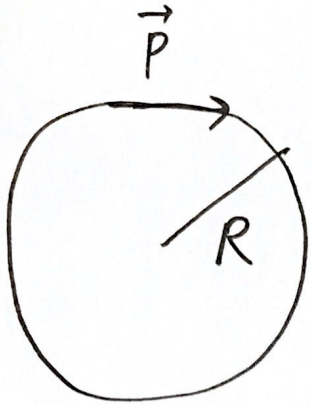


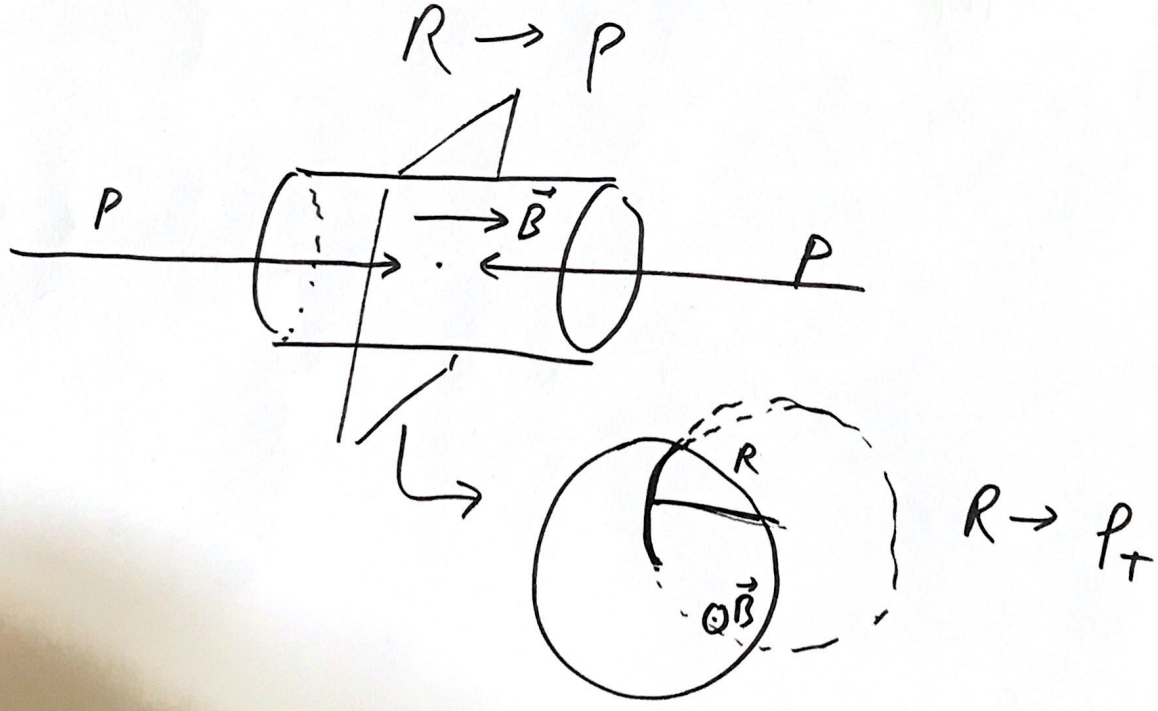
$\odot \vec{B}$

$$\vec{F} = q\vec{v} \times \vec{B}$$

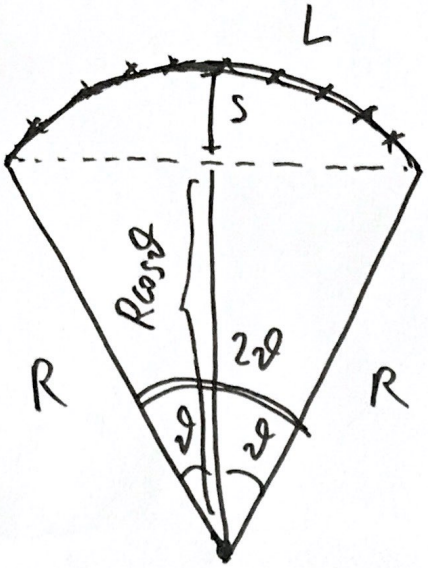
$$\begin{cases} F = qvB \\ F = \dfrac{mv^2}{R} \end{cases}$$

