

IEEE ELECTROMAGNETIC COMPATIBILITY SOCIETY NEWSLETTER



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ROBERT D. GOLDBLUM, *Editor*

MESSAGE FROM THE PRESIDENT



WARREN KESSELMAN
PRESIDENT, EMC SOCIETY

If you were unable to attend our annual symposium in Atlanta you missed a very successful conference. My thanks go to the local Atlanta committee (under the guidance of John Rohrbaugh) for the many days of planning and preparation. I heard numerous favorable comments about the technical program, hotel accommodations and the Fernbank Museum educational social. Most attendees agreed that the scheduling of a record-setting heat wave was not necessary.

Your 1996 President will be elected by your Board of Directors (BoD) on November 10th. Our bylaws place a two-term restriction on the President; hence this is my final message. What should it contain? A summary of the past two years? Thanks to everyone for their support? Or a response to reader comments on previous messages? To cover all bases, I'll try to address all of the above in a succinct manner.

As I mentioned at the awards luncheon in Atlanta, my management style is to "delegate." Hence, the major focus of the past two years to develop a strategic plan to better serve a global membership was accomplished under the guidance of our Vice-President, with the entire BoD and committee chairs participating. It was a team effort; thank you all. The EMC Society is truly becoming a global entity as evidenced by the growth in non-North American membership and chapters. Approximately 50% of our recent new members are from IEEE Regions 8, 9, and 10 (see list in last Newsletter). Also, about 25% of our chapters are in those regions. Planning is an evolutionary process. Your feedback is important.

An all-volunteer organization's operation is dependent upon the enthusiasm and dedication of individuals. My thanks go to: the executive committee for their willing acceptance of assigned tasks; the BoD for their dedication to the Society's well-being; committee chairs for their initiative in accomplishing their specific responsibilities; and chapter chairs for maintaining a global Society influence. Collectively you continued the fine tradition of leadership that our Society has had since its inception.

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BOARD OF DIRECTORS ELECTION BALLOT

A ballot for the election of six members to the IEEE Electromagnetic Compatibility Society Board of Directors was issued on August 11, 1995. The ballots returned have been counted, and the following candidates have been elected for a three-year term beginning January 1, 1996:

Franz Gisin
Donald N. Heirman
H.R. (Bob) Hofmann
Dan Hoolihan
James P. Muccioli
Andrew S. Podgorski

We wish the newly-elected members of the Board of Directors success and thank all candidates for their willingness to serve and for permitting their names to be included on the ballot.

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EDITORIAL



ROBERT D. GOLDBLUM
EDITOR

In the Summer issue of the EMCS Newsletter, I asked five questions. They were:

1. Is the EMC 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 U.S. 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 standards are European. Do we need the U.S. military EMI standards to retain the controls essential for the EMC of military systems?

In response to these questions, we received several letters. They are included in this issue of the EMCS Newsletter. I do not necessarily agree with the opinions of those who responded but would rather have additional comments from our membership before I offer mine. So keep those letters and e-mail messages coming in and I will keep the home fires burning.

Another successful EMC Symposium was conducted in Atlanta in August. There were exhibits, many technical sessions and papers, social events, and various technical society meetings. We tend to take these events for granted and often overlook the hard work and long hours contributed by the organizers of these symposiums.

Each symposium is organized and run by local chapter members. Most of these participants have no prior experience in running a symposium, and therefore must go through an on-the-job learning experience as they plan to host nearly a thousand people each year. They are the unsung heroes of these symposiums and get very few accolades from the membership at large. However, if you come upon someone wearing a symposium committee badge, please be sure to stop them and to congratulate them on a job well done. With very few exceptions, the Society has been blessed with annual symposiums which have been successful from nearly all points of view. It speaks well for the membership.

NEWSLETTER STAFF

EDITOR

Robert D. Goldblum
R & B Enterprises
20 Clipper Road
West Conshohocken, PA 19380
TEL: (610)825-1960 • FAX: (610)825-1684
e-mail: rbgoldb@ix.netcom.com



ASSOCIATE EDITORS

ABSTRACTS

William H. McGinnis
Southwest Research Institute
P.O. Drawer 28510
San Antonio, TX 78284
(210)522-2721
e-mail: BillMcG@connecti.com

EMCS 60d ACTIVITIES and EMCS PHOTOGRAPHER

Dick Ford
Naval Research Laboratory
Code 5330.2F
Washington, D.C. 20375-5000
(202)767-3440; fax: (202)767-6172

BOOK REVIEWS

Reinaldo Perez
c/o Lockheed Martin
MS: 58700, P.O. Box 179
Denver, CO 80201
(303)777-5845; fax: (303)971-4106
e-mail: rayj.perez@den.mim.com

EMCS EDUCATION COMMITTEE

Kimball Williams
Laton Corporation
26201 Northwestern Highway
P.O. Box 766
Southfield, MI 48037
(810)354-2845
fax: (810)354-2739
e-mail: k.williams@ieee.org

J. L. Norman Violette
Violette Engineering Corp.
120 East Broad St., Ste. B
Falls Church, VA 22046
(703)532-1355; fax: (703)538-3870

INTER-SOCIETY ACTIVITIES

Joseph C. Butler
Chemeries, Inc.
77 Dragon Ct.
Woburn, MA 01888
(617)935-4850
fax: (617)932-0569

CHAPTER CHATTER

Todd Hubing
University of Missouri - Rolla
219 Electrical Engineering Building
Rolla, MO 65401
(314)341-6069; fax: (314)341-4532
e-mail: thubing@ee.umr.edu

PRACTICAL PAPERS, ARTICLES & APPLICATION NOTES

Edwin L. Bronaugh
10210 Prism Drive
Austin, TX 78726
(512)258-6687
fax: (512)258-6982

EMC PERSONALITY PROFILE

William G. Duff
Computer Sciences Corp.
Systems Eng. Division (ETD)
Suite 309, 5501 Backlick Rd.
Springfield, VA 22151
(703)914-8450

POINT AND COUNTERPOINT

Anthony G. Zimbalatt
294 Crowell St.
Hempstead, NY 11550

EMC STANDARDS ACTIVITIES

Donald N. Herman
143 Jumping Brook Rd.
Linerort, NJ 07738-1442
(908)741-7723; fax: (908)540-5695

IEEE EMC SOCIETY NEWSLETTER PUBLICATION SCHEDULE

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

Editorial Contributions for the February issue should be received by December 15.

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LETTERS TO THE EDITOR

Dear Sir:

So far, I have never taken the liberty to write a "letter to the editor" of an IEEE publication. Furthermore, the views expressed here are my own and may not reflect those of my employer. To avoid a possible violation of ethics the "name of company" is missing in my address statement.

Your request asked for more editorials in the Summer edition of the *EMC Society Newsletter*. This has inspired me to fax you my personal opinion on:

"Will the U.S. rely upon European regulations to control EMI...?"

Although norms on regulating immunity carry the flag of protecting end-users against unwanted interference, they are also a sophisticated blueprint for trade barriers.

Whether consumers from Greece to Sweden will enjoy their computers, television sets or telephones more if the devices used are immunity tested (CE) or not may be an interesting question to discuss, but only from a purely engineering point of view. For the U.S. export industry there is no question at all that the immunity standards must be met, otherwise exporting to Europe will be impossible. It does not make much sense to force a U.S. manufacturer to produce two sets of electronic equipment: one that meets the European directive "for export models" and one that does not, "for domestic use only." Such a two-way approach should come at a higher cost and hence reduces the chances to stay competitive. The fact that a European directive may force another economic power (the NAFTA region) to follow the lead blindly - or lose economically, should serve as a warning. In the future every major industrial power should carefully watch each other. Whenever there is a committee formed to review or create technical regulations each country must ensure participation. We can ensure only by participating that the outcome may not work as a trade barrier. However, at the moment I do not see the possibility for the U.S. to participate in European committees and vice versa. So we should enlighten our political leaders to the fact that it is in our own best interest to open up all kinds of technical bodies to almost everybody. I envision a technological "GATT" on everything from frequency bands to limits on conducted emissions on power cords, a so-called General Agreement on Frequencies and EMC (GAFFE).

An example is how a prudent idea of protecting LANs against unwanted interference from other devices turned into an emotional battle of UTP versus STP (shielded twisted pair) cabling in Europe. Especially in Germany and France, unshielded wiring is viewed as incapable of delivering high data rates (>16 MBit/s) AND meeting the limits with regard to emission and immunity. Would the "new and tough" European directive 89/336 EMC practically outlaw the use of (Anglo-American) UTP cables in LANs?

Continued on page 18

CHAPTER CHATTER



TODD HUBING
ASSOCIATE EDITOR

Most people don't realize that EMC engineering is a fast-paced high-stakes profession. EMC engineers make decisions that can save (or cost) their companies millions of dollars. Poor EMC design can make a product unprofitable, non-competitive, or even unsafe. A good EMC engineer is a HERO!

When I am called in to work on a particularly difficult and urgent EMC problem, I feel like the Lone Ranger charging to the rescue. The William Tell Overture echoes through my brain as I plan my attack. My heart pounds, the adrenalin flows. Faster than an RF plane wave, more powerful than a nuclear electromagnetic pulse, able to protect tall buildings with a single ground.

Ahem, well...enough about me. I'm sure that you have all experienced the same feeling. It's no wonder that we EMC engineers enjoy our work so much. It's exciting! It's challenging!

Let's face it though. The general public's image of the EMC engineer is somewhat different from reality. This is due largely to the media. Heroes on TV and in the movies are typically doctors, lawyers, lifeguards, military officers, etc. When engineers are portrayed in the movies, they are invariably unromantic, socially inept nerds who shrink their kids or plot to take over the world with crazy inventions.

EMC problems are rarely portrayed on TV or in the movies. When they do occur, the engineers are usually helpless to do anything about them. For example, electromagnetic interference in one form or another is a persistent source of trouble to the crews of the Enterprise on "Star Trek." Although the engineer is usually called upon to fix the problem initially, invariably it is a bridge officer or another member of the crew that saves the day.

We need to let the world know that EMC problems are real and potentially dangerous. We need to show the public that EMC engineers play an important role in our society. We need a superhero that is not a multi-millionaire or a mild-mannered reporter.

For example, Todd Michaels, mild-mannered EMC engineer for a major metropolitan electronics firm, is en route to Paris with a new lightning protection plan for the Eiffel Tower. Todd played professional basketball and soccer for several years before leaving both sports in order to devote his full attention to EMC. He is seated in an aisle seat on a Concorde SST 50,000 feet above the Atlantic Ocean, making notes for his latest suspense novel.

Continued

Suddenly the plane jerks violently and begins diving toward the ocean.

The passengers scream, the flight attendants are frozen with fear, the pilots try desperately, but fruitlessly, to regain control of the plane. Todd discretely reaches for the small knob on his wrist watch and pulls on it to reveal a hidden antenna. The display on his watch changes. Instead of the time, it now provides a reading of the electric field strength at various frequencies and directions. With this device, Todd determines that a laptop computer two rows behind him is generating a signal that is interfering with the plane's stabilator control. With incredible grace and agility, he darts into the aisle and grabs the non-compliant device. As he is about to shut it down, the young owner of the computer begs him to leave it on. It seems she is in the middle of a chat session with the daughter of a foreign dictator. Ending the transmission prematurely could have grave diplomatic consequences.

Our hero deftly removes the machine's covers using a screwdriver hidden in his gold ball-point pen. A quick inspection of the interior reveals a pinched copper gasket that is not making good electrical contact with the cover. Todd pulls a short length of copper tape from a roll hidden in the cuff of his shirt sleeve. With one swift motion, he removes the adhesive backing (without slicing his fingers) and strategically places the tape over the gasket. He quickly replaces the cover and control of the plane is restored just seconds before it would have crashed into the ocean.

Well, what do you think? Maybe I should send this idea to FOX. It would make a great, action-packed drama. It's kind of like "Baywatch" without all the swimsuits and beaches. If they don't like this, I have another idea.

