

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

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1 Abstract

1 Partons (quarks/gluons) in heavy ion collisions interact strongly with the QGP, and hence
2 have their energy and shower structure modified compared to those in vacuum, e.g., those
3 produced in proton-proton collisions. Theoretical calculations predict that radiative energy
4 loss, which is the dominant mode of energy loss for gluons and light quarks in the QGP, is
5 suppressed for heavy quarks (such as charm and bottom) at low transverse momenta (p_T). A
6 measurement of the $D^0(c\bar{u})$ meson radial profile in jets from the CMS experiment at the LHC
7 hints at its modification at low D^0 p_T in heavy ion collisions, that is qualitatively different
8 from that of the inclusive hadrons. The precise secondary vertex resolution provided by the
9 Heavy Flavor Tracker in the STAR experiment at RHIC enables reconstruction of a high
10 statistics, pure sample of D^0 mesons at low p_T , making STAR ideal for similar measurements.
11 We report the first measurements of the D^0 meson tagged $p_{T,jet}$ spectra and D^0 meson radial
12 profile in anti- k_T jets from Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV at RHIC, collected by
13 the STAR experiment in 2014. We compare the results to PYTHIA-8 predictions at the
14 same center-of-mass energy. We also report the nuclear modification factor R_{CP} for these
15 D^0 -meson tagged jets. Such measurements are expected to shed light on parton flavor and
16 mass dependencies of jet quenching, and constrain theoretical models.