## **Electromagnetic Compatibility Society**



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E E R

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EDITOR: ROBERT D. GOLDBLUM

Newsletter

#### FCC ISSUES BULLETIN ABOUT **BIOLOGICAL EFFECTS OF** RADIATION

The FCC regulates the use of radio waves and microwaves for communications. Because of its responsibilities in this area, the Commission often receives inquiries concerning potential hazards to human health and to safety from radio frequency and microwave radiation. In recent years, there has been a noticeable increase of public awareness and concern over this issue. Increased publicity about new uses of RF and microwave technology has generated much discussion and speculation concerning the alleged "electromagnetic pollution" of the environment. OST Bulletin #56 dated July, 1982 is a short publication designed to provide information on some of the most commonly asked questions about RF and microwave radiation. It is titled "Questions and Answers About Biological Effects and Potential Hazards of Radio Frequency Radiation."

The publication provides a distinction between ionizing and non-ionizing radiation. It discusses what biological effects can be caused by RF radiation and briefly describes current and future US standards, as well as some of the lower standards used by Soviet block nations. It contains a brief discussion about the safety of microwave ovens; but, refers the readers to the Bureau of Radiological Health (BRH) of the Food and Drug Administration. Their safety standard of 5 mW/cm<sup>2</sup> measured at approximately two inches from the oven's surface is stated. A brief discussion of RF radiation effects on electronic cardiac pacemakers also is presented.

The bulletin addresses the radiation emitted by radio and television broadcasting towers, as well as microwave pointto-point relay towers. Although the safety levels are to be defined by the Environmental Protection Agency and the Occupational Safety and Health Administration, the bulletin points out that workers and maintenance personnel should only work on such towers with reduced power or with the power turned off. Of particular importance is the emphasis made that the human body absorbs the most RF radiation in the frequency range of 30 - 300 MHz. Copies of OST Bulletin #56 may be obtained from the FCC Office of Science and Technology, Technical Analysis Division.

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#### **EDUCATION COMMITTEE NEWS**

Several short courses on EMC related topics are scheduled for the fall and winter of this year.

The Continuing Education Center of George Washington University is offering a course on "Lightning Protection" to be given on November 8-9 in Washington, DC. The instructors will be Bernhard E. Keiser and A.K. Guthrie. For more information, contact George Washington University at 202-676-6106.

McGraw-Hill Seminar Center is presenting a course on "Controlling Electromagnetic Interference" on December 9-10 in New York. The seminar leader is Ernest R. Freeman. For more information, contact McGraw-Hill at 212-687-0243.

Don White Consultants will be offering "Grounding and Shielding" in Philadelphia on November 2-5 and in Phoenix on January 25-28. "EMC Design and Measurement for Control of EMI" is scheduled for San Jose on December 6-10. "TEMPEST — Design, Control and Testing" will be offered November 1-5 in Washington, DC and on January 31-February 4 in Palo Alto. "EMP — Design and Measurement for Control of Susceptibility" will be given on December 7-9 in Washington, DC. "EMI Control in Weapon Systems and Military Vehicles" will be presented on November 16-18 in Washington, DC. For more information, call 703-347-0030.

Completing R & B Enterprises' fall 1982 series of seminars, which concentrate on EMI problems and design solutions, is the second two-day test workshop. This session will provide practical, hands-on training in equipment operation, set-up procedures, test administration and evaluation to participants, and will be held at R & B's modern, FCC approved test laboratory in suburban Philadelphia. EMC Science Center engineers will demonstrate testing methods and pitfalls and then will supervise students as they repeat the procedure. Classroom instruction and course materials will supplement actual test exercises. The workshop has been structured to include testing problems submitted by students. Additional series of seminars are being planned. For specific information, call 215-828-6236.

In order to be included in the newsletter, information on courses and seminars must reach me by December 1 for the winter issue, March 1 for the spring issue, June 1 for the summer issue, and September 1 for the fall issue.

> Henry Ott Chairman, EMCS Education Committee

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#### POSITION STATEMENT OF THE EMC-S BOARD OF DIRECTORS ON HR 5008

On June 10, 1982, the Board of Directors for the EMC-S of the IEEE voted unanimously to adopt a position in support of enabling legislation to permit the FCC to set minimum performance standards for susceptibility to interference of audio and video electronic equipments. This is one of the issues addressed in H.R. 5008. The position statement has been distributed to a number of Senators, Representatives, key individuals with the IEEE (including all Society Presidents), TAB, FCC, and the Telecommunications Policy Committee Chairman, and the contents are found below.

The Board of Directors of the IEEE Electromagnetic Compatibility Society believes that interference caused to audio and video electronic equipment is a serious problem, and one that has been growing in recent years.

The spectrum is a precious and limited resource which must be used efficiently and wisely in order to serve the public interest and to accommodate the growing demand placed on it to support a wide range of radio communication services in the United States. This goal can be reached with a systems engineering approach to interference.

The Federal Communication Commission has sought to reduce interference by the regulation of radiating devices. This authority to regulate emitters is found in 47 USC 301 and 302. No similar provision exists with regard to the complementary characteristic; i.e., susceptibility to interference of audio and video electronic equipment.

There is one narrow exception which provides for regulation of TV receiver characteristics. This exception (47 USC 303s and 330) was made to allow the Commission to implement the All Channel Law aimed at achieving some comparability in UHF and VHF TV reception. This limited authority cannot serve as precedent for regulation of audio and video electronic equipment.

However, the design of many TV and AM/FM receivers, as well as stereo amplifiers, tape recorders and other electronic devices now in use throughout the United States and on the U.S. market, makes them susceptible to interference from transmitters and other emitting devices designed to accepted engineering standards and in accord with all applicable regulations of the FCC. Inadequately designed receivers also have been responsible for the large separation distances required between FM and TV stations operating on adjacent or nearby channels. If better designs were incorporated in production receivers, much greater use could be made of the available spectrum for more broadcasting stations, or for mobile radio systems, the use of which has been increasing rapidly in recent years.

Past experience indicates that it has been the prospect of imposed standards that has stimulated industry groups to take action and make "voluntary" standards effective.

The EMC Society Board of Directors, therefore, favors the passage of enabling legislation to permit the FCC to set minimum performance standards for susceptibility to interference of audio and video electronic equipment, such power to be employed only when necessary to alleviate widespread, serious and continuing interference caused by poor design of both domestic and imported devices.

We support such enabling legislation, knowing that the process by which the FCC would set up standards will insure that action will not be taken unless other alternatives (such as voluntary industry standards) have not proved timely and effective. Furthermore, the FCC rulemaking process which permits comment by industry and the public (and the participation of experts working in advisory committees established from time to time by the Commission) will insure that this authority will be exercised only when marketplace forces and voluntary standards have proven inadequate to protect the public from serious and widespread interference to audio and video devices. As in its past rulemakings, economic impact on manufacturers and consumers should and will be taken into account so that the resulting rules and standards incorporated in them will protect the public, while not representing an unreasonable or uneconomic burden on manufacturers or consumers of the devices affected.

The Board of Directors of the IEEE EMC Society offers, to the extent possible, its continuing technical assistance to Congress during its consideration of legislation. We stand ready to provide the expert counsel in the area of interference control, electromagnetic compatibility, equipment design and cost reviews to members of Congress, its Committees and their staffs. Should legislation be enacted, we offer this assistance to the FCC in its use of this new authority.

#### NEW LAW EMPOWERS FCC TO REGULATE RFI

Just before quitting for the August recess, Congress tied up several loose telecommunications strands and approved legislation that empowers the FCC to set minimum performance standards for home electronic equipment and systems, and to take appropriate action to protect such equipment from radio frequency interference (RFI). In the rush to adjourn, House and Senate conferees were able to batch the RFI bill (H.R. 5008) with the authorization bill for NTIA and send the measure to the White House for signature.

The omnibus bill (H.R. 3239), which cleared Congress Aug. 19th, contains several technical changes to the 1934 Communications Act; authorizes appropriations (\$12.9 million for 1983 and \$11.8 million for 1984); to NT1A; authorizes the FCC to eliminate individual licensing of citizen band services; increases the terms of certain licenses; and eliminates the need for certain construction permits.

The House Commerce Committee, in its report on H.R. 5008, said it had hoped that voluntary efforts by manufacturers to reduce RFI would be sufficient. "Devices designed and marketed for use in a commercial environment normally include necessary protection against interference and do not require Commission regulation." The Committee report continued:

"In the market for home devices, however, good faith industry attempts to solve this interference problem have not always been successful. Thus, in view of complaints regarding home devices, the Committee believes that Commission authority to impose appropriate regulations on home electronic equipment and systems is now necessary to insure that consumers' home electronic equipment and systems will not be subject to malfunction due to RFI. However, the legislation does not mandate Commission exercise of this authority; that decision is well within the technical expertise of the agency."

Continuing, the Committee gave this indication of its thinking:

"The Committee intends that the Commission's authority apply only to "home electronic equipment and systems" likely to be found in a private residence and intended for residential use, as distinguished from devices intended for office and business use. Radio and television sets would be typical examples of equipment subsumed under the term "home electronic equipment and systems." Other examples include home burglar alarm and security systems, automatic garage door openers, electronic organs, record turntables, and stereo/high fidelity amplifier systems."

"The Committee expects the Commission to exercise the authority granted herein, as it has exercised the authority granted under Section 302, by balancing the cost of improving the performance of a device to particular levels against the benefit to be gained from requiring manufacturers to meet standards of various levels of stringency. In so doing, the Committee expects the number of interference complaints recorded and investigated by the Commission to be significantly reduced."

The IEEE committee on Communications & Information policy, in an entity position statement approved in May, took note of the RFI problem; but, suggested to relevant Congressional committees that consumer protection could best be served "by stimulating appropriate market conditions that will fix the blame for RFI and the responsibility for its correction."

#### U.S. TO TRACK SMUGGLING OF HIGH TECHNOLOGY

The U.S. Customs Service has been assigned the task of halting the smuggling of millions of dollars worth of high technology equipment and other items on the munitions control list that officials believe eventually reach the Soviet Union. Among the equipment that has been seized by Customs agents, principally at airports in the U.S., are advanced radar navigation systems, laser guidance systems for bombs, aerial survey photographic and topographic mapping systems, infrared spectrometer and other infrared systems, advanced computer subsystems related to weapons systems.

#### **ELECTRO/82 WAS THE LARGEST**

A total of 43,840 individuals involved in high technology electronics were registered during the three-day Electro/82, held last May in Boston. The registered attendance was the highest in the history of the long-running event. Major attractions at this year's event included a complete Professional Program, addressing both state-of-the-industry and state-ofthe-art. Among the most popular seminars were: The Gate Array Approach to Circuit Design; Speech Recognition Generation and Synthesis; Progress in Robotics and Automated Manufacturing.

#### IEEE 1983 INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY

#### AUGUST 23-25, 1983 at the HYATT REGENCY CRYSTAL CITY WASHINGTON, DC

This <u>change in dates and hotel</u> will put the 1983 EMC Symposium in a Tuesday, Wednesday, Thursday time frame and eliminate traveling on Sunday for most attendees. The Hyatt Regency Hotel is located at Washington National Airport in the Crystal City complex. The new dates also make it attractive for a family trip, to visit Washington with its multitude of museums and government buildings and tourist attractions.

This 25th Anniversary Symposium promises to be the biggest, most outstanding one in the history of the EMC Society.

The 1983 IEEE International Symposium on Electromagnetic Compatibility will be the Silver Anniversary celebration for the EMC Society. The theme of the symposium will be "A Quarter Century of EMC Progress" and it is fitting that this symposium be held in the Nation's Capital. A large attendance from both industry and government is expected. The symposium will focus on the current "state-of-art" after a quarter century of EMC progress and look into the future to see where efforts should be directed. Particular emphasis will be given to the systems approach to EMC which involves reduction of undesired emanations and the reduction of the susceptibility of electronic devices and systems. Authors are invited to submit original, unpublished papers in all areas of EMC theory and practice. Suggested topic categories include, but are not limited to, the following:

#### TECHNICAL AREAS

Design	Lightning
Control	EMP
Analysis	ESD
Regulations	Materials
Standards	Management
Measurements	Filters
Instrumentation	Systems
Radiation Hazards	Vulnerability
Sequency Theory	

#### APPLICATION AREAS

Aerospace Automation Bio-Medical Communications Components Computers Automotive Consumer Products Signal Processing Defense Electrical Power Environments Production Remote Sensing Spectrum Utilization Legislation Non-Sinusoidal Applications

Prospective authors should submit a 50 to 70 word abstract and a 500 to 700 word summary (up to five illustrations) that clearly explain their contribution, its originality, and its relevance to the EMC discipline. For anonymity during review, please identify author(s) only on the cover sheet. Upon acceptance, authors will receive forms and instructions for the preparation of materials to be printed in the Symposium Record. If poster presentation is desired, please indicate on the material submitted. Papers written by bona fide students will be eligible for a student prize.

#### AUTHOR'S SCHEDULE

Abstract and Summary (3 copies required)
December 15, 1982
Notification of Acceptance February 1, 1983
Camera-ready Copy May 1, 1983
Submit abstracts and summaries to: William G. Duff, Tech-

nical Program Chairman; Atlantic Research Corporation, 5390 Cherokee Avenue, Alexandria, VA 22314.

#### EMI SUPPRESSION ON MOBILE RADIO

Owners and operators of vehicles with mobile communication equipment will be interested in a new publication from the Commerce Department's National Bureau of Standards (NBS) that describes methods of suppressing electromagnetic interference (EMI) affecting this radio equipment. Although NBS performed its study primarily for the nation's law-enforcement community, the findings are applicable to most users of mobile radios. The report, titled *Methods of Suppressing Automotive Interference* (SP 480-44), concentrates on radio systems utilizing narrowband FM communications in the 25 MHz frequency bands; these bands were selected as those most commonly used by public safety agencies.

Prepared by NBS for the National Institute of Justice, U.S. Department of Justice, the report is available for \$6.00 prepaid from the National Technical Information Service, Springfield, VA 22161. Order by title and PB#82-165259.

#### FUTURE EMC-S INTERNATIONAL SYMPOSIA PLANS

2	
1983 —	Washington D.C.; August 23-25 Hyatt Regency, Crystal City A. H. Sullivan, Jr., Chairman 301-881-4036
1984 —	Tokyo, Japan; October 16-18 Tohoku University Prof. Risaburo Sato, Chairman Aramaki Aza Aboa Sendai, Japan 980
1984 —	National Symposium San Antonio, Texas; April 24-26 Hyatt Regency M. Johnson, Chairman 512-684-5111
1985 —	Boston, Mass.; August 20-22 Hilton Wakefield C. L. Smith, Chairman 617-271-7086
1986 —	San Diego, CA; September 9-11 H. K. Mertel; Chairman 714-574-1444
1987 —	Atlanta, Georgia; September H. W. Denny, Chairman 404-894-3535 * * *
	EMC-S Symposia Committee, W. E. Cory, Chairman

512-684-5111

#### THIRD INTERNATIONAL CONFERENCE ON LIVE LINE MAINTENANCE

ESMO-83, the Third International Conference on Live Line Maintenance, will be held in Atlanta, Georgia, June 6-9, 1983, at Dunfeys Atlanta Hotel. The conference is being sponsored by Engineering in the Safety, Maintenance, and Operation of Lines Subcommittee of the Transmission and Distribution Committee. The purpose of the conference is to present new technology, methods, and procedures for work on energized lines. Field and laboratory demonstrations, tool and equipment displays, as well as technical paper presentations and panel discussions, will be included. Tours through local manufacturers' facilities and Georgia Power facilities will be available, as well as a ladies' program.

For further information, contact the Executive Vice Chairman of the conference, Jack Lawrence, Georgia Power Co., 270 Peachtree St., P.O. Box 4545, Atlanta, GA 30302; Tel.: 404-526-2352.

#### LAST CALL FOR SALE OF 1980 POLISH EMC SYMPOSIUM RECORD

The Record of the EMC Symposium held in Wroclaw, Poland, September 17-19, 1980, contains the full text of all papers delivered. Of the 96 papers making up the technical program, 57 are in English and 39 are in Russian. Each Russian paper is accompanied by an abstract in English. While the papers are given either in Russian or in English, they represent the research going on in many other countries, including the USA, Hungary, Italy, Germany F.R., Germany D.R., France, Japan, United Kingdom, and Yugoslavia. Quite a number of papers deal with CISPR limits and measuring methods, including Paolini's paper on the use of reverberating chambers in field measurements. The opening paper by CCIR Secretary Richard C. Kirby discussed the results of the World Administrative Radio Conference, Geneva, 1979, with particular regard to its influence on the future policy in the field of EMC. General guidelines concerning the investigations aiming to reduce the EMC environment pollution, and improve spectrum utilization are given in the conclusion.

Orders for the two volume set should be sent, with payment enclosed, to: James S. Hill, The EMXX Corp., 6706 Deland Drive, Springfield, VA 22152. The price to IEEE members is \$20.00, to non-members \$25.00. Please make checks payable to EMC Society, IEEE. Shipment will be made, postpaid, to any address in the USA. This offer will be withdrawn on December 31, 1982 and the Polish EMC Symposium Record, 1980, no longer will be available.

#### **TECHNICAL WRITING COURSE**

"Technically-Write II," a newly revised correspondence course, now is available from the IEEE. The course is designed specifically to help scientific and engineering professionals master the every-day communication techniques that are essential for career development. It covers the entire spectrum of communication tasks that might confront a modern engineer, including field reports, inspection reports, formal reports, technical correspondence, technical descriptions and instructions, technical presentations, briefings and proposals, and even resumes, and letters of application.

The correspondence course features personal instruction, with each student assigned to an instructor who is a specialist in the field, and who will evaluate student progress every step of the way. Completion of this course is projected at  $3\frac{1}{2}$  months and students who successfully fulfill all course requirements receive a Certificate of Achievement and 6.0 CEAUs.

