



REFLECTIONS ON THE 1986 INTERNATIONAL MICROWAVE SYMPOSIUM



by Edward C. Niehenke

The 1986 IEEE-MTT-S International Microwave Symposium and Workshops was for the first time hosted by the Baltimore MTT-S Chapter during the first week in June. This Symposium broke all previous records in attendance with many innovations and activities, both technical and social. Baltimore offered the attendees a convenient location at the beautiful Baltimore Inner Harbor complex. The technical activities were held at the new spacious Baltimore Convention Center, with the majority of hotels located within walking distance of the Center. Many hotels had over-the-street walkways to the Convention Center. The weather was perfect with the sun shining every day and an average day temperature of 80 degrees F. The many attractions of the Inner Harbor within walking distance of the Convention Center were enjoyed by the attendees at lunchtime and in the evenings.

The Baltimore Symposium Steering Committee was motivated by a sense of pride of Baltimore, a dedication to professionalism, and the desire to make the 1986 International Microwave Symposium "The Best" for the 6671 attendees plus their families that visited Baltimore from all over the world the first week in June 1986. The volunteer committee, some 38 strong, worked hard over a period of five years, devoting countless hours to make this Symposium one that will be remembered for years to come. I thank all of the committee members for the excellent job they did and I cherish the friendships we have all experienced in this endeavor.

The Microwave Symposium was held on Monday, June 2, through Wednesday, June 4. The Monolithic

Symposium was held jointly with the Microwave Symposium on Wednesday afternoon and all day Thursday. Six panel sessions were held on Monday, Wednesday, and Thursday, and six workshops as well as the 27th ARFTG Conference were held on Thursday and Friday. These well attended panel sessions and workshops explored the latest issues and technologies to complete the technical program. This year's exhibition with 256 companies in 425 booths was the largest in MTT-S history.

A full social program throughout the week made for an enjoyable time for the attendees and their families. Sunday evening prior to the symposium, 800 persons attended the complimentary Microwave Journal Reception at the Maryland Science Center. The entire Science Center, including all exhibits, was open exclusively for us. Complimentary continental breakfasts were served to all technical attendees at the Convention Center every morning prior to the start of the sessions to get people together and to make it convenient for the attendees. A complimentary Crab Feast/Bull Roast, a Maryland tradition, was enjoyed by 1050 persons on Wednesday evening. The guests' program, with visits to historic Baltimore, picturesque Annapolis, and Washington, D.C., was well attended with a total of 338 participants during the three days.

The week's program started on Monday morning with the opening ceremonial session attended by about 1200 persons. In keeping with the Symposium theme, "Microwaves Linking Nations," the 51 Chapter Chairmen/representatives from the various MTT-S Chapters from 15 countries and 36 of the United States carried their state/country flags in procession to the music of the Zim Zemarel orchestra. "The Star Spangled Banner," written by Francis Scott Key in Baltimore on September 13, 1814, was played and sung by all.

The Symposium was officially opened with a two-way live microwave transmission between Baltimore and West Germany, representing our overseas members. AT&T long lines carried the transmission from Baltimore to Etam, West Virginia, where the signal was beamed up to the INTELSAT satellite and beamed down to Raisting, West Germany. The transmission link was completed with a special overland microwave link to the West German studio in Bonn. Dr. Reinhard Knerr, the

(Continued on page 10)

PRESIDENT'S REPORT "YOU MADE MY DAY"



by Reinhard H. Knerr

In my last report, I obviously wanted to rattle some cages. I got reactions which I should have expected, but they were still a surprise since all my observations are a matter of record. I guess I also should not have been surprised when, as I entered the hotel lobby to check in for our ADCOM Meeting, I was jokingly greeted by an old friend with the words "here comes our trouble maker". He had just returned from the TAB meeting (Technical Activities Board — Major IEEE Officers meeting) and explained to me that some folks at TAB were upset about my last Newsletter Column, and it was noted that I was not at the TAB meeting to clarify matters.

Well it is true, I was not at the TAB meeting because I have other responsibilities besides IEEE, including a family. The TAB meeting took place Thursday and Friday in Pittsburgh, and our ADCOM meeting on Saturday and Sunday in Baltimore with the Symposium immediately following. Besides, nobody had mentioned to me that I was "on the agenda".

Now here comes the good part: One morning during the Symposium week, I marched over to the convention center and noticed a gentleman looking at me from the side and trying to glance at my badge. He finally caught up with me and said, "I read your report in the Newsletter, and I agree completely with you..." We did some chitchatting, and he finally said, "For whatever it's worth, this member is 100% behind you". Our paths separated, and regrettably I did not even get the name of the man, but suddenly everything seemed brighter and worthwhile. Whoever you are, my friend, "you made my day!"

More good news: At our January ADCOM meeting, I have asked our Vice President, Dr. Dave McQuiddy, to form a committee of distinguished ADCOM or ex-ADCOM members to study our financial situation and report back to ADCOM with their long-range recommendations. Dave and his committee met for two days, and they did a terrific job. By way of this message, I would like to congratulate them all, namely

- H. Howe
- D. McQuiddy
- P. Rodrigue
- F. Rosenbaum
- C. Rucker
- T. Saad
- H Sobol

I hope that Dave will talk about his committee's findings in the "ADCOM Report". Meanwhile, I have taken immediate action to implement the recommendations. We will hear more about it at our October ADCOM meeting.

ADCOM HIGHLIGHTS



by Dave McQuiddy

The second ADCOM meeting of 1986 took place on Sunday, 1 June, in Baltimore. The meeting started promptly at 8:00 AM with 16 of the 18 elected ADCOM members in attendance. Since this meeting was held on the day before the opening of the International Microwave Symposium, a larger than normal number of visitors (27) were present. MTT-S members are welcome at these meetings and are encouraged to participate in the discussions and to introduce new ideas/concepts for ADCOM consideration.

As in the past, a large number of agenda items were administrative in nature and, although necessary for normal operation of the Society, not of general interest to the members. An example of this type item was the numerous minor changes to the MTT-S Constitution and By-Laws considered as a result of recommendations made by IEEE Headquarters. It seems that each ADCOM meeting recently has dealt with constitution and by-law changes as a result of actions initiated several years ago to update our procedures to meet current needs.

Reinhard Knerr asked me in January to form a committee of distinguished ADCOM or ex-ADCOM members to examine MTT-S future activities in the areas of education, philanthropy, budget, etc. The committee consisting of Harlan Howe, Pete Rodrigue, Fred Rosenbaum, Charlie Rucker, Ted Saad, Hal Sobol and I met for two days starting May 1. I reported the results of this meeting to ADCOM and will highlight the key elements in the following paragraphs.

The first task involved a fairly detailed examination of the previous six years of income and expense records to establish surplus growth trends and major expense items. We found that although our surplus has been increasing approximately \$84K per year, our expenses have been increasing at nearly the same rate (\$80K). Thus, our reserve as a percent of operating expense is growing at a much slower rate than originally thought. The 1985 year-end reserve (\$776.7K) to expense (\$731.5K) ratio is 1.06, or we have a little over one year operating expense in reserve. This was not viewed as an overly conservative position. It should be pointed out

EDITOR'S NOTES



by R.S. Kagiwada

that the financial reporting procedure is dependent on timely submission of expense invoices and accounts receivable actions to give credit to the correct year. This has not been the case. For example, during the past six years the year-end reserve to expense ratio has fluctuated from a low of .80 to a high of 1.85. Averaging was used to smooth the data and draw the conclusions outlined above.

The next task was concerned with reviewing and evaluating the financial impact of actions previously taken by ADCOM that were not reflected in the prior six year data set. These actions are in the educational area and consist of the graduate and undergraduate fellowships and the grant-in-aid assistance plans. A proposal for the establishment of a microwave foundation had been submitted to ADCOM a few years ago and action on this proposal had been deferred. This proposal was reviewed to provide planning guidance.

With the review process completed, attention was focused on generating and exploring new areas of activity that would benefit both the MTT-S membership and the microwave community at large. A round table discussion provided a forum for each participant to provide their ideas for consideration. At the completion of this general brainstorming session, the various ideas were condensed into six projects. These projects, including a brief synopsis, are listed below:

1) INFORMATION DISSEMINATION

Annotated bibliographies and/or tutorials should be generated in selected technical areas. This information could be made available in hard copy form as well as in an electronic data base. The use of the IEEE electronic bulletin board should be encouraged and a dedicated MTT-S bulletin board should be considered as appropriate in the future. Satellite based continuing education courses should be developed. It is felt that in the process of generating the annotated bibliographies, a need will be identified for a definitive book or document requiring a solid engineering base for design and manufacturing. Support should be provided for the generation of a course of action to solicit outside support to fund the study and experimental verification where required. The MTT-S support would be to structure a proposed statement of work and present it to the appropriate government, foundation, or industrial sponsor.

2) INDUSTRY TRADE ASSOCIATION

An industry association should be formed to further the microwave industry through image enhancement, standards setting, and communication of public issues as well as the funding of specific items for the microwave community. MTT-S should serve as a catalyst to form the association and should become a full participant and dues paying member with a permanent position on the board of directors.

3) EDUCATION RELATED PROGRAMS

The base programs that have been approved by

(Continued on page 4)

For the first time, the International Microwave Symposium was hosted in Baltimore. Edward Niehenke, the Symposium General Chairman, and his 1986 Symposium Committee made it both an elaborate and gala affair. Opening ceremonies started with a flag procession of the various MTT-S Chapters from all over the world. In keeping with the theme, "Microwave Linking Nations", this was followed with a two-way live microwave transmission between Baltimore and West Germany. It seems only fitting that Reinhard Knerr, the MTT-S President, was able to converse in his native tongue with West Germany.

Marvin Cohn, the Symposium Technical Program Chairman, had an outstanding Technical Program which consisted of 183 papers. For the first time, the program had two Focused Sessions: "Advances in Low-Cost Components Manufacturing" and "Microwave Aspects of GHz/Gbit Optical Transmission." In a never ending struggle to improve the technical program, Marvin has enclosed a questionnaire in the Newsletter. I hope that you will take the time out to fill it out and send it in. It is important that the technical program committee hear from you so that we can continue to serve the membership in the proper manner. The complimentary Crab Feast/Bull Roast, a Maryland tradition, was enjoyed by more than 1,000 people.

The 1986 IEEE Microwave and Millimeter-Wave Monolithic Circuits Symposium was held in conjunction with the International Microwave Symposium. In five short years, this symposium now draws over 750 attendees. The opening session was joint with the International Microwave Symposium and featured E.D. Maynard, Jr., who spoke on his upcoming MIMIC program and its implications for microwave research and development.

Next year the International Microwave Symposium will be held in Las Vegas. Steve March, the General Chairman, and his committee are busy working on this event. I hope we will all see you there.

Congratulations are in order for Kiyo Tomiyasu, our Division IV Director. Kiyo was awarded the annual prize of the Telecommunications Association of Japan. Kiyo was born in Las Vegas, Nevada and is the first non-Japanese citizen to receive the prize in its 27 years. Kiyo is one of the founders of MTT-S and has served as president, vice-president and in other various offices. He is presently an honorary life member of the Society.

(Continued on page 4)

Editors' Notes –
(Continued from page 3)

For this issue, John Horton's Special Article deals with the applications of ferrite/magnetic materials at microwave and millimeter-wave frequencies. It is co-authored by Bill Hord and John Owens. The authors give you an excellent insight on the field and what challenges remain in the future.

My term as Editor has expired, and this will be my last issue. These three years have gone by quickly, and I hope you enjoyed the Newsletter as much as I enjoyed working on it. I thank the many people who have worked so hard in making the Newsletter a success in the last three years. I would like to name them all, but unfortunately the list would be too long to publish. I would like to thank John Horton for his hard work and dedication on the Special Article. Finally, I would like to thank Cindy Yokono whose high level of commitment and perserverance made the publication of the Newsletter possible.

ADCOM Highlights –
(Continued from page 3)

ADCOM should be aggressively pursued (undergrad. scholarship, graduate fellowship, and grant-in-aid).

4) ENHANCEMENT OF AWARDS AND RECOGNITION

A significant effort should be mounted to increase the monetary value of our awards. The publicity surrounding the presentation of the awards should be increased. The establishment of a major IEEE field award that would include a co-sponsor should be investigated.

5) MTT-S VISITNG FELLOW

The sabbatical exchange of professionals among government, industry, and university entities should be promoted.

6) COMMITTEE FOR THE PROMOTION OF NATIONAL MICROWAVE STANDARDS (PNMS)

The existing PNMS Committee should be encouraged to convene an industry panel to address funding sources to expand their efforts. Our \$3K per year funding level should be continued and we should be receptive to a proposal for increased MTT-S participation with the long term objective of helping PNMS stand alone or become a part of the Industry Trade Association.

A preliminary cost estimate was generated for each of the projects with the intent that it serve as a guide for the more detailed project definition that will be the next step. The table below presents these cost estimates by project for the next several years:

PROJECT	1987	1988	1989	1990
INFORMATION DISSEMINATION	\$25K	\$40K\$	60K	\$60K
INDUSTRY TRADE ASSOCIATION	\$5K	\$10K	\$10K	\$10K

EDUCATION RELATED PROGRAMS	22.5K	\$37.5K	\$48K	\$55K
ENHANCEMENT OF AWARDS/RECOGNITION	\$5K	\$5K	\$5K	\$5K
MTT-S VISITING FELLOWS	\$5K	\$5K	\$5K	\$5K
COMMITTEE ON PNMS	3K	\$3K	\$3K	\$3K
TOTAL	65.5K	\$100.5K	\$131K	\$138K

It was recommended that the proposed projects be referred to the appropriate ADCOM standing committee for consideration and that these committees report their recommendations to ADCOM for approval. It was also pointed out that if a majority of these projects are implemented, additional income will be required to maintain our reserve at a prudent level. If you would like to make your views known concerning these projects, now is the time. Please call or write me or any of your other ADCOM members.



... PERSONAL POINTS

Wine before a meal.

Wine before a meal tends to increase hunger. But drinking wine while you eat helps to quell the appetite, and wine at the end of a meal can drown the desire for dessert.

Maria Simonson, director of the health, weight and stress program, Johns Hopkins Medical Institutions, Baltimore 21205.

Fat is poison.

For every 1% drop in blood cholesterol, there is a 2% reduction in heart attack and death.

Dr. Robert Levy, cardiologist, Columbia University, New York 10027.

Crash diets.

Crash diets actually make people *fatter* in the long run. *Reason:* When dieters consume fewer than 1,200 calories a day, they lose muscle tissue as well as fat. If they go far enough below that level, their *percentage* of body fat will increase, even though their weight may go down.

University of California's Berkeley Wellness Letter, Box 10922, Des Moines, IA 50340, monthly, \$18/yr.

Drinking* and walking.

Drinking* and walking don't mix. Of 6,000 teenage and adult pedestrians killed by cars in 1984, 40% were legally drunk.

**Alcoholic beverages.*

National Highway Traffic Safety Administration, in New Age, 342 Western Ave., Brighton, MA 02135, monthly, \$15/yr.

... HEALTH HOTLINE

Heart-attack victims.

Heart-attack victims who take niacin (a B vitamin) live an average of two years longer than those without the supplement. *Theory:* Niacin slows the progress of atherosclerosis by lowering cholesterol and triglyceride levels.

Study by Dr. Paul Canner, Maryland Medical Research Institute, Baltimore, cited in Men's Health, 33 E. Minor St., Emmaus, PA 18049, monthly, \$24/yr.

AWARDS



by Don Parker

MTT-S HONOR ROLL

The MTT-S Honor Roll was displayed for the first time in the Historical Exhibit at the 1986 International Microwave Symposium. The Honor Roll was recently instituted by the Society to provide continuing recognition to those individuals who have made outstanding contributions to microwave technology or have given outstanding service to the Society. Those individuals who receive the Microwave Career Awards, the Distinguished Service Award, or are Life Members are automatically members of the Honor Roll. Other former members who have died may be added to the Honor Roll, posthumously, if it is determined that their contributions are equally significant and are elected by ADCOM.

The Honor Roll consists of a large walnut plaque with the names of each member and their qualifying award(s). Listed below are the names of those presently on the Honor Roll.

- Andre G. Clavier *Honorary Life Member*
- George C. Southworth *Honorary Life Member*
- Alfred C. Beck *Honorary Life Member*
- Seymour B. Cohn *Honorary Life Member*
Microwave Career Award
- Donald D. King *Honorary Life Member*
- William W. Mumford *Honorary Life Member*
Microwave Career Award
- Theodore S. Saad *Honorary Life Member*
Distinguished Service Award
- Kiyo Tomiyasu *Honorary Life Member*
Microwave Career Award
- Leo Young *Honorary Life Member*
- Harold A. Wheeler *Microwave Career Award*
- Henry J. Riblet *Microwave Career Award*
- John R. Whinnery *Microwave Career Award*
- Ernst Weber *Microwave Career Award*
- A. Gardner Fox *Microwave Career Award*
- Werner J. Kleen *Microwave Career Award*
- Akio Matsumoto *Microwave Career Award*
- Marion E. Hines *Microwave Career Award*
- John R. Pierce *Microwave Career Award*
- Harold M. Barlow *Microwave Career Award*
- Nathan Marcuvitz *Microwave Career Award*
- George L. Matthaei *Microwave Career Award*
- Alvin Calvin *Distinguished Service Award*
- George P. Rodriguez *Distinguished Service Award*
- Harold Sobol *Distinguished Service Award*

H. George Oltman accepted the assignment to have the plaque made and ready for the symposium. I would like to thank him for helping to bring to fruition this new means of honoring our members.

1986 AWARDS BANQUET

The following awards were presented at the Annual Symposium Banquet in Baltimore by MTT-S President, Reinhard Knerr:

- Microwave Career Award George L. Matthaei
- Microwave Prize Yalcin Ayasli
Leonard D. Reynolds, Jr.
James L. Vorhaus
Larry K. Hanes
- Microwave Application Awards . . . Clarence B. Swan
- Distinguished Service Award Harold Sobol
- Distinguished Microwave Lecturer . . Kenneth L. Carr

In addition to the above awards, Bruno Weinschel, IEEE President, presented Fellow Awards to seven members of MTT-S. President Knerr also presented the Past President Pin to Harlan Howe, Jr. A Certificate of Meritorious Service was given to Richard A. Sparks for his many years of service to the Society. Certificates of Recognition were given to Fred J. Rosenbaum, Steering Committee Chairman, James Roe, Steering Committee Vice-Chairman, William E. Hord and Stephen Honickman, Co-Chairman Technical Program Committee, 1985 International Microwave Symposium. George J. Jerinic retiring ADCOM member was given a Certificate of Recognition for his past service to the Society. Certificates of Recognition were also presented to Rodger D. Kaul and Ted M. Nelson for coordinating lecture series and chapter records respectively on the Membership Services Committee.

The following members of MTT-S were elected Fellows of IEEE and chose to have their Fellow Certificates presented at the 1986 International Microwave Symposium banquet. Bruno Weinschel, IEEE President, presented the Fellow Awards.

- Kenneth L. Carr For contributions to the application of microwave technology in medicine
- James E. Degenford For Contributions to hybrid and monolithic microwave integrated circuits
- John B. Horton For leadership in the design of military millimeter-wave systems
- James Chih-I. Lin For contributions to understanding the biological effects of pulsed microwaves in the inner ear of humans
- David N. McQuiddy, Jr. For leadership in the developments of solid-state modules for phased arrays
- Barry S. Perlman For contributions to micro-

wave solid-state device and circuit design, and leadership in computer-aided methods for microwave engineering
For contributions to the development of millimeter-wave components

Jorg E. Raue

The following were elected Fellows with the endorsement of MTT-S but were presented their Fellow Awards elsewhere.

Timothy Ting-Jau Fong For contributions to the development of millimeter-wave technology

Robert J. Mattauch For contributions to the development of low-noise millimeter-wave diode technology

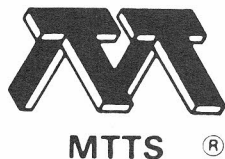
CHARLES RUCKER NEW AWARDS CHAIRMAN

Reinhard Knerr, MTT-S President, announced at the June ADCOM meeting that Charles "Charlie" Rucker is the new chairman of the Awards Committee. He will begin functioning immediately. His first task will be to prepare the nominations for the 1987 Microwave Career Award, Applications Award, and the Distinguished Service Award for presentation and approval at the ADCOM Fall meeting.

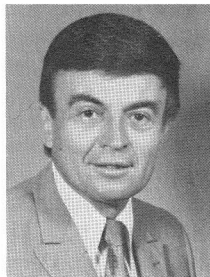
Charlie has been a member of ADCOM for several years and is a Past President. He is highly qualified to function as the Awards Chairman. He is dedicated and very knowledgeable about the Society and the contributions of its members. I wish him well and look forward to the future.

As the retiring chairman of the Awards Committee, I would like to say that the last three and a half years have been very enjoyable. In the beginning I didn't fully realize the amount of work involved in the assignment. But it is very gratifying each year to see the fruits of the Committee's labors as the awards were presented. I am very appreciative of the extensive efforts made by the various committee members. They remain anonymous so, except for the results, their work is not known by others. Each has been responsive when asked to participate, worked hard, been honest and forthright with their recommendations and evaluations, and supportive of the committee's activities.

I know that there is much more that should and could have been done. I feel confident that Charlie will be able to find ways to give even greater recognition to more of the Society's members.



AWARDS COMMITTEE Thank You Don Parker — Welcome Charlie Rucker



by Reinhard H. Knerr

The awards chairman of our Society has a very important function. After all, our annual Awards Banquet at our International Microwave Symposium is the highlight of the year. There we recognize each year the outstanding contributors of our Society, and they have the rare opportunity to stand in front of their peers and receive well-deserved recognition.

Before we get to the point, however, there is a year of hard work by the awards committee and its chairman. The chairman has to do a lot of coordinating, polling and judging before a final list of Fellow Candidates is established, or before the candidates for the various prizes and awards are ready to be presented to ADCOM for final approval.

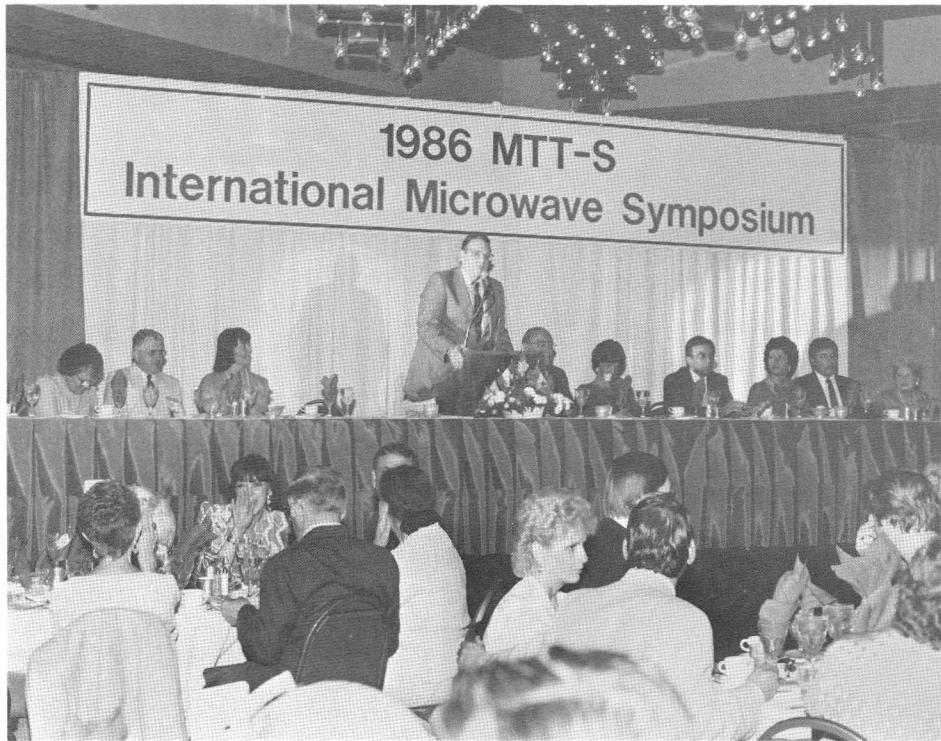
Don Parker served with distinction as our awards Chairman, as he has in his other MTT-S functions, such as President and Editor. Under Don's chairmanship, our awards structure was reorganized, and new awards such as the Distinguished Service Award and the Honor Roll were introduced. Don's extended term is now over, and I was so pleased to work with Don at our Awards Banquet. I was nervous before the presentation, but there was Don Parker; he had everything prepared, the script, the framed certificates, and as he handed them to me, I knew there was no better partner. Thank you, Don, for having done an outstanding job.

It is with great pleasure that I introduce our new Chairman of the Awards Committee, who is well known to all of us as a Past President: Charlie Rucker. Charlie took over immediately after the Baltimore Symposium, and all related correspondence should now go to:

Mr. C. T. Rucker
Georgia Institute of Technology
Engineering Experimental Station
EML/PSD
Atlanta, GA 30332

Welcome Aboard, Charlie!

1986 IEEE International Microwave Symposium Awards Banquet



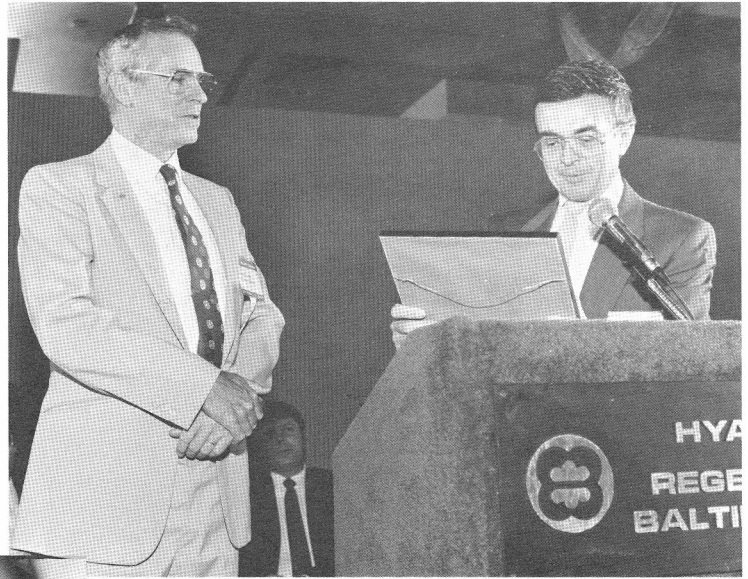
Edward Niehenke at the Awards Banquet head table welcomes the 556 attendees.



IEEE President Bruno Weinschel addresses the banquet before presenting the IEEE Fellow awards.

1986 IEEE International Microwave Symposium Awards Banquet (Continued)

Richard Sparks receives the Meritorious Service Award from MTT-S President Reinhard Knerr.



Fred Rosenbaum receives his Certificate of Recognition for serving as chairman of the 1985 Microwave Symposium.

William Hord receives his Certificate of Recognition for serving as Technical Program Co-chairman of the 1985 Microwave Symposium.



1986 IEEE Intenational Microwave Symposium Awards Banquet (Continued)



George Jerinic receives his Certificate of Recognition marking his retirement from ADCOM.

Roger Kaul receives his Certificate of Recognition for his services as Coodinated Lecture Series organizer for Membership Services.



Ted Nelson receives his Certificate of Recognition for his service with Membership Services Chapter Records.

Reflections –
(Continued from page 1)



Fred J. Rosenbaum, chairman of the 1985 Microwave Symposium, opens the ceremony and heads the procession of the 51 MTT-S Chapter.

MTTS President, and I, as Symposium Steering Committee Chairman, welcomed everyone to the Symposium. I showed original slides of the planet Uranus some 1.8 billion miles away, its 10 rings, and two of its eight moons as taken in January 1986 by Voyager II, launched eight years ago, a spectacular application of the use of microwaves. Dr. Knerr presented a special message in German to the West Germans, who included Dr. Winfried Florian from the Ministry of Posts and Telecommunications, Professor Dr. Horst Groll of the Technical University in Munich, and Dr. Nigel Keen, founder of the West Germany MTT-S Chapter. Professor Groll commented on the history of microwaves and showed some experiments of Hertz from the Deutsches Museum. Nigel Keen showed some recent exciting antenna and mixer developments in West Germany.



Rolf Jansen, chapter chairman of the West Germany MTT-S Chapter, carries the West German flag at the opening ceremony.

Helmut Schrank, the Symposium Vice Chairman, introduced Dr. Arthur Clarke, the well-known author and inventor of the geostationary earth-orbit satellite in the 1940's, who presented us with a special message via video tape made for this Symposium from his home in Sri Lanka. Dr. Clarke introduced Dr. Joseph Charyk, his personal friend and the founder of COMSAT, who gave the keynote speech. Dr. Charyk traced the developments of microwaves from Maxwell, Hertz, and Marconi to the present and gave some projections on what the future holds in microwave communication.

A proclamation by the governor of Maryland was presented to me on behalf of the Symposium by Sylvia Ramsey proclaiming June 1-7, 1986, International Microwave Week in Maryland. Francis Kuchta from the office of the mayor of Baltimore presented me with the key to the city of Baltimore.

Dr. Marvin Cohn, the Symposium Technical Program Chairman, summarized the events of the technical program as well as the many innovations of the Baltimore Symposium. One of these is the introduction of the focused session, which this year were on "Advances in Low-Cost Component Manufacturing" (one session) and "Microwave Aspects of GHz/Gbit Optical Transmission" (two sessions). Another innovation was to provide recognition to the authors of well presented papers in every session. A third new feature, which was appropriate for this year's symposium theme, was the inauguration of an exchange of technical sessions with the European Microwave Conference. Papers by four prominent Europeans, selected by the European Microwave Conference, were presented at the International Session. An exchange with four U.S. authors is planned for the 1986 European Microwave Conference.

The opening ceremonial session required extensive coordination by many people from both sides of the Atlantic Ocean. This memorable and uplifting occasion was enjoyed by the record 1200 in attendance and set the stage for the week's technical and social events.

The Technical Program Committee under the able direction of Dr. Marvin Cohn did an excellent job this



R. Knerr, H. Schrank, J. Charyk, S. Ramsey, F. Kuchta, and E. Niehenke all sing the "The Star Spangled Banner" at the opening ceremony.



The West German speakers, W. Florian, N. Keen, Professor Groll, speak to the attendees at the symposium on a giant projection screen.

year in soliciting and selecting the papers which describe important advances in the field. Due to the record number of submissions this year, the committee had a hard task evaluating and selecting from the record number of papers. The quality of this year's Technical Program is a tribute to the work done by the Technical Program Committee.

The Technical Program consisted of 183 papers, of which 87 were 20 minutes long, 50 were 10 minutes long, and 46 were open-forum papers. These were presented in three parallel sessions. The papers presented the latest results and technical breakthroughs in over 20 areas. Included in this count were seven papers, held jointly with the Microwave and Millimeter-Wave Monolithic Circuits Symposium, on Wednesday afternoon.

The open forum, located adjacent to the technical sessions, was well attended this year on Monday and Tuesday afternoons. Dan Buck provided the forum with many creative and unique features, including clustering according to common topics, which led to lively interaction. Additionally, booths were laid out in rectangular alcoves to provide sound and spatial isolation, required for good communication between the speaker and visitors. Chesapeake Bay seafood, cheeses from all over the world, and refreshments that included a special punch made to Dan's recipe were served and enjoyed by all the attendees.

The Historical Exhibit was well attended this year, with major loans from Baltimore's Historical Electronics Museum as well as from numerous companies throughout the United States. Ted Saad, Melvin Zisseron, and Ellen Prucha did an outstanding job in obtaining and presenting the many artifacts and memorabilia in a professional and eye-catching manner this year. In addition to the many exhibits, ranging from early magnetron developments to the history of radar, there was a separate reading area with comfortable couches for browsing through the books, as well as a separate cinema complete with a large screen and comfortable seats for viewing the many historic films presented continuously during the day.



Dr. Joseph Charyk delivers his keynote speech to 1200 persons at the opening ceremonial session.

The exhibition this year was the largest ever with 256 companies in 425 booths presenting the latest microwave products and services. All four halls of the Baltimore Convention Center were used, and the new Center provided a beautiful setting for this event. The exhibition layout at the Center was perfect, with high ceilings, Hollywood lighting, wide aisles, color-coordinated accessories, complete with rest areas with refreshments throughout the center. Howard Ellowitz did a flawless job in this mammoth exhibition.

The social highlight of the Symposium, perfectly organized by Helene Malinow, was the Awards Banquet on Tuesday evening, attended by 556 persons to honor the recipients of this year's awards. In keeping with our theme, "Microwaves Linking Nations," the banquet hall at the Hyatt Regency Hotel was beautifully decorated with the 36 state and 15 country flags of the 51 MTT-S Chapters hung from the ceiling. In addition, every table was decorated with a world globe encircled by flags and flowers. A five-piece roving musical ensemble played individual requests, which added a festive air during the delicious gourmet international dinner.

This year the Microwave Career Award was presented to Dr. George Matthaei "for a career of meritorious achievement and outstanding technical contributions in the field of microwave theory and techniques." The Microwave Application Award was next presented to Dr. Clarence Burke Swan "for pioneering the application of diamond heat sinks useful for high-thermal-power-density semiconductor devices." The Microwave Prize was presented to Dr. Yalcin Ayasli, Mr. Leonard Reynolds, Jr., Dr. James Vorhaus, and Dr. Larry Hanes for their paper, "2-20 GHz GaAs Traveling-Wave Amplifier," which was published in the IEEE MTT Transactions in January 1984. The Distinguished Service Award was presented to Dr. Harold Sobol for his outstanding service for MTT-S.

Dr. Bruno Weinschel, president of IEEE, presented the Fellow Awards to Mr. Kenneth Carr, Dr. James Degenford, Mr. John Horton, Professor James Chin-I. Lin, Dr. David McQuiddy, Jr., Dr. Barry Perlman, and Dr. Jorg Raue. The Distinguished Lecturer Award was given to Mr. Kenneth Carr for his lecture, "The Detection and

(Continued on page 15)

The State of Maryland



Proclamation from the Office of the Governor

INTERNATIONAL MICROWAVE WEEK
JUNE 1-7, 1986

WHEREAS, Microwave energy is the primary carrier of long-distance communications in the world today, both on land and in space, including the system which allowed the Voyager spacecraft to beam pictures back to Earth from the planet Uranus, one billion miles away; and

WHEREAS, Microwave radar is used for weather forecasting, air traffic control, aerial mapping, motion detection, speed measurements, and many national defense applications; and

WHEREAS, Microwave communications systems will continue to bring distant nations together and will be the mainstay of world communications in the next century; and

WHEREAS, The Microwave Theory and Techniques Symposium has brought together in Baltimore more than 10,000 engineers, scientists and manufacturers to discuss the state-of-the-art of microwave technology;

NOW, THEREFORE, I, HARRY HUGHES, GOVERNOR OF THE STATE OF MARYLAND, do hereby proclaim June 1-7, 1986, as INTERNATIONAL MICROWAVE WEEK in Maryland, and commend this observance to all our citizens.

