IEEE NEWSLETTER

ELECTROMAGNETIC COMPATIBILITY GROUP

Rexford Daniels, Editor
Monument Street
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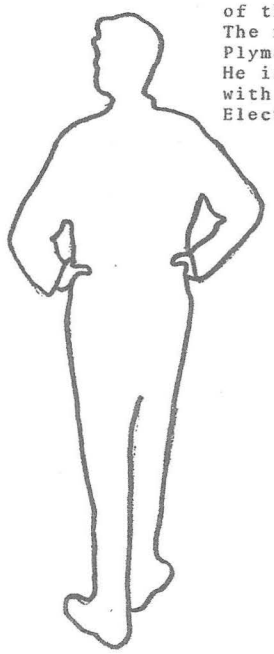
editorial



With this issue your editor is handing on the challenge of the Newsletter to younger and more active hands. The new editor is Robert D. Goldblum, 608 Gawain Road, Plymouth Meeting. Pa. 19462 - Tel: (215) 828-2805. He is chairman of the Philadelphia G-EMC Chapter and with the Space Systems Organization of the General Electric Company - Tel: (215) 962-4908.

It seems impossible for your editor to try and enumerate all the thrills and satisfactions which he has been exposed to, over the years, in witnessing EMC grow from a "black art" to an all-encompassing responsibility to all disciplines throughout the entire electromagnetic spectrum. The present challenge is now a thousand-fold greater than when he first took over and promises to grow greater still.

Your retiring editor takes this opportunity to thank, literally, the hundreds of associates and friends who have helped him get the story out to the members of the EMC Group and hopes that they will give their support to the new editor who will certainly need it.

Your retiring editor is glad to say that he will continue as chairman of the EMC Spectrum Study Committee, which is interested in everything which goes on in the electromagnetic spectrum in all disciplines and will welcome any and all material on this tremendous subject, which is the next big responsibility of EMC. So, with a tear in the eye, this is GOODBYE.

Rexford Daniels

Rexford Daniels, Retiring Editor
G-EMC Newsletter
Monument St., Concord, Ma. 01742

report to adcom on '68 symposium

ARRANGEMENTS

1. The 1968 IEEE Symposium of Electromagnetic Compatibility will be held in Seattle, Washington, July 23, 24, and 25. Headquarters will be the Benjamin Franklin Hotel with technical sessions and exhibits at the Civic Center (former World's Fair Site).

2. The following events are scheduled at the Hotel:

   2.1 Sleeping accomodations consisting of 150 single and 50 double rooms are reserved. Oth facilities are available.

   2.2 Two conference rooms have been reserved and another held for potential use. Invitations have been sent to industry EMC committees to avail themselves of this service.

   2.3 Early arrivals can register for the Symposium on Monday evening, July 22, in the booth on the hotel balcony.

2.4 The reception and the dinner banquet will be in the Hotel.

2.5 Evening sessions could be held here if desired.

3. The Seattle Civic Center will be the site of the following activities:

3.1 Normal registration will begin July 23 in the foyer of the Rainier Room in the North Court.

3.2 Exhibits will be located in the Olympic Room and expand as necessary into the San Juan Rooms (11:00 a.m. to 6:00 p.m. daily).

3.3 Technical sessions will be held in the two end rooms of the five (5)-room San Juan Complex.

3.4 The luncheon banquet will be held in the Rainier Room.

4. Downtown Seattle is joined to the Civic Center by inexpensive monorail transportation, included in the registration package.

5. The local chapter EMC exhibit will be in the Pacific Science Center, a short walk from the Symposium area.

EXHIBITS

1. All exhibits will be in the San Juan Rooms of the North Court complex at the Seattle Civic Center. They will begin in the Olympic Room and expand into the other rooms as needed. The inside route from session rooms to lunch is through the exhibit area.

2. Rowan Northwestern Decorators have been contracted to handle details of the exhibit area.

3. Letters have recently been mailed to potential sponsors.

PUBLICITY

1. National publicity was prepared and released by Fred Nichols.

2. Publicity in the Los Angeles area is being handled by George Ufen, and Guy Ottinger is covering the San Francisco area.

