Measurements of Jet Anisotropy in Isobar Collisions at $\sqrt{s_{NN}} = 200$ GeV at STAR

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Abstract

In ultra-relativistic heavy-ion collisions, a novel phase of QCD matter, known as the Quark-Gluon Plasma (QGP), is formed, where quarks and gluons (called partons) are no longer confined in nucleons. Any parton scatterings with high momentum transfer occur early in these collisions. The scattered partons traverse the QGP, fragment, and hadronize into collimated collections of final state particles, known as jets. While passing through the medium, partons experience a quenching effect due to both collisional and radiative energy losses. This effect has been measured through several observables, such as dihadron correlation and dijet asymmetry. The path length dependence of the jet quenching can also be studied via the anisotropy of the transverse momentum distribution of jets with respect to the event plane. Due to the approximately elliptical shape of the initial geometry in semi-central heavy-ion collisions, jets in plane will lose less energy in the QGP than those out of plane. As a result, we expect more in-plane jets than out-of-plane ones, quantified by v_2^{jet}, the second order azimuthal anisotropy of jet production. Progress towards the first measurement of $v_2^{\text{ch jet}}$ at STAR will be presented using charged jets in both Ru+Ru and Zr+Zr collisions at $\sqrt{s_{NN}} = 200$ GeV. This is the first data set at top RHIC energy for heavy ions collected with the Event Plane Detector (EPD), which has an acceptance of $2.1 < |\eta| < 5.1$. The EPD enables the determination of the event plane at forward rapidity with good resolution. This creates a gap in rapidity from where jets are measured, at mid-rapidity, reducing autocorrelation between the observables.

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