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Production of D^* Meson in ep Collisions at HERA

H1 Collaboration

Measurements of charm photoproduction cross sections in electron-proton collisions at various γp centre-of-mass energies are presented. Heavy quark production is tagged by reconstruction of D^* mesons, which are detected in the decay channels such as $D^{*+} \to D^0\pi^+$, $D^0 \to K^-\pi^+$. At the ep collider HERA, heavy quarks are mainly produced by the photon–gluon fusion process, $\gamma g \to c\bar{c}X$. In these processes, the cross section depends on the gluon density distribution in the proton. Charm detection provides therefore a direct method to determine this distribution in the proton down to values of $x_g \approx 10^{-3}$, where x_g represents the momentum fraction of the proton carried by the gluon. Measurements of the differential cross section are confronted with next-to-leading order QCD calculations. The results are found to extrapolate favourably from the low-energy fixed-target experiments provided a rather steep increase of the gluon density at low x is assumed. The fraction of charm candidate events with an interval of pseudorapidity devoid of any hadronic energy flow adjacent to the incident proton direction, is used to study the diffractive photoproduction of D^{*+} mesons.