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Boson pairing and unusual criticality in a generalized XY model

YIFEI SHI, University of Virginia — Motivated by the physics of condensates of boson pairs, we study the generalized XY model in two dimension, which has a term proportional to $\cos(2\,\theta)$ in addition to the normal XY Hamiltonian. This corresponds to having half vortices connected by solitons, as well as integer vortices. From both renormalization group analysis and Monte Carlo simulation using the worm algorithm, we find that the phase diagram includes Kosterlitz-Thouless transitions of half and integer vortices, together with an Ising transition. Remarkably, part of the Ising line is a direct transition from the quasi-long-ranged ordered state to the disordered state.

Yifei Shi
University of Virginia

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