

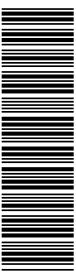
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# Deep inelastic inclusive and diffractive scattering at $Q^2$ values from 25 to 320 GeV $^2$ with the ZEUS forward plug calorimeter

ZEUS Collaboration

## Abstract

Deep inelastic scattering and its diffractive component,  $ep \rightarrow e'\gamma^*p \rightarrow e'XN$ , have been studied at HERA with the ZEUS detector using an integrated luminosity of 52.4 pb $^{-1}$ . The  $M_X$  method has been used to extract the diffractive contribution. A wide range in the centre-of-mass energy  $W$  (37 – 245 GeV), photon virtuality  $Q^2$  (20 – 450 GeV $^2$ ) and mass  $M_X$  (0.28 – 35 GeV) is covered. The diffractive cross section for  $2 < M_X < 15$  GeV rises strongly with  $W$ , the rise becoming steeper as  $Q^2$  increases. The data are also presented in terms of the diffractive structure function,  $F_2^{D(3)}$ , of the proton. For fixed  $Q^2$  and fixed  $M_X$ ,  $x_{_{IP}}F_2^{D(3)}$  shows a strong rise as  $x_{_{IP}} \rightarrow 0$ , where  $x_{_{IP}}$  is the fraction of the proton momentum carried by the Pomeron. For Bjorken- $x < 1 \cdot 10^{-3}$ ,  $x_{_{IP}}F_2^{D(3)}$  shows positive log  $Q^2$  scaling violations, while for  $x \geq 5 \cdot 10^{-3}$  negative scaling violations are observed. The diffractive structure function is compatible with being leading twist. The data show that Regge factorisation is broken.



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