IEEE

Electromagnetic Compatibility Society

Newsletter

ISSUE NO. 130 SUMMER 1986 (ISSN 0164-7644) EDITOR: ROBERT D. GOLDBLUM

BOARD OF DIRECTORS' MEETING IN PARSIPPANY, N J

The second Board meeting for 1986 was held on Thursday, May 22nd, at the Parsippany Hilton in Parsippany, New Jersey. Thirteen of the 18 Board members, as well as members of the 1991 EMC Symposium (New Jersey) Steering Committee, attended the meeting. President Len Carlson officiated for the first time at a Board meeting. He called the meeting to order at 10 am with the introduction of each Board member and guests. Reasons for Board member absences were recorded by the Secretary, Gilda Haskins. No correspondence was received from Board member George Kunkel. The Secretary was asked to keep a running absence record to present to the Board any successive absences which should be brought before the Board for corrective action in accordance with the Society's Bylaws. Gilda then presented the minutes of the last meeting held in Anaheim, California on February 5, 1986. The minutes with minor editorial changes were approved as distributed.

Major items discussed include the following:

1. Treasurer Dick Ford reported that our Society's net worth as of 2/28/86 was $273K. A letter by E. J. Doyle, the IEEE Treasurer, pertaining to investment of Society reserves was read. In short, he requested that each Society increase their long-term investment of their cash reserves. After considerable discussion, the Board approved transferring $150,000 to the higher rate of return long-term investment. The term is six months to start and then 90 days thereafter. The Treasurer's report was accepted by the Board.

2. Bob Haislmaier, Director for Communications Services, introduced his Standing Committee Chairmen, who presented their reports. First, Bob Goldblum, Newsletter Editor, requested expanding the Institutional Listings to a second page due to the increased number of advertisers. This was approved. He is also working with Bob in placing all the Newsletters and related EMC periodic reports on microfiche for safekeeping for our historical files. A new deadline schedule for each quarterly issue was announced. Deadlines for articles are now the following:

Issue	Deadline Date
Summer	May 15
Fall	August 15
Winter	November 15
Spring	February 15

The Newsletter generally reaches most Society members within 6 to 8 weeks after the above deadlines. Bob reported for Dick Schulz, Transactions Editor, that Dick will be reviewing each Transactions paper to ensure that the proper international EMC definitions are used. This is a major job, since many terms used in the United States may represent slightly different meanings abroad. Board members ex-

(Continued on page 4)

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EDUCATION COMMITTEE NEWS

The Education Committee has been compiling a list of colleges and universities which offer courses on EMC as part of their normal undergraduate or graduate curriculum. This does not include courses offered in continuing education programs.

The following is a listing of the ten colleges and universities, we are aware of, that have a course devoted to EMC — or a course with a large portion of its contents devoted to EMC. Included is the name of the institution and the name of a contact at the school (if known).

UNIVERSITY OF CALIFORNIA AT BERKELEY
Dr. Martin Graham

FLORIDA ATLANTIC UNIVERSITY — Boca Raton, Florida
Dr. Vichate Ungvichian

UNIVERSITY OF SOUTH FLORIDA — Tampa, Florida
Mr. David Widdoes

UNIVERSITY OF KENTUCKY — Lexington, Kentucky.
Dr. Clayton Paul

UNIVERSITY OF KANSAS — Lawrence, Kansas
Prof. D. G. Daughtery

AUBURN UNIVERSITY — Auburn, Alabama

GENERAL MOTORS INSTITUTE — Flint, Michigan

STATE UNIVERSITY OF NEW YORK AT NEW PALTZ — New Paltz, New York
Dr. Gerald Kitzmann

UNIVERSITY OF YORK — York, UK
Dr. A. C. Marvin

UNIVERSITY OF BRADFORD — Bradford, West Yorkshire, UK
Peter S. Exell

Anyone with information on other colleges and universities with courses should contact me with that information.

The EMC Society Education Committee will hold a meeting during the EMC Symposium in San Diego. The meeting will be held on Tuesday September 16 from 8:00 to 9:00 am. This is just prior to the Plenary session on the first morning of the symposium. Anyone interested in EMC education is invited to attend.

Henry Ott
Chairman, EMC/S
Education Committee

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Room 1E-212A
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SEPTEMBER 1986

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SAN DIEGO

IEEE INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY

P.O. Box 231559 • San Diego, CA • 92123-0920

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Standards, Spectrum Management,
Susceptibility.

The International Special Committee on Radio Frequency Interference (CISPR) will hold its annual meeting in San Diego the week prior to EMC 86 from 6 to 13 September.

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(619) 578-1480

Vice Chairman & Publicity
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(714) 738-0903

Secretary/Treasurer
Alfred H. Mills
(619) 573-6320

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(213) 642-0049

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Bill Johnson
(619) 283-5592

EMC ENGINEERING FOR THE FUTURE: BUILDING ON THE PAST

pressed interest in publishing some of the most used terms and their correct international definitions either in the Newsletter or Transactions so that our readers will include these terms in all paper submissions for our symposia and Newsletters as well as for the Transactions. The Transactions editor's report also indicated that several papers will be published in the next issue on sequency union that met with mixed reviews by the Transactions reviewers. These reviews will be published as well so as to show the differences in opinion.

Gene Cory presented a review of the future symposia and conferences. He indicated that the books on the 1982 Santa Clara Symposium will be closed by the Board meeting in September. The books are now closed for the 1984 and 1985 symposia. The Board approved a $1000 loan to the 1988 Seattle Symposium Steering Committee. Gene also reported that he sent a letter at the request of the Board to the Israeli Chapter suggesting that they hold a regional conference before requesting sponsoring an international EMC Symposium. The 1991 Symposium Steering Committee, chaired by Don Heirman, asked for a preference of the most favorable time of the year for its conference. After considerable discussion, the Board indicated that July-August remains their choice. Hence, the 1991 Symposium will be held in August.

The New Jersey Steering Committee also presented a short video tape on their plans for an exhibit pavilion next to the hotel. The Board members were supportive of the plan. The pavilion is comprised of rigid framing and heavy vinyl fabric with interior space of up to 29 feet in height, 100 feet across, and a length suitable to accommodate the anticipated number of exhibitors. Climate control is included. Finally, no report from the International Affairs Committee was available.

3. Ed Bronaugh, Director for Technical Services, presented his Standing Committee Chairmen, who gave their reports. Don Heirman, the Society's Standards Committee Chairman, indicated that his Committee will meet in the two-hour period prior to every Board meeting. At the Parsippany meeting, these highlights were reported to the Board:

a. New update drafts of Standards 139 and 140 were being circulated for comments to Committee members.
b. Project Authorization Requests for P478 and P482 (Cable Shielding and Transfer Impedance Measurements) were forwarded for approval by the IEEE Standards Board.
c. P626 on RF Signal Grounding Practices was also sent to the Standards Board for approval.
d. Two new projects are started, pending approval by the IEEE New Standards Committee:
    i) Method of measurement of near-field E and H fields.
    ii) Method of measuring RF absorber efficiency for material backed by metals, such as shielded room walls.

The next meeting will be at 8:30 am on Monday, 15 September in San Diego at the Town & Country Motel. For more information, contact Don on (201) 834-1801 (new phone number).

Ed Bronaugh announced that Ed Skomal, Chairman of the Technical Advisory Committee, is resigning and a new replacement is being sought. Ed will be missed. He has contributed so much both technically and professionally to our Society. We wish him success and enjoyment in his retirement.

Hank Ott, Education Committee Chairman, reported that the introduction to the EMC video tape is on schedule and will be available for showing at the San Diego Symposium. There will also be an educational session at the Symposium on Wednesday, 17 September.

4. Member Services reports were given by the Standing Committee chairpersons. Bob Hofmann, Chairman for Chapter activities in Regions 5-10, reported little Chapter change from his report in this column in the last Newsletter. He offered the Board a proposed list of Board members who will serve as a personal link between each Chapter and the Board. This will especially help Chapters who are looking for EMC speakers from outside their section, as well as special funding or suggestions for local EMC activities, such as seminars. The list should be available by September at the Chapter Chairmen's breakfast at the EMC Symposium in San Diego. A national EMC lecturer list is being compiled for local chapters to use. These lecturers will provide their time; travel and living expenses will be paid for by the Society. It is expected that more than one Chapter per tour will be visited by each lecturer. Charlotte Tyson, Awards and Membership Chairman, reported that the Society membership stands at 2527 with a yearly growth of 5%. She also presented Board and Chapter Chairman nominations for Society awards. There was considerable deliberation with the Board submitting their filled-out ballots to Charlotte for the final award recipient at the San Diego Symposium. The Board asked that the Chapter-of-the-Year Award be reinstated. Don Heirman submitted the original scoring sheet after the meeting to Bob Hofmann, who will communicate the requirements to each Chapter. Finally, Bill Duff submitted his report in writing, stating that there were 9 EMC Society senior members who submitted their paperwork for Fellow nominations. He also resigned as head of the Nomination Committee in order to run for elected Board member-at-large for 1987. Vice President Don Clark will assume this position. President Carlson noted that Bill was selected for the IEEE National Fellow Evaluation Committee as the EMC Society representative. Jim Hill will be his alternate.

