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Structure of the broken phase of the sine-Gordon model

We present the IR behavior of the flow of the sine-Gordon model in d=2 using functional renormalization at the local potential approximation. We demonstrate that the broken phase exhibits a continuum of non-perturbative IR fixed points that can not be seen using the usual Fourier expansion. We also show that that the phase boundary remains valid when starting with a strongly coupled bare theory, and that these IR fixed points are reached the same way -exhibiting a generalized universality.

We then discuss the use of the average action -a necessary step to study wave function renormalization- where the regulator breaks periodicity and demonstrate that the phase boundary is independent of the choice of the regulator. We also show that the structure of the IR flow is preserved by the regulator qualitatively and partially quantitatively.

Finally, we discuss the structure of the sine-Gordon model in higher dimensions and show that the fixed points disappear and that the flow possibly run into a singularity.

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