IEEE

NEWSLETTER

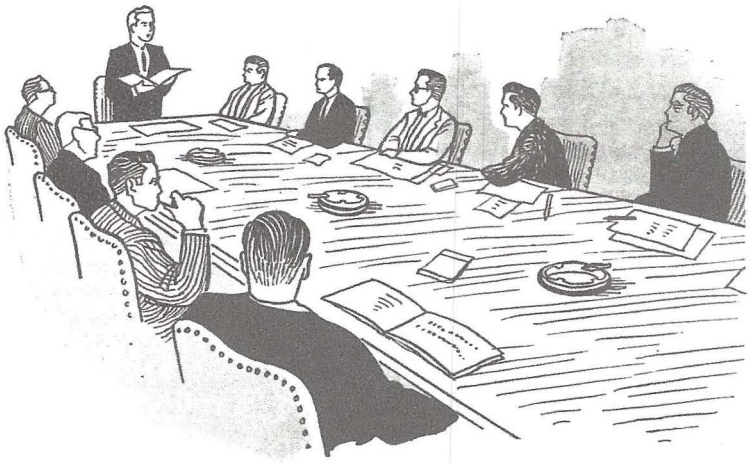
ELECTROMAGNETIC COMPATIBILITY GROUP

ISSUE NO. 50

Rexford Daniels, Editor
Monument Street, Condord Mass.

OCTOBER 1967

HIGHLIGHTS OF WASHINGTON SYMPOSIUM July 18-20, 1967



The EMC Symposium was a great success in attendance and financially and a final report is being prepared for presentation to AD COM at the next meeting scheduled during the Eastern Convention of G-AES, October 16-18, 1967, in Washington.

Attendance

Paid Attendance	631	
Committee and Speakers	110	est.
Exhibitors	90	est.
Registered for Exhibits only	275	
Total Attendance	1106	

NEW ADCOM MEMBERS

The following five members have been elected for the term beginning January 1st, 1968 to December 31st, 1970:

R. M. Showers
H. Garlan
F. J. Nichols
J. Roman
J. E. Maynard

A Tribute to Charles A. Gregory

Charles A. Gregory died on September 1, 1967 at his home. He was Chairman of the Washington Chapter of IEEE G-EMC in 1966; Assistant General Chairman of the 1967 EMC Symposium in Washington, July 1967, and a member of the Administrative Committee of the IEEE G-EMC Group. He was an electronics engineer on the engineering staff of Atlantic Research Corp., Alexandria, Virginia. Previously, on retirement from Civil Service with the Army in 1962, he had received the Army award for "Sustained Superior Performance" and the "Decoration for Meritorious Civilian Service."

EMC can ~~can't~~ ill afford to lose such an outstanding member who gave so much of himself in our behalf. The outstanding success of the 1967 Symposium, at which the military was welcomed back as participants, is a fitting tribute to his vision and effort. Our sincere sympathies are extended to Mrs. Gregory and his family.

Chapter Activities

Binghamton:

A meeting was held on May 24, 1967, at which Admiral T. J. Rudden, Jr., U. S. Navy, Washington, D. C., spoke on "Organization/Operations - U. S. Navy Material Command"

Boston:

A meeting was held on May 17, 1967,and Mr. Rexford Daniels, Interference Consultants, Inc., Boston, Mass. gave a talk on "Nature, The New Interface in Electronics."

Metropolitan New York:

There was a meeting on February 21, 1967, and Mr. Ralph Cacase, Fairchild Space & Defense Systems, Syosset, N. Y., spoke on "A Simple Test Fixture for Bonding Impedance Measurements."

Another meeting was held on May 11, 1967, and a talk was given on "Gasketing and Gasketing Techniques" by Mr. Willem Bakker, Metex Corporation, Clark, N. J.

New Jersey Coast:

A meeting was held on May 9, 1967, and a talk was given by Chief Master Sergeant T. J. Hibbard, Griffiss Air Force Base, Rome, New York, on "Interference Problems in South East Asia."

Seattle:

Two meetings have been held by this Chapter. On March 2 1967 Messrs. James Stannard and Don Baer, Seattle City Ligh spoke on "City Light's Approach to EMC."

On April 26, 1967, there was a panel discussion on "Curre EMC Group Activities". Mr. John Lee, Boeing Supervisor in Missile & Information Systems Division and also Editor of the Data Link, Local Seattle Section IEEE Publication, spoke on current activities and responsibilities of Data Link and the IE Mr. Richard Schulz, Boeing Supervisor in Commercial Airpla Division and also Chairman of 1968 EMC Symposium Steering Committee spoke on progress of the 1968 Symposium to date.

Washington, D. C. & Baltimore:

There was a meeting held on June 1, 1967, and Mr. Aaron Sullivan, Jr., Executive Office of the President, Telecommu cations Management, Washington, D. C., gave a talk on "IEE EMC and You."

Notes of Washington Meeting

G-EMC CHAPTER CHAIRMEN WASHINGTON, D. C.
19 JULY 1967

The Chairman of the Administrative Committee, IEEE Group on Electromagnetic Compatibility met with the Group Chapter Chairman to discuss items of mutual interest, become acquainted with the functions and responsibilities of Group Chapters and of the Group Administrative Committee and improve liaison between them.

Chapter Chairmen Present:

Alfred W. DiMarzio	Boston
Steve Dyrnes	Seattle
J. F. Fischer	Los Angeles
R. D. Goldblum	Philadelphia
F. S. Marshall	Washington
H. Dean McKay	Cape Canaveral
Glenn R. Rowe	Huntsville
Victor Turesin	San Francisco

Other G-EMC and IEEE Members present:

A. H. Sullivan, Jr.	Chairman, Ad Com
Z. V. Grobowski	Eastern Chapters Chairman
Clarence J. Saunders	Washington Chapter
Leonard W. Thomas	Secretary, Ad Com
H. M. Schlicke	Milwaukee
L. Glen Whipple	Washington

1. The matter of Chapters converting to the calendar year was discussed, and it was thought probable that Chapters would follow the lead of the respective Sections in this conversion.

2. It was reported that the Los Angeles Chapter was bringing in groups and individuals from outlying locations such as Santa Barbara, San Diego, etc., and that the Los Angeles Chapter Chairman is the liaison between their Chapter and the Ad Com.

3. The Seattle Chapter reported that a solution to the previous problem of securing speakers had been found by following the lead of the Los Angeles Chapter in scheduling a visit to a brewery. The Seattle Chapter was believed to be the strongest in that area. Liaison with the Ad Com is performed by the Chapter Chairman.

4. The membership of the Philadelphia Chapter is widely dispersed, making it rather difficult to set up convenient meeting places. A suggestion was made that the Philadelphia Chapter consider luncheon meetings. It was pointed out, however, that there may be some difficulty in members getting away for lunch. Another suggestion was made that they consider planned tours. Liaison with the Ad Com is performed by the Chapter Chairman.

5. The Boston Chapter Chairman reported the need of re-vitalizing the Chapter. Their greatest need was that for a secretary, for which they intend to solicit student chapters.

6. The Washington, D. C. Chapter meetings are announced ahead of time, and just prior to each meeting a post card is sent out by IEEE Headquarters which requests that reservations be made for the (luncheon) meeting. Two days prior to the meeting telephone calls are made to prospective attendees to secure additional reservations, Guests are invited to these meetings. Five meetings are planned for this year. They will be held every other month. Liaison with the Ad Com is good. The EMC Chapter is spear-heading the Washington Section Annual Awards Banquet.

