The IEEE International Symposium on Electromagnetic Compatibility (EMC) will be held in Washington, DC from 21-23 August 1990. The Symposium is sponsored by the EMC Society of the Institute of Electrical and Electronics Engineers (IEEE).

The theme of the seminar is "A Spectrum of EMC Issues for the Nineties." Three crucial EMC-related issues should be addressed during the short ten years remaining before the 21st century. First, many of the existing EMC practices and standards go back to the sixties and the days of vacuum-tube technology and analog solutions. This issue will be addressed in two ways: a status report and an "open forum" discussion for government and industry on the revision of MIL-STD-461/2/3, and a special session on recent developments in non-sinusoidal waves with potentially interesting applications to EMC problems.

Second, the population density of radiating devices is continuing to increase at such a rapid pace on land, sea, and in the air — an even in space — that the conventional techniques of interference control no longer suffice. Papers will address this problem in the sessions on EMC Control, EMC Management, and Spectrum Management. There is also a special session on spectrum issues for the 90's that addresses the broad issues we face and proposes solutions.

Third, the damages that modern technology are wreaking on our environment and on the health, welfare, and safety of mankind, must be more carefully controlled. Potential EMC-related control measures are addressed in special sessions on Product Safety, EMC Environment, and Socio-economic Implications.

For information on all aspects of the Symposium, write IEEE EMC International Symposium on Electromagnetic Compatibility, P.O. Box 19342, Washington, DC 20036.
NEWSLETTER STAFF
EDITOR
Robert D. Goldblum
R & B Enterprises
20 Clipper Road
W. Conshohocken, PA 19428

ASSOCIATE EDITORS

ABSTRACTS
William H. McGinnis
Southwest Research Institute
P.O. Drawer 28510
San Antonio, TX 78284

BOOK REVIEWS
Reinaldo Perez
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 91109

CHAPTER CHATTER
Charles F. W. Anderson
2302 Keener Road
Hagerstown, MD 21740

EMC CERTIFICATION
& ACCREDITATION
Russell V. Carstensen, P.E.
Naval Air Systems Command
AIR-5162, Room 902
Washington, DC 20361

EMC PERSONALITY
PROFILES
William G. Duff
Atlantic Research Corporation
5390 Cherokee Ave.
Alexandria, VA 22314

EMC STANDARDS
ACTIVITIES
Herbert Mertel
EMACO, Inc.
P.O. Box 22066
San Diego, CA 92122

EMC-S BOD
ACTIVITIES
Donald N. Heirman
AT&T Information Systems
Crawfords Corner Rd.
Building 4-112
Holmdel, NJ 07733

EMC-S EDUCATION
COMMITTEE
Dr. Clayton Paul
Dept. of Electrical Engineering
University of Kentucky
Lexington, KY 40506

IEEE ELECTROMAGNETICS
AND RADIATION DIVISION
DIRECTOR'S REPORT
B. Leonard Carlson
516 W. Snoqualmie River Rd., SE
Carnation, WA 98014

INTER-SOCIETY
ACTIVITIES
Donald A. Weber
Hamilton Engineering, Inc.
2108 S.W. 152 Street
Seattle, WA 98166

PAPERS,
ARTICLES &
APPLICATION NOTES
Edwin L. Bronaugh
The Electro-Mechanics Company
P.O. Box 1546
Austin, TX 78757

PCs FOR EMC
Edmund K. Miller
Group MSEE-3, MS 3580
Los Alamos National Laboratory
P.O. Box 1663
Los Alamos, NM 87545

PHOTOGRAinker
Fred J. Nichols
LectroMagnetics, Inc.
6056 W. Jefferson Blvd.
Los Angeles, CA 90016

POINT AND
COUNTERPOINT
Anthony G. Zimbalatti
294 Crowell St.
Hempstead, NY 11550

PRODUCT SAFETY
John McBain
Hewlett Packard
19447 Pruneridge Ave.
Cupertino, CA 95014

IEEE NEWSLETTER PUBLICATION SCHEDULE

Publication Dates
May
August
November
February

Editorial Deadlines
March 15
June 15
September 15
December 15
In the last issue, we published an article by Mr. Roger A. McConnell titled, "An Impedance Network Model of the Open Field Range." We have received a letter to the editor from Dr. Mark T. Ma of NIST and a response by Mr. McConnell. These follow.

June 6, 1990

Mr. Edwin L. Bronaugh
EMCO
P.O. Box 1546
Austin, TX 78767

Dear Ed:

I just read one of the practical papers, articles and application notes, "An impedance model of the open field range," by Roger McConnell, which appeared on EMC Newsletter Spring, 1990 issue #145 (rather than #141 as printed), and was favorably endorsed by you.

I would like to take this opportunity to let you know that while the subject matter, site attenuation, may be timely as you noted in your introduction, the contents are certainly not original. The same subject has been thoroughly discussed by one of my former colleagues, Mr. R. G. FitzGerrell, such as EMC Wakefield Symposium 85; NBS Tech Note 1809, Nov. 85; EMC Trans., vol. EMC-28, No. 1, Feb., 86; and Chapter 2 of NBS Tech Note 1099, July, 86. Yet none of these published articles was referenced in his short paper. The last cited Chapter 2 has been used in our EMC/EMI Short Course text, a copy of which is herein included for your attention. Contents are certainly same even though notations may be somewhat different.

In our derivation, we also included the antenna and source mismatch losses, and expressed the final results in terms of powers (real numbers), which can then be put in decibels. We also discussed different definitions by IEC and FCC, and pointed out the major difference.

The equation (5) defining the site attenuation in McConnell's paper involves complex numbers of impedances, which, strictly speaking, cannot be put in dB form of equation (6) as McConnell did.

Thanks for your attention.

Truly yours,

Mark T. Ma, Ph.D.
Electromagnetic Fields Division
NIST
cc: Robert Goldblum, Newsletter Editor

June 19, 1990

Mr. Edward L. Bronaugh
EMCO
P.O. Box 1546
Austin, TX 78767

Dear Ed:

I would like to respond to Dr. Ma's comments re my article "An Impedance Network Model of the Open Field Range." Taking his last comment first, he is, of course, quite correct in pointing out that equation (5), as it stands, cannot be put in decibel form. There should have been absolute value signs around the complex quantities of equations (5) and (6), indicating that the magnitudes are to be taken.

With regard to listing of references, had I been aware of FitzGerrell's work I certainly would have referenced it, particularly since his 1985 EMC Symposium paper contains and precedes the central idea of my article, that the mutual impedances have a dual role in both altering the center impedance of each antenna, and in expressing the transmit and receive antenna coupling at any distance. In fact, my work was also preceded by that of Maeda, Takeya and Kami in their 1986 EMC Symposium paper, "New Correction Factor for High Precision Open Site Attenuation Calculation." FitzGerrell's work and the Japanese work came to my attention after submission of my article for publication.

An important point is that several researchers now have independently arrived at very similar models and results through the impedance network approach. The EMC Quarterly Newsletter is more a popularizing publication than an archival journal, and I hope that my article has succeeded in making this effective modeling approach more widely known.

Very truly yours,

Roger A. McConnell
CKC Laboratories
BOD ACTIVITIES

The second meeting of 1990 of the EMC Society Board of Directors was held between 1 and 5 pm on May 19, 1990 at the Hyatt Cherry Hill Hotel, the site of the 1991 EMC Symposium, in Cherry Hill, NJ (Philadelphia area). The meeting was held as part of a series of EMC meetings including meetings of ANSI-accredited Standards Committee C63 and the Technical Advisory Group (TAG) for Subcommittee E (Television Receiver Emission/Immunity) of the International Special Committee on Radio Interference (CISPR). Board members present included: Ed Bronaugh, Bob Haismaier, Don Heirman, Herb Mertel, Don Clark, Dick Ford, Bob Hofmann, Dan Hollihan, Pat Coles, and Warren Kesselman. Members absent: Charlotte Tyson, Gene Knowles, Al Mills, Chet Smith, Joe Butler, Walt McKechar, Dave Staggs, Don Weber and Janet O'Neil. Guests present included Bob Goldblum and Henry Ott.

Prior to the opening of the meeting, the Board was taken on a brief tour of the meeting and exhibition facilities of the hotel which is the site of 1991 EMC Symposium. President Ed Bronaugh then opened the meeting at 1 pm and after introductions, the agenda was approved. Dan Hollihan was appointed acting secretary for the meeting. He then reviewed the minutes of the February 21, 1990 meeting. The minutes were approved with amendments and corrections.

Treasurer Dick Ford presented his report that showed our Society's net worth was $286.8K as of the first of the year. Our long term investments amount to $190K of that amount. He noted that the cost of the Transactions exceeded the budgeted amount. He presented the 1991 probable budget including our projected income from the Cherry Hill Symposium and the Society's line-by-line expenses. The projection is no loss for the year. The Board then approved Dick's report.

The reports by the four directors followed:

1. Director Bob Haismaier (Communications Services) introduced Bob Goldblum, Newsletter Editor, who indicated that the Newsletter was now following a new publication deadline with the next deadline June 15 and every 3rd month thereafter. Bob Haismaier next reported that the planned special issue of the Transactions on high power microwaves is on hold. Next he gave Gene Cory's report which briefly reviewed the status of our next 5 symposia. An advance of $10K was approved by the Board for the 1991 symposium. A discussion of the exhibitor point system for priority placement as an exhibitor for future symposia ensued. The Board moved and approved that the point system cannot be changed from that previously approved. This motion defeated a proposal to lose priority points if an exhibitor missed exhibiting at a symposium. Bob then indicated that there was an EMC Colloquium in Santa Clara on 12-13 June 1991. The Board indicated its concern for the timing in that the International EMC Symposium in Cherry Hill, NJ, is only 2 months later. Exhibitors and attendance at the August 13-15, 1991 symposium may be affected. Director Haismaier will pass along the Board's concerns to the colloquium organizers and to review present Board policy on such potential conflicts at the August meeting.

