Abstracts

Characterization of Three-Dimensional Open Dielectric Structures Using the Finite-Difference Time-Domain Method

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Millimeter and submillimeter wave three-dimensional (3-D) open dielectric structures are characterized using the finite-difference time-domain (FDTD) technique. The use of FDTD method allows for the accurate characterization of these components in a very wide frequency range. The first structure characterized through FDTD for validation purposes is a mm-wave image guide coupler. The derived theoretical results for this structure are compared to experimental data and show good agreement. Following this validation, a sub-mm wave transition from a strip-ridge line to a layered ridge dielectric waveguide (LRDW) in open environment is analyzed, and the effects of parasitic radiation on electrical performance are studied. The transition is found to be very efficient over a wide sub-mm frequency band which makes it useful for a variety of applications. In addition to the transition, a sub-mm wave distributed directional coupler made of the LRDW is extensively studied using the FDTD method as an analysis tool. Furthermore, an iterative procedure based on the FDTD models is used to design a 3-dB coupler with a center frequency of 650 GHz and negligible radiation loss. This successful design shows that the FDTD techniqne can be used not only as an analysis method, but also as a design tool to provide designs which take into account all high frequency parasitic effects.

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