

Complex Langevin simulation of 4D SU(2) gauge theory with a theta term

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The Monte Carlo simulation of the gauge theory with a theta term is extremely difficult due to the sign problem. The complex Langevin method (CLM) is one of the approaches which allow us to avoid the problem. Recently the analytic study of 't Hooft anomaly matching condition predicted some nontrivial phase structures around $\theta=\pi$. We use CLM to study 4D SU(2) gauge theory with a theta term. Since the topological charge on the lattice is contaminated by short-range fluctuations, we apply the stout smearing to recover the topological property. In this method, the effect of the smearing can be included dynamically. We discuss the relation between the validity of CLM and the behavior of the topological charge.

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