IEEE

Electromagnetic Compatibility Society

Newsletter

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SURVEY DATA FOR 1983 AND 1986 EMC SYMPOSIA COMPARED

An attendee survey was performed at both the 1983 EMC Symposium in Washington, DC and the 1986 EMC Symposium held in September in San Diego, CA. Despite the fact that the surveys were taken three years apart at opposite ends of the continent, the results are remarkably similar in most cases. However, some changes are worth noting:

- Full-time employment in EMC by those attendees surveyed climbed from 60 to 76%, also, part-time employment in EMC dropped from 21 to 11% and full-time employment in non-EMC areas by those surveyed dropped from 17 to 7%. This may indicate that EMC Symposia attendees are becoming a more homogeneous audience.
- Engineers in training among attendees went from 9 to 14%, perhaps indicating an earlier interest or a greater perception of EMC among engineering students.
- The majority of those surveyed at both Symposia (86% in 1983 and 80% in 1986) saw no reduction in EMC engineering manpower in the future, but the number that predicted no increase in manpower over the long run rose from 23 to 38%.
- While salaries in the $30K - $40K range dropped somewhat between 1983 and 1986 (26 to 22%), those in the $40K - $50K range dropped greatly (36 to 24%), even while those in the $50K - $60K range rose significantly (17 to 24%). The heavy concentration of aerospace and defense industries on the West Coast may account for some of these changes from the 1983 figures, however.

1983 AND 1986 EMC SYMPOSIA ATTENDEE SURVEY DATA

	1983	1986
IEEE MEMBERSHIP GRADE		
Associate	0%	2%
Member	46%	49%
Senior Member	11%	14%
Fellow	5%	3%
Not Member	38%	32%

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EDUCATION COMMITTEE NEWS

A meeting of the Education Committee was held on September 16, 1986 at the EMC Symposium in San Diego.

In order to expedite the completion of various projects that are in progress by the Education Committee, a number of sub-committees were formed as summarized below:

1. A committee to formalize the EMC Experiments Booklet. This committee will put the present booklet into publishable form by running the present experiments and making the necessary corrections. The work is to be completed by February 1, 1987. The committee consists of Clayton Paul, Fred Cribbens and Henry Ott.
2. A committee to write an EMC article for *Potentials,* the IEEE Student Branch Magazine. Kimball Williams will assume this responsibility.
3. A committee to organize a Distinguished Lecturer Program. The Distinguished Lecturers will be sponsored by the Society and travel to EMC Chapters to present talks. The work is to be completed by January 1, 1987 so that the proposal can be presented to the Board of Directors at their January meeting. The committee consists of Clayton Paul, Don Clark and Henry Ott.
4. A committee to put together an EMC Bibliography for distribution by the society. Committee members are Kimbal Williams and Gerald Kitzmann.
5. A committee to work on EMC video tapes. One tape on an Introduction to EMC, and the other on EMC in ISM Equipment. Committee members are Henry Ott and Dan Weinberg.

Anyone with an interest in one of these projects should contact one of the committee members listed above.

It was decided that all future meetings of the Education Committee will be held on the morning of the first day (Tuesday) of each EMC Symposium. Therefore, the next committee meeting will be held on August 25, 1987 at the EMC Symposium in Atlanta.

Henry Ott
Chairman, EMC-S
Education Committee

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AGE	1983	1986
20-25	3%	7%
26-30	11%	9%
31-35	13%	14%
36-40	9%	11%
41-45	23%	15%
46-50	11%	15%
51-55	12%	8%
56-60	12%	10%
Over 60	6%	11%

HIGHEST EARNED DEGREE		
None	6%	11%
Associate	8%	4%
Bachelor	40%	47%
Professional Degree	4%	2%
Master	25%	25%
Doctorate	9%	11%

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

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

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

NUMBER OF YEARS OF PROFESSIONAL EXPERIENCE	1983	1986
0 - 5	11.4%	11%
6 - 10	13%	18%
11 - 15	13%	14%
16 - 20	20%	12%
21 - 25	17%	14%
Over 25	26%	31%

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

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

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

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

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

	1983	1986
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%
Six Months	1%	4%
One Year	1%	0%
Two Years	2%	1%
No Opinion	8%	12%
No Reduction	86%	80%

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

WHAT PERCENTAGE OF YOUR TIME IS ALLOCATED TO THESE AREAS OF SPECIALIZATION?	
FCC	19%
VDE	10%
CISPR	4%
DOD	26%
EMP	8%
ESD	4%
TEMPEST	9%
Other Specify	20%

WHAT IS YOUR AREA OF TECHNICAL EXPERTISE?	
Test	39%
Design Analysis	36%
Frequency Management	6%
General Management	19%

FUTURE EMC-S SYMPOSIA SCHEDULE

1987 — Atlanta, GA; August 25-27
Marriott Downtown
Hugh W. Denny
(404) 894-3535

1988 — Seattle, WA; August 2-4
Westin Hotel
Donald A. Weber
(206) 575-5781

1989 — International
Nagoya, Japan
Drs. Akao & Sato
0565 48-8121

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

1990 — Washington, DC; August 21-23
Washington Hilton
Thomas W. Doeppner
(703) 664-3477

1991 — New Jersey, August
Cherry Hill Hyatt
Cherry Hill, NJ
Donald N. Heirman
(201) 834-3566

NOMINATIONS FOR BOARD OF DIRECTORS

Nominations are now being accepted for election of the IEEE EMC Society Board of Directors. In accordance with the by-laws, nominations can be by petition or by the Nominating Committee. The petition (Attachment 1) shall carry a minimum of 15 names of Society members, excluding students. Nominees should possess significant technical and professional stature in eletromagnetic compatibility. Nominees must be a full member of IEEE and a member of the EMC Society. No member can serve for more than six consecutive years, including partial terms. All nominees are required to submit a biographical summary to the Nominations Chairman. The summary must not exceed one-half typewritten page and must be in the following format:

1st paragraph:	Name, title, place of employment, educational background.
2nd paragraph:	Technical and professional experience.
3rd paragraph:	IEEE service and activities, including offices, committees, awards, etc.

Petition forms and information can be obtained from the Nominations Chairman, or from your Chapter Chairperson.

Please submit petitions and biographical summaries postmarked no later than May 15, 1987 to:

Gene Knowles
Nominations Chairman
16954 S.E. 149th St.
Renton, WA 98056
(206) 271-3396

1987 IEEE INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY

The 1987 IEEE International Symposium on EMC will be held at the Atlanta Marriott in Atlanta, Georgia, August 25-27, 1987. The theme for 1987 is "EMC: Advancing The State-Of-The-Art." Papers to be presented will cover topics that include, but are not limited to, the following categories:

TECHNICAL AREAS

Analysis
Control
Design
EM Environment
EMP
ESD
Filters
Instrumentation & Theory
Lightning
Magnetics
Materials
Microwave Theory & Techniques
Noise Phenomena
Non-Sinusoidal Signals
Radiation Hazards
Regulations
Signal Processing
Spectrum Management
Standards
Susceptibility
Vulnerability

APPLICATION AREAS

Aerospace & Electronic Systems
Antennas & Propagation
Automatic Control
Biomedical Engineering
Broadcasting
Circuits & Systems
Communications
Components, Hybrids & Manufacturing
Computer-Aided Design of Integrated Circuits
Computers
Consumer Electronics
Control Systems
Education
Electrical Insulation
Electron Devices
Geoscience & Remote Sensing
Isolation & Shielding
Industrial Electronics
Industry Applications
Medicine
Military Applications
Plasma Science
Power Apparatus & Systems
Quantum Electronics
Solid State Circuits
Vehicular Technology

For more information, write to the IEEE International Symposium on Electromagnetic Compatibility, P. O. Box 94208, Atlanta, GA 30318.

BOARD OF DIRECTORS ELECTION RESULTS

Ballots for the election of six members to the IEEE Electromagnetic Compatibility Society Board of Directors were mailed on September 19, 1986. The winners of that election are:

William E. Cory
William G. Duff
Walter D. McKerchar
Henry W. Ott
Richard B. Schulz
Donald A. Weber

The new Directors will serve for a three-year term starting January 1, 1987. We thank all those who took the time to participate in the election and support the Society and wish success to the new members of the Board.

METHOD FOR CALCULATING POWER DENSITY

For reasons of safety and the reduction of electromagnetic interference, it is often necessary to know the microwave power density near an antenna. This knowledge can help uncover and prevent hazards to personnel, equipment or ordnance.

NBS has developed a reliable and concise method for estimating the radiation intensity in the near-field of microwave antennas, using a plane wave scattering matrix theory. The method is accompanied by an efficient way to graphically represent the results. Input to the calculations are discrete numerical values of the radiated plane-wave spectrum (far-field pattern) of the antenna. Sample results have been compared to precision near-field measurements for specific antennas and found to be in excellent agreement.

The techniques are presented in *An Efficient and Accurate Method for Calculating and Representing Power Density in the Near-Zone of Microwave Antennas* (NBSIR 85-3036), available from the National Technical Information Service, Springfield, VA 22161, for $9.95 prepaid. (Order by PB#86-181963/AS).

BOARD OF DIRECTORS' MEETING AT THE SAN DIEGO EMC SYMPOSIUM

by Donald N. Heirman

The final Board meeting of the year was held on September 15th at the Town and Country Hotel in conjunction with the 1986 San Diego EMC Symposium. Fifteen of the eighteen Board members and several Society members were present including the General Chairman of the Symposium, Herb Mertel. President Len Carlson opened the meeting at 10 am with introductions of each Board member present and guests. Gilda Haskins, Secretary, was unable to attend. Vice President Don Clark filled in as Acting Secretary. The minutes were reviewed and corrections were made from the floor and by mail. The minutes were then approved subject to these changes.

Major items discussed are as follows:

1. Treasurer Dick Ford updated the Board on our fiscal status. As of 6/30/86, the Society net worth is $324K. The final tally for the 1985 Boston (Wakefield) symposium is a surplus of about $22K. A major portion of that surplus was used to provide all Society members a copy of the 1986 Symposium record, including postage and handling costs. The Board was happy to be able to approve the distribution of the record, especially for those members from abroad who are generally not able to attend. Dick also pointed out that our long-term investment in T-bills are paying off. Over $1500 interest has accrued for our treasury as of May. The Treasurer's report was approved.

