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Measurement of the Equation of State of the Two-Dimensional Hubbard Model LUKE MILLER, EUGENIO COCCHI, University of Bonn and University of Cambridge, JAN DREWES, MARCO KOSCHORRECK, DANIEL PERTOT, FERDINAND BRENNECKE, MICHAEL KOEHL, University of Bonn
— The subtle interplay between kinetic energy, interactions and dimensionality challenges our comprehension of strongly-correlated physics observed, for example, in the solid state. In this quest, the Hubbard model has emerged as a conceptually simple, yet rich model describing such physics. Here we present an experimental determination of the equation of state of the repulsive two-dimensional Hubbard model over a broad range of interactions, $0 \leq U/t \leq 20$, and temperatures, down to $k_B T/t = 0.63(2)$ using high-resolution imaging of ultracold fermionic atoms in optical lattices. We show density profiles, compressibilities and double occupancies over the whole doping range, and hence our results constitute benchmarks for state-of-the-art theoretical approaches.

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