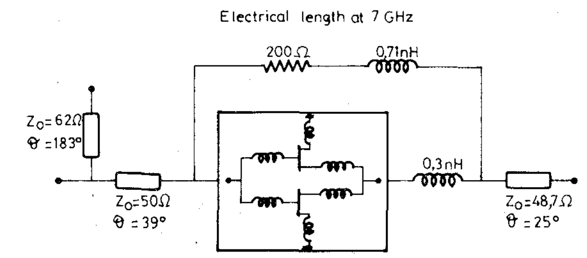

Fig. 3. 0.15–12-GHz amplifier module.

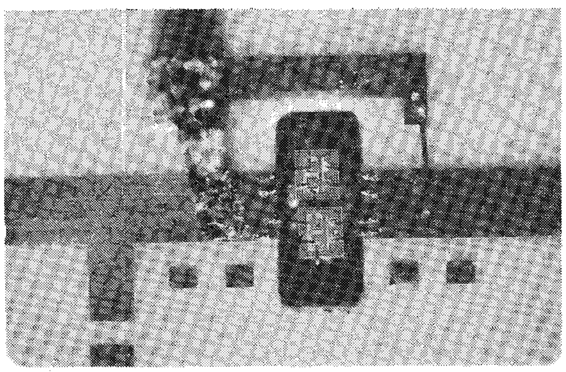

Fig. 4. Photograph of amplifier module.

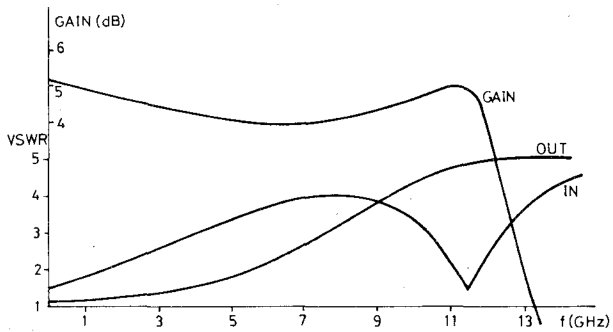

Fig. 5. Experimental results.

the practical realization of the feedback network easier. Definitely, the feedback diagrams allow us to determine the circuit that we present in Fig. 2.

Finally, two simple high-frequency matching networks were designed and the complete circuit was optimized by computer. The resulting final network is shown in Fig. 3. The stability factor was calculated obtaining $K > 1$ for all frequencies in the band.

IV. Experimental Results

A photograph of amplifier module is shown in Fig. 4. Resistors and microstrip lines are fabricated on 0.635-mm thin alumina ceramic substrates. The rated sheet resistance is 50 Ω/square and the coupling capacitor is a multilayer high-dielectric-constant ceramic capacitor. Experimental results are presented in Fig. 5, the power gain measured in a 50-Ω system is 5±0.5 dB in the 0.15–12-GHz band. The VSWR'S measured are higher than the calculated ones, this disagreement being attributed to the parasitics of the feedback network.

V. Conclusions

Using two NE-38800 chips, a feedback amplifier with 5-dB gain covering the frequency range from 0.15 to 12 GHz and low reflection coefficients has been designed. The experimental results obtained show that ultra-broad-band feedback amplifiers can be implemented with commercially available transistors.

These results are very important for the integration of this type of circuit in monolithic technology.

Acknowledgment

The authors wish to thank the members of the Laboratoire d'Etudes Microelectrique Hyperfrequence Thomson-CSF (Orsay, France), where the prototype was realized. The authors are indebted to Dr. J. Obregon who contributed to the success of this project.

References

[1] E. Ulrich, "Use negative feedback to slash wideband VSWR," *Microwaves*, pp. 66–70, Oct. 1978.

[2] K. B. Niclas, W. T. Wilson, R. B. Cold, and W. R. Hitchens, "The matched feedback amplifier: Ultrawide-band microwave amplification with GaAs MESFET's," *IEEE Trans. Microwave Theory Tech.*, vol. MTT-28, pp. 285–294, Apr. 1980.

[3] F. Pérez and V. Ortega, "A graphical method for the design of feedback networks for microwave transistor amplifier: Theory and applications," *IEEE Trans. Microwave Theory Tech.*, vol. MTT-29, pp. 1019–1027, Oct. 1981.

