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Floquet engineering of unconventional Hubbard terms and heating timescales in an interacting fermionic system FREDERIK GORG, MICHAEL MESSER, GREGOR JOTZU, KILIAN SANDHOLZER, RMI DESBUQUOIS, TILMAN ESSLINGER, Institute for Quantum Electronics, ETH Zurich, 8093 Zurich, Switzerland — Periodically modulated systems have recently attracted much interest both from a theoretical and experimental perspective, since they can be used to create novel effective Hamiltonians which feature terms that are not accessible in static systems. In this context, we experimentally demonstrate how Floquet engineering can be used to create unconventional Hubbard terms for interacting Fermions in an optical lattice. By modulating the lattice position at a frequency close to the interaction energy of a two-body system, we can tune both the sign and magnitude of the magnetic exchange energy independently of the single particle tunneling. An open question in this context is if experimental heating timescales are favorable enough to study driven interacting many-body systems. To investigate this problem, we measure spin-spin correlations in a shaken three dimensional lattice and directly compare them to an equivalent static configuration. In addition, we perform a detailed heating study by measuring the lifetime of magnetic correlations as a function of the driving parameters.

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