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Generalized BKT Transitions and Persistent Order on the Lattice

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The BKT transition in low-dimensional systems with a $U(1)$ global symmetry separates a trivially gapped, disordered phase, and is driven by vortex proliferation. Recent developments in modified Villain actions provide a class of lattice models which have an extra \mathbb{Z}_W global symmetry that counts vortices mod W , mixed 't Hooft anomalies, and persistent order even at finite lattice spacing. While there is no fully-disordered phase (except in the original BKT case) there is still a phase boundary which separates gapped ordered phases from gapless phases. I'll describe a numerical Monte Carlo exploration of these phenomena.

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