



IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES

A PUBLICATION OF THE IEEE MICROWAVE THEORY AND TECHNIQUES SOCIETY



APRIL 1995

VOLUME 43

NUMBER 4

IETMAB

(ISSN 0018-9480)

PART I OF TWO PARTS

PAPERS

Si/SiGe MMIC's	J.-F. Luy,	
K. M. Strohm, H.-E. Sasse, A. Schüppen, J. Buechler, M. Wollitzer, A. Gruhle, F. Schäffler, U. Guettich, and A. Klawnsen		705
Methods for Measuring the Power Linearity of Microwave Detectors for Radiometric Applications		
..... V. S. Reinhardt, Y. C. Shih, P. A. Toth, S. C. Reynolds, and A. L. Berman		715
Millimeter-Wave On-Wafer Waveform and Network Measurements Using Active Probes		
..... R. Y. Yu, M. Reddy, J. Pust, S. T. Allen, M. Case, and M. J. W. Rodwell		721
Planar Microwave and Millimeter-Wave Lumped Elements and Coupled-Line Filters Using Micro-Machining Techniques		
..... C.-Y. Chi and G. M. Rebeiz		730
Design of Microwave Filters by Inverse Scattering	P. P. Roberts and G. E. Town	739
Full-Wave Design of Spurious Free D.R. TE Mode Band Pass Filters		
..... A. Abdelmonem, J.-F. Liang, H.-W. Yao, and K. A. Zaki		744
A Non-Contact Interconnection Through an Electrically Thick Ground Plate Common to Two Microstrip Lines		
..... M. Davidovitz, R. A. Sainati, and S. J. Fraasch		753
The Radiometric Characterization of AMSU-B	R. W. Saunders, T. J. Hewison, S. J. Stringer, and N. C. Atkinson	760
CAD Models for Shielded Multilayered CPW	S. Gevorgian, L. J. P. Linnér, and E. L. Kollberg	772
Novel Concepts for Improved Nonlinear Transmission Line Performance		
..... H. Shi, W.-M. Zhang, C. W. Domier, N. C. Luhmann, Jr., L. B. Sjogren, and H.-X. L. Liu		780
Propagation Characteristics of TE-Waves Guided by Thin Films Bounded by Nonlinear Media		
..... J.-G. Ma and I. Wolff		790
Rigorous Analysis of Arbitrarily Shaped <i>H</i> - and <i>E</i> -Plane Discontinuities in Rectangular Waveguides by a Full-Wave Boundary Contour Mode-Matching Method	J. M. Reiter and F. Arndt	796
Analysis of a Wide Compound Slot-Coupled Parallel Waveguide Coupler and Radiator		
..... A. M. Rajeek and A. Chakraborty		802
Modeling Sources in the FDTD Formulation and Their Use in Quantifying Source and Boundary Condition Errors		
..... D. N. Buechler, D. H. Roper, C. H. Durney, and D. A. Christensen		810
Analysis of the Electromagnetic Waves in an Overmoded Finite Length Slow Wave Structure	M. R. Amin,	
K. Ogura, H. Kitamura, K. Minami, T. Watanabe, Y. Carmel, W. Main, J. Weaver, W. W. Destle, and V. L. Granatstein		815

(Continued on back cover)



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 interests 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 \$25.00. For information on joining, write to the IEEE at the address below. *Member copies of Transactions/Journals are for personal use only.*

ADMINISTRATIVE COMMITTEE

E. D. COHEN, <i>President</i>	M. A. MAURY, JR., <i>Vice President</i>	R. W. BIERIG, <i>Secretary</i>	D. G. SWANSON, <i>Treasurer</i>
J. T. BARR	M. GOLIO	T. KEMERLEY	M. SCHINDLER
R. E. BRYAN	D. HORNBuckle	R. POLLARD	R. SUDBURY
S. J. FIEDZIUSZKO	R. H. JANSEN	E. A. REZEK	G. THOREN
			J. W. WASSEL
			D. WEBB
			E. YAMASHITA

