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Precise description of medium-induced emissions

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We study jet fragmetation via final-state parton splittings in the medium. These processes are usually calculated theoretically by invoking one or two approximations: the large-Nc and the eikonal approximations. We want to develop methods to do the calculations without using these approximations, and to quantify the error that is introduced by employing them.
As partons go through the medium their color continuously rotates, an effect that is encapsulated in a Wilson line along their trajectory. When calculating observables, one typically has to calculate correlators of several Wilson lines. This is usually dealt with in the literature by invoking the large-Nc limit. In an earlier work we showed how correlators of multiple Wilson lines appear, and developed a method to calculate them numerically to all orders in Nc.
However, in our previous paper we made use of the eikonal approximation, meaning that the partons are assumed to travel in straight lines through the medium. This might not be a good approximation for soft and imbalanced splittings, where the produced partons can be kicked around by the medium. We show how the full problem can be transformed into solving a set of coupled Schrödinger equations, with the aforementioned Wilson line correlators acting as the potential term. This system of differential equations is then solved numerically. These results are relevant for high-pT jet processes, multi-gluon emissions in the QGP and initial stage physics at the LHC.

Experiment/Theory

Theory/Phenomenology

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