Low p_T non-photonic electron production in Au+Au collisions at $\sqrt{s_{NN}}$ = 200 GeV

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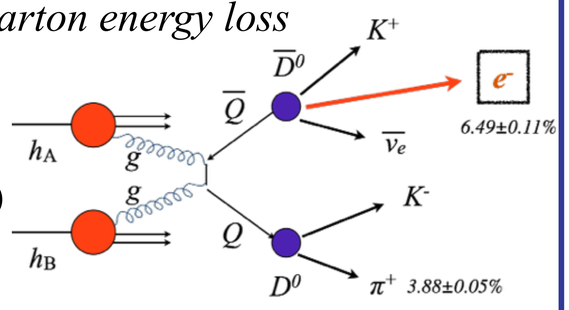
Abstract

Particles containing heavy quarks are very useful tool to investigate the properties of hot and dense matter produced in early stage of the relativistic heavy ion collision in terms of the mechanisms of their interaction with nuclear matter. This can be studied by non-photonic electrons (NPE) coming from semi-leptonic decays of heavy flavor hadrons. In year 2010, STAR has collected a large sample of minimum bias Au+Au events at $\sqrt{s_{NN}}$ = 200 GeV with newly implemented full barrel Time-Of-Flight detector. This enables us to analyse NPE production in the low p_T region ($0.2 < p_T < 2.0$ GeV/c) with high statistics.

In this presentation we report status of the low p_T NPE analysis in Au+Au collisions at $\sqrt{s_{NN}}$ = 200 GeV at STAR.

Motivation

- **Heavy Flavor** in heavy-ion collisions
  - Created mostly in initial parton-parton hard scatterings
  - Interaction with hot and dense ***QCD*** matter differently from that of light quarks.
  - Study flavor dependence of *parton energy loss* machanisms.

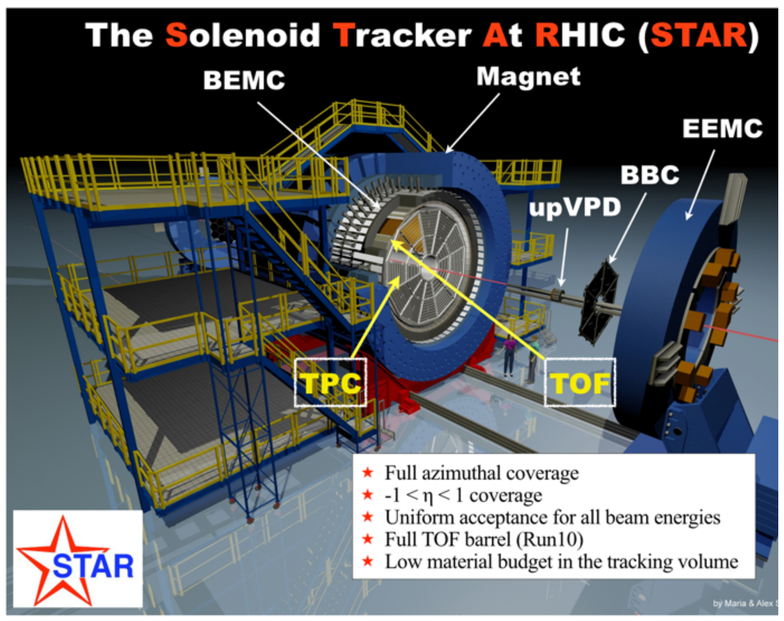


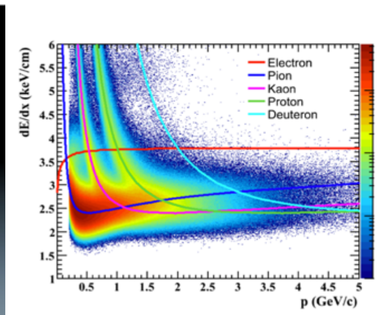
- **Non-photonic electrons (NPE)**
  - *Semileptonic channel* have high B.R. of *open heavy flavor mesons.*
  - *Easy for triggering and identification.*

