



1996 Microwave Pioneer Award Honoree Kaneyuki Kurokawa

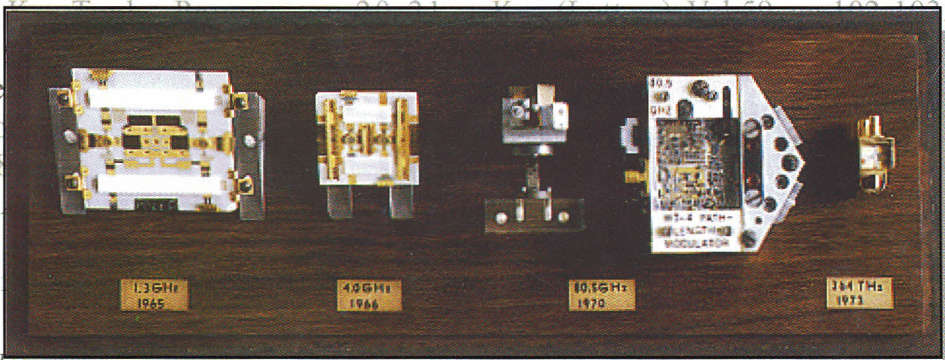
Kaneyuki Kurokawa, Fujitsu Labo- 1963, K. Kurokawa, "Actual

ra
P
ce
ve
T
O
E
P
W
Ja
19
ne
W
cr
10
K
E
ity)



ditional Stability," IEEE Trans. Mi-
crowave Theory Tech., Vol.MTT-
49, pp.1391-
1. R. S. Kurokawa, "Noise In Synchron-
ized Oscillators," IEEE Trans. Micro-
wave Theory Tech., Vol.MTT-16,
pp.234-240, April, 1968. K. Kurokawa, "Injection Locking Of
Microwave Solid-State Oscilla-
tors," Proc. IEEE, Vol.61,
pp.1386-1410, Oct. 1973. K. Kurokawa, "An Analysis Of
Rucker's Multidevice Symmetric
Oscillator," IEEE Trans. Micro-
wave Theory Tech. Vol.MTT-18,
pp.967-969, Nov.1970. K. Kurokawa and F. M. Magelhaes,
"An X-Band 10-Watt Multi-
IMPATT Oscillator," Proc. IEEE
ISSCC Dig. 8-19. W. J. Kenyon, K. Kurokawa and W. O. Schott,
"Experimental MM-
Wave Path-Length
Modulation," Proc. IEEE
ISSCC Dig. 8-19. W. J. Kenyon, K. Kurokawa and W. O. Schott,
"Experimental MM-
Wave Path-Length
Modulation," Proc. IEEE
ISSCC Dig. 8-19.

Vol.38, pp.980-986, Dec.1955. K. Kurokawa, "The Expansions
of Electromagnetic Fields In Cavities," IRE Trans. Microwave Theory
and Tech., Vol.MTT-6, pp.178-183, April, 1958. K. Kurokawa, *Introduction To The Theory
of Microwave Circuits*, New York: Academic Press, 1969. K. Kurokawa, *Introductory Micro-
wave Circuits*. Tokyo : Maruzen, Kurokawa, "Comments On Uncon-
ventional Waveguides," J. Commun. Engrs.



Michael B. Steer

Dept. of Electrical & Computer Eng.
Daniels Hall
North Carolina State University
Raleigh, NC 27695-7911
Phone: 919-515-5191
Fax: 919-515-5523
mbs@ncsu.edu

G. Austin Truitt, Editor

Texas Instruments, Incorporated
13500 North Central Expressway
M/S 245
Dallas, TX 75243
Phone: 972-995-9918
Fax: 972-995-4347
a.truitt@ieee.org

Hector J. De Los Santos

Hughes Space & Communications Co.
PO Box 92919
Building S12, MS W305
Los Angeles, CA 90009
Phone: 310-416-4919
Fax: 310-416-4966
hjdellostos@ccgate.hac.com

New York

IEEE Headquarters
345 East 47th Street
New York, NY 10017-2394
Phone: 212-705-7900
Fax: 212-752-4929
Telex: 236-411

New Jersey

445 Hoes Lane
PO Box 1331
Piscataway, NJ 08855-1331
Phone: 908-981-0060
Fax: 908-981-0027
Telex: 833-233

Washington

IEEE Washington Office
1828 L Street NW
Washington, DC 20036-5104
Phone: 202-785-0017
Fax: 202-785-0835

Printed by
Texas Business Printers
Dallas, TX

Published by
MINGraphics, Plano, TX

©1997, IEEE. Information contained in this Newsletter may be copied without permission provided that copies are not used or distributed for direct commercial advantage, and the title of the publication and its date appear on each photocopy.



1997 IEEE MTT-S INTERNATIONAL MICROWAVE SYMPOSIUM
DENVER, COLORADO



JUNE 8-13, 1997

MTT-S Members:

Join us for breakfast in Denver!

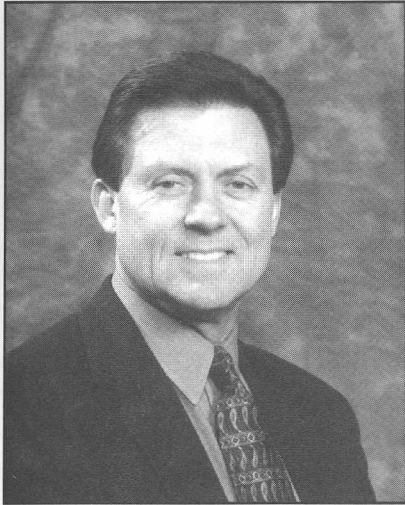
MTT-S members need not go hungry at the 1997 IEEE MTT-S International Microwave Symposium! The IMS'97 Steering Committee is hosting an innovative complimentary breakfast on Tuesday and Wednesday mornings (June 10 and 11) from 7:00-8:00 AM, in Ballroom 1 of the Colorado Convention Center. This full buffet-style cooked breakfast will encourage membership in MTT-S and give you an opportunity for professional and social interactions with your fellow members. Come make yourself at home and meet MTT-S leaders and AdCom representatives, initiate new contacts, renew old friendships, and chat with colleagues.

This function is restricted to MTT-S members only. However, nonmembers are welcome to join IEEE and MTT-S at the door, so please bring your nonmember friends along! They'll really appreciate the introduction to the Society and its benefits. Current IEEE members, who can join MTT-S for only \$8 a year, will thank you twice!

Remember not to stay out too late on Monday and Tuesday nights, because we'll be expecting you bright and early on Tuesday and Wednesday mornings!



Protocol: David F. Wait; University Relations: Dick Ehret; Publications Support: Charles M. Jackson, Don Huebner, Joseph Donovan; Publicity Support: George Rinard, Jeffrey Jargon; Signs: Christie Whitehead; MTT-S AdCom Liaison: Karl Varian; Industry Relations: Dick Loewecke, Robert O'Rourke; Historical Exhibit: Dave Russell



Welcome from the 45th MTT President/ Administrative Committee Chairman!

R. E. "Skip" Bryan

Yes, the MTT Administrative Committee and its parent, the National Administrative Committee, have been in existence for 45 years. During this time we have seen our profession move from tubes to transistors and from short wave radio to millimeter-wave radiometry and well beyond. This year we will see a third generation of microwave engineers complete their university educations and begin their careers. The challenge for the Administrative Committee and me is to continue to improve the forums for all our members to learn, to share ideas and to grow technically as they strive to develop the tools and products for the future.

One of the reasons for the continued success of the society is the continued involvement and support it receives from its past Presidents. Over half are still actively involved and more than 30 attended the International Microwave Symposium in San Francisco last June. This is one of the great strengths of the MTT and will provide me, as it has former

Presidents, with a rich history of what has worked well for our society. I will build on this sage council to continue moving our society forward in its service to our members and to society in general.

John W. Wassel, our out-going President has continued this tradition in passing me a rich pallet of tools to continue developing timely services for our membership. He has continued the focus on electronic communications based upon the IEEE MTT web home page (<http://www.ieee.org/mtt/mtt.html/>) and sponsored the investigation into electronic publishing of our technical publications. As our members know, this will increasingly be the preferred method of international information exchange. To balance this more impersonal communications process, John has continued our expansion of chapter activities. We both recognize the face-to-face forum for sharing of ideas as the key ingredient in successful, rapid growth of our technology and your

professional careers and I will continue to focus on this in the future.

Chapter and regional MTT meetings are a critical element in the success of the MTT and the personal and career growth of its attendees. It is through these meetings that members from diverse corporations and universities come together to exchange information and develop relationships which serve them in their daily work. I will continue our support of the development of a Region 9-Europe, and Region 9-South America premiere microwave symposium, similar in scope to the International Microwave Symposium and the Asia-Pacific Microwave Conference in Region 10.

The 1997 International Microwave Symposium will be held in Denver, Colorado, USA. The IMS Chair, Claude Weil, and his committee are in preparation for this year's Microwave Week. I hope that your support and participation will be larger than ever and am asking that

each of you considers getting on top of your technology by attending the IMS in the Mile-High-City. Elsewhere in this newsletter is information on the program and early registration forms.

As part of our continuing effort to focus our technical meetings on the latest trends and topics in microwave technology, the Microwave and Millimeter-Wave Monolithics Conference, held the first two days of Microwave Week, has evolved

its focus and name to Radio Frequency Integrated Circuits (RFIC) Symposium. The steering committee has expanded upon the former topics to focus on highly integrated ICs and subsystems that include RF functions at any frequency. So expect to see a broader forum of technology related to the rapidly expanding fields of cellular and portable telephony, radio frequency identification and asset tracking, IC technologies for hybrid fiber/coax applications as well as

T/R modules for commercial and military applications.

I look forward to the challenges of 1997 and pledge my efforts to the continued support and development of the careers of our members. Be active in your chapter, and in regional and international MTT events so you can provide AdCom feedback on your needs. Together we can move microwave technology further and faster toward the next millennium. 

MTT Society Ombudsman



Ed Niehenke

As your Ombudsman, I have received 11 inquiries from MTT-S members since the last reporting in the Summer 1996 Newsletter.

Two members requested back issues of MTT-S publications as well as AP publications that were not received. Back issues were sent

to these members. One member wanted to know how to obtain back issues of the IEEE Frequency Control Symposium. I gave him the information and I am reporting it here in case other members would like to obtain copies as well.

From 1956 through 1989, one may obtain issues by sending requests to:

NTIS (National Technical Information Service)
5285 Port Royal Road,
Sills Building
Springfield, VA 22161, USA
(703) 487 4600

The cost ranges from \$9 to \$19.50 for Microfiche and \$61

to \$77 for hard copy, depending on the year.

From 1990 through present, the issues can be purchased from IEEE as follows:

IEEE
445 Hoes Lane
Piscataway, NJ 08854 USA
(800) 678-4333 or
(908) 981-0060

The cost ranges from \$90 to \$120 for either Microfiche or for hard copy, depending on the year.

Three MTT-S members wanted to receive either or both of the *MTT-S Transactions on*

Microwave Theory and Techniques and *MTT-S Microwave and Guided Wave Letters* and did not. They were concerned because they paid their MTT-S dues and have not received the above periodicals. I told them that starting in 1994, the Microwave Theory and Techniques Society reduced the cost of MTT-S membership from \$20 to \$8 per year and gave the members a choice to include either or both of *MTT-S Transactions* and *MTT-S Microwave and Guided Wave Letters* at an additional cost as follows:

MTT-S Transactions:

\$13 per year or
\$7 for a half year

MTT-S Microwave and Guided Wave Letters:

\$8 per year or
\$4 for a half year

These costs are for 1996 and will remain the same in 1997. The basic MTT-S membership fee includes the MTT-S Newsletter.

One member had a paper approved for IEEE Transactions on Education and had not heard from the editor on the status of his paper. I called the editor, and he informed me that paper is scheduled to be published in the November 1996 issue. I informed the member of this and alerted him to look for the final proof for his approval.

Another student member needed copies of articles by Harold Wheeler (1964-65), which I provided for him.

One of our new MTT-S Chapter officers wanted to have the new officers names of his chapter documented in the MTT-S Committee Directory, MTT-S Internet home page, and in the MTT-S Chapter Records. I contacted the people to have this done. For MTT-S officers, if the MTT-S Chapter officers are not correct or need to be updated, please contact the Chapter Records person of Membership Services whose name and address is listed below:

Hector J. De Los Santos
Hughes Space &
Communications Co.
PO Box 92919
Bldg. S12, MS W305
Los Angeles, CA 90009
Tel: (310) 416-4919
Fax: (310) 416-4966
e-mail:
h.j.delossantos@ieee.org

He will put you on the mailing list to receive important information from MTT-S and make sure your name is included in the MTT-S Committee Directory, as well as in the MTT-S Internet home page. For those who want to browse the Internet, the MTT-S home page is: <http://www.ieee.org/mtt/mtt.html>

I had a letter from an MTT-S member who had some suggestions for our Society. I forwarded his letter to the MTT-S president for review and reply. One of his comments was that he enjoys the AP Magazine which has many advantages over a Newsletter such as exists with MTT-S. In a recent call to our Newsletter editor, I learned that starting in January 1997, MTT-S will publish a quarterly MTT-S Magazine that replaces the Newsletter for the benefit of our members.

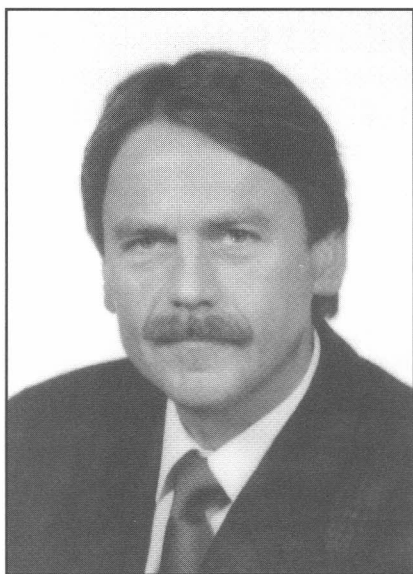
Finally I received an inquiry for information on "SDH Microwave Technology." I asked many people about this with no results. If anyone has information on this please let me know so I can forward information to our member.

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

Ed Niehenke
Northrop Grumman
PO Box 1521, MS-3K11
Baltimore, MD 21203
(410) 765-4573
(410) 765-2116 FAX
e-mail: e.niehenke@ieee.org



IEEE Division IV Electromagnetics and Radiation



Rolf H. Jansen
Division IV Director

The various efforts initiated in 1995, my last year of office, particularly the transnational activities, have achieved the first level of success during the TAB meetings at Montreal in June 1996. As I announced, I have been driving the development of an organizational model structure (called the 'Transnational Committee Model') for all IEEE Societies with the goal of spurring transnational activities and globalization. This TC model has been put into the form of a draft brochure outlining the

history of the activity, the structure and interactions with other IEEE Committees, as well as the functions and specific tasks to be performed in cooperation with other Society Committees. Also, the draft brochure describes the first steps for implementation into various Societies, starting with Division IV Societies. Furthermore, I conducted a survey throughout all IEEE Societies to collect information on the level of implementation of TC structures throughout IEEE.

As brought forward through the RAB/TAB Transnational Committee, in June 96 TAB approved the Transnational Committee Model for consideration by all Societies and Sections in order to establish IEEE-wide standard procedures and coordination of the relevant Committees. Implementation in each Society is subject to AdCom decision, adaptations and modifications. The latest version of the Transnational Committee Model brochure, jointly authored by myself, Mike Adler, Division I Director 1996/97, and Peer Martin Larsen, Region 8 Director, was

distributed during the TAB November meetings to all IEEE Societies. Updated versions of the TC Model brochure will be generated by the RAB/TAB Transnational Committee in the future to be given out to all Society officers dealing with transnational issues.

Besides the described TC Model activity, I worked hard on a variety of activities for aiding the electrical engineering community in Eastern Europe and the Former Soviet Union, which in 1996 were channeled into a major stream, in which now many Division IV and Division I Societies participate. The generation of 12 new MTT/ED Chapters in EE/FSU during 1995/96 has prepared the ground and provided the seed membership to let all Division I and Division IV Societies now benefit from that, using the newly established membership for making contacts and setting up further Chapters addressing their individual fields of interest. The AP-S has systematically made use of that network, LEO-S is presently discussing with the EE/FSU community in Minsk, Moscow and Slovakia


the formation of further Chapters and more Division I and Division IV Societies, like BT-S, EMC-S and CAS-S have taken the first steps. On September 8, 1996, the first-ever joint Division I/Division IV IEEE Region 8 Chapters meeting was held in Prague, Czech Republic, jointly organized by Mike Adler and me with a participation of nearly 40 Chapter representatives. A detailed report of that meeting was written and distributed to the Division I/Division IV Societies.

In 1996, it was also one of my declared goals to work on EE educational issues and for this reason, Jerry Yeagan, Vice-President EAB, and I prepared an international workshop at the end of October 96 at Aachen, Germany, through which IEEE educational expertise stepped out of the US and participated in the German/European discus-

sion of important engineering educational aspects. In this sense, the workshop was an outreach of EAB to a non-US region and was also a seed activity for the IEEE Task Force on Transnational Activities, which I chaired in 1996.

The IEEE Vice-President EAB played a major role in the workshop program together with two additional key speakers from the US. German and international leaders in university education contributed, as well as representatives of the Northrhine-Westphalia (NRW) State Parliament (Landtag), the State of NRW Ministry of Research (MWF), the Federal Ministry of Education and Research (BMBF) and the German EE Faculty Assembly (Fakultätentag). Key representatives of both the EE industry in Germany (Siemens AG) and the German Association of Electrical Engineers

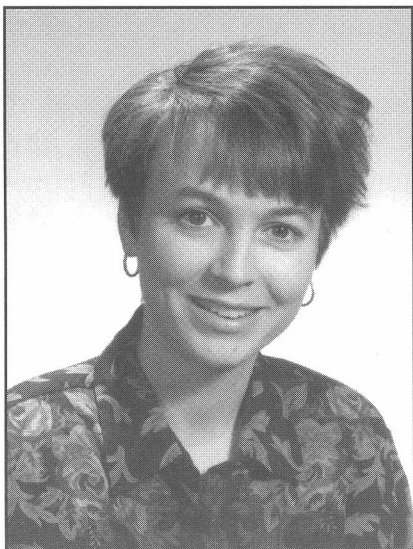
(VDE) were among the presenters. The workshop topic has put the focus on the problem of achieving and maintaining a high quality level for students in electrical engineering education. Educational models, experience with educational programs worldwide, accreditation activities, trends in EE educational programs and related issues were discussed. It looks as if EAB is considering the continuation of such international workshops in the future.

Finally, it has been an honor, a pleasure and an experience to serve as your Division IV Director in 1995/96 and I have to express my appreciation for the support of many IEEE officers within TAB and beyond, particularly the efficient and enjoyable interaction with Bill Van Der Vort, ED-S Executive Director. Thanks to all of you for your cooperation. 

Corrections

The following corrections should be noted in the article "Modeling Human Interactions" by Kaneyuki Kurokawa (MTT-S Newsletter, Number 144, Fall 1996): Parkinson studied the British cabinet instead of the English cabinet (last line, left column, p.34 and 11th line, center column, p.35). Also, he gave a dubious formula for the turning point from efficient to inefficient meetings instead of the optimum number of committee members (7 and 8th lines, center column, p.34). In addition, the page numbers of reference 4 should have been pp.169-170 instead of pp.555-561.

STAR Program Encourages Young Women to Consider Engineering Field



Julia Brown

Studies show that many girls and young women lose interest in math and science during the junior high and high school years. This results from many factors, including some loss of confidence in their ability to achieve in math and science, active and subtle discouragement from teachers and guidance counselors, and lack of contact with real engineers and scientists. Many students do not even understand what engineers do!

The IEEE STAR program (Student-Teacher and Research Engineer/Scientist) brings

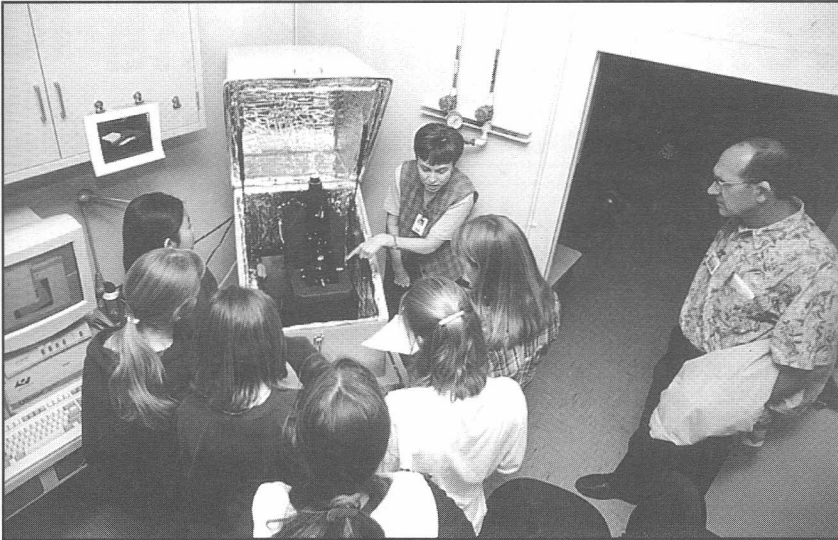
together girls/young women with IEEE members to introduce students to the world of the real engineer and scientist. This innovative IEEE program was introduced in 1995 and is jointly administered and funded by the Electron Devices Society and the Microwave Theory and Techniques Society.

While many successful programs aimed at bringing together

students and science and engineering professionals exist, most of these programs are a one-time event for the student—such as a career day at a local school. The STAR program takes a different approach. Participants are encouraged to interact with students over a longer time period, for example an academic year, and within that time period pursue a number of activities with a common set of



Julia Brown and a group of STAR program participants outside Hughes Research Labs, Malibu, California.




Julia gives the girls a show and tell of atomic force microscopy and robots.

girls. In this way, our program complements, rather than duplicates existing programs, and effectively connects local IEEE members to a given local organization – such as a local junior high school or a local Girl Scout chapter.

A number of existing programs show how different IEEE members have shaped their STAR program to best suit their abilities and the local environment. Julia Brown, of Hughes Research Laboratories has worked with a local high school teacher and six seventh graders throughout the past academic year. She has visited the school once a month to work on experiments with the girls—such as how to observe and record the properties of liquid nitrogen and how to build a solar-powered windmill – and has taken the girls to Hughes for a show and tell of atomic force microscopy and robots. The

key to this program was the enthusiasm of the junior high science teacher, Craig Fox, who takes an active role in expanding his science curriculum at Redwood Intermediate in Thousand Oaks, California. Karen Moore of Motorola is investigating a joint program with the Girl Scouts. In addition, Larry Dunleavy and Parveen Wahid in Central Florida have set up and are pursuing such mentoring programs.

There are several European IEEE Chapters which are also participating in the STAR Program. One example is the STAR program initiated by the Yugoslavia Section, under the direction of Ninoslav Stojadinovic, Aleksandar Jaksic, and Tatjana Trajkovic, which has had numerous joint activities with girls at a local high school, including a university visit, participation in an annually-

held electronics faculty meeting with knowledge and sports competitions, and software training. The emphasis for this program in its second year is to enable IEEE members who are interested in participating but unsure of how to get started. Over the past year several tools have been developed to help members start new programs. The program is designed to allow interested members to volunteer as much time as they are able to manage along with all the other demands of day-to-day life. 

New participants in this program are welcome. If you would like to start your own STAR program, please contact:

Julia J. Brown
Hughes Research Labs
MS RL-61
3011 Malibu Canyon Road
Malibu, CA 90265
phone: (310) 317-5068
e-mail: julia.brown@ieee.org

MTT-S AdCom Nominations

Call for AdCom Nominations and Committee Appointment Suggestions



**Reynold Kagiwada, Chairman
Nominations and
Appointments Committee**

The MTT-S Nominations and Appointments Committee (N&A Committee) is actively soliciting candidates for the MTT-S Administrative Committee (AdCom). The N&A Committee consists of:

- Eliot Cohen
(e.cohen@ieee.org)
- Tatsuo Itoh
(t.itoh@ieee.org)
- Peter Staecker
(p.staecker@ieee.org)
- Reynold Kagiwada
(r.kagiwada@ieee.org)
- Kiyo Tomiyasu
(k.tomiyasu@ieee.org).

The nominations for AdCom will be processed in accordance with the MTT-S Bylaws and Procedures Manual. Nomination Procedure:

- Obtain suggested nominees from each member of the N&A Committee. Process must ultimately result in at least two nominees for each open slot.
- Chapter nomination submitted prior to July, 1997.
- Prepare a "Suggested Starting List of Candidates" of perhaps more than 40 names and solicit responses from AdCom.
- Committee shall downselect, and seek acceptance of nominee and commitment to perform as expected, if elected from this reduced list.
- Assemble list of suggested nominees and prepare a "spreadsheet" of biographical information emphasizing MTT-S, IEEE, and other activities. Compile results. Inform President of slate.
- Prepare ballot for use at Annual Meeting. Petition candidates (signed by 25 MTT-S members, by July 1, 1997) are automatically included on the ballot.

All nominees will be contacted to ascertain that they will accept the nomination and will commit themselves for active participation in at least two meetings a year, held at various locations in the United States.

The geographical and affiliation distributions of current AdCom members are given in the table at right.

In addition to the elections, the N&A Committee seeks interested and qualified individuals who will be recommended to the president for his consideration to serve on various MTT-S committees.

The N&A Committee is soliciting your help to suggest potential nominees to serve our membership as AdCom members. Please submit your suggestions by July 1, 1997. You may submit them to your local Chapter Chairman, to the N&A Committee by e-mail, or to:

R. Kagiwada
N&A Committee Chairman
TRW Incorporated
MS M5/1470
One Space Park
Redondo Beach, CA 91278
Fax: 310-814-5483

Present Elected AdCom (1997) Total = 18	
Mid-Atlantic/Eastern US	3
Southeastern US	1
Middle Region US	3
Southwestern US	1
Western US	6
Europe	2
Asia-Pacific Region	2
Industry	10
Government	2
University	6

Distinguished Microwave Lecturers for 1996-1997

Application of Photonics to Microwave and Millimeter-Wave Devices and Systems



Peter R. Herczfeld

Abstract

Microwave photonics, a synergism of microwave and optical electronics, is a rapidly expanding technical area with numerous potential applications in communications, microwave measurements and signal processing, radar and remote sensing.

The optical control of microwave devices and circuits has been a fertile area of research. The interaction of light with microwaves in devices, MESFET, HEMT and HBT, has been exploited in the

design of optically-controlled circuit elements, phase shifters, attenuators and mixers. The chip level integration of microwave and photonic components is an emerging technology. High-speed fiberoptic links are used increasingly to transmit and distribute microwave and millimeter-wave signals. The optically controlled phased array antenna offers the potential of compact, lightweight, low loss feed networks, with optical domain signal processing using true time delay phase shifters. Hybrid lidar-radar systems are employed in the exploration of the ocean. This unique combination of optical and microwave remote sensing concepts will be extended to the medical and process control areas as well. The preceding summary highlights a few of the topics that may be included in the presentation. Dr. Herczfeld would be happy to tailor his presentation to the interest of the particular group hosting him.

Biography

Born in Budapest, Hungary in 1936, and now a U.S. citizen, Peter R. Herczfeld received his BS degree in Physics from Colorado State University in 1961, his MS in Physics in 1963, and his Ph.D. in Electrical Engineering in

1967, both from the University of Minnesota. Since 1967 he has been on the faculty of Drexel University, where he is a professor of Electrical and Computer Engineering. He has published over 300 papers in Solid-State Electronics, Microwaves, Photonics, Solar Energy, and Biomedical Engineering. Dr. Herczfeld has lectured extensively in the North and South America, Europe and the Asia-Pacific region.

Dr. Herczfeld is the Director of the Center for Microwave-Lightwave Engineering at Drexel, a Center of Excellence which conducts research in microwaves and photonics. He has served as project director for more than seventy projects. A member of APS, IEEE, SPIE, and the ISEC, he is a recipient of several research and publication awards, including the Microwave Prize (1986 and 1994). He is a Fellow of the IEEE.

Peter R. Herczfeld
Center for Microwave-Lightwave Eng.
Dept. of Electrical and Computer Eng.
Drexel University
32nd and Chestnut Streets
Philadelphia, PA 19104
Tel. 215-895-2256
Fax. 215-895-4968
E-mail herczfeld@ece.drexel.edu

Microwave/ Millimeter-Wave



Packaging

Wolfgang Menzel

Abstract

Microwave and millimeter-wave systems are being introduced now not only into military but also into civil applications like automotive sensors or modern communication equipment with high volume production. Including monolithic integrated circuits, effective, often hermetic, and low-cost packaging is necessary. Especially at millimeter-wave frequencies, this includes considerations concerning front-end architecture (e.g. choice of transmission line types or arrangement of devices and components), choice of proper materials for packages and carrier substrates, feedthrough elements for the package, and, as a major problem, interconnect techniques

between different MIMICs or a MIMIC and a carrier substrate.

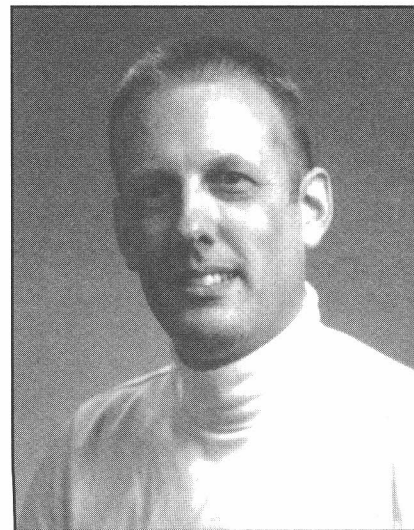
The talk will give an overview on various microwave relevant aspects of the topic as well as a number of examples, mostly from European research activities.

Biography

Wolfgang Menzel has over 20 years of experience in the areas of planar circuits, MIMICs, millimeter-wave components and systems. From 1974 to 1979, he was research assistant at the University of Duisburg, Germany, working on microstrip circuits and planar antennas (1977 Dr.-Ing. degree). In 1979 he joined AEG Telefunken (now Daimler-Benz Aerospace, DASA) in Ulm, Germany, where he was involved in R&D of integrated hybrid and monolithic millimeter-wave circuits and antennas as well as in mm-wave system design and realization. In 1984, he became head of the mm-wave department in that company. Since 1989, he has had the position of a full Professor and Head of the Microwave Department at the University of Ulm where he is involved in research projects on planar (multilayer) circuits, planar and quasi-planar antennas, mm-wave interconnects and packaging, and millimeter wave system aspects.

Wolfgang Menzel
University of Ulm
PO Box D-89069
Ulm, Germany
Phone: 49-731-502-6350
Fax: 49-731-502-6359
E-mail:
menzel@mwt.e-technik.uni-ulm.de

Microwave Active Filters: The Search for New Solutions to a Long-Standing Problem



Christen Rauscher

Efforts to miniaturize high-frequency systems through increased utilization of MMIC technology are being hampered by difficulties associated with realizing small, high-Q microwave filters. Refinements of established methods, together with adaptations of concepts borrowed from other disciplines, have led to new microwave filter solutions that not only deal with the size issue, but also provide design and manufacturing advantages.

The presentation begins with a review of passive-circuit filtering techniques, tracing the evolution of microwave filters from early hollow-waveguide designs to modern implementations that conserve space by relying on

innovative filter architectures and efficient utilization of dielectric materials.

The talk then goes on to address the main topic, namely active-circuit realizations of microwave filters. The basic idea is to employ active circuit elements to overcome the effects of passive-circuit losses, thereby permitting selective filter characteristics to be obtained without a need for bulky, high-Q passive components. A variety of approaches are available to the designer, each with its own advantages and limitations, as is illustrated with practical examples. The talk concludes with a discussion of filter banks and how to realize them in a space-efficient manner. Emphasis throughout the presentation is on innovative design schemes that have evolved both from evolutionary development practices as well as from adopting concepts from other disciplines, such as speech synthesis, digital signal processing, and antenna design.

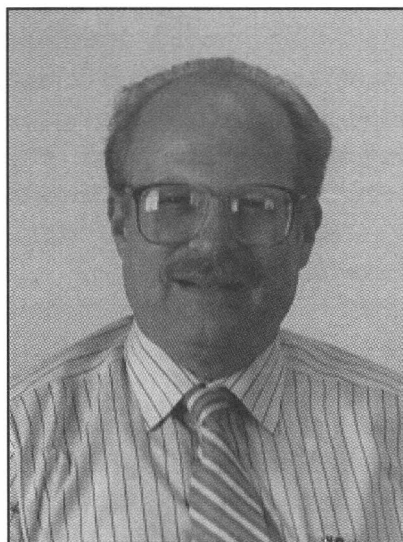
Dr. Rauscher has been working in the microwave field for over twenty-five years. He has been with the Naval Research Laboratory in Washington, DC, since 1978, where he currently heads the Solid-State Circuits Section. The focus of his work has been on deriving solutions to a wide range of linear and nonlinear microwave circuit problems. Dr. Rauscher has published numerous articles on his findings, holds ten patents on his circuit inventions, and has received

several notable awards, including the IEEE Microwave Prize in 1987 for his work on microwave distributed active filters.

Chapters interested in inviting the Distinguished Microwave Lecturer should contact him directly:

Dr. Christen Rauscher
Code 6851
Naval Research Laboratory
Washington, DC 20375-5347
Phone: 202-767-3526
Fax: 202-767-0455
E-mail:
rauscher@chrisc.nrl.navy.mil

New Frontiers in Medical Applications of RF/Microwave Technology



Arye Rosen

Abstract

An overview of the utilization of RF/Microwaves in medicine will be presented. In the last ten years,

microwaves have been used increasingly in the areas of diagnostic and therapeutic medicine as well as in surgery.

For example, passive radiometry is an important tool for measuring the temperature of subcutaneous regions of the human body non-invasively, with the potential of detecting deep-seated tumors.

Microwave hyperthermia, meanwhile, is currently in use in many medical centers in the United States in the treatment of cancer as an ancillary modality to radiation therapy and chemotherapy, and in the treatment of benign prostatic hyperplasia, a technique recently approved by the FDA (Federal Drug Administration) for use in the United States.

Microwave balloon angioplasty (MBA), a modality currently being tested in animals, combines heat and mechanical force (balloon) to open occluded and partially occluded arteries. In addition, RF and microwave energies are currently being investigated for their use in the treatment of various types of arrhythmia.

In the last two years, two additional applications have been researched: microwave-assisted suction lipectomy (microwave-aided liposuction); and microwave anastomoses.

