

# Electromagnetic Compatibility Society

Newsletter



ISSUE NO. 106 SUMMER 1980

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EDITOR: ROBERT D. GOLDBLUM

## CONGRESS REFLECTING ON FCC DECISION BEFORE RESUMING WORK ON TELECOMMUNICATIONS BILL

The decision of the FCC to deregulate enhanced telecommunications services has prompted a reexamination of legislative proposals to rewrite the basic telecommunications law. On April 7th, the FCC announced its final decision in the Second Computer Inquiry permitting AT&T and General Telephone to enter computer-related markets and deregulating much of the telecommunications industry. According to experts, the decision is the most far-reaching action affecting the industry since passage of the basic telecommunications act in 1934. FCC Chairman, Charles Ferris, said the Commission has "removed the barricades from the door to the information age." Rep. Van Deerlin, Chairman of the House Communications Panel, said the FCC "has hit a home run with its new policy." The action represents "deregulation at its best."

## PROPOSED TESTING METHODS FOR COMPUTING DEVICES RELEASED BY THE FCC

Released on June 20, 1980, General Docket 80284 contains the Commission's proposed testing procedures for compliance to the now famous Docket 20780. The new docket describes both the conducted and radiated emission configurations, the LISN configuration and design, and the radiated test site parameters. Contingencies for computing devices which are too large for standard measurement procedures also are discussed.

This Docket is a proposed rule making and is subject to change. Comments are requested by July 30, 1980. For further information, contact Mr. Art Wall, FCC, Office of Science & Technology, Washington, DC 20554; Tel.: 202-653-8128.

DEADLINE FOR OCTOBER 1980 ISSUE OF  
THE NEWSLETTER IS SEPTEMBER 15, 1980

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## EDUCATION COMMITTEE NEWS

Two new projects are presently underway. The Education Committee and the Interference Control Committee are jointly sponsoring a tutorial workshop on "The Use and Application of EMI Gaskets" to be presented at the 1980 EMC Symposium in Baltimore this October.

The second project is the production of a short video tape titled "Introduction to EMC." It is intended to introduce students, engineers, and scientists to the subject of EMC. The tape will point out the need and advantages of considering EMC in the design of electronic equipment.

In order to expedite the production, and to provide a means to "try out" the resultant product, an Audio Cassette/Slide presentation will be produced first. This can be shown to various audiences, while still being capable of easy modification and improvement.

The schedule is to have a preliminary version of the Cassette/Slide show available in time for the EMC Symposium in October.

If you would like to have an input to this project or would like to preview and comment on the presentation, please contact me.

The Education Committee will hold a meeting during the EMC Symposium in Baltimore. Tentatively, this is scheduled for Tuesday evening, October 7, 1980. Anyone interested in the work of this committee, please feel free to attend.

*Henry Ott*

Chairman  
EMCS Education Committee  
Room 2C-322  
Bell Laboratories  
Whippany, NJ 07981  
201-386-4654  
201-386-6660

## USAB INFORMATION LINE "WORTH DIALING"

We quote the Northern Virginia Section Bulletin in declaring USAB's Info Line "worth dialing." The Bulletin reported that a call was placed simply "to find out just what it was all about." After hearing news on age discrimination, the salary survey, and other projects, the Bulletin reporter concluded it was "worth dialing." Call 202-785-2180.

## ENERGY COMMITTEE POSITIONS ENDORSED

The IEEE Executive Committee, United States Activities Board, and Technical Activities Board have endorsed the following three Energy Committee Entity Position Statements for issuance as IEEE Position Papers: "Solar Power Satellites," "Solar Energy," and "Energy from Municipal Solid Waste." Copies can be obtained by writing to William G. Herrold at IEEE's Washington Office.

### NEWSLETTER STAFF

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# CHAPTER CHATTER



by Charles F. W. Anderson

Things definitely are looking up! I've been receiving lots more material from the Chapters - but, there are many from which I don't hear a thing. Please let me have your news so that we can publish it in the next issue.

First, your column editor's thanks to the Chapter Officers who provided activity reports for 1979 - it's gratifying to have these inputs and a big help in scoring for the Chapter-of-the-Year Award!

## Atlanta

The Chapter's April 29th meeting was held at the Georgia Tech Student Center. Dr. Gene Huddleston, Assistant Professor of Electrical Engineering at GIT, was the speaker. His topic was "Electrical Pulse Protection of Solid-State Devices." He discussed protection of solid-state systems, identification of susceptible circuits, use of avalanche diodes and special considerations for data circuits.

Their June meeting was a business one. The officers for '80-'81 were introduced and the results of the interest questionnaire which recently was distributed to the Chapter membership were presented.

Officers for the 1980-81 year will be: Jim Toler, Chairman; Earnest Donaldson, Vice Chairman; John Daher, Secretary. They are all Georgia Tech affiliates. Kudos to Bob Hammack (AT&T) for his fine little newsletter! Samples of short items from his June issue: brief report on the April FAA/NASA/FIT grounding and lightning workshop; satellite lightning detection program being set up by MSFC-NASA; summary of paper on power transmission line lightning outages published in the November/December 1979 power apparatus and Systems Society Transactions; precis of NAB's comments on the FCC's NOI on biological effects.

## Seattle

Gene Knowles reported via telecon on 13 June that he will be the new Chapter Chairman. He said that he had just been talking with Vern Chartier at Vancouver, who reported that it was "raining mud." Gene also reported that the LA Chapter is alive and well. (How about some input for the next issue, Mike?)

## Central New England

On April 8th, the Chapter co-sponsored a meeting in conjunction with the PES Chapter. The topic, "Electromagnetic Compatibility of Advanced Propulsion Systems for Urban Rail Vehicles," was discussed by Messrs. Frasco and Gagnon of DOT/TSC and Dr. F. R. Holstrom of the University of Lowell. Not surprisingly, the dominant EMI source was stated to be SCR-chopper control systems. A demonstration of the interference was presented by means of tape recordings of data and a GENRAD spectrum analyzer. There were 16 attendees. The May 21st meeting was held at the Emerson & Cuming facility at Canton, MA. E&C's Chief Electronics Engineer, Dr. E. F. Buckley, spoke on the work being done in the areas of test chamber design, shielding compound development and fire-retardant absorbing materials. The tour of the plant included a demonstration of those materials. Safety considerations include both flammability and toxic-gas generation from the urethane foams used in anechoic chambers. Dr. Buckley was assisted by Robert Free in the organization of the tour and by other E&C staff members during the tour.

Chapter officers for 1980-81 will be: Arthur W. Murphy, Chairman; Chester L. Smith and John M. Clarke, Vice Chairmen; Robert J. Berkovits, Secretary-Treasurer.

## Dayton

On April 29th, as indicated in the Spring Issue of this N/L, the meeting was a "twin-bill." Dr. Philip Little, of Culham Laboratory, in Abingdon UK, described lightning-related research activities at the Culham Labs and provided information on the physical plant and its capabilities. Dr. Pete Rustan, of AFIT's EE Department, gave what amounted to a second running of his PhD dissertation, renamed "The Lightning Flash - From Soup to Nuts." He provided experimental data and conclusions of VHF measurements of lightning charge activity during pre-strike and strike phases, including restrikes. Among those present were Dr. Martin Uman of U. of Florida (Pete Rustan's graduate advisor), plus visitors to AF Aero Labs from Boeing, MCAIR, Em Associates and LTRI.



The Chapter's next scheduled activity will be the September/October meeting. No date or topic as yet; but, call Jack Corbin at 255-5078 or Larry Walko at 257-7469 for information if you visit the AF Dayton complex.

My thanks to Eldon Wick for the above report.

#### Mohawk Valley

Although dormant for about a year or so, the Mohawk Valley Chapter is alive and doing well. A meeting with the Mohawk Valley Section Executive Committee helped rejuvenation. Dr. James H. Mulligan, of the Univ. of California at Irvine, spoke on the topic "Engineering Education - Another Crossroads." He devoted specific interest and concern to education for careers in specialized professional areas, such as EMC.

New vitality has been added to the Chapter with the locating of the EMC/Intrasystem Analysis Program (IAP) Support Center at RADC. This activity is operated by IITRI and headed by John Dobmeier.

Among meeting topics for the remainder of the year are: applications of the IAP and a rescheduled presentation of a talk on EMC on the MX program.

The Chapter congratulates Mr. John Spina (RADC), a Chapter member, and Dr. Donald Weiner (Syracuse Univ.), a frequent visitor, on their recent publication of the book titled, "The Sinusoidal Analysis and Modeling of Weakly Nonlinear Circuits with Application to Nonlinear Interference Effects."

If you travel to RADC or vicinity, call Carmen Paludi at 330-2563 or John Dobmeier at 330-7168 for meeting info or just a chat.

Thanks, Carmen, for the input.

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#### EMCS CHAPTER CHAIRMEN

The following is the list of Chapter Chairmen as our records presently indicate. Chapter officers are requested to send all changes or corrections to:

Charles F. W. Anderson  
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Lilburn, GA 30247

Baltimore  
William E. Tate  
12901 Broadmore Rd.  
Silver Spring, MD 20904

#### New Jersey Coast

On April 15th, the Chapter's luncheon meeting was addressed by Paul J. Phillips, U. S. Army Spectrum Management Engineer. His topic was "WARC '79 Decisions Affecting DoD." He presented a capsule summary of the WARC with emphasis on decisions with impact on military programs. The April issue of the Chapter's Newsletter carries an excellent summary of the talk. Jerry Rothhammer, of Ailtech Instruments, spoke at the May 20th meeting. The topic was "A Flexible Interactive Operating System for Automated EMI Data Measurement and Processing." He discussed computer-controlled, automated EMI measurement systems, with particular emphasis on the interactive approach; and gave a hardware demonstration of such techniques. The June meeting featured Henry Ott, of Bell Labs - Whippany, speaking on "A Cost Effective Approach to the Control of Interference in Electronic Equipment." Hank emphasized proper consideration of interference control in the early design phases. He presented some of the most cost-effective interference control techniques and discussed actual case histories.

Congratulations to Marge Stone on her first-rate job as Chapter Chairman for two terms. (Results of balloting for the new slate of officers were not available as of column deadline.) Marge also has been acting as Editor of the Newsletter for the last several issues and doing a fine job in that area also.

#### Japan

Professor Risaburo Sato continues to keep us informed as to the activities across the Pacific. As an indication of the intensity of interest of our Japanese colleagues in EMC/EMI, their monthly meetings have been averaging around 12 papers each, with topics ranging from the highly theoretical to the very practical. (We are going to attempt to obtain abstracts of these papers for Ed Bronaugh to publish in the EMCABS.)

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#### IEEE OFFERS VIEWS TO NATIONAL POLITICAL PARTIES

Pensions, energy and innovation are the topics for discussion in a series of appearances being made by the IEEE before the Republican and Democratic Platform Committees. On February 29th in Indianapolis, IEEE presented its position to the Republican Platform Committee on pension problems of the highly mobile engineering profession and on the existing climate which does not encourage innovation in the United States today.

Both parties are holding hearings across the nation to gather information which will serve as the basis for the development of the 1980 platform statements. IEEE intends to make subsequent appearances before these committees to present its views.

#### IMPACT

IMPACT is a bi-monthly publication of the Professional Activities Committee of the IEEE U.S. Activities Board. It is normally distributed to IEEE members holding national positions or offices. However, U.S. members may be added to the distribution list by calling 202-785-0017.

#### EDITORIAL OBJECTIVES

##### IMPACT will

- carry new items from section activities for cross-pollination (as received)
- carry news items to field activities (legislative status reports, proposals, and programs)
- inform on all aspects of the complete USAB program
- balance coverage, insofar as possible, and maintain a neutral editorial stance
- carry letters to the editor
- disseminate IEEE Position Papers, and Entity Statements
- provide the forum for the interchange of ideas, concepts, successes, and failures among the PACs
- carry signed contributions on subjects of interest together with commentary and/or dissent
- provide detailed data not available from another source issuing from various USAB activities (such as PAC Workshops and the TAB/USAB Technological Policy Conference)
- publish, where possible, open letters to government officials by IEEE members

##### IMPACT will not

- carry technical material that belongs in a Transactions or magazine of one of the IEEE Societies
- provide interpretive reporting of IEEE activities (the province of The Institute)
- duplicate any of the editorial coverage of the core publications of IEEE, and rather, it will seek to supplement the core publications with working data and other points of view
- be produced for intentional circulation outside of IEEE

IMPACT will grow into the definitive USAB communicative medium that: Is responsive to PAC member desires; Publishes controversy and dissent; Provides data for reference use by PACs; Accepts contributions within its purview; and is not subject to the "winds of change" or political-style influences.



