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Dihadron azimuthal asymmetry and light-quark dipole moments at the Electron-Ion Collider

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We propose a novel method to probe light-quark dipole moments by examining the azimuthal asymmetries between a collinear pair of hadrons in semi-inclusive deep inelastic lepton scattering off an unpolarized proton target at the Electron-Ion Collider. These asymmetries provide a means to observe transversely polarized quarks, which arise exclusively from the interference between the dipole and the Standard Model interactions, thereby depending linearly on the dipole couplings. We demonstrate that this novel approach can enhance current constraints on light-quark dipole operators by an order of magnitude, free from contamination of other new physics effects. Furthermore, it allows for a simultaneous determination of both the real and imaginary parts of the dipole couplings, offering a new avenue for investigating potential CP -violating effects at high energies.

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