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Systematic Analysis of Scaling Properties in Deep Inelastic Scattering

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Using the Quality Factor" (QF) method, we analyse the scaling properties
of deep-inelastic processes
cross-sections at HERA for $x < 10^{-2}$. We look for scaling formulae of the
form $\sigma^{\gamma^* p}(\tau)$, where $\tau(L = \log Q^2, Y)$ is a
scaling variable proposed
in the literature and suggested by the asymptotic properties of QCD evolution
equations with rapidity Y. We consider four cases:Fixed Coupling",
corresponding to the original geometric scaling proposal and motivated by
the asymptotic properties of the Balitsky-Kovchegov (BK) equation with {\it
fixed} QCD coupling constant, two versions Running Coupling I,II" of the
scaling suggested by the BK
equation with {\it running} coupling, andDiffusive Scaling" suggested by
the QCD evolution equation with Pomeron loops. The Quality Factors,
quantifying the phenomenological validity of the candidate scaling
variables, are fitted on the total and DVCS cross-section data and
predictions are made for the elastic vector-meson and for the diffractive
cross-sections at fixed small x_{calP} or β.The first three scaling formulae have comparably good QF while the fourth
one is disfavored. Parametrizing non-asymptotic contributions gives a
significant improvement of the "Running Coupling II" scaling.

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