

MARION E. HINES
1972 MICROWAVE PRIZE RECIPIENT

1972 International Microwave Symposium

ROBERT M. KNOX, COCHAIRMAN, CHICAGO STEERING COMMITTEE

INTRODUCTION

THE Arlington Park Towers Hotel, Arlington Heights, Ill., was the scene of the 1972 IEEE-G-MTT International Microwave Symposium, May 22-24, 1972. This was the first occasion in the history of this technical forum that the Chicago Chapter of the G-MTT has been privileged to serve as host to Symposium attendees. Highlights of the 1972 Symposium included the introduction of microwave industrial exhibits, the panel session, "Microwave State-of-the-Art International," and the banquet address, "Technology and National Goals," by William M. Magruder.

The theme of the 1972 Symposium, "Microwave International," was reflected in several aspects of the program as well as in the décor of the hotel. An intensive publicity program resulted in an unusually large submission of papers from outside of the United States, as

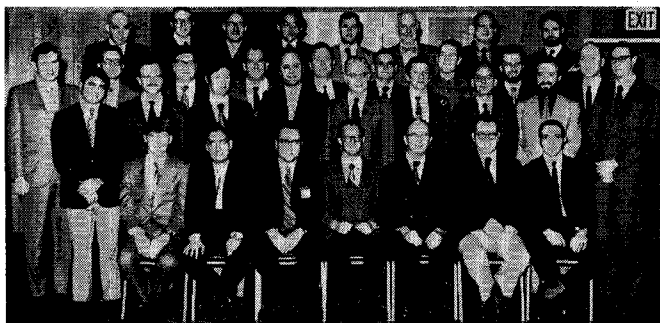
described below. The panel session, featuring presentations on International Microwave Technology, was attended by more than 200 persons. Attendees were free to lounge in the International Hospitality Center which featured cultural exhibits from each of the nations represented on the technical program. Also in the Hospitality Center was a photographic historical exhibit of products by several microwave industrial firms.

TECHNICAL PROGRAM

The technical program consisted of 83 papers presented in six morning and afternoon periods, with two simultaneous sessions offered during each period. The papers were given by authors from eleven countries: Australia, Canada, France, Germany, Great Britain, Israel, Italy, Japan, The Netherlands, Sweden, and the United States. Of the 70 contributed papers in the pro-



Symposium Steering Committee. *Seated:* C. Knop, P. Toullos, Mrs. L. Hansen, L. Hansen, R. Knox. *Standing:* A. Feller, C. Arnow, J. Brown, G. Stanton, E. Weber, J. Hupert, R. Morgan, J. Huber, R. Hargis, E. Book, A. Holtum. *Missing:* G. Haddad, H. Cooper, K. Snyder, T. Charlton, T. Smith, Miss B. Lukasevicius, Mrs. L. Whitney, Mrs. J. Brown, Mrs. K. Wrobel, Mr. J. McArdle.



Technical Program Committee. *First row, left to right: Seated:* C. Knop (cochairman), L. Young, B. Deloach, Jr., R. Garver, W. Spaid, A. Solomon, P. Rizzi. *Standing: First Row:* G. Haddad, L. MacKenzie, F. Rosenbaum, A. Bahr, J. Cheal, W. From, H. Sobol, A. Wexler, D. Parker. *Second Row:* A. Clavin, N. Lipetz, K. Richer, J. Hupert, J. Horton, L. Whicker, J. Allen, J. Bandler, E. Cristal. *Third Row:* P. Romanelli, D. Wait, R. Beatty, J. Honda, J. Gray, P. Coleman, C. Lee, A. van den Heuvel. *Missing:* M. Brodwin, D. Clarricats, C. Cuccia, W. Edwards, W. Getsinger, J. Gewartowski, A. Love, S. Okwit, A. Oliner, J. Pippin, P. Potter, P. Toullos (cochairman), R. Wenzel.



Administrative Committee. *Seated left to right:* S. Okwit, J. Horton, A. Clavin, L. Young, G. Haddad. *Standing:* A. Wexler, N. Lipetz, R. Beatty, G. Rodrigue, J. Osepchuk, J. Bryant, F. Rosenbaum, L. Whicker, R. Garver, D. Parker, H. Sobol, E. Torgow, R. Rivers. *Missing:* H. Cooper, D. Leeson, F. Arams, S. Rosenthal.

gram, 27 (39 percent) originated outside of the United States.

