

IEEE EMC SOCIETY

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ROBERT D. GOLDBLUM, Editor

Board of Directors Election Ballot

A ballot for the election of six members to the IEEE Electromagnetic Compatibility Society Board of Directors was issued in August 1996. The ballots returned have been counted, and the following candidates have been elected for a three-year term beginning 1 January 1997:

Joseph E. Butler
Andrew L.S. Drozd
Richard (Dick) Ford
William H. McGinnis
J.L. Norman Violette
Herbert R. Zajac

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.

Notice: Proposed EMC Society Bylaws Change

A motion was passed at the EMC Society's August 18, 1996 meeting to modify the Bylaws to ensure adequate international representation on the Board of Directors. The proposed changes to the current Bylaws are shown in bold type in the following text:

3.1 Directors-at-Large

There shall be 18 Directors-at-Large elected by the Society membership. Their term of office shall be three years with six Directors-at-Large elected each year. In addition to the six nominees receiving the largest number of votes, the next top nominees from IEEE Regions 7, 8, 9 and 10 shall be elected to the Board if the Region is not represented on the Board as a result of the election of the top six nominees or by a carry-over Director-at-Large. To qualify, the Region must have at least 5% of the membership of the Society on December 31 of the year preceding the election and at least 2 nominees from that Region. No Directors-at-Large can

serve more than six consecutive years, partial terms included.

4.4

In the preparation of the slate of nominees, consideration shall be given to both geographical representation and technical interests. In the event the 2/3 Board of Directors carry-over members into the following year and the nominations received by petition do not include members and nominees from IEEE Regions 1 through 10, the Nominating Committee will contact Society members in these unrepresented Regions (who are qualified for Board of Directors membership, and who are willing to serve in that capacity if elected) and submit their names in the slate of nominees on or before 30 June.

The 1996 Society Directors at Large are from regions 1, 2, 4, 5, 6, 7, and 8. The Proposed Bylaws change will become effective only if approved by 2/3 of

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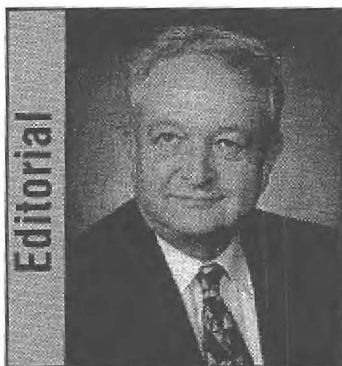
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ROBERT D. GOLDBLUM
EDITOR

The Santa Clara EMCS Symposium Committee did a marvelous job and gave us another excellent annual symposium. I have written about the good fortune that the EMCS enjoys year after year from these events. Each symposium committee is made up of local personnel and operates with minimal support and supervision by the EMCS Board of Directors. It is not well-known, but the EMCS is dependent upon the annual symposium for most of its income. Thus, each symposium committee should be complimented on its apparent success as well as its not-so-obvious financial success.

The inclusion of workshops on the opening Monday of the Symposium week has become more of a tradition in recent years. I am not familiar with the process of selecting topics or speakers for the workshops but did attend some at the 1995 Symposium and have reviewed the workshop notes from the 1996 Symposium. It has become obvious that some of the workshops crossed the line to become "infomercials." This happens when the workshop leader enhances personal business through the repeated use of the company affiliation on view graphs, the overemphasis of the need for his competent body or foreign affiliation, and examples of how a manufacturer can go to jail if he does not work through his foreign-affiliated or foreign-owned entity.

I think that a procedure should be established to screen workshop presentations so that they are not perceived to be infomercials. To start with, let's have view graphs without company logos, and let's emphasize the acceptance of independent laboratories on an equal scale and reduce emphasis on foreign affiliation. Finally, let's interpret the EMC requirements without the use of fear tactics. I also believe that we should properly thank those who give their time and effort to present EMC workshops and do not misuse the opportunity to sell their wares.

To the Symposium Committee for the Santa Clara Symposium, I offer my congratulations. To the Symposium Committee for next year's EMCS Symposium in Austin, I offer my best wishes. To the EMCS Ethics Committee, I plead that you get involved.

On a more positive note, I would like to report on changes in our Newsletter staff. I am delighted to introduce two new associate editors. Janet O'Neil will be covering BoD activities while Bob Rothenberg will be taking over the reigns for the Practical Papers, Articles and Application Notes feature. Join me as I welcome both to the excellent staff of the EMCS Newsletter Committee. Dick Ford will be stepping down as associate editor of BoD activities, but will carry on as EMCS photographer. Also, one associate editor has retired from the Newsletter staff. Tony Zimbalatti contributed to the Newsletter for many years as the associate editor of Point and Counterpoint. I extend my very best wishes and thanks to Tony for his service to our readers.

BACK ISSUES OF THE EMC SOCIETY NEWSLETTERS ON MICROFICHE

We still have a few sets of the microfiche 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.

Letters to the Editor

In reference to your editorial in the *IEEE EMCS Newsletter* (Summer 96 issue) I disagree entirely with your conclusions.

Based on over thirty years involvement with EMI/EMC measurements, my conclusion is that an error analysis procedure such as suggested by the NAMAS standards would solve numerous real and present problems.

The U.S. approach is basically unscientific. I have heard the age-old justification "accuracy through uniformity," but repeatedly making the same mistakes is not a scientifically correct solution. MIL-STD-461 is probably the worst example; it has been shown numerous times and can be demonstrated theoretically that taking field strength measurements in a shielded room will not provide the correct result and the measurement is nearly impossible to repeat. This is the same situation with any open field measurement to a lesser degree, because the antenna and site attenuation calibration techniques and tolerances far exceed those which could be obtained by more scientific

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Thanks for the nice editorial about measurement accuracy in the recent *EMCS Newsletter* (Summer 96). It echoes exactly my sentiments. I myself like to talk about the "integrity" or "substance" of the measurements rather than the "accuracy" or "precision."

I have deliberately avoided the actual issue of accuracy just because of the logistic nightmare that might ensue. We use several serial numbers of the same antenna, all with similar but not equal calibration curves. The spectrum analyzers that we use for emissions measurements have a rather complex description of their accuracy over the huge measurement range, etc.

To help keep QA satisfied (but unverified as to its truth) I put in my test procedures that RF amplitudes are measured with an accuracy of ± 5 dB, which is coincidentally the number you used as an example in your article. Yes, I hope that we are never forced to do what apparently is contained in the NAMAS standards you mentioned.

*Al Whittlesey, JPL EMC Engineer
NARTE certified (to an unknown degree of accuracy) EMC-000936-NE.*

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**BILL GJERTSON
PRESIDENT,
EMC SOCIETY**

Wasn't the 1996 IEEE International Symposium on Electromagnetic Compatibility in the Santa Clara Convention Center on August 19 to 23, 1996 just great! Dave Hantulla and his team put on a highly successful and record-setting event. The attendance was outstanding, exhibits were special, the technical papers and workshops were on target and I believe everyone enjoyed the location (the high-energy Silicon Valley).

This year's exhibitors were again vital to our business with their EMC related products and services which are in greater demand than usual because of worldwide product compliance efforts. EMC engineering is exciting in and of itself and

even more so when your product is on the fast-track to compliance and to market.

Now looking to the future, we have many more great EMC Symposia in our future and also in your future, especially when you become an IEEE and/or EMC Society volunteer. The following EMC Symposia are planned for next year: February 18-20, 1997, 12th International Zurich Symposium & Technical Exhibition on Electromagnetic Compatibility in Zurich, Switzerland; May 21-23, 1997, The 1997 International Symposium on Electromagnetic Compatibility in Beijing, China; August 18-22, 1997, and the IEEE International Symposium on Electromagnetic Compatibility in Austin, TX, USA. Investigate today and make a contribution to the Society and to future symposia.

As the EMC Society year rolls on, we all must think again to the future, with a November 1996 Strategic Planning meeting for the year 1998 and on, integration of six new members of the EMC Society Board of Directors (elected in September '96 by all of you), executing the 1997 Plan with the recently approved budget and the March 1997 meeting developing a 1998 budget to support the 1998 plan.

As we all sit in our own individual work areas earning a living and/or contributing to various endeavors, we should consider what things we are good at and what things we could contribute to the EMC Society and its members. It is really not a difficult job, but perhaps getting started is challenging. I hope this very newsletter, when studied a bit will yield the name of the contact you should make to discuss your support of the EMC Society. Yes, I do keep beating that "volunteers" drum, but IEEE and EMC volunteer work is fun and the volunteer-related contacts you make will reward you and your affiliation. This is not a minority opinion! Others have said the same words.

There are also other ways to contribute to the IEEE and EMC Society. For example, you don't have to wait until next year's Member Survey in order to express your thoughts and contribute ideas to the EMC Society Board of Directors. The e-mail, telephone, fax and mail are all acceptable methods for you to contribute ideas and suggestions for things that the EMC Society should consider. The list of committees is significant and covers many areas already, and perhaps this may be a way for you to participate, contribute and enjoy your EMC activities.

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IEEE EMC Society Newsletter Publication Schedule

Publication Dates

February
May
August
November

Editorial Deadlines

December 15
March 15
June 15
September 15

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JANET O'NEIL
ASSOCIATE EDITOR

The second meeting of the EMC Society Board of Directors in 1996 was held on August 18 and 22 at the Westin Hotel in conjunction with the IEEE International EMC Symposium in Santa Clara, California.

Attending the Board meeting were officers President Bill Gjertson, Vice-President Dan Hoolihan, Treasurer Andrew Podgorski, Secretary Janet O'Neil, and Board members Don Sweeney, Joe Butler, Warren Kesselman, Kimball Williams, Len Carlson, Don Heirman, Bill Duff, Bob Hofmann, Todd Hubing, Norm Violette, Franz Gisin, Bill McGinnis, Bill Ritenour, Henry Ott, Ferdy Mayer, Dick Ford and Jim Muccioli. This represented attendance by 100% of the Board. Many guests also attended. One of the benefits of holding the Board meeting during the EMC Symposium are the many guests who can attend and provide their unique perspective on the EMC Society membership.

Treasurer's Report

Treasurer Andrew Podgorski noted that the Society has experienced tremendous financial growth. For example, in 1990 the Society annual budget was approximately \$200K. By 1996, the annual budget had grown to some \$800K! During this growth period, the Society has increased its benefits to members while keeping Society membership dues low. The Society continues to enjoy good financial health as it exceeds the level of cash reserves per member guideline established by the IEEE. Further, the actual Society 1995 annual budget resulted in a net surplus of \$115K.

Member Services

The Director for Member Services, Todd Hubing noted that the new Chapter Coordinator Ray Adams introduced a new chapter award this year entitled "Most Improved Chapter of the Year." This award was meant to provide incentive to less active chapters to become more active and to report their progress.

Warren Kesselman, Nominations Chairman, reported that a slate of 12 nominees for this year's Director-at-Large election was sent to the IEEE on June 26th for processing. Ballots were mailed to the membership in early August with a ballot return date of

September 13. (See page 1 for results.) As custodian of the Society's Constitution and Bylaws, Warren noted that he has completed his action item from a previous Board meeting regarding investigating a change in the bylaws to ensure elected representation on the Board from IEEE Regions 8, 9 and 10. (See article on page 1). An informal poll of the Board was taken to document current IEEE Regional representation on the Board. There was heavy representation from Region 4 (five Board members) and zero representation from Regions 3, 9, and 10.

Scott Roleson, Chairman of the Distinguished Lecturer Program, presented a thorough report on program activities to date. Scott is also researching the possibility of creating a separate Distinguished Lecturer Program in Europe for our growing European chapters. Lastly, the report of Member Services was closed with comments by Bill Duff, Fellows Evaluation Chairman. Bill encouraged the Board to solicit candidates for the nomination of Fellow next year.

Technical Services

Don Heirman, chairman of the Standards Committee, presented a proposed matrix organization for the coordination of global EMC standards work and noted that the committee is actively pursuing improved national and international presence in EMC standards. The current status report of the various standards was also presented.

