IEEE ELECTROMAGNETIC COMPATIBILITY SOCIETY NEWSLETTER

ISSUE NO. 166 SUMMER 1995 (ISSN 0164-7644) ROBERT D. GOLDBLUM, *Editor*

MESSAGE FROM THE PRESIDENT

WARREN KESSELMAN
PRESIDENT, EMC SOCIETY

Your Society's 1995 Directors-at-Large nomination/election cycle will be completed shortly. According to the bylaws, every Society member has a right to participate in that process. Soon you will receive (or may already have) your 1995 election ballot. Please return it before the deadline date. Last year, about 20% of our membership voted. I'd like to encourage everyone to vote this year.

Our Society's Constitution states that

"The Society shall be managed by a Board of Directors whose membership shall consist of:

1. Directors-at-Large: *Members of the Society elected by the Society membership at large* to the Board of Directors as specified in the Society's Bylaws.
2. Executive Directors: Executive officers of the Society elected by the Board of Directors to designated offices as specified in the Society's Bylaws.
3. Ex-officio Directors: Members appointed or elected to designated positions or offices as specified in the Society's Bylaws. Ex-officio Directors are nonvoting members of the Board of Directors.

At least two-thirds of the voting members of the Board of Directors *must be elected by the Society membership* at large."

Our Bylaws state that there shall be 18 Directors-at-Large whose term of office shall be 3 years with 6 Directors-at-Large elected each year. No Directors-at-Large can serve for more than 6 consecutive years. The election process for those individuals begins with a Call for Nominations issued in the Spring of each year (see Winter '95 issue of the EMC Society Newsletter). The Nomination Petition requires a minimum of 15 Society member signatures. The Nominating Committee may make additions to those nominated by petition to give consideration to both geographical representation and diversified technical interests. The Nominating Committee's objective is to submit a slate of at least 12 nominees for election to the 6 offices to be filled on the Board of Directors.

As members of the Board of Directors, the elected Directors-at-Large are responsible for the guidance and approval of all Society programs, functions, and finances. The annual budget is on the order of $460,000.00. That includes the Transactions, Newsletter, yearly symposium, nine technical committees, education, standards, member services, and professional services.

In addition to our Society election, I'd like to also encourage your participation in the general IEEE 1995 elections. This year, members of Division IV Societies (EMC is included) will be voting to fill the Division IV Delegate-Director-Elect position. This is a new position and the elected person will become the Division Director for the 1997/1998 term. During 1996, that individual will, in a sense, be in an on-the-job training mode. The Division IV Nominating Committee submitted a slate of three distinguished IEEE Fellows, who are also past Society presidents. One of the nominees is Dr. William G. Duff from our Society. I am sure Bill would appreciate your support.

I trust that the above review of the Directors-at-Large election process and their broad responsibilities gives you some insight to the importance of your participation as a voting member of your Society. Your Nominating Committee presented to you a ballot of worthy candidates. Please exercise your voting rights in both our Society and IEEE elections.

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EDITORIAL

ROBERT D. GOLDBLUM
EDITOR

Founders of the dB Society held a 20th reunion in San Antonio at the site where the dB Society was founded. In fact, the La Mansion Del Rio, the hotel where the IEEE EMC Symposium was held in 1975 and where the dB Society was founded, was the site for the reunion, which took place on May 19-20. Participants traveled from as far as Poulsbo, WA, San Diego, CA, and Philadelphia, PA. All of the original founders were present with the exception of one, the Rev. Bill (Sunfish) Johnson.

Over the 20-year period, the dB Society met during the annual IEEE EMC Symposiums and conducted a membership party, which was referred to as a "picnic." Its officers, e.g., president, vice president, secretary, and treasurer, usually were members of the founder group, although others participated in this capacity from time to time. This reunion was strictly for the founders and none of the past officers who were not founders were present.

The prerequisite for joining the dB Society 20 years ago was that the individual have at least 10 years of experience in EMC work. If we add 20 years to that, then the founders now have at least 30 years experience and many have as much as 40 years experience.

As one of the founders, I was pleased to attend this notable event. I brought my video camera to capture some of the memories these EMC engineers would relate and indeed, to capture the founders themselves since all were over the age of 60 and, with few exceptions, all were retired. It was my desire to exact some work experience and "war stories," but most attendees were reluctant to discuss actual work experience. Rather, they focused their discussions on the dB Society and a bit on their careers. The video is currently being prepared and may be available to Society members, depending upon my initiative and the level of general interest.

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IEEE EMC SOCIETY NEWSLETTER PUBLICATION SCHEDULE

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

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

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

CHAPTER CHATTER

TODD HUBING
ASSOCIATE EDITOR

Lightning struck a tree near my house the other day. Although my phone, TV, and power cables were all buried near the tree that was struck, I am happy to report that the damage was minimal. After all, it would be very embarrassing for an EMC engineer to suffer significant damage due to lightning. Lightning damage in the home of an EMC engineer is like an electrical fire in the home of an electrician, or a flooded basement in the home of a plumber.

The tree lost most of its bark and will have to be removed. The acoustic shock wave knocked a ceramic thermometer off a wall inside the house causing it to shatter. Overall however, I fared pretty well thanks to my well thought-out grounding and surge protection. For those of you who are unfamiliar with lightning and surge protection, let me describe the various methods used to protect my home.

The primary lightning protection on my phone line was provided by a plastic box on the outside wall of my house. It works like this. The lightning surge blows this box off the side of the house immediately severing all of the connections inside. No more connections, no more surge current. I also employ a secondary level of protection based on a similar principle. The four thin wires in each of my phone jacks vaporize at the first sign of a current surge. Thanks to these unique primary and secondary levels of surge protection, only one of the three phones in my house was toasted. It was very easy to restore my phone service following the storm. All I had to do was have the phone company splice a few wires and replace the box on my house. Then, after replacing all my wall jacks (and one phone), I was back in business.

The lightning protection on my cable TV service is equally effective and based on a similar concept. The center conductor of the coaxial cable buried in my yard is made of very thin copper wire that quickly melts away at the first sign of a current surge. Thanks to this fuse-like behavior, the lightning damage to my television was minimal. It should be back from the repair shop in a couple of weeks (about the same time they replace the cable under my lawn). Both my phone and TV cable protection systems rely on the fact that current no longer flows in metal that has been vaporized. My power line surge protection employs a different technique based on the conservation of energy. The idea here is that any given surge has a finite amount of energy. Therefore, energy used to vaporize or otherwise destroy the components in one device is unavailable to harm other devices attached to the same power line. Thanks to this protection scheme, I am happy to report that my personal computer survived the storm and continues to work flawlessly. True, I did lose a few lights and my garage door opener. And yes, my oven doesn't get hot anymore and I'll admit that my refrigerator no longer makes ice. But after all, no lightning protection system is perfect. As I told my insurance agent, if it hadn't hit the house of an EMC engineer, this strike might have caused some real damage.

CENTRAL NEW ENGLAND

Many thanks to John Clarke, Secretary of the Central New England chapter, for sending in the following update. The April meeting featured Bruce Archambeault, of Seth Corporation, who gave a presentation titled, "EMC/EMI Modeling Software." Bruce not only discussed modeling equations and techniques, but he provided several real-world examples. Joseph Butler, of Chomerics, was the featured speaker at the May meeting. He discussed EMC regulatory issues facing medical device electronic equipment manufacturers. The November 1993 FDA Draft Reviewer Guidance Document for 510K submittals establishes EMC testing requirements for a cross section of medical devices being introduced or modified. The European Union EMC Directive ends a transition period and becomes law on January 1st, 1995 with voluntary compliance extended to June 1998.

CHICAGO

Ray Klouda, Secretary of the Chicago chapter, reports that the last meeting of the 94-95 season was held in May. It was a joint session with the Antenna and Propagation Society and the Microwave Theory and Techniques Society. The guest speaker was Scott Roleson of Hewlett Packard. His presentation was titled, "Gaining Insights from EMI Radiation Patterns." His insights were based on the premise that "antennas can happen anywhere." For example, a poorly grounded PC board may radiate like a horizontally polarized dipole antenna, and a PC clock trace without a guard trace may appear as a loop antenna. He explained a method of measuring the emission's azimuthal patterns and how to use the patterns to infer antenna-like radiating structures. Sometimes the results can provide useful insights. Scott told of a particularly stubborn EMI problem he experienced with a large-format printer. They had a strong EMI signal at 150 MHz. His EMI radiation pattern method revealed that the paper guide, which was roughly 1/2 wavelength at 150 MHz, acted like a horizontally polarized dipole. The problem was solved by adding a ferrite toroid to one leg of the paper guide to dampen the resonance effect. He added these words of caution: "Unlike intentionally designed antennas, real products sometimes produce confusing or misleading patterns."

