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Two Qubits and a Cavity: Three's Company FABIO ALTOMARE, MICHAEL ALLMAN, KATARINA CICAK, JAE A. PARK, MIKA A. SILLANPAA[1], ADAM SIROIS, JOSHUA STRONG, JED WHITTAKER, RAYMOND W. SIMMONDS, National Institute of Standards and Technology, Boulder, CO (USA) — Quantum information theory suggests that there are two inequivalent classes of tripartite entanglement under stochastic local operations and classical communications (PRA, 62, 062314). Representative of these classes are the GHZ state and the W states, respectively. In this talk I will describe our experimental results on two superconducting phase qubits coupled through a cavity: one of the few cases where three is company and not a crowd. This system, effectively three coupled qubits if we restrict the cavity excitation to the single photon manifold, has allowed us to observe the spectroscopic signature and dynamics of Tripartite Entanglement. The rich dynamics of this system has allowed us to also observe a) Bell state between two qubits (with the third one disentangled), and b) W state between the three qubits. Future possibilities include the observation of GHZ state, particularly interesting for its practical applications, and for testing the non-locality of quantum mechanics.

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