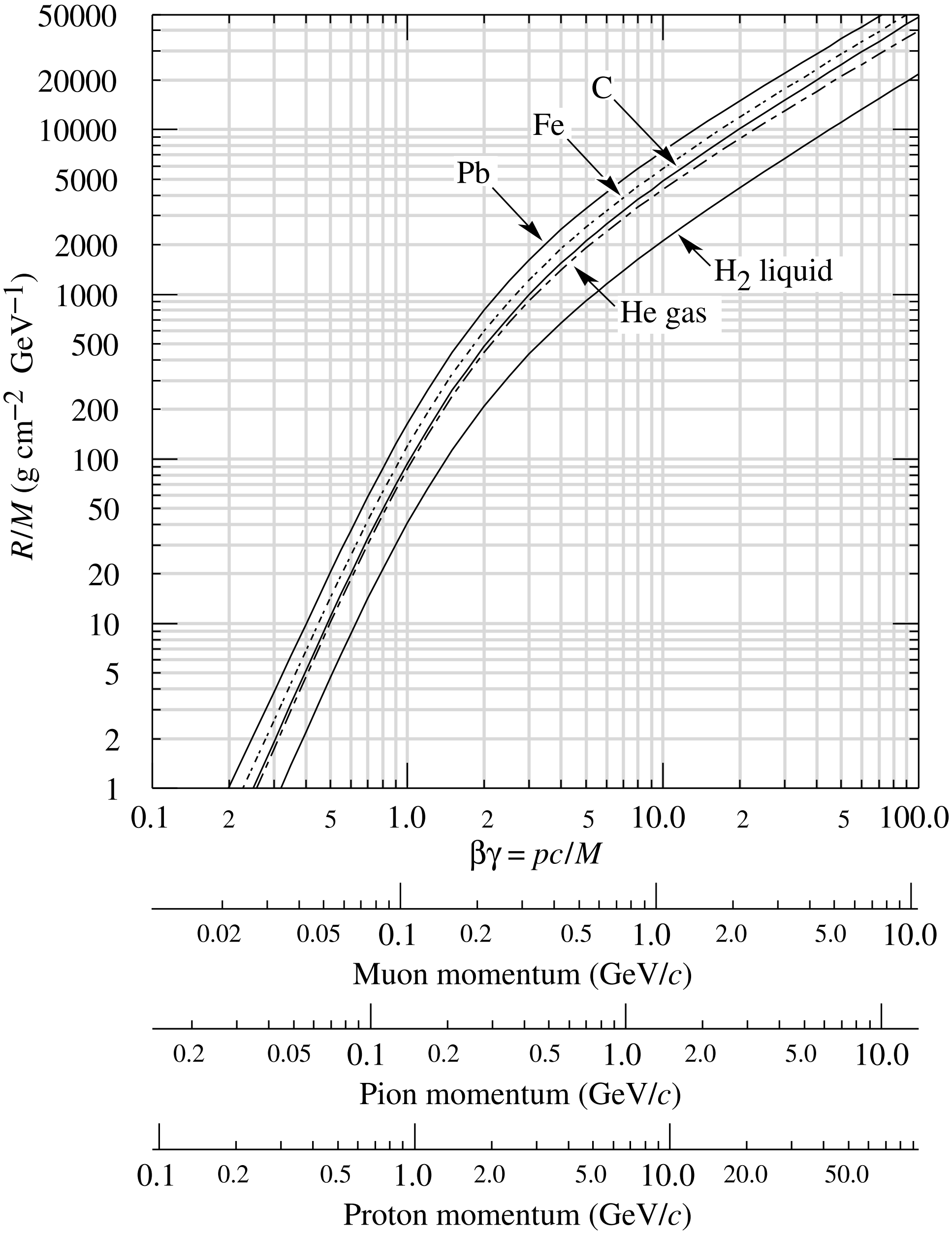

Figure 10.3: Range of heavy charged particles in liquid (bubble chamber) hydrogen, helium gas, carbon, iron, and lead. For example: For a K^+ whose momentum is 700 MeV/c, $\beta\gamma = 1.42$. For lead we read $R/M \approx 396$, and so the range is 195 g cm^{-2}.

important. These are especially relevant for high-energy muons, as discussed in Sec. 10.9.

For particles moving more slowly than atomic electrons, the above discussion is inapplicable.

It is often stated that for $\beta \gtrsim z/137$, $|dE/dx|$ falls as β^{-2} before reaching the broad minimum at $\beta\gamma \approx$ 3.0–3.5. In fact, the slope is nowhere this great, and $|dE/dx| \propto \beta^{-5/3}$ provides a very good approximation to the actual function out to $\beta\gamma > 1$.

The quantity $(dE/dx)\delta x$ is the mean energy loss via interaction with electrons in a layer of the medium with thickness δx. For finite