# EMC STANDARDS ACTIVITIES

by Richard B. Schulz



In the previous issue, the coverage of various ANSI EMC-related committees was completed. For the present, attention will be directed toward EMC committees of the Computer and Business Equipment Manufacturers Association (CBEMA) and the Electronic Industries Association (EIA).

## COMPUTER and BUSINESS EQUIPMENT MANUFACTURERS ASSOCIATION (CBEMA)

The CBEMA is an association of approximately 41 manufacturers of office machines, equipment, furniture and supplies. The Association holds conferences and seminars in management, distribution, and conducts market research. The CBEMA also cooperates in developing standards in U.S. and abroad, for computers and data-processing equipment and office machines.

### CBEMA ESC5: Environmental Safety Subcommittee No. 5

Chairman: Mr. Wallace E. Amos  
Burroughs Corporation  
P. O. Box 517  
Paoli, PA  
215-648-3608

EMC Interest: Review existing and proposed national and international standards and regulatory activities relative to electromagnetic interference (EMI) and susceptibility as related to office machines and data processing equipment, and to report its findings and recommendations to CBEMA/ESC and the CBEMA Telecommunications Committee.

Program: Review and assess the technical requirements and/or proposals being developed by national and international regulatory agencies and consensus standards in establishing limits, methods and measurements pertaining to EMI. Establish and maintain liaison with ECMA, CSA and others as appropriate and provide representation to CISPR/WG 1-Data Processing Equipment and Office Machines.

Report: CBEMA/ESC5 77/29, Limits and Methods of Measurement of Electromagnetic Emanations from Electronic Data Processing and Office Equipment, 20 May 1977. (Note: This report is presently being considered by the FCC as a basis for regulation of such emanations.)

## ELECTRONIC INDUSTRIES ASSOCIATION (EIA)

The EIA is a non-profit organization representing manufacturers of electronic products. The activities of EIA include the development of voluntary standards for electronic components, circuits, and equipment. Standardization activities of EIA are coordinated with ANSI and other organizations. Some of these activities, such as standardization in the area of digital interface circuits, directly impact government standards.

### EIA G46: Electromagnetic Compatibility

Chairman: Mr. Eldon S. Hughes  
Rockwell International  
P. O. Box 2429  
Palos Verdes Peninsula, CA  
90274  
213-594-3151

EMC Interest: Electromagnetic compatibility area, particularly as applied to aerospace industry.

Activity: Current activity is directed primarily toward defining the essential features desirable for an improved version of MIL-E-6051. This effort is being conducted jointly with SAE AE-4.

### EIA R-2: Consumer Electromagnetic Compatibility

Chairman: Mr. Gil Hermeling  
RCA, M/S 28-301  
600 North Sherman Dr.  
Indianapolis, IN 46201  
317-267-5218

EMC Interest: EMC of consumer products.

Activity: Coordination with German Post Office standards on susceptibility of TV and radio receivers.

### EIA TR8.10: EMC of Mobile Transmitters with Vehicles

Chairman: Mr. Charles Lynk  
Motorola, Inc.  
Ft. Worth, TX  
817-232-6142

EMC Interest: The EMC of land-mobile systems with vehicles.

Activity: Present concern is greater control of ignition-noise radiation in order to limit more effectively the degradation to land-mobile systems. Accordingly, a meeting has been held with the SAE Radio-Frequency Interference subcommittee to urge higher-percentage compliance requirements in a forthcoming revision of SAE J551.



SCHEDULED COMMITTEE MEETINGS OF  
MAJOR EMC INTEREST

BOTH CHAMBERS STALLED ON  
TELECOMMUNICATIONS LEGISLATION

COMMITTEE	NAME	NEXT MEETING
ANSI C63	Radio Electrical Coordination Techniques and Developments	10/10/80 9AM-4PM Baltimore Hilton, Baltimore, MD
ANSI C68	High-Voltage Testing Techniques	Unavailable
ANSI C95	Radio Frequency Radiation Hazards	Fall
ANSI MD105	Medical Electronics	November
CBEMA ESC5	Environment and Safety Committee Subcommittee 5	10/8-9/80 9AM-5PM Baltimore Hilton, Baltimore, MD
EIA G-46	Electromagnetic Compatibility	10/6/80 9AM-5PM Baltimore Hilton, Baltimore MD
EIA R-2	Consumer Electromagnetic Compatibility	Unavailable
EIA TR8.10	Vehicular Electrical Interference and Electromagnetic Compatibility	Unscheduled
IEEE S27	EMC Standards Committee	10/6/80 10AM-12N Baltimore Hilton, Baltimore, MD
SAE AE-4	Electromagnetic Compatibility	10/6/80; 9AM-5PM 10/10/80; 9AM-12N Baltimore Hilton, Baltimore, MD
SAE ESC/SC	Electronic Systems Committee/EMI Standards and Test Methods Subcommittee	10/6/80 9AM-12N Baltimore Hilton; Baltimore, MD
SAMA PMC33	Process Measurement and Control	Unavailable

NEW STANDARD

ANSI C63.2 - 1980: Specifications for Electromagnetic Noise and Field Strength Instrumentation, 10 kHz to 1 GHz. Availability: Standards Department, IEEE, 345 E. 47th St., New York, NY 10017

Negotiations are continuing on both sides of the Capitol on the major telecommunications bills, H.R. 6121 (Van Deerlin et al.), S. 611 (Hollings), and S. 622 (Goldwater, Schmitt). Members of the staffs of the House and Senate Communications Subcommittees said recently that intensive lobbying efforts have contributed to the delay in scheduling action by the full committees. However, advocates hope for action soon.

Rep. Van Deerlin said that some opponents have been telling "outright falsehoods" about the bill his subcommittee approved 13 to 1. The telecommunications legislation, he said, "is intended to promote full, fair competition in the rapidly changing \$300-billion-a-year telecommunications and information industry."

On another front in advanced communications, Rep. Barry Goldwater, Jr., has proposed that the President call an international conference on communication and information. He believes that laws assuring privacy to individuals may have the effect of erecting trade barriers. He said (in a House statement March 19) that Sweden, France and West Germany have enacted laws establishing some form of national data board to monitor the use and storage of information. "They have discovered the simple fact that to block data flow in the 1980s is to block trade. As a result, multinational corporations face vast difficulties in transferring necessary data between countries in which they conduct business. This could adversely affect operations and might unfairly restrict markets for the world information and telecommunications industry, which is predominantly U. S. owned."

SPECIAL ISSUE ON PUBLIC SPEAKING

The March 1980 issue of the IEEE TRANSACTIONS ON PROFESSIONAL COMMUNICATION was devoted exclusively to the subject of public speaking for engineers and scientists. It includes several general articles on the preparation and delivery of technical speeches. Some of these articles cover the broad concept of oral communication, while others provide capsule guidelines for one or more specific aspects. In addition, several articles treat special topics such as off-the-cuff talks and use of microphones. An annotated bibliography listing 178 organizations and publications concerned with speech also is included.

Copies of this special issue are available from Dr. R. J. Joenk, IBM Corporation, P. O. Box 1900, Boulder, CO 80302. The price is \$5.00 each in any quantity, and checks should be made payable to the IEEE Professional Communication Society.





## A REPORT FROM THE EMCS BOD PRESIDENT

### EMC SOCIETY MID-YEAR REPORT

As we enter the second half of 1980, a review of the status of our Society and the many activities it is engaged in is appropriate.

1. Standards: Bud Taggart, standards chairman, has appointed Leonard Thomas and Hank Knoller as the east and west coast vice chairmen, respectively. This move was made to increase standards activities while cutting down on excessive travel. Leonard held a meeting on March 25 in Washington where his committee reviewed and proposed changes on over 20 current standards assigned to the EMC Society by Headquarters. These are being reviewed by the west coast group. New standards in the areas of EMC in a residential environment and interference from electronic equipment also are being discussed. Art Wall, EMCS representative to the IEEE Standards Board, also is actively seeking EMCS participation in these new standards areas. For more information, contact Bud Taggart on 303-499-1000, Ext. 3462.

2. Tokyo EMC Chapter Formed: We are pleased to announce that we have a new chapter in Tokyo comprised of 102 EMC members under the chairmanship of Professor Risaburo Sato, Sendai City, Japan. Welcome all Tokyo members! We look forward to working with you especially for the 1984 International EMC Symposium which will be held in your section.

3. EMC Society Dues to Hold Line: Though the general IEEE membership dues will increase \$4 to \$8 next year, your Board of Directors has agreed to maintain our present \$7.00 membership fee. That \$7.00 has been retained over the past 7½ years through the careful budgetary management of our TRANSACTIONS and Symposia. We hope to continue holding the line in this inflationary period.

4. Membership: As of 31 May 1980, our regular membership is 1665 with 122 students for a total of 1787 members worldwide. That is a healthy total that is increasing each year as is the number of local EMC Chapters which now serve an average of approximately 100 members.

5. CHAPTERS: At the 11 June 1980 Board of Directors meeting, it was agreed that there was need for the Board to identify more with our Chapters. To further that effort, the Board will seek out Chapters to support special Society activities which need immediate attention. Projects associated with technical and standing committee activities are being considered. A meeting of all Chapter chairmen at our EMC Symposium in October will be held to discuss the specifics. Please make plans for all chairmen or their representative to be in attendance.

6. TRANSACTIONS Reader Survey: A recently published 1979 reader survey of all Institute TRANSACTIONS shows that our EMC TRANSACTIONS, edited by Dick Schulz, scored very high marks. Of the readers surveyed, 86% said that the EMC TRANSACTIONS was the leading publication in its field. A great deal of credit goes to Dick and his associate editors, as well as you, our contributors. Another interesting response was that 57% wanted more practical papers. Dick is actively seeking such papers. If you have such a paper idea, give Dick a call on 301-267-3218.

7. EMC Education: Hank Ott, our education committee chairman, has been actively pursuing making a video tape titled "Introduction to EMC." This tape is intended to introduce the subject to students, engineers, and scientists not in EMC to our discipline. Items to be covered include: What is EMC? Is EMC cost effective? What design techniques add cost and which do not? All engineers should be aware of EMC. How can you learn more about EMC? Prevention is cheaper than cure. Hank could use your suggestion now so that he makes his 1 April 1981 release date. Call him on 201-386-4654.

8. COMMITTEE Job Openings: There are openings for membership in our Society technical and standing committees, all of which are listed in the By-Laws published in the NEWSLETTER last year. We are actively seeking participation and hope that you will think it over and join. At the Baltimore EMC Symposium, there will be a special booth set up near the registration area to answer questions you may have on the work of these committees. This will be manned throughout the day and we hope to see you there. We will have information in a handbook to take with you. If you need immediate answers, call Don Heirman on 201-949-5535 after 5:00 P.M., New York City time. A recording machine will take your message.

9. Board of Directors Election: Petitions for Board membership for the 1981-83 term have been received from nine members. A ballot to elect six of these will be circulated by the end of summer for your vote. PLEASE, PLEASE take the 10 minutes necessary to select your candidates so that those elected are truly representative of the majority of our Society's members.



10. Board of Directors Meeting: The BoD will hold their annual meeting at the EMC Symposium in October. In order to streamline the meeting and to enable you, our members who can attend, to get the most out of the meeting, the Board unanimously voted the following at its Seattle BoD meeting on 11 June:

Resolved, that the policy and procedures relating to committee reports be as follows:

- (1) At BoD meeting, all verbal committee reports should be presented by the cognizant Technical Director and are to be limited to short summaries of substantive accomplishments or problems and/or to motions, resolutions, or requests that require BoD action.
- (2) Written reports and/or supporting materials relating to agenda items for BoD meetings are to be submitted to the Secretary within 30 days following the date of each meeting for inclusion in the minutes.

