IEEE EMC SOCIETY NEWSLETTER

ISSUE NO. 154 SUMMER 1992 (ISSN 0164-7644) ROBERT D. GOLDBLUM, *Editor*

PRESIDENT'S MEMORIAL AWARD FUND

I am happy to announce that the IEEE EMC Society President's Memorial award has been approved by the IEEE Awards Board and the overall IEEE Board of Directors. This is the result of three years of effort on the part of the EMC Society Awards Committee and our treasurer, Dick Ford, and contributions will be tax exempt.

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

We hope to have sufficient contributions to permit the EMC Society to grant this year's scholarship winner the full $2000 of the award, and to establish an endowment of $20,000 by next year so that we can fully fund the awards in future years.

If you haven't already sent in a contribution to the memorial fund, please consider doing so. Donations are fully tax deductible and will be used to further the educational work of the Society. All donations of $100 or more will be acknowledged in the EMC Newsletter (unless the donor requests otherwise). The Board of Directors of the EMC Society and the Society Awards Committee hope that you will participate in this forward-looking activity which will help to educate the future members of the EMC Society.

I would be happy to speak with potential donors who have any questions about the Memorial Award and Fund. Please contact me at 708-979-3627.

H.R. Hofmann,
EMC Society President

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NEWSLETTER STAFF

IEEE NEWSLETTER PUBLICATION SCHEDULE

PUBLICATION DATES	EDITORIAL DEADLINES
November	September 15
February	December 15
May	March 15
August	June 15

Editorial contributions for the November 92 issue should be received by September 15.

BACK ISSUES OF THE EMC NEWSLETTERS ON MICROFICHE

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

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PRESIDENT'S MESSAGE

BOB HOFMANN
PRESIDENT,
EMC SOCIETY

It's soapbox time.

As EMC Society President, I receive newsletters from many other IEEE Societies. A recent article by Harold Flescher, the President of the Nuclear and Plasma Sciences Society,so closely mirrored my thoughts that I called him and asked permission to excerpt and paraphrase his comments for this column. He agreed, and here goes:

IEEE AND TAB FINANCES REVISITED

Once again our April Technical Activities Board (TAB) meeting was rife with discussions about the financial condition of IEEE and TAB. Although IEEE bested its anticipated $500K 1991 deficit by only showing a deficit of slightly more than $100K, the money came from the $1M contingency budget.

Unfortunately, we cannot rely upon contingencies to save us every year, and although IEEE appears to be within their 1992 budget through March 1992, (the 1992 budget shows a $874K surplus without any contingency reserves shown), there are several good opportunities to do poorly in 1992 (one of which will be discussed further on). TAB is in worse shape for 1992, as our TAB Treasurer Bob Begun sees us heading toward a TAB deficit of $577K, doubling the original projected $282K budget deficit, based on March projections. We also expect that at the July TAB meeting, IEEE will request that TAB kick back part of its entitlement for 1994 to help bring up the IEEE general fund reserves to a reasonable level (one of the principal reasons our dues are going up every year is to help improve the general fund).

"What's the problem"? I hear you shouting at my column. A very complex question perhaps, but with an exceedingly simple answer. The answer is **"Ownership."** No one person or organization is causing the problem, all parts of the organization are causing the problem. Hence, no one person or organization can fix it, everyone must contribute to the solution. So, everyone owns the problem and everyone has to own the solution. Unfortunately, few are willing to make the hard decisions that affect their personal fifedoms or desires. How do we solve the problem? In my opinion, the role model to solve the problem must start at the top. The President of IEEE, the general manager of IEEE and all of the vice-presidents must provide the role models for the solution. Each must **demonstrate through their action, not words,** that IEEE finances are critical issues, and each must **demonstrate through their actions, not words,** that the improvement of IEEE finances is important enough to be considered over personal goals. Do we have that role model? Read on!

Well, at the April TAB meeting we learned that our 1992 President, Merrill Buckley, is going to increase the number of Board of Directors (BOD) meetings in 1992 from three to four (in spite of the fact that last year, specifically because of financial concerns, TAB voted almost unanimously to send a message to Merrill that TAB wanted him to hold only three BOD meetings in 1992). Why four? Because Merrill says he needs four to properly manage IEEE. Why couldn't he extend each of the three meetings by one day to get the "extra" work done in only three meetings? Are there other solutions? Probably, but Merrill wants four meetings. The cost? Probably $60K to $75K of unbudgeted funds because of the extra cost of travel. Where will IEEE get the money? They won't; the deficit will simply go up or the reserves will go down (sounds like our government, wherever you live). Is this the presidential role model we need to solve IEEE's financial problems? Read On!

Enter Martha Sloan, IEEE President-Elect and IEEE President for 1993. President-Elect Sloan has set her BOD meeting schedule for 1993, and the first meeting will be in Singapore. Why Singapore? Great Question! She wants to show the IEEE flag, an activity I (and many others) believe could be done better and at much less expense by a small group of 4-6 people sent for that specific purpose. And the Executive Committee had a meeting in Singapore only last year! The cost of a meeting in Singapore will be many tens of thousands of dollars more than a meeting in the U.S. because the vast majority of attendees (over 90%) are from the U.S. It will also require two additional days of travel. Naturally, the Regional Activities board will also hold their meeting in Singapore, and TAB is strongly leaning in that direction. This cast of thousands (actually perhaps 100 to 150 people) will also cost TAB an additional $80-$150K of unbudgeted funds, plus extra travel time and costs for each society president and attendee (borne separately by the budgets of the IEEE, the societies and their employers). Another good role model in these trying times!

I have spoken against these deficit expenditures vociferously, perhaps to the point of annoyance for some. So have many of the other society presidents. But self interests seem to be besting sound financial decisions (the governmental model strikes again). I need your help to focus attention on good financial decisions in these times of financial difficulty

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for IEEE and TAB. If you believe as I do, that spending the extra unbudgeted funds on a fourth BOD meeting in 1992 and the combined BOD/RAB/TAB meetings in Singapore in 1993 are poor financial decisions and should be rescinded, please tear this column out, affix your name and IEEE membership number and mail it to President Merrill Buckley at:

IEEE Headquarters
345 East 47th Street
New York, NY 10017-2394

It would be better if you were to personally write a letter, but my experience is that very few will do this amount of work in response. If you want change, however, YOU must do something. The least you can do and be effective is to tear out this column and send it to Merrill with your name and membership number. My request is as simple as that. It would be additionally useful (but not necessary) if you also sent a separate copy to our President-Elect, Martha Sloan at the same address."

Hats off to Harold Flescher for his excellent commentary on the state of IEEE finances! To those of you that agree with my endorsement of Harold's comments, please take the trouble and the 58 cents for two postage stamps, make two copies of the column and send one to Merrill Buckley and one to Martha Sloan at IEEE HQ at the address above.

Also, the members of the EMC Society Board of Directors need to know how we can serve you. Past requests for input to the Board have been made in this newsletter with neglible response. Address your comments to the newsletter editor; he will pass them onto the board, or contact me at Room 2B-220, AT&T Bell Labs, 2000 N. Naperville Rd., Naperville, IL 60566. Phone (708) 979-3627, Fax (708) 979-5755. PLEASE let us know what you would like YOUR Society to do for you.

1992 IEEE ADMINISTRATIVE MEETINGS CALENDAR

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

July 30	RAB/TAB Transnational Committee	Reno, NV
July 30	USAB	Reno, NV
July 30 - August 1	TAB Meeting	John Ascuaga's Nugget Reno, NV
July 31	EAB	Reno, NV
August 2	IEEE Executive Committee	John Ascuaga's Nugget Reno, NV
August 3-4	IEEE Board of Directors	John Ascuaga's Nugget Reno, NV
October 2-3	TAB Administration Council	Conrad Hilton Hotel Cancun, Mexico
October 4-5	IEEE Executive Committee	Conrad Hilton Hotel Cancun, Mexico
December 5 and	IEEE Executive Committee	Arizona Biltmore Phoenix, Arizona
December 6-7	IEEE Board of Directors	Arizona Biltmore Phoenix, Arizona
March 4-5, 1993	IEEE Investment Committee	Ritz Carlton Naples, FL
June 17-18, 1993	IEEE Investment Committee	Ritz Carlton Aspen, CO
November 4-5 1993	IEEE Investment Committee	To be announced Hawaii

CHAPTER CHATTER

CHARLIE ANDERSON
ASSOCIATE EDITOR

CENTRAL NEW ENGLAND

John Clarke reported that chapter officers were elected for 1992-1993 at the final 1991-1992 Chapter meeting, which was held Tuesday, May 26, 1992. The results are: Chairman - Larry Lee, EMC Sales; Vice Chairman - Marty Metcalf, National Technical Systems; Program Coordinator - Tom Carberry, Mitre Corp.; Secretary/Treasurer - John Clarke, US DOT/FAA, Retired.

