IEEE

Electromagnetic Compatibility Society

Newsletter

ISSUE NO. 136 WINTER 1988 (ISSN 0164-7644) EDITOR: ROBERT D. GOLDBLUM

EMC MAKES HEADLINES

As Fredrick Matos comments in the "Letters To The Editor" section, it is a rare event when a major EMC-related story appears in the general media. But on Sunday, November 8th, the Knight-Ridder News Service broke the story, based on a three-month investigation, that the U.S. Army's UH-60 Black Hawk helicopter is highly susceptible to EMI/RFI or electromagnetic environmental effects (E^3). This received front page coverage in the *Philadelphia Inquirer* and the *Baltimore Sun* (just to name two major East Coast newspapers) and probably EMC engineers from Bangalore to Zurich have seen some mention of the story.

The story presented strong evidence that most, if not all, of the sudden crashes that have killed 22 servicemen since 1982 were caused by flying close to radar antennas, radio or microwave towers and, in one case, an illegal CB transmitter. Black Hawks have been known to suddenly flip over or go into steep dives even with expert pilots at the controls. The Black Hawk's electronically-controlled flight control system, as well as much of the rest of its avionics, was said to be both EMI/RFI-susceptible and inadequately shielded. The Navy version of the UH-60, the Sea Hawk, was reported to have suffered from the same condition until the Navy required the contractor, Sikorsky Aircraft Company, to provide greater shielding on the Navy models. Follow-up stories several days later reported that the Army is now requiring that all future Black Hawk logic modules be shielded like the Navy versions and the old modules replaced.

Newspapers that covered the story in full were forced to discuss the concept of EMI/RFI susceptibility in some detail. For many readers, this may have been their first exposure to the concept that EMI/RFI can be an actual danger and not just a nuisance. For the defense procurement and defense contractor community it is yet another harsh and expensive lesson that electromagnetic compatibility *must* be *designed into* a weapons system before it reaches the hardware stage.

What made the story of such interest to newspaper editors was not the EMC aspects but the evidence of a cover-up of the cause of the crashes by the Army. One newspaper was even-handed enough to point out that when EMI/RFI causes a crash it leaves no positive evidence behind for crash investigators to find. However, EMC engineers are (or should be) used to dealing with such non-evidence. Members of former crash review panels told reporters that they were forced to produce reports with false conclusions. We don't *know* the composition of those panels,

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EDWIN L BRONAUGH
128 WOODHAVEN DR
SCOTIA NY 12302
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EDUCATION COMMITTEE NEWS

The following is a partial listing of the short courses and seminars on EMC-related topics being offered this spring:

CK Consultants is offering two-day seminars on *Grounding, Bonding and Shielding* and *Hands-On Laboratory Workshop* and one-day seminars on *FCC/VDE Commercial Applications, ESD/RF Susceptibility, Product Safety* and *EMCad Computer Programs.* These courses will be offered in Mariposa, California. For more information call (209) 966-5240.

Interference Control Technologies is offering courses on *Grounding and Shielding, Practical EMI Fixes, TEMPEST Design* and *MIL-STD-461/462 Testing.* The courses will be offered at various locations. For information call (703) 347-0030.

Compliance Engineering is offering courses on *EMI, ESD, SAFETY* and *TELECOM* at various locations. For more information call (617) 264-4208.

A three-day course on *Electromagnetic Compatibility Engineering* will be offered in the Boston area by Henry Ott Consultants. For additional information call (201) 992-1793.

A five-day course on *Worldwide Nonionizing Radiation Safety Standards* is being presented in Capri, Italy on May 2–6, 1988. For more information call Om Gandhi at the University of Utah at (801) 581-7743.

R&B Enterprises is offering two new three-day courses: *Worst Case Circuit Analysis* and *EMI Suppression Methods.* In addition, they continue to offer their one-day *EMP Workshop* and their two-day courses on *TEMPEST: An Overview for Managers and TEMPEST Officers, Grounding, Bonding and Shielding, EMP Design and Test, Understanding and Applying MIL-STD-461C,* the *MIL-STD-461C/462 Test Workshop, Architectural Shielding,* and *Printed Circuit Board and Wiring Design for EMI and ESD Control.* Three-day courses include *EMI/EMC in the Automotive System* and *Identification and Control of Microwave/RF Hazards.* R&B also offers a five-day *TEMPEST Detailed Design Course* and a ten-day *EMI Training Institute.* The courses will be offered at various locations. For more information, call (215) 825-1960.

Henry Ott
Chairman, EMC/S
Education Committee
Henry Ott Consultants
48 Baker Road
Livingston, NJ 07039
(201) 992-1793

NEWSLETTER STAFF

EDITOR

Robert D. Goldblum
R&B Enterprises
20 Clipper Road
W. Conshohocken, PA 19428

ASSOCIATE EDITORS

CHAPTER CHATTER	Charles F.W. Anderson 2302 Keener Road Hagerstown, MD 21740
BOOK REVIEWS	James S. Hill The EMXX Corporation 263 N. Main Street Hudson, OH 44236
EMC PERSONALITY PROFILES	William G. Duff Atlantic Research Corporation 5390 Cherokee Ave. Alexandria, VA 22314
ABSTRACTS	William H. McGinnis Southwest Research Institute P.O. Drawer 28510 San Antonio, TX 78284
PHOTOGRAPHER	Fred J. Nichols LectroMagnetics, Inc. 6056 W. Jefferson Boulevard Los Angeles, CA 90016
EMC STANDARDS ACTIVITIES	Herbert Mertel EMACO, Inc. P.O. Box 22066 San Diego, CA 92122
EMCS EDUCATION COMMITTEE	Henry Ott Henry Ott Consultants 48 Baker Road Livingston, NJ 07039
EMC-S BOD ACTIVITIES	Donald N. Heirman AT&T Information Systems Crawfords Corner Rd. Building 41-112 Holmdel, NJ 07733
POINT AND COUNTERPOINT	Anthony G. Zimbalatti Grumman Aerospace Corporation M.S. B25/35 Bethpage, NY 11714
PAPERS, ARTICLES & APPLICATION NOTES	Edwin L. Bronaugh Electro-Metrics 100 Church Street Amsterdam, NY 12010
INTER-SOCIETY ACTIVITIES	Walt McKerchar Electromagnetic Engineering, Inc. P.O. Box 1888 Poulsbo, WA 98370-0269
PCs FOR EMC	Edmund K. Miller Rockwell Science Center P.O. Box 1085 1049 Camino dos Rios Thousand Oaks, CA 91360
EMC CERTIFICATION & ACCREDITATION	Russell V. Carstensen, P.E. Naval Air Systems Command AIR 5161 CG1, Room 940 Washington, DC 20361

but we would like to *think* that there were no EMC engineers on those panels. One gets the impression from reading the story that this story came to light because someone blew the whistle. We don't *know*, but we would like to *think* that someone was an EMC engineer.

The unstated policy of this publication is to concentrate on subjects that concern EMC Society members directly and to leave extensive coverage of broader issues, such as tax reform, career guidance and engineering ethics, to other IEEE publications that can devote more space to discussing them. We don't *know*, but we would like to *think* that you do read about these issues, *especially* engineering ethics, and treat them with the importance they deserve. The best EMC engineer in the world is worth little if he or she won't make themselves be heard when someone *must* be heard.

SURVEY DATA FOR 1983, 1986 AND 1987 EMC SYMPOSIA COMPARED

Attendee surveys were performed at the 1983 EMC Symposium held in Washington, DC, the 1986 EMC Symposium held in San Diego, CA and the 1987 EMC Symposium held in Atlanta, GA. Despite the fact that the locations, the number of attendees and the number of attendees filling out survey forms all varied, the results are still remarkably similar in most cases. Some notable changes or trends include:

- The percentage of attending Associate Members appear to have increased significantly while the percentage of Members and Not Members decreased somewhat.
- Attendance by those with no degrees or only Associate degrees appears to be steadily declining.
- The percentage of self-employed attendees appears to be steadily increasing while a growing percentage of retirees available for employment are attendees. However, it seems that none of those filling out surveys were retirees attending just for the fun of it.
- The percentage of those surveyed that work for companies or institutions of 1000 employees and up still remains at about one-third. Yet, about one-half of those surveyed still work in an EMC group of under five people and about *three-quarters* of those surveyed still work in a group of under twenty people. This implies that to many fellow employees practitioners of EMC engineering are not very visible.
- There is an increase in those finding EMC symposia outside of the United States useful. Perhaps this indicates a growing tendency for companies to agree to send employees to attend offshore symposia out of a growing appreciation for the need for continued professional development.
- Those surveyed in 1987 project an increase in EMC manpower where they work over a decrease by about three-to-one for all surveyed time periods except for the 1989 time period. For that time period, optimists outnumber pessimists by only two-to-one.
- DOD requirements and EMP remain growing areas of EMC specialization.
- Testing and design analysis combined continue to be the major area of EMC expertise for two-thirds of those surveyed.

1983, 1986 AND 1987 EMC SYMPOSIA ATTENDEE SURVEY DATA

	1983	1986	1987
IEEE MEMBERSHIP GRADE			
Associate	0%	2%	27%
Member	46%	49%	32%
Senior Member	11%	14%	15%
Fellow	5%	3%	2%
Not Member	38%	32%	24%
AGE			
20–25	3%	7%	2.5%
26–30	11%	9%	12.5%
31–35	13%	14%	5%
36–40	9%	11%	14%
41–45	23%	15%	5%
46–50	11%	15%	17.5%
51–55	12%	8%	17.5%
56–60	12%	10%	17.5%
Over 60	6%	11%	12%
HIGHEST EARNED DEGREE			
None	6%	11%	2.5%
Associate	8%	4%	2.5%
Bachelor	40%	47%	47.5%
Professional Degree	4%	2%	10%
Master	25%	25%	25%
Doctorate	9%	11%	12.5%

EMPLOYMENT STATUS	1983	1986	1987
Employed Full-time in EMC Area	60%	76%	62.5%
Employed Full-time in other than EMC Area	17%	7%	12.5%
Employed Part-time in EMC Area	21%	11%	20%
Unemployed Involuntarily	0%	0%	0%
Unemployed Voluntarily	0%	3%	0%
Retired—Not Available for Employment	0%	0%	0%
Retired—Available for Employment	1%	1%	2.5%
Self Employed	1%	2%	2.5%

REGISTRATION/ORGANIZATION REPRESENTATION			
Registered Professional Engineer	22%	19%	22.5%
Engineer in Training	9%	14%	7.5%
Certified Engineering Technician	1%	2%	2.5%
Member Professional Bargaining Unit	1%	2%	2.5%
None	67%	63%	65%

SUPERVISION RESPONSIBILITY			
No Supervision Responsibility	20%	21%	20%
Indirect or Staff Supervision	24%	23%	17.5%
Supervise Team or Unit	11%	20%	27.5%
Supervise Project or Section	22%	16%	15%
Supervise Project or Division	16%	10%	0%
General Management	5%	6%	5%
Self Employed	2%	4%	14.5%

NUMBER OF YEARS OF PROFESSIONAL EXPERIENCE			
0-5	11.4%	11%	15%
6-10	13%	18%	12.5%
11-15	13%	14%	2.5%
16-20	20%	12%	7.5%
21-25	17%	14%	15%
Over 25	26%	31%	47.5%

PRESENT ANNUAL BASE COMPENSATION OR SALARY			
Under $20K	3%	2%	5%
$10-$30K	11%	7%	10%
$30-$40K	26%	22%	12.5%
$40-$50K	36%	24%	27.5%
$50-$60K	17%	24%	20%
$60-$70K	4%	10%	12.5%
$70K and Above	3%	11%	12.5%

NUMBER OF EMPLOYEES IN YOUR ENTIRE COMPANY OR INSTITUTION	1983	1986	1987
1-99	9%	13%	20%
100-199	3%	5%	2.5%
200-499	12%	11%	10%
500-1499	12%	11%	15%
1500-2999	11%	6%	7.5%
3000-4999	12%	6%	7.5%
5000-9999	8%	11%	2.5%
10000 & Over	33%	37%	35%

NUMBER OF EMC/EMI EMPLOYEES AT YOUR PLACE OF WORK			
1-4	46%	51%	50%
5-9	22%	23%	30%
10 & Over	32%	26%	20%

ARE YOU ACTIVE IN			
EMC Chapter	45%	58%	32%
Other Technical Chapters	31%	17%	27%
IEEE Section	24%	20%	21%
Student Activities	0%	5%	20%

WHICH OF THE FOLLOWING ARE USEFUL TO YOU?			
EMC Symposiums (Held in USA)	35%	35%	40%
EMC Symposiums (Held outside of USA)	5%	5%	20%
EMC Transactions	28%	24%	16%
EMC Newsletter	24%	24%	24%
EMC Chapter Symposia	8%	12%	—

DO YOU SEE A REDUCTION OF EMC ENGINEERING MANPOWER IN YOUR COMPANY?			
If so, Indicate the Time When This Might Occur:			
Three Months	2%	3%	5%
Six Months	1%	4%	5%
One Year	1%	0%	5%
Two Years	2%	1%	7%
No Reduction	86%	80%	73%
No Opinion	8%	12%	5%

DO YOU SEE AN INCREASE OF EMC ENGINEERING MANPOWER IN YOUR COMPANY?			
If so, Indicate the Time When This Might Occur:			
Three Months	16%	12%	14%
Six Months	24%	14%	15%
One Year	13%	17%	22%
Two Years	7%	6%	12%
No Increase	23%	38%	27%
No Opinion	17%	13%	10%

WHAT PERCENTAGE OF YOUR TIME IS ALLOCATED TO THESE AREAS OF SPECIALIZATION?	1986	1987
FCC	19%	17%
VDE	10%	12%
CISPR	4%	2.5%
DOD	26%	32%
EMP	8%	14%
ESD	4%	7.5%
TEMPEST	9%	12%
Other Specify	20%	3%

WHAT IS YOUR AREA OF TECHNICAL EXPERTISE?	1986	1987
Test	39%	32.5%
Design Analysis	36%	35%
Frequency Management	6%	10%
General Management	19%	22.5%

SEATTLE

EMERALD CITY

IEEE 1988 INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY

P.O. Box 68157 • Seattle, WA • 98168

IEEE

August 2, 3, 4, 1988 • Westin Hotel • Seattle, WA

TRAVEL SAVINGS TO SEATTLE EMC SYMPOSIUM

A special convention airfare has been arranged with United Airlines, the official airlines for the 1988 IEEE International Symposium on Electromagnetic Compatibility. A five percent bonus discount off United's published fares is available when you travel to Seattle for the conference. All conference attendees, exhibitors and their traveling companions are eligible for this exclusive offer.

Qualification requires that you fly United round trip to Seattle between July 27 and August 12, 1988 and meet all restrictions of the fare to which the discount is being applied. If you cannot meet the restrictions of the many discount fares United offers, a special forty percent discount from the normal coach (Y) fare will be offered. No minimum stay or advance purchase is necessary for this 40 percent savings.

Travel at these fares is permitted from all points in the United States including Alaska and Hawaii. (Attention international attendees: It is possible for all travel arrangements to be made for your travel to and from the United States.) Reservations and ticketing at these special reductions are available only through Global Express-Southcenter Travel, the official travel coordinator for the IEEE/EMC 1988 Symposium.

