Abstract Submitted
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Progress towards a Hybrid Rydberg Atom, Superconductor Quantum Interface[1] DONALD BOOTH, JUAN BOHORQUEZ, University of Wisconsin-Madison, JOSHUA ISAACS[2], University of California-Berkeley, MATTHEW BECK, ROBERT MCDERMOTT, MARK SAFFMAN[3], University of Wisconsin-Madison — Hybrid quantum computation bridges disparate quantum technologies in order to achieve fast gates with long coherence times. We present progress towards a hybrid quantum interface between single atoms and microwave excitations of a superconducting coplanar waveguide (CPW) resonator. The hybrid interface is based on trapping single Cesium atoms in a 4K cryostat in close proximity to the CPW. Two-photon excitation via the $6S_{1/2} \rightarrow 5D_{5/2}$ quadrupole transition prepares $90P_{3/2}$ Rydberg states that are strongly coupled to excitations of the CPW. We have completed construction on a new Ultra High Vacuum chamber and optical system for atom trapping, transport, and excitation. We demonstrate results for single atom trapping and Rydberg spectroscopy within the new optical system and report on progress towards observation of atom-microwave photon coupling. We also present theoretical calculations of Rydberg polarizability dressing to minimize the influence of background electric fields on the Rydberg states.

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