

ELECTROMAGNETIC COMPATIBILITY GROUP

Rexford Daniels, Editor
Monument Street
Concord, Mass. 01742

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1968

IEEE EMC

SYMPOSIUM

The 1968 IEEE Symposium on Electromagnetic Compatibility will be held at the Benjamin Franklin Hotel, Seattle, Washington, July 23, 24, 25, 1968. Symposium officers are:

Chairman:	<u>Richard B. Schulz</u>
Vice Chairmen:	<u>Guy L. Ottinger</u> <u>George R. Ufen</u>
Secretary:	<u>Vellar C. Plantz</u>
Treasurer:	<u>B. Leonard Carlson</u>

Committee Chairmen

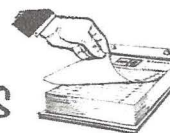
Arrangements:	<u>Eugene D. Knowles</u>
Exhibits:	<u>Stephen L. Dyynes</u>
Finance:	<u>B. Leonard Carlson</u>
Program:	<u>John E. Maynard</u>
Publications:	<u>Reuben Goldman</u>
Publicity:	<u>Fred J. Nichols</u>

Advisors

A.H. Sullivan, Jr.
John J. Egli
Leonard W. Thomas

The theme of the Symposium will be $E + M = C$ or Engineering plus Management equals Compatibility. The technical papers will be held at the Seattle Center Exposition Grounds, site of the Seattle World's Fair, and internationally famous Space Needle. Delegates will be transported from the hotel to the fair grounds via Seattle's unique Monorail System. The call for papers, unfortunately, reached the newsletter too late to meet the closing date of December 31st, 1967 but, if any members have something they wish to submit, they can, probably, get consideration if the list has not yet been closed. All correspondence should be addressed to: IEEE Symposium - EMC, Mail Stop 73-65, P.O. Box 707, Renton, Washington 98055. Checks for any exhibits or other matters should be made out to: 1968 IEEE-EMC Symposium.

CHAPTER ACTIVITIES



Canaveral:

There was a meeting held on September 25, 1967 at which time Gus Cargar, Boeing Company, Cocoa Beach, Florida, presided over a Panel Discussion on EMC Courses, Symposium and Specifications.

Central Texas:

A meeting was held on August 1, 1967 and Dale S. Samuelso Fairchild Electro-Metrics Corp., Amsterdam, N.Y., spoke on "Fairchild FSS-250 Automated Spectrum Surveillance System."

New Orleans:

There was a meeting on September 20, 1967 and a talk was given on "Interference Problems Relative to System Layout and Coordination" by J.D. Creel, Sou. Bell Telephone & Tel. Co., Atlanta, Georgia.

Philadelphia:

On October 3, 1967 a meeting was held and S.J. Burruano, Burruano Associated, Inc., Harrington Park, N.J., gave a talk on "Selection of EMI Suppression Devices."

San Francisco:

A meeting was held on April 26, 1967 at which time a talk was given by A.R. Carlson, Hewlett-Packard Company, Palo Alto, California, on "Spectrum Analyzers for EMI Measurements."

Seattle:

The following meetings have been held by this Chapter:

- | | |
|-----------------|--|
| May 24, 1967- | <u>Fred J. Nichols</u> , of Lektromagnetics, Inc., Los Angeles, spoke on " <u>Future Challenges in EMC.</u> " |
| Sept. 27, 1967- | <u>Joseph F. Fischer</u> , of Genistrion, Inc., Los Angeles, spoke on " <u>Evaluating Filters in Situ Under Heavy Load Currents and Normal Working Impedances.</u> " |
| Nov. 27, 1967 - | <u>Herbert T. Mertel</u> , of General Dynamics, San Diego, spoke on " <u>Contemporary Instrumentation and Fundamental Radio Receiver Parameters.</u> " |

Atlanta, Georgia, Group Formed

The IEEE Executive Committee has approved the establishment of a local Chapter of the Electromagnetic Compatibility Group in the Atlanta, Georgia, Section. James D. Huddleston III is secretary and can be reached in care of the Georgia Power Company, Box 4545, Atlanta, Georgia 30302. W.F. Free is listed as organizer of the Chapter.

Excerpts from the Philadelphia Section G-EMC Newsletter November 1967

Awards: A Philadelphia Section G-EMC Awards Committee has been formed consisting of past group chairmen. Members are D. Lawrence George of Univac-Sperry Rand, Frank Hamell of Burroughs, Robert Sugarman and Conrad Fowler of AEL and Fred Haber of the Moore School of Electrical Engineering. Dr. Haber has been selected as Chairman of the Committee. It would be helpful if G-EMC members would bring all technical achievements and contributions to the attention of one of these gentlemen.

AdCOM Elections: A total of 607 ballots were returned to headquarters for the election of five members to the Electromagnetic Compatibility Group Administrative Committee (AdCOM). Elected to three year terms were: R.M. Showers, H. Garlan, F.J. Nichols, J. Roman and J.E. Maynard. Our congratulations to Dr. Ralph Showers on his re-election, the only Phila. Group member on the AdCOM. It is worthy to note that Dr. Showers received the greatest number of votes, 424.

Next Meeting: The second meeting of the season will be held at General Electric, Valley Forge Space Center on Tuesday, December 5, 1967. Topic - "CATV and EMC/EMI" by Walter Wydro. Included will be an interesting tour of some of the G.E. facilities, while the meet-the-speaker dinner will be held at the Peacock Inn. The Almanac and Meeting Notice will contain all the details. Try to be there and bring a friend.

