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Probing the Sivers Asymmetry with Transverse Energy-Energy Correlators in the Small-x Regime

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We investigate transverse energy-energy correlators (TEECs) for both polarized and unpolarized targets in the small-x regime at the Electron-Ion Collider (EIC). Focusing on the approximately back-to-back electroproduction of a hadron-electron pair, we apply transverse-momentum-dependent (TMD) factorization formulas that incorporate TMD evolution for both event-shape observables and expand them in terms of the small-x dipole amplitude. This allows us to write the TEEC off the transversely polarized proton in terms of a C-odd interaction, corresponding to an odderon exchange. Due to the charge-conjugation-odd nature of the small-x quark Sivers function, we restrict the sum over final hadronic states to positively and negatively charged hadrons separately. We present numerical predictions for the TEEC Sivers asymmetry at the EIC and find the magnitude of the asymmetry to be on the 0.1% level. This channel offers a promising avenue for benchmarking the still largely unconstrained odderon amplitude.

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