

# LHC soft physics and transverse momentum dependent gluon density at low $x$

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## Summary

We study the connection between the inclusive spectra of hadrons produced in  $pp$  collision at LHC energies at low transverse momenta and the unintegrated gluon distribution (u.g.d.) at small  $x$  at the starting scale  $Q_0^2$ .

This gluon distribution [1] is obtained from the best description of the LHC data in the soft kinematical region and it does not contradict to the asymptotic behaviour of the solution of the BFKL equation at large transverse momenta of gluons. To extend the u.g.d. to higher  $Q^2$  we use the Catani-Ciafaloni-Fiorani-Marchesini (CCFM) evolution equation.

It is shown that the evolved u.g.d. is very sensitive to the starting u.g.d. especially at low transverse momenta  $|k_T| < 1 \text{ GeV}/c$ .

The inclusion of the CCFM evolution results in a large increase of the u.g.d. magnitude at low  $x$  and large  $|k_T|$  above a few  $\text{GeV}/c$ . The application of the obtained u.g.d to the analysis of the  $ep$  deep inelastic scattering allows us to get the results, which describe reasonably well the H1 and ZEUS data on the longitudinal proton structure function  $F_L(x, Q^2)$  [2]. So, the connection between the soft processes at LHC and small  $x$  physics at HERA has been confirmed and extended to a wide kinematical region. The self-consistent satisfactory description of both the LHC and HERA data allows us to correct the value of saturation scale for the gluon density.

## References

[1]

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[2]

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Phys.Rev. D89 (2014) 014001.

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