D^0 production in p+p $\sqrt{s} = 200$ GeV collisions at STAR

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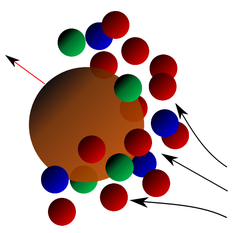
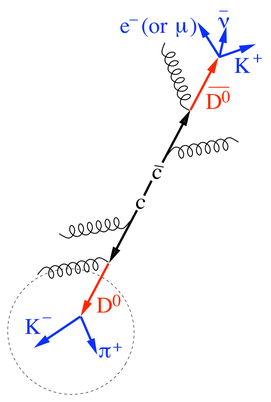
Abstract and motivation

The charm production is sensitive to early dynamics of the created system in RHIC heavy ion collisions. Understanding both the charm production total cross section and the fragmentation in p+p collisions is a baseline to further explore the QCD medium via open charm and charmonium in heavy ion collisions.

- Poster presents the $D^0 \to K\pi$ (B.R.:3.8%) reconstruction.
- $D^0 = (c, \bar{u}),\ c\tau = 123\mu m,\ m_{D^0} = 1.865\ GeV/c^2$



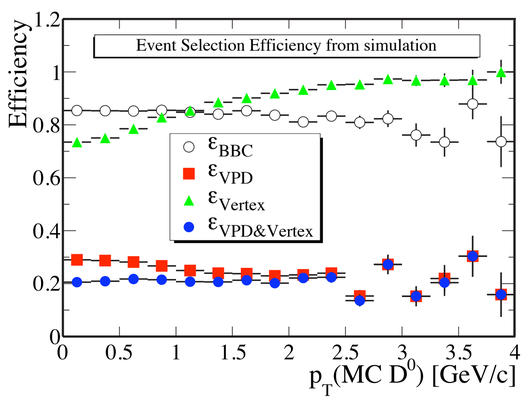
pp collisions
$m_c = 1.27\ GeV/c^2 > \Lambda_{QCD} \Rightarrow$ pQCD
Heavy ion collisions
Energy loss in partonic matter: pQCD
Sensitive to medium($R_{AA}, v_2 \Rightarrow \eta/S$)
pp as an important baseline



- **Semileptonic decay**
  can deploy a special trigger
  contribution from open beauty
  photonic e^- background
  kinematics smearing
- **Hadronic decay**
  Direct clean identification (peak)
  Large combinatorial background
  need high resolution silicon vertex detectors

