Abstracts

Analysis of Miniature Electric Field Probes with Resistive Transmission Lines

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The miniature dipole probe is a useful tool for measuring the electric field at high radio and microwave frequencies. A common design for the probe consists of an electrically short dipole antenna with a diode across its terminals; a resistive, parallel-wire transmission line transmits the detected signal from the diode to the monitoring instrumentation. The high resistance per unit length of the transmission line reduces the direct reception of the incident field by the line and also reduces the scattering of the incident field by the line. In addition, the resistive transmission line serves as a low-pass filter in the detection process. In this paper, the effect of the resistive transmission line on the operation of the miniature field probe is analyzed. Specifically, the reception of the incident signal by the transmission line is compared with that of the dipole. The scattering of the incident signal by the transmission line is studied by means of the scattering cross section, and the limitation imposed on the measurement of amplitude-modulated signals by the low-pass filtering by the resistive line is examined. The results of the theoretical analyses are presented as simple formulas which are useful in the design and optimization of the probe. The theoretical results are shown to be in good agreement with measurements.

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