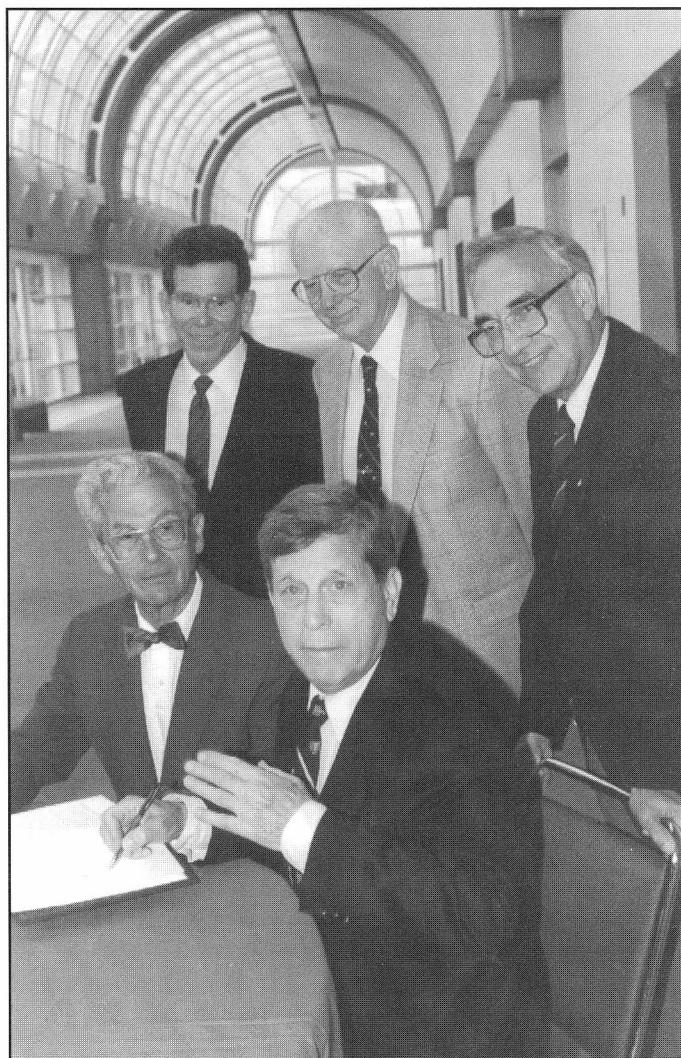


President Jim Crescenzi presents the Microwave Career Award to Dr. Yoshihiro Konishi.

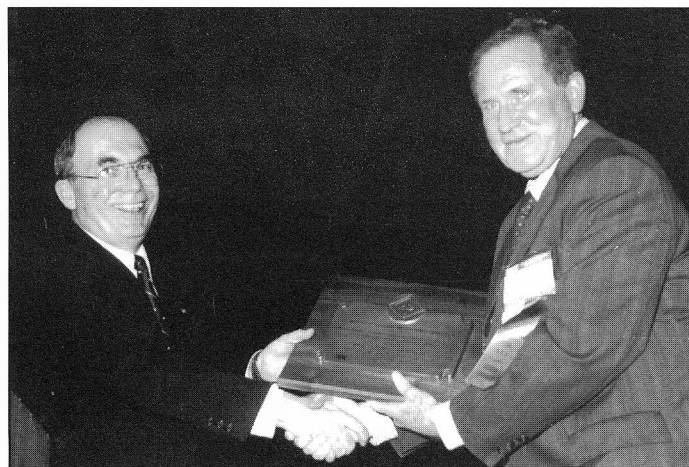
**MTT-S Award Recipients on page 3
(more in Winter Issue No. 139)**

**Long-Range Planning Committee Report,
page 17**

IEEE MTT-S Fellows, page 5



Seymour Cohn signs the black book as sponsor Nat Lipetz watches. The principal authors (L-R) were (standing) E. M. T. Jones, George L. Matthaei, and Leo Young.



John B. Horton accepts the Distinguished Service Award from Jim Crescenzi.

**See: MTT-S Honors MYJ
"The Black Book,"
page 7**

**and Return to Yesteryear—
Evolution of a Book, page 7**

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The MTT Newsletter staff is interested in obtaining feature articles dealing with current topics in the technical and professional areas of interest to MTT members. These articles should provide 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 should cover topics in a broad, general sense. Specific design techniques and applications will be covered in the papers appearing at the MTT Symposium 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 Eisenberg
25 Parson Way • Los Altos, CA 94022 • (415) 941-7426

Apology

The 1994 TPC Technical Program Invitation
by Dr. Bob Eisenhart was inadvertently omitted from
Issue No. 137, Spring 1994.

My sincere regrets.

—John Wassel, Editor

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From the Editor

It's always a pleasure to see someone get their due rewards. I had that distinct enjoyment this year in seeing John Horton receive the MTT-S Distinguished Service Award at the 1994 International Microwave Symposium annual Awards Banquet in San Diego. The Distinguished Service Award is presented to honor an individual who has given outstanding service over a period of years for the benefit and advancement of MTT-S. The program announcement was somewhat laconic as usual since we as engineers are expected to be reserved. It read "The 1994 honoree is John Horton of TRW who has served MTT-S and the IEEE for several years in various functions including President of the Society.

I think John's service record is legendary in terms of overall commitment to AdCom, symposia, the *Transactions*, various service committees, the *Newsletter*, setting up and helping to organize new conferences and ventures for MTT-S. Some of this I know because John, my supervisor at Texas Instruments in 1969, was the person who stimulated my interest in the MTT Society and was my sponsor in joining IEEE and MTT-S. I had an excellent introduction to the workings of the Society because John was so helpful in sharing his experiences and insights. This relationship has developed even more in later years even though he worked in different parts of the country. I turned quite frequently to John for his sage advice when I was chairman for the 1990 IMS held in Dallas. His encouragement and support have meant a great deal to me over the years. I'm most proud to have John as a friend.

Now John is a most modest and unassuming fellow who to my knowledge has never sought a spotlight for himself. He is easily embarrassed when complimented upon his achievements. In meetings, he stays in the background and speaks only when he has something worthwhile to contribute to the subject at hand. People always listen when he does respond because his observations and comments are so direct and pertinent. He is one of the mainstays for our Society.

You can be sure that serving on the Awards Committee is a very difficult and arduous job, particularly when our Society has so many qualified candidates for each award. It has to be heartwrenching to choose among so many outstanding people and hope that you don't slight some otherwise deserving candidate. I think the Awards Committee does an excellent job every year. I appreciate very much the honor and recognition bestowed upon our mutual friend and esteemed colleague, John Horton. Thanks for a job well done.

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About the Award Recipients



Yoshihiro Konishi

Career Award

Dr. Yoshihiro Konishi was born on September 24, 1928, in Nara, Japan. He received the B.Eng. and the Ph.D. degrees in engineering from Kyoto University in 1951 and 1961, respectively.

He joined Nippon Hoso Kyokai (NHK, Japan Broadcasting Corporation) in 1951 and began working at NHK Technical Research Laboratory in 1953. He performed research on microwave field theory, filters and ferrite components. He invented a mesh-type lumped-element circulator which is widely used in broadcasting and communications systems.

From 1962 to 1963 he was a visiting scholar at the Microwave Research Institute of the Polytechnic Institute of Brooklyn (now Polytechnic University of New York). His research included parametric amplifiers and low-noise receivers developed for satellite broadcasting.

He successfully developed a low-noise low-cost satellite receiver by using a planar circuit mounted in waveguide which he invented. Using this newly developed receiver, NHK and NASA entered into a joint venture for the development of a Satellite Earth Station. Dr. Konishi was the project leader.

After retiring as Director of NYK Technical Research Laboratories in 1983, he joined Uniden Corporation as Senior Executive Vice President. Dr. Konishi retired from Uniden Corporation in 1993, becoming a professor in the Department of Electrical Engineering in Tokyo Institute of Polytechnics. He remains as chief technical advisor to Uniden Corporation.

Dr. Konishi received the Medal with Purple Ribbon from the Japanese Emperor in 1982. He is also recipient of the award of the Minister of the Post Office (1978), the award of the Minister of the Patent Bureau (1977), and the award of the Minister of State for Science and Technology (1979).

He is a senior editor for Asia for the IEEE Society on Broadcast Technology, and a member of the editorial board of the *IEEE Transactions on Microwave Theory and Techniques*.



Michiyuki Uenohara

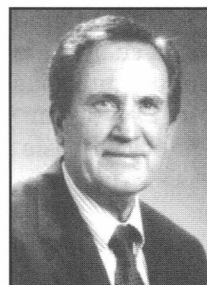
Pioneer Award

Dr. Michiyuki Uenohara received his B.S. degree from Nihon University in Tokyo and M.S. and Ph.D. degrees from Ohio State University, all in Electrical Engineering. Dr.

Uenohara is Executive Advisor of NEC Corporation in Tokyo, Japan. He also serves as Chairman of the NEC Research Institute in Princeton, New Jersey, and Chairman of the Board of Trustees at the NEC Research Institute for Advanced Management Systems in Tokyo. Before joining NEC, Dr. Uenohara worked at Bell Laboratories for ten years as MTS and supervisor. As General Manager of Central Research Laboratories at NEC he managed corporate R&D and was elected to the Board of Directors. After serving as Senior Executive Vice President and Director, he assumed his present position in 1989.



He is a Japanese member of the High Level Advisory Panel established pursuant to the US-Japan agreement on cooperation in science and technology and serves on various government councils, including the Higher Education Council of Ministry of Education, Science and Culture. He is an IEEE Fellow, a member of the Engineering Academy of Japan, a foreign associate of the National Academy of Engineering and the Swedish Royal Academy of Engineering Sciences. In 1992 he received the Blue Ribbon Medal from the Japanese government for his meritorious contributions on the advancement of microwave device technology.



John B. Horton

Distinguished Service Award

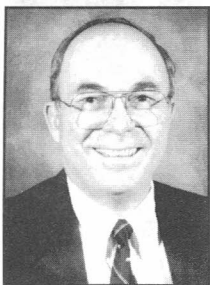
John B. Horton received the BEE degree from the George Washington University (1956) and the MSEE degree from the University of Pennsylvania (1964). He is a licensed Professional Engineer in New Jersey. He is a Project Manager, System Engineering, in TRW's System and Electronics Group, Redondo Beach, California. He is currently on special assignment for new business in satellite communications systems.

John has had a long association with IEEE, beginning as a Student Member in 1955. He is a Fellow of IEEE and a member of the MTT, AES, ED and Com Societies. He began his affiliation with the Microwave Theory and Techniques Society as a member of the Steering Committee for the 1965 International Microwave Symposium. Since 1968 he has served on most of the annual MTT symposia, including Technical Program Committee Chairman for 1969, Special Sessions Chairman in 1969, MMWMC and NTC Liaison for 1994, and organizer/chairman of numerous focused sessions, workshops and panels. He is currently a member of the Microwave Systems Technical Committee.

John's AdCom service began with his election to AdCom in 1969. He served for ten years: Vice President in 1972,

(continued on next page)

President's Message



E. James Crescenzi, Jr.

I am writing this article shortly after returning from the 1994 International Microwave Symposium in San Diego. As many of you know, the event was very successful and attendance was on the upswing. Many of the participants sensed a new mood of optimism in our industry. This was undoubtedly aided by the superb organizational efforts of the San Diego IMS Steering Committee and of the Technical Program Committee. I couldn't help but observe that the basic organization of this event has served the Society well for many years. The strong response to our annual Call for Papers initiates the process. Prospective authors know that a very serious effort will be made to evaluate all papers in a professional and objective manner. The Technical Program Committee (which includes numerous paper evaluation subcommittees) has expanded over the years to almost 200, and it has been receptive to "new blood" and strong transnational participation. Also, each TPC is locally managed and has a mandate to conduct judicious experimentation with their particular program organization, in an effort to improve upon previous symposia. Key contributors to the tradition of success for the International Microwave Symposium include:

- A relatively open organization with fresh leadership each year, which is receptive to new ideas, yet which also derives continuity from traditional practices.
- An accepted process of open paper solicitation and objective paper evaluation.
- Strong industry support including the outstanding exhibits.
- Operational discipline that keeps registration fees modest, and the benefits high for those who attend the symposium.
- A fine tradition of generous volunteer support.

There is a reasonable parallel between these symposia elements and our overall Society objectives. That is, to maintain our focus on technical content, timeliness, and relevance of material to our membership; and to structure Society activities to facilitate participation by all of our diverse membership.

Upon taking office, I asked the AdCom to accept as an overriding objective for the Society:

To provide such outstanding services and products that microwave technologists will consider membership and participation in the MTT-Society to be essential ele-

ments of their professional lives. Strive to anticipate the professional needs of future generations of microwave engineers.

Returning with renewed enthusiasm from the 1994 International Microwave Symposium, it is appropriate to ask: "How are we doing?" What follows is a short status report.

Financially, the Society is exceptionally strong. Our so-called "net worth" is at an all time high (about \$1.6 million, or 80% of annual operating expenses). Achieving the surpluses necessary to form reserves on the order of one year's operating expenses has been a high priority

(continued on page 41)

About the Award Recipients

(continued from previous page)

President in 1973 and was on most of the operating committees, including Chairman of Chapter Activities, Chairman of Technical Committees, Chairman of Awards Committee, and representative to the Solid State Circuits Conference, MILCOM, ICC and other conferences co-sponsored by MTT-S. He is currently on the MTT-S Budget Committee, AdCom President's Advisory Committee, and is the MTT-S representative and Co-Chairman of the 1994 National Telesystems Conference.

Several other MTT-S activities John has completed or is currently involved in include: Editor of two special issues of the *MTT Transactions* (1980 to present), and the *MGWL* (1990 to present). He was a member of the 1974 IEEE Delegation to the USSR Popov Congress and is currently the AdCom Liaison for the UK/RI MTT/AP/ED Chapter. He has 21 publications and has made 23 presentations at Chapter and Section meetings.

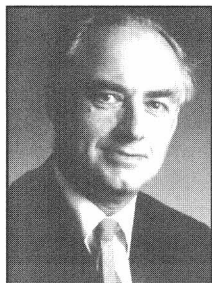
Student Paper Award Winners



L-R: Peter Liao; Steven Gearhart; Rhonda Drayton.

IEEE MTT-S Fellows

The Following New Fellows Received Their Certificates of Recognition at the 1994 IMS:



Colin S. Aitchison

For contributions to the design of microwave active circuits.



Yalcin Ayasli

For contributions to the design and development of wide band gallium arsenide (GaAs) monolithic microwave integrated circuits (MMICs).



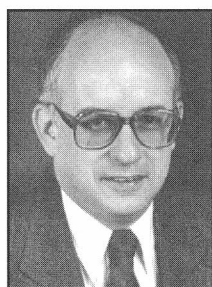
Tibor Berceli

For contributions in the fields of microwave photonics and nonlinear microwave circuits.



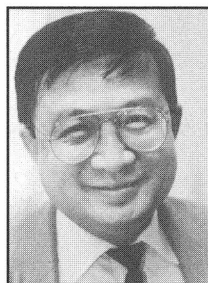
Jitendra Goel

For contributions to the development of microwave and millimeter-wave high-power components.



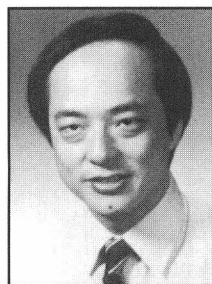
Ronald J. Gutmann

For contributions in microwave semiconductor technology.



Charles C. Huang

For engineering contributions and technical leadership in the development of high-volume GaAs MMICs for commercial applications.



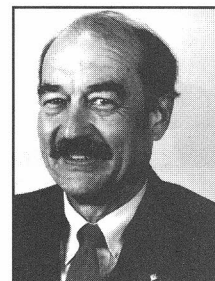
James C. Hwang

For contributions to the development of molecular beam epitaxy manufacturing and heterostructure devices and materials.



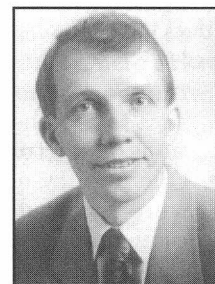
Robert W. McMillan

For development of phase and frequency control techniques for millimeter-wave electromagnetic sources.



Tom Y. Otoshi

For contributions to microwave measurement techniques for deep space communications and radio science.



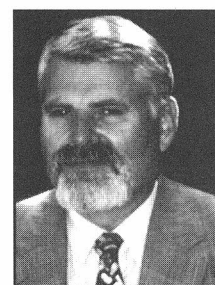
Antti V. Räisänen

For contributions to and leadership in millimeter-wave receiver technology.



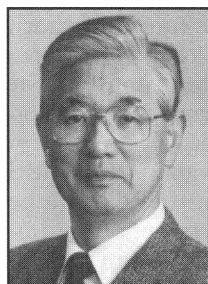
Vittorio Rizzoli

For contributions to the simulation and design of nonlinear microwave integrated circuits.



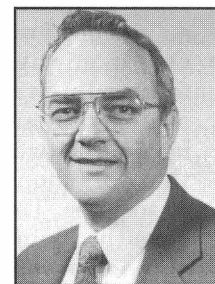
Peter H. Russer

For fundamental contributions to noise analysis and low-noise optimization of linear electronic circuits with general topology.



Hiroshi Shigesawa

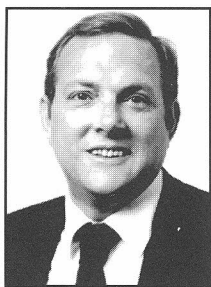
For contributions to basic guided-wave effects and structures at millimeter and submillimeter wavelengths.



Robert J. Weber

For contributions to microwave solid-state circuit design applied to high-power sources.

MTT Society Ombudsman



Ed Niehenke

As your Ombudsman, I have received ten inquiries from MTT-S members since the last reporting in the Spring 1994 *MTT-S Newsletter*. Five inquiries were from the U.S., while the others were from the Republic of China, India, Israel, Spain and Switzerland. A summary of the inquiries is listed below:

- Three inquiries needing MTT-S Transactions issues which were not received. One member requested the quality of packaging be improved for both the MTT-S Microwave and Guided Wave Letters and Transactions so that they can survive the worst mailing conditions. He also requested name and address to be printed on the journal cover. Action taken: Missing issues were sent to members. Packaging requests sent to Publications Department.
- One inquiry needing MTT-S Transactions issues that were received but missing from personal library. All requested issues were older than 1 year. Action taken: IEEE does not keep issues older than 1 year, but will provide the issues on microfiche film. Informed member of this.
- One inquiry needing microwave sales in Oregon State, Washington State and British Columbia Area. Action taken: IEEE does not keep this information. Requested member contact various exhibitors at the exhibit floor of the 1994 International Microwave Symposium (IMS).
- One inquiry relating to a manuscript presented for the AP Transactions a year ago and has not heard results of reviews. Action taken: Contacted AP editor as did member. Reviews of paper got lost in Christmas mail. Reviews of acceptance with recommended changes sent to member with future priority service.
- Two inquiries regarding paid 1994 IEEE and MTT-S dues. Have not received journals and were notified by IEEE that their membership has expired. Action taken: One member is sending me a copy of his cancelled check to submit to IEEE. Requested other member inform me of his method of payment. Will submit to IEEE for reinstatement when I receive this information. All 1994 subscribed journals will also be mailed.
- One inquiry regarding member who paid 1994 IMS fees and was unable to attend. Requested digests be sent to him and also the names and telephone numbers of the two workshop organizers, so he can receive the workshop notes. Action taken: Contacted LRW Associates. The digests were already mailed to him. I gave the member the names and telephone numbers of the two workshop organizers so he can request the

workshop notes from them.

- One member wanted to know the requirements for IEEE lifetime member and requested information as to his qualification. Action taken: Effective December 31, 1993, the new policy for life member is for the member to be at least 64 years of age and be a member of IEEE for 36 years. The old policy was for your age and years of membership to add up to 100. Lifetime membership entitles members to free IEEE dues as well as free membership in the Societies of interest providing the member has been a member of that Society for 5 consecutive years and is presently a member. The lifetime member pays for the cost of the requested publications. I informed the member of this policy and the fact that he is eligible for lifetime member starting in 1995.

Please feel free to contact me by letter or telephone concerning any complaint you may have or any assistance you may need in obtaining membership services from IEEE and MTT-S.

Ed Niehenke

Westinghouse Electric Corporation

P.O. Box 746, MS-75

Baltimore, MD 21203

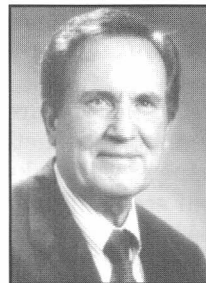
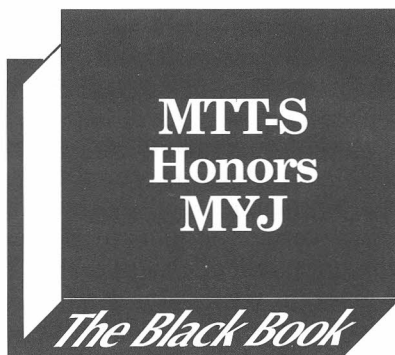
(410) 765-4573

(410) 993-7432 Fax

At the IMS:



Good friends, Ayre Rosen and Stewart Perlman.



by John Horton
Honorary Session Organizer

On May 24, 1994, during Microwave Week in San Diego, the Microwave Theory and Techniques Society honored the now classic book, *Microwave Filters, Impedance-Matching Networks, and Coupling Structures*, by George L. Matthaei, Leo Young, and Edward M. T. Jones, for outstanding contribution to the Society and the microwave field. A special Honorary Session was held on Tuesday afternoon, May 24, to recognize and honor the authors and its major contributors who conceived, wrote and published the book. The idea of the book originated with Nat Lipetz, at the time employed at the U.S. Army Research Laboratories at Fort Monmouth, NJ. The project was started at Stanford Research Laboratory (SRI) under the leadership of Seymour Cohn and was later taken over by George Matthaei. The staff of SRI completed the book under George's direction and the book was published in 1964, with G. L. Matthaei, L. Young and E. M. T. Jones as

principal authors. Special recognition is given in the foreword to Nat Lipetz and the Army Research Laboratory for initiating and sponsoring the project that resulted in the book, and to Seymour Cohn for starting the project and contributing many of the papers that were the basis for the book.

The book has acquired many aliases over its 30 years of use in the industry, the "black book," the "bible," and "MYJ," to cite a few. Bob Wenzel's Keynote Address highlights the history of the book, and contributions the book has provided microwave designers. The text of Bob's talk is given below. Other speakers were: Don Parker, Ted Saad, Bud Cristal, Ralph Levy, Clark Bell, and Jerry Fiedziuszko. Over 250 participated in the session. The session was preceded by a luncheon, where a special 30th Anniversary copy of the book was autographed by the authors and cited contributors, Nat Lipetz and Seymour Cohn. The book will be a permanent fixture in the MTT-S Historical Exhibit.

