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Autonomous quantum error correction with superconducting qubits YAO LU, University of Chicago, ELIOT KAPIT, The Graduate Center, City University of New York, SAMUEL SASKIN, NELSON LEUNG, NATHAN EARNEST, DAVID MCKAY, University of Chicago, JENS KOCH, Northwestern University, DAVID SCHUSTER, University of Chicago — Quantum error correction is of vital importance for the successful performance of quantum information tasks. Based on recent work [1], we propose a superconducting circuit with flux-driven Josephson qubits capable of autonomously protecting many-body states against bit-flip errors. Unlike the traditional error correction schemes where feed-back operations are applied conditioned on the measurements, in our circuit, error correction is achieved by tailoring interactions between low-Q resonators (the "shadow lattice") and sinusoidally flux-driven qubits. An energetic resonance condition minimizes errors generated by the resonator coupling itself while still allowing for rapid error correction. In this talk, I will introduce our autonomous quantum error correction scheme, and present our fabricated superconducting circuit. I will also discuss preliminary results obtained from our experiments.

[1] Phys. Rev. X 4, 031039 (2014)

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