The 2D AKLT state is a universal quantum computational resource TZU-CHIEH WEI, University of British Columbia, IAN AFFLECK, ROBERT RAUSSENDORF, University of British Columbia — We demonstrate that the two-dimensional AKLT state on a honeycomb lattice is a universal resource for measurement-based quantum computation. Our argument proceeds by reduction of the AKLT state to a 2D cluster state, which is already known to be universal, and consists of two steps. First, we devise a local POVM by which the AKLT state is mapped to a random 2D graph state. Second, we show by Monte Carlo simulations that the connectivity properties of these random graphs are governed by percolation, and that typical graphs are in the connected phase. The corresponding graph states can then be transformed to 2D cluster states.

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