Biography

Arye Rosen was born in Israel in 1937. He received his B.S.E.E. degree (cum laude) from Howard

University, his M.Sc.E. degree from Johns Hopkins University, his M.Sc. degree in physiology from Jefferson Medical College, and his Ph.D. degree in Electrical Engineering from Drexel University.

He is a Senior Member of the Technical Staff at the David Sarnoff Research Center (formerly RCA Laboratories) in Princeton, NJ, which he joined in 1967 and where he is presently responsible for research and development in the areas of millimeter-wave devices and circuits and microwave optical interaction. He currently holds an appointment as Center Professor in the Center for Microwave and Light-wave Engineering at Drexel University, where he has held an appointment as Adjunct Professor in the Department of Electrical and Computer Engineering since 1981.

He also holds the title of Associate in Medicine at Jefferson Medical College, where he has been engaged in research in the Division of Cardiology since 1970, specifically in the areas of Microwave Balloon Angioplasty and Microwave/RF Catheter Ablation for the treatment of cardiac arrhythmia, two subjects which are currently being investigated in several medical centers around the world.

The author of more than 150 technical papers, he is co-editor of *High-Power Optically Activated Solid-State Switches* (Boston: Artech House, 1993), *New Frontiers in Medical Device*

Technology (New York: Wiley, 1995), and six book-chapters in the fields of engineering and medicine. He holds 45 U.S. patents in the fields of engineering and medicine, and is the recipient of numerous achievement and professional awards, including a 1989 IEEE Region One Award "for significant contributions to microwave technology by the invention and development of microwave balloon angioplasty."

Dr. Rosen became a Fellow of the IEEE in 1992 "for innovation in semiconductor devices and circuits for use in microwave systems and for microwave applications to medicine." He is a member of the IEEE MTT-S Technical Program Committee since 1979, MTT-S Technical Committee Chairman on Biological Effects and Medical Applications; he has served as Associated Editor of the IEEE *Journal Of Lightwave Technology* (JLT), and is a member of the Editorial Board of *Microwave and Optical Technology Letters*.

He has served on the Technical Committee for the IEEE International Conference on Microwaves in Medicine held in Belgrade, Yugoslavia, in April 1991. He is also a Member-at-Large of the IEEE Health Care Engineering Policy Committee, and has served as a Member of the IEEE Educational Activities Board. His biography was selected for inclusion in *Marquis Who's Who in the World*, 1995-1996.

Chapters interested in inviting the Distinguished Lecturer may contact him directly:

Dr. Arye Rosen
David Sarnoff Research Center
CN 5300
Princeton, NJ 08543-5300
Phone: 609-734-2927
Fax: 609-734-2050
E-mail: arosen@sarnoff.com

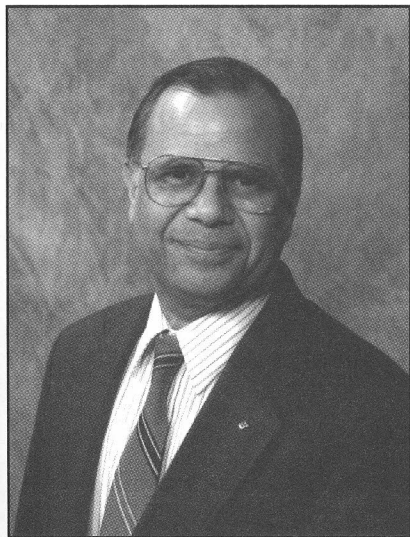
Measurement Professional? or Interested in Learning More?

We will be looking forward to discussing the latest in measurement automation and accuracy with you in Phoenix. 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-S
Hewlett-Packard
1400 Fountaingrove Parkway
Santa Rosa, CA 95405-1799
j.barr@ieee.org. 

Newly Elected AdCom Members

K.C. Gupta



K.C. Gupta received his B.E. and M.E. degrees in Electrical Communication Engineering from the Indian Institute of Science, Bangalore, India in 1961 and 1962, respectively, and his Ph.D. degree from Birla Institute of Technology and Science, Pilani, India, in 1969.

Dr. Gupta has been at the University of Colorado since 1983, initially as a Visiting Professor, and later as a Professor. Presently, he is also the Research Coordinator for NSF IUCR Center for Advanced Manufacturing and Packaging of Microwave, Optical and Digital Electronics (CAMPmode) at the University

of Colorado. Previously, he had a long stay (since 1969) at the Indian Institute of Technology, Kanpur, where he had been a Professor in Electrical Engineering since 1975. On leave from IITK, he has been a Visiting Professor at the University of Waterloo, Canada; at the Ecole Polytechnique Federale de Lausanne, Switzerland; at the Technical Hochschule, Zurich; and at the University of Kansas, Lawrence. From 1971 to 1979 he was the Coordinator for the Phased Array Radar Group of the Advanced Center for Electronics Systems at the Indian Institute of Technology. On sabbatical from the University of Colorado in 1993-94, Dr. Gupta was a Visiting Professor at the Indian Institute of Science Bangalore and a Consultant at Indian Telephone Industries.

Dr. Gupta's current research interests are in the area of computer-aided design techniques for RF, microwave and millimeter-wave integrated circuits, integrated antennas and RF packaging.

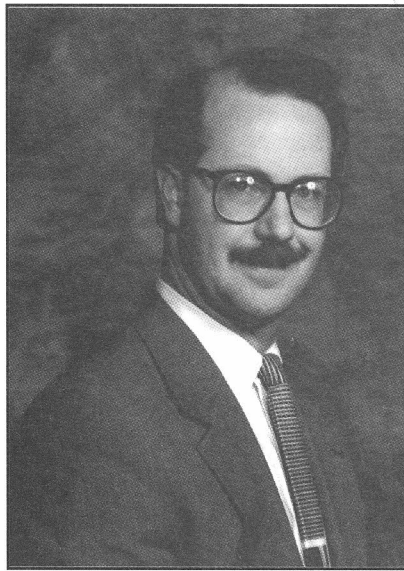
He is author or co-author of six books: *Microwave Integrated Circuits* (Wiley Eastern, 1974; Halsted Press of John Wiley, 1974), *Microstrip Lines and Slotlines* (Artech House, 1979; revised second edition 1996), *Microwaves* (Wiley Eastern, 1979; Halsted Press of John Wiley, 1980; Editorial Limusa Mexico, 1983), *CAD of Microwave Circuits* (Artech House, 1981; Chinese Scientific Press, 1986; Radio I Syvaz, 1987), *Microstrip Antenna Design* (Artech House, 1988), and *Analysis and Design of Planar Microwave Components* (IEEE Press, 1994). Also, he has contributed chapters to the *Handbook of Microstrip Antennas* (Peter Peregrinus, 1989), the *Handbook of Microwave and Optical Components, Vol. 1* (John Wiley, 1989), *Microwave Solid-State Circuit Design* (John Wiley, 1988), and *Numerical Techniques for Microwave and Millimeter-Wave Passive Structures* (John Wiley, 1989). Dr. Gupta has published over 160 research papers and hold three patents in the microwave area.

Dr. Gupta is a Fellow of the Institution of Electronics and Telecommunications Engineers (India), a Member of URSI (Commission D, USA), and a Member of Electromagnetics Academy (MIT, USA). He is the founding editor of the *International Journal of Microwave and Millimeter-Wave Computer-Aided Engineering*, published by John Wiley since 1991. He is on the editorial boards of *Microwave and Optical Technology Letters* (John Wiley), *International Journal of Numerical Modeling* (John Wiley, UK) and three journals of IETE (India). He is listed in *Who's Who in America*, *Who's Who in the World*, *Who's Who in Engineering*, and *Who's Who in American Education*.

IEEE/MTT-S Related Activities

He has been a Member of IEEE since 1962, Senior Member since 1974, and a Fellow since 1987. He has served as Chair of MTT-1 Technical Committee on CAD, and Member of MTT-15 Technical Committee on Microwave Field Theory. He has been on the Editorial Board of *MTT Transactions* since 1985, and a Guest Editor for the *Special Issue of Transactions on CAD*, February, 1988. He has been a Member of the TPC for MTT Symposia since 1986, and is the Technical Program Chair for the 1997 MTT Symposium.

J.K. McKinney



Local Service

He is Chairman, Local Arrangements, for the 1999 MTT-S IMS. He has previously served as Chairman, Publicity, for the 1994 MTT-S IMS and as Vice-Chair, Publicity, for the 1989 MTT-S IMS

AdCom Service

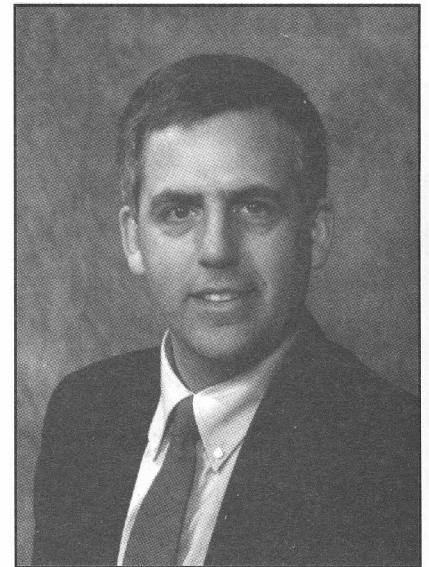
He has been the Membership Services Committee Chapter Activities Coordinator since 1994. From 1990-1994 he served as the Meetings and Symposia Committee Publicity Coordinator and has previously been responsible for the Publicity Section of the IMS Symposium Guidelines and Procedures Manual.

Technical Service

Since 1993 he has served on the MTT-S IMS TPC, Microwave and Com Sys Sub-Committee.

In 1993, he was Session Chairman for the 1993 MTT-S IMS and Session Co-Chairman for the 1996 MTT-S IMS.

Karl R. Varian



Technical Background

Born in Kansas City, Missouri, on May 2, 1948, Karl received his MSEE from the University of Colorado in 1973.

He is presently employed by Texas Instruments, Incorporated, of Dallas, Texas as a microwave design engineer supporting the phased array radar T/R modules. Other responsibilities that he has had at Texas Instruments include: Project Engineer, Broadband T/R module and highly linear device development; Program Manager of dual upconversion and dual downconversion modules; Senior designer of GaAs Monolithic Integrated Circuits. Circuits developed:

broadband phase shifters, power amplifiers, linear low-noise amplifiers, switches, attenuators, oscillators, and mixers. From 1977 to 1986 he was employed by Rockwell International, of Dallas, Texas. Responsibilities were Digital Radio development, microwave filter design, development of microwave sources in the 4 to 18 GHz range, baseband and IF switches, and network manager for the local area computer network. First employed by Varian Associates, Palo Alto, California, his responsibilities were the development of Gunn oscillators above 18 GHz and Gunn oscillators with electronic bandwidths greater than 15%. Some of his major accomplishments at Varian Associates were the development of full X- and Ku-Band oscillator product lines, power combining circuits, pulsed and injection locked oscillators, and STALOs. Since 1978 he has published 8 papers and has been issued two patents.

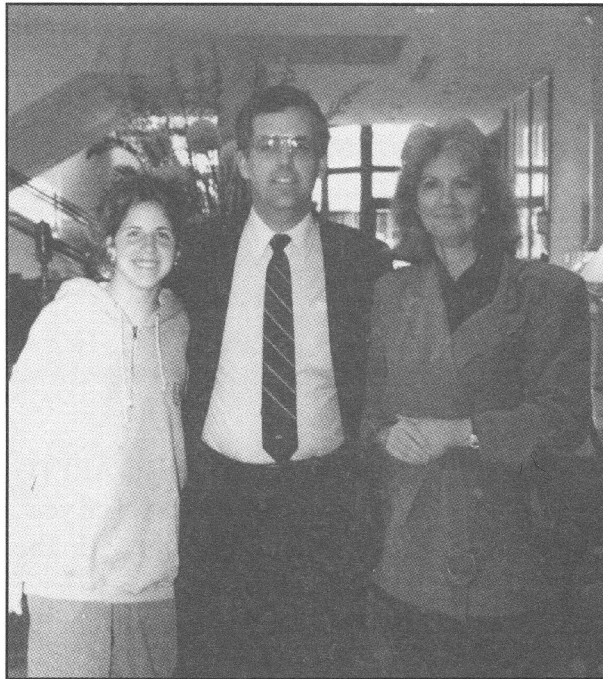
Professional Activities

2004 - Symposium Chairman for the 2004 MTT Symposium

1997 - Advisor-at-Large for the 1997 MTT Symposium

1990 - Symposium Vice Chairman for the 1990 MTT Symposium

1989 - Chairman for the 1989 Dallas Chapter Industry Night



Karl Varian with his wife, Carol and daughter, Joann

held in conjunction with the 1989 AES International Symposium

1988 - Chairman of the MTT Dallas Chapter Bylaws Committee, responsible for generating the first Chapter Bylaws in the Dallas area and possibly in the United States

1985-1988 - Member of the local Chapter Awards Committee

1987 - Audio-Visual Chairman for the 1987 MTT Symposium

1982 - Publicity Chairman for the 1982 MTT Symposium

1981 - Chairman of the local MTT Chapter

1979 - Coordinated the first Dallas MTT Workshop

Eta Kappa Nu - Student Chapter President, Member Tau Beta Phi and Sigma Tau

IEEE Member since 1967, Senior Member since 1987

Awards:

Outstanding Member of the local MTT Chapter - 1985

Best Presented Paper of Session at the 1986 MTT Symposium

The definitive salary reference guide . . .

Order by May 15, and SAVE \$10.00!

NEW! 1997

IEEE U.S. Membership Salary and Fringe Benefit Survey

The NEW 1997 IEEE U.S. Membership Salary and Fringe Benefit Survey brings you the very latest statistics on U.S. engineering salaries—current information to help you consider prospective jobs, negotiate your salary and benefits, or find out about related positions in your field. Compiled from thousands of responses, this survey provides definitive data based on education, job function, geographic area, industry, retirement plans, insurance, and much more!

Pinpoint your personal salary estimate with a special regression-analysis formula based on more than 50 individual variables.

Special Offer Good Through May 15, 1997!

Special List Price: \$99.95* Special Member Price: \$64.95*
List Price: \$119.95* IEEE Member Price: 74.95*

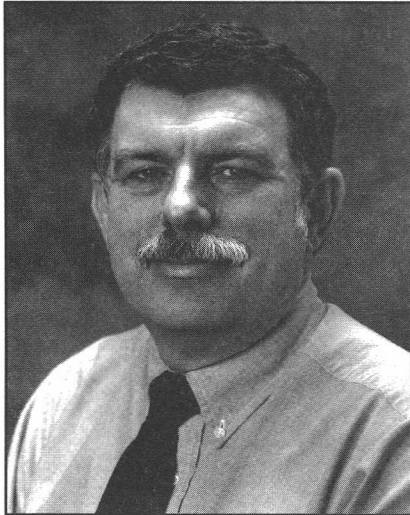
Ask for Product Code: UH2966-0-0-10

The help us serve you, please have IEEE member/customer number ready when you call.
FOR FAST SERVICE CALL TOLL-FREE 1(800) 678-IEEE
Outside the USA, call 1(908)981-0060 or FAX 1(908)981-9667
e-mail: customer.service@ieee.org • 24 HOURS A DAY, 7 DAYS A WEEK!



THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.
IEEE UNITED STATES ACTIVITIES
1828 L Street, N.W., Suite 1202
Washington, DC 20036-5104, U.S.A.

ARFTG Highlights — Winter '96



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 early December.

47th ARFTG Conference — High-Power RF/Microwave Device Measurements

The 47th ARFTG Conference was held in San Francisco, CA at the Moscone Convention Center on June 21, 1996, as part of the 1996 MTT-S International Microwave Week. The theme of this one-day

technical conference with concurrent manufacture exhibits was High-Power RF/Microwave Device Measurements. There were 161 paid attendees and eleven exhibits that were held in the adjoining exhibitors' room. Additionally, ARFTG and MTT-S held a joint technical session on Thursday, June 20 on "Nonlinear Circuits Measurements" in honor of the late Mario A. Maury, Jr., Former ARFTG President and Vice-President of MTT-S. Below is a list of the presented papers:

ARFTG / MTT-S Joint Mario A. Maury Memorial Session, June 20th

"Retrospective on the Career of Mario A. Maury, Jr.",
Oltman, H. G. Jr.

"W-Band Noise Figure Measurement Designed for On-Wafer Characterization",
Drury, R., Pollard, R. D., Snowden, C. M.

"Experimental Investigation of On-Wafer Noise Parameter Measurement Accuracy",
Boudiaf, A., Scavenec, A.

"Vector Corrected On-Wafer Power Measurements of Frequency Converting",
Roth, B., Kother, D., Sporkmann, T., Lutke, W., Wolff, I.

"Transmission Response Measurements of Frequency Translating Devices",
Clark, C. J., Moulthrop, A. A., Muha, M. S., Silva, C. P.

"An Application of Membrane Probes for On-Wafer Testing of Unmatched High Power MMICs",
Tonks, D., Vaillancourt, W. Smith, K., Strid, E.

High Power RF/Microwave Device Measurements Session, June 21st

"Characterization of a 2 GHz Submicron Bipolar 60 Watt Power Transistor with Single Tone, Multitone, and CDMA Signals",
Shaw, M., Wood, A.

"Full 2-Port Calibrated S-Parameter Measurements up to 30 W of High-Temperature Superconducting Filters",
Wilker, C., Shen, Z-Y., Pang, P. S. W., Carter, C. F. III, Wineman, J.
Voted Best Paper of the 47th Conference

"20W Full Octave Amplifiers in S- and C-Band",
Sechi, F., Bujatti, M.

"Automated Test Equipment for High Power Solid State Device Development and Characterization",
Basset, R., Raicu, D., Sarkissian, G., Phelps, D.

"Simple Technique Employs Vector Network Analyzer to Broadband High Power Amplifiers in Situ",
Driver, T.

"GaAs MESFET Lifetime Prediction Using Microwave Waveform Probing",
Tkachenko, Y. A., Wei, C. J., Hwang, J. C. M.

"New Applications for Pulsed/Isothermal Test System",
Scott, J., Parker, A., Rathmell, J., Sayed, M.

"Overview of High Power and Large Signal Measurements and Calibration",
Rytting, D.

"Development of On-Wafer Microstrip Characterization Techniques",
Pham, A., Laskar, J., Schappacher, J.

"Versatile W-Band On-Wafer MMIC Test Set",
Lin, E. W., Huang, T. W., Lo, C. C. W., Wang, H., Yang, D. C., Dow, G. S., Allen, B. R.

"An On-Wafer Deembedding Procedure for Devices under Measurement with Error-Networks Containing Arbitrary Line Lengths",
Winkle, T. M., Dutta, L. S., Grabinski, H.

"Using Orthogonal Polynomials as Alternative for VIOMAP to Model Hardly Nonlinear Devices",
Verbeyst, F.

"Vector Network Analyzer Check Standards Measurements and Database Software",
Duda, L. E.

"Waveform Measurements on a HEMT Resistive Mixer",
Scheurs, D., Verspecht, J., Nauwelaers, B., Barel, A., Van Rossum, M.

Poster Session, June 21st

"Sure Methods of On-Wafer Scattering Parameter Measurements with Self-Calibration Procedures",
Heuermann, H.

"Statistical Calibration of Wafer Probe Data into a Fixtured Environment",
Carroll, J., Reese, E., Chang, K., Dahm, F.

"Novel Software Techniques for Automatic Microwave Measurements",
Ferrero, A., Madonna, G. L., Pisani, U.

"Measurement and Modeling of Picosecond Step Response of GaAs MESFETs",
Law, C. S., Vendelin, G. D., Van der Weide, D. W.

"Improvement of the Electronic Mode Stir Chamber Automated Data Acquisition System for Conducting Electromagnetic Susceptibility Tests",
Johnson, E. A.

"C-Band Multipactor Breakdown Using a Ring Resonator and Peak Power Meters",
Tellier, G. A. Jr.

"A New Technique for Measuring the Scattering Parameters of Two-Port Junctions with a Single Multiport Reflectometer",
L'vov, A. A., Moutchkaev, A. S.

"A New Technique for Microwave Circuit Parameter Measurement",
L'vov, A. A., Semenov, K. V.

"Accuracy Improvement of the Automated Multiprobe Transmission Line Reflectometer",
L'vov, A. A., Semenov, K. V., Moutchkaev, A. A.

ARFTG Website

ARFTG now has a website at <http://www.ieee.org/mtt/arftg.html>. The website has information on ARFTG, registration and Call for Papers for upcoming conferences, information on how to obtain digests of past conferences and a listing of the present Executive Committee and their e-mail addresses. The website is maintained by Roger Pollard, University of Leeds, r.pollard@ieee.org.

The Conference Chair was Ken Wong of Hewlett Packard, and the Conference TPC was Mohamed Sayed of Hewlett Packard. A conference digest is available, please contact:

Henry Burger, ARFTG
1008 East Baseline Rd, No. 955
Tempe, AZ 85283-1314

Cost is \$20.00 for an ARFTG Member and \$45.00 for a non-member. An additional \$9.00 is requested for airmail outside the USA.

Upcoming Activities 48th ARFTG Conference – Nonlinearity Measurements

The 48th ARFTG Conference will be held in Clearwater, FL at the Radisson Sand Key Resort (see <http://www.ieee.org/mtt/arftg.html> for registration forms and other details) on December 5 & 6, 1996. The theme of this two-day technical conference with concurrent manufacture exhibits will be Nonlinearity Measurements. Communications is a growth area in the electronics industry, and the trend in communications is toward digital systems. In commercial application areas such as mobile telephony or CATV and in military applications for surveillance or radar, digital methods are providing significant performance improvements. The nonlinear characteristics of these digital

systems are creating substantial simulation and measurement challenges.

Papers are solicited relating to test requirements, methods and techniques, test equipment design, performance results and environmental considerations. Both transmitter and receiver nonlinear phenomena are requested. Measurement topics such as Adjacent Channel Power, Noise Power Ratio, Load Pull, Bit-Error Rate, Power, Noise, and Noise Parameters are of concern.

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 the Conference Chair:


Michael Fennelly
ATN Microwave
11 Executive Park Drive
Billerica, MA 01821
(W) 508-667-4200 x18
(F) 508 667-8548
mfennelly@atn-microwave.com

or Conference TPC:

Ed Godshalk
Tektronix
PO Box 500, M/S 50-240
Beaverton, OR 97077
(W) 503-627-4772
(F) 503-627-5177
Edward.Godshalk@tek.com

Those interested in exhibiting should contact:

Bill Pastori
Maury Microwave
2900 Inland Empire Blvd.
Ontario, CA 91764
(W) 909-987-4715 x225
(F) 909-987-1112

Deadline for early paper submissions is September 1, 1996 and the final camera-ready paper submission deadline is October 7, 1996. Potential presenters should request the ARFTG Author's Preparation Package. 

Completion of Phase I of the Joint MTT/ED Activities for Membership Promotion and Chapter Formation in Eastern Europe/Former Soviet Union

Rolf H. Jansen
Past Transnational
Committee Co-Chairman
IEEE Division IV Director

Following my report in the Winter 1995 Newsletter, here is a brief update of how the MTT/ED initiative for aiding Eastern Europe and the Former Soviet Union (EE/FSU) continued through 1996.

By August 1995, 6 new Chapters had been established and were starting their first activities (Bulgaria, Lithuania, Moscow, Saratov-Penza, St. Petersburg and West Ukraine (Lviv)). After negotiations and approval by AP-S, all of these Chapters were expanded into joint MTT/ED/AP Chapters. Talking to AP-S was one of the first steps of broadening the initiative into a joint Division I / Division IV transnational activity with the plan to cover the interests of all Division I / Division IV Societies and activate corresponding synergies. At the same time, during 1996 another 6 Chapters were formed by the joint MTT/ED initiative, namely Central Ukraine (Kiev), Belarus (Minsk), Nizhny Novgorod, Novosibirsk, East Ukraine (Kharkov) and the Republik of Georgia (Tbilisi). Of the

12 Chapters established in EE/FSU in 95/96, 11 were subsidized financially by MTT-S and ED-S (later by AP-S also). The East Ukraine Chapter originated by expanding the previous AP-S Chapter into a joint AP/MTT/ED/AES Chapter. The group at Kharkov was originally only AP-S, and was able to form a Chapter without financial support from our initiative, but this happened in parallel with our efforts, and they were later convinced to expand their role to include MTT/ED, completing the plan for newly formed Chapters in the Ukraine. The only Chapter of the 12 mentioned, that has not yet been officially approved by IEEE Headquarters, is Georgia, but this is waiting only for the final approval of the Ukraine Section to affiliate the Chapter, because there is not currently an IEEE Section in the Republic of Georgia. We are expecting this approval in November.

Completion of the founding phase (Phase I of the EE/FSU initiative)

was achieved with the recent IEEE Division I and IV Region 8 Chapters meeting at Prague parallel to the European Microwave Conference early September 1996. This meeting reflected the broadening of our initiative and was jointly organized by Mike Adler, Division I Director, and myself with excellent logistical preparation coming from Bill Van Der Vort, ED-S Executive Director, and Zbynek Skvor, Czech Section Chairman. The meeting combined the yearly Region 8 Chapters meetings usually held by MTT-S and ED-S separately, and integrated the regional Chapter Coordinators and the Presidents of CAS (Circuits and Systems) as well as CPMT (Components, Packaging, and Manufacturing Technology) in addition to nearly all of the MTT and ED Chapters in Region 8. Note that 2/3 of our more than 30 Chapters in Region 8 are jointly operated with ED-S.

Following this brief update report is the Agenda and the List of Attendees of the Prague meeting

and a detailed summary of the Division I and Division IV Region 8 Chapters meeting.


Finally, this is to inform all of our members, that I have stepped down from my office as MTT Transnational Committee Co-Chairman in conjunction with the completion of Phase I of our EE/FSU initiative. Jozef Modelski, whose valuable support I enjoined already during Phase I, will now lead into Phase II (consolidation and further expansion of Chapters) and Adalbert Beyer of Duisburg,

Germany, will take over Jozef's function as the Region 8 Coordinator within the Transnational Committee. Jozef Modelski and Adalbert Beyer took over the offices during the September meeting at Prague.

Welcome on board and I wish you success for the coming activities under Phase II.

The great success of this initiative and the tremendous response received from the members in EE/FSU and from many levels of the

IEEE organization, would not have been possible without the help of dedicated people in the background, like Bill Van Der Vort, Mike Adler, Jozef Modelski, Zbynek Skvor, Ari Sihvola and many others, that I cannot mention here. I would like to express my deep thanks and gratitude here for all this support and the constructive help in many details and aspects of the initiative.

It was a pleasure to work with you on this project. It always made me feel good and I am proud to be a member of the IEEE family. 

Summary of the Divisions I and IV Region 8 Chapters Meeting

On Sunday, September 8, 1996, the IEEE Division I Director, Michael S. Adler, and the IEEE Division IV Director, Rolf H. Jansen hosted a Divisions I and IV Region 8 Chapter Meeting in conjunction with the European Microwave Conference (EuMC) in Prague, Czech Republic. This meeting was an all day event and the first of its kind involving Region 8 chapter chairs from Divisions I and IV societies. Approximately 50 people attended the meeting from 24 different Region 8 countries and representing 38 chapters involving the ED, LEO, CAS and CPMT societies from Division I and the MTT and

AP societies from Division IV. The majority of these chapters are joint chapters involving multiple societies. In attendance were: Peer Martin Larsen, Region 8 Director; Zbynek Skvor, Czech Republic Section Chair; Lou Parrillo, ED-S President; Bill Van Der Vort, ED-S Executive Director; Michael Lightner, the CA-S President; Ralph Wyndrum, CPMT-S President; Ed Labuda, LEO-S Executive Director; and the Region 8 Chapter Coordinators for APS & MTT-S, ED-S and CAS, Andre Vander Vorst, Imre Mojzes, and Tony Davies, respectively.

Mike Adler began the meeting by stating the primary objectives were to:

- increase communications among the chapters
- increase communications between the chapters, sections, region and the societies
- listen to problems and issues
- find areas where societies can help.

An additional objective was identifying opportunities to form new chapters. In this case, the focus was

adding new society affiliations to existing chapters where there is already a sufficient number of existing members to form a chapter. Based on 1995 year-end statistics, there is an opportunity for each of the societies represented at the meeting to increase the number of its Region 8 chapters as follows:

- ED-S: 23 to 32
- CAS: 13 to 30
- CPMTS: 4 to 32
- LEOS: 5 to 32
- MTT-S: 22 to 31
- APS: 17 to 31

A second focus was to encourage the 11 new ED-S & MTT-S chapters in Eastern Europe to add other Division I and IV society affiliations. These chapters were formed as a result of the ED-S and MTT-S initiative to subsidize the required number of IEEE and society memberships (12 per chapter). Each of these chapters is currently in the process of surveying its members to identify which society affiliations are desired based on the technical activity in their area.

Rolf Jansen spoke next about his efforts to provide a roadmap for transnational committee structure for societies and also about the status of the joint MTT-S and ED-S chapter formation process in Eastern Europe. As previously noted, there are 11 chapters now in place and additional society affiliations are being pursued.

Peer Martin Larsen spoke about the growth of the regional workshops

sponsored by Region 8, the various Region 8 library projects, the upcoming TAB Colloquia in Eastern Europe and the Entrepreneurial Skills Seminar to be held next year in Kiev, Minsk and St. Petersburg. He emphasized the importance of having the Region be involved in society and chapter activities and that the society regional coordinators help to make this possible.

Lou Parrillo spoke about ED-S activities for chapters such as an increased level of financial support, the STAR Program (Student-Teacher Research Engineer/Scientist) an expanded Distinguished Lecturer Program involving 19 lecturers from Region 8, and the growth of ED-S Region 8 chapters to reach its current count of 31.

Michael Lightner noted that 40% of CAS members reside outside Regions 1-7 and highlighted new CAS efforts to grow chapters plus new initiatives to put the society publications on the WWW. In particular, he noted that CAS will have a Region 8 Web site to facilitate easy access to the journals.

Ralph Wyndrum noted that he will be in contact with all the chapters represented at the meeting and will invite them to become affiliated with CPMT. He noted that CPMT is attempting to grow its members and increasing the number of its chapters is a key part of the strategy.

Ed Labuda noted that LEOS is looking to expand its Region 8 chapters from the current six. He highlighted the \$2000 (maximum) support available as well as the chapter awards for chapter of the year, most improved, most innovative, and most membership growth. He also spoke of an innovative chapter angel program whereby a member of the Board of Governors will focus on helping three chapters and attend at least one meeting a year.

The meeting then switched to presentations from the various chapters present. The following are the major themes noted by the chapter representatives.

The most common complaint was the difficulty in getting accurate membership lists for their chapters. In principle, the lists are available through the sections, but not all sections make the effort to distribute them. A suggestion was for the society to distribute membership lists to the chapters directly.

The ED-S Videotape Lending Library of the IEDM (International Electron Devices Meeting) short courses was deemed valuable, particularly for students. It was commented that the quality of the tapes could be improved. One suggestion was to tape courses directly in the PAL format.

The report on the Eastern Europe library project was generally favorable, but there was some dissatisfaction with the microfiche format. It was commented that

microfiche is difficult to use and to print copies. One suggestion was to offer future library copies in CD-ROM. As a comment, this was considered at the outset of the project, but CD-ROMs of the past ten years worth of journals were not available at that time. In other cases, machines are needed to make copies from the microfiche such as in Belarus and Lithuania. It was noted that a company in Vilnius makes such machines. This will be investigated.

Chapters spoke about the value of IEEE membership and society affiliation and noted that regional activities are the key. People will not join just to get the journals, since they are generally available. In this vein, support from the societies for regional activities, such as meeting sponsorship, distinguished lecturers and student activities is very important.

A suggestion was made to have a web site in Region 8 to facilitate e-mail between chapters and from the society.

There was an observation that conference fees are much too high, particularly in Europe. MTT-S noted that the European Microwave Conference will reduce its fees in the future. Another suggestion was to hold meetings in areas where the living costs are lower.

Another suggestion was for the organizers of regional technical meetings to join together and rotate the location of these conferences on an annual basis.

Comments concerning the Eastern European Chapters included the following:

Particular attention was given to the presentations from the 11 new Eastern European chapters supported by ED-S & MTT-S. In general, they are all doing well and growing slightly in membership without any more direct society support. All of the chapters were active, holding upwards of two meetings per year, and often these were regional conferences.

Some specific observations and suggestions were made by these 11 Eastern European chapters:

Income levels in Eastern Europe are very low relative to those in the west, often on the order of \$100/month.

Specific suggestions were for lower conference fees for Eastern European attendees as well as travel subsidies. In general, there was a desire for the conference fees to be reduced.

Journals often arrive very late.

It is difficult to get funds to the chapters. Checks are a big problem since it takes a long time to cash them and a large fee is charged. Direct bank transfers are better. An additional suggestion was an IEEE credit card for the chapters.

Support was requested for continuing education as well as for entrepreneurial workshops to help people in setting up new businesses.


Finally, relative to the chapter chairman's meeting itself some com-

ments and suggestions were made:

The meeting was worthwhile and should continue. The major benefit was the communication between the chapters and societies.

There was agreement that holding the meeting as a joint Division I and Division IV meeting was worthwhile, because of the large number of common chapters. The meeting should continue to be an adjunct to a technical meeting and the suggestion was to alternate between the European Microwave and European Solid-State Device Research meetings.

In the future the suggestion was made to focus more on problems and issues and reduce the time taken on reports of chapter activities. One possibility would be to have working sessions on particular topics.

One final point: there was unanimous agreement and praise for the work done by Zbynek Skvor and Bill Van Der Vort in setting up this meeting. There also was particular praise for Rolf Jansen and Bill Van Der Vort for their efforts in setting up the 11 Eastern European chapters. 

