Abstracts

Probing Amplitude, Phase, and Polarization of Microwave Field Distributions in Real Time

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A coherent (homodyne) detection system is used to map field distributions in real time. A key feature is the use of an electrically modulated (10-kHz) dipole scatterer which is also mechanically spun (150 Hz) to create an amplitude- and phase-modulated backscattered field. The system is monostatic. The backscattered field is coherently detected by mixing with the CW reference. A phase-insensitive detector is used, comprised of two balanced mixers which are fed in quadrature phase by one of the RF inputs followed by a phase quadrature combiner. The resulting amplitude and phase of the 10-kHz output are proportional to the square of the RF field component along the instantaneous axis of the spinning dipole. Both are measured simultaneously and independently in real time. From these, the polarization properties can also be found, so the field is uniquely described. The system's application to scanning the E-field transmitted through lossy, nonhomogeneous and anisotropic media (e.g., wood) is demonstrated. Other applications besides nondestructive testing are microwave vector holography, nearfield antenna measurements, and inverse scattering.

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