

Abstract Submitted
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Multi-Resonator Circuit QED Part III: Two-Resonator Entanglement HAOHUA WANG, MATTEO MARIANTONI, RADOSLAW C. BIALCZAK, M. LENANDER, ERIK LUCERO, M. NEELEY, A.D. O'CONNELL, D. SANK, M. WEIDES, J. WENNER, Y. YIN, J. ZHAO, JOHN M. MARTINIS, A.N. CLELAND, Department of Physics, UC Santa Barbara, T. YAMAMOTO, Green Innovation Research Laboratories, NEC, Japan — Quantum entanglement, a defining feature of quantum mechanics, has been demonstrated in a variety of nonlinear spin-like systems. Quantum entanglement in linear systems has proven significantly more challenging, as the intrinsic energy level degeneracy associated with linearity makes quantum control more difficult. Here we demonstrate the quantum entanglement of photon states in two independent linear microwave resonators utilizing two superconducting phase qubits coupled through a band-pass resonator. After entangling two qubits into a Bell state, we demonstrate the controlled sequential photon amplification and transferring procedures, creating N quanta excitations distributed in two resonators. We completely characterize the two-resonator states with bipartite Wigner tomography and prove the existence of entanglement.

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