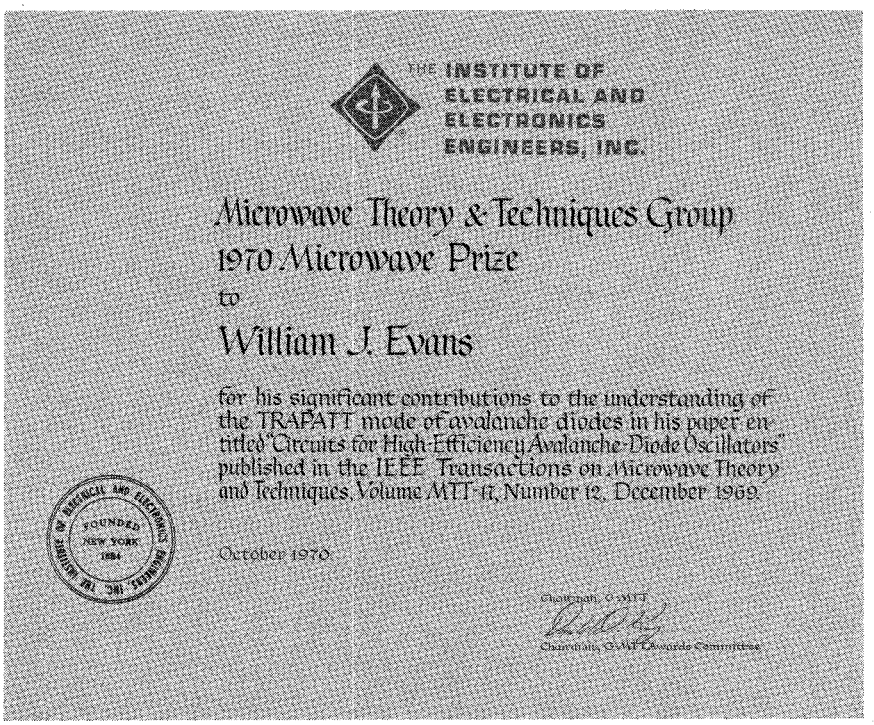


1971 International Microwave Symposium

LAWRENCE R. WHICKER, CHAIRMAN, PUBLICITY AND PUBLIC RELATIONS COMMITTEE

Introduction

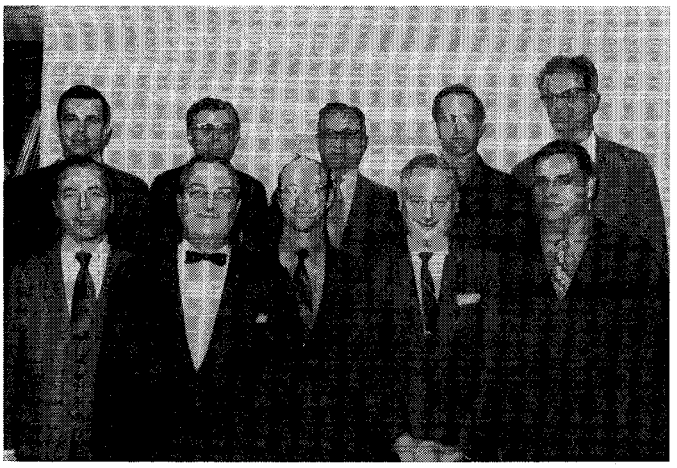
THE 1971 International Microwave Symposium was held in Washington, D. C., on May 17–19 at the Marriott Twin Bridges Motel. The Symposium, in spite of the present economic situation, was both a technical and a financial success. A total registration of 460 was obtained. The success of the Symposium is attributable in part to the hard work of the Symposium Steering Committee, H. W. Cooper, Chairman, and the strong local support from engineers in the Baltimore–Washington area.