5. There was no formal report for Professional Services. The Board did review the activities of this directorship. The Secretary was directed to send a letter to the Public Relations Chairman — Peter Grant — to identify his plan for this activity. It was also moved that any EMC employment analysis information be made available to the general public only after the EMCS Newsletter has published the results to its member readers.

6. Under New Business, the Board requested that Gene Cory, Chairman of Symposia/Conference Standing Committee, present a Society policy on regional EMC meetings at the September meeting. Some of the items which may be addressed includes limiting such conferences to regional participation only, specify whether papers should be original or previously published, and that any conference proceedings be non-archival (no IEEE catalogue number). If any members have inputs or opinions, Gene can be reached on (512) 684-5111, ext. 2711. There was a discussion on the cash award contest available to advance registrants at the San Diego Symposium. This will be researched at IEEE Headquarters. The Board approved a $200 contribution to the IEEE student magazine *Potentials*. The President was asked by the Board to call the Chairman of the Washington, DC Section to explain our Society's position of not sponsoring a booth at the 1986 EMC Expo in Washington, DC on 16-19 June. Finally, Jim Hill was appointed to chair the Society's Historical Committee. Of special interest is a listing of all Board approved policy statements over the years.

6. President Carlson adjourned the meeting at 4:15 pm. The next meeting will be at 10 am on September 15 at the Town & Country Hotel in San Diego, the site of our 1986 International Symposium. For more information, contact Gilda Haskins on (215) 752-4749.

Respectfully submitted,

Donald N. Heirman
Associate Editor
Board of Directors' Activities

EMC SOCIETY WILL NOT SUPPORT "FOR PROFIT" CONFERENCES

At its meeting on May 22, 1986, the Board of Directors of the Electromagnetic Compatibility Society of the IEEE reaffirmed its position not to support "for profit" EMC conferences, symposia and product exhibits. This decision was in light of promotional material being circulated by a non-IEEE organization implying official cooperation and participation by the EMC Society for a June conference and product exhibit. The Board of Directors had previously made a specific and direct request to this organization to cease and desist.

IEEE members should be reminded that they may not commit the Institute or the EMC Society without prior authorization. Persons who violate this policy are subject to personal liability. Most responsible firms will not accept the signature of individuals without verifying their authority to sign on behalf of the Society and the IEEE.

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 electromagnetic compatibility and should have adequate resources and/or backing to be able to attend three BODS meeting per year and be able to actively contribute to the Board of Directors, including committee activities, correspondence, telephone calls, etc. 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.

Please submit petitions and biographical summaries postmarked no later than August 15, 1986 to:

Donald E. Clark
Nominations Chairman
4086 Shady Circle, NW
Lilburn, Georgia 30247
(404) 894-3535

(Continued on page 6)

NOMINATION PETITION
IEEE ELECTROMAGNETIC COMPATIBILITY SOCIETY
BOARD OF DIRECTORS

I. NOMINEE'S NAME: _____

MEMBERSHIP NO.: _____

ADDRESS: _____

_____

PHONE: _____

II. BIOGRAPHICAL SUMMARY: ATTACH TYPED COPY

III. SIGNATURES: (Minimum of 15 names.)

We, the undersigned, all of whom are current IEEE Electromagnetic Compatibility Society (EMC/S) members in good standing, nominate the above mentioned person to serve on the EMC/S BODS for a three-year term beginning January 1, 1987.

	MEMBER'S NAME (PRINT)	SIGNATURE	MEMBERSHIP NO.
1.			
2.			
3.			
4.			
5.			

UPDATE ON CONNECTIONS TO IERE CONFERENCE, YORK, ENGLAND

There have been some changes in travel arrangements to the IERE EMC Conference since the announcement in the Spring issue.

The Electromagnetic Compatibility Conference of the Institution of Electrical and Radio Engineers will be held at the University of York and is scheduled for the week of 29 September to 3 October. The United States is well represented with 9 papers on the program. The conference manager, Mr. R. Larry, can provide information on registration and other details. Contact him at IERE, 99 Gower Street, London WC1E6AZ, or telephone 01-388 3071.

As announced, arrangements have been made with American Airlines for special fares to travel to the Conference with considerable flexibility between 20 September and 12 October. While allowing for group rates, there is still no requirement to travel as a group and each traveler can still arrange his or her itinerary with side trips and use the special fare. These special fares will now be lowest when purchased at least 21 days before departure, but there is now no mention of discounts for later bookings.

Non-stop flights are available from Chicago to Manchester with rail or rental car to York. Non-stop from Dallas/Fort Worth is to London's Gatwick Airport with rail or air connections to York. A tour of England or Scotland via Railpass or an added tour of the Continent as part of the tour package should be considered. For complete information on all these options, call American Airlines at (800) 433-1790 (change of number) and ask for information on Star No. S-71408, which identifies the special arrangmeents for travel to the IERE Conference. Either you or your travel agent can book directly through this number.

For additional assistance or any comments, call Jim Hill at (703) 451-4619.

ERRATUM

An error in the listing of EMC Society Chapter Chairpersons on page 28 of the Spring 1986 issue has been reported. The current chairperson for the Mohawk Valley Chapter is:

Daniel J. Kenneally
7976 Brookside Drive
Rome, NY 13440
(315) 330-2563 (Work)
(315) 336-8699 (Home)

Mr. Capraro, who was listed, is the current Vice Chairman of the Chapter.

RALPH E. TAYLOR, 1923-1985

Ralph Edward Taylor, 62, of 630 Fifth Avenue, NE, Hickory, North Carolina died December 31, 1985 at a Hickory hospital. Ralph suffered from a rare form of muscular dystrophy. In declining health, he broke his hip two days earlier in a fall at his home. In his weakened condition doctors were not able to operate, but his death was unexpected.

Ralph was born November 28, 1923 in Catawba County, the son of Bertha Hollar and the late Ronald Martin Taylor. He was employed by NASA when he retired in 1982. He was in government service for 40 years, having started with the Naval Research Laboratory in 1942. He had been active in church work throughout his career. Since 1972 he had worked with Gideons International.

He attended Lenoir-Rhyne College in the early 1940s and had received its Distinguished Alumni Award in 1984. After moving to Washington in 1942, he attended the George Washington University night school and graduated in 1951 with a degree in Physics.

Ralph was active in the EMC Society, serving on the Standards Committee. He received the Society's Certificate of Achievement in 1977 and the Richard R. Stoddart Award in 1981. He was elected an IEEE Fellow in 1982 for contributions to electromagnetic interference predictions. Other awards included the Recognition Award, U.S. Patent Invention, 1950, 1963, 1967, 1969, 1970 and 1981; Sustained Superior Performance Award, Diamond Ordnance Fuze Labs, U.S. Army, 1958 and Special Achievement Award, National Aeronautics and Space Administration, Goddard Space Flight Center, 1975.

Survivors in addition to his mother are his wife, Ruby Brown Taylor; a son, Mark Edward Taylor of Hickory; a daughter, Mrs. Laurence (Melanie) Garver of Walkersville, MD; two brothers, Ronald M. Taylor, Jr. of Hickory and Willard C. Taylor of Morresville, NC and two grandsons.

APPLIED COMPUTATIONAL ELECTROMAGNETICS SOCIETY SEEKS MEMBERS

The Applied Computational Electromagnetics Society, officially established at the Second Annual Review of Progress in Applied Computational Electromagnetics at the Naval Postgraduate School in Monterey in March, has announced its purpose and scope and issued a call for membership.

According to E. K. Miller (University of Kansas), its first President, ACES was formed primarily for "fostering information exchange among computer modelers in electromagnetics" working on practical problems. A second goal is to "foster software distribution" mainly for PC users, as mainframe and minicomputer have "other means of exchange." Meeting presentations and ACES Newsletter articles will thus deal with such topics as code validation, code applications to design, code studies of basic physics, code enhancements, fixes and updates and user experiences. G. J. Burke will be writing a regular column for the ACES Newsletter. For more information about the Newsletter, contact:

Lawrence Livermore National Laboratory
Editor — ACES Newsletter
c/o Robert Bevensee — L-156
P.O. Box 5504
Livermore, CA 94550
(415) 422-6787

Robert Adler (Naval Postgraduate School), ACES Secretary, reports that membership fees are $25 for an annual individual membership and $75 for an annual organizational membership. All 1985 and 1986 members of ACES will receive the 1985 issue and copies of all 1986 issues of the Newsletter and the 1986 conference proceedings. Send membership fees to:

Naval Postgraduate School
ACES Secretary (Richard Adler)
Code 62AB
Monterey, CA 93943

Make checks payable to: The Applied Computational Electromagnetics Society.

