IEEE EMC SOCIETY Newsletter

ISSUE NO. 153 SPRING 1992 (ISSN 0164-7644) EDITOR: ROBERT D. GOLDBLUM

MIL-STD-461/462 CIRCULATED

As most IEEE EMCS Newsletter readers are aware, representatives from the Tri-Service EMI Standardization Working Group have been working on a revision of MIL-STD-461/462 to reflect state-of-the-art measurement methods and current interference control requirements. The group is comprised of representatives from the U.S. Army, Navy and Air Force. Various United States professional societies and military agencies have circulated draft versions of revised MIL-STD-461 and MIL-STD-462, along with their appendices. Distribution was in accordance with the Department of Defense (DoD) Defense Standardization and Specification Program.

The public has been given 75 days to review the proposal. Evaluations and comments must be received by the originating agency by May 30, 1992.

Readers should be sure to critique the appendix and the Data Item Descriptions (DIDs) as well as the document itself. The agencies involved are very interested in the public's response. If you have not received a copy, they are available from members of the following committees: Electronic Industries Association (EIA)/G-46 Committee; Society of Automotive Engineers (SAE)/AE-4 Committee; American National Standards Institute (ANSI)/C-63 Committee; and Institute of Electrical and Electronic Engineers (IEEE)/ EMC Society.

CHAPTER CHATTER EDITOR TO RESIGN

After many years of devoted service as the EMCS Newsletter Associate Editor for Chapter Chatter, Charlie Anderson has announced his resignation starting this fall. Mr. Anderson has been the Chapter Chatter editor since 1971, at which time he was also the editor of the New Jersey Coast Chapter Newsletter. His wit, direct reporting style and 'inside information' contributed to the great popularity of the column.

Mr. Anderson remains active in amateur radio professional organizations in Washington County, MD, communication services for the Red Cross and experimental work with antennas.

Chapters are the lifeblood of the Society and their activities must be publicized to keep them vital. Thus, the position of Chapter Chatter editor should be filled as soon as possible. The Chapter Chatter editor should have ongoing contact with Chapter chairmen, gather and edit information and forward a final column to the Newsletter editor each issue.

For more information for this important position, contact Bob Goldblum, Newsletter Editor, R&B Enterprises, 20 Clipper Road, West Conshohocken, PA 19428. Tel: (215) 825-1960. Fax: (215) 825-1684

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IEEE NEWSLETTER PUBLICATION SCHEDULE

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

Editorial contributions for the August 92 issue should be received by June 15.

BACK ISSUES OF THE EMC NEWSLETTERS ON MICROFICHE

We still have a few sets of the uFiche copies of the back issues of the IEEE EMC Society Newsletters from the present to 1955 when it was called "Quasies and Peaks." The price is $25.00 postpaid. If you would like to have one of these sets you can order it from: Dr. Chester L. Smith, EMC Society Historian, 2 Jonathan Lane, Bedford, MA 01730.

CHAPTER CHATTER

CHARLES ANDERSON
ASSOCIATE EDITOR

SPRING 1992

First, apologies to all for missing several issues of the Newsletter - no excuses; just my apologies. As you have probably assumed, there's quite a backlog of reporting to be done! First, please note that my address has changed as follows: 13403 Keener Road (instead of 2302) and ZIP code 21742-2833 (instead of 21740) - no move; just County going to grid-type addresses and Postal Service giving us a new Zip.

CENTRAL TEXAS

Back in October, the Chapter held a dinner meeting, followed by a tour of IBM/Austin's new semi-anechoic test range, with Jim Ball (IBM) performing the host activities.

In November, a meeting was held in New Braunfels, at which the speaker was consultant Bob Hunter. His topic was "Regulatory and Technological Trends in Power Supplies." He stressed the fact that the regulatory aspects of power supplies are in a period of significant change, and that power-supply design is one of the primary determinants of both safety and EMC compliance.

DALLAS/FT. WORTH

In January, Ed Bronaugh (Electro-Mechanics) was the featured speaker. The title of his talk was "The New Standard for Measuring Shielding Effectiveness of Room-sized Shielded Enclosures." He discussed several of the tests necessary to evaluate shielded enclosures using IEEE STD-298-1991. Covered were standard scope, objectives, content overview, procedures, test frequencies, and setup geometries. Examples of problems were presented and the report format/content was outlined.

The February meeting had as its speaker another Distinguished Lecturer, Don Heirman (AT&T Bell Labs). His topic was "The European EMC Directive and its Impact on Your Product." Although full implementation of the directive will not occur until the beginning of 1996, voluntary action might be an option. Don pointed out that the Directive includes immunity as well as emission limits. Questions which Don addressed were, among others: the possibility of trade barriers for marketing inside of the EC; advantages which multinational companies might have if manufacturing within the EC; ways in which the U.S. impacts EC norms; similarities/dissimilarities with respect to FCC standards; and current draft standards activities.

In March, Myron Crawford (NIST - Boulder) presented a talk on "Radiated EMC Measurements Using Reverberating Chambers." The speaker covered the status of work at NIST in the evaluation, development and documentation of methodology for making radiated EMC measurements in reverberating chambers or in hybrid TEM-mode-driven chambers. Limitations and advantages of the techniques were discussed to assist potential users in determining applicability to their specific needs.

MONTREAL

It has been quite interesting for me to receive this Chapter's newsletter. To try to improve my French, I've been folding the English (right-hand) side of the page under and struggling my way through the other - French - side. It has made for some interesting hours! At one meeting, Dr. T. J. Pavlasek (McGill U.) pointed out that some of the concepts which EMCers talk about are not well "grounded," using the concept of the "ground" as an example. With regard to open-area test sites, Dr. Pavlasek showed his audience some slides which illustrated the effects of ground planes on radiated field measurements. (I can remember having had a few arguments in years past with colleagues who didn't feel that ground-plane effects were significant!)

NEW JERSEY COAST

Last October, the Chapter had a meeting at which the speaker was David J. Goodman (Director of the Rutgers Wireless Information Network Laboratory - WINLAB). His lecture was entitled "Evolution of Wireless Information Networks." (Wouldn't some of the pioneers of our profession be astounded to find out what "wireless" involves these days!) He described the emerging technologies and some of the preliminary work on information networks anticipated for Century 21.

The November meeting featured Justin C-I Chuang (Bellcore) speaking on "Frequency Reuse and Planning for Personal Communications." After pointing out the problems of high computational complexity and lack of reliable propagation models in base-station carrier-frequency assignment, Dr. Chuang described a simple autonomous procedure by which each port (i.e., base station) can determine its own carrier frequency and achieve coordination for the entire system.

NORTHERN VIRGINIA & WASHINGTON

Words won't come easily - Bob Haislmeier's untimely death

Continued on page 4

#153 - SPRING - 1992

Continued from page 3

was a great shock to all who knew him, and a personal loss to those of us in the Chapter who were associated with him in its activities. Most of you have probably seen the obituary in the Winter issue of the newsletter. In deference to Bob's passing, the January meeting of the Chapter was cancelled.

Back in November, Mr. Robert Eckert (FCC Office of Engineering & Technology) presented a talk entitled "North American Effort to Create an HDTV Service." He described the ongoing committee and laboratory work being done to provide a basis for a decision as to which of the competing systems will be given FCC approval. Target date for adoption of a HDTV standard is currently 1993. A lively discussion period followed Mr. Eckert's presentation. The Chapter's March meeting (which I was unable to attend) featured Mr. Gerald Keightley (Deputy Director of Acquisition Career Management, Navy Department), whose topic was "Defense Acquisition Workforce Improvement Act." This Act, passed in 1990, is aimed at increasing the professionalism of military and civilian personnel who are active in DoD acquisition fields. The speaker outlined the educational training and experience requirements which these personnel must have prior to assignment. It has been estimated that over 100,000 DoD positions will be classified as acquisition-related. The DoD must comply fully with the law by October 1993.

SANTA CLARA VALLEY

Last September, the Chapter held a social and planning session and distributed a questionnaire to its members to develop a basis for the '91/92 season.

In October, a meeting was held at Apple Computer's Cupertino facility. Timothy D'Arcangelis (IFI President) spoke about a simple method to evaluate any room for immunity testing. He presented data plots for three types of rooms: bare metal, semi-anechoic and full-anechoic. Other aspects, such as the unsuitability of semi-anechoic rooms for immunity testing, were also discussed.

