

Threshold charmonium production at JLab

Wednesday, 5 June 2024 11:30 (30 minutes)

The 12 GeV Continuous Electron Beam Accelerator Facility (CEBAF) at JLab allows the study of J/ψ photoproduction and some higher-mass charmonium states at their thresholds, starting from 8.2 GeV. In this regime, the reaction amplitude is dominated by its real part (in contrast to the high-energy case) and contains important information about the interactions of the $c\bar{c}$ pair with the proton target at low energy. This amplitude can be related to the gluon properties of the nucleon such as gluon form factors, mass radius of the proton, and the anomalous contribution to the proton mass. Threshold J/ψ production can also be used to study the $J/\psi N$ scattering length and the possibility of $J/\psi N$ bound states like the LHCb pentaquarks. We discuss the results of two JLab experiments, GlueX and J/ψ -007, where we aim to extract the above quantities from J/ψ production and test the theoretical assumptions used to relate those quantities to the measured cross sections. These studies are complemented by observations of higher-mass charmonium states in the GlueX experiment. The proposed 22 GeV CEBAF upgrade would allow more comprehensive studies of the above reactions, also using polarization measurements, and at the same time increase the energy reach well above the D-Dbar threshold.

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Session Classification: Session 5