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ROBERT D. GOLDBLUM, *Editor*

VP'S COMMENTS ON SOCIETY PLANS

by **WARREN A. KESSELMAN, VP EMCS**

Where should your Board of Directors (BoD) be heading? I'm sure that many of you will jump at an appropriate humorous answer to that question. In a more serious mode, I'd like to tell you about the BoD plans that are based on your written comments to that question.

Attendees at our society's annual symposium are requested to fill out a questionnaire that is intended to facilitate member feedback to your elected BoD. The Board thanks those of you who took the time to complete the questionnaires, and they did give serious consideration to all comments.

Planning and goal setting within a group of eighteen volunteers is not an easy task but I persevered and your Board unanimously adopted a set of generic goals on which to focus near-term objectives. The long term goals are: PROMOTE EMC AWARENESS, SUPPORT EDUCATION, ENCOURAGE APPLIED EMC PRACTICES, INCREASE MEMBERSHIP, UPDATE MANUALS/POLICY, AND PROMOTE DEVELOPMENT OF FUTURE EMC LEADERS. Those six goals probably will remain for many years. The 42 near-term objectives adopted, however, will be under continuous review and

update. Examples of the 42 objectives are actions such as: disseminate EMC videos to Sections, other Societies and Public TV channels; support EMC sessions at other society symposia; extend the Distinguished Lecturer Program to non-EMC Chapters; publicize in trade magazines; support annual student papers contest; print a college level "experiments" manual; publish one EMC-oriented IEEE Press book per year; continue an aggressive EMC Standards Program; assist Chapters in communicating importance of EMC's participation to local business managers; develop Chapter Chairperson handbook; and establish leadership succession program.

To put commitment into "The Plan," Technical Directors and the Executive Committee accepted (with some arm twisting) responsibility for providing leadership on specific objectives. Now comes your part. We have a plan, we have assigned leadership, but who are the doers? If you want to be involved in implementing the plans resulting from your comments to the BoD, please speak to your Chapter Chairperson. Or if you desire to contact the BoD, send me a note (31 Hope Road, Tinton Falls, NJ 07724) and I'll pass it to the appropriate Board member.

NEWLY ELECTED IEEE FELLOWS

Three members of the IEEE EMC Society have been elected IEEE Fellows (as of January 1, 1993).

Mr. John W. Adams

1425 Gillaspie Drive
Boulder, CO 80303

For contributions to the development of standards for measuring the electromagnetic shielding effectiveness of planar materials.

Mr. Donald E. Clark

4086 Shady Circle
Lilburn, GA 30247

For contributions to electromagnetic compatibility in military systems.

Mr. L. Arthur Wall, Jr.

10651 Breezewood Drive
Woodstock, MD 21163

For contributions and leadership in the development of electromagnetic compatibility (EMC) standards and measurement methods for computers and radio frequency devices.

Congratulations and best wishes to our esteemed colleagues!

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IEEE NEWSLETTER PUBLICATION SCHEDULE

PUBLICATION DATES

May
August
November
February

EDITORIAL DEADLINES

March 15
June 15
September 15
December 15

Editorial contributions for the May 93 issue should be received by March 15.

BACK ISSUES OF THE EMC NEWSLETTERS ON MICROFICHE

We still have a few sets of the uFiche copies of the back issues of the IEEE EMC Society Newsletters from the present to 1955 when it was called "Quasies and Peaks." The price is \$25.00 postpaid. If you would like to have one of these sets you can order it from: Dr. Chester L. Smith, EMC Society Historian, 2 Jonathan Lane, Bedford, MA 01730.

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H.R. HOFMANN
PRESIDENT, EMC SOCIETY

It was an honor to be re-elected Society President by the Board of Directors at the November board meeting. The Society can be no stronger than the members, and I will continue to try to lead the Society in a manner which will serve the interests of the members in every possible way. The full results of the elections at the November Board meeting are included in Don Heirman's report which begins on page 5 of this newsletter.

I would like to welcome Andrew Podgorski and Dan Hoolihan as newly elected Directors-at-Large, and thank the outgoing Board and Director members for their contributions to the Society over the past several years.

Joe Butler has served as an elected Director-at-Large for the past 3 years, and will continue as Assistant Director of Technical Services and also as chairman of the Representative Advisory Committee. Although Walt McKerchar is also formally leaving the Board as an elected Director-at-Large, he will be continuing as our Professional Services Director. Gene Cory, our outgoing Communications Services Director, is continuing to act as Symposia and Conference Committee chairman.

Income from dues and transactions, and healthy surpluses from our

annual symposia have allowed us to fully fund our activities on behalf of our members. Symposia records have been sent to all attendees except student members, and will continue to be sent unless the BoD changes its policy. The number of Transactions papers remains at a high level, and the Newsletter has a number of changes planned which should make it even more interesting.

Our Distinguished Lecturer program is fully operational, and Chapter Angels are available to help individual chapters with specific problems. We added two new chapters in 1992 in Austria and Northwest Florida. We now have a total of 35 chapters, 25 based in the United States and 10 throughout the rest of the world. Several more chapters are in the formative stage. Our overall membership growth the past year is slightly above 3 percent.

A planning committee, led by Vice-President Warren Kesselman, in conjunction with the entire Board, has developed a list of short-term and long-term goals for the Board. Actions of the various boards and committees will be reviewed against these goals to ensure that the actions of the Board are in concert with the approved goals. The contributions of all of the boards and committees is what makes the Society work.

The Board and I are anxious to hear from our members. We specifically solicit feedback during the Symposia using the questionnaire, but would appreciate hearing from any Society member at any time. The Board must have your input if we are to run the Society the way you want it to be run. Please let us hear from you. Our names, addresses and telephone numbers are listed on page 18 of this issue of the newsletter.

PRESIDENT'S MEMORIAL AWARD FUND

The President's Memorial Award, our Society's most prestigious award, honors the memory of a recently deceased Society member by granting a scholarship of up to \$2000 to a worthy graduate or undergraduate studying in an EMC-related technical field.

The Society encourages contributions to this fund, and hopes to establish an endowment of \$20,000 by this year so that it can fully fund the awards in future years.

Potential donors who have any questions about the Memorial Award and fund should contact H. R. Hofmann at 708-979-3627.

MEMORIAL FUND CONTRIBUTOR

Many thanks to Haefely Test Systems for their recent contribution to the President's Memorial Award.

ENRICH OUR LEGACY

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**Contribute to
the President's
Memorial
Award Fund**



TODD HUBING
ASSOCIATE EDITOR

By the time you receive this newsletter, I hope to have attended my first IEEE EMC chapter meeting. I plan to make the 1600-mile trip from Rolla, Missouri to Santa Clara, California in order to hear Mr. Lee Hill give a presentation on multilayer printed circuit board decoupling. Lee is a graduate student at the University of Missouri-Rolla with several years experience in EMC. He is putting himself through school by running his own consulting business. I'm looking forward to his presentation.

Many thanks to Janet O'Neil and John Clarke for providing the information on the activities of the Los Angeles and Central New England chapters. My call for input from more chapters in the last issue appeared too late to result in a flood of new contributions to this issue. But now that everyone is aware of just how easy it is to contribute to this column, there is no reason that we can't hear from every chapter.

Contributions to this column can take many forms. You can e-mail a few lines that mention a meeting date, speaker and topic. You can fax a copy of a meeting announcement or minutes. You can send an abstract of a talk, your thoughts on a topic, your thoughts on a speaker, or just your thoughts. If you want to ensure that the article is well-written and exciting as well as informative, you can send me the complete text (and maybe even a picture) like Janet O'Neil did for this issue.

CENTRAL NEW ENGLAND

Franklin Fisher of Lightning Technologies, Inc. was the speaker at the November meeting of the Central New England chapter. The title of his presentation was "Lightning Effects and Protection of Electronic Systems." Electronic systems, subsystems or enclosures can become indirect recipients of lightning strikes occurring some distance away from their operational location; however, with proper protection, the equipment can survive and continue to function normally in the lightning environment. Mr. Fisher's fascinating presentation provided an extensive tutorial on lightning and its related phenomena. Methods of protection were also covered in considerable detail.

LOS ANGELES

The Los Angeles Chapter of the EMC Society featured Dr. Magdy Iskander of the University of Utah for its October meeting. Many from the local EMC and educational communities attended despite the conflict of presidential debates and the World Series. Dr. Iskander is a Professor of Electrical Engineering at the University of Utah and the Director of the National Science

Foundation/IEEE Center for Computer Applications in Electromagnetic Education, more popularly known as CAEME. Dr. Iskander's presentation summarized CAEME activities including a rousing demonstration of their EMC software. Several universities including MIT, University of Iowa, University of Mississippi, Syracuse University, University of California at Davis, the University of Utah and many others, participated in writing software on such topics as EM waves, transmission lines, waveguides, antennas, and numerical techniques. Oohs and ahs were heard throughout the audience in response to the incredible graphics displayed. One engineer commented, "I wish I had this software when I was in college," while another stated, "It would have been nice to have this information in my early days as a design engineer."

The highlight of the evening was a software "quiz" to test one's knowledge of the EMC topics presented. If a question was answered incorrectly, a loud "gong" was heard. After many such gongs, the Los Angeles chapter answered all

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Pictured left to right are Gurdip Saran, Vice Chairman of the Los Angeles Chapter, Ray Adams, Chairman of the Los Angeles Chapter, and Dr. Magdy Iskander, who is visibly pleased that his presentation was so well accepted.



DON HEIRMAN
ASSOCIATE EDITOR

The last EMCS Board of Directors meeting for 1992 was held on November 9-10, at the Atlanta Marriott Marquis, the site of our 1995 EMCS International Symposium. The meeting was called to order at 1 PM by President Bob Hofmann. Board members present were John Adams, Ed Bronaugh, Joe Butler, Don Clark, Gene Cory, Hugh Denny, Bill Gjertson, Don Heirman, Bob Hofmann, Dan Hoolihan, Warren Kesselman, Walt McKerchar, Herb Mertel, Al Mills, Janet O'Neil, Henry Ott, and newly-elected Andy Podgorski. Board members absent included Prof. Akao, Pat Coles, Dick Ford, Bob Goldblum, Dave Staggs and Don Weber.