2. Bob Haislmaier, Director for Communications Services, introduced his standing committee chairmen who were present. Bob Goldblum, Newsletter Editor, indicated that the Fall issue was on time. There will be no EMCABS due to the illness of Mel Johnson, Associate Editor. Mel was wished a speedy recovery. The Winter issue will be published and mailed by the first week in 1987. Bob is looking for copies of back issues of the Newsletter starting with 1967. Dick Schulz, Transactions Editor, reported that he is planning for a special issue on shielding with Mark Ma, NBS, as guest editor. Bill Duff offered to be guest editor for a second special issue covering EMC measurements for February 1988. This latter special issue would be approximately 200 pages and cost about $36,000. The issue would be a compilation of material from past NBS EM metrology seminars. Don Heirman, Chairman of the Society's Technical Committee on EM Measurements (TC-2) asked that updated information on certain of the topics be provided by his committee. Bill agreed. Dick Ford also agreed to review the proposal for completeness. Any Society members interested in contributing or reviewing the outline should contact Bill on (703) 642-4049. Dick commented that the cost per copy of the Transaction is $2.42, which is a real bargain. He also indicated that he would be publishing the EMC Society award recipients in the November issue. Next, Gene Cory gave a review of the future symposia and conferences. First, Herb Mertel summarized the San Diego particulars. There were 93 papers, 2 workshops and 106 exhibitors. A feature of this symposium is that 2400 records were direct mailed to every Society member, 400 to IEEE co-op students and, of course, one for each attendee. This service has Board approval and encouragement. The 1987 Atlantic Symposium was on schedule. Hugh Denny, General Chairman, reported that there was room for 140 exhibit booths. Professor Sato distributed a report containing the advisory staff for the 1989 International Symposium on EMC to be held in Nagoya, Japan in September. The 1991 symposium in New Jersey will be at the Cherry Hill Hyatt in Cherry Hill, NJ, across the Delaware River from downtown Philadelphia. Don Heirman is the General Chairman. There was a discussion of interest in holding the 1992 symposium in Los Angeles, Santa Clara or Ottawa. The International Committee was restructured as the Trans-national Committee. Jim Hill continues to chair this activity. The purpose is to promote international representation and participation in IEEE EMC Society activities by fostering new chapters, symposia, membership, awards and standards. Representatives are to include members from Europe, Japan, Israel, India, Canada, Australia and the U.S. The committee is now being formed. Letters of invitation are being written. If there are any questions, call Jim Hill on (703) 451-4619 or Bill Duff on (703) 642-4049. Jim also reported that he has received 50 copies of the 1986 Wroclaw Symposium proceedings. Look for ordering information elsewhere in this Newsletter. Finally, Jim Hill was selected to chair our Society's Historical Committee. Leonard Thomas and Dick Schulz also serve on the committee. If you want to help, call Jim.

3. Vito Greco of Electro-Metrics stood in for Ed Bronaugh, Director for Communications Services, who is recovering from a coronary illness. Ed is the Director for Technical Services. First, Vito announced that Wil Lauber will replace Ed Skomal, who retired as Chairman of the Technical Advisory Committee for our seven technical committees. We wish Ed good health and a hearty thanks for all his efforts as TAC coordinator. Don Heirman, Standards Committee Chairman, presented his report which indicated that Standard 376 and 377 (spurious emission measurements) have been reaffirmed under the 5-year rule, a new PAR 1128 on "Recommended Practice for RF Absorber Evaluation in the

Range 30-1000 MHz" was approved by the IEEE Standards Board and PARs 626 (signal grounding) and 482/478 (shielding effectiveness of cables/connectors) were also approved. Mike Heart of EMCO was approved as Secretary to the Committee. The next meeting will be two hours preceding the Board meeting in Washington, DC at the Washington Hilton on January 29, 1987. For more information, contact Don on (201) 834-1801. Hank Ott, Education Committee Chairman, indicated he has received calls from universities regarding information on EMC topics. His committee sponsored a session at the San Diego symposium. See his column in this issue for further information.

4. Fred Nichols, Director for Member Services, introduced his several committee chairmen, who reported. Bob Hofmann, Chapter Activities, indicated that the Chapter Chairman's breakfast would again be held at the symposium. He also indicated that a Board member has been assigned as an "angel" for at least one chapter. This Board member is to interface with the chapters to help them provide speakers and to help offset extraordinary expenses for special seminars. The angels are as follows:

Chapter	Angel	Phone Number
Albuquerque	Mel Johnson	(215) 684-5111
Atlanta	Don Clark	(404) 894-3535
Baltimore/Annapolis	Gilda Haskins	(215) 752-4749
Boulder	Charlotte Tyson	(303) 924-6041
Central New England	Chet Smith	(617) 271-7086
Central Texas	Mel Johnson	(512) 684-5111
Chicago	Bob Hofmann	(312) 979-3627
Dallas-Ft. Worth	Dick Schulz	(214) 420-7919
Dayton	Dick Ford	(703) 642-4238
Denver/Littleton	Charlotte Tyson	(303) 924-6041
Detroit (Planned)	Bob Hofmann	(312) 979-3627
Tel Aviv, Israel	Len Carlson	(206) 773-6279
Japan	Prof. Sato	—
Long Island	Hank Ott	(201) 386-6660
Los Angeles	George Kunkel	818-843-5880
Minnesota-Twin Cities	Bob Hofmann	(312) 979-3627
Mohawk Valley	Ed Bronaugh	(518) 843-2600
New Jersey Coast	Don Heirman	(201) 834-1801
Orange County, CA	George Kunkel	(818) 843-5880
Ottawa, Canada	Bob Hofmann	(312) 979-3627
Philadelphia	Gilda Haskins	(215) 752-4749
Phoenix	Dick Schulz	(214) 420-7919
San Diego	George Kunkel	(818) 843-5880
Santa Clara Valley, CA	Hank Ott	(201) 386-6660
Seattle	Len Carlson	(206) 773-6297
Tucson	Dick Schulz	(214) 420-7919
Washington, D.C.	Bob Haislmaier	(301) 864-9395

In addition, the chapter-of-the-year was reestablished and the form used during the 1979-81 period was reissued. All Chapters wishing to be considered for this award for 1987 should submit the form by *January 30, 1987* to Bob Hofmann. Charlotte Tyson, Membership/Awards Chairman, indicated that the Society will again provide free EMC-S membership to those IEEE and non-IEEE symposium attendees. Non-IEEE members must, of course, pay for the IEEE portion of the membership fee. Bill Duff reported that there were eight EMC-S fellow nominations sent to the IEEE. He expected two to three to be accepted. Finally, Don Clark reported that the ballots for Board membership were to be sent to the Society members by October 19. The election results will be announced at the January Board meeting.

5. Bob Brook, Director for Professional Services, requested that he still needed to fill the chairmanship of the Intersociety Relations Committee. Walt McKercher was named to handle Public Relations and Bob Goldblum agreed to handle Employment Analysis, at least for summarizing the results of the employment questionnaire handed out at the San Diego Symposium. Bob Haislmaier will work on the Government Relations Committee.

6. Under Old Business, the Board asked Hank Ott to prepare a visiting lecture program so that Chapters can avail themselves of speakers who can travel to local meetings. The list will be available by the end of the first quarter of 1987. Both travel and living expenses will be borne by the Society. For more information, call Hank on (201) 386-6660. It was urged that each Chapter submit their meeting dates in advance so that visiting lecturers, as well as Board members, can plan to be available. Bob Brook discussed the activities of the IEEE Task Force on EM Radiation Hazards. The Board suggested that their inputs be funneled through Dan Hoolihan, who is our representative to the IEEE Technical Activities Board on COMAR (Committee on Man and Radiation).

7. Under New Business, a policy regarding EMC-S support of "For-Profit" organizations was presented by Bob Haislmaier and Chet Smith. It was decided to take this matter up at the next Board meeting. For further information, contact Len Carlson on (206) 773-6297. The Board also reviewed a proposal for an EMC-S consultant's list or directory. The objective of the Committee is to provide a pool of past experience, to review standards and to perform tasks as requested by the Board and its President. Further discussion on this Committee charter will be held at the next Board meeting.

8. President Carlson adjourned the meeting at 4:30 pm. The next meeting will be at 10 am on January 29 at the Washington, DC Hilton, the site of our 1990 Symposium. For more information, contact Gilda Haskins on (215) 752-4749 or Len Carlson on (206) 773-6297.

Respectfully submitted,

Donald N. Heirman
Associate Editor
Board of Directors' Activities

PCs FOR EMC

by Edmund K. Miller

The following column has appeared in the Antennas and Propagation Society Newsletter since February 1984. It began as a follow-on to a feature article in the Newsletter titled "Personal Computer Applications in Electromagnetics," by E.K. Miller and G.J. Burke. The column was originally motivated to provide a mechanism for exchanging information and software among AP-S members who were using or interested in alternatives to mainframe computing in electromagnetics. Since it started, the column has branched out to include other PC and computing issues. It has been offered to the EMC-S Newsletter by its author because there is a great deal of commonality of interests and applications between AP-S and EMC-S members. The column will appear for two issues on a trial basis.

While software exchange has perhaps been modestly helped by the column, it has probably provided a broader service for disseminating various kinds of information concerning computational issues. This column, for example, contains mini-reviews of several books which deal with computer modeling and numerical analysis. Your comments and suggestions concerning the utility of this kind of column for the EMC-S Newsletter will be instrumental in determining whether it or an alternative will continue beyond the two-issue trial. Send your comments and suggestions directly to your Newsletter Editor or to Professor Miller at Nichols Hall, The University of Kansas, Lawrence, KS 66045.

Although books on numerical methods have appeared in large numbers over the years, books dealing with computer applications in general and PC applications in particular are a more recent phenomenon. The August 1986 column was devoted entirely to reviewing one of this latter category, *Exploring Antennas and Transmission Lines by Personal Computer,* by John A. Kuecken. In this column we'll present some "mini reviews" or short reports of several more recent examples which are especially relevant for PC aficionados of modeling and related activities.

One reason why this seems more worthwhile now is that more of these books are either accompanied by disks which contain material discussed in the book or such diskettes are available separately. The books to be discussed here are: 1) *Numerical Recipes,* 2) *Circuit Design Using Personal Computers,* 3) *Computer Modeling in Electrostatics,* and 4) *Computational Physics.* I expect that this exercise will become a fairly regular feature of the column because providing information concerning such resources is one of the more valuable functions it can perform.

This is not an entirely new endeavor as various relevant books have been mentioned in past columns, but generally only in terms of title, author and publisher. In these mini reviews I'll try to strike a happy medium between single-review columns and titles-only listings. I will plan on periodically providing a resource list that includes all titles reviewed here as well as others that appear to be of general interest. Once again, if you find any books that you think are worth passing on, I'd be grateful to hear from you.

As the first title to be considered here, *Numerical Recipes,* subtitled *The Art of Scientific Computing* (ISBN 0-521-30811-9), by W.H. Press, B.P. Flannery, S.A. Teukolsky and W.T. Vettering was published by Cambridge University Press, in 1986. It is well worth your examination if you do much numerical analysis. But first, it's worth mentioning that the book is relatively unique in several respects. Firstly, it's typeset in TEX, a computer typesetting language developed by David Knuth of Stanford University. That is a distinction that will probably rapidly vanish as more scientific books are produced in this fashion. Secondly, *Numerical Recipes* at 818 pages is relatively modestly priced compared with the cost of many engineering books coming on the market, costing $40.00 list price. I obtained a copy through The Library of Computer and Information Sciences at their price of $29.50 plus shipping and handling. Thirdly, the book contains FORTRAN listings throughout of the various numerical procedures that are discussed, with an appendix containing PASCAL translations thereof. Finally, IBM PC and Macintosh disks are available that contain all of the programs listed in the book with a second offering being disks containing demonstration applications which exercise the subroutines of the first. There is also available an accompanying example book in each language for the demonstration disks. The list price each for any of the diskettes and example books is $19.95.

