

IEEE

ELECTROMAGNETIC COMPATIBILITY GROUP



NEWSLETTER

EDITOR: ROBERT D. GOLDBLUM

ISSUE NO. 86 SUMMER 1975

1975 INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY

EL TROPICANO MOTOR HOTEL

110 Lexington Avenue

San Antonio, Texas 78205

SAN ANTONIO, TEXAS OCTOBER 7-9, 1975

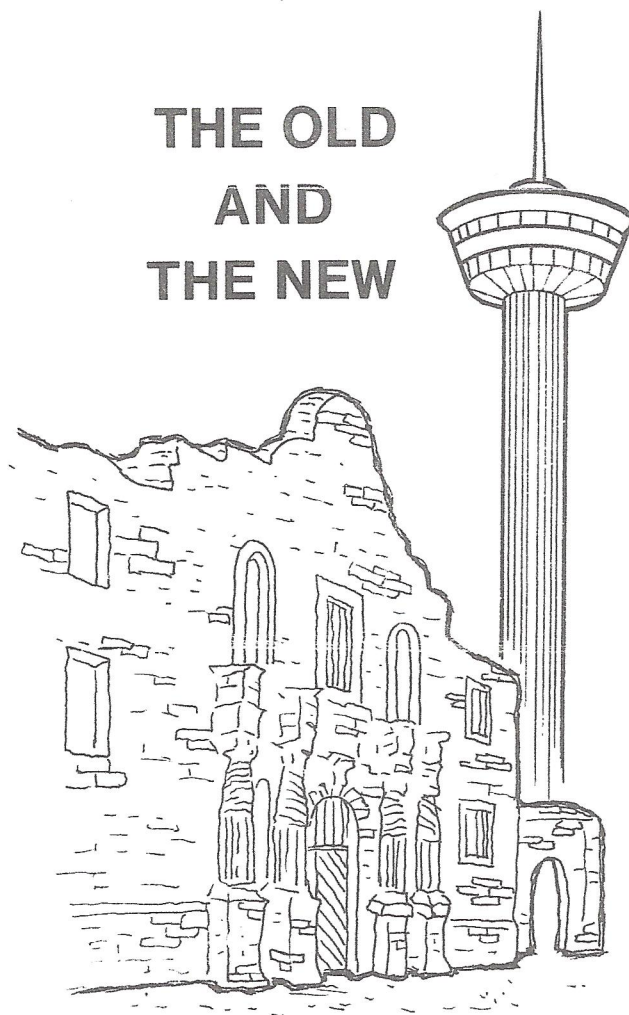
P. O. DRAWER 28510, SAN ANTONIO, TEXAS, 78284



GENERAL CHAIRMAN

William E. Cory
(512) 684-5111

THE OLD AND THE NEW



IEEE ELECTROMAGNETIC COMPATIBILITY GROUP NEWSLETTER is published quarterly by the EMC Group of the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, N.Y. 10017. Sent automatically and without additional cost to each member of the EMC Group.

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EMC NEWSLETTER NEWS



EDITOR:

Robert D. Goldblum

During the April AdCom meeting, the editor presented the general G-EMC Newsletter format as follows:

Standard features for each issue include:

- . Book Reviews by Jim Hill 1 page
- . Chapter Chatter by Charlie Anderson 2 pages
- . Sequency Union by Bob Redinbo 2 pages
- . Personality Profile by Bill Duff 1 page
- . Institutional Listings 1 page
- . Meetings & Events 3 pages
- . IEEE News 2 pages
- . FCC News 1 page
- . Symposium News 1 page
- . Misc. 2 pages

The concensus of the AdCom was to limit the Walsh Function section prepared by Bob Redinbo to one page since it is of interest to a very small segment of our members. They also did not want the Newsletter to print technical articles which could be included in the Transactions. However, brief technical notes are welcome and any subject of interest to our members. (It should be remembered that AdCom anticipates the desires of our membership and persons who wish to express a different point of view should do so by writing to your editor.)

In other action, the AdCom decided to sell subscriptions to the Newsletter to non-Group members at \$7.00/yr. Thus, the free distribution of the Newsletter to non-members will be limited. The purpose of this policy is to entice more interested parties to join the Group. Requests for subscriptions should be sent to R.M. Emberson, The IEEE, Inc., 345 East 47th Street, New York, N. Y. 10017.

In keeping with its policy to limit Newsletter distribution, 10 copies of each issue will be allotted to Chapter Chairmen for distribution at their meetings. Chapter Chairmen are requested to notify the editor of their desire to participate in this program.

1975 ARRL TECHNICAL SYMPOSIUM AND NATIONAL CONVENTION SEPTEMBER 13 & 14, 1975 RESTON, VA.

Theme - RFI - Reaching for Improvement

Subjects to be covered include:

ARRL RFI Task Group
Analysis & Modeling
Cleaning House
Designing for EMC
Field Modifications
Legislation & Regulations
Measurements
Resolving Complaints
Standards

A technical proceedings will be published for attendees. Questions pertaining to the RFI/EMC Sessions may be directed to Ted Cohen, W4UMF, 8603 Conover Place, Alexandria, VA. 22308, Tel: (703) 780-6397. Other questions may be directed to Paul Rinaldo, K4YKB, 1524 Springvale Ave., McLean, Va. 22101, Tel: (703) 356-8918.

NEWSLETTER STAFF

EDITOR:

Robert D. Goldblum
R&B Enterprises
P.O. Box 328
Plymouth Mtg., Pa. 19462

ASSOCIATE EDITOR:

(Chapter Chatter)
Charles F. W. Anderson
2 Bauer Avenue
Oakhurst, N. J. 07755

ASSOCIATE EDITOR:

(EMC Personality Profiles)
William G. Duff
Atlantic Research Corp.
8601 Greeley Blvd.
Springfield, VA. 22150

ASSOCIATE EDITOR:

(Book Reviews)
James S. Hill
6706 Deland Drive
Springfield, Va. 22150

ASSOCIATE EDITOR:

(Sequency Union)
Dr. G. Robert Redinbo
Code R740
Advanced Systems Concept Branch
Defense Communications Agency
1860 Wiehle Avenue
Reston, VA. 22090

CONSULTING EDITOR:

Rexford Daniels
P.O. Box 129
Concord, Mass. 01742



BOOK REVIEWS

BOOK REVIEW

by Jim Hill, RCA Service Company

"Buchsbaum's Complete Handbook of Practical Electronic Reference Data" by Walter H. Buchsbaum, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, Copyright 1973, 529 pages, \$29.95.

This is a compilation of data for the student, technician, design engineer and scientist who may be so absent-minded that he can't remember the basic formulas.

The first nine Chapters contain the technical information frequently needed in the course of normal electronics work. There are formulas, graphs, charts, and tables for ready reference.

At the beginning of each chapter are the standards, fundamentals, or general theories, together with applicable practical examples. Detailed instructions are provided for all charts, tables and graphs, and, again practical examples are included. At the end of each Chapter there is a bibliography directing the user to more detailed information. The sources for all data are given unless they are in the public domain.

Chapters 10 to 19 deal with specific areas of specialization in electronics and feature the fundamentals as well as the most widely used applications of each area. To cover any of these ten areas thoroughly would require many specialized books but the author provides enough basic information so that an electronics professional who is a specialist in one area can get a good understanding of the essential features, standards, and operational performance in another specialized area. For example, a competent TV service technician can refer to the sections on microwave ovens and understand enough about their operation to use the manufacturer's service manual to troubleshoot the unit.

To complete the handbook chapter 20, mathematical formulas, includes all of these formulas, tables and graphs which are used in the various areas of electronics. Included are the fundamental equations of algebra, trigonometry, calculus and the more specialized mathematics of transforms, series, etc. Where appropriate, numerical values and typical applications are used as illustrative examples. Tables and graphs as well as frequently used values are provided to keep computations to a minimum.

There is a good index in the back and a table of contents in the front of the book. The table of illustrations seems misplaced because it precedes the table of contents. As a handbook it fulfills its mission faithfully and is reasonable priced on the scale of book prices in today's market.