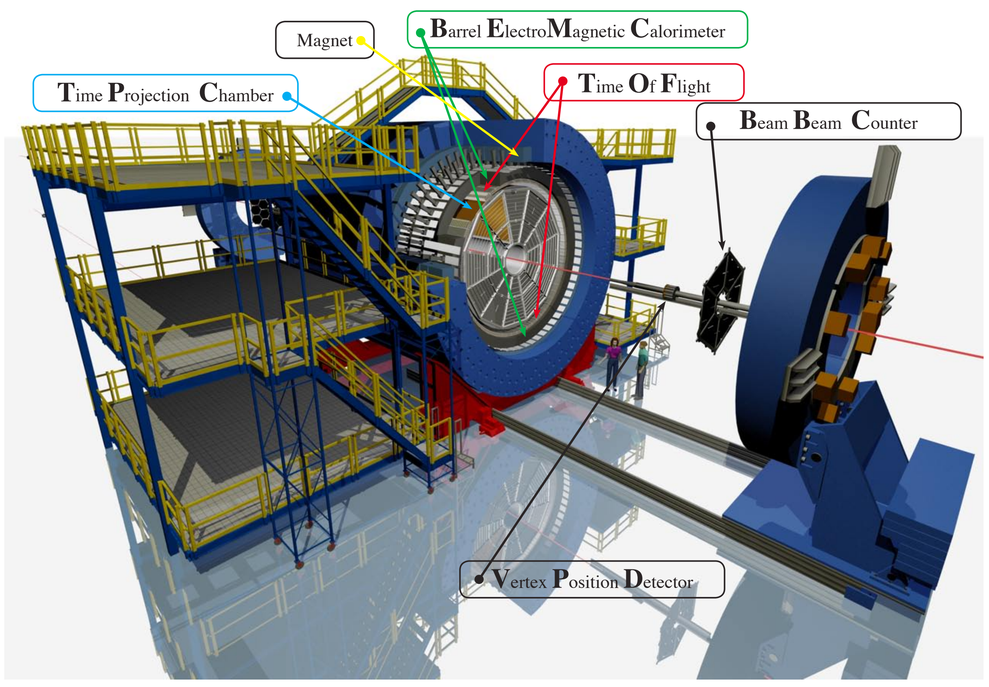
Measurement: The Trigger and PID

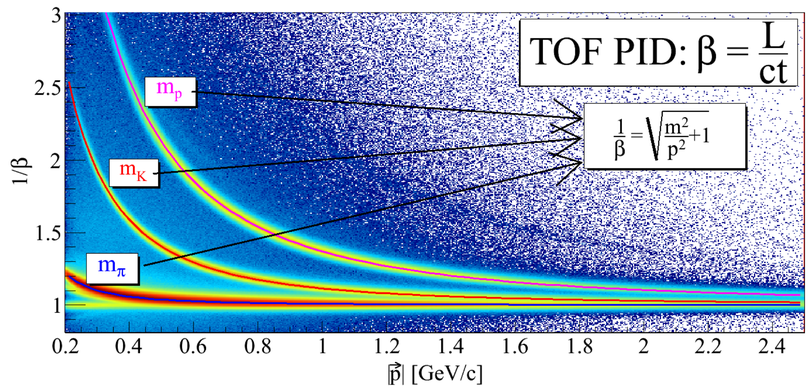
Trigger and Vertexing more sensitive on charmed events. Number of events N_{evt} corrected by a factor ϵ_T based on PYTHIA simulations.

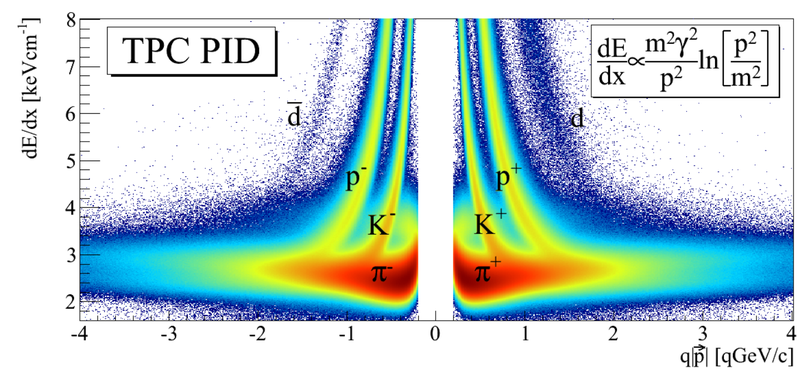


$$\epsilon_T = \frac{\varepsilon_{VPD\&Vertex}(\text{all events})}{\varepsilon_{VPD\&Vertex}(\text{events with } D^0)} = \frac{0.143}{0.213}$$

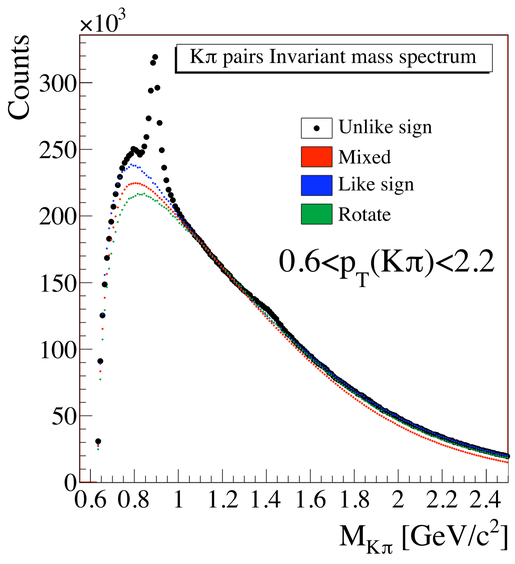
Solenoidal **T**racker **A**t **R**HIC : $-1 < \eta < 1, 0 < \phi < 2\pi$