Return to Yesteryear— Evolution of a Book



by Bob Wenzel
Wenzel/Erlinger Associates Inc.

The year is somewhere between 1956 and 1964. People looked about the same as they do today—with the exception of a special group that could be identified by the now antique computing device that others not so privileged thought was permanently attached to their anatomy. Of course, the device I'm talking about is the slide rule.

From our present viewpoint, it's hard to believe that the entire engineering profession depended on hand calculations and a simple mechanical computing device

with two moving parts for essentially all calculations.

These computational limitations forced researchers and practicing engineers to seek clever and simple solutions to difficult problems, and often gave them insights into problem solutions that some of our current approaches do not provide.

In the late 1950's and early 1960's, computers of limited capacity by today's standards were in existence. But in many, if not most, organizations their primary function was to perform such tasks as accounting or payroll, rather than engineering applications. Most engineers were insulated from direct contact with computers by programming experts, in most cases because the programming staff had physical control of the computer, and engineers for the most part had little or no programming capability. Hand calculators had not yet appeared, and the slide rule was KING.

Let us return to those days of yesteryear. The book (I'll call it MYJ after the author's initials) did not appear out of the blue in 1964. Besides new material and reference material, it contained a compilation of work that was carried out at SRI (Stanford Research Institute) over the period of the previous 6-7 years, from 1956 through 1963. As we might say today, much of the content of the book had been "leaked" to the microwave

community by means of contractual reports, conference presentations, and publication in the technical literature, particularly in the MTT Transactions.

Consider, if you will, the year to be 1956, and you are faced with a practical microwave filter or passive network design problem. There are a few papers and books that may allow you to gauge the general scope of your problem, but little direct design information that would allow you to obtain a practical design.

In the next 6-7 years all that would change. In 1956, Jones and Bolljhan published their paper on parallel coupled line sections, and put the description of these important elements on a firm analytical footing. In 1957 and 1958 Seymour Cohn's papers on direct coupled filters, dissipation loss in filters, and parallel-coupled filters suddenly clarified and presented a comprehensive, understandable, and practical method of design for several types of microwave filter forms. The design approach was based on known lowpass prototype element values and the impedance inverter concept. It is true that the approach was approximate, and best suited to narrow or moderate bandwidth applications, but its simplicity, or perhaps a better word would be elegance, was that the approach was understandable and usable by even the non-specialist. One could, using hand calculations and a slide rule, design a microwave filter with assurance that the resulting device would work!

In the next several years, George Matthaei would expand the lowpass prototype inverter approach to handle designs of increased bandwidth with ever increasing accuracy. George developed equations for the design of interdigital and combline bandpass filters, and for many other filter forms. All such designs could be carried out by the non-specialist using nothing more than a pencil, paper, and a slide rule in a relatively small amount of time.

Leo Young adopted a slightly different viewpoint and showed us how to design very broadband devices based on the quarter-wave transformer prototype. His approaches were also useful for solving a wide range of directional coupler and high power filter problems and would ultimately lead to solution of the multisection broadband directional coupler problem.

The book not only contains solutions to filter and coupler problems, but also to the "nuts" and "bolts" type problems that are so essential to practical circuit realization. For example, realization of George Matthaei's interdigital and combline filters with rectangular bar geometries required solution of the static field problem for coupled rectangular bars. Bill Getsinger's solution, presented in a few graphs, is as valuable and widely used today as it was 32 years ago when it first appeared. Bud Cristal would solve a similar problem for round rod arrays that would just miss being included in the book.

Some of the problem solutions presented in MYJ required use of the digital computer. I wonder if the same problems were to be solved today if the results would be presented in such a direct and useful fashion. It's as though our dependence on the computer has hindered

our ability to present results in a simple and useful form. The MYJ book does not suffer from this malady and that is one of the reasons for its continued usage to the present day.

Compare the MYJ approach to current trends in publications. In MYJ a problem is stated and a solution is given that can be implemented by the average knowledgeable reader in a modest amount of time.

In many current publications a problem is stated and a solution is given in terms of a mathematical outline that can be implemented with a computer program if the reader is a specialist and is willing to invest the weeks or months of time required to implement the solution. Quite a difference!

When the book was published in 1964, the contributions of the authors and other contributors had literally taken us from the dark ages and into the modern computer era, in the short period of but 6-8 years. And all of the countless design solutions could be carried out by the average knowledgeable reader in a reasonable amount of time. Quite a remarkable accomplishment!

There was another important ingredient that was needed to make publication of the book possible. Someone had to supply the funds to support the work, and to provide direction. It has been said that about all governments can sometimes do well is collect taxes and fight wars. For the case of the MYJ book we can add a third attribute. Much of the work presented in the book was supported by the U.S. Army Research Laboratory at Fort Monmouth, NJ, under the direction of Nat Lipetz, with significant contributions and support from John Agrios and Bill Datillo. I do not know the exact dollar figures, but by any standard, the money expended to support the work described in MYJ is certainly one of the greatest bargains the taxpayer has ever received. The return on investment was and continues to be phenomenal. A significant portion of our microwave industry was nourished and maintained by the steady flow of technical output supported by the Fort Monmouth Group. The group not only supported the work, but encouraged publication. They insisted that the publications be as clear and forthright as was possible, and of practical value not only to the specialist, but to the average non-specialist as well. That they were successful at achieving this goal goes without saying. The contributions of the SRI and Fort Monmouth groups might be summarized by paraphrasing a famous quotation—"Never was so much owed by so many to so few," and I might add, "at such a reasonable cost."

The other necessary ingredient that led to the MYJ publication was the technical talent required to do the work. Although they were not all together at SRI for the entire period from 1956 to 1964, consider being able to introduce the following people as some of the members of your technical staff: Seymour Cohn, George Matthaei, Leo Young, Ted Jones, John Bolljahn, Bill Getsinger, Bernie Shiffman, Bud Cristal . . .—the list goes on and on. There were other stars and other teams at other facilities, but none outshone the SRI team. The incred-

ible advances made by this talented group in a relatively short period of time are something that we have not seen since, and are unlikely to see again.

We are privileged to have with us today the authors George Matthaei, Leo Young, and Ted Jones, along with contributors Seymour Cohn and Bud Cristal, and representing the Fort Monmouth organization that supported much of the work and publication of the book, Nat Lipetz. We all owe them a debt of gratitude for their outstanding contributions to our profession and industry, and I think it fitting that we give them a hearty round of applause.

On a personal note, I began my career in microwave networks in 1962, and adopted a somewhat different viewpoint than that of the SRI team. Being young and self-confident, I initially tended to discount the value of other approaches and viewpoints. I must admit that after reading and studying the SRI group's publications over that first year or two, I was amazed at how much they had learned in such a short period of time! I also fondly remember attending my first MTT Symposium in 1963, and having the opportunity to meet and discuss network topics with many of the SRI team members. Their friendship, enthusiasm, and openness to a young and inexperienced beginner is something that I'll never forget. I've known most of the people we are honoring today for more than 30 years, and my admiration for their work and appreciation of their giving nature grows with every passing year.

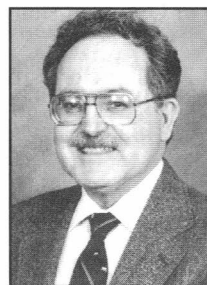
Before I turn the program over to our authors, contributors, and other speakers, I'd like to leave you with one final thought. If you work in the area of filters, couplers, and matching networks, and you were told that all but one of your reference books and publications would be taken from you, I believe that everyone in that situation would choose to keep their copy of MYJ, as it contains the essential information required to carry on. Perhaps the greatest tribute to the book is the fact that we all know it to be the preeminent publication in our field.

Text of Bob Wenzel's Keynote Address at the MYJ Honorary Session.



John Horton, Don Parker, and Bob Eisenhart at MYJ Luncheon.

Workshops, Panels and Special Sessions at the 1994 International Microwave Symposium



*by Mario A. Maury, Jr.
Special Sessions Chairman*

The Workshops, Panels and Special Sessions at the 1994 International Microwave Symposium in San Diego, California, were a great success. They were well attended and several innovative and new features were introduced this year.

There was a total of thirty-two (32) workshops, panels and special sessions during Microwave Week drawing a total attendance of 2,433 persons (this number is for workshops and panels only, no actual count is available for the focus or honorary sessions). For the sake of brevity, we have condensed the titles, etc. of these events; for complete details, refer to the 1994 IMS Program for titles, abstracts, organizers, speakers/panelists, etc. The following summarize the attendance for these events; the number in parenthesis is the registration attendance (more people attended than this in many cases, however, unless they registered, we don't have a count).

Sunday Workshop

- WSFA—Wireless Communications: I—System Concepts and Applications; II—MMIC Circuits and Components (311)

WOW! This is the first time a workshop was held on a Sunday and it set a record for attendance; it turned out to be a mini-conference in itself. This event was held in conjunction with MMWMC and it was extremely successful. We strongly recommend that Sunday workshops be held in future symposiums with two provisions: 1) it must have a strong (HOT!) topic, and 2) it has a direct tie in with the MMWMC Symposium.

Monday Workshops

- Engineering Applications of Electromagnetic Field Solvers (109)
- Ultra Low Noise Microwave Sources—Part II (46)
- Measurement of Noise in Amplifiers (57)
- High Power Microwave Processing of Materials (32)
- CAD Design of Superconducting Microwave Components (69)
- Accuracy in On-Wafer Measurements (67)

- Lightsats: Microwave Technology Requirements and Opportunities (41)
- High Power Superconducting Microwave Technology (93)
- CAD of Microwave Systems (67)

Friday Workshops

- WFFA—Circuit Design and Modeling of Quasi-optical Circuits and Systems (84)
- WFFB—Millimeter-wave Technology Applications in Automobiles (78)
- WFFC—Interconnect and Packaging Technologies and Issues (102)
- WFFD—R.F. Signal Processing MMIC's for Commercial Communications Systems (85)
- WFHE—Filters for Mobile Communications Network (79)
- WFHF—Optically-Fed Wireless Communications (45)
- WFHG—Optically Generated Tera-Hertz Electrical Pulses (16)

Workshop Notes

This was one of the major innovations this year—where the workshop notes were preprinted in bound volumes and provided to the registered attendees. All attendees thought this was a great idea—as a matter of fact, many people that did not register wanted copies. Of the seventeen (17) workshops held, only one did not have its workshop notes ready for the symposium.

We feel this method of providing workshop notes should be standardized for all future symposiums and also that they be available for separate purchase on the registration form for those that can't attend and want copies (for a fee).

Panel and Rump Sessions

There were a total of eight (8) Panel and Rump Sessions during Microwave Week. They are summarized below:

- PMON—Can Millimeter-wave Products be Used for Dual Use? (140)
- PTUA—Power MMICS for Commercial Applications (262)
- PTUB—Design and Producibility of Ferrite Components (56)
- PWEC—Microwave & Millimeter-wave IC Interconnect Technology (182)
- PWED—Circuit Design with Optimization-Driven Electromagnetic Simulators (101)
- PTHE—Low Noise Amplifier Linearity (161)
- PTHF—Software Law From An Engineers Perspective (28)
- RTUG—Microwave After the Cold War (RUMP-Evening panel) (122)

Focused and Honorary Sessions

There were a total of seven (7) of these sessions during Microwave Week. They are not listed here because there

is no statistical data available for attendance. They were well attended as sessions for "hot" topics normally are, particularly the honorary session on the "30th Anniversary—Microwave Filters, Impedance Matching Networks and Coupling Structures"—the "Black Book" of the microwave industry where its authors were honored (richly deserved). Refer to the 1994 IMS Program for complete details on these sessions and the coverage by John Horton and Bob Wenzel in this *Newsletter*.

A Large Measure of Thanks

A lot of people worked very hard to make the Workshops, Panels and Special Sessions successful at the Symposium.

The following members of the 1994 IMS Special Sessions Committee deserve a lot of credit for how smoothly their events ran:

- Gary R. Simpson, Maury Microwave Corp., Workshops—Monday
- Rick Sturdivant, Hughes Aircraft Co., Workshops—Sunday & Friday
- Michael Saad, Andrew Corp., Panel & Rump Sessions

The Local Arrangements Committee was a tremendous help in making room arrangements, setting up the meal functions and putting out last minute fires. Dave Rubin (Chairman), Don Harris and Bob Welch, etc. did an outstanding job.

The people that really deserve the most thanks are the organizers, speakers and panelists too numerous to mention that brought such an excellent and wide ranging variety of topics to the attendees. Please refer to the 1994 IMS Program for the names of these individuals.

Special thanks is also due John Horton for being a strong proponent of the very successful Sunday Workshop (he also helped with on site registration along with Rick and others, since formal registration had not opened yet) and for all his comments and suggestions.

Last, but not least and certainly the most important, a great measure of thanks to all the attendees who by their attendance made our program successful. I trust this was a meaningful and rewarding experience for all of you.

Looking Forward

If you are planning to submit a Workshop or Panel for 1995, you may want to scrutinize the attendance figures to see what topics had the greatest appeal. Also, we strongly recommend that all proposals be approved by the Technical Committees before they are submitted—this caused several delays this year that could have been avoided. Jim Wiltse, next year's Special Sessions Chairman, will probably appreciate this. All in all, it went well; it was a lot of work, but worth it!

Now it's over and we are looking forward to Orlando in 1995.

The 1994 IEEE MTT-S International Microwave Symposium



Chairman Don Parker at the podium for the IMS Awards Banquet.

We had a great time planning and sponsoring the 1994 International Microwave Symposium in San Diego, California. One always has concern that everything will happen as planned and that the people will come. We are happy to report that all aspects of the symposium exceeded our expectations. Everyone who provided feedback was very positive about their experience. The technical sessions were excellent and well attended with 1848 registered—up from the previous two years. The workshops and panel sessions were very popular. Over 300 registered for the Sunday



IMS Plenary Session (L-R): Ralph Levy, Andrew Viterbi, Hal Sobol, President Jim Crescenzi, Don Parker, Bob Eisenhart.

workshop on Wireless Communications alone, and over 1000 each registered for the workshops and the panels. There were 438 exhibitor booths and an additional 40 spaces for the Historical Exhibit, university booths, and an exhibit by the Navy. In total there were over 7300 individuals at the symposium and exhibits.

The technical program was excellent and reflected the changes in the industry as it shifts from defense oriented products to more commercial applications and products. There were 294 papers presented in the seated sessions, and 130 in the open forum sessions. The plenary session was attended by over 1000. We were fortunate to have Dr. Andrew Viterbi of Qualcomm and Dr. Harold Sobol of the University of Texas in Arlington discuss the technologies associated with the personal communication revolution at the plenary session. They helped set the tone for the symposium and the microwave industry's thrust into the commercial field. Despite the slowdown

in defense, the interest in microwaves is still very high; at least, it was during Microwave Week in San Diego.

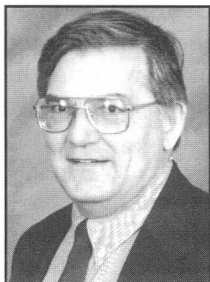
A special part of the symposium was the focus session organized by John Horton honoring the authors of the book *Microwave Filters, Impedance Matching Networks, and Coupling Structures*. The authors, George Matthaei, Leo Young, and E. M. T. Jones were present and related their early experiences in research and in writing the book. Nat Lipetz, the Army sponsor of the book, was also present and described his role in having the book written and published. Others who spoke were Robert Wenzel, Jerry Fiedziuszko, E. G. "Bud" Cristal, Ralph Levy, Clark Bell, Ted Saad, and Seymour Cohn. Bud Cristal had worked with the authors at Stanford Research Institute and carried on research after the book was published. Seymour Cohn started much of the early work reported in the book. Ralph Levy described how the book had many of the attributes of a human with a personality of its own. Robert Wenzel described the importance of the book to the microwave industry and placed the authors' contribution in the proper historical perspective. Jerry Fiedziuszko related his experiences in using the book and showed a picture of the three copies he has used. The first two were worn out and he pleaded with the publishers to issue a version that is more robust. The three authors autographed a special copy of their book which was placed in the Microwave Historical Museum for display at future symposia. Nat Lipetz and Seymour Cohn also signed the book on the acknowledgment page.

The San Diego convention center proved to be an ideal facility with its spacious rooms and their close proximity to one another. The openness and light and airy atmosphere of the center added to one's sense of enjoyment. It takes the efforts of many dedicated people to produce the IMS each year. I am pleased with the 1994 Steering Committee and the results of their long hours of hard work. It is especially gratifying in view that all were volunteers and gave so freely of their time and energy.

The Awards Banquet held Wednesday night was very enjoyable. In addition to the Society's major awards, fourteen IEEE Fellows received their awards. Three student paper award recipients were recognized as were three MTT-S Microwave Fellowships. It was wonderful to be able to honor those who have distinguished themselves and enhanced the prestige of the microwave profession. I personally was touched by the response of each award recipient. Each was grateful for the opportunities the microwave profession has provided him. The evening was topped off with an exciting show by Chuck Jones, a superb illusionist. Many are still puzzled by his magic disembodiment, levitating, and making disappear his lovely assistants. Like microwaves, to those not in the profession, it all appears to be done with "smoke and mirrors."

We had a great symposium and a wonderful time. On behalf of the 1994 steering committee, thank you for coming; it was a pleasure for us. We'll see you in San Diego next century.

1994 MTT-S International Microwave Symposium Technical Program Review



by Bob Eisenhart
Technical Program Chairman

During the last week of May, the 1994 International Microwave Symposium was held in San Diego, California. By all accounts it was very successful, contributed to in part by both the great location and the excellent technical program. The location focused on the San Diego Convention Center which offered great meeting rooms, unlimited exhibit space and attractive surroundings by the San Diego Harbor. The Technical Program was the result of sorting and sifting 426 papers out of 725 submitted, producing a program of record size. There were 58 sessions, five in parallel on all three days (Tuesday through Thursday) of the Symposium with exception only during the Plenary Session. The Plenary on Tuesday morning featured two renowned speakers, Dr. Andrew Viterbi and Prof. Hal Sobol. There were six special sessions integrated into the program, each with invited speakers. In addition there were 17 workshops, one on Sunday with the rest on Monday and Friday, and six panel sessions, two each on the three mid-week days during the lunch break.

A separate competition for student papers was held on Tuesday evening with all participants provided tickets to the Awards Banquet on Wednesday. The winners of 1st, 2nd, and 3rd places, respectively, were Rhonda Drayton, University of Michigan; Steven Gearhart, University of Michigan; and Peter Liao, University of California at Santa Barbara. They received their prizes at the Awards Banquet.

Recognition is being made this year for quality presentations in a "Technical Program Chairman's Honor Roll." A presentation rating procedure was established and performed by the members of the Technical Program Committee during the Symposium. The criteria focused on the **presentation** rather than the technical content and recognition was not limited to one or two speakers per session. All presenters were notified of the procedure and criteria, hopefully motivating them to put in that little extra effort. It is felt that this was very successful since there were many comments by registrants who specifically pointed out the overall level of presentation was greatly improved over past years. This high quality was also evident in the rating scores re-

ceived. In a rating system of 0 to 20 where 12 was defined as an average *presentation*, the average *rating* received was 14. The threshold for placement on the Honor Roll was for all scores greater than 14, and resulted in 153 presenters being recognized. When duplicate speakers and papers not receiving scores are removed, this represents approximately 50% of the rated papers. The Honor Roll will be listed in the Special IMS December *MTT-S Transactions* issue and these presenters will receive a Certificate of Recognition. Unfortunately, out of the 426 papers, 97 did not receive ratings and therefore could not be considered for recognition.

Aside from the Presentation Recognition, *all* presenters of contributed papers received a Symposium Medalion for their part in the Symposium.

Thanks again to all involved in the Technical Program, and particularly those on the Technical Program Committee who took the time to provide reviews of the presentations. The results easily justified our efforts.

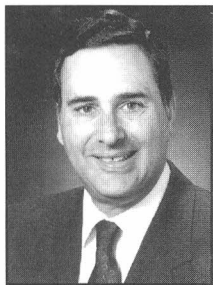


L-R: Nancy and Bob Eisenhart and Roger Sudbury at the IMS.



IMS logo as displayed outside San Diego Convention Center.

Budget Committee Report



by Eliot D. Cohen
Vice President

During its May meeting, AdCom approved the projected 1995 budget for the Society. Special thanks go to Dan Swanson, the MTT Treasurer, for his diligent preparation of a voluminous amount of detailed material supporting the budget request and the excellent charts and graphs he prepared that made this complex budget easy to understand. Thanks is also due to other members of the budget committee: Peter Staecker, John Horton, Derry Hornbuckle and Dick Sparks, the MTT-S Administrator, for their careful review of the large number of budget submissions from the various MTT committees and their many helpful suggestions.

This budget is the first \$2 million one for MTT-S. It is approximately balanced and requires no increases in either member dues or International Microwave Symposium registration fees during 1995. The only increase that will be necessary for members to bear is a \$2 rise in the *Transactions* fee, from \$10 to \$12. This modest increase is needed to offset the rising costs incurred in publishing an increasing number of pages in this very valuable journal. Several special *Transactions* issues are planned for 1995, making the *Transactions* an increasingly important reference source for all microwave engineers. Publications represent the largest portion of the Society budget, approximately 45% of its expenses and 43% of its revenues. In addition to the popular *Transactions* and the *Newsletter* that you are presently reading, MTT-S publishes another very useful publication, *Microwave and Guided Wave Letters*. The *Letters* were started in January, 1991, in an effort to provide dissemination of exciting new results to the membership as rapidly as possible. Although this publication is of very high quality and has received a very favorable response from its readers, it is not purchased by as many members or libraries as the *Transactions* are. This is primarily because it is relatively new. Members who are not current subscribers are encouraged to try the *Letters* during the coming year and to suggest to the libraries where they work that this journal would be an important and useful addition to their company's reference material.

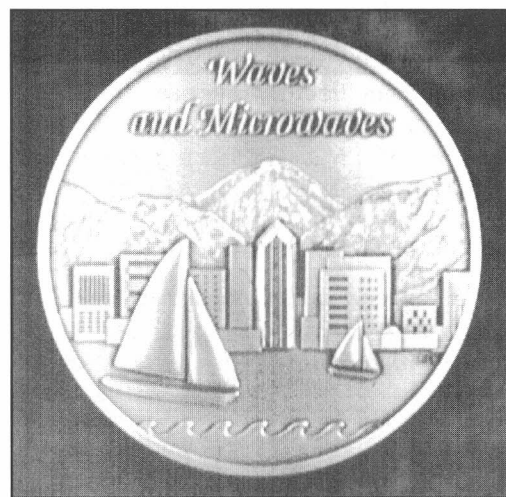
Meetings and symposia generate nearly 49% of revenues and consume about 35% of revenues. The surplus generated from holding meetings and symposia, principally

the International Microwave Symposium, is used to provide needed additional revenue for publications, technical committee activities, local chapter activities, standards development, the formation of a microwave consultants' network, and educational activities including graduate fellowships, an undergraduate scholarship, and the student paper contest. A modest amount of this surplus is also used to provide seed money for encouraging the formation of new MTT chapters in Eastern Europe and the former Soviet Union and in helping to support conferences in areas of the world with emerging interest in the microwave field. One such conference is the SBMO, held in Brazil.