To her friends and constituents, she's known as Mary Lockhart, mild-mannered congresswoman from Rhode Island. No one suspects that

she has a secret identity. As Ferrah Ferrite, she has the unusual ability to see electric charge and hear RF radiation. Ferrah uses her talents to fight a never-ending battle for truth, justice, and electromagnetic compatibility.

It could happen. Anyway, if you want to meet other real-life EMC heroes in person, just be sure to attend your next local EMC chapter meeting. After all, even superheroes need to meet and compare notes once in a while. You can't be a superhero if you live in a cave. Well, OK, most of us can't.

CENTRAL NEW ENGLAND

The Central New England chapter elected new officers for the 1995-96 year. The following new officers were announced at the May 1995 meeting: Chairman: John Clarke, US DOT/FAA (retired); Vice-Chair: Tom Carberry, Booz Allen & Hamilton; Vice-Chair: John Luchini, MPM Corporation; Sec/Treas: John Clarke, US DOT/FAA (retired).

ISRAEL

Many thanks to Elya B. Joffe for providing us with this update of the Israeli Chapter activities. The Israeli IEEE EMC Chapter held annual elections for the officers of the chapter at the end of 1994. This is the first year that the "veterans" of the chapter and its founders, Rafi Rubinstein and Oren Hartal, have both stepped aside and vacated the seat for the next generation.

Many thanks are due to the outgoing officers for the leadership they provided to the chapter and to the EMC community in Israel. We know that they will continue to be active in the chapter in the future too. The new Chairman is Elya Joffe. Moshe Netzer is the new Vice-Chairman, and Moshe Henig is the new Secretary. Good luck to the incoming chapter.

This year, the chapter is off to a robust start in order to get all EMC-

involved personnel in Israel active in the chapter's activities. The chapter currently has about 40 active members, only 15 of whom are IEEE members. So, work has started to recruit new members for both the Chapter and the Society.

The chapter held its first formal activity in June, after reorganization, and held a meeting which took place at the Israeli Institution of Standards (several members of the chapter are actively involved in the EMC standardization process in Israel, and serve on the Israeli national committees). In the meeting, attended by over 30 members and guests, an update on the activities of the chapter was provided, as well as an update on the status of EMC standardization in Israel. Following that, there were two technical presentations. Dr. Avri Frenkel gave a presentation describing EMC applications of the EMAS FDTD software. The second presentation, by Moshe Netzer, described the results of a RADHAZ survey in the vicinity of broadcast facilities in Israel, many of which are located in urban areas. Mr. Netzer concluded his presentation with a demonstration of a computer program called TRIGO that he developed for the assessment and analysis of radiated electromagnetic environments, RADHAZ and coupling problems. Both presentations were very well received by the audience.

Currently, the chapter membership is organizing a one-day workshop on lightning and lightning protection. This workshop is scheduled to take place in March or April of 1996. It will be co-sponsored by the Israeli IEEE EMC Society Chapter and the IEEE Israel section.

LOS ANGELES

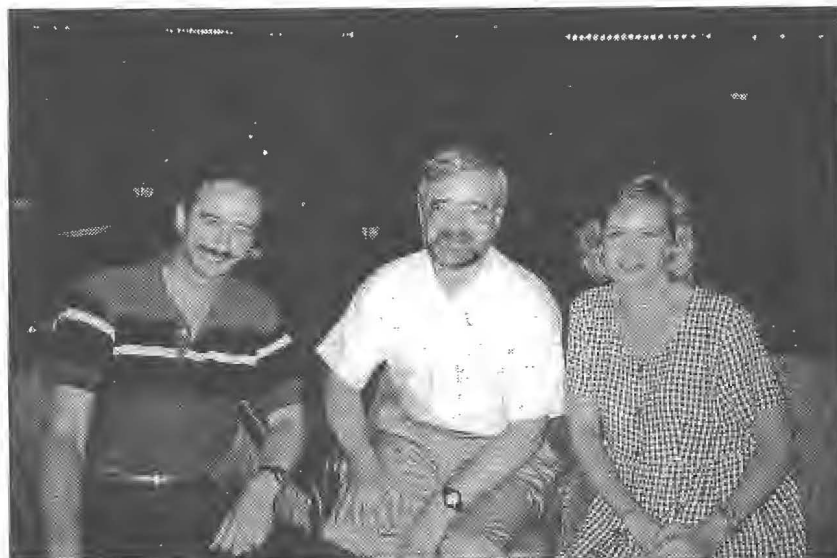
The Los Angeles Chapter kicked off its exciting 1995/1996 meeting schedule with Mark Nave of EMC Services in Huntsville, AL. This was a joint meeting with the Orange County Chapter. Mark's presentation at the September meeting was titled "EMI

Control in Switched Mode Power Supplies." The meeting was advertised in the local edition of the IEEE Bulletin, thus attracting many non-EMC Society members. For example, the power related societies were represented in force. Also, one person drove over two hours from San Diego to hear the presentation. In total, 57 people attended the meeting, including one EMC Society member who brought along a copy of Mark Nave's book *Power Line Filter Design for Switched-Mode Power Supplies* for a personal autograph. Mark's in-depth presentation included over 60 view graphs. During the meeting, Mark apologized for the length of material being presented, at which point a member of the audience replied, "We've got all night!" Another member actually brought along a power supply for Mark to evaluate. The presentation addressed the theory and operation of the basic topologies currently used in today's power factor corrected power supplies. This was followed by a discussion of the potential EMI sources inherent in the design and how the available options can affect those choices. After the exhausting presentation (Mark is a very lively speaker who actively encourages audience participation), Mark retired to his hotel room early so he would be refreshed for a 6:00 a.m. wakeup call the following morning from LA Chapter Chairman Ray Adams. Both avid scuba divers, Ray and Mark organized a day trip to Santa Catalina Island just off the Southern California coastline. Talk about combining business and pleasure! (Hear that, you speakers who want to visit California?) Those interested in more information about the Los Angeles Chapter may contact Ray Adams via e-mail at ray_adams@qmail4.sp.trw.com. Mark Nave may be reached via phone at (205) 461-0241.

Chapter Photographer Janet O'Neil commented in the last edition of Chapter Chatter that she would "snap" Scott Roleson and Ken Javor at the EMC Society Symposium in Atlanta. She was unable to attend the chapter



EMC Society Board of Directors members Janet O'Neil and Dan Hoolihan get into the southern spirit at the EMC Society Symposium in Atlanta.



Ray Adams, Scott Roleson and Janet O'Neil (left to right) enjoy some quiet social time during the hectic activities of the EMC Society Symposium in Atlanta.

meetings for their respective presentations in Los Angeles, so she tracked them down in Atlanta. You can see from the photos that everyone enjoyed the Atlanta EMC Society

Symposium! Incidentally, Scott was recently named Chairman of the EMC Society Distinguished Lecturer Program. He may be reached via e-

Continued

Photos courtesy of Janet O'Neil.

mail at scott@SDD.HP.COM. Ken may be reached via phone at (205)971-9527.

MONTREAL

Jean-Jacques Laurin reports that the Montreal Chapter held two meetings in 1994-95. The first meeting, in October 1994, featured a presentation by Dr. Rosemonde Mandeville, researcher at Armand-Frappier Institute in Laval, Quebec. Dr. Mondeville discussed the EMF/cancer issue and described on-going activities at the Armand-Frappier Institute relating to possible carcinogenic effects of magnetic fields.

Phillip Modouall, President and General Manager of Tektronix Canada, was the speaker at the second meeting held in March 1995. Mr. Modouall's presentation was titled "EMC Test Equipment, From Design to Compliance, An Introduction to EMC Testing." Test setups and equipment for conducted and radiated emission and immunity tests were discussed. The presentation included a live demonstration of selected tests.

PIKES PEAK

The following report was sent to me by John Will via e-mail. What a convenient way to let the world know what your chapter has been up to. Thanks, John.

The Pikes Peak IEEE EMC Society held its August meeting at DIGITAL on August 24th. Our hosts for the evening were Mike Nemeth and the Senior EMC Test Engineer for DIGITAL, Colorado Springs, Dennis Laurence. DIGITAL has a real nice EMC test facility here in town, complete with a small anechoic chamber for performing the European Community susceptibility testing, a shield room for performing conducted emissions and conducted susceptibility, and an Open Area Test Range (OATS) for radiated emissions testing. We were even able to witness first-hand one of the difficulties with using an OATS, since Pikes Peak once again favored us with a nice afternoon thunderstorm and shower during the entire meeting. The 3 m and 10 m sections of DIGITAL's OATS are, however, covered with a wooden A-frame structure. So once the lightning let up, we were able to check it out in relative comfort. The OATS extension for 30 m testing (which apparently was an old European requirement that is no longer required) extends beyond the A-frame; thus, we just looked out at it and the rain and the puddles about the ground plane screening and thought about the joys of working on an uncovered OATS! A great big thanks for a wonderful tour goes out to Mike Nemeth and Dennis Laurence.

In other news, the Pikes Peak IEEE Section is now on the Web! Thanks to the University of Colorado at Colorado Springs for providing the host services and to John Will for the initial effort in putting the home pages together and arranging the hosting with UCCS. Check us out at <http://www.uccs.edu/~ieec>. The intent is that this home page will provide information about local activities, upcoming events, points of contact, local engineering jobs which are available, and a place to post resumes. A word of caution: a substantial amount of work has gone into getting the home page started, but much more is needed to keep it going, updated, and timely. WE NEED VOLUNTEERS TO HELP WITH THE MAINTENANCE OF THE HOME PAGE or it will die. Please contact John Will at j.will@ieec.org or at 577-9700 if you are willing to help with the home page. Comments on what you like and don't like about the pages would also be appreciated.

MESSAGE FROM THE PRESIDENT . . .

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My final thanks go to the one and only Society member who commented on one of my previous messages. He suggested, after reading the message on individual career development, that I mention something about career change in a future writing. Thanks for the feedback (and the knowledge that this column is read). Yes, your individual development plan should include the consideration that you may not always be a "working" EMC engineer. Based on my 45 years of experience, many engineers transition to management, develop their own business, or are "forced" into another engineering discipline. My own career evolution was from EMC R&D engineering to EMC group supervisor, to the communications security field, to middle management of a communications R&D organization, to retirement and President of the EMC Society.

Career changes can broaden and enrich your life if you are prepared to accept new challenges with a positive attitude.

APPLIED COMPUTATIONAL ELECTROMAGNETIC SOCIETY

The 12th Annual Review of Progress in Applied Computational Electromagnetics will be held from March 18 - 22, 1996 at the Naval Postgraduate School, Monterey, California. The purpose of the symposium is to bring EM analysts together to share information and experience about the practical application of EM analysis using computational methods. The symposium offers technical presentations, demonstrations, vendor booths and short courses. Contact Richard Gordon, EE Department, University of Mississippi, Anderson Hall, Box 41, University, MS 38677. Phone: (601) 232-5388. Fax (601) 232-7231.
e-mail: eeegordon@vm.cc.olemiss.edu



DICK FORD
ASSOCIATE EDITOR

The second EMCS Board of Directors meeting of 1995 was held at the Marriott Conference Center in Atlanta, GA. This meeting coincided with our 1995 IEEE International EMC Symposium, 14-18 August. In accordance with recent practice for our meetings at the Symposium, the meeting was held in two parts. The first part was held all day Sunday, and the second part on Thursday evening. All directors except **Bill Gjertson** were in attendance, though not all were able to attend the entire meeting due to competing duties attendant to the Symposium. Others attending were **Ray Adams, Bob Brook, Gene Cory, Scott Davis, Hugh Denny, Jacques Gavan (Israel), Don Heirman, Lee Hill, Rex Jameson (CAEME), Moto Kanda, Leo Makowski, Maqsood Mohd, Herb Mertel, Mark Montrose, John Rohrbaugh, Scott Roleson, Risaburo Sato, and Gao Yougang (China)** (as well as several other society members/symposium attendees who dropped in for brief periods). The meeting was chaired by EMCS President **Warren Kesselman**.

