



IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES

A PUBLICATION OF THE IEEE MICROWAVE THEORY AND TECHNIQUES SOCIETY



OCTOBER 1996

VOLUME 44

NUMBER 10

IETMAB

(ISSN 0018-9480)

PART I OF TWO PARTS

PAPERS

Interpolation/Extrapolation of Frequency Domain Responses Using the Hilbert Transform	1621
..... <i>S. M. Narayana, G. Rao, R. Adve, T. K. Sarkar, V. C. Vannicola, M. C. Wicks, and S. A. Scott</i>	
Modes and Their Stability of a Symmetric Two-Element Coupled Negative Conductance Oscillator Driven Spatial Power Combining Array	1628
..... <i>Z. Ding and K. Chang</i>	
Analytical Method for Determining Equivalent Circuit Parameters of GaAs FET's	1637
..... <i>S. Yanagawa, H. Ishihara, and M. Ohtomo</i>	
Low Cost and Compact Active Integrated Antenna Transceiver for System Applications	1642
..... <i>R. A. Flynt, L. Fan, J. A. Navarro, and K. Chang</i>	
Finite Element Analysis of MMIC Waveguide Structures with Anisotropic Substrates	1650
..... <i>A. C. Polycarpou, M. R. Lyons, and C. A. Balanis</i>	
Extensions of the Chalmers Nonlinear HEMT and MESFET Model	1664
..... <i>I. Angelov, L. Bengtsson, and M. Garcia</i>	
Ridge Coplanar Waveguide for Optical Amplitude Modulation	1675
..... <i>W. A. Artuzi, Jr. and T. Yoneyama</i>	
Multimode Equivalent Network Representation for <i>H</i> - and <i>E</i> -Plane Uniform Bends in Rectangular Waveguide	1679
..... <i>B. Gimeno and M. Guglielmi</i>	
Loss-Compensated Distributed Baseband Amplifier IC's for Optical Transmission Systems	1688
..... <i>S. Kimura, Y. Imai, Y. Umeda, and T. Enoki</i>	
A Simple Technique for the Design of MMIC 90° Phase-Difference Networks	1694
..... <i>M. Mahfoudi and J. I. Alonso</i>	
Capacitance of Microstrip Lines with Inhomogeneous Substrate	1703
..... <i>J.-F. Kiang</i>	
Existence of a Leaky Dominant Mode on Microstrip Line with an Isotropic Substrate: Theory and Measurements	1710
..... <i>D. Nghiem, J. T. Williams, D. R. Jackson, and A. A. Oliner</i>	
Chromatic Dispersion in Fiber-Optic Microwave and Millimeter-Wave Links ..	1716
..... <i>U. Gliese, S. Nørskov, and T. N. Nielsen</i>	

SHORT PAPERS

Microwave Noise Characterization of Two-Port Devices Using an Uncalibrated Tuner	1725
..... <i>R. Benelbar, B. Huyart, and R. G. Bosisio</i>	
The Analysis of General Two-Dimensional PEC Structures Using a Modified CPFDTD Algorithm	1728
..... <i>C. J. Railton, I. J. Craddock, and J. B. Schneider</i>	
CAD Model for Coplanar Waveguide Synthesis	1733
..... <i>T. Deng</i>	
Lower Order Modes of YBCO/STO/YBCO Circular Disk Resonators	1738
..... <i>S. Gevorgian, E. Carlsson, P. Linnér, E. Kollberg, O. Vendik, and E. Wikborg</i>	
Transient Analysis of Tapered Lines Based on the Method of Series Expansion	1742
..... <i>Y. P. Tang and S. Y. Tang</i>	
Electrostatic Potential Distribution through a Rectangular Aperture in a Thick Conducting Plane	1745
..... <i>H. H. Park and H. J. Eom</i>	
Photovoltaic-FET for Optoelectronic RF/ μ wave Switching	1747
..... <i>C. K. Sun, R. Nguyen, C. T. Chang, and D. J. Albares</i>	



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 \$8.00 plus an annual subscription fee of \$13.00. For information on joining, write to the IEEE at the address below. *Member copies of Transactions/Journals are for personal use only.*

