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1968 G-MTT INTERNATIONAL MICROWAVE SYMPOSIUM

DIGEST AND TECHNICAL PROGRAM

MAY 20, 21, 22, 1968

**HOWARD JOHNSON'S
NEW CENTER MOTOR LODGE**

DETROIT, MICHIGAN

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Cover photos: Downtown Detroit seen across the international boundary from Windsor, Ontario, Canada. In the foreground is the Detroit River, one of the world's busiest waterways.

TECHNICAL PROGRAM

HOWARD JOHNSON'S NEW CENTER MOTOR LODGE
DETROIT, MICHIGAN

INTRODUCTORY SESSION: 0845-0900, Monday, May 20

Welcoming Remarks

J. E. Rowe, Co-Chairman, Steering Committee, 1968
G-MTT International Microwave Symposium

R. E. Henning, Chairman, G-MTT Administrative
Committee

SESSION 1: 0900-1150, Monday, May 20

MICROWAVE NETWORKS

Chairman: R. J. Wenzel
Bendix Research Laboratories
Southfield, Michigan

1-1	Non-Minimum Phase Microwave Filters,	<u>Page</u>
0900	T. Fjällbrant, Telefonaktiebolaget LM Ericsson, Sweden	1
1-2	Multi-Octave Bandwidth Microwave Mixer Circuits,	8
0920	R. C. Van Wagoner, Radiation Systems, Inc. McLean, Virginia	
1-3	A Wideband Stripline Matched Power Divider,	16
0940	P. C. Goodman, Bendix Research Laboratories, Southfield, Michigan	
1000	Coffee Break	
1-4	The Calculation of TEM-, TE-, and TM-Waves in Shielded	21
1030	Strip Transmission Lines, W. Baier, Institute for High Frequency Techniques, Technical University, Munich, Germany	
1-5	Analysis and Synthesis of Waveguide Multi-Aperture	32
1050	Directional Couplers, R. Levy, Microwave Development Laboratories, Inc. Needham Heights, Massachusetts.	

1-6	An Investigation of Sharp Discontinuities in Rectangular	<u>Page</u>
1110	Waveguides by Ray Theory, M.A.K.Hamid, Department of Electrical Engineering, University of Manitoba, Winnipeg, Canada	39
1-7	A New Finite-Difference Techniques for Higher-Order Modes	41
1130	in Arbitrarily Shaped Waveguides, M. J. Beaubien and A. Wexler, University of Manitoba, Winnipeg, Canada	

SESSION 2: 1400-1710, Monday, May 20

SOLID-STATE MICROWAVE POWER GENERATION

Chairman: B. C. DeLoach, Jr.
Bell Telephone Laboratories
Murray Hill, New Jersey

2-1	Network Integration Approaches for Multiple-Diode High Power	46
1400	Microwave Generation, M. E. Hines, Microwave Associates, Inc. Burlington, Massachusetts. (Invited)	
2-2	Power and Efficiency of Impatt Oscillators,	54
1440	W. J. Evans and G. I. Haddad, The University of Michigan Ann Arbor, Michigan.	
2-3	Circuit Techniques for the Noise Reduction and Frequency	63
1500	Stabilization of Avalanche Diode Oscillators, E. F. Scherer, Sylvania Electric Products, Inc. Woburn, Massachusetts.	
1520	Coffee Break	
2-4	Microwave Integrated IMPATT Diode Radiator,	72
1550	H. W. Cooper, C. Moskowitz, M. R. Natale, T. Andrews, Westinghouse Electric Corp. , Baltimore, Maryland	
2-5	Gunn Oscillator as a Frequency Memory Device,	77
1610	J. Magarshack, R.T.C. La Radiotechnique-Compelec Suresnes, France.	
2-6	Ultra-High-Speed Diode Switch for 50 GHz Band Utilizing	91
1630	Avalanche Breakdown of Varactor Diodes, S. Sugimoto, Central Research Laboratories, Nippon Electric Company, Kawasaki, Japan.	

2-7	Feedback Stabilization and Noise Reduction in Solid-State	<u>Page</u>
1650	Multiplier Chains,	99
	C. L. Cuccia and A. Savarin, Philco-Ford Corp.,	
	Palo Alto, California	

Evening Sessions

2000-2200, Monday, May 20

PARALLEL SESSIONS

1. COMPUTER-AIDED DESIGN OF MICROWAVE NETWORKS
New Center Ballroom

ORGANIZER; W. J. Getsinger
Lincoln Laboratory
Massachusetts Institute of Technology

A panel of guest speakers will discuss the various philosophies employed in computer-aided design of microwave networks and will give examples of their present work. They will also discuss their future activities in this area. Following the presentation, an open discussion with questions and comments invited from the audience will take place. Brief summaries (5 minute limit) of new results or viewpoints by interested persons may also be presented. Persons with such contributions are asked to contact the session organizer in advance, if possible.

Guest Speakers and Panel:

M. O'Hagen, Texas Instruments
L. Young, Stanford Research Institute
H. Stinehelfer, Microwave Associates
R. Anderson, Hewlett-Packard Co.

2. SOLID-STATE CONTROL DEVICES
New Center Boulevard Rooms

ORGANIZER: D. K. Adams
Stanford Research Institute

Brief presentations will be given by a panel of guest speakers on high and low power microwave control devices using ferrite and semiconductor diode techniques. Fundamental limitations, performance, and cost will be compared for phase shifters, switches, circulators, duplexers and limiters. Following the presentations an open discussion will take place with questions and comments invited from the audience. Capsule summaries (5 minute limit) of new results or viewpoints not presented by the panel may also be given. Persons with such contributions are asked to contact the session organizer in advance, if possible.

