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The constraint potential in the chiral Gross-Neveu model

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We present results using a novel method for constraining fermionic condensates in a fermionic path integral. This approach enables us to obtain the quantum effective potential in the infinite volume limit, which is typically inaccessible using the standard technique of taking the double limit of infinite volume and zero explicit symmetry breaking. By constraining the relevant order parameter such as the chiral condensate, we can explore the flat region of the potential and determine the physically realized value of the order parameter. We apply our method to the chiral Gross-Neveu model in the large-N limit, where the continuous chiral symmetry is spontaneously broken, and demonstrate that in the infinite volume limit, the potential becomes flat, dominated by inhomogeneous field configurations. Beyond this test-case setup, the method is fully applicable in full Monte Carlo simulations of other theories such as QCD.

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