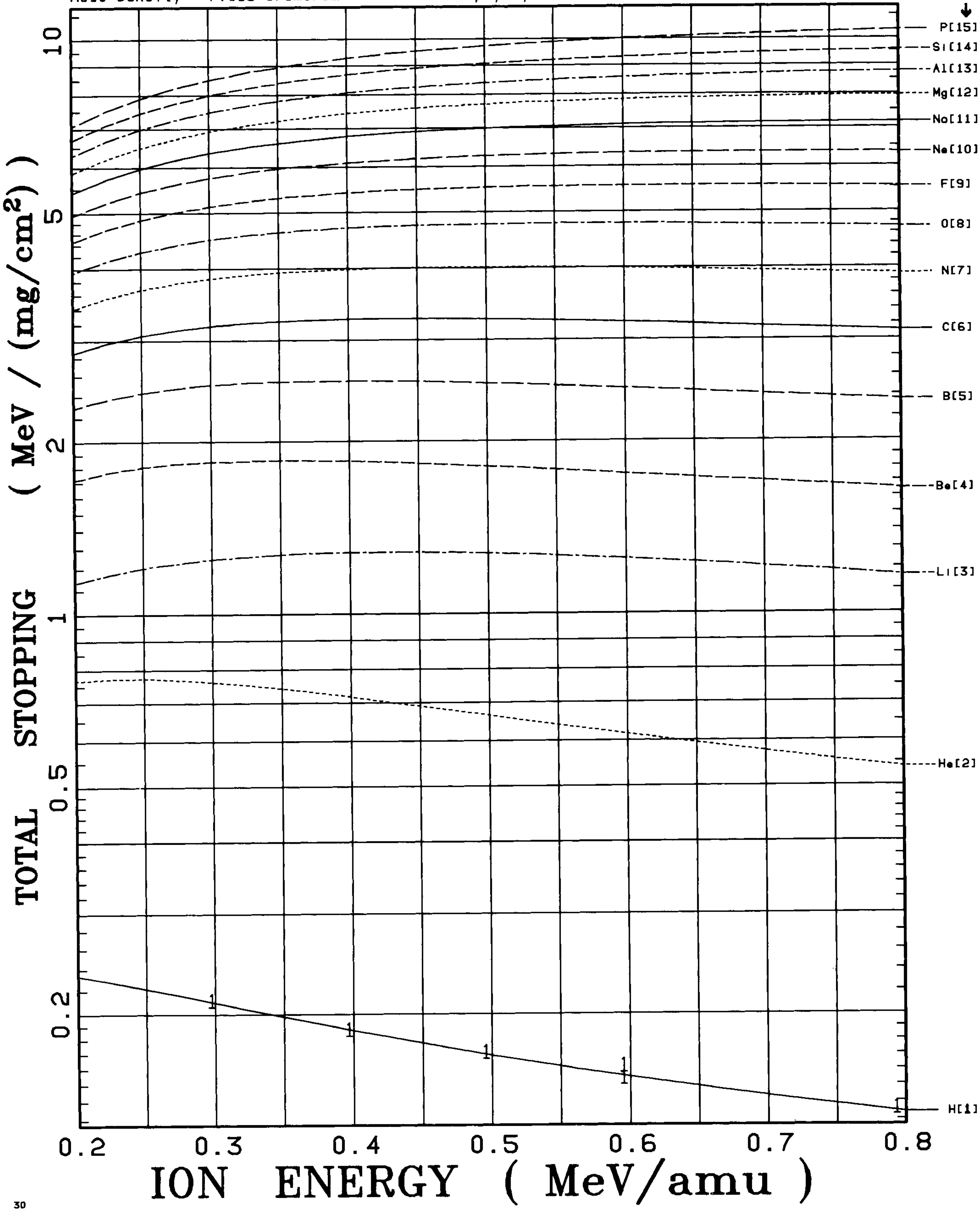
Cu(29) ←←← TARGET →→→ Cu(29)

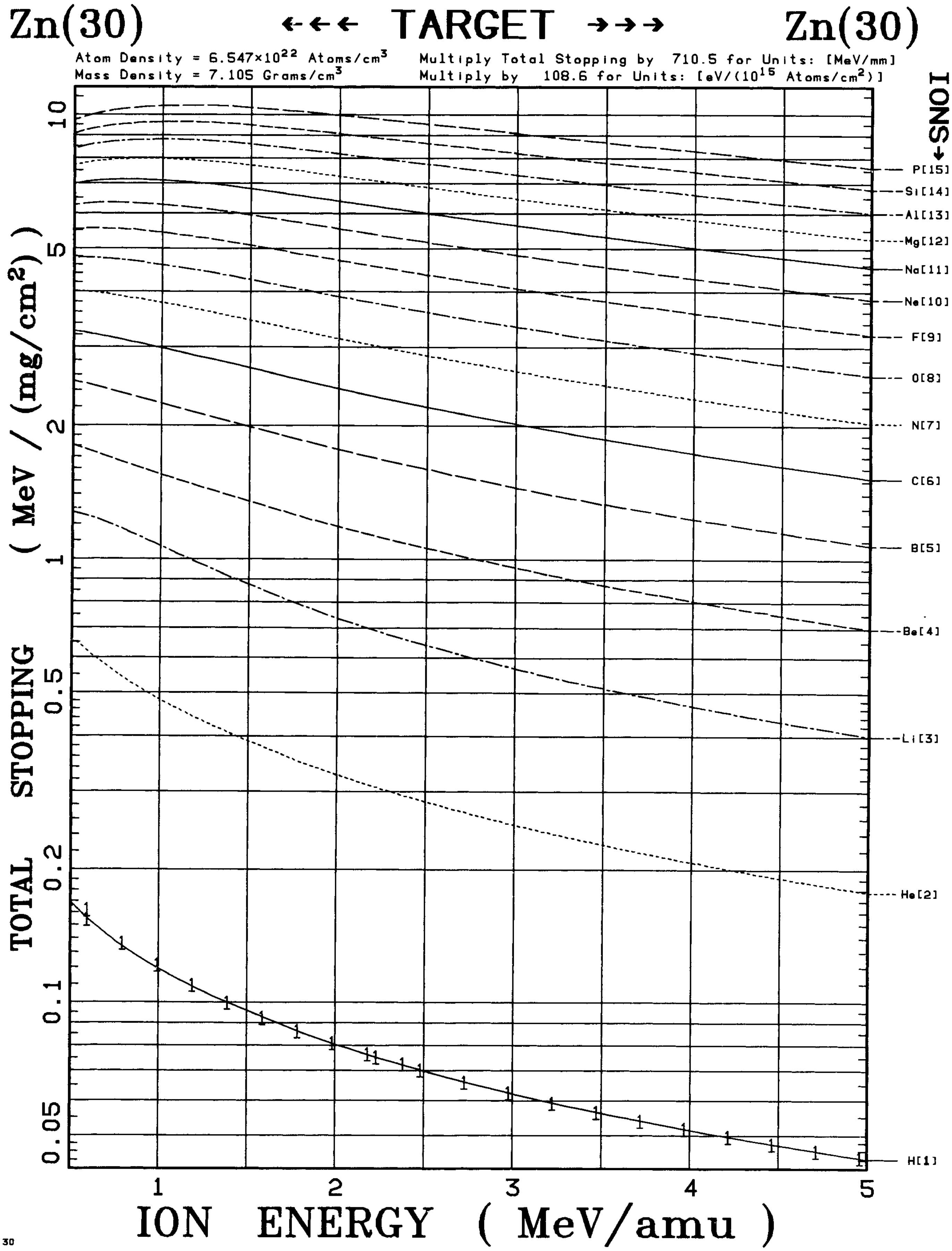
Atom Density = 8.483×10^{22} Atoms/cm^3 Multiply Total Stopping by 894.9 for Units: [MeV/mm]
Mass Density = 8.949 Grams/cm^3 Multiply by 105.5 for Units: [eV/(10^{15} Atoms/cm^2)]

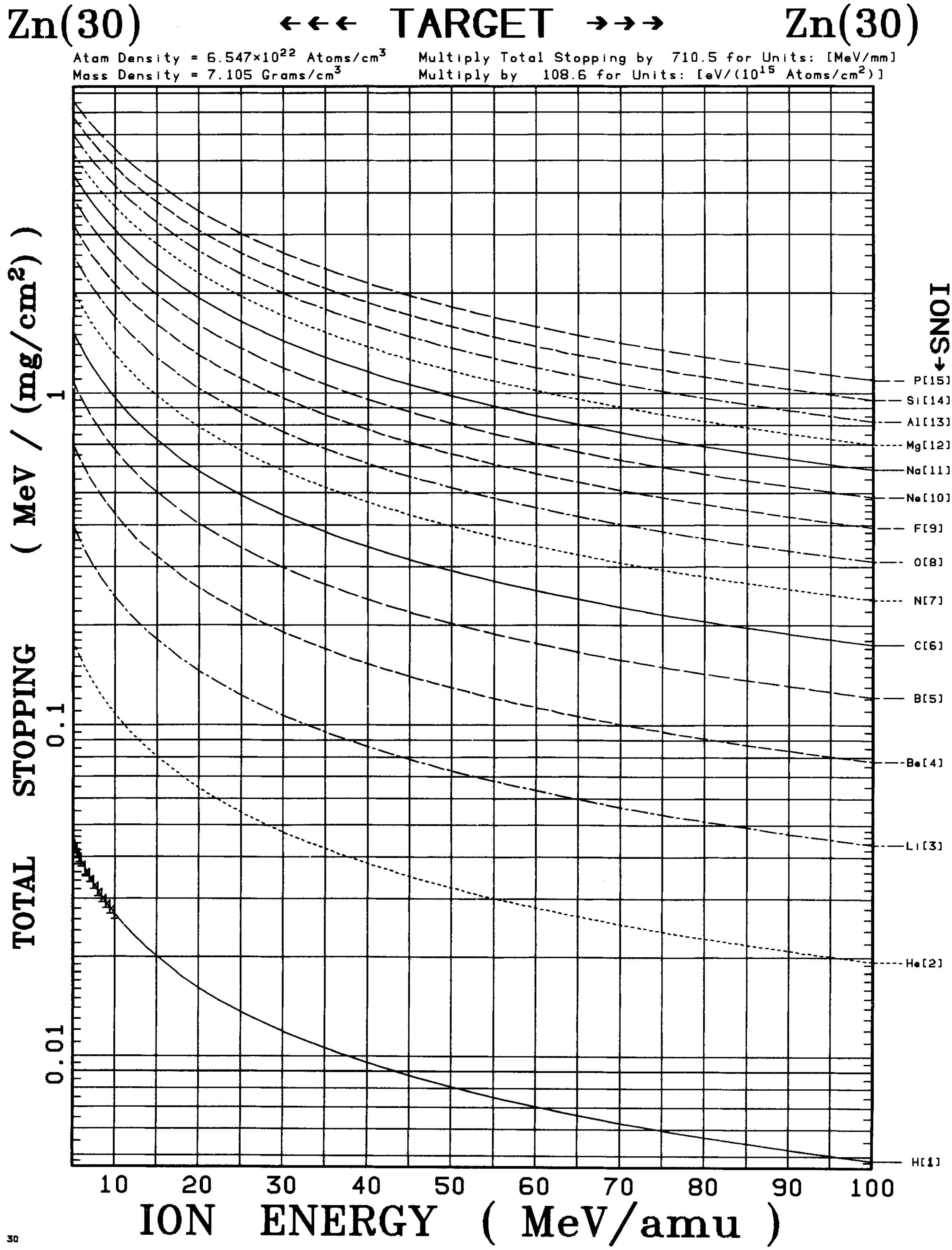


Zn(30) ←←← TARGET →→→ Zn(30)

Atom Density = 6.547×10^{22} Atoms/cm^3 Multiply Total Stopping by 710.5 for Units: [MeV/mm]
Mass Density = 7.105 Grams/cm^3 Multiply by 108.6 for Units: [eV/(10^{15} Atoms/cm^2)]

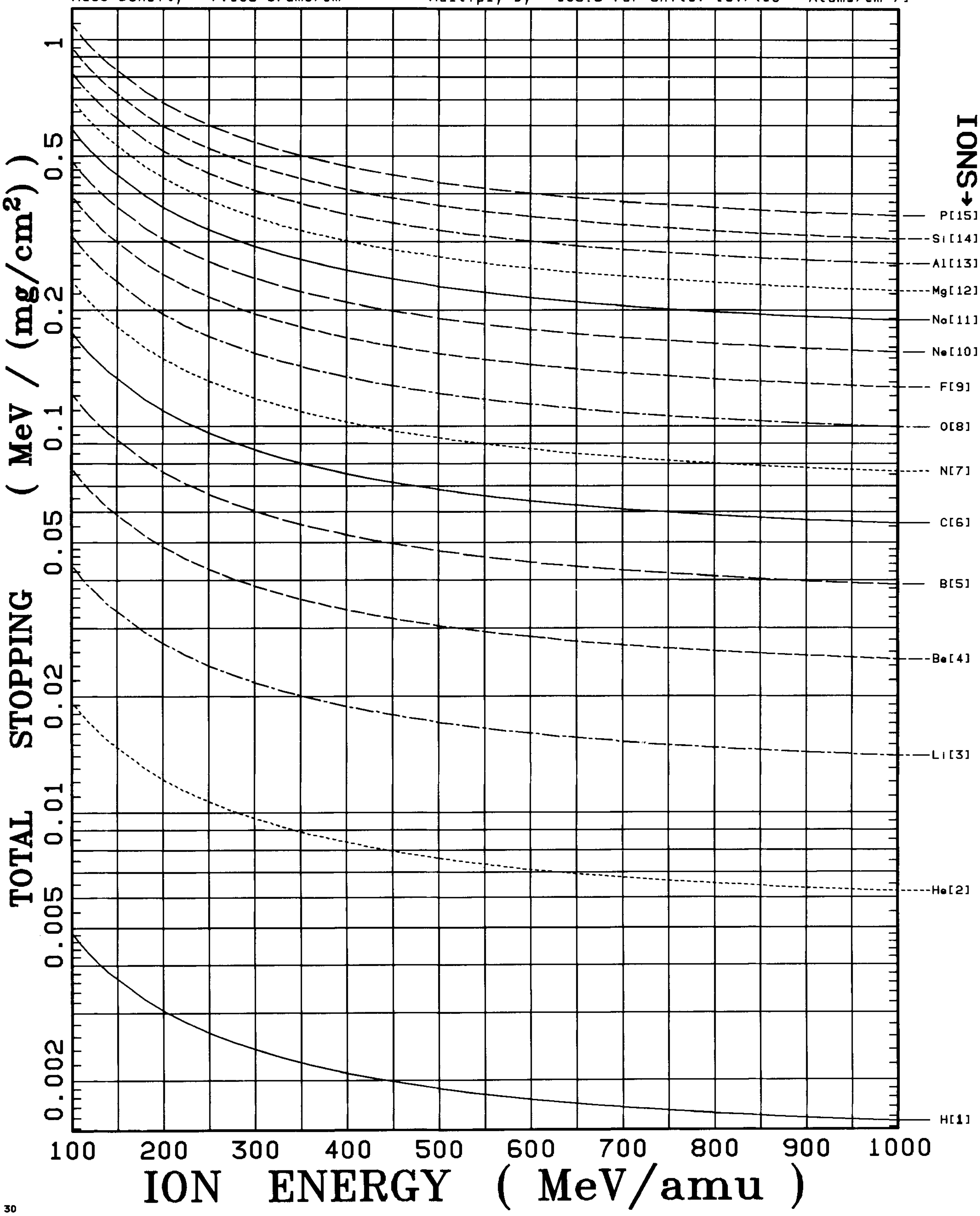


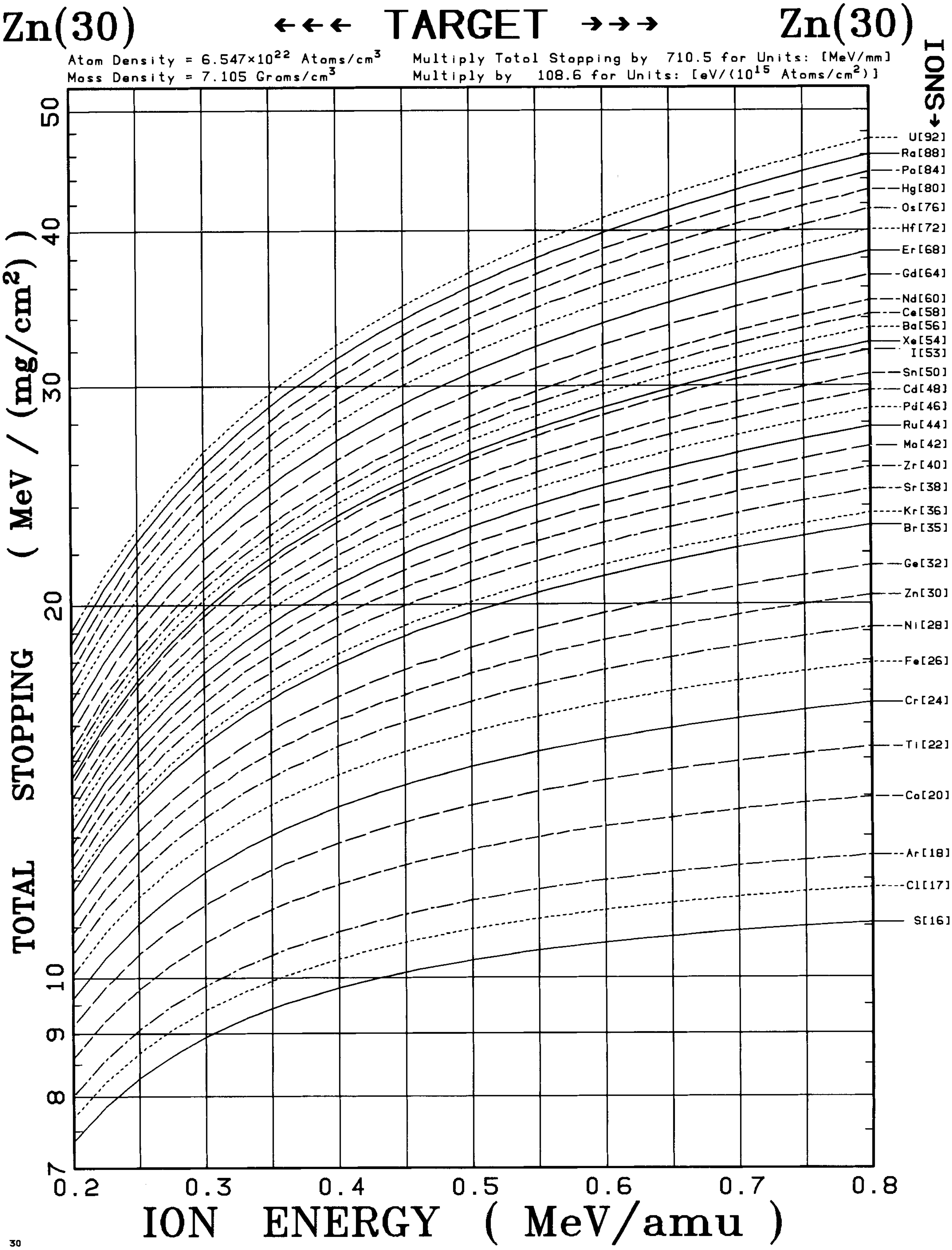

Zn(30) ←←← TARGET →→→ Zn(30)
Atom Density = 6.547×10^22 Atoms/cm^3
Mass Density = 7.105 Grams/cm^3
Multiply Total Stopping by 710.5 for Units: [MeV/mm]
Multiply by 108.6 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm²))
10
5
2
1
0.5
0.2
0.1
0.05
1
2
3
4
5
ION ENERGY (MeV/amu)


Zn(30)
←←← TARGET →→→
Zn(30)
Atom Density = 6.547×10^22 Atoms/cm^3
Multiply Total Stopping by 710.5 for Units: [MeV/mm]
Mass Density = 7.105 Grams/cm^3
Multiply by 108.6 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
1
0.1
0.01
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
10
20
30
40
50
60
70
80
90
100
ION ENERGY (MeV/amu)

Zn(30) ←←← TARGET →→→ Zn(30)

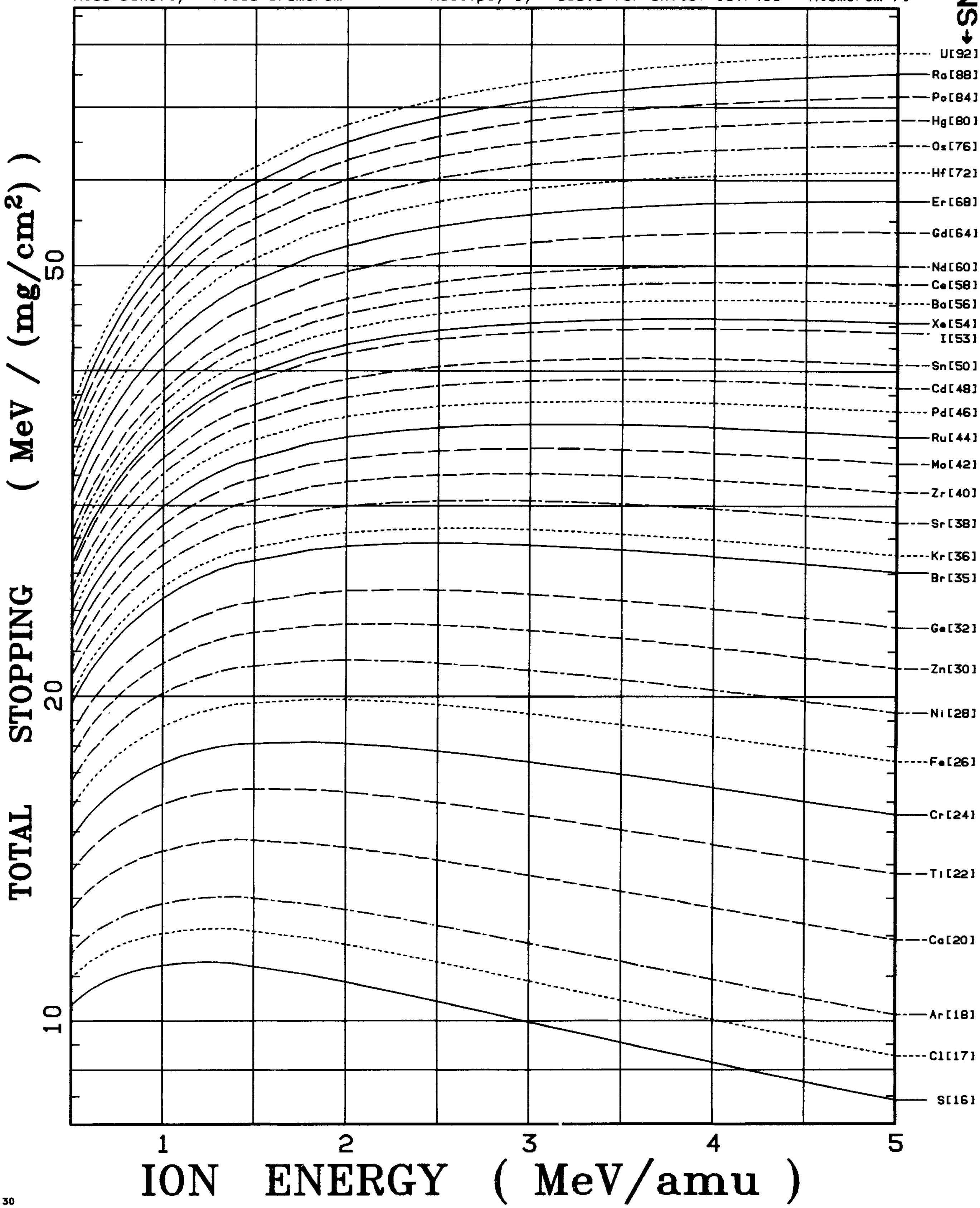
Atom Density = 6.547×10^{22} Atoms/cm^3 Multiply Total Stopping by 710.5 for Units: [MeV/mm]
Mass Density = 7.105 Grams/cm^3 Multiply by 108.6 for Units: [eV/(10^{15} Atoms/cm^2)]

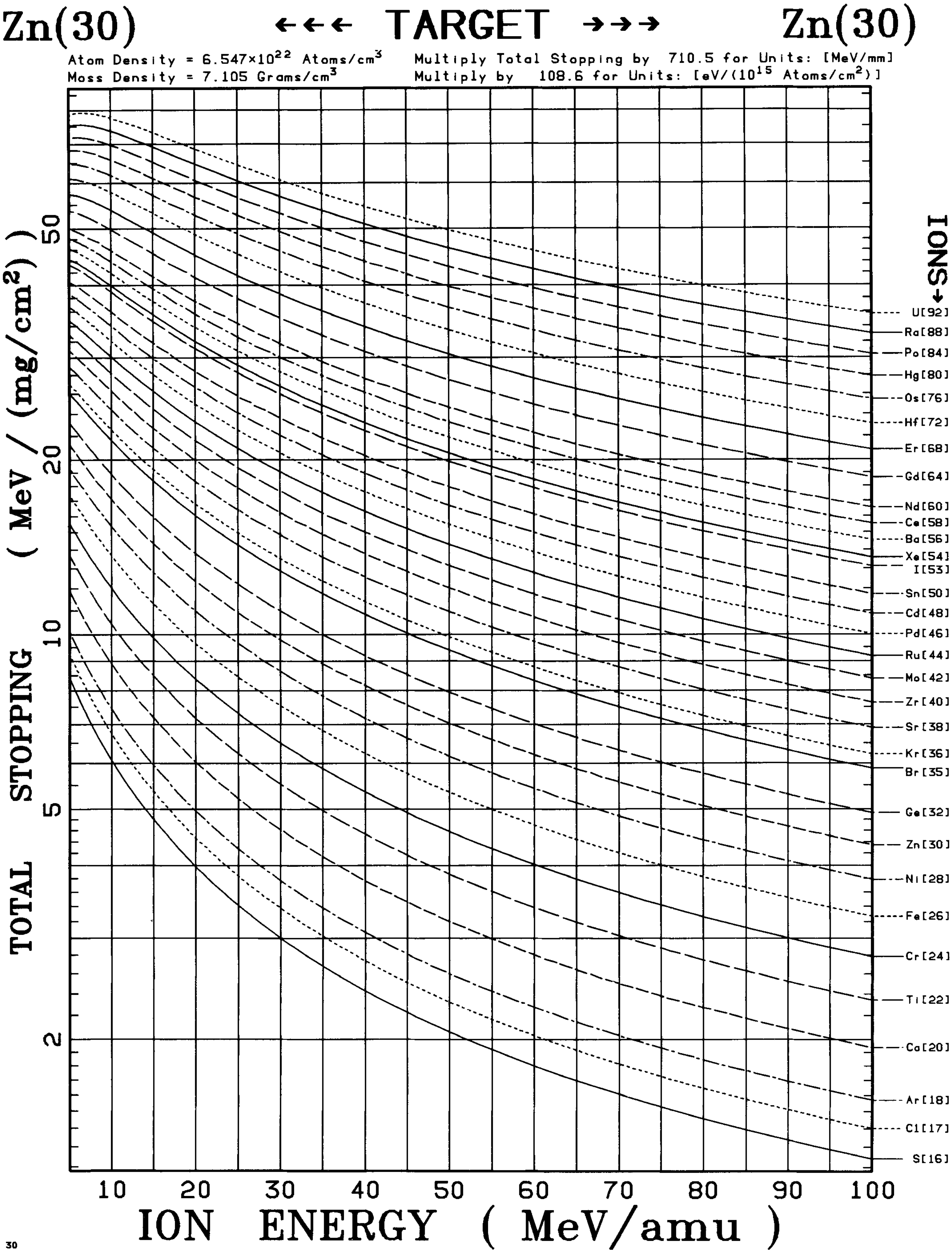



Zn(30) ←←← TARGET →→→ Zn(30)
Atom Density = 6.547×10^22 Atoms/cm^3
Mass Density = 7.105 Grams/cm^3
Multiply Total Stopping by 710.5 for Units: [MeV/mm]
Multiply by 108.6 for Units: [eV/(10^15 Atoms/cm^2)]
IONS
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm²))
50
40
30
20
10
9
8
7
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

Zn(30) ←←← TARGET →→→ Zn(30)

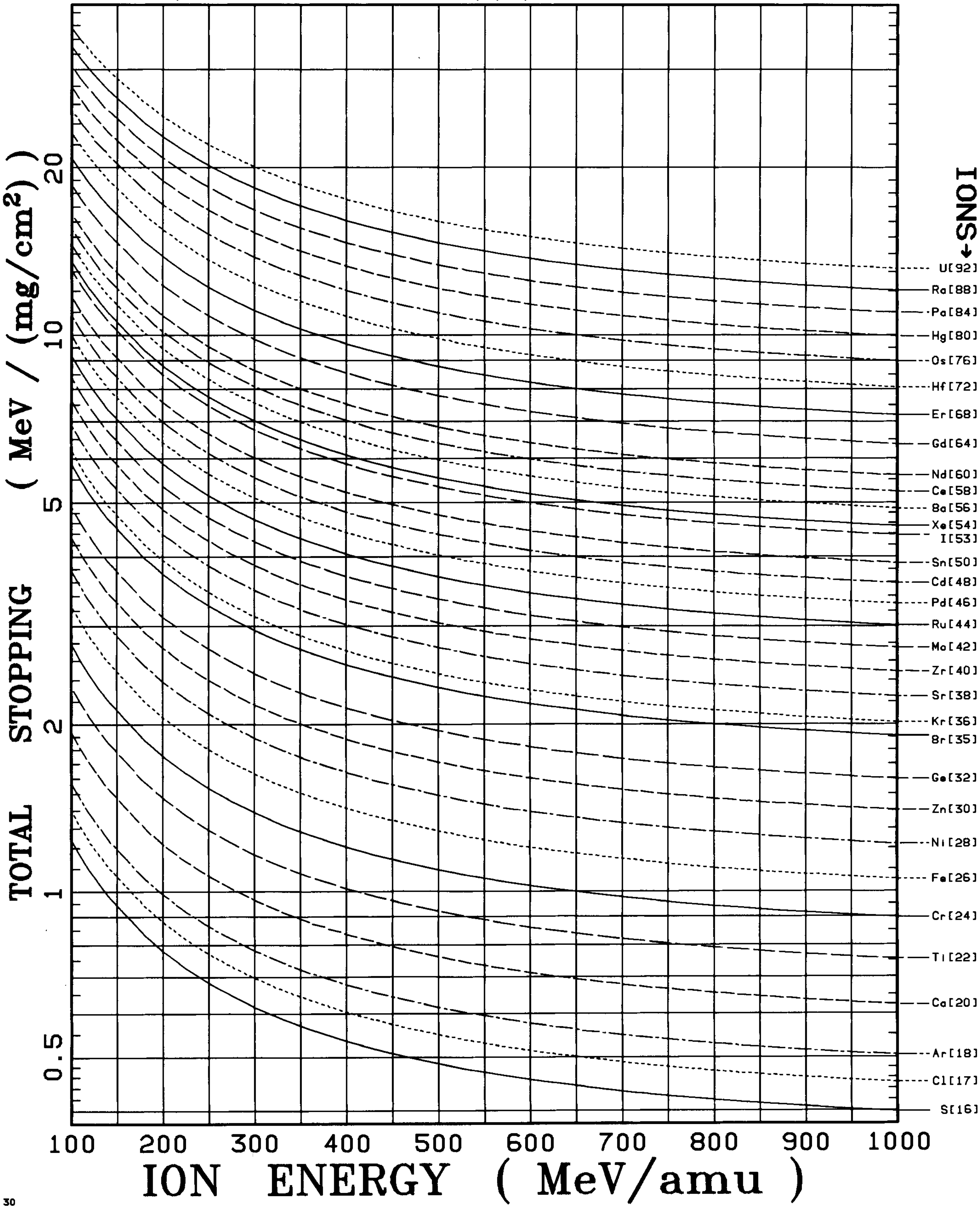
Atom Density = 6.547×10^{22} Atoms/cm^3 Multiply Total Stopping by 710.5 for Units: [MeV/mm]
Mass Density = 7.105 Grams/cm^3 Multiply by 108.6 for Units: [eV/(10^{15} Atoms/cm^2)]

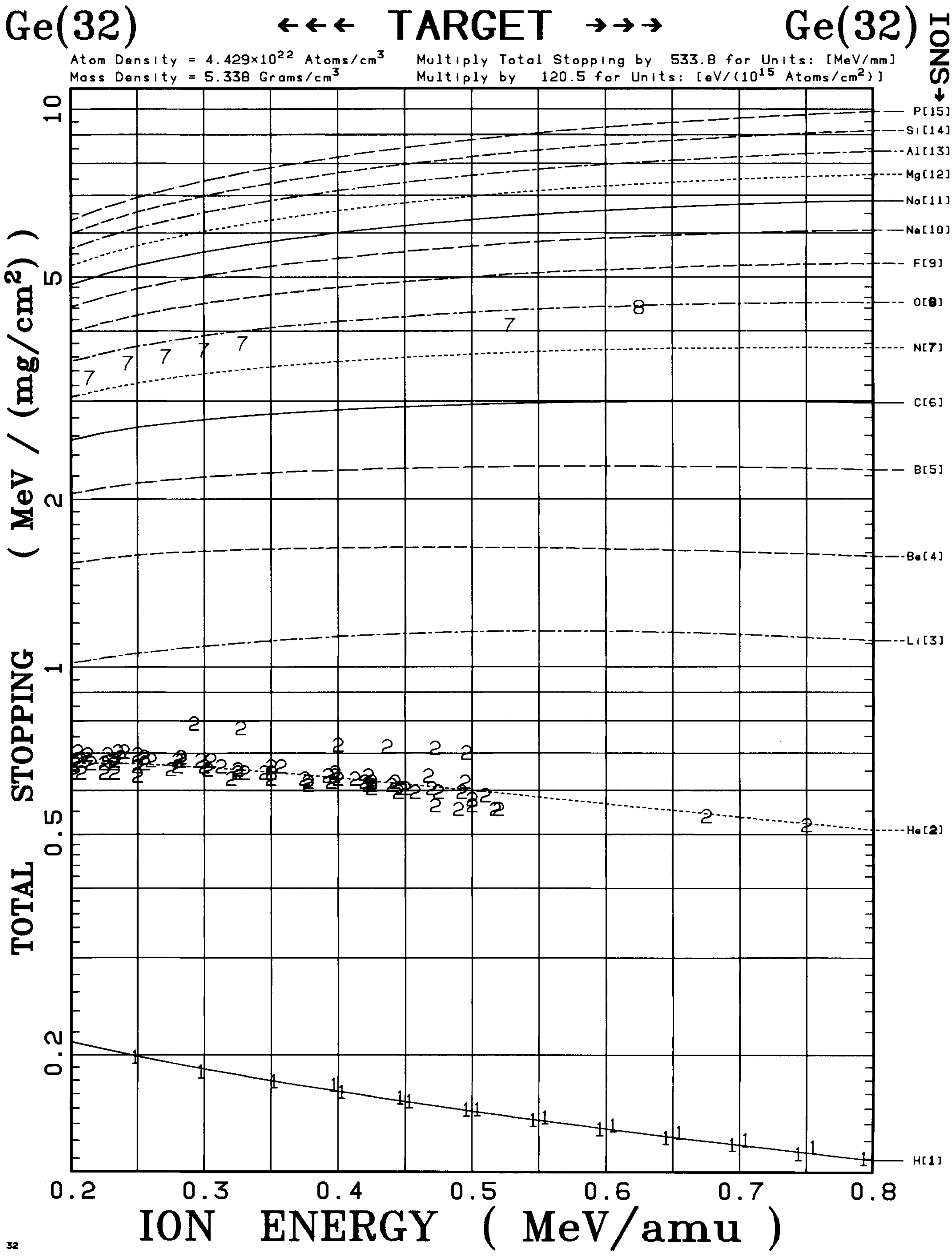



Zn(30)
←←← TARGET →→→
Zn(30)
Atom Density = 6.547×10^22 Atoms/cm^3
Mass Density = 7.105 Grams/cm^3
Multiply Total Stopping by 710.5 for Units: [MeV/mm]
Multiply by 108.6 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm²))
50
20
10
5
2
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
10
20
30
40
50
60
70
80
90
100
ION ENERGY (MeV/amu)

Zn(30) ←←← TARGET →→→ Zn(30)

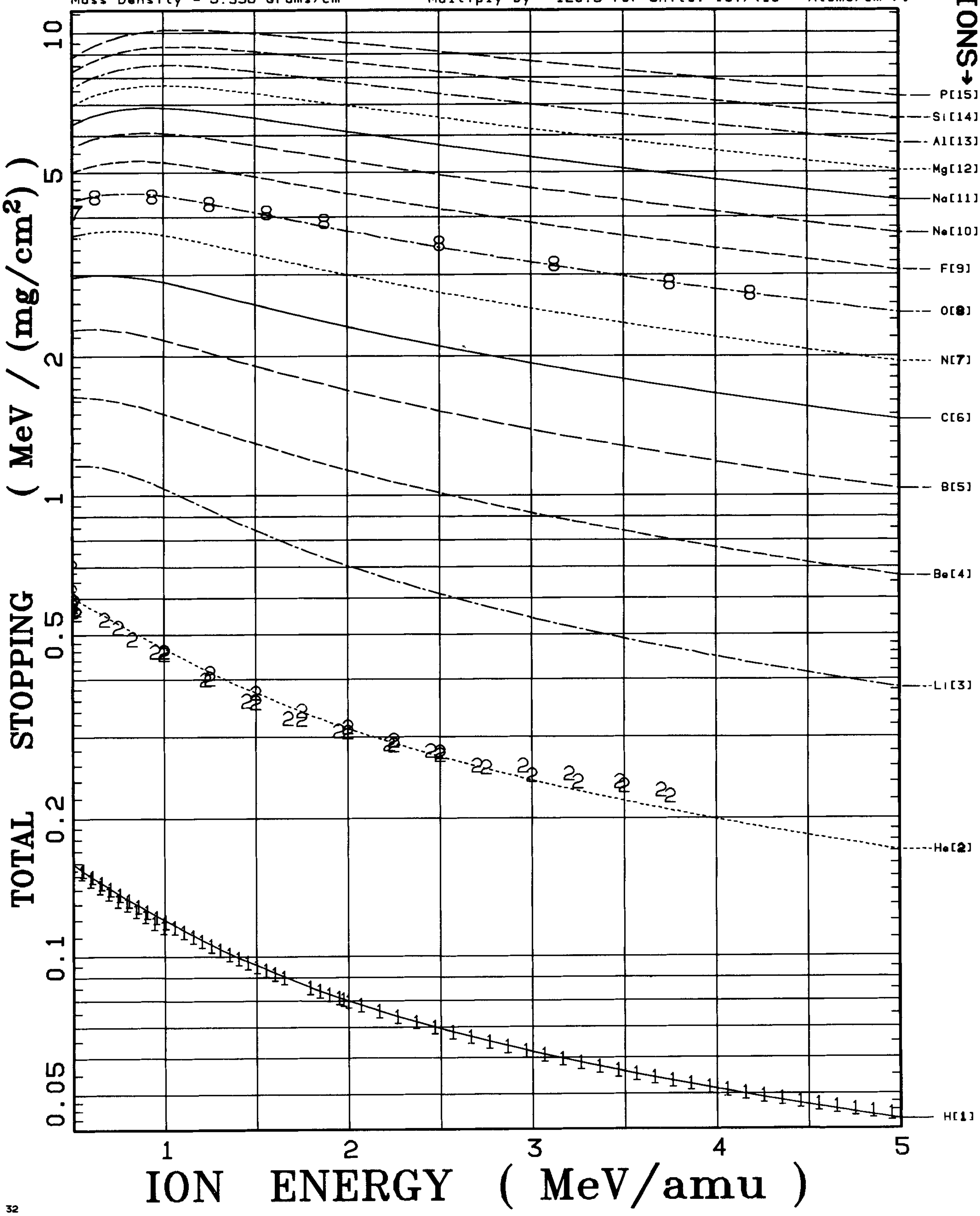
Atom Density = 6.547×10^{22} Atoms/cm^3 Multiply Total Stopping by 710.5 for Units: [MeV/mm]
Mass Density = 7.105 Grams/cm^3 Multiply by 108.6 for Units: [eV/(10^{15} Atoms/cm^2)]

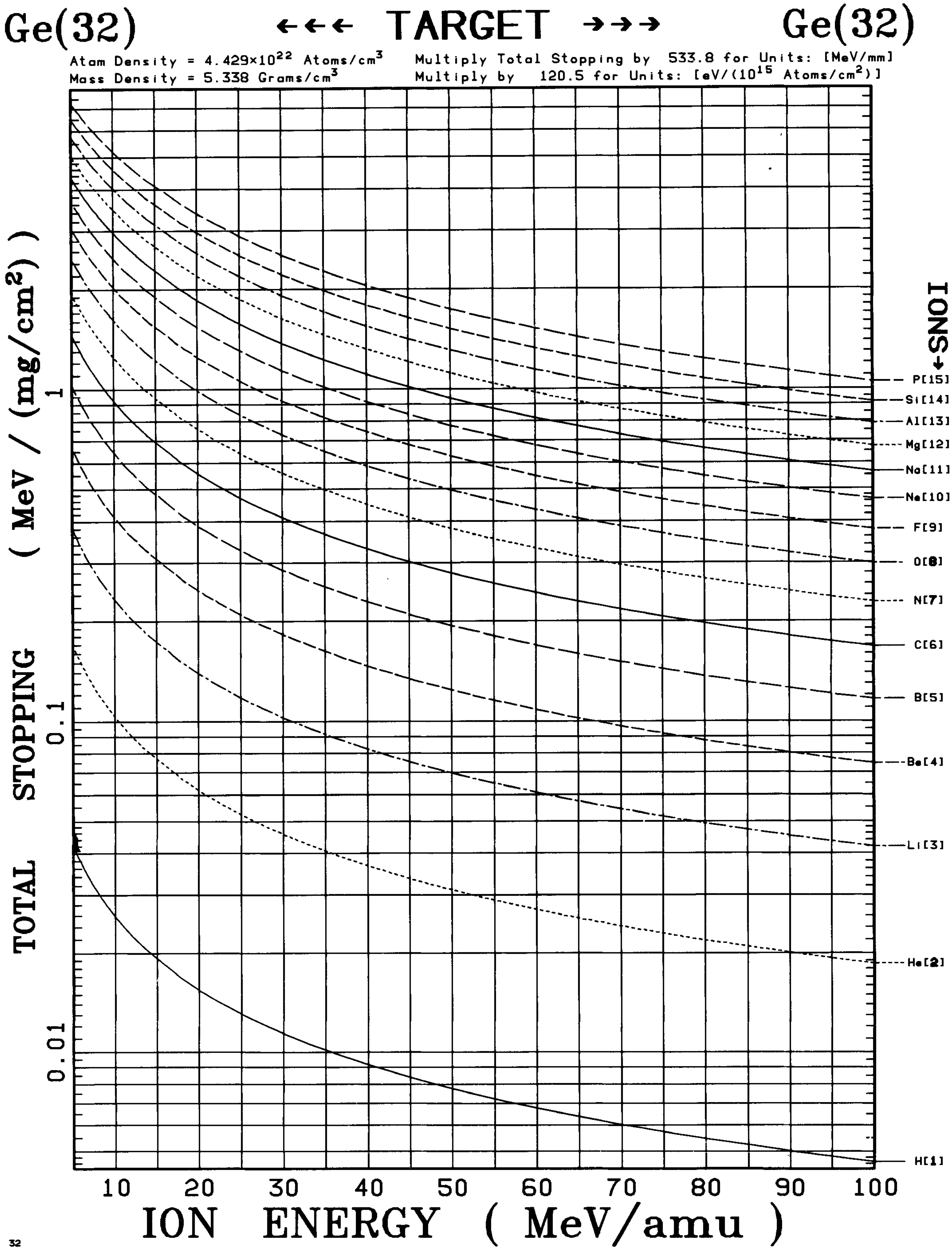



Ge(32)
←←← TARGET →→→
Ge(32)
IONS→
Atom Density = 4.429×10^22 Atoms/cm^3
Mass Density = 5.338 Grams/cm^3
Multiply Total Stopping by 533.8 for Units: [MeV/mm]
Multiply by 120.5 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
10
5
2
1
0.5
0.2
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

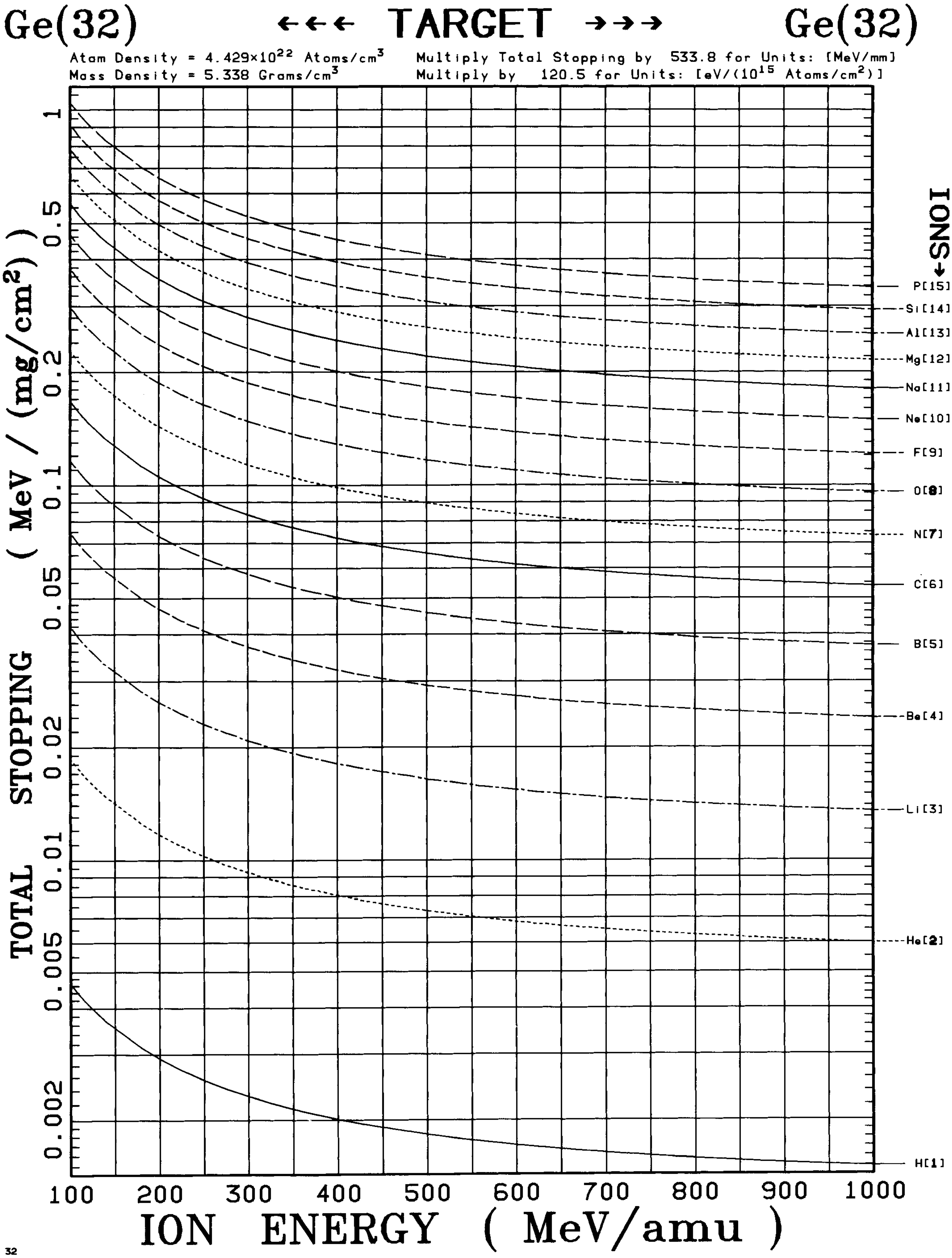
Ge(32) ←←← TARGET →→→ Ge(32)

Atom Density = 4.429×10^22 Atoms/cm^3 Multiply Total Stopping by 533.8 for Units: [MeV/mm]
Mass Density = 5.338 Grams/cm^3 Multiply by 120.5 for Units: [eV/(10^15 Atoms/cm^2)]





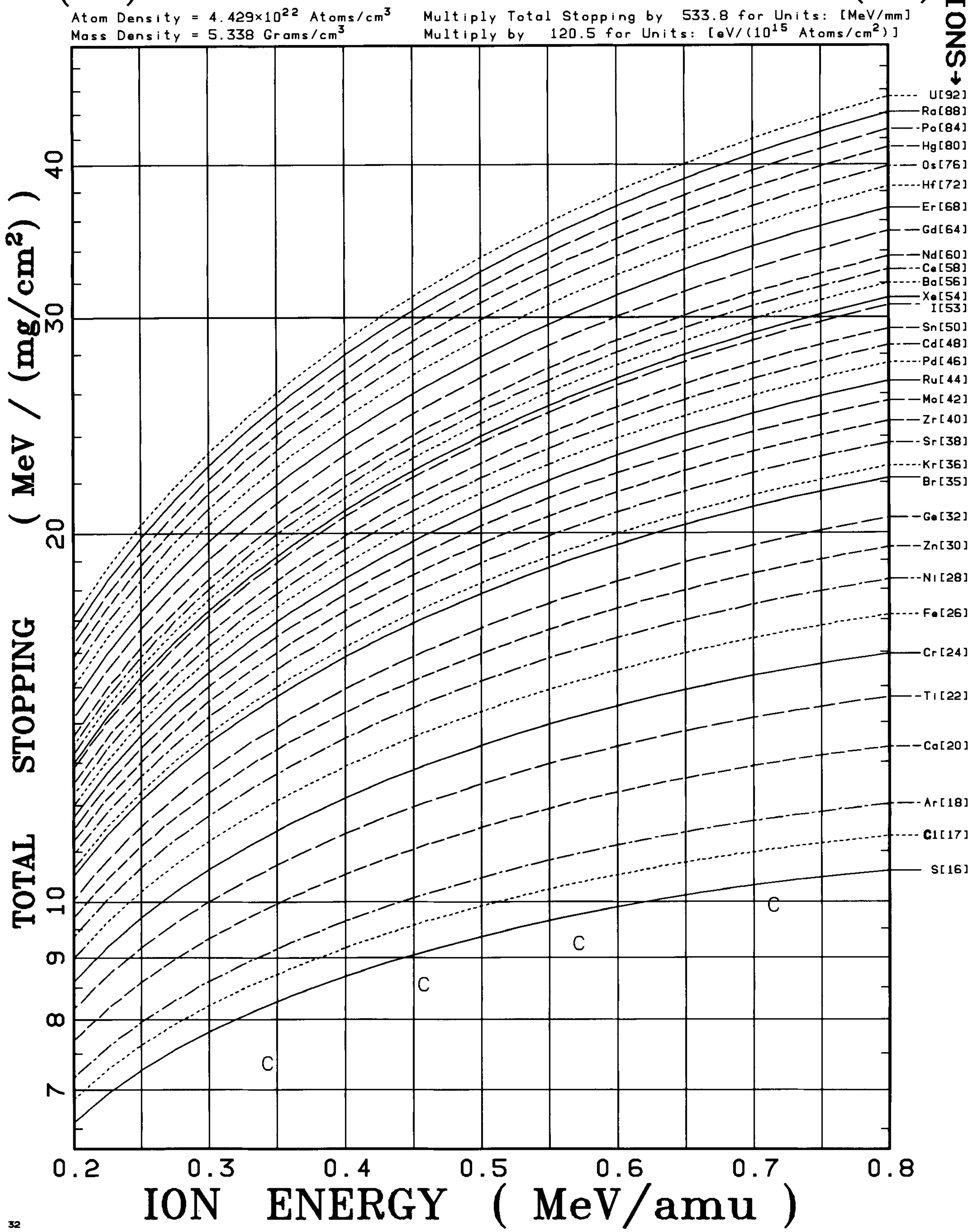
Ge(32)
←←← TARGET →→→
Ge(32)
Atom Density = 4.429×10^{22} Atoms/cm^3
Mass Density = 5.338 Grams/cm^3
Multiply Total Stopping by 533.8 for Units: [MeV/mm]
Multiply by 120.5 for Units: [eV/(10^{15} Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
1
0.1
0.01
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
10
20
30
40
50
60
70
80
90
100
ION ENERGY (MeV/amu)

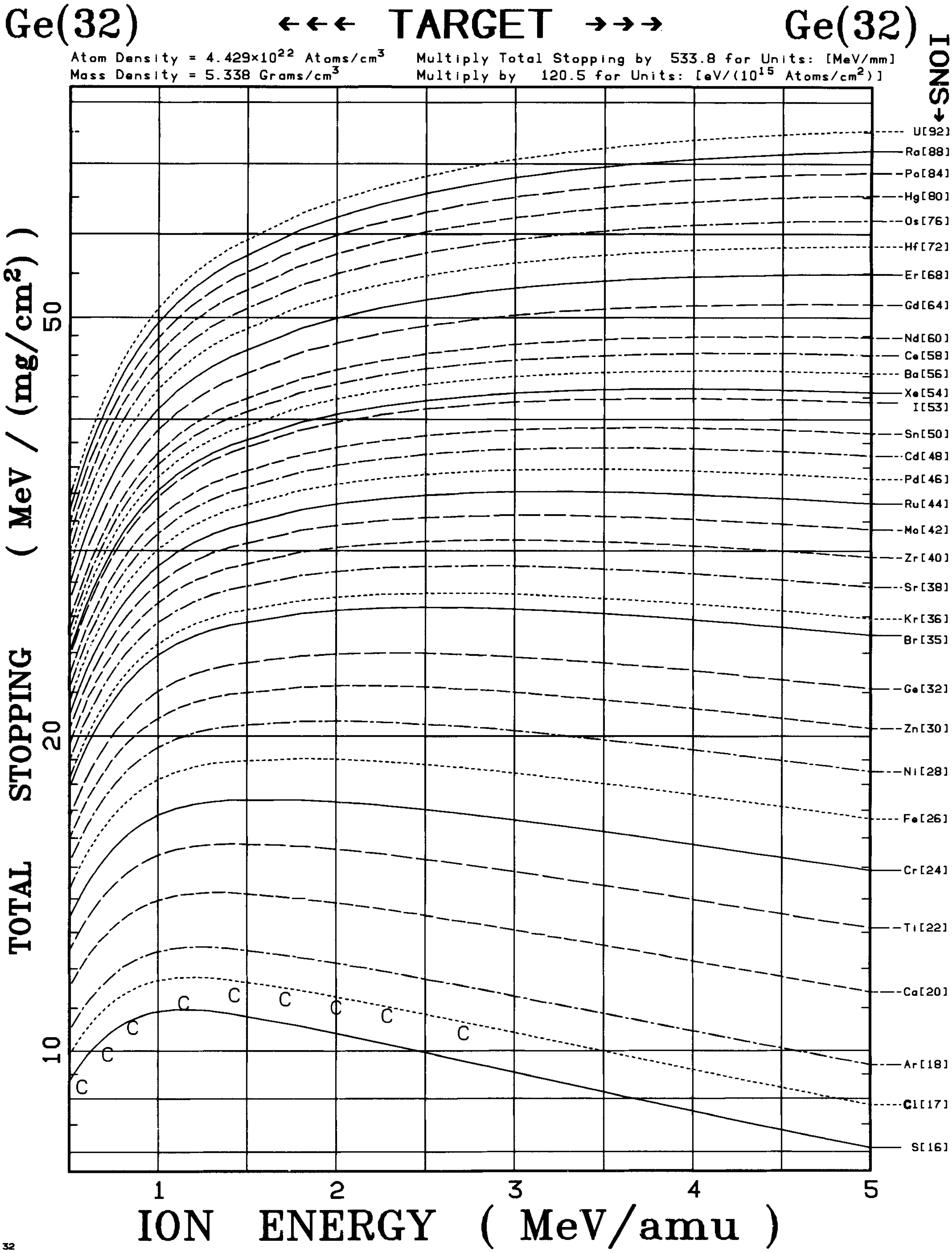

Ge(32) ←←← TARGET →→→ Ge(32)
Atom Density = 4.429×10^22 Atoms/cm^3
Multiply Total Stopping by 533.8 for Units: [MeV/mm]
Mass Density = 5.338 Grams/cm^3
Multiply by 120.5 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
1
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)

Ge(32) ←←← TARGET →→→ Ge(32)

Atom Density = 4.429×10^{22} Atoms/cm^3 Multiply Total Stopping by 533.8 for Units: [MeV/mm]

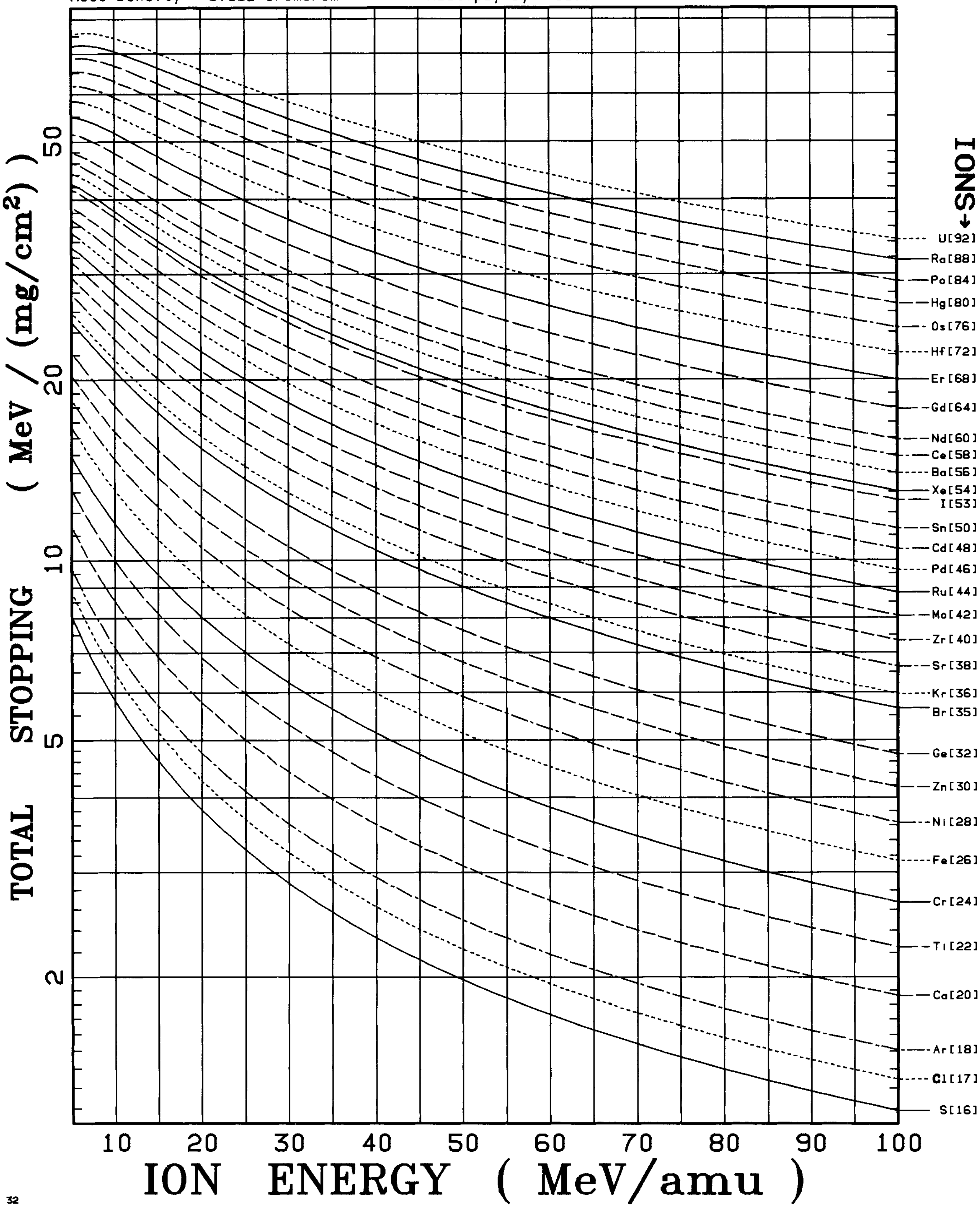
Mass Density = 5.338 Grams/cm^3 Multiply by 120.5 for Units: [eV/(10^{15} Atoms/cm^2)]




Ge(32) ←←← TARGET →→→ Ge(32)
Atom Density = 4.429×10²² Atoms/cm³
Mass Density = 5.338 Grams/cm³
Multiply Total Stopping by 533.8 for Units: [MeV/mm]
Multiply by 120.5 for Units: [eV/(10¹⁵ Atoms/cm²)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm²))
50
20
10
1
2
3
4
5
ION ENERGY (MeV/amu)

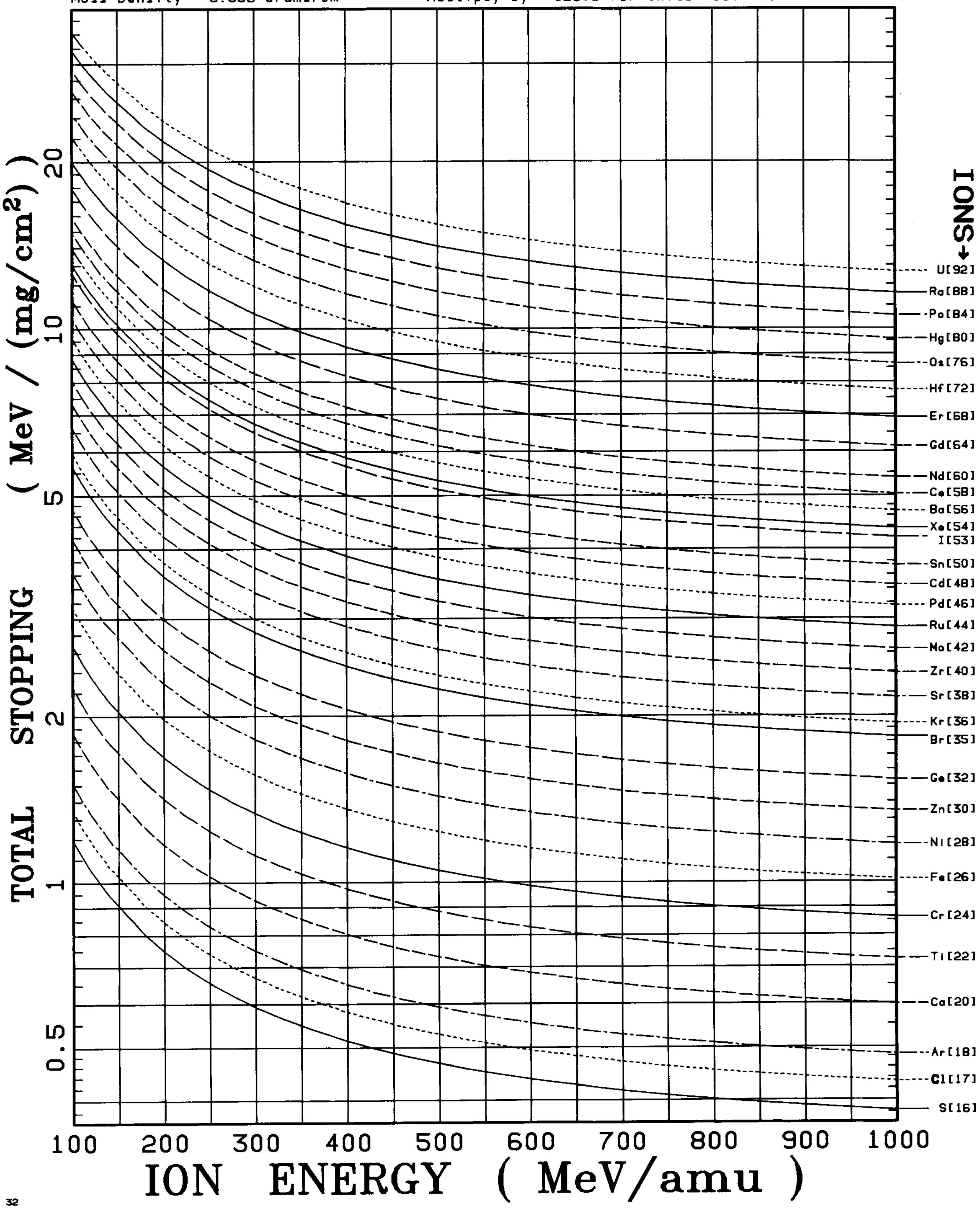
Ge(32) ←←← TARGET →→→ Ge(32)

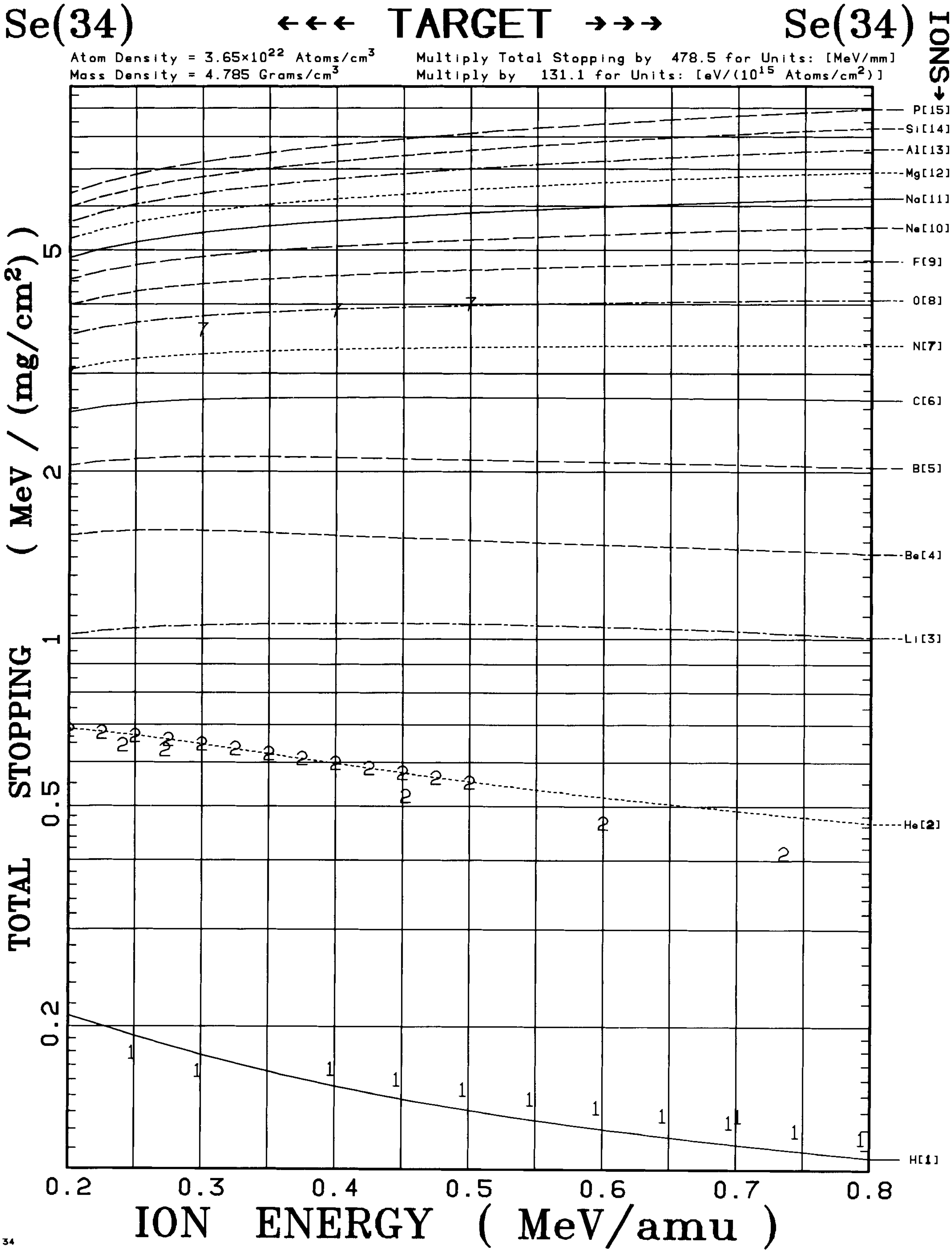
Atom Density = 4.429×10^{22} Atoms/cm^3 Multiply Total Stopping by 533.8 for Units: [MeV/mm]
Mass Density = 5.338 Grams/cm^3 Multiply by 120.5 for Units: [eV/(10^{15} Atoms/cm^2)]



Ge(32) ←←← TARGET →→→ Ge(32)

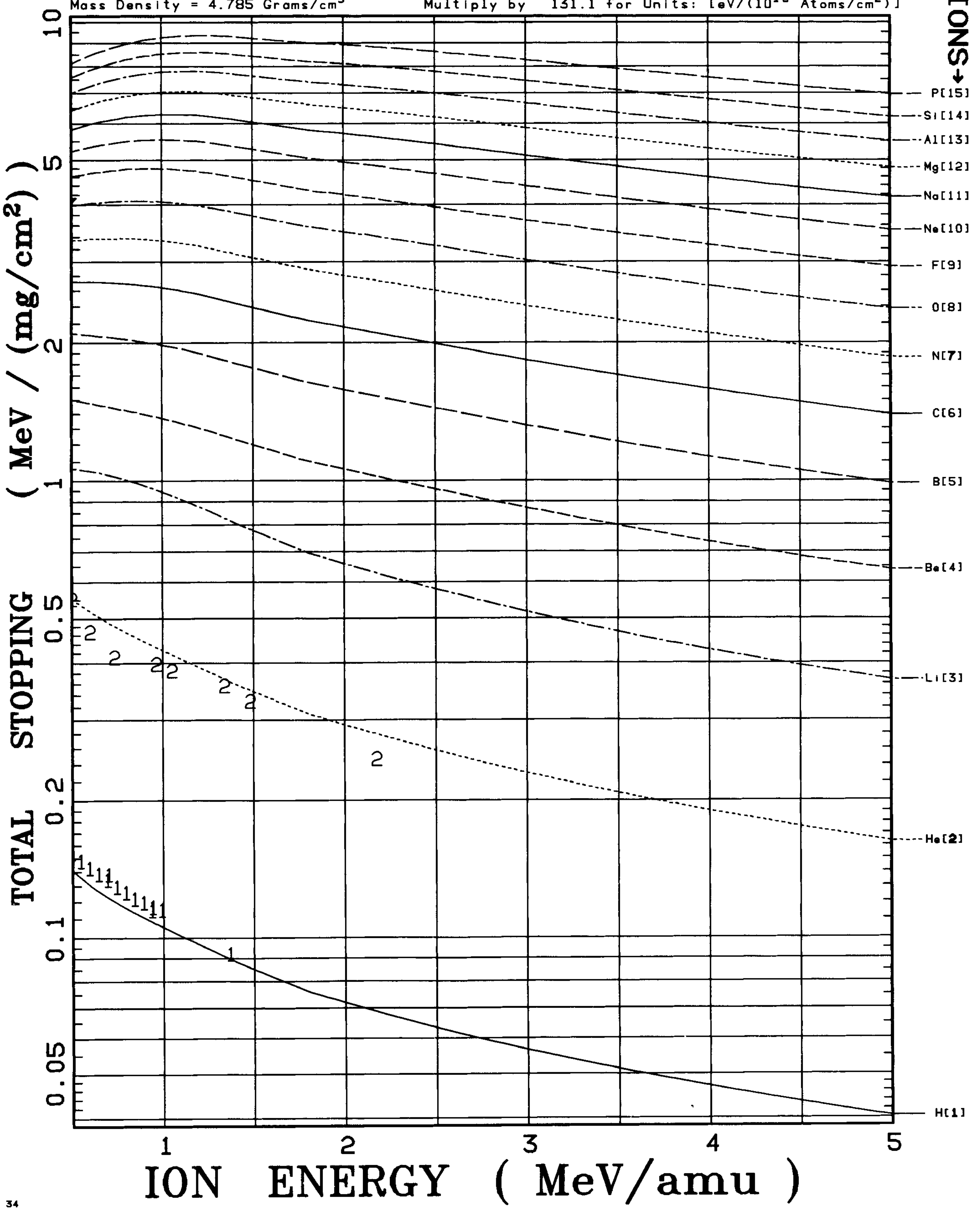
Atom Density = 4.429×10^{22} Atoms/cm^3 Multiply Total Stopping by 533.8 for Units: [MeV/mm]
Mass Density = 5.338 Grams/cm^3 Multiply by 120.5 for Units: [eV/(10^{15} Atoms/cm^2)]

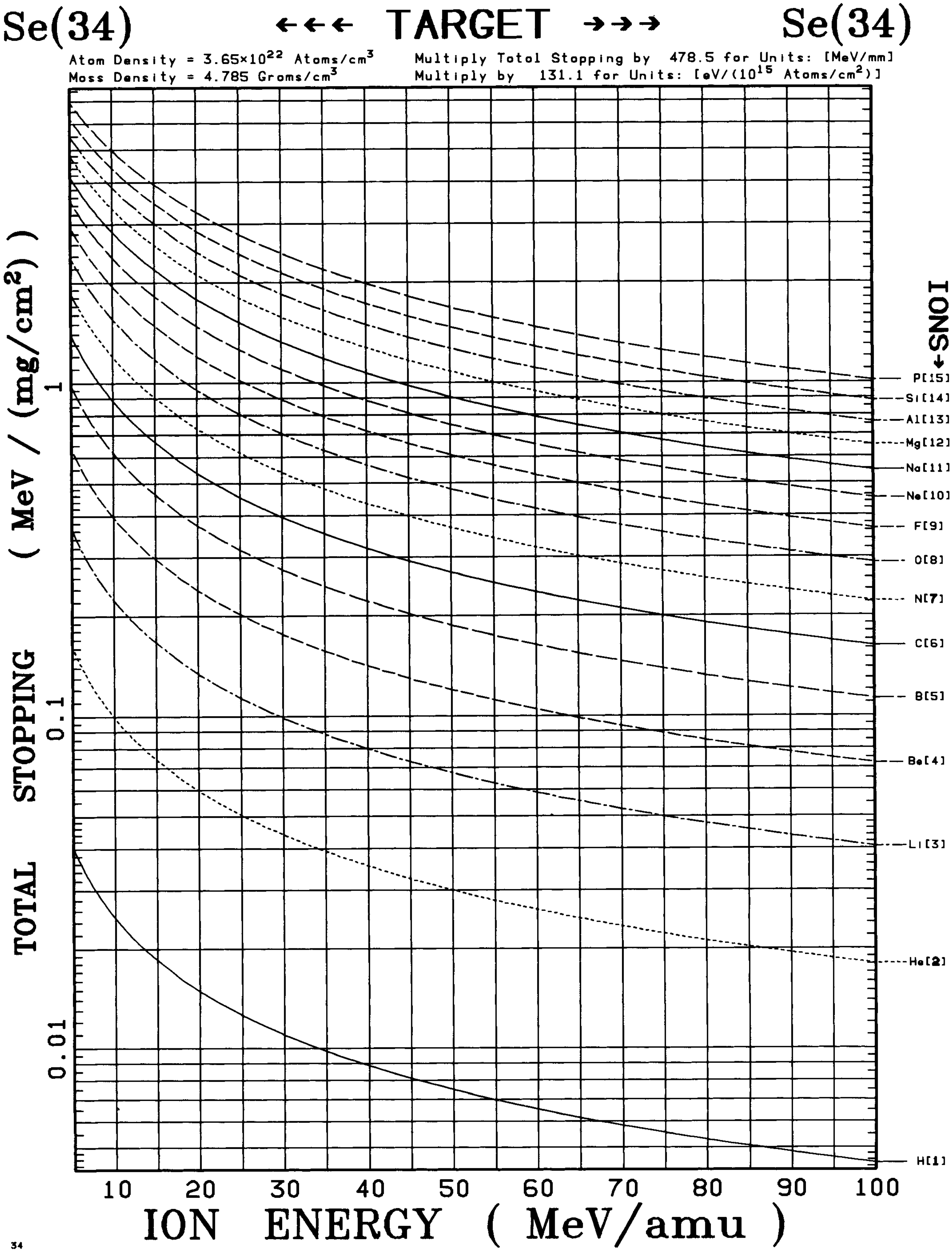



Se(34)
←←← TARGET →→→
Se(34)
IONS→
Atom Density = 3.65×10^22 Atoms/cm^3
Mass Density = 4.785 Grams/cm^3
Multiply Total Stopping by 478.5 for Units: [MeV/mm]
Multiply by 131.1 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
0.2
0.3
0.4
0.5
0.6
0.7
0.8
5
2
1
0.5
0.2

Se(34) ←←← TARGET →→→ Se(34)

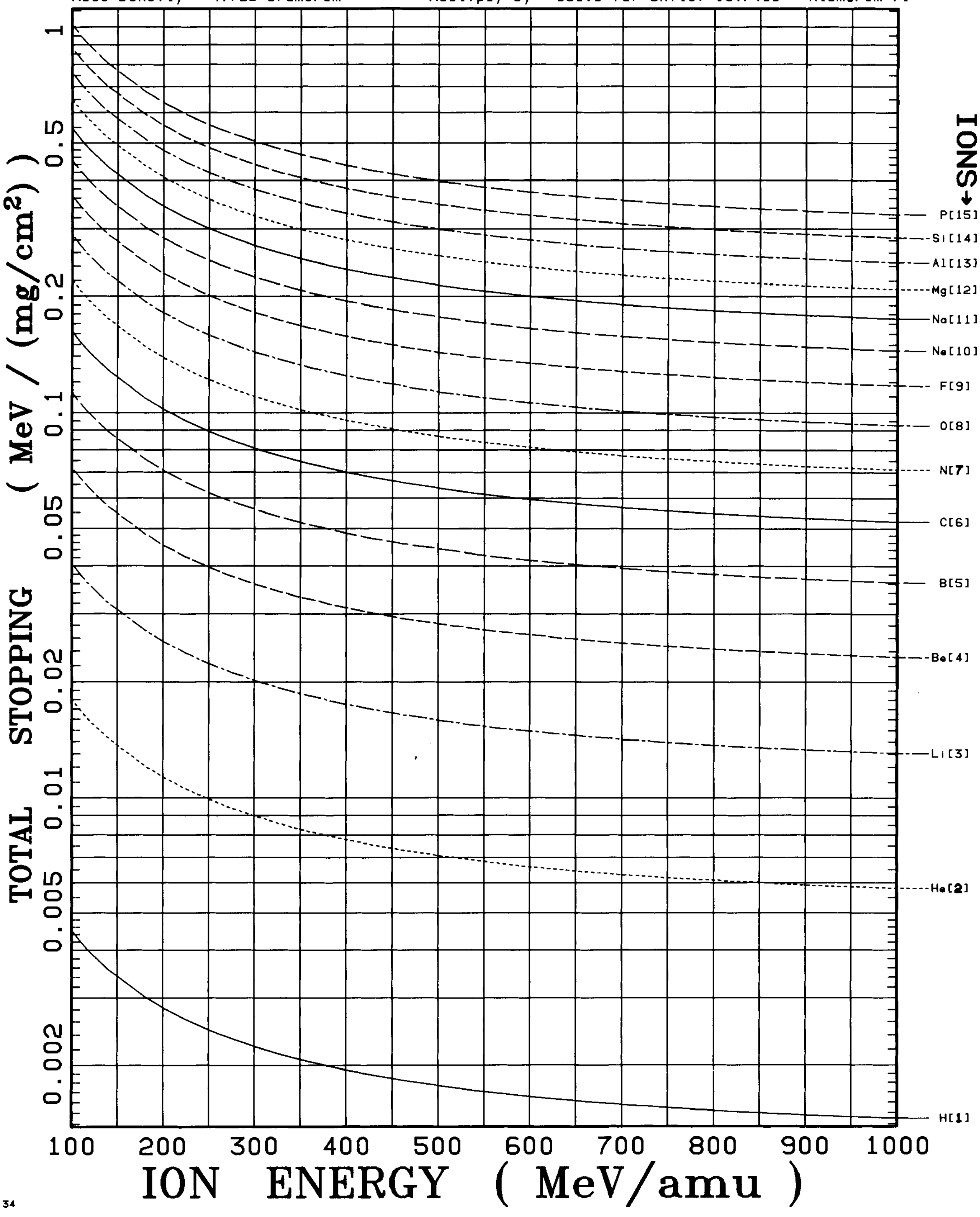
Atom Density = 3.65×10^{22} Atoms/cm^3 Multiply Total Stopping by 478.5 for Units: [MeV/mm]
Mass Density = 4.785 Grams/cm^3 Multiply by 131.1 for Units: [eV/(10^{15} Atoms/cm^2)]




Se(34) ←←← TARGET →→→ Se(34)
Atom Density = 3.65×10^22 Atoms/cm^3
Mass Density = 4.785 Grams/cm^3
Multiply Total Stopping by 478.5 for Units: [MeV/mm]
Multiply by 131.1 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm²))
1
0.1
0.01
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
10
20
30
40
50
60
70
80
90
100
ION ENERGY (MeV/amu)

Se(34) ←←← TARGET →→→ Se(34)

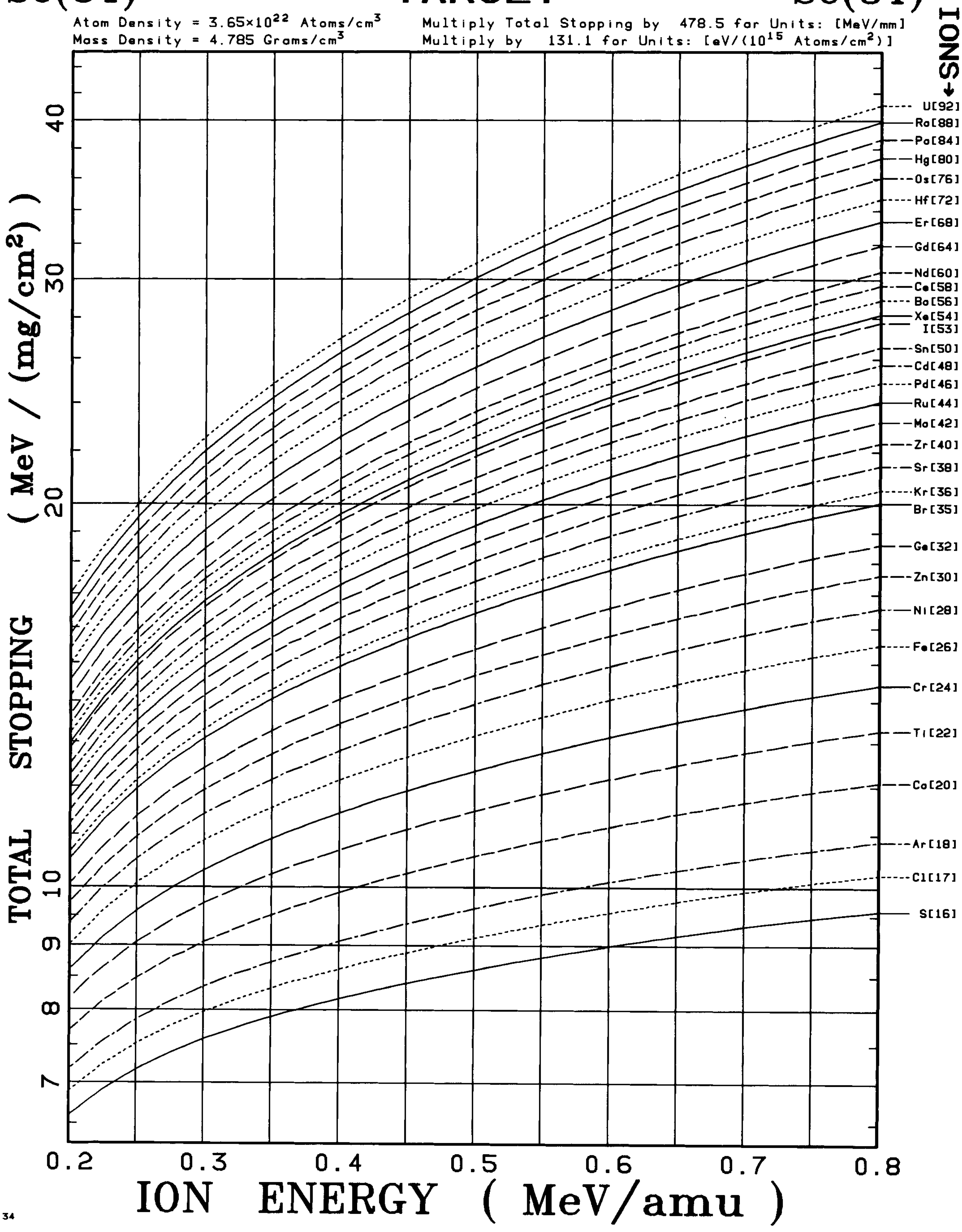
Atom Density = 3.65×10^{22} Atoms/cm^3 Multiply Total Stopping by 478.5 for Units: [MeV/mm]
Mass Density = 4.785 Grams/cm^3 Multiply by 131.1 for Units: [eV/(10^{15} Atoms/cm^2)]



Se(34) ←←← TARGET →→→ Se(34)

Atom Density = 3.65×10^{22} Atoms/cm^3
Mass Density = 4.785 Grams/cm^3

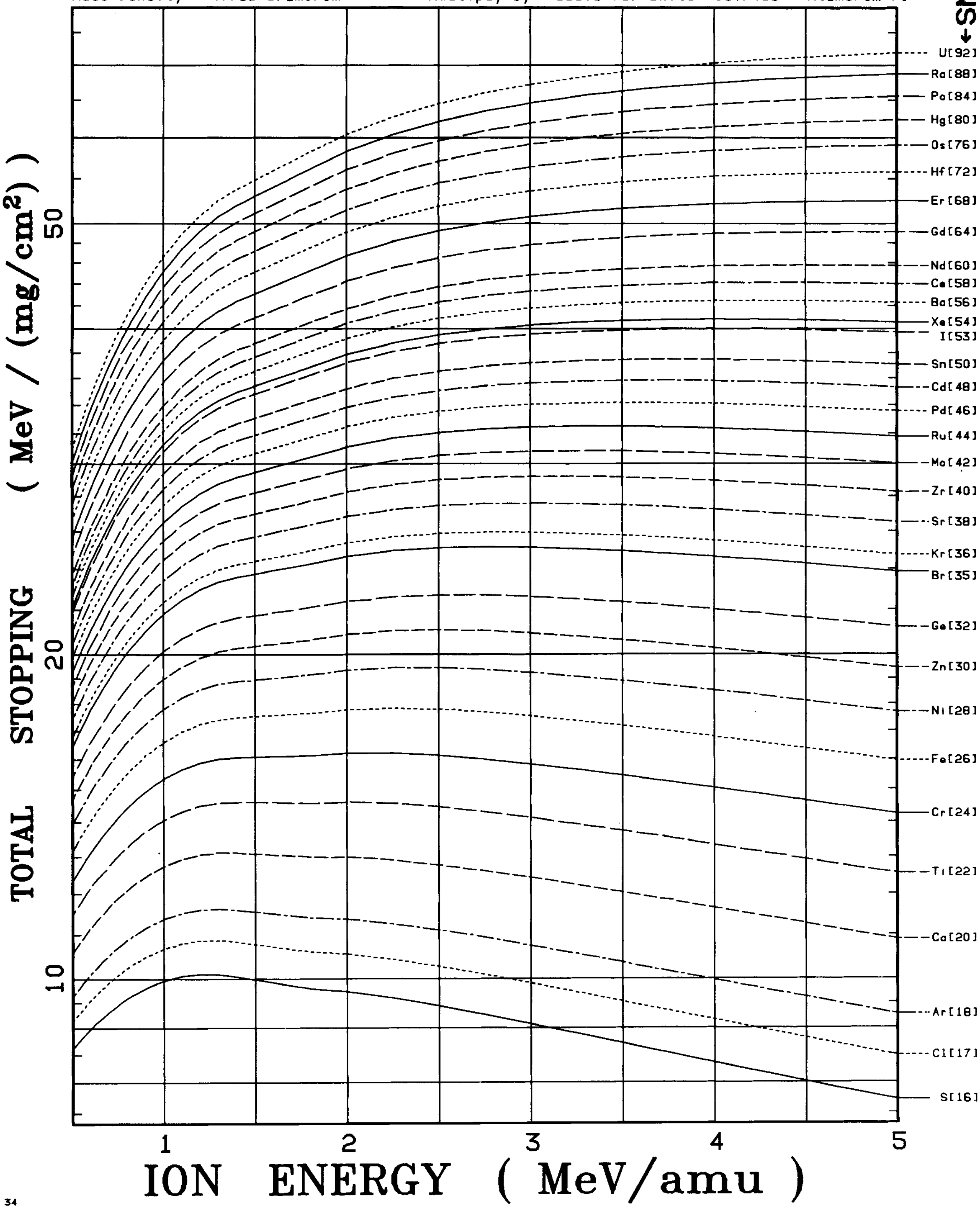
Multiply Total Stopping by 478.5 for Units: [MeV/mm]
Multiply by 131.1 for Units: [eV/(10^{15} Atoms/cm^2)]



Se(34) ←←← TARGET →→→ Se(34)

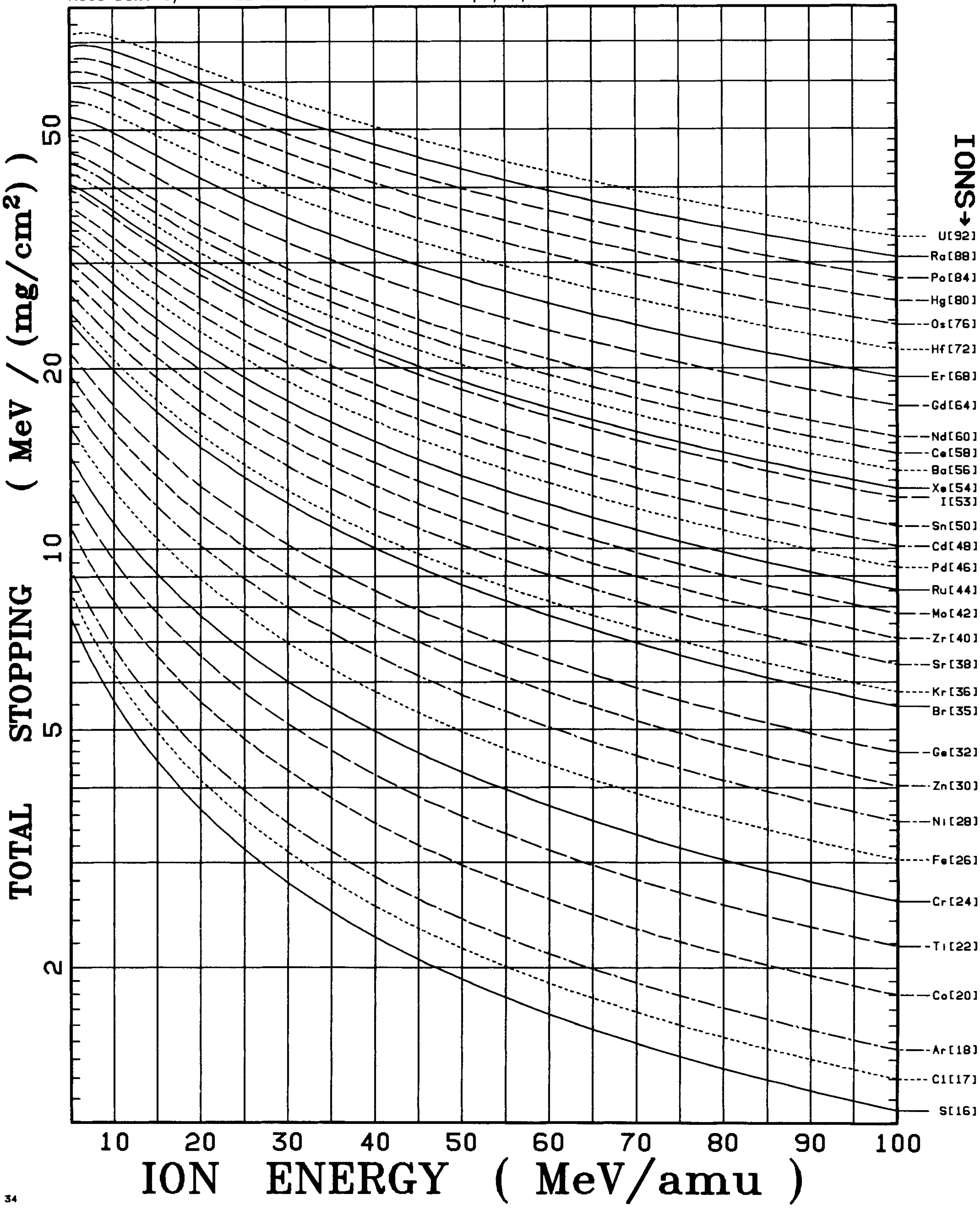
Atom Density = 3.65×10^{22} Atoms/cm^3 Multiply Total Stopping by 478.5 for Units: [MeV/mm]

Mass Density = 4.785 Grams/cm^3 Multiply by 131.1 for Units: [eV/(10^{15} Atoms/cm^2)]



Se(34) ←←← TARGET →→→ Se(34)

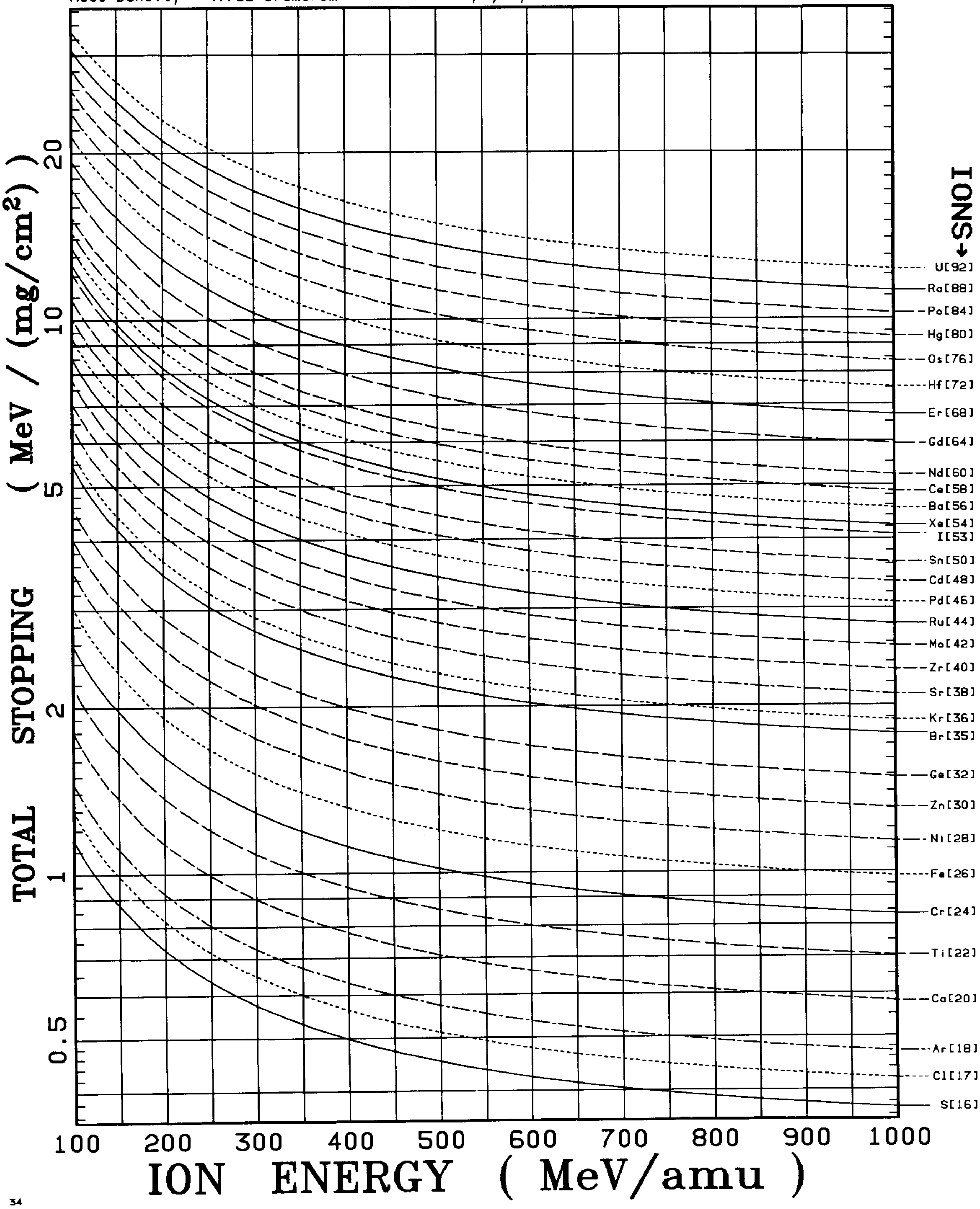
Atom Density = 3.65×10^{22} Atoms/cm^3 Multiply Total Stopping by 478.5 for Units: [MeV/mm]
Mass Density = 4.785 Grams/cm^3 Multiply by 131.1 for Units: [eV/(10^{15} Atoms/cm^2)]

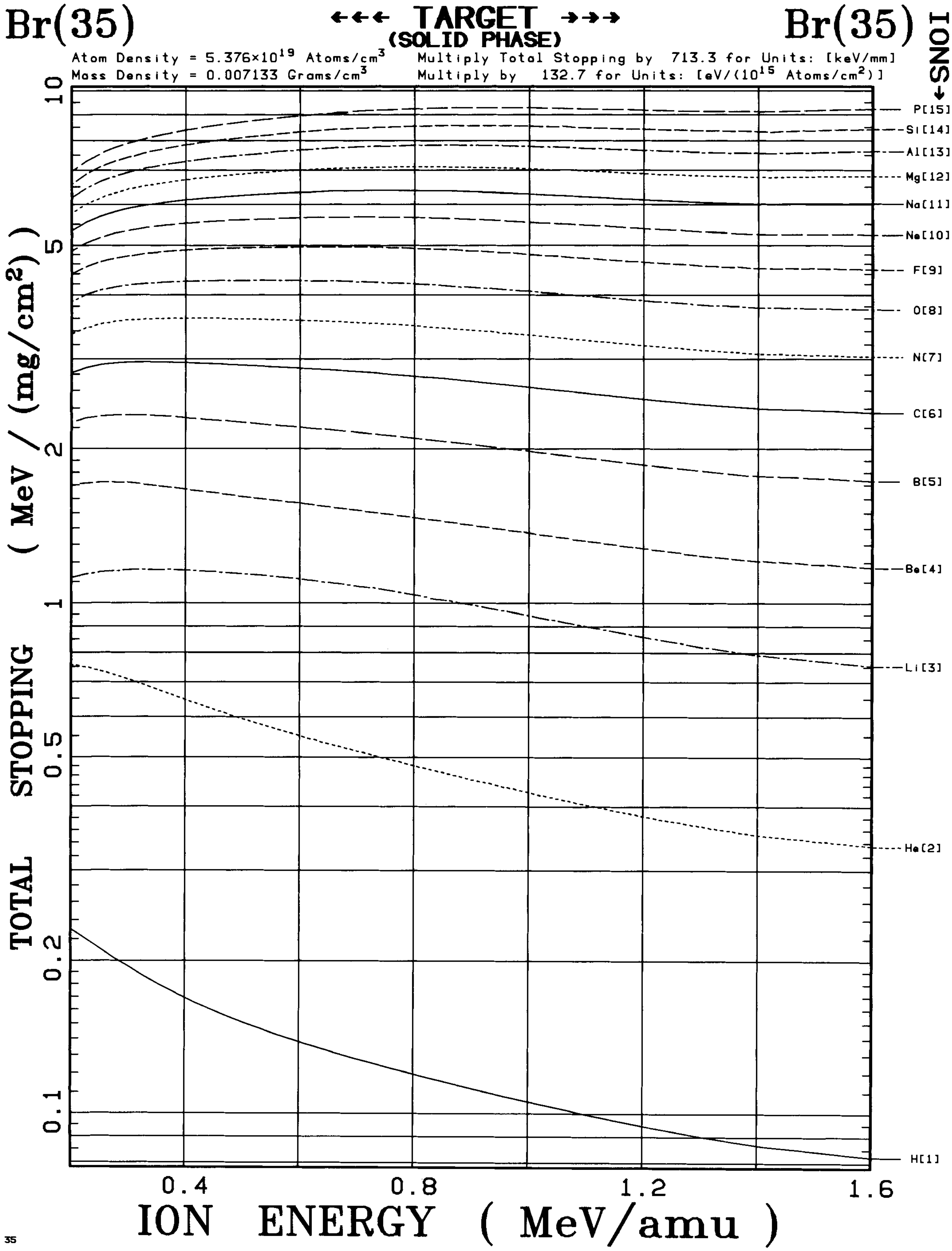


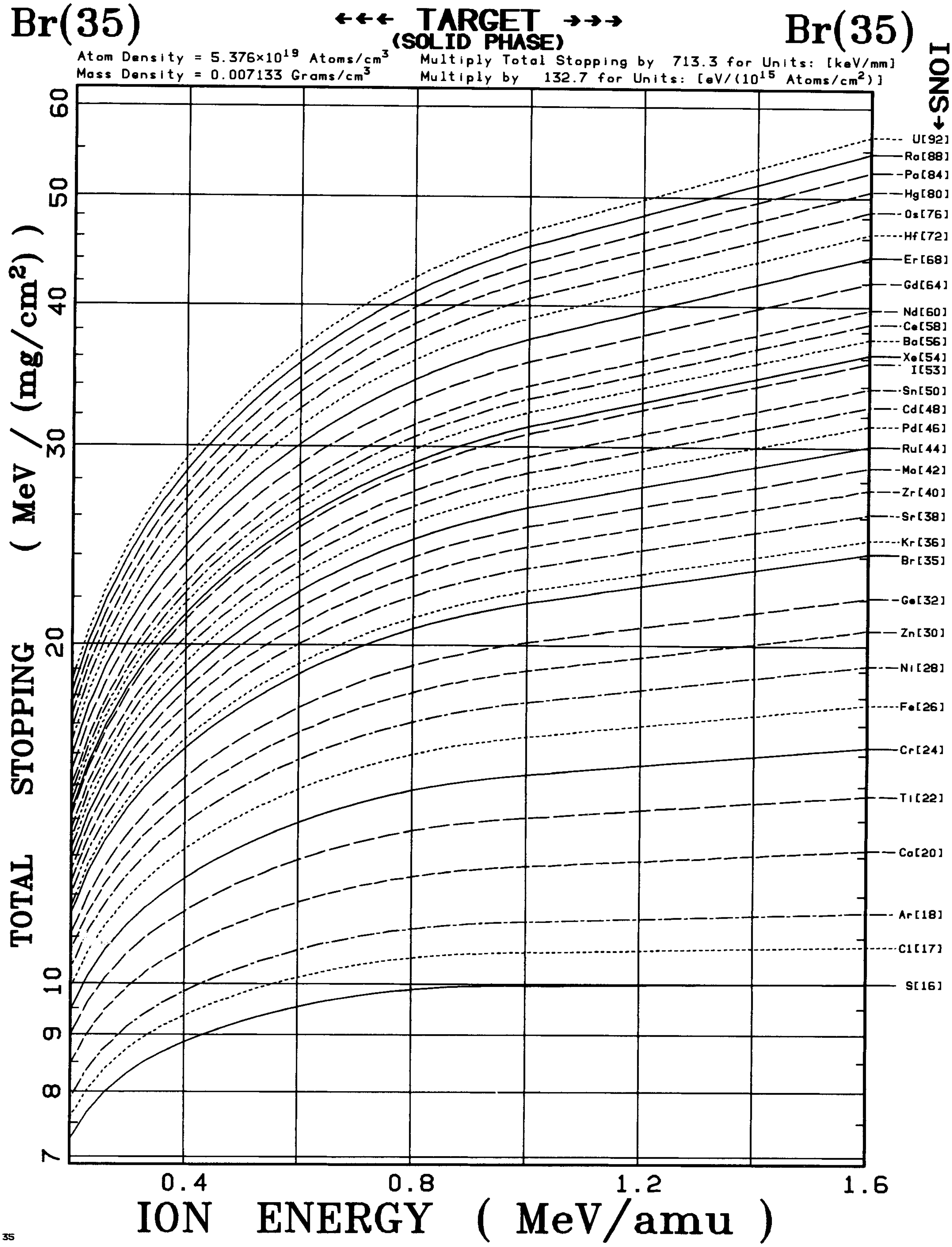
Se(34) ←←← TARGET →→→ Se(34)