A thorough review of *Numerical Recipes* cannot be achieved in a few paragraphs, so I will do some very selective highlighting. Probably most useful to a potential buyer of this book is to see a chapter title and page listing, which is as follows:

1)	Preliminaries	1-18
2)	Solution of Linear Algebraic Eqns	19-76
3)	Interpolation and Extrapolation	77-101
4)	Integration of Functions	102-130
5)	Evaluation of Functions	131-154
6)	Special Functions	155-190
7)	Random Numbers	191-239
8)	Sorting	226-239

9) Root Finding and Nonlinear Sets of Equations 240-273
10) Minimization or Maximization of Functions 274-334
11) Eigensystems 335-380
12) Fourier Transform Spectral Methods 381-453
13) Statistical Description of Data 454-497
14) Modeling of Data 498-546
15) Integration of Ordinary Differential Equations 547-577
16) Two Point Boundary Value Problems 478-614
17) Partial Differential Equations 615-667
References 668-672
Numerical Recipes in Pascal 673-790
Table of Program Dependencies 791-796
Index 797-818

Reviews that I have seen of *Numerical Recipes* are almost uniformly positive. From my own perspective, I value it for the breadth and kind of coverage of computational tools it provides. It covers most kinds of the numerical procedures used by today's engineers in applications oriented way they would find most relevant to their problems, and it does this without the theorem and proof approach found in mathematically-focussed texts. If you were to add one new book to your collection on the general topic of numerical methods, I recommend that you take a look at *Numerical Recipes.*

Circuit Design Using Personal Computers (ISBN 0-471-87700-X) by T.R. Cuthbert, Jr. was published in 1983 by John Wiley & Sons, Inc. Its table of contents is as follows:

1) Introduction 1-6
2) Some Fundamental Numerical Methods 7-33
3) Some Tools and Examples of Filter Synthesis 34-69
4) Ladder Network Analysis 70-112
5) Gradient Optimization 113-169
6) Impedance Matching 170-229
7) Linear Amplifier Design Tools 230-272
8) Direct-Coupled Filters 273-334
9) Other Direct Filter Design Methods 335-387
A) HP-67/97 Programs 386-416
B) PET BASIC Programs 417-452
C) Derivation of the Fletcher-Reeves Scalar Multiplier 453-454
D) Linear Search Flowchart 455-456
F) Doubly Terminated Minimum-Loss Selectivity 457-458
G) Direct-Coupled-Filter Design Equations 459-468
H) Zverev's Tables of Equivalent Three- and Four-Element Networks 469-475
References 476-482
Index 483-494

This book was prepared by the author from material used for a two-semester graduate-level course at Southern Methodist University, and was also used for a 48-hour industrial seminar for practicing engineers. Cuthbert recommends that approximately six hours of study per chapter (except for 1) be spent in the latter mode. The book is intended for the practicing engineer and for university students with at least senior-class standing. As he states in the Preface, he "wrote this book to show how effective personal computers can be in circuit design." He observes that "many students have recently developed an appreciation and interest in these topics precisely because the techniques have become visible on the personal computer." Excessive analytical detail is avoided with the reader pointed toward reference material for more detailed explanations. In the Introduction, Cuthbert quotes from Hamming that "computing should be intimately bound with both the source of the problem and the use that is going to be made of the answers; it is not a step to be taken in isolation from reality. Therefore, the art of connecting the specific problem with the computing is important, but it is best taught within a field of application." That is the aim of this book for circuits, with the organization being developed around design applications.

Since the table of contents provides a good idea of what those applications are, it may be helpful to summarize briefly what the coverage is from the viewpoint of the mathematical subjects that are treated. Matrix algebra includes multiplication, exponentiation, inner products and norms, quadratic forms and conics and partitioning. Polynomial algebra of real and complex variables touches on power series and product forms, as well as rational-polynomial continued fractions, partial fractions and Chebyshev expansions. Calculus topics include multivariate Taylor series, partial derivatives and gradient vectors, the Cauchy-Riemann principle, numerical differentiation and integration and infinite summations and products. Mathematical transforms receive considerable attention, including bi-linear, Hilbert, Fourier and Laplance transformations. Gradient optimization is quite thoroughly discussed from quadratic forms, to conjugate gradient, linear search and the Fletcher-Reeves Optimizer, network objective functions and constraints. Although the programs covered in the book are not available in magnetic media, there are legible BASIC listings for 28 programs in Appendix B. If your work involves circuit analysis and design, you might find *Circuit Design Using Personal Computers* worth investigating.

Computer Modeling in Electrostatics (ISBN 0-86380-035-1) (spelled "Modelling" in the British style) by D. McAllister, J.R. Smith and N.J. Diserens, is the sixth in the Electrostatics and Electrostatic Applications Series which is being published by the Research Studies Press Limited, Hetchworth, Hertfordshire, England. The other titles in this series are: 1) Static Elimination; 2) Electrostatic Hazards in the Petroleum Industry; 3) Electrophotography Principles and Optimization; 4) Electrostatic Powder Coating; and 5) Electrostatic Mineral Separation. This particular book was published in 1985 and is marketed worldwide by John Wiley & Sons, Inc.

The book's 130 pages are allocated to seven chapters and four appendices as follows:

1) Introduction 1-3
2) Theoretical Background 4-16

3)	Differential Methods	17-39
4)	Equation Solving	40-52
5)	Practical Applications	53-73
6)	Transport of Low Conductivity Liquids	74-94
7)	Transport of Low Conductivity Powders	95-105
A)	Shape Functions for Use with Finite Elements	106-109
B)	Some Useful Numerical Integrations Formulae	110-111
C)	Computer Coding	112-122
D)	Other Methods	123-126
Index		127-130

The book has numerous illustrations in spite of its brevity and includes a simple FORTRAN program for solving 2D axisymmetric finite-element problems. The figures are generally reproduced quite well with just a few of the computer-generated equipotential plots losing some detail. The text has been prepared in double-spaced typescript. You may find the book to be a useful reference for electrostatic field modeling, especially in terms of its emphasis on illustrating practical applications.

Computational Physics (ISBN 0-8053-5430-1) by Steven E. Koonin, was published in 1986 by The Benjamin/Cummings Publishing Company, Inc., 2727 Sand Hill Road, Menlo Park, CA 94025. It also is computer typeset using the UNIX-based TROFF text-processing system running on a VAX-11/750. Its table of contents is as follows:

1)	Basic Mathematical Operations	1-22
2)	Ordinary Differential Equations	23-48
3)	Boundary Value and Eigenvalue Problems	49-76
4)	Special Functions and Gaussian Quadrature	77-100
5)	Matrix Operations	101-136
6)	Elliptic Partial Differential Equations	137-160
7)	Parabolic Partial Differential Equations	161-184
8)	Monte Carlo Methods	185-216
A)	Synopsis of the BASIC Language	217-226
B)	Programs for the Examples	227-330
C)	Programs for the Projects	331-404
References		405-409

There is no index.

Each of the book's chapters contains a text section, an example and a project. The text section includes brief discussion of one or more related numerical techniques illustrated with simple mathematical examples and accompanied by numerous exercises. In Chapter 1 for example, there is discussed numerical differentiation, numerical quadrature and finding roots, followed by an example of semiclassical quantization of molecular vibrations and a project for scattering by a central potential.

The back inside cover of *Computational Physics* has a plastic envelope attached which contains the BASIC source codes for the examples and projects for the IBM PC/XT/AT series or compatibles operating under MS-DOS 2.0 or higher. The example and project programs are also listed in the appendices. Koonin chose the BASIC language in spite of its many "well-known deficiences" because of "the simplicity of the language and the widespread fluency in it, BASIC's almost universal availability on the microcomputers most likely to be used with this book, the existence of both BASIC interpreters convenient for writing and debugging programs and of compliers for producing rapidly executed finished programs, and the powerful graphics and 1/) statements in this language."

The book is not intended to be a book of numerical techniques. As Koonin states in the Preface, it is primarily a physics text, and is aimed at refining computational skills in advanced undergraduate or beginning graduate students. The student is intended to learn computational techniques by "doing physics" on a computer. A book with the working title *Computational Engineering* or something comparable is naturally suggested by *Computational Physics.* The idea in either case is to introduce the student to computational means of problem solving as a natural adjunct to experimental and analytical techniques by illustrating the representation and solution of commonly encountered problems. Numerical techniques are learned by and from experience rather than as a mathematically rigorous, but often-times separate, topic.

DETERMINING MICROWAVE POWER DELIVERED TO AN ANTENNA

In laboratory settings as well as in the field, it is often desirable, even essential, to know the net power delivered to a microwave horn or other antenna. For example, standard-gain horns are used to establish known electromagnetic fields in anechoic chambers, and uncertainties in knowing the net delivered power cause uncertainties in knowledge of the fields.

NBS has developed a procedure for measuring the net delivered power and evaluating its uncertainty. This measurement and computation procedure also can be used to self-calibrate the system by placing terminations of known characteristics, such as shorts or matched loads, on certain ports. The technique is explained in *A Radio-Frequency Power Delivery System: Procedures for Error Analysis and Self-Calibration* (TN 1083), available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, for $1.00 prepaid. (Order by stock no. 003-003-02610-1).

INTER-SOCIETY ACTIVITIES

by Walt McKerchar

SAE Committee AE-4 On Electromagnetic Compatibility

At the San Diego meeting the SAE AE-4 Committee on Electromagnetic Compatibility reorganized their committee structure. Following is the "new look."

COMMITTEE	CHAIRMAN
AE-4 A SYSTEMS	A. ROBERTS
Sub-Committees:	
AE-4 AB	
Business Systems	S. Bloom
AE-4 AC	
System Compatibility	M. Malinick
AE-4 AE	
Engine Systems	N. Brown
AE-4 AT	
System Test Methods	D. Awerkamp
AE-4 F	
INTERNATIONAL LIAISON	H. MERTEL
AE-4 L	
LIGHTNING	
Co-Chairmen	J. PLUMER, J. ROBB
Vice Chairman	R. Hess
AE-4 P	
PASSIVE COMPONENTS	S. BERNSTEIN
Sub-Committees:	
AE-4 PC	
Composites	S. Bernstein
AE-4 PF	
Filters	W. Parker
AE-4 PG	
Gaskets	E. Carlson
AE-4 PI	
Interconnect Components	A. Martin
AE-4 S	
SHIPBOARD EMC	W. JOHNSON
AE-4 X	
STATIC	inactive

The Committee Chairmen will set up the agendas for the committees and work with the sub-committee chairmen to ensure that work progresses. In addition to continuing to issue Aerospace Recommended Practices (ARP) and Aerospace Information Reports (AIR), the committee may develop handbooks and training courses for the SAE educational program. Also being considered is an annotated bibliography or inter-related specifications.

The next meeting of the AE-4 Committee will be at the Chase Hotel in downtown St. Louis on March 17, 18 and 19. All meetings are "open" and you are welcome to attend. Contact the Chairman, Mr. Dwaine Awerkamp (M/S H2550, Motorola Inc., 8201 E. McDowell Rd., Scottsdale, AZ 85252 or phone (602) 949-3138) if you want to contribute to the committee activities.