EMC PERSONALITY PROFILE

by William G. Duff

HERBERT K. MERTEL

Herb Mertel is the Chairman for the 1986 IEEE International Symposium on EMC in San Diego. Herb has worked in the EMC field continuously for 27 years and 25 of these in San Diego. For two years he also tried living in the rain country working for United Control on EMC for Boeing's Minuteman.

Herb started his career as an Electrician Journeyman in West Germany before he went to the Wild West working on the rural electrification of the Nebraska sandhill ranches. However, the U.S. Army needed radar technicians during the Korean War, and Herb was drafted. This two-year sabbatical changed Herb's life. After two years of knob twiddling to tweek the M-33 radar into shape he decided to learn about the electronics he had been twiddling. He enrolled in college under the GI Bill, which paid about $138.00 per month. This was enough to pay college tuition in 1957, but he and his wife, Jill, also worked to put Herb through college.

Upon graduation Herb was hired by General Dynamics in San Diego to help build the Atlas. He wound up in the EMC Lab only because the Antenna Lab supervisor was out to lunch, and the EMC lead engineer, Joe Fischer, was available to give Herb an interview and job. The initial EMC work at General Dynamics was primarily test and fix; however, after one year Herb was fortunate to work on a one-year study "to develop current probes to 1 GHz" for Sam Skolnik of WPAFB. Subsequently, he worked on two other "study contracts" to develop an "EMI Instrumentation System to 40 GHz" (Sam Skolnik), and the "Orbiting Spectrum Measurement Experiment" for John Kelleher of NASA. Herb considers himself fortunate for the opportunity that these study contracts gave him to further the EMC technology on one hand and his knowledge of EMC on the other. His other tasks during 15 years at General Dynamics were always EMC-related on projects, such as Atlas, Apollo Tracking Ships, Centaur, Titan and numerous spacecraft integration tasks.

In 1975 Herb became a registered professional engineer and established his firm, EMACO, INC., to perform RFI/EMI/EMC testing, provide consulting services for RFI and electrical safety design and translate the VDE specifications.

Herb Mertel is active in several EMC Committees. His EMC Society participation is as follows:

Symposium Chairman, 1986
Associate Newsletter Editor, 1985-86
San Diego Chapter Chairman, 1985
Technical Committee Chairman, 1980-85
Symposium Arrangements Chairman, 1979
Board of Directors, 1977-83
Seattle Chapter Membership Chairman, 1963

He is a member of the SAE/AE-4 Committee on EMC and is serving as Chairman of International Liaison. He has represented the SAE for 10 years at the Swiss EMC Symposium by organizing five workshops.

As a member of ANS/C-63, he was Chairman of the Task Group to prepare the C-63.2 Specification for EMI Instrumentation and is presently Chairman of the group to prepare the U.S. National EMC Standard.

Herb is U.S. Technical Advisor for CISPR Subcommittee A matters on RFI instrumentation and is Chairman of the Hosting Committee for the CISPR Meeting in San Diego from 6 to 13 September 1986.

Herb was born in Frankfurt, West Germany, on May 27, 1931 and spent his first 20 years there before immigrating to the U.S. He holds a BSEE from Indiana Institute of Technology, 1959, and a Master's Degree from U.S. International University, 1973. Herb lives in San Diego with his wife, Jill, and daughter, Tina, who will be off to college in the fall. His son lives on Bainbridge Island and is a dealer in Oriental antiques in Seattle. Herb's firm and EMC work keep him quite busy, but when he finds time he enjoys bicycling, boating, swimming and snorkling.

CHAPTER CHATTER

by Charles F. W. Anderson

CENTRAL NEW ENGLAND

The Chapter's March 25 meeting featured a presentation by Henry Ott on "Introduction to EMC" and was followed by a panel discussion by Chet Smith, Art Murphy and John Clarke, moderated by Bob Berkovits. This was followed by a lab tour of the Chomerics facility. There were about 70 attendees, about 25 being EMC-S members and the rest mostly students from the University of Lowell and State University and their advisors. About 25 Chapter members attended. On April 17 a joint meeting was held with ISM at the Hewlett-Packard facility in Lexington, MA. The Chapter cosponsored and ISM organized the meeting. Joe Butler spoke on "Eliminating EMI in Test Systems" and discussed EMI control in automatic test systems. There were 21 attendees, five from the Chapter.

On May 8 a meeting was held at GTE in Needham, MA. C. Kendall (CK Consultants, Inc., CA) spoke on "Avoiding Pitfalls On FCC/VDE Testing." There were 12 attendees, five from the Chapter. Chapter officers are: Art Murphy (GTE Communications), Chairman; Len Long (DOT/TSC), Vice Chairman; Bob Berkovits (Teledyne Brown Energy), Vice Chairman and John Clarke (DOT/FAA), Secretary/Treasurer. Chapter officers for next year will meet in July to discuss the 1986/87 program. Details will be reported in the Fall issue. Thanks to John Clarke for the reports.

DAYTON

The Chapter met on May 11 at the Engineers' Club. After a luncheon, Carl Blau (NCR's Manager for Product Evaluation Engineering) presented "Electromagnetic Interference Standards for Computers." He discussed EMI problems and suppressions methods in personal computers, and the FCC standards used to verify compliance. A display of NCR computer hardware was also featured.

Last October, the Chapter had a meeting at which the speaker was Tim Ralston (of 3M's Static Control Systems Division), whose topic was "Electrostatic Discharge (ESD); Effects and Cures." Thanks to Vic Morats for the above information.

CENTRAL FLORDIA

A meeting will be held in the near future at which, it is anticipated, Brian Vancata (Chapter Organizer and Chairman) will exhibit some of Eaton's hardware for hands-on operation. Date/location not firmed as of deadline time.

LONG ISLAND CHAPTER

The Chapter held a breakfast meeting on June 10. Dick Moore (a consultant) spoke on "Do-It-Yourself EMI Evaluation of Seams." Plans for future meetings were discussed at the January business meeting held at Brooklyn Polytechnic.

NEW JERSEY COAST

On May 19, the Chapter held a luncheon meeting at which the speaker was William Stickney (Instrument Specialties) His topic was "EMC Considerations in Electronic Enclosure Design." His presentation covered such enclosure design aspects as materials properties, construction methods, surface finishes and gasketing. Considerations for necessary penetrations (e.g., ventilation, power) were also discussed. The April 15 meeting featured Professor George Whitman (New Jersey Institute of Technology), who spoke on "Radiation from an Integrated Dielectric Slab — Wedge Structure." His discussion covered a theoretical model and numerical investigation of the slab-wedge radiator. FORTRAN 77 programs developed for evaluation of the far-field were covered, together with radiation patterns for various wedge depths for silicon. Bob Davis (AEL) supplies me with copies of the Chapter Newsletter — Thanks!

SANTA CLARA VALLEY

The Chapter meeting was held on May 13 at Apple Computer's De Anza facility. The current officers were continued for another year by unanimous vote. Chapter Officers: Dave Hanttula, Chairman; Jim Duckett, Vice Chairman; Darryl Ray, Treasurer and Ghery Pettit, Secretary. Dave Hanttula gave a short summary of EMC '86 — a small profit was realized. The Chapter voted to make a $1000 contribution to the CISPR meeting to be held in San Diego. (Your Column Editor thinks that plaudits are indeed in order for this generous action!). Jane Clemmensen (SRI International) was the featured speaker. She gave an update on standards for radio frequency exposure, for both the general population and in work areas. Their next meeting will be sometime in September. Thanks to Ghery Pettit for the above.

TOKYO

On March 18, the Chapter meeting featured seven papers. Two of the papers which seem to be of special interest were: "The EM Emission Phenomena as a Precursor of Earthquakes and the Possibility of Epicenter Location Predication" by Takeo Yoshino (University of Electro-Communications) and "Ground Characteristics of the Metal Plane on the Floor" by Yoji Nagasawa (Tohoku University Faculty of Engineering).

The first of these presented results of observations of EM emissions which occur before the first shock of an earthquake, and examined the source mechanism for that phenomenon. Also covered was an example of successful prediction using the multipoint direction-finding networks which have been established in the Tokyo area since 1983.

The second paper presented results of improved ground impedance obtained by connecting a 1 x 2 meter metal plate to the floor reinforcing bars. Measured impedance was 0.4 ohm at 100 MHz. (Quite good, I'd say, based on my experience.) Thanks to Professor Echigo (Chapter Treasurer) for the report.

TWIN CITIES

The Chapter met on April 23 with Daryl Gerke (Intel, Inc.) as the speaker. His topic was "Designing for Reduced Noise in Microprocessor Systems." A "Thank you" to Dan Hoolihan (Chapter Chairman) for the input.

PROCEEDINGS FOR JAPANESE ACCESS SEMINAR AVAILABLE

How the United States can gain better access to Japanese technical literature in electronics and electrical engineering is the topic of a 155-page report now available. The report, *U.S. Access to Japanese Technical Literature: Electronics and Electrical Engineering* (SP 710), summarizes a June 1985 seminar held at NBS and offers transcripts of presentations by representatives from Congress, industry, universities and federal agencies.