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GERMANY

A new EMC Society chapter has been formed in Germany. The German chapter is the 39th chapter of the EMC Society. Dr. Sturm, of WWDBwABC, Munster, is the Chairman of the new chapter. The Vice Chairman is Prof. Gonschorek, of TU Hamburg-Harburg. The Treasurer is Dipl.-Ing. Moehr of Siemens, Erlangen. Other members of the executive committee are Prof. ter Haseborg of TU Hamburg-Harburg (Educational Activities) and Prof. Garbe of the University of Hannover (Technical and Scientific Activities). More information about the new chapter can be obtained from Prof. Garbe by contacting him at garbe@geml.uni-hannover.de.

LOS ANGELES

The Los Angeles chapter of the EMC Society had two stellar speakers for the spring season. In April, the chapter welcomed Ken Javor of EMC Compliance in Huntsville, Alabama. Ken presented a broad overview of historical forces which resulted in the control of conducted and radiated emissions and susceptibility. He covered the philosophy of standards from 1944 to the present and discussed the economics of EMC. Early in his career, Ken noted that he was often at a loss when asked by a program manager how much of an over limit is really a problem. He, like many EMC engineers, found that he often did not have a good answer - nor could he find one! Thus, he spent time researching old documents, military standards, and had conversations with people involved in EMC since its infancy. The result of this effort was Ken's book entitled *Introduction to the Control of Electromagnetic Interference - A Guide to Understanding, Applying, and Tailoring EMI Limits and Test Methods.* Ken donated a copy of this book to the chapter to be the prize at the chapter's year-end social. The chapter was grateful to Ken not only for receiving this wonderful book, but also for his ability to solve many of the chapter members' nagging EMI mysteries. Further, Ken debunked several fallacies that have been propagated throughout the years. Contrary to popular belief, there is NO safety margin between radiated emissions limits and radiated susceptibility levels. The radiated emissions limits

Ray Waldemar, Alex Rivera, Kainaiya Mahendra, and Richard Mahoney (left to right) get a charge out of the electrifying "floor show" at the LA chapter summer social.

LA chapter member Steve Jensen applies the juice to a vintage spark gap generator.

LA chapter chairman Ray Adams (l) shares a laugh with Efrim Pecht and David Garakanian (r).

EMC Society Secretary Janet O'Neil and son, Henry, are pictured here with the new member of the O'Neil family, Helene, born on April 10, 1995.

John Stanford (l), Janet O'Neil and Fernando Mendoza (r) enjoy the LA chapter summer social.

Bill Limburg lights up the LA chapter summer social with a Tesla coil he made as a high school project.

PHOTOS COURTESY OF JANET O'NEIL

are designed to protect intentional receivers from unintentional transmitters. Radiated susceptibility limits are designed to protect unintentional receivers from intentional transmitters. Chapter members thanked Ken for his informative and enlightening presentation.

In May, chapter members enjoyed the return of Scott Roleson from Hewlett-Packard in San Diego. Scott last spoke to the LA chapter on "'Bench-Top EMC Test Techniques" and this practical, workshop type presentation was well received. Thus, chapter members eagerly awaited Scott's return to speak on the topic "Gaining Insight from EMI Radiation Patterns." Scott showed that when radiated EMI amplitude is plotted as a function of rotational angle, and when these patterns fall into recognizable shapes, specific antenna-like structures can be inferred as the source of this EMI in some cases. One memorable part of Scott's presentation was when he shared an analogy of what it's like to be an EMC engineer. He commented that "it's much like buying a jigsaw puzzle from a swap meet or garage sale. You don't always get all the pieces and some of the pieces are not part of the overall puzzle you are putting together." It's the job of the EMC engineer to determine which puzzle pieces (test data) are relevant and which are irrelevant to the problem at hand. The EMC engineer often only gets a few pieces of the puzzle and from these he must try to put together the big picture. Chapter members nodded in agreement with Scott's humorous, accurate analogy. Scott highlighted Hewlett Packard colleague Bob Dockey's "Printed Circuit Board (PCB) Resonance Experiment" that predicts the resonance frequency of a PCB. This resulted in a very interesting discussion. Incidentally, it should be noted that Scott Roleson is now a Distinguished Lecturer of the EMC Society.

June signaled the beginning of the summer break so chapter members convened for an end of the year social event to celebrate. This was held at a local hotel and featured a fun "show and tell." Chapter member Steve Jensen brought along his grandfather's home-made spark gap generator. Not to be outdone, chapter member Bill Limburg brought alone a Tesla coil he had made for a high school project. Both of these antiques still worked beautifully! The demonstrations were certainly colorful and noisy. Suddenly, the social event "lit up" and attracted many gawkers to the party. The evening was brought to a close with a raffle for Ken Javor's book noted above. Bill Craig was the lucky recipient.

The Los Angeles chapter looks forward to an exciting fall line-up featuring, speakers Mark Nave (on switch mode power supply filter design), Bill Ritenour (on ESD), Lee Hill (on printed circuit board parasitic modeling) and Jose Perini (on numerical methods). Wow!

Chapter Photographer, Janet O'Neil, was absent from the April and May chapter meetings as she had a baby girl in mid April. She regrets that there are no photos available of the illustrious speakers noted above and vows to "snap" these fellows at the August EMC Symposium in Atlanta. Look for them in the next issue of the EMC Society Newsletter! Thanks are due to Chapter Chairman Ray Adams for supplying the "info" on what happened at the April and May chapter meetings.

PIKES PEAK

John Will, Chair of the Pikes Peak chapter, reports that their June meeting featured a talk on the state of the art of reverberation chambers by the chapter's Vice Chair, Gus Freyer of USI. There has been a lot of progress in the use of reverberation chambers in the last few years. Anyone doing EMC/EMS/EMV work should become familiar with the uses and limitations of reverberation chambers. John is currently looking for speakers for future meetings.

Also, the Pikes Peak chapter is currently in the process of putting together a home page on the world wide web. If you have any ideas (or want to volunteer yourself or others) call John at (719) 577-9700 or send him an email at j.will@ieee.org.

SANTA CLARA VALLEY

Werner Schaefer of Hewlett Packard was the featured speaker at the May meeting of the Santa Clara Valley Chapter. The title of his talk was "Signal Processing in Radiated EMI Measurements." Also at the May meeting, Geoff Day, of Lockheed-Martin was elected as the new Secretary. Ken Renda is the new Treasurer. Franz Gisin is the new Vice Chair. Michael Heckrotte is the new Chair.

SEATTLE

Rick Covill of Boeing is the new Chair of the Seattle chapter. Congratula–tions, Rick.

SWEDEN

Peter Landgren reports that there are currently about 90 members of the EMC Society chapter in Sweden. The chapter held three meetings in 1994. The February meeting was held at the High Voltage Research Institute in Uppsala. Three papers were presented: "Background and History of the Research Institute and Information on Current Projects," by Prof. Viktor Scuka; "ESD" by KG Lovstrand from the Swedish Defence Material Administration; and "Verification and Protection of Electronic Systems from Lightning," by Mats Backstrom from SAAB Military Aircraft.

The June meeting was held at SAAB Military Aircraft in Linkoping. Myron Crawford, of NIST in Boulder Colorado, presented a paper titled, "Narrow Band White Gaussian Noise Excitation of Shielded Enclosures for Radiated Immunity and Shielding Effectiveness (SE) Testing." Wilhelm Scenki, of SAAB Military Aircraft, presented a paper titled "The SAAB/ FMV Mode Stirred Chamber." Mats

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Backstrom of SAAB Military Aircraft, gave a presentation on "Shielding Effectiveness Measurements of Apertures." Peter Landgren, of Bofors, gave a presentation titled "Comparison of SE Measurements in a Mode Stirred Chamber with those in an Anechoic Chamber."

