Single electron cocktail from mesons in Au + Au collisions at $\sqrt{s_{NN}}$ = 200 GeV

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The single electrons coming from semi electronic decays of charm and beauty quarks are important hard probes of the properties of matter produced in heavy ion collisions [1]. In order to obtain the electron spectra from heavy quark made meson decays, one needs to subtract the electron contribution from other meson decays. Thus getting the cocktail of electrons coming from all mesonic sources is crucial in any such analysis [2]. In cocktail calculation, neutral as well as charged pion data are incorporated to parameterize the pion spectra, which are the most important ingredients. Combination of the neutral and charged pion data is based on the assumption that the neutral pion spectrum is the same as the average charged pion spectrum. This additional input will significantly improves the quality of the electron cocktail at low p_T (<1.5 GeV/c).

Figure 1 upper pannel shows the transverse momentum distributions for pions measured in Au + Au collisions at $\sqrt{s_{NN}}$ = 200 GeV for minimum bias taken from Refs. [3, 4]. These spectra are fitted using Hagederon distribution given by:

$$(1/2\pi p_T)(1/N_{event})d^2N/dp_Tdy=A(\exp(-a\, p_T - b\, p_T^{\,2}) + p_T/p0)^{-n}$$

where A, a, b, p0 and n are the fit parameters.

The other light mesons contributing to the inclusive electron spectrum via their decays are η, ρ, ω, φ, η' etc. The η meson contributes a sizeable fraction of decay electrons, in particular at high p_T. Using mT scaling, we obtain the spectra of other light neutral mesons i.e. by replacing p_T by $\sqrt{(p_T^2+m_h^2-m_{\pi 0}^2)}$, where m_h is the rest mass of the corresponding hadrons or mesons. The spectra for all mesons obtained by m_T scaling are shown in Fig. 2. The relative normalization of the mT scaled spectra is fitted to the experimental data for η[5, 6] and φ mesons[7] as shown in Fig. 3.The agreement of the m_T scale and experimental data shapes are excellent.

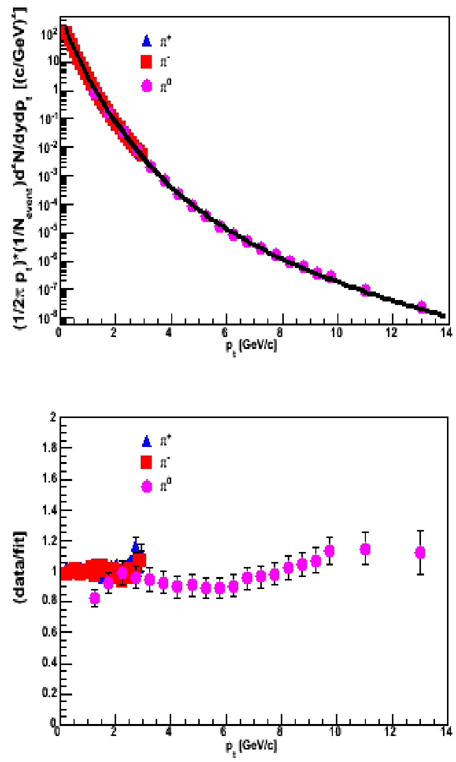

Fig. 1: Upper panel: Invariant yields of charged and neutral pions as a function of p_T for Au+Au at 200GeV. Lower panel: Ratio of data to fit.

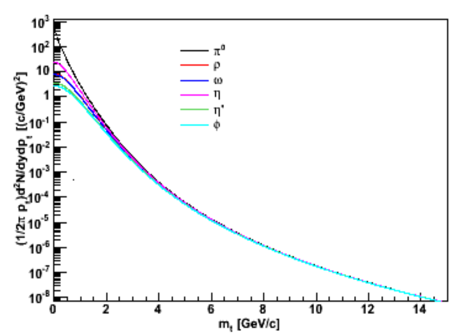

Fig. 2: The invariant yield of different mesons as a function of p_T obtained using m_T scaling.

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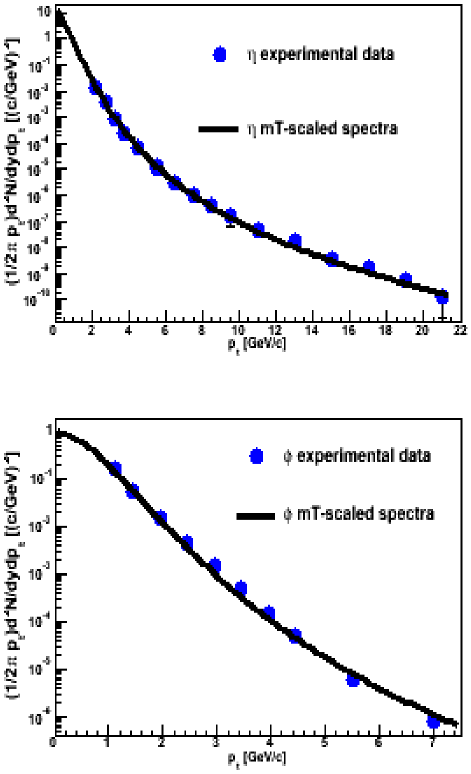

Fig. 3: **T**he m_T scaling test of η[5,6] (upper panel) and φ[7] (lower panel) mesons with the experimental data. Blue points show the experimental data and black line shows the m_T scaled spectra.

For each meson mentioned above including π^0, the differential number of particles (dN/dy) was derived by integrating the invariant yield over p_T. According to the m_T scaling approach, h/π^0 is constant at high p_T region. Thus we normalize our spectra with the standard particle ratios [8]: $\rho/\pi^0 = 1.0 \pm 0.06$, $\omega/\pi^0 = 1.0 \pm 0.06$, $\eta/\pi^0 = 0.45 \pm 0.1$, $\eta'/\pi^0 = 0.25 \pm 0.007$, $\varphi/\pi^0 = 0.40 \pm 0.12$ taken from different experiments. With our fitting we found η/π^0 = 0.50 +/ -0.01, φ/π^0 = 0.33 +/- 0.01 which is similar to the above ratios.

The p_T spectra of electrons from various mesons can be obtained using a particle generator (Exodus) through following input parameters: (1) Hagedorn fitting parameters (2) dN/dy of π^0 (3) relative normalization of mesons with respect to π^0 at mid rapidity. Fig. 4 shows the p_T spectra of single electrons from these different mesons.

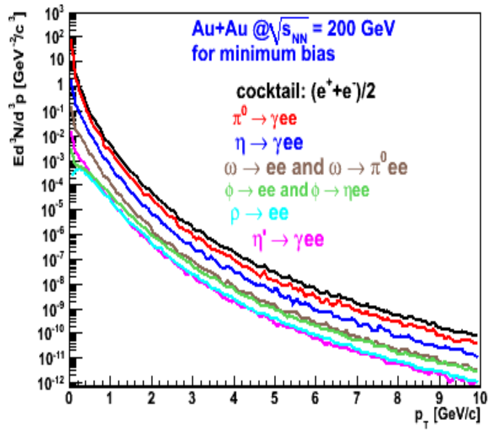

Fig 4: The p_T spectra of single electrons from different mesons.

This work is supported by DAE-BRNS, Mumbai and University Grant Commission, New Delhi, India. Author is grateful to the PHENIX Collaboration.

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