$$\hookrightarrow \underline{p = qRB}$$

$$\boxed{p[GeV] = 0.3 \cdot \underline{R[m]} \cdot B[T]}$$



SAGITTA



$$p = 0.3\,RB$$

$$s = R - R\cos\vartheta = R(1-\cos\vartheta)$$

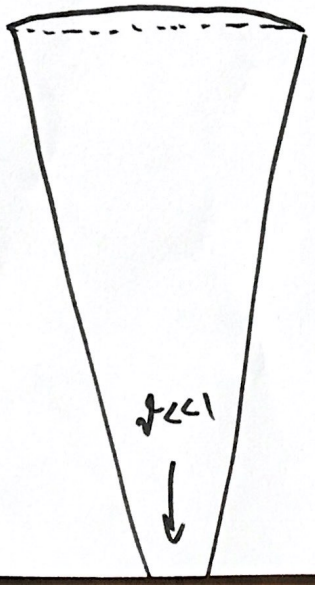
$\cos\vartheta = 1 - 2\sin^2\frac{\vartheta}{2}$

$$= R\left(1 - 1 + 2\sin^2\frac{\vartheta}{2}\right)$$

$$= 2R\sin^2\frac{\vartheta}{2}$$

$\vartheta \ll 1$

$$\Rightarrow s \simeq 2R\,\frac{\vartheta^2}{4} = \frac{1}{2}R\vartheta^2$$



$$L = 2\vartheta \cdot R$$

$$\Leftrightarrow \vartheta = \frac{L}{2R}$$

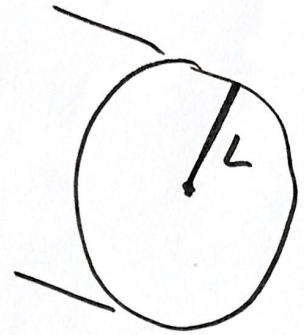
$$\Rightarrow s = \frac{1}{2}R\left(\frac{L}{2R}\right)^2 =$$

$$= \frac{1}{2}R\,\frac{L^2}{4R^2} = \frac{1}{8}\frac{L^2}{R}$$

$$s = \frac{1}{8}\frac{L^2}{R}$$

$$p = 0.3 \cdot R \cdot B \Rightarrow R = \frac{p}{0.3\,B}$$

$$\Rightarrow \boxed{s = \frac{0.3}{8}\frac{BL^2}{p}}$$



$$\boxed{p = \frac{0.3}{8}\frac{BL^2}{s}}$$

$$p = 0.3 \cdot R \cdot B$$

$$dp = 0.3 \cdot B\, dR$$

$$dp = \frac{0.3}{8}\frac{BL^2}{s^2}\,ds = \frac{p}{s}\,ds$$

$$\boxed{\frac{dp}{p} = \frac{ds}{s}} = \underbrace{\frac{8}{0.3}\frac{p}{BL^2}}_{\frac{1}{s}}\,ds$$