SURVEY RESULTS

During the winter, a survey prepared by Joseph F. Fischer, Jr. of Litton Systems, was sent to G-EMC Chapter Chairmen. Responses were received from the Jersey Coast, San Francisco, Los Angeles and Boulder Chapters. The following is the composite results:

Average years spent in present position 9.9
Percentage forced to leave previous position 14.9%
Average total years experience 18.9
Average number of different employers 2.63
Percentage that experienced unemployment 22.4%
Average period of unemployment 2.5 Mos.
Salary ranges: 10K and under - 0%
12-15K - 9.5%
15-20K -26.4%
20K and up -64.1%

NEXT ADCOM MEETING

The G-EMC AdCom will meet only twice this year. The first meeting was held during INTERCON in New York in April. The next meeting will be held during our annual Symposium in San Antonio, Texas, on Monday, October 6th. AdCom meetings are open to all those who wish to observe.

Other groups that will meet during the week of the Symposium include the SAE AE-4 Committee on EMC, and the EIA G-46 Committee on EMC.

DEADLINE FOR RECEIPT OF MATERIAL

FOR NEXT ISSUE:
September 12, 1975

MAIL

Subject: Electromagnetic Environment Pollution; Request for Action on

There is an urgent need to push for action on the EMC aspects of reducing electromagnetic pollution. A two pronged attack is suggested. Push the adoption of an EMC requirement into environmental impact statements that are required by the EPA (Environmental Pollution-Agency). Second, push the adoption of a "Spectrum Availability" requirement into procurement and operational documents of the DOD (Department of Defense). See Enclosure 1 for two pollution examples.

The need for acting now is to preclude further erosion of certain societal benefits and EMC jobs. This action has a direct impact on every EMC engineer and everyone else. It will give our group a meaningful, timely objective, as well as, excellent reasons for increasing membership and member activities. These increases may best be brought about by delegating to chapter chairmen specific tasks which are best done at local levels. ADCOM members should pursue direct contacts with EPA, DOD and others sympathetic with the subject action.

A good strategy is to push for stronger enforcement of existing, governmental and military, regulations and standards, particularly those that are readily defensible. Also, push for the allocation, and where allocated, the expenditure of resources and monies to implement the required EMC engineering efforts. In addition, formulate a policy statement and a defensible set of pollution guidelines. These guidelines should not overly tilt toward purity or prostitution of the spectrum at the expense of unacceptable costs.

Tactics call for using all communication techniques, especially press releases, to inform others of the benefits that will derive from the subject action. The electromagnetic spectrum, an increasingly polluted and unavailable natural resource, will be cleansed, more readily available and conserved. Man and man-made electrical/electronic devices and systems, which must share the electromagnetic spectrum, will work better and more efficiently. Human and animal comforts, which derive from properly operating electromagnetic devices, will increase. Personnel lives and property which are affected by electromagnetic energy, will be more secure. EMC engineers will have more job opportunities.

Many of us know that certain influential people and most managers, hopefully only uninformed ones, will give little or no support to the subject action. They will say that present policies and EMC efforts are already accomplishing beneficial results and that prices will be driven up. Because of the present money difficulties, these statements are falling on sympathetic ears of certain managers, called "bean counters" by some. These managers are already thwarting the intent of existing regulations and standards. They rationalize that these documents contain excessive and unjustifiable requirements, therefore, they fail to allocate or expend authorized resources. This must be forestalled now and precluded in the future for the good of all people.

Our message must be heard, otherwise, other messages will.

Respectively submitted,

Anthony G. Zimbalatti
PG-27 Member
294 Crowell Street
Hemstead, New York 1150

ENCLOSURE 1

Two Pollution Examples

1. An environmental impact statement has been filed for a proposed high voltage, about 300 kV, power line on Long Island, New York. Local newspapers have published articles covering the results of a study which revealed the existence of dangerous shock hazards to nearby residents. Since radiated levels are high enough for shock, I expect real interference problems to exist with home radio and television sets and other communication services. Interference was not mentioned in the article. Perhaps EMC aspects of electromagnetic environmental pollution is not required in the impact study.

2. Some high power radars radiate from their antenna terminals harmonic power levels that are only 30 dB below the fundamental power level at the input terminals of the antennas. Deviations have been allowed against military specifications, which required 80 dB down from fundamental, because there are no electromagnetic incompatibilities with on-board equipments. These levels may pollute the environment and degrade the performance of other man-made, airborne and ground systems.

CHAPTER CHATTER

by Charles C.W. Anderson



Washington DC Tom Doeppner, Secretary of the Chapter, reports that the officers for the 1975-76 season will be: George Hagn, Chairman; Thomas W. Doeppner, Vice Chairman; and Al Paul, Secretary. According to Al Paul, the Chapter's May meeting was addressed by Thomas J. Bode, Manager of the Analysis Systems Section of ECAC. Mr. Bode described the mathematical models for EMC analysis which have been developed by ECAC. Two sets of these have been adapted to programmable-type desk-top computers. A survey of such devices available within the DoD was made to determine which ones were most widely used. Capabilities of the software packages were demonstrated on a typical computer.

Central Texas Activities in preparation for the upcoming EMC Symposium are in full swing, according to Gene Cory. (The program for this meeting appears elsewhere in this issue). The Chapter also sponsored the May meeting of their Section.

Pacific Area No input from Bob Ford as of press time, so he's probably sipping around somewhere west of Honolulu and east of Bangkok.

San Francisco The Chapter's big news is, of course, the EMC session which they sponsored at the International Conference on Communications on Monday, June 16. (Speaker/topic list for this session appeared in the Spring Newsletter). The April meeting featured Ken True of Fairchild-Mt. View speaking on Line Drivers and Receiver Circuits. Andy Nalbandian reports that Ken gave a most interesting presentation, which was well received. Once again, the May meeting was a wine tasting, in which the Chapter combined with the local G-AES, G-ASSP, G-EM and the Golden Gate Section to have another of their now famous occasions.

Mohawk Valley Ken Siarkiewicz, the Chapter Chairman, reported that a meeting was held on March 11. A. L. Hiebert, Project Director of Rand Corporation Engineering Services Department spoke on "An EMC Program for the 1970's". Among the topics treated were EMC and spectrum engineering practices in weapons systems acquisition, a new intra-system analysis program for vulnerability assessment, EMC control and design of spec limits, and a new approach to national, spectrum management.

New Jersey Coast The Chapter's April meeting was addressed by Dr. Emanuel Goldber, Chief of the Cardiology Division of the Department of Medicine of the Beth Israel Medical Center of New York. Dr. Goldberg

presented a well-illustrated talk on EMC considerations in heart pacemakers, which featured reports of incidences in which pacemakers had been affected by external electromagnetic energy sources. He assessed the hazards and pointed up some areas in which further study is urgently needed. He also raised for consideration the question as to whether such ubiquitous energy sources might possibly be utilized to power devices which could be incorporated in the human body for survival of safety purposes. This meeting was held jointly with the Bioengineering Group Chapter with good turnouts from both sponsoring units.

The May meeting featured Ezra B. Larsen of NBS-Boulder, who spoke on "Active Isotropic Antenna with Fiber Optic Link to Receiver". Sponsored by the U.S. Army Electronics Command, NBS has been developing near-field probe-type antennas with high sensitivity and minimum disturbances to the fields in the vicinity of the radiating item. Mr. Larsen described the circuitry involved and presented results of field tests.

As previously mentioned, the June meeting will have Mr. D.M. Jansky of OTP/EOP speaking on telecommunications policy and spectrum management.

