Abstract Submitted
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Mean-field scaling of the superfluid to Mott insulator transition in a 2D optical superlattice.[1] MASAYUKI OKANO, CLAIRE THOMAS , THOMAS BARTER, TSZ-HIM LEUNG, University of California, Berkeley, GYU-BOONG JO, Hong Kong University of Science and Technology, JENNIE GUZMAN, California State University, East Bay, ITAMAR KIMCHI, Massachusetts Institute of Technology, ASHVIN VISHWANATH, Harvard University, DAN STAMPER-KURN, University of California, Berkeley — Quantum gases within optical lattices provide a nearly ideal experimental representation of the Bose-Hubbard model. The mean-field treatment of this model predicts properties of non-zero temperature lattice-trapped gasses to be insensitive to the specific lattice geometry once system energies are scaled by the lattice coordination number z. We examine an ultracold Bose gas of rubidium atoms prepared within a two-dimensional lattice whose geometry can be tuned between two configurations, triangular and kagome, for which z varies from six to four, respectively. Measurements of the coherent fraction of the gas thereby provide a quantitative test of the mean-field scaling prediction. We observe the suppression of superfluidity upon decreasing z, and find our results to be consistent with the predicted mean-field scaling. These optical lattice systems can offer a way to study paradigmatic solid-state phenomena in highly controlled crystal structures.

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