



IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES

MAY 1971

VOLUME MTT-19

NUMBER 5

Published Monthly

PAPERS

- The Even- and Odd-Mode Capacitance Parameters for Coupled Lines in Suspended Substrate *J. I. Smith* 424
- A Design Method for Meander-Line Networks Using Equivalent Circuit Transformations *R. Sato* 431
- Reciprocal and Nonreciprocal Modes of Propagation in Ferrite Stripline and Microstrip Devices *M. E. Hines* 442
- On the Design of Optimum Dual-Series Feed Networks *W. R. Jones and E. C. DuFort* 451
- Field Description with Spatial Complex Variables and Its Application to Scattering and Waveguide Problems
 *M. Hashimoto and K. Fujisawa* 458
- Diffraction of Electromagnetic Waves by a Conducting Screen Perforated Periodically with Circular Holes . . . *C. C. Chen* 475

CORRESPONDENCE

- Noise Figure for a Mixer Diode *J. W. Gewartowski* 481
- Two-Cavity Ring-Type Channel-Dropping Filters for a Millimeter-Wave Guided Wave Communication System
 *I. Ootomo, S. Shimada, and N. Suzuki* 481
- Use of Finite Difference Approximations to Partial Differential Equations for Problems Having Boundaries at Infinity
 *F. Sandy and J. Sage* 484
- New Design Equations for a Class of Microwave Filters *E. G. Cristal* 486
- Some Considerations about the Diffraction Loss of Open Resonators *G. R. Bisio, L. Ronchi, and V. Tognetti* 490
- Integrated Parametric Amplifier Module with Self-Contained Solid-State Pump Source
 *H. C. Okean, C. M. Allen, E. W. Sard, and H. Weingart* 491
- Performance Limitations of Lossy Circulators *H. Bex and E. Schwartz* 493
- Computation of Lumped Microstrip Capacities by Matrix Methods—Rectangular Sections and End Effect
 *A. Farrar and A. T. Adams* 495
- A Time-Delay Equalizer Using Directional Filter Cascades *R. D. Standley* 497

-
- CONTRIBUTORS 498

-
- INFORMATION ON COMPUTER PROGRAM DESCRIPTIONS 500
-



IEEE MICROWAVE THEORY AND TECHNIQUES GROUP

The Microwave Theory and Techniques Group 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 Group and will receive this **TRANSACTIONS** upon payment of the annual Group membership fee of \$6.00. Affiliate membership is available upon payment of the annual affiliate fee of \$16.00. For information on joining write to the IEEE at the address below.

ADMINISTRATIVE COMMITTEE

S. OKWIT, Chairman		A. CLAVIN, Vice Chairman		N. LIPETZ, Secretary-Treasurer
F. R. ARAMS	R. V. GARVER	J. B. HORTON	R. A. RIVERS	S. W. ROSENTHAL
R. W. BEATTY	G. I. HADDAD	M. C. HORTON	G. P. RODRIQUE	E. N. TORGOW
J. H. BRYANT*	R. E. HENNING*	D. B. LEESON	F. J. ROSENBAUM	A. WEXLER
H. W. COOPER		J. M. OSEPCHUK		L. YOUNG*

