# Measurements of charm hadron production and anisotropic flow in Au+Au collisions at $\sqrt{s_{NN}}$ = 200 GeV with the STAR experiment at RHIC

Sooraj Radhakrishnan for the STAR Collaboration
Lawrence Berkeley National Laboratory

Heavy flavor quarks, owing to their large masses, are predominantly produced through initial hard scatterings in heavy-ion collisions and thus are ideal probes to study the properties of the strongly coupled Quark Gluon Plasma (sQGP) also produced in these collisions. For example, study of the heavy flavor anisotropic flow can help understand the nature of the interactions between heavy quarks and the medium as well as the bulk properties of the medium. In particular, the first order anisotropy (directed flow), $v_1$, can provide information about heavy quark dynamics at early times. It is also predicted that the magnetic field present in the early stages of the collisions can induce large $v_1$ for heavy flavor mesons and can therefore be used to study such magnetic field.

Measurements of charm hadron spectra can provide further information on charm quark interactions and hadronization in the QGP. The modifications to charmed hadron spectra in heavy-ion collisions ($R_{AA}$) are sensitive to the energy loss of charm quarks, which in turn depends on the interactions between charm quarks and the medium. On the other hand, if the coalescence mechanism, observed for light flavor hadrons, also plays a significant role for charm quark hadronization in the QGP, enhancements in the yield ratios of $\mathrm{D_s^{\pm}}$ and $\Lambda_\mathrm{c}$ to non-strange charmed mesons can be expected.

We use the STAR Heavy Flavor Tracker (HFT) to reconstruct the heavy flavor hadrons, via their hadronic decay channels, in Au+Au collisions at $\sqrt{s_{NN}}$ = 200 GeV. The first measurement of the directed flow of $D^0$ and $\overline{D^0}$ mesons is presented as a function of particle rapidity, and compared to that of light hadrons. Measurements of the elliptic ($v_2$) and triangular flow ($v_3$) of $D^0 + \overline{D^0}$ mesons will also be presented and compared to model calculations. We also show measurements of $R_{AA}$ for $\mathrm{D^0}$ and $\mathrm{D^{\pm}}$ mesons as well as the yield ratios of $\mathrm{D_s^{\pm}/D^0}$ and $\Lambda_\mathrm{c}/\mathrm{D^0}$. The implications of these results on the understanding of the charm quark dynamics and the degree of charm quark thermalization in the sQGP medium, will be discussed.