

EXECUTIVE SUMMARY / ABSTRACT

The production mechanisms for the reaction of a circularly polarized photon on a proton target producing two protons and an antiproton are not well understood. The specific interactions contributing to the overall final state are not known. Polarization observables are found to be sensitive to the interference present in the production process. This sensitivity should allow us to disentangle and identify the production mechanisms through the analysis of these polarization observables. There are over sixty polarization observables, however the focus of this project is the measurement of the beam helicity asymmetry as a function of the angle between the photoproduction plane and the proton-proton plane. This measurement the polarization observable should assist in probing the underlying mechanisms of the reaction, as the states that provide large background may contribute little to a polarization asymmetry.

Jefferson Lab's polarized beam at CLAS in Experimental Hall B offers the opportunity to study this reaction of the circularly polarized photon on the proton in detail. The data analyzed was from the g12 run of the E04-005 experiment taken with CLAS. The purpose of this research is to produce a first-time measurement of the angular dependence of the beam helicity asymmetry for the reaction of $\gamma p \rightarrow pp\bar{p}$. Features of the data, such as missing mass spectra and angular distributions necessary for the analysis, will be shown.

The results obtained from this investigation would provide much needed constraints to this reaction's theoretical models, provide a greater understanding of its production mechanisms, and further our knowledge of high energy particle physics as a whole.