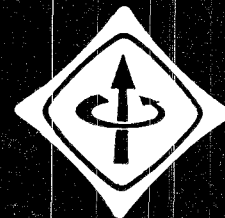


IEEE Transactions

ON MICROWAVE THEORY AND TECHNIQUES



Formerly IRE Transactions on Microwave Theory and Techniques

Volume MTT-11

MARCH, 1963

Number 2

Published Bimonthly

Waffle-Iron Filter

3-Port Y-Junction Ferrite Circulator

Stabilization of Mixer Diode Performance

Lines with Thin Tubular Conductors

Variable Directional Couplers

Millimeter Resonant Structures

**PROFESSIONAL TECHNICAL GROUP ON
MICROWAVE THEORY AND TECHNIQUES**

IEEE PROFESSIONAL TECHNICAL GROUP ON MICROWAVE THEORY AND TECHNIQUES

The Professional Technical Group on Microwave Theory and Techniques is an association of IEEE members with professional interest in the field of Microwave Theory and Techniques. All IEEE members are eligible for membership and will receive all Group publications upon payment of the prescribed annual fee of \$4.00. Members of the American Physical Society and the Institution of Electrical Engineers of Great Britain may become affiliated with PTGMTT and receive all Group publications upon payment of the Affiliate fee of \$7.50 per year.

Administrative Committee

Chairman

S. B. COHN

Vice Chairman

D. D. KING

Secretary-Treasurer

E. N. TORGOW

B. D. AARON	R. C. HANSEN	T. S. SAAD
H. M. ALTSCHULER	G. L. MATTHAEI	G. SHAPIRO
T. N. ANDERSON	W. W. MUMFORD	K. TOMIYASU
R. W. BEATTY	A. A. OLINER	R. D. WENGENROTH
A. C. BECK	R. A. RIVERS	J. L. YEN
	S. W. ROSENTHAL	

Honorary Life Members

G. C. SOUTHWORTH

A. G. CLAVIER

Editor

ROBERT W. BEATTY

PTGMTT Chapters

Albuquerque-Los Alamos	D. C. Thorn	Omaha-Lincoln	A. R. Edison
Baltimore	F. C. Ogg, Jr.	Orange Belt	C. E. Dunn
Boston	R. Tennenholtz	Orlando	R. E. Johnson
Buffalo-Niagara	D. J. Leonard	Philadelphia	H. B. Klippel
Chicago	H. Zucker	San Diego	Harley Babbitt
Columbus	W. D. Stuart	San Francisco	P. D. Strum
Denver-Boulder	R. W. Beatty	Santa Ana	D. S. Sabih
Detroit	J. H. Bryant	Schenectady	C. B. Mayer
Florida-W. Coast	R. C. Aucremann	Seattle	I. C. Peden
Long Island	L. W. Forker	Syracuse	H. G. Totten
Los Angeles	A. Clavin	Tokyo, Japan	Kivoshi Morita
Montreal	F. G. R. Warren	Toronto	J. L. Yen
New York	S. Hollander	Washington, D.C.	J. A. Kaiser, Jr.
Northern N.J.	R. S. McCarter		

IEEE TRANSACTIONS

on Microwave Theory and Techniques

Published by The Institute of Electrical and Electronics Engineers, Inc., for the Professional Technical Group on Microwave Theory and Techniques, Box A, Lenox Hill Station, New York 21, N.Y. Responsibility for the contents rests upon the authors, and not upon the IEEE, the Group, or its members. Individual copies of this issue may be purchased at the following prices: IEEE members (one copy) \$2.25, libraries and colleges \$3.25, all others \$4.50. Annual subscription price: nonmembers, \$17.00; college and public libraries, \$12.75.

Address all manuscripts to Robert W. Beatty, PTGMTT Editor, National Bureau of Standards, Boulder, Colo. Submission of three copies of manuscripts, including figures, will expedite the review.

COPYRIGHT © 1963—THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

Printed in U.S.A.

All rights, including translations, are reserved by The Institute of Electrical and Electronics Engineers, Inc. Requests should be addressed to the Institute of Electrical and Electronics Engineers, Box A, Lenox Hill Station, New York 21, N.Y.