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Factorization and Jet Broadening in Medium

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In deeply inelastic lepton-nucleus scattering, hadron-nucleus and heavy-ion collisions, multiple scatterings of energetic partons in the nuclear medium lead to a broadening of the average jet transverse momentum. This jet broadening phenomenon offers a useful tool for probing the properties of nuclear media, including the quark-gluon plasma formed in high-energy heavy-ion collisions. Many theoretical frameworks have been developed in the study of multiple scatterings and their subsequent effects. We will focus on the collisional and radiative parton energy loss formalisms, as well as the higher-twist collinear factorization framework. In this talk, we present predictions for the jet broadening in heavy-ion collisions calculated using the Djordjevic-Gyulassy-Levai-Vitev (DGLV) energy loss model. DGLV assumes a factorization of the hard production process and the subsequent jet evolution in medium. As the next step, we will compute the transverse momentum jet broadening in semi-inclusive deep inelastic scattering (SIDIS) at Twist-4 where factorization is not assumed but appears to hold. The Twist-4 derivation includes cross talk between the production and evolution that is missing in the energy loss formalisms; we aim to quantify the importance of these neglected terms in energy loss calculations and, ultimately, to derive energy loss formulae that respect a rigorous factorization.

Preferred track

Jets & QCD at High Scales

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