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Constraining the Quark-Gluon Vertex: A Study of Transverse Slavnov-Taylor Identities

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In this work, we investigate the transverse Slavnov-Taylor identities as a means to constrain the nonperturbative structure of the transverse form factors of the quark-gluon vertex. These identities arise from the interplay between BRST symmetry and Lorentz invariance. While they provide a novel approach to studying the transverse component of the quark-gluon vertex, certain challenges arise, particularly due to the presence of nonlocal terms associated with path-independent Wilson loop contributions. This work represents an initial attempt to develop a general framework for computing these path-independent Wilson loop contributions by analytically evaluating the remaining terms in the transverse identities at the one-loop level and comparing them with well-established perturbative results in the literature. Subsequently, we will extend our analysis to the nonperturbative regime by incorporating dressed propagators and vertices.

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