IEEE

Electromagnetic Compatibility Society

Newsletter

ISSUE NO. 140 WINTER 1989 (ISSN 0164-7644) EDITOR: ROBERT D. GOLDBLUM

JAMES STEWART HILL
December 2, 1912–October 30, 1988
IEEE Life Fellow

Founding Member PGRFI

"When y'ave said a gentleman, you have said all."
John Crown
Sir Courtly Nice I (1685)

In the last issue of this *NEWSLETTER*, the book review section carried the reviews on the records of two symposia on EMC—one held in Warsaw and the other held in Budapest. Those of us who were privileged to read those articles could not know that they would be the last contribution of Associate Editor James S. Hill. Jim died suddenly at his home in Hudson, Ohio, on October 30, 1988. Those last reviews were thorough and listed meticulously the subject matter of each paper presented. Busy EMC Society members were alerted to topics related to their particular areas of interest and were informed of subject matter new or unusual in EMC literature. In short, the care, the thoroughness, and the service to his profession were typical of Jim Hill.

James Hill was born December 2, 1912, in Washington, DC. He was educated at the Case Institute of Technology, where he received his Bachelor of Science in Electrical Engineering. Later Jim pursued graduate studies in statistics at Western Reserve University.

Jim's academic credentials served him well during an impressive career in which he helped to pioneer the realization of the importance of EMC. From 1950 to 1953 he was employed at the National Bureau of Standards, where he directed the installation and operation of an antenna farm with field intensity recording equipment. Studying samples of propagation conditions on forty different paths, Jim directed a group of ten engineers, technicians, and analysts in the collection, analysis, and preparation of the resulting data. In 1953, Jim joined Carl E. Smith Consulting Engineers as senior engineer. Concurrently he was vice president of Smith Electronics, Inc. At Smith, he made field surveys for am and fm broadcast stations and for VHF and UHF television stations.

In 1956 Jim took his expertise on antenna studies to Eglin AFB, FL, where propagation measurements were interpreted in terms of reliability. After a period of self-employment, Jim joined Jansky & Bailey in 1959. A particularly interesting problem arose when the DCA became con-

(continued on page 3)

IEEE ELECTROMAGNETIC COMPATIBILITY SOCIETY NEWSLETTER is published quarterly by the EMC Society of the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY 10017. One dollar ($1.00) per member per year (included in the Society fee) for each member of the EMC Society. Second-class postage paid at New York, NY and additional mailing offices.

4181178 M 27N
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EDUCATION COMMITTEE NEWS

An article on EMC written by Kimball Williams of Eaton Corporation was published in the October, 1988 issue of *Potentials,* the IEEE student magazine. The article titled "Keeping the Peace: Ensuring Compatibility between the Electromagnetic Environment and Electrical Devices" is a non-technical discussion of what EMC is and its importance to the harmonious operation of electronic systems in both the commercial and military environments. The article was intended to impart EMC awareness to engineering students. The article is reprinted on page 16 of this *Newsletter.*

The Distinguished Lecturer Program is in full swing with all four lecturers having been chosen. They are Herb Mertel of EMACO in San Diego, CA; Roger Southwick, an EMC consultant in Tucson, AZ; Scott Bennett of Hewlett-Packard in Fort Collins, CO; and Don Heirman of AT&T in Holmdel, NJ. To date, four lectures have been given and two more are scheduled. Anyone interested in having a Distinguished Lecturer speak at a chapter meeting or other gathering should contact the lecturers directly or through Dave Hanttula, the chairman of the program. Please note that Dave Hanttula's phone number has changed. His new number at Grid Systems, Fremont, CA is (415) 656-1661, extension 249.

In the future, information regarding short courses and seminars on EMC will not be included in this column. Anyone who wishes to have a short course or seminar publicized, should sent the information directly to the *Newsletter* editor.

Henry Ott
Chairman EMCS
Education Committee

STANDARD AVAILABLE
Electromagnetic Compatibility Society

The recently published standard 213-1987 IEEE Standard Procedure for Measuring Conducted Emissions in the Range of 300 kHz to 25 MHz from Television Receivers to Power Lines (ANSI/IEEE) is available for $57.00, plus $5.00 postage and handling. Request product number SH12047 from:

IEEE Service Center
445 Hoes Lane, P.O. Box 1331
Piscataway, NJ 08855-1331
Telephone: (201) 562-5346

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(continued from page 1)
cerned with the impact of the 1964-65 low in the sunspot cycle on the high frequency trunks in STARCOM. Jim participated in a study program which took him to STARCOM facilities in Germany, Ethiopia, and Morocco. The final conclusions led to an upgrading of the transmitter, the terminal equipment, and the antennas.

Joining the U.S. Army Electronic Command at Ft. Huachuaca, AZ. Jim served as a project manager of the Spectrum-Signature Management Program. Jim directed a fifty-member team which produced fifty-eight spectrum signatures. Following this experience with the military, Jim went to the Genisco Corporation, where he worked on the acceptance test of a near-field intensity meter developed for the Naval Weapons Laboratory, Dahlgren, VA.

In 1969 Jim joined the RCA Service Company as an EMC project engineer. Jim's accomplishments at RCA were considerable. He helped develop a comprehensive manual for EMC courses, participated in the Integrated Radio Room (IR^2) Project for the TRIDENT submarine, conducted a shipboard interference survey for the NASA Goddard Space Flight Center, and conducted two airborne surveys of the electromagnetic environment on the East Coast and in the Midwest. In 1977 he participated in the NASA/ESA CV-990 Spacelab Simulation (ASSESS II). The results of this project were used in the planning and development of instrumentation for the Space Shuttle/Spacelab program.

After retiring from the RCA Service Corporation, Jim formed the EMXX Corporation, which produced EMI/EMC training seminars and provided consulting services. Additionally he was a consulting engineer at R&B Enterprises, where he was instrumental in setting up the test facilities. Another project which received Jim's creative energies was *Electromagnetic News Report,* which he edited for R&B Enterprises from 1971 through 1981.

Despite these considerable career demands, Jim was always generous in sharing his time, energies, and talents with his professional colleagues. He was the author of numerous technical papers and was one of the founders of the Professional Group on RFI, now known as the IEEE EMC Society. He was a life fellow of the IEEE and had served the EMC Society as Chairman of the International Affairs Committee. He was also a member of the Historical Committee and an Associate Editor of this *NEWSLETTER* for over twenty years. Other professional memberships included the Society of Automotive Engineers AE-4 Committee on EMC and the Electronic Industries Association G-46 Committee on EMC.

Significantly within the dB Society, his manners had earned him the nickname "Gentleman Jim." Members of the IEEE EMC Society are saddened and extend their sympathy to his four children Noel, Hugh, Gary, and Dawn but are heartened by his legacy of excellence in ethics, technology, and professionalism—a legacy truly befitting a gentleman.

ELEVENTH ANNUAL ELECTRICAL OVERSTRESS/ ELECTROSTATIC DISCHARGE SYMPOSIUM

The EOS/ESD Association and the ITT Research Institute will sponsor the annual symposium dealing with the effects of electrical overstress (EOS) and electrostatic discharge (ESD) on solid state microelectronics from September 26 through 28, 1989 at the Hyatt Regency in New Orleans, LA. This symposium will be devoted to the understanding of the fundamental phenomena associated with transient electrical overstress and the application of this knowledge to the solution of problems in electronic components, equipment, systems, and subsystems used in the military, industry, computing, communications, consumer products, and automotive engineering.

Potential authors should submit abstracts, including 500 word summaries and figures (optional) by March 17, 1989. Possible topics include:

FAILURE MECHANISMS

- **Modeling and Physics of Damage**
- **Breakdown of Thin Dielectric Layer**
- **Shallow Junction and Contact Failure**
- **Damage of VLSI Chip Interconnection**
- **Latent Failures**

MEASUREMENT, TESTING AND TESTER EVALUATION

- **Test Methods and Procedures**
- **Specifications and Standards**
- **Simulation and Prediction**
- **Failure Analysis Techniques**

VLSI, III-V, & PHOTONIC CHIPS AND SYSTEMS PROTECTION

- **New Materials, Processes and Devices**
- **New Circuit & Layout Designs**
- **Control and Prevention of Hot-Electron and Latch-Up at CMOS VLSI I/O Nodes**
- **Optimal Protection for Both HBM and CDM**

PRECAUTIONARY MEASURES

- **Chip Protection during Wafer Processing**
- **Effectiveness of Air Ionization in Static Control**
- **Facility, Packaging, and Handling**
- **ESD Control Programs**

For further information, contact:

Bob Rountree
Texas Instruments, Inc.
12201 Southwest Freeway, MS 631
Houston, TX 77001
Telephone: (713) 274-4077

THE DISTINGUISHED LECTURER PROGRAM ELECTROMAGNETIC COMPATABILITY SOCIETY INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

BIOGRAPHICAL SKETCHES

W. Scott Bennett. Dr. Bennett attended Syracuse University earning the Ph.D. in Electrical Engineering in 1967. Previously he had been a radar technician in the U.S. Air Force and a technical representative for General Electric Company. Dr. Bennett has been a staff engineer for Burroughs Corporation and has been on staff at both Syracuse University and Virginia Polytechnic Institute. Since 1974 he has been a member of the technical staff of Hewlett-Packard Company, where he has specialized in the control and measurement of EMI since 1977. His subject areas include EMI measurement techniques, open area test site characterization, measurement and site errors associated with radiated emission testing.

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

Donald N. Heirman. Mr. Heirman received the BS and MS degrees in Electrical Engineering from Purdue University. After college he joined AT&T Bell Laboratories and has worked in areas of predicting interference levels, harmonic content, and time variability of power-induced audio frequency noise on telephone lines. Mr. Heirman presently supervises the EMC/Product Safety Group which provides regulatory compliance interpretations, testing and associated mitigation. Additionally the group provides appropriate liaison with safety underwriters. He is a Fellow of the IEEE, a Life Member of the EMC Society, a Member of the Society's Board of Directors, and a contributer to many technical committees. His subject areas include EMC RF environments, emission and immunity measurement techniques, EMC standards, compliance testing, and test facility planning, construction, calibration, and improvements.

AT&T Information Systems, M/S Bldg. 41, Rm. 112, Crawfords Corner Road, Holmdel, NJ 07739. (201) 834-1801.

Herbert K. Mertel. Mr. Mertel holds BS and MS degrees and is a registered professional engineer. He is the president and principal consultant of EMACO, Inc., a firm of radio frequency interference control engineers. Working for General Dynamics and for EMACO, Mr. Mertel has had 30 years of experience in RFI control. He performs RFI control design and testing of electrical and electronic equipment to FCC, VDE, CISPR and MIL-SPEC requirements. He is a member of the IEEE EMC Society, the SAE AE-4 Committee, the ANSI C-63 Committee, the Swiss Electrotechnical Association (SEV) and is U.S. National Advisor for IEC/CISPR matters. His subject areas include RFI design and control; FCC, VDE and CISPR standards; and EMI testing to specifications for FCC, VDE, CISPR and MIL-STDs.