Past Meeting: The first meeting of the season was considered by most to be a big success. Mr. Burruano lived up to his reputation of being an interesting speaker and Philco-Ford was a gracious host. There were over 40 members and guests who shared in the social and technical gathering as we inspected part of Philco's impressive and expensive EMI test facilities.

Guests: Part of the EMI engineers endeavors are devoted to educating his colleagues of other specialties. For this reason, it is beneficial to all of us to bring guests to our meetings. Actually, IEEE meetings are open to all interested persons, members and non members alike. (This is why our meetings must be kept unclassified and we cannot discuss specifications of a sensitive nature.)

Education: Seattle University is considering incorporating an EMI/EMC graduate course into its engineering curriculum next year. If enough local people are interested, one of the 13 local colleges and universities in the Philadelphia area may offer a similar course or series of courses. If you would be interested in taking such a course, please notify the Editor. It would also be interesting to note how many non-EMI engineers would be interested. If there is enough interest in this matter, the initial steps toward providing such a course (or series of courses) will be taken by the EMC Group Chairmen. An EMI design course should be a desirable addition to the list of evening graduate courses now available. (Why not let the under graduates in on our secrets?)

Meeting Announcements: Meeting announcements for our October meeting were made over radio stations WCAU and WFLN.

Additional stations will carry the announcement for our next meeting.

1971 Symposium: The AdCOM failed to reach a decision in the selection of a host city for the 1971 EMC Symposium. Their decision was postponed in order to enable the Washington Chapter to submit a formal proposal. The next AdCOM meeting will be held in New York during the March 1968 National IEEE Show. The Philadelphia Group still has an excellent chance to host the Symposium.

Transactions: Did you miss your March 1967 issue of the EMC Transactions? This issue was cancelled since the Symposium Record was published containing complete papers in June. The next regular issue will be published in December 1967 after which two special issues will follow. The first one will be in March 1968 on the topic of Shielding. We understand it may contain as many as 25 different papers. The second special issue will be published in June 1968 on the topic of Filters. Many papers have already been prepared for this issue, but many more are needed. If you have material pertaining to filters, their design or application, and would like to have it published in the IEEE EMC Transactions, please contact Dr. Heinz M. Schlicke, 8220 North Poplar Drive, Milwaukee, Wisconsin 53217.

Membership: The latest count revealed that there are 1709 G-EMC members in the IEEE. Eighty-five of these are in the Philadelphia Chapter. The national EMC Group was established in 1958 while the Philadelphia Chapter was formed three years later in 1961. Philadelphia now has the second largest EMC Chapter behind Washington.

New Members: Group affiliation listings in the Philadelphia Section files can be up to six months late. Therefore, if you have changed your address recently, or are a new Group member and are not receiving Group correspondence (such as this Newsletter) please call Miss Yonan at the IEEE office. (594-8106)

Editor: Robert D. Goldblum
Chairman Phila. G-EMC
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1968 Officers

Chairman:	Richard B. Schulz The Boeing Company Airplane Division P.O. Box 707 Renton, Washington 98055
Vice Chairman:	Fred J. Nichols LectroMagnetics, Inc. 6056 West Jefferson Blvd. Los Angeles, California 90016
Secretary:	Leonard W. Thomas Electromagnetic Compatibility Analysis Center U.S. Naval Engineering Experiment Station Annapolis, Maryland 21402
Treasurer:	John Roman Tri-Service RAD HAZ Group Bu Ships Navy Headquarters Bldg. 18th & Constitution Ave., N.W. Washington, D.C. 20360

The above officers will take office on 1 January 1968.

G-EMC TO FORM



SPECIALIST WORKING GROUPS

At its meeting of July 18, 1967, the Administrative Committee approved a proposal to form working groups or "colleges" within EMC to assist in determining those areas in need of further development and in which organized exchange of technical information would provide mutual benefits to the members. The specific groups to be formed will depend upon members interests; however, suggestions have been made for groups which individually fall in one of two classes: Systems, or Technical as follows:

<u>Group #</u>	<u>Systems</u>	<u>Group #</u>	<u>Technical</u>
10	computers	20	shielding
11	control and audio	21	grounding
12	communication and navigation	22	filtering
13	aircraft and space craft	23	interference generation
14	power transmission	24	measurement techniques and instrumentation
15	carrier systems	25	propagation
		26	interference prediction

Any member of G-EMC is eligible to volunteer to serve on any of these working groups. The operation of the group will be as follows. As soon as enough members indicate interest in a specific area, a chairman for the group in that area will be designated. He will be required to call a meeting of the group at least once each year (probably at the Annual Symposium) to review and discuss in general progress and needs for work related to the group. The function of a group will be as follows:

1. To evaluate the current "state of the art" in the area of group interest.
2. To determine if information on the "state of the art" is truly available to the members.
3. To recommend the preparation of individual papers, special issues of transactions, or special conferences in the area of interest.
4. To recommend the development of pertinent standards on measurement or definitions.
5. To point out to the AdCom of G-EMC other needs of the members.

Note that as presently conceived the functions are purely evaluative and advisory. For example, the development of standards will continue to be carried out under the Standards Committee, conferences such as at the Annual Symposium will be conducted by the appropriate program committee, and editing of Transactions papers by the Technical Papers Committee. Of course, members of the groups will be expected to participate in any related program. For the purpose of coordination the groups will be organized under the Technical Advisory Committee of the Administrative Committee.

It is expected that all active members of G-EMC will join one of these groups. To indicate your choice, please fill out and mail the following form.

To: R.M. Showers
Chairman, TAC-G-EMC
Moore School of Electrical Engineering
University of Pennsylvania
Philadelphia, Penna. 19104

I am interested in participating in the work of working group # _____ (or I suggest a group on _____)

Name _____

Mail Address _____

Company _____

Cincinnati IEEE Section Study Group on Reduction of Electrical Noise

TIME: 7:30 p.m. to 9:30 p.m. - Beginning Wednesday February 7, 1968.

