

EXTRA

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ROBERT D. GOLDBLUM, Editor

President's Message



BILL GJERTSON
PRESIDENT,
EMC SOCIETY

ased on the discussions at the first EMC Board of Directors' meeting, 1996 appears to be the year in which the EMC Society does more for its members and initiates specific thrusts into overseas Regions 8 to 10. The new developments are in response to an

The year 1996 will also be an exciting year because all BoD Directors and Society officers will be going on-line to conduct the EMC Society's business.

all-EMC Society member survey and the annual survey conducted at the EMC Symposium in Atlanta, in which the desires, concerns and comments of the members were collected. Results revealed that the members would like more benefits and would not object to paying for them. The BoD has committed to pursuing these objectives in 1997. (The 1996 budget is already in place, so the 1997 program expenditures will result from the planning done during 1996).

The year 1996 will also be an exciting year because all BoD Directors and Society officers will be going on-line to conduct the EMC Society's business. Each of you is encouraged to investigate Internet access and visit the IEEE web pages and the EMC home page created and maintained by Todd Hubing. Franz Gizin will be assuming the maintenance of the EMC home page after the Santa Clara EMC Symposium. Your ideas and/or participation in this new medium are requested. For those that are interested, the related IEEE SPAS on-line system for all standards, including EMC is also underway.

All EMC Society members are encouraged to attend EMC Chapter, IEEE Section, and EMCS BoD meetings and to provide your elected directors with your inputs. Also, consider supporting their volunteer efforts with volunteer work of your own. We are all volunteers, with EMC being the common cause that we desire to further.

This may sound familiar to all of you, as most previous presidents advocated the same volunteer participation. However, it bears repeating, because it is one of the most important characteristics of the EMC

Society, and therefore of each of its members. The possibilities for the EMC Society are very exciting and our volunteer work is a limitless tool. You can become part of the EMC Society in 1996-1997 and the future. Make a commitment and personalize your EMC society. Thank you very much for your interest.

IEEE EMCS Web Page:
http://www.emclab.umn.edu/ieee_emc

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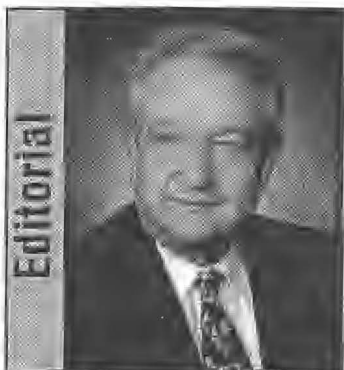
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ROBERT D. GOLDBLUM
EDITOR

In response to my editorials calling for a harmonized worldwide EMC Standard, Mr. R. Harms sent the accompanying letter. The TC 210/WG5 has been meeting mainly with the U.K. in regard to the DEF STANs and Germany regarding the V.G. standards. Even though most NATO countries use MIL-STD-461/462, there is no current activity to include it in the Working Group meetings. Where do we go from here?

Dear Mr. Goldblum,

On behalf of the German IEEE EMC Chapter I strongly support your position about the present situation of EMC test standards. Time has come to cut a straight way to electromagnetic compatibility, and to drop the relicts of the AM-radio era, such as the open-air test site and the QP detector in the civilian test standards.

The European EMC Directive, 89/336/EEC has, as a byproduct, generated a wealth of test methods (and also limits), which are mostly uncoordinated and useless for any system philosophy because they were taken from different sources, e.g., CISPR, IEC, VDE and others. A common approach, as in military EMC standards, cannot be found.

The EMC requirements per 89/336/EEC are legal ones, unlike the contractual requirements for military, aircraft, and space industries. The legal requirements prevail, resulting in uneconomical multiple testing of multipurpose electronic equipment.

To overcome this situation, common test methods, including the EUT setup, are necessary. In Germany, the standard committees NEA 763 for the military VG norms are already working on this topic, and on the European level CENELEC TC 210 WG 5 is going to harmonize military and civilian test (method) requirements.

The German IEEE EMC chapter wants to participate in this work, and in our opinion, a worldwide solution should be possible, of course with the assistance of IEEE.

The test methods of MIL-STD-462D could be a good starting point, as all military standards in Europe are very similar. Once all complicated systems are tested using military methods or derivatives, the superiority of the military philosophy becomes evident.

Please, let us know if you are interested in the harmonization of EMC standards. We all live in the same world, and the same physical phenomena should be measured in the same way.

— **R. Harms**
Daimler-Benz Aerospace
FAX: (0421) 539-5577

BACK ISSUES OF THE EMC SOCIETY 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. Sets can be ordered from: Dr. Chester L. Smith, EMC Society Historian, 2 Jonathan Lane, Bedford, MA 01730.

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EMCS BoD Activities

BY
JANET O'NEIL
EMCS SECRETARY

The first meeting of the EMC Society Board of Directors in 1996 was held on March 7 and 8 at the IEEE Service Center in Piscataway, New Jersey. This location was selected so that meeting attendees could take advantage of the many services the IEEE has to offer. An example was the Standards Committee Training Series, which was held on March 5 and 6, prior to the Board meetings. This was organized by Don Heirman, Chairman of the Standards Committee. The first training of its kind for the Standards Committee conducted by IEEE staff, this series featured education on project planning, editing of standards, and the SPA (Standards Process Automation) System, among other topics.

Attending the Board meeting were President Bill Gjertson, Vice-President Dan Hoolihan, Secretary Janet O'Neil, and BoD members Don Sweeney, Joe Butler, Warren Kesselman, Kimball Williams, Len Carlson, Don Heirman, Bill Duff, Bob Hofmann, Todd Hubing, and Norm Violette. Newly elected Board member Franz Gisin was present for his first Board meeting. Absent were Board members Andrew Podgorski, Bill McGinnis, Bill Ritenour, Henry Ott, Ferdy Mayer and Jim Muccioli. Guests in attendance included Leo Makowski, RAC Chairman, and IEEE staff members Pat Holst, James Taylor, Luigi Napoli, and Irving Engleson, who provided a very informative, extensive, and lively tour of the IEEE Service Center, including a history of why the IEEE chose Piscataway as its headquarters site.

Despite the threat of shutdown of the IEEE Service Center due to a menacing snowstorm, the meetings were held as originally scheduled. The meeting on March

7 began with breakfast, followed by the IEEE Service Center tour. The tour included a visit to the respective editors and staff of various IEEE publications, including *Spectrum* magazine and one Society's *Transactions*. The computer software capabilities of the publications department were indeed impressive. The tour also included stops at the mail room, document storage room,

technical library, etc. One couldn't help but realize the magnitude of the IEEE, with its worldwide membership totaling some 300,000 professional engineers. It is a major corporation!

Back in the Board conference room, IEEE staff member Pat Holst provided further information on the first ever formal, scientific survey conducted of the EMC Society membership by the IEEE. Information on the survey results will be communicated to the membership by Dan Hoolihan, Vice-President and Director of Planning. (See article on page 12.)

IEEE staff member James Taylor provided a presentation on the electronic services available to members by the IEEE. This includes e-mail aliases, fax and FTP services. Todd Hubing, the "official" computer expert on the Board, took copious notes on these services which may be used to improve communication.

Lunch followed these presentations, with the Board resuming at 1:00 P.M. The agenda was adopted with minor revisions. Secretary O'Neil presented the minutes of the prior Board meeting which were approved as amended. In the absence of Treasurer Andrew Podgorski, President Gjertson distributed a report summarizing EMC Society financial activity. Highlights of the report included the announcement of a \$100K net income surplus for 1995, comments on the revenue generating activities of the Society (including sales of *Transactions* and the annual EMC symposia), and an analysis of the cost of providing services to EMC Society members. The total expenditure for services provided to members was \$55K in 1990, increasing to \$72K in 1995. With some 4,100 EMC Society members, this amounts to reimbursing 100% of the annual dues (\$72K divided by the total members at 4.1K equals \$17.56; the current EMC Society dues are \$10.00). The Treasurer's report was accepted as presented.

The Director for Member Services, Todd Hubing, next presented his report. He noted that the new Chapter Coordinator is Ray Adams of TRW in Manhattan Beach, California. Ray will be contacting the chapters to offer assistance on behalf of the Board. Ray may be contacted via e-mail at ray_adams@qmail4.sp.trw.com. Todd encouraged greater interaction between the Board and the chapters. Ray will facilitate this effort. Steve Mullenix of Chomerics in

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Dallas, Texas is the new Membership Committee Chairman, responsible for recruiting and retaining EMC Society members. The Sections Congress will be held November 1 through 6, 1996 in Denver, Colorado. This is traditionally attended by the Chapter Coordinator and plans are being made for EMC Society representation at this important conference. Warren Kesselman, Nominations Chairman, reported that nominations for the slate of Board candidates for a three year term beginning January 1, 1997 are being solicited. Nomination forms are due no later than May 30, 1996.

The Director for Communication Services, Len Carlson, next presented his report. The main item of his report concerned discussion on converting the entire collection of annual EMC Society symposia records to CD-ROM. Chet Smith has been spearheading this effort. Currently, the Board has authorized the expenditure to prepare a master from the microfiche originals of these documents. Len reported for Henry Ott, Symposia and Conference Chairman, that all is going well with preparations for the 1996 EMC Society Symposium in Santa Clara and that record numbers are expected.

The Director for Professional Services, Norm Violette, next presented his report. He noted that Ferdy Mayer, International Activities Chairman, has possession of the EMC Society table top display and will be using this to promote IEEE membership at various international EMC related conferences in 1996. Dick Ford discussed the results of the employment analysis survey/member feedback form distributed at the 1995 Atlanta symposium. (See article on page 14.)

The Director for Technical Services, Joe Butler, next presented his report. Don Heirman, chairman of the Standards Committee, reported

positively on the Standards training conducted by the IEEE. He also elaborated on the reorganization effort the Standards Committee has been considering in order to make the committee more efficient and global in nature. Leo Makowski, chairman of the Representative Advisory Committee (RAC) reported on the committee's efforts to become more "proactive." RAC will host a committee luncheon meeting during the 1996 EMC Society Symposium in Santa Clara. Regarding the ANSI C63 RAC member, a special workshop on "Measurement Uncertainty" will be held late April 1996 in Baltimore. Todd Hubing, 1995 Technical Activities Committee (TAC) Chairman, presented the committee's 1995 Annual Report. He noted that a web page has been established for the TAC which includes the name and charter of each technical committee along with the chairman's name and contact information. Kimball Williams reported as Chairman of the Education and Student Activities Committee. Notable activities involved NARTE, CAEME, Tutorials, Experiments Manual and Demonstrations committees. Following Mr. Butler's report, the Board adjourned for the day.

The Board gathered for a social dinner that evening at a wonderful Italian restaurant in nearby New Brunswick. Most Board members walked gingerly from the hotel to the restaurant on the salt-covered sidewalks. Due to a traffic accident caused by the inclement weather, nearby resident Don Heirman and his wife Lois were one hour late for dinner. The Board had expected them to be greeters at the door!

On Friday, March 8, the Board meeting resumed at 9:00 am at the IEEE Service Center. The Planning Director, Dan Hoolihan, reviewed the goals and objectives of the Society's

five-year Long Range Plan. He requested that each Director review respective progress in meeting the plan's goals and objectives at the Santa Clara Board meeting in August 1996. Under Old Business on the agenda, President Gjertson reviewed reimbursement policy at the request of Treasurer Podgorski.

Under New Business on the agenda, the Board discussed various issues. Notable decisions made included the transfer of \$100K in cash reserves to the long-term investment account, the holding of the March 1997 Board meeting in Switzerland in conjunction with the Zurich EMC conference, the establishment of a formal policy for EMC Society involvement in foreign EMC conferences, the appointment of an "official" EMC Society Internet Representative (Franz Gisin), the resolution for all Board members to have e-mail communication capabilities by August 1996, and the determination to raise EMC Society member dues from \$10 to \$15 in the near future. The Board also agreed to increase the nonmember subscription rate for the EMC Society Transactions to \$125.

The topic of nominations of foreign EMC Society members for the Board was discussed and Todd Hubing led a brainstorming session on EMC Society services which would be available for members only (i.e., others could not benefit from a colleague's EMC Society membership, thus discouraging "satellite" memberships). If you have ideas in this regard, please contact Todd at thubing@ee.umn.edu.

