NEW ACCURATE DESIGN DATA FOR A SUSPENDED MICROSTRIP LINE

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ABSTRACT

New design data for an open suspended microstripline is reported. Two most commonly used substrate materials, namely RT-Duroid (\(\varepsilon_r=2.22\)) and fused quartz (\(\varepsilon_r=3.78\)) are considered. Effects of dispersion and strip thickness are included in the results which are based on a fullwave spectral-domain analysis. The data, which is computed over the complete practical ranges of frequency and parameter values, is much more reliable than the currently available quasistatic results.

I. INTRODUCTION

Suspended microstrip (Fig. 1) is a very widely used planar transmission medium in the millimeter-wave band. At present, most of the available data on this line is quasistatic (see, e.g., [1]-[3]). In the present work, the results of a fullwave spectral-domain analysis of this line are reported. Effective dielectric constant and characteristic impedance (power-current definition) are computed over the complete practically used ranges of frequency and physical parameters. Only the fundamental (\(E_z\)-even, \(H_z\)-odd) mode of propagation has been considered. Results belie the popular belief that the suspended microstrip is a low-dispersion line.
II. OUTLINE OF THE ANALYSIS

A suspended microstrip structure is shown in Fig. 1. Various dimensions and parameters are defined as shown. A fullwave spectral-domain analysis of this structure was carried out by the authors [4] with a view to compute the effective dielectric constant and the characteristic impedance. In the following, the computed data based on that analysis is presented. The data is obtained for RT-duroid and fused quartz, which are the two most commonly used substrate materials for this kind of structure.

III. RESULTS

The data for RT-Duroid ($\varepsilon_r=2.22$) is presented in Figs. 2-6 and that for fused quartz ($\varepsilon_r=3.78$) is given in Figs. 7-11. A frequency range of 1 GHz to 100 GHz is considered. The parameter ranges considered ($1 < W/b < 8$ and $0.2 < a/b < 1$) are the most practically used ones. For the sake of clarity, the various curves have been left unmarked inside the graph. Following instructions thus need be followed while reading data from these graphs:

![Cross-section of a suspended microstrip](image)

**Fig. 1. Cross-section of a suspended microstrip.**