At the December meeting, the speaker was Joe Swaswamy (President - EMC Automation). He described a practical approach to radiated susceptibility testing with emphasis on the EC 1992 regulations. His discussion included both hardware and software aspects of an automated susceptibility test systems.

SWEDEN

Last Fall, the Chapter had a meeting at the Swedish National Testing and Research Institute (SP). Ingemar Islander (CEBIT, Stockholm) reported on the Cherry Hill Symposium. Ed Bronaugh was there to give a paper in which he discussed the new IEEE STD-299-1991. Martin Green (Interference Technology International - Consultants, Swindon, UK) presented a talk on shielding effectiveness of complete cable harnesses. After a luncheon, SP staff personnel showed the new large EMC test facility in which vehicles up to tank size can be tested. Peter Landgren, who keeps me posted regarding the Swedish Chapter's activities, enclosed a brochure with his last report showing the facility - quite impressive indeed! If anyone is interested, let me know and I'll send you a copy.

A meeting is planned for April 9 at the Swedish Ordnance facility in Karlskoga.

TWIN CITIES

Last October, the Chapter held a meeting in conjunction with the Minnesota EMC Event, which was sponsored by Amador Corp. and Kimmel Gerke Associates, Ltd. (This was the sixth of these annual Events. Perhaps some of the other Chapters might consider holding similar gatherings.) The three-day event featured a full-day seminar, Desing for EMC, on the 22nd; four half-day seminars on the 23rd; and on the 24th, an exhibit/trade show combined with half-hour tutorial sessions which ran throughout the day. The Chapter dinner meeting, held the evening of the first day, had as its speaker Jerry White (Marketing Manager - TDK/America). his topic was "Concepts in Anechoic Design using Stae-of-the-art Microwave Absorbers." The Chapter held two meetings in March. The first of these was a tour of the Bakken Library of Electricity in Life. The second featured Distinguished Lecturer Henry Ott, and was held in Rochester, MN, in conjunciton with the Southeastern Minnesota Section.

CENTRAL NEW ENGLAND

The November Chapter meeting had Timothy D'Arcanglis (IFI Corp) as a speaker. His topic was" Evaluating Test Rooms for Use in Immunity Compliance Testing." He presented data for three types: bare shielded, semi-anechoic and totally ferrite-lined. There were 16 attendees.

In January, Dick Ford (NRL) described the MIL-STD-461 Tri-Service Committee's work on revising limits, methods and applications. (The revised version should be available about now). There were 33 in attendance, of whom 18 were EMCS members.

The February meeting featured Leo Makowski (Haefely Test Systems). He spoke on "European Community 1992 Standards." Of the 34 attendees, 15 were EMCS members. Another meeting took place on March 10. The topic was "ISO 9000 Criteria - Do's and Don'ts for Certification." (Hope to have more info on this meeting for the next issue).

EMCS BoD ACTIVITIES

DON HEIRMAN
ASSOCIATE EDITOR

The first EMC Society Board of Directors meeting for 1992 was held on February 10 and 11, 1992 at the Grand Kempinski in Dallas, the site of our 1993 EMCS Symposium. Board members present included Warren Kasselman, Dan Hoolihan, Hugh Denny, Ed Bronaugh, Henry Ott, Janet O'Neil, Don Weber, Bob Goldblum, Don Clark, Walt McKerchar, Bob Hofmann, John Adams, Gene Cory, Bill Gjertson, Dave Staggs, Al Mills, Pat Coles, Don Heirman, Dick Ford, and Joe Butler. Board members absent were Chet Smith, Herb Mertel, and Bob Haislmaier, who recently passed away. Our newly installed President, Bob Hofmann, called a minute of silent prayer for our colleague and close friend of the EMC Society. Guests present included Ed Vance, Steve Mullenix, Luc Truong, Dick Schulz and Gary Sandoval (for Dr. R. Sato).

At 10:15 AM, the meeting was called to order and President Hofmann introduced the first order of business to fill Bob Haislmaier's unexpired term of office as a member of the BoD. The Board approved Dr. Akao to fill the unexpired term. Next, Gene Cory and Don Clark were nominated to fill the Director of Communications Services post which was held by Bob Haislmaier. Don withdrew his nomination and Gene Cory was then elected by acclamation.

Secretary O'Neil reviewed the minutes which were approved with minor changes. Next, Treasurer Dick Ford, presented his report. As of 1/21/92, the Society's net worth is $340K. Our long term investments continue to grow and now stand at around $235K of our net worth. Dick then showed a new Institute video on finance management. The BoD then critiqued the video and approved sending the critique to Headquarters.

Director Dan Hoolihan (Member Services) presented his series of reports. First, Pat Coles, Awards and Membership Chairperson, cited the awardees that were honored in Cherry Hill and circulated the request for award nominees for the Anaheim symposium in August. Impressively, 38 new IEEE members and 16 new EMCS members were enrolled at the Cherry Hill symposium. This resulted from an aggressive program which had as an incentive a free EMCS membership fee for the first year. The excellent location of the IEEE EMCS booth in the Cherry Hill Hyatt hotel lobby at the entrance to the exhibits also played an important membership recruiting role. Pat then reported that our Society stands at 4116 active members as of year end 1991. This is a 1.8% increase over 1990. The Institute's growth was only 0.4%. Of the 4116, 2602 are members, 353 are senior members, 65 are Fellows, and 1096 are in other categories such as affiliates and student members. Dave Staggs (Chapter Coordinator) reported that we have 33 active chapters with 9 outside of the United States. Nineteen Chapters were represented at the Chapter Chairperson's Luncheon at the Cherry Hill Symposium. Three joint chapters were proposed along with their organizers in 1991:

Washington, Connecticut - Jim Graham
Huntsville, Alabama - Joe Tannehill
Toronto, Canada - Victor Kee

The Atlanta EMC Chapter is now joint with the Instrumentation and Measurement Society. Bill Duff (Fellow Evaluation) reported that his committee evaluated 4 Fellow candidates in 1991. Only one nominee was approved - Fred Tesche. Bill urges that Society members submit nominees; nominations are due April 30 of each year. Bill works with Bud Taggart who conducts the Fellow search process. Don Clark (Constitution and Bylaws) reported that the latest changes to the society bylaws (March 1990) were approved by the Institute's Technical Activities Board (TAB). His chairmanship has now been transferred to our new Past President - Ed Bronaugh. John Adams (Distinguished Lecturer Program) proposed two new DLs. There was a strong sentiment to have one DL from Europe and one from the Pacific Rim/Asia. The Board will review the proposal and vote on approval at the next BoD meeting in May.

Director Cory (Communications Services) presented several reports. Chet Smith (History) recommends that we postpone our discussion to microfiche our publications and EMC Newsletters pending the TAB review of using the CD-ROM format. Bob Goldblum (Newsletter Editor) reported that his 17 associate editors are quite active in contributing EMC Newsletter articles. He also asked for comments on the 4-color photograph section used in the Fall 1991 issue. Pass your comments to Bob on (215) 825-1960. Hugh Denny (IEEE Press Liaison) reported the need to identify EMC Society reviewers of IEEE Press proposals and manuscript on EMC topics which are sponsored by our Society. If you are interested, call Hugh on (404) 894-3522. Dr. Kanda's (Transactions) report showed that Dr. Reinaldos Perez of JPL replaced Dr. Scott Bennett as the Associate Editor for EMC Standards. Dr. David Cohen of NTIA replaces S. H. Cameron for Spectrum Utilization. Prof. M. Ianoz of the Polytechnical University of Lasusanne, replaced Dr. David Giri for Lightning. Dr. Frederick Tesche replaced Prof. Clayton Paul for Cables and Grounding and Mr. Eyla B. Joffe joins Dr. Chang Yu Wu for Systems EMC. The special Transactions on High Power Microwaves will have 16 papers and will be published in August.

