

## Rigorous reconstruction of gluon propagator in the presence of complex singularities

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It has been suggested that the Landau-gauge gluon propagator has complex singularities, which invalidates the Källén–Lehmann spectral representation. Since such singularities are beyond the standard formalism of quantum field theory, the reconstruction of Minkowski propagators from Euclidean propagators has to be carefully examined for their interpretation. In this talk, we present rigorous results on this reconstruction in the presence of complex singularities. As a result, the analytically continued Wightman function is holomorphic in the usual tube, and the Lorentz symmetry and locality are kept valid. On the other hand, the Wightman function on the Minkowski spacetime is a non-tempered distribution and violates the positivity condition. Finally, we discuss an interpretation and implications of complex singularities in quantum theories, arguing that complex singularities correspond to zero-norm confined states.

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