Only a few of the activities could be addressed here. You can see from this glimpse that we are moving ahead in some interesting and exciting areas. Why not join with us?

Cordially,

*Don Heirman*

Don Heirman, President EMC Society

#### COMMITTEE ON SOCIAL IMPLICATIONS OF TECHNOLOGY

The IEEE Committee on Social Implications of Technology (CSIT) has launched a petition drive to convert CSIT to an IEEE Society (see Petition).

The Committee on Social Implications of Technology was established by the IEEE in 1972. During the eight years of CSIT's existence, we have published 29 issues of our quarterly sixteen-page newsletter, Technology and Society, which features articles, book reviews, and commentary on such topics as ethics, energy, environmental quality, arms control, information technology, societal systems engineering, consumer product safety, and technology in less developed countries. (Technology and Society has a paid circulation of 2500.) At IEEE conventions, CSIT has organized sessions on "Social Implications of Nuclear Power" (ELECTRO '75) and "Solar Energy: A Status Report" (ELECTRO '77). CSIT provided the impetus for the IEEE to adopt a Code of Ethics and to set up a Member Conduct Committee that enforces the Code and supports engineers who adhere to the Code. CSIT has given four engineers the Award for Outstanding Service in the Public Interest, consisting of a certificate and \$750.

Nevertheless, CSIT's effectiveness has been severely limited by the constraints that are imposed on IEEE Technical-Activities-Board committees. To do the quality work that is needed in this area, CSIT must have access to the full range of activities and communication channels that are available to IEEE groups and societies; most importantly, we must be able to publish a refereed Transactions.

Maximizing the benefits and minimizing the harmful effects of technology are important for the well-being of all people; but, these pursuits have a special importance for members of the engineering profession by reason of our technical knowledge, ethical responsibility, and economic self-interest. CSIT asks all IEEE members who care about these issues to sign our petition. (Your IEEE member number appears on the mailing label on the outside page of this Newsletter.)

Sincerely,

Frank Kotasek, Jr.

Frank Kotasek, Jr.  
Secretary, CSIT

#### PETITION TO FORM AN IEEE SOCIETY ON SOCIAL IMPLICATIONS OF TECHNOLOGY

The undersigned IEEE members hereby petition the Executive Committee of the IEEE to authorize the formation of a Society on Social Implications of Technology. The purposes of the Society are to develop and promote understanding of the interaction between technology and society, to enhance our knowledge of the benefits and detriments of technological options, to support the engineer in the exercise of ethical responsibilities, and to discover and promote means to make technology better serve society. These purposes will be pursued by publishing a transactions, by publishing a newsletter, by holding meetings and conferences, and/or by any other activities appropriate for encouraging analysis, communication, discussion, and action relating to social implications of technology. The interests and activities of the present IEEE Committee on Social Implications of Technology, including publication of Technology and Society, will be assumed by the new Society.

Signature.....

Name  
(please print).....

IEEE Member Number  
(above student grade).....

Please return      Stephen H. Unger  
signed petitions to: 229 Cambridge Ave.  
Englewood, N. J. 07631



# Book Reviews



by Jim Hill, EMXX Corporation

In this issue, we have reviews by A. H. Sullivan, Jr. of two recent books. In the last issue, we reviewed Dr. Keiser's "EMI Control in Aerospace Systems." Almost simultaneously, his second book, "Principles of Electromagnetic Compatibility," has been released by Artech House Books and Sully's review of it appears below. Sully's second review is of a book not dealing with EMC; but, with a subject of general interest to engineers - patents. This ties in with a current effort of IEEE to push for more favorable terms for engineers in the usual invention agreement between employers and engineer/employees. The term, "intellectual property," is applied to the broad area of patents, trademarks, copyrights, and trade secrets.

## *"Principles of Electromagnetic Compatibility"*

BY

Bernhard E. Keiser, D.Sc.E.E.  
Published by Artech House Books  
610 Washington Street  
Dedham, MA 02026, 1979

318 Pages, \$35.00, No Postage or Handling Charge

Review by A. H. Sullivan, Jr.  
Sullivan Associates, Rockville MD 20852

This is an excellent, modern book on EMC principles and the procedures and equipment necessary to attain EMC. The book contains a great many good diagrams, charts, pictures and photographs which this reviewer found to be extremely clear and informative. In addition, formulas are well presented in a manner which allows them to be used easily in calculations - symbols are well defined and practical units are given. This same type of presentation continues throughout the technical discussion in the book.

Specific methodology is provided for dealing with the many EMC situations in the gray areas of bonding, grounding, shielding and indeterminate electromagnetic fields. For example, there is particular attention paid to the methods of shielding panel openings for meters and displays by the use of special techniques such as feed-through filters and conductive glass, and the design of apertures as wave-guide attenuators. The problems (and there are many) of bonding and grounding effectiveness are discussed in detail and some answers are provided to two of my favorite questions - "When is a ground not a ground?" - and, "When is a bond not a bond?"

In Chapter 8, materials and special devices are discussed, including gaskets, conductive coatings, and filter contact connectors. Chapter 9 discusses equipment design and proceeds through the usual descriptions of transmitters, receivers and antennas to modern solid state switches, A/D and D/A converters, microcircuits, and digital computers. There is a very good listing of digital circuitry problems and an explanation of EMC effects.

There are three chapters (10, 11 and 12) on mathematical models, system analysis programs and EMI prediction, a total of 46 pages - probably the heart of the book - which describe the basic approaches to determining potential EMI and the EMC planning necessary to offset it.

Two chapters deal with standards and specifications - Chapter 13 on military aspects and Chapter 14 on industry and government aspects. This material could have much better been put in one chapter with more detail provided as to the philosophy, problems and practical application of standards and the relationship of all standards and specifications. There needs to be a thorough discussion of standards and specifications generally, the difficulties in establishing them, and the very important problems in using them, including some discussion of those circumstances under which they cannot be used. In such a chapter, there also should be some details of the international procedures for regulating the use of the radio spectrum, the activities of the World Administrative Radio Conferences, and the impact of all of these matters on



inter- and intra-system EMC.

The book neglects what may be one of the potentially most important EMC measures for the future - the use of optical sensors and transmission lines as a means of essentially eliminating many types of EMI problems.

It must be admitted that no single book can cover everything as thoroughly as each reader would like and within its limits this book is a good one. The clearcut theoretical and practical presentations should do much to take some of the mystery out of EMC. I recommend the book as a valuable and easily used reference for EMC engineers and technicians to fully understand the in-depth aspects of EMC problems, and as a tutorial text for architects, builders, aerospace system designers, medical equipment designers and almost any technical person who has, or wants to know if he may have, an EMC problem.

*"What Every Engineer Should Know About Patents"*

BY

William G. Konold, Bruce Tittel,  
Donald R. Frei, David S. Stallard  
Published by Marcel Dekker, Inc.  
270 Madison Ave., NY, NY 10016, 1979  
124 Pages

Review by A. H. Sullivan, Jr.  
Sullivan Associates, Rockville MD 20852

This book is an excellent treatise on the "law of intellectual property," particularly patents, but containing also some brief but well-rounded information on trademarks, copyrights and trade secrets. Collectively, the authors have degrees in electrical engineering, chemistry and physics. All of them have law degrees and limit their practice to the field of "intellectual property."

In a book of this type, this reviewer is always interested in how the material is organized, how well the reader is introduced to the topic, and how carefully he is led through the various aspects of the subject matter. The authors do a good job in this respect, starting first with definitions and discussions of intellectual property, what patents are and are not, what can be patented and the documentation necessary to establish your rights. There are three chapters on patent searches and patent applications, followed by a thorough discussion of one of the most important aspects of patents - relationships of the patent holder to competitors and licensees, and some specific discussion on patent interferences. The five Appendices show actual examples of design and utility patents, a trademark registration and a U. S. Patent Office Classification Schedule.

This reviewer could find essentially nothing to criticize in the book. It provides an outstanding guide both for the person seeking a patent and for a supervisor who must deal with technical people whose efforts within an organization may lead to patentable ideas. The author makes three points of particular importance:

A. As of the date of this book and the cost of getting a patent, including preparation of and filing the application; prosecuting the application; and the issue of final fees, is in the neighborhood of \$850. Costs can rise substantially if the application is questioned, there is an interference, or there is some other complication.

B. Patent laws and their legal interpretations may vary from court to court, and frequently change, so it behooves the patent seeker to work closely with the patent lawyer to obtain the most effective patent statement which will (1) cover every aspect of the patentable idea, (2) best present the logic of the patent idea to the Patent Office (and to patent courts if litigation should arise), and (3) will demonstrate clearly the unique and unobvious aspects of the idea so there will be sufficient evidence to show would-be infringers that the idea is not only patentable, but is so strongly patentable that it will be upheld in legal proceedings against it.

C. Patent misuse can occur, particularly if the patent holder is not aware of proper licensing procedures. Patent misuse, if found, renders the patent unenforceable, in court, against an infringer. In fact, some patent misuses may give rise to an antitrust claim. The patent is not invalidated; but, to become enforceable in court again, the patent owner must legally purge himself of the misuse. Details of misuse and its consequences are contained in Chapter 15 of the book.

To cover in further detail the material contained in the book would take more space than is available; but, there is one point that is absolutely basic to obtaining a patent - the patent seeker must have documented evidence of the idea and its development, dates on which specific work was done, and results obtained, with signatures of witnesses. The general methodology and details of this documentation, and the serious consequences of not having it, are thoroughly discussed in the book.

This book is recommended for its content, and for its highly readable and understandable style, to anyone interested in obtaining a patent or to patent holders who are seeking guidance in handling and profiting from patents.



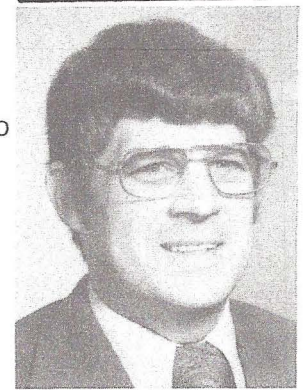
# NOTES FROM SEQUENCY UNION

SeQUENCY Union Organizes Parallel  
Sessions at EMC '80

There will be several sessions of direct interest to researchers interested in nonsinusoidal functions throughout the EMC '80 Symposium in Baltimore MD. Beginning with Plenary Session, Tuesday morning October 7, where Professor Harmuth will deliver a lecture entitled "Carrier Free Systems", there will be five sessions devoted to nonsinusoidal functions during the three day conference. EMC'80 will be held at the Baltimore Hilton, October 7-9, 1980. A list of the sessions concerned directly with non-sinusoidal functions is given below. Make plans to be there!

BY

G. ROBERT REDINBO



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## SUMMARY OF APPLICATIONS OF SEQUENCY THEORY

Sessions SEQ-1, Tuesday Afternoon  
Chairman: H. Harmuth  
Catholic University  
Washington, D.C.

1. Walsh Functions: Some properties and Applications (invited paper): N. Ahmed,
2. Radio Signals with Large Relative Bandwidth (Panel): C. Bertram, Bertram Associates, Merrimack, NH/J.C. Cook, Teledyne Geotech, Dallas TX/A. Dean, U. S. Army Cold Regions Research & Engineering Lab., Hanover, NH/Fan Changxin, Northwest Telecommunication Engineering Institute, Xi'an, Peoples Republic of China/J.R. Rossiter, Memorial University of Newfoundland, Canada/D.F. Stanfill, Geophysical Survey Systems, Inc., Hudson, NH/M. Zecha. Academy of Sciences, German Democratic Republic/H. Lueg, Technische Hochschule, Federal Republic of Germany.

