Comments

Comments on "A Super Absorbing Boundary Condition for the Analysis of Waveguide Discontinuities with the Finite-Difference Method"

Omar M. Ramahi, Ahmed Khebir, and Raj Mittra

In the above letter,[1] the authors may have overlooked our paper, which introduced a numerically derived Absorbing Boundary Condition for the solution of open region scattering problems [1].

In [1], the idea was to present the unknown field or its derivative at a terminal node in terms of a weighted summation of neighboring nodes that lie in the interior. The weighting coefficients are solved for by representing the field at the terminal node in terms of a finite number of its spatial harmonics (three or five dominant harmonics). In [1], we demonstrated the concept by applying it to cylindrical harmonics in the context of the finite-element method, whereas the authors of the above letter[1] considered planar waveguide harmonics in the context of the finite-difference method.

References

[1] O. M. Ramahi, A. Khebir, and R. Mittra, "Numerically derived absorbing boundary condition for the solution of open region scattering problems," *IEEE Trans. Antennas Propagat.*, vol. 39, pp. 350–353, Mar. 1991.

Authors' Reply

Jian Yi Zhou and Wei Hong

As early in 1992, Prof. K. K. Mei and his student R. Pous sucJcessfully applied the MEI method to solve waveguide discontinuity problems [1]. In Pous' thesis, the scattering parameters of an inductive post in a rectangular waveguide are calculated by finite difference-measured equation of invariance (FD-MEI) method with conformal meshes around the surface of the post (as shown in Fig. 1), where the Green's function was used to calculate the MEI coefficients. It is known that the Green's function in a rectangular waveguide is an infinite summation of harmonic functions, so the calculation of MEI coefficients costs most of the computing time. In 1993, the second author of our letter proposed the concept of measuring loop based on the Equivalence Principle and applied the MEI to scattering problems involving penetrable media [2]. Meanwhile, the author further extended the concept to waveguide discontinuity problems by which conformal meshes are replaced by standard orthogonal meshes and the "metrons" on the surface of the post are moved to planes A and B, as shown in Fig. 2. If sine and cosine functions are chosen as "metrons," the results after integrating with Green's function are just the waveguide modes. So, we need only use waveguide modes to measure the MEI's for determining the MEI coefficients that entirely avoided the Green's function and finally results in dramatic saving in computing time. If we use first three modes to measuring the four-

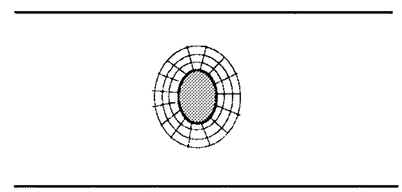

Fig. 1. A conducting post in a rectangular waveguide and the conformal meshes.

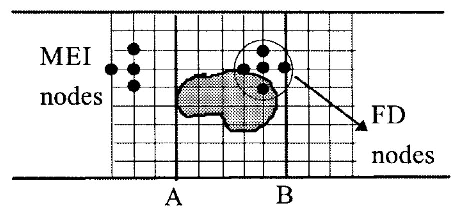

Fig. 2. Arbitrarily shaped obstacle and standard rectangular meshes.

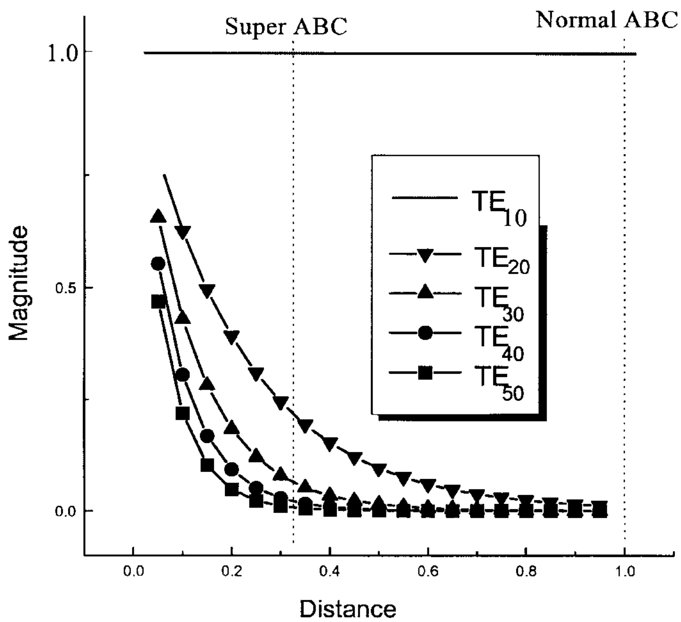

Fig. 3. Attenuation of the modes in a rectangular waveguide.

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[1] J. Y. Zhou and W. Hong, *IEEE Microwave Guided Wave Lett.*, vol. 7, pp. 147–149, June 1997.

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