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Two-particle azimuthal correlations as a probe of collective behaviour in deep inelastic ep scattering at HERA

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Two-particle azimuthal correlations have been measured in neutral current deep inelastic ep scattering with virtuality $Q^2 > 5 \text{ GeV}^2$ at a centre-of-mass energy $\sqrt{s} = 318 \text{ GeV}$ recorded with the ZEUS detector at HERA. The correlations of charged particles have been measured in the range of laboratory pseudorapidity $-1.5 < \eta < 2$ and transverse momentum $0.1 < p_T < 5 \text{ GeV}$ and event multiplicities N_{ch} up to six times larger than the average $\langle N_{\text{ch}} \rangle \approx 5$. The two-particle correlations have been measured in terms of the angular observables $c_n\{2\} = \langle \langle \cos n\Delta\phi \rangle \rangle$, where n is between 1 and 4 and $\Delta\phi$ is the relative azimuthal angle between the two particles. The correlations observed in HERA data do not indicate the kind of collective behaviour recently observed at the highest RHIC and LHC energies in high-multiplicity hadronic collisions. Available Monte Carlo models of deep inelastic scattering, tuned to reproduce inclusive particle production, provide a qualitative description of the HERA data.

Primary author: WING, Matthew (UCL)

Presenter: WICHMANN, Katarzyna (DESY, Hamburg)

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