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Three-dimensional coupling between jet and flow in heavy-ion collisions.

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Particles associated with the jet will be deflected from their initial direction due to the scatterings with the thermal partons flowing in the QGP fluid. Such deflections lead to an intra-jet asymmetry coupled with flow, which we can use to extract the properties of the QGP medium. This work calculates the intra-jet asymmetry distribution in both transverse and longitudinal directions and investigates their dependence on path length, local energy gradient, and flow velocity. By studying the intra-jet asymmetry in different rapidity ranges, we extract the average radial flow velocity distribution and compare it with the hydrodynamic simulation results. We also observe jet-flow coupling effects in jet chemistry, especially in the distribution of strangeness inside the jet cone. We further use intra-jet asymmetry and event-shape engineering to localize the initial production position of the jet. The localization accuracy can be improved via the interplay between QGP flow and the diffusion wake induced by the backside jet.

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