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www-h1.desy.de/h1/www/publications/conf/conf_list.html

Measurement of the Polarisation Dependence of the Total $e^- p$ Charged Current Cross Section

H1 Collaboration

Abstract

Data taken with the H1 detector, for longitudinally polarised electrons in left handed state in collision with unpolarised protons at HERA, are used to measure the total charged current cross section for $Q^2 > 400\,\mathrm{GeV}^2$ and inelasticity $y < 0.9$. The polarisation dependence of the total charged current cross section is compared with Standard Model expectations.

The integrated charged current (CC) cross section of longitudinally polarised electrons in collision with protons is measured in the range $Q^2 > 400\,\mathrm{GeV}^2$ and $y < 0.9$. The measurement of the cross section is performed following the same analysis procedure as in [1] and is based on the left handed data set taken recently by the H1 experiment with an integrated luminosity of $L = (17.75 \pm 0.21)\,\mathrm{pb}^{-1}$ and an average polarisation of $P_e = (-25.40 \pm 0.44)\,\%$. The value is:

$$\sigma_{CC}(P_e = -0.25) \quad = \quad 66.42\,\mathrm{pb} \pm 2.39\,\mathrm{pb}\ (\mathrm{stat}) \pm 2.99\,\mathrm{pb}\ (\mathrm{sys})$$

where the 1.2% luminosity normalisation uncertainty is included in the systematic error. The polarisation uncertainty, which does not directly enter in the cross section measurement, is shown in Fig. 4.

The measurement of the unpolarised CC cross section based on the HERA-I data set with a luminosity of $16.4\,\mathrm{pb}^{-1}$ and measured in the same phase space region is:

$$\sigma_{CC}(P_e = 0) \quad = \quad 57.03\,\mathrm{pb} \pm 2.21\,(\mathrm{stat}) \pm 1.38\,(\mathrm{sys})$$

where the systematic error also includes the normalisation uncertainty of 1.8%.

The polarisation dependence of these cross sections is shown in Fig. 4 in comparison with the Standard Model expectations based on the H1 PDF 2000 [2]. Also shown are the total cross sections and their polarisation dependence of the charged current interactions measured previously in positron-protron collisions [1].

References

[1] H1 Collaboration, Contributed paper no. 756/758 to ICHEP04, http://www-h1.desy.de/h1/www/publications/htmlsplit/H1prelim-04-141.long.html .

[2] H1 Collaboration (C. Adloff et al.), *Eur. Phys. J.* **C30** (2003) 1.

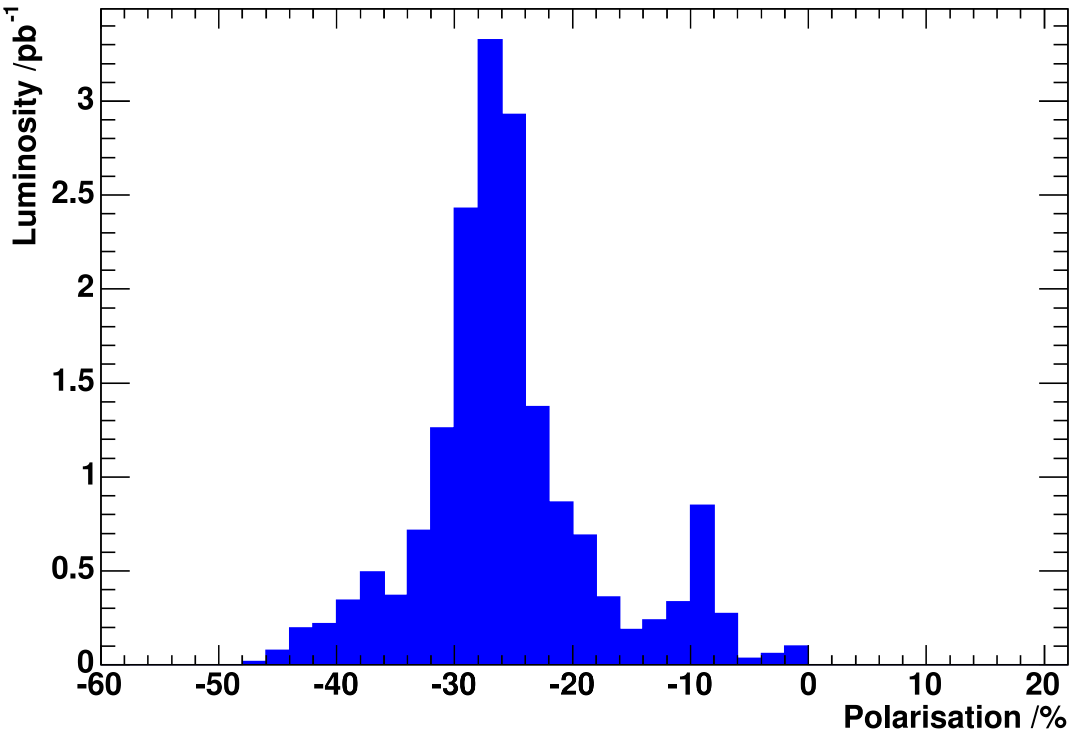

Figure 1: Distribution of luminosity versus polarisation P_e for data taken in 2005.