Highlights of the Directors' reports and discussions follow:

AWARDS

Over two dozen awards were voted for this year. A special congratulations to our Society's two new Fellows, **Dr. Jacques Gavan** and **Hugh Denny**.

MEMBERSHIP

Dave Staggs reported that the IEEE headquarters computer problems continue to prevent us from getting

membership data (this problem has persisted nearly a year now). Unofficially our membership is believed to be 4357, which is down from a high of 4513 in 1993. There was considerable EMCS BoD discussion about the continuing IEEE headquarters problems. We know these problems are causing our members problems (especially overseas members). This is very likely hurting overall membership.

CHAPTERS

There are currently 41 chapters worldwide, 27 of which are in the U.S.

DISTINGUISHED LECTURER

Scott Roleson has agreed to chair the DL program, relieving **Dave Hanttula** so he can concentrate on the upcoming symposium next year in the Santa Clara area.

TRANSNATIONAL

Clay Paul has resigned as Chair. **Ferdy Mayer (France)** has agreed to replace him.

REPRESENTATIVE ADVISORY COMMITTEE (RAC)

The RAC formally invited **Dave Imeson (U.K.)** to be a speaker at this year's symposium. This invitation included underwriting Mr. Imeson's travel costs. He is current Chair of the Association of European EMC Competent Bodies (ACB) as well as Chair of EMIT & EMCEL (EMC agreement groups with EOTC). Although there was solid agreement that the talk was excellent and well received (over 160 attended - and more would have but the talk was scheduled in a room too small to accommodate all wishing to attend), many thought Mr. Imeson was to be a keynote speaker, not just a session speaker. There was considerable discussion at the BoD meeting on whether this set a precedent. **Joe Butler** was appointed to chair an ad-hoc subcommittee to study this issue and report back to the full BoD. The

RAC also held its first Symposium luncheon. RAC Chair **Leo Makowski** noted at the Thursday BoD meeting that the luncheon was well attended. At the luncheon, **Gary Fenical**, who has replaced **Dave Graham** as SAE-AE4 Representative, reported that SAE-AE4 activity levels are quite high. Most efforts are responding to the U.S. military's need to get commercial equivalents to the now "outlawed" (by U.S. Defense Secretary William Perry) MIL SPECS. **John Osburn** reported on EIA's EIA-IS-647/648 (commercial versions of MIL-STD-461/2). Since 461 (and possibly 462) are now expected to get a waiver from the "Perry de-implementing process," EIA's efforts may proceed at a less urgent and hence more deliberative pace. **Ed Bronaugh** reported that SAE Automotive EMI & EMR's work on J551 and J113 is almost complete. These are whole vehicle and component assembly tests, respectfully. Both are also harmonized with their counterparts in IEC/CISPR and ISO. **Dan Hoolihan** gave an extensive report on the recent COMAR meeting. (See Inter-Society Activities, COMAR, page 10.)

EDUCATION

The Education committee activity level continues at a very high level under **Kimball William's** leadership. As usual his report is much more comprehensive than there is room for coverage in this article. Highlights: The Symposium Experiments Demonstrations were staffed for the week for the third year under **Andy Drozd's** leadership. This year saw us go from two to three booths. At one booth **Rex Jameson** demonstrated CAEME education software courtesy of CAEME's **Magdy Iskandar** (Rex also gave demonstrations to the BoD at the Thursday evening meeting). These demonstrations were again very well received by the Symposium attendees. Unfortunately Andy has to resign as Chair of the Experiments subcommittee. Anyone interested in helping to continue this work should contact **Kim Williams**. The Tutorials

Continued

workshop "Fundamentals of EMC," under **Maqsood Mohd's** leadership, was held on Monday. It was well attended. As a one-day event, many felt that its quality rivaled some multi-day commercial short courses.

NARTE

On Monday **Jim Whalen** held another successful symposium workshop on taking the NARTE EMC exam. The BoD was informed that over twenty people had registered to take the formal NARTE exam scheduled all day Friday. For the first time NARTE agreed to hold the actual exam at the Symposium. It was proctored by NARTE employees who also staffed a very popular NARTE booth in the Symposium exhibits area.

TRANSACTIONS

Moto Kanda has agreed to ask all Transactions candidate authors to include a paragraph which explains how the material in their article relates to, or is important to, the field of EMC.

HISTORY

Chet Smith continues efforts to store EMCS archival material using the latest technology, i.e., CD-ROM. **Len Carlson** reported that IEEE headquarters plans to offer an "all IEEE journals package" on CD-ROM in a "bundled package" for about \$34k/yr. (with discounts down to about \$19k). He noted that headquarters apparently has no problems with our plans to sell CD-ROMS of our past Symposium records. Chet proposed a plan which would result in members getting this material for as little as \$10. A question arose as to whether our CD-ROM could include our Transactions. Len took an action item to check with headquarters and find out if we could do this.

SYMPOSIA

The Israel Chapter requested, and the BoD approved, that the 2003 International Symposium be held in

Israel (the U.S. Symposium will hence be a national event). During discussion of an upcoming Symposium in China, there was considerable discussion about a new type of IEEE Symposium sponsorship called "Technical Co-Sponsorship." Under Technical Co-Sponsorship, IEEE would have no symposium financial involvement (risk or benefit), but IEEE members would get a discount on registration, IEEE would provide a Symposium Co-Chairman, all papers which are presented in English would be reviewed and assessed by the Society TC's, and the Symposium Record would be published in English and would be available through the IEEE TAB bookbroker program. **Henry Ott** reported on an A/I he had regarding volunteers collecting sales taxes at symposia. He reported that headquarters said to just collect the regular price and that if sales taxes were due on a particular transaction, headquarters would cover this from the base price.

TREASURER

During the Sunday BoD meeting, based on budget inputs received, treasurer **Andy Podgorski** submitted to the BoD a budget with a \$90k (U.S.) deficit. During the week, the finance committee met and pared this proposed budget down in accordance with our EMCS Financial Guidelines. After about \$60k (U.S.) was eliminated the final 1996 budget was approved. A key reduction was the deletion of \$20k requested for CAEME. The EMCS joined as a sponsor of CAEME several years ago. As a nonprofit sponsor our "dues" have been \$5k/yr., which the Society has paid each year. There was considerable discussion about the need and appropriateness of this \$20k, one-time, additional assessment. However, it became a moot issue once the scope of the overall EMCS funding shortfall became evident. (See Treasurer's report on page 22.)

As usual, **Janet O'Neil**, EMCS secretary, will be happy to provide additional detail on the happenings at this (or any other) BoD meeting.



After nearly a dozen heavy hours of the EMCS Directors meeting, a lighter moment. EMCS BoD member Todd Hubing receives a surprise birthday greeting and gift.



JOSEPH E. BUTLER
ASSOCIATE EDITOR

IEEE TECHNOLOGY POLICY COMMITTEE Aerospace R&D

B. Leonard Carlson, Representative

Several items related to space and NASA were discussed at the July 1995 meeting. The most interesting item is the Solar Power Satellite Review. At the request of NASA, the Aerospace Policy Committee is examining the issue and Bill Brown is heading the effort. Len Carlson is a member of the committee representing the EMCS. It was noted that one of the most pressing challenges facing global society is providing clean, economical energy. The unlimited solar energy available in space suggests a solution to this basic need for civilization. Capturing this energy in space and importing it to earth to meet human needs offers a space-based option which should be pursued along with other options for a sustainable energy future. The goal scale and the technical, economic and environmental challenges of implementing space solar power systems require international cooperation.

The technical approach to power importation is to capture energy in space on large satellite platforms, convert it to RF energy, and transmit it to receiving antennas that convert the RF energy into electrical energy. Various means of energy conversion have been advanced but the current emphasis is on photovoltaics. Optical transmission approaches with lasers have been suggested. However, RF appears to be the most useful in the near term because the technology is proven and conversion efficiencies are

high. Studies have indicated that non-terrestrial resources, from lunar or asteroidal sources, may eventually be the most economical way of supporting a mature space-based manufacturing operation for solar power satellites and other space-based industries. Wireless power transmission from point to point on the ground (across difficult terrain), or from the ground to high altitude, long endurance aircraft (for communications or other purposes) may provide logical stepping stones to importation of solar power from satellites.

USAB R&D Policy Committee (formerly IEEE Technology Policy Council Committee Engineering and Defense R&D)

Richard Ford, Representative

The combining of the Defense R&D Policy and the Engineering R&D Policy Committee into one committee is paying benefits. We now have a number of active subcommittees, including one on all government laboratories.

As to issues with which the USAB R&D Policy Committee is grappling, I think the most important one is our ability (read inability) to marshal, on short notice, our larger institute and society USA members to input to Congress on those issues that we may feel are of vital interest to IEEE members. As Congress slowly but surely increases its oversight into more and more of society's business, it becomes more and more vital that "lobbying" efforts be effective.

Timing is everything, one often hears. This is one case where it's certainly true. One thing is clear: fifty to a hundred engineers from a congressional member's own state calling about a bill addressing pension reform or intellectual rights can make a dramatic difference in that member's vote. BUT, those calls (or letters) must occur in the few days leading up to the actual vote. A day late is too late; several days too early means the member (Senator or Congressman/woman) is on other issues and the caller gets "staffed."

On specific issues, the future of federal laboratories is high on the agenda. Several possible bills address this. Their focus is all over the park, from do nothing to close them all down. The answer (as usual) is somewhere in the middle. Nationally orchestrated corporate initiatives on complex high-tech things like hybrid future automobile engines, or high speed rail, are vital for global leadership. Federal labs are one way to get the long view, so often missing in our private enterprise.

ACES

Richard Ford, Representative

No new activity at this time.

ESD ASSOCIATION

T. J. (Bill) Ritenour, Representative

The ESD Association will have had its 1995 Symposium by the time this newsletter is out. The symposium, held in Phoenix this year, started on Sunday the 10th and ran through Thursday the 14th of September. There were tutorials and seminars on Sunday and Monday and a two-track symposium on Tuesday, Wednesday, and Thursday. The symposium's technical content was high as usual with emphasis on testing, standards, ESD suppression in the factory and other topics. There were more than 100 exhibitors registered and the attendance was to be in excess of 1000.

ANSI C63

Don Heirman, Representative

No new information at this time.

CISPR A&G

Don Heirman, Representative

CISPR/A: The final edited version of CISPR Pub. 16, part 2 (Method of Measurements for Emission and Immunity) was sent to Geneva in June for publication in 1995. Part 1 (Instrumentation) was published in 1993.

Continued

Reports and Recommendations will be published next, in 1996.

CISPR/G: Pub. 22 (Emission Limits and Emission Measurements Methods for Information Technology Equipment) revision to include much of ANSI C63.4-1992 material is due in early 1996. Pub. 24 on ITE Immunity Limits and Measurements is due later in 1996.

SOCIETY OF AUTOMOTIVE ENGINEERS - SAE-AE4 EMC

Gary Fenical, Representative

Mr. Gary Fenical has taken over RAC responsibilities from Dave Graham for SAE-AE4. SAE-AE4 met on Monday, August 14, 1995 at the IEEE Symposium. Discussions took place on the updates and revisions to ARP 1972/4244 for relating to MIL-STD EMC Recommended Practices, ARP 704 for Gasket Testing, and for EMC Equipment Reports. The committee has been asked by the U.S. military to come up with commercialized revision of any/all relevant military standards.

Subcommittee AE4L: Working with Eurocae WG-31 to revise sections 22 and 23 for RTC DO-1600 and SAE AE4L-87-3 (orange book).

Subcommittee AE4R: Completing harmonized version of HIRF report and User's Manual.

The helicopter environmental sub-panel continues to meet. A European HIRF environment for helicopters has been approved.

