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Charge and spin correlations in the 2D Hubbard model realized with ultracold atoms EHSAN KHATAMI, San Jose State University, LAWRENCE W. CHEUK, MATTHEW A. NICHOLS, KATHERINE R. LAWRENCE, MELIH OKAN, HAO ZHANG, MIT, NANDINI TRIVEDI, The Ohio State University, THEREZA PAIVA, Universidade Federal do Rio de Janeiro, MARCOS RIGOL, The Pennsylvania State University, MARTIN W. ZWIERLEIN, MIT
— Site-resolved observation of charge and spin correlations in the two-dimensional Fermi-Hubbard model realized with ultracold atoms has recently been accomplished [1]. It has been found that at large doping, nearest-neighbor correlations between singly charged sites are negative, revealing the formation of a correlation hole, the suppressed probability of finding two fermions near each other. Also, as the doping is reduced, the correlations become positive, signaling strong bunching of doublons and holes. Highly-precise results from numerical linked-cluster expansions and quantum Monte Carlo simulations have played an important role in the accurate characterization of the system and the interpretation of the experimental results. Here, we highlight some of the important new numerical results for the spin and charge correlations of the Hubbard model for various interaction strengths and across doping regimes. [1] Cheuk et al., Science 353, 1260 (2016)

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