Measure Position by E_T, impact parameter relation

at RHIC, E_T distribution contains contributions from "soft" processes, ≈ independent of collision energy and "hard" parton-parton interactions, increase with energy

$$\frac{d\sigma}{dE_T} = \int d^2b \sum_{N=1}^{\infty} \frac{[\bar{N}_{AA}(b)]^N}{N!} \exp[-\bar{N}_{AA}(b)] \int \prod_{i=1}^{N} dE_{T_i} \frac{1}{\sigma_{pp}} \frac{d\sigma^{pp}}{dE_{T_i}} \delta(E_T - \sum_{i=1}^{N} E_{T_i})$$

$$\approx \int d^2b \frac{1}{\sqrt{2\pi\sigma^2(b)}} \exp\left(-\frac{(E_T - \bar{E}_T^{AA}(b))^2}{2\sigma^2(b)}\right)$$

$$\bar{E}_T^{AA}(b) = T_{AA}(b) \left\{ \sigma_H^{pp}(p_0) \langle E_T \rangle_H^{pp} + \varepsilon_0 \right\}$$

$$\sigma^2(b) = T_{AA}(b) \left\{ \sigma_H^{pp}(p_0) \langle E_T^2 \rangle_H^{pp} + \varepsilon_1 \right\}$$

$|y| \leq 0.5$ $\quad \varepsilon_0 = 15$ mb GeV $\quad \sigma_H^{pp}(p_0) \langle E_T \rangle_H^{pp} \approx 17$ mb GeV

$\varepsilon_1 = 50$ mb GeV^2 $\quad \sigma_H^{pp}(p_0) \langle E_T^2 \rangle_H^{pp} = 70$ mb GeV^2

Eskola

at small E_T, $c\bar{c}$ production large part of E_T ($E_T < 20$ GeV), Gaussian approximation breaks down for small # of collisions