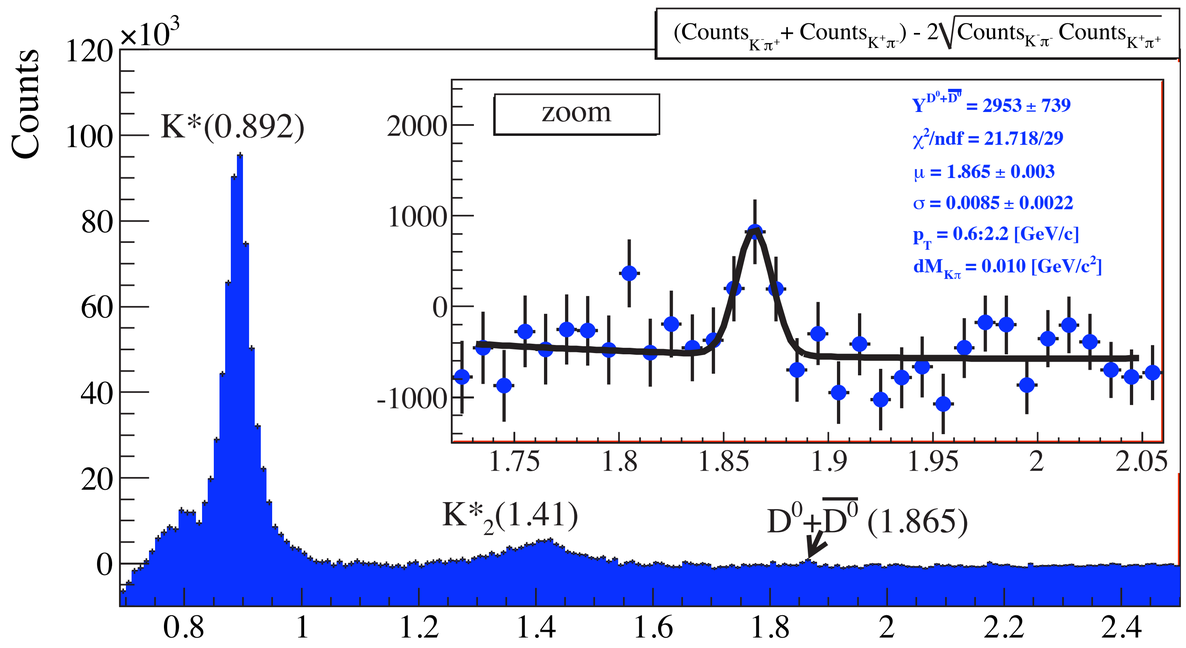


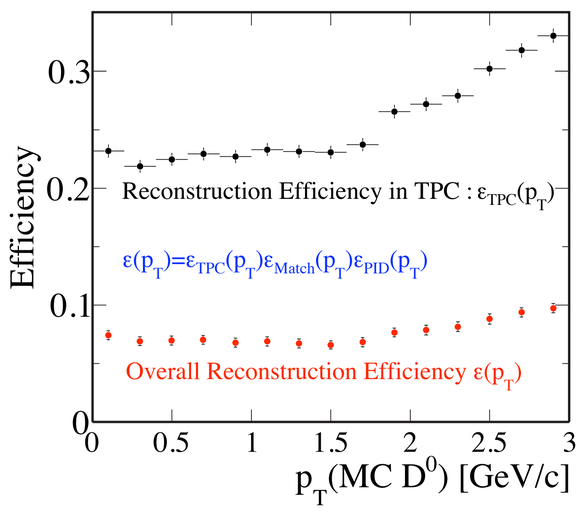


Results



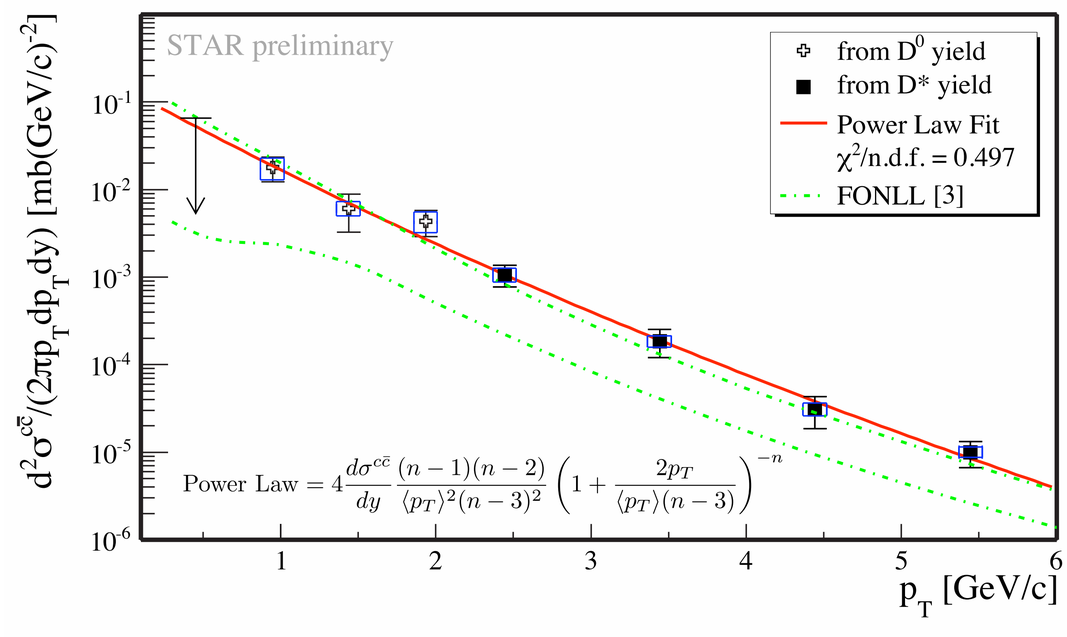
Background reconstruction - Mixed event, Rotated momentum and Like Sign





$$\frac{d^2\sigma^{c\bar{c}}}{2\pi p_T dp_T dy} = \frac{Y^{D^0+\overline{D^0}}}{4\pi p_T \Delta p_T \Delta y\, BR\, \varepsilon} \frac{\sigma^{NSD}\epsilon_T}{N f_{frag.}}$$

$$\begin{aligned}
\sigma^{NSD} &= 30\ mb \\
BR^{D^0\to K\pi} &= 0.038[1] \\
BR^{D^*\to D^0\pi} &= 0.677[1] \\
\Delta y &= 2 \\
f_{frag.}^{c\to D^0} &= 0.565 \pm 0.032[1] \\
f_{frag.}^{c\to D^*} &= 0.224 \pm 0.028[1] \\
\epsilon_T &= 0.67
\end{aligned}$$



Charm Cross section at mid y

$$\frac{d\sigma^{c\bar{c}}}{dy} = 202 \pm 56(stat) \pm 40(syst) \pm 20(norm)\ \mu b$$

References

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[3] M.Cacciari, P.Nason and R.Vogt, Phys.Rev.Lett. **95**, 122001 (2005)

[4] D. Kharzeev *et al.*, Phys. Lett. **B519**, 199 (2001)

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