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Testing a generalized cooling procedure in the complex Langevin simulation of chiral Random Matrix Theory

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The complex Langevin (CL) method has been attracting much attention as a solution to the sign problem since the method was shown to work in finite density QCD in the deconfined phase by using the so-called gauge cooling procedure. Whether it works also in the confined phase with light quarks is still an open question, though. In order to shed light on this question, we apply the method to the chiral Random Matrix Theory (RMT), which describes the epsilon regime of finite density QCD. Earlier works reported that a naive implementation of the method fails to reproduce the known exact results and that the problem can be solved by choosing a suitable coordinate. In this work we stick to the naive implementation, and show that a generalized gauge cooling procedure can be used to avoid the problem.

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