IEEE GROUP ON
MICROWAVE THEORY
AND TECHNIQUES

NEWSLETTER

EDITOR: J. B. Horton
Electronic Resources, 4561 Colorado Blvd., Los Angeles, California 90039

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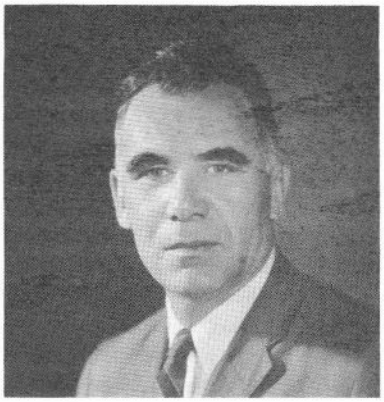


M.E. Hines

1972 MICROWAVE PRIZE RECIPIENT

The Awards Committee of the G-MTT ADCOM recently announced that Marion E. Hines is the 1972 Microwave Prize winner. Mr. Hines was awarded the Microwave Prize for his paper, "Reciprocal and Nonreciprocal Modes of Propagation in Ferrite Stripline and Microstrip Devices", published in the May 1971 issue of the IEEE Transactions on Microwave Theory and Techniques. The Prize is awarded on an annual basis to the author of the paper, published in the IEEE Transactions on Microwave Theory and Techniques, Proceedings of the IEEE, or other official IEEE publication, which is judged to be the most significant contribution in the field of interest of G-MTT.

Marion E. Hines is a graduate of the California Institute of Technology. He received the B.S. degree in Applied Physics in 1940 and the M.S. in 1946. He served as a Weather Officer with the Air Force from 1940 to 1945. With the Bell Laboratories from 1946 to 1960, he worked in Research and Development of microwave tubes and storage tubes; parametric amplifiers; pulse transmission systems; and tunnel diode amplifiers and oscillators. At Microwave Associates, he has been active in the development of harmonic generator type microwave sources and high power microwave signal control devices using diode switch elements, and more recently in the development of amplifiers and oscillators using Avalanche and Gunn-effect diodes. At present, his title is Vice President, Research. He is a Fellow of the Institute of Electrical and Electronics Engineers.

1973 MICROWAVE SYMPOSIUM IN DENVER

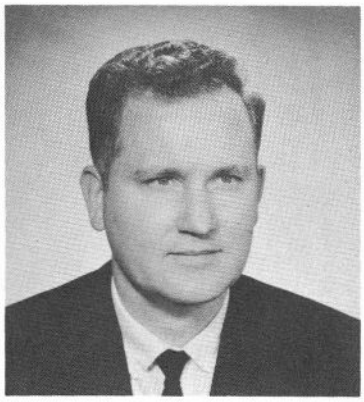
A proposal by the Denver-Boulder Chapter of G-MTT to hold the 1973 International Microwave Symposium in Boulder, Colorado was accepted by the G-MTT ADCOM at its September meeting. The proposed site is the Campus of the University of Colorado. Accommodations for Symposium attendees will be in the University residence halls.

Symposium Committee appointments include D.F. Waite, Chairman, Steering Committee; R.W. Beatty, Chairman, Technical Program Committee; S.W. Maley, Digest Editor; W.J. Anson, Publicity; J.E. Partch, Finance; R.L. Gallawa, Local Arrangements; and A.J. Spano, Digest Listings.

Congratulations to the Denver-Boulder Chapter.

MICROWAVES FOR A BETTER WORLD

SPECIAL FEATURE
Photographs Taken at the 1971 G-MTT Symposium in Washington, D.C.



EDITORS NOTES

by J. B. HORTON

The September meeting of the G-MTT ADCOM brought to light many changes that G-MTT and IEEE are going through. The continuing concern about finances is a real one and the present slump in the microwave industry is being felt both in G-MTT membership and in the Group operations. The principal effects the present situation has had on G-MTT operations are a cutback in the TRANSACTIONS page allowance, deferment of the W.W. Hansen Award, and reduction of attendance at the G-MTT Symposium. It is inspiring, however, to see the continuing enthusiasm and efforts of G-MTT members in the ADCOM and in the chapters to make G-MTT activities of greater value to its members.

This issue of the NEWSLETTER highlights both the impending changes and some of the recent awards and programs planned by ADCOM and the Chapters. Examples of some of the changes to be made in the near future are: the December ADCOM meeting has been delayed until February 1, 1971, to schedule the next ADCOM meeting the day after the Technical Program Committee of the 1972 G-MTT Symposium, thereby saving the cost of a trip; the ADCOM recently approved exhibits for the G-MTT Symposium; and the TRANSACTIONS page allowance is being held to 992 pages for 1972 (original plans called for approximately 1200 pages).

Contrasting these changes are the recent award of the Microwave Prize to M.E. Hines; the election of T.S. Saad as 1972 National Lecturer; plans for a renewed membership drive; the promise of an exciting Symposium in Chicago next May; reports from two recent Microwave Symposia; and the announcement of a new lecture series by the Washington Chapter.