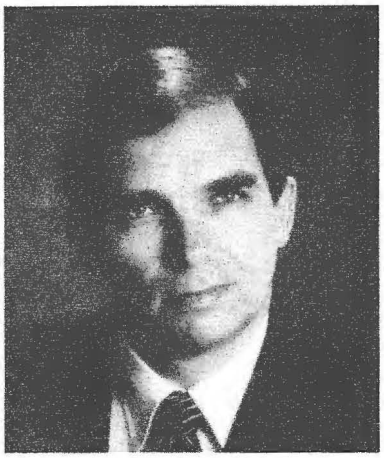
FAA/RF Vulnerability Project

The FAA is considering a project to re-evaluate the RF Susceptibility limits of the Radio Technical Coordinating Committee (RTCA) document DO-160 in light of today's RF environments. The objective of this project is to provide technical information and guidance material to define appropriate electromagnetic susceptibility standards for airplanes using advanced technology airframes and fly-by-wire/light control systems. This effort is restricted to the development of susceptibility criteria related to high energy radio and radar transmissions (10 Hz to 300 GHz). Avionics systems for transport category airplanes have been satisfactorily designed and certified in the past to meet susceptibility standards set forth in RTCA DO-160-A/B, "Environmental Conditions & Test Procedures for Airborne Equipment." With the introduction of flight critical fly-by-wire avionics and composite aircraft structures, the avionics systems have become increasingly more susceptible to electromagnetic energy from both internal and external aircraft sources. This project will provide for (1) a mapping of the electromagnetic environment from sources other than lightning that a transport aircraft/helicopter would be expected to encounter during normal flight operations, primarily from RFI and radar threats, (2) develop a roadmap of electromagnetic standards for new technology aircraft and upgrades for existing standards, (3) provide examples and definition of potential susceptibility criteria for flight critical avionics hardening to the electromagnetic threat, (4) provide examples of hardware and software techniques that can be used to harden critical avionics systems against the EM threat, (5) model typical threats for system level equipment testing and (6) develop a recommended aircraft systems level testing procedure.

Should the readers have comments, suggestions or questions, inquiries may be directed to Mr. William Larsen, FAA Field Office, P.O. Box 25, Moffett Field, Mountain View, CA 94035-0025 or phone Mr. Larsen at (405) 694-6380 or 5051.

EMC PERSONALITY PROFILE

by William G. Duff



DONALD E. CLARK

Don is a Principal Research Engineer at the Georgia Tech Research Institute located on the Georgia Institute of Technology campus in Atlanta, GA. He is a staff member of the Electromagnetic Compatibility Division where he performs contract research primarily for the Department of Defense. Don has been at Georgia Tech for the past ten years and has managed and directed numerous projects mainly related to system-level EMC. During his first five years at Tech, he contributed to projects dealing with the electromagnetic vulnerability of guided weapon systems. He developed methodologies, encompassing management and design factors, that can be implemented in the development stages to protect guided systems against electromagnetic radiation. His more recent projects have dealt with the development of a Navy facility that uses automated test equipment to perform EM susceptibility testing of tactical aircraft. Other recent projects involved the application of numerical electromagnetic analyses to complex antenna structures and the performance of studies related to large anechoic chambers.

Don was born in Glen Ferris, WV on May 9, 1941. He graduated from West Virginia Institute of Technology in 1964 with a Bachelor of Science degree in electrical engineering. While attending college he served in the Air National Guard, where he performed duties as an airborne radio repairman. Later, he continued his education and received a Master of Science degree in electrical engineering from the Ohio State University in 1969. While at Ohio State, he worked part time as a graduate research assistant at the ElectroScience Laboratory.

Don began his professional career in 1964 as an electronics engineer with the U.S. Naval Weapons Laboratory (now the Naval Surface Weapons Center) at Dahlgren, VA. He contributed to a major Navy EMC program, designated F/R-69 Multiple Ship Tests, dealing with the EMC of shipboard fire control radars. He spent considerable time at sea, including a cruise across the North Atlantic during very stormy conditions. Another Navy project he contributed to required electronic support measurements to determine the electromagnetic environmental densities in Southeast Asia during the Vietnam War. After completing his Master's degree, Don continued his career with the Westinghouse Electric Corporation in Leesburg, VA in 1970. While at Westinghouse he designed and tested ground plane antenna systems and performed EMC test and design for consumer products. Later, he performed TEMPEST studies and tests on a number of classified projects. During 1975 Don moved to the Atlantic Research Corporation in Alexandria, VA and continued as a TEMPEST engineer. He performed evaluations on secure communications and computer equipment to preclude compromising emanations. He joined the Georgia Tech Research Institute as a Research Engineer in 1976. Don has authored numerous reports and papers on EMC and is a Registered Professional Engineer in Georgia and West Virginia.

Don joined the IEEE in 1962 as a student member and upgraded to senior member in 1981. He has been very active in the IEEE for the last eight years and has served at the Society, Section and Chapter levels. He is presently the Vice President of the EMC Society and served two years as the EMC Society Secretary. In 1978 he was the Registration Chairman for the IEEE EMC Symposium held in Atlanta and is currently serving as an advisor for the EMC Symposium to be held in Atlanta during 1987. He has chaired technical sessions at two EMC Symposia. Over the last six years, he has been elected to the Atlanta Section Executive Committee as Director, Treasurer, Secretary, Vice Chairman and Chairman for 1985-86. He also served as the Atlanta Section Newsletter Editor and as the Program Chairman. At the local chapter level he has served as Chairman and Vice Chairman of the Atlanta EMC Society Chapter. Other IEEE activities include Registration and Attendance Chairman for the SOUTHCON regional conference held in the Southeast.

Over the years, Don has been involved in community service and was active in the U.S. Jaycees for five years. During 1975-76 he served as President of the Sterling Park Jaycees in Virginia. He is listed in *Who's Who in the South and Southwest.* His leisure time activities include lunchtime jogging, listening to classical music, and tent camping. Don and his wife, Edith, and his two daughters, Kelly and Courtney, live in Lilburn, GA, which is located in the suburbs of Atlanta.

CHAPTER CHATTER

by Charles F. W. Anderson

My apologies to all for missing the September issue.

CENTRAL NEW ENGLAND

The Chapter officers for '86/'87 are:
Art Murphy (GTE Communications): Chair
Bob Berkovits (Teledyne Brown): Vice Chair
John Clarke (DOT/FAA): Secretary

The Chapter's '86/'87 season promises to be an interesting one. The October meeting featured a tour of the Digital Equipment Corporation's Marlboro facility, with a DEC staff member acting as guide. A technical presentation on antenna factors was also given. Projected topics for the upcoming meetings include: EMC/EMI standards (November); radiation hazards (February); frequency management (March); and an IEEE student night at Chomerics - Woburn.

Thanks to John Clarke for the above inputs.

CENTRAL FLORIDA

An organization/planning meeting of the newly-formed Chapter is to be held shortly according to Brian Vancata, Organizer and Chair.

CHICAGO

On March 12, the Chapter held a meeting at which the speaker was Hugh Hyatt of Experimental Physics - Sunnyvale. His topic was "Protection from Electrostatic Discharge and other Transients." Bally Midway Manufacturing hosted the meeting. Bob Hofmann supplied the information. Thanks!

NEW JERSEY COAST

The June meeting had Anatoly Tsaliovich (AT&T) speaking on "Anechoic Chamber Performance." His talk covered a practical method to obtain realistic absorber performance parameters for evaluation over the 30-1000 MHz range. Absorber effectiveness can be determined as functions of signal frequency, polarization and receiving and incident angles. Materials investigated included ferrite tile, pryamidal absorbers and a combination of the two.

In October, Tony Zimbalatti (Grumman) presented a talk entitled "Nuclear Magnetic Pulse, Aircraft Vulnerability Assessment."

H.W. Arnold (Bell Communications Research) presented a talk on "Radio Propagation in the Portable Communications Environment." He reviewed results of recent research into propagation in such environments as within and near buildings as it affects operation of tetherless voice and data communications devices.* Techniques to mitigate the problems were also presented. The three Society Chapters which combine their efforts (Antennas & Propagation, Vehicular Technology and EMC) have an ambitious '86/'87 season planned. The traditional Christmas Party will be the December function. In January, the VT Chapter will sponsor the meeting followed by an EMC topic in February. In March, AP will organize the session. The cycle will repeat through June.

SANTA CLARA VALLEY

The September meeting was a planning session and social to sound out the area's EMC/EMI community on their collective desires for the '86/'87 program. Prospective participants were invited to discuss possible program contributions.

In October, Hans Mellberg, Regulatory Engineering Manager of Wyse Technology, addressed the Chapter meeting. His topic was "Low-frequency Magnetic Field Testing." He discussed methods for lf magnetic field measurements in the 10 kHz to 30 MHz range with regard to the VDE 0871 standard. His talk included such items as variance of data due to environmental conditions and the frequency dependence of inverse-distance signal-intensity decrease.

The November meeting featured Robert Vreeland (U. of California - San Francisco R&D Laboratory) speaking on "Pacemaker RF Susceptibility - A Review and Notes on RF and Microwave Health Hazards." He reviewed the joint paper "The Effects of FM and TV Broadcast Stations upon Cardiac Pacemakers" (authored by Messrs. Huchinson, Shepard and himself), which was presented at the '74 EMC Symposium. He commented on experiences in the period since the studies reported in that paper. He also discussed RF radiation hazards and some of the incidents which have been recently reported in the media.

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*Recent experience of your Column Editor has shown that many of these devices are unconscionably susceptible to environmental RF fields.

TOKYO

Our colleagues in the Far East continue their excellent monthly technical gatherings. As of September (the latest report I have received) over 40 papers had been presented in 1986. The range of topics covered such items as 900 MHz mobile field-strength modeling by use of scaling in the 10 GHz range, investigations of a new conducting fiber, a method for interference analysis of systems using a program designated RFIAP (Radio Frequency Interference Analysis Program), which is utilized to make predictions related to the MIL specifications, human-body ELF field distribution measurements using an innovative technique and EM absorbers based on foamed rock covered with carbon powder. (Abstracts of all the papers should be appearing in the Transactions). My thanks to Professor Echigo for providing the reports.

TWIN CITIES

The October meeting featured Dave Shmania (Wiltron Corp.), whose topic was "Swept Measurements at Microwave Frequencies."

On November 12, the Chapter luncheon meeting had Burton Gran (Holaday Industries) as the speaker. His talk was titled "The Measurement of Non-ionizing Electromagnetic Radiation."

Chapter Chairman Dan Hoolihan (Amador) provided the information. Thanks, Dan!

WASHINGTON/NORTHERN VIRGINIA

The I & M and EMC Chapters co-sponsored the November meeting. The speaker was Dr. Jerry Wyss (General Research), whose talk covered "Photonic Sensors for Electromagnetic Field Measurements." He discussed applications of photons (I.E., light) as signal carriers, with reference to how such techniques could solve some of the current problems encountered in performing EM measurements with non-photonic methods.

SPECIAL NOTE TO ALL CHAPTER CHAIRPEOPLE AND SECRETARIES:

Your Column Editor will be retiring from Martin Marietta and moving to Maryland about the last week of January. My new address will be:

Charles F.W. Anderson
2302 Keener Road
Hagerstown, MD 21740

I'm hoping to be able to get to some of the Baltimore/Annapolis and Washington/Northern Virginia Chapter meetings once my wife and I get settled in.

