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

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Collaboration

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Abstract content

The exclusive deep inelastic electroproduction of $\psi(2S)$ and $J/\psi(1S)$ at an ep centre-of-mass energy of 317 GeV have been studied with the ZEUS detector at HERA in the kinematic range $2 < Q^2 < 80$ GeV^2, $30 < W < 210$ GeV and $|t| < 1$ 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 $2 < Q^2 < 5$ GeV^2 were taken in the HERA I running period and correspond to an integrated luminosity of 114 pb^{-1}. The data for $5 < Q^2 < 80$ GeV^2 are from both HERA I and HERA II periods and correspond to an integrated luminosity of 468 pb^{-1}. Also, the exclusive photoproduction reaction $\gamma p \to \Psi(2S)p$ has been studied using an integrated luminosity of 350 pb^{-1}. The measurement has been performed in the kinematic range $30 < W < 180$ GeV, $Q^2 < 1$ GeV^2, $|t| < 5$ GeV^2. 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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