



IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES

MARCH 1987

VOLUME MTT-35

NUMBER 3

(ISSN 0018-9480)

A PUBLICATION OF THE IEEE MICROWAVE THEORY AND TECHNIQUES SOCIETY



PAPERS

- High-Speed Digital IC Performance Outlook (*Invited Paper*) P. T. Greiling 245
- Coplanar Waveguides for MMIC Applications: Effect of Upper Shielding, Conductor Backing, Finite-Extent Ground Planes, and Line-to-Line Coupling G. Ghione and C. U. Naldi 260
- Complex and Backward-Wave Modes in Inhomogeneously and Anisotropically Filled Waveguides A. S. Omar and K. F. Schünemann 268
- An Efficient Technique for Computing the Potential Green's Functions for a Thin, Periodically Excited Parallel-Plate Waveguide Bounded by Electric and Magnetic Walls W. F. Richards, K. McInturff, and P. S. Simon 276
- A Penetrable Dielectric Waveguide with Periodically Varying Circular Cross Section S. L. G. Lundqvist 282
- On the Numerical Solution of Fields in Cavities Using the Magnetic Hertz Vector M. Couture 288
- The Matrix Amplifier: A High-Gain Module for Multioctave Frequency Bands K. B. Niclas and R. R. Pereira 296
- Two-Tone Intermodulation in Diode Mixers S. A. Maas 307
- A Low-Loss Ku-Band Monolithic Analog Phase Shifter C. L. Chen, W. E. Courtney, L. J. Mahoney, M. J. Manfra, A. Chu, and H. A. Atwater 315
- General Solution for Excitation by Slotted Aperture Source in Conducting Cylinder with Concentric Layering J. R. Wait 321
- A Generalized Spectral-Domain Green's Function for Multilayer Dielectric Substrates with Application to Multilayer Transmission Lines N. K. Das and D. M. Pozar 326
- A Spectral-Domain Analysis of Periodically Nonuniform Microstrip Lines F. J. Glandorf and I. Wolff 336

SHORT PAPERS

- A Low-Frequency Investigation into the Discontinuity Capacitance of a Coaxial Line Terminated in a Lossless, Dielectric-Loaded Circular Waveguide J. D. Mahony 344
- A Printed Circuit Stub Tuner for Microwave Integrated Circuits B. J. Minnis 346
- Phase Noise Reduction in FET Oscillators by Low-Frequency Loading and Feedback Circuitry Optimization M. Prigent and J. Obregon 349

LETTERS

- Comments on "A Fast and Reliable Method for Computer Analysis of Microwave Mixers" ... M. E. Adamski and B. Schüppert 353

- PATENT ABSTRACTS J. J. Daly 354

ANNOUNCEMENT

- Special Issue on Computer-Aided Design 358



IEEE MICROWAVE THEORY AND TECHNIQUES SOCIETY

The Microwave Theory and Techniques Society is an organization, within the framework of the IEEE, of members with principal professional interest in the field of microwave theory and techniques. All members of the IEEE are eligible for membership in the Society and will receive this TRANSACTIONS upon payment of the annual Society membership fee of \$8.00. Affiliate membership is available upon payment of the annual affiliate fee of \$24.00, plus the Society fee of \$8.00. For information on joining write to the IEEE at the address below.

ADMINISTRATIVE COMMITTEE

D. N. MCQUIDDY, JR., <i>President</i>			B. E. SPIELMAN, <i>Vice President</i>		G. LERUDE, <i>Secretary</i>
K. AGARWAL	P. T. GREILING	R. LEVY	E. C. NIEHENKE	B. E. SPIELMAN	
N. W. COX	T. ITOH	S. L. MARCH	J. E. RAUE	P. W. STAECKER	
E. J. CRESCENZI, JR.	F. IVANEK	M. A. MAURY, JR.	M. V. SCHNEIDER	S. J. TEMPLE	
V. G. GELNOVATCH	R. S. KAGIWADA	D. N. MCQUIDDY, JR.			