## DIGITAL LOGIC AND IMAGE PROCESSING

Session SEQ-2, Wednesday Morning  
Chairman: N. Ahmed  
Kansas State University  
Manhattan, KS

1. Application of Orthonormalized M-Sequences for Data Reduced and Error Protected Transmission of Pictures: H. J. Grallert, Gesamthochschule Duisburg, West Germany
2. Rademacher Transform Image Coding: T. Ohta, Kyushu Institute of Technology, Kitakyushu, Japan
3. Walsh - Domain Filtering of Finite Discrete Two-Dimensional Data: P. R. Rao, Regional Engineering College, Tiruchirapalli, India
4. Processing of Finite Discrete Two-Dimensional Data Using One - Dimensional Cyclic Convolution Systems: P. R. Rao, Regional Engineering College, Tiruchirapalli, India
5. A WHT Method for Generation and Processing of Subsumed and Averaged Data: P. W. Besslich, Universitat Bremen, Federal Republic of Germany
6. Noise Analysis of Soft Errors in Combination Digital Circuits: G. R. Redinbo, Rensselaer Polytechnic Institute, Troy, N.Y.
7. On the Logic Design Using Multiplexers and Spectral Techniques: A. B. Ektare, University of Roorkee, India.

## SENSOR PROCESSING

Session SEQ-3, Wednesday Afternoon  
Chairman: G. R. Redinbo  
Rensselaer Polytechnic Institute  
Troy, N.Y.

1. Angular Resolution of Sensor Arrays for Signals with a Bandwidth Larger than Zero: H. F. Harmuth, Catholic University, Washington, D.C.
2. High Resolution Radar with Welfi Waveforms for Low-Angle Tracking: S. H. Leong, Naval Surface Weapons Center, Dahlgren, VA.
3. A Broadband Concept for Solutions of Radar and Sonar Dynamic Equations: M. Zecha, Akademie der Wissenschaften der DDR, Warnemunde, DDR
4. Ground-Penetrating Radar Using Carrier-Free Impulse Excitation with Broadband Antennas: D. F. Stanfill, Geophysical Survey Systems, Inc. Hudson, N.H.
5. Remote Identification of a Salt Water Wedge Through Dissipative Media with a Monocycle Radar: C. Bertram, Bertram Technology, Inc. Merrimack, N.H.
6. New and Known Methods of the Application of Transforms to Quasiperiodic Biomedical Signals: B. Meffert, D. Schubert, T. Lazarus, R. Poll, Humboldt Universitat, Berlin, DDR

## SIGNAL PROCESSING

Session SEQ-4, Thursday Morning  
Chairman: G. F. Sandy  
The Mitre Corp.  
McLean, VA

1. Multicomponent Time-Varying Signal Analysis: R. Gendrin, Centre de Recherches en Physique de l'Environnement terrestre et planetaire, Issy-les-Moulineaux, le, France
2. An Adaptive Multiplex Delta-Modulation System: Hu Zheng, Yang Youwei, The Northwest Telecommunication Engineering Institute, Xi'an Shaanxi, People's Republic of China
3. On Even Channel Majority Multiplexing: Fan Changxin, The Northwest Telecommunication Engineering Institute, Xi'an Shaanxi, People's Republic of China
4. Suppression of Electromagnetic Impulse Noises by Synchronous Matched Filters: Y. Tanada, H. Sano, Okayama University, Okayama, Japan



5. Error Protection in the Transmission of Numerical Data: G. R. Redinbo, W. Y. Cheung, Rensselaer Polytechnic Institute, Troy, N.Y.
6. Error Analysis in the Walsh Sampling Theorem: W. Splettstosser, Rheinisch-Westfallischen Technischen Hochschule, Aachen, Federal Republic of Germany
7. An Intermediate Domain Solution to the System Identification Problem, B. Dwolausky, University of the Witwaterstrand, Johannesburg, South Africa
8. Construction of Unitary Transforms which are Equivalent to Karhunen-Loeve Representative: E. A. Trachtenberg, University of South Africa, Pretoria, South Africa

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I would like to add a personal note about the organization of these sessions at EMC '80. Many people cooperated to bring this part of the program to reality, but one individual in particular worked very diligently and conscientiously throughout the last 1 1/2 years. Ferrel Sandy of The Mitre Corporation represented the Sequency Union on the EMC '80 Steering Committee. He also provided the administrative assistance to organize the special call for papers and coordinated and participated in the review process for papers in these sessions. The strong technical program in this area at EMC '80 is a tribute to his efforts. We owe him our gratitude.

#### FIFTH INTERNATIONAL WROCLAW SYMPOSIUM ON EMC SCHEDULED FOR SEPTEMBER 17 to 19, 1980

The EMC Society again is cooperating with the Association of Polish Electrical Engineers, the Wroclaw Technical University, and the Institute of Telecommunications in a symposium at the Wroclaw Technical University. A "preliminary program" has been mailed to EMC Society members giving details of the program and information on registration, travel, and accommodations in Wroclaw and Warsaw. Further information may be obtained from Mr. W. Moron, Secretary General, EMC Symposium, P. O. Box 2141, 51-645 Wroclaw 12, Poland; Telex 0712118.

Authors of the 111 papers on the program represent 18 countries including England, France, Finland, Sweden, Japan, Federal Republic of Germany, Italy, India, Iraq, Israel, Hungary, Czechoslovakia, German Democratic Republic, Romania, Poland, Yugoslavia, USSR, and USA. Of the 111 papers, 16 are by USA authors.

Earlier, we had announced plans for a group tour to Poland to attend the symposium and to visit Warsaw. Due to a lack of response, these plans have been abandoned.

#### 1980 NUCLEAR EMP MEETING

5-7 AUGUST 1980

at

THE DISNEYLAND HOTEL  
ANAHEIM, CALIFORNIA

Features of special interest at this meeting include:

- PLENARY SESSION: This session will comprise invited papers by eminent authorities reviewing EMP programs in relation to national defense and to research and development.
- PANEL DISCUSSION: SYSTEM HARDENING APPROACHES: This panel will address such issues as shielding vs. device hardening, hardness maintenance and assurance, and hardness verification for major strategic weapon systems.
- PANEL DISCUSSION: EMP DESIGN AND TESTING OF TACTICAL SYSTEMS: Many national EMP programs in Europe and North America are devoted to tactical rather than to strategic systems. The panel will comprise speakers from several countries discussing their approaches to such issues as hardening design, test facilities, and instrumentation.

Unclassified papers describing original work will be presented in the areas of: EMP Environment, Simulation Technology, Measurement Techniques, EMP Interaction, Laboratory Testing, System-Level Testing, Hardening Technology, Lightning.

#### NUCLEAR EMP (NEM) MEETING ANNOUNCEMENT

The second Nuclear Electromagnetic Pulse Meeting (NEM 1980) will be held at the Disneyland Hotel, 1150 W. Cerritos Ave., Anaheim, CA on 5-7 August 1980. The registration fee for NEM 1980 will be \$75.00 (\$65.00 for pre-registration before August 1, 1980) which includes registration, a meeting record, a buffet luncheon at noon on Tuesday, August 5, and a banquet dinner following a no-host cocktail hour Wednesday evening, August 6. Additional banquet dinner tickets for guests will be available for \$25.00 at the registration desks any time during the meeting.

For additional information, contact W. R. Spark, Dept. 238, M/S 14-3, McDonnell Douglas Astronautics Company, 5301 Bolsa Ave., Huntington Beach, CA 92647.



# ◆◆ MEETINGS & EVENTS ◆◆

## IERE ELECTROMAGNETIC COMPATIBILITY CONFERENCE AT SOUTHAMPTON UNIVERSITY

SEPTEMBER 16-18, 1980

The Provisional Program as recently released:

### CONFERENCE PROGRAMME

#### TUESDAY 16 SEPTEMBER

0830 - 1000 Registration & Coffee  
1000 Keynote Address  
Dr. C. G. Bradshaw

#### SESSION 1 SPECIFICATIONS & REGULATIONS

CHAIRMAN: Mr. G. A. Jackson

An EMC Documentation Facility  
T. R. Bowly, Royal Signals &  
Radar Establishment

Regulating Interference at the US Federal  
Communications Commission

A. W. Paul (FCC, USA)

The Australian Standard to Specify Network  
Harmonics Units

T. L. Baitch

The Characteristics of an Evaluation &  
Advisory Service for EMC (EASE)

E. M. Frost

#### SESSION 2 CABLES & CONNECTORS

CHAIRMAN: Col. W. Barker

On Screens and Layout for Instrument  
Circuits

D. A. Best (UKAEA Winfrith)

Co-Axial Connectors for Superscreened  
Cables

E. P. Fowler (UKAEA Winfrith)

A New Generation of EMI - Suppressor &  
EM-Compatible Wires & Cables

Dr. F. Mayer (Lab d'Electronique &  
d'Automatique Dauphinois)

Coupling Between Co-Axial Cables at Radio  
& Microwave Frequencies

A. H. Badr (Univ. of Sheffield)

#### SESSION 3 MODELLING & SIMULATION

CHAIRMAN: Mr. A. Hann

EMC - A Computer Programme for Analysis &  
Prediction of Conducted EMI  
J. P. Catani (Centre National d'Etudes  
Spatiales)

Numerical Simulation of Interference in  
Aircraft due to EM fields

Dr. P. B. Johns (Univ. of Nottingham)

#### WEDNESDAY 17 SEPTEMBER

SESSION 3 CONTINUED (NOTE: THESE SESSIONS  
RUN CONCURRENTLY WITH SESSIONS 7, 8 & 9)

An EM Environment for Aircraft - Prediction  
of Field Strengths Near H F  
Transmitters

Dr. J. M. Thomson (Royal Aircraft  
Establishment)

Estimating Bulk Surface Current of Fat  
Cylinders Due to an EMP

Dr. J. Bishop (Royal Aircraft Establishment)

#### SESSION 4 E M ENVIRONMENT IN AIRCRAFT

CHAIRMAN: Mr. P. A. Shaw

Assessment of EM Screening Characteristics  
of Carbon Fibre Composite  
Materials

D. A. Bull (Electrical Research Association)

The Coupling of EM Interference into Air-  
craft Systems

R. V. Pankhurst (Aeroplane & Armament Exper-  
imental Establishment)

The Variation of Induced Currents in Air-  
craft Wiring

P. M. Newton (Aeroplane & Armament Exper-  
imental Establishment)

#### SESSION 5 AEROSPACE DESIGN & TESTING

CHAIRMAN: Dr. J. M. Thomson

EMC Control in the Design of Scientific  
Space Projects

A. D. Pitt (British Aerospace)

MIL STD 1553 Aircraft Environment Suscep-  
tibility Effects

G. Gerbi (Aeritation)

Material Aspects in EMC Design

M. W. Baskerville (Plessey Research(Caswell)  
Ltd.)



## SESSION 6 AEROSPACE DESIGN & TESTING

CHAIRMAN: Mr. G. M. Smith

EMC Clearance of Modern Military Aircraft  
I. P. Macdiarmid (British Aerospace)

R F Resistivity of Carbon-fibre Composite  
Materials

B. W. Smithers (Electrical Research Assoc.)

The Testing of Aircraft Under Near-Field  
Conditions

M. Elliott (Aircraft & Armament Experimental Establishment)

## SESSION 7 COMMUNICATIONS (NOTE: THESE SESSIONS RUN CONCURRENTLY WITH SESSIONS 3, 4, 5 & 6)

CHAIRMAN: Mr. W. S. Wilkinson

Mobile EM Incompatibility

D. E. G. Ley (Royal Signals & Radar Establishment)

The Effects, Measurement, Detection, Location & Suppression of Non-Linear (Rusty-Bolts Effects) Which Affects Radio Systems

A. W. D. Watson (Plessey Electronic Systems Research)

Determining Effects of Transmitter Noise and Receiver Desensitization at Land Mobile Base Station Aerial Sites

H. M. Sachs (Sachs/Freeman Assoc., Inc.)

Effects of Pulse Interference FDM/FM Multichannel Telephony Transmissions of the Fixed Satellite Service

A. A. Hernandez (Hains Corp.)

Increased Frequency Usage Through the Application of Adaptive Milling Techniques

P. M. Hansen (US Naval Ocean Systems Ctr.)

Applications of Adaptive Techniques for Adjustment of Broadcast Arrays

P. M. Hansen (US Naval Ocean Systems Ctr.)

## SESSION 8 EMP & LIGHTNING

CHAIRMAN: Brigadier R. Knowles

Studies of the Effects of Lightning Induced Surges in Telephone Cables

Dr. R. J. Fox (Post Office Research Ctr.)