The budget committee and the MTT AdCom want to serve you, the Society members, by providing the information and services that are most important in advancing the microwave profession and your personal career. Your suggestions of new activities that would be of benefit to you and other Society members are always welcome.

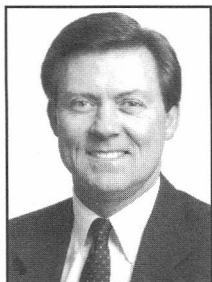


Budget Committee Members at IMS. Front row L-R: Jim Crescenzi, Eliot Cohen, Derry Hornbuckle. Back row: Dick Sparks, Dan Swanson, Peter Staecker, John Horton.

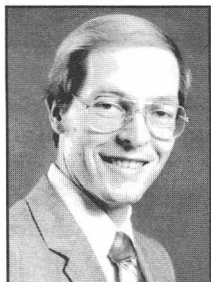


IMS Medallion presented to TPC speakers and presenters. Designed by R. L. Eisenhart.

MTT-S Meetings & Symposia Committee Report



R. E. (Skip)
Bryan



E. A. Rezek

May 1994 AdCom Meeting

Following is a summary of the Committee business concluded at the May 21-22 AdCom meeting in San Diego, California.

Meeting Sponsorship

- MTT-S addressed several technical events held in Regions 1-6.

The Society approved the addition of Dr. Tony England of the University of Michigan to the Organizing Committee of the **1995 Combined Optical Microwave Earth and Atmosphere Sensing Conference (COMEAS '95)**. We are co-sponsoring this event with LEO-S and GRSS-S. COMEAS '95 will be held April 3-6, 1995, at the Atlanta Renaissance Hotel in Atlanta, Georgia. This is our second year of co-sponsorship. The point of contact is Dr. Al Gasiewski, Georgia Institute of Technology, Atlanta, GA 30332-0250, Tel. No: 1 404 894 2934; email: ag14@prism.gatech.edu. Dr. Tony England of the University of Michigan is the MTT-S member of the Organizing Committee.

AdCom approved co-sponsorship of the **1995 National Telesystems Conference (NTC '95)**. This event has been held concurrently with the IMS since 1993 and was also co-sponsored in 1994. The event is also cosponsored by AES-S. NTC '95 will be held May 16-19, 1995, at Orlando, Florida. The point of contact is Dr. Madjid A. Belkerdid, University of Central Florida, Tel. No: 1 407 823 5793, Fax 1 407 823 5835.

We also reviewed a request for cooperative sponsorship of the **2nd International Conference on Millimeter and Submillimeter Waves and Applications**. Action on the request was tabled until the event organizers could contact the Society Technical Committee cognizant of this field (MTT-4 led by Professor Fawwaz Ulaby) and develop a more comprehensive venue with closer alignment with the Society Field of Interest.

- MTT-S is continuing its effort to reach out to its members outside of the United States. Major advances have taken place in Regions 8 and 9 during the last period.

Region 8: The Society approved cooperative sponsorship of several technical events in this region. We renewed our cooperative sponsorship of Microwaves '94 at a previous AdCom meeting. At the May meeting we extended that involvement to cover the **2nd Joint IEEE European Chapter Workshop on CAD, Modeling and Measurement Verification**. This Workshop is organized by the joint IEEE UKRI MTT/ED/AP Chapter and will be held concurrently with Microwaves '94. The Workshop will run from October 25-27, 1994 and will be at the Wembley Conference Centre in London, England. Details may be obtained from Mr. Terry Oxley; his address is "Tremont", Back Lane, Halam, Newark, Notts NG22 8AG England. His telephone number is 44 636 815510 and his Fax number is 44 636 815865.

We also approved cooperative sponsorship for the **1994 Conference on High Performance Electron Devices for Microwave and Optoelectronic Applications (EDMO '94)**. This event is also organized by the joint IEEE UKRI MTT/ED/AP Chapter in cooperation with King's College London. EDMO '94 will be held November 14, 1994 at King's College London at Strand, London, England. This event is also cooperatively sponsored by the IEE and ED-S. The point of contact is also Mr. Terry Oxley.

Region 9: Details are being definitized on Society co-sponsorship of the **1995 SBMO/IEEE MTT-S International Microwave and Optoelectronics Conference** held in Brazil. Open issues involve IEEE and SBMO copyright of the Technical Digest, exhibit details, etc. A Memorandum of Understanding is in review to clarify details of cosponsorship. Dr. Jose C. Araujo dos Santos of the Instituto Militar de Engenharia is the Chairman of the Technical Program Committee. Dr. Santos attended the AdCom meeting. The workshop will be held in July 1995 in Rio de Janeiro, Brazil. The point of contact is Professor Luiz A. R. Silva-Mello, CETUC-PUC, Rua Marques de Sao Vicente, 225 Rio de Janeiro, Brazil RJ 22435-9000, Tel. No: 55-21-529-9384; Fax: 55-21-294-5748. A Call for Papers for the event is included elsewhere in this *Newsletter*.

Region 10: No new activities are being pursued at this time in this Region.

- The Society also completed a review of sponsored conferences that were held in the last review period. We analyzed conference metrics (attendance, demographics, finance, etc.) for the 1993 GaAs IC Symposium, the 1994 Asia Pacific Microwave Conference, the 2nd Topical Meeting on Electrical Performance of Elec-

tronic Packaging, the 1993 International Semiconductor Device Research Symposium, and the Workshop on Microwave Optoelectronics, the Symposium on Optical Microwave System, and the Topical Meeting on Optical Microwave Interactions. This review helps us guarantee that the Society is supporting the technical needs of its members.

2001 IMS

The location of the 2001 MTT-S International Microwave Symposium was approved at the May 1994 meeting of the Society Administrative Committee. Excellent proposal packages were submitted by the cities of Dallas, TX, Phoenix, AZ, and Seattle, WA. After due deliberation Phoenix was selected as the host city for 2001. Mike Golio is the Chairman of the 2001 IMS, which will be held from May 19-27, 2001. If you are interested in obtaining further information please contact Mike at the address below:

Mike Golio
Motorola SPS
M/S E-510
2100 E. Eliot Rd.
Tempe, AZ 85284
Tel. 602 897 5947
Fax 602 897 3518
email: m.golio@ieee.org

Special thanks to Peter Staecker, Chairman of the Negotiating Committee, and the rest of his team (Dave McQuiddy, George Oltman, Chuck Swift) for doing another outstanding job in supporting this important site selection process.

2002 IMS

Even though this seems far off, planning for this conference is overdue and should begin immediately. We have received a formal letter of intent from the Philadelphia Chapter indicating interest in sponsorship. We are soliciting inputs from other Chapters at this time. Please contact Skip Bryan if you need further information at: Systron-Donner, 13100 Telfair Ave, Sylmar, CA 91342, Tel. (818) 364-7270, Fax (818) 362-1035.

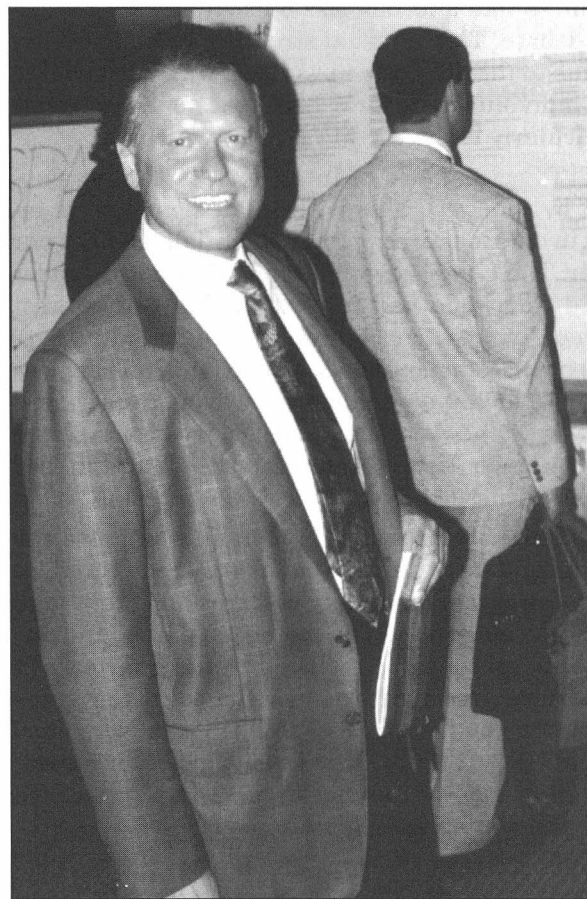
Future MTT-S Symposia

Following is a listing of the International Microwave Symposia sites through 2001 with their chairmen. If you are interested in participating please contact the chairman directly; they can always use the help and this is a good way to actively support your Society.

- 1995—Orlando, Florida, May 16-18, 1995, Keith Huddleston, Chairman, Martin Marietta Corp., Tel. 407 356 7201, Fax 407 356 0933
- 1996—San Francisco, California, June 17-21, 1996, Jim Crescenzi, Chairman, Watkins-Johnson Co., Tel. 415 813 2506, Fax 415 813 2402, email: j.crescenzi@ieee.org

- 1997—Denver, Colorado, June 8-13, 1997, Hussain Haddad, Chairman, Ball Aerospace, Tel. 303 460 2114, Fax 303 460 2315
- 1998—Baltimore, Maryland, June 7-12, 1998, Steve Stitzer, Chairman, Westinghouse Electric Corp., Tel. 301 765-7348, Fax 301 993-7747, email: Stitzer@zeus.bwi.wec.com
- 1999—Anaheim, California, June 13-18, 1999, Mario Maury, Jr., Chairman, Maury Microwave Corp., Tel. 909 987 4715 x201, Fax 909 987 1112, email: mamjr@easyst.com
- 2000—Boston, Massachusetts, June 11-16, 2000, Glenn Thoren, Chairman, Lockheed/Sanders Corp., Tel. 603 885 2988, Fax 603 885 3177, email: thoren@dune.sanders.lockheed.com
- 2001—Phoenix, Arizona, May 19-27, 2001, Mike Golio, Chairman, Motorola SPS, Tel. 602 897 5947, Fax. 602 897 3518, email: m.golio@ieee.org

Also, refer to the centerfold for the Master Calendar for MTT-S sponsored conferences.



Vittorio Rizzoli, Vice-Chairman of the '94 European Microwave Conference, at the Open Forum.

TAB Report

by E. James Crescenzi, Jr.

The IEEE Technical Activities Board (TAB) met in Denver, Colorado on June 19 and 20. That's correct, it did include Father's Day! In my case, because our sons live relatively long distances away from home, it really wasn't a sacrifice to attend the meeting. Of course, Denver is a beautiful city, and attending the TAB meetings is becoming enjoyable as I become more acquainted with the other participants.

One of the highlights of the events was not the actual meeting, but rather the opportunity to witness a live debate between the candidates for IEEE President-Elect—Charles Alexander, Donald Bolle, Wallace Read. All candidates represented themselves well, but differences in priorities were clear. The debate was video taped, and will be distributed to IEEE Sections throughout the world. If you have a chance to view the debate, I highly recommend doing so.

The TAB series of meetings starts with smaller committee meetings (examples: Technical Meetings Council, TAB Products Council), followed by the TAB Caucus, Society President's Forum, and finally, the TAB meeting. The TAB Caucus and Society President's Forum are sort of dry runs for the actual TAB meeting, which is very business like and has less opportunity for discussion and debate. This unusual structure has apparently evolved due to the difficulty in working with such a large group of individuals. Several highlights of those items that particularly affect the MTT-Society include:

1. The MTT-Society Field-of-Interest statement was approved by the TAB. This is the statement that is included in our Constitution that essentially defines our Charter. The Long Range Planning Committee under Reynold Kagiwada had revised our Field-of-Interest so it would more accurately reflect the breadth of activities now covered by our society activities. There was a minor "friendly amendment" to avoid a perceived conflict with the Antennas and Propagation Society, after which the Field-of-Interest motion passed with minimal discussion.
2. The MTT-Society presented a motion to improve the reporting and disclosure of the results of the IEEE investment program for society reserves (long term and short term categories). The motion contained numerous specific items to be included in the quarterly financial report received by the societies. It contained contributions by Dick Sparks (MTT-S Administrator) and Eliot Cohen (MTT-S Vice President). After considerable discussion of this hot topic at the President's Forum, the motion passed unanimously.
3. The Engineering in Medicine and Biology Society proposed a new periodical bundling (grouping) of a select set of transactions judged to be of particular interest

for libraries of medical research institutions. This creative initiative was passed, and it can be expected to be a model of future periodical alliances. The intent is to promote non-member sales to libraries that would not otherwise subscribe to the massive all periodicals package.

4. Reports were received from a previous IEEE retreat at Innisbrook that was restricted to participation by "large" societies (Computer, Communications, and Power Electronics Societies). These societies requested elimination of particular fees and procedures that are associated with duplicative IEEE staff efforts, since they each support large internal professional staffs. The request was approved, although there is a concern that it has started a trend to differentiate societies with permanent staff at IEEE Headquarters. To the extent that we are dealing with a zero-sum financial situation, this may in time cause increased fees for the societies of small to medium size.
5. The TAB members voted to recommend (to the IEEE Board of Directors) NOT approving a request to increase the fees assessed US members for the USAB. This is not an area of authority for the TAB, and the motion against the fee increase was advisory only.

There were approximately 50 motions passed at the TAB meeting, and I have only reported those items that may be of particular interest to our members.

The TAB series of meetings is also an important opportunity to meet with representatives of other societies. I learned, for example, that the Electron Devices Society has approved our joint MTT-ED program to support (through subsidy of individual dues) joint chapter formation in Eastern Europe and the Former Soviet Union. The specific plan was devised by Rolf Jansen (Transnational Committee Co-Chairman), and had been previously passed in May at the MTT-S AdCom meeting.

I also was able to participate in the IVHS Committee meeting, a Technical Meetings Council meeting, and to attend a New Technologies Directions Committee Workshop.

I concluded the three days of continuous meetings with the satisfaction that all major motions presented on behalf of the MTT-Society had been approved, and that I continued to learn more and more about the operations of our very large Institute of Electrical and Electronic Engineers.

The proposed MTT-S Field of Interest Statement is included in the Long Range Planning Committee Report by Reynold Kagiwada.

The Field of Interest can also be found in the Constitution of the Microwave Theory and Techniques Society, Article II, IEEE Newsletter, Winter 1993, Issue No. 136, pp. 19-20.

Long Range Planning Committee Report



by Reynold Kagiwada
LRPC Chairman

The 1994 Long Range Planning Committee (LRPC) met on May 21, 1994, in the San Diego Marriott Hotel. The Committee consisted of Reynold Kagiwada (LRPC Chairman), Eliot Cohen (MTT-S Vice President, Vice Chairman LRPC), Peter Staecker (1993 MTT-S President), Reinhard Knerr (PPC Chairman), Tatsuo Itoh (PPC Vice Chairman, Roger Sudbury (TC Chairman), Derry Hornbuckle (Publications Chairman, Edward Rezek (Meeting and Symposium Chairman) and Bill Wisseman (MTT-S member).

Our discussion on Technical Areas generated a lot of interest and dialogue. Technical Areas discussed were: Satellite Communication/Service, Automotive/Transportation, Microwave Optoelectronics, Microwave Packaging, Millimeter Wave, and Wireless Technology. The mission of the LRPC is to position the Society to take advantage of expected technology developments in critical technical areas. The end product of the LRPC will be the recommendation of an implementation plan for the Society to follow in selected technical areas. Highlights of the Technical Areas discussion are as follows:

Today's Satellite Communication/Service

The Satellite Communication/Service Systems are now at a point of rapid expansion. These services include Direct Broadcast Satellite (DBS), Global Positioning Systems (GPS), Fixed Satellite Service (FSS) and Mobile Satellite Services (MSS).

The first DBS transmission of TV signals was done in Japan in 1983. This transmission was followed by Europe in 1989. The United States' High Powered DBS system is planned for 1994. DBS sales are expected to reach over \$3.5 billion by 1995.

Navstar, the first GPS satellite, was launched in 1985. Today's GPS position locators can be bought for about \$600 with about 10 meter resolution. GPS position locators with accuracy slightly larger than one meter are also commercially available. By 1995 the expected sales will be about \$300 million.

FSS systems include cable TV, VSAT and international video. These systems are expected to be a good commercial product. Predicted VSAT sales are expected to be \$1.0 billion in 1995.

Mobile Satellite Service (MSS) includes Maritime services, digital car services and digital tracking, cellular telephone from satellite, digital radio and in-flight telecom/data services. Perhaps the most advertised application is the cellular telephone from satellite: The ability to talk to anyone, anywhere and anytime. The systems proposed are Globstar, Iridium, Odyssey, and Teledesic. These systems have architecture with as many as 840 low-earth orbit satellites and as low as 12 medium-orbit satellites. The majority of these MSS services will not be available until after 1997. Full implementation would require the investment of billions of dollars.

5 Year Satellite Communication/Service Vision

Satellite Communication/Services will be a pervasive industry. Technology advances in the next 5 years will be greater than one's imagination. Sales for this industry in 5 years could easily be over \$25 billion. Satellite Communication/Services is part of the major thrust of the information super highway of the future. The information super highway is predicted to be a \$125 billion market by the year 2000 without accounting for service revenues. The exact share of SATCOM market will be heavily dependent on cost, serviceability, reliability and time to market.

Satellite Communication/Service Preliminary Thoughts on Implementation

We developed a general listing of tasks that provide the structure for an implementation plan to keep our Society at the forefront of emerging technologies. We identified Society committees that need to participate in the plan. Highlights of the plan are as follows:

- *Publication:* Special issues and IEEE press
- *Meetings and Symposia:* IMS workshops, panels, focus sessions and topical meetings
- *Membership Services:* Chapter Activities and Distinguished Microwave Lecturers
- *Technical Committee Involvement:* Implementation plan should be carried out with an MTT-16 Microwave Systems lead. The Committee should solicit help and expand or form a separate committee if necessary
- *Joint Venture* for meetings and publications with IEEE Communications Society and IEEE Aerospace and Electronics Systems Society
- *Other Publications:* IEEE Communication Society Transactions
- *Other Meetings:*
 - GLOBECOM '94 (COM)
 - 1994 IEEE National Telesystem Conference (MTT-S/AES-S)
 - IEEE International Conference of Communication
 - International Symposium of Subscriber Loops and Services (COM)
 - International Conference on Communication (COM)
 - International Conference of Universal Personal Communication (COM)
 - Military Communication Conference (COM)

- International Workshop of Personal, Indoor and Mobile Communication (COM)
- Symposium on Worldwide Advances on Communication Networks (COM)
- Global Telecommunication for the 21st Century (MTT-S/Horizon House)

Today's Automotive/Transportation

The automotive or transportation application can be divided into vehicle communications and vehicle control. Vehicle communications include: vehicle-to-vehicle, vehicle to roadside beacon, vehicle identification, driver information and automatic debiting systems. Vehicle control consists of near-obstacle detection, collision warning and intelligent cruise control.

Governments worldwide are looking for more economic ways of transportation. They would like to cut down on pollution, save fuel and reduce commuting costs. In 1990 the United States started the "Intelligent Vehicle Highway System." Europe has "Programme for European Traffic with Highest Efficiency and Unprecedented Safety" (1986) and "Dedicated Road Infrastructure for Vehicle Safety in Europe" (1991). The Japanese have a variety of advanced transportation programs; these include: "Road Automotive Communication Systems" (1984), "Advanced Mobile Traffic Information and Communication System" (1988), "Vehicle Information Communication System" (1991), and "Millimeter Wave Industry and Technology Development Association" (1991).

The Automatic Debiting System (ADS) is used to pay highway and bridge tolls; systems are now being deployed in Europe and the United States. The European system uses 5-7 GHz toll booths transceiver to the vehicle transponder. In the United States ADS is being used in New Jersey, New York and Oklahoma for toll collection and operates at 908 to 928 MHz.

General Motors has developed FORWARN, a near-obstacle detection radar for buses. Greyhound buses and Illinois and Indiana school buses have already deployed FORWARN. This system operates at 10 GHz. Space Collision Warning systems are being developed in over 18 companies throughout our world. They operate from 10 GHz to 94 GHz and typically have a range of 100 meters.

5 Year Automotive/Transportation Vision

Automotive automatic debiting system will continue to expand rapidly in the next five years. The main market growth will be in automotive radar. The number of units will start with a modest number of hundreds of thousands but grow in five years to over 30 million units. Automobile radar will be installed first in luxury cars and move quickly to almost all car classes. The most important factor on the growth of units is affordability. Units selling for about \$500 will create rapid growth.

Automotive/Transportation Preliminary Thoughts on Implementation

- *Publication:* Special issues and IEEE press

- *Meetings and Symposia:* IMS workshops, panel, focus sessions and topical meetings
- *Membership Service:* Chapter Activities and Distinguished Microwave Lecture
- *Technical Committee Involvement:* Implementation plan should be carried out with an MTT-16 Microwave System, Subcommittee Vehicular Technology Communications lead
- *Joint Venture* for meetings and publications with IEEE Vehicular Technology Society
- *Other Publications:* IEEE Vehicular Technology Society
- *Other Meetings:*
 - Vehicular Technology Conference (VT)
 - Vehicular Navigation and Information Systems Conference (VT)
 - The IVHS America Annual Meeting (IVHS)

Today's Microwave Optoelectronics

Today's situation in microwave optoelectronics can be described in terms of 3 major market areas: telecom, datacom, and analog.

Long-haul telecommunications has been the first commercial application of microwave optoelectronics. Nearly all new long distance telecom cable installations worldwide are now optical fiber, with data rates between 150 Mbit and 2.5 Gbit. Submarine cables will soon be installed at 5 Gbit, and 10 Gbit systems are nearing installation. Design work is under way for systems up to 40 Gbit.

Data communications over optical fiber has not yet reached microwave bit rates, other than in the laboratory. Datacom at 10 Mbit is primarily over coax or twisted pairs. Optical fiber is likely to be used in a significant share of the 100 Mbit systems, for which standards are established, but actual installations are few to date. Optical fiber will predominate at 1 Gbit, but at this bandwidth standards are just being finalized and IC's are still being designed.