Atom Density = 3.65×10^{22} Atoms/cm^3
Mass Density = 4.785 Grams/cm^3

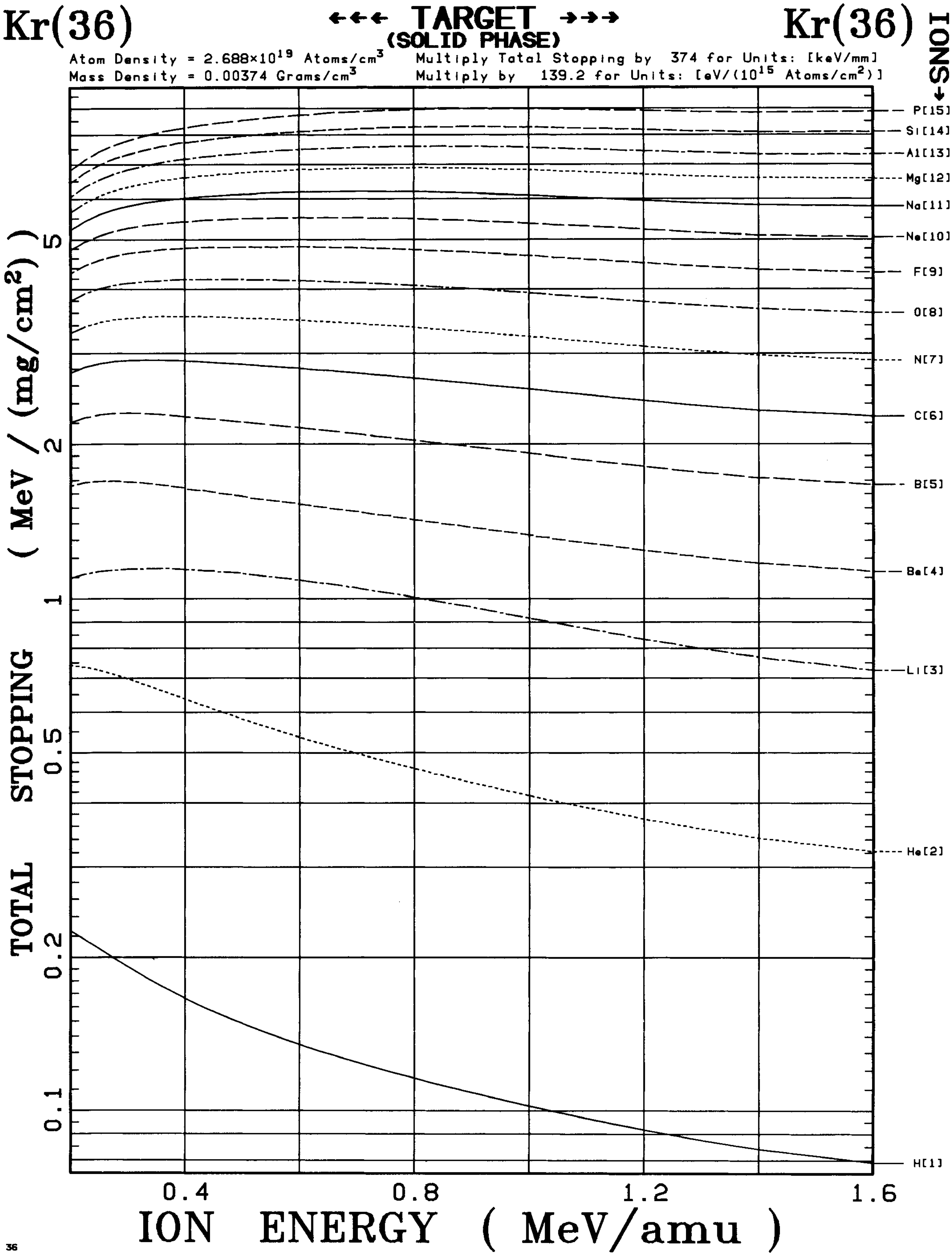
Multiply Total Stopping by 478.5 for Units: [MeV/mm]
Multiply by 131.1 for Units: [eV/(10^{15} Atoms/cm^2)]

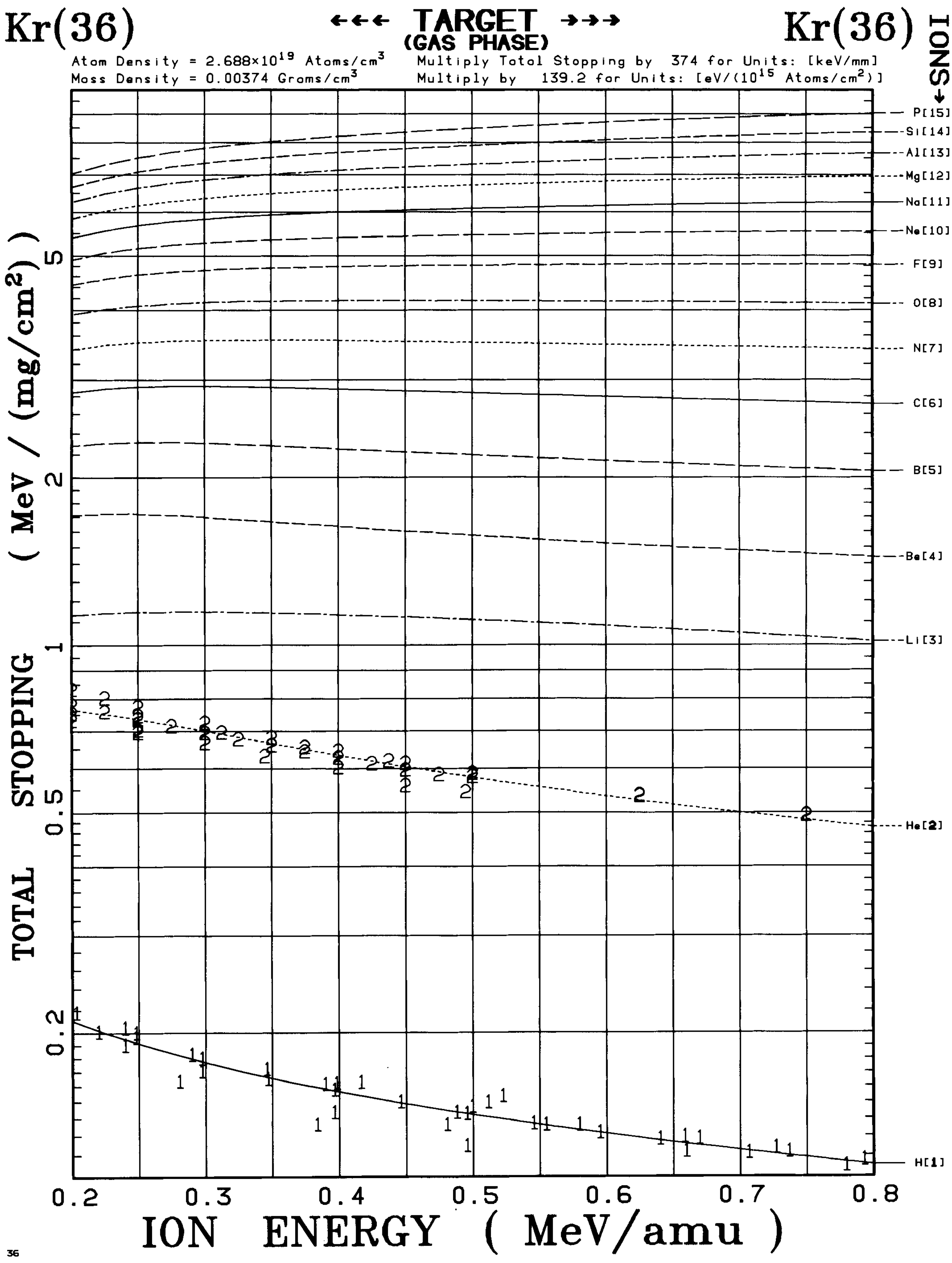



Br(35)
←←← TARGET →→→
(SOLID PHASE)
Br(35)
IONS→
Atom Density = 5.376×10^19 Atoms/cm^3
Multiply Total Stopping by 713.3 for Units: [keV/mm]
Mass Density = 0.007133 Grams/cm^3
Multiply by 132.7 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
10
5
2
1
0.5
0.2
0.1
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
0.4
0.8
1.2
1.6
ION ENERGY (MeV/amu)



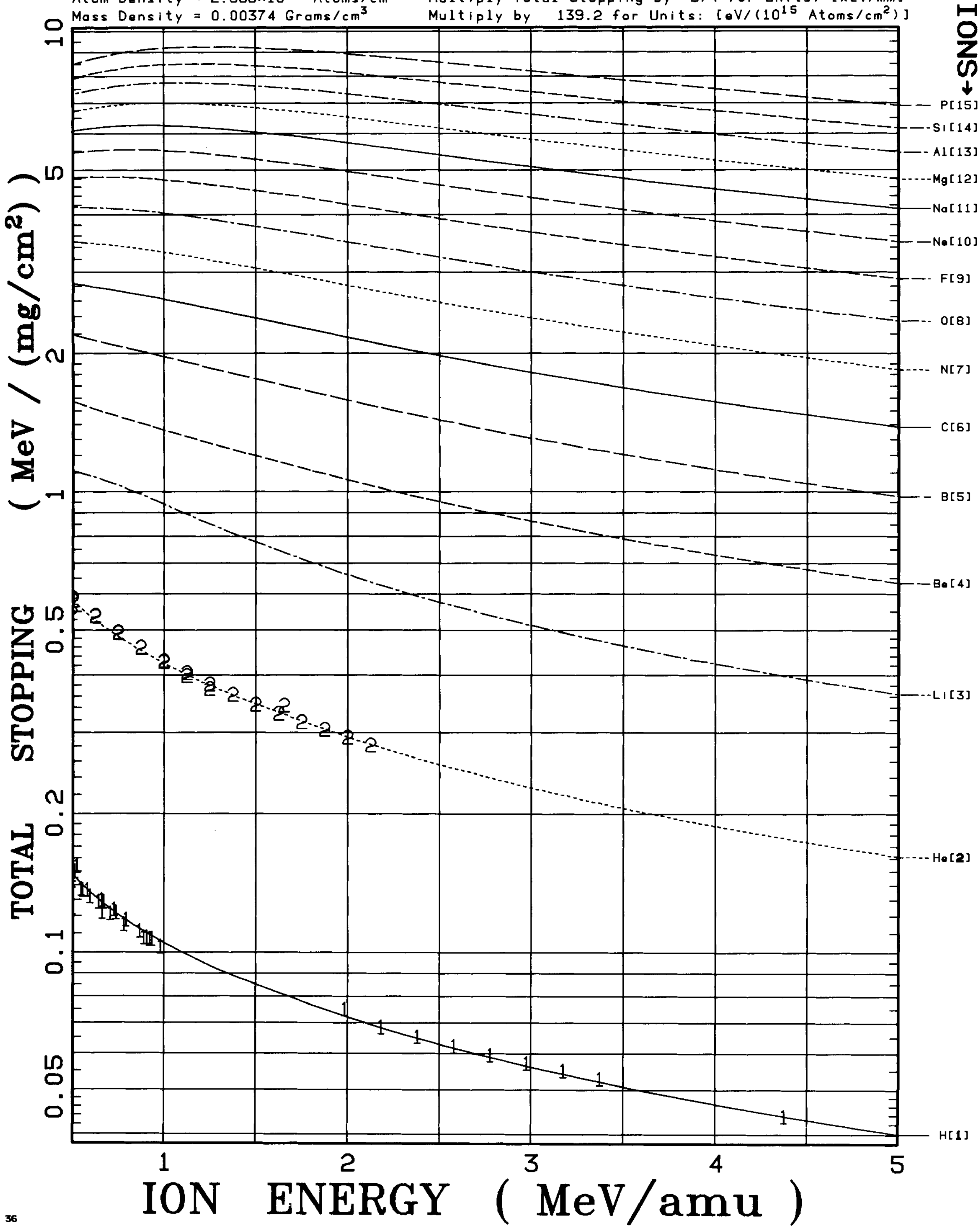
Br(35)
←←← TARGET →→→
(SOLID PHASE)
Br(35)
Atom Density = 5.376×10^19 Atoms/cm^3
Mass Density = 0.007133 Grams/cm^3
Multiply Total Stopping by 713.3 for Units: [keV/mm]
Multiply by 132.7 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm^2))
7
8
9
10
20
30
40
50
60
0.4
0.8
1.2
1.6
ION ENERGY (MeV/amu)


Kr(36)
←←← TARGET →→→
(SOLID PHASE)
Kr(36)
IONS→
Atom Density = 2.688×10^19 Atoms/cm^3
Mass Density = 0.00374 Grams/cm^3
Multiply Total Stopping by 374 for Units: [keV/mm]
Multiply by 139.2 for Units: [eV/(10^15 Atoms/cm^2)]
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm²))
5
2
1
0.5
0.2
0.1
0.4
0.8
1.2
1.6
ION ENERGY (MeV/amu)


Kr(36)
←←← TARGET →→→
(GAS PHASE)
Kr(36)
IONS→
Atom Density = 2.688x10^19 Atoms/cm^3
Mass Density = 0.00374 Grams/cm^3
Multiply Total Stopping by 374 for Units: [keV/mm]
Multiply by 139.2 for Units: [eV/(10^15 Atoms/cm^2)]
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm^2))
0.2
0.5
1
2
5
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

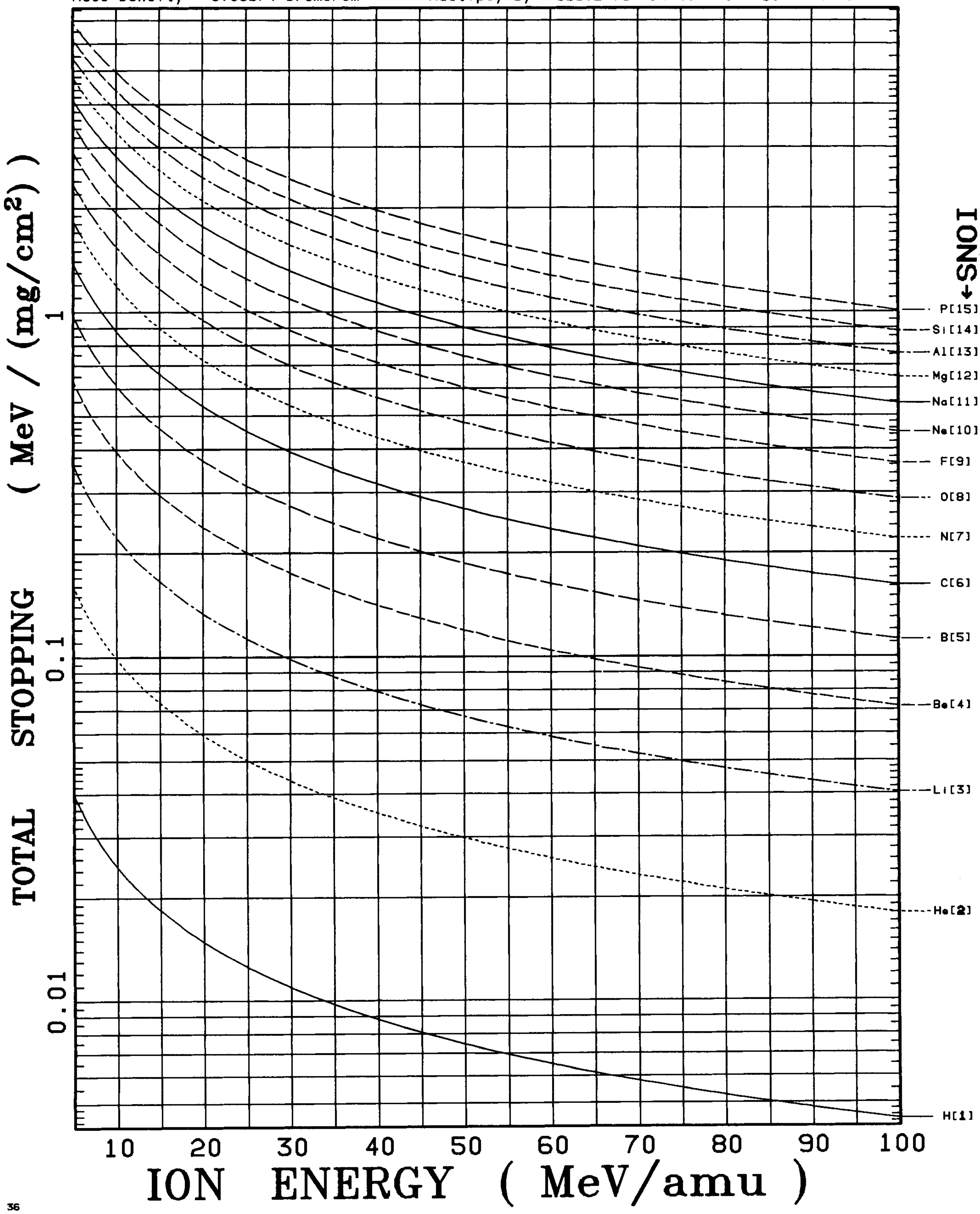
Kr(36) ←←← TARGET (GAS PHASE) →→→ Kr(36)

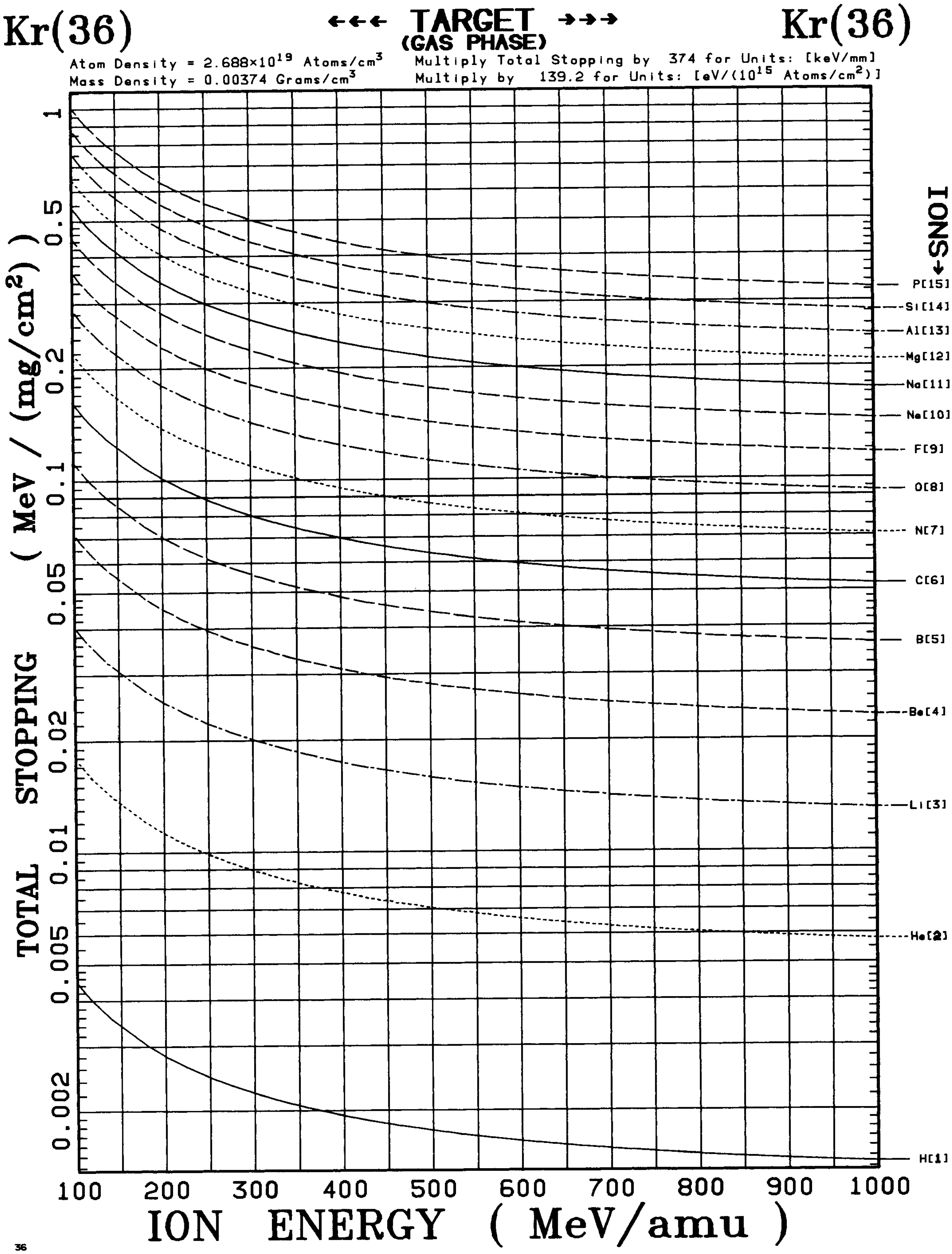
Atom Density = 2.688×10^{19} Atoms/cm^3 Multiply Total Stopping by 374 for Units: [keV/mm]
Mass Density = 0.00374 Grams/cm^3 Multiply by 139.2 for Units: [eV/(10^{15} Atoms/cm^2)]



Kr(36) ←←← TARGET (GAS PHASE) →→→ Kr(36)

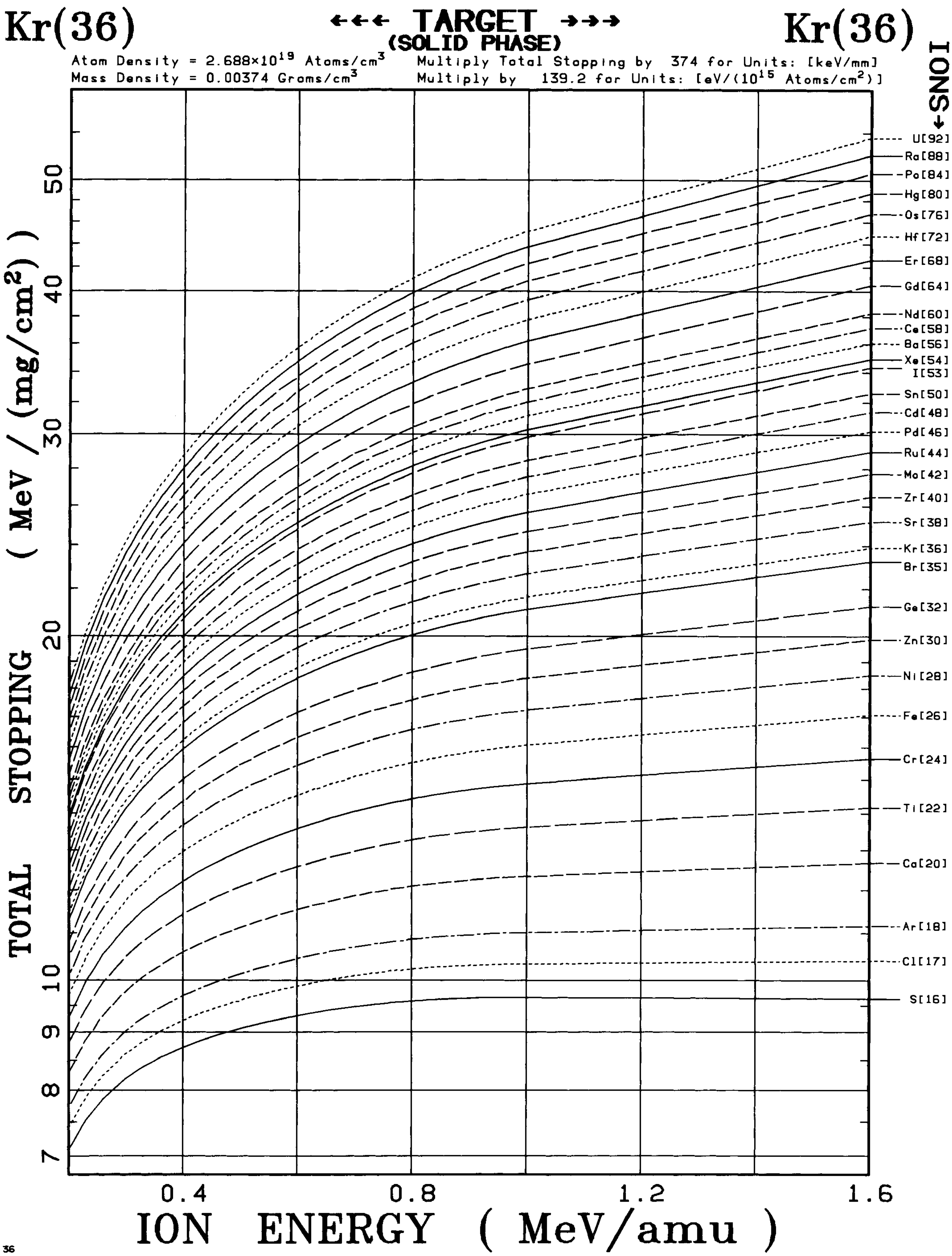
Atom Density = 2.688×10^{19} Atoms/cm^3 Multiply Total Stopping by 374 for Units: [keV/mm]
Mass Density = 0.00374 Grams/cm^3 Multiply by 139.2 for Units: [eV/(10^{15} Atoms/cm^2)]





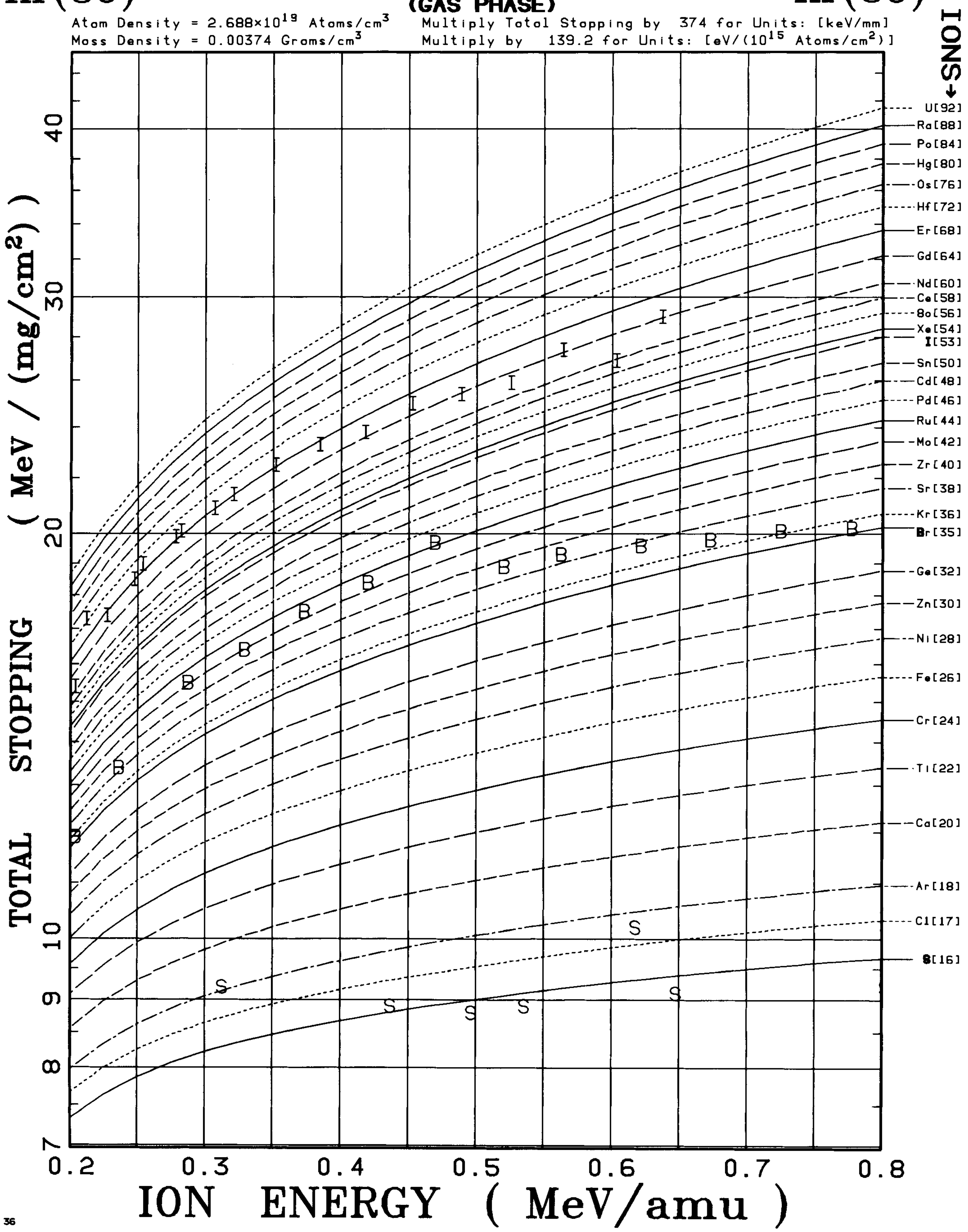
Kr(36)
←←← TARGET →→→
(GAS PHASE)
Kr(36)
Atom Density = 2.688×10^19 Atoms/cm^3
Mass Density = 0.00374 Grams/cm^3
Multiply Total Stopping by 374 for Units: [keV/mm]
Multiply by 139.2 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
1
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)

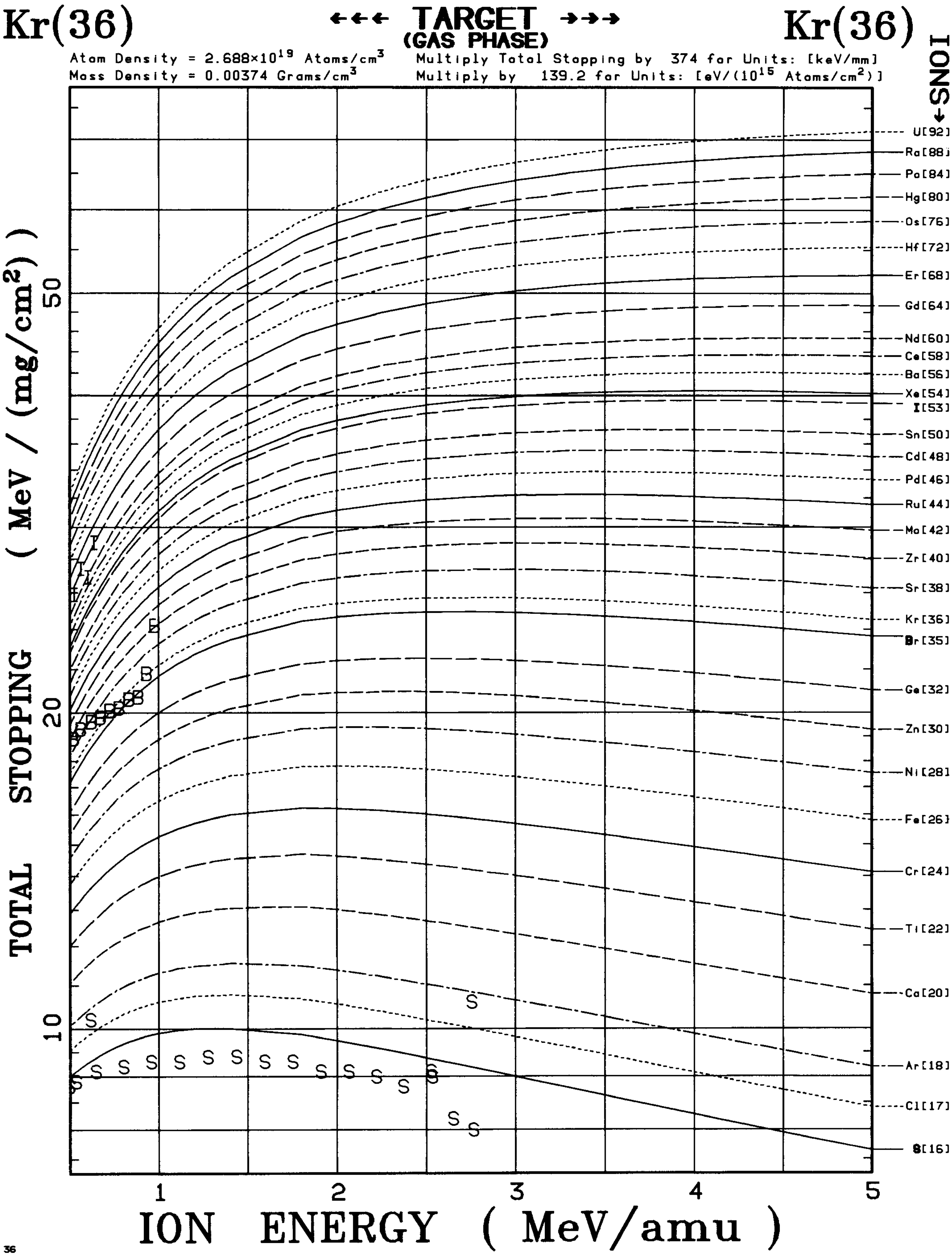
36

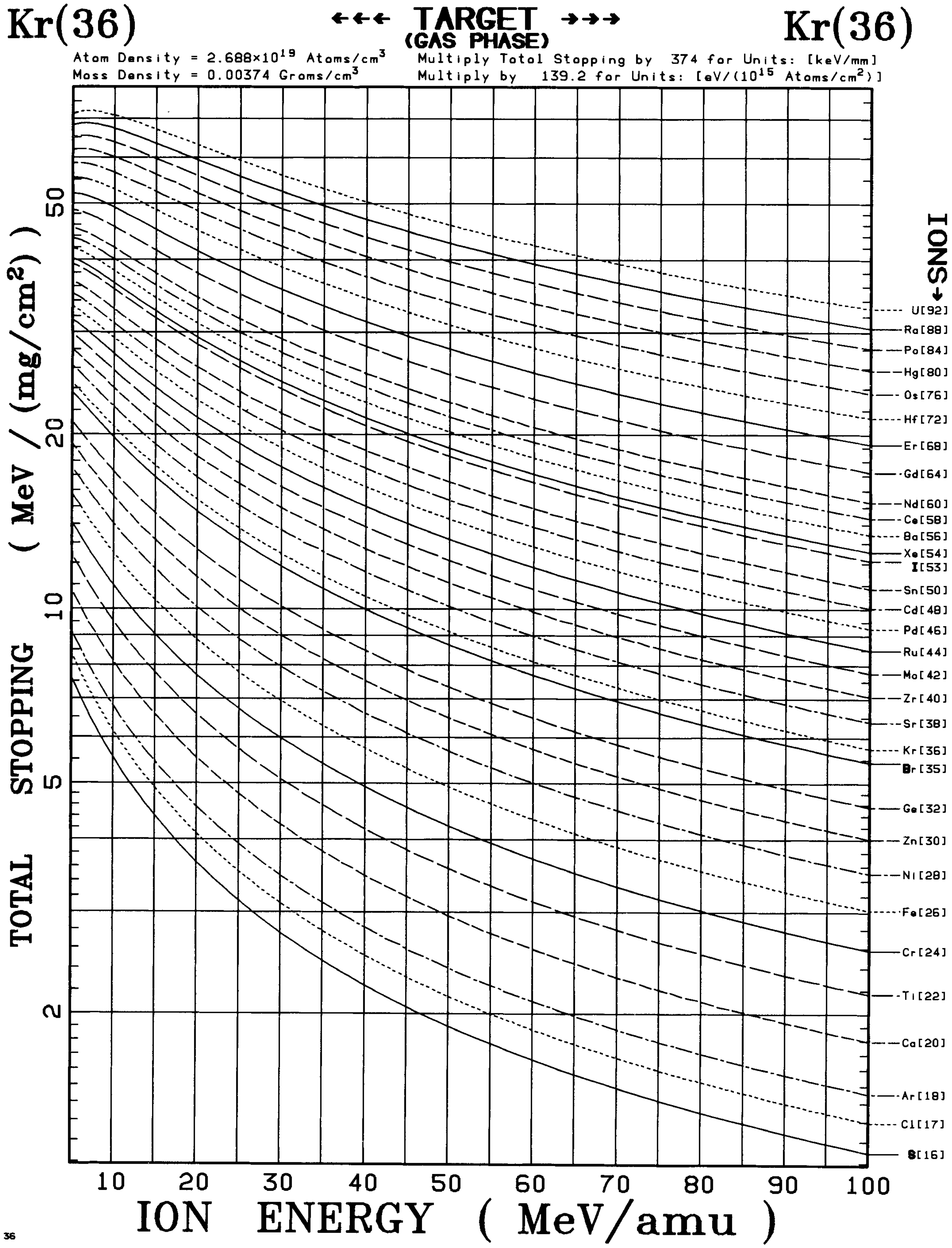

Kr(36)
←←← TARGET →→→
(SOLID PHASE)
Kr(36)
IONS→
Atom Density = 2.688×10^19 Atoms/cm^3
Multiply Total Stopping by 374 for Units: [keV/mm]
Mass Density = 0.00374 Grams/cm^3
Multiply by 139.2 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
0.4
0.8
1.2
1.6
7
8
9
10
20
30
40
50
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]

Kr(36) ←←← TARGET (GAS PHASE) →→→ Kr(36)

Atom Density = 2.688×10[19] Atoms/cm[3] Multiply Total Stopping by 374 for Units: [keV/mm]
Mass Density = 0.00374 Grams/cm[3] Multiply by 139.2 for Units: [eV/(10[15] Atoms/cm[2])]



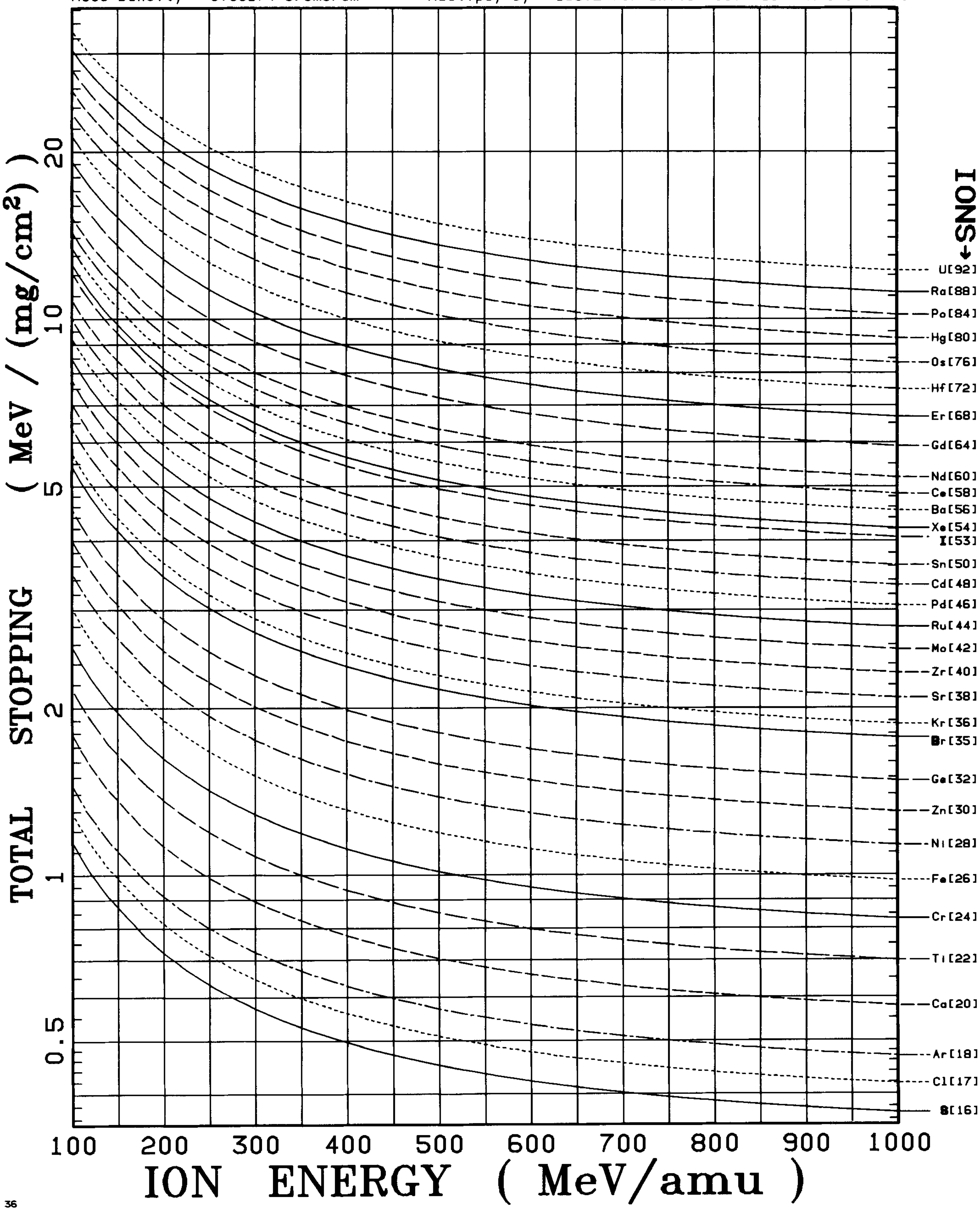

Kr(36)
←←← TARGET →→→
(GAS PHASE)
Kr(36)
Atom Density = 2.688×10^19 Atoms/cm^3
Mass Density = 0.00374 Grams/cm^3
Multiply Total Stopping by 374 for Units: [keV/mm]
Multiply by 139.2 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm^2))
50
20
10
1
2
3
4
5
ION ENERGY (MeV/amu)

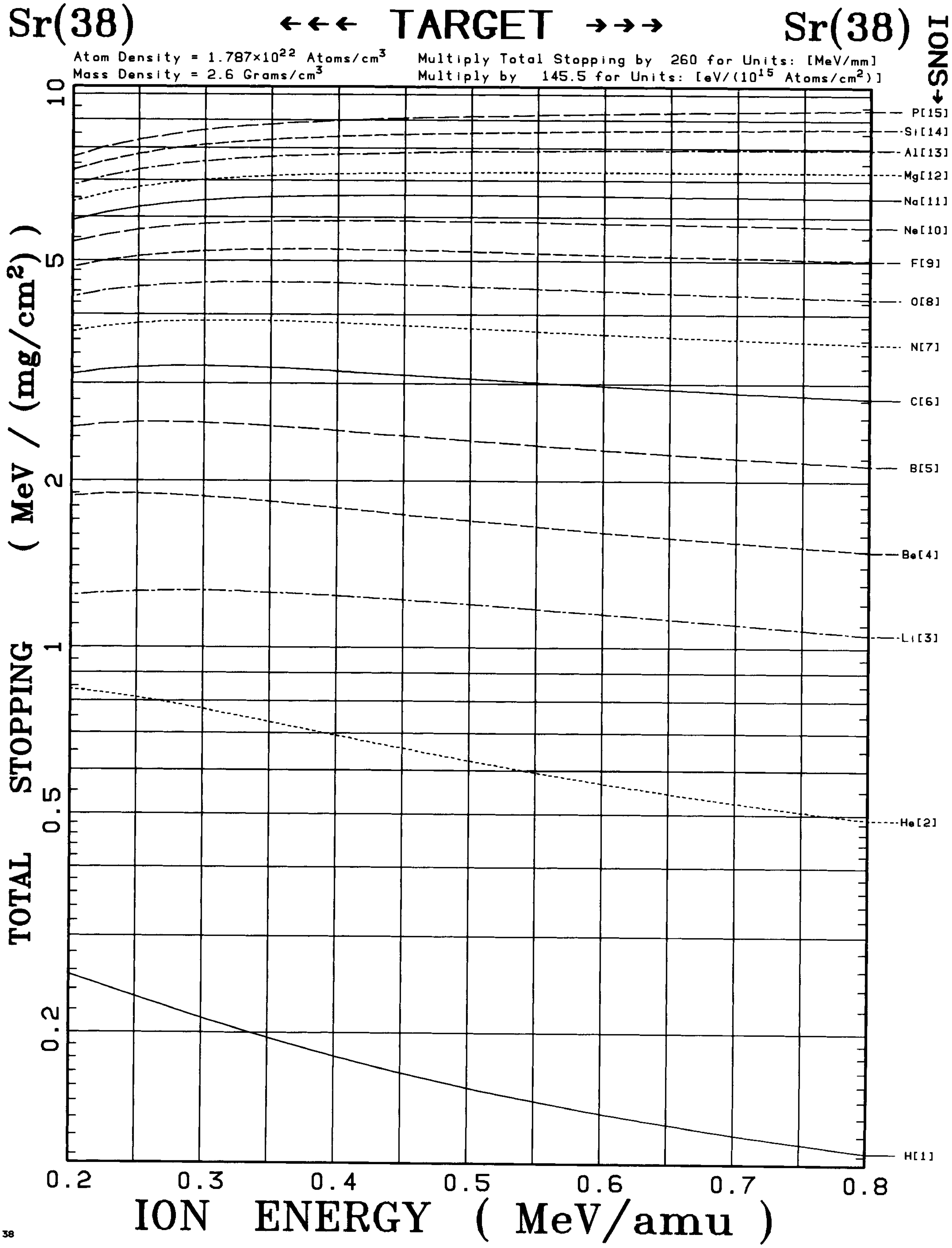

Kr(36)
←←← TARGET →→→
(GAS PHASE)
Kr(36)
Atom Density = 2.688×10^19 Atoms/cm^3
Mass Density = 0.00374 Grams/cm^3
Multiply Total Stopping by 374 for Units: [keV/mm]
Multiply by 139.2 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
50
20
10
5
2
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
10
20
30
40
50
60
70
80
90
100
ION ENERGY (MeV/amu)

Kr(36) ←←← TARGET (GAS PHASE) →→→ Kr(36)

Atom Density = 2.688×10^{19} Atoms/cm^3 Multiply Total Stopping by 374 for Units: [keV/mm]

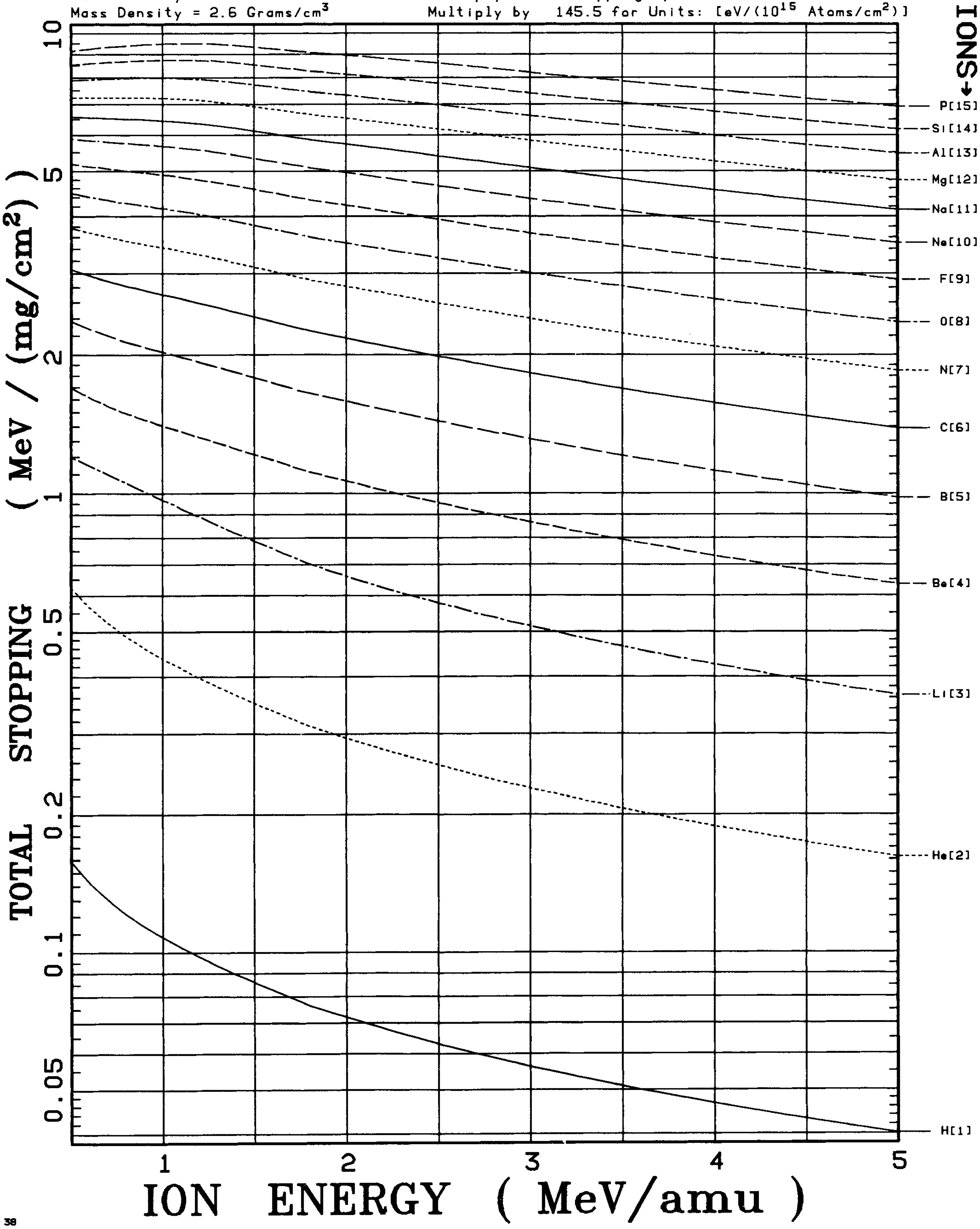
Mass Density = 0.00374 Grams/cm^3 Multiply by 139.2 for Units: [eV/(10^{15} Atoms/cm^2)]




Sr(38)
←←← TARGET →→→
Sr(38)
IONS↓
Atom Density = 1.787×10^22 Atoms/cm^3
Mass Density = 2.6 Grams/cm^3
Multiply Total Stopping by 260 for Units: [MeV/mm]
Multiply by 145.5 for Units: [eV/(10^15 Atoms/cm^2)]
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
10
5
2
1
0.5
0.2
TOTAL STOPPING (MeV / (mg/cm²))
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

Sr(38) ←←← TARGET →→→ Sr(38)

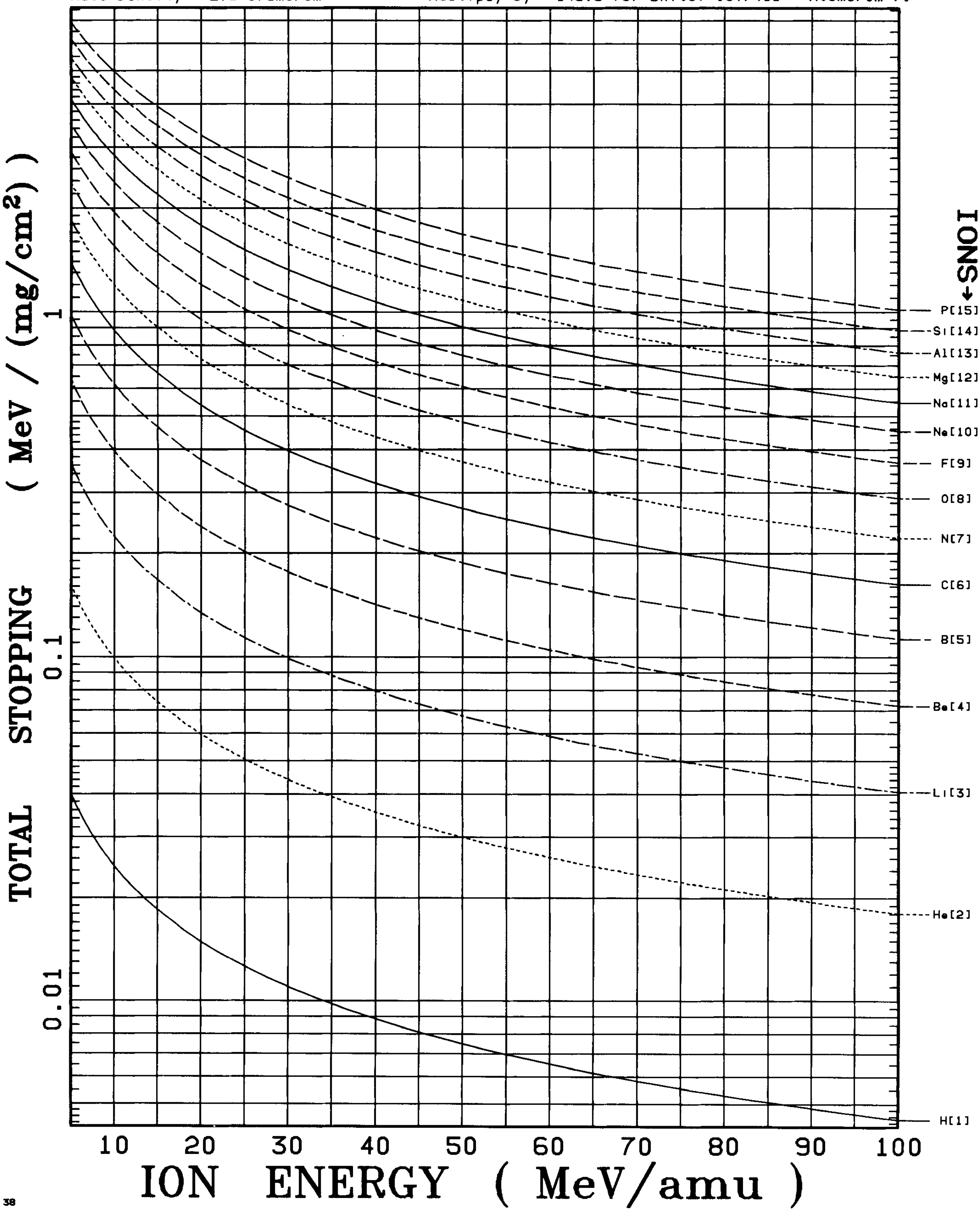
Atom Density = 1.787×10^{22} Atoms/cm^3 Multiply Total Stopping by 260 for Units: [MeV/mm]
Mass Density = 2.6 Grams/cm^3 Multiply by 145.5 for Units: [eV/(10^{15} Atoms/cm^2)]

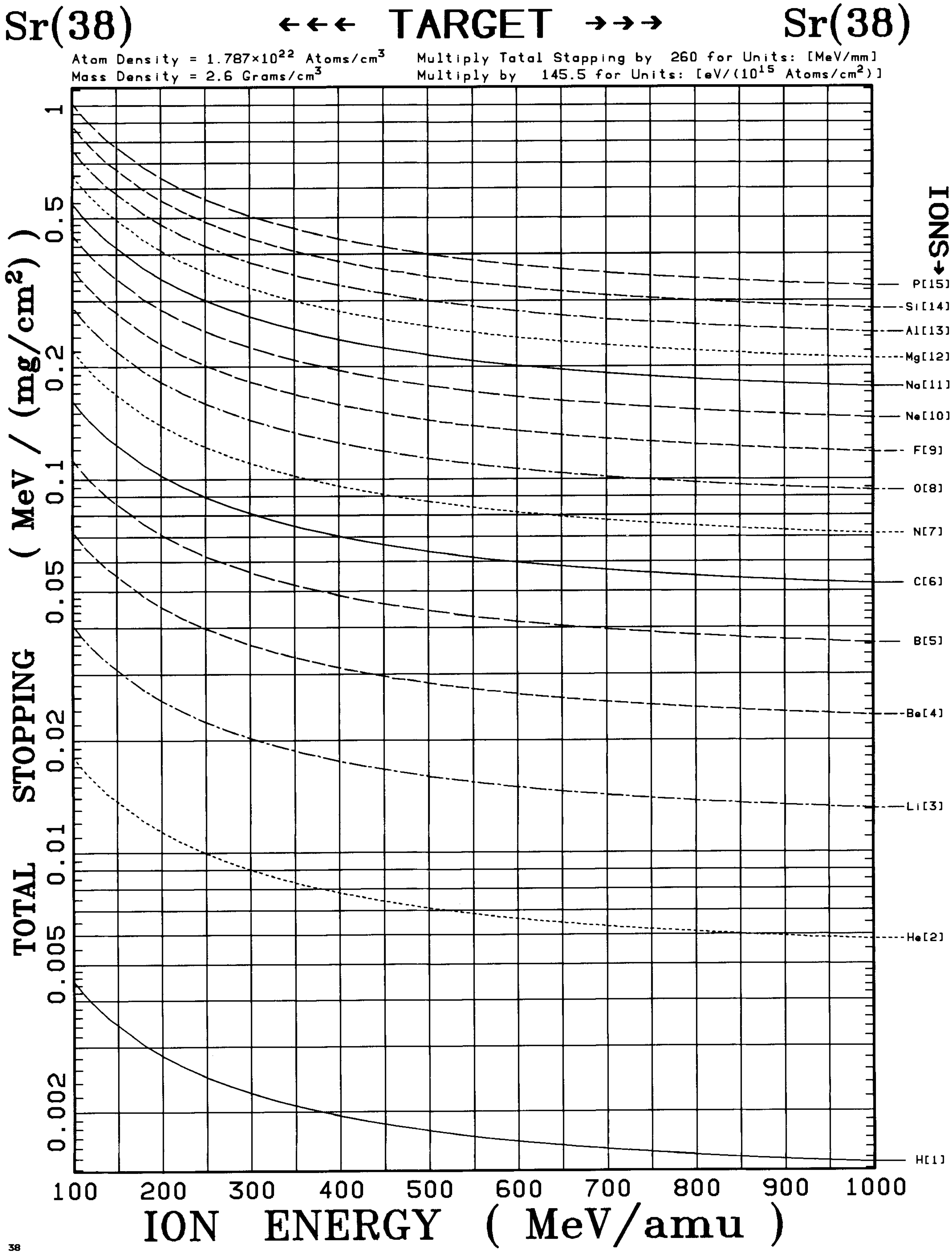


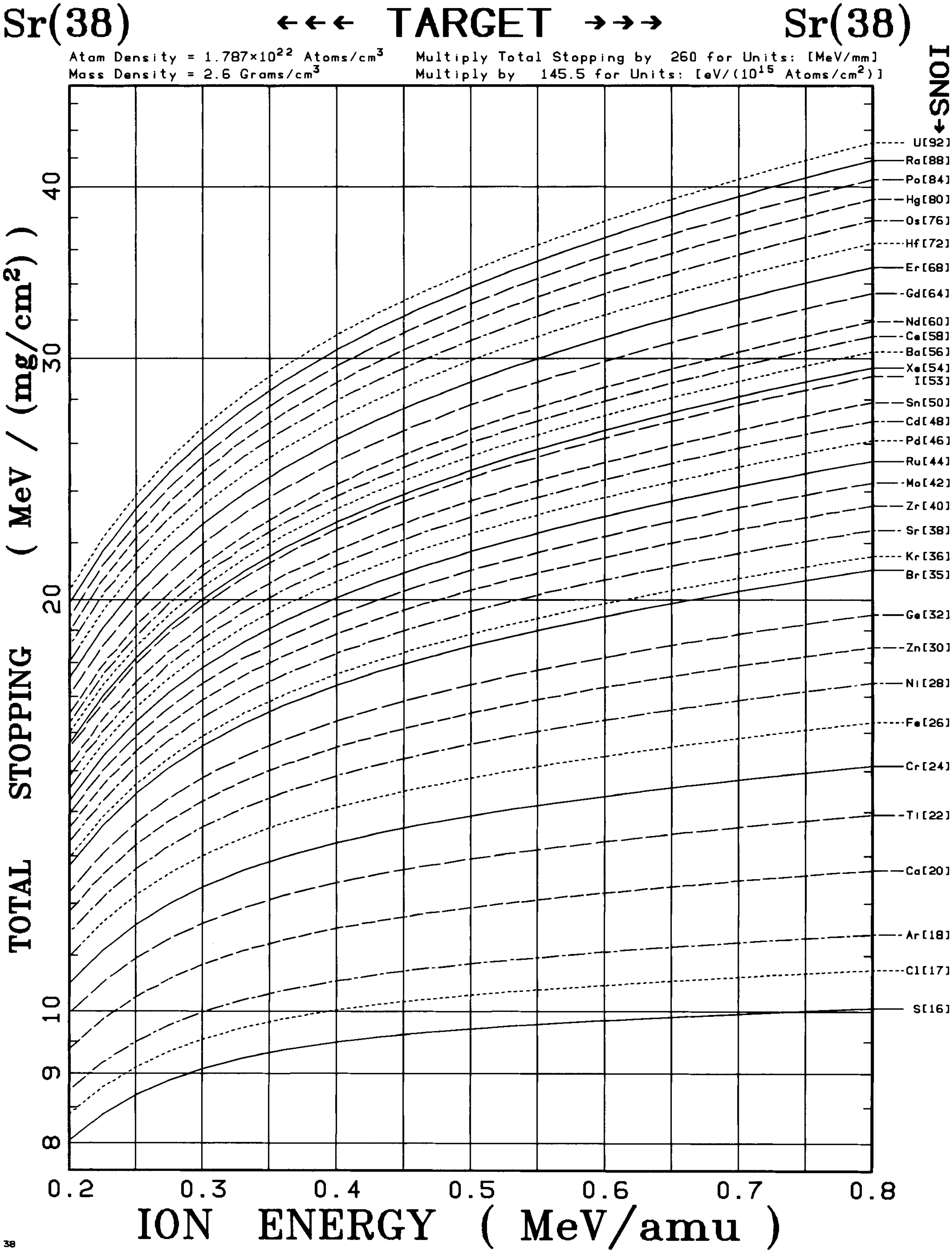
Sr(38) ←←← TARGET →→→ Sr(38)

Atom Density = 1.787×10^{22} Atoms/cm^3 Multiply Total Stopping by 260 for Units: [MeV/mm]

Mass Density = 2.6 Grams/cm^3 Multiply by 145.5 for Units: [eV/(10^{15} Atoms/cm^2)]

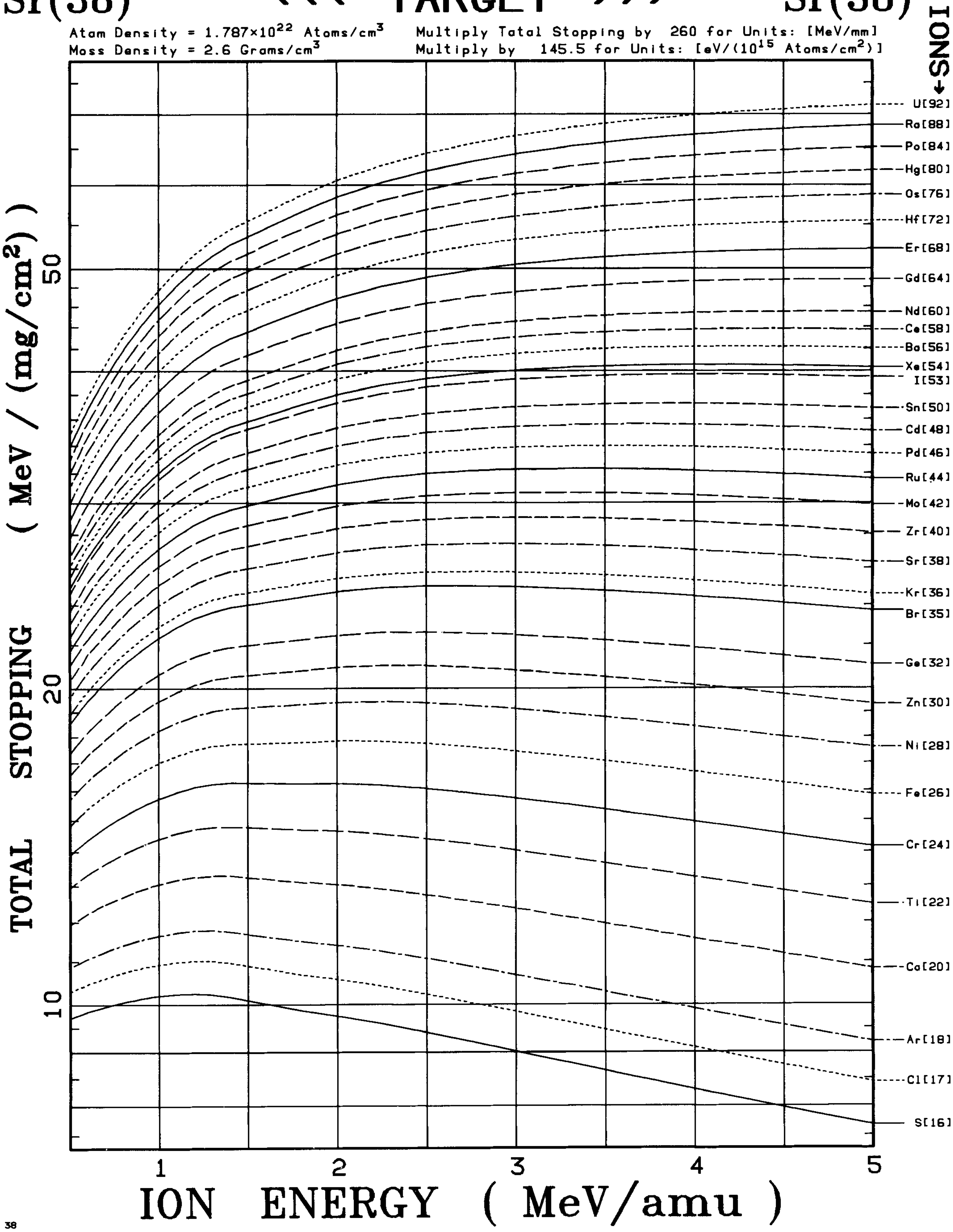


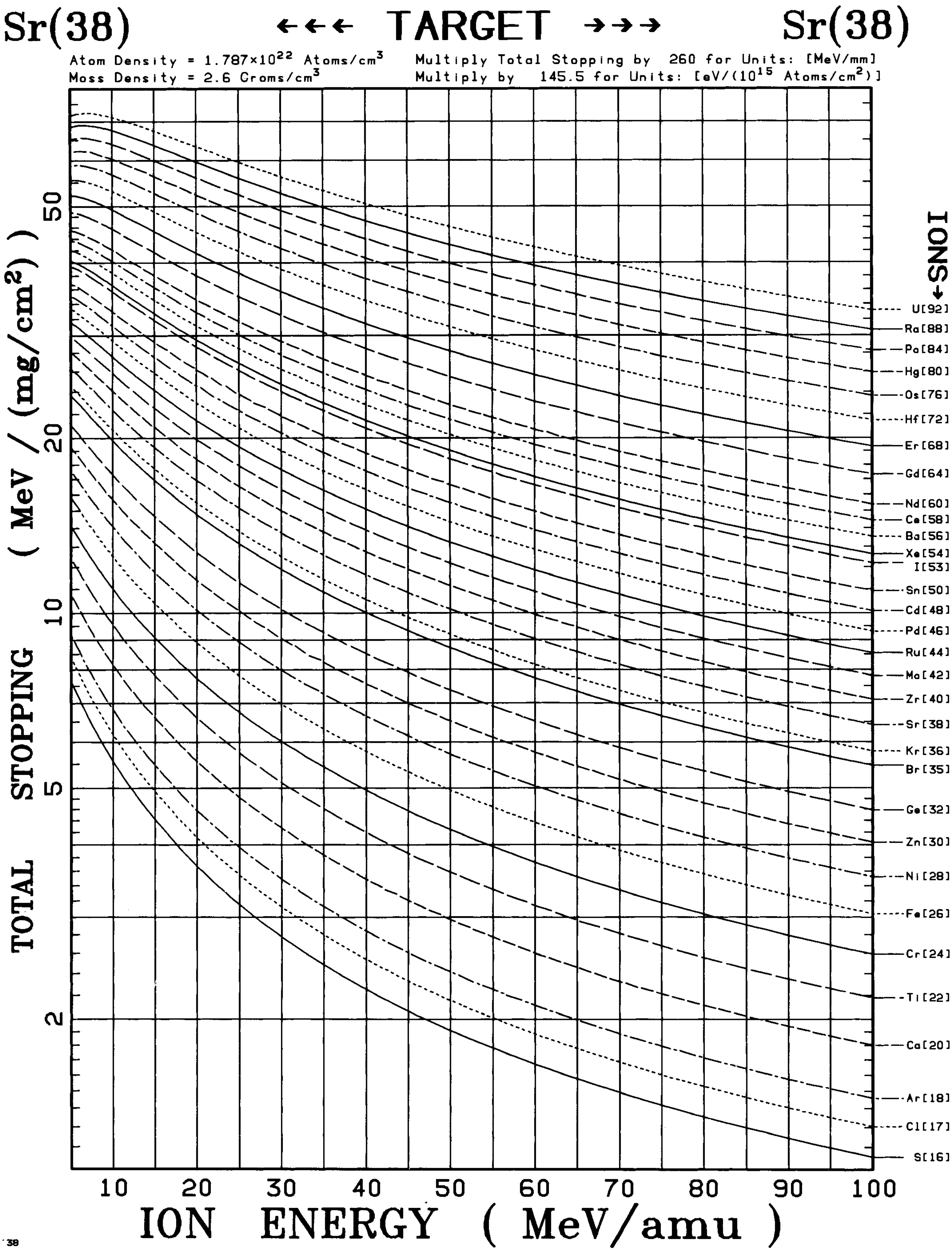

Sr(38) ←←← TARGET →→→ Sr(38)
Atom Density = 1.787×10²² Atoms/cm³
Mass Density = 2.6 Grams/cm³
Multiply Total Stopping by 260 for Units: [MeV/mm]
Multiply by 145.5 for Units: [eV/(10¹⁵ Atoms/cm²)]
TOTAL STOPPING (MeV / (mg/cm²))
1
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)


Sr(38)
←←← TARGET →→→
Sr(38)
Atom Density = 1.787×10^22 Atoms/cm^3
Mass Density = 2.6 Grams/cm^3
Multiply Total Stopping by 260 for Units: [MeV/mm]
Multiply by 145.5 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm^2))
40
30
20
10
9
8
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

Sr(38) ←←← TARGET →→→ Sr(38)

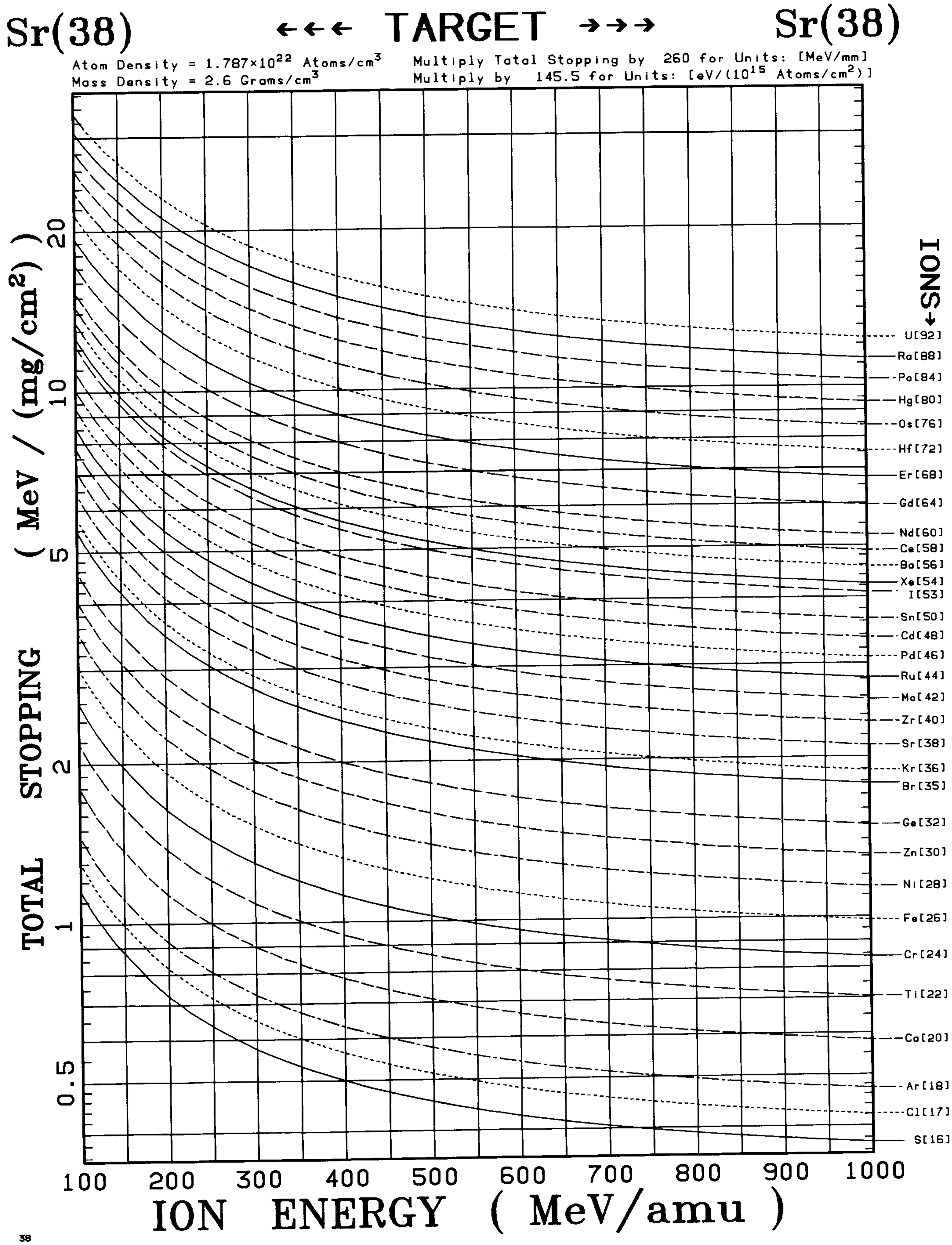
Atom Density = 1.787×10^{22} Atoms/cm^3 Multiply Total Stopping by 260 for Units: [MeV/mm]
Mass Density = 2.6 Grams/cm^3 Multiply by 145.5 for Units: [eV/(10^{15} Atoms/cm^2)]

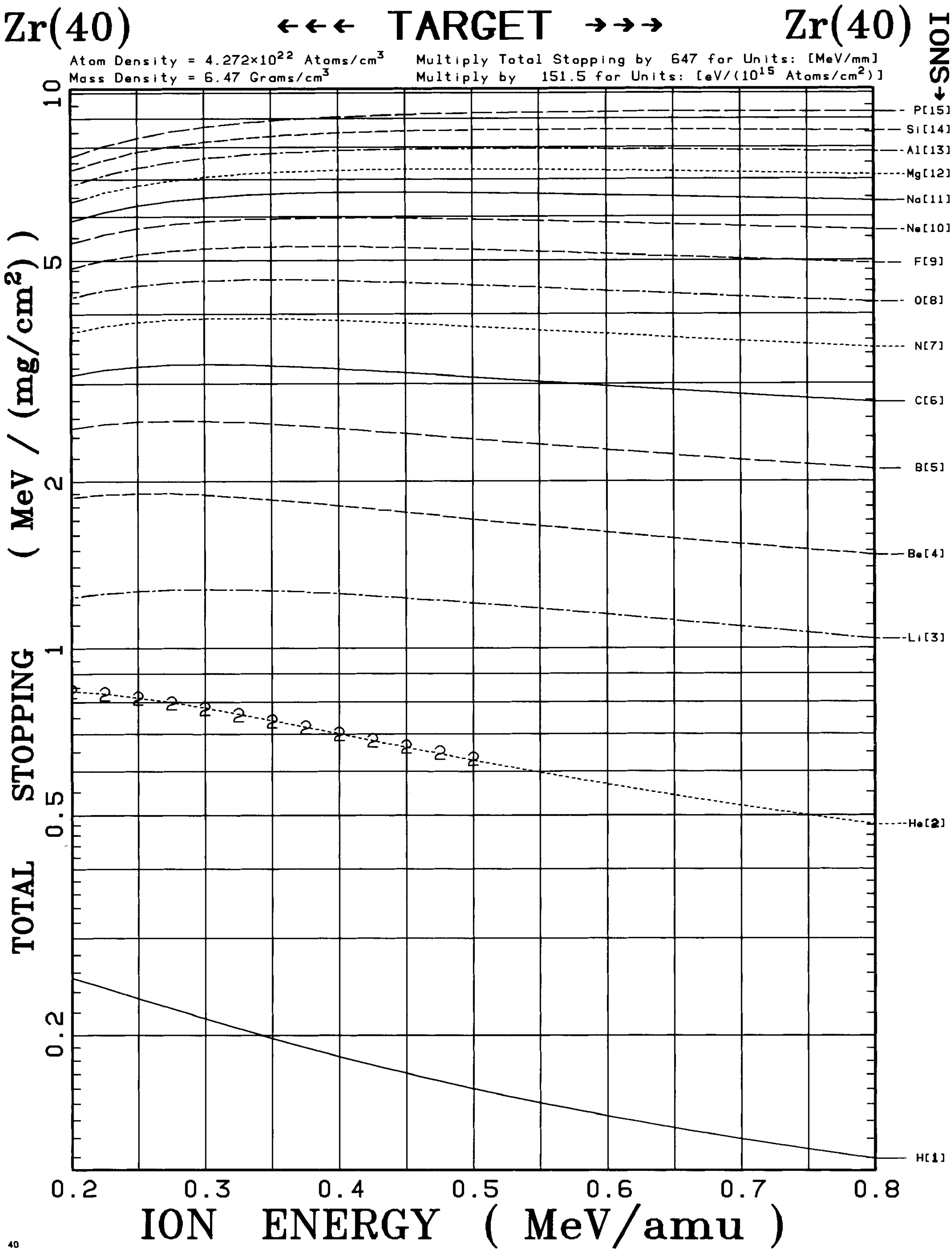




Sr(38)
←←← TARGET →→→
Sr(38)
Atom Density = 1.787×10^22 Atoms/cm^3
Multiply Total Stopping by 260 for Units: [MeV/mm]
Mass Density = 2.6 Grams/cm^3
Multiply by 145.5 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
50
20
10
5
2
IONS
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
10 20 30 40 50 60 70 80 90 100
ION ENERGY (MeV/amu)

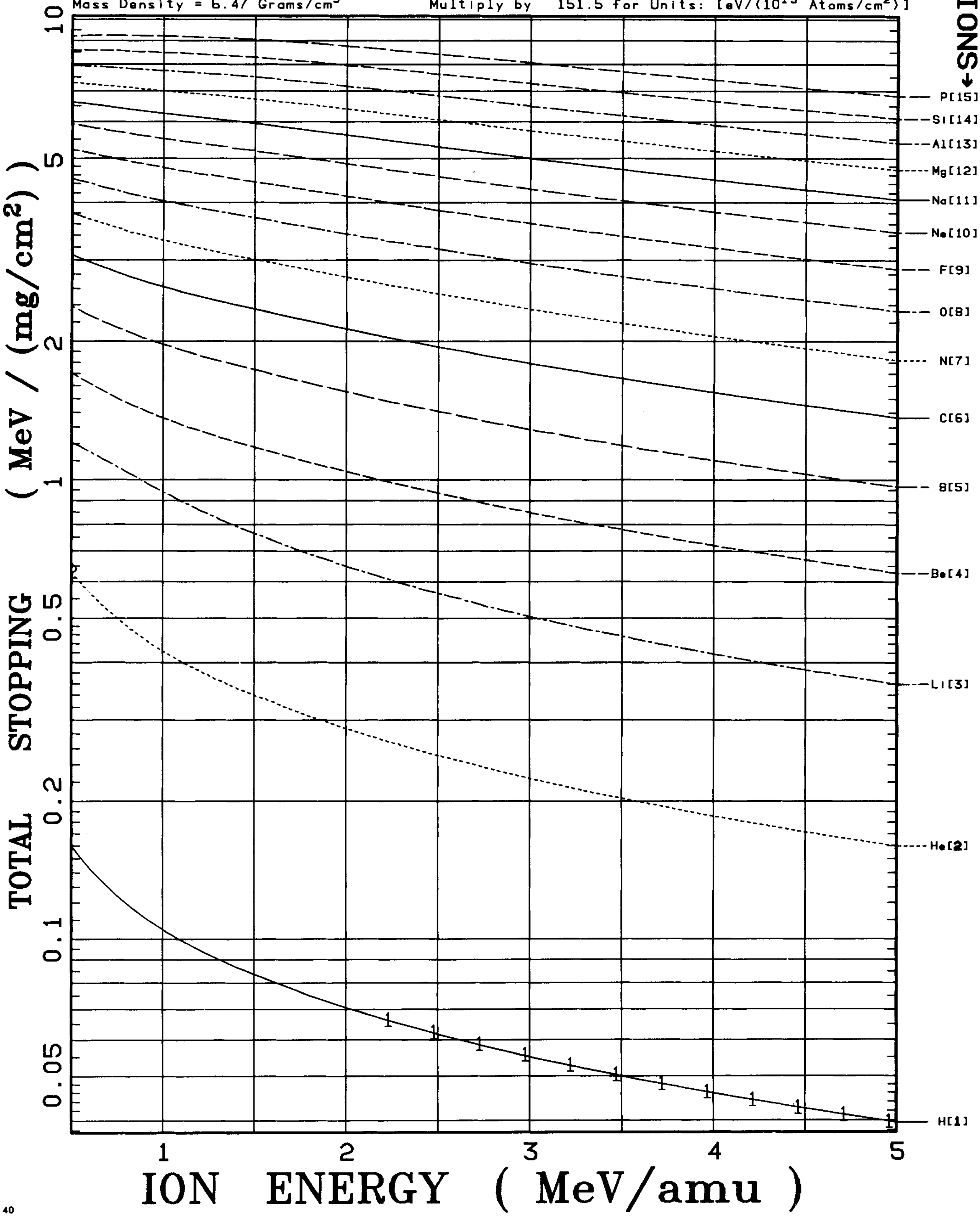
38


Sr(38)
←←← TARGET →→→
Sr(38)
Atom Density = 1.787×10^22 Atoms/cm^3
Mass Density = 2.6 Grams/cm^3
Multiply Total Stopping by 260 for Units: [MeV/mm]
Multiply by 145.5 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
0.5
1
2
5
10
20
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)


Zr(40)
←←← TARGET →→→
Zr(40)
IONS→
Atom Density = 4.272×10^22 Atoms/cm^3
Mass Density = 6.47 Grams/cm^3
Multiply Total Stopping by 647 for Units: [MeV/mm]
Multiply by 151.5 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
10
5
2
1
0.5
0.2
0.2
0.3
0.4
0.5
0.6
0.7
0.8

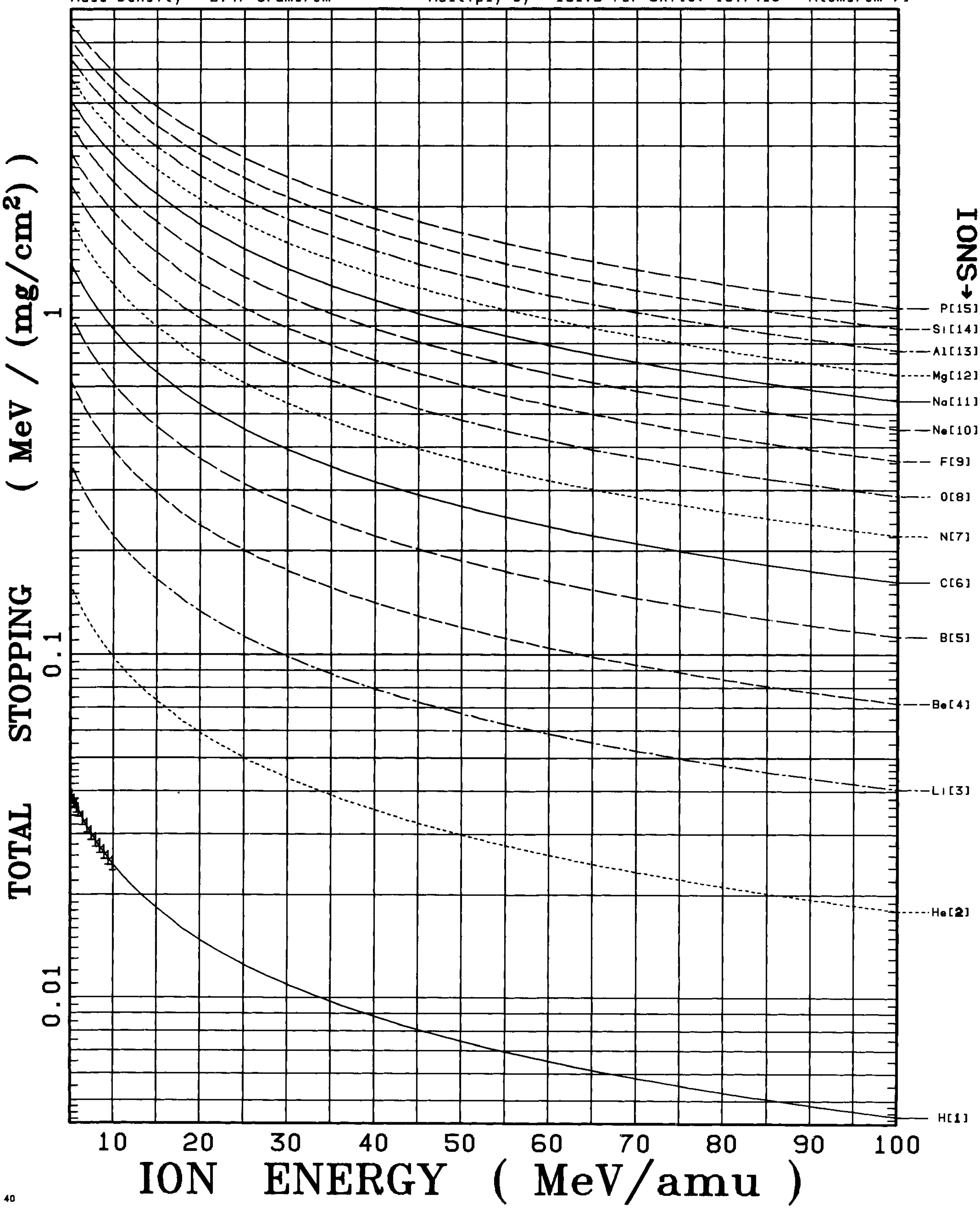
Zr(40) ←←← TARGET →→→ Zr(40)

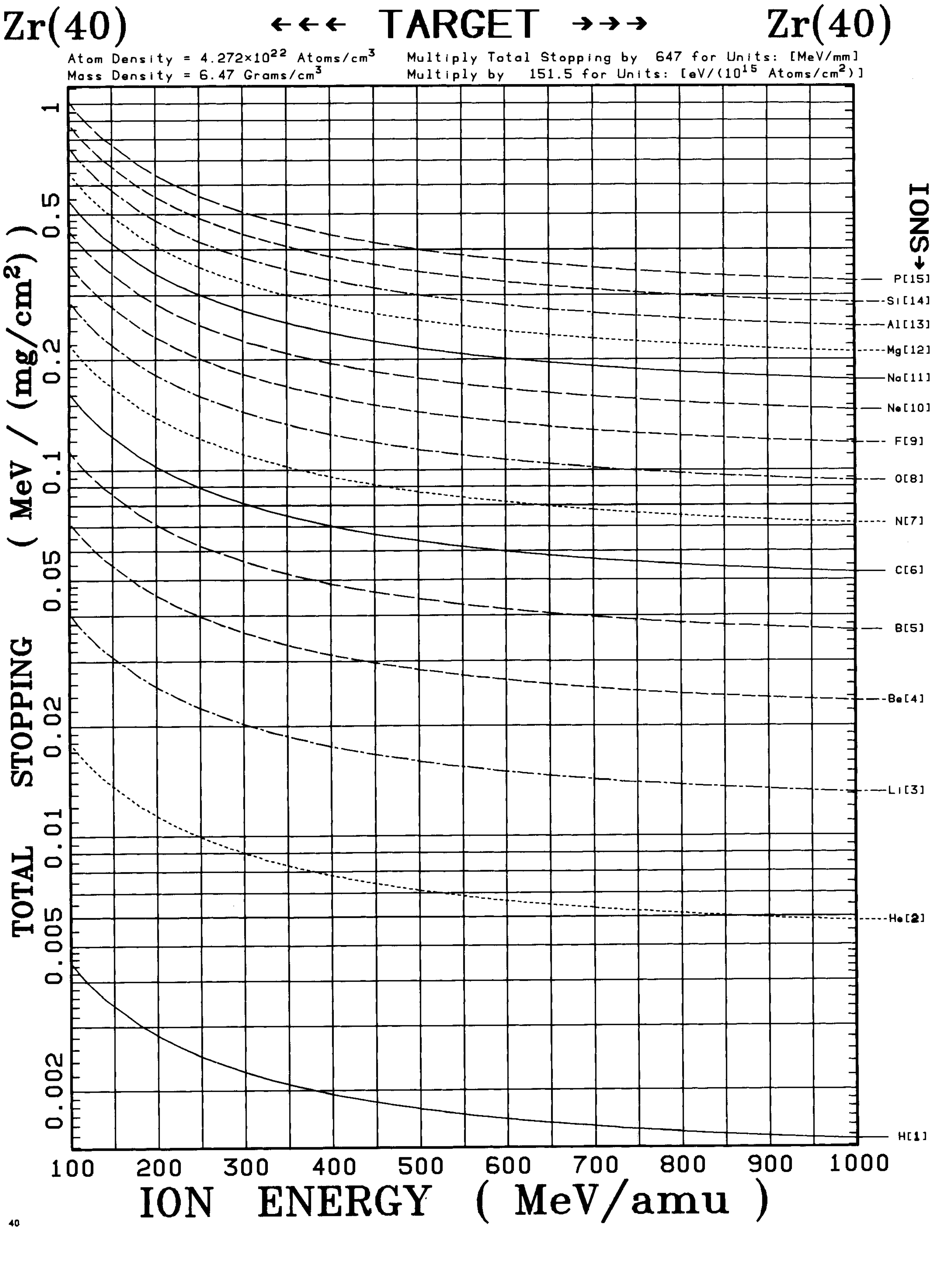
Atom Density = 4.272×10^{22} Atoms/cm^3 Multiply Total Stopping by 647 for Units: [MeV/mm]
Mass Density = 6.47 Grams/cm^3 Multiply by 151.5 for Units: [eV/(10^{15} Atoms/cm^2)]



Zr(40) ←←← TARGET →→→ Zr(40)

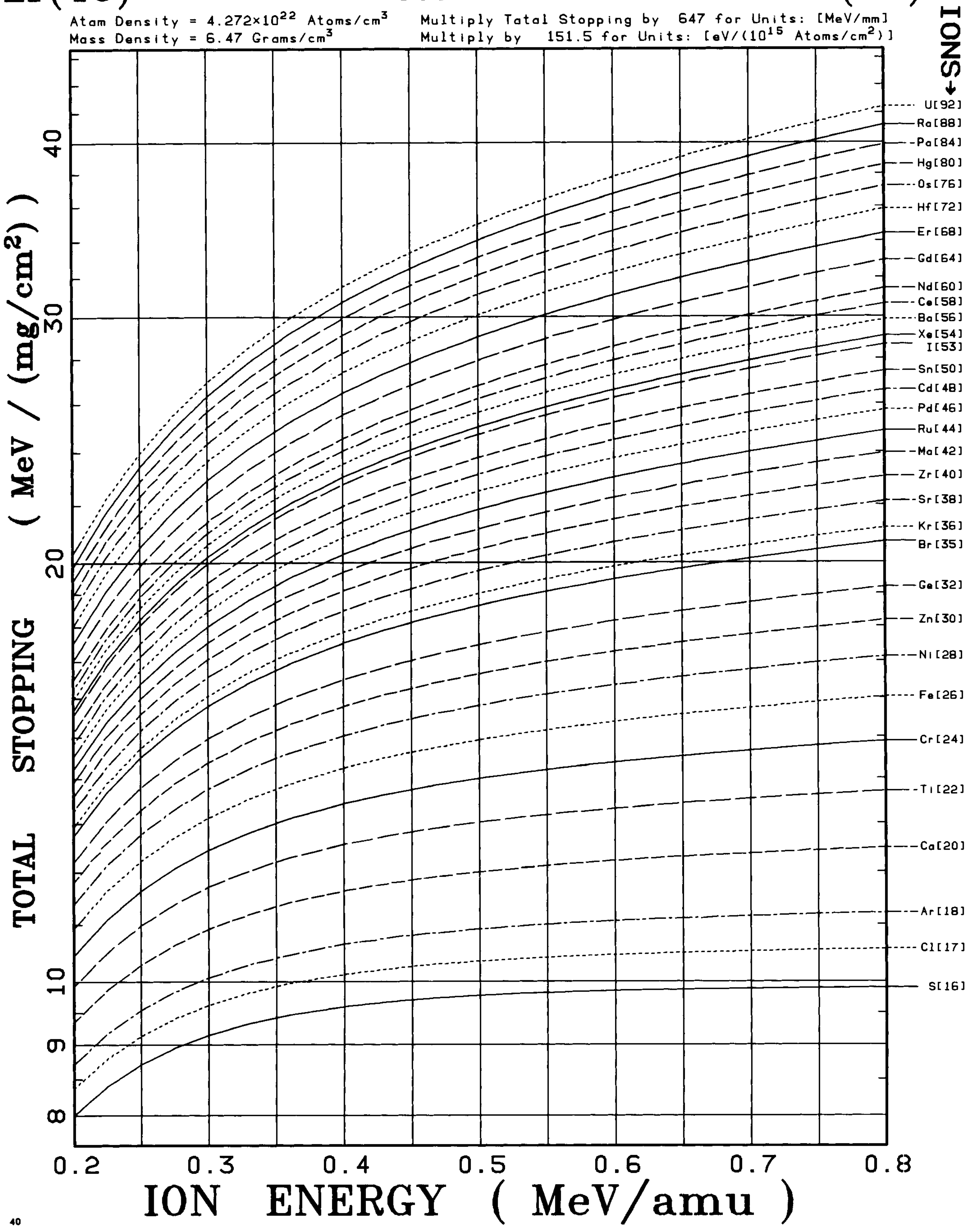
Atom Density = 4.272×10^{22} Atoms/cm^3 Multiply Total Stopping by 647 for Units: [MeV/mm]
Mass Density = 6.47 Grams/cm^3 Multiply by 151.5 for Units: [eV/(10^{15} Atoms/cm^2)]




Zr(40)
←←← TARGET →→→
Zr(40)
Atom Density = 4.272×10^22 Atoms/cm^3
Multiply Total Stopping by 647 for Units: [MeV/mm]
Mass Density = 6.47 Grams/cm^3
Multiply by 151.5 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
1
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)

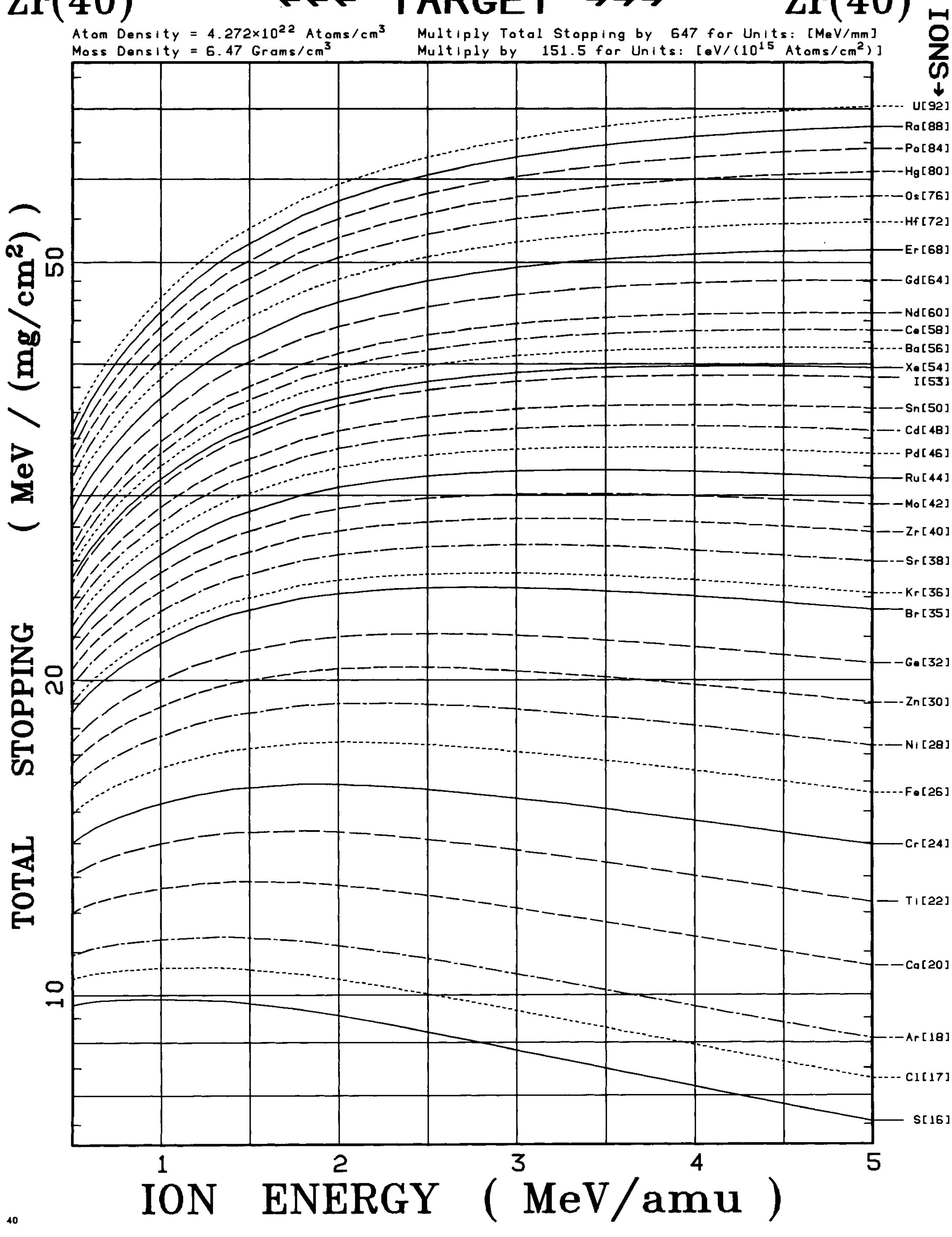
Zr(40) ←←← TARGET →→→ Zr(40)