3. In Seattle, the Section's "Data Link" has begun publishing a series of biographies of personalities associated with the coming symposium. The first one was of R.B. Schulz, chairman.

4. Lawrence G. Cumming is to publicize the symposium in the Vancouver, British Columbia area.

PUBLICATIONS

1. To date, the Publications Committee has been primarily concerned that stationery was designed and available.

2. Published papers will be restricted to eight (8) pages, including photographs. Consideration is also being given to recording and publishing the keynote, dinner, and luncheon addresses.

PROGRAMS

1. Summaries of approximately 85 papers have been received and 49 selected, including standbys.

2. One full panel session on Industrial EMC Committees is being chaired by Don Clark, Port Hueneme. Two short panel sessions are being considered, each of which would replace two papers. One is on shielding; the other concerns near-fields of antennas.

3. The first program announcements will be on time (approx. May 1).

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'68 EMC Symposium

(ENGINEERING + MANAGEMENT = COMPATIBILITY)

The 1968 National Symposium on Electromagnetic Compatibility, Institute of Electrical and Electronic Engineers, is announced by Mr. Richard B. Schulz, Symposium Chairman. The Symposium will be held on 23-25 July in Seattle, Washington, with headquarters at the Benjamin Franklin Hotel and the technical conferences and exhibits at the nearby Seattle Civic Center, connected by monorail.

The outstanding technical program makes this year's EMC Symposium the first one truly international in scope with papers fromEngland, France, Italy and Sweden, in addition to the U.S.A. A complete preliminary program is presented below.

Other firsts for this Symposium include:

(1) More technical exhibits than ever before.

(2) Package admission fee good for all Symposium activities: technical sessions, luncheon, banquet, monorail transportation, Symposium Record.

(3) A truly complete spouse's program at half the participant's package fee - tentatively includes (a) bus tour of Seattle, (b) Space Needle elevator ride (both ways), (c) Pike Place Market, (d) underground Seattle, (e) water tour, (f) Snoqualmie Falls (g) reception (by co-sponsors) and banquet.

(4) EMC-related committee meetings of the EIA, SAE, G-EMC Ad Com, etc.

In addition, various optional no-host events are planned such as a boat ride to Blake Island with an Indian-style baked fresh salmon dinner, an EMC exhibit at the nearby Science Pavilion, etc.

Guest speakers are as follows: Mr. Maynard L. Pennell, V.P. The Boeing Company, will speak on the SST at the banquet; Mr. A. H. Sullivan, Jr., past Chairman G-EMC, will talk on spectrum pollution at the luncheon; Dr. R. M. Showers, University of Pennsylvania, will offer the keynote address.

Officers of the Symposium include: Vice Chairmen: G. L. Ottinger (San Francisco area) and G. R. Ufen (Los Angeles area), Secretary: V. C. Plantz, Treasurer: B. L. Carlson. Sommittee Chairmen are as follows:

Arrangements:	E. Knowles	Technical Program:	J. Maynard
Finance:	B. Carlson	Papers Review:	A. Eckersley
Publications:	R. Goldman	Nat'l. Publicity:	F. Nichols
Exhibits:	S. Dyrnes	Local Publicity:	E. Marek

Advisors to the Symposium Staff are: A. H. Sullivan, Jr., past Chairman, G-EMC; J. J. Egli, past Vice Chairman G-EMC and L. W. Thomas, Sec. G-EMC.

PRELIMINARY TECHNICAL PROGRAM

TUESDAY

8:00 AM Registration

9:00 AM Welcoming Address

R. B. Schulz, Symposium Chairman

Keynote Address

R. M. Showers, Univ. of Penn.

Session 1A - Communication Equipment Interference

Chairman: Dr. H. Schlicke — Allen-Bradley

1. An Orthogonal Detection Kit for Communication Receivers to Suppress Common Channel Double Sideband Interference — J. E. Bridges, R. Zalewski, T. Shaifer, IIT Research Instit.
2. Adjacent Signal Interference — William G. Duff, Gerard Capraro, Atlantic Research Corp.
3. RFI Suppression and MIL-STD-188B Conversion of Model 2B Teletypewriter Apparatus. — J. A. Bellino, Teletype Corp.

