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Rapidity evolution of observables at high energies using the gaussian truncation

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Today, the biggest predictive uncertainties in the standard model arise from theoretical uncertainties in quantum-chromo-dynamics contributions to cross-sections measured at high-energy collider experiments. At high energies, the quantum-chromo-dynamics of particle collisions is well described through the use of the colour-glass condensate. In this domain, the interaction of coloured objects with the CGC medium is well explained through the use of path-ordered colour rotations, called Wilson Lines, as well as their correlators. The rapidity evolution of these correlators is given by the JIMWLK equation. However, this leads to an infinite hierarchy of coupled differential equations, which are impossible to solve in a closed form and truncations become necessary. The most common truncation relies on the large Nc limit, which is relatively crude and subtly breaks gauge invariance. To get around this, we can perform a gauge invariant truncation of this hierarchy in the form of the gaussian truncation for the correlators of these Wilson lines. Initial comparison to HERA data for the total and rapidity gap cross-sections show a noticeable improvement in comparison to data which only depend on the dipole correlator. We extend this method to incorporate observables that depend on more complicated correlators and present the machinery for how to compute their rapidity dependence with the gaussian truncation.

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Yes

Level for award
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MSc

Main supervisor (name and email)
and his / her institution

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Yes

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