CONSTRAINING PARTON ENERGY LOSS VIA ANGULAR AND MOMENTUM BASED DIFFERENTIAL JET MEASUREMENTS IN AU+AU COLLISIONS AT STAR QUARK MATTER 2019

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1. ABSTRACT

Parton energy loss has been established as an essential signature of the QGP in heavy ion collisions since the earliest measurements at RHIC indicating suppression of hadron spectra at high p_T and coincidence yields. Understanding this phenomenon of jet quenching is a requirement for extracting the microscopic properties of the QGP via jet-tomography. STAR has recently introduced a technique called Jet Geometry Engineering (JGE) wherein we enforce particular selection criteria imposed on the jet collection, such as recoiling off a high p_T hadron trigger along with an additional transverse momentum threshold for jet finding in events with back-to-back di-jets. With JGE, we are able to control the extent of energy loss ranging from quenched/imbalanced to recovered/balanced recoil jets. Since jet quenching is also expected to be dependent on the resolution/transverse-length scales with which the jet probes the medium, it is necessary to perform differential measurements with a handle on both momentum and angular scales. With the large 2014 Au+Au data sample at $\sqrt{s_{NN}} = 200$ GeV we are able to quantitatively constrain parton energy loss via JGE and measure it differentially as a function of both the jet p_T and opening angle between the two leading sub-jets (θ_{sj}). We probe the medium response to jets at varying resolution scales by measuring the recoil jet yield and the di-jet asymmetry and search for significant differences between wide and narrow θ_{sj} jets. These double differential measurements in p_T and angle, along with JGE, enable us to probe the medium and its coherent or decoherent interaction with a hard scattered parton leading to partonic energy loss.

Date: June 28, 2019.