

Homework #4

- Calculate the distance travelled by a 15 GeV charged pion, a 15 GeV J/psi and a 15 GeV charged B meson before decaying. How can we use this information to identify them?
- We want to separate pions, kaons and protons of 1 GeV/c momenta using Cherenkov counters. What materials shall we use to build a suitable detector?
- A proton moving in water emits Cherenkov radiation in a cone making an angle of 40 degree with the electron's direction of motion. Compute the kinetic energy of the proton. How many photons are emitted and how much energy is lost by the proton via Cherenkov radiation per centimeter? How does this compare to the energy lost via ionization by the same proton per centimeter?
- A 1 MeV proton loses 5 keV energy by ionisation in a given detector. How much energy is lost by a 6 MeV ^{12}C nuclei in the same detector? And if it has only 1 MeV energy?