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Event-by-event picture for the medium-induced jet evolution

Saturday 24 September 2016 08:30 (20 minutes)

We discuss the evolution of an energetic jet which propagates through a dense quark-gluon plasma and radiates gluons due to its interactions with the medium. Within perturbative QCD, this evolution can be described as a stochastic branching process, that we have managed to solve exactly.
We present exact, analytic, results for the gluon spectrum (the average gluon distribution) and for the higher n-point functions, which describe correlations and fluctuations. Using these results, we construct the event-by-event picture of the gluon distribution produced via medium-induced gluon branching. In contrast to what happens in a usual QCD cascade in vacuum, the medium-induced branchings are quasi-democratic, with offspring gluons carrying sizable fractions of the energy of their parent parton. We find large fluctuations in the energy loss and in the multiplicity of soft gluons.
The multiplicity distribution is predicted to exhibit KNO (Koba-Nielsen-Olesen) scaling. These predictions can be tested in Pb+Pb collisions at the LHC, via event-by-event measurements of the di-jet asymmetry.

Based on e-Print: arXiv:1601.03629 [hep-ph] published in JHEP 1605 (2016) 008 and work in progress.

Summary

Presentation type

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