Analog microwave transmission over optical fiber has begun to take on commercial importance mainly for its use in Community Antenna Television (CATV) systems. It is also being applied in custom installations for remote antenna connections, and studied in detail for applications like feeding signals to elements of phased array antennas.

5 Year Microwave Optoelectronics Vision

Optical amplifiers will be widely used in long-haul telecommunication. System design will be radically altered by the inclusion of erbium-doped fiber amps or their kin (erbium/ytterbium-doped, or, perhaps, praseodymium-doped amps). With this revolution, electrical repeater circuitry is no longer required in long-haul fiber links. The bandwidth of a system can be increased by changing only the terminating electronics. Although many fewer electronic circuits will be required, it will become cost effective to install the highest avail-

able performance electronics at the headend of systems which need additional bandwidth. As a result, both 20 Gbit and 40 Gbit systems are likely to be in commercial operation in 5 years, which is sooner than would have occurred without the availability of optical amplifiers. Other systems will instead use optical wavelength-division multiplexing, which is also made more attractive by the availability of optical amplifiers, but does not require such high speed electronics.

In the Datacom area, most new installations will be at 100 Mbit in 5 years, either fiber or copper, with a significant fraction of 1 Gbit optical fiber LANs being installed. R&D will be in the microwave regime, at 10 Gbit, over fiber. Optical amplifiers will not be much of a factor due to the short distances, except in wide area networks and connections through public or private telecom systems. Cost effectiveness of the microwave-rate electronics will be the key to success of datacom applications above 1 Gbit.

Microwave analog optoelectronic applications will include deployment of optically-fed phased array systems as well as increasing use for antenna remoting and microwave instrumentation. CATV usage of fiber will increase for analog systems, although there will be some emergence of digital compressed video in CATV systems in 5 years.

Microwave Optoelectronics Preliminary Thoughts on Implementation

- *Publications:* Special Issue, IEEE Press Emerging Technology series book related to an MTT-sponsored topical meeting.
- *Meetings and Symposia:*
 - IMS Workshops and Panels (1 or more per year) and Focus Sessions
 - Topical Meeting on Optical Microwave Interactions—upgrade sponsorship from tech. cooperation to joint with LEOS (every 2 years)
 - Optical Fiber Communication Conference—Consider holding one or more additional workshops and special sessions like those in '94; upgrade from tech. cooperation to joint with OSA/LEOS/COM.
- *Membership Services:* Distinguished Microwave Lecturer(s), speakers list for chapters.
- *Technical Committee Involvement:* MTT-3 Lightwave Technology in lead role, with MTT-6 Microwave and Millimeter-wave IC's.
- *Collaboration:* IEEE Lasers and Electro-Optics Society, IEEE Communications Society, Optical Society of America.
- *Other Publications:* Microwave and Optical Technology Letters (J. Wiley), IEEE Photonics Technology Letters (LEOS), IEEE Journal of Lightwave Technology (OSA and IEEE, including MTT). There is also some competition from publications which focus mostly on optical components: Journal of the Optical Society of America—part B, Optics Letters (OSA), IEEE Jour-

nal of Quantum Electronics (LEOS). Others cover high speed electronics for optical fiber communications: Electronics Letters (IEE), IEEE Electron Device Letters (ED), IEEE Trans. on Electron Devices (ED). Systems aspects are covered in journals like: IEEE Trans. on Communications (COM), IEICE Trans. on Communications.

- *Other Meetings:* The Optical Fiber Communications Conference is the most direct competitor. The GaAs IC Symposium usually contains a number of papers on high speed electronics for optical communications as does, to a lesser extent, the International Solid State Circuits Conference and the International Electronic Devices Meeting. Conferences organized by sponsors of the publications above also contain varying degrees of coverage of microwave optoelectronics.

Today's Microwave Packaging

Microwave packaging has a relatively young history in our microwave community and has not been a major thrust until recently. For this reason, there is no concerted effort evidenced to date. A quick study indicates that this area of technology is extremely interdisciplinary ranging from electromagnetic numerical analysis from the academic side all the way to day-to-day manufacturing problems in a production line. In addition, many problems not very familiar to typical microwave engineers are integral parts of the packaging, such as thermal and material problems.

During the ARPA-funded MIMIC projects, industry and governmental leaders discovered that the success of MIMIC chip production cannot be separated from successful packaging techniques. It is understood that the most expensive parts of MIMIC chip production are testing and packaging which are often correlated. In the course of pursuing packaging technology, it was discovered that there is much wisdom microwave engineers can learn from other areas of technology such as digital packaging, and consumer electronics, with recognition that there exist certain differences in these technologies from that for microwaves.

Researchers in numerical electromagnetics and CAD, notably those from the academic community, have recognized the importance of packaging problems. They have applied some of the standard exercises for microwave integrated circuit analysis to the new problems with mixed outcome. The analysis of packaging is much more difficult due to its complex nature and its essentially 3-D configuration. A number of techniques have been introduced. Some are frequency domain based approaches similar to those used in typical EM simulators; the Finite-Difference Time-Domain method has also gained popularity due to its versatile nature. At present, the magnitude of numerical volume is one of the concerns which is expected to be solved by a number of practices and techniques.

Microwave Packaging Technologies Challenges

- Materials
 - Materials for packaging housing
 - Interconnection layers for microwave and millimeter waves
 - Coating materials for MMICs and other components for non-hermetic housing without performance or reliability problems
 - Novel materials for multi-chip interconnect
- Test and Simulation and Design Characterizations
 - Improved test methodologies for package and interconnect layer performance evaluation
 - Characterization techniques for arrays
- Low Temperature Package
 - Cryogenic package for radio astronomy
 - Superconducting electronics

Microwave Packaging Technologies Issues

- Manufacturing
 - Reducing package cost without performance and reliability degradation
 - Improved passive components (circulators, capacitors, inductors, onboard power supply)
 - Integration within a single housing of circuits and devices made from different materials (Si, GaAs, SiGe, InP, etc.)
 - Equipment for quick assembly and packaging (microwave/photonic)
 - Incorporation of passive elements on substrate layers
 - Packaging that accommodates different technology chips (microwave, digital, photonic) including interconnects
 - Quasi-optical packaging
 - Reliability
 - Comprehensive electromagnetic analysis and simulation (both time domain and frequency domain in 3-D)
 - Integrated CAD for electrical, thermal, mechanical and manufacturing parameters
 - Database development and correlation of different databases
 - Simulation with visualization and zooming and segmentation capability
 - Sensitivity analysis for design

Microwave Packaging Preliminary Thoughts Implementation

- Significantly enhance the presence of microwave and millimeter-wave technical content as well as Committee membership in the existing conferences. This is particularly important for the forthcoming 3rd Topical Meeting on Electrical Performance of Electronic Packaging.
- Create or enhance Packaging Sessions in the MMWMC Symposium
- Work with the AP Society to enhance the presence of MTT topics and committee membership

- Plan a short course or an intensive tutorial workshop for Packaging Technologies for Phased Array Applications as a bonus issue for MTT Transactions.

Today's Millimeter Wave Technology

Millimeter wave technology addresses radar and communications products in military, automotive, and wireless markets, while influencing techniques in manufacturing and packaging. Spectrum: from 24 GHz to 100 GHz not even including remote sensing applications. Hardware: integrated transceivers, as well as components, using all kinds of implementation media.

Millimeter Wave Issues/Status/Projection

- Market Drivers
 - Cost
 - Common frequency allocations
 - Reliability
 - Serviceability (base stations)
- Technology Drivers
 - Platform (cars, base stations, airplanes)
 - Spectrum allocation
 - Integration techniques and technology (includes packaging)
- Competitive Analysis
 - Photonics (IR) vs. mm-wave
 - InP-based vs. GaAs-based
 - MMICs vs. MCM vs. hybrids

Millimeter Wave Preliminary Thoughts on Implementation

- Publications
 - Special issues of Transactions
 - IEEE Press activity
- Meetings and Symposia
 - IMS workshop, panel, focus session
 - Topical meeting, workshop
 - Video conferencing
- Membership Services
 - Chapter activities
 - Regional colloquia
 - Distinguished Microwave Lecturer
 - Videos
- Technical Committees
 - Emerging technology meeting
 - Other technology meeting

Today's Wireless

Today's wireless activity essentially reflects applications defined by markets. Personal communications using the existing spectrum from 900 MHz to 5 GHz (and above) for voice and data communication dominates the field today. This includes PCS, PCN, Wireless LAN, etc. Present applications are using very high data rate (>10 MB) methods. This technical area does not include automotive and SATCOM which are separately addressed. Hardware: subscriber units, base station subassemblies.

Wireless Technology Issues

- Market Drivers
 - Cost
 - Common frequency allocations
 - Reliability
 - Battery life (subscriber units)
- Serviceability (base stations)
- Technology Drivers
 - Modulation format
 - Spectrum allocation
 - Integration techniques and technology (includes packaging)
 - Battery technology
- Competitive Analysis
 - Digital vs. analog
 - Silicon vs. GaAs
 - MMIC vs. MCM vs. hybrids
 - Wired vs. lightwave vs. wireless
 - The battle among modulation formats

Wireless Preliminary Thoughts on Implementation

- Publications
 - Special issues of Transactions
 - IEEE Press activity
- Meetings and Symposia
 - IMS workshop, panel, focus session
 - Topical meeting, workshop
 - Video conferencing
- Membership Services
 - Chapter activities
 - Regional colloquia
 - Distinguished Microwave Lecturer
 - Videos
- Technical Committees
 - Emerging technology meeting
 - Competing technology meeting

Draft Implementation Plan for Technical Areas

Our Society needs the support of various MTT committees for finalization and implementation of this plan. These committees include but are not limited to: Publications, Meetings and Symposia, Membership Services, Technical Committees, IMS Committees, MMWMCS Committee, and the Topical Meeting Committee.

- Publication: Transactions Special Issues and IEEE Press
- Meetings and Symposia: IMS workshops, IMS panel, IMS focus sessions, MMWMCS, and other topical meetings
- Membership Services: Chapter Activities and Distinguished Microwave Lectures
- Technical Committee: Strong support from subcommittees

Joint ventures with other societies to structure meetings, publications and lectures are needed. A key to success is the identification of technical champions who

will take ownership of the task and plan and orchestrate these technical areas. Please contact any member of the LRPC if you are interested.

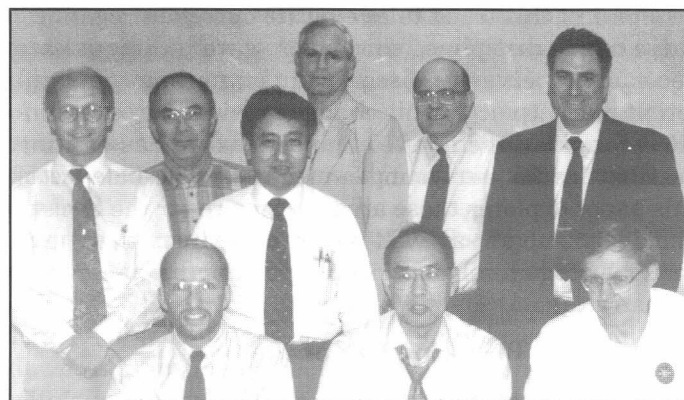
The LRPC also discussed the proposed change to MTT-S Field of Interest Statement. This was approved by MTT-S AdCom and will be presented by our Society President, Jim Crescenzi, at the next TAB meeting.

Proposed MTT-S Field of Interest Statement

Microwave theory, techniques and applications, as they relate to components, devices, circuits, integrated circuits, multi-circuit assemblies, packages, subsystems, and systems involving the generation, amplification, processing, modulation, control, transmission, reception, detection, and demodulation of microwave signals. Microwave theory and techniques also apply to the interaction and interface of microwave signals with digital and optical circuitry and interconnecting transmission media.

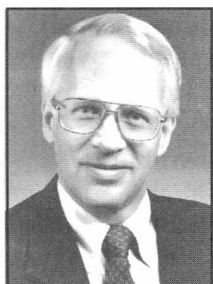
Microwave theory and techniques relate to and are applicable to electromagnetic waves typically in the frequency region between 0.1-1000 GHz; other spectral regions and wave types are included within the scope of the Society whenever basic microwave theory and techniques can yield useful results. Generally, this occurs in the theory and application of wave propagation in structure with dimensions comparable to a wavelength and in the related techniques for measurement, analysis and design. Examples are optical waves in suitably confined structures, as well as the applications of acoustic, magnetic, and domain waves to microwave systems.

The LRPC is extremely interested in your thoughts on the Field of Interest and the technical areas described above. Please contact them if you have any questions or suggestions.



At the IMS—Long Range Planning Committee. Front row L-R: Derry Hornbuckle, Rey Kagiwada (Chairman), Peter Staecker. Back row: Ed Rezek, Jim Crescenzi, Tatsuo Itoh, Dick Sparks, Roger Sudbury, Eliot Cohen.

Re-Engineering Ourselves



by W. Keith Kennedy
Watkins-Johnson Company
Palo Alto, California

Abstract

Both the Microwave Theory and Techniques (MTT) Society of the IEEE and microwave engineers are facing an uncertain future. The changing marketplace will force both the Society and its members to redefine themselves while the microwave industry transitions from centralized departments at universities or companies to a discipline that is practiced throughout diverse markets. Industrial firms are embracing "re-engineering" as a concept for doing a better job of the business process, and we need to do the same for ourselves.

While the MTT Society membership has declined from the peak of roughly 11,000 members in 1989, the dynamic situation within the Society is demonstrated by roughly half of the current members having joined within the past five years. This tremendously changes a membership that the author perceived as having a relatively stable base during the 1980s.

Not only are new members joining, but also the attendance at the MTT Symposium is healthy. The workshops offered at the annual MTT Symposium have been especially well attended. The attendees are enthusiastically embracing the new markets and technologies that are using microwave theory and techniques. We all need to be a part of this trend to re-educate ourselves regarding these newer disciplines since microwave techniques are becoming a pervasive discipline in several new and different marketplaces. This change provides career extensions for older microwave engineers as well as exciting possibilities for our younger members. The balance of this paper explores these areas of growth for the Society and its members, as well as for companies that have thought of themselves as being part of the microwave industry.

Breaking Out of the Box

To re-educate ourselves, we can broaden our skills along any of several different axes. The classic growth area for microwave engineers during the past thirty years has been into either semiconductor processing or more complex assemblies as depicted in Figure 1. This trend toward vertical integration has affected all industries as segments of every firm have followed a path of

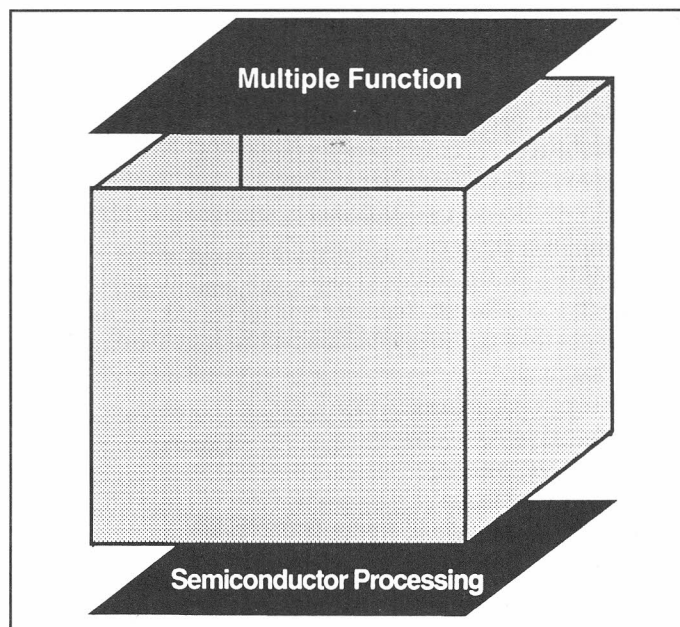


Figure 1. Career Extensions for Microwave Engineers (Vertical Integration).

broadening their product offerings whether in aerospace/defense or in commercial markets, such as instruments and telecommunications.

The migration toward vertical integration has also had dramatic effects on the jobs of the microwave practitioners. Originally formed into self-contained groups, microwave engineers are becoming "distributed" throughout whatever institutions employ them. This trend is expected to accelerate over the next few years with the typical microwave practitioner becoming more of a "solitary" specialist within an organization. This shift within the job market will result in Society members becoming even more reliant on re-education opportunities sponsored by the MTT since the normal mentor relationships within a large organization may no longer be available to them.

Today's explosion in the telecommunication market is creating exciting opportunities for a wide array of microwave engineers. The use of Digital Signal Processing (DSP) at ever higher frequencies is probably the most dramatic shift in our field. The digital world is rapidly absorbing the information processing function of what was formerly an analog approach to communications. For example, the cellular market is rapidly changing from analog receivers (for both base stations and the individual's personal receiver) to digital devices. The bandwidth requirements for transmitting data and video are forcing the newer microwave front ends and the DSP back ends to combine into a seamless piece of equipment. The rapid developments in these fields are creating career opportunities as shown in Figure 2. While much of the current attention is on the DSP portion of the equipment, the density of signals, as well as new applications, will also drive the sensor or front end portion of equip-

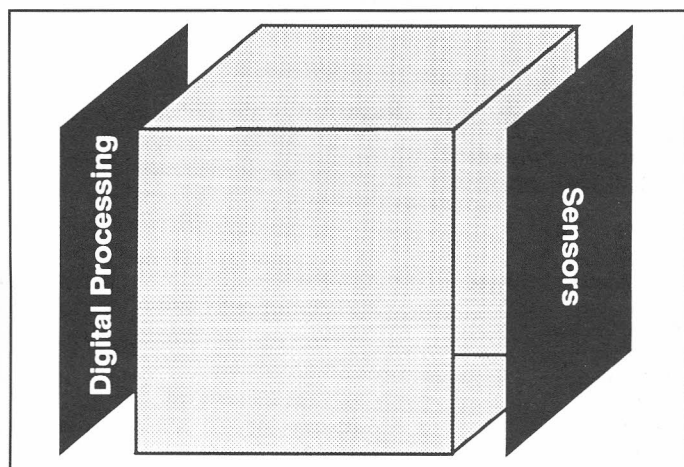


Figure 2. Career Extensions for Microwave Engineers (Horizontal Movement).

ment. The current rapid evolution of equipment will begin to resemble a revolution as the use of the spectrum is sorted out around the globe. What might be the preferred solution in one country will be inappropriate elsewhere, and this multitude of techniques will create a variety of opportunities.

Peter Drucker and Tom Peters have both recently discussed the tremendous upheaval with which our world is coping. Mr. Drucker compared our current situation to two previous time frames. The first occurred 500 years ago with the introduction of the printing press. The second was the industrial revolution. These two previous periods generated tremendous changes in how we work, live and are educated. Our "current revolution" will be no different. The Society should be part of the educational change because our current situation has only one constant—change. The rate of change in our technology will continue to accelerate. The time to market and the product life cycles will be far shorter than the microwave industry has previously experienced. This accelerated pace will create new demands on our skills. The practitioners who are able to continually re-engineer themselves will continue to be hot commodities.

We are completing our box expansion as shown in Figure 3. Microwave engineers are finding they can use their knowledge and skill in new areas. The optical and lightwave field, for example, is less mature than the microwave industry, yet it uses many of the same techniques. The need for noninterfering transmissions of high-speed data will proliferate the current applications of lightwave technology. As discussed by Harold Sobol at the 1994 International Microwave Symposium Plenary Session, the huge demand for high-speed optical network capacity will create numerous opportunities for microwave engineers who chose to break out of the box by broadening their skills to the lightwave arena.

At the same time, the computer industry is dealing with many of the transmission problems familiar to microwave engineers. With clock speeds in the hundreds of

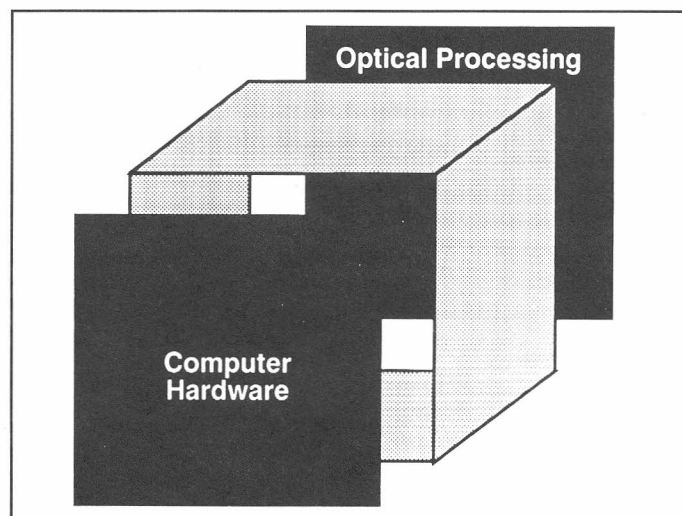


Figure 3. Career Extensions for Microwave Engineers (Companion Fields).

megahertz, the transition times for circuits is already in the microwave range, and faster speeds are announced every few months. How many of us are using PCs with clock speeds at 30 MHz or lower? Today's entry level systems were top of the line two years ago. Chip designers are dealing with transmission problems that are familiar to the microwave engineer.

Conclusion

The current "globalization" of the world into closer contact is being driven by instant communications. The movement of mass (trade goods) is decreasing in importance as compared to the new medium (knowledge) that can be transferred instantly. The fact that many of the new communication techniques use a wireless format creates unparalleled opportunities for the practitioner of microwave technology.

The use of microwaves is expanding in the same way that computers moved from mainframes to PCs. The microwave technology will be distributed throughout the industry and not be isolated in a few bastions of knowledge. If the current microwave engineers educate themselves on the emerging markets, they have a bright future; but they must be aware that the future will not look like the past and it will not even look like the present.

The same paradox faces the MTT Society as its members. Are the newer IEEE Societies that specialize in portions of this broad technology going to capture the membership? If our Society can supply the continual re-education its members need for the future, it will remain one of the largest and most vibrant Societies within the IEEE. In the author's opinion, this re-education is desperately needed since some of the newer Societies address only one application of microwave techniques. An MTT Society that aggressively leads the effort to supply the education craved by a diverse membership base has a bright future!