Here's what you should do *today* to take advantage of these special travel savings:

- **Call Cathy Gunstone at Global Express-Southcenter Travel, (800) 456-8183 toll-free, between the hours of 8:30 am and 2:00 pm Pacific Time.**
- **Cathy will provide all information and make reservations for all flights and fares. Tickets will be mailed to you upon receipt of payment.**
- **Seats are limited and there are restrictions on some fares, so call early for the best availability. Fares are guaranteed at the time of ticket purchase.**
- **Arrangements for car rental or pre- and post-conference travel is also available. Special packages to Victoria or Vancouver, British Columbia, Alaska or vacation spots in Washington State can be reserved for you and your family.**

EMC 88 . . . . . A PULSE FOR PROGRESS

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

BOD ACTIVITIES

by Donald N. Heirman

BOARD OF DIRECTORS' MEETING IN ORLANDO

The final 1987 Board Meeting was held at the Lake Buena Vista Hilton Hotel in the Orlando area on November 19, 1987. Fifteen of the 22 Board members were present. For this meeting Vice President Don Clark agreed to take the minutes in the absence of Secretary Gilda Haskins. He then presented the minutes from the August meeting. The Board approved the minutes with minor editorial changes.

The major items discussed are summarized below:

1. Treasurer Ford presented an extensive report. Our Society's net worth as of September is $340K. Our long-term investments amount to about $180K of that worth. The interest rate for the long-term investment is about 13%. Dick noted that we will probably lose about $30K due to the stock market drop in October. He finished his report by stating that our Society was 18th out of the 33 societies in total reserves and a very healthy ninth from the highest in reserves per member (approximately $125 per member). The Treasurer's report was accepted by the Board.

2. Director Bob Haislmaier (Communications Services) presented his several reports. For the Newsletter, Bob indicated that the Editor, Bob Goldblum, was again asking for contributions for the Newsletter, especially from the Board members. A new feature will be quarterly articles from the President of our Society on various current issues facing the Society and you, its members. Dick Schulz then presented his *Transactions* Report. In it he tendered his resignation after 19 years of service. His last issue as Editor will be the February 1988 *Transactions.* Dick recommended and the Board agreed that his replacement be Dr. Motohisa Kanda of the National Bureau of Standards. Moto has been involved for many years as an Associate Editor. We all want to extend our heartfelt thanks to Dick for an exemplary job and wish Moto success in this important undertaking. Dick then finished his report by stating that there will be two special issues of the *Transactions* in 1988: one on shielding edited by Mark Ma, NBS, and one on measurement technology edited by Bill Duff, Atlantic Research. Gene Cory presented a rundown on Symposium planning. He is working with the Atlanta Symposium Committee to see if their planning software using Lotus 1-2-3 can be used by future symposium committees.

The acceptability of the 1991 Symposium hotel site at the Hyatt in Cherry Hill, New Jersey was addressed as a separate agenda item. For convenience, the results are presented here. Don Heirman, 1991 Symposium General Chairman, had sent the President a letter outlining in some detail the 1991 plans. Copies were sent to Gene and Terry Cantine. The plans were presented in response to questions raised by exhibitors on space, aisle widths, sleeping accommodations, location of technical sessions, etc. The relayout of the exhibit area now accommodates 142 eight-foot by 10-foot booths with aisle widths of eight feet or more, except for a very few places where a curved wall clearance requires about six additional inches. All the exhibits are in one place and immediately across the lobby from the technical sessions. The Hyatt hotel will serve as reservations and shuttle bus agent for accommodations among the four hotels in the area which will house the attendees. The Hyatt will provide a buffet as well as normal restaurant food services in the hotel lobby area. The awards luncheon is planned to be held at the new Garden State Raceway across from the hotel. After extensive discussion, the Board approved the site and plans for the 1991 Symposium in Cherry Hill. The Board then asked that the items brought up during the discussion on desirable hotel, technical session, exhibit, food service and accommodation layouts be written down for presentation to the Board. Those who have ideas on what should be incorporated into this document should call Gene Cory at (512) 684-5111, extension 2711.

Jim Hill next discussed our continued cooperation with the organizing committees for the British, Swiss and Polish EMC Symposia. Jim is also helping in putting together a list of all the policy items the Board has approved into a historical record that can be referred to by all future Board members. For more information, call Jim at (216) 650-6230.

3. Director Ed Bronaugh (Technical Services) introduced his Committee Chairmen, who presented their reports. Don Heirman, Standards Committee Chairman, presented a brief summary of his written report. There are now 16 standards identified with the EMC Society. That's roughly double the activity of only five years ago. Action on Standards 139, 213 and 263 are being balloted by the IEEE Standards Board Review Committee. Don wanted to thank all Working Group Chairmen and their Group members for their impressive performance in 1987. Next, Hank Ott presented a draft copy of an EMC bibliography that was presented to his Education Committee for possible publishing in the *Transactions* and Newsletter. If you

are interested in critiquing the draft, call Hank at (201) 992-1793, which is his new work number effective January 15, 1988. Hank retires from Bell Labs on January 15. Ed then reported the new charter and scope for the Technical Committee reporting to Wilf Lauber, Technical Advisory Committee Chairman. The Board approved the new Charter. For copies contact Wilf at (613) 998-2377.

4. Director Hofmann (Member Services) indicated that there was Chapter organizational activity in Cleveland (Jim Hill in spearheading this drive). He also indicated that each Chapter Chairman will be receiving a list of the last Symposium's attendees to see if new Chapter members can be pursued locally. He is also sending a list of the meeting topics from all Chapters for last year. This will help the local Chapter Program Chairmen in seeking speakers from outside their section. He then turned the reporting over to Chet Smith, who presented the slate of elected officers and directors for 1988. Chet asked for nominations from the floor. There being none, the slate was accepted, moved, and approved by acclamation. The results are as follows:

President: Don Clark
Vice-President: Ed Bronaugh
Treasurer: Dick Ford
Secretary: Janet Nichols

Technical Directors:

Communications Services: Bob Haislmaier
Membership Services: Bob Hofmann
Technical Services: Don Heirman
Professional Services: Walt McKerchar

Congratulations to all. We wish them success for 1988.

5. President Carlson presented Director McKerchar's report for Professional Services. Walt was out of the country. The results of the 1987 EMC Symposium employment analysis is now available. There will be a complete report in the next issue (Winter 1988) of the Newsletter. The Public Relations Committee, chaired by Herb Zajac, is drafting a letter to send to the membership to ask their help in making the general public more aware of EMC via key articles or news stories on the importance of EMC and the EMC engineer. For more information contact Herb at (503) 627-4759.

6. President Carlson reported that he nominated Dr. Gerry Cappraro as an ABET member from the EMC Society. The Board also approved continuing support for the *Potentials* magazine which is intended for engineering students. He also handed out a dated list of the scopes of our Society's Standing Committees. The purpose is to update so that this information can be handed out to members who want to volunteer to serve their Society. He then turned the meeting over briefly to President-Elect Clark to discuss the Board meeting schedule for 1988. Tentative dates are as follows:

Date	Place
2/16-17	San Antonio (elected officers and directors only)
5/10	Boston
8/1	Seattle
11/18	San Diego

These dates fall during TAB meetings.

7. Before President Carlson adjourned the meeting at 4:45 pm, the Board unanimously thanked him for his outstanding leadership for the past two years and wished him well. The next full Board meeting will be in Boston at 10 am on May 10. The EMC Society Standards Committee will meet in the same room for 75 minutes, immediately preceding the Board meeting. (The Standards Committee will also meet in San Antonio). For further information contact Don Clark at (404) 894-3535.

Respectfully submitted,
Don Heirman
Associate Editor
Board of Directors' Activities

FIVE EMC-S MEMBERS ELECTED IEEE FELLOWS

In honor of their valuable contributions to electronics and electrical engineering, the following five members of the Electromagnetic Compatibility Society have been awarded by their elevation to IEEE Fellow:

- **Mr. Edwin L. Bronaugh:**
  For leadership in advancing electromagnetic compatibility.
- **Dr. Motohisa Kanda:**
  For contributions to the theory and numerical analysis of electromagnetic field probes used for compatibility measurements and field strength standards.
- **Mr. Henry W. Ott:**
  For contributions to education in electromagnetic compatibility and to the development of design techniques for electromagnetic compatibility.
- **Professor Dipak L. Sengupta:**
  For contributions to antenna theory and development, electromagnetics, and the understanding of electromagnetic interference phenomena.
- **Mr. Albert A. Smith, Jr.:**
  For contributions to the characterization of electromagnetic measurement sites.

Professor Sengupta, who is also a member of the Antennas and Propagation Society (among others), was elected following favorable evaluation of his work by that Society. The work of the four other Fellows was evaluated by the EMC-S.

LETTERS TO THE EDITOR

Dear Editor:

I want to congratulate you for the article "PCs for EMC" by E.K. Miller in the Fall 1987 issue of the EMC Newsletter. There was more useful information on four pages than one can find in a stack of computer journals.

Could Dr. Miller write a similar paper about co-processors? What do they really do besides "co-processing" and when do they bring an advantage that justifies their cost?

Sincerely yours,

.F. Harmuth
Department of Electrical Engineering
The Catholic University of America
Washington, DC 20064

Thanks for your comments. I'm sure that Dr. Miller also appreciates your input and will endeavor to address your specific interests. We would certainly like to hear from other members about our articles. This is the only way we have of knowing about the acceptance of our work.

RDG

Dear Editor:

The enclosed article [on the United States Army's problems with the UH-60 Black Hawk helicopter] appeared on the front page of *The Sun,* (Baltimore, MD) on Sunday, November 8, 1987. Needless to say, it is very unusual to see EMC as the major topic of a front page article in a major Sunday newspaper. I am sending the article because you may want to consider reprinting it in the Newsletter.

There is one additional suggestion that I have for the Newsletter. This regards the lack of coverage of spectrum management issues. There is a community within the IEEE EMC Society membership where spectrum management is the main interest. While the EMC material is of interest, my primary interests are in spectrum management and telecommunications policy. The Newsletter could run news items concerning the ITU.

I find the new "slicker" version of the Newsletter much more interesting and easier reading than the previous format and I commend you for an excellent publication.

Best wishes,

Fredrick Matos
1029 Harbor Drive
Annapolis, MD 21403
IEEE Senior Member and
currently IEEE
Congressional Fellow

Dear Editor:

For a number of years I have been a member of the EMC Society receiving the *Transactions* and your Newsletter regularly. In these publications a wide range of subjects is covered, many being of interest to me also.

However, with these lines I would like to suggest that someone knowledgeable about *radar EMI* might provide a review article on this subject to the Newsletter. Over 20 years ago this was a hot item with quite a few papers appearing in scientific and engineering journals, the *Transactions on EMC* included.

As a result of the radar EMC problems in those days, the DOD issued MIL-STD-469 applicable to all armed services. Similarly, the NTIA issued is Manual of Regulations, etc., with a section on Radar Spectrum Engineering Requirements.

Would it be possible to have a review of the history of these regulations along with comments on their ramifications for radar system design?

My interest in this matter as a member residing in IEEE Region 8 is due to the apparent lack of regulations in Europe similar to the above mentioned U.S. requirements.

Because of this, a number of high power radar installations have been found to cause serious EMI to microwave radio relay systems using modern digital modulation, e.g. 140 Mbit/s with 16 QAM.

I would like to start a discussion among the readership: do the U.S. regulations provide adequate protection of said digital radios? Conversely: what do we have to expect outside North America with respect to radar EMI vs. digital radio, and what may be done about it, both technically and in terms of new regulations?

Best regards,

H.U. Eichhorn, Ph.D.
DK 4130 Viby, Denmark

EDITOR'S NOTE:

In a further communication, Dr. Eichhorn adds the following comments:

"Your attention is drawn to a book by Woodrow W. Everett, Jr. et al., who published *Topics in Intersystem EMC* (Holt, Rinehart & Winston, Inc.) in 1972. I'm not sure if Mr. Woodrow and his co-authors (notably A. Scott Gilmour) are still around, but this kind of expert(s) I would think should be approached by you to write a review article.

"Also let me mention an internal report (in Danish) which I wrote in 1986 about radar EMI incidents. For this I collected extensive background material from unclassified sources. This I listed in an annex to that

report. If you think this material would be useful for your volunteer author of said review, please drop me a note so I can forward a copy of the list of references."

Anyone wishing to prepare an article on radar EMI should send it to Associate Editor Ed Bronough. If you wish to prepare a regular feature column in the Newsletter on this subject, contact the Editor. Thank you, Dr. Eichhorn, for your interest and suggestions.

RDG

ENGINEERING SPECIALTY CERTIFICATION

Eighteen engineering societies will sponsor a major conference to consider establishing specialty certification for the engineering profession. IEEE is among the sponsors of the conference, which will be held April 12–13, 1988 in Atlanta, GA.

Currently after receiving a college degree in a major technical discipline, an engineer can pursue registration as a professional engineer, which, in many states, is a broad designation of professional competence that identifies minimum competence in an engineering discipline but not expertise in a specialty area. Some technical engineering societies have already developed their own certification programs for both registered and non-registered engineers.

The Conference is expected to examine a number of crucial issues, including:

- **Granting specialty certification before or after registration;**
- **Granting certification by a centralized body or by a number of authorized organizations;**
- **Determining qualifications;**
- **Maintaining certification;**
- **Legal issues (including liability and due process for denial of certification); and**
- **Benefits and disadvantages of certification.**

Engineers and engineering societies in all practice areas are encouraged to participate in the Conference, as are members of the public. For more information, contact Arthur Schwartz, National Society of Professional Engineers, (703) 684-2845, or write to NSPE Legal Department, 1420 King Street, Alexandria, VA 22314.

FUTURE EMC-S SYMPOSIA SCHEDULE

1988 —Seattle, WA; August 2–4
Westin Hotel
Papers: Tom Herring
(206) 463-3567
Registration: Dave Dennis
(206) 525-9336

1989 —International
Nagoya, Japan
Secretariat: Professor
Y. Miyazaki
Telephone: 0532-47-0111, ext. 576
Fax: 0532-45-0480

—National
Denver, CO; May 23–25
The Radisson
John Adams
(303) 497-3328

COMMUGUIDE BOOKLET SERIES ANNOUNCED

The Professional Communication Society of the IEEE announces the publication of the first two booklets of the COMMUGUIDE Booklet Series, *How To Publish An Anthology* (Order Number TH01487) and *How To Write An Invention Disclosure* (Order Number TH01495).

The authors, Lois K. Moore from the Applied Physics Laboratory of the Johns Hopkins University and President of the IEEE Professional Communication Society and Daniel L. Plung from Westinghouse Electric Corporation, are the co-authors and also the compilers of the popular anthology, *Marketing Technical Ideas and Products Successfully!* published by the IEEE Press.