2. Director Don Heirman (Technical Services) presented his reports for all committees reporting to him. Don, as chairman of the EMCS Standards Committee, indicated that revisions to Standard 140 (Minimizing Interference from RF Heating Equipment) and Standard 187 (Measurement of Spurious Radiation from FM and TV Broadcast Receivers using Open Area Test Sites) has been sent to the IEEE Standards Board for approval. This brings up to date all 1950-1960 standards under the cognizance of the EMCS. Bob Egan from DEC assumed the chair of the working group for PAR 1190 (LISN calibration). Finally, IEEE STD 299 (Shielding Effectiveness Measurements) has been undergoing final revision before being submitted for further IEEE coordination.

Don then presented Clayton Paul's education committee report. First, Henry Ott (201) 992-1793 and Bob Cowdell (714) 832-6626 have been named new Distinguished Lecturers for 1990-1992. They join Ed Bronaugh (512) 835-4684 and Joe Fischer (213) 644-0728. Scott Bennet and Don Heirman ended their two year terms on 30 June. They gave over a dozen lec-
3. Director Dan Hoolihan (Member Services) presented his reports. He indicated that we now have 6 international chapters: France, Israel, Ottawa, Sweden, Switzerland, and Japan. A future chapter is being discussed in Montreal. Benoit Nadeau of the Center of Industrial Research (CRIQ) in Montreal is spearheading that formation. Those in Quebec Province who are interested in helping with this formation should call Benoit on (514) 383-1550. Dan also reported for Charlotte Tyson (Awards). He then sent out the ballot for our EMCS awards to be presented in Washington. There were 23 nominations to be balloted by the Board. That is a record. Don Clark (BOD Nominations Committee) reported that he was finalizing the nominations for the Board for the term ending December 31, 1993. Don’t forget to vote!

4. Walt McKerchar’s (Professional Services) report was presented by Dan Hoolihan. Herb Mertel (Transnational Committee) reviewed his committee work and noted that there will be a 10 ft. by 10 ft. IEEE booth at the Washington, DC Symposium for advertising International EMC Symposiums and conferences in the UK, Switzerland, and Poland. Reciprocally, the IEEE of the United Kingdom will make available a table at their EMC Symposium on 28-31 August 1990. Herb has also been working with organizers of an EMC Symposium in Leningrad, Russia to determine if there are areas of mutual EMC interests with our society. Al Mill’s report (PACE) indicated communication with our EMC chapter chairman on IEEE professional activities in current retirement income policy as well as other IEEE-US Activities Board position papers presented to the 101st Congress. For more information, call Al on (619) 463-2123. Finally, Bob Brook’s report (SSIT) was introduced. The last SSIT Administrative Committee meeting minutes indicated that the IEEE is looking into conflicts of interest between different IEEE boards. The area of radiation hazards was also discussed in light of current discussions in the Institute and in public. For more information, contact Bob on (516) 595-3136.

5. Under old business, the 1991 budget was approved. Treasurer Ford is to discuss our detailed breakdown budget with IEEE headquarters. The plan is to keep line items of various BOD offices and directorships’ budgets so the BOD can determine whether our expenses are within our budget. This has been difficult to obtain in the past due to more global categories supported in the past by the IEEE. Dan Hoolihan then discussed the upcoming Sections Congress in Toronto. He asked that BOD and chapter officers let him know of any concerns with the relationship between the Section and local chapters that he should present. Call Dan on (612) 583-3322.

6. Under new business, a discussion was held on a request from ICT Inc. to have EMCS’ informal endorsement of EMC satellite courses in exchange for presenting a 1-minute video on the EMCS during these courses. Walt McKerchar was asked to look into the costs of such videos while President Bronaugh will further investigate the meaning of “informal endorsement.” Don Heirman reported on discussions on the role of TC-8 in the EMCS and the Product Safety Society. Don has conversed with TC-8 (and PSS) chairman Rick Pescatore and PSS secretary/treasurer John McBain and several general conclusions were reached: 1) The PSS retains its identity as a separate organization apart from TC-8. 2) The PSS will continue its own Newsletter. 3) Any requests for Newsletter financial support will be considered by the Board. Such requests would be considered as to their appropriateness for the entire EMCS. The Board tabled a motion for approving financial support of the PSS Newsletter subject to further review of the matter at meetings to be held by TC-8 at the Washington, DC Symposium. The Board then approved distributing the 1991 EMC Symposium records to EMCS members on record in 1991. The policy of who receives these records can be obtained from Janet O’Neil, our EMCS secretary.

7. President Bronaugh discussed positions on the proposed IEEE reorganization. The Board was not in favor of changing the present structure. He also discussed various TAB reports. Len Carlson described Division IV News.

8. The meeting was adjourned by President Bronaugh at 5:00 pm. The next meeting will be on 20 August at the Hilton Hotel in Washington, DC, site of our 1990 EMC Symposium. It will start at 10:15 AM and last through the afternoon. Contact secretary Janet O’Neil for more details on (213) 870-9383.
The year 1989 was an extremely active year for the IEEE and especially the Technical Activities Board (TAB). Several changes were implemented including (1) moving the Technical Activities Department (TAD) and portions of the Publishing Services Department to Piscataway, New Jersey from New York, (2) restructuring TAB to include Society Presidents in decision making positions, (3) expanding E-mail services to volunteers and IEEE staff, (4) expanding Society office operations in Piscataway, and (5) increasing the international character of TAB through AdCom membership and IEEE offices outside the USA. The following Ad Hoc Committees and Task Forces were then set up to address these matters: TAB Restructuring, Society Support, Financial Reporting, E-mail, TAB International Opinion Survey, International Participation in Society Administration, Magazine Monitoring, Training Videos, Strategic Planning and Review, Society Self Study, and Technical Activities Department Organization.

The committee that developed the new TAB Structure was composed of Society Presidents, past Division Directors, and incumbent Division Directors. TAB in 1990 will consist of five Councils (Publication Products, Periodicals, Liaison, Technical Meetings, and Administration). The Periodicals and Meetings Councils are renamed versions of the old TAB Standing Committees. The Publication Products Council is an expansion of the Book Broker Committee and will investigate new ideas for TAB and Society products. The Liaison Council is a policy coordinating body of TAB Liaison to other entities from within and outside IEEE. The TAB Administration Council is a new version of TAB OpCom with five Society Presidents (elected by the President’s Forum) added as voting members, replacing the first year Division Directors who become non-voting members. The Administration Council is chaired by the TAB Chair. The other four Councils’ Chairs are elected by TAB from among its present and past members. They also serve as voting members of the Administration Council. TAB will have two Standing Committees, the Strategic Planning and Review Committee, consisting of three past Division Directors and three past Society Presidents (SPRC elects its Chair), and the Nomination and Appointments Committee, consisting of six Society Presidents elected by the Presidents’ Forum and six Division Directors elected by the Directors’ Forum. The SPRC will develop the TAB Strategic Plan and assess TAB’s achievements each year. The N&A Committee will suggest slates of nominees for TAB elections and approve the TAB Chair’s appointments.

TAB is the focal point for the Societies in which the common needs are addressed and through which they are tied to the rest of the IEEE. In a related structure, the Technical Activities Department (TAD) provides permanent staff functions and aids to all the Societies.

The objectives of the TAD are: (1) provide a strong Volunteer-Staff interface, (2) aid the volunteer technical activities, (3) promote the sale of conference records and Society/Council periodicals and journals, and (4) provide and improve management reports on society operations for the volunteers and IEEE.

The TAD functions fall into two categories. Volunteers serve the Society only for a few years and are then replaced. TAD provides some of the "Corporate Memory" that is often limited in Society operations. Coordination of Efforts, Providing Resources, Financial Services, Data Analysis and Archival Functions all fit this category. Presenting the IEEE entity image is another function of TAD. Coordination of TAB activities, promotion of society publications, promoting membership, reporting data and replying to public inquiries fall into this category. All of these services are to aid and extend the efforts of society volunteers.

During the TAD restructuring and subsequent move to Piscataway, NJ, two Society Associates were added to address the immediate needs of the Societies and their members. Their names and phone numbers are as follows:

Diane De Marzo (201) 562-3853
Marsha Tickman (201) 562-3854

In 1990, the cost for the society associates is being paid by the TAB. They act as points of contact in the IEEE, and can act as Society administrators, taking minutes at AdCom or committee meetings and sending out notices in support of Symposia and other Society functions. If you need any help from the IEEE please feel free to contact these Society Associates at the above numbers.
Last issue I wrote about the Product Safety Newsletter. Previously I have discussed the local groups that regularly have technical meetings on topics of interest to product safety professionals. Another type of communication we are sponsoring is called by several different names: symposium, colloquium, convention or conference.

This year we are participating for the first time in the IEEE International Symposium on Electromagnetic Compatibility, which is being held in Washington, DC, from August 21 to 23. This participation takes the form of a "Product Safety Special Session" scheduled for Tuesday, August 21, starting at 2:00 p.m. The EMC Symposium Advance Program describes it as follows:

All electric products have the potential of being a source of electric shock. It is important in the design of electrical products to be aware of the various means for protection to minimize electric shock. The methods include: grounding, double insulation, shielding, ground fault circuit interruption and polarization. This tutorial by the Product Safety Technical Committee will provide a brief overview in defining each method and the advantages of each. A more in-depth study will be made of one or more of the methods as time allows.

This year would be an excellent time to attend the EMC Symposium and drop in at the Product Safety Special Session. Just in passing, another time to remember is that of the IEEE EMCS TC-8 (product safety) meeting, which is scheduled for Wednesday, August 22, from 7:00 to 9:00 p.m. Hope you can make it to Washington!

A cooperative effort like organizing a Special Session requires more than the presence of the presenters, although, of course, that is essential. Those people who devote hours of their time to arranging all the tedious details, who make sure things work without sharing the spotlight on the podium, must be mentioned and praised. Perhaps this sounds a lot like your regular job: to make sure your company's products are safe and radiated emissions "don't bring down low flying airplanes," while the marketeers closing multimillion dollar deals get the glory. Why not ask any space shuttle passenger whether he prefers the glory ... or gaskets that work? Keep up that attention to details!

Sorry about the harangue. It was inspired by the upcoming Symposium and by the EMCS President's Message in the last issue (Spring 1990) of the EMC Society Newsletter. If you haven't read it yet, then right now would be a good time. He is urging people to participate, to get involved, which will help the Society and themselves. And this leads me back to the topic of symposia.

