

Probing Transverse Momentum Broadening via Dihadron and Hadron-jet Angular Correlations in Relativistic Heavy-ion Collisions

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Dijet, dihadron, hadron-jet angular correlations have been reckoned as important probes of the transverse momentum broadening effects in relativistic nuclear collisions [1]. When a pair of high-energy jets created in hard collisions traverse the quark-gluon plasma produced in heavy-ion collisions, they become de-correlated due to the vacuum soft gluon radiation associated with the Sudakov logarithms and the medium-induced transverse momentum broadening [2, 3]. For the first time, we employ the systematical resummation formalism and establish a baseline calculation to describe the dihadron and hadron-jet angular correlation data in pp and peripheral AA collisions where the medium effect is negligible. We demonstrate that the medium effects, especially the so-called jet quenching parameter \hat{q} , can be extracted from the angular de-correlations observed in AA collisions. A global χ^2 analysis of dihadron and hadron-jet angular correlation data renders the best fit $\langle \hat{q}L \rangle_{\text{tot}} \sim 14\text{GeV}^2$ for a quark jet at RHIC top energy, with L the typical traversed medium length. Our approach [1] stands as a new and complimentary method for the extraction of the jet quenching parameter \hat{q} as compared to the JET Collaboration effort [4]. Further experimental and theoretical efforts along the direction of this work shall significantly advance the quantitative understanding of transverse momentum broadening and help us acquire unprecedented knowledge of jet quenching parameter in relativistic heavy-ion collisions.

References:

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Preferred Track

Jets and High pT Hadrons

Collaboration

Not applicable

Primary author: QIN, Guang-You (Central China Normal University)

Presenter: QIN, Guang-You (Central China Normal University)

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