In September, the Sweden chapter met at Svenska EMC Lab in Karlskrona. The topic of the meeting was BCI. Dr. Nigel Carter, of DRA in the UK, spoke on the "Advantages and Disadvantages of BCI." Sven Garmland, of EMICON, discussed large system applications, Nial Andersson covered BCI-methods in standards, and Leif Johnson, of VOLVO, discussed small system applications.

The first meeting of 1995 was held at Telub Teknik AB in Ostersund. Here the open information about TEMPEST, which is called ROS in Swedish, was presented by Thomas Theiler from the Swedish Defence Material Administration. This was followed by demonstrations of two different ways of detecting information being typed on a computer. A paper about a new type of loop antenna was presented by Torsten Sjogren of Telub Teknik. Finally, the latest information about the EMC standards within the EU was discussed.

EDITORIAL . . . *Continued from page 2*

To me, the dB Society was simply a fraternal organization which served no noble purpose, had no major achievements, but did provide an escape every year from the usual Symposium humdrum hospitality suites. I was eventually elected president of the organization and served a term of about four years, during which time I realized the true value of the organization. It enabled me to meet and associate with a wide variety of leaders and senior citizens of the EMC Society, to learn more about their diverse careers, and to feel fortunate to be among those who have advanced technology and provided leadership in our field in their own ways. Let us not be mistaken: all those who have made major contributions to the EMC Society were not necessarily members of the dB Society. It is unfortunate that these other notable EMC engineers were not there to be recorded by video for posterity.

The dB Society continues to flourish under the leadership of Dan Hoolihan. As usual, there will be a "picnic" at the Atlanta IEEE EMC Symposium, which most dB Society members will attend. Application forms for membership are available from all members, including this editor. For a modest sum, you can be a member of this fun-filled and elite fraternal organization if you qualify.

. . . . . .

My attempts to stimulate letters to the editor via editorials have not been very successful. Is it due to complacency among the members or the topics which I choose to expound upon? The Newsletter has traditionally never attracted many letters or comments, which may be due to the complacent nature of engineers in general. The activists somehow have avoided membership in the EMCS and have left Tony Zimbalatti, with his Point and Counterpoint column, and me stirring an empty pot. Let me ask a few questions and see if people wish to respond:

1. Is the EMCS Board of Directors too large and unwieldy with 18 elected members plus ex officio members?

2. Should our Society sponsor meetings in Communist China where human rights violations continue to be a major and significant occurrence?

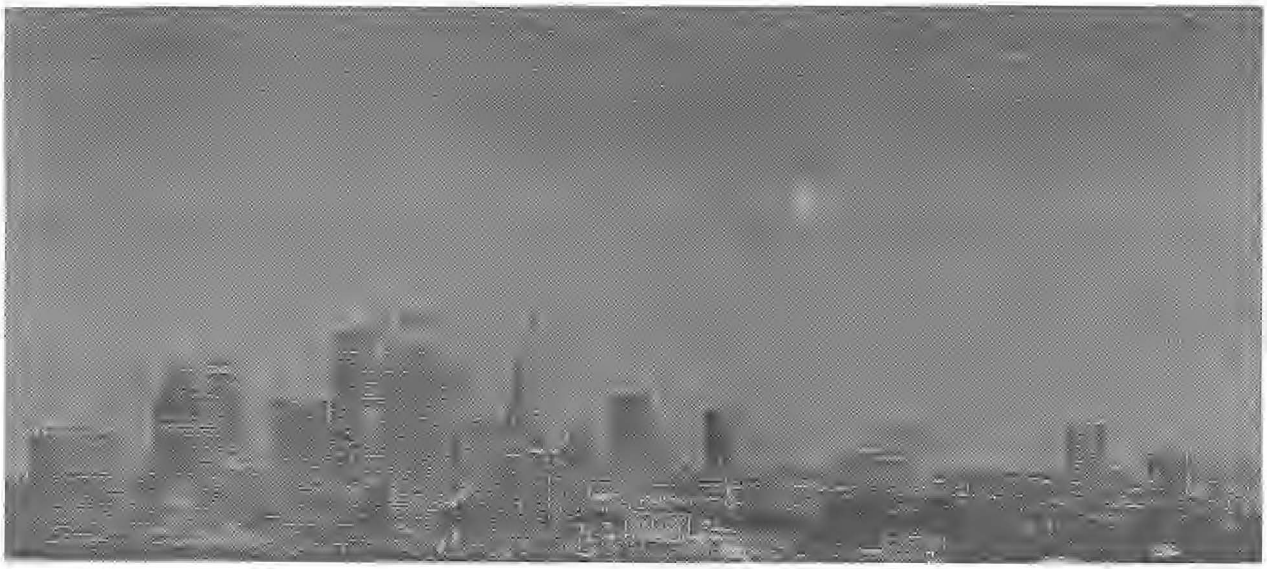
3. Should the IEEE accept advertising in its high-profile magazine, *The Spectrum*, from organizations or countries which discriminate against women and other people based upon ethnic backgrounds and religious beliefs? Is the revenue that the IEEE receives from these ads more important than the moral principles, and what about the ethics policies of our Society and the IEEE?

4. Will the USA rely upon European regulations to control EMI and disband much of its FCC and non-mandatory standards efforts since the EU has taken a quantum leap ahead of the U.S. regulatory bodies?

5. The U.S. military is largely dependent upon commercial standards and the most common of these standard are European. Do we need the U.S. military EMI standards to retain the controls essential for the EMC of military systems?

Send in your comments via e-mail, fax, UPS, Federal Express, or the old-fashioned way, U.S. mail. I look forward to hearing from you.

1995 IEEE International Symposium On Electromagnetic Compatibility



Kevin C. Rose

Photo Courtesy Atlanta Convention and Visitors Bureau

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EMC SOCIETY

At the Atlanta Marriott Marquis
August 14-18, 1995

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EMCS EDUCATION COMMITTEE

KIMBALL WILLIAMS
ASSOCIATE EDITOR

The EMCS Education Committee has slowly expanded the scope of its operations over the past two years to fill some of the educational needs perceived by our members, and to continue the excellent work begun by Clayton Paul and by Henry Ott. Since this issue of the newsletter will be published just prior to the 1995 symposium in Atlanta, Georgia, I thought it would be appropriate to review our activities and plans. If you have the opportunity to join us, we welcome visitors and guests as well as current and new members to our meetings at the symposium on Tuesday and Wednesday mornings at 7 A.M. in the Champagne room of the Marriott Marquis.

SUBCOMMITTEES

At the present time we have ten active subcommittees working on immediate and long term projects. Many of these subcommittees have projects with strong cross relationships. The subcommittees and their chairman are:

Subcommittee	Chairman
Experiments Manual II	Jim Drewniak
Demonstrations	Andy Drozd
University Grant	John Howard
Internet	Todd Hubing
Outline & Abstracts	John Maas
Publications	Maqsood Mohd
Tutorials	Maqsood Mohd
Student Activities	Jim Muccioli
NARTE	Jim Whalen
CAEME	Kim Williams

SUBCOMMITTEE ACTIVITIES

Experiments Manual - Volume II
Jim Drewniak

This is one of our newest subcommittees and members are needed. The committee will compile a follow-on volume to the successful "EMC Experiments Manual, Volume I." Volume I focused on experiments with little or no sophisticated test equipment. Volume II will assume the availability of spectrum analyzers, network analyzers, etc. and build experiments appropriately configured. If you have an experiment that might find a home in Volume II, or if you would like to help with this task, contact Jim at "drewniak@hertz.ee.umr.edu".

Demonstrations Booth
Andy Drozd

Since the original development of the concept, planning and organizing the experiments demonstrations held each year at the symposium has been smoothly handled by Andy Drozd. Each year Andy and his team secure a favorable location within the exhibit area, solicit a varied mix of demonstrations, manage to get donations of equipment from suppliers and make sure that the entire course of the demonstrations flows without a visible hitch.

If you enjoy the demonstrations, drop by the booth this year and let Andy know that you appreciate all the hard work by his committee, or drop Andy a line at "andro1@aol.com".

