IEEE NEWSLETTER

ELECTROMAGNETIC COMPATIBILITY GROUP

Issue No. 41 December 1965

8TH ANNUAL EMC SYMPOSIUM DATES CHANGED

The dates of July 11, 12, 13, 1966 have been finalized for the 8th Annual Symposium on Electromagnetic Compatibility to be held in San Francisco. Additional committee members, not mentioned in the previous notice, are Bernard Cooperstein, Secretary, and Dan Fogard Exhibits. A call for technical papers and other details will be announced in the immediate future. Further information may be obtained from Fred J. Nichols, Genistron, Inc., 6320 West Arizona Circle, Los Angeles, Calif. 90045.

NOMINATIONS FOR IEEE G-EMC ADMINISTRATIVE COMMITTEE MEMBERSHIP

The IEEE G-EMC Nominations Committee hereby notifies the membership that nominating petitions for the election of five (5) members to the IEEE G-EMC AdCom for a three-year term commencing July 1, 1966 will be accepted up until January 1, 1966. The by-laws concerning these nominations are as follows:

ARTICLE VI

Section 1: On or before December 1st of each year, all members of the IEEE G-EMC shall be notified that nominations for members of the Administrative Committee are open. This shall be done either by notice in a Newsletter or by direct notification of each member by post card or letter.

Section 2: Nominations shall be made by petition. The nominating petition for each nomination submitted shall contain at least 15 IEEE G-EMC members' signatures together with a short (not more than 100 words) biography listing the affiliation and background of the individual nominated. All nominations must be in the hands of the Nominations Committee by January 1st of each year. If the Nominations Committee receives less than 10 names (two for each vacancy) or if the Nominations Committee sees fit to make nominations in addition to those received from the members, it shall be within the authority of the Nominations Committee to do so. Not less than two names for each vacancy shall be submitted by the Nominations Committee.

Section 3: On or before February 1st of the year, a ballot containing the names of all members nominated for vacancies on the Administrative Committee and their biographies shall be sent to all members of the IEEE G-EMC. The marked ballots shall be returned to the Nominations Committee on or before March 1st. The candidates receiving the highest numbers of votes shall be deemed to have been elected to the Administrative Committee. In case of a tie for any vacancy, the names of the candidates receiving the same number of votes shall be put in a container, and the name drawn from the container shall be deemed to have been elected to the Administrative Committee. The names of the elected members shall be transmitted to the Chairman of the Groups Committee and through him to the IEEE Executive Committee. Unless disapproval of such elected members is received within 60 days of such transmittal, the elections shall become final.

Each nominating petition (signed by at least 15 IEEE G-EMC members and accompanied by a biographical sketch of not more than 100 words) should be sent before January 1, 1966 to the Chairman of the Nominations Committee:

James J. Krstansky, Manager
Electromagnetic Compatibility
IIT Research Institute
10 West 35th Street
Chicago, Illinois 60616

The members of the Administrative Committee, whose term of office expires on June 30, 1966 are: Rexford Daniels, Harold Dinger, Herman Garlan, John E. Maynard and A. H. Sullivan, Jr.

The above notice in this Newsletter complies with the requirements in Section 1 and will be the only notification for 1966 nominations which will be sent to members by the IEEE G-EMC.

A COMPUTER STUDY OF THE INSERTION LOSS OF EMI FILTERS IN MISMATCHES SYSTEMS

A paper, under the above title, was presented at the Tenth Tri-Service Conference on Electromagnetic Compatibility, Nov. 17-19, 1964 by Jerrald C. Shifman and Robert B. Cowdell, Genistron Applied Research, College Park, Maryland. The Abstract states:

"Abstract - This paper presents a simple graphical method for determining the insertion loss of electromagnetic interference (EMI) filters in systems having mismatched source and lead impedances. Conversely, the element values required to produce a desired amount of insertion loss at a given frequency can be obtained. General equations are presented for the insertion loss of one, two and three element filters in mismatched systems. Expressions for cutoff frequency and damping ratio are developed. Design nomographs and charts, based on the results of a computer study of the equations, are presented for the case of the pi circuit. Instructions for the use of the charts are provided, and typical examples are studied."

