

Abstract Submitted  
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**Parity check operation in a surface code plaquette segment with superconducting qubits**<sup>1</sup> JERRY CHOW, JAY GAMBETTA, SRIKANTH SRINIVASAN, EASWAR MAGESAN, ANDREW CROSS, DAVID ABRAHAM, NICHOLAS MASLUK, IBM TJ Watson Research Center, BLAKE JOHNSON, COLM RYAN, BBN Technologies Raytheon , CHRISTOPHER LIRAKIS, MATTHIAS STEFFEN, IBM TJ Watson Research Center — An essential part of the two-dimensional surface code is the ability to perform  $X$  and  $Z$ -stabilizer parity checks of code qubits via the measurement of ancilla qubits. We benchmark a complete set of high-fidelity single- and two-qubit gates on a three-qubit sub-section of a surface code layout comprised of superconducting resonators and transmons. Combining these gates with high-fidelity individual single-shot readouts, we show a parity check operation, deterministically entangling two qubits which are non-nearest neighbors.

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