



IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES

APRIL 1972

VOLUME MTT-20

NUMBER 4

Published Monthly



PAPERS

The Planar Circuit—An Approach to Microwave Integrated Circuitry	<i>T. Okoshi and T. Miyoshi</i>	245
LSE ₂₀ -Mode Characteristics in Phase-Shifter Parametrization	<i>G. N. Tsandoulas, F. G. Willwerth, and W. J. Ince</i>	253
Narrow-Bandpass Waveguide Filters	<i>A. E. Atia and A. E. Williams</i>	258
Power Amplification with IMPATT Diodes in Stable and Injection-Locked Modes	<i>Y. Takayama</i>	266
The Diffraction of Electromagnetic Waves by Dielectric Steps in Waveguides	<i>E. G. Royer and R. Mittra</i>	273
Attenuation Characteristics of Hollow Conducting Elliptical Waveguides	<i>J. G. Kretzschmar</i>	280

SHORT PAPERS

A Novel Design of an X-Band High-Power Ferrite Phase Shifter	<i>K. H. Hering</i>	284
Wide-Band Phase Locking and Phase Shifting Using Feedback Control of Oscillators	<i>D. Rubin</i>	286
Notes on the Conjugate Matched Two-Port as an UHF Amplifier	<i>C. S. Gledhill and M. F. Abulela</i>	289
A Multioctave Microstrip 50- Ω Termination	<i>D. LaCombe</i>	290
The Solution of Helmholtz Equation in Elliptical Domains	<i>P. A. Laura</i>	292

LETTERS

Instantaneous Frequency-Measuring Receivers	<i>N. E. Goddard</i>	292
Correction to "Distortion Performance of the Abrupt-Junction Current-Pumped Varactor Frequency Converter"	<i>J. G. Gardiner and S. I. Ghobrial</i>	293
Correction to "Computation of Lumped Microstrip Capacities by Matrix Method—Rectangular Sections and End Effect"	<i>A. Farrar and A. T. Adams</i>	294

COMPUTER PROGRAM DESCRIPTIONS

FINPLT: A Finite-Element Field-Plotting Program	<i>Z. Csendes and P. Silvester</i>	294
---	------------------------------------	-----

CONTRIBUTORS	295
--------------------	-----



IEEE MICROWAVE THEORY AND TECHNIQUES GROUP

The Microwave Theory and Techniques Group 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 Group and will receive this TRANSACTIONS upon payment of the annual Group membership fee of \$7.00. Affiliate membership is available upon payment of the annual affiliate fee of \$16.00. For information on joining write to the IEEE at the address below.

ADMINISTRATIVE COMMITTEE

A. CLAVIN, <i>President</i>		J. B. HORTON, <i>Vice President</i>		D. PARKER, <i>Secretary-Treasurer</i>	
F. R. ARAMS	H. W. COOPER	N. LIPETZ	G. P. RODRIQUE	E. N. TORGOW	
R. W. BEATTY	R. V. GARVER	S. OKWIT*	F. J. ROSENBAUM	A. WEXLER	
J. H. BRYANT*	G. I. HADDAD	J. M. OSECHUK	S. W. ROSENTHAL	L. R. WHICKER	
	D. B. LEESON	R. A. RIVERS	H. SOBOL	L. YOUNG*	