The meeting adjourned at 3:00 P.M. with several Board members racing towards Newark Airport which was eventually closed that evening due to the snowstorm. Members driving home after the meeting were justifiably anxious about the roads. But for Board members Len Carlson, Bill Gjertson, Janet O'Neil and Norm Violette who had travel plans the following day, the snowy evening meant a relaxed, cozy dinner at a nearby restaurant, The Frog and the Peach.

A web page has been established for the TAC which includes the name and charter of each technical committee along with the chairman's name and contact information.



TODD HUBING
ASSOCIATE EDITOR

Occasionally, I'll come across an EMC problem that's so complex or so bizarre that mere mortals (like myself) cannot begin to understand it. In these situations, I always seek the solace and wisdom of Mr. EMC. Mr. EMC lives in a small shielded room on a remote mountain top. His wealth of EMC knowledge comes from constant meditation and contemplation (and his Internet connection). In this issue, Mr. EMC has graciously consented to answer questions posed by a few of his loyal followers.

Dear Mr. EMC:

Our company's latest product is 5 dB over spec and we are supposed to ship next week. Yesterday afternoon, I walked into the EMC laboratory and found our EMC engineer dancing, chanting, and waving a rubber chicken. Should I be looking for a new EMC engineer?

— *Concerned Manager*

Dear Concerned:

Yes, get rid of the quack. Every reputable EMC engineer knows that the rubber chicken ritual is only effective between midnight and 4 a.m. By the way, if you're looking for a new EMC engineer, try posting the position to the "job listings" section of the IEEE EMC Society web page.

Dear Mr. EMC:

EMC problems are costing our company millions of dollars in lost revenue each year. After consulting with representatives from several different software companies, I am convinced that all our problems could be solved by purchasing the right EMC software. Which EMC software would you recommend?

— *Head of Product Development, Block 4*

Dear Blockhead:

I recommend that you send each software vendor one of your boards that has an EMC problem. Be sure to include schematics, layout information and all other relevant data. When one of them demonstrates how their software was used to solve your EMC problem, buy their software.

Dear Mr. EMC:

I often have EMC-related questions, but I can't always travel to the Tip of Tibet to confer with you in person. Is there anywhere else I can turn for free help?

— *Seeker of Answers*

Dear Seeker:

Subject to the caveat that most free advice is worth what you pay for it, there are two usenet newsgroups that you would probably find beneficial. Technical questions and questions about EM software can be directed to sci.physics.electromag. Questions about EMC testing and EMC requirements can be directed to sci.engr.electrical.compliance. Most Internet service providers now support access to these usenet newsgroups. Also, the IEEE EMC Society's Web page at http://www.emclab.umn.edu/ieee_emc can answer many questions or at least point you in the right direction. If you want to talk to a real human, the ideal strategy is to attend your local EMC chapter meetings. There is no better way to keep up with the latest developments in EMC and product design.

Thanks, Mr. EMC. Wise advice indeed!

Central New England

I would like to thank John Clarke for his regular updates on the activities of the Central New England chapter. The February meeting of the Central New England chapter featured Jill Geppert of TÜV Product Service GmbH. She discussed the Medical Device Directive 93/42/EEC. This is the second of three directives harmonizing the way medical devices are approved in Europe. This directive will impact the largest number of manufacturers because of its broad scope. The MDD is a new approach published on 14 June 1993. It took effect on 1 January 1995 with a transition period ending on 13 June 1998. During the transition period, manufacturers may choose between the MDD approach to device approvals or individual Member State approval procedures using laws in force as of 31 December, 1994.

Chicago

Ray Klouda provided me with this update of the Chicago chapter's activities. Thanks, Ray. The first meeting of 1996 was held in February. The meeting started with '96 Officer elections. This year, Tom Braxton joins the executive committee as the Programs Co-chair. Welcome aboard, Tom! Congratulations to all those elected, new and old. Jim Klouda gave a first-hand report of the current development of the new CEL (Council of EMC Laboratories). The new CEL is open to all U.S. EMC Labs (independent and company affiliated). The main purpose of the council is to deal with technical questions related to the European test requirements. "EMC Tales from the Trenches" was the topic of the February meeting. Dale Svetanoff, our Program Chair, arranged for a lively night of EMC storytelling by himself and other members of the chapter. Dale began the tales with "Once upon a time RF ground was a quiet place ..." and then concluded with the reality that RF grounds are not always "quiet" but that they can actually be a significant noise source. Another story, "The EMI Problem that Wasn't" described a design problem where the initial thought was that the problem was EMC, but it turned out to be interference of a different sort. Another presentation, "If You Can't Fix the Source, Change the Receptor," included creative EMC solutions including buying new radios for a law enforcement agency. Another classic tale was "One Man's Feast is Another Man's Famine" or "Be Careful Where You Aim, You may Shoot Yourself in the Foot," in which the thoughtful act of pre-painting metal panels and fasteners with three coats of a good exterior paint turns out to diminish the shielding effectiveness of the metal panels. The audience participation was great. All in all, the discussions were entertaining, as well as informative.

Long Island

In February, the Long Island chapter hosted a tour of the Underwriters

Laboratory's new EMC test facility. Mr. Corey Hyatt of Underwriters Laboratories hosted the tour. Mr. Kevin Baldwin of Rantec gave a presentation on new developments in anechoic shielded test facilities. Sandwiches and drinks were provided by Underwriters Laboratories.

Los Angeles

Thanks once again to Janet O'Neil for keeping us informed of the many and varied activities of the Los Angeles chapter. It was academia time in Southern California as the Los Angeles Chapter of the EMC Society featured Professor Todd Hubing of the University of Missouri at Rolla (UMR) and Professor Jose Perini (Emeritus from New York University at Syracuse) at its winter meetings. Professor Todd Hubing, a Distinguished Lecturer of the EMC Society and member of the EMC Society Board of Directors (whew!) gave a presentation entitled "Putting the 'EMC Expert' in EMC Expert System Software" at the January meeting. Some 25 people attended the very thought-provoking meeting.

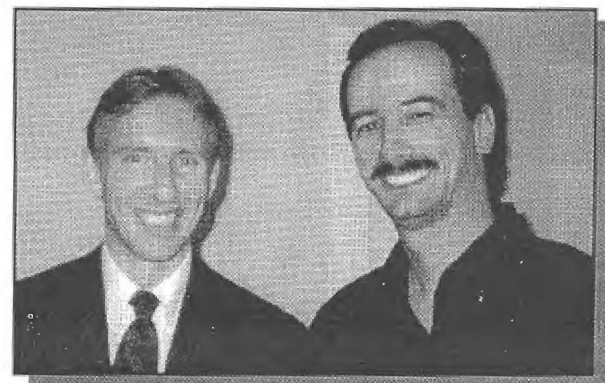
Todd explained the desired attributes of EMC Expert System software: it must think like an EMC expert; the user doesn't need to be an expert; the software works with incomplete data and minimal user inputs; automatically reads in board layout; predicts radiated EMI levels; identifies and quantifies EMC problems; and suggests fixes. No small task! He also stated that the significant challenges faced by the software are visualizing return current paths, recognizing shapes and obtaining information from the user. Todd has developed some of the algorithms that would be used in EMC Expert System software.

In February, Professor Jose Perini gave the most technical presentation in recent memory and attracted the highest attendance in recent memory! The meeting RSVPs started

coming in three weeks before the meeting date (which is almost unheard of!) and continued steadily until 67 people had RSVP'd by the meeting date. This wrecked havoc (albeit the good kind!) with the organizing committee as the regular meeting space in the formal presentation room at TRW was not available. Chairs, tables and a screen were hastily rented and erected in the EMI lab area at TRW. Jose gave a unique three-hour tutorial presentation entitled "Numerical EMC Methods". The meeting was scheduled from 4 to 8 P.M., including a one-hour dinner break. Given the length and depth of material presented, this new meeting format worked great! Everyone seemed to enjoy the presentation and the opportunity to stretch/socialize/network during the dinner break.

In brief, Jose reviewed 12 different numerical techniques and provided an analysis of their respective strengths and weaknesses. He also answered the difficult question of which technique to use for a given problem while providing a good understanding of the basis for each technique, its limitations, its computer requirements, and its range of applicability.

Incidentally, Jose was selected as a speaker for the Los Angeles and San Diego chapters during the 1994 EMC Symposium in Chicago. At that time, Jose received his IEEE Fellow Award and LA chapter member Janet O'Neil sat riveted in the audience with San Diego chapter member Scott Davies while listening to Jose's eloquent acceptance speech. Immediately, Jose



Ray Adams (right) gets a kick out of Todd Hubing's definition of an "EMC Expert."

was identified as a potential chapter speaker. That was the summer of 1994 and some 18 months later, Jose gave his well-received presentations in Southern California. Based upon the high attendance at the chapter meetings in Los Angeles and San Diego, Jose was worth the wait!

Lights! Camera! ACTION! That's the popular refrain heard in southern California and Monday, April 1 was no exception. There was plenty of action at EMC'96: A Colloquium and Exhibition on Pre-Compliance EMC Testing Problems and Solutions. This one-day EMC conference was jointly sponsored by the Los Angeles, Orange County and San Diego chapters of the EMC Society. Some 230 people attended the seven practical tutorial sessions, feasted on an elaborate lunch, watched demonstrations of the presented material, and celebrated at the Happy Hour reception following the event.

The speakers were experts in their respective fields. They included Herb Mertel of Mertel Associates who provided an overview of EMC requirements and who acted as the "Master of Ceremonies" throughout the day, Bill Rhoades of Xerox, who spoke about power quality, Scott Roleson of Hewlett Packard, who discussed bench-top radiated emission test techniques, Henry Ott of Henry Ott Consultants, who informed the audience about PCB design techniques related to ground plane inductance, Bill Ritenour of EMC Compliance, who gave a lively presentation on ESD (who will forget his endlessly extendible pointer?), Joe Fischer of Fischer Custom Communications who provided conducted and radiated immunity troubleshooting techniques, and last, but not least, Steve Jensen of Steve Jensen Consultants, who spoke about conducted emission troubleshooting techniques and analysis.

The day began with a complimentary continental breakfast during registration from 7:30 to 8:30 A.M. The 27 participating vendors who started setting up their respective table top displays at 6:00 A.M. were ready to greet the attendees and discuss the latest and greatest in EMC related products and services. Sessions began at 8:30 A.M. and continued until lunch. A "networking" lunch was held on an outdoor terrace overlooking the hotel's golf course. Fortunately, no one was hit by a stray ball and the sun shined overhead until showers started at 3:00 P.M. (how's that for committee planning?!). The networking lunch was a new idea which featured table topics related to the presentations. Speakers at different tables were identified by their name and topic. Based upon the topic or speaker of interest, attendees could select their seats on a first-come, first-served basis. Lunch was a real hit, especially for those attendees lucky enough to come to California from the chilly Midwest and East Coast. Most of these fellows forgot to pack their sunglasses and sunscreen!

After lunch the sessions continued, only pausing for a half hour mid-afternoon break featuring "Chocolate Lover's Delight," i.e. chocolate cookies and brownies in the table top display area. By the time the last speaker, Steve Jensen,



EMC '96 speakers Steve Jensen of Steve Jensen Consultants (left) and Joe Fischer of Fischer Custom Communications rate the pre-party a "thumb's up."



EMC '96 Registration Chairman, Dave O'Neil of Advanced Technical Sales, Eileen McNally (the "better half" of DJM Electronics), and event Co-Chairman Ray Adams of TRW enjoy the calm after the registration storm.



Henry Ott of Henry Ott Consultants congratulates Noel Sargent of the NASA Lewis Research Center in Cleveland, Ohio upon winning his book at the raffle held during the reception following EMC '96.

presented his material, the attendees were getting tired from all the food and a long day of sessions. So, Steve began his presentation with his summary page and worked backwards!



EMC '96 speakers Scott Roleson of Hewlett Packard, Henry Ott of Henry Ott Consultants and Bill Rhoades of Xerox (left to right) are obviously relaxed since their representations are over!



Photos courtesy of Janet O'Neil

At the IEEE membership booth, speaker and "Master of Ceremonies" Herb Mertel of Mertel Associates (left) and EMC '96 Co-Chairman Janet O'Neil of Lindgren RF Enclosures enthusiastically recruit new members for the EMC Society.

