

# N\* Studies from Exclusive Electroproduction off Protons with CLAS and CLAS12

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The study of the spectrum and structure of excited nucleon ( $N^*$ ) states via the electroproduction of exclusive reactions is an important avenue for exploring the nature of the non-perturbative strong interaction. The  $\gamma_v p N^*$  electrocouplings of  $N^*$  states in the mass range below 1.8 GeV have been determined from analyses of CLAS  $\pi N$ ,  $\eta N$ , and  $\pi\pi N$  data at beam energies up to 6 GeV at four momentum transfers  $Q^2$  up to 5  $\text{GeV}^2$ . Consistent results from independent analyses of these different channels have provided new insights into the emergence of hadron mass. These experimental results, together with data on the nucleon and pion/kaon elastic form factors, are critical in order to validate the relevance of dressed quarks as the active constituents in the structure of the pion/kaon and in the nucleon and its excited states. New data from CLAS12 on  $\pi N$ ,  $\pi\pi N$ , and KY electroproduction at beam energies up to 11 GeV will extend the  $Q^2$  range of the  $\gamma_v p N^*$  electrocouplings to 10  $\text{GeV}^2$  to probe the dressed quark mass over the full range of distances where the dominant part of hadron mass emerges from QCD. They will also allow for more detailed explorations of higher-mass  $N^*$  states to help resolve the long-standing “missing” resonance problem. Experimental results from both CLAS and CLAS12 will be highlighted and prospects for future studies will be discussed.

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