Abstracts

Methods for Measuring the Power Linearity of Microwave Detectors for Radiometric Applications (Apr. 1995, Part I [T-MTT])

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A microwave radiometer relies on the power linearity of its microwave receivers to accurately measure the temperature of remote microwave noise sources. This paper considers linearity issues in the design and characterization of such receivers. Analysis is presented relating the radiometer temperature interpolation error to a second order power nonlinearity coefficient for the receiver. Formulas are also developed specifying the temperature error in terms of individual receiver component parameters. It is shown that the key parameter for the RF detector in the receiver is A/sub 4/, a fourth order RF distortion coefficient, and the key parameter for the RF amplifiers in the receiver is IPs, the third order intercept. This paper also discusses experimental methods for measuring the power linearity of RF detectors to the levels required for radiometric applications. Three methods are discussed: the two-tone method, the amplitude modulation method, and the constant ratio method. The theory of determining the coefficients that characterize the nonlinearity of the detector from experimental data is presented. Experimental results are presented showing that the two-tone method and the constant ratio method agree to within experimental error. The sensitivity for measuring nonlinearities and the difficulties encountered in implementing each of these methods are also discussed.

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