

Studies of HERA deep inelastic scattering data at low Q^2 and low x_{Bj}

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A phenomenological study of the final combined HERA data on inclusive deep inelastic scattering (DIS) has been performed. The data are presented and investigated for a kinematic range extending from values of the four-momentum transfer, Q^2 , above 10^4 GeV^2 down to the lowest values observable at HERA of $Q^2 = 0.045 \text{ GeV}^2$ and Bjorken x , $x_{Bj} = 6 \times 10^{-7}$. The data are well described by fits based on perturbative quantum chromodynamics (QCD) using collinear factorisation and evolution of the parton densities encompassed in the DGLAP formalism from the highest Q^2 down to Q^2 of a few GeV^2 . The standard DGLAP evolution was augmented by including an additional higher-twist term in the description of the longitudinal structure function, F_L . This additional term, $F_L A_L^{\text{HT}}/Q^2$, improves the description of the reduced cross sections significantly. The resulting predictions for F_L suggest that further corrections are required for Q^2 less than about 2 GeV^2 . The Regge formalism can describe the data up to $Q^2 \sim 0.65 \text{ GeV}^2$. The complete data set can be described by a new fit using the ALLM parameterisation. The region between the Regge and the perturbative QCD regimes is of particular interest.

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