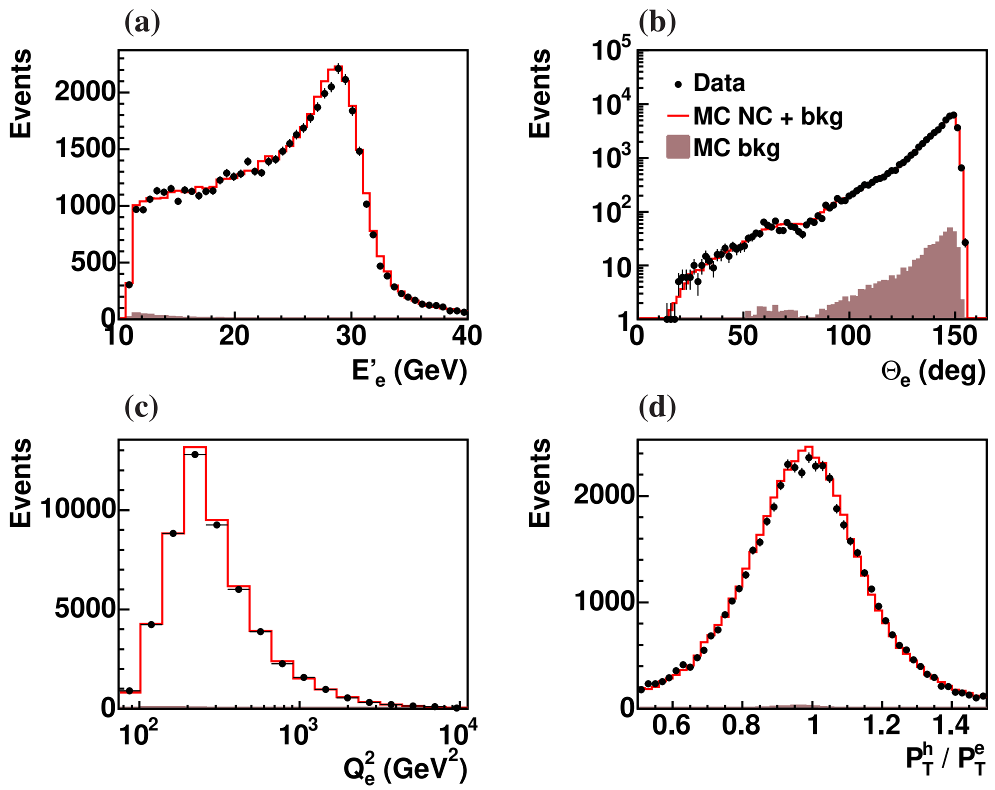

Figure 2: Distributions of E'_e (a), θ_e (b), Q^2 (c) and $P_{T,h}/P_{T,e}$ (d) of the NC data set.

