

Abstract Submitted
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Ultra-cold fermions with attractive interactions in optical lattices

CHIHCHUN CHIEN, University of Chicago, QIJIN CHEN, Zhejiang University, KATHRYN LEVIN, University of Chicago — We address how attractive Hubbard model can be simulated using ultra-cold fermions with attractive interactions loaded into optical lattices. Our study may be relevant to high-temperature superconductivity. For s-wave pairing, smooth crossover behavior similar to the BCS-Bose Einstein condensation crossover in homogeneous Fermi gases can only be observed at low fillings. Near half filling crossover in lattices is interrupted and the BCS wavefunction breaks down. By analyzing the attractive Hubbard model in the strongly attractive regime, we show that states with local pairs instead of Cooper pairs are better ground states. We also study d-wave pairing in optical lattices and find that interruption of crossover occurs at almost all fillings. Our phase diagram for d-wave pairing capture some features of experimental phase diagrams of high-temperature superconductors.

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