Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

**The Quantum Socket: Wiring for Superconducting Qubits - Part 1** T.G. MCCONKEY, J.H. BEJANIN, 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 systems with ten superconducting quantum bits (qubits) have been realized, making it possible to show basic quantum error correction (QEC) algorithms. However, a truly scalable architecture has not been developed yet. QEC requires a two-dimensional array of qubits, restricting any interconnection to external classical systems to the third axis. In this talk, we introduce an interconnect solution for solid-state qubits: The quantum socket. The quantum socket employs three-dimensional wires and makes it possible to connect classical electronics with quantum circuits more densely and accurately than methods based on wire bonding. The three-dimensional wires are based on spring-loaded pins engineered to insure compatibility with quantum computing applications. Extensive design work and machining was required, with focus on material quality to prevent magnetic impurities. Microwave simulations were undertaken to optimize the design, focusing on the interface between the micro-connector and an on-chip coplanar waveguide pad. Simulations revealed good performance from DC to 10 GHz and were later confirmed against experimental measurements.

Thomas McConkey
University of Waterloo

Date submitted: 06 Nov 2015 Electronic form version 1.4