A full session, chaired by W. L. Spaid, was devoted to "Gigabit Data Rate Applications," a topic of expanding

interest in the microwave field. Papers were presented covering both high data-rate baseband and carrier-modulation systems. Another area of expanding activity, "Microwave Acoustics," was covered by seven papers involving primarily topics in surface-wave technology. This session, chaired by N. Lipitz, featured two invited papers: one on analog filters, and one on parametric interactions between surface waves to perform signal processing functions.

A diverse range of topics was covered in the session, "Commercial and Industrial Applications of Microwaves," chaired by A. Solomon. Topics included: millimeter transmission systems, solid-state sources for radio relay, tunnel communications via transmission lines, automobile crash sensor systems, a guided surface-wave "radar," and a review of the submillimeter state of the art. C. M. Knop chaired another applications-oriented session, "Low Noise Microwave Receiving Systems." Featured were papers on noise in radiometers, radio relay systems, and space vehicle communication systems.

Chairman E. G. Cristal introduced the session on "Passive Microwave Components." A variety of filter topics was supplemented by papers on meander lines, diode mounts, a rotary joint, and parallel coupled lines. Passive components utilizing ferrites were covered in the session, "Ferrite Devices," chaired by J. L. Allen. Waveguide, lumped-element, and microstrip ferrite devices were described in seven papers.

The first of two sessions on active devices was chaired by J. White. Papers on switches, phase shifters, and diode parameters were featured in "Solid-State Microwave Control Devices." Transistor, Gunn, and avalanche diode oscillators and amplifiers were described in the session, "Solid State Microwave Active Devices," chaired by L. A. MacKenzie.

In addition to papers on microstrip microwave integrated circuits, new transmission-line approaches were described in the session, "Microwave Integrated Circuits," chaired by P. Romanelli. The new approaches were: "Microguide," ceramic-filled waveguide, "fin-line," and oversized microstrip. The merger of computer and microwave technologies was explored in a wide range of papers under the chairmanship of J. W. Bandler. The session, "Computer-Aided Microwave Devices," covered the design of both active and passive microwave devices in waveguide and stripline.

A wide range of measurement techniques was covered in papers presented during the session chaired by R. W. Beatty. Included in "Microwave Measurements," were methods of measuring impedance (including both scattering parameter and time-domain reflectometer methods), millimeter power standards, measurement of dielectric properties, and near-field antenna patterns. Other papers in the session described a millimeter hot load for noise measurement and an automatic Rieke diagram plotter.

A list of the "late news" papers presented during the Symposium follows.

Session 3—Monday Afternoon

- 3-7 "A Low Loss Lumped Element X-Band MIC Phase Shifter," J. E. Degenford (Westinghouse Electric Corp., Baltimore, Md.).

Session 4—Monday Afternoon

- 4-8 "Microstrip Dispersion Model . . .," W. J. Getsinger (COMSAT Labs., Clarksburg, Md.).
4-9 "A Quasi-Dynamic Method of Waveguide Analysis," L. Lewin (Colorado State University, Ft. Collins, Colo.).

Session 5—Tuesday Morning

- 5-8 "Further Applications of Double Electrodes in Acoustic Surface Wave Design," T. W. Bristol (Hughes Aircraft Co., Fullerton, Calif.).
5-9 "Use of Rotated Electrodes to Provide Amplitude Weighting in Interdigital Surface Wave Transducers," A. P. van den Heuvel (Filter Technology, Inc., Homewood, Ill.).

Session 6—Tuesday Morning

- 6-8 "The Development of Microwave Couplers and Filters Using a New Computer-Aided Technique," B. E. Spielman (Naval Research Lab., Washington, D. C.).

Session 9—Wednesday Morning

- 9-8 "Stabilized Transferred-Electron Amplifier Characteristics," A. K. Talwar and W. R. Curtrice (University of Michigan, Ann Arbor).
9-9 "Progress in Distributed Unidirectional Microwave Amplifier Development," R. N. Wallace (Microwave Associates, Inc., Burlington, Mass.).

PANEL PRESENTATION

"Microwave State-of-the-Art International," a panel presentation on Monday evening, May 22, featured ten-minute presentations by microwave representatives from England, France, Canada, Germany, and Japan, and shorter presentations by representatives of Israel, Italy, Sweden, and The Netherlands. While all the presentations, with a lively discussion session following, occupied two full hours, most of the 200 attendees listened to the entire program. Ted Saad, moderator and organizer of the session, later expressed the hope that the session would be a start towards a better two-way exchange of microwave technology.