7. Mr. Turesin of the San Francisco Chapter reported on his efforts to obtain membership address lists in that area for mailing meeting announcements. He had obtained such a list from the IEEE Section office in Palo Alto, but found that approximately 50% of the addresses were incorrect. It was noted that apparently many engineers frequently move and they do not always advise IEEE Headquarters of their new addresses. That coupled with the system delays in getting address changes out to the sections would account for some of the wrong addresses. It was suggested that Chapters directly contact IEEE Headquarter for current membership lists. An observation was made that when Chapter meetings were well publicized, they were well attended.

8. Mr. McKay reported that the Cape Canaveral Chapter had not been too active during the past year, but it had now been re-organized. Plans had been made for six meetings for the coming year, and there was interest in the outlying areas. Luncheon meetings were held, but something more was needed. It was suggested that they exchange speakers with other chapters in the southeastern area. Also, the Chapter could consider supporting a symposium in the future.

9. Mr. Rowe of the Huntsville Chapter reported that he had not heard of the Group Administrative Committee until last year, and will in the future attempt to more thoroughly indoctrinate Chapter officers. He could use some help in suggestions for speakers since they were not well acquainted with people in the EMC community. This Chapter plans 5:00 pm meetings with a 2 hour technical session, followed by a social hour at another location.

10. During and after the preceeding Chapter reports various suggestions were advanced for improving Chapter effectiveness and their liaison with the Administrative Committee.

a. Chapter - Ad Com liaison on IEEE awards should be improved. The Ad Com needs the "feedback" from chapters to determine whether Group members are being adequately serv Nominations for Awards should be received by the Ad Com from the Chapters. Chapters should each designate a person to estab awards liaison with Mr. James S. Hill, Chairman of the Ad Com Awards Committee. In this connection, a recent Ad Com Chairman's letter to all chapter chairmen included a list of available IEEE awards and proposed such liaison. This list will also be sent to new chapter chairmen.

b. Monthly contact via telephone between chapter chairmen and the Ad Com chairman was proposed. Two liaison people are already designated, Mr. Grobowski for East Coast Chapters and Mr. Maynard for West Coast Chapters. The chapter chairmen in these two areas should designate the points of contact within the respective chapters who will maintain this monthly contact with the East Coast/West Coast chairman, who will, in turn report to the Ad Com Chairman. The invoices for these telephone contacts will be forwarded to the Ad Com Treasurer, Mr. R. B. Schulz, who will approve them for payme by IEEE Headquarters. Those present concurred with this monthly telephone contact.

c. An address list, indicating membership of the Administrative Committees and Chapter Chairmen was distributed. It was found that the names and addresses of many of the Chapter Chairmen were incorrect, and many corrections were made. The Ad Com Chairmen requested that, in addition to IEEE Headquarters, he be provided with further address corrections in order that a correct list may be published and distributed.

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d. The matter of Chapter projects was discussed. It was noted that the Chicago Chapter had conducted an EMC Training Course which was well attended. A suggestion was made that students in colleges and universities having IEEE student chapters should be advised of EMC problems and the work of the IEEE EMC Group-Contacts with the Student Chapter Advisors could be made by the local chapters.

e. There is need of a better "sales pitch" to management on the importance of EMC. Present technical meetings are not fully effective, and do not reach the administrative and managemen levels where decisions are made.

A. H. Sullivan, Jr.
Chairman,
Administrative Committee

New Philadelphia Chapter Newsletter. . .

1971 Symposium: The Philadelphia GEMC Chapter has petitioned the ADCOM to host the 1971 EMC Symposium. The 1968 Symposium will be held in Seattle, 1969 at Fort Monmouth and 1970 in Los Angeles. The Washington Chapter has also petitioned for the 1971 Symposium even though they were hosts this year. It appears that four years advance planning is not too much. In support of the petition, a Symposium Coordinating Committee has been found consisting of thirteen members. If we are successful in obtaining the symposium, this committee will meet early next year to organize and plan its efforts.

EMC Awards: A local EMC awards committee is being formed consisting of past chapter chairmen. This committee will review the contributions made by individuals in the field of EMC, and will make recommendations to the EMC ADCOM awards committee. They will also consider local chapter awards for technical contributions and service to the Community.

Symposium Record: The 1967 EMC Symposium recently held in Washington, D. C. was a financial success. As a result, the Symposium Record will not just consist of abstracts as in past years, but will contain the complete papers. All members of the GEMC will receive copies.

Next Meeting: The first meeting of the new season will be held at Philco-Ford, Wissahickon Ave., on Oct. 3. Topic-"The Selection of Suppression Components" by Sam Burruano. Included will be a tour, cocktails, and meet-the-speaker dinner. Watch for your official meeting notice and plan to be there.

International: There has been considerable discussions pertaining to International participation in Group Symposia. There are over 80 GEMC members located in 19 foreign countries, the largest being Japan with 40 members.

Meeting Time: The Washington GEMC Chapter conducts luncheon meetings with a great deal of success. We have considered holding a luncheon meeting in Philadelphia, but this idea lacks the required enthusias, of our membership. The Washington GEMC membership stands at 154, (the largest EMC Chapter in existance) many of whom are Government employees.

New Publications: A report entitled "Historical Analysis of Electromagnetic Interference Limits" prepared by C. B. Pearlston, Jr., of Aerospace Corp. has been released by the Air Force. The report goes back to the origin of the interference specifications explaining how interference limits were first derived. It shows the original correlation between broadband and narrowband limits, and how the correlation has since vanished. The report is, as the title indicates, a true historical analysis starting with JAN-1-225 and MIL-1-6181, and leading up to the proposed MIL-STD-461. The report is identified as Aerospace Report No. TR-1001-(2307) -12 and AF report no. SSD-TR-67-127 dated April 1967. Mr. Pearlston has been invited to present his report to our membership (he presented this report at the SAE Committee AE-4 Conference on Electromagnetic Compatibility on May 24, 1967 in Dayton, Ohio) but will be unable to make the trip from El Segundo, Cal. to Philadelphia. (See also Historical Analysis of Electromagnetic Interference Limits - by C. B. Pearlson, Jr.)

Transactions: The next two EMC transactions will be concentrate on specific subjects, "Shielding" and "Filters" respectively. Following these issues, the subject matter will again assume a general nature. More papers are needed for the Transactions! If you have written a paper, or would like to write a paper on a related subject in the EMI/EMC field, please contact your Newsletter editor for further information. Editors for special subject transactions are also needed.

Volunteers: The EMC ADCOM would like to have additional help in the form of participation on its various committees, such as finance, technical paper review, study committees, etc. If you feel that you may qualify, please contact your Newsletter editor for further information.

Participation: Your $25.00 IEEE dues and $4.00 GEMC membership entitles you to receive Transactions and other correspondenc without exerting any effort. However, the true value of being a member can better be realized by participation at local meetin and if possible, national Symposia. By attending the meetings, you will be able to reap the rewards of meeting your colleagues both professionally and socially, and discussing mutual problem in a common language. You will be able to listen to and questio qualified speakers, and to express your opinions. Controversy is a seed of thought, a true professionalism can best be realized by participation with eventual contributions to the professional engineering community. The Philadelphia GEMC Chapter has clo to 74 members, and is the third largest EMC Chapter in existe We plan to have the best and most qualified speakers available adress us on timely and meaningful topics. Within our local membership, we have internationally known experts in the diver field of EMC, and we should be honored to have the opportunity to collectively associate with them in Group participation.