Michael S. Adler
General Electric Company
Schenectady, NY 12301

William F. Van Der Vort
ED-S Executive Office
445 Hoes Lane
PO Box 1331
Piscataway, NJ 08855-1331
Phone: 908-562-3926
Fax: 908-235-1626
e-mail: w.vandervort@ieee.org

IEEE Divisions I and IV Region 8 Chapters Meeting

September 8, 1996
Opera Hotel, Conference Room
Tesnov 13, Prague, Czech Republic

Agenda

IEEE Division I Director, IEEE RAB/TAB Transnational Committee Member and ED-S Sr. Past President	Mike Adler	9:00 a.m.
IEEE Division IV Director, IEEE RAB/TAB Transnational Committee Member and MTT-S Transnational Committee Co-Chair	Rolf Jansen	
IEEE Region 8 Director	Peer Martin Larsen	
IEEE Region 8 Coordinator for AP-S and MTT-S	André Van Der Vorst	
IEEE Region 8 Chapter Coordinator for ED-S	Imre Mozjes	
IEEE Region 8 Chapter Coordinator for CAS-S	Tony Davies	
IEEE Czechoslovakia Section Chair	Zbynek Skvor	
ED-S President Lou Parillo		
CAS-S President	Michael Lightner	
CPMT-S President	Ralph Wyndrum	
Chapter Representatives – Western Europe and Africa		
MTT/AP Benelux	C. G. M. Van't Klooster	
ED/MTT France and ED Benelux	Christian Rumelhard	
MTT/AP Germany and ED Germany	Hans Hartnagel	
CPMT Germany	Elke Zakel	
MTT/AP Central & South Italy	Stefano Pisa	
AP/CAS/ED/MTT North Italy	Mario Orefice	
ED/LEO/CAS S. Africa & AP/MTT S. Africa	Wilhelm Leuschner	
AP/MTT Spain and ED Spain	Magdalena Salazar-Palma	
CAS/ED Switzerland	Paul Debeve	
AP/ED/LEO/MTT UK & RI	Colin Atchison (arriving after 4:00)	

Lunch

12:30 p.m.

**Chapter Representatives – Scandinavia,
Central Europe and the Middle East**

1:00 p.m.

MTT/ED/AP Bulgaria
 MTT/AP/ED Czechoslovakia
 MTT/AP/ED Finland
 ED/MTT Greece
 AP/ED/MTT/COM Hungary
 AP/MTT Israel
 ED Israel
 ED Poland
 MTT/AP/AES Poland
 ED Romania
 ED Sweden
 ED Yugoslavia
 MTT Yugoslavia

Hristo Hristov
 Zbynek Skvor
 Antti Raisanen
 Amanda Polydorou
 Istvan Frigyes
 Asher Madjar
 Gady Golan
 Jerzy Klamka
 Jozef Modelski
 Gheorghe Brezeanu
 Staffan Bruce
 Ninoslav Stojadinovic
 Aleksandar Nestic

**Chapter Representatives – Eastern Europe and
the Former Soviet Union**

3:00 p.m.

MTT/ED Minsk, Belarus
 MTT/ED Republic of Georgia
 MTT/ED/AP Lithuania
 MTT/ED Moscow, Russia
 MTT/ED/AP Nizhny Novgorod, Russia
 MTT/ED Saratov-Penza, Russia
 MTT/ED/AP St. Petersburg, Russia
 MTT/ED Central Ukraine
 AES/AP/ED/MTT East Ukraine
 MTT/ED/AP West Ukraine

Sergei Malyshev
 David Karkashadze
 Borisas Levitas
 Vadim Kaloshin
 Boris Kapilevich
 Michael Davidovich
 Sergei Tretyakov
 Yuri Prokopenko
 Anatoly Kirilenko
 Nikolai Voitovich

Open Discussion

5:00 p.m.

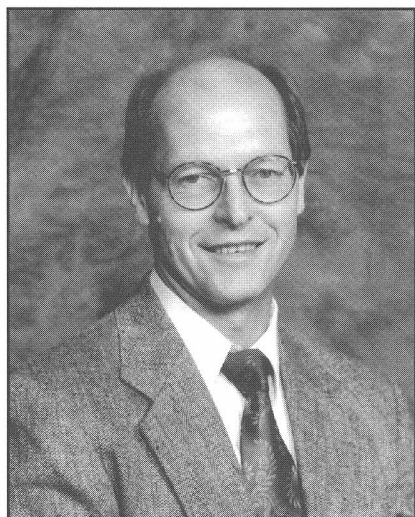
Adjournment

6:45 p.m.

**Divisions I and IV Region 8 Chapters Dinner in the
Adjoining Conference Room of the Opera Hotel**

7:00 p.m.

Membership Services Committee



Ed Rezek

We had a productive session at the September AdCom meeting and presented some positive news about the activities of the Committee. Following is a brief summary of the key items:

Membership Statistics

The Society membership peaked at nearly 12,000 in 1988 and then began a slow but steady decrease. The decline ended in 1994 and since then membership has been increasing. As of M/E July 1996 the overall membership stands at ~8,900. We are expecting the growth to increase with the general upturn in the economic situation of the microwave and RF community.

Society Demographics

One of the metrics that we track is the breakdown of membership across grade and region.

Following is a brief snapshot of the Society membership at the end of 1995:

Grade	Members (%)
Affiliate	0.1
Associate	5.2
Student	14.8
Regular Member	64.4
Senior Member	11.0
Fellow	4.6

Region	Members (%)
1	12.0
2	7.6
3	5.9
4	4.9
5	5.5
6	20.5
7	3.7
8	21.1
9	2.0
10	16.7

Chapter Information

Even though the number of members has decreased since the late 1980's, the number of Chapters has continually grown. In 1993 the Society had 77 Chapters. At the end of 1995 we had 84 Chapters; by May 1986 the number had grown to 87. As of August 1996 we have 89 Chapters. The newest Chapters are located in Novosibirsk, in the former Soviet Union, and Thailand.

As a general note, the Society is experiencing a rapid growth in Chapters in Eastern Europe and the former Soviet Union.

The Microwave Distinguished Lecturer Program

Each year the Society appoints a select number of individuals as Microwave Distinguished Lecturers. Mike Harris of Georgia Tech led the selection process. A committee composed of Kris Agarwal, Eliot Cohen, John Horton, Tatsuo Itoh, Tim Kemerley, Ed Niehenke, Roger Sudbury and Frank Sullivan secured and screened proposed MDL topics. A recommended slate

of Lecturers was approved by Ad-Com at the September 1996 meeting. The new Lecturers and their topics are as follows:

- Dr. Peter Herczfeld, Drexel University, USA, "Applications of Photonics to Microwave and Millimeter-Wave Devices and Systems"
- Dr. Arye Rosen, David Sarnoff Research Center, USA, "New Frontiers in Medical Applications of RF/Microwave Technology"
- Dr. Wolfgang Menzel, University of Ulm, Germany, "Microwave/Millimeter-Wave Packaging"
- Dr. Chris Rauscher, Naval Research Laboratory, USA, "Microwave Active Filters"

These appointments bring the total number of active lecturers to six.

The MDL is expected to give 8 to 10 lectures over a 3-year period. The term of service for the four new Lecturers begins in January, 1997 and will last until December 1999. The two current Lecturers are Rahul Dixit, whose term expires in 1997, and J. Wakino, whose term expires in 1998.

Note that this gives the Society a total of six active Lecturers. This is a departure from the recent past where we had two or three active Lecturers. This is a deliberate move by the Committee to better serve the membership by providing a larger pool of Lecturers.

The MDL program is administered by Kris Agarwal. Chapters can schedule an MDL lecture by contacting Kris at the address below. Direct contact with the Lecturers is encouraged as an alternate approach.

Kris Agarwal
3928 Wilshire Drive
Plano, Texas 75023 USA
E-mail: k.agarwal@ieee.org
Telephone: 972-995-1882
Fax: 972-995-4583



MTT Forms New Technical Committee on Wireless Communications

At the January 1997 MTT-S AdCom meeting in Denver, a new technical committee on Wireless Communications was established to further support the Society's activities in the wireless area. The committee is chaired by Bernard Geller, with John Horton as co-chair. Both are long-time members of MTT-16, Microwave Systems technical committee, and have been involved in wireless for several years as a sub-committee in MTT-16. Terry Oxley, the Technical Committees' European Liaison, will support the MTT-20 activities in Europe (e-mail: t.oxley@ieee.org). The new Wireless Communications committee, MTT-20, will concentrate on upcoming

wireless activities at the Denver International Microwave Symposium, June 8-13, 1997; the Wireless Communication Conference, August 11-13, 1997 at Boulder, CO; the European Microwave Conference at Israel in December 1997; and in 1998, will be a part of the RFIC Symposium technical committee for the 1998 Microwave Week at Baltimore, MD.

For information about the MTT-20 upcoming activities, contact:

B. D. Geller
David Sarnoff Research
Laboratory
Princeton, NJ
Tel: 609-734-2629
email: bgeller@Sarnoff.com



Region 8 MTT-S Chapter Activity Reports



Jozef Modelski MTT-S Transnational Committee Co-Chairman

As of September 8, 1996, I have begun to serve as the new MTT-S Transnational Committee Co-Chairman. In this function, I have replaced Professor Rolf Jansen, Division IV Director. I met Rolf in Warsaw more than four years ago, when I became Chairman of the Polish Chapter. Since that time we have been working closely together particularly on the Ad Hoc Committee for Aiding Eastern Europe and the Former Soviet Union. He was a real father of the MTT/ED initiative whose results we could see during Division I/Division IV Region 8 Chairman Meeting at Prague, September 8,

1996. Details from the productive and very motivated event are given in Rolf's report.

Professor Jansen, "the volcano" of indefatigable energy and new ideas, has always been an enduring IEEE teacher, an excellent advisor and a good friend. On behalf of the new EE/FSU Chapters, the Transnational Committee Co-Chairman Professor Yamashita and myself, I wish to thank Rolf for all that he has done during his long years of activity on the Transnational Committee. I have agreed to take the new responsibility because I know that I can always receive Rolf's advice and help.

In my new function, at the beginning, I would like to concentrate on:

Consolidation of the new Chapters (I will continue the close cooperation with Bill Van Der Vort from ED-S in this matter.)

Coordination between regional and national conferences and workshops organized or sponsored by local chapters (which should lead to joint events)

Improvement of the Distinguished Lecturer Program

I will present the details during the AdCom meeting in January in Denver and the Spring Newsletters.

The following information concerning activities in 1995/96 has been prepared on the basis of the Region 8 Chapter Officers' reports presented at the Prague meeting on September 8, 1996.

Benelux

Chairman:
C.G.M. Van't Klooster

The Chapter held its activities in the preceding year as follows:

Technical meetings:

"MMIC and Measurement", Dr. Urslott, 28 November, 1995

"Large Radio Telescope Antennas in Russia", Dr. Belov, 6 March, 1996

"Hybrid Planar ICs", Dr. K. Wu, 20 March, 1996

Workshops:

"Large Antennas in Radio Astronomy", IEEE AP/MTT with NFRA-NL and ESTEC, 28-29 February, 1996

"Active Phased Arrays", associated with EEC, ESTEC, SEP and IEE: Cost Workshop, 27-28 June, 1996

Joint Chapter Activities:

There was also a great contribution to the formation of a new Chapter in Nizhny Novgorod (Russia)

France

Chairman: Robert Adde

A series of events have continued throughout the year:

- **GaAs '96 Symposium:** European GaAs Symposium and associated CAD workshop in cooperation with European MTT Chapters (Germany, Italy, UK), 5-7 June, 1996. 145 attendees, 101 papers from 26 countries, plus 13 invited papers.

Annual Topical Meetings:

- **Nomadic Microwave Technologies and Techniques for Mobile Communications and Detection**, Congress Palace, Arcachon, 16-18 November, 1995.

Half-day Meetings:

- "Silicon MESFET Scaling Beyond 0.1 μm .", Hiroshi Iwai, 6 June 1995.
- "Millimeter-Wave Electronics and Micromachined Microwaves at the University of Michigan", Gabriel Rebeiz, 28 June, 1995.
- "Advanced Technology Challenges for High-Performance Microprocessor Applications", Louis Parrillo, 28 September, 1995.

Workshops

(Technical Sponsorship):

- **International Workshop on Millimeter-Waves**, cooperative effort with European MTT Chapters (Italy, France, Germany), 11-12 April, 1996.
- **Second Workshop on Low-Temperature Electronics** (Benelux, France), 26-28 June, 1996.

Germany

Chairman: Nigel Keen

The following conferences, workshops and meetings have been organized, sponsored, or supported by the Chapter during 1995-96:

- "Microwaves and Optronic Exhibition and Conference", Prof. Detlefson together with the firm NETWORK GmbH, 30 May - 1 June, 1995.
- "MMIC Technology and Characterization", Dr. Wurfel, 29 September, 1995.
- **Third International Workshop on Terahertz Electronics**, Dr. Vowinkel, 31 August - 1 September, 1995.
- "Antennas for Mobile Systems", Dr. Brunner, 18-19 April, 1996.
- **Fourth Conference on Terahertz Electronics**, Erlangen, 5-6 September, 1996.
- "RF and Microwave Noise", Prof. H. Loele, Dr. R. Stephen, Ilmanau, 10-11 October, 1996.
- **Fourth International Workshop on Integrated Nonlinear Microwave and Millimeter-Wave Circuits**, Prof. Ingo Wolff, Gerhard-Mercator Universitat, Duisburg, 10-11 October, 1996.
- "Analog GaAs MMIC Design Course", Dr. W. Heinrich, Berlin, 14-16 October, 1996.

Of particular note is the biannual conference MIOP '97 - Microwave and Optronic Conference and Exhibition on Microwaves, Radio Communica-

tion and Electromagnetic Compatibility, that will be held in Sindelfingen on 22-24 May, 1997. Prof. Dr. Ing. Wolfgang Menzel from the University of Ulm is conference Chairman.

Central and South Italy

Chairman: Carlo U. Naldi

In 1996 the Chapter organized technical meetings which were held at Politecnico di Torino:

- "Dielectric Wedges", Dr. P.L.E. Uslenghi
- "Impulse Radiating Antennas", Dr. Carl Baum
- "Discrimination of Buried Unexploded Ordnances", Dr. Carl Baum
- "Waveguides Filled With Bianisotropic Materials", Dr. R. D. Gralia

Furthermore, the Chapter supported the following international conferences and workshops:

- **Fifth International Workshop on GaAs in Telecommunications**, April, 1996
- **International Workshop on Millimeter-Waves and Applications**, 11-12 April, 1996
- **GaAs '96 Conference**, Paris, June, 1996

The Chapter is also cooperating in the organization of the next ICEAA conference which will be held in Torino in September, 1997.

South Africa

Chairman: David Davidson

During 1995-96 the main events were Microwave Conferences '95 and '96. The last one was combined with AFRICON 1996.

Spain

**Chairman:
Magdalena Salazar-Palma**

The main event held at Universidad Politécnica de Madrid was the national meeting that attracted colleagues from Spain, Portugal, and Italy:

- XI National Symposium of the URSI Spanish Committee, Madrid, 18-20 September, 1996. 42 oral sessions, 257 papers presented, 256 attendees.

The Chapter also organized a series of technical meetings, workshops, and one short course.

Technical Meetings:

- "Quasi Optical and Active Antennas", Prof. Tatsuo Itoh, Madrid, March, 1996.
- "Space Time Adaptive Processing; Radars for the 21st Century", Prof. Tapan K. Sarkar, Madrid, 25 April, 1996.
- "Design of a Microstrip Antenna Array for Direct Broadcast Satellite Receiver", Prof. Parveen Wahid, Madrid, 17 May, 1996.

Workshops:

- "Antenna Arrays", Prof. Sembiaan R. Rengarajan, Prof. Francisco J. Ares-Pena, Madrid, 22 January, 1996.

- "Signal Processing Techniques in Telecommunication Engineering", Prof. Tapan K. Sarkar, Prof. Magdalena Salazar-Palma, Santander, 8-9 February, 1996.

- "Numerical Methods for Electromagnetic Problems", Prof. Tapan K. Sarkar, Prof. Magdalena Salazar-Palma, Santiago de Compostela, 19 April, 1996.

Short Course:

- "Global Positioning System", Prof. Thomas S. Logsdon, GPS International Association, Madrid, 29 January - 2 February, 1996.

United Kingdom and Republic of Ireland

Chairman: T.H. Oxley

Current and planned activities:

22 events planned for 1996, with a mixture of evening lectures, workshops and colloquia.

Additional members recruited onto AdCom committee, resulting in a greater geographical spread in events.

Aim to achieve balanced programme and include topics which emphasize the synergy between different societies. For example, the largest event: Workshop on High Performance Electron Devices for Microwave and Optoelectronic Applications EDMO '96.

The post-graduate high-frequency symposium (last held in 1995), giving students an opportunity to gain experience in presenting their work to a large audience is being repeated in 1996.

The 1996 programme includes presentation by two IEEE Distinguished Lecturers: Peter Zory (LEO) and Kikuo Wakino (MTT).

Joint Chapter Activities:

- CAD, modeling and measurement verification (in conjunction with French and German MTT Chapters).

Consideration is being given to organization of events in conjunction with the UK Communications and Circuits & Systems Chapters.

Bulgaria

Chairman: Hristo D. Hristov

The chapter was established on 24 June, 1995 and there are 19 members so far. The following events took place during 1995-96:

- 17th International School on Microelectronics and Microwaves, Sozopol, 26-28 September, 1995. School Chairman: Dr. Philip I. Philipov. 42 papers presented, co-organized for the first time by Bulgarian chapter
- Video Courses on Microelectronics Packaging at TU-Varna and TU-Sofia
- 18th School on Microelectronics, Microwaves and Active Antennas, 26-28 September, 1996 (co-organized and cosponsored)
- Conference ELECTRONICS '96, 10-11 October, 1996 (co-organizer)
- Lectures in Sofia delivered by Distinguished IEEE Lecturers on selected topics, Sofia, October, 1996

- Membership Development Meetings in Varna, Bourgass, and Tarnovo

The chapter has also participated in the publishing of the first issue of IEEE Bulgaria Section News Bulletin (VESTI).

The planned events until the end of 1996 run as follows:

- Discussion meeting on CEA in Microelectronics, Microwaves and Antennas at TU-Varna and TU-Sofia, June, involving demonstration of CEA software
- Preparation and starting STAR Mentoring program with the aim of encouraging students to choose careers in Electronics and Telecommunications.

Czechoslovakia

Chairman: Miraslov Zeman

The following meetings have been organized and cosponsored in 1996:

- EuMC Conference, Prague, 9-13 September (cosponsor)
- RADAR '96 Conference, Brno, 18-19 September (cosponsor)
- Workshop CAD & CAE '96
- Student master degree thesis competition
- E-mail bulletin RADIOBOX and ELMAGPO
- RADIOELEKTRONIKA '97 Conference

The chapter also cooperates successfully with the local Radioengineering Society.

Finland

Chairman: A.H. Sihvola

Several technical meetings and one convention were held during 1995-96:

- 6 meetings with visiting lecturers: R. Raab - 26 June, 1995; M. Adler - 26 September, 1995; S. Maas - November, 1995; G. Gaetsman - 2 February, 1996; W. Gwarek - 5 February, 1996, H. Leib - 17 April, 1996.

URSI/IEEE/IRC XXI National Convention on Radio Science, Dipoli, Espoo, 2-3 October, 1996. The convention was organized by the Finnish National Committee of URSI Finland Section and HUT/IRC (Institute of Radio Communications). Invited speakers: A. Viterb (Qualcom), D. Hill (Texas Instruments), J. Rapeli (Philips), T. Narhi (ESA/ESTEC). 105 contributed papers on Radio Communications, Remote Sensitivity, Radio Astronomy, and Electromagnetics.

Greece

Chairman: N. K. Uzunoglu

As listed below, a large number of meetings have been organized:

Symposia/Summer Schools:

- Black Sea Region International Symposium on Applied Electromagnetism, Metsovo Epirus, 16-19 April, 1996.
- "Virtual Reality Applications in Medicine" - summer school; cooperation with UCLA, NTUA-ICCS (Institute of Computer and

Communication Systems), University of Belgrad, Samos Island, 27 July - 3 August, 1996.

Training and Technical Meetings:

- Video technical meetings at NTUA and University of Athens on Microelectronics and Microwaves
- Two technical meetings on EESOF and MDS Packages at NTUA
- Intensive 2-week courses on Microwaves and Microelectronics for 40 students from University of Belgrad, October, 1995
- Hosting 10 Students from University of Tirana to carry out their diploma thesis on high-frequency topics
- Hosting Ph.D. students from Romania and Armenia to work on their thesis at NTUA

Other Activities:

- Establishment of database to promote cooperation between members of Trans Black Sea Union of Applied Electromagnetism
- Issue of Electronic Journal
- Promotion of cooperative research activities within European Union, Black Sea Region Economic Union and other International Organizations.

Hungary

Chairman: Asher Madjar

The following courses and conferences have been organized:

- "Advanced Silicon Techniques",

IEDM Course, Center for Technological Education, Holon, December, 1995.

- “Heterostructure Transistors”, IEDM Course, Center for Technological Education, Holon, May, 1996.
- IEDM video short course, Center for Technological Education, Holon, November, 1996.
- VLSI conference with URSI in March, 1997 - organizer

The activities also include merging with the Israeli Society of Materials, mailing list formation, and an Electronic Bulletin.

Poland

Chairman: Wojciech Gwarek

The chapter held its activities during 1995-96 as follows:

Conferences:

Microwave Conference MIKON '96, Warsaw, 27-30 May, 1996.

Technical Meetings:

- “Measurements and Modeling for Nonlinear Circuit Design”, Dr. G. Leuzzi, 8 November, 1995
- “New Model of Coupled Transmission Lines”, Dr. A. Abramowicz, 8 November, 1995.
- “New Techniques of Impedance and Noise Temperature Simultaneous Measurement in Multistage Radiometer System”, Dr. Wiatr, Dr. M. Szmidt-Szalowski, 10 January, 1996.
- “Dual-Applicator Microwave

Hyperthermia System in Prostate Therapy”, Dr. P. Debicki, 17 April, 1996.

- “Polish Radar Technology - Prospect in Future”, Prof. E. Sedek, 24 April, 1996.
- “General Purpose Electromagnetic Simulator Based on the FD-TD Method”, Dr. M. Celuch, A. Kozak, 15 May, 1996.

Workshops:

- “GaAs and Silicon Products”, Prof. J. Modelski, 25 October, 1995.
- “Biomedical Applications of Microwaves”, Prof. B. Galwas, 29 May, 1996
- “Mobile Communications”, Prof. M. Amanowicz, Prof. J. Grishin, 27 May 1996

Other Activities:

- Competition for the Best M.Sc. Thesis
- Participation in the Initiative for Aiding the Former Soviet Union Republics

Yugoslavia

Chairman: B. S. Jocanovic

The following technical meetings have been organized in 1996:

- “CAD of Metallic Structures by Method of Moments (WIPL Code)”, Dr. Branko Kolundzija, Belgrade
- “Optical Microwave Systems”, Prof. Tibor Berceci, IMTEL, October, 1996

- “RF Micromachining”, Prof. L. Katehi, December, 1996.

The chapter also issues a magazine, the *Yugoslav MTT Chapter Informer* (2 times per year).

Belorussia

Chairman:

Sergei A. Malyshev

The chapter was established on 29 May 1996 and there are 14 members so far. In the first year of activity they started to organize monthly technical meetings on Microwave Electronic Devices—the first one took place in September 1996.

The program for the next year comprises:

- “Modeling Methods in Electronics”—Symposium, March 1997
- Distinguished Lecturers Program
- Support for scientific activity

Lithuania

Chairman: Boris Levitas

The chapter was established in 1995 as a part of the Poland Section and assembles 14 members. New members will be recruited from Lithuanian universities in the near future. The main events in 1996 have been the following:

- Two Chapter meetings in Vilnius
- “Antenna Measurements in Near Field”—two workshops held together with the Poland Section in Warsaw and Gdansk
- International Workshop on Millimeter-Microwave Technique

— October 1996 (in cooperation with the Vilnius University)

Moscow, Russia

Chairman: V. Lioubtchenko

The chapter was established in 1995. Activities in 1996 include:

- International Conference CHIRALITY '96 - Solid-State Microwave Electronics (co-organizer)
- Workshop on Three-Dimensional Microwave Integrated Circuits, Prof. V. Lioubtchenko (co-organizer)

The schedule comprises also two monthly meetings:

- Meeting on Electromagnetic Theory, Prof. Shevchenko
- Meeting on Numerical Techniques in Electromagnetism, Prof. Yu. Shestopalov.

Nizhny Novgorod, Russia

Chairman: Yu. Belov

The chapter was established on 22 March 1996 and there are 18 members so far. The current activities have been as follows:

Technical Meetings:

- "Industrial and Scientific Usage of Hydrogen Masers. Space Applications of Standard Frequencies", 5 July 1996. Invited speakers: C.G.M. Van't Klooster, and Dr. A. Belyaev. The members of MTT/ED/AP Chapter from the Institute of Measurement made their own contribution to the meeting.

- "News of ESA Space Activity", C.G.M. Van't Klooster and "Ongoing Activity of MTT/ED/AP Chapter Nizhny Novgorod and Benelux AP/MTT Chapter", Yu. Belov, 8 July 1996. Many members of the Radiophysical Research Institute visited the meeting.

Other Activities:

- The competition of student qualification projects — 40 students from State Technical University took part and there was a widespread range of engineering topics of research presented. The best project was "Time-Domain Method of Oscillators Studying (Theory and Experiment)", V. Golubev.

The chapter is going to hold local annual meetings involving excursions with the purpose of showing the activities of the "SALUT" Research Production Enterprise. The anticipated benefit for the chapter is to get acquainted with the general investigation directions of the "SALUT" enterprise.

Novosibirsk, Russia

**Chairman:
Boris Yu. Kapilevich**

The chapter was established in May 1996. At present there are 17 members from universities, research institutes and industry, and 10 specialists who would like to join. According to a preliminary survey there is a tendency toward Communication and Computer Societies since the local engineering com-

munity is close to these fields of professional activities. Since Novosibirsk (an unofficial capital of Siberia) and other neighbouring towns have a powerful scientific and industrial potential in the areas of IEEE interests, the total estimated number of new IEEE members that might be recruited is about 100-200 individuals.

Moreover, the same applies to the new states of Central Asia such as Kazakhstan (Alma-Ata), Uzbekistan (Tashkent) and Khyrgyzstan (Beshkek) that could be an additional source of chapter extension.

Current and planned activities include lectures and discussions on the latest advances in selected topics, e.g.:

- "Microwave Active Filters"
- "Measurement and Identification of Power Microwave Semiconductor Devices".

Saratov-Penza, Russia

**Chairman:
Michael V. Davidovich**

Officially the chapter was established on 11 July 1996. However, last year it existed within the framework of Joint MTT-S/ED-S Initiative for Aiding Eastern Europe and Former Soviet Union Area. The following events took place in 1996:

- Tenth International Winter School — Conference on Microwave Electronics and Radiophysics, Saratov, 12-20 January 1996.

- ICND '96 — International Conference on Nonlinear Dynamics and Chaos, Saratov, 7-14 July 1996. The conference showed the new aspects of nonlinear dynamics and chaos applications in physics, biology and medicine. Recognition should be given to Conference Chairman Prof. V.S. Anischenko (Chair of Radiophysics and Laboratory of Nonlinear Dynamics) for his outstanding efforts.
- APEDE '96 — International Conference on Actual Problems of Electron Device Engineering, Saratov, 10-12 Sep 1996
- Participation in Distinguished Lecturer Program: Prof. Dmitry I. Trubetskov, Prof. Dmitry A. Usanov

Regarding future activities in 1997, the chapter, among other efforts, intends to recruit new members and present publications in the IEEE periodical issues. Furthermore, the chapter is going to organize a workshop on "CAD and Numerical Methods in Applied Electrodynamics and Electronics" during the first week of June 1997.

St. Petersburg, Russia

Chairman: Sergei Tretyakov

The chapter was established as a result of the joint ED/MTT Initiative on 6 April 1995, and extended into an ED/MTT/AP Chapter afterwards. The main chapter activities in 1996 run as follows:

- IEEE Vacuum Microelectronics Conference

- "Day on Diffraction" — International Seminar
- CHIRAL '96 — International Workshop on Complex Composite Materials Microwave Engineering
- Specialists' meetings at *Leninetz* and *Svetlana* companies
- Competition for junior students studying radioengineering — participants: 90 students from 6 different institutions

Other chapter plans and suggestions include an Entrepreneurial Skills Seminar, membership promotion and helping in new chapter formation.

Central Ukraine

Chairman: Yuri M. Poplavko

The chapter was established in April 1996. So far, there are 14 members who are leading scientists from National Ukrainian Technical University, Ukrainian State University, Institute of Theoretical Radioengineering, Institute of Cybernetics (National Academy of Science), Institute of Communication and people from young but prospective enterprises.

As its initial activity, the chapter has been organizing meetings and discussions for members. Prospective directions of scientific research in Ukraine were considered and outlined, as well as plans for activities and development for the chapter.

East Ukraine

**Chairman:
Alexander I. Nosich**

The chapter was established on 24 May 1995. By September 1996 the total membership had grown up to 29, and 3 members were upgraded to Senior membership. So far, the chapter activities have been as follows:

- ICATT '95 — International Conference on Antenna Theory and Techniques, Kharkov, 1995
- Workshop on Antenna Radomes and Covers, Kiev, 1995
- 4 technical meetings were held from May to December 1995
- Workshop on Industrial Applications of Microwaves, Kazan (Russia), 1995 (co-organizer)
- MMET '96 — Sixth International Conference on Mathematical Methods in Electromagnetic Theory, Lviv, 9-13 September, 1996 (co-organizer)
- 9 technical meetings in 1996

In 1997 the chapter is going to hold 1 or 2 workshops and a number of technical meetings as well as co-organize the International Conference on Antenna Theory and Techniques (ICATT '97) on 20-22 May, 1997.

West Ukraine

**Chairman:
Nikolai N. Voitovich**

The chapter was formed as the first one by the MTT/ED Initiative for Aids EE/FSU. The number of members is 13 and there are many

potential members in the region. The current activities have been as follows:

- MMET '96 — International Conference on Mathematical Methods in Electromagnetic Theory, Lviv, 9-13 September, 1996. 130 papers from 16 countries.
- A separate workshop on Antenna Theory as a form of annual seminar/workshop: "Direct and Inverse Problems of Electromagnetic Wave Theory (DIPED).
- Three technical meetings during January to August, 1996 (2 in Lviv, and 1 in Kharkov).

The future plans are concerned with the chapter's cooperation within the Black Sea Union on Applied Electromagnetism (BSUAE), Workshop DIPED '97 in Sep 1997 as well as expansion of the chapter activities at universities.

The New MTT-S Region 8 Coordinator

I am pleased to announce that Professor Adalbert Beyer (German Chapter), has been nominated by the 1996 President, John Wassel, to replace me as the new MTT-S Region 8 Coordinator within the MTT-S Transnational Committee. Below please find a brief biography of Professor Beyer.


Prof. Dr. Ing. Adalbert Beyer received his diploma in 1964 and his Dr. Ing. (Ph.D.) degree in 1969, both in electrical engineering. In

1976 he joined the Duisburg University, where he has held the position of a Foundation Member of the "Sonderforschungsbereich 254" since Spring, 1986.

His areas of research interest are in field theory, microwave and millimeter-wave techniques, CAD and FET applications, and especially the theory and measurement of integrated circuits and remote sensing. In 1987 he was a Visiting Professor at the University of Ottawa/Canada. In 1990 he also spent a period as Visiting Professor at the University of Texas at Austin/TX/USA. He is author and co-author of

several books, patents, and more than 200 technical papers.

Professor Beyer is a Member of VDE/ITG (Germany), a Fellow of IEEE, a Member of the Technical Program Committee (TPC), the Committee on Microwave Ferrite, and a Member of MTT-15, the Committee of Field Theory. Furthermore he is also a member of the editorial board of several scientific journals.

My Co-Chairman, Professor Yamashita, and I would like to wish Professor Beyer success and satisfaction with his new responsibility. 

Activities of South Australia in 1996

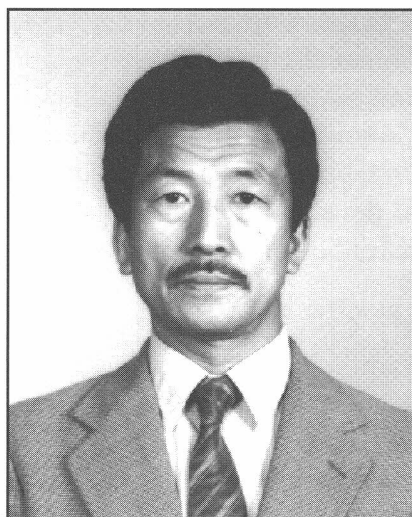
A. J. Parfitt, Chairman

The joint Antennas and Propagation and Microwave Theory and Techniques chapter has had a productive year. In February we held our AGM and at the same time heard three local papers which were presented at the 5th Australian Symposium on Antennas the previous week. The presenters were Assoc. Prof. D. W. Griffin of the University of Adelaide, Dr. C. Coleman of DSTO and Dr. A. J. Parfitt of the University of Adelaide. In April we were privileged to run a one-day workshop on Geometric Optics and Field Theory presented by Prof. H. E. Green. A visit and tour of CODAN Pty Ltd., manufacturers of HF and satellite communications equipment was arranged in August. In September, IEEE AP Society Distinguished Lecturer Dr. A. Roederer of the European Space Agency presented a paper on active arrays.

1997 Officers and Committee Members are:

Chairman:	Dr. A. J. Parfitt
Vice-Chairman	Dr. B. D. Bates (DSTO)
Secretary/Treasurer	Dr. A. Kulesa (DSTO)
Committee:	Mr. P. Fisher (CODAN Pty. Ltd.) Dr. L. Powis (DSTO)

Region 10 Chapter Activity Reports (Part 1)



Eikichi Yamashita
MTT-S Transnational
Committee Co-Chairman

Chapter officers in Region 10 submitted the following reports on their activities until the end of October 1996.

Thailand (MTT/AP/ED Chapter)

Prof. Narong, Dean of Faculty of Engineering, Chulalongkorn University, Bangkok, has submitted the petition to form the above Joint Chapter via Thailand Section to IEEE in August 1996.

Hong Kong (MTT/AP/LEO Chapter)

Dr. Beatrice Chu

The founding meeting of the IEEE Hong Kong Joint Chapter on MTT/AP/LEO was held on 4 December

1995 at the City University of Hong Kong at 7:20 p.m.

The following seminars were sponsored by the Joint Chapter for the 1995-96 academic year.

- 7 December 1995 — “From Hollow Pipes to Microwave Integrated Circuits: A Short Historical Guide” Prof. A. A. Oliner, Dept. of Electrical Engineering Polytechnic University, Brooklyn, NY, USA
- 7 December 1995 — “An Introduction to Integral Equations in Electromagnetics” Prof. Chalmers M. Butler, Dept. of Electrical and Computer Engineering Clemson University, Clemson, SC, USA
- 13 December 1995 — “Leaky Dominant Modes in Microwave Integrated Circuits” Prof. A. A. Oliner, Dept. of Electrical Engineering Polytechnic University, Brooklyn, NY, USA
- 13 December 1995 — “Electromagnetic Penetration Through Small Apertures” Prof. Chalmers M. Butler, Dept. of Electrical and Computer Engineering Clemson University, Clemson, SC, USA
- 26 February 1996 — “A 2.45 GHz Microwave Link for Automatic Debiting Application” Prof. Lin Deyun and Prof.