SYMPOSIUM BANQUET

Professor Paul Coleman served as Master of Ceremonies of the Symposium Banquet, adding a bit of wit and humor to the otherwise rather serious atmosphere of the Symposium. Sy Okwit received the Past Chairman's Award, presented by the 1972 Ad Com Presi-



1972 Ad Com President, Alvin Clavin, presents the Past Chairman's Award to Seymour Okwit.

dent, Al Clavin. Al also presented the Microwave Prize to Marion Hines in recognition of his outstanding paper, "Reciprocal and Nonreciprocal Modes of Propagation in Ferrite Stripline and Microstrip Devices," given at the 1971 Symposium.¹ Carl Blake received, in absentia, a certificate of appreciation for serving as the 1971 National Lecturer.

Highlight event of the Banquet was the address, "Technology and National Goals," given by William M. Magruder, Special Consultant to the President. This talk gave attendees insight into the planning of the Federal Administration relative to the application of technology to national problems and economic opportunities. He challenged engineers and scientists to present technically sound and politically unbiased testimony to Congress and Federal agencies, in order to provide sound direction to technology-related legislation. Mr. Magruder's talk fell on many responsive individuals in the microwave field who have provided leadership in recent years to develop a greater sense of professionalism among engineers. Several practical suggestions were provided by Mr. Magruder to help realize this objective. The audience showed its appreciation with a standing ovation at the close of the address. Excerpts from this address were printed in the July 1972 G-MTT *Newsletter*.

EXHIBITS

Perhaps the most significant innovation of the 1972 Symposium was the introduction of a product exhibit area. This inaugural effort included sixteen exhibitors presenting a wide range of microwave instrumentation,

¹M. E. Hines, *IEEE Trans. Microwave Theory Tech.*, vol. MTT-19, pp. 442-451, May 1971.

devices, and materials. All of the exhibitors interviewed found their participation useful, and several were very enthusiastic about this opportunity to interact with microwave design and development engineers. Most attendees availed themselves of this opportunity to view recent product developments in the microwave field.

LADIES' PROGRAM

A friendly group of fifteen wives participated in tours planned by the Ladies' Program Committee. Included were visits to Hager Potteries, Long Grove, and a shopping spree in Chicago.

DIGEST

The 1972 Steering Committee continued the precedent established in 1971 for an 8½- by 11-inch format to the *Symposium Digest*. Space available to each author

was expanded from two to three pages to facilitate greater depth in the material presented and to enhance the value of the *Digest* as a reference publication.

A WORD OF THANKS

Countless hours by many dedicated individuals are required to put on the International Microwave Symposium. I wish to thank my cochairman, Larry Hansen, all of the Chicago Steering Committee members, the Ad Com members, and others who enthusiastically cooperated with us during many months of preparation. The Chicago Chapter and its members have benefited by this experience of hosting the Symposium. We would encourage other G-MTT Chapters who may be considering this undertaking for the first time to do so with confidence that your efforts will result in a greater Chapter vitality and the uncovering of new leadership capability.

The 1972 G-MTT National Lectureship

THE MICROWAVE INDUSTRY 1972: A SUMMARY OF THE 1972 G-MTT NATIONAL LECTURE

DUE TO THE generally weak economic conditions during the past three years, the reduction and change in Defense spending, and the reordering of priorities in our society, the microwave industry has suffered through the most difficult period in its history. To give a proper perspective of the conditions that face the industry today, this paper presents some of the background that led to the establishment of the microwave industry. It touches on the original contributors starting with Faraday. In giving the historical background, it highlights the fact that it has been the U. S. Department of Defense that has been the principal financial agent in the stimulus of microwave technology.

Whereas the U. S. Department of Defense has been the principal agent in the economic growth of the microwave industry, the IEEE has been the principal focal point for the professional activity of the industry. The paper touches on the background of the IEEE and discusses some of the recent actions that have taken place to stimulate the IEEE into increased activity on behalf

of its membership. The role of the Microwave Theory and Techniques Group in this activity is highlighted.

The position of the microwave industry is analyzed in the light of reduced Defense spending, increased concern with our environment, and increased involvement of engineers in our total society. In addition to the Defense budget as a continuing and prime marketplace for microwave technology, there are now several other areas with promise, including communications, microwave ovens, microwave industrial heating, the non-defense applications of radar, and some of the nondefense aspects of the Federal budget.

The general observation is made that microwave technology has matured, and the microwave industry is now in a position to take advantage of that maturity. Today we have a design capability that enables the microwave engineer to function as a circuit designer, much as his colleagues at lower frequencies. Most of the basic designs are available in the literature or on computer programs. These can readily be produced, in operating form, using either printed circuits or microwave integrated-circuit techniques. In addition, there are