Contribution ID: **25** Type: **Contributed Oral**

Jet broadening in a viscous nuclear medium

Sunday, 16 February 2025 10:30 (15 minutes)

Heavy-ion collisions have reached energies high enough to melt the nucleus into its fundamental constituents, the quarks and gluons, making a Quark Gluon Plasma (QGP). In addition to creating the QGP, these collisions can transfer large momenta to a small subset of quarks and gluons (also known as partons), thus promoting these partons to a highly excited state, which will subsequently radiate a collimated spray of particles called a jet. Jet showering has been studied extensively in electron-positron collisions where no QGP is formed (i.e. in the vacuum), thus making them a calibrated probe to study the QGP. Interactions between partons of the jet and the surrounding medium cause Brownian diffusion of the momentum of jet partons through collisions with the QGP, which is the main topic studied herein. Specifically, we compare the scattering rate and transverse momentum diffusion of jet partons within an inviscid as well as viscous QGP, thus allowing the use of jets to constrain the viscosity of the QGP.

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Session Classification: Morning 6 - QCD and Hadrons

Track Classification: QCD and Hadrons