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Full NLO corrections for DIS structure functions in the dipole factorization formalism

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In the regime of low Bjorken x for DIS on a proton or nucleus target, one enters in the nonlinear regime of gluon saturation, where the gluons are better described as a strong coherent semi-classical field than as a collection of quasi on-shell partons. Hence, that regime lies outside the validity range of the collinear factorization, and is better described within the dipole factorization of DIS observables which allows to resum coherent multiple scattering on the target as well as the high-energy leading logarithms (LL).

So far, phenomenological studies have been performed successfully at LO in the dipole factorization, with high-energy LL resummation, using HERA data for inclusive DIS on a proton. However, in order to reach a decent precision for the theory, NLO corrections should be included, as well as high-energy NLL resummations. This is important not only to fully benefit from the great precision of HERA data, but also in prevision of future electron-proton and/or electron-nucleus colliders.

In this talk, I will present a full calculation of the (fixed order) NLO corrections to DIS structure functions on a dense target in the dipole factorization picture. In earlier studies, only one part of the NLO corrections has been calculated, the one corresponding to a quark-antiquark-gluon Fock state interacting with the target. By contrast, I will present the first direct calculation of the other part of NLO corrections, for which a quark-antiquark Fock state interacts with the target. I will also discuss issues related with the combination of the two pieces, with a consistent treatment of UV divergences.

Reference: G. Beuf, Phys.Rev. D94 (2016) no.5, 054016 (arXiv:1606.00777 [hep-ph])

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