

Gluon Helicity Distribution of the Nucleon from Lattice QCD in Continuum Limit

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We report a state-of-the-art lattice QCD calculation of the gluon helicity parton distribution function of the proton within the large-momentum effective theory framework. The calculation employs 2+1-flavor CLQCD gauge ensembles at three lattice spacings $a = \{0.105, 0.0897, 0.0775\}$ fm and pion mass of approximately $300 \text{ MeV}/c^2$, with nucleon momenta up to $3.0 \text{ GeV}/c$. Distillation with momentum smearing is applied to improve the signal of two-point gluon-field correlation functions. We renormalize the results in the hybrid scheme, applying self-renormalization to purely imaginary and antisymmetric matrix elements.

After one-loop perturbative matching, the gluon helicity distribution is extrapolated to the continuum and infinite-momentum limits. The final result is consistent with global fitting within errors.

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