Shi Chang Sheng, Dept. of Electronic Engineering Tsinghua University, Beijing, China

- 23 May 1996 — “Liquid Crystals Nonlinear Optical Fiber Array” Prof. I. C. Khoo, Dept. of Electrical Engineering, Pennsylvania State University, Pennsylvania, USA
- 24 May 1996 — “Microwave Plasma Electronics – A New Growing Branch in Science and Technology” Prof. Liu Shenggang, President, University of Electronic Science and Technology of China, Chengju, Sichuan, China
- 11 September 1996 — “Photonic Integration for Multigigahertz Systems” Prof. John H. Marsh, Dept. of Electronics and Electrical Engineering, University of Glasgow, Scotland, UK
- 16 September 1996 — “Semiactive Transmitting Antennas” Dr. Antoine G. Roederer, Electromagnetics Division - XE ESA-ESTEC, PB299, NL-2200 AG Noordwijk, Netherlands

A technical visit was organized by the Joint Chapter on 13 July 1996. The places visited were the Central Control Room, and the train maintenance area of the Mass

Transit Railway Corporation
Kowloon Bay Depot, Hong Kong.

Singapore (MTT Chapter)

Prof. M. S. Leong

During the 1995-96 year, the Chapter has been involved in the organization of the following activities:

- ICCS '96 (International Conference on Communications Systems) 25-29 November 1996. Our chapter members act as the Conference Co-Chairman, Tutorial Committee Co-Chairman and Publicity Committee Chairman, in addition to assisting in the technical session chairing. This biennial event is a regular viable source of income for our Chapter.

The Chapter also organized in July 1996 a number of video nights at which IEEE-produced videos of lectures of general interest to members are screened. This was done as part of a general membership recruitment drive on the NUS campus, to give more visibility to the professional activities of the IEEE in Singapore and attract student members.

The Chapter recently received visits from two distinguished visitors from the US — Professors P. Pathak and B. Munk — who gave the following specialized courses:

- Prof. P. Pathak "Special Domain Techniques", held on 3-15 August 1996, NUS Room E4-05-26V
- Prof. B. Munk "Frequency

Selective Surfaces", held on 20-31 August 1996, NUS Room E4-05-26V. The number of participants was 21.

The Chapter also welcomed Professor Ramjee Prasad of Delft University, Netherlands, who gave one lecture on "Recent Developments in Mobile Telecommunications". The attendance was 40.

Another distinguished visitor from Kaiserslautern University, Professor W. Rupprecht, gave a 3-hour presentation on "Recent Developments of Telecommunications in Germany", and visited a number of multimedia companies who sought his expert advice. He was presented with a plaque by the Chapter for his tangible contributions.

Four short courses, namely, Antenna Engineering Fundamentals, EMC Fundamentals, Microwave Foundations, and RF Circuit Design were given by Chapter members. Admission was free of charge.

Other visitors in the Chapter's calendar include Dr. Kane S. Yee of FD-TD fame in November 1997 and Prof. J. A. Kong of MIT in January 1997.

Nanjing (MTT/AP/EMC Chapter)

Prof. Wen Xun Zhang

Since October 1995, various chapter activities and events have been completed. There were lectures and visits, symposium and workshops, members' meetings and a members' party, newsletters and Chapter Bylaws, membership development and

officer elections, etc.

- 15 technical lectures were held on numerical methods and applications, progress in Antennas and Microwaves, EMC in Electronic Systems, optical fiber devices, waveguide components, Aperture synthesis, and Microwave Imaging, etc. The audience averaged more than 40.
- A distinguished lecturer tour by Prof. M. F. Iskander included Beijing, Nanjing, Yangzhou, Suzhou and Shanghai. His 8 lectures on three topics attracted about 800 attendees in all.
- A tour of the radar, satellite communication and telemetry equipment set on the *Long-Sight* scientific survey ship; and a visit to the Optical Communication Lab of Nanjing University of Post & Telecommunications.
- Cosponsorship of '95 National Symposium on Microwaves with 220 participants. 333 papers were exchanged and printed in a 1356-page Proceedings (in Chinese).
- Sponsorship of '96 National Workshop of EM Theory with 12 invited lecturers and about 50 attendees, supported by the MTT-S special fund; another half-day local workshop on EM scattering with 6 invited speakers and some 20 in attendance.
- Two members' meetings held in Nanjing and Shanghai respectively, to explain the construction, constitution and Bylaws of the IEEE and related societies, and to discuss chapter affairs.

- A joint party co-organized with CIE local chapter with introduction of the IEEE and announcement of membership development, free forum, and self-selected video program.

Besides those events, two issues of Chapter Newsletters have been published, the chapter Bylaws were approved by members, the nomination-election procedure for 1997-98 term Chapter officers is in progress. The number of chapter members has increased at a rate of 20% in the past year. In addition, the Joint Nanjing Chapter has been honored with the 1995 Best Chapter Award by AP-S.

Korea (MTT Chapter)

Prof. Dong-Chul Park

- Workshop on Antenna Technology — April 25-26, 1996, Seoul Educational Center 12 papers presented. Invited speakers: Dr. Gentei Sato (Japan), Prof. Kyohei Fujimoto (Japan), Dr. Bart Van Rees (Raytheon, USA), Dr. P. K. Park (Hughes, USA), Prof. Makoto Ando (Japan), Dr. A. P. Popov (Russia). Hosted by Korean Institute of Communication Sciences and IEEE MTT Korea Chapter. 250 attendees. Charges: ₩ 160,000 (~ US\$ 190).
- Microwave Symposium '96 Spring — May 18, 1996, Chung Ang University in Seoul, 62 papers presented. Invited speaker: Prof. K. W. Yeom (Chungnam National University)

Hosted by Korea Institute of Telecommunications and Electronics and IEEE MTT Korea Chapter. 200 attendees. Charges: ₩ 25,000 (~ US\$ 30).

- Microwave Symposium '96 Fall — September 21, 1996, Pohang University of Science and Technology, 62 papers presented. Invited speaker: Dr. Y. H. Cho (Korea Telecom) Hosted by Korean Institute of Communication Sciences and IEEE MTT Korea Chapter. 170 attendees. Charges: ₩ 30,000 (~ US\$ 36).

Tokyo (MTT Chapter)

Yoshio Kobayashi,
Chairperson

Toshio Niahikawa, Vice-Chairperson

Kiyomichi Araki, Secretary

Akio Iida, Treasurer

News

The Distinguished Microwave Lecturer, Dr. Kikuo Wakino of Murata Mfg. Ltd. Presented his lecture, "Miniaturization Techniques of Microwave Components for Mobile Communications System".

Dr. Y. Kobayashi (Chairperson) and Dr. T. Nishikawa (Vice-Chairperson) attended MTT-S Chapter Chairperson's Meeting held at Clarion Plaza Hotel, Orlando, Florida, on May 16, 1995.

Tokyo Chapter was in cooperation with 1995 Microwave Workshop and Exhibition (MWE '95) which was held on December 12-14, 1995 at Pacifico Yokohama. More than 1200 participants attended.

The Tokyo Chapter sponsored memorial lectures by the Microwave Career Award and Pioneer Award recipients on December 12 during MWE '95.

Technical Meetings

- January 20, 1995, Tokyo, 40 attendees. "1994 European Microwave Conference Report" T. Nojima, NTT Docomo and five other members.
- Apr 22, 1995, Tokyo, 70 attendees. "Recent Progress of High-Tc Superconductive Microwave Devices" K. Suzuki, ISEC.
- May 25, 1995, Nara, 80 attendees. "Technological Trends in Mobile Communications" H. Yamamoto, AIST.
- June 22, 1995, Toyohashi, 40 attendees. "1994 Asia-Pacific Microwave Conference Report" S. Mizushina, Shizuoka University.
- July 24, 1995, Sapporo, 45 attendees. "A Report on 1995 IEEE MTT-S International Microwave Symposium" H. Ogawa, NTT, and seven other members.
- December 12, 1995, Yokohama, 80 attendees. "Special Lectures of Recipients of Microwave Career and Pioneer Awards" Microwave Career Award Recipient: Dr. Y. Konishi, Tokyo Institute of Polytechnics. Microwave Pioneer Award Recipient: Dr. M. Uenohara, NEC.
- January 25, 1996, Tokyo, 40 attendees. "1995 European

- Microwave Conference Report” T. Hirota, NTT, and three other members.
- February 28, 1996, Tokyo, 50 attendees. “A Report on the 1995 Asia-Pacific Microwave Conference” I. Awai, Yamaguchi University, and seven other members.
 - February 28, 1996, Tokyo, 50 attendees. “Miniaturization Techniques of Microwave Components for Mobile Communications System” Kikuo Wakino, Murata Mfg. Co. Ltd.
 - April 1996, Hefei, China, 120 attendees. “Miniaturization Techniques of Microwave Components for Mobile Communications System” Kikuo Wakino, Murata Mfg. Co. Ltd.
 - May 1996, Tokyo, 60 attendees. “High Rate Transmission of Integrated Traffic over Wireless Communication Networks” V. Bhargava, University of Victoria, Canada.
 - May 1996, Tokyo, 40 attendees. “Design and Analysis of a Rague Adaptive Concatenated Code for the Cellular Channel” V. Bhargava, University of Victoria, Canada.

Nontechnical Meetings

- March 30, 1996, 15 attendees. “AdCom Meeting of MTT-S Tokyo Chapter” at Tokyo Institute of Technology
- May 10, 1996, 10 attendees. “Exercise of Oral Presentation for 1996 IEEE MTT-S International Microwave Symposium” Advisors: T. Tsukii, Raytheon Systems Co. and H. Kondou, Hitachi Ltd. at Tokyo Institute of Technology



IEEE-USA'S LEGISLATIVE AGENDA FOR THE 105TH CONGRESS

IEEE-USA will pursue the following legislative goals in support of the objectives and positions adopted by our members:

- ◆ Passage of **retirement-security legislation to improve portability of pension-plan benefits and expand savings opportunities** available under tax-deferred Individual Retirement Accounts;
- ◆ Support for **tax incentives, regulatory reforms, and public investments** that will help **promote new enterprise** and create well-paid, value-added jobs for Americans, particularly in the high-technology and manufacturing sectors;
- ◆ Passage of budget **authorization and appropriations bills that sustain and strengthen federal investment in research and development**, especially in applied research, engineering and precompetitive technology areas;
- ◆ Permanent extension and expansion of the **Research and Experimentation Tax Credit**;
- ◆ Permanent extension of the **Section 127 (Internal Revenue Code) tax exclusion for Employer-Provided Educational Assistance**, and restoration of eligibility for graduate education expenses for the tax exclusion;
- ◆ Introduction and passage of **legislation to provide protection against unauthorized copying of original useful articles**;
- ◆ Adoption of **legislation, executive orders and/or regulations relaxing U.S. export controls** and other regulations on **encryption technologies** to the maximum extent possible; and
- ◆ **Repeal of Section 1706** of the Internal Revenue Code and **restoration of the Section 530 safe harbor** to ensure the fair and equitable tax treatment of all engineering service providers.



THE INSTITUTE OF ELECTRICAL
AND ELECTRONICS ENGINEERS, INC.

UNITED STATES ACTIVITIES
1828 L Street, N.W., Suite 1202
Washington, DC 20036-5104, U.S.A.

Telephone: 202-785-0017
Fax: 202-785-0835
E-mail: ieeeusa@ieee.org
WWW: <http://www.ieee.org/usab>

Calendar MTT-S Sponsored Conferences

1997

Name	Date/Location	Involvement	
International Topical Symposium on Technologies for Wireless Electronics Group Applications (WTS) Ave.	23-26 February Vancouver, BC	Sponsor Canada	Dr. Reynold Kagiwada TRW Space 3117 Malcolm Los Angeles, CA 90034-3406 Tel.: 310 475-5255 FAX: 310 475-5483 email: r.kagiwada@ieee.org
Radio Frequency Integrated Circuits Symposium	8-10 June Denver, CO USA	Cosponsor	Louis C. T. Liu TRW, Inc. Tel.: 310 812-8372 FAX: 310 814-4656 email: louis_liu@ qmail2.sp.trw.com
MTT-S International Microwave Symposium	8-13 June Denver, CO USA	Sponsor	Claude M. Weil NIST 325 Broadway Boulder, CO 80303 Tel.: 303 497-5305 FAX: 303 497-6665 email: weil@boulder.nist.gov
1997 Topical Symposium on Millimeter Waves	7-8 July Kanagawa Japan	Technical Cosponsor	Prof. Tatsuo Itoh UCLA Dept. of Electrical Engineering 405 Hilgard Avenue Los Angeles, CA 90095-1594 Tel: 310 206-4820 FAX: 310 206-4819 email: itoh@ee.ucla.edu

Calendar MTT-S Sponsored Conferences

1997

Name	Date/Location	Involvement	
SBMO International Microwave and Optoelectronics Conference	11-14 August Natal Brazil	Cosponsor	Adaildo G. d'Assuncao UFRN, EE Dept. PO Box 168 Natal, RN Brazil 5 9072-970 Tel.: 55 84 231 4254 FAX: 55 84 231 4254 email: sbmo97@ct.ufrn.br
SPS 97 and Third Conference on Wireless Power Transmission	24-28 August Montreal Canada	Cooperative	I. Ross Canadian Aeronautics and Space Institute #818-130 Slater Street Ottawa ON Canada, K1P6E2
International Topical Meeting on Microwave Photonics	4-6 September Duisburg Germany	Technical Cosponsor	Prof. Dr. Dieter Jaeger Gerhard-Mercator-Universitat Geshamthochschule Duisburg Kommandantenstrasse 60, KA D-47048 Duisburg, Germany Tel.: 49 02 03 379-2341 FAX: 49 02 03 379-2409 email:jaeger@ optorisc.uni-duisburg.de
IEEE Conference on Intelligent Transportation Systems	9-12 November Boston, MA USA	Cosponsor	Lyle Saxton 6108 Browning Lane Broadrun, VA 22014 Tel.: 540 347-9512 FAX: 540 347-3311 email: l.saxton@ieee.org

Notes:

(1) Meetings 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.

MTT-S Continuously Sponsored Conferences

MTT-S International Microwave Symposium (IMS)
Annual (Sponsor)

Automatic RF Techniques Group (ARFTG)
Semi-annual (affiliated)

European Microwave Conference (EuMC)
Annual (Cooperate)

Asia Pacific Microwave Conference (APMC)
Annual (Cooperate)

MIOP
Biennial - 1993, etc. (Cooperate)

MIKON
Biennial - 1994, etc. (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; Cosponsor 1995)

IEEE GaAs IC Symposium
Annual (Cosponsor)

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)

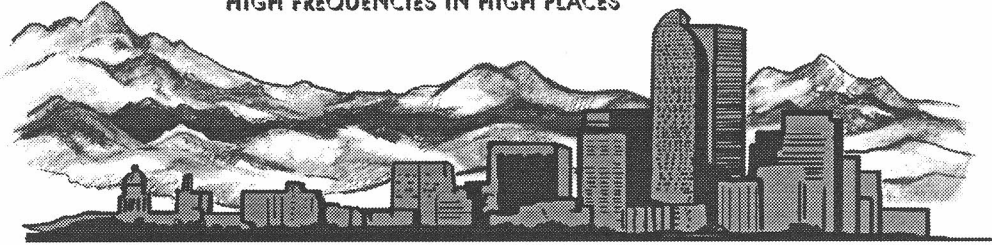
Microwaves in Medicine
Triennial - 1993, etc. (Cooperate)

National Radio Science Meeting
Annual (Cooperate) (with International Union of Radio Science)

International Workshop on High-Performance Electron Devices for Microwave and
Optoelectronic Applications (EDMO)
Annual (Cooperate) (with UKRI MTT/AP/Leo Joint Chapter and King's College London)

Cornell University Conference on Advanced Concepts in High Speed Semiconductor Devices and
Circuits Biennial (Technical Cosponsor) (Sponsored by the IEEE Electron Device Society)

HIGH FREQUENCIES IN HIGH PLACES



1997 IEEE MTT-S INTERNATIONAL MICROWAVE SYMPOSIUM
DENVER, COLORADO



JUNE 8-13, 1997

Microwave Week Comes to Denver!

1997 marks the historic return of the IEEE MTT-S International Microwave Symposium (IMS) to Colorado, where it was last held 24 years ago in Boulder. The IMS has vastly outgrown its original Colorado venue to the point that only nearby Denver — Colorado's booming metropolis — can now accommodate it. You can reach Denver, located in the shadow of the magnificent Rocky Mountains, through the world's most advanced airport. Yet the downtown area is so compact that all of the conference hotels are within walking distance of the Symposium site, the Colorado Convention Center. As a major telecommunications hub of the wireless, cable TV, and spaceborne TV industries, Denver perfectly reflects the recent transformation of the RF/microwave industry to commercial applications. A comprehensive program of technical presentations and workshops, as well as the largest exhibition in the industry, will review the latest advances in RF and microwave technology, with particular emphasis on wireless communications. So, come join us at the world's foremost microwave technical conference and exhibition during the week of 8-13 June. And, if you have the time, why not stay over and enjoy more of Colorado?

24 Workshops Spotlight Key Technical Areas

The 1997 IMS provides an exciting and timely workshop program to augment the continuing education of engineering professionals. These workshops offer the opportunity to interact with specialists during extended full-day and half-day sessions, as well as over lunch and during refreshment breaks. This year, you can choose from among 24 workshops that range in format from tutorials on emerging technology to working forums where experienced professionals examine critical issues within their fields. In addition to hot technical areas such as multipoint television distribution and personal communication technology, we have introduced workshops to cover business issues and teach timely workplace skills. You will find new workshops on FCC procedures, emerging business issues in the rapidly changing microwave industry, and training for World Wide Web site development. Look over the list of workshops and register now for these exciting educational opportunities.

Special Sessions Focus on Hot Topics

To accent the latest technical developments, the 1997 IMS features five Focused Sessions during the regular technical program. These sessions, listed in this Advance Program's Schedule of Events, present the latest advanced research in fast-developing areas such as millimeter-wave over optical fiber, acoustic wave devices for portable communications, electromagnetic interaction with devices, and microwave applications of silicon carbide. A Historical Session reviews 40 years of microwave metrology, and an Honorary Session is dedicated to the late Professor J.C. Bose on the centenary of the publication of his astonishing millimeter-wave research.

Six lunchtime Panel Sessions and one rump session will feature lively interactive discussions of topical issues. The topics are listed on the back of the enclosed registration form; sign up for them using the form.

Plenary Session: Microwave & RF Telecommunications

The 1997 IMS Plenary Session highlights two telecommunications infrastructures that will revolutionize the microwave/RF industry. Mr. Shant Hovnanian, CEO of CellularVision USA, will address the future of the local multipoint distribution system (LMDS), a cellular video network poised for rapid growth. CellularVision pioneered LMDS and operates a growing 28 GHz consumer network in New York City. Pioneering a spread spectrum personal communications system (PCS) in the same city is Omnipoint Corp., whose chief scientist, Mr. Robert Dixon, will also address the Plenary Session. Mr. Dixon, author of the key text on spread spectrum technology and a well-known lecturer, will discuss the impediments to real technological innovation in PCS, posing the question, "Will the Real PCS Please Stand Up?" The IMS Plenary Session, on Tuesday morning, June 10, is a rare look into your microwave future and is not to be missed!

New RFIC Symposium

Expanding from the previous Microwave and Millimeter-wave Monolithic Circuit (MMWMC) Symposium, the RFIC Symposium will focus on highly integrated RFICs and subsystems. Papers will describe original work on analog, mixed-signal, and mixed-mode ICs and subsystems. Commercial and military applications will include wireless communications, broadband communications, analog and digital mobile communications, intelligent transportation systems, broadband access modems, and radar systems.

ARFTG Conference Goes Video

The Automatic RF Techniques Group (ARFTG) presents its 49th Conference at Denver's landmark Brown Palace Hotel on June 13. This year's theme, "Characterization of Broadband Telecommunications Components and Systems," highlights the microwave/RF aspects of new television distribution networks. The meeting covers advanced digital cable television as well as microwave and cellular TV (LMDS and MMDS), with speakers representing the leading edge of those industries. Mr. Syd Fluck of HP CaLan serves as the keynote speaker. An accompanying exhibition features the latest in instrumentation. If television matters to your business, mark your calendar for Friday of Microwave Week!

Hundreds of Exhibits

As in the past, Microwave Week includes the premier exhibition in the industry. With hundreds of participating companies, this is a golden opportunity to display and view the latest products and talk to your customers and suppliers. A Microwave Historical Exhibit and University Exhibits will also enliven the hall.

Microwave Application and Product Seminars (μ APS)

In 1997, we continue the tradition begun in 1996 by again presenting μ APS, a forum for technical product application seminars by exhibiting companies. μ APS, held on the exhibit floor and free of charge to all Microwave Week registrants, gives practitioners direct access to practical technical information provided by those who know the equipment best. Bring your questions, because the answers are here!

Look for the full program at <http://www.boulder.nist.gov/ims>

Travel to Denver: Welcome to the Mile High City

Air Travel: United Airlines is the official airline of IMS '97. For service in the United States or Canada, United offers five percent off the lowest applicable discount fare, or 10 percent off full-fare coach seats purchased at least three days in advance. Call the United Meeting Desk at 1-800-521-4041 and use our **Meeting ID Number: 504SD**.

Air Freight: Call Joe at United Airlines Meeting Sales (1-800-633-8825) at least 21 days in advance. **Meeting ID number: 504SD**.

Rental Car: Avis, the official rent-a-car agency of IMS '97, offers special meeting rates starting at \$30.99 daily, \$112.99 weekly, and \$16.99 weekend days for subcompact cars, with unlimited free mileage. Should a better promotional rate be available at conference time, you will be entitled to five percent off that lower rate. Call the Avis Meeting Reservation Desk at 1-800-331-1600 and refer to **Meeting ID Number: A606092**.

Airport Shuttle: SuperShuttle will provide discounted round-trip-only tickets (\$25) to all downtown IMS sites. Vehicles depart Denver International Airport (DIA) every 15 minutes. Purchase tickets at the SuperShuttle counter on the **Baggage Claim** level near the center of the terminal. Please use **Meeting ID Number: MTT970601**.

For public bus service, look for RTD skyRide Route AF. Service is at least hourly and reaches the 16th Street Mall in under an hour. Tickets are \$6, exact change only.

Driving to IMS 1997: Denver is at the intersection of Interstates 70 and 25. From DIA, take Peña Boulevard to I-70 West to I-25 South. Exit at Speer Boulevard South and follow signs for "Convention & Performing Arts Complex." Turn left on Arapahoe; a covered parking garage on your right is about \$4/day. Or continue on to 14th Street, turn right, and you will pass the Colorado Convention Center. Off-street parking nearby typically runs \$10/day. All of the IMS hotels offer parking at \$15-\$30/day.

Weather and Logistics: A Peak Experience

Elevation: Denver, the Mile High City, lies at an altitude of 1609 meters. Most people will not feel the effect of the thinner air, but beware of vigorous activity until you become acclimated. It's a good idea to spend at least a day in Denver getting adjusted before a strenuous mountain excursion.

Weather: Springtime in Denver usually heralds warm, sunny days with low humidity. The sunshine can be intense, so protect yourself! Expect cool evenings and occasional late afternoon showers. If your plans include a mountain visit, prepare for any weather! Bring along rain gear, walking shoes, sunscreen, and a winter-weight jacket.

The Colorado Convention Center (CCC): Registration will take place in Lobby A at 14th & California Streets. Meeting rooms are located on the same floor, and the Exhibition is up the front escalators. A business office will provide shipping and other services.

IMS Transportation: Bus service between conference hotels, the Colorado Convention Center, and evening social events begins at 7:00 AM on Sunday, June 8 and continues through Friday afternoon, June 13. Schedules will be posted at all IMS venues.

Public Transportation: The 16th Street Mall Shuttle — a free, cross-town bus — runs past the Adam's Mark Hotel and within two blocks of most of the downtown business district, including the CCC. The shuttle runs from 5:00 AM until 1:00 AM, at least once every three minutes until 7:00 PM (every minute at peak hours!). The Light Rail trolley runs by the CCC, perpendicular to the Mall. Passes for all-day travel on public buses and the Light Rail cost \$3. The "Cultural Connection Trolley" (actually a bus) serves museums, galleries, historic sites, the botanic gardens, and the zoo. Taxicabs are always available.

Social Events: You're Invited!

Microwave Journal/MTT-S Reception: Microwave Journal and MTT-S invite all Microwave Week attendees and exhibitors to a reception on Monday, June 9 from 6:00 PM to 10:00 PM at the Denver Museum of Natural History. We have exclusive use of the museum. Come enjoy an IMAX film and tours of internationally acclaimed exhibits, along with beverages and hors d'oeuvres. Bus

service to the museum from the Colorado Convention Center runs from 5:30 PM to 7:00 PM; service from the hotels to the museum will begin at 6:45 PM. Return buses to IMS hotels will run from 7:00 PM to 10:00 PM.

Industry-hosted Cocktail Reception: On Wednesday, June 11 from 5:45 PM to 7:15 PM at the Adam's Mark Hotel, just prior to the Awards Banquet, join old and new colleagues at a cocktail party hosted by symposium exhibitors. Beverage tickets will be included in your registration package.

The IEEE MTT-S Awards Banquet: The annual Awards Banquet will be held on Wednesday, June 11 from 7:30 PM to 10:00 PM in the Grand Ballroom of the Adam's Mark Hotel. During an elegant dinner and after the presentation of MTT-S technical and service awards, Denver's own "Four-Hands, Two-Grands" (pianos, that is) will entertain. Use the registration form to make your reservation today!

RFIC Reception: The RFIC Symposium invites RFIC conference participants to a reception on Sunday, June 8 from 7:00 PM to 10:00 PM at Denver's Marriott Hotel.

Guest Programs: Something for Everyone

Hospitality Suite: Guests of IMS attendees are invited to visit our Hospitality Suite, the Central City Room in the landmark Brown Palace Hotel at 321 17th Street (see the Hotel Information map). Morning hospitality includes a professional travel advisor (7:15 AM to noon daily) with brochures of Colorado attractions and restaurant guides. Light snacks and beverages will be served from 7:15 AM to 4:30 PM daily.

Tours: From urban walking tours to a mountainous motor-coach excursion, we've planned a diverse program of guest outings. All tours begin at our Hospitality Suite, the Central City Room of the Brown Palace Hotel. Please use the IMS registration form to sign up in advance. Guests will be accommodated on a first-come, first-served basis. Minors must be accompanied. Listed rates are per person.

Monday, June 9
9:00 AM-12:30 PM

Denver City Tour
Cost: \$21 (Tour GA)

This half-day tour will help get you oriented and give you a taste of the good things urban Denver has to offer. You will visit the "Mile High" Colorado State Capitol, the "Unsinkable" Molly Brown's house, and Ninth Street Historic Park.

Tuesday, June 10
8:00 AM-4:30 PM

Rocky Mountain National Park
Cost: \$38 (Tour GB)

As your bus winds its way toward one of our continent's most breathtaking experiences, Rocky Mountain National Park, you'll see the beautiful city of Boulder as well as Estes Park, with its famous Stanley Hotel. A morning snack will be served on the bus. Once in the park, you'll take the scenic drive to the summit of Trail Ridge Road, with rest, photo, and box-lunch stops along the way. Bring a warm coat for this high-altitude expedition!

Wednesday, June 11
9:00 AM-12:30 PM

Art, Sports & Books
Cost: \$15 (Tour GC)

On this walking tour through Denver's historic Lower Downtown (LoDo) district, you'll visit some of the city's oldest buildings, now housing hotels, galleries, restaurants, and shops, including the Tattered Cover, one of the nation's finest independent bookstores. Explore historic Union Station. Admire urban architecture and mountain views. Top off the morning with a tour of beautiful, state-of-the-art Coors Field, home of baseball's Colorado Rockies.

Wednesday, June 11
1:30 PM-4:00 PM

How Theater Works
Cost: \$14 (Tour GD)

Try this private, behind-the-scenes walking tour of the Denver Center for the Performing Arts, which contains some of the nation's finest theaters for music, dance, and drama. Discuss it all over a coffee and dessert buffet at the adjacent Theater Cafe.

Thursday, June 12
8:00 AM-5:00 PM

Colorado Springs
Cost: \$35 (Tour GE)

Begin your day with a tour of the stirring and scenic US Air Force Academy. Then on to Old Colorado City for shopping and lunch: soup, salad, and Beau Jo's unique mountain-style pizza pie. Cap off the afternoon with a visit to the stupendous natural red rock formations at the Garden of the Gods. Home in time for supper!

Advance Conference Registration

1997 IEEE MTT-S MICROWAVE WEEK EVENTS

June 8-13, 1997 ♦ Denver, CO ♦ IMS ♦ RFIC ♦ ARFTG

Each Conference Attendee must submit a separate registration form. A copy of this form may be used.
The deadline for advanced registration is May 12, 1997. Afterwards, on-site fees apply.
On-site fees will be approximately 30% higher.

NAME _____
Last First

AFFILIATION _____
Company, Etc. Mail Stop

ADDRESS _____
Street

_____ City State Postal Code Country

_____ e-mail Address

US/CANADA TEL. _____ INT'L TEL. _____

IEEE MEMBER Yes No IEEE Membership No.* _____ MTT-S MEMBER Yes No
*Must be given to qualify for member discount

GU Name of Guest _____

To register, check the appropriate boxes and enter corresponding fees in the Remittance column.

♦ INT. MICROWAVE SYMPOSIUM
 Tue., Wed. & Thur.

<input type="checkbox"/> IM	All IMS Sessions (Includes IMS Digest)	<input type="checkbox"/> \$235	<input type="checkbox"/> \$325	\$ _____
<input type="checkbox"/> IMS	Single-Day Registration (No Digest)	<input type="checkbox"/> \$105	<input type="checkbox"/> \$150	\$ _____
<input type="checkbox"/> IMR	Student, Retiree, Life Member* (No Digest) *Must Qualify	<input type="checkbox"/> \$ 40	<input type="checkbox"/> \$ 45	\$ _____

♦ RFIC SYMPOSIUM \$ 85 \$110 \$ _____
 Sunday, Monday & Tuesday (Includes RFIC Reception and Digest.)

♦ ARFTG-AUTOMATIC RF TECHNIQUES CONFERENCE
 Fri. (Includes breakfast, lunch, ARFTG Digest and ARFTG Exhibition.)

<input type="checkbox"/> ARM	ARFTG Member	<input type="checkbox"/> \$130	\$ _____
<input type="checkbox"/> ARN	ARFTG Non-member	<input type="checkbox"/> \$155	\$ _____
<input type="checkbox"/> ARS	ARFTG Student, Retiree	<input type="checkbox"/> \$ 65	\$ _____

♦ ADDITIONAL DIGESTS

<input type="checkbox"/> DI	IMS Digest	Qty. ___ @ <input type="checkbox"/> \$75	<input type="checkbox"/> \$90	\$ _____
<input type="checkbox"/> DC	IMS CD ROM	Qty. ___ @ <input type="checkbox"/> \$40	<input type="checkbox"/> \$50	\$ _____
<input type="checkbox"/> DR	RFIC Digest	Qty. ___ @ <input type="checkbox"/> \$35	<input type="checkbox"/> \$50	\$ _____
<input type="checkbox"/> DA	ARFTG Digest (ARFTG member)	Qty. ___ @ <input type="checkbox"/> \$20	\$ _____	
<input type="checkbox"/> DN	(non-member)	Qty. ___ @ <input type="checkbox"/> \$45	\$ _____	

AB ♦ AWARDS BANQUET
 Wed. evening, Adam's Mark Hotel Qty. ___ @ \$40 \$ _____

HA ♦ EXHIBITION ONLY \$10 \$ _____

♦ WORKSHOPS (See reverse side for selections.)

	Regular Rate	Student/Retiree/Life Member
Full Day	\$80	\$55
Half Day	\$50	\$35

<input type="checkbox"/> WSA (Full Day) \$ _____	<input type="checkbox"/> WFA (Full Day) \$ _____
<input type="checkbox"/> WSB (Full Day) \$ _____	<input type="checkbox"/> WFB (Full Day) \$ _____
<input type="checkbox"/> WSC (Full Day) \$ _____	<input type="checkbox"/> WFC (Full Day) \$ _____
<input type="checkbox"/> WMD (Full Day) \$ _____	<input type="checkbox"/> WFD (Morning) \$ _____
<input type="checkbox"/> WME (Morning) \$ _____	<input type="checkbox"/> WFE (Morning) \$ _____
<input type="checkbox"/> WMF (Morning) \$ _____	<input type="checkbox"/> WFF (Morning) \$ _____
<input type="checkbox"/> WMG (Morning) \$ _____	<input type="checkbox"/> WFG (Afternoon) \$ _____
<input type="checkbox"/> WMH (Morning) \$ _____	<input type="checkbox"/> WFH (Afternoon) \$ _____
<input type="checkbox"/> WMI (Afternoon) \$ _____	<input type="checkbox"/> WFI (Afternoon) \$ _____
<input type="checkbox"/> WMJ (Afternoon) \$ _____	
<input type="checkbox"/> WMK (Afternoon) \$ _____	
<input type="checkbox"/> WML (Afternoon) \$ _____	

Total for all WORKSHOPS \$ _____

Full-day workshops include continental breakfast, lunch and afternoon refreshments.
 Morning workshops include continental breakfast and lunch.
 Afternoon workshops include lunch and afternoon refreshments.
 All workshop registrations include a bound copy of the presenters' notes.

♦ PANEL SESSIONS (Includes box lunch. See reverse side for schedule.)

PA: Portable Power Amplifiers	<input type="checkbox"/> \$15	\$ _____
PB: Wireless Personal Networks	<input type="checkbox"/> \$15	\$ _____
PC: Commercial Application IC Reliability Needs	<input type="checkbox"/> \$15	\$ _____
PD: Packaging for Optical/Microwave Modules	<input type="checkbox"/> \$15	\$ _____
PE: Low Cost Packaging	<input type="checkbox"/> \$15	\$ _____
PF: RF Identification Tags and Data Cards	<input type="checkbox"/> \$15	\$ _____

♦ GUEST PROGRAMS (See page 2 for complete information.)