COMMUGUIDES are practical "how to" booklets in a series on proven communications techniques. Each booklet addresses a single, practical subject and offers readers short, focused guidelines on how to deal with it successfully. Engineers, scientists, inventors, technical communicators and other creative professionals can now benefit from this valuable extension to the IEEE's Professional Communication Society's continuing communications assistance program. Each booklet is designed to help the professional face a specific communications challenge with confidence and successfully complete new and difficult tasks. Two new booklets will be published each year. Each booklet contains approximately 20 pages and is priced at $5.00, including postage and handling charges. Maryland and New Jersey residents add 5 percent and 6 percent sales tax, respectively. Make checks payable to IEEE and send your order to the IEEE Service Center, Cash Processing Department, P.O. Box 1331, Piscataway, NJ 08855-1331.

IEEE TECHNICAL ACTIVITIES BOARD, PERIODICALS COMMITTEE MEETING SEPTEMBER 15, 1987

by Chester L. Smith

The Periodicals Committee (TAB/PC) is the watchdog group for the IEEE on transactions, magazines, journals and occasional reprints for the Societies that make up the Institute. Sometimes technical content is discussed, but mostly the issues surrounding transactions have to do with meeting publication deadlines. The Committee, itself, is composed of the TAB Chairman, a Committee Chairman and the immediate Past Chairman and a representative from each of the ten divisions. Also these are supported by IEEE staff personnel. The Committee meets three or four times per year to review the state of things and to address problems.

THE "ALL-TRANSACTIONS PACKAGE" (ATP)

TAB puts together and markets to libraries of corporations, universities and the like what they call the "All-Transactions Package." This includes all current transactions and magazines, but not the Newsletter and Section publications. A recent survey has indicated that this is a popular item with the users (88 percent said they were satisfied with it, and like the convenience of a one-time order rather than having to put in 46 orders if done individually). When asked about level of usage compared to the engineering and scientific journals of other organizations, the respondents indicated a whopping 96 percent usage compared to 2 percent (2 percent—no information) non-IEEE. A perennial problem discussed at each TAB/PC meeting is failure to meet deadlines. Some Societies seem to have more than a little "sand on their wheels" in this regard and this impacts the timeliness of the All-Transactions Package to the customers. Since the Societies derive income from this source, it behooves the responsible officers in the Societies to keep things moving along. Usually what happens is that the Division Rep is tasked to investigate and report back at the next meeting with a plan of action on how the problem will be solved. The "Iron Fist in the Velvet Glove" is that if the problem can't be solved in a reasonable length of time the offending transactions will be dropped from ATP and if that doesn't work the extreme action would be to suppress the transactions. As far as I know, neither of these Jovian lightning bolts has ever been loosed. Maybe they never will, but I am too chicken to want to find out.

IEEE MAIL

IEEE Headquarters has adopted a policy that *ALL IEEE Second Class* mail must be funneled through them. This includes newsletters and Section publications such as Washington's *Scanner* or Boston's *Reflector*. This is not merely bureaucratic aggrandizement, but is due to a Postal Service rule that allows any Postmaster anywhere to challenge Second Class mailings. IEEE maintains a Second Class permit under an IRS Sect 501C3 at the Post Office in New York. Headquarters does not want to run the risk of losing this status if some Postmaster somewhere decides that the IEEE comes under some other Section and is therefore not entitled to Second Class, but must pay First or Third Class rates, which are considerably higher. For the full story call Dave Staiger at (212) 705-7548.

OTHER ISSUES

There were a couple of other topics of interest to the Division IV Societies.

The Magnetics Society has taken on the responsibility of the *Translation Journal on Magnetics in Japan.* This journal is an elegant piece of work and well worth publishing in English, but it is rather expensive at the present time—$345 a year to Members and $545 to Non-Members. The costs, even so, are still somewhat beyond the current resources of Mag-S. I moved that TJMJ be included in ATP. The motion was seconded, noted in the minutes and then tabled for future reconsideration. The reason given for not including in ATP at this time was that the material was not "original" in the sense of never having been previously published. While this is technically true, unless you are fluent in scientific Japanese it might as well have never been published. If you have any thoughts on why such a journal should either be included or excluded I would appreciate hearing from you. It will be interesting to see how this issue will finally be resolved, but any Society contemplating taking on a project of this sort would be well advised to consult with the leadership of Mag-S before proceeding.

Headquarters would like to discourage extensive publishing of technical articles in newsletters and the like,

since such publications are not abstracted, indexed or retrievable. Furthermore, there may be a copyright issue lurking in the woodwork and, possibly, an unresolved liability question. The proper vehicles for non-transaction papers, reviews, tutorial and historic papers are the magazines. We now have sixteen being published and the Board is looking to see more in a number of areas. Not only that, magazines bring in advertising revenue and are also included in the All-Transactions Package.

Dr. Chester L. Smith
Division IV Representative
The MITRE Corporation
Bedford, MA 01730
(617) 271-7086

EMP NOTE SERIES

The following EMP-related notes have been published and distributed recently:

IN 459 "New Techniques for the Analysis of Multiconductor Transmission Lines," A.H. Paxton and R.L. Gardner, Mission Research Corporation, 1720 Randolph Road S.E., Albuquerque, NM 87106, October 1984.

MN 32 "Monitor for Integrity of Seams in a Shield Enclosure," Carl E. Baum, Air Force Weapons Laboratory, April 1987.

MN 33 "Effective Rise Time Resulting From a Convolution of Waveforms With Exponential and Gaussian Rise Characteristics," D.V. Giri, Pro-Tech, 125 University Avenue, Berkeley, CA 94710, May 1987.

SSN 299 "Early Time Performance at Large Distances of Periodic Arrays of Flat-Plate Conical Wave Launchers," D.V. Giri, Pro-Tech, 125 University Ave., Berkeley, CA 94710, and Carl E. Baum, Air Force Weapons Laboratory, April 1987.

SSN 300 "Use of Modified Pole Series for Characterizing the Surface Response of Scatterers," Carl E. Baum, Air Force Weapons Laboratory, December 1986.

SSN 301 "Review of Characteristic Impedance of Two Conductor Transmission Lines," N. Ari, SSC Research Center, Baden, Switzerland, and D.V. Giri, Pro-Tech, 125 University Avenue, Berkeley, CA 94710, May 1987.

SDAN 30 "Protection of Equipment and Electronic Systems Against Electromagnetic Interference, Especially NEMP," Diethard Hansen, BBC Brown Boveri Ltd., 5401 Baden, Switzerland, February 1987.

Copies of these notes may be obtained directly from the author, from the Defense Documentation Center, Cameron Station, Alexandria, VA 22134 or from the note series editor, Dr. Carl Baum, Air Force Weapons Laboratory (EL), Kirtland AFB, NM 87117-6008. Non-U.S. citizens desiring the most recently published notes should request copies directly from the authors or through their embassies. In addition, these notes are available at many universities and companies doing research in EMP and electromagnetic theory. The EMP note series actively solicits contributed papers in this area for publication. For such contributions, contact Dr. Baum.

THE FOURTH ANNUAL REVIEW OF PROGRESS IN APPLIED COMPUTATIONAL ELECTROMAGNETICS

The Fourth Annual Review is sponsored by the Applied Computational Electromagnetics Society (ACES) and will be held at the Navy Postgraduate School in Monterey, CA on March 22-24, 1988. The Review provides a forum for information exchange among practitioners of applied computational electromagnetics. Contributions by both users and developers of electromagnetic computer modeling codes are solicited, addressing topics pertaining to experience gained in practical applications. Research and development issues are of secondary interest.

The Review will highlight topics related to the design, selection, performance and implementation of current and emerging electromagnetic modeling codes and techniques. Special-interest sessions featured this year are a panel discussion on software validation by code comparision, analytical methods and measurements, an EM code users panel discussion on experiences and suggestions for needed enhancements and a PC Applications Workshop and Poster Session for demonstrating codes and enhancements.

The deadline for abstracts is February 15, 1988. The deadline for registrations is March 5, 1988 and the fee is $150. Late registrations are $165. Make checks payable to The Applied Computational Electromagnetics Society.

Send Conference remittance and abstracts to:

Prof. Richard W. Adler
Code 62AB
Naval Postgraduate School
Monterey, CA 93943
(408) 646-2352 or AUTOVON 878-2352

INTER-SOCIETY ACTIVITIES

by Walt McKerchar

SAE Committee AE-4 On Electromagnetic Compatibility

At the 1987 IEEE Symposium in Atlanta, the FAA requested Committee AE-4 to review present EM susceptibility requirements in light of new EM environmental test results by the United Kingdom and France and predicted analysis by the ECAC.

The goal of the committee will be to draft an advisory circular and attendant user's manual for guidance and information on how to certify a commercial aircraft to the electromagnetic environment created by incidental emitters. Emitters of interest include radar (ground based, ship based and aircraft based), commercial radio stations, mobile communication systems and any other transmitter or emitter that could illuminate commercial aircraft either on the ground or in the air.

Committee AE-4 has established Committee AE-4R for this effort. AE-4R has decided to divide into three subcommittees. They are: 1) Data Accuracy, which will look at the exterior electromagnetic RF environment, 2) Design Approach, which will develop design guidance for airframe manufacturers for the defined electromagnetic environment and 3) Test and Analysis Methods, which will focus on validation techniques. The first meeting will take place (after this article was written) at the Douglas Aircraft Company's Long Beach (CA) facility, on December 15, 16, and 17th, 1987.

It is planned that Committee AE-4R will meet three to four times a year and the activity will be complete in two years. It is hoped that the committee will issue an Aerospace Recommended Practice (ARP) or an Aerospace Information Report (AIR) at the end of their efforts.

Information on this committee's activities and progress can be obtained from Mr. Stan Schneider (The Boeing Company) by calling him at (206) 241-4417 or by contacting the AE-4 Chairman, Duane Awerkamp (Motorola Company) at (602) 949-3138. The next national meeting of Committee AE-4 will be on April 24–28, 1988 at SAE Headquarters in Warrendale, PA. The suggested hotel is the Hyatt-Pittsburgh.

North Atlantic Treaty Organization

As reported in my last article, the NATO Air Electrical Working Party (the EMC group) will meet at the Canadia National Defence Headquarters in Ottawa in April of 1988. At this meeting, the EM environmental situations presently being discussed by the SAE, FAA, ECAC, CAA (United Kingdom) and the STCA (France) will be addressed as the subject relates to NATO aircraft operations. A formal program is presently being structured by the Professional Services Director of the IEEE EMC-S, Mr. Walter D. McKerchar ((206) 779-7069), the U.S. Delegate Charles E. Seth ((513) 255-7275) and this year's Canadian host, Mr. Joseph Ballenger ((613) 993-1905).

Chinese National EMC 87 Conference

Through an official invitation from the government of the People's Republic of China, this writer had the unique opportunity of attending this, the first conference on EMC by China. After a most formal "ribbon cutting" ceremony, the conference was off to a well-planned and organized start. As one might expect from a first in anything, there were some "bumps" along the conference path. The Conference Committee, however, was quick to smooth out those bumps and the conference, in general, went well.

The Conference Committee reported that approximately 400 were in attendance, most from mainland China, about 12 from the United States (five exhibitors), and other exhibitors (four reps. from Hong Kong, one from West Germany and three from mainland China). Most papers were in Chinese. Four presentations from the U.S.A. were in English, as was the presentation from West Germany. The symposium digest was issued in Chinese.

From this writer's experience in conducting or assisting in EMC conferences, The People's Republic of China can be proud of their first EMC conference. The Conference Committee did not express to me any plans for another. Perhaps after they assess the results of this one they will proceed with another.

POINT AND COUNTERPOINT

by Anthony G. Zimbalatti

ACCREDITATION OF EMC PERSONNEL AND LABORATORIES

Accreditation of personnel and laboratories providing engineering and testing services is felt by many persons to be a product integrity essentiality. Furthermore, some of these persons feel that the accreditation of Electromagnetic Environmental Effects Compatibility (E^3C) services is essential for assuring the integrity and operational effectiveness of aircraft, avionics and other products procured by the U.S. Naval Air Systems Command (NAVAIR). One person with this feeling is Russell Carstensen, P.E., NAVAIR E^3 Branch Head, who requested eliciting commentary on the NAVAIR accreditation process described in his article presented below.

I am unconvinced that E^2C accreditation is a major factor in achieving E^3C product integrity. If accreditation is to be potent, I believe that the accreditation process must include other conjunctive and supervisory personnel and laboratories, and perhaps a corporate officer. What do you feel about the need for and NAVAIR approach to E^3C accreditation, and its role in product integrity? We are listening.

Anthony G. Zimbalatti
Grumman Aerospace Corporation
M.S. B25/35
Bethpage, NY 11714

NAVY ACCREDITATION OF EMC PERSONNEL AND LABORATORIES

Russell V. Carstensen, P.E.
Head Electromagnetic Environmental Effects Branch
(AIR-5161)

The Approach

The Electromagnetic Environmental Effects Branch (AIR-5161) of the Product Integrity Division (AIR-516) at the Naval Air Systems Command (NAVAIR) has life cycle responsibility for aircraft, avionics, electrically initiated air-launched ordnance and ground support equipment. A portion of that responsibility includes establishment and maintenance of adequate technical resources to assure that air weapon systems can meet their mission.

Early in 1987 it was determined that an accreditation process for EMC technical support was needed. It was felt that accreditation was needed in two areas: personnel providing direct technical support and laboratories doing MIL-STD-462 acceptance testing. Accreditation of personnel to a recognized standard provides a basis for rejecting offers from contractors who do not have experienced, qualified personnel on staff. It also provides a demonstrable bench mark to which Government activities train or replace professional and technical staff. Accreditation of laboratories, both public and private, assures that acceptance testing will be accomplished to a consistent standard.

Laboratory Accreditation

The National Bureau of Standards administers the National Voluntary Laboratory Accreditation Program (NVLAP). This program has been accrediting test labs since 1976. NVLAP has been accrediting electromagnetic compatibility testing for certain FCC requirements since 1983. The accreditation process uses technical experts from the field of interest to develop critical elements around which the accreditation is structured. The accreditation process involves on-site visitation by the accreditation team. The team observes test practices, records, management structure, equipment and calibration. NVLAP-accreditated laboratories pay annual fees, go thru on-site reassessment every two years, and participate in scheduled proficiency tests to maintain accredited status. The laboratories are listed in the NVLAP directory that is distributed world-wide.

NVLAP is being used as the accreditation authority for the NAVAIR program for several reasons. The experience base is available. It's use will greatly expedite implementation of the accreditation process. Since NVLAP does not do any testing or have any product line responsibility beyond that of acting as accreditation agent, there is no

potential for conflict of interest. Thus accreditation to do MIL-STD-462 test procedures will be entirely objective.

Critical elements for MIL-STD-462 testing are being developed under the direction of the Naval Air Systems Command, with assistance from The Naval Air Development Center, Warminster, PA, The National Bureau of Standards at Boulder, CO and The Space and Naval Warfare Systems Command. Proof testing of the critical elements and the ensuing on-site visitation check lists are being accomplished with the cooperation of the Naval Electronics Support Engineering Activity, St. Inigoes, MD and the Naval Air Test Center, Patuxent River, MD.

Personnel Accreditation

Accreditation of personnel will be a four-step process based on education, work experience, peer endorsement and examination. Education requirements for engineers will include graduation from a four-year curriculum in engineering from an accredited school. For technicians, education will include graduation from a trade or vocational school course in electronic technology. Work experience for both engineers and technicians will include a term of years directly practicing in the field.