A number of people are contributing to the Product Safety Special Session at the Washington Symposium this year, including the session chairman, John Knecht, from Underwriters Laboratories in Northbrook, Illinois. This kind of participation is great, and we need more of it. But if participating at the international level is a bit too intimidating for a first effort, have I got a deal for you!

The Santa Clara Valley Chapter of the EMC Society is sponsoring a local colloquium to be held on June 12 to 13, 1991. "IEEE SCV 91 EMC: A Product Compliance Colloquium" will include an afternoon session on product safety. Speakers are being sought now for this event. If you are interested, please call Franz Gisin, Rolm Systems Inc., at 408-492-3543.

I am hoping that other local product safety groups may take advantage of their association with the EMC Society and participate in local conferences like this one. Any takers?
EMP INTERACTION AND HARDENING

A one week intensive course on EMP interaction and hardening (including related transient phenomena) will be held from Sunday, September 9, 1990 to Saturday, September 15, 1990 at the University College, Durham, U.K.

The course is sponsored by the Education Committee of the SUMMA Foundation USA, The UK Pulsed Power Association, Imperial College of Science, Technology & Medicine, London, AEA Technology, Abingdon, Oxfordshire and British Aerospace pic, Stevenage, Herts. The program is supported by the Institution of Electrical Engineers, Electronics Division, Savoy Place, London.

The course is designed to provide students who already have a good electromagnetic background with working principles and reference sources on the subject matter.

For reservations or registration, contact The UK Pulsed Power Association, Dept. of Electrical Engineering, Imperial College of Science, Technology and Medicine, Exhibition Road, London SW7 2BT. Phone 071-584-2005. For additional information contact Dr. C. E. Baum, 5116 Eastern, SE, Unit D, Albuquerque, New Mexico 87108, Phone (505) 844-9816 or Dr. W. R. Bell, Dept. of Electrical and Electronic Engineering, University of Newcastle-upon-Tyne, Merz Court, Newcastle-upon-Tyne NE1 7RU, Phone 091-222-7344.

IEEE 1991 SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY

The IEEE 1991 EMC Symposium will be held August 13-15, 1991, at the Hyatt Cherry Hill in Cherry Hill, NJ. A call for papers has been issued for sessions, workshops, and tutorials on all aspects of EMC. Suggested technical areas, featuring practical applications and benefits to environment and technology include all aspects of EMC, EMP, lightning and ESD.

Prospective authors can receive detailed information from the IEEE 1991 International Symposium on EMC, P.O. Box 609, Lincroft, NJ 07738, or phone Ed Bronaugh (800) 253-3761.

THE IEEE TRANSACTIONS ON ELECTROMAGNETIC COMPATIBILITY ON HIGH POWER MICROWAVES

The last decade has been characterized by rapid development in high power microwave (HPM) science and technology. The HPM generation is in the range of several gigawatts with pulse widths of hundreds of nanoseconds. Other related areas such as radiating systems for HPM, propagation in air, interaction with targets, and instrumentation have also advanced in step with source development.

In the past, IEEE Transactions on Plasma Science has devoted two special issues exclusively on HPM generation (December 1985 and April 1988). The goals of this special issue are to build on the past special issues and expand the scope of the technical contents to related areas. The subject areas of interest include, but are not limited to: new advances in source development; propagation; radiating systems; coupling; and instrumentation.

Original contributions in these and related topics by way of analytical, experimental or computational results are solicited.

The deadline for receipt of contributions for consideration in the Special Issue is October 1, 1990. Instructions for the preparation of your paper may be found on the inside back cover of current issues of the IEEE Transactions on Electromagnetic Compatibility. The special issue is scheduled for publication in May 1991.

1992 IEEE-APS/URSI/NEM SYMPOSIUM

The 1992 IEEE-APS/URSI/NEM Symposium will be held at the Hyatt Regency Chicago Hotel, 151 East Wacker Drive, Chicago, Illinois 60601, USA on July 18-25, 1992. The host institution is the University of Illinois at Chicago, in cooperation with the Illinois Institute of Technology, Northwestern University, the University of Illinois at Urbana-Champaign and local industry. USNC-URSI will participate with Commissions A, B, D, and E. The program will include workshops, short courses, industrial visits, an APS AdCom meeting, technical sessions, a plenary session and the official banquet. Poster sessions and industrial exhibits will also be featured.

For additional information, contact Professor P.L.E. Uselgh, 1992 IEEE-APS/URSI/NEM Symposium Chair, Department of EECS (m/e 154), The University of Illinois at Chicago, Box 4348, Chicago, IL 60680, USA. Phone (312) 996-5487, FAX (312) 413-0024.
EDUCATION COMMITTEE NEWS

Clayton Paul
Associate Editor

The EMC Experiments Booklet has been printed. An initial printing of 250 copies spiral bound will be available at the Washington symposium. We still desperately need more experiments to be submitted for inclusion if this booklet is to become a useful tool in achieving its objectives. Anyone who has an experiment in mind that they would like included should submit that experiment to Clayton Paul, Department of Electrical Engineering, University of Kentucky, Lexington, KY 40506. Please help us by submitting experiments.

The Distinguished Lecturer Program is a viable program with four lecturers: Scott Bennett, Don Heirman, Joe Fischer and Ed Bronaugh. Two new lecturers for 91 have been appointed: Henry Ott and Bob Cowdell. Scott Bennett and Don Heirman will have completed their terms June 30, 1990. We encourage you to make use of this program. Anyone interested in having a Distinguished Lecturer speak at a chapter meeting or other gathering should contact the lecturers directly or through the program director, Dave Hanttula at 26787 Robleda Court, Los Altos Hills, CA 94022 or call him at his work number (415) 335-1071; FAX (415) 967-1042.

Kimball Williams has finished converting the EMC Bibliography to diskette files. It is available in both Word Perfect 5.0 or ASCII file format. EMCS members wishing to obtain a copy of it should send Kimball a floppy disk that is formatted on the system you wish to use and advise him which version you want. It can be copied to 5-1/4 or 3-1/2 disks formatted on IBM compatible machines. Please indicate which version(s) of the files you want along with information on how it is formatted. Also include your return address. Kimball’s address is:

Kimball Williams
Eaton EMC Laboratory
Box 766
26201 Northwestern Highway
Southfield, MI 48037
Phone: (313) 354-2845

This document is intended to be a compact and localized source of reading material germane to the subject of EMC.

By the time you read this article we may or may not have completed our EMC Symposium in Washington, DC. The meeting of the EMCS Education Committee will be held on Tuesday morning August 21 at 8 AM. We invite anyone interested in participating in our committee to attend.

DISTINGUISHED LECTURER PROGRAM

Two additional speakers for the Distinguished Lecturer Program of the EMC Society have been selected: Robert B. Cowdell, R. B. Cowdell, Consultant and Henry W. Ott, Henry Ott Consultants. Mr. Ott is an IEEE Fellow, Mr. Cowdell a Senior Member; both have contributed to technical sessions of the Society, and are well-regarded by their professional peers. The term for both will run from July 1, 1990 to June 30, 1992.

Distinguished Lecturer Addresses and Periods of Office

W. Scott Bennett
Hewlett-Packard Company
Fort Collins, CO 80525
(303) 229-3161

Edwin L. Bronaugh
The Electro-Mechanics Company
P.O. Box 1546
Austin, TX 78767-1546
(512) 835-4684

Robert B. Cowdell
Robert B. Cowdell Consultant
1951 La Loma Drive
Santa Ana, CA 92705
(714) 832-6626

Joseph F. Fischer
Fischer Custom Communications
3121 W. 139th St. Unit F
Hawthorne, CA 90250
(213) 644-0728

Donald N. Heirman
AT&T Information Systems
M/S Bldg. 41 Rm. 112
Crawfords Corner Road
Holmdel, NJ 07738
(201) 834-1801

Henry W. Ott
Henry Ott Consultants
48 Baker Road
Livingston, NJ 07039
(201) 992-1793
PCs FOR AP

This column covers three quite different topics, two being provided by readers and the third an announcement of a new special-purpose computer. First, we hear from R. P. Haviland describing one of the earlier PCs, the Amiga, and its potential for use as a workstation. Next, an emphatic "second" concerning APL as a programming language is provided by David G. Fern, following D. B. Miran's enthusiastic recommendation in the Winter, 1990 issue. Finally, we conclude with a brief description of a new computer designed primarily around the Finite-Difference Time-Domain formulation. Perhaps this approach provides a glimpse of one branch of future computer developments, where not only will software designers be challenged to design algorithms that maximally exploit new computer architectures, but conversely, computer designers will attempt to design hardware adapted to particular kinds of numerical models.

The AMIGA as a Workstation
Dr. R. P. Haviland, Daytona Beach, FL

The combination of game based hardware and a theory-based operating system yields a machine of unusual power. Virtually all features of the Lisa, the Mac and the PC family are included. Flexibility approaches mainframe level. Other micro-computers are just now playing catch-up on multi-media and multi-tasking.

All of the Amigas are multi-tasking, and multi-media. Up to the limits of memory, as many as 20 executing programs can exist at the same time, although three or four are more common. Multi-tasking is a great convenience. It's nice to have a language, a program editor, a file editor and the full operating system available by 2 or 3 mouse clicks.

There is still a belief that the Amiga is not worth having because of the lack of programs. Actually, a full complement of languages, including BASIC, C, Comal, Fortran, Modula 2, Pascal plus several specialized ones are compatible. The bundled BASIC is more powerful than that for the PC, (although the editor is not as good). A compiler for this BASIC is available, giving code which approaches C and Fortran in power and speed. C, however, is the language preferred by programmers who work at the machine level.

Several years use of an Amiga as a workstation have led to the following conclusions. Useful work can be done on even the low-end Amiga 500, but serious work needs expansion, to 1.5 or 2 MB of memory, plus two drives. A hard disk is convenient but not really necessary. If program interchange is needed, 5 1/4 inch drive is indicated, plus a modem and null-modem. If high speed is a must, an accelerator with a 68020 or 68030 plus a numeric chip is in order. It really isn't necessary, since the computer is happy working through the dinner hour or even all night.

A standard printer is satisfactory for personal work, but at least 300 DPI is needed for publication. Laser print is best handled by paying page charges, working from a file disk. A spread sheet is a necessity for a personal workstation, as is a word processor, preferably with equation capability. A useful element is a plotter simulator, which allows even 9-pin printers to emulate an E-size plotter.

