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Maintaining Qubit Coherence in the face of Increased Superconducting Circuit Complexity DAVID HOVER, STEVE WEBER, DANNA ROSENBERG, GABRIEL SAMACH, ADAM SEARS, JEFFREY BIRENBAUM, WAYNE WOODS, JONILYN YODER, LIVIA RACZ, JAMIE KERMAN, MIT Lincoln Laboratory, WILLIAM D. OLIVER, MIT Lincoln Laboratory; Research Laboratory of Electronics, Massachusetts Institute of Technology — Maintaining qubit coherence in the face of increased superconducting circuit complexity is a challenge when designing an extensible quantum computing architecture. We consider this challenge in the context of inductively coupled, long-lived, capacitively-shunted flux qubits. Specifically, we discuss our efforts to mitigate the effects of radiation loss, parasitic chip-modes, cross-coupling, and Purcell decay. Our approach employs numerical modeling of the ideal Hamiltonian and electromagnetic analysis of the circuit, both of which are independently shown to be consistent with experimental results. This research was funded by the Office of the Director of National Intelligence (ODNI), Intelligence Advanced Research Projects Activity (IARPA) and by the Assistant Secretary of Defense for Research Engineering under Air Force Contract No. FA8721-05-C-0002. The views and conclusions contained herein are those of the authors and should not be interpreted as necessarily representing the official policies or endorsements, either expressed or implied, of ODNI, IARPA, or the US Government.

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