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Two-particle azimuthal correlations as a probe of collective behaviour in 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 $-1.5 < \eta < 2.0$ and transverse momentum $0.1 < p_T < 5.0 \text{ GeV}$ and event multiplicities N_{ch} up to six times larger than the average $\langle N_{ch} \rangle \approx 5$. The two-particle correlations have been measured in terms of the angular observables $c_n^2 = \langle \cos n \rangle$, where n is between 1 and 4 and ϕ is the relative azimuthal angle between the two particles. Comparisons with available models of deep inelastic scattering, which are tuned to reproduce inclusive particle production, suggest that the measured two-particle correlations are dominated by contributions from multijet production. The dependence of the correlations as a function of Q^2 has also been studied as well as the correlations in photoproduction events ($Q^2 \approx 0$). The correlations observed here do not indicate the kind of collective behaviour recently observed at the highest RHIC and LHC energies in high-multiplicity hadronic collisions.

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