Honorary Life Members

A. C. BECK	A. A. OLINER	K. TOMIYASU	D. K. BARTON	R. H. JANSEN
S. B. COHN	T. S. SAAD	L. YOUNG		

Distinguished Lecturers

S-MTT Chapter Chairmen

Albuquerque: R. L. HUTCHINS	Kitchner-Waterloo: Y. L. CHOW	Santa Clara Valley/San Francisco: G. VENDELIN
Atlanta: P. STEFFES	Los Angeles: K. A. JAMES	Schenectady: J. M. BORREGO
Baltimore: J. W. GIPPRICH	Middle & South Italy: R. SORRENTINO	Seattle: T. G. DALBY
Beijing: W. LIN	Milwaukee: F. JOSSE	South Africa: J. A. MALHERBE
Benelux: A. GUISSARD	Montreal: G. L. YIP	South Brevard/Indian River: T. DURHAM
Brazil: L. F. CONRADO	New Jersey Coast: A. AFRASHTEH	Southeastern Michigan: P. C. GOODMAN
Central Illinois: G. E. STILLMAN	New York/Long Island: J. LEVY	Spain: M. P. SIERRA
Central New England/Boston: N. JANSEN	North Jersey: R. V. SNYDER	St. Louis: J. MYER
Chicago: M. S. GUPTA	Orlando: M. J. KISS	Sweden: E. L. KOLLBERG
Columbus: E. H. NEWMAN	Ottawa: J. S. WIGHT	Switzerland: R. E. BALLISTI
Dallas: A. ESTES	Philadelphia: A. K. AGRAWAL	Syracuse: D. M. MCPHERSON
Dayton: G. A. THIELE	Phoenix: M. DYDYK	Tokyo: E. YAMASHITA
Denver-Boulder: D. A. HUEBNER	Portland: M. H. MONNIER	Tucson: H. C. KOHLBACHER
Florida West Coast: D. CAMERER	Princeton: B. EPSTEIN	Twin Cities: J. SULLIVAN
Houston: S. A. LONG	San Diego: D. MAY	Utah/Salt Lake City: M. F. ISKANDER
Huntsville: E. A. BOYSEN	San Fernando Valley: B. GUNSHINAN	Venezuela: A. BIANCHI
India: J. BEHARI		Washington/Northern Virginia: M. HEIMER
Israel: A. MADJAR		West Germany: R. H. JANSEN

IEEE TRANSACTIONS® ON MICROWAVE THEORY AND TECHNIQUES

Editor		Associate Editors		
R. LEVY	M. AKAIKE (Abstracts Editor—Asia)	J. J. DALY (Patent Abstracts)	J. B. HORTON (Systems and Applications)	P. W. STAECKER (Index Issues)

THE INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS, INC.

Officers

HENRY L. BACHMAN, <i>President</i>	RONALD G. HOELZEMAN, <i>Vice President, Educational Activities</i>
RUSSELL C. DREW, <i>President-Elect</i>	CARLETON A. BAYLESS, <i>Vice President, Professional Activities</i>
MERRILL W. BUCKLEY, JR., <i>Executive Vice President</i>	CHARLES H. HOUSE, <i>Vice President, Publication Activities</i>
EDWARD J. DOYLE, <i>Treasurer</i>	ROBERT S. DUGGAN, JR., <i>Vice President, Regional Activities</i>
RAMIRO GARCIA SOSA, <i>Secretary</i>	EMERSON W. PUGH, <i>Vice President, Technical Activities</i>

G. A. THIELE, *Director, Division IV—Electromagnetics and Radiation*

Headquarters Staff

ERIC HERZ, *Executive Director and General Manager*
ELWOOD K. GANNETT, *Deputy General Manager*

THOMAS W. BARTLETT, <i>Controller</i>	DAVID L. STAIGER, <i>Staff Director, Publishing Services</i>
DONALD CHRISTIANSEN, <i>Editor, IEEE Spectrum</i>	CHARLES F. STEWART, JR., <i>Staff Director, Administration Services</i>
IRVING ENGELSON, <i>Staff Director, Technical Activities</i>	DONALD L. SUPPERS, <i>Staff Director, Field Services</i>
LEO FANNING, <i>Staff Director, Professional Activities</i>	THOMAS C. WHITE, <i>Staff Director, Public Information</i>
SAVA SHERR, <i>Staff Director, Standards</i>	

Publications Department

Production Managers: ANN H. BURGMAYER, GAIL S. FERENC, CAROLYN TAMNEY
Associate Editor: WILLIAM J. HAGEN

IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES is published monthly by The Institute of Electrical and Electronics Engineers, Inc. Responsibility for the contents rests upon the authors and not upon the IEEE, the Society/Council, or its members. **IEEE Headquarters:** 345 East 47 Street, New York, NY 10017. **NY Telephone:** 212-705 + extension: Information-7900; General Manager-7910; Controller-7748; Public Information-7867; Publishing Services-7560; Spectrum-7556; Standards-7960; Technical Activities-7890. **NY Telecopier:** 212-752-4929. **NY Telex:** 236-411 (international messages only). **IEEE Service Center** (for orders, subscriptions, address changes, Educational Activities, Region/Section/Student Services): 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331. **NJ Telephone:** 201-981-0060. **IEEE Washington Office** (for U.S. professional activities): 1111 19th Street, NW, Suite 608, Washington, DC 20036. **Washington Telephone:** 202-785-0017. **Price/Publication Information:** Individual copies, IEEE members \$10.00 (first copy only), nonmembers \$20.00 per copy. (Note: Add \$4.00 postage and handling charge to any order from \$1.00 to \$50.00, including prepaid orders.) Member and nonmember subscription prices available on request. Available in microfiche and microfilm. **Copyright and Reprint Permissions:** Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limits of the U.S. Copyright Law for private use of patrons: 1) those post-1977 articles that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through the Copyright Clearance Center, 29 Congress Street, Salem, MA 01970; 2) pre-1978 articles without fee. Instructors are permitted to photocopy isolated articles for noncommercial classroom use without fee. For all other copying, reprint, or republication permission, write to Copyrights and Permissions Department, IEEE Publishing Services, 345 East 47th Street, New York, NY 10017. Copyright © 1987 by The Institute of Electrical and Electronics Engineers, Inc. All rights reserved. Second-class postage paid at New York, NY and at additional mailing offices. **Postmaster:** Send address changes to IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, IEEE, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331.