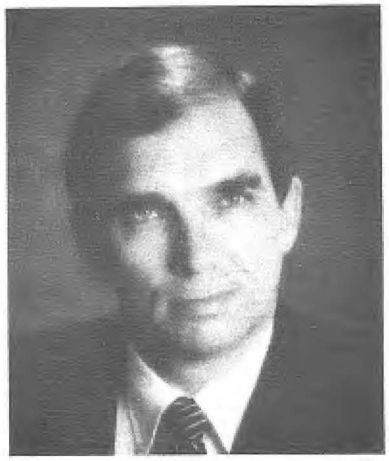
EMACO, Inc. 7562 Trade Street, P.O. Box 22066, San Diego, CA 92122. (619) 578-1480.

Roger A. Southwick. Mr. Southwick received the BS degree from the University of Denver. He has 28 years of experience in electromagnetic compatibility related areas and had held positions at the U.S. Army Electronic Proving Ground, Atlantic Research Corporation, ECAC, Southwest Research Institute, and IBM. He is presently president and principal consultant for EMC Consulting, specializing in EMC Measurements, software, and automated EMC measurements. Mr. Southwick is a Senior Member of the IEEE and EMC Society and is the author of numerous papers on EMC measurements. His subject areas include EMC measurements, software for automated EMC measurements, and special broadband antennas for radiated emission testing.

EMC Consulting, 2716 N. Estrella, Tucson, AZ 85705 (602) 792-9491.

PRESIDENT'S MESSAGE

from Donald E. Clark



Donald E. Clark
Electronics Research Building
Georgia Tech Research Institute
Atlanta, GA 30332

CALL FOR PARTICIPATION

The EMC Society Board of Directors held its last meeting for 1988 in San Diego during November. At this meeting, the annual election was held; and I am pleased to announce that all the officers and technical directors were elected for another year. I look forward to serving the Society as President for a second year, and I hope to build on the experience of this past year.

At the San Diego meeting, the Board reviewed its Plan-of-the-Year and evaluated its overall progress. We found that we were successful in some areas and not so successful in others. Overall, I think we have become more goal-oriented in our programs, and the Plan does provide unified direction. The officers and technical directors will hold another planning session in early 1989 to identify our successes and shortcomings in 1988 and to prepare plans for 1989.

Over the past year, I have become aware that the Society is not utilizing all of its resources. The Board of Directors meets only three times a year and thus has only limited time in which to meet its objectives and to track progress. Also our Society has too many one-person committees. If a board member or a committee chairman becomes pressed for time due to job or family duties, then little can be accomplished for the Society. Furthermore a one-person committee, no matter how open-minded or creative that one person may be, cannot produce the new ideas which spring from the in-put of several viewpoints. Moreover it is difficult to sustain enthusiasm when working by oneself.

First, we need more members to step forward and to volunteer their time and talents. I realize that we all must decide how to divide our free time among community, civic, and religious activities; and it has been my observation that engineers are valuable contributors. However, I think we sometimes put our professional activities too far down the list. I would like to ask each member to consider volunteering more time to the Society's activities during the coming year. What are some advantages to volunteering time to our IEEE EMC Society? Some that come to mind include the following:

- Foremost, one can enhance his/her professional status by getting to know the leaders of the Society and by contributing to technical areas such as standards, workshops, symposia, etc.
- Building or maintaining a professional network can be invaluable in obtaining job or career objectives and goals.
- Taking on a committee chairmanship means an opportunity to develop leadership and managerial abilities and to discover new talents.
- Participation contributes to a company's public relations image. Other engineers notice which companies support professional activities by paying for expenses and/or giving time off to attend meetings.
- Developing new interests outside one's job can actually reduce job-related stress. One has a new outlet for achievement and new opportunities for friendship.
- Finally participation in the Society brings a sense of accomplishment and the satisfaction of contributing to one's chosen field.

Once a member volunteers, it is up to the Board to see that that volunteer is utilized effectively. In this instance, the Board must demonstrate its leadership role. If anyone would like to volunteer, please write me a letter listing experience and areas of interest.

UPDATE ON WROCLAW SYMPOSIUM PROCEEDINGS

The Proceedings of the Ninth International Wroclaw Symposium on EMC are **still** available. The price is $30.00 postpaid to any address in the United States. Contact:

Bob Haislmaier
3021 Gumwood Drive
Hyattsville, MD 20783

EMC SOCIETY BOARD OF DIRECTORS

AUGUST 3, 1988

Seated left to right: Don Heirman ; Don Weber; Don Clark, President; Ed Bronaugh, Vice President; Janet Nichols, Secretary; Dick Ford, Treasurer; Walt McKerchar; Charlotte Tyson; and Herb Mertel.

Standing left to right: Joe Fischer, Henry Ott, Gene Cory, Risaburo Sato, Dan Hoolihan, Dick Schulz, Len Carlson, Bob Hofmann, Bill Duff, Bob Haislmaier, Gene Knowles, and Jim Hill.

BOD ACTIVITIES

by Donald N. Heirman

BOARD OF DIRECTORS MEETING IN SAN DIEGO

The final Board meeting of 1988 was held between 9:30 a.m. and 5:00 p.m. on November 16, 1988, at the San Diego Hilton in San Diego, CA in conjunction with various IEEE Board and Committee meetings. Board members present included Don Clark, Ed Bronough, Janet Nichols, Dick Ford, Bob Haislmaier, Don Heirman, Gene Knowles, Dan Hoolihan, Bob Hofmann, Joe Fisher, Gene Cory, Walt McKerchar, Don Weber, and Len Carlson.

Members unable to attend were Charlotte Tyson, Herb Mertel, Bill Duff, Henry Ott, Dick Schulz, and Risaburo Sato. [Tei Iki was sitting in for Dr. Sato.]

President Clark was saddened to announce the death of Jim Hill. Jim served the Board and our Society for many, many years, most recently as chairman of our International Relations Committee. He was also a member of our Historical Committee and an associate editor of the EMCS NEWSLETTER. A moment of silent prayer was observed for our good friend Jim.

Next Don Clark announced the results of the BoD elections for the three-year term ending December 31, 1991. The newly-elected BoD members are Al Mills, Chet Smith, Don Clark, Dick Ford, Bob Hofmann, and Dan Hoolihan. We wish them success at their posts.

Don also announced that Len Carlson had been elected IEEE Division IV Director. His election marks the first time that an EMC Society member has been elected to this prestigious and important position. Len's presence and influence should focus attention on the importance of EMC technology. Good luck to Len, our immediate Past President.

After approval of the agenda, Don introduced Secretary Janet Nichols, who reviewed the minutes. After minor changes, the minutes were approved. Dick Ford next presented his Treasurer's Report. Our Society's net worth as of 8/31/88 is $32.9 K. Our long-term investment is earning over 6%. Dick also requested and the Board approved a policy for processing requests for payment of society funds to members. The new policy now requires written requests with the payee's name and address before a check may be forwarded. The Treasurer's Report was approved.

Len Carlson is preparing changes to our Bylaws and is still accepting input from Society members. Contact Len at (206) 773-6297.

Major items discussed during the remainder of the meeting include the following:

1. Director Bob Haislmaier (Communication Services) presented his report. He was pleased to report for Moto Kanda that we were within eight days of meeting our *Transactions* deadline to the IEEE editing staff.

2. Bob then introduced Gene Cory, who reported on our future EMCS symposia plans. In particular, 1992 is now set for Anaheim for August 25–27. Future dates include:

Dallas	1993
Chicago (national)	1994
Florida	1995
Santa Clara	1996

The 1994 Symposium will be held in Sendai, Japan. The Board approved the holding of the 1991 International Symposium in Beijing, China. For 1989, Denver has completed its "paper" acceptance and has 70 exhibit booths sold to date.

3. Bob has arranged to visit Jim Hill's home to pick up his EMCS materials. Secretary Nichols will accompany him. Bob also requested candidates to fill the roles of History and Information Exchange chairs. Interested candidates should call Bob at (202) 695-7503.

4. Director Don Heirman (Technical Services) presented several reports. First, he gave the Standards Committee Report indicating that IEEE Standard 213/214 (LISN use and construction) has just been published and can be ordered from the IEEE Service Center (201) 981-0060. A new Project Authorization Request on Calibrating LISNs was recently approved by the IEEE Standards Board. Those interested in working on this important new project should call the chairman Dave Staggs at (512) 835-4684. The Working Group on RF Absorber Efficiency Measurements (P1128) will be holding its first tutorial at the Denver Symposium. Next Don presented Henry Ott's Education Committee Report. Kimball Williams article on EMC was published in the October issue of *Potentials,* the IEEE student magazine.*

5. Dave Hantulla, Distinguished Lecture Program Chairman, submitted a report indicating that four lectures have already been given. Four others have been scheduled through June of 1989. Our readership is again reminded that the Distinguished Lecturer Program is available to all chapters; give Dave a call at (415) 948-5495.

*See page 16

6. Don Heirman presented Wilf Lauber's Technical Advisory Committee Report. Wilf's report indicated that the Technical Committees have finished reviewing the Denver Symposium abstracts, have proposed two tutorials for Denver (RF absorber Efficiency Measurements and a review of the new FCC MP-4 computer device measurement procedures), and is coordinating the establishment of a new TC on Product Safety. Finally the TC's reviewed a letter from Charles Seth on aeronautical EMC (fly by wire) and found that the SAE Committee AE4R has been covering adequately the concerns expressed by Mr. Seth. Director Heirman then moved that the scope and officers of the new TC-8 on Product Safety be approved. The Board approved the motion. The new Committee officers are: Chairman, Rich Pescatore; Vice-Chairman, Jim Norgaard; and Secretary/Treasurer, John McBain.

The Committee strives to advance the knowledge and awareness of product safety through:

- **Study of product safety engineering principles and applications, including those related to EMC.**
- **Promotion of consistent understanding and interpretation of applicable product safety standards.**
- **Understanding of the contribution to product safety of the test house.**
- **Understanding of the certification processes.**
- **Review of emerging standards.**
- **Study of the implementation of product safety principles within organizations.**

For further information, call Rich at (408) 447-6607.

7. Director Bob Hofmann (Member Services) gave his reports. The Board requested an expansion of the Awards Program by submitting the names of qualified EMCS members for consideration for IEEE regional and field awards. Dan Hoolihan discussed briefly the results of the Chapter Chairman Breakfast held on August 2, 1988, at the Seattle Symposium. Twenty-two people attended and heard chapter activity reports from 16 of our 29 chapters. The chapter "angel" program and Distinguished Lecturer program were explained again. Dan urged chapters to use those programs which the BoD initiated to serve individual chapters. For more information, please call Dan at (612) 583-3322. Bob also indicated that there will be a Search Committee put in place to look for more qualified Fellow candidates. We are still under-filling these honors. For information call Bob at (312) 979-3627. Finally Bob reported on the formation of a committee to increase student activities within the EMC Society. Proposed committee members include Henry Ott (Education), Charlotte Tyson (Membership). Walt McKerchar (Professional Services) Herb Zajac (Publicity), Clayton Paul (Education), and Bob Hofmann. Anyone interested in joining should call Bob directly.

