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Azimuthal correlations in photoproduction and deep inelastic ep scattering at HERA

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Collective behaviour of final-state hadrons, and multiparton interactions are studied in high-multiplicity ep scattering at a centre-of-mass energy $\sqrt{s} = 318\text{GeV}$ with the ZEUS detector at HERA. Two- and four-particle azimuthal correlations, as well as multiplicity, transverse momentum, and pseudorapidity distributions for charged-particle multiplicities $N_{\text{ch}} \geq 20$ are measured. The dependence of two-particle correlations on the virtuality of the exchanged photon shows a clear transition from photoproduction to neutral current deep inelastic scattering. For the multiplicities studied, neither the measurements in photoproduction processes nor those in neutral current deep inelastic scattering indicate significant collective behaviour of the kind observed in high-multiplicity hadronic collisions at RHIC and the LHC. Comparisons of PYTHIA predictions with the measurements in photoproduction strongly indicate the presence of multiparton interactions from hadronic fluctuations of the exchanged photon.

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