Peer endorsement is used to substantiate the credibility of a candidate. Currently it is planned that a candidate will provide endorsement from five persons (two of which are themselves accredited), with whom he or she has worked and that can attest to the validity of the candidate's work experience.

Examination will be confined to the area of EMC fundamentals. The target for the fundamentals examination is to test for knowledge in certain specific areas. The examination is expected to be confined to a single day. The examination will be open book and the candidate may bring any text or bound set of notes desired. The following areas will be covered:

- **Bonding**
- **Interface Control**
- **Intersystem Design**
- **Equipment Design**
- **Radiated Interference**
- **EMI Prediction**
- **Specifications**
- **Test Equipment**
- **Mathematics**
- **EMP**
- **Grounding**
- **Filtering**
- **Intrasystem Design**
- **Conducted Interference**
- **Filter Theory**
- **EMI Analysis**
- **Standards**
- **Test Facilities**
- **Spectrum Analysis**
- **Lightning Protection**
- **Shielding**
- **Materials**
- **Special Devices**
- **Antennas**
- **Terminology**
- **ESD**
- **EMC Test Plans**
- **Safety**
- **Field Theory**

It is expected that commercial training organizations will provide refresher courses in EMC fundamentals to assist candidates in passing the examination.

(For more information about Mr. Carstensen, see EMC PERSONALITY PROFILE.)

A REPORT ON THE 7TH INTERNATIONAL ZURICH SYMPOSIUM HELD IN 1987

The 7th International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility, held on March 3–5, 1987, proved that this biennial event is becoming the most significant international meeting in EMC science and industry. Its growth demonstrates the worldwide increasing interest in EMC (930 participants from 28 countries) and the expanding EMC market (64 exhibitors this year, compared to 43 in 1985).

As in 1985, the symposium was held under the auspices of Mr. R. Trachsel, Director-General of the Swiss PTT and was sponsored by the Swiss Electrotechnical Association (SEV/ASE). A number of international and national professional organizations cooperated, including EUREL and IEEE. Organization of the conference was with the Institute for Communication Technology of the Swiss Federal Institute of Technology, Zurich (ETH-Z). President of the Symposium was Dr. P. Leuthold (Zurich), Chairman Dr. T. Dvorak (Zurich) and Program Chairman Dr. R. M. Showers (USA).

The ample variety of the technical program may be one of the reasons of the large success of EMC 1987. The program featured 116 papers (originating from 22 countries), three tutorial lectures, three workshops, an exhibition and two technical excursions. A welcome cocktail party, dinner, authors' lunch and a ladies' program offered further opportunities for professional and personal contacts.

The following outstanding papers received certificates of honor and monetary awards totaling 5000 Swiss francs: A. H. Paxton, R. L. Gardner: "Application of Transmission Line Theory to Networks with a Large Number of Component Wires;" F. Heidler: "E dot Measurement by Video-Type Recorder;" B. Daout, H. Ryser, A. Germond, P. Zweiacker: "The Correlation of Rising Slope and Speed of Approach in ESD Tests;" D. M. Parkes, P. D. Smith: "The Generation of Fast Transient Fields and the Coupling to Systems;" A. B. Tsaliovich: "Anechoic Room vs Open Area Test Site: A Case For EMC Study;" A. S. McLachlan: "Radio Frequency Heating Apparatus As a Valuable Tool of Industry and a Potential Source of Radio Interference;" F. D. Martzloff, P. F. Wilson: "Fast-Transient Tests—Trivial or Terminal Pursuit?".

The 8th International Zurich Symposium and Technical Exhibition on EMC is planned for March 1989. The call for papers was mailed in December 1987. For further information and to order the 658-page conference proceedings *Electromagnetic Compatibility 1987* (100 Swiss francs including mailing) contact:

EMC Symposium
ETH Zentrum-IKT
8092 Zurich, Switzerland
Telephone: (+ 441) 256-2790

PCs FOR EMC

by Edmund K. Miller

By the time this column appears, several months will have elapsed but right now the Blacksburg Meeting is still a vivid memory. There was a near-record attendance of 800+, and a record number of parallel sessions (11 during part of the meeting). Needless to say, anyone who attended this very successful meeting could stay as busy as desired.

There were two organized sessions which addressed issues of specific interest to PCers and numerical modelers, Computer-Based Instruction and Design I and II. In addition there were four sessions which dealt with the general topic of numerical techniques, while there were numerous papers scattered throughout many of the other sessions that made significant use of numerical methods and modeling.

The proliferation of papers and discussion on this general topic demonstrates the growing attention being devoted to computer applications, which is good from one perspective. On the other hand, there is also a growing sense of confusion about what works, what is the state of the art, where can modeling software be obtained, etc.? One purpose of the column is to open some discussion on the general topic of software useful to electromagneticists, to make some suggestions, to pass along some comments I've already received from others, and to invite your own input.

When this column began in late 1984, a stated motivation on my part was the goal of promoting information dissemination about PC software, ranging from announcements of available programs to serving as a switchboard for software exchange. To some extent, progress towards these goals has been made but of very limited scope. Two particular concerns were voiced at Blacksburg. One, raised initially by Ed Wolf, resurrected the old problem of software distribution. Put succinctly, Ed suggested that this column, AP and IEEE could be doing more to help in this area. The other, originated by Leo Felsen, raised the problem of how to validate numerical techniques and the software which implements them. I'll discuss the latter question first, and then consider the former, as the column concludes with brief descriptions of software which is likely to interest many of our members.

Software validation is a problem with which we will always have to contend. There are three attributes that determine the value of any modeling code. In order of importance they are accuracy, efficiency, and utility. A modeling code that produces results of unacceptable accuracy clearly has little or no value to the modeler. But results of unknown accuracy are also diminished in value, limiting the use that can be made of them. It is probably fair to say that 90+% of the total effort eventually invested in applications codes deals with validation issues. But validation mostly seems to be treated mostly as a sideline in discussions which deal with computer-model development and application. One reason for this is the lack of accepted benchmark solutions and standards for evaluating accuracy.

Leo suggested the possibility of organizing a special session (or more if needed) to address this topic along the lines of a program he organized for the December 1986 meeting of the Acoustical Society of America having the title "Quality Assessment of Numerical Codes". The program consisted of two session, the first discussing codes themselves, and the second benchmarks. Another benchmark session was held at the May 1987 meeting where participants presented their solutions (in a standardized format) of two benchmark problems posed by the two co-organizers of the session.

In a post-session letter to the participants that followed up suggestions to collect the results for possible submittal to the Journal of the Acoustical Society of America as a special issue on benchmarks, a number of items were included by Leo for consideration. These were broken down into: 1) Introduction; 2) Substance; and 3) Conclusions and Recommendations. Quoting from Leo's letter, the questions raised under these categories included:

"I. Introduction--This should state the philosophy of benchmarks, pro and con:

a) Why are benchmarks useful (if they are)?

b) How should they be used?

c) What aspects of a numerical code can be checked with a benchmark?

d) What should not be expected from a benchmark?

e) What kind of solution qualifies as a benchmark?

f) How should a benchmark be presented?

g) Can one agree on a standardized form, and if so, should this lead to a recommendation that all presentations of numerical data should follow a format that facilitates comparison?

II. Substance--This concerns the detailed contents:

a) What results should be included? How many results?

b) How should the results be grouped?

c) How should the results be presented? What should be compared, and how critical should be the comparison?

d) What "checklist" should be presented as to how the code was structured and implemented? Mike Buckingham (co-organizer for one of the benchmark problems) suggested: type of code; type of computer; CPU time; step size; number of range steps; number of depth steps; number of elements; bottom type; bottom depth; starting field; radiation conditions (since these sessions had been directed towards underwater acoustics).

e) What questions should be answered concerning the limitations of the code?

III. Conclusions and Recommendations--This should sum up where we are; what this "exercise" has contributed; whether new benchmark problems should be posed, and if so, what problems should be addressed; etc."

Based on other discussions I had in Blacksburg, there seems to be widespread agreement on the potential value of conducting a similar program through auspices of URSI/AP-S at our yearly joint meeting. I should add that considerations along these same lines have also started in ACES (Applied Computational Electromagnetics Society).

It is relevant to mention another approach taken to this basic problem, in this case by researchers performing eddy-current computations for applications such as non-destructive evaluation. A series of five regional workshops (United Kingdom, Japan, France, and two in the United States) was held between March 1986 and January 1987, followed thereafter by an international workshop in Austria in August 1987. The stated goal of the workshops was " . . . to show the effectiveness of numerical techniques and associated computer codes in solving electromagnetic field problems, and to gain confidence in their predictions. . . ."

The participants were expected to compare their computed results for one or more of the given test problems plus other similar problems. Problems included transient and stead-state ac magnetic fields, close and far boundary conditions, magnetic and non-magnetic materials. All the problems selected are based either on experiments or on geometries that can be solved analytically. Besides defining the problems, suggestions were even made for candidate meshes, number of unknowns to be used, and the results to be presented. I hope to hear more from Hal Sabbagh who gave me this input about the outcome of the workshops.

If you have any comments, suggestions, etc., concerning any of the above, please contact me at the Rockwell Science Center, PO Box 1085, Thousand Oaks, CA 91360, Tel. (805) 373-4297 (please note new extension).

On the issue of software distribution, Ed Wolf has also struck a responsive chord judging by the comments I heard from others at the Blacksburg meeting. Obtaining information about numerical software of potential interest more often than not seems to be a hit-or-miss proposition. While not all software relevant to one's needs would prove to be useful, an essential first step in any case is finding out that something exists. A logical next step is obtaining a description, possibly even a review, of a potentially useful code, and finally acquiring a copy, perferably in magnetic media and in a form compatible with your own computer.

A reasonable starting point then would seem to be a periodic cataloging of developed software. Perhaps this column, or a separate feature in the Newsletter if the volume justified it, could do this. But that is by far the easiest of the problems involved, as without convenient access, the best-sounding software is of little use. It might be helpful to categorize the various kinds of software in terms of accessibility. On the one hand, there is public-domain software, the kind for example that is offered through electronic mail and bulletin boards (one of these, *netlib*, will be discussed in a future column), probably the kind most freely available. In some cases, there might be a nominal charge requested on an "honor" system by the developer of "shareware", but which is typically very low. In order to take advantage of such sources however, it is generally necessary that you (or a friend) be able to access an electronic-mail system. Public-domain software usually is provided as source code.

Proprietary software on the other hand, is by definition available under more limited conditions. These can include either a monetary charge and/or a requirement that the recipient have certain other qualifications. One of the more common in the United States for example, at least where government-funded software is concerned, is that it be distributed only to government agencies or contractors. The price charged for proprietary software can range from a nominal charge to many thousands of dollars, and it is often the case that only executable code is provided.

Which category a given piece of software falls into can greatly affect how it is distributed. As a particular example, we can refer to MININEC, the original versions of which were made available for the cost of materials.

For various reasons, the most recent version, MININEC-3 is provided under more limited conditions because of US government policy. Distribution of the NEC code has also changed over time.

Any procedures being considered by AP-S for expediting software distribution must take these realities into account The possibilities might range from review by AP-S and possibly even distribution to announcements based simply on data provided by the developer/vender. While it might be argued that the latter provides free publicity for what can be an expensive product, the IEEE routinely review books, instrumentation, etc. As a matter of fact, one activity that we should probably initiate is that of a software-review section similar to that on books that now appears in the Newsletter.

In any case, we might establish a firm policy that whatever software is announced in the AP-S Newsletter must be available to a substantial proportion of the membership under clearly stated conditions. It might also be observed that at recent AP meetings presentations have been made that could be considered "sales" pitches for software packages developed and being sold by the presenters. Such presentations may fall outside the typical meeting paper, but can still provide valuable information to the audience.

To conclude this column, brief announcements provided by the developer(s) of software that fall in the two categories discussed follow below. I expect that future columns will discuss the problem of software distribution in more detail.

The account which follows describes *Puff*, a microstrip and stripline code for IBM PCs developed by Professors Richard Compton of Cornell University, and David Rutledge of Caltech, who provided the write-up:

"There are limitations in using commercial CAD packages, particularly in teaching and research. The programs are expensive, and they usually come with copy-protection devices that make it difficult to operate them on a large number of machines. The algorithms and models are often proprietary and this makes the program hard to understand. It tends to become a black box--providing answer but not insight."

"To address these problems, we have written a new program in *Turbo Pascal*, named *Puff*, after the magic dragon in the song by the folk group Peter, Paul, and Mary. We have made *Puff* fast and easy to use. In the program the user lays out microstrip and stripline circuits on the screen with cursor keys. We have found it dramatically faster to lay out a circuit this way, instead of using the traditional circuit-description file. In addition, it is easy to catch errors, because you can see the circuit on the screen. One can analyze circuits with transmission lines, lumped elements, coupled lines, and arbitrary multi-ports. A frequency-domain or time-domain analysis can be made at any time. *Puff* can also calculate voltage-transfer functions. Artwork corrections can be included to compensate for discontinuities."

"Several aspects of *Puff* invite new design approaches. We adjust the response curves directly instead of developing analytical expressions. This is healthy, because it stresses the physics of the circuits. In a traditional microwave class, a student often spends many hours deriving a complicated formula, and is then too exhausted to make much sense of it. The time-domain plots in *Puff* are also instructive. Even the experienced microwave engineer may never have considered the impulse response of a branch-line coupler, and he will find it a good puzzle to interpret the bumps in the plot. *Puff* is also fun. We have overheard otherwise cynical students saying, 'You have to be careful; you could play all night.'"

"*Puff* is distributed free of charge. The program comes on a single diskette with a typeset, illustrated 36-page manual that includes instructions, examples, and a description of the algorithms and the models. *Puff* runs on an IBM-compatible computer with an Enhanced Graphics Adapter or a Color Graphics Adapter. An individual who would like a copy, or an instructor who would like a copy for each student in his class should write Professor David Rutledge Department of Electrical Engineering, California Institute of Technology, Pasadena, CA 91125."

M. C. Horton of MCH Associates, Thousand Oaks, CA provided the following descriptions of two modeling programs that he has developed.

"Two programs in the Microwave Component Handware (© MCH Assoc., 1987) series have been developed using Rocky Mountain BASIC 2.1 on the HP 9816 desktop computer, and can run on any HP 9000, series 200/300 machine. Each member of the MCH series is similar; electrical and physical specifications are entered, the component is synthesized, all internal dimensions are determined, then the resulting physical component is analyzed and auto-scaled response plots, or tabular data, are presented on screen or dumped to a printer or plotter. These programs are available from MCH Associates, 1466 Oberlin Avenue, Thousand Oaks, CA 91360, (805) 495-7005."

"BEADLP© first release in the MCH series, is used to design 'bead' type, coaxial lowpass filters. Chebyshev or Levy/Achieser/Zolotarev (LAZ) approximation can be used: LAZ is quasi-lowpass, with one large ripple near dc, but has the advantage of an extra parameter (determining lower equal ripple cutoff) useful in foreshortening filter length. After specifying cutoff, rejection, and ripple electrical specs, the number of

sections is calculated. Three diameters (inductive, capacitive, and coaxial bore) and dielectric properties are entered prior to calculating all internal lengths. All fringing capacities are accounted for in synthesis, and equal-ripple response is assured via optimization. Analysis of the resulting physical filter, including dissipation loss and fringing capacity, permits tabulation or auto-scaled plots of |S21|, Ang(S221), RetLoss, passband InsLoss, and GrpDelay. Mr. Horton says that the program is very easy to use, and that 15 years of experience in design of filters using the program fully verifies the model. The price of BEADLP is $499.00."