Session 1B - Spectrum Signatures

Chairman: W. W. Everett Jr. — RADC

1. Spectrum Signature Predictions — W. B. Henry, Univ. of Mich.
2. Interference Reduction Techniques for Radar Transmitters — S. H. Zelinger, Hughes Aircraft Co.
3. Distributed Noise Emission Spectra — Harry M. Martin, ECAC - IIT

12:00 Luncheon — Speaker - A. H. Sullivan, Jr.

Session 2A - Computer Use in Interference Analysis

Chairman: H. Bartman

1. EMI Data Reduction, Prediction and Analysis Using Time-Shared Computers — Alfred W. DiMarzio, R. C. A.
2. A special Purpose Digital Radar Simulation and Performance Prediction Model — M. E. Parmer, Textron-Bell Aerosystems Co.
3. A Probabilistic Performance Evaluation Technique Based on Dual Receiver Thresholds — A. S. Thompson, D. S. Chandler, Textron-Bell Aerosystems Co.
4. A Method of Using Audio Signal-to-Noise Measurements to Obtain Criterion Contours for the Probability Scoring Model for Scoring Voice Communication Reception — T. J. Witter, I. J. Sorkin, Textron-Bell Aerosystems Co.
5. A Method for Computing Inter-modulation-free Frequency Lists — M. N. Lustgarten, ECAC - IIT

Session 2B - Magnetic Shielding

Chairman: A. Fong — Hewlett-Packard Co.

1. Field Pattern Plotting as an Aid to Magnetic Shielding Analysis — C. M. Brennan, C. G. Conner, F. J. Morris, Electro-Mechanics Co.
2. Ferromagnetic Shielding Relate to the Physical Properties of Iron — Frederick J. Young, Westinghouse Electric Co.

Panel - Industry Committee Activities

Chairman: Don Clark, U. S. Naval C. E. Laboratory

Panel Members: W. E. Pakala

WEDNESDAY - July 24, 1968

Session 3A - Environmental Noise

Chairman: A. Eckersley — The Boeing Co.

1. Radio Noise Measurements on High Voltage Lines 2.4 to 345 KV — William E. Pakala, E. R. Taylor, R. T. Harrold, Westinghouse Electric Co.
2. A Survey of Radio Frequency Noise in Urban, Suburban and Rural Areas — A. H. Mills, General Dynamics
3. Summary of Present Knowledge of Metropolitan Radio Noise — C. D. Lunden, W. E. Buehler, The Boeing Co.
4. Measurement of Manmade Electromagnetic Radiations from a 200 Mile Orbit — Herbert K. Mertel, General Dynamics
5. Radio Frequency Distortion in Plasmas — R. D. Trammel, Jr., Ga. Inst. of Tech.

Session 3B - Measurements

Chairman: Dr. R. C. Baird — NBS

1. The Electromagnetic Incompatibility of EMI Filter Test Methods and Test Results — David J. Jobe, Motorola, Inc.

2. Field Strength and RFI Standards at Nat. Bur. of Standards — Harold E. Taggart, Nat. Bureau of Stds.

3. The Role of Metrology in Electromagnetic Compatibility — Frank K. Koide, Autonetics

4. Recording and Reproducing Transients for Frequency Domain Analysis — Donald W. Moffat, Gen. Dynamics

5. Generating High Intensity Electromagnetic Fields for Radiated Susceptibility Tests — Victor P. Musil, Genisco Technology Co.

