Since proton and α-particle of energy 20 MeV are obviously non-relativistic we can use formula (6.3) for the stopping power

$$S(T) \; = \; \frac{4\pi Q^2 e^2 \rho A_0 Z}{m_e A \beta^2 c^2} \ln \frac{2m_e \beta^2 c^2}{\bar{I}}$$

where $\bar{I} \;\simeq\; 10Z$ eV, A=27 is atomic weighht, Z=13 atomic number, $A_0 = 6.02 \times 10^{23}$ Avogadro number, $\rho = 2.7\frac{g}{cm^3}$ density of aluminum.

First, let us calculate $\frac{4\pi Q^2 e^2 \rho A_0}{m_e c^2}$ for a proton. Since $Q = e$ in this case we have (in CGS units)

$$\frac{4\pi Q^2 e^2 \rho A_0}{m_e c^2} \; = \; \frac{4\pi e^4 \rho A_0}{m_e c^2} \; = \; \frac{4\pi (4.8)^4 \times 10^{-40} \times 2.7 \times 6.02 \times 10^{23}}{9.11 \times 10^{-28} \times 9 \times 10^{20}} \; = \; 1.32{\times}10^{-6}\frac{erg}{cm} \; = \; 0.825\frac{MeV}{cm}$$

for the proton (1 erg $\simeq 6.24 \times 10^5$ MeV). Since for the 20 MeV proton $\beta^2 = 0.043$ we get for the stopping power

$$S(T) \; = \; 0.825\frac{MeV}{cm}\frac{Z}{A\beta^2} \ln \frac{2m_e \beta^2 c^2}{\bar{I}} \; = \; 0.825\frac{MeV}{cm}\frac{13}{27 \times 0.043} \ln \frac{1.02 \times 10^6 \times 0.043}{130} \; = \; 53.7\frac{MeV}{cm}$$

so the energy loss after $\Delta x = 0.001$ cm of aluminum foil is

$$S(T)\Delta x \; = \; 53.7\frac{MeV}{cm} \times 10^{-3cm} \; = \; 53.7keV$$

Similarly, we get 160 keV for the α-particle.

NB: SI system is not convenient here since Eq (6.3) appears to be different (by $(4\pi\epsilon_0)^{-2}$?)