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Long-range coupling mechanism and architecture for superconducting flux qubits AUSTIN FOWLER, WILLIAM THOMPSON, ZHIZHONG YAN, Institute for Quantum Computing, University of Waterloo, Ontario, Canada, ASHLEY STEPHENS, Centre for Quantum Computer Technology, The University of Melbourne, Victoria, Australia, FRANK WILHELM, Institute for Quantum Computing, University of Waterloo, Ontario, Canada — Devising a scalable mechanism enabling long-range interaction of qubits in a solid-state quantum computer is an important open problem. With only nearest neighbour interactions, gate error rates of order 10^{-7} or lower would be required to perform an arbitrarily large computation. If the right kinds of long- range interactions are available, gate error rates of order 10^{-4}, and possibly higher, would be acceptable. We discuss exactly what kinds of long-range interactions are required, present a simple mechanism for superconducting flux qubits, a scalable architecture based on this mechanism, and discuss the challenges on the road to physical realisation.

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