PHYSICS SEMINAR

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J/ψ Photoproduction Near Threshold with CLAS12

Abstract

A mechanism that can extract the characteristics of the hidden-color correlations of the nuclear wavefunction is the production of charm near threshold. Because energy cannot be wasted near threshold in the production of J/ψ, all three valence quarks must act coherently to exchange energy for the reaction to occur. Predicted by perturbative QCD, models have been developed to predict the nature of J/ψ photoproduction at these specific energies. These include the two-gluon and three-gluon exchanges. The differential cross sections are dependent on the gluonic form factors, which describe the distribution of color charge in the proton. The CLAS12 detector is capable of measuring J/ψ photoproduction at the energy range closest to the threshold. Work showcased in this seminar encompasses the preparation of this CLAS12 RG-A experiment, including the optimization of tracking reconstruction through the study of the Torus magnetic field. In terms of software, contributions were made to the CLAS12 Event Builder, a key stage of reconstruction where event-by-event information is summarized for efficient data analysis. After the run periods were successfully completed, analysis of the RG-A data commenced and an analysis framework was developed for the first measurements of the differential and total cross sections of J/ψ photoproduction in Hall B.

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