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Overview of Light Meson Results from the GlueX Experiment

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The GlueX experiment in Hall D at Jefferson Lab consists of a well-instrumented photon beamline in conjunction with a solenoidal spectrometer providing near-hermetic coverage for charged particles and photons. Since 2016, the experiment has had several run periods with a 9 GeV linearly polarized photon beam on a 30cm liquid hydrogen target, completing its initial low-intensity program. Light (i.e., < 1.05 GeV/c2) meson studies have been critical to commissioning the GlueX detector, elucidating the photo-production reaction mechanism in this photon energy range, and testing the event selection techniques needed to search for exotic hybrid mesons. We have measured the beam asymmetries for photo-production of pseudo-scalar mesons including π, η, and η', and have preliminary results for the Spin Density Matrix Elements (SDMEs) for the vector mesons ω, ρ, and ϕ. Cross-section determinations are in progress for all these mesons, usually in more than one decay branch, and with 3-7 particles exclusively detected in the final state. The outlook appears encouraging for GlueX to measure precise, competitive Dalitz plots for $\eta \to 3\pi$ and $\eta' \to \eta\, 2\pi$. The latter $\eta' \to \eta\, 2\pi$ studies are synergistic with exploratory studies of the continuum $M(\eta 2\pi)$ mass spectrum between 1.5 and 2.5 GeV/c2 where we plan to search for hybrid exotic mesons.

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