University Grant
John Howard

One of the ongoing concerns of the education committee has been the knowledge that most graduating EEs have never been exposed to the concepts of and needs for electromagnetic compatibility. As one way to place courses on EMC into university curricula, the committee began exploring the possibility of providing seed money to assist in EMC course startup programs. The seed money was to be in the form of a one-time grant to a college or university that would offset approximately half the cost of starting a course.

At the present time, plans for the development of a university grant program to foster the establishment of a course in EMC have been placed on indefinite hold. The consensus of the members of the sub-committee is that funding that is not accompanied by a committed EMC champion at the university may be useless at best. At this time the members are considering the question and seeking ways to address the problem that have more chance of producing tangible results. If you have any ideas or concerns in this area, contact John at "jhoward@svpal.org" and offer your suggestions and/or assistance.

INTERNET
Todd Hubing

From the beginning of the effort to provide electronic access to EMC information, Todd Hubing has shouldered this task alone. Through the University of Missouri at Rolla, Todd first created an anonymous "FTP" site for generic INTERNET access and more recently a World Wide Web "Home Page" for EMC that is accessible either directly or through the home page of IEEE. Current usage rates indicate about a dozen inquiries a day.

Todd has a long-range vision of creating a central repository of easy-to-access EMC information. The scope and depth of such a repository is still under consideration. Coordination with other committees such as Standards and Member Services will be necessary to determine the most immediate needs and useful directions for growth. While I have no doubt that Todd would carry this effort solo without complaint, I believe that he would welcome assistance as the task expands. If you have an interest in this area, contact Todd at "thubing@ee.umr.edu".

EMC Abstract and Outline
John Maas

At the request of Clayton Paul, John and his subcommittee have evolved two forms of an abstract and an outline of a generic presentation on the subject of EMC. One form is directed at general audiences such as you would expect at a non-technical gathering. The other is directed at university engineering students with some technical background.

With the help of the Student Activities subcommittee, we are developing this paper document into a set of slides and/or overheads with the possibility of accompanying video materials. John is currently preparing subcommittee plans to evaluate this package and seeks methods of distribution and use. John can be reached at "jsmaas@vnet.ibm.com".

EMC Fundamentals Tutorials
Maqsood Mohd

An initial experiment was carried out at the symposium in Chicago in 1994 to see if there was interest in tutorial lectures designed for the newcomer to the EMC field. This initial effort was well received, and Mac has prepared another set of lectures on fundamentals by noted educators for Atlanta. The tutorials will run from 9 A.M. to 5 P.M. on Monday in the Marquis Salons III and IV.

Although the tutorials were designed for the new EMC engineer, many of us that have been at this for a while have found them both entertaining and enlightening as the speakers touch on topics that we use only occasionally in our work. A brush-up never hurts anyone.

Publications
Maqsood Mohd

The thought was spawned at our meeting in Chicago that it would be of benefit to everyone if we could convince the authors of some of the more practical papers at each symposium to do a quick rewrite of their materials and seek to have them printed in other publications that have sections dealing with EMC. Mac has contacted Hugh Denny to coordinate this work for articles from past symposia. This effort requires many tasks and follow-on work and I am sure that Mac would appreciate assistance. If you have an interest in forwarding this work, Mac may be contacted at (904)678-2001.

Student Activities
Jim Muccioli

Jim and his committee have been working on an outreach program to expose IEEE student chapter members to EMC concepts through a series of presentations to student chapters at universities around the country. To date, as a group and as individuals, they have spoken to eight student chapters. The secondary purpose of these lectures is to develop and refine a set of presentation materials to accompany the lecture outline and abstract from John Maas's committee.

Jim is also planning a student paper contest for the 1996 symposium. He is preparing an article for *Potentials* magazine to spark interest in EMC and in the contest. If you have an interest in student activities, or would be interested in assisting Jim and his committee in their work, contact Jim at (810)576-3331.

NARTE
Jim Whalen

Jim will again present his workshop on preparation for the NARTE examination. The workshop will take place on Monday at the symposium from 2 P.M. to 5 P.M. in the London room. This year, a formal NARTE examination opportunity following the symposium will take place on Friday from 9 A.M. to 5 P.M. in the Madrid/Trinidad rooms.

The question of using the NARTE question pool to establish a basis for an EMC Engineering Self Appraisal Program (ESAP) continues to be discussed at NARTE. This option also received interest at the IEEE Life Long Learning workshop in Washington D.C. in June. If you would like to know more about the NARTE workshop, the NARTE examination or would be interested in assisting Jim and his committee in their work, contact Jim at "jjw@ubvms.cc.buffalo.edu".

CAEME
Kimball Williams

The education committee has continued its funding of "Computer Aided Electromagnetic Education" (CAEME) in its development of multimedia learning tools for electromagnetic and electromagnetic compatibility. In a thrust to assist CAEME in the development of a more structured learning opportunity for students in traditional E-Mag field theory courses, an initial outline of the topics which we believe should be modeled by the CAEME electromagnetic programs has been accepted by CAEME. We are proposing to continue and increase our funding to CAEME over the next two years to assist them in accomplishing this goal.

Operating Procedures

At the request of the Board of Directors, each operating unit within the EMC Society has developed a set of working guidelines and formulated them as a Policy and Procedures. The proposed Policy and Procedures for the Education Committee is now under review by the entire committee. Most of the document has been accepted, with only a few points being discussed for either clarity or continuity of operation. The final version will be available for review by the BoD at the symposium in Atlanta.

AN INVITATION

I mentioned it at the beginning of this article, and I want to repeat again our invitation to join us for our meetings at the symposium on Tuesday and Wednesday mornings at 7 A.M. in the Champagne room. Or if you just want to comment on the Education Committee activities in general, you can reach me at "k.williams@ieee.org".

Electromagnetic Compatibility (Compatibilité Electromagnetique) edited by Pierre Degauque & Joel Hamelin*
Oxford University Press, ISBN 0-19-8 56375-2, hard-back, 652 pages. U.S. $ 95.00, 1993
[This book is a verbatim translation of the French language paperback published by Dunod, Paris, ISBN 2-04-018807-X, 1990]

by JAMES R. WAIT
Guest Book Reviewer

This material, now available in English and French, fills a real need. This compilation is a masterful presentation of all facets of the subject. The editors, Professor Degauque and Dr. Hamelin, have enlisted eight of their compatriots to share in the preparation of the eleven chapters. The English translation was executed by Henry Whyte in an impeccable manner with the assistance of the two editors. However, it appears that the translated version has not been updated beyond what appears in the original French edition submitted in 1988.

In Chapter 1, Degauque and Hamelin pose the question : "La Compatibilité Electromagnetique: Science ou Regle de savoir vivre?" (Is it a science or a code of behavior?). No direct answer is given but the editors go on to say that their objective is to achieve compatibility between the operation of a sensitive system and its electromagnetic environment. The three main categories of the book are: 1) To describe the interfering source and to determine interfering fields it may radiate, 2) To consider all the possible modes of coupling between the disturbing source and the disturbed system in both a qualitative and quantitative manner, and 3) To design simulations and tests which eventually may lead to the implementation of protective procedures.

In Chapter 2, Hamelin describes the sources of natural noise with emphasis on lightning phenomenology. He and his colleagues have made many original contributions to the subject. However, the reader might desire to consult a companion book "Lightning Electromagnetics" edited by R.L. Gardner, in which the electromagnetic propagation effects are discussed in more detail, particularly from the analytical standpoint. It was also published in 1990, by Hemisphere; Taylor and Francis, New York.

In Chapter 3, A. Azoulay gives us a very nice concise review of electromagnetic, man-made (person-made) noise which may predominate over that from natural sources, particularly in urban areas and at frequencies above a few kilohertz. This is a subject of numerous study groups in the CCIR over the past several decades and URSI Commission E has played a major role here. One observation, in a modern context, is that field strength at 1 meter in front of a computer terminal can range from 20 to 50 dB(μV/m) over the frequency range from 20 to 200 MHz. Many other examples are given by the author of this chapter.

In Chapter 4, M. Gaurrand covers electromagnetic pulses of nuclear origin and gives an interesting history of such phenomena and reviews the relevant physics. In one example he shows curves of the electric field pulse as a function of time for a 100 kt explosion computed for a homogeneous atmosphere.