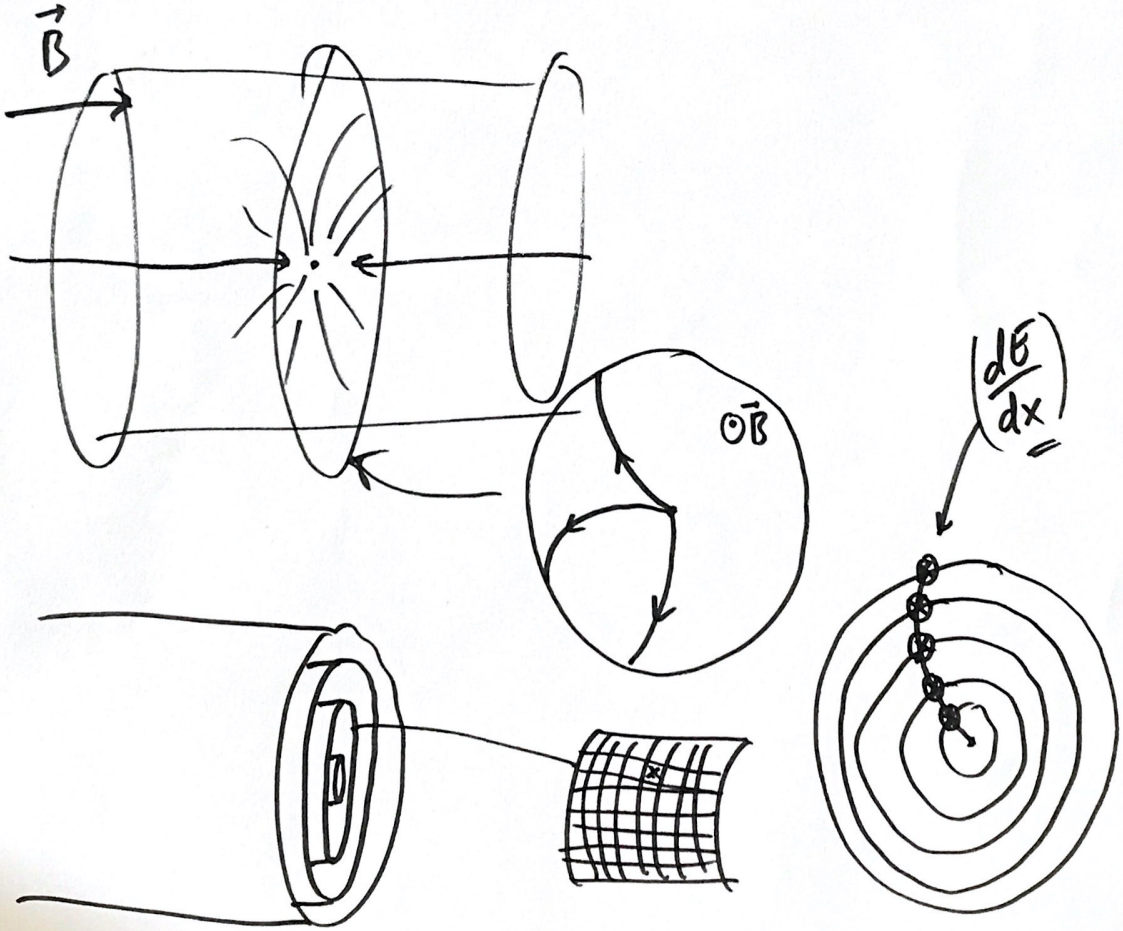
$$\frac{\delta p}{p} \propto p$$

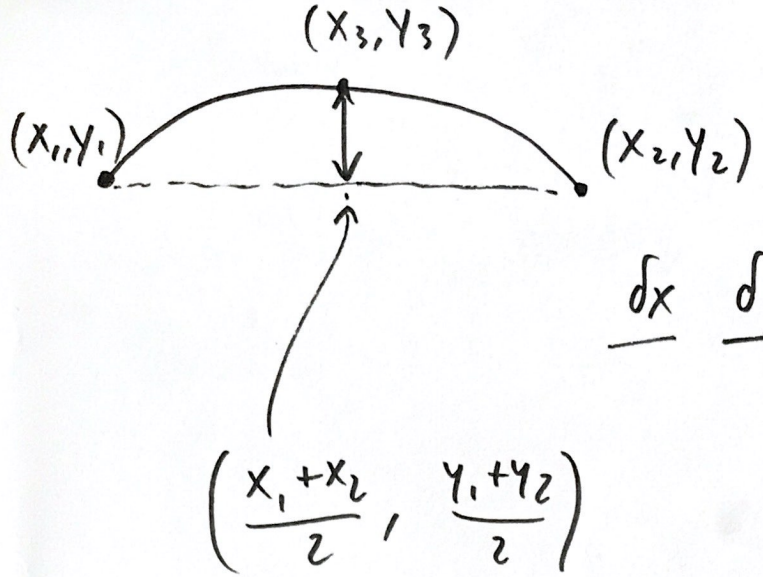
$p_1 < p_2$

CALORIMÉTRIE

$$\frac{\sigma(E)}{E} \sim \frac{1}{\sqrt{E}}$$

$$\frac{\delta p}{p} \propto \frac{1}{BL^2}$$





$$\vec{s} = \left(x_3 - \frac{x_1+x_2}{2}, \; y_3 - \frac{y_1+y_2}{2} \right)$$

(δx δx δx)