RADIO TECHNICAL COMMISSION FOR AERONAUTICS (RTCA)

Rick Gaynor, Representative

No new information at this time.

NARTE

John Luchini, Representative

No new information at this time.

AMERICAN SOCIETY FOR TESTING MATERIALS (ASTM) D09, 12, 14 AND ELECTROMAGNETIC SHIELDING

Drew Peregrim, Representative

The ASTM shielding effectiveness test method is under revision and is now in committee for approval. Results will be announced at the next meeting.

SAE AUTOMOTIVE EMI & EMR

Ed Bronaugh, Representative

Work on SAE J551 and J1113 is almost complete. J551 is a coordinated collection of tests for whole vehicle EMC, and J1113 is a similar collection for vehicle components and modules. Each test is identical to or harmonized with its counterpart in the IEC/CISPR or ISO, International Standard.

IEEE METRIC POLICY

Ed Bronaugh, Representative

No new information at this time.

COMMITTEE ON MAN AND RADIATION (COMAR)

Dan Hoolihan, Representative

Nearly 35 members attended the meeting of the Committee on Man and Radiation which was held from 7 to 10 PM on June 22, 1995, in the Whittier Room of the Boston Park Plaza Hotel. The chair announced that the new association with EMBS as an ad hoc technical committee is working very well.

Following a discussion of Ruth Miller's most recent draft of her paper in response to Brodeur's "Great Power-Line Cover-Up," the committee voted approval of a motion that this be a "Paper Commissioned by the IEEE Committee on Man and Radiation," and thus a companion to the earlier "Currents of Death — Rectified."

COMAR's continued representation to the IEEE USAB activities was discussed at length. Our official representative to the new Electromagnetic Effects Subcommittee of the Medical Technology Policy Committee (within TPC) is C. K. Chou; he and one other member constitute the subcommittee. They will meet via teleconference in July to discuss the revision of certain position state-

ments, some of which had been generated originally by COMAR.

The Chair announced that the 1996 EMBS meeting will be held in Amsterdam (October 31 - November 3) and the proposals for mini-symposia and workshops on October 30th are being solicited. More information is to be obtained by the Chair regarding advanced funding for speakers and other technical matters; nevertheless, the members present voted that COMAR develop a one-day workshop for the Amsterdam meeting.

With respect to publications, the HDTV Technical Information Statement will be published in the Sept./Oct. '95 issue of the EMB Magazine. Reprints have been ordered for that and the previous RF/MW statement. C. K. Chou reported that the Dosimetry tutorial has been accepted by Bioelectromagnetics and a revised MS was scheduled to have been mailed back at the end of June. New member Gregory Lapin has agreed to be COMAR's editorial consultant and Ron Petersen has volunteered to serve as Secretary until the end of 1995.

The draft technical information statement on pulsed RF fields and a second statement on Nexrad radar will be completed by B. Jon Klauenberg's subcommittee before the fall meeting. Charles Polk announced that his subcommittee's second draft on health effects from power frequency fields is not ready yet because he has recently received critiques and suggestions from several COMAR members. He envisions a longer statement than that contained in the first draft and hopes to finish the second draft by the fall meeting.

Those attending the Boston meeting agreed to hold the next meeting of the full COMAR in conjunction with (prior to) the DOE/EPRI contractors meeting scheduled for Palm Springs, CA from November 12-16, 1995.



KIMBALL WILLIAMS
ASSOCIATE EDITOR

LIFELONG LEARNING

When I was growing up in my parents' home, the contents of the lowest shelf on the bookcase was math, physics and engineering texts. Naturally, I spent a lot of time looking at all the interesting pictures and learning to read some of my first words out of *Elementary Physics* by Chute.

Later, as I started reading for content, I discovered that I lacked the background to comprehend what was going on in the math, physics and engineering texts. Fortunately, the next shelf up was devoted to science fiction.

As I became a reader, I read the SF ABC's: Azimov, Bradbury and Clark. I finally got through the alphabet with Roger Zelazny's work. The early exposure to works of math, physics and engineering as well as the work of disciplined dreamers who speculate on the effects of science on human society have shaped my outlook on science, engineering and life in general.

My belief in the influence of the environment on the potential student was most profoundly set by the example of my youngest son. When Leland was in his most formative years, 5 to 14, my wife Mary Lou was completing her degree in science in day school, while I was completing my own degree in engineering in night school. After dinner every night, both Mary Lou and I settled down to study. It was natural that Leland did what

Mom and Dad did. He would return from school himself, and sit down and study for a couple of hours before dinner and study after dinner with Mary Lou and me. "Isn't that what every family does?" How would he know any different? The end result of this early influence is one of the most dedicated students it has been my privilege to know.

Neither Mary Lou nor I can take any credit for this happy result. It just happened because of what we were and how our life was directed at a critical time in Leland's growth. Nor can we say that our studies directed his eventual goal, molecular biology, or that we had much to do with his successes, publishing papers and the joint authorship on a laboratory text in his field. What we did do was provide an opportunity for development.

That is what the lifelong learning thrust of the IEEE Education Activities Board (EAB) is designed to do for working engineers. It hopes to provide an opportunity for further development in your chosen field. The EAB is currently holding lifelong learning workshops around the country in an effort to develop a curriculum suitable for the continued development of working engineers. If any of you have an opportunity to participate in one of these workshops, don't miss the chance. You may be helping to shape the careers of many engineers to follow you in the future.

AFTER SCHOOL, SCHOOL

In an earlier editorial I noted that the education process was a never ending one. Once placed on the path to knowledge, it is impossible to leave without massive trauma if the search was a serious one to begin with. For many of us, the process also involves giving back to the system by becoming a teacher as well as a continuing student.

I am not saying that everyone must teach. But, if you have the

information that someone else needs, it is incumbent on you to step up and deliver the message. Most often this is a one-on-one experience. Sometimes it is by teaching in a seminar format. For a few, we wind up teaching formal classes. Whatever form it takes, most of us become teachers somewhere along the way.

This is part of the lifelong learning process as well. Anyone who has had to explain some complex subject to another knows how much the process of making the information clear to another person clarifies the subject in your own mind. Teaching is learning, but on a deeper level.

MIRROR MIRROR ON THE ... TUBE?

One of the most interesting statements in the Bible has, for me, always been... "Come and reason with me." If taken literally, we seem to have a direct message from the Almighty telling us to use our heads! Not only are we being admonished to think, but to reason, which implies awareness, analysis and conclusion. If C.S. Lewis was serious in his little book *The Screwtape Letters*, then he, at least, believed that the purpose of man is to "know and understand."

Today, mankind is in the process of developing tools that provide him with the ability to gain access to vast quantities of information: TV, radio, Internet, etc. (the tube). We also are developing a mirror for the human mind in the form of the computer (another tube). Here is a tool that allows us to reason' with our own minds and see the results of that reasoning process when dealing with technical subjects. Modeling tools or simple spreadsheets allow us to reason in complex ways that were not possible just a decade ago.

With the available teaching and modeling tools on computer today we have the ability to move from knowing a technical subject to the gut feel that makes the difference

between knowing and being able to fully use the information. Further, by using the "what if" capabilities of the computer for exploring the limits and possibilities of a structured model, we can actually progress in reverse from a guess about the behavior of a system, to a gut feel for what it will do, to the full intellectual understanding of the system.

One of the poems of the mystic poet William Blake reads:

Tiger, Tiger burning bright
In the forests of the night,
What immortal hand or eye
Could frame thy fearful symmetry?

Here is an example of something that evokes powerful imagery and strong feelings with minimal understanding. I can remember having the same feeling about field gradients during my first field theory course. Here was something important and challenging that promoted powerful feelings, but I couldn't get my hands around it. Now, with the CAEME programs I can model the problem and watch the field change as I manipulate the describing equation. Too bad I can't do that with Blake!

We have information coming to us from many sources. We have the beginnings of a mental mirror that can assist us in the reasoning process as well as acting as a selective filter on the incoming information. In short, we have an environment that can be highly conducive to extending any study program as far as the individual wishes to take it. All that is lacking is a way to understand what it is that we need to know, and a method to kick-start us in the right direction.

Here is where the lifelong learning process will fill a much needed role. Part of the lifelong learning program is to include a way for the student to perform a self-evaluation of how acquired skills correspond to the ideal practitioner in a particular field. This will be a self test. The results should indicate the areas where the student should concentrate efforts to provide the most balanced capabilities when current studies are concluded.

Now we are back to those lifelong learning workshops I mentioned way back when. The self evaluations and curriculum programs that emerge from the workshops will determine how successful the whole process will be. The more input and participation we have from concerned individuals, the better the final output. So, if you have the opportunity and want to help in the development process, contact Peter Lewis at IEEE at the e-mail address below and offer to help. p.lewis@ieee.org

As always, if you wish to contact me I can be reached at: k.williams@ieee.org

WHERE IS IEEE HEADED ON RESTRUCTURING?

By BILL MIDDLETON

(Source: *Almanack*, September 1995)

Extensive coverage in the June issue of the *Institute* of a possible new organizational structure for IEEE has motivated extensive discussion and feedback from the membership. A special session was held during the Washington Board of Directors (BoD) meeting in June; Task Force leaders took time to explain their proposals and respond to questions from the audience.

A quick sense of the proposals is complex. Why is all this necessary? Why aren't the efforts on this activity being spent more properly to correct existing service problems at Piscataway? And simply, why can't the current structure be modified without radical change if it takes structural change to improve efficiency?

Many there felt that these questions were not answered to the satisfaction of the attendees. There was a pronouncement from the Strategic Planning Committee Vice Chair that a further look at tweaking the present structure would be done by the committee. Feedback from all sources would be considered by the Committee, leading to further modifications and presentations. The Committee will meet in July and September on this matter.

In a subsequent BoD action, a motion was approved to move action on the three scenarios to the December 1995 meeting rather than delay until a 1996 vote when a new Board will have to rehash a lot of the current background. This move was prompted by a desire on the part of many Directors to bring the matter to a head by a disapproval vote of all three scenarios.

The Philadelphia Section Executive Committee will be discussing the various proposals and a response at their September meeting. The answer for this will be in December. But, for now, keep the feedback rolling as you, the members, see what has been presented and offer your considered opinion to the leadership.

Send your comments to Chair Ken Laker, me, President Tom Cain, or Ken Moore, Editor of the *Institute*. Don't be a bashful member; speak your mind!

1995 INTERNATIONAL EMC SOCIETY SYMPOSIUM

By JOHN ROHRBAUGH
SYMPOSIUM CHAIRMAN

The 1995 IEEE International Symposium on Electromagnetic Compatibility (EMC) was held in Atlanta, Georgia at the Marriott Marquis, August 14-18, 1995. A total of 978 people attended the workshops, technical sessions and exhibits at this year's event. Twenty-eight countries were represented with 170 non-U.S. attendees. There were 112 exhibitors occupying 161 booths in the exhibit hall. Eight booths were occupied by non-U.S. exhibitors, including representatives from Canada, The Netherlands, Belgium, Germany, Japan and England.

The 1995 EMC Symposium featured eight workshops, with four on Monday and four on Friday. Twenty-four technical sessions were held, two of which were poster sessions. Twenty-six poster papers were presented and 109 technical papers were presented in 24 oral sessions. The most popular workshops were "The Fundamentals of EMC" and "1995 European Requirements: EMC Directive 89/336/EEC and its Application to Your Product," both held on Monday, August 14. The technical session drawing the most interest was session 3A: "International Standards and Regulations," held on Wednesday, August 16. Of particular interest were the FCC's discussions of their proposal to deregulate equipment authorization requirements for digital devices. A special continuation session was added for people to meet the FCC on Thursday morning. Sessions 2A and 4A on Measurement Techniques and Devices were very popular as well.

Seventeen demonstrations of important aspects of EMC were made as part of the symposium in the Amsterdam room of the Marquis. The demonstrations were of great interest and I want to thank Andy

Drozd for his hard work in getting everything pulled together.

