K* meson production in Cu+Cu collision at $\sqrt{s_{NN}}$ = 200 GeV at PHENIX

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Introduction

Suppression of high p_T particles in the heavy ion collsion is one of the most pronounced signal of the Quark Gluon Plasma (QGP). This phenomenon is referred as 'jet quenching'. The high p_T particles come from jets which are formed in the collision. The jet which is formed near peripheral region will be suppressed less as compared to that is formed in the interior.

It has already 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 $N_{\rm binary}$. The light hadrons like π and η [1, 2] have similar suppression at high p_T which is consistent with parton energy loss in hot and dense medium. At intermediate p_T, suppression of baryons and meson differs which is interpreted in recombination models.The ϕ [3] which is a closed strange system, is suppressed less than π at intermediate p_T whereas at high p_T its suppression is consistent with other mesons within uncertainties. The K* meson has open strangeness and is already measured in p+p and d+Au system [4]. Here we present the K* ($\rightarrow K^{\pm} + \pi^{\mp}$) nuclear modification factor in Cu+Cu system at $\sqrt{s_{NN}} = 200$ GeV at RHIC, measured with PHENIX detector.

Analysis and Results

In PHENIX, the charged particles are tracked by Drift Chamber (DC) and the 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 three sets:
1. TOF - PC3 : Kaon is identified in TOF and a PC3 matched track is taken as pion.

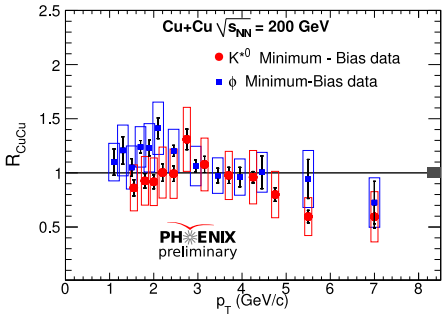

FIG. 1: Comparison of R_{CuCu} for K* and ϕ in Cu+Cu system at $\sqrt{s_{NN}} = 200$ GeV for for Minimum Bias data.

2. PC3 - PC3 : PC3 matched tracks are taken as kaon and pion.
3. TOF - TOF : Both the particles pions and kaons are identified in TOF.

The invariant mass spectrum is constructed from measured kaons and pions. The uncorrelated background obtained from mixed event technique has been subtracted. The contributions coming from ϕ meson ($\rightarrow K^+ + K^-$) and K_S ($\rightarrow \pi^+ + \pi^-$) has also been subtracted. The contributions of ϕ and K_S appear 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 and background is taken as described by 2^{nd} order polynomial. The width of RBW is fixed to the value obtained from simulation. The K* transverse momentum spectra for Cu+Cu system at $\sqrt{s_{NN}} = 200$ GeV is measured from p_T 1.4 GeV/c to 8 GeV/c.

The Nuclear Modification Factor is defined

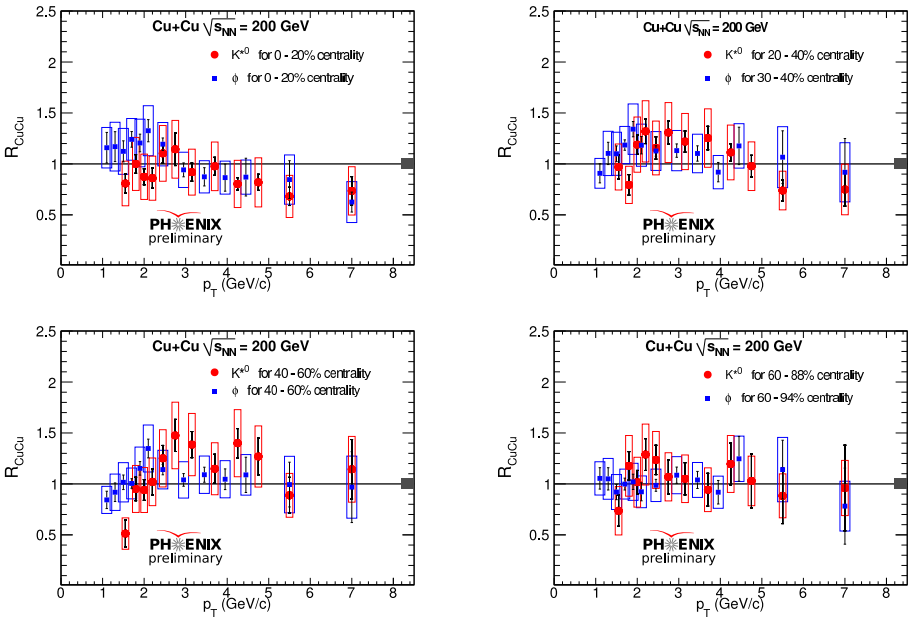

FIG. 2: Comparison of R_{CuCu} for K* and ϕ in Cu+Cu system at $\sqrt{s_{NN}}$ = 200 GeV for different centralities.

as :

$$R_{AB} = \frac{\sigma_{pp}^{inel}}{N_{binary}} \times \frac{d^2N_{AB}/dydp_T}{d^2\sigma_{pp}/dydp_T} \quad (1)$$

A, B are the collsion species, $d^2N_{AB}/dydp_T$ is the K* yield in the heavy ion collison, σ_{pp}^{inel} is the pp inelastic cross section = 42.2 mb, N_{binary} is the number of binary collision for a given centrality. If there are medium effects R_{AB} is differs from 1, otherwise $R_{AB} = 1$.

Fig. 1 shows the comparison of R_{CuCu} for K* and ϕ in Cu+Cu system at $\sqrt{s_{NN}}$ = 200 GeV for Minimum Bias Data and and Fig. 2 shows the same for four centrality bins. The red circles are the data points and the hollow boxes are the systematic errors for K* and the blue ones are for ϕ given for comparison. It has been observed that irrespective of centralities at low p_T K* is more suppressed than ϕ. Also at high p_T K* is more suppressed than ϕ in the most central bins i.e. 0 - 20% and 20 - 40%. In the most peripheral bins 40 - 60% and 60 - 88%, K* is not suppressed within uncerainties.

Conclusions

The K* transverse momentum spectra for Cu+Cu system at $\sqrt{s_{NN}}$ = 200 GeV is presented from p_T 1.4 GeV/c to 8 GeV/c. The nuclear modification factor plots for K* show suppression in case of the most central bins at higher p_T while in the most peripheral bins the suppression is consisent with unity with errors. It is first measurement of suppresion of a open strange particle in heavy ion collisions at high p_T.

References

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