The March 10th meeting featured a presentation on "ISO 9000 Criteria for Certification - A Panel Discussion." A three-member panel discussed several ISO 9000 criteria in detail plus some do's and don'ts of pursuing certification. Panelists were James P. O'Neal, National Technical Systems (NTS); Christine Briggs, NTS; Barry Silva, LAU Technologies. Sixty-five people attended.

The topic at the May 26th meeting was "What's happening to Electromagnetic Compatibility Standards?" Jo Butler (Chomerics) presented a technical overview of this standards activity and the committees responsible for their development. Twenty-one people attended.

Finally, the newly-elected 1992-1993 chapter officers met on June 9, 1992 in order to plan meetings for the upcoming season (September 1992 through May 1993). We hope to arrange talks on ESD, ANSI EMC standards, IEC 801-4 and 801-5, MIL-STD-461D status, FCC regulations, RTCA/DO-160C and bulk current injection.

John Clarke also reported that since a change in the meeting location, effective January 1992, to the Boxborough Host Hotel, sponsored by the National Technical Systems, attendance has improved considerably.

DALLAS/FORT WORTH CHAPTER OF EMC SOCIETY

Submitted by Dick Schulz

How can the D/FW Chapter expect to host our International EMC Symposium in 1993 when they have been inactive in past years? Not so! The word has just not gotten out that regularly since inception it runs eight meetings per year spearheaded by nationally and internationally known speakers. For instance, the February 1992 meeting was addressed by Don Heirman on the subject of "The European EMC Directive and its Impact on Your Product." Since this subject is on the cutting edge of our technology, Don held an audience of 26 practically spellbound with his vivid descriptions and explanations of the evolving and ever changing proposed European regulations. Great interest in the subject was evidenced by the barrage of questions he answered.

The meeting was hosted by Hewlett Packard at its training facility close to the D/FW International Airport. Both the pre-meeting dinner and the chapter meeting were attended by several members of the Board of Directors of the EMC Society (see photo, pg. 8). Earlier that day they had attended their board meeting and discussed plans for the 1993 International Symposium (Chairman Ed Vance, 817-478-5653) to be held in a Dallas suburb at the Grand Kempinski hotel on August 10-12, 1993.

NEW FREQUENCY ALLOCATIONS

New radio frequencies were recently allocated by the 1992 World Administrative Radio Conference (WARC-92,) which was held in Torremolinos, Spain. The conference was attended by member countries of the International Telecommunication Union, the UN agency which regulates international telecommunications, including radio frequency allocation. Issues addressed included HF broadcasting, mobile satellites, audio and broadcasting satellite services, HDTV and space communications. Areas of agreement become effective, pending ratification by individual countries in October, 1993.

Conference attendees reached agreement on the allocation of 790 kHz of addition spectrum to shortwave bands. Two hundred kHz of this was added below 10 MHz and 590 between 11 MHz and 19 MHz. Mobile and mobile-satellite services were also expanded, with most of the additional space below 1 GHz. WARC-92 also allocated the 1.70 -2.69 GHz band for the future public land-mobile telecommunications system (FPLMTS). For public telephone service to and from commercial aircraft, the bands 1.60 - 1.675 and 1.800 - 1.805 GHz were allocated.

In the area of satellite services, a new digital audio broadcasting service was assigned to 1.452 - 1.492 GHz. Exceptions to this are the U.S. and India, which are allocated 2.31 - 2.35 GHz, and several Asian countries which were given the 2.535 - 2.655 GHz band.

International frequency allocation for HDTV satellite service was a source of contention. As yet, a unified common band is not internationally accessible. Space agencies however were pleased to receive the primary allocation for 2 bands near 2 GHz, an area for which they had only secondary access.

JOSEPH BUTLER
ASSOCIATE EDITOR

SAE AEROSPACE STANDARDS ACTIVITY
SAE AE-4 Electromagnetic Compatibility

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

- The ARP 598 antenna calibration was revised and is ready for release by committee. The rod antenna calibration is included.
- AIR and ARP documents that are more than five years old are being reviewed, revised, or reconfirmed by AE-4.
- The new MIL-STD-461/462 was reviewed by AE-4 members. Comments were sent to ANSI/C63 for consolidation with other industry comments before submittal to the DoD Tri-Service Committee on EMC.
- New officers were elected by SAE-AE4 committee.

Chairman:
David Graham,
Simmonds Precision

Vice Chairman:
Noel Sargent, NASA

SAE AE-4R RADIATED ENVIRONMENTS

The committee was recently balloted with regard to draft 15 of the FAA Advisory Circular on HIRF with a due date of May 29, 1992. The plan is that the executive committee will review the results of the ballot process sometime in June. A subset of the committee met in the Boston area, also in June, to review helicopter HIRF environmental assumptions. The RTCA SC 135, which is working on HIRF related revisions to Part 20 of DO-160C for radiated susceptibility requirements of commercial avionics also met in June in the Boston area.

SAE AUTOMOTIVE STANDARDS ACTIVITY
SAE Automotive EMI and EMR Standards Committees

Ed Bronaugh, SAE Automotive EMI and EMR RAC representative, reported that the SAE EMI and EMR TC's met April 9-10 to work out differences between Parts 1 of SAE J1113 and SAE J551. These first parts are general, and include definitions and test conditions. They should be as similar as possible where the same items are defined, etc. Since J551 is on whole vehicles and J1113 is on components, there are some things which will necessarily be different about their first parts, but as much as possible they should be the same.

ELECTRONIC INDUSTRIES ASSOCIATION (EIA) G-46
Electromagnetic Compatibility

John Osborne, EIA G-46 RAC representative, reported on the meeting of March 18-19, 1992 in Washington, DC. Topics discussed included: the draft, NAVAIR Best EMC Practices document on "Aircraft and Avionics Cabling"; EIA Task 069 report "Historical Rationale for Military Limits"; and a review of MIL-STD-461D. With regard to the EIA G-46 review of MIL-STD-461D, the committee recommended: retention of CS03, CS04, and CS05; fully lined semi-anechoic chambers for RE102 and RS103 testing; and concerns on test equipment bandwidths and scan rates. The next meeting is scheduled for August.

IEEE TECHNOLOGY POLICY COUNCIL
Committee on Man and Radiation (COMAR)

Dan Hoolihan, COMAR RAC representative, reported that the next meeting of COMAR will be on June 15 in Lake Buena Vista, Florida. COMAR members were sent a meeting announcement and a copy of the January 1992 EPA report entitled, "Potential Carcinogenicity of Electric and Magnetic Fields" as well as much material from the Electromagnetic Energy Policy Alliance (EEPA) which is an association of manufacturers and users of electronic and electrical systems that utilize non-ionizing electromagnetic energy in the telecommunications, broadcasting, manufacturing, and consumer services.

The agenda for the June 1992 meeting includes the following items:

- high peak pulse power — safety of EMP simulators
- RF sealers — entity statement on health aspects of exposure
- medical applications of non-ionizing fields
- entity statement on RF fields from portable and mobile transceivers/telephones
- EM fields from VDT
- power line frequency electric and magnetic fields — research needs

DON HEIRMAN
ASSOCIATE EDITOR

The second EMC Society Board of Directors' meeting for 1992 was held on May 11-12, 1992 at the Broker Inn in Boulder, CO. The meeting was called to order at 10:15 AM by President Hofmann. Board members present included Warren Kesselman, Henry Ott, Bill Gjertson, Don Clark, Janet O'Neil, Bob Hofmann, Gene Cory, Dick Ford, Ed Bronaugh, Pat Coles, Don Heirman, Dan Hoolihan, Joe Butler, Walt McKerchar, John Adams, Herb Mertel, Don Weber and Bob Goldblum. Members absent were Al Mills, Dave Staggs and Yasuo Akao. Guests present included Moto Kanda, Jim Muccioli, Magdy Iskander, and Steve Berger.

Secretary O'Neil reviewed the minutes of the last meeting which were then approved with few changes. Next, Treasurer Ford presented his report that showed our current net worth as $500K, with approximately half of that in long-term investments.

The director reports followed. Director Dan Hoolihan (Member Services) presented several reports. Pat Coles, Awards and Membership chairperson, presented a ballet that the Board used to select EMCS awards to be presented at the Anaheim symposium. She then reported that the Society has 3784 active members as of 3/31/92, which is an increase of 4.7% over membership on 3/3/91. Thirty-six percent of the total were higher grades, e.g., Senior Member, Fellow, Life, etc. which is an excellent ratio. A report from Dave Staggs (Chapter Coordinator) was discussed. There are 33 active chapters worldwide (9 outside of the United States). A Chapter Officer's Handbook to explain the services provided by the Board is being prepared.

