



IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES

SEPTEMBER 1982

VOLUME MTT-30

NUMBER 9

(ISSN 0018-9480)

A PUBLICATION OF THE IEEE MICROWAVE THEORY AND TECHNIQUES SOCIETY



SPECIAL ISSUE ON MICROWAVE FILTERS

FOREWORD	S. B. Cohn	1297
INTRODUCTION	A. E. Williams and A. E. Atia	1298

PAPERS

Synthesis and Realization of Narrow-Band Canonical Microwave Bandpass Filters Exhibiting Linear Phase and Transmission Zeros (<i>Invited Paper</i>)	G. Pfitzenmaier	1300
Dual-Mode Dielectric Resonator Loaded Cavity Filters	S. J. Fiedziuszko	1311
A 450-W Output Multiplexer for Direct Broadcasting Satellites	D. J. Rosowsky and D. Wolk	1317
Transmit-Receive Multiplexer for the 12-14-GHz Band	H. L. Thal, Jr.	1324
Microwave Filter Loss Mechanisms and Effects	H. L. Thal, Jr.	1330
Canonical Asymmetric Coupled-Resonator Filters	H. C. Bell, Jr.	1335
A Novel Class of Generalized Chebyshev Low-Pass Prototype for Suspended Substrate Stripline Filters	S. A. Alseyab	1341
Design of Low-Pass Elliptic Filters by Means of Cascaded Microstrip Rectangular Elements	F. Giannini, M. Salerno, and R. Sorrentino	1348
Electronically Tunable Microwave Bandpass Filters	I. C. Hunter and J. D. Rhodes	1354
Electronically Tunable Microwave Bandstop Filters	I. C. Hunter and J. D. Rhodes	1361
Analysis and Composition of a New Microwave Filter Configuration with Inhomogeneous Dielectric Medium	A. Fukasawa	1367
Synthesis and Realization of Multisection Tandem Stripline Bandpass Filters	G. Saulich	1375

SHORT PAPERS

The Design of a Multiple Cavity Equalizer	M. H. Chen	1380
Improved Selectivity in Cylindrical TE ₀₁₁ Filters by TE ₂₁₁ /TE ₃₁₁ Mode Control	D. E. Kreinheder and T. D. Lingren	1383
Quarter-Wavelength Coupled Variable Bandstop and Bandpass Filters Using Varactor Diodes	S. Toyoda	1387

PATENTS	N. R. Dietrich	1390
---------------	----------------	------



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*

V. G. GELNOVATCH

R. H. KNERR

D. PARKER*

J. C. AUKLAND

P. T. GREILING

H. J. KUNO

J. M. ROE

G. R. BASAWAPATNA

R. B. HICKS

S. L. MARCH

F. J. ROSENBAUM*

B. E. BERSON

F. H. HOWE, JR.

E. C. NIEHENKE

B. E. SPIELMAN

J. E. DEGENFORD, JR.

T. ITOH

H. G. OLTMAN, JR.

** 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
L. YOUNG

F. IVANEK
J. A. GIORDMAINE

S-MTT Chapter Chairmen

Albuquerque: **B. SINGARAJU**
Atlanta: **J. A. FULLER**
Baltimore: **D. E. DAWSON**
Benelux: **A. GUISSARD**
Boston: **P. W. STAECKER**
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. K. ARORA**
Israel: **A. MADJAR**
Kitchener-Waterloo: **Y. L. CHOW**
Los Angeles: **F. J. BERNUES**
Milwaukee: **C. J. KOTLARZ**
Montreal: **J. L. LEIZEROWICZ**
New Jersey Coast: **M. V. SCHNEIDER**
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; J. BULL**
Phoenix: **A. C. BROWN, JR.**
Portland: **INACTIVE**
Princeton: **H. HUANG**
San Diego: **C. DONN**
Santa Clara Valley: **J. CRESCENZI**
Schenectady: **R. A. DEHN; J. BORREGO**
Seattle: **C. K. CHOU**
Southeastern Michigan: **P. I. PRESSEL**
St. Louis: **J. BOGDANOR; W. CONNORS**
Syracuse: **C. R. ROBERTS; D. AUCKLAND**
Tokyo: **Y. KONISHI**
Tucson: **E. P. PIERCE**
Washington, DC: **J. H. JACOBI**

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, T. Itoh, Dept. of Electrical Engineering, University of Texas at Austin, Austin, TX 78712. 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. ELTON, 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, Contoller
DONALD CHRISTIANSEN, Editor of Spectrum
IRVING ENGELSON, Staff Director, Technical Activities
LEO FANNING, Staff Director, Professional Activities

SAVA SHERR, Staff Director, Standards
DAVID L. STAIGER, Staff Director, Publishing 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

Production Managers: **ANN H. BURGMEYER, CAROLYN ELENOWITZ, GAIL S. FERENC***
Associate Editors: **JOHN DE GASPARI, MARY E. GRANGEIA, THOMAS R. GRECO,**
JEFFREY S. MARTIN, NELA RYBOWICZ, 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 212-705 + extension; Information -7900. General Manager -7910, Contoller -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. **Postmaster:** Send Address changes to IEEE, 445 Hoes Lane, Piscataway, NJ 08854.