Many public-domain programs can be used, for example Mininec, Spice, FFT, plus various data analysis, drafting, plotting and mapping programs. "Pet" programs from the office in BASIC, Fortran and C are easily ported.

So, hardware and software customized, an Amiga can approach or even equal a mainframe in power. The speed won't be as good unless fully expanded, but speed is rarely necessary in personal work.

More Support for APL
David G. Fern, El Cajon, CA

FINALLY, FINALLY, FINALLY someone has come out in defense of APL! I read with great interest Dr. Miran's installment in your PCs for EMC column. As an electrical engineer who uses computers quite frequently (as we all do), I have become increasingly disgusted with FORTRAN and BASIC for precisely the reasons stated by Dr. Miron ... to this day I maintain that APL is the ONLY computer language that makes any sense at all for those who want answers from the computer without having to waste time on type declarations and INCLUDE files. I am fully in agreement with everything that Dr. Miron states in your column, however there are several things which I think need to be added to drive his arguments for APL home.
The power that APL possesses is a double-edged sword—a single line of code in APL can often replace a nested-loop structure in FORTRAN or BASIC (as Dr. Miron notes in his reference to matrix inversion with the monadic domino operator). One can pack so much into a single line of APL that it can be absolutely impossible to read several months down the road. For this reason, many critics of APL have called it a "write only" language. To some extent I agree with this criticism, but most programmers that I have met are horrible at documenting their FORTRAN code with comment lines anyway. Documentation of APL code with comments I feel is essential if anyone other than the creator of a particular program is to understand it.

Computer Designed for a Particular Algorithm — The WaveTracer Data Transport Computer

Upon first hearing about the project described briefly below, I contacted the company to request further information for this column. The following edited account was received from WaveTracer, in connection with the company's announcement for their new "Data Transport Computer."

WaveTracer Electromagnetic Design and Analysis Software

The Electromagnetic Design and Analysis Software is based on the Finite Difference Time Domain (FDTD) algorithm. The principal function of the software is to analyze scattering and radiation problems.

The FDTD technique directly solves the initial-value problems of Maxwell's Equations. The algorithm is simple, three-dimensional and local. The simplicity of the algorithm is very important for scattering and radiation problems since, for these problems, the total number of discretization nodes is usually very large. Furthermore, the simplicity permits straightforward treatment of geometries and materials. The three-dimensional and local nature permits massively-parallel computation.

The current version of the software handles arbitrary geometries, media and material characteristics, steady-state and frequency-domain analysis, and RCS calculations. Materials may be conductors, inhomogeneous, dielectric, electric and magnetic loss, and frequency-dispersive materials.

Users specify the problem's computational domain, media characteristics, geometry of scatterer, material of scatterer, time-stepping parameters, incident excitation, and visualization parameters with an easy-to-use interface. The visualization output is a three-dimensional volumetric data set that consists of the three electric-field and magnetic-field components in cartesian coordinates.

The system's postprocessor currently extracts two-dimensional volumetric slices and displays each slice in a separate window on the workstation screen.

WaveTracer Multidimensional Computer

The WaveTracer Data Transport Computer is a massively-parallel computer designed to provide highly efficient computing power to software algorithms that deal with problems of two or more dimensions. The DTC provides problem-solving software with an ultra-fine grained three-dimensional computational domain (millions of nodes). A unique aspect of the DTC is its ability to be configured, via a software command, into a natural two-dimensional machine. The DTC attaches to most industry-standard workstations.

In addition to the preprogrammed tools for complex physical phenomena, mathematics, and visualization, WaveTracer offers multi C™, a C compiler that provides the user with a simple, straightforward way of developing multidimensional algorithms, as well as handling parallel variables, computational domains, and parallelization.

ELECTROMAGNETIC ENERGY POLICY ALLIANCE

The Board of Directors of the Electromagnetic Energy Policy Alliance (EEPA) held its sixth Annual Meeting and Symposium in April in Alexandria, VA. "Current Scare: Electrophobia" was the theme of the conference, which addressed major electromagnetic energy issues. During the two-day program 15 experts presented information in a variety of disciplines. A short course entitled "An Overview of Electromagnetic Fields: Bioeffects and Standards" was also presented. The focus of the course was electromagnetic field health and standards issues and related institutions and researchers.

The EEPA is an organization comprised of concerned individuals and companies whose goal is to verify or disclaim information presented on non-ionizing radiation.

An increasing number of news reports, articles and books have expressed concern with the effects of technologically generated electric magnetic fields on humans. Recently, the focus has been on fields surrounding 60 Hz electric power transmission and distribution lines, as well as electrical wires from standard household and office appliances. Similar concerns have been voiced regarding higher frequency radio and TV broadcasting and communications equipment, civilian and military radar, microwave ovens, video display terminals and induction heating devices.

The EEPA endeavors to put these alleged dangers into perspective citing the most current research. EEPA also investigates the basis on which writers and reporters present material on adverse bioeffects. The latest recommendations for state and federal safety standards are also considered.

For information about the EEPA, contact: EEPA, 1225 23rd St., N.W., Suite 850, Washington, DC 20037. Phone: (202) 452-1070.
BOOK REVIEW

ELECTROSTATIC DISCHARGE CONTROL

As the author states in the Preface of his book, the subject of electrostatic discharge (ESD) continues to be a "narrow field." One of the main objectives of this book is not only to dispel such a belief, but to convey to high-tech industry leaders the need for ESD control measures, even if they are pursued for purely economic reasons. The author also intends to raise the ESD awareness to the point of foreseeing, as the author states, the need for "ESD control specialists" in many electronic industries in the future.

The book addresses all the major facets of electrostatic discharge, from its history to the use of ESD control measures and standards. Within this scope, the author introduces the readers not only to the basic principles and mathematical fundamentals of electrostatic discharges, but provides a broad view on such topics as ESD source models, failure analyses (including latent failures), design techniques and case histories of ESD in the workplace. The book assumes the reader has very little prior knowledge on the subject.

The book is organized into 17 chapters (no appendices). The first four chapters serve as basic introduction to the nature of electrostatics, followed by a chapter on the basic physics of electrostatics. Chapters 6 through 12 are devoted to ESD, starting from the fundamental concepts of static electrification and damage (Chapters 6 through 8) to the analysis of failures (Chapters 9 through 12). The last 5 chapters in the book focus on the application and evaluation of ESD control measures in the workplace with the last chapter (Chapter 17) devoted to a brief outline of presently known ESD control standards.

Chapter 1 gives a concise history of how electrostatic discharges become a "hot" issue. The author clearly discusses how the trend toward microminiaturization and higher speeds has made ESD a major threat to the electronic industry. In Chapter 1 a definition statement of ESD and its implications are given, followed by a synopsis of ESD threats to electronic parts. The chapter concludes by providing a sequence of historical events which brought the understanding of ESD phenomena from their infancy to their mature state.

The author asserts that "awareness is at least 85% of the battle in conquering the ESD threat" and Chapter 2 then proceeds to spell out the reasons for the lack of awareness of this threat in the electronics industry. The chapter provides 7 reasons why so much doubt still exists on the ESD threat. The chapter ends by explaining the need to target three groups: management, factory operators and technical personnel who need to be convinced and trained in ESD awareness.

The history, basic principles and the mathematics of electrostatics are covered in Chapters 3 through 5. In Chapter 3 a complete history of the observations, theories and experiments made in electrostatics by a group of individuals throughout history are recorded, starting from the Greek philosopher, Thales, to Faraday and Maxwell. Chapter 4 provides the theoretical foundation of electrostatics by first discussing contact and triboelectric charging and then several factors which can change the charge separation processes, such as conductivity, resistivity (volume and surface), type of materials, and humidity. The second part of the chapter defines several terms associated with electrostatics and finishes with laboratory-type methods used for charge generation (electrophorous and Van-de-Graff generators) and neutralization. The subjects of triboelectric charging and induction are uniquely explained in this chapter. Triboelectric charging is rarely mentioned (much less explained) in most electromagnetic textbooks and the subject of induction is used to introduce the concept of "compound induction" which is particularly common in ESD events.

The related Chapter 5 reviews the fundamentals of electrostatics and physics, and most of the topics covered on the chapter can also be found in undergraduate textbooks in electromagnetics. However, one section in this chapter on "Green's Reciprocity Theorem" (GRT) for electrostatics and its application to determine the mutual capacitance among separated conductors is uncommon in many electromagnetic textbooks. This application of the GRT forms the basis for most ESD analyses.

The introduction to ESD starts in Chapter 6. The first six sections contain a very brief introduction to solid state physics where the concepts of band structures in solids, fermi levels in semiconductors and work functions are outlined. The second part of the chapter discusses several types of electrification process that occur in metals and dielectrics, including contact and pyro/piezo electrification, flow/spray electrification and also static electrification due to the polarization of dielectrics in electric fields. The chapter...
concludes with a brief discussion of three common discharge processes from points (including corona), sparks and lightning.

Chapters 7 and 8 address the nature of static damages and ESD source modeling respectively. In Chapter 7 detailed discussions on seven types of damages in semiconductors are reviewed. They include 1) MOS, 2) junction-type, 3) metallization, 4) wire, 5) passive-device, 6) very thin oxides 7) schottky diode and 8) gallium-arsenide. When addressing each type of damage the author not only identifies the major "characteristic traits" of such failures but tries to convey possible mechanisms or models (e.g., Wunsch-Bell, Speakman, adiabatic) which corroborate analytically the observed damages. Chapter 8 covers ESD source models that bring about failures such as 1) a human body, 2) a charge-device, 3) field-induced, 4) machine-type, 5) field-enhanced, and 6) capacitive-coupled models. The chapter describes well the major characteristics of these models with the realization that certain overlaps exist among them. Emphasis in the chapter is on direct source-to-device modeling rather than the modeling of currents and voltages. When the path between source to victim is complex, such modeling is dependent on the type of circuits involved.