Copies are now available from Genistron, Inc., 6320 West Arizona Circle, Los Angeles 45, Calif.

IEEE WORKING GROUP ON AEROSPACE FACILITY GROUNDING

The following are members of IEEE Working Group on Aerospace Grounding:

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RADIATION EFFECTS IN ELECTRONICS STP 384

The American Society for Testing and Materials has published the Proceedings of the ASTM and American Nuclear Society Joint Conference on Radiation Effects in Electronics held in Syracuse, N. Y. Oct. 5-6, 1964. Copies of the publication may be obtained from AST ASTM, 1916 Race St., Philadelphia, Penna. 19103 - Price: $5.00; to ASTM members: $3.50. The papers mentioned fall into two categories: radiation effects on materials, components and systems; and radiation damage correlation.

SPECIFICATION INFORMATION NOW AVAILABLE

The following memo has been received from Mr. Michael D. Slueny, Jr., Acting Chief, Radio Interference Control Branch, Communications Division, Directorate of Avionics Subsystems Engineering, Systems Engineering Group, Wright-Patterson Air Force Base, Ohio 45433:

"1. Many people in the interference and compatibility field have expressed a desire to be automatically informed of any changes, revisions, or issue of new interference specifications. The DOD now offers such a service that partially answers this need. It would be appreciated if you would bring the following information to the attention of readers of the G-EMC Newsletter.

a. Automatic mailings of unclassified military specifications and standards are available. The Director, U.S. Navy Publications and Printing Service Office, 700 Robbins Avenue, Philadelphia, Pennsylvania 19120, can provide information on this service and accept subscriptions. There is a charge for this service, and mailings are by Federal Supply Classes.

b. All requests for copies of military specifications and standards should be submitted to Commanding Officer, Naval Supply Depot, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

"2. It should be noted that the above services are limited to personnel and companies who have an official need for them and who supply adequate justification, such as contract numbers, number of RFP's, IFB's, et cetera."

Information supplied by U.S. Navy Publications and Printing Service Office, in amplication of the above, is as follows:

"The Navy Department has announced that effective 1 January 1964 new and revised releases of those Military and Federal Specifications and Standards (including Qualified Products Lists) which are to be listed in the Department of Defense Index of Specifications and Standards (DODISS) will be available to industry on a subscription basis with automatic mailing upon payment of fees.

"Subscriptions will be accepted on a Federal Supply Classification basis for a single class or for as many individual classes as the subscriber chooses. Applicable classes may be determined by referring to the list of Federal Supply Groups and Classes attached. FSC numbers are the 4-digit numbers listed under the Group number.

"A service charge of $6.00 per class per year will apply without regard to the number of documents which may be issued within the class. This fee is to defray the administrative expense for screening and distributing releases. The Naval Supply Depot, 5801 Tabor Ave. Philadelphia, Pennsylvania, will continue to make available individual copies of published specifications and standards on an 'as ordered' basis without charge to the requisitioner. Only one copy of each document will be forwarded under the subscription procedures. Subscription to this Service does not relieve contractors of the responsibility for application of specifications of appropriate date in complying with Military contracts.

"Subscriptions may be forwarded at any time to the Director, Navy Publications and Printing Office, Building 4, Section D, 700 Robbins Avenue, Philadelphia, Pennsylvania 19111, in any form accompanied by a certified bank check or postal money order payable to the Treasurer of the United States, covering an annual subscriptio by class computed at $6.00 for each class the subscriber desires.

"Firms desiring to redistribute the Specifications and Standards documents in any form at a fee or for internal use may do so without reference to the Navy Department or any other element of the Department of Defense since the documents are in the public domain.

"Distribution will be made of copies in printed form only.

IMPORTANT NOTICE

"Subscription Service pertains to new and revised releases of Military Specifications and Standards only. Previously published individual documents may be obtained on an 'as ordered' basis without charge, from the Naval Supply Depot, as indicated above."

