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Intra-jet asymmetry and jet-flow coupling in heavy-ion collisions

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The interaction between the jet and QGP fluid will deflect particles associated with the jet from their initial direction. Such deflection will depend on the energy of the jet constitutes and the velocity of the flow. The soft particles suffering stronger deflection will drift towards the direction of the flowing medium, away from the center of the jet cone where the hard particles are located, leading to an angular intra-jet asymmetry of particle distribution coupled with flow inside the jet. The intra-jet asymmetry could be obtained by the angular distribution of jet constituents and the angle between the Winner-takes-all(WTA) and standard jet axis. In this work, we first calculate the contributions from jet particles with different pT to the jet shape to get the average effect of the jet-flow coupling. We further explore the intra-jet asymmetry of gamma-jet in both longitudinal and transverse directions and study their dependence on jet path length and fluid viscosity. Together with gamma-jet asymmetry, we can use the difference between the longitudinal and transverse intra-jet asymmetry to extract the velocity of the transverse flow and identify the initial production position of the jet. We also compare the differences between dijet and gamma-jet to investigate the effect of the diffusion wake. The rapidity ordering of particles with different pT shows an explicit picture of the jet-flow coupling effect in the longitudinal direction.

Experiment/Theory

Theory/Phenomenology

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