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**Macroscopic Quantum Coherence in a Multi-Level Nb Persistent-Current Qubit**[1] YANG YU, MIT, W. D. OLIVER, MIT Lincoln Laboratory, J. C. LEE, K.K. BERGGREN, L.S. LEVITOV, T.P. ORLANDO, MIT — We drove a niobium persistent-current qubit with strong microwaves and observed single-, two-, and three-photon transitions between its macroscopic quantum states. A multi-level energy-band diagram was extracted by mapping the frequency of the induced transitions as a function of applied magnetic flux to the qubit, and the anti-crossing caused by the superposition between the third and fourth excited states were directly measured. The energy relaxation time T1 between two states connected by multi-photon transitions ranged from 30 to 100 ms. In addition, three-photon coherent temporal oscillations between the ground state and fourth excited state were observed with a decoherence time of approximately 50 ns.

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