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## Energy Loss of Open Charm Produced In Relativistic Heavy Ion Collision

**CHARM QUARK** :- A) Heavy Quarks B) They do not equilibrate fully C) Study charm quark energy loss as signature. D) Use **Parton Cascade Model** based on microscopic Boltzmann Transport Equation. E) Use **PCM-VNI/BMS** and box mode.

$$p_\mu \partial^\mu F_i(\vec{p}, \vec{r}) = \sum_{processes} C[F]$$

$$C[F] = \frac{1}{2S_i} \int \prod d\Gamma_j |M|^2 (2\pi)^4 \delta^4(P_{in} - P_{out}) D[F]$$

$$D[F] = \prod_{in} F_j \prod_{out} [1 \pm F_j]$$

$$\prod d\Gamma_j = \prod_{i \neq j} \frac{d^3 p_j}{(2\pi)^3 (2E_j)}$$

$$|M|_{eff}^2 = |M|_{ab \rightarrow cd}^2 \times T_c(Q^2, \mu_0^2) T_d(Q^2, \mu_0^2)$$

$$\frac{d\hat{\sigma}}{d\hat{t}} = \frac{1}{16\pi(\hat{s} - M_c^2)^2} \sum |M|^2$$

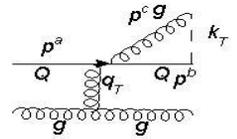
$$\hat{s} - M_c^2 \geq Q_0^2 \sim 1 \text{ GeV}^2$$



$$\frac{d\sigma}{d\hat{t}} \propto \frac{1}{(\hat{t} - \mu_D^2)^2}$$

$$\mu_D^2 = \frac{2}{3} (2N_c + N_f) \pi \alpha_s T^2$$

$$\frac{\alpha_s(Q^2)}{2\pi} \frac{dQ^2}{Q^2} P_{c \rightarrow c'd'}(z)$$

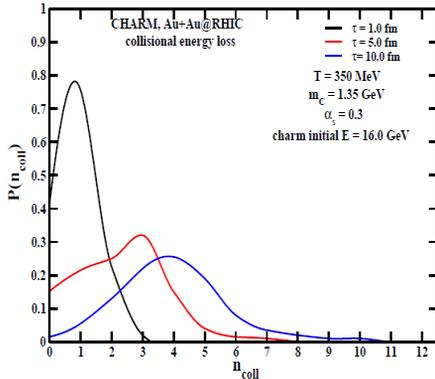
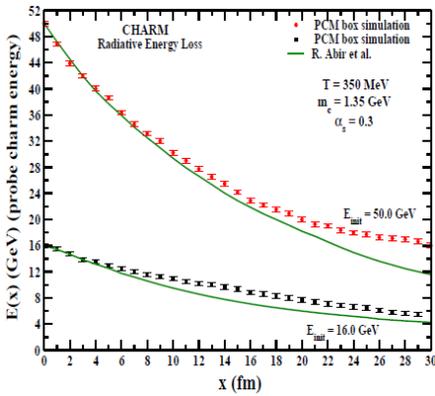
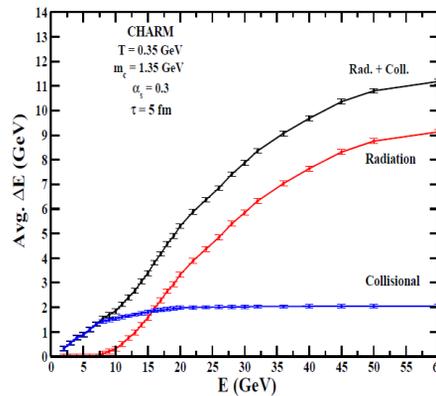
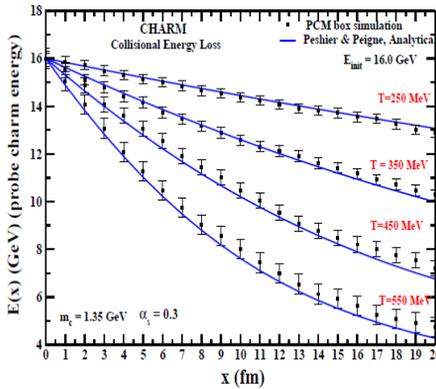
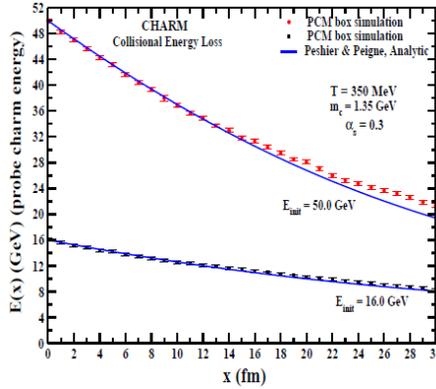


$$q_\perp^2 \Rightarrow Q^2 \Rightarrow \mu_0^2 \sim M_c^2$$

$$\hat{q} = \frac{1}{l_x} \sum_{i=1}^{N_{coll}} (\Delta p_{\perp,i})^2$$

For  $T = 350 \text{ MeV}$ ,  $m_c = 1.35 \text{ GeV}$ ,  $\alpha_s = 0.3$  and  $E_{init} = 16.0 \text{ GeV}$   
 $\hat{q} \sim 1.22 \text{ GeV}^2/\text{fm}$   
 while for  $E_{init} = 50.0 \text{ GeV}$ ,  $\hat{q} \sim 1.1 \text{ GeV}^2/\text{fm}$

**Transport Coefficient**



$$\tau_f > \lambda, N_{coh} = \frac{\tau_f}{\lambda} \sim \sqrt{\frac{\omega}{q_\perp^2 \lambda}} > 1; \quad \tau_f^0 = \frac{2\omega}{k_\perp^2}, \quad \tau_f^n = \frac{2\omega}{\left(k_\perp + \sum_{i=1}^{n=N_{coh}} q_{\perp,i}\right)^2}$$

$$\omega \frac{dI_{LPM}}{d\omega} = \omega \frac{dI_{BH}}{d\omega} \cdot \frac{1}{N_{coh}}$$

**LPM effect**