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Extracting Phenomenology from Dyson-Schwinger equations: The $^3P_0$ Model and (Hybrid) Meson Decays

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Dyson–Schwinger equations (DSEs) provide a non-perturbative framework for computing QCD Green's functions. When constrained by lattice QCD data, these solutions—originally formulated in Euclidean space—can potentially be analytically continued to Minkowski space. Achieving this continuation enables the extraction of hadronic phenomenology directly from non-perturbative DSE calculations.

Meson decay models frequently invoke the creation of quark–antiquark pairs in a $^3P_0$ state —a scalar configuration that does not arise in perturbative QCD due to chiral symmetry. By employing DSEs constrained by lattice data for the quark propagator and quark–gluon vertex—naively extended into the Minkowski domain—we explore (in https://arxiv.org/abs/2312.14994) how such a scalar vertex may emerge dynamically in tandem with constituent quark mass generation.

Additionally, several established techniques will be discussed for reliably extending Euclidean DSE solutions to Minkowski space. These methods provide a foundation for extracting further phenomenological insights, particularly in the context of hybrid meson decays involving quark–antiquark–gluon (qqg) states, within a fully non-perturbative QCD framework.

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