Session 4A - International Papers

Chairman: J. Hill

(Papers and authors to be supplied later, total 5 papers)

Session 4B - Computer Use in EM Specification

Chairman:

1. Math. Modeling Techniques for a Computerized EMC Analysis — A. K. Thomas, TRW, Inc.

2. Computerized EMC Specification Development for Space Vehicles — W. R. Johnson, TRW, Inc.

Panel - Transfer of Antenna Radiated Energy Between Proximal Equipments

Chairman: Dr. R. Whiteman, ECAC

Panel Members:

Marvin Aasen, John Ramsay, Frances Prout
Cmdr. H. Winter, Reginald Gray

Reception

7:30 PM Banquet

Principal Speaker - M. Pennell, SST

THURSDAY - July 25, 1968

Session 5A - Near Field Coupling

Chairman: C. D. Lunden — The Boeing Co.

1. Near Field Coupling to Aircraft 1-30 MHz Band — R. I. Gray, U. S. Naval Weapons Lab.

2. Improvement of System Compatibility Through Coupling Reduction — J. A. M. Lyon, C. J. Digenis, W. W. Parker, Univ. of Mich.

3. Empirical Formula for the Prediction of Microwave Antenna Coupling — Frances M. Prout, Lester E. Polisky, John J. Oliva, Atlantic Research Corp.

4. A general Model for Integrated Circuit Susceptibility Prediction — W. W. Cowles, R. M. Showers, Univ. of Penn.

5. Calculation of the Field in a Closed Cylinder Resulting from an Electromagnetic Pulse — J. L. Erskine, The Boeing Co.

Session 5B - Electromagnetic Shielding

Chairman: W. McCullough

1. Simplified Shielding for Perforated Shields — R. B. Cowdell, Genisco Tech. Corp.

2. Electromagnetic Shielding in the Near Field — W. S. Adams, A. H. Mills, Martin Marietta Corp.

Panel - Recommended Practices for the Measurement of Shielding Effectiveness

Chairman: J. E. Bridges, IIT

Panel Members:

R. B. Schulz

James Klouda

Len. Thomas

Session 6A - Installation Environments

Chairman:

1. Environmental Interference Study Aboard a Naval Vessel	R. F. Elsner M. J. Frazier L. S. Smulstys IIT Research Inst.	
2. Relations of Site Effects to Statistical Gain Characteristics of Radar Antennas	F. L. Cain K. G. Byers, Jr. Ga. Inst. of Tech.	
3. Electromagnetic Compatibility Operational System (EMCOPS)	T. E. Cherot, Jr. Pacific Missile Range	
4. Space Radiation Challenges the MOSFET	Roy O. Lange Lockheed Co.	

Session 6B - Cable & Wire Coupling

Chairman:

1. Internal Voltages and Currents in Solid-Shielded Cables	E. F. Vance J. E. Nanevicz Stanford Research Inst.
2. Common Mode Cable Coupling Matrices	T. H. Herring The Boeing Co.
3. Coupling Between Open Wires Over a Ground Plane	R. J. Mohr Airborne Inst. Lab.
4. Penetration of Coaxial Cables by Transient Fields	D. A. Miller P. P. Toulios IIT Research Instit.

Miscellany

H.R. 14910 APPROVED BY HOUSE OF REPRESENTATIVES

The above Bill was approved in the House by voice vote on March 12, 1968. The Bill as approved is as follows:

"To amend the Communications Act of 1934, as amended, to give the Federal Communications Commission authority to prescribe regulations for the manufacture, import, sale, shipment, or use of devices which cause harmful interference to radio reception.

BE IT ENACTED BY THE SENATE AND HOUSE OF REPRESENTATIVES OF THE UNITED STATES OF AMERICA IN CONGRESS ASSEMBLED, that the Communications Act of 1934, as amended, is further amended by adding thereto a new section 302 to read as follows:

'DEVICES WHICH INTERFERE WITH RADIO RECEPTION

'Sec. 302. (a) The Commission may, consistent with the public interest, convenience, and necessity, make reasonable regulations giverning the interference potential of devices which in their operation are capable of emitting radio frequency energy by radiation, conduction, or other means in sufficient degree to cause harmful interference to radio communications. Such regulations shall be applicable to the manufacture, import, sale, offer for sale, shipment, or use of such devices.

