Contribution ID: **327** Type: **Oral report**

Jet-flow coupling in heavy-ion collisions

Wednesday, 14 August 2024 17:55 (15 minutes)

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 depend on the energy of the jet, the local energy gradient, and the local flow velocity. In general, the soft particles 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 intra-jet asymmetry coupled with flow, which can be used to extract the properties of the QGP medium. In this work, we first calculate the intra-jet asymmetry distribution in both transverse and longitudinal directions and investigate their dependence on path length, viscosity, and jet multiplicity. Such asymmetry is also observed in the jet chemical structure. We then extract the average radial flow velocity distribution via the intra-jet asymmetry distribution and compared it with the hydrodynamic simulation results. Our approach can be further used to localize the initial production position of the jet without specified requirements of the jet direction. As we apply jet localization to gamma-jet and dijet events, we find an improvement in the localization accuracy of dijet events due to the interplay between QGP flow and the diffusion wake induced by the backside jet.

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Session Classification: 分会场三

Track Classification: 重离子物理