In Chapter 5, J. Piponnier expounds on the management of the frequency spectrum and related regulation. Here, as the author points out, there are major problems of incompatibility when different communication systems must share the available spectrum and still provide guaranteed space for essential services such as air and sea navigation.

In Chapter 6, B. Demoulin presents a very readable and certainly useful outline of the characterization of screened cables. This is one of the core subjects in electromagnetic compatibility and many papers on such topics appear in the IEEE *Transactions* on EMC. The author, like most engineers who need to design things, uses transmission-line equivalences based on circuit concepts. The surface transfer impedance of the cable shield here plays a major role and the author presents some key measuring techniques for this and related parameters. He calls attention to field theory methods for treating braided sheaths such as published by the reviewer and his colleague D.A. Hill and also by Professor Paul Delogne (former Adjoint Secretary General of URSI). The reader may also wish to consult the latter's excellent book, *Leaky Feeders and Subsurface Communication Systems*, 9 IEE EM Wave Series, 1982.

In chapter 7, Degauque gives a fairly exhaustive account of the theory and practice of cable coupling with the earth or ground plane. A key problem here is to determine the propagation constant of the cable or overhead conductor as a function of the geometrical parameters and the electrical properties of the adjacent imperfectly conducting half-space. As he points out, many of the earlier approaches have a limited validity. The reviewers's interpretation is that the effective series impedance and shunt admittance of the equivalent

* Pierre Degauque is currently the chairman of the French National Committee of URSI and Joel Hamelin is the past chairman of international commission E of URSI.

transmission line are spatially dispersive in the sense that these parameters are functions of the sought-for propagation constants. A recent book by Samir Mahmoud "Electromagnetic Waveguides" IEE EM Wave Series, 1991, covers the field theory of some of these problems with reference to cables in subsurface tunnels.

In Chapter 8, F. Molinet gives a more-or-less self-contained account of the interaction of wire antennas and related structures with an incident plane wave. In chapter 9, Y. Le Gullou covers the penetration of electromagnetic waves into three-dimensional open and closed structures of various shapes. Many of the numerical techniques are discussed in detail. In Chapter 10, B. Besnault describes general measurement procedures in a very thorough fashion with many practical hints. In Chapter 11, M. Blanchet provides what appears to be a very complete description of simulation schemes, particularly with regard to nuclear-source generated fields.

There is no doubt that this collection of tightly edited chapters, written by these very competent French scientists and engineers, is an authoritative documentation on the subject in a compact form readily accessible to the radio science community. The sale price, while high, is not unreasonable. Both French and English editions are printed in a uniform style with numerous high-quality illustrations. Also, the extensive references, while none later than 1988, do cover the world literature with a possibly forgivable emphasis on French journals and conference proceedings

(Reprinted with permission from The Radioscientist, *Vol. 5, No. 1, March 1994.)*

EMCABS

WILLIAM H. McGINNIS
ASSOCIATE EDITOR

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

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

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

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

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

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

NATIONAL VOLUNTARY LABORATORY ACCREDITATION (NVLAP) DRAFT HANDBOOK 150-11 ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS (ECT) LAP, FCC METHODS

EMCABS: 01-08-95

Eric R. Lindstrom and Jeffrey Horlick
U.S. Department of Commerce, Technology Administration,
National Institute of Standards and Technology (NIST)
January 1995

Abstract: This handbook supplements NIST Handbook 150, NVLAP Procedures and General Requirements, which was previously abstracted. It includes the special technical requirements for NVLAP accreditation of test sites that perform testing for Federal Communications Commission (FCC) Part 15, Digital Devices and for Part 68, Connection of Terminal Equipment to the Telephone Network. Appendices provide operations checklists for assessments of the laboratories. The FCC Part 15 on-site checklist is based on ANSI C63.4, CISPR 22 and similar references. The FCC Part 68 on-site checklist is based on the Telecommunications Industry Association's publication TSB31A and other standards. The FCC Part 15 aspects of the NVLAP program will become especially significant if the proposed rule (ET Docket No. 95-19; FCC 95-4(6) for digital devices becomes an FCC rule.

Index terms: FCC test methods, NVLAP accreditation, FCC Part 15, FCC Part 68

REDUCTION OF POWER SUPPLY EMI EMISSION BY SWITCHING FREQUENCY MODULATION

EMCABS: 02-08-95

Feng Lin and Dan Y. Chen
Virginia Power Electronic Ctr., Virginia Polytechnic Institute and State Univ., Blacksburg, VA
IEEE Transactions on Power Electronics, Vol. 9, January 1994, pp. 132-137.

Abstract: Significant reduction of switch mode power supply (SMPS) emissions may be achieved by frequency modulating the switching frequency. This paper investigates analytically and experimentally how SMPS conducted emissions are reduced with that technique. FM signal theory is briefly reviewed and then applied to show how the SMPS emissions are reduced in a typical forward converter operating at a nominal 90 kHz. The FM technique is investigated experimentally for various choices of modulating frequency and deviation and some useful guides for those choices are outlined. The modulating frequency should be comparable to the resolution bandwidth (RBW) of the measuring instrument. Although large deviations spread the spectrum more, the authors point out some of the factors limiting that choice. Practical reductions in conducted emissions of 10 dB are demonstrated and similar results for radiated emissions are proposed.

Index Terms: SMPS emissions reduction, SMPS switching frequency modulation, EMI noise sources and coupling paths in SMPS, conducted EMI filter selection

DESIGN GUIDELINES FOR REDUCING ELECTROMAGNETIC FIELD EFFECTS FROM 60-HZ ELECTRICAL POWER SYSTEMS

EMCABS: 03-08-95

William L. Cotton, Kai C.K. Ramsing and Charles Cai ,
Ralph M. Parsons Co., Pasadena CA , IEEE Transactions on Industry Applications, Vol. 30, November/December 1994, pp. 1462-1471

Abstract: This paper briefly surveys extremely low frequency (ELF) electric and magnetic fields and the possible biological risks and limits for ELF fields. It also surveys body averaged current densities, body averaged surface fields, and body averaged magnetic densities for several common environments. It includes field measurements in a petrochemical refinery environment and several cases for power transmission lines. Several general recommendations for the reduction of ELF fields are included. A PC program developed by Southern California Edison for Transmission Line Right of Ways, based on Florida's relatively strict limits for 115-kV and 230-kV lines, is discussed. "No regrets" and "prudent avoidance" strategies are defined and discussed. Based on the field limits recommended by the International Radiation Protection Association (IRPA), the authors conclude that the field limits are not exceeded in the average home or in a petrochemical refinery except near motor end-bells and single-phase buses.

Index Terms: Biological effects of ELF EM fields, transmission line design to mitigate fields, IRPA limits

NUMERICAL METHODS IN EMC - AN UPDATE

EMCABS: 04-08-95

Prof. Jose Perini
Syracuse Univ.,5207 S. Atlantic Ave. Ap.1221,New Smyrna Beach, FL
International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility Electromagnetic Compatibility 1995, Supplement, 7-9 March, 1995, Pages 3-19

Abstract: This is an update on a previous tutorial given at a 1991 Zurich Symposium. A number of new and emerging techniques are listed but only a few are discussed in more detail. The Geometric Theory of Diffraction will be revisited, including its extension to dielectric materials. The Method of Moments, which is still the most widely used technique, will be discussed in more detail. The two fastest emerging techniques, the Finite Element and the Finite Difference Methods will then be discussed. The presentation is more from the physical rather than the mathematical point of view. A list of references and a bibliography is appended to satisfy those interested in pursuing the subject further. A partial list of software is also given.

Index terms: Numerical Analysis, GTD, MOM, FEM, FDTD

EMC OF PRINTED WIRING BOARDS

EMCABS: 05-08-95

B. Danker
Nuenan, The Netherlands
International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility Electromagnetic Compatibility 1995, Supplement, 7-9 March, 1995, Pages 51-58

Abstract: A large part of today's EMC problems is caused by improper design of printed wiring boards (PWBs). The various aspects of EMC of circuits on PWBs can best be highlighted with demonstrations. These demonstrations are very useful to make electronic designers aware of EMC and to help them understand and solve hitherto hazy problems.

