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Dynamical mass generation constrained by gauge symmetries

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A nonperturbative approach to derive the dressed quark-gluon vertex is based on longitudinal and transverse Slavnov-Taylor identities, rather than on perturbative dressing or solving the inhomogeneous Bethe-Salpeter equation. The adequate manipulation of these identities with projections leads to the functional form of all form factors of the vertex.

This novel vertex is used in the Dyson-Schwinger (DSE) equation of the quark with lattice QCD simulations for the gluon and ghost propagators. The dynamical chiral symmetry breaking this vertex induces is very large and gives rise to a realistic mass gap for all quark flavors, compatible with those of the usual phenomenological interaction models in DSE calculations. Finally, we test the gauge covariance of our DSE kernel by studying the gauge dependence of the quark mass and wave renormalization function as well as of the quark condensate and the anomalous chromomagnetic moment.

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