Master Calendar MTT-S S

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Name	Date/Location	Involvement	Key Contact
• Topical Workshop on Heterostructure Transistor Technology and Physics	August 17-19 Mt. Fuji Resort Area Japan	Cooperate	Prof. Dimitris Pavlidis University of Michigan Ann Arbor, MI 48109-2122 Tel. 313 747 1778 Fax 313 747 1781
• 3rd International Conference on Millimeter-Wave and Far-Infrared Science and Technology	August 22-26 Guangzhou China	Cooperate	Ms. Gail Tucker Georgia Tech Research Institute OOD Georgia Inst. of Technol. Atlanta, GA 30332 Tel. 404 894 3500 Fax 404 894 9875
• European Microwave Conference	September 5-9 Cannes, France	Cooperate*	Prof. A. Papiernik Laboratory d'Electronique Universite de Nice-Sophia Antipolis CNRS Bat 4 250 Rue Albert Einstein 06560 Valbonne, France Tel. 33 92 94 2801 Fax 33 92 94 2812
• IEEE GaAs IC Symposium	October 16-19 Philadelphia, PA USA	Co-Sponsor*	Don D'Avanzo Microwave Tech. Division Hewlett Packard 1412 Fountain Grove Pkwy Santa Rosa, CA 95403 Tel. 707 577 2644 Fax 707 577 2036
• 19th Int'l Conference on Infrared and Millimeter Waves	October 17-21 Sendai, Japan	Co-Sponsor	Miss Reiko Sasaki Research Inst of Electrical Communication Tohoku University Katahira, Sendai 980 Japan Tel. 81 22 228 2124 Fax 81 22 228 2128
• Microwaves '94	October 25-27 London, England	Cooperate	Prof. P. J. B. Clarricoats Queen Mary & Westfield College Mile End Road London E1 4HS Tel. 44 71 975 5330 Fax 44 81 981 0259
• CAD, Modeling and Measurement Verification Workshop	October 25-27 London, England	Cooperate	Mr. Terry Oxley "Tremont" Back Lane, Halam, Newark Notts NG22 8AG England Tel. 44 636 815510 Fax 44 636 815865
• Int'l Conf on Computational Electromagnetics and Its Applications	November 1-4 Beijing P. R. China	Cooperate	Zhou Mengqi Nongzhanguan Nanlu No. 12 Room 2308 Beijing 100026 China Tel. 861 5001144 x2310 Fax 861 5005233
• Topical Meeting on Electrical Performance of Electronic Packaging	November 2-4 Monterrey, CA USA	Sponsor*	Prof. A. Cangellaris ECE Department, Bldg. 104 University of Arizona Tucson, AZ 85721 Tel. 602 621 4521 Fax 602 621 2999
• High Performance Electron Devices for Microwave and Optoelectronic Applications (EDMO '94)	November 14 King's College Strand, London England	Cooperate	Mr. Terry Oxley "Tremont" Back Lane, Halam, Newark Notts NG22 8AG England Tel. 44 636 815510 Fax 44 636 815865
• Optical/Microwave Interactions (held in conjunction with the 1994 National French Microwave Conference)	November 21-23 Paris, France	Cooperate	Mr. John Magarshack 52A Chemin des Hauts Bernards 92500 Ruell-Malmaison France Tel. 331 4708 3707 Fax 331 6019 7695

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Name	Date/Location	Involvement
• INTELCOM	November 2-5 Turin, Italy	Cooperate
• Asia-Pacific Microwave Conference	December 6-9 Chiba, Japan	Cooperate
• Automatic RF Techniques Group	December USA	Cooperate Aff
• National Radio Science Meeting		Cooperate
— 1995 —		
• INTER COMM 95	February 21-23 Vancouver, B. C. Canada	Cooperate
• Combined Optical and Microwave Earth and Atmospheric Sensing	April 3-6 Atlanta, GA USA	Cooperate
• MTT-S International Microwave Symposium	May 16-19 Orlando, FL USA	Sponsor
• Microwave & Millimeter Wave Monolithic Circuits Symposium	May 15-16 Orlando, FL USA	Sponsor
• Automatic RF Techniques Group	May 19 Orlando, FL USA	Cooperate Aff
• MIOP'95	May Stuttgart-Sindelfingen Germany	Cooperate
• Optical Microwave Interactions Topical Meeting	July USA	Technical Co-
• SBMO/IEEE MTT-S International Microwave and Optoelectronic Conference	July 24-27 Rio de Janeiro Brazil	Cooperate
• Int'l Symposium on Signals, Systems and Electronics	October 25-27 San Francisco USA	Cooperate

S Sponsored Conferences¹

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Involvement	Key Contact
Co-Sponsor	Mr. Harlan Howe Microwave Journal 685 Canton St. Norwood, MA 02062 Tel. 617 769 9750 Fax 617 762 9230
Cooperate*	Shizuo Mizushima 2-16-13 Yushima Bunkyo-ku Tokyo 113, Japan Tel. 81 3 3815 8939 Fax 81 3 3815 8590
Cooperate*	
Affiliated	
Cooperate*	

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Co-Sponsor*	Mr. Harlan Howe Microwave Journal 685 Canton St. Norwood, MA 02062 Tel. 617 769 9750 Fax 617 762 9230
Co-Sponsor*	Dr. Al J. Gasiewski Georgia Inst. of Technol. Atlanta, GA 30332-0250 Tel. 404 894 2934 ag14@prism.gatech.edu
Sponsor*	Mr. Keith Huddleston Martin Marietta MP 200 P.O. Box 555837 Orlando, FL 32855-5837 Tel. 407 356 7201 Fax 401 356 6406
Sponsor*	Mr. Terry Duffield Martin Marietta P.O. Box 555837 Orlando, FL 32855-5837 Tel. 407 356 4509 Fax 407 356 0413
Cooperate*	Prof. Lawrence Dunleavy University of S. Florida Tampa, FL 33620 Tel. 813 974 2574 Fax 813 974 5250
Affiliated	
Cooperate	Network GmbH Wilhelm-Suhr-Str. 14 D-3055 Hagenburg Germany Tel. 49 5033 7944 Fax 49 5033 7944
Technical	Prof. Chi Lee University of Maryland College Park, MD 20742 Tel. 301 405-3739 Fax 301 314 9281
Co-Sponsor	Dr. L. A. R. da Silva Mello CETUC-PUC/Rio 22453-900 Rio de Janeiro-RJ Brazil Tel. 55 21 529 9255 Fax 55 21 294 5748 smello@cetuc.puc-rio.br
Co-Sponsor	Prof. Ming C. Wu UCLA, EE Dept. 405 Hilgard Avenue Los Angeles, CA 90024-1594 Tel. 310 825 6859 Fax 310 825 6954 wu@icssl.ucla.edu

1995 (cont.)

Name	Date/Location	Involvement	Key Contact
• Int'l Semiconductor Device Research Symposium	December 5-8 Charlottesville, VA USA	Co-Sponsor	Dr. Elias Towse Dept. of Electrical Engineering Thornton Hall University of Virginia Charlottesville, VA 22903 Tel. 804 924-6078 Fax 804 924-8818
• Microwaves in Medicine	TBD USA	Cooperate*	Prof. James C. Lin Dept of EECS University of Illinois (Chicago Circle) 851 S. Morgan St. Chicago, Illinois 60607 Tel. 312 413 1052 Fax 312 413 0024

— 1996 —

• 5th International Conference on Satellite Systems for Mobile	15-17 April London	Cooperate	Mr. Terry Oxley "Tremont" Back Lane, Halam, Newark Notts NG22 8AG England Tel. 44 636 815510 Fax 44 636 815865
• Asia-Pacific Microwave Conference	October 10-13 Taejon, Korea	Cooperate*	Prof. Noh-Hoon Myung Dept of EE KAI ST 373-1 Kusong-dong, Yusong-gu Taejon 305-701, Korea Tel. 82 42 869 5417 Fax 82 42 869 8010 nhmyung@eekaist.kaist.ac.kr

— MTT-S Continuously Sponsored Conferences —

- MTT-S International Microwave Symposium (IMS)
Annual (Sponsor)
- IEEE Microwave & Millimeter-Wave Monolithic Circuits Symposium (MMWMC)
Annual (Co-Sponsor)
- Automatic RF Techniques Group (ARFTG)
Semi-annual (affiliated)
- European Microwave Conference (EMC)
Annual (Cooperate)
- Asia Pacific Microwave Conference (APMC)
Annual (Cooperate)
- Combined Optical and Microwave Earth and Atmospheric Sensing
Biennial (1993, etc.) (with GRSS-S, LEO-S)
- International Microwave Conference/Brazil (SMBO)
Biennial—1993, etc. (Cooperate; Co-Sponsor 1995)
- IEEE GaAs IC Symposium
Annual (Co-Sponsor)
- IEEE Conference on the Computation of Electromagnetic Fields
Biennial—1992, etc. (Cooperate)
- European GaAs Applications Symposium
Biennial—1992, etc. (Cooperate)
- Topical Meeting on Electrical Performance of Electronic Packaging
Annual (Sponsor)
- 19th International Conference on Infrared and Millimeter Waves
Annual (Cooperate)
- Microwaves in Medicine
Triennial—1993, etc. (Cooperate)
- National Radio Science Meeting
Annual (Cooperate) (with International Union of Radio Science)

Notes: ¹Meetings listed are those that have been officially sponsored by MTT-S (i.e., AdCom approved). There are many other microwave related meetings (chapter sponsored, commercial, etc.) that are not listed.

*Continuous MTT-S involvement approved by AdCom

²MTT-S conference involvement (Involvement may change for particular years).

Microwave Engineering Graduate Scholarship Fund



by Barry S. Perlman

It is a pleasure to announce that a new scholarship fund has been established to extend the Society's support for graduate level education. This fund is unique in that it has been formulated to accept contributions from MTT-Society members, their families, and supporting institutions. The fund is administered by the MTT Society, and it includes safeguards to assure that 100% of the contributions are awarded to students. Our vision and hope is that increased support for our graduate students will yield significant future benefits to the Society. An investment in this worthy cause is critical in ensuring a well educated, well informed generation of microwave engineers, scientists and technicians.

The challenge to be creative and investigate alternative means to fund scholarships was offered by Peter Staecker, MTT-Society President in 1993. Peter suggested that we look at some of the special educational funds set up by other societies. That original idea coupled with a lot of fact finding and numerous helpful discussions with Marsha Tickman, Manager, Society General Activities at IEEE Headquarters, provided a basis for our approach. Implementation involved the necessary preparatory work by an ad hoc committee consisting of James Crescenzi, Kiyo Tomiyasu and me. A plan was proposed and promulgated with the scholarship charter undergoing several reviews and revisions before final adoption. The need for such a scholarship fund was made especially clear and personal by the request of the family of one of our distinguished former members, Octavius Pitzalis, to be able to direct memorial contributions to the benefit of students in microwave engineering. The result is the establishment of "MEGSF," the "Microwave Engineering Graduate Scholarship Fund" under the auspices of the IEEE Foundation. Final approval was received on January 29, 1994, from the IEEE Technical Activities Board (TAB) at its January 29 meeting following approval of the TAB Awards and Recognition Committee.

Donations to this fund will be used to help support the education and accreditation of worthy future microwave engineers and may be made to honor a deceased member

of the Society. Each year the Society will select scholarship grant recipients who show exceptional promise in science and technology under the purview of MTT-S. The focus is support for graduate students specializing in microwave theory, techniques, applications and related disciplines. Donations are encouraged from MTT-Society members, families and friends of members, trusts of deceased members, companies and institutions wishing to make contributions. It is expected that such funds would be exempt from tax under the guidelines imposed by local authorities.

Eligibility requirements are that the candidate must: 1) be an IEEE-MTT member in good standing, 2) have applied for full-time enrollment or be enrolled as a student in a recognized graduate school in a curriculum specializing in the field of microwave engineering or a related science and technology, 3) be recommended by a recognized faculty advisor, and 4) submit a paper outlining career objectives. If the applicant is already enrolled in a graduate school by November 1 of the first year, the scholarship would fund the second or a later year. Selection factors would include satisfying the eligibility requirements above in addition to demonstration of: 1) need for financial support, 2) academic record and technical accomplishment, 3) potential for contributing to the microwave profession as an engineer, scientist, educator and/or technical leader, and 4) potential for serving the MTT-Society and the microwave profession. Other items such as endorsements may be used to demonstrate technical merit, proficiency, career intentions and worthiness of the candidate.

We hope to raise enough funds to permit scholarship aid to as many of the worthy candidates as possible each year. Availability of scholarships will be announced in June of each year. Applications should be submitted to the Education Committee Chairperson by November 1st of that year to assure consideration in the next calendar year. The Education Committee will present its recommendations to the AdCom in January of the following year for approval. The scholarship(s) will then be given in June of that year at the annual MTT Symposium.

The scholarship(s) will be a minimum of \$2,000 and not exceed \$5,000. The grant will be forwarded to the graduate school and credited to the account of each student. Such prizes will be considered annually assuming that the Foundation reserves in this account exceed \$20,000 and that the Education Committee determines that the selection factors are met. The prize amounts are subject to change based on fund reserves and cost of education.

If separate and sufficient funds are identified, an endowment could be established. A special endowment would be welcomed by the MTT Society, and each would be structured to satisfy the specific circumstances and conditions of the donation, subject to approval of the MTT AdCom and the IEEE. The minimum amount necessary to support an endowment is \$100,000.

Contributions to the MEGSF should be made out payable to the "IEEE Foundation—MTT Education." A brief note may be included describing the donor's intentions, e.g. "to be used to award a microwave education scholarship in behalf of, or in memory of . . .", etc. It is important to note use for MTT education purposes in order to credit the MTT Education Account. Donations should be sent to: "The IEEE Fund, c/o IEEE Controller, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, U.S.A." Donations from U.S. sources would be exempt from federal income tax under IRS guidelines. I would be happy to speak with potential donors who have any questions about this fund. Please contact me at (908) 544-4024 or Dr. Glenn Thoren, Chairman of the Education Committee, at (603) 885-2988. The point of contact at the IEEE Headquarters for this effort is Marsha Tickman, Manager of Technical Activities, at (908) 562-3903.

1995 IEEE Microwave Theory and Techniques Society Graduate Fellowships

- Several \$5,000 fellowship awards each year
- For Graduate research studies in microwave engineering on a full-time basis
- Applicants must have attained high academic achievements in engineering or physics
- Award can be granted *in addition* to any other support received by student
- Award cannot be used for equipment purchase, travel, supplies, etc.
- Award made to institution for support of named student
- Faculty supervisor must be MTT-S member

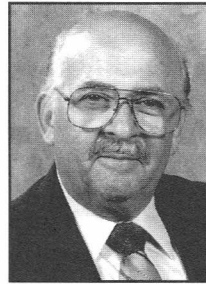
Application Deadline: 21 October, 1994

For applications contact:

Dr. Aditya Gupta
Westinghouse Electric Corporation
P.O. Box 1521
MS 3K11
Baltimore, MD 21203
410-765-9170
410-765-7370 (Fax)

Requests for application materials must be received no later than 30 September, 1994.

Will Your Systems Survive Microwave Weapons?



by Jerry Hausner
Logicon R&D Associates

While the idea of directed energy weapons goes back to the days of Buck Rogers, they are now on the verge of becoming reality. There are specific wavelengths of electromagnetic energy that are applicable to such weapons. Strides have been made in the area of lasers and in the microwave range, mostly from the UHF band to about 3 GHz, to produce power levels that can effect distant targets. Those power levels for the microwave frequencies are in the range of tens or hundreds of gigawatts. With the advent of high power microwave (HPM) weapons, the word "kill" requires better definition. With these weapons the target does not burst into flames or spew smoke and oil because the HPM weapon attacks the electronic systems located on the target and its effect can be from very subtle to catastrophic. The key work is "effect". This effect can be a temporary upset of the electronic system, a permanent degradation of performance or complete burnout. The systems of concern in most targets include the guidance systems, monitors and controls, and communications systems.

The assets that are particularly vulnerable to such weaponry are space platforms. Consequently, the US Air Force, at its Phillips Laboratory facility on Kirtland AFB in Albuquerque, New Mexico, is developing a methodology to assess the susceptibility of satellites to the risks associated with the exposure to high levels of microwave energy. The structure of that methodology was assembled starting in late 1992 and defined by the end of 1993. To accomplish this with maximum efficiency, one of the ground rules was to use software tools that either already existed or were currently being developed, but it was understood that some modifications to the software might be required to adapt it to the task at hand.

To perform this assessment, the prime type of threat must first be determined. It had to be decided if the means by which the microwave energy would couple to the system under examination was by the 'front' or 'back' door. Front-door coupling is defined as energy that enters the system via intended paths, such as antennas. Back-door coupling refers to energy that enters a system via cracks, seams, power cables, or sensor apertures. Examples of such sensors are IR detectors, optical windows, video arrays, etc. Additionally, energy entering through an antenna or RF port but out of the band for the propagation path is considered a back-door signal. Performing a back-door evaluation is notably more com-

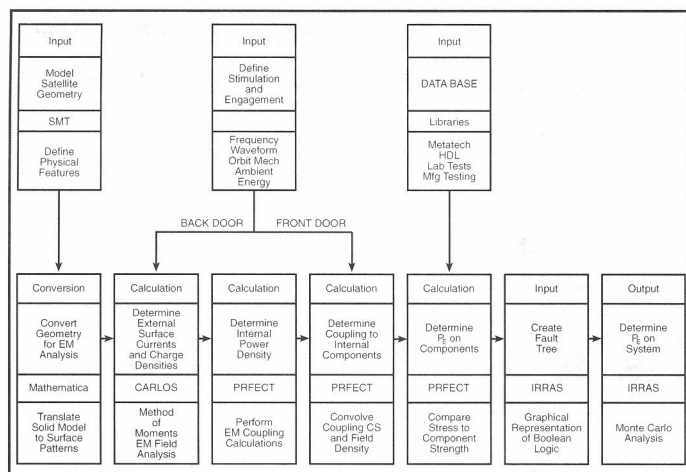


Figure 1. System Vulnerability Assessment General Methodology.

plex than a front-door exposure. The methodology developed for this program covers both situations. The description that follows envelopes a back-door situation. A front-door analysis eliminates some of the early process steps.

The general methodology for a back-door analysis used to assess the susceptibility of satellites to an HPM weapon is depicted in Figure 1. As shown in that diagram, the steps to determine the susceptibility of a system to a source of radiation are as follows:

- Calculate power density of the field that occurs within the system as a result of being illuminated from a particular source. This quantifies the internal fluence to a subject system in the form of a power density function.
- Physically model the internal parts of the system under study to determine the coupling cross section of the component parts (initiators). Multiplying the coupling cross section by the external fluence will result in a value for the energy coupled to each component. This will lead to an estimate of the stress placed on the components by the microwave energy.
- Convolve the stress (as a method of comparison) with the strength distribution data for the same or similar components. This determines the probability of effect distribution on each component.
- Once there has been an evaluation of which components are effected by the electromagnetic (EM) radiation, generate a fault tree to determine the impact on system functions. Relate this to the system's mission to determine a probability of effect on the overall system and its mission.

The flow chart in Figure 1 also indicates which tool is to be used for each step. During the course of this development many codes and tools were investigated. The tools selected for this methodology are as follows.

- SMT—Solid Modeling Technique. This code most easily describes the geometry of a subject for assessment and will also provide all relevant material properties, such as conductivity and permeability. SMT was developed by the Phillips Laboratory Satellite Assessment Center.

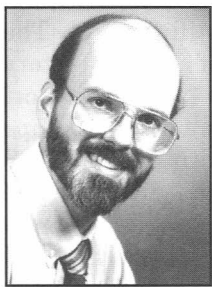
- MATHEMATICA—This is a commercially available math package that is capable of translating the shapes described in SMT into faceted surfaces with interconnect information.
- CARLOS-3D—This code determines the field distributions on the surface and at strategic points of the subject in accordance with the surfaces generated by MATHEMATICA.
- PRFECT—Predictive Radio Frequency Effects Coupling Technique. This code first determines the resulting stress on each component of concern, then compares that stress to the strengths of those components, and yields a probability of effect for each. The stress levels may result from a front-door entry or can be derived from the fields defined by CARLOS.
- IRRAS—Integrated Risk and Reliability Assessment System. This code evaluates the probability of effect on the subject system using its fault tree analysis capability. The failure probability of each component, as determined by PRFECT, provides the input to each event in the fault tree. IRRAS was developed for the Department of Energy for risk analysis of nuclear power plants.
- RF Component Data Base—This data base provides information to PRFECT about the strength of the various components for the stress/strength convolution. It incorporates the information already contained in the Harry Diamond Laboratories' data base plus new data as measured in ongoing experiments.

Current activities are focused on refining this methodology. Since five different software packages are used to perform the assessment, moving data from one to another is not necessarily straightforward. Therefore, present efforts include the writing of direct interface code. A man-in-the-loop which has many advantages, may still be required, but an individual with minimal training should be capable of using this methodology.

A major step in this analysis is the comparison of the stress on a component produced by the radiation to the strength of that component. That strength is read from a data base, but the value is not a discrete number. It is a probability function consisting of some mean and a distribution. The greater the sample tested, the more accurate the value. Such data have been collected by numerous organizations that have undertaken testing programs. The most comprehensive compilation was done at the Army Research Laboratory (formerly Harry Diamond Laboratories) in Adelphi, MD. Another major effort of the current program is additional testing and a search for correlations between known effects data and component manufacturers' reliability data to bolster that data base.

In conclusion, a methodology has been developed to assess, by probabilistic means, the susceptibility of electronic systems to microwave radiation. This offers the military the capability to determine the vulnerability of friendly assets to hostile weapons. This capability is a valuable asset for test planning. Testing cost will be reduced by eliminating the need to test for unlikely situations. It will also be a most useful tool in the development of radiation hardening techniques.

Legal and Tax Issues for Consultants: Section 1706



by Steve Maas

Probably nothing in our business is as damaging to consultants as the infamous Section 1706 of the 1986 Tax Reform Act. An op-ed column in the April 7, 1993 *Wall Street Journal* describes the degree to which the Internal Revenue Service (IRS) is pursuing its vendetta against the self-employed, and especially against their clients. Clearly, this is not the time to be apathetic about this issue.

The *Wall Street Journal* item shows that the IRS, never known for a devotion to principle, has sunk to an all-time ethical low. Recently, for example, the IRS has started targeting small businesses for special harassment, primarily because such businesses don't have the ability to fight back effectively. IRS agents have even urged businessmen to "snitch" on their competitors who use contractors of questionable status. This trick is as powerful as it is dirty: an adverse IRS ruling could easily put a small enterprise out of business.

This type of harassment is partly intended to scare managers of small companies away from retaining consultants. It definitely works. Before I was incorporated, I had potential clients tell me bluntly that, in order to avoid risk, they deal only with incorporated companies. One even asked me to register with a job shop before he would retain me. He was willing to pay the job shop an extra 25% on top of my rates just to avoid this liability!