The common thread in the presentations was interest in maintaining current knowledge of technical progress in Japan despite frustration over language barriers. Few Americans can read Japanese, and only about 20 percent of Japanese technical literature is routinely published in English. This raises questions such as: How important is the 20 percent available in English? How can one gain access to the other 80 percent? The seminar offered possible answers, including a more active translation role for professional societies as well as support from American industry. The report is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D C. 20402 for $6.00 prepaid. (Order by stock number 003-003-02709-0).

EMC SOCIETY MEMBER NAMED TO NATIONAL ACADEMY OF ENGINEERING

Robert Plonsey, Professor of Biomedical Engineering, Department of Biomedical Engineering, Duke University, Durham, NC, was elected to the U.S. National Academy of Engineering for the application of electromagnetic field theory to biology and for distinguished leadership in the emerging profession of biomedical engineering.

Election to the Academy is the highest professional distinction that can be conferred on an engineer. Academy membership honors those who have made "important contributions to engineering theory and practice, including significant contributions to the literature of engineering," or those who have demonstrated "unusual accomplishments in new and developing fields of technology."

The election of 73 engineers and six as foreign associates brings the total U.S. membership to 1289, with 113 foreign associates.

IEEE PRESS PUBLISHES POWER SPECTRUM ESTIMATION REPRINTS

The IEEE Press, book publishing division of the IEEE, has announced the publications of *Modern Spectrum Analysis, II,* edited by Dr. Stanislav B. Kesler, an Associate Professor at Drexel University.

The past decade witnessed the emergence of the field of power spectrum estimation as a very active subfield of digital signal processing. Advances in very large scale integration technology have had a major impact on the technical areas to which spectrum estimation techniques are being applied. This second volume of selected reprints on power spectrum estimation complements the first, *Modern Spectrum Analysis,* published in 1978.

The book contains 38 reprinted papers in six sections: Introduction; Parametric Methods; Nonparametric Methods; Multichannel, Multidimensional and Spatial Spectral Analysis; Algorithms and Adaptive Techniques and Statistics and Detection.

Modern Spectrum Analysis, II (Order number PC01958) contains 456 pages and is priced at $49.50 ($37.15 for IEEE members). The book may be ordered postpaid from the IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854-4150. Make check payable to IEEE. A $2.00 billing charge is added to all non-prepaid orders of under $100.00. Credit card orders (MasterCard, VISA, and American Express) are acceptable and considered prepaid. This volume, part of the IEEE Press Selected Reprint Series, was prepared under the sponsorship of the IEEE Acoustics, Speech and Signal Processing Society.

BOOK REVIEWS

by Jim Hill, The EMXX Corp.

With the 7th Symposium and Technical Exhibition on EMC in Zurich less than a year away (March 1987), we thought it would be appropriate to review the Proceedings of the 6th Symposium and Technical Exhibition to give our readers an insight into the subject coverage and national source of the papers presented at the most recent symposium (March 1985). In our experience this has been a well-run series of EMC symposia with high quality papers and exhibitors from Europe, Japan and the U.S.A. Some have not been exhibiting at our symposia. If the terrorist threat is under better control in 1987 our readers should consider attending the Zurich EMC symposium. I am sure that they will find it worthwhile. The first of this symposium series was held in Montreux in 1975 and since that year they have been alternating annually with the Polish EMC symposia held in Wroclaw. We are indebted to Herman Garlan for this review of the 6th Symposium Proceedings.

The second book under review discusses some interesting electromagnetic effects. *Nonlinear and Environmental Electromagnetics* delves into esoteric aspects of electromagnetics, such as ponderomotive force. This is a word the reader may not recognize. Ponderomotive force pertains to the force mutually exerted by conductors traversed by the electric current, or that exerted on such conductors by any magnetic field. Ponderomotive force tends to move the conductor bodily. For those not working in the field some source of translation may be helpful. We are indebted to Bill Duff for this review.

PROCEEDINGS OF THE 6th SYMPOSIUM AND TECHNICAL EXHIBITION ON EMC, ZURICH, MARCH 5-7, 1985

Organized by the Institute for Communication Technology of the Swiss Federal Institute of Technology, Zurich

Copies available from the Proceedings Editor, Dr. T. Dvorak, ETH Zentrum-IKT, 8092 Zurich, Switzerland

The Proceedings include 116 papers that were presented at the Symposium, divided into 19 sessions. The vast majority of the papers came from the western world, with 34 from the U.S.A., 47 from Western Europe and a significant number, 16, from Eastern Europe. The other countries represented were Japan with 7, Canada with 6, India with 3, China with 2 and Australia with 1.

The 19 sessions included the expected subjects of EMC measurements (8 papers), automated EMC measurements (4 papers), Shielding and coupling (7 papers), EMC in printed circuits and microelectronics (2 sessions-10 papers), EM effects on biological systems (the RADHAZ problems-7 papers). In addition a number of less frequently treated subjects were treated in some depth. EMP was treated in two sessions (12 papers), electrostatic discharge (4 papers), EMC problems in the power field were treated in three sessions (19 papers), spread spectrum and mobile communications (9 papers) and statistics of radio noise and EMC in two sessions (9 papers).

In view of the large number of papers and the wide range of subjects covered, it is not feasible to discuss each paper in detail. Attention should be called to certain papers. In the session on electromagnetic hazards papers were presented covering the effect in depth of EM fields on specific biological systems as the eye, ionic and conduction in the body, etc.

A paper by Bronaugh and Sikors (U.S.A.) reviews the problems of automated EMC measurements and discusses the problems in some detail. Van Essen (Netherlands) describes the instrumentation of an automated EMC test facility used to make radiated emission and susceptibility measurements in the range of 20 Hz to 40 GHz and conducted emissions and susceptibility measurements in the range of 20 Hz to 100 MHz.

Kashyap (Canada) discusses the disturbances in the field in a TEM cell produced by the equipment under test and shows how these disturbances can be taken into account. Linkowitz (U.S.A.) shows how to discriminate between narrowband and wideband EMI using a spectrum analyzer.

Boronichev (U.S.S.R.) discusses the difficulties in measuring the immunity of a broadcast receiver using the CISPR method. Wieckowski (Poland) presents an analysis of a double-loaded circular loop acting as a broadband probe for EM power density measurements. Paul (U.S.A.) discusses the EMC problems in printed circuit board design and describes a simple crosstalk model suitable for incorporation into a computer-aided design and computer-aided manufacturing process.

A paper from France (Weidman, Hamelin & LeBoulch) presents measurements of radiation in the VHF and UHF bands from naturally occurring lightning discharges and compares them with simultaneous recordings of magnetic fields (B fields) and photoelectric data. Jaeger & Rode (W. Germany) discusses the protection requirements for modern aircraft equipment from nuclear EMP and lightning and show how these requirements differ.

Whitehouse (England) discusses the approach being taken by CCIR and CISPR in reassessing limits for ISM equipment. The most difficult part of the problem is assessing the probability that an ISM will actually cause interference.

The application and development of EMC in China is discussed in a paper by Chen & Zhu. This paper is a broad brush treatment of EMC developments in China from 1950 to the present and describes the use of APD measuring equipment and CISPR measurement procedures. The paper describes the EMC standards developed in China.

Strnad & Rohsler (W. Germany) report on noise sources and interference levels in HV power substations. The noise sources that are considered are switching in primary and secondary circuits, atmospheric even-s, earth faults, electrostatic discharge and fields produced by radio transmitters (particularly walkie-talkies) used by maintenance staff.

Hopkins & Cravey (U.S.A.) present a tutorial overview of interference considerations in spread spectrum communications. Varakin (U.S.S.R.) compares the efficiency of a cellular radiotelephone system using spread spectrum techniques with that of a conventional FM cellular system and concludes that the spread spectrum system efficiency of spectrum usage is significantly higher.

A paper by Satamurthy (India) discusses the problem of producing compatible electronic controls for use in land mobile vehicles and the EMC measurements required to insure compatibility.

The subject of radio frequency spectrum management is discussed in a paper by Olms (W. Germany). He points out the need for inspection of stations and monitoring to insure compliance with international and domestic regulations and the need for an adequate data base to be used for frequency usage planning.

The design objectives to be met by a mobile spectrum monitoring system are discussed in a paper by Vaccani (Canada), who shows how a new automated monitoring vehicle recently built in Canada meets these objectives. The vehicle will be used to monitor mobile radio operations for enforcement purposes and to collect spectrum occupancy data.

A paper from Japan (Yamakazi, Nog-chi & Kuronuma) describes a new receiver with a wide IF bandwidth for measuring the amplitude probability distribution (APD) and the crossing rate distribution (CRD) of impulsive radio noise such as that produced by automobiles. The paper shows that these measurements give a better correlation with the subjective evaluation of the annoyance of TV pictures impaired by ignition noise than is given by traditional quasi-peak measurements.