LOCATION: The Cincinnati Gas & Electric Co. Auditorium
315 Main Street, Cincinnati, Ohio

REGISTRATION FEE: Advance Registration by Feb. 1, IEEE Members - \$8.00 - Non-Members \$10.00

Registration after Feb. 1, IEEE Members \$10.00 - Non-Members \$12.00

STUDY GROUP PROGRAM

- | | |
|-------------|--|
| February 7 | Introduction and Theory of Noise
By Mr. Alfred W. Scheide, University of Cincinnati |
| February 14 | Theory of Grounding
By Mr. Alfred W. Scheide, University of Cincinnati |
| February 21 | Standards, Instrumentation, and Detection of RFI Over the Frequency Range
By Mr. H.A. Gauper, General Electric Co. |
| February 28 | The Third Dimension of EMC
By Mr. J. Paul Georgi
Electromagnetic Compatibility Analysis Center |
| March 6 | Shielding Practices
By Mr. James Spellman, Burndy/Husky Products, Inc. |
| March 13 | Characteristics & Interpretation of Impulse Noise on Telephone Channels
By John Fennick, Bell Telephone Labs., Inc. |
| March 20 | Local Telephone Company Problems
By Mr. Dwight A. Marshall
Cincinnati & Suburban Bell Telephone Co. |
| | Utility Problems
By Mr. Robert Herrmann, Cincinnati Gas & Electric Co. |
| March 27 | Installation Methods and Practices for Industrial plants.
By Mr. Fred Geisheimer, The W.W. Clark Corp. |

SOCIETY FOR THE HISTORY OF TECHNOLOGY

The Society for the History of Technology is an organization whose name covers its purpose. It is devoted to technology and is not a society for the history of science. Although relatively young as societies go, it now has more than 1400 members and publishes a quarterly (an extremely interesting journal). This journal is not devoted to electrical engineering alone, but to all aspects of technology. It serves as a vehicle for interesting original studies in the history of our broad field.

SHOT has recently been admitted to associate membership in EJC, thus recognizing the interests of engineers in its work. Anyone who would like to join is invited to write to Dr. Melvin Kranzberg, Department of the History of Technology, Case Western Reserve University (of which Case Institute of Technology is now the engineering part), Cleveland, Ohio 44106.

SAE AE-4 Holds Dallas Meeting

The Committee on Electromagnetic Compatibility, SAE AE-4 of the Society of Automotive Engineers, had a day devoted to technical papers at their 3-day business conference, October 30-November 1st, 1967, at Dallas, Texas. The titles of the papers were:

"EMC Aspects of System Engineering," Dr. Ralph Showers, University of Pennsylvania

"Applied Systems Engineering," R. Williams, Convair #2

"EMC and Systems Engineering Documentation Requirements," E. Hughes, NAR

"The Correlation between Grounding Considerations and the Design of the System," G. Kunkel, Jet Propulsion Labs.

"Ground Considerations for Aerospace Facilities," J. Toler, Georgia Institute of Technology

"Relativity of Grounding," Thomas Herring, Boeing

"Grounding, Effects on Compatibility," W.R. Joynson, TRW

Followed by a Panel Discussion.

Frank T. Mitchell Appointed to ADCOM

Frank T. Mitchell has been appointed to fill the unexpired term of office ending 31 December 1969 due to the death of Charles A. Gregory.

JAMES C. SENN JOINS LECTROMAGNETICS, INC.

James C. Senn, formerly manager of the Applied Research Division of Genistron, Inc., Washington, D.C., has joined LectroMagnetics Inc., 6056 West Jefferson Boulevard, Los Angeles, California 90016, as Manager of Research and Development. In his new position, Mr. Senn will supervise and manage all LMI EMC consulting programs and engage in research and development with a strong emphasis on developing new shielding techniques and materials.

PSEUDO-RANDOM AND RANDOM TEST SIGNALS

The Hewlett-Packard Journal, September, 1967, published at 1501 Page Mill Road, Palo Alto, California 94304, an issue containing 19 pages devoted to the following subjects: "Pseudo-Random and Random Test Signals" by George C. Anderson, Brian W. Finnie and Gordon T. Roberts, and "Testing with Pseudo-Random and Random Noise". Copies may be obtained from Hewlett-Packard at the above address.

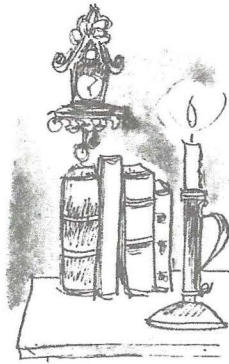
NEW STUDIES OF THE BONDING OF ELECTRICAL ELEMENTS

Product Engineering, December 4, 1967, carried the following information on the above subject:

"New studies of the bonding of electrical elements are being spurred by recognition of the fact that hot spots resulting from bonding faults may ignite fuel-air mixtures. Such hot spots may have been the cause of the Apollo explosion, and they are a potential source of trouble in many systems, even in those that have been rated 'explosion-proof.'"

"At the IEEE Conference in Washington this fall, Boeing researchers said studies indicate that a voltage drop of less than 0.5 v may ignite petroleum fuel-air mixtures if a high-current source is being used. Such a voltage drop may result from the overheating of metallic debris at bonds used to mount electrical equipment or, indeed, at any point having low current-carrying capability in the equipment housing or supporting structure.