Before we go too far, what exactly is Section 1706? Before 1986, all technical consultants were presumed to be independent contractors, even those who worked for long periods at a single company and were virtually indistinguishable from employees, as long as it was "customary industry practice" to do so. This "safe harbor" gave them tax benefits that were not available to regular employees, and, of special concern to the IRS, gave them a theoretical opportunity to dodge taxes illegally. Section 1706 removed that presumption, leaving the IRS free to determine who was entitled to independent contractor status. It is important to note that 1706 applies only to technical consultants; however, after 1706 was passed, the IRS started applying same principles to independent contractors in virtually all fields. Also, 1706 technically applies only to consultants who obtain work through job shops; however, the IRS has been using 1706 to harass all consultants, even those who operate entirely independently.

If you, as an independent technical consultant, are audited by the IRS, you can expect to be asked the infamous "20 questions" to determine whether you should be allowed independent-contractor status. These questions are not a strict test; IRS has a great deal of discretion in deciding, according to your answers, whether you are legitimately an independent contractor. The flexibility granted the IRS is supposed to allow for individual circumstances; instead, it is often used as a tool to deny independent contractor status capriciously.

Even if you believe you are safe, it is not unlikely that the IRS might decide you are not an independent contractor; after all, the IRS believes that 3.4 million of the estimated 5 million self employed Americans should not be classified as independent contractors. Over 90% of the IRS rulings have been against such individuals.

If the IRS decides that you are not a legitimate independent contractor, you are in deep trouble: you will undoubtedly owe taxes and penalties for the time during which you claimed independent-contractor status. Furthermore, your clients may also be fined and forced to pay your employee withholding taxes, according to the IRS preset formulas. In this way, the IRS often collects double taxes: once from you, and again from your clients. You can imagine how likely your clients will be to retain you again, or, for that matter, any other consultant, after this happens.

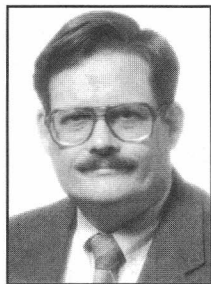
You may be able to avoid this disaster by asking your client to file IRS form SS-8 to verify your status. However, this ruling applies primarily to the client, and does not apply to your other jobs. It may be better simply to make certain that you fall well within the guidelines, to be prepared in case of an audit, and to be ready to fight if the IRS rules against you.

How do you make sure you stay on the good side of 1706? The most important requirement is simply to act like an independent contractor, not an employee. Be sure that you, not the client, are in control of the "means and manner" (IRS terminology) in which you do a job; work in your own office, with your own substantial equipment; do not seek or accept reimbursement for expenses that are normal business overhead; do not use a job shop; have several clients at a time. If you have only one or two clients, do all your work at the client's establishment, keep regular business hours, and have no office or business equipment of your own, you may be in trouble. (However, if *you do* have your own home office, it may not be deductible as a business expense, thanks to a recent Supreme Court ruling. Does this sound lunatic? Welcome to the American tax asylum!)

Another way to avoid this risk is to incorporate. Although the IRS has sometimes even ignored incorporation and ruled an incorporated consultant to be an employee of the client, it is very difficult for them to do so. In the past, incorporation offered significant tax advantages; unfortunately, many of these have evaporated in recent changes in the tax law. Incorporation is also ex-

(continued on page 38)

MTT-S Historical Collection



by Steve Stitzer
MTT-S Historical Collection
(410) 765-7348

The Historical Exhibit drew quite a bit of attention at the International Microwave Symposium this year. I think we had the greatest attendance in several years. As with last year, we were located in the middle of the commercial exhibits, with just enough separation to enhance our visibility.

The MTT Collection now includes an autographed copy of the famous text, *Microwave Filters, Impedance-Matching Networks, and Coupling Structures*. This specially bound copy was signed by the authors, George L. Matthaei, Leo Young, and E. M. T. Jones in a session honoring the 30th anniversary of its first publication. A number of attendees got their personal copies, ranging from the well-worn veterans (the books, I mean!) to the brand new reprints, autographed as well.

Terry Cisco, who organized this year's Historical Exhibit, added to the permanent exhibit by bringing in several examples of traveling wave tubes from Hughes. These ranged from low power pencil-sized devices to multi-kilowatt transmitter types, some nicely cut open for a good view of the internal works. He also donated an experimental TWT, big enough to really see the insides, to the permanent collection. Thanks, Terry.

Other items new this year included several high power klystrons developed by Westinghouse during World War II. One of the more interesting ones is a reflex oscillator utilizing a positively-charged reflector. This normally negatively-charged electrode was made with a secondary electron emitting coating to achieve the reflex action. These 2K51 series tubes could produce up to 10 watts CW at S-band.

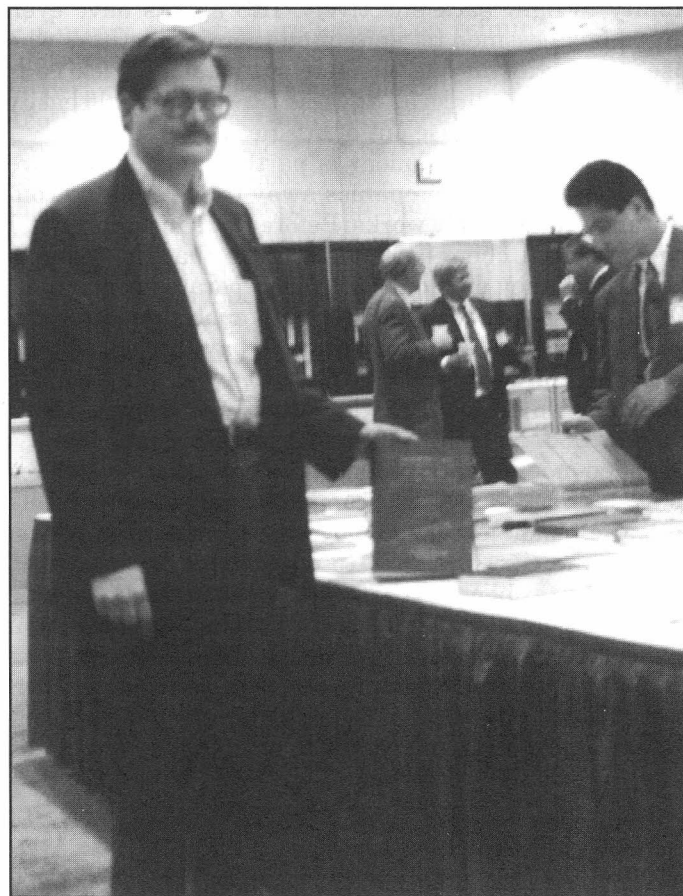
Several attendees promised to donate a number of items of historical significance in the microwave field. Paul Coleman, one of this year's MTT-S honorees, had already donated a large number of high power microwave and millimeter wave tubes. Some of these materials are too big to be brought to the symposium each year, but I hope to eventually get them on display at the Historical Electronics Museum.

One of the security people who helped us turned out to be the daughter of one of the five founders of Penta Labs,

a California vacuum tube manufacturer. She told me that her family still has a lot of old material from that company. I encouraged her to try to put together a history of that enterprise, which was founded about 1952, while those who know about it are still around. The same applies to our own history. A lot of exciting history has taken place in our industry in a relatively short time. If you are aware of some interesting history, I hope you will try to get it recorded, either with IEEE/MTT-S or in some other manner, before all the artifacts and memories disappear.

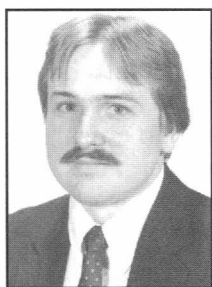
Our active display, consisting of a WW II era klystron-energized X-band slotted line setup and TS-148/UP spectrum analyzer, held up well for all three days, except for one tube which had to be replaced "in the field."

The MTT-S Collection, many of the phased array radar antennas shown at last year's Symposium, and numerous other electronic and microwave artifacts, are on permanent display at the Historical Electronics Museum. It is located just a few minutes away from the Baltimore-Washington International Airport, outside Baltimore, MD. The Museum is open daily, with free admission. Telephone (410) 765-2345 for details.



Steve Stitzer displaying the new addition to the Historical Exhibit at the IMS.

The MMIC Historical Exhibit



by Fred Schindler

The MMIC Historical Exhibit is displayed every year at the International Microwave Symposium as part of the MTT Historical Exhibit. This year, the San Diego Steering Committee placed the exhibit in the main Exhibition. This made viewing the Historical Exhibit an attractive, convenient and informative break for many IMS attendees. The MMIC exhibit, originally established by Bob Pucel, consists of noteworthy achievements related to MMIC technology. Most exhibits consist of a sample chip, a photograph of the chip, and data. The collection consists primarily of published achievements. This is a complete list of the present collection:

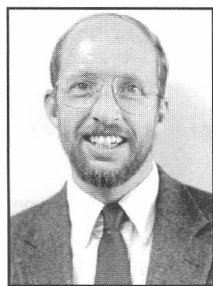
Year	Name of Item	Principal Investigator(s)
1965	Si PIN switch	Ertel, et al (TI)
1968	A 94 GHz receive	Mehal, et al (TI)
1974	X-band amplifier	Pengelly, et al (Plessey)
1978	First microwave on-wafer probe	Tuyl (HP)
1978	X-band power amplifier	Pucel, et al (Raytheon)
1979	X-band power combiner	Pucel, et al (Raytheon)
1979	First multi-stage PA	Sokalov, et al (TI)
1979	Low-noise amplifier	Higashisaka (NEC)
1980	SPDT X-Band switch	Ayasli, et al (Raytheon)
1980	First DBS receiver	Harrop (LEC)
1980	Mixer/IF	Chu, et al (Lincoln Lab)
1981	X-band power amplifier	Tserng, et al (TI)
1981	Direct-coupled amplifier	Hornbuckle (HP)
1981	MMICs for radar transceiver	Sudbury, et al (Lincoln Lab)
1981	Traveling-Wave Amplifier	Ayasli, et al (Raytheon)

1981	S-Band Signal Generator	Tuyl, et al (HP)
1981	X-Band T/R module MMICs	Pucel, et al (Raytheon)
1982	Voltage-controlled oscillator	Scott, et al (TI)
1982	High power X-band T/R switch	Ayasli, et al (Raytheon)
1982	X-band phase shifter	Ayasli, et al (Raytheon)
1984	DBS receiver	Kermarrec, et al (LEP)
1985	Multi-octave TWA	(Hughes)
1985	X-band T/R module	(Raytheon)
1985	C-band receiver	Podell, et al (PMI)
1985	High frequency oscillator	Tserng (TI)
1986	Millimeter-wave PA	Kim, et al (TI)
1987	Multi-octave band switch	Schindler, et al (Raytheon)
1989	High-power octave BW PA	Komiak (GE)
1989	HBT Power Amplifier	Bayraktaroglu, et al (TI)
1990	Multi-octave TWA (InP chip)	Majidi-Ahy, et al (Varian)
1991	HBT Multi-octave Matrix Amp	Kobayashi, et al (TRW)
1991	Multi-octave BW FET PA	Platzker, et al (Raytheon)

We're always on the lookout for additions to the collection. If you are aware of a new noteworthy MMIC accomplishment, or an older one that is not yet in the collection, please make a nomination. In particular, we are interested in significant technical innovation, state-of-the-art results, or milestones in production or commercialization. Not all items need be MMICs themselves, but any technology related to MMIC development. Most of the collection consists of actual MMICs. Keep in mind that if a MMIC is selected for the collection, we would like to have an actual chip. We also prefer to select items that have already been published. To consider an item that has not been published we must have some tangible verification of the claims made.

Please make a nomination of any MMIC achievement that you think is substantial and different from what we already have in the collection. Feel free to nominate any work, whether you've been involved in it or not. Send your nominations to Fred Schindler at Raytheon Research Division, 131 Spring Street, Lexington, MAS 02173; or preferably by e-mail to m.schindler@ieee.org.

MTT Co-sponsored Optical-Microwave Meetings



by Derry Hornbuckle

MTT is continuing to emphasize topical meetings, often jointly sponsored with other Societies, in order to serve our members with the best available information on technical developments. This article describes two such meetings which took place within the past year in the area of optical-microwave interactions, and extends an invitation for participation in future meetings.

MTT cooperated with the Lasers and Electro-Optics Society in organizing the 1993 Summer Topical Meeting on Optical Microwave Interactions in Santa Barbara, CA. Two MTT Technical Committees were represented on the Program Committee for this meeting: MTT-3, Lightwave Technology, and MTT-6, Microwave and Millimeter Wave Integrated Circuits. Chi Lee, of the University of Maryland and an MTT-3 member served as Co-Chairman along with LEOS member G. Arjavalingham of IBM. Alwyn Seeds (MTT-3), Tatsuo Itoh (AdCom and MGWL Editor), and Derry Hornbuckle (MTT-6) were also Program Committee members. The topical meeting consisted of 35 papers, 8 of which were invited, over two and a half days. There were 60 attendees, and the single-session format provided opportunities to meet the top researchers in this field, as well as a chance to hear every paper. Interested readers may order a copy of the Topical Meeting Digest as Catalog Number 93TH0549-6 from the IEEE.

MTT also cooperated with the Optical Fiber Communication (OFC) Conference in organizing a workshop and invited symposium session at OFC-'94, 2/94 in San Jose, CA. Organizers were Derry Hornbuckle (MTT-6), Alwyn Seeds (MTT-3), Ron Esman (Optical Society of America, LEOS, and MTT member), and Chi Lee (MTT-3). OFC Technical Co-chairman Joseph Weller and OFC General Chairman Rod Alferness were instrumental in providing support for these events which are believed to represent the first such cooperative effort between MTT and OFC. The workshop on Sunday, 2/20/94, was titled "Microwave Optoelectronics: Devices and Systems". It included 10 presentations, 3 of which were by international presenters. The workshop was divided into three portions, covering the following aspects of microwave optoelectronics:

Topic	Moderator	Overview Speaker
Components	Chi Lee	Peter Herczfeld
Phased Arrays	Ron Esman	Gerhard Koepf
Analog		
Transmission	Alwyn Seeds	Charles Cox

The workshop attracted approximately 90 attendees, and over 100 handouts were distributed.

The OFC Symposium special session on Optical Microwave Systems Using Fiber optics was organized by the same individuals who put together the workshop, and was held on Tuesday, 2/22/94. Speakers were:

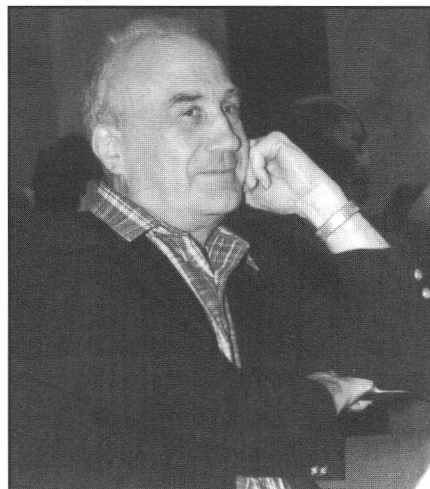
- Huan Yen, Hughes Research, "Application of Fiber Optics Microwave Systems"
- F. A. Deborgies, Thomson-CSF, "Linear Fiber Optic Links for Antenna Remoting and Signal Processing"
- M. J. Wale, GEC-Marconi, "Coherent Optical Beam Formers for Satellite Based Phased Array Antennas"
- Howard Thomas, ATR (Japan), "Millimeter Waves Over Optical Fiber for Broadband Wireless Communication"

The OFC'94 Technical Digest containing these papers may be ordered from the IEEE as Catalog Number 94CH3422-3.

MTT intends to continue organizing events such as those above which bring together expertise from multiple disciplines. Work has begun on a 1995 Summer Topical Meeting with LEOS in the area of microwave optoelectronics. If you are interested in participating, contact either of the individuals below:

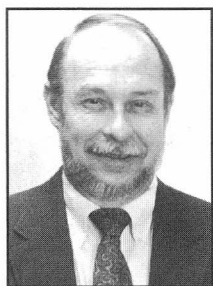
Professor Chi Lee, U. of Maryland
Tel: 301/405-3739, Fax 301/314-9281
Derry Hornbuckle, Hewlett-Packard
Tel: 707/577-3658, Fax: 707/577-2036

At the IMS:



*MTT-S
Transactions
Editor, Dan
Masse, at the '95
IMS briefing.*

MTT-S Operations Committee



by John Wassel

The Operations Committee is one of the standing committees of the MTT-S Administrative Committee or AdCom. This committee has been restructured over the last several years to focus more upon the procedural matters needed to support the other AdCom committees. Several new standing committees, formerly under the Operations Committee, have been established: Awards, Finance, and Nominations. The results so far have been very positive in providing a better focus upon these areas and eliminating some rather cumbersome reporting through the Operations Committee. The present structure of the Operations Committee is as follows:

Administrator	Dick Sparks
Bylaws	Denis Webb
Procedures Manual	John Barr
Historical Collection	Steve Stitzer
MTT-S Historian	Ted Saad
Electronic Communications	Fred Schindler/ Roger Pollard
Publicity	Roger Pollard
Ombudsman	Ed Niehenke
MTT Consultants' Network	Steve Maas

I'll provide a brief description of each position below. You may already be familiar with some of these offices by having read the reports in this and past *Newsletters*.

The position of Administrator was created last year and Dick Sparks is the first to fill this role. The initial idea was to have a paid assistant for the MTT Society President and officers to help in planning and to provide follow-up to business conducted during the AdCom meetings. Dick has expanded these duties to provide liaison to the IEEE Service Center and to advise or assist us in dealing with the various IEEE offices, including those committees within MTT that we serve on such as publications, finance (budget), awards, symposia, etc.

AdCom solicits candidates from the retired community of present or former active AdCom members, including past presidents, for the Administrator position. Each candidate is then asked to submit an expression of interest along with his resumé of qualifications for this post. The AdCom search committee then reviews and selects the individual who is hired as an independent contractor for a one-year term. Dick has admirably fulfilled our expectations for an Administrator and has considerably

expanded the original job duties to provide additional assistance to the International Microwave Symposia, MTT-S Chapters, and various international conferences.

Denis Webb is now responsible for Bylaws. A task force was appointed in June 1993 to restructure the Bylaws and to devise a more operational procedure for AdCom as I've mentioned before. Kiyo Tomiyasu and Bob Moore were the co-chairmen for this effort. Our MTT organizational documents (or our rule books) are, in order of permanence, the MTT Constitution, MTT Bylaws, and a new document to be called the MTT Procedures Manual. The Bylaws as amended by the task force were published in the *MTT-S Newsletter*, Number 136, Winter 1993, page 19. The Constitution was also published along with the Bylaws but no changes were made by the task force. The IEEE Technical Activities Board (TAB) has approved these changes to the Bylaws and hopefully we shall see only infrequent need for subsequent revisions.

John Barr has taken on the task of organizing the MTT Procedures Manual using the portions removed from the previous Bylaws as starting material and adding additional information as needed to codify the AdCom operations. John will be reviewing the older material and providing detailed guidelines, schedules, and job descriptions for the offices defined in the Constitution and Bylaws. His first cut at the Procedures Manual will be ready for review at the December AdCom meeting this year.

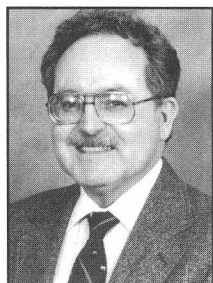
The MTT-S Historical Collection at the IMS is under Steve Stitzer, who has an article in this *Newsletter*. Steve also supports the Historical Electronics Museum near the Baltimore Airport. Also in this *Newsletter*, Fred Schindler has provided a detailed listing of MMICs in the Historical Collection. Ted Saad is our official MTT-S Historian and has recruited Steve and Fred to foraging for the historical collections. Ted has for many years reminded AdCom of our duty to collect and preserve our bit of history—You enjoy his efforts when you visit our collections.

Fred Schindler also serves as Chairman of the Electronic Communications Committee with Roger Pollard as Vice-Chairman. The objective is to promote the use of electronic communication technology within the MTT-S and to establish electronic facilities as needed by the various AdCom committees and MTT-S Chapters. Fred and Roger are currently investigating a number of services that could be provided through the infobahn for use by MTT-S members and will report on these services in future *Newsletters*. Roger Pollard is also responsible for Publicity and is planning to use electronic communications to improve our publicity efforts to members.

The Ombudsman role is filled by Ed Niehenke. The Ombudsman is one who investigates reported complaints from our members, reports findings, and helps to achieve equitable settlements of problems. Ed regularly reports to AdCom and writes for the *Newsletter* a listing of problems he has dealt with.

(continued on page 38)

MTT-S Membership Services Committee Report



*by Mario A. Maury, Jr.
Chairman*

Chapter Officers Meeting at IMS

The Annual Chapter Officers Meeting was held during the IEEE/MTT-S International Microwave Symposium in San Diego, California. It was held in the evening of Tuesday, May 24, at the Marriott Hotel, and was preceded by a reception and dinner.

Awards were presented to Chapter Officers present at the dinner. A new procedure was utilized that pre-sorted the awards so only those in attendance were announced; those not present were mailed their certificates. Should any past officer not have received his certificate, please notify the Chapter Activities Coordinator.

The meeting was extremely well attended (over 61 total attendees) with a broad representation from all IEEE regions. J. K. McKinney, who is the new MTT-S Chapter Activities Coordinator, did an outstanding job of organizing and setting up the meeting and the accommodations were outstanding. This was by far one of the best meetings we have ever had and we will try to continue to improve it in the future.

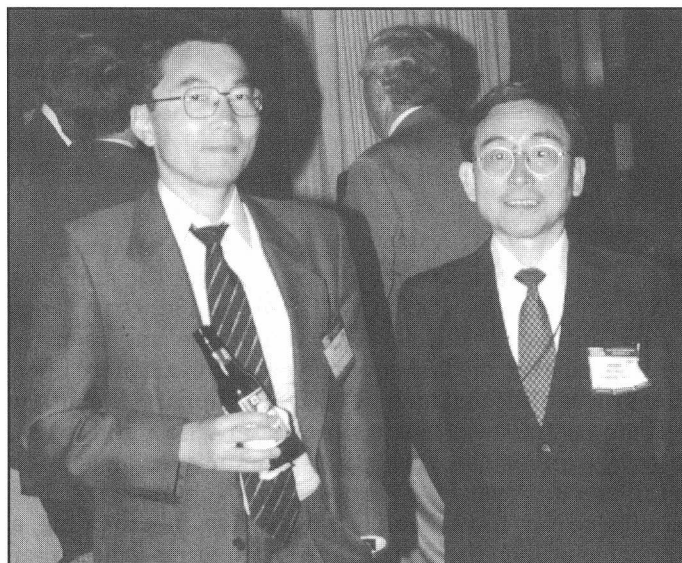
A large number of MTT-S AdCom members and Past Presidents attended, including the current President, Jim Crescenzi. Jim welcomed the attendees and stressed the importance of chapter activities to the society and its members. He also thanked the Chapter Officers for their efforts on behalf of the society and reaffirmed AdCom's commitment to supporting its chapters.

