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Resummation of large higher order corrections in non-linear QCD evolution

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Due to the non-Abelian nature of QCD and the existence of the 3-gluon coupling, the wavefunction of a high energy hadron at small-x is dominated by gluons (with x the longitudinal momentum fraction of a parton). The occupation numbers for these soft gluons increase rapidly with decreasing x and eventually saturate to their maximal allowed value, in a region where the coupling is still weak. The most suitable way to study this phenomenon of parton saturation, is to probe the hadron with a small color dipole, and the ensuing evolution equation for the scattering amplitude is the Balitsky-Kovchegov (BK) equation, with its NLO version derived a few years ago. We show that the NLO BK eqaution leads to unphysical solutions, we identify the reason for the large and negative NLO corrections and we resum the respective terms to all orders. The emergent resummed evolution equation can be used to address many phenomenological aspects in hadronic, and in particular heavy-ion, collisions.

Summary

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