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Flux-noise insensitive and flux-tunable superconducting qubit EYOB SETE, MATTHEW REAGOR, NICOLAS DIDIER, CHAD RIGETTI, Rigetti Quantum Computing — Fast high-fidelity two-qubit gates are an essential component of a universal quantum computer. Tunable qubits are promising candidates to realize such gates. However, tunability often comes at the expense of increased noise sensitivity for a qubit, thus degrading gate performance. We propose a superconducting circuit that mitigates a dominant noise source for a class of tunable qubits. The circuit consists of a SQUID with asymmetric junctions and shunted using a superinductor. We show that flux sweet spots can be engineered at the frequency of operation by varying the junction asymmetry and the applied magnetic flux. This device coupled with a fixed frequency qubit allows a realization of fast high-fidelity two-qubit gates.

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