'(b) No person shall manufacture, import, sell, offer for sale, ship, or use devices which fail to comply with regulations promulgated pursuant to this section.

'(c) The provisions of this section shall not be applicable to carriers transportation such devices without trading in them, to devices manufactured solely for export, to the manufactuter, assembly, or installation of devices for its own use by a public utility engaged in providing electric service, or to devices for use by the Government of the United States or any agency thereof. Devices for use by the Government of the United States or any agency thereof shall be developed procured, or otherwise acquired, including offshore procurement, under United States Government criteria, standards, or specifications designed to acheive the common objective of reducing interference to radio reception, taking into account the unique needs of national defense and security.'"

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WALTER D. McKERCHAR FORMS NEW COMPANY

Walter D. McKerchar and John C. Peters have formed the Electromagnetic Sciences Company at the EMC Science Center, 1616 Victory Blvd., Glendale, Calif., 91201 - (213) 245-1024. Walter McKerchar was formerly with the McDonnell Douglas Corp., in St. Louis, Mo., and was chairman of the SAE, AE-4 Electromagnetic Compatibiltiy Committee and the first editor of Spikes and Ripples.

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NBS DEVELOPS ACCURATE MEANS OF MEASURING RF POWER

In "Technical News", April 1968, from U.S. Department of Commerce - National Bureau of Standards - the following information appeared. Paragraphs of interest are as follows:

"IN BRIEF...A dual dry-load calorimeter to accurately measure rf power in coaxial systems has been developed by NBS. This calorimeter is a significant improvement over existing types in that it provides a power range of 10 mW to 1 W at a working frequency up to 4 GHz with a maximum uncertainty of less than 0.35 percent. Time required for the measurement system to reach equilibrium is less than two minutes.

"The measurement of power is fundamental to the electronics industry and is necessary in determining the absolute level of electromagnetic energy. With the effort now being put into space exploration and the rapid rate at which the electronics industry is progressing, greater demands are being made for increased accuracy in the measurement of rf quantities. In rf power measurements, for example, one percent uncertainty is often required for measurements in industrial standards laboratories. Because uncertainties are accumulated in a chain of calibrations, the uncertainties in the reference standards maintained by the National Bureau of Standards (U.S. Department of Commerce) must be appreciably less than one percent. Research at the NBS Institute for Basic Standards to meet these demands has resulted in the development of a new dual dry-load calorimeter, which incorporates an automatically controlled reference dc input power, as an accurate means of measuring rf power."

X-RAY WAVELENGTHS AND X-RAY ATOMIC ENERGY LEVELS

U.S. Department of Commerce - National Bureau of Standards has announced the following publication:

"by J.A. Bearden (The Johns Hopkins University), National Bureau of Standards Publication NSRDS-NBS 14, issued September 25, 1967; 66 pages; 40 cents. (Order from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402; the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151; or from local U.S. Department of Commerce Field Offices.)

The new determinations of x-ray wavelength and atomic energy levels in this publication provide, for the first time, highly accurate data base of selected primary standards and methods of computation. These compilations were first published in Reviews of Modern Physics, January 1967 and are reprinted as part of the National Standards Reference Data System with the permission of the editors of the Reviews of Modern Physics and the approval of the authors.

In a Johns Hopkins University study, serious discrepancies were found in the values of the reference standards for nuclear beta and gamma ray spectroscopy provided by the higher energy emission and absorption x-ray wavelengths. These discrepancies resulted from the fact that the shorter and longer wavelengths are not on the same relative energy scale. By precisely remeasuring the most used reference lines relative to a selected primary standard wavelength and by establishing the selected primary x-ray wavelength standard on an absolute Angstrom scale, university scientists were able to eliminate these discrepancies. Over 2700 reevaluated emission and absorption wavelengths listed in A* units are included in this publication."

