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QCD multiple scattering in cold nuclear matter

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Multiple scatterings of energetic partons inside cold or hot nuclear matter play an important role in the study of the QCD medium in high-energy $e+A$, $p+A$, and $A+A$ collisions. They lead to parton energy loss and transverse momentum broadening that are responsible for the well-known jet quenching phenomena. In this talk, we present some of our recent theoretical developments on radiative higher-order corrections to parton multiple scattering in the medium. We demonstrate how QCD factorization holds at next-to-leading order for multiple parton scattering in cold nuclear matter and discuss its implication for the medium properties. In particular, we emphasize the universality of the properties of nuclear matter as probed by a propagating parton, and identify the QCD scale and jet energy dependence (QCD evolution) of the jet transport parameter (\hat{q}) as revealed by either quark or gluon jets.

Primary author: Dr XING, HONGXI (Northwestern Univ./Argonne National Lab)

Co-authors: Prof. QIU, Jianwei (Brookhaven National Laboratory); Dr WANG, Xin-Nian (LBNL); Prof. KANG, Zhongbo (University of California Los Angeles)

Presenter: Prof. KANG, Zhongbo (University of California Los Angeles)

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