



IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES

FEBRUARY 1982

VOLUME MTT-30

NUMBER 2

(ISSN 0018-9480)

A PUBLICATION OF THE IEEE MICROWAVE THEORY AND TECHNIQUES SOCIETY



PAPERS

Recent Developments in Fiber Optic Devices (<i>Invited Paper</i>)	<i>K. Shirahata, W. Susaki, and H. Namizaki</i>	121
Prediction of Laser Wavelength for Minimum Total Dispersion in Single-Mode Step-Index Fibers		
.....	<i>P. S. M. Pires, D. A. Rogers, E. J. Bochov, and R. F. Souza</i>	131
Equivalent Representations of Nonuniform Transmission Lines Based on the Extended Kuroda's Identity		
.....	<i>K. Kobayashi, Y. Nemoto, and R. Sato</i>	140
A Study on Circular Disk Resonators on a Ferrite Substrate		
.....	<i>K. Araki, D. I. Kim, and Y. Naito</i>	147
Theory and Design of Low-Insertion Loss Fin-Line Filters		
.....	<i>F. Arndt, J. Bornemann, D. Grauerholz, and R. Vahldieck</i>	155
Radial-Symmetric <i>N</i> -Way TEM-Line IMPATT Diode Power Combining Arrays		
.....	<i>D. F. Peterson</i>	163
Tunable Low-Loss UHF Circulator for Cryogenic Applications		
.....	<i>J. Kadlec</i>	173
The Thermal Response of a Human in the Near-Zone of a Resonant Thin-Wire Antenna		
.....	<i>R. J. Spiegel</i>	177
A Six-Port Reflectometer and its Complete Characterization by Convenient Calibration Procedures		
.....	<i>P. I. Somlo and J. D. Hunter</i>	186

SHORT PAPERS

A Broad-Band Amplifier Output Network Design		
.....	<i>A. N. Riddle and R. J. Trew</i>	192
Application of the Galerkin Method for Determination of Quasi TE _{10k} Mode Frequencies of a Rectangular Cavity Containing a Dielectric Sample		
.....	<i>A. Kedzior and J. Krupka</i>	196
The Conservation of Complex Power Technique and <i>E</i> -Plane Step-Diaphragm Junction Discontinuities		
.....	<i>E. M. Sich and R. H. MacPhie</i>	198
Multifrequency Cryogenically Cooled Front-End Receivers for the Westerbork Synthesis Radio Telescope		
.....	<i>J. L. Casse, E. E. M. Woestenburg, and J. J. Visser</i>	201

PATENT ABSTRACTS		
.....	<i>N. R. Dietrich</i>	210



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 \$20.00. For information on joining write to the IEEE at the address below.

ADMINISTRATIVE COMMITTEE

R. A. SPARKS, *President*

C. T. RUCKER, *Vice President*

G. JERINIC, *Secretary-Treasurer*

S. F. ADAM*

J. C. AUKLAND

G. R. BASAWAPATNA

B. E. BERSON

J. E. DEGENFORD, JR.

V. G. GELNOVATCH

P. T. GREILING

R. B. HICKS

F. H. HOWE, JR.

T. ITOH

R. H. KNERR

H. J. KUNO

S. L. MARCH

E. C. NIEHENKE

H. G. OLTMAN, JR.

D. PARKER*

J. M. ROE

F. J. ROSENBAUM*

C. T. RUCKER

B. E. SPIELMAN

* *Ex officio (past presidents)*

Honorary Life Members

National Lecturer

A. C. BECK
S. B. COHN

D. D. KING
W. W. MUMFORD

A. A. OLINER
T. S. SAAD

K. TOMIYASU

F. IVANEK

S-MTT Chapter Chairmen

Albuquerque: B. SINGARAJU
Atlanta: J. A. FULLER
Baltimore: D. E. DAWSON
Benelux: A. GUSSARD
Boston: P. W. STAECCKER
Boulder/Denver: C. T. JOHNK
Buffalo: INACTIVE
Canaveral: O. K. NYHUS
Central Illinois: G. E. STILLMAN
Chicago: E. EKELMAN
Columbus: E. WALTON
Connecticut: M. GILDEN
Dallas: B. SCOTT
Florida West Coast: M. MOCZYNSKI

Houston: W. L. WILSON, JR.
Huntsville: M. D. FAHEY
India: R. P. WADHWA
Kitchener-Waterloo: Y. L. CHOW
Los Angeles: F. J. BERNUES
Milwaukee: C. J. KOTLARZ
Montreal: R. BELANGER
New Jersey Coast: B. GLANCE
New York/Long Island: J. HAUSNER
North Jersey: R. SNYDER
Orange County: J. C. AUKLAND
Orlando: C. F. SCHUNEMANN
Ottawa: R. P. DOUVILLE
Philadelphia: M. AFIFI

Phoenix: A. C. BROWN, JR.
Portland: INACTIVE
Princeton: M. KUMAR
San Diego: G. L. VANCE
Santa Clara Valley: J. CRESCENZI
Schenectady: R. A. DEHN
Seattle: D. K. REYNOLDS
Southeastern Michigan: P. I. PRESSEL
St. Louis: J. BOGDANOR
Syracuse: C. R. ROBERTS
Tel Aviv: A. MADJAR
Tokyo: Y. KONISHI
Tucson: E. P. PIERCE
Washington, DC: A. W. FRIEND, JR.

