

# Covariant quark model for the electromagnetic structure of light nucleon resonances

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The Covariant Spectator Quark Model, successful in the description of the nucleon elastic form factors revealed by the Jefferson Lab polarization transfer experiments, has been extended to the calculation of transition form factors associated to several light nucleon resonances  $N^*$ . The electromagnetic structure of the  $N^*$  are characterized by the  $\gamma^* N \rightarrow N^*$  transition form factors. Combining the electromagnetic structure of the constituent quarks, calibrated by the nucleon data, with appropriated ansatz for the radial wave functions of the resonances, we are able to estimate the transition for factors for the resonances  $N(1440)_{\frac{1}{2}}^+$ ,  $N(1535)_{\frac{1}{2}}^-$  and  $N(1520)_{\frac{3}{2}}^-$ , based on the parametrization of the nucleon radial wave function (nucleon shape) with no adjustable parameters. The calculations take into account exclusively the effect of the valence quarks and are in good agreement with the data for momentum transfer  $Q^2 > 2 \text{ GeV}^2$ , with a few exceptions. The exceptions are discussed in terms of the role of the valence quarks and the meson cloud. All the estimates are based on the parametrization of the nucleon structure, and can be tested in a near future for large transfer momentum at the Jefferson Lab (12 GeV upgrade). The model can also be extended to the  $\Delta(1232)_{\frac{3}{2}}^+$ , with the assistance of the results from lattice QCD, to estimate the radial wave function of the  $\Delta(1232)$  valence quark core. The model estimates are in agreement with the empirical data when theoretical and phenomenological parametrizations of the pion cloud are taken into account.

## Summary

I wrote the abstract at the “content”

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