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Design improvements for superconducting qubits

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Rapid understanding of decoherence processes, both energy and phase relaxation, for superconducting qubits led to novel design modifications with which various qubit performance metrics were improved dramatically. One example of a successfully redesigned qubit is the Transmon qubit. Here we show that there are other modifications that can made bestowing qubits with properties which we believe are advantageous for multi-qubit applications. Specifically we highlight two modifications for two types of qubits and compare these with experimental results. The first is a modified flux qubit which is less sensitive to some of the known decoherence sources. The second is a microwave-based read-out for phase qubits which completely avoids some of the decoherence mechanisms that were recently shown to limit qubit performance.