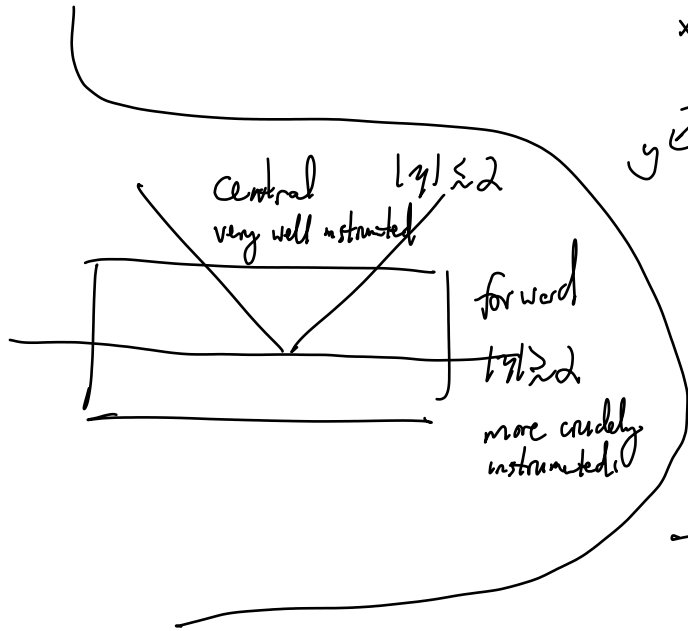
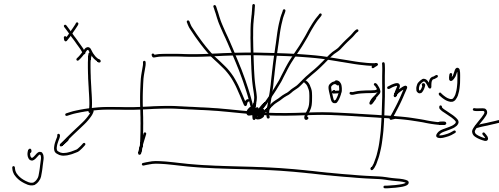


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# Lecture 11

From last time:

- Detector coordinates



$$(E, p_x, p_y, p_z)$$

$$\downarrow$$

$$p_T, \eta \text{ or } y, \phi, (m)$$

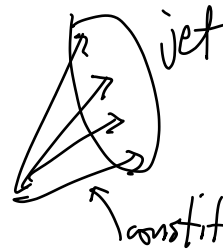
$$\left\{ \begin{aligned} y &= \frac{1}{2} \log \frac{E+p_z}{E-p_z} && \text{"rapidity"} \end{aligned} \right.$$

$$\downarrow m \rightarrow 0$$

$$\left\{ \begin{aligned} \eta &= \frac{1}{2} \log \frac{1+\cos\theta}{1-\cos\theta} && \text{"pseudo-rapidity"} \end{aligned} \right.$$

$$\phi = \tan^{-1} \left( \frac{p_y}{p_x} \right) \quad \text{"azimuthal angle"}$$

- Jet mass



$$m = \sqrt{E^2 - \vec{p}^2} \quad \text{(general formula for mass)}$$

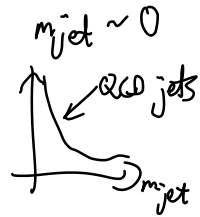
$$p_{jet}^m \equiv \sum_{i \in jet} p_i^m \rightarrow m_{jet}$$

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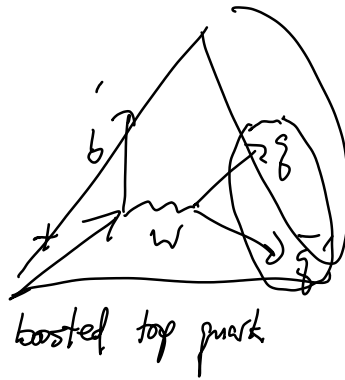
# Top tagging



$\bar{q}$  or  $q$  jet  
"QCD jet"



vs.

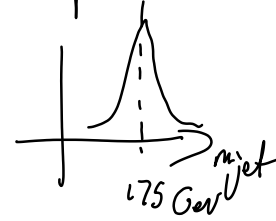


boosted top quark

$$R \sim \frac{2m}{p_T}$$

$$m_{top} \sim 175 \text{ GeV}$$

$$m_W \sim 80 \text{ GeV}$$



- look for b in top
- jet radius - tops are wider
- jet mass
- # of constituents (hard to simulate)
- mass of constituents?  $m_b \sim 5 \text{ GeV} \rightarrow 0$

- 2 subjets  $\rightarrow m_W$  "jet substructure"
- jet shapes (dist'n of energy inside jets)
- # of prongs ( $\sim 1$  for QCD,  $\sim 3$  for tops)