"Boeing engineers have now developed a chart to guide specifications for grounding electrical equipment located in explosion-hazard areas. The chart gives the maximum joint resistance for the available fault current, with a built-in five-to-one safety factor. For example, with a maximum fault current of 75 amps, the recommended maximum electric bond resistance would be about 0.001 ohm. But if the maximum fault current is 750 amps, the recommended maximum bond resistance would be only 0.0001 ohm."



Notes on Articles of Interest

OPTIMIZING RADAR MODULATOR DESIGN FOR LOW RFI

E.M. Goldfarb, Assistant Chief Engineer, Energy Systems, Inc., Palo Alto, California, and R.C. Cumming, Consultant, Department of Electrical Engineering, Stanford University, Stanford, California, have authored a 6-page article under the above title in MICROWAVES, August, 1966. The sub-title and first two paragraphs are as follows:

"Minimize RFI by proper choice of pulse waveform, modulation method, and tube operating conditions. Trade-off with range accuracy and efficiency need not be severe. Here are the considerations.

"The greater use of higher-powered pulsed transmitters, and the advent of more sensitive receivers, makes RFI (radio-frequency interference) increasingly severe. Radar transmitters not only occupy wide fundamental bandwidths, but they also radiate considerable harmonic energy. Unfortunately, concern for RFI is often neglected during systems design and assembly-the time when it is most easily corrected.

"Pulse shape, method of modulating the power amplifier, and nonlinear characteristics of the transmitter tubes, affect the spectrum of radiated energy. For minimum RFI, the radar signal should occupy only the frequency band necessary for its proper function."

TRANSITION-ZONE ANECHOIC CHAMBERS SIMPLIFY SYSTEM CHECKING

James T. Hunter, Senior Engineering Specialist, The Emerson Electric Company, St. Louis, Mo., has authored a 4-page article in MICROWAVES, October, 1966, titled "Transition-Zone Anechoic Chambers Simplify System Checking". The sub-title and first paragraph are as follows:

"When used for production testing and field check-out, cost and space are saved. Here are seven design steps for these chambers, together with application criteria.

"Production and maintenance of microwave antennas and associated systems can be greatly simplified by use of small transition-zone anechoic chambers. They can perform many radiation tests that otherwise require elaborate, remotely located facilities."

CIRCUITRY FOR TESTING MAGNETIC TAPE

Ronald Zussman, U.S. Naval Applied Science Lab., Brooklyn, N.Y., has a 2 1/2 page article in Electronic Products, October 1967, under the above title. The sub-title and first paragraph, together with a special section, are as follows:

"Skew, dropout and noise detection measurements are easily accomplished by these two circuits, which can be made with IC's. They allow pretesting magnetic tapes off-line.

"Two circuits described here permit inexpensive and rapid evaluation of digital and analog recording tapes. Both circuits may be constructed from standard digital microcircuit gates. They permit quantitative measurements of tape skew, noise and dropouts. These circuits replace more complicated measuring schemes and perform their objectives with more accuracy.

Dropout and Noise Detection Circuitry

"All manufacturers certify their digital magnetic tapes to be dropout free, but industry standards vary widely. Even though certification required actual dropout testing of each reel of tape on a digital transport, no adequate specifications exist to guarantee the quality or performance on particular transports of tape purchased on open bids; most tapes are currently bought on a proprietary basis. While manufacturers replace defective rolls of tape, the computer time for such on-line testing is costly. Ordinarily, users discard faulty tapes or increase system redundancy in an effort to increase the efficiency of on-line computer operations.

"This dropout and noise detection circuit permits off-line pretesting of digital tapes. This will allow competitive purchases of digital magnetic tapes.

"When this circuit is used with the new skew measuring circuit described earlier, complete and inexpensive computerized digital tape testing is possible. Both circuits can easily be connected to or disconnected from existing unmodified tape transports or built into digital transports. Skew, dropout, and noise testing are performed on the user's own transport.

"This hazard-free asynchronous sequential dropout and noise detection circuit is economical, reliable, and lends itself to realization with IC's. The circuit is insensitive of up to 50% skew."

DESTROY YOUR MICROWAVE TRANSISTORS

Howell Boyd, Applications Engineer, Texas Instruments, Inc., Dallas, Texas, has a 3-page article, under the above title, in Electronic Design, 25 October 1967. The first two paragraphs are as follows:

"The rapid increase in the use of transistors at microwave frequencies, where the average unit price is around \$100, dictates the need to understand how to avoid unnecessary failures.

"While the microwave transistor obeys the same laws of physics as lower-frequency devices, some of the rules must be observed more closely. Here are a few of the don'ts:

"Never use an ohmmeter for continuity checks.

"Never pick up a unit by its leads.

"Never use a constant-current bias.
"Don't use transistor test sets without proper precautions.
"Don't solder leads unless you can do it fast.
"Don't use a supply that has high-voltage spikes."

HOW SYSTEMS CAN BUG POWER SUPPLIES

Pat Milone, Consolidated Avionics, Westbury, N.Y., has a 2 1/2 page article in the September 1967 issue of Electronic Products. Paragraphs of interest are as follows:

"When you buy a power supply, you're interested mostly in what the supply can do for the load. It is a little shocking to discover that the load can do things to the power supply - such as wreck it. And we're talking about ordinary, garden-variety loads, not short circuits or prolonged overloads or other unthinkable things.

"In pulse systems, particularly, the opportunities to misapply spring up like weeds. Some of the abuses hung onto power supplies are fairly obvious, but some are the result of 'systems' and they can be a little hard to spot.

"The power supplies we're talking about are typically regulated with one or more series transistors and have an output capacitor. The series regulating transistor often has a low voltage rating and the output capacitor has a low but not zero resistance. These characteristics keep costs low and cause no problems in many applications, but sometimes the load will strike back."

