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Two Pion Photo- and Electroproduction with CLAS and CLAS12

Wednesday 12 June 2019 16:30 (30 minutes)

The \piˆ+\piˆ-p photo- and electroproduction off proton channel is sensitive to the contributions from most excited nucleon states, offering an effective tool for the exploration of the nucleon resonance spectrum and structure. The data on nine independent one-fold differential \piˆ+\piˆ-p photo- and electroproduction cross sections have become available for the first time from the measurements with the CLAS detector at invariant masses of the final state hadrons W < 2.0 GeV and in the range of photon virtualities Qˆ2 < 5.0 GeVˆ2. Phenomenological analysis of these data has allowed us to establish all essential contributing mechanisms and makes possible the credible isolation of the resonant contributions needed for the extraction of the resonance photo-/electroexcitation amplitudes, the so-called resonance photo-/electrocouplings.

In the talk, I will discuss the results on the resonance photo-/electrocouplings obtained from the CLAS \piˆ+\piˆ-p photo- and electroproduction data, as well as their impact on understanding resonance structure and the insight gained into the strong QCD mechanisms underlying hadron mass generation. I will also present the evidence for the existence of the new N'(1720)3/2ˆ+ baryon state that has recently become available from the combined analysis of the CLAS \piˆ+\piˆ-p photo-/ electroproduction data. The completion of the phenomenological analysis of the CLAS \piˆ+\piˆ-p electroproduction data will provide results for the electrocouplings of the most nucleon resonances in the mass range up to 2.0 GeV and at Qˆ2 < 5.0 GeVˆ2, shedding light on the evolution of nucleon resonance structure at the distances where the transition to the dominance of quark degrees of freedom takes place. The future prospects for the studies of Nˆ* structure in the 12 GeV era at Jefferson Laboratory from the \piˆ+\piˆ-p electroproduction data foreseen from the CLAS12 detector will be outlined with a focus on the insight into the strong interaction dynamics at distances where the transition from quark-gluon confinement to perturbative QCD is expected, addressing key open problems of the Standard Model on the nature of hadron mass and quark-gluon confinement.

Authors: MOKEEV , Victor (Jefferson Lab); BURKERT, Volker (Jefferson Lab)

Presenter: MOKEEV , Victor (Jefferson Lab)

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