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A Froissart-bounded longitudinal structure function

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We present a method to extract, in the leading and next-to-leading order approximations, the longitudinal deep-inelastic scattering structure function $F_L(x,Q^2)$ from the experimental data by relying on a Froissart-bounded parametrization of the transversal structure function $F_2(x,Q^2)$ and, partially, on the Dokshitzer-Gribov-Lipatov-Altarelli-Parisi equations. Particular attention is paid on kinematics of low and ultra low values of the Bjorken variable x. Analytical expressions for $F_L(x,Q2)$ in terms of the effective parameters of the parametrization of $F_2(x,Q2)$ are presented explicitly. We argue that the obtained structure functions FL(x,Q2) within both, the leading and next-to-leading order approximations, manifestly obey the Froissart boundary conditions. Numerical calculations and comparison with available data from ZEUS and H1-Collaborations at HERA demonstrate that the suggested method provides reliable structure functions $F_L(x,Q^2)$ at low x in a wide range of the momentum transfer (1 GeV^2 < Q^2 < 3000 GeV^2) and can be applied as well in analyses of ultra-high energy processes with cosmic neutrinos.

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