Bill Duff's report urged Fellow nominations for 1993 submissions. If you have a qualified candidate, call Bill on (703) 914-8450. Ed Bronaugh, immediate past president, took over the Constitution and Bylaws/ Nominations Committee work from Don Clark. Don served the Board well when he introduced Bylaw changes to enable the Board to serve more effectively.

Jim Muccioli, Student Activities, made a brief presentation on improving the student involvement level. He urged continuing the support that was given to students at the Cherry Hill symposium to pay for travel and living for a student who presented a peer-review and accepted paper.

Next John Adams, of the Distinguished Lecturer Program, presented four candidates for approval by the Board to become DLs. A discussion was held on the outstanding Transactions paper award structure. This led to a more general discussion on monetary and certificate awards equity among all our EMCS major awards. The results of these deliberations will not take effect until 1993.

Director Cory (Communications Services) introduced several reports. Chet Smith (History Committee) is obtaining costs to microfiche EMCS conference/symposia records. Bob Goldblum (Newsletter Editor) announced that Charlie Anderson (Chapter Chatter Chairman) is stepping down as Associate Editor. If you are interested in assuming this position, call Bob on (215) 825-1960. The Board then approved a transfer of Chapter Chatter from Member Services to Communications Services to be more closely aligned with the Newsletter. Hugh Denny (IEEE Press Liaison) is looking for reviewers and an editor to work with the Hungarian author of the proposed "Power Supply EMI" book. Call Hugh on (404) 894-3522.

Next, several symposium reports were given. Warren Kesselman (1991 Cherry Hill Steering Committee Treasurer) indicated that the final surplus is $80,384.04, which is the net after paying for the production and mailing of the symposium record to EMCS full members. Terry Cantine's report indicated that 130 attendees have registered in advance for the 1992 symposium and 116 booths were sold as of 5/11/92. Possible sites for future symposia were discussed. Mohawk Valley (New York) for 1998, Seattle for 2001 and Denver for 1999 were mentioned.

Dick Ford was identified as the Board representative to the Israeli Regional symposium in November. There were further discussions on our international participation and relations with our society members outside regions 1-6. The sense of the Board was that overseas EMCS members should be considered for Transactions associate editors. Dr. Kanda is soliciting these members. Concern for supporting Soviet engineer attendance at our EMCS symposia was again voiced. President Hofmann is to write a letter expressing the Board's stand on this matter.

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Director Heirman (Technical Services) presented his several reports. He first reported progress on standards. Standard 475 on "RF Field Sensor Measurements" is about to be revised. Any member interested in this subject should call Don on (908) 741-7723. A new project to formalize our standards committee operating procedures, membership requirements, and working group chair status is being undertaken by Joe Butler.

Don Heirman also presented Clayton Paul's (Education Committee) report. The final package of information educators need to establish an EMC course in an undergraduate EE curriculum will be available in Anaheim. As part of Dr. Paul's report, Dr. Magdy Iskander of The Center for Computer Applications in Electromagnetic Education (CAEME) in Salt Lake City, Utah presented a video review of the CAEME work. It was well received by the Board. Anyone interested in the excellent, self-paced, interactive computer review of EM principles should call Dr. Paul on (606) 257-1644 or Dr. Iskander, on (801) 581-6944.

Wilf Lauber's (Technical Advisory Committee) report indicated that the review for the Israeli symposium in November was completed by the TAC Technical Committees. Joe Butler (Representative Advisory Committee) briefly discussed the RAC report he received from our EIA G-46, SAE AE-4, IEC/CISPR, SAE Automotive/SAE EMR, COMAR, and NARTE representatives. The representation on NARTE is still open. This is being resolved with the TC-1 chairman. Finally, John Osborn was confirmed as a voting member of the Standards Committee.

Director McKerchar (Professional Services) presented his reports. Bruce Gjertson reported that the second video will be available by 1 June 1992. It will be shown at the Society's booth in Anaheim. Herb Mertel (Transnational Committee) indicated that the Edinburgh, Scotland, EMC Symposium will have an EMCS booth, as was given at last year's York Symposium. He also invited speakers for the special workshop on "Worldwide EMC Standards" at the 1993 Zurich EMC Symposium, March 9-11, 1993. For more information, call Herb on (619) 741-3301.

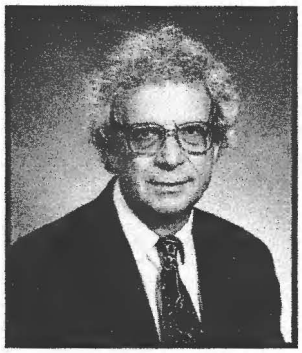
Under old business, four candidates were nominated for the new President's award. For new business, President Hofmann will be handling the TAB review of our Society operations. The Board passed a motion that the 1990 EMC Symposium committee be reimbursed on the basis of $4.53 per copy of the symposium record sent to our full EMCS membership. The Board further approved that each EMCS - sponsored symposium budget totally cover cost and effort to provide symposium records to EMCS members as specified by the Board. The fee for advertising in our Newsletter and TRANSACTIONS institutional listings was doubled by the Board. Finally, the Board approved an annual business dinner to be held in conjunction with the last BoD meeting of the year.

The next BoD meeting will be at the Anaheim symposium starting on 17 August. Due to time conflicts, the meeting will be in parts with a portion being held on 20 August. The EMCS Standards Committee will meet on Wednesday, 19 August, between 7:30 AM and 9:00 AM This will not preceed any Board meeting that day. For more information, call Janet O'Neil, Secretary, at (213) 870-9383.

Photo: Dick Ford

BoD meets with Dallas EMC Chapter. (l-r) Don Heirman, BoD Member, Hewlett Packard guest speaker, Steve Mullinex, Chapter Chairman and Dick Schultz, Chapter Vice Chairman.

REPORT OF THE DIVISION IV DIRECTOR



MARTIN SCHNEIDER
DIVISION IV
DIRECTOR

HIGHLIGHTS OF THE MAY 1992 IEEE BOARD MEETING

The IEEE Board of Directors met in Boston, MA from May 13-14, 1992. The meeting was held in conjunction with the ELECTRO International Symposium to enhance interactions between IEEE members and officers. The highlights of the Meeting were as follows:

- The 1991 IEEE general fund spending was on target.
- A 1992 general fund surplus of 850K was anticipated.
- The Board encourages the introduction of group e-mail addresses for IEEE entities.
- Quality training of the IEEE staff is in progress.
- Special efforts are needed to offer 100,000 IEEE members incentives to join Societies.

A number of other topics which were addressed (building expansion of IEEE Service Center in Piscataway, NJ, constitutional amendment process, and formation of an electronics communication steering committee) are reported in the June 1992 *Institute* which has been mailed to all IEEE members.

SUPPORT FOR SECTIONS, CHAPTERS AND MEMBERS IN THE FORMER SOVIET UNION

At the last meeting of the Technical Advisory Board on April 4, 1992, in Atlanta, GA, the following motion was formulated by Stanley Charap, President of the Magnetics Society, and adopted: "That an adhoc committee under the TAB Liaison Council explore mechanisms for assisting engineers and scientists in needy countries in Regions 8, 9 and 10. Because of the urgency of the current situation, the initial emphasis shall be on Region 8."

Several of the attending Society Presidents pointed out that there is a crying need for special support programs on a worldwide basis, but the consensus of the body was that we have to start somewhere. One society has scheduled a major workshop in Crakow for June 1992, and approved scholarship funds which will enable a number of Soviet engineers to attend. The formation of a chapter will result from this activity. Another proposal which can be readily implemented with limited resource in all regions is to hold technical meetings around video presentations. Since the Electromagnetic Compatibility Society has already created a first-rate video tape, this solution offers us an opportunity to make a useful contribution. Finally, a number of periodicals and books are languishing in our IEEE warehouse and will never reach a customer. An excess stock of conference proceedings has already been identified and will be shipped to IEEE groups in the emerging countries.

NEW OPPORTUNITIES IN STANDARDS

The development of new standards is important because their acceptance by industry creates new jobs. This is so because manufacturers are able to enter the business without fear of making incompatible products. The problem in persuading engineers to spend more effort on writing new standards is that there is a widespread feeling that standards are boring. This misconception can be easily corrected by pointing out that the great culinary works by French chefs are based on recipes which I consider highly interesting. The following comments may whet your appetite to pitch in and help our EMCS standard bearers, Donald Heirman and the members of his new Standards Committee, to identify opportunities in developing new standards.

The creation of standards stems from the documentation of technical practices and procedures which are needed to perform tests or fabricate a product. The breeding ground of the standard is an engineering report which contains a description of a recipe or procedure which can be successfully followed by your colleagues. If you can describe this process clearly and succinctly, you are the potential godfather or godmother of a new standard which, in the long run, will open up new job opportunities.

