

XXV International Baldin Seminar on High Energy Physics Problems
"Relativistic Nuclear Physics and Quantum Chromodynamics"



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Gluon distribution in nucleon and its application to analysis of pp and AA collisions at high energies and mid-rapidity

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The review of the transverse momentum dependent (TMD) gluon density and its application to analysis of pp and AA collisions in the wide region of initial energies at mid-rapidity is presented. It is shown that the non-collinear QCD evolution is sensitive to the TMD gluon distributions at initial scale μ_0 . The new TMD gluon density in a proton at μ_0 is suggested using its saturation at low scales observed in DIS at HERA. Corresponding phenomenological parameters important at low x are found from the best description of charged hadron p_T -spectra in pp collisions at low hadron transverse momenta p_T in the mid-rapidity at the LHC energies. Other parameters important at moderate and large x are found from the satisfactory description of many data on hard pp processes at LHC energies. The Catani-Ciafaloni-Fiorani-Marchesini (CCFM) evolution equation is applied to extend the initial gluon distribution into the whole kinematical region.

The TMD gluon suggested in [1-4] is used to analyze the pion and kaon inclusive production in pp and $BeBe$ collisions [5,6]. The satisfactory description of NA61/SHINE data on inclusive spectra versus their transverse momenta p_T less than 1 GeV are presented in [5,6]. The data on ratio of cross sections $R_{K/\pi} = \sigma_{K^\pm}/\sigma_{\pi^\pm}$ at the zero rapidity y are also described satisfactorily and predictions for high energies are presented.

Using the suggested TMD gluon distribution we obtain the self-consistent description of soft hadron production in pp collisions at moderate and high energies at mid-rapidity. Extension of proposed initial gluon distribution into the whole kinematical region using the CCFM evolution equation allows us to describe satisfactorily many data on hard pp processes at LHC energies.

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