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Site-Resolved Observation of Charge and Spin Correlations in the 2D Fermi-Hubbard Model MATTHEW NICHOLS, LAWRENCE CHEUK, KATHERINE LAWRENCE, MELIH OKAN, HAO ZHANG, Massachusetts Institute of Technology, EHSAN KHATAMI, San Jose State University, NANDINI TRIVEDI, The Ohio State University, THEREZA PAIVA, Universidade Federal do Rio de Janeiro, MARCOS RIGOL, The Pennsylvania State University, MARTIN ZWIERLEIN, Massachusetts Institute of Technology — The application of quantum gas microscopy to fermionic systems has allowed for rapid advances in the field of ultracold fermionic atoms in optical lattices, including site-resolved studies of metallic, Mott insulating, and band insulating states of the two-dimensional Fermi-Hubbard model. In this talk, we extend these studies to explore spatial charge and spin correlations using spin sensitive fluorescence imaging of ultracold ^{40}K atoms trapped in a square optical lattice [1]. We observe nearest-neighbor antiferromagnetic spin correlations which are maximal at half-filling, and which weaken monotonically upon doping. Correlations between singly charged sites on the other hand display non-monotonic behavior as a function of doping. At low filling, these correlations are negative, revealing the effects of Pauli blocking and strong repulsive interactions. As the filling is increased beyond a critical value however, the correlations become positive, indicating an effective attraction between holes and doublons in the system. These findings agree well with numerical linked-cluster expansion (NLCE) and determinantal quantum Monte Carlo (DQMC) calculations. [1] Cheuk et al., Science 353, 1260 (2016)

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