The course is available to IEEE members at \$127.00, including shipping and handling, and to non-members at \$177.00. For information, please call the IEEE Education Registrar, at 212-705-7860.

#### CEDAR RAPIDS IEEE CONFERENCE

EMI/EMP: Protecting the User is the theme of the 29th annual fall conference of the Cedar Rapids IEEE Conference to be held November 10-11, 1982 at the Five Seasons Center in Cedar Rapids, Iowa. A host of prominent authorities will examine, in detail, the theme, protection against electromagnetic pulses and interference. Among the major presentors are Dr. Heinz M. Schlicke, President of Interference Control Co.; Roy Oberholtzer, plastics engineer in Advanced Technology & Engineering of Rockwell International's Collins Avionics Group; W.D. Nason, also from Rockwell-Collins, who will co-author the plastics engineering session; Carl Schuck, nuclear hardening and survivability engineer, and Larry Pinkston, serving in a similar capacity in the product assurance department, both of Rockwell-Collins; two from the U.S. Navy's Surface Weapons Center in Virginia, Dr. Bob Richardson and John Bean; three representatives of the John Deere Product Engineering Center, Waterloo, IA, Ted Armfield, Mike Howard and Scott Walter; Sebald R. Korn, Application Engineer in the Semiconductor Products Dept. of the GE Co.; Ronald Crouch, Midwest Regional Manager and National Military Liaison Manager of the Deutsch Electronic Components Div.

In one of two power utility sessions, Gerald Bair from Iowa Electric Light & Power Co. will provide insights from his 23 years of experience in helping to answer the question, "Why do I have radio and TV interference?" Focusing on professional growth in the engineering field, Colleen C. Holmes will present a practical analysis of human behavior that can be an effective training tool with long-term benefits. On the lighter side, Ray J. Stanish, who has degrees in physics, mechanical engineering and engineering mechanics, and who has worked for TRW for the past 19 years, will present a humorous explanation of atomic energy in an entertaining discussion, "Atomic Energy - Peasant Style" at the conference banquet.

In addition to the major presentations, approximately 60 exhibitors will be in attendance. For more information about the conference, registration, and exhibits, contact Cynthia Bonebright, IEEE Fall Conference, Box 451, Marion, IA 52302; Tel.: 319-395-5481.

#### **RESULTS OF THE BOARD OF DIRECTORS ELECTION BALLOT**

A ballot for the election of six members to the IEEE Electromagnetic Compatibility Society Board of Directors was issued on August 20, 1982. The ballots returned have been counted, and the following candidates have been elected for a three-year term beginning January 1, 1983:

William E. Cory William G. Duff James S. Hill Eugene D. Knowles Richard B. Schulz Leonard W. Thomas, Sr.

We wish the newly elected members of the Board of Directors success and thank all nominees for their willingness to serve and for permitting their names to be included on the ballot.

#### **ASSOCIATE EDITOR RETIRES**

Ed Bronaugh, formerly of Southwest Research Institute, is retiring from his position as Chairman of the Abstracts Committee and Associate Editor of our EMC-S Newsletter, following many years of devoted service. Ed has been responsible for keeping IEEE members abreast of up-to-date and pertinent publications on various EMC topics with the abstracts that have appeared in each issue. Ed's fine service over the years also has included his Chairmanship of the AdCom and Member of the Board of Directors, in which position he will continue. Ed's active participation with various other IEEE activities, such as the SAE and the Standards activities, also will continue. Grateful appreciation is extended to Ed, and we wish him well in his new endeavors with Electro-Metrics, as he assumes the responsibility for directing all the technical activities with the company. Ed will be moving to Amsterdam, NY, the locale of Electro-Metrics....

#### OFFICIAL IEEE/USSR RELATIONS REMAIN FROZEN

The IEEE Board of Directors has voted against reconsidering a 1980 suspension of official exchanges between the IEEE and the Soviet Union's Popov Society. The Board indicated, however, that they encouraged individual involvement with USSR engineers and scientists because such involvement does not constitute an endorsement of that country's activity.

#### **PATENT RIGHTS**

Several Congressmen have jumped on IEEE's bandwagon by agreeing to sponsor legislation, providing that individual inventors are assured equitable patent rights in agreements with employers. Rep. Robert Kastenmeier, who heads a House Judiciary subcommittee with patents responsibility, introduced IEEE's individual inventor patent bill last year (H.R. 4732). Since then, two other subcommittee members, Rep. Jack Brooks and Rep. Barney Frank, have added their names to the list.

## Book Reviews



by Jim Hill, EMXX Corporation.

In issue No. 113 of this newsletter, I mentioned that "Sequency Theory Foundations and Applications" by Dr. Harmuth had been printed in 2500 copies at \$65.00 in the USA. The Russians picked it up and printed 5200 copies at \$6.00, while the Chinese ran off 8300 copies at under \$2.50 each. I then inquired as to why we in the USA were not subsidizing the advancement of science and technology, so vital to the future of our country, in a similar way. This brought a letter from Erwin V. Cohen, Senior Vice President of Academic Press, Inc. He comments that "not subscribing to the copyright convention, the Chinese publishers do not pay any royalties and the quality of material on which the books are printed is not up to the standards of the western publishers. A similar point on material may be made with respect to the Russian publications." He attributes lower cost, in part, to lower labor costs. He goes on to say, "what is usually not publicized about the Russian publishing industry, is that it often overprints books with respect to its market and disposes of the extra copies in non-literary ways, such as selling them to farmers who, in turn, use them to insulate their barns. For titles that call for a legitimate reprint, a second print run is usually impossible because paper cannot be requisitioned easily. Both of these facts have been told to me by several of the Russian authors whose work we have translated into English. Hence, once a book is published and the initial sales have been made to the scientific community to which it is addressed, the possibility of obtaining a copy of the book even a couple of years later is extremely difficult. As we see it, the answer to the high cost of books will come about when wordprocessors will allow easy copy editing and direct coupling into appropriate typesetting equipment. That day should not be far off."

In this issue, we review the second edition of Heinz Schlicke's book on EMC where the C stands for "compossibility." Contrary to your first thought that this is a word invented by Herr Schlicke, it is defined in "Webster's New International Dictionary (Unabridged)" as "able to coexist with another thing, or to concur in time and space or in conception: consistent." So, as you can see, compossibility and compatibility have much in common.

The second book reviewed is a collection of papers on the subject of active RC filters. The editor has selected these papers from IRE, IEEE, IEE and several other publications. They go back over a period of about 20 years, starting in 1955. The active filter is of more than passing interest. It eliminates the requirement for a physical inductor in the conventional filter and substitutes an active element with resistors and capacitors. This, of course, makes it possible to design integrated circuits with the performance characteristics of LC filters.

In the next issue of this newsletter, we plan to review another filter book, a design manual, and the English edition of the Polish EMC book, "Electromagnetic Compatibility in Radiocommuncation Systems," edited by Prof. W. Rotkiewicz. I had received a copy of the Polish edition in 1979 with the promise that the English edition would be forthcoming in the following year. Well, it has finally arrived. "Active RC Filters: Theory and Application" edited by L.P. Huelsman Published by Dowden, Hutchinson & Ross, Inc. Stroudsburg, Pennsylvania Copyright 1976 Hardbound, 317 pages, \$55.00 Reviewed by James S. Hill The EMXX Corporation 6706 Deland Drive, Springfield, VA 22152 Available from: Academic Press, Inc. 111 Fifth Ave., New York, NY 10003

When Herman Hosmer Scott's paper, "A New Type of Selective Circuit and Some Applications," was published in the Proceedings of the IRE in February 1938, it started a trend in the development of inductorless filters. The basic idea of using resistors, capacitors, and active elements to produce an inductorless filter is very appealing. It overcomes the cumbersome mechanical construction required to fabricate this element with the inevitable core and winding losses, the nonlinear behavior which seriously degrade the results obtained from otherwise precise synthesis techniques. In addition, the weight and physical-size of inductors, especially in low-frequency applications, make them unattractive for space and satellite applications. More recently, a compelling reason to eliminate the inductor is that it is nonintegrable. By combining resistors and capacitors with an active element, the filter designer can participate in integrated circuit development with very few restrictions.

Looking back, when inductorless filters first were proposed, the active elements were vacuum tube circuits with power and heat dissipation requirements that, to a large extent, negated the advantages gained in the inductorless design of the filter. With the development of transistors in the late 1940s, interest in the RC filters revived. Additional impetus came with the use of inverting and noninverting voltage amplifiers and, again, with the use of the negative impedance converter. A further impetus to the development of the active RC filter circuit was the introduction of the integrated monolithic operational amplifier in the 1960s. It offered the advantage of low cost, high reliability, modest power requirements, low weight, and small size. The introduction of this circuit led directly to the development of a wide range of practical, mass-produced, active RC filter packages from several companies.

Of the large number of published papers on active filters, there is a small number which may be identified as benchmark papers. The stated purpose of this volume is to select and to reprint those most significant papers, to make them more readily available to those persons looking for guideposts to the research in this field. The editor, Lawrence P. Huelsman, is Professor of Electrical Engineering at the University of Arizona, and is author or coauthor of three of the papers included in this volume. He has selected the 48 papers on the basis of new theoretical development, as well as practicality of application. In some cases, the practicality of the author's results was evidenced by development into a product line. Of the 48 papers which date back to 1955, 31 are from IRE or IEEE publications and 12 have been taken from IEE publications. They have been organized into 7 groups identified as: Basic Active Filter Structures, Biquadratic Building Blocks, High-Order Filters, Inductive Simulation, Frequency-Dependent Negative Resistors, Distributed-Active Circuits, and Practical Considerations. The editor has included comments with each group of papers, indicating the significance of the paper, the practicality of its approach, or other features. In addition, the editor has included a list of references with each group of papers for the reader who is interested in further investigation. As a further aid, there is an Author Citation Index which includes all of the authors who are referenced in the 48 papers. The Subject Index is quite complete in its listing of the major subjects in each of the papers.

This volume should be a valuable reference source to the reader interested in the theoretical aspects of active RC filter design, as well as to the reader who wants a guide to the practical development of this type of filter. Each paper is a photocopy of the original paper. Some of the papers which have been reduced from 8l/2'' to 11'' to 6l/2'' by 8l/2 inches may result in eyestrain from some readers; but, this can be overcome with a good magnifying glass. In the opinion of your reviewer, this is a thoroughly usable collection of the significant papers covering the development and application of active RC filters. While the papers are available from the sources in which they originally appeared, it is well worthwhile to have this collection of the significant papers together in one volume.

"Electromagnetic Compossibility" (Second Edition) by Heinz M. Schlicke President, Interference Control Co. Milwaukee, Wisconsin Published by Marcel Dekker, Inc. 270 Madison Ave., New York, NY 10016 320 pages, \$45.00 Reviewed by A. H. Sullivan, Jr.

Electromagnetic Compossibility revisited! What can we say? I originally reviewed this book in *IEEE Spectrum* in October 1979, with the review being reprinted in the EMC Newsletter in the winter edition of 1980. The original book was a paperback in  $8-1/2" \ge 11"$  format, published by the author. The new second edition is a much easier to handle  $6-1/4" \ge 9-1/4"$  hardbound book which is a great improvement from a cosmetic viewpoint. The book now is listed as Volume 16 in the Marcel Dekker Electrical and Electronics Series, the editors of which are M. O. Thurston of the EE Department of Ohio State University and W. Middendorf of the Electrical and Computer Engineering Department of the University of Cincinnati.

Dr. Schlicke has revised a number of illustrations to make them easier to understand, as I recommended in my original review. Various other changes and modifications have been made which materially improve the text. Probably, the original version now will become a collector's item; but, I now prefer the second edition for actual use.

For those of you who did not see the review of the original book, I suggest you look it up. Briefly, there were three important points discussed:

- A. First book devoted exclusively to EMC on circuits, components, and systems used in the industrial world.
- B. Industrial EMC problems are magnified greatly by the multiplicity of sources and sensors (not always recognized by designers) and by general non-linearity of industrial circuitry (transformers, switches, semiconductors, motors, corrosion of connectors, fasteners, ground systems, etc.)
- C. Schlicke's new, important EMC acronym: FAT-TMESS - frequency, amplitude, time, temperature, mode, energy, structure, statistics.

If you're interested in the real-world EMC of industry where non-linearity in 60 cycle circuits can cause catastrophic and life-threatening breakdowns, this is the book to read. It's simply illustrated, shows the real-life waveforms and even discusses the proposition, "When is a ground not a ground." Everyone who has designed, bought or installed a filter should read up on the problems of EMI filters in the nonlinear industrial electrical complex.

I found the new added Chapter 12 to be the frosting on the cake—defining the raw problem, coping with human frailties, and most of all, 101 real problems which you, the EMC engineer, should be able to solve easily(?). What about problem number 2—"It makes no difference where a good RF shield is grounded if no low frequencies are involved—True; false." You'll have to read the book to find out.

Now my recommendation—if you don't get any other EMC book this year or next, get this one. It can be used not just in industrial EMC work; but, in EMC engineering, generally. The basic principles can be applied to all EMC situations. The author, an IEEE Life Fellow and former President of the EMC Society, is an excellent writer, is well organized, physically and mathematically precise, and, for heaven's sake, displays much humour and almost no pedantry. The book is destined to be an EMC classic.

## **EMCABS**

In this issue, we are publishing 72 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, Bell Aerospace Textron E.L. Bronaugh, Southwest Research Institute R.N. Hokkanen, Naval Training Equipment Center R. Jacobson, Sperry Flight System



MELVIN J. JOHNSON

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"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.

	Apparatus for the Continuous Monitoring of Ground Bed Resistance August D. Coby and Wils L. Cooley Department of the Interior, Washington, D.C. Patent-4 209 741, Not available NTIS. Patent 8 Mar 1978, patented 24 June 80, 8p PB80-214356, PAT-APPL-884 450 ABSTRACT: A system is described for measuring the resistance of an earth electrode such as a coal mine safety ground bed. Current is circulated between the bed and an auxiliary current probe installed approxi- mately ten times the maximum linear dimension of the ground bed under test. By measuring the voltage level between the ground bed and an auxiliary voltage probe placed about 62 percent of the distance from the ground bed to the auxiliary current electrode along the straight line between them, the true resistance of the ground bed can be determined. To sense the current value of the current flowing into the ground bed, a current transformer is placed around the lead to the ground bed. Voltage measurements are made with a high impedance voltage amplifier connected between the ground bed and the auxiliary voltage probe. Continuous monitoring of the measurements obtained without the presence of operator is achieved by using an analog divider and filter with their output terminal being connected to a recorder. <b>INDEX TERMS:</b> Ground Bed Resistance and mine safety.			EMCABS 4-9-82
			<ul> <li>Sensors for Electromagnetic Pulse Measurements Both Inside and Away From Nuclear Source Regions</li> <li>C.E. Baum, E.L. Breen, J.C. Giles, J. O'Neill, &amp; G.D. Sower Baum, Breen, and O'Neill, Air Force Weapons Lab. Giles and Sower, EG &amp; G, Inc.</li> <li>IEEE Trans, EMC, Vol. EMC-20, No. 1, pp 22-35, Feb. 1978</li> <li>ABSTRACT: For measuring tansient electromagnetic fields and related quantities one needs accurate broadband sensors with simple transfer functions. The various sensor designs developed to achieve this in an optimal manner are summarized. Such sensors are designed for use whether in a "free space" environment (such as in an EMP simulator or on a system under test in such a simulator) or in a nuclear source region that includes local source current and perhaps conductivity. There are now numerous designs which have been iterated for improvements over the last decade.</li> <li>INDEX TERMS: Sensors, EMP, local sources, distant sources.</li> </ul>	
	On the Electromagnetic Pulse Produced by Nuclear Explosions		CISPR Quasi-Peak Measuring Channels with Extended Dynamic Range Ryszard G. Struzak Institute of Telecommunications. Wroclaw Branch and Technical University of	EMCABS 5-9-82
11	Conrad L. Longmire Mission Research Corporation IEEE Trans EMC, Vol, EMC-20, No. 1, pp.3-13, Feb. 1978 <b>ABSTRACT:</b> The electromagnetic pulse (EMP) produced by the gamma rays frod discussed. The gamma rays produce a current of Compton recoil electrons, and further ionization so that the air becomes conducting. The Compton current lea electromagnetic fields according to Maxwell's equations. The conductivity tends to li fields. Approximate methods of solving the equations are described by considerin various terms in the equations are negligible, e.g., either the conduction current or can be dropped. Further advantage is obtained by replacing the transverse fields I waves; outgoing waves are dominant at early times. Features of the solutions are des at the ground surface and at high altitude. The history of EMP is reviewed brieff <b>INDEX TERMS:</b> EMP, nuclear explosions, approximate analyses, brief histo	om nuclear explosions is these electrons produce ads to the generation of imit the magnitude of the ag time regimes in which the displacement current by outgoing and ingoing scribed for nuclear bursts y. ry.	<ul> <li>Wroclaw.</li> <li>IEEE Trans. EMC, Vol. EMC-20, No. 3, pp 361-367, Aug. 1978</li> <li>ABSTRACT: The paper deals with instruments for radio-noise measurements a recommendations; however, the ideas described can be applied also in non-CISPI instantaneous dynamic measurement range is a common drawback of the classic C meters currently used. One of the most important factors limiting this range is a nonl channel. The paper describes two new methods of improving the channel linearity at measurement range. The first of them is based on application of a precision quasi-pe second method is founded on splitting the measured signal into several separate sub ing the resulting output. A simplified theory is outlined, and experimental results are quasi-peak detector application results in a linear input-output relation, wher synthesizing technique makes this relation logarithmic. An increase of dynamic range demonstrated practically in experimental models built.</li> <li>INDEX TERMS: Radio-noise meter, extended dynamic range, quasi-peak, C</li> </ul>	ccording to the CISPR <-type meters. A limited ISPR (and non-CISPR) inearity of the measuring ud extending its dynamic ak detector, whereas the uchannels, and synthesiz- presented. The precision eas the signal-splitting/ je by 20 to 40 dB has been ISPR.
		EMCABS: 3-9-82	Expanding the Bandwidth of TEM Cells for EMC Measurements M.L. Crawford, J.L. Workman, and C.L. Thomas	EMCABS 6-9-82
	System-Generated EMP D.F. Higgins, K.S.H. Lee and L. Marin Higgins — Mission Research Corp; Lee & Marin — Dikewood Corp. IEEE Trans., EMC, Vol EMC-20, No. 1, pp 14-22, Feb. 1978 ABSTRACT: The state of the art of system-generated electromagnetic pulse (SC particular emphasis on the empirical laws of photoelectron emission current and the techniques employed for the calculation of currents and charges induced on the surf satellite. INDEX TERMS: EMP, system-generated, state-of-art review.	GEMP) is reviewed with analytical and numeri^al ace of a system such as a	<ul> <li>Electromagnetics Div., National Bureau of Standards</li> <li>IEEE Trans, EMC, Vol., EMC-20, No. 3, pp 368-375, Aug. 1978</li> <li>ABSTRACT: This paper discusses the development of a modified (absorber-loa magnetic TEM cell with expanded bandwidth for use in accurately characterizing ence (EMI) fields within a shielded environment. The cell is analyzed experimental 'the modification, to determine its radio-frequency (RF) characteristics, both as an I as 'an electromagnetic (EM) field simulator or detector. Comparative measuremer performance of the modified versus the unmodified cell in parameters such as voli (VSWR), insertion loss, test-field uniformity, and reverse-coupling characteristic measurements indicate an approximate two-fold increase in the upper useful freque An example of using the cell to evaluate the radiated emissions from a common elect cesor timing circuit) is given. Finally, the technique of absorber loading is extended to a 3 - x 3 - x 6-m cell.</li> <li>INDEX TERMS: TEM cells, expanded bandwidth, absorber loaded.</li> </ul>	ided) transverse electro- electromagnetic interfer- ly, both before and after &F transmission line and its are given to show the tage standing-wave ratio cs. The results of these ency of the modified cell. ronic module (micropro- to larger cells, specifically