Finally, one impending change will affect the NEWSLETTER. Your editor was recently elected Vice Chairman of ADCOM for 1972, and a new NEWSLETTER editor will be appointed for 1972. In the meantime, I welcome any comments about the NEWSLETTER, the ADCOM and other topics. In particular, letters that can be included in the Letters to the Editor column are welcome.

CHAIRMANS VIEWPOINT

by SY OKWIT

The Institute, over the past few years, has been undergoing organizational changes. Society status has been created and Groups have been bound together into well defined Divisions. Since the reorganization, there have been small perturbations and periodic changes made to both optimize the structure and eliminate inequities. The reorganization is in a continual self evaluation phase.

One interesting sidelight concerned the titles of the leaders of Groups and Societies. Officers of Societies were titled Presidents and Vice Presidents; while Groups had Chairmen and Vice Chairmen. A recent change by the Institute allowed Groups the freedom of changing the titles of their officers to conform with those of the Societies. This resulted in some measure of chaos since not all Groups were concerned with titles (MTT being one of them) and thus had not requested change.

To eliminate the inconsistency in titles, Headquarters recently made the decision that as of January 1, 1972 all Groups' ADCOM officers will be called President and Vice President, unless there was a specific objection.

Why am I telling you all of this in this message? At our recent September AdCom meeting, we held our annual ADCOM nominations and elections, and have elected Al Clavin and John Horton to what we thought was respectively Chairman and Vice Chairman. It appears that what we actually did, besides electing two extremely dedicated, inventive and competent people as MTT's new officers, was to elect MTT's first President and Vice President.

This, of course, also gives me a special distinction; it makes me the last Chairman of MTT's ADCOM.

In all seriousness, MTT is very fortunate in having Al and John at the helm of our Group in this coming year of fiscal problems. I am sure that through their leadership, we will make progress and have continued growth.

T.S. Saad

EXCERPTS FROM ADCOM MEETING

by AL CLAVIN

1972 NATIONAL LECTURER

The Membership Services Committee announced at the September ADCOM meeting that T.S. Saad, President of Sage Laboratories, has been elected 1972 G-MTT National Lecturer. The National Lectureship was initiated in 1967 specifically to make available to the Chapters a prominent speaker on a current microwave topic.

The subject and abstract of Mr. Saad's talk are:

THE MICROWAVE INDUSTRY 1972

During the last few years the Microwave Industry has experienced the most difficult period in its history. Business has decreased, many microwave engineers are out of work and investors have lost interest. This paper will discuss some of the changes that are taking place, the present condition of the microwave market and the future potential and direction of the industry. The talk will also include some specific comments on the uses of microwave energy for industrial and commercial applications.

T.S. Saad has been actively employed in the Microwave Industry since January 1942. Through January 1955 he had worked at the M.I.T. Radiation Laboratory, Submarine Signal Company, Microwave Development Labs. and Sylvania.

To stabilize his employment, he helped found Sage Laboratories in January 1955, and has served as its President since that time. In 1958, he helped establish Horizon House Microwave, Inc., Publisher of the microwave journal and Telecommunications, and has been Editor-in-Chief ever since.

He is a Fellow of the IEEE and was a member of the National Administrative Committee of MTT from 1953 through 1969.

He is a member of NAS-NAE-NRC evaluation panel 272 advisory to the Electromagnetics Division of NBS.

(Chapter officers who wish to schedule the National Lecturer for their Chapter should contact T. Saad at Sage Laboratories, Inc., 3 Huron Drive, E. Natick, Mass. 01760, Tel. (617) 653-0844).

The G-MTT Administrative Committee met September 13, 1971 at the IEEE Headquarters in New York, N.Y. This meeting was the Group's annual meeting in which ADCOM elections were held, the Microwave Prize winner was announced and the National Lecturer was elected.

Sy Okwit, ADCOM Chairman, opened the meeting with comments about the Group's financial position and the meeting agenda. He announced that the December ADCOM meeting will be postponed until February 1, 1972. The February meeting will be held in Chicago the day after the 1972 G-MTT Symposium Technical Program Committee meeting.

E.N. Torgow, Finance Chairman, reported that the Group will operate at a slight deficit this year. He suggested that the following be investigated to increase the Group's income:

1) Exhibits at the annual Symposium

2) Advertising in the Group publications

3) Page charges

He suggested the following areas to be investigated for techniques to reduce costs:

1) Change the Transactions format

2) Drop the National Lecturer

3) Drop the Transactions Editor's expenses

4) Reduce the Group awards

E. Torgow discussed the 1971 budget in detail, noting that the budget was originally established with a higher membership than the G-MTT presently has. In the discussions that followed it was noted that Division 4 has $94K discretionary funds to divide between the six groups in the Division.

