NLO evolution of color dipoles in QCD and in $\mathcal{N}$=4 SYM theory

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(Dated: May 14, 2009)

The high-energy behavior of amplitudes in gauge theories can be reformulated in terms of the evolution of Wilson-line operators. In the leading order this evolution is governed by the non-linear Balitsky-Kovchegov (BK) equation. In order to see if this equation is relevant for existing or future DIS accelerators (like EIC or eLHC) one needs to know how large are the next-to-leading order (NLO) corrections. In addition, the NLO corrections define the scale of the running-coupling constant in the BK equation and therefore determine the magnitude of the leading-order cross sections. In QCD, the next-to-leading order BK equation has both conformal and non-conformal parts.

To separate the conformally invariant effects from the running-coupling effects, we first restore the conformal NLO BFKL kernel out of the eigenvalues known from the forward NLO BFKL result using the requirement of Möbius invariance of $\mathcal{N}$=4 SYM amplitudes in the Regge limit, and then we calculate the NLO evolution of the color dipoles in the conformal $\mathcal{N}$=4 SYM theory. To this end we define the "composite dipole operator" with the rapidity cutoff preserving conformal invariance, and the resulting Möbius invariant kernel for this operator agrees with the forward NLO BFKL calculation performed before.

In QCD, the NLO kernel for the composite operators resolves in a sum of the conformal part and the running-coupling part.

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