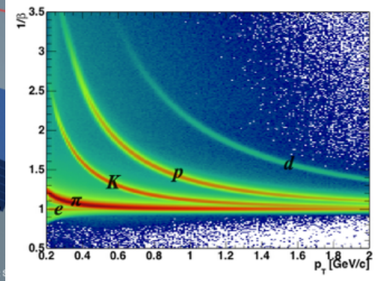
Non-photonic electrons(NPE) = Inclusive electrons (after electron PID) − *Photonic electrons(PE)*

D^0, $D^\pm$, B, Λ_c ... | γ, π^0, η^0 ...

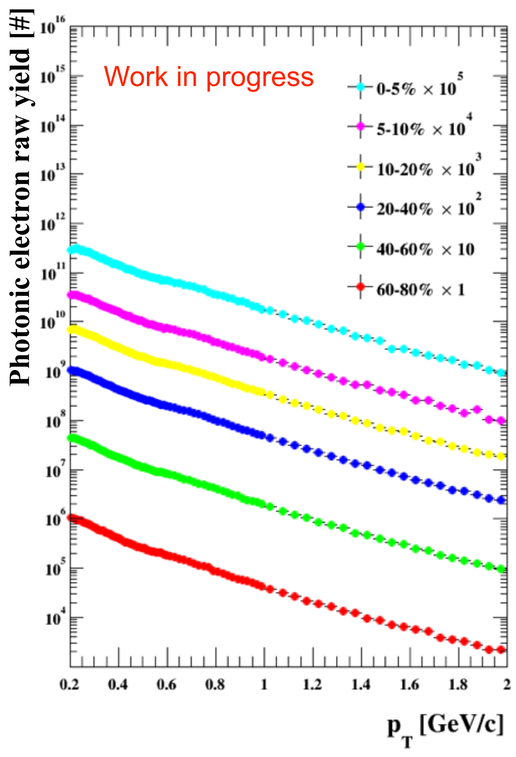
STAR detector

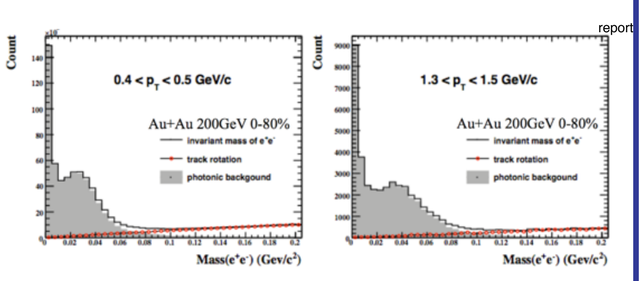






Photonic electrons (PE)