$$\hookrightarrow \; s = x_3 - \frac{1}{2}(x_1+x_2)$$

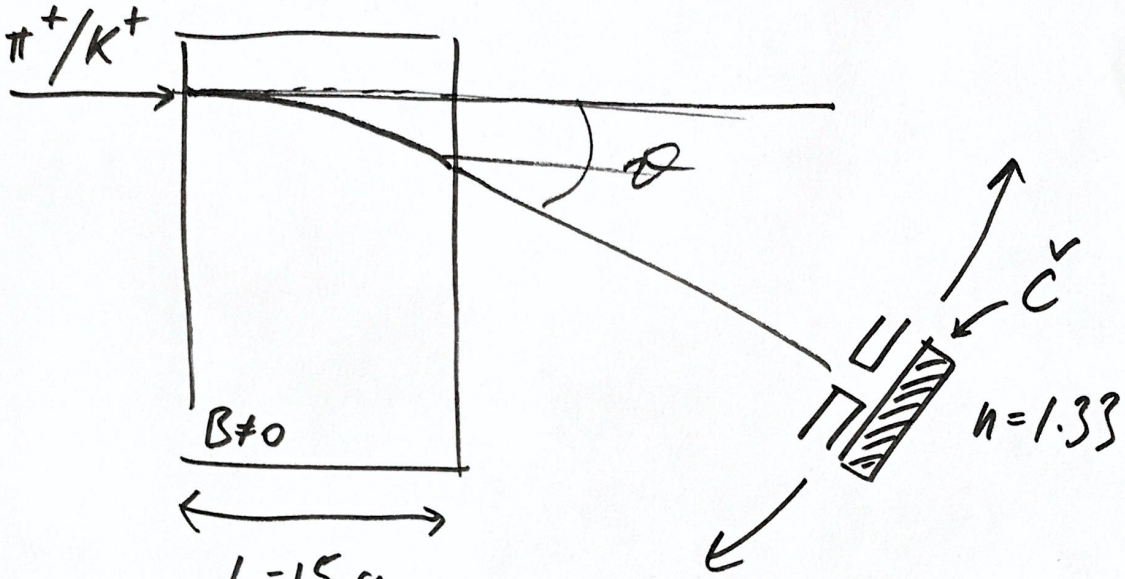
$$\delta s^2 = \delta_x^2 + \frac{1}{4}(\delta x^2 + \delta x^2)$$

$$= \frac{3}{2}\delta x^2$$

$$\delta s \propto \delta x$$

$$\frac{\delta p}{p} \propto \frac{p}{BL^2}\delta s = \frac{p}{BL^2}\delta x$$

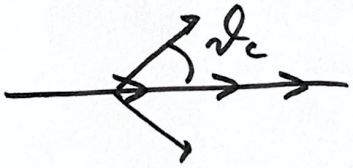
EX fascio π^+ K^+ $\quad p \leq 10$ GeV



$\vartheta \leftrightarrow p$

(a) p_{min} t.c. segnale nel cherenkov = ?

π, K



$\beta > \frac{1}{n}$

$$\cos\vartheta_c = \frac{1}{n\beta}$$

contatori & DIGITALI SI $\beta > \frac{1}{n}$

NO $\beta < \frac{1}{n}$

$$\beta_{th} = \frac{1}{n} = \frac{1}{1.33} = 0.752$$

$$\gamma_{th} = \frac{1}{\sqrt{1-\beta_{th}^2}} = 1.52$$

(π) $\gamma = \frac{E}{m}$ (140 MeV)

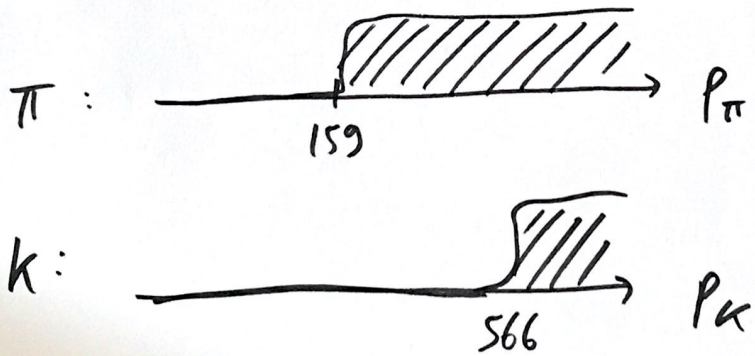
$$\Rightarrow E_\pi = \gamma_{th} \cdot m_\pi = 212 \text{ MeV}$$

$$p_\pi = \sqrt{E_\pi^2 - m_\pi^2} = \underline{\underline{159 \text{ MeV}}}$$

(494 MeV)