This resulted in chuckles from the audience and renewed energy reflecting the sentiment, "The Show Must Go On!" (as they also say in Southern California). The day concluded with a Happy Hour Reception where specialty food stations laden with scampi, pasta, fajitas, cheeses, vegetables and sweets, sweets tempted the most discriminating palates. The free food and drink tickets encouraged attendees to stay and mingle with other attendees, witness the various demonstrations, and visit the vendors at their table top displays.

The highlight of the reception was the raffle for three great books which were generously donated by the authors. Henry Ott's popular book, *Noise Reduction Techniques in Electronic Systems*, was won by Noel Sargent who traveled to the conference from Cleveland, Ohio, where he is employed at the NASA Lewis Research Center. Charles Pollard of Hughes Aircraft won Clayton Paul's new book, *Analysis of Multiconductor Transmission Lines*. Lastly, a special raffle was held only for those attendees who joined the IEEE and the EMC Society at the event. The winner, Khoa Pham of SMC, System Products Division, received the book *Handbook of Electromagnetic Compatibility* by Reinaldo Perez. There was also a raffle for a shiny new red convertible sports car but, alas, this was an April Fool's joke (after all, the conference

was held on April 1, ha!). Wow! What a day and night! No wonder speakers Bill Ritenour and Henry Ott were spied later in the lobby bar with their shoes off and their feet on the cocktail table! Conference co-chairmen Ray Adams of TRW and Janet O'Neil of Lindgren RF Enclosures were overheard vowing to get back now to their "real jobs." It was a long day, but informative and enjoyable for all. For more information about EMC '96: A Colloquium and Exhibition on Pre-Compliance EMC Testing Problems and Solutions, contact Ray at (310) 813-7152 (or: ray_adams@qmail4.sp.trw.com) or Janet at (310) 973-8757.

Nanjing

The November 7th meeting of the Joint Nanjing Chapter featured Xing Nan Hong from Tsinghua University who gave a talk titled "Progress on Microwave Techniques." This meeting was co-sponsored by the CIE Microwave Society. There were two featured speakers at the November 24th meeting. Neng Hang Fang, of the Nanjing Research Institute of Electronic Technology presented a paper titled "Glance at Defence Electronic Technology in Russia." Qi Hong Sha, of the Nanjing Marine Radar Institute, gave a talk on "Non-Plane Wave Aperture Synthesis." Prof. Wen Xun Zhang, chair of the Joint Nanjing Chapter, gave a presentation titled "Introduction of the IEEE: Organization, Constitution and Bylaws, Membership Development" at the December 20th meeting. Professor Zhang is on the faculty at Southeast University.

Sweden

Many thanks to Dr. Mats Backstrom for updating us on the activities of the Sweden chapter. New officers were elected at the November meeting of the Sweden chapter. The new chair is Bo Wahlgren of Saab Military Aircraft. The new vice chair is Dag Bjorklof, of Semko AB. Then new secretary is Mats Backstrom of FOA. Also at the November meeting, three presentations on the use of numerical analysis were made. Two of them were made by Mr. Jan Carlsson from SP (Swedish National Testing and Research Institute). The first was on crosstalk on PCB's and the other on emission from and susceptibility of PCB's. In both cases the analysis was made using software developed at SP. The third presentation was given by Mr. Peter Landgren from Bofors AB. In the talk he presented two commercial codes, AWAS and NEC-WIN and compared their usefulness for EMC analysis. At the February meeting, two presentations were given. Mr. Dag Bjorklof and Mr. Staffan Bernstrom from Semko EMC Center gave a presentation on the European directive for EMC including a case description of problems that may arise when compliance with the directive shall be shown by in-situ measurements. The other presentation was given by Dr. Mats Backstrom from FOA (National Defence Research Establishment) on field probes specially developed for low level measurements of shielding effectiveness in the microwave range.



WILLIAM G. DUFF
ASSOCIATE EDITOR

David Hantulla received a BSEE from California State University, San Jose, and performed graduate work at the University of Santa Clara.

David began his electrical engineering career with Varian Associates in Palo Alto, and when the instrumentation business slowed, moved to ISS Sperry/Univac in Cupertino. It was at ISS, in 1976, that David read an article in *Electronic Design* that reported that the Federal Communications Commission was considering limiting RF emissions from computers. Having an interest in "electrical noise," he volunteered to take on the technical responsibility for "EMI control." During the first couple of years, he was involved in assuring compliance with VDE emission requirements and hardening products for electrostatic discharge and radiated immunity. In 1978, David was promoted to Manager, EMI Control for ISS.

He also became involved in the CBEMA (now ITI) ESC-5 effort with the FCC to develop emissions limits and measurement methods for commercial computing and business equipment. "This was a learning opportunity of a lifetime - working with people such as Scott Bennett, Joe Fischer, Al Visek, Al Smith, Ralph Calcavecchio and Dan Hoolihan." During this time David attended almost every EMI seminar available. He credits Don White with taking EMC out of the "Black Art" realm and moving it to the education/science arena.

In 1980, he accepted a position with Apple Computer to start and manage the Compliance Engineering group. His responsibility was to provide EMC engineering services to development projects such as the Apple II, Ile, Lisa, and Macintosh computers. "This was a pioneering effort, with tremendous pressure to meet product release dates, but also a great learning experience and a tremendous sense of accomplishment. Our engineers were developing suppression techniques on the fly - taking basic information from seminars and applying it to personal computers. We had no model to work from. The mainframe techniques simply weren't applicable and cost and size were definite constraints."

In 1984, David left Apple Computer and formed EMC Engineering, a consulting business. He described it as "a lot of money for shielding cables, bonding metal and closing apertures, but no real engineering work and too much time spent on the freeway between clients." He joined Ridge Computers, working on high-performance workstations, and later moved to Grid Systems to manage the laptop compliance program. The real interest was to get involved in TEMPEST products. What a disappointment, desktop Class B products are much more challenging!

David is currently Manager, Product Compliance and Power Systems for the Silicon Desktop Group, Interactive Systems Division of Silicon Graphics, Inc.

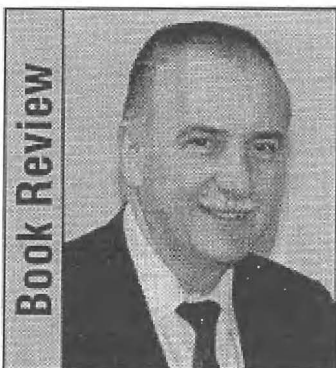
David has been involved in IEEE EMCS activities since he assumed the position of Chairman of the EMCS Santa Clara Chapter for 1985-1987. He organized the EMC Society's Distinguished Lecturer Program in 1987 and has chaired EMC colloquiums for the Santa Clara Chapter in 1986, 1991 and 1994.

David and his wife Shirley, a teacher, restaurateur and property manager, have two sons, Daniel, a marketing manager, and Michael, a film/video senior at NYU-Tisch. David's non-EMC passions are growing chillies and flyfishing.



DAVID HANTULLA

This year David rounds out twenty years in EMC by chairing the IEEE 1996 International EMC Symposium. "I am most excited about our sessions on source suppression at the IC/ASIC level, which is reflected in our theme, 'EMC: Silicon to Systems.' With microprocessors approaching 50 watts and 500 MHz, we must design for suppression in the silicon."



J.L. NORMAN VIOLETTE
ASSOCIATE EDITOR

HANDBOOK OF ELECTROMAGNETIC COMPATIBILITY

Edited by
Dr. Reinaldo Perez

Academic Press, Inc.
A Division of Harcourt
Brace & Company
525 B Street, Suite 1900
San Diego, CA
92101-4495

Starting from page iii to page 1098, this well-written book is loaded with 27 chapters of information. The 19 contributors form a mini "Who's Who" in Electromagnetic Compatibility (EMC) and related disciplines. The editor, "Ray" Perez, successfully performed the challenging task of coordinating the efforts of the other expert authors to produce a rich reference that presents information on most of the essential topics in EMC.

Part I: Fundamentals and Physics of Electromagnetic Interference

The three chapters of Part I, Fundamentals and Physics of Electromagnetic Interference, introduce theorems, definitions, and basic formulas. Included are tables of quantities, units, and symbols, a review of vector differential operators, plus seven pages of definitions and terminology.

A chapter on electromagnetic (EM) theory and fundamentals of EMC includes basic EM concepts based upon Maxwell's equations using vector differential and integral calculus formulations. A chapter entitled *The Physics of Interference Phenomena* addresses EMI degradation sources, coupling paths, immunity deficiencies, and interference mitigation.

Part II: Analysis and Prediction for EMC

Plane Wave Coupling to Cables develops methods to analyze coupling of electromagnetic (EM) energy to "wire" or cable configurations using various excitations of transmission lines. Time-domain and frequency-domain responses are presented. The application of scattering techniques is discussed along with solutions through transmission line theory.

A comprehensive chapter on crosstalk, using multiconductor transmission line modeling, essentially describes capacitive and inductive crosstalk. General models are developed and time and frequency domain solutions are presented. Approximation techniques are derived, and a section is provided on crosstalk reduction methods.

A chapter on radiated and conducted

emissions describes the creation of electromagnetic fields by electric currents. Common-mode and differential-mode currents are compared. Conducted emissions are described, including power supplies as sources, with filter applications included.

The chapter on computational methods in EMC is highly applicable for anyone either involved, or planning to become involved, in the nitty-gritty details of applying computer techniques to solve some EMC problems.

Part III: Methods for Ensuring EMC

Once an interference problem has been identified and described (quantified), EMC requires that its effects must be adequately suppressed to assure proper system operation.

Grounding and bonding concepts lead to the power interface of electronic hardware and safety aspects of grounding, including reference to the national Electrical Code (NEC). The importance of bonding path connection impedance is described, especially the significance of path inductance. Illustrations of grounding in facilities, noise aspects of grounding, and filter installations are provided.

Electromagnetic shielding concepts are described and equations are developed based on transmission line theory. Design data in the form of graphs are provided, with design tables also provided to describe the parameters of typical shielding materials.

The properties of filters are presented and described. Insertion loss, s-plane concepts, cut-off (corner) frequencies, pole-and-zero concepts, single vs. multipole networks, ferrites, and the effects of parasitics are presented.

Part IV: Commercial and Military Standards and Methods

The rationale for international commercial radio frequency interference limits forms the basis for a chapter. The reader is encouraged to read the documents which may be of interest for specific situations and applications.

The rationale for international EMI

immunity requirements for commercial equipment is presented. The IEC immunity specifications are described briefly, and include a description of the European Community immunity specifications. Immunity requirements in the U.S. are currently voluntary.

The development and history of military specifications are presented. Requirements and test methods for conducted emissions (CE), conducted susceptibility (CS), radiated emissions (RE), and radiated susceptibility (RS) are described and accompanied by illustrations. The relationship between system EMC specifications (such as MIL-E-6051), and component specifications (MIL-STD-461/462) is discussed. Also included is a discussion of MIL-STD-1818 for Air Force applications. NATO, United Kingdom, RTCA, EUROCAE, and SAE standards are described briefly. The replacement of military standards by commercial standards is reviewed briefly.

Part V: EMC Measurements

Topics in the chapter *Methodology for Electromagnetic Interference Measurements* include measurements and measurement environments such as: (1) anechoic chambers, (2) open area test sites, and (3) guided wave structures. Electric and magnetic field standards for radiated measurements are described.

A chapter on standard antennas for electromagnetic compatibility measurements describes standard techniques and instrumentation for measuring near-field and far-field EM fields. The electrically-short dipole and resonant half-wave dipole are illustrated as standards for electric field measurements. Descriptions of magnetic field measurement techniques using loop sensors (antennas) are also included. The requirements, parameters, desired characteristics, and layout of EMC compliance test facilities are also described.

Alternatives to conventional test facilities, such as open area test sites and shielded/anechoic chambers, are described. Typical alternative sites considered include TEM and GTEM facilities, mode-stirred or reverberation chambers, and combined TEM and reverberation hybrid chambers.

Part VI: Radio Systems, Sparks and Pulses, Biological Effects, Fiber Optics, and Plasmas

A chapter addresses the increasing importance of EMC in the face of rapidly increasing radio services. The essentials of typical radio communication systems and subsystems are described briefly, including the effects of various noise sources on radio performance.

