Near-threshold J/ψ photoproduction

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Abstract

The near-threshold charmonium photoproduction opens the door for studying the gluonic properties of the proton: gluonic GPDs, anomalous contribution to the mass of the proton, gravitational form factors, and the *mass* radius of the proton. However, such an ambitious program requires precise measurements to validate the theoretical assumptions that relate the experimental results to the above quantities. The first total cross-section measurements of near-threshold J/ψ exclusive photoproduction ($\gamma p \to J/\psi p$) [1] by the GlueX collaboration that became possible with the 12-GeV Jefferson Lab machine sparked remarkable theoretical interest, however had a limitted statistics. We plan to report new total cross-section results based on more than a four-fold increase in statistics. Even more, due to the full acceptance of the GlueX experiment for this reaction, we will present measurements of the differential cross-sections over the whole near-threshold kinematic region. Such measurements allow to make more general quantitative conclusions about the reaction mechanism, when compared to the theoretical calculations that cover a wide range of methods and reaction channels, from gluon exchange to open-charm intermediate states. Prospects of future J/ψ measurements at Jefferson Lab that include also polarization quantities will be discussed, as well.

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[1] A. Ali et al. (GlueX collaboration), Phys. Rev. Lett. **123**, 072001 (2019).