(K) $E_K = \gamma_{th} \cdot m_K = 751 \text{ MeV}$

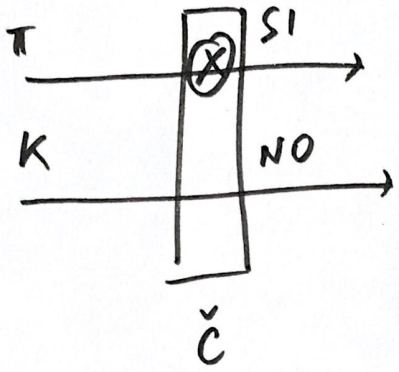
$$\rightarrow p_K = \sqrt{E_K^2 - m_K^2} = \underline{\underline{566 \text{ MeV}}}$$



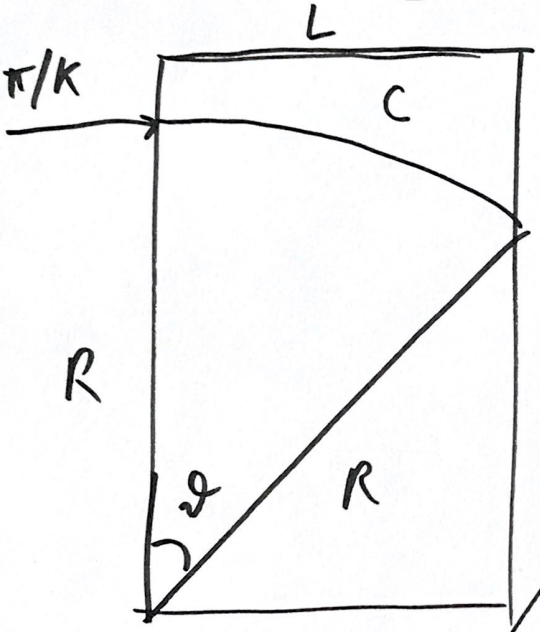
(b) per quale angolo ϑ discriminare π/K = ?

$\vartheta \leftrightarrow p$

$p = p'$



$\Rightarrow$ 159 MeV $\leq p \leq$ 566 MeV



$\frac{C}{R} = \vartheta \quad \vartheta \ll 1$

$\Rightarrow C \sim L$

$\Rightarrow \frac{L}{R} = \vartheta$

$p = 0.3 \cdot R \cdot B$

$\rightarrow R = \frac{p}{0.3 \cdot B}$

$\vartheta = \frac{L}{R} = L \frac{0.3 \cdot B}{p}$

$$p = \frac{0.3 \cdot B \cdot L}{\vartheta}$$

$B = B[T]$!
$L = L[m]$!
$p = p[GeV]$!

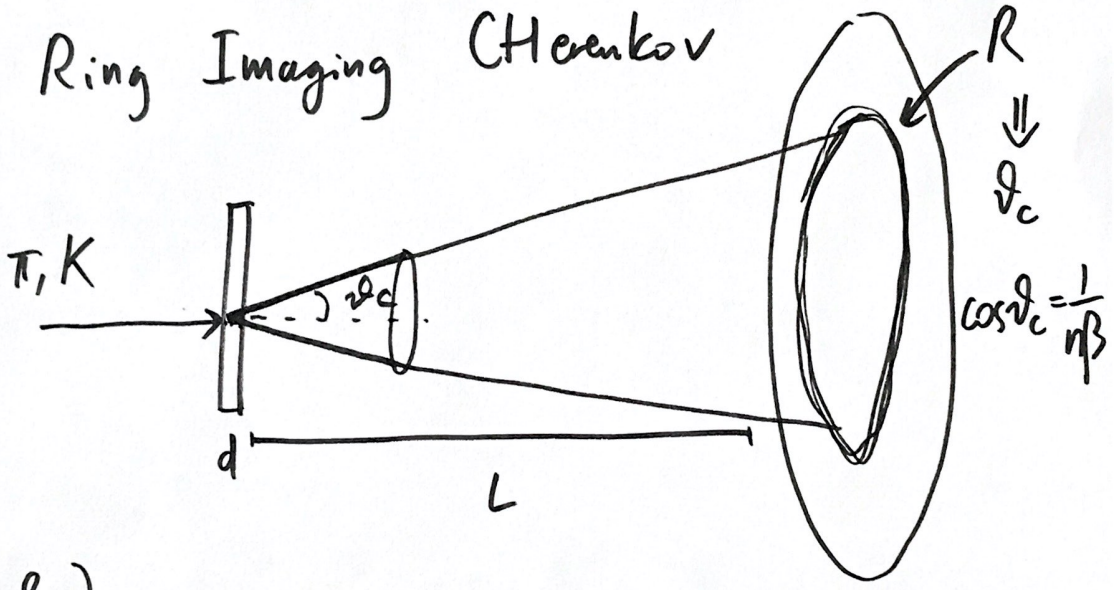
$$\vartheta_1 = \frac{0.3 \cdot B[T] \cdot L[m]}{p_1[GeV]} = \frac{0.3 \cdot 0.1 \cdot 0.15}{0.159} = 0.028\,rad = 1.60°$$

