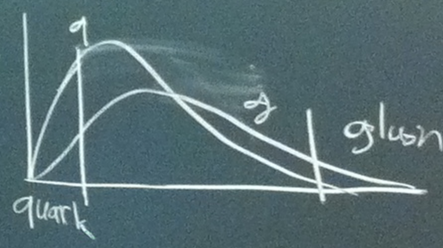
Why?
- BSM
- QCD

Rules
$e^+e^- \to q\bar{q}g$
$Q = 500$ GeV
$E_p \geq 150$ GeV
Match: $\frac{|E_j - E_p|}{E_j} < .15$
$\cos(\theta_j - \theta_p) > 0.9$

$z_i = \frac{1}{\sum_{E_j} E_j} \sum_{i \in j} |\vec{p}_i| e^{-\eta_i(1+a)}$



$P(q) = \frac{d\sigma_q}{d\tau} \Big/ \left(\frac{d\sigma_q}{d\tau} + \frac{d\sigma_g}{d\tau}\right)$

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$$\frac{d\sigma_q}{d\tau}$$

$$\frac{d\sigma_q}{d\tau} + \frac{d\sigma_g}{d\tau}$$

keeps 20% q, 2% g

keeps 10% g, 2-3% q

$$\frac{d\sigma}{d\tau} = \frac{d\sigma^{resummed}}{d\tau} + \left(\frac{d\sigma}{d\tau}\right)_{pert} - \left(\frac{d\sigma^{resum}}{d\tau}\right)_{exp}$$

q-region $\mathcal{M}_s = Q\tau$ Non-perturbative

g-region Separation is meaningless

$$\frac{d\sigma_2}{d\tau}$$

$$\frac{d\sigma_2}{d\tau} + \frac{d\sigma_3}{d\tau}$$

keeps 20% q, 2% g

keeps 10% g, 2-3% q

$$\frac{d\sigma}{d\theta} = \frac{d\sigma}{d\theta}^{\text{resum}} + \left(\frac{d\sigma}{d\theta}\right)_{qcd} - \left(\frac{d\sigma}{d\theta}^{\text{resum}}\right)_{exp}$$

q-region $\mathcal{M}_S = Q\tau$ non-perturbative

g region separation is meaningless

Uncertainty

- tail matching
- non-perturbative
- perbturbative (scale variation)
- generate Pythia
- reweight to (τ_0)
- generate pseudodata

$$r(\tau) = \left(\frac{d^3\sigma}{d\tau d\phi d\tau}\right)_{qcd} - \left(\frac{d\sigma}{d\tau_q d\tau_g d\tau_{qg}}^{\text{resum}}\right)_{exp}$$

- check reweighted data
- PUT uncertainties on separation