Study of K* meson production in PHENIX for d+Au and Cu+Cu systems at $\sqrt{s_{NN}}$ = 200 GeV at RHIC

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Introduction

Quantum Chromodynamics (QCD) predicts a phase transition from nuclear matter to quark gluon plasma (QGP) at energy density higher than >1 GeV/fm^3 achievable in high energy heavy ion collisions. Measurements of various mesons and baryons provide the information about the interaction dynamics in heavy ion collision. Lighter systems such as p+p are used as baseline for production mechanism and d+Au for the cold nuclear matter effects such as shadowing and Cronin effect. It has been observed that high p_T hadrons measured in Au+Au are suppressed in comparison to p+p system scaled with number of binary collison $N_{\rm coll}$. Light hadrons like π and η [1, 2] have similar of suppression at high p_T which is consistent with parton enery loss in hot and dense medium. At intermediate p_T suppression of baryons and meson differs. ϕ [3] which has a strange quark and anti-quark content, is suppressed less than π at intermediate p_T whereas at high p_T its suppression is consistent with other mesons within uncertainties.

The spectra of kaon which has net strangeness is measured only in low p_T range upto 2 GeV/c in d+Au system [4]. The K* with open strangeness can provide additional information on hadron production at intermediate and high p_T. The K* is already measured in p+p system [5]. Here we present the measurement of K* ($\rightarrow K^{\pm} + \pi^{\mp}$) in d+Au and Cu+Cu system at $\sqrt{s_{NN}}$ = 200 GeV at RHIC, with PHENIX detector.

Analysis

The data presented here were taken during 2008 for d+Au and 2005 for Cu+Cu. In PHENIX, the charged particles are tracked by Drift Chamber (DC) and Pad Chamber (PC3) is used to match the tracks upto the end of PHENIX central arm. The time of flight (TOF) identifies the particles but has limited coverage. To obtain the K* yield the data is divided into four sets:

1. TOF-PC3 - Kaon is identified in TOF and a PC3 matched track is taken as pion.
2. PC3-PC3 - PC3 matched tracks are taken as kaon and pion.
3. DC-PC3 - A drift chamber (DC) track is taken as kaon and PC3 matched track as pion.
4. TOF-TOF - Both pion and kaon are identified in TOF.

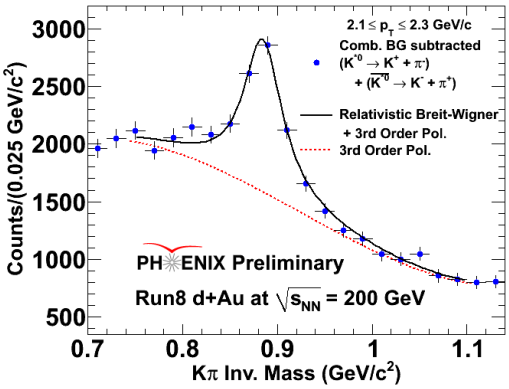

FIG. 1: Invariant mass of pion and kaon pairs for TOF-PC3 data set for d+Au system at $\sqrt{s_{NN}}$ = 200 GeV.

Fig. 1 shows the invariant mass of pion and kaon pairs for TOF- PC3 data set in p_T bin of (2.1-2.3 GeV/c). Fig. 2 is the invariant mass for TOF-PC3 data set for Cu+Cu system. The uncorrelated background obtained from

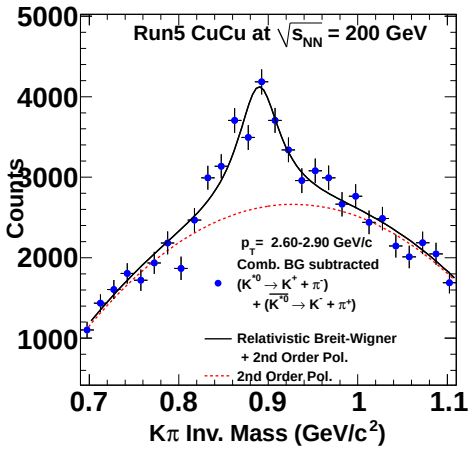

FIG. 2: Invariant mass of pion and kaon pairs for TOF-PC3 data set for Cu+Cu system at $\sqrt{s_{NN}}$ = 200 GeV.

mixed event technique has been subtracted. Also the contributions coming from ϕ meson ($\phi \to K^{\pm} + K^{\mp}$) and K_S ($K_S \to \pi^{\pm} + \pi^{\mp}$) (for Cu+Cu system) has also been subtracted. The effect due to ϕ and K_S appears in all sets except TOF-TOF due to the misidentification of kaon tracks as pions and vice-versa. The signal is fitted with relativistic Briet Wigner (RBW) and background is described by 2nd order polynomial. The width of RBW is fixed to the value obtained from simulation. The study of mass and width shift is under progress in different p_T ranges.

Fig. 3 shows the K* p_T spectra for d+Au system at $\sqrt{s_{NN}}$ = 200 GeV for different centrality bins. While in p+p system K* yield (shown as open circles) was measured from p_T 0.9 GeV/c to 7.5 GeV/c, in d+Au system it starts from p_T 1.2 GeV/c.

Fig. 4 shows the nuclear modification R_{dAu} as a function of p_T for K* in d+Au system. It is flat within the uncertainties.

Conclusions

The K* transeverse momentum spectra for d+Au system for different centralities has been measured in the p_T range of 0.9 GeV/c to 7.5 GeV/c. R_{dAu} as a function of p_T is flat within the uncertainties.

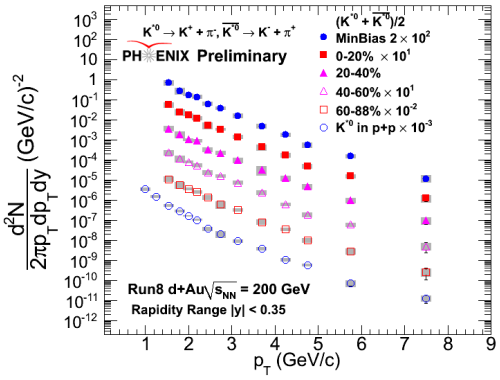

FIG. 3: K* p_T spectra for d+Au system at $\sqrt{s_{NN}}$ = 200 GeV for different centrality bins.

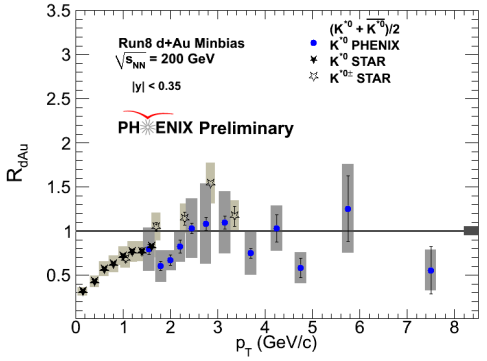

FIG. 4: R_{dAu} for K* at $\sqrt{s_{NN}}$ = 200 GeV for d+Au system.

References

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