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Probing gluon saturation through two-particle correlations at STAR and the EIC

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The gluon distribution function exhibits a rapid increase when the momentum fraction x decreases. However, the total scattering cross section cannot grow beyond a certain limit due to unitarity constraints, which requires the increase of gluon density to be tamped. Gluon recombination under the color glass condensate (CGC) framework provides a possible solution. Therefore, discoveries of nonlinear effects and gluon saturation in QCD will significantly enhance our understanding of nucleon structure and nuclear interactions at high energies, which is a crucial aspect of the Cold QCD program at STAR and the future EIC.

Two-particle azimuthal correlation has been proposed to be one of the most direct and sensitive channels to access the underlying gluon dynamics. In this talk, we will present recent results of forward di-hadron correlations in p+p and p+A collisions at STAR, along with model studies for e+p and e+A collisions at the EIC. In 2024, STAR is planning to record high statistics p+p and p+Au data with the forward upgrade. New opportunities for studying the nonlinear effects in QCD using these new datasets will also be discussed.

Category

Experiment

Collaboration (if applicable)

STAR Collaboration

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