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Bridging the Gap for High-Coherence, Strongly Coupled Superconducting Qubits JONILYN YODER, DAVID KIM, PETER BALDO, ALEXANDRA DAY, GEORGE FITCH, ERIC HOLIHAN, DAVID HOVER, GABRIEL SAMACH, STEVEN WEBER, WILLIAM OLIVER, MIT Lincoln Laboratory — Crossovers can play a critical role in increasing superconducting qubit device performance, as long as device coherence can be maintained even with the increased fabrication and circuit complexity. Specifically, crossovers can (1) enable a fully-connected ground plane, which reduces spurious modes and crosstalk in the circuit, and (2) increase coupling strength between qubits by facilitating interwoven qubit loops with large mutual inductances. Here we will describe our work at MIT Lincoln Laboratory to integrate superconducting air bridge crossovers into the fabrication of high-coherence capacitively-shunted superconducting flux qubits. We will discuss our process flow for patterning air bridges by resist reflow, and we will describe implementation of air bridges within our circuits. This research was funded in part 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 and 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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