SPURIOUS NOISE IN PRECISION POTENTIOMETERS

John P. Doering, Jr., Chief Engineer, Product Design, Helipot Division, Beckman Instruments, Inc., Fullerton, California, has written a 3-page article in Evaluation Engineering, September/October 1967, under the above title. Paragraphs of interest are as follows:

"The noise test normally used to evaluate wire wound precision potentiometers doesn't work with closed loop potentiometers or those with shunted sections or overtravel. This is because the extra current paths in these devices appear as noise to the measuring instrument. This deceptive phenomenon, perhaps best described as 'spurious noise,' actually is unrelated to contact resistance and has no effect on the potentiometer's performance.

"Knowing how to recognize and avoid spurious noise can save the evaluation engineer from many an erroneous conclusion and unnecessary rejection."

LIFE OR DEATH FOR TRANSISTORS

Ronald M. Mann has written a 4-page article under the above title in E D N, August 1967. The sub-title and paragraphs of interest are as follows:

"Evaluating devices with virtually unlimited life isn't easy. Sometimes some of the worst headaches stem from the instrumentation. Here the most frequently encountered problems are outlined, and testing practices are suggested.

"Life testing of transistors or other types of semiconductors is done primarily to enable prediction of their failure rate and to assess key parameter variations in a given 'lot'.

"By evaluating various test methods and conditions and highlighting problem areas in testing it is hoped that these testing goals can be met more fully....

"Static Discharge Damage - Considerable capacitance exists between the human body and the floor or surrounding

objects. This can be as high as 400 pf, and in conjunction with static-generating clothing and rugs can store appreciable electrical energy at voltages up to about 6000. Static discharge through the transistor can occur when it is removed from life test to perform measurements or when it is picked up for any reason. This can damage it or alter its parameters, giving an indication of failure that falsely might be attributed to the life testing."

ADDING DB'S BY THE MIL

Roy O. Lange, Lockheed Missiles and Space Company, Sunnyvale, California, has written a several page article with 4 Figures and 2 Tables in E D N, June 1, 1967. The sub-title and paragraphs of interest are as follows:

"The need for effective lightweight shielding materials is a continuing one. The test results described here shed a bit more light on the subject.

"An investigation was undertaken to determine the possibility of improving the shielding effectiveness of small aluminum canisters by electroplating, laminating and gasketing.

"The intended operational location of the canisters was inside metallic cylindrical sections of flight vehicles. The source of energy to be shielded against was the field established inside the cylindrical sections as a result of currents coupled into the sections from external fields. Since the interference source was low-impedance, a loop antenna was chosen as the appropriate method of simulation in test.

Canister halves were pressed from 0.032-inch aluminum sheets. The assembled canisters measured 8 by 5.5 by 5 inches. A mating surface was provided by 1/2-inch flanges joined with screws. A coaxial connector was installed for the pickup probe. The general appearance of the two canisters is indicated in Figs. 1 and 2."

HOW TO MAGNETIZE, MEASURE AND STABILIZE PERMANENT MAGNETS

J.M. Janicke, R F L Industries, Inc., Boonton, New Jersey 07005, has written a 26-page folder under the above title. Chapter contents are as follows:

Chapter One - The Selection and Use of Magnet Charging and Treating Equipment

Chapter Two - Hall Effect Gaussmeters

Chapter Three - A Complete System Approach

Copies of the folder may be obtained by writing to Mr. Janicke, Box No. 239, Boonton, New Jersey 07005.

HOW TO RECOVER WEAK SIGNALS BURIED IN NOISE

The Hewlett-Packard Journal for May, 1967, has a 5-page article by Raymond C. Hanson under the above title. The sub-title and first two paragraphs are as follows:

"A new phase-lock synchronous detector enables this ac microvoltmeter to lock on to signals obscured by noise.

"Measuring low-level signals nearly obscured by noise or other nonrelated signals is required in many applications. Some general areas in which this condition is encountered

include instrument calibration, communications and medical research.

"The broadband, average responding voltmeter is limited in sensitivity by inherent noise and spurious signals. An extension of the average-responding voltmeter for very low level signals obscured by noise uses the synchronous rectifier. When driven at the fundamental frequency of a known waveform, the filtered output of a synchronous rectifier is proportional to the average value of that waveform. Noise and spurious signals are rejected."

THE EFFECT OF HARD LIMITING IN THE PRESENCE OF LARGE OUT-OF-BAND INTERFERING SIGNALS

IEEE Transactions on Aerospace and Electronic Systems, September 1967, contains a 7-page article by J.E. Medlin, Lockheed Missiles and Space Company, Palo Alto, Calif. 94304, under the above title. The Abstract and first two paragraphs of the Introduction are as follows:

Abstract

"The effect of hard limiting on the phase of a test signal was investigated when large out-of band interfering signals are present at the input to the limiter. First a single and then two discrete interfering signals were considered. The interfering signals and the test signal are restricted to narrow but separated bands. The test signal is recovered after limiting by narrowband filtering. The analysis of the single interfering signal is essentially the same as that performed by Cahn. In this correspondence experimental evidence is presented to verify the analysis and, in addition, the case of two interfering signals is considered."

Introduction

"When two discrete signals are present simultaneously at the input to an ideal hard limiter, the effect of the limiting is to normalize the signals to the level set by the limiter. This is essentially an instantaneous automatic-gain control action, controlled by the amplitude of the instantaneous envelope of the composite signal."

