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The Quantum Socket: Wiring for Superconducting Qubits - Part 3 M. MARIANTONI, J.H. BEJIANIN, T.G. MCCONKEY, J.R. RINEHART, J.D. BATEMAN, C.T. EARNEST, C.H. MCRAE, Y. ROHANIZADEGAN, D. SHIRI, University of Waterloo, B. PENAVA, P. BREUL, S. ROYAK, M. ZAPATKA, Ingun, A.G. FOWLER, Google Inc. — The implementation of a quantum computer requires quantum error correction codes, which allow to correct errors occurring on physical quantum bits (qubits). Ensemble of physical qubits will be grouped to form a logical qubit with a lower error rate. Reaching low error rates will necessitate a large number of physical qubits. Thus, a scalable qubit architecture must be developed. Superconducting qubits have been used to realize error correction. However, a truly scalable qubit architecture has yet to be demonstrated. A critical step towards scalability is the realization of a wiring method that allows to address qubits densely and accurately. A quantum socket that serves this purpose has been designed and tested at microwave frequencies. In this talk, we show results where the socket is used at millikelvin temperatures to measure an on-chip superconducting resonator. The control electronics is another fundamental element for scalability. We will present a proposal based on the quantum socket to interconnect a classical control hardware to a superconducting qubit hardware, where both are operated at millikelvin temperatures.

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