TRAVEL PLANS TO ZURICH FOR THE 7th INTERNATIONAL ZURICH SYMPOSIUM & TECHNICAL EXHIBITION ON ELECTROMAGNETIC COMPATIBILITY, MARCH 3-5, 1987

For those who are planning to attend the Zurich EMC Symposium (to be held at the Swiss Federal Institute of Technology, Zurich) we have put together two travel plans. "Option One" is for those who can only spare a week to attend. This plan includes air travel from JFK International Airport to Zurich and six nights at the Hotel Leoneck with breakfast each morning. The Leoneck Hotel is close to the Swiss Federal Institute of Technology where the symposium and exhibition are held. Travel on PanAm will leave on Saturday, February 28 and return on Saturday, March 7, 1987.

"Option Two" is for those who want to add a week's vacation to drive around Switzerland and adjoining countries on the week after the symposium. It includes the same travel on PanAm with six nights at the Hotel Leoneck and, in addition, rental of an economy car for one week. In this way you can visit all those places Switzerland is famous for, such as Montreux, Geneva, Lake Lucerne, Berne (capitol of the Swiss Confederation), Interlacken, Basel, The Valais and many others, not to mention France, Germany, Italy and Austria.

In addition to these two options, you can make your own itinerary because there is considerable flexibility in arrangements with no minimum or maximum stay. Advance ticketing must be made at least 15 days before departure to qualify. PanAm was selected to conform with requirements by the Federal Government that a U.S. carrier be used for travel wherever possible.

The "Option One" package is priced at $746.00 and the "Option Two" package is $918.00. For single occupancy add $80.00 to either option. The itinerary is arranged to get you into Zurich Sunday morning. This gives you time to catch up on your rest. On Monday you can visit the Zurich Old Town during the day and register at the Technical Institute in the evening. Tuesday, Wednesday and Thursday you will attend the sessions. Friday you can see more of Zurich or go on one of the tours arranged by the Symposium Group. Leaving Zurich on Saturday morning will get you back to the U.S.A. in the mid-afternoon. Special reduced add-on fares apply to travel to and from JFK International Airport for this trip.

To take advantage of this plan, call Travel World of Springfield, (703) 451-1606. Their address is 6901 Old Keene Mill Road, Springfield, VA 22150. They are ready to book you for "Option One" or "Option Two" or work with you on your own special itinerary.

BOOK REVIEWS

by Jim Hill, The EMXX Corp.

At the time we write this we are looking ahead more than three months to the EMC Symposium and Exhibition in Zurich scheduled for March 3-5, 1987. If it follows the pattern of the Wroclaw EMC Symposium recently held in Poland, there will be interesting new subjects such as "EM Emissions Related to Earthquakes" and we will be meeting participants from parts of the world that had not been heard from on EMC subjects. I refer to the attendees at Wroclaw who came from Libya, Malasia, Vietnam and Jordan. Our review of the *Eighth International Wroclaw Symposium on Electromagnetic Compatibility Symposium Record* by Bill Duff gives an insight into the program of papers. We have a number of copies of the *Symposium Record* available for sale at $30.00 for the three-volume set. Send me your order with a check made out to "IEEE EMC Society." Details are elsewhere in this Newsletter.

We are indebted to Dick Schulz for a review of "Special Functions for Engineers and Applied Mathematicians." This should be valuable as a reference book and by reference to it it may lead to short-cuts in your software and new methods of dealing with difficult problems.

EIGHTH INTERNATIONAL WROCLAW SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY SYMPOSIUM RECORD

Chairman Prof. A. Smolinski
Edited by W. Moron, W. Sega and W. Waszkis
Copyright by Technical University of Wroclaw

This publication presents papers from the Eighth International Wroclaw Symposium on Electromagnetic Compatibility. The program for the Wroclaw Symposium was organized to offer something for both the beginner and the experienced EMC engineer. There are technical and scientific papers covering a wide variety of subjects from standards and regulations to analysis and modeling. There were several highly theoretical sessions and a special session on EM phenomena connected with earthquakes. There were also several workshops for practicing EMC engineers.

The symposium record is published in three parts and presents approximately 130 papers on various topics related to EMC. The papers are presented in either English or Russian, but each paper includes a brief summary in the other language. Therefore, each of the papers that are presented in Russian contain a brief summary in English and vice versa. This makes the overall symposium record more valuable to the reader not familiar with both languages.

The first part of the symposium record contains the opening lecture on "The EM Emission Phenomena As A Precursor of Earthquakes and the Possibility of Epicenter Location Prediction," by Takeo Yoshino, and papers from six sessions as indicated below.

- EM Emissions Related to Earthquakes — four papers
- EMC and Biological Risks — ten papers
- EMC in Wire Communications — nine papers
- Lightning EMP — five papers
- Propagation — six papers
- Terrestrial EM Environment — four papers

Part Two consists of papers from three sessions as indicated below:

- Antennas — eighteen papers
- EM Fields — four papers
- EMI/EMC in Devices and Systems — twenty-three papers

Part Three consists of papers from four sessions as described below:

- EMP Threat — ten papers
- Interference Control — nine papers
- Measurement and Simulation of Signals — fourteen papers
- Spectrum Management and Utilization — twelve papers

This symposium record provides an extensive collection of papers which present new and controversial ideas and concepts. Most of the papers are well written and much of the material represents a contribution to the field of EMC. Because of the many notions represented by the authors, the record provides valuable insight into international EMC activities.

Reviewed by:
William G. Duff

Atlantic Research Corp.
5390 Cherokee Avenue
Alexandria, VA 22312

SPECIAL FUNCTIONS FOR ENGINEERS AND APPLIED MATHEMATICIANS
by Larry C. Andrews
Macmillan Publishing Company
866 Third Ave. New York 10022
Price: $32.50

Here is a book on special mathematical functions that I wish were available to me in my student days. It explains clearly the interconnecting relationships among various special functions and elementary functions. It is especially adapted to engineering by way of plenteous examples and exercises to illustrate some of the techniques of applied analysis useful in the evaluation of nonelementary integrals, summing series, etc. It exposes the mathematical "bag of tricks" so that the engineer can solve problems that appear at first to be intractable.

The book resulted from lecture notes refined over a period of ten years and used by a mix of advanced undergraduates and first-year graduate students in mathematics, engineering and physics. For that usage, the special functions are developed without using the language of complex variables.

Each chapter begins with the historical origin of the functions discussed, their relationship to others previously presented, and their realm of typical applications.

Major functions developed are the following:

- Gamma Function
- Beta Function
- Incomplete Gamma Function
- Digamma and Polygamma Function
- Error Function
- Exponential Integral
- Elliptic Integrals
- Legendre Polynomials
- Legendre Series
- Lengendre Functions of the Second Kind
- Associated Legendre Functions
- Hermite Polynomials
- Laguerre Polynomials
- Bessel Functions of the First, Second and Third Kinds
- Integral Representations of Bessel Functions
- Bessel Series
- Bessel-Related Differential Equations
- Modified Bessel Functions
- Asymptotic Formulas
- Boundary-Value Problems
- Confluent Hypergeometric Function
- Generalized Hypergeometric Functions

Also contained in this book are 1) a list of special-function formulas and 2) selected answers to exercises, as well as 3) an index.

This is the most readable book on special functions that I have seen. It also forms a valuable reference on the subject.

Reviewed by
Richard B. Schulz
Xerox Corp.
Lewisville, TX

PROCEEDINGS OF THE EIGHTH INTERNATIONAL WROCLAW SYMPOSIUM ON EMC NOW AVAILABLE

The eighth Wroclaw Poland EMC Symposium was held at the Wroclaw Technical University, Institute of Telecommunications, June 24-26, 1986. This meeting is held in even numbered years, alternating with the Swiss Technical University sponsored EMC Symposium, which has been held in Zurich since 1981. The 1987 Zurich symposium is scheduled for March 3-5, 1987.

The three-volume proceedings of the Wroclaw Symposium is reviewed in the Book Review section of this Newsletter. Authors of the 130 papers included represent 19 countries, some new to the EMC community. The countries represented are Poland, The Netherlands, Japan, U.S.S.R., U.S.A., Bulgaria, Italy, United Kingdom, German Democratic Republic, Federal Republic of Germany, Czeckoslovakia, Libya, Spain, France, India, Sweden, Hungary, China and Malaysia. The 215 attendees represented these countries, Vietnam and Jordan. Eighty of the papers are in English and 50 in Russian. At the symposium simultaneous translations were available in both languages. In the proceedings each paper is accompanied by a summary or abstract with the figure titles translated. Translations of the Russian papers can be arranged with Dr. P. S. Excell of the University of Bradford, Bradford, West Yorkshire, BD7 1DP, United Kingdom, telephone +44 274 733466, Ext. 263/232, Telex 51309 UNIBFD G. (see Newsletter Issue No. 124, Book Review, page 7 for details).

Copies of the 1191-page proceedings are available from the EMXX Corporation, 6706 Deland Drive, Springfield, VA, telephone (703) 451-4619. For shipment in the U.S.A., Canada or Mexico send a check in the amount of $30.00 made payable to the "IEEE EMC Society." For shipment to other countries add $6.00 for additional postage.

EMP NOTE SERIES

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

LPN 17 "Motion of Ion Clouds in Air," Carl E. Baum, Air Force Weapons Laboratory, Kirtland AFB, NM 87117, March 28, 1986.

SSN 291 "An Anisotropic Lens for Transitioning Plane Waves Between Media of Different Permittivities," A.P. Stone, University of New Mexico, Albuquerque, NM 87131, and C.E. Baum, Air Force Weapons Laboratory, Kirtland Air Force Base, NM 87117, April 11, 1986.

SSN 292 "Design Procedures for Arrays which Approximate a Distributed Source at the Air-Earth Interface," Y.G. Chen, S. Lloyd and R. Crumley, Maxwell Laboratories, Inc., San Diego, CA, Carl E. Baum, Air Force Weapons Laboratory, and D.V. Giri, Pro-Tech, 125 University Avenue, Berkeley, CA 94710, May 1, 1986.

Copies of these notes may be obtained directly from the author, from the Defense Documentation Center, Cameron Station, Alexandria, Virginia 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.

EMC-S MEMBER AWARDED CONGRESSIONAL FELLOWSHIP

Fredrick Matos, who works in spectrum management at the National Telecommunications and Information Administration, has been awarded a Congressional Fellowship. Senior Member Matos will spend his Fellowship year, which began in September, as a Legislative Assistant to Congressman Tom Tauke of the Second District of Iowa. Congressman Tauke (R) has been a member of the House Telecommunications Subcommittee for the past six years and has introduced significant legislation.

At the NTIA, Matos played a leading role in organizing international conferences of the United Nations International Telecommunications Union. As a senior engineer and expert consultant for the System Review Branch, he reviewed major Federal telecommunications systems.

From 1967 to 1978 he worked at ITT Research at the DOD Electromagnetic Compatibility Analysis Center (ECAC) in Annapolis, MD. He earned his BSEE from the Illinois Institute of Technology in Chicago in 1966 and his MSEE from George Washington University in Washington, DC in 1975.

Long an EMC Society member, Matos is a member of the Washington Chapter.

IEEE VEHICULAR TECHNOLOGY CONFERENCE ANNOUNCED

The IEEE Vehicular Technology Conference will be held June 1-3 at the Holiday Inn Hotel and Convention Center, Tampa, FL. Topics to be covered will include the full range of vehicular electronics, with the Call For Papers listing the following topics.