Leo Makowski, chairman of the Representative Advisory Committee (RAC) reported that RAC hosted a committee luncheon meeting during the Symposium on ways in which RAC can better serve the Society. Regarding the ANSI C63 liaison, a special workshop on "EMC Measurement Uncertainty" was scheduled for November 11, 1996 in the Los Angeles area. This is a follow-up to the successful workshop held in Baltimore in April 1996.

Kimball Williams reported as Chairman of the Education and Student Activities Committee. Notable activities involved the NARTE, Tutorials, Experiments Manual and Demonstrations committees. Some 60 people were expected at the NARTE workshop during the symposium. The format of the

Tutorials is under consideration as material was expanded from fundamental to intermediate EMC during the symposium. CAEME activity is on hold pending the next policy Board meeting. A new subcommittee on Standards Education has been formed to provide exposure to the standards development process and an overview of the National and International Standards. Vichate Ungvichian of Florida Atlantic University is chairing this committee.

Communications Services

The Director for Communication Services, Len Carlson, next presented his report. Santa Clara was confirmed as the site of the 2004 International EMC symposium. John Osburn, chairman of the 1997 symposium in Austin reported that the symposium will be held at the Austin Convention Center and the nearby Hyatt Hotel will be the official "headquarters." There will be a Sunday through Saturday schedule to accommodate the many committee meetings, sessions, etc.

Chet Smith has been spearheading the effort by the Board to put all past symposia records, including the early "Armour" conferences on CD ROM. He distributed the first sample to the Board. Five thousand sets (each set is four disks with part of disk four being devoted to the software and instructions) will soon be ready. The committee is now researching pricing, marketing, and distribution plans for the CD-ROM disks.

Next, Moto Kanda, Transactions Editor, commended the Italian Research Team headed by Professor D'Amore of the University of Rome for their excellent contributions to the special August 1996 Transactions issue on research activities in Italy.

The final report under Communication Services regarded the IEEE Press activities. The chairman of this committee, Hugh Denny, noted that there are currently eight EMC

related books offered by the IEEE Press. Total sales of these books to date amounts to some \$250K. Topics for new books being considered include shielding and the EMC Directive.

Professional Services

The Director for Professional Services, Norm Violette has a number of IEEE EMC symposium records which he will exchange with various other international EMC related symposia. This will further the Board's globalization efforts.

Ferdy Mayer, International Activities Chairman, has possession of the EMC Society table top display and is using this to promote IEEE membership at various international EMC related conferences in 1996 and in 1997. This includes the Wroclaw and Bordeaux conferences in 1996. Ferdy also proposed regularly providing a formal presentation to the conference attendees informing and motivating new Society membership. He did this at the Wroclaw EMC conference and later signed up eight new IEEE and EMC Society members. Bob Brook, EMCs liaison to the Society for the Social Implications of Technology (SSIT) committee, highlighted the activities of their April 1996 AdCom meeting in Princeton, New Jersey. The topics of discussion at this meeting centered on employment issues, including pension reform, career support, and technology policy and advocacy. Lastly, Public Relations chairman Herb Zajac called attention to the status of the new PR video.

Planning

On Thursday, August 22, the Board meeting resumed. Vice-President and Planning Director Dan Hoolihan reviewed the goals and objectives of the Society's three-year Long Range Plan. Moving forward, the seven proposed areas of the plan

address the following topics: Promote EMC Awareness, Enhance and Expand EMC Education, Develop Applied EMC Practices, Increase Active Membership, Exploit Institute and Society Globalization, Formalize EMCS Leadership Development, and Career Enhancement. Each of the Technical Services Directors reviewed their respective progress in meeting the plan's goals and objectives.

Under old business all directors were asked to submit their E-mail addresses for a Board electronic directory. The Board confirmed its intent to hold its February 1997 meeting in Zurich, Switzerland in conjunction with the EMC conference held there biannually. Under new business, the Board approved the appointment of Kimball Williams as the new Technical Activities Committee chairman, replacing Jim Parker. Kimball will also continue with his responsibilities as chairman of the Education and Student Activities Committee. Moto Kanda announced that NIST will host the "Mode-Stirred Chamber, Anechoic Chamber, and OATS Meeting" in Vail, Colorado in the May/June 1997 time frame. Takeo Yoshino promoted the Fourth International EMC Symposium in Tokyo, Japan May 17-21, 1999 and encouraged US participation. Finally, Dave Hanttula, chairman of the Santa Clara symposium committee, reported that there were a total of 1,243 full registrants in attendance and 781 exhibits-only badges were issued. With the addition of One Day, Workshop Only, Life Member and Senior Member registrations, the total number of badges issued was 2,282. The workshops were once again well attended. There were problems with registration which will be addressed. Otherwise, the symposium seemed to run rather smoothly. The Board thanked Dave and his committee for a job well done. There being no further business, the meeting adjourned at 9:00 pm.



TODD HUBING
ASSOCIATE EDITOR

Quaff a glass of eggnog, the holiday season is upon us. 'Tis the season of joy, peace and holiday stories.

A Visit to the EMC Lab from St. Nicholas

'Twas the night before Christmas when all through the company Not a creature was stirring, except Emma Frump and me.

Our nerves were on edge.
We were ready to pounce.
Only two days away from our product announce.

The accountants were nestled all snug in their beds.
The managers slept, not a thought in their heads.

But for Emma and I there was work to be done.
There was no time to sleep.
There was no time for fun.

Testing and taping and grounding and shielding
The problems were many, the product unyielding.

After weeks in the lab, we longed to be free.
But our product was over by 20 dB.

We rerouted traces.
We sealed up the seams.
We added more ferrite.
We thought up new schemes.
We filtered the signals.
We bypassed the power.
We tested the thing at least once every hour.

When finally, I'd had it, I called out to Emma.
"Nothing is working.
We face a dilemma.

This product is clearly so poorly designed.
If we think we can fix it, we're out of our mind!"

And Emma, whose spirit had started to sink,
Suggested we go get some coffee to drink.

So we walked down the hall to the vending machine.
We were clearly exhausted.
We needed caffeine.

When all of a sudden there arose such a clatter,
We ran to the lab to see what was the matter.

We peeked through the door and were startled to see,
A jolly old elf and an evergreen tree.

He was dressed in red velvet, with white hair in mounds.
He looked like our manager plus 50 pounds.

But he moved through the lab so lively and quick,
we knew in a moment that this wasn't Dick.

The elf stood the tree on the chamber turntable,
and trimmed it with gaskets and 50-ohm cable.

Then using some tools that he found in the shop,
he fashioned a copper-tape star for the top.

I whispered to Emma to call the police,
and spied on the elf as he pulled out a piece

of beryllium copper he had in his sack.
It was shiny on one side, the other was black.

He picked up our product and took a close look.
Then made a few notes in a little red book.

He thumped on our box like a vegetable shopper,
then opened it up and inserted the copper.

I wanted to tell him to cease and desist.
But I was too frightened.
I had to resist.

So I crouched out of sight and continued to spy
as he turned on our product and set it on high.

I watched as he measured the product emissions,
while tweaking the cables for worst-case conditions.

He followed procedures with nary a blunder
and our product was now more than 4 dB under!

Soon Emma returned and I told her to peep
at the elf, as he ran a high-frequency sweep.

The product was passing.
His fix was effective.
We met FCC and the EU directive.

With wide-eyed amazement, we watched as the elf
put our tools back in place and our box on the shelf.

And we heard him exclaim as he vanished from sight,
"Compliance to all and to all a good night!"

Have a happy holiday season!



Central New England

New officers were elected for the 1996/1997 year. The new Chair is Mirko Matejic of the Foxboro Company. The new Vice Chairs are Tom Carberry, of Booz Allen & Hamilton, and John Luchini of MPM Corporation. The Secretary/Treasurer is John Clarke, U.S. DOT/FAA (retired).

Chicago

Thanks to Ray Klouda for updating us on the activities of the Chicago chapter. The first meeting of the '96-'97 season was held on September 18. We would like to thank Leo Makowski of Haefely Trench for his wonderful presentation on the European Standards Process. His presentation included welcome information regarding the progress of current and future standards. He makes a good point when he reminds us of the importance and benefits of being involved with the standards process. His presentation is yet another in the Chapter's continuing effort to provide quality and timely EMC technical programs. We'd also like to thank Lucent Technologies for continuing to allow the chapter meetings to be held at their facilities. Their hospitality is appreciated.

Israel

The Israeli chapter held a one-day conference on the topic of lightning phenomenon and lightning protection. Lightning is one of the most common and powerful natural phenomena, and

yet one of the least understood. In recent years, awareness of the need for effective protection against lightning strikes has increased. The necessity of ensuring reliable public communication services, power distribution and national security systems has led to the need for the development of methods for lightning risk assessment and techniques for protection against direct and indirect strikes. The objective of the conference was to discuss and present recent developments in lightning characterization, risk assessment and protection techniques. The conference was organized jointly by the IEEE EMCS Israel chapter, the IEE Israel Center and the Association of Architects and Engineers in Israel. It was chaired in turn by Mr. Elya B. Joffe, IEEE Israel EMC Chapter, Prof. Arie Braunstein, Chairman of the IEE Israel Center, and President of AEAI, Mr. David Berla of Tel Aviv University and Dr. Haim Goldstein, of RAFAEL/ADA. Attendance was 140, out of which approximately 20 were IEEE members.

Following a brief welcome address by Chairman Elya B. Joffe, the technical sessions commenced with six presentations by world renowned experts on lightning, LEMP and overvoltage effects. Attendees were provided with a copy of the conference proceedings. In addition to the technical presentations, there were exhibits of primary lightning protection components and devices.

Los Angeles

The Los Angeles Chapter of the EMC Society had a busy summer. This activity was particularly concentrated on the recent EMC Symposium in Santa Clara. Chapter Chairman Ray Adams and Publicity Chairman Janet O'Neil took the opportunity to solicit speakers for the chapter's 1996/1997 program, fine-tune the one-day tutorial planned with Dr. Clayton Paul in March 1997, and attend the Board of Directors meetings to lobby for our chapter members. In addition, Ray Adams as "Chapters Coordinator" chaired the annual "Chapter Chair Luncheon" which is traditionally held during the symposium week. (See page 8.) Ray also assisted the symposium committee in acting as Session Chairman for the workshop on "Intermediate EMC." As a result of this networking, the chapter can look forward to a stellar group of speakers for the coming year. This includes (in order of appearance at the monthly chapter meetings): Dr. Reinaldo Perez of JPL on "MOM" as discussed below, John Stanford of Allied Signal on "Unique Log Periodic Dipole Array Antenna Design," Werner Schaefer of Hewlett-Packard on "Measurement Parameter Evaluation for Prescans as Part of Radiated EMI Measurements" (he'll elaborate on the paper he presented of this same title at the Santa Clara symposium), Dan Hoolihan of TUV Product Service on "Medical Devices and EMC," Franz Gisin of Siemens Rolm on "Fun with Fourier



Photo courtesy of Israeli Chapter

David Berla (left) of Tel Aviv University and Conference Session Chairman with Dr. Peter Hasse, from Dehne & Sohne, Distinguished Guest Speaker at recent Israeli Chapter Conference.



Photo courtesy of Janet O'Neil

Attendees at monthly chapter meeting included LA Chapter members (l-r) Dave Giangulli and Jay Edie with Speaker Reinaldo Perez.

