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Transverse Force Distributions in the Proton from Lattice QCD

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Single-spin asymmetries observed in polarised deep-inelastic scattering are important probes of hadron structure. The Sivers asymmetry provides information about the transverse momentum of the struck quark and can be related to final-state interactions. Understanding these asymmetries at the quark level has been the subject of much interest in QCD phenomenology. In this talk, we present a lattice QCD calculation of the transverse spatial distribution of a colour-Lorentz force acting on the struck quark in a proton. Our lattice calculations employ $N_f = 2 + 1$ flavours of dynamical fermions at the SU(3) symmetric point across three lattice spacings. We determine a central, spin-independent confining force, as well as spin-dependent force distributions with local forces larger than the QCD string tension. These distributions offer a new, complimentary picture of the Sivers asymmetry in transversely polarised deep-inelastic scattering.

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