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Orbital Angular Momentum at Small x Revisited

Tuesday, 28 March 2023 09:40 (20 minutes)

We revisit the problem of the small Bjorken-x asymptotics of the quark and gluon orbital angular momentum (OAM) distributions in the proton utilizing the revised formalism for small-x helicity evolution derived recently in \footnote{F. Cougoulic, Y. V. Kovchegov, A. Tarasov, and Y. Tawabutr, Journal of High Energy Physics 2022,
10.1007/jhep07(2022)095 (2022).}. We relate the quark and gluon OAM distributions at small x to the polarized dipole amplitudes and their (first) impact-parameter moments. To obtain the x-dependence of the OAM distributions, we derive novel small-x evolution equations for the impact-parameter moments of the polarized dipole amplitudes in the double-logarithmic approximation (summing powers of $\alpha_s \ln^2(1/x)$ with α_s the strong coupling constant). We solve these evolution equations numerically and extract the large-N_c, small-x asymptotics of the quark and gluon OAM distributions, which we determine to be
\begin{align}
L_{q+\bar{q}}(x, Q\^2) \sim L_{G}(x,Q\^2) \sim \Delta \Sigma(x, Q\^2) \sim \Delta G(x,Q\^2) \sim \left(\frac{1}{x}\right)\^{3.66 \, \sqrt{\frac{\alpha_s N_c}{2\pi}}},
\end{align}
in agreement with \footnote{R. Boussarie, Y. Hatta, and F. Yuan, Physics Letters B 797, 134817 (2019).} within the precision of our numerical evaluation (here N_c is the number of quark colors). We also investigate the ratios of the quark and gluon OAM distributions to their helicity distribution counterparts in the small-x region.

Submitted on behalf of a Collaboration?

No

Participate in poster competition?

No

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