AN AEROSPACE DILEMMA - POLYTECHNIC DEVICES

A paper, titled "An Aerospace Dilemma: The Incompatibility o Electromagnetics and Necessary Pyrotechnic Devices", has been prepared by A. F. Milano and R. J. Colin, Jr. of Hughes Aircraft Co., Culver City, Calif. The first paragraph of the Introduction is as follows:

"The scope of this discussion will be limited to devices that release energy due to chemical reactions, thereby generating heat, flame, or gas. It will be further restricted to such devices designed to be initiated by electrical control signals of less than 200 volts and 20 amperes. These and similar devices requiring higher level control signals are frequently referred to inthe current literature as electroexplosive devices (EEDs)."

Copies may be obtained by writing to Ray J. Colin, Jr. at the above address.

STUDY OF MAN-MADE NOISE SOURCES BY WORKING GROUP #3

This paper by Jules Deitz, Technical Research Division, FCC, Washington, D. C., was presented at the 7th National Symposium on EMC. Mr. Deitz writes that no copy is available at the present time but that a copy may be available early in 1966. The final paragraph of the Minutes of Meeting, May 27, 1965, of Working Group #3 of Technical Committee (ACLMRS) states:

"Working Group #3 has also undertaken a long term program which could continue beyond the life of ACLMRS. Its goal is to encourage and follow research into which set of parameters are most appropriate for measuring man-made noise and how such data can best be utilized."

GRAPH SPEEDS CALCULATION OF SKIN-EFFECT

Larry D. Jambor, Senior Electronic Engineer, General Dynamics, San Diego, Calif., has a page article under the above title in the Nov. 8, 1965 issue of Electronic Design. A graph is presented for determining the skin effect of the following metals: Iron, silver, copper, aluminum and lead, together with accompanying formulae.

LIST OF EQUIPMENT THAT COMPLIES WITH INTERFERENCE SPECIFICATIONS

A 14-page pamphlet has been compiled under the above title by the Electromagnetic Interference (EMI) Subgroup of the Saturn Systems Checkout Working Group. Equipments under the following headings are mentioned: Oscilloscopes; Signal Sources; Power Supplies; Meters (Volt, Ohm, Amp, Power, Digital Differential, etc.); Recorders; Counters; Miscellaneous Equipments. Contributors to this equipment list included designers and manufacturers of electrical/electronic equipment, Saturn State contractor personnel, and personnel from Marshall Space Flight Center (MSFC). Information concerning this list may be directed to J. C. Toler, Bldg. 4708, R-QUAL-PI, MSFC, Huntsville, Alabama, 205-876-1447, or to any member of the EMI Subgroup.

TEST TIME SAVING SEEN AMORTIZING MAGNETIC INTERFERENCE TEST UNITS

The following article appeared in the October 18, 1965 issue of Electronic News and was accompanied by a block diagram which has not been reproduced. The text is as follows:

DAYTON - Test time saving will pay industry for required new electromagnetic interference testing equipment, made necessary by implementation of MIL-STD-826.

This is the conclusion of Charles E. Seth, project engineer, Systems Engineering Group, Wright-Patterson AFB, and a member of the DOD Tri-Service Committee studying adoption of the standard as an all-service document.

"Most of the existing interference measurement equipment is based on 20-year-old design concepts, and uses inefficient methods of data collection." Mr. Seth said. "And with the emphasis on obtaining interference control during initial equipment design, these deficiencies often negate this effort and force designers to rely on the 'design it-test it-patch it' approach."

He said typical tests with the old equipment cost $50 to $100 per hour, and often require anywhere from six weeks to three months to run. He questioned whether companies could afford tieing up prototypes and breadboards for such a time to check designs in this competitive period.

Old Equipment

"Industry is being affected by MIL-STD-826 in two basic ways," Mr. Seth continued. "The first and most obvious is that of obtaining new equipment. The process of acquiring required new test capabilities will be long term, as there are millions of dollars now invested in old equipment."

