

On the Limitations of the Space Domain Formulation of the MoM Method for Planar Circuits

K. Kochlef, A. B. Kouki, and A. Samet
Ecole Polytechnique de Tunisie, Tunisie

The Method of Moments (MoM) is arguably the most well suited technique for the analysis of planar circuits. This technique has been traditionally formulated in the spectral domain, since it is only in this domain that the Green's functions can be determined exactly. However, the spectral domain formulation suffers from several limitations, particularly for open structures, that make its implementation and use difficult and the required computational resources high. In light of this, substantial research effort has been invested in developing a space domain alternative whereby an approximate space domain Green's function is derived from its spectral domain counterpart and used in space domain formulation of the MoM technique. Therefore, the accuracy of this technique depends on that of the space domain Green's function.

In this paper, we present a systematic investigation of the accuracy of the space domain MoM technique applied to single layer planar circuits with the aim of establishing its limitations and determining its zones of applicability. The study covers a wide range of parameters, including frequency, cell spacing, dielectric constant values and substrate height. We also examine the impact of varying the parameters of the generalized pencil of function (GPOF) technique, used to determine the space domain Green's function, on the precision of the technique and its zones of applicability. Finally we discuss potential remedies to overcome the limitation of the space domain techniques.

REFERENCES

1. Aksun, M. I., "A robust approach for the derivation of closed-form Green's function for a general microstrip geometry," *IEEE Trans. Microwave Theory Tech.*, Vol. 44, 651–658, May 1996.
2. Shuley, N. V., R. R. Boix, F. Medina, and M. Horno, "On the fast approximation of Green's functions in MPIE formulations for planar layered media," *IEEE Transactions on Microwave Theory and Techniques*, Vol. 50, No. 9, 2185–2112, September 2002.
3. Sarkar, T. K. and O. Pereira, "Using the matrix pencil method to estimate the parameters of a sum of complex exponentials," *IEEE Trans. Antennas and Propagation Magazine*, Vol. 37, 48–55, February 1995.
4. Alatan, L., M. I. Aksun, K. Mahadevan, and M. T. Birand, "Analytical evaluation of the MOM matrix elements," *IEEE Transactions on Microwave Theory and Techniques*, Vol. 44, No. 4, April 1996.