We had a couple of EMI problems in the exhibit hall, mainly RF-controlled light panels turning off or on when you least wanted them to turn off or on. Problem was, we couldn't find an EMC engineer since they were all busy working their booths or listening/presenting a talk!

The symposium featured three major social functions, the Tuesday Publishers' Reception, the Wednesday Awards Luncheon and the Wednesday evening at Fernbank. The Publishers' Reception was an informal gathering that featured a magician, "Peter the Adequate," courtesy of EMCO, a buffet dinner and a raffle. We gave away a number of prizes with the big prizes being two color TVs and the grand prize consisting of two round-trip tickets on Delta and a Marriott weekend package. For future reference, we could have given more tickets away if people flying Delta had referred to the file number given in the registration information. We earned one free round-trip ticket for every 40 reservations and we raffled off all tickets we earned!

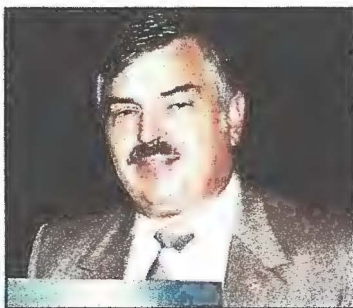
The social highlight was Wednesday's Evening at Atlanta's Fernbank Natural History Museum. Over 700 people enjoyed a buffet dinner, drinks and great cheesecakes. The museum features included the Chinese Dinosaur exhibit and an IMAX presentation on worldwide volcanic activities, "The Ring of Fire." One thing we learned, for future symposium planners that is, was that the most popular attraction for engineers (besides the food) was the hands-on science exhibit geared towards 6 to 10 year olds! I guess we are all little kids at heart. We ran out of cheesecake and unfortunately, not everyone got to have a piece. We planned 1.5 pieces of cheesecake for

1,000 people (there were six kinds of cheesecake and I guess some ate a piece of each kind). I might add that the catering captain at the Marriott Marquis commented, "Your people like to eat," as he presented me with the bill for Tuesday's Publishers' Reception. I also suggested that future symposia planners add a "race to the buffet line" as part of the door prize giveaway. This year's winner was a woman who ran to the front of the line (nice running shoes), but unfortunately we did not get her name! Maybe a gold fork would be a good prize!

Wednesday also featured the annual Awards Luncheon. This year, two individuals, Mr. Hugh Denny and Dr. Jacques Gavan, were honored by being named Fellows in the IEEE. This year's Best Symposium Paper Award went to D.G. Cammell and M.T. Ma, for their paper "Data Evaluation of a Linear System by a Second-Order Transfer Function." Numerous other awards were presented and our congratulations to all of the recipients.

Everybody seemed to have a good time at this year's symposium and I know I enjoyed helping to put it together. Putting on a symposium is a lot of work done by a few volunteers. This year's crew was outstanding to work with and my thanks and congratulations on a job well done to all of them. We started putting this year's symposium together in 1989. At that time I thought I was the Chairman-of-Vice, but was quickly corrected that I was the Vice-Chairman. I didn't realize there was a difference. Well our Chairman quit a couple of years later and I became the Chairman. Even though I didn't get to do some of the things I thought I was going to be able to do when I originally signed on, I still found the experience very enjoyable!

Thanks again to the exhibitors and everyone who attended!



Clay Paul, recognized for Best Paper, "A SPICE Model for Multiconductor Transmission Lines Excited by an Incident EM Field."



The Crowd eagerly awaits a trip to Fernbank.



Wilf Lauber, awarded Certification of Appreciation for Outstanding Service as Technical Activities Chair.



Bob Brook (right) was one of dozens of prize winners at the Publishers' Fete.



Gene Cory, recipient of the Stoddard Award for Outstanding Performance.



Diners enjoy great food at the Publishers' Fete.

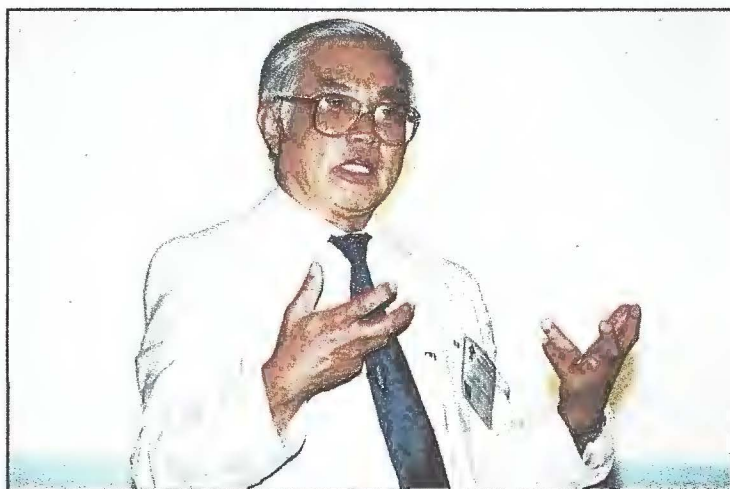
CIETY SYMPOSIUM IN ATLANTA



Past Society President Ed Bronaugh feeds Dino at Fernbank.



Attendees and Dino enjoy the food and atmosphere at Fernbank.



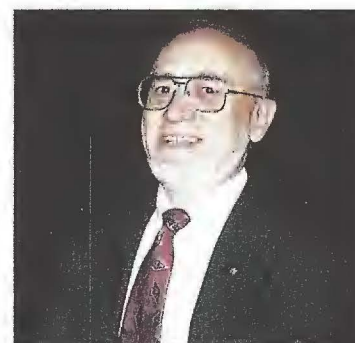
Mark Ma, along with D.G. Camell, received Best Paper Award.



Joe Butler, recipient of the Lawrence Cuming Award for Outstanding Service.



Peter the Adequate, surprised by his own magic.



*Hugh Denny,
IEEE Fellow Recipient.*

IEEE DIVISION IV REPORT

ROLF H. JANSEN
IEEE DIVISION IV DIRECTOR

JOINT IEEE MTT/ED INITIATIVE

A program for aiding Eastern Europe and the former Soviet Union has been organized by the MTT and Education Societies. The initiative has been well-received on various levels of the IEEE organization and is a noteworthy example of cooperation between two societies associated with different divisions. The organizational structures employed during the initiative may become a suitable model for society-based membership development outside the U.S. and the first step planned is to make this model popular within Division IV. During the June 1995 RAB/TAB Transnational Committee Meeting, a motion was approved for a model to be developed for application throughout IEEE Societies.

The first ideas for the initiative were generated as a result of the end of the Cold War. It was realized then that Eastern Europe and the former Soviet Union was a large geographical area with virtually no IEEE membership at all. It needed an organizational effort to encourage contact with engineers in the area, identify their interests, and help to form membership and chapters, so that these members of the electrical engineering community could participate in the worldwide exchange of technical information.

Parallel to the start phase of the initiative, the ED Society was working on an EDS globalization trust and it became obvious that there were closely related interests between the EDS and the MTTs. One of their major activities in Eastern Europe and the former Soviet Union was the Eastern Europe Library Project conducted by Mike Adler, EDS 1993 President, organizing free IEEE journal supplies for selected public libraries in the region.

Specifically, it was decided to select 6 focus areas and sponsor 12 to 14 members in each area with the goal of chapter formation and the setting-up of local MTT/ED-related activities. The plan was approved for a time period of three years, costing each of the involved societies a total of about U.S. \$2000 annually. The six focus areas to be addressed first are St. Petersburg, Russia; Vilnius, Lithuania; Lvov-Kharkov, Ukraine; Sofia-Varna, Bulgaria; Saratov-Penza, Russia; and Moscow, Russia.

It would be a pleasure to see more Division IV Societies make use of the established links, contacts and procedures for their own membership development in Eastern Europe and the former Soviet Union. Please contact me if you think that our experience in the region would be of interest to your Society. Fax +49-241-8888294; e-mail: jansen@ithe.rwth-aachen.de

BOOK REVIEW



RINALDO PEREZ
ASSOCIATE EDITOR

ANALYSIS OF
MULTICONDUCTOR
TRANSMISSION LINES
by Clayton R. Paul
John-Wiley Interscience, 1994
Pages: 557
Price: \$79.95

One of the earliest models I can remember in the analysis of EMI problems is that of representing a crosstalk scenario with a voltage/current source connected to a load by a straight wire/cable and adjacent to a victim circuit of near or similar configuration. These early models dealt with the analysis of EMI problems using transmission lines (a very idealized environment of straight wires, parallel, and lossless lines and a homogeneous medium). This book by Clayton Paul deals with the detailed analysis of transmission lines in both time and frequency domains. The issues concerning EMI (e.g., ground loop coupling, crosstalk) are covered throughout the text but only as a subset of the general treatment of transmission lines. Therefore, the purpose of this book is to study the common solutions and techniques in transmission line equations. The book shows a very thorough treatment of such techniques and contains probably the best review of published work on transmission lines. The book is divided into 8 chapters and 1 appendix. The appendix describes briefly a series of 17 fortran programs (all in a diskette accompanying the book) for the analysis of diverse types of transmission line problems (e.g. wires separated, shielded separated wires, ribbon cables, microstrip in PCB, SPICE formulations).

The fundamental assumption used throughout this book is that for all transmission line networks (whether just two wires, a wire over a ground plane, or multiconductor transmission lines) the field surrounding the conductor is a TEM wave, hence, electric and magnetic fields are perpendicular to the line axis. Natural consequences of this are that: the lines are small compared to wavelength, and conductor diameters are small. Conditions that are not TEM are not treated in the book and require that the solutions of such transmission line equations be dealt with numerically. Because of the importance of TEM principles, chapter 1 is dedicated to the study of the TEM mode of propagation and the derivations of simple transmission line equations for the two conductor lines. Chapter 1 ends with the classification of transmission lines. It is important for EMI engineers to realize that transmission line currents (or differential mode currents) derived from the solution of transmission line equations in this book are only a fraction of the total current that may be present on these lines. The asymmetries of transmission line networks can also produce common-mode currents (antenna effects of transmission lines) which are often the major sources of EMI. The author explains these issues at the end of chapter 1.

Chapter 2 goes beyond the two wire transmission lines and derives, from the integral form of Maxwell's equations, the two generalized multiconductor transmission line (MTL)

equations (i.e. for voltage and current) where all the parameters involved ($V(z,t)$, $I(z,t)$, R,L,C and G) are vector quantities and are represented by matrices. The terms R,L,C , and G are matrices of per-unit-length elements. As is well known, the MTL equations are a set of first order coupled partial differential equations which can also be decoupled, and this is shown in the chapter.

The first step in solving MTL equations is to calculate the per-unit-length parameter inductance, capacitance, conductance, and resistance for a given line. Chapter 3 covers this material. The per-unit-length elements of the inductance, capacitance, and conductance matrices are derived, as are the relationships with each other in homogeneous media. These generalized principles and derivations are extended to circular conductors (i.e. wires) and conductors with rectangular cross sections (e.g. in PCBs) in homogeneous media. Special cases include: two wires separated, wire above an infinite perfectly conducting ground plane, coaxial cable, $(n+1)$ wires separated, n wires above an infinite perfectly conducting ground plane, and n wires within a perfectly conducting shield. For circular conductors and conductors with rectangular cross sections in non-homogeneous media, the chapter explains how numerical methods can be used (e.g. method of moments, finite differences, and finite element methods).

