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A New Model for Jet Energy Loss in Heavy Ion Collisions

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We present a new model for jet quenching from coherent radiation in a brick medium. 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 acts 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 gluon will be realised 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. The realistic case with minimal assumptions are 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.

Future studies will allow for the interface with full simulations of the quark-gluon-plasma with hydrodynamic evolution, such as vHLL, along with subsequent hadronisation of the jet partons in order to produce realistic distributions that can be directly compared to LHC and RHIC data.

Experiment/Theory

Theory/Phenomenology

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Track Klassifizierung: Jets and their modification in QCD matter