Stony Brook University
The Graduate School

Doctoral Defense Announcement

Abstract

Jet-medium interactions via direct photon-hadron correlation measurements in Au+Au collisions at $\sqrt{s}$ = 200 GeV

By

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Hot and dense matter called quark-gluon plasma (QGP) has been created in high energy heavy ion collisions in the relativistic heavy ion collider (RHIC). Jets are observed to be suppressed in heavy ion collisions compared to those in p+p baseline – a phenomenon known as "jet quenching". This arises from the fact that partons from initial hard scatterings lose energy when traversing through and interacting with the medium. Extensive effort has been made in understanding the energy loss mechanism.

Direct photon-hadron correlations are a golden channel to study parton energy loss in QGP. Photons do not interact strongly with the medium and exit unperturbed. High momentum photons are produced back-to-back with partons at leading order in the initial hard scatterings via predominantly QCD Compton scatterings. Their measured momentum will approximately balance those of the opposing partons before any medium modification. Consequently, using high-momentum direct photons as triggers is a most direct measure of the initial parton energy. Compared to di-hadron correlations or reconstructed jets, this measurement has no bias toward the medium surface.

The modification of the fragmentation function for the away-side jet can be measured by comparing the integrated γ_{dir}-h yields in heavy ion collisions to those in p+p. We analyzed Au+Au data taken by PHENIX in 2011 and combined with the results from 2007 and 2010. The per-trigger-yield of associated hadrons in Au+Au collisions is measured and we observe a suppression compared to p+p for higher momentum fraction (z_T) hadrons. A yield enhancement is found at low z_T (high ξ). Comparison with theory shows that jet induced medium response is likely to be responsible for the enhanced production of these lower momentum particles.

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