

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Unconventional Surface Criticality Induced by Quantum Phase Transitions from 2D AKLT Phase to Neel Order FA WANG, LONG ZHANG, Peking Univ — Symmetry-protected topological phases have nontrivial surface states in the presence of certain symmetries, which can either be gapless or be degenerate. In this talk, we will present our studies about the physical consequence of such gapless surface states at the bulk quantum phase transition (QPT) which spontaneously breaks these symmetries. We realize the two-dimensional Affleck-Kennedy-Lieb-Tasaki phase on a square lattice and its QPTs to Néel ordered phases by a spin- $\frac{1}{2}$ Heisenberg model on a decorated square lattice. With large-scale quantum Monte Carlo simulations, we find that even though the bulk QPTs are governed by the conventional Landau phase transition theory, the gapless surface states induce unconventional universality classes of the surface critical behaviors.

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Date submitted: 08 Nov 2016

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