

Chapter 3: Experimental methods

1. A secondary particle beam can consist of several types of different particles. Separators are used to select the type of particle required. The separator consists of two parallel plates with a high potential between them. The beam passes between the plates and then through a deflecting magnet and slit system. Show that the difference in angular deflection, $\Delta\theta$, of two relativistic particles with momentum p and masses m_1 and m_2 , after traversing an electric field of strength E and length L , is:

$$\Delta\theta = EeL \frac{(m_1^2 - m_2^2)}{2p^3}$$

2. Critical energy of the electromagnetic shower development in iron is $E_C = 24 \text{ MeV}$, and one radiation length is $X_0 = 1.76 \text{ cm}$. Estimate the necessary thickness of a calorimeter that uses iron as an absorber, if initial electrons have energies not exceeding $E_0 = 100 \text{ MeV}$.

Chapter 4: Space-time symmetries

Electromagnetic decays of η meson to two pions have never been observed, which is explained by the parity conservation requirement. Use this knowledge to:

- a) knowing that η has spin 0, deduce its parity
- b) knowing that decays of η to three pions are readily observed, deduce intrinsic parity of a pion