"The analysis shows that the effect of a large out-of-band interfering signal, present at the input to the limiter along with the smaller test signal, is to suppress the smaller test signal. The suppression appears as amplitude modulation on the test signal. The amplitude characteristic of the large interfering signal is impressed on the test signal by the IAGC action of the limiter. The phase of the interfering signal, however, is not transferred to the test signal. The phase angle of the test signal is preserved."

This is so, even if the interfering signal is assumed to have both random amplitude and phase. The output of the limiter contains additional signals at frequencies resulting from cross products generated as a result of the nonlinear limiting characteristic. Only one of these cross products is of an amplitude comparable to that of the test signal. This term appears as a symmetrical sideband, with the test signal about the larger interference signal, in the limiter output."

ITEMS OF INTEREST IN SCIENCE NEWS - SEPTEMBER 16, 1967

The following are two items of interest in the above publication:

Noise and Fading Cut

"Radio-telephone communications are plagued by fading and noise caused by atmospheric disturbances. New devices developed at Bell Telephone Laboratories, however, bring normal quality up almost to the level of trans-Atlantic cable communications, according to BTL spokesmen."

"Noise is reduced by a device known as a compandor (compressor-expandor). It reduces the variations in loudness of the speaker's voice so that his speech is at an almost constant level. That means that all of his words can be amplified the same amount and be loud enough to be heard over any electronic noise in the background. At the receiver end, the loudness range in the speaker's voice is restored to normal."

"Although ocean cables and satellites are used now on heavy traffic overseas telephone routes, radio-telephones are still important in less-used routes."

Communication by Surface Waves

"Proposals which could pave the way for the successful launching of 'surface waves' over the earth, at frequencies of about 1.5 megacycles per second, have been put forward by Prof. H.M. Barlow of University College of the University of London."

"If successful, this technique would appear to allow highly directional communications signals to be launched along the surface of the earth with a very low attenuation."

"A surface wave is one which propagates in the space where two different media join. Radiation outside the interface is small."

"In the past, surface wave systems have been confined mainly to very high frequency waves due to the physical size of efficient horn launchers."

New Products



Instrument Transformers

James Electronics, Inc., 4050 N. Rockwell St., Chicago, Illinois 60618, has brought out a new catalog on Instrument Transformers electrostatically shielded between windings for isolation and common mode rejection. A new line of Miniature Instrument Transformers has attenuation values on two charts.

Glenair Introduces a New Line of Bulkhead Feed-Thrus and Stuffing Tubes

Glenair, Inc., 1211 AirWay, Glendale, California 91201, has introduced a new line of bulkhead feed-thrus and stuffing tubes which cover a wide range of "special purpose" applications. Several units have RFI control characteristics.

Tecknit Introduces New Gasket Material

Technical Wire Products, Inc., 129 Dermody St., Cranford, N.J. 07016, has introduced a new gasket material "Teckspan". It is a thin material formed by critically expanding Monel 400 or aluminum 3003D alloy thin metal foil, .031 inches thick, producing a thin conductive sheet with over 200 resilient contact points per square inch. Information bulletin No. 113 gives further details.

Siemens Gasfilled Surge Voltage Protectors

Siemens America Inc., Empire State Building, 350 Fifth Avenue, New York, N.Y. 10001, has brought out a 6-page brochure describing its Gasfilled Surge Voltage Protectors for the communication industry and to protect solid state circuitry and other delicate equipment. Further information may be obtained from R.H. Giampietro, Telecommunications Division, at the above address.

Electromagnetic Pickups

Airpax Electronics, Seminole Division, P.O. Box 8488, Fort Lauderdale, Florida 33310, has brought out a 6-page brochure describing their Airpax Magnetic Pickups which convert mechanical motion to an AC voltage without physical contact or external power. These sensitive transducers create an external magnetic field which when interrupted, for example, by a ferrous gear tooth, generate an AC voltage. This AC voltage has a frequency proportional to RPM when the pickup is mounted in proximity to the teeth of a gear on a rotating shaft. Airpax pickups have a threaded shell with lock nut to facilitate mounting.

Spectrum Signature Adapter

Electro-Magnetic Measurements Company, 50 Baiting Place Road, Farmingdale, L.I., New York 11736, has brought out a new Spectrum Signature Adapter which covers a spectrum display of received pass-band. It also provides information on sideband splatter, nulls and lobes of pulsed signals, resolution of closely spaced signals, modulation characteristics, dynamic nature of signal, and frequency stability. One display unit can be used for all currently used radio interference meters.

Film/Foil Shielding and Insulating Tapes

Sun Chemical Corporation, Facile Division, 185 Sixth Avenue, Paterson, New Jersey 07524, has brought out a line of film-foil shielding and insulating tapes under the name of "Lamiglas." A research staff is available to develop a special product design for individual requirements.

Thermally Conductive Epoxy Coating for 500° F Use

Emerson & Cuming, Inc., Canton, Massachusetts 02021, has developed a new epoxy based coating, Eccocoat[®] 672, designed to enhance heat dissipation. It provides electrical insulation, protection against moisture and adhesive bonding of components to heat sinks. It is capable of withstanding continuous exposure to temperatures of 500° F. Because it is based on an epoxy resin, its adhesion to a wide variety of substrates is excellent.

Miniature Coaxial High-Voltage/Corona-Free Connectors and Cable Assemblies

Rowe Industries, Inc., 1702 Airport Highway, Toledo, Ohio 43609, has developed miniature coaxial high-voltage corona-free connectors and cable assemblies. A technical bulletin claims that there is no sustained corona discharge at 30 KV DC, and corona-free operation in excess of 5 DV RMS per MIL-C-17 (up to 50,000 feet in temperature range of - 75° C to 175° C). Reduced ratings for field assemblies.