Reviewed by Herman Garlan, Annandale, VA

NONLINEAR AND ENVIRONMENTAL ELECTROMAGNETICS
Edited by Hiroshi Kikuchi
Elsevier Science Publishing, Inc.
52 Vanderbilt Avenue
New York, New York 10017

This book is a compilation of papers that were presented at the International Workshop on Nonlinear and Environmental Electromagnetics. The papers presented in this book deal with various aspects of nonlinear and environmental electromagnetic phenomena that result from atmospheric disturbances (such as thunderstorms, weather fronts, sudden ionospheric disturbances, etc.), corona and arc discharge, nuclear electromagnetic pulses and other nonlinear atmospheric effects.

The book opens with an interesting review by Professor Kimpara of a half century of atmospherics. He includes a discussion of the various factors that result in nonlinear and environmental electromagnetic emissions. The remainder of the book presents papers that were given in sessions that deal with:

- Whistlers and other VLF Phenomena,
- Nonlinear Waves, Quasi-Particles and Solutions,
- Nonlinear and Chaotic Lines,
- Environmental Electromagnetics,
- Ponderomotive Force in an EM Environment, and
- Environmental Effects of NEMP.

This publication of the proceedings of the International Workshop on Nonlinear and Environmental Electromagnetics should prove helpful and beneficial to those interested in the subject.

Reviewed by:
Wiliam G. Duff
Atlantic Research Corp.
5390 Cherokee Avenue
Alexandria, VA 22312

EMC STANDARDS ACTIVITIES

CISPR 22 AND ITS USE BY FRANCE AND JAPAN FOR INFORMATION TECHNOLOGY EQUIPMENT

by Herbert K. Mertel

This article is prepared for our colleagues who perform "commercial" RFI measurements to FCC part 15 J, VDE 0871, and similar RFI requirements. Even though it appears as if each country has different RFI regulations, there is a "unifying" effort to generate a universal RFI specification. The CISPR Subcommittee G for Information Technology Equipment is working in this direction.

The long-awaited CISPR Publication 22, "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment", was published in late 1985. This document will become the new World Standard for RFI control of Information Technology Equipment (ITE) where ITE is defined as:

Equipment designed for the purpose of:

A) receiving data from an external source (such as a data input line or via a keyboard);

B) performing some processing functions on the received data (such as computation, data transformation or recording, filing, sorting, storage, transfer of data);

C) providing a data output (either to other equipment or by the reproduction of data or images).

NOTE: — This definition includes electrical/electronic units or systems which predominantly generate a multiplicity of periodic binary pulsed electrical/electronic waveforms and are designed to perform data processing functions such as word processing, electronic computation, data transformation, recording, filing, sorting, storage, retrieval and transfer, and reproduction of data as images.

The ITE RFI Standard was coordinated amongst all member countries of the CISPR. This document is already used in France and Japan. It will also be the foundation for the European Community RFI Specification for ITE and compliments 82/499/EEC, which is used as the Inter-European RFI Specification for incidental RFI sources, such as vacuum cleaners, mixers, etc.

CISPR 22 has two classes of equipment:

Class A equipment is information technology equipment which satisfies the Class A interference limits, but does not satisfy the Class B limits. In some countries, such equipment may be subject to restriction on its sale and/or use.

NOTE: The limits for Class A equipment are derived for typical commercial establishments for which a 30 m protection distance is used. The Class A limits may be too liberal for domestic establishments and some residential areas.

Class B equipment is information technology equipment which satisfies the Class B interference limits. Such equipment should not be subject to restrictions on its sale and is generally not subject to restrictions on its use.

NOTE: The limits for Class B equipment are derived for typical domestic establishments for which a 10 m protection distance is used.

The limits for powerline RFI for the quasi-peak and average detectors and a 9 kHz bandwidth are as follows:

Frequency MHz	Class A, dBuV QP	Class A, dBuV Avg.	Class B, dBuV QP	Class B, dBuV Avg.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5	73	60	56	46
5 - 30	73	60	60	50

*The limit decreases linearly with the logarithm of the frequency in the range of 0.15 to 0.50 MHz for the Class B limit.

In reviewing the limits one should observe that the "average" limit is close to the present FCC or VDE limits and the "quasi-peak" limit relaxes the average limit by 13dB (for A) or 10dB (for B). In other words, the average limit is for narrowband RFI and the quasi-peak limit is for broadband RFI. This is similar to the FCC - 13dB Rule which states in MP-4, Sec. 4.2.2, Note 4,

"For line conducted tests, if the equipment exhibits emissions which exceed the limit under the above specified conditions the following option may be exercised. The measurements may be made in the average mode with a 9 kHz minimum bandwidth. If the signal level in average mode is significantly less than in peak or quasi-peak mode, the emission is considered broadband and the quasi-peak value may be reduced by 13dB for comparison to the limit."

The CISPR 22 average/quasi-peak approach is also similar to the VDE "B" limit relaxation for broadband RFI of 12dB because VDE 0871 and FTZ 1046 state that the (12dB higher) RFI limits of VDE 0875 are applicable for broadband RFI. One should remember though, that originally the VDE 0875 "N" limit existed. When computers came along the "N-12dB" Law Vfg. 529/1970 was passed to account for the higher interference potential of narrowband RFI.

The bottom line of all this is that if the average limit is met when using a quasi-peak detector receiver, the test unit shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary. From a practical point of view, an automated "average" scan is extremely long because of the long time constant of the average detector.

The limits for radiated RFI field strength of CISPR 22 require no discussion since the limits are expressed in terms of the standard quasi-peak detector and a 120 kHz bandwidth as follows:

Frequency MHz	Class A dBuV/m at 30 meter	Class B dBuV/m at 10 meter
30 - 230	30	30
230 - 1000	37	37

The Class A or B radiated RFI measurements can also be made at closer distances with the limits adjusted (higher by 20 log 30/d or 20 log 10/d) where d is the measurement distance used.

The size of the minimum required ground plane is defined in CISPR 22 as shown in Figure 1.

CISPR 22 and France

CISPR 22 has been adopted by France in its entirety by the draft "Interministerial Decree." However, the precise mandatory compliance date is not yet known. ITE must be tested and must comply with the limits. The equipment must be marked:

"ATI conforme Classe A" or
"ATI conforme Classe B"

The locations of Class A equipments must be reported to the Comite de Servitudes Radioelectriques by the owner (user) within 30 days of installation on a form available from the prefecture.

Class B equipment need not be reported.

CISPR 22 and Japan

The Electronics Industry Association of Japan (EIA) has adopted a voluntary compliance with the RFI requirements of CISPR 22. The following are excerpts from an EIA release, dated February 27, 1986:

> "The electronics industry in Japan believes that RFI problems should be solved not by governmental regulations but by industry. "The Voluntary Control Council for Interference by Data Processing Equipment and Electronic Office Machines" (VCCI) was established on November 26, 1985 by four concerned organizations; Japan Electronic Industry Development Association (JEIDA), Japan Business Machine Makers Association (JEMMA), Communications Industry Association of Japan (CIAJ), and our Association (EIAJ) in order to take prompt measures. The Council is chaired by Mr. Katsushige Mita, President of Hitachi, Ltd. and will implement a voluntary plan from April 1, 1986.

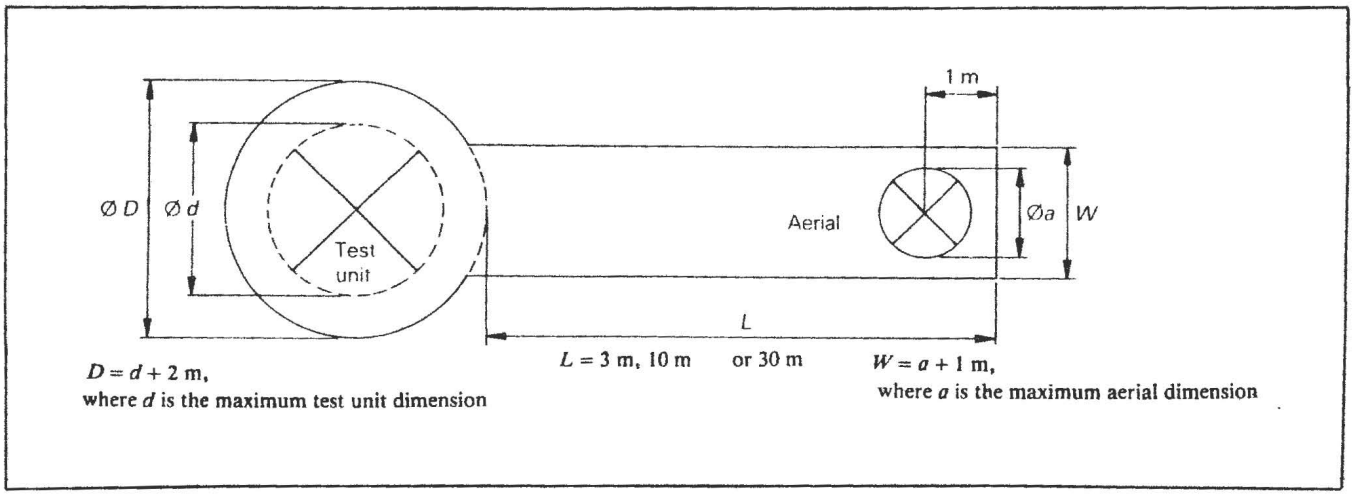

Figure 1. Minimum size of metal ground plane.

