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The Quantum Socket: Wiring for Superconducting Qubits - Part 2 J.H. BEJANIN, T.G. MCCONKEY, J.R. RINEHART, J.D. BATEMAN, C.T. EARNEST, C.H. MCRAE, Y. ROHANIZADEGAN, D. SHIRI, M. MARIANTONI, University of Waterloo, B. PENAVA, P. BREUL, S. ROYAK, M. ZAPATKA, Ingun, A.G. FOWLER, Google Inc. — Quantum computing research has reached a level of maturity where quantum error correction (QEC) codes can be executed on linear arrays of superconducting quantum bits (qubits). A truly scalable quantum computing architecture, however, based on practical QEC algorithms, requires nearest neighbor interaction between qubits on a two-dimensional array. Such an arrangement is not possible with techniques that rely on wire bonding. To address this issue, we have developed the quantum socket, a device based on three-dimensional wires that enables the control of superconducting qubits on a two-dimensional grid. In this talk, we present experimental results characterizing this type of wiring. We will show that the quantum socket performs exceptionally well for the transmission and reflection of microwave signals up to 10 GHz, while minimizing crosstalk between adjacent wires. Under realistic conditions, we measured an S_{21} of -5 dB at 6 GHz and an average crosstalk of -60 dB. We also describe time domain reflectometry results and arbitrary pulse transmission tests, showing that the quantum socket can be used to control superconducting qubits.

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