Various topics were covered and discussed during the meeting. John Barr, Vice Chairman of Membership Services, presented some interesting facts regarding MTT-S membership statistics and our ongoing efforts to retain members. Rolf Jansen and Eikichi Yamashita provided a Transnational Committee report. J. K. McKinney reported on the results of last year's Chapter Officers survey and also mentioned that a new survey will be conducted this year. Jitendra Goel mentioned the various membership recruitment activities underway and solicited Chapter Officers cooperation.

The Chapter Officers were encouraged to contact the Distinguished Microwave Lecturers to schedule a visit to one of their chapter meetings. We were fortunate to have two of our DML's in attendance, Ferdo Ivanek and Martin Schneider. Also, Reinhard Knerr again encouraged the audience to submit qualified candidates for IEEE/MTT-S awards.

The meeting was concluded by all the Chapter Officers presenting a brief report on their chapter activities. This exchange of information was extremely valuable to the members present.

At the IMS:



L-R: Hiroyo Ogawa and Masami Akaike, Chairman of the Tokyo Section, at the Chapter Chairperson's Reception.

Chapter Officers Meeting at EUMC and APMC

There will also be MTT-S Chapter Officers Meetings held in Regions 8 and 10 at the following Conferences; please contact the individuals shown for further information:

- Region 8—European Microwave Conference in Cannes, France (9/5-8/94). Contact Rolf Jansen, tel. (49) 2102-83095, fax (49) 2102-842391
- Region 10—Asian Pacific Microwave Conference in Tokyo, Japan (10/25-27/94). Contact Eikichi Yamashita, tel. (81) 424-83-2161, fax (81) 424-80-3801.

Chapter Officers from these various regions should make every effort to attend these meetings since they are very beneficial. They provide information to help you in conducting better activities and an open forum to exchange information and ideas with other MTT-S members with similar interests.

Travel support is now available for Chapter Chairpersons from Eastern Europe and the Former Soviet Union travelling to the Chapter Officers meeting during the European Microwave Conference. Please contact Rolf Jansen for further particulars. We are also looking into similar arrangements for Regions 9 and 10.

Chapter Officers Handbook

The new 1994-95 handbook was issued at the Chapter Officers Meeting in San Diego and has been sent out to all chapters not in attendance. This handbook provides a wealth of information for conducting chapter activities. It also provides the names of people to contact on the Membership Services Committee when you need assis-

tance in specific areas. The following is a partial list of its contents:

- Planning Successful Meetings
- Reporting Meetings
- Reporting Chapter Officer Changes
- Financial Support Chapters
- Technical Speakers
- Travel Funds to MTT Symposium
- Section Financial Support
- Membership Development
- Chapter AdCom Liaisons
- Transnational Committee
- Distinguished Microwave Lecturers
- Videotape Series
- Etc.

Should you not receive your copy or need additional copies, please contact Austin Truitt.

Chapter Officers Newsletter

The Chapter Officers' Newsletter *Transceiver* is being published on a regular basis three times a year. The purpose of this newsletter is to provide focused information to the Chapter Officers concerning their activities. We hope that by providing this forum, we can help to exchange information to help the Chapters conduct more effective meetings and to provide specific chapter operating information. We encourage all Chapter Officers to submit their inputs, articles, etc., directly to Vijay Nair, Editor of the *Transceiver*.

MTT-S Membership Recruitment

The Membership Development Committee headed by Jitendra Goel has a membership drive underway. The Membership Booth at the 1994 IMS in San Diego signed up over 90 new MTT-S members.

Membership Booths are also being planned at the following conferences:

- European Microwave Conference—Cannes, France (9/5-8/94)
- Microwaves '94—Wembley, London, England (10/25-27/94)
- APMC—Tokyo, Japan (12/6-9/94)

The IEEE and MTT-S provide discounts as an incentive to join at conferences. Also Chapters should remember that the Chapters in Regions 1-6 and 7-10 with the largest membership gain each year can get a \$200.00 award. Contact Jitendra for additional information, or if you would like to help at the upcoming conferences membership booths.

Membership Services Committee

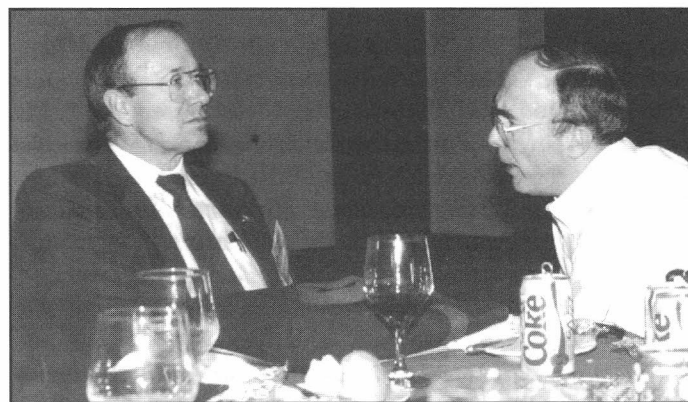
The following are members of the Membership Services Committee:

- M. A. Maury, Jr., Chairman—tel. (909) 987-4715, fax (909) 987-1112, e-mail mamjr@easyst.com
- John Barr, Vice-Chairman—tel. (707) 577-2350, fax (707) 577-5644, e-mail barr@sr.hp.com
- J. K. McKinney, Chapter Activities—tel. (909) 612-1044, fax (909) 612-1047, e-mail jkm@easyst.com

- Joe Staudinger, Chapter Records—tel. (602) 897-4456, fax (602) 897-4477, e-mail ryym70@email.sps.mot.com
- Austin Truitt, Chapter Officers Handbook—tel. (214) 995-9918, fax (214) 995-4583, e-mail truitt@ms3.dseg.ti.com
- Vijay Nair, Chapter Communications—tel. (602) 897-5922, fax (602) 897-5934
- Samir El-Ghazaly, Chapter Funding—tel. (602) 965-5322, fax (602) 965-8325, e-mail sme@asu.edu
- Richard A. Sparks, International Chapter Meeting Liaison—tel. (617) 862-3000, fax (617) 863-0586, e-mail r.sparks@compmail.com
- Kris K. Agarwal, Microwave Lecturer Program—tel. (203) 576-4109, fax (203) 576-4117
- Jitendra Goel, Membership Development—tel. (310) 814-2031, fax (310) 812-7011, e-mail jitendra_goel@qmail4.sp.trw.com
- Roger D. Pollard, Student Membership Development—tel. (44) 532-332080, fax (44) 532-332032, e-mail roger@ee.leeds.ac.uk
- John W. Wassel, Newsletter Editor—tel. (214) 995-3216, fax (214) 995-3347, e-mail john.wassel%jugo@timsg.csc.ti.com
- David Zimmerman, Associate Editor—tel. (214) 995-8190, fax (214) 995-9867, e-mail zimm@ms3.dseg.ti.com
- John Eisenberg, Feature Article Editor—tel. (415) 941-7426
- Rolf Jansen, Region 8 Editor—tel. (49) 2102-83095, fax (49) 2102-842391

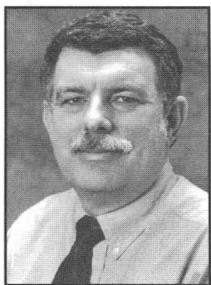
It is the objective of the Membership Services Committee to administrate the services MTT-S provides to its members and chapters and to continually try to make improvements. Listed above are all committee members' phone and fax numbers so you can communicate with any of us if you need any information, assistance or have any suggestions relative to MTT-S activities or benefits.

At the IMS:



Keith Huddleston, Chairman of the '95 IMS, receiving good advice from President Jim Crescenzi.

ARFTG Highlights



by John T. Barr, IV

The Automatic RF Techniques Group (ARFTG) is an independent professional society that is affiliated with MTT-S as a conference committee. ARFTG's primary interests are in computer-aided microwave analysis, measurement and design. ARFTG holds two conferences each year, one in conjunction with the MTT-S International Microwave Symposium and a second in the late fall.

43rd ARFTG CONFERENCE— Improving Performance and Quality of Automated Microwave Test Systems

The 43rd ARFTG Conference was held in San Diego, California at the San Diego Marriott Hotel and Marina on May 27, 1994, as part of 1994 MTT-S International Microwave Week. The theme of this one day technical conference with concurrent manufacture exhibits was *Improving Performance and Quality of Automated Microwave Test Systems*. In attendance were 120 paid technical attendees plus 11 exhibits that was held in the concurrent exhibitors' room. Below is a list of the presented papers:

- *Manufacturing Microwave and RF Test Equipment to Meet the Requirements of ISO 9002*, B. Smith
- *Electronic Calibration of a Vector Network Analyzer (VNA) for Non-Insertable Devices*, V Adamian
- *The Multi-State Two-Port. An Alternative Transfer Standard*, G. Engen
- *Study of Millimeter-Wave On-Wafer Calibration Techniques and the Effect Upon HEMT Parameter Extraction*, M. Nishimoto
- *Cryogenic Probe Station for Use in Automated Microwave and Noise Figure Measurements*, S. Taub
- **** Selected Best Paper of the 43rd Conference ****
- *Implementation of a Noise Model and Extraction Method for GaAs MESFETs*, J. Birkeland
- *High Accuracy Signal/Noise Measurement of Microwave Power Amplifiers*, S. Hillenberg
- *An Air Coplanar Wafer Probe*, E. Godshalk
- *Microwave Probing Measurements with a Monolithic Six-Port Module (MSPM)*, B. Huyart
- *Determining Uncertainty in Antenna Array Measurements*, J. Cha
- *Automated High-Power RF/Microwave Tube Test Stand*, A. Young

Poster Papers

- *Data Processing for Q-Factor Measurement*, D. Kajfez
- *A Non-Linear High-Power MESFET Amplifier Model Verified by Wave and Load-Pull Measurements*, C. Wei

The Conference Chair was Patrick Nolan, Lockheed Missile & Space, 0/48-70 B/1958, PO Box 3504, Sunnyvale, CA 94088-3504, (408) 756-2144 and Conference TPC was S. D. Phleger, TRW Space and Electronics Group, MS S/2767, One Space Park, Redondo Beach, CA 90278, (310) 812-4667. A conference digest is available, contact: Henry Burger, ARFTG, 1008 East Baseline Road, No. 955, Tempe, AZ 85283-1314. Cost is \$20.00 for an ARFTG Member and \$35.00 for a non-member. An additional \$9.00 is requested for airmail outside the USA.

Upcoming Activities 44th ARFTG CONFERENCE— Multichip Systems: Models and Measurements

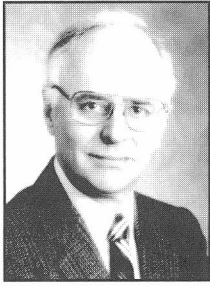
The 44th ARFTG Conference will be held in Boulder, CO on December 1 & 2, 1994. The theme of this two day technical conference with concurrent manufacture exhibits will be *Multichip Systems: Model and Measurements*. The measurement and modeling of densely packed, high performance multichip systems present new and difficult challenges for designers. Multichip modules, hybrids, and high density circuit boards require sophisticated analysis of discontinuities, crosstalk, and signal quality using a variety of frequency and time domain instruments and circuit simulation tools. Papers are solicited on the RF/Microwave aspects of multichip systems design, verification and analysis. Papers are also invited on other areas of automated microwave and RF testing including improved techniques for calibration and verification, MMIC related measurements issues, CAD, millimeter wave systems and other topics of current interest to the RF/Microwave community.

In addition to the technical presentations, the attendees will have ample time for informal discussion among themselves during the breaks and during the provided lunches and dinner (your spouse is invited to the Awards Banquet at no extra cost). There will be time for discussions with vendors and viewing of exhibits to see the latest in automation and measurement products. The registration fee includes technical sessions, exhibits, and all meals and break refreshments, one year membership in ARFTG and conference digest of the presented papers.

Those interested in participating should contact Conference Chair: Ray Tucker, Rome Laboratory/ERST-A, 525 Brooks Road, Griffiss AFB, NY 13441-4505, (w) (315) 330-3884, (f) (315) 330-7083 or Conference TPC: Ron Ginley, NIST, 325 Broadway, MS 813.06, Boulder, CO (w) (303) 497-3634, (f) (303) 497-3970. Those interested in exhibiting should contact: Bill Pastori, Maury Microwave Corp., 2900 Inland Empire Boulevard,

(continued on page 38)

Division IV Report



*by W. Kenneth Dawson
Director*

At the three-quarter point in my term I am becoming less and less sure as to what type of activity a volunteer elected to the Board of the IEEE should carry out. This column is an attempt to explain my concerns and a plea for your thoughts on the subject.

There is a fundamental difference between the role of volunteers in the governance of a Society, especially one in Division IV, and their role when serving on the Board. Let's look at the Societies first.

In many respects each Society is a separate business loosely tied to the IEEE structure. These ties supply the advantages of size and general recognition, the protection by a form of oversight on procedural and financial matters, and the benefit of a number of services that would be difficult or overly expensive for Societies, especially the smaller ones, to provide on their own. Of course, Societies pay for most of these services but they also profit from the marketing and other efforts of the IEEE. Occasionally the rules feel burdensome and petty but, on the whole, they are not difficult or onerous to follow.

In general the long-term and day-to-day operations of Societies are looked after by volunteers who are either directly or indirectly elected by the membership. This group then allocates tasks, such as secretary and treasurer, among its members and appoints other volunteers to fill additional jobs such as Transactions Editor and Awards Chairperson. The operation of a Society and the responsibility for this operation both lie in the hands of the volunteers.

When starting new initiatives or solving problems a Society's volunteers need only have the ability to properly evaluate the opportunities or identify the problems. All the tools to accomplish these tasks are there because everything, within the limits of the Society's resources, is clearly under their control. Most, if not all, the work required to carry out the agreed upon actions will be supplied by the volunteers themselves. Volunteers determine what should be done and then select other volunteers or themselves to do the work. The abilities of those assigned to tasks are usually well known—hence their selection. If those chosen do not perform they are simply not asked to help again. Motivation to spend the required time and effort is most often simply a belief that work of this nature is necessary for the profession to flourish. (Some Societies have paid staff, but, with one

exception, their numbers are small and do not significantly perturb this general view of the way volunteers in Societies work.)

At the Board level and, especially, the Executive Committee of the Board level, this picture changes considerably. The volunteer Board's function is to make sure that the IEEE operates in a way that best serves its members. But the IEEE is big business; the general fund budget this year is about \$50M. This does not include the budgets of all the Societies which, if included, would more than double this figure. Membership dues account for only about a third of the revenue. The rest is derived from IEEE business ventures such as publishing whose products are available to all (with discounts for members) and the Financial Advantage program (available to members only). The staff required for all of this plus the support for Regional, Technical, Education, Standards and Professional Activities is large—over 500.

Board members, through either direct experience or information received from members, become aware of parts of the operation that are running well and others that are not. How should they proceed to make sure that proper recognition is given and appropriate remedial actions taken? The Board also proposes new or expanded activities for staff to carry out. In principle the Board should have its recommendations appear as directives to the staff from the General Manager. Should the Board just assume that the outcomes it seeks will occur and go on to other topics? No, because the Board has a duty to provide volunteer oversight of what is (and is not) going on. At what level does this oversight start to undermine the authority of the General Manager?

Many Board actions require financial and people resources. These resources are severely limited hence internal reallocations are made by the General Manager to accede to the Board's wishes. Reallocations imply that resources are removed from current activities and added to new or changed ones. From time-to-time members of the Board have severe difficulties with the reallocations that are made. For example they may be concerned that existing, very important, staff-volunteer working relationships that took years to develop will be broken or that the reallocations will in due course cause a bigger problem than the one currently being solved. Many such details are available only after the fact. But to demand them before the fact would start the Board on the road to micromanagement to say nothing of placing staff, especially the department heads (Staff Directors), in the difficult position of having to serve two masters, their supervisors and Board members.

There is no easy solution. Supervisors at all levels should be more sensitive to effects on volunteers of moving staff around (and, perhaps, do more overt succession planning) and volunteers need to be more understanding of the overall needs of the big business that is the IEEE. A more delicate and difficult necessity is that of establishing a trusting working relationship between the ever-

changing volunteer contingent on the Board and staff. To a great extent these problems are, I believe, inherent in the operation of a volunteer organization as large and as complex as the IEEE. But, perhaps not! Your thoughts on these questions would be most appreciated.

Ken Dawson is the Director for Division IV, the Electromagnetics and Radiation division of the IEEE. The IEEE has 10 divisions for Technical Activities. The Electromagnetics and Radiation Division IV had 29,747 members and affiliates in its various societies and councils as compared to the total IEEE membership of 372,428 at the end of 1993. The Microwave Theory and Techniques (MTT-17) Society had the largest membership, 9825, within Division IV, followed by the Antennas and Propagation (AP-03) Society at 8876. Other societies within Division IV are Broadcast Technology (BT-02), Consumer Electronics (CE-08), Electromagnetic Compatibility (EMC-27), Magnetics (Mag-33), Nuclear and Plasma Sciences (NPS-05), and the Solid State Circuits Council (SCC). Several societies have allied interests in the Solid State Circuits Council which is nominally under Division I, Circuits and Devices. The members of a council are other IEEE Societies such as MTT-S. The members of a society are people (IEEE members). A council has its own operating budget and also sponsors conferences, periodicals, books, etc. A council elects its own executive committee just like a society.

ARFTG Highlights

(continued from page 36)

Ontario, CA 91764, (w) (909) 987-4715, (f) (909) 987-1112. Deadline for paper submissions is September 15, 1993. Potential presenters should request the ARFTG Author's Preparation Package.

Microwave Measurement Short Course

On November 29 & 30, 1994, prior to 44th Conference, ARFTG and National Institute of Standards and Technology will jointly offer a short course in Microwave Measurements. See announcement in the back of this Newsletter or contact, Ray Tucker, 44th Conference Chair, for more information.

Measurement Professional? or Interested in Learning More?

We will be looking forward to discussing the latest in measurement automation and accuracy with you in Boulder. ARFTG brings you the latest in RF, Microwave and Millimeter wave analysis, design and measurement. State of the art papers are presented twice a year. If you are involved in automated measurement techniques, come and join your peers and keep current with our ever-evolving technology. For more information on ARFTG or future conferences, write: John Barr, Santa Rosa System Division—3US-Q, Hewlett-Packard, 1400 Fountaingrove Parkway, Santa Rosa, CA 95403.

MTT Operations Committee

(continued from page 33)

During the May AdCom meeting, Steve Maas presented a proposal to establish an MTT Consultants' Network under the aegis of the Microwave Theory and Techniques Society. Steve has carefully investigated the existing consultants' networks that have been set up in several American metropolitan areas (Los Angeles is the largest to date) to help independent consultants develop support for their technical efforts and to provide a forum for their common interests. An existing problem area within all of these local networks is the difficulty of providing a focus for referrals, particularly when a variety of different specialists are expecting to use the network. Referrals are of course the main *raison d'être* of a consultants' network with education on various aspects of setting up a consulting business and networking with regular meetings as extra benefits to be obtained through a network. Local referral databases have not been very effective despite intensive efforts to develop and maintain them. A specialized database, properly maintained and publicized, will probably be a better way to promote increased usage of consulting services. Steve has agreed to establish and maintain an MTT Consultants' Network within his office with MTT providing start-up costs and subsidizing early operations. In time, we expect this to be self-sustaining as with so many activities we have started in the past. There are a number of obstacles to be overcome in order to have a truly effective service; some are privacy, ethical issues, legal/liability, and sustainability. Steve has an article within this *Newsletter* of a problem facing independent consultants, the infamous Section 1706 of the U.S. Internal Revenue Code. I expect we'll be hearing more from Steve in the future on his continuing efforts to develop the MTT Consultants' Network.

Legal and Tax Issues for Consultants: Section 1706

(continued from page 29)

pensive, and requires extra paperwork and legal hassles.

If you are worried about all this legal stuff, there is a publisher you should know about: Nolo Press, 950 Parker St., Berkeley CA 94710 (510-549-1976). They publish a fine line of legal self-help books and software. Call and ask for their catalog. Another resource is the Business and Tax Handbook of the Independent Computer Consultants' Association (\$27; call 1-800-GET-ICCA). Finally, you can get an IRS publication no. 937 from the IRS forms hotline; check your local phone book under government listings.

This article appeared in The Engineering Independent, (the newsletter of the Los Angeles Consultants' Network) in June, 1993. Steve Maas has volunteered to help establish MTT Consultants' Network and will be reporting selective topics in the future.



1994 Asia-Pacific Microwave Conference—APMC '94—

December 6- 9, Tokyo, Japan

The Institute of Electronics, Information and Communication Engineers

The Sixth Asia-Pacific Microwave Conference (APMC '94) will be held at Nippon Convention Center (Makuhari Messe), Japan, on December 6- 9, 1994. This conference is organized and sponsored by the Institute of Electronics, Information and Communication Engineers (IEICE) of Japan, and is co-sponsored by IEEE MTT-S Tokyo Chapter and is cooperatively sponsored by IEEE MTT-S and URSI. Makuhari Messe is located 20km (30-minute train ride) east from downtown Tokyo.

CONFERENCE TOPICS

The main conference topics are listed below

1. Solid State Devices and Circuits
2. GaAs FET, HEMT, HBT and other Devices
3. Low-Noise Devices and Techniques
4. High-Power Devices and Techniques
5. Microwave and Millimeter Wave Monolithic Circuits
6. High Speed Digital Circuits
7. Microwave Measurement for Gigabit Devices
8. Opto-Electronic Techniques
9. Microwave and Millimeter Wave Packaging
10. Passive Devices and Circuits
11. Microwave Superconductivity
12. Electromagnetic Field Theory
13. Ferrite Devices
14. Microwave Acoustics
15. Millimeter Wave and Submillimeter Wave Techniques
16. EMC/EMI
17. Scattering and Propagation
18. Microstrip Antennas
19. Measurement Theory and Techniques
20. Computer Aided Design
21. Microwave and Millimeter Wave Systems
22. Microwave Terrestrial, Satellite and Mobile Communication Systems
23. Microwave Industrial Applications
24. Microwave Medical/Biological Applications
25. Phased and Active Array Techniques
26. Remote Sensing

Prof. Masami Akaike

Chairperson, Technical Program Committee

c/o REALIZE INC.

Cosmos Hongo Bldg. 4-1-4 Hongo, Bunkyo- ku, Tokyo 113, Japan

TEL. +81-3-3815-8590 FAX. +81-3-3815-8939

WORKSHOPS

Workshops will be held on December 9, 1994, and organized by IEICE and MTT-S Tokyo Chapter. The topics are listed below:

- (1) Optoelectronics signal processing and applications to microwave systems
- (2) Personal communications and related technology
- (3) Present status and trends of mobile/satellite communications
- (4) Advanced nonlinear device modeling and circuit simulations
- (5) Microwave circuit simulation technology by electromagnetic field analysis
- (6) Millimeter wave MMIC technology
- (7) Microwave and millimeter wave radar/sensor technology for consumer applications
- (8) Superconducting device applications to microwave and millimeter wave circuits

The detail of each workshop will be announced on the advanced program.