ADMINISTRATIVE COMMITTEE

J. W. WASSEL, <i>President</i>		R. E. BRYAN, <i>Vice President</i>		R. E. LEHMANN, <i>Secretary</i>		D. G. SWANSON, <i>Treasurer</i>	
J. T. BARR	J. M. GOLIO	R. T. KEMERLEY	E. A. REZEK	G. R. THOREN	C. M. JACKSON	R. J. TREW	
R. E. BRYAN	D. HORNBuckle	R. D. POLLARD	M. J. SCHINDLER	J. W. WASSEL	D. J. SWANSON	D. C. WEBB	
S. J. FIEDZIUSZKO	R. H. JANSEN		R. W. SUDBURY		J. -W. RA	E. YAMASHITA	
<i>Honorary Life Members</i>		<i>Distinguished Lecturers</i>		<i>Past Presidents</i>			
A. C. BECK	A. A. OLINER	K. TOMIYASU	M. V. SCHNEIDER	K. WAKINO	E. D. COHEN (1995)		
S. B. COHN	T. S. SAAD	L. YOUNG	R. DIXIT		E. J. CRESCENZI (1994)		
T. ITOH					P. W. STAECKER (1993)		

S-MTT Chapter Chairmen

Albuquerque: D. D. MCLEMORE	Huntsville: H. L. BENNETT	San Diego: K.-L. P. YU
Atlanta: D. R. LEWIS, JR.	India: K. S. CHARI	San Fernando Valley: M. M. RADMANESH
Baltimore: H. B. SEQUEIRA	Indonesia: S. NATANAGARA	Santa Clara Valley/San Francisco: S. F. WETENKAMP
Beijing: W. G. LIN	Israel: A. MADJAR	Schenectady: R. J. GUTMANN
W. X. ZHANG	Kitchener-Waterloo: Y. L. CHOW	Seattle: J. MCCANDLESS
Benelux: K. VAN'T KLOOSTER	A. NATHAN	Singapore: L. MOOK-SENG
Buffalo: M. R. GILLETTE	Korea: D. C. PARK	South Africa: D. B. DAVIDSON
Bulgaria: H. D. HRISTOV	Los Angeles: J. A. VERKADE	South Australia: B. D. BATES
Central Iowa/Cedar Rapids: J. C. COZZIE	Milwaukee: J. RICHIE	South Brazil: A. O. M. ANDRADE
Central & South Italy: P. BERNARDI	Montreal: G. L. YIP	Southeastern Michigan: J. W. BURNS
Central New England/Boston: C. P. MCCLAY	New Hampshire: R. O. GEOFFROY	Spain: M. SALAZAR-PALMA
Central Virginia: S. H. JONES	New Jersey Coast: A. PAOLELLA	Springfield: J. B. MEAD
Chicago: J. DAVALOS	New South Wales: T. S. BIRD	St. Louis: R. W. KIEFEL
Cleveland: K. B. BHASIN	New York/Long Island: M. HANCZOR	Sweden: P. T. LEWIN
College Station: R. NEVELS	M. E. KNOX	Switzerland: W. BACHTOLD
Columbus: R. LEE	North Italy: C. U. NALDI	Syracuse: T. SARKAR
Czechoslovakia: M. ZEMAN	North Jersey: W. M. SCHMIDT	Taipei: G.-L. LIU
Dallas: S. R. NELSON	Oregon: V. K. TRIPATHI	Tokyo: Y. KOBAYASHI
Dayton: K. NAISHADHAM	Orlando: C. CHRISTODOULOU	Toronto: T. E. VAN DEVENTER
Denver-Boulder: R. G. GEYER	Ottawa: D. H. REEKIE	Tucson: H. C. KOHLBACHER
Egypt: I. A. SALEM	Philadelphia: W. D. JEMISON	Turkey: A. ALTINTAS
Finland: A. H. SIHVOLA	Phoenix: C. A. GAW	Twin Cities: M. J. GAWRONSKI
Florida West Coast: M. SMITH	Poland: J. W. MODELSKI	Ukraine: N. N. VOITOVICH
Foothill: D. A. PAUL	B. LEVITAS	United Kingdom/Ireland: T. H. OXLEY
France: R. A. ADDE	Princeton/Central Jersey: W. R. CURTICE	Venezuela: A. N. BIANCHI
Germany: F. ARNDT	Rio de Janeiro/Brazil: J. R. BERGMANN	Virginia Mountain: H. P. SINGH
Greece: N. K. UZUNOGLU	Russia: Y. I. BELOV	Washington D.C./Northern Virginia: S. BAIJAI
Houston: J. T. WILLIAMS	S. TRETYAKOV	Winnipeg: L. SHAFAI
R. D. NEVELS	M. V. DAVIDOVICH	Yugoslavia: B. S. JOCANOVIC
Hong Kong: K. K. MEI	V. LIOUBCHENKO	
Hungary: I. FRIGYES		

