

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

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November 23, 2021

1 Abstract

1 Partons (quarks/gluons) in heavy-ion collisions interact strongly with the Quark-Gluon
2 Plasma (QGP), and hence have their energy and shower structure modified compared to
3 those in vacuum, e.g., those produced in proton-proton collisions. Theoretical calculations
4 predict that radiative energy loss, which is the dominant mode of energy loss for gluons and
5 light quarks in the QGP, is suppressed for heavy quarks (such as charm and bottom) at low
6 transverse momenta (p_T). A measurement of the $D^0(c\bar{u})$ meson radial profile in jets from the
7 CMS experiment at the LHC hints at its modification at low D^0 p_T in heavy-ion collisions,
8 which is qualitatively different from that of the inclusive hadrons. The excellent secondary
9 vertex resolution provided by the Heavy Flavor Tracker in the STAR experiment at RHIC
10 enables reconstruction of D^0 mesons at low p_T with high significance, making STAR ideal
11 for similar measurements.

12 We report the first measurements of the D^0 meson tagged jet p_T spectra and D^0 meson
13 radial profile in anti- k_T jets from Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV at RHIC, collected
14 by the STAR experiment in 2014. We compare the results to PYTHIA-8 predictions at the
15 same center-of-mass energy. We also report the nuclear modification factor R_{CP} for these
16 D^0 -meson tagged jets. Such measurements are expected to shed light on parton flavor and
17 mass dependencies of jet quenching, and constrain theoretical models.