"COMBCLID©, second program available in the MCH series, enables the complete internal dimensional design of both COMBline and Capacitively Loaded Interdigital (CLID) bandpass filters. Many options are available to the designer, such as COMB or CLID, double or single terminations, lumped or distributed capacitors, tapped or parallel-coupled inputs, and symmetric or asymmetric input parameters. Electrical specifications for loss breakpoints are entered, along with desired equal ripple cutoff frequencies and ripple level. Nominal default values are calculated for all subsequent electrical and physical numerical entries. The filter is virtually auto-designed and the number of required sections is determined. Round rods or rectangular bars can be chosen, and capacitors may be placed within the resonators or in the housing/cover. The program contains a lookup table for all English and metric drills and all commonly-used fine-thread taps; reasonable, approximate values are calculated, whence the designed chooses from among five closest drills and two or three taps. Input lines, if tapped into the first resonator, can have round or rectangular center conductors. The program has been developed for extreme flexibility; yet very practical designs are achieved by one having almost no familiarity with microwave filters. After synthesis, gaps between adjacent resonators are determined so that all resonators have equal cross sections (end-most cross sections can differ from central ones), and all capacitor dimensions are determined, including fringing effects. An exact network is used for tapped input lines during synthesis. Analysis in COMBCLID allows the same plots as listed above for BEADLP; in addition, Re(Z), Im(Z), Re(Y), and Im(Y), can be plotted for use in interconnecting such filters in diplexers or multiplexers. COMBCLID has also been in practical use for design of combline filters for more than 15 years, and Mr. Horton says that the model is known to give excellent representation of the physical structure. The price of COMBCLID is $749.00.

18TH INTERNATIONAL SYMPOSIUM ON AUTOMOTIVE TECHNOLOGY AND AUTOMATION

The 18th International Symposium on Automotive Technology and Automation will be held in Florence, Italy from May 30–June 3, 1988 and will concentrate specifically on the topics of MECHATRONICS—THE USE OF ELECTRONICS FOR PRODUCT DESIGN, TESTING, ENGINEERING AND RELIABILITY. Papers will be presented on the following (and other) subjects:

- **Electromagnetic Interference (EMI) Testing**
- **Electromagnetic Compatibility (EMC) Testing**
- **Instrumentation and Sensors**
- **Information Display Systems**
- **Diagnostics (use of expert systems)**
- **Multiplexing and Serial Communications**
- **Navigation Systems**
- **Microprocessors**
- **Transmission, Suspension and Steering Controls**
- **Ergonomics and Aided Driving**
- **Reliability**
- **Fuel Controls and Control Electronics**
- **Anti-Lock Braking Systems**
- **Engine Testing**
- **Component Testing**
- **Emission Testing**
- **Noise and Vibration Testing**
- **Environmental Testing**
- **Simulation**
- **Artificial Intelligence**

Concurrent with the Symposium, a full-scale, static exhibition will be held, enabling companies to display their latest innovations in automotive technology to more than 500 delegates who attend the ISATA meetings from all over the world. Space is also available for advertising in the ISATA program book and proceedings.

For more information on registration, exhibit space or advertising, contact the ISATA Secretariat, 42 Lloyd Park Avenue, Croydon CRO 5SB, England, telephone 01-681 3069 or 01-686 1329 or Telefax 01-686 1490. The Symposium is sponsored by the Cassa Di Risparmio Di Firenze, the Thermotechnical Association of Tuscany and both the Province and the University of Florence.

EMC CERTIFICATION AND ACCREDITATION

I am pleased to introduce Russell V. Carstensen as a new Associate Editor of the IEEE EMC Newsletter. Russ will be writing a regular column on the EMC accreditation and certification program being initiated by the Navy.

Russ is a long time member of the EMC community and the Professional Society. He is currently the Branch Head for Electromagnetic Environmental Effects at the Naval Air Systems Command in Washington, DC. Persons wishing to contact him relative to the certification and accreditation program may do so at the address shown on page two of the Newsletter. Welcome aboard, Russ. We look forward to your enlightening column.

RDG

EMC CERTIFICATION AND ACCREDITATION PROGRESS REPORT

This is the first of what is planned to be a regular column on the development of EMC accreditation and certification. For this issue I will give you background on why the Naval Air Systems Command is establishing this requirement and the present status toward implementation. Future columns will point out bench marks, successes and setbacks.

The Navy is giving EMC a lot of visibility. There is high level concern that the systems and equipment currently in inventory must work right the first time; there may not be a second chance. In the face of declining budgets, more care is being given to compatible development and modernization from a battle force prospective. While this is the right trend, it severely stresses available trained reserves of technical personnel.

It has been said that it can take five or more years beyond the Bachelor's degree to develop a competant EMC engineer. Similar time is required to develop an EMC technician as well. Making money available to address a problem without allowing time to refine the requisite technical support can lead to problems; overworking those who can perform or employing lesser trained people and hoping that it will turn out OK.

To avoid these obvious pitfalls, the Naval Air Systems Command is establishing an accreditation process for EMC technical personnel and a certification process for EMC testing laboratories. The requirements for certification or accreditation will be imposed on those who offer direct EMC services. It will not apply to system manufacturers who offer an end item (i.e., a radar, an airplane or a missile). It is expected that the requirement will be in place by October of 1988, with a six-month introductory period. It will probably show in contract documents issued after April of 1989.

The personnel certification process will be based on education, work experience, peer endorsement and examination. There will be separate criteria for engineers and technicians. The longest leg in this process is the development of a suitable examination. This was tasked to the State University of New York at Buffalo. The effort is being lead by Dr. James Whalen. He, in turn, is drawing on the EMC community for examination questions and solutions. The target is to have the first draft of 200 engineering questions by January, a pilot examination by March and a completed inventory of questions and structure to be able to administer the examination beginning in October.

Laboratory accreditation is being administered by the National Bureau of Standards under the National Voluntary Laboratory Accreditation Program. NVLAP has been accrediting electromagnetic compatibility testing for certain FCC requirements since 1983. Jeffrey Horluck (NBS, Gaithersburg, MD) is leading the effort for Navy MIL-STD-462 testing. Critical elements for MIL-STD-462 testing have been identified and agreed upon by Navy users.

NVLAP is now in the process of developing laboratory inspection processes from these elements. The accreditation process involves on-site visitation by the accreditation team. The team observes test practices, records, management structure, equipment and calibration. NVLAP-accredited laboratories pay annual fees, go through on-

site reassessment every two years and participate in scheduled proficiency to maintain accredited status. They are also preparing a handbook for candidate labs to introduce the areas of interest and the inspection process. It is anticipated that Navy EMC personnel will be part of the inspection teams.

NVLAP will host a workshop in February of 1988 to introduce the process and walk through the forms. There will also be sessions on accreditation at EMC Expo 88 and, hopefully, the IEEE EMC Symposium in Seattle in August of 1988.

We are proceeding at a deliberate pace to avoid creating an artificial shortage of qualified EMC test laboratories and EMC technical personnel. We do not want to disrupt the competitive process.

(For more information about Mr. Carstensen, see EMC PERSONALITY PROFILE.)

1988 IEEE AP-S INTERNATIONAL SYMPOSIUM AND URSI RADIO SCIENCE MEETING

The 1988 International Symposium and Radio Science Meeting, sponsored jointly by the IEEE Antennas and Propagation Society and by USNC Commissions A, B, E and F of the International Union of Radio Science (URSI), will be held at the Sheraton University Inn, Syracuse University, Syracuse, NY, on June 6-10, 1988. The technical sessions for IEEE AP-S and URSI will be coordinated to provide a comprehensive and well-balanced program.

Topics to be covered by the two organizations include:

SUGGESTED AP-S TOPICS

- **Adaptive antennas**
- **Antenna measurements and metrology**
- **Antenna theory**
- **Environmental effects on waves**
- **Feeds and radiating elements**
- **Microstrip antennas**
- **Millimeter waves**
- **Numerical methods**
- **Phased arrays**
- **Propagation**
- **Reflector antennas**
- **Remote sensing**
- **Scattering and diffraction**
- **Wave-propagation theory**
- **Imaging radar**

SUGGESTED URSI TOPICS

- **Commission A (Electromagnetic Metrology):**
  EM measurements using satellites
  Field and antenna measurements
  Microwave and Millimeter wave measurements
  System identification measurements
  Time domain measurements
- **Commission B (Field and Waves):**
  Antenna theory
  EM theory
  Guided waves
  Inverse scattering
  Interface effects
  Numerical techniques
  Random/nonlinear media
  Scattering and diffraction
  Transient fields
- **Commission E (Electromagnetic Noise and Interference):**
  Characterization and modeling of noise
  Interference and its suppression
  Spectrum utilization and management
  System performance in non-Gaussian noise
- **Commission F (Remote Sensing and Wave Propagation):**
  Propagation through random media
  Radio metrology
  Remote sensing
  Tropospheric effects

Questions about the technical program may be directed to Tapan K. Sarkar, Technical Program Committee Chairman, at the address below. Further information regarding the Symposium may be obtained from A.T. Adams, General Chairman, 111 Link Hall, Syracuse University, Syracuse, N.Y. 13244-1240, telephone (315) 423-3775, Telex 131659, or Fax (315) 423-4936.

A workshop on the topic of software validation is being co-organized by Professor Leo Felsen and Dr. Edward K. Miller. For current information on the format, agenda, length and date of the workshop, contact Professor Felsen at (516) 454-5073 or Dr. Miller at (805) 373-4102 or at his mailing address listed on page two.

CHAPTER CHATTER

by Charles F.W. Anderson

PLEASE—PLEASE—PLEASE: Chapter Chairs and/or Secretaries—Use my *new* (since January) mailing address. After 01/31/88 the Postal Service (so-called) will not forward any letters sent to the former address in Florida. Most of you, thankfully, *are* using my new mailing address. This is the *third* and *final* notice!

ATLANTA

(Not a Chapter meeting report, but a very brief summary of the Chapter Chairpeople Breakfast.) Twelve of the active chapters were represented, plus two others which are in the process of getting themselves implemented. Thanks to Bob Hofmann for the input. An added note—I believe I can speak for those of us who were not able to attend the Symposium when I say a big "thank you" to Hugh Denny for distributing copies of the Symposium record to *all* of the EMC-S affiliates.

CENTRAL NEW ENGLAND

The Chapter held their first meeting on October 27. The topic was "New Measurement Instrumentation Supporting Extended Millimeter-Wave Shielding Effectivity Evaluation." Speakers were Eric Pesciotta (Unisys Corporation) (substituting for P. McCarty) and D. Genis (Tektronix). The title tells the story—the innovative spectrum analyzer and software were described and demonstrated. There were 13 attendees: 8 EMC-S members, 5 other IEEE members, plus two guests. A meeting is scheduled for November 17 at Apollo Computer's Chelmsford facility. Don Heirman (who really gets around!) was to speak about open-area test site construction, operation and maintenance. Thanks, to John Clarke (Chapter Sec./Treas.) for his conscientious reports.

DALLAS/FT. WORTH

On September 16, the Chapter held a meeting at which the speaker was Joe Butler (Chomerics-Woburn). His topic was "Designing and Using Gaskets in an EMP Environment." Eleven members and four guests were in attendance. Another meeting was held on October 13, with Don Heirman (see above) as the speaker. His topic was "What's All this Activity Concerning Open-area Test Sites for Radiated Emissions Measurements?" Fifteen attended, of whom ten were IEEE members. Thanks to Kurt Fischer for the reports.

NEW JERSEY COAST

The Chapter's May meeting was mentioned in the Summer issue. The picture below (courtesy of Seymour Krevsky, who is taking over as the Chapter's Newsletter Editor from Bob Davis) shows (left to right) Mike Sligh-Treasurer, Tony Noerpel-Vice Chairman, John Mumbauer-Chairman and Dr. Y. T. Lo, who was the speaker.

On September 15, the Chapter's meeting had as its speaker Dr. Anthony Tripp (IRT-San Diego). The topic was "Testing the Hardness of Military Electronics." Dr. Tripp covered the new 461C EMP stress tests (CS-10, CS-11 and RS-05), with emphasis on procedures and test equipment used for those damped-sinewave injection tests. On October 21, Professor Peter Claircoats (Queen Mary College-London University) spoke on "Satellite Systems and the Optical Fiber Challenge-a Europe View." He reviewed the history of both technologies and made a case for coexistence of the two. He also discussed some of the challenges regarding antennas for future satellite systems. A "well done" is due to Bob Davis for his stint as the Chapter Newsletter Editor.

SANTA CLARA VALLEY

On September 8, the Chapter held a planning meeting and social. John Howard (Lockheed M&S) was the speaker at a meeting on October 13. His paper dealt with logic component interconnection methods as an extension of PSB wiring, with particular emphasis on guidelines for obtaining acceptable EMI performance in new designs. The Chapter Chair, Jim Duckett, has issued a "Call for Speakers." If you are interested, contact Ghery Pettit (the Vice Chairman) at (408) 748-2729.

TOKYO

Our Far Eastern colleagues continue their excellent technical meeting schedule. The wide range of topics covered

and the diversity of organizations represented by the authors indicate the high level of EMC/EMI technology interest in Japan. The upcoming International Symposium should be truly outstanding. Our thanks to Professor Echigo for keeping us abreast of the Chapter's activities.

TWIN CITIES

The Chapter held their fourth meeting of the year on September 16. Eric Doyle (Amador) presented a paper entitled "A Study of the Magnetic-field Ambient in the Frequency Range of 10kHz to 30MHz." (This was the paper presented by Eric at the Atlanta Symposium). Thanks to Dan Hoolihan (Amador) for the information.

WASHINGTON/NORTHERN VIRGINIA

On September 17, Frank Rose (Chief of FCC's Technical Standards Branch) spoke on the topic "EMC in Consumer Electronics." He reviewed the emissions requirements of FCC's Parts 15 and 18, and also outlined the Commission's policy regarding susceptibility of consumer electronics. Examples of some specific products which have experienced EMC problems were given. Mr. Rose also reported on the status of an imminent FCC proposal for a comprehensive revision of Part 15. (Your Column Editor attended and found Frank's talk most interesting, particularly in view of my activities in connection with interference problems involving amateur radio stations. I've even got one of my very own, due to my HF signals affecting a neighbor's GTE 7130 telephone answering machine. Fixes still not determined as of the date of writing, but my neighbor is very cooperative!)

If another personal note might be pardoned, yours truly recently gave a talk to the Shenandoah Valley Chapter of the Quarter Century Wireless Association in Winchester, VA (of which I am a member). It was basically a rehash/update of the paper which I presented at the ICC Symposium in San Francisco in 1975, entitled "Some Pages from the Casebook of an Interference Detective (With Apologies to Sherlock Holmes)."

SEVENTH INTERNATIONAL CONFERENCE OF THE ISRAEL SOCIETY FOR QUALITY ASSURANCE

The bi-annual Seventh International Conference of The Israel Society for Quality Assurance will be held in Tel Aviv, Israel November 8–10, 1988.