IEEE TRANSACTIONS® ON MICROWAVE THEORY AND TECHNIQUES

Associate Editors

Editor			
R. J. TREW	EIKICHI YAMASHITA	FAZAL ALI	LINDA KATEHI
Case Western Reserve Univ.	(Electromagnetics/Guided Waves)	(Applications, Tutorial, and Review)	(Special Issues and Invited Papers)
EEAP Department	The University of Electro-Communications	Nokia Mobile Phones	University of Michigan
516 Glennan Bldg.	Department of Electronic Engineering	R&D Center	EECS Department
Cleveland, OH 44106-7221	1-5-1 Chofugaoka	9605 Scranton Rd.	3240 EECS Bldg.
Phone: (216) 368-4089/4088	Chofu-shi	Suite 450	1301 Beal Avenue
Fax: (216) 368-2668	Tokyo 182 JAPAN	San Diego, CA 92121	Ann Arbor, MI 48109-2122
email: r.trew@ieee.org	Phone: +81-424-83-2161, ext. 3321	Phone: (619) 450-4020, ext. 331	Phone: (313) 747-1796
	Fax: +81-424-41-2588	Fax: (619) 677-7980	Fax: (313) 747-2106
	email: yama@wave.ee.uec.ac.jp	email: fazal.ali@nmp.nokia.com	email: katehi@eeecs.umich.edu

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

Officers

WALLACE S. READ, <i>President</i>	JOEL B. SNYDER, <i>Vice President, Professional Activities</i>
CHARLES K. ALEXANDER, <i>President-Elect</i>	W. KENNETH DAWSON, <i>Vice President, Publication Activities</i>
TSUNEO NAKAHARA, <i>Secretary</i>	RAYMOND D. FINDLAY, <i>Vice President, Regional Activities</i>
HOWARD L. WOLFMAN, <i>Treasurer</i>	DONALD C. LOUGHRY, <i>Vice President, Standards Activities</i>
JERRY R. YEARGAN, <i>Vice President, Educational Activities</i>	BRUCE A. EISENSTEIN, <i>Vice President, Technical Activities</i>

THEODORE W. HISSEY, JR., *Executive Director*

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

Executive Staff

DANIEL J. SENESE, <i>General Manager</i>	
RICHARD D. SCHWARTZ, <i>Staff Executive, Business Administration</i>	
ANTHONY J. FERRARO, <i>Staff Executive, Publications</i>	
IRVING ENGELSON, <i>Managing Director, Corporate Activities</i>	ANDREW G. SALEM, <i>Managing Director, Standards Activities</i>
PETER A. LEWIS, <i>Managing Director, Educational Activities</i>	W. THOMAS SUTTLE, <i>Managing Director, Professional Activities</i>
CECELIA JANKOWSKI, <i>Managing Director, Regional Activities</i>	ROBERT T. WANGEMANN, <i>Managing Director, Technical Activities</i>

IEEE Periodicals

Transactions/Journals Department

Staff Director: FRAN ZAPPULLA
Transactions Manager: GAIL S. FERENC
Electronic Publishing Manager: JERI L. UZZO
Editorial Manager: VALERIE CAMMARATA
Managing Editor: GERALDINE E. KROLIN

Senior Editor: ROBERT W. DAVIDSON Associate Editor: DAWN SPETH WHITE

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 © 1996 by The Institute of Electrical and Electronics Engineers, Inc. All rights reserved. Periodicals 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.