If you are interested in getting your knowledge accepted and your skills followed on a transnational scale, contact our EMCS Standards guru, Don Heirman or call our staff members, Andy Salem and Judy Gorman, at the IEEE Service Center in Piscataway on (908) 562-3820.

THE SEVEN GRAND CHALLENGES IN ELECTROTECHNOLOGY

As reported earlier, I have continued serving on the TAB New Technology Directions Committee whose mission

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is to stimulate technical activities in the field of new and emerging technologies. Our team, strengthened by the appointment of Dick Ford as a corresponding member, was approached by the prestigious IEEE Strategic Planning Committee to come up with a list of grand challenges in electrotechnology. The seven great ventures and concepts which were proposed were:

1. To be or not to be reachable any time, anywhere (wirefree and fiberless communications).

2. To have instant access to all information (data bases, high-speed links, flat panel displays and interfaces).

3. To be present or absent any time, anywhere (virtual presence and reality).

4. Abundant, clean, safe and affordable energy.

5. Intelligent highways and transportation systems (personal global navigation).

6. The paperless office (flat panel/ pen and tablet).

7. The cashless society (electronic purse and wallet).

It should be noted that several of these challenges will demand the skills of experienced electromagnetic compatibility engineers. They will also require the development of advanced software and will stimulate engineers to develop national and transnational high data rate networks.

EMC PERSONALITY PROFILE

ANDREW S. PODGORSKI

Dr. Andrew S. Podgorski received a B.A.Sc. degree in electronics in March, 1969 from the Technical University of Warsaw. He attended graduate school at the University of Waterloo and received M.A.Sc. and Ph.D. degrees in electrical engineering in 1975 and 1980, respectively.

Dr. Podgorski's active career spans a period of 23 years. It encompasses areas such as systems design, teaching, research and active involvement in consulting for industry, government, defense and RCMP in the areas of lightning, nuclear electromagnetic pulse, high power microwaves and electrostatic discharge protection, verification of protection, electromagnetic simulation, measurements and standards.

He has been a Senior Research Scientist and the Leader of the Advanced Electromagnetic Protection Group with the National Research Council for the last 11 years. During this time, he has been involved in a variety of areas, such as intellectual leadership in the conception of new research, analytical and practical studies that often contributed to the development of new international standards, and theoretical and practical guidance to industry and federal government departments, preparing presentations and lectures and representing Canada internationally.

Dr. Podgorski has made a number of important scientific contributions in the areas of broadband electromagnetics, high voltage engineering and electromagnetic protection. He has made very significant contributions in the following areas:

WILLIAM G. DUFF
ASSOCIATE EDITOR

- 3-D non-linear modeling of electromagnetic interaction
- picosecond, broadband electromagnetic and high voltage measurements
- gigahertz, broadband electromagnetic simulators
- application of artificial intelligence to electromagnetic protection
- electromagnetic protection standards (lightning, ESD, NEMP, HPM)
- high voltage, picosecond pulse generation
- gigawatt monopulse radar system

Andrew has published more than 60 unclassified papers. Many of his papers have been quoted as references in IEEE publications. His paper, "Lightning Standards for Protection of Ground Electronic Systems," is the core publication used for revising the IEEE standard in the area of lightning protection.

Dr. Podgorski participated in international panels on the future of electromagnetic protection and composite pulse protection, protection against the combined lightning, nuclear EMP and high power microwave threats.

Andrew is a Senior Member of IEEE and he has been very active in the IEEE EMC Society. He is currently the Chairman of the Ottawa Chapter of the IEEE EMC Society. He is also a member of the IEEE committee on high voltage impulse measurements. As a result of his many achievements, he is listed in the Canadian Who's Who publication.

Andrew lives in Ottawa, Canada. He is married and has one son.

J.L. NORMAN VIOLETTE
ASSOCIATE EDITOR

INTRODUCTION TO ELECTROMAGNETIC COMPATIBILITY
by
Clayton R. Paul
Department of Electrical Engineering
University of Kentucky, Lexington

Wiley Series in Microwave and Optical Engineering
A Wiley Interscience Publication
John Wiley & Sons, Inc.
New York, New York. 1992.

This book presents a well-balanced menu of theoretical/conceptual aspects of EMC and practical applications. The author has published numerous, highly-regarded technical papers on EMC related subjects and this book reflects his in-depth expertise. It is an excellent book to be used as a textbook and professional reference supported by illustrative examples and numerous problems at the end of each chapter. The author is obviously well-versed in the principles of electromagnetics and expertly applies these concepts to develop EMC topics.

The preface sets the stage for the remainder of the book by defining EMI, creating EMC awareness, illustrating the impact of EMI on electrical and electronic systems, and the costs in the marketplace associated with EMI. The role of EMC in the regulation and control of EMI in commercial and military systems is introduced.

Titled *Introduction to Electromagnetic Compatibility (EMC)*, Chapter 1 discusses sources of EMI, the frequency (spectral) content of common EMI signals, and the basic EMC source-coupling-path-receptor situations in terms of the four basic EMC problems: radiated emissions, radiated susceptibility, conducted emissions and conducted susceptibility. The role of mathematical models, a presentation of dimensions and basic units, a brief history of EMC, decibel development and common EMC units, power loss in cables, and signal source specification, along with appropriate examples, round out the first chapter.

Chapter 2 discusses EMC requirements for electronic systems. The governmental requirements for commercial products marketed in the U.S. and the significant role of the FCC are described. The procedures and required testing for compliance with the FCC Rules and Regulations are presented along with the FCC limits for radiated and conducted emissions. The country-by-country EMC requirements are outlined for commercial products marketed outside the U.S. CISPR 22 and FCC requirements are compared. The German VDE requirements are briefly mentioned without detail. No information is presented on the European Community (EC) EMC Directive and the current (1992) ongoing efforts towards the harmonization of EMC specifications.

A description is included of the critical EMC requirements for military products in the U.S., which address susceptibility (CS, RS) as well as emission (CE, RE) specifications. Examples from MIL-STD-461 include a comparison between RS02 and FCC radiated emission limits.

A detailed section is included on the measurement of radiated and conducted emissions from commercial products for compliance verification. Typical actual measurement profiles are provided. An example illustrates the potential difficulty of meeting FCC radiated emission specifications if EMC considerations are not included early in the equipment design. Radiated and conducted susceptibility are described briefly, and practical, design constraints are discussed along with the advantages of early EMC design.

Chapter 3, *Electromagnetic Field Theory*, reviews basic concepts associated with a typical undergraduate fields course.

Transmission lines are the subject matter of Chapter 4. The transmission line equations are used to develop mathematical transmission line models. Per-unit-length, and lumped-circuit parameters — resistance, inductance, capacitance and conductance — are developed for circular and coaxial line geometries. Time-domain and frequency-domain (sinusoidal steady-state) solutions, including numerical methods, are illustrated.

Antennas, intentional and unintentional, are the fare for Chapter 5. The basics of intentional antennas are reviewed and analyzed, which provides insight into the ability of unintentional antennas to radiate and also to assist in minimizing the unwanted radiations. The concepts of elemental electric (Hertzian) and magnetic (loop) dipoles are presented, including half-wave dipoles and quarter-wave monopoles. Radiated field patterns,

Continued on page 12

Continued from page 11

radiation resistance, reactance, and power relationships are developed, along with aperture, and antenna factor parameters. Other antenna topics include the near-field/far-field definition, the effects of balancing and baluns, impedance matching and the use of pads.

Use of the *Friis transmission equation* is introduced for performing field calculations. Wave reflections at boundaries, the method of images, multipath effects and polarization are described. Broadband measurement antennas described include the biconical and log-periodic antenna configurations.

Chapter 6 begins Part II of the book, **Applications to EMC Design.** Chapter 6 describes the non-ideal behavior of lumped RLC components and wires, such as the resistance, capacitance, and inductance of wires, and wire configurations such as parallel wire assemblies. Other conductor configurations analyzed include microstrip, coplanar strips, and parallel strips. Ferrite components, common mode chokes, dc and ac motors, solenoids, digital circuit devices, mechanical switches, and arcing effects are described.

Chapter 7 covers basic concepts of signal spectra. The spectral analysis of *periodic signals* is examined with the objective of representing the deterministic clock waveforms of digital products in the frequency domain. The concepts of *orthogonal basis functions* and *series expansions* are reviewed, followed by Fourier series representation techniques. Encountered in the development is the response of linear systems to periodic inputs, which includes the response to sinusoidal and unit impulse inputs. An example illustrates the application of a 1-volt square wave to a low-pass RC filter. Computational techniques are presented for computing the coefficients of either trigonometric or complex-exponential Fourier series.

