MODELING OF SHIELDED MICROSTRIP TRANSMISSION LINES

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in Partial Fulfillment of the Requirements
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University of Saskatchewan

Electrical Engineering Abstract

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ABSTRACT

Microstrip lines are widely used not only in microwave circuits, but also in very large scale integration (VLSI) and high frequency circuit boards. Initially microstrip lines were analyzed mainly in the frequency domain, but now time domain analysis is also becoming a subject of prime importance. Time domain analysis data is relevant in determining the behavior of many microwave and VLSI circuits. Full wave time domain analysis is usually not practical due to computer time and memory requirements. Therefor, time domain analysis is usually carried out via frequency domain analysis and the inverse Fourier transform. Frequency domain analysis can be very accurate when a

stationary model for the dispersive behavior of a microstrip line is utilized. This method has been successfully employed in time domain analysis of various forms of open microstrip lines.

Since most microwave integrated circuits (MIC) and VLSI packagings have closed structures, an efficient and fast time domain analysis of such structures requires a model which describes the dispersive behavior of a shielded microstrip line. However, unlike the case for an unshielded microstrip line, no dispersion model exists for the shielded microstrip line.

In view of this problem, this research work has the following objectives:

1) to develop a general microstrip dispersion model which accounts for the effect of a top shield
2) to develop a model for the attenuation constant of a shielded microstrip line
3) to perform time domain analysis for a shielded microstrip line

In addition to time domain analysis, the dispersion model will also be helpful in analyzing of a large number of shielded microstrip circuits. Such circuits could not be analyzed without recourse to rigorous solution of Maxwell's equations. This would require large amounts of computer time and memory.

Two different dispersion models have been developed based on the data obtained from full wave analysis. These models have been found to be sufficiently accurate for all engineering purposes. The second model was subsequently used in the time domain analysis of various shielded microstrip lines.

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