Given Under My Hand and the Great Seal of the State of Maryland
this 13th day of May in the Year of Our Lord
One Thousand Nine Hundred and Eighty-six

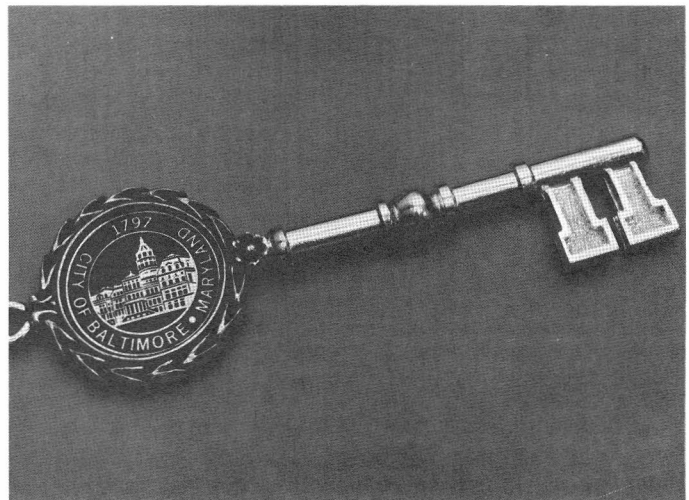
Harry Hughes
Governor

Lorraine M. Sheehy
Secretary of State



This proclamation from the Office of the Governor of Maryland was presented at the opening ceremony.

This key to the city of Baltimore from the Office of the Mayor, opens all of Baltimore to our Symposium.





Marvin Cohn, Dan Buck and Edward Niehenke are all smiles at the successful Open Forum.

William Brown explains his microwave-powered high-altitude platform at the Open Forum which was organized to include topical clustering with rectangular alcoves.



Chesapeake Bay seafood and cheeses from around the world are enjoyed at the Open Forum.



Radar developments were shown at the Historical Exhibit.



The microwave exhibition drew a record 257 companies displaying at 425 booths. Shown above is one of four halls.

(Reflections — Continued from page 11)

Treatment of Cancer Using Microwave Technology.” Harlan Howe, Jr., was given the Past President’s Pin. Richard Sparks received the Meritorious Service Award for his many years of service to MTT-S.

Certificates of recognition were presented to the following: Fred Rosenbaum and James Roe for serving respectively as chairman and vice-chairman of the 1985 Microwave Symposium; William Hord and Stephen Honickman for serving as Technical Program Co-chairman of the 1985 Microwave Symposium; George Jerinic as retired AdCom member; and Roger Kaul and Ted Nelson for serving in their respective membership services jobs as Coordinated Lecture Series organizer and in Chapter Records.

The entertainment following the awards was an exciting climax to this event. The Sweet Adelines, a group of 80 Baltimore area women of national musical reputation, presented precision vocal and dance routines. They were dressed in beautiful white gowns with gold sequins, and presented memorable songs, fitting for this occasion. The star of the show, Ethel Ennis, an internationally recognized jazz-oriented singer from Baltimore, entertained us with all her warmth and personality. We now know why the mayor of Baltimore named her the Official Cultural Ambassador of the City.

The excellent technical program with many technical breakthroughs, the many innovations introduced this year, the exciting social program, and the location all contributed to the record attendance in Baltimore. The final count showed 6671 in for the Microwave Symposium while 773 registered for the Monolithic Symposium; 655 attended the six workshops and approximately 800 attended the six panel sessions. Another 127 attended the ARFTG Conference. The Awards Banquet was attended by 556 persons and the Crab Feast/Bull Roast attracted 1050 persons.

Without the dedicated and volunteer work of the local Baltimore Symposium Steering Committee and their employers’ support, this fine and memorable 1986 International Microwave Symposium would not be possible. The Symposium Committee is to be commended for their fine work. Photographs of all the committee members including their contributions and their employers follow:

The workshops and the panel sessions were well attended and complemented the technical sessions. The attendance at these events follow:

Panel Sessions:

Issues in Government Funding of Microwave R&D (Monday noon lunch)	187
Manufacturing MIC Assemblies for Performance, Reliability, and Profit (Monday noon lunch)	183
Millimeter Wave System Development (Monday evening)	about 100
Millimeter Wave Integrated Circuit Sources (Wednesday evening)	about 100



Singer Ethel Ennis entertained the banquet with warmth and personality.

GaAs Microwave Monolithic Integrated Circuits From Research Lab to Production (Wednesday evening)	about 100
Microwave GaAs FET and MMIC Reliability (Thursday evening)	about 100
Workshops:	
Microwave Procurement Challenges of the Late 80’s and 90’s (Thursday)	92
Microwave Aspects of GHz/Gbit Optical Transmission (Thursday)	92
Trends in Microwave CAD (Thursday)	183
Dielectric Resonators (Thursday)	104
Filters and Multiplexers (Friday)	113
Microwave/Millimeter Wave Magnetics and MMIC Compatibility (Friday)	71



Sweet Adelines from the Baltimore area sing memorable songs during the banquet.



SYMPOSIUM STEERING COMMITTEE



... COST CUTTING

Fluorescent lights.

Fluorescent lights have always had a major drawback: They couldn't be controlled by a dimmer. Now a wall-mounted dimmer switch and control box is available. It can control as many as 18 lamps with a total of 300 watts and reduce brightness by as much as 55%. It allows installation of fluorescents in low-light areas, cutting lighting loads by as much as 80%. *Cost uninstalled: \$250. Guaranteed Energy Savings, Inc., 1031 N. Fair Oaks Ave., Sunnyvale, CA 94086.*

Warehouse heating strategies.

Warehouse heating strategies that cut energy costs: (1) Set back thermostats at night and on weekends unless electric heat pumps are used to provide heat — with these, setting back temperatures can increase energy use. (2) Rely more heavily on infrared heaters placed directly over work areas rather than trying to warm an entire warehouse to a comfortable temperature. (3) Avoid air heaters that use 100% outside air unless substantial ventilation is needed. (4) Don't use electric overhead fans to move hot air down from tall ceilings. This method often raises costs.

Wayne C. Turner, professor, Oklahoma State University, writing in Modern Materials Handling, 221 Columbus Ave., Boston 02116, 15 issues, \$45/yr.



The former specialty.

The former specialty must be let go of when a person enters management, but it's possible to go overboard in pulling free of it. Maintaining basic skills and staying up with major developments in the specialty help the manager tell if the staff is up to date, ask the right questions, recognize good advice and understand new concepts. Stay abreast by scanning the literature and associating with people who are in the forefront of the field.

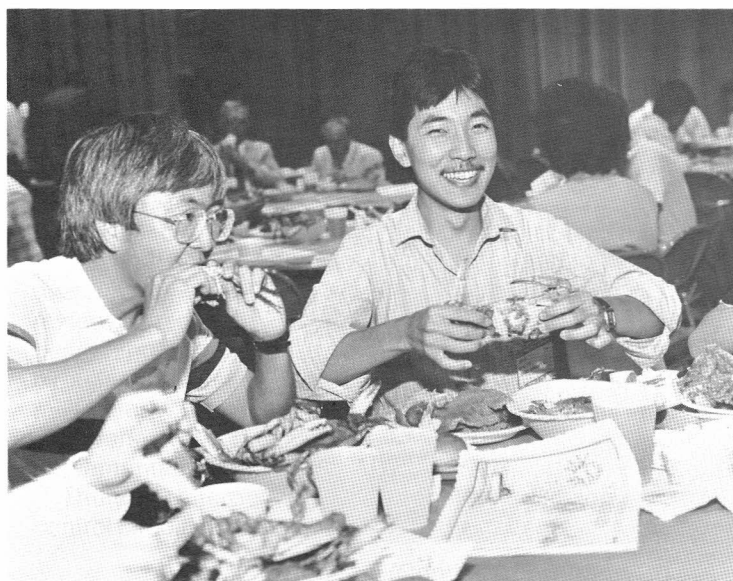
Industry Week's Guide to Tomorrow's Executive by Perry Pascarella, Van Nostrand Reinhold Co., 135 W. 50th St., New York 10020, \$16.95.

Learn to like yourself.

The best way to think positively about yourself is to think positively about others. They will then reflect back to you how wonderful you are, which will make it a lot easier. Our sense of self is a reflection of other people's responses to us. *Exercise:* Pay three *sincere* compliments a day to others. You'll soon see how much better this makes you feel about yourself. The key word is *sincere*. Finding things you really like will change how you think about people, which will, in turn, make you a lot more likeable.



People from all over the world, some 1050, enjoyed the complimentary Crab Feast/Bull Roast, a Maryland tradition.





1986 IEEE MICROWAVE AND MILLIMETER-WAVE MONOLITHIC CIRCUITS SYMPOSIUM



by *Yalcin Ayasli*

TECHNICAL PROGRAM CHAIRMAN

The 1986 IEEE Microwave and Millimeter-Wave Monolithic Circuits Symposium was held on June 4th and 5th, 1986 at the Baltimore Convention Center, in conjunction with the IEEE MTT-S International Symposium. With more than 750 attendees, five sessions, and two invited and twenty-one contributed papers, this fifth Monolithic Symposium continued to enjoy a high level of interest from the scientific community. Baltimore Inner Harbor proved to be a fun conference site and the Crab Feast and Bull Roast was a total success.

The technical program covered a good variety of subjects, for which I thank all the authors and the Technical Program Committee members.

The invited paper in the opening joint session was given by Mr. E.D. Maynard, Jr. of OUSDRE, Pentagon, on the new MIMIC program and its implications for microwave research and development.

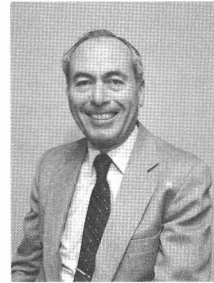
This paper of general interest was followed by the afternoon session on microwave amplifiers where the design and performance of two power amplifiers at C and X bands and four wideband distributed amplifiers were discussed. The fact that two-third of the session was devoted to distributed or traveling wave amplifiers is indicative of the industry-wide interest in this class of amplifiers in particular and the potential of wideband amplification in general.

The session on Thursday morning started with the second invited paper; Dr. Haun-Wun Yen of Hughes Research Laboratories introduced the fundamental principles of optoelectronics and electro-optic techniques that can be applied to microwaves and gave an overview of state-of-the-art system applications. His review paper was followed by two contributed papers describing GaAs chips for optical communication circuits. The rest of the morning was devoted to millimeter-wave integrated circuits and microwave receivers, with papers covering applications and implementations up to 86 GHz.

Thursday afternoon had Session 4 on switching and control circuits and Session 5 on MMIC technology with

(Continued on page 21)

REFLECTIONS ON THE 1986 INTERNATIONAL MICROWAVE SYMPOSIUM TECHNICAL PROGRAM



by *Marvin Cohn,*
TPC Chairman

Like its long line of predecessors, the 1986 International Microwave Symposium's technical program continued the trend of evolutionary rather than revolutionary changes. In the manner of a traditional bride, it had something old and something new, something borrowed, but lacked the titillation of something blue. We would like to think that the technical program itself provided sufficient stimulation.

The "old" which was retained was the basic format of prior technical programs, i.e. a three day program of papers with parallel sessions, evening and lunch-time panel session and two days of workshops.

I take a liberty with the term "borrowed" by using it for features which were introduced at a recent Microwave Symposia, many of which had been borrowed from other technical conferences. These included the Open Forum, short papers and the ninety minute sessions.

The "new" features included:

a. Focused Sessions, which this year were on "Advances in Low-Cost Component Manufacturing" organized by Mike Malbon (one session) and "Microwave Aspects of GHz/Gbit Optical Transmission" organized by Norm Dietrich (two sessions). These focused sessions were augmented by panel sessions and workshops on the same or related themes. The idea of having focal themes and focused sessions¹ was introduced by Ferdo Ivanek, Chairman of the 1984 International Microwave Symposiums TPC upon reflection following the completion of that symposium. The purpose of these focused sessions was to emphasize "hot areas" of current technology which are expected to be of even greater significance in the future. A society as vital as ours can hardly be accused of being moribund, but we believe that the introduction of Focused Sessions is an appropriate stimulus to maintain the MTT-S at the cutting edge of the technology. Should this practice be continued? Should it be expanded?

1. F. Ivanek, "How Can We Further Improve the Technical Program of the MTT-S Symposium?", IEEE Society on MTT Newsletter, pp. 31, 42-44; number 113, Fall 1985.

(Continued on next page)

Reflections on Microwave Symposium
Technical Program –
(Continued from page 19)

b. Recognition for the best presented papers in both the regular and open forum sessions. We of course would like to get some feedback from symposium attendees as to whether any generalizations can be made on the quality of the presentation (note: not the technical content) this year compared to prior years. If they were better, can we attribute the improvement to the presenters desire for recognition? We do not mean to preclude comments about the technical content of the papers.

c. The inauguration of an exchange of technical sessions with the European Microwave Conference resulted in four invited survey type papers by eminent European microwave research people being presented at our 1986 symposium. The papers were selected by a committee of the European Microwave Conference. On reflection, I wonder whether the future TPC's should exercise some measure of control, e.g. identifying the subjects of these invited papers in consultation with the EMC people. Possibly future TPCs may want some of these papers to augment focused themes.

Dan Buck, who was in charge of the Open Forum, made many innovative changes in the physical layout of the spaces provided for presenting each paper. Rectangular alcoves for each paper were arranged to provide a degree of visual and sound isolation to reduce cross-talk. Groups of papers were clustered in separate islands according to technical areas.

Looking back on the 1986 Symposium, I believe that the ways in which the special sessions (panel sessions and workshops) are selected and run require reexamination. Suggestions for panel sessions and workshop originate from individual members and from the MTT-S Technical Committees. Duplication of subjects, scheduling problems, and saturation effects resulting from too frequent (at many successive symposia) presentation of some subjects are some of the problems that recur. The Technical committees in the various disciplines have the expertise to provide guidance on these problems. Many guard their turf zealously, while others did not participate. Perhaps the deadline for submitting requests to have panel sessions and workshops should be advanced, in order to provide more time for the Technical Committees to comment on the requests. Pradeep Wahi, who was in charge of the Special Sessions, displayed both wisdom and forbearance in dealing with these problems.

In my opinion a disturbing trend on both types of special sessions has taken place during the past few years. I have observed a movement toward greater formalization of both panel sessions and workshops, and thereby a loss of both the climate of direct technical interchange and the degree of participation by most of those in attendance.

Specifically in the case of panel sessions, there has been a tendency for large panels in which each

panelist's opening remarks have grown to the length of a short paper. As a result, frequently more than an hour has elapsed before audience participation commences, and panelists start responding to questions and comments from the floor.

In the case of workshops my sample size has been smaller, but I sense a similar trend of more speakers taking more time. Since most of the workshops are all day affairs, that is not as bad, however, the degree of direct interaction between specialists appears to have diminished. In some of the workshops the ratio of active participants to passive observers has decreased. I don't believe that the success of workshops should be measured by the attendance but rather by the mutual benefits obtained by the participants which I grant is difficult to measure.

In general my concern is that if the current trend continues, both the panel sessions and the workshops will evolve into mini-symposia within the Microwave Symposium rather than serving their original purposes. I am concerned that the specialists intent on having a truly "working workshop" will look elsewhere. Is my concern valid or am I being an alarmist? I would like to hear your opinions.

A last and happy thought that comes to mind is that of gratitude to all of the people I worked with on the Technical Program Committee, a number of whom I have already mentioned. I am particularly grateful for having had Bernie Geller as a Vice Chairman, who was both willing and able to share the burdens and help overcome the problems. I am sure that he shares with me the hope that some of the 1986 innovations are adopted and improved upon at future Microwave Symposia.

(Continued on next page)



Manager burnout.

Symptoms to watch for: Blaming others for mistakes . . . Putting off making decisions . . . Drastically changing eating habits . . . Increasingly using profanity . . . Displaying behavior that reflects self-pity . . . Stepping up the work schedule for no apparent reason . . .

Nursing Life 1111 Bethlehem Pike, Springhouse, PA 19477, 6 issues, \$13.95/yr.

Lee Iacocca's black book.

Lee Iacocca's black book on his managers keeps him aware of performance down the line. Each senior executive sets goals for the coming quarter at the time results are reviewed for the past quarter. Every first-of-the-quarter week Iacocca reviews results against goals. Goals and results go into the *black book*. Senior managers keep similar books on junior managers. *Advantages:* Forces dialogue on specifics between boss and subordinates. And review of the black books keeps the top executive aware of good performers and dead-wood down the line.

The Iacocca Management Technique by Maynard M. Gordon, Dodd, Mead & Co. 79 Madison Ave., New York 10016, \$14.95.



1986 International Microwave Symposium

TECHNICAL PROGRAM QUESTIONNAIRE

1. Should recognition for the best presented papers be continued?
Yes No

2. Should Focused Sessions be continued?
Expanded Dropped

3. Should panelist/audience interaction start sooner?
Yes No Leave it as it is

4. Should the workshops be more participative?
Yes No Ok as they are

Please send your responses to the above questions and any comments on the 1986 Symposium's technical program to

MARVIN COHN, Chairman
Technical Program Committee
Westinghouse Defense and Electronics Center
P.O. Box 1521, Mail Stop 3717
Baltimore, Maryland 21203

Your responses will be reviewed and forwarded to the 1987 Technical Program Committee.

1986 Microwave and Millimeter Monolithic Circuits Symposium – (Continued from page 19)

a total of eight papers that covered very interesting subjects ranging from new active and passive circuits and device design and fabrication techniques on GaAs to millimeter wave circuit technology on silicon substrates.

I thank General Chairman Roger W. Sudbury and members of the Steering Committee for the hard work that it takes to organize and run a successful symposium. The cooperation of the 1986 MMT-S International Microwave Symposium Committee, especially from Ed Niehenke, General Chairman, and Marvin Cohn, Technical Program Chairman, is also greatly appreciated.

Essentials of motivation.

(1) Employees must understand the specific requirements of their jobs. (2) Desired behavior must be part of the company culture, not just something written in a memo. (3) Each individual must perceive that *his own* interests are best advanced by performing his job well.

The Decision-Maker, Box 15005, Charlotte, NC 28111, 6 issues, \$36/yr.

Printers and typewriters.

When these machines are new, make a sample of all characters and save it for future comparison. When printing differs from the sample it's time for replacement or repair.

Time Talk, Box 5, Grandville, MI 49418, monthly, \$39/yr.

Electronic typewriters.

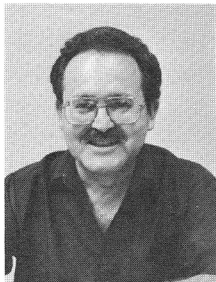
Electronic typewriters won't be replaced by computers and word processors. The sales of electronic typewriters should hit \$6.6 billion by 1988, up from \$2 billion in 1984. *Reasons*: The low cost of the machines, their ability to be used with other office equipment and the realization that word processors aren't always needed for daily routine jobs.

Report by International Data Corp., Framingham, MA, quoted in Computer Decisions, 10 Mulholland Dr., Hasbrouck Heights, NJ 07604, monthly, \$35/yr.



MTTS®

ARFTG HIGHLIGHTS



by Mario A. Maury, Jr.

The Automatic RF Techniques Group (ARFTG) is a professional society that is affiliated with MTTs. It is primarily concerned with computer-aided microwave measurements and design. The following is a summary of its recent activities.

27th ARFTG CONFERENCE

The Spring ARFTG Conference was held as a part of the 1986 IEEE/MMT-S International Symposium in Baltimore, Maryland at the Sheraton Hotel on June 5 and 6, 1986. The main Conference topic was "Pulsed RF Automated Measurements" and was chaired by Richard Irwin, SAT, Sunnyvale, California. Ray Tucker, Rome Air Development Command, Griffiss AFB, New York and President of ARFTG opened the meeting and welcomed the Conference attendees.

The Technical Program Chairman was Jim Manning, Westinghouse, Baltimore, Maryland, who put together an excellent program consisting of 19 technical papers. The following is a partial summary of the papers presented:

- *Techniques for Pulsed Microwave Measurements*
Michael O. Little, Rome Air Development Center, Griffiss AFB, NY
- *The Effect of Test Set Distortions on Pulsed-RF Measurements*
John DiStefano, Vitro Corp., Silver Spring, MD
- *New RF Test Methods Using Waveform Synthesis From Digital Data*
Nicholas J. Kuhn, Hewlett-Packard Co., Inc., Palo Alto, CA
- *Repeatability Issues for De-Embedding Microstrip Discontinuity S-Parameter Measurements by the TSD Technique*
L.P. Dunleavy, Hughes Aircraft Co., Torrance, CA
- *An Improved Open for Calibrating Sexed Vana Test Ports*
Gary Simpson, Maury Microwave Corp., Cucamonga, CA
- *Preliminary Results of a Time-Harmonic Electromagnetic Analysis of Shielded Microstrip Circuits*
James C. Rautio, Syracuse University, Syracuse, NY
- *A Calibration Method for the De-Embedding of Microwave Test Fixtures*
S.E. Rosenbaum, Hughes Research Laboratories, Malibu, CA
- *26 GHz Wafer Probing for MMIC Development and Manufacture*

Eric W. Strid, Cascade Microtech, Inc., Beaverton, OR

- *Load-Pull Characterization for MESFET Oscillator Design*

V. Pozzolo, Politecnico di Torino, Torino, Italy

Vendor Exhibits were also held at the Conference and 14 exhibitors participated as listed below:

Adams Russell	Made-It-Associates
Cascade Microtech	Polorad
EESOF	RCA/Princeton
EIP Microwave	Tektronix
Hewlett-Packard	Wavetek Microwave
Hughes Aircraft	Weinschel Engineering
Maury Microwave	Wiltron

A continental breakfast and all the breaks were held in the exhibits area on both days of the Conference. This activity was extremely successful and Vendor Exhibits have now become a regular part of the ARFTG conferences.

The semi-annual ARFTG Awards Banquet was held the evening of June 5 and the following awards were presented by Ray Tucker, ARFTG President:

- *Best Paper Award, 26th Conference*
William Oldfield, Wiltron, Mountain View, CA
- *ARFTG Service Award*
John Barr IV, Hewlett-Packard Co., Santa Rosa, CA
- *ARFTG Distinguished Service Award*
Robert E. Nelson, NBS (Retired), Boulder, CO
- *Automated Measurements Technology Award*
Richard Q. Lane, California Eastern Labs, Santa Clara, CA
- *Automated Measurements Career Award*
Andrew Alford, Alford Manufacturing, Winchester, MA
- *Conference Chairperson, 27th Conference*
Richard Irwin, SAT, Sunnyvale, CA
- *Technical Program Chairman, 27th Conference*
Jim Manning, Westinghouse, Baltimore, MD
- *Certificate of Appreciation, Assistant Exhibits Chairperson, 26th and 27th Conference*
Darlene Payette, Maury Microwave Corp., Cucamonga, CA

Dr. Alford told the Awards Banquet attendees how he got started in microwave measurements when he built the first slotted line in order to measure the impedances of antenna elements which were to be installed on the Empire State Building in New York City.

The Banquet Speaker, Ray Villard (John Hopkins University) gave a very interesting overview of the Space Telescope project and entertainment was provided by the Ojczyzma Polish Song and Dance Ensemble.

EXECOM ELECTIONS

At the ARFTG Business meeting, the following members were elected to the Executive Committee for the

(Continued on page 25)

DISTINGUISHED MICROWAVE LECTURER



by Edward C. Niehenke

GALLIUM ARSENIDE — KEY TO MODERN MICROWAVE TECHNOLOGY

It has been a great pleasure presenting my lecture, "Gallium Arsenide — Key to Modern Microwave Technology," to the first three groups. The third lecture was given on July 11 at the Martin Marietta seminar series in Baltimore. I had the most questions ever, some 15 in number, indicating a lot of interest in this topic. Dr. H. Brian Sequeira showed me the Martin Marietta Laboratories after the lecture which was most interesting; especially his work with microslab, a transmission line consisting of a three dielectric composite structure. In this transmission media, I saw both a working Gunn oscillator producing power at 141 GHz as well a novel isolator at 94 GHz. My first job was with Martins, some 24 years ago, and I was hoping to meet some previous coworkers. I did not meet a one. This disappointment was far overshadowed by the many friends like Woody Reid and George Kariotis from Boston, Mel Zisseron from the Washington, D.C., area, to name a few, and the many gracious people I met for the first time.

A summary of the lectures presented to date appears below:

Date	Group	Attendance
January 16, 1986	Baltimore MTT/AP Chapter Baltimore, MD	53
March 3, 1986	Drexel University Philadelphia, PA	50
July 11, 1986	Martin Marietta Seminar Baltimore, MD	24

In addition to these lectures, I have had to date 58 additional requests from all over the world. I am actively scheduling these requests in composite trips to visit as many groups as possible.

My first major trip in 1986 will be to Australia and New Zealand. The schedule of IEEE Section lectures includes: Monday, August 25, Sydney, Australia; Tuesday, August 26, Brisbane, Australia; Thursday and Friday, August 28 and 29, Perth, Australia; Monday, September 1, Adelaide Australia; Tuesday, September 2, Melbourne, Australia; and Thursday, September 4, Christchurch and Wellington, New Zealand.

The second major trip in 1986 will include Europe and Israel. I am most fortunate to be lecturing at three major meetings there. The first is the National Meeting on Applied Electromagnetics held every other year in Italy. This is a two day meeting, held this year in Trieste, Italy on Wednesday and Thursday, October 22 and 23. I will present my lecture on Wednesday, October 22. The second major meeting is the Workshop on Monolithic Microwave Integrated Circuits of the West Germany MTT-S Chapter under participation of the IEEE, PG E 12, and Membership Meeting of the West Germany MTT-S Chapter. This will be held on Thursday and Friday, October 23 and 24 at the Radio-Frequency Lab, University of Darmstadt in Darmstadt, West Germany. I will give my lecture the first day. The third major meeting in which I will lecture, is a one day symposium in Haifa, Israel, sponsored by the Israel MTT/AP Chapter on Monday, October 27.

I plan to visit additional MTT-S Chapters for their chapter meetings in Louvaine, Belgium (tentatively Thursday, October 16); Madrid, Spain (tentatively Friday, October 17); Rome, Italy (Monday, October 20); Zurich, Switzerland (Monday, November 3); and Gothenburg, Sweden (tentatively Wednesday or Thursday, November 5-6). I am trying to tie in requests from IEEE sections from London, England; Alborg, Sweden; and Copenhagen, Denmark.

(Continued on page 24)

DISTINGUISHED MICROWAVE LECTURER



by John H. Bryant

Chapters Can Book Lecture:

"The First Century of Microwaves — 1886 to 1986"

Twenty Six Chapters and Sections have already scheduled talks on "The First Century of Microwaves — 1886 to 1986", by MTT-S Distinguished Microwave Lecturer John H. Bryant.

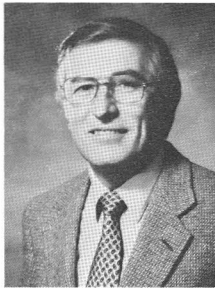
His 1986 fall schedule still has dates open, and 1987 dates are largely open.

Contact John H. Bryant at the:

Department of Electrical Engineering
and Computer Science
The University of Michigan
Ann Arbor, MI 48109-1109
(313) 663-4618

DISTINGUISHED MICROWAVE LECTURER (1985-1986)

Edward C. Niehenke
Westinghouse Electric Corp.
P.O. Box 746, MS-75
Baltimore, MD 21203
(301) 765-4573



by Kenneth L. Carr

As the last segment of my Lecture Series draws to a close, I look back with both appreciation and a sense of satisfaction. The Chapter Chairmen and the audiences themselves have been most receptive, and it has sincerely been an enjoyable time for me personally.

The visit to the United Kingdom mentioned in a previous report was completed in March, as was a trip which included Canada and Nova Scotia. Approximately 250 people attended these sessions.

All of the scheduled domestic Lectures were accomplished before the end of May. These totalled 63 Lectures; attendees for these Lectures have run close to 2500 people. (It would also be an interesting project, if one had the time, to log the miles and picture the end result.)

The trip scheduled for September/1986 covering New Zealand, Australia, India, Japan and Taiwan is beginning to firm up, as is the European venture. These two tours will complete the 1985-1986 Lecturer's duties.

My personal thanks, once again, for the opportunity to present my Lecture to so many of my associates. From their response, I can only assume that the material was noteworthy.

Distinguished Microwave Lecturer – Niehenke,
(Continued from page 23)

Definite scheduled lectures in the United States appear below:

Wednesday, September 17, 1986	Twin Cities MTT-S Chapter
Tuesday, October 7, 1986	Dallas MTT-S Chapter
Thursday, April 16, 1987	Boston MTT-S Chapter

I am linking these three meetings with other nearby requests and have tentative plans to visit 30 IEEE MTT-S Chapters/Sections in 1986-87. I will report these in the next newsletter.

MEMBERSHIP MATTERS



by Patrick A. Green

MTT-S has continued to remain consistently high in recruiting new members. MTT-S rank in the IEEE Society held a solid seventh position this year. MTT-S membership increased 9.3 percent to 8,211 as compared to 7,512 members a year ago. This is well above the 60 percent growth (about 450 members at this time) expected this year.

The MTT-S membership booth was a success this year. MTT-S has received over 35 newly acquired members, of those, about thirty members joined the IEEE. Special thanks to the Baltimore Chapter and ADCOM on their efforts for promoting MTT-S.

Chapter Congratulations

Congratulations are in order to the Orlando, Philadelphia, Sweden and West Germany Chapters for their outstanding efforts in promoting MTT-S membership for 1985. A representative from each chapter received \$200.00 and a plaque at the 1986 Microwave Symposium in Baltimore.

Congratulations again!!



Poor performances.

Poor performances are very hard to get on track because employees typically won't admit that their performance is bad. They have a strong tendency to ignore the problem. Progress begins when employees *actively* deny the existence of a problem. The next step forward is when employees blame others. But too often, matters are dropped at this stage. Improvement occurs only after employees accept responsibility for their work.



AFRTG Highlights –
(Continued from page 22)
terms indicated:

- Dr. J. Robert Ashley 3 Years
- Mr. Frank Mendoza 3 Years
- Dr. Barry S. Perlman 3 Years
- Mr. Mark Roos 2 Years
- Mr. Gary R. Simpson 3 Years

At the EXECOM meeting, the following members were elected or appointed to the following positions:

OFFICERS:

- President Ray Tucker
- Vice President John Barr
- Secretary Jim Taylor
- Treasurer Barry Perlman

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- Awards Bob Ashley
- Nominations Peter Lacy
- Publications Mark Roos
- Publicity Rich Irwin
- Library Ken Bradley (*)
- MTT-S Ray Tucker
- Exhibits Gary Simpson

(*)Appointed to the EXECOM by the President to fill vacancies due to retirement.

ANNOUNCEMENT 28th CONFERENCE

The Fall 1986 ARFTG Conference will be held December 4 and 5, 1986 at the Don CeSar Beach Resort in Saint Petersburg Beach, Florida. The Conference Host will be Bob Ashley and the ARFTG Awards Banquet will be held on the evening of December 4.

The theme of the Conference will be "Precision Microwave Measurements". Papers are solicited on recent hardware and software developments on this topic, as well as other computer-aided RF design and testing topics. Technical presentations will be informal 25 minute talks using viewgraphs or 35mm slide illustrations. Manufacturers are also encouraged to discuss or demonstrate new products that have been developed for RF design and testing; a separate exhibits area will be available for demonstrations. Authors should submit a one page abstract and a 500 to 1,000 word summary with attachments containing illustrations, etc., providing sufficient technical content to properly evaluate the paper's contribution and its usefulness to the Conference attendees. Two copies of the abstract and summary should be sent to the Technical Program Chairman before September 28, 1986. All accepted papers will be published in the Conference Digest. Please refer to the "ARFTG Instructions to Authors" for additional information.

Submit papers to the Technical Program Chairman (TPC):

Dave Hopping
Hewlett-Packard, 4LS-L

1400 Fountaingrove Parkway
Santa Rosa, CA 95401
(707) 577-4029

Manufacturers interested in exhibiting their products, contact the Exhibits Chairman (EC):

Gary Simpson
Maury Microwave Corporation
8610 Helms Avenue
Cucamonga, CA 91370
(714) 987-4715, X41

For further information, contact the ARFTG Conference Chairman (CC):

John Barr
Hewlett-Packard, 4US-Q
1400 Fountaingrove Parkway
Santa Rosa, CA 95401
(707) 577-2350

This ARFTG Conference promises to be an outstanding success with an excellent Technical Program and Exhibits — in an outstanding winter resort location — so shed your winter coats and plan to attend this one!



... MANAGEMENT

Planning for contingencies.

Planning for contingencies is overdone at many companies, but that doesn't mean it should be ignored, as many other companies do. The trick is to do it selectively, according to Dale D. McConkey. Some firms draw up several alternate plans, select one and then run with that. Selective contingency planning means having fall-back plans if key parts of the approved plan prove unrealistic, as often happens. By planning in advance for such possibilities, management avoids having to make crisis responses.

Author of How to Manage by Results, AMA-COM, 135 W. 50 St., New York 10020, \$19.95.

... MOTIVATION

Recognition.

Recognition of good performance needn't be on a grand scale to be a highly effective motivator. At one large company, an employee who has performed extra well gets a handful of M&M's. The giving and receiving makes everyone feel good. The point is that a moment of hoopla is created, and everyone understands why the reward is being given.

Corporate Cultures by Terrence E. Deal, Addison-Wesley, Jacob Way, Reading, MA 01867, \$14.95.