The minutes of the August 17 and 20 meetings were presented by Secretary O'Neil and were then approved by the BoD. President Hofmann and Secretary O'Neil presented Treasurer Ford's report that showed that through August of 1992, our Society's net worth was approximately \$480K with about \$250K of that being invested in the IEEE's long term investment program.

Director Dan Hoolihan (Member Services) presented several reports. Membership (Pat Coles) reports that as of September 30, 1992, our EMCS had 3923 active members which is a 3% increase over last year's September totals. Our senior membership is up by 10% over the same period. There was no report from the Fellows Evaluation and

Search Committees. Ed Bronaugh then indicated the results of the BoD election for the term January 1, 1993 through December 31, 1995. The elected Board members are:

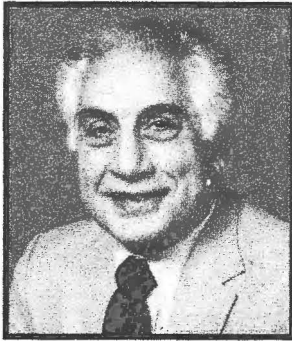
Dan Hoolihan
Dave Staggs
Bob Hofmann
Pat Coles
Warren Kesselman
Andrew Podgorski

John Adams (Distinguished Lecturer Program) is re-establishing the criteria for selection of distinguished lecturers. He will be contacting former lecturers to see if they also want to be included in the DLP pool available for EMC chapters and even non EMC-oriented audiences. John is also working with the Education Committee to complement their lecture program. In any case, there is a wealth of lecture resources available for our membership. For more information call John on 303-497-3328. Director Hoolihan then distributed Dave Staggs' (Chapter Coordinator) Chapter Chairman's Handbook draft. The Board approved the draft which will now be published by the time you receive this Newsletter. Copies are available from Dave on 512-343-3751.

Director Gene Cory (Communication Services) reviewed several reports from his chairmen. Chester Smith (History Committee) is moving forward on microfilming past EMCS conference and symposia records. Bob Goldblum (Newsletter Editor) reported that the next Newsletter is proceeding on time and that all payment issues raised by the IEEE have been resolved. Hugh Denny (IEEE Press Liaison) requested help from EMCS members to have original work on EMC topics published. Herb Mertel suggested the work in preparing the Worldwide EMC Standards Special Session to be presented in March at the Zurich Symposium be considered. Contact Hugh with ideas on 404-894-3522. Gene

presented an update on our future symposium plans. The Cherry Hill 1991 Symposium results are final. A surplus of \$80,384.04 was earned by the 1991 symposium committee. Gene noted that Denver has been accepted as the site of the 1998 symposium while Seattle will host the next year's event in 1999.

Director Walt McKerchar (Professional Services) introduced his chairs. Bruce Gjertson (Public Relations) indicated the work he and Greg Abernathy are doing to further promote the use of our EMCS logo. They are interested in reaching student members with information on the EMC Society. Herb Mertel (Transnational Committee) reported that at the September 1992 Edinburgh EMC Conference, 15 new EMCS members were recruited. He indicated on 8 March, the EMCS will sponsor a special seminar on Worldwide EMC Standards at the Zurich EMC Symposium and Technical Exhibition. Bob Hofmann, Don Heirman, Dan Hoolihan, Ed Bronaugh, and Herb Mertel will present papers on the subject. Herb also mentioned that he now has a complete list of contents for most major EMC international symposia (China, France, India, Israel, Japan, Poland, Sweden, Switzerland, and the United Kingdom). For these contacts call Herb on 619-578-1400. Al Mills (PACE) has available a recent workshop summary covering competitiveness, technology policy, mobile pensions, and new careers for engineers. For more info, call Al on 619-578-1480. Walt McKerchar indicated that he will be working with Bill Johnson and Dick Ford to prepare a proposal on a better way to conduct employment analysis and member feedback surveys. It is hoped that the new progress will be ready for the Dallas symposium. Bob Brook (SSIT) was asked to present the EMC impact of the work in the Society of the Social Impact of Technology.



ANTHONY ZIMBALATTI
ASSOCIATE EDITOR

MIL-STD-461C & MIL-STD-462 PROPOSED DRAFT REVISIONS CS-03, CS-04, CS-05 REQUIREMENTS

It is unnecessary, wrong-headed and counterproductive to delete the subject requirements from the proposed draft revisions of the subject standards. These military (MIL) standards (STDs) delineate requirements for controlling the radiated, conducted, emission and susceptibility electromagnetic compatibility (EMC) characteristics of equipment procured for the U.S. military. MIL-STD-461C requirements control the permissible types and levels of these characteristics. MIL-STD-462 requirements control the methods and conditions for measuring these characteristics. The CS-03, CS-04 and CS-05 requirements of these standards apply to equipment antenna terminals, conducted susceptibility, EMC characteristics, respectively named intermodulation, rejection of undesired signals, and cross modulation.

Let's discuss the proper method for determining the requirements for controlling equipment EMC characteristics that are to be delineated in the EMC paragraphs of Equipment Procurement Documents. These requirements derive from an EMC Equipment Requirement Adequacy Analysis. This analysis identifies the nature and extent of the need, if any, for controlling any of the EMC characteristics of the subject standards. Also identified is the

need for controlling EMC characteristics other than those delineated in the subject standards. Requirement adequacy is obtained by developing narrative for modifying, augmenting, clarifying, or deleting any unneeded requirement of the subject standards. Those characteristics needing control and associative narrative comprise the requirements that are to be delineated in the EMC paragraphs of equipment procurement documents. Given the commitment to using standards, those EMC paragraphs will require compliance to the subject standards, as amended by the associative narrative, if the need exists for such narrative.

Imagine what happens if the proposed revised standards do not delineate CS-03, CS-04 and CS-05 requirements. This would exclude from the EMC Equipment Requirement Adequacy Analysis the ability to determine the need for these requirements. Consequently, these requirements will not appear in the equipment procurement documents. After contract award this omission would exclude from the Initial Equipment Design EMC Analysis aspects such as identifying the impact of these requirements on equipment design, costing, and EMC related effort. This could be unfortunate if later determinations identified some need for any of these requirements. This is a likely occurrence given the history of the need for these requirements, especially for dense equipment configurations. Therefore, it would be egregiously wrong to delete these requirements from the subject revised standards.

Alternatively, imagine the good that happens if the proposed revised standards retained the CS-03, CS-04, CS-05 requirements. This would enable the EMC Equipment Requirement Adequacy Analysis to include identifying the nature and extent of the need for these requirements. This analysis would

clarify or delete any of these requirements. If this analysis revealed no need for these requirements, this could be reflected in the appropriate paragraphs of the procurement documents, thus effecting the same result as deleting the subject requirements from the revised standards. On the other hand, if this analysis revealed a need for a degree of compliance for any of these requirements, this need could be reflected by adding narrative in the appropriate paragraphs of the equipment procurement documents. Consequently, after contract award, the Equipment Design EMC Analysis would include analyzing these needed requirements, thus identifying the impact of these requirements on initial equipment design, costing and EMC related effort. In this way the aforesaid egregious wrong associated with deleting the subject requirements from the revised standards would be avoided.

Finally, imagine this scenario. The revised MIL-STD-461C and MIL-STD-462 standards do not retain CS-03, CS-04 and CS-05 requirements. Persons have identified the need for including these requirements in certain equipment procurement documents. Since the revised standards can no longer provide guidance for specifying these requirements, these persons will be free to create their versions of these requirements! Thus these documents may embrace EMC requirements, limits and test techniques that are strange, incomprehensible, or irresponsible. Multiply this by the number of military procurements incorporating such requirements, and the result will be chaos.

Have you got the point by now? History shows a compelling need for the subject CS-03, CS-04 and CS-05 requirements, especially for densely configured equipment. For example, most of the EMC problems occurring on aircraft result from inadequately

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KIMBALL WILLIAMS
ASSOCIATE EDITOR

EMC EDUCATION MANUAL

At Anaheim, Clayton Paul introduced us to the new "EMC Education Manual" which combines a detailed EMC Course Outline, the EMC Experiments Manual and the EMC Bibliography. This "aid to the establishment of a course in EMC at a university in an EE program" is available upon request from:

Clayton R. Paul
Department of Electrical Eng.
University of Kentucky
Lexington, KY 40506

If you are planning such a course, I can think of no better way to start. Dr. Paul has put all of his years of experience in starting and running his own course at the U of K into this guide book. It should get any new venture in this area off to a solid beginning.

INTERNET

At the Anaheim symposium I suggested that the committee look into the possibility of establishing a communications system on the Internet to permit us to exchange information in digital formats within the committee and the society, and to provide a location where anyone interested could retrieve completed documents.

Todd Hubing volunteered to look into establishing a directory structure on the Internet which can serve as a repository for IEEE EMCS Education Committee materials. He has

provided the network resources and enlisted the aid of one of his students, Puneet Grover, to create the directory structure. The address on the Internet is:

EMCLAB@EE.UMR.EDU.

There is currently one directory, \PUB\IEEE where the first files will be kept.

Early in January the first file, the EMC Bibliography, will be loaded and will be available for anyone who wishes to copy it. As other documents become available, they will be identified here in the newsletter.

SCHOLARSHIP

I want to again remind our readers that the President's Memorial Award scholarship is waiting for a worthy graduate or undergraduate studying in an EMC related technical field. Details of the award and a call for nominations were first-page items in the last issue of the newsletter. If you know of someone who might qualify as a scholarship recipient, please refer to the last issue for details of the submission process, and get that name into the hopper!

EMC PRESENTATIONS

The Distinguished Lecturer Series under the leadership of John Adams continues to provide exciting speakers for IEEE functions. This is one of the best ways to provide an opportunity for a local chapter to hear some of the best speakers in our society. Anyone interested in having a distinguished lecturer speak to their IEEE group should contact:

John Adams
NIST M/S 813.03
Boulder, CO 80303
(303) 497-3328 Fax (303) 497-6665

At the symposium in August, John Mass gave us two EMC presentation

outlines, one directed to engineering students and another suitable for general audiences. John wants to further flesh out the outlines and asked for feedback from members of the committee. I would like to add my voice to request that all EMCS Education committee members look through John's outline and select one section to which you can contribute something. Send your thoughts to John. I am sure that he will welcome any suggestions he receives.

