

Nucleon Resonances and their Structure

Tuesday, 26 July 2016 10:00 (40 minutes)

Meson-photoproduction measurements and their reaction-amplitude analyses can establish more sensitively, and in some cases in an almost model-independent way, the nucleon excitation and non-resonant reaction amplitudes. However, to investigate the strong interaction from explored –where meson-cloud degrees of freedom contribute substantially to the baryon structure –to still unexplored distance scales –where quark degrees of freedom dominate and the transition from dressed to current quarks occurs –we depend on experiments that allow us to measure observables that are probing this evolving non-perturbative QCD regime over its full range. Transition form factors are uniquely suited to trace this evolution by measuring exclusive single-meson and double-pion electroproduction cross sections off the free proton. Recent efforts try to access their isospin dependence by analyzing the cross sections off the quasi-free neutron and proton in Deuterium. In the near future, these exclusive measurements will be extended to higher momentum transfers with CLAS12 and the energy-upgraded CEBAF beam to study the strong interaction where the dressed quark degrees of freedom dominate, which in turn are responsible for the ground and excited nucleon state formations. Recent and preliminary results will highlight the status of the analyses and of their theoretical descriptions, and an experimental and theoretical outlook will outline what shall and may be achieved in the new era of the 12-GeV upgraded transition form factor program. This work is supported in part by the National Science Foundation under Grant PHY 1505615.

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Session Classification: Plenary