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SUBA-Jet: a new coherent jet energy loss model for heavy-ion collisions

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We present a new model for jet quenching via coherent gluon radiation and elastic scatterings off medium partons. The jet energy loss is simulated as a perturbative final-state vacuum parton shower followed by a medium-induced shower originating from elastic and radiative collisions with the medium constituents. Coherency is achieved by starting with trial gluons that act as field dressing of the initial jet parton. These are formed according to a Gunion-Bertsch seed. The QCD version of the LPM effect is attained by increasing the phase of the trial gluons through elastic scatterings with the medium. Above a phase threshold, the trial gluons will be formed and can produce coherent radiation themselves.

The model has been implemented in a Monte Carlo code and has been validated by successfully reproducing the BDMPS-Z prediction for the energy spectrum of radiated gluons in a static medium. The realistic case with minimal assumptions is also produced and shown. In particular, we show the influence of various parameters on the energy spectrum and transverse momentum distribution, such as the in-medium quark masses, the energy transfer in the recoil process, and the phase accumulation criteria, especially for low and intermediate energy gluons.

The model is constructed with realistic medium description and jet-medium coupling in mind. As such, we also show the first results when the parton shower is coupled to realistic expanding medium modelled usign vHLLE code. Finally, we use Pythia for jet hadronization and draw a basic comparison to RHIC and LHC data.

Reference: to be submitted soon to arXiv/journal

Category

Theory

Collaboration (if applicable)

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