Nucleon resonance electrocouplings from CLAS data on pion electroproduction.

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Studies of nucleon resonance electrocouplings for excited proton states at various photon virtualities Q^2 represent an important part in the N^* Program with the CLAS detector [1]. The CLAS measurements extended considerably data on differential cross sections, longitudinally polarized beam/beam-target asymmetries for π and η electroproduction off protons, providing a nearly complete coverage of the final hadron phase space. Electrocouplings of $P_{11}(1440)$, $D_{13}(1520)$ and $S_{11}(1535)$ resonances were determined from analyses within the framework of two conceptually different reaction models [2] at $0.3 < Q^2 < 5.0$ GeV^2.

Data were also collected on charged double pion electroproduction off protons leading to nine independent differential $\pi^+\pi^- p$ cross sections [3]. Using a phenomenological approach [4] allowed us to establish all essential mechanisms contributing to this channel at invariant masses of the final hadrons $W < 1.8$ GeV and $Q^2 < 1.5$ GeV^2. The $P_{11}(1440)$ and $D_{13}(1520)$ electrocouplings were determined from the $\pi^+\pi^- p$ electroproduction data for the first time. They are in a good agreement with the results of independent $N\pi$ electroproduction analyses [2], offering an evidence for the reliable extraction of resonance electrocouplings. Also first results from the $\pi^+\pi^- p$ electroproduction channel on electrocouplings of $S_{11}(1650)$, $D_{33}(1700)$ and $P_{13}(1720)$ resonances have become available.

Comparison of the CLAS data on $\gamma_v NN^*$ electrocouplings with quark models and evaluation [5] of N^* meson-baryon dressing strongly suggests two main contributions from the internal quark core and external meson-baryon cloud to resonance structure.

Further extension of the N^* Program with CLAS12 detector after completion of JLAB 12 GeV Upgrade Project will be outlined.

References

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