Evolution of jet shapes in Au+Au collisions at $\sqrt{s_{\mathrm{NN}}} = 200$ GeV with the STAR experiment at RHIC

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Abstract

In relativistic heavy-ion collisions, a strongly interacting medium known as the Quark Gluon Plasma (QGP) is produced. Quarks and gluons from incoming nuclei collide to produce partons at high momenta early in the collisions. By fragmenting into collimated sprays of hadrons, these partons form 'jets'. The resulting jets, which in vacuum are well understood within the framework of perturbative QCD, are attenuated by medium interactions, a process known as jet quenching. The jet shape observable, $\rho(\Delta r)$, reveals the radial profile of transverse momentum distribution inside the jet. By measuring the modifications of the jet shape, properties of the QGP at different length scales can be studied.

In this presentation, the differential jet shape for full (charged + neutral) jets in mid-peripheral Au+Au collisions at $\sqrt{s_{\mathrm{NN}}} = 200$ GeV with the STAR experiment at RHIC will be presented and compared to a baseline p+p measurement. As the first measurement of its kind at RHIC energies, this work will measure jets at low p_T (10-40 GeV/c), complementary to the LHC and demonstrate whether there is a modification and a broadening of the jet profile at RHIC energies. The jet shape measurement is differential in both jet definition and event-plane angle (defined by the beam direction and the vector of the impact parameter). The event plane is used to study the path length dependence of medium modifications to the jets and their associated hadrons. To further explore how the substructure of jets is modified in Au+Au relative to p+p collisions, the dependence on centrality and jet size (R) will be investigated.