He estimated within the next several months plans will be completed regarding the amortization and wearing out of existing equipment. Mr. Seth said it is neither feasible practical nor desirable to throw away the millions invested in testing equipment and a transition period of at least five years will be permitted for phasing it out.

He emphasized that use of additional accessories could improve the capability of existing test equipment for the requirements of EMI compatibility testing under MIL-STD-826. He pointed to units that provide motordrive capability, signal processing circuits for X-Y recordings and IF spectrum monitors, noting the saving of test time will pay for them in a short time, rendering basic equipment usable for another few years.

"The second impact of 826, and its major problem area, involves personnel working in the EMI field," he stressed. "Interference control now is widely regarded as an art and as it gradually changes to a science in systems engineering, there will be problems involving reorientation and retraining of personnel.

"By close coordination with industry EMI committees, the Air Force is attempting to minimize problems in introducing the new testing techniques required by MIL-STD-826," Mr. Seth contended.

"Society of Automotive Engineers committee AE-4 is working on a number of documents directly pertaining to 826, which will cover special procedures for testing jet engine accessories; guide lines for preparing control and test plans, and uniform methods for specifying broadband antennas, current probes and other sensors."

Designer's Guide

He said Electronic Industries Association committee M 5. 8 has prepared an interference designer's guide. The Air Force will reference it and other industry documents in the EMI area in MIL-STD-826 and AFSC manual 80-9 Vol. IV.

Although MIL-STD-826 has been applied to many AF contracts since January, 1964, many aspects of the document will not be completely implemented for several years, according to Mr. Seth.

He pointed to a number of changes being considered to provide uniformity and resolve problem areas:

- Use of spectrum analyzer techniques.
- A method to complete the implementation of techniques of measuring internal impedance of interference sources.
- Conversion to the new system of units recommended by the Bureau of Standards.
- Possible revision of limits to restore correlation between narrowband and broadband limits.
- Use of time domain measurements of spikes to supplement frequency domain measurements.
- Application of Fourier transform theory and computers to calculate the frequency content of spikes and other transient signals.

Further implementation of the standard likely will come with establishment of a tri-service specification for all Dept. of Defense agencies. Mr. Seth estimates this will be accomplished within the next year.

He said EMI symbols, abbreviations and definition of terms as proposed in the tri-service version of MIL-STD-826 is currently out for industry review and comment. It is due back by Dec. 1, when the DOD Committee will make some decision, likely by June, on acceptance.

Drafts of EMI requirements and measurement characteristics of EMI as proposed by the tri-service document are being studied by the Service Committee, and will go out for industry review after approval. He estimated the remainder of the draft may be completed during the first quarter of 1966.

Mr. Seth sees adoption of 826 eliminating the need for evaluation of interference measurement only by engineers with extensive radio noise experience. He said this had been a difficulty with the older interference specifications.

ACHIEVE OPTIMUM NOISE PERFORMANCE IN FET CIRCUITS

Under the above title, Wm. A. Rheinfelder, manager of applications engineering, Dickson Electronics Corp., Scottsdale, Ariz., has a 4-page article in the October 11, 1965 issue of Electronic Design. The subtitle and first two paragraphs are as follows:

"Troubled by noise specifications for FET Devices? Here is a graphical approach to understanding and designing FET stages where noise behavior is crucial.

"You are faced with a circuit-design problem for which the field-effect transistor (FET) looms as the best device to choose. Noise behavior is extremely important; yet, you can't make head or tail out of the noise characteristics on the specification sheet. And because of the FET's high-input-impedance attribute, among others, you are unsure of how to determine or measure the optimum noise performance.

"Here is a graphical approach to specifying and designing low-noise FET stages. Based upon the familiar equivalent-noise-resistance figure (from vacuum-tube days), the method yields rapid, easy-to-understand solutions. It enables the designer to select the best FET for his application. Moreover, because it considers high and low frequency, tuned and untuned, and matched and mismatched cases, it allows optimized circuit designs to be readily achieved.