Index terms: PWB design, PWB couplings

EMC STANDARDS

EMCABS: 06-08-95

G. Goldberg
IEC Advisory Committee on EMC, Geneva, Switzerland
International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility Electromagnetic Compatibility 1995, Supplement, 7-9 March, 1995, Pages 67-74

Abstract: At present there is intensive activity in the development of EMC standards. This task has also become important for the implementation of the EMC Directive of the European Union.

The aim of the paper is to present the rules to be followed in the development of the standards. Four types of standards have to be considered: basic, generic, product and product family standards. Directly relevant to these standards for the implementation of the EU Directive are the product/product family standards and the generic standards. They include emission and immunity requirements and tests. Several examples of important product standards are summarized in tables which allow comparison of the different approaches.

Index terms: EMC standards, EU EMC Directive

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THE BALANTENNA: AN INTEGRATED IMPEDANCE MATCHING NETWORK AND HYBRID EMP SIMULATOR

EMCABS: 07-08-95

D. McLemore(1), G. Sower (2), C. Baum(3) and W. Prather(3)
(1) Kaman Sciences Corp., (2) EG&G Special Projects, and (3) Phillips Lab., all in Albuquerque,NM
International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility
Electromagnetic Compatibility 1995, 7-9 March,1995, Pages 17-20
EMC Zurich Proceedings Editor, ETH Zentrum-IKT, 8092 Zurich, Switzerland

Abstract: This paper describes the integration of a matching circuit(balun) with the "wormhole" antenna feed concept for a hybrid CW EMP simulator described in previous work. The amplifier for this system is still on the ground: however, at the gap of the antenna is a matching network which is designed to give the traditional 1:4 impedance ratio as found in previous designs. With this design, matching for the antenna can be achieved up to the GHz regime.

Index terms: EMP, antennas

ALTERNATIVES TO OPEN AREA TEST SITES

EMCABS: 08-08-95

P. Wilson
EMC Baden Ltd, Baden, Switzerland
International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility
Electromagnetic Compatibility 1995, 7-9 March,1995, Pages 579-582
EMC Zurich Proceedings Editor, ETH Zentrum-IKT, 8092 Zurich, Switzerland

Abstract: This paper discusses the fact that a good EMC test method should strive to be:
repeatable (between measurements),
reproducible (between sites),
meaningful (physically understandable,sufficient dynamic),and
simple (implementable, inexpensive, fast, efficient).

Index terms: measurements, test chambers

CHARACTERIZATION OF A SMALL MICROWAVE REVERBERATION CHAMBER

EMCABS: 09-08-95

T.F. Trost, A.K. Mitra, and A.M. Alvarado
Texas Tech University, Lubbock, TX
International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility
Electromagnetic Compatibility 1995, 7-9 March,1995, Pages 583-586
EMC Zurich Proceedings Editor, ETH Zentrum-IKT, 8092 Zurich, Switzerland

Abstract: A small microwave reverberation chamber has been tested. Signal transmission through the chamber was measured using antennas and small surface-mounted sensors in various configurations within the chamber. The observed dependence of the signals on frequency, averaged over many positions of a rotating paddle wheel, is explained in terms of the characteristics of the antennas, the sensors, and the chamber wall losses. The range of frequencies employed caused the chamber to operate on the low-frequency edge of the region of validity of the existing statistical theory for the chamber electric field. It was observed that as frequency is decreased through the range, the behavior of the field deviates from the theory: the probability density function becomes flatter, the spatial correlation function shows a large increase in the distance over which the field remains correlated, and the spatial homogeneity decreases.
Index terms: reverberation test chamber, measurements

LIMITED-ANGLE-OF-INCIDENCE AND LIMITED-TIME ELECTRIC SENSORS

EMCABS: 10-08-95

Carl E. Baum
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International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility
Electromagnetic Compatibility 1995, 7-9 March,1995, Pages 411-416
EMC Zurich Proceedings Editor, ETH Zentrum-IKT, 8092 Zurich, Switzerland

Abstract: This paper considers two classes of antennas which under the right conditions can be considered as accurate: time-domain field, and time integral. As these are electrically large but not infinitely large, there is generally a limited time based on when the truncation sends a signal to the output terminal pair. Furthermore, there are limitations on the allowable angles of incidence of a plane wave for ideal performance. They do not measure a single component of the incident field, independent of angle of incidence, in the manner of the classical electrically small electric-dipole sensor.

Index terms: antennas, sensors, measurements

A VARIABLE POSITION, GRAVITY DOWN G-TEM CONFIGURATION

EMCABS: 11-08-95

H. Stephen Berger
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International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility
Electromagnetic Compatibility 1995, 7-9 March,1995, Pages 465-470
EMC Zurich Proceedings Editor, ETH Zentrum-IKT, 8092 Zurich, Switzerland

Abstract: This article reports on the development and implementation of a new configuration of the GTEM cell, called the Extended Hyper Rotation GTEM. This configuration introduces two improvements over other designs. First, the EUT holds its normal orientation, with gravity down relative to the EUT . Secondly, the cell rotates, so that sufficient information may be derived to solve for the magnetic and electric dipole moments separately. The magnetic and electric dipole moments model the EUT emission at any given frequency. Further, the design allows full automation of the testing. The movement scheme used allows automation of algorithms that assume the far-field condition and newer, low frequency algorithms that do not make this assumption.

Index terms: GTEM, measurements

PHOTONIC FIELD SENSOR FOR SIMULTANEOUS AND FULLY PASSIVE ISOTROPIC ELECTRIC AND MAGNETIC FIELD MEASUREMENTS UP TO 1 GHZ

EMCABS: 12-08-95

F.Gassmann(1),A.K.Skrivervik(2), and D.D.Hall(3)
(1) EMC Baden AG, Switzerland; (2) Ecole Polytechnique Federale de Lauusanne, Switzerland; (3) GEC Marconi Research Centre, UK
International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility
Electromagnetic Compatibility 1995, 7-9 March, 1995, Pages 477-482

Abstract: This paper treats the theory and development of a fully passive field sensor for simultaneous electric and magnetic field measurements. The sensor head consists of three orthogonal double-loaded loops and three orthogonal dipoles. The sensor outputs are connected to six passive, electro-optic lithium niobate modulators. Summing the output voltages of each double-loaded loop enables an accurate measurement of the magnetic field. The modulators provide an integrated electrode structure to form the vector sum or difference of two RF voltages in a frequency range from dc up to 1 GHz. The loads of the loops are chosen to give a flat frequency response from 10 MHz to 1 GHz. Since the modulator input impedance is predominantly capacitive and the dipoles are electrically short, the frequency response of the latter are approximately flat up to 1 GHz. The measurement sensitivity limits of the electric and of the magnetic field depend on the pass band of the receiver.
Index terms: Sensors, RF fields, measurements

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A NEW DIRECT-MEASURING FIELD SENSOR UP TO 1000 MHZ WITH AN ANALOG FIBER-OPTICAL LINK — DESIGN, TRACEABLE CALIBRATION, AND RESULTS

EMCABS: 13-08-95

J.Glimm, Th. Schrader, K.Munter, R.Pape, M. Spitzer
Physikalisch-Technische Bundesanstalt, Braunschweig, Germany
International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility
Electromagnetic Compatibility 1995, 7-9 March, 1995, Pages 483-487

Abstract: In order to reduce the uncertainty of electromagnetic RF-field measurements for frequencies up to 1000 MHz, new field sensors, new calibration methods, and better transfer sensors for field strength are necessary. Following a research project sponsored by Deutsche Forschungsgemeinschaft, reports are given on a new direct-measuring field sensing system, a traceable calibration procedure with a microTEM-cell, and results of improved field measurements in the vicinity of a DUT. The overall aim is to clarify typical deviations of measurement results in different types of field generators.

Index terms: Sensors, RF fields, measurements

FERRITE ABSORBERS FOR ABSORBER-LINED CHAMBERS: A NEW APPROACH WITH PERMEABILITY AND PERMITTIVITY DISPERSION

EMCABS: 14-08-95

Ferdy Mayer
LEAD Maisons-Alfort, France
International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility
Electromagnetic Compatibility 1995, 7-9 March, 1995, Pages 591-594

Abstract: An earlier survey of ferrite tile absorbers showed that all commercially available ferrite absorbers used the "thin layer approach," where broadbanding of the absorber reflectivity (over the 3 MHz - 1 or 3 GHz range) is achieved by the dispersion of the loss permeability, together with a low nondispersive permittivity.

