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Rotations of a logical qubit using the quantum Zeno effect extended to a manifold[1] S. TOUZARD, A. GRIMM, Z. LEGHTAS, S.O. MUNDHADA, P. REINHOLD, R. HEERES, C. AXLINE, M. REAGOR, K. CHOU, J. BLUMOFF, K.M. SLIWA, S. SHANKAR, L. FRUNZIO, R.J. SCHOELKOPF, Department of Applied Physics, Yale University, M. MIRRAHIMI[2], Yale Quantum Institute, Yale University, M.H. DEVORET, Department of Applied Physics, Yale University — Encoding Quantum Information in the large Hilbert space of a harmonic oscillator has proven to have advantages over encoding in a register of physical qubits, but has also provided new challenges. While recent experiments have demonstrated quantum error correction using such an encoding based on superpositions of coherent states, these codes are still susceptible to non-corrected errors and lack controllability: compared to physical qubits it is hard to make arbitrary states and to perform operations on them. Our approach is to engineer the dynamics and the dissipation of a microwave cavity to implement a continuous dissipative measurement yielding two degenerate outcomes. This extends the quantum Zeno effect to a manifold, which in our case is spanned by two coherent states of opposite phases. In this second talk we present the result and analysis of an experiment that performs rotations on a logical qubit encoded in this protected manifold.

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