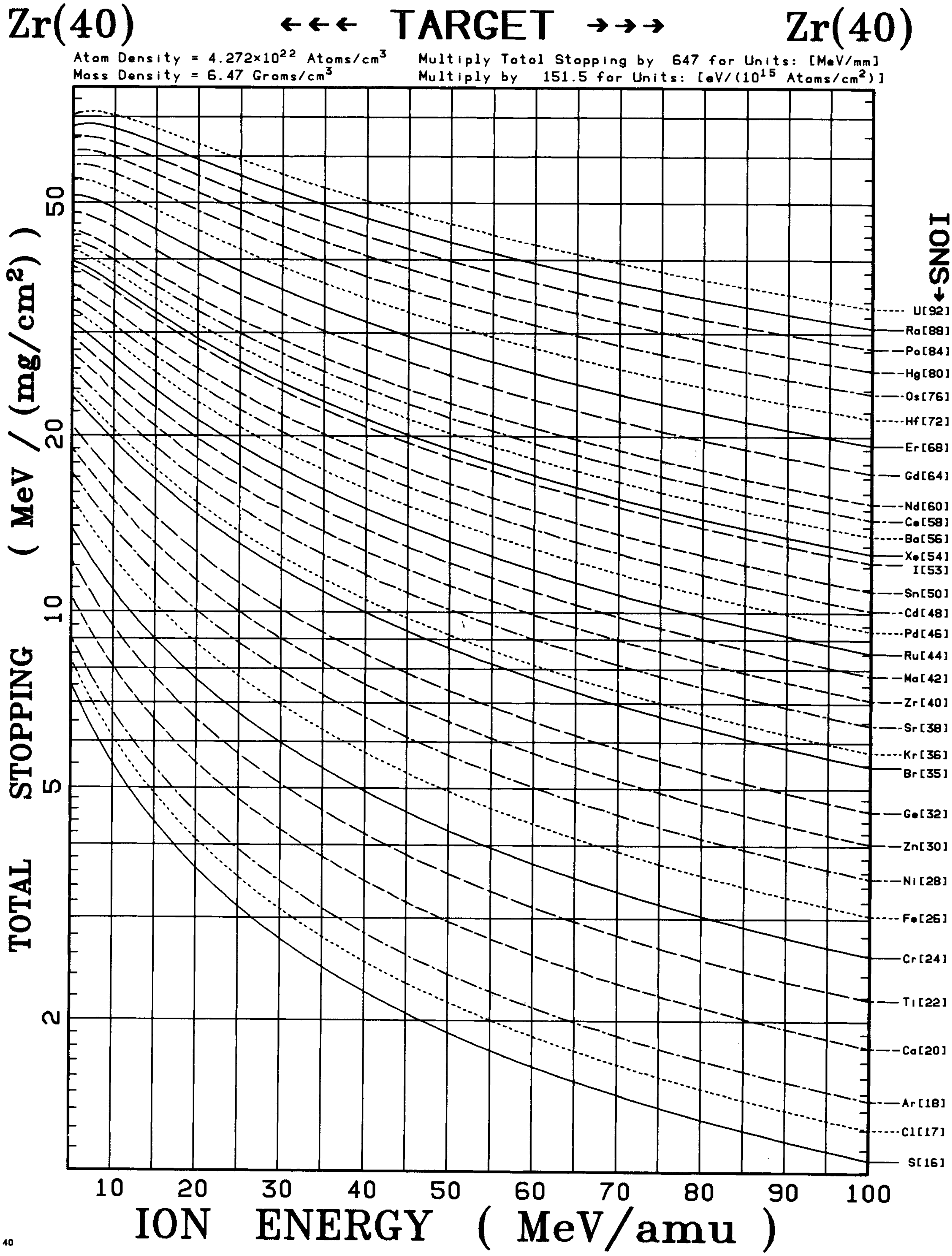
Atom Density = 4.272×10^{22} Atoms/cm^3 Multiply Total Stopping by 647 for Units: [MeV/mm]
Mass Density = 6.47 Grams/cm^3 Multiply by 151.5 for Units: [eV/(10^{15} Atoms/cm^2)]



Zr(40) ←←← TARGET →→→ Zr(40)

Atom Density = 4.272×10^{22} Atoms/cm^3 Multiply Total Stopping by 647 for Units: [MeV/mm]
Mass Density = 6.47 Grams/cm^3 Multiply by 151.5 for Units: [eV/(10^{15} Atoms/cm^2)]

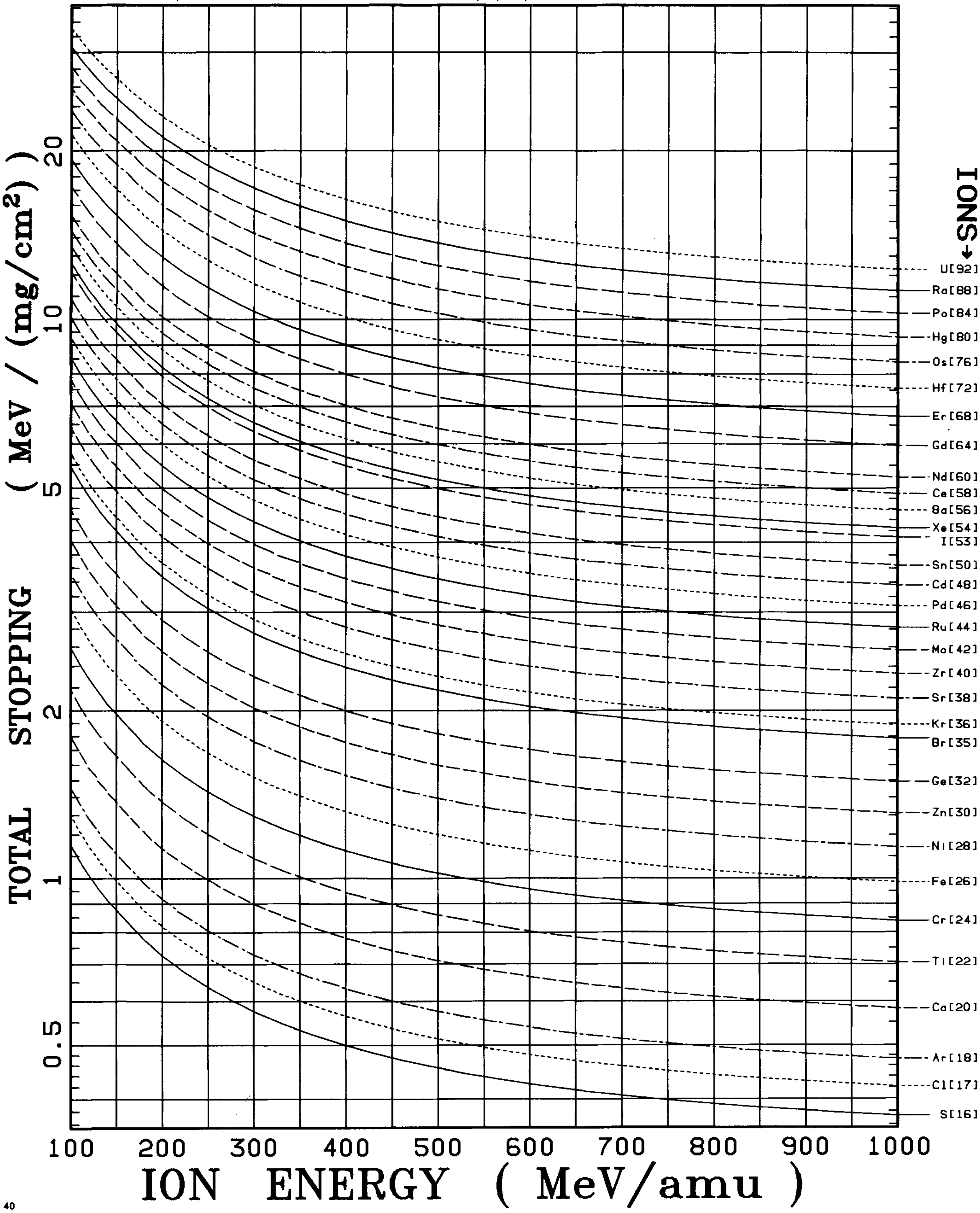


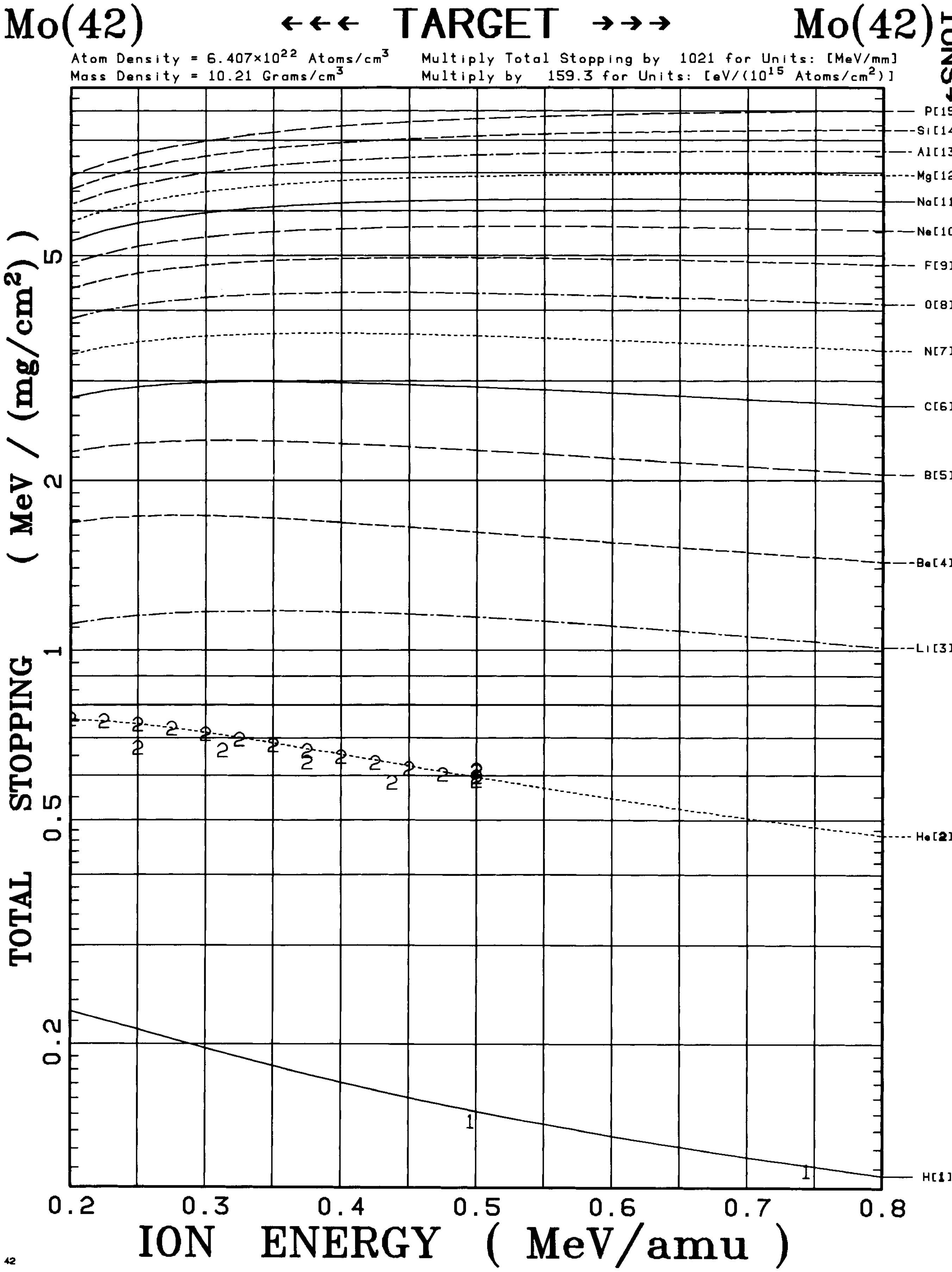


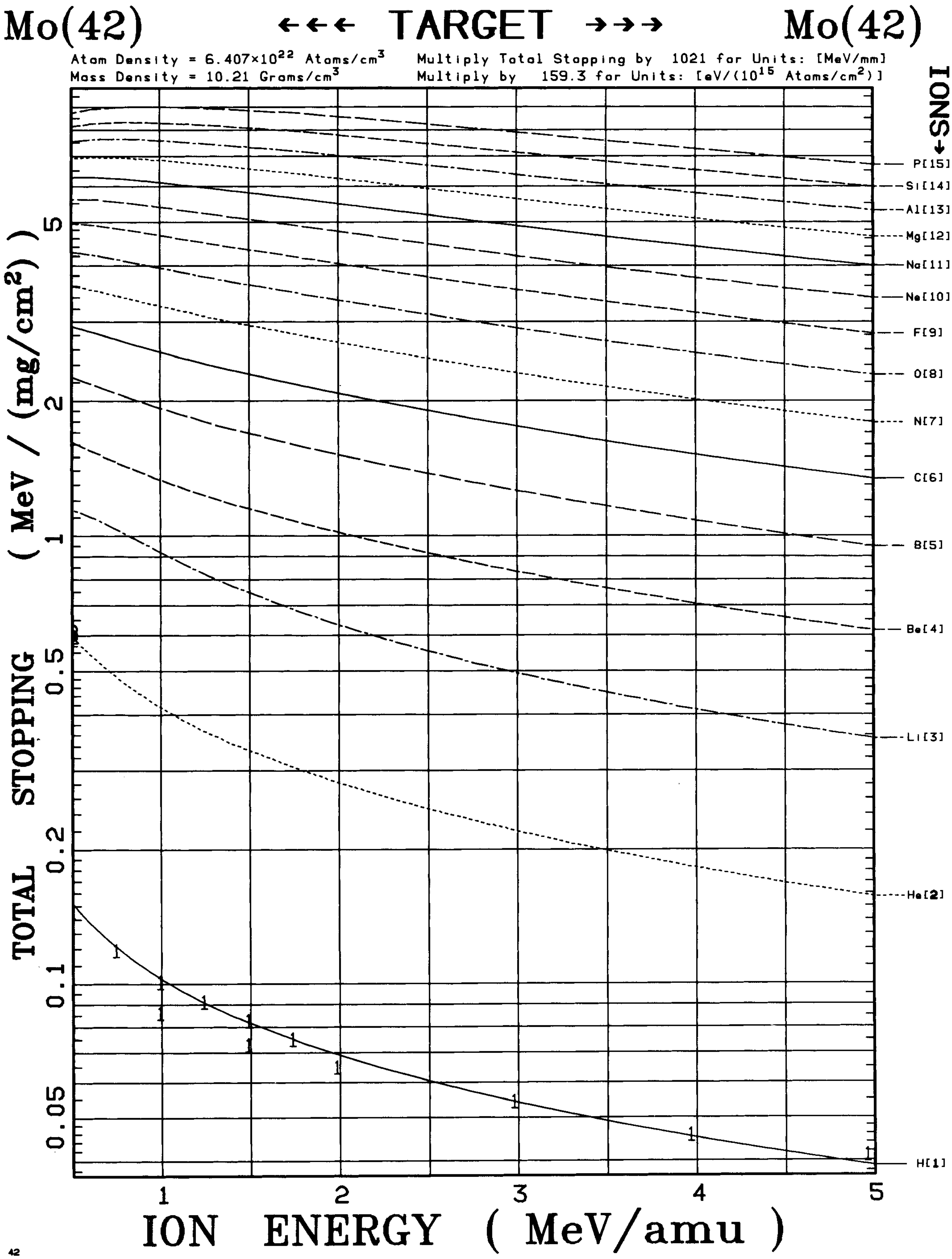
Zr(40)
←←← TARGET →→→
Zr(40)
Atom Density = 4.272×10²² Atoms/cm³
Mass Density = 6.47 Grams/cm³
Multiply Total Stopping by 647 for Units: [MeV/mm]
Multiply by 151.5 for Units: [eV/(10¹⁵ Atoms/cm²)]
TOTAL STOPPING (MeV / (mg/cm²))
50
20
10
5
2
IONS↓
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
10
20
30
40
50
60
70
80
90
100
ION ENERGY (MeV/amu)

Zr(40) ←←← TARGET →→→ Zr(40)

Atom Density = 4.272×10^{22} Atoms/cm^3 Multiply Total Stopping by 647 for Units: [MeV/mm]
Mass Density = 6.47 Grams/cm^3 Multiply by 151.5 for Units: [eV/(10^{15} Atoms/cm^2)]

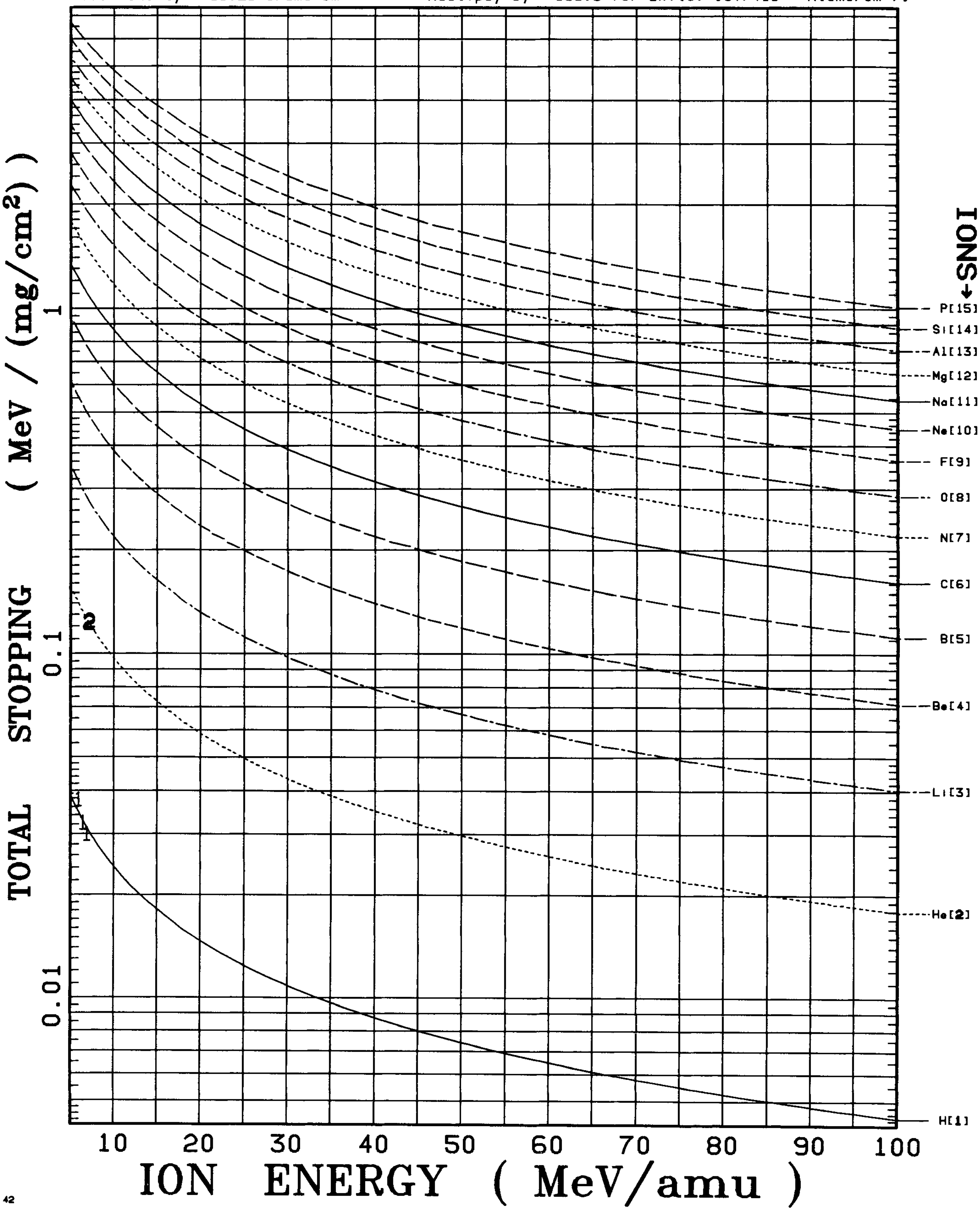


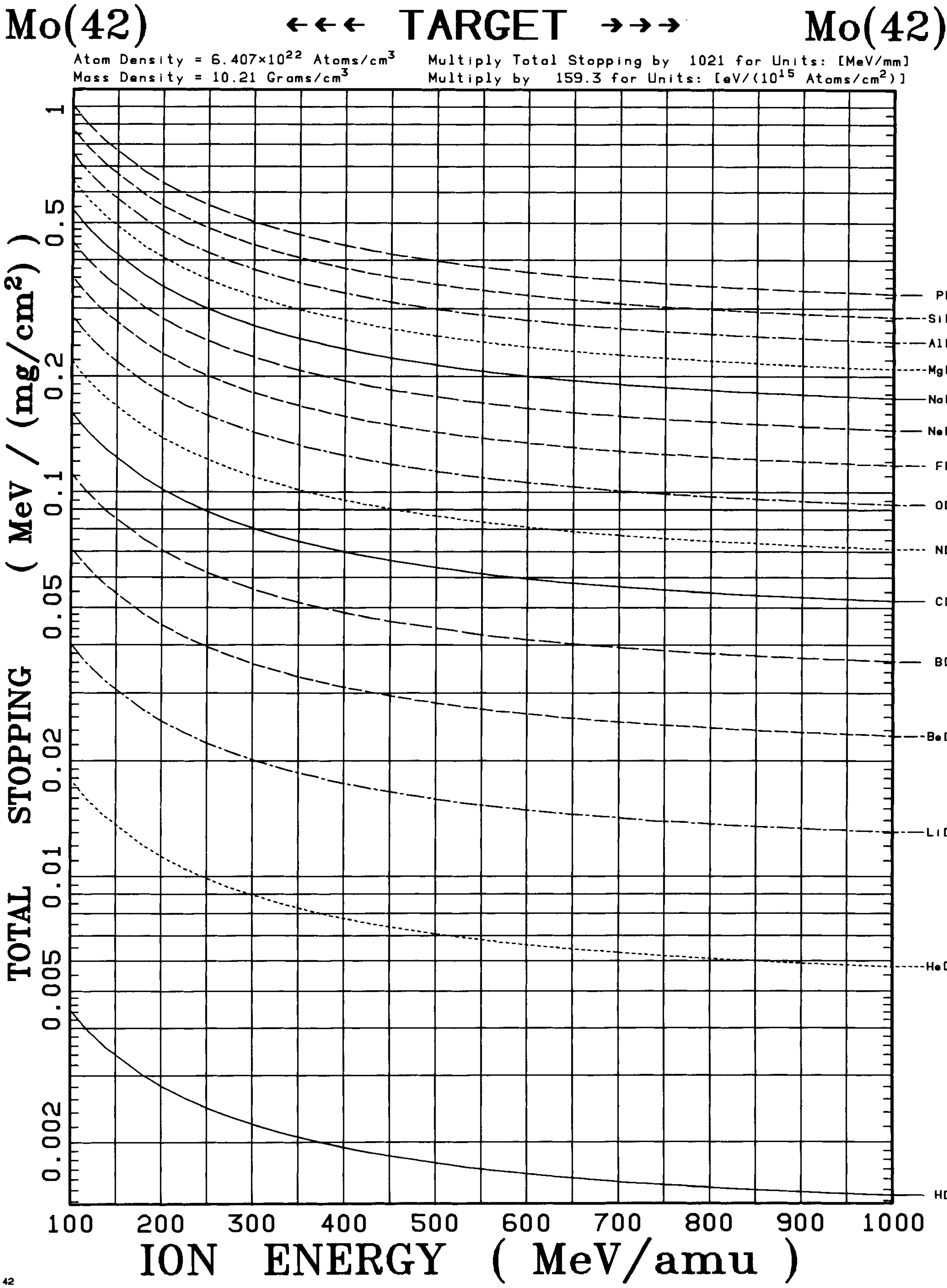

Mo(42) ←←← TARGET →→→ Mo(42)
IONS→
Atom Density = 6.407×10^22 Atoms/cm^3
Mass Density = 10.21 Grams/cm^3
Multiply Total Stopping by 1021 for Units: [MeV/mm]
Multiply by 159.3 for Units: [eV/(10^15 Atoms/cm^2)]
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm^2))
5
2
1
0.5
0.2
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)


Mo(42)
←←← TARGET →→→
Mo(42)
Atom Density = 6.407×10²² Atoms/cm³
Multiply Total Stopping by 1021 for Units: [MeV/mm]
Mass Density = 10.21 Grams/cm³
Multiply by 159.3 for Units: [eV/(10¹⁵ Atoms/cm²)]
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm²))
5
2
1
0.5
0.2
0.1
0.05
1
2
3
4
5
ION ENERGY (MeV/amu)

Mo(42) ←←← TARGET →→→ Mo(42)

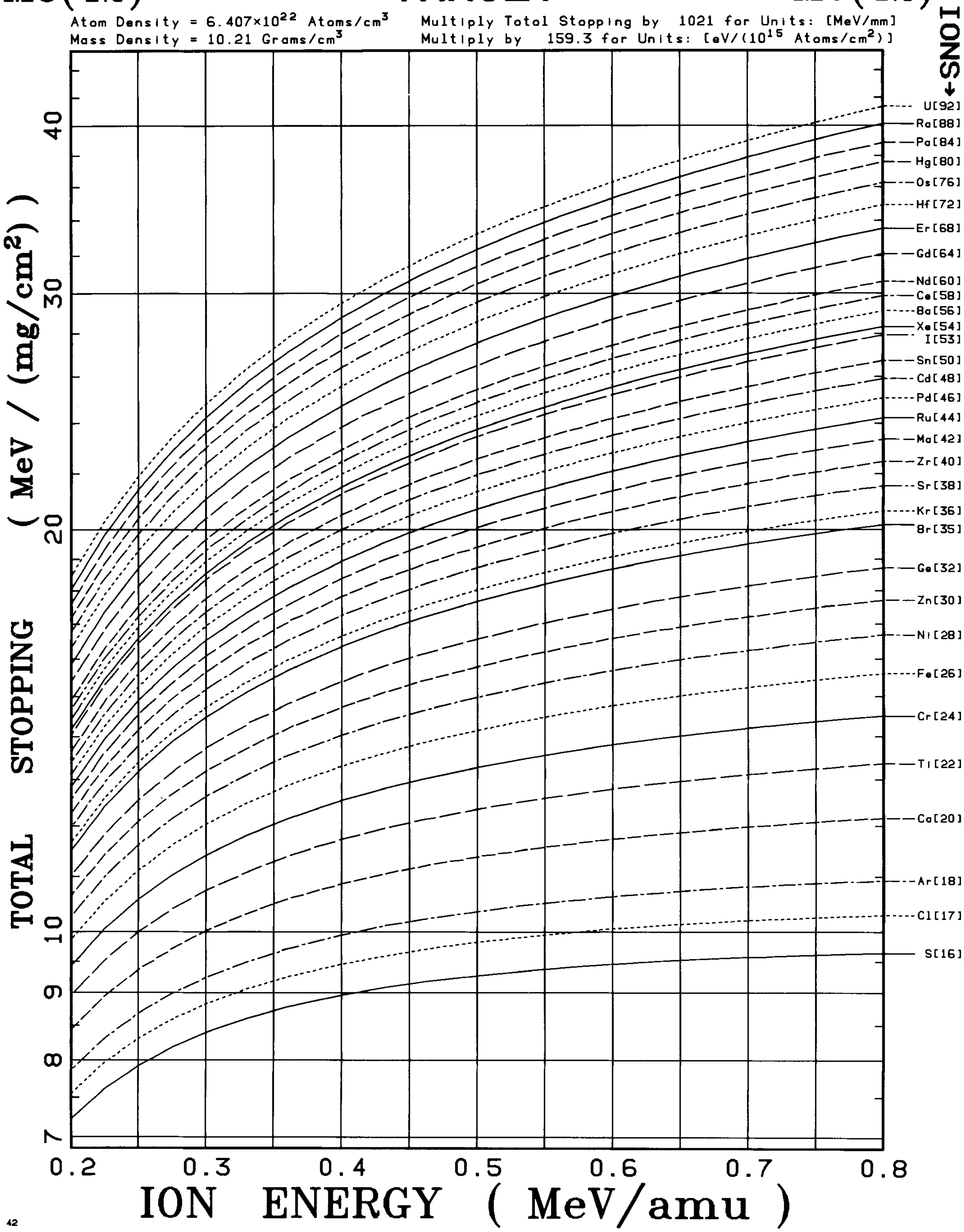
Atom Density = 6.407×10^{22} Atoms/cm^3 Multiply Total Stopping by 1021 for Units: [MeV/mm]
Mass Density = 10.21 Grams/cm^3 Multiply by 159.3 for Units: [eV/(10^{15} Atoms/cm^2)]

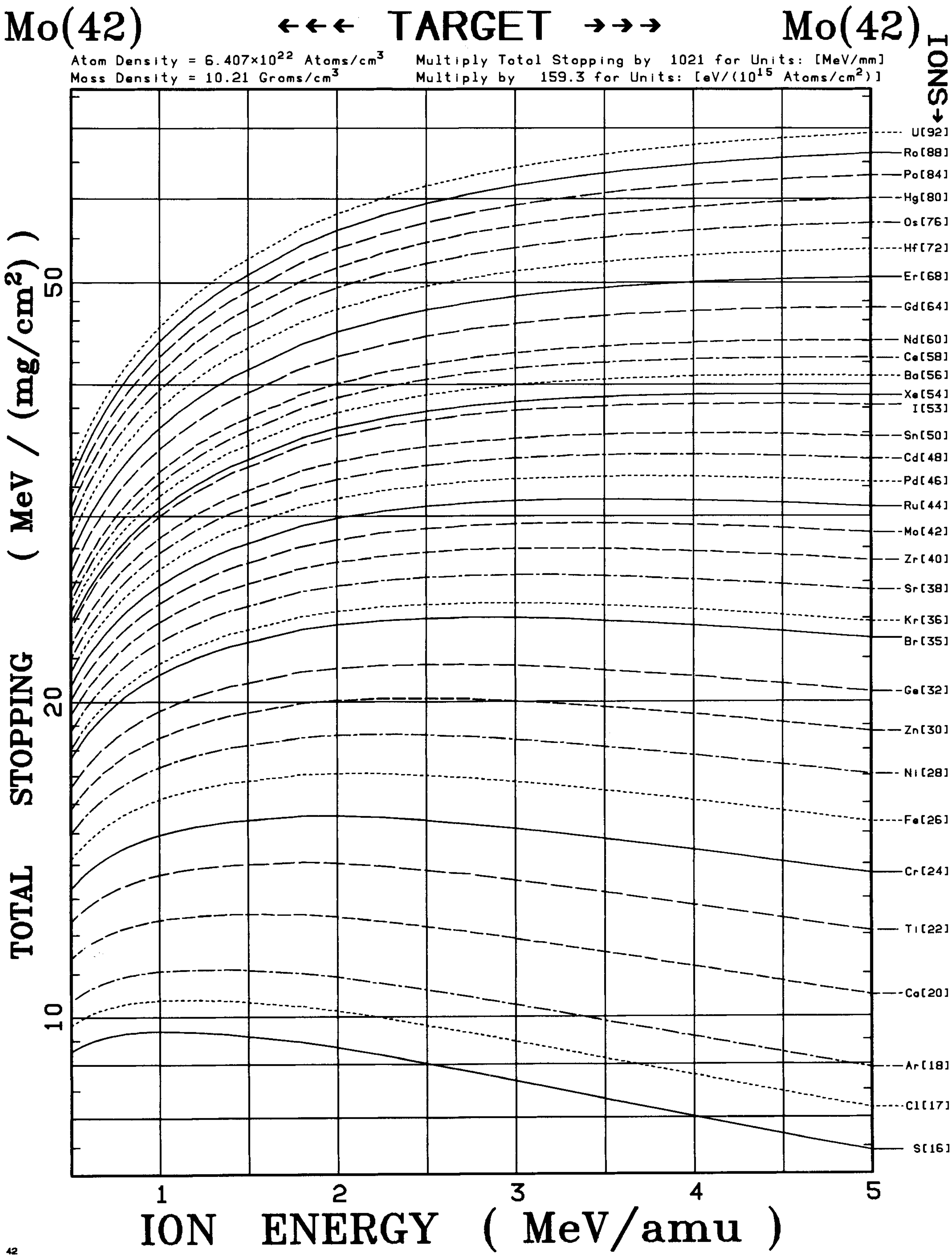



Mo(42)
←←← TARGET →→→
Mo(42)
Atom Density = 6.407×10^22 Atoms/cm^3
Multiply Total Stopping by 1021 for Units: [MeV/mm]
Mass Density = 10.21 Grams/cm^3
Multiply by 159.3 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm²))
1
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
IONS↓
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)

Mo(42) ←←← TARGET →→→ Mo(42)

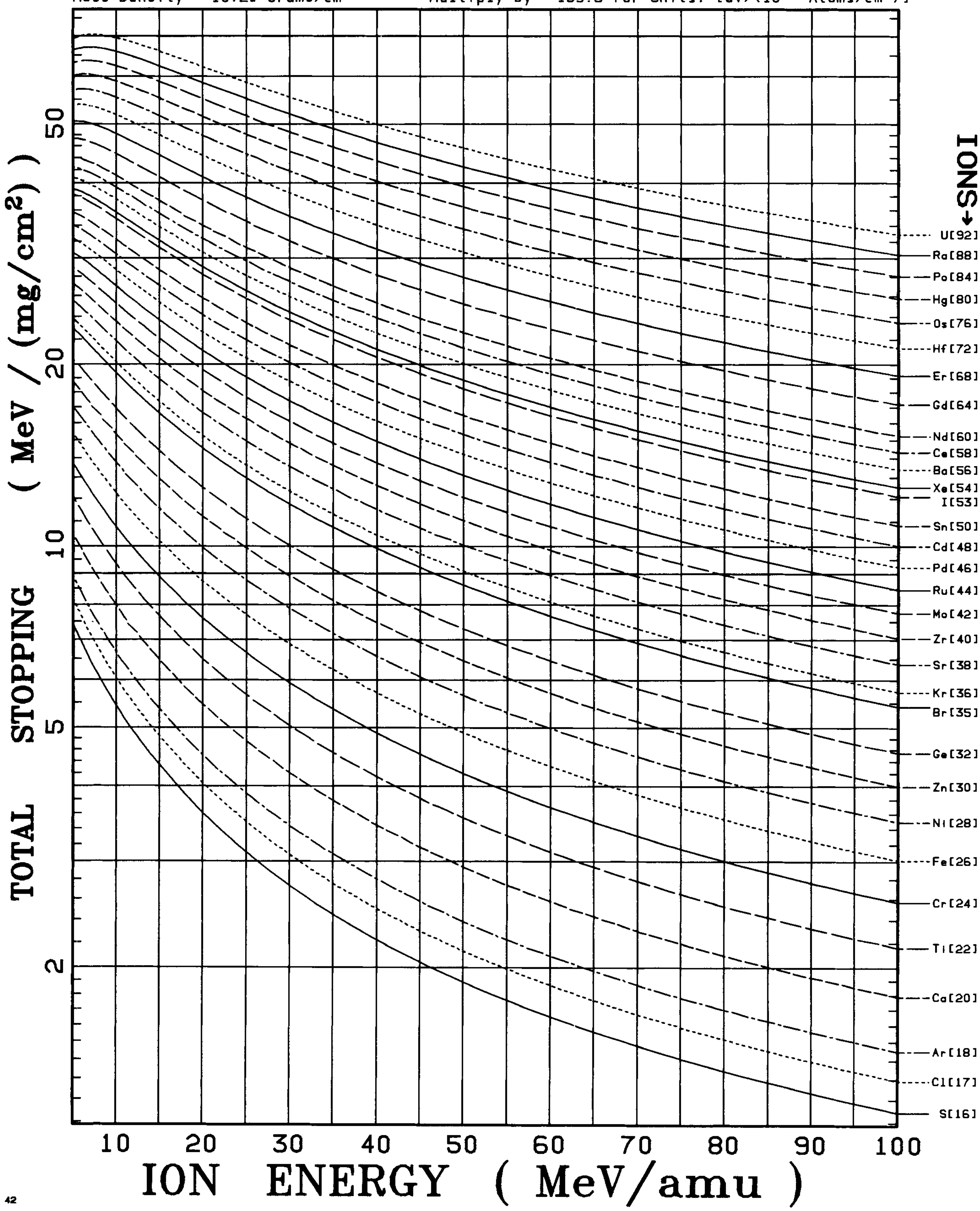
Atom Density = 6.407×10²² Atoms/cm³ Multiply Total Stopping by 1021 for Units: [MeV/mm]
Mass Density = 10.21 Grams/cm³ Multiply by 159.3 for Units: [eV/(10¹⁵ Atoms/cm²)]




Mo(42) ←←← TARGET →→→ Mo(42)
Atom Density = 6.407×10^22 Atoms/cm^3
Mass Density = 10.21 Grams/cm^3
Multiply Total Stopping by 1021 for Units: [MeV/mm]
Multiply by 159.3 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm^2))
50
20
10
1
2
3
4
5
ION ENERGY (MeV/amu)

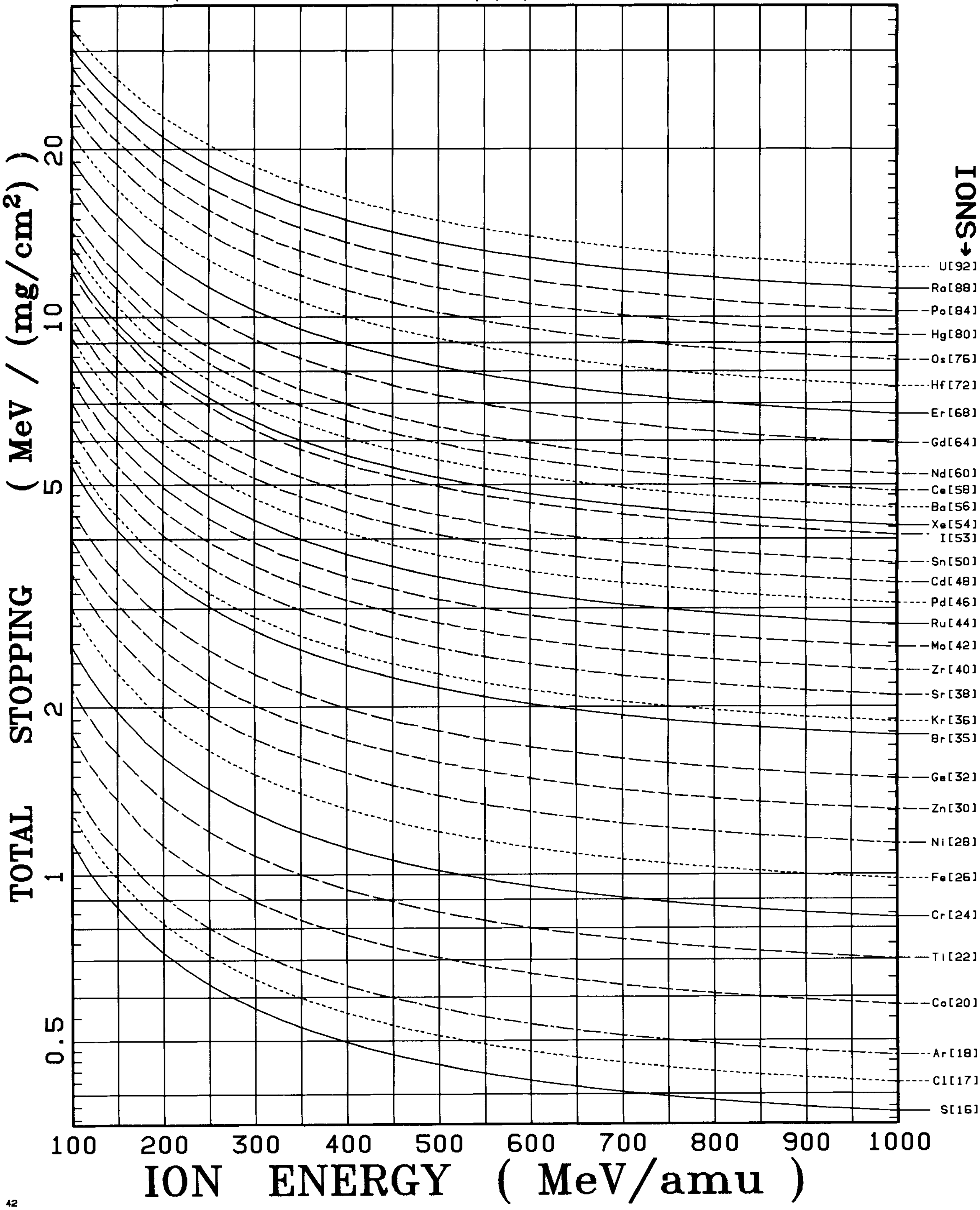
Mo(42) ←←← TARGET →→→ Mo(42)

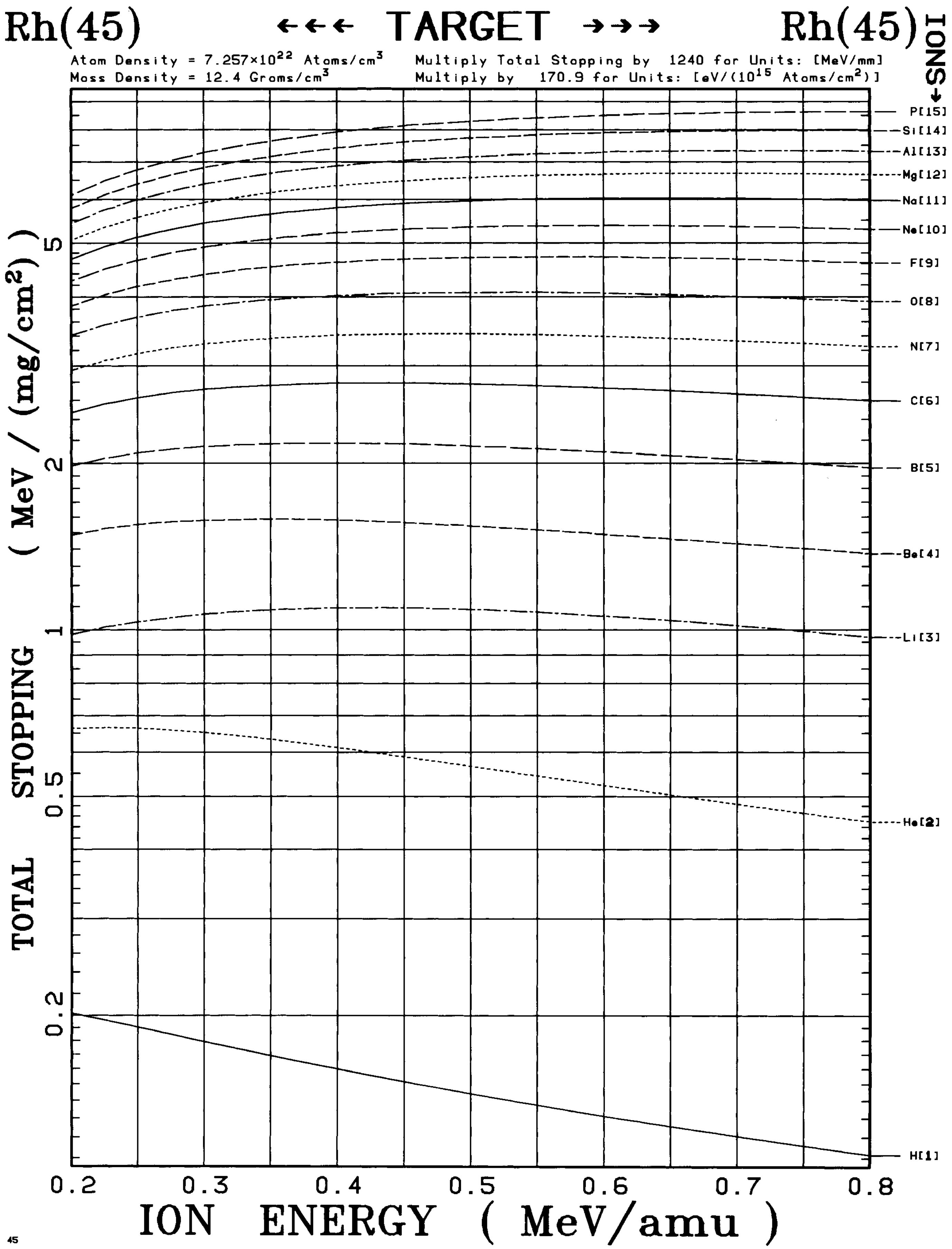
Atom Density = 6.407×10^{22} Atoms/cm^3 Multiply Total Stopping by 1021 for Units: [MeV/mm]
Mass Density = 10.21 Grams/cm^3 Multiply by 159.3 for Units: [eV/(10^{15} Atoms/cm^2)]



Mo(42) ←←← TARGET →→→ Mo(42)

Atom Density = 6.407×10^{22} Atoms/cm^3 Multiply Total Stopping by 1021 for Units: [MeV/mm]
Mass Density = 10.21 Grams/cm^3 Multiply by 159.3 for Units: [eV/(10^{15} Atoms/cm^2)]

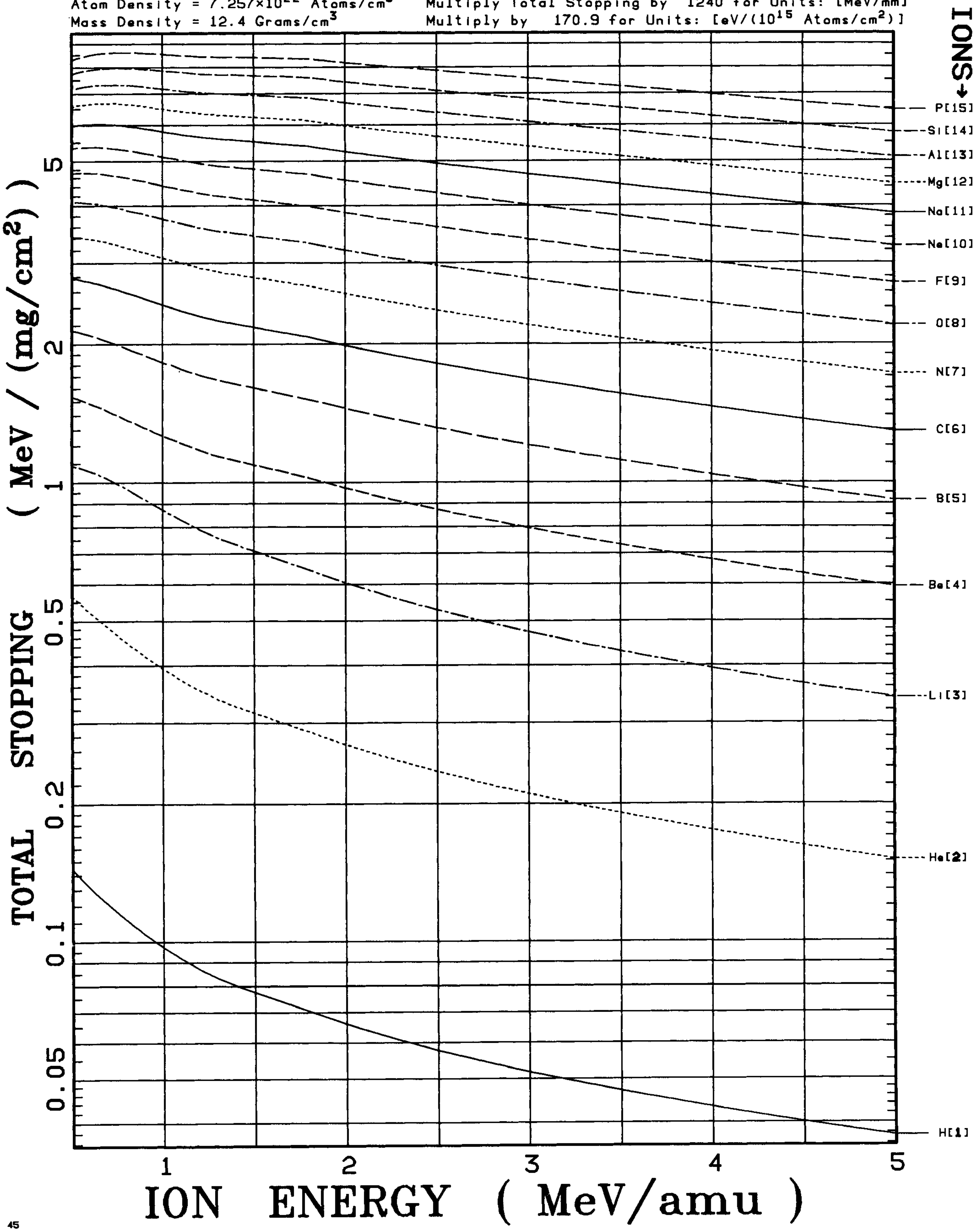



Rh(45)
←←← TARGET →→→
Rh(45)
IONS→
Atom Density = 7.257×10^22 Atoms/cm^3
Multiply Total Stopping by 1240 for Units: [MeV/mm]
Mass Density = 12.4 Grams/cm^3
Multiply by 170.9 for Units: [eV/(10^15 Atoms/cm^2)]
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm²))
5
2
1
0.5
0.2
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

45

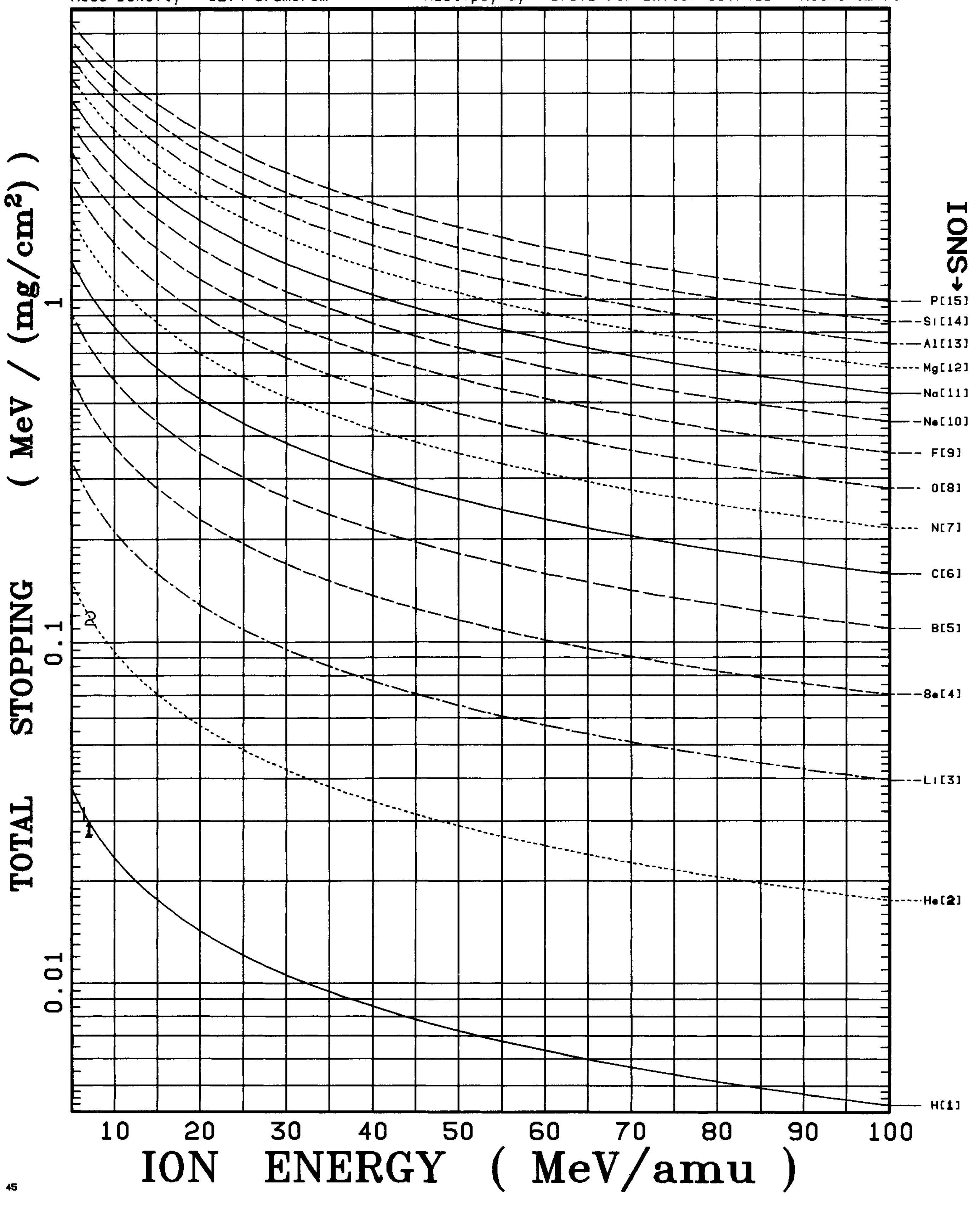
Rh(45) ←←← TARGET →→→ Rh(45)

Atom Density = 7.257×10^{22} Atoms/cm^3 Multiply Total Stopping by 1240 for Units: [MeV/mm]
Mass Density = 12.4 Grams/cm^3 Multiply by 170.9 for Units: [eV/(10^{15} Atoms/cm^2)]



Rh(45) ←←← TARGET →→→ Rh(45)

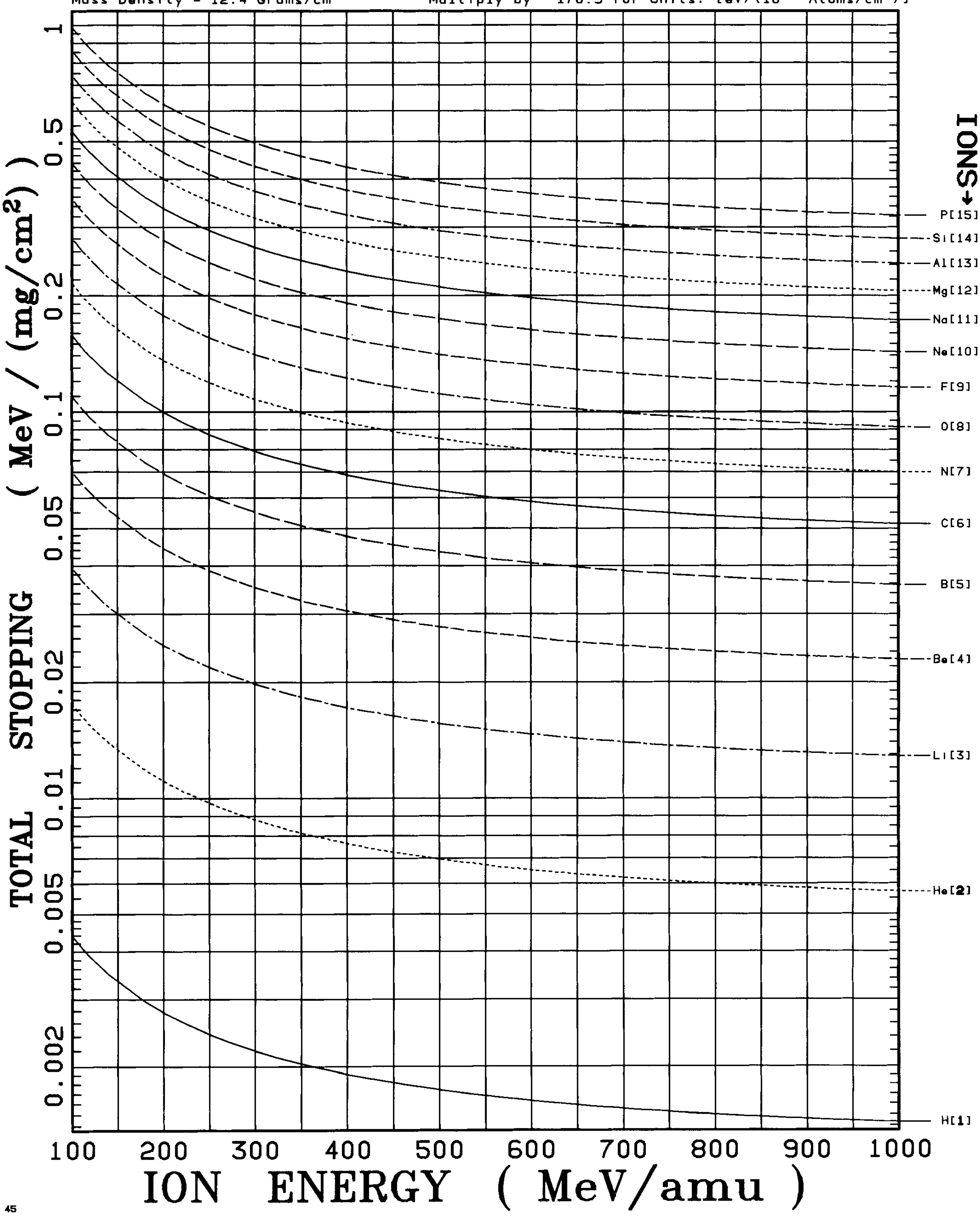
Atom Density = 7.257×10²² Atoms/cm³ Multiply Total Stopping by 1240 for Units: [MeV/mm]
Mass Density = 12.4 Grams/cm³ Multiply by 170.9 for Units: [eV/(10¹⁵ Atoms/cm²)]

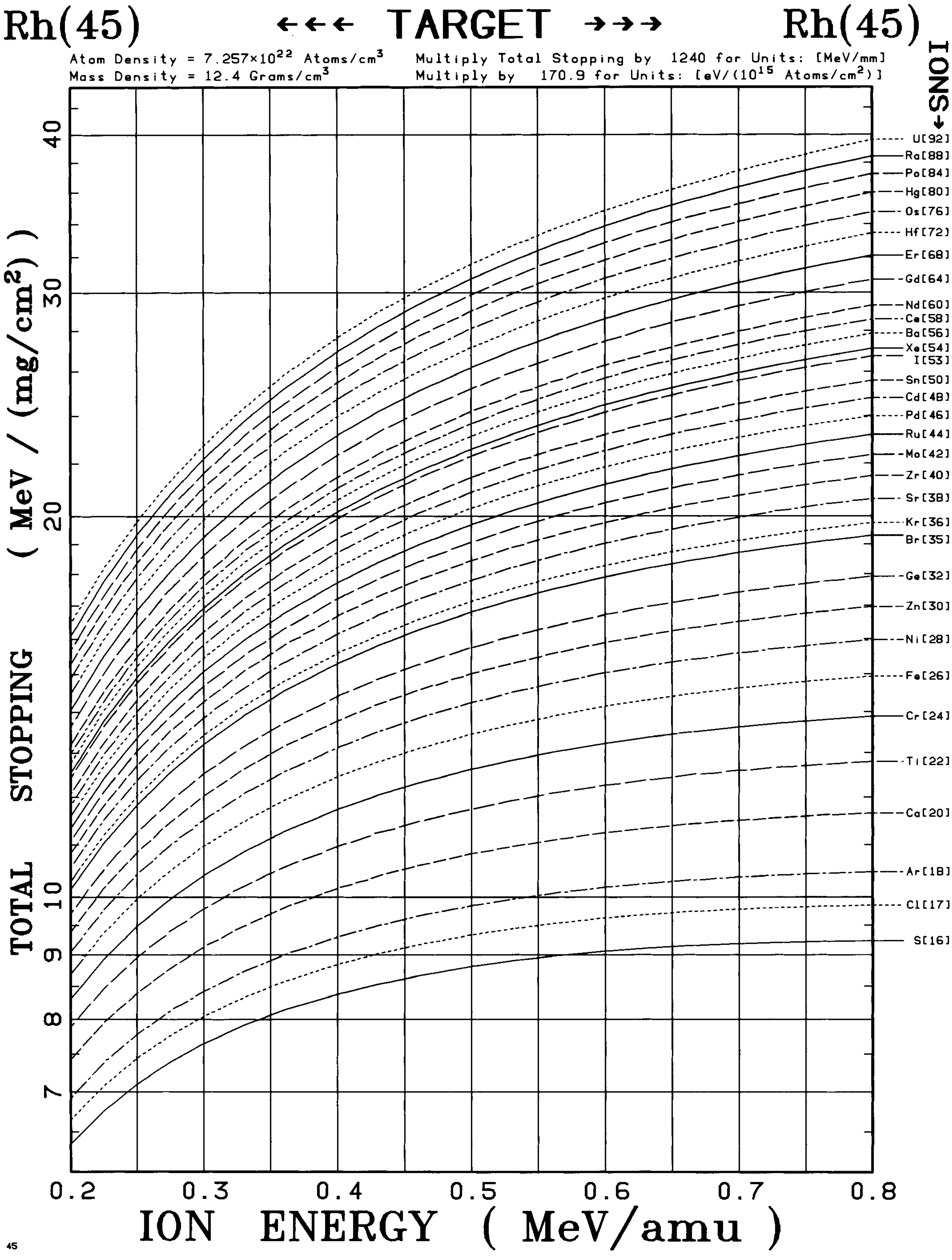


45

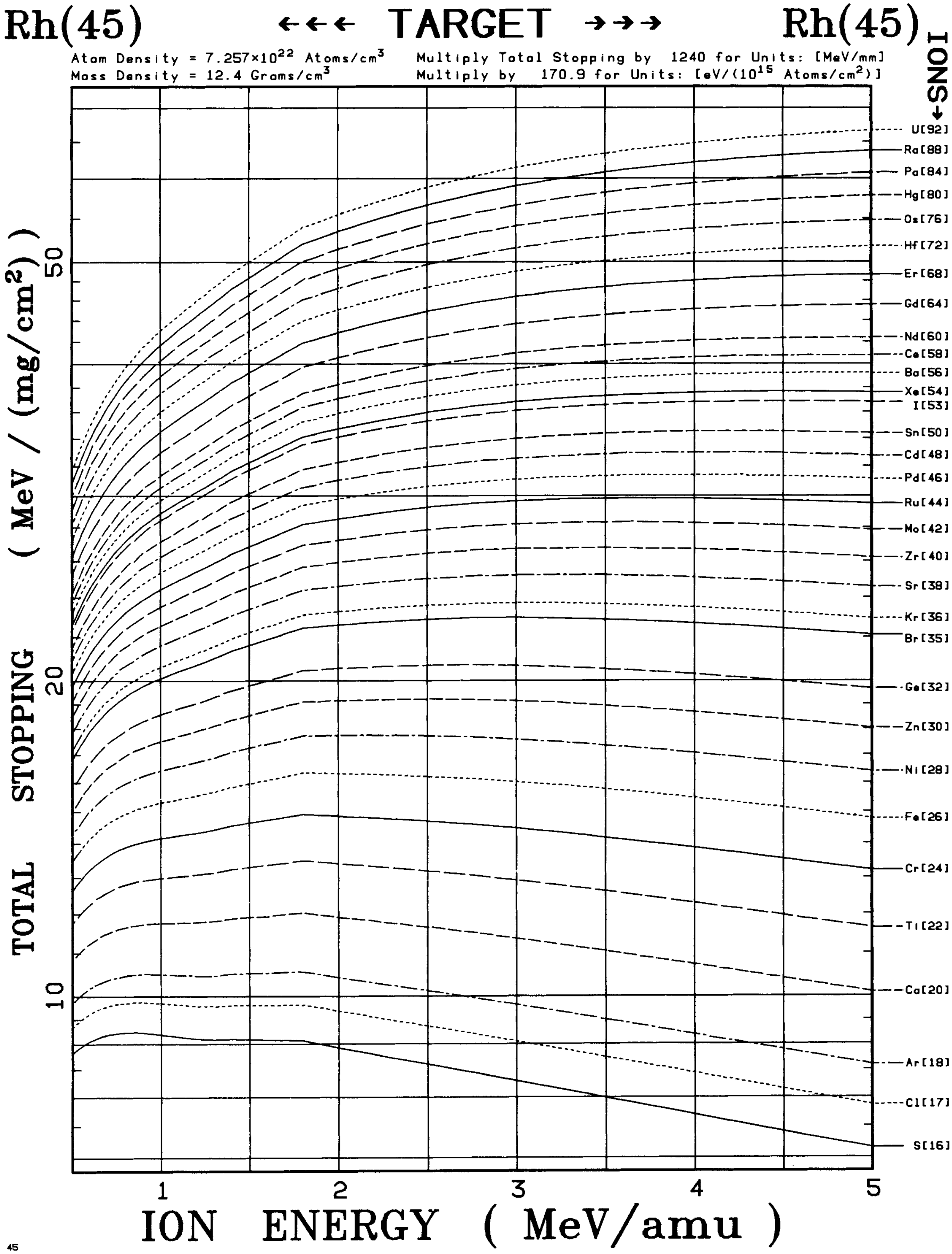
Rh(45) ←←← TARGET →→→ Rh(45)

Atom Density = 7.257×10^{22} Atoms/cm^3 Multiply Total Stopping by 1240 for Units: [MeV/mm]
Mass Density = 12.4 Grams/cm^3 Multiply by 170.9 for Units: [eV/(10^{15} Atoms/cm^2)]



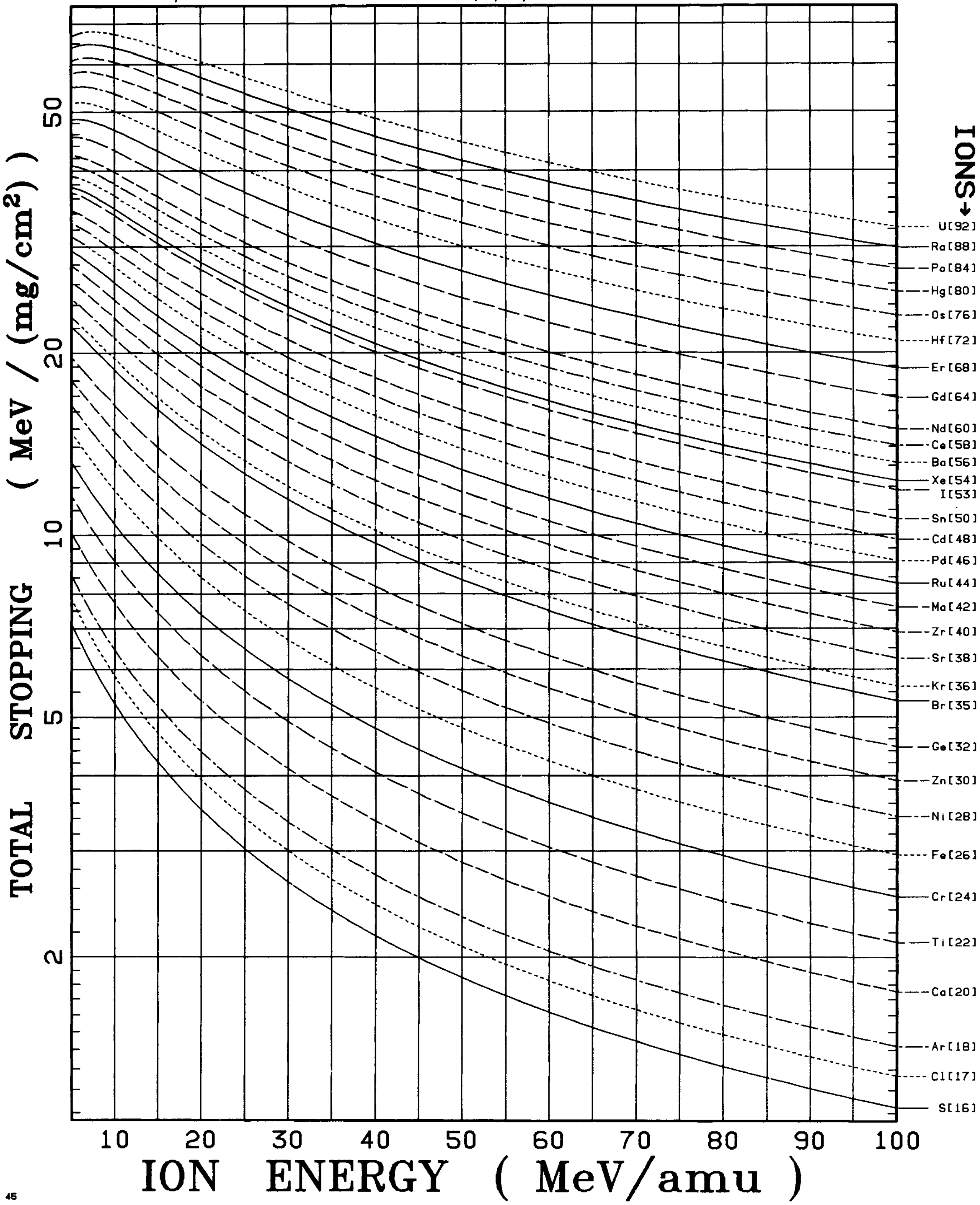

Rh(45)
←←← TARGET →→→
Rh(45)
Atom Density = 7.257×10^22 Atoms/cm^3
Mass Density = 12.4 Grams/cm^3
Multiply Total Stopping by 1240 for Units: [MeV/mm]
Multiply by 170.9 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
0.2
0.3
0.4
0.5
0.6
0.7
0.8
7
8
9
10
20
30
40
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]

45


Rh(45) ←←← TARGET →→→ Rh(45)
Atom Density = 7.257×10^22 Atoms/cm^3
Mass Density = 12.4 Grams/cm^3
Multiply Total Stopping by 1240 for Units: [MeV/mm]
Multiply by 170.9 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Pa[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm^2))
50
20
10
1
2
3
4
5
ION ENERGY (MeV/amu)

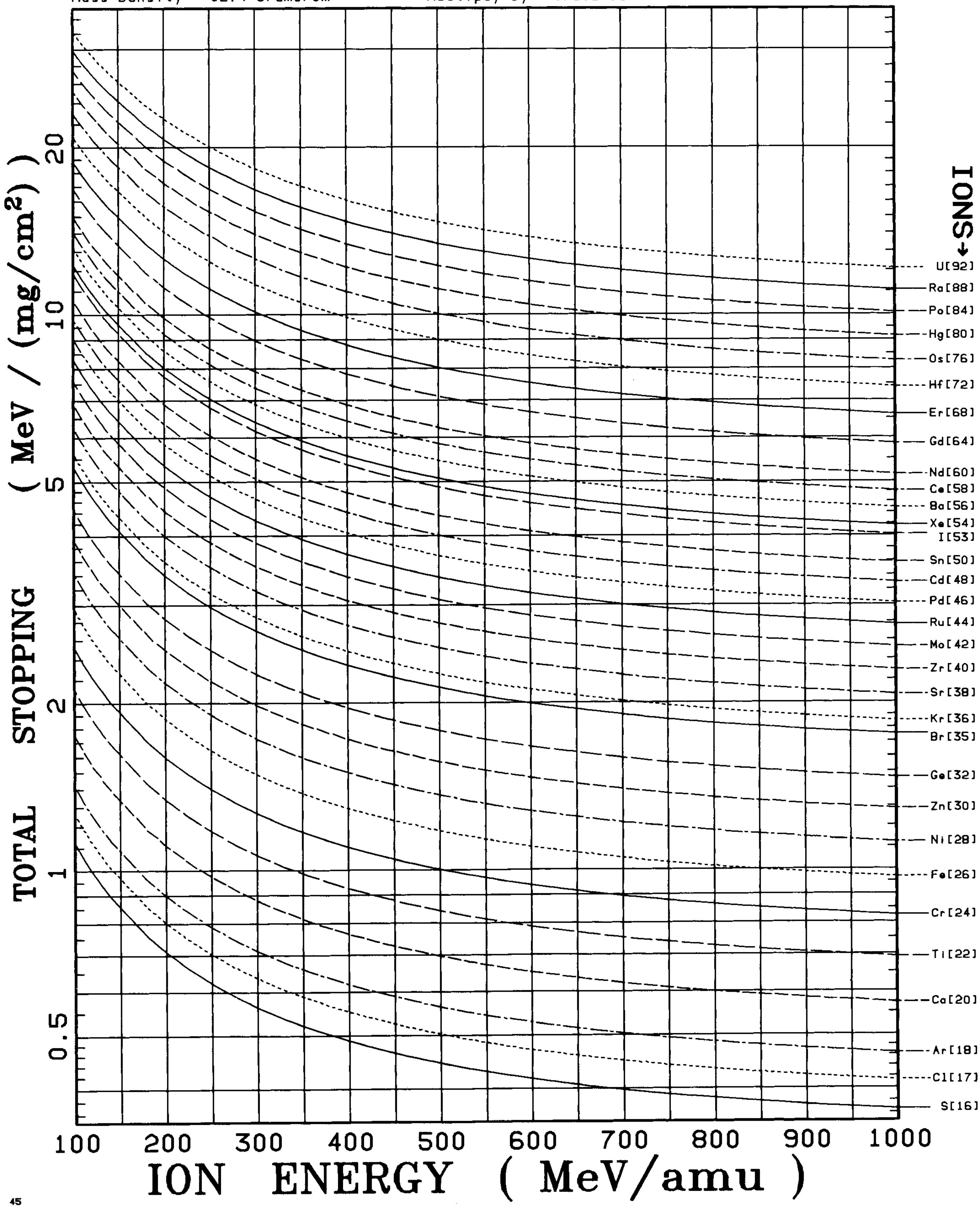
Rh(45) ←←← TARGET →→→ Rh(45)

Atom Density = 7.257×10^{22} Atoms/cm^3 Multiply Total Stopping by 1240 for Units: [MeV/mm]
Mass Density = 12.4 Grams/cm^3 Multiply by 170.9 for Units: [eV/(10^{15} Atoms/cm^2)]



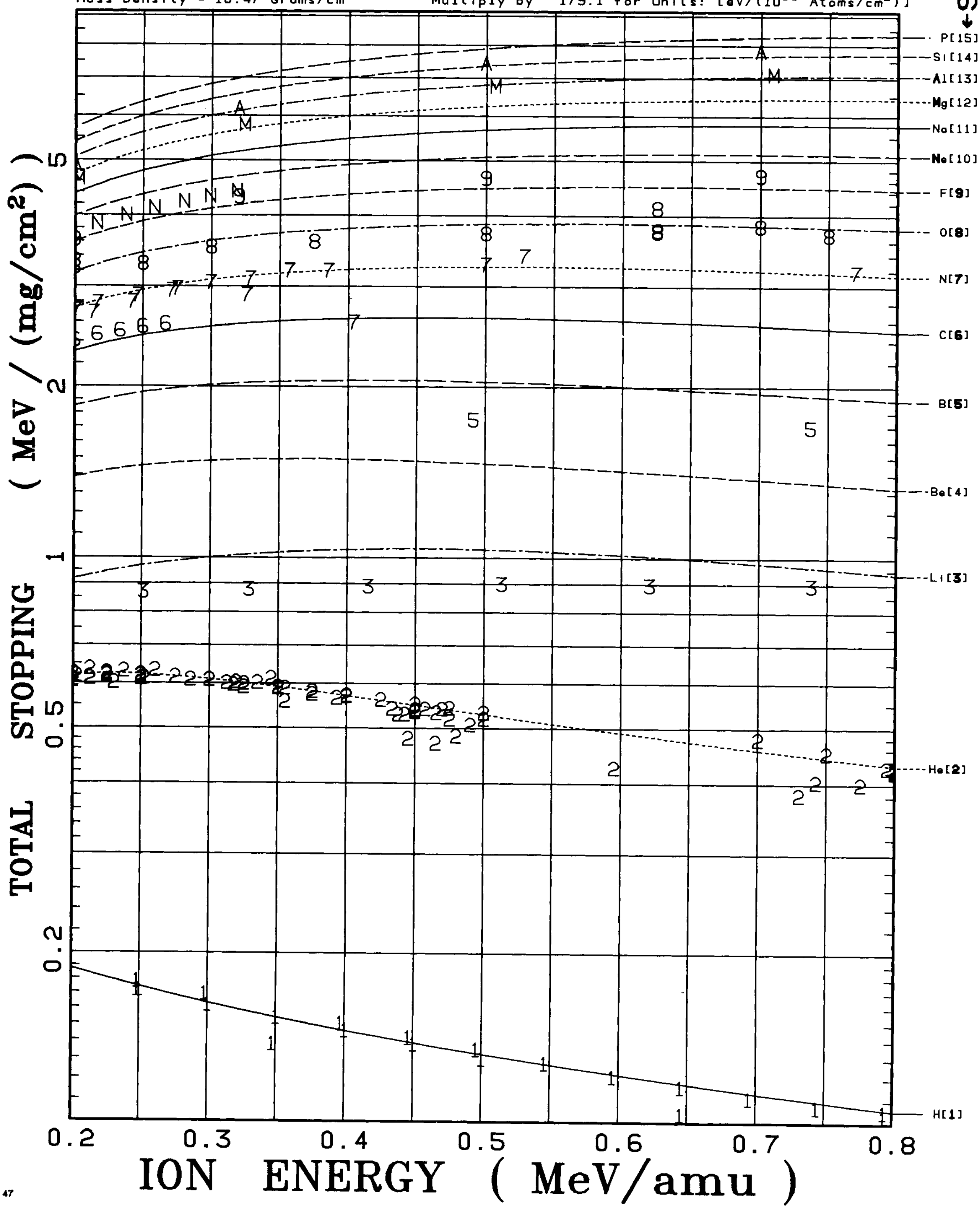
Rh(45) ←←← TARGET →→→ Rh(45)

Atom Density = 7.257×10^{22} Atoms/cm^3 Multiply Total Stopping by 1240 for Units: [MeV/mm]
Mass Density = 12.4 Grams/cm^3 Multiply by 170.9 for Units: [eV/(10^{15} Atoms/cm^2)]



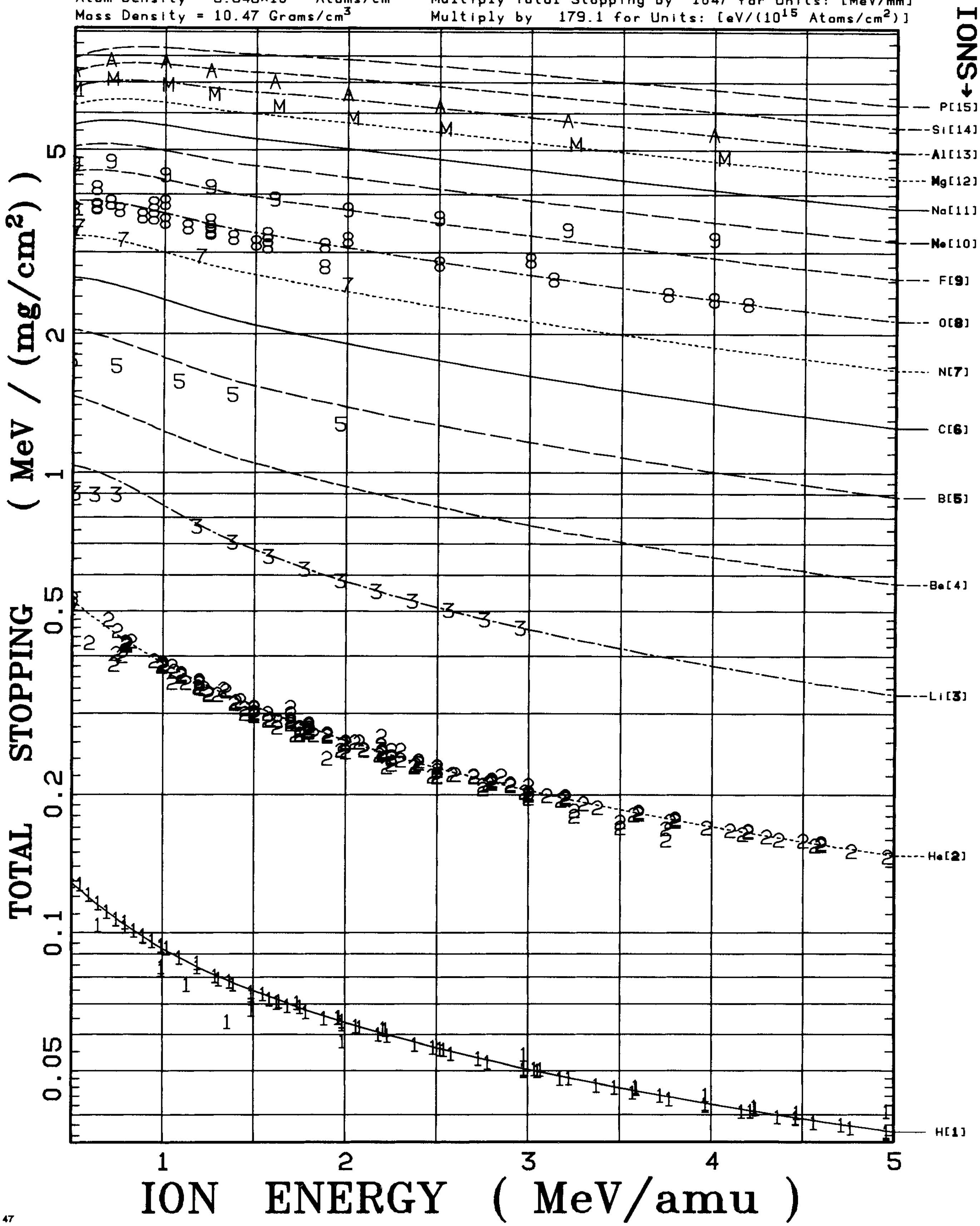
Ag(47) ←←← TARGET →→→ Ag(47)

Atom Density = 5.848×10^22 Atoms/cm^3 Multiply Total Stopping by 1047 for Units: [MeV/mm]
Mass Density = 10.47 Grams/cm^3 Multiply by 179.1 for Units: [eV/(10^15 Atoms/cm^2)]



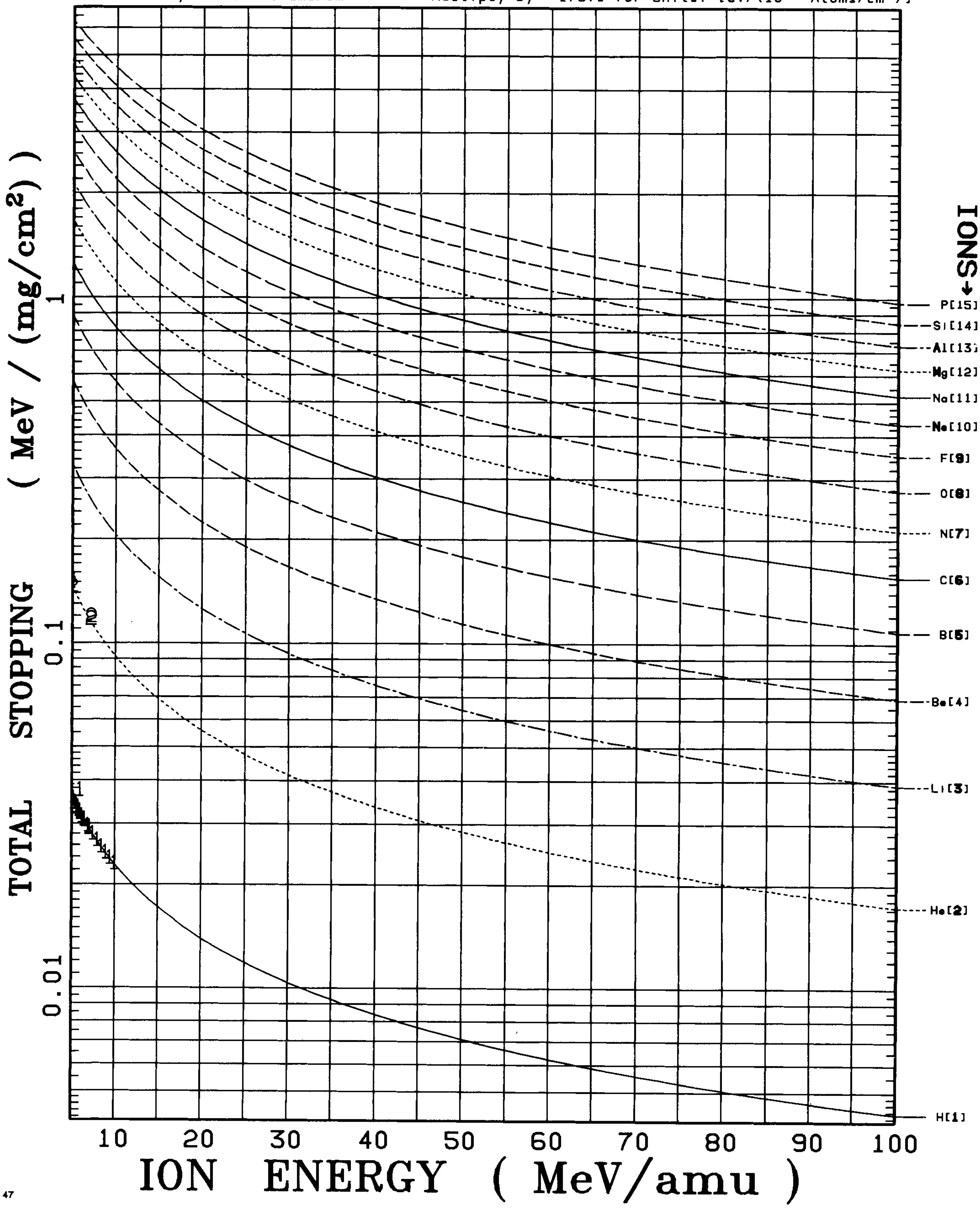
Ag(47) ←←← TARGET →→→ Ag(47)

Atom Density = 5.848×10^{22} Atoms/cm^3 Multiply Total Stopping by 1047 for Units: [MeV/mm]
Mass Density = 10.47 Grams/cm^3 Multiply by 179.1 for Units: [eV/(10^{15} Atoms/cm^2)]

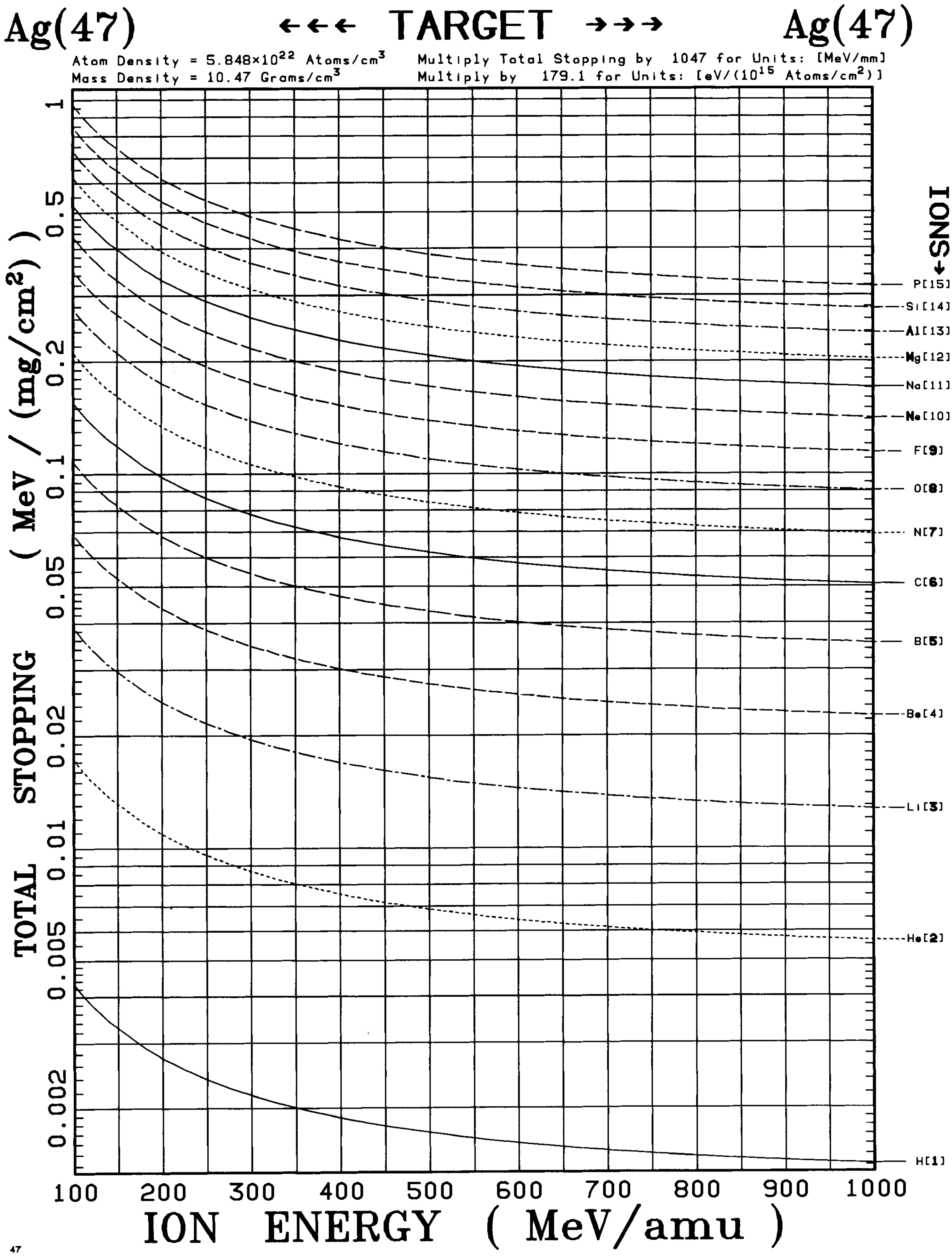


Ag(47) ←←← TARGET →→→ Ag(47)

Atom Density = 5.848×10^{22} Atoms/cm^3 Multiply Total Stopping by 1047 for Units: [MeV/mm]
Mass Density = 10.47 Grams/cm^3 Multiply by 179.1 for Units: [eV/(10^{15} Atoms/cm^2)]

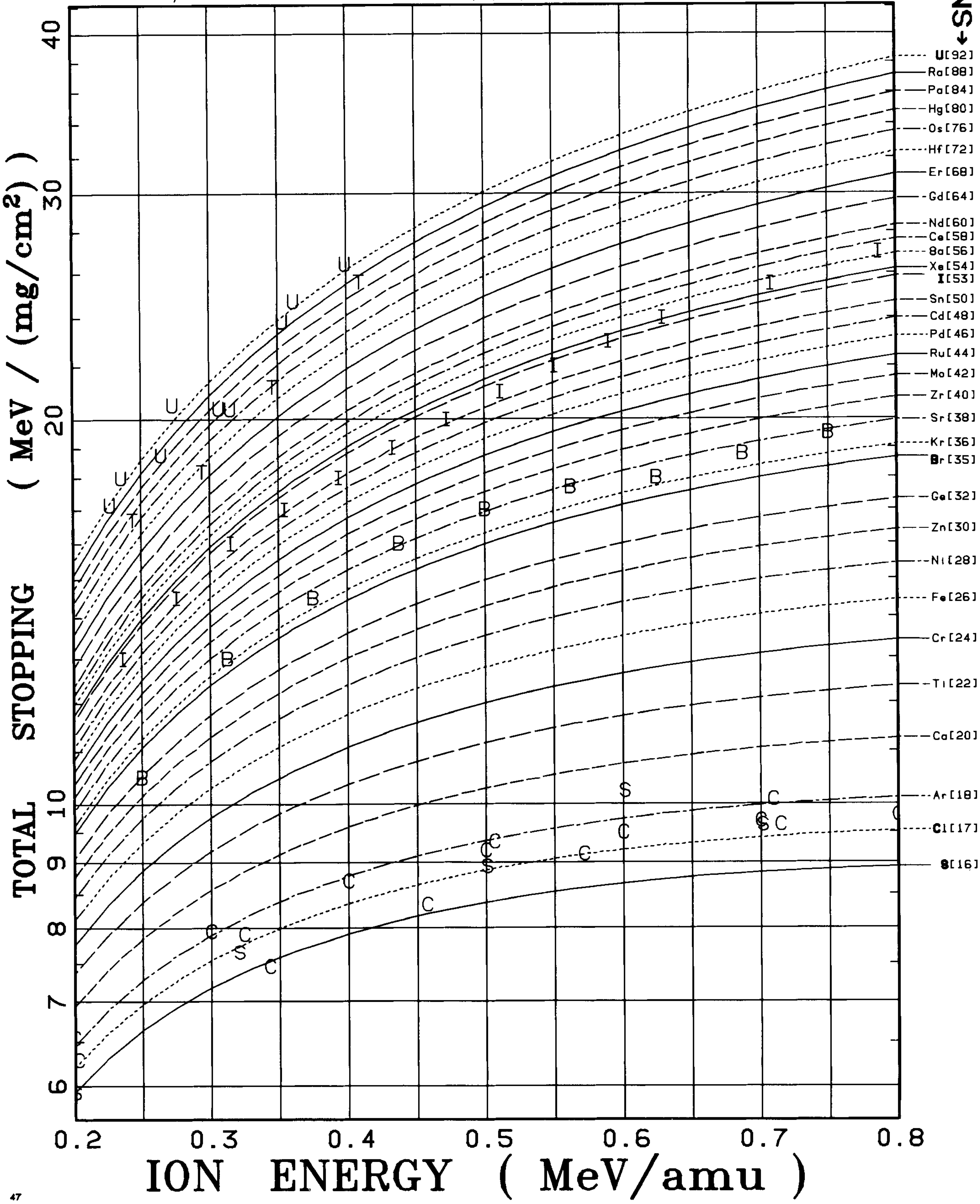


47


Ag(47)
←←← TARGET →→→
Ag(47)
Atom Density = 5.848×10^22 Atoms/cm^3
Mass Density = 10.47 Grams/cm^3
Multiply Total Stopping by 1047 for Units: [MeV/mm]
Multiply by 179.1 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
1
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
ION ENERGY (MeV/amu)
100
200
300
400
500
600
700
800
900
1000
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]

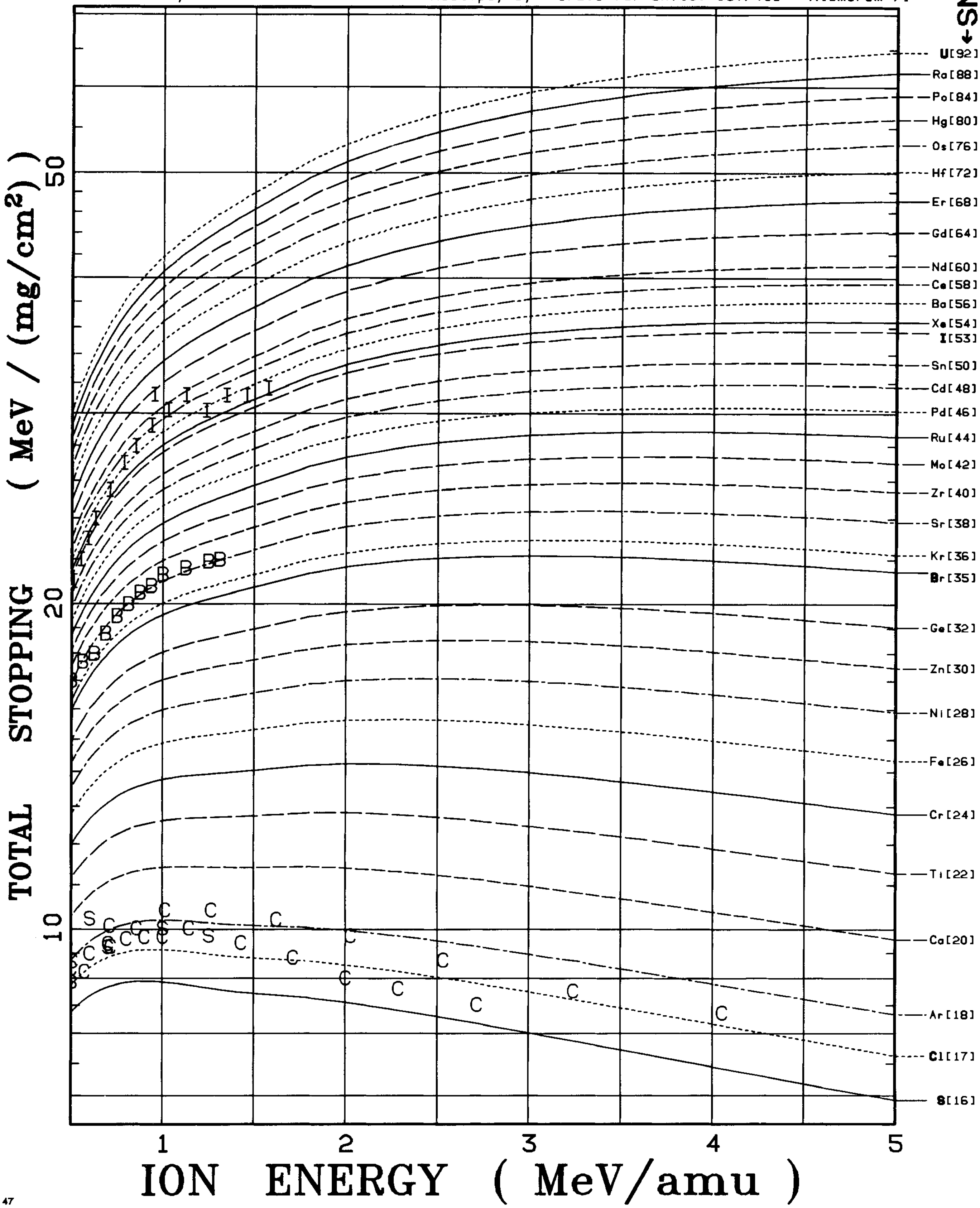
Ag(47) ←←← TARGET →→→ Ag(47)

Atom Density = 5.848×10²² Atoms/cm³ Multiply Total Stopping by 1047 for Units: [MeV/mm]
Mass Density = 10.47 Grams/cm³ Multiply by 179.1 for Units: [eV/(10¹⁵ Atoms/cm²)]

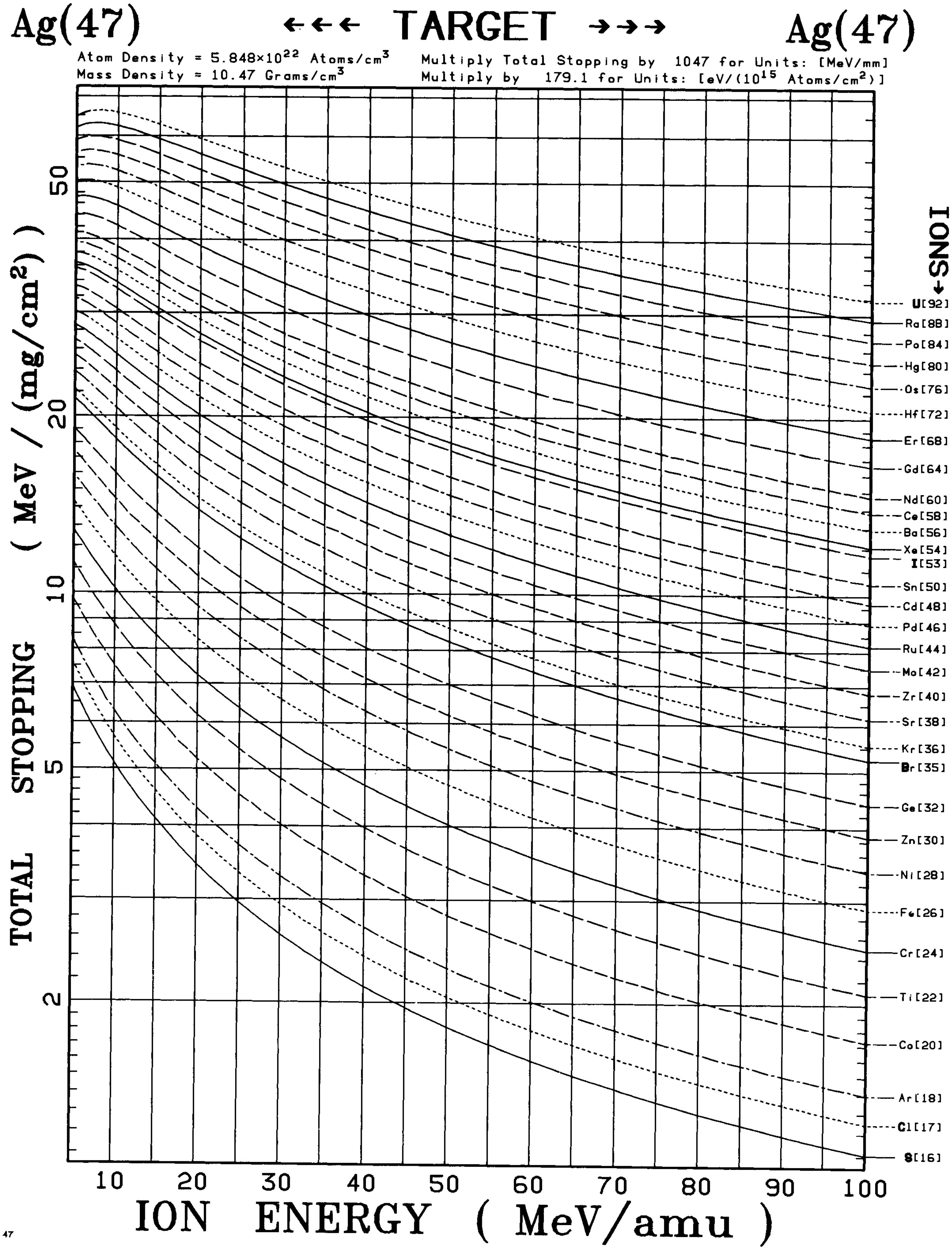


Ag(47) ←←← TARGET →→→ Ag(47)

Atom Density = 5.848×10^{22} Atoms/cm^3 Multiply Total Stopping by 1047 for Units: [MeV/mm]
Mass Density = 10.47 Grams/cm^3 Multiply by 179.1 for Units: [eV/(10^{15} Atoms/cm^2)]



