Abstracts

Theory of distributed mixing and amplification in a superconducting quasi-particle nonlinear transmission line

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An analysis is presented for the behavior of the superconducting quasi-particle nonlinear transmission line driven by a high-frequency local oscillator (LO). The theory developed includes a large-signal nonlinear analysis, a small-signal analysis, and a noise analysis. This model is used to simulate the conversion loss and noise temperature of distributed quasi-particle mixers based on the nonlinear transmission line. The numerical results are compared to an experimental mixer at 460 GHz. The theory also predicts that the nonlinear transmission line will provide parametric amplification when the idler frequency is inductively tuned. This new phenomenon may present new opportunities to low-noise receiver systems at submillimeter wavelengths.

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