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Quantum simulation of ultrafast and quasiperiodic systems with ultracold strontium[1] SHANKARI RAJAGOPAL, RUWAN SENARATNE, TOSHIHIKO SHIMASAKI, PETER DOTTI, DAVID WELD, University of California, Santa Barbara — This poster discusses experiments using degenerate strontium atoms for the quantum emulation of ultrafast dynamics and quasicrystals. Trapped atoms subjected to a time-varying force field are used to emulate the ultrafast response of bound electrons or nuclei exposed to the electric field of a pulsed laser. The simulator operates in regimes equivalent to those of ultrafast and strong-field pulsed-laser experiments, opening up a hitherto unexplored application of quantum simulation techniques and a complementary path towards investigating open questions in ultrafast science. Separately, we study the dynamical response of atoms in a quasiperiodic bichromatic lattice to rapid modulation of the phasonic degree of freedom. Such excitations are typically frozen out as strain in solid-state quasicrystals; these measurements thus represent a new spectroscopic probe of quasicrystals which is inaccessible to traditional experiments.

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