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Jet substructure modifications in a QGP from multi-scale description of jet evolution with JETSCAPE

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The JETSCAPE Collaboration (Jet Energy-loss Tomography with a Statistically and Computationally Advanced Program Envelope) has developed and released an innovative, modular and flexible event generator to be used by the heavy-ion community. The modifications of jet substructure in relativistic heavy-ion collisions represent a new class of quenching observables, which are sensitive to the redistribution of energy within the jet and the medium excitation that is triggered by the passage of the shower. In this talk we present calculations of jet substructure observables (jet shape, fragmentation function, nuclear modification factor of jet spectra with different cone radii) obtained from numerical calculations using JETSCAPE 1.0, and compare them to experimental data from both A-A and p-p collisions.

The JETSCAPE 1.0 package is a Monte-Carlo simulations of multi-stage jet evolution. The code package invokes four different modules for energy loss which have different effects on intra-jet observables. As a feature of JETSCAPE 1.0, in multi-stage jet evolution the energy loss description for a jet constituent can be switched from one model to another, depending on the scale or virtuality, or momentum during the propagation. The simulations of multi-stage jet evolution make it possible to comprehensively explore the detailed mechanisms of jet quenching.

We study the effect of introducing a space-time extent to the radiation-dominant (MATTER) portion of the shower; the effect of broadening of shower partons due to scattering; the effect of the recoil partons which propagate as a wake of the jet; the effect of the scattering dominated (MARTINI/LBT) portion of the shower; and the effect of AdS/CFT drag on a vacuum and medium modified shower. We also explore the effect of hadronization on these observables.

Summary

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