Continued on page 6

Continued from page 5

Gene then presented his symposium committee report. The Cherry Hill Committee (Don Heirman and Warren Kesselmen) reported that the financial audit has been successfully completed. Warren Kesselman, Symposium Treasurer indicated that he forwarded a check for $80,000 to Dick Ford which is the surplus from Cherry Hill. The mailing and cost for the free symposium record to all our members was already accounted for and hence the $80K is the real surplus. Don Heirman (General Chairman) indicated that the symposium final report is printed and will be handed to all future symposium chairmen that have been identified in Regions 1 to 6 to date. This report is a comprehensive review of all aspects of the symposium and its planning. The 300-page document will also be forwarded to Gene Cory and Hugh Denny for reference. Anyone interested in reviewing the document should contact Gene or Hugh. Gene is at (512) 736-0714. Hugh is at (404) 894-3522. Terry Cantine (1992 Symposium Chairman) reported that the advance program is about to be published. Ed Vance escorted the Board around the Grand Kempinski, the site for the 1993 symposium. Gene reported that Austin, Texas has been selected as the site for the 1997 symposium (Austin Hyatt will be the headquarters with the symposium held in the new Austin Convention Center). Boston is under consideration for 1998 and Denver for 1999. Bill Duff will now chair the 2000 symposium in Washington, D.C.

Pat Coles moved and the Board approved that the EMCS contribute $1000 to the IEEE New Jersey Coast Section Scholarship Fund in appreciation of their efforts in supporting the Cherry Hill symposium.

Director Walt McKerchar (Professional Services) presented his report. Bill Gjertson reviewed the proposal for a new videotape to promote an awareness of the EMC Society. The target audience are those with less than a high school education to those highly educated members in a variety of technical societies. This is scheduled to be available at the Anaheim symposium. Herb Mertel's report showed that for 1992 plans are to exhibit at the ESD/EMC Symposium in Denver, April 23-25, Beijing, China on May 25-27 and Edinburgh, Scotland on 21-24. Al Mills reported that his PACE activity includes reviewing information on engineering unemployment and the unemployment forecast. Bill Johnson's employment analysis report indicated that the survey responses from the Cherry Hill symposium will be published in the EMC Newsletter(Winter, 1992, pg.15). The results show an average of $72K in salary and an age of 45-46 years with about 20 years of EMC experience. Finally Bob Brook included a 17-page report on SSIT activities. For a copy of this report, contact Bob directly on (516) 595-3136.

Director Don Heirman (Technical Services) introduced his reports. First, as Chairman of the Society's Standards Committee, Don indicated that there were two new work proposals: calibration of isotropic probes and the measurement of magnetic fields using Helmholtz coils. If our members have interests in these topics, contact Don on (908) 741-7723. Clayton Paul's report (Education Committee) noted that John Adams has taken over the chairmanship of the Distinguished Lecturer Program and now reports to Dan Hoolihan, Director for Member Services. Clayton will also chair a special session on EMC Education in Universities at the Anaheim symposium. The EMC Experiments Manual now has 15 experiments that will be available for the Anaheim symposium. Wilf Lauber's report (Technical Advisory Committee) showed that the TCs reviewed 154 papers for the Anaheim symposium. The Technical Committees will present three tutorials and one special session at the Anaheim symposium:

1. EMC Compliance Test Alternatives: Non-Traditional Measurement Techniques (TC-2)
2. Control and Management of RFI Resolution in Southern California (TC-6)
3. Product Safety and EMC (TC-8)
4. Non-Sinusoidal Waves (TC-7)

Joe Butler (Representative Advisory Committee) presented his report. John Luchini was approved as the RAC representative to the National Association of Radio and Telecommunications Engineers (NARTE). Other topics covered in Joe's report included the COMAR-distributed IEEE USA entity position statement on "Human Exposure to RF Fields from Police Radar," EIA G46 activity, EOS/ESD Association highlights from their February 1992 Dallas meeting, SAE AE-4 work on shield room fires and ARP 958 EMC Antenna Calibration, and an Aerospace R&D Policy Committee report. Joe was also asked to scope out the interaction between the RAC or TC-1 (EMC Management) with NARTE.

Under other business, the Board approved the establishment of the President's Memorial Award. The award will be in the form of scholarship to a selected IEEE student or regular member. The scholarship will be for $1000 for one year with $1000 available for a second year. This proposal has been forwarded to the IEEE for their approval. More will be covered in our next newsletter. Dr. Bob Haislmaier was named the first honoree to be named for this award. The Board then approved the Treasurer's financial guideline for the 1993 budget submission. Don Clark proposed a change to the bylaws to accommodate eligibility of Board members for elected offices such as the presidency, vice-presidency, etc. The full text will be published in the Newsletter in a separate article.

In closing, President Hofmann indicated that the next meeting will be held in Boulder, CO, on May 11 and 12 at the Broker Inn. The EMCS Standards Committee will meet between 8 and 10 am on May 12 at the same location as the immediately following the Board meeting. For more information, call Janet O'Neil, Secretary, at (213) 870-9383.

INTER-SOCIETY ACTIVITIES

JOSEPH BUTLER
ASSOCIATE EDITOR

SAE AEROSPACE EMC STANDARDS ACTIVITY

SAE AE-4 ELECTROMAGNETIC COMPATIBILITY

Shield Room Fires: The AE-4 Committee is still collecting data related to fires, alarms, false alarms, damage, and other fire related situations that have occurred in EMC shielded enclosures. Any and all case histories are of interest. Questions include:

- Was there a fire or only smoke?
- Was a fire alarm or smoke detector involved?
- Was there some sort of extinguishing system and did it activate?
- Did the system put out the fire and/or did it create damage itself?

ARP 958 EMC Antennas: The first draft was circulated and comments were received. A second draft will be recirculated around March 1992. This document is also used as a reference in the new MIL-STD-461/462.

SAE AE-4R RADIATED ENVIRONMENTS

As a result of the last AE-4R meeting the week of January 27, 1992 in Tucson, Arizona, the FAA Advisory Circular on HIRF (High Intensity Radiated Fields) stands at draft 15 and is essentially complete. After approval by the SAE AE-4R Committee, the document will be formally sent to the FAA, as well as issued as an SAE study report by mid-year 1992.

The Notice of Proposed Rulemaking for the proposed FAA regulation on HIRF should be out by mid-year. At this point, the HIRF certification environment is defined from 10 kHz to 18 GHz with the highest levels at 6800 volts/meter from 4 to 6 GHz.

No further meetings of the entire SAE 4R committee are planned but Panel 3 of AE-4R, which is working on the User's Guide to accompany the Advisory Circular, will meet one or two more times to complete their work. RTCA SC-135 has been meeting in concert with AE-4R and will continue to do so with Panel 3 as they are addressing needed changes to DO-160C Part 20 as a result of the HIRF environment.

AMERICAN NATIONAL STANDARDS INSTITUTE C63.1 STANDARDS COMMITTEE, TECHNIQUES AND DEVELOPMENT

This committee is continuing its work on commercial equipment EMI testing issues in several areas. These include: LISN placement; site attenuation requirements below 30 MHz and above 1 GHz; acceptability of semi-anechoic and anechoic rooms; use of TEM devices for emissions and immunity measurements; antenna calibration; measurement errors; and FCC test site construction. This committee continues its work on EMI standards for household appliances and medical equipment. The immunity standard for commercial equipment was previously balloted to the committee. The negative ballots received are being addressed by the committee. Within the parent committee, C63, a ballot has been sent out recently on ANSI C63.16, "Guide for Electrostatic Discharge Test Methodologies and Criteria for Electronic Equipment." A review copy of C63.4, Draft 7, February 7, 1992 is out for comment as well.

ELECTROSTATIC OVERSTRESS/ELECTRONIC DISCHARGE (EOS/ESD) ASSOCIATION

T.J. (Bill) Ritenour, Representative Advisory Committee member, reports as follows:

A standards development meeting was held (February 1-5) at Loew's Anatole Hotel in Dallas, Texas to review EOS/ESD Association and Electronics Industries Association (EIA) published standards concerning electrostatic discharge (ESD) materials, products and testing techniques. In addition, new standards, now under development by the Association, were discussed. The meeting represented an effort of significant magnitude and has been enthusiastically supported by the EOS/ESD Association members.

The standards being examined or developed include: Packaging with respect to test methods, triboelectric generation, electrostatic shielding and symbols; workstations, device testing, and hand tools; ionization equipment and work surfaces, as well as a glossary; flooring, garments, footwear, grounding (for electrostatic control) and wrist straps; and a wrap-up meeting with the standards committee.

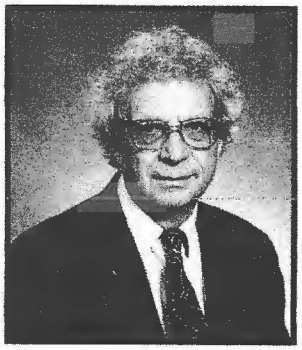
The next report will detail the EOS/ESD Standards that have been elevated to full standard status as a consequence of the February meeting.

