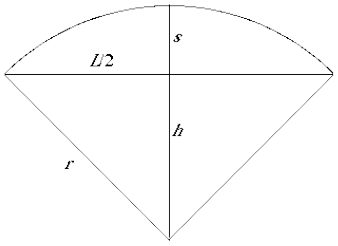
Exercises 1 & 2

1. Show that a particle of charge *q=ze* and velocity v subject to a uniform magnetic field B has a momentum

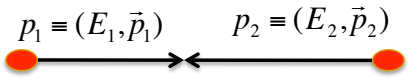
$$p[GeV] = 0.3zr[m]B[T] \qquad If\ \vec{v}\ perpendicular\ to\ \vec{B}$$



Show that the resolution in the momentum is

$$\left.\begin{aligned} \frac{\delta p}{p} &= \frac{\delta s}{s} \\ p_0 &= \frac{L^2 qB}{8\delta s} \end{aligned}\right\} \quad \frac{\delta p}{p} = \frac{p}{p_o}$$

2. Calculate the center of mass energy of the collision of two protons travelling in opposite directions at an Energy of 7 TeV



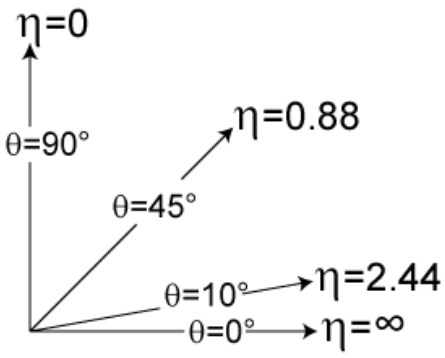
See appendix of the talk for some hints

Exercise 3

1. Show that pseudorapidity can be written in terms of the momentum as

$$\eta = \frac{1}{2}\ln\left(\frac{|\vec{p}| + p_L}{|\vec{p}| - p_L}\right) \qquad \vec{p}_L$$

Particle momentum along the beam axis



- Note: Pseudorapidity is defined as

$$\eta = -\ln\left[\tan\left(\frac{\theta}{2}\right)\right]$$

- Where θ is the angle between the particle momentum $\vec{p}$ and the beam axis

1. Show also that in the relativistic limit v→c (speed of the particle is close to speed of light)

$$\eta = \frac{1}{2}\ln\left(\frac{E + p_L}{E - p_L}\right)$$