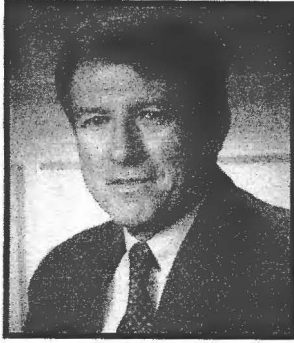
If you were unable to attend the meeting in Anaheim, or did not receive a copy of the Committee minutes, you can request a copy of the outlines from:

John Mass
IBM Dept. 515
Rochester, MN 55901
(507) 252-2426

CAEME

Anyone who did not push through the crowd that always seemed to surround the Computer Aided ElectroMagnetic Education (CAEME) booth at the symposium at Anaheim and talk directly with Magdy Iskander about this unique and valuable educational aid may want to contact Magdy and request a brochure which describes the program. If you are directly involved in teaching Electrical Engineering, CAEME presents an opportunity for student growth that should be explored. Those interested in information on CAEME, or in becoming a sponsor of the program should contact:

Magdy Iskander
Department of Electrical Eng.
University of Utah
3280 Merrill Engineering Building
Salt Lake City, UT 84112
(801) 981-6944



JOSEPH BUTLER
ASSOCIATE EDITOR

SAE AEROSPACE - STANDARDS ACTIVITY

SAE AE-4 Electromagnetic Compatibility

Herb Mertel, SAE AE-4 representative to the Representative Advisory Committee (RAC), reported as follows:

The SAE AE-4 Committee on EMC held their last meeting in Anaheim on 17 August 1992. The future meetings are: May 11, 1993, Allentown, PA; August, 1993, Dallas, TX; Spring, 1994, California; and August, 1994, Chicago. ARP958, Antenna Calibration, was submitted to SAE Aerospace Council for approval. Approval is expected soon. AIR 1255 (Spectrum Analyzer) revision is 95% complete. A draft will be available in 1992. AIR 1499 "Recommendations for Commercial EMC Susceptibility Requirements" was sent to the AE-4 committee for balloting.

SAE AE 4R Radiated Environments

The subcommittee working on the User's Guide to accompany the HIRF Advisory Circular is working to complete their document. A subset of the environment subcommittee will meet in Orlando, Florida in mid-January to continue discussions on the helicopter HIRF certification environment. The RTCA subcommittee 135 continues its work on HIRF related revisions to RTCA/DO-160C Part 20 for avionics radiated susceptibility requirements. A pending revision to DO-160C Part 20 has been proposed to the RTCA parent committee. This revision would establish a radiated test level

environment for essential equipments which would agree with the HIRF Advisory Circular Certification level for essential equipment.

SAE AUTOMOTIVE STANDARDS ACTIVITY

SAE Automotive EMI and EMR Standards Committees

Ed Bronaugh, SAE Automotive EMI and EMR RAC representative, reports as follows:

Work continues on a new J551 to cover whole vehicle emissions and immunity tests and a new J1113 to cover component emissions and immunity tests. The changes in J1113 are also being written into ISO documents, again to assure international harmonization. When the international standards are complete, both SAE documents will contain a statement which says that they are identical to the international documents.

ELECTRONIC INDUSTRIES ASSOCIATION (EIA)

G-46 Electromagnetic Compatibility Committee

John Osborne, EIA G-46 RAC representative reports as follows: The G-46 Committee met in Anaheim during the 1992 IEEE EMC Symposium. The activity of preparation of historical information as a data base for Existing EMI requirements was discussed. After discussion of the Best Practice Document Status, the committee decided to undertake a study of EMI reporting for the CALS system. The next meeting was set for Dallas, at the 1993 EMC Symposium.

IEEE TECHNOLOGY POLICY COUNCIL

Committee on Man and Radiation (COMAR)

Dan Hoolihan, COMAR RAC representative, reports on the following activities:

The final draft of the proposed IEEE entity position statement "Human Exposure to Radio-frequency Fields

from Portable and Mobile Telephones and Other Communications Devices" has been sent out for ballot to the COMAR committee.

Work on the proposed entity position statement concerning safety of High Peak Power Pulse Microwaves is continuing in the committee.

Work within the committee on a new entity position statement, "The Roles of Epidemiology in Evaluating Exposure to ELF Fields as a Potential Human Health Hazard," is proceeding.

The committee's entity position statement "The Safety of Electromagnetic Pulse Simulators" has been approved by the IEEE U.S. Activities Board (USAB) and has been released.

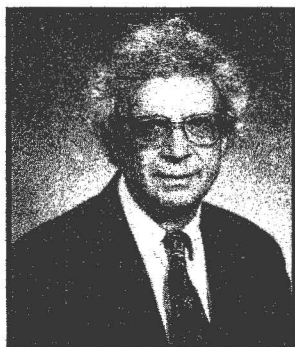
The USAB also approved release of the COMAR white paper on "Medical Applications of Non-ionizing Electromagnetic Fields." The committee is working on a shortened version of this paper for possible publication in IEEE Spectrum Magazine.

Work on the proposed entity position statement, "Human Exposure to Radio-frequency Fields from Portable and Mobile Telephones and Other Communications Devices," continues.

Aerospace Research and Development

Len Carlson, Aerospace R&D RAC representative, reports as follows: On September 14, 1992, the committee was briefed on Space Station Freedom Status by Dr. Richard Rogers, NASA Program Director, and Dr. Robert Phillips, Chief Scientist. The program passed Preliminary Design Review (PDR) in November, 1991, and is currently 30% through Conceptual Design Review (CDR). Plans call for a man-tended station to be assembled in place by December, 1996, and

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MARTIN SCHNEIDER
DIVISION IV
DIRECTOR

ACTIVITIES OF THE NEW TECHNOLOGY DIRECTIONS COMMITTEE

Since the beginning of this year I have worked with Richard Ford on the TAB New Technology Directions Committee (NTDC), whose mission is to identify emerging technologies and distribute information on significant technical advances to our members. Our committee meets every two months at the IEEE Service Center in Piscataway, New Jersey, where we benefit from the active participation of IEEE staff members and have immediate access to existing technical data bases and other relevant information. Our team has been action oriented, which means that we have been focusing our efforts on finding and promoting fields with the strongest prospects for steady economic growth. These technical fields are compiled in our new document entitled *Portfolio of Emerging Technologies* which has been made available to the IEEE Spectrum and a number of IEEE magazines and newsletters. Our publication was reviewed by the IEEE 2002 Task Force of the Transnational Committee whose members were impressed by the quality and content of the document. They recommended distributing it to all IEEE Sections worldwide. If you wish to receive your own copy please give a call to Richard Ford on (202) 767-3440 or dispatch a note to my internet e-mail address: mschneider@ieee.org, or mvs@hoh-1.att.com.

In addition to our work on identifying and promoting new technologies, our committee started a cooperative project with the IEEE Standards Board and its Committee on New Opportunities in Standards (NosCom). More specifically, we submitted a proposal to create a series of documents entitled *IEC/IEEE Emerging Technical Practices and Procedures* which will facilitate the development of new standards. With the help of Jerry Seveck and John Zyskind we already completed two draft versions entitled *Design and Realization of Broadband Transmission Line Matching Networks* and *Measurements and Characterization of Erbium-Doped Amplifiers*. Our proposal was unanimously adopted by the Standards Board as well as by NosCom and NTDC. We expect that the program will receive the support of the IEEE Technical Activities Board and become one of the TAB operating goals in 1993.

HIGHLIGHTS OF THE AUGUST 1992 IEEE BOARD MEETING

The IEEE Board of Directors met in Sparks, Nevada on August 3 and 4, 1992. The meeting was held in conjunction with TAB to enhance interactions between our Society Presidents and members of the major IEEE Councils and Boards. The highlights of the board meeting were as follows:

- A 1992 General Fund deficit of \$505K was anticipated. A \$189K deficit for the 1993 Operating Budget was approved.
- The 1993 membership dues were increased by \$5 to \$78.
- The first 1993 board meeting will be held near Piscataway, New Jersey. The Singapore meeting was canceled.
- Drastic measures were taken to reduce the costs for attending board meetings. IEEE Volunteers and staff people will meet in places which are cost

effective. In addition, alcoholic beverages will no longer be served at IEEE functions.

- A revised IEEE Bylaw which will permit the nomination of one or more candidates for the Office of President-Elect was approved.

The final board meeting in 1992 will be held in Phoenix, Arizona from December 6 to 7. In 1993 the number of meetings will be reduced from four to three. The consensus of our IEEE officers is clearly that costs have to be curtailed and that we have to become more productive.

NEW FACES AT THE TOP

The results of the election of 1993 IEEE officers were announced in November. It was a close race for both the office of President-Elect and the Division IV Director. The new President-Elect of the IEEE is Troy Nagle from the Department of Electrical Engineering at North Carolina State University in Raleigh. He served as Vice President of Technical Activities in 1989-90 and as Division VII Director from 1987-88. With a Ph.D. in Electrical Engineering, an M.D. degree from the University of Miami and a wide range of interests ranging from biomedical instrumentation to classical art, Troy can be considered a true Renaissance man.

Ken Dawson is our new Division Director for 1993-94. His past experience as President of the Nuclear and Plasma Sciences Society and Editor-in-Chief of three NPS Transactions will be a valuable asset in representing our needs and concerns at the board level. I have worked with Ken at several AdCom meetings. Besides being well informed and full of constructive ideas, he brings to the group an infectious good nature. We are fortunate to have these fine people to work for us on the major IEEE boards and councils in the next two years.



