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Collective Phenomena in a Capacitively-Coupled Transmon Array ARTHUR SAFIRA, DEVIN UNDERWOOD, WILLIAM SHANKS, JAMES RAFTERY, ANDREW HOUCK, Princeton University — The manifestation of condensed matter physics phenomena in interacting photon systems has been of recent theoretical interest. Under the circuit quantum electrodynamics (cQED) architecture, light-matter interactions can be engineered into a strong coupling regime and many-body interacting photon systems can be fabricated. In this experiment, we create a triangular array of 100 niobium transmon qubits on a sapphire substrate. Photon-mediated interactions are facilitated through capacitive coupling among the transmons, each with a charging energy of approximately 200MHz. Collective quantum behavior of the josephson-junction array is explored by measuring transmission across the array through input-output ports on the device itself as well as through a 3D cavity. This experiment is an important step towards realizing many-body, interacting quantum phenomena with photons.

Arthur Safira
Princeton University

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