F.J. Rosenbaum reported for G. Haddad, Publications Committee Chairman. He stated that the page allotment of 992 pages for 1971 still appears feasible. A discussion on future special issues and stricter editorial policy followed. ADCOM went on record as in favor of both of these. The question of printing costs was brought up by E. Torgow. F. Rosenbaum, T. Saad and E. Torgow were assigned as a committee to check into the possibility of reduction in printing costs. Sy Okwit requested that a committee be set up to try to increase the return on page changes. The committee was established and approved by ADCOM.

H.W. Cooper reported on the 1971 G-MTT Symposium. He reported that the final report is awaiting the receipt of two outstanding payments from coffee break sponsors. A check for $3200 in proceeds from the Symposium was given to E. Torgow.

R.M. Knox reported on the 1972 G-MTT Symposium. A revised budget was submitted and approved except for minor changes. The theme of the Symposium will be "Microwave International". R. Knox stated that it is planned that the Chicago Section will be included in the banquet. The Technical Program Committee meeting is scheduled for January 31, 1972.

A. Clavin reported on the Exhibits Committee actions since its establishment in May 1971. It was recommended that exhibits be tried at the G-MTT Symposium. A discussion followed and ADCOM voted for exhibits at the Symposium.

D.F. Wait presented a proposal to hold the 1973 G-MTT Symposium in Boulder, Colorado. The ADCOM accepted the proposal.

D.D. King announced that the 1972 Microwave Prize has been awarded to M.E. Hines (see story on page 1). He reported that the W.W. Hansen Award has been approved as an IEEE Field Award, but that funds are not available yet.

H. Sobol reported on the status of the MTT Technical Committees. He is presently reviewing each committee and expects to add several new committees in the areas of systems, field theory, ferrites, industrial applications and communications.

K. Tomiyasu conducted the elections for 6 ADCOM members (3 year terms), and for Chairman and Vice Chairman of ADCOM for 1972. The following were elected:

A. Clavin
J. B. Horton
H. Sobol
H. W. Cooper
N. Lipetz
L. R. Whicker

A. Clavin—Chairman ADCOM 1972
J. B. Horton—Vice Chairman ADCOM 1972

A discussion on long range planning followed. Suggestions by those at the meeting included the need for new technical areas in G-MTT and a need for a long range plan that is compatible with that of the Division 4. S. Okwit stated that the present schedule for coming up with a long range plan is impractical, and requested that H. Altschuler, Chairman of Long Range Planning, first work on a philosophy for long range planning to be discussed at the next ADCOM meeting.

J.B. Horton reported that the last NEWSLETTER was composed in Los Angeles, and printed and mailed by IEEE Headquarters Staff. This technique should result in a lower cost per issue.

G.P. Rodrigue announced that T.S. Saad was elected 1972 G-MTT National Lecturer. The election was approved unanimously by ADCOM.

J.B. Horton reported that S. Rosenthal has started a program to get more students and professors interested in G-MTT. This is being done through a series of letters to the IEEE Student Chapter Chairman and to professors at key universities. One of the principal objectives is to get more student papers for the 1972 Symposium.

R.A. Rivers, Chairman of the Professional Action Committee, reported that several committee activities have been started. The committee is working on techniques to serve the membership through IEEE and to devise a group of actions to promote the welfare of the engineer.

Sy Okwit announced that the next meeting will be held in Chicago on February 1, 1972.

WHAT IS THE IEEE PROBLEM?

by R. A. Rivers

In reviewing our present employment environment, one factor is obvious. The career needs of engineers cannot be satisfied by the present system under conditions of long term surplus of engineers.

1. Previously, individuals could take care of their career needs by job switching under conditions of perennial shortages of engineers.

2. IEEE was only required to supply the technical information interchange needs.

3. As long as there is a serious surplus of engineers, mobility will be reduced and career needs not satisfied.

In order to go back to the previously acceptable mode of operation, there must be an excess of job opportunities, i.e., a shortage of engineers.

This can be achieved by the following alternatives:

1. Through imposed shortages

   a. Union restrictions on practice
   b. Government imposed restrictions on practice
   c. Employer restrictions on qualifications

2. Through created demand

   a. New socially oriented programs
   b. Increased military R&D
   c. Fostered Industrial and Commercial R&D

What Career needs were satisfied by an engineering shortage environment?

1. Job security (either where you were working or with a competitor)

2. Challenge (opportunity for development by assignment to jobs that you really weren't qualified for)

3. Mobility (for variety itself, geographical preference, challenge)

4. Growth in responsibility

5. Ability to reject downgrading assignments

6. Professional Travel (Including Symposiums and Seminars)

7. Generally rising salary scales

In the present environment, practically all of the above have been curtailed or have been lost completely. Therefore, it is recommended that all possible action be taken by the entire IEEE organization to optimize the lifetime engineering career opportunities for its members by:

1. Taking action to control excess supply

2. Taking action to place its members in meaningful creative activities

3. Taking action to reduce the supply created by industrial classification

4. Lobbying for support of military, industrial, commercial and socially oriented Research and Development.

5. Lobbying to improve economic fringe benefits

6. Publishing individual industrial employer policies for employment, utilization, advancement, training, and retirement of professionals (a mild form of coercion)

7. Reorganizing to provide more personal career development, educational, and counseling activities

8. Promoting any other activity tending to enhance the career environment.

What are we going to do about it?

