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Advancing real-time Yang-Mills: towards real-time observables from first principles

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The complex Langevin method shows great promise in enabling the calculation of observables for theories with complex actions. Nevertheless, real-time quantum field theories have remained largely unsolved due to the particular severity of the sign problem. In this contribution, we will discuss our recent progress in applying the complex Langevin method to SU(2) Yang-Mills theory in 3+1 dimensions. We introduce an anisotropic kernel that stabilises systems for real times longer than the inverse temperature - a first in this field. We provide explicit evidence of reproducing thermal relations among different types of propagators when the complex time path approaches the Schwinger-Keldysh contour. This method could pave the way for calculating transport coefficients and other real-time observables from first principles.

Topical area

QCD at Non-zero Temperature

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