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Adiabatic Preparation of Topological Order ALIOSCIA HAMMA, DANIEL LIDAR, University of Southern California — Topological order characterizes those phases of matter that defy the standard description in terms of symmetry breaking and local order parameters. Topological order is found in nature in the fractional quantum Hall effect. Topologically ordered systems have ground state degeneracy that is robust against perturbations, which has given the root to topological quantum information processing. We discusss the second order quantum phase transition between a spin-polarized phase and a topologically ordered string-net condensed phase. Next we show how to prepare the topologically ordered phase through adiabatic evolution in a time that is upper bounded by $O(\sqrt{n})$. This provides a physically plausible method for constructing a topological quantum memory. We discuss applications to topological and adiabatic quantum computing.

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