Analysis of ESD failures start with Chapter 9 and continues in Chapter 10 and 11. As the author states, the analysis of failures will reveal "how big the static problem is." Chapter 9 describes the techniques and methodologies used for static failure analysis. The major objective is to teach how we can uniquely identify failures caused by ESD vs those caused by other factors (e.g., EOS, mobile ions, etc.). The largest section in the chapter is reserved for part analysis where a series of physical dissecting techniques (de-lidding, internal microscopic inspection, failure-site-isolation, etc.) and other methods (chemical/plasma etching, scanning electron microscopy) are used. Chapter 10 presents a series of selected case histories which illustrate and complement the failure analysis procedures of Chapter 9 and illustrate failure-analysis elements and technologies appropriate for use by ESD-failure analysts.

Of all the chapters in the book Chapter 11 is the largest and most unique. It describes latent ESD failures and by latent is meant time-dependent malfunctions which occur due to earlier exposure to ESD. The author acknowledges the controversial nature of the subject because past controlled laboratory experiments have yielded inconclusive results and because of the lack of published data. The scope of the chapter is to show proof of the existence of latent ESD failures by addressing two experimental research projects (with author involvement) which matched the author's expectations.

A series of ESD immunity techniques (electrical and mechanical) to reduce the vulnerability of electronic parts to the damaging effects of ESD are reviewed in Chapter 12. The techniques outlined are "on-circuit" (built-in) protections to integrated circuits. The chapter does not consider ESD protection at the subsystem and system levels, but instead focuses on ESD protection of "parts" only. Among the on-circuit protection devices reviewed are a) diode and resistors, b) diode-resistor combinations, c) field plate, d) punch-through, e) thin & thick oxide transistors and f) spark-gaps. A few examples of how these protection devices can be used in NMOS, SOS, CMOS and VLSI circuits are then presented.

The guidance necessary in the selection of specific control measures is provided in Chapter 13. Common sources of static generation that are typical in an industrial environment are described. These include insulative material, factory processes, test and troubleshooting, shipping and others. Chapter 14 deals with how to determine the extent of control measures in ESD programs and how to manage such programs. To tailor an ESD program which best meets the needs of a facility, the chapter covers such aspects as funding, previous ESD experiences, control needs, management and personnel. The last part of the chapter covers some of the economic factors involved in ESD control.

In Chapter 15 the use of ESD control measures is considered. The chapter divides control measures into primary, secondary and tertiary (order of importance). Primary control measures discussed are personnel grounding, grounded work surfaces and equipment, purging of static hazardous materials, and protective packaging. Among the secondary and tertiary types of control measures reviewed are training, ESD certification, replacement of materials, humidity and ionization.

Control measures often have to be "tailored" for particular applications and the need arises to "evaluate" the control product (series of implemented control measures). Chapter 16 analyzes these topics by first telling the reader that many of the now available ESD control products (known as "standards") are useless in many applications because they were intended for entirely different purposes. Rather, the reader is informed, it may even be better to intelligently use non-ESD techniques and concepts and apply them (with certain limitations) to ESD issues. Such concepts as resistance, triboelectric properties, shielding and grounding can be effectively incorporated into ESD control programs and tailored for a particular application. The chapter covers all these issues with some interesting examples. Finally, Chapter 17 reviews the highlights of presently available military (MIL-STD-883, DOD-STD-1686) and commercial ESD standards with emphasis on the need for "revisions" due to the constantly evolving electronic environment.

With this book, the author helps to fill a need for ESD awareness and knowledge among engineers and managers in a field that is constantly changing. Though many aspects of ESD are addressed, the thrust of the book is on ESD control. Two issues which may be useful in future editions of the book are a) examples of complete source-to-victim protection at the subsystem and system levels.
EMC STANDARDS ACTIVITIES

Much is happening in standards:

- MIL-STD-461/2 and 3 is being updated.
- ANSI C-63.4 was updated to include the FCC measurement procedure.
- With 1992 approaching, Europe is releasing a set of "European Norms" (EN) such as EN55022 (based on CISPR 22 for ITE) EN55014 (based on CISPR 14 for domestic equipment).
- However at present, the VDE 0871 limit B is still in force, although a new series of VDE 0878 is appearing in draft form. This series will be the same as the EN's, however some 10 kHz to 150 kHz limits are still being planned for Germany (VDE 0878 Part 30).

Consequently, the US EMC community should keep abreast of these developments. The most effective way to do this is to participate (and work) on one of the EMC committees. The IEEE, ANS C-63, EIA and SAE committees need dynamic participants that will contribute by attending meetings, review and correct documents and to start new projects. The following two standard summaries were prepared by Don Heitman from the IEEE/EMCS Standards Committee and by Ed Bronaugh for the ANS C-63 Committee.

IEEE/EMCS Standards Status
May 19, 1990

<table>
<thead>
<tr>
<th>Standard</th>
<th>W/G Chairman</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>140-1950 (RF Heating)</td>
<td>Secretary</td>
<td>Submitted to IEEE Stds. Review Committee; awaits action at Summer/Fall meeting.</td>
</tr>
<tr>
<td>187-1951 (Open Field)</td>
<td>Secretary</td>
<td>Forwarded to REVCOM for approval; on REVCOM agenda at May 30, 1990 meeting.</td>
</tr>
<tr>
<td>299 (Shielding)</td>
<td>Gene Knowles</td>
<td>Draft was balloted with over 75% returned. Revision incorporating comments and being retyped.</td>
</tr>
<tr>
<td>475-1983 (Field Sensors)</td>
<td>Don Kerns</td>
<td>New PAR overdue from W/G chair. Major changes are needed.</td>
</tr>
<tr>
<td>P478/482 (Connector Shielding)</td>
<td>Jim Parker</td>
<td>P478 &amp; P482 is being combined into one PAR. The revised PAR will use the P482 number. P478 needs to be formally dropped. W/G chair will discuss with SAE committee at Washington, DC Symposium.</td>
</tr>
<tr>
<td>P509 (Gaskets)</td>
<td>George Kunkel</td>
<td>TC-4 to submit its recommendations for further action. Plans are to merge this with P482 effort; TC-4 chair to discuss this with SAE reps.</td>
</tr>
<tr>
<td>F626 (Grounding)</td>
<td>John Osburn</td>
<td>Meeting being planned for Washington, DC Symposium. New PAR prepared.</td>
</tr>
<tr>
<td>P1140 (E &amp; H Field)</td>
<td>D. Moonglinan</td>
<td>Chair contacting W/G members to determine their continued interest and to solicit others to join.</td>
</tr>
<tr>
<td>P1190 (LJSN Cal.)</td>
<td>R. Egan</td>
<td>New W/G chairman named; W/G meets at Washington, DC Symposium - plan to draft outline of document.</td>
</tr>
</tbody>
</table>
### ANSI ASC C63 Project Schedule

(Revised 5/90)

(Changes in boldface)

<table>
<thead>
<tr>
<th>Number</th>
<th>Title</th>
<th>Chairman</th>
<th>Target</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-0.5</td>
<td>Guide to EMC Std's &amp; Proc.</td>
<td>Mertel, H.</td>
<td>TBD</td>
<td>C63.8/D7 <em>(Needs Date)</em>.</td>
</tr>
<tr>
<td>0-0.6</td>
<td>Extension of C63.2 below 10 kHz</td>
<td>Bronaugh, E.</td>
<td>9/90</td>
<td>Circulate, discuss and ballot.</td>
</tr>
<tr>
<td>0-0.7</td>
<td>Power Line Filter guide.</td>
<td>Bloom &amp; Showers</td>
<td>5/90</td>
<td>Resolution of ballots.</td>
</tr>
<tr>
<td>0-1.2</td>
<td>Revision of C63.4 to include FCC Test Proc.</td>
<td>Showers, R.</td>
<td>5/25/90</td>
<td>Circulate D11.3 to Committee Response ASAP but NLT 6/22.</td>
</tr>
<tr>
<td>0-2.0</td>
<td>Ad Hoc Committee on Appliance EMC-Limits.</td>
<td>Showers, R.</td>
<td>9/90</td>
<td>Generic standard under consideration.</td>
</tr>
<tr>
<td>0-4.2</td>
<td>Third Party Certification of US EMC Laboratories for EC '92.</td>
<td>Heirman, D.</td>
<td>TBD</td>
<td>Ad Hoc committee to study.</td>
</tr>
<tr>
<td>1-1.1</td>
<td>Immunity add to C63.4</td>
<td>Heirman, D.</td>
<td>D10 3/90</td>
<td>Ballot due 5/15/90.</td>
</tr>
<tr>
<td>1-1.2</td>
<td>ESD</td>
<td>Staggs, D.</td>
<td>D6 to WG for comment Feb.</td>
<td>Ballot by 7/15/90.</td>
</tr>
<tr>
<td>1-1.3</td>
<td>Immunity Instrumentation.</td>
<td>Hayes, W.</td>
<td>D7 current</td>
<td>Ballot due 5/15/90.</td>
</tr>
<tr>
<td>1-3.2</td>
<td>C63.4 down to 20 Hz.</td>
<td>Bronaugh, E.</td>
<td>D1 by Aug.</td>
<td>SC-1 comments on outline. Needs task group members.</td>
</tr>
<tr>
<td>1-4.1</td>
<td>C63.4 Cable Placement.</td>
<td>Dash, G.</td>
<td>3/15/90</td>
<td>SC-1 comment on proposal.</td>
</tr>
<tr>
<td>1-7.1</td>
<td>C63.4 for Medical Devices.</td>
<td>Hoolihan, D.</td>
<td>4/1/90</td>
<td>Revise charter, organize task group.</td>
</tr>
<tr>
<td>1-8.2</td>
<td>C63.4 for Automatic Test Procedures.</td>
<td>Xavier, S.</td>
<td>D4 by 3/90</td>
<td>Comments on D3 from SC-1 due.</td>
</tr>
<tr>
<td>1-8.3</td>
<td>C63.2 to Add Spectrum Analyzers.</td>
<td>Magnuson, R.</td>
<td>5/91</td>
<td>Needs task group members.</td>
</tr>
<tr>
<td>1-11.1</td>
<td>Appliance.</td>
<td>Smith, C.</td>
<td>D7 available</td>
<td>Steering Committee guidance needed. SC-1 comments by Apr. 4/90</td>
</tr>
<tr>
<td>1-13.1</td>
<td>Alternate Site Acceptibility 30-1000 MHz.</td>
<td>Pate, B.</td>
<td>5/91</td>
<td>Approved by C63 on 3/15/90.</td>
</tr>
<tr>
<td>1-13.2</td>
<td>Site Acceptibility Above 1 GHz.</td>
<td>(Vol. needed)</td>
<td>5/91</td>
<td>Approved by C63 on 3/15/90.</td>
</tr>
<tr>
<td>1-13.3</td>
<td>Test Sites Below 30 MHz.</td>
<td>(Vol. needed)</td>
<td>5/91</td>
<td>(Continued on page 17)</td>
</tr>
</tbody>
</table>
EMC CERTIFICATION AND ACCREDITATION

PROGRESS REPORT

It is renewal time for my EMC certificate! I was notified by NARTE in April that my certificate will expire within 90 days. In order to renew I must provide verification that I am still practicing in the EMC field, a listing of professional courses or other training that I have received during the past year and my renewal fee of $40.00. Renewal is simple enough and is certainly to my advantage. The purpose of this procedure is to advise NARTE my credentials are current and to assure NARTE of my continued competence.

