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First Observation of Hadronic Final State Charge Asymmetry in High Q^2 Deep-Inelastic Scattering at HERA

H1 Collaboration

Abstract

A first measurement of the charge asymmetry in the scattered hadronic final state in high Q^2 deep-inelastic ep neutral current scattering at HERA has been made. The difference between the normalised distribution of the scaled momentum, x_p, for positive and negative particles, measured in the current region of the Breit frame, has been studied together with its evolution as a function of Q^2. The results are compared to Monte Carlo models at the hadron and parton level.

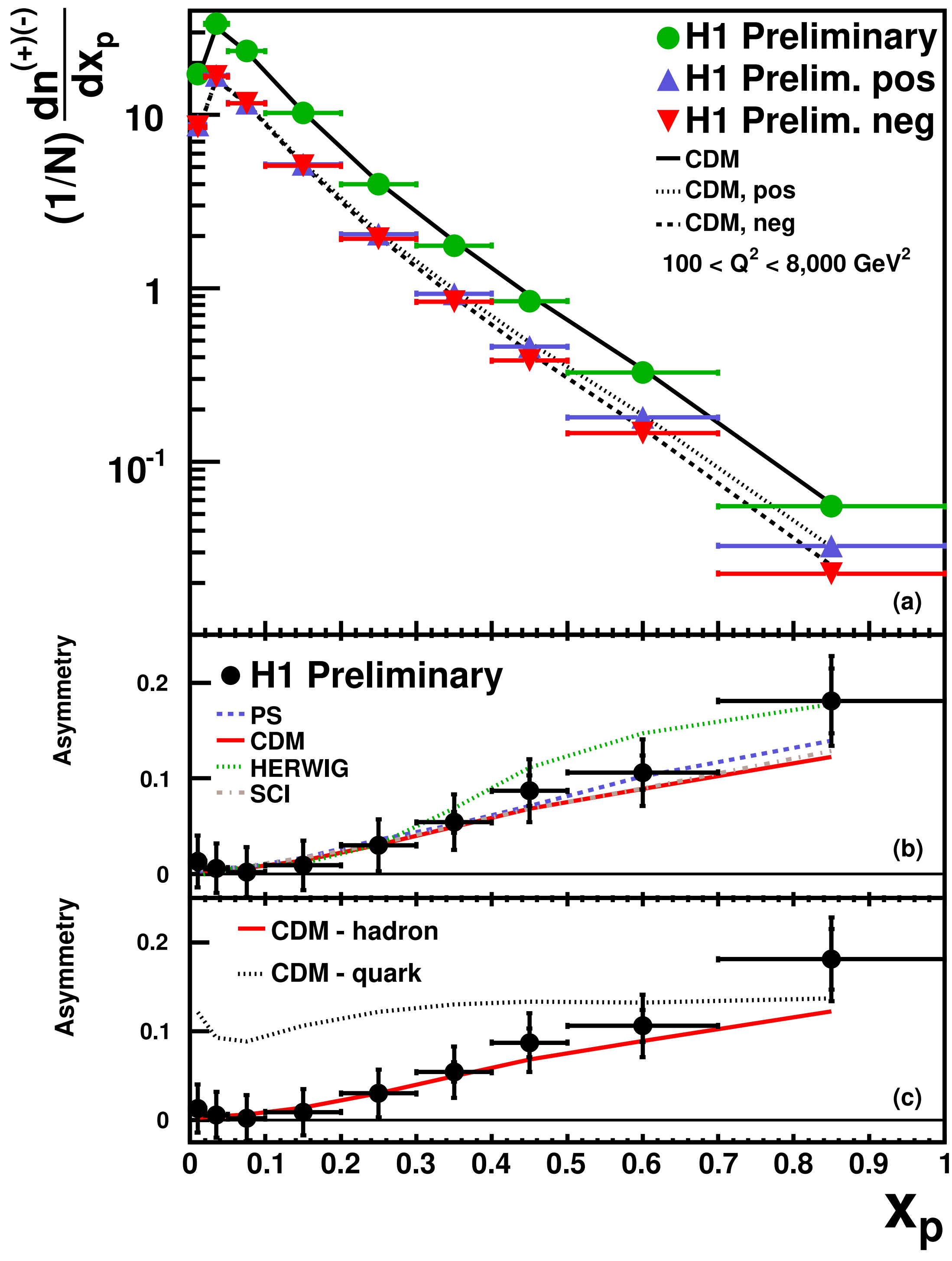

Figure 1: (a) The measured normalised distributions of the scaled momentum, $\frac{1}{N}dn/dx_p$, for all charged particles and for positive and negative separately and (b, c) the charge asymmetry, $(n^+ - n^-)/(n^+ + n^-)$, as a function of x_p. The inner error bars represent the statistical errors, the outer error bars the statistical and systematic errors added in quadrature. The data are compared to predictions from different models of the parton cascade and hadronisation processes implemented in leading order matrix element Monte Carlo programs and to the parton level before hadronisation.