<ul> <li>Coaxial Cables as Sources of Intermodulation Interference at Microwave Frequencies.</li> <li>M. Bani Amin and Frank A. Benson</li> <li>Formerly The University of Sheffield, now Royal Military College of Science; The University of Sheffield.</li> <li>IEEE Trans. EMC, Vol. EMC-20, No. 3, pp 376-384, Aug. 1978</li> <li>ABSTRACT: Intermodulation interference arising from nonlinearities in braided coaxial cables at micro- wave frequencies is discussed. Detailed investigations have been carried out using a large number of commercially available and specially constructed cables to isolate and assess the relative contributions of different parameters of coaxial cables responsible for the generation of intermodulation products (IP's) at L-, S-, and C-band frequencies centered on 1.5, 3, and 5 GHz. Ambient temperature in the case of polythene dielectric cables and oxides on copper-wire braids affect considerably the IP's generated in a coaxial cable. INDEX TERMS: Intermodulation, coaxial cables, microwaves.</li> </ul>		<ul> <li>Prediction of Crosstalk in Ribbon Cables: Comparison of Model Predictions and Experimental Results</li> <li>Clayton R. Paul</li> <li>University of Kentucky</li> <li>IEEE Trans. EMC, Vol., EMC-20, No. 3, pp 394-406, Aug. 1978</li> <li>ABSTRACT: The prediction of crosstalk in ribbon cables is investigated. Experimental configuration tested, it would appear that acc can be achieved in these controlled-characteristic cables. The prediction accurate for frequencies such that the line is electrically short and ±6 dB for frequencies s long. It was found that the parasitic wires in the cable can have a significant effic coupling between a generator circuit and a receptor circuit in the cable. The predictions in ribbon cables, one must consider the interactions between all insulation evidently cannot be ignored for frequencies such that the line is electric frequencies such that the line is electric for frequencies such that the line is consider the interactions between all insulation evidently cannot be ignored for low frequencies where the common-in the electromagetic-field coupling.</li> <li>INDEX TERMS: Crosstalk, ribbon cables, model predictions, experimetransmission lines.</li> </ul>	EMCABS 10-9-82 imental results are obtained for transmission line (MTL) arate predictions of crosstalk es are typically within±1 dB ch that the line is electrically ct (as much as 40 dB) on the erefore, to achieve accurate wires in the cable. The wire cally long. The impedance of pedance coupling dominates intal results, multiconductor
Insertion Loss of Mismatched EMI Suppressors	EMCABS 8-9-82	Electromagnetic Coupling to an Infinite Cable Placed Behind a Slot-Perforated Screen	EMCABS 11-9-82
Insertion Loss of Mismatched EMI Suppressors Bruno Audone and Luciano Bolla Aeritalia, Caselle Torinese, Italy IEEE Trans. EMC, Vol. EMC-20, No. 3, pp 384-389, Aug. 1978 ABSTRACT: The insertion loss (IL) of EMI suppressors operating in systems with mismatched load and source impedances is studied. The design of an EMI suppressor is difficult because the actual impedances connected to it are often unknown. It has been recognized for a long time and by many authors [1]-[7] that the IL defined in a 50-ohm system (MIL-STD-220) is rather meaningless for general application. It may happen that the line voltage delivered to systems changes strongly after the insertion of the suppressor [8]. The IL under operating conditions may be quite different from that predicted. The source and load impedances are the variable parameters; for variations of one of them, the maximum and minimum IL's are calculated. Some general guidelines are also given in order to improve the performance of suppressors. INDEX TERMS: EMI filters, mismatched, insertion loss.		Korada R. Umashankar and James R. Wait Cooperative Institute for Research In Environmental Sciences, University of Colorado/NOAA IEEE Trans. EMC, Vol. EMC-20, No. 3, pp 406-411, Aug. 1978 ABSTRACT: We present an analysis of the electromagnetic coupling from an external illuminating field to an infinitely long thin cable placed behind the conducting screen that is perforated by a narrow slot. By using a Fourier transform representation for the unknown electric current on the cable, we obtain an integro- differential equation for the distribution of the electric field in the slot that accounts completely for the coupling. The transfer admittance function so obtained, is in a form very convenient to estimate the electric current on the infinite cable. Results of the slot electric-field distribution and the current induced on the infinite cable are given for a few typical cases. Not surprisingly, the axial distribution of induced voltage on the slot is markedly affected by the presence of the cable. <b>INDEX TERMS:</b> Cable coupling, slot-perforated screen.	
	EMCABS 9-9-82		EMCABS 12-9-82
Scattering of Electromagnetic Waves by Arrays of Conducting Cylinders Interspaced by Inhomogeneous Dielectrics Hassan A. Kalhor Pahlavi University, Shiraz, Iran IEEE Trans. EMC, Vol. EMC-20, No. 3, pp 390-394, Aug. 1978 ABSTRACT: The scattering and transmission properties of arrays of rectangular conducting cylinders interspaced by homogeneous and inhomogeneous dielectric materials are studied by a finite-difference coupling method for an E-polarized incident wave. Computed numerical results are presented which reveal interesting physical phenomena. INDEX TERMS: Scattering, conducting-cylinder arrays, inhomogeneous dielectrics.		Attenuation of Electric and Magnetic Albert A. Smith, Jr. Fields by Buildings IBM Corporation IEEE Trans, EMC, Vol. EMC-20, No. 3, pp 411-418, Aug. 1978 ABSTRACT: Results of an empirical investigation of the shielding propertie from single-family detached residences to multistory office buildings, are pres magnetic-field attenuations were measured in the frequency range of approxi INDEX TERMS: Shielding properties, buildings, 20 kHz-500 MHz.	of seven buildings, ranging nted. Both electric-field and nately 20 kHz to 500 MHz.

Low-Angle Tracking by Carrier-Free Radar Henning F. Harmuth Catholic University of America IEEE Trans. EMC, Vol. EMC-20, No. 3, pp 419-425, Aug. 1978 ABSTRACT: Multinath transmission is currently the most important limitation	EMCABS 13-9-82	Leaky Modes in Parallel-Plate EMP Simulators A.M. Rushdi, R.C. Menendez, R. Mittra, and S.W. Lee	EMCABS 16-9-82
<b>ABSTRACT</b> : Multipath transmission is currently the most important immutation for the accurr elevation-angle radar. The use of properly polarized nonsinusoidal electromagnetic waves perr discriminate between the wave that propagated directly from the radar to the target and back, other waves that propagated via the surface of the earth, either on the way to the target and back, other waves that propagated via the surface of the earth, either on the way to the target or on th (first-order multipath transmission). The effect works both over water, a good conductor, and ow a good insulator. It appears that the error due to first-order multipath transmission can be eliminated. As a fringe benefit, one avoids the enormous propagation losses incurred when pu duration of about 1 ns are transmitted with the help of a sinusoidal carrier. (A similar polarity-rev that exists for circularly polarized sinusoidal waves, cannot be used for an all-weather radar bec high absorption losses.) <b>INDEX TERMS:</b> Radar, carrier-free, low-angle tracking.		Rushdi, Mittra, and Lee-University of Illinois; Menendez-Bell Laboratories IEEE Trans. EMC, Vol. EMC-20, No. 3, pp 443-451, Aug. 1978 ABSTRACT: The finite-width parallel-plate waveguide is a useful tool as an E characteristics have recently been investigated by a number of workers. In this paper, study of the modal fields in such a waveguide. Once these modal fields and their corre are known, the problem of source excitation in such a waveguide can be solved, at lea the so-called leaky-wave concept. INDEX TERMS: EMP simulators, parallel palte, leaky modes.	MP simulator, and its we report the results of a sponding wavenumbers ast approximately, using
Synthetic-Aperture Radar Based on Nonsinusoidal Functions: I-Moving Radar and Stationary Arrays in One or Two Dimensions Henning F. Harmuth	EMCABS 14-9-82		EMCABS 17-9-82
Henning F. Harmuth Catholic University of America IEEE Trans. EMC, Vol. EMC-20, No. 3, pp 426-435, Aug. 1978 ABSTRACT: Synthetic-aperture radar in the form known for more than twenty years uses the Doppler shift of a periodic sinusoidal wave caused by the relative motion between a radar and a target. This paper investigates the use of pulses to produce a synthetic-aperture radar. It is assumed that the pulses are either too short to show a useful Doppler shift or that one wants to use the Doppler shift for something else than to generate a synthetic aperture. The pulses may or may not be radiated with the help of a sinusoidal carrier. It is shown that the equivalent of the usual sidelooking radar mounted on a moving vehicle exists for the pulse technique. In addition, one can implement a stationary synthetic-aperture radar with either a one- or a two-dimensional sensor array. Numerical values for the typical resolution are not given in this paper, since they depend on a more-detailed definition of the pulses to be used. This matter will be discussed in a future paper. Also postponed to future papers are the use of the Doppler shift for beamforming with nonsinusoidal waves, and the practical use of synthetic-aperture techniques for all-weather tracking radars, beam riders, etc. INDEX TERMS: Synthetic-aperture radar, nonsinusoidal electromagnetic waves, Walsh functions, sequency theory.		<ul> <li>An Application of Walsh Functions in Radio Astronomy Instrumentation</li> <li>J. Granlund, A.R. Thompson, and B.G. Clark</li> <li>National Radio Astronomy Observatory</li> <li>IEEE Trans. EMC, Vol. EMC-20, No. 3, pp 451-453, Aug. 1978</li> <li>ABSTRACT: Walsh functions can be used to advantage to perform phase switching in antenna arrays used for radio mapping of the sky by Fourier synthesis. This paper describes the reason for phase switching, the advantage of using Walsh functions, and the implementation of these ideas in the Very Large Array (VLA) program of the National Radio Astronomy Observatory.<sup>1</sup></li> <li>INDEX TERMS: Radio astronomy, instrumentation, Walsh functions, antenna arrays, phase switching, National Radio Astronomy Observatory.</li> </ul>	
	EMCABS 15-9-82		EMCABS 18-9-82
<ul> <li>Electromagnetic Pulse Coupling Through an Aperture into a Two-Parallel-Plate Region</li> <li>Yahya Rahmat-Samii</li> <li>Formerly University of Illinois; now, Jet Propulsion Lab.</li> <li>IEEE Trans. EMC, Vol. EMC-20, No. 3, pp 436-442, Aug. 1978</li> <li>ABSTRACT: Analysis of electromagnetic-pulse (EMP) penetration via apertures i tant study in designing hardened systems. In this paper, an integral equation pro determining the frequency and consequently the time behavior of the field inside a excited through an aperture by an EMP. Some discussion of the numerical results is a for completeness.</li> <li>INDEX TERMS: EMP, coupling, aperture, two-parallel-plates.</li> </ul>	nto cavities is an impor- ocedure is developed for two-parallel-plate region also included in the paper	On a Real-Time Walsh-Hadamard/Cosine Transform Image Processor D. Hein and Nasir Ahmed Kansas State University IEEE Trans. EMC, Vol. EMC-20, No. 3, pp 453-457, Aug. 1978 ABSTRACT: A real-time image processor which is capable of video compression u ordered Walsh-Hadamard transform (WHT)w, or the discrete cosine transform (D processing is done on an intraframe basis in (8 x 8) data blocks. The (WHT)w co directly, and then used to obtain the DCT coefficients. This is achieved via an (8 x 8 which is orthonormal, and has a block-diagonal structure. As such, it results in si number of multiplications and additions required to obtain the DCT, relative to its d aspects of a hardware implementation of the processor are also included. INDEX TERMS: Image processor, real time, Walsh-Hadamard/cosine transfor	sing either the sequency- OCT), is considered. The pefficients are computed 3) transformation matrix ubstantial savings in the irect computation. Some orm.

Damped EMI Filters for Switching Regulators         Daniel M. Mitchell         Collins Telecommunications Products Div., Rockwell Internt'l         IEEE Trans. EMC, Vol. EMC-20, No. 3, pp 457-463, Aug. 1978         ABSTRACT: the phenomenon of open-loop instability between the powerline EMI filter and the switching-regulator power supply is investigated [1]. As a first step to the filter-design problem, simple modifications are made to the filter chosen from EMI considerations alone to assure stability as well.         INDEX TERMS:       EMI filters, damped, switching regulators.		Electromagnetic Surface-Wave Propagation Over a Rectangular-Bonded Wire Mesh David A. Hill and James R. Wait University of Colorado/NOAA and Consultant to ITS/OT. IEEE Trans. EMC, Vol. EMC-20, No. 4, pp 488-494, Nov. 1978 <b>ABSTRACT:</b> The electromagnetic surface wave which can propagate over a rectang extent is considered. The propagation constant is determined both from a rigorous F an approximate method using averaged boundary conditions. The agreement is fa small mesh dimensions. The rectangular mesh is found to be highly anisotropic, a effective anisotropic transfer inductance representation for the mesh is discussed b INDEX TERMS: EM surface-wave propagation, rectangular-bonded wire met	EMCABS 22-9-82 ular wiremesh of infinite Floquet formulation and irly good for sufficiently und the possibility of an oriefly. sh.
A Note on "Variation in the Surface-Charge Density of an Excitable Nerve Membrane Exposed to Optical Radiation" P.S. Nellakantaswamy and K.K. Gupta Indian Institute of Technology, Madras IEEE Trans. EMC, Vol. EMC-20, No. 3, pp 464-466, Aug. 1978 ABSTRACT: An error depicting the dimensional inconsistency in the expression for surface density of an excitable nerve membrane obtained by Agrawal et al. in the above paper, is indicated. This error arises mainly due to the incorrect definition and evaluation of surface-charge density adopted in the paper. Further, the analysis presented completely ignores the beam-wave parameters of the optical radiation. Hence, necessary corrections to the expression for surface-charge density and modifications to the reflection coefficient at the membrane surface, by taking into account the beam-wave characteristics, are presented. INDEX TERMS: Nerve membrane, surface-charge density, optical excitation.		On Electromagnetic-Field Excitation of Unshielded Multiconductor Cables. Clayborne D. Taylor and J. Philip Castillo Air Force Weapons Laboratory IEEE Trans. EMC, Vol. EMC-20, No. 4, pp 495-500, Nov. 1978 ABSTRACT: Unshielded multiconductor cables are considered to be illuminated b wave fields. A study of the currents that are induced in the terminations is made theory, transmission line theory, and wire antenna theory. Questions of accuracy general trends are addressed. INDEX TERMS: Unshielded multiconductor cables, EM-field excitation, com	EMCABS 23-9-82 y electromagnetic plane- using quasistatic circuit , ranges of validity, and aparison of theories.
An Optically Linked Telemetry System for Use with Electromagnetic-Field Measurement Probes Howard I. Bassen and Robert J. Hoss Bureau of Radiological Health; Rockwell International IEEE Trans. EMC, Vol. EMC-20, No. 4, pp 483-488, Nov. 1978 ABSTRACT: A battery-powered optical telemetry transmitter, 2.5 x 2.5 x 3 cm, has been developed for use with various electromagnetic-field hazard probes. The electrical outputs from one of these probes, containing three orthogonal sensors, are electrooptically converted to three separate optical pulse trains so that a dc to 2-kHz information bandwidth is established in the transmitter using frequency-modulation techiques. The three optical pulse trains are transmitted over a 4.6-m fiber-optics bundle to one of two types of receivers. These units reconvert the information to either an analog replica of the transmitter input waveform, or to a three-digit, scaled numerical display of the time-averaged value of the input signal. Practical applications involving field-strength measurements in the 1-MHz to 12-GHz region are presented. Advantages over hardwire data links are discussed, and significant reductions in RF interference and cable backscatter during field-strength measurements are described. INDEX TERMS: EM-field probes, telemetry system, optically linked.		<ul> <li>Radio Signals with Large Relative Bandwidth for Over-the-Horizon Radar and Spread-Spectrum Communications</li> <li>Henning F. Harmuth</li> <li>Catholic University of America</li> <li>IEEE Trans. EMC, Vol. EMC-20, No. 4, pp 501-512, Nov. 1978</li> <li>ABSTRACT: It is known that radio signals must have a small relative frequency bancircuits resonating with sinusoidal functions are to be used for radiation and recept concepts showing that a small relative frequency bandwidth is also required for frequency modulation of sinusoidal radio carriers in the usual form. However, it is methods of amplitude and frequency modulation for signals with large relative frequency application of such methods is for over-the-horizon radar and spread-spect the short-wave region where the desired relative frequency bandwidths are neither s or less) nor close to 1.</li> <li>INDEX TERMS: Large relative bandwidth, OTH radar, spread-spectrum context of the structure of the spectrum context of</li></ul>	EMCABS 24-9-82 ndwidth if structures and ion. This paper develops the use of amplitude or easy to modify the usual equency bandwidth. The trum communications in mall (in the order of 0.01 nmunications.