8. Director Walt McKerchar (Professional Services) reported that Bob Goldblum has resigned from performing employment analysis at the annual symposium. He cited lack of questionnaire returns and the demands of staffing his booth. The Board wants to see this activity continue and has asked Walt to seek a replacement. Anyone interested call Walt at (206) 779-7069. Walt reported that there was no news from the Government Relations Committee. Also there is a continuing need for activity from the Intersociety Relations Committee and the Public Relations Committee. Herb Zajac has left his employer and has thus lost resources to continue Public Relations work. Again anyone interested in this work should contact Walt. Finally, the Professional Services directorship has prepared an EMCS Brochure to be used to explain the activities of our Society and to recruit new volunteers. Gerry Rothammer and Janet Zack prepared the booklet. For more information, call Janet at (213) 822-3061, Ext. 207. Final copies are expected to be available after January, 1989.

9. Under old business, the Board authorized the Denver Symposium Committee to mail symposium records.

10. Under new business, President Clark received Board approval for the EMCS to participate in the IEEE Academy. The Academy is an IEEE program to establish lifelong education goals for its members. One of the facets is to develop a self-assessment questionnaire so that members can evaluate their current proficiencies (or lack thereof) in specific job-related, technical areas. We will be participating in the EMC version of this program. Call Don Clark at (404) 894-3535 for further information.

11. Bob Haislmaier suggested that the BoD appoint a permanent exhibits chairman for all of our symposia.

12. Ed Bronaugh moved that if hardbound copies of our symposium records are made, their distribution should include all principal speakers, authors of papers, and others as specified by the Symposium Committee. The Board approved this motion.

13. Finally the election of officers for 1989 was held. Those unanimously elected were:

President:	Don Clark
Vice-President:	Ed Bronaugh
Secretary:	Janet Nichols
Treasurer:	Dick Ford
Directors:	
Communication Services:	Bob Haislmaier
Member Services:	Bob Hofmann
Technical Services:	Don Heirman
Professional Services:	Walt McKerchar

14. President Clark adjourned the meeting at 5:00 p.m. The 1989 meeting dates were then announced:

February 17-18, 1989 in Washington, DC
(Executive Committee only on the 17th.)

May 22, 1989 in Denver, CO.

November 15, 1989 in Tarpon Springs, FL.

Respectfully submitted, D.N. Heirman, Associate Editor

REPORT OF DIVISION IV DIRECTOR

REFLECTIONS FROM AN OUTGOING DIRECTOR

by Gary A. Thiele

After two years of serving as your Divisional Director, I would like to share with you some observations derived from this experience.

Volunteerism is both a strength and weakness of the IEEE. Aside from the IEEE staff in New York and New Jersey, all other positions are essentially volunteer ones. Elected positions are held for either one or two years while appointed positions vary somewhat in tenure. Thus, people come and go rather quickly, and the organization as a whole suffers from short "corporate memory." On the flip side of the coin, the steady stream of volunteers does insure a constant supply of willing workers with fresh ideas and invigorating enthusiasm.

Most volunteer positions require a reasonably modest commitment of time on the part of the volunteer. Exceptions to this rule are positions at the Board of Directors level, which require considerable amounts of time. For example, a Divisional Director is:

1. a member of the Institute of the Board of Directors (BOD)
2. a member of TAB OPCOM, the Executive Committee of TAB, the Technical Activities Board
3. a member of another board as a liaison between that board and the Board of Directors or a member of a major committee as a BOD representative.

Memberships 1 and 2 require at least five trips per year, three of which last for six days. If TAB OPCOM meets outside of North America, as it is committed to doing annually and which it did this past autumn, two weeks are added to the travel schedule. Membership 3 typically can require three more trips of one to three days, depending on the assignment. In addition to these commitments, there are five societies in Division IV. These are APS, EMC, MAG, MTT, and NPS. Thus, there are five ADCOMS that look forward to having the Divisional Director at ADCOM meetings. For obvious reasons, I found it impossible to meet this ADCOM expectation and was grateful for the understanding and the cooperation of the society presidents on this matter.

In my opinion, as well as that of others, the best interests of the Institute are not served by overburdening its volunteer workers. What can be done about this situation? At the June Special Meeting of TAB OPCOM, I made a preliminary proposal that there be established the position of Division Director-Elect. This would be an elected position and would automatically lead to the Division Director position after a one-year tour as Director-Elect. During this year, the Director-Elect would serve without vote but would liaison with division ADCOMS. If managed properly, this arrangement could take some of the load off the Division Director, and it would also provide a period of time during which the Director-Elect could get "up to speed" on the various issues. The way things are now, the incoming Director hits his new duties somewhat unprepared and spends the better part of the first year learning the issues and politics involved. After two years, he is gone. Unfortunately, unless one of the continuing directors takes up an interest in this Director-Elect proposal, it will die for lack of sponsorship.

Next, there is the issue of size. The size of TAB (over 50 members) and the BOD (33 voting members) are both too large. It is widely recognized by those of us on TAB OPCOM that TAB is so large that much of its effectiveness is lost. I would look for proposals to downsize it. This step will be about as easy as closing a military base, but it should be done. Furthermore, in my opinion, the BOD is too large as well, but not to the same degree as TAB. However, changes in the Board of Directors are not likely.

Then there is the revenue issue. In spite of the recent five dollar dues increase, IEEE dues are about 60% of the 1967 dues when inflation is taken into account! Maybe, just maybe, the quality of service you've been getting has decreased a little over those same 22 years. This situation does not contribute to a stronger organization for the future. More revenue is needed. One way to raise this needed revenue, which was proposed earlier in 1987,

(continued)

would be to place a fee on all non-IEEE attendees at IEEE conferences and to allocate those fees to the general fund. Not a bad idea; but some of the BOD felt it infringed on the societies' turf, and the proposal was defeated. During this past summer, I had an idea during our agonizing sessions over a dues increase. Specifically a surcharge would be placed on all society memberships. I saw two defenses for this proposal. First 40% of all IEEE members are not society members. Hence the other 60% are getting more out of the IEEE. Society memberships are marvelously cheap so why shouldn't beneficiaries pay a bit more ($2–$5 per membership) for what they are getting? Secondly, those who hold multiple society memberships are likely to be older, more established, and therefore more able to pay a little extra for their IEEE memberships.

Raising taxes never got anyone elected, but then I'm not running! By and large, one gets what one pays for. If we want more, then ways must be found to pay for it. It is as simple as that. The IEEE is doing a fine job with the resources it has, but I'd like to think it could be better if it had revenues which approximately kept pace with inflation.

Finally, some have asked me why I'm not seeking higher office. The sole reason is that I need to direct my energies toward my career. I have, one hopes, 15 to 20 more productive years ahead of me, and now is the time to seek out some fresh challenges. I have enjoyed many aspects of my tenure as your Division IV Director and thank you for the opportunity to serve. I turn over the reins to the capable hands of Len Carlson. Give him your support and cooperation as you have done for me. Best wishes to all.

CHAPTER CHATTER

by Charles F.W. Anderson

CENTRAL NEW ENGLAND

As announced in the last issue, the Chapter held a meeting on October 18, 1988. Mike Hopkins of Keytek discussed various methods used to determine susceptibility of electronic equipment to ESD. The next meeting was scheduled for December 7 and was to feature a speaker from Electro-Metrics; the topic was to be "Spectrum Analyzer or Receiver?" Larry Lee, the local Electro-Metrics rep had organized the meeting; but at press time there was no word on the speaker. [Thanks to John Clarke for the information.]

DALLAS/FT. WORTH

On October 19, the Chapter meeting was addressed by Rudy Garbeley of ITT Cannon in Phoenix. The title of his talk was "EMI/EMP-Source and Control." There were 16 attendees. [Thanks to Scott Sullivan for this information.]

LOS ANGELES

The November 17 meeting of the Chapter had as its speaker Albert Pruden, Jr., who is a Director of Systems Engineering and Requirements, Lockheed Aero Systems. He discussed the Advanced Tactical Fighter (ATF), which is the joint USN/USAF program aimed at countering the new evolving generation of Soviet fighters. It will be a "follow-on" to the F-14/-15 with planned Navy procurement of 618 aircraft and Air Force procurement of 750.

NATIONAL CAPITAL AREA

On November 17, the Chapter's meeting had as its speaker William Tate, who spoke on ship systems EMP/EMI protection. [Your column editor apologizes after attending the meeting, taking notes and losing them. I hope to have something on this meeting for the next issue.]

NEW JERSEY COAST

On September 27 the Chapter held a meeting at which the speakers were Umesh Mishra and April Brown of Hughes Research Labs Malibu. Their topic was "Gallium Indium Arsenide Heterostructures for Low-noise Amplification High-speed Circuits and Lightwave Detection." They discussed material statuses, device properties and applications of heterostructures based on inGaAs. Current gains of 3000 have been obtained; and an f_t of 170 GHz has been achieved! [This meeting could be termed a joint/joint one since the EMC/VT/AP Chapter teamed with the MTT/ED/LEO Chapter to sponsor this mini-symposium.]

This Chapter had two meetings in October! On October 17 Paul Major, Chief of Spectrum Management for C^3 in CECOM at Fort Monmouth, had as his topic "The Army Frequency Allocation Process." He then discussed the DoD Form DD 1494, the committee involved in reviews, and the analyses which must be performed. On October 25, Don Heirman spoke on the topic "Avoiding Imposi-

tion of Immunity Regulations for Home Electronic Equipment." His presentation reviewed a special case where voluntary standards were useful to manufacturers.

The November 15 meeting featured Phil Porter of Bellcore speaking on the topic "Requirements for Signal Protocols for Universal Digital Portable Communications." His talk focused on Layer 2 and Layer 3 functions of the OSI model (the link and network layers). Also the layer 1 (physical) design was described briefly. Coding, signaling, alert/answering and privacy aspects were outlined along with the rationale for concepts adopted.

The Chapter also sponsored an FCC Seminar on November 29 and 30. Practical ways to test large, distributed commercial items to FCC Part 15J standards for Class A requirements were discussed. Focus was on ideas for expanding the measurement procedure guidance given in FCC MP-4 (1987) relating the guidance to more complex, distributed equipment under test.

The "NJC EMC/VT/AP Chapter Newsletter" continues to be the largest within the EMI/EMC community (to this editor's knowledge). It features advertisements from firms having EMI/EMC products or activities. Kudos to editor Bob Davis!