This NEWSLETTER will be sent to all members of the Philadel GEMC Chapter on a periodic basis. Its purpose is to keep the membership informed of news and activities pertaining to EMC related fields. Non-members who wish to receive Newsletter and Meeting Announcements may have their names added to the mailing list by sending a check or Money Order for $1.00 payab to IEEE, to Miss Helen Yonan, IEEE Office, Moore School of Electrical Engineering, University of Pennsylvania, 34th and Walnut Streets, Phila. Pa. 19104.

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NOTE: The editor would like to thank the American Electronic Laboratories for their assistance and contributions in the publishing of this Newsletter.

DOD Directive No. 3222.3

RELEASED JULY 21, 1967

SUBJECT Department of Defense Electromagnetic Compatibility Program

Refs: (a) Secretary of Defense Memorandum to Secretaries of the Military Departments, "Radio Frequency Compatibility," July 19, 1960 (hereby superseded)

(b) DoD Directive 4650. 1, "Management and Use of the Radio Frequency Spectrum," August 23, 1966

(c) DoD Directive 5160. 57, "Electromagnetic Compatibility Analysis Center (ECAC)," September 23, 1966

(d) DoD Directive 4120. 3, "Defense Standardization Program," April 23, 1965

I. PURPOSE

A. This Directive establishes an integrated Department of Defense program, hereafter referred to as the "DoD Electromagnetic Compatibility Program (EMCP)," to ensure electromagnetic compatibility of all military communications-electronic equipments, subsystems, and systems during conceptual, design, acquisition, and operational phases.

B. This Directive assigns specific or joint responsibilities to DoD components for leadership in each of the program areas of standards and specifications, measurement techniques and instrumentation, education for EMC, data base and analysis capability, design, concepts and doctrines, operational problems, and test and validation capability.

II. CANCELLATION

Reference (a) is superseded and cancelled.

III. DEFINITIONS

A. Electromagnetic Compatibility (EMC) is the ability of communications-electronics (C-E) equipment, sub-systems and systems to operate in their intended operational environments without suffering or causing unacceptable degradation because of unintentional electromagnetic radiation or response. It does not involve a separate branch of engineering but directs attention to improvement of electrical and electronic engineering knowledge and techniques to include all aspects of electromagnetic effects.

B. Design Compatibility is EMC achieved by incorporation of engineering characteristics or features in all electromagnetic radiating and receiving equipments (including antennas) in order to eliminate or reject undesired signals, either self generated or external, and enhance operating capabilities in the presence of natural or man-made electromagnetic noise.

C. Operational Compatibility is EMC achieved by the application of C-E equipment flexibility to ensure interference-free operation in homogeneous or hetrogeneous environments of C-E equipments. It involves the application of sound frequency management and clear concepts and doctrines to maximize operational effectiveness. It relies heavily on initial achievement of design compatibility.

IV. OBJECTIVES

The objectives of the EMCP are:

A. Achievement of electromagnetic compatibility of all electronic and electrical equipments, subsystems and systems, produced and operated by components of the Department of Defense, in any electromagnetic environment. Operational compatibility is part of and the paramount focus of, this objective.

B. Attainment of built-in design compatibility rather than use of after-the-fact remedial measures.

C. Fostering of common DoD-wide philosophies, approaches and techniques in the design, production, test and operation of C-E equipments.

V. POLICY

A. Policy Guidance: Detailed policy guidance for the EMCP shall be provided jointly by the Director of Defense Research and Engineering, and the Chairman, Joint Chiefs of Staff, or their designees, on a continuing basis as outlined herein.

B. Program Areas: This program shall include, but not be limited to, efforts in the following areas:

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1. Standards and Specifications.

   a. Adequate and useful military standards and specifications for design, development, procurement, production, test, measurement, etc., related to EMC shall be developed. This shall be done in accordance with Reference (d), the Department of Defense Standardization Program.

   b. Adherence by all DoD components to all EMC standards and specifications shall be mandatory for the applicable operational C-E equipments, subsystems and systems unless duly waived.

   c. Where required standards and specifications for EMC do not exist or need correction, they shall be developed or updated promptly.

   d. Authority for waiver control over any of the EMCP standards and specifications shall rest at a level as determined by the Secretary of the Military Department or Agency Director concerned for intra-service equipment environments. This authority shall be delegated with careful discretion to prevent evasion of the EMC standards and specifications.

2. Measurement Techniques and Instrumentation. The future of electronic design and electromagnetic analysis depends directly upon use of the best instruments and techniques. These are the basic tools of electronic and electrical engineering: not special EMC instruments and techniques. Measurements made in determining compliance with standards and specifications indicate the degree of success in equipment design. Measurements made in the field or in emulated environments establish analytical prediction confidence levels.

   a. Every effort shall be made to develop reliable measurement techniques and equipment with the sensitivity, accuracy, range and stability required to provide meaningful electromagnetic data and facilitate the extension an application of EMC standards and specifications.

   b. Automatic control and all electronic measurement techniques and instruments shall be used to the maximum practical extent to reduce operator errors and measurement costs.

3. Education for EMC. Awareness of the effects of EMC deficiencies on the part of all DoD personnel concerned with the design, development, production, test, operational use and maintenance of military C-E equipment shall be attained through:

   a. Training of designers and engineers in the design and production methods and techniques for achieving EMC.

   b. Training of operating and maintenance personnel in field techniques to optimize EMC.

   c. Emphasis on engineering for EMC as a refinement and much needed improvement in basic electronic and electrical engineering techniques.

4. Data Base and Analysis Capability. Acquisition of effective data bases and mathematical and statistical tools for electromagnetic analysis of any C-E component, circuit, equipment, subsystem, system, environment, concept or doctrine and the ability to apply these tools to predict, prevent and correct incompatibilities will require:

   a. A DoD wide data collection and verification plan to ensure complete and current data bases adequate to the description of any probable C-E environment in significant technical and operational detail.

   b. Common data processing and analytical techniques to provide rapid and timely summaries of data and analysis of equipments within known or expected environments, site selection and evaluation, analysis of concepts and doctrine for the use of C-E equipment in support of military operations and solution of existing operational problems.

5. Design. Research, development, test and evaluation (RDT&E) to evolve techniques, circuits and components designed from conception to achieve EMC is the basis of design compatibility. This requires emphasis on constant attention to EMC factors in all component, circuit and equipment RDT&E projects.

6. Concepts and Doctrine. Development of concepts and doctrine which will consider EMC factors in the field employment of C-E equipments, subsystems and systems and will minimize the impact of interference effects, will require:

   a. Analysis for EMC of all current and proposed concepts and doctrine in the earliest possible time frame to ensure that they will not be invalidated by degradation of sensors or communications equipment due to mutual or external interference.

   b. Consideration of EMC factors in war gaming to ensure awareness of the total electromagnetic environment in the evolution of new concepts and doctrine.

7. Operational Problems. Development of a capability for detecting, reporting, solving and correcting current time frame operational EMC problems will require:

   a. Procedures for detecting and channels for reporting electromagnetic incompatibilities which degrade combat effectiveness in the field.

   b. Application of existing measurement and analysis techniques to identify the sources of the problems and determine corrective action.

   c. Procedures for rapid implementation of required corrective action.