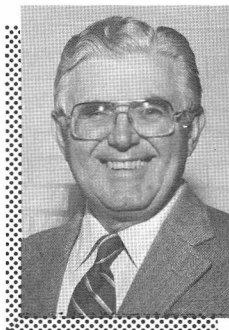
1986 MTT-S SYMPOSIUM STEERING COMMITTEE

Without the dedicated and volunteer work of the local Baltimore Symposium Steering Committee and their employers' support, this fine and memorable 1986 International Microwave Symposium would not be possible. The Symposium Committee is to be commended for their fine work. Photographs of all the committee members including their contributions and their employers follow:



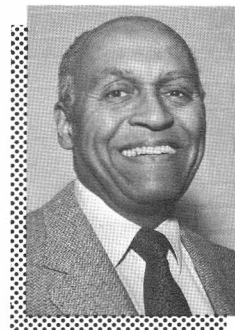
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Chairman, Steering
Committee

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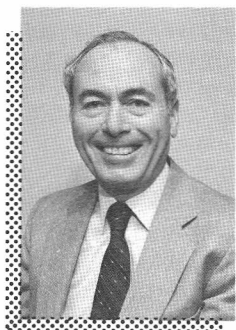
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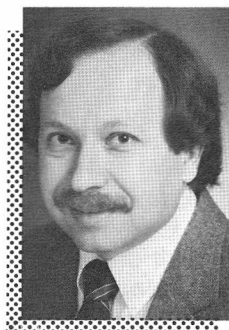
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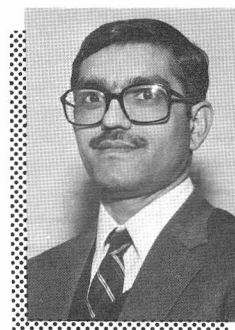
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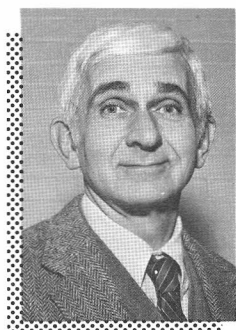
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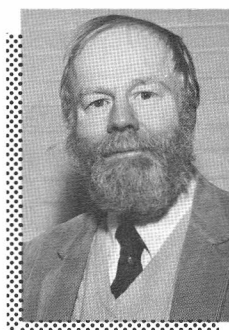
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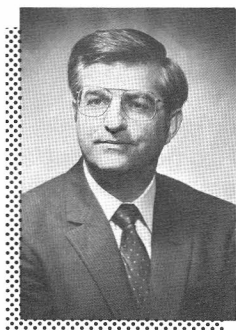
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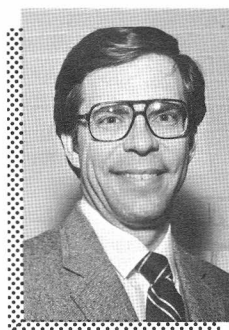
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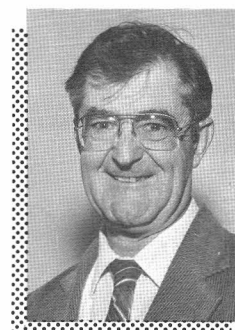
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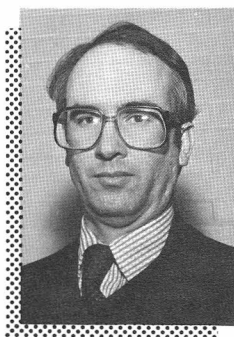
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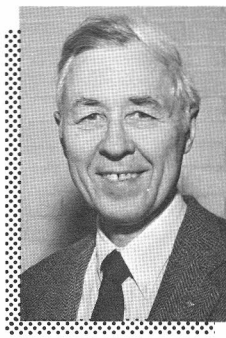
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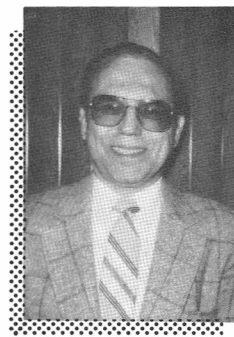
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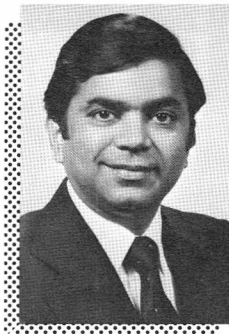


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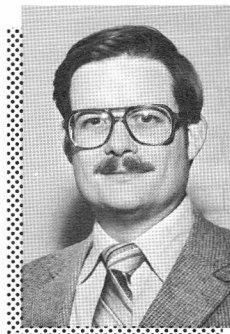
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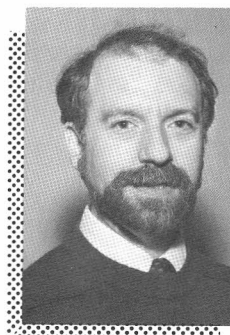
Lawrence Whicker
Symposium
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Margaret Whicker
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LRW Associates



Melvin Zisserson
Historical Exhibit
Litton AMECON



... HEALTHY EXECUTIVE

Aspirin and asthma.

The respiratory ailment increases the chances of sensitivity to aspirin. The risk is even higher if nasal polyps accompany asthma. *Symptoms:* Runny nose, tearing of the eyes and occasional asthma attacks after taking aspirin. The newer analgesics – indamethacin, naproxen, ibuprofen and others – can also cause problems and should be avoided by some asthma sufferers. *Alternatives:* Acetaminophen (Datril, Tylenol), propoxyphene (Darvon), sodium salicylate, salicyl salicylate and choline salicylate.

Mayo Clinic Health Letter, Mayo Clinic, Rochester, MN 55905, monthly, \$24/yr.

Good News for beef eaters.

If you manage it right, there's no reason not to eat beef. The trick is to minimize fat intake and keep your portions small. People who get their protein from lean meat in moderate quantities have cholesterol levels no higher than those who concentrate on vegetable proteins. *Bonus:* Beef also helps supply important minerals such as iron, zinc and copper.

Dr. Vivian Bruce, Department of Foods and Nutrition, University of Manitoba, Winnipeg, Manitoba.

Reduce high blood pressure.

Reduce high blood pressure and stress by being a good neighbor. People who have close personal relationships with the folks next door have lower than normal cardiovascular disease rates. *At risk:* Socially isolated people, who have higher rates of both heart and blood-vessel disease.

Study of Brazilian, Jamaican and Mexican populations by Dr. William Dressler, researcher, University of Alabama, University 35486.



A beer belly.

A beer belly may indicate much worse health than just being generally overweight. Those with abdominal obesity carry about five times more risk of heart attack and stroke than those with fat deposits elsewhere in the body. *How to check:* Measure the circumferences of both waist and hips. If the waist-to-hips ratio is over 1.0 in men or above 0.8 in women, the risk is five to 10 times greater. Males are more prone to abdominal obesity than women, though they're less likely to be overweight.

US Pharmacist, 352 Park Ave. S., New York 10010, 12 issues, \$20/yr.

... MANAGEMENT

Essential of motivation.

Essential of motivation. (1) Employees must understand the specific requirements of their jobs. (2) Desired behavior must be part of the company culture, not just something written in a memo. (3) Each individual must perceive that *his own* interests are best advanced by performing his job well.

The Decision-Maker, Box 15005, Charlott, NC 28111, 6 issues, \$36/yr.

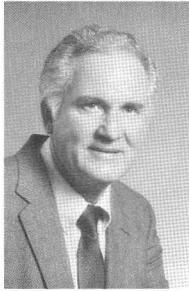
Winning Ways.

Always act confident, no matter how you feel. Never stand still. Take the initiative and the risk. Seize your opportunities. Always press your advantage to the full. Do the unexpected – it will keep your opponent off balance. Bluff occasionally to keep your opponent guessing. *Goal:* Respect, not love. Know when to retreat in one area to gain an advantage in another. Learn from your mistakes – don't make the same one twice.

Tactics by Edward de Bono, Little, Brown & Co., 34 Beacon St., Boston 02108, \$16.95.



SPECIAL ARTICLES SOLICITED FOR THE MTT NEWSLETTER

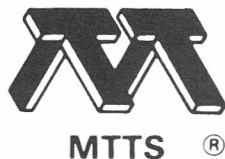


by J.B. Horton

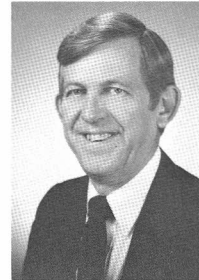
The MTT Newsletter staff is very interested in obtaining feature articles dealing with current topics in the technical and professional areas of interest to MTT members. The idea is to provide the members with a general understanding of the topic and its significance in current and future activities in the microwave field. I would like to emphasize, however, that these special articles will cover topics in a broad, general sense. Specific design techniques and applications will be covered in papers appearing at the MTT symposia and in the Transactions.

If you know of a topic that is current and/or you are willing to contribute an article to the NEWSLETTER, please contact John Horton (213) 536-3190 or Reynold Kagiwada (213) 535-5515 at TRW, One Space Park, Redondo Beach, CA 90278.

This issue's feature article deals with the applications of ferrite/magnetic materials at microwave and millimeter wave frequencies. Our feature authors, Bill Hord and John Owens, provide us with a brief history of ferrite materials and through a series of applications, show the many ways these materials are being used today. This is an example of a mature technology which provides us with working components for production applications, and yet new applications continue to emerge. As the authors point out, the field is mature, but it certainly is not stagnate, and we can look to a very exciting and challenging future in microwave magnetics.



CONTROL AND PROCESSING OF MICROWAVE SIGNALS USING FERRITES



*by William E. Hord and
John M. Owens*

1.0 INTRODUCTION

The introduction of ferrite material in 1946¹ was stimulated by the demand for magnetic materials with low core losses for use in radio and television applications. Ferrite is a generic term for those materials which are classified as ferrimagnetic. Several iron oxides exhibit ferrimagnetic behavior as do garnets with iron ion substitution. This behavior, from the viewpoint of the microwave engineer, may be characterized as a magnetic material with extremely low electrical conductivity. Because of the low conductivity, microwave propagation through the material is possible with low loss. Also, the permeability may be controlled by the application of an external magnetic field.

In 1949, Polder² derived the permeability tensor which described ferrite behavior at microwave frequencies. Tellegen³ provided the analysis of gyrator networks in 1948 and Hogan⁴ in 1952 demonstrated the first microwave ferrite gyrator. The first commercially available ferrite device, the Uniline isolator, was marketed in 1953. The use of ferrite devices has increased dramatically and modern microwave systems use thousands of these devices to control the amplitude (attenuators, limiters), phase (phase shifters), frequency (YIG-tuned oscillators), transmission paths (circulators, isolators), and frequency bandwidth (filters) of microwave signals.

In 1961 Damon and Eshbach⁵ conducted the initial study of the propagation characteristics of magnetostatic waves (MSW). Since then extensive investigations have been conducted by several workers. These investigations have led to the introduction of many devices which, while finding some use as control elements, find their main use as signal processing elements such as filters, tapped delay lines, and delay lines both dispersive and non-dispersive.

Section 2 of this survey paper will treat ferrite control devices. These are typically characterized by the interaction of the magnetized ferrite with a circularly-polarized rf magnetic field. Section 3 will discuss magnetostatic wave propagation in thin films and their application as signal processing devices. The conclusion of the paper will be found in Section 4.

2.0 FERRITE CONTROL DEVICES

The microwave permeability of ferrite is described by the Polder² tensor which relates the rf magnetic flux density to the rf magnetic field intensity.

$$\vec{\beta} = \vec{\mu} \cdot \vec{H}$$

When all the magnetic domains that make up the ferrite are aligned along an external dc bias field, H_0 , the magnetization of the sample is at the saturation value $4\pi M_s$. The Polder tensor for a ferrite saturated in the +z direction is

$$\mu = \mu_0 \begin{bmatrix} \mu & -jk & 0 \\ jk & \mu & 0 \\ 0 & 0 & \mu_z \end{bmatrix}$$

For the case of small magnetic loss the elements are

$$\mu = 1 + \frac{\omega_m (\omega_0 + j\omega_L)}{(\omega_0 + j\omega_L)^2 - \omega^2} = \mu' - j\mu''$$

$$k = \frac{-\omega_m \omega}{(\omega_0 + j\omega_L)^2 - \omega^2} = k' - jk''$$

$$\mu_z = 1$$

with

$$\mu_0 = 4\pi \times 10^{-7} \text{ h/m} = \text{permeability of free space}$$

$$\omega_0 = 2\pi\gamma H_0 = \text{resonant radian frequency}$$

$$\omega = 2\pi f = \text{microwave radian frequency}$$

$$\omega_m = 2\pi\gamma(4\pi M_s)$$

$$4\pi M_s = \text{Saturation magnetization of the ferrite}$$

$$\gamma = 2.8 \text{ MHz/Oe}$$

$$\omega_L = \frac{1}{T} = \frac{2\pi(\gamma\Delta H)}{2}$$

$$T = \text{macroscopic relaxation time.}$$

$$\Delta H = \text{resonance line width.}$$

Ferrite materials exhibit a hysteresis loop similar to iron. The squareness of the loop (ratio to remanent flux density to maximum flux density) may be controlled by various metal ion substitutions. Several

devices utilize square loop material and operate at the remanent level of the flux density. Such a device is said to be latched and control power is not required until it is desired to change the state of the device. A device operating with an internal field less than that necessary to saturate the ferrite is said to be partially magnetized. In this case the elements of the permeability tensor are⁶

$$\mu = \mu_{\text{dem}} + (1 - \mu_{\text{dem}}) \left(\frac{4\pi M}{4\pi M_s} \right)^{3/2}$$

$$\kappa = \frac{\gamma(4\pi M)}{\omega}$$

$$\mu_z = \mu_{\text{dem}}$$

$$\mu_{\text{dem}} = \frac{1}{3} + \frac{2}{3} \sqrt{1 - \left(\frac{\omega_m}{\omega} \right)^2}$$

where $4\pi M$ is the average magnetization of ferrite. For simplicity only the lossless case is given here. Latching devices using partial switching operate at various values of remanent magnetization.

YIG-TUNED OSCILLATORS

Two qualities of YIG-tuned oscillators which make them attractive to microwave systems designers are multi-octave tunability and excellent tuning linearity. Because of these characteristics, usage of these oscillators is widespread. YIG-tuned oscillators are constructed of three essential parts: the YIG resonator, the active device complete with bias circuitry and matching networks, and the magnetic structure which provides a variable DC magnetic field. The YIG resonator normally consists of a YIG sphere placed in a microwave resonator and loop coupled to the active device. The equivalent circuit of a YIG-tuned oscillator is shown in Fig. 1. For oscillation to occur

$$G_R + G_D \leq 0, \quad B_R + B_D = 0.$$

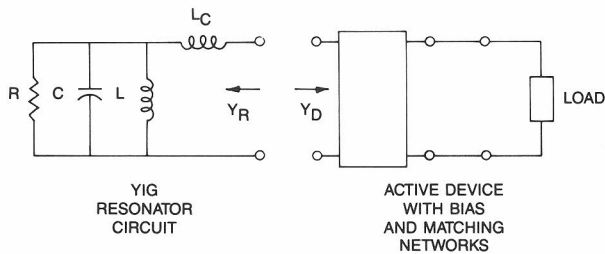
The negative resistance is provided by the active device. The input impedance of the resonator, $Z_R = 1/Y_R$ is given by

$$Z_R = \frac{R}{1 + Q_u^2 \left(\frac{\omega}{\omega_0} - \frac{\omega_0}{\omega} \right)^2} + j \left[\omega L_C + \frac{R Q_u \left(\frac{\omega_0}{\omega} - \frac{\omega}{\omega_0} \right)}{1 + Q_u^2 \left(\frac{\omega}{\omega_0} - \frac{\omega_0}{\omega} \right)^2} \right]$$

Both ω_0 and Q_u are proportional to H_0 as shown in Fig. 1. The real part of the resonator admittance must be less than the negative resistance provided by the active device. Once this condition is met, the frequency of oscillation may be controlled by the imaginary part of the resonator admittance.

A more detailed explanation of the design theory of YIG-tuned oscillators is given by Trew⁷ who describes an

X-band device. with a 10 dBm minimum power output. Papp and Koyano⁸ report on a device operating from 8 to 18 GHz with a 6 dBm power output. Schiebold⁹ describes and approach to realizing multi-octave performance from 3.5 to 19.5 GHz a power output of about 6 dBm.



$$L = \frac{R}{\omega_0 Q_u}$$

$$C = \frac{Q_u}{\omega_0 R}$$

L_c = COUPLING LOOP INDUCTANCE

$$Q_u = \frac{H_0 - (1/3)4\pi M_s}{\Delta H}$$

$$R = \mu_0 \frac{V}{d^2} \omega_m Q_u$$

V = SPHERE VOLUME

d = COUPLING LOOP DIAMETER

Fig. 1 Equivalent Circuit of YIG-Tuned Oscillator.

ISOLATORS

The isolator is a device with very low insertion loss in one direction (forward) and very high insertion loss in the other (reverse) direction. Normally, low loss is interpreted to be less than 0.5 dB although losses higher than this might be tolerated if the operating frequency is in the millimeter-wave region. Likewise, high loss is interpreted to be more than 20 dB although isolation less than this might be tolerated if the device is operating in the millimeter-wave range. Isolators are used to provide protection from high VSWR and to stabilize generators from frequency shifts caused by variations in load impedance.

Isolators have been realized in a variety of transmission media ranging from coaxial lines at the lower microwave frequencies to fin-line at millimeter wavelengths. A large volume of literature exists, and the reader is referred to two bibliographies^{10, 11} which cover the field up to 1975. In the remainder of this section three versions of field-displacement isolators will be reviewed. Field-displacement devices are selected because of the large bandwidths obtainable and the ease of construction of these devices.

Isolation may be obtained by locating a transversely magnetized ferrite in the proper location in a rectangular waveguide¹² as shown in Fig. 2. An exact solution of the boundary value problem is done and field patterns as shown in Fig. 2 are obtained. The propagation constants and field patterns are different for the two directions of propagation. For the forward direction of propa-

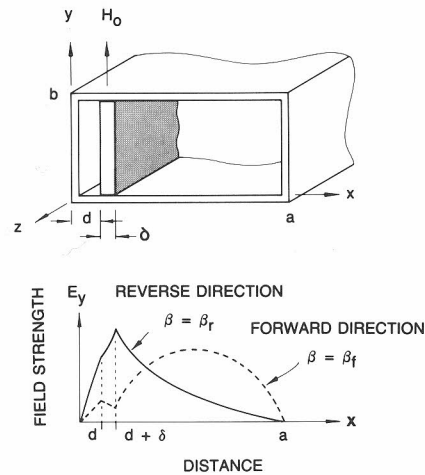


Fig. 2 Transversely Magnetized Ferrite in Rectangular Waveguide.

gation the rf field is effectively displaced from the ferrite — hence the name field-displacement isolator. Isolation is achieved by placing a resistive film along the plane defined by $x = d + \delta$. The electric field is highly attenuated for the reverse direction of propagation and attenuated only slightly for the forward direction.

In 1971, Hines¹³ published a landmark paper on non-reciprocal propagation in microstrip transmission line on a magnetized ferrite substrate. He described a device, shown in Fig. 3, called either the edge-coupled isolator or the peripheral-mode isolator. For one direction of propagation the field pattern is stronger at the bottom edge of the metal conductor than the top edge. When the propagation is reversed, the field pattern is concentrated at the upper edge of the conductor where it is absorbed by the resistive film.

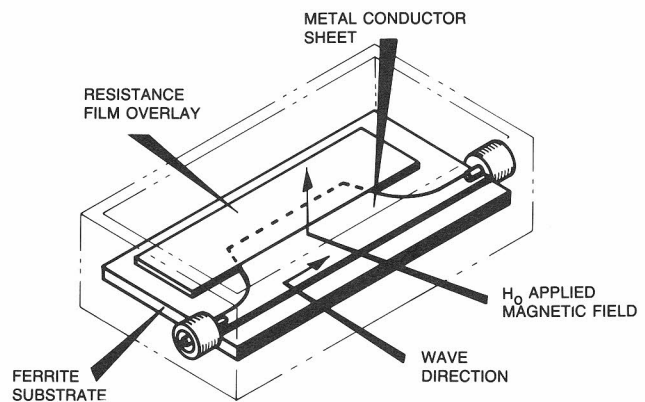


Fig. 3 The Microstrip Edge-Coupled Isolator.

Fin-line has emerged in recent years as a useful transmission medium for millimeter-wave circuits. A fin-line isolator, shown in Fig. 4, was discussed by Beyer and Solbach¹⁴. The device was built and tested at X-band. Davis and Sillars¹⁵ published results on a fin-line isolator operating at Ka-band and exhibiting rather broad bandwidth. The fin-line isolator will be investigated extensively in the coming years, and it may emerge as the dominant isolator for millimeter-wave applications.

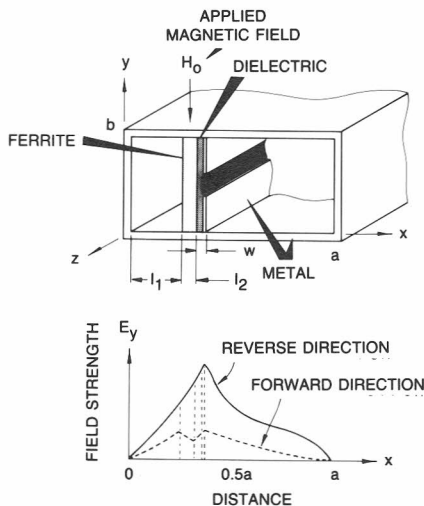


Fig. 4 Fin-Line Isolator.

CIRCULATORS

The ideal n -port circulator has power flow from port 1 to port 2 or from port 2 to port 3, etc., according to the sequence $1 \rightarrow 2 \rightarrow 3, \dots, n \rightarrow 1$. The most common value of n is 3, but $n = 4$ is not uncommon and higher values of n may be realized by cascading three-ports. As with the isolators discussed previously, the insertion loss of the circulator should be on the order of 0.5 dB and the isolation should be 20 dB or greater. Again these specifications may be relaxed for high power operation, high frequency operation or extremely large bandwidth devices.

Circulators find wide usage in microwave circuits. A three-port circulator may be operated as an isolator if port 3 is terminated in a matched load. They are used to separate the input and output ports for reflection circuits, in particular, reflection amplifiers. They provide the duplexing function in a radar system by connecting the high power transmitter to an antenna and the antenna to a low power receiver. The circulator is probably the most common microwave ferrite device and the interested reader is referred to the bibliographies cited previously^{10, 11} for a review of the field up to 1975. A variety of microwave circuits have been employed to realize circulators in various transmission media. However, the Y-junction circulator has emerged as the dominant geometry because good performance is realized with a circuit which is physically easy to realize. The junction circulator is characterized by a resonant circuit which is connected to three transmission lines via impedance matching networks, as shown in Fig. 5. The resonant circuit is loaded by a piece of magnetized ferrite which must have three-fold symmetry. Cylindrical disks, triangular disks and spheres are some typical ferrite shapes employed.

In the absence of a magnetic biasing field the resonant circuit supports two contra-rotating modes which are degenerate (have the same resonant frequency). Application of a bias field along the axis of symmetry will remove this mode degeneracy since the

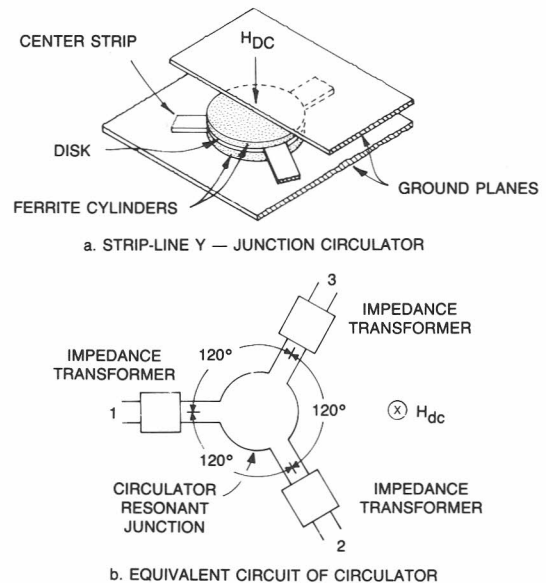


Fig. 5 A Strip-Line Y-Junction Circulator.

relative permeability for one mode is $\frac{\mu + k}{\mu}$ and for the other mode is $\frac{\mu - k}{\mu}$. This is referred to as mode splitting¹⁶. Circulation will occur at a frequency between the resonant frequencies of the modes. The mode splitting is adjusted in order to effect compatibility with the desired bandwidth which is determined by the coupling to the transmission lines.

Goebel and Schieblich¹⁷ reported a fin-line circulator operating at Ka-band frequencies. The isolation exceeded 20 dB over a 8 GHz bandwidth although the insertion loss increased somewhat at the lower band edge. Arain¹⁸ has described a suspended stripline circulator operating at W-band (94 GHz). This circulator demonstrated 1 GHz isolation bandwidth with an insertion loss of about 1 dB. Rabel, Schell and Davidson¹⁹ reported on waveguide junction circulators operating at 140 GHz and 220 GHz. At 140 GHz they demonstrated an 8.5 GHz bandwidth with 18 dB isolation and 1.5 dB insertion loss. At 220 GHz they reported a 2 dB insertion loss and 15 dB isolation, but they did not report the bandwidth of the device. This short review of the recent literature indicates an active interest in millimeter-wave devices. Although the junction circulator is clearly the dominant type device, the optimum type of transmission medium is not clear at this time.

PHASE SHIFTERS

A phase shifter is a device which will provide variable insertion phase in a microwave signal path without changing the physical length. Most phase shifters are two-port devices and are characterized by low insertion loss and low VSWR. There are a variety of uses of phase shifters in microwave circuits and systems, but the single most important factor influencing device development is the application to two-dimensional electronic scanning arrays.

Ferrite phase shifters may be reciprocal or non-

reciprocal, latching or non-latching. A reciprocal phase shifter provides the same insertion phase to rf signals irrespective of direction of propagation through the device. Non-reciprocal phase shifters provide an insertion phase which is dependent upon the direction of propagation through the device. Latching phase shifters use a closed magnetic path so that the device operates at the remanent flux level and does not require holding current. For non-latching operation, continuous holding current must be supplied.

Early versions of ferrite phase shifters used discrete lengths of ferrite to provide phase quantization. Thus, a four-bit phase shifter consisted of cascading four sections of ferrite (of length l , $2l$, $4l$, $8l$) separated by dielectric spacers which provided magnetic isolation. Each individual bit operated at the maximum remanent magnetization (plus or minus) so that a simple electronic circuit was adequate to control the phase shifter. However, machining and assembly of discrete ferrite sections are expensive. Furthermore, variations of remanent magnetization with temperature and frequency dependent effects cannot be compensated easily with this type control. Most phase shifters are now constructed from a single piece of ferrite with the phase shift quantization, frequency compensation and temperature compensation allocated to the electronic driver. The driver accomplishes this by operating the ferrite in a partially magnetized state. As the magnetization varies from negative saturation to positive saturation, the relative permeability of the ferrite changes from $\frac{\mu - k}{\mu}$ to $\frac{\mu + k}{\mu}$. Thus, any value of relative permeability in this range may be realized by adjusting the magnetic flux density in the ferrite core. This will control the insertion phase of the device as will be shown subsequently.

Three types of phase shifters have found widespread applications in ground-based and airborne radar. Historically, the twin toroid (or its predecessor — the toroid) was the first phase shifter to be realized in a latching geometry.²⁰ A sketch of this device is shown in Fig. 6.

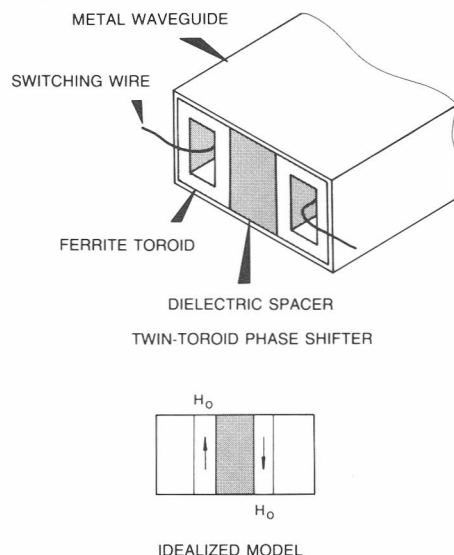


Fig. 6 The Twin-Toroid Phase Shifter.

Square loop ferrite materials are readily available so that the toroidal shape of the ferrite facilitates latching operation. It was shown in the section on isolators that the propagation constants are different for the two directions of propagation through a transversely magnetized ferrite slab. Thus the twin-toroid phase shifter is non-reciprocal. If β_{rs} designates the propagation constant for the reverse direction when the ferrite is saturated and β_{fs} the propagation constant for the forward direction when the ferrite is saturated, the maximum amount of variable insertion phase per unit length is $\Delta\phi/l = \beta_{rs} - \beta_{fs}$. Any amount of phase shift less than this is achievable by reducing the magnetization level. When zero magnetization is reached $\beta_{rs} = \beta_{fs}$ and the variable insertion phase is zero.

Radar applications require a reciprocal antenna. If a non-reciprocal phase shifter is utilized in the antenna, it must be switched at twice the PRF. For an array consisting of thousands of elements this may constitute a severe demand on the system power supply. Thus a latching, reciprocal phase shifter would seem to be the ideal device to minimize power supply weight which is of crucial importance in airborne applications. The dual-mode phase shifter,²¹ shown in Fig. 7, is the only reciprocal, latching ferrite phase shifter currently in large scale production. This phase shifter uses a quadrantly symmetric ferrite rod which is metallized to form a ferrite-filled waveguide. The cross-section must have quadrantal symmetry so that circularly polarized energy will propagate through it with no deleterious

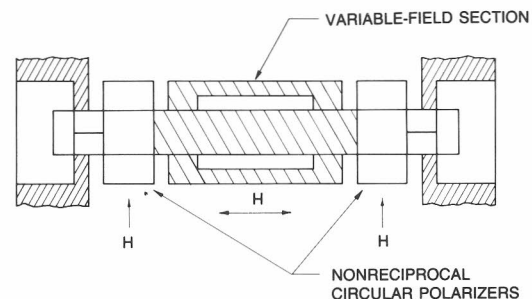


Fig. 7 Dual Mode Phase Shifter Configuration.

effects. The name dual-mode arose because of the fact that the structure must support two orthogonal, linearly-polarized modes for proper operation. At either end of the rod non-reciprocal, quadrupole polarizers are used to convert linearly-polarized fields to circularly-polarized fields and vice-versa. External latching yokes are fitted to the ferrite rod to provide a closed magnetic path and permit latching operation. Resistive vanes are incorporated in dielectric sections at either end of the rod to absorb undesired cross-polarized fields. Linearly-polarized energy incident on port 1 of the unit is converted to circular polarization by the quad polarizer. This circularly-polarized field interacts with the partially magnetized ferrite in the variable field section and receives an insertion phase which is dependent upon the relative permeability exhibited by the variable field

section. This relative permeability ranges from $\frac{\mu - k}{\mu}$ for negative saturation to $\frac{\mu + k}{\mu}$ for positive saturation.

If β_+ is the propagation constant for positive saturation and β_- is the propagation constant for negative saturation, the variable insertion phase per unit length is $\Delta\phi/l = \beta_+ - \beta_-$. The circular polarization is reconverted to linear polarization by the second quad and the resistive film absorbs the undesired sense of linear polarization. For signal transmission in the reverse direction the quad polarizer on the right converts linear polarization in the variable field section. However, the same amount of phase shift is received since the direction of propagation has also changed which results in the rf circularly-polarized magnetic field spinning in the same direction as before and reacting identically with the magnetized ferrite.

Neither the dual-mode phase shifter nor the toroid-phase shifter provides phase accuracies of the order of a degree as might be required in single-axis electronic scanning arrays. This is because the control of the device is essentially the magnetic flux in the microwave ferrite. The rotary-field phase shifter overcomes this by providing control of the phase shift as the ratio of two currents which may be controlled very accurately.²² The rotary-field phase shifter is shown conceptually in Fig. 8. Linearly-polarized energy at either the transmitter/receiver port of the antenna port

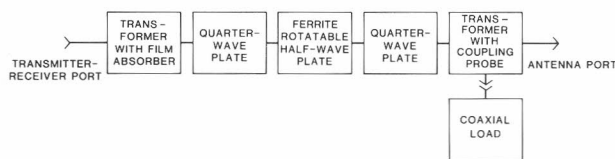


Fig. 8 Medium-Power Rotary-Field Phase Shifter Conceptual Diagram.

is converted to circular polarization by the quarter wave plates. The circular polarization impinges on the ferrite rotatable half-wave plate where variable insertion phase is imparted with the wave depending upon the rotational angle of the magnetic bias field. Each degree of rotation of the bias field results in two degrees electrical phase shift.²³ Cross-polarized energy resulting from deviations from design values for the quarter-wave plates and the half-wave plate is absorbed either by the thin-film absorber at the T/R port or the coaxial load at the antenna port. The rotary-field phase shifter routinely yields phase accuracies of one degree rms for S-band frequencies. Strictly speaking, the device is non-reciprocal since a phase shift differential of 180 degrees is exhibited by signals propagating through the device. However, this is fixed and, if the phase shifter is used in an array is common to all units so that switching between transmit and receive is not required. The unit has not been realized in a latching geometry. Consequently, switching speed and control power are considerably higher than for the latching phase shifters.

The rotary-field phase shifter has been demonstrated at Ku-band frequencies. It is doubtful that operation at

frequencies higher than this will be easily achieved because of machining and assembly difficulties. Further development of the phase shifter will be toward latching versions to reduce switching speed and control power. Both latching phase shifters have been demonstrated at millimeter-wave frequencies. With the development of ferrite materials with higher saturation magnetization and good squareness ratios, both types of phase shifters should work adequately to 100 GHz. Beyond this the machining tolerances and assembly procedures will dictate that either new concepts be developed or new techniques for machining and assembly of small parts be found.

3.0 FERRITE SIGNAL PROCESSING DEVICES

Magnetostatic waves (MSW) are slow, dispersive, magnetically-dominated electromagnetic waves which propagate in magnetically-biased ferrite materials at microwave frequencies (1-40 GHz in Yttrium Iron Garnet). A key to the recent interest in MSW devices has been the development of high-quality, low-linewidth (low-loss), large-area, Yttrium Iron Garnet (YIG, $Y_3Fe_5O_{12}$) grown by liquid-phase epitaxy on insulating Gadolinium Gallium Garnet (GGG) substrates. As an example, magnetostatic waves in EPI-YIG offer lower propagation loss than SAW on lithium niobate at 3 GHz, and losses can be less than 13 dB/ μ sec at 10 GHz.

Magnetostatic wave propagation in thin films has been extensively considered, and three major propagating modes with the propagation direction in the film plane have been used in device applications. These three modes are determined by the relative orientation of bias field, propagation direction and the crystalline orientation of the ferrite slab normal. The modes are dispersive and characterized by a limited propagation passband width and magnetic bias field tunability. This tunability in principle can permit propagation of a particular wavelength at any particular frequency in a range of frequencies. First consider the Magnetostatic Surface Wave (MSSW) mode in which the bias field, H, is perpendicular to the direction of the wave propagation and in the plane of the film. This mode has highly anisotropic propagation in the film plane, and the mode energy is confined to the "top" surface for forward propagation and to the "bottom" surface for reverse propagation as indicated in Fig. 9.