Once we know the per-unit-length parameters, the next step is to solve the MTL equations in the frequency domain (treated in chapter 4) and in the time domain (treated in chapter 5). Chapter 4 starts by summarizing the two-conductor transmission line with a sinusoidal excitation. This analysis is similar to the one shown in most undergraduate textbooks in electromagnetic theory (e.g. voltage/current expressions, reflection coefficients, input impedance, average power flow). The solutions for voltage and current expressions are expressed in matrix forms. The author correlates this solution to the ones that could be obtained using state variable analysis. This allows us to obtain generalized matrix forms for line voltages and currents using chain parameter matrices. This chapter goes on to explain how such chain parameter matrices can be obtained using the well-known technique in state variable analysis of similarity transformations. The most difficult part in solving MTL equations in matrix forms is the calculation of chain parameter matrices using similarity transformations, and very often this has to be done numerically. Other topics discussed in this chapter are MTL equations incorporating terminal conditions, generalized thevenin/norton equivalency, and approximations needed for the treatment of non-uniform lines. The special case of perfect conductors is studied where the chain parameter matrices can be evaluated analytically. The chapter ends with examples of computed results for ribbon cables and printed circuit boards.

Chapter 5 examines the total solution of MTL equations in the time domain. As in chapter 4, a review of the solution for a two-conductor transmission line is done first. Introduction of traveling waves on the line is followed by

the introduction of the numerical computation technique known as Branin's method. The chapter discusses the MTL equations for lossless lines (e.g. decoupling of MTL equations, lossless lines in homogeneous/non-homogeneous media, SPICE implementation, FDTD implementation). The chapter ends with several worked examples for lossless and lossy lines.

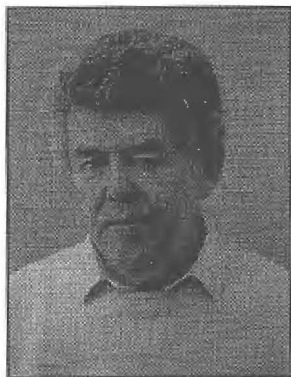
Chapter 6 is intended specifically for EMI engineers. The purpose of this chapter is to derive the literal solutions of the MTL equations for a three-conductor line and to incorporate the terminal impedance constraints into this solution to yield explicit equations for the crosstalk. The analysis is done for both the frequency and time domain. It is assumed in these derivations that the medium is homogeneous though not necessarily lossless lines. The author shows that for low frequency, electrically small lines and for weak coupling, the total crosstalk is made up of both inductive and capacitive coupling (a fact well known to EMI engineers).

Chapter 7 examines the response of MTL to incident fields. These fields can be far fields (e.g. those from antennas) or near fields from other unintentional radiating sources. These types of problems are derived analytically by including distributed sources along the line; then the resulting MTL equations are derived again in the usual fashion, and finally the equations are solved for the currents. As explained before, the currents obtained from MTL equations are differential-mode currents, which are only a fraction of the total current (common-mode current missing) in the lines. However, it is shown that at terminal conditions in electrically small lines, for crosstalk purposes, the common-mode current goes to zero and the currents derived from MTL equations are all that is needed. The analysis is done in the frequency and time domains and later simplified for a two-conductor line with an incident plane wave and a single line over a ground plane with an incident plane wave. In the frequency domain, computed results are compared with the method of moments. In the time domain, SPICE equivalent circuits are also developed.

Chapter 8 covers transmission line networks. This is an attempt to solve practical configurations (e.g. no parallel lines assumptions). Here transmission lines can end in termination networks or interconnection line networks. The transmission lines are represented with simple lines, termination networks are represented with nodes (only one line incident), and interconnection networks are represented with nodes with more than one incident line. The chapter describes the different ways of representing such configurations using SPICE, lumped- π , BLT equations, and admittance/impedance parameters.

The book is highly recommended for the teaching of MTL in a senior undergraduate or graduate level course in electrical engineering. The book has a listing of assigned problems at the end of each chapter, hence, it is very much a textbook for university teaching. For the EMI engineer this book can serve as a good reference on MTL.

PERSONALITY PROFILE



JACQUES GAVAN

Jacob (Jacques) Gavan earned a BSEE degree from the Technion, Haifa, Israel in 1960, an MEE degree from the T.H. of Eindhoven (Philips Scholarship Program) in 1969, and a Ph.D. in radio communications from the ENSERG, Grenoble, France, in 1979.

Dr. Gavan worked for the ITU as an expert in radio communications from 1963 to 1967 and from 1971 to 1974. He was head of the mission in Zaire during the last two years. He also held positions with Elta Electronics Industries, the Israeli Ministry of Post and Communications, and the Israeli Army Signal Corps. For several years he was an Adjunct Associate Professor in Microwaves and Communication Systems at Ben Gurion University, Beer Sheva, Israel.

At present, Dr. Gavan is head of the Electricity and Electronics department and also head of a new Communication Engineering department at the CTEH, affiliated with TAU. In addition, he acts as a consultant in radio communication systems and RF circuitry to several large Israeli companies, including Elta, Motorola, Orbit, Tadiran and Telrad. A frequent lecturer to various organizations and institutions on trends in modern radio systems and circuits, especially about co-located interference sources and satellite systems, Dr. Gavan has published over 75 papers on radio communication and radar theory and systems. He is the author of two chapters on radio systems in an Academic Press EMC Handbook which is to be published in 1995, and of several books in Hebrew and French.

Dr. Gavan is a member of IAEA and PTI. He received the best paper award from the IEEE International Symposium on Electromagnetic Compatibility in Santa Clara, September 1982; he is listed in the 1989 International Directory of Distinguished Leadership; and he was invited to become a member of the Electromagnetics Academy for a five-year term in the Institute for Electromagnetic Modelling and Applications from December 1993. He was recently elected to the Fellow grade in the IEEE.



WILLIAM G. DUFF
ASSOCIATE EDITOR

LETTERS. . . Continued from page 3

Indeed, this perception was carefully built by a unique alliance of standard committees which do not believe that immunity can be achieved through signal balancing, and by some domestic (European) industries who apparently can earn more revenue in producing heavily shielded cable and connecting hardware than with pure UTP. However, such economical reasons are never discussed. The simple directive with all its complicated implications on the active and passive information technology equipment (ITE) is being discussed endlessly in all kinds of semi-scientific LAN magazines. This discussion is creating uncertainty and doubt with most readers. Therefore it is believed by many that a heavily shielded system in a securely grounded laboratory environment can yield better EMC results than a UTP cabling system. Still, some "surprising" tests done by UTP vendors which prove that Anglo-American UTP cabling can be compliant anyway, are being fought at yet another standard arena. Europe has finished specifying the design of shielded cables while at the same time there are no European norms concerning the design of UTP-LAN cables. Hence, this can easily be exploited to the effect that one ITE media is considered the "European" choice and the other fits "only" American standards. Of course, the European choice is perceived as superior. Even some branches of the German federal and state governments have begun to think that way and have employed the necessary restrictions on UTP.

The implementation of tough U.S. military standards to "protect" the American public from unwanted interference may not enhance U.S. credibility abroad. It would only serve as an additional burden to the U.S. export industry which is already struggling to find a free chamber for CE conformity testing.

Yours sincerely,
Gerhard Tschiederl
Goethestr. 41, Erzhausen, Germany

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In response to your editorial in the recent issue of the IEEE EMCS newsletter:

Item 1: I am not sure if the number of EMCS Board of Directors is too large or too small or even the right size. I must be in a minority of members who really don't know what our Directors' responsibilities really are, and if those responsibilities can be done with fewer Directors or if more Directors are needed.

Item 2: Our Society should not only sponsor meetings in locations that have the same social values and customs as ourselves, but in areas where human rights or anything else that needs "correcting." If we or our EMC Society are to influence China or others in a positive manner, we need to interact with them on their soil. The exchange of similar ideas or things that we take for granted will show others that treating each other with certain basic respect will achieve greater prosperity and advancement than trying to browbeat someone into submission. Only by shunning those areas of human mistreatment will those practices continue and nothing will be gained.

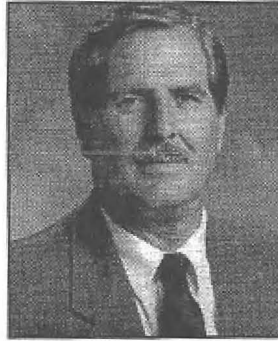
Item 3. I think we should continue to accept advertising from organizations or countries which discriminate against women and other people based upon ethnic backgrounds and religious beliefs. By not accepting their advertisements, the IEEE is closing a means of "educating" others by example of how we prefer to do business and treat others. I am sure there will be articles in the IEEE *Spectrum* that will focus on the unfair treatment of engineers who must struggle with their own cultures' ignorance. Those articles will name names, and maybe by embarrassment, their own citizens will start to rethink how they treat each other. Also, the advertisements and articles will alert others on who they want to do business with and if so, pay the price if need be. In the meantime, the IEEE might as well take their money while we are teaching them something.

Item 4. Many people have said this before me, that the U.S. regulations are based on volunteerism and what industry consensus is. The European regulations are based on what the workers and consumers want and mandate it through their government regulations. Hence, U.S. manufacturers will only do what is mandatory first to gain access to the marketplace, then do anything extra that will give them a market advantage. So, the U.S. will most likely respond to the European mandatory standards faster than the US non-mandatory standards. Business is business.

Item 5. I believe the U.S. military should use commercial standards for items they use in non-combative areas. For example, many of the military offices in the U.S. are no different than regular U.S. businesses. It only makes sense to use products that were designed to meet commercial needs and to be sufficient for this particular military application. For those military items which are used in top secret data transfers and/or in combative areas, the military should maintain those standards they feel represent those combative environments. The U.S. military personnel should get the best by using the best standards if they are going to put their lives on the line.

Thanks for your time.
Richard Georgerian, Product
Compliance Engineer, Exabyte
richardg@exabyte.com
(303)417-7537; Fax:(303)417-7829

EMCABS



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
Professor Fujiwara, Nagoya Institute of Technology
Sha Fei, EMC Research Section, N. Jiatong Univ., Beijing, China
Ferdy Mayer, L.E.A.D., Maisons, Alfort, France
Diethard Hansen, Euro EMC Service, Berlin
Perry Wilson, EMC Baden, Ltd., Switzerland
Heinrich Garn, Austrian Research Center
Atanas Lazarov, Technical University of Sofia, Bulgaria

"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. 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.

DEVELOPMENT OF DAISET-F CABLE FOR ADVANCED COMMON MODE RADIATION

Toshio Kudo

EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
March 17, 1995, EMCJ94-91

EMCABS: 01-11-95

Abstract: In interface cables for electronic equipment, the shield layer acts as an antenna and causes common mode radiation. The DAISET-F cable was developed to reduce this radiation by adding a magnetic lossy layer in the cable jacket. Test of radiation levels with a model system in a shielded room proved the DAISET-F to be as effective as a cable equipped with a ferrite core. Another experiment that measured leakage of electromagnetic energy along the cable shield showed that the DAISET-F attenuated the leak more effectively than ordinary PVC jackets, especially at higher frequencies. These experiments indicate that at higher frequencies, reducing the antenna effect depends on attenuating the leakage of electromagnetic energy and at lower frequencies, a converging effect depend on the magnetic lossy layer's high constants. DAISET-F cables are expected to be effective in fields preventing common mode radiation noise as advancement of electronic equipment systems

Index terms: Conducted immunity, radiated immunity, current injection clamp

A RADIO WAVE TRANSMISSIVE TYPE CURTAIN WALL TO PREVENT A TV RADIO WAVE REFLECTION FAULT DUE TO BUILDINGS

Yoshinori Kasashima, Mikio Kobayashi, and Hiroaki Nakagawa
EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
March 17, 1995, EMCJ94-96

EMCABS: 04-11-95

Abstract: As a new method of preventing a VHF band television radio wave reflection due to the wall of a skyscraper, especially applicable to buildings, the author has developed a radio wave transmissive type curtain wall which allows a radio wave hitting against the wall on the surface to transmit indoors so as to reduce reflecting waves. This curtain wall is mainly made of FRC (Fiber Reinforced Concrete), with a small amount of ferrite radio wave absorbing material partially applied. It is the lightweight inexpensive curtain wall showing a reflection loss of about 10 dB or more.