Papers are invited on quality assurance issues with emphasis on the leading theme "Quality—The Key for Competitiveness," and on practical application in modern industry.

Topics include:

- **Interference Control (ESD, EMP, EMI, RFI, EMC)**
- **Reliability, Availability and Safety of Systems**
- **Reliability, Quality Assurance of Components and Assemblies**
- **Software Reliability and Quality Assurance**
- **Quality Assurance in Computerized Environments (CAD/CAM)**
- **Standardization**
- **Calibration and Metrology**
- **Integrated Logistic Support**
- **Environmental Tests: Planning Control and Simulation**
- **Senior Management and Quality Assurance**
- **Education for Quality**
- **Customer—Supplier Relationships**
- **Quality Costs**

Deadline for abstracts submission (200 words)—March 1, 1988

Program Committee decision—May 1, 1988

Deadline for full-length paper submission (up to 2000 words)—July 1, 1988

Please forward abstracts and papers to the Conference Secretariat, ORTRA Ltd., 2 Kaufman Street, P.O.B. 50432, Tel Aviv 61500, ISRAEL or telephone 03-664825, Telex 361142 or Fax 03-660952.

INTERNATIONAL SYMPOSIUM ON RADIO PROPAGATION

The 1988 International Symposium on Radio Propagation (ISRP '88) will be held in Beijing, China on April 18–21 under the co-sponsorship of the Chinese Institute of Electronics (CIE) and the International Union of Radio Science (URSI) in co-operation with the IEEE Antennas and Propagation Society (IEEE/AP-S). The symposium is organized by the CIE Radio Propagation Society (CIE/RP-S).

Topics to be covered include:

- **Electromagnetic theory**
- **Earth-space propagation**
- **Ionospheric propagation and ionospheric physics**
- **Radio sounding of the earth environment**
- **Inverse scattering and imaging**
- **Tropospheric propagation**
- **LF, VLF and ELF propagation**
- **Propagation problems in remote sensing**
- **Laser beam propagation**
- **Waves in plasmas**

Address requests for information and expressions of interest to: Professor Sha Zong (Z. Sha), China Research Institute of Radiowave Propagation, P.O. Box 138/88, Xinxiang, Henan, People's Republic of China.

EMC PERSONALITY PROFILE

by William G. Duff

RUSSELL V. CARSTENSEN, P.E.

Russ Carstensen is head of the Electromagnetic Environmental Effects Branch of the Naval Air Systems Command. His Branch is responsible for electromagnetic compatibility in aircraft, avionics, electrically initiated air-launched ordnance and ground support equipment. He is also responsible for electromagnetic compatibility in air navigation, landing and control equipment installed on board Navy ships.

He graduated from the University of Washington in 1968 with a BSEE. He graduated on a Friday. The following Monday he began his professional career in the Design Division at Puget Sound Naval Shipyard. He started as a Radar Systems Installation Design Engineer. He rotated through several developmental assignments in the Radar and Sonar design groups. He was subsequently appointed as Communication Systems Project Engineer.

He served for a 15-month period as the waterfront representative for the Design Division. He had on-site authority to modify the ships' issued design to avoid or eliminate problems and thus assure a smooth productive effort. He worked in this capacity on the post-shakedown availability of a cruiser and the regular overhaul of a SSN 637-class submarine.

His interest in EMC began when he was designated as the shipyard consultant for electromagnetic pulse, electromagnetic compatibility and electrostatic discharge. He initiated the pilot effort to institutionalize electromagnetic interference control in the ship maintenance, modernization and overhaul process as a part of the Shipboard Electromagnetic Compatibility Improvement Program (SEMCIP).

He joined Electromagnetic Technology Inc. in 1981 as General Manager of the Springfield operation unit. He was responsible for engineering and technical support provided by offices in Springfield, VA, Lexington Park, MD, Dahlgren, VA and Crystal City, VA. He supervised 40 engineers, technicians and other personnel providing technical support to various Navy shipboard EMI control projects. He was subsequently promoted to Vice President for EMC Programs.

In July of 1984, he re-entered public service with the Naval Sea Systems Command as the Technical Director of SEMCIP, where he provided EMI problem resolution to 548 active fleet aircraft carriers, surface ships and submarines. He was responsible for Fleet EMI control training, development and implementation of an Industrial EMC program in all shipyards, management of a waterfront corrective action program to support deploying ships and the SEMCIP engineering effort to characterize and correct tough EMI problems plaguing the fleet.

In July of 1986, he joined the Naval Air Systems Command in his present position. One of the goals of his Branch is to establish a certification and accreditation program for EMC engineers, technicians and laboratories providing support to NAVAIR. He feels that this is necessary to enhance quality and assure product integrity. He would like to see the NAVAIR approach adopted Navy-wide.

Russ is a Senior Member of the IEEE and a member of the EMC Society, where he is currently serving as Chairman of TC-1, EMC Management. He is also a member of the Society of Naval Architects and Marine Engineers and the American Society of Naval Engineers. He has written 18 articles and two text books on various aspects of shipbuilding and EMC. He is a professional engineer registered in the states of Washington and Virginia.

BOOK REVIEWS

by Jim Hill, The EMXX Corp.

I have just returned to Hudson, Ohio after a 25-year absence. When I left I was active in the IRE, serving as Vice-Chairman of the Cleveland Section. One of the first things I did in Washington was to organize a chapter of the Professional Group on Radio Frequency Interference, now the EMC Society. Now I want to see if I can organize an active Chapter of the EMC Society in the Cleveland Section or possibly as a joint operation with the Akron Section. Hudson is within the Akron Section and within commuting distance from Cleveland. I would like to hear from EMC Society members and anyone else interested in participating in an EMC Society Chapter in this area.

Our book review this time is of *High Power Switching* by Vitkovitsky, recently released by Van Nostrand Reinhold in August, 1987. Those dealing with EMP will find the subject covered in detail. We are indebted to Dick Schulz for this review. Dick has recently retired from Xerox and is now operating as an independent consultant. He has also announced his coming retirement from the editorship of the *EMC Transactions*. The February 1988 issue will be his last. We want to express our appreciation to Dick for his 19 years of service as *Transactions* Editor. The *Transactions* has been published continuously since 1958, a period of 30 years, and Dick Schulz has served as Editor for 19 of those 30 years, a period of outstanding service to the profession.

HIGH POWER SWITCHING

by Ihor Vitkovitsky
Van Nostrand Reinhold Company
135 West 50th Street
New York, NY 10020
304 pages, Cloth; $54.95

High Power Switching is of interest to those concerned with either of two areas; (1) the generation of very high power electromagnetic pulses (EMP), or (2) sophisticated electric-power distribution. For the pulsed-power area, the book deals with switching technology used in applications where pulser output exceeds 10^9 watts. In most cases, such output is a monopulse with current and voltage amplitudes ranging from kiloamperes and kilovolts to megamperes and megavolts, respectively.

The book is a source of information and a reference on existing types of high-power switches and on new switching concepts currenting being developed, as well as those that are in the speculative stages. One group of chapters deals with *closing* switches and another group with *opening* switches. These are sandwiched between two opening chapters providing a tutorial discussion and a closing appendix providing peripheral information related to electromagnetic noise problems and the safety aspects of switch operation.

The basic subject is covered by separate chapters devoted to each of the following types of switching:

- **Gas spark-gap**
- **Vacuum and low-pressure discharge**
- **Solid dielectric breakdown**
- **Liquid dielectric**
- **Opening arc**
- **Fuse**
- **Opening plasma**
- **Solid-state opening**

Such information should be most helpful to members of the EMP community; the book is recommended for them. The appendix covering shielding and safety procedures should also be of more widespread interest to the EMC community, although the discussion is limited in consequence of its peripheral nature with respect to the main thrust of the book.

Reviewed by
Richard B. Schulz

8TH INTERNATIONAL ZURICH SYMPOSIUM AND TECHNICAL EXHIBITION ON EMC

The Symposium and technical exhibition will be held March 6–9, 1989 at the Federal Institute of Technology in Zurich, Switzerland. It is sponsored by the Swiss Electrotechnical Association and organized by the Institute for Communication Technology of the FIT. President of the Symposium is Dr. P. Leuthold, Symposium Chairman is Dr. T. Dvorak and the Program Committee is chaired by Dr. R. M. Showers. The conference has the cooperation of URSI and other international and national bodies. The last conference in 1987 registered 932 participants from 28 countries and 64 exhibiting companies.

Topics to be covered include:

- **Social and economical impact of EMC**
- **Electromagnetic pollution, control and enforcement**
- **Spectrum economy and management**
- **National and international cooperation in EMC**
- **Immunity of electronic systems**
- **Electromagnetic compatibility of communications, electric power and automotion**
- **EMC hazards to ordnance and vital safety systems**
- **Compatibility of medical electronics**
- **Biological effects of RF energy**
- **Interference propagation, source-to-receptor coupling**
- **Nuclear and Lightning Electromagnetic Pulse (NEMP/LEMP) impact**
- **Regulation, limits, standards and specifications**
- **Measuring methods and instrumentation, production testing**
- **Computers in EMC, prediction and analysis**
- **Design of compatible equipment, suppression methods and devices**
- **Special techniques: spread-spectrum, fiber optics**
- **EMC education**

English abstracts and summaries of up to 5 pages in 11 copies must be received not later than by March 14, 1988 by the Technical Program Committee, EMC 1989, ETH Zentrum-IKT, 8092 Zurich, Switzerland. For anonymity of reviewing, list addresses, affiliations, telephone and Telex numbers of all authors on a separate sheet. Summaries should clearly describe work done (including results and conclusions) and should preferably be accompanied by graphs and key figures. Only papers not published or submitted elsewhere will be considered. Authors will be notified by June 24, 1988. Author's kits will be enclosed. Photo-ready manuscripts will be due by October 31, 1988. The official language of the Symposium is English. Limited funds for authors of less than 35 years of age, as well as for authors unable to fully cover the expenses of their attendance, will be provided by the URSI and the Symposium. Applications should be enclosed with the submission.

The conference is traditionally accompanied by a technical exhibition. Exhibition space, constructed stands, showcases, mural display area, advertisement space in the Proceedings and distribution of information materials to all participants may be booked. For further information contact Dr. T. Dvorak, ETH Zentrum-IKT, 8092 Zurich, Switzerland or telephone (+ 411) 256-2790. In the United States contact Dr. R. M. Showers, University of Pennsylvania, The Moore School of Electrical Engineering D2, Philadelphia, PA 19104 or telephone (215) 898-8123.

CALENDAR FOR SUBMISSION OF ARTICLES AND MEETING NOTICES

In addition to our Associate Editors who contribute articles and columns on a regular basis, anyone is welcome to contribute suitable material to the EMC-S Newsletter. Because the Newsletter is a quarterly publication, we need to receive material by the proper date in order to fit it into our publication schedule. For the convenience of all potential contributors, we are publishing part of our publication schedule for the next four issues below:

ISSUE	SPRING 1988	SUMMER 1988	FALL 1988	WINTER 1989
SUBMISSION DEADLINE	2/15	5/16	8/15	11/15
PASTEUP DEADLINE	3/15	6/15	9/15	12/15
MAILING DATE	4/6	7/7	10/5	1/5/89

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1988 - Seattle, WA, Aug 2-4	D.A. Weber
1989 - Denver, CO, May 23-25	J.W. Adams
1989 - Nagoya, Japan, Sept 8-10	Y. Akao
1990 - Wash, DC, Aug 21-23	T.W. Doepper
1991 - Cherry Hill, NJ, Aug 13-15	D.N. Heirman
1992 - Los Angeles, CA, Sept ?-?	F. J. Nichols

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Please send all corrections and changes to H. R. Hofmann. Nov 26, 1987

ADDRESSES OF 1988 EMC-S BOD, STANDING COMMITTEE, AND SYMPOSIA CHAIRPERSONS

Adams, John W.
Nat Bur Stds-MC 723.04
325 Broadway
Boulder, CO 80303
303-497-3328 (Work)

Professor Yasuo Akao
Professor of Electronics
AICHI Inst of Technology
1247 Yachigusa, Yakusa-cho
Toyota 470-03, Japan
0565-48-8121

Anderson, Charles F. W.
2302 Keener Road
Hagerstown, MD 21740
301-773-3061

Berry, Leslie A.
ITS
325 Broadway
Boulder, CO 80302
303-497-5474 (Work)

Bronaugh, Edwin L.
Electro-Metrics
100 Church Street
Amsterdam, NY 12010
518-399-6142 (Home)
518-843-2600 (Work)
518-843-2812 (FAX)
710-446-4798 (TELEX)

Brook, R. H.
9 Ruey Place
Plainview, NY 11803
516-595-3136 (Work)
516-938-6991 (Home)

Capraro, Gerard T.
1027 Mohawk Street
Utica, NY 13501
315-732-1955 (Work)
315-733-3286 (Home)

Carlson, B. Leonard
Boeing Aerospace Co.
PO Box 3999, M.S. 8K-25
Seattle, WA 98124
206-773-6297 (Work)

Carstensen, Russell V.
Naval Air Systems Command
AIR 5161 CG1 Room 940
Washington, DC 20361
202-692-8600 (Work)
703-280-1773 (Home)

Clark, Donald E.
4086 Shady Circle NW
Lilburn, GA 30247
404-894-4315 (Work)
404-921-2906 (Home)

Cory, William E. (Gene)
Southwest Research Inst.
P.O. Drawer 28510
San Antonio, TX 78284
512-522-2711 (Work)

Dash, Glen R.
Dash, Straus & Goodhue
593 Massachusetts Ave
Boxborough, MA 01719
617-263-2662 (Work)

Denny, Hugh W.
2528 LaVista Road
Decatur, GA 30033
404-894-3522 (Work)

Doeppner, Tom W.
8323 Orange Court
Alexandria, VA 22309
703-780-3983 (Home)
703-664-3763 (Work)

Duff, Dr. William G.
Atlantic Research Corp.
5390 Cherokee Avenue
Alexandria, VA 22312
703-642-4049 (Work)
703-250-2409 (Home)

Everett, W. W., Jr.
S.C.E.E.E.
Box 68
Port Royal Square
Port Royal, VA 22535
804-742-5611

Fisher, Joe J.
6403 Winnepeg Road
Bethesda, MD 20817
301-530-0954 (Home)
703-486-5697 (Work)

Ford, Richard T.
6 Westcot Place
Falmouth, VA 22405
202-767-3440 (Work)
703-371-4008 (Home)

Goldblum, R. D.
R&B Enterprises
20 Clipper Road
West Conshohocken, PA 19428
215-825-1960

Haislmaier, Robert J.
3021 Gumwood Drive
Hyattsville, MD 20783
301-864-9395 (Home)
202-695-7503 (Work)

Hanttula, David M.
Ridge Computers
2451 Mission College Blvd.
Santa Clara, CA 95054
408-986-8500 x324 (Work)

Harmuth, Dr. Henning F.
Catholic Univ. of America
Electrical Engineering Dept
Washington, D.C. 20064
202-635-5193

Haskins, L. Gilda
Haskins Associates
2525 Sharon Court
Bensalem, PA 19020
215-752-4749 (H&W)

