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Nucleon Helicity and Transversity Parton Distributions from Lattice QCD

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We present the first lattice-QCD calculation of the isovector polarized parton distribution functions (both helicity and transversity) using the large momentum effective field theory (LaMET) approach for direct Bjorken-x dependence. We first review the detailed steps of the procedure in the unpolarized
case, then generalize to the helicity and transversity cases. We also derive a new mass-correction formulation for all three cases. We then compare the effects of each finite-momentum correction using lattice data calculated at $M\pi \approx 310$ MeV. Finally, we discuss the implications of these results for the poorly known antiquark structure and predict the sea-flavor asymmetry in the transversely polarized nucleon.

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