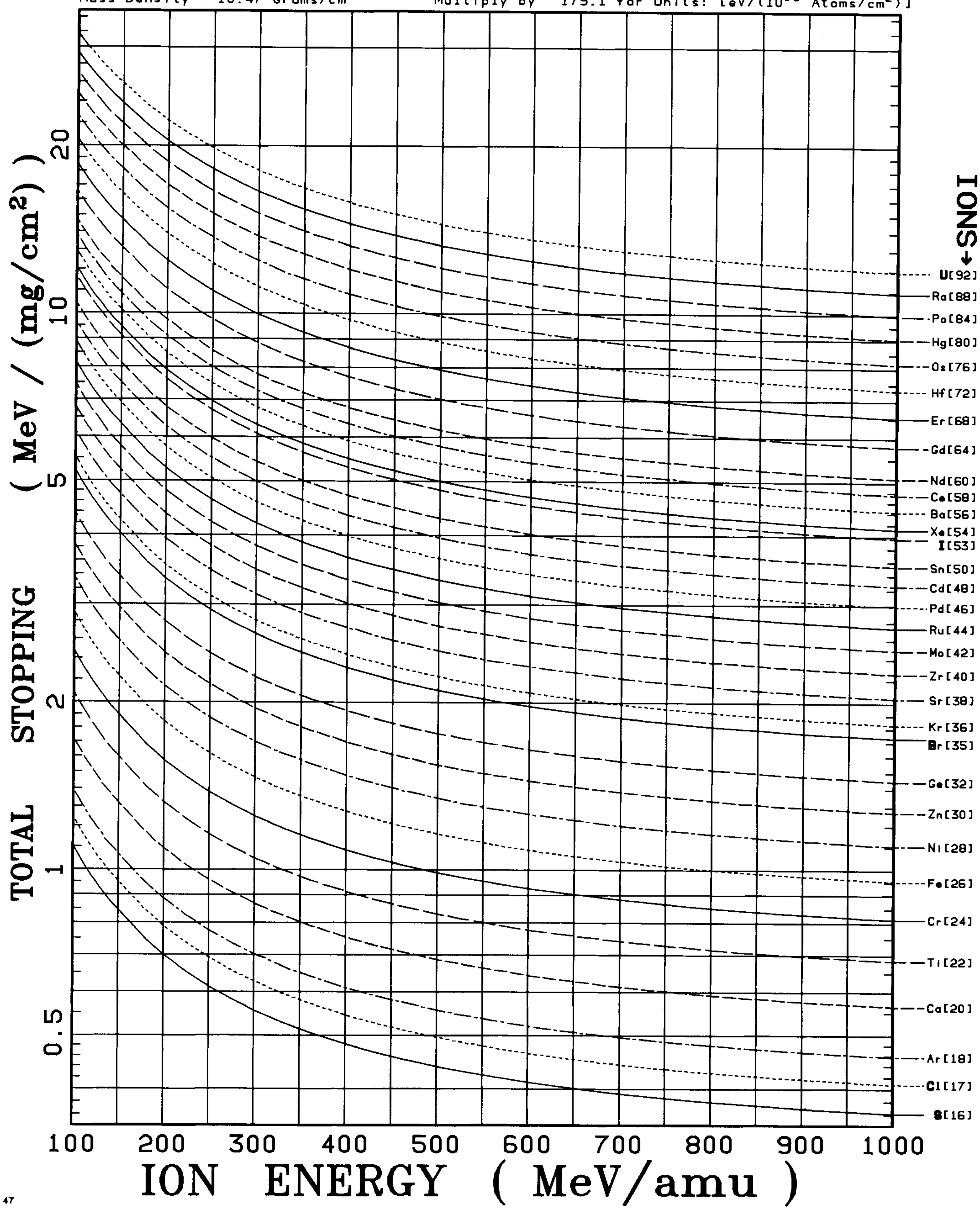
47


Ag(47)
←←← TARGET →→→
Ag(47)
Atom Density = 5.848×10^22 Atoms/cm^3
Mass Density = 10.47 Grams/cm^3
Multiply Total Stopping by 1047 for Units: [MeV/mm]
Multiply by 179.1 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]

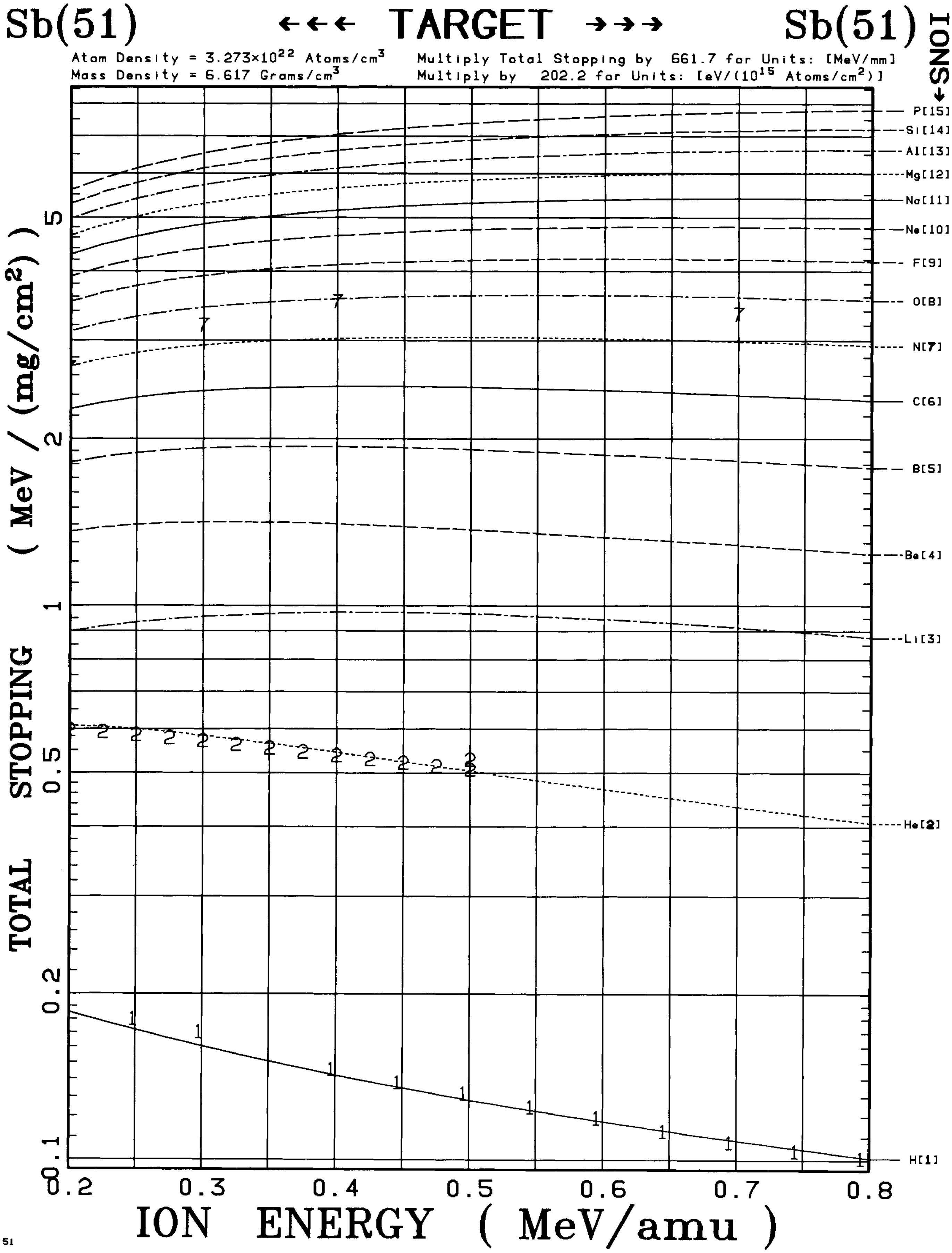
47

Ag(47) ←←← TARGET →→→ Ag(47)

Atom Density = 5.848×10[22] Atoms/cm[3] Multiply Total Stopping by 1047 for Units: [MeV/mm]
Mass Density = 10.47 Grams/cm[3] Multiply by 179.1 for Units: [eV/(10[15] Atoms/cm[2])]

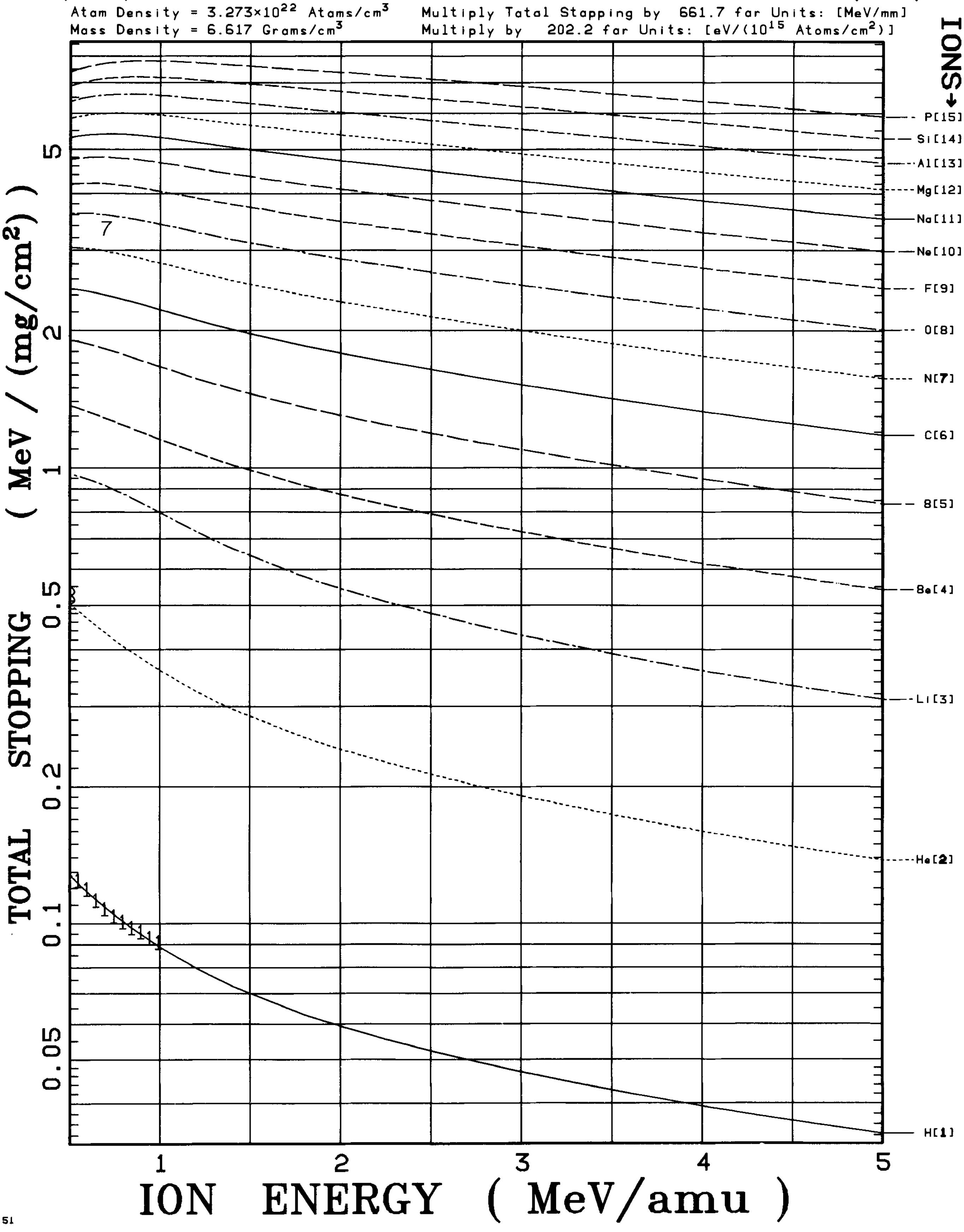


47


Sb(51) ←←← TARGET →→→ Sb(51)
IONS→
Atom Density = 3.273×10²² Atoms/cm³
Mass Density = 6.617 Grams/cm³
Multiply Total Stopping by 661.7 for Units: [MeV/mm]
Multiply by 202.2 for Units: [eV/(10¹⁵ Atoms/cm²)]
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm²))
5
2
1
0.5
0.2
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

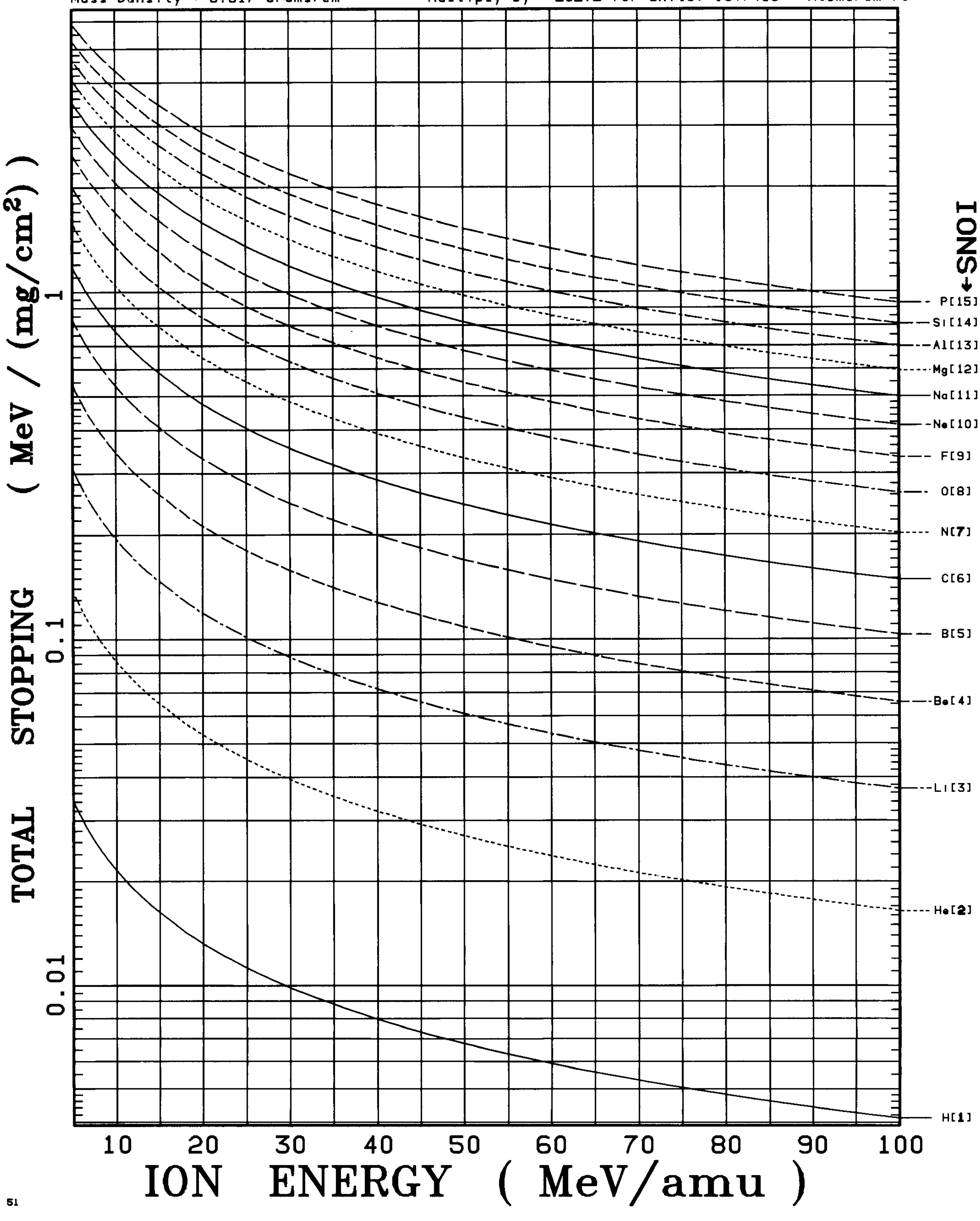
Sb(51) ←←← TARGET →→→ Sb(51)

Atom Density = 3.273×10^{22} Atoms/cm^3 Multiply Total Stopping by 661.7 for Units: [MeV/mm]
Mass Density = 6.617 Grams/cm^3 Multiply by 202.2 for Units: [eV/(10^{15} Atoms/cm^2)]



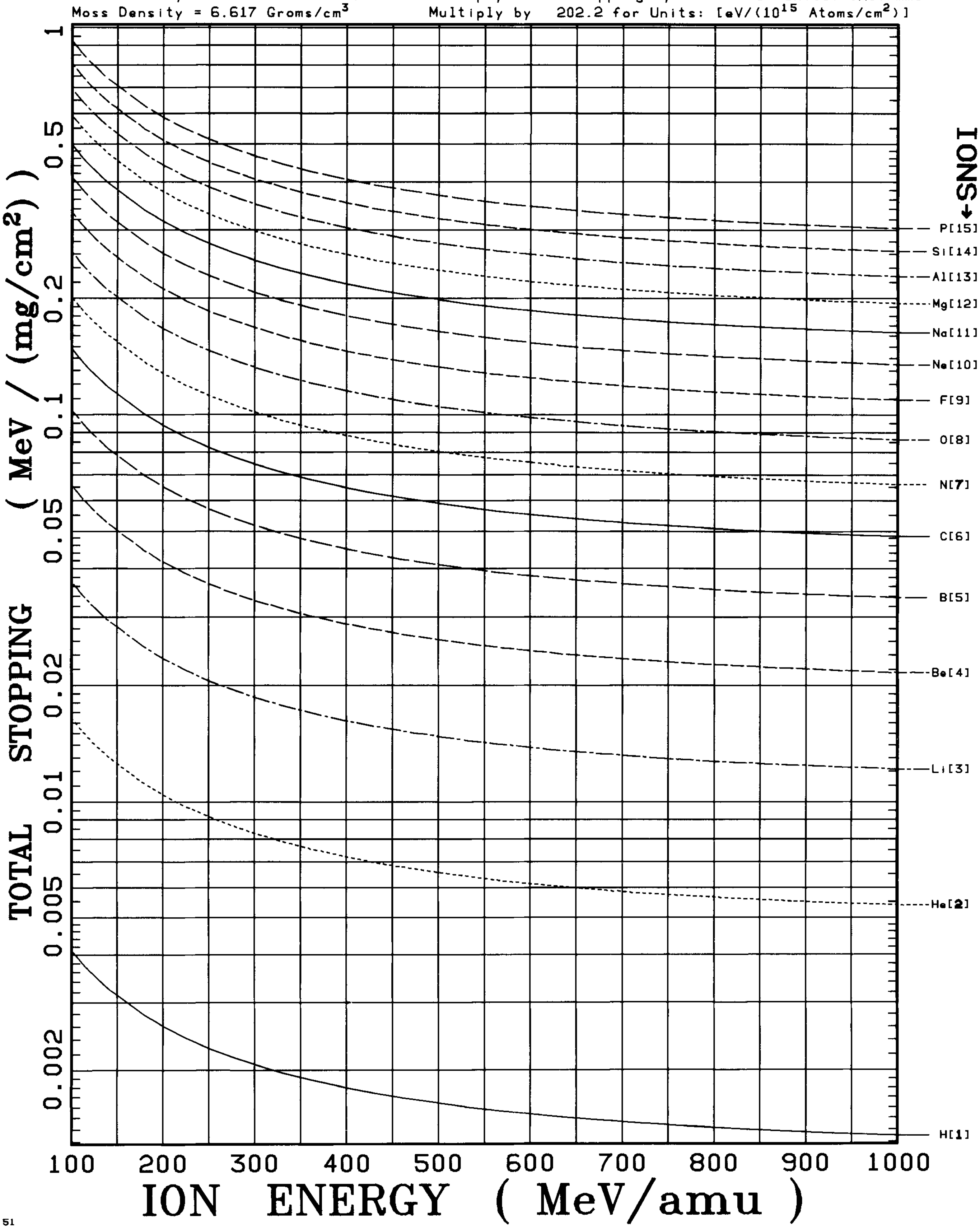
Sb(51) ←←← TARGET →→→ Sb(51)

Atom Density = 3.273×10^{22} Atoms/cm^3 Multiply Total Stopping by 661.7 for Units: [MeV/mm]
Mass Density = 6.617 Grams/cm^3 Multiply by 202.2 for Units: [eV/(10^{15} Atoms/cm^2)]



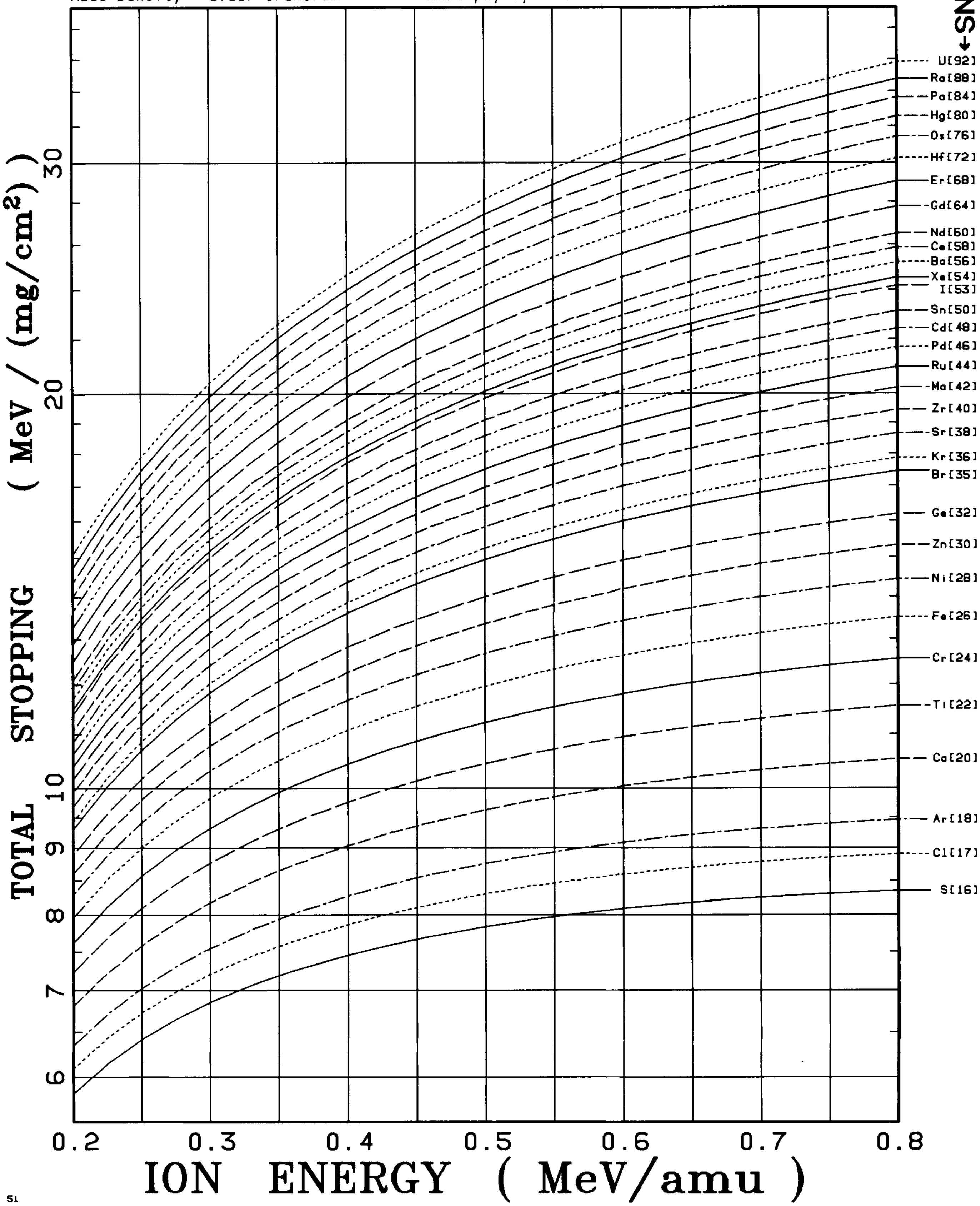
Sb(51) ←←← TARGET →→→ Sb(51)

Atom Density = 3.273×10^{22} Atoms/cm^3 Multiply Total Stopping by 661.7 for Units: [MeV/mm]
Mass Density = 6.617 Grams/cm^3 Multiply by 202.2 for Units: [eV/(10^{15} Atoms/cm^2)]



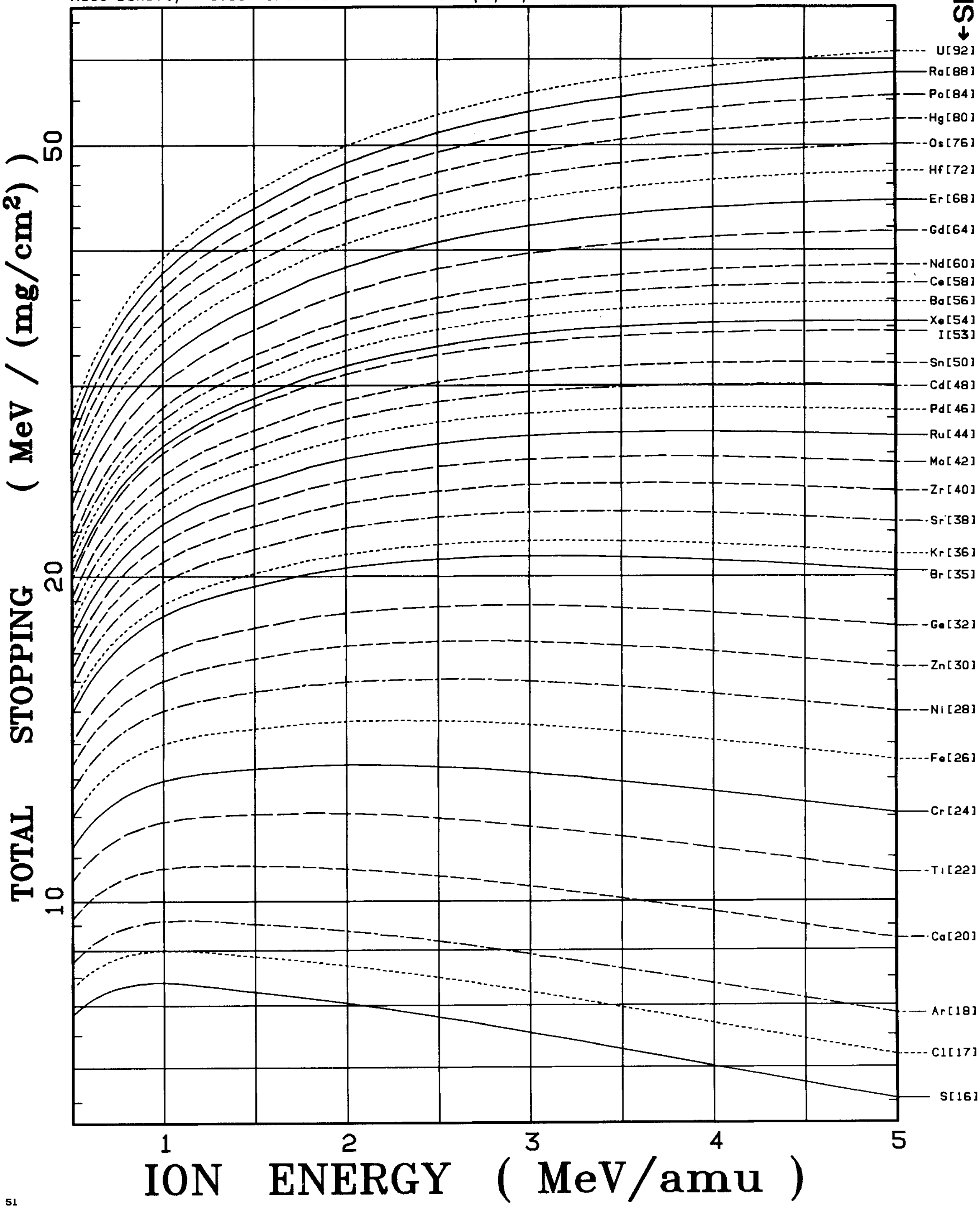
Sb(51) ←←← TARGET →→→ Sb(51)

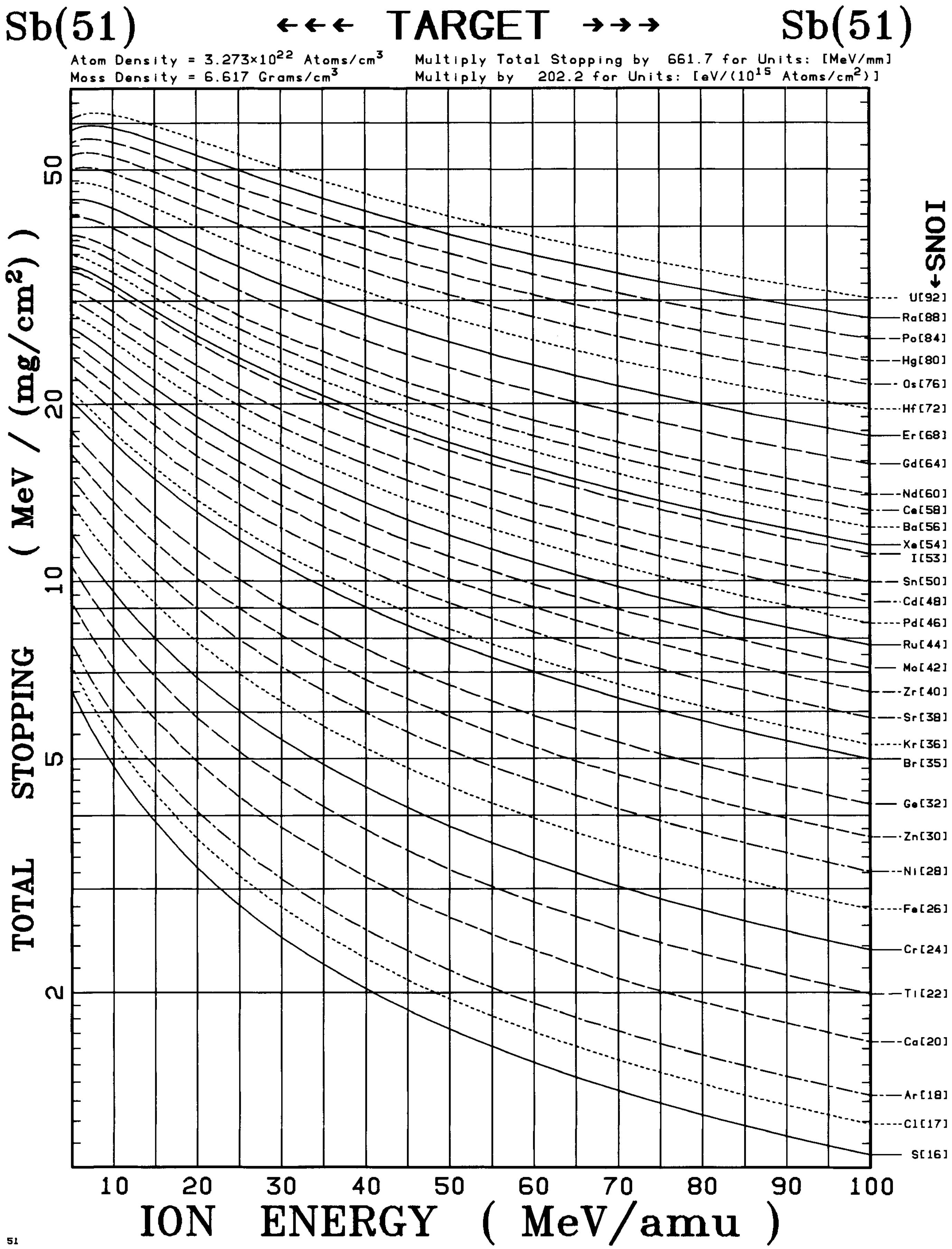
Atom Density = 3.273×10^{22} Atoms/cm^3 Multiply Total Stopping by 661.7 for Units: [MeV/mm]
Mass Density = 6.617 Grams/cm^3 Multiply by 202.2 for Units: [eV/(10^{15} Atoms/cm^2)]



Sb(51) ←←← TARGET →→→ Sb(51)

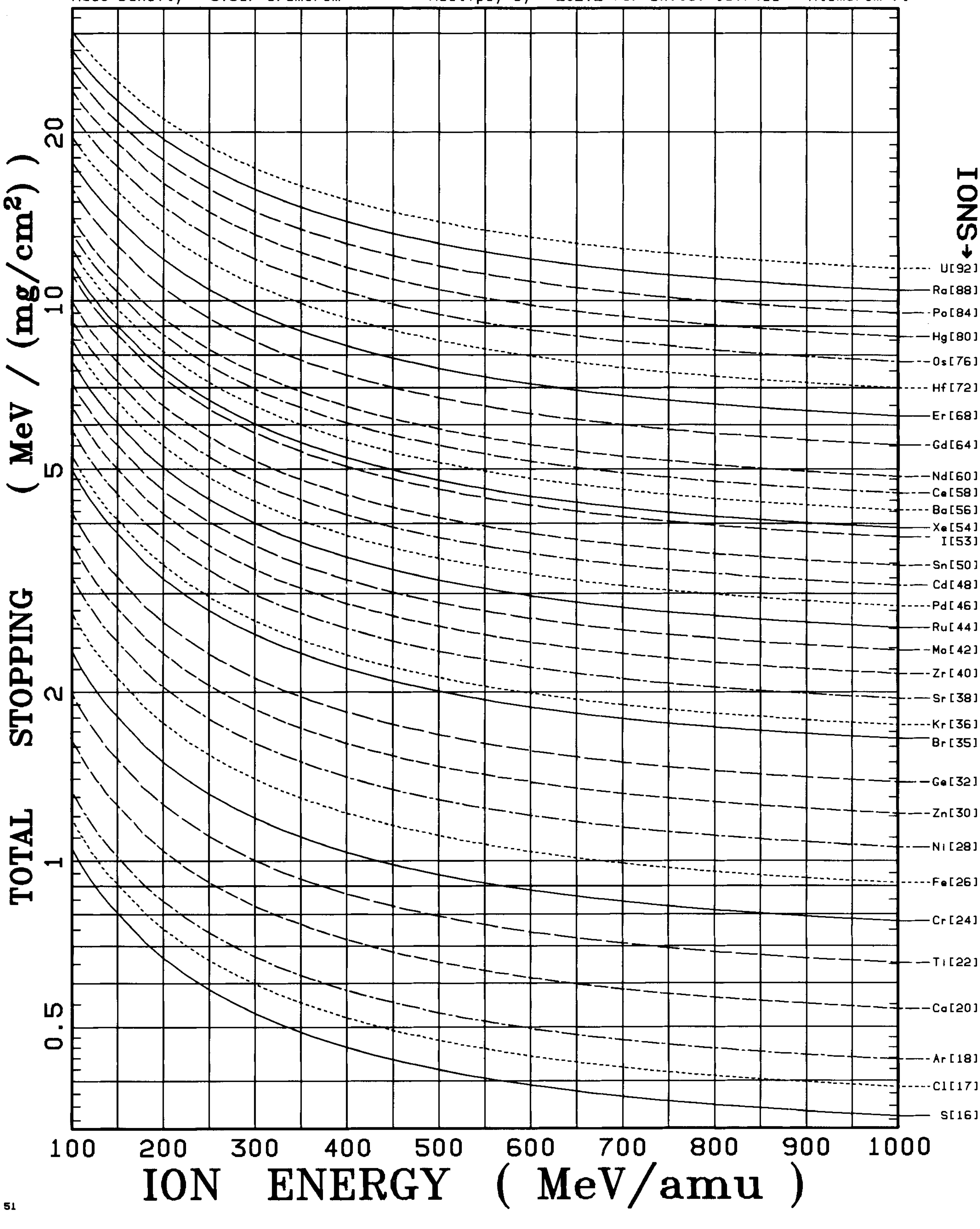
Atom Density = 3.273×10^{22} Atoms/cm^3 Multiply Total Stopping by 661.7 for Units: [MeV/mm]
Mass Density = 6.617 Grams/cm^3 Multiply by 202.2 for Units: [eV/(10^{15} Atoms/cm^2)]




Sb(51) ←←← TARGET →→→ Sb(51)
Atom Density = 3.273×10^22 Atoms/cm^3
Mass Density = 6.617 Grams/cm^3
Multiply Total Stopping by 661.7 for Units: [MeV/mm]
Multiply by 202.2 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
50
20
10
5
2
10
20
30
40
50
60
70
80
90
100

Sb(51) ←←← TARGET →→→ Sb(51)

Atom Density = 3.273×10^{22} Atoms/cm^3 Multiply Total Stopping by 661.7 for Units: [MeV/mm]
Mass Density = 6.617 Grams/cm^3 Multiply by 202.2 for Units: [eV/(10^{15} Atoms/cm^2)]

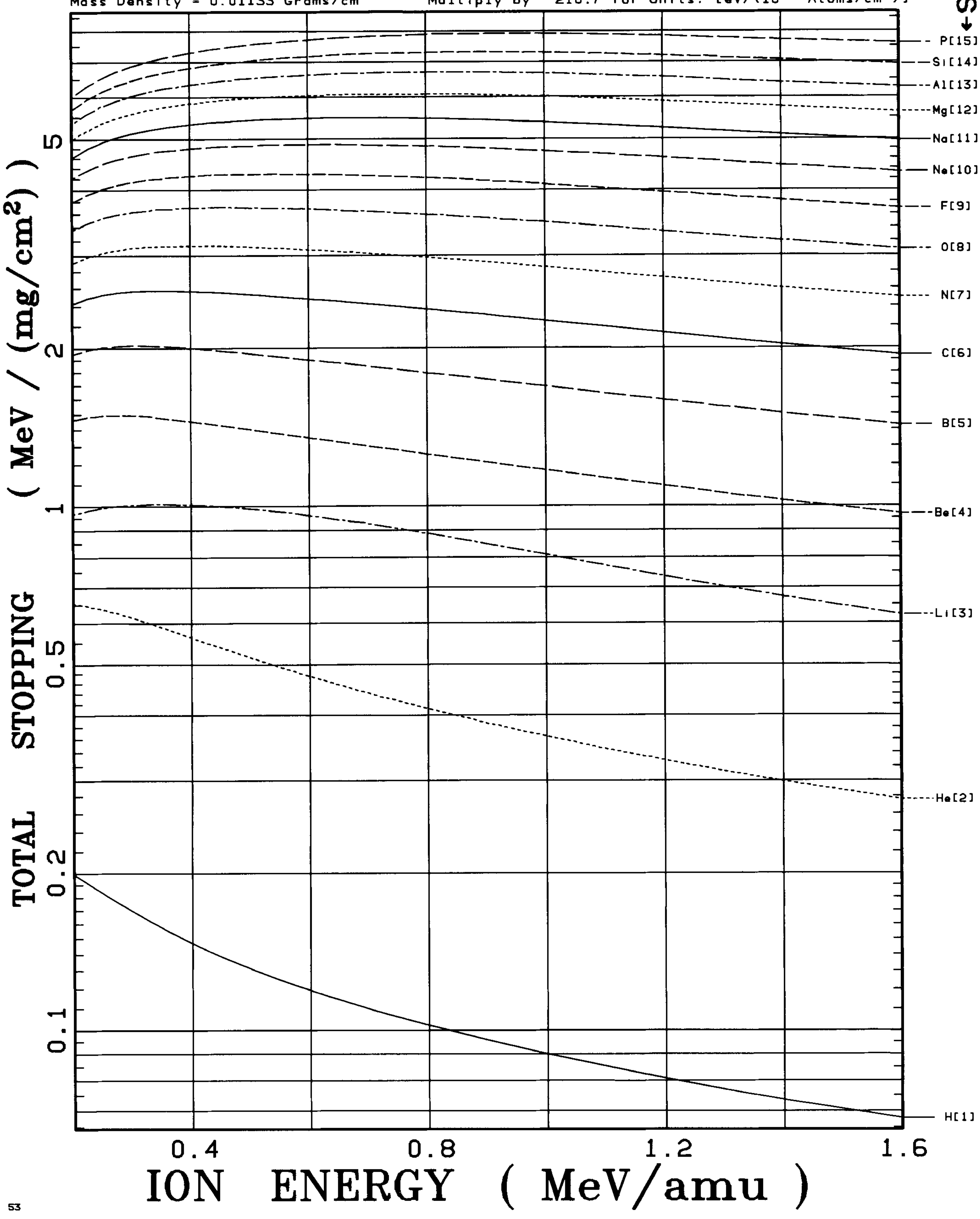


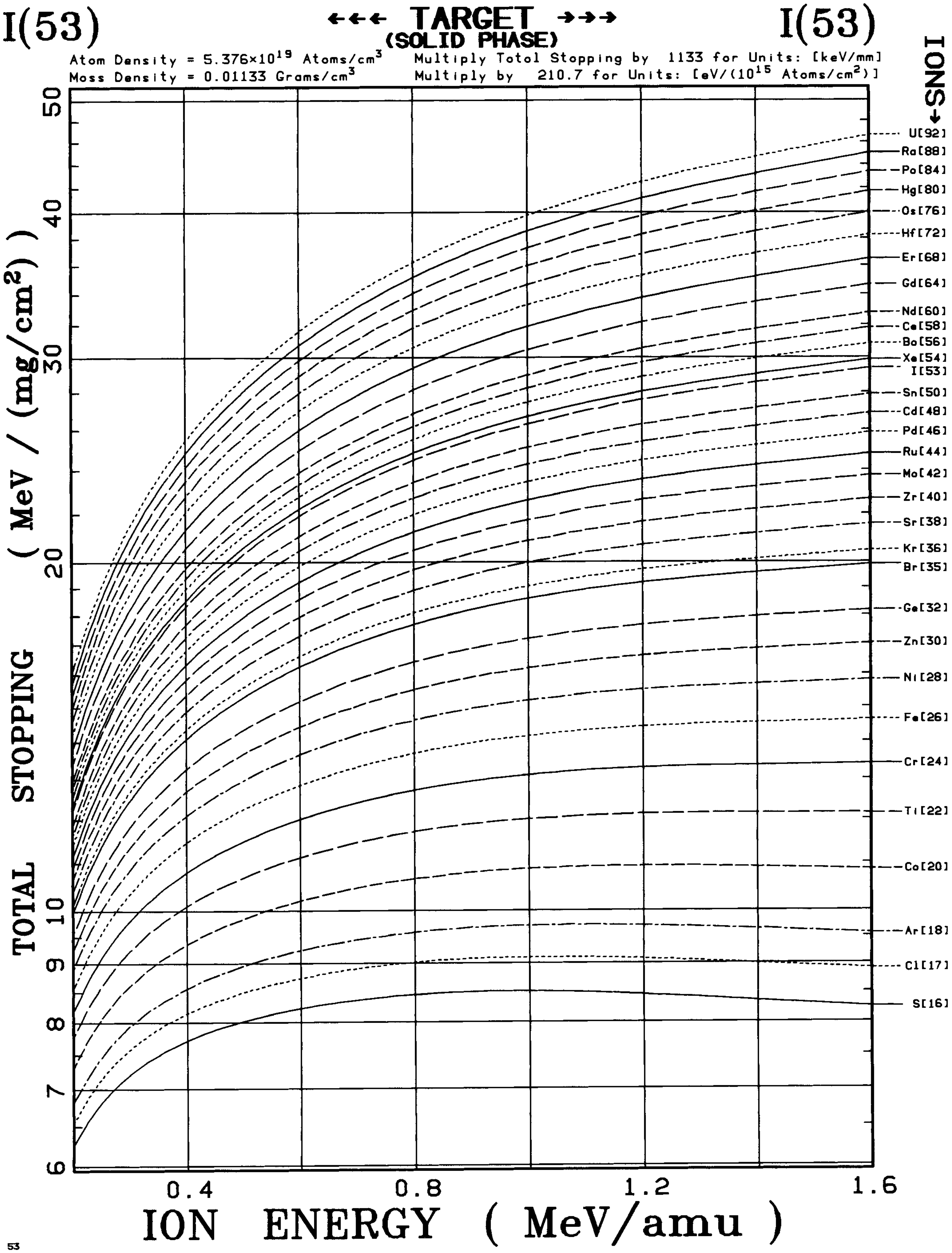
I(53) ←←← TARGET →→→ I(53)

(SOLID PHASE)

Atom Density = 5.376×10^{19} Atoms/cm^3 Multiply Total Stopping by 1133 for Units: [keV/mm]

Mass Density = 0.01133 Grams/cm^3 Multiply by 210.7 for Units: [eV/(10^{15} Atoms/cm^2)]

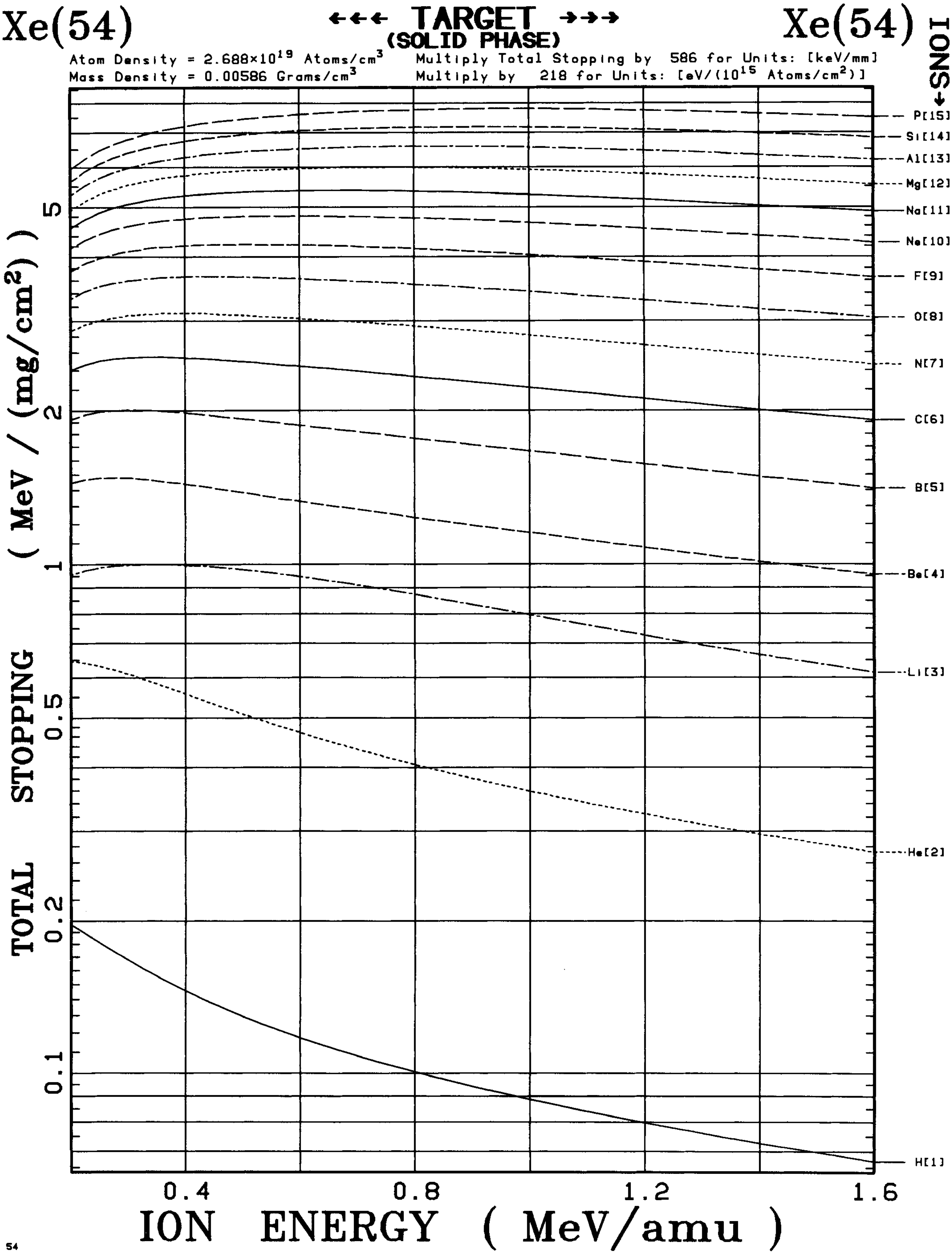



I(53)
←←← TARGET →→→
(SOLID PHASE)
I(53)
Atom Density = 5.376×10^19 Atoms/cm^3
Multiply Total Stopping by 1133 for Units: [keV/mm]
Mass Density = 0.01133 Grams/cm^3
Multiply by 210.7 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm^2))
50
40
30
20
10
9
8
7
6
0.4
0.8
1.2
1.6
ION ENERGY (MeV/amu)

Xe(54) ←←← TARGET →→→ Xe(54)

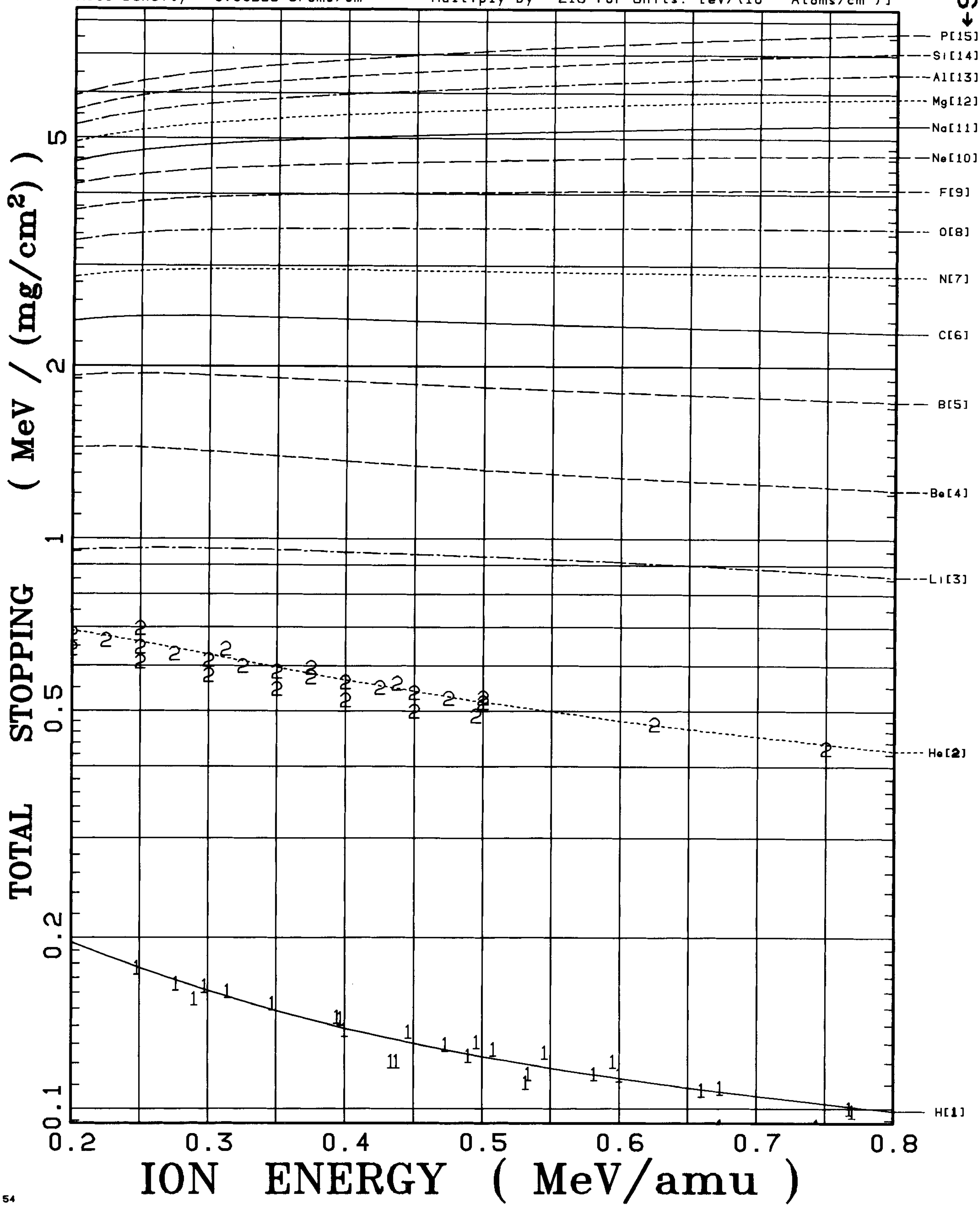
(SOLID PHASE)

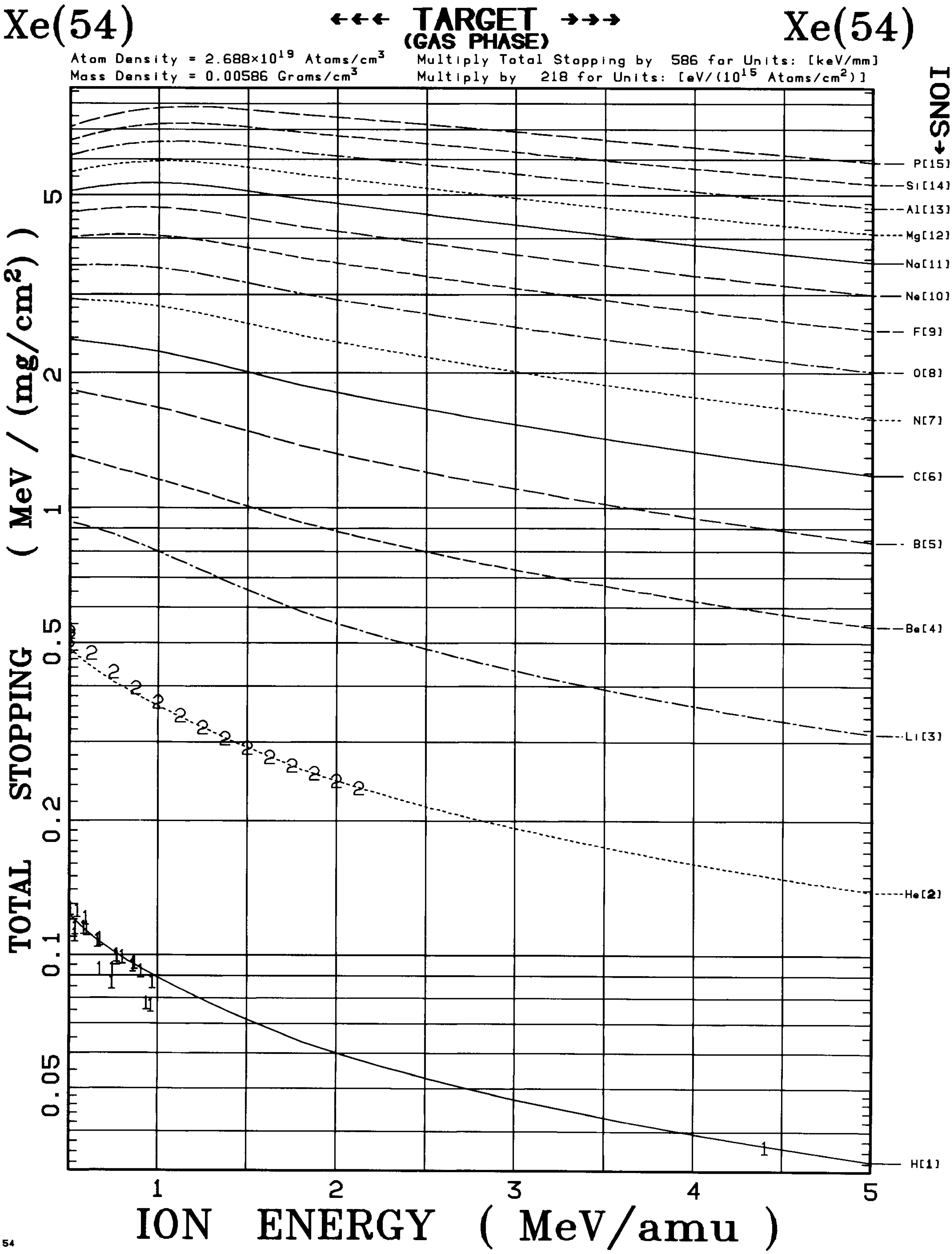
Atom Density = 2.688×10[19] Atoms/cm[3] Multiply Total Stopping by 586 for Units: [keV/mm]
Mass Density = 0.00586 Grams/cm[3] Multiply by 218 for Units: [eV/(10[15] Atoms/cm[2])]



Xe(54) ←←← TARGET (GAS PHASE) →→→ Xe(54) IONS→

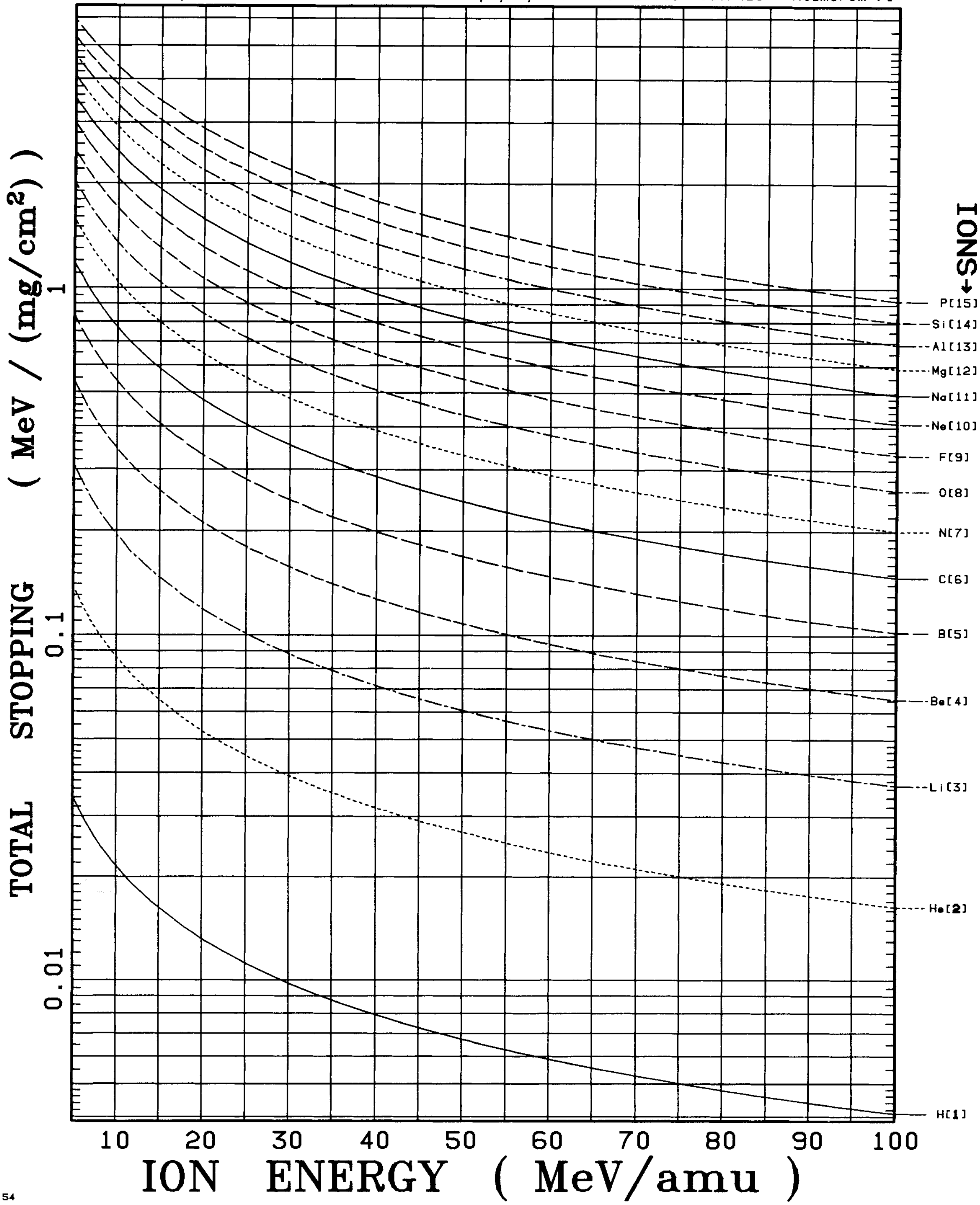
Atom Density = 2.688×10^{19} Atoms/cm^3 Multiply Total Stopping by 586 for Units: [keV/mm]
Mass Density = 0.00586 Grams/cm^3 Multiply by 218 for Units: [eV/(10^{15} Atoms/cm^2)]

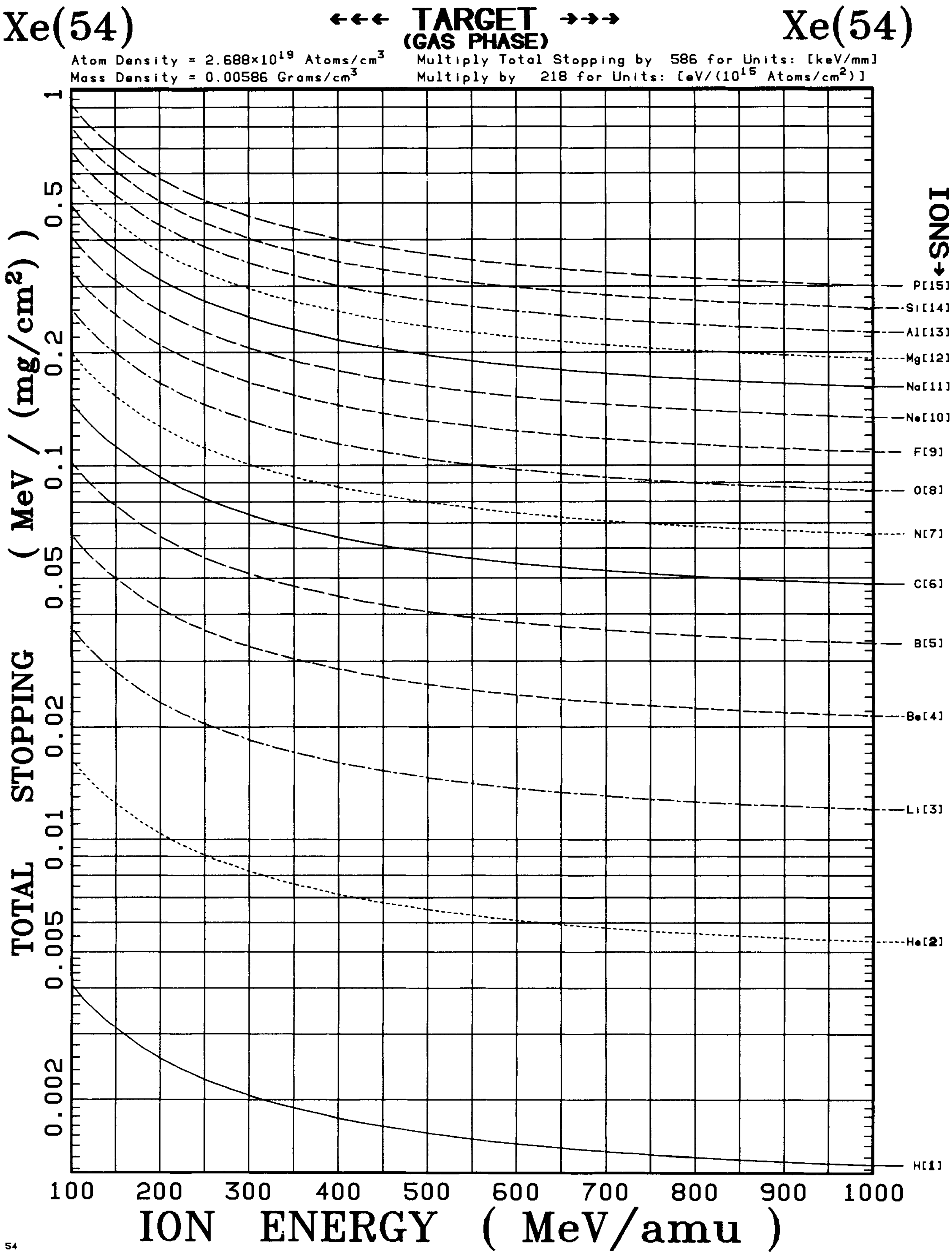


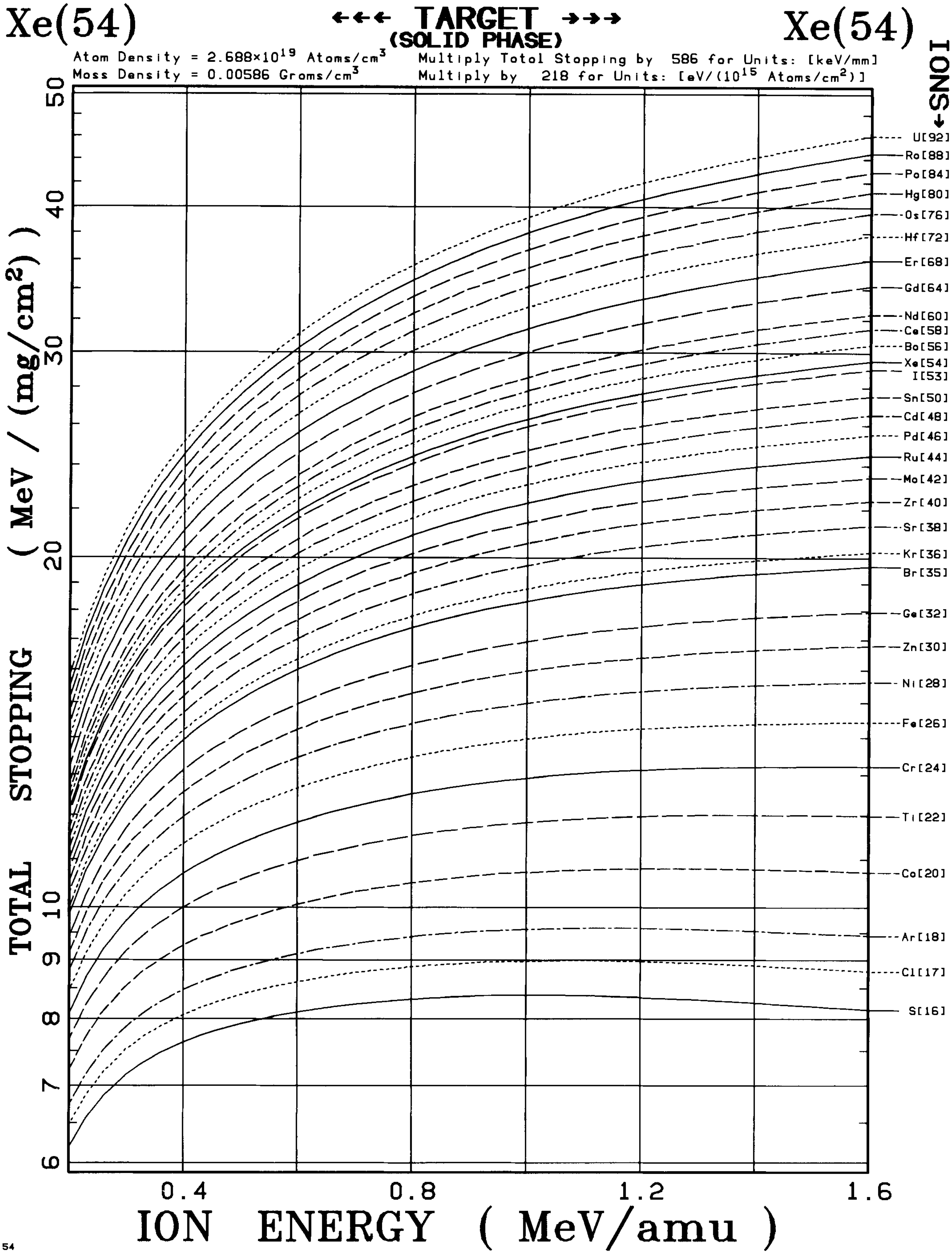

Xe(54)
←←← TARGET →→→
(GAS PHASE)
Xe(54)
Atom Density = 2.688×10^19 Atoms/cm^3
Mass Density = 0.00586 Grams/cm^3
Multiply Total Stopping by 586 for Units: [keV/mm]
Multiply by 218 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm^2))
0.05
0.1
0.2
0.5
1
2
5
1
2
3
4
5
ION ENERGY (MeV/amu)

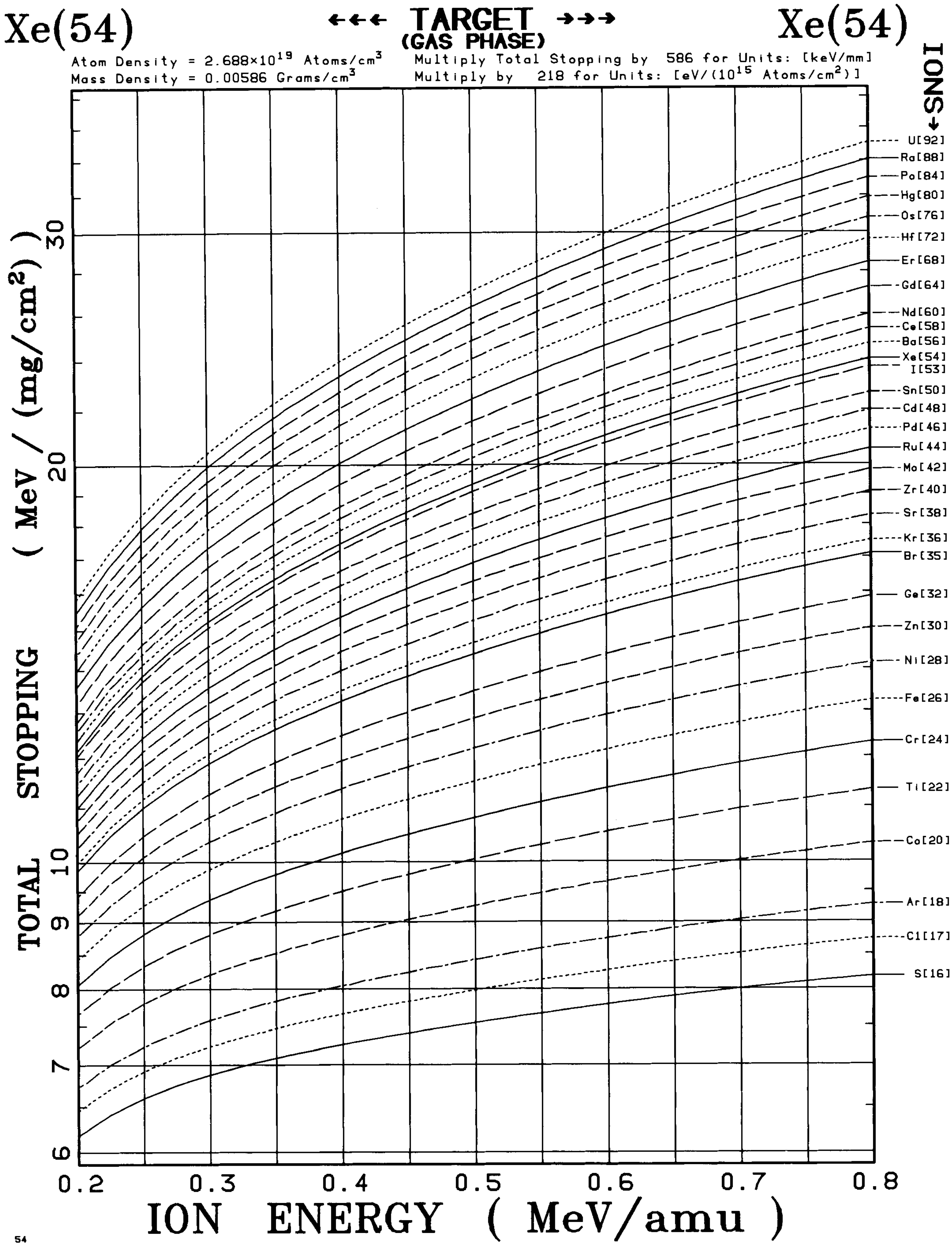
Xe(54) ←←← TARGET →→→ Xe(54)
(GAS PHASE)

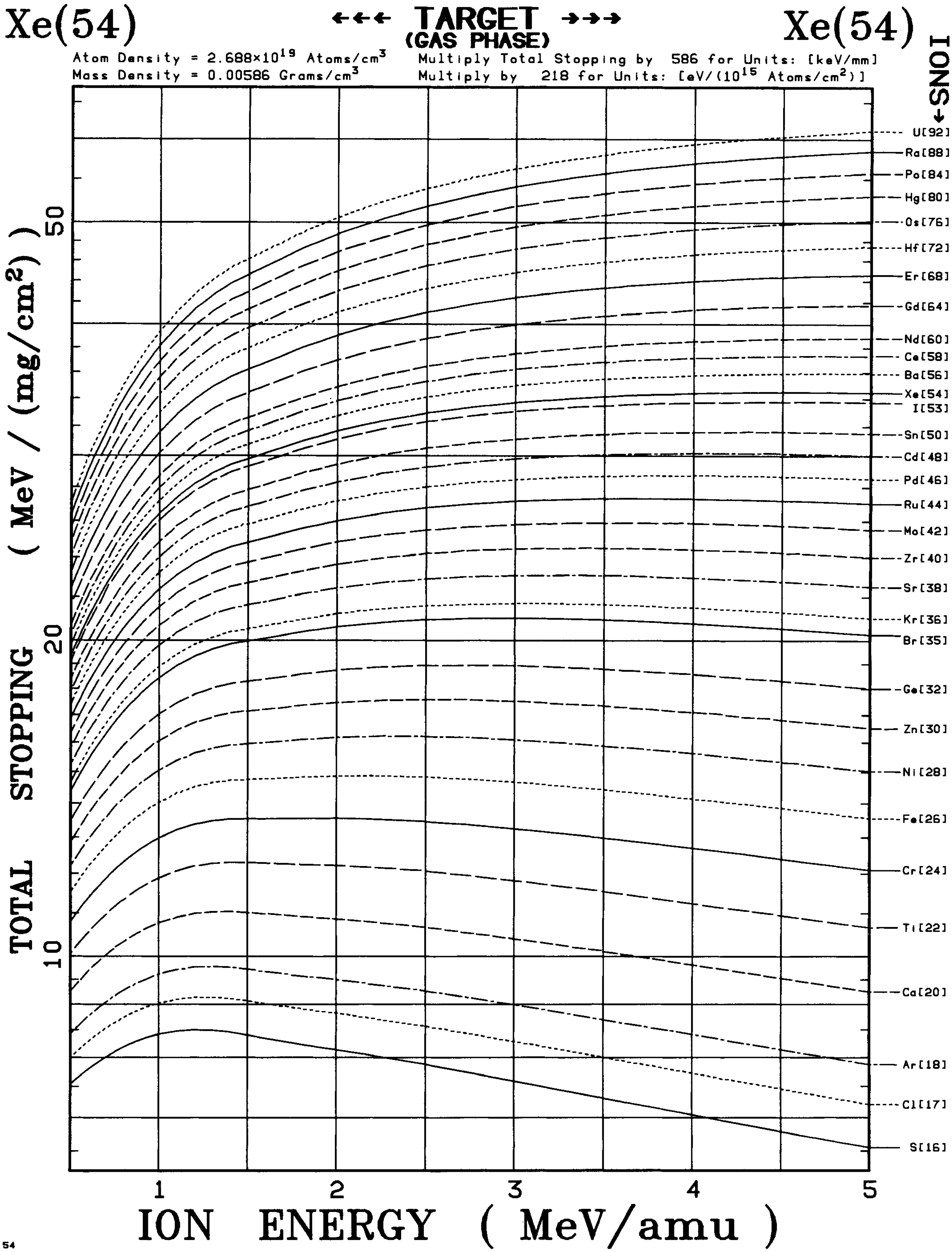
Atom Density = 2.688×10^19 Atoms/cm^3 Multiply Total Stopping by 586 for Units: [keV/mm]
Mass Density = 0.00586 Grams/cm^3 Multiply by 218 for Units: [eV/(10^15 Atoms/cm^2)]




Xe(54)
←←← TARGET →→→
(GAS PHASE)
Xe(54)
Atom Density = 2.688×10^19 Atoms/cm^3
Multiply Total Stopping by 586 for Units: [keV/mm]
Mass Density = 0.00586 Grams/cm^3
Multiply by 218 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
1
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)

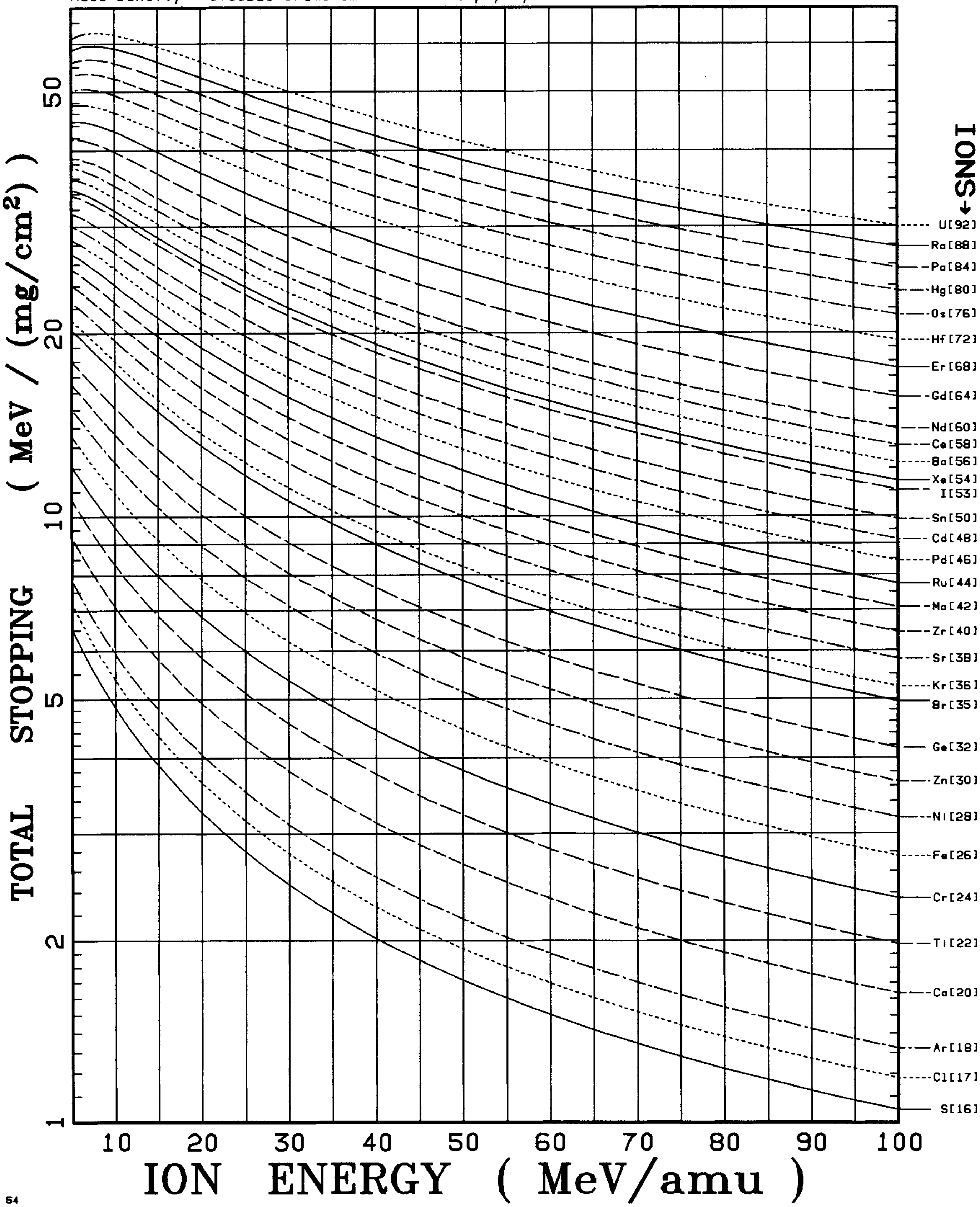

Xe(54)
←←← TARGET →→→
(SOLID PHASE)
Xe(54)
IONS→
Atom Density = 2.688×10^19 Atoms/cm^3
Mass Density = 0.00586 Grams/cm^3
Multiply Total Stopping by 586 for Units: [keV/mm]
Multiply by 218 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
0.4
0.8
1.2
1.6
6
7
8
9
10
20
30
40
50

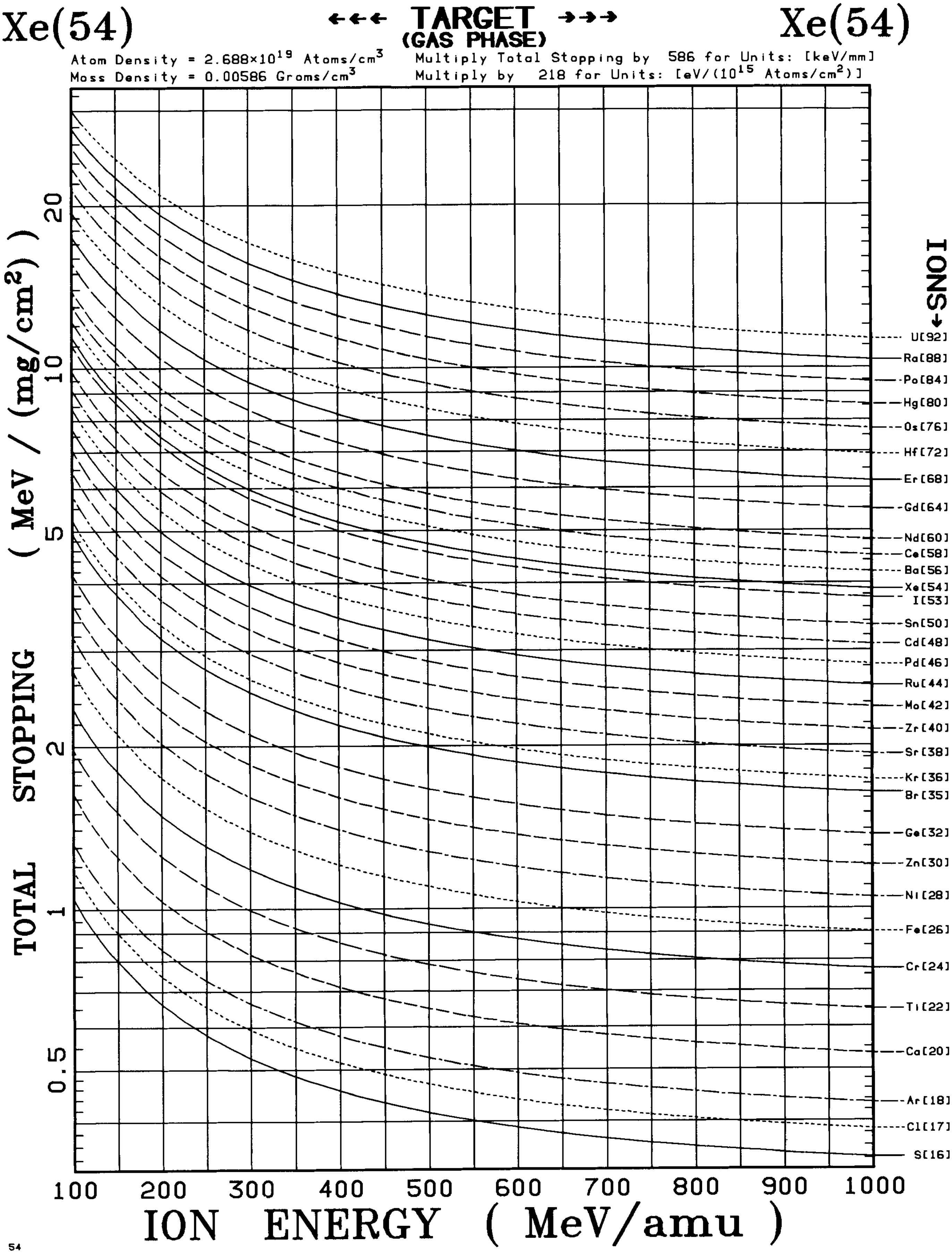

Xe(54)
←←← TARGET →→→
(GAS PHASE)
Xe(54)
Atom Density = 2.688×10^19 Atoms/cm^3
Mass Density = 0.00586 Grams/cm^3
Multiply Total Stopping by 586 for Units: [keV/mm]
Multiply by 218 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Co[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm²))
30
20
10
9
8
7
6
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)


Xe(54)
←←← TARGET →→→
(GAS PHASE)
Xe(54)
Atom Density = 2.688×10^19 Atoms/cm^3
Mass Density = 0.00586 Grams/cm^3
Multiply Total Stopping by 586 for Units: [keV/mm]
Multiply by 218 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm²))
50
20
10
1
2
3
4
5
ION ENERGY (MeV/amu)

Xe(54) ←←← TARGET (GAS PHASE) →→→ Xe(54)

Atom Density = 2.688×10^{19} Atoms/cm^3 Multiply Total Stopping by 586 for Units: [keV/mm]
Mass Density = 0.00586 Grams/cm^3 Multiply by 218 for Units: [eV/(10^{15} Atoms/cm^2)]

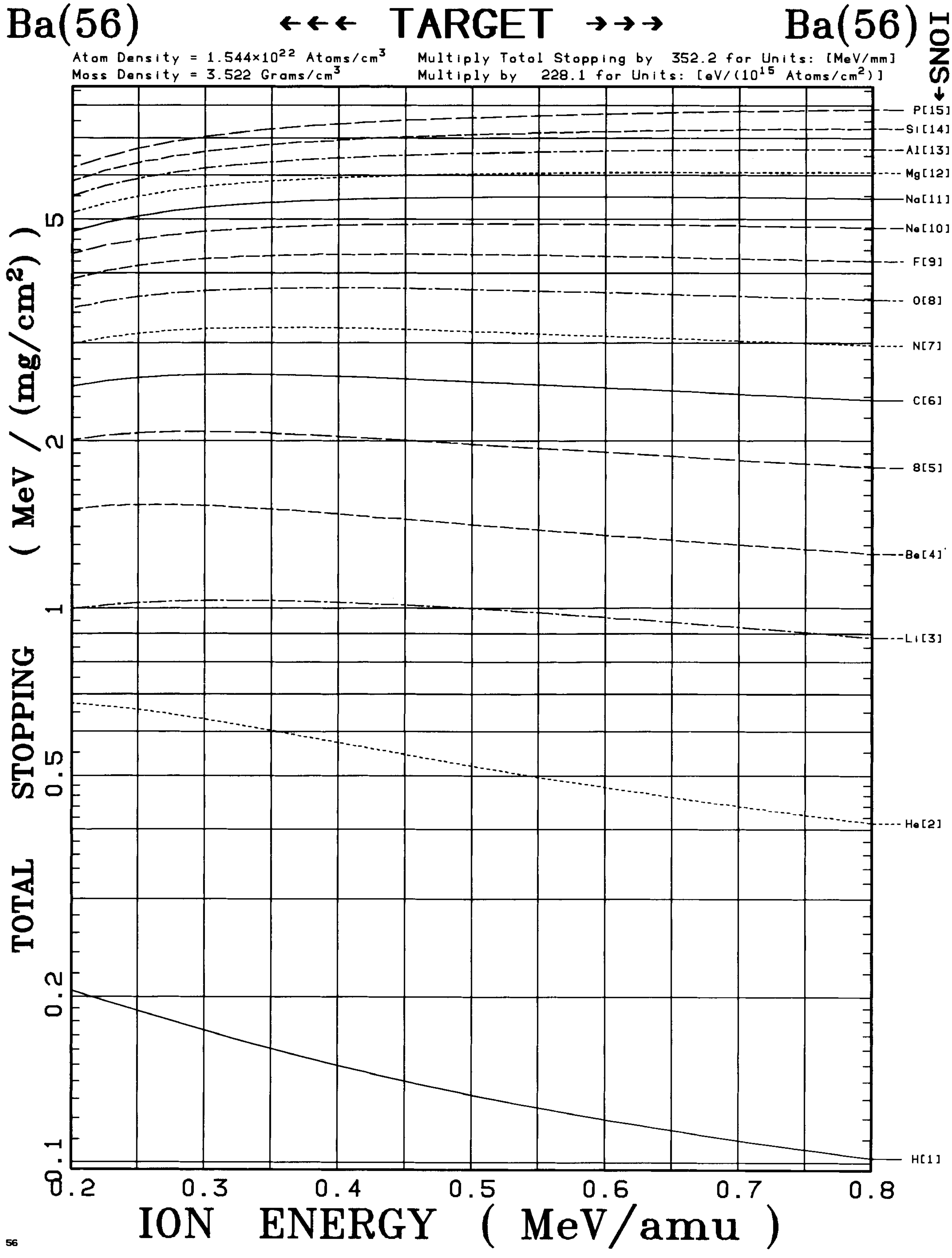



Xe(54)
←←← TARGET →→→
(GAS PHASE)
Xe(54)
Atom Density = 2.688×10^19 Atoms/cm^3
Moss Density = 0.00586 Groms/cm^3
Multiply Total Stopping by 586 for Units: [keV/mm]
Multiply by 218 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm²))
0.5
1
2
5
10
20
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)

54

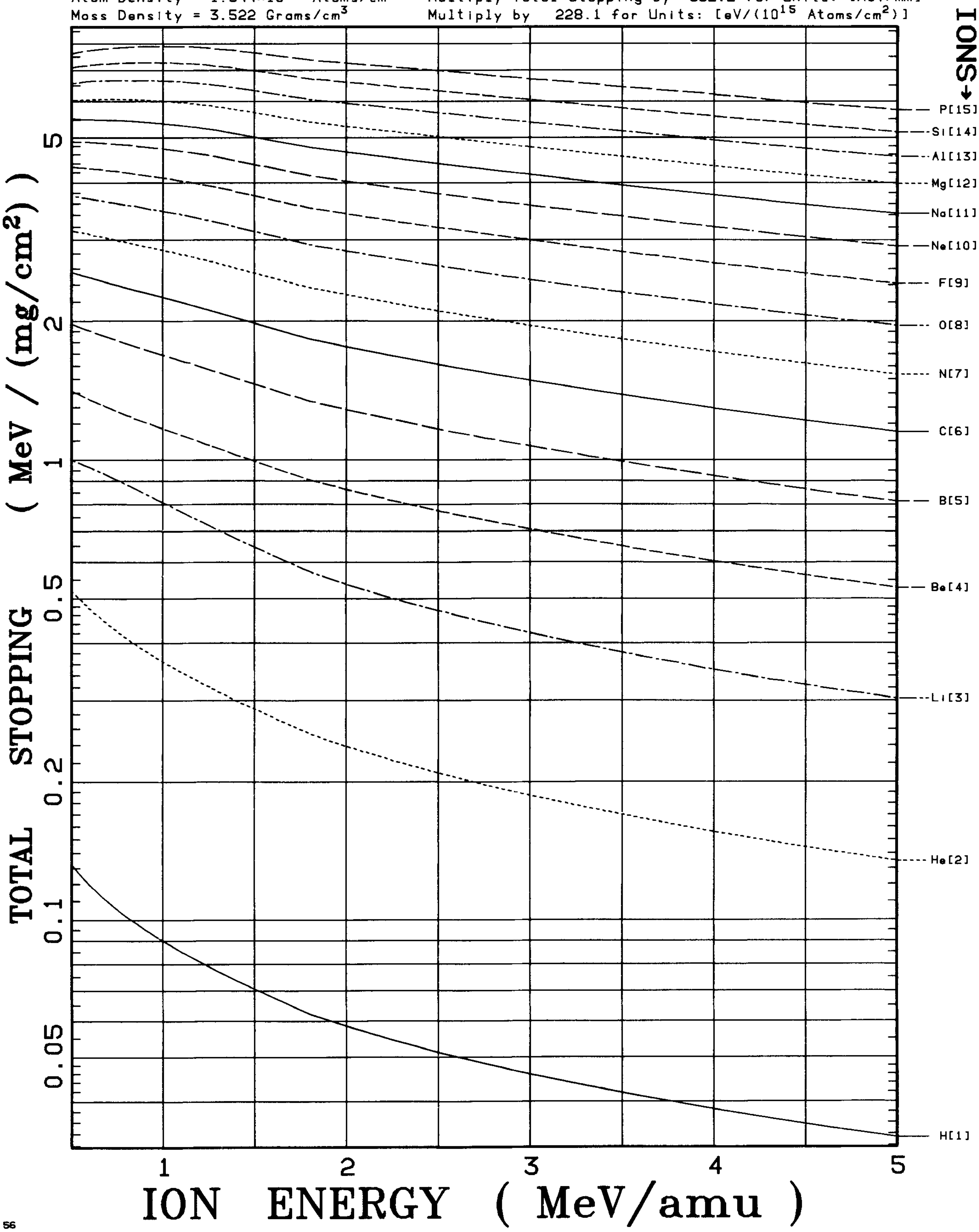
Ba(56) ←←← TARGET →→→ Ba(56)

Atom Density = 1.544×10^{22} Atoms/cm^3 Multiply Total Stopping by 352.2 for Units: [MeV/mm]
Mass Density = 3.522 Grams/cm^3 Multiply by 228.1 for Units: [eV/(10^{15} Atoms/cm^2)]



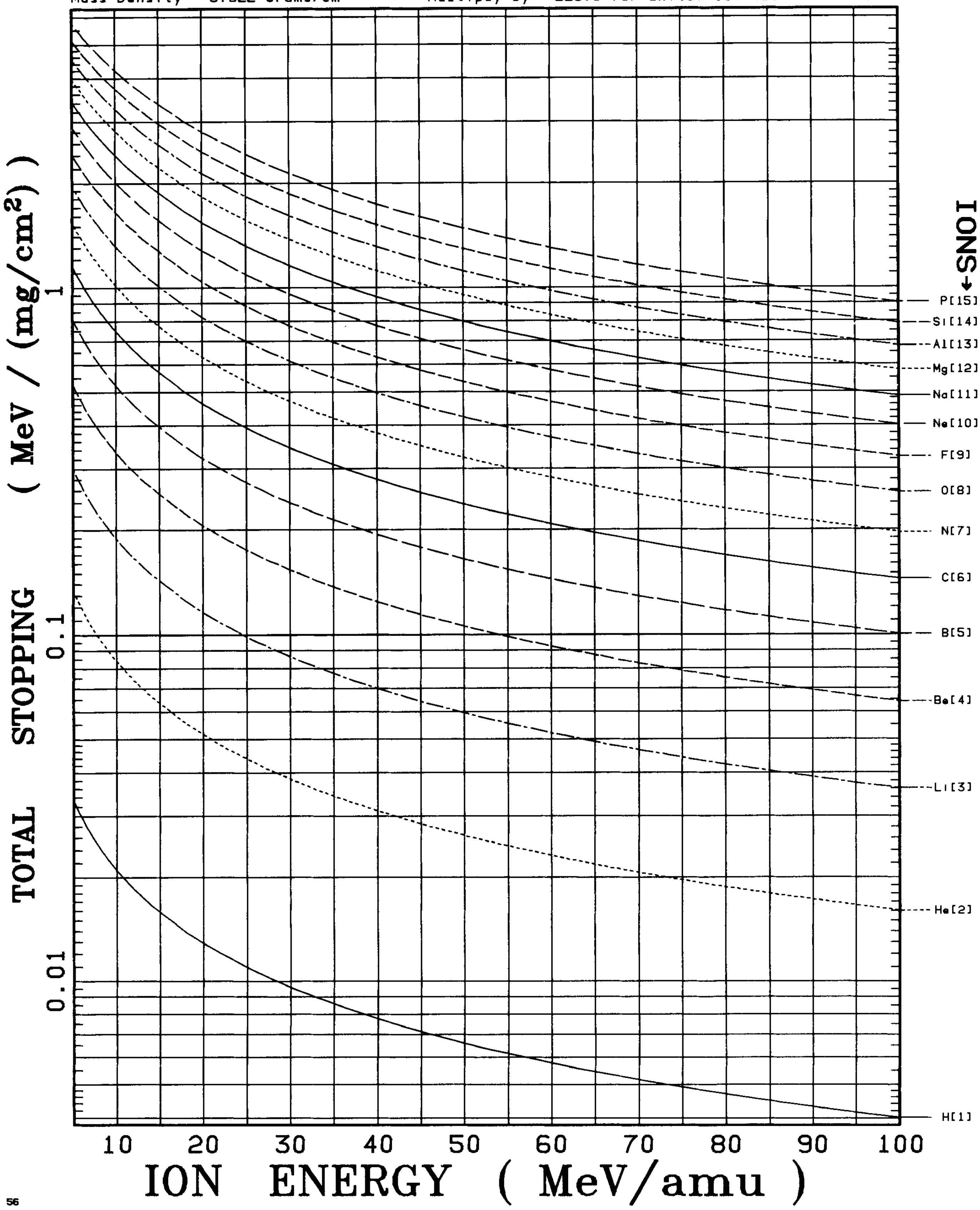
Ba(56) ←←← TARGET →→→ Ba(56)

Atom Density = 1.544×10^22 Atoms/cm^3   Multiply Total Stopping by 352.2 for Units: [MeV/mm]
Mass Density = 3.522 Grams/cm^3   Multiply by 228.1 for Units: [eV/(10^15 Atoms/cm^2)]



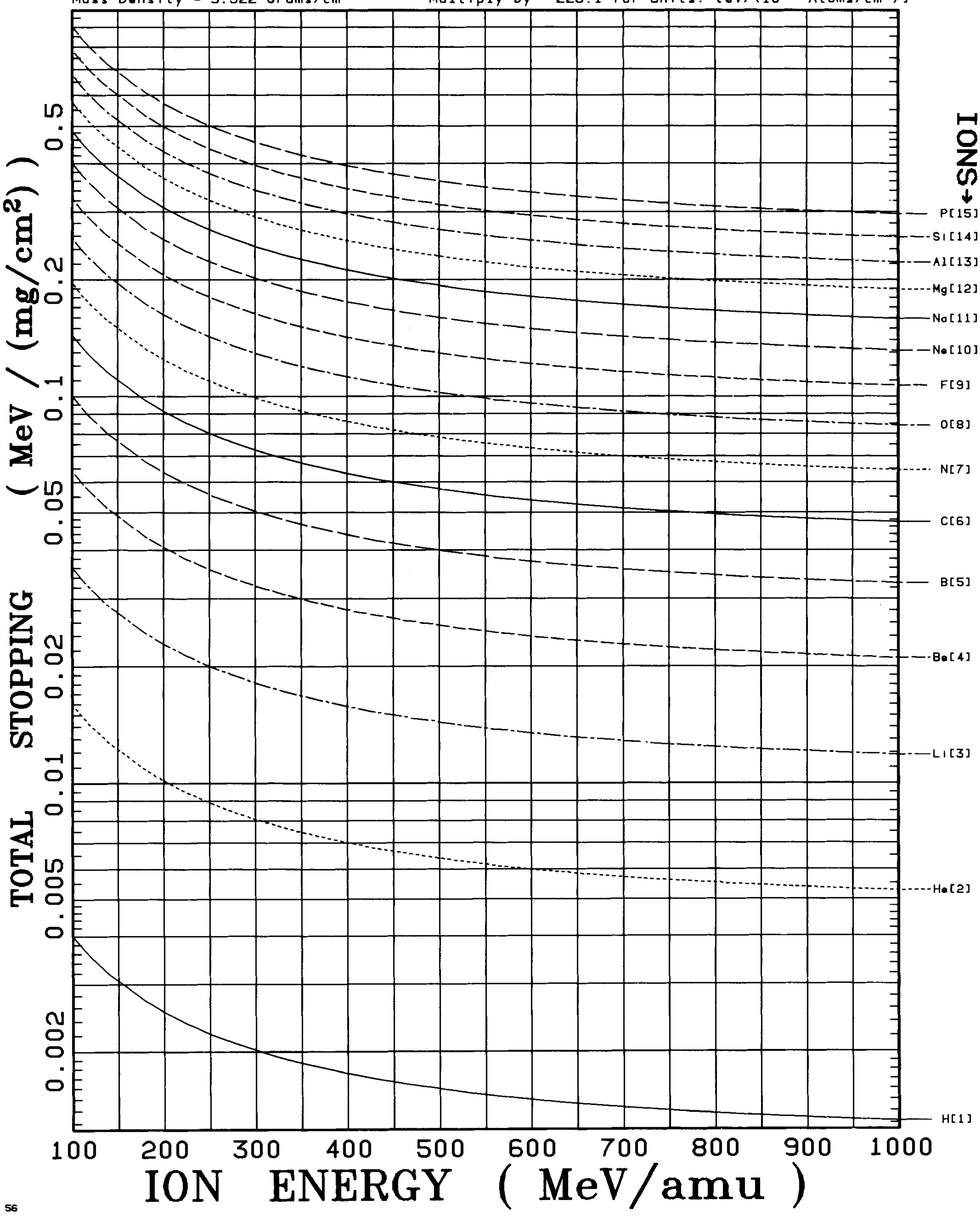
Ba(56) ←←← TARGET →→→ Ba(56)

Atom Density = 1.544×10^{22} Atoms/cm^3 Multiply Total Stopping by 352.2 for Units: [MeV/mm]
Mass Density = 3.522 Grams/cm^3 Multiply by 228.1 for Units: [eV/(10^{15} Atoms/cm^2)]



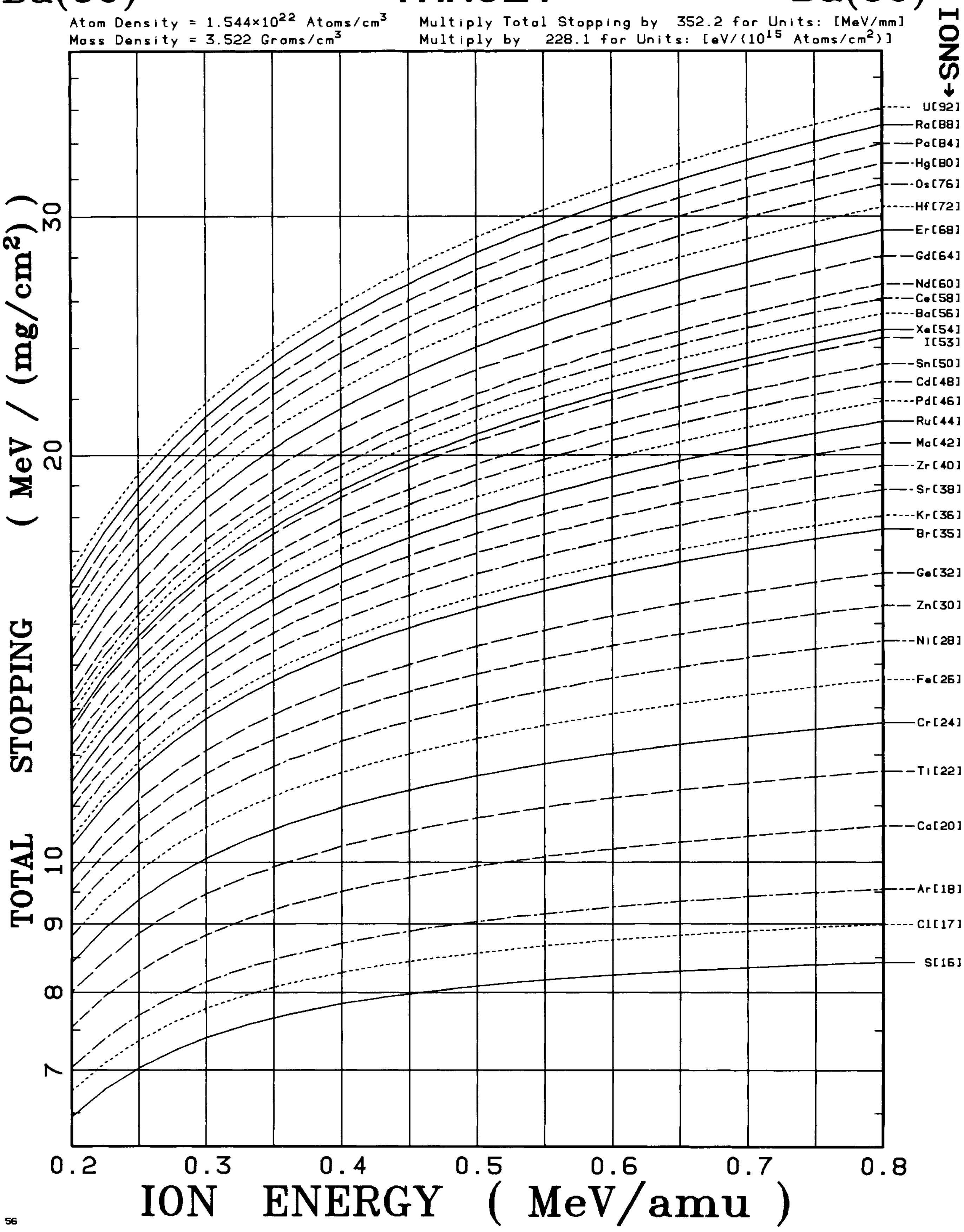
Ba(56) ←←← TARGET →→→ Ba(56)