		EMCABS 25-9-82		EMCABS 28-9-82
	<ul> <li>A Comparison of Test and Model-Predicted RF-Pulse Susceptibilities of UHF Transistors</li> <li>Thomas J. Lange and Gregory A. Hjellen Boeing Aerospace Company</li> <li>IEEE Transactions, EMC, Vol. EMC-20, No. 4, pp 513-514, Nov. 1978</li> <li>ABSTRACT: A semiconductor thermal-damage model was presented previously. Accuracy verification was limited to dc pulses and a damped sinusoidal waveform. Data published on UHF transistors allow additional model verification of RF pulses.<sup>1</sup> Results confirm that dc-pulse data are sufficient to predict RF-pulse damage levels.</li> <li>INDEX TERMS: UHF transistors, RF-pulse susceptibilities, comparison of model predictions with experiment.</li> </ul>		On the Walsh Analysis of Nonlinear Systems Mohammad Maqusi University of Jordan IEEE Trans. EMC, Vol. EMC-20, No. 4, pp. 519-523, Nov. 1978 <b>ABSTRACT:</b> This paper considers some aspects of the analysis of nonlinear syste Two basic approaches are investigated. These are 1) a characteristic-function m Walsh-transformable nonlinearity and 2) a matrix method that is suitable when the by a truncated Walsh series expansion. Illustrative examples are included. <b>INDEX TERMS:</b> Nonlinear systems, Walsh analysis, statistical dyadic, matrix	ms via Walsh functions. hethod which assumes a input can be represented
		EMCABS 26-9-82		EMCABS 29-9-82
19	A Simplified Computational Technique for Longitudinal H-Field Shielding M.H.S. El-Markabi Imperial College, London IEEE Trans. EMC, Vol. EMC-20, No. 4 pp. 514-516, Nov. 1978 ABSTRACT: A method is described for the calculation of the shielding effect of a cylindrical tubes in an alternating longitudinal <i>H</i> -field. The arrangement is modell transmission-line equivalent circuit composed of a number of micro- <i>T</i> -circuits. The u completely obviated without loss of accuracy. INDEX TERMS: Longitudinal, <i>H</i> -field shielding, simplified computational tech	set of coaxial circularly ed using a nonuniform use of Bessel functions is hniques.	<ul> <li>Economic Efficiency: The Objective of Spectrum Management Donald R. Ewing</li> <li>National Telecommunications and Information Administration</li> <li>IEEE Trans. EMC, Vol. EMC-20, No. 4, pp. 523-524, Nov. 1978</li> <li>ABSTRACT: The author notes a degree of confusion as to the overall objective of The concepts of spectrum conservation, spectrum efficiency, and economic effic compared. Economic efficiency is concluded to be the proper objective.</li> <li>INDEX TERMS: Spectrum management, objectives, spectrum conservation, s nomic efficiency.</li> </ul>	spectrum management. iency are discussed and spectrum efficiency, eco-
	On the Walsh-Hadamard Transform and Prime Implicant Extraction P.W. Besslich	EMCABS 27-9-82	Transverse Voltage Due to 3-Electrode Gas Tube Arrester Hiroshi Yamane, Tsuyoshi Ideguchi, Mitsuo Hattori, Hiroaki Koga and	EMCABS 30-9-82
<ul> <li>Universitat Bremen, Germany</li> <li>IEEE Trans. EMC, Vol. EMC-20, No. 4 pp. 516-519, Nov. 1978</li> <li>ABSTRACT: The Walsh-Hadamard transform (WHT) provides a one-to-one mapping of <i>n</i>-variable lean functions onto an <i>n</i>-dimensional transform space. As such, it enables synthesis procedures to be cout in the transform domain.</li> <li>This short paper discusses the role of the WHT in extracting prime implicants, which is pertinent overall minimization problem. First, a procedure to identify all the prime implicants of a 1-vertex<sup>1</sup> loc: the origin is developed by inspecting the elements of a single inverse transform. Second, a theorem is p to show how the signs of the transform coefficients can be changed, to obtain all the prime implicant arbitrary 1-vertex via the same inverse transform operation.</li> <li>INDEX TERMS: Walsh-Hadamard transform, prime implicant extraction.</li> </ul>		ping of <i>n</i> -variable Boo- procedures to be carried which is pertinent to the of a 1-vertex <sup>1</sup> located at nd, a theorem is proved e prime implicants of an	Tamio Motomitsu Ibaraki Electrical Communication Laboratory N.T.T. Report of Technical Group on EMC, IECE, and IEE of Japan Vol. 82, No. 78, EMCJ 82-21, pp. 13-18 <b>ABSTRACT:</b> A 3-electrode gas tube arrester is used to protect the telecommunic overvoltage. As the arrester discharge voltage distributes, a transverse voltage app This paper shows a transverse voltage inducing mechanism, and also describes eq transverse voltage distribution for lightning surge and power line inducing voltage. A circuit is obtained from the relation between the transverse voltage and equipmen <b>INDEX TERMS:</b> Three-electrode gas tube arrester, lightning surge.	ation equipment against ears across paired wires. Juations that express the overvoltage protection at trouble occurrences.

	EMCABS 31-9-82 Radio Noise Caused by Gap Switch and Consideration of Its Circuit Toshiaki Suda and Teizo Aida Sasebo Technical College and Faculty of Engineering, Kumamoto University Report of Technical Group on EMC, IECE and IEE of Japan Vol. 82, No. 60, EMCJ 82-9, pp. 1-6 ABSTRACT: A gap switch is often used as a starter switch for surge current generators. It creates electromagnetic interference (EMI) to surrounding susceptible electromagnetic receivers including measur- ing devices. A study was conducted on the brass gap switch concerning radio noise. It was measured in accordance with the Standard CISPR. The following results were obtained: (1) the radio noise was in proportion to f-2(0.15-1.5MHz) and f-1(1.5-30MHz), (2) the radio noise was increased with the increasing of the discharge voltage, (3) the radio noise was in proportion to L-1(0.85-4.6uH) (f=0.15-1.5MHz). INDEX TERMS: Radio noise, gap switches.		Transfer Impedances of Balanced Shielded Cables Michel Mardiguian Don White Consultants, Inc., Gainesville, Virginia, USA. EMC Technology & Interference Control News Vol. I, No. 3, July 1982, pp. 54-59 <b>ABSTRACT:</b> Transfer impedance is a well-defined and understood parameter to (and sometimes emission) of coaxial or triaxial unbalanced cables. This concept, w extended to balanced shielded cables like shielded pairs and twinax, in which the act the load between the two wires of a pair is emphasized. This parameter can be knowledge of the shield $Z_1$ per se, and the shield-to-pair coupling (i.e., the pair u unique parameter called shield coupling evolves which relates directly the shield c output voltage. Applications discussed cover conditions of cable pair and harness sh grounding at one or both ends. INDEX TERMS: Transfer impedance, shield coupling.	EMCABS 34-9-82 qualify EMI immunity ith some amendments, is tual voltage developed at computed by a separate inbalance ratio). Thus, a urrent to the differential ielding and the impact of
21	<ul> <li>Time Domain Sensors for Radiated Impulsive EMI Measurements</li> <li>Electromagnetic Fields Division, National Bureau of Standards</li> <li>Motohisa Kanda and Francis X. Ries</li> <li>Report of Technical Group on EMC, IECE and IEE of Japan</li> <li>Vol. 82, No. 78, EMCJ 82-22, pp. 19-24</li> <li>ABSTRACT: The purpose of this paper is to review various sensors and radiators commonly used for time domain antenna measurements. For electric field strength measurements, linear antennas loaded nonuniformly and continuously with resistance, or both resistance and capacitance are discussed. Also a conical antenna and an asymptotic conical antenna are discussed from the standpoint o! improved characteristics. For an improved directivity, various types of TEM horns are discussed, e.g., a conducting TEM horn, a CALSPAN antenna and a resistively loaded TEM horn.</li> <li>INDEX TERMS: Time domain sensors, impulsive EMI measurement.</li> </ul>		Guidelines on Substitution of Shielded for Nonshielded Electrical Cable for Shipboard Topside Application William F. Johnson and Russell V. Carstensen Electromagnetic Technology, Inc. EMC Technology & Interference Control News Vol. 1, No. 3, July 1982, pp. 60-67 ABSTRACT: As braided aluminum armor deteriorates, it has been shown to be a s interference. Removal of the armor eliminates this source of interference in electric exposed topside areas on board ship. However, elimination of the armor also resulter in electromagnetic shielding that had been provided by the armor when in good cond be used in the topside area, equivalent types are available with a braided shie impervious sheath. This paper presents a table of equivalents for substitution of shie ble nonshielded types. INDEX TERMS: Nonshielded electrical cables, shipboard topside arrangement	EMCABS 35-9-82 ource of electromagnetic cal cables installed in the d in an unanticipated loss dition. For most cables to eld imbedded under the lded cables for compara- nt.
	An Introduction to Surface Transfer Impedance Albert R. Martin Raychem Corporation, Menlo Park, CA EMC Technology & Interference Control News Volume I, No. 3, July 1982 pp. 41-53 ABSTRACT: Surface transfer impedance is basically a means for evaluating th components (e.g., cables, connectors, harnesses), as opposed to active systems. In the centers on what surface transfer impedance is, how it is measured and how it effectiveness data obtained from active system tests. The discussion is concluded by using surface transfer impedance numbers to design or select shielding to control INDEX TERMS: Surface transfer impedance, shield performance.	EMCABS 33-9-82 ne leakage from passive his paper, the discussion relates to the shielding describing a method for EM1.	Electromagnetic Transient Analysis in EHV Power Networks W. Derek Humpage and Kit-Po Wong Department of Electrical and Electronic Engineering, University of Western Australia Proceedings of the IEEE Vol. 70, No. 4, April 1982, p. 379-402 ABSTRACT: Following an outline of electromagnetic transients in high-voltage p with their principal implications in relation to system overvoltages and the swi circuit-breakers, the paper develops a broad review of the now numerous analysis for solution methods in this area of applied analysis in power systems. The perspective is the earliest developments in surge analysis to the most recent proposals from current includes the main forms of traveling-wave methods. Bergeron analysis, time-conver- recently derived methods in which the z transform has a unique part. INDEX TERMS: Transients, EHV, Power networks, Bergeron Analysis, Z tra-	EMCABS 36-9-82 ower networks, together tching duty imposed on mulations and computer s one which extends from research. In particular, it olution schemes, and the ansforms.

The Effect of a Pulsed Interference Signal on an Adaptive Array R.T. Compton, Jr. The Ohio State University Electro-Science Laboratory IEEE Transactions on Aerospace and Electronic Systems Vol. AES-18, No. 3, May 1982, pp. 297-309 ABSTRACT: The performance of the least mean square adaptive array in the presence of pulsed interference signal is examined. It is shown that a pulsed interference signal has two effects. First, it causes the array to modulate the desired signal envelope (but not its phase). Second, it causes the array output signal-to- interference-plus-noise ratio (SINR) to vary with time. The desired signal modulation is evaluated as a function of signal arrival angles, powers and interference pulse-repetition frequency and -pulsewidth. It is shown that the signal modulation is small except when interference arrives close to the desired signal. To evaluate the effect of the timevarying SINR, it is assumed that the array is used in a differential phase-shift keyed communication system. It is shown that the SINR variation causes a noticable but not disastrous increase in bit error probability. INDEX TERMS: Pulsed Interference, Adaptive Array, Noise.		<ul> <li>Determination of the Far-Field from Measured Near-Field Data, Theory and Measuring Technique of the Near-Field Far-Field Transfer Nation</li> <li>A. Schrott and V. Stein</li> <li>European Space Agency, Paris (France)</li> <li>Translated into English "Bestimmung des Fernfelds Aus Nahfeldmessdaten</li> <li>Theorie U. Messtech. Der Nahfeld-Fernfeldtransformation," Rept.</li> <li>Dfvir-Mitt-79-07 Dfvir. N81-22274/7, PC AO5/MF AO1</li> <li>Dec 80, 100p, SDA-TT-616, DVLR-MITT-79-07</li> <li>ABSTRACT: Methods are described for measuring the far field of antennas at compared to the wavelength of the field. The so called compact test range is explaine near field far field transformation is described. The advantages and disadvantages cand spherical transformation techniques are discussed. Theory and measuring tech method are treated extensively. An assessment of the influence of errors is given and are presented. A proposal is given for the construction of a near field test range. Fi the method is demonstrated with the aid of some examples.</li> <li>INDEX TERMS: Far-Field, Measured, Theory, Measuring, Near-Field, Compared Method.</li> </ul>	<b>EMICABS 40-9-82</b> distances that are small d and the principle of the of the planar, cylindrical, hniques for the spherical the acceptable tolerances nally the performance of pact Test Range, Spheri-
EMCABS 38-9-82 Proper Shielding Protects ICs from Electrostatic Damage James R. Huntsman 3M Co., St. Paul, MN Electronics Vol. 55, No. 14, July 14, 1982, pp. 142-146 ABSTRACT: The insulating materials that aim to protect chips against current-induced damage often actually harm them by holding a charge and generating an electric field. Yet by not shielding ICs, especially MOS types, against stray electricity, the user risks their degradation or total failure. Compounding the problem is the fact that the shielding included around chips is sometimes ineffective either because of improper positioning or because of lack of understanding about electrostatic theory. However, shielding can be quite easily accomplished by totally enclosing a device in a low-resistance, properly grounded shield. INDEX TERMS: Electrostatic damage, MOS, VLSI, Shielding, Grounding.		<ul> <li>Electric and Magnetic Field Measurement</li> <li>R.H. McKnight, F.R. Kotter, M. Misakian, and P. Ortiz</li> <li>National Bureau of Standards, Washington, DC.</li> <li>NBSIR—81-2267, PB218182, PC AO4/MF AO1</li> <li>Feb 81, 73p</li> <li>ABSTRACT: The NBS program is concerned with developing methods for evinstrumentation for use in measuring the electric field and various non-related el vicinity of high-voltage direct current (HVDC) transmission lines and in apparatus transmission line environment.</li> <li>INDEX TERMS: Electric, Magnetic Field Measurements, Calibrating Instrum Direct Current Transmission Lines.</li> </ul>	EMCABS 41-9-82 aluating and calculating ectrical quantities in the designed to simulate the mentation, High-Voltage
<ul> <li>An Automated MIL-STD 461 Emissions Test Procedure</li> <li>R.A. Snead and L.G. Stoudermire</li> <li>Army Missile Command, Redstone Arsenal, AL. Test &amp; Evaluation</li> <li>Directorate</li> <li>Technical Report, AD-AO99 492/1, PC AO3/MF AO1</li> <li>22 Jul 80, 31p, DRSM/RT-80-23-TR, AD-E950 128</li> <li>ABSTRACT: Test procedures for MIL-STD 461, test REO2 and REO2.1 are d testing system and computer program to perform the tests are presented, along explain the program flow. This program, and modifications to perform MIL-STD ments may be obtained by writing: Commander, US Army Missile Commander Redstone Arsenal, AL 35898.</li> <li>INDEX TERMS: MIL-STD, REO2, REO2.1, Automated Testing, Compute ments.</li> </ul>	EMCABS 39-9-82 iscussed. An automated with documentation to 461 emissions measure- d, Attn: DRSMI-RTR, er, Emissions Measure-	<ul> <li>Railroad Electromagnetic Compatibility (EMC): Proceedings of a Symposium Sponsored by the Railroad EMC Group Association of Americal Railroads, Institute of Electrical &amp; Electronics Engineers, American Railway Engineering Association</li> <li>Paul Elliott</li> <li>United Industries, Inc., Springfield, VA.</li> <li>Final Report, PB81-1-99333, PC A10/MF AO1, Contract DOT-FR-9044</li> <li>Jan 81, 220p, FRA/ORD-80/46</li> <li>ABSTRACT: The Symposium on Railroad Electromagnetic Compatibility (May five technical sessions on electric traction power distribution systems, locomotiv systems, communication and power lines paralleling the right-of-way, signal and catechniques, a special session giving an overview of the Transportation Test Center, an activities of the Railroad Electromagnetic Compatibility Working Group.</li> <li>INDEX TERMS: Railroad, EMC, Electromagnetic Compatibility, Electric Trapulsion, Communication, Power Lines, Signal, Control, Magnetic Compatibility, Electric Traction, Power Lines, Signal, Control, Magnetic Compatibility, Electric Tractic Traction, Power Lin</li></ul>	EMCABS 42-9-82 14-15, 1980) consisted of ve and other propulsion ontrol, and measurement nd a special session on the action, Locomotive, Pro- easurement.

