



IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES

NOVEMBER 1975

VOLUME MTT-23

NUMBER 11

A PUBLICATION OF THE IEEE MICROWAVE THEORY AND TECHNIQUES SOCIETY



ACCENT ON THEORY

PAPERS

- Fundamental- and Harmonic-Frequency Circuit-Model Analysis of Interdigital Transducers with Arbitrary Metal-
lization Ratios and Polarity Sequences *W. R. Smith and W. F. Pedler* 853
- A Chebyshev Approximation Method for Microstrip Problems *G. M. L. Gladwell and S. Coen* 865
- Numerical Solution of Coupling Between Two Collinear Parallel-Plate Waveguides
..... *Y. E. Elmoazzen and L. Shafai* 871
- Nondegenerate Surface-Wave Mode Coupling Between Dielectric Waveguides *E. F. Kuester and D. C. Chang* 877
- Single-Mode Pulse Dispersion in Optical Waveguides *E. F. Kuester and D. C. Chang* 882
- Computation of the Electromagnetic Fields and Induced Temperatures Within a Model of the Microwave-Irradi-
ated Human Eye *A. Taflove and M. E. Brodwin* 888
- Even- and Odd-Mode Waves for Nonsymmetrical Coupled Lines in Nonhomogeneous Media *R. A. Speciale* 897
- Annotated Literature Survey of Microwave Ferrite Control Components and Materials for 1968-1974
..... *L. R. Whicker and D. M. Bolle* 908

SHORT PAPERS

- Effect of Discontinuities on the Group Delay of a Microwave Transmission Line *R. W. Beatty and T. Y. Otoshi* 919
- Performance Characteristics of 4-Port Stripline Circulators *A. M. Hussein, M. M. Ibrahim, and S. E. Youssef* 923
- Insertion Loss of 3-Port Circulator with One Port Terminated in Variable Short Circuit
..... *J. Helszajn, G. P. Riblet, and J. R. Mather* 926
- Application of a Property of the Airy Function to Fiber Optics *J. A. Arnaud and W. Mammel* 927
- The Relation of Teratogenesis in *Tenebrio molitor* to the Incidence of Low-Level Microwaves
..... *L. M. Liu, F. J. Rosenbaum, and W. F. Pickard* 929
- The Coupling of a Single-Ridge Waveguide to a Fabry-Perot Resonator *M. L. Van Blaricum* 931

LETTERS

- Comments on "Radiation from Curved Dielectric Slabs and Fibers" *J. A. Arnaud* 935

- CONTRIBUTORS 937



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

H. W. COOPER, *President*

G. P. RODRIGUE, *Vice President*

J. E. DEGENFORD, *Secretary-Treasurer*

S. F. ADAM

J. L. ALLEN

D. B. ANDERSON

R. W. BEATTY

K. J. BUTTON

* *Ex officio (past chairmen)*

A. CLAVIN*

A. W. GUY

G. I. HADDAD

J. B. HORTON*

R. M. KNOX

H. G. OLTMAN

D. PARKER

R. A. RIVERS*

F. J. ROSENBAUM

H. SOBOL

R. A. SPARKS

H. STINEHELPER

D. F. WAIT

L. R. WHICKER

Honorary Life Members

A. C. BECK

D. D. KING

W. W. MUMFORD

T. S. SAAD

K. TOMIYASU

National Lecturer

ROBERT W. BEATTY

S-MTT Chapter Chairmen

Atlanta

Baltimore

Boston

Boulder-Denver

Buffalo

Chicago

Columbus

Connecticut

Dallas

Florida West Coast

Houston

Huntsville

G. H. ROBINSON

T. L. AP RHYS

H. E. STINEHELPER, SR.

L. LEWIN

L. L. GRINIUS

J. P. PHILLIPS

T. A. SELIGA

M. GILDEN

M. L. WALLACE

J. L. ALLEN

W. L. WILSON, JR.

J. M. LOOMISI, III

India

NY/Long Island

Los Angeles Council

Milwaukee

Montreal

N. J. Coast

North Jersey

Orange County

Orlando

Ottawa

Philadelphia

Phoenix

V. P. KODALI

E. W. MARKARD

D. G. KELLING

J. H. BATTOCLETTI

G. L. YIP

S. MARSHALL

E. M. NIEMIEC

J. A. SANGUINET

J. R. ASHWELL

D. S. JAMES

C. E. PROFERA, JR.

R. J. KENYON

St. Louis

San Diego

San Francisco

Schenectady

Seattle

S. E. Michigan

Syracuse

Tel Aviv

Tokyo, Japan

Washington, D. C.

J. M. ROE

J. M. DEVAN

D. R. CHAMBERS

W. A. DAVIS

G. L. MITCHELL

W. G. RADO

A. FARRAR

A. I. MADJAR

S. SAITO

A. R. SINDORIS

IEEE TRANSACTIONS® ON MICROWAVE THEORY AND TECHNIQUES

Editor

D. PARKER

H. G. OLTMAN

(Applications)

D. F. WAIT

(Business Editor)

B. PERLMAN

(Computer Program

Descriptions)

Associate Editors

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, Calif. 94025. Submission of three copies of manuscripts, including figures, will expedite the review.

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

Officers

ARTHUR P. STERN, *President*

JOSEPH K. DILLARD, *Executive Vice President*

BURKHARD H. SCHNEIDER, *Secretary-Treasurer*

FRANK S. BARNES, *Vice President, Publication Activities*

ROBERT F. COTELLESA, *Vice President, Technical Activities*

HAROLD S. GOLDBERG, *Vice President, Professional Activities*

T. F. JONES, JR., *Vice President, Educational Activities*

ROBERT M. SAUNDERS, *Vice President, Regional Activities*

Headquarters Staff

H. A. SCHULKE, JR., *General Manager, Executive Director*

THOMAS W. BARTLETT, *Controller*

ESMI L. BIDSTRUP, *Special Assistant to the President*

LEONARD FARRELL, *Director, Professional Services*

DONALD G. FINK, *Executive Consultant*

JACK FRAUM, *Director, EDP Services*

ELWOOD K. GANNETT, *Director, Publishing Services*

JOHN M. KINN, *Director, Educational Services*

R. J. MENDOLIA, *Director, Administrative Services*

CHARLES F. STEWART, JR., *Director, Member and Field Services*

BETTY J. STILLMAN, *Executive Assistant to the Executive Director*

EDWARD M. EMBERSON, *Director, Technical Services*

EDWIN D. MACDONALD, *Conference Services*

SAVA I. SHERR, *Standards*

Editorial Department

H. JAMES CARTER, *Manager, Editorial Services*

Senior Editors: NANCY B. BUDD*, ANN H. BURGMAYER, CAROLYN ELENOWITZ, GAIL S. FERENC

Associate Editors: CLARA FEGER, HELEN S. GOLDMAN, PRIJONO HARIDJOWIROGO, CASIMIR PSUJEK, TRUMBULL ROGERS

* *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, N. Y. 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, N. J. 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 © 1975 by The Institute of Electrical and Electronics Engineers, Inc. Printed in U.S.A. Second-class postage paid at New York, N. Y. and at additional mailing offices.