Atom Density = 1.544×10^{22} Atoms/cm^3 Multiply Total Stopping by 352.2 for Units: [MeV/mm]
Mass Density = 3.522 Grams/cm^3 Multiply by 228.1 for Units: [eV/(10^{15} Atoms/cm^2)]



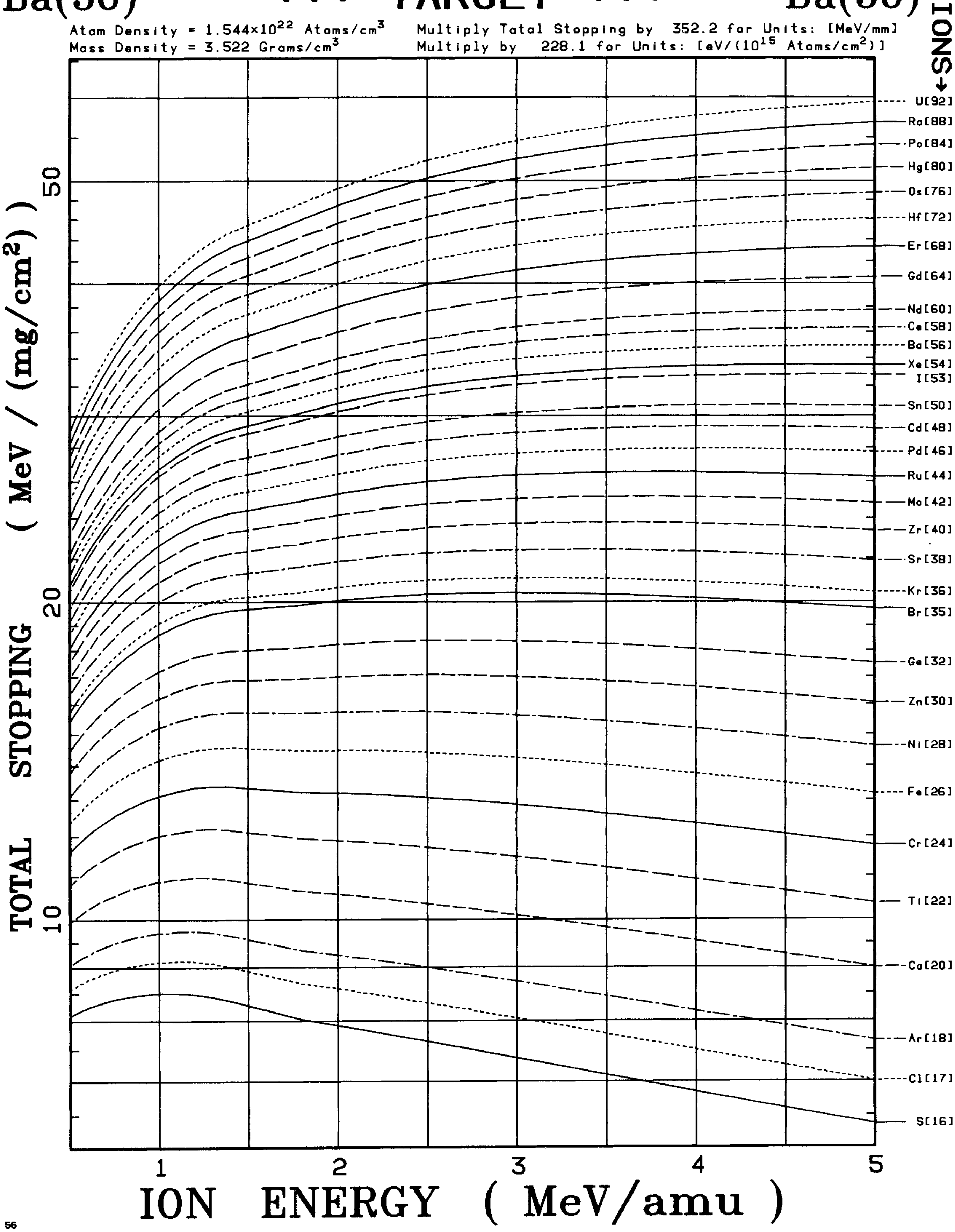
Ba(56) ←←← TARGET →→→ Ba(56)

Atom Density = 1.544×10²² Atoms/cm³ Multiply Total Stopping by 352.2 for Units: [MeV/mm]
Mass Density = 3.522 Grams/cm³ Multiply by 228.1 for Units: [eV/(10¹⁵ Atoms/cm²)]



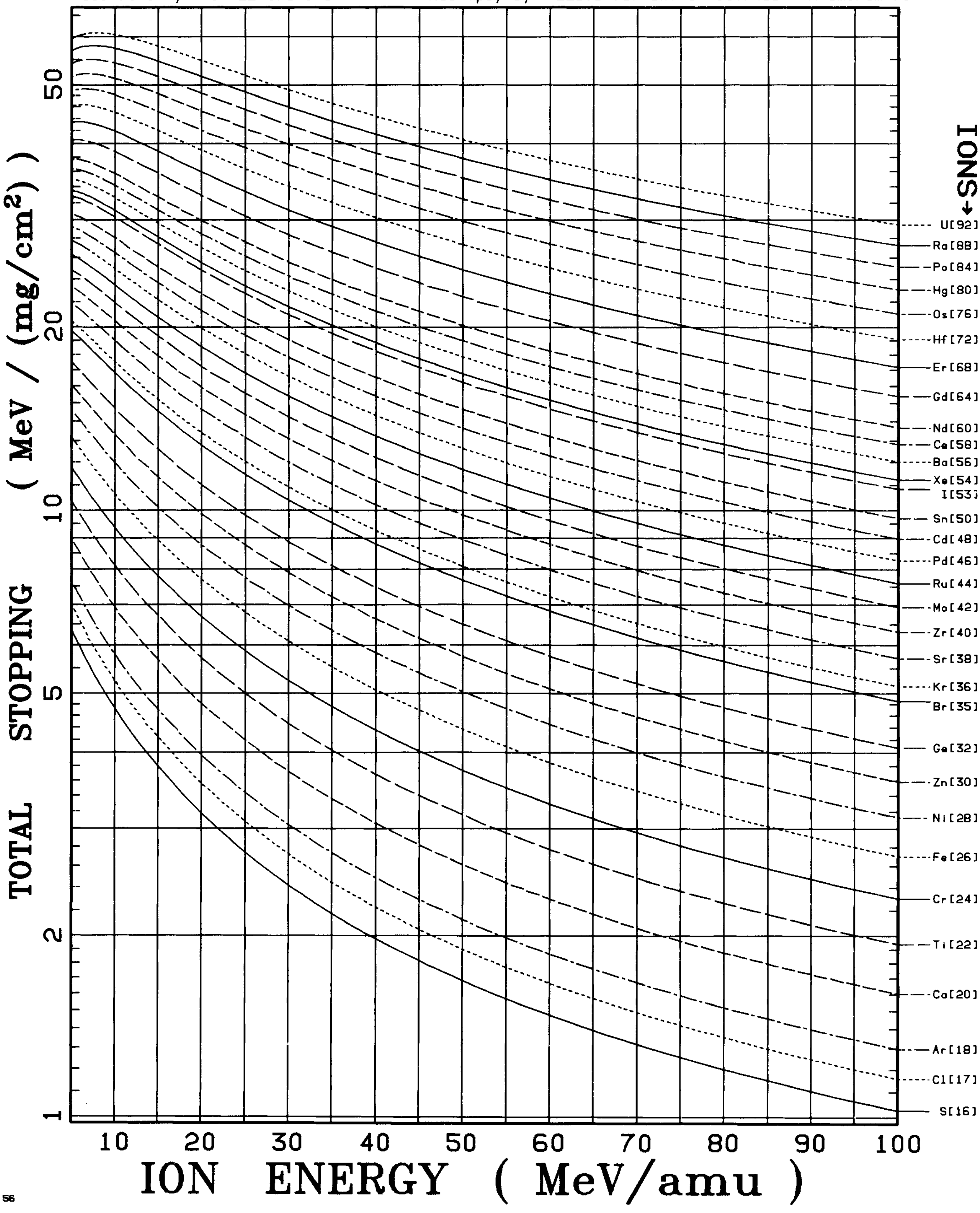
Ba(56) ←←← TARGET →→→ Ba(56)

Atom Density = 1.544×10^{22} Atoms/cm^3 Multiply Total Stopping by 352.2 for Units: [MeV/mm]
Mass Density = 3.522 Grams/cm^3 Multiply by 228.1 for Units: [eV/(10^{15} Atoms/cm^2)]



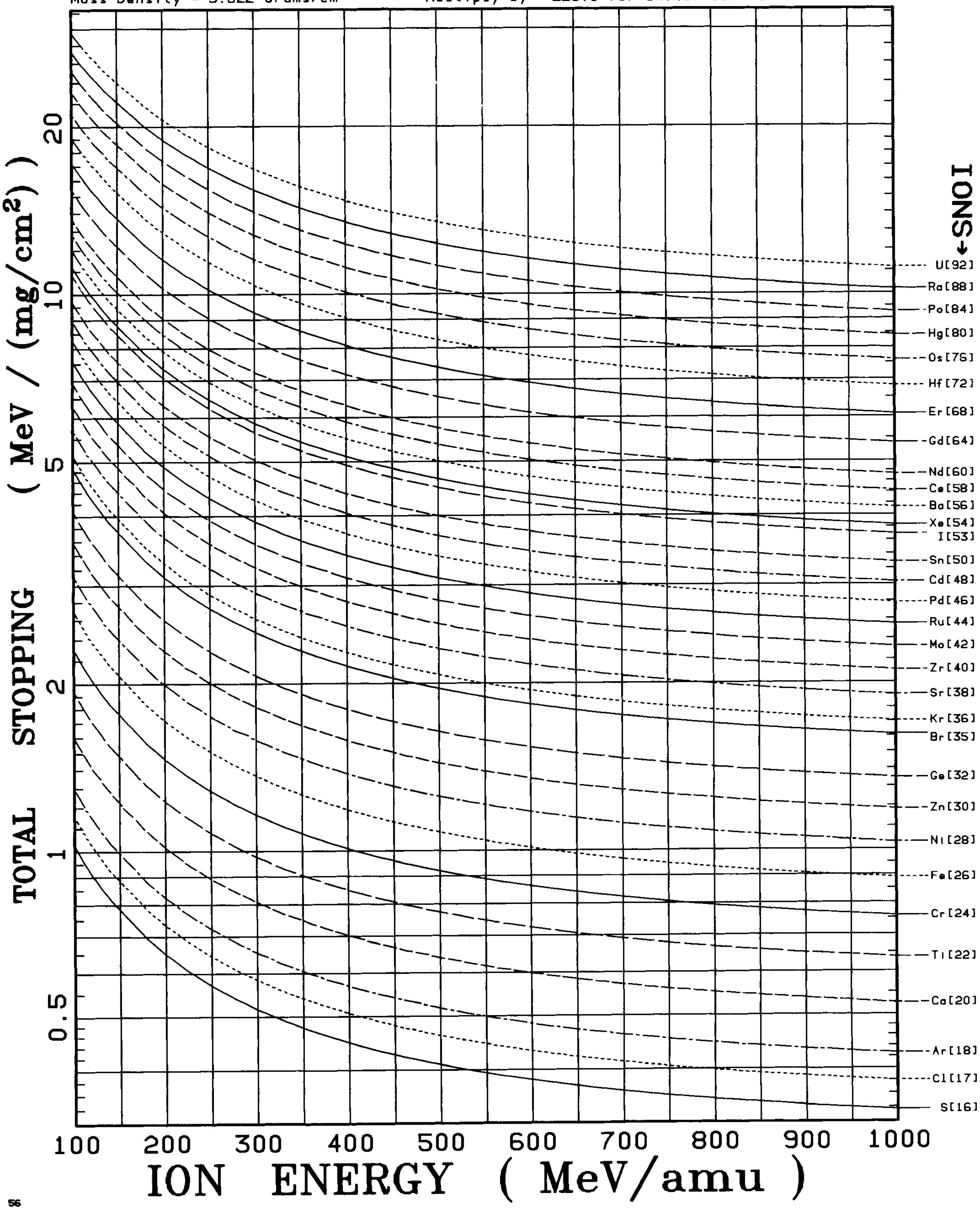
Ba(56) ←←← TARGET →→→ Ba(56)

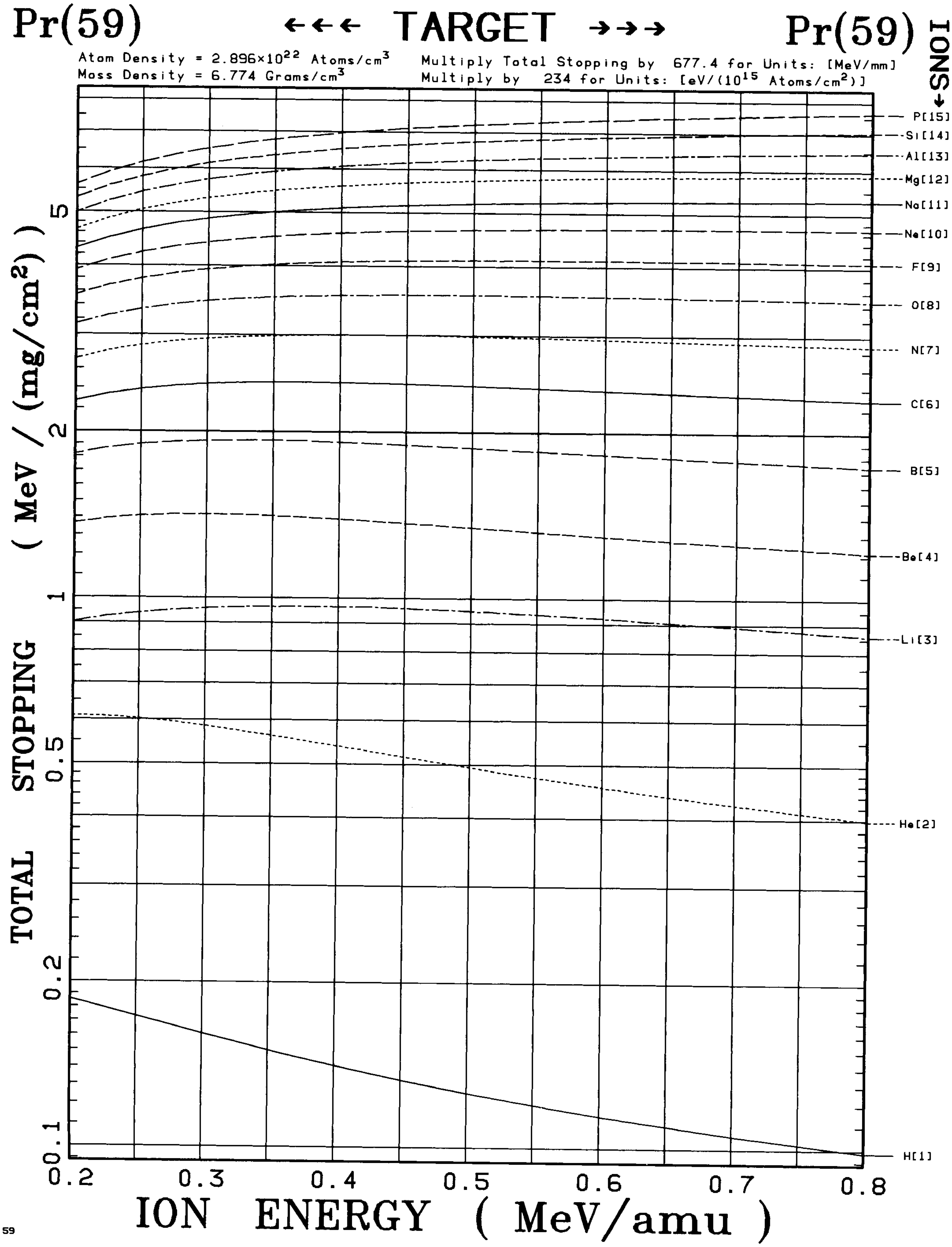
Atom Density = 1.544×10^{22} Atoms/cm^3 Multiply Total Stopping by 352.2 for Units: [MeV/mm]
Mass Density = 3.522 Grams/cm^3 Multiply by 228.1 for Units: [eV/(10^{15} Atoms/cm^2)]



Ba(56) ←←← TARGET →→→ Ba(56)

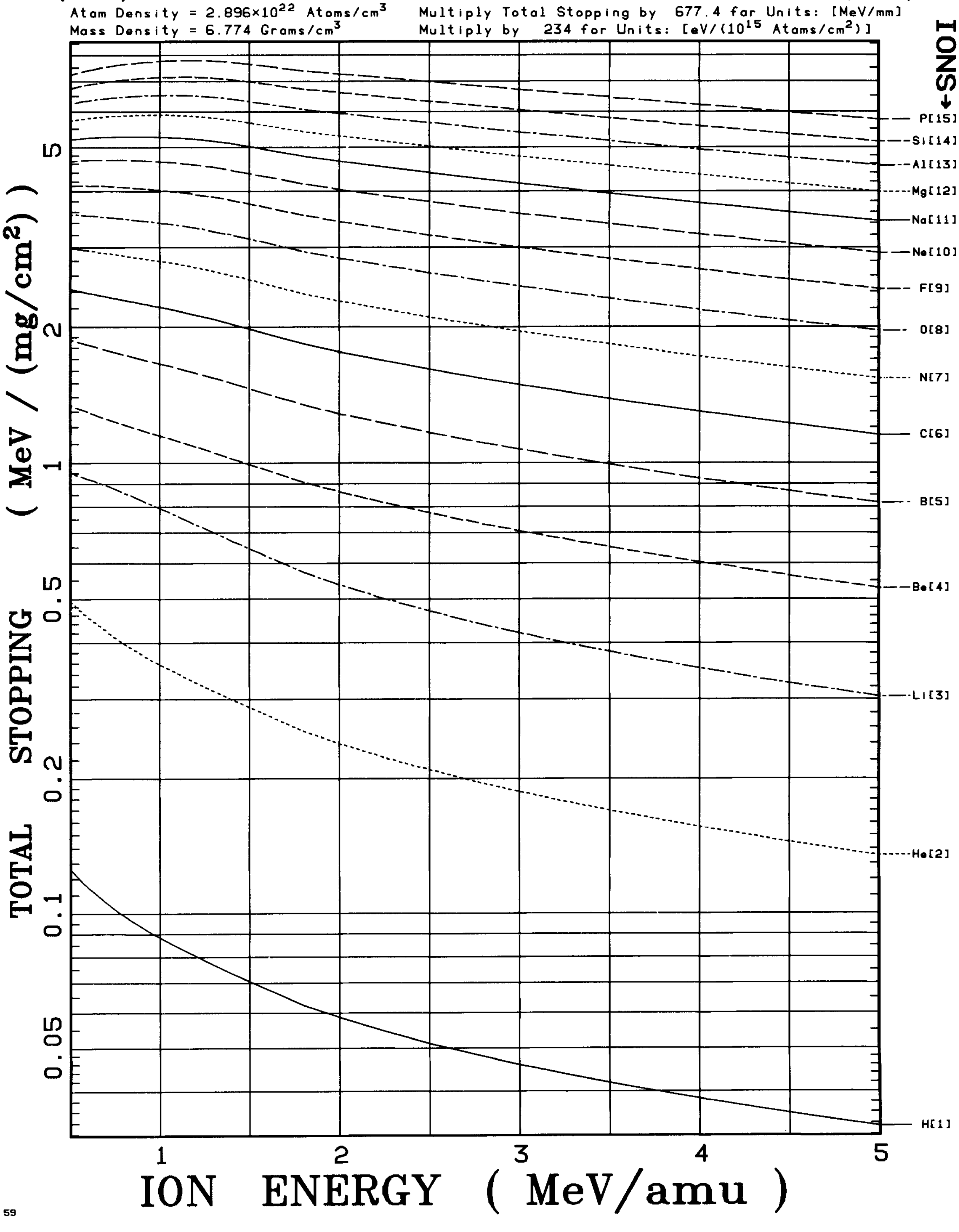
Atom Density = 1.544×10^{22} Atoms/cm^3 Multiply Total Stopping by 352.2 for Units: [MeV/mm]
Mass Density = 3.522 Grams/cm^3 Multiply by 228.1 for Units: [eV/(10^{15} Atoms/cm^2)]




Pr(59)
←←← TARGET →→→
Pr(59)
IONS→
Atom Density = 2.896×10^22 Atoms/cm^3
Mass Density = 6.774 Grams/cm^3
Multiply Total Stopping by 677.4 for Units: [MeV/mm]
Multiply by 234 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
0.1
0.2
0.5
1
2
5
0.2
0.3
0.4
0.5
0.6
0.7
0.8
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]

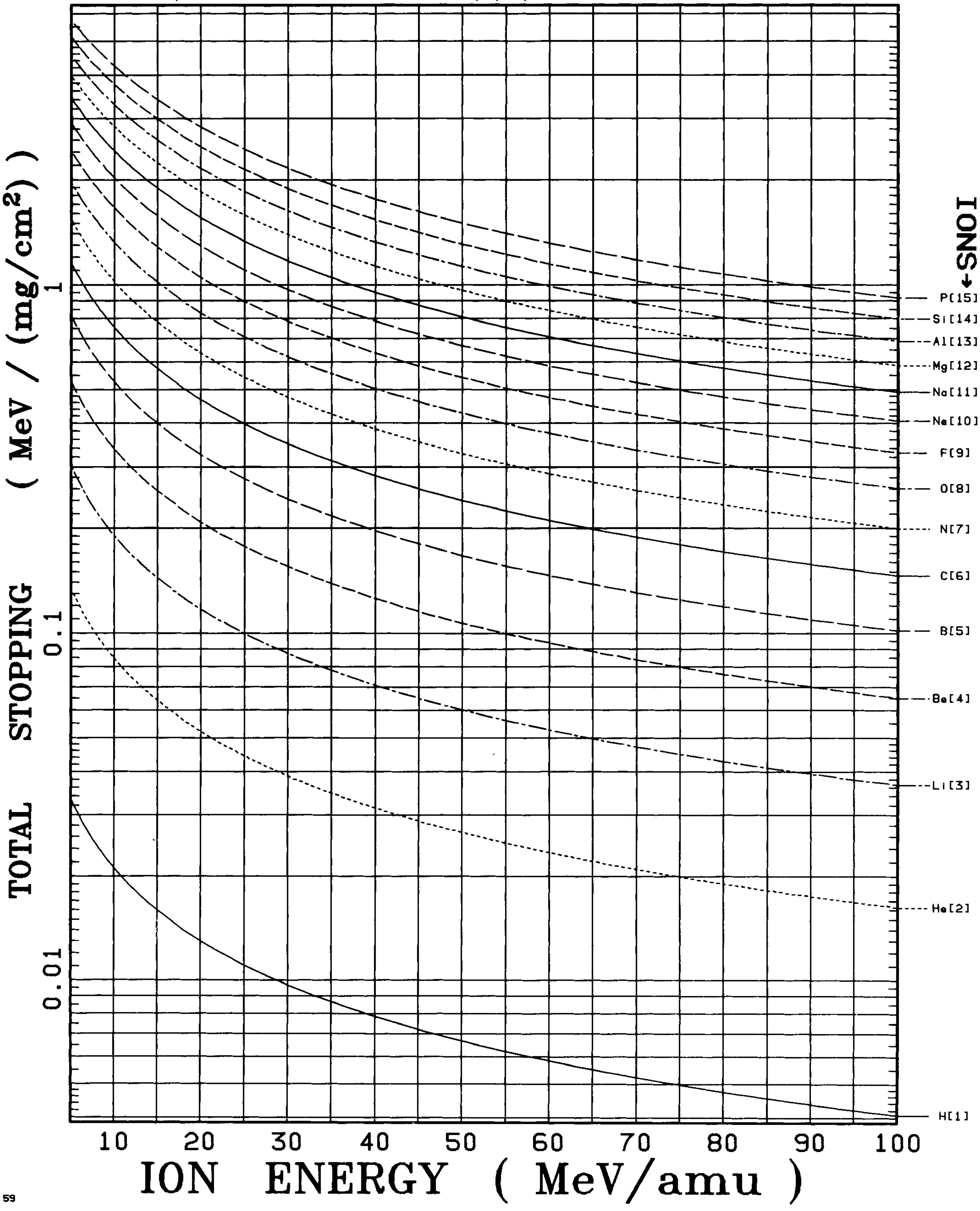
Pr(59) ←←← TARGET →→→ Pr(59)

Atom Density = 2.896×10^{22} Atoms/cm^3 Multiply Total Stopping by 677.4 for Units: [MeV/mm]
Mass Density = 6.774 Grams/cm^3 Multiply by 234 for Units: [eV/(10^{15} Atoms/cm^2)]



Pr(59) ←←← TARGET →→→ Pr(59)

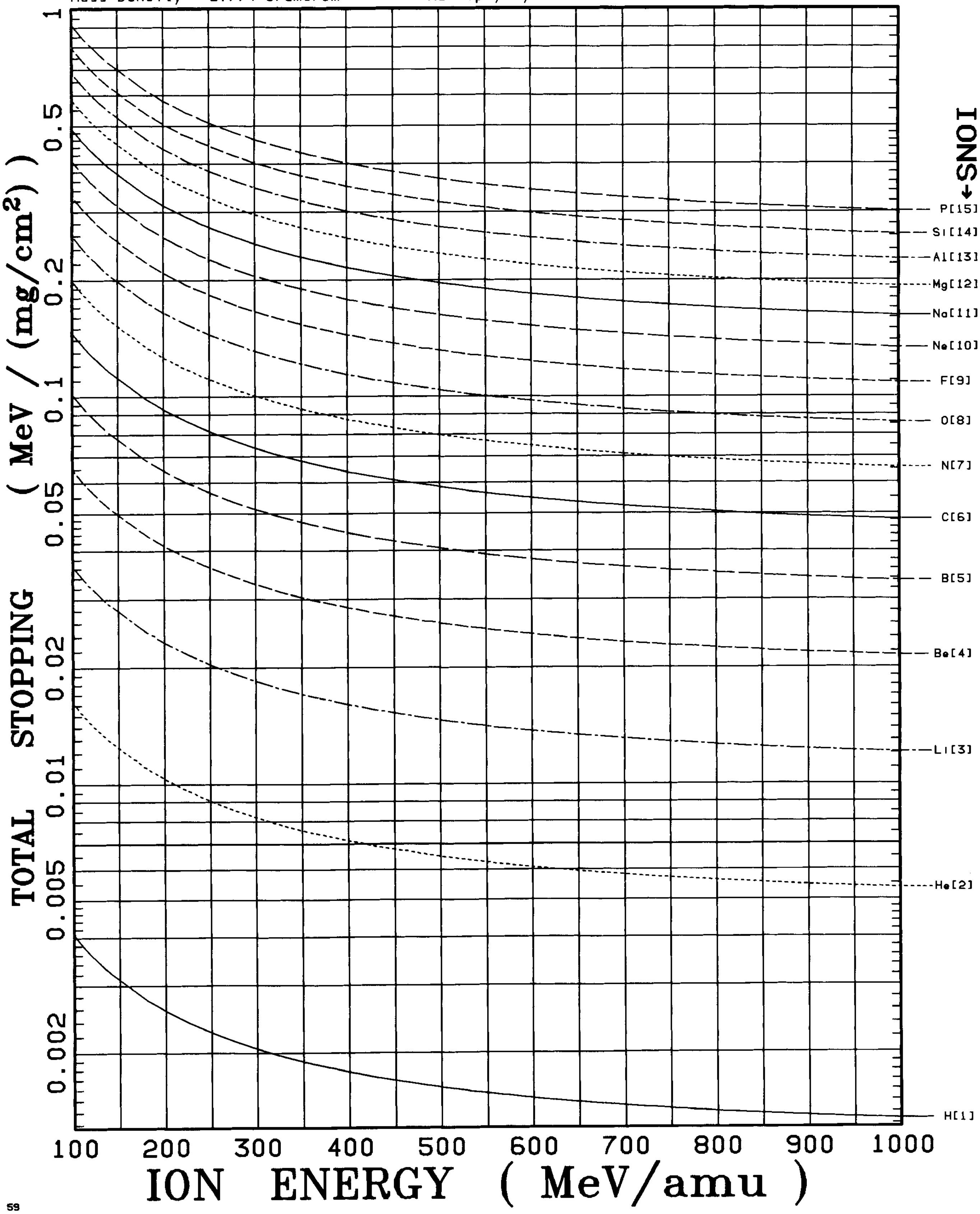
Atom Density = 2.896×10^{22} Atoms/cm^3 Multiply Total Stopping by 677.4 for Units: [MeV/mm]
Mass Density = 6.774 Grams/cm^3 Multiply by 234 for Units: [eV/(10^{15} Atoms/cm^2)]



Pr(59) ←←← TARGET →→→ Pr(59)

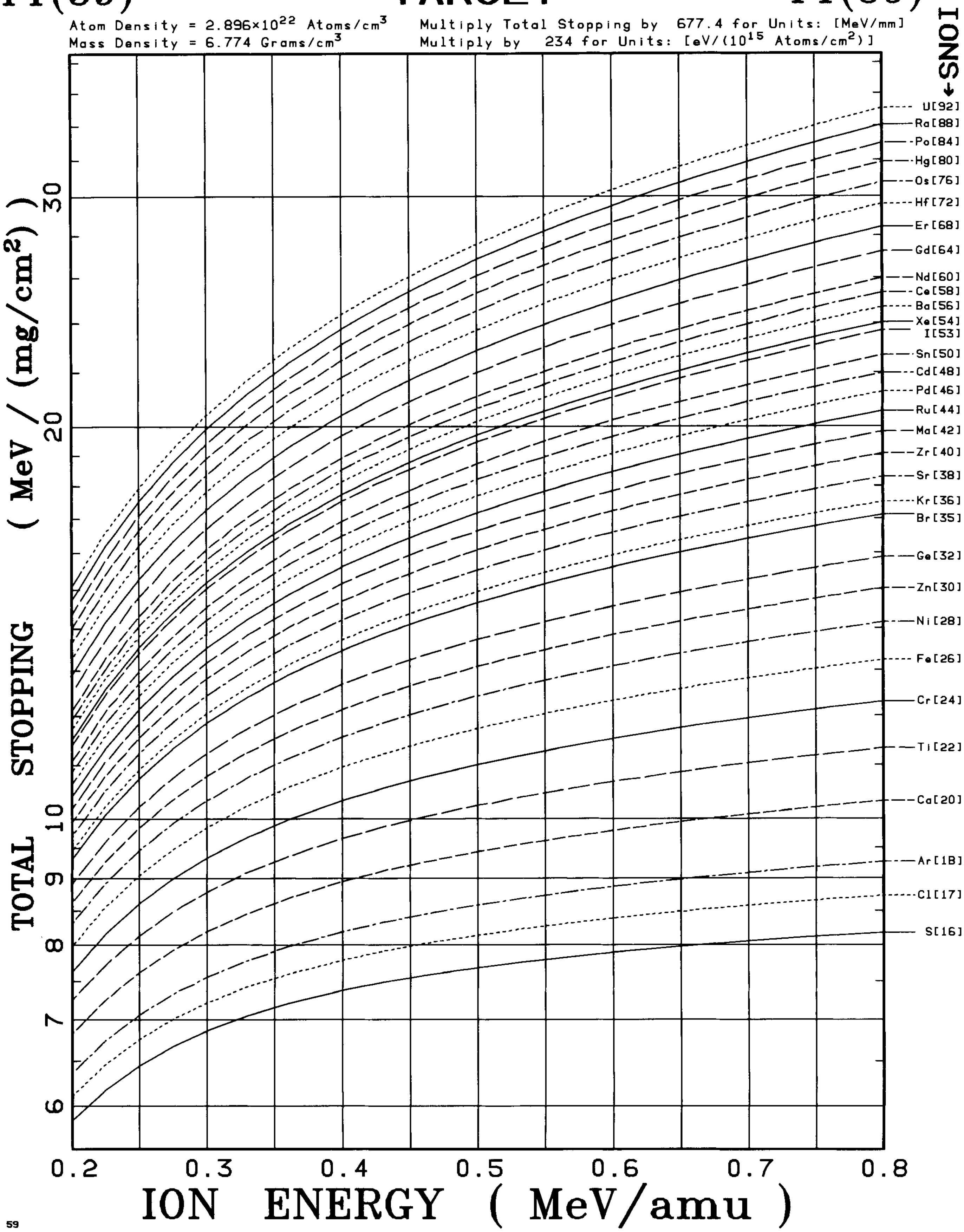
Atom Density = 2.896×10^{22} Atoms/cm^3 Multiply Total Stopping by 677.4 for Units: [MeV/mm]

Mass Density = 6.774 Grams/cm^3 Multiply by 234 for Units: [eV/(10^{15} Atoms/cm^2)]



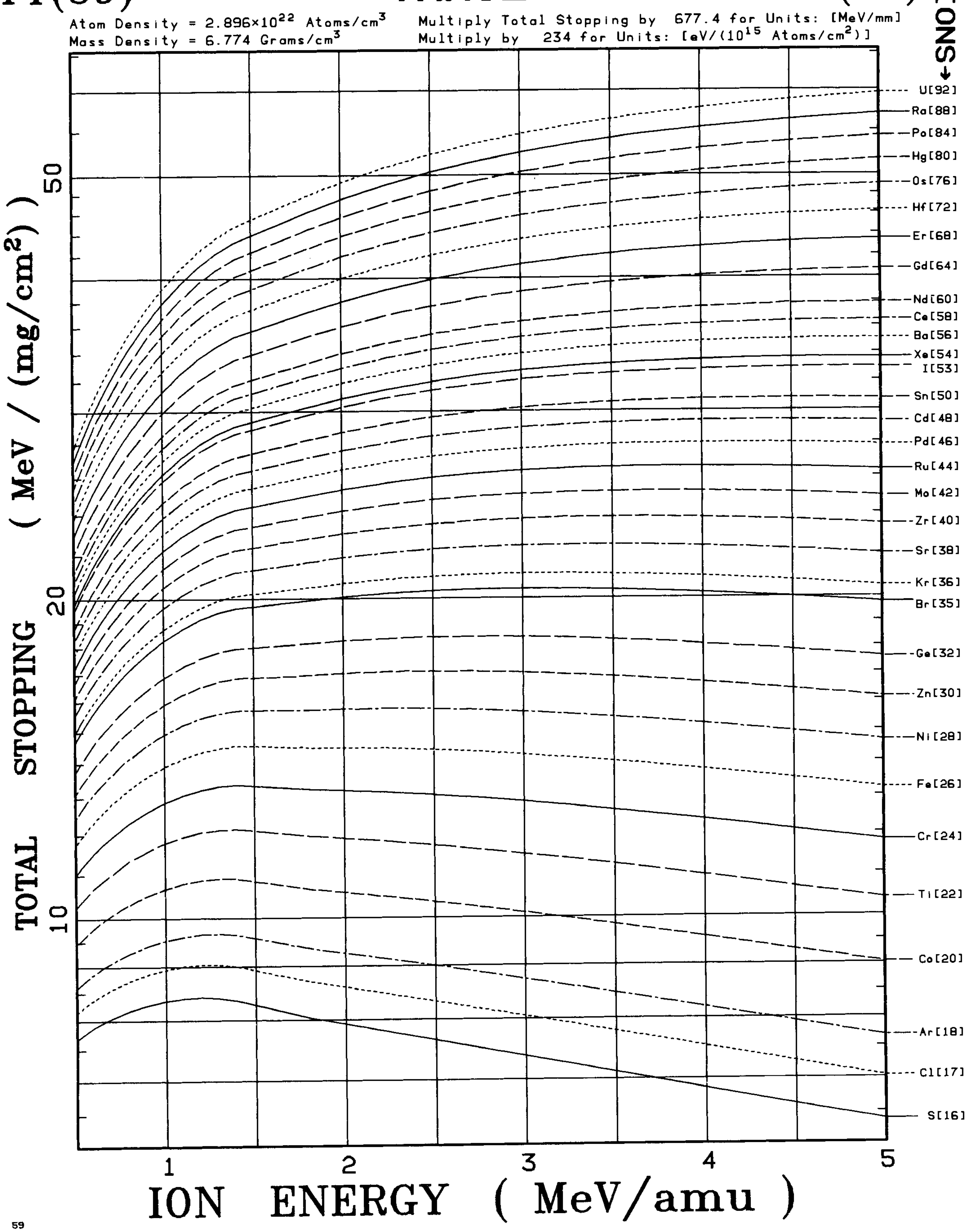
Pr(59) ←←← TARGET →→→ Pr(59)

Atom Density = 2.896×10^{22} Atoms/cm^3 Multiply Total Stopping by 677.4 for Units: [MeV/mm]
Mass Density = 6.774 Grams/cm^3 Multiply by 234 for Units: [eV/(10^{15} Atoms/cm^2)]



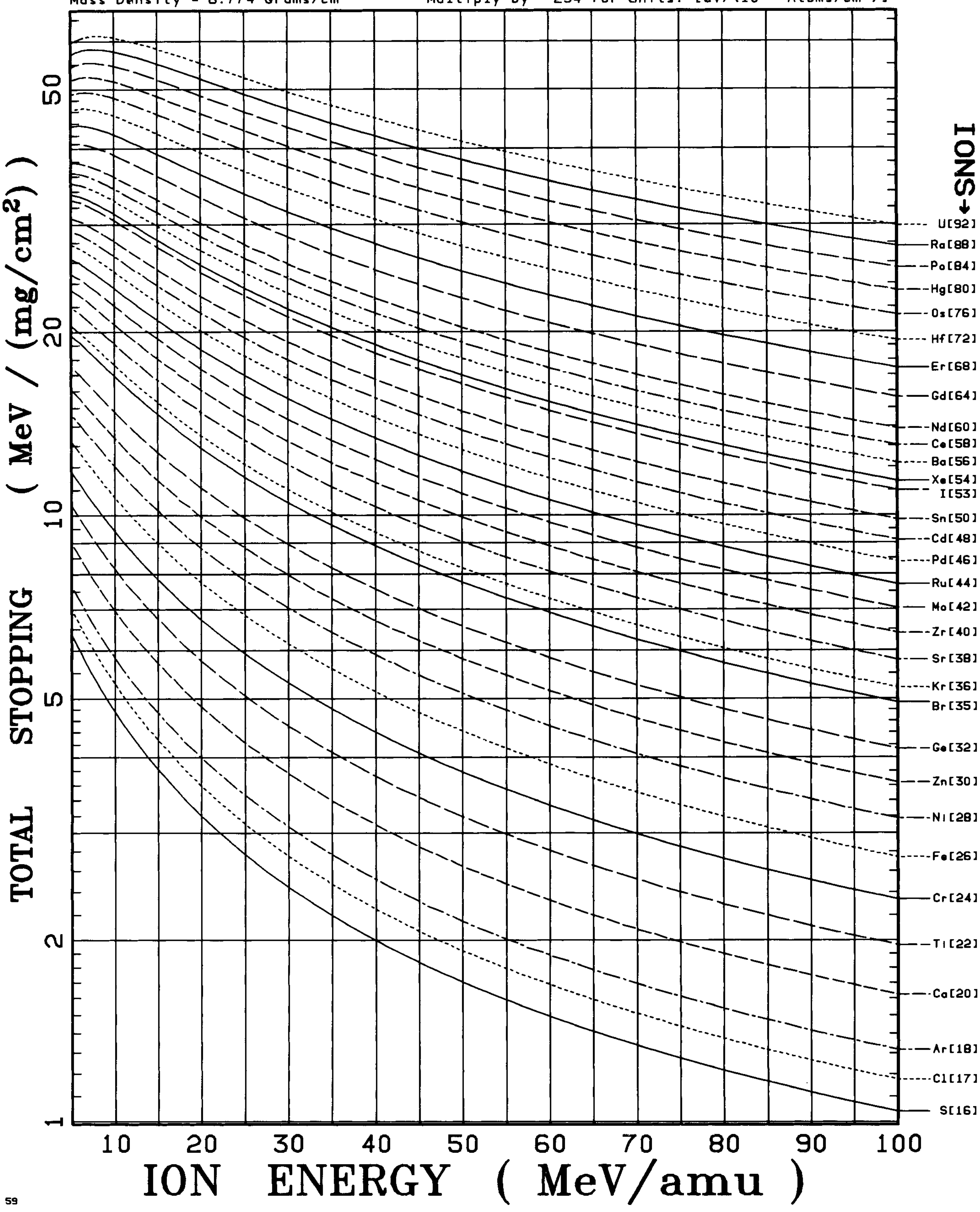
Pr(59) ←←← TARGET →→→ Pr(59)

Atom Density = 2.896×10^{22} Atoms/cm^3 Multiply Total Stopping by 677.4 for Units: [MeV/mm]
Mass Density = 6.774 Grams/cm^3 Multiply by 234 for Units: [eV/(10^{15} Atoms/cm^2)]



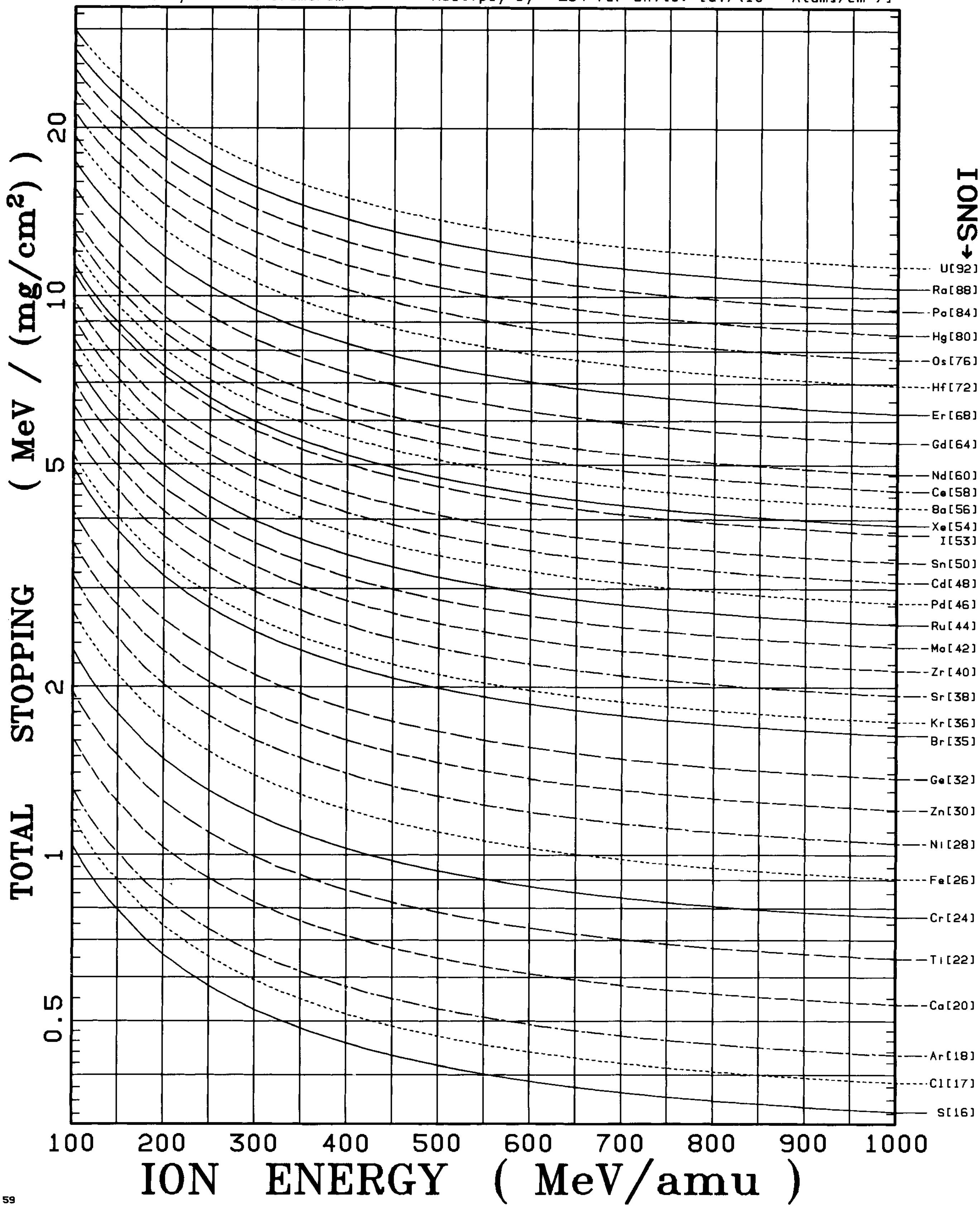
Pr(59) ←←← TARGET →→→ Pr(59)

Atom Density = 2.896×10^{22} Atoms/cm^3 Multiply Total Stopping by 677.4 for Units: [MeV/mm]
Mass Density = 6.774 Grams/cm^3 Multiply by 234 for Units: [eV/(10^{15} Atoms/cm^2)]



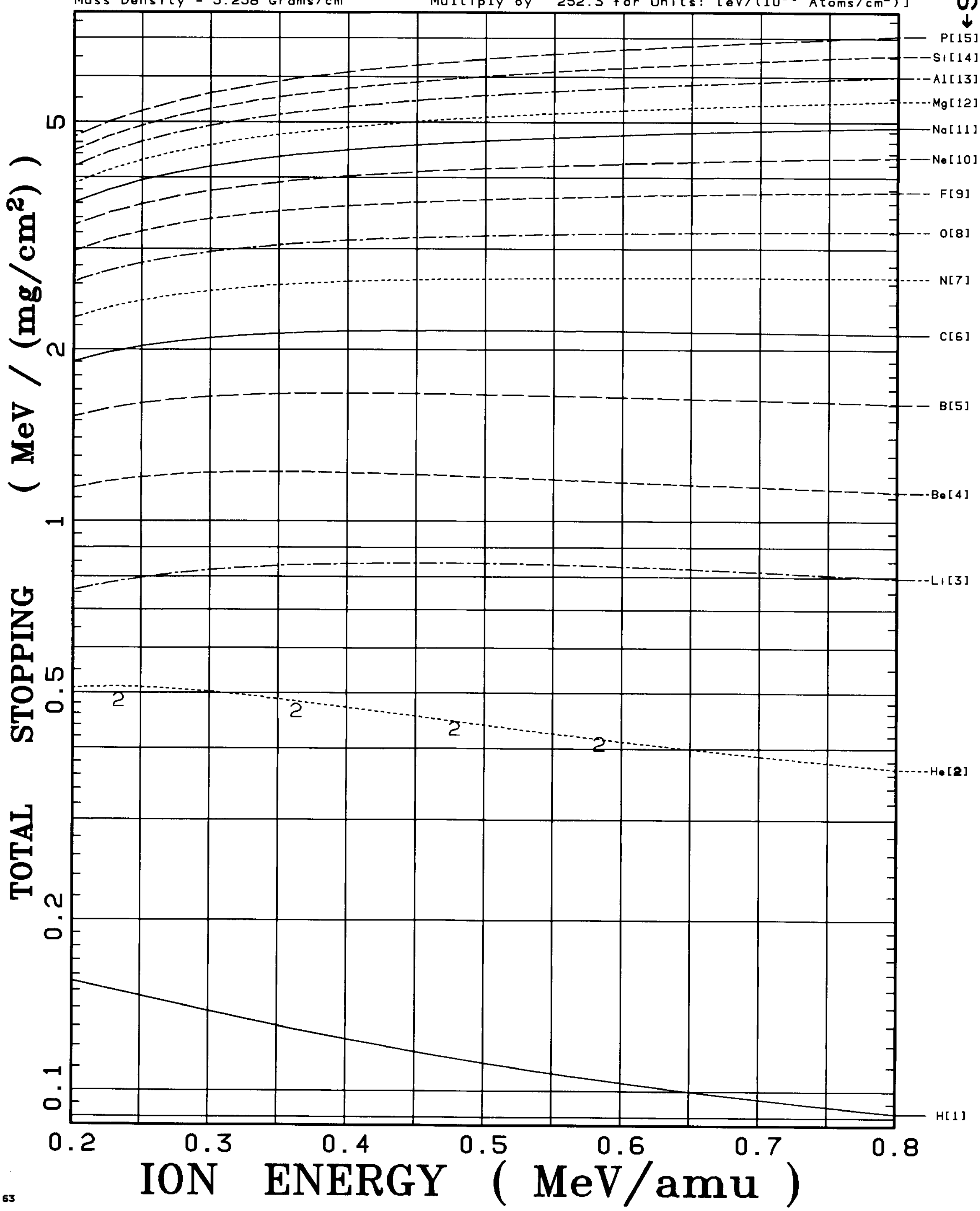
Pr(59) ←←← TARGET →→→ Pr(59)

Atom Density = 2.896×10^{22} Atoms/cm^3 Multiply Total Stopping by 677.4 for Units: [MeV/mm]
Mass Density = 6.774 Grams/cm^3 Multiply by 234 for Units: [eV/(10^{15} Atoms/cm^2)]



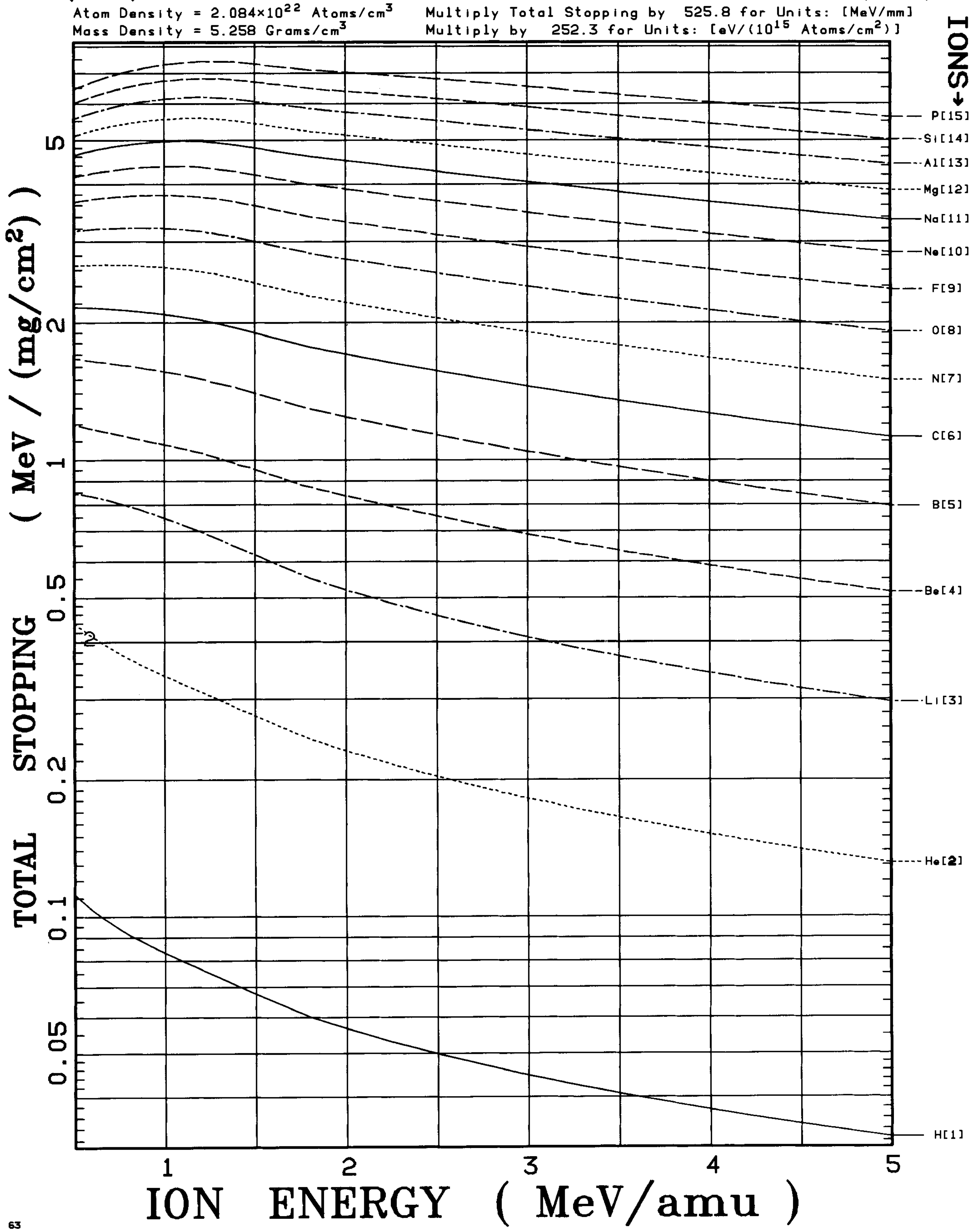
Eu(63) ←←← TARGET →→→ Eu(63)

Atom Density = 2.084×10^{22} Atoms/cm^3 Multiply Total Stopping by 525.8 for Units: [MeV/mm]
Mass Density = 5.258 Grams/cm^3 Multiply by 252.3 for Units: [eV/(10^{15} Atoms/cm^2)]



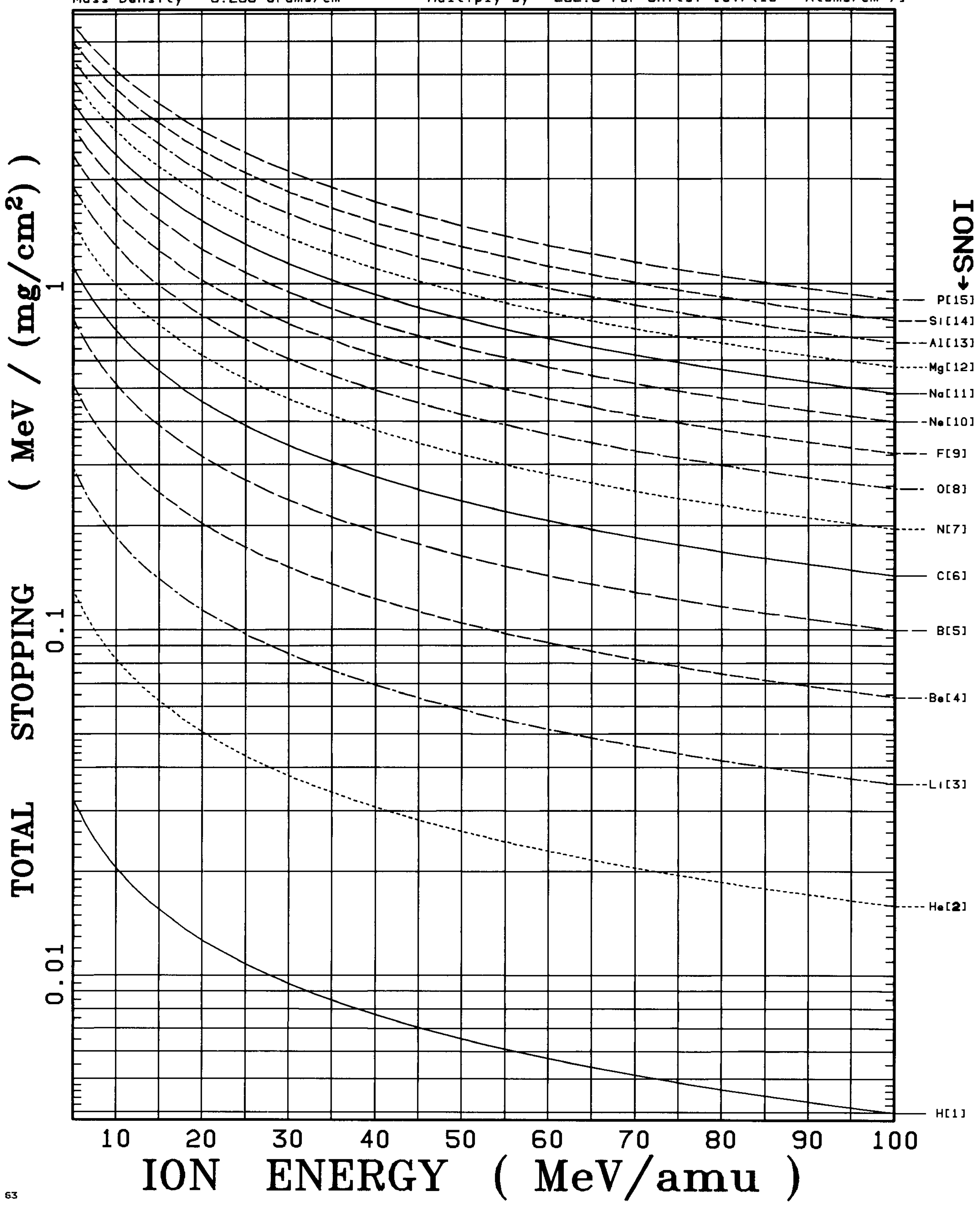
Eu(63) ←←← TARGET →→→ Eu(63)

Atom Density = 2.084×10^{22} Atoms/cm^3 Multiply Total Stopping by 525.8 for Units: [MeV/mm]
Mass Density = 5.258 Grams/cm^3 Multiply by 252.3 for Units: [eV/(10^{15} Atoms/cm^2)]



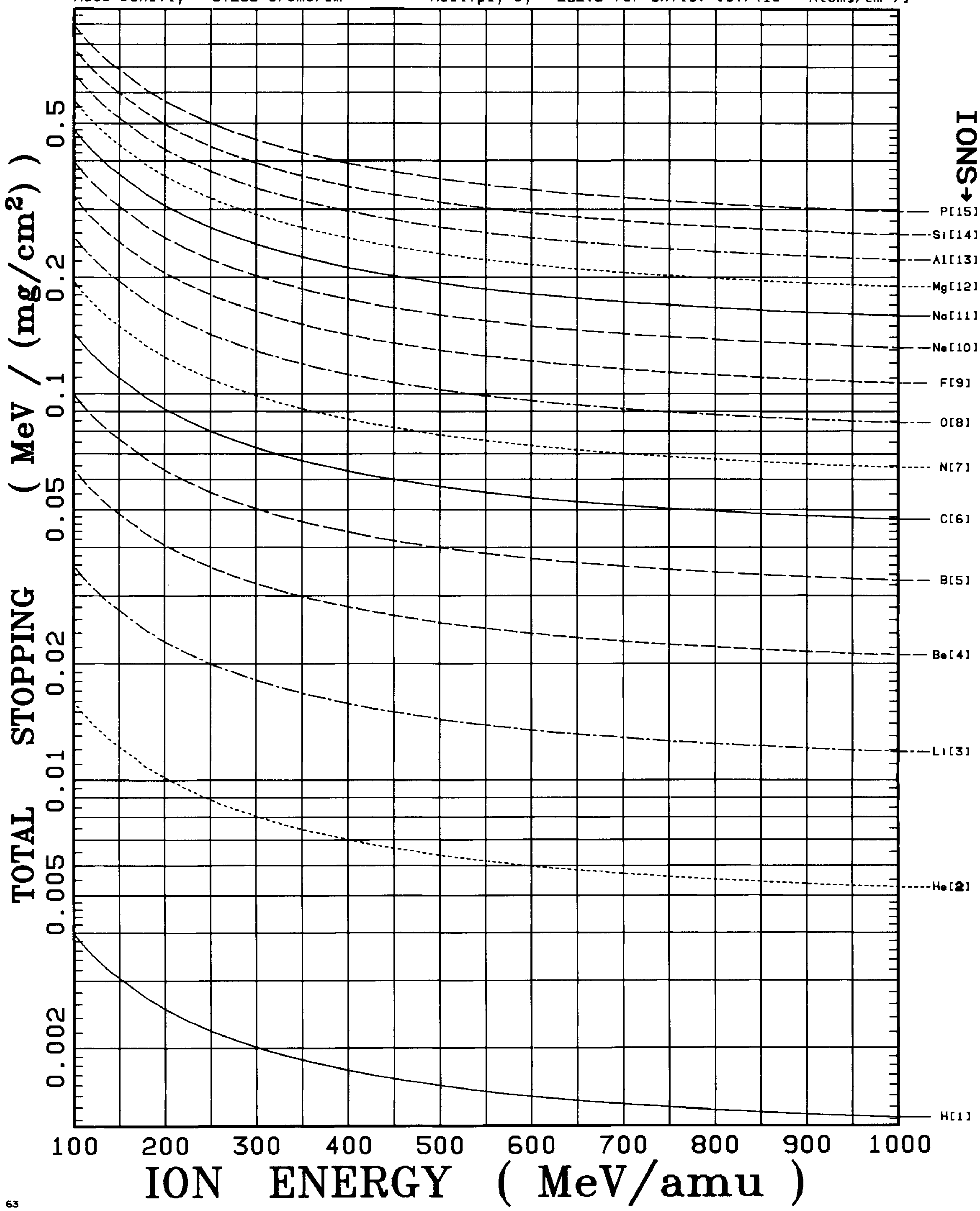
Eu(63) ←←← TARGET →→→ Eu(63)

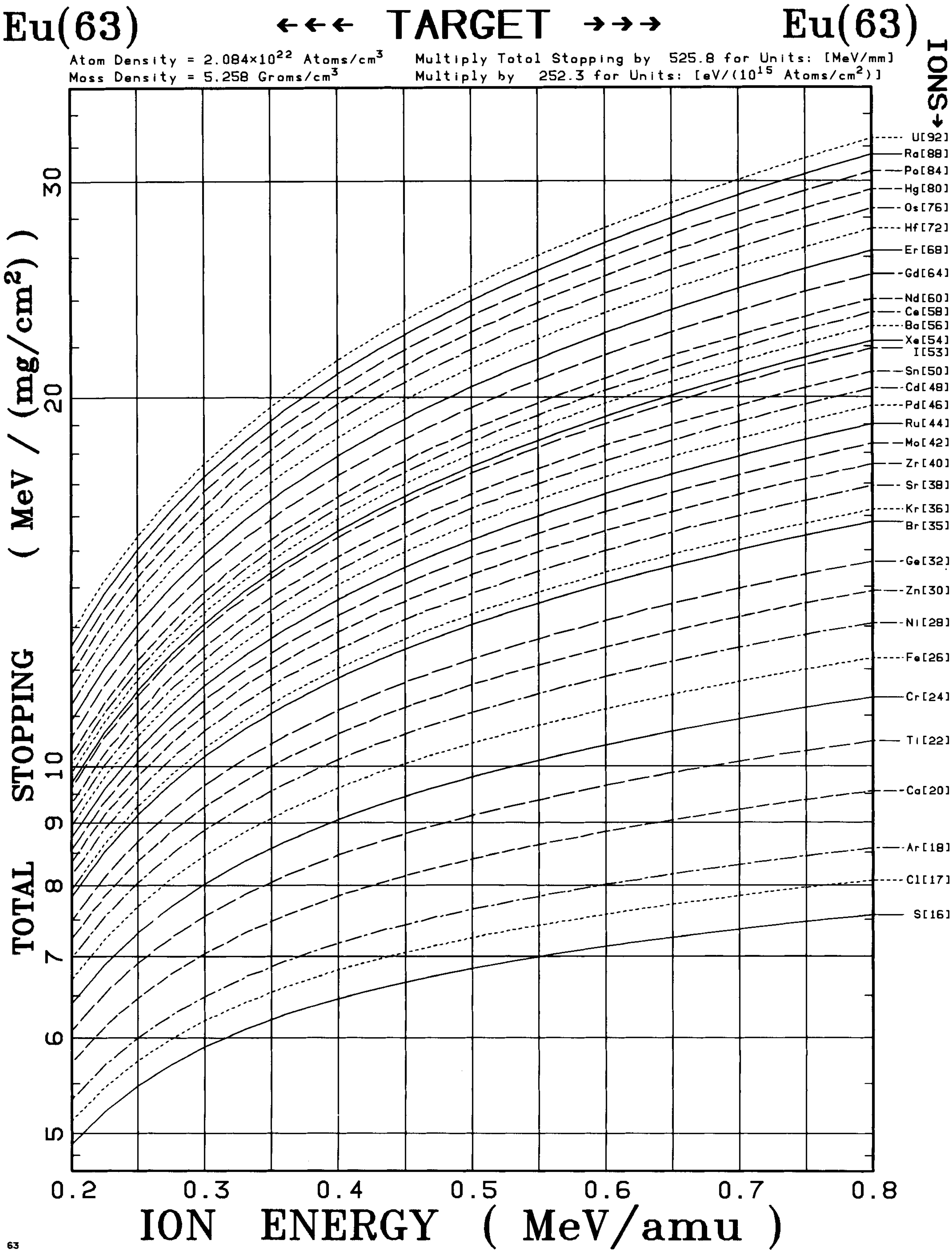
Atom Density = 2.084×10^{22} Atoms/cm^3 Multiply Total Stopping by 525.8 for Units: [MeV/mm]
Mass Density = 5.258 Grams/cm^3 Multiply by 252.3 for Units: [eV/(10^{15} Atoms/cm^2)]



Eu(63) ←←← TARGET →→→ Eu(63)

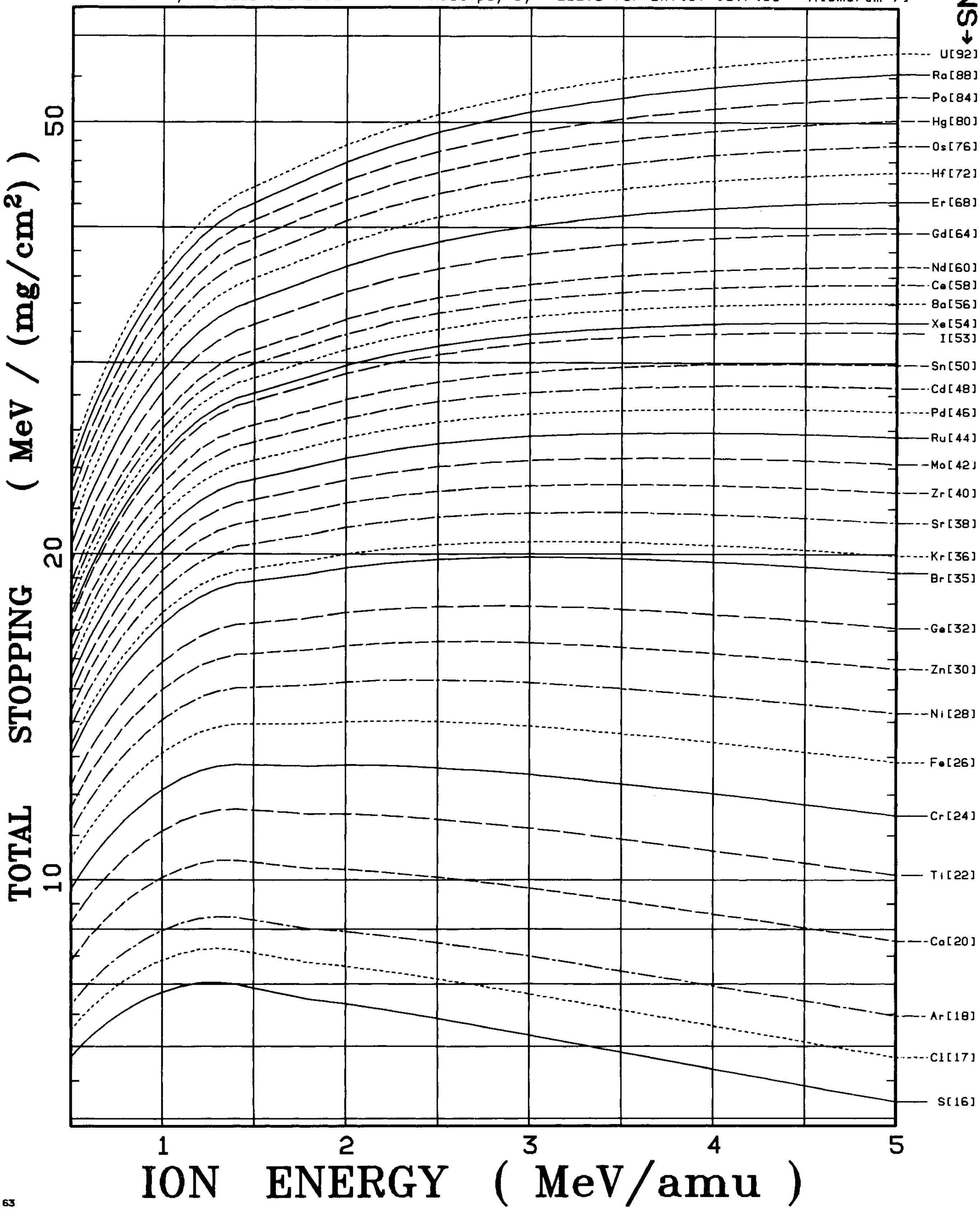
Atom Density = 2.084×10[22] Atoms/cm[3] Multiply Total Stopping by 525.8 for Units: [MeV/mm]
Mass Density = 5.258 Grams/cm[3] Multiply by 252.3 for Units: [eV/(10[15] Atoms/cm[2])]




Eu(63)
←←← TARGET →→→
Eu(63)
Atom Density = 2.084×10^22 Atoms/cm^3
Mass Density = 5.258 Grams/cm^3
Multiply Total Stopping by 525.8 for Units: [MeV/mm]
Multiply by 252.3 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm^2))
5
6
7
8
9
10
20
30
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

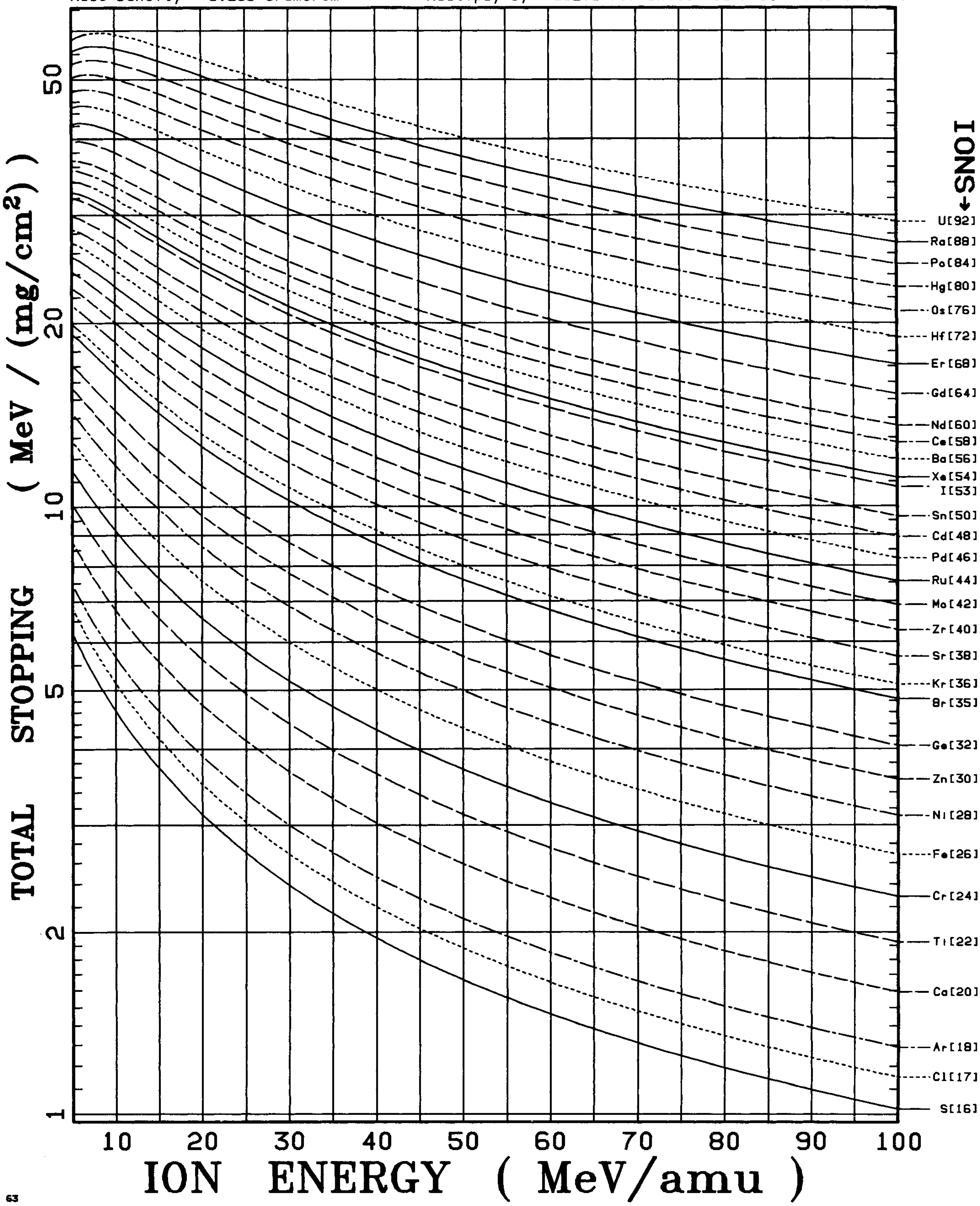
Eu(63) ←←← TARGET →→→ Eu(63)

Atom Density = 2.084×10^22 Atoms/cm^3   Multiply Total Stopping by 525.8 for Units: [MeV/mm]
Mass Density = 5.258 Grams/cm^3   Multiply by 252.3 for Units: [eV/(10^15 Atoms/cm^2)]



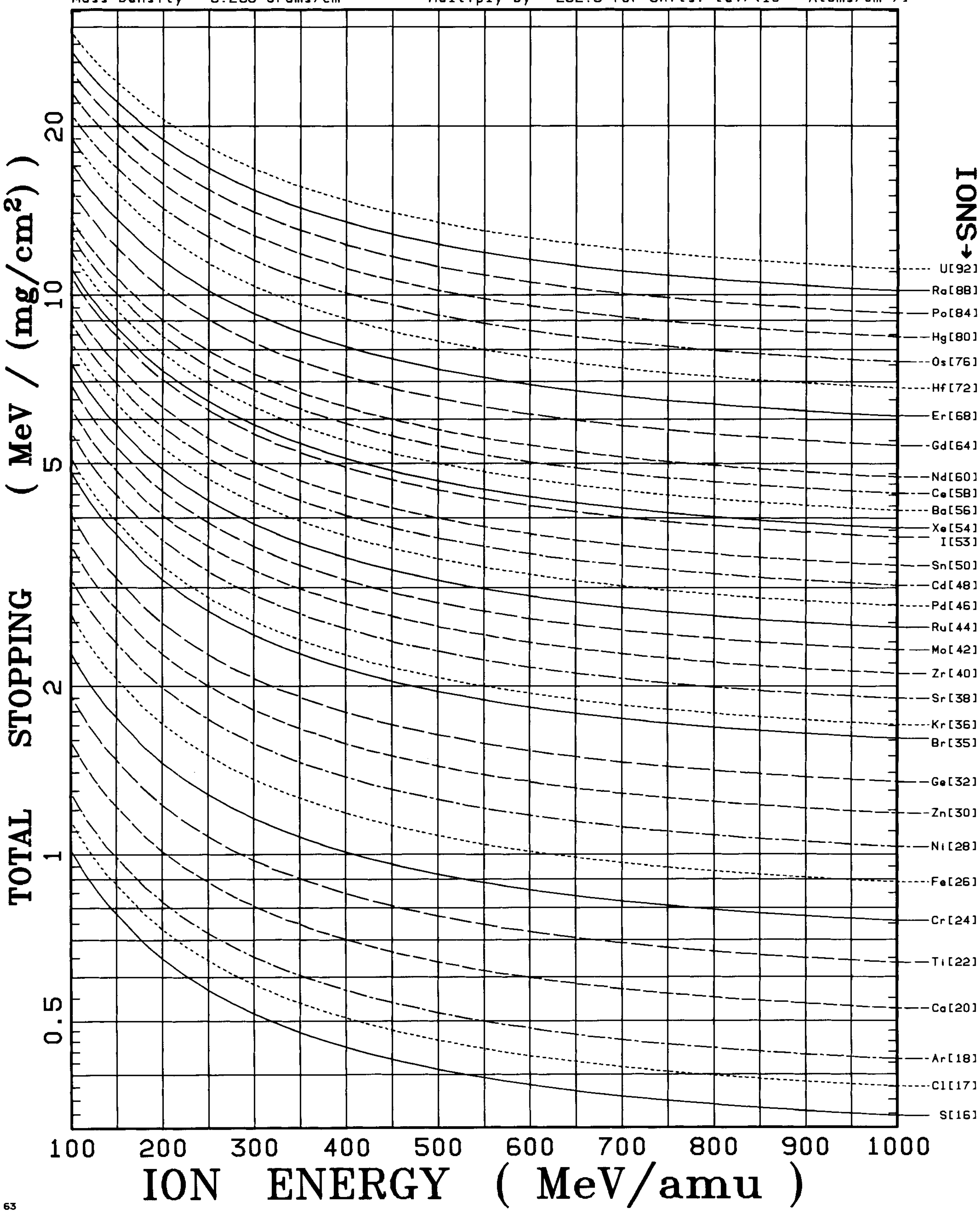
Eu(63) ←←← TARGET →→→ Eu(63)

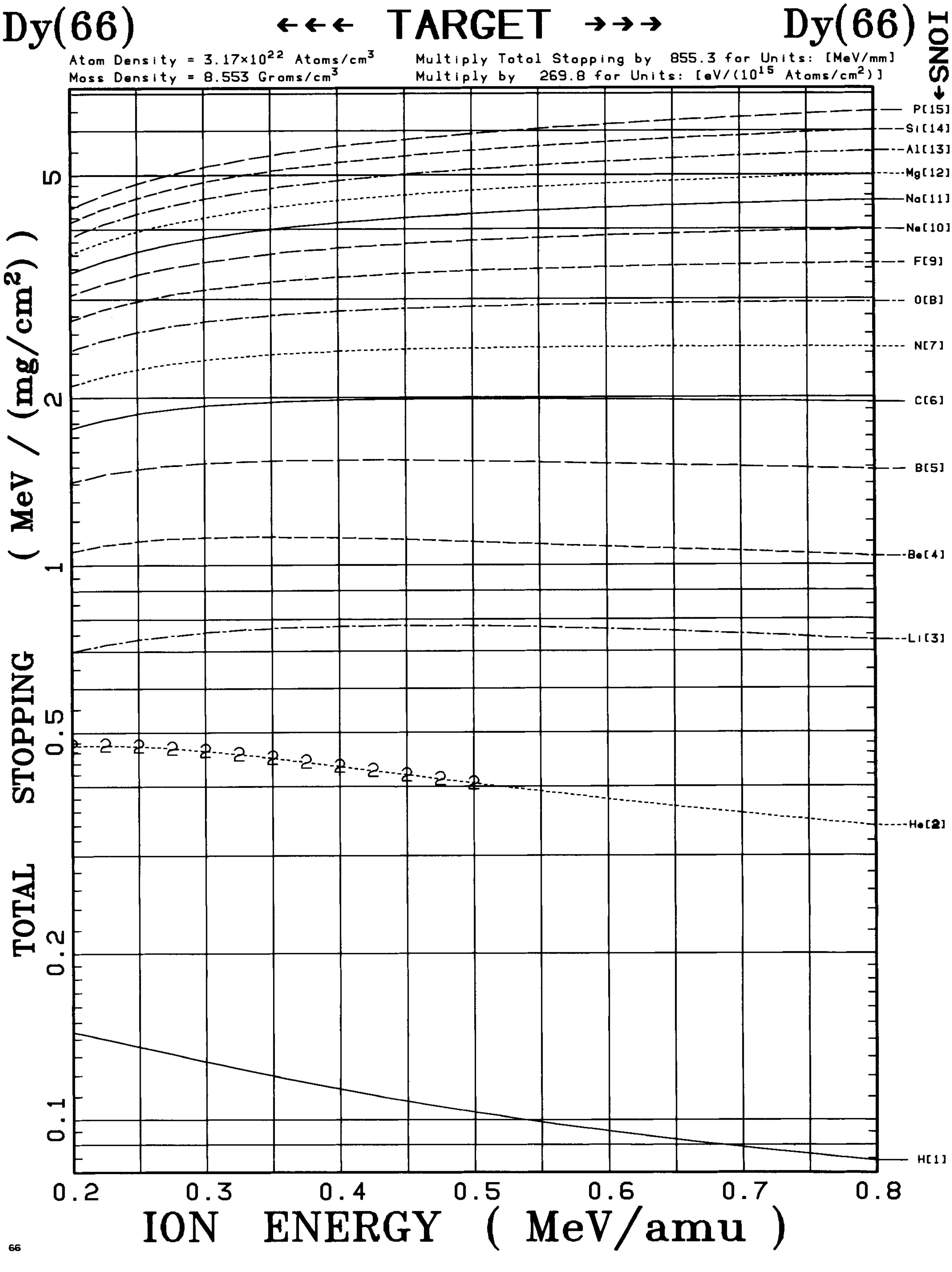
Atom Density = 2.084×10^{22} Atoms/cm^3 Multiply Total Stopping by 525.8 for Units: [MeV/mm]
Mass Density = 5.258 Grams/cm^3 Multiply by 252.3 for Units: [eV/(10^{15} Atoms/cm^2)]



Eu(63) ←←← TARGET →→→ Eu(63)

Atom Density = 2.084×10^{22} Atoms/cm^3 Multiply Total Stopping by 525.8 for Units: [MeV/mm]
Mass Density = 5.258 Grams/cm^3 Multiply by 252.3 for Units: [eV/(10^{15} Atoms/cm^2)]

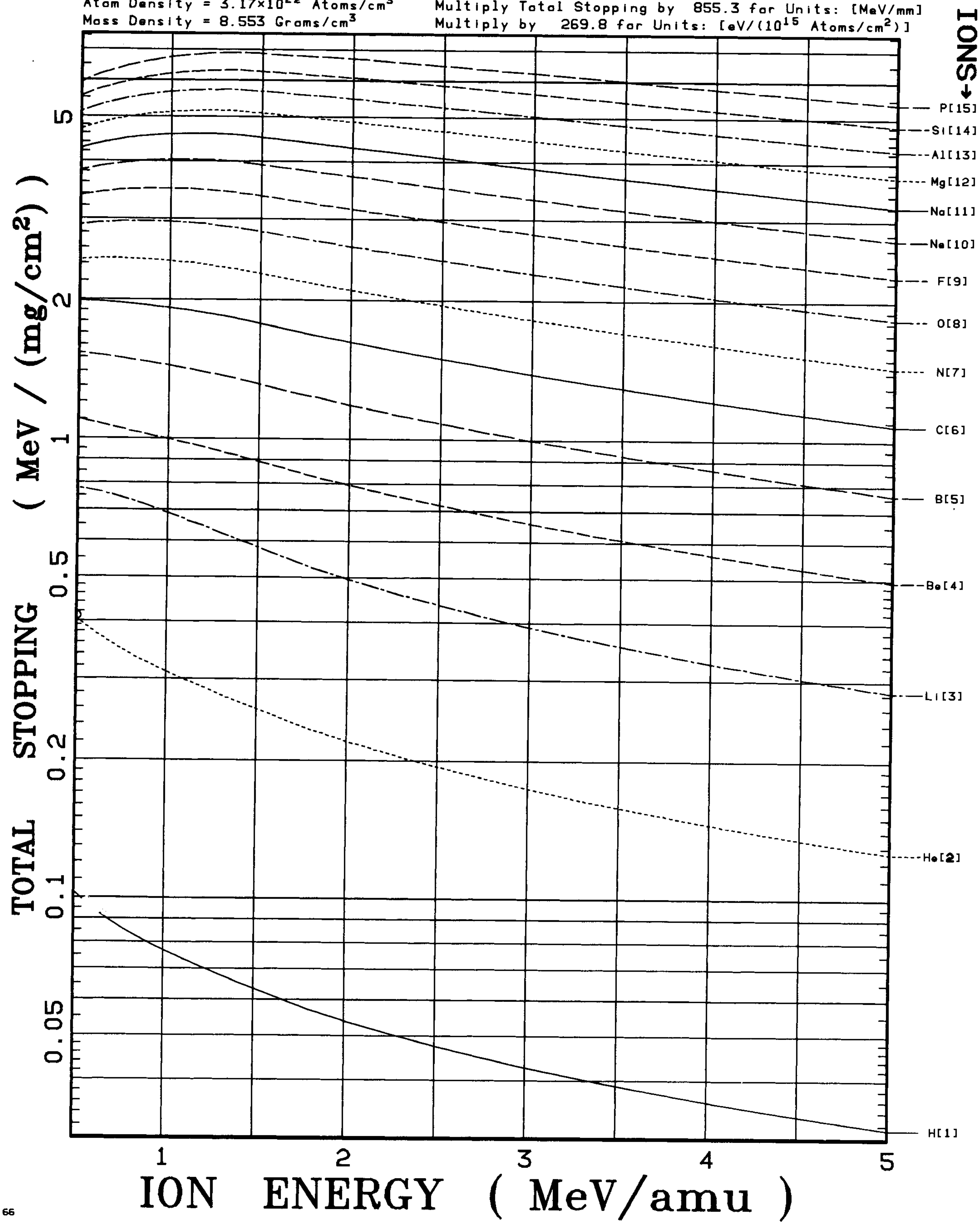



Dy(66)
←←← TARGET →→→
Dy(66)
IONS→
Atom Density = 3.17×10^22 Atoms/cm^3
Mass Density = 8.553 Grams/cm^3
Multiply Total Stopping by 855.3 for Units: [MeV/mm]
Multiply by 269.8 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
0.2
0.3
0.4
0.5
0.6
0.7
0.8
5
2
1
0.5
0.2
0.1
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]

Dy(66) ←←← TARGET →→→ Dy(66)

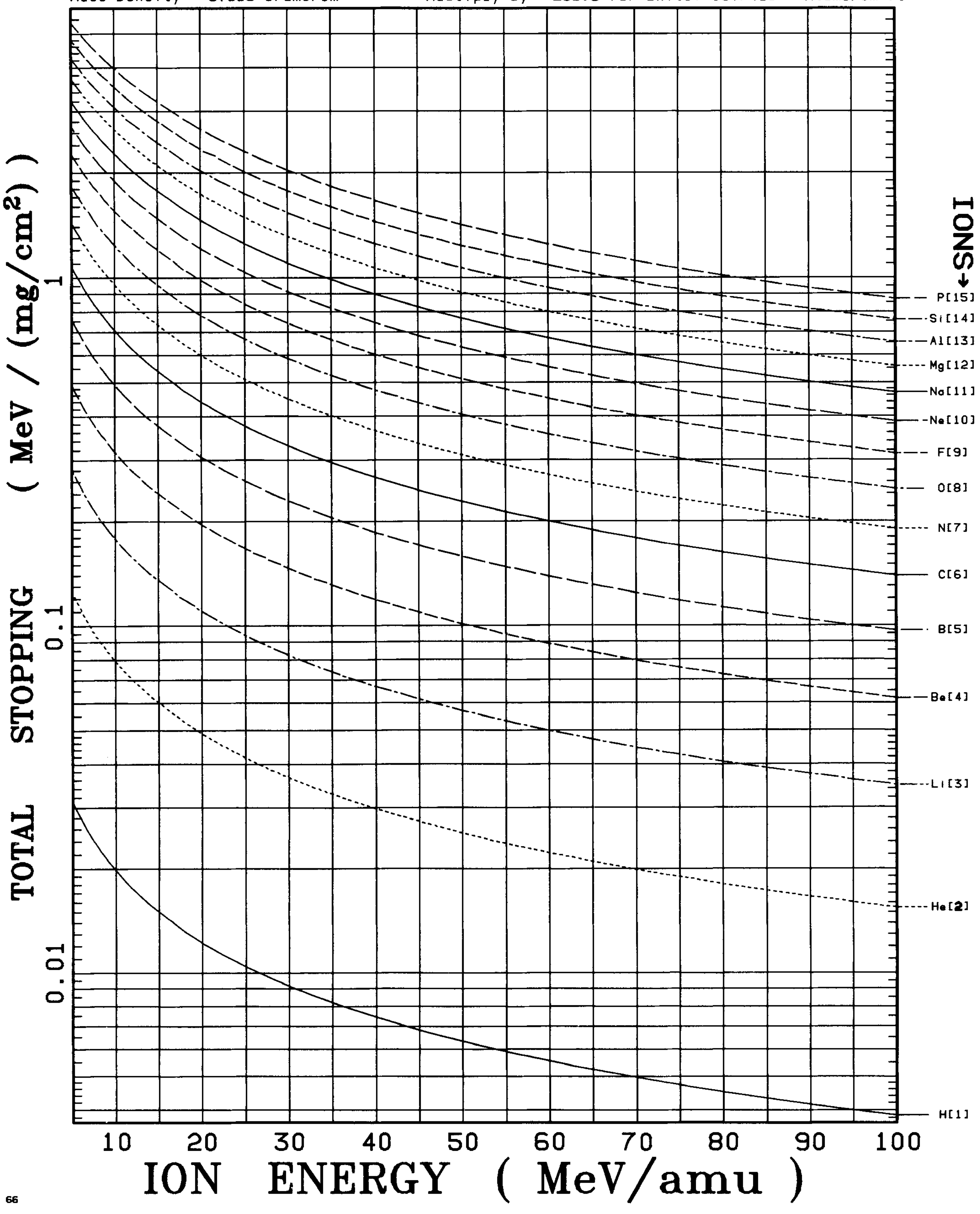
Atom Density = 3.17×10^{22} Atoms/cm^3
Mass Density = 8.553 Grams/cm^3

Multiply Total Stopping by 855.3 for Units: [MeV/mm]
Multiply by 269.8 for Units: [eV/(10^{15} Atoms/cm^2)]



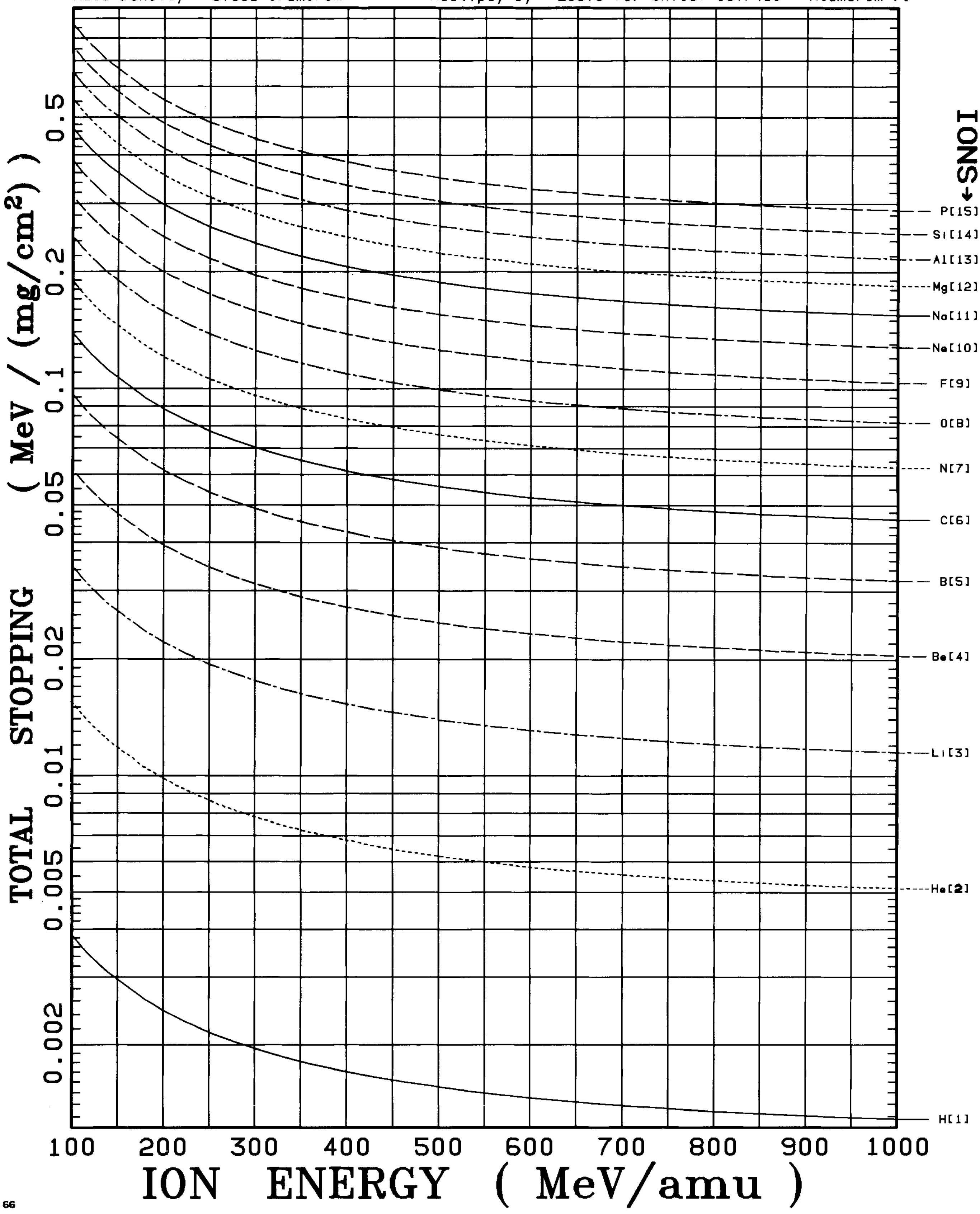
Dy(66) ←←← TARGET →→→ Dy(66)

Atom Density = 3.17×10^{22} Atoms/cm^3 Multiply Total Stopping by 855.3 for Units: [MeV/mm]
Mass Density = 8.553 Grams/cm^3 Multiply by 269.8 for Units: [eV/(10^{15} Atoms/cm^2)]



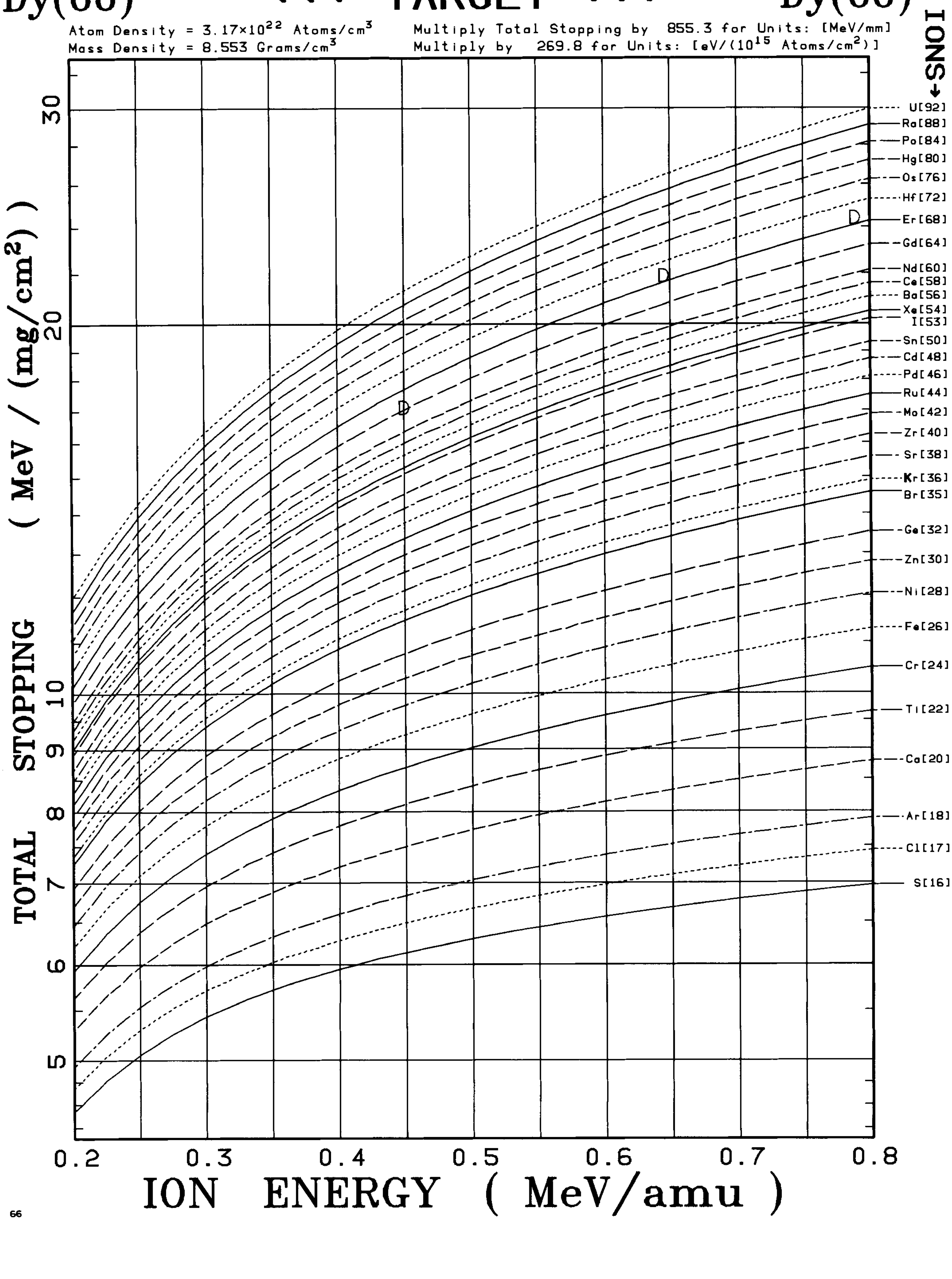
Dy(66) ←←← TARGET →→→ Dy(66)

Atom Density = 3.17×10^{22} Atoms/cm^3 Multiply Total Stopping by 855.3 for Units: [MeV/mm]
Mass Density = 8.553 Grams/cm^3 Multiply by 269.8 for Units: [eV/(10^{15} Atoms/cm^2)]



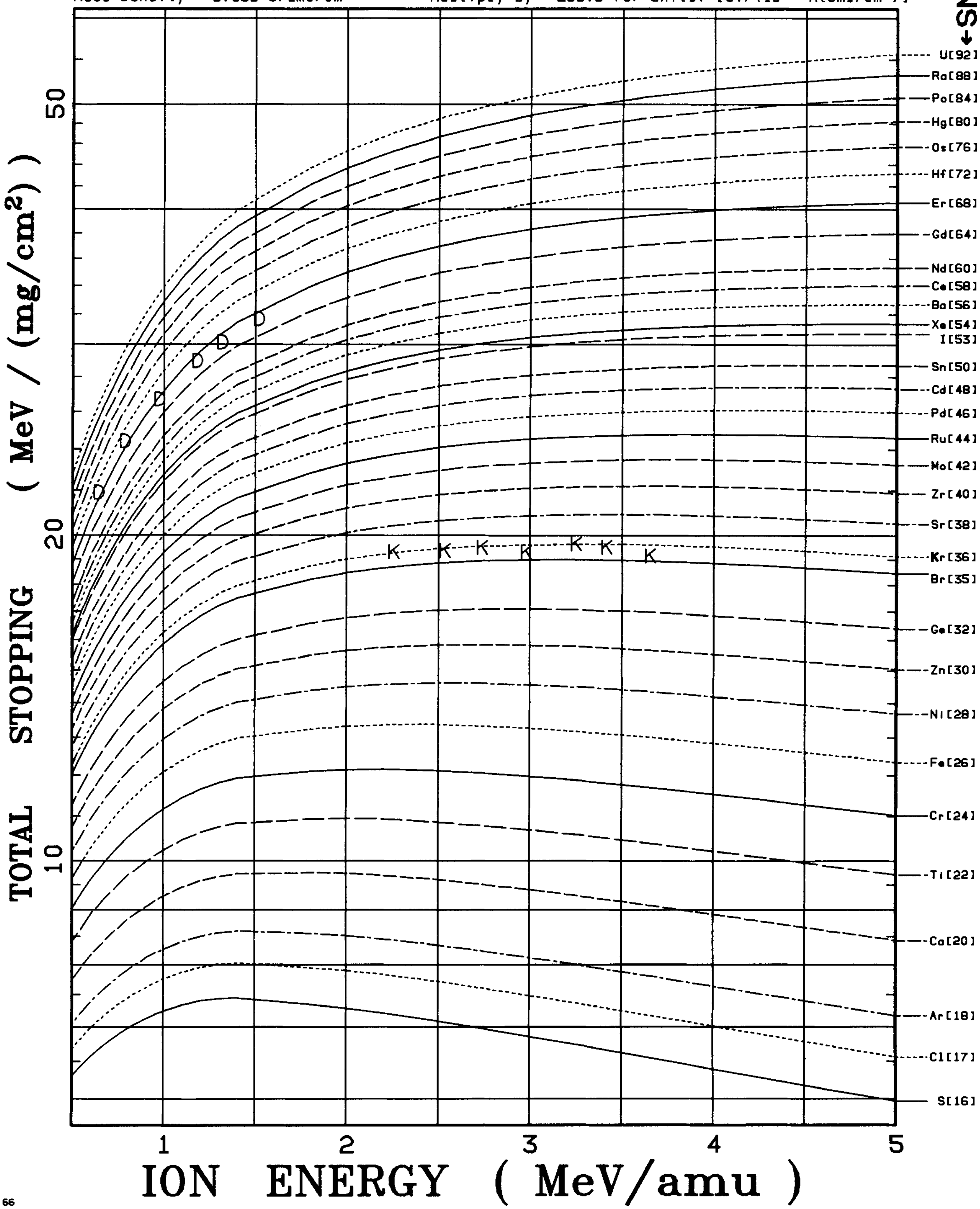
Dy(66) ←←← TARGET →→→ Dy(66)