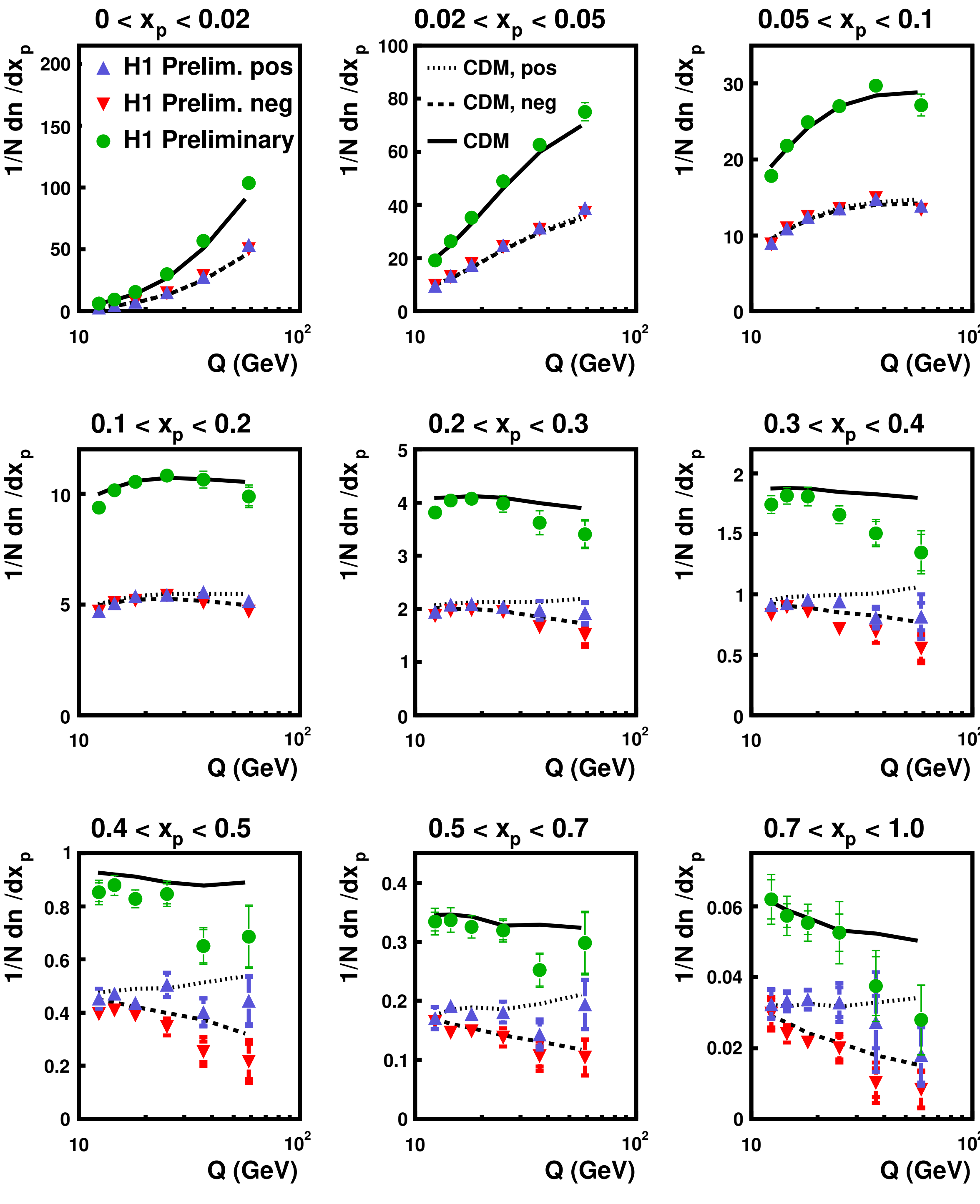

Figure 2: The measured normalised distributions of the scaled momentum, $\frac{1}{N}dn/dx_p$, for all charged particles and for positive and negative separately, as a function of Q for nine different x_p regions. The error bars include statistical and systematic errors added in quadrature. The data are displayed at the average value of Q. The data are compared to predictions from the CDM Monte Carlo program.

