Energy loss and flow of charm and bottom quarks from single electron measurements in Au+Au collisions at PHENIX

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Heavy flavor is powerful probe to study properties of QGP

Mainly created at early stage of the collision
Production can be calculated by pQCD
Passing through QGP
Suffer energy loss and flow effects

$p_T$ and angular distributions can be modified in QGP
Bottom and charm separation

- Charm and bottom separation by the unfolding method using the distance-of-closest-approach (DCA) and $p_T$ distribution
- Au+Au and $p+p$ are analyzed by the same analysis technique
- $p+p$ baseline updated using 2015 dataset
$R_{AA}(b\rightarrow e) \& R_{AA}(c\rightarrow e)$ in Au+Au 200GeV

- Nuclear modification factor $R_{AA}$
  - Broad $p_T$ range : $1$ – $8$ GeV/c
  - Small uncertainty with new p+p baseline

- Centrality and $p_T$ dependence
  - Low $p_T$ : $R_{AA}(b\rightarrow e) \sim R_{AA}(c\rightarrow e) = 1$
  - Mid $p_T$ : $R_{AA}(b\rightarrow e) > R_{AA}(c\rightarrow e)$
  - High $p_T$ : $R_{AA}(b\rightarrow e) \sim R_{AA}(c\rightarrow e) < 1$

- Bottom suppression is different from charm
  - A clear $p_T$ dependence

- PHENIX MB and STAR 0-80% are in good agreement within uncertainties
Clear centrality and $p_T$ dependence observed
Comparison with Models

- Compared with 3 models
  - DGLV (Phys. Rev. C 90 034910)
    - E-loss + plasma w/ static potentials
  - SUBATECH (Phys. Rev. C 78 014904)
    - E-loss + running coupling
  - T-Matrix + diffusion (2πTD=4) (Phys. Rev. Lett. 100 192301)
    - Strongly coupled QGP

- Models qualitatively consistent with data
  - Mass dependent energy loss agree with the mass dependent suppression

- Bottom models underestimates the data
- Charm models slightly higher than data
Toward final $v_2^c(\text{c} \rightarrow \text{e})$ and $v_2^b(\text{b} \rightarrow \text{e})$

- $v_2^c(\text{c} \rightarrow \text{e})$: $v_2$ is positive with ~3.5 sigma
- A hint of positive $b \rightarrow \text{e} \ v_2$ with 1.1 sigma

Outlook
- Final $v_2$ result with improved yield unfolding
- New analysis in Au+Au and small systems coming soon