

# Beam Asymmetries from $\eta\pi$ Photoproduction on the Proton at GlueX

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The GlueX facility, featuring a linearly polarised 9 GeV real photon beam delivered to a large-acceptance detector system, has recently completed an initial phase of data taking at energies where quark systems beyond the three quark and quark-antiquark systems of baryons and mesons, such as hybrid mesons, tetraquarks and glueballs, should exist. Analysis efforts of this dataset are well underway, and studies of these systems are expected to shed new light on how quarks combine under the strong force, particularly the role played by gluons.

GlueX data encompasses final states where photoproduction of light scalar meson states, whose nature remains poorly understood, such as the  $a_0(980)$  and  $f_0(980)$ , can provide discriminatory evidence between various models. This is achieved through the measurement of experimental observables, for example the cross section and beam asymmetry.

The work presented showcases efforts to measure beam asymmetries in the reaction  $\gamma p \rightarrow p\eta\pi$ , where both mesons decay to two photons, and whose invariant mass spectrum features both the  $a_0(980)$  meson and an overlapping signal from  $a_2(1320)$ . The beam asymmetry of the  $\eta\pi$  system can be used to search for exotic signals, for instance through the presence of a non-zero P-wave contribution, which may be seen in asymmetry measurements at small opening angles in the meson decay frame. Additionally, the t-dependence of the  $a_0(980)$  beam asymmetry can provide insight into production mechanisms of this light scalar meson state. Future prospects for related analyses in this reaction topology, informed by these measurements, will also be discussed.