SANTA CLARA VALLEY

The September 13 meeting was devoted to planning for the 88-89 season and social activities. At the October 6 meeting Albert Chiaravallo, National Sales Manager for Schaffner EMC, presented a talk on "Simulation of ESD and Power Line Transient Events in Mini- and Micro-Computer Environments." The presentation was based on a paper given at the 1988 EMC Expo by Heinrich Kunz, General Manager of Schaffner Electronik's Instrument Division in Switzerland.

On November 3, the speaker was Franz Gisin, Manager of ROLM/IBM's EMC Department. His subject was "EMC, Computer Graphics, and Pop Art." He discussed the use of graphic techniques to provide insight into complex EMC processes including those associated with digital signals, near-field crosstalk on PC boards, and far-field radiation patterns from shielded items. [Thanks to Steve Cabral, Chapter Secretary for the inputs.]

TOKYO

The July 29 meeting attracted 41 attendees, 16 of whom were IEEE members. Nine papers were given with topics ranging from RFI suppression of magnetic contactors to lightning surge protection from subscriber telecommunications equipment. [Thanks to Chapter Chairman Toshihiko Namekawa for the report.]

TWIN CITIES

The November 17 meeting of the Chapter featured Daryl Gerke of Kimmel Gerke Associates, whose topic was "How to Design to Fail FCC and VDE in Twenty Easy Steps." Sounds like a paper which should appear in the *Transacttions*! [Thanks to Dan Hoolihan for the input.]

EIGHTH INTERNATIONAL ZURICH SYMPOSIUM AND TECHNICAL EXHIBITION ON ELECTROMAGNETIC COMPATIBILITY

March 6-9, 1989

The eighth Zurich EMC symposium is being organized by the Institute of Communication Technology of the Swiss Federal Institute of Technology (ETHZ), under the auspices of Mr. R. Trachsel, Director General of the Swiss PTT. It is sponsored by the Association of Swiss Electrotechnicians (SEV/ASE) and has the cooperation EUREL, IEEE, URSI and other professional organizations. President of the symposium is Dr. P. Leuthold. The Chairman is Dr. T. Dvorak, and the Program Committee is chaired by Dr. R.M. Showers.

The last symposium in 1987 featured 64 exhibitors and was attended by 932 participants from 28 countries. This year the conference offers an extended program featuring:

- **Over 120 technical papers in 18 sessions**
- **Tutorial lectures on electrostatic discharge (ESD) and nuclear electromagnetic pulse (NEMP)**
- **Open meetings of the URSI on lasting effects of transients, interference control, satellite observations of lightning, man-made and natural noise**
- **Four workshops on EMI/EMP standards and testing, EMC modeling, surge protection, and EMC in space programs**
- **A technical exhibition with special demonstrations**
- **Technical excursions and a rich social program**

The sessions will cover a wide selection of EMC topics and will review the current status and future trends of EMC technology. The tutorial lectures and workshops offer an opportunity to study and to discuss selected problems with the finest experts in the EMC field.

In addition to full registration, one-day tickets will also be issued, permitting economical attendance at selected sessions. The exhibition is open to the non-registered public free of charge. The full text of presentations will be made available in conference proceedings.

The conference program with registration and hotel reservation forms may be obtained from:

Dr. T. Dvorak
ETH-Zentrum-IKT
Ch-8092 Zurich
Switzerland
Telephone: (+ 411) 256 2790

EMC CERTIFICATION AND ACCREDITATION

PROGRESS REPORT

by Russell V. Carstensen, P.E.

I'm caught in my own trap! Just like everyone else, I'm stuck with drafting ten questions for the certification examination. I received my letter in October and have been trying to push myself into getting the job done. I am pleased that the staff at the National Association of Radio and Telecommunication Engineers (NARTE) treats all applications equally.

There are two reasons for requiring the questions from each "grandfather" candidate—to build a base of questions stemming from practical experience and to make the contributors real participants in the certification process. The initial set of questions (of which there are now about 800) are strongly academic in nature. They were prepared by those working more closely with theory than with practical problems. This approach allowed us to build a base of questions which were "classic" in nature, easily verifiable, and treated in available literature. However, these sort of questions do not take advantage of those increments in knowledge which come about through practical experience. The questions coming from current practitioners will offset this shortcoming and will assure a broadly-based examination.

It is important that the "grandfather" candidates feel a kinshop with the program. The current practitioners are the model around which we are building our qualifications. In the absence of a defined set of qualifications, each entry into the field has had to determine what is important to his or her field of responsibility and to build a working knowledge of the physics which applies to everyday problems in that area. As a consequence, we are a group of highly trained specialists, none of whom followed the exact same curriculum of study. It is important to capture as much of this unique experience as we can before the certification process begins to exerts its influence on individual career development.

Thus I continue to pick away at completing my ten questions. I recognize that I won't be the first in line for certification, which will be awarded in the order in which application requirements are met. NARTE started processing applications on the first of October.

A draft study manual has been prepared to help candidates prepare for the examination. The draft was circulated at the Naval Air Systems Command E^3 Progress Review in November. Some initial reactions were that the set of questions were too difficult and were not representative of the examination. (Or conversely if they did represent the examination, that it would be impossible to pass.)

The text of the *Study Guide* describes the examination. It indicates that there will be approximately 250 questions in an eight-hour period. A score of 70% is needed to pass the exam. Most likely the candidate can expect 125 questions in the morning and an additional 125 in the afternoon. It is stressed that the candidate need answer only 88 questions (70% of 125) in each session; exam strategy should be planned accordingly.

Also the questions in the computer files are flagged with indicators to tell which of the 25 areas of essential knowledge is represented, how much time is reasonably needed to solve the question, and how often the question has been used. This system assures that no two examinations will be the same. However, it also means that the number of questions will vary with each printing. This variation was not indicated in the draft *Study Guide* but will be included in the final printing.

The questions used in the *Study Guide* were not evaluated as to complexity or time required for completion. Thus these questions are not absolutely representative of the exam. This shortcoming will be a little harder to correct, but it must be done to improve the *Guide's* utility. All comments from the initial review should have been

received by the end of December, and the final *Study Guide* should be out to users by the end of January. It will be stocked by NARTE, P.O. Box 15029, Salem, OR 97309, Telephone: (503) 581-3336. It will be forwarded upon request. We also expect that it will be supplied to every applicant as part of the application package.

Establishment of laboratory accreditation is moving slower than we initially anticipated. Based on industry comments, we have been looking hard at the qualifications for laboratory assessors. It had been thought that we could use one NVLAP and one Navy assessor per team. The teams have now been realigned to include two Navy assessors. We have scanned the community for assessor candidates with a strong background in MIL-STD 462 test procedures. The candidates must have actual hands-on experience in running MIL-STD to qualify. Also they must not be from a laboratory which will be requesting accreditation. Where contractors will be used, they must not be placed in a position of potential conflict, such as assessing their own laboratory or evaluating that of a direct competitor. These criteria make selection difficult but not impossible.

We expect to train assessor teams between January and March of 1989. A part of the training will be the development of accreditation checklists. The checklists will be derived from the critical elements published in the *NVLAP Handbook,* and they will target the essentials for conducting successful MIL-STD 462 testing. By the way anyone interested in serving as a laboratory assessor should contact Richard Ford, Code 5330, Naval Research Laboratory, Washington, DC 20375, Telephone: (202) 767-3440. He can make arrangements for induction into the program.

Application forms for NVLAP accreditation are not out as yet. The "sticker" is pricing of the accreditation visit. NVLAP is constrained to charge only what is necessary for maintaining the program. Building a cost model is difficult when factoring in travel to and from the lab site, time on the site, and report preparation. Now that we have a "stable" of assessor candidates and a reasonable feel for the number of laboratories that could be involved, and their geographic locations, a cost model can be developed. This model will be based on a two-year cycle covering the alternate year on-site assessment and the off-year proficiency testing. Once the cost model is approved by NVLAP management, application forms can be issued.

The Fall issue of *Compliance Engineering* gives good coverage of the program as it was presented at the IEEE EMC Symposium in Seattle, WA in August. However, there is a "snag" on page 29 regarding the qualification of laboratory personnel. The description included actually pertains to the certification of engineers and technicians. Also it is incorrectly indicated that current practitioners will be "grandfathered" for six months. The actual period is twelve months following the signing of the instruction implementing the requirement. The instruction has not yet been signed so the clock is not yet running.

1989 INTERNATIONAL SYMPOSIUM ON ANTENNAS AND PROPAGATION, JAPAN

ISAP '89 will be held at the Nippon Toshi Center in Tokyo, Japan, August 22 through August 25, 1989. It is intended to provide international forums for the exchange of information on the progress of research and development in antennas, propagation, electromagnetic wave theory and related fields. Another important objective of this meeting is to promote mutual interaction among the participants.

This symposium will treat a wide range of subjects. Some suggested topics are listed below although papers concerned with other aspects of antennas and propagation will be considered.

- **Analytical and Numerical Techniques**
- **High Frequency Techniques**
- **Scattering and Diffraction**
- **Guided Waves**
- **Inverse Scattering**
- **Random and Nonlinear Media**
- **Transient Fields**

For further information, contact

Dr. Takashi Katagi
Chairman, ISAP '89 Publicity Committee
Mitsubishi Electric Corporation
325 Kamimachiya, Kamakura, 247
Japan
Telephone: +81-467-44-8862

EMC PERSONALITY PROFILE

by William G. Duff

H.R. HOFMANN

H.R. (Bob)Hofmann is a member of the technical staff and the supervisor of the AT&T-Bell Laboratories Electromagnetic Compatibility Test and Procedures Group in Naperville, Illinois, located thirty miles west of Chicago. Bob has been with Bell Labs for thirty-one years and in his present position for eight years.

His group performs emissions and susceptibility tests on AT&T computers and telephone switching equipment for compliance with both domestic and international EMC requirements. The group also performs field EMC measurements in response to reported problems and works on both power and grounding and electrostatic discharge problems. They conduct an active EMC educational program and work with circuit and physical designers to minimize potential EMC problems.

Bob received a BSEE degree from the University of Florida in 1957 and a MSEE degree from New York University in 1961. In 1957 Bob joined AT&T-Bell Laboratories, where he worked initially on the first AT&T Electronic Switching System ESS#1 (TM) at Whippany and then Holmdel, NJ.

In 1966 he was transferred to Naperville, IL where he continued work on the development of switching networks and scanners for No. 2 and No. 3 ESS. He has been concerned with electromagnetic compatibility issues involving switching equipment since 1969.

Bob is a member of the Board of Directors of the IEEE EMC Society, a member of the Board of the Chicago Section of the IEEE, and a past president of the Chicago Chapter of the IEEE EMC Society. For the past three years, he has served as editor of the Chicago Section newsletter *SCANFAX*. Currently he is the AT&T representative to the Computer and Business Equipment Manufacturers' Association (CBEMA) Committee on Electromagnetic Compatibility and the AT&T representative to the American National Standards Institute Committee C63 on Electromagnetic Compatibility.

