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Elastic and resonance structures of the nucleon from hadronic tensor in lattice QCD

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We present the determination of the nucleon's Sachs electric form factor using the hadronic tensor formalism and verify that it is consistent with that from the conventional three-point function calculation. We additionally obtain the transition form factor from the nucleon to its first radial excited state within a finite volume. Consequently, we identify the latter with the nucleon-to-Roper transition form factor $G_E^*(Q^2)$, determine the corresponding longitudinal helicity amplitude $S_{1/2}(Q^2)$ and compare our findings with experimental measurements, for the first time using the hadronic tensor formalism.

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