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Low x: diffusion, screening, fusion

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Summary

A feasible mechanism of unitarization of amplitudes of deep inelastic scattering at small values of Bjorken x is the gluon fusion. However, its efficiency depends crucially on the vacuum color screening effect which accompanies
the multiplication and the diffusion of BFKL gluons from small to large distances. From the fits to lattice data on field strength correlators the propagation length of perturbative gluons is $R_c \simeq 0.2 - 0.3$ fermi. The probability to find a perturbative gluon with short propagation length at large distances is suppressed exponentially. It changes the pattern of (dif)fusion dramatically. The magnitude
of the fusion effect appears to be controlled by the new
dimensionless parameter $\sim R_c^2/8B$, with the diffraction cone slope B standing for the characteristic size of the interaction region. It should slowly $\propto 1/\ln Q^2$ decrease at large Q^2. Smallness of the ratio $R_c^2/8B$ makes the non-linear effects rather weak even at lowest Bjorken x available at HERA.
We report the results of our studies of the non-linear BFKL equation which has been generalized to incorporate the running coupling and the screening radius R_c as the infrared regulator.

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