CHARLIE'S CORNER



RFI BILL INTRODUCED IN CONGRESS

Congressman Charles Vanik of Ohio recently introduced a bill, H.R. 7052, the objective of which is to provide the FCC with the power to require the incorporation of protective components in audio and visual electronic equipment to reduce their vulnerability to external rf energy. The bill has been referred to the Subcommittee on Communications of the Committee on Interstate and Foreign Commerce. This long-needed bill, when favorably acted on, will give the FCC the "clout" to insist that equipment manufacturers, particularly those in the home entertainment field, take the circuit precautions necessary to alleviate the rising incidence of complaints of interference to hi-fi sets, TV receivers and numerous other items from the rapidly proliferating transmitters in such classes of service as public safety, land transportation and CB. Expressions of support for favorable action on the bill should be addressed as follows:

(continued)

(continued)

The Honorable Torbert H. MacDonald
Chairman, Subcommittee on Communica-
tions - Room B331
Rayburn House Office Building
U. S. House of Representatives
Washington, DC 20515

A separate letter with a copy of your letter to Congressman MacDonald, should be sent to your own Congressman. If you can cite some instances of interference to your own or your neighbors' equipment which were due to internal design shortcomings, so much the better.

EIA, it is rumored, is already actively opposing this proposed legislation.

G-EMC ADCOM PRESIDENT TO PARTICIPATE IN RFI
FORUM AT ARRL NATIONAL CONVENTION

Gene Cory, G-EMC ADCOM President, will present an overview of G-EMC's objectives and activities during an RFI/EMC forum at the National Convention of the American Radio Relay League in Reston, VA. on 13 September. Other organizations to be represented during this session will be FCC, Congressman Vanik's staff, and the Santa Barbara interference group. (The Fall issue of the Newsletter will, it is hoped, have a report on this session.)

STATUS OF AMERICAN RADIO RELAY LEAGUE

RFI TASK GROUP

Dr. Ted Cohen reports as follows:

- (1) Interest in the RFI information packet (previously announced in the Newsletter) continues quite high; as well over 1000 sets have already been mailed out. Send a 9 x 12 self-addressed envelope with 40¢ postage attached to the following address if you wish to obtain one of these info packages.

Dr. Theodore Cohen
8603 Conover Place
Alexandria, VA. 22308

- (2) At least three groups are now active in this area. Besides the ARRL group, the Amateur Research and Development Association (AMRAD) under Paul Rinaldo in the Washington area, and a West Coast group under Don Gerue in Santa Barbara, are active. Hardware-level investigations are underway at the ARRL Laboratories under direction of Lewis G. McCoy.

- (3) One of the Technical Advisors to the ARRL Task Group, Hal Richman, has written to over 100 electronic equipment manufacturers asking for information on the measures (if any) which they have taken in their items to reduce susceptibility and what their procedures are when reports of problems encountered with their equipment are forwarded to them.

HEW/FDA EMC SPECIFICATION

Last summer, the FDA awarded McDonnell Douglas Astronautic Co., East St. Louis, Mo., a three year contract to prepare an EMC specification for commercial medical electronic instrumentation to be used in hospitals. The work statement includes a survey of ambients in ten St. Louis area hospitals, development tests using the proposed requirements, and the circulation of two draft copies (preliminary and final) of the proposed specification.

The first draft of the spec is scheduled to be circulated this Fall and the FDA is compiling a list of qualified reviewers. Approximately two hundred names will be selected from persons who submit their request to be included on the reviewer list. Interested persons should contact David A. Segerson, HEW/FDA, Bur. of Medical Devices, 5600 Fishers Lane, Rockville, Md. 20852; (301) 443-4166.

CONSTRUCTION METHODS & EVALUATION OF
SHIELDED CONSTRUCTION SYSTEMS

A paper with the above title was presented by Ralph Aronson, Executive Vice President of Keene Corporation's Ray Proof Division. It was presented at the Montreux 1975 EMC Symposium. The paper emphasized the importance of the total system rather than its components in relation to meeting the precise functional requirements of the facility.

After a detailed discussion of the electromagnetic spectrum covered by such shielding, materials selection and the critical joining operation, Mr. Aronson described all of the components of a shielded room -- including doors, walls, mechanical and electrical penetration and room assembly and grounding in addition to testing and final acceptance.

He concluded by saying: "It is quite possible to obtain from a shielded room an attenuation of 120 db at full frequency range and to maintain it at peak performance. To accomplish this, it is important that the work be done exclusively under the engineering and field supervision of an experienced RF room manufacturer. All components should be designed to be part of a complete RF shielding construction system. In this way, there is only one responsible party with an established reputation to achieve and fully guarantee this high performance."

Copies of the technical presentation may be obtained by writing to Ray Proof Division, Keene Corporation, 50 Keeler Avenue, Norwalk, Connecticut 06856.

ADVANCE PROGRAM 1975 IEEE INTERNATIONAL SYMPOSIUM

ON ELECTROMAGNETIC COMPATIBILITY

El Tropicano Motor Hotel
San Antonio, Texas

October 7, 8, 9, 1975



Technical Program

Tuesday Morning, October 7, 1975
9:30 A.M. to 12:00 Noon

SESSION 1

Welcome

H. Lyndon Taylor, Chairman, Central-Texas Section
IEEE

William E. Cory, President, G-EMC, IEEE

Keynote Address

Raymond E. Spence, Jr., Chief Engineer
Federal Communications Commission
Washington, D.C.

"The Role of EMC in Spectrum Allocation"

Discussion of radio frequency interference, new radio services, and the process of integrating them with current radio services.

Intersociety EMC Activities

Technology Forecast and Assessment Forum

H. M. Schlicke, Chairman, G-EMC, TF&A Committee

Tuesday Afternoon, October 7, 1975
2:00 P.M. to 5:30 P.M.

SESSION 2A

I. Electronic Warfare—2:00 P.M.-3:00 P.M.
Chairman: James D. Savage, USAF EW Center, San Antonio, Texas

a. *Air Force Electronic Warfare Center Support and Services*, Col. F. A. McLaurin, Commander, USAF EW Center, San Antonio, Texas

b. *Spectrum Signatures of Chaff Clouds*, C. Pinson, Pinson Associates, Austin, Texas

c. *Military Interference Reporting Program*, Maj. J. R. Knight, USAF EW Center, San Antonio, Texas

d. *Simulation of Tactical Electronic Environments, Collection and Data Processing for Systems Evaluation*, S. Moskowitz, Hughes Aircraft Corporation, El Segundo, California

e. *"EW R&D—Forecast for the 1980's"*, Lt. Col. R. A. Klimek, Jr., E W Division, Hq. Air Force Systems Command, Andrews AFB, Maryland

II. Electro-Optics—3:45 P.M.-5:30 P.M.
Co-Chairmen: Marvin D. Aasen, IIT Research Institute/ECAC; James H. Atkinson, ECAC, Annapolis, Maryland

a. *Spectrum Management and Allocation*, D. Jansky, Office of Telecommunications and Policy, Executive Office of The President, Washington, D. C.

b. *Electro-Optical Technology: Systems, Components, Trends and Awareness to Compatibility and Safety*, W. C. Eppers, Jr., Air Force Avionics Lab., Dayton, Ohio

c. *EMC of the E-O Systems: Optical-to-Optical Interference, RF-to-Optical Interference, Optical-to-RF Interference. Need for New Concepts of Analysis and Measurements*, A. Van Den Heuvel, IIT Research Institute, Chicago, Illinois

d. *Hazards: The Effects of Optical Radiation on Biological Environments and Materials*, W. T. Ham, Jr., Medical College of Virginia, Richmond, Virginia

e. *Standards: Systems, Components, Safety, etc.*, D. J. Albares, Naval Electronics Laboratory Center, San Diego, California

f. *High Energy Lasers and Systems Applications*, John M. MacCallum, Naval Research Laboratory, Washington, D.C.

SESSION 2B

I. Space—2:00 P.M.-3:00 P.M.
Chairman: Eldon S. Hughes, Rockwell International, Los Angeles, California

a. *The Genesis and Implications of MIL-STD-1541 (EMC Requirements for Space Systems)*, C. B. Pearlston, Aerospace Corporation, Los Angeles, California

b. *Spacecraft Charging at High Altitudes—The Scatha Satellite Program*, D. A. McPherson, The Aerospace Corporation, El Segundo, California; D. P. Cauffman, NASA Headquarters, Washington, D.C.; Capt. W. Schober, Space and Missile Systems Organization, El Segundo, California

c. *Experimental Measurement of Man-Made Electromagnetic Noise at Orbital Altitudes*, P. J. Mondin, P. Locke, National Scientific Laboratories, McLean, Virginia

II. Workshop on Application of Programmable Calculators to EMC—3:15 P.M.-4:45 P.M.

Chairman: Thomas J. Bode, IIT Research Institute/ECAC, Annapolis, Maryland

The U.S. Department of Defense Electromagnetic Compatibility Analysis Center (ECAC) has developed numerous mathematical models for performing electromagnetic compatibility analyses and frequency management. Two sets of models selected from ECAC's computer program library have been adapted for use with programmable desk-top calculators. The programs are available in several different versions, each designed to be used with one of the popular makes of programmable calculators. Description of capabilities, discussion of applications, procedures for obtaining programs, and demonstrations will be given.

