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Formation and dynamics of anti-ferromagnetic correlations of ultracold fermions in tunable lattices RÉMI DESBUQUOIS, DANIEL GREIF, GREGOR JOTZU, MICHAEL MESSER, FREDERIK GÖRG, TILMAN ESSLINGER, ETH Zurich, Switzerland — The observation of anti-ferromagnetic spin correlations of ultracold fermions in optical lattices is an important milestone towards an experimental study of the Hubbard model. In this model many questions on the low-temperature phase diagram still remain open, both for simple cubic and square configurations, as well as for more complex lattice geometries. Additionally, for creating an equilibrated low-temperature state and a successful implementation of advanced cooling schemes based on entropy redistribution, an understanding of the formation time for spin correlations is of paramount importance. In our experiment we load a two-component, repulsively interacting fermionic quantum gas into an optical lattice of tunable geometry. For very low temperatures we observe anti-ferromagnetic correlations on neighbouring sites in both isotropic 3D cubic and 2D square lattices. We also study the strength of the spin correlations in more complex lattice geometries, such as honeycomb, 1D-dimerized and spin-ladder lattice configurations. Furthermore, we investigate the characteristic formation time of spin correlations in optical lattices by changing the lattice geometry on variable timescales.

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