The determination of the spectra of digital circuit waveforms is illustrated, including the spectral bounds of trapezoidal waveforms. The effects of rise-times and fall-times, repetition rate, and duty cycle are illustrated. The effects of *ringing* on the spectra of digital waveforms are developed. Basic applications of spectrum analyzers, peak vs. quasi-peak detectors, and the representation of nonperiodic waveforms by Fourier transforms, and the representation of random signals are also presented in this chapter.

Chapter 8 covers radiated emissions and susceptibility with simple emission models for wires and PCB traces (lands). Differential-mode and common-mode current emission models are presented and the approximate calculations of radiated field levels from these currents are illustrated. Current probes and applications are described along with experimental results of radiated emission techniques. Simple susceptibility models for wires and PCB traces (lands) are developed, including the surface transfer impedance concept of coaxial cables.

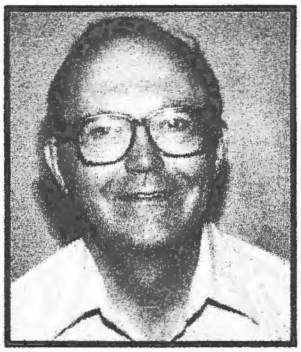
Conducted emissions and susceptibility topics form Chapter 9. The main developments include measurement of conducted emissions, applications of LISNs, differential-mode and common-mode current measurements, power line filtering techniques, power supply configurations (linear, switched-mode), and conducted susceptibility.

Chapter 10 covers many details pertaining to crosstalk. This is a lengthy chapter covering crosstalk in three-conductor line configurations such as circular wire configurations and PCB traces over a ground plane. Transmission line models are developed including per-unit-length lumped parameters used in models to calculate crosstalk. Inductive and capacitive coupling are addressed along with common impedance coupling. Time-domain crosstalk is also discussed, and experimental measurement data presented. SPICE model crosstalk calculations are illustrated. The effects of shield discontinuities, such as shield grounding via pigtails, are presented. Crosstalk reduction techniques are presented. These include shielded wires (including multiple shields), twisted wires, and balancing.

Chapter 11 addresses aspects of shielding, including factors of shielding effectiveness (reflection, absorption, multiple reflections) which are developed for far-field and near-field situations. Electric-field and magnetic-field shielding techniques are described. The effects of apertures and shield penetrations are presented.

Electrostatic discharge (ESD) as a source of EMI is developed in Chapter 12. The origins of ESD events and the potential effects are presented. Prevention of ESD and mitigation design techniques are developed.

In Chapter 13, **System Design for EMC**, the principles developed in the previous chapters are tied together to form a composite picture to plan for system-level EMC. Topics presented include packaging considerations, grounding, system enclosures, PCB design and layouts, filtering, interconnections and cable routing, component placement, and power distribution and decoupling.



E. K. MILLER
ASSOCIATE EDITOR

SOURCES OF INFORMATION ON "COMPUTATIONAL ELECTROMAGNETICS"

Several books or special journal issues on computational electromagnetics recently have been published. Because that is a continuing topic of interest in this column, I will mention them here, providing minireviews.

Two Special Issues of the IEEE Proceedings

Since Allan Schell became Editor of the IEEE Proceedings, two special issues have been published on electromagnetics, in October 1991 and January 1992. The former, for which the guest editor was Walter Kahn, assisted by associate editors Roger Lang and Wasyl Wasylkiwskyj, is called "Special Issue on Electromagnetics" while the latter is the "Special Issue on Antennas" for which the guest editor was Louis Medgyesi-Mitschang. Taken together, the 40 papers included in these two issues (22 and 18 respectively) cover a wide spectrum of topics of interest to electromagneticests. The electromagnetics issue covers topics such as quasiparticles and random media; transient phenomena and methodologies; surface impedance; computational models; coupled-modes and inverse scattering; MMIC modeling; radar polarimetry; scattering calibration; and antenna optimization. The issue on antennas is organized into four sections that address basic theory and analysis techniques; generic antennas; arrays; and special applications. Taken together, these two issues comprise more than 400 pages of general-interest articles on electromagnetics that you will also want to examine.

Three Special Issues of Computer Physics Communications

Lot Shafai of the University of Manitoba recently undertook the ambitious job of organizing and editing nearly 500 pages of three thematic issues of the *Computer Physics Communications* published jointly in November 1991 as Volume 68, Numbers 1-3, on the theme "Computational Electromagnetics." The combined issue is divided into the four sections:

1) Integral operator methods
2) Differential operator methods
3) Analytic and asymptotic based methods
4) Some applications to devices

As noted in the preface, some areas, such as high-frequency techniques, remote sensing, and finite-difference time-domain models could not be covered due to author commitments. The 24 papers which were included, however, provide a good, broad coverage of some of the most widely used CEM tools. I think that you will find this thematic issue to be an especially useful reference and well worth examining.

Computational Electromagnetics: Frequency Domain Method of Moments (ISBN 0-87942-276-9)

Published by the IEEE Press, 1991, edited by Edmund Miller, Louis Medgyesi-Mitschang, and Edward Newman. Available from IEEE Press, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855-1331, price $55.00 to IEEE members. Containing 500+ pages, this book is primarily a reprint volume with about 15% new material, including a 35-page bibliography. The book is divided into seven major sections:

1) Theory (nine papers)
2) Conducting bodies (seven papers)
3) Thin Wires (seven papers)
4) Penetrable and/or lossy bodies (nine papers)
5) Apertures (six papers)
6) Hybrid moment methods/ alternate Green's functions (12 papers)
7) Numerical Methods (seven papers)

Among the more unusual features of this book is its very first paper, the 1949 article by A. W. Maue, "Toward Formulation of a General Diffraction Problem via an Integral Equation," which was translated from its original German by Lou Mitschang. This is an often-referenced paper which might be regarded as providing much of the impetus for the subsequent development of numerical models based on integral equations. Another paper which was not widely available is "Origin and Development of the Method of Moments for Field Computation," by Roger Harrington. This paper originally appeared in the 1980 SCEEE Press book edited by Bradley Strait, *Applications of the Method of Moments to Electromagnetic Fields*, and is still available from the SCEEE Press, 1101 Massachusetts Avenue, St. Cloud, FL 34769. Also included is an excerpted (by Ed Newman) version of work by Jack Richmond, previously available only as an Ohio State University

Continued on page 23

POLICE RADAR IS NO CANCER THREAT SAYS ENGINEERING POLICY GROUP

There is no scientific basis that exposure to police radar causes cancer, say U.S. members of the world's largest technical society.

Noting recent media coverage about the safety of exposure to radio-frequency fields from police radar guns, the United States Activities unit of the Institute of Electrical and Electronics Engineers, Inc. (IEEE) has issued a statement that concludes such devices pose no health threat.

"Measurements and analysis of microwave exposures near properly operating police radar units have shown that even maximal levels are well below recommended safety limits," the IEEE-USA said.

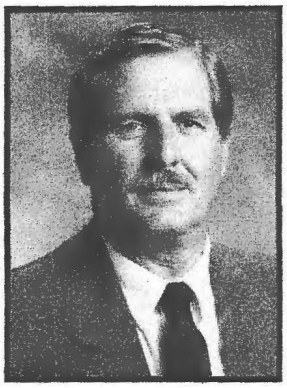
Introduced in the late 1940s as an offshoot of World War II technology, police radar has become a routine means of traffic control. More than 75,000 units are currently used in the United States. Recent media reports, however, have alleged a link to cataracts and cancers in law enforcement officers who work with the devices. As a result of these charges, Connecticut banned the use of radar guns.

The IEEE-USA statement notes that police radars are low-power devices compared with other existing radio-frequency systems such as alarm systems and automatic openers. Most of the police units, which operate with a continuous-wave signal, have an output range of 10 to 25 milliwatts. By comparison, cellular handheld radio-telephones operate at hundreds of milliwatts.

To protect human beings from harmful exposure to radio-frequency electromagnetic fields, guidelines for safe limits of exposure to microwaves have been published by the IEEE and the American National Standards Institute. Measured by these and other world standards, police radar units are safe, even when operating at maximum exposure levels, IEEE-USA concluded.

Other position statements recently released by the group address the safety of electromagnetic pulse simulators, as well as human exposure to radio-frequency (RF) emission from cellular base station antennas and RF sealers and dielectric heaters.