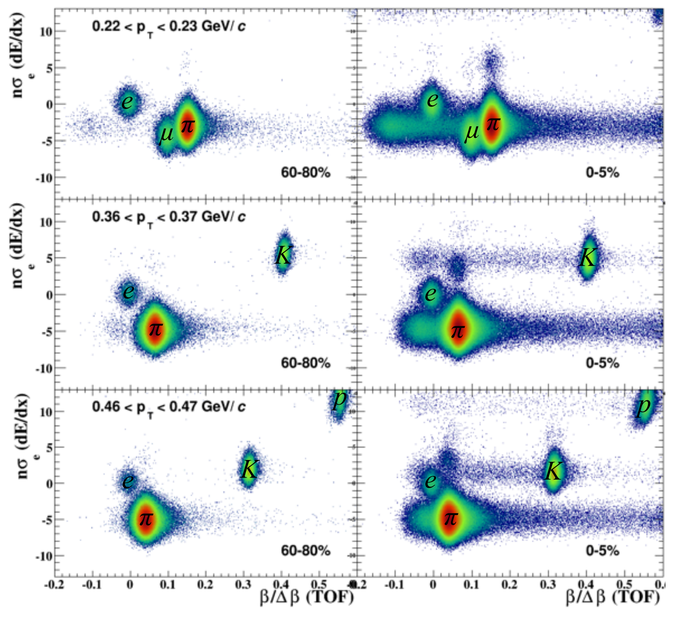


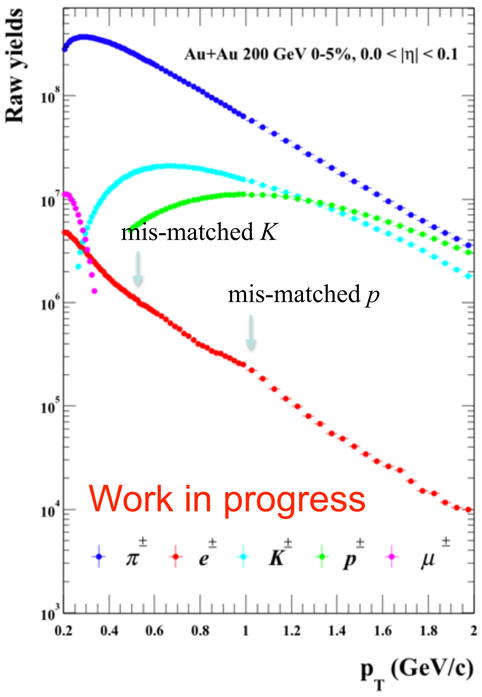


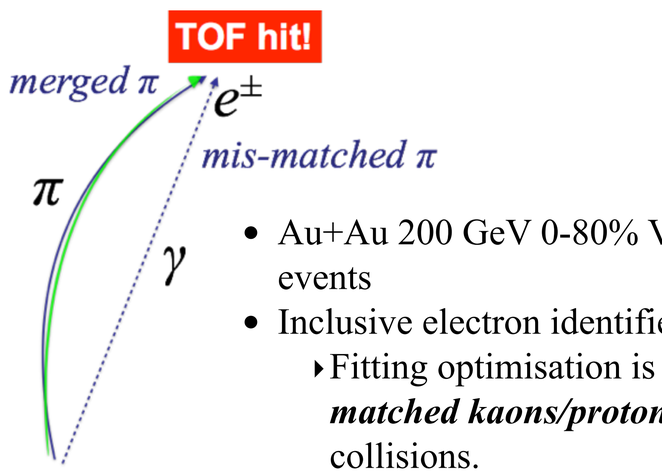
- We used the "**reconstruction method**" to statistically subtract the contribution of photonic electrons from inclusive electrons.
- We estimate the photonic electron contribution using e^+e^- pairs with invariant mass < 0.05 GeV/c^2 in real data.
  - $\gamma \rightarrow e^+ e^-$ photon conversion in the material in STAR detector.
  - $\pi^0 \rightarrow \gamma\, e^+ e^-$ ($B.R.$ = 1.174 ± 0.035%)
  - $\eta \rightarrow \gamma\, e^+ e^-$ ($B.R.$ = 0.70 ± 0.07%)

- **PE reconstruction efficiency**
  - Monte-Calo π^0 embedding simulation with real pions distribution.
  - Partner finding efficiency is 10~40% in minimum-bias Au+Au collisions.

Inclusive electron ID







- Au+Au 200 GeV 0-80% VPDMinBias dataset : 217M events
- Inclusive electron identified by **TOF+TPC** : 2D fitting
  - Fitting optimisation is ongoing including ***mis-matched kaons/protons*** and ***merged pions*** in central collisions.

Summary and outlook

- **Summary**
  - Low p_T NPE analysis in heavy ion collisions is being studied.
  - Estimation of Electrons yield is very sensitive by fitting constrains.
    → Need more reasonable fit constrains with mis-matched and merged particles.
  - Photonic electron yield estimation with Rec. method and corrected with π^0 embedding simulation.

- **Outlook**
  - Electron purity study (including mis-matched and merged particles)
  - Photonic electron reconstruction efficiency study (η^0 and γ …)
  - Systematic error study