IEEE TECHNOLOGY POLICY COUNCIL COMMITTEE - AEROSPACE R&D

Len Carlson, our IEEE EMCS representative, reports as follows: The IEEE USAR Space Station Position Statement was discussed per the request of the Galveston Bay section of the IEEE (GBS). Basically, GBS is concerned about jobs for EEs in the space program. The aerospace committee recommended that USAB stand by its November 20, 1991 statement and support a smaller space station project ($10B to $30B) but not in a pro-active mode. This seemed to appease the GBS folks. The committee then discussed initiatives that the IEEE could support in 1992 relative to space. Specifically, the IEEE

Continued on page 15

DIVISION IV DIRECTOR'S REPORT



MARTIN SCHNEIDER
DIVISION IV DIRECTOR

1991 ANNUAL REPORT OF DIVISION IV - ELECTROMAGNETICS AND RADIATION

Division IV is composed of five technical Societies: Antennas and Propagation (AP), Electromagnetic Compatibility (EMC), Magnetics (MAG), Microwave Theory and Techniques (MTT) and the Nuclear and Plasma Sciences (NPS). An additional member of our electromagnetic team is the Superconductivity Committee (SCC). Two additional Societies are joining Division IV in January 1992: Broadcast Technology (BT) and Consumer Electronics (CE).

The year 1991 in Division IV was characterized by efforts to enhance communications between the Societies and encourage their transnational activities. For example:

1. New chapters were formed at an increasing rate by the Societies in Regions 8, 9 and 10. In addition, members of Regions 8 and 10 were elected to the Administrative Committees of two Societies.

2. Vice Presidents in each Society were encouraged to attend the ADCOM meeting of another Society to establish contacts and learn from the experiences of other groups.

3. Six videotapes on electromagnetic topics featuring distinguished IEEE lecturers were produced. The program has been adopted by LEOS in Division I and has generated interest in other Divisions.

4. A new series of articles, "Classic Papers Revisited," was created. The purpose of this series is to rewrite fundamental classical papers, written several decades ago, for a modern audience.

5. A Division IV speakers' catalog was prepared for the IEEE Colloquium 1992 in Region 8. The proposed list includes four Society Presidents in Division IV, and the timely topic *Telecommunications Manufacturing in Newly Industrializing Countries.*

EMC

The Electromagnetic Compatibility Society, headed by President Edward L. Bronaugh, established new chapters in the United Kingdom and Germany, finalized the agreement with the French SEE to start a chapter in France, and is in the process of forming a joint Society with EMC-IREE in Australia. The EMC Society created an archive of all the Symposia, Newsletters and other relevant technical and historical information. Progress was made in updating existing standards and the publication of a new, important standard, No. 299-1991, entitled *IEEE Standard for Measuring the Effectiveness of EM Shielding Enclosures.*

EMERGING TECHNOLOGIES

Since the beginning of this year, I have been chairing the TAB New Technology Directions Committee whose mission is to forecast the future of various technologies and spearhead the investigation of the emerging fields. I contacted our Society President, Robert Hofmann, to discuss how the EMCS can make an impact and gain more visibility by informing IEEE members and Societies about emerging technologies in our field of interest. As a first step we propose to create a one-page executive summary describing emerging technologies in the EMC field. By adding similar summaries from other societies we will be able to create a portfolio and a data base of emerging technologies in the fields of electromagnetics and electrotechnology. Bob and I are also encouraging the publication and dissemination of emerging technology news briefs through society newsletters, magazines and the *IEEE Spectrum.* If you wish to participate in this team effort or have any suggestions on how to fulfill our mission please send us your thoughts by FAX, e-mail or just POTS (Plain Old Telephone Service).

SPEAK OUT!

EMC Society BoD members are eager to hear from Society members. Let them know what you would like your Society to do.

Names, addresses and phone numbers were listed on pages 15 and 17 of the Winter 1992 issue of the EMCS Newsletter. Call a board member. Speak out.

SPEAK OUT!

EDUCATION COMMITTEE NEWS

CLAYTON PAUL
CHAIRMAN

The Education Committee is in the final stages of preparing the packet of information for educators interested in establishing an EMC course in an undergraduate Electrical Engineering curriculum. As detailed in earlier articles, the packet consists of (1) a sample course outline, (2) a list of EMC experiments/demonstrations and (3) an extensive EMC bibliography. The bibliography was prepared primarily by Kimbal Williams of Eaton Corporation. The experiments/demonstrations were started by Henry Ott and myself. For several years we only had a few experiments. That list has now grown to 11. Each of the experiments has been checked and illustrates an important concept in EMC. The following is a list of those experiments and the authors:

(1) Crosstalk in Cables	Clayton Paul
(2) Electrostatic Discharge	Tony Nasuta
(3) Ground Noise in Digital Logic	Henry Ott
(4) "Rusty Bolt" Demonstrator	Raymond Elsner
(5) Noise Measurement by Induction	Doug Smith
(6) The Thinking Engineer's Voltage Measurement	Andy Marvin
(7) The Effect of Circuit Impedance on Field-Coupled Crosstalk	Tom Jerse
(8) Magnetic-Field Coupling of Current Loops	Jasper Goedbloed
(9) Effect of Pulse Rise/Fall Time on Signal Spectra	Clayton Paul
(10) Electromagnetic Leakage through Seams	Richard Mohr
(11) Common-Mode Currents and Radiated Emissions of Cables	Clayton Paul

The entire package will be printed and available at the Anaheim symposium. Anyone interested in obtaining a copy should send their name and address to: Clayton Paul, Department of Electrical Engineering, University of Kentucky, Lexington, KY 40506. I will send packages when they are printed. Those who have sent requests earlier, don't despair. I am keeping a list of requests and will send copies once they are printed. As before, if you have an experiment that you would like to submit for inclusion in future printings, send it to me at the above address. Please prepare it in the format that is suggested at the beginning of a previous edition of the EMC Experiments Manual. Any additional submissions will have to wait until a future edition is printed since I want to get this latest version printed.

As the representative of the EMC Society, I recently attended the meeting of the Computer Applications in Electromagnetic Education (CAEME) Policy Board. This meeting was held on March 6 at the University of Utah in Salt Lake City. EMCS joined CAEME to show our support for this worthwhile venture. CAEME has produced a number of interesting PC codes that illustrate various aspects of EM. Although they are primarily intended for teaching use in universities, CAEME has a number of corporate sponsors who are using these in their continuing education programs. Anyone interested in obtaining a list of these codes and other CAEME information can write me at the address given above, or the program director, Dr. Magdy Iskander, Center for Computer Applications in Electromagnetic Education, Department of Electrical Engineering, University of Utah, Salt Lake City, UT 84112.

The EMCS Newsletter is seeking a Chapter Chatter Editor. The position requires ongoing contact with Chapter chairmen, gathering and editing information, and forwarding a final column to the Newsletter editor. Interested persons should contact Robert Goldblum, IEEE EMCS Newsletter Editor, R&B Enterprises, 20 Clippper Rd., West Conshohocken, PA 19428. Tel: 215-825-1960 or Fax: 215-825-1684.

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INTERNATIONAL SYMPOSIA SCHEDULE

1992 Beijing, China: May 25-27
Prof. You-Gang Gao
P.O. Box 171
University of Post & Telecommunications
Beijing, 100088 China

Los Angeles, CA:
August 17-21
Anaheim Marriott Hotel
Terry Cantine
(818) 767-6770

1993 Dallas/Ft. Worth, TX:
August 10-12
Grand Kempenski Hotel
Ed Vance
(817) 478-5653

1994 Sendai, Japan: May 17-19
Sendai International Center
T. Takagi
Tohoku University
Aoba Aramaki
Sendai, Japan

Chicago, IL: August 22-26
Palmer House
Bob Hofmann
(708) 979-3627

1995 Atlanta, GA: August 22-24
Marriott Marquis Hotel
John Rohbaugh
(404) 894-8235

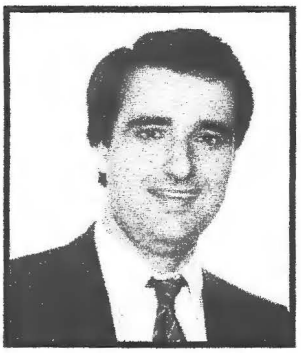
1996 Santa Clara, CA:
August 19-23
Santa Clara Convention Ctr.
Double Tree Hotel
David Hanttula
(415) 335-1071

1997 Austin, TX: August 18-22
Austin Convention Center
Hyatt Hotel
Gene Cory
(512) 736-0714

1999 Japan: May 15-17

2000 Washington, D.C.
Bill Duff, (703) 914-8450

BOOK REVIEW



REINALDO PEREZ
ASSOCIATE EDITOR

ARCHITECTURAL ELECTROMAGNETIC SHIELDING HANDBOOK
LELAND H. HEMMING
IEEE PRESS, 1991
$40.00 (IEEE MEMBERS)
$59.95 (NON-MEMBERS)

In the design and construction of shielded facilities for EMC testing, the need arises to evaluate all aspects of architectural shielding in order to obtain a good quality shielded enclosure. This book offers, in a single source, what you need to know if you plan to procure or upgrade a shielded enclosure for your business or company. The book will teach you to ask the "right questions" and get the "correct answers" in your contract with the manufacturer. The author compiles information from many sources and provides the most important aspects in this science-art subject.