III. Thirty Minutes With the HP-65—4:45-5:15 P.M.
Chairman: R. B. Cowdell, Collins Radio Group, Rockwell International, Newport Beach, California

Discussion and demonstration of the application of the HP-65 to cable coupling problems.

Wednesday Morning, October 8, 1975
9:00 A.M. to 12:00 Noon

SESSION 3A

I. Lightning—9:00 A.M.-10:45 A.M. Chairman: Warren Peele, Purdue University, W. Lafayette, Indiana

a. *Lightning Protectors for Modern Control and Communication Systems*, C. L. Chen, University, West Lafayette, Indiana

- b. *Lightning Protection for Status and Control Lines of the Mark III Instrument Landing System*, G. K. Huddleston, Georgia Institute of Technology, Atlanta, Georgia
- c. *Lightning-Induced Transients on Buried Shielded Transmission Lines*, J. D. Nordgard, Georgia Institute of Technology, Atlanta, Georgia; C. L. Chen, Purdue University, West Lafayette, Indiana
- d. *Use of Lightning to Measure the Electromagnetic Penetration of Large Structures*, E. B. Joy, L. E. Corey, Georgia Institute of Technology, Atlanta, Georgia
- e. *Lightning Simulation Tests of Communication Cables*, A. W. Revay, Jr., R. M. Cosel, Florida Institute of Technology, Melbourne, Florida; J. Stahmann
- f. *Frequency Response of Multiconductor Transmission Lines Illuminated by an Electromagnetic Field*, R. Paul, University of Kentucky, Lexington, Kentucky
- II. Electromagnetic Pulse—11:00 A.M.-12:00 Noon
Chairman: Carl E. Baum, Air Force Weapons Laboratory, Albuquerque, New Mexico
- a. *EMP-Induced Transients in Long Cables*, E. F. Vance, Stanford Research Institute, Menlo Park, California
- b. *Devices and Methods for EMP Transient Suppression*, O. M. Clark, General Semiconductor Industries, Inc., Tempe, Arizona
- c. *Comparative EMP Design Tactics*, L. C. Martin, Lawrence Livermore Laboratory, Livermore, California
- d. *EMP Hardening of Aircraft by Closing the Points of Entry*, Rockwell International, Anaheim, California
- SESSION 3B
- I. *Intrastem Analysis*—9:00 A.M.-12:00 Noon
Chairman: Joseph Naresky, Rome Air Development Center, New York
- a. *An Overview of the Air Force Intrastem Analysis Program*, A. L. Hiebert, Rand Corporation, Santa Monica, California
- b. *An Intrastem Electromagnetic Compatibility Analysis Program*, G. L. Weinstock, McDonnell Aircraft Company, St. Louis Missouri
- c. *Static Discharge Problems on Data Processing Equipment*, E. Nakauchi, K. West, Westminster, California
- d. *Gap Energy, A More Accurate Criterion for Ignition Threshold*, V. P. Nanda, J. E. Bridges, IIT Research Institute, Chicago, Illinois
- e. *Electrostatic Ignitions in Air Force Refueling Systems*, J. B. Godwin, San Antonio Air Logistic Center, San Antonio, Texas
- SESSION 4B
- I. *Shielding*—2:00 P.M.-5:00 P.M.
Chairman: Don B. Clark, Civil Engineering Labs, Port Hueneme, California
- a. *Light Transmittance and RF Shielding Effectiveness of Gold Film Coating on Plastic Dome of a Missile*, S. V. Liao, California State University, Fresno, California
- b. *Cable and Connector Shielding Attenuation and Transfer Impedance Measurements Using Quadraxial and Quinaxial Test Methods*, P. J. Madle, TRW Systems, Redondo Beach, California
- c. *Coupling to Aerospace Cables at Microwave Frequencies*, V. R. Ditton, McDonnell Douglas Astronautics Company, St. Louis, Missouri
- d. *Nuclear Electromagnetic Pulse (NEMP) Hardened Cables*, W. C. Wells, J. Bridges, P. L. E. Uslenghi, IIT Research Institute, Chicago, Illinois
- e. *Techniques of Shielding and Filtering Digital Computers for EMI Emissions and Susceptibility*, P. M. Rostek, The National Cash Register Company, San Diego, California
- f. *MIL-STD-1377 VS MIL-STD-285 Microwave Shielding Effectiveness Measurements*, J. D. Lee, McDonnell Douglas Astronautics Company, St. Louis, Missouri
- g. *Shielded Enclosures for EMC and TEMPEST Testing*, E. S. Kenney, Ray Proof Corporation, Norwalk, Connecticut
- h. *Contemporary R. F. Enclosures*, E. A. Lindgren, Eric A. Lindgren & Associates, Inc., Chicago, Illinois
- i. *Facts and Myths of R. F. Shielding*, F. J. Nichols, Lectro Magnetics, Inc., Los Angeles, California
- c. *Prediction of Lighting-Induced Transients*, K. J. Maxwell, F. A. Fisher, General Electric Company, Pittsfield Massachusetts
- d. *Static Electricity Analysis Program*, J. E. Nanevich, D. G. Douglas, Stanford Research Institute, Menlo Park, California
- e. *Considerations for Implementation of the Intrastem Analysis Program*, K. Gardner, Aeronautical Systems Division, Wright-Patterson AFB, Ohio
- f. *The Environmental Level Concept Applied to the Trident Submarine Intrastem EMC Program*, R. M. Showers, University of Pennsylvania, Philadelphia, Pennsylvania; P. J. Johnson, Naval Underwater System Center, New London, Connecticut; G. C. Rees, Naval Ship Engineering Center, Hyattsville, Maryland
- Wednesday Afternoon, October 8, 1975
2:00 P.M. to 5:00 P.M.
- SESSION 4A
- I. *Susceptibility*—2:00 P.M.-3:20 P.M. Chairman: J. F. Fischer, Jr., Litton Systems, Inc., Van Nuys, California
- a. *The Susceptibility of Home Entertainment Devices to Strong RF Fields*, T. J. Cohen, The American Radio Relay League, Inc., Newington, Connecticut
- b. *Microwave Interference Effects in Integrated Circuits*, J. M. Roe, McDonnell Douglas Astronautics Company, St. Louis, Missouri
- c. *Low Impedance Transient Generation*, R. H. Burnett, Corcom, Inc., Chicago, Illinois
- d. *Translational Electromagnetic Environment Chamber, A New Method for Measuring Radiated Susceptibility and Emissions*, J. R. Cummings, McDonnell Douglas Astronautics Company, St. Louis, Missouri
- II. *Environment*—3:40 P.M.-5:30 P.M.
Chairman: H. E. (Bud) Taggart, National Bureau of Standards, Boulder, Colorado
- a. *Transmission Line Electromagnetic Compatibility*, R. E. Clayton, J. R. Stewart, Power Technologies, Inc., Schenectady, New York
- b. *Estimating Outage Time in Terrestrial Microwave Systems Caused by Mobile or Stationary Interference Sources*, M. A. Weissberger, R. L. Hinkle, IIT Research Institute/ECAC, Annapolis, Maryland

