



Production of D^\pm mesons in Au+Au collisions at $\sqrt{s_{NN}}=200$ GeV at the STAR experiment

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PHYSICS MOTIVATION

- At RHIC energies, charm quarks are produced predominantly through hard partonic scatterings at early stages of Au+Au collisions, making them an excellent probe of the QGP
- Suppression of high- p_T D^0 is observed in central Au+Au collisions and is comparable to models incorporating both radiative and collisional energy losses, and collective flow

$$R_{AA}(p_T) = \frac{dN_D^{AA}/dp_T}{\langle N_{coll} \rangle dN_D^{pp}/dp_T}$$

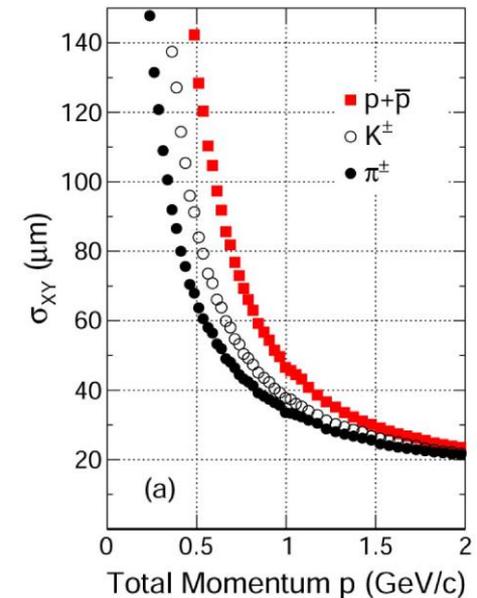
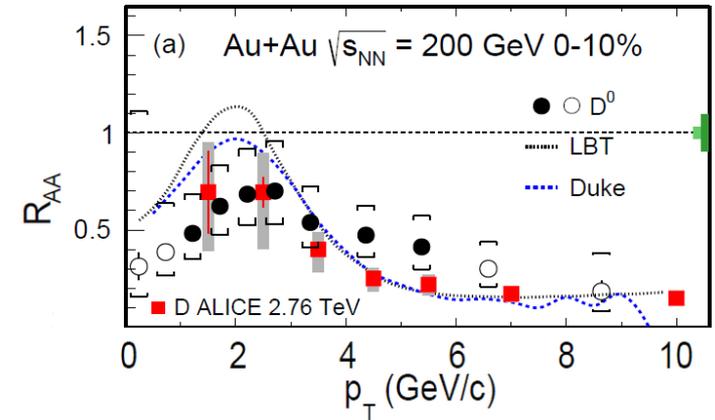
- The Heavy Flavor Tracker allows direct topological reconstruction of three body decay $D^\pm \rightarrow K^\mp \pi^\pm \pi^\pm$ at mid-rapidity
 - BR = $(8.98 \pm 0.28)\%$, $c\tau = (311.8 \pm 2.1) \mu\text{m}$
- The study of D^\pm production is complementary to that of D^0 and also provides constraints on the total charm cross-section in heavy-ion collisions

D^0 (STAR): Phys. Rev. C 99, 034908, (2019).
 D (ALICE): JHEP 03, 081, (2016).



