(6.4) Make a rough estimate of the range in air for a 1 MeV α, 1 MeV H^+ and 1MeV e^- using the plot in Fig. 6.7. The energy of an ion pair in air is 14.6 eV but assume that twice as much energy is lost through excitation.

$eV := 1.60217733 \cdot 10^{-19} \cdot joule$ $\quad MeV := 10^6 \cdot eV$

$E_{ionpair} := 14.6 \cdot eV$ $\quad E_{loss} := (1 + 2) \cdot E_{ionpair}$ According to the text.

(a) 1 MeV α:

ion pairs/mm air $\quad n_\alpha := 7 \cdot 10^3 \cdot mm^{-1}$ $\quad E_\alpha := 1 \cdot MeV$

$Range_\alpha := \dfrac{E_\alpha}{E_{loss} \cdot n_\alpha}$ $\quad Range_\alpha = 3.3 \cdot mm$

(b) 1 MeV H^+:

ion pairs/mm air $\quad n_p := 10^2 \cdot mm^{-1}$ $\quad E_p := 1 \cdot MeV$

$Range_p := \dfrac{E_p}{E_{loss} \cdot n_p}$ $\quad Range_p = 23 \cdot cm$

(c) 1 MeV e^-:

ion pairs/mm air $\quad n_e := 6 \cdot mm^{-1}$ $\quad E_e := 1 \cdot MeV$

$Range_e := \dfrac{E_e}{E_{loss} \cdot n_e}$ $\quad Range_e = 3.8 \cdot \mathrm{m}$