Fundamental Studies - EMP Response Calculations in Transmission Cables

M. Ianovici (EPF Lausanne)

Circumvention for Lightning

J. R. Cox, Jr. (Rockwell International)

Ship Equipment Interference Signals Due to EMP

F. J. Deadrick (Lawrence Livermore Labs)

## SESSION 9 SCREENING

CHAIRMAN: Mr. L. Walters

Shield Topology and Interference Control  
F. Vance (Stamford Research Institute)

High Performance EMC Windows

P. M. Grant (Tecknit)

Low Frequency EM Interaction With Bonded Junction Wire Mesh Screens

K. F. Casey (Dikewood Corporation)

## THURSDAY 18 SEPTEMBER

### SESSION 10 SUSCEPTIBILITY & IMMUNITY

CHAIRMAN: Mr. R. J. Harry

Investigation of Some RF Radhaz Meters

I. Langlet (National Institute of Radiation Protection, Sweden)

EMI Test of Some Meters for Ionizing Radiation

I. Langlet (National Institute of Radiation Protection, Sweden)

Digital Component Susceptibility to EM Interference

J. M. Roach (Aircraft & Armament Experimental Establishment)

Susceptibility Determination Under Uncertainty

H. S. Cabayan (Lawrence Livermore Labs)

R F Isolation Behaviour of Gas Discharge Tubes

Dr. D. C. Strachan (Shell Research Ltd.)

### SESSION 11 CASE STUDIES & DESIGN AIDS

CHAIRMAN: Dr. C. G. Bradshaw

R F Interference Generated by a Thyristor Controlled Hand-held Drill Motor

Dr. J. K. Hall (Univ. of Technology, Loughborough)

Macromodel Predictions for EMI in Bipolar Operational Amplifiers

G. K. Chen (Univ. of New York at Buffalo)

Some Theoretical and Practical Aspects of Threshold Crossing Detection in the Study of Impulsive EM Interference

M. A. Bridgwood (Portsmouth Polytechnic)

The Use of Magnetic Cores in Controlling Earth Loop Current

J. W. E. Jones (Portsmouth Polytechnic)

Closing Remarks by Conference Chairman

As presently arranged, there will only be parallel sessions on the second day. Exhibits will occupy 45 spaces in the area adjacent to the meeting rooms. It is anticipated that 250 to 300 delegates will attend from both the UK and overseas. Arrangements have been made to house a number of delegates in the dormitories of the university. More complete details on registration and arrangements are given in the program that was released in June. Copies may be requested from Mr. J. F. Hayes, Conference Registrar IERE, 99 Gower St., London WC 1E 6AZ, UK.



It was announced in the Winter 1980 Newsletter that a group tour was being formed to attend the Conference and to visit some of England's outstanding points of interest. Due to a lack of response to this, group tour plans have been cancelled. The Cosmopolitan Travel Agency which had been arranging the tour has offered to make travel arrangements for individuals planning to attend the Conference. For further details, make a collect call to John Haville, 202-466-6330, or write Cosmopolitan Travel Agency, Suite 400, 1120 Connecticut Ave., N.W., Washington, DC 10026.

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### IEMCAP COURSE

The Electromagnetic Compatibility/Intrasystem Analysis Program (EMC/IAP) Support Center has rescheduled its third course on the Intrasystem Electromagnetic Compatibility Analysis Program (IEMCAP). The previously announced IEMCAP Course has been tentatively rescheduled for the convenience of the customer.

The training course will run five full days, October 20 through October 25, 1980. The course will be given at the Pacific Missile Test Center, Pt. Mugu, CA. The cost of the course is \$500.00. Class size is limited to 30 students on a first-come-first-serve basis. Registration for the course closes September 22, 1980. Both the theory and practical operations of IEMCAP Version 05 will be examined.

Topics to be covered include:

- The EMC/IAP and its role in the Air Force
- Continuous Systems Equations
- Discrete Systems Equations
- Port Spectrum Quantization
- Emitter, Receptor and Transfer Models
- IEMCAP Implementation and Data Preparation
- Data and Program Execution Workshop

The student is responsible for supplying his pen and a calculator only. The Support Center will supply the books needed for the course.

Hotel reservations are being arranged at a local hotel. Particulars will be included in a future announcement. Contact Ms. Donna Crossland at the Support Center for reservations not later than September 22, 1980; Tel.: 315-339-3830 or AV 587-7168.

### HOUSE BILL CALLS FOR A NATIONAL TECHNOLOGY FOUNDATION

After a long incubation period, a bill has been introduced in the House to create a National Technology Foundation. The bill (H.R. 6910, March 25), is sponsored by Rep. George Brown and eleven other members, all strong supporters of committing the Federal government to improved industrial innovation and higher productivity. As described by Brown, the bill represents a compromise between the status quo, with responsibility for technology-related programs continuing to reside in mission agencies and creation of a single cabinet-level Department of Science and Technology. The Foundation would "consolidate technology-related activities which are not now closely tied to an agency mission and would insure that the Federal government will assume additional responsibilities for technology which have heretofore not been adequately discharged by any sector of society."

Brown paid tribute to the engineering profession and its contributions to society and asked for recognition of their importance.

The bill envisages transfer to the Foundation of a major chunk of the Commerce Department -- almost all the programs of the Assistant Secretary of Commerce for Science and Technology -- as well as programs from the National Science Foundation, mainly from Engineering and Applied Science.

It would be an independent agency, with eight main branches: small business; institutional and manpower development; technology policy and analysis; intergovernmental technology; engineering; national (problem-focused) programs; National Bureau of Standards; and Patent and Trademark Office and National Technical Information Service.

The bill was referred to the Committee on Science and Technology.



# 1980 IEEE INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY

## AT THE BALTIMORE HILTON OCTOBER 7-9, 1980

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# EMCABS



EDWIN (ED) BRONAUGH

## EMCABS

In this issue we are publishing 42 abstracts. These are abstracts of some of the papers prepared for the 1979 IEEE Transactions on EMC - Volume 21. We plan to continue publishing abstracts of papers from previous EMC Symposia and from International Conference on Communications (ICC) and National Telecommunications Conference (NTC) Records. The EMCABS committee is composed of the following members:

L. F. Babcock	E. L. Bronaugh
J. S. Hill	R. N. Hokkanen
J. R. Janoski	M. Kant
D. R. Kerns	G. R. Redinbo
R. B. Schulz	R. M. Showers



# AIRBORNE EAST COAST/MIDWEST URBAN SURVEY AT 121.5/243 MHz

Ralph E. Taylor, James Stewart Hill

NASA/Goddard Space Flight Center; formerly RCA Service Co.,  
now EMXX Corporation

IEEE TRANS EMC, Vol. EMC-21, No. 2, pp. 80-87, May 1979

**ABSTRACT:** This paper describes final results of a National Aeronautics & Space Administration (NASA) airborne measurement survey of environmental radio-frequency interference over East Coast and Midwest urban centers. The measurements were made in the emergency-distress frequency bands at 121.5 MHz  $\pm$  25 kHz and 243 MHz  $\pm$  25 kHz at an altitude of 25,000 ft. A steady maximum value of noise temperature was observed approximately over the geographical center of a given urban area. Typical data indicates daytime maximum values of 280.00-450,000 K, at 121.5 MHz over New York City. A nighttime maximum value of 70,000 K was observed at 243 MHz over Chicago, Ill. The median of the daytime noise temperature maximum values for five urban areas surveyed is 280,000 K at 121.5 MHz, and 75,000 K at 243 MHz. These values agree within about 1 dB of Skomal's (1969) averaged function for incidental, man-made, noise power for a suburban I (5-15 mi) region.

**INDEX TERMS:** Urban RFI surveys, USA, East Coast, Midwest, airborne.

ACCESSION NO.

EMCABS 6-80-1

# EARTH-CURRENT EFFECTS ON COMMUNICATION-CABLE POWER SUBSYSTEMS

Henry G. Root

GTE-Sylvania Inc.

IEEE TRANS EMC, Vol. EMC-21, No. 2, pp. 87-92, May 1979

**ABSTRACT:** Earth potentials can be a serious threat to cable systems in areas of high magnetic-field activity. This paper describes analytical techniques for evaluating actual system susceptibility and precautions for minimizing outages. The power equipments that energize modern, wideband cable-communication links are more vulnerable to this phenomenon than were the earlier versions. Recently shutdowns have occurred in both land and sea-cable systems and fires have been started in communication-plant power equipments in Scandinavian countries where high-intensity magnetic disturbances occur. Analytical methods, devised by magneto-telluric prospectors for making deep soundings into the earth, have been adapted for estimating the amount of earth potential that would be applied to the cable power apparatus. Results are presented showing the level of earth potentials which are developed and the mode of failure associated with the cable power equipment. Effects on both land and undersea cables are presented, and

**INDEX TERMS:** transatlantic cables are specifically discussed.

Earth current, communication cable, power systems, land, undersea.

ACCESSION NO.

EMCABS 6-80-2

# RESPONSE COEFFICIENTS OF A DOUBLE-BALANCED DIODE MIXER

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IEEE TRANS EMC, Vol. EMC-21, No. 4, pp. 316-319, Nov. 1979

ACCESSION NO.

EMCABS 6-80-3

**ABSTRACT:** This paper presents the results of a computer-assisted analysis of a commonly used double-balanced diode mixer circuit. It is shown that the magnitudes of some of the responses to one or more input radio frequency signals are sharply dependent on the degree to which the diodes comprising the mixer are balanced. A Fourier-series expansion of the time-dependent coefficients of a Taylor-series representation of the four diode currents was employed to compute the response coefficients of the mixer. The method treats the switching action characteristic of the large local-oscillator power levels, rather than relying on the more usual and invalid assumption of "mild" nonlinearity.

**INDEX TERMS:** Double-balanced diode mixer, response coefficients, large LO signals.

# MICROWAVE-RECTIFICATION RFI RESPONSE IN FIELD-EFFECT TRANSISTORS

Marie L. Forcier and Robert E. Richardson, Jr.

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IEEE TRANS EMC, Vol. EMC-21, No. 4, pp. 312-315, Nov. 1979

**ABSTRACT:** This paper discussed the rectification of microwave energy in low-medium frequency field-effect transistors (FET's) and develops a small-signal model for RFI noise analysis in low-frequency linear circuitry. The modeling procedure centers on a Taylor series expansion of the gate voltage-drain current characteristic which shows a small increase in drain current due to a microwave voltage at the gate. The increase in drain current is proportional to the variation in transconductance with gate voltage, and the square of the microwave voltage. Analysis of the microwave power in the transistor shows that critical parameters in determination of the sensitivity are the gate capacitance and the real part of the device input impedance, which ultimately is limited by the parasitic resistance between the active channel and contacts.

**INDEX TERMS:** Field-effect transistors, microwave rectification, RFI response, small-signal model, low-frequency, linear circuitry.

ACCESSION NO.

EMCABS 6-80-4

# MODELING OF LOW-LEVEL RECTIFICATION RFI IN BIPOLAR CIRCUITRY

Robert E. Richardson, Jr.

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IEEE TRANS EMC, Vol. EMC-21, No. 4, pp. 307-311, Nov. 1979

**ABSTRACT:** This paper discussed the rectification response exhibited by low-frequency bipolar transistors when microwave energy is injected. A circuit-analysis model for calculating low-frequency small signal RFI response is outlined and applied in analyzing RFI behavior of a 741 op amp. Principal results from the RFI-device model are (1) RFI is due basically to nonlinearity of the emitter-base characteristic, and also to ac crowding and nonuniformity of gain across the emitter, and (2) there is a distinct inverse relationship between device size (emitter perimeter) and rectification-RFI sensitivity. Model results and comparison with 740 op amp measurements indicate that the rectification sensitivity to 1 GHz power is approximately 3 mV of offset voltage referred to the device input, per microwatt of absorbed power.

