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Leading Baryon Production at HERA

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The production of highly energetic forward neutrons has been studied in deep-inelastic scattering. The data were taken with the H1 detector at HERA in the years 2006-2007 and correspond to an integrated luminosity of 117 pb^-1. Semi-inclusive cross sections have been measured in the kinematic region 4 < Q^2 < 100 GeV^2, 0.7*10^-4 < x < 0.3*10^-1 and the fractional momentum of the neutron 0.3 < X_L < 1.0. The data are used to estimate the structure of the pion. Furthermore, the cross sections are measured differentially in neutron energy and p_T and compared to the predictions of models of leading neutron production.

Differential cross sections for dijet photoproduction and in association with a leading neutron have been measured in the reaction e+ p -> e+ jet jet X n with the ZEUS detector at HERA using an integrated luminosity of 40pb-1. The data are consistent with a simple pion exchange model. The ratio of the neutron-tagged and dijet cross sections show violations of factorization of the lepton and photon vertices which can be explained by kinematic effects constraining the phase space for neutron production. Normalised double-differential leading-neutron cross sections have been measured in dijet photoproduction for the first time. The distributions can be fully characterised by only two energy dependent parameters
extracted from fits to the data. Absorption effects were studied by comparing the dijet photoproduction measurements and similar results in deep inelastic scattering. No clear effect, not related to kinematics, was observed. In a resolved-enriched dijet photoproduction sample, significantly fewer neutrons were seen than for direct. This depletion can also be accounted for by kinematic constraints.
The semi-inclusive reaction e+p -> e+Xp was studied with the ZEUS detector at HERA using an integrated luminosity of 12.8 pb-1. The final state proton, which was detected with the ZEUS leading proton spectrometer, carried a large fraction of the incoming proton energy, x_L > 0.32, and its transverse momentum squared satisfied p_T2 < 0.5 GeV2; the exchanged photon virtuality, Q2, was greater than 3 GeV2 and the range of the masses of the photon-proton system was 45 < W < 225 GeV. The leading-proton production cross section and rates are presented as a function of x_L, p_T2, Q2 and the Bjorken scaling variable, x.

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