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Exclusive diffraction at HERA

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The exclusive reaction $\gamma p \rightarrow \psi(2S) p$ has been studied in both deep inelastic electroproduction and in photoproduction with the ZEUS detector in ep collisions at HERA using an integrated luminosity of 350 pb^{-1} . The $\psi(2S)$ mesons were identified via their decay chain: $\psi(2S) \rightarrow J/\psi \pi^+ \pi^-$ with $J/\psi \rightarrow \mu^+ \mu^-$. The ratio of the production cross sections $R = \sigma(\psi(2S)) / \sigma(J/\psi)$ was measured as a function of the kinematic variables, in particular the photon-proton centre-of-mass energy, W , and compared to predictions of perturbative QCD. The exclusive production of dijets in diffractive deep inelastic lepton-proton scattering has also been measured. Jets have been reconstructed in the photon-Pomeron ($\gamma\text{-}IP$) centre-of-mass system frame using the exclusive k_T algorithm. The cross section for the exclusive production of dijets is given as a function of the angle between the plane defined by exchanged photon and dijet system and the plane defined by the incoming and scattered lepton momenta in the $\gamma\text{-}IP$ rest frame. It is compared to theoretical predictions of models based on boson-gluon fusion and two-gluon exchange processes. The first measurement of exclusive photoproduction of ρ mesons associated with leading neutrons with the H1 detector at HERA is also presented. The data correspond to an integrated luminosity of 1.12 pb^{-1} . The ρ meson is identified by its decay pions reconstructed in the central tracking chamber, while the leading neutron carrying a large fraction of the incoming proton momentum, $x_L > 0.3$, is detected in the Forward Neutron Calorimeter. The cross section of the reaction $\gamma p \rightarrow \rho + n + Y$, where Y is a small mass system escaping undetected in the proton direction, is measured as a function of the neutron energy, the invariant mass of the $\pi^+ \pi^-$ system and p_T^2 of the ρ meson. The data are interpreted in terms of two dominant contributions: diffractive proton dissociation channel and elastic production via virtual pion exchange.

Summary

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