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Tensor network study of two dimensional complex ϕ^4 theory at finite density

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We study the complex ϕ^4 theory with finite chemical potential. To closely understand nontrivial effects such as the Silver Blaze phenomenon, experimental studies on the lattice will give some knowledge; however, on account of the finite chemical potential, there is a sign problem in Monte Carlo simulations. In this study, to overcome the problem, the tensor renormalization group approach is employed, and we give some numerical results surrounding the phenomena in the finite density system.

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