WILFRED R. LAUBER

Wilfred R. Lauber was born in Windsor, Ontario, Canada in 1944. During his high school years he spent many hours listening to shortwave broadcasts and fixing radios and televisions. Because of high marks in math and science his high school guidance teacher convinced him to attend university rather than become a television repairman. He attended the University of Waterloo, Waterloo, Ontario, Canada, where he graduated in 1968 with a BSc in Electrical Engineering. His prime interest was control systems theory. However, after graduation he was offered a postgraduate position in the area of statistical communication theory. He graduated in 1970 with a MSc in Electrical Engineering. His thesis was on modelling sea noise using a Markov stochastic model.

In 1970 he joined the Communications Research Centre (CRC), the research laboratory of the Canadian Department of Communications in Ottawa, as a research engineer in the Radio Propagation Laboratory. Here he worked on HF radio noise surveys of Department of National Defense receiving sites, on measurement and modelling of powerline noise, and on measurement of atmospheric noise and of VHF and UHF manmade

radio noise. He has published several papers on measurement and modelling of the electromagnetic environment from HF to UHF and has contributed to CCIR reports for both atmospheric and manmade radio noise. He also spent several years working on frequency assignment techniques for land mobile communications in large urban areas. Recently he managed a research project concerned with validating models of VLF propagation and VLF and HF noise in the Canadian Arctic. This work included sailing on Canadian Coast Guard icebreakers, and trips to every community on Baffin Island. He is presently manager of the Electromagnetics and Compatibility Research Group of the Radio Propagation Laboratory of CRC.

He joined the IEEE as a student member and became a member in 1968. He joined the EMC Society in 1978 and became a member of TC-2, the Technical Committee on Electromagnetic Environments (EME). In 1984 he became TC-2 chairman, responsible for presenting papers, and organizing and chairing special sessions on the EME. He was also a co-author of the IEEE Recommended Practice for an Electromagnetic Site Survey (10 kHz to 10 GHz) [IEEE Std 473-1985]. In 1986 he became chairman of the Technical Advisory Committee (TAC) following Herb Mertel and Ed Skomal. The TAC works with local Symposium Committees on reviewing proposed papers for the technical program and with the Technical Committees which organize and run workshops and tutorials at the IEEE EMC Symposiums. His goal is to build up

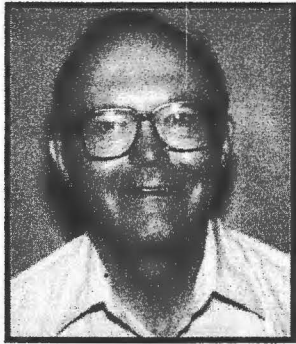


WILLIAM G. DUFF
ASSOCIATE EDITOR

the quality and reputation of the technical programs so that top notch authors will be enticed to participate in the IEEE EMC Symposiums and to publish their work in the IEEE EMC Transactions.

Wilf has received two awards from the EMC Society, a Certificate of Acknowledgement in 1986 and a Certificate of Appreciation in 1989. He is a registered Professional Engineer in the Province of Ontario.

Wilf and his wife, Gloria, have two daughters, Amy and Susie. His leisure time is spent on crosscountry skiing in the winter, tent camping in the summer, exploring the Canadian Arctic on work trips, reading and researching family history. He is presently the treasurer of the church that he and his family attend.



EDMUND K. MILLER
ASSOCIATE EDITOR

PUFF: A previous announcement of PUFF was included in the October 1987 "PCs for AP" column. I recently inquired of Professor David Rutledge of the California Institute of Technology about his recent experience with PUFF distribution and user feedback. He responded by telling me that more than 10,000 copies of the program had been distributed, and he offered to provide (with some prompting) an update. What follows was sent by Dr. Scott, who has more recent experience with PUFF's distribution and user experience. I thank Professor Rutledge for his help and Dr. Scott for his response which follows below.

"Last June the California Institute of Technology released version 2.0 of its "Puff" program. Created by Scott Wedge, Richard Compton, and David Rutledge, Puff is the linear circuit analysis program developed at Caltech for microwave education. The program was designed as an inexpensive and simple-to-use alternative or supplement to professional software. Made for IBM-compatible personal computers, Puff has a simple interactive schematic-capture type environment for the fast layout and analysis of microstrip and stripline circuits. The Puff screen is divided into windows that give a scale replica of the microwave circuit, the list of parts used, the substrate parameters, and the analysis conditions. Circuits may be analyzed for scattering

parameters in the frequency domain, or impulse and step responses in the time domain. Puff's element library includes several lumped elements, transmission lines, and coupled lines. Multiport scattering parameter files can be read in as parts to represent transistors, to create hypothetical components, or to compare theory and experiment. Puff produces photographic artwork for dot-matrix and HP LaserJet printers, and for HP-GL plotters. Support for VGA, EGA, and CGA graphics is included. The Puff user manual gives detailed descriptions of the component models and the analysis algorithm used.

To make Puff readily available to students, the program is distributed at cost with a modest fee to cover disk duplication, manual publication, and shipping and handling charges. Puff users pay no development costs and advertising is typically word-of-mouth. Public distribution of the program began in 1987, primarily to universities and colleges. The program has since become popular with working engineers, scientists, and amateur radio operators as one of the few RF/microwave simulators available for home use. Over 8000 copies of versions ~1.0 and 1.5 were distributed worldwide.

Former Puff users will notice several new features in the 2.0 release. Hardware support is now included for VGA displays, HP LaserJet printers, and HP-GL plotters. New analysis features include the ability to analyze dielectric and metal losses, dispersion in impedance and effective dielectric constant, and effects due to finite strip thickness and surface roughness. A variable parameter feature has been incorporated into Puff called the "component sweep." Instead of sweeping with respect to frequency, a circuit component's electrical parameter may be treated as the swept variable. New graphics, pop-up help windows, a longer parts list, substrate parameter editing, an

enlarged Smith chart (for VGA users), and additional components have all been added for the 2.0 release.

A package containing both Puff diskette and 60 page user manual is provided for \$10. When ordering, please specify a 5 1/4 or 3 1/2 inch diskette. Foreign orders: add \$5 per item for shipping. Direct orders to:

Puff Distribution
Electrical Engineering M/S 116-81
California Institute of Technology
Pasadena, CA 91125

Checks and money orders must be in U.S. funds and made payable to "Caltech." Foreign checks must be drawn on a bank with a U.S. branch office. All prices include handling and shipping by U.S. postal service. Puff's Turbo Pascal source code is also available for \$10, in 3 1/2 inch 720k format only. To obtain additional distribution information, send a FAX to (818) 356-2137."

PARNEC: A parallel implementation of NEC (Numerical Electromagnetics Code), developed by Dr. David Davidson of the University of Stellenbosch in South Africa. Further information about PARNEC can be obtained from Dr. Davidson. He can be reached by E-Mail at: DAVIDSON@firga.sun.ac.za. His FAX number is +27 2231 77 4981 and his mailing address is Department of Electrical and Electronic Engineering, University of Stellenbosch, Stellenbosch 7600, South Africa.

"PARNEC is a partial re-implementation of the thin-wire capabilities of NEC2 in Occam 2. PARNEC is not presently a substitute for NEC2, but for problems involving structures radiating in free space, offers most of the capabilities of full NEC2 and very efficient parallel execution on transputer arrays. Much of the original FORTRAN logic has been substantially re-coded, and the procedure interfaces cleaned up by



NORMAN VIOLETTE
ASSOCIATE EDITOR

**NOISE AND OTHER
INTERFERING SIGNALS**

by
RALPH MORRISON

Instrum, Inc.

Monrovia, CA 91016

A Wiley-Interscience Publication

John Wiley & Sons, Inc.

New York, NY

1992

The preface of this basic 144-page book sets the tone for the development of the technical material. The main thrust is based upon the practical experience gained by the author in the design and construction of instrumentation and then in making things work in the field.

Chapter 1 introduces the concept of noise in many forms: sources can be acoustical, electrical, mechanical. Sources of noise are identified, including potential sources in electronic equipment. "Acceptable" limits of noise are discussed vis-a-vis system sensitivity and potential consequences. For example, the human eye is more sensitive to visual "noise" than the human ear to noise in sound. In either case, the noise can be of no serious consequence. On the other hand, spikes or glitches in a digital data stream of several million operations can alter the digital process unacceptably.

Basic noise characteristics, measurements, waveforms, and frequency spectra are illustrated. Coherent noise, form factor, and

other definitions are presented. Basic electric and magnetic field concepts are presented.

Chapter 2 discusses power supplies and related topics: single-phase and three-phase power supplies and rectifiers, regulators and stability, common-mode and differential-mode electrostatic shields, magnetic shields, transformers, and basics of switched-mode power supplies are presented.

Chapter 3 addresses transmission line basic concepts for analog and digital signal transmission. The effects of transmission line impedance terminations are presented. The characteristics of coaxial cables (and other cable configurations), cable shielding, crosstalk, ground planes, and backplanes are discussed qualitatively without mathematical developments.

Chapter 4 briefly discusses radiation and susceptibility to field coupling to a loop. Skin effect, shielding, the effect of apertures in shields, waveguide concepts, and basic filters are presented.

Chapter 5 discusses analog circuits and associated topics such as feedback, noise, loop gain, stability, differential amplifiers, fundamental instrumentation problems, common-mode rejection, drift and dc offset, signal rectification, hum, distortion and linearity, shielding, analog printed wiring layout, and aliasing errors.

Chapter 6 switches to digital circuits. The author indicates the fact that "...digital circuits are actually high-speed analog circuits in nature." Basic circuit and printed wiring layouts are discussed, and the function of clocks, noise, balanced transmission lines, and digital-analog mix considerations are presented.

Chapter 7 is titled "Computers." This chapter addresses computer systems and basic installations: small computer systems and the FCC,

small computers and military testing, and computer installations in general. Facility ground planes, ground plane earthing, connections to the ground plane, racks as a ground plane, and rebar type ground planes are discussed as topics of computer systems grounding. Computer power distribution, transformers, power centers, isolated power, and ESD considerations are presented.