$$\vartheta_2 = \frac{0.3 \cdot 0.1 \cdot 0.15}{0.566} = 0.0079\,rad = 0.45°$$

π/K $\quad$ $0.45° < \vartheta < 1.6°$

EX $\quad$ RICH

Ring Imaging CHerenkov



(p, β)

$\Rightarrow E$, (M)

$d = 2\,cm$

$L = 1\,m$

$n = 1.46$

$X_0 = 12.3\,cm$

(a) per quali p (π, K) $\longrightarrow$ luce ?

$$\beta_{th} = \frac{1}{n} = \frac{1}{1.46} = 0.685$$

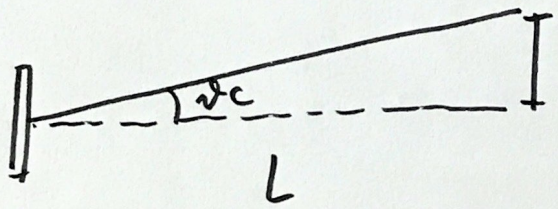
$$\Rightarrow \gamma_{th} = \frac{1}{\sqrt{1-\beta_{th}^2}} = 1.372$$

$$p_{\pi}^{th} = m_{\pi} \beta_{th} \gamma_{th} = 131.2 \text{ MeV}$$

$$p_{K}^{th} = m_{K} \beta_{th} \gamma_{th} = 464.1 \text{ MeV}$$

(b) $p = 1$ GeV $(\pi \circ K)$

$\Rightarrow R_{\pi}, R_K = ?$



$$\tan \vartheta_c = \frac{R}{L}$$

$$\cos \vartheta_c = \frac{1}{n\beta}$$

$$\Rightarrow \tan \cos^{-1}\left(\frac{1}{n\beta}\right) = \frac{R}{L}$$

$$\Rightarrow R = L \tan \cos^{-1}\left(\frac{1}{n\beta}\right)$$

$p = 1$ GeV

(π)

$$\Rightarrow E_\pi = \sqrt{p^2 + m_\pi^2} = 1.0097 \text{ GeV}$$

$$\Rightarrow \beta_\pi = \frac{p_\pi}{E_\pi} = 0.990$$

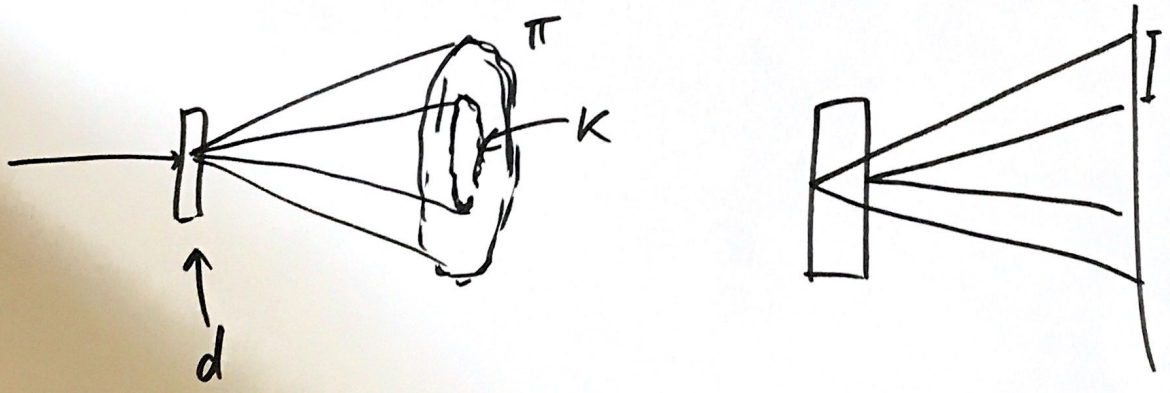
(K)

