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The Podolsky propagator in gap and bound-state equations

Content

Based on the Generalized Quantum Electrodynamics expression for the Podolsky propagator, which preserves gauge invariance for massive photons, we propose a model for the massive gluon propagator that reproduces well-known features of established strong-interaction models in the framework of the Dyson-Schwinger equation. By adjusting the Podolsky mass and the coupling strength we thus construct a model with simple analytical properties known from perturbative theory, yet well suited to describe a confining interaction. We obtain solutions of the Dyson-Schwinger equation for the quark at space-like momenta on the real axis as well as on the complex plane and solving the bound-state problem with the Bethe-Salpeter equation yields masses and weak decay constants of the π,K and ηc in excellent agreement with experimental values, while the D and Ds are reasonably well described. The analytical simplicity of this effective interaction has the potential to be useful for phenomenological applications and may facilitate calculations in Minkowski space.

Summary

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