nalysis of Interference from the Solar Power Satellite to General Electronics ystems R. Juroshek and F.K. Steele ational Telecommunications and Information Administration, Boulder, CO. nstitute for Telecommunications Sciences. TIA-REPORT-81-65, PB81-194250, PC AO3/MF AO1, Sponsored in part y the Department of Energy, Washington, DC. Feb 81, 38p. <b>BSTRACT:</b> The concept of collecting solar energy in an orbiting, geostationary, solar power satellite (SPS) and then beaming this power to earth via a focused microwave beam at 2.45 GHz has received considerable tention in recent years. This report examines some of the potential interference problems that might exist etween SPS and general electronics equipment. The report specifically considers the possibility of interfer- nce to conventional consumer electronic devices such as TV receivers, AM/FM stereo receivers, electronic alculators, and FM mobile receivers. Also included are estimates of the field intensities that would be equired to produce interference in three different types of integrated circuits. The report also examines the otential for interference to medical electronics devices, with specific emphasis on pacemakers and site curity devices such as proximity detectors and security TV cameras. NDEX TERMS: Interference, Solar Power Satellite, Microwave, Electronics, TV Receivers, AM/FM Stereo Receivers, Calculators, Mobile, Field Intensities, Integrated Circuits, Medical Electronics, Pacemakers, Security Devices.		<ul> <li>Flush Mounted Low Impedance Grounding Cone</li> <li>Bernard Zendle and Marcella Petree</li> <li>Department of the Navy, Washington, DC.</li> <li>Patent Application, PAT-APPL-6-214 545, PC AO2/MF AO1</li> <li>9 Dec 80, 12p, AD-D008 433/5</li> <li>ABSTRACT: A device for grounding a coaxial cable to a ship's hull or bulkhead ha cable, is configured to include a split metallic cone with serrated apex portions fas shield of the coaxial cable, and flanged base portions securable to the ship's hull and such that the split cone forms substantially 360 deg. of coupling between the bared sl This configuration increases the area and effectiveness of electrical contact between a ship's hull while decreasing the effective inductance and overall impedance, thereby re high frequency transients caused by an externally induced electromagnetic pulse (EI netic interference source having a similiar frequency range.</li> <li>INDEX TERMS: Grounding, Patent, Grounding a Coaxial Cable, Ship's Hull, I Cone, Effective Inductance, Impedance, High Frequency Tran Pulse (EMP), Electromagnetic Interference.</li> </ul>	EMCABS 46-9-82 .ving an opening for the tenable around a bared l overlying the opening, hield and the ship's hull. the bared shield and the ducing the amplitude of MP) or any electromag- Bulkhead, Split Metallic nsients, Electromagnetic
Analysis of a Phase-Locked Loop to Suppress Interference from a Solar Power Satellite J.R. Juroshek and F.G. Stewart National Telecommunications and Information Administration, Boulder, CO. Sponsored in part by Department of Energy, Washington, DC NTIA-REPORT-81-63, PB81-193781, PC AO2/MF AO1 Feb 81, 24p ABSTRACT: This report takes a cursory look at the possibility of using signal cancellation techniques as an alternate method for eliminating interference in these cases. The technique is particularly suited to interfer- ence from the proposed solar-power satellite which would transmit a coherent, cw, microwave, power signal from a geosynchronous satellite. The analysis concludes that a phase-locked loop and associate AGC circuit could be used to generate a replica of the interfering signal which would then be subtracted from the composite signal. The report presents a brief analysis of a second-order, type-one, phase-locked loop. INDEX TERMS: Phase-Locked Loop, Interference, Solar Power Satellite, Signal Cancellation Coher- ent, cw, Microwave, Second Order.		Suitability of ARES for Simulating Tactical Burst EMP Environments D.W. Hoist Mission Research Corp., Santa Barbara, CA. Topical Report 15 Jan-1 Apr 80. Contract DNAOOI-80-C-0076, AD-AO97 708/2, PC AO4/MF AO1 1 Apr 80, 73p MCR-R-565, DNA-5442T <b>ABSTRACT:</b> The possibility of using the ARES to evaluate source region coupli discussed. A "tactical" source region is defined and the environment at the inner edg determined for a 50 kt burst at a range of 1.2 km. The time and amplitude character are compared with those from the selected environment. Coupling of the ARES and into a short monopole antenna and small loop are compared. These objects are repre- in tactical systems. Based upon these results suggestions are made for augmenting and in the ARES to obtain responses representative of the source region. <b>INDEX TERMS:</b> ARES, Tactical Burst EMP, Time, Amplitude, Pulse, Short	EMCABS 47-9-82 ng in tactical systems is e of this source region is istics of the ARES pulse I the source region fields sentative of those found d supplementing testing Monopole, Small Loop.
<ul> <li>Analysis of Interference Caused by the Solar Power Satellite to Satellite Earth Terminals</li> <li>J.R. Juroshek</li> <li>National Telecommunications and Information Administration, Boulder, CO. Inst. for Telecommunication Sciences.</li> <li>NTIA-REPORT-81-64, PC81-194268, PC AO3/MF AO1, Sponsored in part by Department of Energy, Washington, DC.</li> <li>Feb 81, 44p</li> <li>ABSTRACT: The solar power satellite (SPS) is a concept for generating electrical via a geosynchronous orbiting satellite. A facility, such as this, would be able to set gigawatts of power to earth on a highly focused 2450 MHz microwave beam. The elective problems caused by this amount of microwave power transmission are recognize implementation of such a system. This report examines the potential for interfe conventional satellite earth terminals.</li> <li>INDEX TERMS: Interference, Solar Power Satellite, Earth Terminals, Electron Microwave, Transmission.</li> </ul>	EMCABS 45-9-82 power from solar energy nd approximately 5 to 10 etromagnetic compatibil- d as a critical factor in the rence between SPS and smagnetic Compatibility,	User's Manual for Electromagnetic Pulse Coupling Code TEMPO Werner J. Stark, David A. Clark, and Roy E. Strayer, Jr. Harry Diamond Labs, Adelphi, MD. Technical Memo, AD-AO99 238/8, PC AO3/MF AO1 Feb 81, 38p, Report No. HDL-TM-81-2 <b>ABSTRACT:</b> A computer code, TEMPO, has been developed to aid in the solution (EMP) coupling problems. The code is general in nature. It provides approximate so practical problems that are commonly encountered during system evaluations. Wit engineer may rapidly determine which sources of coupling are a threat to his system a more effort on solving those problems than searching for them. This report depicts operation of TEMPO on Harry Diamond Laboratories' IBM System/370. INDEX TERMS: Electromagnetic Pulse Coupling Code TEMPO, Computer	<b>EMCABS 48-9-82</b> of electromagnetic pulse lutions to simplified, but h the aid of TEMPO, an and, consequently, spend the organization and the Code.

	EMCABS 49-9-82		EMCABS 52-9-82
Measurement of Scaled-Down High-Altitude Electromagnetic Pulse (HEMP) Waveforms Andrew A. Cuneo, Jr. and James J. Loftus Harry Diamond Labs., Adelphi, MD. Technical Memo, AD-AO99 032/5, PC AO3/MF AO1 Mar 81, 28p, Report No. HDL-TM-81-6 ABSTRACT: If one desires to scale down a high-altitude electromagnetic pulse wave form to illuminate and measure the response of a physically scaled version of an Army tactical system, he is confronted with the problems of how to measure the radiated pulse, what the limitations of existing field sensors are, and what new sensors are required. This report discusses the techniques used by the Harry Diamond Laboratories to adequately describe the early time of the radiated fields in the scale modeling facility. INDEX TERMS: High-Altitude Electromagnetic Pulse, Measure, Radiated Pulse, Field Sensors.		Lightning Physics Martin A. Uman Florida University, Gainesville, Department of Electrical Engineering Contract N00014-75-C-0146, AD-AO99 285/9, PC AO2/MF AO1 3 April 1981, 7p. ABSTRACT: During the course of the contract, we studied a variety of properties of lightning, concentrat- ing, however, on the return stroke, its electric and magnetic fields, and its currents. INDEX TERMS: Lightning Physics, Return Stroke, Electric, Magnetic Fields, Currents.	
Lightning Technology Conference Publication	EMCABS 50-9-82		EMCABS 53-9-82
<ul> <li>National Aeronautics and Space Administration, Hampton, VA. Langley Research Center.</li> <li>Presented at the Proceedings of a Technical Symposium, NASA Langley Research Center, Hampton, VA. 22-24 Apr 80, AD-AO99 589/4, PC A20/MF AO1.</li> <li>Apr 80, 451p NASA-L-13666, FAA-RD-80-30, NASA-CP-2128; See also report dated Jan 81, AD-AO99 590.</li> <li>ABSTRACT: This symposium included papers in several facets of lightning technology including phenome- nology, measurement, detection, protection, interaction, and testing. Papers include a set organized as "New Thrusts in Lightning Electromagnetics." In addition to the presentation sessions, open forums were held on protection of ground systems and on simulated lightning testing. The NASA Langley Research Center lightning-instrumented F-106 aircraft was displayed and the instrumentation system was described.</li> <li>INDEX TERMS: Lightning Technology, Phenomenology, Measurement, Detection, Protection, Inter- action, testing.</li> </ul>		Lightning Problems at Building 1409 (Control Tower) Maxwell Air Force Base, Alabama. John F. Zych Electronics Engineering Group (1842nd), Scott AFB, IL. Technical Report, AD-AO97 729/8, PC AO2/MF AO1 Mar 81, 22p, Report No. 1842-EEG/EEISG-TR-81-11 ABSTRACT: As a result of the survey performed at subject USAF sites, recommendations are made to decrease vulnerability to lightning which have been destroying communication equipment components. INDEX TERMS: Lightning, Survey, USAF Sites.	
Lightning Technology Supplement Conference Publication.	EMCABS 51-9-82		EMCABS 54-9-82
<ul> <li>National Aeronautics and Space Administration, Hampton, VA. Langley Research Center.</li> <li>Presented at the Proceeding of a Technical Symposium, NASA Langley Research Center, Hampton, VA. 22-24 Apr 80, AD-AO99 590/2, PC AO7/MF AO1</li> <li>Jan 81, 133p NASA-L-13666-SUPPL, AD-E800 273</li> <li>ABSTRACT: The proceedings of the 1980 Symposium on Lightning Technology I Center April 22-24, 1980, are reported in NASA-CP-2128. The Symposium was sp Aeronautics and Space Administration, the Florida Institute of Technology, and the portation. This supplement contains papers that were presented at the Symposium, printing at the time of publication of NASA-CP-2128.</li> <li>INDEX TERMS: Lightning Technology, Phenomenology, Measurement, Deten action, Testing.</li> </ul>	neld at Langley Research onsored by the National ne Department of Trans- but were unavailable for ection, Protection, Inter-	<ul> <li>Grounding, Bonding, Shielding, and Lightning Bibliography 1972 to 1979</li> <li>Thomas E. Brewer and Marshall Leach, Jr.</li> <li>Georgia Inst. of Tech., Atlanta School of Electrical Engineering</li> <li>Contract F30602-78-C-0120, Final Report 20 Jun 79-30 Sep 80, AD-AO98</li> <li>539/0 PC AO8/MF AO1</li> <li>Feb 81, 160p, FAA-RD-81-22</li> <li>ABSTRACT: As a result of a literature search carried out in conjunction with an extensive effort concerning grounding, bonding, shielding, and lightning a bibliography was compiled. The bibliography, cover period 1972 to 1979, is contained in this report.</li> <li>INDEX TERMS: Grounding, Bonding, Shielding, Lightning Bibliography.</li> </ul>	

Radio Frequency Interference Evaluation of a Single Skin S-280B Shelter Robert V. Garver and Charles Brown Harry Diamond Labs, Adelphi, MD. Technical Memo, AD-AO99 237/0, PC AO3/MF AO1 49p, Report No. HDL-TM-81-7 ABSTRACT: An S-280B shelter was subjected to MIL-STD-285 radio frequency interference (RFI) tests in the normal configuration and with the curb-side and rear exterior skins removed. Although the shelter had been damaged before testing, it was repaired to bring its performance up to meet the MIL-STD-285 requirements of a new shelter. The measurements after the skin was removed showed a 20-dB reduction of shielding for electric (E-) field at the higher frequencies and a 14-dB reduction of shielding for magnetic (H-) field at the lower frequencies. Sealing a gap between the interior wall and the door frame restored one-third of the low-frequency H-field shielding and about 10 dB of the high-frequency E-field shielding. The conclusion is that the leakage is dominated by the seams. An 80-dB single skin shelter must have either welded seams all the way around or equivalent or else multiple walls each having RFI shielding. INDEX TERMS: MIL-STD-285 radio, interference (RFI), shelter, shielding, electric, field, magnetic, field, leakage.		Varistor-Initiated Arcs in Lightning Arrestor Connectors J.O. Brainard, L.A. Andrews, and R.A. Anderson Sandia National Labs., Albuquerque, NM Electronic Components Conference, Atlanta, GA, USA, 11 May 1981, Contract ACO4-76DPOO789 1981, 8p CONF-810510-3 ABSTRACT: The electrical breakdown of gas-filled gaps is currently being used in Lightning Arrestor Connectors. The Lightning Arrestor Connector (LAC) is a combination connector and high-current tran- sient suppressor where an overvoltaged signal is shunted from the connector contacts to the connector shell, thus protecting downstream circuitry. Control of the breakdown voltage is difficult, relaying on electrode spacing and surface conditions, and the gas composition and pressure. The breakdown control using solid state devices such as a zener diode or a varistor would be far superior, but the current carrying capacity is greatly reduced. A varistor-initiated gas breakdown gap has been developed which has excellent breakdown control and can handle much higher currents than would be possible from the solid-state conduction of the varistor alone. The varistor-initiated arc concept involves the surface flashover of a doped sintered zinc oxide varistor. The varistor-initiated arc LAC is simple in design and easy to produce. INDEX TERMS: Gas-Filled, Lightning Arrestor Connectors, High-Current Transient, Zener Diode, Varistor, Varistor-Initiated Arc.	
Investigation of Low Level Aircraft Nonavionic Nonlinear Interference J.L. Allen University of South Florida, Tampa, Dept, of Electrical Engineering	EMCABS 56-9-82	Effects of the Satellite Power System on Low Earth Orbit and Geosynchronous Satellites W.B. Grant, E.L. Morrison, and J.R. Juroshek National Telecommunications & Information Administration, Boulder, CO.	EMCABS 59-9-82
<ul> <li>University of South Florida, Tampa, Dept. of Electrical Engineering</li> <li>Contract F30602-78-C-0120, Phase Report 1 Oct 79-30 Sep 80, AD-AO98</li> <li>784/2 PC AO3/MF AO1</li> <li>50p RADC-TR-81-26</li> <li>ABSTRACT: High transmitter power levels combined with increased receiver sensitivity in multi-channel communication systems have led to operational problems caused by passively generated intermodulation products (IM). This report summarizes the results of a literature survey on causes, effects and reduction techniques for passively generated IM interference. An extensive list of references is included.</li> <li>INDEX TERMS: Nonlinear Interference, Multi-Channel Communication, Intermodulation Products, Literature Survey, Reduction</li> </ul>		<ul> <li>PB81-232019 PC AO5/MF AO1</li> <li>Jun 81, 86p</li> <li>ABSTRACT: The large amount of power contained in the main beam and principal sidelobes of the proposed Solar Power System (SPS), now under study by DOE and NASA, potentially presents an EMC problem for other satellite systems. This report examines selected geosynchronous orbit (GEO) satellites in adjacent slots to an SPS, GEO satellites on a chord passing an earth horizon, and low-earth-orbit (LEO) satellites which may pass through the SPS power beam. Potential functional and operational impacts to on-board systems are analyzed. Mitigation techniques for SPS effects are examined, and recommendations summarized to allow satellites to operate satisfactorily in an SPS environment.</li> <li>INDEX TERMS: Satellite, Low Earth Orbit, Solar Power System (SPS), EMC, Geosynchronous, (GEO), (LEO).</li> </ul>	
Electromagnetic System Trade-Offs and Data Base Management for Advanced Composite Aircraft Study, Composite Coupling Analysis. D. Auckland and R. Wallenberg Syracuse Research Corp., NY	EMCABS 57-9-82	Time-Domain in Analysis of Lumped/Distributed Networks for Electromagnetic Compatibility (EMC) Applications	EMCABS 60-9-82
Contract N00014-78-C-0673, Final Report, 1 Aug 78-31 Dec 80, AD-AO97 741/3 PC AO8/MF AO1 Feb 81, 159p, Report No. SRC-TR-81-1084 ABSTRACT: The problem of electromagnetic interference which couples to the interior of composite material shell enclosures is studied. Interference sources considered are a distant nuclear electromagnetic pulse, near-strike lightning, and direct-strike lightning. The electromagnetic properties of the composite material shell wall are simplified by assuming a constant bulk conductivity sigma. Several models for the coupling mechanism are analyzed including integral equation formulations, exact series solutions, and a diffusion coupling model. Several computer programs are presented to determine the interior fields over a large range of frequencies when the shell is modeled as an infinitely long two-dimensional cylinder of arbitrary cross section. A user-oriented interactive computer program is also described which is used to determine the response of circuits situated inside the shell. INDEX TERMS: Electromagnetic Interference, Composite Material, Enclosures, Nuclear Electromag- netic Pulse, Lightning, Conductivity, Models, Coupling, Computer Programs, Interactive.		<ul> <li>J. Lamar Allen</li> <li>Syracuse University, N. Y.</li> <li>Prepared in cooperation with the University of South Florida,</li> <li>RADC-TR-81-110 Contract F30602-79-C-0011, AD—A102 268/0, PC</li> <li>A04/MF A01</li> <li>Phase Report Jun 79-Aug 80</li> <li>ABSTRACT: A new technique suitable for time-domain analysis of a very general class of lumped/distributed networks is introduced. The basic procedure is described and illustrated with examples. The analysis procedure can also be used to generate time-domain models of transmission lines and other structures. This feature is illustrated by generating an exceptionally simple mode for lossless transmission lines. Finally, a novel concept using time-varying reflection coefficients is introduced.</li> <li>INDEX TERMS: Time-Domain, Analysis, Electromagnetic Compatibility, (EMC), networks, transmission lines, mode, reflection coefficients.</li> </ul>	