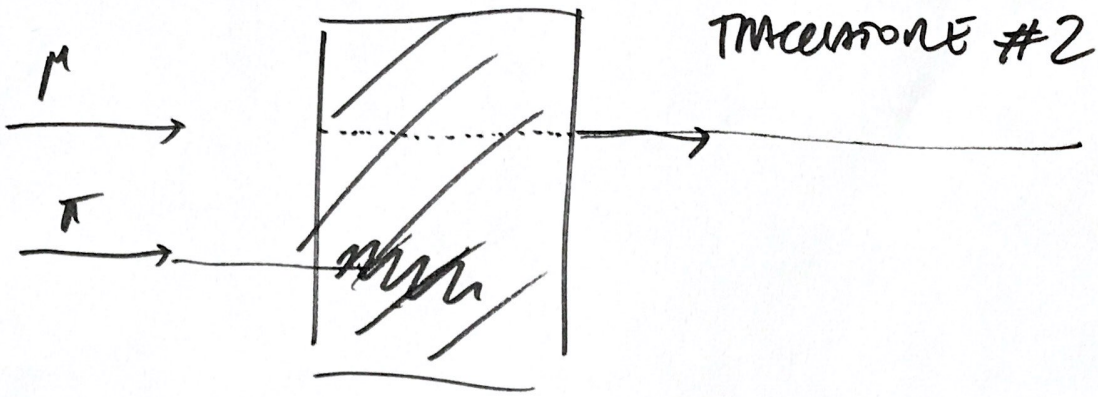
$$E_K = \sqrt{p^2 + m_K^2} = 1.12 \text{ GeV}$$

$$\Rightarrow \beta_K = \frac{p_K}{E_K} = 0.90$$

$$\Rightarrow R_\pi = L \tan \cos^{-1} \frac{1}{n\beta_\pi} = 104.4 \text{ cm}$$

$$R_K = L \tan \cos^{-1} \frac{1}{n\beta_K} = 84.5 \text{ cm}$$



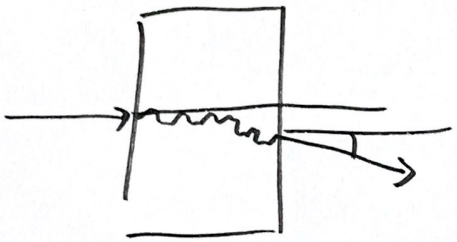


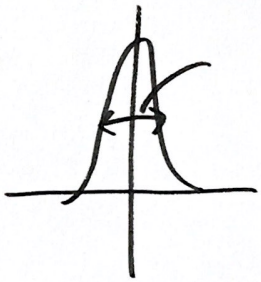
TRACCIATURE #2

(c) angolo medio diff. coulomb. multipla

$X_0 = 12.1$ cm

$p = 1$ GeV





$$\langle \vartheta^2 \rangle = 21\ \text{MeV}\ \frac{1}{\beta p}\sqrt{\frac{d}{X_0}}$$

$$\langle \vartheta^2 \rangle_\pi = 21\ \text{MeV}\ \frac{1}{\beta_\pi p}\sqrt{\frac{d}{X_0}} = 8.55\ \text{mrad}$$

$$\langle \vartheta^2 \rangle_K = 9.4\ \text{mrad}$$

$\sigma(R)$

$\Rightarrow \Delta R \sim L \langle \vartheta^2 \rangle = 1\text{m} \cdot 0.01 = 1\text{ cm}$

$\langle \vartheta^2 \rangle \sim 10$ mrad

$p = 1$ GeV

$\pi^+ \; K^+ \; p \; \mu^+$