GA: Denver City Tour (Mon. AM)	Qty. ___ @ <input type="checkbox"/> \$21	\$ _____
GB: Rocky Mountain National Park (Tues. all day)	Qty. ___ @ <input type="checkbox"/> \$38	\$ _____
GC: Art, Sports & Books (Wed. AM)	Qty. ___ @ <input type="checkbox"/> \$15	\$ _____
GD: How Theater Works (Wed. PM)	Qty. ___ @ <input type="checkbox"/> \$14	\$ _____
GE: Colorado Springs (Thurs. all day)	Qty. ___ @ <input type="checkbox"/> \$35	\$ _____

♦ RUMP SESSION (Includes beverages and hors d'oeuvres.) Tues., 7-9 PM

RA: HF to UHF Design and Applications	<input type="checkbox"/> \$30	\$ _____
---------------------------------------	-------------------------------	----------

The only acceptable forms of payment are check, money order, MasterCard or VISA. **TOTAL REMITTANCE \$ _____**

♦ Make your check or money order (US \$ ONLY on a US Bank or Traveler's Check) payable to: **PAYMENT MUST ACCOMPANY FORM**

"1997 IEEE MTT-S Symposium" ♦ Or charge your MasterCard or VISA: MasterCard VISA

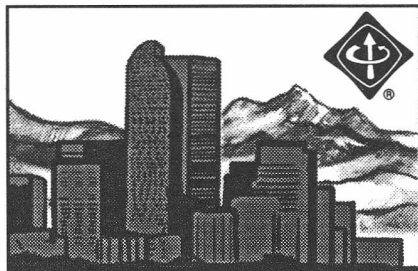
Card # _____ Exp. Date _____

Signature _____

♦ Written requests for a refund will be honored if received by May 12, 1997.
 A \$25 cancellation fee will be charged for processing.

MAIL COMPLETED FORM AND PAYMENT TO:
 1997 IEEE SYMPOSIUM, c/o CDS, P.O. Box 1328, Hyannis, MA 02601, USA • FAX: (508) 778-7718.
 For information or phone registration call (800) 251-8628.
 If this form is sent by FAX do NOT also mail; a credit card number & signature, or a check or money order in US dollars must be included.
PLEASE FAX OR MAIL; DO NOT FORWARD HARD COPY IF FAXED

WORKSHOPS				
	7 AM BREAKFAST 8 AM	BREAK	12 PM LUNCH 1 PM	
Sunday June 8	WSA	The Emergence of Multipoint Distribution Systems (MMDS, LMDS)		
	WSB	Low Voltage, Low Power Consumption RFICs for Wireless Communications Products		
	WSC	Measurements for Silicon and GaAs Telecommunication ICs		
Monday June 9	WMA	State-of-the-art Filter Design Using EM and Circuit Simulation Techniques		
	WMB	Microwave and Millimeter-wave Optoelectronic Integrated Circuit Modules: Manufacturing and Applications		
	WMC	Nonlinear Measurements and Modeling		
	WMD	Cryogenic Packaging of Electronic Subsystems and Their Applications		
	WME	System Requirements for Ferrite Components	WMI	Ferrite Measurements and Device Applications
	WMF	Next Generation High-speed Mixed Signal Testing	WMJ	EM Waves in Artificial Structures (PBGs)
	WMC	Millimeter-wave Opportunities for Automotive and Radio Applications	WMK	Digital Frequency Synthesizers: Technology and Applications
	WMH	Emerging Business Issues in Microwave Technology	WML	Telecommunications and Spectrum Policy for the Microwave Engineer
Friday June 13	WFA	Low-cost Millimeter-wave Products: Design and Manufacturing Issues		
	WFB	Power Amplifier Design for Digital Wireless Systems		
	WFC	Interconnects and Packaging for RF Wireless Communications Systems		
	WFD	Nonlinear Frequency-domain Device Modeling and Circuit Simulation	WFG	Optical Amplifiers in Microwave Systems
	WFE	Applications of Artificial Neural Networks to Microwave Design	WFH	Epitaxial Materials Manufacturing for HEMTs and HBTs
	WFF	Quasi-optical Power Combining	WFI	World Wide Web Basics
PANEL SESSIONS				
12:00 PM TO 1:15 PM				
PA	Monday	Device Technology Choices for Commercial Portable Power Amplifier Products		
PB	Tuesday	Transceiver Technology for Multi-mode Wireless Personal Networks		
PC	Tuesday	IC Reliability Needs for Commercial Applications		
PD	Wednesday	Packaging Techniques for Optical/Microwave Modules		
PE	Thursday	Balancing the Tradeoffs between Thermal Management Techniques and Electrical Performance in Microwave Packaging		
PF	Thursday	Radio Frequency Identification Tags and Data Cards		
RUMP SESSION				
7:00 PM TO 9:00 PM				
RA	Tuesday	HF to UHF Design and Applications		
GUEST PROGRAMS				
Monday	GA	9:00 AM-12:30 PM	Denver City Tour — Visit the Colorado State Capitol, the "Unsinkable" Molly Brown's house, and Ninth Street Historic Park.	
Tuesday	GB	8:00 AM-4:30 PM	Rocky Mountain National Park — Take in beautiful Boulder and Estes Park on the way to Rocky Mountain National Park and the breathtaking summit of Trail Ridge Road.	
Wednesday	GC	9:00 AM-12:30 PM	Art, Sports & Books — View the Lower Downtown district, historic Union Station, and Coors Field, home of the Colorado Rockies, on this walking tour of Denver.	
Wednesday	GD	1:30 PM-4:00 PM	How Theater Works — Take a behind-the-scenes walking tour of the Denver Center for the Performing Arts, then visit the adjacent Theatre Cafe for coffee and a dessert buffet.	
Thursday	GE	8:00 AM-5:00 PM	Colorado Springs — Tour the US Air Force Academy, lunch and shop in Old Colorado City, and explore the Garden of the Gods.	



CONFERENCE HOUSING
1997 IEEE MTT-S INTERNATIONAL MICROWAVE SYMPOSIUM

June 8-13, 1997 · Denver, CO

IMS · RFIC · ARFTG

Reservations will be accepted by phone Monday through Friday between 9:00 AM and 5:00 PM (Denver time), by fax, or by mail. Reservations must be received at the housing bureau by NOON, May 12, 1997. PLEASE REGISTER EARLY.

Phone requests to: (800) 880-9047 (303) 892-1112, ext. 601

OR

Fax this form to: (303) 571-9435 & do NOT mail this form

OR

Mail this form to: IEEE MTT-S Housing Bureau 1555 California Street, Suite 300 Denver, CO 80202-4264

Hotel locations and rates are shown on the reverse side of this form

INSTRUCTIONS AND HOUSING BUREAU POLICY

- 1. Please gather all of the answers on this form prior to your call.
2. Please print or type all data requested (if you fax or mail).
3. Reservations will be processed on a first-come, first-served basis.
4. The Housing Bureau will acknowledge your reservation within five days after your request is received.
5. All reservations require a one night room and tax deposit.
6. Credit card charges for your deposit will be transacted immediately.
7. Reservations made without a credit card deposit must be covered by a deposit check received by the hotel within 15 days of the Housing Bureau acknowledgment. Do not submit checks or money orders to the Housing Bureau.
8. Changes and cancellations prior to May 12, 1997 must go through the Housing Bureau via mail, fax, or phone (numbers above).
9. For changes after May 12, 1997, contact your hotel directly.
10. Cancellation is according to terms set by your hotel.

HOTEL PREFERENCE

(Please write full name of hotel and show at least three choices.)

First choice _____ Third choice _____
Second choice _____ Fourth choice _____

If hotel choices are unavailable, which is most important: Rate _____ or Location _____ (please select one)

Acknowledgments for all rooms reserved should be sent by: Mail _____ or FAX _____ (please select one) to:

Name _____ First _____ Last _____

Company _____

Address _____

City _____ State/Province _____ ZIP/Postal Code _____

Country _____ Daytime Phone () _____ or FAX () _____
w/Int'l Country Code w/24 hr. dedicated line

Deposit paid by: [] Check or Money Order (do not send to the Housing Bureau)

CARD NAME: [] MasterCard [] Visa [] American Express

CARDHOLDER NAME (printed) _____

CARDHOLDER SIGNATURE _____

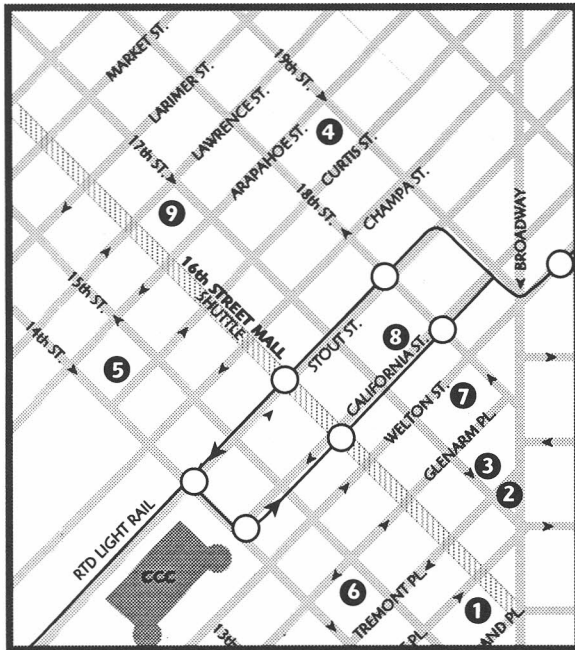
CARD NO. _____ EXP. DATE _____

ROOM OCCUPANTS

- 1. Print or type names of persons occupying each room. If more than three rooms are required, attach a list providing the information requested below for each additional room.
2. Select room type desired, indicate arrival and departure dates, and special requests (not guaranteed).

Occupants (first name first)

Table with 3 main rows for Room No. 1, 2, and 3. Each room row has two sub-rows for occupants 1 and 2. Columns include occupancy type (Check one), arrival/departure dates, and special requests.



1997 IMS Hotels				
Map	Hotel	Single	Double	
	CCC Colorado Convention Center			
1	Adam's Mark (Headquarters Hotel)	\$117	\$127	GW
2	Brown Palace	\$138	\$138/\$156	
3	Comfort Inn	\$ 74	\$ 85	
4	Embassy Suites	\$125	\$135	G
5	Executive Towers	\$ 87	\$ 87	G
6	Holiday Inn	\$ 88	\$ 98	GW
7	Hyatt Regency	\$124	\$139	
8	Marriott City Center	\$129	\$144	G
9	Westin Tabor Center	\$134	\$158	

Prices do not include Room Tax, currently 11.8%

G government rate available (with travel orders)
W weekend special

All hotels are equipped with smoke detectors, sprinklers, 24-hour security, cable TV, room service, non-smoking areas, secretarial services, interior corridors, and parking (for fee).

Four bus routes will shuttle attendees between the Colorado Convention Center (CCC) and their hotels.

A free public shuttle bus also runs the length of the 16th Street Mall (see map), connecting hotels to downtown restaurants and shops throughout the day and evening.

- 1 **ADAM'S MARK:** Headquarters Hotel, on the 16th Street Mall, newly renovated. Hotel has business center, a restaurant, two lounges, valet laundry, health club, sauna, and heated rooftop outdoor pool. Rooms have climate control, work desk, two phones, and voice mail. Ask about the weekend special.
- 2 **BROWN PALACE:** Historic luxury four-star hotel with three dining rooms, including the four-diamond Palace Arms Restaurant. Hotel offers afternoon tea, nightly entertainment, 24-hour room service, a business center, a health club, and valet parking. Rooms have two-line phones with voice mail, speaker phones and fax/modem capability, hair dryers, irons w/boards, and terry cloth robes. IMS Hospitality Suite will be in the Central City Room on the second floor. ARFTG Conference will meet here on Friday.
- 3 **COMFORT INN:** Newly remodeled, affordable guest rooms with 24-hour room service, valet laundry, and complimentary deluxe continental breakfast. Dining and other services are available via the second-floor skywalk to the Brown Palace Hotel.
- 4 **EMBASSY SUITES:** All rooms are suites equipped with two phones, a hair dryer, a coffee maker, a refrigerator, and a wet bar. Guests receive a complimentary full breakfast and evening cocktails. For a small daily fee, guests can use the athletic club.
- 5 **EXECUTIVE TOWERS:** Two dining rooms, complete athletic club with jogging track, heated indoor pool, saunas, whirlpool, and valet laundry. Rooms have phones with data ports on desks. No daytime IMS shuttle; hotel is two blocks to the CCC.
- 6 **HOLIDAY INN:** Closest hotel to the Colorado Convention Center, with a restaurant, lounge, exercise room, laundry, and outdoor swimming pool. Rooms have data phones. Complimentary transportation is available within five miles. Parking is free. No daytime IMS shuttle.
- 7 **HYATT REGENCY:** This hotel has valet laundry, a business center, and a dining room. Rooms have three phones with voice mail and modem plugs, desk, service bar, coffee maker, iron/w board, and a hair dryer. Rooftop mini resort has an indoor swimming pool, health club, jogging track, tennis court, and whirlpool.
- 8 **MARRIOTT CITY CENTER:** Hotel has a dining room, Pizza Hut, microbrewery, business center, health club, whirlpool, saunas, heated indoor lap pool, coin or valet laundry, and valet parking. Rooms have two phones with data port, voice mail, iron w/board, and a hair dryer. RFIC Reception will be held here on Sunday evening.
- 9 **WESTIN TABOR CENTER:** Four-star hotel adjacent to upscale indoor shopping mall. Two restaurants including the four-diamond Augusta Restaurant, a business center, 24-hour room service, valet laundry, health club and racquetball court, indoor/outdoor heated pool, sauna, and whirlpool. Rooms have two phones with voice mail and data ports, coffee makers, service bars, safes, irons w/boards, and hair dryers.

INTERNATIONAL SCIENTIFIC MEETING ON ELECTROMAGNETICS IN MEDICINE



Chicago, Illinois November 3-5, 1997



CALL FOR PAPERS

The International Scientific Meeting on Electromagnetics in Medicine is the third scientific meeting on Microwaves in Medicine, sponsored by the International Union of Radio Science (URSI) through its Commission on Electromagnetics in Biology and Medicine (Commission K) and the Institute of Electrical and Electronic Engineers (IEEE) through its Microwave Theory and Techniques Society (MTT-S). It will be held at the Congress Hotel in Chicago, Illinois, November 3-5, 1997. A single session format will be coordinated to provide a comprehensive well-balanced scientific program. The international scientific meetings have been outstanding forums for interdisciplinary discussion on key research issues. Authors are invited to submit papers on all topics of interest to electromagnetics in biology and medicine. Some topics are suggested below.

Microwaves in medicine	Electric and magnetic injuries
Telemedicine	Diagnostic applications
Therapeutic uses	Biological effects
Animal models	Health protection
Treatment of Injuries	Dosimetric studies
Electrophysiology	Computational models
RF ablations	Hyperthermia treatments
Healing and repair	Fundamental Science
Physiological responses	Histopathologic uses
Laboratory techniques	Biotechnology
Minimally invasive interventions	Imaging and sensing

Instructions for Authors - The original and three copies of a one-page abstracts in camera-ready form must be submitted by May 3, 1997. The abstract must consist of not less than 300 words. The text should be typed single-spaced on 21.5 x 28 cm (8.5 x 11 in) white paper. The title should be in capital letters and centered 1 inch from the top of the page. Author's name(s) and affiliation should be below the title. The mailing and e-mail addresses, telephone and fax numbers of the corresponding author (also specify by an asterisk) follow next. The text should start flush left, one line below the last address. Left and right-hand margins should be 4 cm (1.5 in). A 2.5 cm (1 in) margin should be at the top and bottom of the page. Single space between paragraphs. The presentation equipment (viewgraph or 35 mm slide projector) should be specified in the letter accompanying the submission. **FAX AND E-MAIL SUBMISSIONS ARE NOT ACCEPTABLE.**

PAPER SUBMISSION DEADLINE: MAY 3, 1997

Address for Correspondence: Address abstract and question to EM-Med, M/C 154, University of Illinois at Chicago, 851 South Morgan Street, Chicago, IL 60607-7053. Questions can also be directed to the conference E-mail address: emmed@eecs.uic.edu and Fax number (312) 413-0024.

Meeting Chairman: Dr James C. Lin, University of Illinois at Chicago (UIC). Phone: (312) 413-1052; E-mail: james.c.lin@uic.edu.

Local Arrangement Chairman: Dr. Bin He, UIC, Phone; (312) 413-0030; E-mail: bhe@eecs.uic.edu

WWW Location: <http://www.eecs.uic.edu/~emmed>.

Steering Committee

General Chair

Dr. Roger B. Marks, *NIST*

Technical Program Chair

Dr. Michael S. Heutmaker,
Lucent Technologies

Finance Chairs

Mr. Richard A. Sparks, *Anro Engineering*
Mr. James R. Drehle, *Hewlett-Packard Co.*

Exhibits Chair

Mr. Daniel G. Swanson,
Watkins-Johnson Co.

Publicity Chair

Mr. John W. Meredith, *Hewlett-Packard Co.*

Publications Chair

Ms. Janet Kingston, *IMAPS*

At-Large

Dr. Peter W. Staecker, *M/A-COM, Inc.*

Technical Program Committee

- Prof. Masami Akaike, *Science University of Tokyo, Tokyo, Japan*
- Dr. Seng-Woon Chen, *Qualcomm, San Diego, CA*
- Dr. Roger Dalke, *Institute for Telecommunication Sciences, Boulder, CO*
- Dr. Kari-Pekka Estola, *Nokia Research Center, Helsinki, Finland*
- Mr. Michael Fennelly, *ATN Microwave Inc., Billerica, MA*
- Dr. Bernard D. Geller, *Sarnoff Research Center, Princeton, NJ*
- Dr. Michael S. Heutmaker, *Lucent Technologies, Princeton, NJ*
- Mr. Charles R. Hodges, *nCHIP, San Jose, CA*
- Dr. Kenneth M. Lakin, *TFR Technologies, Inc., Bend, OR*
- Dr. Mali Mahalingham, *Motorola SPS, Tempe, AZ*
- Dr. Louis T. Manzione, *Lucent Technologies, Murray Hill, NJ*
- Dr. Roger B. Marks, *NIST, Boulder, CO*
- Dr. Luc Martens, *University of Ghent, Belgium*
- Dr. Masahiro Muraguchi, *NTT Wireless Systems Laboratories, Kanagawa, Japan*
- Dr. Modest Oprysko, *IBM T.J. Watson Research Center, Yorktown Heights, NY*
- Mr. Richard Perko, *M/A-COM, Lowell, MA*
- Dr. Peter Petre, *Hughes Research Laboratories, Malibu, CA*
- Mr. Bill F. Riddle, *NIST, Boulder, CO*
- Mr. Joseph Staudinger, *Motorola SPS, Tempe, AZ*
- Dr. Mohammad Shakouri, *Hewlett-Packard Co., Palo Alto, CA*
- Mr. Andreas Thiel, *Swiss Federal Institute of Technology, Zurich, Switzerland*
- Prof. Vijai Tripathi, *Oregon State University, Corvallis, OR*
- Mr. Ben Zarlingo, *Hewlett-Packard Co., Everett, WA*

Call for Papers

**Second Annual
Wireless Communications Conference
Boulder, Colorado
August 11-13, 1997**

The success of last year's Wireless Communications Conference demonstrated the appeal of a symposium focused on technological advances in the commercial wireless industry. The WCC will be back in 1997, once again offering a broad and integrated perspective in a single track, providing an exposure to the big picture as well as the critical details. The program breadth is consistent with the wide interests of its cosponsors:

- IEEE Microwave Theory and Techniques Society
- International Microelectronics And Packaging Society (IMAPS)
- IEEE Communications Society - Pike's Peak Chapter
- National Institute of Standards and Technology
- Institute for Telecommunications Sciences

We seek original, practical technical presentations in these wireless technologies:

- systems: PCS, cellular, paging, wireless LANs, LMDS, etc.
- active components
- passive components
- packaging and integration
- antennas, propagation, compatibility, and interference
- measurements

Authors are asked to submit five copies of a 1-2 page summary (including figures) to the Technical Program Chair (TPC) by April 1, 1997. Submissions will be evaluated for originality, significance of the work, and interest to a broad audience. Authors will be notified of acceptance by May 2, 1997. Final accepted papers (3-5 pages in length) must be received by the TPC in camera-ready form by June 13, 1997 to be included in the published Proceedings.

As it becomes available, information will be posted to:

<http://www.boulder.nist.gov/wcc>

For Conference information, contact the General Chair. For an outstanding exhibition opportunity, contact the Exhibits Chair.



General Chair

Dr. Roger B. Marks
NIST, Mail Code 813.06
325 Broadway
Boulder, CO 80303
tel: 303-497-3037
fax: 303-497-7828
r.b.marks@ieee.org

Technical Program Chair

Dr. Michael S. Heutmaker
Lucent Technologies
P.O. Box 900
Boulder, NJ 08542
Rte. 569 Carter Rd
Hopewell, NJ 08525*
tel: 609-639-3116
fax: 609-639-3197
heutmaker@lucent.com
**for non-postal shipments*

Exhibits Chair

Mr. Daniel G. Swanson
Watkins-Johnson Co.
3333 Hillview Avenue
Palo Alto, CA 94304-1204
tel: 415-813-2036
fax: 415-813-2402
d.swanson@ieee.org

The Asia Pacific Microwave Conference

**December 2 - 5, 1997
in Hong Kong**

Kenneth K. Mei

There are many reasons why you should visit Hong Kong. Hong Kong is a treasure-trove of fascinating sights and experiences, from the glittering towers to the rural tranquillity, from the giant container ships to the single seat sampans, from the modern shops of high fashions to the old stores of antiques, from the exquisite cuisine of France to the adventurous specialties of the Orient. Anything, you name it and Hong Kong has it.

Yet, all the treasures of Hong Kong are readily accessible, because the territory is so compact, and the transportation system is so well-planned that you can explore a wildlife sanctuary during the day and attend the theater at night or visit a historic temple, a traditional fishing village and a modern shopping mall all in the same day.

Historic 1997

You should visit Hong Kong especially in 1997, because that will be a historic year, the year that the

British government returns the colony to China after 150 years of occupation. *Fortune* wrote the obituary of "Hong Kong After 1997" a year ago.


So, you will either come to pay homage or to celebrate the reincarnation of Hong Kong. In 1997, the best part of the year to visit Hong Kong will be early December, because the weather will be nice and the APMC'97 is being held there. It will be the first major scientific conference in Hong Kong after its demise a la *Fortune*.

APMC'97

The APMC has been the major microwave conference of the Asia Pacific region since 1986. It is cosponsored by IEEE and MTT. It has been held in different countries of the Asia Pacific rim: India '86, China '88, Japan '90, Australia '92, Taiwan '93, Japan '94, Korea '95, India '96. The conference papers are strictly refereed, so the high quality of the conference is assured. The conference has been well-attended by U.S. and European participants.

In addition to good papers, the conference also includes product exhibits of major microwave manufacturers. In 1997, the exhibit will also feature low-cost microwave components from manufacturers of the Pacific area including China, Korea, and India. Manufacturers who wish to have more information about the exhibit should contact Prof. Y. C. Chan (e-mail: eeycchan@cityu.edu.hk).

Why wait?

Plan to come to attend the APMC'97 in Hong Kong. The conference will include many tours for the spouses and a fantastic banquet in a luxurious boat restaurant. Please read the call for papers in this issue of the MTT magazine. 

Kenneth K. Mei
Department of Electronic
Engineering
City University of Hong Kong
88 Tat Chee Ave. EE
Kowloon 94720
Hong Kong

MTT-18 — Microwave Superconductivity: “Cold is Better”

M. Nisenoff, MTT-18 Co-Chair
Naval Research Laboratory

Guo-Chun Liang, MTT-18 Co-Chair
Conductus, Inc.

The Technical Coordinating Committee MTT-18 Microwave Superconductivity was established in 1988 shortly after the report of the discovery of superconductivity in materials with superconducting transition temperatures in excess of 77 K, the boiling point of liquid nitrogen at atmospheric pressure. Prior to this discovery, it had been known for more than 30 years that the microwave surface resistance of then-known superconductors (the highest known superconducting transition temperature, at that time, was only 23 K) could be orders of magnitude smaller than that of copper at the same temperature. This property had been used since the mid-1960's to fabricate very high Q-value cavities for accelerating atomic particles in high-energy particle accelerators in physics laboratories around the world. However, the requirement of cooling such devices to

temperatures near 4 K restricted their use to mostly very large installations. With the advent of high-temperature superconductivity opened the possibility of deploying very high-Q-value, very low-electrical-loss RF, microwave and millimeter-wave components with drastically reduced cryogenic refrigeration needs. As a result, it becomes feasible to use such components on platforms such as cars, ships, airplanes, ground stations and even satellites.

Cryogenic and superconductive electronics have played an important role in communication, instrumentation and military applications. Cryogenically-cooled front-ends have been deployed in radio astronomy receiver systems. Amplifiers and infrared sensors have been used extensively in military and commercial markets for night vision and security applica-

tions. During the past several years, ultra-stable, low-phase-noise oscillators and low-insertion-loss, sharp-skirt filters based on high-temperature super-conductivity have been demonstrated. In addition, the noise figure of many high-performance, low-noise amplifiers (LNAs) improves as their operating temperature is lowered.

Significant progress has been made in the cryocooler industry in reducing the size and cost and enhancing the reliability of cryogenic refrigerators. As applications for cryocooled electronics, including high-temperature superconductor-based products, begin to emerge in the commercial and military marketplace, engineers are confronted with a series of design and tradeoff issues associated with such issues as the selection of the appropriate cryogenic cooler and the cryogenic packaging configuration.


In 1988, MTT-S established a TCC to address this new technology. Dr. Erwin Belohoubek, then at the David Sarnoff Research Center, was appointed as Chairman. In 1991, Dr. M. Nisenoff of the Naval Research Laboratory assumed the position of Chairman and in 1996, Dr. Guo-Chun Liang, of Conductus, Inc., Sunnyvale, CA, was elected as Co-Chairman of MTT-18. At the present time, there are 13 members on MTT-18 from the US, Japan and Germany representing various research organizations in industry, government and academia.

During the intervening years, MTT-18 has been very active at

the IMS, sponsoring one or sometimes two workshops each year as well as an occasional rump session. The workshops have covered a wide range of topics in microwave superconductivity from basic phenomena, CAD tool development, high-power device characterization and wireless communications applications.

At the 1997 IMS, there will be a workshop on Monday, 9 June 1997, entitled "Cryogenic Packaging of Electronics Subsystems and Their Applications" which will address the issues associated with the cryogenic packaging and system integration of superconducting and conventional electronics. This workshop will be cosponsored

by MTT-18 along with MTT-16, Microwave Systems, and MTT-14, Microwave Low-Noise Techniques.

In the near future, members of MTT-18 will evaluate the advisability of establishing definitions and standards for various terms and parameters frequently encountered in evaluating and exploiting microwave superconductivity. This will be closely coordinated with Roger Marks of NIST-Boulder from the IEEE Standards Committee. The committee will work very hard to help bring superconductive technology into practical applications. 

For Members Only

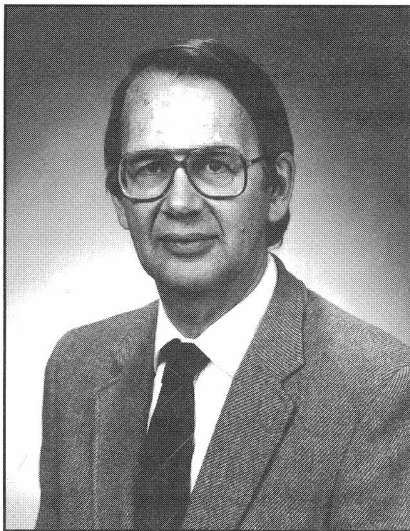
This year the Microwave Theory and Techniques Society will host an exciting new event during the International Microwave Symposium. On Tuesday, June 10 and Wednesday, June 11, between 7:00 and 8:00 a.m., MTT-S members will have the opportunity to participate in a complimentary breakfast in Ballroom 1 of the Colorado Convention Center. The objective of this function is to encourage membership in the

IEEE Microwave Theory and Techniques Society (MTT-S) and to facilitate beneficial professional and social interactions among members. This is your opportunity to meet MTT-S leaders and AdCom representatives, initiate new professional contacts, renew old friendships and chat with colleagues while enjoying a full delicious buffet-style breakfast.

If you are not currently a member, you are welcome to sign up

for MTT-S and IEEE membership in the conference registration area; this will allow you to take advantage of this enjoyable event. Remember, for those joining IEEE at the conference, MTT-S membership is free during the first year. If you are already an IEEE member, you can join MTT-S for only \$8 per year — much less than the regular cost of the breakfast! With so many advantages of MTT-S membership, how can you refuse? 

Education Committee Gears Up for the 1996-1997 Academic Year



Denis Webb

The Education Committee is involved in three principle activities at the present time - the Student-Teacher and Research Engineer/Scientist (STAR) Program, the Graduate Fellowship Program and Graduate Scholarship Program. For information on the STAR Program the reader is referred to an article by Julia Brown elsewhere in this Newsletter.

Microwave Theory and Techniques Society Graduate Fellowship Awards

The Microwave Theory and Techniques Society awards a

number of \$5000 fellowships for graduate research in the field of microwave technology. The actual number of awards is determined and budgeted by the MTT-S Administrative Committee each year. MTT-S Student Members throughout the world are eligible for these awards with no citizenship restrictions. Details about this program can be obtained by contacting Dr. Aditya Gupta at the following address or by looking up the MTT-S web page at: http://www.ieee.org/mtt/grad_fs.html

Dr. Aditya Gupta
Northrop Grumman Corp.
Advanced Technology Lab
1212 Winterston Road
MS 3K13
Linthicum, MD 21090
voice: 410-765-9170
fax: 410-765-7370
e-mail: a.gupta@ieee.org

This year four students received this award at the 1996

International Microwave Symposium in San Francisco. The winners were: Andrew Adams of The University of Leeds, United Kingdom; Vikram Jandhyala of the University of Illinois, Urbana, Illinois, USA; Chien-Nan Kuo of the University of California, Los Angeles, California, USA; and Ajay Prabhu of the University of Massachusetts, Amherst, Massachusetts, USA. We congratulate these outstanding students for this achievement and hope that students throughout the world who are engaged in research in microwave technology will be encouraged to compete for these awards next year.

Microwave Engineering Graduate Scholarship


The first Microwave Engineering Graduate Scholarship will be awarded in 1997. This program

was established to recognize and help support the education of exceptionally promising microwave engineers. It is financed entirely by personal and corporate donations and contributions are accepted on behalf of current and deceased members of the society. The award consists of a certificate and monetary grant of \$2,000 to \$5,000 depending upon contributions received. Presentations to the winner will be made at the 1997 MTT-S Symposium in Denver. Donations of \$100 or more will be publicly acknowledged (at the donor's discretion).

Those wishing to support this program should make their contributions 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 on order to credit the MTT Education Account. Donations should be sent to:

The IEEE Fund
c/o IEEE Controller
445 Hoes Lane
PO Box 1331
Piscataway, NJ 08855-1331
USA

For further information please contact:

Denis C. Webb
MTT-S Education Committee
Chairman
(202) 767-3312
e-mail: d.webb@ieee.org. 

MTT-S Emphasizes Inclusion of HF and VHF

MTT-S has decided to emphasize its interests in the HF and VHF frequency ranges. "Radio-frequency engineering" involves frequencies up to 1 GHz and includes not only transmitters and receivers for radio communication, but also RF heating (plasma), medical imaging (e.g., MRI), and RF ID. This area is rapidly growing because of the rapid expansion of "wireless" communication systems and devices.


It is estimated that more than 26,000 "RF engineers" have to date lacked a focal point within IEEE. Related papers have been scattered through various IEEE and trade journals. As a result, most RF engineers have not seen a great benefit in being IEEE members.

RF and microwave work use different components (e.g., MOSFETs rather than GaAsFETs), but many techniques (power amplifiers, low-noise receivers, couplers) are analogous. Of equal or greater importance is the attitude that the application of theory has practical limits imposed by stray capacitance and lead inductances. The interests of microwave and RF engineering thus have much in

common. Inclusion within MTT will provide a focal point for peer-reviewed publications with long-term availability.

How the increased emphasis on HF and VHF is to be handled within MTT has yet to be determined. It is likely that many disciplines will fall within the scope of existing MTT technical committees. Others that are unique to HF-VHF may necessitate the formation of a new, permanent technical committee. An ad-hoc committee has been formed to look into these issues. Anyone interested in helping in this effort should contact F. H. Raab.

Readers are encouraged to submit papers on HF and VHF techniques to the *IEEE Transactions on Microwave Theory and Techniques* via the editor. A special session at MTT-S'97 in Denver is also planned. Proposals for papers should be submitted to F. H. Raab via mail or fax.

Frederick H. Raab, Ph.D.
Green Mountain Radio
Research Company
50 Vermont Avenue
Fort Ethan Allen
Colchester, VT 05446 USA
Tel./Fax.: +1 (802) 655-9670
E-mail: f.raab@ieee.org 

MIKON'96

Tatsuo Itoh

The MIKON'96 Conference was held on May 27-30, 1996 at the Holiday Inn in Warsaw, Poland. This unique conference was organized by Telecommunications Research Institute under the auspices of the Polish Academy of Science in cooperation with the AES/AP/MTT Polish Chapter and was cooperatively sponsored by IEEE MTT Society. Members of the Chapter were the core of this conference. Professor Jozef Modelski of the Warsaw University of Technology acted as the Technical Program Committee Chair and Professor Edward Sedek of the Telecommunications Research Institute acted as the Chair of the Organizing Committee. Technical Program Committee and Paper Review Board contained a number of scientists from several European and Former Soviet Union countries in addition to the Polish members.

The conference was attended altogether by 237 persons including 67 foreign attendees from 22 countries. The Technical Program Committee accepted 120 papers, of which


40% are from abroad. These papers and 20 invited papers, as well as 3 workshops, composed the Conference Program. The topics of the Workshops were "Mobile Communications," "Optoelectronics in Microwave Technology," and "Biomedical Applications of Microwaves." The Conference was particularly attractive to the Former Soviet Union countries because of:

- Very low costs (conference fee of only \$50 for Former Soviet Union countries, a special hotel offer for eastern participants) and growing attendance of Western participants
- A professional organizational level
- Social events, i.e. a concert, a reception, a barbecue — a good opportunity to make friends.

The MIKON has continuously improved its international status due to the initiative and hard work of the Polish Chapter and active support from MTT, in particular the Transnational Committee and the MTT Chapters in Germany, Sweden and Hungary. The MIKON now

enjoys a regional microwave conference status. Strategic planning of the MIKON organizers helped to attain this status. Since 1994, the MIKON Conference has been held every second year, alternating with the MIOP Conference in Germany.

