Exclusive $\pi^+\pi^-$ photoproduction with polarized target and beam at CLAS

The exclusive double pion electromagnetic production is an important tool for the study of N* and Δ* excitations and for the search of missing baryonic resonances. In fact, in photoproduction reactions the two pion channel represents the dominant contribution to the total cross section, therefore favoring, especially in the second resonant region, the observation of intermediate states whose decay leads to an exclusive final state with two pions and a nucleon.

Several measurements of unpolarized γp cross sections have been performed so far; however, the integrated information they carry is difficult to be fully exploited for spectroscopic purposes, as several wide resonant states are expected to overlap in the same region of the mass spectrum.

A different approach for their investigation is to resort to the study of polarization variables, which are theoretically related to partial wave amplitudes and for this reason can provide additional information on the amplitude interference. These studies can be pursued exploiting data featuring both a polarized beam and a polarized target. The polarization variables, in fact, are experimentally related to asymmetries in the cross sections, measured in different combinations of beam helicity and target polarization.

Such experimental conditions could be met in the g14 experiment, run at CLAS (Jefferson Lab, USA) in the years 2011-2012: a circularly polarized photon beam, with momentum in the 0.6-2.3 GeV/c range, interacted on a HD longitudinally polarized target. In this talk, results on beam-helicity and target-spin asymmetries in the photoproduction of $\pi^+\pi^-$ pairs with these data will be presented and compared with earlier results by CLAS and other experiments, to disclose the potentialities of this analysis approach.