formula for the complex propagation constant" in terms of real frequency and the three-vector $\vec{H}$ is to take into account the correct adjoint solutions, which finally yields an equation in terms of γ and γ^2.

Reply[2] *by Srboljub R. Cvetkovic and J. Brian Davies*[3]

The authors wish to thank Dr.-Ing. Hoffman for pointing out the apparent lack of clarity in [1], for drawing attention to his paper [3], and for spotting the sign error in [1, eq. (12)]. We would therefore like to take this opportunity to discuss briefly these ambiguities, as they probably led Dr.-Ing. Hoffmann to incorrectly presume some of our steps and then to draw conclusions about the overall validity of (37).

Let us look at the central criticism on which those conclusions are based, i.e., that the authors overlooked the equations relevant to their argument, namely, (53) in [4] and (18) in [5], and consequently failed to establish the correct relationship between the fields in the original and the adjoint waveguides. This is in fact not true as [1, eq. (37)] was obtained from the well-known general formulation [1, eq. (35)] by expressing in it the adjoint field in terms of the components of the original field, as indeed is given by [4, eq. (53)] and under the key assumption that the permittivity tensor is symmetric. We agree with Dr.-Ing. Hoffman that γ terms, indeed, so not *simply* cancel out; but they do, after considerable algebraic manipulation, nevertheless lead to (37).

Looking at the relationship between the original and the adjoint solutions more closely, in contrast to Dr.-Ing. Hoffmann's suggestions, no attempt was made in our paper to identify the forward-running wave in the original with the forward-running wave in the adjoint waveguide. However, the existence of self-adjointness in the two-dimensional as opposed to three-dimensional problems, and using the real inner product, was still observed (following Bresler *et al.* [5]), but only under the following conditions: that the permittivity tensor is symmetric and provided the appropriate boundary conditions in the respective waveguides are satisfied. Then the two waveguides are identical, and the authors conclude that the solutions of the original and the adjoint problems must be two identical SETS of eigenvectors, which is clearly stated in the text and expressed using (25) and (26).

On the other hand, when considering the corresponding eigenvectors individually, it was nevertheless understood that the forward-running wave in the adjoint waveguide can be identified with the backward-running wave in the original guide, as stated by Bresler *et al.* [5], and this was taken into account when obtaining (37) from (35). As mentioned, this relationship between the corresponding eigenvectors in the two guides is also given by [4, eq. (53)]. This relationship is a result of introducing z dependence into the analysis when going from three- to two-dimensional problems, and can be deduced directly from Maxwell's equations and (42) in [4]. Of course, such a relationship might still be possible in case of certain tensors that are not symmetric (see [4, eq. (51)], where the self-adjointness is not present, and obviously (37) cannot then be applied.

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References

[1] S. R. Cvetkovic and J B. Davies, "Self-adjoint vector variational formulation for lossy anisotropic dielectric waveguide," *IEEE Trans. Microwave Theory Tech* , vol MTT-34, pp. 129–133, Jan. 1986

[2] P. R. McIsaac, "Bidirectionality in gyrotopic waveguides," *IEEE Trans. Microwave Theory Tech.*, vol. MTT-24, pp. 223–226, 1976.

[3] R. Hoffmann, "Variational formulation of electromagnetic field problems in gyrotropic media," *Arch. Elek Übertragung.*, vol AEÜ-38, pp. 271–277, 1984

[4] C. H Chen and C. D. Lien, "The variational principle for nonself-adjoint electromagnetic problems," *IEEE Trans. Microwave Theory Tech* , vol MTT-28, pp 878–886, Aug. 1980.

[5] A. D. Bresler, G. H. Joshi, and N. Marcuvitz, "Orthogonality properties for modes in passive and active uniform wave guides," *J. Appl. Phys.*, vol. 29, no. 5, pp. 794–799, May 1958.

Comments on "Computer-Aided Design Models for Millimeter-Wave Finlines and Suspended-Substrate Microstrip Lines"

JERZY K. PIOTROWSKI

In the above paper,[1] Pramanick and Bhartia state in Section I that, "In this paper, closed-form equations are developed for dispersion in bilateral and unilateral finlines by using equivalent susceptances of waveguide T-junctions, and for the characteristic impedances by curve fitting to the spectral-domain results." Expressions for wave propagation in finlines described by the authors are based on:

1) the dispersion model suggested by Meier [1];
2) the solution for cutoff wavelength in an air-filled finned waveguide proposed by Burton and Hoefer [2];
3) equations for the equivalent susceptances in the bilateral (eq. (9)) and unilateral (eqs. (8) and (14)) finlines;
4) factor K (eq. (18)) for the unilateral finline, which has been found empirically by the authors.

I would like to point out that the equivalent susceptances in the bilateral and unilateral finlines, using Marcuvitz's [3] formula for the equivalent network of a waveguide T-junction, have already been described in [4] and [5] (compare (9), (8), and (14) with (4), (8), and (10) in [4]). Additionally, the authors have known the paper [4], which is given as [20] in their references.

I wish to call this to the attention of the authors of the above paper so that in future articles they may place their work in proper perspective, and properly inform their readers of the state of the art.

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[1] P. Pramanick and P. Bhartia, *IEEE Trans. Microwave Theory Tech.*, vol. MTT-33, pp. 1429–1435, Dec. 1985.

Reply[2] *by P. Pramanick and P. Bhartia*[3]

The authors of the paper[1] are thankful to Mr. J. K. Piotrowski for pointing out the error due to a missing reference number ([20]) in their paper and regret any confusion that may have been caused to the readers due to their presentation. They also give full credit to Mr. Piotrowski for his models for the equivalent networks.

References

[1] P. J. Meier, "Integrated fin-line millimeter components," *IEEE Trans. Microwave Theory Tech.*, vol. MTT-22, pp 1209–1216, Dec. 1974.

[2] M. N. Burton and W. J. R. Hoefer, "Closed-form expressions for finned and ridged waveguides," *IEEE Trans. Microwave Theory Tech.*, vol. MTT-30, pp. 2190–2194, Dec. 1982.

[3] N. Marcuvitz, *Waveguide Handbook*. New York: McGraw-Hill, 1951.

[4] J. K. Piotrowski, "Accurate and simple formulas for dispersion in finlines," in *IEEE MTT-S Symp. Dig.*, 1984, pp. 333–335.

[5] Ch. Schieblich, J. K. Piotrowski, and J. H. Hinken, "Synthesis of optimum finline tapers using dispersion formulas for arbitrary slot widths and locations," *IEEE Trans. Microwave Theory Tech.*, vol. MTT-32, pp. 1638–1645, Dec. 1984.

[2] Manuscript received July 11, 1986.

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Corrections to "Normal Modes in an Overmoded Circular Waveguide Coated with Lossy Material"

C. S. LEE, S. W. LEE, AND S. L. CHUANG

In the above paper,[1] the following corrections need to be made.

1) The angular dependences in (19) and (20) for the surface mode and in (24) and (25) for the interface mode are missing. The angular dependences of those two modes are the same as those of the field expressions in (2).

2) The x labels in Figs. 20 and 21 in the paper should read a/a_0 instead of a/λ. The y labels should vary from 10^{-3} to 10^1 instead of 10^{-2} to 10^2 in Fig. 20; and from 10^{-3} to 10^3 instead of 10^{-2} to 10^4 in Fig. 21.

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[1] C. S. Lee, S. W. Lee, and S. L. Chuang, *IEEE Trans. Microwave Theory Tech.*, vol. MTT-34, pp. 773–785, July 1986.

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