The book is divided into nine chapters with three appendices. Appendix A includes a series of specifications for RF filters and doors which can help in the procurement process. Appendix B is a brief introduction to the magazine **ITEM**, which the author quotes extensively. The last appendix (Appendix C) is a two-page bibliography. Throughout the book the author uses the shielding standard NSA-65-6 as a baseline for shielding effectiveness (SE) comparisons among the different types of enclosures.

The first two chapters of the book provide a very brief introduction to shielded enclosures and associated terminology. Shielding theory is described in Chapter 3 and is similar to the material covered by other EMC books. The chapter covers three main types of seams in enclosures: welded seams for the large welded-type rooms, clamped seams for modular double-shielded rooms, and single-shielded seams for single-shielded rooms. The main point stressed is that continuous metal-to-metal contact is the most important requirement in seams.

The next three chapters discuss commercial systems and how they are built to achieve the desired performance. Chapter 4 deals with the most common enclosure - the modular-type - which is a clamp-up system using galvanized steel sheets (24 or 26 gauge) on both sides of a wood core or framework made of plated steel. The SE is about 100 dB for plane-wave/electric field (PW-EF) and the frequency, f, is greater than 10 kHz. The sheets are fabricated in panels four feet wide and eight, ten or twelve feet long. The most critical feature of modular enclosures is the clamping of the different sheet metals; if not clamped properly, the metal-to-metal seal will not exist and leakage will occur. Several types of clamps for wall and corner panels are discussed. The chapter ends with a discussion of double-isolated shielded/screen enclosures and single shielded enclosures. Because the outer shield is isolated from the inner shield in the double-isolated shielded rooms, they provide the best SE among all modular types (about 120 dB, PW-EF, f>10 kHz). The author stresses that SE in modular-types depends "on the skills of the installer"; hence, a reputable manufacturer is important.

Welded enclosures are covered in Chapter 5. Because of the expense, this type of enclosure should be considered when long term (> 30 years) high performance shielding (> 120 dB, PW-EF, f>10 kHz) is needed and where a large facility is required. They are built mostly of very large/heavy (16 gauge) galvanized steel plates with continuous welded seams and joints. The welding process is critical and three types are discussed: pan-welding, butt-welding, and lap-welding. Other construction considerations are also covered. Architectural shielding, covered in Chapter 6, refers to the shielding structure built into the structure of an existing room. It is a low-cost shielding alternative where either aluminum or copper foils are used for the shield. The SE is approximately 50-60 dB, PW-EF, f>10 kHz. Methods for soldering the aluminum and copper foils are reviewed. An architectural shielding facility that is of interest is that which uses "the sandwich seam approach" (seam shielding is achieved by using seams of metal sheets which are sandwiched between two layers of sheet metal). Good shielding is achieved by using the waveguide-beyond-cutoff principle. The seams/screws patterns form gaps with length. Thus they act as waveguides cutting off the electromagnetic energy below a given cutoff frequency. The metal sheets are positioned against plywood and flat-head dry wall screws are used.

Probably one of the most important subjects is penetrations into shielded enclosures and their control (Chapter 7). Penetrations are probably the major cause of decreased SE in many enclosures. Any penetration should have a cross-section as small as possible with respect to wavelength. Six types of suspect penetrations are: doors (by far the most troublesome), heater/AC vents, pipes, fiber optics tubing, shielded windows (only used for viewing in MRI rooms), and fire protection systems. For doors, four types of seal mechanisms are discussed: compression of RF gaskets between door and frame; the knife-edge door seal mechanism (also known as recessed contact mechanism) presently the most widely used/reliable; the wedge RF seal; and the sliding door/air pressured compression mechanism (mostly used in welded structures). Honeycomb frames (3/16 to 1/8 inch cells, 1 inch thick) should be used on vents and either clamped or welded to the ducts. Pipe penetrations should always maintain metal-to-metal sealing.

Continued on page 14

Continued from page 13

Some EM filtering is required in all electrical wiring which enters the enclosure. Chapter 8 covers the subject of filtering. After a brief introduction to filtering theory the chapter discusses the specifications required for different types of filters needed in an enclosure: power line, data, communications, and control.

Once an enclosure has been built, its SE needs to be tested. This subject is covered in Chapter 9. Three shielding standards for testing are addressed: MIL-STD-285 (now almost outdated), NSA 65-6, widely used since it is very conservative, NSA 73-2A for aluminum foil shielded enclosure, and IEEE 299 (proposed to replace MIL-STD-285). The testing procedures in MIL-STD-285 and NSA 65-6 are described with some comments based on the author's interpretations. Chapter 10 focuses on the grounding issue for fault protection and signal references. Single point and multiple single grounds are briefly covered. The book ends with a useful "Design Checklist" (Chapter 11) to guide in shielded enclosure procurement.

If you are thinking of procuring a shielded enclosure, this is a good book to consult. Even readers who are already familiar with the subject will find that Chapters 7, 9, and 11 contain very practical information.

ROOM RATE CHANGED

The site of the 1992 International IEEE EMCS Symposium, at the Anaheim Marriott has dropped its room rate for symposium attendees. Rates have been reduced from $95 to $89 (single) and $105 to $99 (double). For further information, contact Terry Cantine (818) 767-6770.

WROCLAW SYMPOSIUM

The 11th International Wroclaw Symposium and Exhibition on EMC will be held September 2 to 4, 1992. A preliminary program and registration information are available from: ORBIS Congress Bureau, POB 146, 00-950, Warsaw, Poland.

Detailed exhibitor information is also available. A video cassette demonstration service and an information material distribution service are also available. Contact: EMC Symposium, Box 2141, 51-645, Wroclaw, Poland.

GERMAN ASSOCIATION FOR EMC TECHNOLOGY FOUNDED

On Thursday, November 7, 1991, the "German Society for EMC-Technology" (DEMVT) was founded in Munich. MOre than 60 EMC experts from Germany, Austria and Switzerland attended the event. Dr. Erich Riedl, Parliamentary Secretary of State of the Ministry for Economics, was the guest speaker.

Dr. Riedl noted that EMC has the topic of many conversations since the German EMC regulations became valid on January 1, 1992. With these regulations, a multitude of national and international recommendations became law. In stating that "EMC is not only a theme for experts but also has growing importance in the political field," Dr. Riedl emphasized the importance of EMC technology and its extensive consequences in political and economic decisions.

The aim and task of the DEMVT is the demonstration and representation of EMC technology in political, economic and public spheres. The society would also like to promote an information exchange by establishing committees for specified fields.

More information is available from Kilian Muller, DEMVT, Geschaftsstelle, Chiemseestrabe 21, W-8200 Rosenheim, Germany.

EMC SYMPOSIUM

A Symposium on Electromagnetic Compatibility (EMC - 93) will be held in St. Petersburg, Russia from June 21-27, 1993. The symposium is sponsored by the St. Petersburg Electro-Technical Institute and Joint Stock Enterprise ILIP (Innovation of Leningrad Institutes and Enterprises). The symposium will provide a forum for the discussion of all aspects of EMC problems. Commercial concerns will also be addressed so that manufacturers can benefit from current research and development programs. An exhibition on EMC technologies will run concomitantly.

To receive a call for papers, general announcement, or exhibition application, contact: Professor Popov, str. 5, Electro-Technical Institute, 197376, St. Petersburg, Russia. FAX (812) 234-15-43.

