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Towards Quantum Simulation of Light-Matter Interfaces with Strontium Atoms in Optical Lattices NEVEN ŠANTIĆ, ANDRÉ HEINZ, ANNIE JIHYUN PARK, ETTIENE STAUB, RUDOLF HAINDL, STEPAN SNIGIREV, Max-Planck-Institut für Quantenoptik, Garching, Germany, JEAN DALIBARD, Collège de France and Laboratoire Kastler Brossel, CNRS, ENS-PSL Research University, Paris, France, IMMANUEL BLOCH[1], SEBASTIAN BLATT, Max-Planck-Institut für Quantenoptik, Garching, Germany — In the last two decades, quantum simulators based on ultracold atoms in optical lattices have successfully emulated strongly correlated condensed matter systems. With the recent development of quantum gas microscopes, these quantum simulators can now control such systems with single-site resolution. Within the same time period, atomic clocks have also started to take advantage of optical lattices by trapping alkaline earth metal atoms such as Sr, and interrogating them with precision and accuracy at the 10^{-18} level. Here, we report on progress towards a new quantum simulator that combines quantum gas microscopy with optical lattice clock technology. We aim to trap ultracold Sr atoms in large-mode-volume and state-dependent optical lattices to emulate strongly-coupled light-matter-interfaces in parameter regimes that are unattainable in real photonic systems. We also report on a narrow-line magneto-optical trapping technique that outperforms standard techniques in terms of speed, robustness, and capture fraction.

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