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Local properties of the two-dimensional Hubbard model JAN DREWES, University of Bonn, LUKE MILLER, EUGENIO COCCHI, University of Bonn and University of Cambridge, CHUN FAI CHAN, DANIEL PERTOT, FERDINAND BRENNECKE, MICHAEL KÖHL, University of Bonn — Quantum gases of interacting fermionic atoms in optical lattices promise to shed new light on the low-temperature phases of the Hubbard model such as spin-ordered phases, or in particular, on possible d-wave superconductivity. In this context it remains challenging to further reduce the temperature of the trapped gas. We experimentally realize the two-dimensional Hubbard model by loading a quantum degenerate Fermi gas of 40K atoms into a three-dimensional optical lattice geometry. By tuning the interaction between the two lowest hyperfine states to strong repulsion the two-dimensional Mott-insulator is created. High resolution absorption imaging in combination with radio-frequency spectroscopy is applied to spatially resolve the atomic distribution in a single layer in the vertical direction. This measurement scheme gives direct access to the local properties of the trapped gas and we present most recent data on the distribution of entropy and density-density fluctuations.

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