

Abstract Submitted
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Controlling coherence via tuning of the population imbalance in a bipartite optical lattice MARCO FEDELE DI LIBERTO, Utrecht University —
The control of transport properties is a key tool at the basis of many technologically relevant effects in condensed matter. The clean and precisely controlled environment of ultracold atoms in optical lattices allows one to prepare simplified but instructive models, which can help to better understand the underlying physical mechanisms. Here we show that by tuning a structural deformation of the unit cell in a bipartite optical lattice, one can induce a phase transition from a superfluid into various Mott insulating phases forming a shell structure in the superimposed harmonic trap. The Mott shells are identified via characteristic features in the visibility of Bragg maxima in momentum spectra. The experimental findings are explained by Gutzwiller mean-field and quantum Monte Carlo calculations. Our system bears similarities with the loss of coherence in cuprate superconductors, known to be associated with the doping induced buckling of the oxygen octahedra surrounding the copper sites.

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