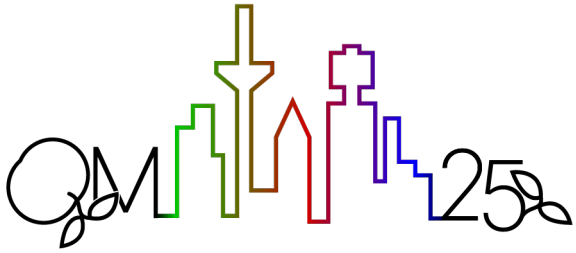

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A new perspective on nuclear SIDIS and Drell-Yan data from dynamical TMD effects analysis

The semi-inclusive deep inelastic scattering (SIDIS) and Drell-Yan (DY) processes are primary channels for studying the parton distributions of the proton and the nucleus, and for deducing the properties of cold nuclear matter. However, for nuclear targets, the DY and SIDIS differential cross-sections are modified by multiple interactions between the active parton and spectator nucleons, which we refer to as dynamical nuclear effects. Only recently have theoretical developments allowed us to understand these processes in the nuclear environment from first principles. We present the complete calculation of next-to-leading order (NLO) dynamical nuclear corrections to the longitudinal and transverse-momentum dependent (TMD) cross-sections in both reactions using the Soft Collinear Effective Theory with Glauber gluons. The main result that this talk focuses on is the first TMD analysis of the nuclear SIDIS and DY data that incorporates these dynamical effects. We show for the first time medium-induced renormalization group (RG) equations improved to second order in opacity to estimate the truncation uncertainty and a rapidity RG (a Blaitsky-Fadin-Kuraev-Lipatov evolution) applied in the initial state for DY and the final state for SIDIS. We discuss the implications of the new theoretical analysis for the interpretation of existing data, and for the physics program of the future EIC.

Category

Theory

Collaboration (if applicable)

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