Transforms" (is this an oxymoron?), Dr. Clayton Paul of the University of Kentucky at Lexington on "Fundamental to Intermediate EMC," Consultant Scott Bennett on "Electromagnetic Radiations Newly Examined" (this meeting will feature a book signing party as Scott's new book *Control and Measurement of Unintentional Electromagnetic Radiation* will have just been published by Wiley Interscience), and last, but not least, Dr. Norm Violette of Violette Engineering on "Transient Protection Techniques." How's that for a great line-up? Everyone is welcome to attend the chapter meetings so spread the word to your colleagues. Out-of-town visitors are especially welcome. For more information about the meeting dates, location, and time, check the chapter home page at: http://www.emclab.umn.edu/ieee_emc/lachap.html

At the first chapter meeting of the 1996/1997 program, Dr. Reinaldo "Ray" Perez discussed "When and How to

Use Method of Moments in EMC Analysis and Design." The meeting was held at The Lakes at El Segundo, an executive nine-hole golf course. Dr. Perez visited the chapter from Colorado where he is a Member of the Technical Staff at the Jet Propulsion Laboratory. Dr. Perez explained that the Method of Moments (MOM) is one of the oldest but still one of the most widely used computational electromagnetic techniques in the analysis and design of all sorts of electromagnetic phenomena, including devices ranging from antennas to microwave components and circuits. His presentation included a brief mathematical introduction, a brief computational introduction, three simple but typical examples of MOM use, and when to use and not use MOM. Dr. Perez also provided sources of MOM code from the inexpensive to the expensive. During his presentation, Dr. Perez noted that he believed Dr. Clayton Paul should be credited with applying the concept of common mode

currents to EMC. It was a very informative presentation.

The Los Angeles chapter will also be busy in the fall as a cosponsor of the "EMC Measurement Uncertainty Workshop" on November 11, 1996 at the Radisson Plaza Hotel in Manhattan Beach, California (three miles south of LAX Airport). The workshop is organized by the American National Standards Institute Accredited Standards Committee C63 with the cooperation of the National Institute of Standards and Technology (NIST). Speakers include Don Heirman of Lucent Technologies - Bell Labs Innovations, Dan Hoolihan of TUV Product Service, Ed Bronaugh of EdB EMC Consultants and Jeffrey Horlick of NIST. For more information about the workshop or the activities of the Los Angeles Chapter of the EMC Society, check the chapter home page noted above, or call Ray Adams at (310)813-7152 or Janet O'Neil at (310)348-9665.

Chapter Chair's Luncheon at EMCS Symposium

Chapter Coordinator Ray Adams welcomed an overflow crowd to the annual Chapter Chair's Luncheon held at the Westin Hotel during the EMC Symposium in Santa Clara. Both national and international chapters were represented. After a barbecue buffet lunch, chapter chairmen shared their respective chapter successes and failures (fortunately there weren't many of these!). Ferdie Mayer, Mike Violette, and Mitumasa Tokuda, chapter chairmen of Paris, Washington DC, and Tokyo respectively, each distributed a written report on their chapter activities. Ferdie Mayer noted that the most popular topic for the Paris chapter members is understandably the European EMC Directive. Mike Violette reported that the Washington DC chapter's annual Valentine's Day Dinner Dance at the Fort Belvoir Officer's Club was well-attended.

Their semi-monthly lunch time meetings continue to be popular. The Tokyo chapter has an extensive technical program which will be augmented by the Fourth International Symposium on EMC in Tokyo, May 17-21, 1999. Five-hundred participants are expected. Vice-Chairman Shuichi Nitta was present to personally extend an invitation to the chapter chairmen to attend this important conference. (Copies of the written reports from these chapters are available by contacting Ray Adams at (310)813-7152.

Don Sweeney, chairman of the Chicago chapter, shared two view graphs entitled "Most Popular Topics" and "Best Practices in Running Your Chapter," respectively. Popular topics included "EMC Tales from the Trenches" (this encourages lively audience participation), RF Exposure Hazards for Humans, "Real World"

Problems and Solutions, European EMC Directives, FCC EMC Issues, and Circuit EMC Issues, among others. "Best Practices" included combining EMC Society chapter meetings with other related IEEE Society chapter meetings, such as with the MTT and AP Societies and providing meeting programs which are tutorial in format, i.e., relating experience in performing measurements, for example, or stating and solving common EMC related problems.

Other suggestions for a successful chapter included:

- Including the chapter meeting announcement in the local IEEE regional publication to increase attendance. This notifies EMC and other related Society chapter members who may or may not be on your chapter mailing list about your activities.
- Creating a chapter home page so

members can see up-to-date information about the meeting location, time, speaker and topic. Including a map to the meeting location and/or the dinner menu (if applicable) was deemed helpful.

- Create a newsletter to announce meetings and chapter information. Finance the newsletter mailing by selling ads or institutional listings to EMC related companies on the back of the newsletter.

- Ask EMC-related companies to mail the meeting announcement for the chapter in exchange for including a one-page promotional flier about their products and services.

- Use "Angel" funds (limited to \$500.00 per year per chapter) to finance a good out-of-town speaker, provide a meal for a special meeting, provide seed money for a one-day EMC conference, or whatever! There are no stipulations on the spending of angel money; it must simply be spent on something which is deemed beneficial to the success of the chapter.

- Use the Distinguished Lecturer Program to ensure good speakers.

(Contact Scott Roleson for more information at (619)655-4809.)

- Combine speakers with a nearby chapter. For example, the Los Angeles and San Diego chapters have been sharing speakers for several years. One night the program will be presented in San Diego, the next night it will be presented in Los Angeles. This also spreads the travel costs between the chapters, should the speaker not be local.

The most notable chapter "failure" issue concerned geography. Many chapter meetings are located too far from where members live and/or work. There were several solutions proposed to address this issue including free Food (always a draw), holding the meeting in conjunction with another event, scheduling an "extended meeting" which is a three-hour tutorial, for example, and which includes a lunch or dinner break to promote social interaction and a one-day EMC colloquium format, such as that successfully organized by the Los Angeles, Orange County and San Diego chapters on April 1, 1996. (Subsequent to this meeting, Henry Benitez of the

Bend, Oregon chapter and Mike Violette of the Washington DC chapter expressed interest in holding a similar one-day EMC colloquium at their respective chapter locations. More information on putting this type of an event together may be obtained by calling Janet O'Neil at (310)348-9665.)

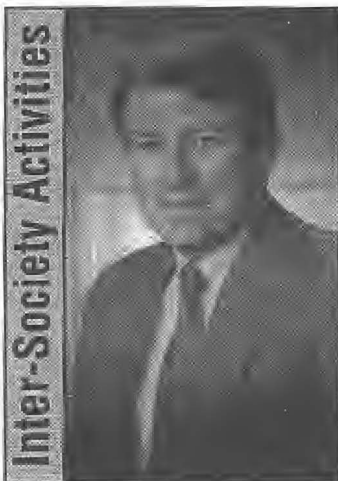
Another general idea was to set up an IEEE "Reflector" (mail list) for electronic correspondence with chapter chairmen and perhaps event chapter members.

The two-hour meeting passed quickly with many good ideas exchanged. Most importantly, it was a good opportunity to thank the chapter chairmen present for their continued hard work at creating and sustaining a successful chapter. The chapters provide an essential service to the EMC Society membership and without strong chapter leadership, a strong chapter cannot exist. Ray Adams adjourned the meeting by thanking everyone for coming, including the EMC Society Board of Directors members present. The enthusiasm for EMC in the room was certainly contagious and inspiring for all.



Photo courtesy of Dick Ford

Attendees at Chapter Chairperson's Luncheon (left to right): Front row: Shuichi Nitta, Tokyo, Japan; Matsamitsu Yokuda, Kysushu Tech Univ., Japan; Robert Berkovits, Huntington, NY; Magsood Mohd, Eglin AFB, FL; Christian Dubé, St. Bruno, Quebec; D. Ferdy Mayer, Maisons-Alfort, France. Middle Section: Paul Foley, Ottawa, Ontario; John D.M. Osburn, Austin, TX; Raymond Adams, Redondo Beach, CA; Mark T. Ma, Boulder, CO; Henry Benitez, Beaverton, OR; Michael Heckrotte, Cupertino, CA; Mirko Matejic, Foxboro, MA; Bruce Crain, Marietta, GA; Frederick Heather, Patuxent River, MD. Back Row: Stephen Mullenix, Dallas, TX; William Moyer, San Diego, CA; Barry Wallen, Rollinsville, CO; Tim O'Shea, New Brighton, MN; Elya Joffe, Kfar-Safa, Israel; Donald Sweeney, Glenview, IL; Dennis Barberi, Waterford, MI.



JOSEPH E. BUTLER
ASSOCIATE EDITOR

SAE AUTOMOTIVE EMI & EMR

Ed Bronaugh

RAC Representative

The EMI committee is in the process balloting a new standard which deals with the use of the TEM devices for testing vehicle components. Both the EMI and EMR committees are continuing their work in the development of three standards: SAE J551, Performance Levels and Methods of Measurement of Electromagnetic Compatibility of Vehicle and Devices (60 Hz to 18 GHz); SAE J1113, Electromagnetic Compatibility Measurement Procedure and Limits for Vehicle Components (Except Aircraft) 60 Hz to 18 GHz; and SAE J1762, Electromagnetic Measurement Procedure for Integrated Circuits.

IEEE TAB Committee on Man and Radiation (COMAR)

Dan Hoolihan

RAC Representative

COMAR is in the process of approving a position paper entitled Biological Effects of Power Frequency Electric and Magnetic Fields. A COMAR workshop on Biological and Health Effects of Extremely Low Frequency (ELF) and Radio Frequency (Including Microwave Radiation), with an Update on Electromagnetic Compatibility Issues will be held on October 30, 1996 in concert with IEEE Engineering in Medicine and Biology Society Symposium in Amsterdam.

CISPR A, G, AND E

Don Heirman

RAC Representative

CISPR A continues its work on CISPR Publication 16 with the status as follows: Part 1 (Instrumentation) revision is underway; Part 2 (Emission and Immunity Measurements) will be published soon; Part 3 (Reports) is due out in 1997. Other working group activities include site attenuation, antenna calibrations, and limits and measurements over 1 GHz.

CISPR G activities chiefly involves work on revision of CISPR Publication 22. This next revision which is due out in early 1997 will include the essential procedures from

ANSI C63.4. Also included in the revision will be provisions for making signal line conducted emissions measurements from 150 kHz - 30 MHz and provisions for allowing in situ emission measurements for large equipment. Results of the recent ballot on new CISPR Publication 24 for immunity of Information Technology Equipment is also being discussed.

CISPR E activities include work on amendments to CISPR Publication 20 (Receiver Immunity), specifically conducted immunity measurements in the range 150 kHz to 150 MHz as well as information on coupling units in the range 150 kHz to 30 MHz.

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) AE-4 EMC COMMITTEE

David Graham

RAC Representative

SAE AE-4 is currently working on revisions to EMI Gasket Aerospace Recommended Practices (ARP), SAE ARP 1173 (RF Gasket Shielding) and SAE ARP 1705 (Coaxial Gasket Measurement Procedure). Current plans call for both of these revisions to be balloted in the first part of next year.

The committee is also involved with reviewing draft copies of new standards MIL-STD-464 and MIL-HDBK-237B.

The next meeting of the committee is scheduled for Albany, NY in the spring of 1997.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) D09.12.14

Drew Peregrin

RAC Representative

This committee is continuing its work with the development of three new standards as well as modification of an existing one. ASTM D4935 (Shielding Effectiveness of Planar Materials) is being modified to reflect slight modifications to the fixture to reduce resonances, better definition of the test sample, and improved legibility of the standard.

The ASTM EMI Gasket Transfer Impedance Test Method is still being refined as it moves toward a ballot. The ASTM Corrosion Test Method which measures EMI Gasket Transfer Impedance after

environmental exposure is on hold pending completion of the EMI Gasket Transfer Impedance Test Method. Finally, the ASTM EMI Gasket Slot Aperture Test Method for Shielding Effectiveness has recently been modified and is moving toward a ballot. Next meeting of this committee will be the week of October 28, 1996 in New Orleans.

AMERICAN NATIONAL STANDARDS INSTITUTE, STANDARDS COMMITTEE ON EMC, C63

Don Heirman

RAC Representative

Subcommittee 1

Techniques and Developments

Significant activities within this subcommittee include: the move toward ballot status for the standard on immunity measurements, C63.15; the work involved in drafting the new standard on ESD, C63.16 which is based on the existing Recommended Practice; and the development of a new standard writing effort on measurement uncertainty.