Bob has just completed a revision of ANSI standard C63.12 on Electromagnetic Compatibility Limits. He has authored and presented a number of papers on EMC testing and has chaired several sessions at various IEEE EMC symposia.

As Member Services Director of the IEEE EMC Society, Bob is concerned with encouraging productive contacts between the Board and individual EMC Society members and with strengthening local EMC chapters. He instituted the Chapter "Angel" Project and has been a strong supporter of the Distinguished Lecturer Program. Both these efforts help local chapters to develop programs featuring out-of-town speakers, attract more members to local chapter meetings, and make interesting programs available to more IEEE EMC Society members. He has also pushed for development of new chapters.

For relaxation Bob likes to climb 14,000-foot mountains in Colorado, to bike the flats of Illinois, and to fix TV sets. He also writes a column for the local Naperville newspaper. His wife Marianne sells real estate. Their daughter Susan is a music composition graduate student, and their son Steven works on integrated circuit technology at Bell Labs.

INCEMIC '89 UPDATE

The 1989 International Conference and Workshop on Electromagnetic Interference and Compatibility will take place at the Hotel Taj, Bangalore, India from **September 12 through 16, 1989.** It should be noted that the dates have been changed to avoid scheduling conflicts with the EMC Symposium in Nagoya, Japan.

Registration. Registration fees have been set at $250.00 for both conference and workshop. The student fee for both is $90.00. A ten percent rebate is available to IEEE members. All foreign nationals must submit the fee in U.S. dollars. This payment covers the conference, workshop proceedings, lunch, and tea. Requests for free registration will be considered from full-time, student authors.

Accommodations. Hotel accommodations are available in varying price ranges. Limited economy accommodations can be arranged, on request for students and members of the academic community. Economy lodging will be in hostels or guest houses at academic or research instituions.

Call for Papers. The first call elicted an excellent response. Notifications of acceptance will be sent by March 1, 1989. Mailing of authors kits is scheduled for April 15, 1989; and camera-ready manuscripts should be received by June 15, 1989.

For further information contact:

Prof. G.R. Nagabhushana
Dept. of High Voltage Engineering
Indian Institute of Science
Bangalore-560 012
India

CALL FOR PARTICIPATION IEEE TECHNICAL COMMITTEE ON ELECTROMAGNETIC ENVIRONMENTS

The Technical Committee on Electromagnetic Environments, TC-3 of the EMC Society, is seeking new members. TC-3 is concerned with all aspects of man-made and natural radio noise, including characterization of the electromagnetic environment, measurement methods, and instrumentation. Man-made noise includes measurement power-frequency electronic and magnetic fields, ESD, power line transients, broadcast and communication fields, automotive ignition noise, power generation, conversion and transmission noise, ISM emissions, and consumer product emissions. Natural radio noise arises from atmospheric (lightning), solar and galactic sources.

The activities of the Technical Committee on Electromagnetic Environments include reviewing papers in cooperation with the *Transactions* editor and the Symposium Technical Papers Committees, organizing technical sessions and workshops at meetings of the EMC Society, developing standards for processing by the EMC Society Standards Committee, and evaluating the state-of-the-art in the field of electromagnetic environments. In 1985, TC-3 published "IEEE Recommended Practice for an Electromagnetic Site Survey (10 kHz to 10 GHz)," IEEE Std 473-1985. Anyone interested in participating in the activities of TC-3 should contact the chairman:

Albert A. Smith, Jr.
IBM Corporation
69RA/170
Neighborhood Road
Kingston, NY 12401
Telephone: (914) 385-0013

The next meeting of TC-3 will be at the IEEE National Symposium on EMC in Denver, CO, May 23 through 25 and is open to anyone who is interested in the electromagnetic environment.

KEEPING THE PEACE

by Kimball Williams

Ensuring Compatibility between the Electromagnetic Environment and Electric and Electrical Devices

Electrical noise has been a problem ever since Marconi put up his first antenna and found that Mother Nature was already "on the air" with lightning storms. Since that time electrical engineers have been dealing with the problems of electrical interference in one form or another in all aspects of electrical engineering. Almost every form of electrical or electronic device has had the problem at one time or another. Today electrical interference and the frequency with which it occurs is growing with the rapid spread of electronic devices.

Electromagnetic interference (EMI) can be demonstrated by tuning a radio receiver to a quiet portion of the am band where there is no radio station and then placing a calculator with a light emitting diode (LED) display near the receiver. Turn on the radio; then turn on the calculator. The noise you will hear is caused by the circuit which strobes the LED display, and each impulse sound is made by a small current pulse to a display segment. Try entering a number and listen to the tone change.

Since the problem first became obvious to early radio engineers, the term "radio frequency interference" (RFI) was most often applied. As engineers spread the use of electronics, it was found that electrical interference didn't confine itself to the radio spectrum. Today we recognize that almost any device which operates on the principle of moving an electron from one point to another can be either a source or receiver of electrical noise. The newer term EMI acknowledges the fact that electrical interference encompasses the entire electromagnetic spectrum from the lowest magnetic frequencies through the highest microwave frequencies.

TWO-SIDED PROBLEM

Electromagnetic interference is a problem with two sides. On one hand is the concern that some sensitive electronic instrument or control system will suffer a loss of performance when an outside signal invades its circuitry. It is said that the device is a "victim" and that it is "susceptible" to outside interference. The device, in effect, becomes a receiver of electromagnetic noise. On the other hand, if the device is electronically "noisy," it is said that it is a "culprit." The main concern is its "emission." It is acting as a small, unlicensed radio transmitter.

When two electrical or electronic devices must operate together in the same environment or in the same system, the potential for conflict between these unintended transmitters and receivers can present significant and challenging problems. Some problems are obvious in the first prototype of a new device if it tends to "self-interfere." This can happen when the design results in having a strong emitter and a sensitive receiver in the same package.

Of more concern, is the design which results in only one-half of the problem. If a circuit is only a strong transmitter, or only a sensitive receiver, the potential for later problems is there. However, it may not be discovered until the design has left the laboratory unless the device is tested for electromagnetic compatibility (EMC). Electromagnetic compatibility is the discipline of designing, analyzing, and testing to ensure that electronic and electrical devices are compatible with their electromagnetic environment—*i.e.* being neither victims nor culprits.

WHAT IS AFFECTED

Besides concern for the safety and security of communications, there is concern for the integrity of control, computing, and measurement systems. In addition to possibly disrupting communication to essential services, such as fire and police departments, the possibility also exists of interfering with such diverse electronics as computers, robotics control systems, missile firing systems, aircraft controls, and microwave ovens. And the list goes on. Concern must now focus on ensuring the safe operation of office building elevator control systems near air conditioning motors, industrial robots operating near automatic welders, and braking systems in an automobile in the vicinity of the ignition. No one wants the computer in a banking institution to miscalculate a bank transaction because of the radar from a passing airplane or the signal from a night guard's walkie talkie or for a weighing system to overcharge a truck transport company for road usage when a nearby driver asks for a weather report using his CB radio. And certainly no one would want the lives of patients in a hospital emergency room threatened by a malfunction in the electronic life support systems due to unintentional outside interference.

THE SEARCH FOR HARMONY

In attempting to resolve the possible conflicts between sensitive electronics and a noisy environment, engineers seek to make circuits which are potential receivers more immune and to make those which are potential emitters less noisy. But how much protection is enough, and are there practical limits?

Susceptibility, in general, tends to be a self-debugging phenomenon. This is because a product which tends to fail in service is usually called to the attention of the manu-

facturer by the disgruntled user. As a result, most producers of electronics are sooner or later aware of any serious susceptibility problems that they have built into their equipment. Emission, on the other hand, does not have this automatic "market feedback" characteristic. As a result, the Federal Communications Commission (FCC) has been given the authority to regulate emissions from products in the U.S. And they do! The FCC also has been given the authority to regulate product susceptibility in the U.S. but, so far, has chosen not to use this authority.

Since emitters and receivers circuits must coexist, there must be guidelines for emission and susceptibility limits. The guidelines can be found in formal standards and rules which are based upon the type of service the device will eventually see in its application. In these cases, the attempt is made to provide a reasonable margin of safety between permissible emissions of unintended transmitters (emitters) and the susceptibility levels of sensitive circuits. The most widely-used limits for electromagnetic compatibility are spelled out in the FCC Part 15 J and the Military Standards MIL-STD 461 and 462. These and other standards provide solid guidance based upon practical experience in the environment in which the system will operate.

In the area of commercial and residential electronics, no digital design with a clock frequency equal to or greater than ten kilohertz can be sold, offered for sale, or imported into the U.S.A. unless it can pass the emission requirements of FCC Part 15 J. No electronic device for the military will be accepted unless it is designed to pass MIL-STD 461/462 emission and susceptibility testing and does so successfully. Automotive electronics all must comply with SAE standards for emission (J551) and susceptibility (J1113). Industrial equipment must comply with ANSI, IEEE, NEMA, SAMA, and UL standard tests to verify its behavior under EMI. Other countries have similar standards (*e.g.*, CISPR in Europe and VDE in West Germany).

These standards are not static. As technology changes, committees in various societies are working continuously to keep the standards which apply in their area of concern current for EMC design and testing.

EDUCATION

In an ideal world, the solution to the problems of EMI would be in the hands of every electrical engineer. The design principles and techniques are well understood and documented. Unfortunately, engineering curricula are so crowded with core materials that only a few universities can offer courses in EMC, even as an elective. In 1985, the IEEE EMC Society, through its EMC Education Committee, conducted a survey of 350 engineering schools in North America and Europe requesting information on the availability of courses with at least 40 percent of the course material devoted to EMC. Only ten positive replies were received. Although the majority of the schools replied said that they should offer such material.

EMC Engineering

Electromagnetic compatibility is a well-defined technical discipline practiced by a relatively small number of engineers. These engineers have, by and large, been those who recognized the problem and who educated themselves in the discipline. While these dedicated few have been generally successful up until now, the explosive growth of electronics will soon outstrip even their best efforts. At last count, the IEEE had 282,708 members; the IEEE EMC Society had 2688. If this is a representative proportion of the engineering community mix, we are asking every EMC engineer to guide the work of 105 of his or her coworkers and to keep them out of trouble. And the ratio is getting worse.

It is not necessary for every electronic engineer to be an "expert" in EMC; just as it is unnecessary for everyone to be expert in packaging, thermal control, or digital communications. What is desperately needed is for every electrical engineer to become aware of EMC and the general implications it has for any design. If help is needed, call on the "expert" in the organization or contact an outside consultant for assistance. The one way the engineer should not become aware of EMC for the first time is having the best customer complain about an EMC-caused field problem.