The Arlington Towers, Chicago, Illinois

"MICROWAVE INTERNATIONAL" is theme for 1972 IEEE International Microwave Symposium

An international atmosphere with pervade the Arlington Park Towers Hotel as Engineers and Scientists from throughout the world gather for the 1972 Microwave Symposium in Chicago, May 22-24, 1972. The international aspects of the Symposium are being emphasized in order to encourage the submission of high quality papers from outside the United States. Microwave Research and Development has matured considerably in many foreign countries in recent years and the Technical Program Committee is hopeful of bringing reports of some of this excellent work to the Symposium. In this regard, G-MTT members who may be aware of interesting and original research being conducted at industrial firms or universities in foreign countries are asked to contact the Technical Program Committee through its Co-Chairman:

Dr. P. P. Toulios (312/225-9630)
IIT Research Institute
10 West 35th Street
Chicago, Illinois 60616

Deadline for submission of a 500-word summary will be January 7, 1972. Subject areas will be:

1. Microwave Integrated Circuits

2. Applications of Microwave Acoustics

3. Solid-State Microwave Devices

4. Computer-Aided Microwave Practices

5. Microwave Components

6. Millimeter Solid-State Devices and Systems

7. Low Noise Microwave Receivers

8. New Transmission Line Techniques

9. Microwave Measurements and Dosimetry

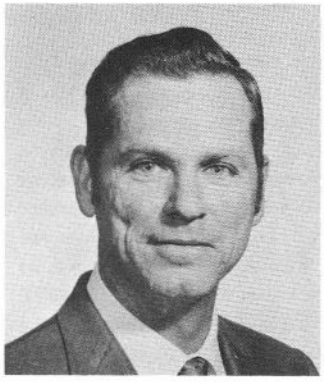
10. New Microwave Civil/Industrial System Applications

11. Devices and Circuits for Gigabit Data Rates

Additional information on the Symposium is available from the Steering Committee Co-Chairmen:

R. M. Knox (312/225-9630)
IIT Research Institute
10 West 35th Street
Chicago, Illinois 60616

L. H. Hansen (312/349-3300)
Andrew Corporation
10500 W. 153rd Street
Orland Park, Illinois 60642



FALL MEMBERSHIP DRIVE

by R. A. Sparks

Every organization requires strong and dedicated leaders to survive and flourish. It is also recognized that the real strength of any group resides in the individual efforts of its members. To obtain peak effectiveness the magnitude of each contribution should be as large as possible, but more important is the fact that their phase be aligned. It is this viewpoint that has motivated the current Fall Membership Drive.

With the new technical calendar already in full swing, the Membership Drive Subcommittee is implementing a plan to increase membership in the G-MTT that will initially involve about ten percent of the total Group members. A letter of appeal is being sent to each member of the following Chapters: Long Island, Orlando, Chicago, Dallas and Denver. Included with the letter is a membership application, a stamped return envelope, and a request that at least one new G-MTT member be recruited during the remainder of 1971.

If this initial effort is successful we plan to expand the drive to include all Chapters and all members. However, everyone is welcome to participate in recruiting new members at any time. Perhaps there is a recent graduate in your department or section who would be interested in joining, or a systems engineer with whom you interface. Your local Chapter Chairman can assist you with any questions that arise, or contact me directly at:

Raytheon Company, MS 315
Bedford, Mass. 01730
(617) 274-7100 X-3601

WASHINGTON CHAPTER SCHEDULES RADAR LECTURE SERIES

by B. E. Spielman

This year the Washington G-MTT Chapter is replacing its normal technical program with a radar lecture series. A coherence is given to the series by having each lecture based upon a portion of the book "Radar Handbook," edited by Dr. Merrill Skolnik. The lectures will be held at the Naval Research Laboratory in Washington, on the second Tuesday of each month, beginning October 12 and continuing through May, 1972. Dr. Skolnik will present the first lecture. The lectures thereafter will be presented by individuals who authored portions of the "handbook." The lecture series registration fee is $40.00, which includes the cost of the reference book.

Prior to each meeting, dinner will be held for all interested participants at the Seaport Inn in Alexandria, Virginia. This restaurant offers an enticing menu in a pleasant atmosphere and is conveniently situated with respect to the Laboratory.

The response to the series has been overwhelming. At this writing the registrations number over 160, with a total of over 200 registration requests being anticipated by the time the smoke clears.[1]

Arrangements for the lecture series have proceeded smoothly under the coordinating efforts of Harvey Edwards, Chapter Chairman. The publicity, registration, and textbook purchase arrangements were handled by Chapter Vice Chairman, Willard Workman and Secretary, Barry Spielman. The planning of the series agenda was headed by Program Chairman, Douglas Maki, with supporting efforts by Robert Garver and William Gabriel.

