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Weight-4 Parity Checks on a Surface Code Sublattice with Superconducting Qubits[1] MAIKA TAKITA, ANTONIO CORCOLES, EASWAR MAGESAN, NICHOLAS BRONN, JARED HERTZBERG, JAY GAMBETTA, MATTHIAS STEFFEN, JERRY CHOW, IBM T.J. Watson Research Center — We present a superconducting qubit quantum processor design amenable to the surface code architecture. In such architecture, parity checks on the data qubits, performed by measuring their X- and Z- syndrome qubits, constitute a critical aspect. Here we show fidelities and outcomes of X- and Z-parity measurements done on a syndrome qubit in a full plaquette consisting of one syndrome qubit coupled via bus resonators to four code qubits. Parities are measured after four code qubits are prepared into sixteen initial states in each basis. Results show strong dependence on ZZ between qubits on the same bus resonators.

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