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Study of the b1(1235) meson decay via the omega+piˆ0 channel at GlueX

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One of the fundamental objectives of hadron physics is to explore how quark and gluon interactions shape the hadron spectrum as described by Quantum Chromodynamics (QCD). The GlueX experiment at Jefferson Lab plays a key role in this global spectroscopy program by utilizing an 8–9 GeV beam of linearly polarized photons to investigate meson production. By focusing on the light-quark sector, this experiment provides a unique opportunity to study hybrid mesons that may exhibit exotic J^{PC} quantum numbers through photoproduction processes. Recent lattice QCD calculations predict that the lightest exotic $\pi_1(1600)$ decays primarily to a $b_1 \to \omega\pi^0$ system and can be experimentally accessed through the dominant decay $b_1 \to \omega\pi^0$. The GlueX experiment provides access to this process through photoproduction channels such as $\gamma p \to p b_1 \pi^0$ and $\gamma p \to b_1 p$, where the axial-vector $b_1(1235)$ meson decays to $\omega\pi^0$. To better understand this decay mechanism, partial wave analysis has been successfully employed to extract the D/S wave ratio, which is essential for validating Lattice QCD predictions regarding the couplings of this resonance. Next steps involve handling ambiguities in the extracted amplitudes of the partial waves as well as examining the combinatorics of the final state particles to ensure that their effects do not result in spurious results.

Keyword-1

GlueX Physics

Keyword-2

Partial Wave Analysis

Keyword-3

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