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Quantum Control of Cavity Resonators, Part II:Experiment
REINIER HEERES, PHILIP REINHOLD, NISSIM OFEK, KATRINA SLIWA, Yale University, MICHAEL HATRIDGE, University of Pittsburgh, STEFAN KRASTANOV, LIANG JIANG, LUIGI FRUNZIO, MICHEL DEVORET, ROBERT SCHOELKOPF, Yale University — Harmonic oscillators offer a large Hilbert space that can potentially be used to encode multiple bits of quantum information. The long lifetime of superconducting cavity resonators make them a suitable candidate to explore this direction. Due to the linearity of harmonic oscillators it is not directly obvious how to manipulate them. Here we show that pulses designed using optimal control methods allow us to manipulate the combined cavity – transmon system on a time-scale of order 1/chi, the dispersive shift; in practice pulses of about a microsecond long. Several example unitary operations addressing the first 8 levels of the resonator are described and characterized.

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