Chapter 8 presents topics on large industrial systems. System and component frequency bandwidth and related susceptibility are discussed. Inductance and switching processes, and problems of ground potential differences are illustrated. Methods of interference control on the system level design are presented based upon methods of handling signals. Some basic tools are offered along with lightning protection and other surge suppression considerations. Magnetic field generation and eddy current heating of conductors is presented as a potential problem. The chapter ends with discussions of ground-fault interruption, floating power systems, motor controllers, and a final note on cable shielding and filtering.

The book is an excellent general reference and recommended for engineers who desire something "readable" without having to sort through detailed mathematical developments. This applies to experienced engineers who must address "noise" problems, and to engineers with less experience who want a general or "big-picture" introduction on how to solve electrical noise problems. Mathematical presentations are kept to relatively few simple expressions to illustrate basic quantitative directions that can be pursued further at the discretion of the reader. Several basic circuit diagrams and time and frequency performance curves are included as illustrations of fundamental concepts.

THE 1992 IEEE REGIONAL SYMPOSIUM ON EMC

"FROM A UNIFIED REGION TO A UNIFIED WORLD" **RAFI RUBINSTEIN**

Efforts of many months and dreams of several years became reality with the opening of the 1992 IEEE Regional Symposium on EMC, which took place in Tel-Aviv, Israel, from November 2 to 5, 1992.

The symposium was organized by the IEEE Israeli EMC Chapter, with the sponsorship and support of IEEE Region 8 and the IEEE EMC Society, as well as the Institute of Electrical Engineers (IEE) in the U.K.

THE ISRAEL IEEE EMC CHAPTER

The Israel IEEE EMC Chapter is relatively young, "small but nasty." It is really necessary to understand the Israeli "Chutspa," or "guts," in order to understand the genesis of the symposium.

The Israeli Chapter's membership includes about 35 active members. Only about eight of these are IEEE Members, of whom three are Senior Members. The Israeli Chapter holds about two or three meetings annually, at which technical business as well as social issues are discussed.

A SYMPOSIUM WAS BORN

Several years ago the Israeli Chapter petitioned to hold the IEEE International Symposium on EMC in Israel. However, the EMC Board of Directors requested that a smaller local symposium take place, in order to show our readiness for hosting such an activity. Hence came the idea of holding a regional symposium. As chairman of the EMC Chapter in Israel, I was honored to act as symposium chairman. The vice-chairman was Mr. Oren Hartal, the technical chairman was Mr. Elya B. Joffe, and the exhibition chairman was Mr. Rafi Miron.

Israel belongs to Region 8, and as this

was an EMC Chapter, we felt it was proper to obtain the support of Region 8 and the IEEE EMC Society. Our application for their participation was accepted, and a Call for Papers was issued in mid-1991.

Special support was received from the Swiss Chapter and French Chapter, in the form of participation by Prof. M. Ianoz and Dr. Ferdy Meyer respectively. Their assistance with symposium committee activities helped us to take our first steps in the organization of the symposium.

Additional support was provided by other EMC Chapters in Region 8, and related chapters (MTT, AP). Sister organizations (SAE, IEE) have assisted in providing mailing lists, and the IEE co-sponsored the Symposium.

Over 100 responses to the "Call for Papers" were received. Review of the papers was performed both locally (by the local engineering forces), and by the IEEE EMCS TAC, chaired by Mr. W. Lauber. The support of the TAC is much appreciated, and surely contributed to improving the technical level of the symposium. Of the papers received, over 80 were included in the technical program.

The program committee, chaired by technical chairman Elya B. Joffe, dedicated the first day to an EEC EMC Directive tutorial, which was presented by speakers from the EEC European Commission and CENELEC, and chaired by Mr. George Goldberg, chairman of IEC-ACEC and IEC/TC-77. Three days of technical sessions followed.

Special sessions were held on MIL-STD-461/2/3 Update, presented by Mr. Bob Goldblum from R & B Enterprises, and Mr. Steve Caine from USN/SPAWAR; System EMC, chaired by Mr. Bob Goldblum; lightning and EMP, chaired by Prof. Ianoz from Switzerland; and other

subjects with invited chairmen and speakers. A special one-day tutorial, "Design for EMC Compliance," was presented by Dr. Anatoly Tsaliovitch from AT&T.

A special session was planned on electromagnetic environmental effects, which was to be chaired by the late Dr. Robert J. Haislmaier. In commemoration, the symposium proceedings, as well as the Best Paper Award, were named after the late Dr. Haislmaier. May his memory be with us forever!

OPENING SESSION

The symposium plenary session and opening ceremony took place on November 3, 1992. After I greeted the participants, addresses were given on behalf of the President of the IEEE EMC Society by his representative and member of the BoD, Mr. Dick Ford. Greetings from Region 8 were given by the Region 8 symposium coordinator, Dr. Ba'al Shem, of the Tel-Aviv University. A special guest was Florence Haislmaier, the wife of the late Dr. Bob Haislmaier, who offered her own greetings, and presented the Best Paper Award to Moshe Netzer, from RAFAEL/ADA in Israel, and Dr. Charles Goldblum, from R & B Enterprises, for their paper "Coherent (Amplitude and Phase) Measurements for EMC."

Additional greetings were offered by Mr. Bob Goldblum, on behalf of the dB Society, by the Director General of the Israeli Telecommunication Company - BEZEQ, Mr. Kaol, and by His Excellency, the Ambassador and Head of the Delegation of the Commission of the European Community in Israel, Mr. Albert Maes, who spoke about the developments in Europe with respect to standardization. The Keynote address was given by Mr. Goldberg, who mentioned a very unusual and

Continued on page 22

1992 SYMPOSIUM ON EMC, TEL AVIV, ISRAEL



Mrs. Flo Haislmaier (center) presents the Best Paper Award to Mr. Moshe Netzer (left) and Dr. Charles Goldblum (right).

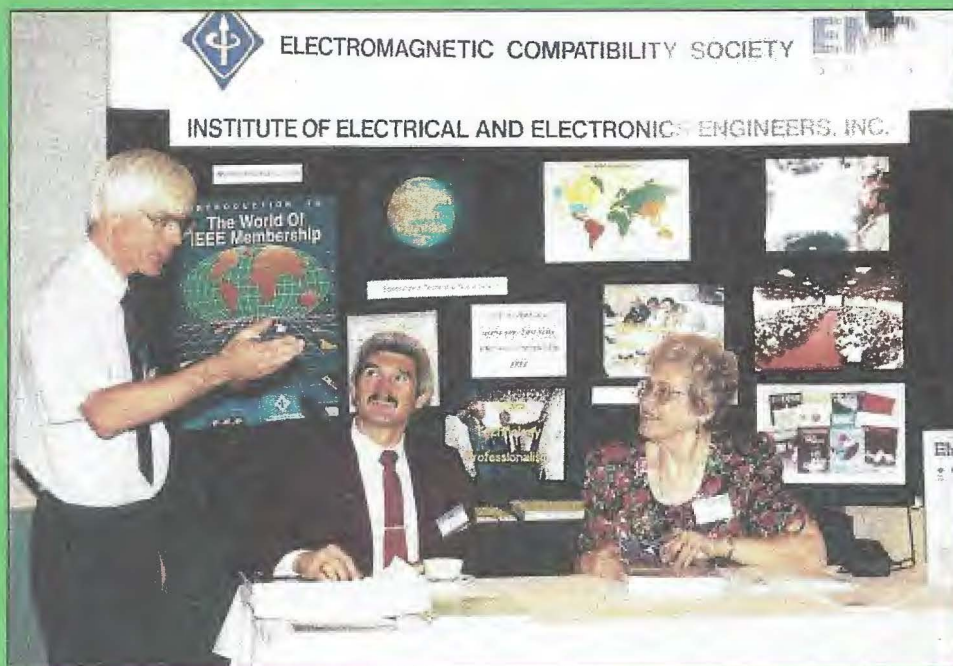


Traffic was active for the 20 Tel Aviv exhibitors.

G. Goldberg, Chairman of IEC-ACEC, adjusts a viewgraph during his tutorial on EMC Directives of the EEC.→



← Dr. David Weisbrot explains a detail in his paper, "Electromagnetic Bio-Effects."



Elya Joffe (center), Technical Chairman, and Flo Halsmaier (right) discuss the benefits of IEEE membership with a symposium attendee.



(l to r) Dick Ford, EMCS BoD Treasurer, Rafi Rubenstein, Symposium Chairman, Steve Caine, Workshop 3 Moderator, Elya Joffe, Technical Chairman, and Bob Goldblum, EMCS BoD and Newsletter Editor.

Photos: Dick Ford

Director Don Heirman (Technical Services) discussed the work of the EMCS standards committee which he chairs. Two draft standards (P482 on Connector Shielding Effectiveness Measurements and P1128 on RF Absorber Evaluation) have been modified to now cover frequencies up to 5 GHz. The work to finalize P1140 (E and H-field, Near Field Measurement from Video Display Units) is near. A concern was raised as to an apparent replication of the work by the European Computer Manufacturer's Association prior to our publishing the standard by the IEEE. (See article by Herb Mertel on EMCS standards in this issue of the Newsletter). Kimball Williams (Education Committee) announced in his report that the Education Committee will have a booth at the Dallas symposium that will provide a live demonstration of the EMC experiments contained in a booklet of the same name. Anyone wishing to communicate with the education committee electronically can use Internet at the EMCLAB@EE.UMR.EDU address. Wilf Lauber's report (Technical Advisory Committee) asked for any Board comments on proposed guidelines for future EMC Symposia Technical Programs. For a copy contact Wilf on 613-998-2377. Joe Butler gave his own report as chairman of the Representative Advisory Committee. Liaison reports from the EIA G-46, SAE Automotive EMI and EMR, SAE AE-4, Aerospace R&D and COMAR representatives were included in Joe's report.

In other business, Vice President Warren Kesselman presented the EMCS long range plan which contains goals and objectives for the Board as well as each directorship. Work will continue by the ad hoc committee on central management of our symposia. In addition to the

work by the TC's and the TAC as reported by Wilf Lauber, the administration of symposia will be reviewed. Hugh Denny is in charge of this work.

There was a wide range of topics discussed from coordination of international EMC symposia to successor training for existing Board members and those chairing major committees. For more information or contacts, give Secretary O'Neil a call on 213-870-9383.