I have attended all the MIKON Conferences and have always been impressed with the level of dedication of the organizers, and with the increasing technical level of the papers being presented. As already mentioned earlier, this Conference is unique in that a large number of scientists and engineers from the Former Soviet Union countries and other eastern countries attend the event so that they can meet and exchange ideas with Western participants.

The MIKON'98 Conference with a special exhibition will be held in historic Cracow from 20 to 22 May, 1998. This Conference will also be organized by the Telecommunications Research Institute. I am certain that the MIKON Conference will continue to enhance its status as a forum of scientific information exchange between East and West. 

My Personal Recollections of Microwaves



Kaneyuki Kurokawa
Fujitsu Laboratories, Ltd.

It was a great honor for me to receive the 1996 Microwave Pioneer Award. The plaque I received reads "For Pioneering Developments on the General Theory of Microwave Solid State Oscillators." In accepting this award, I would like to express my appreciation to the management of Bell Laboratories who kindly hired me and put me in the ideal environment for research, to my colleagues who contributed in various ways to the formation of the oscillator theory, and to the authors of textbooks who kindly disseminated my findings to a wider audience. I have been away from microwaves for about 25 years, and the following are my

personal recollections of my journey to the oscillator theory and my defection later from microwaves.

Waveguides with Wall Losses

The first book I read in the field of microwaves was *Microwave Electronics* by J. C. Slater. As a scholarship recipient in poverty-stricken post-war Japan, I thought the book was very expensive. Fortunately, the high price became the very reason why I would read the book carefully, from cover to cover. From Slater's book, I learned not only the field of microwaves but also how to be truthful in writing.

Professor Slater was unusually honest about his discussions. For example, after the derivation of the waveguide attenuation constant due to wall losses by the power-loss method, he indicated that his analysis was valid when only a direct wave was present. If a reflected wave or other waves are present, the analysis is not valid since the surface loss is a quadratic function of the magnetic field and the principle of superposition does not hold.

Reading this passage, I thought that there must be an analysis which is

valid irrespective of the presence of other waves.

At about that time, under the supervision of my thesis advisor, Professor Shigebumi Saito, the one-tenth scale model of a power transmission line was under construction in the university campus, for the study of the carrier waves along the power line. When poles were erected and a single wire was strung, electric pulses were applied and the propagation characteristics were studied. Nothing particularly interesting was observed. When two wires were strung, my fellow research student, Nagao Abe, studying the power line under Professor Saito, observed two pulses at the output even though only one pulse was applied to the input as illustrated in Figure 1. He called me to share the observation. Looking at two pulses on the oscilloscope, I was excited. Later, I learned that when lightning strikes a power line, it is always observed as two or more pulses from a distance. But, I did not know that at the moment. After careful study of the observed phenomenon, I almost decided that there must be a variational expression for the propagation constants of waves in waveguides with wall losses. The variational expression of a quantity (in our case,

the propagation constant) is constructed in terms of a trial function (representing the electric field) in such a way that the first order errors in the trial function produce only second or higher order errors in the desired quantity. So, the variational expression can be used to obtain excellent estimates of the quantity with relatively crude trial functions. If the variational expression is found, the complications generally

present with energy losses in surfaces will be solved. The boundary condition must be linear and the Maxwell equations are linear, so the principle of superposition should hold.

The variational expression was well-known when the boundary condition was lossless. So, I started to look for a similar variational

expression for the lossy boundary condition. I continued to pursue the expression in my dreams at night as well as during my meals throughout the day. A couple of days passed in vain. I started to have diarrhea. I realized that the problem was far more difficult than my capacity to handle. I resolved to stop thinking. But, apparently I had passed the point of no return. The next day while I was waiting for a commuter train on the platform of a railway

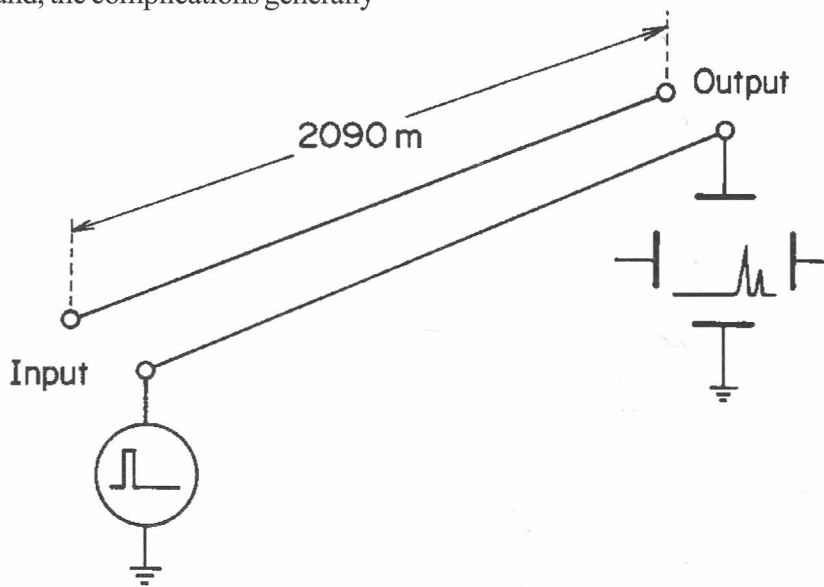


Figure 1. The removal of degeneracy. Two pulses are observed at the output when two wires are strung and only one pulse is applied at the input.

station, I came across a new method which might lead to the desired variational expression.

As soon as I arrived at my desk at the university, I started to check the method with a pencil and paper. Sure enough, I got the desired expression. The initial expression was complicated because I was considering in terms of a scalar trial function^[1]. Later, I changed it to a vector trial function, and the variational expression became less complicated. Once the variational expression was obtained, the rest was more or less routine.

Referring to Figure 1, an independent current can be applied into each wire at the input. So, the system has two degrees of freedom (Only TEM modes are taken into account). Among the infinite number of possible current ratios in the two wires, the variational expression indicates that the one with the minimum attenuation and the other with the maximum attenuation will propagate as waves along the pair of wires. The minimum attenuation is attained when the effect of lossy ground is minimal, namely when the current flowing

into one wire returns through the other wire (odd mode). The maximum attenuation is attained when the ground effect is maximal, namely, when equal currents flow into the two wires and return through the ground (even mode). The equality is due to the symmetrical wire configuration. At the input of Figure 1, one wire is open-circuited, so the current is zero. This is considered as the superposition of the two waves as illustrated in Figure 2. Since the velocity of these two waves are different, we observe two pulses at the output even though only one

pulse is applied at the input. In general, the wave with the maximum attenuation is slower because of the dielectric constant of the ground. So, the delayed pulse is attenuated.

What we observed in Figure 1 is really the removal of degeneracy. When the wires and the ground are perfect conductors, two waves propagate at the same speed with no attenuation. These two waves are said to be degenerate. When the losses are introduced, the degeneracy is removed in such a way that waves with the maximum and minimum attenuations propagate with different velocities.

I am indebted to Professor Saito who had the scale model constructed at the university and taught me the importance of actual experiments (instead of simulations) in the early stages of my microwave study.

Most textbooks discuss the power-loss method without a warning similar to the one Professor Slater kindly added to his discussion. If he had not offered his warning, I would not have studied this problem at all, leaving the two pulses as a mystery for a long time or probably forever.

Before publishing the variational expression^[2], I surveyed the existing literature, and found that V. M. Papadopoulos had already solved the same problem using another approximation, i.e., the perturbation method. The discussion of the removal of degeneracy due to wall losses is his original contribution.

Resonant Cavities

Professor Slater was also frank in his discussion of resonant cavities. He discussed the completeness of the sets of functions used in the expansions of the electric and magnetic fields, but he did not give

the proof of the completeness, leaving it to mathematicians. He stated this explicitly.

Here, a comment on the completeness may be in order. Every decent electrical engineer knows Fourier series expansions. An arbitrary piece-wise continuous function defined on the domain from $x = 0$ to $x = 2p$ can be expanded in terms of $\sin(nx)$, $\cos(nx)$ ($n = 1, 2, 3, \dots$) and a constant. So, the set of functions, $\sin(nx)$, $\cos(nx)$ and a constant, is said to be complete. If one of the functions, say $\sin(2x)$, is missing, the set of remaining functions is no longer complete, since, in this case, $\sin(2x)$ cannot be expanded as the linear combination of the remaining functions.

If the domain is from $x = 0$ to $x = p$, the set of functions, $\sin(nx)$ ($n = 1, 2, 3, \dots$), is complete and so is another set of functions, $\cos(nx)$ ($n = 1, 2, 3, \dots$) and a constant. The first set of functions, $\sin(nx)$, is the solutions of the eigenvalue problem $f'' + k^2f = 0$ with the boundary condition $f = 0$ at $x = 0$ and $x = p$. The second set of functions, $\cos(nx)$ and a constant, is the solutions of the same eigenvalue problem with the boundary condition $f' = 0$ at $x = 0$ and $x = p$.

Coming back to Slater's functions, I wanted to prove the completeness by myself. However, the problem was clearly beyond my capability. I occasionally studied Functional Analysis, a branch of mathematics I thought would be most closely

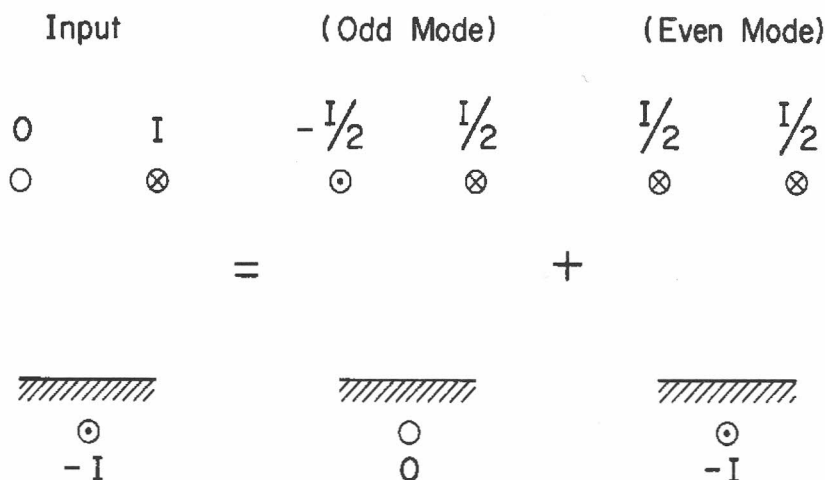


Figure 2. The superposition of odd and even modes to satisfy the boundary condition at the input; one wire is open-circuited.

related to the problem I faced. But progress was slow. Then, I had an opportunity to participate in the Foreign Student Summer Project held at MIT in 1954. There, I took a course on Microwave Circuits. The course was given by David L. Bobroff (unfortunately, he passed away while he was quite young). I asked him if someone had already proven the completeness of Slater's functions. He kindly informed me that Teichmann and Wigner had recently shown that Slater's functions were incomplete and hence his equivalent circuit was incorrect. No wonder I could not prove the completeness.

Coming back home from MIT, I changed my strategy. Instead of trying to prove the completeness of the incomplete sets of functions, I asked the question: What is the eigenvalue problem which gives the complete set of functions as its solutions? Here, my previous work on the variational expressions helped. The variational expression of the eigenvalue k^2 should lead to the proof of the completeness with the infinite growth of k^2 , which means no accumulation point of k^2 s in the finite range. The eigenvalue problem ($\tilde{N}' \tilde{N}' E - k^2 E = 0$ in V with $n' E = 0$ on S) for a cavity V enclosed by perfect conductor walls S gives the variational expression of k^2 with the accumulation point at $k^2 = 0$. In other words, an infinite number of solutions exist corresponding to $k^2 = 0$. So, it was not the eigenvalue problem I was seeking. The eigenvalue problem of

waveguides with perfect conductor walls gave a clue, and I obtained the desired eigenvalue problem ($\tilde{N}' \tilde{N}' E - \tilde{N}\tilde{N} \cdot E - k^2 E = 0$ in V with $n' E = 0$ and $\tilde{N}' \cdot E = 0$ on S). Almost five years had passed since I started.

I published my initial findings in Japanese in 1955^[3]. In the same year, G. Goubau published a book on Waveguides and Cavities, in which Rolf Muller discussed the same eigenvalue problem. However, Muller gave no proof of the completeness either. In addition, he slipped a then-prevailing misconception (if $\tilde{N}' H = 0$ then $H = \tilde{N}f$) into his discussion. So, I translated my paper into English with additional comments and sent the manuscript to some of the researchers in the field, including Professor Slater himself. He kindly wrote back, encouraging publication of my findings. His letter is still kept in my file as the most treasured memento of my youth, since my entire career in microwaves was deeply influenced by Slater's *Microwave Electronics*. My paper was published in IRE Transactions on MTT in 1958^[4] and it was referred to more than 30 years later in the second edition of *Field Theory of Guided Waves* by Robert E. Collin. The proof of the infinite growth of k^2 is detailed in my book, *An Introduction to the Theory of Microwave Circuits* published in 1969^[6]. The book was originally written in Japanese and published in 1963. The help I received in translation from Mark Barber of

Bell Labs was indispensable.

Noise Performance of Amplifiers

I worked on parametric amplifiers from 1959 to 1961 as a temporary employee of Bell Laboratories. Michiyuki (Mickey) Uenohara kindly made all the necessary arrangements for my interim stay there. I met Mickey for the first time when I visited Ohio State University on my way home from MIT and I have been indebted to him for all kinds of arrangements ever since.

A parametric amplifier offers low noise amplification. However, it is a negative resistance amplifier. The meaning of low noise of a negative resistance amplifier was founded on shaky ground. What does low noise amplification really mean? Asking this naive question at Bell Labs, I apparently opened up a Pandora's box.

Noise figure has been around since Friis introduced it in 1944. For a system with a front-end high gain amplifier, the lower the noise figure of the amplifier, the less noisy the system. The noise figure of an ideal noiseless amplifier is 0 dB. However, a piece of lossless waveguide also has 0 dB noise figure. Does this mean that a piece of waveguide has excellent amplifier noise performance? The answer is no since the gain is also 0 dB. For the evaluation of amplifier noise performance, somehow the gain should be taken into account in ad-

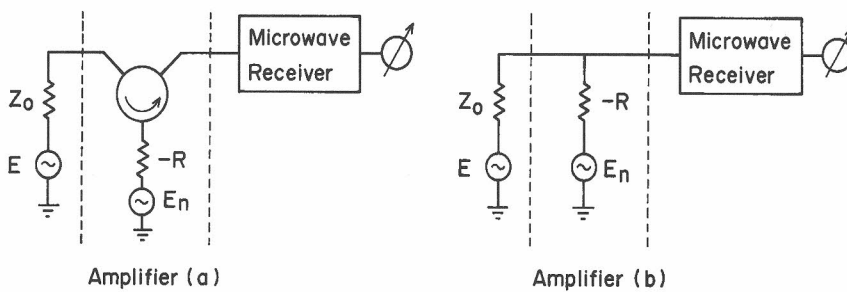


Figure 3. Two types of negative resistance amplifiers, (a) with a circulator and (b) without a circulator.

dition to the noise figure. So, Haus and Adler introduced a new figure of merit, noise measure. The noise measure of a piece of waveguide is indeterminate, $0/0$. A careful evaluation shows that the limit is a negative value. The piece of waveguide is disqualified as an amplifier. It is the low loss limit of an attenuator. The noise measure looked fine as a figure of merit of low-gain amplifiers until negative resistance amplifiers became popular. The noise measure of a negative resistance amplifier was found to be a constant inherent to the negative resistor used, regardless of the lossless imbedding, by Professor Paul Penfield of MIT.

When I started the study of parametric amplifiers, decent microwave receivers were already available on the market and being widely used. The low noise negative resistance amplifiers, including parametric amplifiers, were primarily used to improve the overall noise performance of the receivers. Then unexpected difficulties cropped up.

Let us consider two negative resistance amplifiers (a) and (b) shown in Figure 3. The circuits between dashed lines are the negative resistance amplifiers under consideration. Since an ideal circulator is lossless, the two amplifiers have essentially the same noise measure. Assuming that the negative resistor is low noise (E_n^2 is small), amplifier (a) gives improved overall noise performance but amplifier (b) gives lousy overall noise performance. The designer of amplifier (b) would duly claim as follows. In terms of noise measure, amplifier (b) is as low noise as (a) but the noise performance of the microwave receiver is now poor. The responsibility for the lousy overall noise performance rests on the designer of the microwave receiver. He should improve the noise performance of his receiver. The situation is similar to the following. When a person joins a group and the group's performance deteriorates, he can still declare that his performance is excellent but that others in the group behave poorly, resulting in poor

group performance. However, if somebody else joins the same group and the group's performance improves because of his presence, then I would tend to evaluate this person's performance higher than that of the previous person. What is different is the point of view, not what is "correct" or "incorrect". The source of discrepancies can be analyzed if we replace the microwave receiver by an ideal isolator followed by a high gain amplifier, which we refer to as an isolated high gain amplifier. The overall noise measures can be calculated and (b) gives poor overall noise measure because of the extra noise output which is originating in the isolated high gain amplifier, reflected back from the negative resistance amplifier and amplified by the isolated high gain amplifier. This extra noise output is absent in (a) because the noise originating in the isolated high gain amplifier and radiating toward the negative resistance amplifier is absorbed in the input Z_0 (usually representing the antenna).

Somehow the noise originating in and reflected back to the load should be included in the amplifier noise performance evaluation. I found it could be accomplished by replacing exchangeable gain with transducer gain and the exchangeable noise power to the load with the actual noise power to the load, and I called the revised noise measure the actual noise measure to emphasize the actual power used in place of the exchangeable or available power.

Exchangeable gain is a natural extension of the available gain used by Friis for his noise figure discussions. Available gain was widely accepted because the available gain of the cascade connection of two amplifiers is given by the product of the available gains of the individual amplifiers. The simplicity is, however, only in appearance. As soon as one works with real amplifiers with input and output impedances not matched to the characteristic impedance of the connecting lines, he will encounter all kinds of complications. The available gain formula hides all these complications behind its simple appearance. The transducer gain of the cascade connection of two isolated amplifiers is given by the product of the individual transducer gains. However, there is no simple formula for the transducer gain of the cascade connection of two mismatched amplifiers. To me, this is in line with the complications one faces when he is working with real amplifiers.

When I came up with the actual noise measure, Bell Labs sent me to Professor Hermann Haus to receive his comments. Prof. Haus displayed great sportsmanship by being kind and patient with me while I presented my arguments. He even helped me to improve my paper. The paper was published in the Proceedings of IRE in 1961^[7], and the operating noise temperature which included the load noise contribution was introduced in the IRE Standards in Electron Tubes issued in the Proceedings of IEEE in 1963. Prof. Haus was the chairman of the subcommittee which defined the operating noise temperature.

Although noise measure was extensively discussed after it was introduced, actual noise measure as well as the operating noise temperature defined by the IRE was rarely discussed in the literature. And interest in low noise amplifier discussions dwindled with time. However, I admire Prof.

Haus' derivation of the canonical form of linear noisy networks. It is a monumental work.

Balanced Transistor Amplifiers

In 1963, I joined Bell Laboratories as a permanent employee. Mickey Uenohara, Klaus Bowers and Jim Fitzwilliam were instrumental in my return to Bell Labs.

The first job I undertook was the urgent development of L-band transistor amplifiers for the phased array radar of the Nike Zeus (antimissile missile) system. Professor Joji Hamasaki (on leave of absence from the University of Tokyo) was developing the L-band transistor amplifiers using lumped element circuits. His amplifier characteristics were excellent but the circuit adjustment was extremely time-consuming. My supervisor, Rudy Engelbrecht, thought that a redesign with distributed circuits would alleviate the adjustment difficulty. From my first day, I started to design a test fixture of transistors. A draftsman was waiting for my sketches. Within a few weeks, the distributed circuit transistor amplifier was assembled and tested. The circuit adjustment of this amplifier was just as time-consuming as Hamasaki's amplifiers. So, the decision was made to start production of Hamasaki's amplifiers. The distributed circuit amplifier project was canceled. With no concrete project to participate in, I started to think about what I had done during the past few weeks.

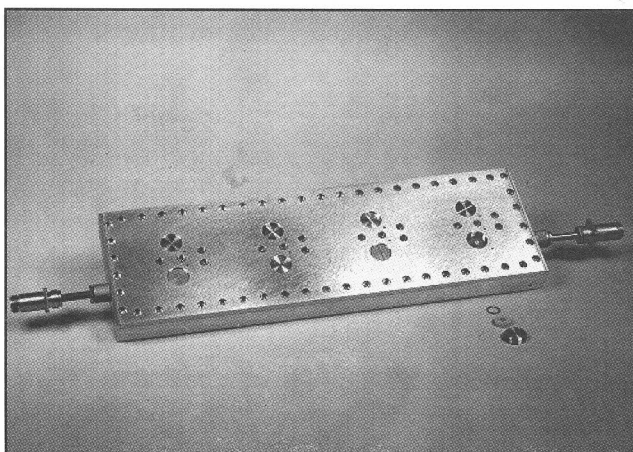


Figure 4.
An L-band
balanced
transistor
amplifier.

Why were the L-band transistor amplifiers so difficult to adjust compared with vacuum tube IF amplifiers?

The isolation of L-band transistors was minimal. The electrical length of each stage was long. So, the internal multiple reflections interfered with the desired flat gain over a broad bandwidth. In addition, the requirements for input and output SWR were stringent. No two sets of transistors for 4 or 7 stages had similar characteristics, so each amplifier required an entirely new adjustment. How to overcome these problems was my next inquiry.

It was well-known that two filters could be combined by Magic Ts to eliminate input and output reflections. Another method to eliminate reflections was to use an isolator in each stage. Both schemes were rejected as being too expensive. Rudy suggested the use of compact 3-dB couplers instead of Magic Ts. His original suggestion was to use two couplers to combine two multistage amplifiers. I insisted that, in order to eliminate internal multiple reflections, each stage should use two couplers to balance two transistors. Rudy didn't seem happy but he allowed me to go ahead since I was the one who would design and test the amplifier. The first four stage amplifier showed excellent input and output SWR and flat gain over the desired bandwidth, all without circuit adjustments. Figure 4 is a picture of the first

balanced amplifier^[8]. Instead of circuit adjustments, however, a pair of transistors had to be selected to balance each stage. The selection was done using a single stage balanced amplifier circuit and it was unexpectedly easy. After only 3 or 4 trials, we could usually obtain an excellent balance. I thought that was it. Higher-ups thought otherwise.

The substrate I used was irradiated polyethylene, a soft plastic. This was the same substrate Hamasaki used. But "soft" has a bad connotation, so the soft substrate would be replaced by a hard substrate, namely, ceramics. Being raised in Japan, then a polite oriental country, I didn't ask questions and began to work with ceramic substrates. Later, somebody told me that cracks developed at sharp recessed corners of conductor patterns in Hamasaki's amplifiers after extreme temperature cycling. The problem was solved by rounding the corners, but by then, management had decided to change the substrate.

We had to secure two independent suppliers of ceramic circuit boards, American Lava and Coors, for a military project. The dielectric constants of their ceramics were slightly different and the glazing materials required different processing. The latter problem was solved by coating Ta₂O₅ over the glazings, a suggestion from the thin film laboratory in the same area (Area 20). In order to cope with the different dielectric constants, a suspended configuration was adopted to utilize air as much as

possible as the dielectric medium. The 3-dB coupler was difficult, but we managed to come up with a design with excellent characteristics^[9]. When we wanted to transfer the technology to the Reading laboratory, however, we encountered a severe NIH (not invented here) problem. They wanted to use their own design of 3-dB couplers. Theirs had an advantage of eliminating a crossover, but utilized ceramics as the odd-mode propagation medium. This meant that, in theory, a slightly different conductor pattern must be used for each supplier's circuit boards and the thickness of the glazing must be precisely controlled, unless they were prepared to adjust the conductor pattern for each lot. They did not listen to our advice and conducted their own experiments. In the end, they accepted our design but it took a long time—about 6 months—if I remember correctly. The production of the ceramic circuit board amplifiers was started but the entire project was canceled as soon as the SALT treaty was signed. The phased array radar Bell Labs envisioned for the Nike Zeus project was never completed.

Quality Factor of Switching Diodes

When the Waveguide Transmission System (WT-4) project was started at Bell Labs, we wanted to contribute from Murray Hill. The Holmdel laboratory proposed the

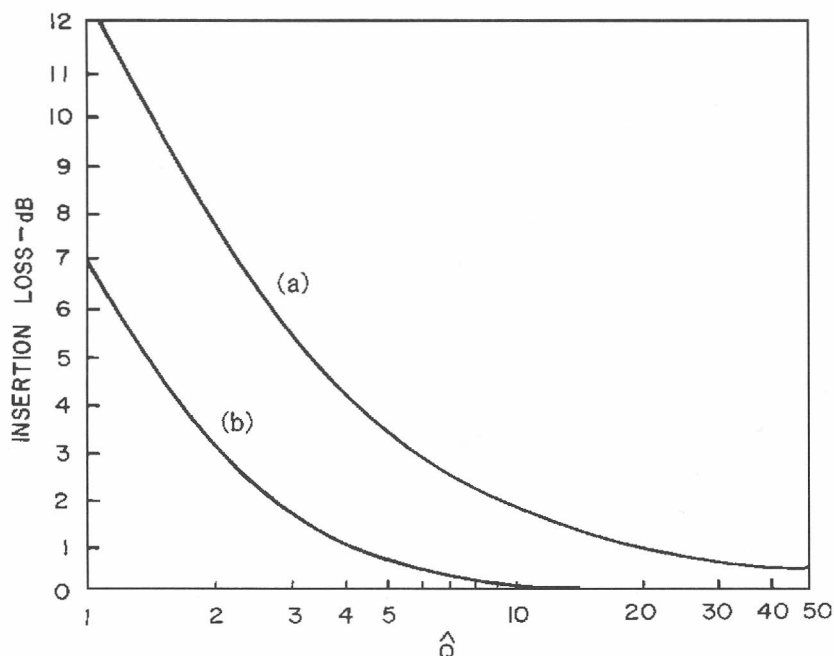


Figure 5. Insertion loss vs. the quality factor of switching diodes for two types of switches, (a) two reflections, 180° out of phase, and (b) reflection and absorption.

direct frequency modulation of mm-wave oscillators to achieve DCPSK (Differentially Coherent Phase Shift Keying). We proposed an external path length modulator to achieve the same DCPSK^[10], as an alternate subsystem to be used just in case the direct frequency modulation ran into difficulties. Our proposal was based on our own experience with IMPATT and Gunn diode oscillators. The simultaneous achievement of low-noise and wide-band electronic tunability was difficult. Our modulation scheme uses a high-Q low noise oscillator followed by a PIN diode phase switch or switches. So, low-noise stable modulation should be easily achievable. The PIN diodes and switch circuits were developed by Wolfgang Schlosser, and the low-noise oscillators by Norman Kenyon. We asked the Allentown

laboratory to develop low-loss circulators necessary for the switches. This turned out to be a right decision as we found out later when we wanted to transfer our technology to the Allentown laboratory. They were on board with us from the beginning.

Wolfgang developed excellent mm-wave digital phase switches. The Merrimack Valley laboratory requested some supply of his PIN diodes for their lower frequency experiments. So, we kept the best diodes for our mm-wave switches and sent remaining diodes to the Merrimack Valley laboratory. Engineers at Merrimack Valley appreciated Wolfgang's generosity, but the management there was furious. They told me that they were being treated as second-class citizens. I tried to explain that the difference in the quality of PIN

diodes would not show up at their lower frequencies. But, I couldn't present a convincing quantitative discussion. Furthermore, our own management didn't appreciate Wolfgang's achievement. They told me that the insertion loss of his switch was about the same as that of the diode switch developed by the Crawford Hill laboratory 10 years earlier. I checked their technical memorandums. Their switch was between two states, reflection and absorption, while Wolfgang's switch was between two reflections, 180° out of phase. If Wolfgang's switch were used in their mode of operation, the insertion loss would have been considerably lower than theirs (see Figure 5).

These two incidents gave me enough incentive to seek a general figure of merit of digital switching diodes. Fortunately, Wolfgang and I came up with the quality factor with a desirable property. It is invariant to lossless imbeddings^[11]. Figure 5 compares the insertion losses of two types of switches; (a) between two reflections, 180° out of phase, and (b) between reflection and absorption. The y-axis is insertion loss and the x-axis is our quality factor of switching diodes. In the search of this invariant quality factor, we used extensively the concept of power waves. The physical meaning of power waves and some properties of their scattering matrix were previously discussed by myself^[12]. Compared to conventional traveling waves, power waves reduce calculation

complexity to about one-half in many applications related to the power exchange among ports. This property is important since, in unexplored fields, go or no-go decisions are often determined by the difference in calculation complexity. This property was first utilized by Professor Penfield when he discussed the noise measure of negative resistance amplifiers. I used power waves in the discussion of actual noise measure as well as in the derivation of the S-parameter expression of the stability factor K introduced by J. M. Rollet. The S-parameter expression of K was presented in *Solid-State Microwave Amplifiers* by Tri T. Ha in 1981 with a reference to my power wave paper of 1965. Since then, the same S-parameter expression has appeared in many microwave textbooks. I also used power waves to derive three S-parameter inequalities as the necessary and sufficient condition for the unconditional stability of linear two-port networks. Unfortunately, one of these inequalities was found to be redundant and this has been a subject of debate among researchers in the field. Although "redundant" does not mean "incorrect", it is not the most desirable^[13]. I should have been more careful.

Solid-State Oscillators

Microwave solid-state oscillators became popular with the advent of IMPATT and Gunn diodes but their behavior was not well understood.

Jim Josenhans measured FM and AM noise of injection locked oscillators at Bell Labs and reported that the FM noise improved while the AM noise essentially stayed the same. He gave no rationalization, so I started to study microwave oscillators seeking a reason. I used the simplest model possible. It consists of an RLC series resonator and a nonlinear negative resistor. I succeeded in explaining why the FM noise should improve while the AM noise should stay essentially the same with injection locking. When I published my result^[14], Marion Hines called me stating that my paper was "a scoop" and that he was ready to withdraw their paper on the same subject. For reasons I don't remember very well (maybe I was a reviewer of their paper), I knew the contents of their paper when I received his call and I told him that their approach was different from mine and worth publishing. Their approach was conceptual while my approach was more mathematical. He must have agreed with me since their paper was published a few months later.

Returning to my simplest model, it showed that the current through the active device always increased with injection locking but the output power sometimes increased and sometimes decreased depending on the original operating point. This agreed with experimental observations. However, the simplest model indicated that the power variation

should be symmetrical with respect to the free-running frequency when we changed the frequency of the locking signal. My internal memo on the injection locked oscillator noise was issued during a heated controversy over the LSA mode of oscillation in GaAs bulk devices. LSA is the abbreviation for Limited Space Charge Accumulation. The frequency and power limits of GaAs bulk devices would be significantly extended with this mode of oscillation and the future mm-wave oscillators would be all of the LSA type with watts of CW power at 30 to 300 GHz. This was the claim that the supporters of the LSA maintained. The opponents claimed that there had been no LSA oscillations observed in GaAs bulk devices. The department was divided and the heated debates continued. With my internal memo, the LSA supporters jumped to a hasty conclusion. They claimed that they observed the asymmetric power variation with injection locking, so their oscillators must be in the new mode of oscillation, namely, the LSA. This was an embarrassment for me, since I had tried to stay as neutral as possible in this controversy. I knew from my own experiments that the power variation would become symmetrical or asymmetrical depending on the circuit adjustment so the asymmetrical power variation should have nothing to do with the LSA.

Unfortunately, I did not have an adequate explanation for the

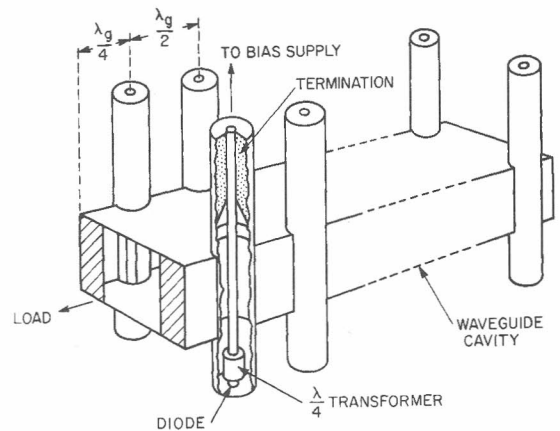
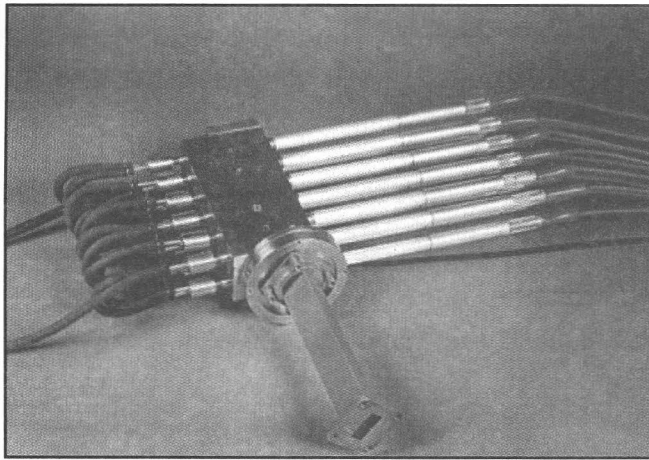


Figure 6. (a) A multiple device oscillator. 12 packaged IMPATT's are combined by a waveguide cavity. (b) A cutaway view of the combiner.

asymmetrical power variation. So, my oscillator study continued. The next model I used was again a simple one. The total impedance times the current is equal to the applied voltage. Namely, $[Z(w) - Z(A)]I = E$ where $Z(w)$ is the circuit impedance, $-Z(A)$ is the impedance of the active device, A is the amplitude of the current I and E is the applied voltage, which is zero for free-running noiseless oscillators. This is only a slight modification of Slater's oscillator model presented in his *Microwave Electronics*. I struggled somewhat to justify the fact that no effects of higher harmonic components had appeared in the model. The problem was solved by the assumption of small harmonic currents and the orthogonality relations among trigonometric functions. Once this point is cleared, I used the model extensively. I could show that the asymmetrical power variation would appear when the device line $Z(A)$ was not perpendicular to the impedance locus $Z(w)$. The asymmetrical power variation has nothing to do

with the LSA mode of oscillation per se. The LSA, an aberration of early computer simulations, has long since been forgotten but it was in the background of my continuing oscillator study. Besides the asymmetrical power variation, onset of oscillation, stability of free-running oscillation, a new locking range formula (the famous Adler's formula has to be modified when the device line is not perpendicular to the impedance locus), noise of locked oscillators, locking stability, two types of locking with single tuned oscillators, and locking around a loop were all well explained by the simple model^[15]. Furthermore, the same model was extended to the analysis of multiple device oscillators. The mode jumping of multiple device oscillators was a severe problem, particularly in radars during World War II, and continued to be as such until Charles Rucker solved the problem by his symmetrical multiple device oscillator. However, he did not give the reason for its stable operation. So, I analyzed it using a matrix representation of his circuit;

this was a natural extension of the above simple model. I could show that the stable operation free from mode jumping was readily obtainable with his oscillator circuit^[16]. As a modification of his circuit, Frank Magelhaes and I were also able to combine 12 packaged IMPATTs by a waveguide cavity to obtain 10 watts of CW power in X band^[17]. Figure 6 shows a picture of the combiner with a cutaway view of the cavity.