INTER-SOCIETY ACTIVITIES *(Continued from page 7)*

should perform studies focusing on ways of reducing by one or more orders of magnitude the unit cost of surface space and space-space transportation; in-space electrical energy and life support systems; and in-orbit long-term residential and working space; Also, the IEEE should perform studies that focus on non-military activities in space which are economically attractive and involve large numbers of people.

If necessary, the IEEE should seek a private foundation to assist in conducting and disseminating the study. The duration of the study is not to exceed (6) months and the results should be tutorial in nature and viable, i.e., capable of being updated.

IEEE TECHNOLOGY POLICY COUNCIL COMMITTEE - COMMITTEE ON MAN AND RADIATION (COMAR)

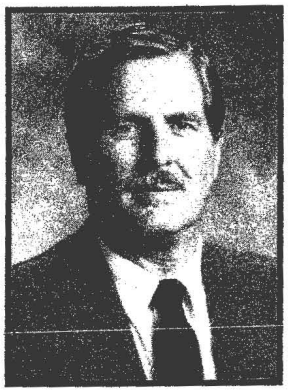
Dan Hoolihan, the IEEE EMCS representative, reports the following activity:

a. With respect to the IEEE-USA Entity Position statement on "Human Exposure to Radio Frequency Fields from Police Radar," the essence of the paper is that ".....it can be concluded that microwave exposures near police radar are safe by existing standards and there is no scientific basis for the alleged link of police radar with cancer."

b. U.S. Congressman George Brown, Chairman of the House Science, Space and Commerce Committee, introduced H.R. 3953 on November 16, 1991, "The National Electromagnetic Fields Research and Public Information Dissemination Act." This bill contains the following provisions:
   - Section 3 would establish an Electromagnetic Fields Interagency Committee charged to outline a proposed annual agenda for agency research.
   - Section 4 would establish a National Electromagnetic Fields Advisory Committee charged to review this agenda and establish short and long-term research priorities.
   - Section 5 directs the Secretary of Energy to establish a program to conduct research on human health effects of electromagnetic fields based on the Advisory Committee's priorities.
   - Section 6 directs the Secretary of Energy to establish a public information dissemination program.
   - Section 7 authorizes DOE expenditures of $60 million over fiscal years 1993 - 2002 for research (with a requirement of matching non-federal contributions for each research project) and $1 million annually for fiscal years 1993 - 2002 for public information programs.

This bill would provide opportunities for testimony by COMAR members while it is debated in the House of Representatives.

EMCABS



WILLIAM H. McGINNIS
ASSOCIATE EDITOR

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

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Readers should be aware that many of the Chinese papers are not available in English. Associate Professor Sah Fei, EMC Research Section, Northern Jiatong University has offered his time and assistance in routing requests for papers to the appropriate author(s). However, he cannot supply translations.

WIDENING THE BANDWIDTH OF FERRITE ELECTROMAGNETIC WAVE ABSORBER: 30-1500 MHz

EMCABS: 01-5-92

Y. Naito and T. Mizumoto (1), M. Takahashi (2), Y. Wakita (1)
(1) Tokyo Institute of Technology and (2) URO Electronics Co. Ltd.
IEEE EMCS Technical Chapter
EMCJ91-36, Sept. 20, 1991

Abstract: Widening the bandwidth of a ferrite electromagnetic wave absorber is discussed to cover the frequency range from 30-1500 MHz. Calculation shows that the reflection of a three-layered structure consisting of ferrite, dielectric and rubber ferrite is less than -20 dB in the frequency range from 30-1830 MHz. Experimental results are also demonstrated.

Index terms: Electromagnetic wave absorber, wide band, ferrite, rubber ferrite, multi-layer

WIDENING THE BANDWIDTH OF FERRITE ELECTROMAGNETIC WAVE ABSORBER [II]: 30-1500 MHz

EMCABS: 02-5-92

Y. Naito and T. Mizumoto (1), M. Takahashi (2), Y. Wakita (1)
(1) Tokyo Institute of Technology and (2) URO Electronics Co. Ltd.
IEEE EMCS Technical Chapter
EMCJ91-40, October 11, 1991

Abstract: Based on the scheme of loading a pair of low-permittivity dielectric and rubber-ferrite layers, widening the bandwidth of electromagnetic wave absorber is discussed to cover the frequency range of 30-1500 MHz. It is shown that the four-layered structure, composed of dielectric, and rubber-ferrite, provides reflection of less than -20 dB in the frequency range from 30 to 1910 MHz. Experimental results are also determined.

Index terms: Electromagnetic wave absorber, wide band, ferrite, rubber ferrite, multi-layer

WIDENING THE BANDWIDTH OF FERRITE ELECTROMAGNETIC WAVE ABSORBER [III]: 30 MHz-40 GHz

EMCABS: 03-5-92

Y. Naito, T. Mizumoto, M. Takahashi, and Y. Wakita
Tokyo Institute of Technology
IEEE EMCS Technical Society
EMCJ91-65, December 10, 1991

Abstract: In order to realize a thin electromagnetic wave absorber, we investigated the required thicknesses of layers for suppressing reflection of less than -20 dB in the frequency range between 30 MHz and higher than 40 GHz. In the case of a three-layered structure composed of ferrite, air and rubber-ferrite, only 43 cm-thick urethan mixed with carbon is sufficient to fulfill the required specification. The thickness, 43 cm, is less than half compared to the conventional structure consisting of a single ferrite layer and a lossy dielectric.
Index terms: Electromagnetic wave absorber, ultra-wide band, ferrite, multi-layer, urethan

APPLICATION OF HIGH PERMEABILITY SHEET DEPOSITED OVER THE WALLS OF RECTANGULAR-SHAPED OPENING TO SHIELDING TECHNIQUE OF FIELD LEAKAGE: THEORY & EXPERIMENT

EMCABS: 04-5-92

Ken-Ich Hatakeyama and Eikichi Sawado
NEC Corp. and Tokyo Metropolitan University
IEEE EMCS Technical Chapter
EMCJ90-4

Abstract: In order to suppress the field leakage through the large aperture of rectangular-shaped metal case, thin high permeability sheets are deposited on the inside. The fields on the case are analyzed theoretically and experimentally. The relationships among sheet thickness, permeability, frequency, and shielding effects are given in this paper.

Index terms: Shielding, high permeability sheet, field leakage

BASIC PROBLEMS IN EMC TEST SITE (ASSESSMENT & THEMES OF NEW CISPR RECOMMENDATION DRAFT)

EMCABS: 05-5-92

S. Shibuya and H. Ishizuka
System Consultant and Radio Engineer consultant
IEEE EMCS Technical Chapter
EMCJ91-31, September 20, 1991
Abstract: According to CISPR recommendation the NSA has no generality since the NSA recommended by CISPR are for antennas with a specific directivity. The NSA, whose dimension is presumed to be "area," is difficult to deal with. Standard site methods, when applied to antenna factor measurement, should produce an error due to antenna directivity. Introduction of the NSA should only lead to confusion in the field of EMI measurement without giving any specific advantage. Then , the alternative concept SSA (standardized site attenuation) corresponding to the CSA parameter where the "antenna gain" is deleted is defined, and the relationship between CSA, NSA, and NSIF (normalized site improvement factor) is elucidated.
Index terms: Site attenuation, CISPR, antenna factor

COMPUTER SYSTEM GROUNDING

EMCABS: 06-5-92

Philip Leibowitz
Texas Instruments, Hunt Valley, MD
TI Technical Journal
Vol. 8, No. 6, November-December, 1991, pp. 16-33

Abstract: Computer system grounding is a relatively complex business that involves some conflicts between the National Electrical Code (NEC) and grounding practices to maximize system immunity to transients and noise injected by the grounding system. The paper reviews the NEC requirements as well as recommendations from other sources. Ground loops are covered extensively, as are the details of suitable grounding techniques for high frequencies. The techniques reviewed were developed by the author through his experience with data processing equipment and systems, including process control and SCADA systems. The origin of some of the product safety requirements is also reviewed.
Index terms: Computer system grounding, process control system grounding, NEC requirements, FIPS 94 recommendations, ground loops, immunity to transients and noise

A CONSIDERATION OF ANTENNA FACTOR OF HALF-WAVE DIPOLE ANTENNA & BROAD-BAND ANTENNA USED FOR EMI MEASUREMENTS

EMCABS: 07-5-92

R. Matsuoka, H. Miyazaki, R. Watanabe, and A. Sano
Jemco Corporation
IEEE EMCS Technical Chapter
EMCJ91-24, July 15, 1991

Abstract: An antenna factor of the receiving antenna used for EMI measurements is one of the principal elements in order to keep the measurement accuracy. This paper deals with the antenna factor of dipole antenna and broad-band antennas, and its mutual impedance from the ground plane.