Finally, the Board elections for 1993 were held using secret ballots. Positions that had more than one candidate running were for the Communications Services, Member Services, and Professional Services directorships. The results are as follows.

President:
H. R. (Bob) Hofmann

Vice President:
W. (Warren) B. Kesselman

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Treasurer:
R. (Dick) T. Ford

Communications Services:

W. (Bill) G. Gjertson

Member Services:

D. (Dan) D. Hoolihan

Professional Services:

W. (Walt) D. McKerchar

Technical Services:

D. (Don) N. Heirman

Congratulations to these volunteers and best wishes for success in 1993.

The meeting adjourned at 1 PM on 10 November 1992. The next meeting will be on 11 and 12 February in San Diego, CA. Contact the secretary - Janet O'Neil - on 213-870-9383 for further information.

controlling these requirements. Deleting these requirements from the subject standards not only defeats the commitment to using standards, but renders these standards inadequate. This will result in poor initial equipment designs, inadequate EMC performance, and wrong costing. This will engender EMC problems, design fixes or performance limitations. This will increase costs, delay schedules, limit the performance of equipment or systems, or worse, imperil lives. The best way to minimize these egregious wrongs is to delete the subject requirements NOT.

Perhaps this column will stimulate others to identify the need for retaining the subject requirements in MIL-STD-461/462 and preclude other requirements from being deleted. After all, that's what this column is about.

manned by December, 1999. U.S. cost is \$30B through 1999 including \$16.9B for development (\$6.9B already spent); \$7.8B for operations; and 4.9B for shuttle launches. International participation is \$7.8B. After the briefing a discussion resulted in the committee adopting the following resolution. "The IEEE-USA Aerospace R&D Policy committee believes that new justification for the space station program must be found. It will work actively with the federal government and private sector to identify new worthwhile applications, as well as means of reducing the program unit costs, that will enhance its contribution to our goal of large scale commercial development of space."

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SOCIETY OFFICERS

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FUTURE EMC SYMPOSIA

1993 - Dallas TX 10-12 August
 1994 - Sendai Japan 17-19 May
 1994 - Chicago IL 22-26 August
 1995 - Atlanta GA 22-24 August
 1996 - Santa Clara CA 20-22 August
 1997 - Austin TX 18-22 August

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 W E Cory (6/94)

Please send all corrections and changes to Daniel D Hoolihan December 1992

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OFFICIAL SUMMARY

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PCs FOR EMC . . .
Continued from page 11

removing common blocks entirely — all interaction between the main program and the procedures (sub-routines) is now via arguments. Due to the substantial amount of effort expended in converting from the unstructured FORTRAN 66/4 that NEC2 was written in to the very highly structured Occam, the Occam version could serve as a useful source for a re-implementation in other languages, such as Pascal or C (although C would require careful coding if dynamic memory allocation were to be used).

At present, PARNEC Version 1.14 has the following main capabilities:

- Supports most of the NEC2 wire generation commands.
- Computes currents, input impedances and radiation patterns.
- Uses either a conjugate gradient or bi-conjugate gradient solver.

The code recognizes most of the symmetry generating cards of NEC2, and generates the appropriate interaction matrix, but does not at present exploit the symmetry to save computational time. PARNEC Version 1.2, to be available this March, will include the implementation of most of the presently still unavailable wire generation commands, and will implement coupling between antennas (CP card). At present, it is not planned to include patches, the Numerical Green's Function option or the extensive ground options that the full NEC2 has. One of the reasons for not fully exploiting symmetry in PARNEC is that NEC2 running on conventional computers and exploiting symmetry can execute electromagnetically quite large problems.

The code has been designed so that it uses *exactly* the same data deck as NEC2 — using the original fields as described in the NEC2 user manual. Output is in the same format as NEC2, although the data is not necessarily in exactly the same column or with the same number of significant digits. Both single and double precision versions of the code are available.

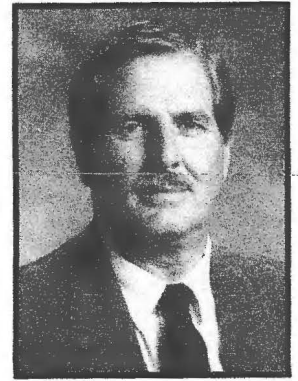
The code was developed as part of a contract, and permission must still be obtained to distribute the code. Letters expressing interest would help to obtain this permission. Cost is still to be determined, but it will probably be on a cost recovery basis of a few hundred dollars for the present version. This will also support continuing work on PARNEC.

Similar work on NEC2 has also been performed at the University of the Witwatersrand, Johannesburg, South Africa [IEEE-AP-Magazine, Vol 33, No 4, August 1991, p.59]. This code appears to be a rather more complete re-implementation, but it is also more expensive.

Following are abstracts of papers from previous EMC Symposia, other conferences, meetings and publications.

EMCAB COMMITTEE

Mike Crawford, NBS
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WILLIAM H. MCGINNIS
ASSOCIATE EDITOR

"HOW CAN I GET A COPY OF AN ABSTRACTED ARTICLE?"

Engineering College/University Libraries, Public Libraries, Company or Corporate Libraries, National Technical Information Services (NTIS), or the Defense Technical Information Center (DTIC) are all possible sources for copies of abstracted articles or papers. If the library you visit does not own the source document, the librarian can probably request the material or a copy from another library through interlibrary loan or, for a small fee, order it from NTIS or DTIC. Recently, it became clear that EMCABS were more timely than publications which were being listed in data files. Therefore, additional information will be included, when available, to assist in obtaining desired articles or papers. Examples are: IEEE, SAE, ISBN, and Library of Congress identification numbers.

Also, the steering staff of the Japan Technical Group and the EMC-J Tokyo chapter have offered to act as a central point for requests of papers abstracted here. Most of the papers will be available in Japanese only. The steering staff will assist in routing your request to the author(s) but will not do translating of the papers. The contact person is Prof. Yoshio Kami, the University of Electro-Communications, 1-5-1, Chofugaoka, Chofu-Shi, Tokyo 182, Japan. Abstracts of papers from EMC-J will be clearly identified.

Some of the Chinese papers are not available in English. Associate Professor Sha Fei, EMC Research Section, Northern Jiatong University has offered his time and assistance in routing requests for papers to the appropriate author(s). He is not furnishing a translation service.

As the EMC Society becomes more international, we will be adding additional worldwide abstractors who will be reviewing articles and papers in many languages. We will continue to set up these informal cooperation networks to assist requesters in getting the information or contacting the author(s). The library at Southwest Research Institute, 6220 Culebra Road, San Antonio, Texas, 78228-0510 has agreed to catalog, shelve, and have available for interlibrary loans proceedings from symposia and meetings which are donated to the library. Any such donations can be sent to me at the above address and I will review them for suitable articles and then forward them to the SWRI library. We are particularly interested in symposium proceedings which have not been available for review in the past. Neither the abstractors nor myself have a budget for acquiring proceedings; we rely on those we receive through attendance at symposia and from various subscriptions. Thank you for any assistance you can give in expanding the EMCS knowledge base.

FOCUSING FIELD PROBE DATA TO IMAGE NEAR-FIELD SCATTERERS IN THREE DIMENSIONS

Scott T. McBride

Microwave & Antenna Tech. Development Lab, Georgia Tech. Research Institute, Atlanta, GA
1992 Joint Symposia (IEEE-APS, URSI, Nuclear EMP Meeting) IEEE CAT#92CH3178-1, ISBN:0-7803-0730-5 (Softbound), or Library of Congress #90-640397
July 18-25, 1992, Vol. Four, pp. 2056-2059

Abstract: Much research has been done recently on the interpretation of measured field probe data in order to locate and quantify error sources present in an antenna range. This paper examines an alternative method of analyzing those data by applying spherical phase offsets to focus the field probe data to near-field distances. This technique yields the correct [x,y,z] coordinates of multiple scattering sources deliberately introduced into the simulated data. Data from multiple cuts at arbitrary θ angles are combined to form the three dimensional image. This paper presents an algorithm that takes advantage of symmetries in the polar coordinate system commonly used in field probing to speed the calculations significantly.

Index Terms: Field probes, near field, analysis

EMCABS: 01-01-93

PROPAGATION INTO AND WITHIN BUILDINGS AT 900, 1800 AND 2300 MHZ

A.F. de Toledo and A.M.D. Turkmani

Univ. of Liverpool, Dept. of EE&E, Liverpool, UK

Proceedings of IEEE Vehicular Technology Society Conference IEEE Cat #92CH3159-1, ISBN 0-7803-0673-2 (Softbound), or Library of Congress #83-645418
May 10-13, 1992, Volume Two, pp. 633-636

Abstract: Investigations of propagation into and within buildings of 900, 1800 and 2300 MHz have been undertaken. The composite Rayleigh-plus-log-normal distribution successfully modelled the measured cumulative distributions of all measurements. The average measured penetration loss at ground level was found to be 14.2, 13.4 and 12.8 dB respectively at 900, 1800 and 2300 MHz. The rate of change of penetration loss with height was 1.4 dB per floor. The rate of change of mean signal level for signals travelling within buildings was, on average, 8.5 dB per floor. The path loss attenuation factor, n , that best modelled the within building measurement was found to be 5.3, 5.5 and 6.0 respectively for 900, 1800 and 2300 MHz.

Index Terms: Microwave propagation, building attenuation, modeling

EMCABS: 04-01-93

MEASURING ANTENNA PARAMETERS IN A GHz TRANSVERSE EM CELL

Edwin L. Bronaugh and John D.M. Osburn

The Electro-Mechanics Company, Austin, TX

1992 Joint Symposia (IEEE-APS, URSI, Nuclear EMP Meeting) IEEE CAT#92CH3178-1, ISBN:0-7803-0730-5 (Softbound), or Library of Congress #90-640397
July 18-25, 1992, Vol. Four, pp. 2064-2066

Abstract: In the past, constant cross-section TEM (Crawford) Cells have been used for measuring antenna factors (the ratio, in dB of the incident field to the terminal voltage) for low frequency EMI measurement antennas, including monopoles and loops, and much smaller, higher frequency probes, such as isotropic UHF and microwave EM field probes. The typical method has been to place the antenna to be calibrated in the center of the test volume, at a point where the field strength is uniform and known. The output voltage from the antenna was then compared to the known field strength to determine its antenna factor. This calibration method has several limitations. The TEM Cell had to be at least six times as large as the antenna being calibrated, and the Crawford cell has an upper frequency bandwidth limitation based on its dimensions; thus, large (practical measurement) antenna could not be tested at higher frequencies. Also, because of several other complications, passive loop and monopole antenna were never used to transmit for gain measurement, even though they could have been.