Subcommittee 8 EMC Testing Standards for Electromedical Devices (EMD)

The significant activities within this subcommittee include: the imminent balloting of the ad hoc, on-site test procedure for immunity testing of medical devices within hospitals; and the emerging work of the relatively new working group on Interference between Wireless Phones and Hearing Aids, i.e., the development of a testing standard. Next meeting of these committees will be in Linthicum, Maryland the week of November 18, 1996.

Letters to the Editor . . . Continued from page 2

methods. Such methods have all been documented in the literature.

The literature is also full of articles about the inability to meet the site attenuation requirements for open area test sites and studies using spherical dipoles to compare measured data at different sites. These articles usually demonstrate the inability to make repeatable measurements and not some fault in sites upon which the measurements are made.

Your comments regarding "negotiated" limits represent the root cause of the problem. Although limits are or may be arbitrary they are a constant reference from which the measured value is compared. Unless the limit is constant there can be no basis for comparison and the whole system would be worthless. The uncertainty is in the measurement. There will always be some uncertainty in any measurement, but unless this uncertainty is known, in a statistical sense, the measured values are nearly meaningless.

Basically all the elements of a measurement setup must be calibrated by today's regulations, receivers, antennas, LISNs, and measurement sites, so why not do the job right and provide calibration procedures that will ensure more accurate results and also provide error tolerances derived from the calibration data? The methods for calculating composite total error tolerance for a test setup is used in other sciences. Such calculations are not difficult and could be incorporated in the EMC/EMI measurement software.

*Roger Southwick
EMC Consulting*

Notice: Proposed EMC Society Bylaws Change . . . Continued from page 1

the Society's Board of Directors and the IEEE. The ten IEEE geographical regions are given below.

REGION	AREA	PERCENTAGE OF SOCIETY
1	Northeast USA	10%
2	Eastern USA	10%
3	Southeastern USA	7%
4	Central USA	8%
5	Southwestern USA	7%
6	Western USA	17%
7	Canada	5%
8	Europe, Africa & Middle East	22%
9	Latin America	2%
10	Asia & Pacific	12%

WORKSHOP ON

EMC MEASUREMENT UNCERTAINTY

ORGANIZED BY THE

AMERICAN NATIONAL STANDARDS INSTITUTES ACCREDITED STANDARDS COMMITTEE C63

WITH THE COOPERATION OF THE NATIONAL INSTITUTE OF STANDARDS & TECHNOLOGY (NIST)

NOVEMBER 11, 1996

RADISSON PLAZA HOTEL ■ 1400 PARKVIEW AVE ■ MANHATTAN BEACH, CA

COSPONSORED BY THE LOS ANGELES CHAPTER OF THE INSTITUTE OF ELECTRICAL & ELECTRONIC ENGINEERS (IEEE)
ELECTROMAGNETIC COMPATIBILITY SOCIETY (EMCS)
CONTACT RAY ADAMS, TRW (310)813-7152 e-mail: ray_adams@qmail4.sp.trw.com

**EMC
SOCIETY**





KIMBALL WILLIAMS
ASSOCIATE EDITOR

Education & Student Activities Committee

WHO SHOULD DO IT ???

One of the philosophical tenants that I have found useful and generally true for most situations can be summed up as: "If you see what should be done, YOU should see that it gets done!"

There are obvious limitations to a universal application of this principle. However, the focus of responsibility is clear and unambiguous. One drawback is that active application by anyone with open eyes and a clear sense of duty can result in what one of my associates refers to as "In basket overload." I have the feeling that many members of the EMC community already suffer from this malady.

There are a couple of ways around the problem. The most obvious is to never get caught up in something that requires extra effort on your part. This is safe. This is dull. Some of the most rewarding events in a life can only occur when you actively engage in working for a cause where you can contribute and make a difference. These usually only come when you get that mental itch that says "This one belongs to you."

The second solution is to get help. If your plate is full, if you can't handle another task, Delegate! This means finding another like-minded individual and helping him see what it is that you see, and gaining his assistance in tackling a piece of the problem. Notice I said a piece of the problem, not the whole problem. You still own some of it!

This is not easy to do. Once you have acknowledged that something is important to you and deserves your attention, you emotionally own it. That makes it doubly hard to let go of even a small piece. There have been whole books written on this problem. In modern business we call the solution "delegation." I don't know if the corresponding problem has an "official" designation.

Committees

This process of delegation, and spreading the load among others who understand and agree with your general view usually evolves into a committee. This is basically what a committee does. A group with shared interests and goals gathers to accomplish tasks that one committed individual alone would be unable to complete in any reasonable time.

In a well-run committee, the committee reaches a consensus as to the tasks to be accomplished, and the chairman, subcommittee chairman and subcommittee members each tackle the tasks that can be best addressed at each level. Obviously, some tasks can only be addressed by the chair. Others can only be addressed by the subcommittee chairs, etc. In Total Quality Management (TQM), this process is referred to as "daily management."

The first key to successful daily management, or delegation, is being able to let go of those tasks that don't require your immediate level of interaction. If someone else can handle the task, give it to them and let them "run with the ball." However, some quarterbacks (committee or subcommittee chairs) want to hike, pass, catch and run, all at the same time. "Impossible" you say! They still try. I keep finding committee and subcommittee chairs that are effectively running a committee of one! They have yet to learn that a successful pass requires that the quarterback LET GO OF THE BALL!

The second key to successful daily management (delegation) is to keep track of progress. The quarterback doesn't throw the ball and then head back to the locker room. Regular reports on progress are vital. If a problem develops, letting those in the level above know that help is needed can bring assistance to break through a log jam and keep the task flow going. If for no other reason, regular reports of activity lowers the blood pressure of those above because they know that things are going along as they should. They are not biting fingernails wondering what is going on.

(Note: Rule 1 of "Managing your Manager" is "No Surprises!" Always keep your superiors informed.)

Tar Baby

There also needs to be a strong distinction between seeing a clear and present task that needs direct action and something that is fuzzy and poorly defined. Not that fuzzy, poorly defined subjects are not important. Indeed, very important subjects often present themselves early on as fuzzy feelings that cannot be clearly defined...as yet. Those fuzzy feelings are clues that more investigation is required, but only rarely is action called for.

Uncle Remiss pointed out the difficulty that one can encounter by getting tangled up with something that lacks sufficient form and content to allow a rational approach or logical interaction. If that happens, it may be necessary to use a matrix of pointed arguments to successfully extract oneself. Better to let it develop a solid form before even touching it!

This is what discussion groups and workshops address. Participants immerse themselves in a question and struggle with amorphous conditions until they achieve a clarification. Make no mistake, that clarification is critical to achieving any significant action later.

Education and Student Activities Committees

So, you may ask, what does all this have to do with the Education and Student Activities of the EMCS? Well, you should ask! At the present time, those of us deeply involved with the EMCS Education and Student Activities Committee find ourselves going through all of the above mentioned scenarios.

University Coordination

Most notably, we have emerged from one tussle with a tar baby that had the University Grant Subcommittee wrestling with concept clarification tasks. Now, it is moving forward with several clear goals in sight. The subcommittee has been reconstituted as the University Coordination Subcommittee with renewed direction for its primary task, and several ancillary tasks that evolve directly as a result of their main focus. Anyone interested in finding out more about this subcommittee and its activities should contact its Chairman, John Howard at (408)736-2514.

Standards Education

We have taken on another task that is still somewhat amorphous in the form of a new Standards Education Subcommittee. Currently the new Chairman of this committee Vichate

Ungvichian is working on coordination and communications issues and forming the necessary links to allow discussion and clarification to proceed with dispatch. If standards and education interest you (why are you reading this if they don't?) I suggest that you contact Vichate at (407)367-3465 and offer to help.

Student Activities

Finally we have the ultimate in delegation with the announcement by Jim Muccioli that he must step down from his long tenure as the Chair of Student Activities. Jim's work no longer involves EMC directly, nor has it for several years. Jim kept on contributing as the Chair of Student Activities out of loyalty to the society and to the committee and from a deep sense of commitment. However, work pressures and travel requirements are making it impossible to continue effectively and Jim is asking for relief.

Naturally, we are seeking someone to take up the reins and lead the Student Activities work. Jim has volunteered to assist wherever he can to help the new chair make a smooth transition. If you "feel the call" and would like to help lead students to EMC as a possible career, please contact Jim at (810)576-3331 and discuss the options with him.

Other Subcommittees

All the evolution in the areas of Student Activities, University Coordination and Standards Education should in no way detract from the excellent work that is continuing in the other Subcommittees within the Education and Student Activities Committee. Tasks are moving forward in all areas, and there are opportunities for interested volunteers within each Subcommittee. Those carrying the banner for those committees are listed along with their contact information. If you "feel the call," please contact the chairmen for the appropriate committee and discuss where you might be able to contribute to the work.

Subcommittee: Demonstrations
Chairman: David Case
Purpose: Organize "Demonstrations" of EMC principles at EMCS Symposia.
Phone: (202)767-6947

Subcommittee: Experiments Manual II
Chairman: Jim Drewniak
Purpose: Publish Volume II of the EMC Experiments.
Phone: (573)341-4969

Subcommittee: University Coordination
Chairman: John Howard
Purpose: Encourage and foster EMC at the university level.
Phone: (408)736-2514

Subcommittee: Outline & Abstracts
Chairman: John Maas
Purpose: Provide EMC presentation materials.
Phone: (507)253-2426

Subcommittee: Tutorials
Chairman: Maqsood Mohd
Purpose: Organize EMC Tutorials at Symposia.
Phone: (904)678-2001 Ext. 6115

Subcommittee: Student Activities
Chairman: Jim Muccioli
Purpose: Encourage student involvement in EMC.
Phone: (801)576-3331

Subcommittee: EMC Standards Education
Chairman: Vichate Ungvichian
Purpose: Standards education - Details currently under development
Phone: (407)367-3465

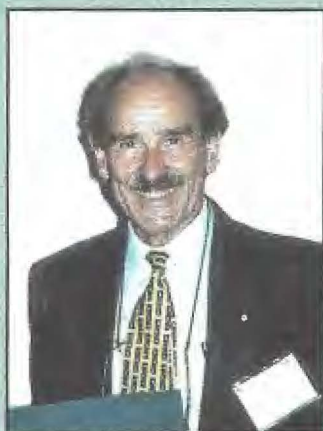
Subcommittee: NARTE
Chairman: Jim Whalen
Purpose: Organize NARTE Workshop at Symposia.
Phone: ((716)645-2422

Subcommittee: Life Long Learning
Chairman: Kim Williams
Purpose: Coordinate activities with IEEE Educational Activities Board.
Phone: (810)354-2845

1996 International EMC Society Symposium in Santa Clara



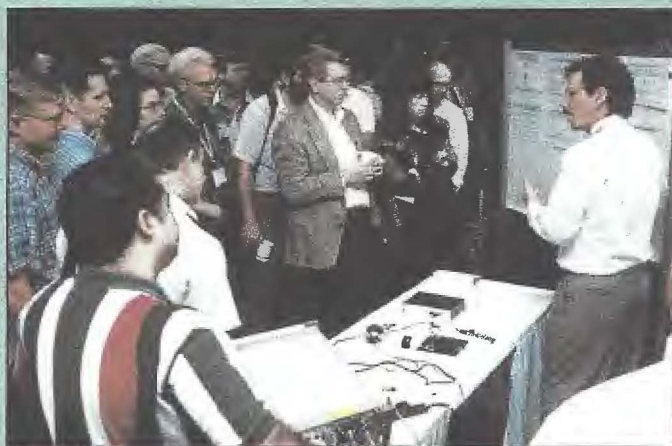
Kimball Williams, recipient of the Richard R. Stoddard Award.



