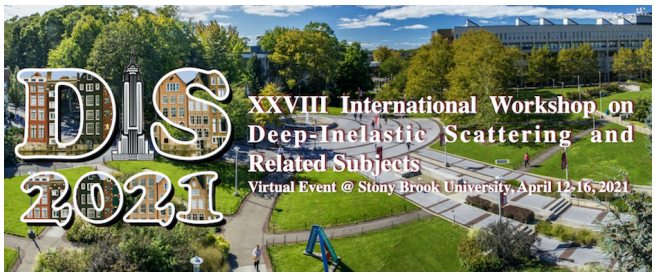

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Measurement of Exclusive π+π− and ρ0 Meson Photoproduction at HERA

Wednesday, 14 April 2021 13:09 (18 minutes)

Exclusive photoproduction of $\rho^0(770)$ mesons is studied using the H1 detector at the ep collider HERA. A sample of about 900000 events is used to measure single- and double-differential cross sections for the reaction $\gamma p \to \pi^+\pi^- Y$. Reactions where the proton stays intact ($m_Y = m_p$) are statistically separated from those where the proton dissociates to a low-mass hadronic system ($m_p m_Y 10$ GeV). The double-differential cross sections are measured as a function of the invariant mass $m_{\pi\pi}$ of the decay pions and the squared 4-momentum transfer t at the proton vertex. The measurements are presented in various bins of the photon-proton collision energy $W_{\gamma p}$. The phase space restrictions are $0.5 m_{\pi\pi} 2.2$ GeV, $|t| 1.5$ GeV^2, and $20 W_{\gamma p} 80$ GeV. Cross section measurements are presented for both elastic and proton-dissociative scattering. The observed cross section dependencies are described by analytic functions. Parametrising the $m_{\pi\pi}$ dependence with resonant and non-resonant contributions added at the amplitude level leads to a measurement of the $\rho^0(770)$ meson mass and width at $m_\rho = 770.8^{+2.6}_{-2.7}$ (tot.) MeV and $\Gamma_\rho = 151.3^{+2.7}_{-3.6}$ (tot.) MeV, respectively. The model is used to extract the $\rho^0(770)$ contribution to the $\pi^+\pi^-$ cross sections and measure it as a function of t and $W_{\gamma p}$. In a Regge asymptotic limit in which one Regge trajectory $\alpha(t)$ dominates, the intercept $\alpha(t=0) = 1.0654^{+0.0098}_{-0.0067}$ (tot.) and the slope $\alpha\,(t=0) = 0.233^{+0.067}_{-0.074}$ (tot.) GeV^{-2} of the t dependence are extracted for the case $m_Y = m_p$.

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