

The Beam-Helicity Asymmetry for $\gamma p \rightarrow pK^+K^-$

Abstract

The first-time measurement of the angular dependence of the beam-helicity asymmetry is shown for $\gamma p \rightarrow pK^+K^-$ and is compared to $\gamma p \rightarrow p\pi^+\pi^-$. The data obtained were from the CLAS g12 experiment at Jefferson Lab. The experiment utilized a beam of circularly-polarized photons with energies between 1.1 to 5.4 GeV incident on an unpolarized liquid hydrogen target. An unprecedented number of hadrons with strange quarks in photoproduction were observed in g12. The production mechanism for hadrons containing strange quarks is not well understood. The beam-helicity asymmetry is a polarization observable that provides information on competing production mechanisms in the reaction. It is shown that the asymmetry is sensitive to several kinematic variables (Mandelstam t , $\sqrt{s}$, $M(K^+K^-)$, $M(pK^-)$) that are key observables in modeling the reaction's dynamics. Furthermore, the comparison of the beam-helicity asymmetries between the kaon and pion channels serves as a platform for the investigation of its flavor dependence. Its significance to understanding the production mechanisms of intermediate resonances is also discussed.