Thursday Morning, October 9, 1975
9:00 A.M. to 12:00 Noon

SESSION 5A

- I. Gaskets—9:00 A.M.-10:20 A.M.
Chairman: George M. Kunkel, Electro-Data Technology, Burbank, California
- a. *Introduction to Shielding of Electromagnetic Fields and the Application to EMI/RFI Gaskets*, G. M. Kunkel, Electro-Data Technology, Burbank, California
- b. *Measuring EMI Gasket Performance*, C. M. Kendall, Consultant, Running Springs, California
- c. *Transfer Impedance Measurements as a Test for Electro-Magnetic Compatibility*, by V. Acuna, Anaconda Telecommunications, Overland Park, Kansas
- d. *Radiated Field Strength Method for Measurement of the R. F. Shielding Characteristics of EMI Gaskets*, D. R. Averkamp, Motorola, Inc., Scottsdale, Arizona

II. Filters—10:40 A.M. - 12:00 Noon

- Chairman: William Lash, McDonnell Douglas Astronautics Company, Huntington Beach, California
- a. *Time Domain Filters—Principles and Applications*, M. E. Converse, Southwest Research Institute, San Antonio, Texas
 - b. *Trade Off Considerations in the Electrical Configuration and Circuit Design of Filters for TEMPEST and NEMP Applications*, H. A. Favors, FA-RAD Engineering, Inc., Encino, California
 - c. *Determination of Filter Performance for any Arbitrary Source or Load Impedance Based on Experimental Measurements*, W. Emberson, Naval Ordnance Laboratory, White Oak, Maryland; J. E. Bridges, IIT Research Institute, Chicago, Illinois
 - d. *Assuredly Effective Filters (The End of a Controversy)*, H. M. Schlicke, Interference Control, Milwaukee, Wisconsin

SESSION 5B

- I. Antennas—9:00 A.M.-10:20 A.M.
Chairman: W. W. Everett, Jr., Post Doctoral Program, Rome Air Development Center, Rome, New York

- a. *Superwideband Electric Field Probes*, H. Trzaska and T. M. Babji, University of Wroclaw, Wroclaw, Poland

- b. *Transient Fields Radiated by TEM Horns*, L. L. Tsai, University of Mississippi, University, Mississippi; W. Hudson and G. Brown, Army Missile Command
- c. *A Comparison of Three Computer Programs for Thin-Wire Antennas*, T. E. Baldwin, Jr., Atlantic Research Corporation, Rome, New York; A. Adams, Syracuse University, Syracuse, New York
- d. *Effects of Near-Field Obstacles on Far-Field Antenna Performance*, F. L. Cain, B. J. Cowen, E. E. Weaver, Georgia Institute of Technology, Atlanta, Georgia; E. F. Duffy, Naval Ship Engineering Center, Hyattsville, Maryland

- e. *Scattering and Diffraction by Conducting Finite Cylinder Containing Apertures*, J. P. Heckl, L. F. Libelo, Naval Surface Weapons Center, Silver Spring, Maryland; C. L. Andrews, D. P. Margolis, State University of New York, Albany, New York

II. EMC-Related Bio-Instrumentation—11:40 A.M.-12:00 Noon

Chairman: John C. Mitchell, School of Aerospace Medicine, San Antonio, Texas

- a. *A Broadband, Miniature, Isotropic, Electric Field Measurement System*, H. I. Bassen, Bureau of Radiological Health, Rockville, Maryland
- b. *Calibration of a Multimode Microwave Exposure Chamber*, E. L. Bronaugh, D. R. Kerns, Southwest Research Institute, San Antonio, Texas
- c. *Measurements of Hospital Electromagnetic Environments*, R. J. Hoff, McDonnell Douglas Astronautics Company, St. Louis, Missouri

SESSION 5C

- I. *Design of LSI Microprocessor-Based Electromagnetic Data Acquisition Systems*—9:00 A.M. - 12:00 Noon
Chairman: H. Dean McKay, AH Systems, Inc., Chatsworth, California

This session will be a "tutorial presentation" on the new emerging technologies including microprocessors, microcomputers, and other LSI components. The session will include introduction to microprocessor architecture, instruction sets and system requirements.

Typical 8-bit microprocessors will be discussed with examples of electromagnetic data acquisition and signal processing. Specific topics to be covered include:

- Introduction to Microprocessors
- Hardware Elements of a Microcomputer System
- Software Elements, Requirements, and Programming
- Typical Electromagnetic Data Acquisition Systems

Thursday Afternoon, October 9, 1975
2:00 P.M. to 5:00 P.M.

SESSION 6A

I. Management—2:00 P.M.-5:00 P.M.

Chairman: James A. Spagon, TRW Systems Group, Redondo Beach, California

- a. *The Emerging Requirement for Total Environmental EMC*, J. D. Atkinson, ECAC, Annapolis, Maryland
- b. *The Impact of EMV Requirements on Weapon Systems Contractors*, H. P. Anthes, McDonnell Douglas Astronautics Company, St. Louis, Missouri
- c. *An English Translation of MIL-STD-704A*, R. B. Cowdell, Collins Radio Group, Rockwell International, Newport Beach, California
- d. *EMC: Relationship to Safety Analyses and Quality Assurance Tests*, C. C. Lambert, Tracor, Inc., Austin, Texas
- e. *Integrated Electromagnetic (EM) Analyses and Testing*, J. R. Heverly, T. W. Doeppner, General Research Corporation, Redondo Beach, California
- f. *EMC Allocation in System Budget Design*, M. D. Aasen, IIT Research Institute/ECAC, Annapolis, Maryland
- g. *Improved EMC Management*, T. W. Doeppner, J. R. Heverly, General Research Corporation, Redondo Beach, California
- h. *Optimum Employment of Electromagnetic Compatibility Engineers*, J. D. Osburn, Tracor, Inc., Austin, Texas
- i. *Harpoon Missile EMC Management*, J. R. Cum-

ings, McDonnell Douglas Astronautics Company, St. Louis, Missouri

SESSION 6B

- I. EMC Instrumentation and Design—2:00 P.M.-5:00 P.M.
Chairman: Frank K. Koide, Autonetics Division, Rockwell International, Anaheim, California
 - a. *Mobile RFI Antenna System*, R. H. Sugarman, American Electronics Laboratories, Inc.; T. E. Baustert, RADC, Griffis AFB, New York
 - b. *Automated MIL-E 6051 Testing*, C. N. Boode, P. G. Burgan, Rockwell International, Anaheim, California
 - c. *An Amplitude Probability Distribution Detector System*, E. L. Bronaugh, D. R. Kerns, Southwest Research Institute, San Antonio, Texas; R. S. Southwick, U.S. Army Electronics Proving Ground, Fort Huachuca, Arizona
 - d. *Baseband Impulse Generator Useful to 5 GHz*, J. R. Andrews, E. E. Baldwin, National Bureau of Standards, Boulder, Colorado
 - e. *Combined Electromagnetic Compatibility and Thermal Analysis and Design*, J. D. Osburn, T. J. Ritenour, Tracor, Inc., Austin, Texas
 - f. *Models of Non-Linear Receiver Interactions*, M. Maiuzzo, IIT Research Institute/ECAC, Annapolis, Maryland
 - g. *Reduction of Circuit Intermodulation Distortion Via the Design of the Linear Out-of-Band Behavior*, J. F. Spina, RADC, Griffis AFB, New York; K. L. Su, Georgia Institute of Technology, Atlanta, Georgia; D. D. Weiner, Syracuse University, Syracuse, New York
 - h. *Millimeter Wave EMC Study*, G. G. Sunberg, Hughes Aircraft Company, Fullerton, California

Join your friends and colleagues for an outstanding program of 88 technical papers, meaningful exhibits, and a fun-filled social program in one of America's four unique cities. The papers will cover the entire EMC field from the tutorial through applications to the theoretical.

Hotel Reservations. A block of rooms has been set aside at the El Tropicano Motor Hotel in downtown San Antonio. Since they are available on a first-come basis, you are urged to make your reservations now on the enclosed form. Should you make reservations by phone or through a travel agent, please mention the EMC Symposium.

Symposium Registration. You can save time and money by sending in the Advance Registration Form. Personal registrations will be accepted at the Symposium.

Exhibits. Technical exhibits will be open as follows: Tuesday, 10:30 A.M. to 6 P.M.; Wednesday, 10 A.M. to 6:30 P.M.; Thursday, 10 A.M. until 6 P.M.