EMCABS



WILLIAM H. McGINNIS
ASSOCIATE EDITOR

In this issue we continue publishing abstracts of papers from EMC symposia, other conferences, meetings and publications. The EMCABS committee is composed of the members listed below.
Mike Crawford, NBS
Bob Hunter, Texas Instruments
R. M. Showers, Univ. of Pennsylvania
Yoshio Kami, Univ. of Electro-Communications
Daniel Keneally, Rome Air Development Ctr.
Sha Fei, EMC Research Section, N. Jiatong Univ., Beijing, China 100044
Ferdy Mayer, L.E.A.D., Maisons, Alfort, France
Diethard Hansen, Euro EMC Service, Switzerland

"HOW CAN I GET A COPY OF AN ABSTRACTED ARTICLE?"
The answer to this frequently asked question follows: Most large public libraries, some small public libraries, all engineering school libraries and most other college or university libraries have copies of publications in which articles appear. If they do not have the desired publication, libraries usually can obtain a copy of the article from other libraries or sources. Many company libraries also have such arrangements. Some articles are available from the National Technical Information Service (NTIS) and/or the Defense Technical Information Center (DTIC). To retrieve an article or publication containing an article abstracted in EMCABS, contact one of these libraries. If the library does not have the publication, the librarian can 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.

NOTE: The steering staff of the EMC Japan Technical Group and the EMCS Tokyo Chapter have graciously offered to act as a central point for requests of papers abstracted. Most of the papers will be in Japanese only. The steering staff will assist in routing your request to the author(s) but will not translate the papers. The contact person is Yoshio Kami, The University of Electro-Communications, 1-5-1, Chofugaoka, Chofu-Shi, Tokyo 182, Japan.

Readers should be aware that many of the Chinese papers are not available in English. Associate Professor Sah Fei, EMC Research Section, Northern Jiatong University has offered his time and assistance in routing requests for papers to the appropriate author(s). However, he cannot supply translations.

GROUNDS FOR SIGNAL REFERENCING

EMCABS: 01-8-92

Anthony N. St. John
San Diego Gas and Electric Co.
IEEE Spectrum
Vol. 29, No. 6, June 1992, pp. 42-45

Abstract: The subjects of noise and mitigation and EMC problems are reviewed from the perspective of the National Electrical Code (NEC), FIPS 94, the forthcoming IEEE Emerald Book and the Military Handbook on Grounding, Bonding and Shielding for Electronic Equipments and Facilities. The hazards of improper grounding are reviewed. The single point ground concept is reviewed and the role of LANs using unshielded lines is discussed. An EPRI report is cited to support the assertion that conducted interference is generated within the same facility in 80% of the cases studied. The alternatives to wire, optical fiber and wireless LANs are mentioned with some cautions for the latter.

Index terms: Ground loops, system grounding, facility grounding, National Electrical Code Requirements, power quality, signal references grounding, green wire safety grounding, grounding inductance

ANNOTATED BIBLIOGRAPHY OF NUMERICAL MODELLING IN ELECTROMAGNETIC COMPATIBILITY

EMCABS: 02-8-92

M.N.O. Sadiku, C.N. Obiozor
Temple University and Tuskegee University
International Journal of Numerical Modelling: Electronic Networks, Devices and Fields
Vol. 4., No. 3, Sept., 1991, pp. 259-269

Abstract: Numerical methods are of increasing importance. This issue of the Journal is a "Special Issue on Numerical Modelling in Electromagnetic Compatibility." The publications covered are mostly in the 1980 to 1990 time frame. Much of the emphasis is on transmission line coupling, but other topics are included: antennas (including PCB traces), lightning and EMP studies, shielding, ESD, microstrip filter, and miscellaneous topics. Most of the papers are in English but some others are included. This paper should be of interest to the research specialist as well as the newcomer to numerical modelling methods.

Index terms: Numerical methods for EMC, transmission lines, EMP, antennas, shielding, ESD, miscellaneous topics in numerical analysis for EMC

E^3 MODELLING AND SIMULATION TOOL

EMCABS: 03-8-92

David Millard, Jimmy Woody, Ralph Herkert
Georgia Tech Research Institute, Atlanta, GA
Proceedings of 8th Annual Review of Progress in Applied Computational Electromagnetics
Naval Postgraduate School, Monterey, CA, March 16-20, 1992, pp. 418-426

Abstract: Due to the changing world and military environment, weapon system platforms are in a constant state of transition. Modern military platforms are designed to employ complex systems and electronic devices (i.e., communications-electronics (C-E), radars, jammers, etc.) which utilize much of the electromagnetic (EM) spectrum. The electromagnetic environment (EME) to which these platforms will be subjected is very complex and can contain emitters (both friendly and hostile) which generate field strengths capable of causing adverse electromagnetic environmental effects (E^3). In addition, use of the platform's electronics can create E^3 problems for other friendly platforms attempting to use the EM spectrum. Thus a sophisticated weapon system may be of little value if its capability is degraded by adverse E^3.

Index terms: Modelling, simulation, analysis

OPTIMIZING EMI SHIELD DESIGN WITH NUMERICAL TECHNIQUES

EMCABS: 04-8-92

Colin Brench
Digital Equipment Corp., Maynard, MA
Proceedings of 8th Annual Review of Progress in Applied Computational Electromagnetics
Naval Postgraduate School, Monterey, CA, March 16-20, 1992, pp. 435-440

Abstract: To meet the critical time to market goals for commercial computer systems it is essential that there are few if any surprises during compliance testing to the various EMC regulations. With CPU clock frequencies that can be in the UHF region it is crucial that some degree of initial modelling is performed early in the product development cycle. This paper discusses one possible approach which combines numerical and analytic methods to provide the information needed to produce a cost efficient shield design.

Index terms: Modelling, shielding

APPLICATION OF THE INTRASYSTEM EMC ANALYSIS PROGRAM (IEMCAP) FOR COMPLEX SYSTEM MODELLING AND ANALYSIS

EMCABS: 05-8-92

Andrew Drazd (1) and Gary Brock (2)
Kaman Sciences Corp., (1) Utica, NY and (2) Colorado Springs, CO
Proceedings of 8th Annual Review of Progress in Applied Computational Electromagnetics
Naval Postgraduate School, Monterey, CA, March 16-20, 1992, pp. 449-458

Abstract: This paper discusses a methodology employed in the EMC modelling and analysis of a complex space platform using the intrasystem Electromagnetic Compatibility Analysis Program (IEMCAP). The purpose of this discussion is to illustrate the utility of IEMCAP in performing such analyses and to highlight several of its inherent capabilities that make it stand out as one of the most powerful EMC assessment tools in use today.

Index terms: IEMCAP, modelling, analysis

FULL-WAVE CALCULATION OF EMISSIONS FROM RADIATING STRUCTURES

EMCABS: 06-8-92

Shahrokh Daijavad and Barry Rubin
IBM T.J. Watson Research Center, Yorktown Heights, NY
Proceedings of 8th Annual Review of Progress in Applied Computational Electromagnetics
Naval Postgraduate School, Monterey, CA, March 16-20, 1992, pp. 459-465

Abstract: A general purpose electromagnetics code developed by the authors is used to determine the field radiated by a number of structures that appear in electromagnetic compatibility (EMC) studies for personal computers and workstations. The code involves a highly optimized moment method solution that employs rooftop basis functions to represent both conduction and polarization currents. Its accuracy has been verified through extensive convergence studies and comparisons with measurements.

Index terms: Modelling, analysis

EMCABS: 07-8-92

INTERNATIONAL ACTIVITY IN PRODUCT IMMUNITY STANDARDS AND TESTING

D.N. Heirman
ATT&T Bell Laboratories, Global product Compliance Dept., Holmdel, NJ
Conference Proceedings, EMC-ESD International, Denver, CO
April 22-24, 1992, pp. 1-6

Abstract: In recent years, there has been a marked increase in the emphasis to control the immunity (the positive aspect of susceptibility) of commercial products not only to work in the customer's own RF environment, but to meet the new wave of immunity regulation proposals, especially those of European Community (EC). Concurrent with standards setting the immunity levels are those standards which provide detailed measurement procedures which are much more complex and time consuming than those for emission tests. This paper will sample immunity level and measurement procedures standards activity. Quite obviously, this is a dynamic time and any changes to the activity reported herein will be highlighted at the symposium.

Index terms: Immunity standards, international standards

EMCABS: 08-8-92

THE ROLE OF BENCH-TOP EMC TESTING IN NEW PRODUCT DEVELOPMENT

Scott Roleson
Hewlett-Packard Co., San Diego, CA
Conference Proceedings, EMC-ESD International, Denver, CO
April 22-24, 1992, pp. 253-259

Abstract: Aggressive new product development benefits from early diagnostic or bench-top EMC testing even if the results are imprecise. Bench-top EMC methods include near-field probing, estimating cable radiations, and finding electrical resonances in the product's structure. These methods are quick, and give valuable insight into potential problems. When trouble is anticipated, contingency solutions can be developed. If they are later found to be needed, contingency solutions can be integrated quickly into the design, saving valuable time.

