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η Meson Photoproduction with the GlueX Experiment

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Studies of the exclusive production of the η meson in photonuclear reactions offer a wide range of physics insight. These include constraining models of hadron photoproduction, insight into the spectrum of excited N* states, and may even provide a probe into the structure of the nucleon at wide-angles of production. GlueX, a high-intensity photoproduction experiment located at Hall D of Jefferson Lab, measures exclusive η mesons off the proton with large statistics and comparatively low background. We present cross section measurements of η photoproduction at $E_\gamma = 6$-11 GeV and find consistent results using the decay modes $\eta \to \gamma\gamma$, $\pi^+\pi^-\pi^0$, and $\pi^0\pi^0\pi^0$. When studied as a function of Mandelstam t, these cross sections can constrain models describing η production in terms of t-channel Reggeon exchange. Such measurements inform future searches for exotic hybrid mesons and serve as a benchmark for the Jefferson Lab Eta Factory, a future upgrade to the existing GlueX facility focused on rare η decays.

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Experiment

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