Charm Quark Jet Spectrum and Shape Modifications in Au+Au Collisions at $\sqrt{s_{NN}} = 200$ GeV

Diptanil Roy
For the STAR Collaboration

July 17, 2022

1 Abstract

The properties of the Quark Gluon Plasma (QGP) produced in heavy ion collisions can be studied by using the hard scattered partons produced in the early stages of the collision as probes. These partons lose energy to the QGP medium, either through collisions, or through medium induced gluon *bremsstrahlung*. Theoretical calculations predict that the radiative energy loss, which is the dominant mode of energy loss for gluons and light quarks in the QGP, is suppressed for heavy quarks, such as charm and bottom, at low transverse momenta (p_{T}). The measurement of the $D^0(c\bar{u})$ meson radial profile in jets from the CMS experiment at the LHC hints at its slight modification at low D^0 p_{T} in heavy-ion collisions, which is qualitatively different from that of the lighter hadrons. At RHIC energies, lower energy jets are produced, closer to the charm quark mass, and could be the key to better understanding the parton mass dependence of jet properties. The excellent secondary vertex resolution provided by the Heavy Flavor Tracker in the STAR experiment at RHIC also enables reconstruction of D^0 mesons at low p_{T} with high signal significance over the background.

We report the first measurements of the D^0 meson tagged jet transverse momentum (p_{T}) spectra and the D^0 meson radial profile in jets reconstructed from Au+Au collisions at $\sqrt{s_{\mathrm{NN}}} = 200$ GeV, collected by the STAR experiment. Such measurements can shed light on parton flavor and mass dependencies of jet energy loss, and therefore constrain theoretical models.