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Lossless, coherent Josephson three-wave combiner[1] BALEEGH ABDO, KATRINA SLIWA, FLAVIUS SCHACKERT, Applied Physics Department, Yale University, NICOLAS BERGEAL, LPEM-UMR8213/CNRS-ESPCI ParisTech-UPM, MICHAEL HATRIDGE, LUIGI FRUNZIO, DOUGLAS STONE, MICHEL DEVORET, Applied Physics Department, Yale University — We designed and operated a three-wave beam-splitter/combiner, based on Josephson parametric converters, which performs frequency conversion without introducing losses and thus adding no noise to the processed signal. We in particular show that the unitary signal-idler scattering parameters of the device can be fully modulated in-situ by varying the intensity and phase of the pump tone feeding the system. By operating the device as a 50/50 beam-combiner, we interfere coherently two input coherent microwave beams with different frequencies and demonstrate that the resulting interference fringes generated by the relative phase of the pump is in agreement with theoretical predictions. Potential applications of the device include quantum information transduction and realization of an ultra-sensitive interferometer with controllable feedback.

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