Measurements of D^0, D^+ and D^{*+} Meson Production at Mid-rapidity in Au+Au Collisions at $\sqrt{s_{\rm NN}} = 200\,{\rm GeV}$ by the STAR Experiment

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We report new STAR measurements of D^+ and D^{*+} meson production and an improved measurement of D^0 meson production within mid-rapidity ($|y| < 1$) in Au+Au collisions at $\sqrt{s_{\rm NN}} = 200\,{\rm GeV}$. The measurements utilize the STAR Heavy Flavor Tracker for topological reconstruction of these mesons through decay channels $D^+ \to K^-\pi^+\pi^+$, $D^{*+} \to D^0\pi^+ \to K^-\pi^+\pi^+$, $D^0 \to K^-\pi^+$ and their charge conjugates. The D^+/D^0 and D^{*+}/D^0 ratios are consistent with PYTHIA8 model calculations in all measured p_T regions and centrality classes. The combined D-meson nuclear modification factors $R_{\rm CP}$ and $R_{\rm AA}$ are reported for various centrality bins in Au+Au collisions. We also report the D^0 meson yield rapidity distribution within $|y| < 1$. Physics implications on charm quarks dynamics in the hot QCD medium will be discussed.

I. INTRODUCTION

II. DATASET AND EXPERIMENTAL SETUP

The measurements reported in this paper utilize the datasets in Au+Au collisions at $\sqrt{s_{\rm NN}} = 200\,{\rm GeV}$ collected by the STAR experiment during RHIC runs 2014 and 2016. A total statistics of x.x $\times 10^9$ minimum bias triggered events were used in these measurements. The trigger condition and STAR subsystems used in the 2014 analysis are the same as those in our previous reported D^0 paper []. The

III. ANALYSIS DETAIL

A. $D^0 \to K^-\pi^+$

1. Signal Reconstruction

- Run16 D^0 signal

2. Efficiency Correction

- Efficiency vs. pT

3. Systematic Uncertainties

B. $D^+ \to K^-\pi^+\pi^+$

- D^+ signal (three pT bins, central/peripheral) - Efficiency vs. pT

C. $D^{*+} \to D^0\pi^+ \to K^-\pi^+\pi^+$

- D^{*+} signal (three pT bins, central/peripheral) - Efficiency vs. pT

IV. RESULTS

D^0 p_T spectra
D^+ p_T spectra
D^{*+} p_T spectra
D^+/D^0 ratio compared to PYTHIA
D^{*+}/D^0 ratio compared to PYTHIA
D^0 dN/dy vs. y compared to PYTHIA
Combined D-meson $R_{\rm CP}$
Combined D-meson $R_{\rm AA}$

V. SUMMARY

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