Dr. Jose Perini received both the EMCS Honorary Life Member Award and a Certificate of Appreciation.



Mrs. Jim Parker thanks the Society for the memorial tribute to her late husband.



Lee Hill (far right) conducts an experiment session for a large and attentive audience.



Wall-to-wall people and great food highlighted the awards banquet.



The exhibits sessions were among the best attended in our Symposium's history.



Attendees enjoyed Tuesday's reception.



Dr. Norman Violette, Lawrence G. Cuming Award recipient.



Richard Mohr was congratulated for achieving the IEEE Fellow grade.



Maria Sabrina Sarto received the President's Memorial Award Scholarship.

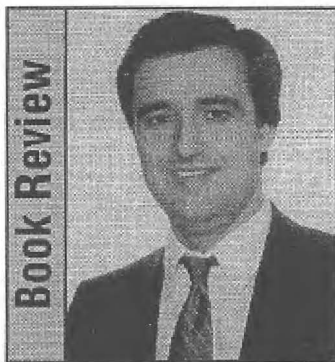


President Bill Gjerison (center) congratulates EMCS Certificate recipients Janet O'Neil (left) and Ray Adams (right).



Stan Kubina was congratulated for achieving the IEEE Fellow grade.

Photos courtesy of Dick Ford



REINALDO PEREZ
ASSOCIATE EDITOR

ELECTROMAGNETIC COMPATIBILITY IN MEDICAL EQUIPMENT: A GUIDE FOR DESIGNERS AND INSTALLERS

**By William D. Kimmel,
Daryl D. Gerke**
Interpharm Press and
IEEE Press, 1995
287 pages

There is an increasing awareness in the medical electronic industry that electromagnetic interference from outside sources can have adverse effects on the proper operation of sensitive medical diagnostic and monitoring equipment. This book of 12 chapters is written for those electronic designers in the medical industry with little or no knowledge of electromagnetic interference (EMI) and electromagnetic compatibility (EMC). The objective is not to give them a crash course on EMC and EMI, but instead to provide them, as the authors call it, with "rules of thumbs" in the design of generalized electronic components. The mathematics is kept to a minimum and readers receive a good dose of theoretical guidelines about EMI, ranging from electronics parts to system level issues.

The medical electronic industry has become aware of possible interference problems in their devices caused by outside EMI sources. Furthermore, medical providers, including hospitals, clinics, outpatient facilities, and medical offices, are taking steps to ensure that their monitoring and diagnostic equipment will not malfunction in the daily operations of providing medical care to thousands of patients. This is crucial because it involves safety issues of people who are already sick and more vulnerable by nature. It is no longer uncommon to observe all kinds of warning signs against the use of intentional transmitters (high power radios, cellular phones, etc.) in the ICU (intensive care units) and other critical areas of health care providers. In some of these facilities the use of such intentional transmitters is prohibited just about anywhere. The objective is to prevent the use of such transmitters whose RF energy can couple into the sensitive front-end analog sensors of most medical equipment (especially those in the diagnostic field).

On a personal note on this subject, my sister, who is an oncology (cancer treatment) specialist at a hospital in Florida, described an EMI occurrence during one of her early morning rounds of visiting patients some time ago. A patient who was "under a morphine drip" (use of IV solution of morphine drug for pain) was temporarily thought (for several seconds) to have experienced final heart

failure when EMI caused one of the vital signs monitors to sound the alarm indicating that the patient has suffered a complete cardiac arrest. The EMI source was never identified for sure but several possible culprits were. Changes have been made in the whole cancer treatment floor of the hospital. Now if a person tries to use a cellular phone, for example, an alarm sounds in the whole floor and the person gets kicked out for ignoring the warning signs that are posted everywhere.

The book comprises 12 chapters and 4 appendices. The appendices deal with: a) series of publications of related EMC subjects, b) electrical and material properties, and c) constants and conversion terminology. The introduction (chapter 1) outlines for the electronic designer the different and possible sources of EMI, interference paths, and some simple receptor models. The material is followed in Chapter 2 by a brief review of U.S. and ECU emission and immunity standards. Chapter 3 outlines some principles about the physics of EMI such as the nature of interference, harmonic components of periodic waves and the rise time/pulse width implications of such interfering waveforms. Antenna effects and simple expressions for field strengths are stated. ESD is also discussed briefly. Chapter 4 is typical of most EMC books where the passive components (capacitors, inductors, wires, resistors, transformers) are described in terms of their non-ideal behavior of impedance vs. frequency. Chapter 5 is also another typical EMC subject discussing the design of PCB to avoid EMI problems. Topics discussed briefly are signal integrity EMI in digital/analog circuits, common mode and differential mode prediction, proper PCB partitioning and construction, grounding, power bus decoupling, and impedance matching. The subject of grounding in Chapter 6 addresses the different types of grounds topologies (single point, multipoint, hybrid) as well as ground methodologies (ground straps, ground planes, ground grids). Ground loops and bonding considerations as well as ground design guidelines are also discussed.

Power supplies and power supply filters are discussed in chapter 7. The chapter covers a brief introduction to the different switching power supply topologies. The

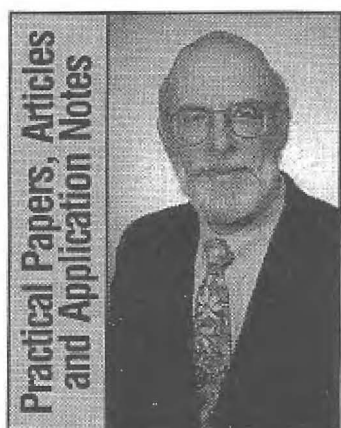
different sources of interference from such power supplies are later discussed. Finally, the chapter discusses methods of controlling interference generation such as snubbers and, of course, filtering. Several guidelines for the selection and mounting of power line filtering are offered. The selection of wires within a cable can affect the EMI performance of a cable and applies to both internal and external cables used in a system. Chapter 8 discusses the aspect of transferring data, information, or power from the internal part of an equipment to another internal part. This is an important issue in medical diagnostic equipment where several modules are

mounted as part of the system. The objective is the transferring of signals from one part of the system to another with minimum signal degradation. Shielding as discussed in Chapter 9 covers some of the fundamentals, including shielding materials, wire meshes and screens. Proper use of the different types of shields is also discussed briefly.

Chapter 10 deals with the issue of cable shielding and terminations which are external to the enclosure. The chapter covers such issues as cables behaving as antennas, frequency range of usage of cables, and cable shielding for low and high frequencies. Chapters 11 and 12 are particularly tailored to

medical electronics. Chapter 11 takes a look at some interference sources found in medical environment and how to deal with them. Such sources can be of high energy content, electromechanical devices, or radio sources. The chapter also briefly covers a series of receiving medical devices. Chapter 12 addresses system level considerations and EMI issues in the placement of medical electronic equipment in a hospital and other clinical settings.

This book is recommended for those involved in medical electronic design who have very little knowledge of EMC and EMI and who want a non-detailed exposure to these subjects and enough knowledge to get their design projects done.



BOB ROTHENBERG
ASSOCIATE EDITOR

In an effort to further enhance the value of your Newsletter as a source of useful and practical EMC information, a new "Practical Papers, Articles and Application Notes" feature will soon be inaugurated. Actually, "resurrected" might be a more accurate description than "inaugurated." Back in the mid-eighties, Ed Bronaugh edited such a feature, which ran on and off for a number of years. (Why does ten years seem like a few orders of magnitude in the timeline of EMC history?)

So what, you might ask, is the difference between an EMC Transactions paper and an EMC Society Newsletter paper? In a couple of words, it's the difference between *news* and *archives*. Transactions papers must have significant archival value, which explains the level of peer review and academic scrutiny they must survive before publication. A Newsletter paper need only be considered newsworthy, useful, relevant, credible and reasonably well-written in the judgment of this Associate Editor and perhaps an EMCS technical committee member. It should

minimize the use of equations and maximize the transfer of experiential knowledge or anecdotal information which might help today's EMC engineers and technicians solve current problems or better understand EMC issues.

By "short," we mean two or three Newsletter pages, or about 2,500 words, maximum. Available space may require that we do some editing for length — but only with the authors' concurrence. Remember that many Newsletter readers are practicing engineers and technicians, not academics. Where line-art sketches, curves or schematics will enhance an understanding of the paper, feel free to include them. Start with a clear, concise title, followed by the name(s) of the author(s) and a brief abstract of 100 words, maximum. Submit in double-spaced form, as hard copy, disc, or e-mail.

Send materials to Bob Rothenberg, Parker-Chomerics, 77 Dragon Court, Woburn, MA 01888-4014 (fax: (617) 933-4318; e-mail: 104362.2415@compuserve.com).

Suitable papers would include application notes, case histories, design tips, test methods, or any other format or subject of educational value to EMC engineers.



WILLIAM G. DUFF
ASSOCIATE EDITOR

Mike Hatfield graduated from the West Virginia Institute of Technology, Montgomery, West Virginia, in 1979 with a B.S. in Electrical Engineering. Upon receiving his degree, he joined what was then called the Naval Surface Weapons Center as a test engineer. Mike worked on the Electromagnetic Performance of Aircraft and Ship systems (EMPASS) project which utilized a modified P3 aircraft to collect various types of electromagnetic emissions data on ship, airborne and land-based emitters.

In 1982 he transferred to the Electromagnetics Branch of the Electronic Systems department, where he worked with Mr. John Bean to develop a large mode-stirred chamber facility. From 1982 until 1991 Mr. Hatfield worked with NSWC personnel and with Myron Crawford and other personnel from the National Institute of Standards to develop specifications for the construction of the NSWC mode-stirred chamber and to acquire and/or construct associated equipments and develop mode-stirred chamber test techniques. In 1990 he received a statutory invention registration from the U.S. Patent Office for "A Means and Method for Performing Shielding Effectiveness Measurements Using Mode-Stirred Chambers." In 1991 he was put in charge of the NSWC mode-stirred chamber facility with technical responsibility for all aspects of chamber operations.

Since 1991 Mike has participated in tests of systems, subsystems, materials and components for the Navy, Marine Corps, Army, Air Force, Federal Aviation Administration, Food and Drug Administration, foreign governments and industry. In addition, Mike has continued to advance the theories, concepts, principles and processes associated with mode-stirred chamber evaluation techniques. He has authored or co-authored over 25 technical papers and presented numerous briefings to various professional groups, organizations and industries. He has also authored numerous reports on testing conducted using mode-stirred chambers. He has hosted and chaired two meetings of the Anechoic Chamber and Reverberation Chamber Operators Group meetings and has co-authored/co-presented workshops on mode-stirred chambers on several occasions.

In 1994, Mike was awarded the Richard R. Stoddard Award from the IEEE for "developing and promoting the use of mode-stirred chambers." He is the U.S. representative to the International Electrotechnical Commission (IEC) SC/77B Working Group 3 committee on mode-stirred chambers and is the convener of the Mode-Stirred Chamber Committee. A member of the IEEE P482 and P1302 Committees, Mike is a National Association of Radio and Telecommunications Engineers (NARTE) certified EMC Engineer and a member of Eta Kappa Nu.

Mike is an active general aviation pilot with single engine land and glider ratings. He also enjoys flying radio control aircraft, scuba diving, swimming and snow skiing. Mike lives in Fredericksburg, Virginia with his wife Pat and two sons, Jacob and Ryan.



MIKE HATFIELD

Since 1991 Mike has participated in tests of systems, subsystems, materials and components for the Navy, Marine Corps, Army, Air Force, Federal Aviation Administration, Food and Drug Administration, foreign governments and industry.

EMC Society Awards Presented at the 1996 Symposium

The following EMC Society members were acknowledged for accomplishments and service to the EMC Society. The awards were presented during the 1996 IEEE EMC Society Award Luncheon, which was held on Wednesday, August 21, 1996 at the Santa Clara Convention Center, Santa Clara, California. The program was organized by Bill McGinnis, Awards Chair, and Todd Hubing, Chair, Membership Services.