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8. Test and Validation. To establish confidence in EMC design standards and specifications and EMC analysis and prediction efforts, field engineering test facilities are required to provide:

a. Problem parameter measurements.

b. Evaluation of EMC analysis and predictions in appropriate (real or emulated) environments.

VI. RESPONSIBILITIES

A. The Director, Defense Research and Engineering, and the Chairman, Joint Chiefs of Staff, or their designees, are responsible jointly for continuous surveillance of the ECMP. They shall provide specific direction as necessary to ensure a well-coordinated, current and vigorous program and achievement of the EMCP objectives.

B. Responsibilities of other DoD components are as follows:

1. Standards and Specifications.

a. The Secretary of the Navy, or his designee, shall be responsible for developing and maintaining a coordinated plan to provide a complete range of component, circuit, equipment, sub-system and system EMC standards for the Department of Defense. Related standards for prediction, measurement and validation of EMC shall be included. This responsibility assignment will be made by ASD(I&L) upon publication of this directive in accordance with reference (d) as an area assignment.

b. The status of this assignment shall be reviewed yearly in January by the DDR&E or his designee for the EMCP and specific direction provided if required.

c. All DoD components shall cooperate in this effort, and shall ensure that all C-E specifications cite appropriate EMC standards developed here-under.

d. Where EMC standards are required but do not exist, the responsible DoD components shall take positive action through the Department of the Navy to initiate a standard. Pending issuance of a standard, each C-E specification shall contain detailed requirements which, in the opinion of the cognizant DoD component will ensure both design and operational electromagnetic compatibility.

2. Measurement Techniques and Instrumentation.

a. The Secretary of the Army, or his designee, is assigned responsibility for developing and maintaining a coordinated plan stating the needs of the DoD components for electromagnetic measurement techniques and instrumentation. This effort shall be coordinated closely with ASD(I&L) and Department of the Navy planning for standards and specifications and with Department of the Air Force planning for data base and analysis capability.

b. The Director of Defense Research and Engineering, or his designee for the EMCP shall review the plan yearly in May (simultaneously with the test and validation plan specified in VI. B. 8. below) and, if required, designate DoD components to proceed with development of specific items.

c. All DoD components shall cooperate in this effort and ensure that their RDT&E programs contribute to and do not duplicate planned efforts.

3. Education for EMC. Each DoD component shall be responsible for:

a. Ensuring that properly balanced emphasis on EMC is included in all formal courses in design, maintenance, and operation of C-E components, circuits, equipment sub-systems, and systems conducted within their organization.

b. Maintaining current handbooks describing the most effective techniques for meeting the Standards for EMC. Adoption of other DoD component handbooks which are adequate is encouraged.

c. Ensuring adequate participation by appropriate members of their Departme or Agency in the symposia, conferences and other professional activities of the industry organizations and technical societies concerned with EMC and complete electronic engineering.

4. Data Base and Analysis Capability.

a. The Secretary of the Air Force, or his designee, is assigned responsibility for development of a coordinated plan for development of EMC analysis capabilities and use of the EMC data bases.

b. The DDR&E and the Chairman, JCS, or their designees for the EMCP, shall review the plan yearly in October and, if required, designate DoD components to carry out specific requirements of the plan.

c. The Chairman, Joint Chiefs of Staff, or his designee for the EMCP, is assigned responsibility for developmen of a joint plan for collection of EMC data bases. This shall specify EMC program needs for equipment spectrum signatures, characteristics, locations and operating plans.

d. The Department of the Air Force, designated the management agency for the Joint DoD Electromagnetic Compatibility Analysis Center (ECAC) by reference (c), shall ensure that this center shall be the DoD focal point of joint analysis for the EMCP and that proven analytical capabilities of the DoD components are included in the DoD EMCP.

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e. All DoD components shall cooperate in this effort and be responsible for:

(1) Maintaining the ECAC data bases complete and current with regard to all equipments, sub-systems and systems developed or operated by their component.

(2) Using ECAC capabilities to the maximum practicable extent, rather than developing duplicates. The requirement for development of some parallel or complementary data base and analysis capability by DoD components is recognized. The need for separate data bases should decrease as communications between data processing systems improve.

(3) Developing new data bases and analytical techniques when required for intra-departmental problems which, with minimum modification, may be exchanged with and used by the Joint DoD ECAC and the other DoD components.

f. The functions of frequency management have a strong influence on operational compatibility and require data base and analysis support. Reference (b) assigns responsibilities in this area. The DDR&E and the Chairman, Joint Chiefs of Staff, or their designee for the EMCP shall ensure that adequate data base and analysis support is provided by the ECAC to the DoD components having these responsibilities.

5. Design. All DoD components shall be responsible for EMC emphasis in RDT&E of C-E equipment, sub-systems, and systems and shall ensure exchange of information regarding results of these efforts.

6. Concepts and Doctrine.

a. The Chairman, Joint Chiefs of Staff or his designee for the EMCP shall be responsible for submission of concepts and doctrine for joint operations to the ECAC for analysis of EMC impact.

b. The DoD components shall be responsible for providing proper EMC impact consideration in the formulation of their intra-component concepts and doctrine.

7. Operational Problems.

a. The Chairman, Joint Chiefs of Staff, or his designee for the EMCP, shall be responsible for developing and implementing procedures and channels for detecting and reporting current joint operational EMC problems.

b. The DoD components shall be responsible for developing and implementing procedures and channels for detecting, reporting, solving and correcting their intra-component operational EMC problems. They shall provide feedback from this to the standards, design, concepts and doctrine, educational and analytical elements of the EMCP.

8. Test and Validation.

a. The Secretary of the Army, or his designee, is assigned responsibility for the development of a coordinated plan for test and validation requirements in support of the EMCP. This shall specify EMC program needs for:

(1) Problem parameter measurements.
(2) Evaluation of EMC analyses and predictions.

b. The DDR&E and the Chairman, Joint Chiefs of Staff or their designees for the EMCP shall review the plan yearly in May (simultaneously with the plan for measurement techniques and instrumentation specified in VI. B. 2. above) and, if required, designate DoD components to carry out specific requirements of the plan.

c. The DoD components shall be responsible for the development and operation of test and validation facilities to support their intra-component EMC requirements. These shall be developed to permit and, when necessary, shall be available for, joint use. They shall ensure service test and operational evaluations of their equipments and systems as appropriate to ensure EMC in typical operational environments and establish confidence in analyses and predictions performed.

VII. RELATIONSHIPS

A. With Other Government Agencies and the Civilian Community. Electromagnetic Compatibility problems are common to all users of the electromagnetic spectrum. A successful program must consider and serve all who use C-E equipment. Within the constraints of national security, and fund or facility availability, the capabilities attained under this EMCP shall be made available to other Government agencies and the civilian community.

B. With Electronic Countermeasures (EMC) Electromagnetic Pulse (EMP), and Radiation Hazards (RADHAZ) Program. These other programs are specific aspects of the use of or defense against effects of electromagnetic radiations. Their existence as separate programs is predicted on either military requirements or overriding urgency due to danger to personnel.

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As the ECMP progresses, it should augment, be used by, and, in some instances, be integrated with these programs. Advances in EMC should signify basic advances in electromagnetic technology. These should be shared among all programs. These other DoD programs shall be so conducted that, as a minimum, equipments and systems developed for their special purposes shall meet all applicable EMC standards of conventional C-E equipments and systems. The EMC community should be alert also for techniques developed in other programs which have general application (i. e. , ECCM techniques also effective against unintentional interference).

