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Hardware-efficient quantum memory protection[1] ZAKI LEGHTAS, GERHARD KIRCHMAIR, BRIAN VLASTAKIS, ROBERT SCHOELKOPF, MICHEL DEVORET, Applied Physics Department, Yale University, MAZYAR MIRRAHIMI, INRIA Paris-Rocquencourt / Applied Physics Department, Yale University — We propose a new method to autonomously correct for errors of a logical qubit induced by energy relaxation. This scheme encodes the logical qubit as a multi-component superposition of coherent states in a harmonic oscillator, more specifically a single cavity mode. The sequences of encoding, decoding and correction operations employ the non-linearity provided by a single physical qubit coupled to the cavity. We layout in detail how to implement these operations in a circuit QED architecture. This proposal directly addresses the task of building a hardware-efficient and technically realizable quantum memory.

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