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Investigating Quantum Phase Transitions in Spin-2 AKLT Systems with Tensor Networks NICHOLAS POMATA, CHING-YU HUANG, TZU-CHIEH WEI, C.N. Yang Institute for Theoretical Physics, Stony Brook University — The spin-2 Affleck-Kennedy-Lieb-Tasaki (AKLT) state on the square lattice, a valence-bond solid (VBS) state, has nontrivial symmetry-protected topological order when translation and rotation invariance are imposed. Niggemann, Klümper, and Zittartz previously studied a two-parameter deformation of this state from the AKLT point, which exhibits a second-order phase transition from a disordered VBS phase to a Neel-ordered phase. We re-examine the deformed AKLT model using tensor renormalization methods. In addition to recovering the VBS-Neel transition, we find new transitions into XY-like and product-state phases, which we can characterize using local order parameters and modular matrices.

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