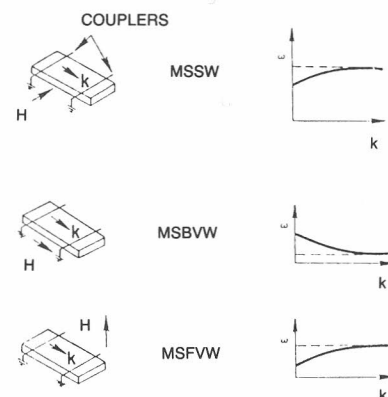


Fig. 9 Principal MSW Propagation Modes.

A second mode is the Magnetostatic Forward Volume Wave (MSFVW) in which the bias field, H , is perpendicular to the film plane and is characterized by nearly isotropic propagation in the plane of the slab with mode energy distributions resembling those found in rectangular metal pipe waveguides. The lowest order mode is usually most easily excited. The third mode, the Magnetostatic Backward Volume Wave (MSBVW) exists when the direction of the bias field and propagation are the same in the film plane. This mode has opposite phase and group velocity directions, is highly anisotropic and is multimode as in the MSFVW case.

All modes typically have velocities in the 3-300 km/sec range and wavelengths from 1 μm to 1 mm for 10 μm thick epitaxial films; thus transducer and periodic structure dimensions may be chosen to permit easy fabrication by standard photolithographic techniques. Since practically any wavelength can be achieved at any frequency, devices designed to work at a specific wavelength will also work at any frequency provided a suitable bias field can be obtained and the internal field of ferrite is uniformly saturated. Propagation delays of ten to several hundred nanosecond per cm are typical.

Bongianni²⁴ at Rockwell International first showed that MSSW dispersion characteristics could be significantly altered to produce both non-dispersive and linearly-dispersive regions by placing a ground plane in close proximity to the YIG layer. Subsequent work by Tsai *et al.*²⁵ of the University of Texas at Arlington, and Daniel *et al.*²⁶ at Westinghouse have shown that a similar situation exists for MSFVW and MSBVW. Adams *et al.*²⁷ of Westinghouse has shown experimentally using MSFVW that constant delay devices with a 100 nsec/cm delay and a bandwidth of 400 MHz are possible at 8 GHz and that linearly dispersive delays of greater than 1 GHz bandwidth at 10 GHz and a time-bandwidth product of 230 can be realized with an insertion loss of 30 dB. Glass *et al.*²⁸ of Rockwell International has demonstrated that dispersion control can be accomplished through the use of layered magnetic structures. These structures consist of 2 or more magnetic layers of slightly different magnetization spaced by a dielectric layer (either the substrate or an epitaxially grown nonmagnetic layer). This technique produces non-dispersive regions with 200 MHz bandwidths at S-band, and 1% delay flatness is achievable with lower propagation loss than is available with metal layered structures. Morgenthaler²⁹ of Massachusetts Institute of Technology (MIT) has shown dispersion can be accurately controlled by bias field gradients.

All of these studies underscore significantly that MSW's are basically dispersive in nature, with a non-linear dispersion characteristic and a finite passband width. These studies demonstrated that the MSW dispersion can be closely controlled over a limited bandwidth.

TRANSDUCERS

MSW transducers are basically the magnetic analog of the Surface Acoustic Wave (SAW) interdigital trans-

ducer. Coupling is direct from rf currents to MSW magnetic field components and shorted "fine wire" couplers have been used since experimentation with MSW was first initiated. Ganguly and Webb³⁰ of the Naval Research Labs first theoretically analyzed the simple "fine wire" MSW coupler using a Poynting Vector analysis, Wu *et al.*³¹ of the University of Texas at Arlington analyzed single wire and simple arrays for MSSW and MSFVW and Parekh *et al.*³² of New York State University studied the MSBVW case. Both groups used an array factor model for the simple arrays considered. Experimental work by Wu³¹ has shown that very low loss (3 dB) unmatched delay lines are possible using MSSW's (see Fig. 10). This is possible due to the anisotropic propagation characteristics of MSSW and the near 50 Ω radiation resistance of a shorted "narrow" microstrip. These models assume independent noninteracting radiators and work well with small arrays but their accuracy decreases with increasing array size. The reason for this inaccuracy lies in the fact that coupling in the MSW case is strong and the change in velocity for metal on YIG can be 2 or greater. Owens *et al.*³³ of the University of Texas at Arlington have developed a 3-port model for the MSFVW transducer arrays. This model shows greatly increased accuracy for larger arrays. MSW devices also suffer from a

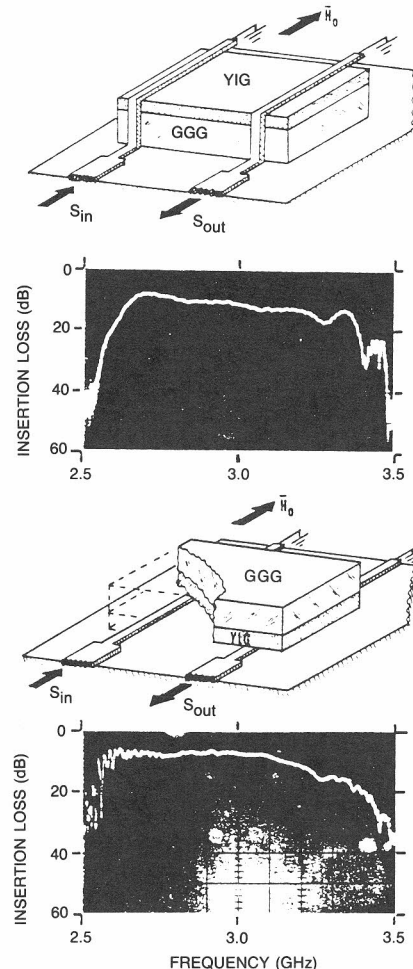


Figure 10. MSSW Single Microstrip Configurations and Delay Line Responses.

further problem related to the strongly dispersive nature of the waves. Transducer filters basically rely on spatial filtering techniques and MSW wavelengths within the passband cover a range from infinity at uniform resonance to $\ll 1 \mu\text{m}$. This implies that spatial harmonic operation presents a significant problem in this type of filter.

Inherently the electromagnetic excitation of MSSW allows directional transduction, and this has resulted in very low (3 dB) insertion loss delay lines being reported by the University of Texas at Arlington. In contrast, MSFVW is reciprocal, and with normal microstrip transducers bidirectional transduction is obtained. Volluet³⁴ of Thomson-CSF, France, has realized unidirectional transducers (UDT) for MSFVW. The transducer configuration is similar to that reported in much earlier SAW work by Collins *et al.*³⁵. Recently, Ataiyan *et al.*³⁶ of the University of Texas at Arlington has demonstrated the first true MSSW transversal filters. These filters are based on an array of narrow ($\ll 10 \mu\text{m}$) open-circuited transducers fed from a power splitter. The first devices tested had $(\sin x)/x$ excitation distributions resulting in tunable bandpass filters. Fig. 11 shows the transducer array, and Fig. 12 shows the response of one of these filters.

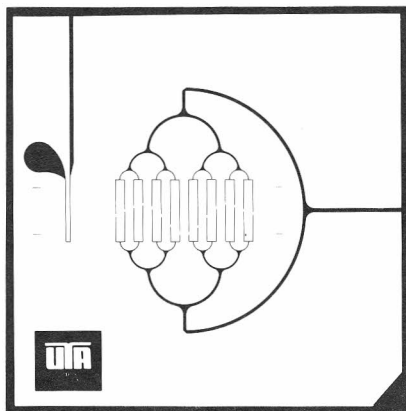


Fig. 11 Circuit Pattern of the 100 MHz Tunable Bandpass filter.

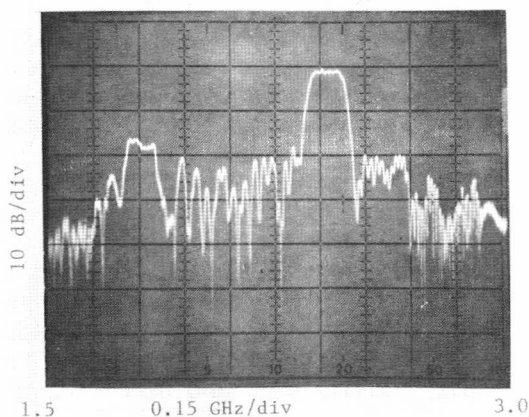


Fig. 12 The Experimental S_{21} of the Device.

TERMINATIONS

As in the surface acoustic wave case, MSW delay lines require terminations to remove wave reflections at sample ends. The first work by Collins *et al.*³⁷ provided a significant reduction of end reflections through the use of lossy propagation regions induced by overlaying thin metal films and lossy ferrites. The best terminations seen thus far involve the use of soft magnetic materials³⁸ or small bias magnets³⁹ to change the field in the region of the sample ends and effectively increase the propagation delay and thus the loss in the end regions. These terminations are still not as good as silicone rubber in the SAW case, but reflections are not a limiting factor in device design at this point.

PERIODIC REFLECTING STRUCTURE

Several significant SAW devices based on normal and oblique reflection of surface waves from periodic structures have been developed, in particular resonators and Reflective Array Compressors (RAC's). The analogs of these devices exist in MSW technology. Initial studies of periodic reflecting structures by Sykes *et al.*⁴⁰, Owens *et al.*⁴¹, have shown that periodic etched grooves and metal arrays (bars and dots) can provide periodic impedance variations in the propagation medium and thus filtering. Either reflector works well in the MSSW case, but etched-groove arrays can result in mode conversion in the MSFVW case⁴² reducing its usefulness. Studies of oblique reflection of MSFVW by metal arrays⁴³ yielded the analog of SAW RAC's at microwave frequencies. Workers at UTA have also demonstrated that strain induced anisotropy created by ion implantation produces an excellent, controllable periodic structure. These reflective array devices show significant advantages over their SAW counterparts in that for etched-groove arrays the effective wave impedance is proportional to the film thickness allowing more design flexibility.

RESONATORS

Initial studies by Sykes *et al.*⁴⁴ of the University of Edinburgh, U.K. demonstrate that etched-groove periodic structures could be used to yield a single-port resonator using MSSW. Work by Owens *et al.*⁴⁵ has shown that 2-port Fabry-Perot MSW resonators with loaded Q's of greater than 800 at 3 GHz are possible with octave tunability. These devices had less than 12 dB insertion loss with spurious down another 13 dB. In 1979 Castera⁴⁶ of Thomson-CSF, France reported results on a 2-port S-band single-cavity magnetostatic volume wave (MSVW) resonator. Ion beam milled periodic etched groove gratings were used in both magnetostatic backward volume wave (MSBVW) and magnetostatic forward volume wave (MSFVW) configurations. An insertion loss of 12 dB and a loaded Q of 550 at 2.2 GHz were obtained with a single resolved mode, and the inherent coupling of MSFVW with resonant exchange dominated spin-wave modes was

largely avoided. With MSBVW the results for the same reflector arrays were insertion loss of 24 dB and loaded Q of 870 at 4.35 GHz. Both the MSFVW and MSBVW resonators were tunable, over an octave with bias field adjustment. In contrast to 'ring-around' MSSW resonators, these resonators were found disadvantageously to have larger off-resonance transmission due to the reciprocal nature of MSVW. However, these devices allow operation up to +10 dB greater power levels than MSSW resonators. Castera, Volluet and Hartemann⁴⁷ reported initial results on cascaded 2-port MSSW resonators. For a single-cavity resonator they obtained at 3 GHz, an insertion loss of 12 dB, rejection of 11 dB and a loaded Q of 600. To obtain better rejection of the off-resonance transmission, they have investigated a new configuration consisting of two cavities, which is similar to that of a single-mode laser. In cascade, a mode of the first resonator is filtered by the second giving overall single-mode resonator with high Q (Fig. 13). At 3 GHz the insertion loss is 15 dB, the off-resonance rejection is 15 dB and the loaded Q is 500. Recently resonators based on reflection from straight edges (SER) of cut rectangular YIG films have been introduced by Huijler and Ishak⁴⁸ of Hewlett Packard Labs. Both MSSW and MSFVW devices have been demonstrated with tunability of 2-20 GHz, Q's of 400 to >2000, and spurious rejection of >10 dB over the tuning range. These devices are simple to fabricate and offer great promise as YIG sphere replacements.

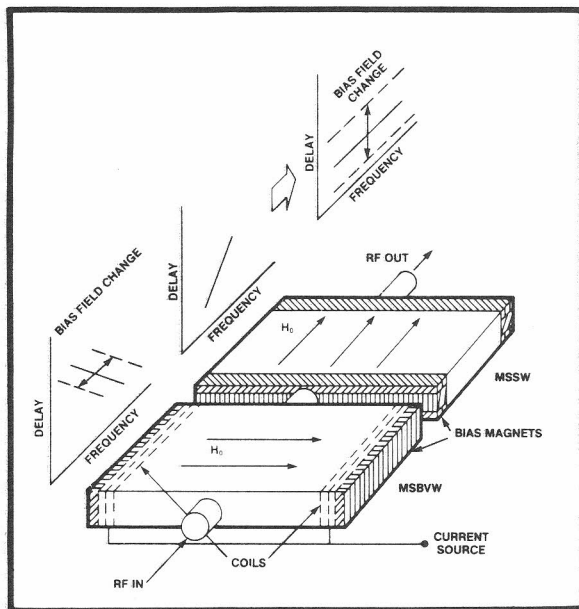


Fig. 13 Electronically Tunable Time Delay Using a Magnetostatic Wave Cascaded Delay Line (CDL).

DISPERSIVE FILTERS

Work on linearly dispersive filters have centered on two techniques. First, control of the existing dispersion characteristic by layering, and second, reflective array devices. Adams *et al.*²⁷ have achieved a MSFVW device with > 1 GHz bandwidth at 10 GHz and time-

bandwidth product of 230, with a linearity of ± 5 nsec over the bandwidth. Insertion loss was 30-45 dB. Also, a backward-wave down chirp device has been built with 800 MHz bandwidth and time bandwidth product of 90. Using reflective array technology Owens *et al.*⁴³ have achieved a 250 MHz bandwidth device at 3 GHz with time-bandwidth product of 70, and linearity of better than ± 2 nsec. Using the variable ground plane technique, the phase error from quadratic of a 400 MHz MSSW delay line at 4 GHz has been produced to less than 6° rms.

MSSW OSCILLATORS

The first reported work on MSW oscillators was by Miller & Brown⁴⁹ from the GEC Hirst Research Centre, London. The configuration used was essentially an S-band MSSW delay line in the feedback loop of a solid-state amplifier having gain adjustable to 50 dB over its bandwidth of 2.8 to 3.3 GHz. The epitaxial YIG film was 30 μm thick, and the 50 μm wide microstrip couplers were separated by 7 mm. To encourage single-mode oscillation the MSSW delay line pass-band was narrowband by flipping the GGG substrate so that it contacted the microstrip couplers and hence decoupling the MSW from the electromagnetic ports. A 10 dB insertion loss delay line was obtained with 3 dB bandwidth of 25 MHz at a particular bias field. The group delay was 33 nsec and mean k-vector, 500 m^{-1} . Oscillations were obtained covering the 500 MHz amplifier bandwidth by tuning the bias field. However, unexplained discontinuous jumps of 25 MHz occurred approximately every 100 MHz. The medium term stability of the oscillator was poor by SAW standards being 2 MHz/ $^\circ\text{C}$.

Castera⁵⁰ of Thomson-CSF has reported advances on the Miller & Brown studies. He built an S-band oscillator using multibar microstrip transducers, originally researched at the University of Texas at Arlington. With 6-bar parallel transducers, each 100 μm wide and spaced by 419 μm , an MSSW delay line with a 3 dB bandwidth of 34 MHz at 3.2 GHz was obtained. This transducer technique has the disadvantage that high order MSSW responses occur. Bias-field tunable oscillation was obtained from 2 to 3.8 GHz but again, like Miller & Brown, discontinuous mode jumps (in this case of 10 MHz) occurred. Castera correctly attributed these to the difference between the variation of the oscillator frequency versus magnetic field. To overcome this mode jumping problem, Castera then followed SAW oscillator principles and built an oscillator using an MSSW delay line having two output transducers which are summed at the amplifier input. In this configuration an oscillator, continuously tunable by the bias field, can be realized when the allowable modes for both loops correspond. Experiments were performed with a 10 μm thick YIG film with 10 mm and 15 mm long MSSW paths to the output transducer. Respective delays and mode spacings were 77 nsec and 13 MHz, and 115 nsec and 8.69 MHz, giving modes of oscillation spaced at 26 MHz. By this technique Castera obtained continuous tuning of oscillation in a linear manner with bias field over several

hundreds of MHz centered around 2.1 GHz. However, this oscillator, because of the single microstrip transducers used, exhibited a comb of frequencies spaced by 26 MHz. Thus, judging from European research, MSSW oscillators have not yet been achieved with single-mode continuous tuning, low-medium term temperature stability, and no measurements are available on the phase noise governing the short term stability.

Carter *et al.*⁵¹ of the University of Texas at Arlington reported work on an octave tunable resonator based oscillator at the 1981 MTT Symposium. In this work a two-port, single-cavity resonator was placed in the feedback loop of a broad band amplifier to give continuous single-mode tuning from 1.8 – 4 GHz. Noise performance measurements indicate that this oscillator is superior to many bulk sphere oscillators with potential significant improvement. More recently, Isham⁵² of Hewlett Packard Labs has demonstrated very broad band (2-20 GHz) resonator oscillators based on edge-coupled resonators with superior noise performance.

MSW SYSTEM COMPONENTS

Several system oriented MSW devices have been developed to date. However, these devices are intended to demonstrate feasibility not application in any particular system. Adams *et al.*²⁷ of Westinghouse has developed a 4 tap programmable MSW tapped delay line operating at 9 GHz. The device had a 22 dB insertion loss and when used as a correlator for a 4-bit Barker code (20 nsec bit duration) achieved a > 10 dB peak to side-lobe correlation peak. Further, the Westinghouse workers have also developed a unique device, the frequency selective signal to noise enhancer, or power expander. This device provides low loss for high level signals and high loss for low level signals. This characteristic is achieved over 1 GHz bandwidths with a differential loss of >20 dB between a +10 dBm signal and a -6 dBm signal. Adams *et al.*⁵² have also achieved temperature com-

ensation of a narrow band MSW filter by utilizing a compensated magnet structure with stability better than $1.2 \times 10^{-5}/^{\circ}\text{C}$. This represents a significant step toward system application of these devices.

Sethares *et al.*⁵³ have developed an electronically variable time delay device utilizing cascaded MSBVW and MSSW delay lines (Fig. 13). By altering the bias field of one device the time delay is varied over 47 nsec with 250 MHz constant delay bandwidth at 3 GHz. The rms phase error from linear was less than 20°. Reed *et al.*⁵⁴, also of UTA, have utilized a MSSW delay line with transducer weighting to achieve an active compression loop with 600 MHz bandwidth at 3 GHz, time-bandwidth product of 60 and time sidelobes of > -24 dB. Reed *et al.*⁵⁴, of the University of Texas at Arlington have demonstrated a pulse compression loop in S-band with time sidelobes greater than 30 dB down and time-bandwidth product of 50.

PRESENT AND POTENTIAL MSW DEVICE STATUS

While SAW devices have been under intensive study for the past 18 years, MSW devices have only been under limited active study for about 12 years. Thus, only the basic proofs of principles have been reported. Also, various technical problems, including higher frequency of operation and dispersion, to name a few, makes MSW more complex than SAW in general. Still progress has been significant and the promise is great. Table 1 shows the present status and future projections for MSW devices. Note that not all parameters are obtainable from a single device. Table II summarizes possible MSW applications.

TABLE I MSW PERFORMANCE

PARAMETER	TRANSDUCER ARRAY		REFLECTIVE ARRAY		RESONATOR		VARIABLE GEOMETRIES	
	CURRENT	FUTURE	CURRENT	FUTURE	CURRENT	FUTURE	CURRENT	FUTURE
Center Freq (GHz Tunable)	1-20	1-40	1-20	1-40	1-20	1-40	1-20	1-40
Bandwidth (MHz)	30-800	10-1200	30-500	30-1000	2 (Q = 1500)	1 (Q = 3000)	500	1000
Time Dispersion (nsec)	NA	NA	250	1000	NA	NA	200	1000
Time Bandwidth Product	NA	NA	125	1000	NA	NA	250	1000
AM Ripple	2 dB	1 dB	3 dB	1 dB	NA	NA	2 dB	1 dB
Phase Ripple (°RMS)	10	5	12	3	NA	NA	6	3
Temperature Stability	$1 \times 10^5/^{\circ}\text{C}$	$1 \times 10^6/^{\circ}\text{C}$	$1 \times 10^5/^{\circ}\text{C}$	$1 \times 10^6/^{\circ}\text{C}$	$1 \times 10^5/^{\circ}\text{C}$	$1 \times 10^6/^{\circ}\text{C}$	$1 \times 10^5/^{\circ}\text{C}$	$1 \times 10^6/^{\circ}\text{C}$

**TABLE II
PRIME APPLICATIONS OF MSW DEVICES**

DEVICE	
Resonator	Narrow band filters, Oscillators
Bandpass filters	EMC, Radar, Communication satellite repeaters
Non-dispersive delay lines	Fusing, MTI Radar, Communication path length equalizers, Altimetry recirculating storage loops
Tapped delay lines	Fourier transformation, Clutter-reference radar, ECM deception, PSK matched filters.
Dispersive delay lines	Radar pulse compression, Variable delay for target simulation and phase array radars, Fourier transforms, Compressive receivers, Group delay equalization.

4.0 CONCLUSION

There is no doubt that the preceding discussion has barely tapped the surface of microwave magnetic devices. However, this newsletter has limited space and the authors have limited time. Consequently, the coverage is limited and is certainly biased by the authors' experiences. If your favorite device has been omitted, rest assured that it was inadvertent and if you will write a note to one of us, we will make sure to publish it in a future issue of the NEWSLETTER.

The broad area of microwave magnetic devices is divided into control elements and signal processing elements. In general, control elements are realized in structures like waveguide, stripline, microstrip, fin-line, etc., while the signal processing devices are realized in thin-film devices. The future development of ferrite control devices will center on three areas. The first of these is the extension of existing circuits and techniques higher in frequency into the millimeter-wave region. This effort will be aided by development of new materials and improvements in existing materials. Hexagonal ferrites can be used to simulate the effect of a large external bias field and consequently may be used to enhance the frequency bandwidth of junction circulators. Recently, efforts have succeeded in improving the squareness ratio of a commercially available nickel-zinc ferrite, providing a latched flux density of 4000 Gauss. This will make possible latched phase shifters operating with about 1 dB insertion loss up to 100 GHz.

The second area will be concerned with the application of proven principles to new microwave circuits, allowing special functions to be performed. In the 1986 International Microwave Symposium, just concluded, two of the five papers in the ferrite session involved new circuit applications of existing technology. The first circuit provided phase shift to any arbitrarily polarized signal, while the second described a device with a single input and two outputs with the amplitude and phase of each output being independently controllable. These circuits will be developed in the microwave range and then extended into the millimeter-wave range. The most exciting area is the development of new techniques to perform many of the existing control functions at millimeter-wave frequencies. We may have reached a practical

limit of 100 GHz as far as using standard grinding and machining techniques. Desposition of ferrite to form thick films may be a method of achieving geometries and tolerances necessary for useful devices as frequencies are increased above 100 GHz.

The future development of ferrite signal processing devices will center on three areas. The first of these is the extension of the processing techniques to higher frequencies, in particular, into the millimeter wave region. Key to the expansion of this area is the development of new, low linewidth, high magnetization ferrite layers, grown either by epitaxy or other thin film technology. Recently, work on high magnetization, epitaxial hexagonal ferrites has shown great promise. Also, circuit techniques will have to be modified to obtain acceptable, low loss transduction at these frequencies. The second area of interest is in obtaining increased bandwidth in signal processing devices. This goal can be obtained in several ways, including; the use of broadband transducer arrays, tapered bias field, and materials with higher magnetization. Devices with operating bandwidths of greater than 1.5 GHz should be possible using YIG, and even greater bandwidths should be available with better materials. Finally, more complex signal processing functions should be possible in the near future. Devices with true transversal filter characteristics are appearing, opening new avenues for microwave signal processing, and devices with substantially higher time-bandwidth products are forecast for the future.

The future of microwave ferrites promises to be exciting. While the field is mature, it is certainly not stagnant, and increased efforts in microwave magnetics development will bring new applications and new challenges for those of us in the field.

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BIOGRAPHY

William E. Hord was born in Leola, South Dakota in 1938. He received the BSEE from the Missouri School of Mines and Metallurgy, Rolla in 1959, the MSEE in 1963 and Ph.D. 1966 from the University of Missouri at Rolla.

His teaching experience is as an Instructor of Electrical Engineering from 1960 to 1966 at the University of Missouri at Rolla, a part-time Assistant Professor at the Graduate Engineering Center, University of Missouri at Rolla during 1967-1968 and Professor of Engineering at Southern Illinois University. At SIU he was Chairman of the Department of Engineering from 1974 to 1981 and Acting Dean of the School of Engineering from 1983 to 1984.

Dr. Hord worked at the Sperry Gyroscope Co. from 1959 to 1960 on the development of high-power klystrons. From 1966 to 1968 he worked at the Emerson Electric Co. on the development of airborne phased-array antenna, in particular, the RARF antenna. In 1984 he joined the Microwave Applications Group where he is presently Vice-President of Engineering.

Dr. Hord is a Senior Member of IEEE. He is a member of Eta Kappa Nu, Phi Kappa Phi, Sigma Xi and Tau Beta Pi. He was named Outstanding Electrical Engineering Teacher in IEEE Region 5 in 1984. He currently serves as Co-Chairman of the MTT Technical Committee on Microwave Ferrites.

John M. Owens was born in Livermore, California on February 12, 1942. He received his BS from the University of California, Berkeley in Electrical Engineering in 1963 and his M.S. and Ph.D. from Stanford University in 1964 and 1968 respectively. His doctoral thesis was on "Avalanching in Gunn Effect Oscillators."

From 1968-1969 he was research associate at University College, London, working on Gunn effect devices and saturation effects in semiconductors. From 1969 to 1971 he worked at the Electronics Division, North American Rockwell, Anaheim, California doing research in GaAs material growth, Gunn effect amplifiers and oscillators, surface acoustic wave devices, and bubble domain materials and devices.

Dr. Owens is a member of the IEEE, ASEE and a registered professional engineer in the State of Texas.

In 1974 Dr. Owens joined the University of Texas at Arlington as an Associate Professor. Research in magnetostatic wave devices millimeter wave components and hybrid and monolithic GaAs integrated circuits and devices was being carried out. In the past 10 years, over \$2.5 million in research support has been received by the research group. Professor Owens has served as Assistant Dean for Research in the College of Engineering, and is currently the Director of the Center for Advanced Electron Devices and Systems. Dr. Owens has published 68 papers in technical journals.



IDEAS INTO PLANS PACE REPORT



by R.A. Moore

Have you ever wondered if any of the good ideas on membership ever go any further than just ideas? Of course, the whole breadth of activities of the MTT-S from transactions and symposium sessions to exhibits are good ideas, which were once embryonic and have developed through the years. Clearly, these are examples of good ideas that have become fundamental to our profession and industry. And they go beyond any earlier expectation.

From time to time, we all have ideas that we think should be adapted by our company, professional organization or other organizations. Too often, our peers do not simultaneously share our ideas, and the ideas lie dormant. Part of the problem is in our democratic society, decisions are made by some form of consensus. Even though the MTT-S may be a reasonably homogeneous body, substantial consensus is necessary before any major diversion is initiated. This is true of any idea other than solutions to an immediate crisis. This becomes more true as the scope of the organization broadens and the constituency becomes more public. Consider the IEEE, your state legislature or the U.S. Congress.

Upon re-examination, what seems to be resistance to new ideas is really the process of developing consensus. Sometimes, delays are called lack of leadership. And there is some truth in that statement. We have seen a charismatic person turn "new" ideas into quick decisive action. Sometimes this is true. Often the charismatic person just gives visibility to an idea that has been latent just beneath the surface of acceptance. Whether the idea rises gradually through broad membership activity or quickly through a charismatic leader, it is consensus that leads to movement. Keeping in mind this need will help our activities toward more productive objectives.

It was within this context that we might review a suggestion of a few years ago by Fred Rosenbaum for a Microwave Foundation. The Foundation would be funded by the MTT-S and microwave industry members. The Microwave Foundation would support solutions to many of the programs of our profession. Problems keep surfacing which need broad industry support.

Details of Fred's ideas for the Microwave Foundation were written out in the Fall 1982 Newsletter. They won't be repeated. His special interest was in meeting the educational needs for potential microwave engineers and those already in the industry. This would be accomplished by offering training. He was also

responding to the large drop in undergraduate interest in microwave courses and the lack of quality facilities in many universities for training graduate students. He was also concerned that educational facilities are deteriorating to the point that quality continuing education cannot be provided.

Reasons for lack of undergraduate microwave interest, equipment and university staffing vary. We are an analog industry where the world is going digital. Many perceive the microwave industry as being static. However the microwave activities in industry has doubled over the past decade. Some microwave engineers may feel it is just as well that there be a scarcity of trained personnel in our field. This will give us more bargaining power. Within certain limits, this may be true. We must, though, have an adequate supply of developing microwave engineers or our industry will begin missing opportunities. We will price ourselves out of the markets. A true balance must be maintained. It can only be maintained with internal debate, i.e. developing of consensus and having the resources on hand to solve the problem. Industry must support the Microwave Foundation.

Additional problems which surface continuously can be best solved by concerted industry actions. The solution to the serious decrease in NBS microwave standards activities is under study by the MTT-S committee. This committee, called Promote National Microwave Standards (PNMS), will require broad industry support. Similarly, identifying and implementing measures to improve competitiveness of the U.S. microwave industry will require such industry support. And, this is just a start.

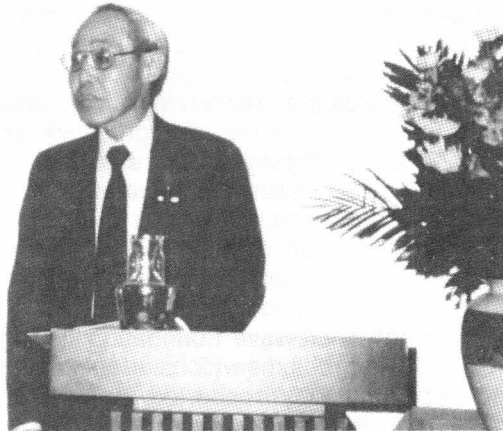
Because the concept of the Microwave Foundation represented such a fundamental shift in thought from current activities, time was needed for thinking, adjustment and modification, and a consensus. The Administrative Committee placed Fred in charge of its development. Familiar!! At the bottom line, Fred's ideas were given a chance.

Often, when such a chance is provided, that is the end. It is pleasant to report that Fred persisted. Fred's efforts were one of the reasons that earlier this year the Administrative Committee appointed a "Long Range Planning Committee" consisting of distinguished members of the microwave engineering profession including several past presidents of the MTT-S. This committee identified the need for a microwave trade association as one of several long range goals. Its purpose would be to further the industry through enhanced marketing, standards setting and communication of public issues, as well as the funding of specific items for the benefit of the microwave community. It would function essentially as the E1A. A committee was formed to explore establishment of a microwave industry trade association for which Harlan Howe and Fred were appointed. With the rapid development of the microwave industry as well as microwave technology and with the large number of influences on its long term health, particularly the U.S. Government, some voices were needed. Could we be seeing an embryonic idea which some day will be as institution-

(Continued on page 50)

ANNUAL PRIZE OF THE TELECOMMUNICATIONS ASSOCIATION OF JAPAN

GE Engineer is First Non-Japanese Citizen to Receive Award



Kiyoo Tomiyasu delivering acceptance speech at the Joint Meeting of the Telecommunications Association and IEEE Tokyo Section held at Iidabashi Kaikan, Tokyo, May 20, 1986.

Kiyoo Tomiyasu, a Life Fellow of the Institute of Electrical and Electronics Engineers, Inc. (IEEE), and a member of its Board of Directors, has been awarded an Annual Prize of the Telecommunications Association of Japan. Dr. Tomiyasu, a consulting engineer for General Electric Company, was honored for his distinguished contribution toward the progress of the telecommunication industries and for his outstanding service. He is the first non-Japanese citizen to receive the prize in its 27-year history.

The award presentation, held in Tokyo this past May, was conducted by the Telecommunications Association. Later the same day, Dr. Tomiyasu made his acceptance speech at a meeting jointly sponsored by the Association and the IEEE Tokyo Section. The Tokyo Section nominated Dr. Tomiyasu and supported his candidacy for the Prize. Both organizations have a number of members in common, including the Association's President, Dr. Shigeru Yonezawa.

Dr. Tomiyasu currently is the Director of Division IV of the IEEE, which covers the areas of Electromagnetics and Radiation. He has also served on the Institute's Technical Activities Board and its Operating Committee, and on the Awards Planning and Policy Committee. Since the 1950s, he has held advisory posts and chairmanship in a vast range of IEEE activities, including: editorial boards, Regional and Sectional activities, Society and Council Committees, and many others. He was elected to Fellow status in 1962, and to Life Fellow in 1984.

The Telecommunications Association was founded in

1938 to foster growth of this field through cooperation between the Japanese government and the telecommunications industry. It also addresses pertinent issues through research, consulting, publishing, education, and cultural development.

At present, Dr. Tomiyasu is a microwave technology consultant at GE's Space Systems Division in Valley Forge, Pennsylvania. He joined the firm in 1955, directing the effort to measure harmonic frequencies in rectangular waveguides (metallic conducting tubes). As an example, airport landing communications systems have benefited from this work. Radar signals that impede landing communications can be measured, leading to more effective ways to filter or eliminate the interference.

After subsequent involvement in laser and antenna development, Dr. Tomiyasu transferred to the Space Division, contributing greatly to its programs in satellite communication and microwave remote sensing.

Dr. Tomiyasu was born in Las Vegas, Nevada. He earned his B.S.E.E. degree from the California Institute of Technology in 1940, the M.S. degree in communications engineering from Columbia in 1941, and Ph.D. in engineering sciences and applied physics from Harvard University in 1948.

Kidney-problem therapy:

A vegetarian diet. Failing kidneys must strain to eliminate protein waste products from the body. A vegetarian diet substitutes amino and keto acid supplements – easily handled by the kidneys – for proteins. Early tests show that the vegetarian diet may eliminate the need for dialysis for two-thirds of sufferers.

Research by Dr. Theodore Steinman, director of the dialysis unit, Beth Israel Hospital, Harvard University.