Heirman, Donald N.
AT&T-Info Sys-Bldg 41-112
Crawfords Corner Rd.
Holmdel, NJ 07733
201-834-1801 (Work)
201-741-7723 (Home)
201-834-1830 (FAX)

Hill, James S.
The EMXX Corp
263 North Main Street
Hudson, OH 44236
216-650-6230 (Work/Home)

Hofmann, H. R. (Bob)
AT&T-Bell Laboratories
Room 2B-220
Naperville Road
Naperville, IL 60566
312-979-3627 (Work)
312-355-2440 (Home)
312-979-2922 (FAX)

Hoolihan, Dan
Amador Corp
Wild Mountain Road
Taylors Falls, MN 55084-0270
612-257-2074 (Home)
612-583-3322 (Work)

Iki, Tei
Sony Corp.
16450 W. Bernardo Drive
San Diego, CA 92127
619-487-8500 x332

Kanda, Motohisa
Electromagnetic Fields Div
National Bureau of Standards
Boulder, CO 80303
303-497-5320 (Work)

Knowles, Eugene D.
16954 Southeast 149th St
Renton, WA 98056
206-271-3396 (Home)

Krevsky, Seymour
69 Judith Rd
Little Silver, NJ 07739
201-741-4918 (Home)

Lambdin, William S.
Electro-Metrics
100 Church Street
Amsterdam, NY 12010
518-843-2600 (Work)

Lauber, Wilfred
Communications Research Ctr
P. O. Box 11490, Station H
Shirley Bay, Ottawa
Ontario, Canada K2H8S2
613-998-2377 (Work)

McKerchar, Walter D.
Electromagnetic Eng. Inc
P.O. Box 1888
Poulsbo, WA 98370-0269
206-779-7069 (H&W)
206-697-1259 (FAX)

Mertel, Herbert K.
EMACO, Inc.
P.O. Box 22066
San Diego, CA 92122
619-578-1480 (Work)
619-453-2480 (Home)

Nichols, Fred / Janet
Lectromagnetics, Inc.
6056 West Jefferson Blvd.
Los Angeles, CA 90016
213-870-9383

Ott, H. W.
Henry Ott Consultants
48 Baker Road
Livingston, NJ 07039
201-992-1793 (Work)
201-533-1828 (Home)
201-533-1442 (Fax)

Parker, J. C. Jr
Apollo Computer Inc
16 Elizabeth Drive
CHC 02RD
Chelmsford, MA 01824
617-256-6600 ext 3339

Parker, William H.
Genisco Technology Corp.
18435 Susana Road
Rancho Dominguez, CA 90221
213-537-4750 x320

Rothhammer, Gerald P.
EATON Corp
5340 Alla Road
Los Angeles, CA 90066
213-822-3061 (Work)

Sato, Risaburo
Tohoku Gakuin Univ
1-13-1 Chuo
Tagajo City,
Miyagi Pref 985 Japan
02236-8-1115

Schulz, Richard B.
2030 Cologne Drive
Carrollton, TX 75007
214-492-0137 (Home)

Skomal, E. N.
1831 Valle Vista
Redlands, CA 92373
714-792-1808 (Home)

Smith, Albert A. Jr
IBM 69 RA/170
Neighborhood Road
Kingston, NY 12401
914-385-0013 (Work)
914-679-9234 (Home)

Smith, Dr. Chester L.
The Mitre Corp, MS-K212
Burlington Road
Bedford, MA 01730
617-271-7086 (Work)
617-275-0598 (Home)
617-271-2271 (FAX)

Talbott, J.
Spectrum Engineering
Gp Supv
MS 502-112
Jet Propulsion Labs
4800 Oak Grove Drive
Pasadena, CA 91109
818-577-6820

Thomas, Leonard W., Sr.
1604 Buchanan St., NE
Washington, DC 20017
202-526-2545

Tyson, Charlotte R.
1231 Martin Road
Longmont, CO 80501
303-924-6041 (Work)

Vance, Ed
Route 3, Box 268A
Fort Worth, TX 76140
817-478-5653 (Home)

Wall, L. Art, Jr.
10651 Breezewood Drive
Woodstock, Md 21163
301-725-1585 (Work)
301-465-3119 (Home)

Weber, Don A.
Hamilton Eng Inc.
2108 S. W. 152nd
Seattle, WA 98166
206-244-0952 (Work)
206-243-0598 (FAX)

H. R. Zajac
7455 SW Hillcrest Place
Beaverton, OR 97005
503-627-4759 (Work)
503-646-4054 (Home)

H. R. Hofmann
Dec 1, 1987

EMC SOCIETY CHAPTER CHAIRPERSONS

ALBUQUERQUE Joint with AP, MTT
Term: Jan 1, 87-Dec 31, 87
Prof Shyam Gurbaxani
University of New Mexico
Dept of Electrical and Computer Eng
University and Central
Albuquerque, NM 87131
505-277-5637 (Work)
ANGEL: Gene Cory

ATLANTA
Term: July 1, 87-June 30, 88
David Millard
Electronics Research Building
Georgia Tech
Atlanta, GA 30332
404-894-3535 (Work)
ANGEL: Don Clark

BALTIMORE/ANNAPOLIS
Term: July 1, 87-June 30, 88
Vernon I. McConnell
8 Caroie Court
Severna Park, MD 21146
301-647-0843 (Home)
301-859-6631 (Work)
ANGEL: Gilda Haskins

BOULDER
Term: Jan 1, 87-Dec 31, 87
C. Bruce Sparks
Hewlett Packard-Bldg B
2945 Center Green Court South
Boulder, CO 80301
303-938-3039 (Work)
ANGEL: Charlotte Tyson

CENT. NEW ENGLAND (BOSTON)
Term: July 1, 87-June 30, 88
Dr. Arthur Murphy
189 B Street
Needham, MA 02194
617-449-2000, x3641 (Work)
ANGEL: ????

CENT. TEXAS (SAN ANTONIO-AUSTIN)
Term: July 1, 87-June 30, 88
Steve Williams
Southwest Research Institute
P. O. Drawer 28510
San Antonio, TX 78284
512-835-4684
ANGEL: Gene Cory

CHICAGO
Term: Jan 1, 87-Dec 31, 87
Donald L. Sweeney
D. L. S. Electronic Systems
10350 Dearlove Road
Glenview, IL 60025
312-699-9060 (Work)
312-724-3044 (Home)
ANGEL: Bob Hofmann

CLEVELAND-UNOFFICIAL
Term: Jan 1, 87-Dec 31, 87
James S. Hill
The EMXX Corp
263 North Main Street
Hudson, OH 44236
216-650-6230 (Work)
ANGEL: Bob Hofmann

DALLAS-FT WORTH
Term: Jan 1, 87-Dec 31, 87
Kurt Fischer M/S TH-59
LTV Missles and Electronics Group
P. O. Box 650003 M
Dallas, TX 75265-0003
(214) 266-9554 (Work)
ANGEL: Gene Cory

DAYTON
Term: Jan 1, 87-Dec 31, 87
Arturo Serrano
6160 Honeygate Drive
Dayton, OH 45424
(513) 257-3016 (Work)
ANGEL: Dick Ford

DENVER/LITTLETON
Term: Jan 1, 87-Dec 31, 87
Melvin K. Anderson
Martin Marietta Co
P.O. Box 179 M/S L1816
Denver, CO 80201
303-971-6468
ANGEL: Charlotte Tyson

DETROIT-UNOFFICIAL
Term: Jan 1, 8 -Dec 31, 8
Rozalina Ebrahimian-Steven Berger
General Motors EMC
General Motors Proving Ground
Milford, MI 48042-2001
313-685-6186
ANGEL: Bob Hofmann

ISRAEL - TEL AVIV - Delinquent
Term: Jan 1, 86-Dec 30, 86
Oren M. Hartay
20 Shazar Street
Haifa, Israel 34862
Phone unknown
ANGEL: Len Carlson

JAPAN
Term: Jan 1, 87-Dec 31, 87
Toshihiko Namekawa
Setsunan University
17-8 Ikedanakamachi
Neyagawa 572, Japan
(0720) 26-5101
ANGEL: Dr. Sato

LONG ISLAND
Term: July 1, 87-June 30, 88
Saul Bernstein
Dayton T. Brown Inc
Church Street
Bohemia, New York 11716
516-589-6300 (Work)
ANGEL: Henry Ott

LOS ANGELES
Term: Sept 1, 87-Aug 31, 88
Janet Nichols
LectroMagnetics Inc
6056 West Jefferson Blvd
Los Angeles 90016
213-870-9383 (Work)
ANGEL: Herb Mertel

MELBOURNE-UNOFFICIAL
Term: Jan 1, 87-Dec 31, 87
David C. & Carol Engle
2000 NASA Blvd.
Melbourne, FL 32904
305-951-5042 (Work)
305-NNN-XXXX (Home)
ANGEL: Bob Hofmann

MINNESOTA-TWIN CITIES
Term: Jan 1, 87-Dec 31, 87
Dan Hoolihan
AMADOR Corp
Wild Mountain Road
Taylors Falls, MN 55084-0270
612-257-2074 (Home)
612-583-3322 (Work)
ANGEL: Bob Hofmann

MOHAWK VALLEY
Term: Jan 1, 87-Dec 31, 87
Daniel J. Kenneally
7976 Brookside Drive
Rome, N.Y. 13440
315-330-2563 (Work)
315-336-8699 (Home)
ANGEL: Ed Bronaugh

NEW JERSEY COAST - Joint AP, VT
Term: July 1, 87-June 30, 88
Tony Noerpel
Bell Communications Research
P. O. Box 7020 Room 3X-341
Red Bank, New Jersey 07701
201-542-1400 (Work)
215-364-2680 (Home)
ANGEL: Don Heirman

ORANGE COUNTY
Term: Oct 1, 86-Sept 30, 87
Larry Caney
EATON Corp
5340 Alla Rd
Los Angeles, CA 90066
213-827-0472
ANGEL: Herb Mertel

ORLANDO-UNOFFICIAL
Term: Jan 1, 87-Dec 31, 87
Brian J. Vancata
EATON CORP
P. O. Box 560778
Orlando, FL 32856
305-857-6226 (Work)
ANGEL: Bob Hofmann

OTTAWA
Term: July 1, 87-June 30, 88
Dr. George Costache
Electrical Engineering
University Of Ottawa
770 King Edward Avenue
Ottawa, Ontario
Canada K1N6N5
613-564-7066 (Work)
ANGEL: Bob Hofmann

PARIS, FRANCE-UNOFFICIAL
Term: Jan 1, 87-Dec 31, 87
Prof. Fardy Mayer
President, L.E.A.D.
92-98 Avenue Victor Hugo
92115 Clichy, France
(1) 47 39 24 44
ANGEL: Len Carlson

PHILADELPHIA
Term: July 1, 87-June 30, 88
Joseph Calabria
ORI Capitals Inc.
444 Jacksonville Rd.
Warminster, PA 18974
215-443-9905 (W)
ANGEL: Gilda Haskins

PHOENIX-Joint MTT, AP, ED
Term: July 1, 87-June 30, 88
Robert Reuss
Motorola MS M-350
2200 West Broadway Road
Mesa, AZ 85202
602-898-5390
ANGEL: Gene Cory

SAN DIEGO
Term: Jan 1, 87-Dec 31, 87
Herb Mertel
EMACO Inc
P. O Box 22066
San Diego, CA 92122
619-453-2480 (Work)
619-578-1480 (Home)
ANGEL: Herb Mertel

SANTA CLARA VALLEY
Term: July 1, 87-June 30, 88
James Duckett
XTRA Business Systems
2350 Qume Drive
San Jose, CA 95131
408-945-8950 (Work)
ANGEL: Henry Ott

SEATTLE
Term: Jun 1, 86-May 31, 87
Gerald D. Johnson
John Fluke Mfg Co, Inc
P. O. Box C-9090 MS 143-F
Everett, WA 98206
206-356-5171 (Work)
ANGEL: Len Carlson

TUCSON-Joint MTT, AP
Term: Jan 1, 88-Dec 31, 88
Howard Kohlbacher
Bell Technical Operations
P.O. Box 850
Sierra Vista, AZ 85636-0850
602-538-4881 (Work)
602-296-5578 (Home)
ANGEL: Gene Cory

WASHINGTON D. C.
Term: July 1, 87-June 30, 88
Julius P. Knapp
4718 Wigglesworth Court
Ellicott City, MD 21043
301-461-1671 (Home)
202-653-8108 (Work)
ANGEL: Bob Haislmaier

Nov 26, 1987

CALENDAR
1988

April 12–13	Engineering Specialty Certification Conference Atlanta, GA Contact: Mr. Arthur Schwartz National Society of Professional Engineers Telephone: (703) 684-2845 or NSPE Legal Department 1420 King Street Alexandria, VA 22314
April 12–14	ASME/IEEE Joint Railroad Conference William Penn Hotel Pittsburgh, PA Contact: Dr. Tristan Kneschke Meeting Chairman, VTS Land Transportation Division Traction Electrification Systems Department Parsons Brinckerhoff/De Leuw Cather 1701 North Market Street Dallas, TX 75202 Telephone: (214) 573-8944
April 18–21	1988 International Symposium on Radio Propagation (ISRP '88) Beijing, China Contact: Professor Sha Zong (Z. Sha) China Research Institute of Radiowave Propagation P.O. Box 138/88 Xinxiang, Henan, People's Republic of China
April 19–21	International Conference on Lightning and Static Electricity Sheraton Century Hotel Oklahoma City, OK Contact: Donald R. MacGorman Conference Chairman, 1988 ICLSE NOAA/ERL/National Severe Storms Laboratory 1313 Halley Circle Norman, OK 73069 Telephone: (405) 366-0405 or G.A.M. Odam European Coordinator, 1988 ICLSE Royal Aircraft Establishment Farnborough, Hants GU14 6TD United Kingdom Telephone: 252 24461, ext. 2662

SYMPOSIUM ON CORROSION AND EMI SHIELDING IN AEROSPACE EQUIPMENT (CORROSION/89)

This symposium, sponsored by the T-9E Committee of the National Association of Corrosion Engineers, is said to be the first totally devoted to this topic. Corrosion/89 is scheduled to be held in New Orleans, LA on April 17-21, 1989.

Papers are sought in the area of EMI shielding design for aerospace electronics (avionics and shipboard electronics) for use in military and severe commercial environments. Specific topics include: case histories of successful and failed designs (lessons learned), studies of shielding degradation in different environments, test methods for screening shielding designs (electrical and environmental), EMI and environmental sealing of aircraft and shelters, new materials for shielding and recommendations concerning EMI gasketing materials/designs, conductive finishes for EMI enclosures and flanges and mechanical design for flanges.

Titles of papers must be received for review by May 2, 1988, abstracts must be received by July 15, 1988 and drafts of papers by September 16, 1988.

Titles should be sent to Eric Carlson, Senior Research Associate, Chomerics, Inc., 77 Dragon Court, Woburn, MA 01888 or Jack Guttenplan, M/S GA25, Rockwell International, Electronic Operations, 3370 Miraloma, Anaheim, CA 92803.

