

Studying isospin breaking and anomalous η/η' -Decay Modes in Photoproduction with GlueX

The η/η' -Meson is a unique tool to study low energy QCD phenomena and test theoretical models.

The isospin violating decay $\eta \rightarrow \pi^+\pi^-\pi^0$ is driven by the strong force and allows probing of the light quark masses, via measuring the corresponding decay amplitude. This amplitude is accessible either via a Dalitz-Plot or partial wave analysis. The latter one allows for a direct calculation of the quark mass ratio Q whereas the parameters from the Dalitz Plot analysis give insights into the decay dynamics and can be compared to theoretical calculations.

The decay $\eta^{(\prime)} \rightarrow \pi^+\pi^-\gamma^*[\gamma^* \rightarrow e^+e^-]$ allows study of quantum anomalies, because its decay amplitude is driven by the box anomaly. However, final state interactions between the two charged pions are present and have to be taken into account when modeling the decay amplitude. CP-symmetry breaking effects can be tested by measuring the angle of the decay plane between the lepton and pion pair.

These $\eta^{(\prime)}$ -decays have been produced and measured in the reaction $\gamma p \rightarrow p\eta^{(\prime)}$ with the GlueX experiment, located at the Thomas Jefferson National Laboratory. GlueX finished the first phase of data taking in the winter last year. The second phase will start this fall with an upgraded setup including a DIRC-detector.

This talk will discuss the status and prospects of the analysis of the two decay modes within the GlueX data set, as well as the application of partial wave analysis.