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Energy loss and (de)coherence effects beyond eikonal approximation

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The parton branching process is known to be modified in the presence of a medium. Colour decoherence processes are known to determine the process of energy loss when the density of the medium is large enough to break the correlations between partons emitted from the same parent. In order to improve existing calculations that consider eikonal trajectories for both the emitter and the hardest emitted parton, we provide in this work, the calculation of all finite energy corrections for the gluon radiation off a quark in a QCD medium that exist in the small angle approximation and for static scattering centres. Using the path integral formalism, all particles are allowed to undergo Brownian motion in the transverse plane and the offspring allowed to carry an arbitrary fraction of the initial energy. The result is a general expression that contains both coherence and decoherence regimes that are controlled by the density of the medium and by the amount of broadening that each parton acquires independently.

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