A First Measurement of the Neutral Current Cross Section at High Q^2 in Longitudinally Polarised e^+p Scattering with the H1 Detector

by

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Abstract

An analysis is presented of data taken in e^+p collisions at HERA with a longitudinally polarised positron beam at a centre of mass energy of $\sqrt{s} \simeq 320$ GeV. The data were taken in the years 2003 and 2004 and consist of a 20.72 pb^{-1} left-handed sample (with polarisation $P_e = -40.2\%$) and a 26.91 pb^{-1} right-handed sample (with polarisation $P_e = 33.6\%$). The experimental apparatus and the measurement and analysis procedures are described. Particular emphasis is placed on the understanding of the performance of the upgraded H1 detector. The inclusive cross sections for neutral current scattering are presented double differentially in Bjorken x and Q^2 and single differentially in each of these variables. The measurement is made in the range $0.002 < x < 0.65$ and $100 < Q^2 < 20000$ GeV^2. The results are consistent with the predictions of the Standard Model. An asymmetry in the single differential cross sections, $\mathrm{d}\sigma/\mathrm{d}Q^2$, between left-handed and right-handed positron scattering has been measured at the 1σ level in two bins at the highest Q^2, providing tentative confirmation of the polarisation dependence of the neutral current cross section.