Contribution ID: **145** Type: **Contributed talk**

Exploring Photoproduced $\eta^{(\prime)}\pi^0$ Systems in the Search for Exotic Hadrons at GlueX

Monday, 8 July 2024 15:20 (20 minutes)

Physicists have been captivated by the spectrum of hadrons for decades, seeking to better comprehend the fundamental building blocks of matter. While various experiments have laid the foundation for this spectrum, Lattice Quantum Chromodynamics (Lattice QCD) has revealed new states with forbidden J^{PC} values. This has challenged the constituent quark model, suggesting *exotic hybrid mesons* that could reshape our understanding of hadronic structure and quark-gluon interactions through gluonic excitations.

The GlueX experiment at Jefferson Lab plays a pivotal role in this quest, with its efforts centered on analyzing photoproduction data. In order to investigate the lightest predicted exotic state with $J^{PC} = 1^{-+}$, known as the π_1 meson, significant attention has been directed towards both $\eta\pi^0$ and $\eta'\pi^0$ systems.

Detailed ongoing amplitude analysis studies of $\gamma p \rightarrow \eta^{(\prime)}\pi^0 p$, leveraging the polarization of the photon beam at the GlueX experiment, will be discussed. Specifically, the extracted moments of angular distributions for these channels will be presented, along with the differential cross-section results for the $a_2(1320)$ meson. These findings aid in identifying the dominant production mechanism and offer valuable insights into complex hadronic interactions. Ultimately, this will contribute to the ongoing search for and future identification of exotic hybrid meson candidates.

session

B. Hadron Spectroscopy

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Session Classification: B. Hadron Spectroscopy