Index terms: TV ghost interference, radio waves, transmission, curtain wall, fiber reinforced concrete

A STUDY OF VISUALIZATION AND MATHEMATICAL MODELING FOR ELECTROMAGNETIC NOISE

Toshiaki Sato, and Isao Otawara

EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
March 17, 1995, EMCJ94-94

EMCABS: 02-11-95

Abstract: This paper describes 3-dimensional measurements and computer processing for electromagnetic field analysis. The measured data is stored in computer memory and then processed by computer and displayed on the CRT display as 3 dimensional picture or 2 dimensional one.

Index terms: Measurement, electromagnetic field, computer processing, mathematical model

ANALYSIS ON MATCHING CHARACTERISTICS OF A CHIRAL MEDIUM

Youji Kotsuka, and Hiroshi Wakita

EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
March 17, 1995, EMCJ94-97

EMCABS: 05-11-95

Abstract: To find a new EM wave absorber, a chiral medium mixed with a ferrite material has been newly investigated. On the basis of the EM wave analysis in the chiral medium, it is clarified that the matching characteristics are improved.

Index terms: Chiral medium, EM wave absorber, magnetic material, matching characteristics

CHARACTERISTICS OF RADIO WAVE PROPAGATION AT A BUILDING CONSTRUCTION SITE DUE TO REINFORCED CONCRETE SLABS

Hajime Chiba, and Yasumitsu Miyazaki

EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
March 17, 1995, EMCJ94-95

EMCABS: 03-11-95

Abstract: The RC slab at the building construction site has various shapes during its construction. Each shape has its own characteristics for radio wave propagation. It is very important to know these characteristics for effective use of some wireless systems, such as the communication systems or the mechanical control systems. Here we formulate a model to determine the characteristics of this situation. First, we analyze the reflection and transmission characteristics of reinforcing bar mesh and the dependence of complex permittivity on the frequency and the water content of concrete. Second, some shaped slabs are modeled as multiple stratification and these characteristics are analyzed by numerical and experimental methods.

Index terms: Building construction site, complex permittivity, reinforced concrete slab, simulation experiment, multiple stratification

FDTD ANALYSIS ON MEASUREMENT OF PERMITTIVITY BY STANDING-WAVE METHOD ON RECTANGULAR WAVEGUIDE

Osamu Hashimoto, Koichi Ikeda, and Takumi Abe
EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
April 18, 1995, EMCJ95-1

EMCABS: 06-11-95

Abstract: Standing wave method in a rectangular waveguide is a convenient method for measuring the permittivity of the materials. But it is found the error due to the deformation became large when the test sample is deformed. In this paper, we applied FDTD, which is a powerful tool for solving waveguide problem to evaluate the error due to the deformation. As the results, we can estimate the error as a function of the deformation of sample.

Index terms: FDTD method, standing wave method, measurement of permittivity

ON THE METHOD FOR MEASURING COMPLEX DIELECTRIC CONSTANTS BY FORCED RESONANCE

Ki-Chai Kim, Kazunori Uchida, and Shinobu Tokumaru
EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
April 18, 1995, EMCJ95-2

EMCABS: 07-11-95

Abstract: This paper presents a new method for measuring complex permittivity. The idea uses the forced resonances of an electrically small cavity filled with the dielectric specimen. The forced series or parallel resonances, can be obtained by controlling the external reactance. The method of moments with Galerkin's procedure is used to determine the complex dielectric constant. Numerical results show that the complex permittivity are determined simply using the series and parallel resonances simultaneously. To verify the usefulness of the method, experimental results are compared with theoretical ones.

Index terms: Measurement of complex permittivity, small cavity, forced resonance

TRANSIENT ANALYSIS OF DISTRIBUTED CONSTANTS LINES ILLUMINATED BY ELECTROMAGNETIC PULSE

Satoshi Ichikawa, and Satoshi Abe
EMC-Japan meeting at Hokkaido University,
June 29, 1995, EMCJ95-16

EMCABS: 10-11-95

Abstract: Analytical method to obtain the transient response of finite length loss-less transmission line with arbitrary terminations and illuminated by plane wave external electromagnetic pulse which propagates in the free space is presented. The problem can be reduced to the analysis of transmission line with distributed sources. By using the Laplace transformation, operational solutions of voltage and current induced on the transmission line are obtained in the closed form and they can be inversely transformed into the time domain by the analytical procedure. The method is conveniently applicable to various types of termination.

Index terms: Transmission line, transient response, external electromagnetic pulse, Laplace transformation

ESTIMATION OF THE DISTRIBUTION OF EDDY CURRENTS IN THE BRAIN USING THE PULSED MAGNETIC STIMULATOR

Kazutomo Yunokuchi, Youzou Tamari, and Hiroshi Yoshida
EMC-Japan meeting at Kagoshima University,
May 22, 1995, EMCJ95-7

EMCABS: 08-11-95

Abstract: Recently, the magnetic stimulation is used to diagnose the function of nerve in the clinical application. In order to investigate the influence of the magnetic stimulation to the organs, the distribution of eddy currents in the simple model which is filled with saline solution was measured by the probe processed a mini-coaxial cable. Two kinds of models are as follows: first model is agar-agar solid and acrylic resin in a large conductor filled with a saline solution, second model is placed in a half spherical volume conductor. As a result, distribution of the eddy currents depends on the structure of boundary of the skull or narrow space.

Index terms: Magnetic stimulation, clinical diagnosis of nerve, focal stimulation, volume conductor

ANALYSIS ON SUPERCONDUCTING CIRCULAR PATCH WITH SPECTRAL DOMAIN METHOD

Tomohiro Murata, Toshihiko Nishimura, Nozomu Ishii, and Kiyohiko Itoh
EMC-Japan meeting at Hokkaido University,
June 29, 1995, EMCJ95-17

EMCABS: 11-11-95

Abstract: In this paper, we analyze resonance frequency and quality factor (Q-factor) of superconducting circular patch antennas. Superconductors have lower surface impedance at lower frequencies than non-superconductor materials. Because of this, we expect application of superconductors to microwave devices to improve their characteristics. We use the two-fluid model to consider frequency dependency of superconductors surface impedance. We use spectral-domain method to analyze the antennas. We find current expand function on circular patch on Fourier transform domain, in general we should use Hankel transform domain on circular, and formulate this process.

Index terms: Superconductors, circular patch antennas, resonance frequency, spectral-domain method

ELECTROMAGNETIC RADIATION NOISE FROM SURFACE DISCHARGES

Keiichi Uchimura, Shuichi Nitta, and Jen-Shih Chang
EMC-Japan meeting at Kagoshima University,
May 22, 1995, EMCJ95-8

EMCABS: 09-11-95

Abstract: Surface discharge is widely used for an industrial ozonizer and toxic gas treatments, hence they will become noise source. In this paper, an experimental investigation from the point of view of electromagnetic compatibility (EMC) has been conducted to grasp noise characteristics of surface discharge type combustion flue gas cleaning systems. The investigations about mechanisms of propagation, coupling, and formations are carried out based on the experimental data.

Index terms: EMC, NOx cleaning system, surface discharge, discharge current

ESD-IMMUNITY TESTING TO IEC 801-2 THE REPRODUCIBILITY OF THE TEST RESULTS EVALUATED FROM A STATISTICAL POINT OF VIEW

E.F. Habiger
Dresden University of Technology, Dresden, FRG
11th International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility
Electromagnetic Compatibility 1995, 7-9 March, 1995, Pages 645-648

EMCABS: 12-11-95

Abstract: From practical experience it is known that accuracy and reproducibility of the test results obtained from standardized ESD-test procedures are unsatisfying in many cases. Assuming the ESD-immunity factor being a random variable that phenomenon can be explained and qualified.

Index terms: ESD immunity, IEC 801, statistics

THE FINANCIAL STATUS OF THE EMC SOCIETY

ANDREW S. PODGORSKI
EMC SOCIETY TREASURER

I have been the treasurer for the last three years. Like many of you, I am an EMC engineer and a scientist, so it's a change of pace and a big challenge for me as a scientist to become a financial officer. As my predecessor Dick Ford mentioned in his last financial Report, most of the treasurer's activities are related to preparation of yearly budgets, as well as approvals and submissions of vouchers for processing by the IEEE headquarters. There is also a substantial amount of work related to the correspondence between IEEE headquarters, treasurer and all other directors of the EMC Society.

As our Society is one of the fastest growing in the IEEE, the financial affairs became more structured and the Society budgets require more frequent verifications and amendments. I have to admit that this process is tedious and time consuming, as well as often frustrating. It is a pleasant feeling when the budget is finally approved and it cannot be changed anymore. Our Society's total income and expenditures per year are shown in Figure 1. During the last five years, the total income and expenditures per year have increased from \$350k in 1990 to \$750k in 1994.

Most of our income is derived from sales of *Transactions on EMC*, the yearly EMC symposium and the interest from long- and short-term investments. During the last five years, due to a low price of *Transactions* to members, the income from sale of transactions remained quite stable at \$160k per year. However, the cost of publishing and

mailing the *Transactions* has increased from \$80k to \$110k. The biggest portion of our income is obtained from the yearly EMC symposia. Back in 1990 the net income from symposia was \$14k, where in 1994 the Symposia net income was \$90k. During the last five years the volatile investment market has resulted in large fluctuations of our investment income: 1990 - \$9.1k, 1991 - \$6.6k, 1992 - \$24.7k, 1993 - \$23.5k, 1994 - (-\$4.0k).

Most of our expenditures are related to providing service to the Society members. Programs such as publishing the *EMC Society Newsletter*, distinguished lecturer and angel programs, financial support to chapters, standards coordinations, awards programs, public relations and education programs are only few examples of EMC Society benefits that are offered to our members. Our total expenditure for the service provided to the members increased from \$55k in 1990 to \$81k in 1994. Considering that the current number of EMC Society members is 4,100, the services included in our expenditures benefit each member by approximately \$20.00 per year, therefore reimbursing 100% the annual dues.

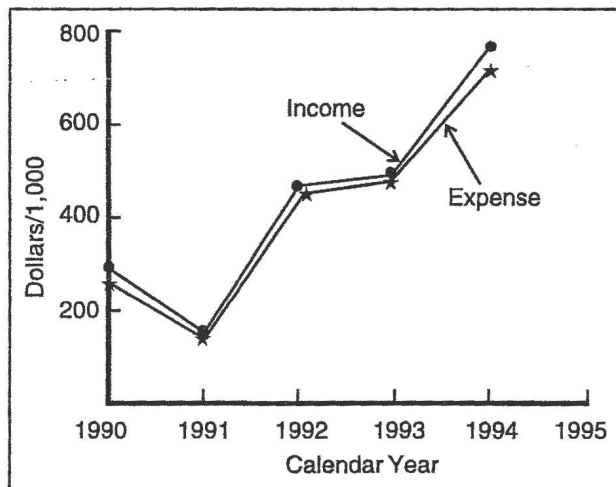


Figure 1. Total Income and Expense.

PIERS 1996

The Progress in Electromagnetics Research Symposium (PIERS 1996) will be held on July 8-12, 1996, at the Congress Center, Innsbruck, Austria. PIERS provides an international forum for reporting progress and recent advances in the modern development of electromagnetic theory and its new and exciting applications. Suggested topics include electromagnetic theory, electromagnetic properties of natural media, electromagnetic wave interaction with natural media, wavelets in electromagnetics and biomedical effects and applications.

PIERS 1996 is organized jointly by the University of Innsbruck, Institute of Meteorology and Geophysics, Tyrol Congress GMBH and Congress Innsbruck GMBH. The Chairman is Dr. Jin Au Kong, 26-305, MIT, Cambridge, MA 02139, USA.

For information on submitting papers, contact

PIERS 1996

Institute of Meteorology and Geophysics

University of Innsbruck
Innrain 52

A-6020 Innsbruck, Austria

E-mail: piers96@uibk.ac.at

Tel: +43-512-507 54 51

Fax: +43-512-507 29 24.