VCCI will implement the following control measures on a "voluntary basis." Any foreign based companies in Japan and Japanese companies selling the foreign products in Japan's market can participate in the Council.

Procedures to Implement the Voluntary Control

1. The equipment suppliers shall become members of VCCI.
2. The members will check whether or not the equipment meets the technological requirements of VCCI.
3. The suppliers shall submit reports to VCCI that the equipment meets the requirements.
4. Indication that the equipment satisfies the requirements of VCCI shall be made on equipment bodies.

Conformity with the technological requirements may be confirmed either at the test site of the presenter of the equipment or by any other testing laboratories."

The VCCI has established an implementation period and a relaxation of the limits of CISPR 22 as follows:

Class A Equipment Manufacturing Date	**CISPR 22 Limits are relaxed by**
Dec. 86 - Nov. 87	10 dB
Dec. 87 - Nov. 89	4 dB
After Dec. 89	0 dB
Class B Equipment Manufacturing Date	**CISPR 22 Limits are relaxed by**
June 86 - May 87	10 dB
June 87 - Nov. 88	4 dB
after Dec. 88	0 dB

For further information on VCCI contact:

Mr. A. Konomoto
Electronic Industries Association of Japan (EIAJ)
Tokyo Chamber of Commerce and Industry Bldg.
2-2 Marunouchi 3-chome, Chiyoda-ku, Tokyo 100
Japan
Phone 03-213-1075
Fax 03-287-1712

FUTURE EMC-S SYMPOSIA SCHEDULE

1986 — San Diego, CA; September 16-18
Town & Country Hotel
Herbert K. Mertel
(619) 578-1480

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
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
Donald N. Heirman
(201) 834-3566

INTERELEMENT INTERACTIONS IN PHASED ARRAYS

Large phased array antennas can be more efficiently and effectively designed, and their performance more accurately predicted, if we understand the effects of mutual impedances on array element excitations, and the role played by multiple reflections and mutual impedances in producing elementary patterns that combine to form the radiated field. The first results of a study of these issues are presented in *Interelement Interactions in Phased Arrays: Theory, Methods of Data Analysis, and Theoretical Simulations* (TN 1091).

A principal objective of the study is to determine if it will be possible to predict the far-field pattern of a large phased array from measurements of some of its subarrays in the near field. Since many large arrays are too big or immobile to be economically measured using present techniques, the study is intended to solve a major measurement problem. Copies may be purchased for $2.00 prepaid from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. (Order by stock no. 003-003-02715-4).

CALENDAR 1986

IEEE International Symposium on EMC
San Diego, CA
Contact: Herb Mertel
EMACO, Inc.
7562 Trade St.
San Diego, CA 92121
(619) 578-1480

September 23-25

Electrical Overstress/Electrostatic Discharge Symposium
Riviera Hotel, Las Vegas, NV
Contact: Michael E. Martin
Publicity Chairman
3M/Static Control Systems Division
2111 West Braker Lane
Building 501, P.O. Box 2963
Austin, TX 78759-2963
(512) 834-3117

September 29-October 3

5th Int'l Conference on EMC
University of York, England
Contact: Mr. R. Larry
IERE
99 Gower St.
London, WC1E 6AZ England
01-388-3071

October 27-29

IEEE Holm Conference on Electrical Contacts
The Copley Plaza, Boston, MA
Contact: IEEE Holm Registrar
IEEE Components, Hybrids, and
Manufacturing Technology Society
345 East 47th Street
New York, NY 10017

November 4-6

6th Int'l Conference
Israel Society for Quality Assurance
Tel-Aviv. Israel
Contact: Conference Secretariat
Ortra Ltd.
2 Kaufman Street
P.O.B. 50432
Tel-Aviv 61 500, Israel

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.

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

MELVIN J. JOHNSON

"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: 1-6-86

Power Line Disturbance Monitor Protects Equipment During Installation
Charlie Harris
Liebert Corp. Instrument Group
Evaluation Engineering Magazine
Vol. 24, No. 6; June 1985; P 142-143

ABSTRACT: The most common power disturbances are short-term voltage variations and very high speed pulses or transients with durations of only a few microseconds. Though these power fluctuations do not dim lighting or shut down electronic equipment, they do cause errors in computer functions. Power line disturbance monitors are described.

INDEX TERMS: Power line, transients, spikes, power line monitors, computers, conducted susceptibility

EMCABS: 2-6-86

Methods For Controlling Ion Levels
Rollin McCraty
Static Control Services
Evaluation Engineering Magazine
Vol. 24, No. 10; October 1985; P 84-100

ABSTRACT: Whenever an electrical spark or discharge occurs, a radio frequency wave will be generated. Electric motors, ignition points and light switches all produce RFI. The corona process itself produces a tiny arc at the discharge point. This produces a small RF signal toward the low end of the AM band. A broken center conductor in a high voltage cable can produce RFI. Noise spectrums are given for two radiated cases.

INDEX TERMS: Radiated noise, arcing, test data, static discharge ionization pulse

EMCABS: 3-6-86

The FCC Wants You! (And That Isn't Good)
No Author Listed
Evaluation Engineering Magazine
Vol. 23, No. 10; October 1985; P 70-83

ABSTRACT: If your company produces digital products that generate timing signals in excess of 10 KHz, you are responsible for ensuring that the products comply with the FCC's RF emission standards. The FCC can order manufacturers to redesign offending products and can even impose fines and classify substandard hardware as unsaleable contraband. Two years ago Coleco had 50,000 of its video games pulled off the shelf just before Christmas.

INDEX TERMS: · FCC, standards, compliance, commercial, emission, testing, CISPR, test instruments, TEMPEST

EMCABS: 4-6-86

Dealing With EMI/RFI—Proper Molding Technique Key to Optional Shielding Performance
Steven D. Gerbig
Wilson-Fiberfil International
Evaluation Engineering
Vol. 24, No. 5; May 1985; P 84-95

ABSTRACT: There are several plastic filler systems that can be used to achieve the necessary FCC-mandated shielding levels, including carbon fibers, aluminum flakes and stainless steel fibers. Each has its own advantages but also suffers from certain disadvantages.

INDEX TERMS: Shielding, FCC, standards, plastic housings, commercial, plastic fillers, carbon, stainless steel, aluminum flakes

EMCABS: 5-6-86

Knowing 'Inductive Logic' Keeps Power Interface ICs Alive and Switching
Paul Emerald
Sprague Electric Co.
Electronic Design Magazine
Vol. 33, No. 6, March 1985, P 195-200

ABSTRACT: Power interface ICs greatly simplify the system designer's task, but must be implemented carefully when they operate in an inductive load. The designer must know how to clamp transients since they can not be prevented. The idiosyncrasies of ever-present parasitic elements also need to be well understood.

INDEX TERMS: Integrated circuits, switching, inductive loads, transients, clamping, suppression techniques, power interface

EMCABS: 6-6-86

EMI Reduction Starts With Connector Doubling as Low-pass Filter
Harry Hazzard, AVX Corp.
Richard Kiefer, Kiefer Electronic Dev.
Electronic Design Magazine
Vol. 33, No. 6; March 1985, P 181-186

ABSTRACT: Many techniques can reduce RF noise, but with a capacitive filter connector, the engineer has a good chance of stopping it at its source.

INDEX TERMS: Connector, filter connectors, attenuation, suppression, ferrite beads, capacitor filters, measurements, data

EMCABS: 7-6-86

Connector, Cable Crosstalk in Controlled Impedance Cable Assemblies
Chris Shmatovich
Chabin Corp., Product Dev. & Testing
Electri-onics Magazine
Vol. 31, No. 9; August 1984, P 51-54
ABSTRACT: Multilayer boards and controlled impedance ribbon cable are often used to minimize pulse reflection or ringing. Proper line terminations and low inductance connectors also must be provided. As signal densities and edge-rates increase, controlling impedance is no longer sufficient. Crosstalk becomes a major problem. Two contributors are the controlled impedance ribbon cabling and the connectors. Tables of cross talk data on cables are presented.
INDEX TERMS: Crosstalk, connectors, ribbon cable, suppression, cables, measurement, coupling, termination

EMCABS: 8-6-86

Filter Connectors and EMI Control
Kamal Boutros
Amphenol Products
Connection Technology
Vol. 1, No. 4; September 1985; P 41-43
ABSTRACT: Connectors are fast becoming a proven and cost effective method to control EMI in computer applications. With built-in low-pass filters, they prevent external EMI from compromising system performance and data integrity. They protect against damage and down time due to electrostatic discharge and they help meet FCC requirements.
INDEX TERMS: EMI, filter connectors, attenuation, FCC, suppression, connector design, cables