Voice Communication Research and Evaluation System Richard L. McKinley Air Force Aerospace Medical Research Lab, Wright-Patterson AFB OH	EMCABS 61-9-82	The Danger of Intermodulation Generation by RF Connector Hardware Containing Ferromagnetic Materials Charles E. Young	EMCABS 64-9-82
Technical Report NO. AFAMRL-TR-80-25, AD-A088 100/3, PC A02/MF A101 May 80, 17p. ABSTRACT: Aircraft voice communications may be degraded by a variety of sources such as electrical and/or acoustical noise, radio interference, jamming and various other forms of distraction. The Voice Communication Research and Evaluation System, located in the Biodynamics and Bioengineering Division of the Aerospace Medical Research Laboratory, has been developed for the comprehensive analysis and enhancement of operational voice communication. The basic system is comprised of a multi-station voice communication network consisting of the USAF standard aircraft intercommunication system, a standard A-19 diluter-demand oxygen regulation system and an on line computer data collection and data analysis system that displays results in real time. The system is housed in a large reverberation chamber containing a programmable sound source capable of reproducing the spectrum and level of any AF operational noise environment. Standardized voice communication effectiveness test materials are used to assess the perfor- mance of any aspect of the total voice communication link, however, emphasis is usually placed upon the performance of its application to voice communication problems. INDEX TERMS: Aircraft Voice Communications, Interference, Enhancement.		<ul> <li>Naval Research Lab, Washington DC</li> <li>Final Report No. NRL-MR-4233-CH-2. Presented at the Annual Connector</li> <li>Symposium (9th) Cherry Hill, NJ, 20-21 Oct 76. AD-A088 768/7, PC</li> <li>A02/MF A01</li> <li>7 Jul 82, 16p</li> <li>ABSTRACT: From the few experiments presented here, it should be clear that intermodulation generation</li> <li>(IMG) by ferromagnetic materials (such as stainless steel, nickel plating and hermetic seals) in RF connector</li> <li>hardware is a very serious interference problem to satellite and other sensitive communication systems. Using</li> <li>ferromagnetic materials in RF connectors for military applications is particularly dangerous because of the</li> <li>possible misuse of such devices in IMG vulnerable systems. MIL-C-39012B and related specifications should</li> <li>be revised, prohibiting the use of ferromagnetic materials. Communication centers should be alerted to the</li> <li>potential interference problems of such materials. Their immediate removal is strongly recommended. The</li> <li>necessity to exclude ferromagnetic materials in the fabrication of RF connector hardware, currently an</li> <li>industry-wide problem, cannot be overstressed as a very important step in linearizing RF systems for</li> <li>maximum communication capability.</li> <li>INDEX TERMS: Intermodulation generation, RF Connector, Interference.</li> </ul>	
In-Flight Evaluation of a Severe Weather Avoidance System for Aircraft Robert K. Baum and Timothy J. Seymour Air Force Wright Aeronautical Labs Wright-Patterson AFB OH Final Report NO. AEWAL-TR-80.3022 Contract FAA/ABD 740. AD A087	EMCABS 62-9-82		EMCABS 65-9-82
ABSTRACT: Since there is increased interest in severe weather avoidance systems to augment conventional radar, a joint flight program was undertaken to evaluate the Ryan Stormscope as a thunderstorm avoidance tool. Comparisons were made between Stormscope electrical activity areas and precipitation countours from both on-board and ground weather radar displays. Strongest correlation between radar and Stormscope was found in regions of high precipitation gradients. Comparisons were also made between Stormscope and a groundbased Lightning Detection and Ranging System (LDAR) to determine range and azimuth accuracy of the electrical activity displayed on Stormscope. Because of inherent differences among these systems (i.e., type and rate of data acquisition), corresponding groups of electrical activity areas were compared. Items compared were group area ratios, group overlap areas and group centroid locations. In general, Stormscope groups were larger than corresponding LDAR groups (150% on the average). Additionally, Stormscope group centroid locations differed an average of 15 NM in range and 11 deg in azimuth from those on the LDAR system. This margin of error is acceptable for in-flight thunderstorm avoidance. INDEX TERMS: Weather avoidance, Ryan Stormscope, Correlation, Lightning Detection and Rang- ing System (LDAR)		<ul> <li>Electrically Conductive Plastics, June, 1976-May, 1980 (Citations from the Energy Data Base)</li> <li>Lawrence H. Marcus</li> <li>New England Research Application Center, Storrs, CT.</li> <li>Sponsored in part by National Technical Information Service, Springfield, VA.</li> <li>NERACEDBNTO399, PB80-852544, PC N01/MF N01</li> <li>Jun 30, 72p</li> <li>ABSTRACT: The bibliography cites reports which deal with the preparation, properties and behavior of electrically conductive polymers. Applications include solar cells. (Contains 058 citations.)</li> <li>INDEX TERMS: Bibliography, Electrically conductive polymers, Solar Cells.</li> </ul>	
Connector Design Techniques to Avoid RFI Charles F. Young Naval Research Lab, Washington DC Final Report. Presented at the Annual Connector Symposium (11th) Cherry Hill, NJ 25-26 Oct 78. AD-A088 769/5, PC A02/MF A01 7 Jul 80, 13p Rept No. NRL-MR-4233-CH-3	EMCABS 63-9-82	The Magnetic Characteristics of Tape Wrapped Cylindrical Ferromagnetic	EMCABS 66-9-82
ABSTRACT: A paper, presented at the Ninth Connector Symposium, gave detailed experimental evidence of the serious RFI levels produced by commonly available RF connectors which use ferromagnetic materials. For example, the body structures of a wide variety of precision made coaxial connectors and adapters are manufactured only from stainless steel, type 303, a ferromagnetic alloy. To cut cost and provide a corrosion resistant finish, nickel plating, another ferromagnetic material, has been almost exclusively substituted for silver or gold, previously employed to plate brass stock connectors. That such materials could be considered is difficult to understand because of the nonlinear effects of even minute quantities of ferromagnetic contami- nants in RF systems. Use of ferromagnetic materials, however, has become so widespread that silver or gold plated brass (nonferromagnetic) devices, which had been standard for years, are no longer available as "off-the shelf" items but must be specially ordered in quantities (500 or more) to obtain reasonable production costs. Connectors fabricated from ferromagnetic materials typically produce IMG power levels 3 to 5 orders (1000 to 100,000 times) higher. Obviously such interference levels connot be tolerated in sensitive communica- tion systems. The ferromagnetic connector RF1 problem came to light in 1975 during the Naval Research Laboratory's investigation of passive component nonlinearity and means for its reduction required by the Fleet Satellite Communications (FLTSATCOM) System.		Louis J. Dalsass Naval Underwater Systems Center Newport R1 Report No. NUSC-TM-791227, AD-A086 333/2, PC A02/MF A01 22 Feb 80, 19p ABSTRACT: The leakage magnetic fields from magnetic devices are known to create EM1 problems for sensitive shipboard VLF receivers and sonar equipment. Devices which contain ferromagnetic cores can be particularly significant EMI offenders because of the high flux densities available in their magnetic circuits. This memorandum discusses the magnetic characteristics of various laminated cores found in shipboard equipment (with source frequencies extending into the VLF band). Test results are presented for an axial and radial air gap. Although this is a more complicated magnetic circuit, its behavior is shown to be identical to predictions derived for simple lamination shapes without air gaps for frequencies up to 40 kHz. INDEX TERMS: Magnetic Devices, EM1, Shipboard, VLF	

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Survey of Potential Radio Frequency Interference Sources C. David Crandall Naval Research Lab Washington DC Final Report, NRL-MR-4200, AD-E000, 465, AD-A086 785/3, PC A12/MF A01 13 May 80, 255p ABSTRACT: This report is a survey of the potential Radio Frequency Interference (RFI) sources that are currently affecting the analysis of data from the SEASAT Scanning Multichannel Microwave Radiometer (SMMR) and those sources that could affect the design of the Large Antenna Multichannel Microwave Radiometer (LAMMR) for the National Oceanic Satellite System (NOSS). The SEASAT SMMR survey is limited to the 6.5 to 6.7 GHz channel and to emitters on the West Coast of the United States and Canada where RFI has been encountered. The NOSS LAMMR survey covers all of the potential frequencies of interest; 3.0 to 7.6 GHz, 10.5 to 11.0 GHz, 13.4 to 14.0 GHz, 14.5 to 14.7 GHz, 17.0 to 18.8 GHz, 20.8 to 22.4 GHz, 34.0 to 35.5 GHz, 36.0 to 37.0 GHz, 76.0 to 77.0 GHz, and 88.0 to 94.0 GHz. Also included are excerpts from the current international frequency allocation tables and excerpts from the U.S. position which was presented at the 1979 World Administration Radio Conference (WARC). INDEX TERMS: Survey, FRI, SEASAT, National Oceanic Satellite System.		Computer Programs for EMC Based on the Methods of Moments Bradley Strait Syracuse University, NY Phase Report, Contract F30602-78-C-0083, AD-AO88 096/3, PC AO5/MF AO1 April 1980, 88p ABSTRACT: This report describes several user-oriented computer programs based on the method of moments that are available and can be useful in solving problems of electromagnetics and electromagnetic compatibility. Emphasis is placed on applications, relative availability, and limitations of the programs rather than on mathematical details or programming descriptions. Attention is limited to moment-method based computer codes suitable for treatment in the frequency domain and also in the time domain of problems involving the electromagnetic behavior of thin wires and rods, treatment in the frequency domain of problems involving radiation or scattering by two- and three-dimensional conducting and/or penetrable bodies, and frequency domain coupling of electromagnetic energy through apertures in conducting bodies. INDEX TERMS: Computer Programs, Method of Moments, Electromagnetics, Electromagnetic Com- patibility, Frequency Domain, Time Domain, Radiation, Coupling.	
EMCABS 68-9-82 Electrically Conductive Plastics, January 1977-June 1980 (Citations from the Engineering Index Data Base) Lawrence H. Marcus New England Research Application Center, Storrs, CT. Report for January 1977-June 1980; Sponsored in part by National Technical Information Service, Springfield, VA. PB80-852551, PC NOI-MF N-OI June 80, 204p NERACEI NTO399 ABSTRACT: The bibliography cites reports which deal with the preparation, properties and effects and influences on the conductivity of electrically conductive plastics. (Contains 180 citations). INDEX TERMS: Bibliography, Electrically Conductive Plastics.		EMCABS 71-9-82 Biological Effects of Nonionizing Electromagnetic Radiation, Volume IV, Number 4 Bruce H. Kleinstein and Sheryl A. Dyner Franklin Research Center Philadelphia PA Science Information Services Organization Quarterly Report Mar-June 80; A Digest of Current Literature; Contract HO-AO1-78-1157; AD-AO86 468/6, PC AO5/MF AO1 June 80, 80p, Report No. 80G-C5003-01-VOL-4-4 ABSTRACT: This quarterly digest presents current awareness information on the biological effects of nonionizing electromagnetic radiation (microwave and radio frequency) in the range of 0 Hz to 100 GHz. The effects of magnetic and electric fields (static and alternating) are also covered. Each issue contains abstracts of English and foreign current literature, summaries of ongoing research investigations, news items, and a directory of meetings and conferences. INDEX TERMS: Digest, Biological Effects, Nonionizing, Radiation.	
Parallel-Plate Transmission Line Type of EMP Simulators: Systematic Review and Recommendations D.V. Giri, T.K. Liu, F.M. Tesche, and R.W.P. King Dikewood Industries Inc., Albuquerque, NM. Final Report, Contract F2960178-C-0045. Prepared in cooperation with LuTech Inc., Albuquerque NM and Harvard Univ., AD-A086 814/1, PC A08/MF A01 May 80, 166p, DC-FR-1299-4, AFWL-TR-79-139, AD-E200 520 ABSTRACT: This report presents various aspects of the two-parallel-plate transmission line type of EMP simulator. Much of the work is the result of research efforts conducted during the last two decades at the Air Force Weapons Laboratory, and in industries/universities as well. The principal features of individual simulator components are discussed. The report also emphasizes that it is imperative to hybridize our understanding of individual components so that we can draw meaningful conclusions of simulator perfor- mance as a whole. INDEX TERMS: Two-parallel-plate transmission line, EMP, Simulator.		A Versatile Fiber-Optic Signal Link for EMP Testing and General Laboratory Applications James Blackburn and Robert Martin Harry Diamond Labs, Adelphi, MD Technical Memo, Jul 77-Jul 78, AD-A087 253/1, PC A03/MF A01 Jun 80, 26p, Report No. HDL-TM-80-5 ABSTRACT: A fiber-optic analog signal link is described that was designed specifically to be used for EMP measurements. The link accepts electrical inputs in the range from millivolts to volts and converts them to optical signals which are then transmitted by optical fibers to a remote receiver. The unit is unaffected by electric fields up to hundreds of kilovolts/meter, and a bandwidth of about 130 MHz is provided; the unit has a dynamic range of approximately 30 dB. This dynamic range is extended an additional 45 dB by an internal attenuator which is commanded (by an optical fiber link) to insert a fixed attenuation in the range of 0 to 45 dB between the input connector and transmitter. A self-calibrator is also commanded by the same link. An unusual circuit feature is the use of a single electro-optic device to perform both light-emitting diode and detector functions. INDEX TERMS: Fiber-optic, Signal link, EMP, Measurements	

#### PAPERS PRESENTED AT THE RESEARCH MEETINGS ON EMC JAPAN

#### June 24, 1982, Saga

- "A Study on Low Loss Pair Type Cables," by Junji TADA, TATSUTA Electric Wire & Cable Co., Ltd. and Risaburo SATO, Tohoku University, Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 60, EMCJ 82-9, pp. 1-6
- "Radio Noise Caused by Gap Switch and Consideration of Its Circuit," Yoshiaki SUDA, Sasebo Technical College, and Teizo AIDA, Faculty of Engineering, Kumamoto University, Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 60, EMCJ 82-10, pp. 7-12

**ABSTRACT:** A gap switch is often used as a stator switch for surge current generators. It creates electromagnetic interference (EMI) to surrounding susceptible electromagnetic receivers, including measuring devices. A study was conducted on the brass gap switch concerning radio noise. It was measured in accordance with the standard CISPR. As a result, the following things were found: (1) the radio noise was in proportion to  $f^{-2}$  (0.15-1.5MHz) and  $f^{-1}$  (1.5-30MHz). (2) The radio noise was increased with the increasing of the discharge voltage. (3) The radio noise was in proportion to L<sup>-1</sup> (0.85-4.6uH) (f=0.15-1.5MHz).

- "The Measuring Method of Conducted Noise Propagating on Power Line," by T. TAKANO, A. TANJI, Y. NAGASAWA, R. SATO, Faculty of Engineering, Tohoku Univ., Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 60, EMCJ 82-11, pp. 13-18
- "Noise Characteristics of Switching Regulators," by Koosuke HARADA and Tamotsu NONOMIYA, Faculty of Engineering, Kyushu University, Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 60, EMCJ 82-12, pp. 19-24
  - **ABSTRACT:** There are two aspects of the noise difficulties in switching regulators: One is the surge and noise generation in the switching instants of a transistor switch, and the other is the penetration of external noise into the switching regulator. These are closely related with the reliability of electronic equipment. This paper reviews the above noise problems, and presents the analytical expressions which are useful for the prediction of noise characteristics.
- "Electromagnetic Absorption Properties of Plastic Plate with Resistance and Conductance Particles," by Shoji TOMINAGA, Masaoki TANAKA, Yasumitsu MIYA-ZAKI, Toyohashi University of Technology, Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 60, EMCJ 82-13, pp. 25-30

**ABSTRACT:** We fabricated electromagnetic plastic absorbers, which contain small particles of resistance and conductance materials, and measured reflection and transmission factors of the plastics. We could obtain height efficient electromagnetic absorption in the plastics. These electromagnetic absorbers are very thin, comparing other absorbers reported so far. They have good mechanical strengths. The absorbers can be applied to electronic systems of IC, LSI, and TV. On measurement, reflection factor was -14.9dB and transmission factor was -21.2dB at measuring frequency of 11.6GHz, thickness of plastic was 13.6mm.

- 6. "Effect of Rising Portion of Voltage, Arc Voltage Fluctuations and Voltage Surge on the Voltage Spectrum (Radio Noise) in Breaking Contacts," by Teizo AIDA, Keiichi UCHIMURA, Takanori OHIRA, Shigeru OGATA, Faculty of Engineering, Kumamoto University, Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 60, EMCJ 82-14, pp. 31-36 ABSTRACT: Waveforms of the voltage between contracts were observed in breaking Ag contacts, in the region of DC source voltage 20 60V and closed contact current 0.15 6A. Then spectra of these voltage waves, especially the rising portion of voltage, the arc voltage fluctuations and the voltage surge, were measured. From the comparison of intensities of spectra, we investigated main reason of radio noise.
- "Spectrum of Noise Current Caused by Electrical Contacts on Opening with Arc Discharge," by S. MINEGI-SHI, T. OHMORI, Faculty of Engineering, Tohoku Gakuin University, and H. ECHIGO, R. SATO, Faculty of Engineering, Tohoku University, Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 60, EMCJ 82-15, pp. 37-42

**ABSTRACT:** Noise current spectrum caused by electrical contacts on opening with arc discharge is described. For real circuits, including relay contacts, a model was introduced, which was made of a relay and a transmission line. Based on this model, the spectrum of the noise which travels along the transmission line was analyzed experimentally and theoretically. The results of both analyses agreed very well and, consequently, the following conclusion may be submitted: The main cause of the noise caused by electrical contacts on opening with arc discharge is multiple reflections of the step-wave at the time of arc generation and of arc termination in the line.