... CAREER ADVANTAGE

Competence on the job

Competence on the job cannot overcome bad chemistry – a personality conflict with other executives in the company, particularly the boss. A candid, conciliatory management style, for instance, may only lose you respect in a more aggressive, conspiratorial environment. *Recommended:* If you can't fit in with the corporate culture, the best way to preserve your self-confidence (and your career) is to leave.

Patricia O'Toole, author of Corporate Messiah: The Hiring and Firing of Million-Dollar Managers, William Morrow & Co., 105 Madison Ave., New York 10002, \$15.95.

Women executives.

Women executives are still paid less than their male counterparts – even when their credentials are identical. A study of Columbia Business School graduates found that men and women started at about the same salary level. But 10 years later, the average male MBA was earning \$49,356 and the average female \$40,022 – almost 20% less.

Study by professor Mary Anne Devanna, research coordinator, Center for Research in Career Development, Columbia Business School.

ANNOUNCEMENT — MTT-S UNDERGRADUATE SCHOLARSHIP WINNER

The first winner of the Microwave Theory and Techniques Society Undergraduate Scholarship is Miss Manik Hinchey of Cambridge, Massachusetts. Miss Hinchey is a graduate of Boston Latin High School and plans to attend the Massachusetts Institute of Technology to major in Electrical Engineering. Manik's mother, Dr. Sheila P. Hinchey, is a member of MTT-S and is an Associate Professor, teaching microwave engineering, at Northeastern University. Her father, Dr. Fred A. Hinchey, is a Physicist at the same university.

The presentation of the scholarship was made at Boston Latin High School by Harlan Howe, Jr. who is the most recent Past President of the Microwave Theory and Techniques Society and currently is serving as Secretary/Treasurer of the Boston Section of the Institute of Electrical and Electronic Engineers (IEEE).

The scholarship is awarded annually on a competitive basis and is available to all children of MTT-S members. It is administered by the National Merit Scholarship Corporation. Inquiries concerning the scholarship should be addressed to:

Dr. Krishna K. Agarwal
Rockwell International Corp.
CTSD, M/S 402-140
P.O. Box 10462
Dallas, TX 75207

1987-1988 Scholarships, Fellowships, and Grants-in-Aid

Two Merit Scholarships — for children of MTT-S members at undergraduate level (not limited to engineering), \$1000-\$2500 each, renewable for 4 years, given to national merit finalists based on PSAT/NMSQT test scores, academic record, leadership, and significant extracurricular activity.

Graduate Fellowships — several \$5000 fellowships and MTT-S membership awards each year for graduate studies in microwave engineering on a full-time basis. Applicants must have attained high academic level in engineering or physics.

Educational Grants-in-Aid — for individual members of MTT-S and for non-profit institutions, number and amount to be based on proposal submitted, relating proposed activity, and financial justification.

For further information, contact:

Dr. Krishna K. Agarwal
Chairman, MTT-S Education Committee
Rockwell International, M/S 448-140
P.O. Box 10462
Dallas, Texas 75207-0462
(214) 996-5751

Requests for information must be made no later than September 15, 1986.

Note: The amount of funding would be adjusted for candidates in overseas institutions.



Manik Hinchey receives the MTT-S scholarship from Harlan Howe, Jr., Past President of the Microwave Theory and Techniques Society, while Boston Latin Headmaster, Michael Contompasis, looks on.

REVIEW OF: THE VIDEO TAPE COURSE "RF/MW TRANSISTOR AMPLIFIER DESIGN"

By Les Besser

This is an excellent video tape adaptation of a course that Les Besser has taught for over 10 years. This video tape course comes in six 1/2-inch video cassettes. Each cassette contains approximately a two-hour session of video material. The course also includes the text "Microwave Transistor Amplifiers: Analysis and Design (Prentice-Hall)", and a course manual. The course follows closely, and very effectively the handout material.

The great advantage of this video course is that it lets you study at your own pace. The course should be taken in segments of 15 to 60 minutes, depending on your previous background and familiarity with the material. The treatment of the various subjects indicate that this course can be used by students with different backgrounds. It provides a good introduction to some basic concepts, as well as detailed and practical design procedures on radio frequency (RF) and microwave (MW) amplifier design. Beginners, practicing engineers and managers in the area of RF and MW amplifier design can all benefit from this course.

The course also includes many design examples using computer-aided design (CAD). Several state of the art CAD programs are used to analyze, optimize and provide statistical analysis of RF and MW amplifiers.

The video tape course is organized in six sessions. The first session covers the fundamentals of active circuits. It begins with a review of two-port parameters, leading to the development of scattering parameters. Impedance matching networks using Smith charts are covered in detail. The development of RF and MW transistor equivalent circuits, as a function of frequency, are also presented.

The second session covers impedance matching CAD concepts. This session starts with a discussion of CAD in general, and the limitations of the difference optimization methods. A one-port matching network design example is worked in detail. The matching design includes circuit modeling, topology selection, synthesis, impedance transformations using Norton's and Kuroda's transformations, optimization, and the effect of tolerances on component selection.

The third session covers the power gain expressions, stability and dc bias of RF and MW transistor amplifiers. The transducer, operating and power gain relations are introduced. The stability circles are developed in terms of the S-parameters of the transistor. Regions of unconditional stability and potential instability are analyzed in the Smith chart. DC biasing of BJTs and FETs are shown using both passive and active bias circuits.

The fourth session covers unilateral and bilateral design procedures. Systematic solutions, aided by graphical techniques, are developed for unilateral and bilateral designs. In a bilateral design, using an unconditional stable transistor, the design procedure is based on a simultaneous conjugate match. If the transistor is potentially unstable, the constant operating and available power gain circles are used.

The fifth session covers broadband amplifier design and noise-figure principles. A complete case of an octave-wide small-signal amplifier is used to illustrate device selection, transistor modeling, matching network design, and the simultaneous optimization for flat gain and low VSWR. A yield analysis is performed using a Monte-Carlo technique. Noise-figure principles are introduced.

The sixth session covers the design of low-noise, and feedback amplifiers. A two-stage, 8 to 10 GHz, low-noise amplifier is shown using an interesting technique that includes the available and operating power gains. A final physical layout for the amplifier is obtained using an automated circuit layout program, which uses the actual physical dimensions of the transmission lines. A feedback amplifier design is also illustrated.

Several homework assignments are included in the different sessions. I found them very interesting.

A very valuable part of this video course is the combination of video, audio and written material to form a unique combination for effective teaching. Many practical design guidelines are given by Les Besser. The examples presented and all the CAD methods are realistic, and the student is given a set of tools that he can immediately apply to real world designs.

In conclusion, Les Besser has done a thorough job in developing a first-rate video course, and I highly recommend it.

Guillermo Gonzalez, Ph.D.
Professor

Double jeopardy.

Edwin Probbler greatly underpaid the taxes he owed. A jury *acquitted* him of criminal tax fraud, but the IRS applied *civil* tax fraud penalties anyhow, and the Tax Court upheld them. *Result*: Probbler avoided a jail term that could have resulted from the criminal charges. But he still had to pay back taxes *plus* the civil fraud penalty of 50% of his tax underpayment . . . *plus* interest.

Edwin Probbler, TC Memo 1985-193.

. . . Ideal fire starters.

. . . Ideal fire starters for camping on a windy day are the trick birthday-cake candles that relight as soon as you blow them out? They're available in novelty and joke shops.

Sports Afield, 250 W. 55 St., New York 10019, monthly, \$11.97/yr.

MEMBERSHIP SERVICES



*by Martin V. Schneider, Chairman
and Steven J. Temple, Co-Chairman*

RAPID GROWTH OF THE MTT-S SOCIETY

Six new Chapters were formed in the first half of 1986: Dayton, Ohio; Huntsville, Alabama; Valencia, Venezuela; Pretoria, South Africa; Rio de Janeiro, Brazil and Beijing, People's Republic of China. This brings the total number of Chapters to 52. Another new Chapter is presently being organized in England.

The number of members has increased by 9.3% to 8,211 over the last twelve months. This compares favorably with the average increase in Society Membership of 3.9%. We would like to thank all the officers and members who were instrumental in achieving these impressive results. Keep your membership growing!

Chapter Chairmen's Meeting

A dinner and meeting for Chapter Chairmen, Vice-Chairmen and ADCOM members was held at the International Microwave Symposium in Baltimore on June 2, 1986. Thirty Chapters were represented at the meeting. The attendees were offered the opportunity to discuss their Chapter's needs with ADCOM members and give a report on their activities. A Handbook for Chapter Officers was distributed at the meeting. The manual contains useful information on how to run Chapters, make use of available resources offered by the Society and recruit new members.

Four Chapters which achieved rapid growth in 1985 were recognized at the meeting and received a plaque and a check of \$200.00. These Chapters were Orlando (35.5% increase in membership), Philadelphia (24.4%), West Germany (22.6%) and Sweden (8.6%).

Distinguished Microwave Lecturers

Fifty requests for presenting talks to Chapters were received by the new 1986/87 lecturers John Bryant and Ed Niehenke. The lecturers and topics were announced in the June issue of the IEEE newsletter "The Institute" thanks to the publicity efforts of Mario Maury. Similar announcements appeared in the Microwave Journal, Microwave System News and Microwaves and RF. Ed Niehenke has already given

two talks on "Gallium Arsenide, Key to Modern Microwave Technology" in Baltimore and Philadelphia, and John Bryant presented his lecture on "The First Century of Microwaves 1886-1986" in East Lansing, Michigan.

The 1985/86 Distinguished Lecturer Kenneth Carr gave 60 talks on "The Application of Microwave Technology to the Detection and Treatment of Cancer" to 2300 attendees. He has scheduled 15 more meetings in 1986.

Membership Development

We urge all officers and members to continue their efforts in encouraging prospective members to join MTT-S. You can receive membership development materials and assistance by contacting the IEEE Service Center, Membership Development, 445 Hoes Lane, Piscataway, New Jersey 08854. Ask for Roseann Schulz or William C. Hunter on (201) 981-0060, Ext. 300 or 301.

Patrick Green of our membership services group will also be helpful on all questions concerning effective ways to attract new members. His address is:

Patrick A. Green
Westinghouse Electric Corp.
P.O. Box 746, M-339
Baltimore, MD 21203
Phone (301) 765-2832

Financial Support to Chapters

Five Chapters (Long Island, Orlando, Phoenix, Syracuse and India) requested and received a total of \$1,700 for covering the expenses for organizing technical meetings. Chapters can request up to \$350.00 by sending a request with a description of specific anticipated expenses to:

Steven J. Temple
Raytheon Company
Hartwell Road, Mail Stop M15-50
Bedford, MA 01730
Phone (617) 274-4736

It is important to note that your Chapter is entitled to receive \$300.00 from your Section if you organize a conference which is co-sponsored by your Section (Section Technical Conference). Your Section also receives a rebate of \$35.00 for each Chapter meeting which is reported and submitted to the Section Secretary on a meeting report form (yellow IEEE form L-31). The forms can be ordered from the IEEE Service Center, Chapter Services, 445 Hoes Lane, Piscataway, New Jersey 08854. A copy of the meeting report should also be sent to Zvi Galani who is in charge of the MTT-S Chapter records and who will publish your

(Continued on page 48)

1989 INTERNATIONAL MICROWAVE SYMPOSIUM



by Chuck Swift

I was in Baltimore this year during Gay and Lesbian Liberation Week. I went to observe something quite different, the 1986 IEEE/MTT-S International Symposium, to see what might be copied and what we might improve on in 1989. For a while, I wasn't sure any of you read these columns, but three people asked me the answer to the riddle posed here some time ago "What do you call a boomerang that doesn't come back?", which tells me at least three of you read a previous column, surmising that none of you knew the answer. Or maybe everyone of our 8671 members read it, and being an intellectual group only 3 members didn't know the answer; "Stick".

After last year's Symposia, I suggested it would be nice if at future Symposia we could (1) have an expectorating contest in the style of the St. Louis Cardinals and (2) have the speakers berate the Session Chairman, in the manner of the same team. My inspiration this year comes from another sporting event, the Indianapolis 500. No, I'm not suggesting we hold the Symposium outdoors, so we could call our wives and tell them we're staying over another week because of a rain delay. What I'm championing is that we follow their lead and have sponsored speakers! Let's get rid of those blue suits and conservative ties, and don attire with patches emblazoning our sponsors names. Wouldn't Sylvania light bulbs want to pay a speaker for his bright idea (that's a pun, son)? And H-P would willingly pay as a young Asian engineer (aren't all young engineers Asian?) tells how he was able to solve some complex computation on their scientific computer? We must have a toothy, short engineer capable of emulating Mary Lou Retton and espousing how Wheaties increased his mental acuity to the point where he can challenge Einstein!

With this, of course, will come notoriety and fortune, something few engineers come to grips with in their daily routine. Therefore, we'll establish an educational fund (engineers always want more education) under the MTT for this specific purpose; hell, we have to get rid of the surplus generated by the Symposium one way or another. Do you think J.R. Fayos would be prepared to appear on the Johnnie Carson Show to discuss his paper "Determination of the Transfer Function of a Nonlinear Circuit for Intermodulation Characteristics" without some schooling? With 2 minutes 30 seconds, prior to the Alka Seltzer commercial, to explain it fully? Wearing a jump suit with

Narda, M/A-COM and Watkins-Johnson patches, squeezing in the names of three other sponsors in his narrative? NO WAY. Well, no one ever said it would be easy to make big money.

That's about it for now, except there is one more thing which will be covered in our course. Speakers will need to learn how to execute the "High Five" as they leave the platform. First, smacking the Session Chairman, then his co-author, and finally his secretary, who really did all the work.

See you in 1989, if you have courage to attend.

Membership Services - (Continued from page 47)

activities in the next MTT Newsletter. Please mail a copy of your meeting report to:

Zvi Galani
Raytheon Company
Hartwell Road, Mail Stop M1-42
Bedford, MA 01730
Phone (617) 274-4184

Future Work by the MTT-S Membership Services Group

1. The membership services committee is planning to interact with the membership service groups of the Antenna and Propagation Society, The Electron Devices and the Laser and Electro Optic Society to exchange information on speakers lists and to encourage the formation of joint Chapters.
2. The data base on Chapter Officers will be extended to include the names and addresses of the Vice-Chairmen. This will facilitate communications with Chapters during the transition period after elections since the Vice-Chairman usually becomes the new Chairman. We urge all the Chapters to report the names of new Officers to Zvi Galani who is in charge of Chapter records.
3. Fifty percent of the overseas Chapters had a declining membership in 1985. We hope to correct this trend by paying more attention to the needs of these Chapters.



Tennis Doubles Tips.

- (1) Don't be afraid to poach at the net, especially if your partner prefers the baseline.
- (2) Vary your responses to a given situation to keep your opponents guessing.
- (3) Ask your partner to try something new. The element of surprise (a lob return of service, for example) may catch your opponents off guard.
- (4) *Communicate*, particularly on where you're planning to serve.
- (5) If your team hits a bad stretch, reassure your partner that your luck is bound to turn.
- (6) Never get down on your partner. That encourages your opponents.

Martina Navratilova, writing in *World Tennis*, 1515 Broadway, New York 10036, monthly, \$13.94/yr.



REPORT OF THE MTT-S TRANSACTIONS EDITOR



by *Ralph Levy*

My term as Editor commenced in February with the inheritance of a backlog of about 80 papers in various stages of processing. As of July 30 we have received 136 new papers, and the status of all of these is shown in the following table:

Papers published or accepted	56
Revise and resubmit (10 now under review)	44
Rejected	45
Original papers under review	68
TOTAL	213

These figures are not inclusive of papers published by our two current Special Editors, namely John Horton for the Special issue on New and Future Applications of Microwave Systems, October 1986, and Bill Getsinger for the Symposium Issue, December 1986.

The task of Editor has been made more pleasant by the computer-aided management system developed by our previous Editor, Tatsuo Itoh. If authors or reviewers note any errors on the various form letters, we can affix the blame on the computer. I have a short list of improvements to be made to the system, a few of which have been implemented.

It has been my pleasure to appoint two new Associate Editors to supplement our present membership. John Horton will be soliciting papers on Systems and Applications, areas which have been somewhat lagging as far as submission to the Transactions is concerned. Such papers will require some original content unless they are solicited as review papers, but they will receive sympathetic consideration (but don't we do that for all submitted papers?).

Our second new Associate Editor is Peter Staecker, who will be taking on the responsibility for Index Issues. Not only do we publish an annual index, but also cumulative indexes, the first of which is the (by now) well-thumbed 28-year issue of June 1981. A supplement of the latter is in the planning stage.

This brings me to the subject of the Editorial Board, or more precisely the list of reviewers which appears on the inside rear cover of the Transactions. Presently this list consists of 165 names, and appears to be several years out-of-date. It may surprise most of you to learn that we have over 600 active reviewers, and I

have called upon the services of at least half of them since February. The number of reviewers has grown as the number of papers submitted has increased, and as the microwave field has become more diverse. Actually I am short of reviewers in several specializations, and would welcome volunteers who feel that they should be taking part in the review process, which I know from experience is a most rewarding one. Younger and more recent authors in particular should make their wishes known. Please be sure to describe your specialities in some detail when writing me.

Meanwhile I am disposed towards the idea of discontinuing printing the Editorial Board in every issue of the Transactions. The best alternative would be to publish a list of reviewers for the previous year.

The other main development on which I would like to report is the change of emphasis regarding the Short Paper category. In the future these will be restricted to 3 pages of the Transactions (equivalent to about 12 double-spaced typed pages, including figures). Short Papers are for reporting new research results or modifications or extensions to previously published results. I would like to take this opportunity to request reviewers not to recommend that full-length papers be published as Short Papers unless this is clearly feasible and desirable. Short Papers should not be regarded as sub-standard long papers. More specifically, if reviewers have doubts about the quality of a paper, the decision should be either to reject or to revise and resubmit.

The final topic I would like to discuss is the standard of English. With so many papers coming from abroad, we must do a better job in editing the papers for grammatical accuracy and lucidity of presentation. We can not rely on IEEE Headquarters to do this since it is often necessary to have good technical comprehension of the text. In the future I must try to appoint at least one American or native English-language speaker for each paper! Other reviewers please note however that you have been doing an outstanding job of reviewing, and this is sincerely appreciated.



Business gets a better deal.

The new bankruptcy law makes it much harder for a debtor to file for bankruptcy and walk away from credit obligations. Creditors now have clout to pressure a debtor to use a "wage-earner plan" that pays debts out of future earnings . . . rather than having them simply wiped out. Debtors claims and luxury goods bought on time payments in the weeks before filing, produce debts that *continue* even after bankruptcy.

Federal Home Administration.

Federal Home Administration financing becomes more feasible for condominium purchases in areas with high real-estate costs. The FHA will now guarantee mortgages up to \$90,000 for such buys. The old limit of \$67,000 remains in effect for cities where real-estate prices are lower.



PACE Report –
(Continued from page 44)

alized as the Transactions, the technical sessions and the exhibits are now?

Although there is momentum, the ideas expressed by Fred Rosenbaum and now given a boost by the Administrative Committee are far from reality. To become effective, consensus must develop within the microwave engineering profession and industry. This is where we must express positive thought that those support areas move forward. Do you think the concept of a microwave industry trade association might be an embryonic idea, which some day will be as institutionalized as the Transactions, the technical sessions and exhibits?



ALL ABOUT HAPPINESS

Dr. Fredrick Koenig

Sometimes happiness seems like a terribly elusive goal. We tend to forget that it doesn't come as a result of getting something we *don't* have, but rather of recognizing and appreciating what we *do* have. *Some steps on the pathway to happiness:*

When you think about time, keep to the present.

My research suggests that thinking too much about events far in the future or in the distant past leads to unhappiness. Very often those who are future-oriented tend to score very high in despair, anxiety, helplessness and unhappiness. As much as practical, focus on the here and now.

Don't dwell on past injustices.

You'll be unpopular company. No one wants to hear about how you got a raw deal in your divorce or how your boss doesn't appreciate you. Bill Bradley once said that one of the biggest problems a basketball player could have was to keep on replaying the game in his head after it was over. This is also true of life. If you keep doing instant replays, you'll lose your chance to enjoy the present.

Check your goals.

Many of us get so wrapped up in the means that we forget about the ends. *Ask yourself from time to time:* "Why am I doing this? Am I working hard because I love my work, or because I think money will buy happiness?" Maybe you'd really like peace of mind, or recognition, or job satisfaction. These can be more immediate, attainable goals. If you're working yourself to the bone because you think money will eventually buy contentment, maybe you can discover that you don't really need a million dollars. Making enough money to buy a small country retreat might do the trick.

Drop your bucket where you are.

Legend says that an explorer's sailing ship was becalmed in the mouth of the Amazon River. Thinking they were in the salty ocean, he and the crew were dying of thirst. Out of the sky a voice commanded, "Drop your bucket where you are." They did so, pulled up fresh water, and were thus saved. *Lesson:* Take advantage of what you already have. There are interesting, stimulating adventures waiting in your own backyard. Get to know your own children, for example.

Develop the habit of noticing things.

An active mind is never bored. While I walk to work every morning, I always try to pick out a house to look at carefully — one I haven't really paid attention to before. Make a resolution to notice new things each day — about nature, people, or anything else that interests you. *Ask questions:* Don't assume you know all the answers, or that showing curiosity will be considered prying. Most people love to talk about themselves or their interests. *Example:* Talk with old people about their childhoods. You may have the fascinating experience of finding out about another world.

Keep your sense of humor.

A good laugh goes a long way in making almost any situation bearable. It also lightens the impact of life's inevitable tragedies.



CHAPTER CHAIRMAN



by Zvi Galani

The latest Chapter Chairman's Directory and a list of Chapter meetings are presented below.

My intent is to update this directory and expand it to include Chapter Vice Chairman. To make this possible, I urge all the Chapters to send me the names, addresses, and telephone numbers of Chapter Officers. Please keep in mind that the IEEE Form L-7, copies of which I have been receiving, does not include the addresses of Chapter officers. My address and telephone number are:

Zvi Galani
Raytheon Company
Mail Stop M1-41
Hartwell Road
Bedford, MA 01730
(617) 274-4184

CHAPTER CHAIRMEN'S RECORDS



We had the largest chapter number of chairman – gathered here at the dinner meeting.

ALBUQUERQUE
MTT/AP/EMC
ADCOM Liaison:
P.T. Greiling

Dr. Robert T. Hutchins
The BDM Corporation
1801 Randolph Road SE
Albuquerque, NM 87106
(505) 848-5000
Term of Office:
1/86 — 12/86

BENELUX
MTT/AP
ADCOM Liaison:
R.H. Knerr

Prof. Albert Guissard
Laboratoire de
Telecommunications
U.C.L.
Batiment Maxwell
1348 Louvain-La-Neuve
Belgium
010/418181 X2300
Term of Office:
Unspecified

ATLANTA
MTT/AP
ADCOM Liaison:
N.W. Cox

Victor K. Tripp
GTRI, ECSSL/EED
Georgia Institute of
Technology
Atlanta, GA 30332
(404) 894-3478
Term of Office:
7/85 — 6/86

CENTRAL ILLINOIS
MTT/NPS/ED
ADCOM Liaison:
T. Itoh

Dr. Gregory E. Stillman
University of Illinois
155 Electrical Eng. Bldg.
1406 West Green Street
Urbana, IL 61801
(217) 333-3097
Term of Office:
Unspecified

BALTIMORE
MTT/AP
ADCOM Liaison:
E.C. Niehenke

Suman D. Patel
Westinghouse Electric
Corp.
M.S. 3716
P.O. Box 1521
Baltimore, MD 21203
(301) 765-7348
Term of Office:
6/85 — 5/86

CENTRAL NEW
ENGLAND/
BOSTON
MTT

Mark L. Stevens
MIT Lincoln Lab,
RM-C257
244 Wood St.

(Continued on page 69)

MTT CONSTITUTION AND BYLAWS



by Peter Staecker

At a recent meeting of the MTT-S Administrative Committee, amendments to both the Constitution and the Bylaws were approved. In accordance with Article IX of the Constitution and Section VII of the Bylaws, these amendments will take effect 30 days after publication of this Newsletter. (Note the rights of membership disapproval described in Article IX of the Constitution). A brief summary of the amendments follows:

Constitution:

Article VI, Section 6 has been amended to allow the MTT-S President in addition to the Treasurer to authorize withdrawals of MTT monies from IEEE accounts.

Article VI, Section 7 clarifies Secretary duties.

Bylaws:

Section I.A.3 has been added, delineating the nomination procedure for MTT Vice-President.

Section II (F through N: ADCOM non-voting membership) have been combined into Section II.F.

Section IV.B has been modified to remove some previous restrictions for (ADCOM) meetings in absence of a quorum.

Section VI.B, C, D and E have been modified to increase the amount of cash awards to the recipients of the Microwave Prize, Microwave Career Award, Microwave Application Award, and Distinguished Service Award.

In addition, there are minor syntax changes in Article VII.2 of the Constitution, and Sections I.A.3, I.B.1, III.A.9.b.1, and IV.d of the Bylaws.

The Constitution and Bylaws were last published in the Summer 1983 Newsletter. To assist those looking for specific references to topics contained in these documents, a subject index has been included.



CONSTITUTION IEEE MICROWAVE THEORY AND TECHNIQUES SOCIETY

ARTICLE I: NAME AND OBJECT

Section 1. This organization shall be known as the Microwave Theory and Techniques Society of the Institute of Electrical and Electronics Engineers, Incorporated, hereafter referred to as the Society.

Section 2. Its object shall be scientific, literary, and educational in character. The Society shall strive for the advancement of the theory and practice of electronics, allied branches of engineering, and of the allied arts and sciences, and the maintenance of high professional standards among its members, all in consonance with the Constitution and Bylaws of the IEEE and with special attention to such aims within the field of interest of the Society as are hereinafter defined.

Section 3. The Society shall aid in promoting close cooperation and exchange of technical information among its members, the members of the IEEE, and of the profession, and to this end shall hold meetings for the presentation of papers and their discussion, and through its committees shall study and provide for the needs of its members.

ARTICLE II: MEMBERSHIP

Section 1. The members of the Society shall consist only of members of the IEEE in any grade, including students, having an interest in any phase of the field of interest of the Society who apply for membership in accordance with IEEE practice and comply with the Constitution and Bylaws of the Society.

Section 2. Affiliates may participate in Society activities as provided by the IEEE Bylaws and subject to the applicable IEEE rules and regulations and any additional limitations imposed by the Society Bylaws.

Section 3. A Society Affiliate cannot serve in an elective office in the Society or in a Chapter of the Society nor vote for candidates for these offices. An affiliate can serve in any appointive office in the Society or a Chapter of the Society, except the office of Secretary.

Section 4. A Society Affiliate is entitled to receive notices of all meetings sent to Society members, to receive copies of publications of the Society, to attend and participate in any function of the Society by payment of IEEE member charges, and to receive any award bestowed upon him or her by the Society.

Section 5. A Society Affiliate may not receive any IEEE benefits that are derived through IEEE membership except as approved by the Executive Committee of the IEEE.

ARTICLE III: FIELD OF INTEREST

Section 1a. The Field of Interest of the Society shall be Microwave Theory, Techniques, and Applications, as they relate to components, devices, circuits, and systems involving the generation, transmission, and detection of microwaves. It shall include scientific, technical, and industrial activities, subject to timely modifications approved by the IEEE TAB.

Section 1b. Microwave Theory and Techniques relates to electromagnetic waves usually in the frequency region between 1-100 GHz; other spectral regions and wave types are included within the scope of the Society whenever basic microwave theory and techniques can yield useful results. Generally, this occurs in the theory of wave propagation in structures with dimensions comparable to a wavelength, and in the related techniques for analysis and design. Examples are optical waves in suitably scaled structures, as well as the applications of acoustic, magnetic, and domain waves to microwave systems.

Section 1c. Considerable overlap exists with several other Societies. Specific areas are electron tubes and semiconductor devices for the Society on Electron Devices; radiating elements and propagation for the Society on Antennas and Propagation; and acoustical waves for the Society on Sonics and Ultrasonics. In each case, activities in areas of common interest shall be coordinated to assure a constructive and mutually satisfactory result.

Section 2. The Field of Interest of the Society may be enlarged, reduced, or shifted moderately as the needs of the occasion indicate with the provision that, if it overlaps the field of interest of another Society to the extent that interference occurs, the IEEE TAB may draw up more exact lines of demarcation, and that, if some other Society wishes to enlarge its field to the disadvantage of the Society, that this Society will reasonably and in good faith consider the proposals and abide by any decision of the IEEE TAB.

ARTICLE IV: CHAPTERS

Section 1. A sub-society may be formed and operated on any plan not inconsistent with the powers of the Administrative Committee of this Society. A sub-society formed in a Section shall be known as a Chapter. A Chapter may assist the Administrative Committee of this Society in the management of the Society's Annual Meeting or Symposium held in the Section in which the Chapter is located. The Chapter shall be responsible for coordinating with the Section on such major meetings or symposia. A Chapter may promote meetings of the Section in the field of interest of this

Society under the control and supervision of the officers of the Section in which the Chapter is located.

ARTICLE V: FINANCIAL SUPPORT

Section 1. The Society may levy fees on its members and Affiliates for publication and other purposes. Society membership and Society affiliation may be maintained only by regular payment of the Society fee. Any Society member or Affiliate who is delinquent in paying the Society fee for three (3) months shall be dropped from Society membership or affiliation. (The fee for certain categories of special members as established in the Bylaws shall be paid by the Society).

Section 2. The Society may make registration charges at its Society meetings, symposia, conferences, conventions, etc. The registration fee for the non-IEEE members shall be higher than for IEEE members and Society Affiliates.

Section 3. The Society shall not make registration charges at a meeting, conference, or convention which it operates as part of a Sectional, Regional, or Institute meeting, conference, or convention.

Section 4. The Society may raise revenues by other means, such as advertising, shows, requests for contributions, etc., provided such means do not conflict with policies established by the IEEE or do not encroach on prior established revenue fields of other IEEE organizations. The Society must receive from the IEEE General Manager an opinion that a proposed method of raising revenue is non-conflicting and not against IEEE policy before embarking on the proposed plans.

ARTICLE VI: OFFICERS AND MANAGEMENT

Section 1. The Society shall be managed by an Administrative Committee consisting of 18 elected members of the Society plus additional ex-officio members as provided in the Bylaws. Elected members shall be of at least Member grade.

Section 2. The terms of office of the elected members of the Administrative Committee shall be three years, one-third of the members being elected each year.

Section 3. The current Administrative Committee shall annually elect one of the members of the following year's Administrative Committee as President, and another as Vice-President, whose terms shall be for one year. These officers shall be of at least IEEE Senior Member rank.

Section 4. The Incoming President shall appoint a Secretary for a one-year term, whose selection is subject to approval by the Administrative Committee as specified in the Bylaws. This officer need not be an

elected member of the Administrative Committee.

Section 5. The President, under direction of the Administrative Committee, shall have general supervision of the Society. The President shall preside at meetings of the Administrative Committee, at any general meeting of the Society, and have such other powers, and perform such other duties as may be provided in the Bylaws, or as may be delegated to him/her by vote of the Administrative Committee. In his/her absence or incapacity, his/her duties shall be performed by the Vice-President.

Section 6. The Administrative Committee may utilize the services of IEEE Headquarters as bursar, in which case funds will be handled under rules established by the IEEE General Manager. If not, the Treasurer shall receive and deposit all monies in his/her name as such officer of the Society in such depository as shall be named by the Administrative Committee, withdrawable on his/her or the President's sole signature. The Treasurer shall make only such disbursements as shall be ordered by the Administrative Committee. He/She also shall be responsible for bringing to the attention of the Administrative Committee all relevant facts bearing on the Society finances and for aiding the President in preparation of the annual estimated budget.

Section 7. The Secretary shall be responsible for recording the minutes of all meetings of the Administrative Committee and general meetings of the Society, for maintaining Society files and records, for assisting the President in the preparation of Administrative Committee meeting agendas, for submitting copies of agendas and minutes to IEEE Headquarters, and for performing other duties as may be required by the President, the Administrative Committee or the Society Bylaws.

Section 8. The President, as soon as expedient after election, shall appoint the standing committees provided by the Bylaws.

Other Committees may be authorized by vote of the Administrative Committee and shall be appointed by the President.

Members appointed shall serve until their successors are appointed or the committee dissolved.

Section 9. The President, as a member of the IEEE TAB, when notified of a meeting of said committee, is entitled to representation of the Society at such meeting by himself/herself, by a delegate, or by letter.

Section 10. The newly elected President, Vice-President, and members of the Administrative Committee shall assume office on the first day of January following the election, unless a different time is provided in the Bylaws.

Section 11. Neither the Microwave Theory and Techniques Society nor any officer or representative thereof, shall have any authority to contract debts for, pledge the credit of, or in any way bind the IEEE except within prior approved budgets.

Section 12. Monies held by or for the Society legally belong to the IEEE, and such monies shall not be expended for purposes known to be inimical to the interest of the IEEE.

ARTICLE VII: NOMINATION & ELECTION OF ADMINISTRATIVE COMMITTEE

Section 1. Nominating procedures as prescribed in the Bylaws shall include provision for nomination by petition.

Section 2. At the annual meeting of the Administrative Committee, a Committee consisting of elected members of the Administrative Committee, excluding those members who are candidates for re-election, and the three (3) Past Presidents of the Administrative Committee, shall elect the members to fill the vacancies on the Administrative Committee about to occur with the coming year and shall transmit the names of such elected members to the Secretary of the IEEE Technical Activities Board. Unless disapproval of such elected members is received within 60 days of such transmittal, the elections shall become final.

Section 3. Within-term vacancies of the Administrative Committee shall be filled by elections for the unexpired terms by the remainder of the elected members of the Committee and the three (3) Past Presidents of the Administrative Committee.

ARTICLE VIII: MEETINGS

Section 1. The Society may hold technical meetings, such as conferences, symposia, or conventions either alone or in cooperation with Sections, Regions, Convention Committees of the IEEE, or other technical organizations subject to IEEE rules and regulations. The Society shall sponsor at least one technical meeting of major scope each year, which may be held during the International Convention, during some other IEEE meeting, or as a separate conference.

Section 2. Technical meetings of the Society shall be open on an equal basis to all members of the IEEE and to Society Affiliates. Special provisions may be made for IEEE student members.

The Society shall not sponsor classified meetings. However, a classified meeting, sponsored by another organization, may be held in conjunction with a Society technical meeting, and publicity on such a meeting may be included in Society mailings provided it is made perfectly clear that the classified meeting is not sponsored by the IEEE or the Society.

Section 3. Meetings of the Administrative Committee shall be held at such times as are found necessary. Meetings of the Administrative Committee may be called by the President at his/her own discretion, or upon request by two other members of the Committee.