Comment on "A New Fin-Line Ferrite Isolator for Integrated Millimeter-Wave Circuits"

FRIEDRICH J. K. LANGE

In the above paper[1] the authors give a separation equation for "TE-eigenmodes" in a transversely magnetized ferrite as

$$k_{xn}^{(2)2} + \left(\frac{n\pi}{b}\right)^2 + \beta^2 = \omega^2 \epsilon^{(2)} \mu_{\text{eff}}. \tag{1}$$

For $n = 0$, this equation is correct when

$$\mu_{\text{eff}} = \mu_0 \left(\mu_1^2 - \mu_2^2\right) / \mu_1. \tag{2}$$

For $n \neq 0$, (1) is neither correct nor is it given in [1], as the authors try to make the readers believe. The correct treatment of the case $n \neq 0$ is mentioned on pp. 197, 198 in [1] and shown more detailed in [2], [3]. It leads to hybrid eigenmodes.

References

[1] A. G. Gurevich, *Ferrites at Microwave Frequencies*. New York: Consultants Bureau, 1963.

[2] I. Wolff, *Felder und Wellen in gyrotropen Mikrowellenstrukturen*. Braunschweig: Vieweg, 1973.

[3] F. J. K. Lange, "Analysis of shielded strip- and slot-lines on a ferrite substrate transversely magnetized in the plane of the substrate," *Arch. Elek. Übertragung.*, vol. 36, pp. 95–100, Mar. 1982.

Reply[2] by Adalbert Beyer and Klaus Solbach[3]

The comment is perfectly right in stating that the used separation equation is incorrect for higher order modes $n \neq 0$ because

Manuscript received February 10, 1982.

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[1] A. Beyer and K. Solbach, *IEEE Trans. Microwave Theory Tech.*, vol. MTT-29, pp. 1344–1348, Dec. 1981.

[2] Manuscript received April 2, 1982; revised April 4, 1982.

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we forgot to explain that we only used a quasi-isotropic approximation theory for the problem [2]. Though the exact field analysis requires hybrid modes in this case, the field expansion in the above mentioned paper employs pure TE-modes, which are valid approximately. This was done in order to allow the efficient use of the developed field expansion method for isotropic fin lines [1].

The error introduced by neglecting the hybrid character of the higher order modes is relatively small, since the main determinant of the field expansion of fin-line structures is known to be the fundamental mode $n = 0$, which, admittedly, has been treated correctly in the paper. As we mentioned in our paper, our contribution was intended to trigger further work, especially in the field-theoretical area of ferrite loaded fin lines. We are happy to hear that Mr. Lange apparently will present a full-wave hybrid theory of this problem in the future.

References

[1] A. Beyer and I. Wolff, "The solution of the earthed finline with finite metallization thickness," *IEEE MTT-S Symp. Dig.*, 1980, pp. 258–260.
[2] I. Wolff, *Felder und Wellen in gyrotropen Mikrowellenstrukturen*. Braunschweig, Vieweg, 1973, pp. 91–92.

Corrections to "A More Accurate Model of the TE_{10}-Type Waveguide Mode in Suspended Substrate"

SEYMOUR B. COHN AND GORDON D. OSTERHUES

The following corrections should be made to the above paper[1]. On page 293, (1) should read

$$Z_2 \tan \phi_2 - Z_1 \cot \phi_1 = 0.$$

On page 293, column one, six lines below (1) the definition of ϵ_1 is

$$\epsilon_1 = \left[1 - \frac{b_3}{b_1} \left(\frac{\epsilon_r - 1}{\epsilon_r} \right) \right]^{-1}.$$

Manuscript received April 6, 1982.
S. B. Cohn is with S. B. Cohn Associates, Inc., Los Angeles, CA 90049.
G. D. Osterhues is with the Ford Aerospace & Communications Corp., Aeronutronic Division, Newport Beach, CA 92660.

[1] S. B. Cohn and G. D. Osterhues, *IEEE Trans. Microwave Theory Tech*, vol. MTT-30, pp. 293–294, Mar. 1982.

Patent Abstracts

These Patent Abstracts of recently issued patents are intended to provide the minimum information necessary for readers to determine if they are interested in examining the patent in more detail. Complete copies of patents are available for a small fee by writing: U.S. Patent and Trademark Office, Box 9, Washington, DC, 20231.

4,291,939 Sept. 29, 1981

Polarization-Independent Optical Switches/Modulators

Inventors: Thomas G. Giallorenzi; Richard A. Steinberg.
Assignee: The United States of America as represented by the Secretary of the Navy.
Filed: Mar. 24, 1978.

Abstract—Optical channel waveguide switches/modulators having polarization-independent operation are disclosed. Electrodes are disposed in proximity to the waveguide channels to provide an electric field that is primarily horizontally directed in at least one channel and an electric field that is primarily vertically directed in at least one channel. Since the different electric-field orientations electrooptically induce difference changes in the index of refraction for waves of different polarization in the guides, this permits improved electrooptic control over both TM-like and TE-like modes. Embodiments of both modal interference switches/modulators and branching waveguide switches/modulators are disclosed.

16 Claims, 17 Drawing Figures