Index terms: Test methods, product development

EMCABS: 09-8-92

MODEL NIM-1022 ISOTROPIC BROADBAND FIELD STRENGTH METER

Ye Xiaoyan, Gao Qiulai, Yang Shengxiang
National Institute of Metrology, Beijing, Chine
Proceedings of 1992 International Symposium on EMC, Beijing, China
May 25-27, 1992, pp.47-50

Abstract: This paper describes an isotropic broadband field strength meter, which has been developed recently in our laboratory. Its technical performances are generally equivalent to that of the NBS Model EFM-5, and its frequency range is wider than that of EFM-5. Moreover, it also features a much smaller size, more complete functions and much simplified circuit. As a new type of field strength meter, it can be widely used in the fields of environmental protection, electromagnetic compatibility and various research works concerning electromagnetic fields.

Index terms: Bioeffects, instrumentation, measurements

EMCABS: 10-8-92

EFFECT OF GROUNDING DESIGN ON RADIATED EMISSION FROM TELECOMMUNICATIONS EQUIPMENT

Masaji Sato, Minoru Ohta, and Kouji Takemoto
NTT Telecommunications Network Labs, Tokyo, Japan
Proceedings of 1992 International Symposium on EMC, Beijing, China
May 25-27, 1992, pp. 503-506

Abstract: The effect of grounding design on the radiated emission from telecommunications equipment is experimentally studied using a rectifier. The impedance between the equipment frame and the floor strongly affects the radiated emission. Therefore, the grounding impedance is measured and simulated with a simplified equivalent circuit. The results show that the integrated grounding system is better for reducing the emission because of its low grounding impedance, especially below 100 MHz. AN isolated grounding system can also reduce the emission level like the integrated system if a copper plane is installed under the equipment.

Index terms: Grounding design, radiated emissions

EMCABS: 11-8-92

PROBES FOR ELECTROMAGNETIC PULSE MEASUREMENTS

Daniel Bem, and Tadeusz Wieckowski
Technical University of Wroclaw, Wroclaw, Poland
Proceedings of 1992 International Symposium on EMC, Beijing, China
May 25-27, 1992, pp. 164-169

Abstract: Analyzed are properties of probes which enable measurements of electromagnetic pulse (EMP) parameters. Using such probes, it is possible to perform independent measurements of the electric and magnetic components of the EMPs, and to determine the electric field strength to magnetic field strength ratio.

Index terms: EMP, measurements, probe design

EMCABS: 12-8-92

COMPUTER ANALYSIS AND SIMULATION OF THE OPTIMUM DESIGN CRITERIA FOR THE ANECHOIC SHIELDED CHAMBER

Joong-Geun Rhee, PhD
Electronics Dept., Han Yang University, An San, Korea
Proceedings of 1992 International Symposium on EMC, Beijing, China
May 25-27, 1992, pp. 312-315

Abstract: Planewave propagation in the anechoic shielded chamber has been studied by utilizing the computer simulation technique. Computer modellings of the anechoic shielded chamber, and the characteristics of incident and reflected wave propagation were developed. The result of this study may give an effective means of determining optimum design criteria for the anechoic shielded chamber, such as shape, dimensions, size and proper locations of required microwave absorbers, etc.

Index terms: Anechoic chamber, modelling, analysis, simulation

GROUNDING & SHIELDING TO ACHIEVE COMPLIANCE FOR ITE EQUIPMENT

EMCABS: 13-8-92

Chris Kendall
CKC Laboratories Inc., Mariposa, CA
Conference Proceedings, EMC-ESD International, Denver, CO
April 22-24, 1992, pp. 167-172

Abstract: Grounding and shielding turn out to be more complex subjects than they might at first seem. To suggest the importance of the ground problem, consider that all of the following terms are used: digital ground; analog ground; safety ground; signal ground; noisy ground; quiet ground; earth ground; hardware ground; single-point ground; multi-point ground; shield ground. And there are probably just as many more not listed. This list should suffice to make the point.

Index terms: Grounding, shielding

FAT LADIES, TRUCKERS, AND EMI AT THE GAS PUMP

EMCABS: 14-8-92

T.J. (Bill) Ritenour
Storage Technology Corp., Louisville, CO
Conference Proceedings, EMC-ESD International, Denver, CO
April 22-24, 1992, pp. 63-68

Abstract: Retail petroleum dispensing equipments (a.k.a., gas stations) do not spring to mind when considering harsh electromagnetic environments. Nor, if the matter is considered further, would a gas station be characterized as especially susceptible to harsh electromagnetic environments even if such an environment existed in the station's vicinity. In fact, gas stations are EMI hot beds. During a work day they can be overrun with high level RF radiated emissions; suffer from poor power quality and its attendant line spikes, line voltage sags, surges, and drop-outs; and be subjected to remarkably high impulsive noise caused by electrostatic discharge (ESD).

Index terms: EMI environment, ESD

SYSTEM'S LEVEL ESD TEST STANDARDS

EMCABS: 15-8-92

T.J. (Bill) Ritenour
Storage Technology Corp., Louisville, CO
Conference Proceedings, EMC-ESD International, Denver, CO
April 22-24, 1992, pp. 15-24

Abstract: The American National Standards Institute (ANSI) Working Group (W/G), charged with writing a guide on electrostatic discharge (ESD) for use by design and test engineers throughout the industry, has completed its work and forwarded the document for review, publication and distribution. This guide provides the reader and user with the most extensive and in-depth information on ESD compiled to date in a document of this nature. Formulation of the guide stemmed from a goal to harmonize as much as possible with international standards, particularly IEC 801-2. It soon became apparent to the W/G members that too much was overlooked in that document for the sake of publishing a final standard.

Index terms: ESD, ANSI, IEC 801-2

GROUND PLANE SIZE & SHAPE EXPERIMENTS FOR RADIATED EMISSIONS MEASUREMENTS

EMCABS: 16-8-92

A.P. Berquist (1) and W.S. Bennett (2)
(1) Hewlett-Packard Co., Fort Collins, CO and (2) EMC Consultant, Loveland, CO
Conference Proceedings, EMC-ESD International, Denver, CO
April 22-24, 1992, pp. 211-217

Abstract: It is generally specified that radiated electromagnetic emissions measurements are to be made over a highly conductive ground plane of finite area. However, the theory associated with such measurements is based upon the assumption of an infinite ground plane. Therefore, the question arises, what should be the size and shape of a finite ground plane if it is to appear to be infinite? This paper describes a set of experiments which were performed in order to begin to answer that question.

Index terms: Radiated emissions, open-field site

PC BOARD DESIGN BASICS

EMCABS: 17-8-92

Stephen Baldassare
Intellistor, Inc., Longmont, CO
Conference Proceedings, EMC-ESD International, Denver, CO
April 22-24, 1992, pp. 214-245

Abstract: This paper presents a basic overview of design guidelines for noise reduction of printed circuit boards (PCBs). This presentation is a primer to PCB design for EMC, hardware and layout personnel.

Index terms: PCB design

INTEGRATED CIRCUIT DECOUPLING — A KEY TO EMI CONCERN

EMCABS: 18-8-92

James Mucciollo
Chrysler Corp., Auburn Hills, MI
Conference Proceedings, EMC-ESD International, Denver, CO
April 22-24, 1992, pp. 57-61

Abstract: Since the development of the first solid-state engine control for automobiles, microcircuit technology has evolved with greater complexity, faster clock speeds, and smaller package size. Electromagnetic compatibility (EMC) has become a high priority in the design of electronic automotive modules. At the same time, the die size of the CMOS technology has decreased from 9 micron process size (50 nsec rise/fall time) to 0.8 micron (1.5 nsec rise/fall time) in high speed CMOS integrated circuits. To minimize the effect of EMI due to the faster rise/fall time the design engineer must analyze the integrated circuit (IC) package and associated decoupling capacitor. This paper will concentrate on how to analyze the decoupling capacitor requirements.

Index terms: EMC design, vehicular requirements

1993 INTERNATIONAL IEEE EMC SYMPOSIUM

The 1993 IEEE International Symposium on Electromagnetic Compatibility will be held in Dallas, Texas, August 9-13, 1993. The Dallas-Fort Worth Chapter is sponsoring the symposium with support from the Central Texas Chapter. The theme of the Symposium, "On the Frontier of Change," is a double-entendre playing on our western heritage and the rapidly changing world of EMC Technology.

The Board of Directors of the EMC Society held its February meeting in Dallas at the Grand Kempinski Hotel, site of the 1993 Symposium. During the meeting, Steve Mullenix, Dallas-Fort Worth Chapter chairman, and Ed Vance, Chairman of the 1993 Symposium Steering Committee, joined the board in a tour of hotel facilities that will be available for exhibits, technical meetings, and luncheons.

The 1993 Symposium will follow the recent pattern of a three-day technical session with exhibits Tuesday through Thursday, with committee meetings and workshops on Monday and Friday. For a change of pace, an evening at the ranch will be offered. The Call for Papers will appear in the 1992 Symposium Record and will be available at the IEEE booth in Anaheim, as well.