* *Ex officio (past chairmen)*

Honorary Life Members

A. C. BECK	W. W. MUMFORD	G. C. SOUTHWORTH
------------	---------------	------------------

G-MTT Chapters

Atlanta	T. J. LYON	Houston	H. C. BOURNE, JR.	Philadelphia	W. H. SCHAEDELA
Baltimore	B. A. SICHELSTIEL	Huntsville	M. D. FAHEY	Phoenix	M. D. SIRKIS
Boston	H. HOWE, JR.	Long Island	J. GOLDBERG	St. Louis	W. E. HORD
Buffalo		Los Angeles	N. PELNER	San Diego	D. G. KILLION
Central N. C.	T. R. SCHILLER	Milwaukee	R. W. LADE	San Francisco	P. M. LATOURRETTE
Chicago	A. W. RUDGE	Montreal	E. F. MORRIS	Schenectady	J. B. UNDERWOOD
Columbus	R. T. COMPTON, JR.	N. J. Coast	R. W. BENJAMIN	Seattle	W. C. CURTICE
Connecticut	R. MASTROIANNI	New Hampshire	W. J. WILSON	S. E. Michigan	C. P. TRESSELT
Dallas	D. N. BOWYER	New York		Syracuse	B. L. BOWLER
Denver	M. T. DECKER	North Jersey	K. C. O'BRIEN	Tokyo, Japan	S. OKAMURA
Florida-W. Coast	B. E. SIGMON	Orange Co.	D. K. WAINEO	Toronto	S. DIMITREWSKI
Foothills, Calif.	H. P. JOHNSON	Orlando	J. M. SCHUCHARDT	Tucson	E. P. PIERCE
Fort Worth	S. D. COLEMAN			Washington, D.C.	C. E. EDWARD

IEEE TRANSACTIONS* ON MICROWAVE THEORY AND TECHNIQUES

Editor		Associate Editors	
F. J. ROSENBAUM	N. LIPETZ (<i>Institutional Listings</i>)	F. G. R. WARREN (<i>Foreign Abstracts</i>)	J. W. BANDLER (<i>Computer Program Descriptions</i>)

Address all manuscripts to the Editor, F. J. Rosenbaum, Dep. Elec. Eng., Washington Univ., St. Louis, Mo. 63130. Submission of three copies of manuscripts, including figures, will expedite the review.

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

Officers

ROBERT H. TANNER, <i>President</i>	CLARENCE L. COATES, JR., <i>Vice President, Publication Activities</i>
HAROLD CHESTNUT, <i>Vice President</i>	ARTHUR P. STERN, <i>Secretary</i>
JOSEPH K. DILLARD, <i>Vice President, Technical Activities</i>	RAYMOND W. SEARS, <i>Treasurer</i>

Headquarters Staff

DONALD G. FINK, <i>General Manager</i>	BETTY J. STILLMAN, <i>Executive Assistant to the General Manager</i>
ELWOOD K. GANNETT, <i>Director, Editorial Services</i>	RICHARD M. EMBERSON, <i>Director, Technical Services</i>
WILLIAM J. HILTY, <i>Director, Convention and Publishing Services</i>	EDWIN D. MACDONALD, <i>Conference Services</i>
WILLIAM J. KEYES, <i>Director, Administrative Services</i>	SAVA I. SHERR, <i>Standards</i>
JOHN M. KINN, <i>Director, Educational Services</i>	
CHARLES F. STEWART, JR., <i>Director, Member Services</i>	

Editorial Department

H. JAMES CARTER, <i>Managing Editor, Transactions</i>
<i>Senior Editors:</i> ANDRÉE ABRAMOFF, ANN H. BURGMEYER, CAROLYNE ELENOWITZ, GAIL S. FERENC
<i>Associate Editors:</i> NANCY B. BUDDE, HELEN S. GOLDMAN, MARY M. HALL, RUTH MELNICK, NELA RYBOWICZ

IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES is published monthly by The Institute of Electrical and Electronics Engineers, Inc., 345 East 47 Street, New York, N. Y. 10017. Responsibility for the contents rests upon the authors and not upon the IEEE, the Group, or its members. This journal is available in either microfiche or printed form. Individual copies may be purchased at \$3.00 (first copy only) by IEEE members and \$6.00 per copy by nonmembers. Annual subscription price: IEEE members, dues plus Group fee. Price for nonmembers available on request. Abstracting is permitted with mention of source. All rights, including translation, are reserved by the IEEE. Requests for republication permission should be addressed to the IEEE Editorial Department, 345 East 47 Street, New York, N. Y. 10017. Copyright © 1972 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.