Atom Density = 3.17×10^{22} Atoms/cm^3 Multiply Total Stopping by 855.3 for Units: [MeV/mm]
Mass Density = 8.553 Grams/cm^3 Multiply by 269.8 for Units: [eV/(10^{15} Atoms/cm^2)]



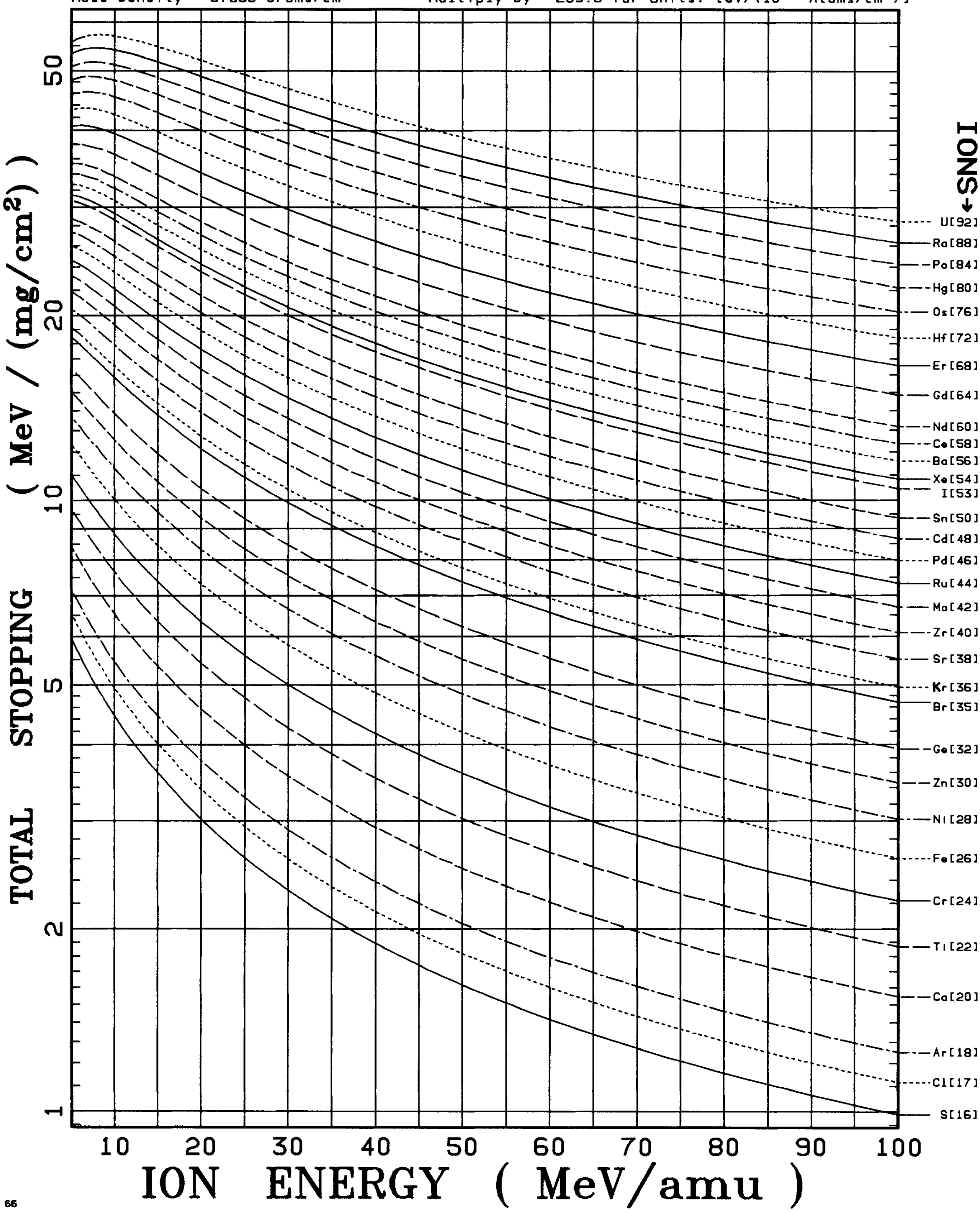
Dy(66) ←←← TARGET →→→ Dy(66)

Atom Density = 3.17×10^22 Atoms/cm^3 Multiply Total Stopping by 855.3 for Units: [MeV/mm]
Mass Density = 8.553 Grams/cm^3 Multiply by 269.8 for Units: [eV/(10^15 Atoms/cm^2)]



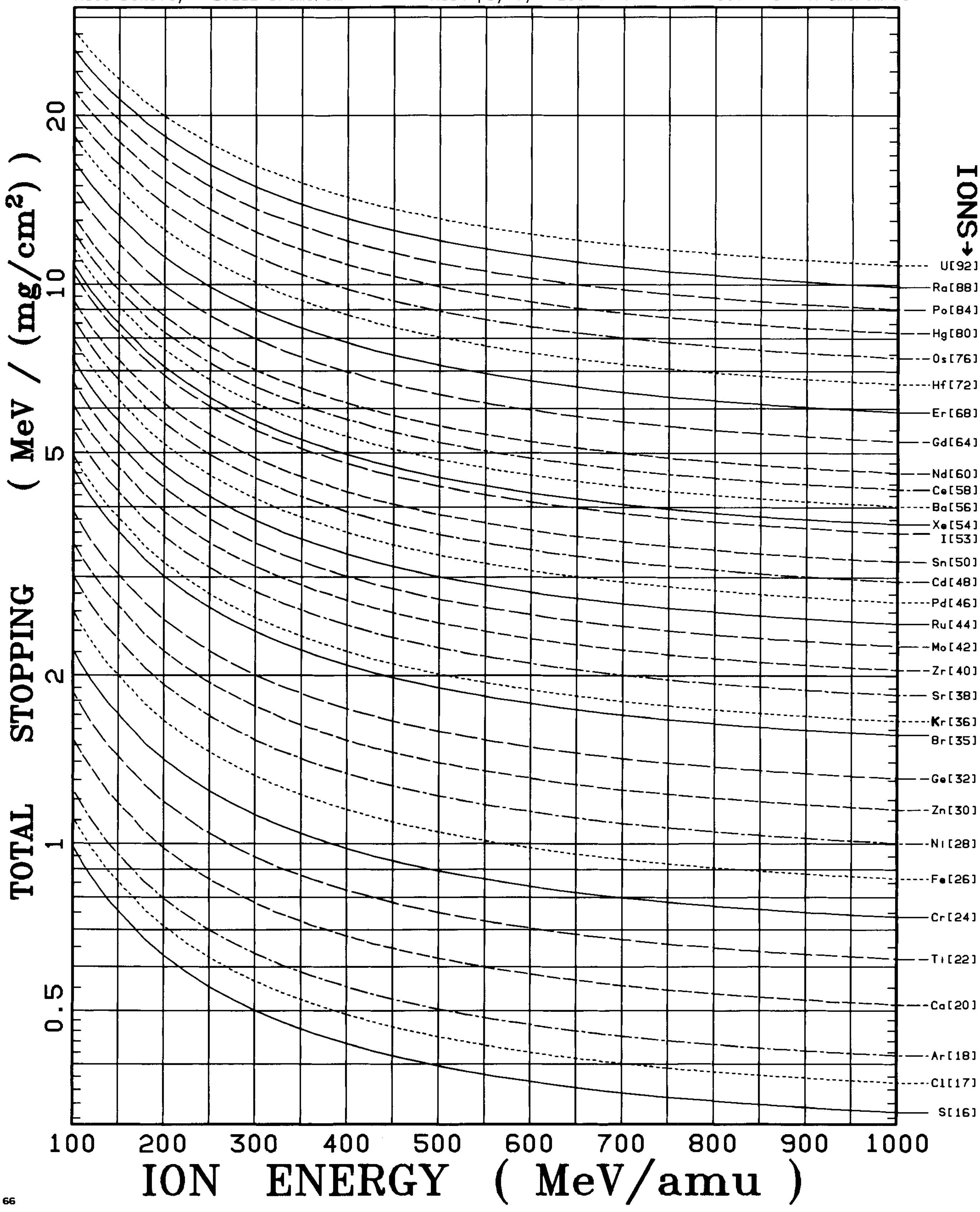
Dy(66) ←←← TARGET →→→ Dy(66)

Atom Density = 3.17×10^{22} Atoms/cm^3 Multiply Total Stopping by 855.3 for Units: [MeV/mm]
Mass Density = 8.553 Grams/cm^3 Multiply by 269.8 for Units: [eV/(10^{15} Atoms/cm^2)]



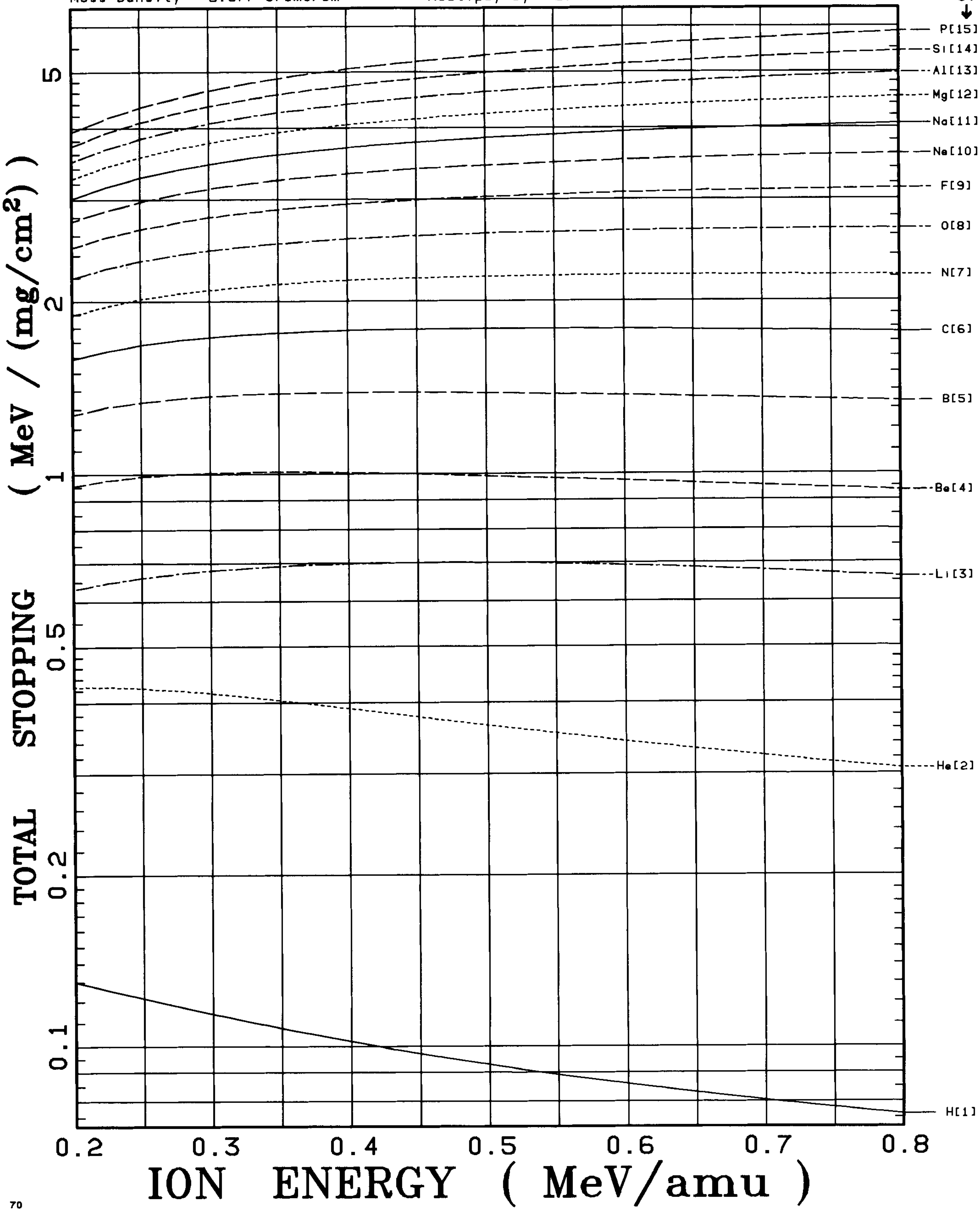
Dy(66) ←←← TARGET →→→ Dy(66)

Atom Density = 3.17×10^{22} Atoms/cm^3 Multiply Total Stopping by 855.3 for Units: [MeV/mm]
Mass Density = 8.553 Grams/cm^3 Multiply by 269.8 for Units: [eV/(10^{15} Atoms/cm^2)]



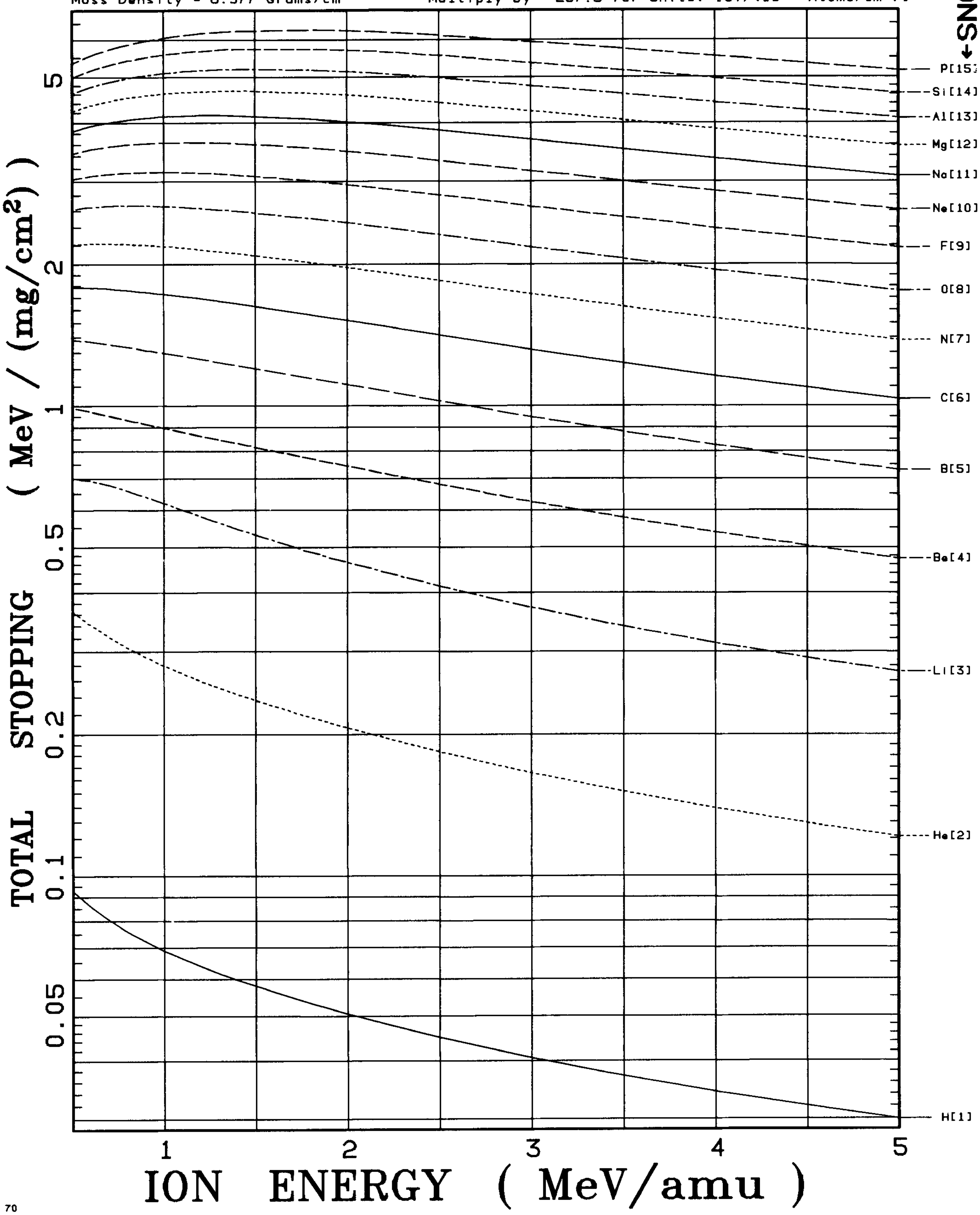
Yb(70) ←←← TARGET →→→ Yb(70)

Atom Density = 2.429×10^22 Atoms/cm^3 Multiply Total Stopping by 697.7 for Units: [MeV/mm]
Mass Density = 6.977 Grams/cm^3 Multiply by 287.3 for Units: [eV/(10^15 Atoms/cm^2)]



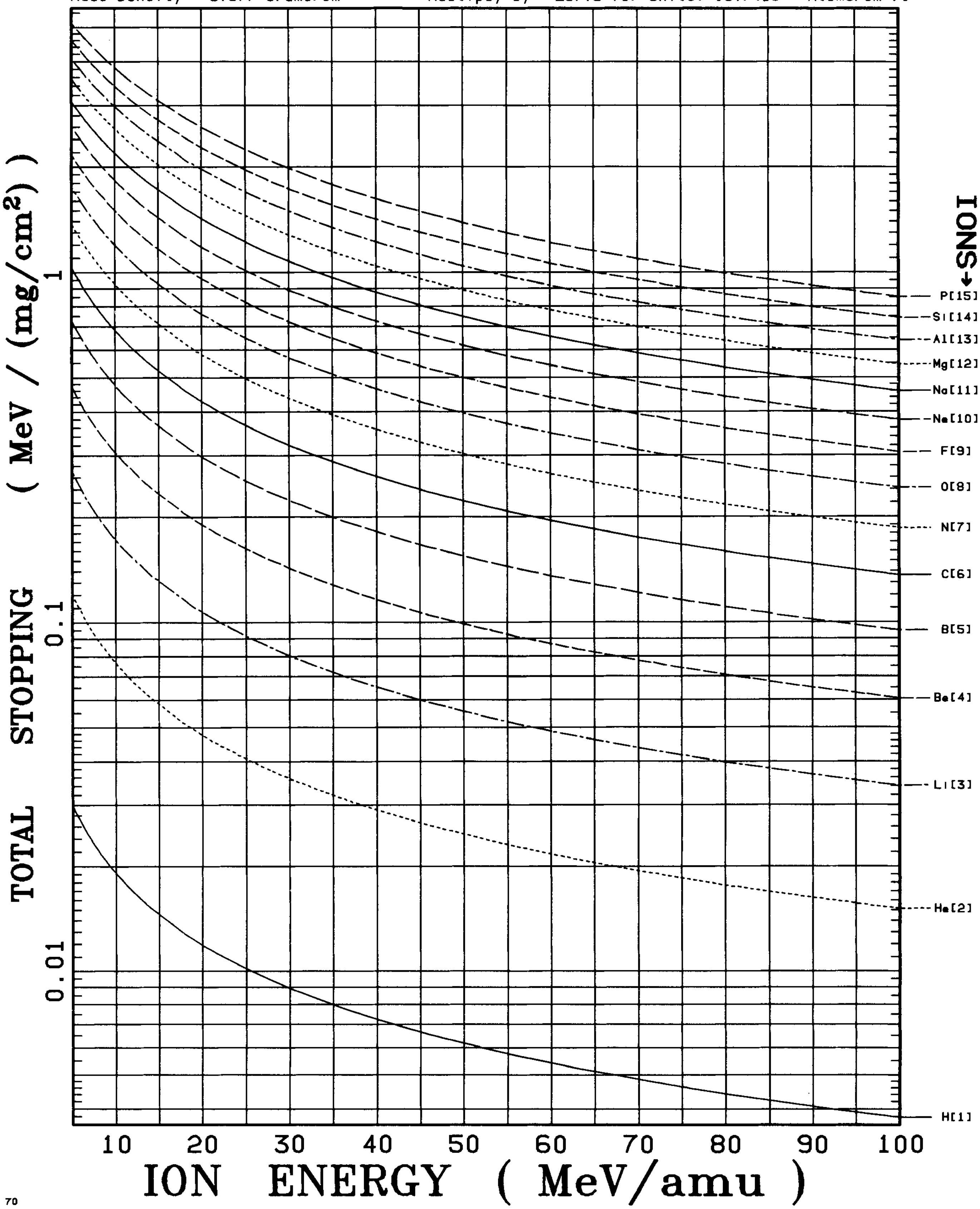
Yb(70) ←←← TARGET →→→ Yb(70)

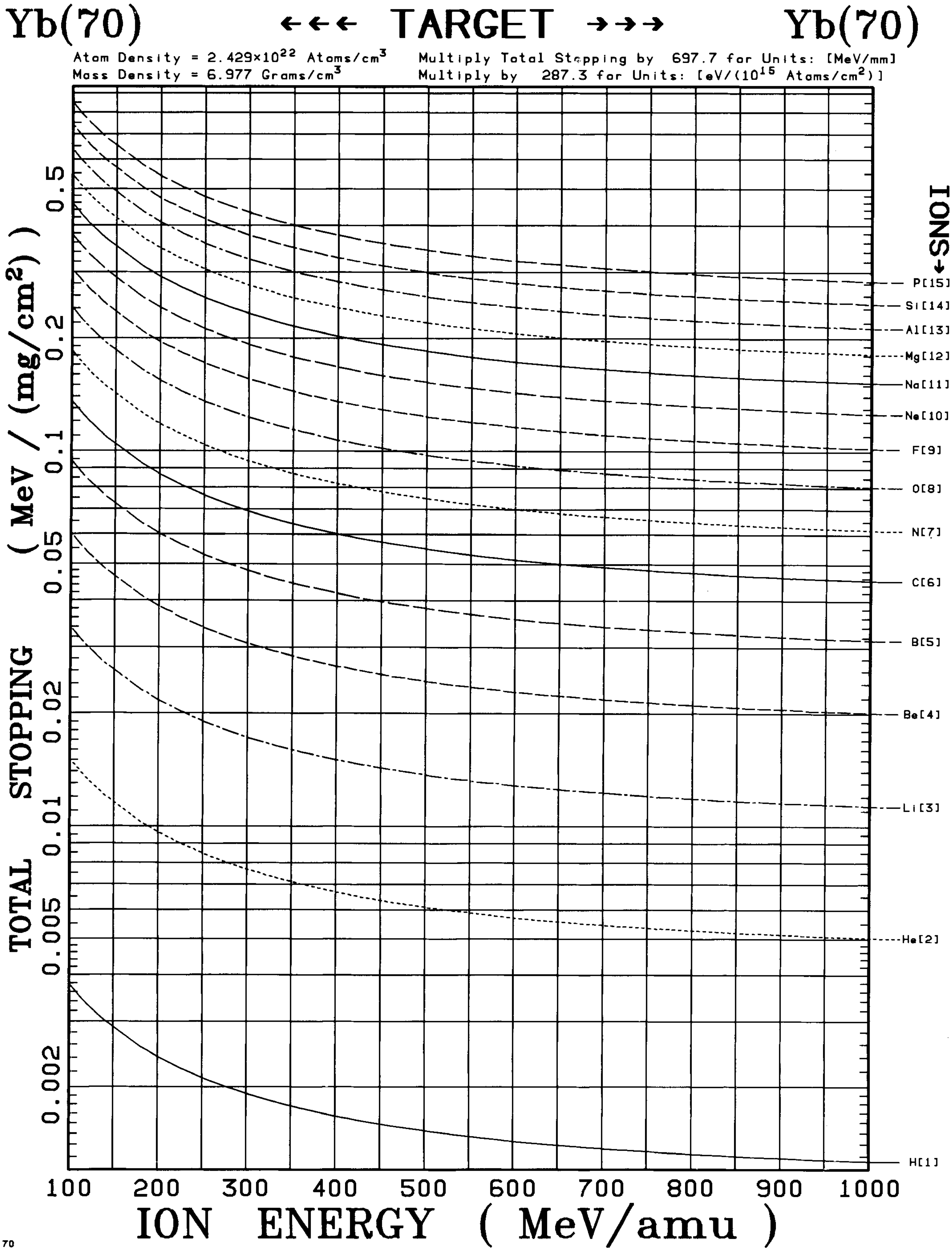
Atom Density = 2.429×10^{22} Atoms/cm^3 Multiply Total Stopping by 697.7 for Units: [MeV/mm]
Mass Density = 6.977 Grams/cm^3 Multiply by 287.3 for Units: [eV/(10^{15} Atoms/cm^2)]



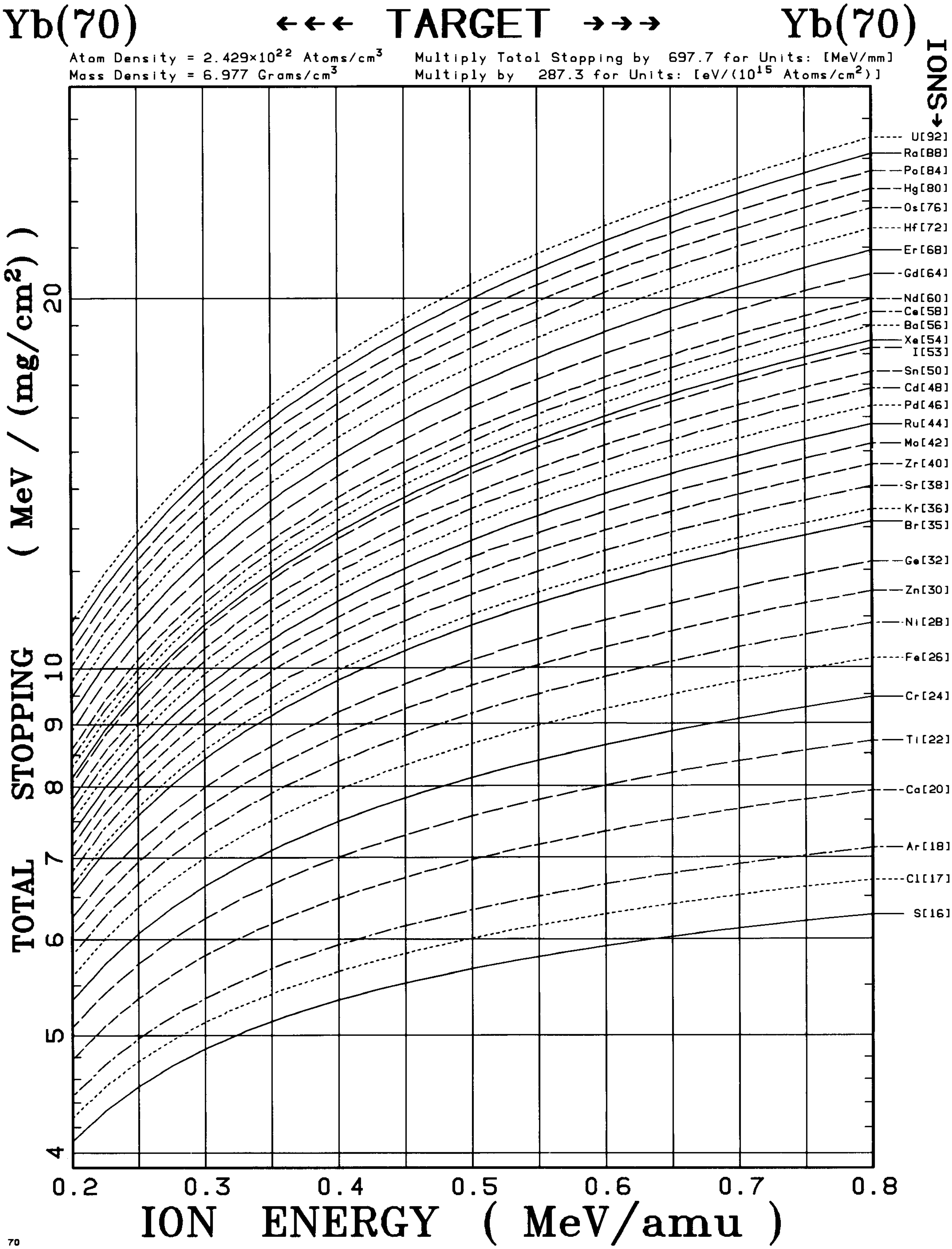
Yb(70) ←←← TARGET →→→ Yb(70)

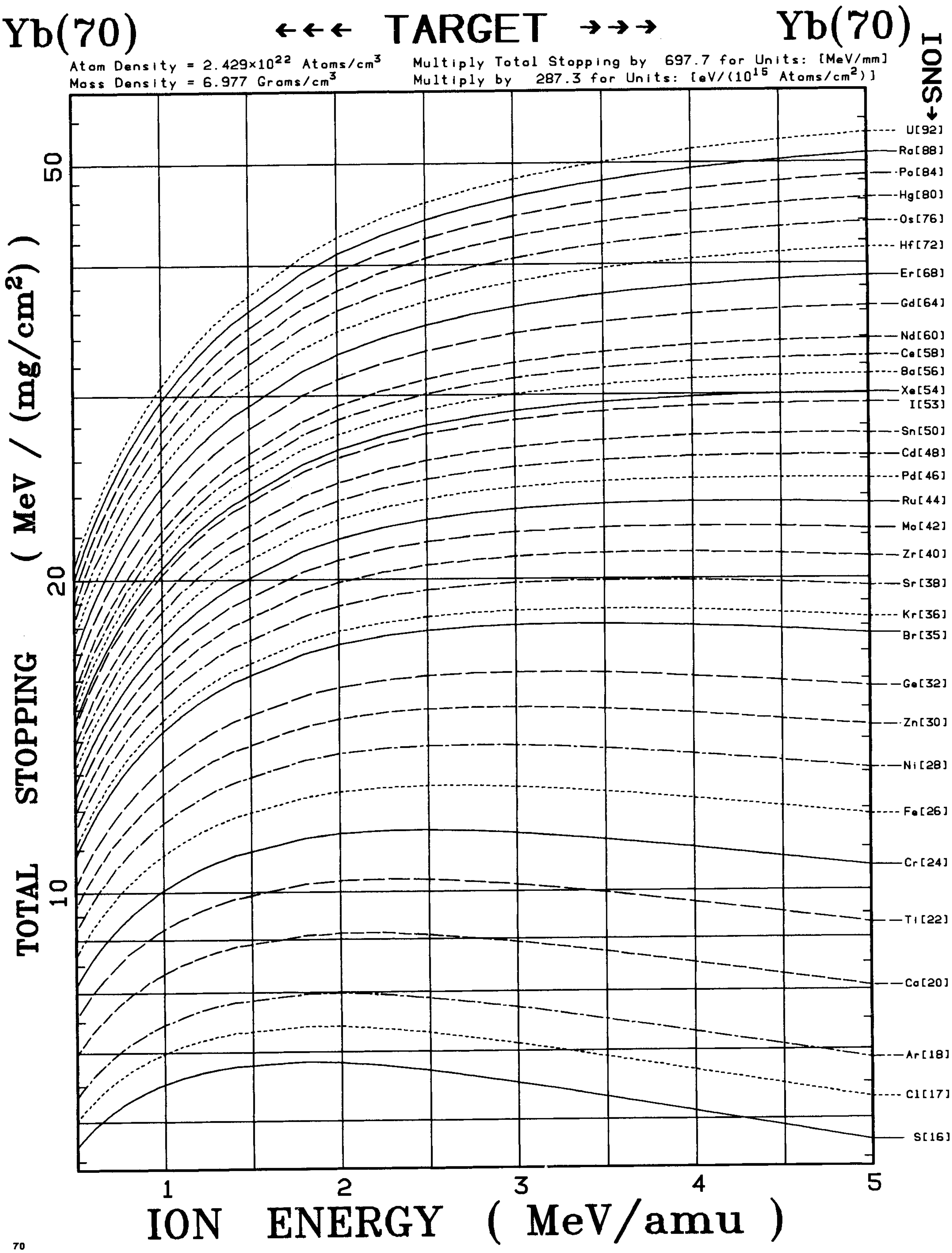
Atom Density = 2.429×10²² Atoms/cm³ Multiply Total Stopping by 697.7 for Units: [MeV/mm]
Mass Density = 6.977 Grams/cm³ Multiply by 287.3 for Units: [eV/(10¹⁵ Atoms/cm²)]





Yb(70) ←←← TARGET →→→ Yb(70)
Atom Density = 2.429×10^22 Atoms/cm^3
Mass Density = 6.977 Grams/cm^3
Multiply Total Stopping by 697.7 for Units: [MeV/mm]
Multiply by 287.3 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)

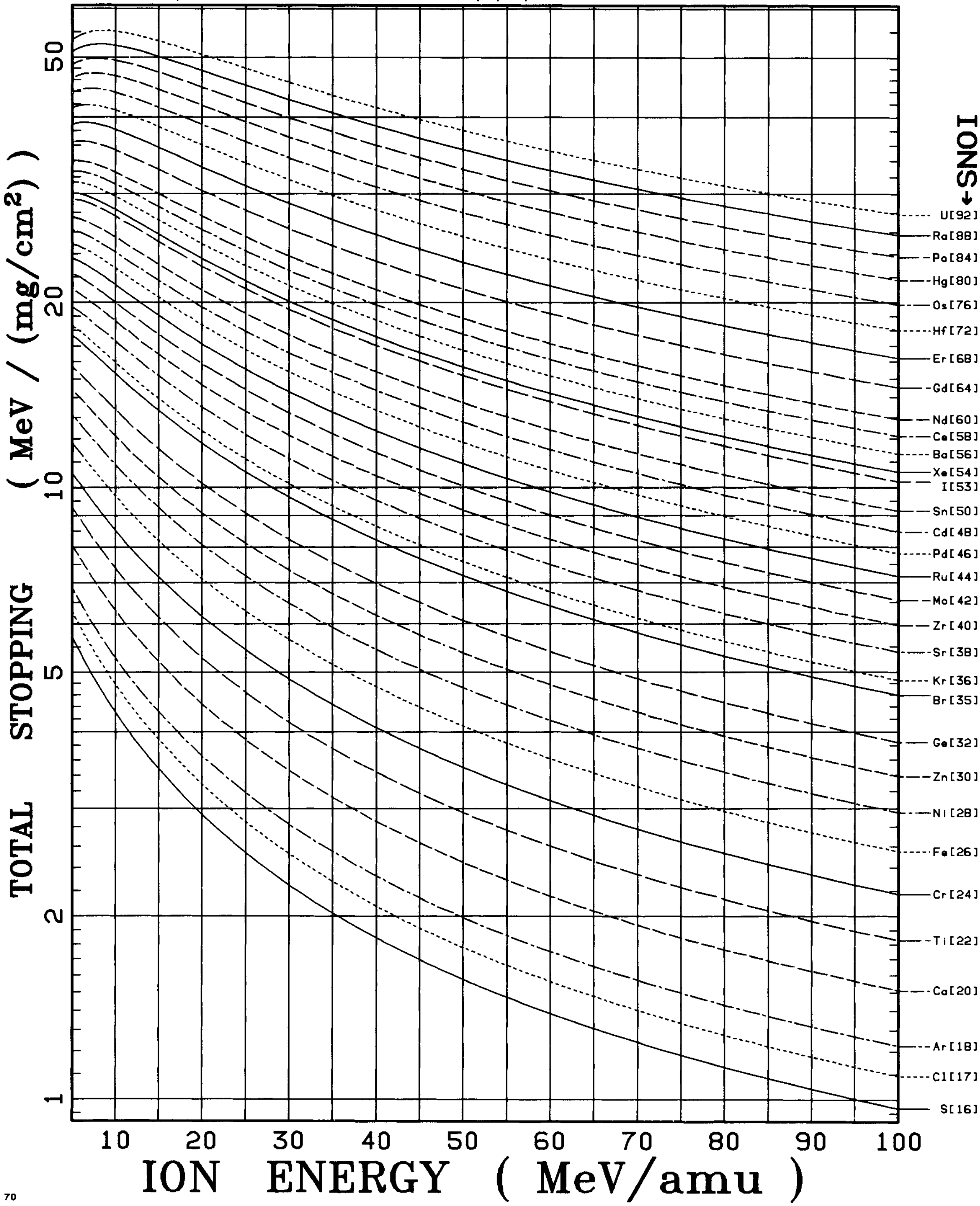

Yb(70)
←←← TARGET →→→
Yb(70)
Atom Density = 2.429×10^22 Atoms/cm^3
Mass Density = 6.977 Grams/cm^3
Multiply Total Stopping by 697.7 for Units: [MeV/mm]
Multiply by 287.3 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm²))
4
5
6
7
8
9
10
20
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)



Yb(70) ←←← TARGET →→→ Yb(70)
Atom Density = 2.429x10^22 Atoms/cm^3
Mass Density = 6.977 Grams/cm^3
Multiply Total Stopping by 697.7 for Units: [MeV/mm]
Multiply by 287.3 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
50
20
10
TOTAL STOPPING (MeV / (mg/cm^2))
1
2
3
4
5
ION ENERGY (MeV/amu)

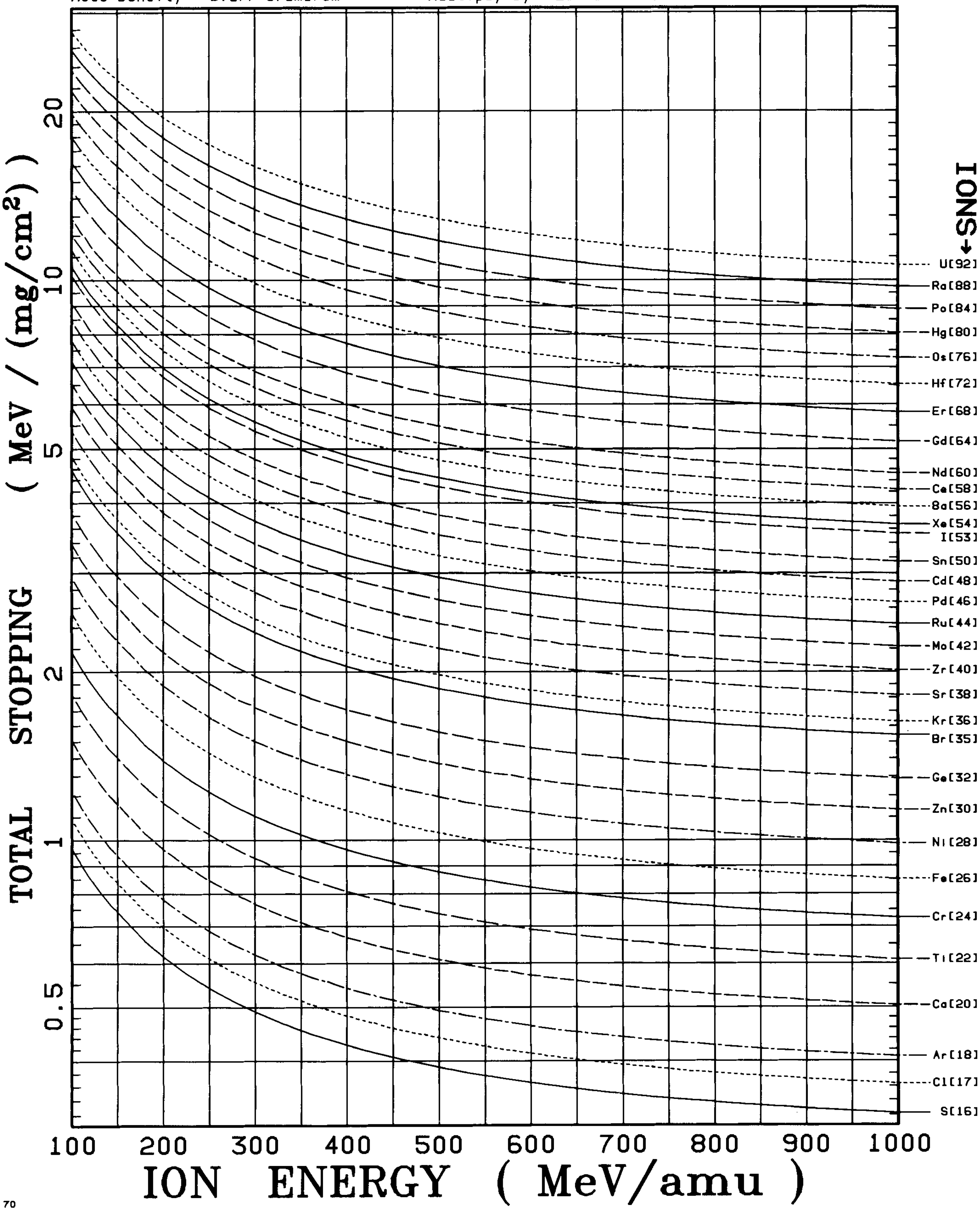
Yb(70) ←←← TARGET →→→ Yb(70)

Atom Density = 2.429×10^{22} Atoms/cm^3 Multiply Total Stopping by 697.7 for Units: [MeV/mm]
Mass Density = 6.977 Grams/cm^3 Multiply by 287.3 for Units: [eV/(10^{15} Atoms/cm^2)]



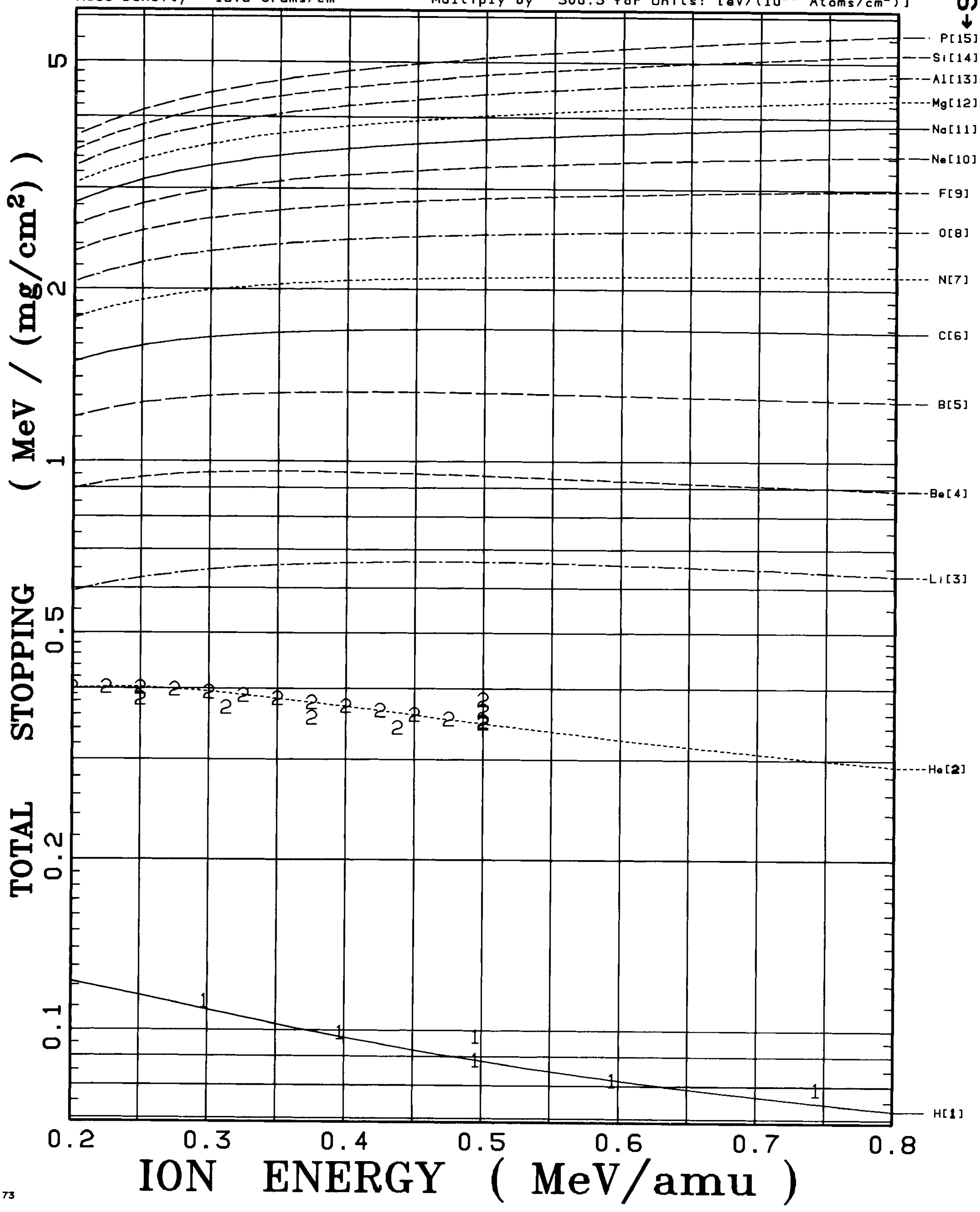
Yb(70) ←←← TARGET →→→ Yb(70)

Atom Density = 2.429×10^{22} Atoms/cm^3 Multiply Total Stopping by 697.7 for Units: [MeV/mm]
Mass Density = 6.977 Grams/cm^3 Multiply by 287.3 for Units: [eV/(10^{15} Atoms/cm^2)]



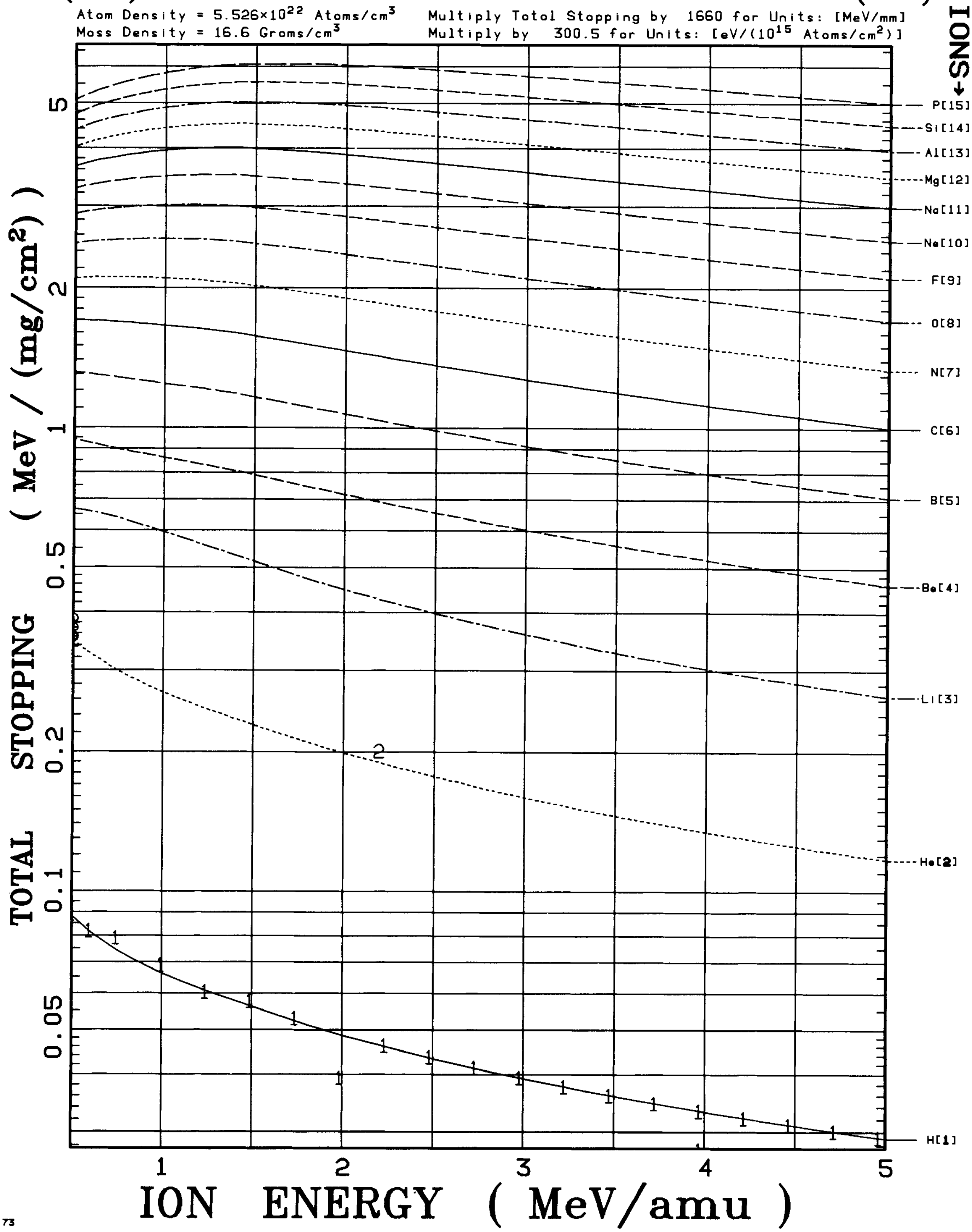
Ta(73) ←←← TARGET →→→ Ta(73)

Atom Density = 5.526×10[22] Atoms/cm[3] Multiply Total Stopping by 1660 for Units: [MeV/mm]
Mass Density = 16.6 Grams/cm[3] Multiply by 300.5 for Units: [eV/(10[15] Atoms/cm[2])]



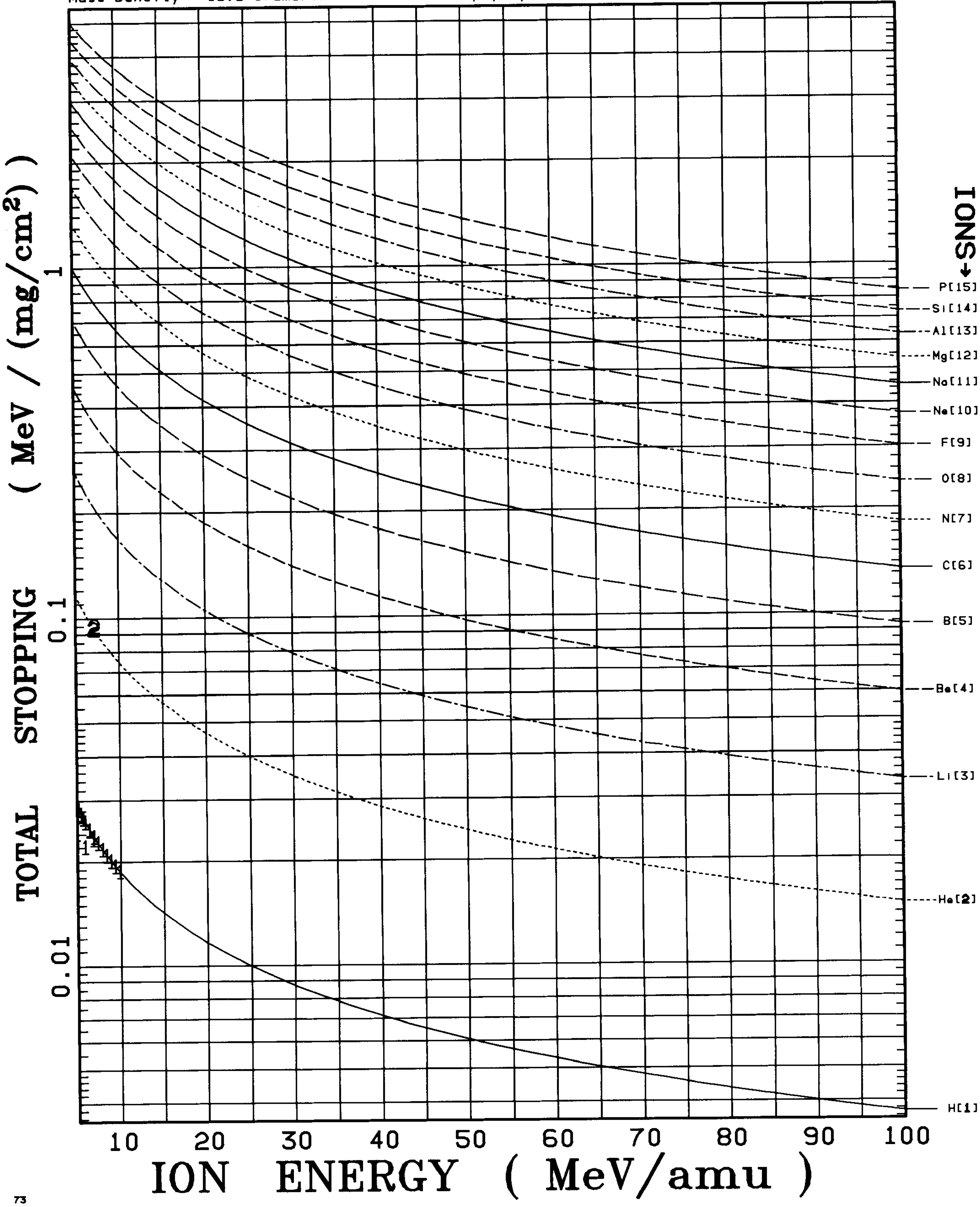
Ta(73) ←←← TARGET →→→ Ta(73)

Atom Density = 5.526×10^{22} Atoms/cm^3 Multiply Total Stopping by 1660 for Units: [MeV/mm]
Mass Density = 16.6 Grams/cm^3 Multiply by 300.5 for Units: [eV/(10^{15} Atoms/cm^2)]



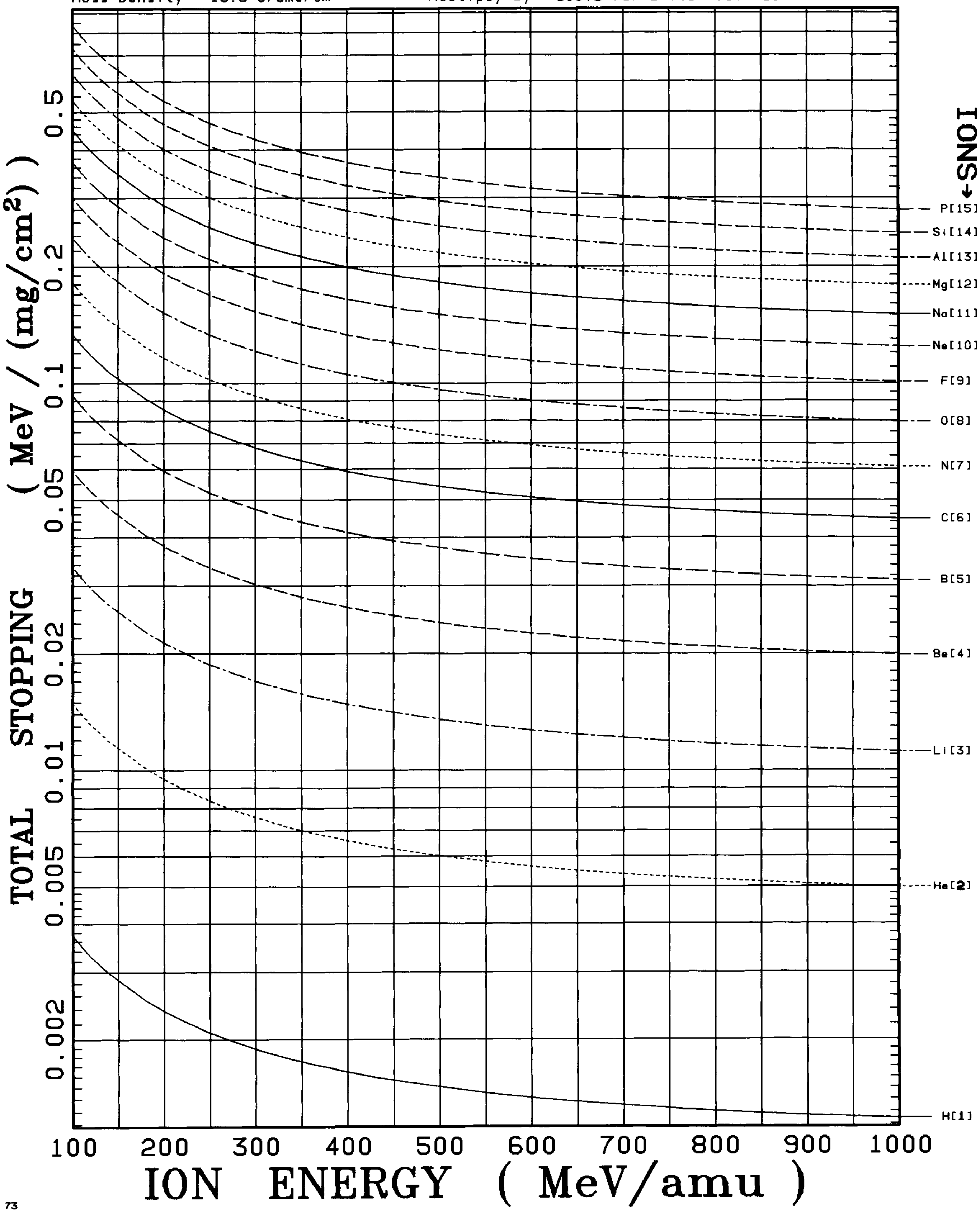
Ta(73) ←←← TARGET →→→ Ta(73)

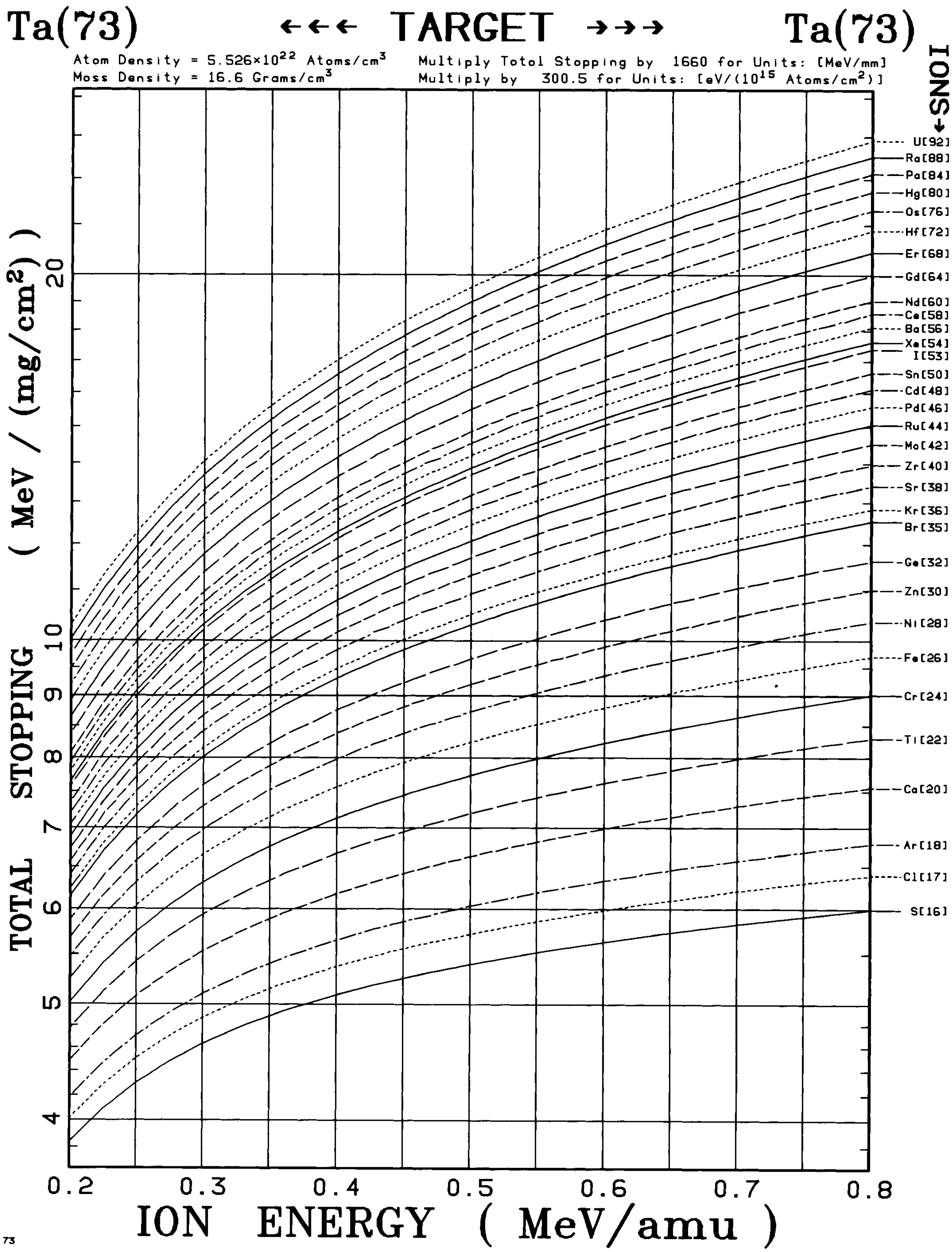
Atom Density = 5.526×10^{22} Atoms/cm^3 Multiply Total Stopping by 1660 for Units: [MeV/mm]
Mass Density = 16.6 Grams/cm^3 Multiply by 300.5 for Units: [eV/(10^{15} Atoms/cm^2)]

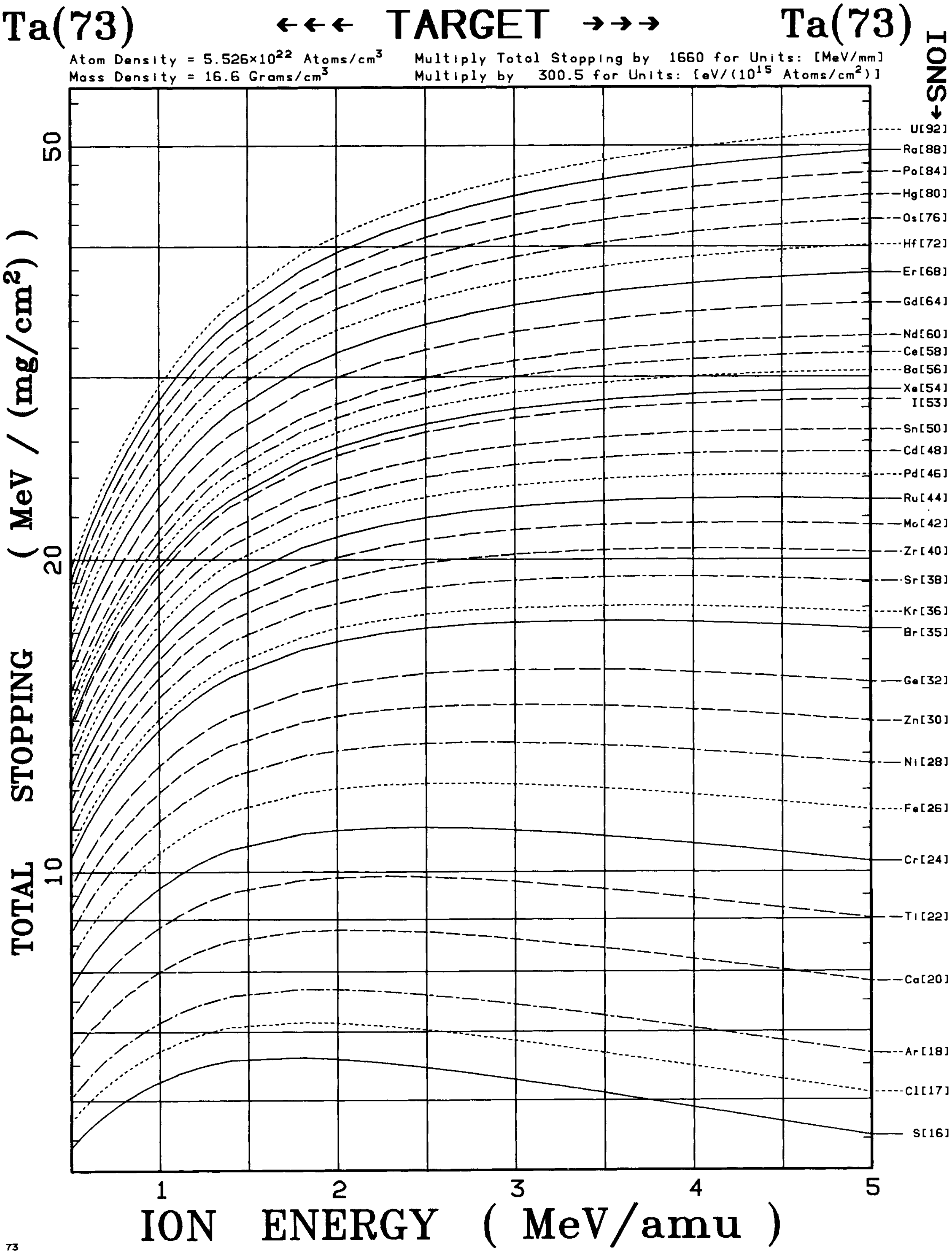


Ta(73) ←←← TARGET →→→ Ta(73)

Atom Density = 5.526×10^{22} Atoms/cm^3 Multiply Total Stopping by 1660 for Units: [MeV/mm]
Mass Density = 16.6 Grams/cm^3 Multiply by 300.5 for Units: [eV/(10^{15} Atoms/cm^2)]

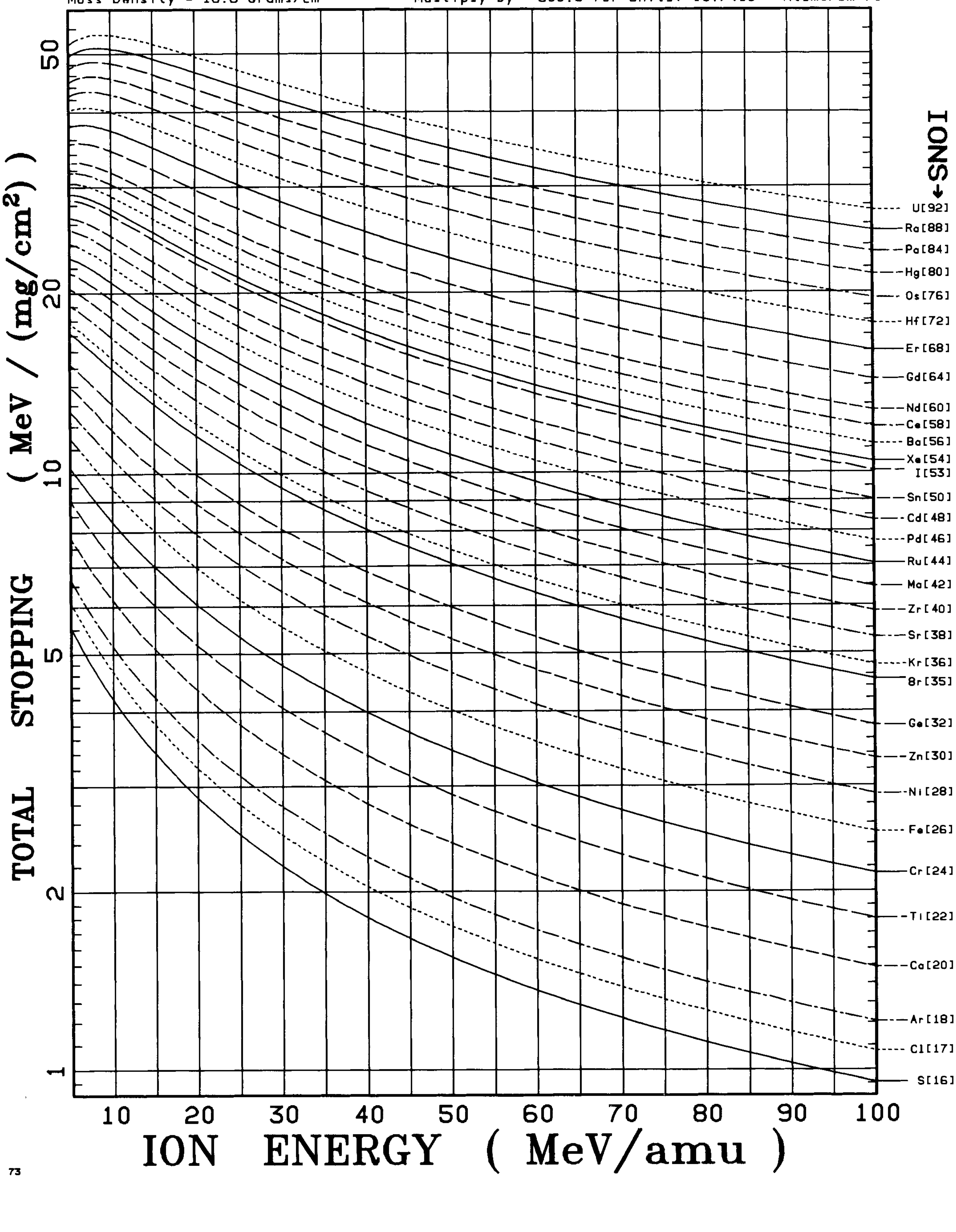



Ta(73) ←←← TARGET →→→ Ta(73)
Atom Density = 5.526×10^22 Atoms/cm^3
Mass Density = 16.6 Grams/cm^3
Multiply Total Stopping by 1660 for Units: [MeV/mm]
Multiply by 300.5 for Units: [eV/(10^15 Atoms/cm^2)]
IONS
U[92]
Ra[88]
Pa[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm²))
4
5
6
7
8
9
10
20
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)


Ta(73) ←←← TARGET →→→ Ta(73)
Atom Density = 5.526×10^22 Atoms/cm^3
Mass Density = 16.6 Grams/cm^3
Multiply Total Stopping by 1660 for Units: [MeV/mm]
Multiply by 300.5 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
50
20
10
TOTAL STOPPING (MeV / (mg/cm²))
1
2
3
4
5
ION ENERGY (MeV/amu)

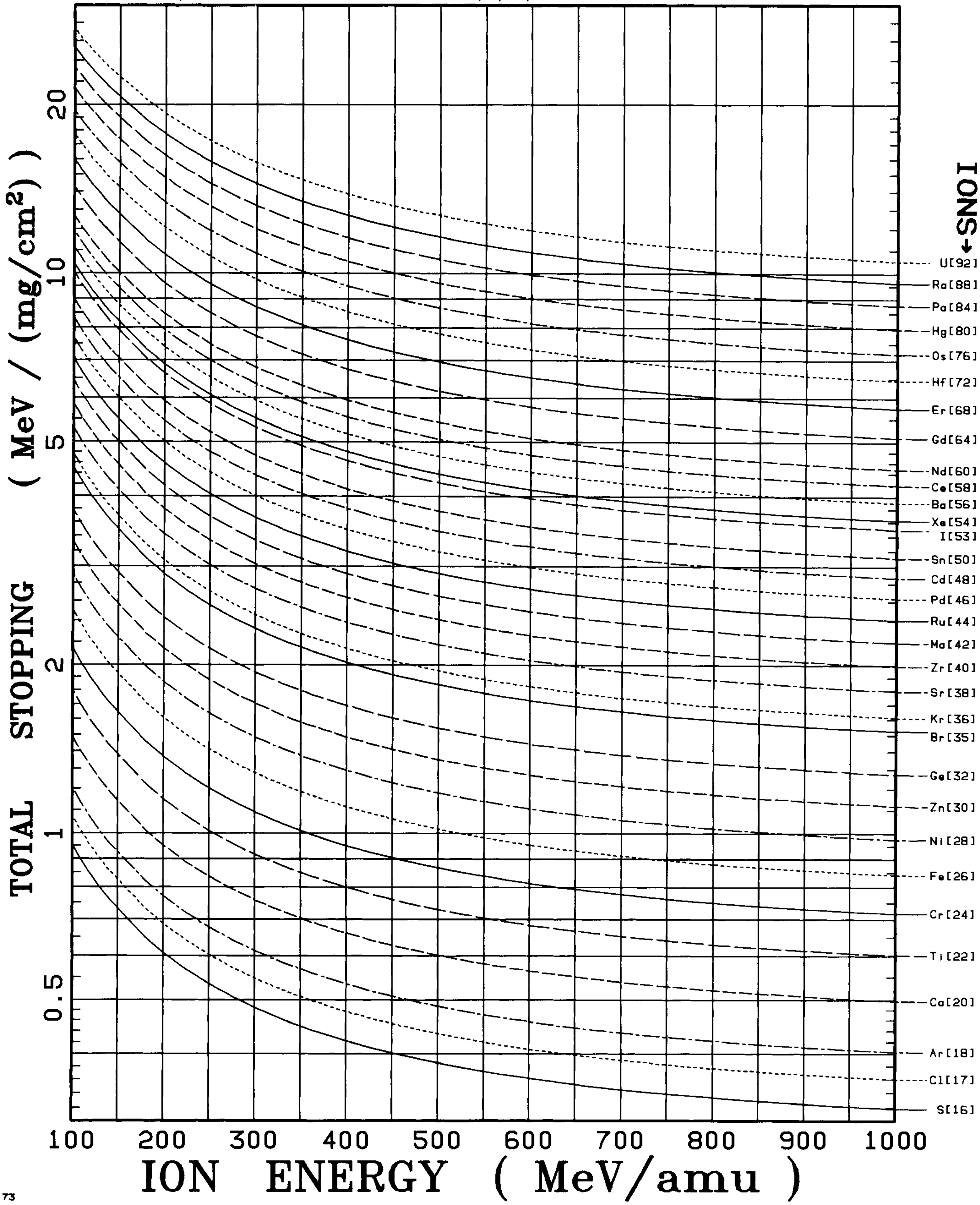
Ta(73) ←←← TARGET →→→ Ta(73)

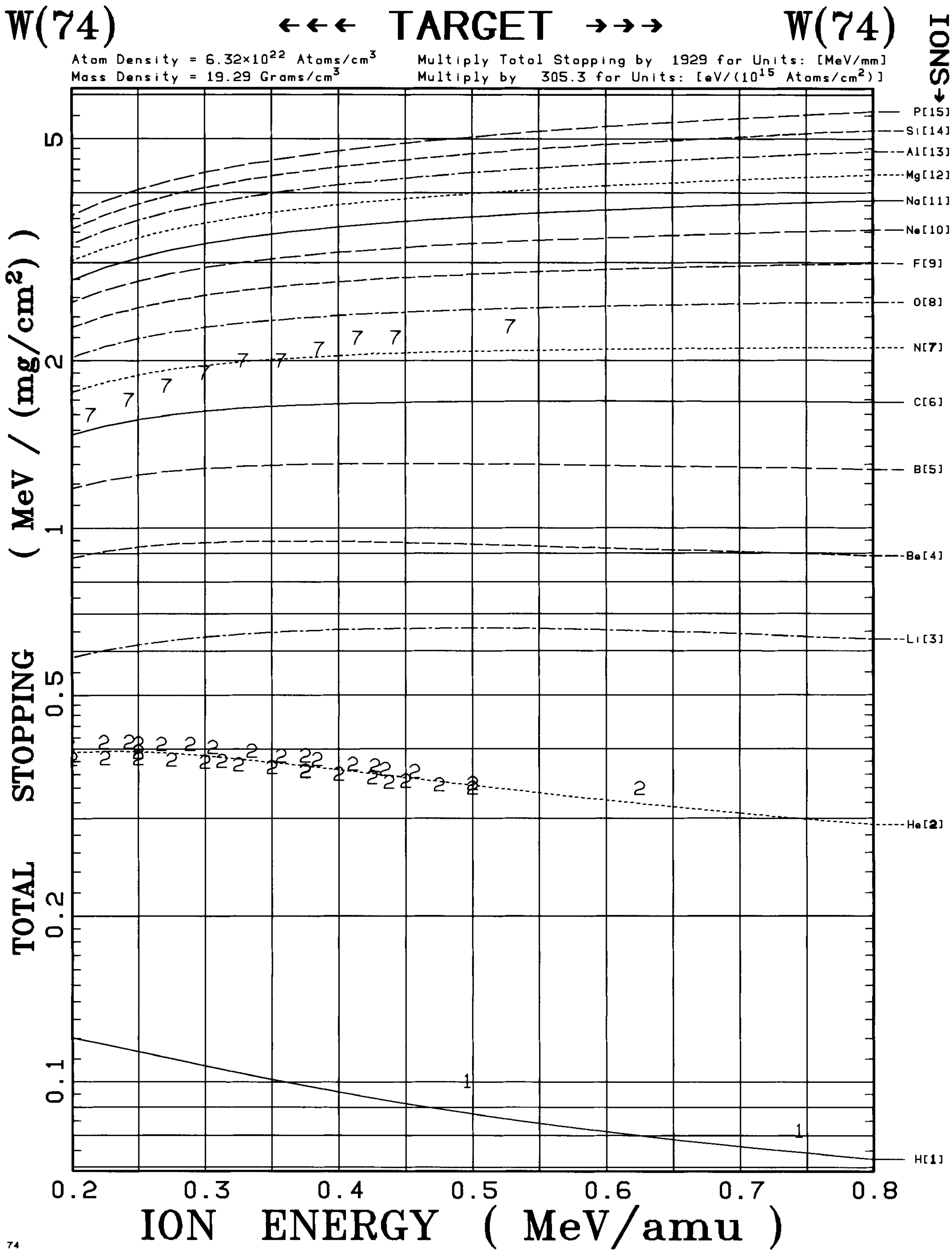
Atom Density = 5.526×10^{22} Atoms/cm^3 Multiply Total Stopping by 1660 for Units: [MeV/mm]
Mass Density = 16.6 Grams/cm^3 Multiply by 300.5 for Units: [eV/(10^{15} Atoms/cm^2)]



Ta(73) ←←← TARGET →→→ Ta(73)

Atom Density = 5.526×10^{22} Atoms/cm^3 Multiply Total Stopping by 1660 for Units: [MeV/mm]
Mass Density = 16.6 Grams/cm^3 Multiply by 300.5 for Units: [eV/(10^{15} Atoms/cm^2)]

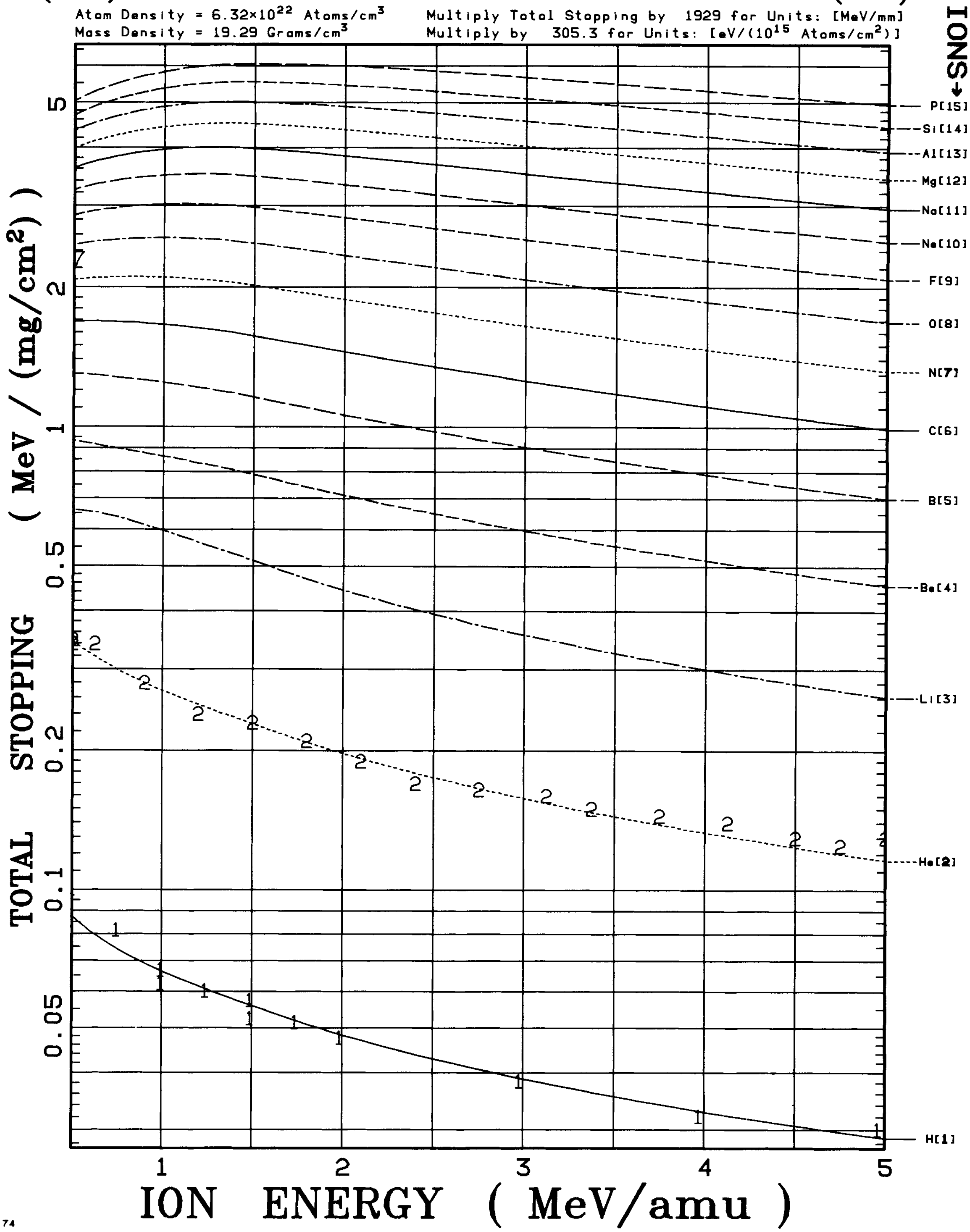



W(74)
←←← TARGET →→→
W(74)
IONS→
Atom Density = 6.32×10^22 Atoms/cm^3
Mass Density = 19.29 Grams/cm^3
Multiply Total Stopping by 1929 for Units: [MeV/mm]
Multiply by 305.3 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.1
0.2
0.5
1
2
5
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]

74

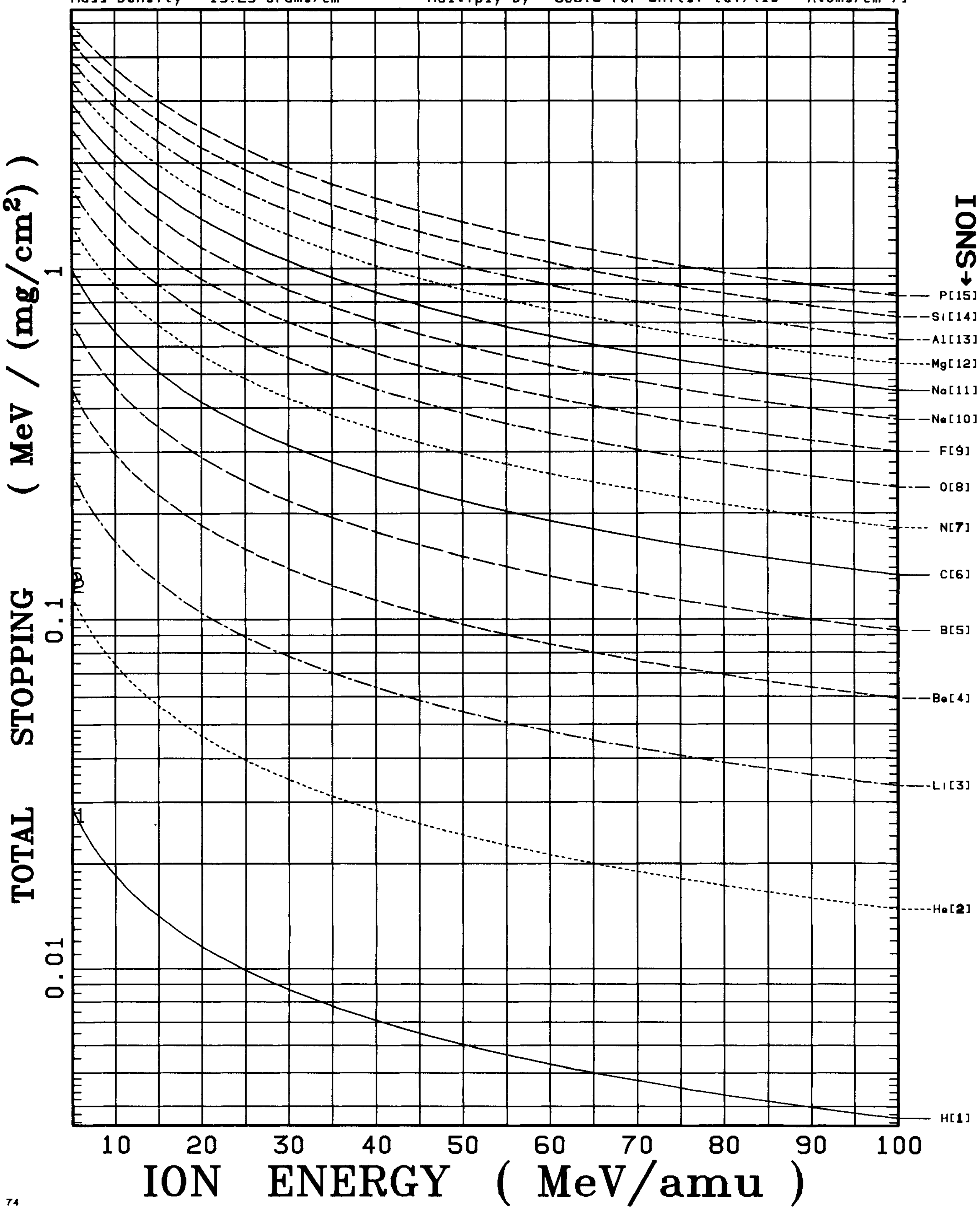
W(74) ←←← TARGET →→→ W(74)

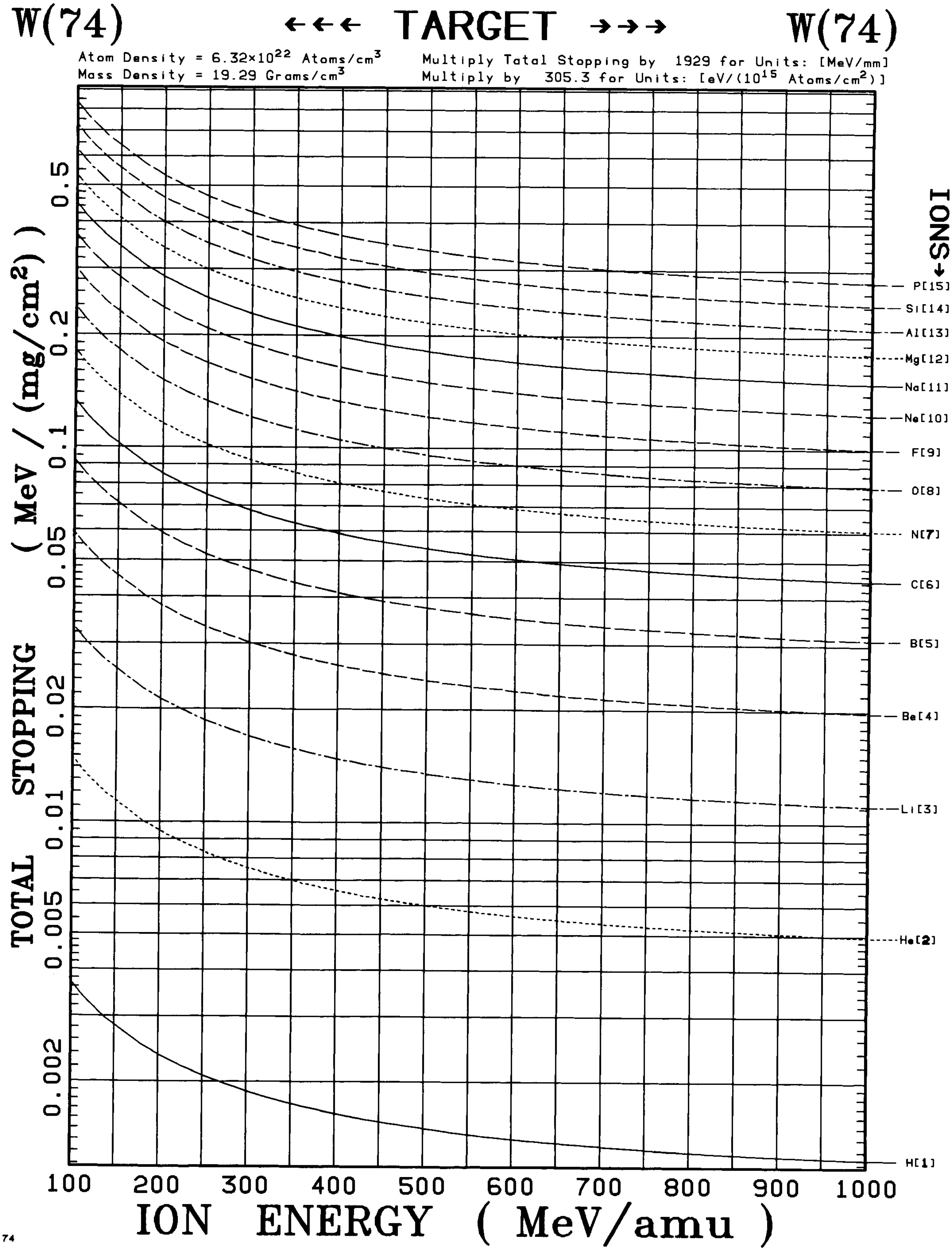
Atom Density = 6.32×10^{22} Atoms/cm^3 Multiply Total Stopping by 1929 for Units: [MeV/mm]
Mass Density = 19.29 Grams/cm^3 Multiply by 305.3 for Units: [eV/(10^{15} Atoms/cm^2)]



W(74) ←←← TARGET →→→ W(74)

Atom Density = 6.32×10^{22} Atoms/cm^3 Multiply Total Stopping by 1929 for Units: [MeV/mm]
Mass Density = 19.29 Grams/cm^3 Multiply by 305.3 for Units: [eV/(10^{15} Atoms/cm^2)]

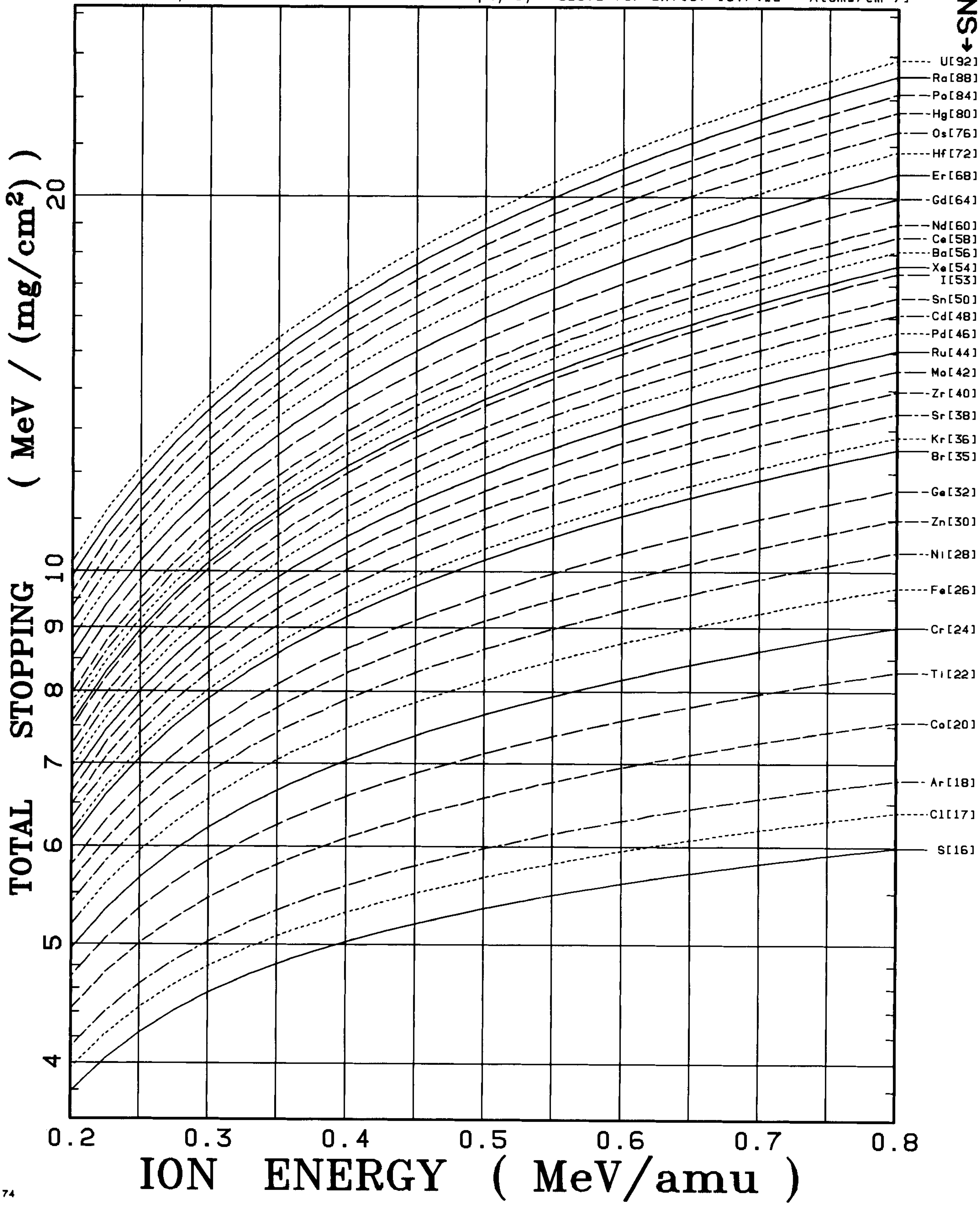


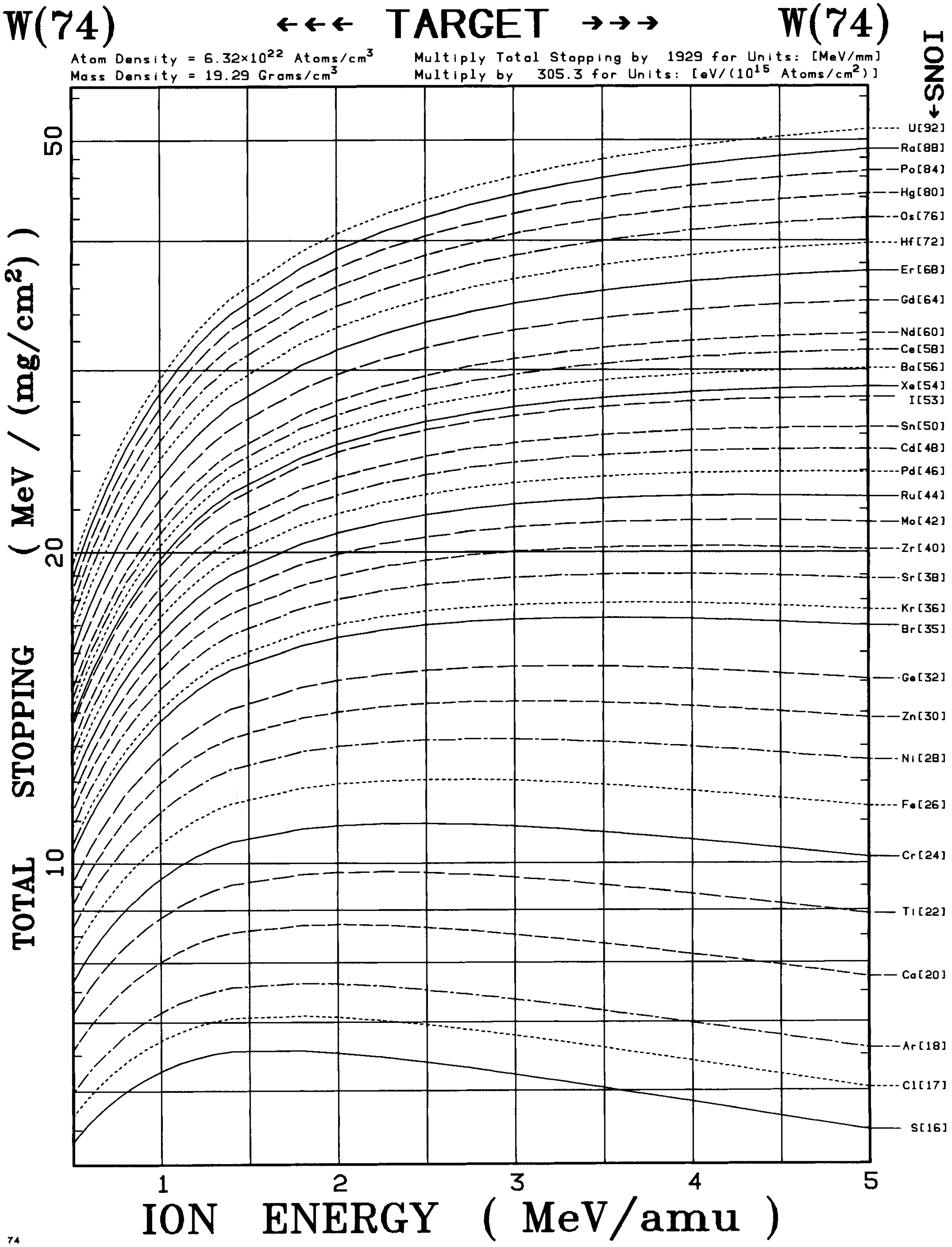

W(74)
←←← TARGET →→→
W(74)
Atom Density = 6.32×10^22 Atoms/cm^3
Mass Density = 19.29 Grams/cm^3
Multiply Total Stopping by 1929 for Units: [MeV/mm]
Multiply by 305.3 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)

74

W(74) ←←← TARGET →→→ W(74)

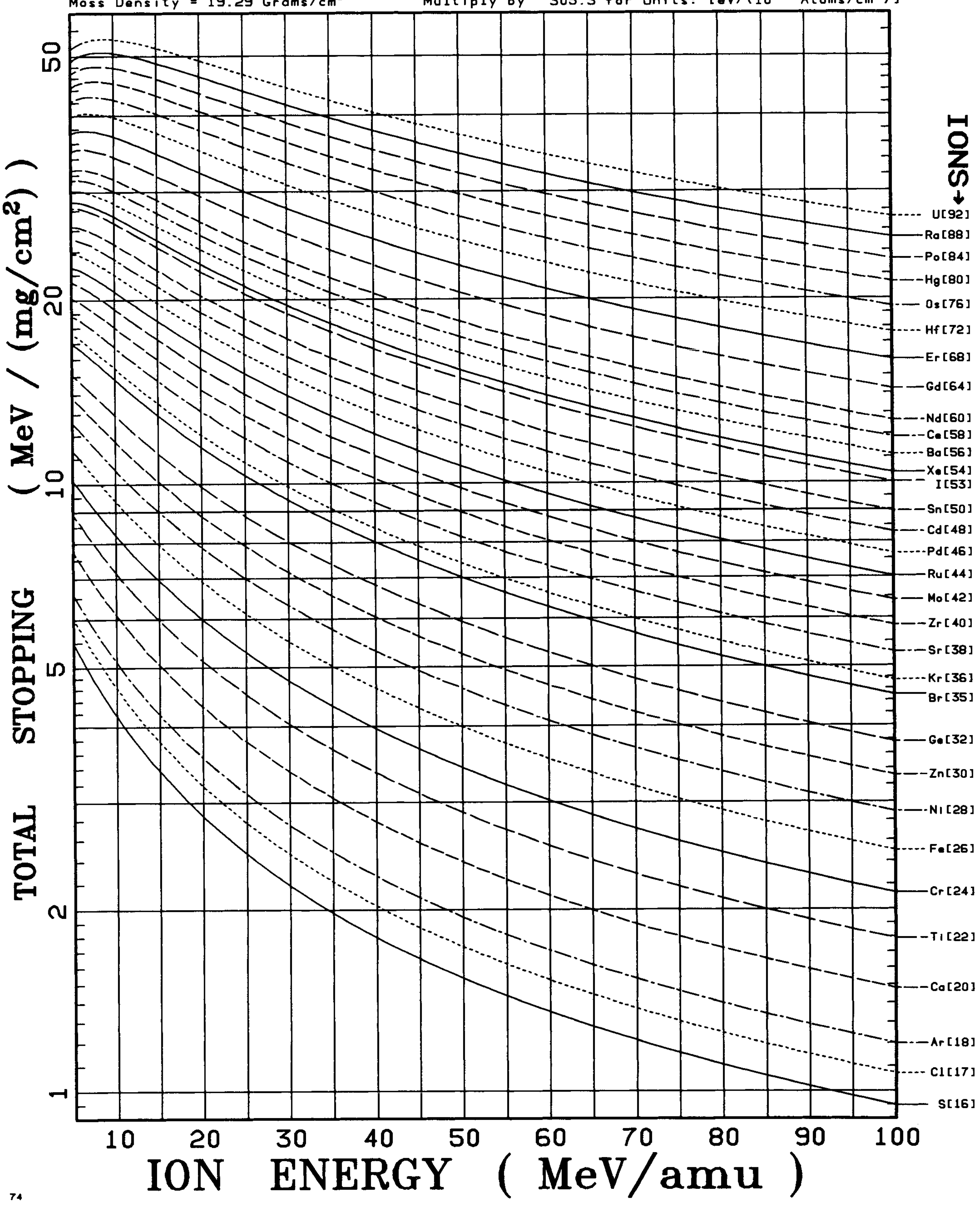
Atom Density = 6.32×10^22 Atoms/cm^3 Multiply Total Stopping by 1929 for Units: [MeV/mm]
Mass Density = 19.29 Grams/cm^3 Multiply by 305.3 for Units: [eV/(10^15 Atoms/cm^2)]




W(74)
←←← TARGET →→→
W(74)
Atom Density = 6.32×10^22 Atoms/cm^3
Mass Density = 19.29 Grams/cm^3
Multiply Total Stopping by 1929 for Units: [MeV/mm]
Multiply by 305.3 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
50
20
10
1
2
3
4
5
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)

