Abstract Submitted
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Microwave-to-optical frequency conversion with a Rydberg atom coupled to a coplanar waveguide[1] BRYAN GARD, U.S. Army Research Lab, KURT JACOBS, U.S. Army Research Lab, Department of Physics University of Massachusetts at Boston, ROBERT MCDERMOTT, MARK SAFFMAN, Department of Physics, University of Wisconsin-Madison — A primary candidate for converting quantum information from microwave to optical frequencies is the use of Rydberg states of a single atom trapped near a surface. The fact that the Rydberg states possess both large electric dipole moments and microwave transition frequencies allows them to interact with superconducting mesoscopic circuits. By considering a concrete example, that of a Cesium atom, and using numerical search methods to optimize the control protocols, we determine the fidelities and transmission rates that could be achievable with such a device. We show that while protocols that exploit the adiabatic STIRAP mechanism provide the best raw transfer fidelities, the fastest communication speeds can be obtained by using heralding, which allows one to remove the adiabatic constraint.

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Bryan Gard
U.S. Army Research Lab

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