Measurement of the Spin-Density Matrix Elements of $\Delta^{++}(1232)$ in $\pi^-\Delta^{++}$ photoproduction at GlueX

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April 8, 2024

Abstract

The GlueX experiment at Jefferson Lab explores the hadron spectrum with many different photoinduced reactions. In particular, the goal is to systematically study the spectrum of light-quark hybrid mesons. For the ongoing amplitude analyses in the search for exotic hybrid mesons, it is crucial to understand the underlying production process, which is dominated by t-channel Regge exchanges with natural- and unnatural-partity contributions. The photoproduction reaction $\gamma p \to \pi^-\Delta^{++}(1232)$ allows to study the charge exchange mechanism, which is important for e.g. the charge exchange reaction $\gamma p \to \eta'\pi^-\Delta^{++}$ that is expected to play a key role in confirming the existence of the lightest hybrid meson $\pi_1(1600)$.

The presented measurement was taken with a linearly polarized photon beam that was incident on a liquid hydrogen target at the GlueX experiment, resulting in a precise determination of the t-dependence of nine Spin-Density Matrix Elements (SDMEs). These SDMEs are directly connected to the underlying helicity amplitudes of the production process and allow the separation of the natural and unnatural-parity exchanges.

This talk presents the SDMEs of the $\Delta^{++}(1232)$ in the photoproduction reaction $\gamma p \to \pi^-\Delta^{++}(1232)$.