The complicated behavior of oscillators with wide-band electronic tunability became clearer both experimentally and theoretically and the Holmdel laboratory gave up their direct frequency modulation for the Waveguide Transmission System (WT-4). So, the oscillator with our external path length modulator became the sole candidate for the transmitters of WT-4.

Defection to Electro-Optics

In 1970, Bob Maurer and Don

Keck of Corning Glass Works succeeded in reducing the transmission loss of optical fiber from several hundred dB/km to 20 dB/km and Izuo Hayashi and Morton Panish of Bell Labs demonstrated the room temperature operation of semiconductor lasers. Combining these two together, optical communication systems previously elusive could now be built. The more I thought about it, the more I was convinced that the fiber optics could grow gracefully while the mm-waveguides could not.

A technology is said to grow gracefully if it enters into the marketplace in its primitive stage of development and finds successively wider applications as it improves, guided by feedback from the marketplace. From the viewpoint

of graceful growth, the mm-waveguide technology stayed in the laboratory too long. The installation of the 2" circular waveguide would be difficult in congested city areas. A quarter million telephone circuits had to be combined to be economical, but this was too large a cross section after the demise of the Picturephone. The WT-4 had no graceful growth capability. So, I wanted to change my group's focus from mm-waveguide to optical fiber transmission systems. I was asked to give a presentation for three executive directors of our area (Area 20). My director, Frank Blecher, and another director, Eugene Gordon, kindly helped me before and during the presentation. One situation where I could change my group's focus was the successful transfer of our WT-4 technology to the Allentown

laboratory. The technology transfer went smoothly because the recipients were on board from the beginning as I mentioned before and because of the thoughtfulness of Louis Moose, Clare Barnes and other members of the Allentown laboratory. I was told that our vice-president concurred. My group and I officially started to develop optical fiber transmission systems. At this moment, I might have regrettably become a defector from the Microwave Theory and Techniques.

Within a year or so, we successfully demonstrated an optical fiber transmission system using a laser, a single mode fiber and an avalanche photodiodes at T-4 rate or about 300 Mb/sec. Figure 7 shows a sketch of our optical transmitter. The T-4 rate was chosen partly because of our own experience in the WT-4 but more importantly because the most likely first application of optical fiber transmission would be in the trunk line. A research group at Crawford Hill had previously demonstrated a system using an LED, a multiple mode fiber and a PIN photodiode at T-2 rate or about 6 Mb/sec. The transmission council decided to carry out a field experiment of the optical fiber transmission system with each channel consisting of a laser, a multiple mode fiber and an avalanche photodiode at T-3 rate or about 45 Mb/sec. This was called the Atlanta Experiment. By then, I must have become quite Americanized. I almost

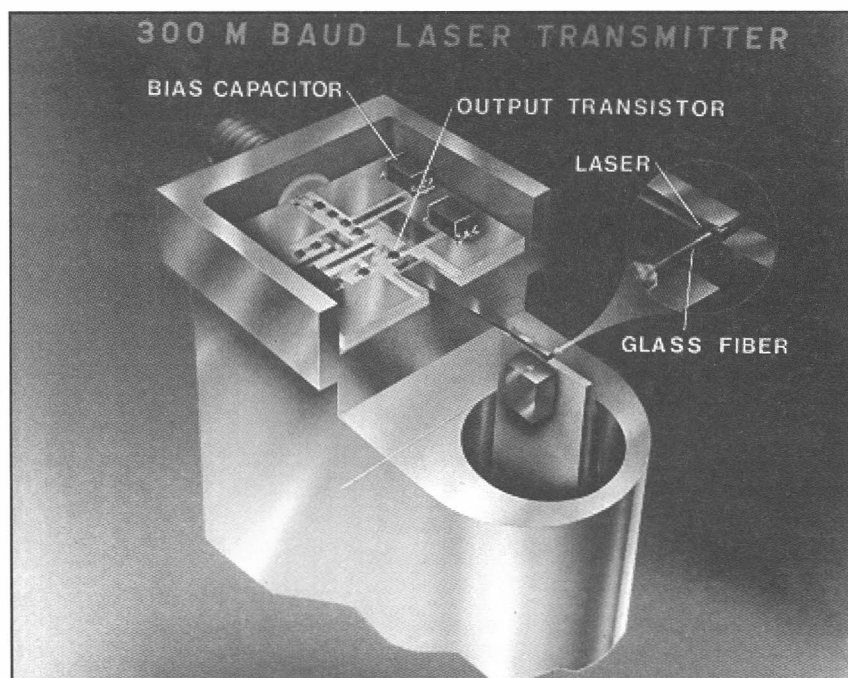


Figure 7. A sketch of the 300Mb/s optical transmitter.

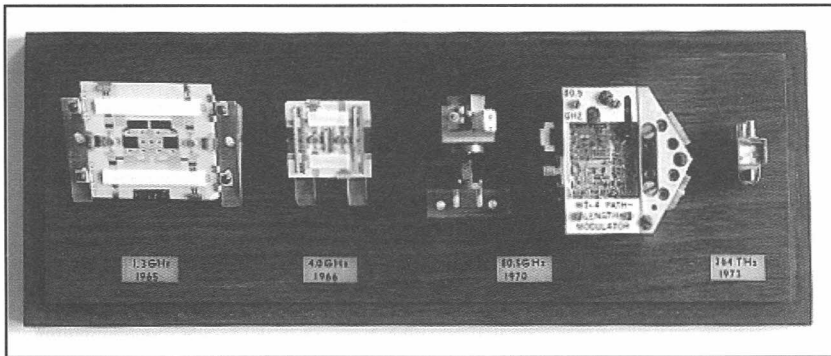


Figure 8. A picture of the souvenir received at my farewell

protested, asking why T-3 rate was chosen. The answer I was given was "Executive Decision." The important thing was that a decision was made which was a step forward to the marketplace. In the meantime, there was a sweeping reorganization. I barely stayed in the optical field thanks to Eugene Gordon's unusual wits, but Wolfgang had to return to the microwave field. In early 1975, my group delivered a half dozen optical transmitter modules to the Holmdel laboratory for the Atlanta Experiment. And I left Bell to join Fujitsu. The Atlanta Experiment was a great success as expected.

I am very grateful to David Thomas, then my executive

director, who was instrumental in arranging a farewell party for me and in treating me as a legitimate member of Bell Labs to the final day of my departure.

Figure 8 shows a picture of the souvenir I received at my farewell party. The device on the left is a ceramic circuit board of the L-band balanced transistor amplifier; the second is a 4-GHz amplifier card developed by Paul Stark and Tom Saunders; in the center is a mm-wave oscillator developed by Norman Kenyon; second from the right is the path length modulator developed by the Allentown laboratory, and on the far right is an optical transmitter developed by Warren Clemetson. Those who

helped me tremendously as members of my group at one time or another but whose names didn't appear above are Fang Chen, Chuck Brackett and Paul Dorman.

The field test of WT-4 was also successful and an article which appeared in the Bell System Technical Journal indicates that the test used the transmitters developed by the Allentown laboratory based on our initial design of the external path length modulator.

Twenty years later, however, there are no commercial mm-waveguide transmission systems that I know of. On the other hand, optical fiber transmission systems are everywhere including trunk lines (as I expected) and even in underwater cables. I was indeed fortunate to be in the right place at the right time with an understanding management, and cooperative group members and friends.

Such are my personal recollections.

✉

Bibliography

- [1] K. Kurokawa, "The Effect Of Wall Losses On The Propagation Constant Of Waveguides," J. Commun. Engrs. Japan. Vol.39, pp.794-800; Sept. 1956.
- [2] K. Kurokawa "Electromagnetic Waves In Waveguides With Wall Impedance," IRE Trans. Microwave Theory Tech., Vol.MTT-10, PP.314-320, Sept. 1962.
- [3] K. Kurokawa, "The Expansion Of Electromagnetic Fields In A Cavity," J. Commun. Engrs. Japan, Vol.38, pp.980-986, Dec.1955.
- [4] K. Kurokawa, "The Expansions Of Electromagnetic Fields In Cavities," IRE Trans. Microwave Theory Tech., Vol.MTT-6, pp.178-187, April, 1958.
- [5] K. Kurokawa, *An Introduction To The Theory Of Microwave Circuits*, New York: Academic Press, 1969.

- [6] K. Kurokawa, *Introductory Microwave Circuits*. Tokyo : Maruzen, 1963.
- [7] K. Kurokawa, "Actual Noise Measure Of Linear Amplifiers," Proc. IRE, Vol.49, pp.1391-1397, Sept. 1961.
- [8] R. S. Engelbrecht and K. Kurokawa, "A Wideband Low-Noise L-Band Balanced Transistor Amplifier," Proc. IEEE. Vol.53, pp.237-247, March, 1965.
- [9] K. M. Eisele, R. S. Engelbrecht and K. Kurokawa, "Balanced Transistor Amplifiers For Precise Wideband Microwave Applications," in 1965 ISSCC Dig. Tech. Papers, pp.18-19.
- [10] W. J. Clemetson, N. D. Kenyon, K. Kurokawa, B. Owen and W. O. Schlosser, "An Experimental MM-Wave High-Speed Path-Length Modulator," in 1970 ISSCC Dig. Tech. Papers, pp.20-21.
- [11] K. Kurokawa and W. O. Schlosser, "Quality Factor Of Switching Diodes For Digital Modulation," Proc. IEEE(Letters), Vol.58, pp.180-181, Jan.1970.
- [12] K. Kurokawa, "Power Waves And The Scattering Matrix," IEEE Trans. Microwave Theory Tech., Vol.MTT-13, pp.194-202, March, 1965.
- [13] K. Kurokawa, "Comments On Unconditional Stability," IEEE Trans. Microwave Theory Tech., Vol.MTT-41, p.1475, Aug.1993.
- [14] K. Kurokawa, "Noise In Synchronized Oscillators," IEEE Trans. Microwave Theory Tech., Vol.MTT-16, pp.234-240, April, 1968.
- [15] K. Kurokawa, "Injection Locking Of Microwave Solid-State Oscillators," Proc. IEEE, Vol.61, pp.1386-1410, Oct. 1973.
- [16] K. Kurokawa, "An Analysis Of Rucker's Multidevice Symmetric Oscillator," IEEE Trans. Microwave Theory Tech. Vol.MTT-18, pp.967-969, Nov.1970.
- [17] K. Kurokawa and F. M. Magelhaes, "An X-Band 10-Watt Multi-IMPATT Oscillator," Proc. IEEE (Letters), Vol.59, pp.102-103, Jan. 1971.



IEEE-USA's

National Job Listing Service

Travel the Information Superhighway to Your Next Job!

IEEE-USA has developed an electronic job-listing service that gives IEEE members free information on job openings in every region of the country.

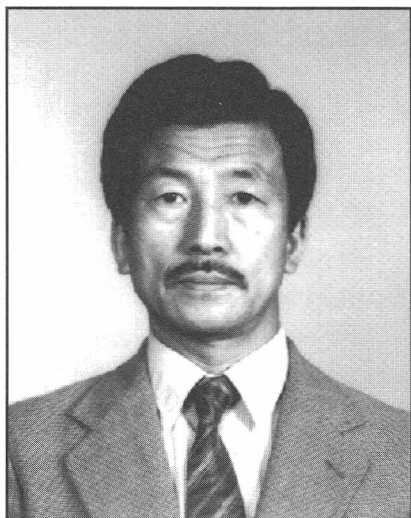
To obtain current job listings, set your web browser to URL **www.ieee.org/jobs.html** or send a message to any of the following e-mail addresses (no subject line or text message is needed):

- ▶ **Region 1:** info.ieeeusa.jobs.r01@ieee.org
- ▶ **Region 2:** info.ieeeusa.jobs.r02@ieee.org
- ▶ **Region 3:** info.ieeeusa.jobs.r03@ieee.org
- ▶ **Region 4:** info.ieeeusa.jobs.r04@ieee.org
- ▶ **Region 5:** info.ieeeusa.jobs.r05@ieee.org
- ▶ **Region 6:** info.ieeeusa.jobs.r06@ieee.org
- ▶ **Non-U.S.:** info.ieeeusa.jobs.other@ieee.org
- ▶ **Massachusetts:** info.ieeeusa.jobs.mass@ieee.org
- ▶ **California:** info.ieeeusa.jobs.cal@ieee.org
- ▶ **Illinois:** info.ieeeusa.jobs.ill@ieee.org



THE INSTITUTE OF ELECTRICAL
AND ELECTRONICS ENGINEERS, INC.
IEEE UNITED STATES ACTIVITIES
1828 L Street, N.W., Suite 1202
Washington, DC 20036-5104, U.S.A.

Quiet Ending of an Old Wireless Transmission Station



Eikichi Yamashita

The eight high antennas of Yosami Station, near Nagoya, Japan, were pulled down in July, 1996.

In 1930, Yosami Station was constructed in order to meet the urgent requirement for radio communication between Japan and various countries in Europe by the use of high power transmitter and very low frequencies.

In the meantime, short wave radio communication was developed for long distance radio communication using very low power. The common belief at the time was that a station such as Yosami was, or would soon become obsolete. However, it was soon discovered that short waves

were sensitive to ionospheric disturbances, and subject to severe fading when the disturbances occur. It was also noted that ionospheric conditions had little effect on the very low frequencies. Yosami Station, then, could perform a very important mission by covering periods of fade-out when short waves were incapable of reaching Europe.

Soon after the outbreak of the Second World War, the station was taken over by the Imperial Japanese Navy, and operated as a highly effective and reliable means of communication to its fleet. Shortly before the end of the war, a portion of Yosami's antenna system was damaged by bombing, and the entire system, with the exception of the towers, was removed after the war was over.

The building and transmitting equipment had been maintained in very good condition both during and after the war, therefore, the US Navy decided to rehabilitate the station and convert it to its own use. After two years of rehabilitation, Yosami Station resumed operations in May 1952, utilizing the original frequency assigned by the Interna-

tional Frequency Registration Board.

Location and Site

This site area had been selected and purchased by the Ministry of Post and Communication, and was transferred to the former company of Denki Kogyo Co., Ltd. when it was established in 1925.

Yosami Station was cleverly designed to occupy the absolute minimum area of the rich, fertile farmland for the communication facility. The land area for buildings, towers, houses and access roads to the towers is about 8.6 hectares. This area is owned by Denki Kogyo Co., Ltd. The large area under the antenna, about 150 hectares, has been leased from the farmers.

Buildings

The main office (headquarters) is a three story building occupying 886.5 square meters (9,542.20 sq. ft), and includes luxurious accommodations for the station guests. The main transmitter building occupies 1,338.5 square meters (14,407.48 sq. ft). Its

associated repair shops, storehouses, etc. occupy about 1,079.2 square meters (11,616.40 sq. ft). All buildings are reinforced concrete construction. The transmitter building is designed with columnless arch roof construction, permitting the use of an overhead traveling hoist for the lifting and transfer of various heavy components used in the transmitter.

Power Sources

Commercial electric power is supplied by the Chubu Electric Power Company through the Noda Substation which was built specifically for Yosami Station and is located about two kilometers to the east. This power substation is fed by three separate power sources, the 77 kV transmission line from Kiso and Kurobe Hydroelectric plants, the 33 kV

Hamamatsu transmission line from Yahagi and Tenryu Hydroelectric plants, and the 33 kV Okazaki transmission line. The transmission line from Noda power substation is one circuit of three-phase, 6.6 kV. In April 1970, an emergency power source, a 1,550 kW diesel engine generator manufactured by Electric Products

Ltd. was installed under the supervision of US Army Corps of Engineers.

Transmitter

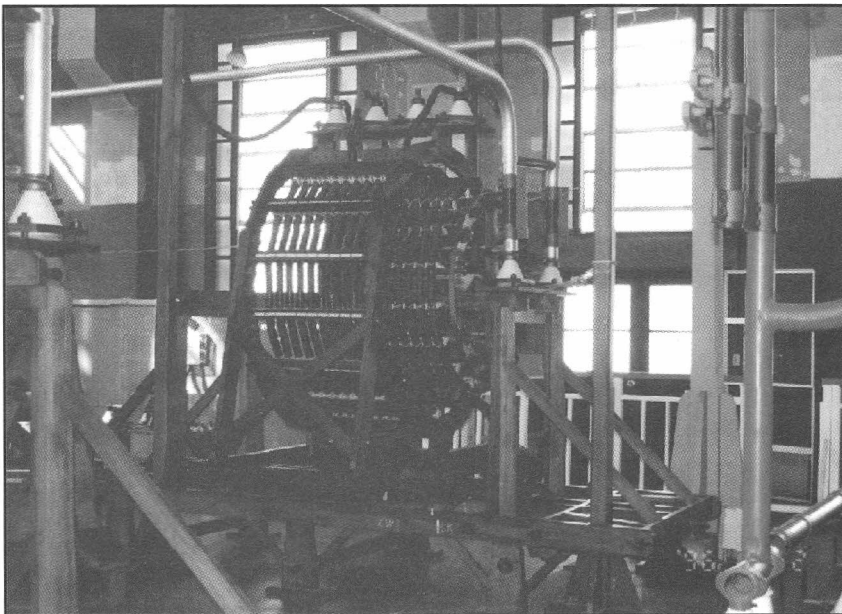
The transmitter consists of two complete rotating machine sets for generating radio power, a set of associated control boards and one set of radio frequency tuning circuits. The Telefunken Company of Germany designed and manufactured this equipment, and its durability has been proven for the duration of the operation. Main equipment and their characteristics are shown in Table 1.

A fundamental frequency (5.8 kHz) is generated by a high frequency alternator with 700 kVA output power. This output power is fed to a frequency tripler which multiplies the frequency to 17.4 kHz. The output of the tripler is fed to an antenna element through the high frequency tank circuit.

The keying method is applied by the "back-shut" or absorption system. When the key is in mark, the

Table 1. Equipment and Characteristics

3 Phase Main Induction Motor	920 kW	2 sets
Direct Current Generator	860 kW	2 sets
Direct Current Motor	730 kW	2 sets
High Frequency Alternator	700 kVA	
Frequency Tripler		2 sets
Keying Choke Coil		2 sets
High Frequency (Tank) Circuit		1 set



Transmitter at Yosami Station

Table 2. Signal Output and Frequencies

CW	(A1)	250 kW	17.4 kHz
FSK	(F1)	200 kW	17.4 kHz ± 25 Hz
MSK	(F7B)	200 kW	17.4 kHz ± 25 Hz

output power of the transmitter is fed to the antenna element, and when the key is in space, the output power is absorbed into the keying circuit by de-tuning the antenna matching circuit.

Prior to July 1970, in order to stabilize the transmitting frequency within the applicable tolerances, the high-frequency alternator was not driven directly by the three-phase main induction motor, but was driven by a DC motor. This method is called the Ward Leonard System. Accurate constant speed control of the high-frequency alternator is achieved by automatically detecting the output voltage of the DC generator.

In July 1970, the new 250 kW vacuum tube transmitters manufactured by Continental Electronics Manufacturing Co. were installed and commenced operation. The Telefunken and Continental equipment are operated alternately. All installation and cabling has been done by Denki Kogyo Co., Ltd. This vacuum tube type transmitter is capable of generating CW, FSK, or MSK signals. The output and respective frequencies are given in Table 2.

The accurate frequency is generated by the precision

frequency oscillator and is multiplied and mixed to obtain the designated frequencies. All high voltage circuits are encased in the aluminum fence which has a specially designed entrance gate to prevent an accident.

Antenna and Grounding System

Yosami Station's Antenna is the "Inverted L" type. Eight 250 meter triangular steel towers are supported by insulated guy wires. The antenna system is stretched between the towers. The length of the antenna elements is 1,440 meters. The antenna elements are separated into two groups consisting of eight elements. The 16 elements total 460 meters in width. The elements are copperweld wires. In June 1963, new "down-leads" to the antenna elements were added in the other end of the transmitter and terminated to the tuning coil. The antenna feeding system was converted to a multiple tuned type in order to increase the antenna efficiency.

The ground system is the multiple grounding type, and the grounding copper wires are buried under the ground in

the 150 hectares area below the antenna system. Antenna constants are as follows:

Static Capacity	006 µF
Natural Wavelength	8700 m
Total Resistance of Antenna	~2.6 W

All eight antenna towers are equipped with aircraft warning lights.

Control

Yosami was keyed from the Communication Center, US Naval Base, Yokosuka. Normal control line is a terrestrial communication network from Yokosuka to Yosami.

Auxiliary System

Yosami VLF Site is completely self-sufficient, supplying its own fresh water and sewage disposal system, in addition to the power system already mentioned. A unique cooling system composed of a circulating pump and outside cooling ponds is used to reduce heat from the transmitters and various other auxiliary equipment. ❧

Upgrading to New Facilities: Potential and Unsolved Problems at Joint MTT Chapter, Novosibirsk, Russia

Brief report presented by
Boris Kapilevich
Joint MTT/ED Chapter Chair
Novosibirsk, Russia

For IEEE Divisions I and IV
Chapter Chairpersons
Meeting, Prague,
September 8, 1996

Abstract

This report briefly describes the state of the newly established Joint MTT/ED Chapter in Novosibirsk, Russia. Each of the major topics, namely, a historical view, first organizing steps and results, potential for new IEEE member recruitment, coordinating a professional activity and unsolved problems are considered. Recommendations for improving some areas of the Chapter's activity are discussed.

History of the question

- In the mid-1980s a cooperation agreement between IEEE and Russian Popov Society was developed
- The agreement between IEEE Region 8 and the Popov Society to create Russia section in Moscow, 1990

- Extended ties between IEEE and Popov Societies by signing a new two-year agreement in 1993
- IEEE Adopted a strategic plan for globalization through cooperation with national societies around the world in November 1993
- The MTT-S Transnational Committee initiative for aiding Eastern Europe and the Former Soviet Union started in 1993
- MTT-S and ED-S adopted a joint plan of action to promote the formation of MTT/ED Chapters in the EE-FSU area in 1994
- IEEE approved the following newly established Chapters in Russia during 1995-96: St. Petersburg, Saratov-Penza, Nizhny Novgorod, Novosibirsk

First Organizing Steps

- Discussions with Prof. Rolf H. Jansen, MTT-S Transnational Committee Chairman about the possibility of creating a joint MTT/ED Chapter in Novosibirsk Region and including the idea in the plans of the MTT-S AdCom to continue the initiative in the

Siberia Region (late 1995 - early 1996)

- Carrying out a survey to estimate the potential for IEEE member recruitment (results presented below)
- Approval by IEEE Headquarters of the Joint MTT/ED Chapter in Novosibirsk, May 1996
- Planning the current Chapter's activity for 1996-97
- A brief overview of the technical interests in the engineering community of Novosibirsk-city
- The information is based on preliminary survey and direct contacts with local individuals from Universities, Research Institutes and Industry during April - May 1996.

Current Status

The Joint MTT/ED Chapter in Novosibirsk was formed in May 1996 under the ED-S and MTT-S initiative for the support of individuals and new chapters in EE/FSU. At present it has 17 members from Universities, Research Institutes and Industry. About 10 specialists would like to join the Chapter but they face financial difficulties

Area of Interest	Number of Individuals
Aerospace and Electronic Systems (AES010)	3
Antennas and Propagation (AP003)	5
Broadcast Technology (BT002)	9
Circuit and Systems (CAS004)	4
Communications (COM019), Professional Communication (PC026), Vehicular Technology (VT006)	15
Component, Packaging and Manufacturing Technology (CPMT021)	3
Computer (C016)	7
Education (E025)	4
Electromagnetic Compatibility (EMC027)	4
Industrial Electronics (IE013)	3
Information Theory (IT012)	4
Instrumentation and Measurement (IM009)	5
Lasers and Optics (LEO036)	3
Reliability (RL007)	2
Signal Processing (SP001)	6
Social Implications of Technology (SIT030), Systems, Men and Cybernetics (SMC028)	4
Microwave Theory and Techniques (MTT017)*	12
Electron Devices (ED015)*	11
Total	103

* Joint MTT/ED Chapter

regarding payment of membership fees. If ED-S and MTT-S would continue sponsoring the new members for another 2 to 3 years it would provide a real framework for extending IEEE membership despite the very difficult financial situation with the income of local scientists. Hopefully, during this transition time many members will gradually be able to stand on their own feet as self-paying members.

According to our preliminary survey the next step is the Chapter's extension toward Communication

and Computer Societies since many people of the local engineering community are involved in these fields of professional activities. Nine individuals specializing in these areas have submitted their applications to IEEE Headquarters for Membership as self-paying members, supported by my signature.

The Chapter's activities planned for 1997 include lectures and discussions on the latest advances in the area of Microwaves such as "Microwave Active Filters" and

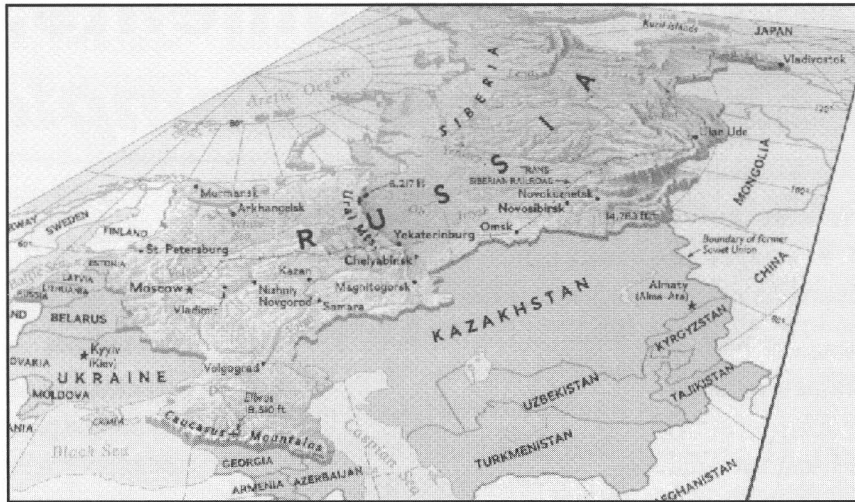
Electronic Devices such as "Measurement and Identification of Power Microwave Semiconductor Devices" primarily in the form of Workshops.

Involving Neighboring Scientific and Industrial Centers in IEEE Activities

Novosibirsk-city is an unofficial capital of Siberia and located near several large cities with populations ranging from 0.5-1.5 million. They have tremendous scientific and industrial potential in the areas of IEEE professional interests. These cities are Krasnojarsk, Omsk, Yekaterinburg, Chelyabinsk, Kazan, Perm, Tomsk, Irkutsk, Chita, Ulan-Ude (see the attached map). The total estimated number of new IEEE members which might be recruited in this area is 100 - 200 individuals.

An additional source of expanding the Chapter is the attraction of individuals from the neighboring new states of Central Asia (the former Soviet Republics). Many of them have good connections with Novosibirsk based on long-term mutual projects developed in the past. It is important that Russian is a well-known language there, so it can be used for communications and teaching. Some of these states have advanced electronic industrial and educational organizations with highly professional staffs. They include Alma-Ata (Kazakhstan), Tashkent (Uzbekistan) and Beshkek (Khyrgysztan).

*Nearest to Joint MTT/ED Chapter, Novosibirsk
Huge Electronic Industry and Academic Centers (Ural and Siberia)
Estimated potential for new IEEE members recruitment is about 100-200 individuals*



*Nearest to Joint MTT/ED Chapter, Novosibirsk
Huge Electronic Industry and Academic Centers in Central Asia region of the former USSR
Estimated potential for new IEEE members recruitment is about 50-100 individuals*

Involving individuals from neighboring Siberia-Ural centers and new States of Central Asia (former USSR Republics) provides a good environment for the expansion of the Chapter. However, this process requires proper financial support from the MTT and ED Societies, about \$4500-5000 (US) for Siberia-Ural and \$3500-4000 (US) for the Central Asia States. If the leaders of both Societies approve submitting funds for the suggested purpose, the authorized members of the Chapter could start a practical realization of this exciting joint venture immediately, resulting in significant membership increase and further professional activity development.

Conclusion

The cooperative efforts of the IEEE and the Russian Popov

Society supported by MTT and ED Professional Groups have resulted in five new joint Chapters in Russia alone. There are good facilities to develop IEEE membership within Novosibirsk-city, Siberia-Ural Region and new Central Asia States. Members of the Joint MTT/ED Chapter in Novosibirsk are ready to start this work if the initiative is approved by MTT-S and ED-S and the proper financial support is provided.

Acknowledgments

On behalf of the members of the Joint MTT/ED Chapter, Novosibirsk, Russia and myself I would like to thank Dr. R. Jansen (MTT-S Transnational Committee Chairman) and Dr. Van Der Vort (ED-S Executive

Director) for their constant help and careful guidance of all stages of the Chapter formation resulting the creation of the first Professional Group of its kind within the vast and severe Siberia Region of Russia. ❧

For further information, please contact:

Chapter Chairman,
Prof., Dr.Sc.(Technol.)
Boris Yu. Kapilevich,
Dept. of Applied
Electrodynamics & Antennas
Siberia State Academy of
Telecomm and Informatics
Kirov St. no. 86, 630102
Novosibirsk, Russia
Tel: 7-3832-660943
Fax: 7-3832-222581 or
7-3832-222274
e-mail: boris@neic.nsk.su

Handbook for Preparing Engineering Documents: *From Concept to Completion*

Joan G. Nagle. New York, NY: IEEE Press, 1995. 372 pages, including appendixes and index.

Consider the concept of Joan Nagle's remarkable *Handbook For Preparing Engineering Documents* to be most unusual. The book offers an abundance of document preparation techniques—some basic, some advanced—and organizes them in a unique way. It can be used either for quick reference, where the reader can enter the text at any point and understand what is going on, or for straight-through reading. When the book is used as a reference, the liberal cross-references and margin notes give it an almost hypertext-like quality. It is even better suited for linear reading because Nagle's fluid literary style is lively and the text is a readable pleasure. Few books on technical communication combine these qualities.

It appears to me that such a handbook has become far more important for the typical engineer-writer now that the time-honored services of in-house publication departments have generally been reduced or eliminated. Although the book is intended for engineers, however, it is also a highly useful reference work for technical communicators.

Because Nagle is sensitive to the work habits of the engineer, she has organized the book along the lines of the engineering development process. In the past, various journal articles have attempted to discuss technical writing in terms of solving an engineering problem. In contrast, the present treatment is far more refined and detailed. Moreover, the author's writing has flair and wit.

The general plan, organized like an engineering hardware project, is as follows:

Requirements Analysis—A probe into the purpose of the document and the background and needs of the audience.

Design—A plan for information design, not merely format and layout; usability as well as readability.

Components and Assembly—Choice of wording; chunking; grammar; graphic elements.

Controls—Attention to ethics; collaboration of authors; proprietary and legal matters.

Packaging—Adoption of format of text and tables; page makeup; choice of paper and binding.

Testing—Study of usability, includ-

ing user interviews; quality assurance; factors affecting customer acceptance.

Production—Management of clearances and scheduling; prototype production of draft text, graphics, and data; printing and distribution; alternative electronic production and distribution.

Appendix—Quick reference guides to mechanics of documentation.

For the engineer who normally proceeds in this sequence of development work, these methods of preparing documents seem to fall naturally into place. Nagle suggests that engineering skills can thus be used to transform data and results into an acceptable form that will fit the customer's needs.

After a long career in industry as a writer and editor, the author understands how to shape information to meet the customer's needs. This combination of professional experiences is a really solid foundation for the handbook.

By using this handbook's Chapter 5 ("Controls") as an example, I can comment on Nagle's breezy style, her approach to important issues, and some of her contributions to the

art of engineering documentation. This chapter implies that the usual criteria—clarity, accuracy, audience sensitivity, sound organization, and faultless mechanics—are no guarantee of a satisfactory document unless certain other aspects are brought under control. Indeed a beautifully written, handsomely produced document can become a disaster without the precautions discussed in Chapter 5. Moreover, most books on technical writing and technical communication either mention such matters lightly in passing, or, more generally, ignore them altogether!

I find it interesting that several kinds of control are discussed in Chapter 5. Some—such as honesty, objectivity, due credit to others, and the use of gender-neutral language—are matters of an author's engineering judgment. Other controls are imposed "by our internal value systems, our collaborators (the working team), our employer, and the laws of the land." The engineering author who is insensitive to these aspects is headed for trouble.

The Controls chapter is a wonderful compilation of the subtle items in a document that can damage an author's credibility, lessens confidence in the company, or even lead to a lawsuit. The examples range from little oversights to downright misrepresentation. There is poor judgment in obviously posed photographs, "a perfectly neat desk, for instance—are you kidding?" Or in a photograph of a computer user staring intently at the screen (not visible), where the back of the com-

puter (facing the camera) shows the power switch in the *Off* position! More important would be technical details omitted in the text, affecting readers' perception of the writer's honesty or accuracy. Or worse still, would be an author's attempt to make recommendations based on data that have no clear statistical significance.

A different kind of control or lack of it is due to co-authors of the document. Here is a good example of Nagle's conversational but coherent style, where she explains the difficulties of team writing:

We do not work in a vacuum (much as we might like to, at times) ... we are usually part of a team effort ... It's unusual for a team to complete a project without at least on breakdown in the working relationship, or at least disagreement on how the project is to proceed. In fact, the more difficult (bigger, time-sensitive, business-critical) the project is, the more likely these disagreements are. Preparing documents in the collaborative mode requires acknowledgment of the controls it imposes. We can't always have our own way. (p. 130)

The next two sections of the chapter deal with controls that deserve the attention of all kinds of technical writers. On the question of company control, there is an important discussion on restricting (1) proprietary information on products and processes and (2) sensitive information about personnel and mar-

keting strategies. In the section on legal matters are separate treatments of copyright law and liability law.

