Abstracts

Some important properties of waveguide junction generalized scattering matrices in the context of the mode matching technique (Comments and reply)

M.A. Solano, J.S. Ipina, A. Gomez, A. Prieto, A. Vegas, A.S. Omar and G.V. Eleftheriades. "Some important properties of waveguide junction generalized scattering matrices in the context of the mode matching technique (Comments and reply)." 2001 Transactions on Microwave Theory and Techniques 49.9 (Sep. 2001 [T-MTT] (Mini-Special Issue on the 2001 IEEE Radio Frequency Integrated Circuit (RFIC) Symposium)): 1663-1664.

For the original paper see ibid., vol. 42, no. 10, p. 1896-1903 (1994). Here the commenters aim to provide another reason in addition to those given in Section II of the aforementioned paper in response to the rhetorical question, "Which mode-matching equations are linearly independent?" When the mode-matching method is used to obtain the generalized scattering matrix of a discontinuity between two waveguides of different cross sections, it is essential to make an adequate choice of the eigenfunctions, which will be used to test the continuity equations of the tangential components of the electromagnetic field in the plane of the discontinuity. It is known that the testing eigenmodes are chosen as being those of the larger guide for enforcing the electric-field continuity and as those of the smaller guide for enforcing the magnetic-field continuity. This means that the electric-field test eigenmodes must be chosen from the smaller guide and the magnetic-field test eigenmodes must be chosen from the larger guide. In the original paper, the authors prove this, first qualitatively and then rigorously. Now the commenters would like to add their reason which lends further support to the point-of-view presented in the paper. In reply the authors disagree with the last sentence of the comments of Solano et al., i.e., that testing the continuity of the tangential magnetic field by the M modes of the larger guide would result in a wrong formulation if the testing cross section is the smaller one. In order to clarify the whole situation, the authors present a table of all possible testing equations.

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