 "A Measurement Method of Wideband Random Signals," by K. OHNUMA, T. OHMORI, Faculty of Engieering, Tohoku Gakuin University, and T. SAEKI, Nippon Electric Engineering Co., Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 60, EMCJ 82-16, pp. 43-46 **ABSTRACT:** A measurement method of random signals in the bandwidth which is larger than that of receiver's front-end stages is described. In this method, repeated staircase signals are supplied to the spectrum analyzer's external scan mode terminal, measured center frequency is changed, corresponding to the step-level, and statistical parameters (Amplitude Probability Distributions, APD and Average Crossing Rate, ARC) can be measured by a way of time share at each center frequency. The measurement results in this method agreed with that which was measured continuously.

- "UHF Radio Wave Propagation Along Underground Gallery in the Experimental Coal Mine at Usui," by Tadasi SUZUKI, Takehiro ISEI, National Research Institute for Pollution and Resource, and Nobuyoshi KOGUE, Kuniaki YOSHIDOMI, Kazuo AOKI, Kyushu University, Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 60, EMCJ 82-17, pp. 47-52
  - **ABSTRACT:** For the purpose of more effective underground communication, UHF radio wave propagation along underground gallery was discussed both experimentally and theoretically. From the experimental results, it became clear that the higher frequency bands, i.e., more than 500 MHz, are favorable for underground use by the reason of the lower propagation loss. To establish the propagation model of UHF radio wave theoretically, the simple geometrical image sources method and the characteristic equation method both were discussed to allow for gallery conditions such as timbering methods, cross sectional area and others. Reasonable good agreements were observed between experimental results and theoretical calculation. COAL MINE, GALLERY, UHF

 "Electromagnetic Interference Eliminator for Television Resection," by Akira TAKAHASHI, Madaji ISOYA, YAGI Antenna Co., Ltd., and Isao NISHIHARA, Masao NAKAJIMA, NHK URAWA Station, Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 60, EMCJ 82-18, pp. 53-58

**ABSTRACT:** In the vicinity of MF/HF broadcasting station, such RF interference is often suffered in radio and TV reception, observed as some ingress of noises in audio output and diagonal beat-stripes on TV screen. Those are caused by the coupling of interference current over to the signal circuit, when the current flows from antenna terminal down to the ground through power-supply circuit of the receiver. For preventing the problem, an eliminator unit has been produced and its performance has been found fully effective.

#### July 20, 1982, Tokyo

 "A Model Experiment of Scattering Characteristics Measurement of Pyramidal Absorber," by Mitsuhiro ONO, Yasutaka NAKAMURA, Yamagata University, and Mitsuhiro NAKAMURA, Fuji Electric Corp., Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 78, EMCJ 82-19, pp.1-5 **ABSTRACT:** We have designed the pyramidal absorber consisting of dielectric and magnetic materials with good reflection characteristics of normal and oblique incidence in VHF band and the above. But, its scattering characteristics were not examined because of the difficulty of theoretical calculation. Accordingly, we examined them using reduced models. As a result, reflection angles are not always equal to incident angles. But, we found to get better scattering characteristics, choose properly the ratio of width of base to length of pyramid.

 "Design Method of Lightning Surge Test Circuit for Communication Equipment," by Nobuo KUWABARA, Hiroaki KOGA, Tamio MOTOMITSU, Tsuyoshi IDE-GUCHI, Ibaraki Electrical Communication Laboratory, N.T.T., Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 78, EMCJ 82-20, pp. 7-12

**ABSTRACT:** This paper discusses the design method of lightning surge test circuit for communication equipment. The test circuit can be used for the equipment containing linear or nonlinear resistances. Internal impedance and surge source of the test circuit are determined, based on lightning surge inducing theory and observation data on the transmission lines. The test surge waveform is determined, based on the distributions of lightning surge parameters, so as to estimate the reliability of equipment.

- 3. "Transverse Voltage Due to 3-Electrode Gas Tube Arrester," by Hiroshi YAMANE, Tsuyoshi IDEGUCHI, Mitsuo HATTORI, Hiroaki KOGA, Tamio MOTO-MITSU, Ibaraki Electrical Communication Laboratory N.T.T., Report of Technical Group on EMC, IECE and IEE of Japan, Vol. 82, No. 78, EMCJ 82-21, pp. 13-18 ABSTRACT: A 3-electrode gas tube arrester is used to protect the telecommunication equipment against over voltage. As the arrester discharge voltage distributes, a transverse voltage appears across paired wires. This paper shows a transverse voltage inducing mechanism, and also describes equations that express the transverse voltage distribution for lightning surge and powerline inducing voltage. An over-voltage protection circuit is obtained from the relation between the transverse voltage and equipment trouble occurrences.
- "Time Domain Sensors for Radiated Impulsive EMI Measurements," by Motohisa KANDA and Francis X. RIES, Electromagnetic Fields Division, National Bureau of Standards, Report of Technical Group on EMC, IECE and IEE of Japan Vol. 82, No. 78, EMCJ 82-22, pp. 19-24

**ABSTRACT:** The purpose of this paper is to review various sensors and radiators commonly used for time domain antenna measurements. For electric field strength measurements, linear antennas loaded nonuniformly and continuously with resistance, or both resistance and capacitance are discussed. Also a conical antenna and an asymptotic conical antenna are discussed from the standpoint of an improved characteristic. For an improved directivity, various types of TEM horns are discussed, e.g., a conducting TEM horn, a CALSPAN antenna, and a resistively loaded TEM horn.

#### INTERNATIONAL CONFERENCE ON LIGHTNING AND STATIC ELECTRICITY

"Lightning Technology Roundup" is the teme for the 1983 International Conference on Lightning and Static Electricity to be held in Fort Worth, Texas, June 21-23, 1983. The conference will be sponsored by the National Interagency Coordination Group of the National Atmospheric Electricity Hazards Protection Program in concert with the Florida Institute of Technology. This group consists of research experts from the U.S. Air Force, U.S. Navy, U.S. Army, NASA, NOAA, and the FAA. The conference also will be in cooperation with the IEEE; SAE-AE4 Committee; the United Kingdom Civil Aviation Authority; Royal Aircraft Establishment, Farnborough; and Culham Laboratory. The conference is of particular interest since research on the protection of aircraft, helicopter, aerospace vehicles, ships and ground facilities against the atmospheric electrical hazards associated with lightning and static electricity is a continual effort being conducted internationally. Members of the worldwide research community will share their findings and observations at the conference, which will dwell on this continuing subject of international research.

A Call for Papers has been issued, and authors wishing to present papers should submit a 300-400 word abstract, in English, to Nick Rasch, Conference Chairman, FAA Technical Ctr., ACT-340, Atlantic City Airport, NJ 08405; Tel.: 609-641-8200, Ext. 1146. Abstracts must include a full postal address, telephone number, and subject category under which the author would prefer to present the paper. Criteria for selection of papers will be based upon the current nature, usefulness and significance of the reported results in relation to subject categories of the conference. Final paper selection will be made January 1, 1983.

Papers accepted for the conference will be presented orally, with time made available during each session for discussion. Sessions will be based on, but not limited to, the following subject categories:

- Phenomenology
- Channel Modelling and Coupling Analysis
- Lightning Test Criteria and Techniques
- Electrostatics and 'P-Static'
- Protection of Aerospace Vehicles
- · Hardening of Airborne and Ground Equipment
- Protection of Fuel Systems
- Protection of Ground Systems
- Structures and Materials
- Effects upon Electrical/Electronic Systems
- Helicopters
- Shipboard Installations
- Specifications and Standards
- Management Responsibility
- Ordnance
- Personnel Hazards
- Grounding and Bonding
- Protection of Aircraft

Rooms have been reserved at the Fort Worth Hilton Hotel at a special rate for the period of the conference. Delegates are, of course, free to make other arrangements. Rooms also will be available for group meetings on particular topics of interest which arise during the conference. For further details, contact Mr. Rasch; Walt McKerchar, Conference Coordinator, c/o Northwest Engineering Service, P. O. Box 1888, Poulsbo, WA 98370; Tel.: 206-779-7069; or, J. J. Fisher, Conference Vice Chairman and Treasurer, U. S. Naval Air Systems Command, Washington, DC 20361; Tel.: 202-692-7788. Technical enquiries also should be directed to Mr. Rasch.

#### MELVIN J. JOHNSON ASSUMES RESPONSIBILITY OF EMC-S NEWSLETTER ASSOCIATE EDITOR

Appointed by the BOD to serve as Chairman of the Abstracts Committee and Associate Editor of the EMC-S Newsletter, Melvin J. Johnson begins his new responsibilities with this issue of the Newsletter by furnishing 72 technical abstracts. Mr. Johnson received his BSEE from Oklahoma State University and then received a commission in the Air Force, serving continuously until 1980. His assignments included research and testing of nuclear generated electromagnetic pulse (EMP) effects on aircraft and missile systems, high voltage susceptibility of aircraft fuel systems, and work with EMP sensors and simulators.

Presently at Southwest Research Institute, Mr. Johnson manages and directs the EMC Concepts and Development section, which work consists of studies of EMC phenomena, standards development, measurement techniques, and reduction of emissions. He also manages and directs the research, development, test, and evaluation of programs involving the measurement, analysis and suppression of signals as required by government agencies.

Mr. Johnson has developed probes and instrumentation used in major biological research studies of 60 Hz electric fields, and has researched and performed design work for probe systems throughout the frequency spectrum up to 20 GHz. He also has been involved in fiber optic sensor design work, results of which are published in the 1982 IEEE Symposium Record, and in more detail, in reports to the automotive industry.

Active in IEEE functions, and presently serving as treasurer of the EMC Chapter of the Central Texas Section, Mr. Johnson has been selected to organize and to chair the EMI session of the SAE 1983 International Congress and Exposition. He also serves as a member of the SAE EMI Standards and Test Methods Subcommittee of the Electronic Systems Committee. Mr. Johnson has been active as an author, having published numerous formal reports while in the Air Force, in addition to publishing his works in ITEM and at IEEE EMC symposia while at Southwest Research Institute.

#### ENGINEERING RESEARCH INITIATION GRANTS

The Engineering Foundation has announced the availability of Engineering Research Initiation Grants for 1983-1984 in fields represented by its Founder Societies, included among which is the IEEE. The program, directed toward starting full time engineering Faculty members who are without research support, will award up to two grants of \$17,000 each on a competitive basis to members of each Founder Society for proposed research projects in fields of mutual interest to the Founder Societies and to the Engineering Foundation. The Engineering Foundation also will make available matching funds for one additional grant per Founder Society, subject to the Society's contribution of the remaining \$8,500. IEEE currently is investigating the feasibility of partially subsidizing an additional grant. Awards made with matching funds will be designated as joint Engineering Foundation -Founder Society awards, and will be selected and administered by the same procedures applicable to all Engineering Foundation Research Initiation Grants.

Those individuals with industrial-type experience, but who are beginning an academic career, are particularly encouraged to apply. It is expected that investigators will devote at least one-fourth time during one academic year as part of their normal academic assignment and full time (2-3 months) during the summer following the academic year to the proposed research on the campus of their institution. One proposal may be submitted per department on behalf of an individual who:

- 1. (A) Holds a full-time regular academic appointment on the engineering teaching faculty of an institution of higher education
  - (B) Is without research support
  - (C) Is a member of the Society to which the proposal is submitted
- 2. (A) Was awarded the Doctor's degree not longer than three academic years prior to the submission of the proposal
- OR
  - (B) Has gained several years of industrial-type or post-doctoral experience and is within his first three years as a full time member of the faculty

All proposals being submitted to the Founder Societies must be received at IEEE Headquarters by December 1, 1982 and should be mailed directly to Dr. Irving Engelson, Staff Director, Technical Activities, IEEE, 345 E. 47th St., New York, NY 10017. For instructions for preparing a proposal, please contact Dr. Engelson.

#### CONGRESS REDUCES MEMBERSHIP OF TWO MAJOR REGULATORY BODIES

The Congress has adopted legislation, originating in the Senate, which reduces the membership of two major regulatory commissions. The vehicle — the Omnibus Budget Reconciliation Act — reduced the Federal Communications Commission from seven to five members and the Interstate Commerce Commission from eleven to five members. Although the cutbacks were opposed by the White House, the Senate adopted the FCC provision by a vote of 71-27.

The reductions were made in the name of budget savings. Sen. Bob Packwood, chairman of the Commerce Committee, said there is "absolutely no need for more than five members on either Commission" since the workloads of both have been reduced substantially by deregulatory legislation.

The concept of reducing the size of the FCC is not new. In 1971, a study conducted by the executive branch recommended a five-member FCC Commission. The idea was endorsed by a former FCC General Counsel (Henry Geller) in 1974. A 1977 Congressional study of regulatory commissions concluded that policy-making bodies of five are preferable to larger groups, the primary advantage being the speed of decision-making.

#### USAB PUBLISHES GUIDE TO ETHICS

USAB has published a guide to ethics titled *The IEEE Role in Engineering Ethics.* It is the third in a series of "PAC Guides" to provide information and guidance to members on professional topics. PAC chairmen will receive a complimentary copy to be placed in the *PAC Source Book*.

The ethics guide discusses the IEEE Code of Ethics and the procedures for enforcing the Code, including IEEE support for members placed in jeopardy for adhering to the Code, and discipline of members for Code violations. Another section of the guide discusses the anatomy of ethical decisions and includes two recent case studies of IEEE involvement. Finally, the guide presents a number of activities that may be undertaken by local PACs, pointing out the USAB resources available to PACs.

Additional copies of the *PAC Guide to Ethics* are available for sale from the IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. The price is \$2.25 for members and \$3 for nonmembers. Ask for IEEE Catalog No. UH0149-5. The earlier guides include PAC Guide to Service Contracts ("Your Rights As A Service Contract Employee") and PAC Guide to Patents ("Employed Engineers: Who Owns Their Inventions?").

## **EMC PERSONALITY PROFILES**



EUGENE (GENE) D. KNOWLES

The EMC Personality Profile for this issue is Gene Knowles. Gene is a very familiar member of the EMC Society. He has been active in the EMC community for a number of years and he has served on a number of committees related to the profession. Gene was a member of the AIA Radio Interference panel in 1963. He also has been a member of SAE Electromagnetic Compatibility Committee AE-4 since 1965; and has served on various sub-committees of AE-4. In 1972, Gene was elected to the EMC Society Board of Directors and since that time, he has served in various capacities, including that of Vice President. He still is serving on the Board of Directors, and he is currently the Technical Director for Professional Services, a member of the Standards Committee, and is involved in other Society activities. Gene has been especially helpful to me during my term as President of the EMC Society, and I have learned that any time I need a volunteer, I always can count on Gene Knowles.

In addition to his service on the Board of Directors, Gene has been active in the Atlanta and Seattle EMC Chapters. He was a Chairman for the Atlanta Chapter and a member of the 1978 EMC Symposium Committee in Atlanta. In Seattle, Gene was the arrangements chairman for the 1968 EMC Symposium and the 1973 Communication Society Convention He has served in various capacities for the Seattle EMC Chapter and he is currently the Vice Chairman. He also has served in various capacities for the Seattle Section during the past twelve years.

Gene is a senior member of the IEEE and he has made a number of technical contributions to the field of EMC. Gene published his first paper at the Armour Conference in 1961. Since then, he has published several other papers in the EMC field. These have included methods of system tests, shielding effects of braided cable types, and shielding of connectors during vibration. He has taught several EMC/RFI courses for Boeing engineering personnel.

Gene received a Bachelor of Science degree in Electrical Engineering from the University of Washington in 1954. He also attended Cogswell Polytechnical College, Utah State Agricultural College and the California Institute of Technology. by William G. Duff



He started his career in electronics in the U.S. Navy as a radio technician. He was later commissioned as Ensign and experienced active service in the Aleutian Islands and the Pacific area. After his release from active duty, he remained in the Navy Reserves and received a Navy commendation for Engineering contributions to Naval Service. He retired from the reserves as a Commander.

In 1950, Gene joined Elsco Marine Electronics as a marine field service engineer involved in EMI and electronic systems design and test. In 1956, he joined the Boeing Company as Facilities Engineer. He was involved in the specification, design and test of special test equipment and shielded rooms. He became involved with the Radio Interference Group at Boeing in 1959 and worked on the EMI/EMC problems associated with the BOMARC, Minuteman, and Saturn. His work during this time involved EMC design, and planning and coordinating EMI/EMC testing. During the period from 1976 to 1978, Gene was the principal EMC engineer on the design and construction of the Metropolitan Atlanta Rapid Transit Authority System (MARTA).

Gene is currently with BE&C Engineers, Inc., a subsidiary of Boeing. BE&C is located in Tukwila, Washington, just south of Seattle. Since joining BE&C in 1978, Gene has been a Senior Project Engineer concerned with EMC consulting, and the design and construction of shielded anechoic chambers and turn-key laboratory facilities.

In addition to his work and IEEE activities, Gene has been quite active in other community activities. He was commended for his work on the Seattle Convention and Visitors Bureau in relation to IEEE and other conventions. He served for the past twenty years as a volunteer instructor with the Washington State Department of Game, Hunter Education Program, and received an inspirational award for his work on this program. Gene's other interests include hunting, fishing and backcountry horse trips. He has a deep interest in wildlife and wilderness conservation.

