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Measurements and Interpretation of the Diffractive Structure Function $F_2^{D(3)}$ at HERA

H1 Collaboration, DESY

New measurements of the contribution $F_2^{D(3)}$ to the proton structure function F_2 from interactions of the type $ep \to eXY$ are presented which extend the kinematic range to both higher and lower Q^2 than hitherto published. A dominant diffractive exchange together with additional subleading reggeon contributions reproduce well the $x_{\mathbb{P}}$ dependence of $F_2^{D(3)}$. In a fit to the new low Q^2 data together with the previous published measurements, the diffractive trajectory is found to have an intercept which is consistent with that already published. A fit is also performed using a QCD-inspired model in which parton distributions are assigned to the leading and sub-leading exchanges. When the new low Q^2 data are included, the results are found to be consistent with those already published. The contribution to $F_2^{D(3)}$ from higher twist processes is found to be important at low Q^2 and large β. The ratio, $r_D^{(3)}$, of the diffractive cross section, for different fixed values of β, to the total deep-inelastic cross section is evaluated as a function of Bjorken-x and Q^2. The results are discussed in terms of the properties of the diffractive exchange in the deep-inelastic domain.