New states of hadronic matter from the data on exclusive meson production with CLAS/CLAS12

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Abstract

The recent data on the two pion photoproduction off the proton at W from 1.6 to 2.5 GeV obtained with the CLAS detector at Jefferson Lab are presented. Previously obtained results on the two pion electroproduction at Q^2 from 0.5 to 5.0 GeV^2 allowed us to extract the $\gamma_v pN^*$ electrocoupling in the framework of the JM phenomenological model for the high lying ($M > 1.6$ GeV) baryon states. Combined analysis of the preliminary CLAS $\pi^+\pi^- p$ photo- and electroproduction data demonstrated that for their successful description with Q^2-independent hadronic parameters of the resonances with masses about 1.7 GeV, the new baryon state $N(1720)3/2+$ should be implemented. For the first time the mass, the total and, the $\pi\Delta$ and ρp partial decay widths as well as the $\gamma_v pN^*$ electrocouplings were determined from the CLAS data. The $N(1720)3/2+$ is the only candidate-state for which the results on the Q^2-evolution of electrocouplings have become available offering the access to the structure of the new baryon state. New generation of experiments with the CLAS12 detector in the upgraded Hall-B at Jefferson Lab will allow us to study the previously unexplored kinematics of large invariant masses of the final hadron system W up 3.0 GeV and extend coverage of low photon virtualities down to 0.05 GeV^2. These studies will be focused on the search for the hybrids baryons which were predicted from the first principles of QCD and contain glue as the structural component. The mass of the low lying hybrids is expected to be in the region from 1.8 GeV to 2.5 GeV. Expected difference in Q^2-evolution of electrocouplings of regular and hybrid baryons will provide a signature for the hybrid states. The search for the hybrid states will be performed in both $p\pi^+\pi^-$ and K^+Y electroproduction channels.