It is anticipated that the series will be a great success, due in no small part to a comprehensive program, summarized as follows:

DATE	SUBJECT MATTER	SPEAKER
12 Oct 1971	Introduction to Radar	M. I. Skolnik
9 Nov 1971	Transmitters	T.A. Weil
14 Dec 1971	Antennas	T.C. Cheston
11 Jan 1972	Doppler Radar	W. K. Saunders
8 Feb 1972	Receivers	**
14 Mar 1972	Synthetic Aperture Radar	R. Harger
11 Apr 1972	An Introduction to Digital Signal Processing	J. S. Shreve
9 May 1972	Philosophy of Radar Design	D. K. Barton

**SPEAKER TO BE ANNOUNCED.

[1] Recent reports from Washington show that registration is 289 and 2 lectures are planned for each topic. – ED.

THE 1971 EUROPEAN MICROWAVE CONFERENCE

by L. R. Whicker

The second Bi-Annual European Microwave Conference was held in Stockholm, Sweden on August 23-27, 1971 at the Royal Institute of Technology. The Royal Institute provided an ideal setting for this conference. Three large, well equipped lecture halls were provided for the three parallel sessions, while a large lounge area was set aside for conference registration and for informal meetings between the conference attendees. A registration of 751 was obtained with 38 countries represented. As might be expected, Sweden provided the largest single group of attendees; however, several other countries, including the United States, were well represented. A partial listing of the representatives from various countries gives some insight into the attendance pattern:

Sweden	165
West Germany	105
England	96
U.S.A.	56
Netherlands	32
Italy	31
Norway	24
Denmark	23
Japan	11
India	2
Pakistan	1
USSR	3

A technical program consisting of approximately 200 invited and contributed papers were presented in the five-day meeting. About one-fourth of the papers were from the United States. As indicated above, three parallel sessions (Session A, Session B, and Session C) were run with the inevitable overlap of technical material. Session A dealt primarily with solid state devices, Session B with Antennas and Components, and Session C with a variety of topics, including integrated techniques, microwave acoustics, industrial applications, and communication links. An additional Session D was added at the end of Session C to make all the parallel sessions run five days.

In comparison to recent Microwave Symposiums held in the United States, the European Symposium was certainly on par. Some of the particularly outstanding papers that receive very favorable comment included:

"Phased Array Antennas"	— by C. Blake
"Microwave Acoustics"	— by E. Ash
"Low Noise Reception"	— by S. Okwit
"Reflections on Nonreciprocal Microwave Ferrite Devices"	— by H. Bosma

Contributed papers on microwave acoustics and microwave integrated circuits by European authors displayed fresh new inputs in these areas. On the negative side, the three parallel sessions made it difficult to decide which session to attend and transit between sessions was quite heavy. Also, on the whole, the conference was a little long and heavy with invited papers.

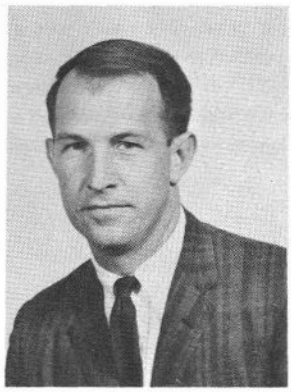
On the social side, we in the United States might well take a lesson from our European friends. The technical program of the conference was run at a leisurely pace with times set aside for the attendees to sightsee or attend social events. This special program complimented a full ladies program. Some of the social program for both attendees and wives is listed below:

August 23 (Evening)	— Cocktail Party at the Technical Museum
August 24 (Evening)	— Opera at the Drottningholm Royal Court Theater
August 25 (Late Afternoon)	— Sightseeing of Stockholm by coach
August 26 (Evening)	— Boat tour in Stockholm Archipelago Dinner (Banquet) at Manor House.

The opera at the Drottningholm Royal Court Theater and the Boat Tour Smorgasbord Dinner at a Manor House were truly outstanding. The dinner at the Manor House replaced a formal banquet. The weather in Stockholm was cool and sunny and complimented both the technical and social programs.

The Proceedings of the Conference are contained in two rather large volumes and were sold at the conference for 125 Swedish kronor (approximately $25.00). Inquiries concerning obtaining copies of the Proceedings should be addressed to:

Dr. H. Steyskal, Secretary General
1971 European Microwave Conference
Research Institute of National Defense
Stockholm, Sweden



CHAPTER ACTIVITIES

by
G. P. RODRIGUE

With fall comes a resumption of Chapter Activities in most areas after a more or less dormant summer. This fall a new chapter swings into operation at Holmdel, New Jersey with almost 200 members. Martin V. Schneider of Bell Laboratories is to be commended for his leadership as Organizer of this joint Electron Devices-Microwave Theory and Techniques Chapter at Holmdel.

At Chicago the previously separated AP and MTT Chapters have merged into a joint AP/MTT Chapter with a total membership about 170. This reflects a growing trend toward joint chapters. Today, two thirds of our MTT chapters are organized jointly with other IEEE groups, AP and ED being the usual partners. This reflects a well recognized overlap of interests and is consistent with IEEE's Divisional organization.