Certificates of Acknowledgement:

Raymond K. Adams for efforts in planning, organizing, and publicizing a very successful one-day EMC Colloquium in Los Angeles.

Lee Hill for his service to the EMC Society as a Distinguished Lecturer.

Janet Nichols O'Neil for efforts in planning, organizing, and publicizing a very successful one-day EMC Colloquium in Los Angeles.

Andrew S. Podgorski for his service to the EMC Society as a Distinguished Lecturer.

Certificates of Appreciation:

Andrew Drozd for initiating the practice of "Demonstrations" of EMC phenomenon at the IEEE EMCS Symposium and fostering the development of a standard procedure for those presentations.

Bill Gjertson in recognition of his significant long-range planning contributions to the welfare, administration, and overall success of the EMC Society during his two-year tenure as Vice-President of the EMC Society.

Todd Hubing to recognize his contributions as Technical Activities Chair and for his efforts in setting up the IEEE EMC Society Home Page on the Internet.

Warren Kesselman for his contributions to the EMC Society as President of the EMCS during 1994 and 1995.

John Kraemer for his contributions to the development of an IEEE Standard on the calibration of electromagnetic field sensors.

Leo Makowski to recognize his efforts in improving the communications activities of the Representative Advisory Committee.

Maqsood Mohd for leading the effort to bring a set of tutorials on "Fundamentals of EMC" to the IEEE EMCS Symposium as an introduction to those entering the field.

Jim Parker to recognize his 12 successful years as chair of IEEE EMCS Technical Committee TC-4.

Dr. Jose Perini for contributions to the development of an IEEE recommended

practice for RF absorber evaluation in the range of 30 MHz to 5 GHz.

Rafi Rubinstein for his contribution in establishing, promoting and placing the Israel IEEE EMC Chapter on the world map of EMC, and in increasing the awareness of the EMC discipline in Israel.

Dave Staggs for contributions to membership development and chapter growth of the EMC Society while a member of the EMCS Board of Directors.

Dave Travers for contributions to the EMC Society as secretary of the EMC Standards Committee.

Anthony G. Zimbalatti for contributions to the welfare, administration and overall success of the EMC Newsletter.

Laurence G. Cumming Award for Outstanding Service:

Robert Goldblum in recognition of his years of service as *EMC Society Newsletter* Editor.

Janet Nichols O'Neil to recognize her nine years of outstanding performance and dedication as Secretary to the IEEE EMC Society Board of Directors.

Dr. Chester Smith for outstanding service in the conversion of EMC Society symposium records to CD-ROM.

Dr. J. L. Norman Violette to recognize many years of service to the Society and efforts to further Electromagnetic Compatibility as a technology with his many contributions to standards and specifications, as well as education and training.

Honorary Life Member Awards:

Dr. Motohisa Kanda to recognize his many years of service to the IEEE EMC Society as editor of the "IEEE Transactions on EMC."

Al Mills to recognize his years of service to the IEEE-EMC Society.

Dr. Jose Perini for sustained contributions to EMC Technology, Education, and Standards.

The Richard R. Stoddard Award for Outstanding Performance:

Dr. Clayton R. Paul for his many contributions over a number of years which significantly continue to enhance the knowledge and professionalism of Electromagnetic Compatibility Engineering, and as a credit to the EMC Society.

Kimball Williams to recognize contributions

Continued

in the field of EMC Education by his continuous broadening of the scope of the IEEE EMC Society Education Committee.

Awards for Best EMCS

Transactions Papers:

Q. Balzano, J.A. Bergeron, J. Cohen, M. Osepchuck, R.C. Peterson, and L.M. Roszyk.

The President's Memorial Award:

Maria Sabrina Sarto presented by Donald Heirman and Mrs. James Parker in memory of Dr. James C. Parker, Jr.

Chapter of the Year Award:

Nanjing, China

Most Improved Chapter of the Year:

Beijing China

Best Symposium Papers Award:

"Experimental and Numerical Investigations of Fundamental Radiation Mechanisms in PCB Designs with Attached Cables," by D.M. Hockanson, J.L. Drewniak, T.H. Hubing, and T.P. Van Doren; University of Missouri Rolla, and C.W. Lam, Quad Design Technologies. (First Place)

"Investigations of EMI on Multilayer Printed Circuit Boards: Delta-I Noise and Power Supply Decoupling," by V. Costa, and R. Preatoni, Caniggia; Italtel, Italy (Second Place)

"The Electromagnetic Radiation of Small Circuits and Small Loop Antennas," by W. Scott Bennett, Consultant; Loveland, CO (Third Place)

EMCS Fellow Award:

Stan Kubina for leadership in computational electromagnetics for EMC analysis and design and in electrical engineering education in Canada and
Richard J. Mohr for the development of practical models for application in the EMC design of electronic equipment.

1997 IEEE EMC SYMPOSIUM ANNOUNCED

**EMC Austin Style
August 18-22, 1997
Austin Convention Center**

EMC AUSTIN STYLE is the theme of the 1997 IEEE EMCS International Symposium on EMC. The theme reflects Austin's eclectic character, where southwestern charm blends with hi-tech vigor.

Technical papers, workshops, and exhibits will be featured along with a schedule of social events.

Information can be obtained by contacting

***John Osburn, Chairman or
Mark Prchlik, Exhibits
(512)835-4684***

e-mail

97.emc.symp@emctest.com

DC REGIONAL EMC CONFERENCE & Exhibition

**"TOWARDS 2000"
Spring 1997
Washington, D.C.**

The Washington DC/Northern Virginia Chapter of the IEEE EMCS proposes to sponsor a one-day EMC conference and exhibition in the Spring of 1997 in the Washington DC area.

SHOW THEME AND FOCUS MILITARY/GOVERNMENT PROGRAMS & PROCUREMENTS

The conversion of defense specifications to commercial specifications affect procurement requirements for military systems. The move to specifying commercial OATS equipment, along with the maturation of MIL-STD-461/462D, has changed the compliance requirements for DoD electronics systems. New types of test requirements, increased spectrum coverage, instrumentation, equipment and facility requirements provide challenges for the design, test and management of system development.

COMMERCIAL REGULATORY REQUIREMENTS

The harmonization of commercial testing and certification requirements and the European EMC Directive have created new opportunities for EMC service and product providers; they have also created special problems for electronics manufacturers. Long familiar with FCC emissions requirements, equipment designers must now cope with immunity test requirements that have affected the design of their products. Other regulatory requirements are currently being enacted for Europe-bound equipment, such as product safety, medical devices, machine safety, telecommunications, etc.

GENERAL SHOW FORMAT & FEATURES

- Technical tutorials from EMC industry leaders and government representatives. Four to six sessions are proposed; topics will be selected by the program committee.
- Exhibit area for EMC product and service providers "Table Top" space will be provided for exhibitors.

**FOR INFORMATION CONTACT:
MICHAEL VIOLETTE
(301)417-0220
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**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
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"HOW CAN I GET A COPY OF AN ABSTRACTED ARTICLE?"

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

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

Some of the Chinese papers are not available in English. Associate Professor Sha Fei, EMC Research Section, Northern Jialong 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, shelf, 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.

DESIGN OF PORTABLE TELEPHONE ANTENNA CONSIDERING THE EFFECT OF THE HUMAN BODY

Kazuo Sato, Kunitoshi Nishikawa, Noriyoshi Suzuki, and Akira Ogawa
EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 26, 1996, EMCJ 95-84

EMCABS: 01-11-96

Abstract: A portable telephone antenna that functions well both in a free space and near a human body is proposed. We widen the bandwidth of the antenna by loading inductance elements on the antenna and adjusting the characteristic impedance of the antenna feeding network. An antenna performance is calculated using the FDTD method in considering the effect of the human body. The results show that a reflection loss of the proposed antenna becomes lower than -10dB in the 900 MHz cellular telephone band for both the free space and near a human body cases.

Index terms: Antenna design, FDTD method, portable telephone, monopole antenna, mobile communication

AN EXPERIMENT OF POLARIZATION ANGLE CHARACTERISTICS OF A DUAL POLARIZATION RECTENNA

Yoshiyuki Fujino, Masaharu Fujita, Norio Kusaka, and Norio Ogihara
EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 26, 1996, EMCJ95-87

EMCABS: 04-11-96

Abstract: Power flux density in a microwave power transmission system may be doubled easily by using dual polarization channels to increase the transmitted power. Polarization axis of a transmitting antenna and a rectenna can be aligned right in an application between fixed points; however, when a rectenna is mounted on a flying vehicle, the angle between the transmitting and receiving polarization axes (polarization angle) may vary due to an attitude variation of the vehicle. This article shows the advantage of using the dual polarization transmitting system by measuring the power transmission characteristics as a function of the polarization angle.

Index terms: Microwave power transmission, rectenna, polarization angle, dual polarization

DUAL-POLARIZED BIDIRECTIONAL HEIGHT DIVERSITY ANTENNA

Keizo Cho, Hajime Tozawa, Shinji Kiya, and Toshikazu Hori
EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 26, 1996, EMCJ 95-85

EMCABS: 02-11-96

Abstract: In a microcellular mobile system, the received signal at a base station is degraded because of the mismatch of the polarization between the incident wave and the base station antenna. Polarization diversity is an effective method to reduce the degradation. However, when a vertically polarized wave comes to a base station, the signal received by a vertically and horizontally polarized diversity antenna is worse than that received by a height diversity collinear antenna because of the difference of the diversity gain between both antennas. This paper proposes 4-branch dual-polarized bidirectional height diversity antenna (DPHDA). This can obtain the larger signal than that received by an ordinary 2-branch eight diversity antenna when receiving signal with any polarization. The measured results also show that the proposed antenna can achieve the larger cell size than the ordinary 2-branch height diversity collinear antenna when receiving vertically and horizontally polarized signal.

Index terms: Microcell, street cell, base station antenna, dual-polarized antenna, diversity

EXPERIMENTAL RESULTS ON INTERFERENCE CANCELLATION CHARACTERISTICS OF A BSCMA ADAPTIVE ARRAY ANTENNA

Toyohisa Tanaka, Ryu Miura, and Yoshio Karasawa
EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 26, 1996, EMCJ 95-89

EMCABS: 05-11-96

Abstract: The number of subscribers for mobile communications services, such as cellular phone or PHS, has been increasing. A mobile satellite communication service will be operated using low orbit satellites from the beginning of the 21st century. Consequently, a shortage of frequency resources will become a severe problem in the near future. An adaptive array has been studied for efficient usage of frequency resources and as a countermeasure against frequency-selective fading of wide band communication. We have been researching and developing a Beam Space CMA (Constant Modulus Algorithm) Adaptive Array Antenna system in mobile communications. In this report, we discuss our experimental results for convergence, capture and tracking characteristics using the developed system.

Index terms: DBF antenna, FPGA, ASIC, CMA, adaptive array

EFFECT OF VARIABLE DIRECTIVITY BASE STATION ANTENNA FOR MOBILE RADIO

Ryo Yamaguchi, and Yoshio Ebine
EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 26, 1996, EMCJ95-86

EMCABS: 03-11-96

Abstract: An adaptive base station antenna for mobile radio is expected to reduce the co-channel interference. This antenna can give us higher spectral efficiency than a switched multi-beam antenna in the ideal environment. However, the null beams of pattern in the multi-path environment are distorted. Considering worst case, we assume a no-null adaptive array antenna that tracks mobile stations. The relation between the beam width and the distance of co-channel cells for both the adaptive array antenna without null beam and the switched multi-beam antenna is illustrated by computer simulation.