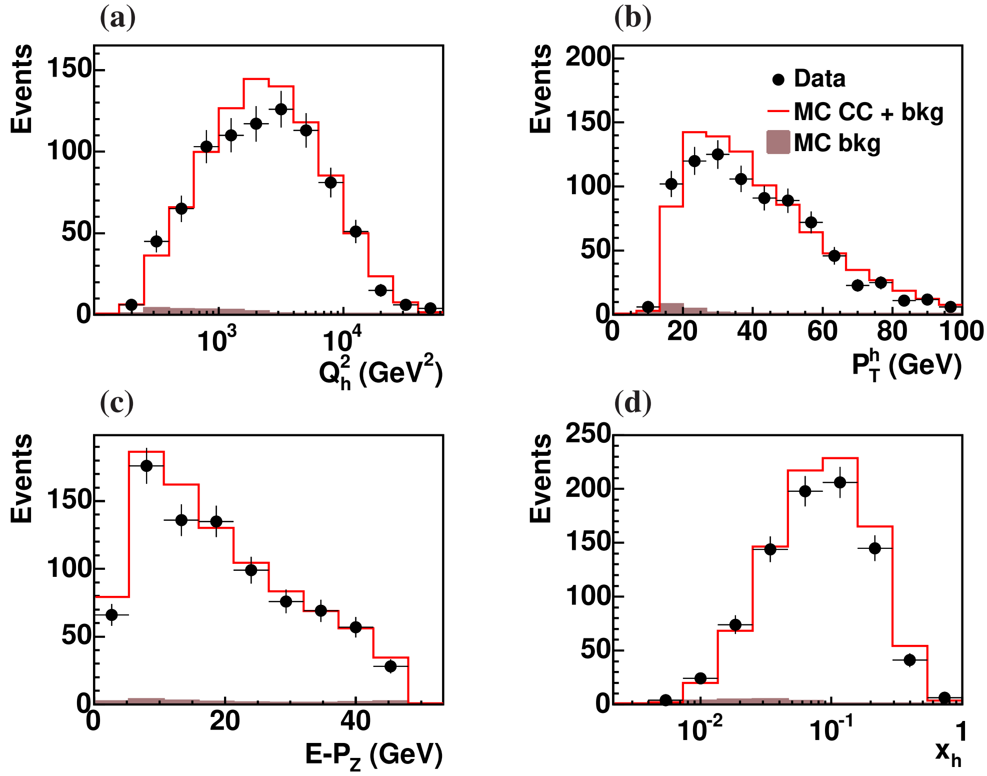

Figure 3: Distributions of Q_h^2 (a), $P_{T,h}$ (b), $E_h - p_{z,h}$ (c) and x_h (d) of the CC data set.

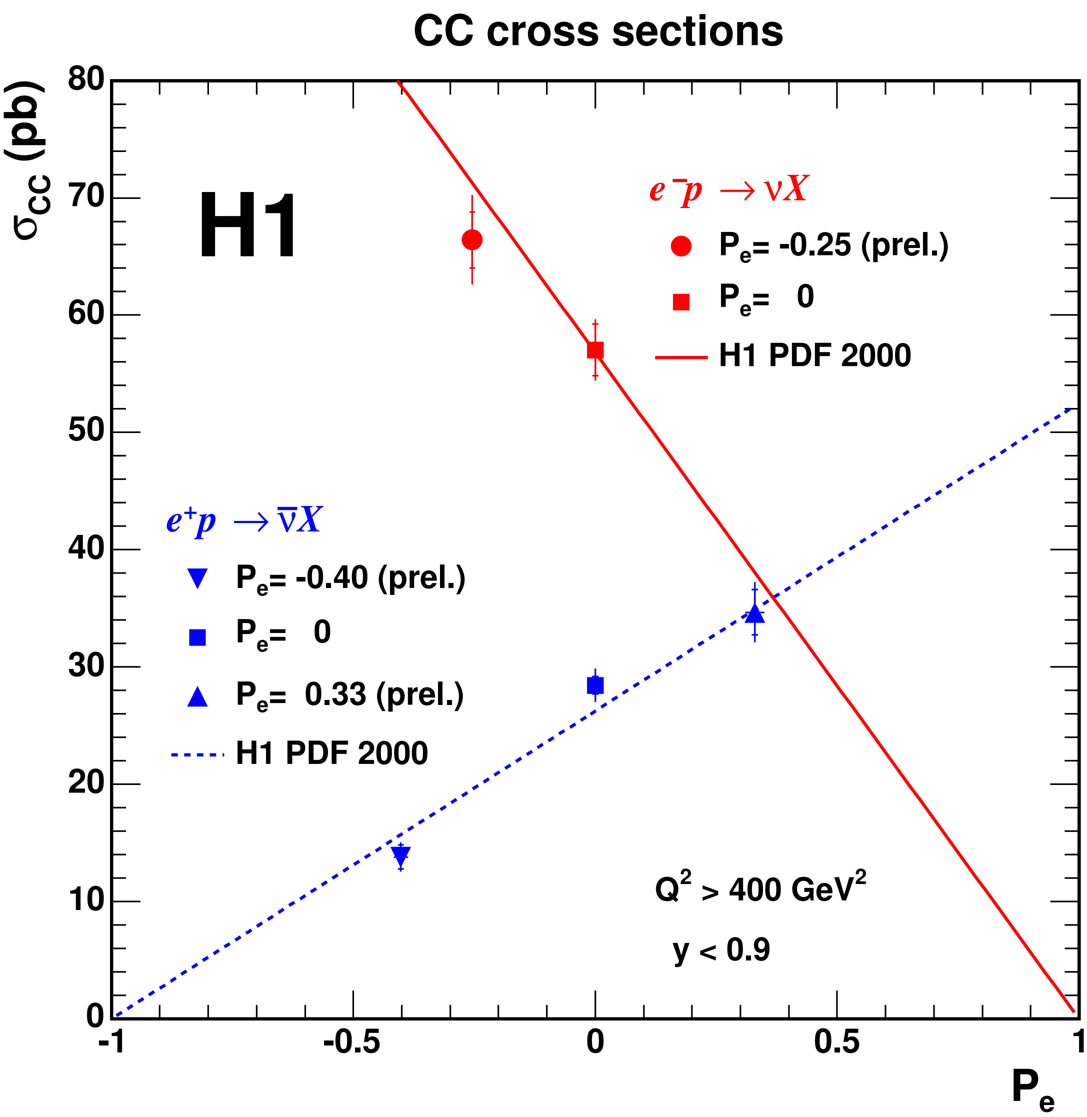

Figure 4: The dependence of the e^+p and e^-p CC cross section with the lepton beam polarisation P_e is shown. The data are compared to the prediction from the H1 PDF 2000 fit for polarised positrons (dashed line) and for polarised electrons (full line) .