Technical Program

In keeping with the Symposium theme "Microwaves for a Better World," a special effort was made to have papers in the area of future applications of microwaves. The results were papers on automobile radar and millimeter wave communication systems. The paper by Harokopus, "Automobile Radar," showed a system, costing about as much as an automobile air conditioner, which can avoid collisions and warn of autos in the driver's blind spot. The paper by Roberts, U. S. Department of Transportation, "Microwave Applications to Transportation," showed more about applications of microwaves to automobiles and gave details of applications to other modes of transportation, i.e., rail and air. A paper by Brown, "The Status of the Technology and the Applications of Free-Space Microwave Power Transmission," gave the system considerations of obtaining massive quantities of power from space. The microwave part of the system relaying the power to earth would not require much advance in the state of the art. The critical area in making a space power source is the development of inexpensive photoelectric cells.

Interest in ferrite limiters and phase shifters has been rekindled because they can fulfill the need to control high RF power at high frequencies in solid-state devices.

Expanded versions of some of the many good papers presented at the Symposium are included in this Symposium issue of this TRANSACTIONS. These and the other technical papers are summarized in the Symposium



Symposium Steering Committee. *First row, left to right:* M. Cohn, H. W. Cooper, W. F. Gabriel, E. A. Wolff, L. R. Whicker. *Second row:* R. C. Van Wagoner, H. E. Schrank, F. Reggia, R. V. Garver, J. A. Kaiser.

Technical Program Committee. *First row, left to right:* A. Clavin, S. W. Rosenthal, G. I. Haddad, R. V. Garver, D. Varon. *Second row:* E. A. Wolff, T. S. Saad, R. A. Moore, H. Sobol, R. E. Fisher, C. L. Cuccia, L. H. Silverman, R. R. Sparks, F. Reggia, S. Okwit, L. R. Whicker, M. E. Hines, J. Cheal. *Third row:* L. E. Dickens, M. Cohn, W. H. From, J. B. Horton, A. J. Bahr. *Missing:* G. Bodway, F. Rand, H. W. Cooper, W. J. Edwards, W. F. Gabriel, D. D. King, D. B. Leeson, A. H. Solomon.

Digest (IEEE Cat. No. 71C25-M) which may be obtained from IEEE Headquarters. A listing of the late news, i.e., papers which are not included in the Digest, is as follows:

Session X

X-5 "Microwave Lumped Circuit Elements," C. S. Aitchison, R. Davies, I. D. Higgins, S. R. Longley, B. H. Newton, J. F. Wells, and J. C. Williams (Mullard Research Labs., Redhill, Surrey, England).

X-6 "Active Circuits with Lumped Elements," C. S. Aitchison, R. Davies, I. D. Higgins, S. R. Longley, B. H. Newton, J. F. Wells, and J. C. Williams (Mullard Research Labs., Redhill, Surrey, England).

X-7 "Advanced MM-Wave Mixer Diodes, GaAs and Si, and a Broad Band Low-Noise Mixer," H. M. Leedy, H. L. Stover, H. G. Morehead, R. P. Bryan, and H. L. Garvin (Hughes Research Lab., Malibu, Cal. and Hughes Aircraft Co., El Segundo, Cal.).

Session XI

XI-6 "Some Tuning Characteristics of Waveguide-Mounted Gunn Diode Oscillators," R. L. Eisenhart and P. J. Khan (University of Michigan, Ann Arbor).

XI-7 "Measurement of Negative Capacitance Component in Microwave Tunnel Diodes," P. L. Fleming and L. E. Foltzer (COMSAT Labs., Clarksburg, Md.).

Panel Discussion

A nontechnical session, "Changing Priorities and Engineering," was held on May 17, with Bob Rivers as Moderator, and was well received, with an attendance of approximately 120 persons.

The conclusion of the panel was most significant. The general feeling had been expressed that the IEEE should be more active in looking out for the welfare of its members—by lobbying on Capitol Hill, by instituting a portable pension plan, and by doing something about the job market. From the discussion it became apparent that one just does not suddenly decide to do these things and be any good at them. Those who make any progress are specialists. We, the IEEE, are specialists at exchanging technical information. Are we to dilute our efforts in areas in which we are successful in order to become amateurs in another field? It would seem that those of us who are inclined toward social action should join organizations that are experienced in dealing with these problems, thus helping them to become more effective.