EXHIBITION

An International Microwave Exhibition (Microwave Exhibition '94) in association with the Conference will be held at International Exhibition Hall in Nippon Convention Center (Makuhari Messe), the venue of the Conference, from December 6 to 9, 1994.

The Exhibition will have two Pavilions: Main Pavilion to accommodate exhibitors from countries all over the world and U.S. Pavilion (Microwave USA '94) to accommodate exhibitors from U.S.A.

JAPAN MICROWAVE PRIZE

During the APMC'94, the Japan Microwave Prize will be awarded to the authors of the papers that are judged by the APMC'94 Award Committee to be the most outstanding contributions to the microwave field among those accepted for presentation at the APMC'94.

REGISTRATION

Registration fee for the conference is 35,000 yen when pre-registered on or before Oct. 31, 1994. After this date, the fee is 40,000 yen. The student fee is 5,000 yen. The registration fee includes admission to all sessions of the conference and a copy of Conference Proceedings. Registration fee for workshops is 5,000 yen. Registration form will be provided in the Advance Program.

BANQUET

The social highlight of the 1994 Asia-Pacific Microwave Conference will be held on December 8, 1994. You will be able to enjoy traditional Japanese cuisine and attractions. Banquet tickets are available at 7,000 yen per person. Detailed information will be provided in the Advance Program.

HOTEL ACCOMMODATION

The Japan Travel Bureau, Inc. (JTB) International Travel Division, official travel agent for the conference, has reserved a sufficient number of rooms at several hotels in Makuhari. Detailed information will be provided in the Advanced Program. Should you have any inquiries, please contact:

Japan Travel Bureau Inc.	Phone : +81-3-3216-7885
International Travel Division	Fax: +81-3-3272-1277
Convention Center	Telex : TOURIST J24418
(Ref. CD101003-099)	(Answer Back)
1-13-1 Nihonbashi, Chuo-ku	
Tokyo 103 JAPAN	

Advance registration deadline: Oct. 31, 1994

You can visit Tokyo Disneyland which is located 18km west from Nippon Convention Center.

For further information, please contact:

Prof. Shizuo Mizushina
Chairperson, Steering Committee
c/o REALIZE INC.
Cosmos Hongo Bldg.
4-1-4 Hongo,
Bunkyo-ku,
Tokyo 113, Japan
Tel. +81-3-3815-8590
Fax +81-3-3815-8939

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Science University of Tokyo, Tokyo, Japan

President's Message

(continued from page 4)

for many previous administrations. They deserve particular credit for achieving it during difficult and uncertain times. This strong financial position allows us to now focus on increasing services to our members and on expanding technical activities.

We took a major and controversial (to the AdCom) step last year of unbundling our technical periodicals—that is, itemizing membership and journal renewal fees. Our member's checkbooks were their ballots. The results were very encouraging, with over 95.5% of our regular members selecting to receive either the Transactions or the Letters (most took both). These statistics are very accurate in their reflection of true member sentiment, and are therefore of great importance to your AdCom. We were surprised that significantly fewer students (77%) elected a technical periodical. Many students (23%) depend solely on the Newsletter for their introduction to our Society.

The content of our technical journals is a regular topic of discussion at the AdCom meetings (as it has been for decades). There is a strong sentiment to increase the number of "applied" papers, although our Editors report that implementation of such an objective is challenging. I personally feel that it would be of great benefit to include more applied and tutorial articles in the Transactions. Perhaps the reader will consider submitting such an article! The number of published pages in the Transactions has steadily increased, resulting in several special issues this year. There is also a new initiative to encourage MTT sponsored IEEE Press publications—to bring improved texts on microwave theory and technology to our membership. As a result of the organizational efforts of Mike Golio, IEEE Press Liaison, several MTT-S sponsored IEEE Press releases will be made in the next twelve months.

We are committed to navigating the "Information Highway" and expect that, in time, an impressive array of MTT services will be available to our members electronically. The potential benefits for volunteer activity on a global scale are extremely promising. The Electronic Communication Committee, chaired by Fred Schindler and Roger Pollard, will be reporting on this activity in the future.

An important new professional service is announced in this issue (refer to the article by Barry Perlman), with the introduction of the Microwave Engineering Graduate Scholarship Fund. This fund is structured specifically to accept individual contributions and contributions on behalf of an individual. It includes safeguards to assure that 100% of the contributions will go to students. Your Society will support this program by funding administrative expenses, and will otherwise assure that all scholarship donations are directed to the intended purpose. The unique quality of this charitable effort should

be especially appreciated by those interested in personally supporting future generations of microwave engineers.

Chapter support remains a priority. A framework for assisting chapter formation in Eastern Europe and the Former Soviet Union was presented by Rolf Jansen to the AdCom, and it was approved at our recent meeting. This new venture will be a partnership between the MTT and Electron Devices Societies, in which both societies will leverage the impact of their limited financial resources by working together.

Technical Meeting Activity continues to expand, with emphasis on new conferences outside the US. These include Topical Congresses at the INTELCOM 94, November 2-5 in Turin, Italy, and INTERCOM 95 in Vancouver, Canada. The INTELCOM 94 Topical Congress is in response to a perceived need for increased sponsorship by MTT-S of technical meetings in Europe. We are also negotiating to upgrade our level of sponsorship of the major microwave conference in South America—a region that is experiencing particularly dramatic growth in MTT-S membership.

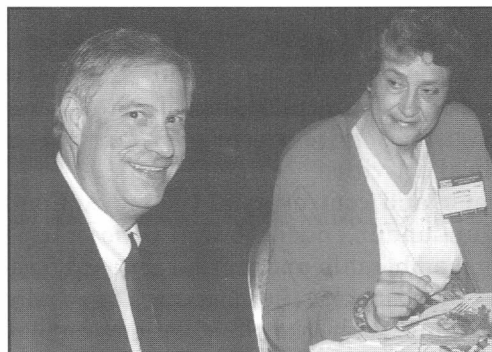
As a result of initiatives taken this year, John Barr (Vice Chairman of the Membership Services Committee) has compiled unique membership profile statistics that offer new insights about MTT-S membership. Although our society has a long history (we were founded in 1952), as of this moment approximately half of our members (including student members) have been in the society for 5 years or less! We believe this is a strong shift from the longer seniority typical of the Cold War era. Clearly, we are experiencing the inflow of new members necessary for a resurgence of growth in membership, in spite of the downturn in defense activity.

As is noted in an article by Keith Kennedy in this issue, our professional environment has changed dramatically, and it may be expected to continue changing at an accelerated rate. Industry is depending on the MTT Society to provide the services to "re-engineer" or re-energize their professional workforce. The very popular workshops at the International Microwave Symposium, short courses sponsored by many of our chapters, and increased publications (including MTT-S sponsored IEEE Press texts) are good examples of the types of activities that contribute to the re-engineering process. Of course, most of MTT-S activities (local technical meetings, technical publications, and sponsored conferences) contribute to the process of continually updating the professional skills of our membership. Are we adapting to the new environment and meeting the increased demand with sufficient urgency? The grading process isn't complete, but my personal opinion is that we have an excellent chance of earning high marks. I would be interested in your feedback. I can be contacted by telephone at (415)-813-2506, by FAX at (415) 813-2402, or by e-mail at j.crescenzi@ieee.org.

At the IMS:



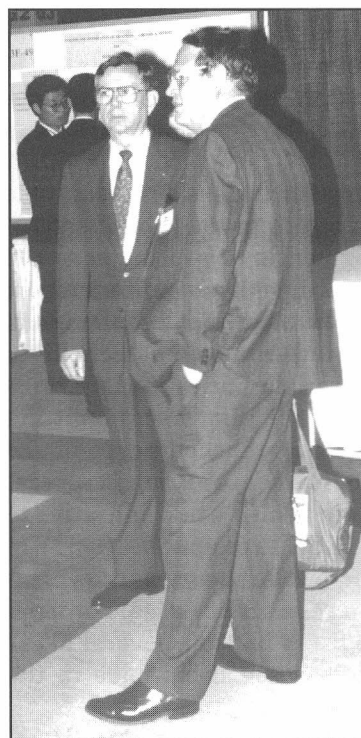
Yoshihiro Konishi upon accepting the Microwave Career Award.



Don and Carolyn Parker enjoyed the Monolithic Circuits Reception.



Michiyuki Uenohara receives the Pioneer Award from President Jim Crescenzi.



Jim Wiltse and Larry Brockman, planning for the '95 IMS in Orlando.

1995 IEEE Microwave Theory and Techniques Society Graduate Fellowships

- Several \$5,000 fellowship awards each year
- For Graduate research studies in microwave engineering on a full-time basis
- Applicants must have attained high academic achievements in engineering or physics
- Award can be granted *in addition* to any other support received by student
- Award cannot be used for equipment purchase, travel, supplies, etc.
- Award made to institution for support of named student
- Faculty supervisor must be MTT-S member

Application Deadline: 21 October, 1994

For applications contact:

Dr. Aditya Gupta
Westinghouse Electric Corporation
P.O. Box 1521
MS 3K11
Baltimore, MD 21203
410-765-9170
410-765-7370 (Fax)

Requests for application materials must be received no later than 30 September, 1994.

Microwave and Millimeter-wave Photonics

Special Issue of the IEEE Transactions on Microwave Theory and Techniques

Jointly Prepared with the JOURNAL OF LIGHTWAVE TECHNOLOGY

The interface between photonics and microwaves has been intriguing researchers for some time. Recent dramatic advances in high-speed optoelectronic components and instrumentation has meant that major applications of hybrid lightwave-microwave systems can now be realized. Applications include antenna remoting, fiberoptic feed networks for phased array antennas and wireless communication networks, delay lines, computer interconnects, cable television signal distribution, personal communications and instrumentation. As the applications of lightwave technology to microwave systems mature, chip level integration of microwave and photonic functions is emerging as a powerful new technology.

Papers are solicited for a special issue of the IEEE Transactions on Microwave Theory and Techniques on "Microwave Photonics," to be published in September, 1995. This issue intends to emphasize the merging of microwave and photonic components, circuits and systems. The special issue will be distributed to subscribers of the Transactions on MTT, and also to subscribers of the Journal of Lightwave Technology. Relevant topics of interest include, but are not limited to, the following areas:

- Optically controlled microwave semiconductor devices and circuits, including MMIC's
- Optical generation, distribution and control of microwave and millimeter wave signals
- Application of lightwave technology to microwaves; phased array antennas, antenna remoting.
- Microwave-Photonic instrumentation
- High-speed analog and digital transmission systems
- High-speed optical transmitters & receivers
- Microwave/millimeter-wave controlled optical devices and circuits
- Chip level integration of photonic and microwave components
- Computer-aided design of Microwave-Photonic circuits and systems

Manuscript requirements for submitted papers are outlined on the outside back cover of the IEEE Transactions on Microwave Theory and Techniques. Authors are requested to send four (4) copies of their manuscripts by January 15, 1995, to one of the guest editors for this special issue:

Peter Herczfeld

Cntr for Microwave-Lightwave Eng
Dept. of Elec. & Comp.Eng.
Drexel University
Philadelphia, PA 19104, USA
Telephone: (215) 895-2256
Fax: (215) 895 4968

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Fax:+61-3-344-7412



CALL FOR PAPERS

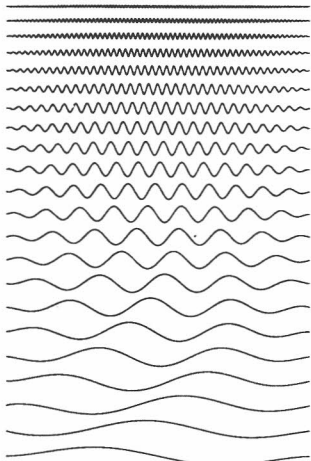
ABSTRACT DEADLINE
NOVEMBER 7, 1994

Second Topical Symposium on

Combined Optical-Microwave Earth and Atmosphere Sensing

April 3-6, 1995
Atlanta, GA

Co-sponsored by the IEEE Lasers and Electro-Optics Society,
the IEEE Geoscience and Remote Sensing Society and the IEEE
Microwave Theory and Techniques Society.

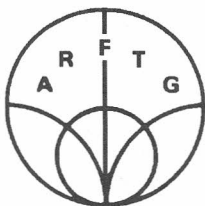


TOPICS TO BE INCLUDED

Topics of discussion at this symposium will include the following:

- **Advances in Optical and Microwave Components and Sensor Technology**
- **Modelling, Inversion, and Processing of Multi-wave length and Multisensor Data**
- **Wind Field and Turbulence Sensing**
- **Cloud, Water Vapor and Temperature Sensing**
- **Atmospheric Trace Species Sensing**
- **Earth-Atmosphere-Ocean Interaction Studies**
- **Multi-wavelength Imaging Techniques**

For further information contact:
IEEE/LEOS CO-MEAS '95
445 Hoes Lane, Piscataway, NJ 08855
Phone: 908-562-3893 Fax: 908-562-8434



AUTOMATIC RF TECHNIQUES GROUP

ARFTG Short Course on Microwave Measurements Preliminary Announcement

The Automated Radio Frequency Techniques Group in cooperation with the National Institute of Standards and Technology will offer a short course in Microwave Measurements on November 29 & 30, 1994 in Boulder, Colorado. This two day course will be held prior to the 44th ARFTG Conference. The course is designed for engineers and scientist concerned with accurate measurement of microwave quantities.

LOCATION: All sessions will be held in the Clarion Harvest House in Boulder, CO.

REGISTRATION: Attendance is by preregistration only. The number of participants is limited. The registration fee of \$350 includes lunch on both days.

COURSE OUTLINE:

Measurement Uncertainties

Uncertainty classifications, statistical characterizations, methods for combining uncertainties, international standards

Microwave Circuit Theory

Voltage, current, power, characteristic impedance, scattering parameters, reference impedance.

Coaxial and Waveguide Transmission Line Standards

Coaxial air line standards, precision waveguides, dimensional measurements, connector problems, determination of characteristic impedance, slotted and slotless contacts.

S-Parameter Measurements

Measurement methods, heterodyne and homodyne network analyzers, dual six-ports, VNA models, calibration techniques, uncertainty sources, verification

MMIC Measurements

On-wafer probing, on-wafer calibration and measurement, multi-line TRL calibration, transmission line characterization, correcting for effects of lossy lines, coupled lines.

Power Standards and Measurements

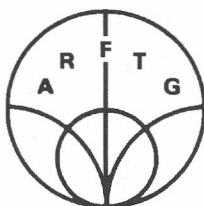
Detectors, reference standards, microcalorimeters, measurement methods, transfer systems, uncertainty sources

Noise Standards and Measurements

Basic definitions, instrumentation, measurement methods, uncertainty sources, amplifier noise

*If you are interested in attending the course or
would like more information please reply to:*

Ray Tucker
Rome Laboratory/ERST-A
525 Brooks Road
Griffiss AFB, NY 13441-4505
315-330-3884 FAX 315-330-7083



AUTOMATIC RF TECHNIQUES GROUP

Call for Papers Fall 1994 Conference

The Automatic RF Techniques Group will hold their 44th Conference in Boulder, CO on December 1 & 2, 1994. The Conference theme is :

Multichip Systems: Model and Measurements.

The measurement and modeling of densely packed, high performance multichip systems present new and difficult challenges for designers. Multichip modules, hybrids, and high density circuit boards require sophisticated analysis of discontinuities, crosstalk, and signal quality using a variety of frequency and time domain instruments and circuit simulation tools. Papers are solicited on the RF/Microwave aspects of multichip systems design, verification and analysis.

Papers are also invited on other areas of automated microwave and RF testing including improved techniques for calibration and verification, MMIC related measurements issues, CAD, millimeter wave systems and other topics of current interest to the RF/Microwave community.

Presentations should be informal 20 minute talks using Viewgraphs or 35 mm slides. For early acceptance and advance publicity, authors are requested to submit two copies of a one-page abstract and a 500 to 1000 word summary including illustrations to allow evaluation with respect to interest of attendees. This submittal should be made to the Technical Program Chair prior to August 15, 1994. Papers not submitted for early acceptance must be sent for review in final form with abstracts by October 3, 1994. Manufacturers interested in exhibiting should contact the Exhibits Chair for information and applications forms. More information can be obtained from the Conference Chair: Ray Tucker, Rome Laboratory/ERST-A, 525 Brooks Road, Griffiss AFB, NY 13441-4505, (w) (315) 330-3884, (f) (315) 330-7083.

Technical Program Chair

Ron Ginley
NIST
325 Broadway, MS 813.06,
Boulder, CO
Phone (303) 497-3634
Fax (303) 497-3970.

Exhibits Chair:

Bill Pastori
Maury Microwave Corp.
2900 Inland Empire Boulevard
Ontario, CA 91764
Phone (909) 987-4715
Fax (909) 987-1112.

1995 SBMO/IEEE MTT-S INTERNATIONAL MICROWAVE AND OPTOELECTRONICS CONFERENCE

Rio de Janeiro, Brazil, July 24-27, 1995.



CALL FOR PAPERS



The "1995 SBMO/IEEE MTT-S International Microwave and Optoelectronics Conference", organized by the Brazilian Microwave and Optoelectronics Society (SBMO), and co-sponsored by the IEEE Microwave Theory and Technology Society (IEEE MTT-S), will be held in July 24-27, 1995, in Rio de Janeiro, Brazil.

This Conference will provide a major international forum for the exchange of information on research and recent developments in the fields of RF, Microwaves, Millimeter Waves, Antennas, Radio Propagation, Optics and Optoelectronics.

Papers are invited for consideration by the Technical Program Committee describing original work on the following suggested topics:

- | | |
|--|---|
| 1. Medical and Industrial Applications | 12. Microwave and Optical Education |
| 2. Microwave and Optical Materials | 13. Field Theory and Guided Waves |
| 3. Microwave and Millimeter Wave Integrated Circuits | 14. Numerical Methods in Electromagnetics |
| 4. Monolithic Integrated Circuits | 15. Antennas and Arrays |
| 5. Optical and SAW Devices and Techniques | 16. Scattering and Diffraction |
| 6. Active and Passive Devices and Components | 17. Radio Propagation and Remote Sensing |
| 7. Microwave/Optical Integration | 18. Radio and Radar Meteorology |
| 8. Packaging Techniques | 19. Wireless and Mobile Communications |
| 9. Computer Aided Design and Modelling | 20. Digital Radio Systems |
| 10. Microwave and Optical Measurements | 21. Optical and Satellite Communications |
| 11. Microwave Techniques in Radar and ECM | 22. Others |

A selection of invited speakers will highlight important and developing areas.

Authors are asked to submit five copies of their summaries, which should be typed single-spaced and occupy two A4 pages (including graphs, diagrams, and references). The summary should include an abstract, and should emphasize what is new in the area. The summary should also include a brief conclusion.

DEADLINE FOR SUMMARY SUBMISSION: October 31, 1994.

The title of the paper, author's name, affiliation, full address, telephone/FAX numbers, and e. mail address should be given in a separate A4 page, together with the topic reference number that seems most appropriate to the work. Number 22 should be used for topics not listed above.

Authors will be notified of the decision of the Technical Program Committee by early December 1994. Authors of selected summaries will be asked to provide a full typescript, in camera ready form, of no more than six A4 pages. Instructions for the preparation of papers will be mailed with the notification letter.

The papers will be assessed by an international review board. Acceptance for inclusion in the Book of Proceedings and presentation at the Conference will be based on the full typescripts.

English will be the official language of the Conference.

Please forward all submissions to:

Dr. J. C. Araujo dos Santos
Instituto Militar de Engenharia - IME
Departamento de Engenharia Elétrica
Praça Gen. Tibúrcio, 80
22290-270 Rio de Janeiro-RJ, Brazil
e.mail: s3araujo@imerj.bitnet
FAX: + 55 21 275 9047

Please forward any other correspondence to:

Dr. L. A. R. da Silva Mello
CETUC - PUC/Rio
Rua Marquês de São Vicente, 225
22453-900 Rio de Janeiro - RJ
Brazil
e.mail: smello@cetuc.puc-rio.br
FAX: + 55 21 294 5748

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NERA Program Commemoration

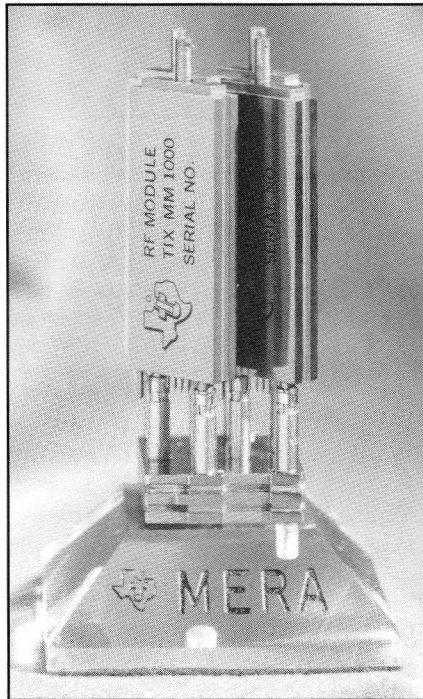
November 5, 1994 • 9-12 a.m.

Texas Instruments
North Building Conference Center
Dallas, Texas

Sponsored by:
Dallas IEEE MTT-S Chapter

Fee: \$25.00

Thirty years ago, the role for microwave solid-state technology in airborne phased array radar was visualized. The U.S. Air Force awarded the Molecular Electronics for Radar Applications (NERA) program in September 1964 as an exploratory development effort to examine the concept of implementing an X-band all solid-state radar. A number of significant innovations for the microwave industry originated with the NERA program, such as microstrip transmission line on ceramic and semiconductor substrates, the first microwave integrated circuits (on silicon), and the con-



cept of transmit/receive modules applied to phased array radar.

A commemorative program will be held to honor the pioneer innovations of the NERA program with perspectives from some of the key contributors, including Bill Edwards of Wright Patterson Air Force Base and Tom Hyltin, NERA Program Manager. Hal Sobol will present an outsider's critique of the NERA program during its inception, and Tim Kimmerly, WPAFB, will present a contemporary perspective of the NERA impact upon Airborne Electronically Steered Arrays. Also planned is a tour of a modern-day T/R module manufacturing facility at Texas Instruments. A lunch and social will follow the presentations.

For additional information contact:
Brad LaGrange, 214/995-8079; Steve Nelson, 214/995-6459; John Wassel, 214/995-3216; or David Zimmermann, 214/995-9939



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