Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Multimode Entanglement Generation in a Parametric Superconducting Cavity C.W.S. CHANG, University of Waterloo, M. SIMOEN, Chalmers University of Technolog, A.M. VADIRAJ, University of Waterloo, P. DELSING, Chalmers University of Technolog, C.M. WILSON, University of Waterloo — Parametric microwave resonators implemented with superconducting circuits have become increasingly important in various application within quantum information processing. For example, quantum-limited parametric amplifiers based on these devices have now become commonplace as first-stage amplifiers for qubit experiments. Here we study the generation of multimode entangled states of propagating microwave photons, which can be used a resource in quantum computing and communication applications. We use a CPW resonator with a low fundamental resonance frequency that than has a number of modes in the common frequency band of 4-12 GHz. These modes are all parametrically coupled by a single SQUID that terminates the resonator. When parametrically pumping the system at the sum of two mode frequencies, we observe parametric downconversion and two-mode squeezing. By pumping at the difference frequency, we observe a beamsplitter-like mode conversion. By using multiple pump tones that combine these different processes, theory predicts we can construct multimode entangled states with a well-controlled entanglement structure, e.g., cluster states. Preliminary measurements will be presented.

C. W. S. Chang
University of Waterloo

Date submitted: 17 Dec 2015 Electronic form version 1.4