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Phase tomography of a strongly driven superconducting artificial atom MARK RUDNER, Harvard University, ANDREI SHYTOV, University of Utah, LEONID LEVITOV, DAVID BERNS, MIT, WILLIAM OLIVER, MIT Lincoln laboratory, TERRY ORLANDO, SERGIO VALEZUELA, MIT — In a recent experiment [1], amplitude spectroscopy of a superconducting qubit was demonstrated by driving the system with a strong rf field through a manifold of states spanning energies up to 120 GHz. The interference between repeated Landau-Zener transitions in a qubit swept through an avoided level crossing results in Stueckelberg oscillations in qubit magnetization. The resulting oscillatory patterns are a hallmark of the coherent strongly-driven regime in qubits, quantum dots and other two-level systems. The two-dimensional Fourier transforms of these patterns are found to exhibit a family of one-dimensional curves in Fourier space [2], in agreement with experiment [1]. We interpret these images in terms of the time evolution of the quantum phase of the qubit state and show that they can be used to probe dephasing mechanisms in the qubit. [1] D. M. Berns et al., Nature 455, 51 (2008). [2] M. S. Rudner et al., Phys. Rev. Lett. 101, 190502 (2008)

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