At it's September meeting MTT-ADCOM accepted the bid of the Denver-Boulder Chapter to host the 1973 National Symposium at Boulder, Colorado, on the campus of the University of Colorado. Locations for subsequent symposia have not been determined, and local chapters are encouraged to submit proposals for hosting the 1974, 1975, etc. symposia. Exhibits were approved for National Symposia at this same ADCOM meeting and National Symposia planning and budgeting should take exhibits into account. The format for handling exhibits is at this point left open to the local, host chapter.

The 1971 National Lecturer, Carl Blake has completed the scheduling of fall talks as indicated below:

Philadelphia, Pennsylvania	21 September
Schenectady, New York	23 September
Holmdel, New Jersey	19 October
St. Louis, Missouri	20 October
Purdue, Indiana	21 October
Phoenix, Arizona	15 November
San Diego, California	16 November
Long Island, New York	8 December

As 1972 National Lecturer, MTT-ADCOM has selected Ted Saad who will talk on "The Microwave Industry 1972."

Chapter Chairmen or Program Chairmen are encouraged to contact Ted Saad or me to arrange for 1972 speaking dates.

CHAPTER NEWS

Dallas Chapter

Date:	September 30, 1971 (41)
Speaker:	Neil Corpron
Title:	Microwave Power Generation and Amplification Using IMPATT Diodes
Affiliation:	Hewlett Packard Company
Date:	October 21, 1971 (16)
Speaker:	Dr. Jerome Butler
Title:	Application of Waveguide Theory to Solid State Injection Lasers
Affiliation:	Southern Methodist University

Milwaukee Chapter

Date:	September 28, 1971 (16)
Speaker:	R. F. Schuchmann
Title:	Second Breakdown in Power Transistors
Affiliation:	Cutler Hammer (Milwaukee)
Date:	October 19, 1971 (21)
Speaker:	Dr. D. Lynch
Title:	Laser Gyros
Affiliation:	Delco Electronics

Newly Elected Officers for 1971-72 are:

Chairman:	R. W. Lade Marquette University
Vice Chairman:	Tim Schlax Delco Electronics
Secretary:	R. C. Garnier Waukesha County Technical Institute

Philadelphia Chapter

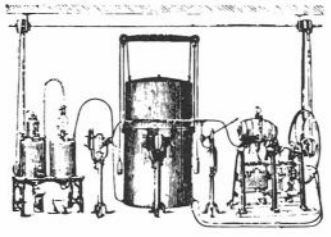
Date:	September 21, 1971 (28)
Speaker:	Carl Blake
Title:	Applications of Solid State Microwave Power Devices
Affiliation:	MIT, Lincoln Laboratory

S.E. Michigan Chapter

Date:	September 22, 1971
Speaker:	R. W. Larson
Title:	Microwave Hologram Radar Techniques
Affiliation:	University of Michigan

Washington Chapter

Date:	October 12, 1971 (287)
Speaker:	Dr. Merrill Skolnik
Title:	Introduction to Radar
Affiliation:	Naval Research Laboratory



TECHNICAL NOTES

REPORT ON THE CORNELL CONFERENCE

by L. F. Eastman

The Cornell Conference on "High Frequency Generation and Amplification: Devices and Applications" was held August 17–19, 1971, in Ithaca, New York. This is the third in a biennial series held at Cornell, sponsored by the School of Electrical Engineering, with the Office of Naval Research as the co-sponsor. IEEE groups cooperating to help the conference were: Electron Devices, Microwave Theory and Technique, and Circuit Theory. Conference Chairman was H.J. Carlin, head of Cornell's School of Electrical Engineering. Proceedings of the conference will be available from: Ms. Elaine Simpson, 224 Phillips Hall, Cornell University, Ithaca, New York 14850.

The attendees were from the major industrial and university laboratories in the United States, Britain, France, Germany, Italy, Scandanavia, Japan, and the U.S.S.R. The objective of the conference is to aid in the transition of these maturing devices from the research and development stage into the engineering and applications stage.

One session of the conference was made up of several of the invited papers. Cyril Hilsum, of England's Royal Radar Establishment, delivered a paper on progress in research and development on Indium Phosphide transferred electron devices. Up to 7% efficiency at more tha 1W peak power in pulsed operation at C-band and up to 60mW CW power with 1.8% efficiency at K-band were reported. W.J. Evans, of Bell Telephone Laboratories, delivered a paper on Trapatt devices. Pulsed device efficiency ranging from 60% in L-band to 25% in X-band were discussed as well as CW operation of 1W at 4 GHz with 18% efficiency. F. Brand, now with Microwave Associates, gave a paper on the breadth of applications for Gunn, LSA, Impatt, and Trapatt, as well as transistor devices. The trade-off between parameters including power, price, reliability, frequency, noise performance, size and efficiency were covered. R. Bowers and J. Frey, of Cornell, gave a paper on the technology assessment related to microwave semiconductor bulk and transit-time devices. The predicted proliferation of these devices, some of the consequences, and some of the controls necessary were covered.