EMV '96

The 5th International Exhibition and Conference on Electromagnetic Compatibility (EMC) will be held February 20-22, 1996 at the Karlsruhe Congress and Exhibition Center KKA in Karlsruhe, Germany. For more information contact

MESAGO

Messe & Kongress GmbH

Rotbuehlstrasse 83-85

D-70178 Stuttgart

Tel: +49-711-61946-0

Fax: +49-711-61946-92

E-mail: bettina_burth@measgo.de

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, CO: 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

Zurich: Biannually, odd years, in March.

Wroclaw: Biannually, even years, in June.

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

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

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

CD-ROMS FOR ELECTROMAGNETICS, ENGINEERING EDUCATION, AND MORE

MAGDY F. ISKANDER
CAEME CENTER
DEPT. OF ELECTRICAL ENGINEERING
UNIVERSITY OF UTAH
SALT LAKE CITY, UT 84112
801-581-6944; FAX 801-581-5281

The CAEME Center for Multimedia Education and Technology is pleased to announce the availability of the *CAEME Software Book*, Vol. II, which contains 16 software packages on nine disks and also includes a CD-ROM for electromagnetics. The CD-ROM includes the 15 software packages published in the *CAEME Software Book*, Vol. I, the 16 software packages published in Vol. II, and four multimedia lessons in electromagnetics. Volume I also includes two video tapes: a two-hour

tape illustrating experimental demonstrations and a 12-minute video showing results of numerical simulations of several basic electromagnetic phenomena. Tables 1 and 2 provide the two lists of the software published in Volumes I and II, respectively. A list of the multimedia lessons included in the CD-ROM published with Vol. II is given in Table 3. It may be also worth mentioning that the Vol. II software book is over 900 pages and contains a description of the solution procedures used in developing the software, instructions on how to use the software, and graphical illustrations (in color) of the results of some of the solved examples. You may obtain a copy of the CD-ROM on

electromagnetics by contacting the CAEME Center at the above address. The price of the CAEME software is as follows:

- Individual copies of Vol. I of the software book including the CD-ROM on electromagnetics are \$150. You may also request the two VHS videos with this purchase at no additional charge.
- Individual copies of Vol. II of the software book including the CD-ROM on electromagnetics are \$200 plus shipping/handling (\$15 in the U.S.; \$30 outside the U.S.).
- University site licenses may be obtained through a membership

SOFTWARE PACKAGE	PRINCIPAL INVESTIGATOR	INSTITUTION
Fields and Operators	M. Lapidus	Lascaux Graphics
Elements of Engineering Electromagnetics	N. N. Rao	University of Illinois
ElectroCard and SilverHammer:		
Teaching Fundamentals of Electromagnetics	R. Cole	University of California, Davis
MacEM	K. E. Lonngren	University of Iowa
Electromagnetic Waves -- A Video Tutor Graphics Package	W. L. Stutzman	Virginia Tech
Electromagnetic Software for Solving Static and Dynamic 2-D Field Problems on a Personal Computer	J. Lebaric	Rose-Hulman Institute of Technology
Experimental Demonstrations for Teaching Electromagnetic Fields and Energy	M. Zahn	Massachusetts Institute of Technology
Nuline Transmission Line Analysis Program	F. M. Tesche	Tesche Associates
Polylines: A Multiconductor Transmission Line Simulator	L. Carin	Polytechnic University of New York
Mapping of Vector Fields Inside Waveguides	A. Elsherbeni	University of Mississippi
Analysis of Waveguides Using the Conjugate Gradient Method	T. K. Sarkar	Syracuse University
Computer-Aided Instruction for Linear Antenna Array Theory and Design	S. J. Blank	New York Institute of Technology
An Interactive Graphics Tool for Displaying Three-Dimensional Equations	J. McKeeman	Virginia Tech
Mininec	R. W. Adler	Naval Postgraduate School
Computer Electromagnetics -- Software for an Introductory Course	M. F. Iskander	University of Utah
Simulation of Electromagnetic Phenomena Using a Finite Difference-Time Domain Technique	R. T. Shin	Massachusetts Institute of Technology

Table 1. Software packages included in the *CAEME Software Book*, Vol. I.

SOFTWARE PACKAGE	PRINCIPAL INVESTIGATOR	INSTITUTION
Modeling Radiated Fields from Moving Charge Distributions	R. Cole	University of California, Davis
MacFields	W. Tabbara	Supelec, France
Lorentz Force	M. F. Iskander	University of Utah
EMAG: A 2-D Electrostatic and Magnetostatic Solver in MATLAB ^a	J. Lebaric	Rose-Hulman Institute of Technology
Sinusoidal Steady-State Analysis of Transmission Lines	M. F. Iskander	University of Utah
Particle Simulation of Plasmas	C. K. Birdsall	University of California, Berkeley
Interactive Analysis of Antenna Arrays	A. Elsherbeni	University of Mississippi
Interactive Antenna Pattern Visualization	A. Elsherbeni	University of Mississippi
Antenna Pattern Visualization Using Personal Computers	A. J. Gasiewski	Georgia Institute of Technology
Learning About Antenna Patterns Using 3D Computer Graphics	S. Chakrabarti	University of Kansas
Reflector Antenna Analysis Software	Y. Rahmat-Samii	University of California, Los Angeles
Array	J. Romeu	Polytechnic University of Catalunya, Spain
Electromagnetic Wave Propagation	T.-W. Kao	Loyola Marymount University
Integral Equation Solution of EM Problems	C. M. Butler	Clemson University
EM Fields Inside Waveguides and Cavities	A. Elsherbeni	University of Mississippi
General Electromagnetic Model for the Analysis of Complex Systems (GEMACS)	E. L. Coffey	Rome Air Development Center

Table 2. Software packages included in the CAEME Software Book, Vol. II.

fee of \$500. This fee is for each Volume I and II. Volume II also has a shipping/handling charge of \$15 in the U.S. and \$30 outside the U.S. These prices were set by the CAEME Policy Board and are based on covering the production expenses of these products and also on helping CAEME be active, productive, and self-supporting in the future. Universities which already have Vol. I of the software book need only purchase Vol. II, although the CD-ROM will include both the Vol. I and Vol. II software and the multimedia lessons.

We are also pleased to announce the availability of a second CD-ROM that includes all the software distributed so far in the journal *Computer Applications in Engineering Education (CAE)*, published by John Wiley & Sons. As you may remember, the *CAE* journal includes a software package with each issue, and Wiley, in collaboration with the CAEME Center, decided to publish this promotional CD-ROM that may be obtained free of charge with new subscriptions to the *CAE* journal. The annual U.S. subscription rate for individuals is \$75, for

institutions \$220, and \$36 for students and members of ASEE. A list of the software packages and video clips included on the *CAE* CD-ROM is given in Table 4. To make sure that you receive the free CD-ROM with your subscription, you may want to contact CAEME at the above address for your subscription.

- Electrostatic charges and Lorentz force
- Dielectric and conductive media
- Electromagnetic plane waves
- Tic-tac-toe review game in electromagnetics

Table 3. Multimedia lessons included in the CD-ROM on electromagnetics.

A. Software:

- Interactive Computer Modules for Chemical Engineering
- Antenna Arrays
- 2-D Finite Difference-Time Domain Solver
- FATPAK II -- Elastic Analysis of Frames and Trusses
- EES -- Engineering Equation Solver for Thermodynamics
- SEDIF -- For Design and Analysis of Passive and Active Filters
- ARRAYS -- For Analysis and Synthesis of Antenna Arrays
- TEACON -- Software for Computer-Aided Teaching of Process Control
- CART -- 3-D Animated Graphical Simulation of Mobile Robot
- WGC -- Visualization of EM Fields in Waveguides and Cavities
- SIGNALS -- Software for One-Dimensional Signal Processing
- CIG -- Simulation of the Effects of Caloric Imperfection in Compressible Flow
- DishPat and FeedPat -- For Calculating Radiation Patterns and Aperture Fields of Dish Antennas

B. Video:

- Simulation of Some Concepts in Electromagnetics (12 minutes)

Table 4. Software packages and the two video clips included in the promotional CD-ROM available with the *CAE* journal.

We truly hope that members of the IEEE will continue to support the *CAE* journal, not only through subscriptions but also by submitting papers describing new software development and also the use of software and multimedia modules in education. As you may know, the *CAE* journal is published in color, contains free software with each issue, and has received the 1993 Award of Excellence in professional and scholarly publishing in the area of science/technology/medicine.

Furthermore, the CAEME Center has been developing software for science and math education. The Center received grants from the State of Utah Centers of Excellence Program and the State of Utah Higher Education Technology Initiative to develop CD-ROMs for calculus, physics, and biology. So far, the Center has developed the *Calculus Castle* CD-ROM and a CD-ROM for the *Physics Museum*.

The *Calculus Castle* is an interactive multimedia CD-ROM tutorial for IBM-based computers. Students are allowed to wander within the rooms of the castle and select a topic of interest. Topics include area under curves, polar functions, limits and continuity, particle motion, rules of differentiation, vectors, a game room, and a tic-tac-toe review game. You may obtain copies of the *Calculus Castle* CD-ROM for \$75 from the CAEME Center.

The *Physics Museum* CD-ROM is a Windows-based application and presents multimedia tutorials and interactive laboratory demonstrations of the concepts of physics. These experiments are comfortably arranged in a virtual-reality museum that promotes the learning of physics in a highly motivating environment. Presently available topics in the museum include electrostatics; optical fibers, refraction, and dispersion; vectors and coordinate systems; and a drill and practice game, "Frantic Physics," which includes questions on mechanics, electricity and magnetism, optics, and sound. The *Physics Museum* will be available for both Macintosh and Windows in late 1995.

We are pleased with the progress the CAEME Center has made and certainly hope that the Center's contributions to education will continue to grow and be productive and beneficial for many years. We are grateful to the Division of Undergraduate Education (DUE) at NSF, IEEE and its participating societies – including AP-S, MTT-S, and EMCS – and to our corporate sponsors – including Andrew Corporation, Hewlett-Packard, Hughes Aircraft, Lockheed, Motorola, and Texas Instruments – for their financial support, technical contributions, efforts, and support. The more recent grants from the State of Utah Centers of Excellence Program and the Higher Education Technology Initiative are also wholeheartedly appreciated.

We will describe the new joint venture with Hewlett-Packard which resulted in establishing the Conceptual Learning of Science (CoLoS) USA project in a future article. Until then, we look forward to hearing from you and learning of your comments and suggestions.

EMCS MEMBER VOLUNTEERS IN UKRAINE

EMCS member Harold E. Taggart and his wife, Marjorie, have returned from a one-month long volunteer mission in Ukraine, where Harold assisted Molniya Research and Engineering Institute in establishing international standards for EMC. The Taggarts served as volunteers with the International Executive Service Corps (IESC) as part of the U.S. foreign assistance effort. Mr. Taggart is the CEO of Taggart Enterprises.

IESC is a private, non-profit organization that sends retired executives to assist businesses and enterprises in the developing world and the emerging democracies of Central and Eastern Europe and the former Soviet Union. Since 1964, IESC's volunteers completed more than 17,000 projects in 122 countries. In addition to providing technical and managerial assistance to small- and medium-sized foreign companies, IESC helps link American companies to business opportunities overseas.

IESC is supported primarily by funding from the U.S. Agency for International Development (USAID), which coordinates U.S. economic and humanitarian development throughout the world.

J. Brian Atwood, Administrator of USAID, speaking about foreign assistance, said, "Rarely has history witnessed a time of such profound change in the lives of nations and peoples. A social and political and economic metamorphosis is now under way throughout the world, and the United States has a unique opportunity to help shape the outcome."

For information on volunteering with IESC, contact: James O. Leet, Vice President – Recruiting, IESC, P.O. Box 10005, Stamford, CT 06904-2005.

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REGULATORY CONSULTANTS NETWORK (RCNET)

P.O. Box 344, Liberty Hill, TX 78642
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