Index terms: Ferrite absorber, test chambers

PARALLEL AND AXIAL TRANSFER IMPEDANCES: THEORETICAL SUMMARY AND LOCAL MEASUREMENT METHODS

EMCABS: 15-08-95

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International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility
Electromagnetic Compatibility 1995, 7-9 March, 1995, Pages 501-506

Abstract: Five possible types of coupling on multiconductor shielded cables have been identified. This paper starts with a short presentation of the basic theory of these five main types of coupling. Then a complete practical example of a field-to-cable coupling calculation is given with the five types of coupling included. Finally, two local methods for measuring the axial transfer impedance (characteristic of type 3 coupling) and the parallel transfer impedance (characteristic of type 5 coupling) are presented.

Index terms: Transfer Impedance, field-to-cable coupling

PCB PLACEMENT UNDER EMC-CONSTRAINTS BY QUADRATIC PROGRAMMING AND SLICING

EMCABS: 16-08-95

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WIDIS Wissenschaftliche Dienstleistungen fur Informatik und Systemtechnik GmbH, Berlin, Germany
International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility
Electromagnetic Compatibility 1995, 7-9 March, 1995, Pages 565-568

Abstract: The consideration of EMC effects during the development process is a highly complex design task. Up to now, commercial design systems contain simulation tools to find electromagnetic disturbances, but their automatic placement tools don't take them into account. This paper describes a new placement method for PCB design. This method consists of three steps: global placement, slicing, and final placement. In each step the corresponding algorithms are able to produce placement results under EMC-constraints. The method ensures the simultaneous treatment of all components over all global optimization steps. A prototype of this new tool has been applied to large placement problems and good results in terms of both satisfaction of EMC constraints and computation time have been obtained.

Index terms: Transfer Impedance, field-to-cable coupling

STEPPED-FREQUENCY METHODOLOGY FOR OBTAINING FASTER DATA RATES IN REVERBERATION CHAMBERS OPERATED WITHOUT A MECHANICAL MODE STIRRER

EMCABS: 17-08-95

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11th International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility
Electromagnetic Compatibility 1995, 7-9 March, 1995, Pages 587-590

Abstract: A stepped-frequency method is discussed for obtaining faster data rates with a reverberation chamber operated without a mechanical mode stirrer. The conditions for obtaining spatially uniform fields on a time (or frequency) average basis for all three polarizations are reviewed. Computer calculations are presented showing the degree of field uniformity that can be achieved with this stepped-frequency method.

Index terms: Reverberation chamber, electronic stirring

COMPARATIVE TESTING OF ENCLOSURES MADE FROM CONDUCTIVE PLASTICS CONCERNING THEIR ESD BEHAVIOUR

EMCABS: 18-08-95

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(3) DSM Polymers, Geleen (NL)
11th International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility
Electromagnetic Compatibility 1995, 7-9 March, 1995, Pages 623-628

Abstract: This paper presents a new method of characterizing the ESD shielding performance of conductive enclosures. The method uses a reference electronic system as a model for PCBs and allows different materials to be ranked according to ESD shielding. Three main points are discussed: the measuring principle of the new ESD shielding effectiveness meter; the ESD shielding effectiveness of several types of conductive plastic materials; and the effect of typical design parameters of the anti-ESD boxes.

Index terms: ESD, shielding, IEC 801, IEC 1000

IEEE-USA SURVEY SHOWS ELECTRICAL ENGINEERS WOULD SAVE MORE WITH EXPANDED IRAs

(Source: *IEEE News*, May 23, 1995)
According to a survey conducted by the U.S. Activities division of The Institute of Electrical and Electronics Engineers Inc. (IEEE-USA), electrical engineers would increase their personal retirement-savings rates if Congress enacts pending savings-incentive legislation. The magazine questionnaire yielded nearly 150 responses last month on issues ranging from engineers' current saving patterns to their preferences on competing legislative proposals.

"The poll reveals an overwhelming consensus that engineers will do their part to rebuild the collapsing national savings rate — if Congress gives them the tools," stated IEEE-USA Board Chair Joel B. Snyder. "Engineers are telling us that they're worried about retirement security, but they simply can't afford to increase their savings and their tax bite at the same time," he said.

The survey results come as Congress considers ways to encourage personal saving. The American Dream Restoration Act, passed by the House as part of the "Contract with America" Tax Relief Act, permits individuals to make taxable contributions of up to $2,000 a year to new "American Dream Savings Accounts" (ADSAs) irrespective of income or pension-plan participation. The distributions from these accounts would not be subject to additional tax or penalty if used for retirement, a first-time home, educational expenses or major medical costs. The Individual Retirement Account (IRA) Equity Act, also passed by the House, raises the dollar amount that a non-working spouse can contribute to a conventional tax-deductible IRA from $250 to $2,000.

Savings-incentive legislation faces higher hurdles in the Senate, where determination to lower the federal deficit has diminished enthusiasm for middle-class tax cuts. The Senate is expected to consider savings options this summer, including the Roth-Breaux Savings and Investment Incentive Act, which restores universal eligibility to make tax-deductible contributions to IRAs and establishes a nondeductible "IRA-Plus Account" similar to the ADSA.

Critics of the current proposals claim that tax incentives to use savings instruments would lead Americans merely to redistribute their investments, not actually increase their net savings. "Our survey data suggest that new savings incentives will result in more investment — increased savings to ensure Americans' retirement security and more private capital to boost U.S. economic competitiveness," said James V. Leonard, chair of IEEE-USA's Engineering Employment Benefits Committee. "As members of the nation's second-largest profession — and a major portion of its middle-class savers — electrical engineers are a bellwether on this issue," he added.

Although 97% of survey respondents claimed they have begun saving money specifically for retirement, the overwhelming majority expressed concern about whether those resources would prove sufficient. Ninety-four percent indicated that they are "worried" about a retirement-savings shortfall; of these, nearly 40% reported that they are "very worried." At present, respondents rely most heavily on employer 401(k) plans — with 82% claiming participation, followed by IRAs (50 percent) and other employer-sponsored pension plans (20 percent).

Survey participants were enthusiastic about pending savings-incentive legislation. Ninety percent indicated they would invest in either or both of two proposed savings instruments; of these, 51% preferred the Roth-Breaux "Super IRA" versus 49% for the ADSA. In addition, almost two-thirds replied that they would be more likely to invest in an IRA if they could withdraw or borrow their savings to help pay for a home, college expenses or major health-care costs — as provided for by both bills.

The survey group was virtually united in its commitment to save more with additional tax incentives. Of those reporting they would participate in the new plans, nearly four of five said their contributions would constitute an increase in their overall level of retirement savings. Only 22% indicated they would merely shift their investments to gain the tax advantages.

AICN WORSKOP PROMOTES SELF-MARKETING SKILLS

The IEEE's Los Angeles and Southern California Consultants' Networks hosted the third national workshop for the Alliance of IEEE Consultants Network (AICN) on June 3 in Anaheim. The expanded workshop, which drew 155 attendees, included dual-track sessions for experienced consultants and those engineers beginning or considering a consulting career.

The prime emphasis for this year's workshop was on self-marketing. Experts introduced the topics and, along with panels of consultants from the Institute's national networks, shared their techniques. Panelists discussed liability, tax considerations, and other specialized independent contracting issues.

For more information about a proposed workshop in Boston this fall, contact William Anderson at the Washington Office at (202)785-0017, ext. 330 (phone); or w.anderson@ieee.org (email).

