Single electron p_T spectra in Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV

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The interactions of heavy flavor hadrons with the medium are ideal probes to the hot and dense nuclear matter created in heavy ion collisions. Due to the large charm quark masses, theoretical calculation predicts that charm production is sensitive to the initial parton distribution function and their spectra are sensitive to the later stage dynamical evolution in high energy nuclear collisions [1–3].

The single electrons from charmed hadrons semi-leptonic decay can provide information on charm production [4]. The charm production and transverse momentum spectra have been studied through indirect semi-leptonic decay channel in p+p and d+Au collisions at $\sqrt{s_{\rm NN}}$= 200 GeV by the STAR experiments [5]. They provide an independent and consistent result with direct charm measurement in d+Au collisions. The spectrum measurement for single electrons at $\sqrt{s_{\rm NN}}$= 62.4 GeV in Au+Au collisions also show consistent result with expected low charm yield. In this report, we presents the preliminary results on single electrons transverse momentum spectra at $\sqrt{s_{\rm NN}}$= 200 GeV in Au+Au collisions.

In this analysis, electron identification is performed with the combination of velocity (β) from TOF and dE/dx from TPC. Electrons can be separated from hadrons using their dE/dx in the TPC after applying a TOF cut of $|1/\beta - 1| \leq 0.03$. The TOF matching efficiency estimated using pion sample is around 0.75%. The efficiency for identifying electron in the STAR TPC is estimated about 85%. Photonic background electrons are evaluated by the invariant mass and opening angle of the e^+e^- pairs reconstruction from an electron (positron) in TOF combined with every positron (electron) candidate in the TPC [6]. The photonic background reconstruction efficiency is around 60% estimated by simulation [5]. The mean value of the $n\sigma_e$, in specific energy loss dE/dx, is also corrected. More than 95% of the background electrons are from γ conversion and π^0 Dalitz decay. The non-photonic electron spectra were obtained by subtracting the photonic background from the inclusive spectra. The results are shown in Fig. 1. The error bars are only statistical.

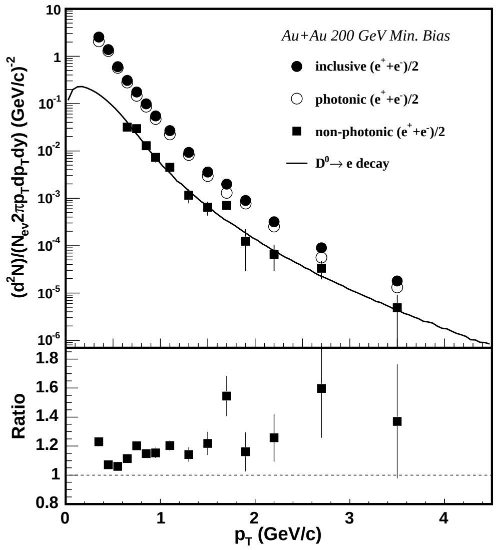

FIG. 1: Upper panels: Electron distributions from Au+Au collisions. Solid circles depict inclusive electrons/positrons ($(e^+$+$e^-)/2$). The photonic electrons are shown as open circles. Solid squares depict the non-photonic electrons with background subtracted. The curve shows the electrons from $D^0 \rightarrow e^+ + X$ in d+Au collisions scaled by one parameter. Bottom panels: the ratio of inclusive electrons to the photonic electrons.

The final non-photonic electron spectrum covers a p_T range from 0.6 to 3.5 GeV/c. A significant increase of the non-photonic over total is observed, see bottom of Fig. 1. These excesses are the charm hadron decayed electrons. In the future, we will study the charm signal as a function of collision centrality in the 200 GeV Au+Au collisions.

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