EMCABS: 9-6-86

Measuring Magnetic-field Shielding Insertion Loss
A. Neil Faught, Jr.
Raytheon Co., Electromagnetic Systems Div.
Electri-onics Magazine
Vol. 31, No. 11; October 1985, P 81-83
ABSTRACT: Traditional methods for evaluating magnetic-field shielding effectiveness of EMI gaskets and other shielding products require the use of shielded enclosures. This article describes how using a dual transverse electromagnetic (TEM) cell system eliminates the need for shielded enclosures and offers advantages over single TEM cells.
INDEX TERMS: Magnetic field, measurement, Crawford cell, TEM cell, FCC, shield attenuation, measurement, shielded enclosure

EMCABS: 10-6-86

EMI Shielding with Perforated Metals
J. Lee Plank, Jr.
Industrial Perforators Assoc.
Machine Design
22 August 1985, P 202
ABSTRACT: To provide guidance on which perforated metal to use, the Industrial Perforators Association contracted with Batelle's Columbus labs to evaluate various samples of perforated aluminum, steel and stainless steel. Tests were made for the shielding effectiveness of the samples at frequencies of 30, 100, 300 and 1000 MHz. Data are included for various hole sizes, hole spacings, and material thickness.
INDEX TERMS: Shielding effectiveness, attenuation, perforated metal, FCC, ventilation, test data

EMCABS: 11-6-86

Radiated Emission Test Sites
James W. Johnson, Daniel D. Hoolihan
Amador Corp.
Test & Measurement World
October 1985, P 116-122
ABSTRACT: When testing electronic devices for radiated emission, the FCC uses an open, flat area with relatively low ambient RF radiation. Manufacturers complying with FCC test requirements may use alternative sites chosen for cost and convenience. Ambient RF field strength spectrum is discussed.
INDEX TERMS: FCC, test sites, ambient environment, measurement, radiated emission, shielded rooms

EMCABS: 12-6-86

Conductive Composites Blunt EMI Effects
Khemchand Nangrani and Steven Gerteisen
Wilson-Fiberfil International
Research and Development Magazine
July 1985, P 60-63
ABSTRACT: When present in plastic composites, high-aspect ratio fillers contribute EMI shielding as well as reinforcement. Metallic fibers or flakes and carbon fibers are the most effective. In this article, steel and carbon fibers and aluminum flake are considered. You'll want to balance costs, product weight and esthetics.
INDEX TERMS: Conductive plastic, shielding, housings, commercial, plastic fillers, ASTM ES 7-83, test data

EMCABS: 13-6-86

EMI Control in the Design of Printed Circuit Boards
Donald R. J. White
White Associates
PC Design Magazine
Vol. 2, No. 2; February 1985; P 3-13
ABSTRACT: This article describes techniques which are essential for the control of EMI in the design of printed circuit boards. Most solutions used to control emission will also result in a reduction in susceptibility. Detailed design methods and data are presented.
INDEX TERMS: PC boards, EMI, RF emission, RF susceptibility, trace impedance, power circuit decoupling, layout

EMCABS: 14-6-86

Normalized Lowest Intermod Mixer Bandwidth Design Curves
Don Neuf and Phil Piro
RHG Electronics Lab. Inc.
Microwave Journal
Vol. 28, No. 2; February 1985; P 165-173
ABSTRACT: Much of the cost of any wide band FW receiver is associated with "front-end" components that channelize or downconvert the input frequencies. The input and output operating bandwidths, associated filters, local oscillator frequencies and powers are all chosen to minimize unwanted mixing responses. Charts of intermodulation product with spurious free regions are given.
INDEX TERMS: Intermodulation, receiver design, spurious responses, electronic warfare, harmonics, data

EMCABS: 15-6-86

Conductive Thermoplastics Meet Shielding Demands
Steven R. Gerteisen
Wilson-Fiberfill International
Design News
Vol. 41, No. 2; 1/21/85; P 66-70
ABSTRACT: While conductive finishes may be used, conductive thermoplastics meet federally mandated regulations and offer long term solutions. Molded-in shielding and ESD control is provided. There is no conductive finish to flake or peel. Shielded plastics are developed by adding conductive agents within a resin matrix. Properties of various materials, including resistivity, are listed.
INDEX TERMS: FCC, commercial, shielding, plastic housings, EMI, plastic fillers

EMCABS: 16-6-86

Cables and Wires: The Invisible Components
No Author Listed
Evaluation Engineering Magazine
Vol. 24, No. 4; April 1985, P 123-131
ABSTRACT: Cable shielding may be accomplished by foil, braid or both. Great confusion centers around shield selection and application, especially in the need for proper grounding in cable types with drain wires, collecting interference instead of blocking it.
INDEX TERMS: Cables, shields, braid, foil, grounding, flat cables, connectors, vendors

EMCABS: 17-6-86

Use Ferrite Components to Suppress EMI/RFI in Digital Circuits, Wires, and Cables
Jim McDermott
Special Features Editor
EDN Magazine
Vol. 30, No. 4; February 1985; P 111-116
ABSTRACT: If you are trying to suppress noise or EMI in digital circuits or are worried about noise problems when connecting wires and cables, consider the use of components fabricated of ferrite materials. Ferrite comes in a wide variety of types, is cheap and has flexibility.
INDEX TERMS: Ferrite material, ferrite beads, filters, attenuation, EMI suppression, wires

EMCABS: 18-6-86

British Labs Target Enhanced EMC Tests
Bill Mitchell
European Correspondent
Microwaves & RF
Vol. 24, No. 6; June 1985; P 51-55
ABSTRACT: In response to new safety standards, British researchers are developing better electromagnetic free-field instrumentation. In response to ANSI and similar British proposals, the National Physical Laboratory has taken aim at better standards for electromagnetic free-field instrumentation. Traceable calibrations for free-field parameters and power-flux density monitors are two areas of particular interest.
INDEX TERMS: Field strength, measurement, test cells, optical telemetry, microwave energy, safety, plane wave

EMCABS: 19-6-86

Circuits Eliminate Power-supply Surge Currents
Nathan O. Sokal
Design Automation Inc.
EDN Magazine
Vol. 30, No. 20; September 5, 1985; P 141-146
ABSTRACT: High turn-on surge currents can overstress the power supply and lead to premature failure. Also a surge can generate EMI — both conducted and radiated — that could interfere with other equipment. Finally, the turn-on surge can cause other equipment connected to the same power line to experience trouble.
INDEX TERMS: Power line, turn-on, power supply, current surges, design, surge suppression

EMCABS: 22-6-86

Mobile Cellular Systems Conserve Frequency Resources
William Lee
Pactel Mobile Companies
MSN & CT Magazine
Vol. 15, No. 7; June 1985; P 139-150
ABSTRACT: It is always of great help to the FCC in allocating the frequency spectrum if a system needs less bandwidth and provides optimum use of the band in service while satisfying the consumer. One system that meets this requirement is the mobile cellular system. Techniques such as frequency reuse, handoff and cell splitting allow maximum use of allocated frequency channels.
INDEX TERMS: Frequency allocation, FCC, mobile cellular communication, frequency reuse, frequency management

EMCABS: 20-6-86

Focus on Power Protection Avoiding Disaster
Ben Harrison
Senior Editor
Telecommunication Products + Technology
Vol. 3, No. 7; July 1985, P 49-52
ABSTRACT: Power line irregularities include voltage spikes, electrical noise, voltage sags and surges, glitches, blackouts and frequency shifts. Any of these power irregularities can seriously impact the operation of computer and telecommunication systems and equipment.
INDEX TERMS: Power line, power supply, uninterruptible power, telecommunication equipment, power outages

EMCABS: 23-6-86

Evaluate Interference in Digital Channels
F. Davarian, J. Sumida
Telecommunications Systems Section, JPL
Microwaves & RF
Vol. 24, No. 5; May 1985; P 97-100
ABSTRACT: Since the spectrum available for mobile satellite service (MSS) is limited, a system's channels should be packed as closely together as possible, with minimum-width guard bands. Also, frequency reuse schemes must be considered. Both of these solutions introduce interference. Spectrum conservation and interference reduction become indirectly proportional.
INDEX TERMS: Interference, satellite, digital transmission, adjacent channel, spectrum conservation, FM, FSK

EMCABS: 21-6-86

Intermodulation Products Basic Program Predicts Troublesome Mixing Products
Marc E. Goldfarb
M/A-COM Microwave Subsystems Div.
Microwave Journal
Vol. 28, No. 5; May 1985; P297-301.
ABSTRACT: Unwanted intermodulation products from a mixer or other non-linear device can have a catastrophic effect on microwave system performance if the products occur in close proximity to the system's desired output frequency range. It is imperative that designers be aware of all the possible intermodulation products that could adversely affect a system's performance before the hardware is built.
INDEX TERMS: Intermodulation, receivers, microwave, spurious response, basic program, prediction