In other books on technical communication, I would consider an appendix of 90 pages to be padding. In this handbook, the guides to mechanics (abbreviations, capitalization, metric conversions, etc.) seem exhaustive, well-chosen, and quite appropriate.

The book is handsomely produced, printed in two colors in a readable format. The page design includes a 1¼" margin for the author's explanatory notes, definitions, and comments, and also for occasional small diagrams.

Joan Nagle's handbook is a gem. It will undoubtedly become a standard reference for engineers.

Herbert B. Michaelson
STC Fellow
Jackson Heights, NY

Used with permission from *Technical Communication*, Published by the Society for Technical Communication, Arlington, Virginia

Member Price: \$34.00
List Price: \$39.95
IEEE Order Number PP4515-QJA
ISBN 0-78-031097-7

To order call 1-800-678-IEEE (toll-free, US and Canada) 24 hours a day, 7 days a week or 1-908-981-0060, Fax 1-908-981-9667

International Workshop on Finite Elements for Microwave Engineering

The International Workshop on Finite Elements for Microwave Engineering—From Electromagnetics to Microwave Electronics Software—is planned to be held at the Futurescope Center in Poitiers, France on Friday and Saturday, 10-11 July 1998. You may wish to note this date in your calendar and plan to attend.

The Workshop will immediately precede PIERS (Progress In Electromagnetics Research Symposium), which will take place in Nantes, France. Poitiers is an attractive city located just a brief train ride from Nantes and Paris, making it convenient to attend PIERS as well as this Workshop.

The Workshop is organized by IRCOM (Research Institute on Optical Communications and Microwaves, University of Limoges, France) UMR CNRS, with the collaboration of the University of California at Los Angeles and the University of Florence. This is the third in a series of workshops which originated with the contribution of Prof. P.P. Silvester

(McGill University, Montreal, Canada) which were held in San Miniato, Italy, in 1992 and Siena, Italy, in 1994.

The Workshop on Finite Elements for Microwave Engineering will focus principally on finite element software relevant to problems of microwave electronics, especially planar circuits, active antennas, device and field simulation. Other related topics of current interest and importance will also be considered. Papers presented at the Workshop will be fully refereed and published. A selection of the presented papers will be published in full length in the French journal *Annals of Telecommunications*.

To obtain information about the Workshop send an e-mail message to dir@ircom.unilim.fr or write to:

Dr. V. Madrangeas
IRCOM
University of Limoges
123 Avenue Albert-Thomas
87060 Limoges C, France
Fax: 33-5-55-457-514

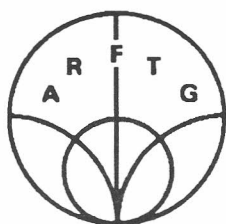
For details about submitting a paper, send an e-mail message to poitiers@ingfi9.die.unifi.it or write to:

Scientific Secretary
c/o Department of Electrical Engineering
University of Florence
Via C. Lombroso 6/17
I-50134 Florence, Italy
Fax: 39-55-4796-767



See you in Poitiers !

P. Guillon, Limoges (Co-Chairman)
T. Itoh, Los Angeles (Co-Chairman)
G. Pelosi, Florence (Scientific Secretary)



Short Course on RF and Microwave Measurements for Wireless Applications

December 3-4, 1996
Clearwater Beach, Florida

NIST

Short Course Announcement

The Automated Radio Frequency Techniques Group (ARFTG), in cooperation with the National Institute of Standards and Technology (NIST), will offer its 1996 Short Course on RF and Microwave Measurements for Wireless Applications in Clearwater, FL on December 3 and 4. This course, held in conjunction with the 48th ARFTG conference (Dec. 5-6), is designed for engineers and scientists concerned with accurate measurement of RF and microwave quantities. The curriculum will specifically support the conference theme of "RF Nonlinearity Measurements."

The first day of the course will cover microwave measurement fundamentals, including microwave circuit theory, vector network analyzers, scattering parameters, spectrum analysis, power, and noise. It will include a discussion of cables, connectors, fixtures, probes and on-wafer measurements. This will provide an excellent introduction for newcomers to the field or a good review for those familiar with RF and microwave measurements.

The second day will highlight topics specifically related to RF nonlinear measurements. Topics to be covered include time domain, phase noise, load-pull, adjacent channel power, digital modulation theory, group delay, and amplifier nonlinearity characterization. This will help build a good base of common understanding to set the stage for the advanced topics to be presented at the conference.

All sessions will be held in the Radisson Sand Key Resort in Clearwater, Florida, site of the ARFTG Conference. The course registration fee is \$300 and includes lunch on both days. For those who wish to attend only the second day, the fee will be \$175. In either case, notes for both days' lectures will be provided. Class size is strictly limited, with preference to those attending both days.

For more information contact:

Robert M. Judish
NIST
Division 813.06
325 Broadway
Boulder, CO 80303
Phone: 303-497-3380
FAX: 303-497-3970
email: judish@boulder.nist.gov

Larry Dunleavy
University of South Florida
Dept. of Electrical Engineering
4202 E. Fowler Ave., ENB 118
Tampa, FL 33620
Phone: 813-974-2574
FAX: 813-974-5250
email: dunleavy@eng.usf.edu

FIRST ANNOUNCEMENT AND CALL FOR PAPERS

1997 IEEE – RUSSIA CONFERENCE
”HIGH-POWER MICROWAVE ELECTRONICS:
MEASUREMENTS, IDENTIFICATION, APPLICATIONS”
MIA-ME’97
September 23-25, 1997

Novosibirsk State Technical University, Novosibirsk, Russia

The 1997 IEEE-Russia Conference MIA-ME’97 organized by the Joint MTT/ED Chapter of IEEE, Novosibirsk, Russia and Novosibirsk State Technical University, Russia and cosponsored by the IEEE MTT-S and ED-S, Systems TV Ltd. (Russia), Microtech Co. (Russia), Society of Radioelectronics and Communication (Russia)

CONFERENCE ORGANIZATION:

MIA-ME’97 Chairman:

Dr. A. Vostrikov
Rector of NSTU
20 K. Marx Prosp.
Novosibirsk, Russia

Vice Chairman (information contact):

Dr.V.Snournitsin,
NSTU,
20 K.Marx Prosp., 630092
Novosibirsk, Russia
tel/fax +7-3832-462598
e-mail: crra@nstu.nsk.su

Technical Chairmen:

Dr.B. Kapilevich
Joint IEEE MTT/ED Chapter Chair
Kirova St.86
SSATI, 630102
Novosibirsk, Russia
tel:+7-3832-660943,
fax:+7832-222581
e-mail: boris@neic.nsk.su

Dr.V.Petrov
NSTU,630092
20 K.Marx Prosp.
Novosibirsk, Russia
tel/fax +7-3832-460633

Conference Committee:

Dr. V. Denisov
Dr. V. Kaznacheev
W. Van der Vort

Dr. L. Lisytsina
Dr. M. Davidovich
Dr. Safa Haddad

Dr. V. Palchun
Dr. J. Modelski
Dr. I. Yakovkin

MIA-ME'97 CONFERENCE SESSIONS:

Session 1. Characterization of high power microwave devices as nonlinear n-ports:

- Procedures of identifications of non-linear devices, using multitone and other signals
- Techniques for measurements and testing of non-linear microwave devices
- Use of nonlinear n-ports models for CAD of nonlinear microwave circuits
- Other related topics

Session 2. Microwave passive and active filters, and acoustics-electronic devices and systems:

- Modeling and CAD microwave filters and acoustics-electronic devices
- New realizations, fabrication technologies and applications
- Other related topics

Session 3. Microwave/RF: Industrial, Scientific and Medicine Applications:

- Industrial microwave heating
- Microwave processing materials and foodstuffs
- Electromagnetic techniques for medical diagnostics and therapy
- Future of microwave technology
- Other related topics

SHORT COURSES (Workshops)

Short courses (workshops) will be offered in conjunction with the Conference covering:

- Computational methods analysis of non-linear circuits based on a Volterra-Wiener representation of nonlinear systems
- Modeling and design microwave active filters

EXHIBITS AND EXCURSIONS

Vendor booths and demonstrations of commercial products, computer hardware/software and company capabilities in areas of measurements, TV and medical techniques are available. Excursions to Siberia Medical Research Center, Microwave Products Manufacturers, and Microwave Research Institutes will be organized.

INSTRUCTIONS FOR AUTHORS AND TIMETABLE

The title of the paper, authors name, affiliation, full address, telephone/fax numbers and e-mail address should be given in a separate A4 page, together with session reference number that seems most appropriate to the work.

Papers should be submitted English or Russian, typed in camera ready form, of no more than 5-6 A4 pages. Please use Times New Roman 12pt font or an equivalent serif typeface, set all margins to 25mm (1 inch), set paragraph indentation to 3.5mm (0.14 inch). Type title in bold, centered in the top. Below title center name of author(s) with the affiliation. Left and right justified is recommended.

Three (3) hard copies of the paper and the diskettes of standard IBM format (1.2 - 5.25" or 1.44-3.5") must be submitted to Vice-Chairman of MIA-ME'97. The text and figures on the diskettes must be combined into files written at word processing Microsoft Word (version 2.0, 6.0 or 7.0), named as follows: paper.doc - for the text of the paper; author.doc - for information about the authors.

May 30, 1997 : Submission papers in Conference Committee (3 hard copies and diskettes)

June 30, 1997 : Acceptance notifications

August 10, 1997: Advanced Program

PIERS 1997

Progress in Electromagnetics Research Symposium
July 7 - 11, 1997

Schlumberger-Doll Research
Cambridge, Massachusetts, USA

CALL FOR PAPERS

The Progress in Electromagnetics Research Symposium (PIERS 1997) will be organized by Schlumberger-Doll Research and will be held on July 7 - 11, 1997 at the Royal Sonesta Hotel in Cambridge, Massachusetts, USA.

PIERS provides an international forum for reporting progress and recent advances in the modern development of electromagnetic theory and its applications. Suggested topics are listed below, but consideration will be given to papers on other subjects.

Symposium Organization

PIERS Chairman: Dr. Jin Au Kong, Room 26-305, MIT, Cambridge, MA 02139, USA

PIERS 1997 General Chairman: Dr. Brian Clark, Schlumberger-Doll Research, Ridgefield, CT, USA

PIERS 1997 Technical Chairmen:

Dr. Tarek M. Habashy, Schlumberger-Doll Research, Old Quarry Road, Ridgefield, CT 06877-4108, USA,
Tel: (203) 431-5563, Fax: (203) 438-3819, e-mail: habashy@ridgefield.sdr.slb.com

Dr. Michael L. Oristaglio, Schlumberger-Doll Research, Old Quarry Road, Ridgefield, CT 06877-4108, USA,
Tel: (203) 431-5566, Fax: (203) 438-3819, e-mail: oristaglio@ridgefield.sdr.slb.com

PIERS 1997 Symposium Committee: Drs. Gary Brown, Michael Fiddy, Hsiu Han, Ping Lee, Thuy Le Toan, Alain Priou, Carey Rappaport, Robert Shin, Reza Taherian, Leung Tsang, Y. Eric Yang

Suggested Topics

- | | |
|--|--|
| 1 Time-domain electromagnetics and pulses | 15 Millimeter, submillimeter and light waves |
| 2 Inverse scattering | 16 Tropospheric and ionospheric propagation |
| 3 Remote sensing of the earth, ocean and atmosphere | 17 Scintillation |
| 4 Polarimetric radar scattering | 18 Photonics, nonlinear optics and devices |
| 5 Polarimetric passive remote sensing | 19 Interconnects |
| 6 Imaging, tomography, holography | 20 Microstrip and printed antennas |
| 7 Random media, nonlinear media and turbulent media | 21 Antenna theory and measurements |
| 8 Geophysical subsurface probing | 22 Rough surface scattering |
| 9 Scattering and diffraction | 23 Wavelets in electromagnetics |
| 10 Microelectronic integrated circuits | 24 Neural network techniques in electromagnetics |
| 11 Acoustic, ultrasonic and elastic wave propagation | 25 Atmospheric optics |
| 12 Waves in composite and complex media | 26 Superconducting electronics |
| 13 Medical applications and biological effects | 27 Mobile antennas |
| 14 Computational and numerical techniques | 28 Others |

DEADLINE: ONE-PAGE ABSTRACT MUST BE RECEIVED BY DECEMBER 2, 1996

Authors are invited to submit an original (camera ready) and three copies of a one-page abstract of no less than 250 words. The abstract should explain clearly the content and relevance of the proposed contribution. No acknowledgments should be included. Your cover letter should include the complete mailing address, telephone, fax number, and e-mail address (if available) for the corresponding author. Please mail abstracts - do not send via facsimile. If possible, please also submit an electronic copy by e-mail (ASCII - plain text) to piers97@ridgefield.sdr.slb.com. The abstract deadline is December 2, 1996. Each presenting author is limited to presenting no more than three papers.

PIERS 1997

Progress in Electromagnetics Research Symposium
July 7 - 11, 1997

Schlumberger-Doll Research
Cambridge, Massachusetts, USA

Abstract guidelines: Abstracts are to be submitted in the English language, typed on one single-spaced 8.5 x 11 inch paper. Please use 12 point Times Roman or an equivalent serif typeface, set all margins to 25 mm (1 inch), set paragraph indentation to 3.5 mm (0.14 inch). Type title in bold, centered at the top. Below title, center name of author(s) with affiliation and complete mailing address. Left and right justify is recommended. On the reverse side of the original and all copies, please indicate (in PENCIL) the topic number for the area in which the paper should be placed (see topic list) or the name of the session organizer, if applicable.

ACCEPTANCE NOTIFICATION BY JANUARY 31, 1997 PRESENTING AUTHOR MUST PRE-REGISTER BY MARCH 7, 1997

Acceptance notification will be mailed to the corresponding author of the submitted paper by January 31, 1997. Each presenting author is required to register in advance by March 7, 1997. A non-refundable pre-registration fee of US \$250 must be sent in by March 7, 1997.

Abstract(s) and inquiries should be directed to:

T.M. Habashy

or

M.L. Oristaglio

Tel: (203) 431-5563

Tel: (203) 431-5566

e-mail: habashy@ridgefield.sdr.slb.com

e-mail: oristaglio@ridgefield.sdr.slb.com

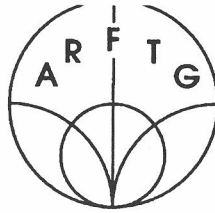
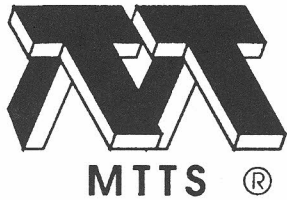
Schlumberger-Doll Research, Old Quarry Road, Ridgefield, CT 06877-4108, USA

Fax: (203) 438-3819

ADVANCE PROGRAM AND INFORMATION WILL BE SENT BY APRIL 18, 1997

Registration: Travel, lodging, registration and local information will be mailed with the Advance Program by April 18, 1997. The advance registration fee for all participants including session chairpersons and authors is US\$250 if payment is received before May 30, 1997. After this date and during the meeting, the registration fee will be increased to US\$300. The fee includes the Symposium program and proceedings, attendance at all technical sessions, refreshments and the opening reception.

Updated information will be posted on the World Wide Web: <http://www.piers.org/>



AUTOMATIC RF TECHNIQUES GROUP

**48th ARFTG Conference
ARFTG/NIST Measurement Short Course
Clearwater, Florida, Dec 3-4, 5-6, 1996**

Preliminary Conference Schedule

Tuesday, December 3

Measurement Short Course Day 1 08:00-17:00

Wednesday, December 4

Measurement Short Course Day 2 08:00-17:00

Thursday, December 5

Registration 07:30-16:00

Exhibits 07:30-17:00

Continental Breakfast 07:30-09:00

Technical Session 08:00-12:00

Lunch and Awards 12:00-13:30

Technical Session 13:30-15:15

Business Meeting 15:15-16:00

Technical Session 16:00-17:00

On the Beach Barefoot Banquet 18:00-22:00

Friday, December 6

Registration 08:00-12:00

Exhibits 08:00-15:00

Continental Breakfast 08:00-09:00

Technical Session 09:00-12:00

Lunch 12:00-13:30

Technical Session 13:30-16:00

Registration

Pre-Registration is encouraged for the conference and mandatory for the short course. Please complete the registration form and mail with payment or visit the web site and register via E-mail by November 8, 1996. The non-member fee includes membership (or membership renewal) in ARFTG for one year. Your address label indicates your status.

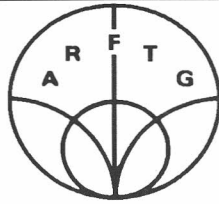
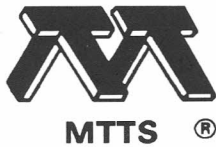
Hotel Reservations

A special room rate of \$85.00 is set for the conference. A limited number of government rate rooms are available. A registration form is included with the mailing. *If you reserve by phone, please indicate attendance with ARFTG/Measurement Shortcourse with your reservation. Reservations must be made by November 7, to guarantee room and rate availability.*

Radisson Suite Resort on Sand Key
1201 Gulf Blvd, Clearwater, FL 34630
(813) 596-1100

Selected Sample Papers

- Highly Accurate Techniques to Measure SNR and Phase of Non-Linear Amplifiers
- A New Method for Noise Figure Measurements of the Low Noise SATV Converter
- On the Deembedding of RF High Power Transistor Parameters
- Development of Microwave Plastic Package Characterization Techniques
- Impedance Controlled Test Fixture for Multi-pin Surface Mount MMICS
- 75Watt MOSFET I-V Characterization Using an Isothermal Measurement System
- Application of Time Domain Measurement and Characterization to the Modeling of Leadframes of Plastic Packages for RFIC Devices.



AUTOMATIC RF TECHNIQUES GROUP

ADVANCE CALL FOR PAPERS 49th Conference Denver, Colorado June 13, 1997

Conference Chair
Roger Marks
NIST, Mail Code 813.06
325 Broadway
Boulder, CO 80303
1-303-497-3037
1-303-497-7828 (fax)
r.b.marks@ieee.org

Exhibits Chair
Michael Fennelly
ATN Microwave Inc.
11 Executive Park Drive
Billerica, MA 01862
1-508-667 4200 x18
1-508-667-8548 (fax)

Executive Committee
Kevin Kerwin, President
Hewlett-Packard Company

Ken Wong, Vice-President
Hewlett-Packard Company

Bill Pastori, Treasurer
Maury Microwave Corp.

Patrick Nolan, Secretary
Lockheed Martin Company

Henry Burger
HB Engineers

Harmon Banning
W.L. Gore & Associates

John T. Barr IV
Hewlett-Packard Company

Michael Fennelly
ATN Microwave, Inc.

Edward Godshalk
Tektronix, Inc.

Robert Judish
NIST

Roger Marks
NIST

Gary Simpson
Maury Microwave Corp.

Raymond W. Tucker
Rome Laboratory

Characterization of Broadband Telecommunications Components

In conjunction with the International Microwave Symposium, the Automatic RF Techniques Group will hold its 49th Conference at the landmark Brown Palace Hotel in Denver, Colorado on Friday, June 13, 1997. The conference technical theme is "Characterization of Broadband Telecommunications Components."

Telephone and cable television service providers are converging in their efforts to provide high-bandwidth, two-way, full-service networks to homes and businesses. Much of the infrastructure is based on coaxial cable, while many proposals are completely or partially wireless. All of these networks require RF components of exceedingly high performance.

The Conference's Keynote Speaker, Syd Fluck of HP/CaLan, will open the meeting with an address entitled "RF Measurements for Broadband Networks." We solicit additional original papers, particularly on the topics of:

- components for coaxial and hybrid fiber/coax telecommunications networks
- LMDS and MMDS systems and components
- wireless local loop
- PCS over cable
- cable telephony

We are especially interested in test requirements and methods, test equipment, and performance results. Measurements of interest include frequency response, group delay, distortion (including composite triple beat and composite second order), ingress, interference, carrier-to-noise ratio, in-channel response, and adjacent channel power. Characterization of digital modulation in terms of error vector magnitude and bit error rate is also of interest.

Papers are also invited in other areas of automated microwave and RF measurements, including network analysis, noise, nonlinear characterization, calibration, and on-wafer measurements.

Presentations should be informal, 20 minute talks using view graphs or 35 mm slides. Authors are requested to submit three copies each of a one page abstract and a 500 to 1000 word summary, including illustrations, to allow evaluation with regard to the interests of the participants and the quality and novelty of the work. This submittal may be made to the Conference Chair no later than **March 14, 1997**. Final deadline for full camera ready papers is April 25, 1997. Additional information can be obtained from the Conference Chair.

For information on an outstanding exhibition opportunity, please contact the Exhibits Chair.

<http://www.boulder.nist.gov/ims/arftg>

[Organizing Committee]
Co-Chairperson
 T. Itoh
 UCLA

Co-Chairperson
 R. T. Kemerley
 Wright-Patterson AFB

Co-Chairperson
 M. Akaike
 Science Univ. of Tokyo

**Technical Program
 Chairperson**
 Y. Takayama
 NEC

Co-chairperson
 R. Treu
 Case Western Reserve Univ.

Editors Proceedings
 J. W. Mink
 NCSU

Transactions
 J. Haroey
 ARO

Local Arrangements
 T. Uchida
 National Defense Academy

Sponsor Coordination
 S. Fujishiro
 AFOSR/AOARD

Publicity
 R. T. Kemerley
 Wright-Patterson AFB

Publicity
 Y. Nikawa
 National Defense Academy

Finance
 M. Akaike
 Science Univ. of Tokyo

Finance
 T. Hashimoto
 Tokyo Engineering Univ.

Committee Members
 A. Iida
 Mitsubishi

O. Ishida
 Mitsubishi

K. Joshin
 Fujitsu Laboratories

H. Kondoh
 Hitachi

T. Manabe
 CRL

K. Mizuno
 Tohoku University

M. Nakajima
 Tokimec

K. Ohata
 NEC

N. Okubo
 Fujitsu Laboratories

Y. Takimoto
 NECREL

S. Watanabe
 Toshiba

**Advisory Committee
 Chairperson**
 Y. Yasuoka
 National Defense Academy

Co-chairperson
 H. Wittmann
 AFOSR



Call for Papers



1997 Topical Symposium on Millimeter Waves July 7-8, 1997, Shonan Village Center, Hayama, Kanagawa, Japan

The 1997 Topical Symposium on Millimeter Waves will be held at Shonan Village Center, Hayama, Kanagawa, Japan in July 7 and 8, 1997. This symposium will bring together an international group of engineers and scientists in the emerging field of millimeter waves and its applications in broad areas such as wireless systems, communications, and remote sensing.

This symposium is scheduled to be held for two days under technical co-sponsorship of IEEE MTT-S, cooperative sponsorship of IEICE and sponsorship of the Asian Office of Aerospace R&D/US AFOSR (AFOSR/AOARD).

[SCOPE]

The symposium will focus on the following specific areas:

1. Millimeter-wave device and circuit technology
2. Automotive radars and remote sensing
3. Millimeter-wave communications
4. Light-wave and millimeter-wave integration
5. Supporting and related technologies

[Partial List of Expected Invited speakers]

T. Yoneyama (Tohoku Univ.), H. Meinel (Daimler Benz AG), W. Menzel (Univ. Ulm), K. Mizuno (Tohoku Univ.), Y. Takimoto (NECREL), Y. Ito (Mitsubishi Electric Corp.), T. Tokumitsu (NTT).

[Preparation of Extended Abstract]

Original papers must be written on A4-size or U.S. letter-size papers within 17 cm x 24 cm. The title of the paper, authors name(s), affiliation(s), complete return address, telephone number, fax number and e-mail address (if available) must appear at the top of the first page followed by a 35-word summary. Clearly prepared tables, line drawings, and photographs can be included anywhere within the 2-page limit.

The submitted extended abstract of accepted paper will appear in the technical digest. Texts and illustrations exceeding the 17cm x 24cm area limit on each sheet may not be printed in the technical digest. Abstracts exceeding the 2-page limit will not be accepted for review.

[Submission of Extended Abstract]

Original and six copies of extended abstract should be sent by January 15, 1997 to:

Dr. Yoichiro Takayama
 c/o Realize Inc.
 4-1-4, Hongo, Bunkyo-ku
 Tokyo 113, Japan

Receipt and notification will be sent to the first author, unless otherwise instructed. Submitted abstract will not be returned to the authors. The disposition of the extended abstract will be informed about March 1, 1997.

[Proceedings]

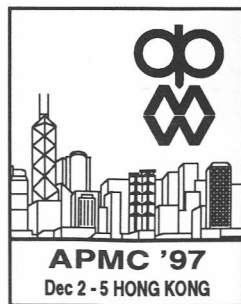
Proceedings for the symposium will be published and mailed to the attendees. The authors of the accepted abstracts will be asked to submit a 4 to 6 page manuscript. The format and detailed manuscript instructions will be sent to the authors along with the notices of acceptance of their extended abstract.

A mini-special issue of the IEEE Transactions on Microwave Theory and Techniques consisting of expanded versions of selected papers from the symposium is being planned.

For more information, please contact the Secretary:

S. Watanabe (Toshiba), c/o Realize Inc.
 Tel: +81-3-3815-8511/Fax: +81-3-3815-8529

Email: rlz@ppp.bekkoame.or.jp or watanab@kakuma.komukai.toshiba.co.jp
<http://www.cc.nda.ac.jp/~nikawa/tsmw97/home.html>



APMC '97

1997 Asia-Pacific Microwave Conference

December 2 - 5, Hong Kong, PRC
Telecommunications Research Centre, City University of Hong Kong

FIRST CALL FOR PAPERS

The 1997 Asia-Pacific Microwave Conference (APMC '97) will be held in Hong Kong on the campus of the City University of Hong Kong on December 2 - 5, 1997. This conference is organized and sponsored by the Telecommunications Research Centre at the City University of Hong Kong and is cooperatively sponsored by IEEE Hong Kong MTT/AP/LEO Chapter and IEEE MTT-S.

CONFERENCE TOPICS

Suggested topics are as follows:

- | | |
|--|--|
| 1. Computational Electromagnetics | 14. Microwave Antennas |
| 2. Computer Aided Design | 15. Microwave Industrial Application |
| 3. Electromagnetic Field Theory | 16. Microwave Measurement |
| 4. EMC/EMI | 17. Microwave-Optical Interactions |
| 5. Ferrite Devices | 18. Microwave Superconductivity |
| 6. Guided Waves | 19. MMIC and GaAs Technology |
| 7. High-Power Devices and Techniques | 20. Mobile Communication Systems |
| 8. High Speed Digital Circuits | 21. Optical Devices and Systems |
| 9. Low-Noise Devices and Techniques | 22. Opto-Electronic Techniques |
| 10. Medical/Biological Applications | 23. Phased and Active Array Techniques |
| 11. Microstrip and Planar Antennas | 24. Remote Sensing |
| 12. Microwave Acoustics | 25. RF Circuits and Devices |
| 13. Microwave and Millimeter Wave
Communication Systems | 26. Scattering and Propagation |
| | 27. Solid State Devices and Circuits |

Submission Guidelines: Authors are invited to submit

- Five copies of a 30 - 50 word abstract on a single separate sheet. This sheet should indicate the title and author(s) of the paper.
- Five copies of a 800 - 1000 word summary with supporting illustrations not more than 4 pages. The title and author's name(s) should be on the front page of each copy.
- A separate sheet with the complete mailing address (and FAX number and E-mail address, as appropriate) of the author and a statement specifying the most appropriate topic from the preceding list.

Time Table:

Paper Submission Deadline:

May 1, 1997

Notification of Acceptance:

July 1, 1997

Camera-Ready Manuscript Deadline:

September 1, 1997

Mail to:

Prof. K. K. Mei

Chairperson, Technical Program Committee

Telecommunications Research Centre

City University of Hong Kong

83 Tat Chee Avenue, Kowloon

Hong Kong

Fax: (852) 2778-1711 or (852) 2788-7189

E-mail: eekmei@cityu.edu.hk

ANNOUNCEMENT AND CALL FOR PAPERS

IEEE AP/MTT-S
Philadelphia Section



15th ANNUAL BENJAMIN FRANKLIN SYMPOSIUM on Antenna and Microwave Technology

The Philadelphia Chapter of the IEEE AP/MTT-S will hold the 15th Annual Benjamin Franklin Symposium on Friday, May 2, 1996 from 8:30 AM to 5:00 PM. This one-day symposium will consist of two sessions:

Morning Session: Interactive Session of contributed papers and a Plenary Session of invited Papers.

Afternoon Session: Parallel Sessions of contributed papers on all theoretical and applied work related to **Antennas, Propagation, Microwaves and Photonics.**

Place: The Franklin Institute, 20th Street and the Benjamin Franklin Parkway, Philadelphia, PA 19103 (rooms available at the Korman Suites Hotel)

Papers: Authors are invited to submit papers in any of the above fields. Please send a camera-ready summary (one to four 8.5" x 11" pages, one inch margins, without page numbers) by **March 1, 1996** to: Dr. Bill Jemison, Dept of Electrical Engineering, Lafayette College, Easton, PA 18042

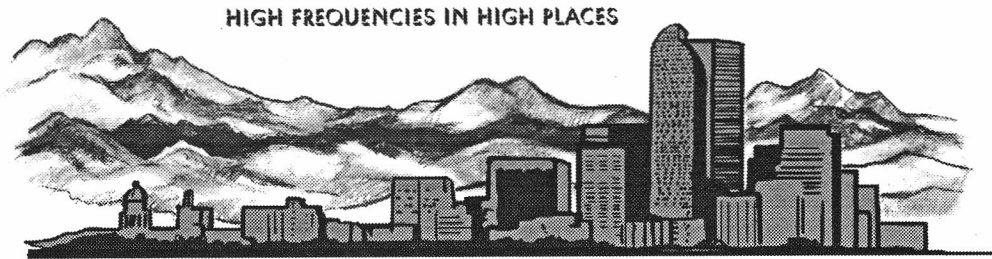
Registration

	<u>Members</u>	<u>Non-members</u>
by April 18	\$75 _____	\$90 _____
after April 18	\$85 _____	\$100 _____
at the door	\$85 _____	\$100 _____
Students	\$35 _____	\$50 _____

Total registration fees _____

Mail registration fees to IEEE Philadelphia Section, Moore School of EE, University of Pennsylvania, Philadelphia, PA 19104.

For further information: Please call William Jemison at (610) 250-5425 (w.d.jemison@ieee.org) or Eric Holzman at (609) 722-2968 (eholzman@motown.lmco.com).



1997 IEEE MTT-S INTERNATIONAL MICROWAVE SYMPOSIUM
DENVER, COLORADO



JUNE 8-13, 1997

Join us for the 1997 IEEE MTT-S International Microwave Symposium at Denver's Colorado Convention Center!

The World's Largest RF/Microwave Symposium

- ✓ Technical Sessions, 26 Workshops, 5 Panel Sessions, and a Rump Session.
- ✓ Plenary Session featuring two pioneers in the new wireless infrastructures of PCS and LMDS.
- ✓ Digest available on CD-ROM.

Radio Frequency Integrated Circuit (RFIC) Symposium

The RFIC Symposium is a new version of the previous MMWMC Symposium and will focus on highly integrated IC's or subsystems that include RF functions at any frequency. June 8-10, 1997.

49th Automatic RF Techniques Group (ARFTG) Conference

This year's meeting will focus on cable, cellular, and microwave television with the theme *Characterization of Broadband Telecommunications Components*. June 13, 1997.

Microwave Application and Product Seminars (μ APS)

These product-oriented seminars provide a great opportunity for exhibitors to address a technical audience, and offer attendees practical information they need.

Guest Program Tours

A variety of guest outings including urban walking tours and motorcoach excursions to the Rocky Mountains.

Microwave Journal/MTT-S Reception

We will have the entire Denver Museum of Natural History, with everything from dinosaurs to IMAX. Great mountain views, too.

For more information on this event, visit the MTT-S Home Page at

<http://www.ieee.org/mtt/mtt.html>

In This Issue

- | | |
|---|--|
| <p>1 Welcome from the 45th MTT President
R. E. "Skip" Bryan</p> <p>2 MTT Society Ombudsman
Ed Niehenke</p> <p>4 IEEE Division IV - Electromagnetics and Radiation
Rolf Jansen</p> <p>6 STAR Program Encourages Young Women to Consider Engineering Field
Julia Brown</p> <p>8 MTT-S AdCom Nominations
Reynold Kagiwada</p> <p>9 Distinguished Microwave Lecturers for 1996-1997</p> <p>13 Newly Elected AdCom Members</p> <p>16 ARFTG Highlights — Winter '96
John T. Barr, IV</p> <p>20 Completion of Phase I
Rolf Jansen</p> <p>21 Summary of the Divisions I and IV Region 8 Chapters Meeting</p> <p>26 Membership Services Committee
Ed Rezek</p> <p>27 MTT Forms New Technical Committee on Wireless Communications</p> <p>28 Region 8 MTT-S Chapter Activity Reports
Jozef Modelski</p> <p>35 Activities of South Australia in 1996
A. J. Parfitt</p> | <p>36 Region 10 Chapter Activity Reports (Part 1)</p> <p>40 Calendar MTT-S Sponsored Conferences</p> <p>51 The Asia Pacific Microwave Conference
Kenneth K. Mei</p> <p>52 MTT-18 — Microwave Superconductivity: "Cold is Better"
M. Nisenoff, Guo-Chung Liang</p> <p>54 Education Committee Gears Up for the 1996-1997 Academic Year
Denis Webb</p> <p>55 MTT-S Emphasizes Inclusion of HF and VHF</p> <p>56 My Personal Recollections of Microwaves
Kaneyuki Kurokawa</p> <p>69 Quiet Ending of an Old Wireless Transmission Station
Eikichi Yamashita</p> <p>72 Upgrading to New Facilities: Potential and Unsolved Problems at Joint MTT Chapter, Novosibirsk, Russia
Boris Kapilevich</p> <p>75 Handbook for Preparing Engineering Documents: From Concept to Completion
Herbert B. Michaelson</p> <p>77 MIKON'96
Tatsuo Itoh</p> <p>78 International Workshop on Finite Engineering</p> <p>79 Announcements and Calls for Papers</p> |
|---|--|



THE INSTITUTE OF
ELECTRICAL AND
ELECTRONICS
ENGINEERS, INC.

445 Hoes Lane
PO Box 1331
Piscataway, NJ 08855-1331

Non-Profit Organization
U.S. Postage
PAID
PERMIT NO. 52
PISCATAWAY, NJ

Third Class