READ MORE ABOUT IT

If you would like to find out more about electromagnetic compatibility, contact your local IEEE section and ask when the next chapter meeting of the EMC Society will be.

For technical information, consult the following recommended reading:

- Henry W. Ott. *Noise Reduction Techniques in Electronic Systems.* New York: Wiley Interscience Co.

For another perspective on EMC in government and industry, consult the following periodicals:

- *EMC Technology.* Circulation Department, P.O. Box 1562, Neptune, NJ 07754. Telephone (800) 255-6286.
- *ITEM (Interference Technology Engineers' Master).* R&B Enterprises, 20 Clipper Rd., West Conshohocken, PA 19428. Telephone (215) 825-1960.

NOTE

This article is reprinted from *Potentials,* the IEEE student periodical. Author Kimball Williams is a senior engineer with Eaton Corporate R&B, where he directs the operation of the Eaton Electromagnetic Compatibility Laboratory. He earned his BSEE in evening school in 1979, is a member of the IEEE EMC Education Committee, and is a licensed amateur pilot. Special thanks is due Associate Editor Henry Ott for pointing out this article and its overview on EMC engineering.

PCs FOR EMC

by Edmund K. Miller

When a guest column by Dan Higgins on FORTH as a desirable computer language for engineering applications was published, I observed (tongue in cheek) that this was a noncontroversial topic. Shortly thereafter, I received some comments from Jerry Raines which were included in the last column. A further relevant and thoughtful response has been sent by David Smith and is presented here. I expect that this might not be the last view heard on the subject since the computer language we use affects every aspect of our computer usage.

ANOTHER VIEW ON FORTRAN

by David W. Smith, Research Assistant
Electromagnetics Laboratory
Department of Electrical and Computer Engineering
University of Illinois
Urbana, IL 61801

Just as Dr. Raines felt compelled to defend FORTRAN, I am also compelled to present some hard, cruel realities of a programming language that is older than I am. I do not intend to engage in "FORTRAN-bashing." Instead, I will examine the limitations of this venerable language.

First, I must respond to three points which Dr. Raines made in his article, *viz.* that FORTRAN is "easy to learn, versatile, and probably the fastest number-crunching language available." To address these in reverse order, there is nothing inherently faster (or slower) about FORTRAN compared to any other high-level language since no one has yet developed a computer which lives and breathes FORTRAN. Thus, the speed at which one's code executes depends on how well a compiler is adapted to a computer's hardware and operating system. In the case of supercomputers, vectorizing compilers exist for other "generally available" languages, such as C.

FORTRAN is versatile by 1950's standards, but then so are vacuum tubes (I apologize to any tube designers who are offended by this comparison). By modern standards, however, FORTRAN lacks much of what makes a programming language useful. For instance, FORTRAN77 does not allow recursion, either direct or indirect. However, many algorithms (for example, those used in sorting) have been developed which are inherently recursive. Although these can be implemented in a language which prohibits recursion, the source code will be longer and less readible.

Another serious problem with FORTRAN77 is the implicit declaration of variables. Although many "scientific programmers" might consider this a wonderful feature, it really is a demon in disguise. How many hours have been wasted finding a bug caused by a mistyped variable name which FORTRAN has so kindly implicitly declared? For some reason known only to the FORTRAN77 standards committee, the specification IMPLICIT NONE was not included in the standard. Although this is an extension available on some compilers, it is not standard and potentially nonportable.

Compared to more modern languages such as Pascal or C, FORTRAN77 is both undertyped and understructured. FORTRAN77 provides the basic arithmetic, logical, and character types; but it provides no real means for creating composite types from these objects (for instance, three REALS combined to make a POINT type). A simple example of where FORTRAN lacks control structure is the absence of a "while-do" type loop. This structure can, of course, be achieved with an IF-ENDIF and a GOTO, but why should programmers be forced into using GOTO statements? Some implementations, however, provide the while-do and other modern types of control structures such as nonportable extensions.

Another FORTRAN deficiency is the lack of a dynamic memory allocation facility. Without going into great detail, there are times when the size of a particular array may ordinarily be small, except in rare cases where a significantly larger array is needed. The FORTRAN programmer is forced to "hard dimension" the array to the larger value and to suffer the memory inefficiency when the space is not needed. This problem could be avoided if FORTRAN provided a facility for allocating and deallocating memory during program execution.

Finally, I should address the ease of learning FORTRAN. In fact, it can be a very difficult language to learn. Not only must one learn the standard; one must also learn what is nonstandard and, therefore, to be avoided. The standard itself is loaded with subtleties and processor-dependent specifications, details which can be difficult for even experienced programmers to master.

I agree wholeheartedly with Dr. Raines' comment that "Good scientific programming must be learned just like good scientific writing." We must remember, however, that we did not learn scientific writing first. We learned (or should have learned) grammar, punctuation, spelling, and style long before we ever wrote a technical proposal or submitted an article for publication. Likewise, students must be taught *good programming* first and good scientific programming later. In my opinion, FORTRAN is not the best language in which to teach good programming. I will leave it to the computer scientists to debate which language is.

To its credit, FORTRAN does provide a COMPLEX arithmetic type, which is essential for work in electromagnetics. This feature is one of the few reasons why I use FORTRAN. As far as the millions of lines of code written in FORTRAN are concerned, the algorithms which they embody are at least as important as their particular implemention in FORTRAN.

I must admit that I am not familiar with FORTRAN88 standard. To the extent that the members of the standards committee move FORTRAN forward, I applaud their efforts. I am afraid, however, that FORTRAN is so entrenched that it will be a long time before substantial improvement is made.

IEEE TOPS 300,000 MARK IN TOTAL MEMBERSHIP

Institute Is World's Largest
Technical Professional Organization

The Institute of Electrical and Electronics Engineers, Inc. (IEEE) has surpassed the 300,000 member mark. According to IEEE 1988 President Dr. Russell C. Drew, the Institute's membership as of December 9, 1988 stood at 300,226—more than twice the size of the next largest engineering society. The IEEE, with headquarters in New York City, is a transnational organization with members in more than 130 countries involved in advancing the theory and practice of electrical, electronics and computer engineering, computer science and related arts and sciences.

The 300,000th member of the IEEE has been identified as Susan Rudy Sanicky of San Jose, CA. Ms. Sanicky has a bachelor of science degree in electrical engineering from the University of California at Davis, and she is currently a senior engineer/manager at IBM following sixteen years of professional practice.

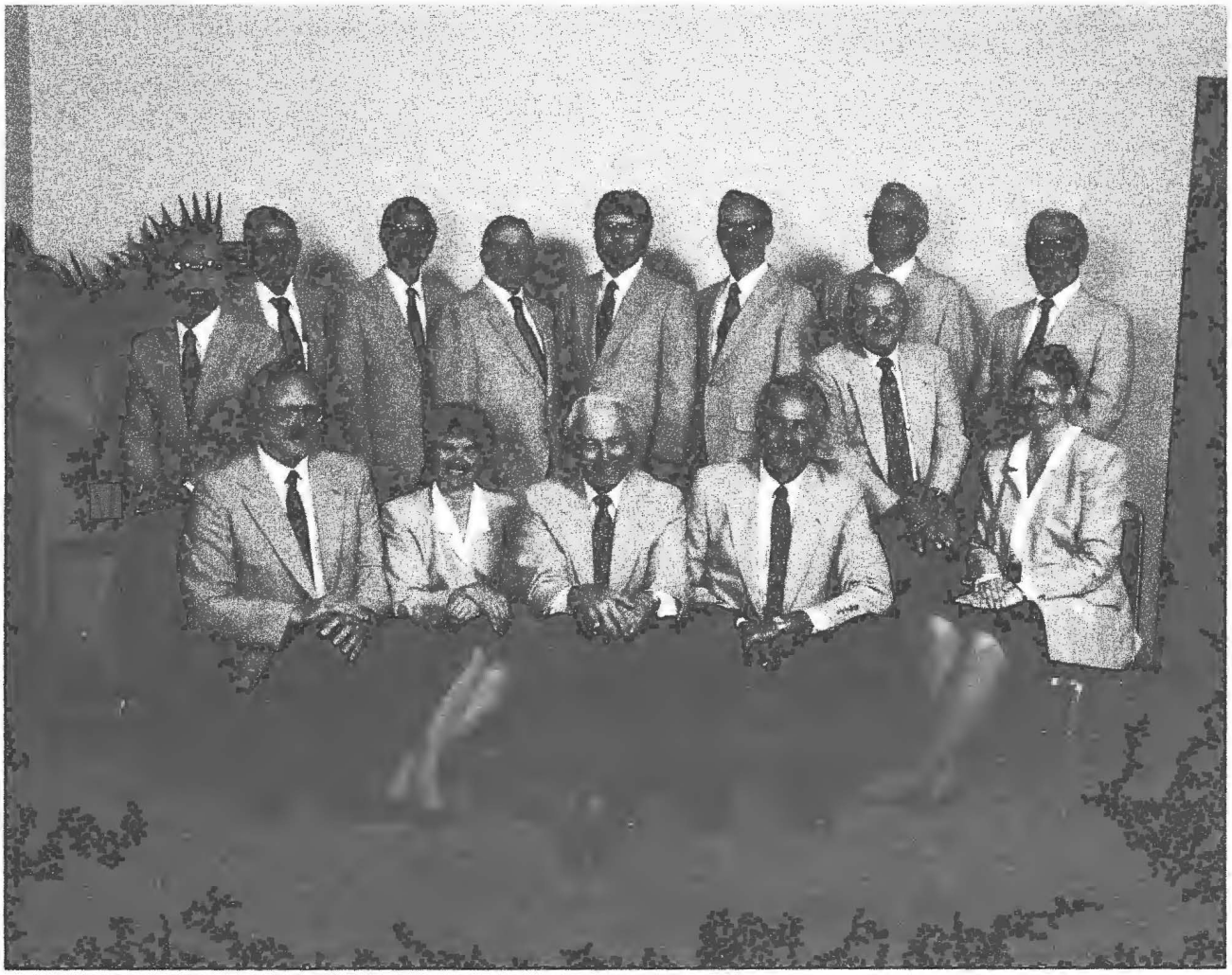
According to Dr. Drew, the growth of the IEEE has paralleled the pervasiveness of electrotechnology which now undergirds the economies of many of the developed nations. Reflecting this scope, the Institute has thirty-six individual Societies active at the cutting edge of technology in areas ranging from aerospace, computers and communications to biomedical technology, electric power and consumer electronics.

SEATTLE EMC '88 COMMITTEE

AUGUST 3, 1988

Seated left to right: Stan Schneider, Secretary; Joel Rogneby, Treasurer; Lee Weber; Len Carlson, Vice President; Bill Gjertson; Walt McKerchar; and Gail Enochsen.

Standing left to right: Dave Dennis; Don Weber, Chairman; Gene Knowles; John Brew; Ralph Jensen; Tom Herring; and Del Black.



