Application of the Space Domain MoM Technique to the Analysis of Planar Guiding Structures

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Integral equation methods are widely recognized as efficient techniques for studying the propagation characteristics of planar structures. In these techniques, the Method of Moments in the spectral domain is typically used since the Green's functions can be obtained in closed form. This approach has been shown to be quite effective for the modeling of planar guiding structures and is behind several empirical models used today in many commercial microwave CAD tools. Nevertheless, this approach requires the evaluation of infinite integrals with oscillating and slowly decaying integrands, for open structures, and infinite series for shielded ones. To circumvent this problem, a space domain formulation of the Method of Moments, widely used to characterize arbitrary planar structures and discontinuities, is proposed for the analysis of guiding structures. The closed form expressions of the Green's functions for the vector and scalar potentials in the space domain are found through the application of the Generalized Pencil of Functions (GPOF) method to the one dimensional case. In such a case, we show that the passage from the spectral to the space domain results in a simplified closed form expression in terms of Bessel functions of the second kind. This new formulation is applied to a microstrip line and the results are compared to other models.