EMCABS: 24-6-86

Diversity Characterizes Connectors for Military Aerospace Applications
EDN Staff
EDN Magazine
Vol. 30, No. 8; April 1985; P 92-98
ABSTRACT: Attempts to increase EMI suppression and decrease EMP susceptibility are highlighting the efforts of military/aerospace-connector manufacturers, who are offering products in myriad package styles. Moreover, fiber-optic connectors are likely to gain in popularity as suppliers of military equipment take advantage of fiber-optic systems resistance to eavesdropping.
INDEX TERMS: Connectors, aerospace, shielding, suppression, EMI, EMP, military, filtered connectors

EMCABS: 25-6-86

Testing Cable Shielding with Composite Conductors
Dennis Chalk, Brand Rex Co.
Dr. Lyle E. McBride, Texas Instruments Inc.
Connection Technology
Vol. 1, No. 2; May 1985; P 29-31
ABSTRACT: Nearly all cable shielding methods utilize conductive materials. Cable shields with magnetically permeable metals have not been used until recently. This article investigates the use of composite conductors containing both copper and a magnetically permeable alloy. Cable transfer impedance (attenuation) curves are included for clad braid, tinned copper, Invar, etc.
INDEX TERMS: Cables, shielding, magnetic materials, attenuation, Invar, testing, transfer impedance, data

EMCABS: 26-6-86

ESD Control: To Prevent the Spark That Kills
Dan Anderson
Dixico Inc.
Evaluation Engineering
Vol. 23, No. 7; July 1984; P 120-131
ABSTRACT: Despite the growing static awareness, millions of dollars are being wasted both by those ignoring the problem and those using the wrong approach to solving it. Overkill and underkill are the order of the day. No more foolish waste of money can be found than the use of packing and handling materials with exposed highly conductive surfaces. Conductors cause all ESD damage.
INDEX TERMS: ESD, packing, static charge, protection, discharge

EMCABS: 27-6-86

Dependence on Distance from Ground at Capacitance of Single Sided Printed Circuit
Nobuo Murota
Industrial Research Institute of Aichi Prefectural Government
EMCJ 85-94
ABSTRACT: On designing the digital circuit, it is better to consider the capacitance of the printed circuit for reducing the wrong circuit operation. This report shows a computational method of the single sided printed circuit capacitance floating from a ground plane. This method is based on the boundary element method. The examinational model is three parallel lines on the dielectric board upon a grounded plane. The capacitance of calculated values and measured values keep a good accordance.
INDEX TERMS: Printed circuit, capacitance, boundary element method

EMCABS: 28-6-86

Electromagnetic Field Pattern Measurement Using Holographic Techniques
Hiroshi Echigo, Tasuku Takagi
Department of Communication, Tohoku University
EMCJ 85-92
ABSTRACT: Authors have developed a new tool to measure E-M field patterns. The tool, which is controlled by a microcomputer system, can measure many points in a plane by a sensor scanning method. By combining the sensor output with a reference signal, holographic images can be obtained. The authors measured field patterns formed by a vertical dipole radiation, which gave a very good agreement with the one calculated on the free space condition.
INDEX TERMS: E-M field, pattern, hologram

EMCABS: 29-6-86

Amplitude and Phase Measurements of RF Magnetic Field Using a Laser Diode
Ken-ichi Hayashi, Kazuo Arai, Yoshio Ida
Faculty of Technology, Kanazawa University
EMCJ 85-93
ABSTRACT: A complex RF magnetic field sensor, composed of a small loop antenna linked with a laser diode (LD), is proposed. This takes advantage of the fact that the LD is able to respond to the instantaneous RF current, due to the time derivative of the RF magnetic field passing through the loop. The light emitted from the LD is transmitted by an RF-immune fiber to a distant detector, where the relative phase of the field is determined by comparing it with a reference field.
INDEX TERMS: Magnetic sensor, laser diode, optical fiber, phase detection, EMC

EMCABS: 30-6-86

Screening Effectiveness of Coaxial Connectors and Measuring Method: The Matched Tri-coaxial Test Set-up
Suano Morisada
Osaka Electro-Communication University
EMCJ 85-89
ABSTRACT: This paper presents the screening effectiveness of coaxial connectors and measuring method at high frequency and microwave. We describe the matched tri-coaxial test set-up with matched T-feed for screening measurements of connectors from 10MHz to 1.7GHz, and 1GH to 9GHz. Using this method, we measured BNC,N connectors and RG401U semi-rigid copper cables.
INDEX TERMS: Sample holder, matched tri-coaxial test set-up

EMCABS: 31-6-86

A New Method For Estimating Discontact Properties in Sliding Current-Collector Using Impulsive Noise Currents
Koji Yamashita, Osamu Fujiwara, Yoshifumi Amemiya
EMCJ 85-87

ABSTRACT: This report describes a new method for estimating the discontact properties in the sliding current-collector by the impulsive noise currents which flow through the pantograph. This method is based on the fact that the peak time of the envelope responses of the band-pass filter (BPF) to the impulsive noises corresponds to those of discontact arc ignition and extinction. A method is also discussed for improving the estimation error due to the overlapped responses of the BPF. The numerical computations are shown for verifying the validity of the above method.

INDEX TERMS: Discontact properties, estimation, impulsive noise, BPF, envelope response, computation

EMCABS: 32-6-86

The Shielding Characteristics of Cable with Plated Cloth: Effect of The Plating Thickness
Kohtaro Mio, Jinichi Taniguchi, Tosio Kudo
Dainichi-Nippon Cables, Ltd.
EMCJ 85-88

ABSTRACT: We have reported the EMI shielding characteristics of plated clothes used as sheets and incorporated in cables. In this paper we described the results of research into the relationship between the plating thickness and the shielding effects of two grades of Cu-plated and Ni-plated clothes with different plating thicknesses, respectively, which were measured in the forms of sheets and cable. As already reported, the hump caused by reflection was found in the results of measurement by the absorbing clamp method. As the result of improved measurement this time, however, the hump disappeared. The sheet placed in a double TEM (transverse electromagnetic) cell was evaluated by plane wave.

INDEX TERMS: EMI shielding, plated cloth

EMCABS: 33-6-86

Modulation Characteristics of Elastic Heat Wave in Human Head Irradiated by Pulsed Microwaves
Tsutayuki Shibata, Osamu Fujiwara, Kazuo Kato, Takashi Azakami
Nagoya Institute of Technology
EMCJ 85-96

ABSTRACT: The microwave hearing effect is said to be caused mainly by elastic heat wave which is produced by the rapid thermal expansion of the brain matter. The paper describes the modulation characteristics of elastic heat wave in a human head irradiated by pulsed-microwaves. Reasonable agreement of the calculated results with the experimental ones is shown. The relationships are also discussed between the frequency spectra of elastic heat wave and the modulation parameters (pulse width and recurrent interval).

INDEX TERMS: Pulsed-microwave, hearing effect, elastic heat wave, spectrum, modulation

EMCABS: 34-6-86

Measurement of Auditory Evoked Fields Elicited by Pure Tone Stimuli: Masking Effect of AEF
Yasushi Isobe, Yoshinari Mizutani, Shinya Kuriki
Research Institute of Applied Electricity, Hokkaido University
EMCJ 85-97

ABSTRACT: Auditory Evoked Fields (AEF) elicited by auditory stimuli consisting of pure tones were measured using SQUID (Superconducting QUantum Interference Device) from the lateral head of humans. The sources of AEF were assumed to be current elements in the auditory area of cortex of right and left hemispheres. The amplitude of the AEF attenuated with the addition of white noise. The dependence indicated that the AEF reflected the perceived loudness of auditory stimuli.

INDEX TERMS: None given

EMCABS: 35-6-86

Attempts at 915-MHz Microwave-CT Imaging of the Human Head
Itsuo Yamaura, Ichiro Yokoshima
Electrotechnical Laboratory
EMCJ 85-99

ABSTRACT: A translate-rotate type of microwave CT scanner was constructed to obtain cross-sectional images of the human head. The field of the view is a circular area with a diameter of 25 cm. Antennas are composed of open-ended, dielectrically loaded X-band waveguides. These are immersed in a bath filled with a saline solution (1%), which serves to reduce multipath-propagation effects. The head is inserted through a hole in the bath tank's base, which hole is covered with a thin polyethylene sheet, the skirt of which is secured to the hole by a leak-proof fastener. Image reconstruction is done by the same method as that used in X-ray CT imaging. The morphological structure of the brain appears to be discernible by this technique.

INDEX TERMS: Microwave CT, CT imaging, microwave imaging of the human head

EMCABS: 36-6-86

1985 IEEE International Symposium on EMC: Report on "1985 IEEE International Symposium on EMC"
Yasuo, Akao
Aichi Institute of Technology
EMCJ 85-101

ABSTRACT: The 1985 Internatinal Symposium on EMC was held on August 20-22, 1985, at the Colonial Hilton, MA, USA. More than 500 EMC engineers participated, and 102 original papers were presented. Prof. Mulligan, UC Irvine, gave an interesting and instructive keynote address at the plenary session. One session was devoted to the panel discussion about EMC education. The symposium exhibits had been planned, and 73 exhibitors presented their products.

INDEX TERMS: International symposium, EMC symposium, symposium report

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