GROUP TRAVEL TO NAGOYA

IEEE EMC Society group travel plans for the EMC Symposium in Nagoya, Japan, are now being handled by—

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1989 INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY

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September 8–10, 1989

IEEE EMC-S

Symposium and Technical Exhibitions will be held at
Nagoya Trade and Industry Center

FIRST CALL FOR PAPERS

Authors are invited to submit papers on the current state of EMC technology and related disciplines. Original, unpublished papers will be considered in the following areas.

1 Noise, Sprious and Harmonics
2 Contacts and Gap Discharge Phenomena
3 Lightning Surge, EMP and ESD
4 EM Field and Lines/ Coupling and Crosstalk
5 Scattering, TV Ghost Problem and Radar False Echoes
6 EM Wave Propagation and Fading
7 EM Environments
8 Interference and Damages
9 Noise and EM Field Measurement and Analysis
10 EM Sensor, Probe and Antenna
11 Shielding and Grounding/ Technique and Material
12 EM Energy Absorber/ Unechoic Material
13 Filter, Transformer and Isolator
14 EMI/EMC Test
15 Immunity and Susceptibility
16 Biological Effects
17 Hyperthermia
18 Non-sinusoidal Signal
19 Spread Spectrum Techniques
20 Optical and Ultrasonic Application

EMC in
21 Communication and Automation Systems
22 Instrumentation
23 CPU/VLSI
24 Radio Navigation/Aerospace
25 Mobile Communication
26 Consumer Products
27 Micro Electronics
28 Transportation
29 High Energy Generation
30 Mines

31 Spectrum Economy and Management
32 Standard, Regulation, Limit and Specification
33 EMC Education
34 EMC in Amateur Radio
35 Seismo-Electromagnetic Phenomena
36 Others

Authors' Schedule

Prospective authors should submit both a 35-50 word abstract and a 500-750 word summary written in English (up to 6 illustrations) that cleary explain their contribution, its originality, and its relevance to the EMC discipline. For anonymity of review, please identify authors(s) only on the cover sheet.

Upon acceptance, authors will receive forms and instructions for prepairing materials to be printed in the Symposium Record. If poster session presentation is desired, please indicate on the abstract/summary submitted.

Abstract and Summary (Original and 2 copies required) ····· Dec. 15, 1988
Notification of Acceptance ····· Feb. 28, 1989
Camera Ready Copy ····· May 31, 1989

Submit Abstract and Summaries to, and For More Information, Contact:

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c/o Prof. Miyazaki
Toyohashi Univ. of Tech.
Toyohashi, JAPAN 440

Telex: 4322201 JPNTUT J
Phone: 0532-47-0111 ext. 576
Fax: 0532-45-0480

POINT AND COUNTERPOINT

QUO VADIS?

by Anthony G. Zimbalatti

The most recent version of the widely-used specification MIL-STD-461/462 delineates several requirements for electrical/electronic equipment. Permissible limits are set for electromagnetic emissions which the equipment might produce. The equipment's ability to withstand electromagnetic emissions (electromagnetic interference susceptibility) is specified. This hardness level includes the requirement that the equipment withstand exposure to nuclear electromagnetic pulse (NEMP). Moreover, the hardness levels of equipment must also be controlled to allow it to withstand atmospheric lightning-induced transients as spelled out in DoD-STD-1795. Further, to assure and to validate compliance with these requirements, delivery of the following documents is required: Control Plans, Analysis and Design Parameter Reports, Test Plans, Procedures, Data, and Reports. Although the proliferation of EMC and EMC-related requirements and calls for action to mitigate the problems caused by this proliferation have appeared previously (*cf. EMC-S NEWSLETTER,* Spring, 1986), the purpose of this column is to discuss issues associated with compliance testing to validate equipment hardness to lightning, NEMP, and electromagnetic interference.

More and more persons and companies are balking at performing all of these tests or are proposing testing that is inadequate or insufficient to validate compliance. Several primary factors contributing to this state of affairs follow. The DoD lightning standard fails to identify test conditions and hardness limits, and this omission could lead to insufficient testing. The approach is to specify the lightning-threat parameters and to leave test compliance to the equipment seller and buyer, who are deprived of test guidance. On the other hand, the NEMP and EMIS test conditions and hardness limits are delineated in MIL-STD-461/2, which requires a considerable amount of electrical transients hardness testing. This testing is expensive, especially the testing for NEMP hardness. Collectively, these test requirements can lead to two undesirable results—either a relatively long test procedure and concommitant high costs to assure full compliance or inadequate or insufficient testing motivated by a desire to reduce test time, to free up needed equipment, or to reduce costs.

Given the competitive nature of business and the profit motive, the aforementioned situations do not necessarily result in compliant equipment, albeit at higher costs. I want to make the point that cost-effective compliance can be achieved provided certain actions are taken. Lightning transient hardness test conditions and limits need to be identified. It should be determined whether or not there is a need for NEMP hardness test requirements for all equipment procurement. When hardness is required, it should be determined whether or not there is a need for both a pin and cable NEMP hardness test. Furthermore it should be determined whether the use of a pulse, rather than a damped sine wave test technique with variable frequencies, is an effective compliance measure. The authorities on lightning, NEMP, and EMC should assess whether a set of universal transients would be an effective compliance measure.

What are your thoughts or counterpoints on the aforesaid? We are listening.

PRODUCT SAFETY

NEW TECHNICAL COMMITTEE FORMED

by John McBain

There's a new kid on the block. Born in August, at the EMC Society Board of Directors Meeting in Seattle, this youngster is growing fast. The new Product Safety Technical Committee of the IEEE EMC Society, chaired by Richard Pescatore of Hewlett Packard, is already mailing its "Product Safety Newsletter" to over 800 readers nationwide. Four local groups, in the San Francisco, Portland/Seattle, Los Angeles, and Boston areas, are holding regular technical meetings. Individuals in both the Chicago and Austin areas are planning organizational start-ups.

What's all the excitement about? It seems to be a case of the traditional "idea whose time has come." And it has been a long time coming! Product safety engineering for electrical products has existed at least as long as electrical product safety certification, which was started in the United States in the 1890's by Underwriters Laboratories, Inc. Although many corporate, standards, and professional groups may deal with electrical product safety, they do not have the same focus as the Product Safety Technical Committee. There are groups with corporate rather than individual memberships, with a broader scope, or with a purpose which differs from PSTC's.

The members of the PSTC are concerned with electrical safety (both direct and indirect) of electronic products. Members study the basic concerns of product safety including areas of commonality with EMC. Primary concerns include safety engineering principles, their application, consistent understanding and interpretation of applicable standards, the implementation of safety principles within organizations, and independent party certification. These interests receive the support on an international professional engineering association, the IEEE.

The best evidence that the creation of the PSTC fills a need is the exponential growth of the group. About a year ago, a small group of product safety engineers in the Santa Clara Valley started holding regular meetings. They decided that affiliating with the IEEE should be one of their goals. The EMC Society was approached as a sponsor because many members of the product safety group were also involved with EMC regulatory activities. This partnership seemed to them to be a good idea; and last August, the EMC Society Board of Directors agreed. The Product Safety Technical Committee was born and will have grown to nearly 1000 members and "Product Safety Newsletter" readers by the start of 1989.

Anyone who would like to learn more about the Product Safety Technical Committee, to receive the "Product Safety Newsletter," or to locate a group in a particular area, should contact one of these PSTC officers.

Richard Pescatore, Chairman
Hewlett Packard M/S 42LS
19447 Pruneridge Avenue
Cupertino, CA 95014
Telephone: (408) 447-6607
FAX: (408) 257-5034

Jim Norgaard, Vice Chairman
Dash Straus & Goodhue
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John McBain, Secretary-Treasurer
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19447 Pruneridge Avenue
Cupertino, CA 95014
Telephone: (408) 447-0738
FAX: (408) 257-5043

EMCABS

by William H. McGinnis

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
Don Kerns, Southwest Research Institute
Jack Orr, Southwest Research Institute
R.M. Showers, University of Pennsylvania

Also I'm looking for more volunteers for EMCABS work. If you would like to volunteer some of your time, please contact me:

William H. McGinnis, Manager
EMC Section
Southwest Research Institute
6220 Culebra Rd.
San Antonio, TX 78284
Telephone: (512) 522-2721
FAX: (512) 522-3396

"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 also 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.

Task Force Report on Power Frequency Electric and Magnetic Field Effects

EMCABS: 01-01-89

L.A. Rosen, J.M. Lee and J.D. Sahl
IEEE Power Engineering Society, Transmission & Distribution Committee
Corona and Field Effects Subcommittee, Working Group
"Biological Effects . . ."
Power Engineering Review, Vol. 8, No. 12, December 1988, pp. 3-8.

ABSTRACT: The Task Force was assigned the review of recent committee reports on the possible effects of exposure to the E and M fields of high voltage transmission lines and household wiring. Six scientific committee reports were reviewed, including the well known "Biological Effects of Power Line Fields, New York State Power Lines Project Scientific Advisory Panel." The conclusions of the six reports are reported and summarized in a common format Report, Conclusions and Specifics. This format simplifies comparisons of the report and makes them more accessible to nonspecialists. Ongoing and proposed research on transmission frequency electric and magnetic fields are summarized in tabular form that includes the institution, the exposure, the subject and comments.
INDEX TERMS: Low Frequency Fields—Biological Effects, Environmental Impact of ELF Electric and Magnetic Fields

Numerical Computation of Induced Currents Inside Heterogeneous Biological Bodies by ELF-LF Electric Fields

EMCABS: 02-01-89

H.R. Chuang, K.M. Chen, and J. Skutnick
Department of Electrical Engineering, Michigan State University
1988 URSI Radio Science Meeting June 6-10, 1988
Program & Abstracts, page 36

ABSTRACT: Recently a numerical technique, the *surface charge integral equation* (SCIE) method, has been developed to quantify the interaction of ELF-LF electric fields with homogeneous biological bodies and conducting objects. By using this SCIE method, the induced electric fields at the body surface and inside the body, the induced current density inside the body, the short-circuit current, and the effects of grounding impedances on the induced current in a homogeneous body of realistic shape can be computed efficiently and accurately.
INDEX TERMS: Biological effects, ELF-LF electric fields

Numerical Analysis of a Biconical Transmitting Antenna

EMCABS: 03-01-89

Vahid Badii, K. Tomiyama, Dale M. Grimes
Department of Electrical Engineering, Pennsylvania State University
1988 URSI Radio Science Meeting June 6-10, 1988
Program and Abstracts, Page 391