VIII. EFFECTIVE DATE AND IMPLEMENTATION

This Directive is effective upon publication. Two (2) copies of the implementing documents of the Military Departments and Defense Agencies shall be forwarded to the Director, Defense Research and Engineering and the Chairman, Joint Chiefs of Staff, within ninety (90) days.

HISTORICAL ANALYSIS OF ELECTROMAGNETIC INTERFERENCE LIMITS

C. B. Pearlston, Jr. , has prepared a 48-page report for the Air Force under the above title. The Introduction is as follows:

> "Within the past few years, there has been a great deal of activity in the generation of new interference specifications which, to a certain extent, have made a break with their predecessors. This trend was started by Mil-Standard-826 in 1964 (and its subsequent revision in 1966) and by the issuance of the proposed Military Standards 461 and 462. The changes in these specifications are not merely ones of organization and methods of testing, but apply to the test limits themselves. Such changes in limits lead one to question why the changes were made and, further, how the original and present interference limits were generated. To provide answers to these questions, a study was conducted to compare the various military department's interference limits, determine the degree of commonality among these limits, and see whether a reasonable criterion might be established to evaluate particular interference limits. It was necessary to trace the formative steps of establishment of interference and susceptibility limits. A continuing picture is presented of the evolution of interference limits to meet the increasingly severe conditions of crowded, electromagnetic environments.
>
> "The following paragraphs present the historical development of interference and susceptibility limits, both conducted and radiated, and describe the empirical and theoretical rationale for formulation of such limits to meet electromagnetic compatibility requirements of present-day systems design."

Copies may be obtained by writing Mr. Pearlston at Aerospace Corporation, El Segundo, California. (See also Philadelphia Chapter Newsletter, Item 7.)

TEST YOUR OWN ICs

Glen R. Madland, President, Integrated Circuit Engineering Corp. , 4900 E. Indian School Rd. , Phoenix, Arizona 85018, has written a 4-page article under the above title in the June, 1967, issue of E E, The Electronic Engineer. A paragraph of interest is as follows:

> "The small wire used for thermocompression bonding can easily be destroyed by capacitor discharge. Even static electricity generated by walking on a carpet will sometimes cause failure. Be careful in sequencing the tests so as not to cause a failure."

PROCEEDINGS OF THE IEEE - JUNE 1967

This was a special issue on Radio Measurement Methods and Standards. An article of particular interest is as follows:

Electromagnetic Compatibility Measurements
by R. M. Showers and O. M. Salati

Standards extending the frequency range of both instrumentation and techniques up to 100 MHz are being developed. Along with the spectrum signature concept, the use of automated instrumentation is becoming increasingly important. Techniques for measurement of harmonic power in a waveguide, near fields of antennas, line current, the Poynting vector, and device radiation at frequencies above 50 MHz are discussed. Chapter and paragraph headings are as follows:

Measurement Techniques
Ground Current Measurement
Waveguide Harmonics
Current Probe
Poynting Vector Measurements
Antanna Probes
Instrumentation
Spectrum Signatures
Automated Measurements

IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT - JUNE 1967

The following are articles of interest:

Another Zero-Crossing Principle for Detecting Narrow-Band Signals
by A. J. Rainal

A zero-crossing principle for detecting weak narrow-band signals immersed in Gaussian noise is described. This principle leads to a zero-crossing detector (detector II), which is also relatively insensitive to system gain fluctuations. Moreover, for the detection of a weak sine wave in noise, zero-crossing detector II performs only 1.2 dB worse than the time-honored square-law detector. An application of the zero-crossing principle to the problem of incoherent detection of a stationary radar target in clutter is discussed.

Progress in the United States on Electromagnetic Standards and Measurements at 30 kHz to 1 GHz, 1963 through 1965
by M. C. Selby

A digest of highlights is presented on the most significant U. S. contributions to the measurement of attenuation, impedance, phase, field strength, thermal noise, current, and voltage at 30 kHz to 1 GHz. Approximately 30 contributions are digested, including the following accomplishments: a supersensitive detector for a complex-insertion-ratio measurement system having accuracies of about 0.0005 dB/10 at 30 MHz; exact equations for mutual and self-inductance of various combinations of filaments, tapes, and bars; a modified twin-T bridge for measuring resistances of 100 to 10,000 ohms to 15 MHz; a set of Q-factor standards for frequencies to 45 MHz based on data and experience accumulated over five years; a unique adjustable characteristic-impedance coaxial line; measurement of Q's greater than 100,000 of cryogenic circuits at frequencies to 300 MHz; a novel T-junction to enable calibrations of voltmeters of any practicable input impedances with VSWRs ranging from 1 to 200, to 1 GHZ and higher; a miniaturized dipole-antenna field strength meter, employing a semiconducting plastic transmission line, to measure complex near-zone fields of 0.1 to 1000 volts per meter, from 150 kHz to 30 MHz; and a prototype 3-MHz model of precision thermal noise-power comparators for an equivalent noise-temperature range of 75 to 30,000°K at accuracies of 0.2 to 1 percent.

RADIO ENGINEERING AND ELECTRONICS PHYSICS - APRIL 1966

The following is an article of interest:

Optimum Reception of Signals in Nongaussian Noise
by R. L. Stratonovich, Yu. G. Sosulin

The problem of the detection of the presence of a signal in nongaussian noise is considered in this paper. The equations for optimum detection are derived for the general case in which signal and noise are assumed to be functions of continuous Markov processes. Added to the nongaussian noise is a white Gaussian noise component. A three-dimensional Markov process is formed using the signal, the nongaussian portion of the noise, and the integral of the observed waveform, from which, using the theory of conditional Markov processes, the equations for the logarithm of the likelihood ratio are developed. The optimum receiver is realized as consisting of optimum nonlinear filtering, formation of the likelihood ratio, and comparison with a fixed threshold.

The general results are applied to a special case consisting of a known sinusoidal signal and phase-modulated interference in which the modulating waveform is white Gaussian noise. The equations for the operating characteristics, in the form of the probabilities of error of the first and second kinds, are derived for this special case.

The results of this paper should be of interest to those working in the area, particularly because of the relatively straightforward manner in which the equations can be applied to specific problems, as is evidenced by the example given in the paper. - A. R. Cohen.

CONSTITUTION OF COMMITTEE AE-4, SAE

The Constitution of Committee AE-4, of the SAE, on Electromagnetic Compatibility has been drawn up and published in a booklet of 36 pages. W. D. McKerchar, Chairman, has prepare a foreword as follows:

> This presentation has been prepared to acquaint you with the Organization, Scope, and Objectives of S. A. E Committee AE-4 on Electromagnetic Compatibility.
>
> Committee AE-4 firmly believes an unnecessary void exists today in the education, communications, and approach to the control and measurement techniques of Electromagnetic Interference. Additionally, within this specialized "community" varied methods of test, terminology and analysis applications are evident.
>
> It is the intent of Committee AE-4 that S. A. E. documents, long a standard of Government and industry, be prepared by those very individuals most concerned with, and knowledgeable of, the control of Electromagnetic Interference, provide for a uniform language, prudent methods of test, and practical Interference control techniques. Of prime importance to Committee AE-4 is that such standardized documentation be consistent with the needs of Government and Industry today, and tomorrow.
>
> These pursuits then are the goals of this Chairman, his Executive Committee and the other selected individuals that serve S. A. E. Committee AE-4 on Electromagnetic Compatibility.