EMCABS

by William H. McGinnis

In this issue we are publishing 12 abstracts. These are abstracts on various EMC topics. We plan to continue publishing abstracts of papers from previous EMC Symposia and from other conferences. The EMCABS committee is composed of the members listed below. By way of introduction to the community, they are listed with their company affiliations:

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EMCABS: 01-11-87

Radiated EMI Measurement Reproducibility

W. Scott Bennett
Hewlett-Packard Company,
3404 East Harmony Road, Fort Collins, CO 80525
1987 IEEE International Symposium on Electromagnetic Compatibility
IEEE Catalog Number 87CH2487-7, August 25-27, 1987, pp. 90-93.

ABSTRACT: In an effort to improve radiated EMI measurement reproducibility, several previously unrecognized problems were found: (1) response differences in supposedly identical antennas, (2) multiple reflections on antenna cables, (3) reflections from otherwise inactive power outlet cords close to the unit under test and (4) interpretational differences in graphical antenna factor data.
INDEX TERMS: Radiated EMI, antennas, antenna factor

EMCABS: 02-11-87

Overview of the Proposal to Revise Part 15

Leslie A. (Art) Wall, Jr.
Federal Communications Commission, Office of Engineering and Technology, Columbia, MD 21046
1987 IEEE International Symposium on Electromagnetic Compatibility
IEEE Catalog Number 87CH2487-7, August 25-27, 1987, pp. 323-328
ABSTRACT: Part 15 of the FCC Rules sets forth requirements for radio frequency devices that operate without an individual license. The intent and primary purpose of these rules is to foster the operation of as many devices as possible, while at the same time controlling the EMI potential to radio communications. Nearly 50 years in the making, Part 15 is a mosaic of individual rules that were changed and expanded many times since the adoption of the original 1938 low power rule. To be sure, each rule change over the years was necessitated to either permit the operation of a new device that would otherwise require licensing or to control EMI. In an effort to update and improve its usefulness to the public, the FCC this summer is expected to consider a complete revision of Part 15. The proposal is intended to simplify Part 15 and, wherever possible, to reduce unnecessary regulatory burdens. This paper covers the historical background of Part 15, an overview and philosophy behind the proposal and the associated measurement procedures.
INDEX TERMS: FCC test procedures, Part 15, FCC Rules

EMCABS: 03-11-87

Characterization of Electrostatic Discharge Generated by an Occupant of an Automobile

William Sperber and Richard P. Blink (retired)
General Motors Corporation, EMC Department,
General Motors Proving Ground, Milford, MI 48042
1987 IEEE International Symposium on Electromagnetic Compatibility
IEEE Catalog Number 87CH2487-7, August 25-27, 1987, pp. 360-363

ABSTRACT: This paper discusses the development of a human model appropriate for Electrostatic Discharge (ESD) testing of the automotive electrical system. Human model parameters along with equipment requirements and test methodology are presented.
INDEX TERMS: Electrostatic discharge, automobile, (ESD), human model

EMCABS: 04-11-87

Studies Relating to the Design of Open Field EMI Test Sites

Joseph DeMarinis
Digital Equipment Corporation, 146 Main Street, Maynard, MA 01754
1987 IEEE International Symposium on Electromagnetic Compatibility
IEEE Catalog Number 87CH2487-7, August 25-27, 1987, pp. 115-126

ABSTRACT: The design of open field EMI measurement sites presents a number of questions for which there have not been readily available answers. This paper presents four studies which were made in order to gain needed information and provide guidance for site design: I. A simple method for measurement of Reflectance and Attenuation of building materials. II. Required separation between nearby open field sites and other sources of computer-generated interference. III. 10-meter site errors from nearby reflecting objects. IV. Prediction and measurement of correlation errors between 3-meter and 10-meter site distances and development of bands of confidence around such correlation.
INDEX TERMS: Test sites, open field, EMI, measurement sites

EMCABS: 05-11-87

Radiated Emissions From Common-Mode Currents

Clayton R. Paul* and Donald R. Bush**
University of Kentucky*, Lexington, KY 40506, IBM**, Lexington, KY 40511
1987 IEEE International Symposium on Electromagnetic Compatibility
IEEE Catalog Number 87CH2487-7, August 25-27, 1987, pp. 197-203

ABSTRACT: Common-mode currents on interconnect cables and cables within a product are significant contributors to the overall radiated emissions of that product. This paper describes an experiment which shows that: (1) levels of common-mode currents are difficult to predict but (2) accurate predictions of their radiated emissions can be obtained if one measures these currents with a current probe. The experiment also illustrates the effectiveness of common-mode chokes (toroids) on the reduction of those currents and their related emissions.
INDEX TERMS: Radiated emissions, common-mode currents, cables

EMCABS: 06-11-87

Statistical EMC: A New Dimension in Electromagnetic Compatibility of Digital Electronic Systems

A. Tsaliovich
AT&T Information Systems, Holmdel, NJ 07733
1987 IEEE International Symposium on Electromagnetic Compatibility
IEEE Catalog Number 87CH2487-7, August 25-27, 1987, pp. 469-474
ABSTRACT: Statistical analysis provides a new perspective on electromagnetic compatibility (EMC) of digital electronic systems and leads to important practical results. The electromagnetic compatibility compliance test results are used as a data base to address three classes of EMC related problems: statistical EMC profile of digital electronic systems, equipment under test (EUT) parameter effects on the electromagnetic emission characteristics and EMC measurement specifics. A comparison is made and statistical correlation factor concept is introduced of the EUT highest radiated emissions measured in an open area test site (OATS) and absorber-lined shielded room (AR). The suggested statistical evaluation methodology can be utilized to correlate different EMC test techniques, characterize EMC performance of electronic systems and components and develop recommendations for optimal EMC design.
INDEX TERMS: Statistical EMC, electromagnetic compatibility, digital electronic systems, statistical analysis, EMC, EMC design

April 19–22	IEEE Instrumentation/Measurement Technology Conference San Diego, CA Contact: Robert Myers Conference Coordinator 1700 Westwood Boulevard, Suite 101 Los Angeles, CA 90024 Telephone: (213) 475-4571
May 9–11	38th Electronic Components Conference Biltmore Hotel Los Angeles, CA Contact: Edmund Bolton AVX Corporation 100 Copeland Drive, Suite 5 Mansfield, MA 02048
May 10–12	EMC Expo 1988 Washington Hilton & Towers Hotel Washington, DC Contact: EMC Expo 1988 State Road 625, P.O. Box D Gainesville, VA 20065 Telephone: (703) 347-0030
May 16–20	1988 Nuclear EMP Meeting (NEM 1988) SRI International Menlo Park, CA Contact: K.F. Casey NEM 1988 Technical Program Committee JAYCOR 39650 Liberty Street, Suite 320 Fremont, CA 94538
May 30–June 3	18th International Symposium on Automotive Technology and Automation Florence, Italy Contact: ISATA Secretariat 421 Lloyd Park Avenue Croydon CRO 5SB England Telephone: 01-681 3069 or 01-686 1329 Telefax: 01-686 1490
June 6–10	1988 URSI Radio Science Meeting and IEEE AP-S International Symposium Sheraton University Inn Syracuse, NY Contact: Tapan K. Sarkar, Technical Program Chairman AP-S/URSI Symposium 111 Link Hall Syracuse University Syracuse, NY 13244-1240 A.T. Adams, General Chairman, same address Telephone: (315) 423-3775 Telex: 131659

Antenna Related Factors Affecting Correlation of Screen Room Measurements

EMCABS: 07-11-87

H. Stephen Berger
The Electro-Mechanics Company, 10620 Metric Blvd., Austin, TX 78758
1987 IEEE International Symposium on Electromagnetic Compatibility
IEEE Catalog Number 87CH2487-7, August 25-27, 1987, pp. 347-353

ABSTRACT: A report on the antenna-related factors which affect the correlation of emissions measurement between two different labs. Five factors were explored during this study: (1) Antenna-to-antenna manufacturing variance and the need for individual calibration of each antenna. (2) The amount of interolation error arising from irregularities in the antenna response curve. (3) Changing the orientation of the antenna when in close proximity to ground affected the accuracy of the antenna calibration. (4) The response to field impedances other than 377 ohms was explored. (5) The effect of which element was placed down in a vertical orientation was measured. Latent balun imbalance appeared to have a minor effort on measurement accuracy. All five of these factors were found to introduce a potential for error in screen room measurements. The most significant factors were found to be (1) and the potential error introduced when measuring fields other 377 ohms.

INDEX TERMS: Antenna, screen room measurements of, antenna calibration

Sensitivity of Crosstalk to Variations in Wire Position in Cable Bundles

EMCABS: 08-11-87

Clayton R. Paul
University of Kentucky, Lexington, KY 40506
1987 IEEE International Symposium on Electromagnetic Compatibility
IEEE Catalog Number 87CH2487-7, August 25-27, 1987, pp. 459-463

ABSTRACT: A description of the process of obtaining the experimental data analyzed in (1) concerning the random variation of crosstalk in cable bundles due to variations in relative wire position is given. Two sets of data are obtained. The first set concerns variations in crosstalk within the cable bundle. The second set concerns variations for the complete system which includes the cable terminated with the printed circuit board containing the Op Amp and LED.

INDEX TERMS: Crosstalk, cable bundles

System Level Approach for Automotive Electromagnetic Compatibility

EMCABS: 09-11-87

Michel F. Sultan and Andreas C. Cangellaries
Electronics Department, General Motors Research Laboratories,
Warren, MI 48090-9057
1987 IEEE International Symposium on Electromagnetic Compatibility
IEEE Catalog Number 87CH2487-7, August 25-27, 1987, pp. 510-520

ABSTRACT: This paper outlines a system level numerical technique to address automotive electromagnetic compatibility (EMC) problems. The system level approach described here is a natural extension of the specification approach where bench level tests for emission and susceptibility characterization are performed on individual components. The aim of the system level approach is to ensure that specifications generated for each component are consistent and would result in overall electromagnetic compatibility of the system. Feasibility issue and requirements for ease of implementation in a car production environment are addressed, accounted for and discussed.

INDEX TERMS: System level approach, automotive electromagnetic compatibility, vehicular EMC

Development of a Cable Shield Tester

EMCABS: 10-11-87

L.O. Hoeft, C.M. Graves , Paul J. Miller** and William D. Prather***
The BDM Corporation, Albuquerque, NM 87016
TRW Defense Systems Group**, Albuquerque, NM 87106 and
Air Force Weapons Laboratory***, Kirtland AFB, NM 87117
1987 IEEE International Symposium on Electromagnetic Compatibility
IEEE Catalog Number 87CH2487-7, August 25-27, 1987, pp. 67-71

ABSTRACT: A conceptual model of a shielded cable tester, capable of measuring the surface transfer impedance of cables installed on an aircraft or other system, has been experimentally demonstrated. The initial design analysis led to an approach in which the cable surface transfer impedance was measured by inductively injecting a CW current on the outside of the cable shield (with both ends attached to the aircraft), measuring the ratio of the voltage on the conductors to the shield current, calculating the shield resistance and mutual inductance and comparing the measured values to a hardness acceptance criteria. Measurements using brass calibration samples showed that sensitivity requirements were met with a factor of five margin. Measurements made on a wide variety of cables demonstrated that the electromagnetic quality of the cable could be quantitatively evaluated in spite of variations in length and load impedances.

INDEX TERMS: Cable shield tester, shielded cable, transfer impedance, aircraft

Measurement of Narrowband and Broadband Emissions using Peak and Average Detection

EMCABS: 11-11-87

Siegfried Linkwitz
Hewlett-Packard Company, 1212 Valley House Drive,
Rohnert Park, CA 94928
1987 IEEE International Symposium on Electromagnetic Compatibility
IEEE Catalog Number 87CH2487-7, August 25-27, 1987, pp. 36-41

ABSTRACT: Regulations for the measurement of emissions from information technology equipment establish separate quasi-peak and average limits. To reduce the quasi-peak measurement time the use of peak detection is suggested. The average measurement can be replaced by a measurement of the video filtered envelope of the log-amplified intermediate-frequency range. This increases measurement range and improves speed. Measurement accuracy is considered and a test algorithm presented.

INDEX TERMS: Narrowband, broadband, emissions, peak, average detection, quasi-peak

A Small Parallel Plates System for EMP Simulation

EMCABS: 12-11-87

C. Goldstein, A. Tehori
Rafael/Elgal, P.O. Box 2250, Haifa, ISRAEL
1987 IEEE International Symposium on Electromagnetic Compatibility
IEEE Catalog Number 87CH2487-7, August 25-27, 1987, pp. 135-138

ABSTRACT: The system consists of a pulse generator and a parallel plates radiator. The E field at the center of the radiator has a maximum amplitude of 100 KV/m and risetime of 10 ns. The E and H field distribution was measured. With plates one above the other the horizontal component of the E field is negligible, with side-by-side plates the considerable vertical component of the field can be reduced by connecting the two plates via a series of resistors at the bottom of the radiator.

INDEX TERMS: EMP simulation, parallel plates radiator

June 15–17	38th IEEE Vehicular Technology Conference Holiday Inn Center City Philadelphia, PA Contact: D.L. Huff, Technical Papers Coordinator IEEE VTC 88 AT&T Bell Laboratories Whippany, NJ 07981
June 28–30	9th International Wroclaw Symposium on EMC Technical University of Wroclaw Wroclaw, Poland Contact: W. Moroń Wroclaw EMC Symposium Box 2141 51-645 Wroclaw 12, Poland Telex: 712118 ilw. pl.
August 2–4	1988 IEEE International Symposium on EMC Westin Hotel Seattle, WA Contact: Dave Dennis The Boeing Company 4220 NE 95th Street Seattle, WA 98115 Telephone: (206) 525-9336
September 12–15	Sixth International Conference on Electromagnetic Compatibility University of York York, United Kingdom Contact: The Conference Secretariat Savoy Hill House Savoy Hill, London WC2R OJD United Kingdom Telephone: 01-240 1871
October 17–19	Fourth International Conference of Satellite Systems for Mobile Communications and Navigation Institution of Electrical Engineers Savoy Place London, United Kingdom Contact: SSMCN 88 Secretariat, Conference Services The Institution of Electrical Engineers Savoy Place London WC2R OBL United Kingdom Telephone: 01-240 1871, ext. 222
November 8–10	Seventh International Conference, Israel Society for Quality Assurance Tel Aviv, Israel Contact: Conference Secretariat ORTA Ltd., 2 Kaufman Street P.O. Box 50432 Tel Aviv 61500, Israel Telephone: 03-664825 Telex: 361142

CALENDAR
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March 6–9	8th International Zurich Symposium and Technical Exhibition on EMC Federal Institute of Technology Zurich, Switzerland Contact: Dr. T. Dvorak ETH Zentrum-IKT 8092 Zurich Switzerland Telephone: (+411) 256-2790 or Dr. R.M. Showers Moore School of Electrical Engineering D2 University of Pennsylvania Philadelphia, PA 19104 Telephone: (215) 898-8123
April 17–19	Symposium on Corrosion And EMI Shielding In Aerospace Equipment (NACE Corrosion '89) New Orleans, LA Contact: Eric Carlson Senior Research Associate Chomerics, Inc. 77 Dragon Court Woburn, MA 01888 Telephone: (617) 935-4850 or Jack Guttenplan, M/S GA25 Rockwell International Electronic Operations 3370 Miraloma Anaheim, CA 92803

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