**INDEX TERMS:** Low-frequency bipolar circuitry, low-level rectification, microwave energy, model, comparison with measurements.

ACCESSION NO.

EMCABS 6-80-5

# COMPUTER-AIDED ANALYSIS OF RFI EFFECTS IN OPERATIONAL AMPLIFIERS

J. G. Tront, J. J. Whalen, C. E. Larson, and J. M. Roe

Tront, Polytechnic Inst. (VA); Whalen, State Univ. of NY;

Larson & Roe, McDonnell Douglas

IEEE TRANS EMC, Vol. EMC-21, No. 4, pp. 297-306, Nov. 1979

**ABSTRACT:** The modified Ebers-Moll model is used to predict RFI effects in the 741 operational amplifier (op amp) a bipolar linear integrated circuit. RF susceptibility predictions for RF incident upon the op-amp input terminals are made using a complete model, a macromodel, and a voltage-offset model. The three sets of calculated results are essentially identical and agree within 4 dB with experimental results measured at 200 MHz. A threshold cannot be given for the RF power level at which a 741 op amp is susceptible to RFI. The level depends upon the op-amp circuit application. For op-amp circuits designed to amplify input signals in the 0.1- to 1.0-V range, RF power levels as large as -15 to +5 dBm may be required to cause susceptibilities. For op-amp circuits designed to amplify input signals in the 1- to 10-mV range, RF power levels as low as -55 to -35 dBm may cause susceptibilities.

**INDEX TERMS:** Operational amplifiers, RFI effects, analysis (computer aided)

ACCESSION NO.

EMCABS 6-80-6



APPLICATION OF MODAL ANALYSIS TO THE TRANSIENT RESPONSE OF  
MULTICONDUCTOR TRANSMISSION LINES WITH BRANCHES

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Agrawal, Fowles, and Scott, Mission Research Corp., Gurbaxani-  
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ACCESSION NO.  
EMCABS 6-80-7

IEEE TRANS EMC, Vol. EMC-21, No. 3, pp. 256-262, Aug. 1979

**ABSTRACT:** An effective method for computing the time-domain response of lossless multiconductor transmission lines with branches in cross-sectionally inhomogeneous dielectric media is presented. Lines of this type are characterized by multiple propagation modes having different velocities. The theory of wave propagation on lossless multiconductor transmission lines with inhomogeneous dielectrics is used to obtain the modal amplitudes on the uniform sections of the line. The scattering matrix for the junction is used to compute the transmitted and reflected waves in the different branches at the junction. The method described in this paper identifies all propagation modes in all branches of the line, and leads to the direct physical interpretation of the results. The method is general. Experimental results for a six-conductor transmission line with a single branch are found to be in good agreement with the results computed using the described method.

**INDEX TERMS:** Multiconductor transmission lines, branches, transient response, modal analysis.

SYNTHETIC-APERTURE RADAR BASED ON NONSINUSOIDAL FUNCTIONS:  
IV-TRACKING RADAR AND BEAM RIDER

Henning F. Harmuth

Catholic University of America

IEEE TRANS EMC, Vol. EMC-21, No. 3, pp. 247-255, Aug. 1979

ACCESSION NO.  
EMCABS 6-80-8

**ABSTRACT:** This paper investigates the application of synthetic-aperture radar principles to tracking radars and beam riders. The main area of application is for high-resolution all-weather radar. The highest significant frequency used is two orders of magnitude lower than for a radar using a sinusoidal carrier, if the same absolute bandwidth and thus the same information flow are used in both cases. Data for the angular resolution and the accuracy of angle measurement are obtained as functions of timing errors and mechanical tolerances. Angle measurements are based directly on the measurement of time differences, while radar with a sinusoidal carrier derives angles from the measurement of phase differences, which yield time differences with an ambiguity of spacing radiators or receptors no more than half a wavelength apart is a major reason for the very different design of radars with and without a sinusoidal carrier.

**INDEX TERMS:** Synthetic-aperture radar, nonsinusoidal electromagnetic waves, Walsh functions, sequency theory, tracking radar, beam rider.

THE TRANSVERSE DISTRIBUTION OF SURFACE CHARGE DENSITIES ON  
MULTICONDUCTOR TRANSMISSION LINES

D. V. Giri, F. M. Tesche, and Shu-Kong Chang

LuTech, Inc.

IEEE TRANS EMC, Vol. EMC-21, No. 3, pp. 220-227, Aug. 1979

ACCESSION NO.  
EMCABS 6-80-9

**ABSTRACT:** In the past, the method of moments has been applied for the computation of transverse charge distribution and the capacitive-coefficient matrix for electrostatic systems formed by multiconductor transmission lines, with prescribed voltages on each line. But classically, there has been an interest in the related problem of finding the transverse charge distributions, given the net charge on each line. When the net charges are prescribed, conformal mapping techniques have been successfully employed in determining the charge distributions for certain common special cases. The integral-equation formulation presented in this note is applicable to a general system of parallel conductors, not necessarily in the same plane. Important application of this method lies in determining the field-coupling parameters when the multiconductor transmission line is illuminated by an external field.

**INDEX TERMS:** Multiconductor transmission lines, surface charge density, transverse distribution, charge integral equations.

CANONICAL NON-GAUSSIAN NOISE MODELS: THEIR IMPLICATIONS FOR  
MEASUREMENT & FOR PREDICTION OF RECEIVER PERFORMANCE

David Middleton

Consultant

IEEE TRANS EMC, Vol. EMC-21, No. 3, pp. 209-220, Aug. 1979

ACCESSION NO.  
EMCABS 6-80-10

**ABSTRACT:** This paper provides a technical summary of the principal noise-model results developed by the author to date. It considers their major implications for measurement, and performance prediction and evaluation. The discussion includes a concise review of model statistics, methods of estimating the model parameters, and the effects on accuracy of finite data samples. A variety of signal detection problems are used to illustrate the very large improvement possible when optimum algorithms are employed, instead of the conventional system optimized for Gaussian interference. Conditions for realizing such gains are given, and the key properties of these new, general models are discussed. These models make possible, for the first time, a systematic treatment of real-world EMI environments, both for measurement and assessment, and for receiver performance therein.

**INDEX TERMS:** Noise models, electromagnetic, canonical, non-Gaussian, measurement implications, performance prediction.

PROCEDURES FOR DETERMINING THE PARAMETERS OF THE FIRST-ORDER  
CANONICAL MODELS OF CLASS A & CLASS B ELECTROMAGNETIC INTER-  
FERENCE

David Middleton

Consultant

IEEE TRANS EMC, Vol. EMC-21, No. 3, pp. 190-208, Aug. 1979

**ABSTRACT:** Simple approximate methods as well as various more precise, analytical procedures for determining the first-order parameters of both the approximate and exact Class A and B noise models are derived and illustrated for both the ideal case of infinite sample data and the practical cases of finite data samples. It is shown that all first-order parameters of these models can be obtained from the ideal or practical measurements. Procedures for establishing meaningful measures of the accuracy of the parameter estimates in the practical cases are also identified: these include suitably adjusted, nonparametric, small-sample tests of "goodness-of-fit" which provide the principal techniques for establishing accuracy, at an appropriately selected significance level ( $\alpha_0$ ).

**INDEX TERMS:** Interference models, canonical, first-order, parameters, procedures, Classes A and B

LIGHTNING-INDUCED TRANSIENTS ON BURIED SHIELDED TRANSMISSION  
LINES

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IEE TRANS EMC, Vol. EMC-21, No. 3, pp. 171-181, Aug. 1979

ACCESSION NO.  
EMCABS 6-80-12

**ABSTRACT:** This paper analyzes induced transient current and voltage surges on buried shielded transmission lines due to earth-conduction effects of nearby lightning discharges. An analytical method is presented to model the conductive coupling mechanisms in the earth and to determine the amount of coupling between a lightning discharge to ground and an earth-return transmission line. The transmission line is assumed to be a long straight horizontal coaxial cable with an inner shield and an outer armor, terminated on both ends with typical communication-equipment load impedance. The general case is considered here, in which the outermost conductor is not necessarily in perfect contact with the conduction earth. Average lightning-channel conditions and a representative buried-cable geometry are examined. The results are conveniently displayed via several graphs of the time histories of the resulting transient current and voltage surges.

**INDEX TERMS:** Lightning-induced transients, transmission lines, shielded, buried, analytical, time histories.



FUNDAMENTALS OF STEADY-STATE AND TRANSIENT ELECTROMAGNETIC  
FIELDS IN SHIELDING ENCLOSURES

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IEEE TRANS EMC, Vol. EMC-21, No. 4, pp. 335-348, Nov. 1979

ACCESSION NO.

EMCABS 6-80-13

**ABSTRACT:** A simplified theory of electromagnetic shielding by enclosures with conductive and/or magnetic walls is presented. The theory is based on a simplified type of boundary condition at the enclosure walls. Theoretical results are compared with exact solutions for steady-state and transient excitation and the approximation turns out to be extremely good in all cases of practical interest. For enclosures of arbitrary shapes, the problem is formulated as a single integral equation in the unknown current in the shield. Numerical solution of the equation is discussed, as well as a possible equivalent lumped-circuit representation.

**INDEX TERMS:** Shielding enclosures, electromagnetic, steady state, transient, simplified theory.

THE ELECTROMAGNETIC FIELD IN AN EMP SIMULATOR AT A HIGH  
FREQUENCY

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IEEE TRANS EMC, Vol. EMC-21, No. 3, pp. 263-269, Aug. 1979

ACCESSION NO.

EMCABS 6-80-14

**ABSTRACT:** The electric field in the working volume of an EMP simulator has been determined experimentally in both amplitude and phase at a frequency that is high enough so that the simulator no longer behaves like a terminated-TEM-mode transmission line. Graphs of the field in the working volume are displayed and interpreted in terms of the TEM and higher parallel-plate modes. The actual field is shown to differ greatly from that characteristic of the TEM mode so that it must be expected that current and charges induced on an obstacle are also very different from those that would be observed if the excitation were an incident plane wave.

**INDEX TERMS:** EMP, simulator, EM field, multimode.

THE ESTIMATION OF INDUCED-VOLTAGE PEAK MAGNITUDE AND ENERGY  
LEVEL UNDER LTA/EMP EXCITATION OF LOW-LOSS AIRCRAFT CABLING

William S. McCormick

Wright State University

IEEE TRANS EMC, Vol. EMC-21, No. 2, pp. 136-146, May 1979

ACCESSION NO.

EMCABS 6-80-15

**ABSTRACT:** The important vulnerability parameters of peak voltage transient magnitude and voltage transient energy are estimated for the LTA/EMP induction problem. Using basic linear system theory, straight-forward expressions are derived to estimate these two survivability parameters. The derived model is quite general including cable characteristics, varying terminating impedances, and varying points of cable excitation. Using the developed model, a comparison of the LTA and EMP cases is made. An illustrative example involving the yaw-damper circuit of the USAF F-111 is also included.

**INDEX TERMS:** Lightning transients, EMP, aircraft cabling.

PREDICTION OF CROSSTALK INVOLVING TWISTED PAIRS OF WIRES-PART

I: A TRANSMISSION-LINE MODEL FOR TWISTED-WIRE PAIRS

Clayton R. Paul and Jack W. McKnight

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IEEE TRANS EMC, Vol. EMC-21, No. 2, pp. 92-105, May 1979

ACCESSION NO.

EMCABS 6-80-16

**ABSTRACT:** A transmission line model for predicting electromagnetic coupling (crosstalk) involving twisted-wire pairs (TWP) is developed. The twisted pair is modeled as a cascade of loops consisting of uniform two-wire sections with abrupt interchanges of wire positions at the ends of each loop. Experimental results are obtained for the coupling between a single wire above ground and a twisted pair above ground. The experimental correlation with the model predictions indicates that the simulation model is typically accurate within 3 dB for frequencies such that the total line length is less than 1/10 of a wavelength. For higher frequencies, the model tracks the experimental results quite well although the prediction error is somewhat larger.