One session of the conference was devoted to laser devices. Molecular, chemical and junction laser recent results were covered, as well as some laser applications. Papers were presented from the University of Illinois, Cornell, and Western Reserve, as well as Bell Telephone Laboratories at Holmdel and Murray Hill, and United Aircraft.

A session on avalanche oscillators and amplifiers was included in the conference. Noise studies on these devices were presented in several of these papers. One theoretical paper by H. Statz of Raytheon, showed the importance of the doping profile in noise performance. Another theoretical paper from R. Kuvas of Bell Telephone Laboratories in Reading, Pennsylvania, showed that Gallium Arsenide Impatts have the highest performance capability in both high power with high efficiency and in low noise. A paper by G.C. Dalman and co-workers at Cornell presented results of FM noise measurements near the carrier in pulsed Impatt and Gunn oscillators. The latest results on GaAs Impatt device CW high power generation were presented by W. Matthei of Raytheon; as well as by D.J. Coleman of Bell Telephone Laboratories, Murray Hill; and by K.P. Weller of RCA. Raytheon results are 5W at nearly 15% efficiency in the 4-5 GHz frequency range and 3W at over 10% efficiency at 8 GHz. Bell Telephone Laboratories showed how up to 6.7W, 18.5% efficiency can be generated with two devices in series on a diamond heat sink in C-band. RCA results include up to 190mW at 31 GHz with 10% efficiency. Also, theoretical studies of Impatt amplifiers by 0. Nilson of Chalmers University in Sweden were presented as well as a computer study of double-drift Impatt efficiency presented by A. Ward of Harry Diamond Laboratories.

One session was devoted to application results on microwave semiconductor devices. Two papers from RCA, presented by S.G. Liu and H. Karamoto, respectively, dealt with selected harmonic power generation in series stacked Trapatt devices and in anti-parallel Trapatt operation. Up to 110W pulse power, at 5.5% efficiency, at 9 GHz, with three devices, was obtained in the first case and 206W pulse power at

15.2% efficiency, at 2 GHz, with a matched pair of devices was obtained in the second case. Injection locking and noise behavior were treated in two papers presented by M.S. Gupta of the University of Michigan and T.R. Turlington of Westinghouse. In two other papers, neutron irradiation effects on Gunn and Impatts were presented by W. Anderson of Rutgers; and on high pulse power LSA devices were presented by W.E. Wilson of Sandia Laboratories. A paper by D. Clunie of England's Services Electronics Research Laboratory, showed the effectiveness of Impatt oscillators as parametric amplifier pumps. A novel dielectric cavity resonator that can be attached to microstrip semiconductor oscillator circuits was presented by W. Day, Jr. of Litton Industries. In addition, a complete FM/CW radar altimeter, operating in Ku-band, using a Gunn diode transmitter, was presented by W. Sadler of General Dynamics. A late paper by J. Magarshack of LEP in France presented results of a study of the dependence of Gun device microwave noise on low frequency noise.

The session on Gallium Arsenide bulk effect devices included both transit time Gunn and limited space charge accumulation (LSA) modes. In a paper presented by T. Hasty of Texas Instruments, up to 10% efficiency at 700mW at 9 GHz, 6.7% efficiency at 480mW at 16 GHz, and 4% efficiency at 200mW at 35 GHz has been achieved using single chip Gunn devices. High performance varactor-tuned Gunn oscillators operating in Ku-band were discussed in two papers by J. Bravman of Cayuga Associates of Ithaca, and D. McQuiddy of Texas Instruments of Dallas. Amplifiers based on the transferred electron effect in GaAs were presented by W. Siekanowicz, representing the research team at RCA, with up to 2W power, 20 dB gain, over 2 GHz bandwidth, in C-band, using parallel output devices and driver stages; and by A. Talwar of University of Michigan. The effect of dielectric loading on bulk effect devices was presented by M. Morisue, representing a research team at Japan's Electrotechnical Laboratory. Means of experimentally achieving the theoretical limit of efficiencies in 200W pulsed S-band LSA oscillators, using harmonic tuning, and of optimizing the spectrum and frequency injection locking of pulsed LSA oscillators were presented respectively by L.F. Eastman and W.L. Wilson, Jr. of Cornell. The operation and theory of very high power LSA oscillators, including up to 2 KW peak power at low duty cycle or up to 1.25W average power at high duty cycle, both in C-band, was presented by W.O. Camp, Jr. of Cayuga Associates. Late papers were presented at the conference by H. Huang of RCA on design of transferred electron oscillators for various duty cycles, by J.J. Purcell of Plessey Company in England on K_A-band pulsed Gunn oscillators yielding up to 1.75W peak power at 28 GHz, and by A. Pearson of Standard Telecommunications Laboratory in England on 250W pulsed Gunn S-band modules using four devices in series.

