

An effective theory for jet propagation in dense QCD matter: jet broadening, radiative energy loss and LHC phenomenology

Soft Collinear Effective Theory (SCET) is a powerful tool to study jet physics. In order to describe jet propagation in the dense QCD matter created in ultra-relativistic nuclear collisions, SCET needs to be modified by the inclusion of the transverse to the jet axis gluon mode, which is commonly referred to as a Glauber gluon. We construct the Lagrangian of the resulting effective theory and demonstrate the gauge invariance of the jet broadening and radiative energy loss results. We show how using effective theory methods allows us to go beyond the soft gluon approximation, which is commonly used in the heavy-ion energy loss phenomenology. Our results are presented for realistic jet-medium scattering cross sections with fully dynamic QGP response. Finally, we discuss the implications of the newly-developed theory for LHC hard probes phenomenology with an emphasis on the quenching of leading particles and jets.

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