Honorary Life Members

A. C. BECK	T. S. SAAD
S. B. COHN	K. TOMIYASU
T. ITOH	L. YOUNG
A. A. OLINER	

Distinguished Lecturers

W. CURTICE	V. RIZZOLI
P. GOLDSMITH	J. R. WHINNERY
F. IVANEK	

Past Presidents

E. J. CRESCENZI (1994)
P. W. STAECKER (1993)
R. S. KAGIWADA (1992)

S-MTT Chapter Chairmen

Albuquerque: E. G. FARR	Huntsville: H. L. BENNETT	Santa Clara Valley/San Francisco: S. CRIPPS
Atlanta: A. F. PETERSON	India: S. K. KOUL	Sao Paulo: A. O. M. ANDRADE
Baltimore: J. A. MOELLERS	Indonesia: A. DITWATAMPU	Schenectady: R. J. GUTMANN
Beijing: W. LIN	Israel: A. MADJAR	Seattle: J. MCCANDLESS
Benelux: K. VAN T. KLOOSTER	Ithaca: R. C. COMPTON	Singapore: M.-S. LEONG
Buffalo: M. R. GILLETTE	Kitchener-Waterloo: Y. L. CHOW	South Africa: B. J. E. TAUTE
Central Iowa/Cedar Rapids: S. BURNS	Korea: C. W. LEE	South Australia: B. D. BATES
Central & South Italy: P. LAMPARELLO	Los Angeles: C. JACKSON	South Brevard Indian River: T. E. DURHAM
Central New England/Boston: P. H. CARR	Milwaukee: D. MISRA	Southeastern Michigan: J. W. BURNES
Chicago: E. G. BOGUS	Montreal: G. L. YIP	Spain: M. SALAZAR-PALMA
Cleveland: J. L. CHRISTIAN, JR.	New Hampshire: R. O. GEOFFROY	Springfield: K. M. LAU
College Station: R. NEVELS	New Jersey Coast: T. FITCH	St. Louis: G. J. SCHMITT
Columbus: R. LEE	New South Wales: C. D. WILSON	Sweden: J. F. JOHANSSON
Czechoslovakia: Z. SKVOR	New York/Long Island: F. WINTER	Switzerland: L. PROST
Dallas: D. EPPICH	North Italy: C. V. NALDI	Syracuse: W. Q. SONG
Dayton: B. SIMPSON	North Jersey: C. GUPTA	Taiwan: S. H. HSU
Denver-Boulder: Z. B. POPOVIC	Orlando: A. MORTAZAWI	Tokyo: M. AKAIKE
Egypt: O. L. EL SAYED	Ottawa: D. H. REEKIE	Toronto: T. E. VAN DEVENTER
Finland: E. T. KEMPPINEN	Philadelphia: A. HOORFAR	Tucson: H. C. KOHLBACHER
Florida West Coast: L. P. DUNLEAVY	Phoenix: J. T. ABERLE	Turkey: A. BUYUKALSOY
Foothill: S. M. SAAD	Poland: J. W. MODELSKI	Twin Cities: M. J. GAWRONSKI
France: R. ADDE	Portland: K. SHENAI	United Kingdom/Ireland: T. H. OXLEY
Germany: F. ARNDT	Princeton: A. KATZ	Venezuela: A. N. BIANCHI
Greece: G. KIRIAKIDIS	Rio de Janeiro/Brazil: J. R. BERGMANN	Virginia Mountain: I. J. BAH
Houston: J. T. WILLIAMS	San Diego: R. LEVY	Washington/Northern Virginia: J. I. UPSHUR
Hungary: I. FRIGYES	San Fernando Valley: M. RADMANESH	Winnipeg: H. MOHEB
		Yugoslavia: B. JOCANOVIC

IEEE TRANSACTIONS® ON MICROWAVE THEORY AND TECHNIQUES

Editor	Associate Editors
D. MASSÉ	R. SORRENTINO (Tutorial/Review Papers)
	J. B. HORTON (Systems and Applications)
	P. W. STAECKER (Index Issues)

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC. Officers

JAMES T. CAIN, <i>President</i>	JOEL B. SNYDER, <i>Vice President, Professional Activities</i>
WALLACE S. READ, <i>President-Elect</i>	W. KENNETH DAWSON, <i>Vice President, Publications</i>
CHARLES W. TURNER, <i>Secretary</i>	VIJAY K. BHARGAVA, <i>Vice President, Regional Activities</i>
V. THOMAS RHYNE, <i>Treasurer</i>	E. G. KIENER, <i>Vice President, Standards Activities</i>
KENNETH R. LAKER, <i>Vice President, Educational Activities</i>	BRUCE EISENSTEIN, <i>Vice President, Technical Activities</i>

ROLF H. JANSEN, *Director, Division IV—Electromagnetics and Radiation*

Executive Staff

THEODORE W. HISSEY, JR., <i>Executive Director</i>
RICHARD D. SCHWARTZ, <i>Acting General Manager</i>
PHYLLIS HALL, <i>Staff Executive, Publications</i>
FRANK R. MOORE, <i>Staff Executive, Volunteer Activities</i>

IRVING ENGELSON, *Staff Director, Corporate Activities*
PETER A. LEWIS, *Staff Director, Educational Activities*
MELVIN I. OLKEN, *Staff Director, Regional Activities*

ANDREW G. SALEM, *Staff Director, Standards Activities*
W. THOMAS SUTTLE, *Staff Director, Professional Activities*
ROBERT T. WANGEMANN, *Staff Director, Technical Activities*

Transactions/Journals Department

<i>Director</i>	PATRICIA WALKER
<i>Manager</i>	GAIL S. FERENC
<i>Electronic Publishing Manager</i>	JERI L. UZZO
<i>Managing Editor</i>	VALERIE CAMMARATA
<i>Senior Editor</i>	ROBERT W. DAVIDSON
<i>Associate Editor</i>	MICHAEL J. HELLRIGEL
	ROBIN V. BRYANT

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 Corporate Office:** 345 East 47 Street, New York, NY 10017-2394. **IEEE Operations Center:** 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331. **NJ Telephone:** 908-981-0060. **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 upon request. Available in microfiche and microfilm. **Copyright and Reprint Permissions:** Abstracting is permitted with credit to the source. Libraries are permitted to photocopy for private use of patrons, provided the per-copy fee indicated in the code at the bottom of the first page is paid through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. For all other copying, reprint, or republication permission, write to Copyrights and Permissions Department, IEEE Publications Administration, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331. Copyright © 1995 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. GST Registration No. 125634188. Printed in U.S.A.