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# Interplay between Mach cone and radial expansion in jet events

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As we see expansion of bulk quark-gluon plasma (QGP) created in high-energy nuclear collisions is well described by relativistic hydrodynamics, fluidity is one of the key properties of the QGP. At the same time, the QGP has a large stopping power against propagation of jets: The jets lose a large amount of their energies while traversing the QGP fluid due to strong interactions between them. The deposited energy of the jet induces a shock wave, a.k.a. Mach cone, in the QGP as a hydrodynamic response. Such a hydrodynamic response is also a clear manifestation of the fluidity of the QGP. Since the structure of shock wave is characterized by various properties of the QGP, e.g., sound velocity, stopping power, and viscosity, we have a great opportunity to extract the property of the QGP by analyzing this phenomenon.

We study the hydrodynamic response to jet propagation in the expanding QGP and investigate how it reflects the particle spectra after the hydrodynamic evolution of the bulk QGP. We perform simulations of the bulk dynamics of the QGP specifically in di-jet and gamma-jet events by solving (3+1)-dimensional ideal hydrodynamic equations with source terms. Mach cones are formed and largely develops in the QGP fluid. However, the double peak in the azimuthal particle distribution, which is believed to be an intuitive signal of the Mach cone, is smeared out by the diffusion wake, the distortion by the radial flow and freeze-out processes. Instead, we find a novel phenomenon of the interplay between the Mach cone and radial expansion when the jets travel through the off-central trajectories: Propagation of Mach cone pushes back the radial flow. As a result, the particle production is suppressed in the direction perpendicular to the jet propagation. This is the direct signal of hydrodynamic response to jet propagation and even includes the information about the jet passage in the expanding QGP fluid.

## On behalf of collaboration:

NONE

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