Primec Brings Out New Shielding Catalog/Manual

Primec Corporation, Division of Perlmuth Electronics Corporation, 1871 South Orange Drive, Los Angeles, California 90019, has brought out a 16-page catalog/manual describing their products to help solve RFI/EMI interference problems. Their products go under the name of "Primag 40" and Primag 90" which are magnetic shielding materials, "Primec" which are RFI/EMI shielding materials and "Elastomet" a silicone rubber RFI/EMI gasket material with individually oriented wire connectors.

Shielded-Room Leak Detection System

Raytheon Company, Dept. 5510, Space and Information Systems Division, Santa Barbara Operation, P.O. Box 1542, Goleta, California 93017, has brought out a new Shielded-Room Leak Detection System which claims to improve EMI attenuation of shielded enclosures by 20 to 40 dB. The leak detection system uses high-frequency magnetic inspection of seams to pinpoint discontinuities and high-resistance joints. Minute faults which could cause leakage at frequencies as high as 10 GHz are easily detected. It is claimed that attenuations as high as 130 dB are commonly obtained after corrective measures have been applied.

Shielded Matching Transformers

Microtran Company, Inc., 145 E. Mineola Avenue, Valley Stream, N. Y. 11582 and 1728 West 130th Street, Gardena, California 90249, has brought out a new catalog on military and commercial Miniature Audio Miniature Transistor Transformers, 60 Hz Power Supply and Isolation/ Power Transformers and 400 Hz Power Supply and Power/Isolation Laminated/Toroidal Transformers. These transformers comply with MIL-Q-9858, NASA NCP 200-3 and MIL-T-27B.

RFI-Free Temperature Controllers

Harrel, Inc., 16 Fitch Street, East Norwalk, Connecticut 06855, has brought out a series of RFI-Free Temperature Controllers. The Temperature Controller is intended for application where a precision control of temperature is wanted but complete freedom from all forms of radio frequency interference is required. Bulletins TDS 109 and 112 and ADS 600 and 606 describe these products.

Laboratory Video Amplifier for EMI

American Electronic Laboratories, Inc., P.O. Box 552, Lansdale, Pa. 19446, has brought out a laboratory video amplifier to perform electromagnetic interference measurements. It provides additional power gain to standard laboratory signal generators for the purpose of performing susceptibility measurements with a wide bandwidth (10 MHz) and variable output impedance, Model 120-B, aids in resolving the problem of generating a field strength of one volt per meter in accordance with MIL-E-55301 (EL), ten volts per meter in accordance with MIL-STD-826 (USAF) and proposed MIL-STD-461.

Lashclad - CP Laminates

Lash Laboratories, 6152 Mission Gorge Road, San Diego, California 92120, has brought out a new line of Kapton based laminates for multilayer and flexible circuits called "Lashclad - CP Laminates". Kapton laminate is clad with electrolytic copper without an adhesive and thereby retains the electrical, thermal and chemical properties of the polyimide film dielectric. A product bulletin is available for more detailed information.

Brushless D.C. Motor for Space Use

Globe Industries, Div. of TRW Inc., 2275 Stanley Ave., Dayton, Ohio 45404, has developed a new brushless D.C. motor which can be used to power blowers, recorders, radios and other equipments with extremely high reliability requirements. The Globe brushless motor construction is the reverse of conventional D.C. units, has a permanent magnet field which rotates and the windings are stationary. The Globe brushless motor is designed for space flights. The new motor is rated at 1/10 HP at 25,000 RPM.

"NoBrush" Generators and Frequency Converters

Georator Corporation, 315 Tudor Lane, Manassas, Virginia 22110, has brought out a line of "NoBrush" Generators and Frequency Converters. The latest "NoBrush" power package is designed specifically to provide line isolation and multiple voltage outputs for numerical control and computer applications. Output of the power package can be either high frequency AC or specified DC voltages. High frequency AC output is either 180 CPS or 400 CPS depending upon the application. A catalog, question and answers on the "NoBrush" generator, and engineering notes are available from the company.

Subminiature Switch Filters

Suppression Devices, 212 Pier Avenue, Santa Monica, California 90405, has brought out a new type of interference filter to eliminate transient R.F. interference from switching circuits. They are designed for military and computer applications and details may be provided by writing for Engineering Bulletin No. 826.

Determining Modem Performance in the Presence of Noise

Rixon Electronics, 2120 Industrial Parkway, Silver Spring, Maryland 20904, has issued Engineering Bulletin No. 89 titled "Determining Modem Performance in the Presence of Noise". The bulletin is concerned with the testing of modems to measure their performance in the presence of communications circuit noise. The types of noise, a test set-up, and the bit error rate as a performance measure are discussed. This bulletin will help the engineer understand, correlate, and use published data on modem performance relative to noise.

Ultra-Sensitive Version of RFI/EMC Meter Model EMC-25N- An extremely narrow, third IF bandwidth providing considerably improved sensitivity is now available in the Interference Analyzer Model EMC-25N. Tangential sensitivity to CW signals in the new model is from .02 microvolts at 14 kHz, the bottom of the EMC-25N's frequency range, to approximately 0.6 microvolts at 1 GHz. The third bandwidth is determined by a special internally-mounted crystal filter for each of the instrument's three 1F channels, and is 10% of the regular narrow bandwidth and 1% of the wide bandwidth.

New Spectrum Analyzing System with Integrally Tuned RF for RFI/EMC Use - The new Calibrated Spectrum Analyzing Receiver Model CSR-200 has been developed to give oscilloscope spectrum presentation, one octave at a time, of the 14 kHz to 1000 MHz range. The new tool for RFI/EMC testing, field strength measurements, spectrum surveillance and other applications, as well as for use in basic design engineering, makes possible visual quick-look surveys of octave frequency ranges with integral pre-selection during manual or automated testing, as well as narrow-band, close scrutiny of specific signals.

