Studying the hadronic and semi-leptonic Decay Modes of the $\eta^{(\prime)}$-Meson with GlueX-I

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

The semi-leptonic decay $\eta^{(\prime)} \to \pi^+\pi^-\gamma[\gamma \to e^+e^-]$ allows to study quantum anomalies, because its decay amplitude is driven by the box anomaly. Moreover, the CP-symmetry can be tested by measuring the angle of the decay plane between the dilepton and pion pair.

These $\eta^{(\prime)}$-decays have been produced and measured in the reaction $\gamma p \to p\eta^{(\prime)}$ with the GlueX experiment, located at the Thomas Jefferson National Laboratory. GlueX finished the first phase of measurements in the winter last year. The second phase will start this spring 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-I data set.