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Engineering stabilizer measurements in circuit QED: I[1] KEVIN CHOU, JACOB BLUMOFF, M. REAGOR, C. AXLINE, R. BRIERLEY, Yale University, S. NIGG, University of Basel, P. REINHOLD, R. HEERES, C. WANG, K. SLIWA, A. NARLA, Yale University, M. HATRIDGE, University of Pittsburgh, L. JIANG, M. H. DEVORET, S. M. GIRVIN, R. J. SCHOEKOPF, Yale University
— Quantum error correction based on stabilizer codes has emerged as an attractive approach towards building a practical quantum information processor. One requirement for such a device is the ability to perform hardware efficient measurements on registers of qubits. We demonstrate a new protocol to realize such multi-qubit measurements. A key feature of our approach is that it enables arbitrary stabilizer measurements to be selected in software, and requires a relatively small number of buses, ancillae, and control lines. This allows for a minimally complex sample realizing a simple dispersive hamiltonian while maintaining a high degree of decoupling between our fixed-tuned qubits. We experimentally implement these measurements in 3D circuit QED using transmon qubits coupled to a common bus resonator. In this first of two talks, we introduce our 3D cQED system and describe the protocol for measuring n-qubit parities of a three qubit register.

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