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First observation of correlations between spin and transverse momenta in back-to-back dihadron production at CLAS12

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We report the first measurements of deep inelastic scattering spin-dependent azimuthal asymmetries in back-to-back hadron electroproduction, where one hadron is produced in the current fragmentation region and the other in the target fragmentation region. The data were taken with a 10.2 and 10.6 GeV longitudinally polarized electron beam incident on an unpolarized liquid hydrogen target using the CLAS12 Spectrometer at Jefferson Lab. Observed non-zero $\sin \Delta\phi$ modulations in $ep \rightarrow e'p\pi^+X$ events, where $\Delta\phi$ is the difference of the azimuthal angles of the proton and pion in the virtual photon-target nucleon center-of-mass frame, indicate that correlations between the spin and transverse momenta of hadrons produced in the target and current fragmentation regions may be significant. The measured beam-spin asymmetries provide a first access in dihadron production to a previously unobserved leading-twist spin and transverse momentum-dependent fracture function. The fracture functions describe the hadronization of the target remnant after the hard scattering of a virtual photon off a quark in the target particle and provide a new avenue for studying nucleonic structure and hadronization.

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