Abstract Submitted
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Realization of a long-range antiferromagnet in the Hubbard model with ultracold atoms[1] ANTON MAZURENKO, CHRISTIE S. CHIU, GEOFFREY JI, MAXWELL F. PARSONS, MARTON KANASZ-NAGY, RICHARD SCHMIDT, FABIAN GRUSDT, EUGENE DEMLER, DANIEL GREIF, MARKUS GREINER, Harvard University — Exotic phenomena in strongly correlated electron systems emerge from the interplay between spin and motional degrees of freedom. For example, doping an antiferromagnet is expected to give rise to pseudogap states and high-temperature superconductors. Ultracold fermions in optical lattices offer the potential to answer open questions about the doped Hubbard Hamiltonian. Here we report the realization and site-resolved observation of an antiferromagnet exhibiting long range order (LRO) in a repulsively interacting Fermi gas on a 2D square lattice of about 80 sites. Signatures of LRO manifest through the development of a peak in the spin structure factor and the divergence of the correlation length that reaches the size of the system. At our lowest temperature of $T/t = 0.25(2)$ we find order spanning the entire sample, where the staggered magnetization approaches the ground-state value. Our experimental platform enables doping away from half filling, where interesting states are expected, but numerical analysis is challenging. We find that the antiferromagnetic LRO persists to hole dopings of about 15%, providing a guideline for computational studies. Our results show that quantum gas microscopy of ultracold fermions can address open questions on the low-temperature Hubbard model.

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