Photo: Dick Ford

BoD visits site of 1993 International Symposium in Dallas. (l to r) Ed Vance, Symposium Chairman, Sigrid Helgason and Connie Hagston, Grand Kempinski staff members, and Bob Hofmann, EMCS President.

EOS/ESD SYMPOSIUM

The 14th Annual Electrical Overstress/Electrostatic Discharge Symposium will be held from September 15 to 18, 1992 at the Loews Anatole in Dallas, TX. The program will feature a keynote address by Henry W. Ott entitled "ESD Concerns in the 1990's." Other highlights include a new products showcase, authors' corners, and an expanded tutorial. Sessions will address: factory issues; system effects and testing; EOS, oxide damage and reliability; failure mechanisms and device issues; ESD materials; and on-chip protection. For more information contact the EOS/ESD Association, P.O. Box 913, Rome, NY 13440. Phone (315)339-6726. FAX: (315)339-6793.

INTERNATIONAL SYMPOSIA SCHEDULE

1992 Los Angeles, CA:
August 17-21
Anaheim Marriott Hotel
Terry Cantine
(818) 767-6770

Tel-Aviv, Israel:
November 2-5
Rafi Rubinstein
Elisra Ltd.
48 Mivtza Kaddesh St.
Benei-Beraq 51203 Israel
North American Travel:
Agelet Tours
1-800-237-1517

1993 Dallas/Ft. Worth, TX:
August 10-12
Grand Kempenski Hotel
Ed Vance
(817) 478-5653

1994 Sendai, Japan: May 17-19
Sendai International Center
T. Takagi
Tohoku University
Aoba Aramaki
Sendai, Japan

Chicago, IL: August 22-26
Palmer House
Bob Hofmann
(708) 979-3627

1995 Atlanta, GA: August 22-24
Marriott Marquis Hotel
John Rohbaugh
(404) 894-8235

1996 Santa Clara, CA:
August 19-23
Santa Clara Convention Ctr.
Double Tree Hotel
David Hanttula
(415) 335-1071

1997 Austin, TX: August 18-22
Austin Convention Center
Hyatt Hotel
Gene Cory
(512) 736-0714

1999 Japan: May 15-17

2000 Washington, D.C.
Bill Duff, (703) 914-8450

CALENDAR 1992

August 18-20	**1992 IEEE INTERNATIONAL SYMPOSIUM ON EMC** Anaheim Marriott, Anaheim, CA	*Contact:*	Terry Cantine AVX Filters 818-767-6770
August 24-25	**ASIA-PACIFIC CONFERENCE ON ELECTROMAGNETIC COMPATIBILITY** Centre for Electromagnetics Madras, India	*Contact:*	Coordinator APC-EMC Sameer Centre for Electromagnetics CIT Campus, 2nd Cross Road Taramani, Madras 600113 INDIA FAX: (44)2350747
September 2-4	**11th INTERNATIONAL WROCLAW SYMPOSIUM ON EMC** Wroclaw, Poland	*Contact:*	Mr. W. Moron EMC Symposium Box 2141 51-645 Wroclaw 12, Poland
September 7-11	**ICEC '92** Loughborough, U.K.	*Contact:*	Dept. of Electronic & Electrical Eng. Loughborough Univ. of Technology Loughborough, Leicestershire, LE11 3TU U.K.
September 16-18	**14th ANNUAL ELECTRICAL OVERSTRESS/ELECTROSTATIC DISCHARGE SYMPOSIUM** Loews Anatole Dallas, TX	*Contact:*	Charvaka Duvvury Texas Instruments, Inc. 12840 Hillcrest, Suite 200 Dallas, TX 75230 214-917-7969, FAX: 214-917-7487
September 21-24	**8th INTERNATIONAL CONFERENCE ON EMC** Edinburgh Conference Centre Heriot - Watt University, Edinburgh, Scotland	*Contact:*	Conference Services IEEE Savoy Place London WC2R 0BL U.K.
October 19-23	**ANTENNA MEASUREMENT TECHNIQUES ASSOCIATION SYMPOSIUM**	*Contact:*	Paul Swetnam Lintek, Inc, P.O. Box 210 Powell, OH 43065 614-888-2700, FAX: 614-888-4778
October 1992	**1992 INT'L AEROSPACE & GROUND CONFERENCE ON LIGHTNING & STATIC ELECTRICITY** Atlantic City, New Jersey	*Contact:*	Mike Cupples 609-484-5228 FAX: 609-484-4005
November 2-5	**1992 SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY** Tel-Aviv, Israel	*Contact:*	Rafi Rubinstein, EMC 1992 Symposium Chairman Elisra Ltd. 48 Mivtza Kaddesh St., Benei-Beraq 51203 Israel Tel: (972-3)7545628, FAX: (972-3)7545468 *Group Discount Travel:*Agelet Tours 1-800-237-1517 Attn: Ruthanne
December 2-4	**THIRD INTERNATIONAL CONFERENCE ON ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY (INCEMIC)** Calcutta, India	*Contact:*	Shri V.R. Katti Electrical Integration Group Indian Space Application Centre Vimanapura - Post, Bangalore 560 017 India *Group Discount Travel:* Certified Travel 1-800-237-1517 Attn: Colleen

CALENDAR 1993

March 9-11	**10th INTERNATIONAL ZURICH SYMPOSIUM AND TECHNICAL EXHIBITION ON EMC**	*Contact:*	Dr. Gabriel V. Meyer EMC Zurich ETH Zentrum IKT, 8092 Zurich, Switzerland (+411) 256 27 88 FAX: (+411) 262 09 43
August 10-12	**1993 IEEE INTERNATIONAL SYMPOSIUM ON EMC** Grand Kempinski Hotel Dallas, Texas	*Contact:*	Ed Vance 817-478-5653

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ElectroScience Lab report (2909-20), "Radiation and Scattering by Thin-Wire Structures in the Complex Frequency Domain." Still another SCEEE Press paper from the book above is "A Summary of Hybrid Solutions Involving Moment Methods and GTD," by W. D. Burnside and P. H. Pathak.

The focus of this book is primarily integral equations, although two of the papers in section 6 involve hybridization of integral-and differential-equation formulations. Even as one of the editors, I regret that the book's subtitle "Frequency Domain Method of Moments," when taken in context with this integral-equation focus, tends unfortunately to imply that the two topics, i.e. integral equations and the moment method, are synonymous. Perhaps a better subtitle would have been "Moment-method Solutions of Frequency Domain Integral Equations" or something similar. As made very clear in Harrington's 1968 book, *"Field Computation by Moment Methods,"* the moment method is an overarching procedure that includes such numerical techniques as finite-difference and finite-element solutions of partial-differential equations as well as the numerical solutions of integral equations. A growing practice in recent years has been to ignore this fact. While this might seem a trivial point, it seems important to me that we use well-accepted and defined terminology so that unnecessary obfuscation can be avoided.

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.

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

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

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

R&B ENTERPRISES, 20 Clipper Road, West Conshohocken, PA 19428
Telephone: (215) 825-1960, TWX: 510-660-8120, FAX: (215) 825-1684
EMI testing/consulting. Full-threat EMP simulation. EMC training/publications. EMP test equipment.

AMPLIFIER RESEARCH, 160 School House Road, Souderton, PA 18964-9990
Telephone: (215) 723-8181, TWX: 510-661-6094, FAX: (215) 723-5688
Broadband RF power amplifiers, 1 W to 10 kW, 10 kHz to 1 GHz; Antennas and accessories for RF susceptibility testing; broadband E-field monitors and fiberoptic links.

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

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

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

J. K. ECKERT & COMPANY, P.O. Box 648, Gainesville, VA 22065
Telephone: (703) 349-8592, FAX (703) 347-3049
Author clearinghouse and producer of technical books in electrical/electronic engineering, aviation, and medicine, including an expanding series of EMC books.

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

COMPLIANCE ENGINEERING, 629 Massachusetts Ave., Boxborough, MA 01719
Telephone: (508) 264-4208, FAX: (508) 635-9407
Complete source for EMC: Publications and Annual Design Handbook, Bimonthly Seminars, International Standards.

SCHAFFNER EMC, INC., 9-B Fadem Avenue, Springfield, NJ 07081
Telephone: (201) 379-7778, FAX: (201) 379-1151
Power line filters and inductors for RFI suppression; Instruments for simulating ESD and power line disturbances.

INSTRUMENT SPECIALTIES CO., INC., P.O. Box A, Delaware Water Gap, PA 18327-0136
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EMI/EMP/ESD shielding materials; gaskets and contact strips, knitted wire mesh, vent panels, both standard and custom designed. Full EMC compliance testing, consulting.

RFI CORP. & FILTRON, 100 Pine Aire Drive, Bay Shore, NY 11706
Telephone (516) 231-6400, FAX (516) 231-6465

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