Section 4. Six elected members of the Administrative Committee shall constitute a quorum. No meeting of the Administrative Committee may be held unless a quorum is present.

Section 5. A majority vote of those elected and ex-officio members of the Administrative Committee attending a meeting shall be necessary in the conduct of its business except as otherwise provided in this Constitution or the Bylaws.

Section 6. Business of the Administrative Committee may be handled by informal meetings, correspondence, telephone, or telegraph where, in the opinion of the President, matters requiring action can be adequately handled in that manner. A majority vote of the members of the Committee is necessary for approval of actions handled in that manner. The Secretary shall prepare minutes of the action including a record of the individual votes.

ARTICLE IX: AMENDMENTS

Section 1. Amendments to this Constitution may be initiated by petition submitted by 25 members of the Society, or by action of the Administrative Committee, such petition being submitted to the IEEE TAB and to the Executive Committee of the IEEE for approval. After such approval, the proposed amendment shall be publicized in a Society publication, or by letter to all members, with notice that it goes into effect unless 10 percent of the Society members object within 30 days. If such objections are received, a copy of the proposed amendment shall be mailed with a ballot to all members of the Society at least 30 days before the date appointed for return of the ballots, and the ballots shall carry a statement of the time limit for their return to IEEE Headquarters. Approval of the amendment by at least two-thirds of those voting shall be necessary for its enactment.

Section 2. Suitable Bylaws or changes in the Bylaws to this Constitution may be adopted by a two-thirds vote of the Administrative Committee present in meeting assembled provided that notice of the proposed Bylaw or change in the Bylaw has been sent to each member of the Administrative Committee at least three weeks prior to such meeting by first class mail. No Bylaw shall take effect until 30 days after it has been publicized to all members of the Society and a copy has been mailed to the IEEE TAB office.

ARTICLE X: PUBLICATIONS

Section 1. Publications of any material may be

entirely or partly by means of the Proceedings of the IEEE by meeting the standards, and to the extent that it is equitable to other fields of interest.

Section 2. The Society shall publish an IEEE Transaction on Microwave Theory and Techniques at least four times a year and a Newsletter at convenient intervals. The Society may also join with other Societies to publish such Journals as may be approved by the Administrative Committee.

BYLAWS: SECTION I

A. NOMINATIONS

1. NOMINATIONS SUBCOMMITTEE

On or before February 1 of each year, the President of the Administrative Committee shall ascertain that the Nominations Subcommittee has been appointed in accordance with Section IIIA of these Bylaws, which shall consist of a Chairman and four or more members of the Society not more than half of whom may be members of the Administrative Committee.

2. MEMBERSHIP NOMINATIONS

(a) PROCEDURE

Each year, before the annual meeting of the Administrative Committee, the Nominations Subcommittee shall select a slate of at least two members of the Society for each vacancy in the elected membership which will occur on the Administrative Committee on the following January 1. Additional nominations may be made by members of the Administrative Committee or by petitions signed by 25 members of the Society. Informal Chapter recommendations are also in order. Such recommendations must be relayed to the Administrative Committee for discussion and possible nomination. In each case, the nominees or potential nominees must be contacted prior to the annual meeting to ascertain that they will accept the nomination.

The Nominations Subcommittee, in its nominations, and the Administrative Committee, in its elections, shall be guided in their selections by principles of efficiency, geographical, and organizational distribution. Administrative Committee members who will have served three consecutive terms by the following January 1 shall not be considered eligible for renomination by the Nominations Subcommittee.

(b) CALL FOR NOMINATIONS

The Chairman of the Nominations Subcommittee shall cause to be published and distributed to the entire Society membership a call for nominations. This call for nominations shall include publication in the Winter Newsletter. In addition, the

Membership Services Committee shall inform all Chapters, in writing, of upcoming elections and nominations due date.

3. VICE-PRESIDENT NOMINATION:

Each year, before the annual meeting of the Administrative Committee, the Chairman of the Nominations Sub-Committee shall solicit nominees for the office of Vice President from each voting member of the Administrative Committee. Each nominee shall be contacted by the Nominations Chairman prior to the annual meeting to ascertain his/her acceptance of the nomination.

4. DIVISIONAL DIRECTOR

Every two years, for purposes of election to office commencing on odd years, the President shall determine a consensus of the Administrative Committee to select a slate of at least two Senior Members or Fellows from the Society as candidates for Divisional Director and shall ascertain their desire to serve. Candidates names will be forwarded by February 1 to the Divisional Director or the Division Nominations Committee.

5. OTHER IEEE NOMINATIONS

The Nominations Subcommittee shall recommend to the President of the Administrative Committee candidates for certain Institute or TAB positions.

B. ELECTIONS

1. MEMBERSHIP

The Administrative Committee shall hold an annual meeting each year during the Fall. At the annual meeting, the Administrative Committee shall hold elections to fill vacancies in the Administrative Committee to occur on the succeeding January 1. All Elected Members and the three (3) immediate past Presidents of the Administrative Committee not presently eligible for re-election shall elect, provided that these elected members present constitute a quorum. The Administrative Committee may make contingent elections to be effective in case an Elected Member fails to accept the office, or a disapproval is received from Headquarters. The names of the Elected Members shall be transmitted to the chairman of the Technical Activities Board. Unless disapproval of such Elected Members is received within 60 days of each transmittal, the elections shall become final.

Each eligible voter shall submit a ballot listing their choice of filling the six elective positions. The votes shall be counted by a teller's commit-

tee appointed by the President of the Administrative Committee, no member of which is either eligible to vote or a candidate for election. All votes shall carry equal weight. The six candidates with the largest number of votes on the first ballot are elected provided each has a majority of the possible votes. Additional ballots shall be held listing as candidates the remaining nominees. In the event that the first ballot does not fill all six (6) vacancies, the eligible voters may choose to remove from the next ballot the candidate(s) having the fewest number of votes on the previous ballot. On additional ballots, the candidate(s) with the largest number of votes is (are) elected provided each has a majority of the votes. The presiding officer shall not vote except to break a tie.

2. PRESIDENT AND VICE-PRESIDENT

At its annual meeting, the Administrative committee shall elect as its President one of the Elected Members of the following year's Administrative Committee for the year beginning on the succeeding January 1; and shall elect as its Vice-President one of the Elected Members of the following year's Administrative Committee for the year beginning on the succeeding January 1.

The President and Vice-President shall each be elected by a majority vote of members eligible to vote as prescribed in Section II. The Presiding Officer shall not vote except in the event of a tie.

3. WITHIN-TERM VACANCIES

Within-term vacancies on the Administrative Committee shall be filled by elections for the unexpired terms by the remainder of the Elected Members of the Committee and the three (3) immediate Past Presidents of the Administrative Committee (MTT-S Constitution, Article VII, Section 3) using the election procedure defined in Bylaw I.B.1.

4. HONORARY LIFE MEMBER

Nomination for Honorary Life Member of the Society may be made by any member of the Administrative Committee, or by a petition signed by at least 50 members of the Society. A two-thirds affirmative vote by all of the Elected Members of the Administrative Committee will be required to elect an Honorary Life Member. In the absence of a sufficient number of Elected Members of the Administrative Committee at a regular meeting, election of Honorary Life Member may be conducted by mail ballot.

(a) ELIGIBILITY

The position of Honorary Life Member may be bestowed upon an outstanding member of the

profession who fulfills the following minimum requirements:

- (1) The candidate shall have made significant technical contributions in the field of interest of the Society.
- (2) The candidate shall have performed outstanding service to the profession and to the IEEE.
- (3) The candidate shall have been a member of the Society for at least five years.
- (4) The candidate shall have been an Elected Member of the Administrative Committee.

(b) AWARD

Society fees for Honorary Life Members shall be paid from the Society Treasury. The Secretary shall arrange for this with IEEE Headquarters. The award shall consist of a suitable certificate and a feature publication in the IEEE Transactions on Microwave Theory and Techniques.

C. APPOINTMENTS

1. SECRETARY

The President Elect, upon receiving notice of election as President, shall submit to the Administrative Committee the name of a proposed Secretary, who shall be a member of the Society, but need not be a member of the Administrative Committee for appointment. If a majority of the members of said Administrative Committee do not object within 30 days of oral or written announcement to the Administrative Committee, the appointment shall become final. If a majority of the members of said Administrative Committee object, a new name(s) must be submitted. The incumbent Secretary shall remain in office until a successor is appointed and arranges to take over the office.

SECTION II – ADMINISTRATIVE COMMITTEE MEMBERSHIP

A. ELECTED MEMBER

An Elected Member of the Administrative Committee is a member of the Society elected in accordance with Article VI, Sections 1 and 2, and Article VII, Sections 1 and 2, of the Constitution. An Elected Member has full rights and voting privileges on all matters before the Administrative Committee as defined in the Constitution and these Bylaws.

B. EX-OFFICIO MEMBER

An Ex-Officio Member shall serve on the Administrative Committee as provided for by these Bylaws. An Ex-Officio Member of the Administrative Committee

has all discussion and voting privileges in all matters before the Administrative Committee, except that no vote may be cast to elect members to the Administrative Committee nor to elect the President nor Vice-President of the Administrative Committee. An Ex-Officio Member is not included in a quorum count. An Ex-Officio Member may serve on standing and ad hoc committees.

C. HONORARY LIFE MEMBER

An Honorary Life Member of the Society has all of the rights of an Ex-Officio Member of the Administrative Committee.

D. PAST PRESIDENT

Past Presidents shall be Ex-Officio Holdover Members and have the full rights and voting privileges of Elected Members of the Administrative Committee for three years following their term of office as president of the Administrative Committee, provided that membership in good standing is maintained with the Society. Any remaining years of a Past President's elective term on the Administrative Committee will be vacated, and a Past President will be ineligible for reelection to the Administrative Committee for this three year period. The Past President's vacated elected Member seat will be filled in accordance with Article VII, Section 3, of the Constitution. Election of a member to fill this forthcoming vacancy shall take place during that meeting of the Administrative Committee at which the annual election of members for the coming year is held.

E. TRANSACTIONS EDITOR

The Transactions Editor, if not an Elected Member of the Administrative Committee, shall be an Ex-Officio Member of the Administrative Committee during the tenure of that office and for a period to terminate on a December 31st ranging from at least one to less than two years thereafter. The Transactions Editor shall be a member of the Society.

F. NON-VOTING MEMBER

Non-Voting Member of the Administrative Committee may participate in discussions of all matters before the Administrative Committee but does not have a vote on any Administrative Committee business. Non-Voting Members shall receive notification of meetings and copies of the minutes of meetings. Non-Voting Members may serve on standing or ad hoc committees.

If not an elected member or ex-officio member of the Administrative Committee, the following shall be non-voting members of the Administrative Committee during the tenure of their offices.

Secretary of the Administrative Committee
Chairmen of Standing Committees

MTT-S Chapter Chairmen
Chairmen of Ad Hoc Committees
President of the Solid State Circuits Council
Members of the Advisory Committee

SECTION III — COMMITTEES

A. Standing Committee

The following Standing Committees shall be appointed by the president as soon as possible after election as President and such committees shall hold office for one year co-extensive with the term of office of the President except as otherwise noted in these Bylaws. It will be discretionary with the Administrative Committee President to appoint any part or all of any Standing Committee, or to appoint the Chairman only of each committee and request the latter to appoint additional committee members.

1. MEETINGS AND SYMPOSIUM COMMITTEE

The Meetings and Symposium Committee shall, as required, assist the conference committees in planning and implementing technical conferences of the Institute and the Society. Upon instruction of the Administrative Committee, the Meetings and Symposium Committee also cooperates with the committees responsible for other meetings, conventions, and symposia.

The Meetings and Symposium Committee Chairman shall take office immediately upon appointment and shall continue for one year, plus such time as is necessary to bring to a termination all activities in connection with any meetings managed by said committees. Such an extension of the term of a Meetings and Symposium Committee for the completion of a given task shall not preclude the appointment of a new committee at the designated time for the succeeding year.

2. PUBLICATIONS COMMITTEE

The Publications Committee shall be responsible for publications and dissemination of technical information of interest to the Society. The Committee shall be responsible for publishing the Transactions and for notifying the technical community of meetings, special publications, and other information of interest to the Society.

(a) TRANSACTIONS EDITOR

The Transactions Editor is responsible for the technical editorial content of the IEEE Transactions on Microwave Theory and Techniques. The Editor is also responsible for coordination with the IEEE facilities for publication. The Transac-

tions Editor shall appoint and be Chairman of the Transactions Editorial Board. The Transactions Editor will continue to serve until such time as a successor is named by the President of the Administrative Committee, and for such time thereafter as may be necessary for a successor to assume the duties of Editor.

(b) ASSOCIATE EDITOR OF THE TRANSACTIONS

An Associate Editor of the Transactions shall carry out the duties assigned by the Transactions Editor.

3. EDUCATION COMMITTEE

The Education Committee shall be responsible for the promotion and coordination of activities furthering the cause of education as it relates to the Society and the field of microwaves. The committee shall institute and administer educational-aid programs to be wholly or partially sponsored by the Society. These activities shall encompass both support of educational activities at the undergraduate/graduate level and continuing education for the Society membership. The committee shall obtain all necessary IEEE approval to implement each activity.

(a) SCHOLARSHIP SUBCOMMITTEE

The Scholarship Subcommittee shall be responsible for instituting and administering the scholarship programs which are wholly or partially sponsored by the Society. The subcommittee shall be responsible for the necessary review and screening of scholarship applications and shall submit the subcommittee recommendations to the Administrative Committee for approval.

(b) GRANTS-IN-AID SUBCOMMITTEE

The Grants-In-Aid Subcommittee shall be responsible for instituting, evaluating and administering the grants-in-aid programs which are wholly or partially sponsored by the Society. The subcommittee shall be responsible for the necessary review and screening of grant-in-aid applications and shall submit the subcommittee recommendations to the Administrative Committee for approval.

4. OPERATIONS COMMITTEE

The Operations Committee shall be responsible for the operational conduct and advisory administration of the Society and the Administrative Committee. It shall be responsible for maintaining the Constitution, the Bylaws, and the Procedures Handbook; for ensuring the proper conduct of business meetings; for providing nominations for offices; and for maintaining historical records.

(a) BYLAWS AND PROCEDURES SUBCOMMITTEE

The Bylaws and Procedures Subcommittee is responsible for the preparation of constitutional amendments and changes to the Bylaws for Administrative Committee action, when such amendments or changes either appear necessary or are so directed by the Administrative Committee. The subcommittee is also responsible for examining Society actions to determine whether these are in accordance with the Constitution and Bylaws of the IEEE.

The subcommittee shall also maintain a Handbook of Procedures for the administrative Committee as a guide for officers and committee members of the Administrative Committee. This Handbook shall be in accordance with these Bylaws, the Society Constitution and the Constitution and Bylaws of the IEEE. Within this framework, the Handbook shall define the specific duties, actions, and responsibilities of the officers and committee chairmen.

(b) NOMINATIONS SUBCOMMITTEE

The Nominations Subcommittee shall nominate candidates for Elected Members of the Administrative Committee in accordance with Section I of these Bylaws; and shall be responsible for recommending to the Administrative Committee nominees for all IEEE positions for which the Society can nominate, in accordance with Section I of these Bylaws.

5. FINANCE COMMITTEE

The Finance Committee shall be responsible for planning, establishing, and administering budgetary control and disbursing of finances for the Society in accordance with the Constitution and the rules of the IEEE. The committee shall also be responsible for planning and soliciting Society incomes such as from institutional listings in the IEEE Transactions on Microwave Theory and Techniques. The MTT-S Treasurer shall be Chairman of the Finance Committee and shall be an elected member of the Administrative Committee.

6. STANDARDS COORDINATING COMMITTEE

The Standards Coordinating Committee shall be responsible for establishing and/or reviewing IEEE Standards within the scope of interest of the Society. The committee shall periodically upgrade existing standards and shall initiate standards in new areas when they have become sufficiently established. The Chairman of the Standards Coordinating Committee shall appoint Ad Hoc Standards Committees to deal with specific areas requiring standardization.

7. LONG-RANGE PLANNING COMMITTEE

The Long-Range Planning Committee shall be responsible for review of advanced goals and policies of the Society and shall submit recommendations to the Administrative Committee President and to the Operations Committee Chairman for inclusion in the Constitution, the Bylaws, or the Procedures Handbook.

8. TECHNICAL COORDINATING COMMITTEE

The Technical Coordinating Committee shall investigate, evaluate, and in some instances, promulgate new or peripheral technologies of interest to the Society. The Technical Coordinating Committee shall coordinate with the Meetings and Symposium Committee to afford the latest technical coverage in all meetings of interest to the Society. The Chairman of the Technical Coordinating Committee shall appoint Ad Hoc Technical Committees to deal with specific areas requiring technology emphasis. The Chairman of the Technical Coordinating Committee will be an advisory member of all Technical committees. The Chairman of each Technical Committee shall report to the Chairman of the Technical Coordinating Committee any significant developments (such as special sessions that the Technical Committee is helping to arrange and organize at the MTT-S Symposium, special issues of the Transactions that are being planned, etc.), for possible inclusion in the minutes of the Administrative Committee. The Chairman of each Technical Committee should report to and advise the Chairman of the Technical Coordinating Committee each year, prior to December, as to the continuation of that Technical Committee during the next year.

9. MEMBERSHIP SERVICES COMMITTEE

The Membership Services Committee shall encourage membership in the Society and shall maintain records of Society membership. The Committee is responsible for the promotion of the Society's area of interest with the formation of new Society Chapters, shall maintain liaison among the IEEE, Society Chapters, and the Administrative Committee, and shall disseminate publicity and information of interest to the IEEE, to the Chapters, and to the Society membership.

(a) NEWSLETTER EDITOR

The Newsletter Editor is responsible for the publication of an information bulletin called Newsletter.

(b) CHAPTER ACTIVITIES SUBCOMMITTEE

The Chapter Activities Subcommittee shall be responsible for promoting and maintaining close liaison between the Chapters and the Administrative Committee.

(1) Distinguished Microwave Lecturer(s)

The Distinguished Microwave Lecturer(s) shall be nominated by the Membership Services Committee and shall be approved by the Administrative Committee during their annual meeting. Each Distinguished Microwave Lecturer shall receive a feature publication in the IEEE Transactions on Microwave Theory and Techniques and a plaque to be presented at the Awards Banquet or another appropriate function as determined by the Society President following completion of the term.

(2) Membership Drive Subcommittee

The Membership Drive Subcommittee shall be responsible for promoting increased membership for the purpose of improved welfare of the Society and IEEE.

10. AWARDS COMMITTEE

The term of office of the Awards Committee Chairman shall normally begin on October 1 of the year in which that Chairman is appointed. The term of office shall normally be more than 1 year. The Chairman of the Awards Committee shall hold the grade of Fellow of the IEEE. This committee shall cooperate with the IEEE in recommending members of the Society for IEEE awards and shall nominate to the Administrative Committee candidates for the **Microwave Career Award, Microwave Application Award, Microwave Prize and Distinguished Service Award.**

The Chairman of the Awards Committee is empowered to submit to IEEE Headquarters the names of the candidates for IEEE Awards with approval of the President of the Administrative Committee.

B. AD HOC COMMITTEES

The President of the Administrative Committee shall create Ad Hoc Committees when, in the President's judgement, such committees are required. The President may appoint a Chairman of an Ad Hoc Committee, who shall be a member of the society and request the Chairman to appoint additional members, or the President may name any part or all members of an Ad Hoc Committee. Ad Hoc Committees shall serve until they are disbanded by the President of the Administrative Committee.

SECTION IV — MEETINGS AND SYMPOSIA

A. MEETING NOTICES

No meeting of the Administrative Committee shall be held for purpose of transacting business unless each Administrative Committee member shall have been sent notice of the time and place of such meeting at least 20 days prior to the scheduled date of the meeting.

B. MEETING IN ABSENCE OF QUORUM

If less than a quorum attend a duly called meeting, tentative actions may be taken which will become effective upon subsequent ratification, either at a meeting or by mail, by a sufficient number of members as to constitute a majority of the voting members of the Administrative Committee. Minutes of such meetings shall be mailed by the Secretary to each committee member who shall register his/her approval or disapproval of any actions taken at such meetings within 30 days after the mailing of said minutes.

C. SYMPOSIUM

1. LETTER PROPOSAL SUBMISSION

Letter proposals by Chapters to sponsor the Symposium for a given year should be submitted to members of the Administrative Committee at least five years prior to the date of the proposed meeting and no later than May 1.

These proposals should be brief and must contain at a minimum:

(a) a statement signifying the willingness of a Chapter to host the Symposium,

(b) a proposed technical and administrative organization showing adequate local interest and participation and,

(c) a proposed facility available and adequate to house both technical sessions and exhibits.

2. CONSIDERATION OF LETTER PROPOSALS

The Administrative Committee will consider letter proposals received by May 1 at the Symposium meeting. Proposals received after May 1 will be considered if agreed by a majority of the Administrative Committee members present.

3. SELECTION OF SITE

The Administrative Committee will utilize adequate letter proposals for long range planning purposes. When appropriate, one or more proposing Chapters will be informed of the committee's acceptance of their proposal, thus allowing necessary long term site selection and facilities commitments to be made.

4. FINAL PROPOSAL SUBMISSION

At an appropriate time, no later than 28 months prior to the proposed meeting, a thorough proposal will be requested from the host Chapter for consideration by the Administrative Committee at their Symposium meeting. The purpose of this proposal is to ensure adequate planning and attention to detail found necessary for previous symposia.

Upon request, the Chairman for the Committee on Meetings and Symposia will provide samples of reports or proposals generated for previous meetings.

5. CHAPTER NOTIFICATION

Society Chapters are to be informed of these provisions via the **Newsletter** and by individual letter by the Chairman of the Membership Services Committee in January of each year.

D. OTHER TECHNICAL MEETINGS

Society participation in technical conferences will be in accordance with IEEE policies and practice. Participation of the Society as a co-sponsor or participation or cooperation in meetings of another IEEE Society or Council, IEEE Section or a non-IEEE not for profit organization requires a vote of approval by the Administrative Committee. The policy governing the extent of participation in such meetings by the Society shall be in accordance with the policy of the Society and the IEEE.

SECTION V — FINANCES

A. BURSAR

The Society shall use the service of the IEEE as Bursar in accordance with the Constitution and the rules of the IEEE.

B. FEES

Each member of the Society shall be assessed a yearly fee, established by the Administrative Committee, which money will be used for the publications and activities of the Society and/or the IEEE.

C. AUTHORIZATION FOR PAYMENT OF BILLS

The approval of one Administrative Committee Officer is needed in the case of bills presented to IEEE Headquarters for payment, and the approval of two Administrative Committee Officers is required for payments to any member of the Society or of the Administrative Committee. The Treasurer will be responsible for requesting all disbursements from IEEE Headquarters.

D. AUTHORIZED BUDGETS

The Administrative Committee may establish an annual operating budget for the operation of any committee and/or activity by a majority vote. Requests for advances, reimbursements, or the payment of bills submitted within the limits of the established budget for any committee, shall be sent by the committee Chairman to the Treasurer in accordance with Paragraph C above.

E. SYMPOSIUM ADVANCES

The Administrative Committee may make an advance to the Steering Committee of an annual Symposium of the Society.

F. SYMPOSIUM FINANCES

All financial arrangements for a Symposium or other special activity shall be in accordance with prudent management procedures, applicable IEEE policies, and any special conditions imposed by the Society. Money deposited in a Symposium or similar account shall be identified with the Society and IEEE. In the event of activities co-sponsored with others, a clear and explicit statement of the financial arrangements shall be reduced to writing at the outset.

SECTION VI — MISCELLANEOUS COMMITTEE BUSINESS

A. ADMINISTRATIVE YEAR

The Administrative Year of the Society shall be January 1st through December 31st of the same year.

B. THE MICROWAVE PRIZE

The Society shall present an award known as **The Microwave Prize** annually. The prize shall be awarded to the author of that 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 the Society. The paper must have been published during the period January 1 to December 31 of the year preceding the annual meeting of the Administrative Committee at which the award is considered. The nomination of the recipient of **The Microwave Prize** will be the responsibility of the Awards Committee, who will make their recommendation to the Administrative Committee at the annual meeting of the Administrative Committee. The President of the Administrative Committee shall inform the recipient of **The Microwave Prize** as soon as possible after the Administrative Committee has approved the award. The award shall consist of a suitable certificate, a cash sum of one thousand dollars, and a feature publication in the IEEE Transactions on Microwave Theory and Techniques. If the paper as published has more than one author, a certificate will be presented to each author and the cash sum of \$500 will be provided to each up to total of \$3,000. If more than six authors are involved, the \$3,000 will be split equally among the authors.

C. MICROWAVE CAREER AWARD

The Society shall present an award known as **The Microwave Career Award**. This award shall be considered annually but not necessarily presented annu

ally. The award shall be made to an individual for a career of meritorious achievement and outstanding technical contribution in the field of microwave theory and techniques. The individual must be a member of the IEEE.

Nomination of the recipient of the award will be the responsibility of the MTT-S Awards Committee which will make its recommendation to the MTT-S Administrative Committee at its annual meeting. Nominations for the award can be submitted by any member of the Society. The award shall consist of a suitable certificate, a plaque, a cash sum of two thousand dollars, and a feature publication in the IEEE Transactions on Microwave Theory and Techniques. The President of the Administrative Committee shall inform the recipient of **The Microwave Career Award** as soon as possible after the Administrative Committee has approved the award.

A travel allowance may be authorized by the MTT-S Administrative Committee. The travel allowance is for those individuals with insufficient organizational funding for travel to receive the award.

1. GUIDELINE FOR MICROWAVE CAREER AWARD

The award shall be made to an individual for a career of meritorious achievement and outstanding technical contribution in the field of microwave theory and techniques. The eligibility requirements are publication in technical journals and presentation of lectures, said contributions to be considered in conjunction with the contributions mentioned above.

D. MICROWAVE APPLICATION AWARD

The Society shall present an award known as **The Microwave Application Award**. This award shall be considered annually but not necessarily presented annually. The award shall be made to an individual for an outstanding application of microwave theory and techniques.

Nomination of the recipient of the award will be the responsibility of the MTT-S Awards Committee which will make its recommendation to the MTT-S Administrative Committee at its annual meeting. Nominations for the award can be submitted by any member of the Society. The award shall consist of a suitable certificate, a cash sum of one thousand dollars, and a feature publication in the IEEE Transactions on Microwave Theory and Techniques. The President of the Administrative Committee shall inform the recipient of **The Microwave Application Award** as soon as possible after the Administrative Committee has approved the award.

1. GUIDELINES FOR MICROWAVE APPLICATION AWARD

The award shall be made to an individual for an out-

standing application of microwave theory and techniques. The eligibility requirements are creation of a new device, component, or technique; novel use of a device or component; or a combination of any or all of the above. Publication of a paper is not required.

The award is aimed primarily toward young or emerging workers.

E. DISTINGUISHED SERVICE AWARD

The Society shall present an award known as **The Distinguished Service Award**. The award shall be considered annually but not necessarily presented annually. The award shall be made to an individual who has given outstanding service for the benefit and advancement of the Microwave Theory and Techniques Society. The individual must be a member of the IEEE and a member of MTT Society.

Nomination of the recipient of the award will be the responsibility of the MTT-S Awards Committee which will make its recommendations to the MTT-S Administrative Committee at the Annual meeting. Nominations may be made by any member of the MTT-S Administrative Committee or by a petition signed by at least 25 members of the Society. The award shall consist of a suitable certificate, a plaque and a feature publication in the IEEE Transactions on Microwave Theory and Techniques.

1. GUIDELINES FOR DISTINGUISHED SERVICE AWARD

The award shall be made to an individual who has given outstanding service for the benefit and advancement of the Microwave Theory and Techniques Society. The eligibility requirements are service in one or more of the following areas: the Administrative Committee, publications, meetings and symposia, Chapter leadership, committee chairman, committee member, Editor, lecturer or other distinguished service. Factors which will be considered are: leadership, innovation, activity, service, duration, breadth of participation and cooperation.

SECTION VII — CHANGES TO THE BYLAWS

Suitable Bylaws or changes in the Bylaws may be adopted by a two-thirds vote of the Administrative Committee present in meeting assembled provided that notice of the proposed Bylaw or change in the Bylaw has been sent to each member of the Administrative Committee at least three weeks prior to such meeting, by first class mail. No Bylaw shall take effect until 30 days after it has been publicized to all members of the Society and a copy has been mailed to the IEEE TAB office. (MTT Constitution, Article IX, Section 2).

BOOK REVIEW —

NOISE IN RECEIVING SYSTEM

by Raoul Pettai

Reviewed by: Madhu S. Gupta,
University of Illinois at Chicago

This well-written, easy-to-follow monograph on a frequently misunderstood subject is a welcome addition to the literature on electrical noise. It was used as a textbook in an undergraduate (senior elective) course at University of California, Santa Barbara, by this reviewer, and was favorably received by the students.

The principal subject matter of the book is the characterization of noise in linear one- and two-port networks in terms of noise temperature and noise figure, and the modeling, calculation, and measurement of these noise quantities. This subject occupies chapters 5 through 11 of the book; the first four chapters are a brief and elementary introduction to the physical origin and mathematical treatment of noise, while the last (12th) chapter takes up the characterization of noise in microwave detectors. The treatment in chapters 5 through 12 is at the professional level (as distinct from watered-down student level), but the book avoids some of the advanced topics that are mathematically or conceptually involved, such as a description in terms of noise power waves, or an accounting for mismatch errors in noise figure measurements. Similarly, results with simpler derivations are carried out in detail, with all intermediate results, while those with lengthy derivations are omitted, and the final results directly quoted. Consequently, the book is readable and accessible for engineers with a wide variety of backgrounds.

The pre-requisites for the book are mostly an undergraduate background in circuits and signals, and no advanced mathematics is required. The book requires very little background in probability and random variables, and this is briefly developed in chapters 3 and 4. This mathematical introduction has been kept at a bare minimum, simple, and intuitive rather than rigorous, and, by comparison with the other chapters which are authoritative, is the weakest part of the book. For example, correlation function is defined but cross-spectral density is not; as a result, the definition of correlation impedance in a later chapter (p. 75) can mislead the reader into inferring that Fourier transform exist for random signal waveforms.

The book claims to "close a sixteen year gap in the literature", presumably in reference to W.W. Mumford and E.H. Scheibe's monograph of 1968 entitled *Noise Performance Factors in Communication Systems*. But the material in this book is not of recent vintage: indeed, very few post-1968 original papers are cited by

the author, all of them in chapter 10 on multi-response transducers. The principles and concepts dealt with in the book are all older, but that does not detract from the value of the book: the book is very readable and accurate, there are hardly any other sources with a book-length treatment of the subject, and unlike Mumford and Scheibe, the author directly presents correct, modern definitions of noise terms, without giving the reader a long tour of a compilation of different definitions of noise figure from the literature and their pitfalls. Finally, no other book provides a detailed, careful treatment of noise in multi-response transducers like mixers, as in chapter 10 of this book.

The book is particularly suited for students and novices, because the writing is systematic and clear, with very few sources of confusion (such as the use of f to represent both current-voltage characteristic and a time-varying modulating signal on p. 244). The order in which topics are introduced is also pedagogically sound (e.g., two-port noise temperature defined and introduced before two-port noise figure). The only handicap in using this book as a student text was the absence of any exercises for problem solving practice.

The book contains over 150 references to the literature, about a third of them not explicitly cited in the text. A summary of important points at the end of every chapter is helpful for review and reference.

The reviewer, Madhu S. Gupta is a Professor of Electrical Engineering at University of Illinois at Chicago, and is the editor of an IEEE Press volume on Electrical Noise.



Make some time for yourself.

Everyone needs at least 20 minutes a day for quiet reflection — just-thinking time. If you think while walking or running, leave the radio home. Let your thoughts drift to who you are, how you feel, what you're doing, how your life is going.

Exercise.

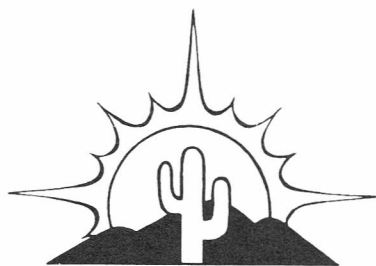
It's good for the mind. I don't mean jogging 10 miles a day. But a brisk walk, maybe during your self-reflection time, will put you in a better frame of mind. And it's important to do it regularly, as part of your daily routine, just as you shower and eat at certain times.

Establish a regimen for yourself.

This will give you a feeling of control. If you can stop smoking, lose weight, exercise, stick to a schedule, etc. you'll gain a sense of mastery. Anything that proves you can affect your own life will give you a positive sense of self.



1987 IEEE MTT-S International Microwave Symposium



Las Vegas

Las Vegas

MGM GRAND HOTEL
June 9, 10 and 11, 1987



First Call for Papers

The 1987 IEEE MTT-S International Microwave Symposium will be held in Las Vegas, Nevada on June 9, 10 and 11, 1987. To allow the presentation of papers in the format best suited to each, the program will consist of three categories of papers: full length, short, and open forum. The third category gives authors the opportunity to present theoretical and experimental material in poster form, to display hardware, and to answer questions in a more relaxed atmosphere. The Technical Program Committee will try to abide by the preferences of authors regarding category of paper but reserves the right to place the paper in the category it considers most appropriate. An award will be made for the best presentation in the open forum.

Papers are solicited describing original work in the microwave field. A list of suggested topics is given below, but papers concerned with other aspects of microwave theory and technology will be considered. Suggested topics are:

- Biological Effects and Medical Applications
- Computer-Aided Design
- Solid-State Devices and Circuits
- Microwave Systems
- Ferrite Devices
- GaAs Monolithic Circuits
- High Power Devices and Systems
- Integrated Optics, Fiber Optics, and Optical Techniques
- Low-Noise Techniques
- Microwave and Millimeter-Wave Integrated Circuits
- Microwave Acoustics
- Communication Systems
- Field and Network Theory
- Passive Components
- Phased and Active Array Techniques
- Submillimeter Wave Techniques and Devices
- Measurement Theory and Techniques
- Manufacturing Methods

A prospective author is required to submit:

1. **15** copies of a concise summary (500-1000 word max.), with supporting illustrations, clearly explaining the author's contribution, the paper's originality, and its relative importance.
2. **10** copies of 30-50 word abstract. (Include author's name and affiliation.)
3. A separate sheet with the complete mailing address of the author and a statement categorizing the submitted paper as full length, short, or open forum.

Each paper will receive careful evaluation. Evaluation criteria will include: contribution to the state of the art, quantitative content, quality of technical content, and overall interest to the microwave community.

