Dual lattice FRG for the BKT transition: Irrelevance of amplitude fluctuations

Jan Krieg[*1]

[1]Goethe-Universität Frankfurt – Germany

Abstract

We have developed a functional renormalization group (FRG) approach for the two-dimensional XY model by combining the lattice FRG proposed by Machado and Dupuis [Phys. Rev. E 82, 041128 (2010)] with a duality transformation that explicitly introduces vortices via an integer-valued field. We show that the hierarchy of FRG flow equations for the infinite set of relevant and marginal couplings of the model can be reduced to the well-known Kosterlitz-Thouless renormalization group equations for the renormalized temperature and the vortex fugacity. Within our approach it is straightforward to include weak amplitude fluctuations of the spins, which lead to additional interactions between the vortices that do not spoil the Berezinskii-Kosterlitz-Thouless transition. This demonstrates that previous failures to obtain a line of true fixed points within the FRG are a mathematical artifact of insufficient truncation schemes.

---

[*]Speaker