Radio Systems Parameters and Performance Criteria Concerning Computation and Mitigation of EMI Effects covers methods to define, analyze, and compute system parameters and performance characteristics for desired and undesired signals.

A brief treatment of electrostatic discharge (ESD) describes the ESD event, the threat, the ESD current waveforms, models, and ESD radiation. ESD prevention and control techniques, including ESD test programs, are presented.

Basic lightning phenomena, characteristics, and the probability of being struck by same are described. Lightning effects for direct and indirect strikes on systems and facilities are categorized. The approaches for the protection of facilities, equipment, and aircraft are illustrated.

A section is included on the high altitude properties of EMP (HEMP). Coupling to long lines and apertures, including analytical approaches, is discussed. Protection techniques against HEMP are outlined. A brief description of HEMP testing is included.

In the chapter on biological effects of electromagnetic fields, a brief section addresses mechanisms of interaction between electromagnetic fields and biological materials, including the effects of low-frequency, RF, microwave, and pulse-modulated fields.

Modern optical fiber communications are described, including the classification and features of the optical fibers. The analysis of optical fibers is developed, and noise and EMI particular to optical communication systems are discussed.

A brief analysis of plasma effects in EMC covers the various aspects of spacecraft charging which create plasmas. Spacecraft sheaths, sheath waves, sheath currents, and sheath wave propagation are described.

Part VII: Practical Problem Solving in EMC

The final chapter includes descriptions of eight EMC problem and solution cases presented in Appendices A to H. These provide practical applications of many topics covered in the previous chapters. Comprehensive author and subject indices are included at the end of the book.

Summary

This highly technical book is recommended for electronic engineers and anyone else who needs a comprehensive reference in the field of EMC. It can satisfy a reader with a bent for mathematics, but can also be used as a more general reference. The mathematical models and illustrated computational techniques provide at least a good start for developing other computational models to solve for emission, immunity, coupling, and other aspects of EMC. The end of the individual chapters contain references for additional information on specific topics. The book could be used selectively as a text for a course on EMC, and is also recommended as a supplementary reference.

1995 EMC Society Member Survey

BY
DANIEL HOOLIHAN
VICE PRESIDENT,
EMCS

The first statistical survey of the total membership of the EMC Society was completed in late 1995 and the results have been summarized and an initial analysis detailed in a written report.

The immediate impetus for the survey was a meeting of the executive committee of the EMCS Board of Directors in January of 1995. While discussing the long-range plan of the Society, it was decided that more information was needed on our members' wishes in order to formulate a more specific near- and middle-term course of action for the Society. At the March BoD meeting, the full board authorized a special expenditure to perform the survey in 1995.

The EMCS contracted with the IEEE Office of Strategic Planning and Institutional Research (SP/IR) in April of 1995 to perform the survey. The focus of the survey was to assist the EMC BoD in clarifying our members' needs and desires in terms of services from the Society.

The survey process covered three phases: Product Development, Sampling and Mailing, and Analyses/Report. In the Product Development phase, a list of topics from the EMCS BoD was submitted to SP/IR, the topics were developed into questionnaire format, modifications were discussed with the BoD and a final questionnaire was agreed upon. In the second phase of the process, a random sample of 1000 members (approximately 25%) was drawn from an international membership database, postcards were mailed to all sampled members (the postcard informed them of their selection for the survey and alerted them to the pending arrival of the questionnaire), the questionnaire was mailed, and, one month after the first mailing, a second questionnaire was mailed to those members who had not responded. The Analyses and Report was the final phase and this has been mostly completed, although the data base will be available for further analysis as the BoD desires.

The response rate of the surveyed members was an impressive 51% which is much higher than most surveys, which average around a 20% return rate. The U.S. response rate was 57% and the non-U.S. rate was 41%. Some of the key findings of the survey were:

- ◆ 46% of EMC members are currently employed in private industry.
- ◆ 17% of United States EMC members are retired.

There is a bimodal distribution of years of EMC experience:

- ◆ 27% of our members have less than 5 years of experience. 26% of our members have 20 or more years of experience.
- ◆ 32% of U.S. members have a salary in the range of \$60-80,000. 22% of Non-U.S. members have a salary in the range of \$60-80,000.

In terms of years of EMC membership:

- ◆ 32% of U.S. members have less than 5 years of experience. 41% of U.S. members have 10 or more years of experience. For non-U.S. members, the respective percentages are 61 and 14.

Other findings were:

- ◆ 30% of those willing to pay an increase in dues wanted to see more EMC short courses and videotapes.
- ◆ 50% of our members joined the EMC Society to keep abreast of new EMC developments.
- ◆ 30% joined for professional development opportunities.
- ◆ 40% listed access to new technical information as an important benefit of being an EMC member.
- ◆ 30% listed symposium proceedings as an important benefit.
- ◆ 10% suggested some form of electronic communication services (Internet/World Wide Web) as an area for development for the EMC Society. (The survey was completed before the EMC Society had its Home Page available on WWW).

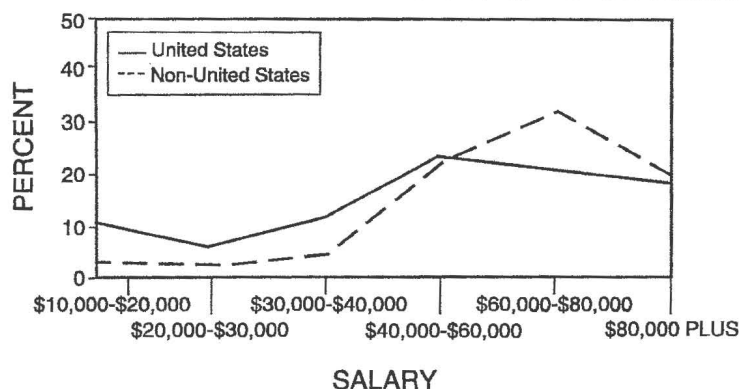


Table 1. Present Annual Base Salary — United States and Non-United States.

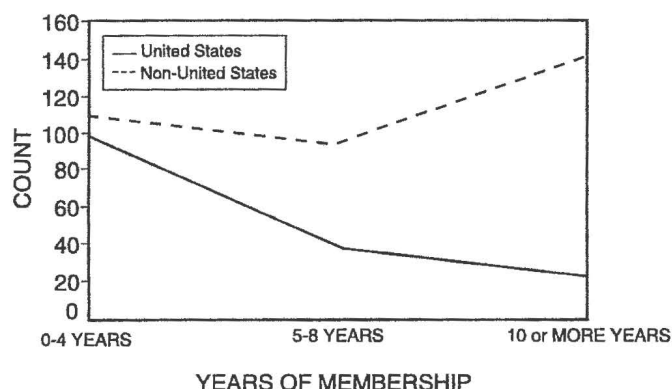


Table 2. Years of Membership in EMCS.

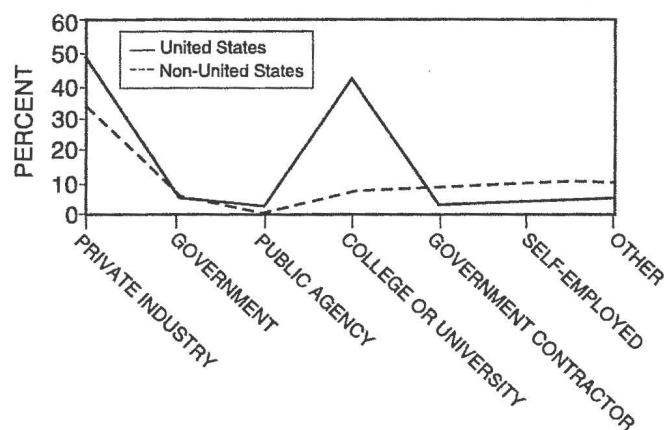


Table 3. Types of Current Employment.

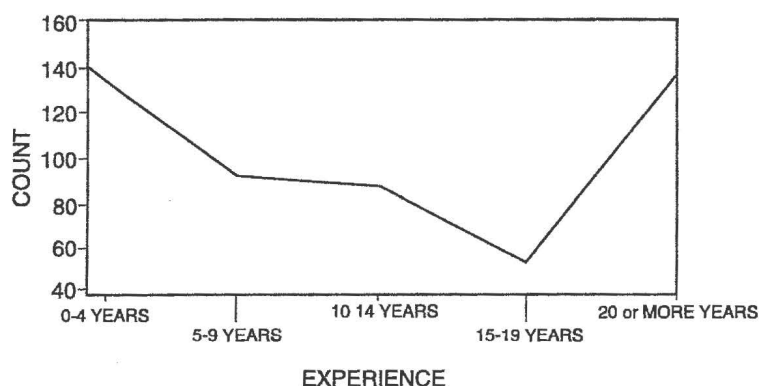


Table 4. Years of Professional EMC Experience.

- ◆ 93% of EMC members read technical information from EMC Society Transactions.

Table 1 compares present annual base salaries for U.S. and non-U.S. EMC members. It can be seen that the peak salary range for U.S. members is higher than the corresponding peak salary range for non-U.S. members. However, in both cases, about 20% of our members make more than \$80,000/year.

Table 2 compares years of membership in the EMC Society for U.S. versus non-U.S. members. This graph indicates that the fastest growing part of our membership is non-U.S. due to the large number of members with few years of membership in the EMCS.

Table 3 compares the type of current employment for U.S. and non-U.S. members. It can be seen that private industry is the largest employer of EMC people in the United States while colleges/universities are the largest employer outside the United States with private industry a close second (43% versus 34%).

Table 4 shows the years of professional EMC experience for our members.

The EMC Society would like to thank Pat Holst and Henry Shein of the IEEE Office of Strategic Planning and Institutional Research for their excellent work on this survey. Although this survey was coordinated on a one-time basis by the Member Services Director (Hoolihan), in the future, total membership surveys and select symposium surveys will be centralized in the Member Survey Committee (chaired by Dick Ford) under the Professional Services Director (currently Norm Violette).

Future articles in this newsletter will address in more detail the open-ended questions and the variety of answers received. Questions or inquiries on additional details on this survey may be addressed to the author at 612-638-0250 or (FAX) 612-638-0285 or dhoolihan@tuvps.com

The 1995 Atlanta Symposium Survey

BY
DICK FORD

Two years ago Bill Johnson stepped down as subcommittee Chair of what has traditionally been called the Employment Analysis Committee. I volunteered to take his place. Hence this is my second year doing the Symposium Survey. Also, as noted in Dan Hoolihan's article (see page 12) on the IEEE Headquarters mail survey of the EMCS, the scope of the old Employment Analysis Committee has been expanded to surveys and their analyses in general, hence its new name "Surveys and Analysis Committee." In support of this new charter I plan, in a future issue, to try to relate the two surveys discussed in this Newsletter.

As to this, the traditional Symposium Survey, depending on the particular symposium, folks involved and other accidents of fate, we've historically gotten sample sizes of between 70 and 280. Admittedly, the samples are biased and their sizes are usually too small to produce confident answers to some of the questions we asked. We're working to eliminate these problems. We made some small changes to the survey this year. Some of these changes helped and others we're not sure about. First, as they say, the numbers... We had 179 respondents (over 20% participation) with membership and country status as shown in Figure 1.

Figure 2 shows the age distribution of attendees, comparing EMCS members with nonmembers. Note the bimodal shape of the age of EMCS members. Figure 3 shows the EMC experience of attendees, again, comparing members with nonmembers. It also reflects a bimodal distribution for EMCS members, but less pronounced. This data complements the data from the IEEE mail survey discussed in Dan's article. The IEEE data accentuates the bimodal behavior because it lumps all experience above 20 years in one "bin."

One new question this year addressed previous symposium survey participation. Though it did not get as good a response rate as we had hoped (only about 50%), the answers were quite helpful in analyzing

several questions. The results from this question are displayed in Figure 4. Note that the lower response levels in 1990 to 1992 only reflect small survey sample sizes for those years. It seems that about half of the symposium attendees are "regulars," i.e., they come nearly every year. Note also that over 80% of the '95 attendees came at least once during the prior five years. Note also that there is little differences between members and nonmembers with respect to "regular" symposium attendance.