Index terms: Mobile radio, base station antenna, adaptive array antenna, multi-beam antenna

PERFORMANCE ANALYSIS OF CMA ADAPTIVE ARRAY FOR QAM SIGNALS

Kentarao Nishimori, Nobuo Tsukamoto, Nobuyoshi Kikuma, and Naoki Inagaki
EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 26, 1996, EMCJ 95-10

EMCABS: 06-11-96

Abstract: The CMA adaptive array has the superior performance in suppressing interfering waves, hence it is expected much as a countermeasure against frequency selective fading in land mobile communications. Though constant modulus, the clear reasoning is not provided. Therefore, this paper deals with theoretical analysis of performance of the CMA adaptive array for QAM signals, in which the 2-wave model is employed for investigating the capability of suppressing interferences and the convergence behavior. Also, some computer simulation results are shown to validate the theoretical analysis.

Index terms: CMA adaptive array, QAM signals, multipath environment, performance analysis, steepest descent method, land mobile communication

THEORETICAL CONSIDERATION ON WIDEBAND CHANNEL MODELING IN NAKAGAMI-RICE FADING ENVIRONMENT

Yoshio Karasawa, and H. Iwai

EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 26, 1996, EMCJ 95-92

EMCABS: 07-11-96

Abstract: Previously, we proposed an approximated evaluation scheme for wideband digital transmission characteristics such as errors due to intersymbol interference and cycle slip of recovered clock in Nakagami-Rice fading environments which include Rayleigh fading as an extreme case. We called the scheme "Equivalent Transmission-Path (ETP) Model". In this paper, through a discussion about more general equivalent propagation channel expressions, we make clear a theoretical foundation of the ETP model, and extend the model to have an ability of expression of instantaneous fading condition varying with time.

Index terms: Nakagami-Rice fading, frequency-selective fading, intersymbol interference, ETP model

PERFORMANCE OF PILOT SYMBOL-ASSISTED COHERENT ORTHOGONAL FILTER OR DS-CDMA MOBILE RADIO

Hidehiro-Andoh, Yoshinori Miki, and Mamoru Sawahashi

EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 27, 1996, EMCJ 95-98

EMCABS: 10-11-96

Abstract: In a pilot symbol-assisted coherent orthogonal filter (PSA-COF) scheme, which was proposed for DS-CDMA mobile radio, complex fading envelope in multi-path environment is estimated by pilot symbols and tap coefficients of orthogonal filter are controlled by minimizing mean-squared error between a RAKE combined signal and a decision data. The bit error rate (BER) performances as a function of E_b/N_0 (energy per bit to the noise power spectrum density) and capacity in the isolated cell are investigated by computer simulations. Computer simulations demonstrate the capacity in the isolated cell using the PSA-COF can be increased by about 1.5 times of the conventional matched filter receiver with channel coding and bit-interleaving in the interference-limited environments.

Index terms: Mobile radio communication, DS-CDMA, interference canceler, pilot symbol, channel estimation

PERFORMANCE ANALYSIS OF ADAPTIVE MODULATION SYSTEMS WITH CONCATENATED CODE FOR DIGITAL LAND MOBILE COMMUNICATIONS

Hidehiro Matsuoka, Seiichi Sampei, Norihiko Morinaga, and Yukiohi Kamio

EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 26, 1996, EMCJ 95-7

EMCABS: 08-11-96

Abstract: This paper proposes an adaptive modulation system with variable coding rate concatenated code to achieve high quality and high bit rate transmission for land mobile communications. As a coding scheme, this system employs a punctured convolutional code as an inner code and a high coding rate Reed-Solomon (RS) code as an outer code. The system adaptively chooses the coding rate of the inner code as well as the symbol rate and modulation level according to the fading variation. The analysis results show that the proposed system is very effective to achieve high quality and high bit rate transmission.

Index terms: Land mobile communication, high quality transmission, TDMA/TDD, adaptive modulation system, concatenated code

ORTHOGONALIZING MATCHED FILTER (OMF) WITH ADAPTIVE ESTIMATION OF STEERING VECTOR

Kazuhiko Fukawa, and Hiroshi Suzuki

EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 27, 1996, EMCJ 95-99

EMCABS: 11-11-96

Abstract: In order to increase the channel capacity in the DS-CDMA mobile communication systems, interference cancellers have been studied recently. Orthogonalizing Matched Filter (OMF) is a blind linear interference canceler that controls the weight coefficients by minimizing the average output power under a constraint. The BER performance of OMF degrades when chip timing synchronization is not accurate enough and paths with the different delay time from predicted one arrive. This paper studies a method to estimate the steering vector that determines the constraint. Computer simulations demonstrate that OMF employing the new method operates well even under the aforementioned conditions in two path multipath transmission.

Index terms: DS-CDMA, interference canceler, orthogonalization, matched filter, steering vector

PERFORMANCE OF AN ADAPTIVE MODULATION/TDMA WITH A SPACE AND PATH DIVERSITY COMBINING TECHNIQUE IN LAND MOBILE COMMUNICATIONS

Takashi Suzuki, Seiichi Sampei, and Norihiko Morinaga

EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 26, 1996, EMCJ 95-8

EMCABS: 09-11-96

Abstract: This report proposes an adaptive modulation/time division multiple access (TDMA) using a space and path diversity combining for multi-media wireless communication systems with the bit rate of up to 10 Mbit/s in microcellular environments. To compensate for the maximum delay time of one symbol duration, this report proposes a new space and path diversity combining technique that resolves and combines the first and delayed paths. In the proposed adaptive modulation system, modulation level and symbol rate are controlled according to signal to distortion power ratio after diversity combining to maximize the average bit rate with satisfying a certain BER. Computer simulation confirms that the proposed scheme can achieve 10 Mbit/s transmission in the microcellular environments with its delay spread of up to 250 ns.

Index terms: Adaptive modulation system, Space and path diversity, Multi-path fading

FREQUENCY COMMON USE BETWEEN LEO MOBILE SATELLITE AND URBAN CELLULAR TELEPHONE SYSTEMS

Takanori Hayashi, M.A. Henriques, and Yasuaki Kinoshita

EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 27, 1996, EMCJ 95-102

EMCABS: 12-11-96

Abstract: Frequency channel doubly reused systems between cordless telephone and cellular telephone systems [1,2] has been extended to LEO (Low Earth Orbit) mobile satellite system and terrestrial cellular system. By solving coexisting equation of both IRIDIUM and cellular systems, cell radius and base station transmission power has been derived. Compared with the conventional system which uses separate frequency bands for both systems, this system can enhance the spectrum utilization efficiency up to 2 times higher.

Index terms: Cordless telephones, cellular telephones, iridium, frequency common use, spectral utilization efficiency

**COMMON AIR INTERFACE BETWEEN INSIDE BUILDINGS CELLULAR SYSTEM AND URBAN CELLULAR SYSTEM-
DESIGN OF A SINGLE PHONE CELLULAR SYSTEM WITH UNDERLYING
INDOOR MICROCELLS AT INITIAL STAGES OF DEPLOYMENT**

Chiaki Hanamura, M.A. Henriques, and Yasuaki Kinoshita
EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 27, 1996, EMCJ 95-103

EMCABS: 13-11-96

Abstract: A single phone cellular system having underlying microcells inside buildings which employ the same frequency channels used by conventional cellular telephones has been reported successful on operational tests. All previous analyses done on such system assumed the most heavy case of interference, i.e., the microcells are fully deployed and operational all over the cellular service area.

This paper shows simplified conceptual system design formulas and evaluates the single phone system under different propagation conditions from an initial to a full stage of deployment. It is also shown that the spectrum efficiency enhancement obtained from this system on an initial stage can be as large as that of a fully deployed one.

Index terms: Microcellular system, macrocellular system, double reuse

PATH DIVERSITY BASED ON CMA

Sanghoon Song, Kiyoharu Aizawa, and Mitsutoshi Hatori
EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 27, 1996, EMCJ 95-109

EMCABS: 16-11-96

Abstract: In land mobile communication, adaptive array has been studied as a countermeasure against multipath fading. Especially path diversity using adaptive array was proposed to fully utilize the received power. In this paper, we proposed PDCMA; the path diversity based on CMA (Constant Modulus Algorithm). Two different algorithms are applied to PDCMA. CMA is to capture the maximum power signal, and LMS (Least Mean Square) algorithm is to capture the other signals. Estimation error of reference signal brings about performance degradation, since the reference signal used in LMS algorithm is generated based on the output of signal and performance improvement can be obtained with this technique.

Index terms: Path diversity, CMA, adaptive array, maximal ratio combining technique

A TRANSMISSION STRATEGY FOR VBR DATA IN PACKET TDMA NETWORKS

Takafumi Hayashi, Masugi Inoue, Hiroyuki Morikawa, and Moriyuki Mizu
EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 27, 1996, EMCJ 95-105

EMCABS: 14-11-96

Abstract: This paper investigates the performance of VBR data transmission strategy in Packet TDMA Networks. In this strategy, high-priority packets are transmitted in the fixed channel and low-priority packets are transmitted in the free slot selected on demand. This strategy utilizes statistical multiplexing and absorbs traffic fluctuation produced by each information sources. Therefore, the efficient sharing of frequency resources among dispersed terminals can be achieved and the system capacity also can be increased. In addition, as an example of VBR data, we consider two layer video data and we present the effectiveness of this strategy by the computer simulation.

Index terms: Wireless communication, packet TDMA, reservation random access, VBR data transmission, layered transmission, two layer video transmission

**HANDOFF CONTROL FOR INDOOR MICROCELLULAR TELEPHONE
-ROBUSTNESS ANALYSIS OF DECISION AVOIDED ALGORITHM-**

Kazuhisa Oku, and Yasuaki Kinoshita
EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 27, 1996, EMCJ 95-110

EMCABS: 17-11-96

Abstract: To implement indoor microcellular telephone, it is necessary to overcome the handoff instability due to violent fading inside buildings. Conventional handoff control using a long averaging time decrease telephone quality in spite of the stability improvement.

The handoff performance of previously reported algorithm, "which reserves the control decision when the received signal strength is small", and relation between the robustness of handoff control and telephone quality has been analyzed.

Autonomous learning procedure which improve the robustness also has been studied.

Index terms: Indoor microcellular telephone, handoff algorithm, robustness, telephone quality

**VARIABLE RATE DATA TRANSMISSIONS
ON SINGLE CODE-CHANNEL IN DS-CDMA**

Yukihiko Okumura, Koji Ohno, and Fumiyuki Adachi
EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 27, 1996, EMCJ 95-106

EMCABS: 15-11-96

Abstract: Coherent multicode DS-CDMA is proposed for the next generation mobile cellular radio access. Two-layered spreading code allocation, pilot symbol assisted coherent RAKE combining, traffic-adaptive transmit power control, and orthogonal multicode transmission are employed. In this paper, cyclic redundancy check (CRC) code and rate-info aided variable rate data transmissions are proposed to realize variable voice and data transmitted on a single code-channel (code-channels are distinguished by short spreading codes) in coherent multicode DS-CDMA. The frame error rate (FER) performance under multipath Rayleigh fading environments is evaluated by computer simulations. The variable rate transmission characteristics, focused on rate-info detection schemes and bit-interleaving structures, are described.

Index terms: Mobile radio, DS-CDMA, data transmissions, variable rate, error detection code

**PROPAGATION LOSS CHARACTERISTICS FOR MICROCELLULAR MOBILE
COMMUNICATIONS IN MICROWAVE BAND**

Kazumasa Taira, Shinya Sekizawa, Gang WU, Hiroshi Harada, and Yoshihiro Hase
EMC-Japan meeting at Kikai-Shinko-Kaikan, Tokyo
February 27, 1996, EMCJ 95-111

EMCABS: 18-11-96

Abstract: Empirical propagation loss characteristics models for the microwave band in microcellular mobile communications are proposed and discussed. Measurements were performed using three frequencies (3.35, 5.20, and 8.45 GHz) and four transmission antenna heights. A new model for line-of-sight case is proposed and severe high propagation loss for non-line-of-sight case is observed in our measurements. Furthermore, the characteristics for fast fading is also introduced.

Index terms: Land mobile communications, propagation, microcell, microwave, path loss

STUDY OF ELECTROMAGNETIC WAVE ABSORBER USING RESONANT EFFECT

Hideki Komori

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

April 17, 1996, EMCJ96-3

EMCABS: 19-11-96

Abstract: It is attempted to compose an Electromagnetic Wave Absorber using the Resonant Effect of the Dielectric Resonator which has some losses.