Automobile EMI Generation

Mobile Radio Systems

Mobile Digital Communication Systems

Network System Design

Narrowband Radio Systems

Cellular Radio

Land-Air & Marine Communication

Satellite Mobile Communications

Computers & Mobile Communications

Transportation Systems

Frequency Planning & Usage

Antennas & Propagation

Land Transportation Systems

Trunking Communications

Paging Systems

User Considerations in Radio System Design

Digital Speech Encoding for Land Mobile

Vehicle Location Systems

Automotive Systems

Vehicle Onboard Computer Systems

Electronic Vehicles

Papers from the conference will be published in the 37th Vehicular Technology Conference Record, which will be available at the conference and from the IEEE Publications Office. For more information on the conference, contact Professor Gerard Lachs, VTC Technical Coordinator, Department of Electrical Engineering, University of South Florida, Tampa, FL 33620, U.S.A.

TWENTY-SECOND GENERAL ASSEMBLY OF URSI

The twenty-second General Assembly of the International Union of Radio Science (URSI) will be held in Tel Aviv, Israel, from August 25-September 2, 1987 at the Tel Aviv Hilton and the nearby Palace Hotel. The following group meetings will run concurrently:

COMMISSION A — Electromagnetic Metrology

COMMISSION B — Fields and Waves

COMMISSION C — Signals and Systems

COMMISSION D — Electronic and Optical Devices and Applications

COMMISSION E — Electromagnetic Noise and Interference

COMMISSION F — Wave Propagation and Remote Sensing

COMMISSION G — Ionospheric Radio and Propagation

COMMISSION H — Waves in Plasmas

COMMISSION J — Radio Astronomy

Commission E will include papers on predischarge processes and associated radiation from lightning, spacecraft charging and electromagnetic effects, lasting effects of transients on equipment performance, lightning interaction with aircraft, electromagnetic phenomena related to earthquakes, the composite noise environment, non-linear effects in EMC/EMP, cloud-to-cloud discharges and radiation from lightning and the satellite and planetary noise environment. There will also be 18 joint symposia (including one on coupling and shielding), three one-hour general lectures, three two-day open symposia and nine one-hour tutorial lectures.

In addition, three half-day tours, seven full-day tours and four-day pre-Assembly and post-Assembly tours of Israel and a post-Assembly tour of Egypt have been scheduled. For additional information about the Assembly, contact the Secretariat, URSI General Assembly, P.O.B. 50006, Tel Aviv 61500, Israel or telephone 03-654571 or Telex 341171 KENS IL.

EMCABS

In this issue, we are publishing 36 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.

MELVIN J. JOHNSON

L.F. Babcock, Ford Aerospace Textron
E.L. Bronaugh, Electro-Metrics/Penril Corp.
R.N. Hokkanen, Harris Corporation
R. Jacobson, Sperry Flight System
S. Kuniyoshi, Naval Sea Systems Command
D.R. Kerns, Southwest Research Institute
R.B. Schulz, Xerox Corp./Off. Products Div.
R.M. Showers, University of Pennsylvania

"HOW CAN I GET A COPY OF AN ABSTRACTED ARTICLE?" The answer to this frequently asked question follows.

Most large public libraries, some small public libraries, all engineering school libraries, and most other college or university libraries have copies of publications in which articles appear. If they happen not to have the desired publication, such libraries usually can obtain it or a copy of the article from other libraries or sources. Many company libraries, both large and small, also have such arrangements. Many articles also are available from the National Technical Information Service (NTIS) and/or the Defense Technical Information Center (DTIC). To retrieve an article or publication containing an article abstracted in EMCABS, it is suggested that you contact your company library, a nearby engineering school library, a university library, or your municipal public library. If the library does not have the publication, go to the librarian, explain what you need and he or she will help you get the publication on loan, perhaps, from another library, or for a nominal charge, from NTIS. If you have a Department of Defense contract, the contracting officer, or your company librarian, can help you get publications from DTIC. The information needed is contained in the EMC abstract heading.

EMCABS: 1-11-86

International EMC Co-Operation in The Military Area
Dr. N. J. Carter
Royal Aircraft Establishment, Farnborough, Hants, ENGLAND
1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0004, September 16-18, 1986, pp. 4-7

ABSTRACT: This paper discusses the progress of international collaboration in the production of common EMC specifications. It does not cover the fields of lightning or EMP, where collaboration is probably working better than for EMC. The problems caused by the emergence of new National EMC specifications are highlighted, and the role of NATO as a focal point for future is discussed.

EMCABS: 2-11-86

Extending The National EMC Instrumentation Standard to Frequencies Below 10 kHz
Edwin L. Bronaugh, Director of Research and Development
Electro-Metrics, 100 Church Street, Amsterdam, NY 12010
1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0008, September 16-18, 1986, pp. 8-13

ABSTRACT: The paper discusses the measurement standards and applications for an Audio Frequency EMI Analyzer and how these diverse needs may be met by a standardized instrument. Some background is given on ANSI C63.2, which is THE U. S. national standard for EMC measurement instrumentation, and its role in providing manufacturers and users in divergent application areas with a common standard to assure highly economical and technically sound instrumentation.

EMCABS: 3-11-86

Time-Efficient EMI Analysis with Test Receivers
Manfred Stecher
Rohde & Schwarz, Muhldorfstr. 15, 8000 Munich 80, FRG
1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7-86-000-0014, September 16-18, 1986, pp. 14-18

ABSTRACT: A system is introduced consisting of two test receivers and an intelligent monitor/controller which is optimized for time-efficient analysis of all types of interference. It offers a panoramic spectrum display for manual operation, fast EMI spectrum analysis of any desired frequency range and the display of the test receivers' scan results. Post scan analysis is possible with zooming, markers, display lines, NB/BB identification and CISPR-QP-weighting where necessary.

EMCABS: 4-11-86

A New Detection Technique for RH and EMI Field Sensors for Measuring Both Peak and RMS Value
D. Golzio
Aeritalia G.Eq., Caselle Torinese, ITALY
1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0019, September 16-18, 1986, pp. 19-23

ABSTRACT: This paper describes the use of a signal multiplier as a detector in order to perform both peak and RMS measurements in an electric/magnetic isotropic field sensor. Since thermosensitive instruments show a high time constant, they can measure the RMS value only. The diode based instruments, using the "square law"-- region of the diode, measure the RMS value of the field but cannot measure the peak value; if used in the linear region they can either measure the RMS value by squaring x, y, z measurements or detect the peak value by using three synchronized peak holders. The proposed detection technique uses three signal multipliers as load of three orthogonal dipoles or loops that perform the square of the signals without losing the mutual phase information. Then the three signals are added to obtain the square of the instantaneous value of the electric or magnetic field. This signal applied to an integrator (RC circuit) gives by definition the square of the RMS value for all types of polarization. From the signal sum it is also possible to detect the peak value.

EMCABS: 5-11-86

Receiver Measurements Near the Noise Floor
R. L. Belding, Jr.
Hewlett Packard Company, Signal Analysis Division, 1212 Valley House Drive, Rohnert Park, CA 94928
1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0024, September 16-18, 1986, pp. 24-31

ABSTRACT: Regulations require emissions to be below given limits. When transducer loss is considered these levels may be near the noise floor of a receiver. Production costs demand minimum practical margin between emissions and the regulated limit. Error budgets should include a factor for the instrumentation. This paper examines the errors when making measurements near the noise floor of the receiver and offers measurement techniques for insuring accuracy at low signal levels.

EMCABS: 6-11-86

Modifications Needed to Improve MIL-STD-462 Test Method CS03
Robert G. Siefker
1986 IEEE International Symposium On Electromagnetic Compatibility
U.S. Government work not protected by U.S. copyright, September 16-18, 1986, pp. 32-36

ABSTRACT: Military radio receivers are required by MIL-STD-461 to comply with requirements CS03 (Intermodulation), CS04 (Rejection of Undesired Signals) and CS05 (Cross Modulation). Each of these requirements appears to test a potentially important susceptibility characteristic of radio receivers. The implementation of Test Method CS03, prescribed in MIL-STD-462, does not accomplish the intended test demonstration of intermodulation characteristics.

17th EUROPEAN MICROWAVE CONFERENCE

The 17th European Microwave Conference will be held on September 7-10, 1987 at the Ergife Palace Hotel, Rome, Italy. A workshop will be held on September 11th on "Present and Future Terrestrial and Satellite Microwave Communications For Fixed and Mobile Services."

CONFERENCE TOPICS

All areas of microwaves will be considered. Special emphasis will be placed on the advanced applications on:

Radiocommunication Terrestrial Systems
Communication Satellite Systems
Radar
Remote Sensing
Mobile Radio Systems
New Technologies

Also, papers on recent advances in the following areas will be welcomed:

Millimeter and sub-millimeter components and circuits
Passive circuits, including SAW
Tubes
MMIC's and their applications
Antennas
Propagation
Electromagnetics
Measurements, including EMC
CAD-CAM
Industrial, medical and biological applications

CONTRIBUTIONS

Papers are sought describing work **not** previously published which can be either theoretical, technological or applications oriented. Papers will be in English.
Authors are requested so submit six typed copies (single-spaced) of a 3-page summary. The summary should include a concise statement of the work under review, emphasizing what is new, as well as the techniques being employed together with the main conclusions. Whenever appropriate, a few essential figures should be added. The first page should start with the author's name, affiliation and full address clearly stated. **DEADLINE FOR SUMMARIES: MARCH 2nd 1987.**

Summaries should be sent to:
Prof. F. Fedi,
17th European Microwave Conference,
Fondazione "Ugo Bordoni",
Via Baldassarre Castiglione, 59
00142 Roma, Italy.

The summaries will be assessed by a European review board. The final decision, taken by the Technical Programme Committee, will be forwarded to the authors at the end of April 1987. A complete manuscript will be requested in June 1987, for inclusion in the Proceedings. Presentation of papers during the Conference will be in English. The Management Committee will award an EuMC Microwave Prize of S.F. 1000 to the author(s) presenting the best paper at the Conference. This conference is supported by the IEEE, URSI, IMPI, EUREL, IEE and FUB.

USING REVERBERATION CHAMBERS FOR EM SUSCEPTIBILITY TESTS

A microwave reverberation chamber is a large metal enclosure for performing electromagnetic interference (EMI) susceptibility (vulnerability) tests on equipment. Its moving tuner provides a suitably uniform electromagnetic (EM) field within the chamber. This type of chamber offers several potential advantages over other methods, including high isolation from the environment, efficient generation of intense EM fields, broad frequency coverage, relatively low cost, potential for use in emission testing as well as susceptibility and no requirement for rotation of the equipment under test. The lowest frequency of operation is typically several hundred megahertz.

In the past, concerns have been voiced about interaction effects between the chamber and the equipment under test, and about the interpretation and accuracy of measurement results and their correlation with more conventional measurement techniques. NBS has conducted a 3-year program to evaluate, develop, and document a methodology for using a reverberation chamber. The detailed results of this program are given in *Design, Evaluation, and Use of a Reverberation Chamber for Performing Electromagnetic Susceptibility / Vulnerability Measurements* (TN 1092), available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, for $7 prepaid. (Order by stock no. 003-003-02734-1).

