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Chip-to-chip entanglement of transmon qubits[1] CHRISTIAN DICKEL, SARWAN PEITER, RAMIRO SAGASTIZABAL, NATHAN LANGFORD, BEN CRIGER, QuTech and Kavli Institute of Nanoscience, Delft University of Technology , DAVID THOEN, AKIRA ENDO, Department of Microelectronics and Kavli Institute of Nanoscience, Delft University of Technology , ALESSANDRO BRUNO, LEONARDO DICARLO, QuTech and Kavli Institute of Nanoscience, Delft University of Technology — We realize entanglement-by-measurement of two superconducting transmon qubits on separate 2D circuit QED chips. Two qubit-resonator pairs are tuned such that a microwave driving field bouncing successively from the two resonators does not distinguish the two odd-parity states of the qubits [1]. Thus, a half-parity measurement is realized, projecting the qubits onto the $|00\rangle$ state, the $|11\rangle$ state or the odd subspace. We use it to project an initial superposition state to a Bell state. The entanglement-by-measurement dynamics are verified via quantum state tomography. Conditioning the post-measurement state on the odd-subspace measurement outcome shows clear signatures of entanglement. Engineering the time-dependent resonator driving fields can reduce the distinguishability within the odd subspace, improving the entanglement. This scheme enables linking up 2D circuit QED processors in a quantum network. [1] N. Roche et al., Phys. Rev. Lett. 112, 170501 (2014)

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