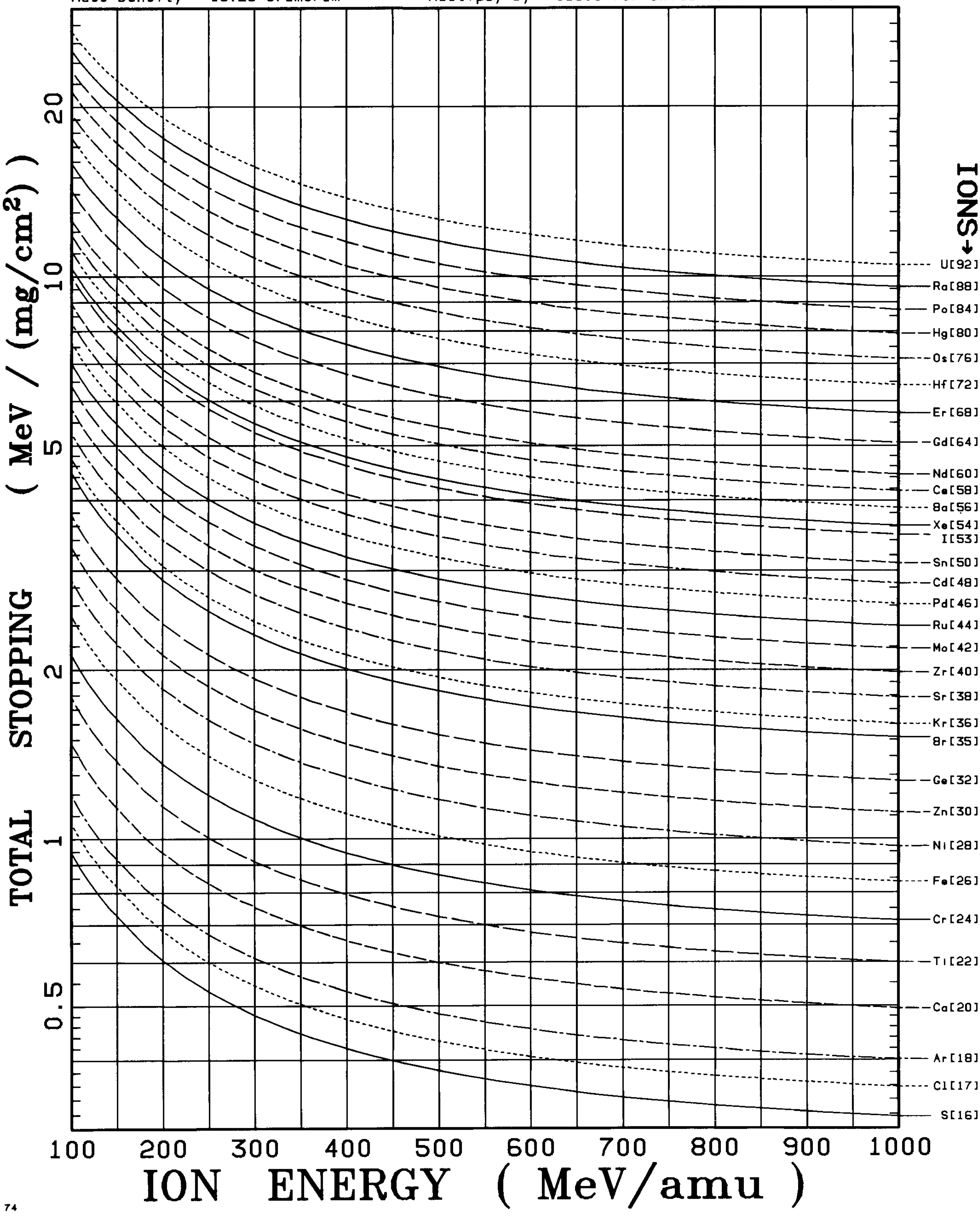
W(74) ←←← TARGET →→→ W(74)

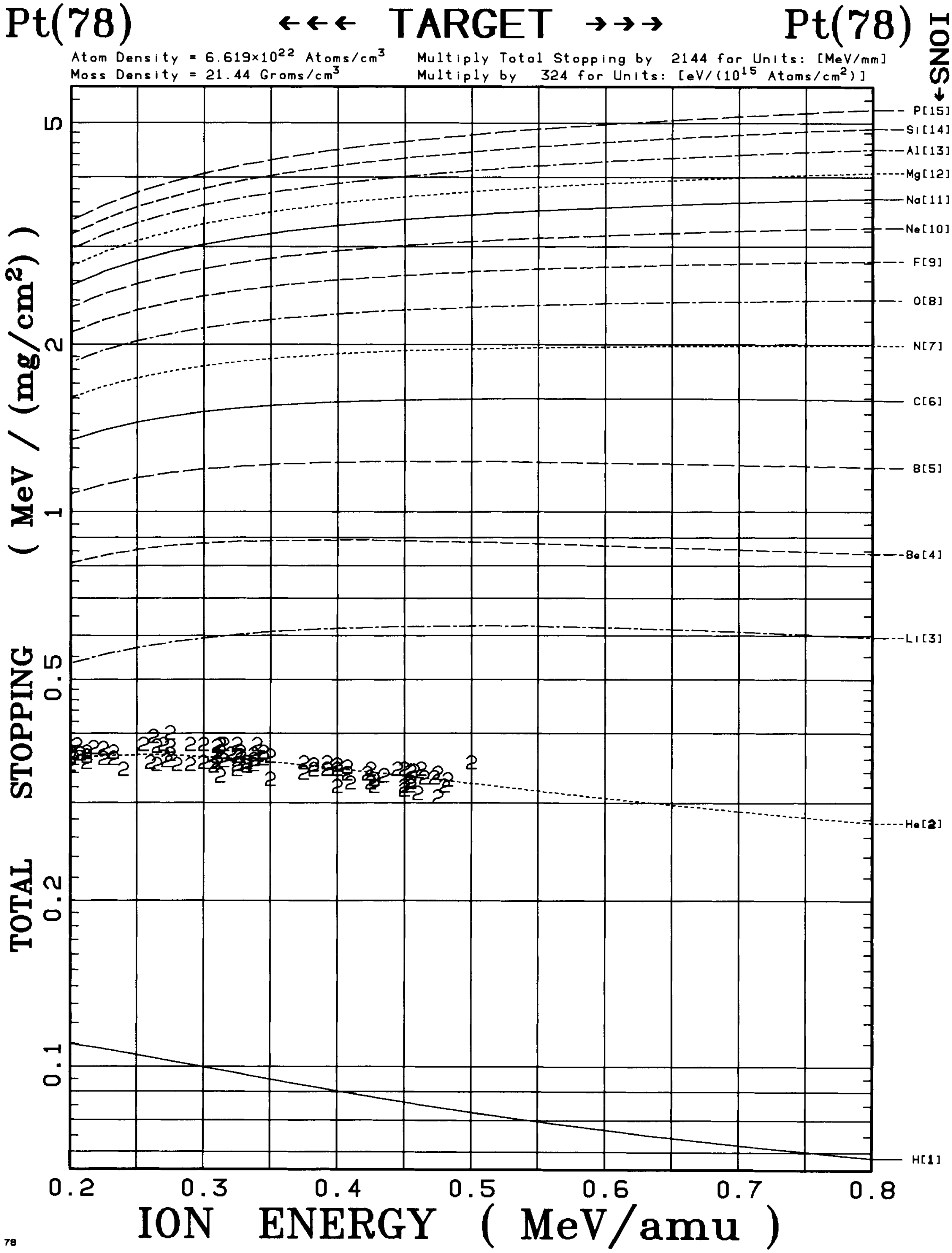
Atom Density = 6.32×10²² Atoms/cm³ Multiply Total Stopping by 1929 for Units: [MeV/mm]
Moss Density = 19.29 Grams/cm³ Multiply by 305.3 for Units: [eV/(10¹⁵ Atoms/cm²)]



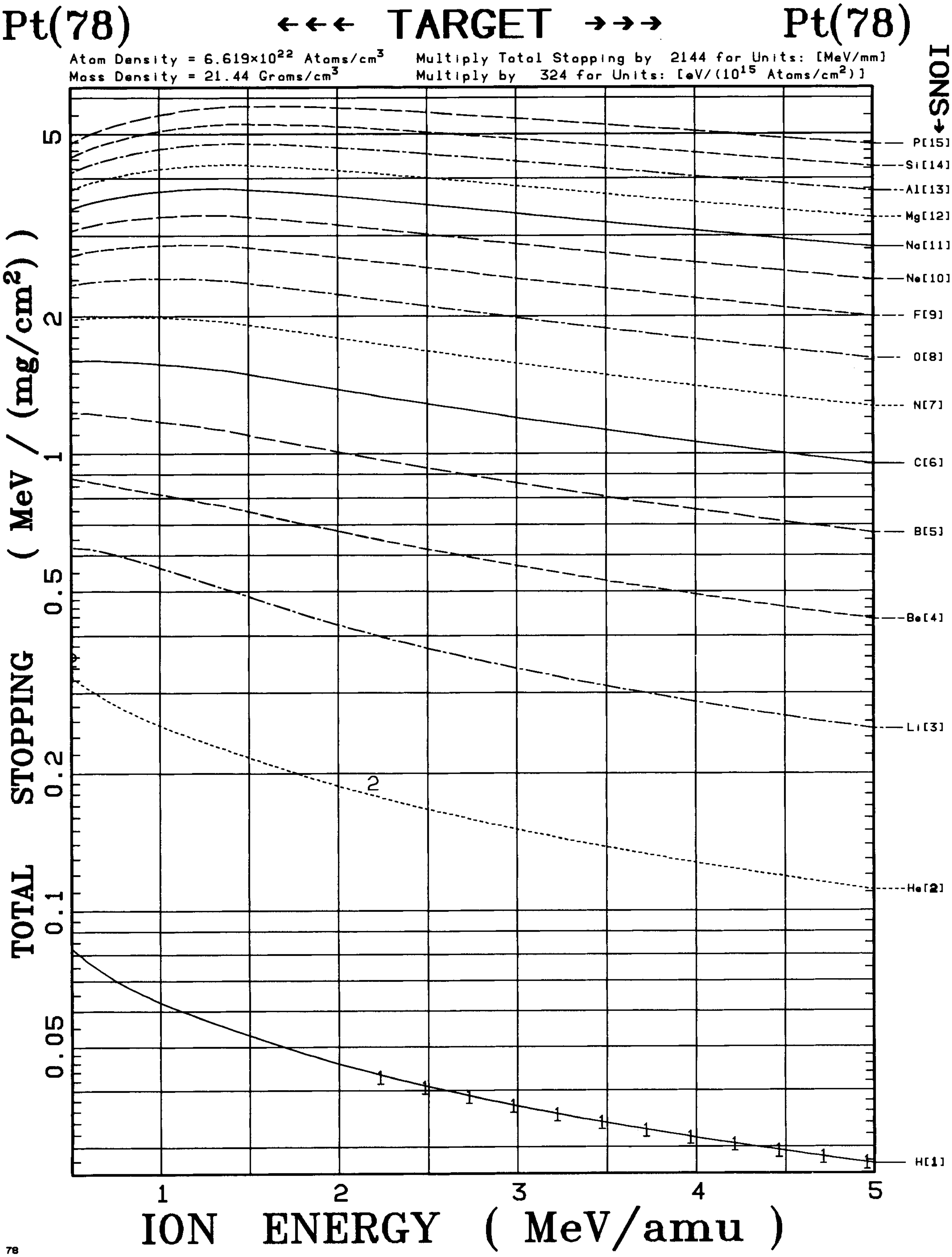
W(74) ←←← TARGET →→→ W(74)

Atom Density = 6.32×10^{22} Atoms/cm^3 Multiply Total Stopping by 1929 for Units: [MeV/mm]
Mass Density = 19.29 Grams/cm^3 Multiply by 305.3 for Units: [eV/(10^{15} Atoms/cm^2)]



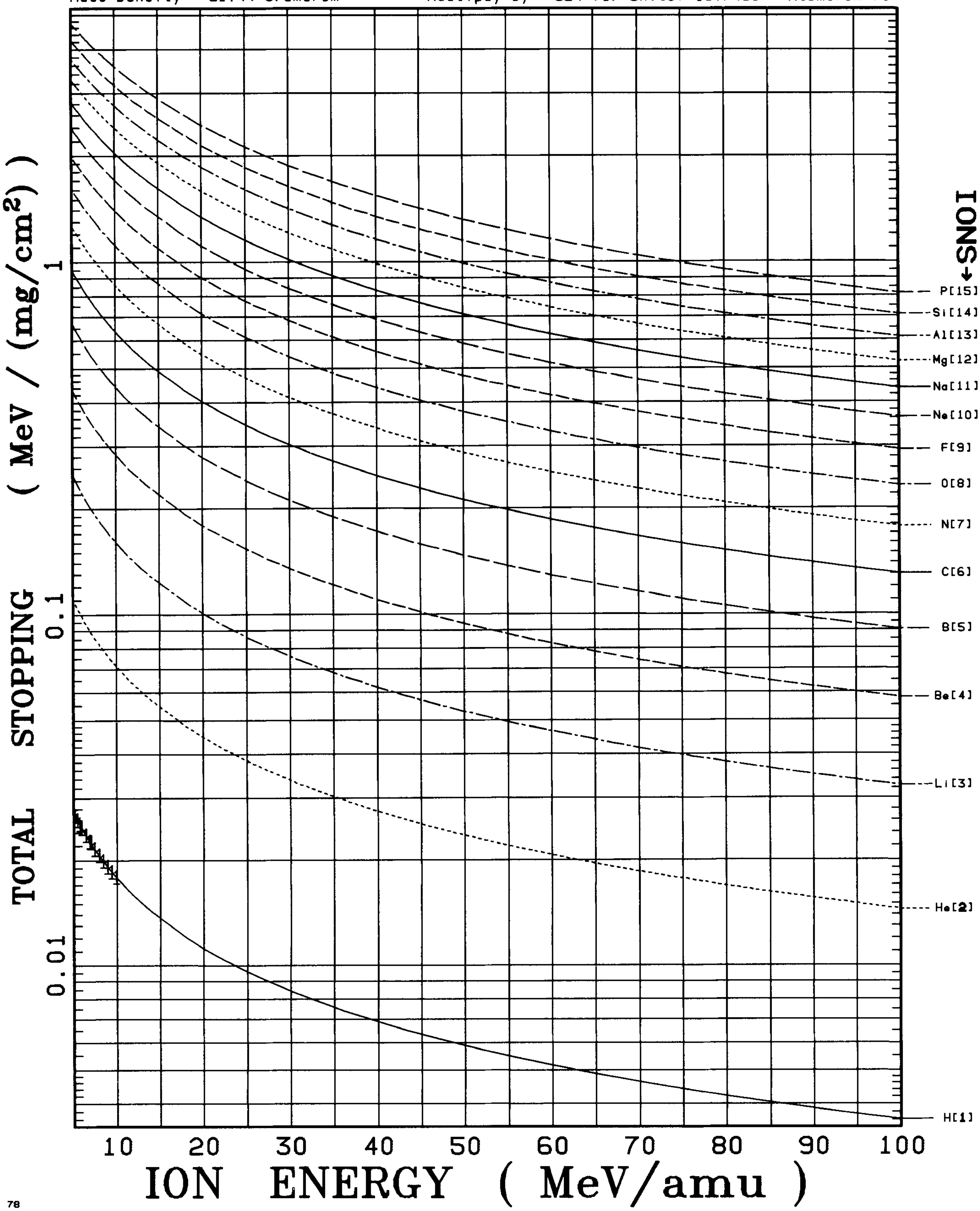


Pt(78) ←←← TARGET →→→ Pt(78)
IONS→
Atom Density = 6.619×10^22 Atoms/cm^3
Mass Density = 21.44 Grams/cm^3
Multiply Total Stopping by 2144 for Units: [MeV/mm]
Multiply by 324 for Units: [eV/(10^15 Atoms/cm^2)]
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm²))
5
2
1
0.5
0.2
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)


Pt(78)
←←← TARGET →→→
Pt(78)
Atom Density = 6.619×10^22 Atoms/cm^3
Mass Density = 21.44 Grams/cm^3
Multiply Total Stopping by 2144 for Units: [MeV/mm]
Multiply by 324 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm²))
5
2
1
0.5
0.2
0.1
0.05
1
2
3
4
5
ION ENERGY (MeV/amu)

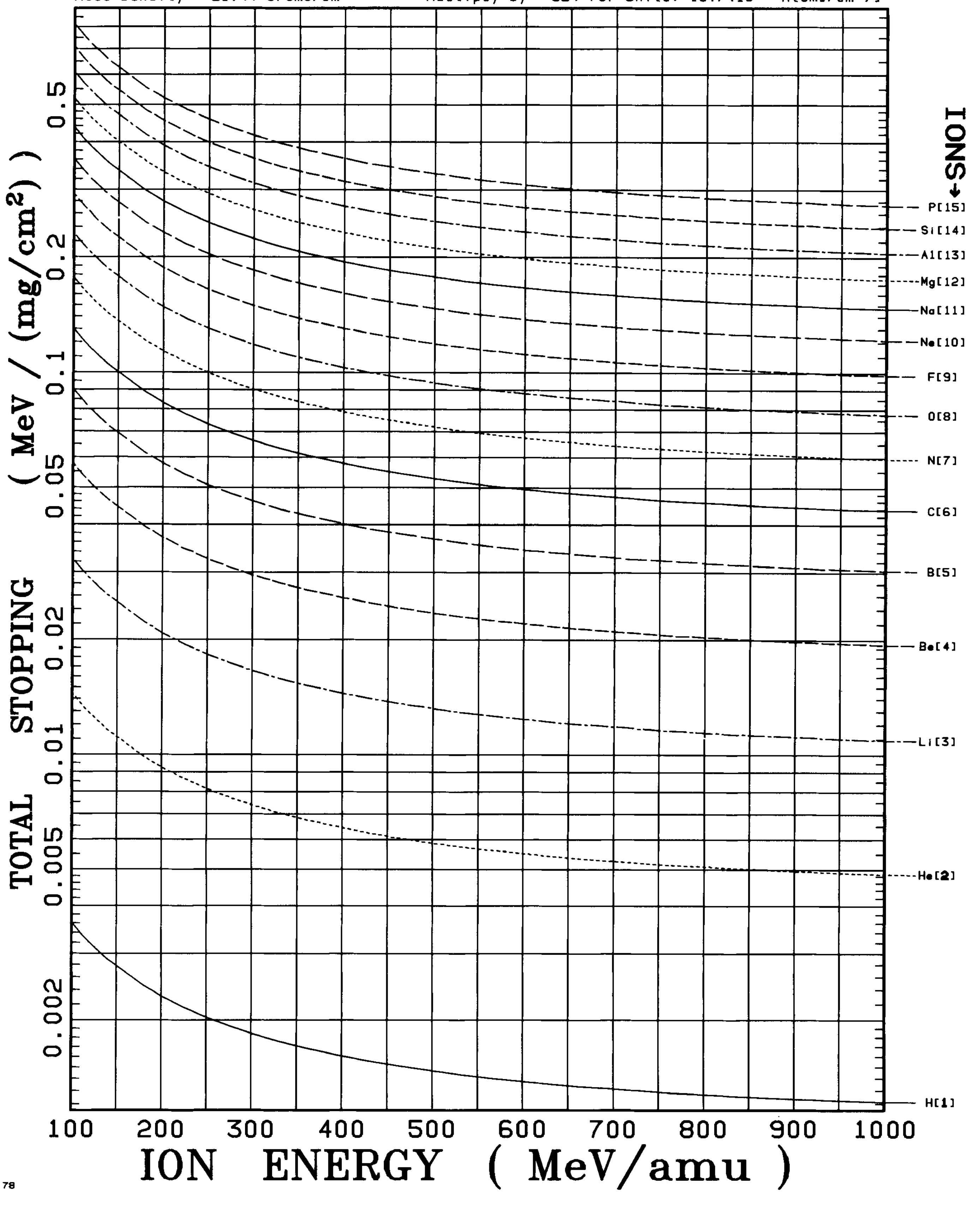
Pt(78) ←←← TARGET →→→ Pt(78)

Atom Density = 6.619×10[22] Atoms/cm[3] Multiply Total Stopping by 2144 for Units: [MeV/mm]
Mass Density = 21.44 Grams/cm[3] Multiply by 324 for Units: [eV/(10[15] Atoms/cm[2])]



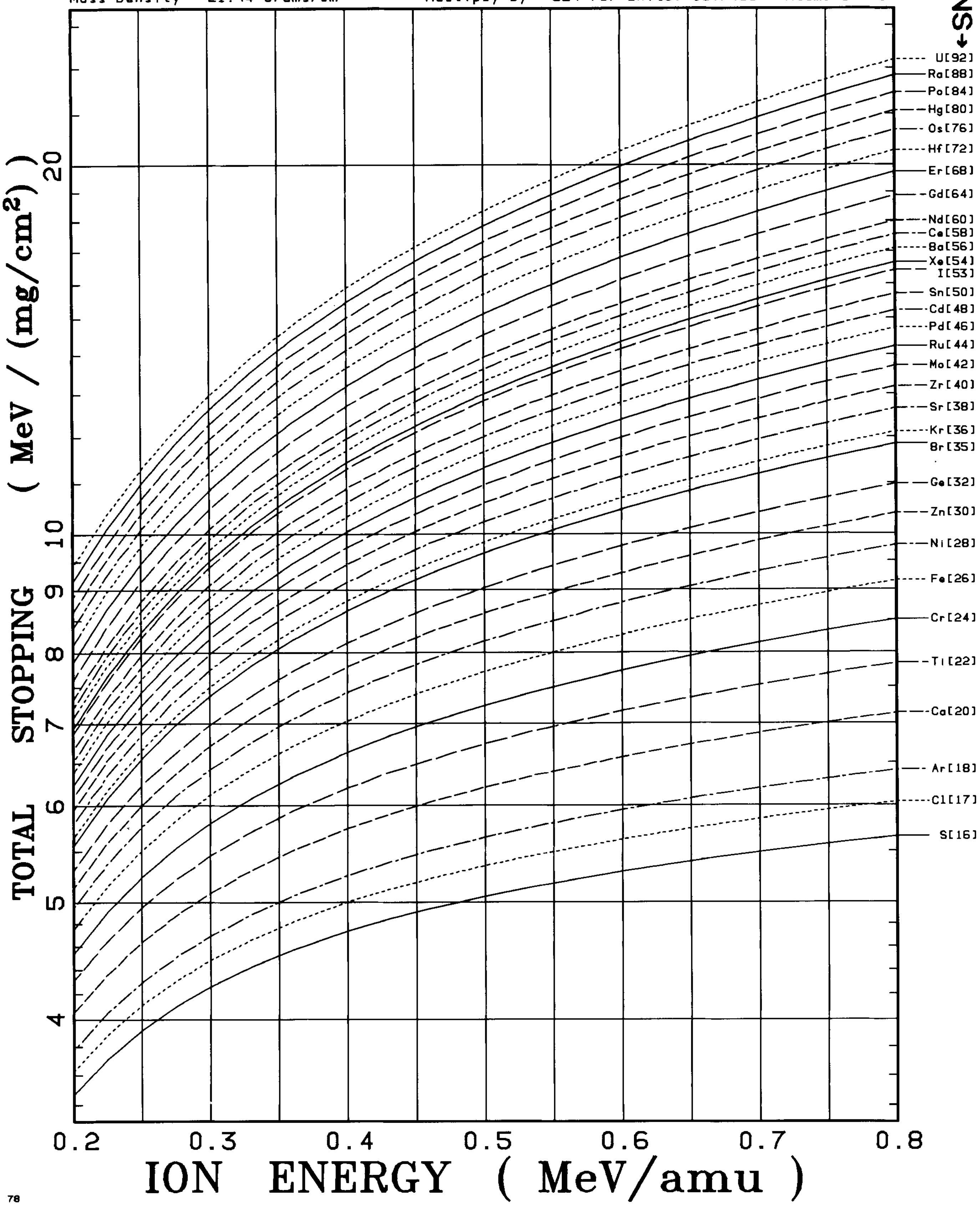
Pt(78) ←←← TARGET →→→ Pt(78)

Atom Density = 6.619×10^{22} Atoms/cm^3 Multiply Total Stopping by 2144 for Units: [MeV/mm]
Mass Density = 21.44 Grams/cm^3 Multiply by 324 for Units: [eV/(10^{15} Atoms/cm^2)]



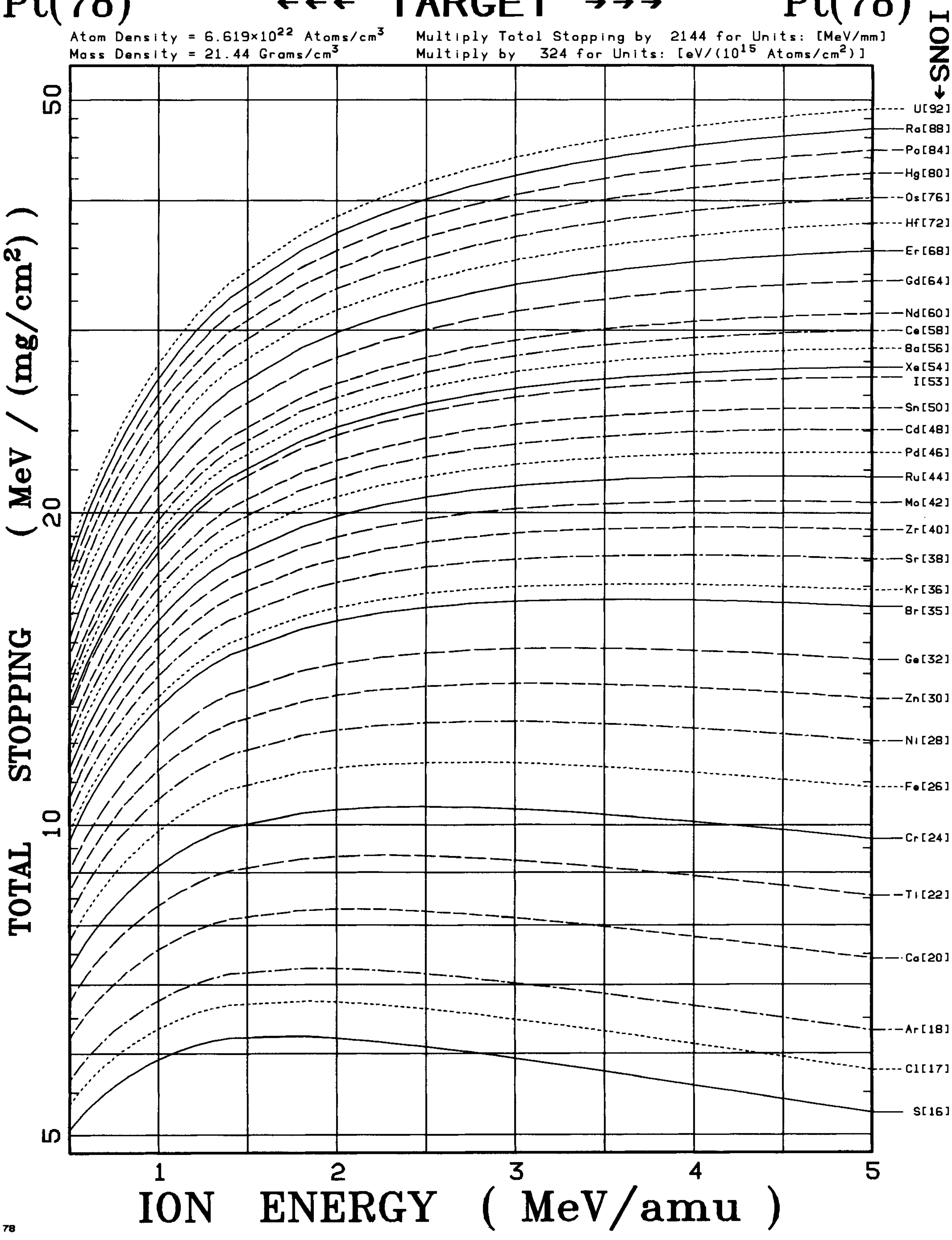
Pt(78) ←←← TARGET →→→ Pt(78)

Atom Density = 6.619×10^{22} Atoms/cm^3 Multiply Total Stopping by 2144 for Units: [MeV/mm]
Mass Density = 21.44 Grams/cm^3 Multiply by 324 for Units: [eV/(10^{15} Atoms/cm^2)]



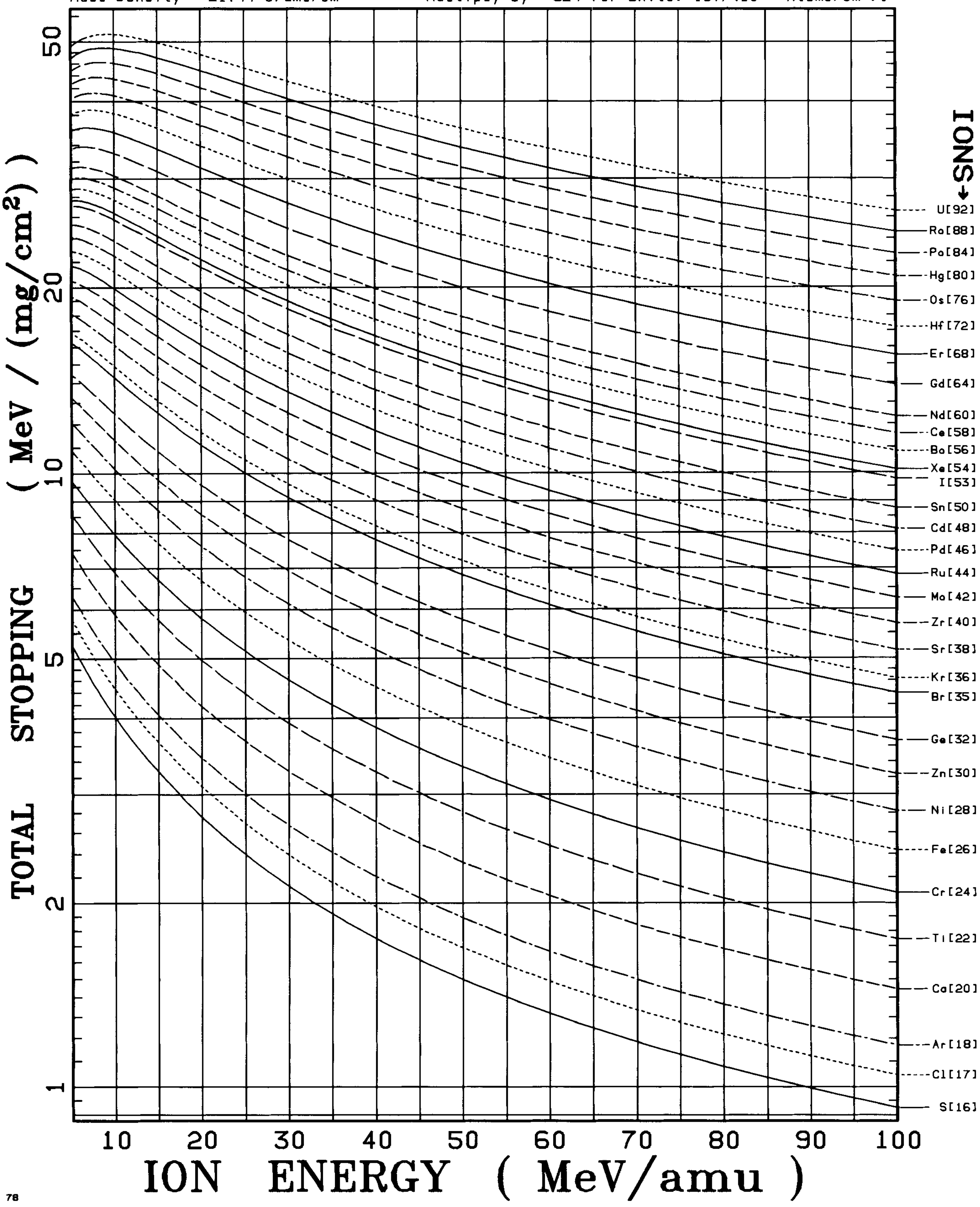
Pt(78) ←←← TARGET →→→ Pt(78)

Atom Density = 6.619×10^{22} Atoms/cm^3 Multiply Total Stopping by 2144 for Units: [MeV/mm]
Mass Density = 21.44 Grams/cm^3 Multiply by 324 for Units: [eV/(10^{15} Atoms/cm^2)]



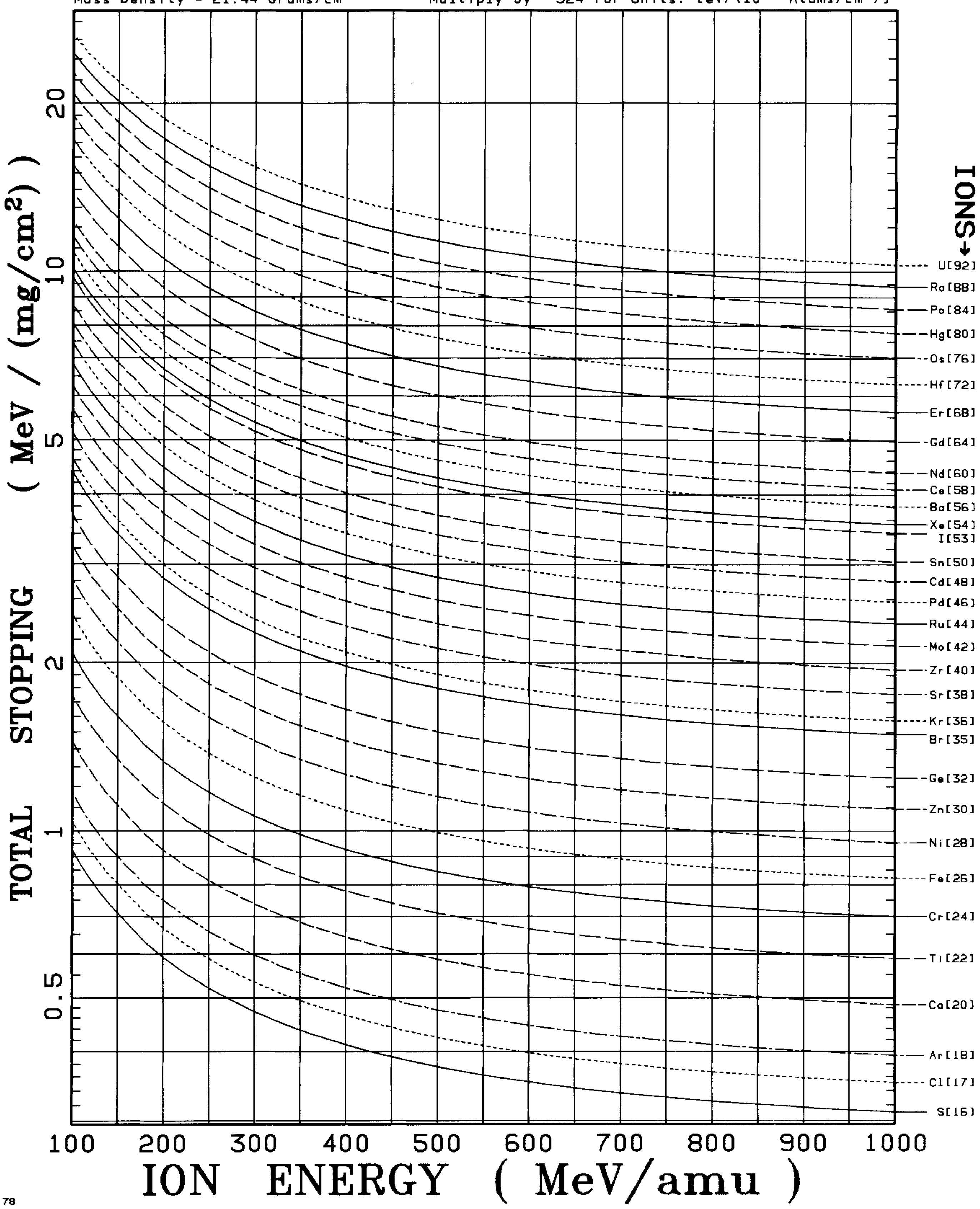
Pt(78) ←←← TARGET →→→ Pt(78)

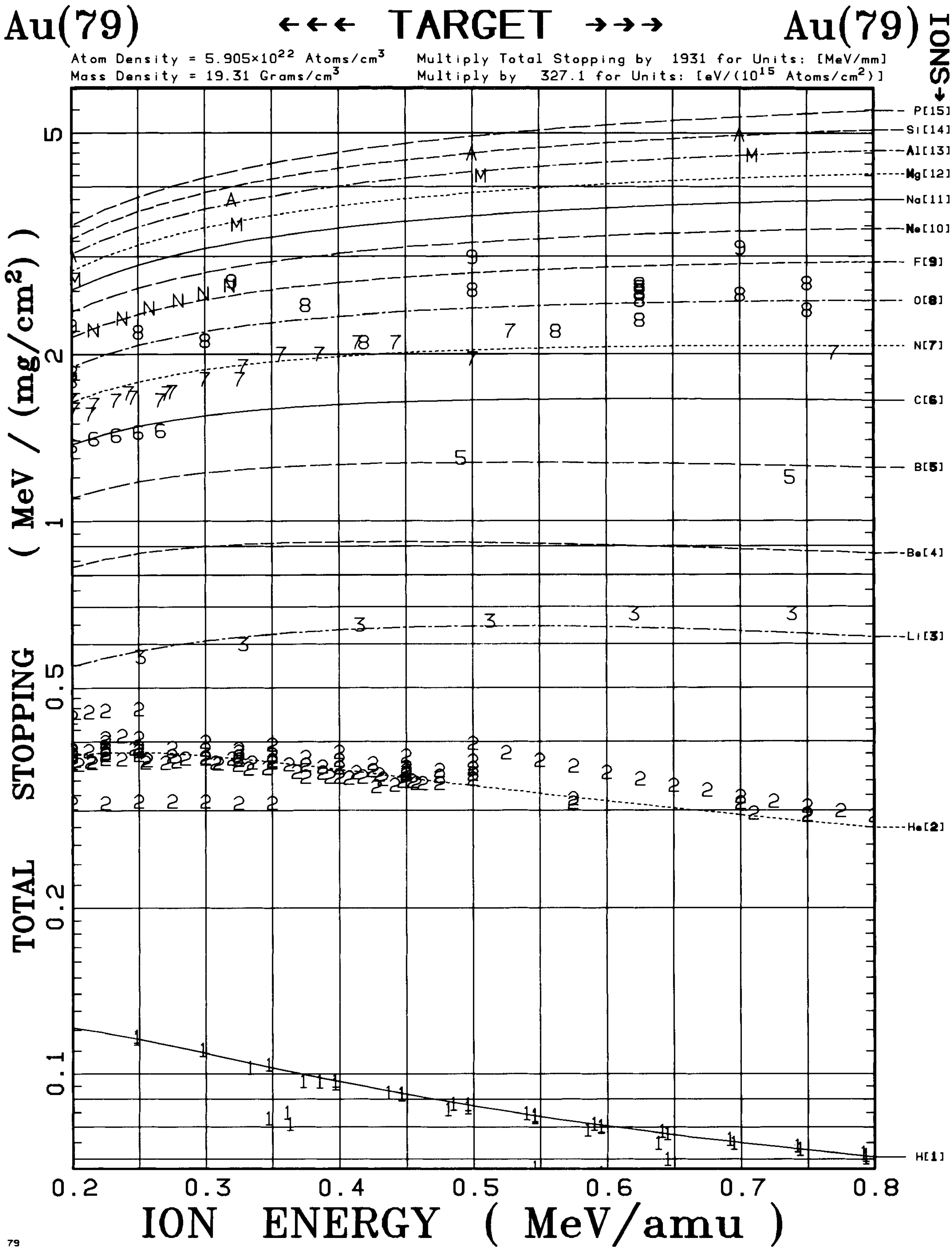
Atom Density = 6.619×10^{22} Atoms/cm^3 Multiply Total Stopping by 2144 for Units: [MeV/mm]
Mass Density = 21.44 Grams/cm^3 Multiply by 324 for Units: [eV/(10^{15} Atoms/cm^2)]

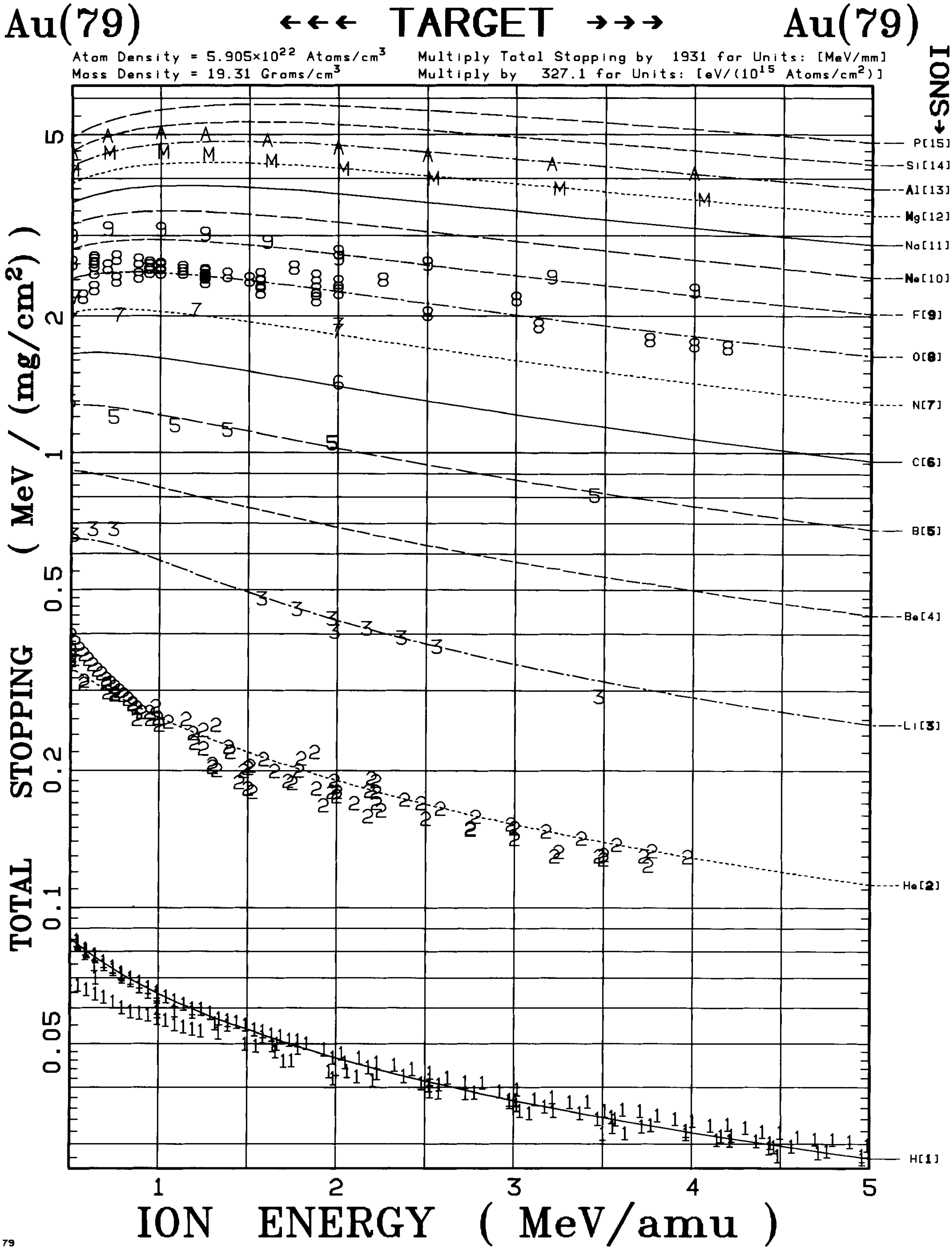


Pt(78) ←←← TARGET →→→ Pt(78)

Atom Density = 6.619×10^{22} Atoms/cm^3 Multiply Total Stopping by 2144 for Units: [MeV/mm]
Mass Density = 21.44 Grams/cm^3 Multiply by 324 for Units: [eV/(10^{15} Atoms/cm^2)]




Au(79) ←←← TARGET →→→ Au(79)
IONS→
Atom Density = 5.905×10^22 Atoms/cm^3
Mass Density = 19.31 Grams/cm^3
Multiply Total Stopping by 1931 for Units: [MeV/mm]
Multiply by 327.1 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
ION ENERGY (MeV/amu)
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
0.2
0.3
0.4
0.5
0.6
0.7
0.8
5
2
1
0.5
0.2
0.1

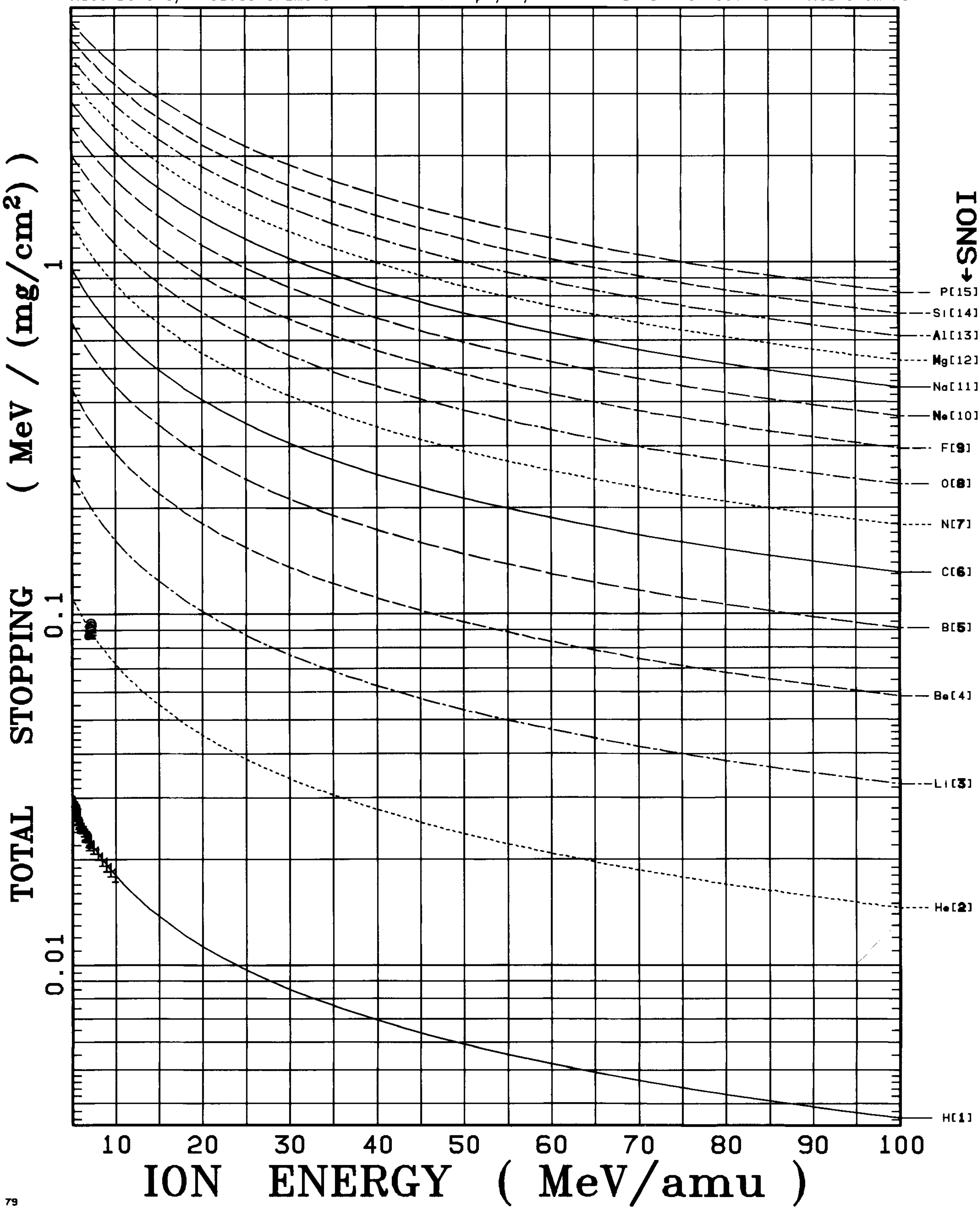


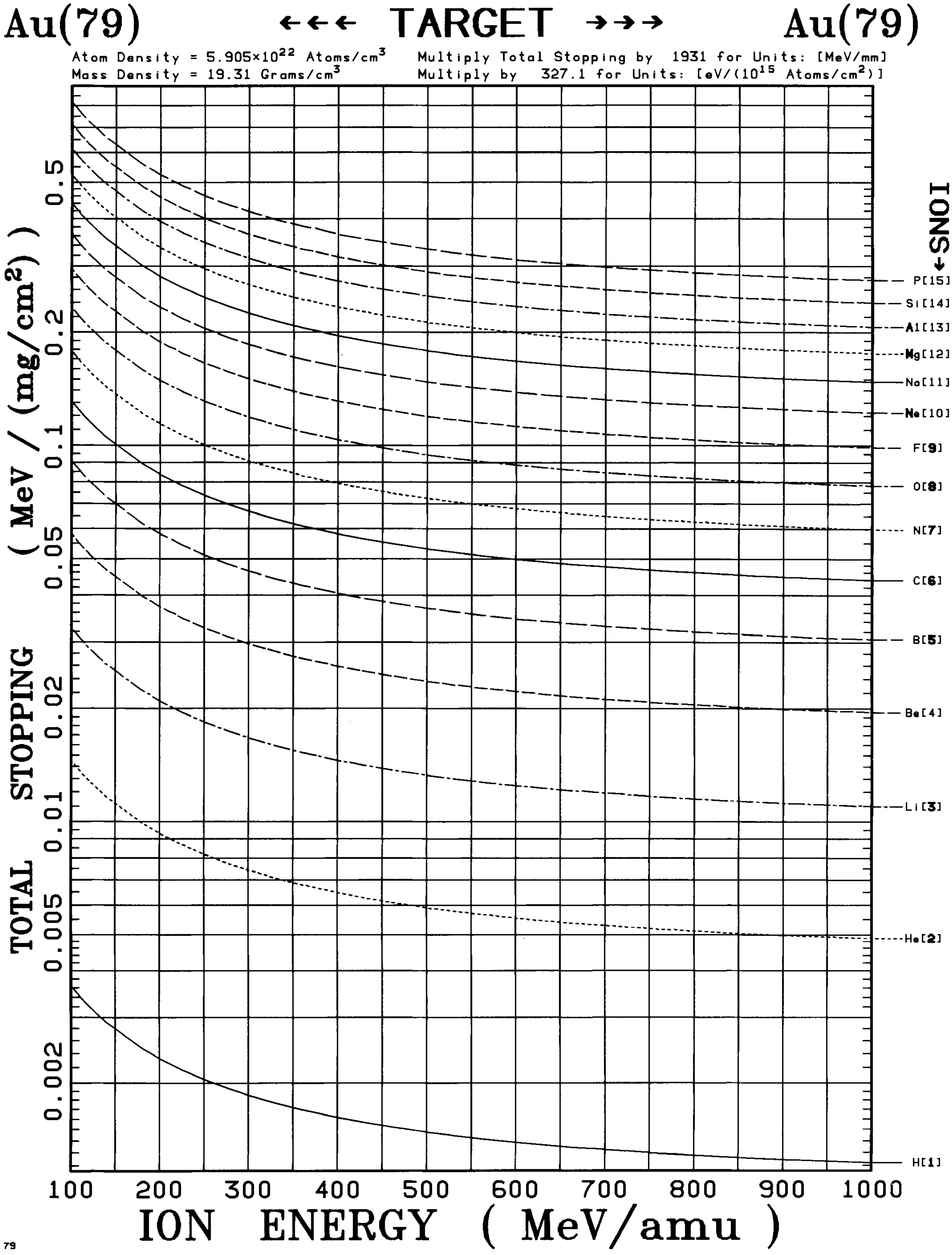
Au(79) ←←← TARGET →→→ Au(79)
Atom Density = 5.905×10^22 Atoms/cm^3
Mass Density = 19.31 Grams/cm^3
Multiply Total Stopping by 1931 for Units: [MeV/mm]
Multiply by 327.1 for Units: [eV/(10^15 Atoms/cm^2)]
IONS ↓
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm²))
ION ENERGY (MeV/amu)

79

Au(79) ←←← TARGET →→→ Au(79)

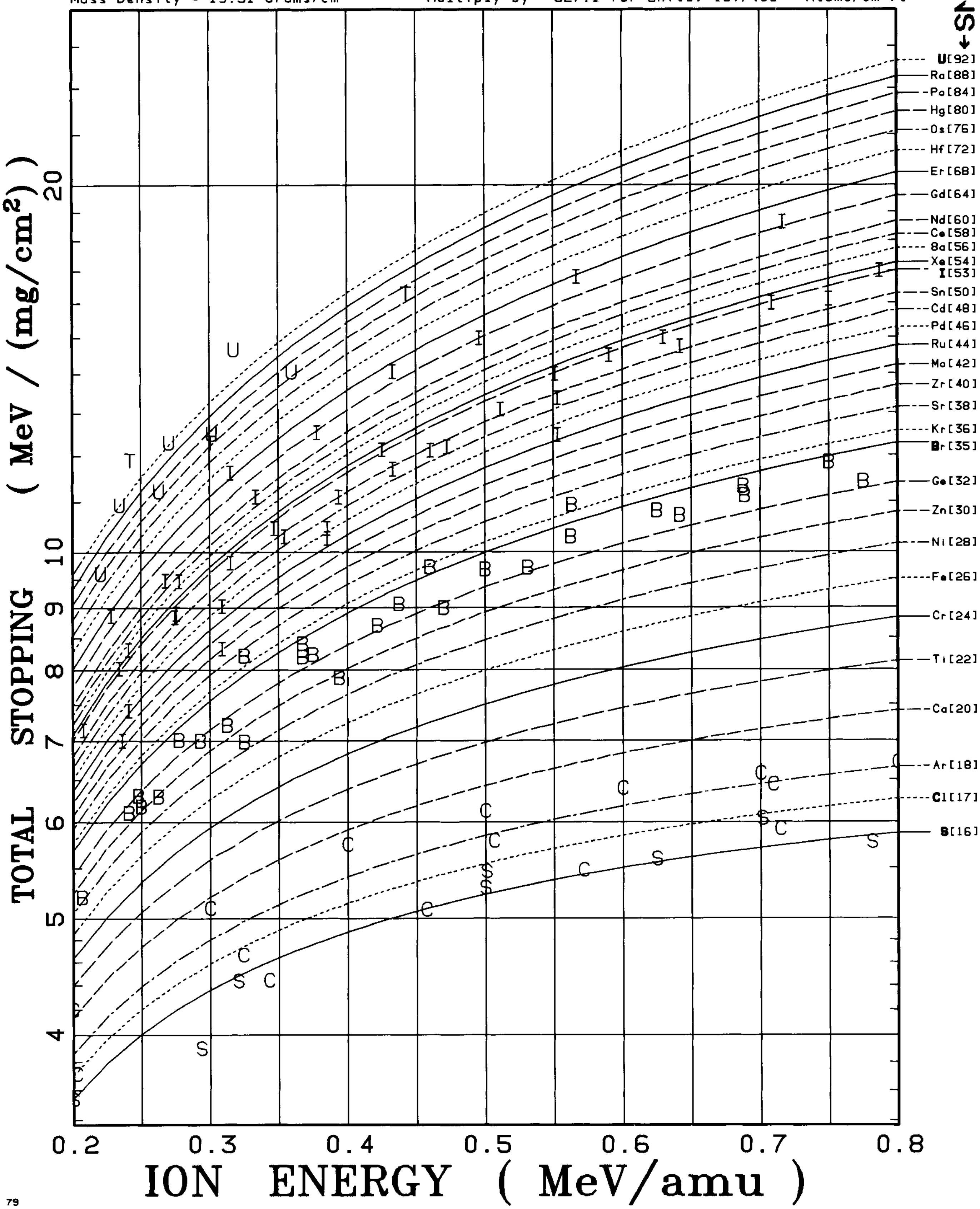
Atom Density = 5.905×10^{22} Atoms/cm^3 Multiply Total Stopping by 1931 for Units: [MeV/mm]
Mass Density = 19.31 Grams/cm^3 Multiply by 327.1 for Units: [eV/(10^{15} Atoms/cm^2)]




Au(79) ←←← TARGET →→→ Au(79)
Atom Density = 5.905×10^22 Atoms/cm^3
Mass Density = 19.31 Grams/cm^3
Multiply Total Stopping by 1931 for Units: [MeV/mm]
Multiply by 327.1 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)

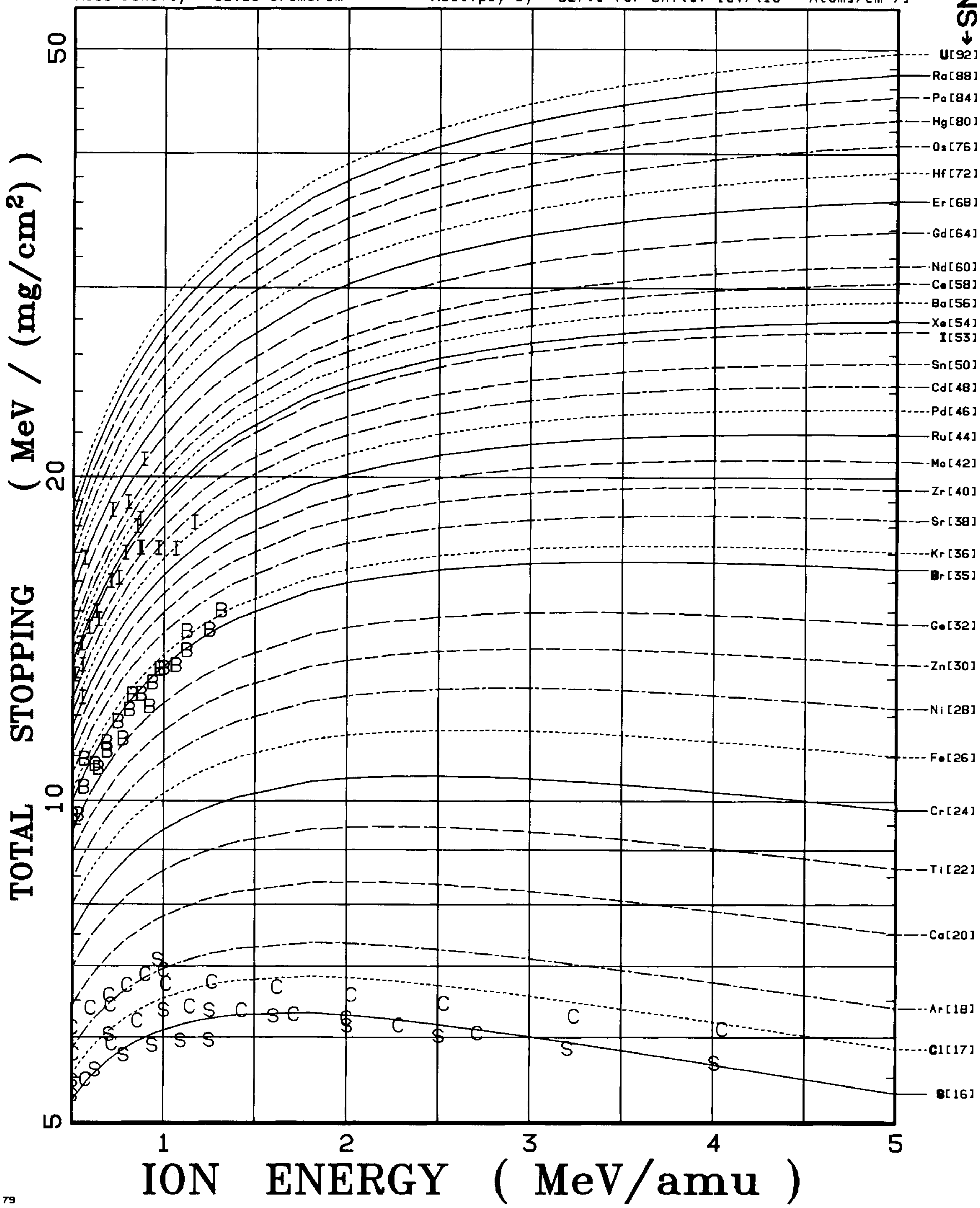
Au(79) ←←← TARGET →→→ Au(79)

Atom Density = 5.905×10^{22} Atoms/cm^3 Multiply Total Stopping by 1931 for Units: [MeV/mm]
Mass Density = 19.31 Grams/cm^3 Multiply by 327.1 for Units: [eV/(10^{15} Atoms/cm^2)]



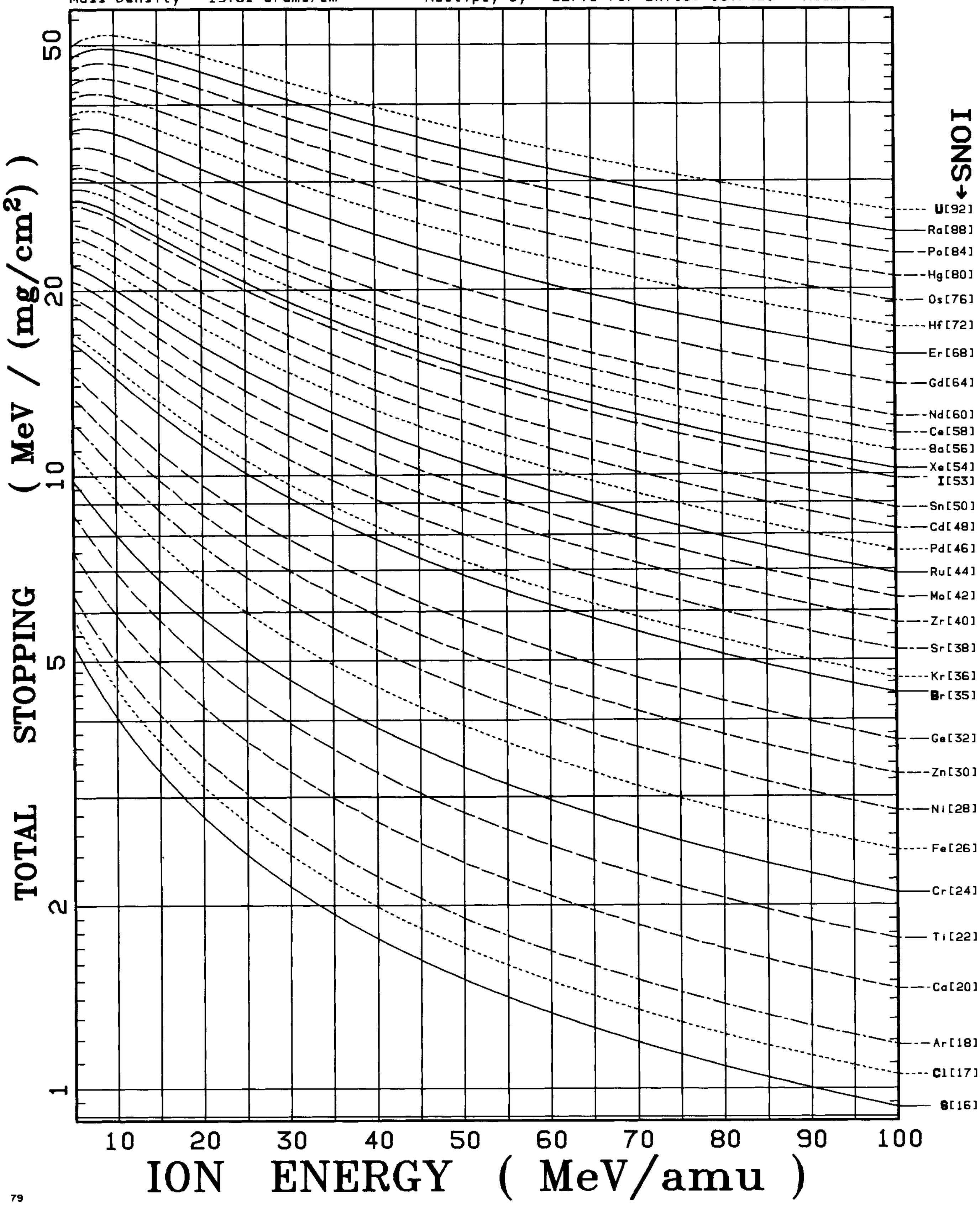
Au(79) ←←← TARGET →→→ Au(79)

Atom Density = 5.905×10^{22} Atoms/cm^3 Multiply Total Stopping by 1931 for Units: [MeV/mm]
Mass Density = 19.31 Grams/cm^3 Multiply by 327.1 for Units: [eV/(10^{15} Atoms/cm^2)]



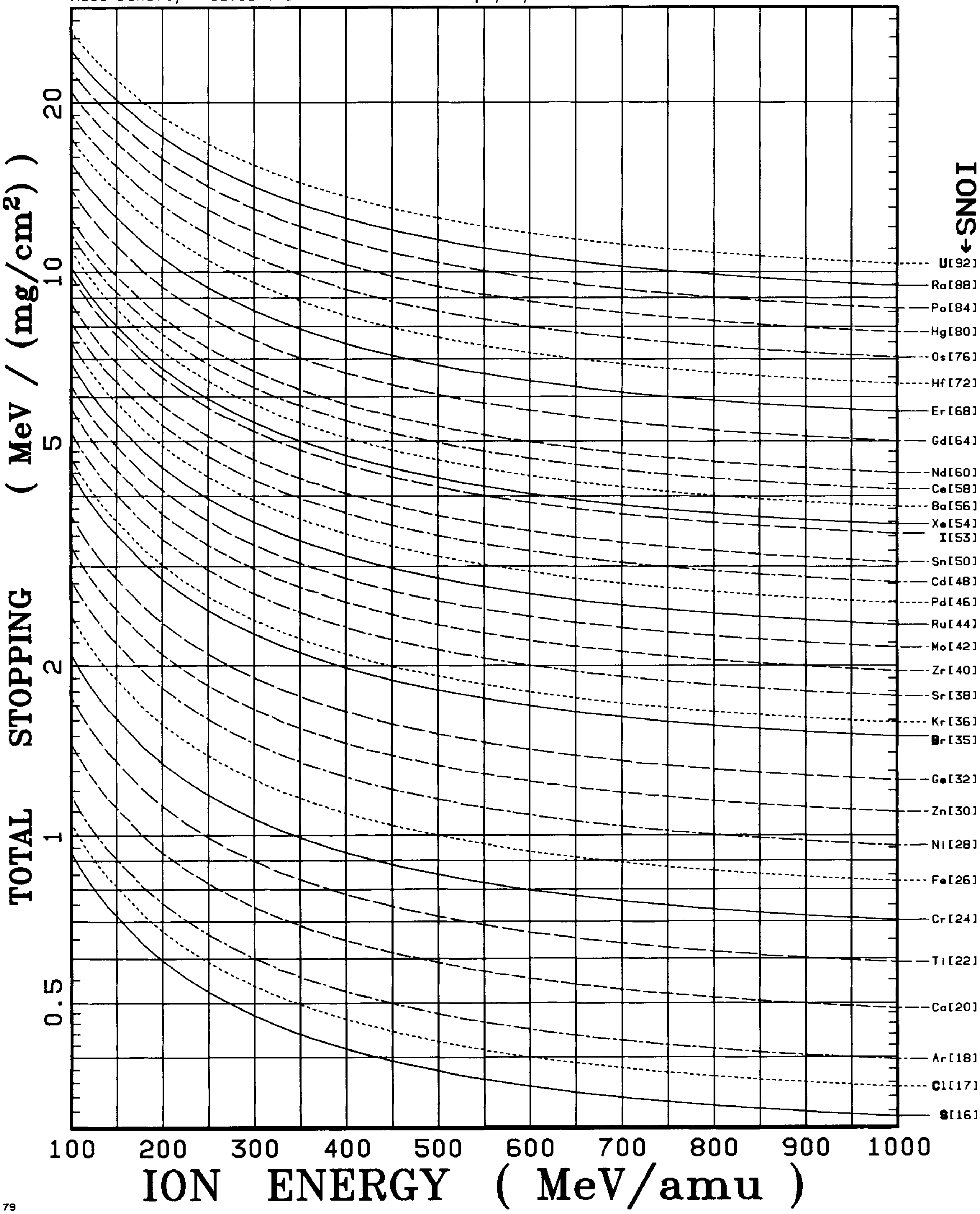
Au(79) ←←← TARGET →→→ Au(79)

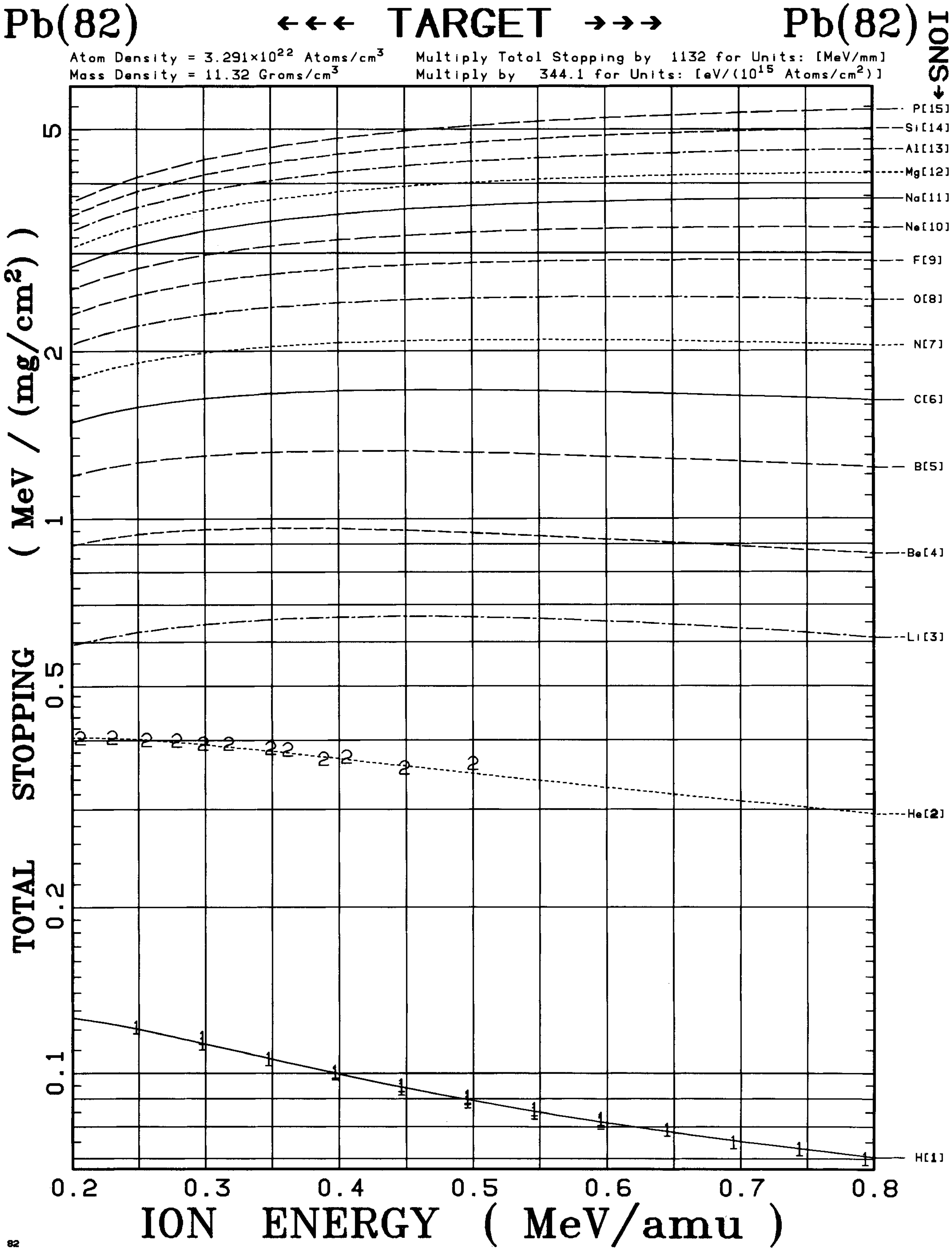
Atom Density = 5.905×10²² Atoms/cm³ — Multiply Total Stopping by 1931 for Units: [MeV/mm]
Mass Density = 19.31 Grams/cm³ — Multiply by 327.1 for Units: [eV/(10¹⁵ Atoms/cm²)]



Au(79) ←←← TARGET →→→ Au(79)

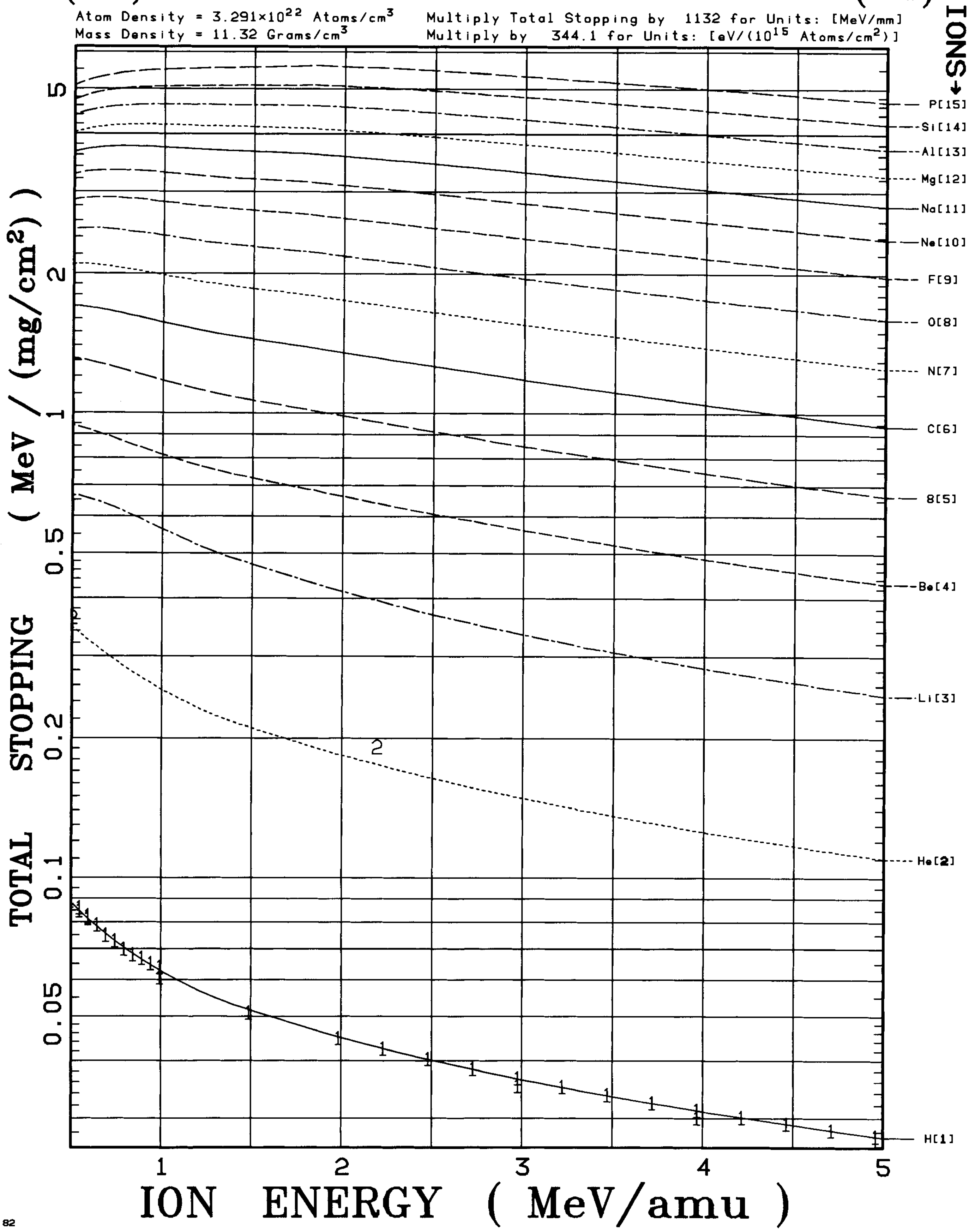
Atom Density = 5.905×10^{22} Atoms/cm^3 Multiply Total Stopping by 1931 for Units: [MeV/mm]
Mass Density = 19.31 Grams/cm^3 Multiply by 327.1 for Units: [eV/(10^{15} Atoms/cm^2)]




Pb(82) ←←← TARGET →→→ Pb(82)
IONS ↓
Atom Density = 3.291×10^22 Atoms/cm^3
Mass Density = 11.32 Grams/cm^3
Multiply Total Stopping by 1132 for Units: [MeV/mm]
Multiply by 344.1 for Units: [eV/(10^15 Atoms/cm^2)]
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
TOTAL STOPPING (MeV / (mg/cm²))
5
2
1
0.5
0.2
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

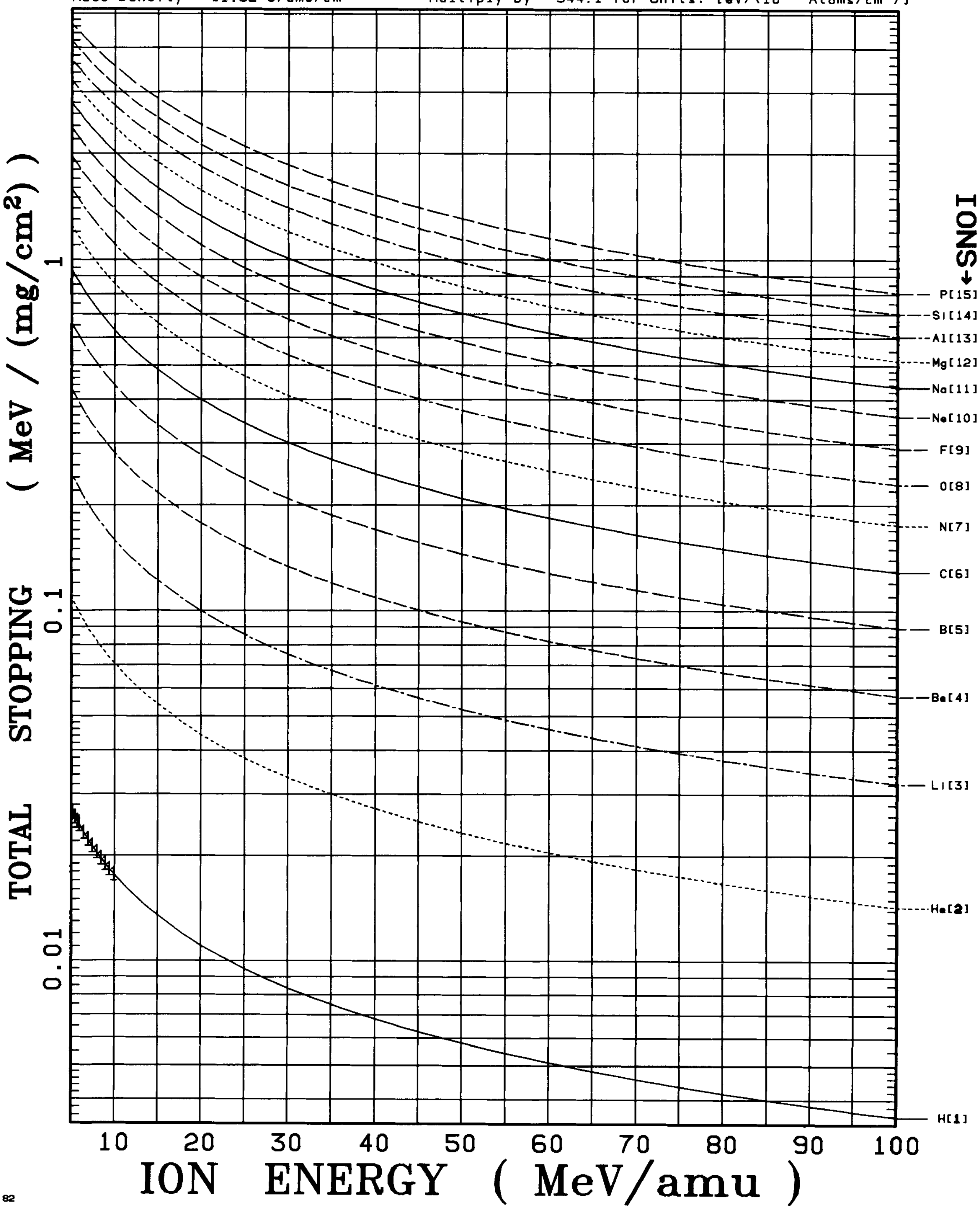
Pb(82) ←←← TARGET →→→ Pb(82)

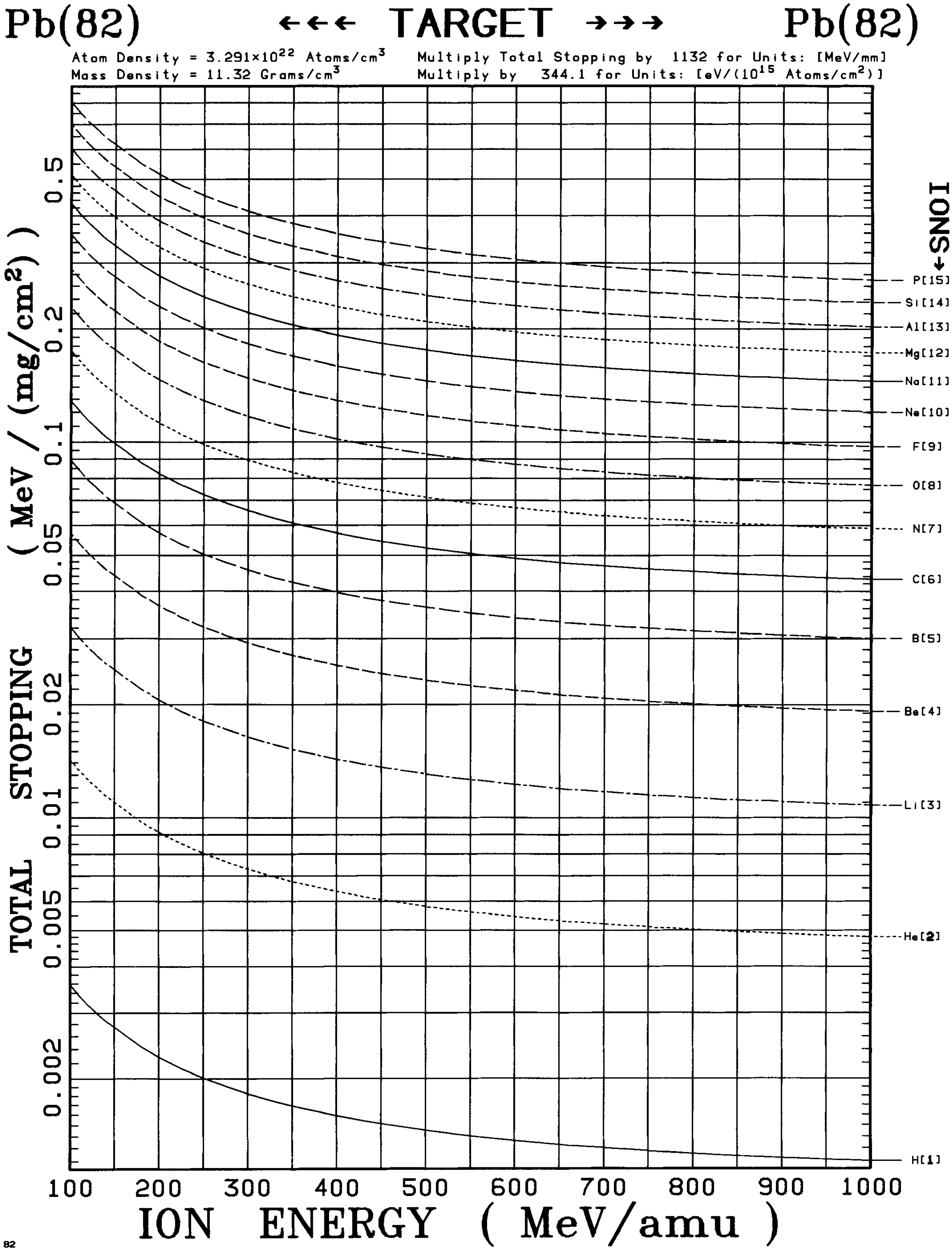
Atom Density = 3.291×10^{22} Atoms/cm^3 Multiply Total Stopping by 1132 for Units: [MeV/mm]
Mass Density = 11.32 Grams/cm^3 Multiply by 344.1 for Units: [eV/(10^{15} Atoms/cm^2)]



Pb(82) ←←← TARGET →→→ Pb(82)

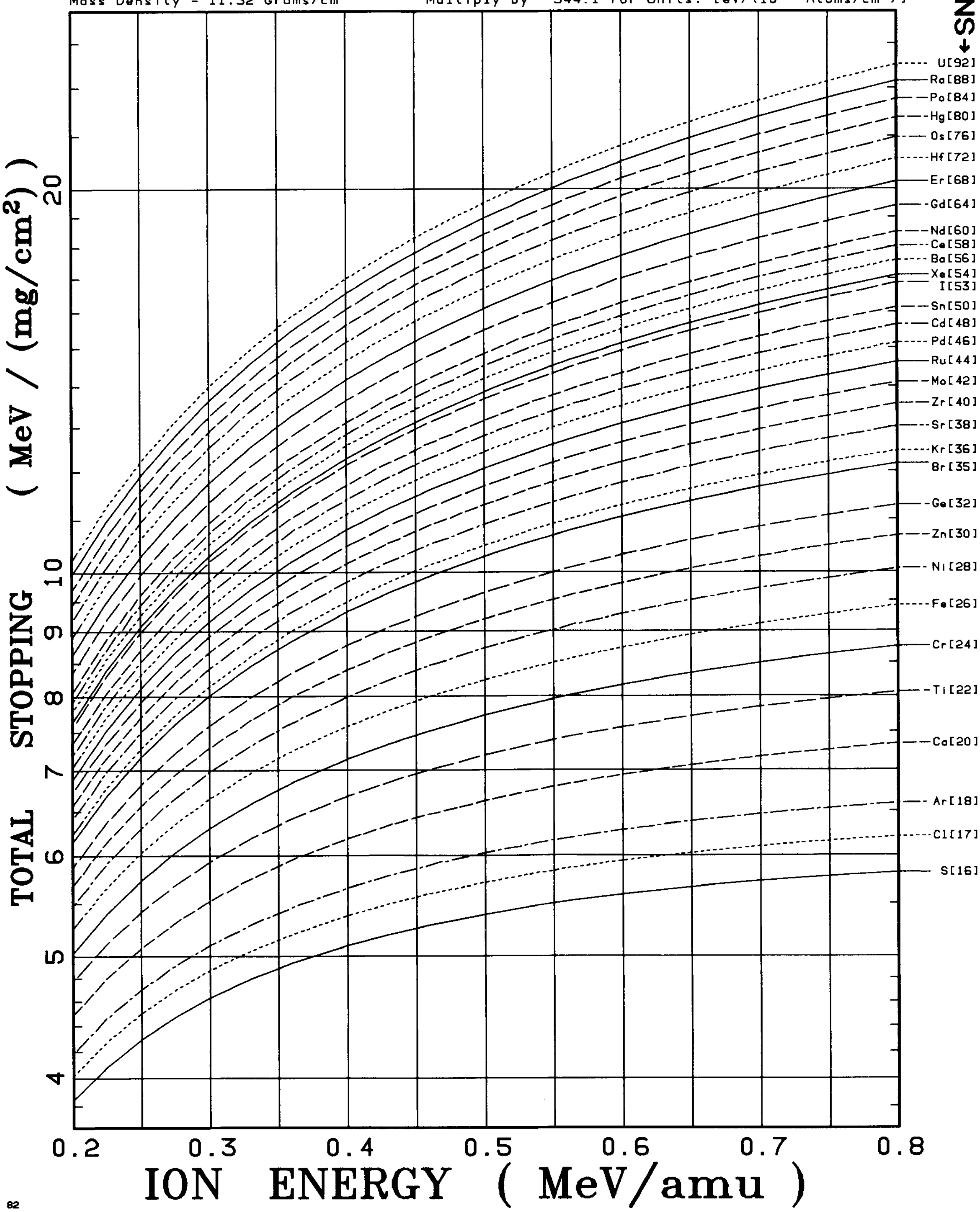
Atom Density = 3.291×10^{22} Atoms/cm^3 Multiply Total Stopping by 1132 for Units: [MeV/mm]
Mass Density = 11.32 Grams/cm^3 Multiply by 344.1 for Units: [eV/(10^{15} Atoms/cm^2)]




Pb(82)
←←← TARGET →→→
Pb(82)
Atom Density = 3.291×10^22 Atoms/cm^3
Multiply Total Stopping by 1132 for Units: [MeV/mm]
Mass Density = 11.32 Grams/cm^3
Multiply by 344.1 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)

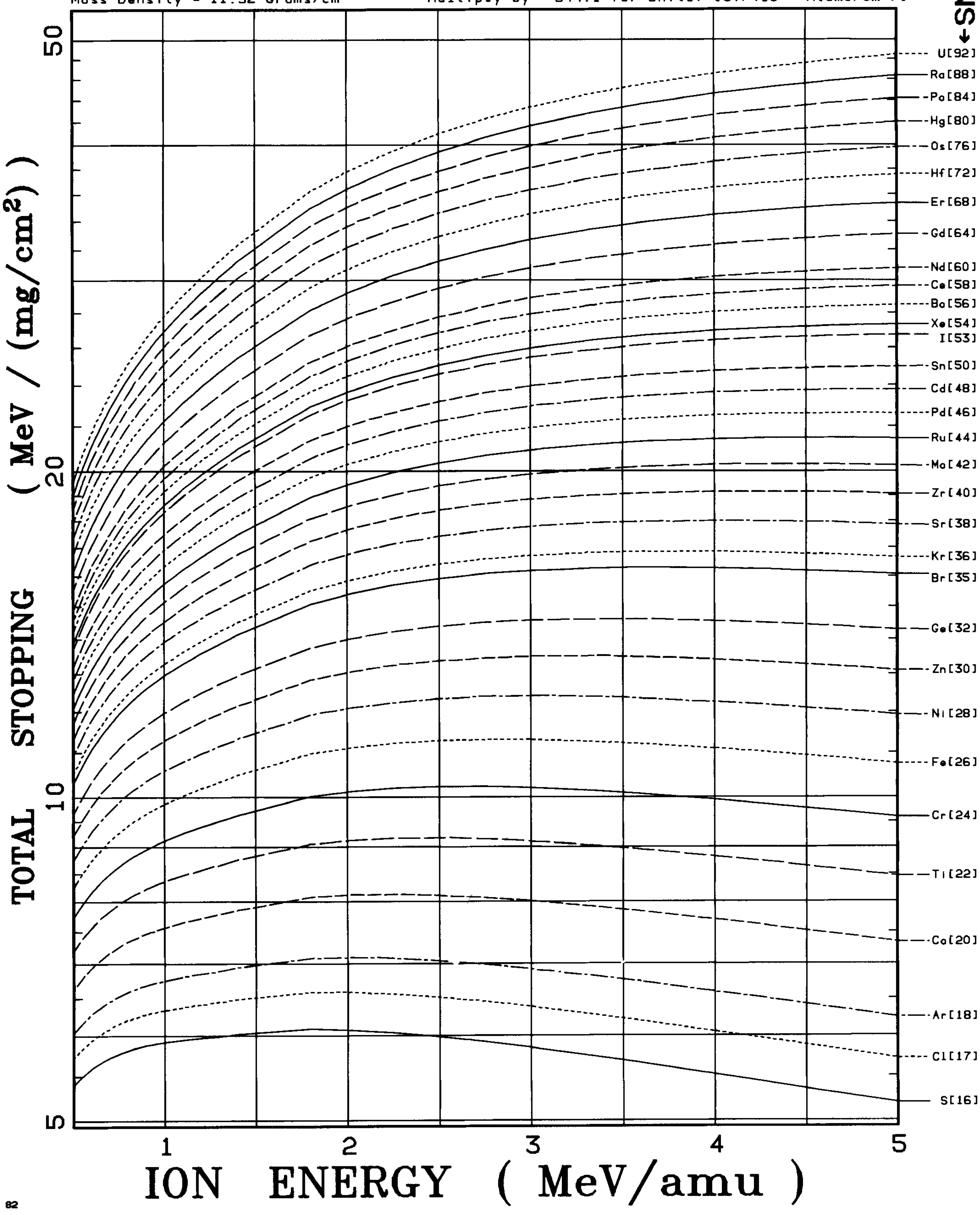
Pb(82) ←←← TARGET →→→ Pb(82)

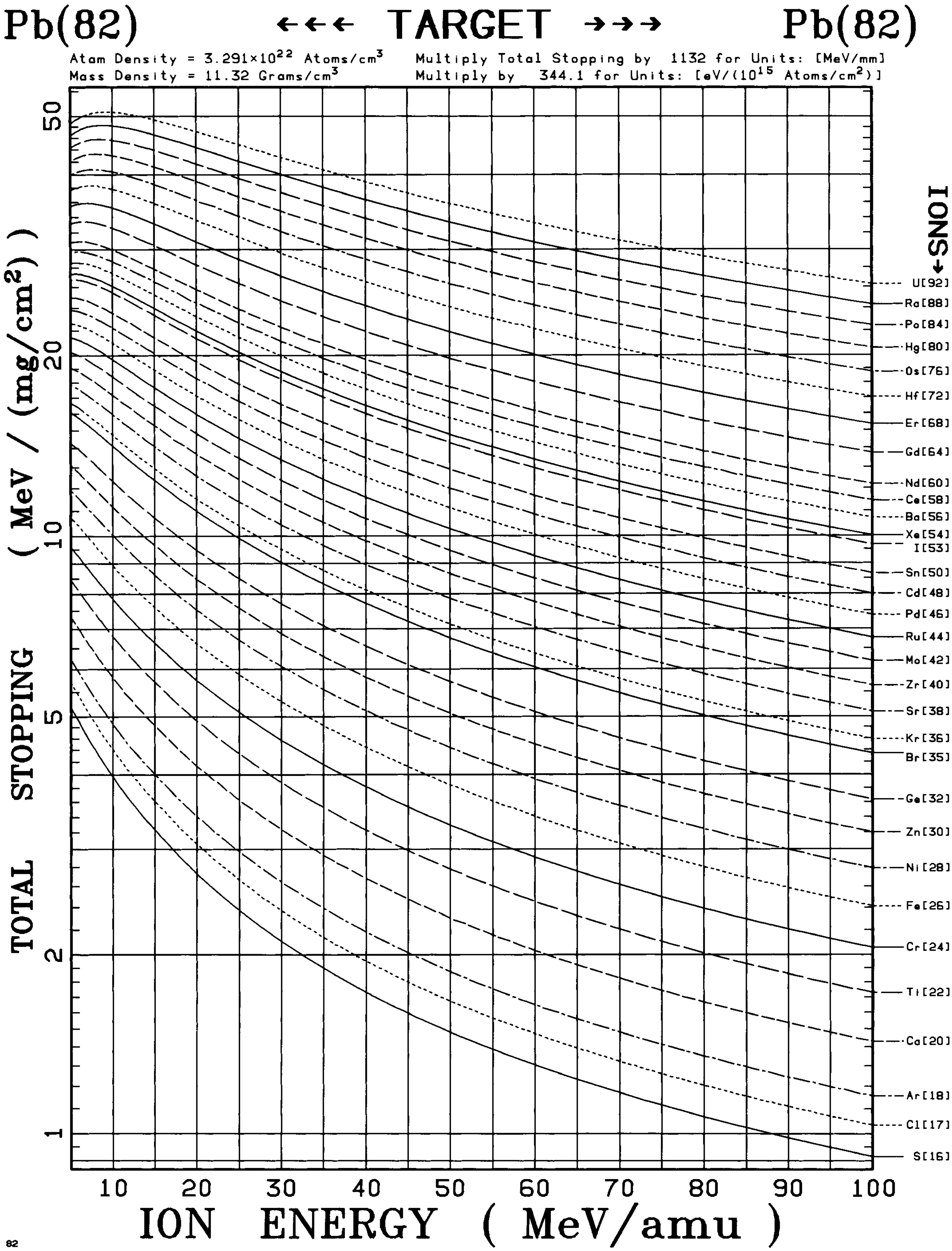
Atom Density = 3.291×10^{22} Atoms/cm^3 Multiply Total Stopping by 1132 for Units: [MeV/mm]
Mass Density = 11.32 Grams/cm^3 Multiply by 344.1 for Units: [eV/(10^{15} Atoms/cm^2)]



Pb(82) ←←← TARGET →→→ Pb(82)

Atom Density = 3.291×10[22] Atoms/cm[3]   Multiply Total Stopping by 1132 for Units: [MeV/mm]
Mass Density = 11.32 Grams/cm[3]   Multiply by 344.1 for Units: [eV/(10[15] Atoms/cm[2])]

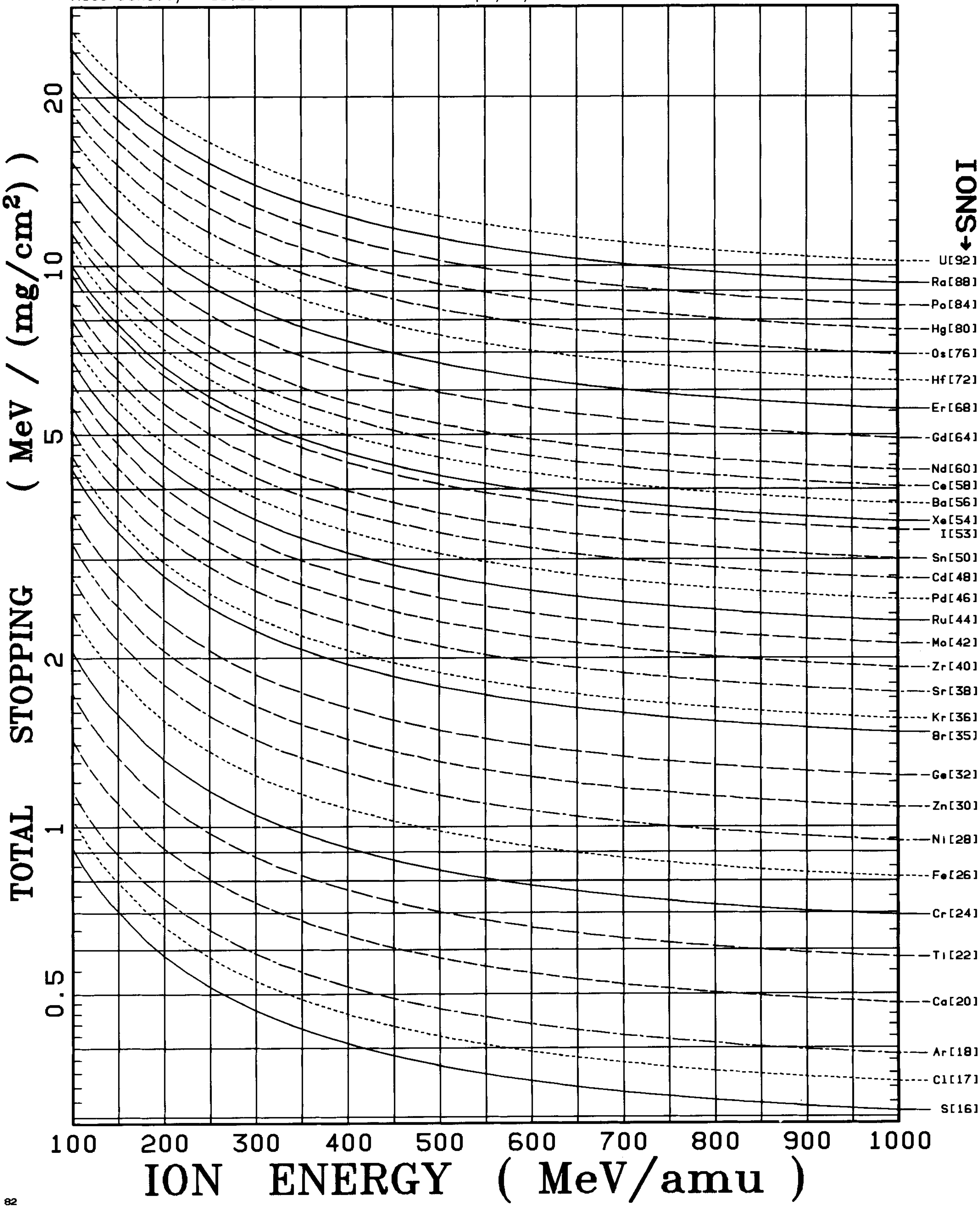




Pb(82) ←←← TARGET →→→ Pb(82)
Atom Density = 3.291×10²² Atoms/cm³
Mass Density = 11.32 Grams/cm³
Multiply Total Stopping by 1132 for Units: [MeV/mm]
Multiply by 344.1 for Units: [eV/(10¹⁵ Atoms/cm²)]
TOTAL STOPPING (MeV / (mg/cm²))
ION ENERGY (MeV/amu)
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
50
20
10
5
2
1
10 20 30 40 50 60 70 80 90 100