SHIELDING EFFECTIVENESS OF PLASTICS

Many of the plastics used as binders or substrates in electromagnetic shielding applications are electrical insulators. This causes problems in measuring the shielding effectiveness of these materials and in interpreting the results of the measurements. Difficulties are encountered in obtaining repeatable results when different techniques are used and in matching measurement conditions to application conditions. Improved measurements can aid design efforts and reduce the cost of redesigns mandated by failure to pass FCC tests of final products.

Shielding Effectiveness Measurements of Plastics (NBSIR 85-3035) explains these problems and provides a solution based on the use of a flanged coaxial holder for the plastic sample. The publication is available from the National Technical Information Service, Springfield, VA 22161, for $9.95 prepaid. (Order by PB# 86-219680).

EMCABS: 7-11-86

Improved Technique for Measuring Induced Bridgewire Current
Marvin W. Shores, EMC Consultant
9 Meadow Ridge Circle, Pomona, CA 91766
1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0037, September 16-18, 1986, pp. 37-42

ABSTRACT: An electroexplosive device (EED) is generally a two-terminal component consisting of a hot bridgewire in intimate contact with explosive materials. The EED and its fire control circuitry, like any other network, is potentially vulnerable to spurious electromagnetic energy and therefore, depending on its function, must be certified either as reliable or, safe and reliable, in its worst case environment. The techniques commonly used today for measuring bridgewire current upset the inherent electromagnetic configuration of the system, because of the addition of instrumentation hardware; thus some degree of confidence in the test results may be lost. This paper describes a measurement device that increases the confidence level of the test by providing a greater degree of accuracy and adds nothing but dielectric material to the system under test.

EMCABS: 8-11-86

Advanced Current Shunting Device for Shielded Cable and Conduit
Mike Van Brunt
G & H Technology, Inc., 750 West Ventura Boulevard, Camarillo, CA 93010
1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0043, September 16-18, 1986, pp. 43-50

ABSTRACT: There is a potential threat to below-decks sensitive electronic equipment on ocean-going vessels. The threat is a result of shielded cables and conduit that are not grounded as they penetrate the ship's deck. This paper deals with the design progression, analytical modeling and qualitative evaluation of a new concept in current shunting devices. The significance of this work is two-fold in nature. It offers the end user a state-of-the-art termination system for shielded cables and conduit that significantly reduces shield currents. The project also produced a correlated mathematical model that was verified during the evaluation testing. This model allows the end user the ability to accurately predict the performance of the device without the tremendous expense of prototyping and evaluation testing.

EMCABS: 9-11-86

Applications of The Ladder Network for Transmission Line and Magnetic Shielding Problems
Chi-Chung Wong, Department of Electronic Engineering
City Polytechnic of Hong Kong, Argyle Centre, Tower II, 700 Nathan Road, Mongkok, Kowloon, HONG KONG
1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0051, September 16-18, 1986, pp. 51-54

ABSTRACT: The ladder network is used to model (i) transmission line performance and (ii) magnetic shielding due to a long hollow tube. A set of first order ordinary differential equations is developed from the network analog and is solved by the 4th order Runge-Kutta or by Gear's method. The latter is used for non-linear problems. Examples of transmission lines and magnetic shielding by a long hollow ferrous or non-ferrous metallic tube are described. The major advantages of the method are (i) an arbitrary signal can be applied and (ii) non-linearity and/or inhomogeneity can be modelled easily.

EMCABS: 10-11-86

How Big A Hole Is Allowable In A Shield - Theory And Experiment
L. O. Hoeft
The BDM Corporation, 1801 Randolph Rd., SE, Albuquerque, NM 87106
1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0055, September 16-18, 1986, pp. 55-58

ABSTRACT: Theory and experiment show that surprisingly large apertures in a shield may be acceptable if the shield has modest (50dB) shielding requirements. Theory allows credible extrapolation to other situations.

EMCABS: 11-11-86

Finite Element Solution Of Steady-State Skin-Effect Problems In Shielded Microstrips
George Costache, Senior Member, IEEE
University of Ottawa, Ottawa, Ontario, CANADA, KIN 6N5
1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0059, September 16-18, 1986, pp. 59-61

ABSTRACT: The skin-effect in shielded microstrips is solved by applying the finite element method to the integro-differential equations written for the vector magnetic potential describing the problem. The approach takes into account a combination of one-dimensional and two-dimensional finite elements. From the magnetic vector potential, the current density inside the shielded microstrip is evaluated and two useful design parameters, ac resistance and ac reactance, are calculated in terms of frequency and proximity of the microstrip to the shield.

EMCABS: 12-11-86

The Effective Shielding Effectiveness Of A Space Vehicle
Abul R. Rashid
Rockwell International, Satellite Systems Division, Seal Beach, CA 90740
1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0062, September 16-18, 1986, pp. 62

ABSTRACT: A mathematical formula has been developed to predict the shielding effectiveness, from inside to outside, of a space vehicle. Such a formula shows that the shielding effectiveness of such a space vehicle varies as the point of observation on the outside of the space vehicle is varied. A possible method of measuring the shielding effectiveness of a space vehicle is presented. A typical method of measuring the shielding effectiveness of a space vehicle is shown in Figure 2. In this method, the space vehicle structure is rotated about its axis and the electric field intensity, at various points on the structure, may be measured with the source located inside the space vehicle. The location of the source inside the space vehicle needs to be varied to take into account the effect of source location on the shielding effectiveness of the structure. The measured minimum shielding effectiveness of the structure at a given frequency should be accepted as the true shielding effectiveness of the structure. If such a true shielding effectiveness value is unacceptable, various techniques may be implemented on the structure to increase its shielding effectiveness.

CALENDAR
1987

January 12-15	1987 Radio Science Meeting University of Colorado Boulder, CO Contact: Professor S. W. Maley National Radio Science Meeting Department of Electrical Engineering University of Colorado Boulder, CO 80309
March 3-5	7th International Zurich Symposium & Technical Exhibition on EMC Zurich, Switzerland Professor Dr. T. Dvorak ETH Zentrum-IKT 8092 Zurich, Switzerland Telephone: (411) 256-2790 Telex: 53178 ethbi ch. In U.S.A.: R. M. Showers (215) 898-8123
April 21-23	Fourth Annual Electric Overstress Exposition San Jose Convention Center San Jose, CA Contact: Jim Russell EOE 2504 North Tamiami Trail Nokomis, FL 33555 Telephone: (813) 966-9521
April 21-23	22nd Annual High Frequency Power Conversion Conference '87 Crystal Gateway Marriott Washington, DC Contact: Sam Davis, Technical Director HF Power Conversion '87 2472 Eastman Avenue Building 34 Ventura,CA 93003 Telephone: (805) 658-0933 Telex: 182218 pci vent.
June 1-3	IEEE Vehicular Technology Conference Holiday Inn Hotel & Conference Center Tampa, FL Contact: Professor Gerard Lachs Dept. of Electrical Engineering University of South Florida Tampa, FL 33620 (813) 626-7111

EMCABS: 13-11-86

Advanced Cable Shield Termination Process For Broad-Band EMI Suppression

Jeffrey J. Hager, Michael K. Van Brunt
G & H Technology, Inc., 750 West Ventura Boulevard, Camarillo, CA 93010

1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0063, September 16-18, 1986, pp. 63-70

ABSTRACT: The objective of this project was to design and develop a shielded cable-to-connector termination that would combine a high level of broad-band electromagnetic shielding, superior mechanical characteristics, ease of assembly and cost effectiveness. The design produced broad-band attenuation in excess of 120dB in the frequency range of 100 KHz to 3 GHz, sloping to 90dB at 10GHz. The mechanical evaluation produced backshell bending moments and torque resistance in excess of 1000 inch-pounds. Dynamic loading of 40 G random for eight hours in each axis produced no degradation to the electrical or mechanical character of the backshell to connector interface.

EMCABS: 14-11-86

Fadings of VHF Signals at 70.3 MHz and 160.6 MHz in a City

Ashok Chandra, Regional Engineer-in-Charge (Western Region)
Ministry of Communications, Government of India, Monitoring Organization, International Monitoring Station, Gorai Road, Borivli (west), Bombay-400 092, INDIA

1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0071, September 16-18, 1986, pp. 71-78

ABSTRACT: It is observed that when vehicle-mounted radio receiving systems move through the roads of a metropolitan city, the rapid fluctuations of the received signals occur. This paper deals with the theoretical explanation of such behavior for the systems operating at 70.3 MHz and 160.6 MHz. The resemblance of the experimental and theoretical behavior has been discussed and analyzed. The theoretical model developed in this paper accounts for the signal losses from the diffraction phenomenon occuring over and around the physical obstructions (like buildings, hillocks), and reflections from the structures. It has been assumed that the diffraction losses depends on the log h^2 or W^2d, where d' is the distance between the measurement spot and the physical structure, h is height and W is width of the obstacle. The field strength of the received signals at various locations in the city areas have also been measured.

EMCABS: 15-11-86

A Survey of VHF Man-Made Noise in the Metropolitan City Area of New Delhi

Ashis Sanyal
Centre for Electromagnetics, Department of Electronics, Government of India, 283 Mount Road, Madras-600 018, INDIA

1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0079, September 16-18, 1986, pp. 79-86

ABSTRACT: Multiple sets of man-made radio noise data are reported for a number of locations in the mertropolitan city area of New Delhi. These are examined to assess the frequency, distance and diurnal characteristics of the composite city noise for urban locations. The measurement was restricted in the frequency band of 50-100 MHz to observe the impact of noise on VHF land-mobile and TV broadcasting services. The incidental noise environment to be experienced by these services at different busy activity zones of the city is observed to have a contrasting spectral pattern.

EMCABS: 16-11-86

Radio Frequency Interference (RFI) and Electromagnetic Compatibility (EMC) Survey of Hospitals

Daniel L. Williams and William H. McGinnis
Southwest Research Institute, P.O. Drawer 28510, 6220 Culebra Road, San Antonio, TX 78284

1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0087, September 16-18, 1986, pp. 87-89

ABSTRACT: Manufacturers of medical and ancillary hospital equipment are interested in the Radio Frequency Interference/Electromagnetic Compatibility (RFI/EMC) environment in hospitals. Southwest Research Institute (SwRI) conducted a mail survey of hospitals across the United States to help identify current RFI/EMC problems. The SwRI questionnaire was designed to qualify electrical/RFI/EMC problems occurring with hospital equipment. From this information, a picture of the RFI/EMC environment of a typical hospital could be drawn.

EMCABS: 17-11-86

An Automated HF Noise Measurement System

L. D. Dornetto, J. R. Reaves, L. M. Valoppi
Naval Electronics Systems Engineering Center, EMC Analysis Division, 4600 Marriott Drive, Charleston, SC 29418

1986 IEEE International Symposium On Electromagnetic Compatibility

September 16-18, 1986, pp. 90-96

ABSTRACT: This paper describes an automated noise measurement system, configured entirely with off-the-shelf components, that accurately gathers a representative sample of both noise and signal data over the entire HF spectrum. The measurement system described, although not strictly portable, has been taken literally around the world, via commercial air carriers, to gather noise data. The results of two surveys, one conducted in a quiet rural area and the other conducted in a suburban area, are also presented. The determination and control of man-made noise in the 2 MHz - 32 MHz (HF) frequency band is a major concern to those who must operate, maintain and plan for HF receiver installations. The ability to obtain an accurate and statistically significant characterization of the RF noise throughout the entire HF spectrum and not be limited to a set of noise measurements taken at several preselected points within the spectrum is paramount.