Figure 5 shows the distribution of formal degrees of the attendees. To gain more information, this year we broke out three categories of Bachelor degrees, BSEE, BSET, and BS/BA. Note that there were no BSET's among the EMCS respondents. Note also the very high percentage of Ph.D.'s among the non-U.S. attendees. Overall, the EMCS distribution is similar to that from last year.

Figure 6 is data for Chapter meeting attendance. We changed the question slightly to ask if a local chapter was available. We looked at this detail because the rate of chapter activity changed so significantly between the Chicago (94 EMCS ALL) and the Atlanta Symposium (95 EMCS ALL). At first I thought I'd reversed the data order! Comparing the regular vs. occasional symposium attendees in 1994 and 1995 explained the difference. The participation levels between the local or "non-regular" symposium attendees in Chicago (an unknown subset that can be extrapolated from 94 EMCS ALL) and in Atlanta (EMCS 95 ONLY) was dramatically different with much higher chapter activity in Chicago! Perhaps the most interesting data in this figure is that nearly 30% of non-society members attend chapter meetings at least occasionally.

Figure 7 shows readership levels of the Newsletter and the Transactions. Readerships levels are very similar to previous data showing good levels for the Newsletter but not so good for the Transactions. However this data does show that levels for the Transactions are up slightly ("mostly" is up about ten points).

NARTE certification continues to be the most popular registration. As shown in Figure 8, 31% of the U.S. EMCS respondents are NARTE-certified engineers. 8% of the non-U.S. EMCS members

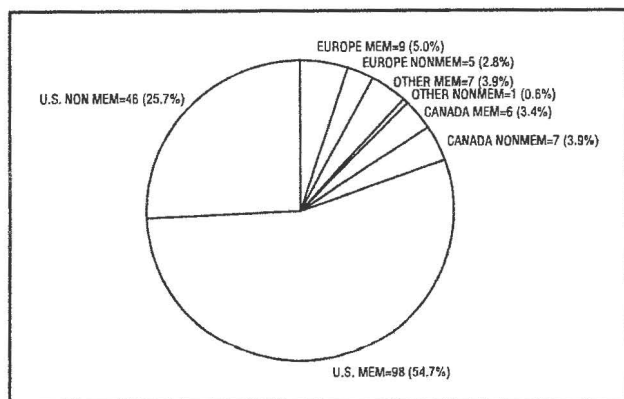


Figure 1. Membership and Country Status.

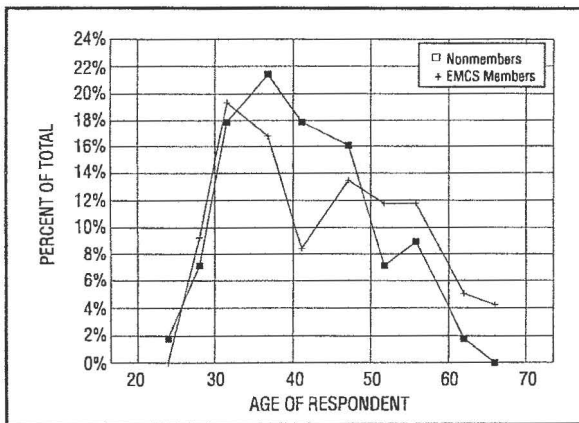


Figure 2. Age Distribution of Attendees.

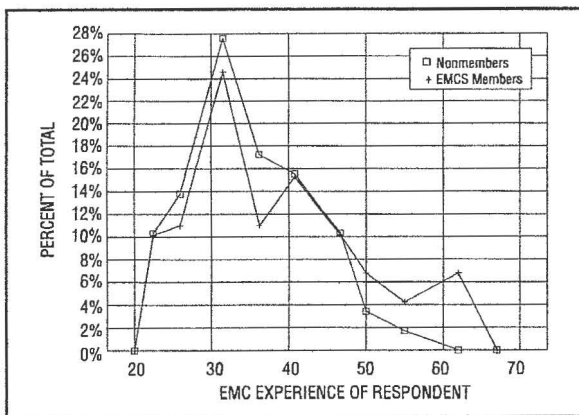


Figure 3. EMC Experience of Attendees.

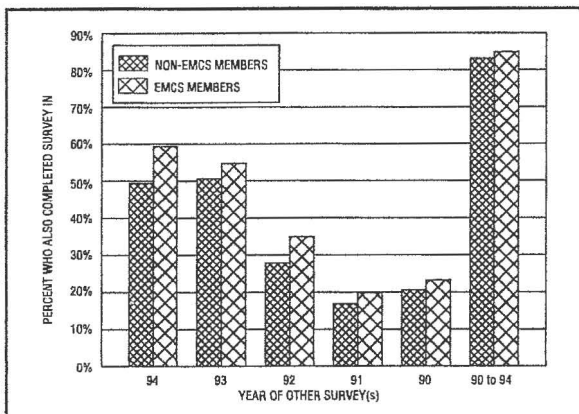


Figure 4. Previous Survey Participation.

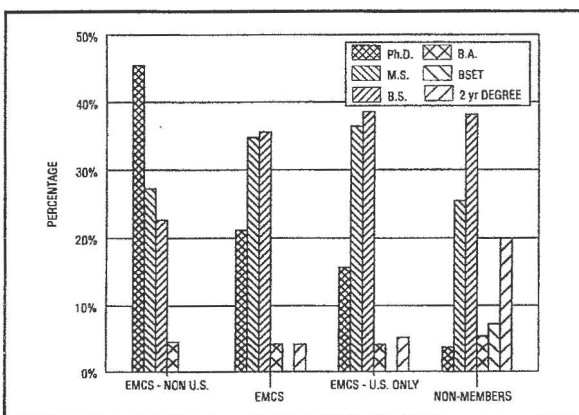


Figure 5. Formal Degrees of Attendees.

are also NARTE-certified. One has to wonder how much greater this would be if NARTE dropped the N (National). The EIT levels were quite a bit higher this year, and for the most part this reflected the status of the local/occasional symposium attendee.

Figure 9 shows that most symposium attendees are from the commercial area rather than government or defense. Perhaps most interesting is the uniformity across the four categories of attendees shown and that for the categories shown, the U.S. EMCS member attendee is the most likely to work for the government or in defense.

Figure 10 shows specialty areas. This reflects data from question 19 on the questionnaire. Based on an examination of problems in responses to previous years' questionnaires, we changed a number of the questions for the Atlanta Symposium relating to work experience. We tried to change as little as possible. In general these changes helped, but for question 19 this may have been a mistake, since it appears that the many folks who attend symposiums routinely (and hence repeatedly filled out the questionnaire) were fooled by changes on this question. A number of respondents just skipped this question, many others filled it out based on the instructions on previous year's forms. In any case, I culled only those respondents whose percentages added up correctly (and hence could be assumed to have entered the data correctly). This reduced the response rate to about 55%. Most of the respondents who listed "OTHER" listed "EMC/EMI" as the "other specialty" work area. Interestingly, the respondent's data shows that a considerable percentage of DoD is working on high power microwaves (HPM) issues.

The question on "Work Arenas" had a very good response rate. This data is shown in Figure 11. I mention this response rate to contrast it with the data in Figure 10. Of some interest is that a look at the details for those listing research shows that we may need to list teaching as a choice. A high percentage of those listing research are at universities and have Ph.D.'s. Though clearly a part of their work is research, for many, teaching is their main job.

Figure 12 shows salary vs. experience for Bachelors of Science and Masters of Science. The EMCS data is for members only, and unlike last year, including the nonmember responses did make a difference (however including non-U.S. data did not - as in Dan's IEEE-conducted mail survey). Moreover this data looks very different from the EMCS Chicago symposium and IEEE USAB data we published last year. Once again the local (or occasional) symposium attendees made "mischief." The data last year showed a fairly stable U.S. \$7K to \$9K benefit for having a Masters Degree as opposed to just a B.S. This year the whole middle of the data curve is reversed! But by looking at the zip codes and whether they attended last year, I created a kind of "centroiding effect" for the "local attendees" for both the M.S. and B.S. curves. Those centroids (marked LP on the figure), for whatever reason, pulled the B.S. curve up but pulled the M.S. curve down. They had little effect at the top pay because most respondents in this category were "regular attendees." At the thirty-year experience mark, the agreement with last year is good, showing about a 3 to 4% salary increase (probably due to inflation).

The last figure, Figure 14 (yes I skipped 13 - so as to not tempt the Fates), summarizes the respondents' feeling about the future. Continuing from last year, optimism remains very high, especially in the commercial sector. In fact, I looked at about a dozen subsets of the data. I could only find one pessimistic subgroup: government civil servants who are not EMCS members. This is understandable given that downsizing has so affected their lives. But note that this contrasts with the fact that

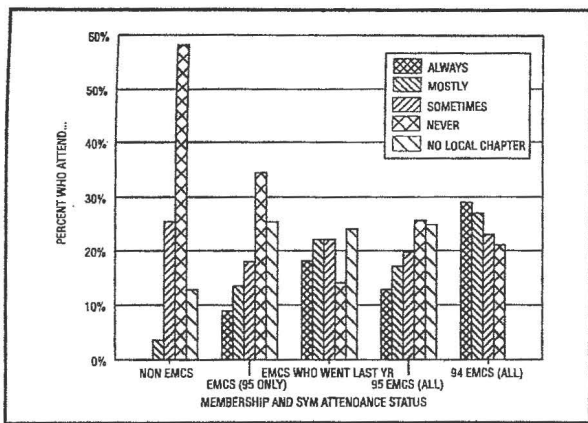


Figure 6. Chapter Meeting Attendance.

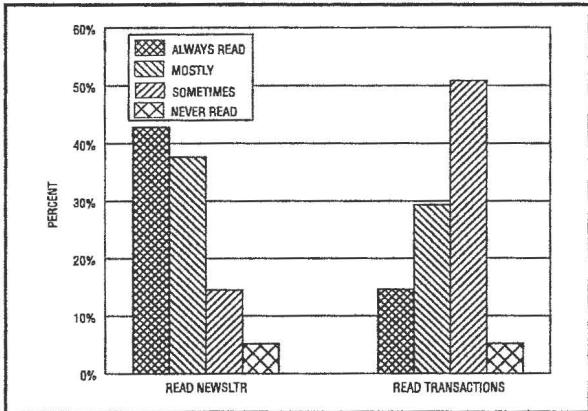


Figure 7. EMCS Publications Popularity.

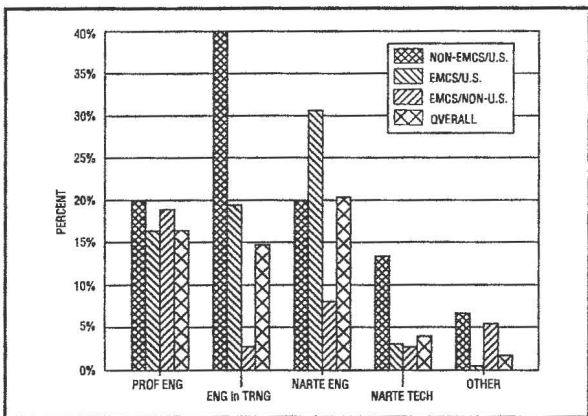


Figure 8. Registration/Certification.

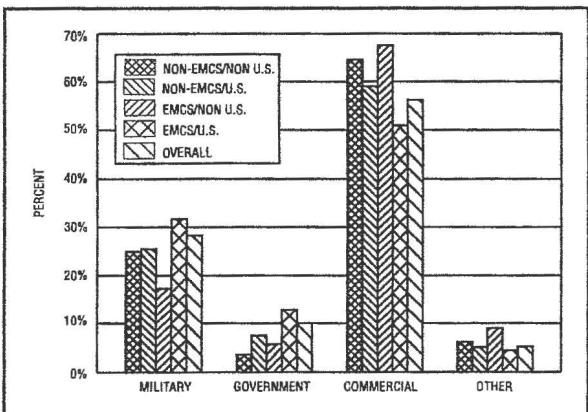


Figure 9. Work Sponsorship.