Cocktail Party. A colorful Make-New-and-Renew-Old Acquaintances Cocktail Party will be held around the patio pool of the El Tropicano. There will be snacks and music by an outstanding Mariachi group. Wednesday, October 8, 6:30 P.M.—8 P.M.

Western Dinner Dance. A Barbecue Dinner and Dance will be held in the quaint Jersey Lilly Hospitality Center of the Pearl Brewing Company on Tuesday, October 7 from 7 P.M. until 11 P.M. Western or sport dress will be the style, and bus transportation will be provided.

Ladies Activities. No formal program is provided for the ladies, but a Hospitality Suite will be staffed in the Monterrey Suite of the El Tropicano Tuesday through Thursday from 9 A.M. until 4 P.M. Local wives, who will be hostesses, will be happy to advise you on walking or bus tours of the Alamo City's outstanding attractions, including the River Walk with its shops and restaurants, the Alamo and the other missions, and San Antonio's museums and zoo.

Weather. October is especially pleasant. You can expect a temperature range of 81.5°F in the daytime and a low of 70.6°F at night. The relative humidity is typically 85 percent.

Other Activities.

- IEEE GEMC will hold its Administrative Committee Meeting on Monday, October 6.
- SAE-AE4 Committee will hold its Executive Meeting on Sunday, October 5 and its Business Meeting on Monday, October 6.
- EIA G46 will hold its EMS meeting on Monday, October 6 at 7 P.M.
- Don White Consultants, Inc. will offer their Shielding Seminar on October 6 & 7 and their Grounding Seminar on October 9 & 10, both at the El Tropicano.
- River Art Show will be held along the downtown river walk on October 4 & 5. Over 250 artists will be showing their works.

Travel and Tour Arrangements. Travel arrangements have been made through Sanborn's Travel Center, 701 Parkridge, San Antonio, Texas 78216 (512) 349-2161, whereby blocks of seats have been reserved from major cities. They will be used where we do not have enough reservations to form groups. You may wish to contact Sanborn's regarding your reservations in order to take advantage of these special fares. There are also post-convention trips planned for Mexico City, Acapulco and Guadalajara/Puerto Vallarta. Special air fares are available between many U.S. and Mexican cities that provide for a stopover in San Antonio. Using these combinations, you may be able to visit Mexico for a very small additional cost. Please see enclosed brochure on these trips and also on reservations to and from San Antonio.

Symposium Committee

General Chairman	— William E. Cory
Secretary	— Edwin L. Bronaugh
Treasurer	— Ray Weity
Advisor	— Fred J. Nichols
Arrangements	— Cecil J. Henne, Chairman — Ignacio S. Martinez — Jesse Torres
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Exhibits	— Jack Howard
International Affairs	— J. S. Hill
Publications	— Jim Bartell
Publicity	— Floyd F. Lewis
Technical Program	— Gus Van Steenberg, Chairman — R. B. Schulz — R. M. Showers

REGISTRATION

Please register in advance if at all possible. Registration will be conducted at the El Tropicano Motor Hotel as follows:
Monday, October 6 5 P.M. to 8 P.M.
Tuesday, October 7 8 A.M. to 4 P.M.
Wednesday, October 8 8 A.M. to 4 P.M.
Thursday, October 9 8 A.M. to 1 P.M.

Sponsors

Group on Electromagnetic Compatibility, IEEE

EMC Chapter, Central Texas Section, IEEE

Cooperating Organizations

Aeronautical Electronics Committee on Electromagnetic Compatibility, Society of Automotive Engineers

Billy Mitchell Chapter, Association of Old Crows

Commission 8, United States National Committee, International Union of Radio Science

Electronic Industries Association

Radio Frequency Interference Task Group, American Radio

Exhibitors

AH Systems, Inc.	Narda Microwave Corp.
Ailtech	National Technical Information Service
Chromerics, Inc.	
	R&B Enterprises
Data Marketing, Associates Inc.	Ray Proof Corp.
Electromagnetic Compatibility Analysis Center	Scientific Devices Southwest
Electro-Metrics Div. of Penril	Singer Instrumentation
Electronic Navigation Industries	Southwest Research Institute
Genistron Division, Genisco Technology Corp.	Syston Donner Corp.
Hewlett-Packard Co.	U.S. Capacitor Corp.
Instruments for Industry, Inc.	Wavetech
Lectromagnetics, Inc.	Don White Consultants, Inc.

SAE AE-4 CONDUCTS 36TH MEETING

The first 1975 bi-annual meeting of the SAE Committee AE-4 on Electromagnetic Compatibility was conducted in Annapolis, Maryland on May 6 & 7. As usual, the meeting was excellent and most informative to those who attended and participated. The average daily attendance of approximately 50 was considered to be low, but this was due to the many competing meetings during the month of May - including the Grounding Workshop at George Tech, and the Montreux, Switzerland, EMC Symposium. Normally, average attendance can exceed 100.

The AE-4 Committee is a very viable and productive organization, led by Walter McKercher, Chairman, and Jack Moe, Vice Chairman. The Committee has produced numerous EMC documents, including standards, test techniques, etc., and has conducted symposiums on lightning and static electricity. A sample of their publications include:

- ARP 935 "Suggested EMI Control Plan Outline"
- ARP 958 "Broadband EMI Measurement Antennas"
- AIR 1221 "EMC System Design Checklist"
- AIR 1261 "Aircraft Power vs. EMC Requirements".

ADVANCE REGISTRATION

Registration:	Member*	Non-Member*	Full-Time Student
Before September 22	\$45	\$55	\$4
After September 22	\$55	\$65	\$3

*Includes admission to technical sessions, exhibits, Dinner/Dance, Cocktail Party, and one copy of Symposium Record.

Additional Copies of Record

To IEEE Members @ \$12 ea. _____ \$ _____ (no.)

Non-Members @ \$16 ea. _____ \$ _____ (no.)

Total Remittance \$ _____

Please make checks payable to:

1975 EMC SYMPOSIUM

Name _____

Mailing Address _____

Company _____

IEEE Membership No. _____

My Spouse plans to attend: Yes ☐ No ☐

Please complete and send with remittance TO: William E. Cory
General Chairman
P.O. Drawer 28510
San Antonio, Texas
U.S.A. 78284

Being their own worst critic, the committee is seeking to revitalize its operation through reorganization and by accepting new members who are willing to participate on a working committee. Membership is by appointment of the Chairman and there are no membership fees. However, you will be required to fulfill the obligations which you agree to undertake, and will share in the pride of making a significant contribution to the technical society and the EMC community. You will be requested to review and comment on new Government EMC related standards before they are finalized and released, and will be given the opportunity to meet and talk with the people behind these standards.

For more information, contact Mr. Walter D. McKerchar, Boeing Engrg. & Construction Div., P.O. Box 3999, Seattle, Wa. 98124. Tel: (206) 655-0726.

SAE AE-4 TO MEET

The next meeting of the SAE AE-4 Committee on EMC will be held on Monday, October 6, 1975 at the El Tropicano Motor Hotel, San Antonio, Texas. This will be the day preceding the start of the IEEE International Symposium on Electromagnetic Compatibility scheduled at the El Tropicano during that week. The AE-4 Meeting will be open to the public and there will be no registration fee.

IEEE VALIDATION OF EDUCATIONAL ACHIEVEMENT PROGRAM

by Roy H. Mattson, Ph. D.

(condensed)

The IEEE wants to keep its members current technically and to pursue planned career development. Many individual Institute members believe these goals can be partially obtained through continuing education. Institute members often underutilize continuing education opportunities for a number of reasons, including:

1. no discernable reward for their effort;
2. no assurance that a continuing education course is current and valid;
3. no assurance that a course fits into a pattern leading to a desired career development goal.

Studies have shown that electrical engineers in practice tend to become less productive after their late thirties. This phenomena has been related to technical obsolescence. Continuing education provides a possible means of retaining a high-level of productivity on the part of IEEE members.

