Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Universal holonomic quantum computing with cat-codes VICTOR V. ALBERT, Yale University, CHI SHU, Yale University; HKUST, STEFAN KRASTANOV, CHAO SHEN, Yale University, REN-BAO LIU, CUHK, ZHEN-BIAO YANG, Yale University; Fuzhou University, ROBERT J. SCHOELKOPF, Yale University, MAZYAR MIRRAHIMI, Yale University; INRIA Paris-Rocquencourt, MICHEL H. DEVORET, LIANG JIANG, Yale University — Universal computation of a quantum system consisting of superpositions of well-separated coherent states of multiple harmonic oscillators can be achieved by three families of adiabatic holonomic gates. The first gate consists of moving a coherent state around a closed path in phase space, resulting in a relative Berry phase between that state and the other states. The second gate consists of colliding two coherent states of the same oscillator, resulting in coherent population transfer between them. The third gate is an effective controlled-phase gate on coherent states of two different oscillators. Such gates should be realizable via reservoir engineering of systems which support tunable nonlinearities, such as trapped ions and circuit QED.

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Date submitted: 29 Jan 2016 Electronic form version 1.4