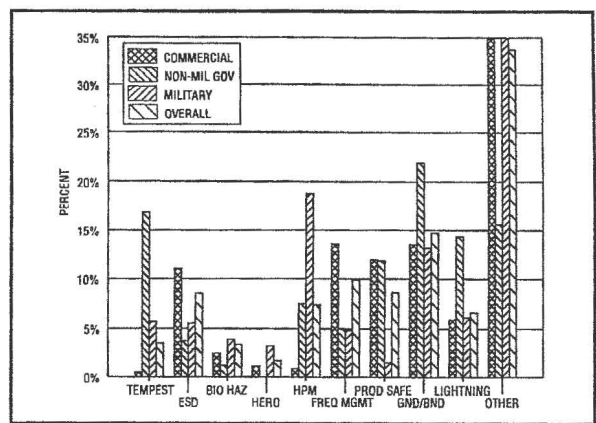


Figure 10. Specialty Area.

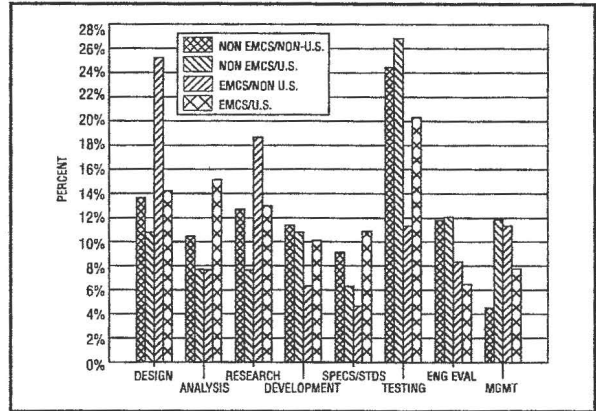


Figure 11. Work Arenas.

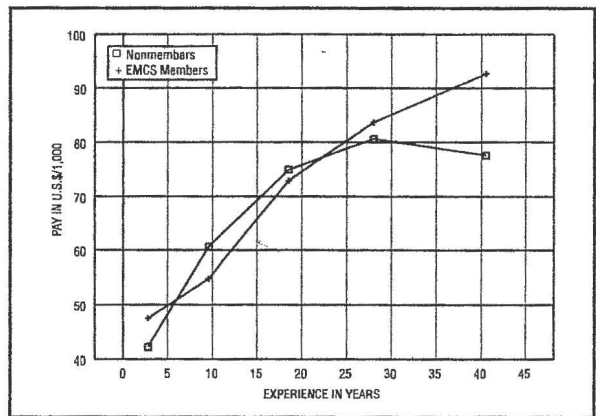


Figure 12. Pay vs. Degree and Experience.

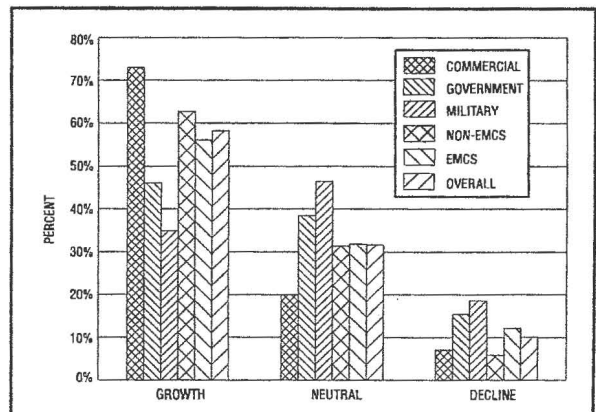


Figure 14. Future Expectations.

government EMCS members were the most optimistic last year (they're still quite optimistic).

As concerns general observations, an interesting question is: Who are the nonmembers? Looking at both the '95 and '95 data, nonmembers tend to be slightly more government, more non-U.S., more full-time in non-EMC jobs, more non-college graduates, and most significantly, they are younger. As mentioned last year, this highlights the value of reaching out to students and young engineers to emphasize the value of EMCS membership. The data this year (Figure 6) showing chapter activity of nonmembers emphasizes possible value in recruiting at the chapter meetings.

So where do we go from here? As concerns the Symposium survey, 179 folks took time to fill out a survey during a very busy week. To those reading this article as well as those who filled out the survey — thanks! But it's clear that the symposium survey must be shortened to something compatible with who is at the symposium and what they're doing (running for a quick coffee break or to the next paper session). My view is that our primary effort should be to survey symposium attendees about symposium issues; perhaps even more to the point, about issues on which their "at-the-time" views matter most. Next, I would list other society issues, and lastly, I'd consider larger issues, such as professionalism, the role of IEEE, etc. Conversely, the mail survey will fill in the larger EMCS picture. Present feelings are that the mail survey will be done every three to five years and a smaller, more symposium-focused survey will be conducted at each year's symposium. What do you think?

A copy of the Symposium questionnaire is available for your reference. If you have any questions concerning data that is not covered in the article call me at (202) 767-3440.

"My view is that our primary effort should be to survey symposium attendees about symposium issues; perhaps even more to the point... about issues on which their 'at-the-time' views matter most."

— Dick Ford

Bioelectromagnetics

In an effort to educate EMCS members about issues central to other societies, the Newsletter occasionally publishes information about their activities. Following are names of selected articles from the journal *Bioelectromagnetics*, the Journal of the Bioelectromagnetics Society, the European Bioelectromagnetics Society, and the Society for Physical Regulation in Biology and Medicine.

For more information about the journal, contact the Editor, Ben Greenebaum, University of Wisconsin-Parkside, Box 2000, Kenosha, WI 53141-2000. 414-595-2140; Fax 414-595-2056. Internet: bems@cs.uwp.edu

For member subscription information, contact the Society at 7519 Ridge Road, Frederick, MD 21702-3519. Thanks to J. Blanche for submitting this information.

VOLUME 17, No. 1, 1996

Selected articles

Magnetic Fields at Resonant Conditions for the Hydrogen Ion Affect Neurite Outgrowth in PC-12 Cells: A Test of the Ion Parametric Resonance Model, *Maria A. Trillo, Alejandro Ubeda, Janie P. Blanchard, Dennis E. House, and Carl F. Blackman*

Theoretical Analysis of Magnetic Field Interactions With Aortic Blood Flow, *Y. Kinouchi, H. Yamaguchi, and T.S. Tenforde*

Raman Spectroscopic Evidence for Structural Changes in Poly-L-Lysine Induced by an Approximately 50 mT Static Magnetic Field, *Surendra P. Verma and Ronald B. Goldner*

Absence of Relation Between Sick Leave Caused by Musculoskeletal Disorders and Exposure to Magnetic Fields in an Aluminum Plant, *Bente E. Moen, Per Arne Drablos, Svein Pedersen, Malvin Sjoen, and Georg Thommesen*

Effect of Low-Intensity Millimeter Wave Electromagnetic Radiation on Regeneration of the Sciatic Nerve in Rats, *L.I. Kolosova, G.N. Akoev, V.D. Avelev, O.V. Riabchikova, and K.S. Babu*

Cell Culture Dosimetry for Low-Frequency Magnetic Fields, *Francis X. Hart*

Dynamic Properties of Lednev's Parametric Resonance Mechanism, *Stefan Engstrom*

SUPPLEMENT 3, 1995

Selected Articles

A 60 Hz Electric and Magnetic Field Exposure Facility for Nonhuman Primates: Design and Operational Data During Experiments, *Walter R. Rogers, Jeffrey H. Lucas, William E. Cory, John L. Orr, and Houston D. Smith*

Detection Thresholds for 60 Hz Electric Fields by Nonhuman Primates, *John L. Orr, Walter R. Rogers, and Houston D. Smith*

Initial Exposure to a 30 kV/m or 60 kV/m 60 Hz Electric Fields Produces

Continued on next page

Continued from previous page

Temporary Cessation of Operant Behavior of Nonhuman Primates, *Walter R. Rogers, John L. Orr, and Houston D. Smith*

Nonhuman Primates Will Not Respond to Turn Off Strong 60 Hz Electric Fields, *Walter R. Rogers, John L. Orr, and Houston D. Smith*

Exposure of Baboon of Combined 60 Hz Electric and Magnetic Fields Does Not Produce Work Stoppage or Affect Operant Performance on a Match-to-Sample Task, *John L. Orr, Walter D. Rogers, and Houston D. Smith*

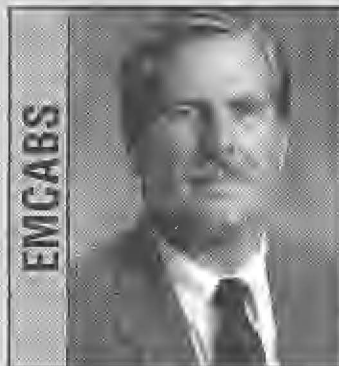
Effects of Concurrent Exposure to 60 Hz Electric and Magnetic Fields on the Social Behavior of Baboons, *Anthony M. Coelho, Jr., Walter R. Rogers, and Stephen Phillip Easley*

Initial Studies on the Effects of Combined 60 Hz Electric and Magnetic Field Exposure on the Immune System of Nonhuman Primates, *Krishma K. Murthy, Walter R. Rogers, and Houston D. Smith*

Chronically Indwelling Venous Cannula and Automatic Blood Sampling System for Use With Nonhuman Primates Exposed to 60 Hz Electric and Magnetic Fields, *Walter R. Rogers, Jeffrey H. Lucas, Brian C. Mikiten, H. Dwaine Smith, and John L. Orr*

Regularly Scheduled, Day-Time, Slow-Onset 60 Hz Electric and Magnetic Field Exposure Does Not Depress Serum Melatonin Concentration in Nonhuman Primates, *Walter R. Rogers, Russel J. Reiter, Lornell Barlow-Walden, H. Dwaine Smith, and John L. Orr*

Brief Communication
Rapid-Onset/Offset, Variably Scheduled 60 Hz Electric and Magnetic Field Exposure Reduces Nocturnal Serum Melatonin Concentration in Nonhuman Primates, *Walter R. Rogers, Russel J. Reiter, Houston D. Smith, and Lornell Barlow-Walden*



WILLIAM H. MCGINNIS
ASSOCIATE EDITOR

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

EMCAB COMMITTEE

Mike Crawford, Consultant
Bob Hunter, Consultant
Prof. Fujiwara, Nagoya Inst. of Technology
Sha Fei, EMC Research Section,
N. Jiatong Univ., Beijing, China
Ferdy Mayer, L.E.A.D., Maisons, Alfort, France
Perry Wilson, EMC Baden, Ltd., Switzerland
Heinrich Gern, Austrian Research Center

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

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

Also, the steering staffs of the Japan Technical Group and the EMC-J Tokyo chapter have offered to act as a central point for requests of papers abstracted here. Most of the papers will be available in Japanese only. Abstracts of papers from EMC-J will be clearly identified. The steering staff will assist in routing your request to the author(s) but will not translate the papers. The contact person is Professor Osamu Fujiwara, Department of Electrical and Computer Engineering, Nagoya Institute of Technology, Gokiso-Cho, Showa-ku, Nagoya 466, Japan; e-mail: fujiwara@odin.elcom.nitech.ac.jp

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

As the EMC Society becomes more international, we will be adding additional worldwide abstractors who will be reviewing articles and papers in many languages. We will continue to set up these informal cooperation networks to assist members in getting the information or contacting the author(s). The library at Southwest Research Institute, 6220 Culebra Road, San Antonio, Texas, 78228-0510 has agreed to catalog, shelve, and have available for interlibrary loans proceedings from symposia and meetings which are donated to the library. Any such donations can be sent to me at the above address and I will review them for suitable articles and then forward them to the SWRI library. We are particularly interested in symposium proceedings which have not been available for review in the past. Thank you for any assistance you can give to expand the EMCS knowledge base.

A PROCEDURE FOR DESIGNING EMI FILTERS FOR AC LINE APPLICATIONS**EMCABS: 01-05-96**

Fu-Yuan Shig (1), Dan Y. Chen (2), Pan-Pei Wu (1), and Yie-Tone Chen (3)
(1) EE Dept., National Taiwan University, Taipei, Taiwan, (2) EE Dept.,
VA Polytechnic Institute and State U., Blacksburg, VA, (3) EE Dept., National Yunlin Institute of
Technology, Tou-Liu City, Taiwan
IEEE Transactions on Power Electronics, Vol. 11, No. 1, January 1996, pp. 170-181

Abstract: The authors use the "noise separator" documented* to separately define the common-mode (CM) and differential-mode (DM) filtering action of typical line filters with practical component values. The design procedure addresses the low frequency range (below which parasitic elements do not control) in detail and broadly treats the high-frequency range as being "beyond the scope of the paper." The procedure uses network theorems to separately design CM and DM (and joint) component values in a practical way. Two design examples, one for a flyback converter and one for a forward switching power supply, describe filters designed to meet the low-frequency VDE limits for conducted noise.