Copies of the Constitution may be obtained by writing Mr. McKerchar at the following address:

W. D. McKerchar, Chairman
SAE Committee AE-4
McDonnell-Douglas Corp.
D-311-33-4
P. O. Box 516
St. Louis, Mo. 63166

HOW THE WEATHER AFFECTS YOUR HEALTH

An article by Ruth Winter, under the above title, appeared in the June, 1967, issue of Family Circle. It is generally a rev of material which has previously appeared in technical publications but has one or two new discoveries which have n yet, appeared in electronic publications.

SYSTEMS SOLUTION TO EMI PROBLEM SOUGHT

Neal Sclater, East Coast Editor, Electronic Design, August 16, 1967, wrote a 3 1/2-page article on the Washington, D. C., Electromagnetic Compatibility Symposium. The sub-title and paragraphs of interest are as follows:

"The systems approach is the best way to solve increasingly complex problems of electromagnetic interference (EMI). To this end, education, measurement and conservation are areas where immediate and extensive efforts are needed.

"This was the concensus of speakers at a recent symposium sponsored in Washington, D. C., by the IEEE Group on Electromagnetic Compatibility. They emphasized that electromagnetic compatibility must in future be designed into equipment and systems, because attempts at correcting problems in the field have been largely unsuccessful.

"During the symposium the Dept. of Defense gave a briefing on its projected program to combat electromagnetic interference. DOD and military spokesmen illustrated their plight with numerous examples of the military's failure to organize frequency allocation and squelch interference.

"It was also brought out that not only was there a lack of knowledge of the cause and effect of interference in many operational situations, but also there were numerous instances where even basic preventive specifications were not followed. Contract officers waived manufacturers' obligations to meet EMI requirements for cost or schedule reasons, only to find that solving problems in the field was much more complex and costly."

LOCATE TV NOISE SOURCES WITH HIGH PRESSURE WATER SPRAY

R. E. Britt, Senior Engineering Assistant, Transmission Division, Texas Electric Service Co., Odessa, Texas, has a 1-page article in Electrical World, May 29, 1967, under the above title. Paragraphs of interest are as follows:

"An elusive case of television interference on the transmission system of Texas Electric Service Co. recently was located by use of a high pressure water spray unit. This unit was purchased specifically for safe and effective cleaning of contaminated insulators.

"The water spray method has since been used in locating television interference on both 22-kv and 12. 5-kv primary circuits. The water shorts out the arc gap instantly when directed upon the offending hardware."

TV RECEPTION BETTER OVER WATER VEINS

The May 1967 Quarterly Digest of the American Society of Dowsers, Inc., Danville, Vermont, had the following quote:

"For some reason that I don't really understand, a television antenna placed over a water vein brings in better reception than one placed off the vein."

STATIC-MAGNETIC REGULATORS - A CURE FOR POWER LINE "SPIKES"

James D. Kimball, Sola Electric Co., Div. of Sola Basic Industries, Elk Grove Village, Ill., has written a 5-page articl in Electronic Products, December 1966. This is Part 1 of two parts. Paragraphs of interest are as follows:

"Rapid changes in line voltage, of shorter duration than the response time of available regulating devices, can cause malfunctions in control systems, as well as errors in processed data. The transient voltages produced by load changes can also be injurious to sensitive circuit components, particularly semiconductors.

"Engineers are frequently deceived by readings taken on standard heavily damped voltmeters or recorders having a relatively slow response time. Rapid voltage changes of a few cycles require either oscilloscopes or special recorders, and since they occur in random time, they are difficult to detect or measure.

"For a wide variety of equipment, the source voltage must be within certain limits for line-voltage changes as short as one or two cycles. This is a problem for a voltage regulator, but in mose cases it is within the operating capabilities of a static-magnetic regulator.

There are several forms of static-magnetic regulators, but the one we will discuss here is specifically the constant-voltage transformer."

FCC ENDS HEATER INTERFERENCE TO AIRCRAFT RADIO ON COAST

Public Notice G 1844, under the above title, is as follows:

"The FCC has eliminated a serious source of interference to aircraft radio transmission in the Los Angeles and San Francisco areas.

"The interference, caused by industrial heaters, resulted in severe difficulties for commercial and private aircraft and was a matter of serious concern to the FAA.

"FCC engineers, called in to locate and eliminate the source of the interference, set up a series of spotting flights. Using direction finding equipment they were able to spot 16 heaters, 12 of which were causing interference to flight communications.

"Contacts with the firms using the heaters resulted in action being taken to eliminate the interference.

"Industrial heaters are electronic devices used in manufacturing operations requiring very rapid drying. The firms using the heaters causing the interference were manufacturers of such diverse products as plywood, plastics, rubber mats, handbags and eyeglass cases.

"The interference can generally be eliminated by shielding the heater equipment properly."

CALCULATIONS FOR EDUCATIONAL FM CHANNEL ASSIGNMENTS IN AREAS SERVED BY TV CHANNEL 6

FCC Report No. R-6702 has been released. The Introduction states:

> "In this report TV receiver performance data from various sources will be summarized and analyzed, and calculations of the extent of interference to Channel 6 TV service by Noncommercial Educational FM stations will be described.
>
> "The following analysis is treated in two aspects. First, the natural limitations for Educational FM station operation beyond the Grade B contour of a Channel 6 TV station are considered. The second viewpoint deals with the limitations on such operation within the Grade A contour. In most cases it would not be practical to operate these FM stations in areas between the Grade A and Grade B contours unless there were no TV receivers within a considerable distance from the FM station."

PROTECTION OF SEMICONDUCTOR DEVICES, CIRCUITS AND EQUIPMENT FROM VOLTAGE TRANSIENTS

Bernard Reich, Electronic Components Laboratory, U. S. Army Electronics Command, Fort Monmouth, N. J., has written a 7-page article in the Proceedings of the IEEE, August 1967, under the above title. The Abstract and first paragraph of the Introduction are as follows:

> "Abstract - In this paper a survey is presented of the means that can be applied to the suppression of voltage transients that can affect the reliability of equipment and systems employing semiconductor devices. Consideration is given to some of the ways transients are generated, their duration and magnitudes, and the approach taken in the military standard MIL-STD-704 in confining the power supply characteristics within limits which must be tolerated by the utilization equipment. Emphasis is placed on the various techniques - their advantages and limitations - that can be applied in suppressing transients generated from 28-volt dc power supplied. In addition, various device approaches used to limit voltage transients to rectifier diodes are also presented.
>
> "The biggest contributions to the unreliability of semiconductor devices applied in circuits or equipment are poor circuit design and unwanted overvoltages or transients on the devices. Poor circuit design manifests itself in the knowing or unknowing operation of the devices beyond their maximum ratings, resulting in reduced life. The other contributor to unreliability, the effects of voltage transients on devices, usually occurs unknown to the circuit designer. It is the prime purpose of this paper to consider only the latter cause of semiconductor unreliability, its origin, and measures that can be taken to increase semiconductor life by transient elimination."

CHOOSE METALS FOR COMPATIBILITY

William A. Melanson, Vice President, Cambridge Thermionic Corporation, Cambridge, Mass., has authored a page and a half article, under the above title, in Electronic Design 17, August 16, 1967, which includes a Table of Galvanically Simil Metals. The sub-title and the first paragraph are as follows:

> "Choose metals for compatibility in packaged circuits to avoid RFI, poor grounds, ground loops and stray coupling.
> "A little knowledge of metallurgy is a useful adjunct for the designer who is packaging his electronics in a metal chassis. An ill-chosen finish for a package can lead to poor grounds, ground loops, stray coupling and RFI. The wrong protective coating for this finish can introduce noise. Metal hardware performing interconnection, support, readout and read-in functions must be selected with care. And in general, the smaller a package of linear or nonlinear circuitry, the greater the problems of metal compatibility tend to become. Only the proper choice of compatibile hardware, materials and finishes can alleviate these problems. Here then are some hints on how to achieve this end."