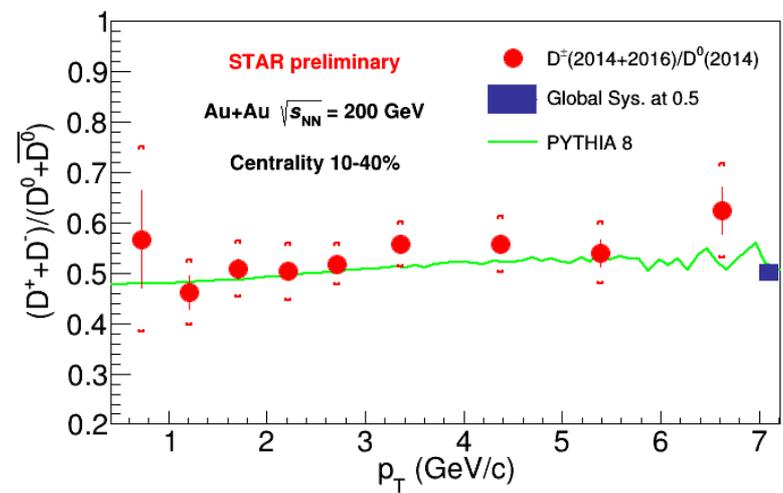
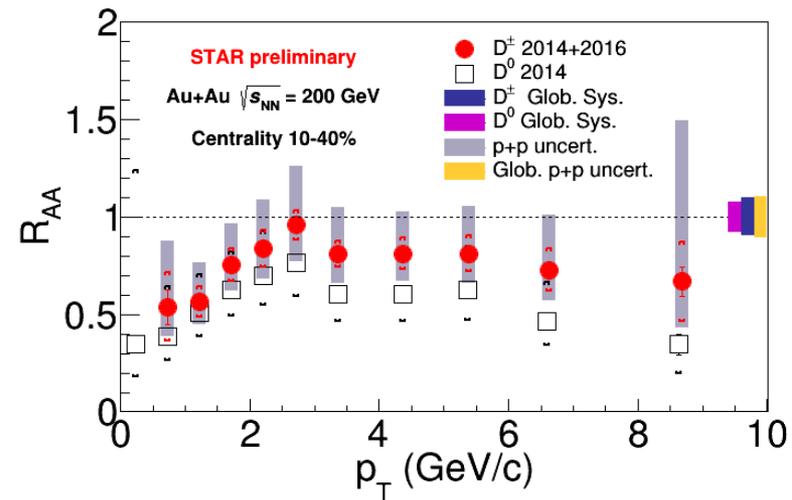
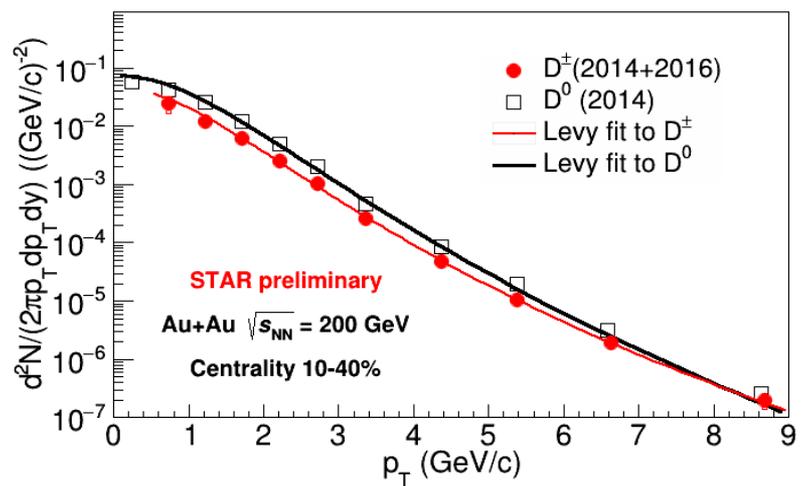
LBT (S. Cao *et al.*): Phys. Rev. C 94, 014909, (2016).
 Duke (Y. Xu *et al.*): Phys. Rev. C 97, 014907, (2018).

HFT resolution (STAR): : Phys. Rev. Lett. 118, 212301, (2017)





D[±] MEASUREMENT RESULTS



- **Invariant spectrum** of D[±] measured in three centrality classes of Au+Au collisions
 - For all centralities, see my poster (ID: 414)
- **Nuclear modification factor:** Similar level of suppression and centrality dependence for D[±] and D⁰
- **The D[±]/D⁰ yield ratio** shows good agreement with PYTHIA 8 calculation

p+p reference (STAR): Phys. Rev. D 86, 072013, (2012)

D⁰ (STAR): Phys. Rev. C 99, 034908, (2019).

CONCLUSION



- STAR has extensively studied production of open-charm mesons in Au+Au collisions at $\sqrt{s_{NN}}=200$ GeV utilizing the HFT
- The HFT allows direct topological reconstruction of hadronic decays of open-charm mesons
- D^\pm invariant spectrum measured for three centrality classes of Au+Au collisions
 - 0-10%, 10-40%, 40-80%
- D^\pm nuclear modification factor is consistent with that of D^0
 - D^0 and D^\pm mesons are significantly suppressed at high- p_T in central Au+Au collisions
 - Charm quarks interact strongly with the QGP
- D^\pm/D^0 yield ratio
 - Agrees with PYTHIA 8 calculation

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