

Abstract Submitted
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Long-range quantum gates using external symmetry breaking

HENDRIK WEIMER, Harvard University, ITAMP, NORMAN YAO, CHRIS LAUMANN, MIKHAIL LUKIN, Harvard University — We propose to use the process of symmetry breaking across a quantum phase transition to perform logical quantum operations between distant qubits. By adiabatically following the ground state from a disordered to an ordered phase we can create an effective interaction between the qubits. We derive general scaling relations and focus on a spin model with long-range interactions which exhibits a quantum phase transition from a paramagnet to a crystalline phase. We discuss possible experimental implementations with Rydberg atoms or nitrogen-vacancy centers in diamond.

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