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Parton Distribution Functions from the Large-Momentum Expansion of Current-Current Correlators

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This report presents a lattice QCD study of parton distribution functions using current-current correlators within LAME. Unlike conventional quasi-PDF approaches based on Wilson-line operators, current-current correlators have simpler renormalization properties and avoid linear power divergences and associated renormalon ambiguities. We formulate the large-momentum expansion for vector-vector and axial-vector current correlators in momentum-fraction space and derive the corresponding one-loop matching kernel in the $\overline{\text{MS}}$ scheme. As a first numerical test, we use existing four-point lattice data from the CLS H102 ensemble and extract the isovector proton PDF. While the current result is limited by statistics, pion mass, and hadron momentum, it demonstrates the feasibility of applying current-current correlators within LaMET.

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