Guest Speakers and Panel:

E. Stern, Lincoln Lab, MIT
N. J. Brown, Microwave Associates
R. U. Garver, Harry Diamond Labs
S. P. Clark, Hughes Aircraft Co.
J. E. Pippin, Scientific-Atlanta
M. D. Sohigian, Hewlett Packard Associates
R. G. Forrest, Microwave Associates

SESSION 3: 0900-1220, Tuesday, May 21

MICROWAVE INTEGRATED CIRCUITS

Chairman: F. A. Brand
USAECON, Fort Monmouth, New Jersey

3-1 Recent Advances in Microwave Integrated Circuits,	<u>Page</u>
0900 R. Webster, Texas Instruments, Dallas, Texas. (Invited)	103
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0930 Integrated Circuits,	104
S. B. Cohn, Consultant, Tarzana, California	

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3-4 Normal Mode Impedances of a Coupled Pair of Microstrip 1010 Transmission Lines, R. G. Bryant, Department of Electrical Engineering, University of Maine, Orono, Maine; J. A. Weiss, Department of Physics, Worcester Polytechnic Institute, Worcester, Massachusetts.	117
1030 Coffee Break	
3-5 Analysis and Experimental Evaluation of Distributed 1100 Overlay Structures in Microwave Integrated Circuits, K. C. Wolters, P. L. Clar and C. W. Stiles, Motorola Inc., Aerospace Center, Scottsdale, Arizona	123
3-6 X-Band Integrated Circuit Mixer with Reactively 1120 Terminated Image, K. M. Johnson, Texas Instruments, Inc. Dallas, Texas	131
3-7 An Integrated Microwave FM Discriminator, 1140 M. D. Bonfeld, Bell Telephone Laboratories, Allentown, Pennsylvania; M. J. Bonomi and E. G. Jaasma, Bell Telephone Laboratories, Holmdel, New Jersey	139
3-8 X-Band Integrated Diode Phase Shifters, 1200 R. G. Stewart and M. N. Giuliano, Westinghouse Electric Corp., Baltimore, Maryland	147

SESSION 4: 1400-1710, Tuesday, May 21

SOLID-STATE DEVICES

Chairman: S. Okwit
Airborne Instruments Laboratory
Deer Park, New York

4-1 S-Band Integrated Parametric Amplifier Having Both 1400 Flat Gain and Linear Phase Response, H. C. Okean and H. Weingart, Airborne Instruments Laboratory, Deer Park, New York	155
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1440 Effects in Varactor Parametric Amplifiers, D. R. Chambers and D. K. Adams, Stanford Research Institute, Menlo Park, California	
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1500 Microwave Circuit Elements, R. J. Taylor and C. R. Westgate, Carlyle Barton Laboratory The Johns Hopkins University, Baltimore, Maryland	
1520 Coffee Break	
4-5 The Transistor, A Microwave Filter Element,	184
1550 D. K. Adams and R. Y. Ho, Stanford Research Institute, Menlo Park, California	
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1610 K. E. Mortenson, J. F. White, A. Armstrong and J. Borrego, Rensselaer Polytechnic Institute, Troy, New York	
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1630 A. Marković, B. Schiek, and H. G. Unger, Institut für Hochfrequenztechnik, Braunschweig, Germany	
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1650 in a 15°K Closed-Cycle Refrigerator, J. Wolczok and J. G. Smith, Airborne Instruments Laboratory, Deer Park, New York	

SYMPOSIUM BANQUET - 1900-2200, Tuesday, May 21

1967 IEEE G-MTT MICROWAVE PRIZE

Robert J. Wenzel
Bendix Research Laboratories

BANQUET SPEAKER

Dr. W. A. Geoffrey Voss, University of Alberta and
Chairman of the Board and Executive Vice President
International Microwave Power Institute (IMPI)

SESSION 5:

0840-1150, Wednesday, May 22

FERRITE COMPONENTS

Chairman: J. E. Pippin
Scientific Atlanta
Atlanta, Georgia

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5-3 The Use of Composite Junctions in the Design of 0920 High-Power Stripline Circulators, C. R. Buffler and J. Helszajn, Microwave Associates, Burlington, Massachusetts.	237
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1000 Coffee Break	
5-5 A Design Theory for Reggia-Spencer Reciprocal 1030 Ferrite Phase Shifters, W. E. Hord, Emerson Electric Company, F. J. Rosenbaum, Electrical Engineering Dept., Washington University, St. Louis, Missouri C. R. Boyd, Department of Electrical Engineering, University of California, Los Angeles, California.	256
5-6 A 500-kW X-Band Air-Cooled Ferrite Latching Switch, 1050 R. A. Stern and J. P. Agrios Electronic Components Laboratory, USAECOM, Fort Monmouth, New Jersey.	264
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SESSION 6:

1330-1630, Wednesday, May 22

MICROWAVE ACOUSTICS AND MILLIMETER-
AND OPTICAL-WAVE COMPONENTS

Chairman: L. Young
Stanford Research Institute
Menlo Park, California

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6-1 Ultrasonic Waveguide Systems for Surface Waves, 1330 D. L. White, Bell Telephone Laboratories, Inc. Murray Hill, New Jersey, (Invited)	291
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