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Preparation of a narrowband, itinerant microwave qubit for quantum information transfer[1] XIZHENG MA, ADAM REED, LUCAS SLETTEN, Department of Physics, University of Colorado, Boulder, Colorado, USA, MATTHEW REAGOR, LUKE BURKHART, WOLFGANG PFAFF, R.J. SCHOELKOPF, Departments of Applied Physics and Physics, Yale University, New Haven, Connecticut, USA., K.W. LEHNERT, JILA, University of Colorado and NIST, Boulder, Colorado, USA; Department of Physics, University of Colorado, Boulder, Colorado, USA — Narrowband microwave-frequency signals are compatible with many quantum information processing technologies and can coherently transfer quantum information between devices. The creation of itinerant, microwave single photon states has been successfully demonstrated. Here, we show progress towards generating a narrowband, itinerant microwave qubit in a coherent superposition of zero and one Fock states. Specifically, we use the red-sideband transition of a transmon to map a superposition of qubit states onto a propagating microwave signal. This signal should have a bandwidth sufficiently narrow to be absorbed by a quantum-enabled electro-optic converter [1], potentially enabling the transfer of quantum information from a transmon qubit to the optical domain.

[1] R.W. Andrews, *et al.*, Nature Phys. **10**, 321–326 (2014).

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