

Complex Langevin for Lattice QCD

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We are applying complex-Langevin simulations to lattice QCD at finite quark-number chemical potential μ and zero temperature. While we observe some improvement as we move to weaker coupling we only find agreement with the expected physics at very small and at large μ . It has been observed by others that at least part of the problem is that at small and even zero μ the gauge fields show large departures from the $SU(3)$ manifold. We are therefore quantifying how these departures depend on the size of the gauge coupling and the quark mass. It appears that these departures decrease as we move to weaker couplings and to smaller quark masses. One might ask whether this means that the complex Langevin will produce correct results in the continuum limit.

We are also extending our simulations to finite μ and temperature where it is believed that the complex Langevin should be better behaved.

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