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

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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 at the early stages of the collision as probes. These partons lose energy in the QGP medium either through elastic 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 a modification at low D^0 p_{T} in heavy-ion collisions, which is qualitatively different from that of the light hadrons. At RHIC energies, lower energy jets closer to the charm quark mass are more accessible, and could provide key insight into the understanding of the mass dependence of parton energy loss. The excellent secondary vertex resolution provided by the Heavy Flavor Tracker in the STAR experiment at RHIC enables the reconstruction of D^0 mesons at low p_{T} with high signal significance.

We report the first measurements of the D^0 meson tagged jet p_{T} spectra and the D^0 meson radial profile in jets reconstructed in 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.