J/ψ Photoproduction Near Threshold

One of the objectives of nuclear physics is to create a comprehensive model of how quarks and gluons interact to form the nucleon. For many decades, electron scattering has been used to study the distribution of charge and magnetization in the nucleon. Even though electric and magnetic form factors have been thoroughly studied experimentally, gluonic form factors of the proton have not been measured.

J/ψ photoproduction near threshold is a mechanism that is sensitive to the distribution of color charge in the proton. Available experimental data on J/ψ photoproduction at high energies are well described by a diffractive, two-gluon exchange mechanism. There is no data at energies less than 11 GeV, and the available data points on the total cross section at the lowest energies suggest a deviation from the two-gluon exchange mechanism. It has been hypothesized that the J/ψ photoproduction cross section near the production threshold (at 8.21 GeV) will follow a model that is consistent with a three-gluon exchange.

With available electron beam energies up to 11 GeV from CEBAF, the CLAS12 detector at Jefferson Lab will be able to study J/ψ photoproduction near threshold in great detail. The reaction ($\gamma p \rightarrow l^+ l^- p'$) will be studied in the untagged photoproduction regime. The CLAS12 forward detector provides reliable detection of the recoil proton and decayed leptons. In this talk, we present the first look at data collected during the first physics run of CLAS12 with a 10.6 GeV electron beam impinging on a liquid Hydrogen target. Important components of analysis will be discussed, including particle identification and event selection for quasi-real photoproduction.