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CNOT logic for Josephson phase qubits MICHAEL GELLER, EMILY PRITCHETT, ANDREW SORNBORGER, University of Georgia, MATTHIAS STEFFEN, JOHN MARTINIS, University of California, Santa Barbara — Josephson junctions have demonstrated enormous potential as qubits for scalable quantum computing architectures. Here we study the speed and fidelity of four controlled-NOT gate implementations designed for capacitively coupled phase qubits. One gate applies to qubits fixed permanently in resonance, two require varying the dc current bias, and the fourth applies to permanently detuned qubits. Realistic simulations suggest that these implementations can be demonstrated with good fidelity using existing superconducting circuits.

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