Mail submissions to:

Dr. R.S. Kagiwada
c/o LRW Associates
1218 Balfour Drive
Arnold, Maryland 21012
USA

To be considered, submissions should be received by **December 12, 1986**. Late submissions will be returned unreviewed.

Authors will be notified of the status of their submissions by February 13, 1987. Authors of accepted papers will receive copyright release forms and instructions for publication and presentation.

The 1987 IEEE Microwave and Millimeter Wave Monolithic Circuits Symposium will be held in Las Vegas, Nevada on June 8 and 9, 1987, in conjunction with the 1987 IEEE MTT-S International Microwave Symposium. *Do not submit the same material to both symposia.*

Submissions for the Microwave and Millimeter Wave Monolithic Circuits Symposium should be sent to Dr. Derry Hornbuckle, Hewlett-Packard Company, Microwave Technology Division, 1412 Fountaingrove Parkway, Santa Rosa, CA 95401, USA.

The 29th ARFTG Conference will be held June 11-12 in conjunction with the 1987 IEEE MTT-S International Microwave Symposium. ARFTG submissions should be sent to Mr. Maurice Moberg, Avantek, Inc., 481 Cottonwood Drive, Milpitas, CA 95035, USA. ARFTG Conference submissions will be due in March 1987.

NOTE: *IEEE MTT-S International Microwave Symposium authors are cautioned to obtain all required company and government clearances prior to submittal. A statement signed by the authors stating that such clearances have been obtained must accompany the final manuscripts of accepted papers that will be published in the Symposium Digest. These final manuscripts will be required about mid-March 1987.*

MEETINGS OF INTEREST

1986

- **1986 Applied Superconductivity Conference** — Sept. 28-Oct. 3, Hyatt Regency — On the Harbor, Baltimore, MD. Contact: Ms Lahni N. Blohm, Executive Administrator, ASC86, Code 6630C, Naval Research Laboratory, Washington, D.C. 20375 (202) 767-3246.
- **1986 IEEE SOS/SOI** — Sept. 30-Oct. 2, South Seas Plantation Resort and Yacht Harbour, Captiva Island, FL. Contact: George K. Celler, AT&T Bell Laboratories, Rom 6F217, Murray Hill, NJ 07974 (201) 582-2861.
- **IEEE Military Communications Conference** — MILCOM '86 — Oct. 5-9, Hyatt Regency Monterey, Monterey, CA. Contact: Jack Thornell, Ford Aerospace and Communications Corporation, 3939 Fabian Way, Palo Alto, CA 94303 (415) 852-5550.
- **IEEE International Conference on Computer Design: VLSI in Computers and Processors (ICCD '86)** — Oct. 6-10, Rye Town Hilton, Rye Brook, NY. Contact: Kenneth R. Laker, University of Pennsylvania, Moore School of E.E./D2, 200 South 33rd Street, Philadelphia, PA 19104 (215) 898-5340.
- **Int'l Telecommunications Energy Conference** — INTELEC '86 — Oct. 19-22, Royal York Hotel, Toronto, Ontario, Canada. Contact: Don Reid, Bell Northern Reserach, P.O. Box 3511, Station C, Ottawa, Ontario K1Y 4H7, Canada (613) 726-2145.
- **Workshop on Charged Coupled Devices** — Oct. 24-26, Columbia University's Arden House, Harriman, NY. Contact: Prof. Eric R. Fossum, Dept. of Electrical Engineering, 1321 Mudd Building, Columbia University, New York, NY 10027 (212) 280-3115.
- **1986 IEEE Gallium Arsenide Integrated Circuits Symposium GaAs IC '86** — Oct. 28-30, Grenelefe Resort & Conference Center, Grenelefe, FL. Contact: Dr. James A. Hutchby, Conference Chairman, Research Triangle Institute, P.O. Box 12194, Research Triangle Park, NC 27709 (919) 541-5931.
- **1986 Twentieth Annual Asiolomar Conference on Signals, Systems and Computers** — November 10-12, Asiolomar Hotel and Conference Grounds, Pacific Grove, CA. Contact: John H. Duffin, Electrical and Computer Engineering Department, Naval Post Graduate School, Monterey, CA 93943
- **1986 IEEE Ultrasonics Syposium** — Nov. 17-19, Colonial Williamsburg Conference Center, Williamsburg, VA. Contact: R.A. Moore, Westinghouse Defense and Electronic Center, P.O. Box 746, MS-335, Baltimore, MD 21203 (301) 765-4027.
- **31st Annual Conference on Magnetism & Magnetic Material** — Nov. 17-20, Hyatt Regency, Baltimore, MD. Contact: Diane Suiters, Courtesy Associates, Inc. 655 15th Street, N.W. Washington, D.C. 20005 (202) 347-5900.
- **Western Electronic Show & Convention** — WESCON '86 — Nov. 18-21, Anaheim Convention Center, Anaheim Hilton, Los Angeles, CA. Contact: Dale Litherland, Electronics Conventions, Inc. 8110 Airport Blvd. Los Angeles, CA 90045 (213) 772-2925.
- **1986 Global Telecommunications Conference** — (GLOBECOM '86) — Dec. 1-4, Westin Galleria Hotel, Houston, TX. Contact: Mr. Ross C. Anderson, Southwestern Bell, Room 706, 3100 Main Street, Houston, TX 77001 (713) 521-8244.
- **1986 International Electron Devices Meeting** — (IEDM '86) — Dec. 7-10, Westin Bonaventure Hotel, Los Angeles, CA. Contact: Ms. Melissa Widerkehr, Courtesy Associates, Inc. 655 15th Street, NW, Washington, D.C. 20005 (202) 347-5900.
- **1986 Semiconductor Interface Specialists Conference** — Dec. 11-13, San Diego Hilton, San Diego, CA. Contact: Dr. Paul Dressendorfer, Sandia National Laboratory, Division 2144, Albuquerque, NM 87185 (505) 844-5373.

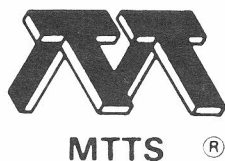
1987

- **1987 Second Topical Meeting on Picosecond Electronics and Optoelectronics** — Jan. 14-16, Hyatt Lake Tahoe Hotel, Incline Village, NV. Contact: Joan Carlisle, Meetings Manager, Optical Society of America, Picosecond Electronics and Optoelectronics, 1816 Jefferson Place, Washington, D.C. 20036 (202) 223-8130.
- **1987 Conference on Optical Fiber Communication** — (OFC '87) — Jan. 19-22, Reno, NV. Contact: OSA Meetings Department, 1816 Jefferson Place N.W. Washington, D.C. 20036 (202) 223-0926.
- **1987 Annual Reliability and Maintainability Symposium** — Jan. 27-29 — Marriott City Line Hotel, Philadelphia, PA. Contact: V.R. Monshaw, RCA Astro-Electronics, P.O. Box 800, Mail Stop 55, Princeton, NJ 08540 (609) 426-2182.
- **1987 Phoenix Conference on Computers and Communications** — (PCCC '87) — Feb. 25-27, Sunburst Hotel, Scottsdale, AZ. Contact: Dr. Forouzan Golshani, Dept. of Computer Science, Arizona State University, Tempe, AZ 85287 (602) 965-2855.
- **International Switching Symposium** — (ISS '87) — Mar. 15-21, Phoenix Civic Center, Phoenix, AZ. Contact: Ed Glenner, GTE Network Systems, 2500 W. Utopia Road, Phoenix, AZ 85027 (602) 582-7792.

- **1987 Quantum Electronics Conference** — April 27-May 1, Baltimore, MD. Contact: OSA, Meetings Department, 1816 Jefferson Place, N.W., Washington, D.C. 20036 (202) 223-0926.
- **1987 Custom Integrated Circuits Conference** — CICC '87 — May 4-7, Portland Hilton Hotel, Portland, OR. Contact Laura A.H. Silzars, Convention Coordinating, 6900 S.W. Canyon Drive, Portland, OR 97225 (503) 292-6347.
- **1987 IEEE International Symposium on Circuits and Systems** — ISCAS '87 — May 4-7, Bellevue Stratford Hotel, Philadelphia, PA. Contact: Samuel D. Bedrosian, Department of Electrical Engineering, University of Pennsylvania, Philadelphia, PA 19104 (215) 898-8518.
- **37th Electronic Components Conference (ECC)** — May 11-13, Boston Park Plaza, Boston, MA. Contact: Mr. James A. Woolley, 3M Company, 3M Center, 207-1W-10, St. Paul, MN 55144 (612) 733-9699.
- **IEEE International Conference on Communications (ICC '87)** — June 7-10, Seattle Sheraton Hotel, Seattle, WA. Contact: Mr. Robert W. Tiplin, Jr., Pacific Northwest Bell, 1600 Bell Plaza, Room 1213, Seattle, WA 98191 (306) 346-8679.
- **1987 IEEE International Microwave Symposium & Workshops** — June 9-12, MGM Grand Hotel, Las Vegas, NV. Contact: S.L. March, 3091 Potter Avenue, Thousand Oaks, CA 91360 (805) 492-6809.
- **Western Electronic Show & Convention (WESCON '87)** — Sept. 15-18, Moscone Convention Center, San Francisco, CA. Contact: Mr. Dale Litherland, Electronic Conventions, Inc. 8110 Airport Boulevard, Los Angeles, CA 90045 (213) 772-2965.
- **IEEE Military Communications Conference (MILCOM '87)** — Oct. 18-22, Bally's Park Place, Atlantic City, NJ. Contact: Alan J. Roberts, The Mitre Corporation, 1820 Dolly Madison Blvd. McLean, VA 22102 (703) 883-5691.

1988

- **1988 International Reliability Physics Symposium** — April 12-14, Del Monte Hyatt Hotel, Monterey, CA. Contact: H.C. Jones, Westinghouse Corp. Baltimore, MD (301) 765-7387.



SHORT COURSES

A number of organizations are offering short courses this Fall and Winter, which may be of interest to some members of the Microwave Theory and Techniques Society.

The following selected short courses will be offered by UCLA Extension.

UCLA Extension Courses, Summer and Fall of Sept.-Dec. 1986, Los Angeles, CA

Modern Digital Signal Processing: Techniques, Technology, and Advanced Applications, Sept. 8-12, 1986, Course No. Engineering 867.67, Fee: \$995. Lecturers are Carl Benning, Joseph Brewer, Mauro Dentino, Benjamin Friedlander, Jock Rader, Ellis Shamash, Alexander O. Williman. For technical information about the course, call Cornelius T. Leondes (coordinator) at (213) 825-2064.

Antenna Arrays: Theory and Design, Sept. 22-26, 1986, Course No. Engineering 867.73, Fee: \$995. Coordinator and lecturer is R.S. Elliot. For technical information about the course, call R.S. Elliot at (213) 825-7880.

Analog MOS Integrated Circuits, Oct. 6-10, 1986, Course No. Engineering 881.49, Fee: \$1,050. Lecturers are Gabor C. Temes (coordinator and lecturer), William C. Black, Jr., Roubik Gregorian, Ken Martin, George Szentirmai, C.R. Viswanathan. For technical information about the course, call Gabor C. Temes at (213) 825-1702.

Gallium Arsenide (GaAs) Integrated Circuits, Oct. 20-24, 1986, Course No. Engineering 881.60, Fee: \$1,050. Lecturers are Louis R. Romasetta (coordinator and lecturer) D. Richard Decker, Stephen I. Long, Robert E. Lee, and C.R. Viswanathan. For technical information about the course, call Louis R. Tomasetta at (805) 388-3700.

Synthetic Array and Imaging Radars, Oct. 27-31, 1986, Course No. Engineering 867.46, Fee: \$1,050. Lecturers are S.A. (coordinator and lecturer), John C. Kirk, John J. Kovaly, Dean L. Mensa, Frederick V. Stuhr, Thomas H. Robinson. For technical information about the course, call S.A. Hovanessian at (213) 616-3272.

Modern Microwave Measurements and Applications, Nov. 18-21, 1986, Course No. Engineering 881.73, Fee: \$950. Coordinator and lecturer is Stephen F. Adam. For technical information about the course, call Stephen F. Adam at (415) 968-4900 or 965-4020.

For registration information on the above UCLA Short Courses, call the Short Course Program Office at (213) 825-1295 or 825-3344.

The Continuing Education Office of George Washington University is offering the following short courses. These courses are to be held in Washington, D.C.

The George Washington University School of Engineering and Applied Science Washington, D.C.

Frequency Hopping Signals and Systems, Sept. 22-24, 1986, (in Washington, D.C.), Course No. 1192DC, Fee: \$750 and includes lecture notes and indicated text(s). Instructor is Robert C. Dixon. Contact: Shirley Forlenzo at (202) 676-8530 or toll free at (800) 424-9773 (within the U.S.) and (800) 535-4567 (within Canada).

Communications Satellite Systems — The Earth Station: A Practical Approach to Implementation, Oct. 6-8, 1986, (in Washington, D.C.), Course No. 823DC, Fee: \$750 and includes lecture notes and indicated text(s). Instructors are Michael J. Downey and Robert Sims. Contact: Darold Aldridge at (202) 676-8518 or toll free at (800) 424-9773 (within the U.S.) and (800) 535-4567 (within Canada).

Video Transmission and Broadcasting Via Satellite, Oct. 20-22, 1986, (in Washington, D.C.), Course No. 1312DC, Fee: \$750 and includes lecture notes and indicated text(s). Instructors are Ernest Simo and Lalji Ghedia. Contact: Darold Aldridge at (202) 676-8518 or toll free at (800) 424-9773 (within the U.S.) and (800) 535-4567 (within Canada).

Global Positioning System: Principles and Practice, November 10-12, 1986 (in Washington, D.C.) Course No. 1081DC. Instructor is Robert C. Dixon. Fee \$750 and includes lecture notes and any indicated text(s). Contact: Shirley Forlenzo at (202) 676-8530 or toll free at (800) 424-9773 (within the U.S.), (800) 535-4567 (within Canada).

Communications Satellite Engineering, Nov. 17-21, 1986, (in Washington, D.C.), Course No. 259DC, Fee: \$950 and includes lecture notes and indicated text(s). Instructors are Eugene Cacciamani, William B. Garner and James R. Owens. Contact: Darold Aldridge at (202) 676-8518 or toll free at (800) 424-9773 (within the U.S.) and (800) 535-4567 (within Canada).

Introduction to Communications Systems for Nonengineers, November 19-21, 1986 (in Washington D.C.) Course No. 1197DC, Fee \$750, and includes lecture notes and indicated texts. Instructor is Robert C. Dixon. Contact: Shirley Forlenzo at (202) 676-8530 or toll free at (800) 424-9773 (within the U.S.) and (800) 535-4567 (within Canada).

Introduction to Receivers, December 1-2, 1986 (in Colorado Springs, Colorado) Course No. 1125CS, Fee \$650, and includes lecture notes and any indicated texts. Instructor is Robert C. Dixon. Contact: Shirley Forlenzo at (202) 676-8530 or toll free at (800) 424-9773 (within U.S.) and (800) 535-4567 (within Canada).

C³I Systems and Technology in the DoD Aerospace

and Terrestrial Environments, Dec. 1-5, 1986, (in Washington, D.C.), Course No. 1206DC, Fee: \$950 and includes lecture notes and indicated text(s). Instructor is John M. Goodman. Contact: Ron Donais at (202) 676-8523 or toll free at (800) 424-9773 (within the U.S.) and (800) 535-4567 (within Canada).

Modern Receiver Design, December 3-5, 1986 (in Colorado Springs, Colorado) Course No. 1079CS, Fee \$750 and includes lecture notes and any indicated text(s). Instructor is Robert C. Dixon. Contact: Shirley Forlenzo (202) 676-8530 or toll free at (800) 424-9773 (within the U.S.), (800) 535-4567 (within Canada).

Introduction to Command, Control, and Communication (C³) Systems, January 5-9, 1987 (in Washington D.C.). Course No. 1095DC, Fee \$950 and includes lecture notes and any indicated text(s). Contact: Shirley Forlenzo (202) 676-8530 or toll free at (800) 424-9773 (within the U.S.), (800) 535-4567 (within Canada).

Foundations of Modern Telecommunications Systems, January 12-16, 1986 (in Washington D.C.) Course No. 1017DC. Instructor is Robert C. Dixon. Contact: Shirley Forlenzo (202) 676-8530 or toll free at (800) 424-9773 (within the U.S.), (800) 535-4567 (within Canada).

California State University, Fullerton, Office of Extended Education is offering the following short courses.

California State University, Fullerton, Office of Extended Education.

Project Management, Oct. 20-21, 1986, Anaheim, CA (The Anaheim Hilton), Fee: \$695 and includes complete materials package and coffee breaks. Program leaders are James Soldani and John Reddish. Contact: Ms. Phyllis Candelaria for registration information (714) 773-3080 or 773-2611.

Secrets of Successful Negotiating, Oct. 21-22, 1986, Anaheim, CA (Inn at the Park), Fee: \$695 and includes complete materials package and coffee breaks. Program leader is James H. Van West. Contact: Ms. Phyllis Candelaria for registration information (714) 773-3080 or 773-2611.

First Line Supervisory Skills, Nov. 19-20, 1986, Irvine, CA (Airporter Inn Hotel), Fee: \$695 and includes complete materials package and coffee breaks. Program leader is Thomas W. Dooley. Contact: Ms. Phyllis Candelaria for registration information (714) 773-3080 or 773-2611.

The Education Foundation of the Data Processing Management Association (EFDPMMA) is offering a seminar.

EFDPMMA SEMINAR:

GaAs/MMIC Gallium Arsenide Monolithic Microwave Integrated Circuits, Sept. 25-26, 1986, Washington, D.C., Fee: \$595 (\$560 for EFDPMMA members; \$495 for

teams of 3 or more; \$475 for University and Government personnel). Seminar speakers are Dr. C.D. Chang and Dr. David C. Wang. Contact: Information (213) 534-3922.

The Continuing Education Institute is offering the following course that may be of interest.

SHORT COURSE

Error Correcting Codes & Reed Solomon Codes with Application to Computers and Communications Systems, Oct. 14-17, 1986, Boston, Massachusetts, Fee: \$1240 (Reduced fee of \$895 for those who wish to attend only the first 3 days of the program). Course director and instructor is E.J. "Ned" Weldon. Contact: Registration Center Woodland Hills, CA (818) 710-1126 or TELEX 704789 CEI LA.

Technology Associates is offering two seminars that may be of interest.

TECHNOLOGY ASSOCIATES SEMINARS:

Semiconductor Technology Seminars, Sept. 22-26, 1986, Clydebank, Scotland, Fee: \$1,295 (\$1,195 is paid one month prior to seminar; refresher fee — \$795). Course instructors are O.D. "Bud" Trapp and Larry J. Lopp. Contact: Information (415) 941-8272.

Burn-In and Accelerated Life Testing of Semiconductor Devices Seminars, Nov. 10-13, 1986, University of South Florida, Tampa, Fee: \$995 (\$950 if paid one month prior to seminar; refresher fee — \$650). Course instructors are D. Stewart Peck and O.D. "Bud" Trapp. Contact: Information (415) 941-8272.



PERSONNEL MAGIC

*James Jenk,
Alexander Hamilton Institute*

WHEN NOT TO DELEGATE

Delegation allows top management to free itself from time-consuming or unpleasant duties, among other things. But no matter how distasteful, disruptive or dangerous, there are certain specific situations for which delegation of responsibilities by managers would be inappropriate:

Crisis.

This is the most important time *not* to delegate. In a crisis it's vital for the boss to demonstrate acceptance of responsibility. If he doesn't, the crisis may look worse than it actually is. *Example:* Eastern Airlines CEO Frank Borman. With all the crises — union contracts, bank loans, earnings — Borman has been out front all the time. That's where he belonged.

People problems.

A job that should never be delegated is firing or reprimanding a subordinate. The head of a financial services company recently hired a technically competent president for a new subsidiary. But he didn't fit with company management and personnel policies. When another officer volunteered to fire the person, the CEO was quick to say, *No matter how much I hate doing it, I can't delegate that to you.*

Sudden change.

Anything that has a sudden impact and ripple effect on a whole organization and its customers must be handled by top management. Massachusetts-based insurance holding company Monarch Capital Corp. announced a restructuring that included unprecedented elimination of the common-stock dividend. Chairman Benjamin F. Jones decided that he or president Gordon Oaks would take every phone call on the subject. He says, *it was a duty we absolutely couldn't delegate to any lower-level persons, no matter how much we might have prepared them.*

Policy making.

Policy sets the limits of decision making. Managers can delegate tasks to be accomplished within established policies. They shouldn't delegate responsibilities that require the delegates to make decisions that actually determine policy. One company found that accounting clerks were making client-alienating credit decisions on some of the company's largest accounts. The company soon put credit-policy decisions in the hands of top marketing management and didn't allow their delegation. The procedure brought back many valuable accounts.

Major decisions.

A choice between two strategies to follow can't be delegated. According to Jenks, the game strategy of Red Auerbach, the former great coach of the Celtics, also applies to business ... When the game was on the line and he had only time for the last play, he'd always make the decision. When winning or losing is on the line, the job can't be delegated.

Ceremonies.

Honoring employees for long service or presiding at retirement dinners can't be delegated. The ceremonial occasion would lose morale-building importance to the beneficiary and attending employees. From such occasions, employees take a reading on how much they're appreciated.

Boardroom interviewed James Jenks, president of the Alexander Hamilton Institute and coauthor with John Kelly of Don't Do. Delegate! Franklin Watts, 387 Park Ave., New York 10016, \$15.95.



Chapter Chairman's Records —
(Continued from page 51)

ADCOM Liaison:
S.J. Temple
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(617) 863-5500 x3997
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Roberto Sorrentino
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Elettronica
Via Eudossiana 18
00184 Rome

	Italy 396-4759657 Term of Office: 1/85 — 12/86	S.L. March	MP 113 P.O. Box 5837 Orlando, FL 32855 (305) 356-7201 Term of Office: 6/85 — 5/86
MILWAUKEE MTT/ED ADCOM Liaison: R. Levy	Fabien Josse Marquette University 206J Department of Electrical Engineering & Computer Science Milwaukee, WI 53233 (414) 224-6789 Term of Office: 7/85 — 6/86	OTTAWA MTT/AP ADCOM Liaison: B.E. Spielman	Prof. James S. Wight Carleton University Room 417, MacKenzie Building 3410 Albion Road Ottawa, Ontario Canada K1V8W3 (613) 231-2637 Term of Office: 5/84 — 4/85
MONTREAL MTT/AP ADCOM Liaison: H. Howe, Jr.	Dr. Gar Lam Yip McGill Univeristy Department of Electrical Engineering 3480 University St. Montral, P.Q. Canada H3A2A7 (514) 392-6739 Term of Office: Unspecified	PHILADELPHIA MTT/AP ADCOM Liaison: M.V. Schneider	Dr. William J. Graham Interspec Corp. 1100 East Hector Street Conshohocken, PA 19428 (215) 834-1511 Term of Office: 6/85 — 5/86
NEW JERSEY COAST MTT/ED/LEO ADCOM Liaison: R.H. Knerr	Dr. Ali Afrashteh Bell Communications Research NVS 3x337 Box 7020 331 Newman Springs Road Red Bank, N.J. 07701-7020 (201) 758-2872 Term of Office: 5/85 — 5/86	PHOENIX MTT/AP/ED ADCOM Liaison: H.G. Oltman, Jr.	Dr. R. Roedel College of Engineering Arizona State University Tempe, AZ 85281 (612) 965-6622 Term of Office: 7/85 — 6/85
NEW YORK/LONG ISLAND MTT ADCOM Liaison: V.G. Gelnovatch	Klaus D. Breuer Eaton Corp./AIL Div. Walt Whitman Rd. Melville, N.Y. 11747 (516) 595-4566 Term of Office: 7/85 — 6/86	PORTLAND MTT/CAS/IM/ED/SU/CHMT/CS/COM/LEO ADCOM Liaison: R.S. Kagiwada	Milton H. Monnier Portland Comm. College 705 N. Killingsworth Portland, OR 97217 (503) 283-2541 Term of Office: 11/85 — 10/86
NORTH JERSEY MTT/AP ADCOM Liaison: V.G. Gelnovatch	Richard V. Snyder RS Microwave Co., Inc. 22 Park Place P.O. Box 273 Butler, N.J. 07405 (201) 492-1207 Term of Office: 6/85 — 5/86	PRINCETON MTT/ED ADCOM Liaison: M.V. Schneider	Walter R. Curtice RCA Laboratories David Sarnoff Research Center Washington Road Princeton, N.J. 08540 (609) 734-2230 Term of Office: 9/85 — 8/86
ORLANDO MTT/AP ADCOM Liaison:	Gene K Huddleston Martin Marietta Aerospace	ST. LOUIS MTT/AP/ED ADCOM Liaison: J.E. Raue	Dr. L. Wilson Pearson McDonnell Douglas Res. Labs. BLDG 110 P.O. Box 516 St. Louis, MO 63166 (314) 233-2507 Term of Office: 6/85 — 5/86

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MTT-S SPECIAL MEETINGS, COURSES, SYMPOSIA WORKSHOPS, CLINICS AND SOCIAL EVENTS (1985/1986)

BALTIMORE (MTT, AP)

Date: 4-12-86 Attendance: 60
Type of Meeting:
One Day Short Course
Subject:
"Modern MIC Transmission Media and Circuits
Speakers:
Tatsuo Itoh University of Texas
William Getsinger Consultant
Ralph Brooker Comsat Laboratories

CENTRAL NEW ENGLAND/BOSTON (MTT)

Date: 3-20-86 Attendance: 130
Type of Meeting:
Tour of the Sanders Associates Microelectronics
Center

CHICAGO (MTT, AP)

Date: 4-14-86 Attendance: 110
Type of Meeting:
Mini Microwave Expo
Meeting included exhibits and technical
presentations.
Speaker:
Robert Lemkowski, Epsilon Lambda
Title of Presentation:
"Satellite Communications System at 60 GHz"

Speaker:
Ulrich Rhode, Feller Associates
Title of Presentation:
"CAD Software for Synthesis Applications"

Speaker:
Daniel D. Duris:
Title of Presentation:
"Features and Benefits of the K Series Connector"

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CHAPTERS

Atlanta, Chicago, Twin Cities
New York/Long Island, North
Jersey
Albuquerque, Southeastern
Michigan, West Germany
Kitchener/Waterloo, Montreal
Central Illinois, Houston,
Middle and South Italy
Santa Clara Valley/San
Francisco, Seattle, Tucson
Portland, Tokyo
Benelux, New Jersey Coast
Los Angeles, San Diego
Dallas, Milwaukee
Denver/Boulder, Sweden
Florida West Coast, Orlando,
South Brevard Indian River
Spain, Syracuse

Speaker:
William J. McNeil, Probe Electronics
Title of Presentation:
"High Performance Semi-Rigid Cables"

Speaker:
Philip Snow, Tektronix
Title of Presentation:
"High Performance Controlled-Impedance Switches
and Attenuators"

DALLAS (MTT)

Date: 2-1-86 Attendance: 140

Type of Meeting:
Section Technical Conference
Topic:
Microwave Systems and Manufacturing in the 80's
Coordinators:
Larry Cardwell and Al Estes

Speaker:
D. Norbury, Avantek
Title of Presentation:
"Mass Microwave Manufacturing"

Speaker:
R. Gold, Adams-Russell
Title of Presentation:
"GaAs Circuit Design and Processing Technology"

Speaker:
J. Crain, Texas Instruments
Title of Presentation:
"Active Phased Array Radar Technology"

Speaker:
R. Rosenfield, Sawtek
Title of Presentation:
"SAW Components and System Applications"

Speaker:
J. Jones, E-Systems
Title of Presentation:
"ESM Receiver Design Trade-Offs"

Date: 4-18-86 Attendance: 120
Type of Meeting:
Mini-Seminar
Topic:
Present and Future Radar Systems
Coordinator: Jim Griffiths
Speakers:
R.T. Hill, Naval Sea Systems Comm.
E.K. Reedy, Georgia Institute of Technology

Date: 5-29-86 Attendance: 50
Type of Meeting:
Speakers' Night
Topic:
Preview of Papers from Dallas to be Presented
at the 1986 MTT-S International Symposium in

Baltimore
Coordinators:
Alan Davis and Jim Griffiths

MIDDLE AND SOUTH ITALY (MTT, AP)

Date: 4-2, 3, 4-86 Attendance:
Type of Meeting:
International Workshop on Millimeter Waves

Speakers:
P.A. Rolland, Universite de Lille, France
W.R. Wisseman, Texas Instruments, USA
Subject:
"Sources and Amplifiers"

Speakers:
T. Itoh, University of Texas, USA
I. Wolff, Universitat Duisburg, West Germany
Subject:
"Transmission Lines"

Speakers:
J. Citerne, INSA, France
W.J.R. Hoefler, University of Ottawa, Canada
Subject:
"Passive Circuits and Components"

Speaker:
K. Schunemann, Tec. Universitat Hamburg-Harburg,
West Germany
Subject:
"Solid State Circuits"

Speakers:
N.G. Alexopoulos, Univ. of California, USA
A.A. Oliner, Polytechnic Inst. of New York, USA
K. Solbach, AEG-Telefunken, West Germany
Subject:
"Antennas"

Speakers:
S.F. Clifford, NOAA, USA
A. Vander Vorst, Univ. Catholique Louvain, Belgium
Subject:
"Propagation of Millimeter Waves"

Speakers:
H. Meinel, AEG-Telefunken, West Germany
J.C. Wiltse, Georgia Inst. of Tech., USA
Subject:
"Systems and Applications"

Speaker:
M.A. Maury, Maury Microwave Corp., USA
Subject:
"Measurements"

PRINCETON (MTT/ED)

Date: 3-14-86 Attendance: 183
Type of Meeting:

David Sarnoff Symposium (Full Day)

Topic:

Microwave and Millimeter Wave Monolithic
Integrated Circuits

Number of Speakers: 11

MTT-S CHAPTER MEETINGS (1985/1986)

ATLANTA (MTT, AP)

Date: 2-18-86 Attendance:

Speaker:

James A. Scheer

Radar and Instrumentation Lab, GTRI

Title of Presentation:

"Millimeter-Wave Radar Research and
Development"

Date: 3-27-86 Attendance:

Speaker:

Prof. Y. T. Lo, Univ. of Illinois

APS National Lecturer

Title of Presentation:

"Microstrip Antennas: Theory, Experiments, &
Applications"

Date: 4-22-86 Attendance:

Speaker:

Kenneth L. Carr, M/A-COM, Inc.

Distinguished Microwave Lecturer

Title of Presentation:

"The Application of Microwave Technology to the
Detection and Treatment of Cancer"

BALTIMORE (MTT, AP)

Date: 1-16-86 Attendance: 53

Speaker:

Edward C. Niehenke, Westinghouse Electric Corp.

Distinguished Microwave Lecturer

Title of Presentation:

"GaAs — Key to Modern Microwave Technology"

Date: 2-12-86 Attendance: 50

Speaker:

Kenneth L. Carr, M/A-COM, Inc.

Distinguished Microwave Lecturer

Title of Presentation:

"The Application of Microwave Technology to
the Detection and Treatment of Cancer"

Date: 3-17-86 Attendance: 25

Speaker:

Dr. Y. Rahmat-Samii, Jet Propulsion Laboratory

California Institute of Technology

Title of Presentation:

"Large Deployable Reflector Antennas for Space
Applications — A New Era"

CENTRAL NEW ENGLAND/BOSTON (MTT)

Date: 1-16-86 Attendance: 47

Speaker:

Kenneth L. Carr, M/A-COM, Inc.

Distinguished Microwave Lecturer

Title of Presentation:

"The Application of Microwave Technology to the
Detection and Treatment of Cancer"

Date: 2-20-86 Attendance: 45

Speaker:

Dr. John Vaughan, M/A-COM Advanced

Semiconductor Operations

Title of Presentation:

"Growth and Characterization of Undoped
Semi-Insulating GaAs Crystals"

Date: 4-17-86 Attendance: 31

Speakers:

Richard W. Chick, Dr. Brian J. Clifton,

John A. Taylor, MIT Lincoln Laboratory

Title of Presentation:

"Millimeter Wave Mixer Development for Satellite
Communications and Imaging"

Date: 5-15-86 Attendance: 34

Speaker:

Dr. James D. Sullivan, MIT Plasma Fusion Center

Title of Presentation:

"Voyage to Uranus and Beyond"

CHICAGO (MTT, AP)

Date: 3-17-86 Attendance: 24

Speaker:

Dr. Richard Dyott, Andrew Corp.

Title of Presentation:

"Fiber Waveguides and Components for Optical
Sensors"

Date: 5-12-86 Attendance: 24

Speaker:

Dr. Yuen T. Lo, University of Illinois

Title of Presentation:

"Microstrip Antennas: Theory, Experiments and
Applications"

COLUMBUS (MTT, AP)

Date: 1-27-86 Attendance:

Speaker:

Kenneth L. Carr, M/A-COM, Inc.