Copies of this article may be obtained by writing Mr. William A. Melanson, Vice President, Cambridge Thermionic Corpora 447 Concord Ave., Cambridge, Mass. 02138

DESIGNING SHIELDED ENCLOSURES WITH RESONANCE IN MIND

R. D. Goldblum, American Electronic Laboratories, Inc., Colmar, Pa., has authored a single page article in the July/August 1967 issue of Frequency Magazine. The article has 3 figures, 2 of which are charts on shielding effectiveness and the 3rd is a schematic for sweep frequency measuring technique. The opening paragraph is as follows:

> "When designing a shielded enclosure to provide a low FR noise environment for tuning sensitive equipment or for performing EMI measurements, you should always consider the enclosure's resonant properties. This may sound like a truism but many engineers overlook the fact that a shielded enclosure has resonance and that resonance can cause side effects.
>
> Accordingly, if unexplained phenomena occur while you are tuning or making measurements within an enclosure, the first thing you should do is determine whether or not resonance could be causing the trouble. To determine the enclosure's natural resonant frequencies, use the formula:

$$\lambda = \frac{2}{\left[\left(\frac{i^2}{2h}\right) + \frac{m^2}{a} + \left(\frac{n^2}{b}\right)\right]^{\frac{1}{2}}}$$

DESIGNING FOR THE WORST OF WORST CASES - NUCLEAR WAR

C. F. Johnson, Systems Group, TRW Inc., Buena Park, Calif., has written a 10-page article in Electronics, August 21, 1967, under the above title. The sub-title and a section of interest are as follows:

> "With the aid of hardening techniques, circuits can be built to withstand the crippling effects of radiation, enabling electronics systems to survive an atomic holocaust.
>
> Shielding against the EMP
> "Complete electrical shielding of the electronics is the most effective method of hardening against the electromagnetic pulse. In aerospace vehicles, this isn't as simple as it sounds, because the vehicle skin isn't a continuous conductor; it is made up of hundreds of pieces of metal, and sometimes non-conductors as well, fastened together by such diverse methods as welding and cementing. The skins, furthermore, have numerous geometrical discontinuties, such as cable raceways, rocket nozzles, and access openings.
>
> "All of these odds and ends can act as antennas receiving some of the frequencies in the EMP. The current transients traverse the vehicle skin or unshielded conductors such as cables between booster rocket stages. Some of the transients will get into the circuitry. At a minimum, spurious signals run through the circuits. Integrated circuits may latch up. In extreme cases, the primary currents and the secondary currents (resulting from the effects described for gamma radiation) may cause overload failures.
>
> "Since the designer cannot trust the skin as a shield, he should shield the electronics, using the devices employed as protection against radio-frequency interference. Outside wiring should also be shielded and access openings made as small as practical. Then, current-limiting impedances should be employed to protect the circuitry against primary overloads."

IC's STALLED

Electronics, June 26, 1967, in the section "Electronics Review", page 46, has the following paragraphs of interest:

> "In Detroit, the marriage of integrated electronics and automotive equipment is turning out to be harder to arrange than anybody expected. Much to their chagrin, electronics engineers have discovered that the automobile is a torturous environment, even worse than many military atmospheres. Noise, high temperature, and vibration - plus an overriding consideration for low cost - are stretching out schedules for the introduction of integrated circuits into automotive equipment.
>
> "Electrical noise and heat are the most debilitating factors. 'The automobile is a superb generator of electrical noise,' said an electronics engineer who had predicted a quick and bright future for IC's in cars. 'Almost everything on it makes noise: spark plugs firing, brushes on motors, relays clanking open and shut, diodes reacting on the alternators, even fuel sloshing in the tanks. The spectrum runs from 10 to 1,000 megahertz,' he complained. So much noise interfers with the operation of the electronic regulator, spoiling its accuracy."

INSTRUMENT GROUNDING KEEPS SPACE SIGNALS CLEAN

H. M. Hoffart, General Electric Company, Valley Forge Space Technology Center, Philadelphia, Pa. 19101, has authored a 4-page article appearing in the August, 1967, issue of Instrumentation Technology. The sub-title and first paragraph are as follows:

> "A really low-impedance, broadband ground system is essential if large numbers of instruments are to work together without interference to each other or from power systems and natural disturbances. This is what NASA contractors have done.
>
> "Merely making a 'ground connection' to electrical equipment will not provide protection from electrical hazards for apparatus or personnel, nor will it assure equipment electromagnetic compatibility in its intended environment. Careful consideration must be given to the impedances of the ground electrodes and of the ground distributing system, to sources of energy which may upset the desired equipotential plane with unwanted and unexpected currents, and to the interaction of nominally independent grounding networks dissipating different currents. To realize a functionally adequate ground system, the design must take acco of these factors and also provide for continuing correcti and maintenance measures."

NOISE FIGURE NOMOGRAPH

In EE, The Electronic Engineer, July 1967, Gerald Beene, LTV Electrosystems, Greenville, Texas, has a single page nomograph with the following description:

> "This graph is a convenient tool for determining sensitivity, bandwidth, and noise figure. If any two are known the third can be found."

SILVER SOLDER CAN BE A HAZARD

EE, The Electronic Engineer, July 1967, has the following item of interest:

> "The Division of Occupational Health, U. S. Public Health Service, warns that improper use of silver solder containing cadmium could prove fatal. Two recent poisoning deaths have been attributed to such improper use.
>
> "Not all silver solders contain cadmium. But, when using any type of this material, follow these precautions:
>
> (1) Read and follow the warning labels, which should be on all packages.
> (2) The working area must be properly ventilated, preferably with specific exhaust systems.
> (3) Do not breathe emitted fumes."

ARTICLES OF INTEREST IN JULY 1967 PROCEEDINGS OF IEEE

The Relationship Between Noise and Impedance Matching in a Negative Resistance Amplifier - by M. L. Attanasio-D'Atri, Ist. Sup. PPTT, G. Martinelli, Ford U Bordoni, V. Trastevers 189, Rome, Italy.

> "Abstract - It is shown that a relationship exists between the impedance matching at the output port of a negative resistance amplifier and its noise performance. The class of amplifiers considered is characterized by a lossless embedding network and by negative resistances having the same noise exchangeable power."

Anomalies in Transistor Low-Frequency Noise - by T. C. Verster, National Research Inst. for Math. Sci., P. O. Box 395, Pretoria, South Africa.

> "Abstract - Accurate low-frequency noise measurements over the range of I Hz to 10 kHz on a number of different transistor types showed that the majority obey the $f^{-\alpha}$ law, the factor α being between 0. 9 and 1. 23. Certain samples, however, exhibited an additional noise component with a frequency dependence of the form $(1 + (f/fo)^2)^{-1}$.

- - - - - - - - - - -

Magnetic Field Shaping for Linear Dispersion in YIG Pulse Compression Filters - by R. W. Damon, H. van de Vaart, Sperry Rand Research Center, Sudbury, Mass.

