Abstract Submitted
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Progress towards a Hybrid Rydberg Atom, Superconductor Quantum Interface[1] JUAN BOHORQUEZ, SEBASTIAN MALEWICZ, University of Wisconsin - Madison, DONALD BOOTH, Argonne National Laboratory, YUJUN CHOI, ROBERT MCDERMOTT, MARK SAFFMAN, University of Wisconsin - Madison — Hybrid quantum computing schemes bridge disparate quantum technologies in order to construct machines with fast quantum gates and long coherence times. We present progress on our effort towards a hydbrid quantum interface between single cold Rydberg atoms and a Superconducting coplanar waveguide (CPW) resonator. We implement our hybrid interface by trapping a single ground state Cesium atom in a 4K cryostat, then vertically transporting it into the resonator interaction region. We use a novel two photon excitation via the $6S_{1/2} \rightarrow 5D_{5/2}$ quadrupole transition to excite $nP_{3/2}$ Rydberg states where there exists strong electric-dipole coupling between the atom and the resonator.

We have completed construction of the cryostat and the UHV chamber that houses the atoms and chip. We demonstrate single atom trapping results and progress towards initialization and quantum control of atomic qubits in terms of optical pumping, single qubit rotations, and Rydberg excitations.

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