

Diffractive PDFs and factorisation tests at HERA

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Diffractive photoproduction of dijets was measured with the ZEUS detector at the ep collider HERA using an integrated luminosity of 77.2 pb^{-1} . The measurements were made in the kinematic range $Q^2 < 1 \text{ GeV}^2$, $0.20 < y < 0.85$ and $x_{\text{IP}} < 0.025$, where Q^2 is the photon virtuality, y is the inelasticity and x_{IP} is the fraction of the proton momentum taken by the diffractive exchange. The two jets with the highest transverse energy, E_{Tjet} , were required to satisfy $E_{\text{Tjet}} > 7.5$ and 6.5 GeV , respectively, and to lie in the pseudorapidity range $1.5 < \eta_{\text{jet}} < 1.5$. Differential cross sections were compared to perturbative QCD calculations using available parameterisations of diffractive parton distributions of the proton.

Measurements are presented of single and double-differential dijet cross sections in diffractive photoproduction ($Q^2 < 0.01 \text{ GeV}^2$) based on 1999 and 2000 HERA data with an integrated luminosity of 54 pb^{-1} . The event topology is given by $ep \rightarrow eXY$, where the system X, containing at least two jets, is separated from a leading low-mass proton dissociative system Y by a large rapidity gap. The dijet cross sections are compared to leading order Monte Carlo models and to next-to-leading order QCD predictions, based on recent diffractive parton densities obtained by H1. The next-to-leading order calculations predict larger cross sections than observed. The suppression of the data relative to the calculation is investigated as a function of various kinematic variables. Ratios of the diffractive to inclusive single-differential dijet cross sections are measured for the first time.

Differential dijet cross sections in diffractive deep-inelastic scattering are measured with the H1 detector at HERA using an integrated luminosity of 51.5 pb^{-1} . The selected events are of the type $ep \rightarrow eXY$, where the system X contains at least two jets and is well separated in rapidity from the low mass proton dissociation system Y. The dijet data are compared with QCD predictions at next-to-leading order based on diffractive parton distribution functions previously extracted from measurements of inclusive diffractive deep-inelastic scattering. The prediction describes the dijet data well at low and intermediate z_{pom} (the fraction of the momentum of the diffractive exchange carried by the parton entering the hard interaction) where the gluon density is well determined from the inclusive diffractive data, supporting QCD factorisation. A new set of diffractive parton distribution functions is obtained through a simultaneous fit to the diffractive inclusive and dijet cross sections. This allows for a precise determination of both the diffractive quark and gluon distributions in the range $0.05 < 0.9$. In particular, the precision on the gluon density at high momentum fractions is improved compared to previous extractions.

ZEUS inclusive diffractive cross-sections data were used in a DGLAP next-to-leading-order QCD analysis to extract the diffractive parton distribution functions. Data on diffractive dijet production in deep inelastic scattering were also included in the fit to constrain the gluon density. Diffractive photoproduction dijet were used to test the extracted parton densities.

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