The basic problem, simply stated, is to find a way to motivate practicing engineers to retain their technical competence, thereby avoiding obsolescence. Dalton and Thompson studied the individual performance of 2,500 engineers in six technology-based companies. Their findings confirm previously published results: "that on the average, individual performance among technically trained men peaks at an early age and declines steadily thereafter". Furthermore, they point out "that the age at which this is happening seems to be falling rapidly, and there appears to be neither adequate recognition of the problem nor effective action to cope with it".

Although continuing education appears to provide a solution to this problem, the Dalton-Thompson study found no correlation between performance rankings of engineers and courses taken in the previous three years. Company managers suggested that after a man's performance ratings declined, he started taking courses, but by then it was too late. Other evidence is available which shows that those engineers who seek and receive the Master of Science degree attain their performance peak ten years later in life than the Bachelor of Science degree holders, who peak in their late thirties. Thus, seeking and acquiring the Master of Science degree is definitely effective against obsolescence, while continuing education courses, by comparison, are relatively ineffectual--particularly after an engineer has passed his peak.

There are a number of national pressures and needs affecting practicing electrical engineers, which may cause them to pursue continuing education. For example, there are pressures from consumer groups regarding technical registration exemption clauses and the legal liability of practicing engineers. If these groups are

successful, all electrical engineers will have to be registered professional engineers. This implies that corporate engineers will be legally responsible for their engineering designs.

Other professions have developed programs to motivate and reward a member's continuing education efforts. The Physician's Recognition Award is now required in some states before relicensing physicians for continued practice. The Minnesota Bar Association requires forty-five (45) hours of formal course work every three (3) years before relicensing. The Minnesota dentists have had a statutory continuing education requirement since 1969.

The legislatures of Ohio, Iowa, and California are requiring all licensed professionals to develop programs by 1976 that will provide proof of up-to-date technical competence by each practitioner before relicensing. This proposed IEEE Validation Program should provide practicing electrical engineers with the ability to respond to these legal requirements for practicing their profession.

Virtually all technical societies are concerned with motivating the continuing education activities of their members and rewarding their efforts. The American Society for Quality Control certifies quality engineers and reliability engineers based on an examination and other requirements. Over 10,000 members of the 40,000-member Society of Manufacturing Engineers (SME) have become certified in various areas, including electrical and electronic manufacturing, based on a grandfather clause or other criteria.

Of the engineering founder societies --- the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Chemical Engineers, the American Institute of Mining Engineers, and the Institute of Electrical and Electronic Engineers --- only the IEEE has formulated a specific program, which they are now ready to implement on a pilot-program basis.

THE PROGRAM

There are three basic goals of this IEEE Validation Program:

1. to motivate practicing electrical engineers to pursue continuing education;
2. to provide practicing electrical engineers with proof of academic performance in their continuing education efforts, which can be used for relicensing purposes, if desired; and
3. to provide practicing electrical engineers with guidance concerning career development.

The program is called "Validation of Educational Achievement Program". It is aimed at the practicing electrical engineer. The validation will be granted to the practicing electrical engineer upon completion of an appropriate continuing technical education program consisting of at least nine (9) Continuing Education Units (CEUs) taken within five (5) calendar years.

There are only two initial basic constraints on these courses. The term CEU refers to ten (10) contact hours of participation in an organized continuing education experience taken under responsible sponsorship, capable direction, and qualified instruction. Thus, the first course constraint is built-in --- because of the definition of a CEU --- and is related to the instruction, direction, and sponsorship of the course. The second constraint is that each course must have an examination associated with it to test the learning accomplishment, and failure must be a possible outcome.

A dated validation certificate will be issued to the IEEE member upon completion of nine (9) CEUs and it will be in effect for five (5) years. Additional validations may be sought at any time, and the member's record will be available at any time.

Qualifications for participation include IEEE membership standing and at least a baccalaureate degree in electrical engineering, or its equivalent. Present IEEE membership consists of approximately 50% Bachelor of Science degree-holders, 25% Master of Science degree-holders; therefore, 85% of the present IEEE membership qualify for program participation.

During the pilot-program stage, two IEEE Regions will be used for testing the program. These two Regions will be Region IV, consisting of the upper-Midwest with relatively sparse concentrations of electronics activities (Much of which is associated with the heavy industry), and Region VI, consisting of the Western states, Hawaii and Alaska with heavy concentrations of high-technology electronics industry.

A major constraint when implementing this Validation Program will be cost. The program will be implemented using existing organizations, without generating a huge new organizational structure. IEEE will provide record-keeping capabilities, and Dr. Roy H. Mattson, Department Head of Electrical Engineering at the University of Arizona, will provide direction and leadership.

Another key element --- namely, course evaluations --- will be provided by the IEEE members themselves, thereby maintaining peer evaluation of course content and quality. Courses, when first offered by an approved sponsoring agency, will be automatically accepted, provided the CEU definitions are met by the sponsoring agency. Membership evaluations will determine long-term course acceptability.

During the pilot-program effort, which is projected to be for five years, the IEEE hopes to provide its members access to the Validation Program at no expense to them. After completion of the pilot-program, operating costs will be accurately identified. Then, based on these results, the IEEE membership can be charged for this service. The final evaluation of the effectiveness of the Validation Program will be membership acceptance within the IEEE and the degree of imitation by other large technical societies.

The Validation of Educational Achievement Program will be developed within the following constraints:

1. that the IEEE Technical Groups and Societies be responsible for a validation action, thereby retaining peer evaluation;
2. that all acceptable courses have a meaningful examination to evaluate the learning accomplishment, wherein course failure is a possible outcome;
3. that each IEEE member seeking validation of their continued education efforts provide the IEEE with an evaluation of their individual courses, thereby retaining course quality control; and
4. that the Education Activities Board of the IEEE, by means of a subcommittee, provide coordination, guidance, control and leadership for the Validation of Educational Achievement Program.

It is the opinion of the IEEE Education Activities Board that validation should be made available through the IEEE because:

1. validation requires peer evaluation and recognition;
2. the technical competence available within the IEEE membership must be applied through the validation process;
3. validation could, and perhaps should, be used by State Boards of Registration as a partial solution to their problems concerned with relicensing; and
4. the IEEE should provide its membership with an opportunity to seek peer evaluation guidance and recognition through validation.

It is anticipated that the Validation of Educational Achievement Program will operate in the following manner: first, the IEEE will initiate a program through advertising in the IEEE Regions IV and VI of the United States. Those IEEE members interested in having validation of their continuing education program will submit proof of their participation in approved courses. These courses must meet the guidelines to be recognized in terms of required CEUs. The member will participate in the course and then evaluate the course in terms of its effectiveness. Allowable courses will include: short-courses, seminars, audio-visual courses, and virtually any type of learning experience that has some form of examination associated with evaluating the learning accomplishment of the student.

It is planned that each IEEE Group and Society will develop their own sequence of courses which will be publicized, thereby providing the IEEE membership with guidance concerning their career goals in specific technical areas. During the pilot-program phase, it is anticipated that the Validation of Educational Achievement Program will retain a considerable degree of flexibility, which will allow the shifting of requirements as a function of the IEEE membership input. In other words, as more is learned about the effectiveness of the program as well as the desires of the IEEE membership, it will be incorporated into the program.

NOTES FROM SEQUENCY UNION



by
G.R. Redinbo

The following article which reports on the special session on Sequency Techniques, 1975 EMC Symposium and Exhibition, Montreux, was written by Dr. Heinz Hubner, Research Institute of the Telecommunications Center of the Deutsche Bundespost, Federal Republic of Germany. Dr. Hubner is an early and prominent researcher on Walsh functions and sequency techniques.

ON ADVANCEMENT IN THE FIELD OF SEQUENCY ENGINEERING

In natural sciences, principles and methods have been known for a very long time, which are not based on sinusoidal operations. They can be regarded as the beginnings of sequency engineering. As early as the middle of the last century, some mathematicians took an academic interest in discrete sets of functions which became the basis of sequency theory. Modern sequency engineering is a creation of the early sixties. Theoretical papers for the completion of the theory of sequency functions and practicable proposals for their technical utilization paved the way for intensive research activities which quickly crossed the borders of the German speaking countries, producing widespread ramifications. Research was concentrated more and more in the United States. The newly gained knowledge was so extensive that, for its presentation, congresses of international impact were organized annually in the United States on the progresses of sequency engineering. In addition, meetings were held in England and India as well as special sessions at more general international congresses.

