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Effect of hydrodynamic response in QGP on full jet

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We study modification of full jet structures in the quark-gluon plasma (QGP) medium including effect of the hydrodynamic medium response. The structures and energies of jets in heavy ion collisions are significantly modified by the processes involving strong interactions during the propagation through the QGP medium, i.e., collisional energy loss, p_T-broadening, and induced parton radiation. The energy and momentum are deposited into the QGP medium by jets via the collisional energy loss and the p_T-broadening due to the energy-momentum conservation. The QGP medium is supposed to respond hydrodynamically to the deposited energy and momentum and flows propagating with the jets are caused. Particles originating from the jet-induced flows are observed as a part of the jets in the actual experiments, and contribute to the modification of the full jet structures. Studying this contribution is not only important for the precise interpretation of the experimental data but also provides a novel opportunity to investigate the collective response of the QGP.

We employ a full jet shower + QGP fluid model composed of transport equations for jet evolution and hydrodynamic equations with source terms for the QGP medium evolution. The transport equations describe the evolution of the three-dimensional momentum distributions of partons in the full jet [1]. In the transport equations, all the processes of the collisional energy loss, p_T-broadening and partonic splittings for all partons within the full showering jet are covered. The space-time evolution of the QGP medium is described by (3+1)-dimensional ideal hydrodynamic equations with source terms [2]. The source terms transfer the deposited energy and momentum to the QGP fluid and are constructed with the evolving distributions of the partons in jets obtained as solutions of the transport equations. In this work, we study the shape and energy loss of the full jet in Pb+Pb collisions at the LHC including the effect of the jet-induced flows. We find that the contribution of the particles originating from the jet-induced flows significantly modifies the full jet shape, and especially dominates it at large angles from the jet direction. We also find that this contribution increase the jet-cone size dependence of the full jet energy loss.

References

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Preferred Track

Jets and High pT Hadrons

Collaboration

Not applicable

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