Open Charm Production in Inclusive and Diffractive Deep-Inelastic Scattering at HERA

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Abstract

A measurement is presented of the total and differential cross sections for inclusive and diffractive $D^{*\pm}$ production based on an analysis of 1995, 1996 and 1997 data from the HERA experiment H1. The decay channel $D^{*\pm} \rightarrow K^{\mp}\pi^{\pm}\pi^{\pm}$ is used.

The measurement of the inclusive D^* cross section, which is the first to use the 1997 data sample, is found consistent with both the prediction of LO QCD based on the gluon distribution in the proton, and with published data which used a smaller data sample. For the measurement of the diffractive D^* cross section, the forward components of the H1 detector are used to select events on the basis of a large gap in the pseudo-rapidity distribution of final state hadrons adjacent to the leading proton. The cross section is measured in the diffractive kinematic range $M_Y < 1.6$ GeV, $|t| < 1$ GeV^2 and $x_{I\!P} < 0.04$, and is found to contribute around 5% to the inclusive D^* cross section. The normalisation of the diffractive cross section is a factor two to three smaller than the QCD prediction based on factorisable pomeron parton distributions obtained from a QCD fit to the H1 measurement of $F_2^{D(3)}$. However, the shape of the differential distributions for diffractive D^* production, which are measured for the first time, are well modelled by the factorisable pomeron model. The model is able to describe the shapes of the cross sections differential in final state hadronic variables which are sensitive to the mass of the diffractively scattered system.