ACCIDENTAL X-RAY EXPOSURE

Serious Accidents, Issue No. 251, of the U. S. Atomic Energy Commission, carried the following information:

"The following description of an x-ray exposure incident is presented, along with the conclusions of the AEC Investigating Committee, for the information and benefit of users of similar devices. The significant aspect of this this incident is the manner in which the X-ray unit developed a short which permitted continuous beam production with the bypassing of all interlocks and controls. This type of incident, involving the use of an X-ray device operating at higher beam energy and/or current, could have severe medical implications.

"Recently, two AEC contractor employees were exposed accidentally to X rays while attempting to radiograph a small metal object. During the course of a series of exposures, the X-ray unit started continuous operation due to an internal short. The short was located so that all interlocks and controls were bypassed. As a result, the men performed several operations in the direct beam, unaware that the machine was operating.

" The X-ray machine was suspended approximately 109 inches above the floor with the beam directed downward. The object to be radiographed and the radiographic film were located on the floor. This geometry resulted in exposures to the men from above while they were making beam alignments in standing and crouching positions. At one point, one employee climbed a ladder adjacent to the X-ray unit and with his right thumb held a plumb line in the beam for a few seconds within an inch of the tube window. (See figure 1). Both employees sustained Class 'B' skin exposures, and the employee who held his hand hear the operating unit received approximately 3500 rem on the end of the right thumb. Nothing of clinical significance was found except for an erythema on the end of the exposed thumb. The erythema first appeared about fourteen days following the exposure, followed by evidence of a second-degree burn on the twenty-sixth day. Five weeks following the exposure, a healthy layer of dermis remained.

"The X-ray unit involved was a portable industrial model of the self-rectifying half-wave type with a five-milliamperes tube current rating and a 110-kilovolt peak tube voltage. The control console and X-ray head are connected electrically by a cable. The exposure in this incident resulted when a conductor in the cable came loose from its connector pin and made contact with the control console chassis through the connector shell, bypassing the normal X-ray controls and interlock."

DEVELOPMENT OF A NEAR FIELD-FIELD INTENSITY (NFFI) METER

Under the above title, Robt. B. Cowdell, Senior Research Eng., Genistron, Inc., 7100 Baltimore Ave., College Park, Md. 20740, delivered a paper at the 7th National Symposium. The paper described the meter as follows:

"A prototype NFFI meter was designed and built to accuracy requirements of ± 2 db over the frequency range 2 - 30 megacycles, at field intensities of 2 - 500 volts per meter or .005 - 1.5 amperes per meter. The meter measured either electric or magnetic field RMS in either a tuned narrow band mode or an untuned broadband mode. . . ."

Editorial Note:

Issue No. 40 of the G-EMC Newsletter has not yet come out due to some breakdowns at IEEE Headquarters. This issue is being rushed to try and comply with the dates on which nominations for G-EMC Administrative Committee memberships are due. If this issue is also late, please try and have the necessary number of nominations handed in as soon as possible.

The change in dates of the 8th Symposium are due to the hotel finally agreeing to give these dates after formerly refusing. Your editor wishes to apologize for this confusion and asks that the dates be changed on Newsletter No. 40 so as not to mix things up.

It had been hoped that a discussion of the North East blackout might have been included, but we could not hold up this newsletter longer.

Rexford Daniels, Editor
IEEE G-EMC Newsletter
Monument Street
Concord, Mass. 01742

NEW PRODUCTS

N-Channel FETS Hold Noise Below 2 db to 200 Mc

Electronic Design, July 19, 1965, has a 3-column article under the above title. The first two paragraphs are as follows:

"A new N-Channel field-effect transistor is said to extend the advantageous low-frequency characteristics of FETS into high-frequency-amplifier circuitry. Notable among these characteristics is a low noise figure up to and beyond 200 Mc.

"The FET, 2N3823, is fabricated by a combination of epitaxial-junction deposition and interdigitated geometry. The manufacturer is the Semiconductor and Components Div. of Texas Instruments, Inc., Dallas.

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ELECTROMAGNETIC COMPATIBILITY GROUP

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