Index Terms: Measurements, antennas

EMCABS: 02-01-93

2.6 GHZ MULTIPATH CHARACTERISTICS MEASUREMENT IN A SHIELDED BUILDING

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I. Kamiya (3), and S. Hattori (3)

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Proceedings of IEEE Vehicular Technology Society Conference IEEE Cat #92CH3159-1, ISBN 0-7803-0673-2 (Softbound), or Library of Congress #83-645418
May 10-13, 1992, Volume Two, pp. 621-624

Abstract: Buildings with shielding material embedded in their structure are now being built to enhance internal communications. In shielded buildings, very little electromagnetic interference is anticipated. However, it might be expected that the delay spread in such buildings will be larger than conventional indoor propagation, due to reflections from the shielding material. This could obstruct high-speed digital communications. Multipath measurement at the 2.6 GHz was carried out on one floor of a shielded building to investigate the feasibility of high-bit-rate digital radio communication systems. In this paper we describe the spatial variations of power delay profile, the cumulative distribution of delay spread and the error rates caused by multipath in a shielded building.

Index terms: Microwave propagation, building attenuation, modeling

EMCABS: 05-01-93

RADIO INTERFERENCE-AN ASPECT FOR DESIGNING A MOBILE RADIO COMMUNICATION SYSTEM

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Proceedings of IEEE Vehicular Technology Society Conference IEEE CAT #92CH3159-1, ISBN 0-7803-0673-2 (Softbound), or Library of Congress #83-645418
May 10-13, 1992, Volume Two, pp. 860-865

Abstract: The paper considers the effect of radio frequency interferences which occur within a system designed for mobile communication applications. The design has to satisfy the objective of providing continuous communication to a large number of users distributed over a vast area while ensuring that the desired received signal level is adequately protected from the noise and interference. The network design, based on frequency the re-use concept for optimum utilization of radio frequency spectrum in a mobile interference environment, is discussed.

Index Terms: Interference, System Design, Communications

EMCABS: 03-01-93

STANDARDS AND INTEROPERABILITY FOR NORTH AMERICAN MOBILE DATA SERVICES

Richard Dean (1), and Allen Levesque (2)

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Proceedings of IEEE Vehicular Technology Society Conference IEEE Cat #92CH3159-1, ISBN 0-7803-0673-2 (Softbound), or Library of Congress #83-645418
May 10-13, 1992, Volume Two, pp. 236-239

Abstract: This paper reviews the issues and activities associated with the introduction of Data Services over the evolving mobile communications networks. It offers a perspective of how the merger of the two fastest growing segments of the market, data communications and mobile communications, presents new technical standards challenges. These issues are complicated by the recent explosion of contenders for this vast market. Key technical problems arising from the need to interoperate between data devices in the analog network and the new digital mobile data devices are described together with proposed solutions that are potentially common to all mobile networks. Finally, a summary of the different mobile segments and the associated standards activities are presented.

Index terms: RF systems, data interface problems, communications

EMCABS: 06-01-93

interesting EMC problem: "My neighbor has a heart pacemaker. Whenever he has sex...my garage door opens!!!"

EXHIBITION

A technical exhibition featured over 20 booths. A special IEEE EMCS booth was "manned" by Flo Haislmaier, Bob Goldblum and Dick Ford, as well as local members. Six new members were enrolled and many attendees expressed interest; all are good potentials for the next symposium.

SOCIAL ACTIVITIES

The technical program is important, but more important is that the attendees have fun! We therefore took great care to organize a variety of social activities, including a get together on the first evening, as well as a symposium committee reception, and a night tour of Tel-Aviv and the ancient city of Jaffa. We believe that those activities were...A BALL! As one of the attendees said, "Never mind the technical program. It was worthwhile holding the symposium, even had it been only for the social program!"

FIGURES AND NUMBERS

It seems as if we cannot do without figures, so here goes:

- The number of participants at the symposium totalled 240, including 131 three-day attendees.
- Attendees came from 18 countries, including Japan, Australia, Korea, U.K., France, Switzerland, Germany, Italy, Sweden, Denmark, Holland, Belgium, Finland, Norway, Austria, Romania, Spain, U.S.A. and last but not least - Israel.

- The exhibition included over 20 booths, representing a variety of international and local companies.
- The symposium, which was financed by ORTRA, the organizer and secretariat of the symposium, ended with a positive balance.
- The proceedings of the symposium have been catalogued in the IEEE, the Library of Congress, and also by the IEE Information Division - INSPEC. Copies were exchanged with the Zurich Symposium, with the Beijing 1992 IEEE EMC Symposium, with the Wroclaw Symposium. Copies were also provided to the IEE.

THE NEXT SYMPOSIUM

One of the questions frequently asked during the farewell reception was, "When will the next symposium be?" We feel that is the indication that the symposium was a success! We have no plans for another regional symposium, but hope to have the opportunity to host an IEEE International Symposium on EMC. Let's do it! Let's have "An Odyssey of EMC in the Holy Land," in 2001!

Special thanks to Bob Goldblum for his help and support throughout the whole project, his good advice, and for his advertisement of the symposium in ITEM and in the EMC Society Newsletter, to Dick Ford, for his continuing help, and for representing the President of the IEEE EMC Society, to Anatoly Tsaliovich, for his goodwill, and presentation of a wonderful tutorial, and to many, many others.

Thank you all who supported us!
Thank you all who offered advice!
Thank you all who attended! Let's do it again!

questions correctly, and heard the triumphant sounds of "Pomp and Circumstance." All meeting attendees agreed that Dr. Iskander and the CAEME group have successfully provided an exciting opportunity to align electromagnetic education with the nineties.

The Los Angeles chapter was honored to host Dr. Iskander, a recipient of the EMC Society's prestigious Richard R. Stoddard Award, and the author of *Electromagnetic Fields and Waves*, published by Prentice Hall, 1992. Dr. Iskander presented the Los Angeles chapter with the CAEME software book which includes over 16 programs that cover all aspects of an introductory course on electromagnetics. Most software runs on IBM 386-type personal computers, while two packages were developed for Macintosh-type computers. In addition to the software, CAEME developed two videos. Further information about CAEME may be obtained by contacting Dr. Iskander at (801) 581-6944.

The Los Angeles chapter planned to host Mr. Herbert K. Mertel, a member of the EMC Society Board of Directors, at the November meeting, where he spoke on "The New European Community Emission Standards." He will also speak at the May meeting on "The New European Community Immunity (Susceptibility) Standards."

EQUALIZATION FOR INTERFERENCE CANCELLATION IN SPREAD SPECTRUM MULTIPLE ACCESS SYSTEMS**EMCABS: 07-01-93**

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Dept. of Systems & Computer Eng., Carleton University, Canada
Proceedings of IEEE Vehicular Technology Society Conference IEEE Cat #92CH3159-1, ISBN 0-7803-0673-2 (Softbound), or Library of Congress #83-645418
May 10-13, 1992, Volume One, pp. 71-74

Abstract: Commercial interest in Spread Spectrum Multiple Access (SSMA) systems has risen dramatically in the last years. It provides protection from interference and jamming, and could provide service for more users than that offered by other access techniques. Several interference cancellation techniques have been proposed for SSMA systems, but they assume that the spreading sequences of all users are known at the receiver. We evaluate the performance of a fractionally-spaced decision feedback equalizer (DFE) for SSMA systems, which does not make explicit use of interferers' spreading sequences. It is found that the system performance is acceptable even for small spreading gains in a slow-fading multipath environment.

Index terms: Interference, jamming, spread spectrum

PROPAGATION EFFECTS AND COUNTERMEASURES ANALYSIS IN VEHICLE-TO-VEHICLE COMMUNICATION AT MILLIMETER WAVES**EMCABS: 10-01-93**

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Proceedings of IEEE Vehicular Technology Society Conference IEEE Cat #92CH3159-1, ISBN 0-7803-0673-2 (Softbound), or Library of Congress #83-645418
May 10-13, 1992, Volume One, pp. 312-316

Abstract: In the context of the European Research Projects, PROMETHEUS (EUREKA) and DRIVE (E.C.C.), special attention has been paid in recent years on possible implementation of short-range millimeter wave communication systems. In fact, vehicle-to-vehicle communications represent one of the major areas of IRTE (Integrated Road Transport Environment) research. The paper presents an analytical approach to the problem of defining and evaluating the performance limits when the system operates in an actual environment. More precisely, the anomalous propagation due to road reflection and multipath propagation effects are considered in order to determine possible counter-measure techniques such as coding and diversity in order to define system availability.

Index Terms: Millimeter, modeling, propagation

STRATEGIES FOR ACQUIRING RADIO FREQUENCIES FOR INTELLIGENT VEHICLE HIGHWAY SYSTEMS (IVHS)**EMCABS: 08-01-93**

J. Chadwick and V. Patel, The Mitre Corp.
Proceedings of IEEE Vehicular Technology Society Conference IEEE Cat #92CH3159-1, ISBN 0-7803-0673-2 (Softbound), or Library of Congress #83-645418
May 10-13, 1992, Volume One, pp. 79-82

Abstract: Although the system's architecture for IVHS is still being developed, it is certain that tetherless radio frequency (RF) communications will play a major role in the program. The portion of the RF spectrum suitable for mobile systems is very congested. New demands for use of these mobile bands are expected as promising technologies and services mature for commercial deployment. This paper describes strategies to identify suitable frequencies, to muster needed support from various communities, and to take appropriate actions for obtaining spectrum for IVHS. In addition to the acquisition of frequencies for exclusive, nationwide use by IVHS, the paper evaluates existing and planned communications media that may be suitable for capacity sharing to yield still further communications capacity for some IVHS functions.

