

The complex structure of strong interactions in Euclidean and Minkowski space

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Constructing Local Gauge-Invariant Operators: The Higgs Model as a Case Study

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In gauge field theory, we follow the fundamental principle that physical observables must be gauge independent. The most straightforward way to ensure this is to work with gauge-invariant operators, since their correlation functions are expected to be gauge independent. In addition to this crucial property, in theories where the physical subspace has a semi-positive norm, correlation functions of gauge-invariant operators exhibit consistent spectral properties, as will be discussed in my talk.

The Higgs model is the most prominent example of a theory with a perturbatively semi-positive normed physical space. As such, it provides a particularly valuable laboratory for investigating key questions that go beyond the perturbative regime, such as confinement—especially given that lattice results suggest the existence of confining phases.

In my talk, I will also present a general framework for constructing gauge-invariant dressed fields in different gauges and discuss how this framework can be implemented at the quantum level.

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