Index terms: Antenna factor, EMI measurement, dipole antenna

DEVELOPMENT OF A PORTABLE MAGNETIC FIELDS EXPOSURE & MAGNETIC FIELDS MEASUREMENTS

EMCABS: 08-5-92

K. Takeshita and T. Shigemitsu
Central Research Institute of Electric Power Industry (CRIEPI)
IEEE EMCS Technical Chapter
EMCJ91-29, July 15, 1991

Abstract: There has been an increased interest in effects for electronic equipments and human health by electromagnetic fields from electric facilities. In order to understand AC magnetic fields exposure characteristics of the living environments, a portable magnetic fields meter was developed. Some measured results are shown in this report. Intensity and phases of three orthogonal axis components and frequency at power frequency bands can be measured at intervals of 1 second or more and memorized on SRAM board. It has wide dynamic-range from 0.1 milliGauss to 50 G.

Index terms: Magnetic field, power frequency, magnetic exposure meter

AN ELECTROMAGNETIC APPROACH FOR MODELING HIGH-PERFORMANCE COMPUTER PACKAGES

EMCABS: 09-5-92

B.J. Rubin, International Business Machines, IBM Journal of Research and Development Vol. 34, July 1990, pp. 585-600
Abstract: This paper includes a critique of the shortcomings of the usual circuit model for understanding transmission of signals when rise times are relatively long compared with propagation delays in modern high-performance computer packages. In this paper, Maxwell's equations are solved rigorously for typical package configurations. Periodic boundary conditions are used to formulate an eigenvalue problem which is then solved numerically with appropriate mesh sizes. Calculated results are compared to measured results for both a scale model and several test vehicles with results of engineering accuracy (scale model agreements were better). The results were for signal-line and via capacitance, signal-line impedance, signal-line coupling capacitance and couple noise, and OLVs (Other Lines and Vias).
Index terms: Transmission lines, modeling in computer packages, electromagnetic approach to package models, couple noise in transmission lines in computer packages, TEM and quasi-TEM analysis, numerical solutions of Maxwell's equations, multilayer package analysis

A FUNDAMENTAL STUDY ON THE ABSORPTION CHARACTERISTICS OF FRP INCORPORATED WITH SILICON CARBIDE FIBER AT 50 GHz BAND

EMCABS: 10-5-92

O. Hashimoto and K. Sakai (1) and T. Soh (2)
(1) Aoyama Gakuin University and (2) Yokohama Rubber Co. Ltd.
IEEE EMCS Technical Chapter
EMCJ91-38, October 11, 1991

Abstract: In this paper, the absorption characteristics of the FRP-type wave absorber incorporated with silicon carbide fiber at 50 GHz band are shown. Flat paper-type thin wave absorber 1.52-1.60 mm thick is designed using the nonreflection curve and the permittivity measured at X. The measured reflection loss is obtained about 17-20 dB at 57-58 GHz for four sample and the techniques for obtaining high reflection loss is discussed.

Index terms: mm wave absorber, silicon carbide fiber

INFLUENCE OF REFLECTIVE OBJECT AROUND OPEN FIELD TEST SITE

EMCABS: 11-5-92

Y. Hotta, T. Masuda, and Y. Sato
Tokin Corporation
IEEE EMCS Technical Chapter
EMCJ91-25, July 15, 1991

Abstract: Deviation between theoretical and practical value of site attenuation of an open field test site should be with ±3 dB. In this paper, reflection from objects is analyzed by using this time domain function of network analyzer and compared with metal plate reflection. The possibility of influence on deviation of site attenuation is discussed.

Index terms: Open test site, reflection, CISPR

A MEASUREMENT OF ELECTROMAGNETIC PULSE BY EMI ANTENNA

EMCABS: 12-5-92

M. Masugi, K. Murakawa, N. Kuwabara, and F. Ameniya
NTT Telecommunications Network Laboratories
IEEE EMCS Technical Chapter
EMCJ91-37, September 20, 1991
Abstract: This paper describes a measurement and analytical result of the electromagnetic pulse by antennas for EMI measurements. We investigated the properties of antennas (loop antennas, biconical antennas, double ridged guide antenna) by measuring pulses radiated from an inverted cone antenna. A wide-band electric field sensor using $LiNbO_3$ optical modulator was also used. The measurement results show that EMI type antennas can't reproduce electromagnetic pulses in the time domain. We measured, as an example, the electromagnetic pulse due to electrostatic discharge (ESD). The ESD pulses are analyzed in the frequency domain by Fourier transforming the time domain data. The analysis shows that indirect ESD energy does not increase in proportion to discharge voltages.
Index terms: EMI, electromagnetic pulse, antenna, ESD, discharge

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NON-DESTRUCTIVE MEASUREMENT OF ε_r and μ_r OBTAINED BY REFLECTION COEFFICIENTS

EMCABS: 13-5-92

H. Koshiji (1), Y. Hashimoto (2), and Y. Shimizu (1)
(1) Tokyo Institute of Technology and (2) TDK Co.
IEEE EMCS Technical Chapter
EMCJ91-41, October 11, 1991

Abstract: The relative permittibity ε_r and relative permeability μ_r of the absorbing sheet were obtained from the absolute values of reflection coeffients, which were measured for TE and TM modes as a function of frequencies in the range of 8 to 12 GHz. It is assumed that the ε_r and μ_r were linear functions for frequency and 6 parameters are calculated by Newton's method to minimize the errors between measurements and calculations. This method is advantageous for non-destructive testing the practical absorbers.

Index terms: Wave absorber, complex permeability, complex permittivity, non-destructive measurement

ON NORMALIZED SITE ATTENUATION & MUTUAL COUPLING FACTORS

EMCABS: 14-5-92

Ki Chai Kim, and Nak Sam Chung
Korea Standards Research Institute, Korea
IEEE EMCS Technical Chapter
EMCJ91-26, July 15, 1991

Abstract: In this paper we considered the normalized site attenuation and mutual coupling correction factors. The current distribution on dipole antennas were analyzed by the Galerkin's method of site attenuation and mutual coupling correction factor.

Index terms: Conventional site attenuation, normalized site attenuation, antenna factor, mutual coupling correction factor

PERFORMANCE CHARACTERISTICS OF THIN FILM MULTILAYER INTERCONNECTS IN THE 1-10 GHz FREQUENCY RANGE

EMCABS: 15-5-92

B.K. Gilbert et al.; K. Jayaraj et al., Mayo Foundation, Rochester, MN; Honeywell Sensors & Signal Processing Laboratories, Bloomington, MN
39th Electronic Components Conference, May 22-24, 1989, pp. 410-416
Abstract: This paper describes work done on thin film multilayer (TFML) interconnect structures for very high speed logic (ECL and GaAs) ICs in the frequency range 1-10 GHz where few results are available. The interconnects must be treated as transmission lines since lengths become a significant fraction of the wavelength of the highest harmonics. Crosstalk and characteristic impedance are among the parameters studied with applicability to the multichip module. Testing techniques are emphasized and results are displayed in frequency domain (S-parameters), time domain (reflectometry) and "digital domain." The time domain plot shows how the line impedance increased from a designed 50 ohms to 73 ohms due to line resistance (22 ohms). The results indicate that the TFML interconnect structure studied is suitable for logic interconnects that operate at frequencies greater than 1 GHz and forms the basic rules for such structures.
Index terms: High-speed logic interconnects, crosstalk, attenuation, impedance matching, signal fidelity, transmission lines

RADIO FREQUENCY INTERFERENCE OF ELECTRIC MOTORS & ASSOCIATED CONTROLS

EMCABS: 16-5-92

M.A. Jabbar and M. Azizur Rahman
Maxtor Singapore, Ltd., Singapore; & Memorial Univ. of Newfoundland, Canada
IEEE Transactions on Industry Applications, Vol. 27, January/February 1991, pp. 27-31
Abstract: Most motorized appliances must comply with laws regarding emissions, i.e., radio frequency interference (RFI). This paper describes how several motor design parameters, including magnetic/electric loading ratio, commutator shift, brush design and mechanical dimensions affect emissions and safety compliances. Most discussions of the emissions of small motors do not develop the fact that emissions can be reproduced by proper motor design. The paper also deals with the proper use of L-C filter and ferrite bead suppression. Compliance with BS800, "Specifications for RFI limits and measurements for equipment embodying small motors..." is emphasized. This paper contains an interesting comment on the effect of cable bundling when testing for compliance with BS800.

