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Scanning the initial jet production points with dijet tomography in heavy-ion collisions

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Jet energy loss and transverse momentum broadening are controlled by the jet transport coefficient $\hat{q}$ in the QGP medium. Specifically, jet energy loss correlates with jet propagation length, while transverse momentum asymmetry caused by the gradient of $\hat{q}$ depends on the initial transverse coordinates. We study both the longitudinal and transverse jet tomography in dijet events by triggering the leading jet propagating along the direction of the event plane in heavy-ion collisions. Simulations are performed using the linear Boltzmann transport model with event-by-event 3+1D viscous hydrodynamic backgrounds. We find that the initial jet production positions in the transverse plane can be simultaneously located by combining the dijet transverse momentum imbalance $x_J = p_T^{\rm subleading}/p_T^{\rm leading}$ and jet transverse momentum asymmetry perpendicular to the initial jet directions for different leading jet p_T regions. The jet tomography can be used to scan the initial jet production positions and to study jet quenching observables in detail, such as the medium-modified jet shape and jet fragmentation functions.

Category

Theory

Collaboration (if applicable)

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