EMCABS: 18-11-86

Experimental Study of Road Guided Waves in a Snowy Mountain

Yoshio Yamaguchi*, Yukio Ohtaki*, Kazuhiro Watanabe*, Yashuaki Kidou**, and Takeo Abe*
*: Faculty of Engineering, Niigata University, Niigata, 950-12 JAPAN
**: Toyama Technical College, Toyama, 930 JAPAN

1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0097, September 16-18, 1986, pp. 97-99

ABSTRACT: This paper presents the experimental results of radio propagation in a large groove guide. The groove guide examined here is a road surrounded by snow-packs of 5m in height in a snowy mountain. Experimental test was carried out on horizontal and vertical polarization characteristics in a frequency range from 150 MHz to 4.7 GHz. It is shown that the attenuation constants for both polarized waves decrease with increasing frequency below 1 GHz and increase slightly in higher frequency.

June 15-19	1987 IEEE Antenna and Propagation Society Symposium and International Union of Radio Science (URSI) Meeting Virginia Polytechnic Institute and State University Blacksburg, VA Contact: Warren L. Stutzman Department of Electrical Engineering Virginia Polytechnic Institute and State University Blacksburg, VA 24061 Telephone: (703) 961-6835
August 25-27	IEEE International Symposium on EMC Marriott Downtown Atlanta, GA Contact: Hugh W. Denny Telephone: (404) 894-3535
August 25-28	COMPUMAG 87 Conference on the Computation of Electromagnetic Fields Graz, Austria Contact: K. Preis, M. Konigswieser INTERCONVENTION P. O. Box 80 A-1107 Vienna, Austria
August 25-September 2	22nd General Assembly of URSI Tel Aviv Hilton & Tel Aviv Palace Hotels Tel Aviv, Isreal Contact: Secretariat URSI General Assembly P. O. Box 50006 Tel Aviv 61500, Israel Telephone: 03-654571 Telex: 341171 KENS IL.
September 7-10	17th European Microwave Conference Ergife Palace Hotel Rome, Italy Contact: Professor F. Fedi 17th European Microwave Conference Fondazione "Ugo Bordoni" Via Baldassarre Castiglione, 59 00142 Roma, Italy

EMCABS: 19-11-86

The Work of CISPR Sub-Committee A Radio - Interference Measurements and Statistical Methods

Ove Larsson
Swedish Telecom Radio, Rff, D - 123 86 FARSTA, SWEDEN

1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0100, September 16-18, 1986, pp. 100-103

ABSTRACT: A review is made of the CISPR specifications for radio interference measuring apparatus, in particular with quasi-peak detectors. Other equipment specified for general measuring methods as artificial mains networks, antennas and the absorbing clamp are also presented. A couple of topics in the present work of Sub-Committee A are mentioned.

EMCABS: 20-11-86

Tasks and Work of CISPR Subcommittee B - Interference from ISM Equipment

Dr. A. C. D. Whitehouse
Radio Regulatory Division, Department of Trade and Industry, Waterloo Bridge House, Waterloo Road, ENGLAND SE1 8UA

1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-00104, September 16-18, 1986, pp. 104-108

ABSTRACT: The paper reviews the background to the current revision of the IEC/CISPR Recommendation for radio interference limits for Industrial, Scientific and Medical Equipment. The emerging conclusions are presented.

EMCABS: 21-11-86

Tasks and Work of CISPR Subcommittee C - Radio Interference Generated by Power Lines and Distribution Equipment

C. H. Gary, Fellow IEEE, Chairman of CISPR - Subcommittee C
Electricite De France, 1 Avenue du General de Gaulle, 92141 Clamart, FRANCE

1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-0109, September 16-18, 1986, pp. 109-115

ABSTRACT: This paper intends to summarize the present state of knowlege enabling the interfering effect of high voltage lines and equipment to be explained and calculated. It first describes the various sources of noises, such as conductor corona, noise produced by insulators and "micro-sparks." It also gives some information about the problem of permissible noise field levels, which issue has been studied by the CISPR-SC/C over the past years and it ends with an explanation of the "philosophy of limits" such as has been worked out by this Subcommittee.

EMCABS: 22-11-86

Progress Toward a World Standard for Control of Ignition Radiation

Frederick Bauer, P. E.
Consultant In Electromagnetic Radiation, 440 Meadowlane Road, Dearborn, MI 48124-1126

1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-00116, September 16-18, 1986, pp. 116-119

ABSTRACT: CISPR (International Special Committee On Radio Interference) Subcommittee D (formerly named Working Group 4) has been engaged in the development of suppression techniques, measurements and limits for impulsive ignition noise since 1960. Beginning with at least seven uncoordinated national specifications, negotiation and cooperation have today resulted in a Standard which has the potential of being adopted for use in every industrial country in the world. Uses of radio and TV have bloomed during development of CISPR Standard, adding complexity to the task. Major developments are highlighted, together with a brief history of the Standard and an explanation offered how the work of the Subcommittee assists the flow of international trade.

EMCABS: 23-11-86

Work And Task of Subcommittee E of CISPR

E. Nano
Politecnico di Torino, Corso Duca degli Abruzzi, 24, Turin (ITALY),,
Istituto Elettrotecnico Nazionale "Galileo Ferraris," Strada delle Cacce, 91, Turin (ITALY)

1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-00120, September 16-18, 1986, pp. 120-128

ABSTRACT: A brief story of the CISPR SC E is given and the main differences existing in the past between its task and those of the other Sub-Committees are underlined. In fact, the measurement methods of receiver radiation and immunity were provided by IEC SC 12 A, and CISPR SC E was asked to fix the limits only. The disadvantages of this procedure were avoided by transferring I2 A/WG 1 into CISPR SC E as CISPR/E/WG2. The main methods of measurement are recalled and the advantage of having the same methods and limits in several countries is considered. As an example, European Standards, based on CISPR Recommendations, will be used in the near future as technical annexes of the European Community Directives in order to relax trade barriers for radio and television broadcast receivers and associated equipment, as far as concerns their radiation and immunity characteristics.

EMCABS: 24-11-86

The Measurement of Complex Permittivity Tensor by Standing-Wave Method in a Rectangular Waveguide

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1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-00133, September 16-18, 1986, pp. 133-139

ABSTRACT: A rubber sheet manufactured by the rolling method has extensive anisotropy, which is caused by carbon particles or carbon fibers aligned along the direction of rolling. The measurement method of complex permittivity tensor in the rubber sheet by standing-wave method in a rectangular waveguide is studied. The tensor including off-diagonal elements and the principal directions were measured and discussed. Errors in the measured tensor elements and principal directions were evaluated.

EMCABS: 25-11-86

Evaluation of RF Anechoic Room Absorbers in 30-1000 MHz Range
Anatoly Tsaliovich
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1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-00140, September 16-18, 1986, pp. 140-144
ABSTRACT: A practical method is developed to evaluate microwave absorbers used in electromagnetic compatibility test rooms. It is based on conventional EMC antenna test procedure and yields realistic absorber performance parameters. The method was used to evaluate the effectiveness of commercially available absorbing materials: ferrite tiles, 30-inch pyramidal absorber, 45-inch pyramidal absorber and a combination of ferrite tile and 45-inch pyramids. The absorber effectiveness is determined as a function of signal frequency, wave polarization, and receive antenna height over the ground plane. These data may be utilized in anechoic room design and electromagnetic compatibility test result interpretation.

EMCABS: 26-11-86

The RF Absorber Horn Test System
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1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-00145, September 16-18, 1986, pp. 145-149
ABSTRACT: The RF Absorber Horn Test System facilitates the measurement of high performance RF anechoic chamber absorbers over the 100 MHz to 18 GHz frequency range. Absorber reflectivity measurements as low as -50dB are possible at normal incidence with practical sized samples. The measurement system and how it functions are detailed, and examples of measured and reduced data are given. The test system consists of a square horn lined with high loss wedge absorber driven by a tapered horn section lined with flat high loss absorber. The tapered section is fed by an electrically small source antenna and the square section houses a directional probe antenna which is moved longitudinally along the axis of the horn to detect the standing wave created by the electromagnetic wave reflecting from the test sample mounted in the end of the square horn and the uniform incident wave formed by the tapered horn at the source end.

EMCABS: 27-11-86

Combiner Networks for High Speed, High Density Integrated Circuit Susceptibility Testing
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1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-00150, September 16-18, 1986, pp. 150-154
ABSTRACT: This paper describes various techniques which have been developed for combining high-speed digital signals with RF signals for use in measuring the susceptibility characteristics of High-Speed, High-Density (HSHD) integrated circuits (IC's). Six different combiner networks are evaluated in terms of pin applicability, frequency range, bandwidth, RF-to-digital port isolation and load sensitivity. This work was sponsored under RADC Contract F30602-85-C-0088.

EMCABS: 28-11-86

Effects of Removing Spring Fingers and the Wavy Washer on the Measured Transfer Impedance of a MIL-C-38999-500 Connector
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1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-00155, September 16-18, 1986, pp. 155-157
ABSTRACT: The surface transfer impedance of a MIL-C-38999-500 connector was measured in the intact condition, with varying numbers of the sprig fingers covered with kapton tape and with the wavy washer removed. Voltage response was measured from 1 kHz to 1GHz. Transfer impedance could be calculated up to 200 MHz. These measurements showed that the transfer impedance did not change significantly when up to 8 spring fingers were covered with tape and that the transfer impedance of the connector with all spring fingers taped was less than that of 1 meter of single overbraid. In addition, the wavy washer was almost as effective as the spring fingers for insuring low contact impedance between the plug and the receptacle.

EMCABS: 29-11-86

Measured Electrical Impedance of Two Generic Panel Joints
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1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-00158, September 16-18, 1986, pp. 158-160
ABSTRACT: The electrical impedance of two generic panel joints was measured by installing a 2-foot-square sample containing the joint on one face of an electrically tight box, injecting a surface current across the joint, and measuring the voltage across the joint on the inside of the box. Impedance measurements were made from 10 Hz to 100 MHz and dc resistance measurements were also made. The dc resistance of the joint in which sealant was applied to the surface before the joint was assembled was 35 microohms. The dc resistance was consistent with the ac impedance for frequencies below 10 kHz. Above 10 kHz, the electrical impedance was proportional to the square root of the frequency. This behavior suggests that the electromagnetic performance of these joints is determined by the contact impedance of the joints.

EMCABS: 30-11-86

On the Computation of Electromagnetic Field Components from a Practical Printed Circuit Board
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1986 IEEE International Symposium On Electromagnetic Compatibility
CH2294-7/86/000-00161, September 16-18, 1986, pp. 161-166
ABSTRACT: An analysis leading to the computation of the electromagnetic field components due to radio frequency current flow in a pair of printed circuit traces, running between two active devices on a printed circuit board (PCB), is presented. A software programme (SWP) incorporating the analysis has been developed to compute the field components for both near zone and far zone. Methods to reduce the emanation components at a field point are discussed and results of numerical investigation are reported.

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