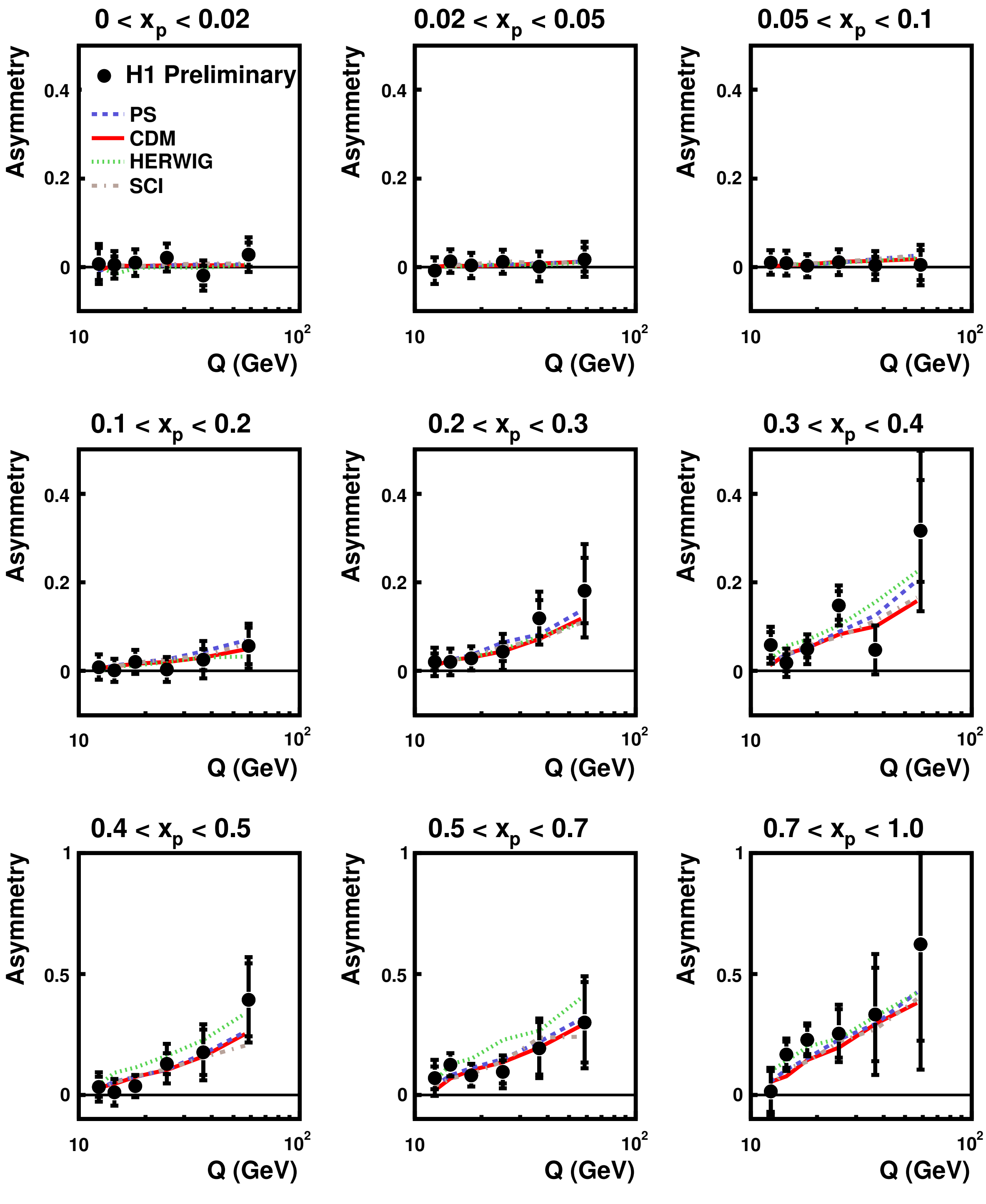

Figure 3: The charge asymmetry, $(n^+ - n^-)/(n^+ + n^-)$, as a function of Q for nine different x_p regions. The error bars include statistical and systematic errors added in quadrature. The data are displayed at the average value of Q. The data are compared to predictions from different models of the parton cascade and hadronisation processes implemented in leading order matrix element Monte Carlo programs.