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LHC soft physics and TMD gluon density at small x

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We study the unintegrated TMD (transverse momentum dependent) gluon density obtained from the best description of the LHC data on the inclusive spectra of charged hadrons produced in the mid-rapidity region and low transverse momenta at starting scale Q_0ˆ2 = 1 (GeV/c)ˆ2. To extend this unintegrated gluon density (u.g.d) at higher Qˆ2 we use the Catani-Ciafoloni-Fiorani-Marchesini (CCFM) evolution equation. The influence of the initial (starting) non-perturbative gluon density is studied. It is shown that the evoluted u.g.d. is very sensitive to the starting u.g.d. especially at low intrinsic transverse momenta |k_T|< 1. GeV/c. The inclusion of the CCFM evolution results in a large increase of the u.g.d. magnitude at small x and large |k_T| above a few GeV/c. The application of the obtained gluon distribution to the analysis of the e-p 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,Qˆ2). 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. This work is the continuation of our previous study of the unintegrated gluon densities at small x.

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