As a result, it is observed that an arrangement of 2.8 mm side cubic resonator whose material is a mixture of Mn-Zn ferrite and resin on a conductive board absorbs an electromagnetic wave of approx. 20 GHz which is the resonance frequency of the resonators. It is found that there is an appropriate number of resonators on the conductive board that maximizes the absorption.

Index terms: Electromagnetic wave absorber, dielectric resonator, dielectric loss, resonant effect

STATISTICAL MODEL IN FREQUENCY DOMAIN FOR NOISE EVALUATION

Qinqin Chen, Shuichi Nitta, Atsuo Mutoh, and Michio Horigome

EMC-Japan meeting at Osaka University

June 25, 1996, EMCJ96-12

EMCABS: 22-11-96

Abstract: Evaluation of electromagnetic noise is usually evaluated in frequency-domain, as modulation and demodulation are realized based on Fourier-theory. However, frequency-spectrum must be induced by settling bandwidth in frequency on signals, by the reason that frequency-spectrum analysis techniques have uncertainty between frequency domain and time domain. However, in case that frequency-resolutions is not enough, we have a problem that measured spectrum are different every time spectrum measurement is implemented. In this paper, by analyzing the limitation of a various kinds of spectrum analysis techniques, authors describes the necessity of application of statistical method in order to evaluate electromagnetic noise in frequency-domain and propose a noise evaluation technique by obtaining and utilizing the probability-distribution of noise in a frequency band.

Index terms: Short-time Fourier transform, uncertainty principle, amplitude probability distribution, crossing rate distribution, akaike information criterion

MEASUREMENT OF RADIATION EFFICIENCY OF ANTENNAS IN THE VICINITY OF HUMAN MODEL

Qiang Chen, Takayuki Shinohe, Kazuhisa Igari, and Kunio Sawaya

EMC-Japan meeting at Kumamoto University, Kumamoto

May 23, 1996, EMCJ96-5

EMCABS: 20-11-96

Abstract: A new equipment which can measure the radiation efficiency of the antennas in the vicinity of human model has been developed based on the pattern integration method. Good agreement between the measured and the numerical results has been obtained conforming the validity of the present measurement method equipment.

Index terms: Radiation efficiency, antenna, human model, measurement

INVESTIGATION ON RADIATED EMISSION CHARACTERISTICS FROM MULTILAYER PRINTED CIRCUIT BOARDS

Takashi Harada, and Hideki Sasaki

EMC-Japan meeting at Osaka University

June 25, 1996, EMCJ96-13

EMCABS: 23-11-96

Abstract: Radiated emission (RE) characteristics from 4-layer printed circuit boards (PCBs) with a power system composed of a power plane and a ground plane is described. The PCBs have circuits composed of oscillators, ICs, traces and terminal resistors. Time domain magnetic fields near the PCBs have been evaluated, in order to analyze the sources responsible for the RE, and the result indicated that the main source exist in the power system. When the power plane and the ground plane are regarded as a parallel plate transmission line, the transmission characteristics have similar frequency characteristics to the RE spectrum.

Index terms: PCB, radiated emission, power system, ground, parallel plate transmission line

ELECTRICAL PROPERTIES OF SKIN AND SAR PROFILE IN A REALISTIC HUMAN MODEL

Kiyofumi Takai, and Osamu Fujiwara

EMC-Japan meeting at Kumamoto University, Kumamoto

May 23, 1996, EMCJ96-6

EMCABS: 21-11-96

Abstract: The skin tissue of a human head can play a shielding role in protecting the central organs from microwave exposure. For the electrical properties, however, the publication data are being widely scattered from fat (low water content) to muscle (high water content), and thus various properties for the skin tissue are used to compute the SAR in a heterogeneous head model. This paper examines numerically how variations in electrical properties of the skin tissue have an effect on the SAR inside a human head. The skin tissue properties are newly estimated from a Debye equation with two relaxation time constants, which are used for the SAR computation in our developed heterogeneous head model for 1.5-GHz microwave exposure. The SAR details are compared with the results computed for the skin tissue properties previously employed.

Index terms: Microwave, biological effects, skin tissue, realistic head model, specific absorption rate

COMPARISON OF REFLECTION CHARACTERISTICS OF WEDGE-TYPE ABSORBER USING MMP AND FD-TD METHOD

Takahiro Aoyagi, Atsuhiko Nishikata, and Yasutaka Shimizu

EMC-Japan meeting at Osaka University

June 25, 1996, EMCJ96-15

EMCABS: 24-11-96

Abstract: Reflection characteristics of wide frequency range electromagnetic wave absorber with wedge structure has been calculated by MMP (Multiple Multipole Program). Equivalent permittivity has been conventionally used to calculate a wedge structure. This method is low frequency approximation.

In this report, the wedge structure is analyzed both by MMP and FD-TD methods. The result is compared with that of two kinds of equivalent permittivity approximation, i.e. The transmission mode approximation and the uniform approximation. The reflection coefficient calculated by FD-TD shows good agreement with that of MMP with frequency up to 1.5 GHz. And the coefficient calculated by equivalent permittivity differs from those of MMP or FD-TD in the higher frequency range. The applicable condition of transmission mode approximation and uniform approximation is considered.

Index terms: EMC, MMP, FD-TD, transmission mode approximation, wave absorber, wedge structure

1995 EMC Society Member Survey Final Report

DANIEL HOOLIHAN
VICE-PRESIDENT, EMCS

This is the third and final planned article on the 1995 EMC Society Statistical Member Survey. The first article appeared in the Spring-1996 EMCS Newsletter and concentrated on the general average relationships found in the survey. The second article was published in the Summer-1996 EMCS Newsletter and it explained the first half of the open-ended questions in the survey. This final article will address the balance of the open-ended questions that were in the 1995 Survey.

Educational Workshops

When asked the question: "Have you attended any educational workshops at the EMC Symposium and, if yes, which workshops," the most popular reply was "European EMC Directive." The second most popular workshop was "Fundamentals of EMC" and the third most popular was "EMC Standards." Other popular workshops included "International Safety," "Spectrum Management," "Transient Overvoltages" and "Test Measurements."

Benefits

As an EMC Society member, the most important benefit was "access to new technical information" and the second most popular benefit was "a copy of the symposium proceedings." The third most valuable benefit was receiving the "IEEE Transactions on EMC" followed by information on "EMC design." "Networking with other EMCS members" was followed by "insurance benefits." The "Spectrum magazine" was next in line. "Book reviews in *The EMCS Newsletter*" and "conference announcements" had an equal number of advocates. In addition to the above, 13 other benefits had singular proponents.

Areas of Interest

Question #35 on the survey asked "What is your particular area of interest in EMC?" Over 13% of the respondents to this question answered "EMC testing" while the second most popular answer was "EMC standards" with 8% of the respondents. "EMC troubleshooting" to bring equipment into compliance with regulations was next at 7% of those surveyed. "Shielding" and "electromagnetic radiation" were tied at 4% of the survey participants while "military EMC" was slightly less at 3.5%. "Modeling and simulation" were strong areas for about 3% of the participants while "automotive development" and "medical devices" were equal at about 2% of the active respondents.

Over 70 other areas of interest had at least one person very involved in that particular subset of EMC engineering.

New EMCS Services

The last open-ended question on the survey asked the participants to list one to three new EMCS Services they would like to see the

Society develop. The most popular answer was an Internet Homepage and on-line conference announcements with a 16% response. (Author's note: the survey was completed before the EMC Home Page had been developed). More EMC educational material was the second most requested new service with about 9% of the respondents. Publishing a technical magazine was the third choice with about 4% of the survey participants saying they would be interested in that as a new service. A current list of European and American EMC standards was desired by about 4% of the people also; it was not clear from the answers whether they wanted this to be "on-line" or "on-paper."

Practical real-life examples of EMC solutions for "small" products was the next most popular request with a 3% rating followed by "more IEEE sponsored seminars relating to current issues" and "more computer programs/products" at slightly less than 3%.

About 2% of the responses requested additional services such as "examples of E³ problems," "list of current EMC job openings on the Internet (Author's note: This is now available on the EMC Home Page), "lectures by experts in the EMC field," "EMC chapter program support," "improvements on measuring techniques for EMC," and "more workshops."

All other responses were 1% or less of the survey participants.

Conclusion

The first statistical survey of the EMC Society was completed in 1995 in order to provide information to the EMCS Board of Directors for long-range planning. In general, the survey was very successful with a response rate of 51% for the surveyed members. It is anticipated that the EMCS will repeat a similar survey in the year 2000.

Future surveys, including symposium surveys, will be the responsibility of the Survey Committee, headed by Dick Ford. This Survey Committee operates under the Professional Services Directorship, presently headed by Norm Violette.

Questions or inquiries on the present article or the two previous articles can be directed to the author at 612-638-0250 or (FAX) 612-638-0285 or dhoolihan@tuyvps.com

EMC Related Conferences & Symposia

November 19-21
**THE 11th ANNUAL
 CONFERENCE OF THE
 ISRAEL SOCIETY FOR
 QUALITY**

"Quality for a Better Life"
 ICC Int'l Convention Center
 Jerusalem, Israel
 ISAS International Seminars
 P.O. Box 34001
 Jerusalem, Israel 91340
 Tel: 972-2-6520574
 Fax: 972-2-6520558
 e-mail: isas@netvision.net.il

February 18-20

(held every two years)
EMC ZURICH '97
**12th INT'L ZURICH
 SYMPOSIUM AND
 TECHNICAL EXHIBITION
 ON EMC**
 Dr. Gabriel Meyer, ETH-Zentrum
 IKT
 Tel: 411 632 27 90
 Fax: 411 632 12 09

May 21-23

**INT'L SYMPOSIUM
 ON EMC**
 Beijing, China
 c/o Prof. Zhang Linchang
 EMC Research Section
 Northern Jiaotong University, Beijing
 Ms. Pang Min
 Secretariat EMC'97
 P.O. Box 165
 Beijing 100036, China
 Tel: 86-10-68283403
 Fax: 86-10-68283458
 e-mail: shaze@njdhep.nj.cn

IEEE Administrative Meetings

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

December 8-9
**STANDARDS BOARD
 COMMITTEE MEETING**
 and

December 10
**STANDARDS BOARD
 MEETING**
 Marco Beach Hilton
 Marco Island, FL
 Terry deCourcelet:
 (908) 562-3807

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

EMCS Cooperating Symposia

1997 Beijing, China: May 21-23

1999 Japan: May 15-17

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

Zurich Biannually, odd years.

Wroclaw Biannually, even years, in June.

IEEE EMCS Symposia Schedule

1997 Austin, TX
 August 18-22
 Austin Convention Center
 Hyatt Hotel
 John Osburn: (512) 835-4684
 e-mail:
 97.emcsymp@emcusa.com

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

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

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

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

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

*The IEEE EMCS Newsletter welcomes contributions
 for this calendar page. Please send information to:*

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Broadband RF power amplifiers, 1 W to 50 kW, dc to 18 GHz; Antennas and accessories for RF susceptibility testing; broadband E-field monitors and fiber-optic links

Medium Size Products: Safety, Emissions to FCC Pts. 15 and 18 CISPR 22 (FCC Listed VCCI Reg.), Immunity for “CE”

Product Safety Test Equipment and Services for Compliance to IEC, UL, CSA, TUV, etc.

Essentials for EMC Testing: Antennas, Towers and Turntables, Broadband E-field Sensors, GTEM and TEM Cells, LISNs, and Accessories

Ferrite Cores for EMI Suppression, Bead-On-Leads, Surface Mount Beads and Multi-Hole Connector Plates. Precision broadband ferrite tile absorbers for semi-anechoic chamber applications.

Anechoic Shielded Rooms and Chambers, High-performance Absorbers

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Suppressor Networks

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