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Search for $\pi_1(1600)$ in a three-pion system at GlueX

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The GlueX experiment in Hall D at Jefferson Lab is designed for studies of the light meson spectrum with an emphasis on searches for hybrid mesons that have exotic quantum numbers and therefore cannot be classified as conventional hadrons. The experimental facility employs a tagged linearly polarized photon beam in the energy range from 8.2 to 8.8 GeV incident on a liquid hydrogen fixed target. The detector setup consists of a spectrometer with a nearly 4π angular coverage, which has excellent capabilities for reconstruction of charged particle tracks, reconstruction of electromagnetic showers, and charged particle identification. Advanced searches for spin-parity exotic mesons are performed through the application of Partial Wave Analysis (PWA) techniques.

I present the search for the $\pi_1(1600)$ meson with 1^{-+} quantum numbers by means of the PWA of the $\pi^+\pi^-\pi^-$ system produced in the $\gamma p \to \pi^+\pi^-\pi^-\Delta^{++}(\to p\pi^+)$ reaction. In the approximation of an isobar decay, data with the selected three-pion final states are fitted as coherent sums of partial-wave amplitudes defined in the reflectivity basis. The PWA techniques are applied in bins of $m(3\pi)$ allowing to extract the overall $m(3\pi)$ lineshape for each of the model contributions. The main interest lies in establishing the existence of a resonant 1^{-+} contribution in the P-wave $\rho\,\pi^-$ and D-wave $f_2\,\pi^-$ configurations.

Collaboration

GlueX

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