ABSTRACT: Several decades ago, the biconical transmitting antenna was analyzed [S. A. Schelkunoff, *Advanced Antenna Theory,* Wiley: New York, 1962], as more recently, was the biconical receiving antenna [D. M. Grimes, *J. Math. Phys.*, 23, 897-914, 1982]. Although these exact results have the capability of teaching us more about antennas, the complexity of the field equations has prohibited widespread usage or even understanding. Usually existing numerical solutions provide only input impedances. Biconical antennas are the only ones that are somewhat practical and for which complete solutions are possible for antennas of arbitrary size. For these reasons, we have recently completed a numerical analysis of the biconical transmitting antenna and are working on the receiving one.
INDEX TERMS: Antennas

Broadband Time Domain Antennas

EMCABS: 04-01-89

Motohisa Kanda
National Bureau of Standards, Boulder, CO 80303
1988 URSI Radio Science Meeting, June 6-10, 1988
Program and Abstracts, Page 414

ABSTRACT: This paper discusses various sensors and radiators commonly used for time domain antenna measurements. The sensors and radiators discussed here are passive analog devices that convert the electromagnetic quantity of interest to a voltage or current at their terminal ports. Moreover, their performance is standardized in the sense that their transfer functions can be calculated from their geometries and are flat (frequency-independent) across a wide frequency range. One of the major requirements of these sensors and radiators is that the electromagnetic far field, for transmission or reception be a replica or high-fidelity derivative of the original pulse.
INDEX TERMS: Antennas, broadband time domain antennas

Experimental Study on Lightning Overvoltages Induced on Actual Size Distribution Line Due to Simulated Indirect Lightning Hit

EMCABS: 05-01-89

S. Yokoyama, A. Asakawa
Central Research Institute of Electric Power Industry
EMCJ87-32, Meeting July 20, 1987

ABSTRACT: Pulse current was applied to a copper wire which was then raised in the air by balloon. Voltage waveforms induced on the actual size power distribution line which was located close to the balloon were measured. Experimental results were compared with calculated values derived from numerical calulation methods. Numerical calculation results agreed comparatively well with experimental ones, demonstrating that the calculation program can be used for working distribution lines.
INDEX TERMS: Lightning, lightning-induced voltage, distribution lines

Traveling Wave Characteristic of Induced Voltage on Buried Cable by Direct Lightning

EMCABS: 06-01-89

Satoshi Ichikawa, Hideto Ohnishi
Kyoto University
EMCJ87-16, Meeting June 26, 1987

ABSTRACT: This paper describes a numerical method for calculating the traveling wave characteristic of the voltage induced on a buried cable by a direct lightning strike. The propagation constant of a metallic shield to ground circuit is calculated with the thickness of the cable jacket factored in. Mutual impedance of every coupling circuit is calculated by using electromagnetic shielding theory. Numerical processes are carried out by inverse Laplace transform, and some numerical examples are presented.

INDEX TERMS: Buried cable, propagation constant, mutual impedance, induced voltage

Measurements and Analyses of the Electromagnetic Field Pattern Direction When Finding a Reflected Wave by the Maximum Entropy Method

EMCABS: 07-01-89

J. Wang,[1] T. Sato,[2] H. Echigo,[1] T. Takagi[2]
Faculty of Engineering, Tohoku University[1], Miyagi Technical College[2]
EMCJ87-31, Meeting July 20, 1987

ABSTRACT: This paper discusses the shape and properties of the spectra of spatial data in the Fresnel region. A method combining both the maximum entropy spectal estimation and error correction for direction finding of reflection waves is proposed. An algorithm is derived, and some results of computer simulation are presented. In the examples of simulation, the directions of reflection from the 40 samples studied are estimated with an error factor of less than 3°.
INDEX TERMS: Reflection wave, direction finding, MEM, error correction

Suppression Mechanism of the Noise of Stepping Motor

EMCABS: 10-01-89

Teizo Aida, Tetsuya Tomoda, Satoshi Kuraya, Keiichi Utimura
Faculty of Engineering, Kumamoto University
EMCJ87-25, Meeting June 26, 1987

ABSTRACT: A stepping motor used in office automation equipment is controlled by the off and on operation of a transistor connected to the motor starter-coil. An abnormal surge was induced with the transistor set at off, and the suppression mechanism was analyzed via a numerical analysis method. With an FTT method, a main noise source in the frequency region below 25 MHz was identified.
INDEX TERMS: Stepping motor, noise

Scattering of a Plane Wave by Two Discontinuities of Impedance Plan (H Wave)

EMCABS: 08-01-89

Yoshio Kage, Kazuo Aoki, Kuniaki Yoshidomi
Kyushu Institute of Technology, Kyushu University
EMCJ87-24, Meeting June 26, 1987

ABSTRACT: The back scattering of an electromagnetic wave plane caused by the junction of two impedance planes is analyzed theoretically by means of Wiener-Hopf method. The impedance plane is considered as an approximate model of lossy dielectric slab. The effect of multiple scattering between the two junctions is shown numerically when the distance between them is small and when the incident wave is illuminated from a direction close to the horizon.
INDEX TERMS: Electromagnetic wave, scattering

Effect of Induced Noise Caused by Breaking Electric Contacts on a Digital Circuit

EMCABS: 11-01-89

Keiichi Uchimura, Junji Michida, Shinji Nozu, Teizo Aida
Faculty of Engineering, Kumamoto University
EMCJ87-21, Meeting June 26, 1987

ABSTRACT: This paper describes the effect of induced noise caused by breaking electric contacts on a digital circuit. A simple automatic-measuring-system was developed, and a personal computer was used for the detection and the count of the malfunction in the digital circuit. Experiments were made with this measuring system under various circuit conditions. It was found that the malfunction was closely related to the occurrence of a showering arc.
INDEX TERMS: Induced noise, electric contact, digital circuit, malfunction, showering arc

Influence of Terminal Impedance on Induced Longitudinal Voltage Measurement

EMCABS: 09-01-89

Mituo Hattori, Tuyoshi Ideguchi, Fumio Ohtsuki
EMCJ87-89, Meeting July 20, 1987

ABSTRACT: This paper describes the influence of telecommunication line terminal impedance on the measurement of induced longitudinal voltage. The induction voltage from the power line is calculated on the 3-conductor transmission line model. This method clarifies the measure parameter for deriving the open circuit termination.
INDEX TERMS: Power line noise, induction voltage, measurement

Performance Analysis of Coded Optical PPM Channels in the Presence of Timing Jitter

EMCABS: 12-01-89

Satoshi Iwasaki, Ikuo Oka, Ichiro Endo
University of Electro-Communications, Musashi Institute of Technology
EMCJ87-22, Meeting June 26, 1987

ABSTRACT: This paper presents a new analytical method for assessing the performance of coded optical PPM channels with a timing jitter. Three different decoding schemes were employed. It was noted that the Soft Decision Summed Viterbi Decoding was an especially effective scheme in this instance.
INDEX TERMS: Optical PPM, soft decision decoding, timing jitter, separate coding, viterbi decoding

CALENDAR
1989

March 6–9	8th International Zurich Symposium and Technical Exhibition on EMC Swiss Federal Institute of Technology Zurich, Switzerland Contact: Dr. T. Dvorak ETH Zentrum-IKT 8092 Zurich, Switzerland Telephone: (+411) 256-2790 or Dr. R.M. Showers Moore School of Electrical Engineering D2 University of Pennsylvania Philadelphia, PA 19104 Telephone: (215) 898-8123
March 21–23	5th Annual Review of Progress The Applied Computational Electromagnetics Society Monterey, CA Contact: Michael Thorburn Oregon State University Corvallis, OR 97331-3202 Telephone: (503) 754-3617
April 4–7	6th International Conference on Antennas and Propagation (ICAP 89) University of Warwick, Coventry Contact: ICAP 89 Secretariat Conference Services Institution of Electrical Engineers Savoy Place London WC2R OBL United Kingdom
April 17–21	Symposium on Corrosion and EMI Shielding In Aerospace Equipment (NACE Corrosion '89) New Orleans, LA Contact: Eric Carlson Senior Research Associate Chomerics, Inc. 77 Dragon Court Woburn, MA 01888 Telephone: (617) 935-4850
May 23–25	IEEE 1989 National Symposium on Electromagnetic Compatibility Radisson Hotel Denver, CO Contact: John Tary Tri-State Gen. & Trans. Assoc., Inc. 12076 Grant Street Denver, CO 80233 Telephone: (303) 452-6111

May 29–June 2	20th International Symposium on Automotive Technology and Automation Florence, Italy Contact: ISATA Secretariat 42 Lloyd Park Avenue Croydon CRO 5SB United Kingdom Telephone: 01-681 3069/01-686 1329 Telefax: 01-686 1490
June 26–30	IEEE Antennas and Propagation Society International Symposium and URSI Radio Science Meeting Red Lion Inn San Jose, CA Contact: Dr. Ray King General Chairman, Lawrence Livermore National Laboratory L-156 Livermore, CA 94550 Telephone: (415) 423-2369
August 1–3	EMC Expo '89 Sheraton Washington Hotel Washington, DC Contact: EMC Expo '89 State Route 625 Gainesville, VA 22065 Telephone: (703) 347-0030 FAX: (703) 347-5813
August 14–17	Triennial URSI International Symposium on Electromagnetic Theory The Royal Institute of Technology Stockholm, Sweden Contact: Prof. S. Strom Organizing Committee Chairman Dept. of Electromagnetic Theory S-100 44 Stockholm Sweden
August 22–25	1989 International Symposium on Antennas and Propagation (ISAP '89 Japan) Nippon Toshi Center Tokyo, Japan Contact: Dr. Takashi Katagi, Chairman ISAP '89 Publicity Committee Mitsubishi Electric Corporation 325 Kamimachiya, Kamakura, 247 Japan Telephone (0467) 44-8862, FAX (0467) 47-2005 Telex: 3862-165 MULCO J.

September 8–10	IEEE International Symposium on EMC Trade and Industry Center Nagoya, Japan Contact: Prof. Y. Miyazaki Toyohashi Univ. of Technology Toyohashi, Japan 440 Telephone: 0532-47-0111, ext. 576 FAX: 0532-45-0480
September 12–16	2nd International Conference and Workshop on Electromagnetic Compatibility (INCEMIC) Bangalore, India Contact: Col. (Dr.) G.K. Deb Electronics and Radar Development Establishment, C V Raman Nagar Bangalore 560 093 India
September 26–28	11th Annual Electrical Overstress/ Electrostatic Discharge Symposium Hyatt Regency New Orleans, LA Contact: Bob Rountree Texas Instruments, Inc. 12201 Southwest Freeway, MS 631 Houston, TX 77001 Telephone: (713) 274-4077 FAX: (713) 274-2067
October 3–5	International Carnahan Conference on Security Technology Swiss Federal Institute of Technology Dr. Gene Grenaker TDD, RAIL, CCRF Georgia Institute of Technology 225 N. Ave. N.W. Atlanta, GA 30332 Telephone: (404) 421-7744 FAX: (409) 421-7728

INSTITUTIONAL LISTINGS

The IEEE Electromagnetic Compatibility Society 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.

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