



Contribution ID: 115

Type: **not specified**

Measurement of the cross-section ratio $\sigma(\psi(2S))/\sigma(J/\psi(1S))$ in deep inelastic exclusive ep scattering at HERA

Tuesday 12 April 2016 11:20 (15 minutes)

The exclusive deep inelastic electroproduction of $\psi(2S)$ and $J/\psi(1S)$ at an ep centre-of-mass energy of 317 GeV has been studied with the ZEUS detector at HERA in the kinematic range $2 < Q^2 < 80 \text{ GeV}^2$, $30 < W < 210 \text{ GeV}$ and $|t| < 1 \text{ GeV}^2$, where Q^2 is the photon virtuality, W is the photon-proton centre-of-mass energy and t is the squared four-momentum transfer at the proton vertex. The data for $2 < Q^2 < 5 \text{ GeV}^2$ were taken in the HERA I running period and correspond to an integrated luminosity of 114 pb⁻¹. The data for $5 < Q^2 < 80 \text{ GeV}^2$ are from both HERA I and HERA II periods and correspond to an integrated luminosity of 468 pb⁻¹. The decay modes analysed were $\mu^+ \mu^-$ and $J/\psi(1S) \pi^+ \pi^-$ for the $\psi(2S)$ and $\mu^+ \mu^-$ for the $J/\psi(1S)$. The cross-section ratio $\sigma(\psi(2S))/\sigma(J/\psi(1S))$ has been measured as a function of Q^2 , W , and t . The results are compared to predictions of QCD-inspired models of exclusive vector-meson production.

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Session Classification: WG5 Small-x and Diffraction

Track Classification: Small-x, Diffraction and Vector Mesons