Abstracts

A Numerical Absorbing Boundary Condition for Finite Difference and Finite Element Analysis of Open Periodic Structures

A. Boag and R. Mittra. "A Numerical Absorbing Boundary Condition for Finite Difference and Finite Element Analysis of Open Periodic Structures." 1995 Transactions on Microwave Theory and Techniques 43.1 (Jan. 1995 [T-MTT]): 150-154.

In this paper we present a novel approach to deriving local boundary conditions, that can be employed in conjunction with the Finite Difference/Finite Element Methods (FD/FEM) to solve electromagnetic scattering and radiation problems involving periodic structures. The key step in this approach is to derive linear relationships that link the value of the field at a boundary grid point to those at the neighboring points. These linear relationships are identically satisfied not only by all of the propagating Floquet modes but by a few of the leading evanescent ones as well. They can thus be used in lieu of absorbing boundary conditions (ABCs) in place of the usual FD/FEM equations for the boundary points. Guidelines for selecting the orders of the evanescent Floquet modes to be absorbed are given in the paper. The present approach not only provides a simple way to derive an accurate boundary condition for mesh truncation, but also preserves the banded structure of the FD/FEM matrices. The accuracy of the proposed method is verified by using an internal check and by comparing the numerical results with the analytic solution for perfectly conducting strip gratings.

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