Fairchild Winston's Noise Suppressor Increases Signal-To-Noise Ratio 10 DB - A newly patented Dynamic Noise Suppressor, which contains a dynamic filter, provides for the reduction of transmission noise in communication and tape recorder systems. The unit depends upon the spectral characteristics of most signals carrying intelligence and dynamically changes the gain for high frequency signals, thereby reducing wideband noise during transmission or recording of data. Useful in video tape recorders, telemetry and other communication systems, the Dynamic Noise Suppressor provides 10 to 12 db of noise reduction. The unit requires no modification of existing equipment and is packaged for a standard EIA rack mounting or as a compact airborne module, operating from 115 volts as or \pm 12 volts respectively.

New RFI Screen for Pushbutton Switches

Master Specialties Company, 1640 Monrovia, Costa Mesa, California 92627, has brought out an RFI screen for Twist-Lite Series 10E Illuminated Pushbutton Switches. Added protection against unwanted radiated and conducted RFI passage thru the panel cutout is offered by inclusion of a fine mesh metal screen. This screen is installed between the lamps and display screen making an electrical contact to the unit's housing, which contacts the panel and grounds any RFI attempting to pass through the unit. It is available for full, vertical, horizontal, three-or-four-way split displays.

Bulletins Available on Isolation Devices

Elcor, a division of Halliburton Co., 2431 Linden Lane, Silver Spring, Maryland 20910, has brought out a series of bulletins as follows: Bulletin 95-765 Reduction of Noise in Low-Level Measurement and Control Systems Through Proper Use of Isolation Devices; Bulletin 58-665 Recommended Methods of Isolation Measurements for Elcor Isolation Devices; Bulletin 79-364 Definition of Isolation Parameters for Elcor Electrical Energy Source Isolation Devices (Isoformers, Isores Units, Isoplys); Bulletin 62-266 1000 Watt Power Isoformers, and Bulletin 89-1064 Shielded Isolation Transformers with Highly Isolated Secondary Windings.

Gask-O-Seal Handbook and Catalog Available

Parker Seal Company, Culver City, California and Cleveland, Ohio, has brought out a 70-page Handbook Catalog W5460 which describes the waveguide flange and EMI sealing of Mark VI Gask-O-Seal. The basis of the Handbook is to review the relationship of important waveguide junction properties to desired performance characteristics. Each of the properties has been measured in an extensive measurement program. Catalog G5411 contains 120 pages of design, engineering and other data on all Gask-O-Seals.

New VLF Impulse Unit

Honeywell, Inc., 4800 East Dry Creek Road, P.O. Box 5227, Denver, Colorado 80217, has brought out a new VLF Impulse Unit. It is a solid-state impulse generator designed to measure and calibrate very low frequencies of electromagnetic energy. The new multi-purpose test unit called the "Honeywell Model 4857" is said to produce a calibrated, wideband, flat frequency spectrum from 120 Hz to 250 Hz with variables of 70 db. Additional functions of the unit are: Calibrating standard for noise and field intensity meters; rapid gain and frequency response checks for amplifiers and radio receivers operating below 250 KHz; rapid filter attenuation and insertion loss measurements; bandwidth measurements; receiver alignment, and measurement of receiver susceptibility.

Measurement of Ultra-Low Level Signals in the Presence of Noise

Teltronics, Inc., Box 466, Nashua, New Hampshire 03060, has brought out a Coherent (Lock-In) Amplifier, Model 300-A, for the measurement of ultra-low level signals in the presence of noise by synchronous detection. Other characteristics are: Continuously tunable from 1.5 Hz to 200 kHz; broad-band to Q = 25 signal filtering; 160 db overall amplifier gain; plug-in preamplifiers, and reference channel can drive a coaxial switch or chopper directly.

Rotary Servo Components

Harowe Servo Controls, Inc., West Chester Pike at Westtown Road., West Chester, Penna. 19380, has issued a catalog with technical details of their line of rotary servo components to fill the need of control system designers with comparisons between the performance of brushless and brush type synchros, etc.

Fairchild Brings Out New RFI/EMC Products

Fairchild Electro-Metrics Corporation, 88 Church St., Amsterdam, New York 12011 and 6711 South Sepulveda Blvd., Los Angeles 45, California, announces the following new products for RFI/EMC application:

The Spectrum Surveillance System designed to sweep the spectrum from 20 Hz to 1000 MHz and plot simultaneously both the average and peak readings of received signals. It is called a "Dual-Pen RFI/EMC Surveillance and Testing System" and is designated as Model FSS-250.

2500 Hz Selective Bandwidth Available on Fairchild RFI Meter - Considerably improved sensitivity to RFI/EMC broadband signals is possible with a new wider-bandwidth version of the EMC-10 Series Interference Analyzer. The EMC-10, which was previously available only with the selective bandwidth combination of 5 Hz, 50 Hz and 250 Hz, can now be obtained with bandwidths of 5 Hz, 50 Hz and 2500 Hz or 5 Hz, 250 Hz and 2500 Hz, resulting in improved usefulness for broadband measurements over its frequency range of 20 Hz to 50 kHz. The company can also now modify previously purchased EMC-10 or EMC-10E's to the new bandwidths.

MEMBERSHIP APPLICATION

IEEE ELECTROMAGNETIC COMPATIBILITY GROUP

Send to: IEEE Headquarters, 345 East 47th Street, New York, N.Y. 10017

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