A New CBF-Generation Algorithm for an Efficient Analysis of Microwave Circuits and Antennas Etched on Layered Media

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Increasing competition in the communication market has fueled the development of increasingly efficient Computer Aided Design (CAD) tools for simulating the performance of microwave circuits. One approach to accelerating the design process is to use a circuit simulator where the microstrip discontinuities are modeled as lumped elements. However, such a network-theory-type of simulator produces accurate results only at low frequencies, and their accuracy degrades rapidly as the operating frequency is increased to the point where the parasitic coupling effects cannot be neglected. One of the most widely employed full-wave algorithms is the Method of Moments (MoM). Though numerically rigorous and accurate, the MoM requires memory and Central Processing Unit (CPU) resources that are orders of magnitude greater than those associated with conventional circuit simulators. Recently, the Characteristic Basis Function Method (CBFM) has been successfully applied for the analysis of Monolithic Microwave Integrate Circuits (MMICs) and antennas etched on layered media. In the original version of this method, the analyzed geometry is decomposed into smaller regions, called blocks, for which high-level basis functions, the Characteristic Basis Functions (CBFs), are generated. Typically, two types of CBFs are calculated, the Primaries (PCBFs) and the Secondaries (SCBFs). The generation of the PCBFs is started by defining appropriate interfaces, *i.e.*, inner ports, between adjacent blocks and considering each section in isolation. To generate accurate results by using the conventional CBFM, it is important to ensure that the inner ports (see Fig. 1) be defined at locations where the effect of the higher-order modes is negligible and the current distribution can be expressed as a linear combination of a forward and a reflected wave. We have developed a new algorithm for an efficient generation of the Primary CBFs which enables us to generalize the decomposition procedure. The partition scheme is user-independent, and allows the interface locations to be arbitrary (see Fig. 1).

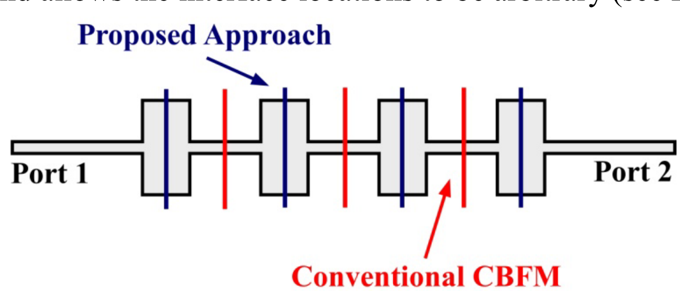

Fig. 1. Division of the geometry into N blocks with the conventional CBFM and the proposed approach.