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**Generation of entangled states in circuit QED using sideband transitions** P.J. LEEK, S. FILIPP, P. MAURER, ETH Zurich, A. BLAIS, Université de Sherbrooke, A. WALLRAFF, ETH Zurich, ETH QUANTUM DEVICE TEAM — The deterministic generation of entanglement between pairs of distant qubits is an important goal in the development of a quantum information processor. A promising and potentially scalable method of achieving this is through the use of sideband transitions between qubits and a globally coupled harmonic oscillator. Here we present an experimental demonstration of such a scheme implemented in an electrical circuit. We generate entanglement between a superconducting transmon qubit and a microwave coplanar waveguide resonator, and transfer this entanglement to a second qubit. We show generation of the four Bell states by this method, extracting the full two-qubit density matrix using a joint dispersive two-qubit readout and quantum state tomography.

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