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Quantum emulation with ultracold strontium in dynamically tunable optical potentials[1] TOSHIHIKO SHIMASAKI, PETER DOTTI, SHANKARI RAJAGOPAL, RUWAN SENARATNE[2], ALEC CAO, ROSHAN SAJJAD, DAVID WELD, University of California Santa Barbara — We present the results of experiments using degenerate strontium atoms in various dynamic optical potentials. First, we discuss quantum emulation of ultrafast phenomena [1]. Atoms trapped in a tightly-focused dipole trap are subjected to a time-varying force field to emulate the ultrafast response of bound electrons or nuclei exposed to the electric field of a pulsed laser. This constitutes an unexplored application of quantum simulation techniques, and one which can potentially unite two largely disjoint communities within DAMOP (ultrafast and ultracold). Second, we report results of experiments on strontium atoms in a tunable quasiperiodic optical lattice. Access to a phasonic degree of freedom enables demonstration of a new spectroscopic probe of quantum quasicrystals. Finally, we discuss the future prospect of implementing a Kitaev chain in a quantum gas. [1] R. Senaratne, S. Rajagopal, et al., Nat. Comm. 9, 2065 (2018)

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