**INDEX TERMS:** Crosstalk, twisted-wire pairs, transmission-line model.

SYNTHETIC-APERTURE RADAR BASED ON NONSINUSOIDAL FUNCTIONS:

III-BEAM-FORMING BY MEANS OF THE DOPPLER EFFECT

Henning F. Harmuth

Catholic University of America

IEEE TRANS EMC, Vol. EMC-21, No. 2, pp. 122-131, May 1979

ACCESSION NO.

EMCABS 6-80-17

**ABSTRACT:** Synthetic-aperture radar based on nonsinusoidal functions was discussed in two previous papers(1). The Doppler effect was not used to produce the synthetic aperture, even though the conventional synthetic-aperture radar would not work without it. This paper shows how the Doppler effect of a nonsinusoidal wave can be used to produce a synthetic aperture. The main result is that the range resolution is about two orders of magnitude better than with a sinusoidal carrier, under the constraint that the highest significant frequency used is the same in both cases. A limit on the highest frequency is necessary, since the absorption due to rain and fog, as well as noise, increase rapidly above about 10 GHz. The paper shows that for the best use of nonsinusoidal carriers, one has to develop a theory of carrier coding, which is considerably more complex than the theory of coding for baseband signals.

**INDEX TERMS:** Synthetic-aperture radar, nonsinusoidal electromagnetic waves, Walsh functions, sequence theory.

NOISE-ERROR DETERMINATION OF COMBINATIONAL CIRCUITS BY  
WALSH FUNCTIONS

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IEEE TRANS EMC, Vol. EMC-21, No. 2, pp. 146-152, May 1979

ACCESSION NO.

EMCABS 6-80-18

**ABSTRACT:** The stochastic behavior of digital combinational circuits is analyzed by the use of Walsh functions. An n-input Boolean function is represented as a Walsh series and the error caused by noise is measured in terms of a distance which is the fraction of the time that the system output due to noise-corrupted signal differs from that due to signal alone. It is shown that the error can be expressed as the sum of two parts: one part depends only on noise statistics, and the other on both signal and noise. Some interesting properties of both parts are discussed and typical examples are given.

**INDEX TERMS:** Noise error, digital combinational circuits, Walsh functions.



WALSH-FUNCTION ARRAY GENERATORS: A COMPARISON

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IEEE TRANS EMC, Vol, EMC-21, No. 2, pp. 153-154, May 1979

ACCESSION NO.  
EMCABS 6-80-19

**ABSTRACT:** A comparison is made between D and T flip-flop Walsh-function array generators from the points of view of (1) maximum clocking rate and (2) hardware requirements. The T flip-flop circuits require modification to be self-healing from noise interferences or momentary power failure.

**INDEX TERMS:** Walsh functions, array generators, D and T flip-flops.

HOW SWITCHES PRODUCE ELECTRICAL NOISE

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IEEE TRANS EMC, Vol, EMC-21, No. 3, pp. 162-170, Aug. 1979

ACCESSION NO.  
EMCABS 6-80-20

**ABSTRACT:** This tutorial paper describes the fundamental mechanism by which mechanical switches produce electrical "noise," and the parameters which determine the complex waveforms, frequency components, and amplitudes produced. Understanding the fundamentals removes some of the mystery often associated with this ubiquitous source of noise and transients, and can assist in development of effective methods of preventing resultant malfunctions and damage in electronic equipment. The primary focus is upon switches operating low-current inductive loads on 120-V residential power lines, and shows peak amplitudes up to several kilovolts and frequencies up to several hundred megahertz produced on the supply line.

**INDEX TERMS:** Noise, transients, switches, contacts, sparks, arcs.

TIME- AND FREQUENCY-DOMAIN CHARACTERISTICS OF MAN-MADE RADIO NOISE AFFECTING HF-COMMUNICATIONS SITES

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IEEE TRANS EMC, Vol., EMC-21, No. 3, pp. 182-189, Aug. 1979

ACCESSION NO.  
EMCABS 6-80-21

**ABSTRACT:** The short-term properties of man-made radio noise affecting operational HF receivers are described by simulated three-dimensional display. Noise is categorized into types, and the importance of each type to HF circuit operation is discussed. The types of noise are also related to source categories to simplify source location and control processes.

**INDEX TERMS:** Man-made radio noise, time-domain, frequency domain, HF-communications sites.

RADIO-FREQUENCY INTERFERENCE AMONG LINEAR-FM RADARS

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IEEE TRANS EMC, Vol., EMC-21, No. 3, pp. 228-246, Aug. 1979

ACCESSION NO.  
EMCABS 6-80-22

**ABSTRACT:** The problem of radio-frequency interference (RFI) between radars using linear-FM pulses is examined. For a very large class of cases, the RFI is the same as if the FM were removed; for the cases not in that category, it is shown that the peak response of an unweighted receiver can be closely approximated by a hand calculation. The effects of cosine-on-a-pedestal weighting, in either the frequency or the time domain, are then considered. Exact expressions for the RFI are developed, and it is shown that, if one is satisfied with knowing the peak of the response, the effect of the weighting can be well approximated by some quite simple expressions.

**INDEX TERMS:** Linear-FM radars, weighted, unweighted, frequency domain, time domain, mutual RF interference, exact expressions, approximations.

FREQUENCY SYNTHESIS USING WALSH FUNCTIONS

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IEEE TRANS EMC, Vol. EMC-21, No. 3, pp. 269-274, Aug. 1979

ACCESSION NO.  
EMCABS 6-80-23

**ABSTRACT:** A new scheme for the programmable generation of either square or sine waves of a required frequency is proposed. It uses neither feedback, nor table lookup of stored values, but it derives the desired square wave from a Walsh function, fairly simple to select and to generate with digital circuits.

For this purpose, the Walsh function is counted down in a binary counter, at whose output a function with clean spectrum results, whose spurious components can be bounded by a simple formula. This approach becomes the design principle for a programmable frequency synthesizer with phase-continuous output, practically instantaneous switching between frequencies, and no limit on the number of closely and evenly spaced frequencies that can be selected.

**INDEX TERMS:** Frequency synthesis, Walsh functions.

MICROWAVE INTERFERENCE WITH THE FUNCTION OF AN IMPLANTED CARDIAC PACEMAKER

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IEEE TRANS EMC, Vol. EMC-21, No. 3, pp. 274-276, Aug. 1979

ACCESSION NO.  
EMCABS 6-80-24

**ABSTRACT:** The effect of external microwave radiation on an implanted cardiac pacemaker is studied. Based on a clinical case history indicating an effective blocking in a patient of the implanted pacing activity due to microwave radiation, the process by which microwave energy may cause this observed effect is analyzed. The problem is formulated in terms of thermoelastic theory in which the absorbed microwave energy of the biomedium containing the implanted pacemaker represents a volume of heat source and a resulting thermoelastic motion sets up acoustic waves; these in turn, cause noisy high-frequency artifact recorded on the ECG tracings

**INDEX TERMS:** Cardiac pacemaker, microwave interference, thermoelastic process.



A MODIFIED EBERS-MOLL TRANSISTOR MODEL FOR RF-INTERFERENCE ANALYSIS

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IEEE TRANS. EMC, Vol. EMC-21, No. 4, pp. 283-290, Nov. 1979

ACCESSION NO.  
EMCABS 6-80-25

**ABSTRACT:** This paper develops analytical techniques for the study of nonlinear RF and microwave effects in semiconductor devices. Rectification in p-n junctions is discussed, and a novel large-signal transistor model is developed, based upon modifications to standard Ebers-Moll formulations for bipolar transistors. Use of the models in worst-case analysis is discussed, with ranges of parameters given based on a simplified analysis of rectification in ideal diodes.

**INDEX TERMS:** Transistor model, bipolar, modified Ebers-Moll, large signal, nonlinear effects.

COMPUTER-AIDED ANALYSIS OF RFI EFFECTS IN DIGITAL INTEGRATED CIRCUITS

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IEEE TRANS EMC, Vol. EMC-21, No. 4, pp. 291-297, Nov. 1979

ACCESSION NO.  
EMCABS 6-80-26

**ABSTRACT:** A computer-aided analysis procedure based upon a modified Ebers-Moll transistor model is used to predict RFI effects in bipolar integrated circuits (IC's). The procedure is applied to a digital IC to determine the RF power levels that cause several EM susceptibility thresholds to be exceeded.

**INDEX TERMS:** Bipolar integrated circuits, RFI effects, modified Ebers-Moll transistor model, computer-aided analysis procedure.

PREDICTING INSERTION LOSS OF COMMON-CORE POWERLINE FILTERS

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IEEE TRANS EMC, Vol. EMC-21, No. 4, pp. 320-334, Nov. 1979

ACCESSION NO.  
EMCABS 6-80-27

**ABSTRACT:** Knowledge of the propagation mode and the source impedance is necessary in order to predict the insertion loss of common-core powerline filters. If these quantities are standardized, the transition-band insertion loss corresponding to two test modes can be accurately calculated by use of only a programmable hand calculator, such as the Hewlett-Packard HP 65 or Texas Instruments SR 56. Such predictions of differential and common-mode insertion loss are of value in designing electronic equipment for conformance to world-wide specifications applying to powerline interference emission and filter leakage current.

**INDEX TERMS:** Powerline filters, common-core, insertion loss, common mode,

THE NEED FOR REALISTIC SUSCEPTIBILITY LEVELS FOR "KADAR" RECEIVERS

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IEEE TRANS EMC, Vol. EMC-21, No. 4, pp. 349-350, Nov. 1979

ACCESSION NO.  
EMCABS 6-80-28

**ABSTRACT:** The frequency-dependent rejection (FDR) terminology is frequently used in EMC analysis, especially in the report literature, and hence it appears useful to discuss it's general definition.

**INDEX TERMS:** Rejection, frequency-dependent, definition.

THE EMC PROCESS (RFI vs EMC)

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1976 IEEE International Conference on Communications Vol. III,  
76CH1085-OCSCB, p. 37-1, June 14-16, 1976

ACCESSION NO.  
EMCABS 6-80-29

**ABSTRACT:** As telecommunications systems continue to become more advanced in concept and more complex in configuration, the operational effectiveness of these systems in the electromagnetic environment becomes an increasingly important factor. The necessity for sharing and the complexity of the problem have been recognized by the international and national organizations which have the responsibility for preparing the rules and regulations governing the use of the electromagnetic spectrum. All of these changes serve to emphasize that the designers of any new C-E systems must consider the operational electromagnetic environment in which they will ultimately be deployed and that these environmental considerations must be addressed as early as feasible in the developmental life-cycle. This paper points out the fact that RFI is a real problem and EMC must be considered throughout the developmental life-cycle is briefly described with emphasis on the EMC aspects of system development.

**INDEX TERMS:** Telecommunications systems, EMC, Emc design.

GENESIS AND EVOLUTION OF MILITARY ELECTROMAGNETIC INTERFERENCE SPECIFICATIONS

C. B. Pearlston

ACCESSION NO.  
EMCABS 6-80-30

1976 IEEE International Conference on Communications Vol. III  
76CH1085-OCSCB, p. 37-4, June 14-16, 1976

**ABSTRACT:** Specifications for the control of radio interference had their genesis some 34 years ago in the attempt to prevent interference from disrupting communications on-board Navy ships. The purpose of these specifications thus began with the desire to assure satisfactory communications; most of the development of interference specifications from that beginning has concerned itself with the question of compatible communications on land, sea, and in the air. For example, as a result of communication problems in Army and Navy tactical fighters in World War II, interference specifications were developed to control the interference to aircraft voice receivers operating in the 2-30 MHz range. The earliest specifications developed a rationale for conducted interference and susceptibility measurements on receiver power leads, as well as for radiated interference measurements from other equipment which could couple energy into the unshielded antenna lead-in.