Student Papers Award

At this year's Symposium, in addition to the usual technical program, a student papers competition for undergraduate and first year graduate students was conducted. The winner was Thomas A. Saponas, a senior at the University of Colorado. His paper, entitled "Generation of Confined Spectrum Pulses Using an Absorption p-i-n Diode Modulator," was one of the stronger papers presented at the meeting.

Symposium Banquet

A good turnout of 114 people attended the banquet on May 18. The food was good, as was the program. Bob Rivers did an outstanding and humorous job as Master of Ceremonies. The banquet speaker, Walter H. Hinchman, Office of Telecommunications Policy, Executive Office of the President, spoke on "Changing National Priorities: A New Challenge for the Communications Engineer." Four awards were presented by Seymour Okwit, Chairman, ADCOM, to deserving individuals. The awards presented were as follows:

Award Certificate to Dr. John H. Bryant, 1970 ADCOM Chairman;

Award Placque to Dr. Harold Sobol, 1970 National Lecturer;

Microwave Prize to Dr. William J. Evans;

Student Award to Thomas A. Saponas.

Ladies Program

The ladies, with Mrs. Marie Cooper as chairman, ran a well-organized and well-received program. The three-day program was highlighted by a tour of Annapolis and the U. S. Naval Academy with up to 26 ladies participating.

Digest

Many compliments on the *Digest* have been received. Each paper in the *Digest*, text, and figures, could be fully viewed without having to continually turn pages. Each paper was complete on two $8\frac{1}{2}$- by 11-inch facing pages. The authors and the editor and his committee made a very useful and information-packed publication as a permanent record of the conference. Those in attendance strongly favored the journal size and two-page paper format. IEEE members may obtain copies of the *Digest* from IEEE Headquarters by sending $5.00 for IEEE Catalog No. 71-C25M "G-MTT Symposium Digest" to IEEE, 345 East 47th Street, New York, N. Y. 10017.

The 1971 G-MTT National Lectureship

Introduction

THE G-MTT National Lectureship was initiated in 1967 specifically to provide assistance to chapters by providing a prominent speaker on a current microwave topic. Emphasis is placed on aiding new chapters and small chapters located in areas where speakers are not readily available. The goals established for the National Lectureship are to stimulate chapter growth, provide a greater dissemination of current technical information, and establish stronger bonds between the chapters and the National Group. A budget of $2000 per year is provided to cover, or partially defray, the expenses of the National Lecturer. Typically, the National Lecturer will speak at 10–15 chapters during his one-year tenure. Past Lecturers are Harold Sobol (1970), Richard W. Damon (1969), Leo Young (1968), and Arthur A. Oliner (1967). The 1971 National Lecturer is Carl Blake, Massachusetts Institute of Technology Lincoln Laboratory, Lexington. His lecture summary follows.

Applications of Solid-State Microwave Power Sources: A Summary of the 1971 G-MTT National Lecture

Solid-state devices currently available in industrial and university laboratories are capable of generating and/or amplifying energy throughout the microwave spectrum. Early indications are that these devices can be manufactured reproducibly at costs comparable to current microwave devices such as varactors and p-i-n switching diodes. The meager data available further suggest that these devices will be capable of achieving comparable reliability to well-designed transistors and digital integrated circuits. These new devices will have a major impact on the existing microwave business. With time and ingenuity, the availability of low-cost, highly reliable, solid-state, microwave power devices will lead to new applications and a broader base for the microwave industry.

This lecture reviews the status of three generic, solid-state, microwave, power-generating devices: the transistor, the transferred-electron device (TED), and the avalanche diode. Characteristic features of each are given including operating parameters, modes of operation, efficiency, gain-bandwidth products, noise performance, etc. Cost factors are presented. Practical and fundamental performance limitations are discussed.

Probably the major current commercial market for solid-state microwave power devices is for Doppler radars used by state and municipal police for detecting automobile speeding violations. These devices are also used extensively in modern microwave relay links. Other applications likely in the near future include wide bandwidth waveguide communications and a variety of