



IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES

SEPTEMBER 1976

VOLUME MTT-24

NUMBER 9

A PUBLICATION OF THE IEEE MICROWAVE THEORY AND TECHNIQUES SOCIETY



ACCENT ON THEORY

PAPERS

- Electromagnetic Theory of the Loosely Braided Coaxial Cable: Part I *J. R. Wait* 547
- Vector Variational Formulation of Electromagnetic Fields in Anisotropic Media *A. Konrad* 553
- A Perturbation Method for the Analysis of Wave Propagation in Inhomogeneous Dielectric Waveguides with Perturbed Media *M. Hashimoto* 559
- Slow-Wave Propagation Along Variable Schottky-Contact Microstrip Line *D. Jäger* 566
- Analysis of a Waveguide Mounting Configuration for Electronically Tuned Transferred-Electron-Device Oscillators and its Circuit Application *J. S. Joshi and J. A. F. Cornick* 573
- Integrated Approach to Microwave Design *J. W. Bandler, P. C. Liu, and H. Tromp* 584
- Effect of the Magnetic Perturbation on Magnetostatic Surface-Wave Propagation *M. Tsutsumi, T. Bhattacharyya, and N. Kumagai* 591
- Different Representations of Dyadic Green's Functions for a Rectangular Cavity *C. T. Tai and P. Rozenfeld* 597

SHORT PAPERS

- A New Approximation for the Capacitance of a Rectangular-Coaxial-Strip Transmission Line *J. C. Tippet and D. C. Chang* 602
- A Coplanar Waveguide with Thick Metal-Coating *T. Kitazawa, Y. Hayashi, and M. Suzuki* 604
- Analytical IC Metal-Line Capacitance Formulas *W. H. Chang* 608
- Equivalent Circuit of a Narrow Axial Strip in Waveguide *K. Chang and P. J. Khan* 611
- On the Theory of Coupling Between Finite Dielectric Resonators *L. Pettersson* 615
- Effect of Diode Parameters on Reflection-Type Phase Shifters *P. Wahí and K. C. Gupta* 619
- Effects of the Surroundings on Electromagnetic-Power Absorption in Layered-Tissue Media *P. Bernardi, F. Giannini, and R. Sorrentino* 621

LETTERS

- General Form of Green's Function for Multilayer Microstrip Line with Rectangular Side Walls *M. Kobayashi and R. Terakado* 626
- Comments on "Design Equations for an Interdigitated Directional Coupler" *J. A. Mosko* 628
- Correction to "Analysis of Microstrip-Like Transmission Lines by Nonuniform Discretization of Integral Equations" *E. Yamashita* 628

CONTRIBUTORS 629



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 \$7.00. Affiliate membership is available upon payment of the annual affiliate fee of \$18.00. For information on joining write to the IEEE at the address below.

ADMINISTRATIVE COMMITTEE

G. P. RODRIGUE, *President*

L. R. WHICKER, *Vice President*

C. T. RUCKER, *Secretary-Treasurer*

S. F. ADAM
J. L. ALLEN
D. B. ANDERSON
K. J. BUTTON
H. W. COOPER*

J. E. DEGENFORD, JR.
A. W. GUY
G. I. HADDAD
J. B. HORTON*
H. G. HOWE, JR.

H. J. KUNO
H. G. OLTMAN, JR.
D. PARKER
R. A. RIVERS*
F. J. ROSENBAUM

H. E. SCHRANK
H. SOBEL
R. A. SPARKS
H. E. STINEHELPER, JR.

* *Ex officio (past chairmen)*

Honorary Life Members

A. C. BECK W. W. MUMFORD
D. D. KING T. S. SAAD

National Lecturer

F. STERZER
R. W. BEATTY

S-MTT Chapter Chairmen

Atlanta
Baltimore
Boston
Boulder-Denver
Central Illinois
Chicago
Columbus
Dallas
Florida West Coast
Houston
Huntsville

