Measurement of $D^0 - \bar{D}^0$ azimuthal correlations and femtoscopic correlations of D mesons with identified hadrons in Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV at STAR

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Heavy quarks are produced at the very early stage of heavy-ion collisions, and they experience the whole evolution of the Quark-Gluon Plasma (QGP) created in these collisions. Measurements of the elliptic flow and nuclear modification factor of charmed mesons in heavy-ion collisions at RHIC and the LHC provide ample evidence of strong interactions between charm quarks and the QGP. However, a complete understanding of the nature of the charm-medium interaction is yet to be achieved. Thus, new observables are needed to constrain theoretical models and the charm quark diffusion coefficient in the QGP.

Measurements of azimuthal and femtoscopic correlations involving charmed mesons can provide such new insights. Azimuthal correlations of charmed mesons can help to pin down the relative role of radiative and collisional energy losses for charm quarks. On the other hand, femtoscopic correlations, i.e., two-particle correlations at the low relative momentum, are sensitive to the final-state interactions and the extent of the region from which correlated particles are emitted. Therefore, a study of femtoscopic correlations between charmed mesons and identified charged hadrons could shed light on their interactions in the hadronic phase and the interaction of charm quarks with the bulk partons.

We will present the azimuthal correlations of $D^0 - \bar{D}^0$ pairs and femtoscopic correlations of charmed mesons with identified hadrons measured by the STAR experiment at mid-rapidity in Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV using high-statistics data collected in 2014 and 2016. We will compare the experimental results with available theoretical model predictions and discuss their physics implications.