

Beam Asymmetries from Light Scalar Meson Photoproduction on the Proton at GlueX

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The GlueX facility, featuring a linearly polarized 9 GeV real photon beam delivered to a large-acceptance detector system, has recently completed its first phase of running, and analysis efforts of this dataset are well underway. It has been suggested that at GlueX energies, quark systems beyond the three quark and quark-antiquark systems of baryons and mesons, such as hybrid mesons, tetraquarks and glueballs, should exist, and studies of these systems could shed new light on how quarks combine under the strong force, particularly the role played by gluons.

GlueX data encompasses final states at energies where photoproduction of light scalar mesons, such as $a_0(980)$ and $f_0(980)$, can provide discriminatory evidence between various models, manifested in experimental observables such as the cross section and beam asymmetry, however many of these analyses comprise multi-particle final states, which can arise from numerous intermediate resonances formed via different production mechanisms.

The work presented showcases efforts to measure the beam asymmetry of the $a_0(980)$ meson from the reaction $\gamma p \rightarrow p\eta\pi$, and discusses the application of longitudinal phase space plots, originally introduced by van Hove fifty years ago, as a means of optimizing event selection. This technique has found traction in several multi-particle final state analyses in GlueX, and provides an effective additional means of separately visualising meson and baryon production events with the same final state.