Last, but not least, Gene is very devoted to his family. He and his wife Grace have been married thirty-six years. They have six children (three are married and three are still home) and eleven grandchildren.

I would like to take this opportunity to personally thank Gene for all that he has done to help the EMC community, in general, and the EMC Society, in particular.

# CHAPTER CHATTER



by Charles F.W. Anderson

#### GENERAL

The Chapter Chairmen's Luncheon at Santa Clara was a truly fine event! Owing to Gene Knowles' hasty departure for England on the day following the close of the Symposium, he and your Column Editor were not able to get together and compile a report of that gathering before the deadline for this issue of the Newsletter. There *will* be a writeup in the next issue. In brief, it appeared that EMC-S *is* energetically alive at chapter level, and that we can look forward to considerable activity "where the rubber meets the road."

#### **CENTRAL NEW ENGLAND**

John Clarke reports that the CNE Chapter's Steering Committee for the 1985 Symposium is getting up steam. CNE's first meeting of the '82/'83 season will be held on November 19th at Chomerics' facility in Woburn, MA. There will be a brief seminar on EMI/RFI Shielding Techniques and EMP shielding, followed by laboratory tours. Future meeting topics, it is anticipated, will include EMI Measurements and Standards for Transit Vehicles, Recent Studies of Lightning Phenomena, EMP Analysis using the TI-59 Calculator, Impact of FCC 20780 on Consumer Electronics and Characterization and Cure of Home RFI Sources. Contact John at (617) 861-2105 if you are in the Boston area and would like to attend one of the meetings.

### DENVER/BOULDER (Joint w/ Instrumentation & Measurements Chapter)

On August 25th, the Chapter held a meeting at the Ball Aerospace Systems Division facility in Boulder. An overview of the company was presented, followed by a tour of Ball Aerospace's new anechoic chamber and their microstrip antenna design group. The following week, on September Ist, the Chapter held its Sixth Annual Joint EMC/1&M Symposium. Of the eleven papers presented, six were previews of papers given later at Santa Clara; thus, providing excellent peer group feedback for the authors/speakers. Thanks to Bob FitzGerrell, Chapter Chairman, for his report.

#### **NEW JERSEY COAST**

The first meeting of the Chapter (joint with Vehicular Technology) was held on October 19th, and featured Fred Link who is the Chapter's liaison representative to the VT Society. His presentation included a short hisotry of Vehicular Technology and an update on the Society's current activities. The proposed slate of officers for the '82/'83 term is as follows:

Chairman: Seymour Krevsky (PRC - Eatontown) Vice Chairman: Charles Joly (Honeywell - Tinton Falls)

Secretary/Treasurer: Dr. Michael Healy (also of Honeywell)

Thanks to Seymour Krevsky for the report.

#### токуо

Dr. Sato and his associates (some of whom I had the pleasure of meeting at Santa Clara) continue their EMC Research Meetings. Ten papers were presented at the June meeting and four at the July meeting. Topics included switch transient phenomena, RF absorbers, switching regulator EMI, UHF propagation in a coal mine, an EMI eliminator unit for TV reception and lightning surge test circuit design. Those who will be fortunate enough to attend the 1984 Symposium can look forward to a menu of excellent papers, judging by the lists which Dr. Sato so faithfully provides to us.

#### REPORT ON EMC-S BOARD OF DIRECTORS MEETING SEPTEMBER 7, 1982

The annual EMC-Society Board of Directors Meeting was called to order by President Bill Duff at 1:00 P.M. on Tuesday, September 7, 1982, the day before our annual EMC Symposium in Santa Clara. Nineteen of the 21 Board members were present, in addition to a dozen Society members and committee chairpersons. It was very encouraging to see such a turnout and interest in the deliberations of our Society.

A sampling of the action and discussions handled by the Board included:

1. The Treasurer's report shows that the projected year-end worth of the Society will be \$119,000, which is about \$9,000 above last year's total. Of that \$119,000, \$70,000 is invested in various options offered by the Institute.

2. Bob Goldblum, Newsletter editor, reported that the new look of our EMCS Newsletter not only looks better; but, in fact, is less expensive than the previous Newsletters, due primarily to typesetting allowing denser packing of news. In the EMC Abstracts area, Mel Johnson, Southwest Research Institute, has replaced Ed Bronaugh as associate editor on a temporary basis. Ed has done an outstanding job over the past few years. Due to his efforts, over 150 abstracts will be published this year alone. The Society owes him our thanks.

3. Dick Schulz, Transactions Editor, indicated that the names of the associate editors for the various subject areas will be added to each Transactions, as well as the phone numbers for the 4 elected EMCS offices of President, Veep, Secretary, and Treasurer. A call to the Secretary will provide a quick up-to-date way to get names, addresses, and phone numbers of other committee chairpersons as well. Each Transactions will, therefore, provide a quick means to contact key Society activities.

4. Plans for the next 5 symposia were discussed. Next year is Washington, DC. The date may change as well as the hotel. Watch for further mailings and announcements. In any case, the deadlines for call for papers (Dec. 15, 1982) and other paper-oriented deadlines will not change. Plans for the 1984 International Symposium in Tokyo on October 16-18, 1984 is proceeding on schedule. Dr. Sato, Chairman, indicated that Dick Schulz will serve as US paper review chairperson. Plans for visits to technical organizations such as NHK/NTT Labs were revealed. To avoid conflicts, this and other visits are planned for the day after the Symposium. There are preliminary plans for low-cost charter tours leaving the major west coast California ports to Japan, as well as linking east coast to west coast tours to enable the trip to be well within range of travel budgets. So, make plans now and include the symposium in your 1984 travel budget requests. For further information, write Tei Iki at Sony Corp., 1650 W. Bernardo Drive,

San Diego, CA 92127. The 1984 National Symposium at the San Antonio Hyatt Regency is during Fiesta Week, April 24-26, 1984. It is suggested that reservations be made as soon as the advance program is released, or sooner. Other symposia (Boston in '85 and San Diego in '86) plans will be reported later. The Board did approve Atlanta as the site for the 1987 Symposium.

5. The Board deliberated considerably over the relationship of the Society and commercial enterprises during the EMCS Symposium. A policy resulted which was approved by the Board. In brief, the Society:

- a. Can advertise the availability of facilities, services and/or educational opportunity in its general field of interest
- Should not announce any program or course in direct competition for time or facilities of any symposium or session directed as sponsored by the EMC Society
- c. Should strive to be totally even handed to all parties
- d. Should make it clear that the announcement by the Society of any auxiliary activity of a commercial nature imply an endorsement by the Society
- e. Should ensure that subject matter of any course or other auxiliary activity must have an obvious and organic relationship to EMC
- f. Should limit announcements in symposium program mailings to a brief description meeting details, costs, point of contact.

Any questions regarding this policy should be addressed to Bill Duff or Chet Smith at (617) 271-7086.

6. Standards Activity continues with Bud Taggart reporting that the revised IEEE Standards 213, 24, and 263 have been reviewed by the Society Standards Committee and that the comments are being considered. Standard 187, which addresses the measurement of emissions from FM and TV receivers, has been revised by the Japanese Chapter under the guidance of Dr. Sato. Copies will be sent to the committee members for review. The Standards Committee continues to be in search of volunteers to bring up-to-date the several standards mentioned previously in this column. Standards on susceptibility, automatic measurements, and other current topics are under consideration. With this meeting, Bud Taggart retires from chairing the committee and Don Heirman takes over as of October 1, 1982. We express thanks to Bud for his many years of contributions in this area to the Society.

7. The Board requested that, at the next meeting, the educational committee report the costs necessary to produce a professional video tape on an introduction to EMC. In addition, the Board wants to review the questionnaire that requested selected colleges/universities to comment on providing a college level EMC course. Hank Ott will provide the results of the first responses to that questionnaire and would like to have any other inputs by those of our members who may have seen college courses on the subject. Call Hank on (201) 386-6660.

8. Fred Nichols reported that papers were being processed for a new Chapter in Orange County, California. Plans continue for a Chicago Chapter (call Bob Hofmann at 312-462-3627, and it looks like the Central Florida Chapter is not materializing.

9. Membership development continues at a brisk pace due to the fine work by Jim Toler (404-894-3964), Chairman, and Don Clark. 246 letters will be sent to those members who did not renew 1982 membership. Letters for membership will be mailed to another 819 IEEE; but, not EMCS members who indicated in their Technical Interest Profile an interest in EMC. Again, the Board aproved the payment of the EMCS membership for all those who signed up at the symposium. The count at the end of the symposium was 72 new members.

10. Revisions to the Constitution/By-laws were proposed by Hugh Denny. These affect voting procedures for President and Veep, as well as the possibility for vote by Chapter chairpersons for these offices. Contact Hugh for further information (404-894-3535).

11. Gene Knowles reported that EMC-type meeting conflicts were being resolved by Lou Loubello, Chairman of the Intersociety Relation Committee. Public relations under Peter Grant is mailing out new membership applications. The various TAB Committee liaison representatives reported their activity.

12. Bill Duff discussed the EMCS position paper supporting a bill (HR5008) to enable the FCC to set minimum performance standards for susceptibility to interference of audio and video equipments, such power to be employed only when necessary to alleviate widespread, serious and continuous interference caused by poor design of both domestic and imported devices. The position statement was forwarded to selected senators, congressmen, IEEE Congressional Fellow, IEEE President, Veep of TAB, Staff Directors, etc. The paper may have had the desired impact, since Congress passed the legislation near the end of August. For specifics, call Dick Schulz (301-267-2350).

13. The election of new EMCS officers was postponed until the first Board meeting in 1983 since the results of the new Board member-at-large election was not available at this last Board meeting of the 1982 year. The meeting adjourned at 4:57 P.M. The next meeting will be in January 1983 at the call of the chair.

Don Heirman Immediate Past President, EMCS

#### FEDERAL COMMUNICATIONS COMMISSION BULLETIN ON OPEN FIELD TEST SITES

The FCC has released a Report & Order Terminating Docket 21371 pertaining to the characteristics and calibration of open field test sites. This docket proposed the provisions of Section 15.38 of the rules, then applying only to open-field sites used for radiation measurements on devices subject to certification. It would have extended the revised site qualification provisions to measurement sites used for type acceptance and type approval, as well as those used for certification.

In the Report and Order, the Commission pointed out that ANSI C63 Subcommittee and CISPR are working on site qualification proposals, which are expected, ultimately, to result in national or international standards. The Commission now views development of site qualification standards on such bases as being preferable to mandating them in its rules.

In this action, the Commission made some minor changes in Part 15 of its rules. It also released Bulletin OST 55, to serve as an interim advisory document re: site qualification pending finalizing the ANSI and CISPR proposals. These were appendices to the Report and Order.

#### FCC GIVES OKAY TO LPTV

Proponents of low power television scored a major victory when the FCC gave the official green light to the first new broadcast system to be approved in twenty years. The estimated implementation of five thousand LPTV stations throughout the United States, coupled with liberal ownership rules, has led FCC Chairman Mark S. Fowler to speculate that LPTV might pave the way for the creation of a fourth major television network. But, regardless of the final outcome, the FCC decision has ended a year of uncertainty for some six thousand hopeful license applicants, and has signaled the start of what is expected to be a lengthy and highly scrutinized selection process.

#### FCC QUITS RTCA

The Federal Communications Commission has terminated its membership in RTCA. Budgetary limitations were cited as the basis for this decision. The FCC has been a supporting agency since the early days of RTCA and has contributed significantly in technical areas related to FCC interests.



Richard B. Schulz IIT Research Institute Annapolis, Maryland 21401

#### **TECHNOLOGY-ALERTING INDEX**

This index lists recent manuscripts received (but, not yet accepted) for publication in the EMC Transactions. New indexing symbols are included to indicate the subjects treated. For details on the meaning of these symbols, refer to the editorial "Coding Scheme for a Technology-Alerting Index" which appeared in the May 1982 issue of the EMC Transactions. Draft copies of the manuscripts may be available, upon request, from participating authors.

- 03d 82-24A A Novel Approach to Fast Walsh and Fourier Transforms—A.U. Keskin, Dept. of Electrical Engineering, Idmma, Yildiz, Istanbul, Turkey.
- A8e 82-24 An Experimental Investigation of the Rhombic EMP Simulator Under Pulse Excitation—H.M. Shen, R.W.P. King, and T.T.Wu, Harvard University, Div. of Applied Sciences, Gordon McKay Laboratory, 9 Oxford St., Cambridge, MA 02138. (617) 495-4468. A8c, A8b.
- H25e 82-25 Experimental Examination on Radiated EM Susceptibility Measurements of Automotive Electronic Devices Using TEM Cells—S. Yamamota, Toyota Central Research and Development Laboratories, Inc.; 41-1, Aza Yokomichi, Oaza Nagakute, Nagakute-cho; Aichi-gun, Aichi-ken, 480-11; Japan. (05616)-2-6111. A6e
- D1d 82-26 Electromagnetic Coupling to or from a Terminated Wire Through a Rectangular Slot in a Conducting Screen—Y. Naiheng and R.F. Harrington, Syracuse University, Dept. of Electrical and Computer Engineering, Syracuse, NY 13210. (315) 423-2655. F12d.
- D7d 82-27 The Calculation of Load Currents of a Finite Size Braided Coaxial Cable Illuminated by an Electromagnetic Field from Outside—A.F. Rashid, TRW Defense and Space Systems Group, Ballistic Missiles Div., P.O. Box 1310, San Bernardino, CA 92402. F12d.
- H25e 82-28 Properties of High-Frequency Conducted Noise from Automotive Electrical Accessories—S. Yamamoto and O. Ozeki (see 82-25). B6e.
- A8d 82-29 Theoretical Analysis of the Rhombic Simulator under Pulse Excitation—H.M. Shen, R.W.P. King, and T.T.Wu (see 82-24). A6d, A6c.
- B12d 82-30 Canonical and Quasi-Canonical Probability Models of Class A Interference—D.A. Middleton, 127 E. 91 St., New York, NY 10029. (212) 831-8565.
- E3d 82-31 Analysis and Filtering Applications of Two Newly Proposed Waveguide-Coaxial Line Junctions-R.S. Tomar and C.D. Gupta, Indian Institute of Technology, Kanpur-208016, U.P. (India). Telephone 40066. E3i, E3j.
- N99d 82-32 Remarks on Electrostatic Field in Silos Due to Charge Accumulation-C.A. Becerra, P.O. Box 5863, Dept. of Electrical Engineering-ESPOL, Guayaquil, Ecuador. Telephone 303733. N99e.
- 16d 82-33 Coupling Between Closely Spaced Parabaloidal Reflector Antennas—M.S. Narasimhan and K.M. Prasad, Electromagnetics and Antennas Group, Centre for Systems and Devices, Indian Institute of Technology, Madras—600 036, India. 112d, 110d.
- Ble 82-34 Diurnal Variations of Atmospheric Noise in the Evening Transition Period--R.A. Agarwala, Dept. of Electronics and Communications Engineering, Regional Engineering College, Kurukshetra-312 119, India. Telephone 83. Bld.
- Ali 82-35 An Automated Electromagnetic-Field-Strength Measurement System With a Magnetic-Field Probe—S. Yamamoto and K. Nishikawa (see 82-25). A2i, H25e.
- F0d 82-36 A Practical Interpretation of Electromagnetic Screening Theory—J.C.G. Field, 15, Gerrard Building, Pulteney Mews, Bath BA2 4DQ, Great Britain. (0225) 65498.

#### INSTITUTIONAL LISTINGS

The IEEE Electromagnetic Compatibility Society is grateful for the assistance given by the firms listed below and invites application for Institutional Listings from other firms interested in the electromagnetic compatibility field.

> SERVICE DIVISION, AMERICAN ELECTRONICS LABS., INC., Richardson Rd., Montgomeryville, PA 18936 EMI/EMC, shield, enc. consult. test. & anal.; Scrn. rm. (incl. for large veh.); Comp. instr. for Mil. EMI test.

> ELECTRO-METRICS, Division of Penril Corp., 100 Church St.; Amsterdam, NY 12010 EMI meters and automated systems incl., calculator/computer-based;20 Hz-40 GHz \*MIL-STD/CISPR/VDE/SAE/FCC.

> > TECKNIT EMI Shielding Products, 129 Dermody St., Cranford, NJ 07016 Telephone (201) 272-5500

EMI/EMP/ESD Shleiding Materials, Gaskets, Vent Panels, Windows, and Conductive Coatings and Adhesives

HONEYWELL, ANNAPOLIS OPERATION, P. O. BOX 391, Annapolis, MD 21404 Telephone (301) 224-4500

EMI/EMC/TEMPEST, R & D, Test and Analysis, Communication and Digital Design.

SPECTRUM CONTROL, INC., 8061 Avonia Rd., Fairview, PA 16415 Telephone (814) 474-1571 Telex 510/699-6848

EMC test and consulting VDE, CISPR, MIL-461, FCC. Mfr. RF filters, RFI capacitors, chips, variable caps---in stock at HALLMARK.

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RF shielded enclosures, modular, prefabricated & all welded. RFI/EMI power line filters; signal line filters.

An Institutional Listing recognizes contributions to support the publication of the IEEE Newsletter and TRANSACTIONS ON ELECTRO-MAGNETIC COMPATIBILITY. Minimum rates are \$75.00 for listing in one issue; \$200.00 for four consecutive issues. Larger contributions will be most welcome. No agency fee is granted for soliciting such contributions. Inquiries, or contributions made payable to the IEEE, plus instructions on how you wish your Institutional Listing to appear, should be sent to M. Bonaviso, The Institute of Electrical and Electronics Engineers, Inc., 345 East 47 Street, New York, NY 10017.