*T. Guo, D. Chen, and F.C. Lee, "Separation of Common-mode and Differential-mode Conducted EMI Noise," Proceedings of the High Frequency Power Conference, Apr. 1994, San Jose, CA.

Index terms: Noise separator, low-frequency design of line filters, conducted noise measurement, switch mode power supply noise.

JOINT DESIGN METHODOLOGY BASED ON THE ELECTROMAGNETIC SHIELDING EFFECTIVENESS CAPABILITIES**EMCABS: 02-05-96**

Behzad Mottahed and Souran Manoocheri
AT&T Bell Labs, Whippany, NJ and Stevens Institute of Technology, Hoboken, NJ.
IEEE Transactions on Components, Packaging and Manufacturing Technology - Part B, Vol. 19, No. 1, February 1996, pp. 238-247

Abstract: The objective of this paper is to provide guidance for the design of enclosure joints to maximize shielding effectiveness (SE). Six joint geometries are investigated experimentally by using a two-cavity arrangement for measuring SE. The 38 references cited in the paper provide a good survey of the literature. The effects of gap size and joint tolerances are investigated. Some attention is paid to the test protocol for measuring shielding effectiveness.

Index terms: Shielding effectiveness (SE), joint design, gap size, joint geometry, manufacturing tolerances

ELECTROMAGNETIC COMPATIBILITY IN THE AUTOMATION OF ELECTRICAL POWER SYSTEMS AND THE ACTIVITIES OF CEPEL**EMCABS: 03-05-96**

J. Saad J., M. Quintais F.B., L.C. de Oliveira C., M.V.F. de Figueiredo
Centro de Pesquisas de Energia Elétrica, Av 1 s/n Cidade Universitária/ Ilha do Fundão, Rio de Janeiro- RJ-20001-970, Brazil
1994 International Symposium on EMC, ISEMC 94 Proceedings, pp 34-39. Rebouças Convention Center, São Paulo, Brazil, December 05-09, 1994,

Abstract: The rising level of automation of the electrical power system is an irreversible trend, despite the hostile electromagnetic environment faced by digital equipment in power plants and substations. Power system digital control and monitoring equipment must be reliable, especially when the most adverse electromagnetic conditions occur. This paper presents an electromagnetic compatibility (EMC) outlook on power system substations and the major activities of CEPEL related to achieving the required EMC. Short term difficulties and needs are discussed. A structure of digitalization scheme for substations and power plants that optimize EMC has been adopted and is presented in the paper.

Index terms: electromagnetic environment, power plant automation, electromagnetic immunity

A COMPARATIVE APPROACH OF IMPULSIVE NOISES MODELS IN PROBLEMS OF ELECTROMAGNETIC COMPATIBILITY**EMCABS: 04-05-96**

V. Ya Kontorovich, R. Linares y Miranda, G. Santana
CINVESTAV del IPN, EE Dept., Communications, Apdo. Postal 14-740, 07000 México, D.F. 1994
International Symposium on EMC, ISEMC 94 Proceedings, pp 97-100. December 05-09, 1994, Rebouças Convention Center, São Paulo, Brazil

Abstract: This paper compares the well-known models of impulsive noises with "Stable Process," from the point of view of their use in EMC problems. It's shown that such use is less advantageous, because it requires a substantial modification of all measurement sets, methods, standards due to man-made noise, atmospheric noise and so on. Principal advantages of the stable process model can be realized with the help of other well-known models.

Index terms: impulsive noise, modeling

ON UNDESIRE D RADIATION FROM SUBSURFACE RADAR**EMCABS: 05-05-96**

Toshifumi Moriyama, Yoshio Yamaguchi, Hiroyoshi Yamada, and
Takco Abe
EMC-Japan meeting at Nigata Institute of Technology
Nov. 17, 1995, EMCJ95-63

Abstract: In recent years, various subsurface radars have been investigated. The requirement for subsurface radar is the ability of high resolution and the detection of deep objects underground. Therefore, the radar must use high power with wide-band spectrum. However, all of the wave radiated from the radar does not necessarily penetrate underground, resulting in undesired radiation into the free space. In order to detect deep objects and reduce undesired radiation to free space, this report discusses the position and structure of a horn antenna based on the FD-TD method.

Index terms: Subsurface radar, undesired radiation, FD-TD method

CALCULATION OF D. RADIATION AND SCATTERING PROBLEMS BY A FEW BEM- HYBRID APPROACH**EMCABS: 06-05-96**

Thomas F. Eibert and Volkert Hansen
Institut für Hochfrequenztechnik, Ruhruniversitätsstrasse 150, 44780 Bochum, Germany 1994
International Symposium on EMC, ISEMC 94 Proceedings, pp 91-96. December 05-09, 1994, Rebouças Convention Center, São Paulo, Brazil

Abstract: This paper addresses the combining of the best field calculation features from finite element method (FEW) and boundary element method (BEM) to arrive at an approach which is more easily utilized and is less computationally intensive. A 3-dimensional approach is presented which is based on triangular boundary elements.

Index terms: electromagnetic fields, finite element method, boundary element method.

THE DUAL-FEED SYSTEM DESIGN FOR PARABOLOIDAL CATR

J.R. Descardecı and Dr. C.G. Parini

QMW College, University of London

1994 International Symposium on EMC, ISEMC 94 Proceedings, pp 101-105.

December 05-09, 1994, Rebouças Convention Center, São Paulo, Brazil

EMCABS: 07-05-96

Abstract: This paper presents a new extrapolation technique for synthesis of a Dual Reflector Feed System (DRFS) to be used in compact Antenna Test Ranges (CATR). An example of this technique is shown and results are presented, demonstrating the validity and possible enhancement of actual CATR systems.

Index terms: Compact Antenna Test Ranges, antennas

MAGNETIC NEAR FIELD AROUND A PRINTED CIRCUIT BOARD

Teruo Tobana, and Yoshio Kami

EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo

July 20, 1995, EMCJ 95-20

EMCABS: 10-05-96

Abstract: Radiated emissions from a printed circuit board (PCB) is an important topic in the field of EMC/EMI. Magnetic fields generated on a PCB of finite area backed with copper foil are considered experimentally. Representative lines of a trace located at the center of the PCB (center model) and near the edge (off-center) model are used for measurement. Experimental results show that the field levels of the center model are lower than that of the off-center model. This suggests that an increase in radiated emission would occur if PCB traces are located near the edges of the PCB. The experimental results of the common-mode currents on the conductor lines attached at the fringe of the ground plane show the fact that the magnitude of the fields for the line parallel to the signal-line path is larger than one perpendicular to the path. Results also shows that the computational results of the fields yielded by taking into account the vector potentials due to the currents on the line-section and at the line terminals are in good agreement with the experimental results in the vicinity of the signal line.

Index terms: PCB, near field, magnetic field, EMI, common mode

RADIATED AND INJECTED MEASUREMENTS

Prof. J. Perini and Lawrence S. Cohen

EE Dept., Syracuse University, 5207 S. Atlantic Av. Ap 1221,

New Smyrna Beach, FL 32169-4558 and Search Radar Branch, Radar Div., Naval Research Lab., Washington, DC 20375-5000

1994 International Symposium on EMC, ISEMC 94 Proceedings, pp 107-111.

December 05-09, 1994, Rebouças Convention Center, São Paulo, Brazil

EMCABS: 08-05-96

Abstract: Radiated tests, for very high field intensities, require the use of quite expensive installations and equipments. This paper discusses a unique approach to the injection of voltages and/or currents to appropriate places in the equipment under test (EUT). Described is the theoretical analysis of the EUT to allow the use of injected voltages and/or currents to evaluate the radiated immunity of the equipment.

Index terms: radiated immunity, injected measurements

A STUDY ON BULK CURRENT INJECTION METHOD

Shigenobu Tajima, Kazuhisa Yoshida, and Koh Takeoka

EMC-Japan meeting at Kyoto University

Sept. 20, 1995, EMCJ 95-33

EMCABS: 11-05-96

Abstract: This report examines the difference of the induced current against the impedance or length of signal line of equipment under test in Bulk Current Injection method. It is shown that the condition which the induced current reaches to the maximum was found. The maximum induced current is generated when the length of signal line is 1/4 wavelength when the frequency is less than 50 MHz. It is also found that the length of signal line needs to be determined for each test frequency to get the maximum induced current when frequency is more than 50 MHz.

Index terms: Bulk current injection method, immunity, induced current, signal line resonance

LIMITATION OF BULK CURRENT INJECTION TESTS

Oren Hartal

Electronic System Division, RAFAEL A.D.A., Israel

Proceedings of the 1995 International Conference on EMI and EMC (INCEMIC), Madras, India, 6 - 8 December 1995, pp. 386-393

EMCABS: 09-05-96

Abstract: Analytical analysis and laboratory tests are described, which highlight some limitations of the bulk current injection method for radiated susceptibility tests. A typical MIL-STD 462 RS 03 test setup was analyzed using the Numerical Electromagnetic Code II. Large variations of the EUT cable port signal were indicated when tested using the field irradiation and bulk current injection methods. The bulk injection method can be used up to 30 MHz. Above this frequency, radiated field tests should be preferred.

Index terms: bulk current injection, radiated susceptibility test

COUPLING OF A TRANSIENT NEAR-FIELD TO A TRANSMISSION LINE

Masafumi Kimura, and Yoshio Kami

EMC-Japan meeting at Nigata Institute of Technology

Nov. 16, 1995, EMCJ 95-55

EMCABS: 12-05-96

Abstract: The coupling response of an external transient electromagnetic field to a transmission line is considered. To verify the line equations for a transmission line excited externally by a transient near-field, an experiment is conducted: the model field is generated by a monopole antenna supplied with a step-like source, which is installed in the vicinity of the transmission line. The waveform of the step-like voltage source is decomposed of the discrete spectrum components by using the technique of Fourier transform. The frequency-domain field-components affecting the transmission line are estimated by using the moment method, and then the induced voltage in the frequency domain at the terminal load is converted into the time domain voltage by using a technique of the inverse Fourier transform. Comparison between the measured and the computed results shows the verification of the line equations. Moreover, the coupling mechanism is discussed from the experimental results; the response seems to consist of components received at both line terminals, where the affecting fields are those from the bottom and the top of the monopole antenna, and in addition, the multi-reflected for the non-matched line.

Index terms: Electromagnetic interference, coupling, line equations, moment method, transient near-field

ON THE EFFECTS OF FINITE GROUND PLANE ON SITE ATTENUATION

Jiro Iwashige, Kwang Yeol Yoon, and Ki-Chai Kim
EMC-Japan meeting at Nigata Institute of Technology
Nov. 17, 1995, EMCJ95-68

EMCABS: 13-05-96

Abstract: The extent of a rectangular conducting plane for measuring electromagnetic interference is discussed. When mutual coupling between the transmit and receive antennas is negligible, the effects of the edges of the ground plane on the normalized site attenuation (NSA) are considered by applying GTD. The calculation was done for the case that measuring distance(d) was 3m or 10m, and for both horizontal and vertical polarizations. As a result, the size of the rectangular ground plane, ($3d \times 2d$), in conformity to the CISPR standards, almost never affects upon NSA for horizontal polarization, but for vertical case, when both width and length of the rectangular plane are several times as long as d, the effects of the edges are reduced under 1d.

Index terms: Open site, finite ground plane, NSA, infinitesimal dipole, GTD

RECENT TECHNIQUES IN ELECTROMAGNETIC MODELING AND ANALYSIS

S.M. Rao and G.K. Gothard
Department of Electrical Engineering, Auburn University, USA
Proceedings of the 1995 International Conference on EMI and EMC (INCEMIC),
Madras, India, December 6 - 8, 1995, pp.131-137

EMCABS: 16-05-96

Abstract: Finite integral technique combined with the measured equation of invariance FIT/MEI and generalized sparse matrix reduction GSMR techniques are used to calculate the electromagnetic fields surrounding an electrically large structure. Several numerical examples are presented to show the validity of these methods.