Participation or attendance at the IEEE International Symposium on EMC is an excellent way to meet both objectives.

The last issue closed with a comment on the first Navy procurement for technical services involving EMC Certification as a consideration. The solicitation was issued by the Naval Sea Systems Command. Under "Qualification of Personnel" the solicitation called for certification of EMI control capability as an additional qualification. The solicitation asked the offeror to demonstrate whether the individual has been certified as an EMI engineer or technician. It stated that this will count as partial proof of EMI control skill. The solicitation further stated that the EMI certification program is documented in NAVAIR Instruction 2410.1D of 17 May 1989.

The following is my perception of the significance of the EMC certification requirement. This perception is based on having been a contractor who has bid on this project in the past, and having been the government manager of the project at one point. The winner had been providing EMC engineering and technical support to the Navy for an number of years. They must have recognized that competition for this particular solicitation would be intense. They took the initiative to meet the competition by gearing up for the EMC certification issue early.

The procedure was for waterfront EMC engineering and technical services. More than 20 positions were involved. The winner probably presumed competition from at least two competent sources plus a possible unknown "dirt cheap" bid. They understood that the customer (the Navy) wanted knowledgeable people who could fix ships efficiently during brief in-port periods. They recognized early that EMC certification was the only new discriminating factor over previous solicitations and that their earlier proposals had probably been obtained by the competition through the Freedom of Information Act requests.

They must have looked internally at how to show the strength of their team. It seemed logical to them to encourage their technical staff to become NARTE certified. They probably did not offer bonuses or awards for certification but they did offer to pay the fee for initial certification and renewal. They accepted "team effort" and let the effects of "peer pressure" motivate, as individuals began to receive notification of certification. They expected the applicants to draft the 10 questions required of "grandfather" candidates on their own time. At the time the proposal was submitted, a large number of their involved personnel were NARTE certified EMC professionals.

Apparently the strategy worked. The contract was awarded without protest.

A second procurement, this time from the Naval Research Laboratory, closed on 18 May 1990. That procurement contained specific qualification language for personnel requiring EMC certification. For example, the EM Hazards Engineer position in the solicitation requires a BSEE and NARTE certified EMC engineer with at least 10 years E3/EMC experience with demonstrated capability in all phases of EM hazards, HERO, HERP, HERF and RF burn. The line "BSEE and NARTE certification appeared in six of the ten labor categories sought.

The first flight of nine laboratories has been accredited by the National Institute of Standards and Technology (NIST). The nine laboratories are:

- Amador Corporation, Taylor Falls, MN
- Chomerics, Inc., Radiation Test Service, Woburn, MA
- Dash, Straus & Goodhue, Inc., Boxborough, MA
- D.L.S. Electronic Systems, Inc., Glenview, IL
- Elite Electronic Engineering Co., Downers Grove, IL
- R & B Enterprises, West Conshohocken, PA
- Radiation Sciences, Inc., Harleysville, PA
NIST EMC accreditation is no simple matter. Not all of the labs that applied for the first flight were accredited. Our congratulations go out to these industry leaders!

NIST has begun work to accredit the second flight. The process is slower than that for certifying people. NIST is very clear that they do not deny accreditation to anyone. However, if a laboratory does not meet the established EMC accreditation standards their accreditation is withheld until they make the changes needed to meet the standards.

Additional assistance is available for laboratories planning to become accredited. For example, one session of the IEEE International EMC Symposium in August at the Washington Hilton, Washington, DC, is set aside as a laboratory accreditation workshop. The workshop will cover issues related to planning, grooming and preparing for the assessment team visit. It will incorporate lessons learned by laboratory assessors and accredited laboratory personnel.

NARTE has reported that the final days of the "grandfather" period has resulted in a flood of applications. They will not have a final nose count of certified EMC professionals for a couple of months. They are planning a second edition of their bulletin, "A View Toward EMC Excellence" to cover what happens now that the first wave of the program has past.

**Electrostatic Discharge Control (Continued from page 13)**

ESD modeling which will include current paths (and voltage drops) among many circuit elements as ESD events are analyzed and b) ESD events in "outerspace" where some of the most intriguing ESD problems in spacecraft have been documented and for which information is readily available in the literature.

The book is recommended as a reference for those engineers and technicians interested in electrostatic discharge. The lack of supplementary problems per chapter and examples makes the book not very suitable as a textbook, a problem which can be corrected by the instructor. The book is recommended for use as a reference by both instructors and students in connection with an electromagnetic compatibility course where the subject of ESD might be covered.

---

**EMC Standards (Continued from page 15)**

1-14.1 Revise C63.5. (Vol. needed) S991

1-14.2 Revise C63.6. (Vol. needed) S991

1-14.3 Revise C63.7. (Vol. needed) S991


5-1.0 Coordination of Immunity Standards in PL97-259. Heirman, D. As Needed


---

**CALENDAR**

1990

<table>
<thead>
<tr>
<th>August 21-23</th>
<th>IEEE Intl. Symposium on EMC</th>
<th>Contact: IEEE EMC International Symposium on EMC P.O. Box 19342 Washington, DC 20036</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 28 - September 5</td>
<td>23rd General Assembly of the Intl. Union of Radio Science (URSI) Prague, Czechoslovakia</td>
<td>Contact: Prof. V. Zima, Chairman Local Organizing Committee 182 51 PRAHA 8 Czechoslovakia</td>
</tr>
<tr>
<td>September 10-13</td>
<td>12th Annual Electrical Overstress/Electrostatic Discharge Symposium Buena Vista Palace Orlando, FL</td>
<td>Contact: 1990 EOS/ESD Symposium P.O. Box 913 Rome, NY 13440 (315) 339-6937</td>
</tr>
<tr>
<td>October 29 - November 1</td>
<td>35th Annual Conference on Magnetism &amp; Magnetic Materials Town &amp; Country Hotel San Diego, CA</td>
<td>Contact: Dr. John T. Scott American Institute of Physics 335 East 45th Street New York, NY 10017</td>
</tr>
<tr>
<td>April 15-18</td>
<td>IEE 7th International Conference on Antennas and Propagation University of York, UK</td>
<td>Contact: ICAP 91 Secretariat Conference Services IEE Savoy Place London WC2$ OBL UK</td>
</tr>
</tbody>
</table>

1991
In this issue we continue publishing abstracts of papers from previous EMC Symposia, other conferences, meetings and publications. The EMCABS committee is composed of the members listed below. By way of introduction to the community, they are listed with their company affiliations:

- Mike Crawford, National Bureau of Standards
- Bob Hunter, Texas Instruments
- R. M. Showers, University of Pennsylvania
- Tasuku Kakagi, Tohoku University, Japan
- Daniel Kenneally, Rome Air Development Center
- Diethard Hansen, Asea Brown-Boveri, Switzerland

"HOW CAN I GET A COPY OF AN ABSTRACTED ARTICLE?" The answer to this frequently asked question follows:

Most large public libraries, some small public libraries, all engineering school libraries and most other college or university libraries have copies of publications in which articles appear. If they happen not to have the desired publication, such libraries usually can obtain it or a copy of the article from other libraries or sources. Many company libraries, both large and small, also have such arrangements. Many articles are available from the National Technical Information Service (NTIS) and/or the Defense Technical Information Center (DTIC). To retrieve an article or publication containing an article abstracted in EMCABS, it is suggested that you contact your company library, a nearby engineering school library, a university library, or your municipal public library. If the library does not have the publication, go to the librarian, explain what you need and he or she will help you get the publication on loan, perhaps from another library or, for a nominal charge, from NTIS. If you have a Department of Defense contract, the contracting officer or your company librarian can help you get publications from DTIC. The information needed is contained in the EMC abstract heading.
<table>
<thead>
<tr>
<th>Miniature Microwave Antennas for Electric Field Sensing</th>
<th>EMCABS: 01-08-90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under Hyperthermia Conditions</td>
<td></td>
</tr>
<tr>
<td>T. M. Babij, 1 M. J. Hagmann, 1 and C. F. Gottlieb 2</td>
<td></td>
</tr>
<tr>
<td>Dept. of Elect. Eng., Florida International University 1 and</td>
<td></td>
</tr>
<tr>
<td>University of Miami School of Medicine 2</td>
<td></td>
</tr>
<tr>
<td>1989 IEEE AP-S International Symposium, Antennas and Propagation</td>
<td></td>
</tr>
</tbody>
</table>

**ABSTRACT:** If an electric field probe is inserted into a tumor, then it is possible to alter the phase and/or magnitude of the current in each element of an array (e.g., APA or MAPA) to maximize the SAR in the targeted region. It would be appropriate to use an implantable electric field probe having an isotropic pattern so that the total electric field, and hence the SAR, is maximized rather than only one component. At present such measurements can not be made because commercial isotropic electric field probes have diameters of 3 mm or greater, which is not suitable for placement in catheters.