**INDEX TERMS:** EMC specifications, radio noise, EMI limits, historical EMC.



## FCC DOMESTIC STANDARDS FOR IMPORTED EQUIPMENT

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1976 IEEE International Conference on Communications Vol. III 76CH1085-OCSCB, P. 37-10, June 14-16, 1976

**ABSTRACT:** In the USA, no person may operate equipment that emits RF energy except under the regulations issued by the FCC. There is one exception. Equipment operated by agencies of the U.S. Government are subject to regulations issued by the President who has delegated this authority to the Interdepartment Radio Advisory Committee in the office of Telecommunication Policy. All other RF emitting equipment must comply with the regulations issued by the FCC. These equipments are regulated through a system of licensing--a complex system of rules divided into 20 separate services or groups of services. These services are further divided into numerous subcategories. In addition to the regulations dealing with licensed operation, the FCC found it desirable as early as 1938, to promulgate a set of rules (now FCC Rules Part 15) to permit the operation without an individual license of certain miniature transmitters. In 1945-6, the concept of operation without an individual license was extended to industrial, scientific and medical (ISM) equipment that generated and used RF energy (FCC Rules Part 18).

**INDEX TERMS:** RFI regulations, equipment authorization, certification.

RFI AS IT CONCERNS THE RADIO OPERATOR, THE CONSUMER AND THE MANUFACTURER OF HOME-ENTERTAINMENT EQUIPMENT

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1976 IEEE International Conference on Communications Vol. III

76CH1085-OCSCB, p. 37-13, June 14-16, 1976

**ABSTRACT:** In Fiscal 1975, the Federal Communications Commission (FCC) received 55,289 complaints of alleged radio-frequency interference (RFI), a 30% increase over the number of cases reported in Fiscal 1974. Of the complaints received, 45,002 involved electronic home-entertainment equipment, and 82% of these were attributed to design deficiencies in the equipment, and not to the transmitters involved. That relatively few cases of RFI are attributable to radio transmitters indicates the effectiveness with which harmonic radiation has been suppressed in transmitters built today. In this regard Amateur Radio operators, and manufacturers of transmitters used by Amateurs, have long sought to reduce the harmonic content of transmitted signals by using techniques which reduce the amplitude of harmonics generated in the transmitter, and prevent harmonics from being fed to the antenna. Then too, in cases where an RFI problem must be corrected at the susceptible device, Amateurs have a long history of resolving the problem for the consumer.

**INDEX TERMS:** RFI to home entertainment equipment, RFI complaints, RFI regulations.

ELECTROMAGNETIC INTERFERENCE (EMI) AND THE COMMUNICATIONS/ELECTRONICS MARKET

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1976 IEEE International Conference on Communications Vol. III

76CH1085-OCSCB, p. 37-19, June 14-16, 1976

**ABSTRACT:** With the advent of increasingly more complex and diversified electronics products, electromagnetic compatibility (EMC) has become an increasingly important consideration in design for the commercial communications/electronics market. However, EMC engineering has been hampered by the limited and usually unsatisfactory information about key market areas, in particular, large population centres, industrial complexes and airports. Studies of the electromagnetic environment performed in Bell-Northern Research over the last few years have provided a much clearer picture of the nature and extent of EMI in these areas. Assuming that the greatest contributors are licensed transmitters, such as AM, FM, TV and radar, we set out to identify areas of prime concern. The approach was to predict and measure the field strengths at selected sites in major cities and to develop improved prediction methods where necessary.

**INDEX TERMS:** EMC, Environment, field strength.

ACCESSION NO.

EMCABS 6-80-31

## EM SUSCEPTIBILITY IMPROVEMENT OF A DC-TO-DC CONVERTER

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1976 IEEE Nat'l. Telecommunications Conference, Vol. II, 76CH1149-4 CSCB, p. 28.2-1, November 29, 30 &amp; December 1, 1976

**ABSTRACT:** The electromagnetic (EM) susceptibility level for dc-to-dc converters has been determined by using a transverse electromagnetic (TEM) transmission cell to generate precise EM fields from 10 kHz to 200 MHz. Initial measurements indicated wide fluctuations in the regulated output, false shutdowns, and power transistor failures at field levels as low as 2 volts per meter. The problems encountered were a function of frequency, suggesting a resonance effect. There is also evidence that the resonance is caused by an inductive reactance of a connecting set of leads (antenna) and the junction capacitance of a semiconductor in the terminating circuitry. The approach taken to improve the susceptibility level was to locate these resonances and eliminate them rather than resort to expensive shielding and filtering. As a result the susceptibility level was raised to the 20 volts per meter range where only minor variations in the regulated output, on the order of 1 percent, were observed.

**INDEX TERMS:** TEM cells, susceptibility, EMI tests.

ACCESSION NO.

EMCABS 6-80-34

BROADCAST ELECTROMAGNETIC INTERFERENCE ENVIRONMENT NEAR TELEPHONE EQUIPMENT

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1976 IEEE Nat'l. Telecommunications Conference, Vol. II, 76CH1149-4 CSCB, p. 28.5-1, November 29, 30 and December 1, 1976

**ABSTRACT:** A mathematical model in conjunction with a field measurement program has been used to predict the distribution of electric field strengths near telephone equipment, such as those located in a telephone company central office (CO). The major sources of these fields are the myriad of commercial AM/FM/TV broadcast stations. The percentage of central office locations which experience modulation-peak field strengths in excess of 1 V/m (120 dB V/m) and the percentage of fields, measured at CO locations, which exceed the same level are significant. The data can serve as a statistical tool in characterizing electromagnetic interference (EMI) environments. Such information will assist telephone equipment designers in finding cost-effective solutions to reduce the broadcast EMI equipment susceptibility problem.

**INDEX TERMS:** Mathematical model, electric field, EMI environments.

NO. 2 ESS DESIGN FOR OPERATION IN HIGH 60-Hz INDUCTION ENVIRONMENTS

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1976 IEEE Nat'l. Telecommunications Conference, Vol. II,

76CH1149-4 CSCB, p. 28.1-1, November 29, 30 and December 1, 1976.

**ABSTRACT:** No. 2 ESS is able to operate successfully in environments which have relatively high values of induced 60-Hz voltage and current on customer lines or trunk pairs coming into the central office. Low metallic noise at high values of ac noise to ground is achieved by the use of well-balanced transmission circuits. Several No. 2 ESS circuits must work on an unbalanced basis. Special design measures were taken to allow them to function properly. One example of such a circuit is the customer dial pulse receiver (CDPR). This circuit, in addition to receiving dial pulses, tests for a grounded tip lead at the station to determine whether the tip or ring party is originating, in the case of a 2-party line, or if a coin is in the slot, in the case of a coin line. The CDPR is capable of receiving customer dial pulses in the presence of high values of 60-Hz current (up to 100-mA RMS) through the use of an electronic detector consisting of a low-pass active filter and a comparator with hysteresis.

**INDEX TERMS:** Inductive interference, 60 Hz interference, balanced transmission circuits, inductive coordination.

ACCESSION NO.

EMCABS 6-80-33

ACCESSION NO.

EMCABS 6-80-36



# EMERGENCY REMOTE MEDICAL MONITORING COMMUNICATIONS SYSTEM

J. Steve Adler, Member, IEEE

Motorola Communications and Electronics, Inc., Schaumburg, IL  
1977 IEEE International Conference on Communications, Vol. 2  
77CH1209-6 CSCB, p. 34.1-328, June 12-15, 1977

ACCESSION NO.

EMCABS 6-80-37

**ABSTRACT:** Medical Monitoring Systems are usually associated with cardiac monitoring. The Medical Monitoring Systems are now generally accepted as a vital part of the patient diagnosis and treatment protocol. Various forms of communications are used for medical monitoring. This paper examines the types of Medical Monitoring Communication Systems. A further examination is made of Radio Medical Monitoring Systems, including spectrum allocated, compatibility considerations and system approaches. The paper concludes with trends in Emergency Remote Medical Monitoring Systems.

**INDEX TERMS:** Medical Monitoring Communication, compatibility, electronic cardiac monitoring.

# DEVELOPMENT OF AN EMC SPECIFICATION FOR COMMERCIAL ELECTRONIC INSTRUMENTS

Ray Magnuson

Hewlett Packard Company, Santa Rosa, California  
1977 IEEE International Conference on Communications, Vol. 2  
77CH1209-6 CSCB, p. 34.5-335, June 12-15, 1977

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EMCABS 6-80-38

**ABSTRACT:** This paper describes the evolution of an internal EMC specification for use by a company developing and manufacturing electronic instruments. The specification contains five susceptibility tests and four emission tests. Reasons for picking the various limits are discussed.

**INDEX TERMS:** EMC specifications, susceptibility tests, emission tests, magnetic susceptibility, electrostatic discharge, power line transient, conducted susceptibility, radiated susceptibility.

# THE MARINE AND AMATEUR SERVICES...MEETING CHANGING NEEDS

David C. Thompson

SBE, Inc., Watsonville, California  
1977 IEEE NTC Conference Record, Vol. 2, 77CH1292-2 CSCB,  
p. 25:2-1

ACCESSION NO.

EMCABS 6-80-39

**ABSTRACT:** The increased value of time to an individual for either business or personal reasons, the need to reduce the consumption of natural resources, increasing awareness of the value of radio communication to gain assistance in time of emergency and the increase in the amount of leisure time available to individuals are all socio-economic changes taking place which have caused an incredibly increased awareness by all segments of the population of the advantages which accrue with the use of one or more of the radio services authorized by the Federal Communications Commission. The two radio services discussed in the context of these changes are Amateur and Marine.

**INDEX TERMS:** Radio communication, Amateur, Marine.

# PRESENT INTERRELATIONSHIPS AND FUTURE TRENDS IN PERSONAL RADIO SERVICES

Carlos V. Roberts

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1977 IEEE NTC Conference Record, Vol. 2, 77CH1292-2, CSCB,  
p. 25:1-1

ACCESSION NO.

EMCABS 6-80-40

**ABSTRACT:** This paper examines common aspects present in today's personal radio services, and develops the theme that the various personal radio services (marine, CB, general mobile, mobile telephone) have a number of key elements in common. The presence of these same elements in what have been previously considered disparate services may indicate that the present service distinctions are artificial divisions that have occurred due primarily to the historical development of these services. Current trends in the development of personal radio services may be leading towards integration of the various services, and there are some indications that future personal radio communications of all types may well be provided under one service. EMC trends are examined, and the conclusion drawn is that for personal radio communications "things are going to get worse before they get better."

**INDEX TERMS:** EMC trends, amateur, CB, general mobile radio, mobile telephone, certain maritime services.

# INTERFERENCE BETWEEN UHF TELEVISION SYSTEMS AND 850 MHZ CELLULAR MOBILE TELEPHONE SYSTEMS

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Bell Laboratories, Whippan, N.J.

1977 IEEE NTC Conference Record, Vol. 2, 77CH1292-2 CSCB,  
p. 25:3-1

ACCESSION NO.

EMCABS 6-80-41

**ABSTRACT:** At this moment, considerable planning and development are underway for High Capacity Mobile Telephone Systems; dense cellular systems which will permit a dramatic increase in both the quantity and quality of available mobile telephone service in the United States. These systems were made possible when, in May, 1974, the FCC reallocated the upper portion of the UHF TV band (806-881 MHz) to various types of land mobile services including cellular. This paper will address one class of interference which may exist between UHF television systems and land mobile services in the 806-881 MHz band, using cellular systems as an example of land mobile services.

**INDEX TERMS:** EMC, cellular mobile radio.

# THE SOCIAL AND POLITICAL IMPACTS OF CB TV INTERFERENCE

Ronald S. Stone

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1977 IEEE NTC Conference Record, Vol. 2, 77CH1292-2 CSCB,  
p. 25:4-1

ACCESSION NO.

EMCABS 6-80-42

**ABSTRACT:** CB related TV interference is increasing at an alarming rate. An identification of the parties that are affected, and their possible responses to this problem will determine the social-political impacts of the problem. Possible impacts of this interference problem include higher cost CB and TV equipment, reduced usage of the CB and TV communication services, lower quality TV reception, increased FCC regulatory activity and increased interpersonal and community strife.

**INDEX TERMS:** TV interference, CB, TV communication.



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