Abstracts

Transmission-Phase Relations of Four-Frequency Parametric Devices

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The gain, bandwidth, and excess noise temperature properties of parametric amplifiers are generally known. However, a knowledge of their transmission-phase properties is also essential for the effective application of parametric amplifiers to angular detection systems, such as monopulse radars and interferometers. These angle detection systems derive even, odd, and quadrupolar spatial components of the antenna diffraction patterns. The differential amplitude and differential phase between these signal components contain the spatial information of position, extent, and shape of the target. Consequently, to employ parametric transducers in certain systems requires an understanding of the transmission phase properties which are delineated in this paper. The analysis follows the matrix representation of a nonlinear capacitive susceptance, four-frequency transducer wherein due note is taken of the phases. The transmission-phase relations are written which include the effects of nonzero port susceptance and nonlinear reactance element losses. At midband without losses, the relations reduce to easily remembered equations which are significant to the application of parametric transducers in phase-sensitive systems. Some applications and experimental results are cited.

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