**INDEX TERMS:** Antennas, Microwave, SAR, Bioeffects

<table>
<thead>
<tr>
<th>Comparison of Experimental and Numerical Results for Transient Electromagnetic Fields Induced on a Scale Model Aircraft by Current Injection Technique</th>
<th>EMCABS: 02-08-90</th>
</tr>
</thead>
<tbody>
<tr>
<td>J. Grando, G. Labaune, J. C. Alliot, F. Isaac, A. Delannoy</td>
<td></td>
</tr>
<tr>
<td>National Office of Aerospace Research Studies, Cedex, France</td>
<td></td>
</tr>
<tr>
<td>1989 IEEE AP-S International Symposium, Antennas and Propagation</td>
<td></td>
</tr>
</tbody>
</table>

**ABSTRACT:** A scale model of the Transall C160 military aircraft, 1/10 of the actual, has been installed above a large copper ground plate and connected to it. The front fuselage diameter, the dimensions nose to tail and wing to wing were respectively 0.4, 3 and 4 meters. The entry point at the nose was hard-wire connected to a 12 µF/5 kV capacitor bank and the current pulse launch was made using a triggered atmospheric pressure spark-gap. The exit point at the tail or at the left wing tip, depending on the configuration, was connected to the ground plate via a 80 waveshaping resistor. The transient electromagnetic fields on the outer skin of the model were measured using D-dot and B-dot sensors.

**INDEX TERMS:** Transient Fields, Modeling, Sensors

<table>
<thead>
<tr>
<th>Test Diagnostics of RF Effects in Integrated Circuits</th>
<th>EMCABS: 03-08-90</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. Wilson, S. Epshtein, M. Rossi, and C. Proffitt</td>
<td></td>
</tr>
<tr>
<td>Martin Marietta Space Systems</td>
<td></td>
</tr>
<tr>
<td>Final Technical Report</td>
<td></td>
</tr>
<tr>
<td>RADC-TR-89-355, February 1990</td>
<td></td>
</tr>
</tbody>
</table>

**ABSTRACT:** This report presents the results of an effort to measure the RF upset susceptibilities of CMOS and low power Schottky integrated circuits and to demonstrate a test probe methodology for measuring RF noise coupling, generation, and propagation into and upon these integrated circuit chips. RF interference used was continuous wave (CW) from 1 MHz to 200 MHz. This was combined with the digital signal using an op-amp combiner and directly coupled into the device ports. Upset threshold voltage levels were measured, complex input impedances were measured, and upset power levels were calculated and plotted.

**INDEX TERMS:** RF Upset, CMOS, EMI, Susceptibility, ESD

<table>
<thead>
<tr>
<th>Alternative Techniques for Some Typical MIL-STD-461/462 Types of Measurements</th>
<th>EMCABS: 04-08-90</th>
</tr>
</thead>
<tbody>
<tr>
<td>J. E. Cruz and E. B. Larsen</td>
<td></td>
</tr>
<tr>
<td>National Institute of Standards and Technology</td>
<td></td>
</tr>
<tr>
<td>NIST Technical Note 1320</td>
<td></td>
</tr>
<tr>
<td>Sup. of Documents, U.S. GPO, Washington, DC, 20402-9325 - issued March 1989, CODEN:N1NOEF</td>
<td></td>
</tr>
</tbody>
</table>

**ABSTRACT:** MIL-STD-461/462 emissions and susceptibility testing is frequently done in a shielded enclosure, resulting in significant uncertainties. This report is a follow-on to an earlier NBS Technical Note 1300 by the same authors on error bounds for such measurements. An E-Field probe was used to measure the fields in unloaded screen rooms, partially loaded screenrooms, loaded screenrooms and an open field site and the results compared with each other as well as with models. Measurement improvements are described for electric field strength beneath a single wire transmission line in a partially loaded screenroom. The effects of a grounded table in the screenroom were also investigated.

**INDEX TERMS:** MIL-STD-461/462 Testing, Antenna Factors in Screenrooms, Susceptibility Measurements in Screenrooms, E-Field Probe Measurements in Screenrooms

<table>
<thead>
<tr>
<th>Overhead Power Lines and High Voltage Equipment: CISPR Issues Methods of Measurement and Procedure</th>
<th>EMCABS: 05-08-90</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Electrotechnical Commission</td>
<td></td>
</tr>
<tr>
<td>3, rue de Varembe, P.O. Box 131, 1211 Geneva 20, Switzerland</td>
<td></td>
</tr>
<tr>
<td>CISPR Pub. 18-2, 1986, 80 pgs.</td>
<td></td>
</tr>
</tbody>
</table>

**ABSTRACT:** This new standard gives the procedure for establishing the limits of the radio field from the power lines and equipment. It also gives methods of measurement. It applies to radio noise from overhead power lines and high-voltage equipment which may cause interference to radio reception. The frequency range covered is from 0.15 MHz to 300 MHz. The new standard does not deal with fields from power line carrier signals.

**INDEX TERMS:** Overhead Power Lines, High Voltage Equipment, Emission Limits, Limits Calculation

<table>
<thead>
<tr>
<th>Guide on Methods of Measurement of Short Duration Transients on Low Voltage Power and Signal Lines</th>
<th>EMCABS: 06-08-90</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Electrotechnical Commission</td>
<td></td>
</tr>
<tr>
<td>3, rue de Varembe, P.O. Box 131, 1211 Geneva 20, Switzerland</td>
<td></td>
</tr>
</tbody>
</table>

**ABSTRACT:** This publication characterizes in detail the effects produced by transients and gives guidance about how to determine the parameters to be measured. It also describes the mechanisms of coupling between transient sources and potentially susceptible devices.

**INDEX TERMS:** Transients, Power Lines, Transient Measurement, Emission Measurement
<table>
<thead>
<tr>
<th>Title</th>
<th>Author(s)</th>
<th>Page Range</th>
<th>Year</th>
<th>Conference</th>
<th>Vol.</th>
<th>Pages</th>
<th>Abstract</th>
<th>Index Terms</th>
<th>EMABS Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The Critical Element in Successful Medical Technology</strong></td>
<td>Kenneth L. Carr</td>
<td>Vol. 1, May 8-10, 1990 pgs. 525-527</td>
<td>1990</td>
<td>IEEE MTT-S</td>
<td>1</td>
<td></td>
<td>Developments in the application of microwave technology to medical problems, particularly the detection and treatment of cancer, have been very encouraging. In the development of cancer, for example, microwave hyperthermia has been accepted as an adjunctive procedure to radiation therapy in the treatment of superficial lesions. While not so widely reported, the use of microwave radiometry as a noninvasive passive technique for early detection of cancer appears very promising. Further development in the areas of antennas and antenna arrays is required if microwave technology is to provide a practical solution to the detection and treatment of cancer.</td>
<td>Antennas, Microwave</td>
<td>07-08-90</td>
</tr>
<tr>
<td><strong>Electromagnetic Radiation from Printed Traces on a Circuit Board with Coated Plastic Cover</strong></td>
<td>Jean-Fu Kiang</td>
<td>Vol. 2, May 8-10, 1990 pgs. 697-700</td>
<td>1990</td>
<td>IEEE MTT-S</td>
<td>2</td>
<td></td>
<td>A rigorous formulation in the spectral domain is used to investigate the radiation from printed traces on a circuit board in the frequency range from 30 MHz to 1 GHz. Both the coupling effect among adjacent traces and the shielding effectiveness of metallic coating on the plastic cover are analyzed. The radiation around resonant frequencies is found to be critical to satisfy the FCC requirement, and an appropriate coating can resolve the problem.</td>
<td>Radiated Emissions, Shielding Effectiveness</td>
<td>10-08-90</td>
</tr>
<tr>
<td><strong>Transient Analysis of Distortion and Coupling in Lossy Coupled Microstrips</strong></td>
<td>James Glib and Constantine Balanis</td>
<td>Vol. 2, May 8-10, 1990 pgs. 641-644</td>
<td>1990</td>
<td>IEEE MTT-S</td>
<td>2</td>
<td></td>
<td>The transient response of lossy coupled microstrips is studied using the Spectral Domain Approach (SDA) to rigorously compute the dielectric losses. Transient coupling is formulated in the frequency domain using an even/odd mode approach. Results for pulse distortion on a semiconducting substrate are presented showing how losses reduce the signal amplitude without significantly distorting the shape.</td>
<td>Microwave, MMIC, Mode Coupling</td>
<td>08-08-90</td>
</tr>
<tr>
<td><strong>Integrated Microwave Field Simulation Using Three-Dimensional Finite Elements</strong></td>
<td>Z. J. Cendes, et al</td>
<td>Vol. 2, May 8-10, 1990 pgs. 721-723</td>
<td>1990</td>
<td>IEEE MTT-S</td>
<td>2</td>
<td></td>
<td>A method for microwave field simulation based on three-dimensional finite elements is described. The method employs solid modeling for geometry generation, Delaunay tesselation for mesh generation, $H_1$ (curl) tangential vector finite elements for field solutions, and transfinite elements for port representation. Applications to conventional and MMIC devices are described.</td>
<td>Modeling, Microwave, MMIC</td>
<td>11-08-90</td>
</tr>
<tr>
<td><strong>Active Endfire Antenna Elements and Power Combiners Using Notch Antennas</strong></td>
<td>Julio Navarro, Yong Hui Shu, and Kai Chang</td>
<td>Vol. 2, May 8-10, 1990 pgs. 793-796</td>
<td>1990</td>
<td>IEEE MTT-S</td>
<td>2</td>
<td></td>
<td>A Gunn device has been integrated with a planar, endfire notch antenna. A simple transmission-line model has been developed to optimize the passive and active circuit parameters. An electronic tuning bandwidth of 275 MHz centered at 9.33 GHz with a maximum power output of 37.5 mW was accomplished. Two active notches in a broadside array configuration were injection-locked at 9.484 GHz with a 30 MHz locking bandwidth and well over 90% power combining efficiency.</td>
<td>Antennas, Microwave, Modeling</td>
<td>12-08-90</td>
</tr>
</tbody>
</table>
George T. Kavelak

George Kavelak is a Senior Engineer with the IBM Corporation, Entry Systems Division, in Boca Raton, Florida. George has been with IBM since he graduated from Penn State University in 1968 with a BSEE Degree.

George started his career with IBM in 1968 at Endicott, New York where he worked on the design of high performance, multilayer printed circuit boards. In this work, he was involved with the dc distribution, L(di/dt) modeling and computations of R, L and C parameters. He also worked on the power distribution design of intermediate sized systems (the 3135, 3145 and 4341 processors). He was involved in integrating circuit voltage tolerance requirements with dc power distribution and L(di/dt) effects and defining electrical packaging parameters.

