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Nearest-neighbor correlations of fermions in optical lattices as a tool to study the approach to magnetic order THOMAS UEHLINGER, DANIEL GREIF, GREGOR JOTZU, LETICIA TARRUELL, TILMAN ESSLINGER, ETH Zurich, Switzerland — Fermionic atoms in optical lattices constitute an almost ideal realization of the Fermi-Hubbard model, a key model in the study of strongly correlated electron systems. This Hamiltonian incorporates the transition from a metallic to a Mott insulating phase, where the suppression of transport results from strong interactions. We have studied this transition in a gas of ultracold fermionic potassium atoms through measurements of the lattice site occupation. Observing magnetically ordered phases will require the detection of spin correlations over several lattice sites. We have developed a method for probing nearest-neighbor density and spin correlations in the system [1]. We show that in the paramagnetic phase it gives access to the number of defects of the Mott-insulating core and is well suited for thermometry. Furthermore, its sensitivity to short range magnetic correlations opens interesting prospects for studying the approach to magnetic order.

[1] Daniel Greif *et al.*, arXiv:1012.0845v1 (2010)

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