Index terms: electromagnetic modeling, numerical techniques, Maxwell equations, matrix

MODELING OF BIOLOGICAL MATTER AS BIO-ELECTRIC CIRCUITS AND ITS ADVANTAGEOUS APPLICATIONS IN EMC

Sven Alfars
ELKRAFT, Innovation Dept, Lautruphøj 5, DK-2750 Ballerup, Denmark
1994 International Symposium on EMC, ISEMC 94 Proceedings, pp 174-179.
December 5-9, 1994, Rebouças Convention Center, São Paulo, Brazil

EMCABS: 14-05-96

Abstract: From Maxwell's equations we can deduce the fact that when a medium radiates electromagnetic fields, the source of this radiation - an electric current - exists inside the medium. Biological matter radiates electromagnetic fields all the time. Consequently, biological matter structuring and function can be modeled and described by Bio-Electric Circuits, BEC. The BEC-model provides the explanation of the mechanism of biological matter interactions with the EM environment. Moreover, the BEC model has shown advantageous applications in medicine.

Index terms: BEC, bio-effects, modeling

EMI ANALYSIS OF AUTOMOTIVE VEHICLES AND ITS SUPPRESSION TECHNIQUES

B. Subba Rao and Sisir K. Das
SAMEER - Centre for Electromagnetics, Madras
Proceedings of the 1995 International Conference on EMI and EMC (INCEMIC), Madras, India,
December 6 - 8, 1995, pp.109-117

EMCABS: 17-05-96

Abstract: This paper describes the electromagnetic disturbances from automotive systems and the appropriate suppression techniques. Three methods of measurement of insertion loss of ignition suppressors are used: CISPR 12 box method, model installation laboratory method and field comparison method. Emission measurement results are given.

Index terms: ignition system noise, interference suppression device, insertion loss measurement

CALIBRATION OF ANTENNA FACTOR OF A TUNED DIPOLE USING TWO ANTENNA METHOD, NIST METHOD AND A PROPOSED REFERENCE ANTENNA

Sisir K.Das (1), P.H. Rao (1) and Motohisa Kanda(2)
(1) SAMEER - Centre for Electromagnetics, Madras, (2) NIST, USA
Proceedings of the 1995 International Conference on EMI and EMC (INCEMIC),
Madras, India, December 6 - 8, 1995, pp.263-265

EMCABS: 15-05-96

Abstract: The paper describes the calibration technique of a horizontally polarized tuned dipole antenna for its antenna factor. Three methods are used: two antenna method, NIST dipole method, proposed reference antenna method.

Index terms: antenna factor, reference antenna, antenna under test

CURRENT BRANCHING TESTING JIG FOR CONDUCTED EMISSION TESTS

G.Abdul Latheef, A.P.Sajeev and L.Punitha
SAMEER - Centre for Electromagnetics, Madras
Proceedings of the 1995 International Conference on EMI and EMC (INCEMIC), Madras, India,
December 6 - 8, 1995, pp.166-168

EMCABS: 18-05-96

Abstract: A measurement technique of carrying out the conducted emission (CE) test when high order of AC or DC currents are required to supply the equipment under test. Current Branching Test Jig (CBTJ) is developed and suggested for use as a part of compliance CE testing per MIL-STD 461D for CE 101 and CE 102 tests respectively.

Index terms: current branching test jig, conducted emission, clamp-on current probe

Partnership for Peace Call For Papers

Organizers of the Partnership for Peace (PfP) Symposium on EMC have issued a call for papers. Topics include:

- EM Environment
- Maritime EMI
- Maritime Radiation Hazards
- Use of Commercial Standards in Military Applications
- Interferences Identification and Warning

Five-hundred word abstracts should be submitted before July 31, 1996. Co-sponsored by NATO SWG 10, the University of Florence and MARITELERADAR IT Navy, the conference will take place on October 23, 24, and 25, 1996, in South Miniato, near Florence. For more information, contact University P.O.C, M. Giannini, University of Florence, Electrical Engineering Department, Via C, Lombroso, 6/17, I-50134 Florence, Italy. Tel: +39-55-4796753. Fax: +39-55-4796767. E-mail: giannini@ingfil.ing.unifi.it

Call for Papers for International Symposium on EMC

The 1997 International Symposium on EMC will be held in Beijing, China on May 21-23, 1997. Prospective authors should submit 4 copies of a 35-50 word abstract and 500-700 word summary which explains the contribution, its originality and the relevance to the EMC discipline. They should be sent to: EMC '97/Beijing, c/o Prof. Zhang Linchang, EMC Research Section, Northern Jiaotong University, Beijing 100044, China. The deadline for submission is August 31, 1996.

Calendar

IEEE EMCS Symposia Schedule

1996 Santa Clara, CA:
August 19-23
IEEE-EMC Symposium
Santa Clara Convention
Center, Westin Hotel
Chair: David Hantula,
Silicon Graphics
(415)933-1071;
FAX: (415)962-9439
e-mail:
emc96@olympus.engr.sgi.com
Web:
<http://reality.sgi.com/csp/emc96/index>

1997 Austin, TX: August 18-22
Austin Convention Ctr.,
Hyatt Hotel
John Osburn: (512)835-4684

1998 Denver, CO: August 9-14
Radisson Hotel
T.J. Ritonour:
(303)673-7096

1999 Seattle, WA: August 2-6
Westin Hotel
Bill Gjerfson
(215)591-6478

2000 Washington, DC
Washington Hilton
Bill Duff
(703)914-8450

2001 Montreal, Canada
Montreal Convention
Center
Christian Dubé
(514)633-9679

2002 Minneapolis/St. Paul
Dan Hoolihan
(612)638-0250

EMCS Cooperating Symposia

1996 AMEREM (NEM),
May 21-27,
Albuquerque, NM

1997 Shenzhen, China:
May 21-23

1999 Japan: May 15-17

U.K. Biannually, even
years, in September.

Zurich Biannually, odd years.

Wroclaw Biannually, even
years, in June.

EMC Related Conferences & Symposia

May 27-31
AMEREM 1996
Albuquerque Convention Ctr.,
Albuquerque, NM
Dr. Shyam Gurbayani,
Phillips Lab. (WSM)
3550 Aberdeen Avenue, S.E.
Kirtland AFB, NM 87117
Tel: (505) 846-4604
Fax: (505) 846-0566

June 4
IEEE INSTRUMENTATION
& MEASUREMENT
TECHNOLOGY
CONFERENCE
Sheraton Brussels Hotel &
Towers, Brussels, Belgium
Robert Myers
IMTC/96 - IMEKO TC-7
Conference Coordinator
e-mail: bob.myers@ieee.org
FAX: (310) 287-1851

June 25-28
13th INT'L WROCLAW
SYMPOSIUM &
EXHIBITION ON EMC
Technical Univ., Wroclaw, Poland
Contact: Dr. W. Segal
Tel: +4871 728812
Fax: +4871 728898/729375
e-mail: EMC@ITA.PWR.WRO.PL

August 14-16
18th PIEZOELECTRIC DEVICES CONFERENCE
 The Ritz-Carlton Hotel
 Kansas City, MO
 Components Group
 Electronic Industries Assoc.
 2500 Wilson Boulevard
 Arlington, VA 22201-3834
 Tel: (703) 907-7500
 Fax: (703) 907-7501

August 28 - September 5
ASSEMBLÉE GÉNÉRALE DE L'URSI
 Union Radio-Scientifique Internationale
 and
September 3-5
COLLOQUE INTERNATIONAL SUR LA CEM
 Prof. Auriol,
 École Centrale de Lyon
 Tel: (33) 72186098
 Fax: (33) 78433717

September 3-6
7th INTERNATIONAL CONFERENCE ON FERRITES
 ICF7 - Bordeaux Congrès Service
 Palais des Congrès
 33300 Bordeaux Lac, France
 Mr. V. Cagan, ICF7 General Secretary Office, Versailles
 Tel: (33) 1 39254662
 Fax: (33) 1 39254652

September 17-20
EMC '96 ROMA INT'L SYMPOSIUM ON EMC
 Faculty of Engineering
 University of Rome
 "La Sapienza"
 Rome, Italy
 Prof. Mauro Feliziani
 Tel: +39 6 44858.809/44585.810
 Fax: +39 6 4883235/4825380

October 23-25
PARTNERSHIP FOR PEACE SYMPOSIUM ON EMC
 Centro Studi "I Cappuccini"
 S. Miniato, Italy
 M. Giannini, Univ. of Florence
 Electrical Engineering Department
 Via C. Lombroso, 6/17

1-50134 Florence, Italy
 Tel: +39-55-4796753
 Fax: +39-55-4796767
 e-mail:
 giannini@ingfil.ing.unifi.it

February 18-20
(held every two years)
EMC ZURICH '97
12th INTERNATIONAL ZURICH SYMPOSIUM AND TECHNICAL EXHIBITION ON EMC
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 Zentrum IKT
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May 21-23
INT'L SYMPOSIUM ON EMC
 Beijing, China,
 c/o Prof. Zhang Linchang
 EMC Research Section
 Northern Jiaotong University,
 Beijing

IEEE Administrative Meetings

June 18-19
EAB COMMITTEES and BOARD MEETING
 Le Westin Mont Royal,
 Montreal, Canada
 Rae Toscano: (908) 562-5482

STANDARDS BOARD COMMITTEE MEETINGS
 Le Westin Mont Royal,
 Montreal, Canada
 T. deCourcelle: (908) 562-3807

June 18-24
IEEE BoD SERIES II
 Le Westin Mont Royal,
 Montreal, Canada
 Julie Cozin: (908) 562-3984

June 20
PUB BOARD MEETING
 Le Westin Mont Royal,
 Montreal, Canada
 Rob Colburn: (908) 562-3972

STANDARDS BOARD MEETING
 Le Westin Mont Royal,
 Montreal, Canada
 T. deCourcelle: (908) 562-3807

NEW TECHNOLOGY DIRECTIONS COMMITTEE MEETING
 Le Westin Mont Royal,
 Montreal, Canada
 Jayne Cerone: (908) 562-3908

USAB MEETING
 Le Westin Mont Royal,
 Montreal, Canada
 Deborah Rudolph:
 (202) 785-0170

June 20-22
RAB MEETING
 Le Westin Mont Royal,
 Montreal, Canada
 Mary Ann Hoffman:
 (908) 562-5506

June 21
IEEE FOUNDATION BOARD
 Le Westin Mont Royal,
 Montreal, Canada
 Fern Katronetsky:
 (908) 562-3932

August 10-17
IEEE EXECUTIVE COMMITTEE MEETING
 To be Announced
 Buenos Aires, Argentina
 Julie Cozin: (908) 562-3984

November 1-4
SECTIONS CONGRESS
 Marriott City Center
 Denver, CO
 Carol Coffey: (908) 562-5512

November 4
REGIONS 5&10 MEETINGS
 Marriott City Center
 Denver, CO
 Mary Ann Hoffman:
 (908) 562-5506

November 4-5
REGIONS 2,7 & 8 MEETINGS
 Marriott City Center
 Denver, CO
 Mary Ann Hoffman:
 (908) 562-5506

November 4-6
RAB MEETINGS
 Marriott City Center
 Denver, CO
 Mary Ann Hoffman:
 (908) 562-5506

November 4-7
TAB MEETINGS
 Marriott City Center
 Denver, CO
 Paula Dunne: (908) 562-3919

November 4-8
PUB MEETINGS
 Marriott City Center
 Denver, CO
 Rob Colburn: (908) 562-3972

November 8
EMCS BoD MEETING
 Adam's Mark Hotel
 Denver, CO
 Janet O'Neil: (310) 348-9665

December 8-9
EAB COMMITTEES
 Marco Beach Hilton
 Marco Island, FL
 Rae Toscano:
 (908) 562-5482

December 8-9
STANDARDS BOARD COMMITTEE MEETING and
December 10
STANDARDS BOARD MEETING
 Marco Beach Hilton
 Marco Island, FL
 Terry deCourcelle:
 (908) 562-3807

December 8-12
IEEE BOD SERIES III
 Marco Beach Hilton
 Marco Island, FL
 Julie Cozin:
 (908) 562-3984

December 10
USAB MEETING
 Marco Beach Hilton
 Marco Island, FL
 Deborah Rudolph:
 (202) 785-0017

December 10
ENERGY POLICY COMMITTEE
 Deborah Rudolph:
 (202) 785-0017