Charmonium Production in Deep Inelastic Scattering at HERA

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The electroproduction of J/ψ and $\psi(2S)$ mesons is studied in elastic, quasi-elastic and inclusive reactions for four momentum transfers $2 < Q^2 < 80$ GeV^2 and photon-proton centre of mass energies $25 < W < 180$ GeV. The data were taken with the H1 detector at the electron proton collider HERA in the years 1995 to 1997. The total virtual photon-proton cross section for elastic J/ψ production is measured as a function of Q^2 and W. The dependence of the production rates on the square of the momentum transfer from the proton (t) is extracted. Decay angular distributions are analysed and the ratio of the longitudinal and transverse cross sections is derived. The ratio of the cross sections for quasi-elastic $\psi(2S)$ and J/ψ meson production is measured as a function of Q^2. The results are discussed in terms of theoretical models based upon perturbative QCD. Differential cross sections for inclusive and inelastic production of J/ψ mesons are determined and predictions within two theoretical frameworks are compared with the data, the non-relativistic QCD factorization approach including colour octet and colour singlet contributions, and the model of Soft Colour Interactions.

References

1. H1 Collaboration, C. Adloff *et al*, DESY-99-026