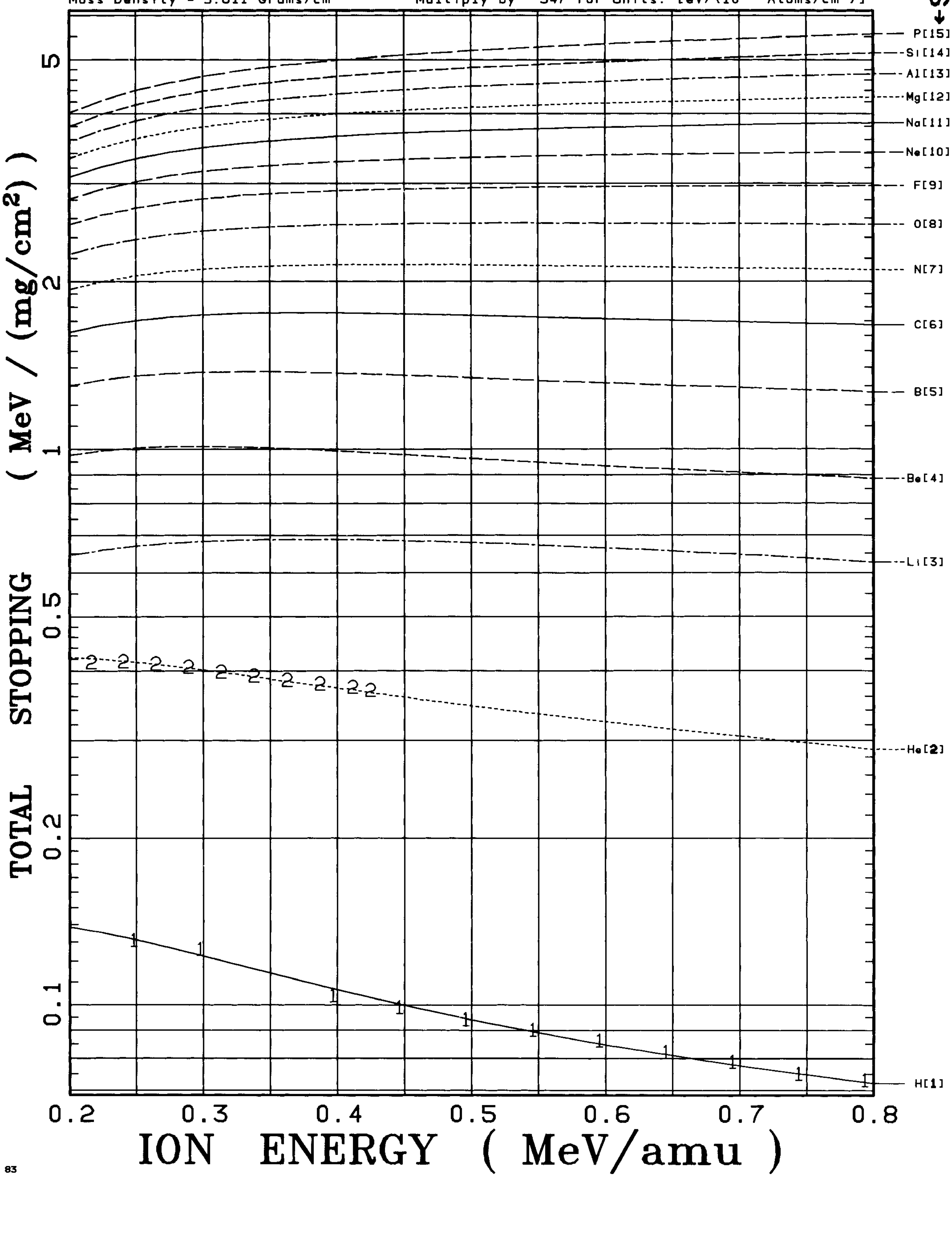
Pb(82) ←←← TARGET →→→ Pb(82)

Atom Density = 3.291×10^{22} Atoms/cm^3 Multiply Total Stopping by 1132 for Units: [MeV/mm]
Mass Density = 11.32 Grams/cm^3 Multiply by 344.1 for Units: [eV/(10^{15} Atoms/cm^2)]



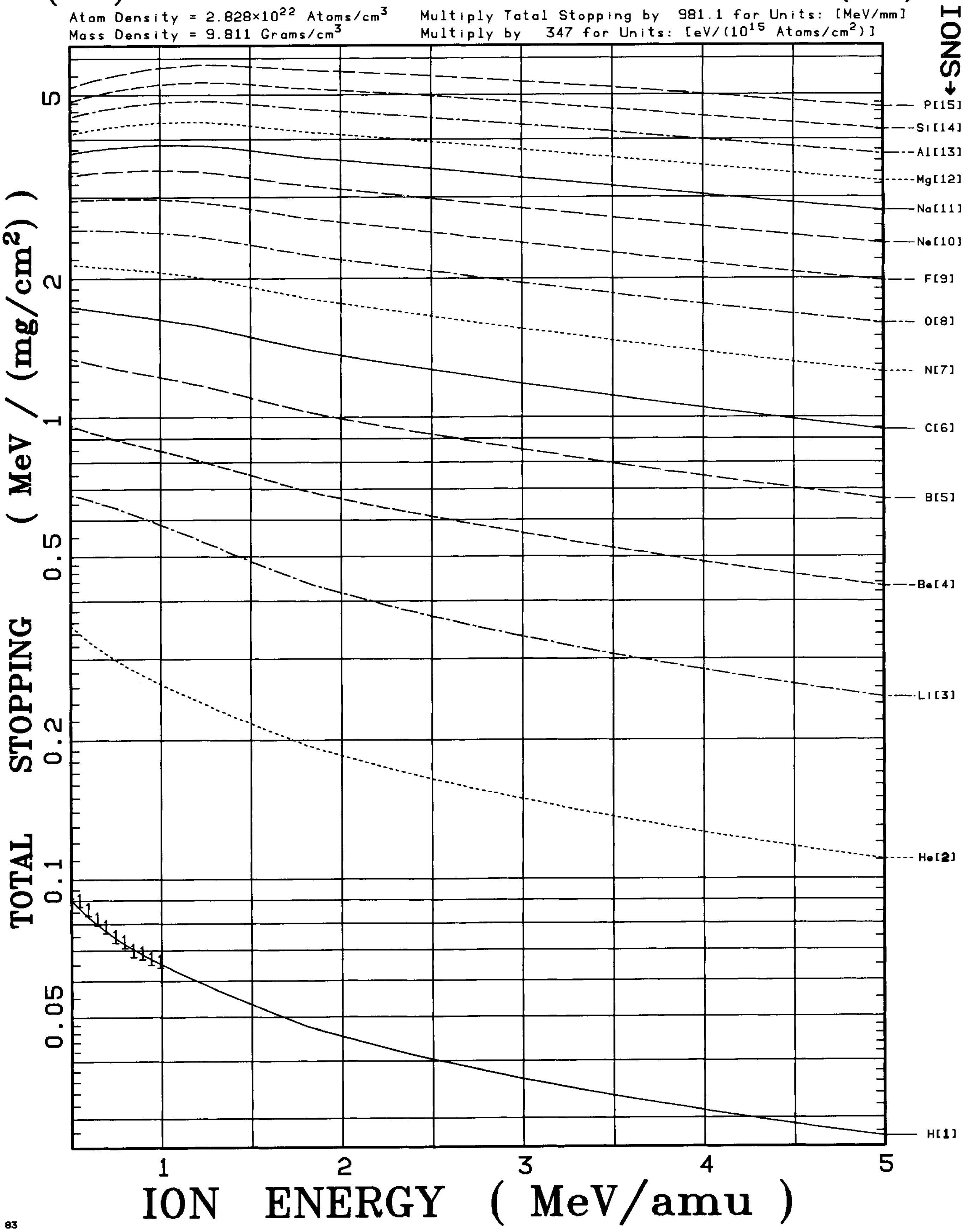
Bi(83) ←←← TARGET →→→ Bi(83)

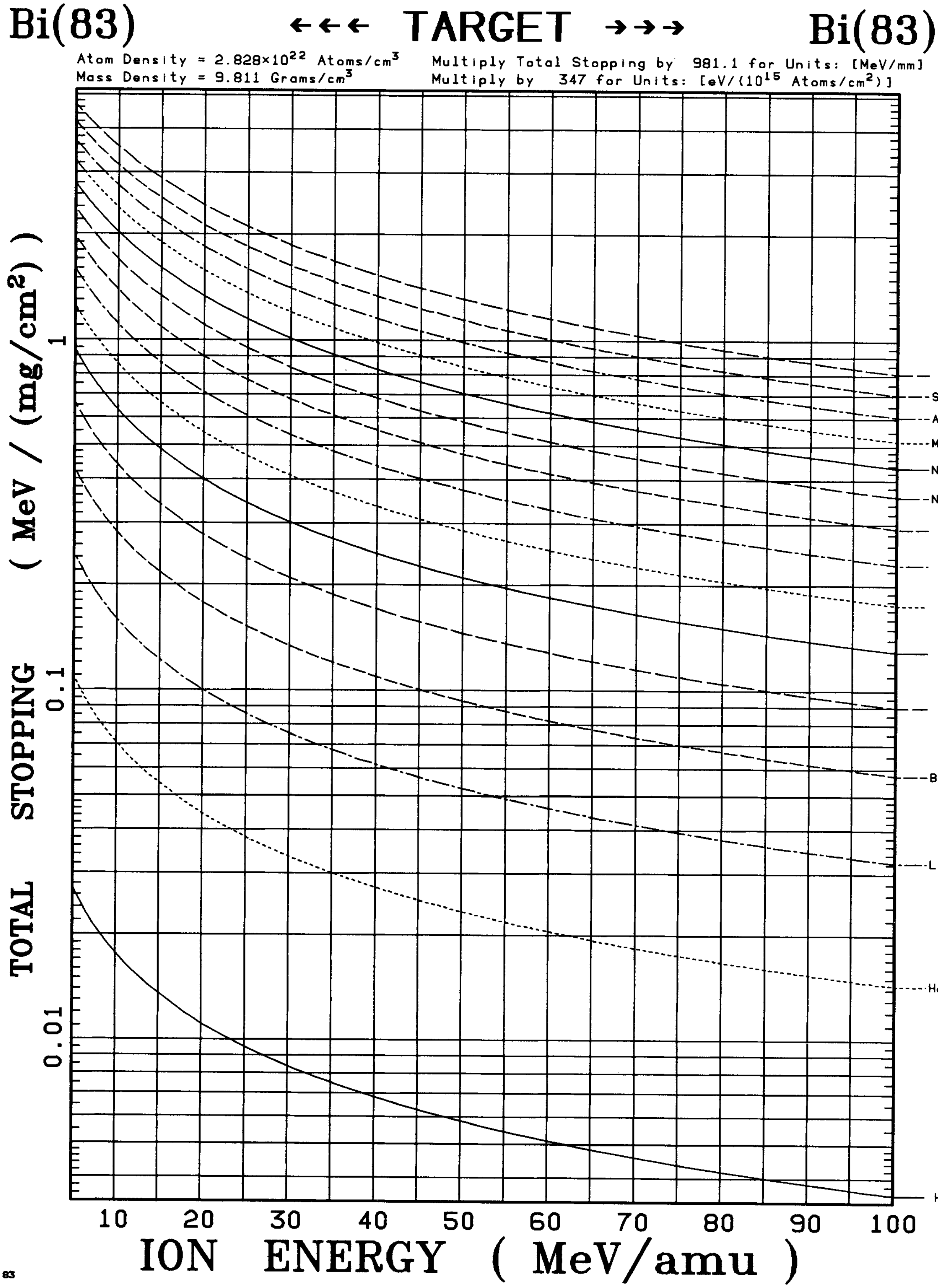
Atom Density = 2.828×10^{22} Atoms/cm^3 Multiply Total Stopping by 981.1 for Units: [MeV/mm]
Mass Density = 9.811 Grams/cm^3 Multiply by 347 for Units: [eV/(10^{15} Atoms/cm^2)]

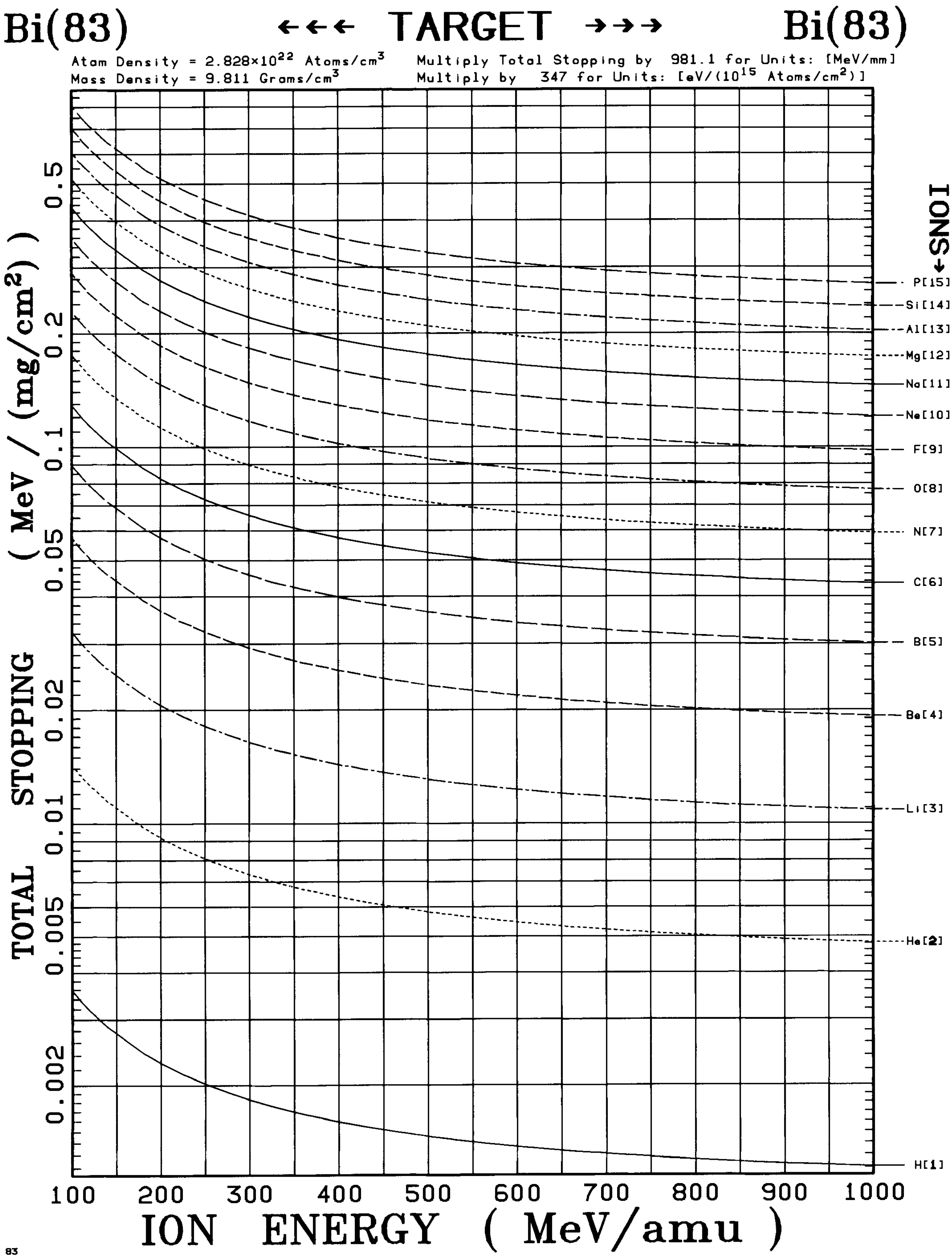


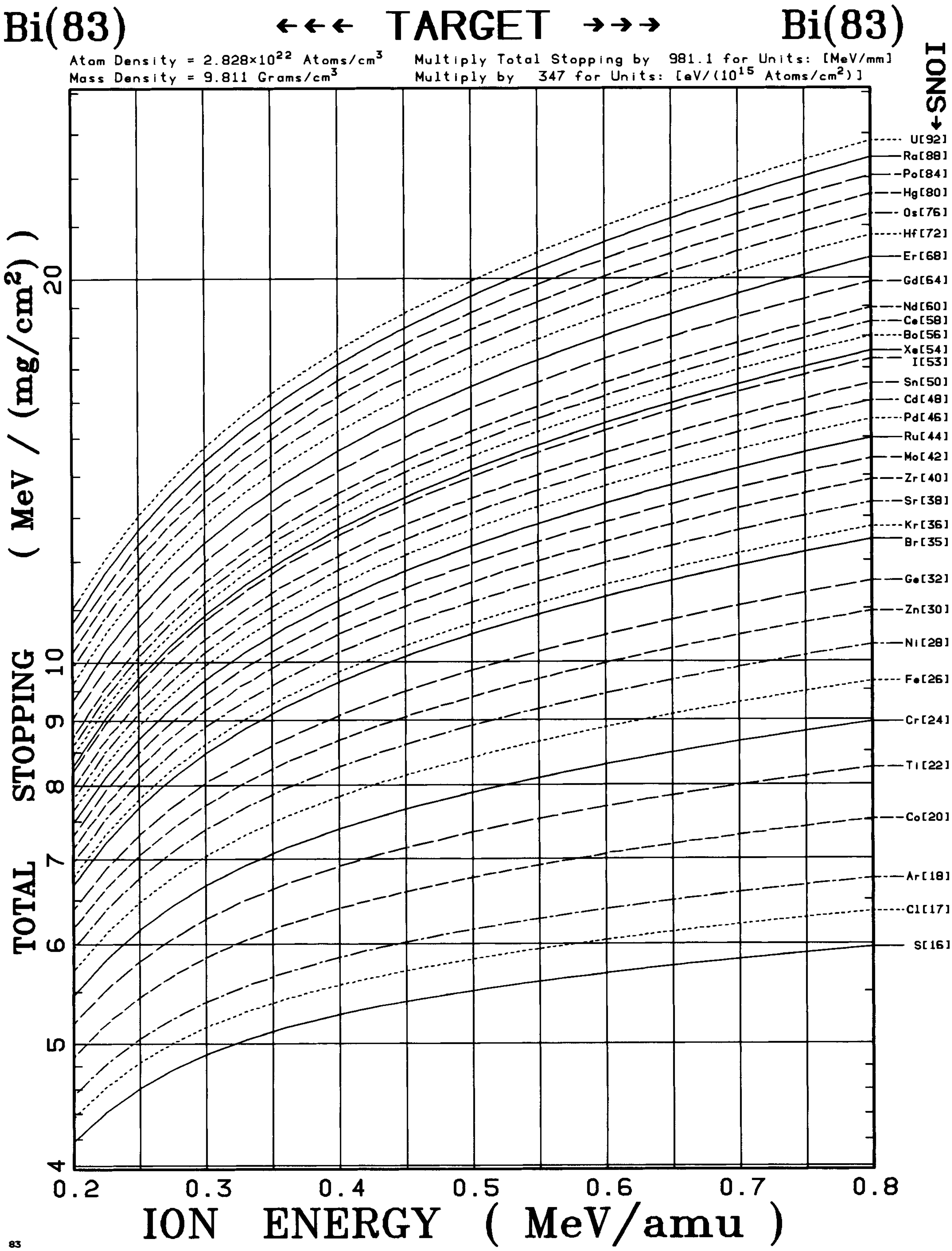
Bi(83) ←←← TARGET →→→ Bi(83)

Atom Density = 2.828×10^{22} Atoms/cm^3 Multiply Total Stopping by 981.1 for Units: [MeV/mm]
Mass Density = 9.811 Grams/cm^3 Multiply by 347 for Units: [eV/(10^{15} Atoms/cm^2)]



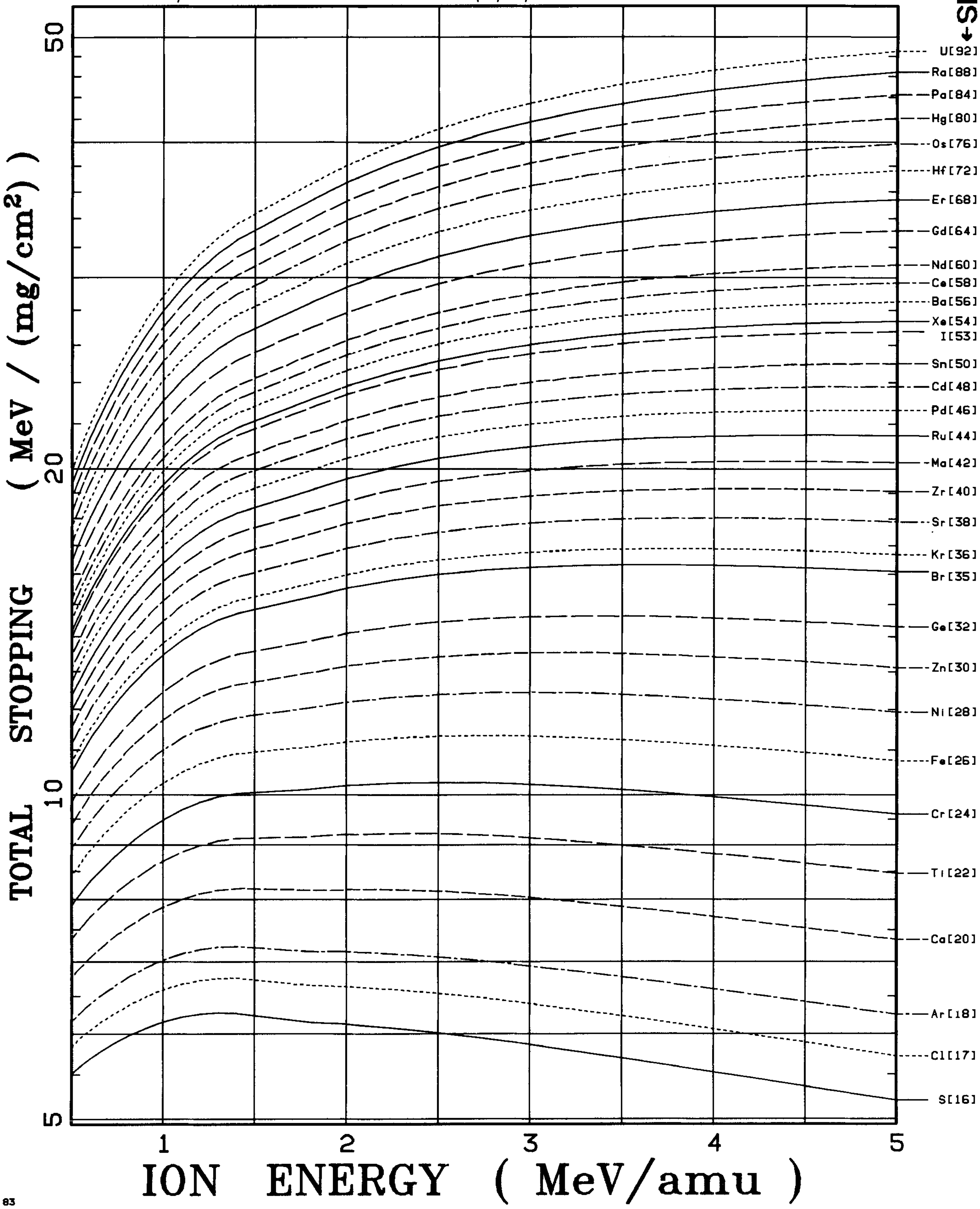

Bi(83)
←←← TARGET →→→
Bi(83)
Atom Density = 2.828×10^22 Atoms/cm^3
Mass Density = 9.811 Grams/cm^3
Multiply Total Stopping by 981.1 for Units: [MeV/mm]
Multiply by 347 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
1
0.1
0.01
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
10
20
30
40
50
60
70
80
90
100
ION ENERGY (MeV/amu)


Bi(83)
←←← TARGET →→→
Bi(83)
Atom Density = 2.828×10^22 Atoms/cm^3
Mass Density = 9.811 Grams/cm^3
Multiply Total Stopping by 981.1 for Units: [MeV/mm]
Multiply by 347 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)


Bi(83) ←←← TARGET →→→ Bi(83)
Atom Density = 2.828×10^22 Atoms/cm^3
Mass Density = 9.811 Grams/cm^3
Multiply Total Stopping by 981.1 for Units: [MeV/mm]
Multiply by 347 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm²))
4
5
6
7
8
9
10
20
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

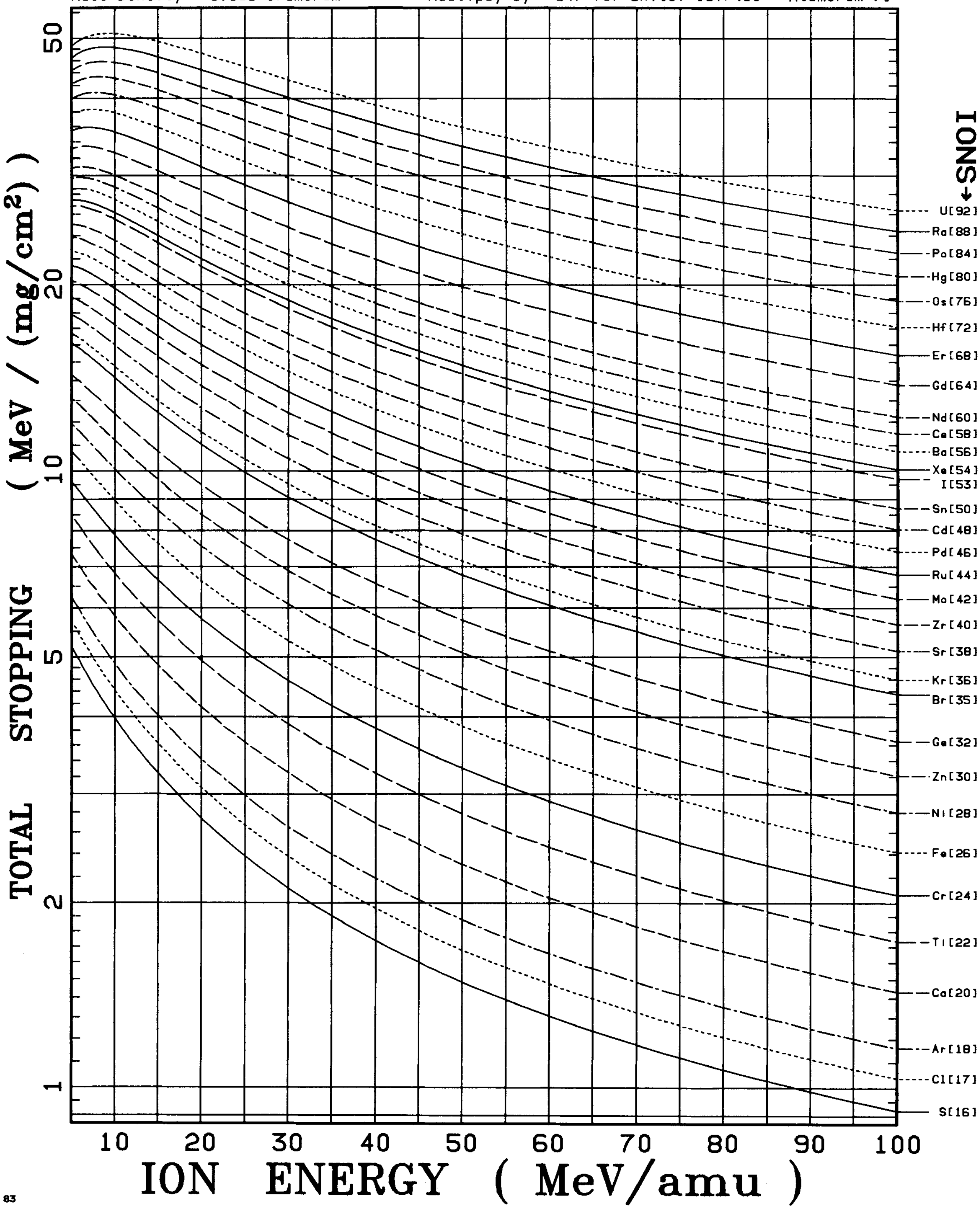
Bi(83) ←←← TARGET →→→ Bi(83)

Atom Density = 2.828×10[22] Atoms/cm[3]   Multiply Total Stopping by 981.1 for Units: [MeV/mm]
Mass Density = 9.811 Grams/cm[3]   Multiply by 347 for Units: [eV/(10[15] Atoms/cm[2])]



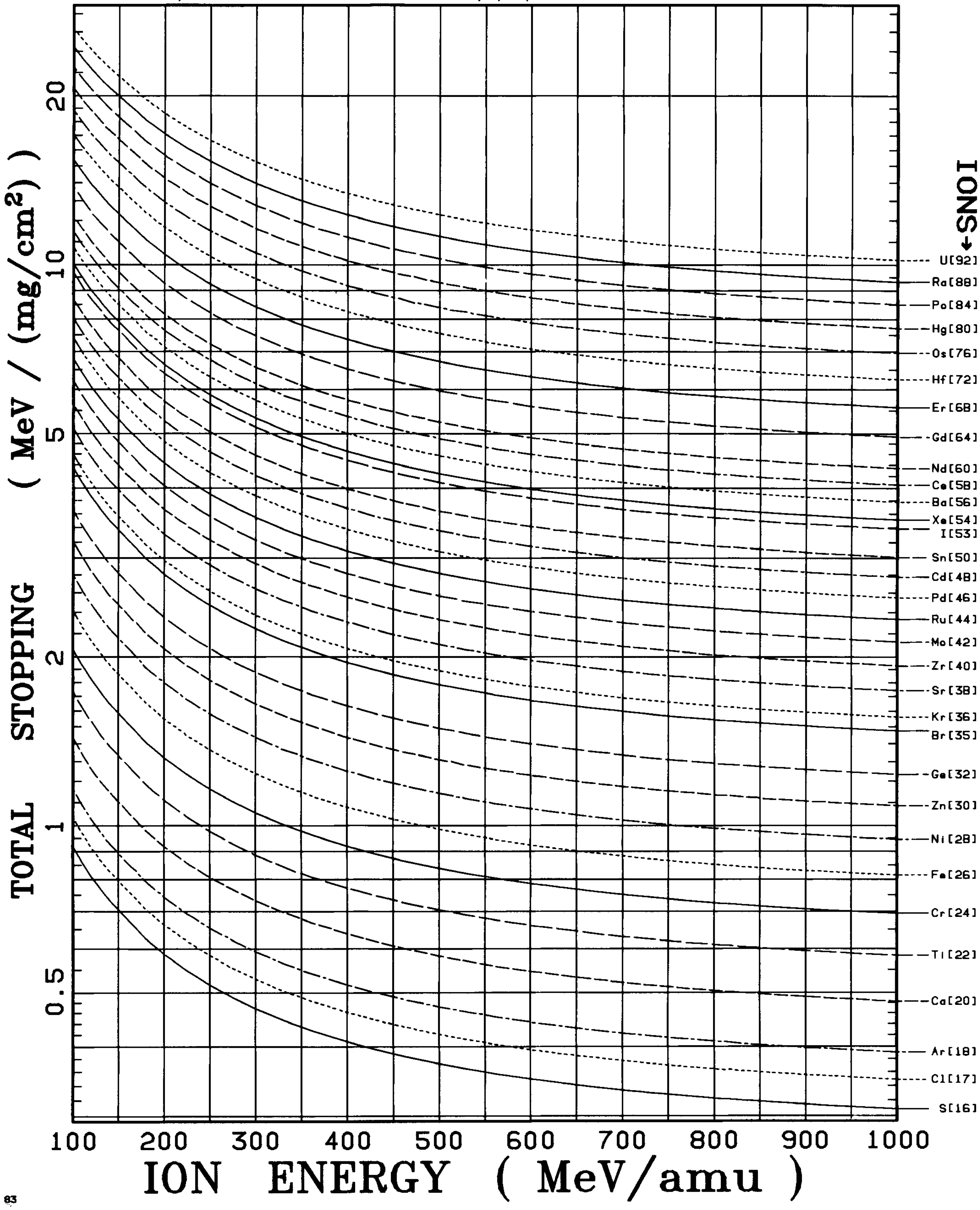
Bi(83) ←←← TARGET →→→ Bi(83)

Atom Density = 2.828×10^{22} Atoms/cm^3 Multiply Total Stopping by 981.1 for Units: [MeV/mm]
Mass Density = 9.811 Grams/cm^3 Multiply by 347 for Units: [eV/(10^{15} Atoms/cm^2)]



Bi(83) ←←← TARGET →→→ Bi(83)

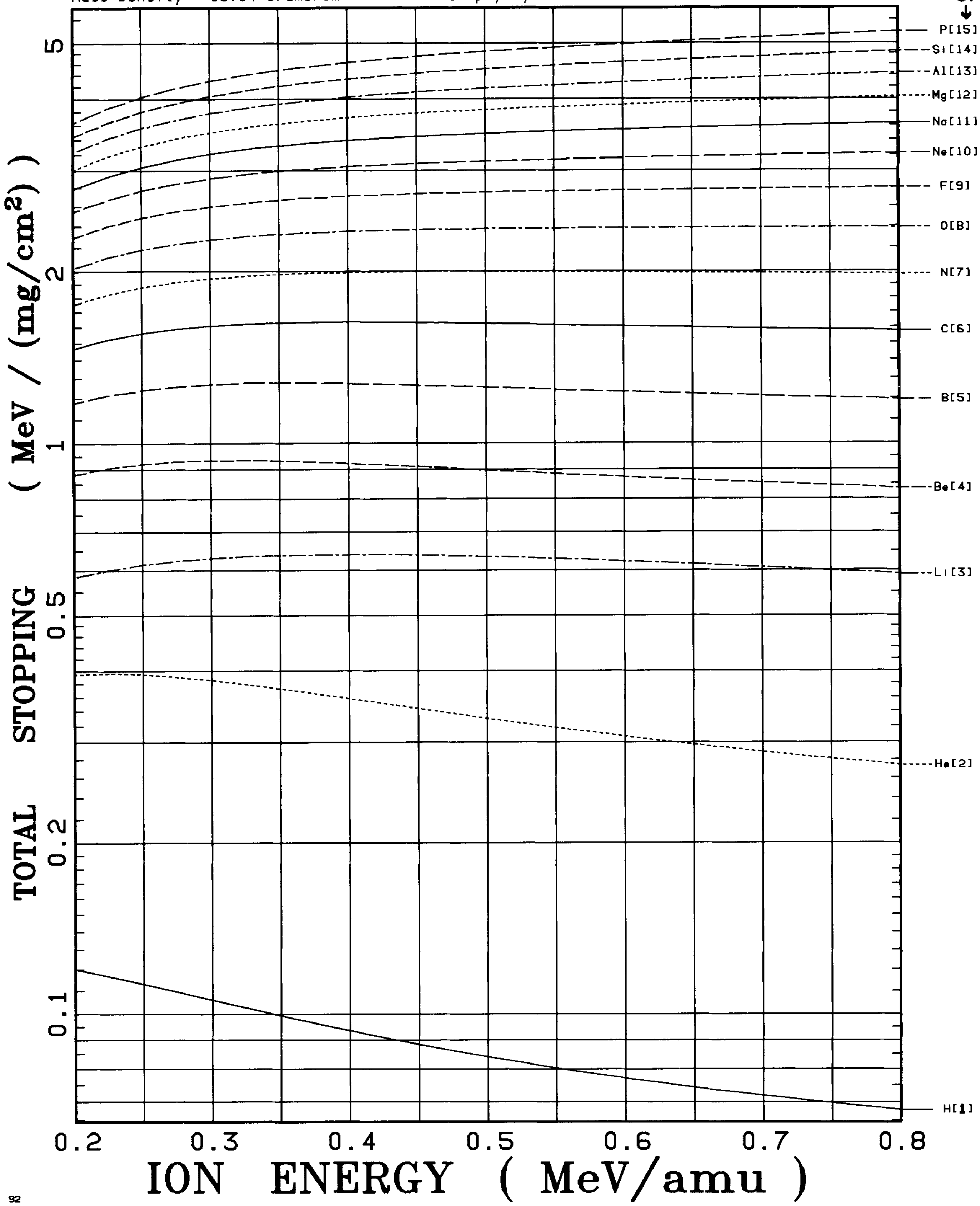
Atom Density = 2.828×10^{22} Atoms/cm^3 Multiply Total Stopping by 981.1 for Units: [MeV/mm]
Mass Density = 9.811 Grams/cm^3 Multiply by 347 for Units: [eV/(10^{15} Atoms/cm^2)]



83

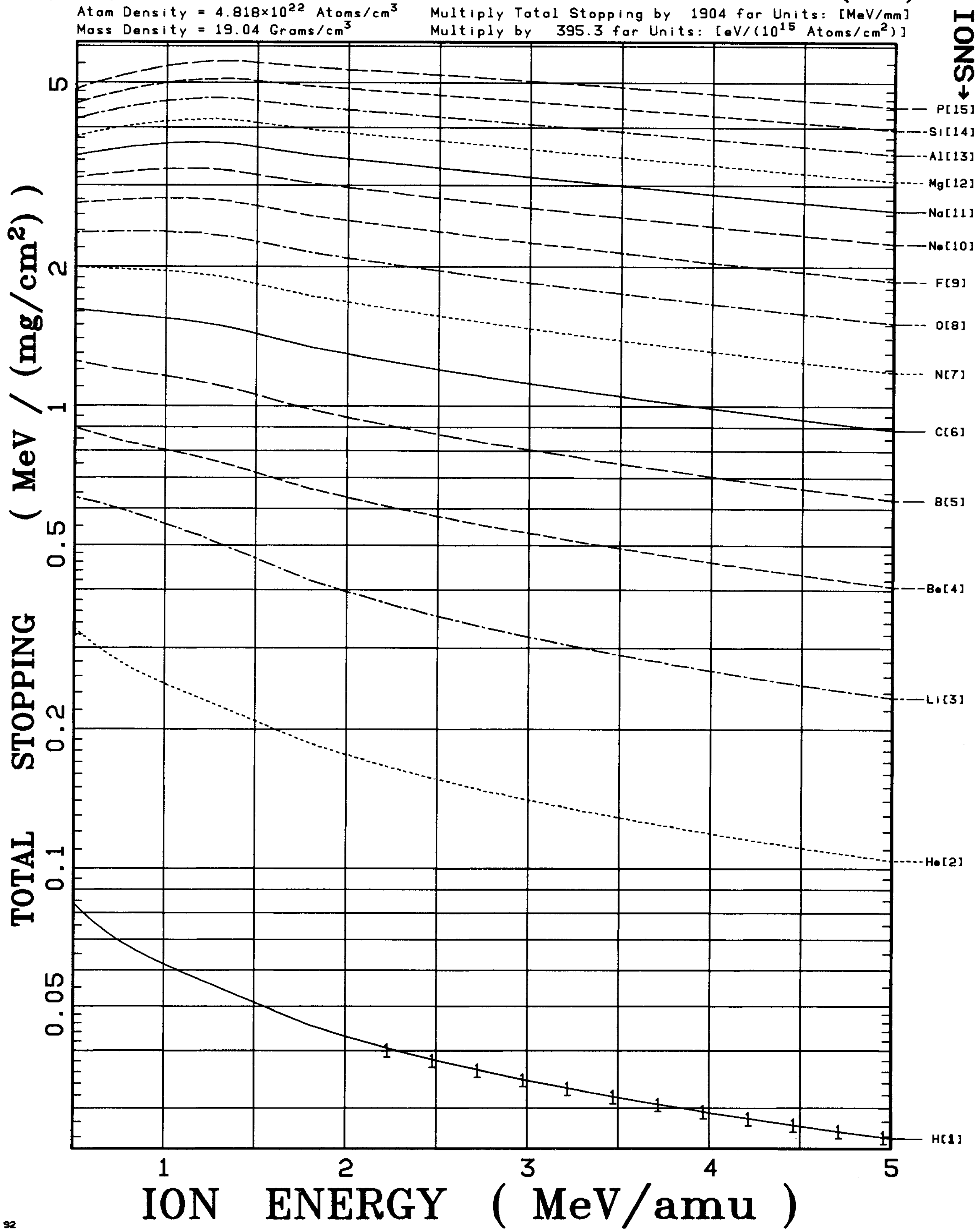
U(92) ←←← TARGET →→→ U(92)

Atom Density = 4.818×10^{22} Atoms/cm^3 Multiply Total Stopping by 1904 for Units: [MeV/mm]
Mass Density = 19.04 Grams/cm^3 Multiply by 395.3 for Units: [eV/(10^{15} Atoms/cm^2)]



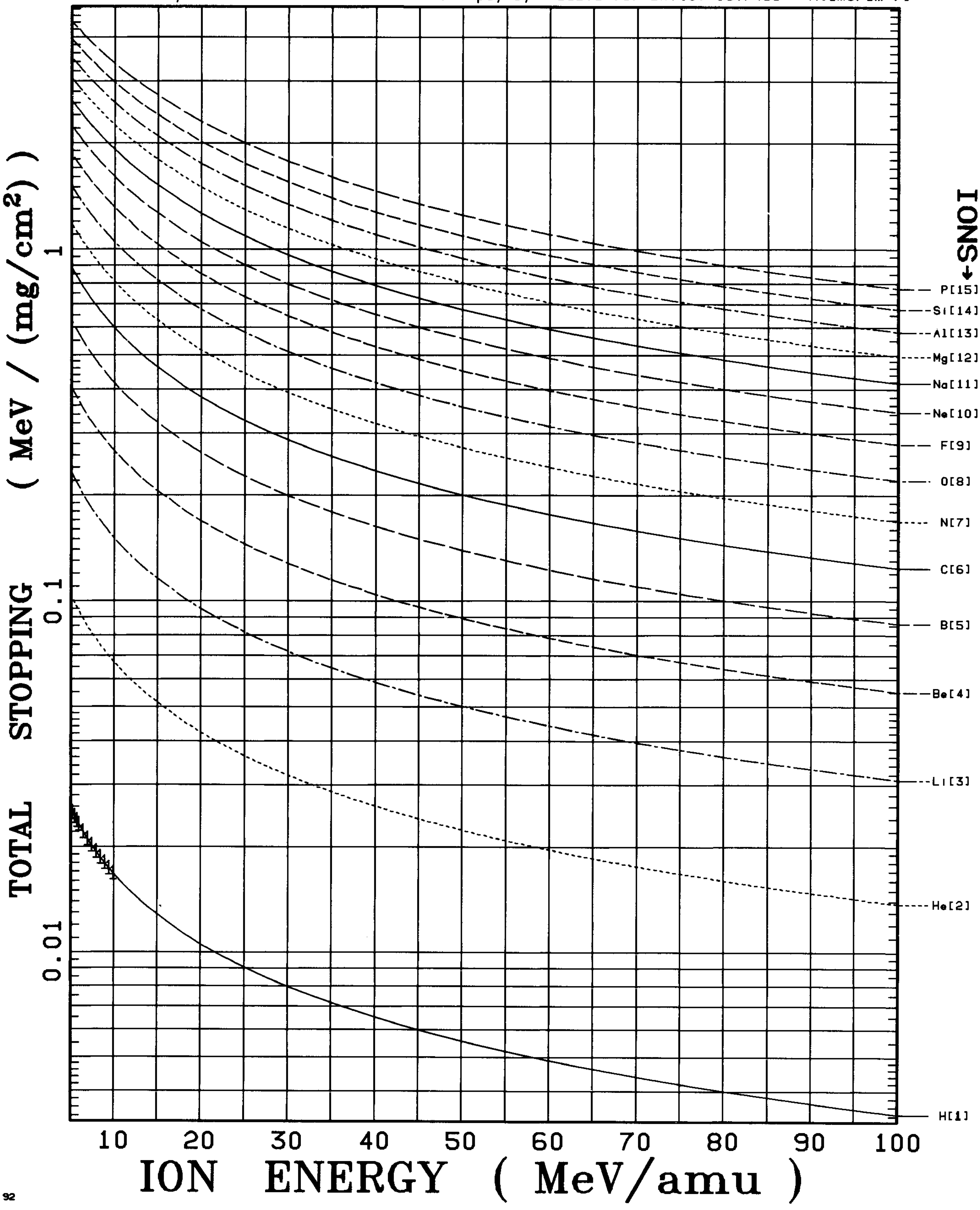
U(92) ←←← TARGET →→→ U(92)

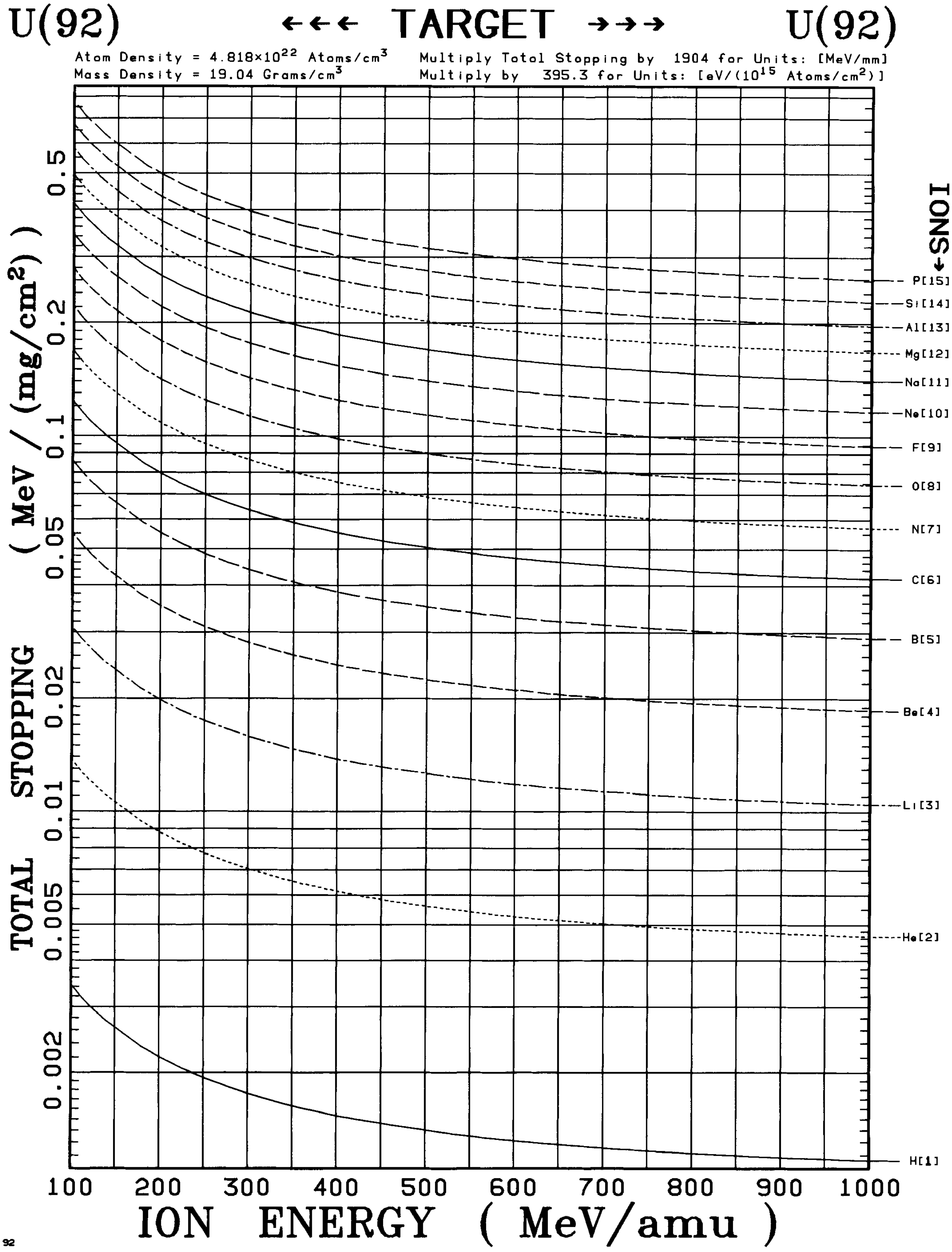
Atom Density = 4.818×10^22 Atoms/cm^3   Multiply Total Stopping by 1904 for Units: [MeV/mm]
Mass Density = 19.04 Grams/cm^3   Multiply by 395.3 for Units: [eV/(10^15 Atoms/cm^2)]

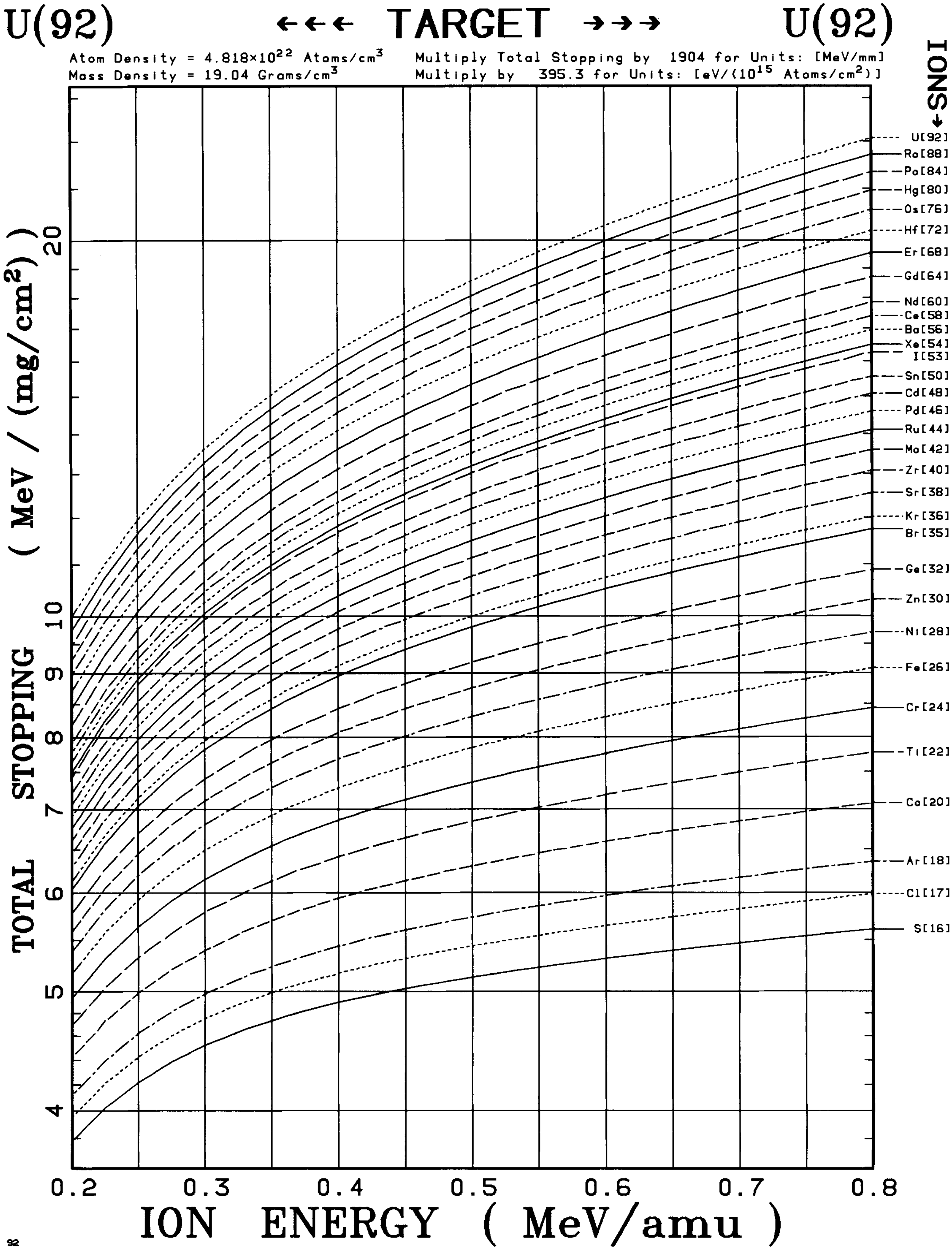


U(92) ←←← TARGET →→→ U(92)

Atom Density = 4.818×10^{22} Atoms/cm^3 Multiply Total Stopping by 1904 for Units: [MeV/mm]
Mass Density = 19.04 Grams/cm^3 Multiply by 395.3 for Units: [eV/(10^{15} Atoms/cm^2)]

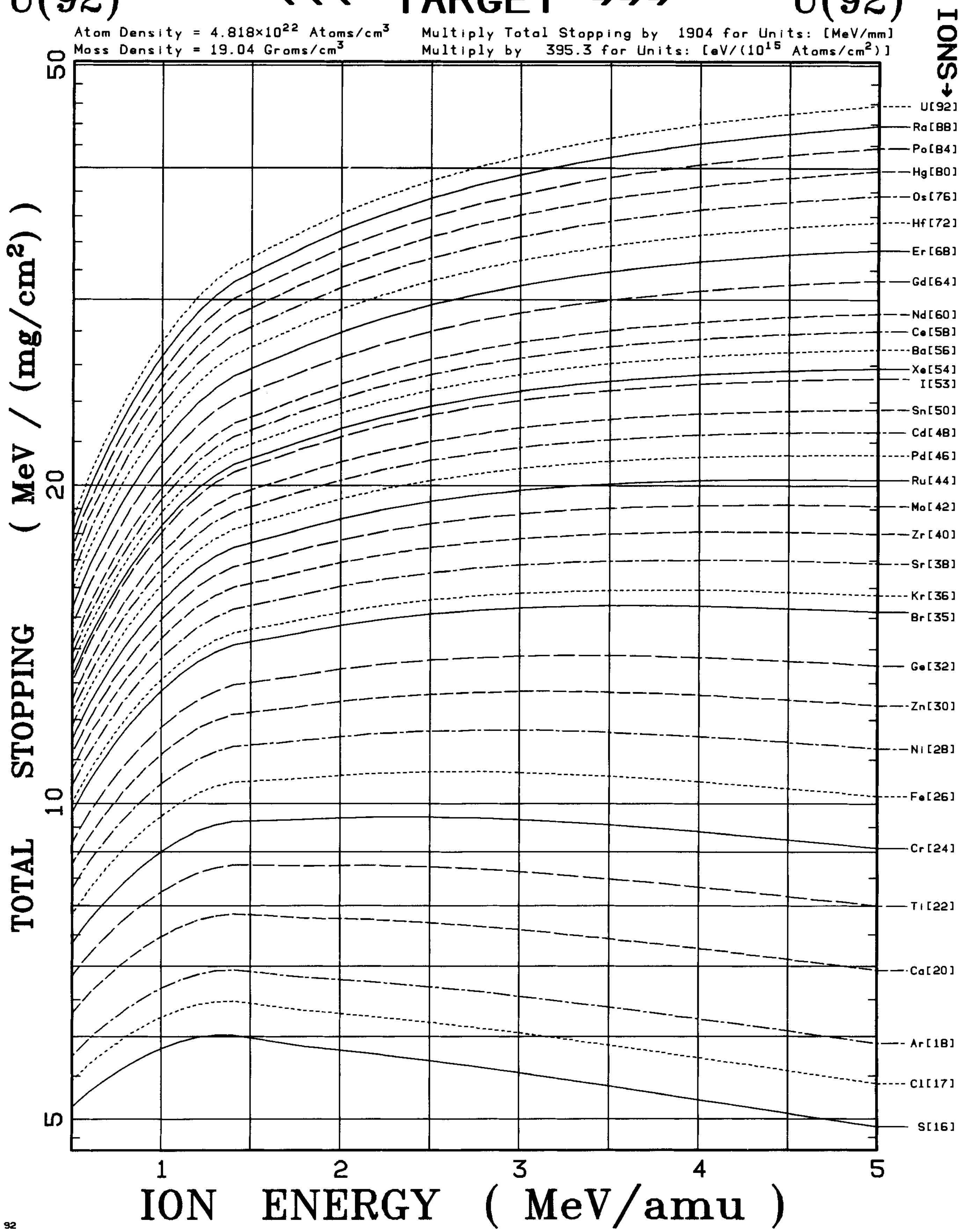



U(92)
←←← TARGET →→→
U(92)
Atom Density = 4.818×10^22 Atoms/cm^3
Mass Density = 19.04 Grams/cm^3
Multiply Total Stopping by 1904 for Units: [MeV/mm]
Multiply by 395.3 for Units: [eV/(10^15 Atoms/cm^2)]
TOTAL STOPPING (MeV / (mg/cm^2))
0.002
0.005
0.01
0.02
0.05
0.1
0.2
0.5
IONS→
P[15]
Si[14]
Al[13]
Mg[12]
Na[11]
Ne[10]
F[9]
O[8]
N[7]
C[6]
B[5]
Be[4]
Li[3]
He[2]
H[1]
100
200
300
400
500
600
700
800
900
1000
ION ENERGY (MeV/amu)


U(92)
←←← TARGET →→→
U(92)
Atom Density = 4.818×10^22 Atoms/cm^3
Mass Density = 19.04 Grams/cm^3
Multiply Total Stopping by 1904 for Units: [MeV/mm]
Multiply by 395.3 for Units: [eV/(10^15 Atoms/cm^2)]
IONS→
U[92]
Ra[88]
Po[84]
Hg[80]
Os[76]
Hf[72]
Er[68]
Gd[64]
Nd[60]
Ce[58]
Ba[56]
Xe[54]
I[53]
Sn[50]
Cd[48]
Pd[46]
Ru[44]
Mo[42]
Zr[40]
Sr[38]
Kr[36]
Br[35]
Ge[32]
Zn[30]
Ni[28]
Fe[26]
Cr[24]
Ti[22]
Ca[20]
Ar[18]
Cl[17]
S[16]
TOTAL STOPPING (MeV / (mg/cm²))
4
5
6
7
8
9
10
20
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ION ENERGY (MeV/amu)

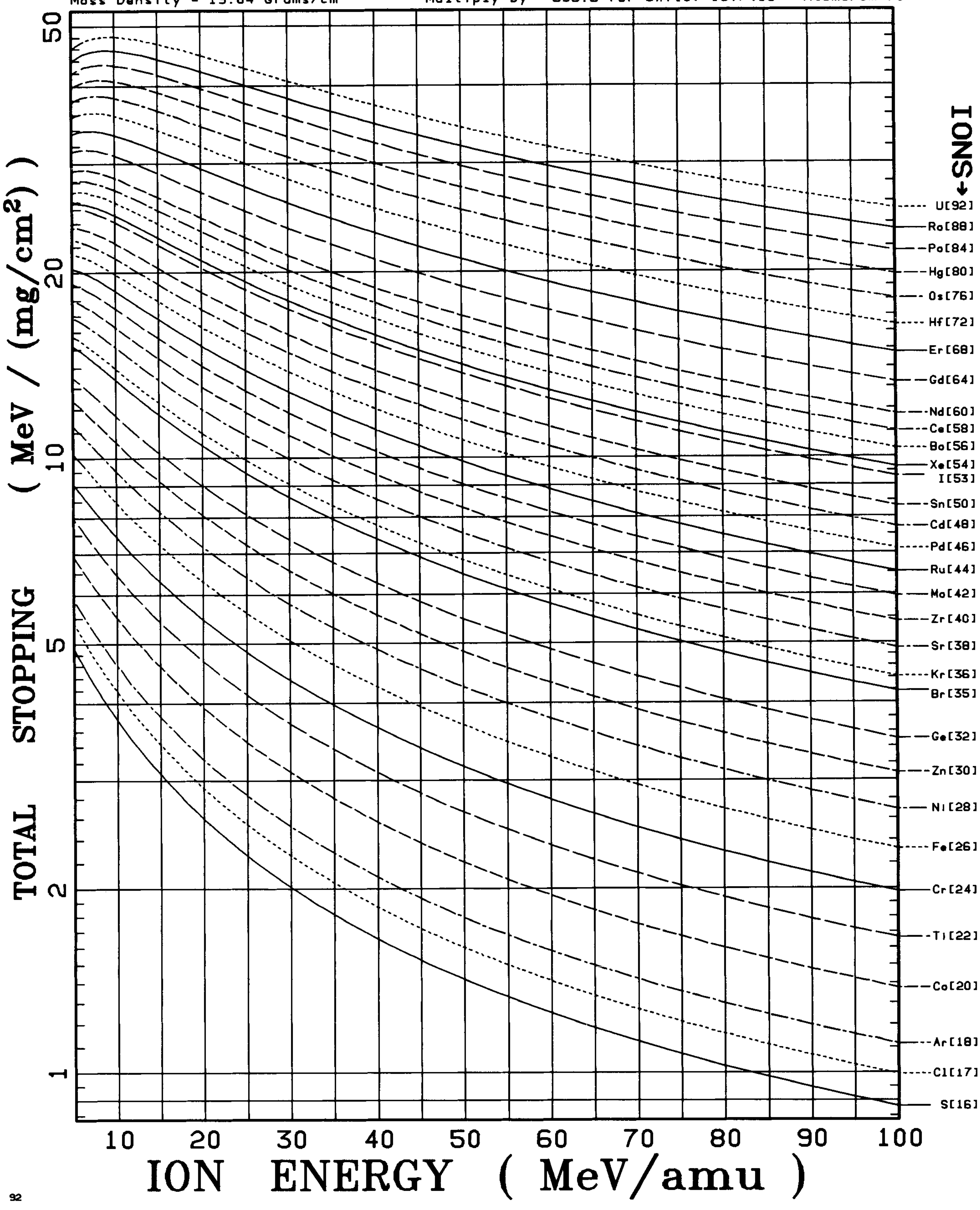
U(92) ←←← TARGET →→→ U(92)

Atom Density = 4.818×10[22] Atoms/cm[3]   Multiply Total Stopping by 1904 for Units: [MeV/mm]
Mass Density = 19.04 Grams/cm[3]   Multiply by 395.3 for Units: [eV/(10[15] Atoms/cm[2])]



U(92) ←←← TARGET →→→ U(92)

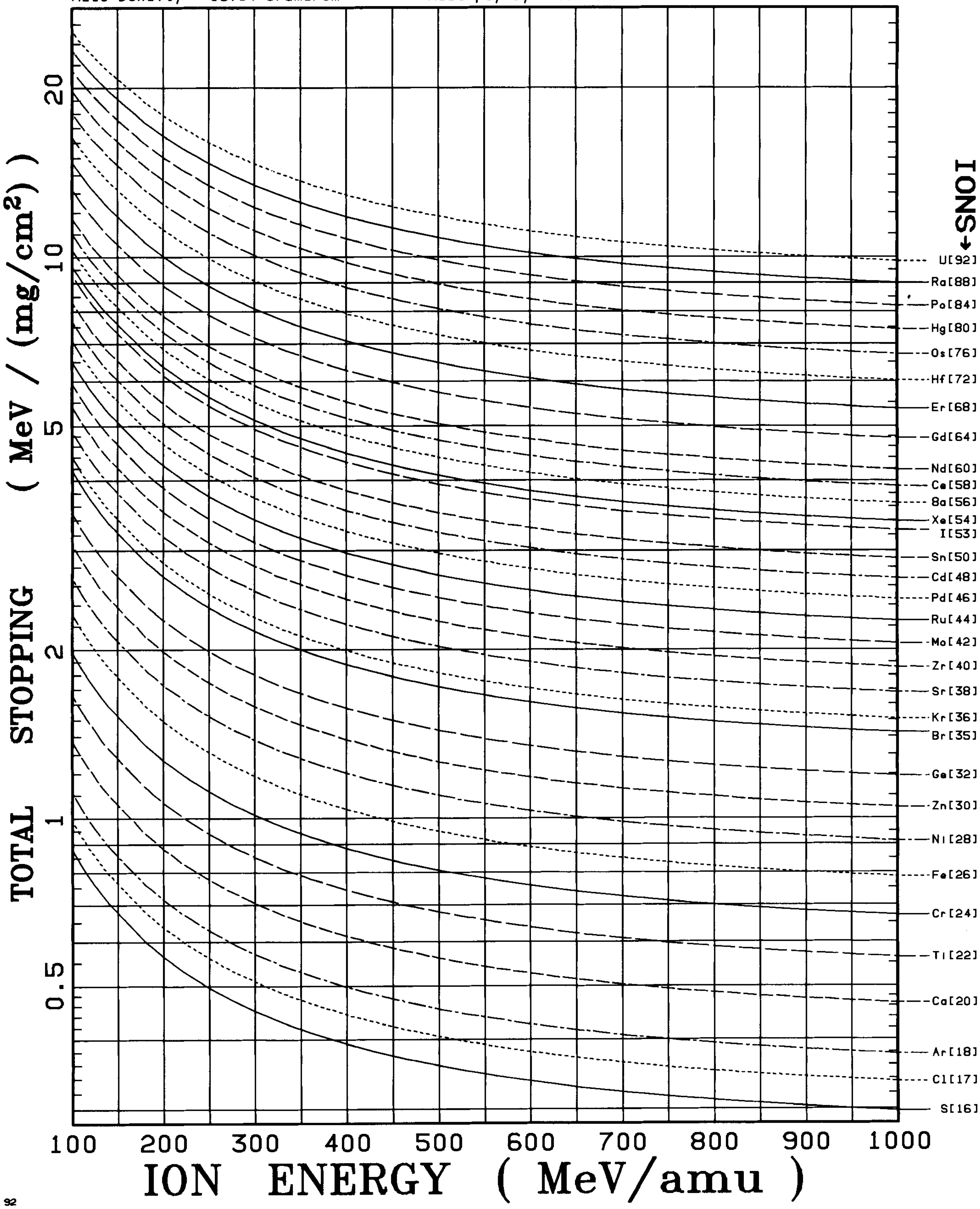
Atom Density = 4.818×10^{22} Atoms/cm^3 Multiply Total Stopping by 1904 for Units: [MeV/mm]
Mass Density = 19.04 Grams/cm^3 Multiply by 395.3 for Units: [eV/(10^{15} Atoms/cm^2)]



U(92) ←←← TARGET →→→ U(92)

Atom Density = 4.818×10^{22} Atoms/cm^3 Multiply Total Stopping by 1904 for Units: [MeV/mm]

Mass Density = 19.04 Grams/cm^3 Multiply by 395.3 for Units: [eV/(10^{15} Atoms/cm^2)]



H[1] — TARGET — H[1]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AK	1953	8	2	
1	1	1	53AN	1953	6		
1	1	1	55AC	1955		1	
1	1	1	75CI	1975	2*	6	
1	1	1	77AQ	1977	6	1	
2	2	4	34AA	1934		*	
2	2	4	62AB	1962		9	13
2	2	4	66AD	1966	5	13	
2	2	4	71AK	1971	13	1	
2	2	4	71AF	1971	9	3	
2	2	4	72AB	1972	4*	7	
2	2	4	73CN	1973	1	6	
2	2	4	75CI	1975	3	1	
2	2	4	77AC	1977	6		
2	2	4	77CP	1977	7	14	
2	2	4	77BU	1977	3	8	
3	3	7	57AF	1957	*	*	
3	3	7	62AK	1962	2*	*	
3	3	6	65BF	1965	5	2	
6	6	12	62AB	1962		6	7
7	7	14	62AK	1962	2*	*	
S	16	32	68BH	1968	4*	17	
C	17	35	68BH	1968	4*	3*	
A	18	40	62AB	1962		2*	6
B	35	79	68BH	1968	2*	*	
I	53	127	68BH	1968	4*	*	

HE[2] — TARGET — HE[2]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AK	1953	8	2	
1	1	1	53AN	1953	6		
1	1	1	55AC	1955		1	
1	1	1	63AR	1963	2		
1	1	1	77AQ	1977	5	1	
2	2	4	34AA	1934		1	
2	2	4	69AN	1969	7*	5*	
2	2	4	71AF	1971	10	3	
2	2	4	71BK	1971	13	1	
2	2	4	72BF	1972		1	
2	2	4	73CN	1973	2*	6*	
2	2	4	77AC	1977	6		
2	2	4	77BR	1977	13*		
2	2	4	77CP	1977	7	14	
3	3	7	62AK	1962	*	*	
3	3	6	65BF	1965	5	2	
S	16	32	68BH	1968	5	16*	
C	17	35	68BH	1968	12*	21*	
B	35	79	68BH	1968	14*	8*	
I	53	127	68BH	1968	15*	6*	

LI[3] — TARGET — LI[3]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AA	1953	1		
1	1	1	56AA	1956	10	8	
2	2	4	28AA	1928		*	

BE[4] — TARGET — BE[4]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	48AC	1948	4	13	
1	1	1	49AK	1949	5		
1	1	1	53AI	1953	*	*	
1	1	1	53AH	1953	12	17	

(CONTINUED)

* SOME DATA POINTS OMITTED FROM PLOT

BE[4] (CONTINUED)

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	56AA	1956	10	13	
1	1	1	61AC	1961		9	
1	1	1	67AC	1967		12	16
1	1	1	77CR	1977			1
2	2	4	69AH	1969	9		
2	2	4	71AJ	1971			1
2	2	4	73CS	1973			1
B	35	81	66AT	1966	9	11	
I	53	127	66AU	1966	13	7	

B[5] — TARGET — B[5]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	62AH	1962	10	18	
2	2	4	62AI	1962	7	8	

C[6] — TARGET — C[6]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	61AL	1961		1	
1	1	1	65AU	1965	5		
1	1	1	67AB	1967	9	59	10
2	2	4	61AK	1961	5		
2	2	4	69AH	1969	18		
2	2	4	71AL	1971	13	1	
2	2	4	72AB	1972	3*	7	
2	2	4	76CA	1976	13	1	
2	2	4	76CA	1976	13	1	
6	6	12	61AJ	1961	5		
8	8	16	61AJ	1961	1		
8	8	16	65AD	1965	5	9	
8	8	16	66AP	1966	3	4*	
N	10	20	61AK	1961	*		
N	10	20	75CM	1975	2	2	
C	17	40	65AD	1965	7	6	
A	18	40	75CM	1975	2		
A	18	40	78BO	1978	2*	8	
T	22	50	78BO	1978	6	10	
B	35	81	66AT	1966	9	11	
K	36	91	76BP	1976		3	
K	36	84	78BO	1978	7	9	
R	37	91	76BP	1976		4	
S	38	94	76BP	1976		1	
Y	39	99	76BP	1976		3	
Z	40	100	76BP	1976	2	8	
N	41	101	76BP	1976	1	3	
I	53	127	64BI	1964	9	6	
I	53	127	66AT	1966	13	7	
I	53	127	67AH	1967		15	
X	54	136	78BO	1978	8	11	
T	73	181	69AS	1969	*	*	
P	82	208	78BO	1978	8	11	
U	92	238	72AT	1972	5		
U	92	238	78BO	1978	10	13	

N[7] — TARGET — N[7]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AK	1953	8	2	
1	1	1	54AC	1954	10	10	
1	1	1	55AC	1955		1	
1	1	3	63AC	1963	11	7	
1	1	1	70AF	1970		13	
1	1	1	75CI	1975	3	6	
1	1	1	77AQ	1977	7	1	
2	2	4	62AB	1962		11	7
2	2	4	66BL	1966	10	7	

(CONTINUED)

N[7] (CONTINUED)

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	68BU	1968	14	16	
2	2	4	71AK	1971	13	1	
2	2	4	71AF	1971	9	3	
2	2	4	75CI	1975	4	2	
2	2	4	77AC	1977	10		
2	2	4	77CP	1977	7	14	
3	3	6	65BF	1965	5	2	
6	6	12	62AB	1962		6	7
7	7	14	75CM	1975	1	1	
N	10	20	75CM	1975	1	1	
S	16	32	68BH	1968	5	33	
C	17	35	68BH	1968	11*	21*	
A	18	40	62AB	1962		5	6
A	18	40	75CM	1975	*		
B	35	79	68BH	1968	16*	7*	
I	53	127	68BH	1968	11*	2*	

O[8] ---TARGET --- O[8]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AK	1953	8	2	
1	1	1	55AC	1955		1	
1	1	1	70AF	1970		13	
1	1	1	75CI	1975	3	6	
1	1	1	77AQ	1977	14	2	
2	2	4	68BU	1968	17	15	
2	2	4	71AK	1971	13	1	
2	2	4	75CI	1975	5	2	
2	2	4	77CP	1977	7	14	
2	2	4	77AC	1977	11		
2	2	4	78AC	1978	3		
5	5	11	60AE	1960		4	6
5	5	10	60AE	1960		4	6
6	6	12	60AE	1960		4	6
7	7	14	60AE	1960		4	6
8	8	16	60AE	1960		4	6
9	9	19	60AE	1960		4	6

F[9] ---TARGET --- F[9]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	72AP	1972	13	1	

NE[10] ---TARGET --- NE[10]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AK	1953	8	2	
1	1	1	54AC	1954	7	9	
1	1	1	55AC	1955		1	
1	1	1	68BT	1968	3		
1	1	1	70AF	1970		13	
1	1	1	71AD	1971	3		
1	1	1	77AQ	1977	5	1	
2	2	4	34AA	1934		1	
2	2	4	71BK	1971	13	1	
2	2	4	71BN	1971		1	
2	2	4	73CN	1973	3	12	
2	2	4	77CP	1977	7	14	
2	2	4	77AC	1977	9		

NA[11] ---TARGET --- NA[11]

*** NO EXPERIMENTAL DATA ***

MG[12] ---TARGET --- MG[12]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	69AH	1969	16		

AL[13] ---TARGET --- AL[13]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	48AD	1948	2		
1	1	1	49AK	1949	5		
1	1	1	53AI	1953	2	4	
1	1	1	53AH	1953	12	17	
1	1	1	56AA	1956	4	1	
1	1	1	61AC	1961		21	
1	1	2	61AC	1961		7	
1	1	3	63AC	1963	11	9	
1	1	1	67AC	1967		12	15
1	1	1	67BI	1967			2
1	1	2	67BI	1967			2
1	1	1	68BQ	1968	2	10	
1	1	1	71AX	1971		1	
1	1	1	71AI	1971			1
1	1	2	71AI	1971			1
1	1	1	73BA	1973		12	28
1	1	1	74BM	1974	3	13	
1	1	1	74AB	1974			1
1	1	1	77CR	1977			1
1	1	1	77AB	1977	1	28	7
2	2	4	13AB	1913		2	
2	2	4	28AA	1928		1	
2	2	4	59AJ	1959	3		
2	2	4	61AK	1961	8	1	
2	2	4	63AZ	1963		*	
2	2	4	66AX	1966	2	10	
2	2	4	68AL	1968			1
2	2	4	69AH	1969	16		
2	2	4	70AH	1970	3*	7	
2	2	4	71AJ	1971			1
2	2	4	73CS	1973			1
2	2	4	75CH	1975		1	
2	2	4	75BG	1975	6		
2	2	4	75CU	1975	22	2	
2	2	4	75BO	1975	3	46	5
2	2	4	75CF	1975			1
2	2	4	76BF	1976	8	1	
2	2	4	77BV	1977	6		
2	2	4	77AB	1977	1	22	3
3	3	7	62AK	1962	6	3	
3	3	7	77AB	1977		12	
6	6	12	61AJ	1961	5		
7	7	14	61AK	1961	8		
7	7	14	62AK	1962	2*	1	
7	7	14	70AD	1970	2*	*	
8	8	16	61AJ	1961	1		
8	8	16	65AD	1965	5	9	
8	8	16	66AP	1966	3	5	
8	8	16	78AH	1978	2	7	
N	10	20	61AK	1961	6		
N	10	20	62AK	1962	*		
N	10	20	73AU	1973		2	
C	17	40	65AD	1965	7	6	
B	35	80	66AU	1966	9	12	
I	53	127	64BI	1964	9	5	
I	53	127	66AU	1966	13	7	
I	53	127	67AH	1967		6	
T	73	181	69AS	1969	15	7	
U	92	238	72AT	1972	8		

* SOME DATA POINTS OMITTED FROM PLOT

SI[14] ←←←TARGET →→→ SI[14]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	77BI	1977	3*		
2	2	4	71BC	1971	10		
2	2	4	72AX	1972	39	47	
2	2	4	73AR	1973	42	12	
2	2	4	73AS	1973		5	6
2	2	4	73AY	1973	53	1	
2	2	4	75CQ	1975	1	1	
2	2	4	77BN	1977			1
6	6	12	73AT	1973		3*	6
7	7	14	73AT	1973		4	6
7	7	14	75CQ	1975	1		
8	8	16	73AT	1973		4*	5

P[15] ←←←TARGET →→→ P[15]

*** NO EXPERIMENTAL DATA ***

S[16] ←←←TARGET →→→ S[16]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	75CI	1975	2	5	

CL[17] ←←←TARGET →→→ CL[17]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	72AP	1972	13	1	

AR[18] ←←←TARGET →→→ AR[18]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AN	1953	4		
1	1	1	53AK	1953	8	2	
1	1	1	54AC	1954	7	9	
1	1	1	55AC	1955		1	
1	1	3	63AC	1963	10	7	
1	1	1	68BT	1968	3		
1	1	1	70AF	1970		13	
1	1	1	71AD	1971	3		
1	1	1	77AQ	1977	6*	3	
2	2	4	34AA	1934		1	
2	2	4	62AB	1962		9	6
2	2	4	66BL	1966	10	7	
2	2	4	69AN	1969	8	6	
2	2	4	70BB	1970	6	16	
2	2	4	71BK	1971	13	1	
2	2	4	71BN	1971		1	
2	2	4	71AF	1971	8	1	
2	2	4	72AL	1972	*	*	
2	2	4	77AC	1977	8		
2	2	4	78AC	1978	3		
3	3	7	62AK	1962	3*	*	
3	3	7	69AZ	1969	2	8	
4	4	9	69AZ	1969	2	8	
5	5	1	69AZ	1969			*
6	6	12	62AB	1962		6	7
6	6	12	69AZ	1969	1	8	
7	7	14	62AK	1962	4	1	
7	7	14	69AZ	1969	2	7	
8	8	16	69AZ	1969	2	7	
N	10	20	75CM	1975	1	1	
N	11	23	69AZ	1969	1	1	
A	13	27	69AZ	1969		2	
S	16	32	68BH	1968	10*	24*	
C	17	35	68BH	1968	15	23	
A	18	40	62AB	1962		5	6

(CONTINUED)

* SOME DATA POINTS OMITTED FROM PLOT

AR[18] (CONTINUED)

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
A	18	40	75CM	1975	1		
B	35	79	68BH	1968	18*	8*	
I	53	127	68BH	1968	10*	*	

K[19] ←←←TARGET →→→ K[19]

*** NO EXPERIMENTAL DATA ***

CA[20] ←←←TARGET →→→ CA[20]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	56AA	1956	4	1	
1	1	1	67AB	1967	10	60	9
1	1	1	68BJ	1968		12	16
C	20	40	69AR	1969	3		

SC[21] ←←←TARGET →→→ SC[21]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	68BJ	1968		12	16

TI[22] ←←←TARGET →→→ TI[22]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	68BJ	1968		12	16
1	1	1	72BC	1972	2	5	
1	1	1	74AB	1974			1
1	1	1	77CR	1977			1
2	2	4	69AH	1969	9	1	
2	2	4	73CS	1973			1
2	2	4	73BC	1973	2	2	
2	2	4	75BB	1975	4		
2	2	4	75CF	1975			1
2	2	4	76BN	1976	12		
7	7	14	75CG	1975	4	1	
9	9	18.99	76AP	1976	4	9	
M	12	24	76AP	1976	4	9	
A	13	27	76AP	1976	3	8	
S	16	32	76AP	1976	4	9	
C	17	35	76AP	1976	4	9	

V[23] ←←←TARGET →→→ V[23]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	56AA	1956	4	1	
1	1	1	68BJ	1968		12	16
1	1	1	68AD	1968	1	3	
1	1	1	77CR	1977			1
2	2	4	69AH	1969	9		
2	2	4	73CS	1973			1
2	2	4	73BC	1973	2	2	
2	2	4	73AI	1973	1	1	

CR[24] ←←←TARGET →→→ CR[24]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	56AA	1956	4	1	
1	1	1	68BJ	1968		12	16
2	2	4	69AH	1969	10	1	
2	2	4	76BN	1976	10		

MN[25] ←←←TARGET →→→ MN[25]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	55AE	1955	9	10	
1	1	1	56AA	1956	4	1	
1	1	1	68BJ	1968		12	16
2	2	4	69AH	1969	13		

FE[26] ←←←TARGET →→→ FE[26]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	56AA	1956	4	1	
1	1	1	68BJ	1968		12	16
1	1	1	74AB	1974			1
1	1	1	77CR	1977			1
2	2	4	28AA	1928		1	
2	2	4	69AH	1969	9		
2	2	4	73CS	1973			1
2	2	4	73AI	1973	1	1	
2	2	4	75CF	1975			1
2	2	4	77AD	1977	21	7	
9	9	19	76AP	1976	3	8	
M	12	24	76AP	1976	4	9	
A	13	27	76AP	1976	3	8	
S	16	32	76AP	1976	4	9	
C	17	35	76AP	1976	4	9	

CO[27] ←←←TARGET →→→ CO[27]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	56AA	1956	4	1	
1	1	1	68BJ	1968		12	16
1	1	1	77CR	1977			1
2	2	4	69AH	1969	9		
2	2	4	73CS	1973			1
2	2	4	76BN	1976	13		

NI[28] ←←←TARGET →→→ NI[28]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	54AC	1954	7	18	
1	1	1	56AA	1956	4	1	
1	1	1	61AC	1961		21	
1	1	2	61AC	1961		7	
1	1	3	63AC	1963	11	9	
1	1	1	68BJ	1968		12	16
1	1	2	71AI	1971			1
1	1	1	71AI	1971			1
1	1	1	72AU	1972	1		
1	1	1	77CR	1977			1
2	2	4	28AA	1928		1	
2	2	4	59AJ	1959	3		
2	2	4	60AE	1960	1	19	6
2	2	4	61AK	1961	8	1	
2	2	4	63AZ	1963		*	
2	2	4	66AX	1966	1	10	
2	2	4	69AH	1969	9		
2	2	4	70AH	1970	4	8	
2	2	4	72AD	1972	1	13	
2	2	4	72AD	1972	1	12	
2	2	4	73CS	1973			1
2	2	4	73BC	1973	2	2	
2	2	4	75BG	1975	7		
2	2	4	75CF	1975			1
2	2	4	77AD	1977	17	5	
3	3	7	62AK	1962	6	3	
5	5	11	60AE	1960		5	6
5	5	10	60AE	1960		5	6

(CONTINUED)

* SOME DATA POINTS OMITTED FROM PLOT

NI[28] (CONTINUED)

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
5	5	11	65AM	1965	2	3*	
6	6	12	60AE	1960		5	6
6	6	12	61AJ	1961	5		
7	7	14	60AE	1960		5	6
7	7	14	61AK	1961	8		
7	7	14	65AM	1965	2	4	
7	7	14	75CG	1975	5	1	
8	8	16	60AE	1960		5	6
8	8	16	61AJ	1961	1		
8	8	16	65AD	1965	5	9	
8	8	16	66AP	1966	2	5	
8	8	16	72AD	1972	1	9	
8	8	16	74AR	1974	3	9	
8	8	16	75AU	1975	2	4	
9	9	19	60AE	1960		5	6
9	9	19	75AU	1975	1	2	
9	9	19	76AP	1976	3	8	
N	10	20	60AE	1960		5	6
N	10	20	61AK	1961	6		
M	12	24	76AP	1976	4	9	
A	13	27	76AP	1976	3	8	
S	16	32	76AP	1976	4	9	
C	17	40	65AD	1965	7	6	
C	17	35	72AD	1972	4	9	
C	17	35	76AP	1976	4	9	
B	35	80	66AT	1966	9	12	
Z	40	91	75DD	1975		3	
N	41	93	75DD	1975		4	
M	42	96	75DD	1975		4	
T	43	99	75DD	1975		5	
R	44	101	75DD	1975		4	
R	45	103	75DD	1975		3	
I	53	127	64BI	1964	9	6	
I	53	127	66AT	1966	13	7	
I	53	127	67AH	1967		6	
I	53	127	75DD	1975	1*	1*	
X	54	131	75DD	1975	1*	1*	
C	55	133	75DD	1975	4*	4*	
B	56	137	75DD	1975	2*	2*	
L	57	139	75DD	1975	2*	1*	
C	58	140	75DD	1975	1*	1	
U	92	238	72AT	1972	11		

CU[29] ←←←TARGET →→→ CU[29]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	49AK	1949	4		
1	1	1	53AI	1953	2	4	
1	1	1	53AH	1953	12	17	
1	1	1	54AC	1954	5	9	
1	1	1	55AE	1955	9	10	
1	1	1	56AA	1956	8	2	
1	1	1	56AA	1956	4	1	
1	1	1	56AA	1956	4	1	
1	1	1	61AC	1961		21	
1	1	2	61AC	1961		10	
1	1	1	67AC	1967		12	16
1	1	1	71AI	1971			1
1	1	2	71AI	1971			1
1	1	1	72AU	1972	1		
1	1	1	73BA	1973		12	28
1	1	1	74AB	1974			1
1	1	1	77AB	1977		25	11
1	1	1	77CR	1977			1
2	2	4	13AB	1913		2	
2	2	4	28AA	1928		1	
2	2	4	67AZ	1967			
2	2	4	68BL	1968	25	17	
2	2	4	68AL	1968			*
2	2	4	69AH	1969	9		
2	2	4	71AJ	1971			1

(CONTINUED)

CU[29] (CONTINUED)

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	73CS	1973			1
2	2	4	75CF	1975			1
2	2	4	75CH	1975		1	
2	2	4	76BF	1976	8	1	
2	2	4	76BN	1976	13		
2	2	4	77AB	1977		19	
3	3	7	77AB	1977		7	
9	9	19	76AP	1976	3	8	
M	12	24	76AP	1976	4	9	
A	13	27	76AP	1976	3	8	
S	16	32	76AP	1976	4	9	
C	17	35	76AP	1976	4	9	

ZN[30] ←→TARGET ←→ ZN[30]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	56AA	1956	4	1	
1	1	1	68BJ	1968		12	16
1	1	1	68BQ	1968	2	10	
1	1	1	77CR	1977			1

GA[31] ←→TARGET ←→ GA[31]

*** NO EXPERIMENTAL DATA ***

GE[32] ←→TARGET ←→ GE[32]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	55AE	1955	9	10	
1	1	1	69AM	1969	9	60	5
1	1	1	76CA	1976	2		
2	2	4	69AH	1969	8*		
2	2	4	72AD	1972		7	
2	2	4	72AD	1972	1	14	
2	2	4	72AD	1972	1	13	
2	2	4	73AI	1973	1	1	
2	2	4	73AY	1973	74	4	
7	7	14	75CG	1975	6	1	
8	8	16	72AD	1972	1	9	
C	17	35	72AD	1972	4	9	

AS[33] ←→TARGET ←→ AS[33]

*** NO EXPERIMENTAL DATA ***

SE[34] ←→TARGET ←→ SE[34]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	55AE	1955	9	10	
1	1	1	71AX	1971	1	3	
1	1	1	76CA	1976	2		
2	2	4	70AH	1970	5	7	
2	2	4	73BB	1973	13	1	
7	7	14	70AH	1970	4	1	

BR[35] ←→TARGET ←→ BR[35]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	72AP	1972	13	1	

KR[36] ←→TARGET ←→ KR[36]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AK	1953	8	2	
1	1	1	54AC	1954	7	9	
1	1	1	55AC	1955		1	
1	1	3	63AC	1963	9	6	
1	1	1	68BT	1968	3		
1	1	1	70AF	1970		8	
1	1	1	71AD	1971	3		
1	1	1	77AQ	1977	9	5	
2	2	4	66BL	1966	10	7	
2	2	4	71BK	1971	13	1	
2	2	4	71BN	1971		1	
2	2	4	77CP	1977	7	14	
2	2	4	77AC	1977	9		
S	16	32	68BH	1968	6*	19*	
B	35	79	68BH	1968	13*	10*	
I	53	127	68BH	1968	18*	4*	

RB[37] ←→TARGET ←→ RB[37]

*** NO EXPERIMENTAL DATA ***

SR[38] ←→TARGET ←→ SR[38]

*** NO EXPERIMENTAL DATA ***

Y[39] ←→TARGET ←→ Y[39]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	72AD	1972	1	14	
2	2	4	72AD	1972	1	13	
2	2	4	73BB	1973	13	1	
8	8	16	72AD	1972	1	9	
C	17	35	72AD	1972	4	9	

ZR[40] ←→TARGET ←→ ZR[40]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	69AX	1969		12	16
2	2	4	73BB	1973	13	1	

NB[41] ←→TARGET ←→ NB[41]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	73BB	1973	13	1	

MO[42] ←→TARGET ←→ MO[42]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	72BC	1972	2	5	
1	1	1	72AZ	1972		6	1
1	1	1	74AB	1974			1
1	1	1	77CR	1977			1
2	2	4	71AJ	1971			1
2	2	4	73BB	1973	13	1	
2	2	4	73AI	1973	1	1	
2	2	4	73CS	1973			1
2	2	4	73BC	1973	2	2	
2	2	4	75CF	1975			1
2	2	4	75BB	1975	4		

* SOME DATA POINTS OMITTED FROM PLOT

TC[43] ---TARGET--- TC[43]

*** NO EXPERIMENTAL DATA ***

RU[44] ---TARGET--- RU[44]

*** NO EXPERIMENTAL DATA ***

RH[45] ---TARGET--- RH[45]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	2	71AI	1971			1
1	1	1	71AI	1971			1
1	1	1	77CR	1977			1
2	2	4	73CS	1973			1

PD[46] ---TARGET--- PD[46]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	76CA	1976	2		
2	2	4	28AA	1928		1	
2	2	4	69AH	1969	12	1	

AG[47] ---TARGET--- AG[47]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	49AK	1949	*		
1	1	1	53AI	1953	2	4	
1	1	1	55AE	1955	9	10	
1	1	2	61AK	1961	7	1	
1	1	1	61AC	1961		15	
1	1	2	61AC	1961		10	
1	1	1	67AC	1967		12	16
1	1	1	68BI	1968		1	
1	1	2	71AI	1971			1
1	1	1	71AX	1971		2	
1	1	1	71AI	1971			1
1	1	1	72AZ	1972		6	1
1	1	1	72AU	1972	1		
1	1	1	73BA	1973		11	28
1	1	1	74AB	1974			1
1	1	1	76CA	1976	2		
1	1	1	77CR	1977			1
1	1	1	77AB	1977	1	28	7
2	2	4	28AA	1928		1	
2	2	4	59AJ	1959	3		
2	2	4	61AK	1961	8	1	
2	2	4	66AX	1966	2	7	
2	2	4	68AL	1968			1
2	2	4	69AH	1969	9		
2	2	4	70AH	1970	6	7	
2	2	4	72AD	1972		7	
2	2	4	72AD	1972	1	13	
2	2	4	72AD	1972	1	14	
2	2	4	72AD	1972		28	
2	2	4	73CS	1973			1
2	2	4	74BS	1974	13	1	
2	2	4	75BO	1975	5	71	
2	2	4	75CF	1975			1
2	2	4	75CH	1975		1	
2	2	4	75BB	1975	4		
2	2	4	76BN	1976	15		
2	2	4	77AB	1977	1	22	
3	3	7	62AK	1962	6	3	
3	3	7	77AB	1977		10	
5	5	11	65AM	1965	2	4	
6	6	12	61AJ	1961	5		
7	7	14	61AK	1961	4		
7	7	14	62AK	1962	2		
7	7	14	65AM	1965	2	4	

(CONTINUED)

* SOME DATA POINTS OMITTED FROM PLOT

AG[47] (CONTINUED)

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
7	7	14	75CG	1975	8	1	
8	8	16	61AJ	1961	1		
8	8	16	65AD	1965	5	9	
8	8	16	66AP	1966	2	5	
8	8	16	68AI	1968	1	5	
8	8	16	72AD	1972	1	9	
9	9	19	76AP	1976	3	8	
N	10	20	61AK	1961	6		
M	12	24	76AP	1976	4	9	
A	13	27	76AP	1976	3	8	
S	16	32	66AP	1966	1*	1	
S	16	32	76AP	1976	4	4	
C	17	40	65AD	1965	7	6	
C	17	35	72AD	1972	4	9	
C	17	35	76AP	1976	4	9	
B	35	80	66AU	1966	9	12	
I	53	127	66AU	1966	13	7	
I	53	127	67AH	1967		8	
T	73	181	69AS	1969	4		
U	92	238	72AT	1972	9		

CD[48] ---TARGET--- CD[48]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	28AA	1928		1	

IN[49] ---TARGET--- IN[49]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	68BQ	1968	2	10	
2	2	4	69AH	1969	13		

SN[50] ---TARGET--- SN[50]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	55AE	1955	9	10	
1	1	1	72AU	1972	1		
1	1	1	74AB	1974			1
1	1	1	77CR	1977			1
2	2	4	28AA	1928		1	
2	2	4	65BD	1965			1
2	2	4	69AH	1969	15		

SB[51] ---TARGET--- SB[51]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	55AE	1955	9	10	
1	1	1	76CA	1976	2		
2	2	4	73BB	1973	13	1	
2	2	4	73AI	1973	1	1	
7	7	14	74AF	1974	4*	1*	

TE[52] ---TARGET--- TE[52]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	73BB	1973	13	1	
2	2	4	73AI	1973	1	1	

I[53] ←→ TARGET ←→ I[53]

PLOT SYMB	ION Z1	M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	72AP	1972	13	1	

XE[54] ←→ TARGET ←→ XE[54]

PLOT SYMB	ION Z1	M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	53AK	1953	8	2	
1	1	1	54AC	1954	7	7	
1	1	1	55AC	1955		1	
1	1	3	63AC	1963	8	7	
1	1	1	77AQ	1977	6	5	
2	2	4	71BK	1971	13	1	
2	2	4	77AC	1977	7		
2	2	4	77CP	1977	7	14	

CS[55] ←→ TARGET ←→ CS[55]

*** NO EXPERIMENTAL DATA ***

BA[56] ←→ TARGET ←→ BA[56]

*** NO EXPERIMENTAL DATA ***

LA[57] ←→ TARGET ←→ LA[57]

PLOT SYMB	ION Z1	M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	73BB	1973	13	1	

CE[58] ←→ TARGET ←→ CE[58]

PLOT SYMB	ION Z1	M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	72AZ	1972		*	

PR[59] ←→ TARGET ←→ PR[59]

*** NO EXPERIMENTAL DATA ***

ND[60] ←→ TARGET ←→ ND[60]

PLOT SYMB	ION Z1	M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
K	36	84	76BM	1976		7	
N	60	142	76BM	1976	3	7	

PM[61] ←→ TARGET ←→ PM[61]

*** NO EXPERIMENTAL DATA ***

SM[62] ←→ TARGET ←→ SM[62]

*** NO EXPERIMENTAL DATA ***

EU[63] ←→ TARGET ←→ EU[63]

PLOT SYMB	ION Z1	M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	73BD	1973	4	1	

GD[64] ←→ TARGET ←→ GD[64]

PLOT SYMB	ION Z1	M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	69AX	1969		12	16
2	2	4	73AI	1973	1	1	

TB[65] ←→ TARGET ←→ TB[65]

PLOT SYMB	ION Z1	M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	68AL	1968			*

DY[66] ←→ TARGET ←→ DY[66]

PLOT SYMB	ION Z1	M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	73BB	1973	13	1	
K	36	84	76BM	1976		7	
D	66	163	76BM	1976	3	6	

HO[67] ←→ TARGET ←→ HO[67]

*** NO EXPERIMENTAL DATA ***

ER[68] ←→ TARGET ←→ ER[68]

PLOT SYMB	ION Z1	M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	76AE	1976	3	5	
2	2	4	76AE	1976	12	3	
K	36	84	76BM	1976		7	
E	68	167	76BM	1976	3	6	

TM[69] ←→ TARGET ←→ TM[69]

PLOT SYMB	ION Z1	M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	68AL	1968			1

YB[70] ←→ TARGET ←→ YB[70]

PLOT SYMB	ION Z1	M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	72AZ	1972		*	

LU[71] ←→ TARGET ←→ LU[71]

*** NO EXPERIMENTAL DATA ***

HF[72] ←→ TARGET ←→ HF[72]

PLOT SYMB	ION Z1	M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	73AI	1973	1	1	

TA[73] ←→ TARGET ←→ TA[73]

PLOT SYMB	ION Z1	M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	56AA	1956	4	1	
1	1	1	69AX	1969		12	16
1	1	1	72BC	1972	2	5	
1	1	1	72AZ	1972		3*	1
1	1	1	74AB	1974			1
1	1	1	77CR	1977			1
2	2	4	71AJ	1971			1
2	2	4	73BB	1973	13	1	
2	2	4	73CS	1973			1
2	2	4	73BC	1973	2	2	
2	2	4	73AI	1973	1	1	
2	2	4	75CF	1975			1
2	2	4	75CH	1975		1	
2	2	4	75BB	1975	4		

* SOME DATA POINTS OMITTED FROM PLOT

V[74] ←←←TARGET →→→ V[74]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	72AZ	1972		6	1
1	1	1	72BC	1972	2	5	
2	2	4	72AZ	1972	3	15	3*
2	2	4	73AI	1973	1	1	
2	2	4	73BB	1973	13	1	
2	2	4	74AE	1974	12		
2	2	4	75BB	1975	4		
7	7	14	75CG	1975	10	1	

RE[75] ←←←TARGET →→→ RE[75]

*** NO EXPERIMENTAL DATA ***

OS[76] ←←←TARGET →→→ OS[76]

*** NO EXPERIMENTAL DATA ***

IR[77] ←←←TARGET →→→ IR[77]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	73AI	1973	1	1	

PT[78] ←←←TARGET →→→ PT[78]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	67AC	1967		12	16
1	1	1	71AI	1971			1
1	1	2	71AI	1971			1
1	1	1	77CR	1977			1
2	2	4	28AA	1928		1	
2	2	4	73AI	1973	1	1	
2	2	4	73BK	1973	25		
2	2	4	76AF	1976	6		
2	2	4	76AF	1976	54		
2	2	4	77BR	1977	9		
2	2	4	77BV	1977	9		

AU[79] ←←←TARGET →→→ AU[79]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	48AD	1948	*		
1	1	2	48AD	1948	3*		
1	1	1	49AG	1949	2	3	
1	1	1	49AK	1949	*		
1	1	1	53AI	1953	2	4	
1	1	1	53AH	1953	8*	15	
1	1	1	55AE	1955	9	10	
1	1	1	56AA	1956	8	2	
1	1	1	61AC	1961		25	
1	1	2	61AC	1961		5	
1	1	1	67AC	1967		12	16
1	1	1	67AB	1967	10	59	9
1	1	1	71AI	1971			1
1	1	2	71AI	1971			1
1	1	1	72AU	1972	1		
1	1	1	73BA	1973		12	28
1	1	1	74AB	1974			1
1	1	1	77CR	1977			1
1	1	1	77CJ	1977		2	
1	1	1	77AB	1977	1	22	11
1	1	1	78BF	1978	4	2	
2	2	4	13AB	1913		2	
2	2	4	28AA	1928		1	
2	2	4	48AD	1948	7		
2	2	4	59AJ	1959	3		
2	2	4	61AK	1961	8	1	

(CONTINUED)

* SOME DATA POINTS OMITTED FROM PLOT

AU[79] (CONTINUED)

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
2	2	4	62AO	1962		3	
2	2	4	63AZ	1963		8	
2	2	4	65BD	1965			1
2	2	4	66AX	1966	1	7	
2	2	4	68BL	1968	16*	17	
2	2	4	68AL	1968			1
2	2	4	70AH	1970	5	8	
2	2	4	71AJ	1971			1
2	2	4	72AM	1972	11		
2	2	4	72AD	1972	1	14	
2	2	4	72AD	1972	1	13	
2	2	4	73BB	1973	13	1	
2	2	4	73CS	1973			1
2	2	4	73AI	1973	1	1	
2	2	4	74BS	1974	13	1	
2	2	4	75CF	1975			1
2	2	4	75BG	1975	10		
2	2	4	76AF	1976	22		
2	2	4	77CJ	1977		2	
2	2	4	77BV	1977	3		
2	2	4	77AB	1977		16	
3	3	7	62AK	1962	6	3	
3	3	7	77CJ	1977		2	
3	3	7	77AB	1977		6	
5	5	11	65AM	1965	2	4	
5	5	11	77CJ	1977		2	
6	6	12	61AJ	1961	5		
6	6	12	77CJ	1977		1	
7	7	14	61AK	1961	4		
7	7	14	62AK	1962	1		
7	7	15	63AF	1963	3		
7	7	15	65AW	1965	1		
7	7	14	65AM	1965	2	4	
7	7	14	75CG	1975	10	1	
7	7	14	77CJ	1977		1	
8	8	16	61AJ	1961	1		
8	8	16	65AD	1965	5	9	
8	8	16	66AP	1966	2	5	
8	8	16	68AI	1968	1	5	
8	8	16	72AD	1972	1	9	
8	8	16	74AR	1974	3	9	
8	8	16	75AU	1975	2	4	
8	8	16	77CJ	1977		1	
9	9	19	76AP	1976	3	8	
9	9	19	77CJ	1977		1	
N	10	20	61AK	1961	6		
M	12	24	76AP	1976	4	9	
A	13	27	76AP	1976	3	8	
S	16	32	66AP	1966	*	*	
S	16	32	68AI	1968	2	5	
S	16	32	75AU	1975	2	2	
S	16	32	76AP	1976	4	9	
C	17	40	65AD	1965	7	6	
C	17	35	72AD	1972	4	9	
C	17	35	76AP	1976	4	9	
B	35	80	66AT	1966	9	12	
B	35	80	72AT	1972	19	10	
I	53	127	64BI	1964	8*	4*	
I	53	127	66AU	1966	13	7	
I	53	127	67AH	1967		4*	
I	53	127	70AA	1970	4		
I	53	127	72AT	1972	14	6	
T	73	181	69AS	1969	3*	*	
U	92	238	72AT	1972	7		

HG[80] ←←←TARGET →→→ HG[80]

*** NO EXPERIMENTAL DATA ***

TL[81] ←→TARGET ←→ TL[81]

*** NO EXPERIMENTAL DATA ***

PB[82] ←→TARGET ←→ PB[82]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	55AE	1955	9	10	
1	1	1	56AA	1956	4	1	
1	1	1	56AA	1956	8	2	
1	1	1	72AZ	1972		6	1
1	1	1	73BA	1973		12	28
2	2	4	28AA	1928		1	
2	2	4	73AI	1973	1	1	
2	2	4	74AE	1974	11		

BI[83] ←→TARGET ←→ BI[83]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	55AE	1955	9	10	
1	1	1	76CA	1976	2		
2	2	4	74AE	1974	10		

PO[84] ←→TARGET ←→ PO[84]

*** NO EXPERIMENTAL DATA ***

AT[85] ←→TARGET ←→ AT[85]

*** NO EXPERIMENTAL DATA ***

RN[86] ←→TARGET ←→ RN[86]

*** NO EXPERIMENTAL DATA ***

FR[87] ←→TARGET ←→ FR[87]

*** NO EXPERIMENTAL DATA ***

RA[88] ←→TARGET ←→ RA[88]

*** NO EXPERIMENTAL DATA ***

AC[89] ←→TARGET ←→ AC[89]

*** NO EXPERIMENTAL DATA ***

TH[90] ←→TARGET ←→ TH[90]

*** NO EXPERIMENTAL DATA ***

PA[91] ←→TARGET ←→ PA[91]

*** NO EXPERIMENTAL DATA ***

U[92] ←→TARGET ←→ U[92]

PLOT SYMB	ION Z1	ION M1	REF NUMB	PUB YEAR	NUMB PLOTTED POINTS IN ENERGY REGION 0.2-0.8	0.5-5.0	5.0-100
1	1	1	73BA	1973		12	28

* SOME DATA POINTS OMITTED FROM PLOT

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