> "Abstract - The magnetic field distribution is derived which gives linear dispersion of magnetoelastic waves in an axially magnetized YIG rod. The specific field variation for dispersion of 100 MHz/μs at a center frequency of 2 GHz is computed."

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Increased Resistance of Crystal Units at Oscillator Noise Levels - by M. Bernstein, Electronic Components Lab., U. S. Army Electronics Command, Ft. Monmouth, N. J.

> "Abstract - Problems have been experienced with inoperative military equipment which have been traced to a defect in some quartz crystal units. This defect has been determined to be an increase in resistance (loss of Q) of crystal resonators when excited at very low power levels. The typical crystal oscillator, when first turned on, excites the resonator with thermal noise and consequently the power dissipated is very small. Simple instrumentation has been assembled to show clearly the low increased crystal resistance effect. Tests have shown that surface defects, due to the final lapping process, contribute to the problem. The necessity of surface etch to remove the damaged surface layer is shown to be required to avoid defective crystal units."

DVM's RAISING HELL

Electronic Products, August 1967, in an article by George Fly Associate Editor, titled "Forum on DVM's" has the following paragraphs of interest:

> "But DVM's are active devices, not passive. They don't just sit there, frowning through it all. They're thinking and making decisions. And sometimes they'r doing things differently than you think. For example:
>
> "An engineer is testing some experimental semicondu devices having low-level electrical characteristics and a $500 price tag. After losing a few devices, he finds that spikes of up to 10 volts were coming out of the front end of his DVM.
>
> "A DVM is calibrated in an air-conditioned standards laboratory and turned over to production. Sitting next to a blast furnace it still gives 6-digit readout. You mean it ain't telling the truth?
>
> "An engineer turns on his DVM, makes one reading and walks away. The DVM clicks away for two days and nights, then quits.
>
> "Who's to blame? The users who didn't understand the DVM? The manufacturer who wrote the DVM spec that tells a lot about application but little about misapplication? The DVM salesman who sold the DVM a year before for a different application?
>
> " 'An engineer doing a particular job,' comments Richard Hartman of Electronic Specialty Corp., 'will make up his mind what the DVM requirements are from a broad point of view and then he relies on expertise both in and out of the company to make his final choice. So it is not just the user who is misapplying the equipment.' "

WHAT'S NEW IN COMPONENT NOISE EVALUATION?

Evaluation Engineering, July/August 1967, has a 2-page article with 1 Figure and 3 Tables under the above heading. The subje is on IC semiconductor devices and the sub-title states:

> "This informative article is based upon answers to questions on EVALUATION ENGINEERING Editor posed to John J. van Beuren, president, Alan P. Stans chief engineer and Richard A. Struble, assistant chief engineer, Quan-Tech Laboratories, Inc. You will wan to save it for future reference."

ITEMS OF INTEREST IN IEEE SPECTRUM, SEPTEMBER 1967

Scanning the Issues - Page 110

"Radio-Frequency Measurements. Because of the demanding re quirements of military and space applications, many important improvements have been made recently in the science and art o RF measurements, and because of their currency, many of the improvements are not yet covered by today's textbooks. Now, however, they are available for the first time in one volume, th first special issue of the Proceedings of the IEEE, July 1967, t be devoted exclusively to the extensive subject of radio-frequen measurements. . . . "

(CONTINUE

IEEE Transactions on Engineering Management, September 1967

"The Need for an Organized Approach to EMI (Electromagnetic Interference) Control, R. D. Goldblum - Electromagnetic interference control refers to the ever-increasing problem of controlling the adverse effects of EMI on electronic equipment. Atmospheric noise due to the phenomena of solar radiation and the ionosphere is one form of ambient interference, but man-made noise adds to the ambient solar interference and increases the ambient intensity by many orders of magnitude. Descriptions are given of several undesirable effects of man-made interference. The interference problem is discussed, as well as many reasons for concern. An approach to EMI control is suggested, including the outline of a proved EMI control program."

IEEE Transactions on Power Apparatus and Systems, August 196

"Effect of Station Radio Noise Sources on Transmission-Line Noi Levels - Experimental Results, J. Davey, H. L. Deloney, J. J. LaForest - Known sources (gaps) of radio noise (RI) generat were applied to a transmission line close to a station and the resultant transmission line RI levels were monitored. Measurements were in good agreement with calculated values. Measurements of station impedance were also made. The RI gaps were found to be stable and operated as constant-current generators over a considerably wide range of load impedance values."

Radio Engineering and Electronic Physics, May 1967

"Optimum Signal Detection in Non-Gaussian Noise - Detection of a Signal with an Unknown Amplitude and Unknown Phase, O. E. Antonov.

"Optimum Reception of Random Pulse Signals in Noise, Yu. G. Sosulin.

"Signal-to-Noise Ratio of a Goniometer in the Presence of an External Noise, Yu. S. Yurchenko.

"new books"

THE PHYSICS OF ELECTRICITY AND MAGNETISM

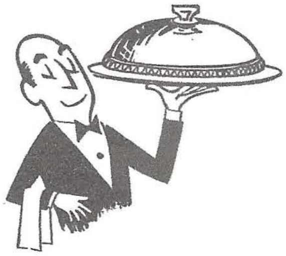
Frequency Magazine, July/August 1967, has the following book review on subject book:

"This is not a book to be casually perused by the practicing engineer - it is a book one 'reads' in the sense that 'reads' means to fully absorb its content. The book is so academically oriented that a question arises as to how much an engineer can profit by trying to study it on his own. Perhaps this is not a good thing to do as the material is quite deep and one can easily get bogged down in it.

"This is an excellent book which has had wide acceptance in academic circles as the answer to the need for a text in the Electricity and Magnetism Course. It endeavors to circumvent all the difficulties which beset a more conventional text and makes no bashful introductions into the newer concepts in physics. In fact, its approach seems so self-assured that one wonders if that is really the case or if the author is simply making an offensive action to assure that he will win over the prospective user.

"Yet this is a book to which the practicing engineer must go if he wants to replenish the springs of his knowledge. Certain sections are particularly rewarding for those persons in the RFI/EMC community who could develop their understanding of much of the empirical approach that one takes, for example, to such matters as shielding. Chapter 10 - Electromagnetic Radiation - contains a wonderful treatment of many important topics. The author discusses the propagation of electromagnetic fields, dipole and plane-sheet radiation, skin depth and skin effect and finally radiation in pipes and cavities. The treatment is good, thorough and to the point." Second Edition, William T. Scott, XVII + 703 pages, $8. 95. John Wiley & Sons, Inc., New York, 1966.

New Products



New Safety Device for Electrical Hazards

Research/Development, May 1967, carries the following news item:

> "'Saver' Backwards is Safer. Being introduced on the market by the Electrical Safety Division of W. D. Gale, Inc., is a new safety device, Revas, expected to remove fatal electric shocks and fires caused by electric sparks from the list of public hazards. The unit is small, light-weight, portable; equipped with an indicator light. It is placed in the electrical line between the power source and the appliance or tool being used. Revas cuts off the power to any electrically-operated mechanism instantaneously (one forty-thousandth of a second) if a fault develops in the circuit. Examples: frayed cord of a power tool brushes a metal pole; a housewife stands barefoot on a wet kitchen floor, and touches a shorted electric appliance with a sweating hand - in both cases, power is cut-off without the individual feeling any shock, and the indicator light goes from its normal white, to red, announcing the disconnect."

FIRST CLASS MAIL

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