They were organized largely on the initiative of the Sequency Union founded in 1971 which - as a Specialist Working Group of the EMC-Group - has the task to serve as a forum for discussions of sequency engineering innovations among scientists and engineers.

This year, the Sequency Union has organized another meeting, the Special Session on Sequency Techniques, which was held on two days late in May at Montreux, Switzerland on the occasion of the first international symposium on electromagnetic com-

patibility. The session offered the opportunity to report on new achievements and to have discussions with experts and scientists. Among the 15 papers read there were 12 from German speaking countries. These contributions are a good illustration of the present research activities in this part of Europe. The papers included proposals for both the generalization and completion of the sequency theory and for sequency engineering applications in the processing of speech, control and radar signals as well as facsimile and video signals.

The beginning of the Special Session on Sequency Techniques was marked by a contribution by P.L. Butzer, H.J. Wagner and W. Splettstober, Lehrstuhl A für Mathematik der Technischen Hochschule Aachen, F.R.G., on the role of Walsh and Haar functions in dyadic analysis. The basis of this analysis are the dyadic differentiation and dyadic integration as the inverse operation. At first, they had only been defined for Walsh functions which are not differentiable in the classical sense. The authors succeeded in extending the dyadic concept to other pulse-shaped sets of functions. Above all, they embedded in dyadic analysis the set of Haar functions which seems to be well suited for technical applications.

In his consideration of a concept of frequency in dyadic analysis, J.E. Gibbs, National Physical Laboratory, Teddington, England, approached a similar subject. In classical engineering analysis, differentiation and local frequency are closely related concepts. Gibbs extended this relation to complex-valued functions which are defined on dyadic groups and showed that the dyadic group appears to be the only such group to have two distinct complexes of differentiation-frequency concepts. G. Berauer, Institut für Elektrische Nachrichtentechnik, Technische

Hochschule Aachen, F.R.G., developed ideas on a generalization of discrete Walsh functions. For the description of functions, he used function spaces and algebraical fields with generalized definitions of completeness and orthogonality. The Walsh functions generalized in a suitable way have properties which open up new possibilities for signal processing.

H. Kremer and H. Gethoffer, Fachbereich Nachrichtentechnik der Technischen Hochschule Darmstadt, F.R.G., introduced a unified representation of Walsh functions and convolution transforms. They showed that Walsh functions in binary, sequency and Kronecker ordering are characters of a dyadic group. These group properties allow dyadic convolution matrices to be defined which can be diagonalized by a finite Walsh transform. This yields a dyadic convolution algebra with an isomorphic spectral correspondence.

The contribution by F. Pichler and B. Quatember, Lehrkanzel fur Systemtheorie, Hochschule Linz, Austria, dealt with possibilities for implementing dyadic correlators which are important tools for the analysis and synthesis of signals. Depending on the specific requirements, the dyadic correlator can be constructed either in the spectral domain or directly in the time domain. The presented solution is implemented in the time domain. The correlator works as a micro-processor on a purely digital basis.

N. Ahmed and T. Natarajan, Departments of Electrical Engineering and Computer Science, Kansas State University, Manhattan, Kansas, U.S.A., presented a sequency power spectrum for the discrete cosine transform, which can be used for signal processing. It is an amplitude-modulated version of the Walsh transform spectrum. Because of the close correspondence, it is easily possible to define sequency power and phase spectra.

Radar systems using non-sinusoidal carriers were dealt with by H.F. Harmuth, Department of Electrical Engineering, The Catholic University of America, Washington, D.C., U.S.A. As he pointed out, theoretical considerations promise possibilities of improving traditional radar systems, both with respect to the relative range resolution and the Doppler resolution. Furthermore, this approach allows reflectors to be discriminated from scatterers and conductors from insulators. According to this theory, the reception diagrams can also be considerably improved.

An account of optimal control algorithms in the sequency domain of the Walsh transform was given by H. Burkhardt, Institut fur MeB- und Regelungstechnik, Universitat Karlsruhe, F.R.G. These algorithms are optimally adapted to the piecewise constant control signals occurring in control systems using digital process computers and, consequently, their numerical behaviour is better than that of algorithms based on block pulse or sinusoidal functions. These advantages were illustrated by examples of time-varying weighting matrices for fixed and free-end problems as well as for the tracking problem.

U. Kraus, Institut fur Technische Elektronik, described in his contribution the principle of, and results obtained, in experiments with another type of two-dimensional picture transform based on Walsh functions. In this procedure, a fast digital computing device performs a spectral analysis of subframes of 4 x 4 picture elements from broadcast standard television pictures. This is followed by the filtering of coefficients and retransformation into pictures at the receiving end.

The last contribution was a report on the application of the discrete Walsh transform to the minicomputer evaluation of electroencephalograms. G. Landwehr, Gesellschaft fur Mathematik und Datenverarbeitung, Bonn, F.R.G., pointed to general difficulties in signal analysis using the discrete Walsh transform. They arise from the lack of a simple formula for the arithmetic shifting of Walsh functions, which considerably reduces the advantage of the faster algorithms for Walsh functions. Above all, the sequency power spectra of encephalograms do not show any properties - in comparison with the corresponding frequency power spectra - which contribute to a better biological or medical understanding of them.

There will be a further opportunity to report on new results obtained in the field of sequency engineering and to have talks with engineers and scientists at the Symposium on Theory and Application of Walsh Functions. It will be organized on July 1 and 2, 1975 at Hatfield, Herts., England, by the Hatfield Polytechnic conjointly with the UKRI section of the I.E.E.E. and the I.E.E. Like its predecessors, the symposiums organized by the Hatfield Polytechnic in 1971 and 1973, this congress will have international reputation.

H. Hubner

A special convention record of the 15 papers presented at the Montreux special session is available through Dr. G.R. Redinbo. A nominal charge of \$5.00, to defray copying expenses, is requested. Make all remittances payable to the Sequency Union.

An error was made in transcribing the tutorial article, "Piecewise Linear (PL) Basis Functions" by Dr. Clayton Paul, which appeared in the last newsletter. I apologize to the author and readers for any inconvenience or distress that this omission might have caused. G.R. Redinbo

The omission begins with the fourth (4) sentence in the third (3) paragraph of the first column on page 14. It should read as follows (underlined items are the omissions):

"As a rather trivial example, it would certainly be more efficient to expand a single frequency sinusoid in a Fourier series rather than a Walsh series since only one term would be required in the Fourier series. On the other hand, a periodic square wave would be more efficiently expanded in a Walsh series rather than a Fourier series since only one term would be required with the Walsh series."

INSTITUTIONAL LISTINGS

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

AEL SERVICE CORP., Subs. of American Electronic Labs., Inc., Richardson Rd., Colmar, Pa. 18915

EMI/EMC, shield. enc. consult. test. & anal.; Scrn. rm. (incl. for large veh.); Comp. instr. for Mil. EMI test.

ATLANTIC RESEARCH CORP., Advanced Programs, 5390 Cherokee Ave., Alexandria, Va. 22314
Telephone (703) 354-3400

Services in the Areas of EMC, TEMPEST, and Radiation Intelligence. Fixed and Mobile Facilities Operating to 40 GHz.

ELECTRO-METRICS, Div. of Penril Data Communications, Inc.
100 Church Street, Amsterdam, N. Y. 12010

Interference Analyzers and EMI Test Systems, MIL-STD and CISPR, Semi-automatic, Automatic, or Computer-Controlled, with complete accessories, 20 Hz to 12.4 GHz.

GLENAIR, INC., 1211 Air Way, Glendale, Calif. 91201
Telephone (213) 247-6000

EMI/RFI Connector accessories and assemblies; EMP interface assemblies; EMI/RFI cable assemblies.

ELECTROMAGNETICS, INC., 6056 W. Jefferson Blvd., Los Angeles, Calif. 90045
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