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Multiplicity dependence of azimuthal particle correlations as a probe of collectivity in deep inelastic electron-proton collisions at HERA

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Recent observations at RHIC and the LHC of two- and multi-particle correlations in high multiplicity relativistic proton-proton and proton-ion collisions and similarity of the results to those observed in central heavy-ion collisions are often interpreted as an evidence for collective particle production in small collision systems. These results motivate a study in even smaller systems, such as produced in relativistic electron-proton collisions. We present a measurement of two-particle correlations in collisions of electron beams at 27.5 GeV with beams of protons at 920 GeV, which corresponds to 318 GeV centre-of-mass energy. A sample of events equivalent to the integrated luminosity of 380 pb^{-1} was recorded with the ZEUS experiment in 2003-2007. The correlations are measured for charged hadrons as a function of event multiplicity for the lab pseudo-rapidity range $-1.5 < \eta_{\text{lab}} < 2$. To probe the possible contribution due to collective effects, the correlations are studied as a function of the particle's pair separation in pseudo-rapidity and the pair mean transverse momentum. The observed correlations are compared to available Monte Carlo models of deep inelastic electron-proton scattering. Observations based on the analysis of the ZEUS data put a limit on the possible collective effects in high multiplicity electron-proton collisions.

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