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Angular analysis of 2π and 3π systems recoiling against Δ^{++} at GlueX

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The GlueX experiment in Hall D at Jefferson Lab is designed for studies of light meson spectroscopy with a focus on searches for hybrid mesons that have exotic quantum numbers and therefore cannot be classified among conventional hadrons. The experimental facility exploits a tagged photon beam with energies from 3 GeV to 12 GeV incident on a liquid hydrogen fixed target. A significant part of the GlueX physics program is dedicated to comprehensive studies of the t-channel exchange mechanism between baryonic and mesonic systems, which is made possible by operating with a linearly polarized photon beam in the energy range from 8.2 GeV to 8.8 GeV. The photoproduction mechanisms are probed by measurements of Spin Density Matrix Elements (SDMEs). Furthermore, advanced searches for spin-exotic mesons are performed through the application of Partial Wave Analysis (PWA) techniques.

In this talk, I present two ongoing physics analyses of the data collected in 2017-2018. First physics analysis is aimed at measurement of the SDMEs in the $\gamma p \rightarrow \Delta^{++}(\rightarrow p\pi^+)\rho^-(\rightarrow \pi^-\pi^0)$ reaction. A fit model is constructed for a simultaneous fit of angular distributions in both baryonic and mesonic systems. Second physics analysis is aimed at the PWA of a $\pi^+\pi^-\pi^-$ system produced in the $\gamma p \rightarrow \pi^+\pi^-\pi^-\Delta^{++}(\rightarrow p\pi^+)$ reaction. In the approximation of an Isobar decay, data with the selected three-pion final states will be fitted as a superposition of partial waves contributing to the total intensity. The PWA techniques will be applied to angle fits in certain bins of $m_{3\pi}$ and $-t$. Particular interest lies in establishing of a resonant spin-exotic 1^{-+} contribution coming from the P-wave $\rho\,\pi^-$ configuration.

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