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Impact parameter dependent JIMWLK evolution meets HERA data

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The small-x evolution of protons is determined from numerical solutions of the JIMWLK equations, starting from an initial condition at moderate x for a finite size proton. The resulting dipole amplitude is used to calculate the total reduced cross section σ_r and charm contribution to it, as well as diffractive vector meson production.

We compare results to experimental data from HERA and discuss fundamental problems arising from the regime sensitive to non-perturbative physics. We emphasize that information on the gluonic content of the proton, gluon spatial distributions and correlations over wide ranges in x, which can in principle be constrained by our study, are essential ingredients for describing the initial state in proton-proton and proton-ion collisions. We demonstrate how the proton evolves as a function of $1/x$, and study the energy dependence of the event-by-event fluctuations of the proton structure.

We further demonstrate how electron-ion collisions will be essential to access the gluon saturation in a kinematical region where non-perturbative effects are suppressed.

Reference:
H. Mäntysaari, B. Schenke, to be submitted in June 2018

Summary

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