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Transition Form Factors at JLab: A Unique Tool to Study the Evolution of the Strong Interaction

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Understanding the strong interaction in the non-perturbative regime constitutes one of the biggest challenges in fundamental science that we can and have to tackle now as the needed experimental and theoretical tools become available. Perturbative Quantum ChromoDynamics (pQCD) at small distances, which is governed by quark and gluon fields, and Chiral Perturbation Theory (ChPT) at larger distances, which is governed by pion fields, are both already experimentally validated. However, strong fields at intermediate distances, where they generate about 98% of the total mass of nucleons and therefore of all normal matter, are not understood on similarly firm grounds. Nucleon (N) to excited nucleon (N*) transition form factors at Jefferson Lab, and in particular with the 12 GeV upgrade, serve as an ideal tool to investigate the evolution of the strong interaction in this intermediate region. The experimental and theoretical status of the research program at Jefferson Lab to study baryon transition form factors and hence the evolution of the underlying effective degrees of freedom, or the origin of mass, will be exemplified by recent results. A thoroughly consistent extraction of resonance parameters within various different models from high precision data in various exclusive production channels will be present.