마이크로스트립 Meander 라인의 S-파라메터 특성

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S-Parameter Characteristics of Microstrip Meander Line

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Abstract

In this paper, using symmetrical condensed node(SCN), the TLM numerical technique has been successfully applied to microstrip meander line. A detailed technique of the symmetrical condensed node(SCN) may be used to model planar microstrip transmission line is presented. Also, the S-parameters S_{11} and S_{21} of microstrip meander line have been computed. From obtained results, TLM analysis is shown to be an efficient method for modeling complicated structure of planar microstrip transmission line.

I. Introduction

The TLM method is one of the most powerful solvers of electromagnetic problems. Because in TLM method the analytical pre-processing in almost negligible, and the basic algorithms are easily modified to solve any kind of electromagnetic problem, either irregular structure or discontinuities of arbitrary cross section. In this paper, the frequency dependent scattering parameters have been investigated for microstrip meander line using TLM method. and then frequency domain response for microstrip meander line are obtained. From obtained results, TLM analysis is shown to be an efficient tool for modeling complicated structure of planar microwave transmission line.

II. Scattering process in TLM method

In the TLM numerical analysis, the scattering of the voltage pulses at the center of the SCN node is represented by the scattering matrix. The scattering expression of entire domain under the studying objects is as follows[1~2]

$$V^r = S\ V^i \qquad (1)$$

where V^r is reflected voltage and V^i is incident voltage. The ordering of voltage pulses within the scattering matrix S is carried out with respect to the original SCN notation. From the incident and reflected fields it is straightforward to compute the S-parameters. The expression of S-parameter is as follows[3]

$$S_{11} = \frac{V_{tot} - V_{inc}}{V_{inc}} \qquad (2)$$

$$S_{21} = \frac{V_{trans}}{V_{inc}} \qquad (3)$$

Ⅲ. Numerical results

The geometry of microstrip meander line is shown in fig. 1. The microstrip thickness is assumed to be zero and the relative dielectric constant of the substrate is 9.2. The number of iterations was 4200. The SCN cubic cell results have been obtained with the discretization $\Delta x = \Delta y = \Delta z = 0.025mm$. The incident voltage, 1V peak value generated by the electric source. The computed S-parameters for a microstrip meander line are plotted in fig. 2. and fig. 3.

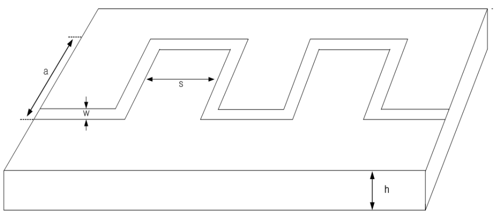

Fig. 1. Schematic of microstrip meander line ($h = 0.6mm$, $w = 1.5mm$, $a = 6.0mm$, $s = 4.0mm$)

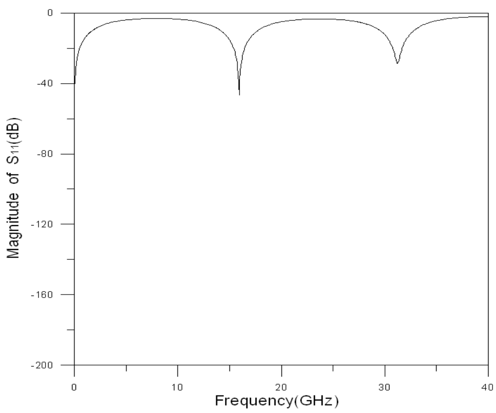

Fig. 2. S_{11} of Microstrip Meander line

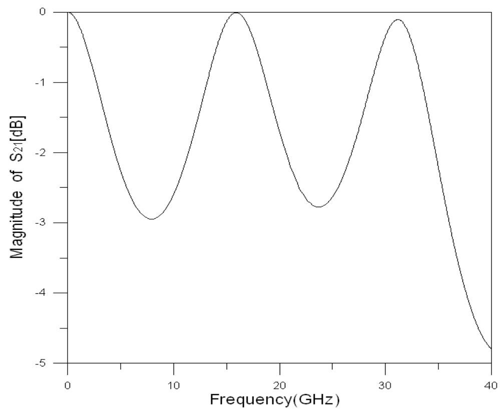

Fig. 3. S_{21} of Microstrip Meander line

Ⅳ. Conclusion

The TLM numerical technique has been successfully applied in microstrip meander line. Using absorbing boundary condition, the S-parameters S_{11} and S_{21} of microstrip meander line have been computed, and no ripple is detected in either magnitude or phase response. The TLM results presented here are useful in the design of microwave integrated circuits.

References

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