Index terms: Commutator motor design, small appliance motors, cable bundling, HF and VHF emissions from small appliance motors

RECEIVING PROPERTIES OF A SPHERICAL DIPOLE ANTENNA

EMCABS: 17-5-92

Kazuo Murakawa, Nobuo Kuwabara, and Fojio Amemiya
NTT Telecommunication Networks Lab
IEEE EMCS Technical Chapter
EMCJ90-85

Abstract: A spherical dipole antenna has a serious problem caused by a cable connected to it; the cable may disturb the electromagnetic fields around the antenna. To avoid the disadvantage, the spherical dipole antenna containing a receiver and a battery inside the sphere has been studied. The spherical dipole antenna is used only for transmitting. The receiving properties of the spherical dipole antenna having an O/E converter inside the sphere is examined. The experimental results are in good agreement with the numerical results by using the mode-matching method. Therefore, it may be useful as a probe for various field measurements.
Index terms: EMI, spherical dipole antenna, O/E converter, mode-matching method

SIMULATING EM FIELDS

EMCABS: 18-5-92

Daniel G. Swanson, Jr.
Watkins-Johnson Co., Palo Alto, CA
IEEE Spectrum, Vol. 28, No. 11, November 1991, pp. 34-37
Abstract: The need for more powerful computation tools for EM systems springs from higher frequencies now employed and the relatively greater complexity of the fields. Extensive testing and redesign may be eliminated by better simulations. This paper surveys the software tools now available for use with engineering workstations. Digital circuits, for example, may be designed while taking ground bounce, crosstalk and other effects into account. EM design and simulation software packages are summarized in tabular form, which includes pricing, platform (host), operating system, applications, and most significant new features for older software packages. Magnetic shielding design is also an application of one of the packages, several of which will be of interest to the EMC community.
Index terms: EM field simulation, Computer Aided Design Tools, PCB layouts, transmission lines crosstalk

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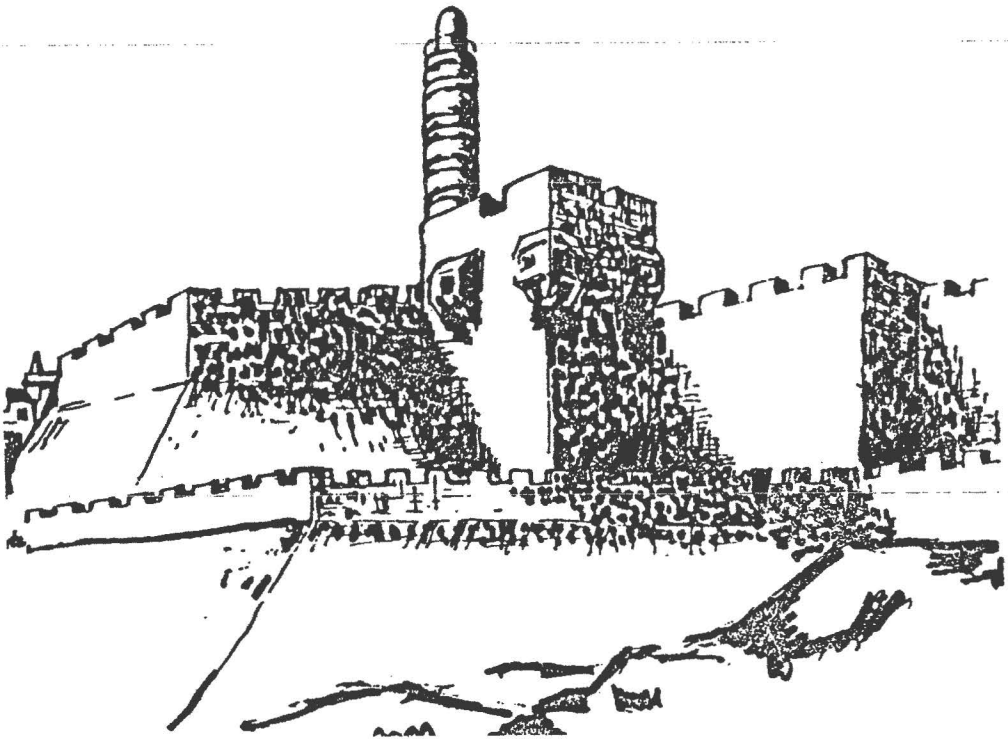

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A PROPOSAL ON BROAD-BAND CHARACTERISTICS OF WAVE-ABSORBING WALL

EMCABS: 19-5-92

Youji Kotsuka, Shuji Atzawa, and Taku Tanaka
Tokai University
IEEE EMC-S Technical Chapter
EMCJ91-15, June 14, 1991

Abstract: Proposed are new methods of widening matching frequency characteristics on EM wave-absorbing wall by switching the surface of the absorber with a polyhedron structure. Mechanisms of rotation or turning, such as transom window, a blind curtain, and a folding door on a closed-loop guide rail, are employed. To compose these wave absorbers, techniques to change the matching frequency characteristics are required. For this purpose, the characteristics of the magnetized ferrite absorber and of the wave absorber with a composition of multi-distributed type absorbing material have been investigated in detail.

Index terms: EM wave absorber, broad-band matching characteristics, magnetized ferrite

AN OBSERVATION SYSTEM OF THE EM ENVIRONMENT IN THE VHF/UHF BAND BY USING A SPECTRUM ANALYZER

EMCABS: 20-5-92

H. Echigo, K. Enami, M. Nitanai, R. Sato, and K. Mitsui
Tohoku Gakuin Univ. and Small Power Communication Systems Research Laboratory
IEEE EMC-S Technical Chapter
EMCJ91-17, June 14, 1991
Abstract: Data about electromagnetic environments give the base for radio communication. It is required and expected that the spectrum usage over a wide frequency range is well recognized and that RF-noise interference with the spectrum is well measured. The system is prepared to observe spectrum usage and spectrum pollution over a wide range on the frequency axis and time axis. A spectrum analyzer controlled by a personal computer was used as the measurement system. By modifying the display method for the measured data, the spectrum usage and pollution could be recognized at a glance. The impulse noise detection method is also given.
Index terms: EM environment, spectrum usage and pollution, spectrum analyzer, RF-noise, interference

CHARACTERISTIC MEASUREMENTS OF HUMAN BODY POTENTIAL DUE TO CONTINUOUS WALKING ELECTRIFICATION

EMCABS: 21-5-92

S. Miura, M. Okazaki, O. Fujiwara, and T. Azakami
Nagoya Institute of Technology
IEEE EMC-S Technical Chapter
EMCJ91-18, June 14, 1991

Abstract: The number of electronic equipment malfunctions due to electrostatic discharges (ESD) has been increasing. Most ESDs are caused by the electrification phenomena of the human body (HB) walking, while this mechanism has not sufficiently been clarified. This paper describes characteristic measurements of the HB potential electrified by continuous walking. Equivalent circuit models are proposed for explaining the electrification mechanism of the HB walking on a metal plate. Statistical measurements of the HB potentials are made for the fundamental walking motion. From these results the HB potential for continuous walking are discussed.
Index terms: ESD, walking electrification, human body potential, statistical measurement

CALCULATION OF SAR INSIDE AN EYEBALL USING FINITE-DIFFERENCE TIME-DOMAIN METHOD

EMCABS: 22-5-92

Akira Kato, Osamu Fujiwara, Takashi Azakami
Nagoya Institute of Technology
IEEE EMC-S Technical Center
EMCJ91-20, June 14, 1991

Abstract: This paper describes the numerical results on the SAR (specific absorption rate) inside an eyeball using finite-difference time-domain (FD-TD) method, which does not require so much computer storage. Two kinds of heterogeneous block models used by Taflove's and Spiegel's groups are employed for computing the SARs inside a human head irradiated by 1.5 GHz electromagnetic wave of the ANSI level. The SAR spatial distribution and contour lines are shown. Comparison is also made between Taflove's results and ours.

Index terms: Biological effects, SAR, heterogeneous block model, FD-TD method

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