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Control and Measurement of an Xmon with the Quantum Socket T.G. MCCONKEY, J.H. BEJANIN, C.T. EARNEST, C.R.H. MCRAE, J.R. RINE-HART, University of Waterloo, M. WEIDES, Karlsruhe Institute of Technology, M. MARIANTONI, University of Waterloo — The implementation of superconducting quantum processors is rapidly reaching scalability limitations. Extensible electronics and wiring solutions for superconducting quantum bits (qubits) are among the most imminent issues to be tackled. The necessity to substitute planar electrical interconnects (e.g., wire bonds) with three-dimensional wires is emerging as a fundamental pillar towards scalability. In a previous work, we have shown that three-dimensional wires housed in a suitable package [1], named the quantum socket, can be utilized to measure high-quality superconducting resonators. In this work, we set out to test the quantum socket with actual superconducting qubits to verify its suitability as a wiring solution in the development of an extensible quantum computing architecture. To this end, we have designed and fabricated a series of Xmon qubits. The qubits range in frequency from about 6 to 7 GHz with anharmonicity of 200 MHz and can be tuned by means of Z pulses. Controlling tunable Xmons will allow us to verify whether the three-dimensional wires contact resistance is low enough for qubit operation. Qubit T1 and T2 times and single qubit gate fidelities are compared against current standards in the field. [1] J.H. Béjanin et al., Phys. Rev. Applied 6, 044010 (2016)

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