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Phase Diagram for a 2-D Two-Temperature Diffusive XY Model[1]
MATTHEW REICHL, CHARO DEL GENIO[2], KEVIN E. BASSLER, University of Houston — Using Monte Carlo simulations, we determine the phase diagram of a diffusive two-temperature conserved order parameter XY model. When the two temperatures are equal the system becomes the equilibrium XY model with the continuous Kosterlitz-Thouless (KT) vortex-antivortex unbinding phase transition. When the two temperatures are unequal the system is driven by an energy flow from the higher temperature heat-bath to the lower temperature one and reaches a far-from-equilibrium steady state. We show that the nonequilibrium phase diagram contains three phases: A homogenous disordered phase and two phases with long range, spin texture order. Two critical lines, representing continuous phase transitions from a homogenous disordered phase to two phases of long range order, meet at the equilibrium KT point. The shape of the nonequilibrium critical lines as they approach the KT point is described by a crossover exponent $\varphi = 2.52 \pm 0.05$. Finally, we suggest that the transition between the two phases with long-range order is first-order, making the KT-point where all three phases meet a bicritical point.

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