Abstracts

Synthesis of Negative Resistance Reflection Amplifiers, Employing Band-Limited Circulators

H.C. Okean. "Synthesis of Negative Resistance Reflection Amplifiers, Employing Band-Limited Circulators." 1966 Transactions on Microwave Theory and Techniques 14.7 (Jul. 1966 [T-MTT]): 323-337.

This paper presents a theory for single-stage circulator-coupled negative resistance reflection amplifiers based on proposed realistic circuit models for frequency-dependent band-limited circulators and broadband negative resistance devices such as the tunnel diode. In particular, gain bandwidth limitations are derived which are imposed by both the inherent resonance associated with the nonreciprocal circulator junction and the reactive parasitic associated with the active device. These limitations are generally more restrictive than past results which assumed a "perfect" frequency-independent circulator and took into account only the device parasitic. In addition, a synthesis procedure is presented for realization of an absolutely stable amplifier with a prescribed nth-order Butterworth or Chebyscheff approximation to an ideally flat band-pass power gain characteristic. The approach employed is based upon the theory of reflection coefficient equalization between two reactively constrained resistances representing the pass band circulator and device immittance models. In addition, a band rejection out-of-band stabilizing network is absorbed in the pass band equalizer in accordance with an over-all synthesis procedure. Finally, the theory is verified by the construction and testing of an L-band tunnel diode amplifier having third-order maximally flat power gain centered at 1.46 Gc/s and with half-power bandwidths (430 Mcls and 355 Mc/s at 10 dB and 16dB midband gain) within six percent of those predicted by theory.

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