

Quantum Flux Parametron Enabled Readout of High-Coherence Superconducting Qubits

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Abstract— A quantum flux parametron (QFP) is capable of acting as both isolator and amplifier in the readout circuit of a superconducting qubit. By treating the QFP like a tunable coupler and biasing it such that the coupling is off, it protects the qubit from Purcell loss and noise caused by the rest of the readout chain. When annealed, the QFP locks in the qubit's state and amplifies its persistent current signal, which allows for fast, high signal-to-noise readout with a strongly coupled resonator. We present our demonstration of the lifetime-preserving and signal amplifying qualities of QFP enabled readout on high-coherence capacitively shunted flux qubits (CSFQs).

Keywords (Index Terms) — Quantum flux parametron, QFP, tunable coupler, Purcell loss, capacitively shunted flux qubits, CSFQ.

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