A session on high frequency junction devices was also held. B.D. Josephson of Cambridge University discussed super-conducting junction effects in one paper. A later paper on microwave parametric interactions in Josephson junctions was also presented at the conference by A.N. Vystavkin of the U.S.S.R. A series of papers on microwave transistors included an analysis of ion-implanted bipolar transistors presented by M. Barnowski of Hughes; measurement techniques on GaAs MSFET devices presented by J. Jahncke of Aachen, Germany; a 1.5W S-band amplifier by A. Presser of RCA; and MOS devices for receiver amplifiers by G.D. Vendelin for Signetics Corporation. Two papers on recent developments in mm wave detector diodes were presented by B.J. Clifton of Lincoln Laboratory and by H.M. Leedy of Hughes.

An invited paper was presented at the conference by S. Furukawa of Tokyo Institute of Technology, covering the latest Impatt and Gunn device results from Japan. Up to 1.85W CW with 8.5% efficiency at X-band with a single Silicon Impatt device, and over 10% efficiency at X-band with GaAs Impatt devices were reported. Some applications in the areas of doppler radars and communications systems were presented.

An evening rump session was held. A presentation of recent results on frequency locking of high pulse power C-band LSA oscillators was made by J. Quine of General Electric. M. Shaw, of Wayne State University, presented an analysis of large signal oscillations in devices yielding S-shaped I-V curves. Finally, two presentations were made on the new barrier injection transit time (BARITT) low noise devices made with Silicon. D.J. Coleman, Jr. of Bell Telephone Laboratories, discussed results with 10 m n-type Silicon devices, with platinum Schottky barriers on both sides, yielding up to 60mW in C-band with over 2% efficiency. C.A. Lee of Cornell discussed results with 3.8 m n-type Silicon, grown on p+ type Silicon substrate, with an outer Schotky barrier of platinum, yielding up to 5mW in Ku-band with nearly 1% efficiency, and with local oscillator noise below 30% of shot noise. These very interesting new devices work on the basis of back-bias punch-through causing hole injection with little time delay, at a Schottky barrier, and yielding negative resistance when the hole transit time is about three quarters of an oscillation period. The modest power and low noise of the BARITT devices makes them the potentially very useful as microwave local oscillations.

REFLECTIONS ON THE 1971 SYMPOSIUM

(Continued from the July issue of the NEWSLETTER)

The 1971 International Microwave Symposium was held in Washington, D.C. on May 17–19 at the Marriott Twin Bridges Motel. 469 attendees registered, resulting a net return to IEEE of $3200. The Symposium was a success both technically and financially. The photographs included here were taken during the banquet and show presentations of some of the Awards at the banquet. More information about the Symposium can be obtained from the Symposium Digest, which is available from IEEE Headquarters (IEEE Catalog No. 71-C25M "G-MTT Symposium Digest", $5.00, order from IEEE, 345 East 47th Street, New York, N.Y. 10017).

The Best Part of Being a Winner is Getting the Check (Loot)
(S. Okwit, T. A. Saponas)

1971 Microwave Prize Winner, W. J. Evans,
Receiving Award from S. Okwit

Dr. J. Brant Receives Award as Past Chairman of ADCOM

W. R. Hinchman, Banquet Speaker –
Tells Engineers That Times Will Get Worse – Go Into Cable T.V.

Bob Rivers – Delivers Punch Line at Banquet

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PERSONALITIES

Dr. A.D. (Dave) Bresler, President of Antenna Systems Consultants, 1393 Fraser Avenue, Merrick, N.Y. 11566, has been flooded with calls since the recent announcement in the Trade Journals that Dr. David Bressler had joined Transco, in Venice, California. Dr. Bresler has not moved West, and there are indeed two Microwave and Antenna experts with similar names. The correct address for David Bressler is: Transco Products, Inc., 4241 Glencoe Avenue, Venice, California 90291.

Bob Beatty has returned to the National Bureau of Standards, Boulder, Colorado, after an extended assignment in Japan. Bob's new address is: R.W. Beatty, NBS, Electromagnetic Division 272.10, Boulder, Colorado 80302, Telephone (303) 447-1000.

Six candidates were elected to the G-MTT ADCOM at the September meeting. Reelected for three year terms were A. Clavin, Hughes Aircraft Company; J.B. Horton, Tasker Industries; H.W. Cooper, Westinghouse; and N. Lipetz, U.S. Army Electronics Command. H. Sobol, RCA Princeton Labs and L.R. Whicker, Naval Research Laboratories, were newly elected. A. Clavin and J.B. Horton were elected ADCOM Chairman and Vice Chairman, respectively, for 1972.

R.E. Henning, ADCOM past chairman, has joined University of South Florida, Tampa, Florida, as Assistant Dean of the College of Engineering.

P.H. Smith, chairman of the ADCOM Standards Committee, recently announced a change of address. His new address is: 24 Burlington Road, Murray Hill, N.J. 07974, Telephone (201) 464-3252.

LETTERS TO THE EDITOR
Should be mailed to:
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