G. H. ROBINSON
T. M. NELSON
C. P. HARTWIG
P. A. HUDSON
B. F. CHERRINGTON
J. P. PHILLIPS
T. A. SELIGA
M. L. WALLACE
S. C. BLOCH
S. A. LONG
M. D. FAHEY

India
NY/Long Island
Los Angeles Council
Milwaukee
Montreal
N. J. Coast
North Jersey
Orange County
Orlando
Ottawa
Philadelphia
Phoenix

G. P. SRIVASTAVA
A. J. KELLY
H. POMERANZ
J. H. BATTOCLETTI
G. L. YIP
S. MARSHALL
E. W. NIEMIEC
J. C. AUKLAND
J. R. ASHWELL
D. R. JAMES
C. E. PROFERA, JR.
G. D. BRUNNER

Portland
St. Louis
San Diego
San Francisco
Schenectady
Seattle
S. E. Michigan
Syracuse
Tel Aviv
Tokyo, Japan
Washington, DC

P. P. FASANG
J. M. ROE
H. S. CABAYAN
L. BESSER
R. J. GUTMANN
G. I. MITCHELL
H. WEIL
H. SCHUMAN
A. I. MADJAR
S. SAITO
B. SHELEG

IEEE TRANSACTIONS® ON MICROWAVE THEORY AND TECHNIQUES

Editor

D. PARKER

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

J. E. DEGENFORD, JR.
(*Business Editor*)

Associate Editors

B. PERLMAN
(*Computer Program
Descriptions*)

M. CAULTON
(*Special Issues*)

T. OKOSHI
(*Abstracts Editor—Asia*)

H. E. SCHRANK
(*Institutional
Listings*)

Address all manuscripts to the Editor, D. Parker, Stanford Res. Inst., Building 44, 333 Ravenswood Ave., Menlo Park, CA 94025. 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 page charges. Voluntary page charges of \$70 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

JOSEPH K. DILLARD, *President*
ROBERT F. COTELLESA, *Executive Vice President*
BURKHARD H. SCHNEIDER, *Secretary-Treasurer*
ROBERT F. BRISKMAN, *Vice President, Technical Activities*

JAMES H. MULLIGAN, JR., *Vice President, Professional Activities*
IRENE C. PEDEN, *Vice President, Educational Activities*
ROBERT M. SAUNDERS, *Vice President, Regional Activities*
JEROME J. SURAN, *Vice President, Publication Activities*

Headquarters Staff

THOMAS W. BARTLETT, *Controller*
DONALD CHRISTIANSEN, *Editor of Spectrum*
RICHARD M. EMBERSON, *Director, Educational, Field, and Technical Services*

HERBERT A. SCHULKE, JR., *General Manager*

DONALD G. FINK, *Executive Consultant*
ELWOOD K. GANNETT, *Director, Publishing Services*
CHARLES F. STEWART, JR., *Senior Staff Director*

Publications Department

H. JAMES CARTER, *Manager, Publication Production*

Supervisors, Publication Production: ANN H. BURGMAYER, CAROLYN ELENOWITZ, GAIL S. FERENC*
Associate Editors: LINDA GRADY-TROIA, PRIJONO HARDJOWIROGO, CASIMIR PSUJEK, CLARA ZAPITI

* *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): 445 Hoes Lane, Piscataway, NJ 08854. **Telephones:** Headquarters 212-644 + extension: Information -7900, General Manager -7910, Controller -7748, Educational Services -7860, Publishing Services -7560, Region/Section Services -7750, Technical Services -7890, IEEE Service Center 201-981-0060. Washington Office/Professional Services 202-785-0017. Individual copies: IEEE members \$5.00 (first copy only), nonmembers \$10.00 per copy. Annual subscription price: IEEE members, dues plus Society fee. Price for nonmembers on request. Available in microfiche and microfilm. Abstracting is permitted with mention of source. For republication permission write to Director, Publishing Services at IEEE Headquarters. All rights reserved. Copyright © 1976 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.