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Multi-mode directional parametric devices LEONARDO RANZANI, ADAM SIROIS, NIST,Boulder - University of Colorado, Boulder, MANUEL CASTELLANOS-BELTRAN, RAYMOND SIMMONDS, JOHN TEUFEL, JOSE AUMENTADO, NIST, Boulder — Josephson parametric amplifiers (JPAs) are very common in quantum information measurement systems, because they can operate close to the standard quantum limit, but require an external circulator to achieve unidirectionality. A possible way to achieve directional amplification without a circulator is to increase the number of coupled modes. By parametrically coupling three or more modes, and selecting the right amplitude and phase for the mode coupling rates, we can realize a non-trivial interference between different internal parametric processes and obtain unidirectional frequency conversion or amplification. In this talk we are going to discuss some recent progress on the experimental implementation of directional lumped-element Josephson parametric devices based on multiple coupled modes.

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