Abstracts

Rigorous Multimode Network Numerical Representation of Inductive Step

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Discontinuities such as inductive steps are very frequently used in waveguide components and several descriptions can be found for them in the technical literature. These descriptions can be broadly divided into two groups. The first group can only take into account fundamentat-mode interactions and is generally very efficient from a computational point of view. Representations of the second group can account for higher-mode interactions but are in general much less efficient numerically. In this paper we derive a novel, rigorous, multimode equivalent net-work representation for arbitrary inductive step discontinuities in rectangular waveguide that is computationally very efficient. The coupling between the modal voltages and currents for all higher order modes explicitly included in the calculations is directly expressed in terms of an impedance coupling matrix that is essentially frequency independent. The expression for the generic coupling matrix element is found in terms of the numerical solution of an integral equation. The novel contribution of this paper is in that it combines two powerful techniques, namely the Multimode Network Formulation of boundary-value problems and the Method of Moments for the solution of integral equations. The result is a very powerful tool that can be applied to the analysis of a wide class of discontinuities. In addition to the theoretical derivation, numerical results are also presented indicating that the theory developed is indeed very accurate and computationally efficient.

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