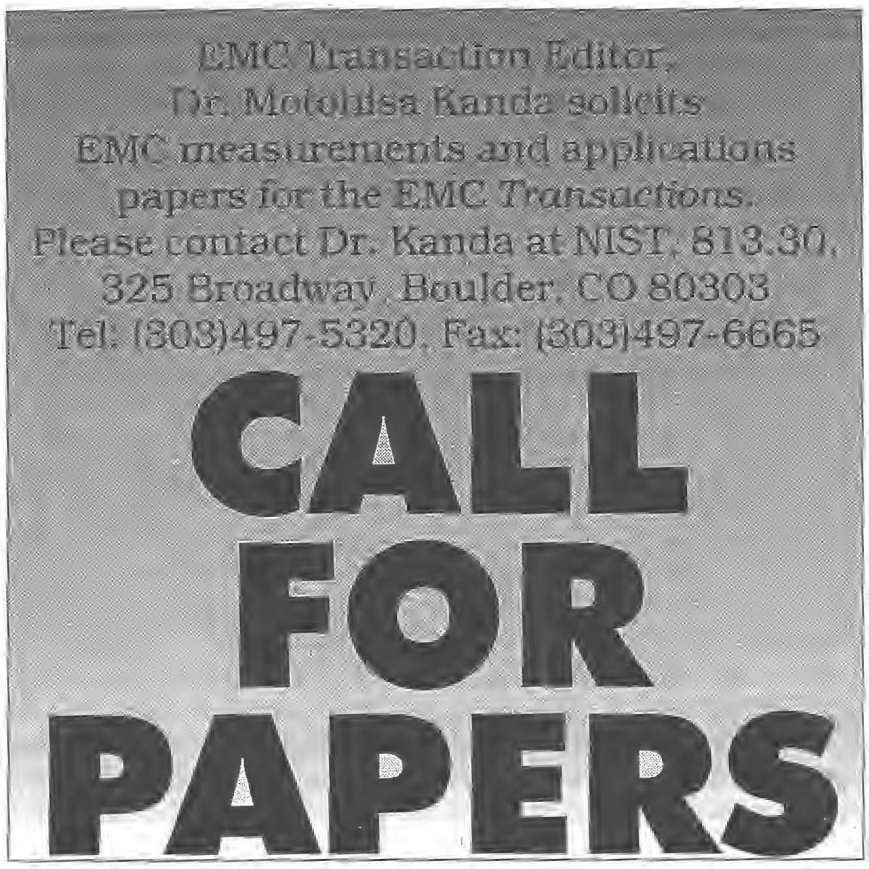
NJ CONSIDERS MAGNETIC FIELD LEVELS

The June 2 edition of the *Philadelphia Business Journal* has reported that a New Jersey state advisory group, the Commission on Radiation Protection, is considering the adoption of regulations covering magnetic field levels near new power lines. According to the article, the proposal would require halving the level of magnetic fields by changing the geometry of the transmission media. It would also require signs at playgrounds, parks, and recreational areas and prevent the development of new recreational areas near existing power lines.

While proponents of the regulations cite studies which link increased rates of certain types of cancer and leukemia, opponents assert that the studies are inconclusive or disprove such relationships. The IEEE has asserted that more research is need before the issue can be resolved conclusively, and that for now, a policy known as "prudent avoidance" is recommended.

PHYSICISTS REFUTE CANCER LINK

The American Physical Society, a national, highly-respected group of physicists, has issued a policy statement refuting claims that electromagnetic fields can cause cancer. This was reported in the May 14 issue of the *New York Times,* which quoted the group spokesman, Dr. Robert L. Park, as stating that "public concern was growing even as the epidemiologic evidence was shrinking and becoming fainter." This opinion reflects the general consensus of experts in the field. Nevertheless, many local utility companies are being forced to relocate power lines in response to residents' concerns.



EMCS SYMPOSIA SCHEDULE

1996 Santa Clara, CA: August 19-23
Santa Clara Convention Center
Doubletree Hotel
David Hanttula
(415)390-1071
FAX: (415)962-9439

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

1998 Denver: August 9-14
Radisson Hotel

1999 Seattle, WA: August 2-6
Westin Hotel
Bill Gjertson
(404)793-0680

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

EMCS COOPERATING SYMPOSIA

1997 Shenzhen, China: May 21-23
1999 Japan: May 15-17

UK: Biannually, even years, in September

Wroclaw: Biannually, even years, in June.

Zurich: Biannually, odd years, in March.

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.

ADMINISTRATIVE MEETINGS

November 9-10
TECHNICAL ACTIVITIES BOARD (TAB) COMMITTEES AND COUNCIL MEETINGS
and November 11
TAB CAUCUS AND FORUM
and November 12
TAB MEETING
Marriott Mountain Shadows
Phoenix, Arizona
Paula Dunne: (908)562-3919

November 11
REGIONAL ACTIVITIES BOARD (RAB) CAUCUS
and November 12
RAB MEETING
Marriott Mountain Shadows
Phoenix, Arizona
Paula Dunne: (908)562-3919

December 9
STRATEGIC PLANNING COMMITTEE (SPC)
and December 10
STRATEGIC PLANNING COMMITTEE MEETING
Fiesta Americana, Monterrey, Mexico
Henry Shein: (908)562-3988

December 10
EDUCATIONAL ACTIVITIES/ ACCREDITATION POLICY COMMITTEE
Fiesta Americana, Monterrey, Mexico
Angela Wyckoff: (908)562-5484

December 10
EDUCATIONAL ACTIVITIES BOARD (EAB) COMMITTEES
and December 11
EAB MEETING
Fiesta Americana, Monterrey, Mexico
Rae Toscano: (908)562-5492

December 10-11
STANDARDS BOARD COMMITTEE
and December 12
STANDARDS BOARD MEETING
Fiesta Americana
Monterrey, Mexico
Terry deCourcelle: (908) 562-3807

December 11
IEEE INFORMATION SESSION
Fiesta Americana
Monterrey, Mexico
Julie Cozin: (908) 562-3984

December 11-12
U.S. ACTIVITIES BOARD MEETING
Fiesta Americana
Monterrey, Mexico
Linda Hall: (202) 785-0017

December 12
IEEE ASSEMBLY
Fiesta Americana
Monterrey, Mexico
Julie Cozin: (908) 562-3984

December 13
IEEE SOCIAL
Fiesta Americana
Monterrey, Mexico
Georgina Crane: (908) 562-3979

December 13-14
IEEE BoD
and December 14
IEEE EXCOM MEETING
Fiesta Americana
Monterrey, Mexico
Julie Cozin: (908) 562-3984

CALENDAR 1996

February 13-19
IEEE BoD SERIES I
Le Meridien Hotel
San Diego, CA
Julie Cozin: (908)562-3984

February 14-17
TAB MEETING
Le Meridien Hotel
San Diego, CA
Paula Dunne
(908)562-3919

June 19-22
TAB MEETING
Westin Mont Royal
Montreal, Canada
Paula Dunne
(908)562-3919

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

INSTITUTIONAL LISTINGS

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

PATTON & ASSOCIATES
4718 W. El Caminito Drive, Glendale, AZ 85302
Telephone: (602) 934-5458 FAX: (602) 242-7700
Worldwide Telecommunication Design Assistance and Agency Submittal

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

FAIR-RITE PRODUCTS CORP.
P.O. Box J, One Commercial Row, Wallkill, NY 12589
Ferrite cores for EMI Suppressions Beads-On-Leads, Surface Mount Beads and Multi-Hole Connector Blocks

MEDA MACINTYRE ELECTRONIC DESIGN ASSOCIATES,
485 Spring Park Pl., Suite 350, Herndon, VA 22070
Telephone: (703) 471-1445
Handheld digital fluxgate magnetometers, AC magnetometers. Custom sensor design.

RANTEC MICROWAVE AND ELECTRONICS, INC.
24003 Ventura Boulevard, Calabasas, CA 91302
Telephone: (818) 591-8189 voice (818)591-8189 fax
Anechoic shielded rooms and chambers, high-performance absorbers

REGULATORY CONSULTANTS NETWORK (RCNET)
P.O. Box 344, Liberty Hill, TX 78642
Telephone: (800) 326-6336
International regulatory consulting for EMC design (including mitigation of EMI/RFI, EMS, EMP, HIRF, etc.), electrical product safety, test plans, standards and training.

An Institutional Listing recognizes contributions to support the publication of the IEEE NEWSLETTER and TRANSACTIONS ON ELECTROMAGNETIC COMPATIBILITY. Minimum rates are $150.00 for listing in one issue; $400.00 for four consecutive issues. Larger contributions will be most welcome. No agency fee is granted for soliciting such contributions. Inquiries, or contributions made payable to the IEEE, plus instructions on how you wish your Institutional Listing to appear, should be sent to Marilyn Prusan, Finance Administrator, IEEE Technical Activities, 445 Hoes Lane, P. O. Box 1331, Piscataway, NJ 08855-1331.