Abstract Submitted
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A Quantum Gas Microscope for Microwave Photons BRENDAN SAXBERG, University of Chicago — Synthetic photonic systems are a promising platform for new physics in the regime of strongly interacting and highly correlated quantum materials. We present our implementation of a strongly interacting Bose Hubbard lattice in the Circuit QED framework by capacitively coupling a 1D lattice of transmon qubits, where the anharmonicity of the transmons provides the effective onsite interaction. Individual readout resonators allow site-, time-, and occupancy-resolved microscopy of the photonic lattice. To stabilize the Mott Insulating phase of light in this lattice we couple our lattice to an autonomous stabilizer – a single lattice site that is continuously driven into the n=1 excited state. This scheme stabilizes the Mott phase, and indeed any many-body target state, so long as the phases are incompressible with respect to photon number. We present Mott phase stabilization data characterizing its performance as well as other experiments on our 1D chain such as quantum random walks. This passive state preparation through our stabilizer provides an avenue for stabilizing novel many-body states like topological lattices with photon-photon interactions.

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