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Constraining parton energy loss via angular and momentum based differential jet measurements in Au+Au collisions at STAR

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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.

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