* *Ex officio (past chairmen)*

Honorary Life Members

A. C. BECK	A. G. CLAVIER	W. W. MUMFORD	G. C. SOUTHWORTH
------------	---------------	---------------	------------------

G-MTT Chapters

Atlanta	R. W. LARSON	Fort Worth	L. J. LANGSTON	Phoenix	D. L. STELZER
Baltimore	L. R. WHICKER	Houston	H. C. BOURNE, JR.	St. Louis	H. REID VANN
Boston	F. R. MORGENTHAUER	Huntsville	F. ROUFFY	San Diego	D. G. KILLION
Buffalo	K. BAKER	Long Island	I. BARDASH	San Francisco	D. B. WELLER
Central N. Carolina	T. R. SCHILLER	Los Angeles	W. H. HARRISON	Schenectady	W. J. D. STEENAART
Chicago	J. MEIER	Milwaukee	S. V. JASKOLSKI	Seattle	J. HARRIS
Columbus	G. T. STROPKI	Montreal	E. F. MORRIS	S. E. Michigan	C. P. TRESSELT
Connecticut	R. MASTROIANNI	New Jersey	R. V. SNYDER, JR.	Syracuse	B. L. BOWLER
Dallas	B. T. VINCENT	New York	S. HOLLANDER	Tokyo, Japan	S. OKAMURA
Denver	M. T. DECKER	Orange Co.	J. H. ZICKGRAF	Toronto	S. DIMITREWSKI
Florida-W. Coast	B. E. SIGMON	Orlando	T. R. PAGE	Tucson	E. P. PIERCE
Foothills, Calif.	H. P. JOHNSON	Philadelphia	A. J. GEIA	Washington, D. C.	R. C. VAN WAGONER

IEEE TRANSACTIONS® ON MICROWAVE THEORY AND TECHNIQUES

Editor	Associate Editors		
G. I. HADDAD	S. OKWIT (Institutional Listings)	F. G. R. WARREN (Microwave Abstracts)	J. W. BANDLER (Computer Program Descriptions)

Address all manuscripts to the Editor, G. I. Haddad, Dep. Elec. Eng., Univ. Michigan, Ann Arbor, Mich. 48104. Submission of three copies of manuscripts, including figures, will expedite the review.

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

Officers

JAMES H. MULLIGAN, JR., <i>President</i>	CLARENCE L. COATES, JR., <i>Vice President, Publication Activities</i>
ROBERT H. TANNER, <i>Vice President</i>	JOHN R. WHINNERY, <i>Secretary</i>
HAROLD CHESTNUT, <i>Vice President, Technical Activities</i>	RAYMOND W. SEARS, <i>Treasurer</i>

Headquarters Staff

DONALD G. FINK, <i>General Manager</i>	JOHN M. KINN, <i>Director, Educational Services</i>
JOHN L. CALLAHAN, <i>Staff Consultant</i>	LEON PODOLSKY, <i>Staff Consultant</i>
RICHARD M. EMBERSON, <i>Director, Technical Services</i>	CHARLES F. STEWART, JR., <i>Director, Member Services</i>
ELWOOD K. GANNETT, <i>Director, Editorial Services</i>	BETTY J. STILLMAN, <i>Administrative Assistant to the General Manager</i>
WILLIAM J. HILTY, <i>Director, Convention and Publishing Services</i>	
WILLIAM J. KEYES, <i>Director, Administrative Services</i>	

Editorial Department

H. JAMES CARTER, <i>Managing Editor, Transactions</i>
<i>Senior Editors:</i> ANDRÉE ABRAMOFF, ANN H. BURGMAYER, CAROLYNE ELENOWITZ, GAIL S. FERENC
<i>Associate Editors:</i> NANCY B. BUDDE, HELEN S. GOLDMAN, SOPHIA MARTYNEC, NANCY L. MILLER, MARILYN SALMANSON

IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES is published monthly by The Institute of Electrical and Electronics Engineers, Inc., 345 East 47 Street, New York, N. Y. 10017. Responsibility for the contents rests upon the authors and not upon the IEEE, the Group, or its members. This journal is available in either microfiche or printed form. Individual copies may be purchased at \$2.50 (first copy only) by IEEE members and \$5.00 per copy by nonmembers. Annual subscription price: IEEE members, dues plus Group fee. Price for nonmembers available on request. Abstracting is permitted with mention of source. All rights, including translation, are reserved by the IEEE. Requests for republication permission should be addressed to the IEEE Editorial Department, 345 East 47 Street, New York, N. Y. 10017. Copyright © 1971 by The Institute of Electrical and Electronics Engineers, Inc. Printed in U.S.A. Second-class postage paid at New York, N. Y., and additional mailing offices.