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Adiabatic construction of d-wave resonating valence bond states of ultracold fermionic atoms in optical lattices SIMON TREBST, ETH Zurich, MATTHIAS TROYER, ETH Zurich, PETER ZOLLER, University Innsbruck, ULRICH SCHOLLWÖCK, RWTH Aachen — We discuss a controlled experimental setup to adiabatically construct superconducting d-wave resonating valence bond (RVB) states of fermionic atoms confined in a 2D optical lattice. The key idea is to start from an already cold initial state, in our approach from fully filled 1D tubes of atoms. The adiabatic transformation then allows to reach ultralow temperatures of a few percent of the Fermi temperature which is required to observe the d-wave RVB states. We discuss hole doping techniques and describe a simple experimental measurement to study the d-wave pairing of such vacancies. Our experimental setup can be used to effectively probe ground state properties of the doped and undoped half-filled Hubbard model on (coupled) plaquettes, ladders and the 2D lattice.

Simon Trebst
ETH Zurich

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