IEEE TRANSACTIONS® ON MICROWAVE THEORY AND TECHNIQUES

Editor

R. H. KNERR

N. R. DIETRICH
(*Patent Abstracts*)

Associate Editors

H. G. OLTMAN, JR.
(*Applications*)

E. YAMASHITA
(*Abstracts Editor—Asia*)

Address all manuscripts to the Editor, R. H. Knerr, Bell Laboratories, 555 Union Boulevard, Allentown, PA 18103. Submission of three copies of manuscripts, including figures, will expedite the review. *Publication Policy:* All papers will be reviewed for their technical merit, and decisions to publish will be made independently of an author's ability or willingness to pay charges. Voluntary page charges of \$85 per printed page will be requested for papers of five pages or less. Page charges of \$100 per page are mandatory for each page in excess of five printed pages. Also, the MTT-S Administrative Committee has established a quota for the number of pages printed in each issue of this TRANSACTIONS whose costs are not defrayed by payment of page charges. Papers not covered by page charges may be delayed until space in an issue is available. The Editor can waive the quota requirement for exceptional papers or because of other extenuating circumstances.

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

Officers

ROBERT E. LARSON, *President*
JAMES B. OWENS, *President-Elect*
THELMA A. ESTRIN, *Executive Vice President*
CHARLES A. ELDON, *Treasurer*
DICK C. J. POORTVLIET, *Secretary*

EDWARD W. ERNST, *Vice President, Educational Activities*
EDWARD J. DOYLE, *Vice President, Professional Activities*
G. P. RODRIGUE, *Vice President, Publication Activities*
HANS C. CHERNEY, *Vice President, Regional Activities*
JOSE B. CRUZ, JR., *Vice President, Technical Activities*

ALLAN C. SCHELL, *Division IV Director*

Headquarters Staff

ERIC HERZ, *Executive Director and General Manager*

ELWOOD K. GANNETT, *Deputy General Manager*

THOMAS W. BARTLETT, *Controller*
DONALD CHRISTIANSEN, *Editor of Spectrum*
IRVING ENGELSON, *Staff Director, Technical Activities*
LEO FANNING, *Staff Director, Professional Activities*
ELWOOD K. GANNETT, *Acting Staff Director, Publishing Services*

SAVA SHERR, *Staff Director, Standards*

EMILY L. SIRJANE, *Staff Director, Corporate Services*

CHARLES F. STEWART, JR., *Staff Director, Administration Services*

DONALD L. SUPPERS, *Staff Director, Field Services*

JOHN F. WILHELM, *Staff Director, Professional Activities*

Publications Department

H. JAMES CARTER, *Associate Staff Director*

Production Managers: ANN H. BURGMEYER, CAROLYN ELENOWITZ, GAIL S. FERENC*, ISABEL NAREA

Associate Editors: MARY E. GRANGEIA, THOMAS R. GRECO, ELAINE A. MAROTTA,

JEFFREY S. MARTIN, EVELYN C. NORMAN, BARBARA A. SOMOGYI

* *Responsible for this Transactions*

IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES is published monthly by The Institute of Electrical and Electronics Engineers, Inc. **Headquarters:** 345 East 47 Street, New York, NY 10017. Responsibility for the contents rests upon the authors and not upon the IEEE, the Society, or its members. **IEEE Service Center** (for orders, subscriptions, address changes, Region/Section/Student Services): 445 Hoes Lane, Piscataway, NJ 08854. **Telephones:** Headquarters 212-644 + extension: Information -7900, General Manager -7910, Controller -7748, Educational Services -7860, Publishing Services -7560, Standards -7960, Technical Services -7890. IEEE Service Center 201-981-0060. Professional Services: Washington Office 202-785-0017. **NY Telecopier:** 212-752-4929. **Telex:** 236-411 (International messages only). Individual copies: IEEE members \$6.00 (first copy only), nonmembers \$12.00 per copy. Annual subscription price: IEEE members, dues plus Society fee. Price for nonmembers on request. Available in microfiche and microfilm. **Copyright and Reprint Permission:** Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limits of 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, 21 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 other copying, reprint or republication permission, write to Director, Publishing Services at IEEE Headquarters. All rights reserved. Copyright © 1982 by The Institute of Electrical and Electronics Engineers, Inc. Printed in U.S.A. Second-class postage paid at New York, NY and at additional mailing offices.