Event-shape engineering of high-momentum probes in Au+Au collisions at $\sqrt{s_{\mathrm{NN}}} = 200$ GeV at STAR

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Abstract

Partonic scatterings with high momentum transfer occur before the formation of the quark-gluon plasma (QGP) in heavy-ion collisions and result in collimated collections of hadrons, called jets. The modification of the high-virtuality parton shower in the QGP compared to that in proton-proton collisions offers insight into the nature of colored probes' interaction with the medium. To study the path-length dependent effects on hard partons traveling through the QGP, we apply a technique known as event-shape engineering to data from Au+Au collisions at $\sqrt{s_{\mathrm{NN}}} = 200$ GeV at STAR – the first such measurement at RHIC. Within a given eccentricity and centrality class, high-momentum probes traveling in the event plane direction (having shorter path length) are compared to those traveling perpendicular to it (having longer path length). By selecting on the centrality, we minimize the effect from variation in energy density. We then report a comparison of the ratios of in-and out-of-plane yields between two eccentricity classes, which reflects the dependence of energy loss on the collision geometry.