Abstracts

Study and Characterization of Optoelectronic Photoconductor-Based Probes

R.H. Voelker, M.Y. Frankel and C.G. Sentelle. "Study and Characterization of Optoelectronic Photoconductor-Based Probes." 1996 Transactions on Microwave Theory and Techniques 44.2 (Feb. 1996 [T-MTT]): 331-337.

Photoconductor sampling probes are important for optoelectronic device and circuit measurement applications. We use the finite-difference transmission line matrix (FD-TLM) method to characterize the ultrafast photoconductor sampling probes' fundamental performance limits imposed by electromagnetic constraints. Both on-wafer and free-standing photoconductor probes are investigated as applied to microstrip lines found in millimeter-wave integrated circuits and as applied to coplanar strip lines found in ultrafast device characterization systems. Localized invasiveness, distributed loading, and measurement accuracy are investigated for various probing configurations and orientations. Localized invasiveness is small for all our simulations. Distributed loading is negligible for cases where the guided-mode field confinement is tighter than the spatial separation between the probe support structure and the transmission line. Measurement accuracy is acceptable for simulated structures, but amplitude calibration precision may be compromised. We also study photoconductor probes for high-bandwidth signal generation on transmission line structures. The generated signals follow the photoconductor switch photocurrent signal for cases where both the probe and the transmission line form well-matched guiding-wave structures but are attenuated and distorted for other cases.

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