Distinguished Microwave Lecturer

Title of Presentation:

"The Application of Microwave Technology to the
Detection and Treatment of Cancer"

Date: 2-19-86, 2-20-86 Attendance:

Speaker:

Prof. Robert S. Elliott, Univ. of Calif., Los Angeles

Title of Presentations:

"Introduction to Special Relativity"
"Relativity and Electromagnetics"

Date: 3-13-86 Attendance:

Speaker:
Chen-To Tai,
Distinguished Visiting Professor
The Ohio State University
Title of Presentation:
"Snell's Law Revisited"

Date: 4-23-86 Attendance:

Speaker:
William F. Gabriel, Naval Research Laboratory
Title of Presentation:
"Using Spectral Estimation Techniques in Adaptive
Array Systems"

Date: 5-6-86 Attendance:

Speaker:
Helmut E. Schrank, Westinghouse Electric Corp.
Title of Presentation:
"Low Sidelobe Reflector Antennas"

DALLAS (MTT)

Date: 9-26-85 Attendance: 250

Speaker:
Dr. Karl Willenbrock
Southern Methodist University
Title of Presentation:
"National Security Conflicts with Technology
Transfer"

Date: 10-24-85 Attendance: 32

Speaker:
Vahe Adamian
Automatic Testing and Net.
Title of Presentation:
"Automatic Noise Measurements"

Date: 11-14-85 Attendance: 30

Speaker:
Dr. C. T. Tai
University of Michigan
Title of Presentation:
"Applications of Dyadic Green's Functions to
E.M. Problems"

Date 2-27-86 Attendance: 50

Speaker:
Thomas S. Laverghetta
ITT Aero./Opt. Division
Title of Presentation:
"Microwave Materials: Complete Your Design —
Include the Materials"

Date: 4-17-86

Speaker:
Kenneth L. Carr
M/A-COM, Inc.
Distinguished Microwave Lecturer

Title of Presentation:
"The Application of Microwave Technology to the
Detection and Treatment of Cancer"

DAYTON (MTT, AP)

Date: 3-11-86 Attendance: 30

Speaker:
Dr. Brian M. Kent, AFWAL
Title of Presentation:
"The AFWAL Compact Antenna Measurement
Range"

Date: 4-17-86 Attendance: 32

Speaker:
Prof. Gary Thiele, University of Dayton
Title of Presentation:
"An Iterative Method for Predicting EM Scattering"

FLORIDA WEST COAST (MTT, AP)

Date: 3-3-86 Attendance: 17

Speaker:
Richard A. Sparks, Raytheon Missile Systems
Division
Title of Presentation:
"Future Radar Technology Trends"

MIDDLE AND SOUTH ITALY (MTT, AP)

Date: 1-17-86 Attendance: 120

Speaker:
B. Palumbo, Selenia Spa.
Title of Presentation:
"Activity of Antenna Analysis and Design at
Selenia"

MILWAUKEE (MTT/ED)

Date: 11-13-85 Attendance: 20

Speaker:
Dr. James Hyde, Medical College of Wisconsin,
Milwaukee, WI
Title of Presentation:
"Parallels Between Loop Gap Resonators at
Microwave Frequencies and at 65 MHz"

Date 2-10-86 Attendance: 47

Speaker:
Richard C. Webb, G.E. Medical Systems,
Waukesha, WI
Title of Presentation:
"Signal and Noise Considerations in Modern
Wideband Receiving Systems"

Date: 3-11-86 Attendance: 20

Speaker:
Dr. Dean C. Jeutter, Marquette University,
Milwaukee, WI
Title of Presentation:
"A Radio Frequency Implanted Telemetry and
Transcutaneous Powering System"

NEW JERSEY COAST (MTT, ED, QEA)

Date: 10-25-85 Attendance: 30

Speaker:

Arthur Ballato, Fort Monmouth, New Jersey

Title of Presentation:

"Frequency and Time Sources —
Past, Present, and Future"

Date: 11-21-85 Attendance: 26

Speaker:

Kenneth L. Carr, M/A-COM, Inc.

Distinguished Microwave Lecturer

Title of Presentation:

"The Application of Microwave Technology to the
Detection and Treatment of Cancer"

Date: 1-22-86 Attendance: 24

Speaker:

Dr. John Ondria, Consultant

Title of Presentation:

"Millimeter Wave Oscillators"

PRINCETON (MTT/ED)

Date: 1-23-86 Attendance: 65

Speaker:

W.A. Helbig, ATL, RCA Moorestown, N.J.

Title of Presentation:

"RISC vs. CISK, GaAs vs. Silicon and Hardware
vs. Software"

Date: 2-20-86 Attendance: 45

Speaker:

H.J. Wolkstein, RCA Laboratories, Princeton, N.J.

Title of Presentation:

"Understanding the Ubiquitous TWT —
An Outstanding Amplifier Device"

SCHENECTADY (MMT)

Date: 2-27-85 Attendance: 22

Speaker:

Richard Jones, Hughes Aircraft

Title of Presentation:

"An Insider's View of the Communication Satellite
Industry"

Date: 11-6-85 Attendance: 17

Speaker:

Dr. Anand Gopinath, MIT Lincoln Laboratory

Title of Presentation:

"Gallium Arsenide Millimeter Wave Circuits"

Date: 11-13-85 Attendance: 16

Speaker:

Joseph F. Weller, Naval Research Laboratory,
Washington, DC

Title of Presentation:

"Laser Diodes and Microwave Applications"

SOUTHEASTERN MICHIGAN (MTT, AP, ED)

Date: 9-24-86 Attendance: 40

Speaker:

Richard E. Jaeger, Auburn Univ., Auburn, Alabama
1985 ED-S Distinguished Lecturer

Title of Presentation:

"Low Temperature Behavior of MOS Devices"

Date: 12-5-86 Attendance: 37

Speaker:

Donald R. Wilton, Univ. of Houston, Houston, Texas
AP-S Distinguished Lecturer

Title of Presentation:

"Numerical Solution Techniques in Electro-
magnetics"

Date: 1-30-86 Attendance: 22

Speaker:

Kenneth L. Carr, M/A-COM, Inc.

Distinguished Microwave Lecturer

Title of Presentation:

"Application of Microwave Technology to the
Detection and Treatment of Cancer"

Date: 2-11-86 Attendance: 36

Speaker:

Helmut Schrank, Westinghouse Electric Corp.

AP-S Distinguished Lecturer

Title of Presentation:

"Low Sidelobe Phased Array Radars"

Date: 4-8-86 Attendance: 30

Speaker:

Leon Peters, Jr., The Ohio State University

Title of Presentation:

"Electromagnetics Research at Ohio State
University"

SWEDEN (MTT, AP)

Date: 4-4-86 Attendance: 15

Speaker:

Prof. G. Franceschetti, Univ. of Naples

Title of Presentation:

"Synthetic Aperture Radar Principles"

SWITZERLAND (MTT, AP)

Date: 2-11-86 Attendance: 34

Speaker:

Dr. Elizabeth Penard, CNET, LAB/MER/MLS, France

Title of Presentation:

"Travaux Recents au CNET dans le Domaine des
Antennes Imprimees en Microruban"

Speaker:

Prof. E. Folke Bolinder, Chalmers Univ. of
Technology, Sweden

Title of Presentation:

"On the Use of the Minkowski Model of Lorentz
Space and Clifford Algebra in Electromagnetic
Theory and Network Theory"

Date: 5-14-86 Attendance: 42
Speaker:
Dr. H.J. Matt, Standard Elektrik Lorentz, Stuttgart, Germany
Title of Presentation:
"A B-ISDN System: Concept and Technology"
Speaker:
Dr. K. Leuenberger, R&D Dept., PTT, Bern, Switzerland
Title of Presentation:
"Digital Radio Systems with PSK and QAM Modulation: System Concepts"

Speaker:
H.J. Bosshard, R&D Dept., PTT, Bern, Switzerland
Title of Presentation:
"Transmission Characteristics of Digital Radio Systems with PSK and QAM Modulation"

Speaker:
M. Liniger, R&D Dept., PTT, Bern, Switzerland
Title of Presentation:
"Untersuchung der Uebertragungsfunktion Eines Richtfunkkanals Unter dem Einfluss von Mehrwegausbreitung"

Speaker:
J.C. Besson, TERCOM SA, Fribourg, Switzerland
Title of Presentation:
"Interesting Possibility at 23 GHz for Short Haul Transmission with High-Bit Rate"

Speaker:
P. Thoma, R&D Dept., PTT, Bern, Switzerland
Title of Presentation:
"Digital Speed and Data Communication on Satellite Links"

TWIN CITIES (MTT)

Date: 2-20-86 Attendance: 23
Speaker:
B. Clarke, Chief Engineer, Metellics Corp.
Title of Presentation:
"Microwave Diode Manufacturing and Automatic Test Techniques"

Date: 3-27-86 Attendance: 13
Speaker:
Dr. R. Schwartz, Vice-President, Adams-Russell Corp.
Title of Presentation:
"Transmission Line Selection in System Design"

Date: 4-17-86 Attendance: 21
Speaker:
Dr. C. Boyd, President, Microwave Application Group Inc.
Title of Presentation:
"Progress in Microwave Ferrite Phase Control Elements"

Date: 5-15-86 Attendance: 22
Speakers:
G. Vendelin, Applications Manager, Avantek Inc.
R. DeBoo, Manager, Avantek Inc., Advanced Development
Title of Presentation:
"MODAMP™ MMIC Circuit Technology"



... BUSINESS PSYCHOLOGY

Leadership.

Leadership versus management. Leaders do the right things, managers do things right. *Leaders who are managers excel at:* (1) Managing attention (being accessible). (2) Managing meaning, (integrating facts meaningfully). (3) Creating and maintaining team spirit. *Executive Excellence, 145 E. Center St., Provo, UT 84603, monthly \$130/yr.*

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Listen to the old saw about accepting what you cannot change.

As we get older, we have to accept our limitations. At some point in life we all must recognize that we'll never be president of General Motors, a Nobel Prize winner, a *Time* cover subject, a perfect "10", or whatever else we thought was crucial to happiness. At this point you have to be able to say sincerely, "So what!"

Don't wear too many hats.

Focus on one thing at a time. Make policy decisions ahead of time about situations such as taking work home. Set time aside for your family, yourself, your golf game, etc. — for *having fun*. If you set your priorities in advance, you avoid the anxiety of making moment-to-moment decisions. These priorities don't have to be carved in stone, but they'll help you cope. *Also:* If you stick to your plans, you don't have to feel guilty because you're having fun and not working.



1987 IEEE MICROWAVE AND MILLIMETER-WAVE MONOLITHIC CIRCUITS SYMPOSIUM



Las Vegas, NV – June 8-9, 1987



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FIRST CALL FOR PAPERS

The 1987 IEEE Microwave and Millimeter-Wave Monolithic Circuits Symposium will be held in Las Vegas, Nevada on June 8 and June 9, 1987. This Symposium is held annually in conjunction with the IEEE MTT-S International Microwave Symposium.

Papers are solicited describing original work in the field of analog and related digital monolithic integrated circuits with applicability to the 1-300 GHz frequency range. The following subject areas concerned with design, fabrication and testing of microwave and millimeter-wave monolithic integrated circuits are particularly appropriate but other aspects of this technology will also be considered for the conference:

- Analog and Related Digital Integrated Circuits
- Solid-State Devices and Circuits
- Fabrication Technology and Yield
- Radiation Effects and Reliability
- Packaging and Testing
- Systems, Subsystems and Components
- Signal Control and Modulation
- Computer Aided Design Techniques
- Integrated Optoelectronic Circuits

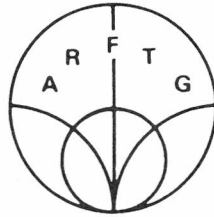
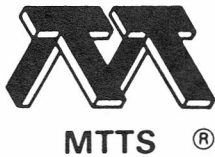
Authors are required to submit 5 copies of a 500-1000 word summary (not to exceed 4 pages of text, typed, double-spaced), with supporting illustrations, that clearly explains their contribution. In addition, 5 copies of an abstract of 30 to 50 words must be submitted with the complete mailing address of the author(s). Please do not submit the same material to both MTT-S and this symposium. The paper summary and abstract must be received on or before 12 December 1986 by:

Derry Hornbuckle
c/o LRW Associates
1218 Balfour Drive
Arnold, MD 21012
Telephone: (707) 577-3658

Authors are responsible for obtaining all required company and government clearances prior to submission of papers. Notice of acceptance or rejection will be mailed to authors by 9 February 1987. Authors of accepted papers will receive material and instructions for preparing photoready copies of papers to be printed in the Symposium Digest, copyright release forms, and presentation guidelines.

The authors are also encouraged to prepare expanded versions of papers presented at the Symposium to be considered for publication in a special section of the MTT-S and/or ED-S Transactions.

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AUTOMATIC RF TECHNIQUES GROUP ANNOUNCEMENT

ARFTG 28th Conference - Fall 1986

FIRST CALL FOR PAPERS

Saint Petersburg Beach, Fla.
December 4th and 5th, 1986

**CALL FOR
PAPERS**

The Automatic RF Techniques Group will hold their 28th Conference on December 4th and 5th, 1986 in Saint Petersburg Beach, Florida at the Don CeSar Beach Resort.

The theme for this meeting will be "Precision Microwave Measurements". Appropriate topics for presentation would be methods and techniques for making or improving the precision of microwave measurements, such as data analysis techniques, improvements in methods of calibration, improvements in connecting or interfacing DUTs to measurement systems, etc. In addition, methods to determine and verifying measurement precision would be appropriate. Papers are solicited on recent hardware and software developments on these topics as well as other areas involving computer-aided RF measurements and design. Manufacturers are encouraged to discuss and demonstrate new products developments for automated RF/microwave design and testing.

Technical presentations shall be informal twenty-five minute talks using viewgraph or 35-mm slide illustrations. Authors are requested to submit a one-page abstract and a 500 to 1,000 word summary with attachments containing illustrations, etc., providing sufficient technical content to enable proper evaluation and explaining the contribution's usefulness to the conference attendees. Please refer to "ARFTG Instructions to Authors" for further information. All accepted papers will be published in the post-conference digest. Two copies of the abstract and summary should be sent by September 28, 1986 to Dave Hopping, Technical Program Chairman.

Manufactures interested in exhibiting at the conference should contact the Exhibit Coordinator for information and an application & agreement form.

The ARFTG banquet will be held on December 4th, 1986.

Send papers to:

Dave Hopping
Hewlett Packard - 4LS-L
1400 Fountaingrove Parkway
Santa Rosa, CA 95401
(707) 577-4029

For exhibit applications contact:

Darlene Payette
Maury Microwave Corporation
8610 Helms Avenue
Cucamonga, CA 91730
(714) 987-4715 Ext. 45

For further information, contact the ARFTG Conference Chairman:

John Barr
Hewlett Packard - 4US-Q
1400 Fountaingrove Parkway
Santa Rosa, CA 95401
(707) 577-2350

2/86



THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS

INCORPORATED

1987 INTERNATIONAL RELIABILITY PHYSICS SYMPOSIUM

April 7 - April 9, 1987 • Town & Country Hotel • San Diego, California

CALL FOR PAPERS

The twenty-fifth Annual Symposium, co-sponsored by the IEEE Reliability and Electron Devices Societies, emphasizes device reliability as the dominating influence in the development of new VLSI technologies and circuit designs. With the awareness that today high reliability is the norm for VLSI, the 1987 Symposium will emphasize the role of design, processing, packaging and testing for building-in high reliability. Papers are especially solicited in this area; however, work in all areas of reliability physics will be included in the program.

Papers should deal with work on:

- Physics of Failure Mechanisms - Quantitative models and mechanisms of component failure.
 - Hot Electrons
 - Electromigration
 - Oxide Breakdown
 - Contact Degradation
 - Metallization Fatigue
 - Soft Errors
- Failure Analysis Techniques - Advanced or simplified, as they are applied to specific problems.
- Accelerated Testing and Screening - Emphasizing the physical mechanisms which validate testing and screening techniques.
 - Burn-in
 - Smart Oven Testing
 - Wafer Level Testing
 - Correlation with Observed Reliability in the Field
- Design and Process Control For Reliability - Relating specific design concepts and process controls to part reliability.
 - Latent Defects
 - Particle Control
 - Computer Aided Manufacturing
 - Statistical Process Control
 - Starting Material and Processing Material Controls
 - Margin Testing and DRAM Repair Criteria
 - Oxide and Metal Process Monitor and Reliability Testing
 - Design Rules for Improved Reliability

In the following or related areas:

- VLSI (Microprocessors, Memory, PLA, DRAM, Redundancy, and Repair, etc.) - MOS, Bipolar, CMOS, I²L, SOS
- Semiconductor/Insulator Interfaces, Contacts and Metallization
- Packaging, Bonding, Die Attach, Coatings and Encapsulation
- Hybrids (Materials, Processes and Components)
- Displays, Sensors, and Solar Cells
- Microwave, Optoelectronic, and SAW Devices
- GaAs Devices and Interface Effects on III-V Devices
- New Devices and Technologies
- Passive Components
- Attachment of Leadless Ceramic Chip Carriers and other Surface Mount Technologies
- Medical Electronics
- Automotive Electronics
- Low Temperature Operation

The deadline for submission of abstracts is October 10, 1986. Prospective authors are requested to notify the Technical Program Chairman before September 10, 1986 of their intention to submit an abstract and the topics to be discussed. Authors must submit a 50-word descriptive abstract and 300-500 word summary appropriate to describe a 20-minute paper. Authors are encouraged to obtain presentation releases prior to submission of summaries on October 10, 1986.

GaAs IC SYMPOSIUM

1986 IEEE GALLIUM ARSENIDE INTEGRATED CIRCUIT SYMPOSIUM
Sponsored by the IEEE Electron Devices Society
and cooperatively sponsored by the IEEE Microwave Theory and Techniques Society

The 1986 Gallium Arsenide Integrated Circuit Symposium will be held at Grenelefe, Florida (near Orlando), October 28-30, 1986. Papers are invited on topics related to Gallium Arsenide Integrated Circuits, including:

- Monolithic Linear and Power Integrated Circuits
- Monolithic Digital Integrated Circuits
- Electro-Optical Integrated Circuits
- Materials Considerations and Advances
- Processing Technology
- Manufacturing Science and Technology
- Computer Aided Design, Modeling, and Simulation of ICs
- Packaging, Interconnecting, and Testing
- Radiation Effects and Reliability
- Applications and Affordability
- Novel Devices for Integrated Circuits

MEETING OBJECTIVE: To accelerate the successful development of gallium arsenide and related III-V compound integrated circuits by providing a forum for the interchange of technical information relative to the design, fabrication, packaging testing, and manufacturing of such ICs. It is the intent of the GaAs IC Symposium to be responsive to both the current and future needs of the technical community it serves.

FOR ADDITIONAL INFORMATION CONTACT:

R. Allen Murphy
TECHNICAL PROGRAM CHAIRMAN
MIT Lincoln Laboratory
244 Wood St., Rm. E118E
Lexington, MA 02173
(617) 863-5500, ext. 7873

James A. Hutchby
SYMPOSIUM CHAIRMAN
Research Triangle Institute
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Research Triangle Park, NC 27709
(919) 541-5931

Richard Y. Koyama
TECHNICAL PROGRAM
VICE-CHAIRMAN
TriQuint Semiconductor
Tektronix Industrial Park
Group 600, P.O. Box 4935
Beaverton, OR 97075
(503) 627-6773



MASSACHUSETTS INSTITUTE OF TECHNOLOGY
INFRARED AND MILLIMETER WAVES
 Box 72, M.I.T. Branch
 Cambridge, MA 02139-0901

CALL FOR PAPERS

**THE 12TH INTERNATIONAL CONFERENCE ON INFRARED AND
 MILLIMETER WAVES
 December 14-18, 1987
 AMERICANA DUTCH RESORT HOTEL
 IN THE WALT DISNEY WORLD VILLAGE HOTEL PLAZA, FLORIDA
 (NEXT TO THE EPCOT CENTER AND MAGIC KINGDOM)**

PROGRAM

NETHERLANDS				
ROOM:	ROOM K	ROOM F	ROOM H	ROOM G
	MILLIMETER WAVES - PLASMA DIAG.		SUB MMW	FEL/GYROTRON
Mon AM	MMW Sources I	MMW Atmos. Phys.	SMM Devices	Free El. Laser I
Mon PM	MMW Sources II	MMW Spectroscopy	SMM Atmos. & Astr.	FEL II
Tue AM	MMW Systems	Plasma I	SMM Detectors	FEL III
Tue PM	MMW Detectors	Plasma II	Semiconductors	Gyrotron I
Wed AM	Mixers/Imaging	Plasma III	Lasers I	Gyrotron II
Wed PM	Guided Prop.	FIR Materials 1	Lasers II	Gyrotron III
Thr AM	Integ. Circuits	FIR Materials 2	Lasers III	Gyrotron IV
Thr PM	Guid. Prop. & I.C.		Spectroscopy I	Gyrotron V
Fri AM	MMW Devices		Spectroscopy II	Gyrotron VI

ABSTRACT DEADLINE: July 1, 1987 Authors of contributed papers are urged to submit their 35-40 word abstract to the Program Chairman before July 1st:

Kenneth J. Button
 M.I.T.
 Box 72, M.I.T. Branch
 Cambridge, MA 02139-0901 USA
 Tel: (617) 253-5561
 (617) 489-4353
 Telex - 92-1473

Late abstracts will be given full privileges. The Preliminary Program will be published and mailed in September. Late papers will be interpolated into the Final Program and published in the Digest of Technical Papers to be distributed at the meeting. The deadline for contributions (on camera-ready templates) to the Digest of Technical Papers is October 1, 1987. The Editor of the Digest is Richard J. Temkin, M.I.T. Fusion Center, Cambridge, MA.

There will be an exhibit of commercial instrumentation in Room A for two days. Exhibitors may write to K. J. Button.

Please return this form if you wish your name to remain on the mailing list.

SEND TO:
 Kenneth J. Button, M.I.T.
 Box 72, M.I.T. Branch
 Cambridge, MA 02139-0901 USA

NAME _____

ADDRESS _____

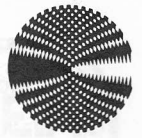
Registration at conference: \$125 (IEEE \$110)
 Proceedings, additional \$50

There will be no advance registration.



IEEE 1986

ULTRASONICS SYMPOSIUM



NOVEMBER 17-19, 1986

COLONIAL WILLIAMSBURG, WILLIAMSBURG, VA

Sponsored by The Ultrasonics, Ferroelectrics and Frequency Control Society

General Chairman

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Westinghouse DEC
P.O. Box 746, MS-70
Baltimore, MD 21203
(301) 765-4027

Technical Chairman

James G. Miller
Department of Physics
Washington University
St. Louis, MO 63130
(314) 889-6229

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(202) 767-3505

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NovaLink
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(301) 921-3646

Proceedings Editor

Bruce R. McAvoy
Westinghouse R&D Center
1310 Beulah Road
Pittsburgh, PA 15103
(412) 256-1470

Papers are solicited describing original work in the field of Sonics and Ultrasonics. Papers concerned with mechanical wave phenomena, including the topics suggested below, will be considered.

GROUP 1:

- ABS Arrays and Beam Steering
- BB Bioeffects and Biophysics
- HT Hyperthermia
- IS Inverse Scattering
- MU Medical Ultrasonics
- PF Piezoelectric and Ferroelectric Materials
- TC Tissue Characterization

GROUP 2:

- AE Acoustic Emission
- AM Acoustic Microscopy
- CU Consumer Ultrasonics
- DMC Defect and Material Characterization
- IU Industrial Ultrasonics
- NDE Nondestructive Evaluation
- PMC Process Monitoring and Control
- SEN Sensors

GROUP 3:

- AO Acousto-Optic Effects and Devices
- AOS Acousto-Optic Signal Processing
- BW Bulk Wave Effects and Devices
- MSW Magnetostatic Waves and Devices
- PA Physical Acoustics
- PAS Photoacoustics
- PM Porous Media
- TFB Thin Films (Bulk & Optical Devices)

GROUP 4:

- ACE Acousto-Electric Effects and Devices
- SFT SAW Filters and Transducers
- SMP SAW Materials and Propagation
- SRO SAW Resonators and Oscillators
- SSA SAW System Applications
- SSP SAW Signal Processing
- TFS Thin Films (Surface Wave Devices)



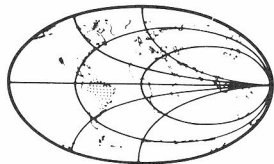
Williamsburg

STUDENT TRAVEL SUPPORT — Some limited travel assistance is available to support student attendance at the Symposium. Awards will be made on a competitive basis. Further information and applications can be obtained from: G.W. Farnell, Dept. of Electrical Engineering, McGill University, McConnell Engineering Bldg., 3480 University, Montreal, Quebec H3A 2A7, Canada. The deadline for applications will be August 1, 1986.

1987 INTERNATIONAL MICROWAVE SYMPOSIUM/BRAZIL

RIO PALACE HOTEL, RIO DE JANEIRO, JULY 27-30, 1987

"GATHERING THE WORLD THROUGH MICROWAVES"



CALL FOR PAPERS

The 2nd International Microwave Symposium/Brazil, organized by the Brazilian Microwave Society (SBMO) in cooperation with the IEE, IEEE MTT-S, IEEE AP-S, will be held on July 27-30, 1987 at the Rio Palace Hotel, Rio de Janeiro, Brazil.

It is intended to provide a major international forum for the exchange of information on research and development in the fields of microwaves, antennas and propagation, including millimeter waves and optics.

TOPICS COVERED

Papers are solicited describing original work on the following topics:

- Antennas and Arrays
- Microwave Radio Propagation and Radiometeorology
- Terrestrial and Satellite Communication Systems
- Microwave Active/Passive Devices and Components
- Millimeter Wave Components, Circuits and Systems
- Microwave Techniques in Radar, ECM, Remote Sensing and Radio Astronomy
- Microwave Measurements
- CAD/CAM
- Scientific, Biological, Medical and Industrial Applications of Microwaves
- Optical Communications
- Field and Network Theory

A selection of invited speakers will highlight important and developing areas.

PREPARATION OF PAPERS

The papers must be written in English and should not exceed six pages including text, figures, photographs, tables and references. The text should be typed single space on white bond paper measuring 21.5 x 28 cm (8 1/2 x 11 inches) on one side only. The title should be centered in capital letters 2.5 cm (one inch) from the top on the first page. The author's name, the affiliation and the address should start two lines below the title, and the text should start three lines below this, with an abstract (maximum 50 words), followed by the introduction and other sections. Left and right-hand margins should be 2.5 cm (one inch). Also, a 2.5 cm (one inch) margin should be left at top and bottom of all pages. Double space should be left between paragraphs. The digest will be produced directly from the originals of the accepted papers. Footnotes should not be used. Pages have to be numbered in pencil. Figures should be in black ink and clearly legible and photos must be glossy, black and white prints.

SUBMISSION OF PAPERS

Send the typed original and three copies of the paper together with the full address of the author(s) and the telephone or telex number to:

Prof. Alvaro Augusto A. de Salles
1987 INTERNATIONAL MICROWAVE SYMPOSIUM COMMITTEE
CETUC-PUC/RJ
Rua Marquês de São Vicente, 225 - Gávea - CEP: 22453
Rio de Janeiro - RJ - BRAZIL, telex nº 2131048

The papers will be assessed by the Symposium review board.

DEADLINE

The deadline for the receipt of the papers is **December 31, 1986**. Advanced submission is encouraged. Authors will be notified of acceptance of their papers by the end of February 1987.

* TECHNICAL PROGRAMME COMMITTEE

- Profs. Luiz Costa da Silva, Abelardo Podcameni and Alvaro Augusto de Salles (Center for Studies in Telecommunications - CETUC, PUC, Rio).
- Prof. Antonio R. Panicelli and Dr. Claudio Violato (Center for Research and Development - CPqD, TELEBRÁS, Campinas, S.P.).
- Profs. Attilio Giarola and Rui Fragassi Souza (University of Campinas, Campinas, S.P.).
- Profs. J. Kleber C. Pinto and Edmar Camargo (University of São Paulo, S. Paulo).
- Profs. Plínio Tissi (Institute for Space Research - INPE) and A. Faro Orlando (Air Force Technological Institute - ITA), São José dos Campos.
- Prof. Mauro S. Assis and Eng. Antonio Pereira Netto (Brazilian Telecommunications Company - EMBRATEL, Rio).
- Prof. José Rodolfo Souza (Military Institute of Engineering - IME, Rio).

* IEEE MTT-S INTERNACIONAL LIAISON

Dr. Richard A. Sparks (Raytheon, Bedford, Ma., U.S.A.).

* EXHIBITION COORDINATOR FOR U.S.A. COMPANIES

Dr. Howard Ellowitz (Microwave Journal).

GENERAL INFORMATION

● SYMPOSIUM LANGUAGE

The Symposium language will be English.

● TECHNICAL EXHIBITION / COCKTAIL

In conjunction with the Symposium a technical exhibition of telecommunication equipments will be organized. Exhibitors will offer a cocktail, for all participants, at the first evening of the Symposium.

● SYMPOSIUM PROGRAM

The Symposium Program will be available by March 87. If you want to receive the Symposium Program, please fill the appropriate box in the Registration Form.

● BRAZILIAN TOURS, SOCIAL AND COMPANIONS PROGRAMS

Social and companions programs as well as special tours in Brazil will be organized by the official tour operator of the Symposium.

● SYMPOSIUM DINNER

The Symposium dinner for the participants and accompanying persons will be held at the Rio Palace Hotel on Wednesday evening, July 29, 1987. The Symposium dinner fee is US 30.00. Participants are kindly requested to fill in the Registration Form for advance reservation.

● SYMPOSIUM KIT

Badges, cocktail tickets and Symposium proceedings, as well as further information must be picked up at the Registration Desk when you arrive at the Symposium.



JEDEC

Solid State Products Engineering Council

2001 Eye Street, NW
Washington D.C. 20006
(202) 457-4971



July 14, 1986

1986 GaAs RELIABILITY WORKSHOP

27 October 1986

at the

**GaAs INTEGRATED CIRCUITS SYMPOSIUM
GRENELEBE, FLORIDA**

SPONSORED BY JEDEC COMMITTEE JC-50 (GaAs)

CALL FOR PAPERS - DEADLINE: 1 SEPTEMBER 1986

A workshop on GaAs reliability will be held one day before the GaAs IC Symposium with the objective of bringing together researchers, manufacturers, and users of GaAs ICs. This is the first of what is intended to be an annual workshop sponsored by JC-50. Papers presenting new results and developments in all phases of GaAs reliability are solicited. Work in progress is acceptable. The topics of interest include:

- Failure Mechanisms
- Metallization Studies
- Electromigration
- Materials Defects
- Drift, Backgating
- ESD/EOS/Pulse Burnout
- Ionic Migration
- Reliability Modelling
- Thermal Analysis
- Accelerated Testing
- Radiation Effects
- MODFETs, Novel Devices
- Humidity Effects
- Hot Electron Effects

Paper Submission: Authors are asked to submit eight (8) copies of one-page abstracts for a 15-20 minute presentation to the Technical Program Chairman by 1 September 1986 for review by the Technical Program Committee. Accepted abstracts will be distributed to attendees at the workshop. Acceptance notices will be sent out by 1 October 1986.

MAIL ABSTRACTS TO: W. T. Anderson
Naval Research Laboratory
Code 6815
Washington, DC 20375

#41074

TWX (710) 822-0148 Telefax (202)-457-4985

NEW YORK CITY

NEW YORK

1987 IEEE International



Solid-State Circuits Conference

FEBRUARY

25, 26, 27, 1987

The IEEE International Solid-State Circuits Conference, the foremost global forum for the presentation of advances in solid-state circuits, celebrating its 34th year, will be held in New York City, February 25 - 27, 1987, under the sponsorship of the IEEE Solid-State Circuits Council, the IEEE New York Section, and the University of Pennsylvania.

Original Papers in the Following Areas are Solicited:

DIGITAL: design, fabrication, and testing of digital LSI and VLSI systems; fixed and reconfigurable logic arrays; architecture; microprocessors and coprocessors.

ANALOG: amplifiers, filters, correlators, comparators, reference circuits, phase-lock loops; A/D and D/A converters.

MEMORY: design, fabrication, and testing of static, dynamic, and nonvolatile memories; memory architecture; redundancy techniques; special-purpose memories.

SIGNAL PROCESSING: digital and analog signal processing, telecommunications circuits.

OTHER AREAS: CAD and simulation; design verification, test generation, modeling, optoelectronics, including image sensing, and displays; medical, consumer, automotive electronics and transducers.

Preparation of Summary and Abstract

Receipt Deadline: Friday, September 19, 1986

A 300-500 summary, required for review, must state clearly and be supported by: new results obtained and their significance, with circuit diagrams, performance curves and die photos, where applicable.

The foregoing represent principal criteria for paper selection. The most common causes of rejection are: lack of specific results, omission of operational circuits and their key functions, and prior publication.

It is important to remember that only text and illustrations that have not been disclosed in any form in US and overseas, prior to the conference, will be considered.

Additionally, a 35-50 word abstract is required for publication in an advance program, if the paper is accepted. The statement must be factual, and provide specific performance values. Marketing claims, such as new, advanced, novel, high performance, high speed, and optimized circuitry should be avoided. Abstracts may be edited without consultation to accommodate the program's format.

Contributors must submit 30 copies of both the abstract and the summary.

Each paper will be allowed 20 minutes for presentation.

Summaries and abstracts must be prepared in single-side, double-spaced typewritten form, with the surnames(s) and given names(s) of author(s), affiliation, complete return address and telephone contact on the first page, and the author(s) name(s) and title on each subsequent page. Author(s) of accepted papers will be asked to prepare an exclusive, illustrated final version for publication in the ISSCC DIGEST of TECHNICAL PAPERS, by November 26, 1986. On first page a FAX number should be included.

All authors* must forward by - the September 19, 1986 receipt deadline - both abstract and summary to:

Lewis Winner, 301 Almeria Ave., Coral Gables, FL 33134 (USA) . . . Tel: 305-446-8193/4

Late-News Papers

Receipt Deadline: Monday, December 1, 1986

A limited number of late-news papers (10-minute presentation), reflecting important new developments and results achieved after the regular paper deadline, will also be considered. Required are 20 copies of a 600-800 word explicit summary, with surnames(s)/given names(s), of author(s), affiliation, complete return address, phone/FAX numbers, plus pertinent illustrations for committee review. Submitted text will be adapted for publication in the DIGEST to meet its editorial format: one set of original diagrams and glossy print photos, suitable for 2/3 reduction, must be included for direct reproduction. The summaries and illustrations should be mailed to Lewis Winner.

*See reverse side of this announcement for detailed instructions to European/Asian authors

The 34th Conference Call-for-Papers . . . The 34th Conference Call-for-Papers

The 34th Conference Call-for-Papers . . . The 34th Conference Call-for-Papers

Overseas authors should follow the abstract/summary instructions on the reverse side of this call-for-papers and send 30 sets (abstract/ summary/illustrations) to Lewis Winner, 301 Almeria Avenue, Coral Gables, FL 33134 (USA) and 15 complete sets to the ISSCC87 European and Asian contacts noted below:

European: J. Danneels
Bell Telephone Mfg.
Francis Wellesplein 1
B-2018 Antwerpen, Belgium
Tel: 32-3-237-17-17

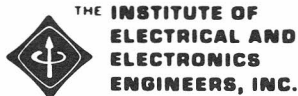
Asian: A. Morino
NEC VLSI CAD Eng. Div.
1753 Shimonumabe
Nakahara-Ku, Kawasaki
Kanagawa, 211 Japan
Tel: 044 (433) 1111/Ext. 5810

Overseas Paper Deadlines: Europe/Monday, Sept. 8, 1986 . . . Asia/Monday, Sept. 1, 1986

ISSCC 87 Executive Committee

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	<i>Public Relations/ Publications*:</i>	Lewis Winner Coral Gables, FL	

*Note to Editors: For further information, please contact
Lewis Winner, 301 Almeria Avenue, Coral Gables, FL 33134 . . . Tel: 305-446-8193/94



345 EAST 47TH STREET, NEW YORK, NY 10017

ISSCC 87 CALL FOR PAPERS
PLEASE CIRCULATE/POST ON BULLETIN BOARD

NEW YORK HILTON, NEW YORK, NY/FEB. 25-27, 1987



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