Index terms: Frequency management, IVHS

PROPAGATION MODELING & MEASUREMENTS IN AN URBAN & SUBURBAN ENVIRONMENT USING BROADBAND DIRECT SEQUENCE SPREAD SPECTRUM**EMCABS: 11-01-93**

V. Erceg, D.L. Schilling (1), S. Ghassemzadeh (1), D. Li (1), and M. Taylor (1)
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Proceedings of IEEE Vehicular Technology Society Conference IEEE Cat #92CH3159-1, ISBN 0-7803-0673-2 (Softbound), or Library of Congress #83-645418
May 10-13, 1992, Volume One, pp. 317-320

Abstract: Due to the increasing demand for mobile communications, it has been suggested that microcellular, high-capacity, personnel communications networks (PCN) be established in the 2-GHz band using Broadband Spread Spectrum Code Division Multiple Access communication systems. In this paper, we develop a new theoretical model for "out-of-sight" propagation in the 2-GHz band using different heights and locations of the transmitting antenna. This theory was verified by experimental results taken in New York City and Long Island areas, using the antenna heights which were less than the heights of the surrounding buildings.

Index Terms: Measurements, modeling, propagation

UHF PROPAGATION MEASUREMENTS**EMCABS: 09-01-93**

B. Feuvrie, J.F. Diouris, and J. Saillard
Lab Systemes et Signaux Hautes Frequences, Ireste, Nantes, France
Proceedings of IEEE Vehicular Technology Society Conference IEEE CAT #92CH3159-1, ISBN 0-7803-0673-2 (Softbound), or Library of Congress #83-645418
May 10-13, 1992, Volume One, pp. 524-527

Abstract: This paper describes the design of a space diversity microwave combiner which is used to measure different parameters of mobile radio channels and to test algorithms in diversity. The transmission equipment uses a carrier at 890.2 MHz in a 6 Watt amplifier. The receiver and measuring equipments are mounted in a mobile van. Source test measurement results are plotted.

Index Terms: Measurements, UHF

SOUNDING RADIO CHANNELS FOR 1.8 GHz PERSONAL COMMUNICATIONS SYSTEMS**EMCABS: 12-01-93**

J-P de Weck (1), J. Ruprecht (1), B. Nemsic (2), and H. Buhler (3)
(1) Swiss PTT General Directorate, Berne, Switzerland, and (2) ASCOM Autophon, Wien, Austria, and (3) Technische Universitat Wien, Wien, Austria
Proceedings of IEEE Vehicular Technology Society Conference IEEE Cat #92CH3159-1, ISBN 0-7803-0673-2 (Softbound), or Library of Congress #83-645418
May 10-13, 1992, Volume One, pp. 490-493

Abstract: Installing a personal communications system may not be a straightforward task since indoor coverage predictions seem to be critical and time dispersion problems may occur. Therefore, a channel sounder has been designed to assess radio channels in the 1.8 GHz band in real-time. Parameters characterizing the channel for a particular system are proposed and their relevance has been investigated and verified for a particular case. Measurements carried out in a warehouse show the importance of careful planning of the fixed stations for an indoor system.

Index Terms: Measurements, communications, analysis



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TECHNOLOGY POLICY COUNCIL EXAMINES IMPACTS OF DEFENSE BUDGET CUTS

IEEE-USA's Technology Policy Council (TPC) hosted its 1992 symposium, *Coping With Defense Budget Restructuring*, on September 15-16 in Washington, D.C. TPC Council and Committee members, USAB leaders, and government policymakers examined key technology policy, related implications of upcoming defense budget cuts, and outlined possible IEEE-USA roles and responses.

The program's two keynote speakers, Mark A. Forman, Defense Economist for the Republican staff of the Joint Economic Committee of the United States Congress, and Victor H. Reis, Director, Defense and Engineering and three panel sessions addressed "The Problem — A Look at What is Happening to the Defense Budget and A Prediction of the Consequences for R&D, Industry, and Engineering"; "Reactions and Responses — Creating new Opportunities for Engineering in the United States"; and "An IEEE-USA Agenda — Prospective Roles of IEEE-USA in Promoting Engineering Opportunity in the New Budget Environment."

For more information, contact the IEEE-USA Office, 1828 L. Street, N.W., Suite 1202, Washington, DC 20036-5104, (202) 785-0017.

REPORT ON THE 11TH INT'L WROCLAW SYMPOSIUM ON EMC

The International Wroclaw Symposium on EMC was organized by the Association of Polish Electrical Engineers, the Institute of Telecommunications and the Wroclaw Technical University. It was co-sponsored by the URSI and supported by CCIR, CCITT and other international organizations, as well as by national associations of electrical and electronic engineers from 17 countries.

The Symposium Council was chaired by Professor W. Majewski (Poland), and the Scientific Programme Committee by Professor F.L.H.M. Stumpers (The Netherlands). The co-chairmen of the symposium were Professor D.J. Bem and Mr. J. Rutkowski, and the Organizing Committee was chaired by Mr. W. Moron.

Attendees numbered 225 from 31 countries. The greatest groups were from Poland (95), Japan (15), Germany (13), Russia (13), Czechoslovakia (9), USA (9), Switzerland (8) and France (8). Some people came from Australia, China, India, Mexico and the Republic of South Africa.

Because of financial problems some authors (especially from the territory of the past Soviet Union) were unable to participate, but at the same time they declared their wish to come to the next Wroclaw Symposium in 1994.

The two-volume Proceedings containing 170 papers (delivered by 305 authors and co-authors from 30 countries) accepted for presentation was available during the symposium.

The day before, the Symposium Open Meeting on Activities of the Technical Committee for Telecommunications (TCT) of the

European Cooperation in the Field of Scientific and Technical Research (COST) was organized. During this meeting 2 papers were presented: "COST Telecom. Activities" by J.M. Dwyer (Ireland), TCT Chairman, and "Radiowave Propagation Studies in the COST Programme" by Dr. M.P.M. Hall (UK).

The meeting was well attended and well received.

The Symposium was opened by its chairman, Professor D.J. Bem, and on behalf of the Symposium Patron, Minister of Posts and Telecommunications of the Republic of Poland, participants were greeted by PTT v-minister, Mr. S. Szuder.

During the opening ceremony, the Director of the CCIR, Mr. R.C. Kirby, was decorated with the Gold Distinction of the Order of Merit of the Republic of Poland for his contribution to Polish radiocommunication in general and to the Wroclaw EMC Symposia in particular. Then 13 people were honored with Awards of Recognition from the Symposium organizers for their contributions to the symposium success.

A plenary session was held on the first day of the Symposium during which the following 2 papers were presented: "Notes from the Program Chairman" by Prof. F.L.H.M. Stumpers (The Netherlands), and "Changing Environments" by M.C. Vrolijk (The Netherlands), Philips Corp. Eighteen regular and seven poster sessions covered various fields of EMC. One-hundred twenty papers from 170 contained in the Proceedings were presented. All sessions were in English.

1992 IEEE ADMINISTRATIVE MEETINGS CALENDAR

The following calendar is compiled by the IEEE Technical Activities Department for its volunteers, and is composed of information received on Society administrative meetings as well as other IEEE Boards and Committees. It does not purport to be a complete set of information. Most meetings are open only to Board/Committee members. Any appropriate meeting information you would like to appear in the Administrative Meetings Calendar should be sent to the Technical Activities Department, IEEE, 445 Hoes Lane - P.O. Box 1331, Piscataway, NJ 08855-1331 or may be faxed to (908)562-1571, Attn: Society Support Services Director.

March 4-5, 1993	IEEE Investment Committee	Ritz Carlton Naples, FL	Michael J. Sosa (908) 562-5324
June 17-18, 1993	IEEE Investment Committee	Ritz Carlton Aspen, CO	Michael J. Sosa (908) 562-5324
November 4-5, 1993	IEEE Investment Committee	Manele Bay Hotel Lanai, Hawaii	Michael J. Sosa (908) 562-5324

1992 PACE CONFERENCE AND WORKSHOP

A. H. MILLS

Representatives from various elements of IEEE-US Activities Board met in Phoenix, Arizona during the 1992 Labor Day weekend for the annual PACE Conference and Workshop. The goal of the conference and workshop was to promote the interchange of ideas that can help IEEE members grow professionally. New ideas and new ways were examined for looking at familiar issues. The theme was "The PACE Network, Delivering Solutions." Sub-themes were, "Jobs, Jobs, Jobs," "Competitiveness," and "Industrial Partnerships."

Mr. Merrill Buckley, IEEE President, welcomed attendees and gave a summary statement on the status of problems facing the IEEE and its members. Dr. Arvid Larson, IEEE Vice Chairman, Professional Activities and Chairman of the

United States Activities Board, discussed the IEEE - USA membership, unemployment, major programs and activities of the USAB. Mr. William Whipkey, Chairman, Professional Activities Council for Engineers, also welcomed attendees and summarized PACE activities. Attendees included council, regional, division, and society representatives. Approximately 235 individuals from all parts of the US met in joint sessions and in working groups. Al Mills, EMCS PACE Chairman attended to represent the EMC Society.

Major issues discussed at the conference and workshop included (1) competitiveness and technology policy, (2) Private Pension Reform Act, (3) career directives in the 1990's, (4) employment assistance, (5) private practitioners, and (6) legal issues for engineers.

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Chicago, IL: August 22-26
Palmer House Hotel
Bob Hofmann
708/979-3627
- 1995 Atlanta, GA: August 21-25
Marriott Marquis Hotel
John Rohbaugh
404/894-8235
- 1996 Santa Clara, CA: August 19-23
Santa Clara Convention Center
Double Tree Hotel
David Hanttula
415/390-1071
- 1997 Austin, TX: August 18-22
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Gene Cory
512/736-0714
- 1999 Japan: May 15-17
- 2000 Washington, DC
Bill Duff
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