In 1978 George was transferred to Boca Raton where he was greeted immediately by Hurricane David. George was first introduced to EMC concerns during his work at Boca. He was involved in the electrical packaging design of a table-top unit (the 5120 Datamaster System) which consisted of a processor, display, drives, keyboard and built-in attachment cards. The consideration for this system included EMI effects from the standpoint of the box-to-environment and component-to-component within a box.

When the Entry System Division was formed, George was promoted to the level of department manager for the newly formed EMC Department. The mission of the EMC Department is to test new and current products to USA, international and corporate requirements for radiated and conducted emissions, radiated susceptibility, electrostatic discharge and power line disturbances. In this role, George's Department provided EMC support for several personal computer developments and follow-on efforts (PCXT, PCAT, PS/2). Under George's leadership, and EMC Department constructed a 3-meter Semianechoic Chamber which was registered with and accepted by the FCC in 1984. This chamber was one of the first chambers registered with the FCC. There are currently two 10-meter Semianechoic Chambers under construction. As a result of EMC tests, the EMC Department has filed and received over 100 FCC Class B Grants of Certification.

At IBM in Boca Raton, emphasis is placed on EMC as a design parameter. Various internal and external EMC Education Classes have been provided for the on-site product engineers and designers.

In 1990 George was appointed to serve as the EMC Program Standards Project Authority for the IBM Standards Program Management. This assignment consists of worldwide standards responsibility for various EMC areas; overview and coordination of efforts to address internal and external standards requirements; and providing direction for Corporate EMC Standards.

George is an active member of the IEEE EMC Society. He presented an invited paper for a Panel Discussion at the 1987 IEEE EMC Symposium in Atlanta, GA. The topic of his paper was Product Reverification Requirements for Continued FCC Compliance. George is also active in CBEMA and he is an alternate representative to ESC-5.

On the personal side, George and his wife Susan, an elementary school teacher, have a 15 year old son, Gregory. When George is not working, he enjoys saltwater fishing and diving in the Atlantic Ocean off the coast of his hometown of Boynton Beach or in the Florida Keys aboard his boat, the "Nittany Lion." He also enjoys spending time attending his son's baseball and football activities.
INTRODUCING ...

[Editors Note: From time to time, as space permits, the IEEE Newsletter will feature biographical sketches of Associate Editors so that readers can become acquainted with the contributors who make the publication possible.]

J. L. Norman Violette
Associate Editor, Book Reviews

J. L. Norman ("Norm") Violette is founder (1979) and currently the President and Director of Systems Engineering of the Violette Engineering Corporation (VEC) located in Falls Church, Virginia. Along with his son, Michael F. Violette, he is also a co-founder of the Washington Laboratories, Limited (WLL), located in Gaithersburg, Maryland.

WLL is operated by Norm's son Mike and functions as an EMC and compliance test laboratory located in the Washington, DC area, providing 'hands-on' technical support to VEC and industrial government clients. As a unique project, Norm and son Mike designed the lightning protection system for the Statue of Liberty during the restoration of our national monument. Norm and son Mike collaborated with Don White and wrote the Electromagnetic Compatibility Handbook published by Van Nostrand Reinhold (VNR) in 1987. Negotiations with VNR are in progress to produce a revised second edition in the near future.

Norm received his BEE from Rensselaer Polytechnic Institute (RPI), MBA from Auburn University, and Ph.D. in EE (math minor) from North Carolina State University. He has performed research in electromagnetic boundary value problems, specifically computer solutions of integral equations, derived from Green's functions and Maxwell's equations, applied to coaxial configurations.

Norm spent over 20 years in the U.S. Air Force as a fighter and transport pilot with duty in Vietnam. He also taught Electrical Engineering at RPI and at the Air Force Academy as an Assistant Professor. Other Air Force duties included research and development in C^3 systems in the Air Force Systems Command, precision guided munitions in the Defense Advanced Research Projects Agency (DARPA), and C^3 requirements and development including the Worldwide Military Command and Control Systems (WWMCCS) as a member of the Air Staff in the Pentagon.

Industrial experience includes assignments at various locations with the General Electric Company, where he worked on the development of high-power microwave klystrons, radar-controlled airborne weapons, and power switchgear equipment. He also worked for the TRW Washington Office in C^3 systems engineering. For the past ten years, he has been an active seminar instructor on various EMC subjects.

In addition to the IEEE EMC Society, Norm is a registered Professional Engineer, belongs to AFCEA, ANSI, the Applied Computational Electromagnetic Society (ACES), Lightning Protection Institute (LPI), Air Force Association, and is a NARTE Certified EMC Engineer. He has been active with the ANSI C63 Committee on EMC Standards and was recently appointed as Acting Vice Chairman of C63 C/2, Terms and Definitions.

Norm and Bette Violette have been married for over 32 years, have seven children, and three grandchildren.

Reinaldo J. Perez
Associate Editor, Book Reviews

Reinaldo J. Perez (IEEE EMC-SM'86) was born in Palm River, Cuba, on July 25, 1958. He received the S.Sc and M.Sc degrees in Physics from the University of Florida, Gainesville, Florida in 1979 and 1981 respectively. He received the M.Sc and PhD degrees, both in electrical engineering from Florida Atlantic University, Boca Raton, Florida in 1983 and 1989 respectively.

For one year (1984) he was employed by NASA as a navigational system engineer for the space shuttle program where he was responsible for testing and evaluating the shuttle's radar and navigational aids. During his doctoral training at Florida Atlantic University his research interest focused on Electromagnetic Compatibility (EMC) and he became involved in the modeling of electromagnetic interference (EMI) effects using a variety of electromagnetic techniques. Additional activities during this period included the testing and evaluation of computing equipment for compliance with FCC and VDE standards at the newly developed EMC/EMI Laboratory at Florida Atlantic University.

At present, Mr. Perez is a member of the technical staff in the EMC group at the Jet Propulsion Laboratory (JPL) where he is involved in implementing EMC and EMI requirements, and testing and evaluation of all spacecraft/instruments designed or managed by JPL. In addition, his involvement continues in the development of EMC models for the analysis of spacecraft systems.

Dr. Perez is a member of Phi-Kappa-Phi national honor society, IEEE Electromagnetic Compatibility Society, the American Association of Physics Teachers, the Applied Computational Electromagnetic Society and the National Society of Professional Engineers (including the California chapter). He is also a member of the New York Academy of Science.
INSTITUTIONAL LISTINGS

The IEEE Electromagnetic Compatibility is grateful for the assistance given by the firms listed below and invites application for Institutional Listings from other firms interested in the electromagnetic compatibility field.

AMPLIFIER RESEARCH, 160 School House Road, Souderton, PA 18964-9990
Telephone: (215) 723-8181, TWX: 510-681-6094, FAX: (215) 723-5888
Broadband RF power amplifiers, 1 W to 10 kW, 10 kHz to 1 GHz; RFI test accessories and antennas; EMP simulators.

ARK ELECTRONICS CORPORATION, 1325 Industrial Highway, Southampton, PA 18966
Telephone: (215) 322-6510, FAX: (215) 322-4231
RF shielded enclosures, custom-manufactured shielded doors, RF filters, waveguide air vents, EMI laboratory testing, EMC consulting; a complete EMC capability.

FAIR-RITE PRODUCTS CORP., P.O. Box J, 2 Commercial Row, Wallkill, NY 12589
Telephone: (914) 895-2055, FAX: (914) 895-2629, TWX: 510-249-4819
Ferrite EMI suppressor elements for cables, ferrite beads on leads for circuit board insertion, ferrite beads for surface mount technology, ferrite sleeves for filter pin connectors.

INSTRUMENTS FOR INDUSTRY, INC., 731 Union Parkway, Ronkonkoma, NY 11779
Telephone: (516) 467-8400, FAX: (516) 467-8558
Anechoic shielded rooms, turnkey systems, EMC/susceptibility measurement systems, broad-band amplifiers, leveling pre-amps, TEM cells, E-field sensors up to 40 GHz, radiation hazard monitors, E-field generating antennas.

MAXWELL LABORATORIES, INC. - MAXWELL/ELGAL, 8888 Balboa Avenue, San Diego, CA 92123
Telephone: (619) 576-3737, FAX: (619) 277-6754
Products, consulting, testing, and training for all electromagnetic disciplines and technologies.

OMEGA SHIELDING PRODUCTS, 1384 Pompton Avenue, Cedar Grove, NJ 07009
Telephone: (201) 890-7455, FAX: (201) 890-9714
EMI/EMP/ESD shielding materials, gaskets and contact strip both standard and custom designed.

PATTON & ASSOCIATES, INC., 4718 West El Caminito Drive, Glendale, AZ 85302
Telephone: (602) 934-5458, FAX: (602) 242-7700
Worldwide TELECOMMUNICATIONS design assistance, consultation, and product submittal.

R & B ENTERPRISES, 20 Clipper Road, West Conshohocken, PA 19428
Telephone: (215) 825-1960, TWX: 510-660-8120, FAX: (215) 825-1884
EMI testing/consulting. Full-threat EMP simulation. EMC training/publications. EMP test equipment.

SPECTRUM CONTROL, INC., 2185 West 8th Street, Erie, PA 16505
Telephone: (814) 445-0966, FAX: (814) 455-2550
Complete EMC, FCC/MIL consulting, testing, repair, mfr. RFI filters, RFI gaskets, D-subminiature connectors. Surface mounted devices: chip capacitors, capacitor networks, HIC and QUAD fastbus line drivers.

TECKNIT, Inc., a TWP Company, 129 Derwood Street, Cranford, NJ 07016
Telephone: (201) 272-5500
EMI/EMP/ESD shielding materials, gaskets, vent panels, windows, and conductive coatings and adhesives.

An Institutional Listing recognizes contributions to support the publication of the IEEE NEWSLETTER and TRANSACTIONS ON ELECTROMAGNETIC COMPATIBILITY. Minimum rates are $75.00 for listing in one issue; $200.00 for four consecutive issues. Larger contributions will be most welcome. No agency fee is granted for soliciting such contributions. Inquiries, or contributions made payable to the IEEE, plus instructions on how you wish your Institutional Listing to appear, should be sent to Marilyn Prusas, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, Technical Activities Department.