IMPROVED CALIBRATION ACCURACY FOR COAXIAL IMPEDANCE (1-8 GHz)

The February, 1968 "Technical News" has an item under the avove heading. Paragraphs of interest are as follows:

"Accuracies of impedance measurements in coaxial-line systems have been improved significantly in recent years 1) by the Radio Standards Laboratory (Boulder, Colorado), of the NBS Institute for Basic Standards (U.S. Department of Commerce), and others. This improvement came primarily from the development of precision coaxial-line standards and precision coaxial connectors. 2) These developments have in turn contributed toward improving measurement capabilities of coaxial slotted-line systems to the extent that very accurate measurements are now possible. Errors originally introduced by structural defects of slotted lines have been minimized by the use of precision made, coaxial slotted lines. Refinements in measurement techniques have helped, in part, to reduce some systematic errors.

These improvements, along with other good practices, make the measurement possible of VSWR (Voltage Standing Wave Ratio) up to 8 GHz with an uncertainty in the range of 0.1 to 1 percent. The phase of the reflection-coefficient magnitude can be measured with an uncertainty ranging from 0.1 degree to approximately 1 degree. These uncertainties apply for coaxial impedance standards equipped with the 14-mm precision coaxial connector, where 1 z VSWR z 2, referred to 50 ohms. Coaxial impedance standards equipped with other than precision connectors and having higher VSWR's can also be measured, but with reduced accuracy."

SOLID-STATE RF NOISE SOURCE

The "Proceedings of the IEEE" February, 1968 contains a manuscript by A.J. Yakutis of MIT Lincoln Lab., Lexington, Mass. with one block diagram and two figures of output noise. The abstract and first two paragraphs are as follows:

"Abstract-RF noise may be generated by driving a step-recovery diode with an RF CW signal. Experiments resulting in watts of VHF noise are described.

Several years ago at MIT Lincoln Laboratory, it was observed by the writer that a step-recovery diode generated RF noise at S-band when reverse-biased and driven by a VHF CW signal. Noise output power densities of the order of 0.1 mW/MHz over a 20-MHz bandwidth were generated by diode A (see Table I) operating into a tunable S-band filter of 20-MHz bandwidth.

Recent advances in the power-handling capabilities of step-recovery diodes have greatly increased our interest in their use for RF noise generation. The point of this letter is to report some further observations made recently at Lincoln Laboratory in this connection."

COMPATIBLE EMI FILTERS

H.M.Schlicke and H. Weidmann, Allen-Bradley Company, authored a 10-page article, under the above title, in the IEEE Spectrum, October 1967. The sub-title and opening paragraphs are as follows:

"Conventional thinking has to be discarded when one is tackling electromagnetic-interference power-line filters. Active, lossy, and ceramic filters offer sensible solutions to problems in this often-frustrating field.

"A vexing problem in electromagnetic compatibility is the effective filtering of conducted interference from power-supply lines. Because of unavoidable and severe mismatch, conventional suppression filters operate only conditionally; such filters are often so large they are omitted from the system. Three new classes of power-line filters without these limitations are described. They are active, truly lossy, and ruggedized ceramic filters, covering the frequency range from direct current to microwaves. Present filter test methods are shown to be misleading and are replaced by a rather simple, realistic test.

"There is a set of filter classes that is rapidly growing in importance and, by necessity, is characterized by the absence of impedance matching. Without matching, all the elegant filter theories developed invalidated the very premise upon which they were based and the theories are wholly inadequate and misleading. Such conditions exist for filters inserted into power lines; power wiring is contrasted with impedance-matched cabling that interconnects subsystems for information handling and for which conventional filtering is fully adequate."

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IMPROVED RESOLUTION FOR MICROVOLT RATIO MEASUREMENTS

Loren Converse, Sandia Corporation, Livermore, Ca., has a 5-page article, under the above title, in the January, 1968, issue of the Electronic Engineer. The sub-title and first three paragraphs are as follows:

"This modified system, by eliminating interference and human error, puts dc measurement in the microvolt range.

"Because ratio measurements are very precise, they have had an important place in laboratories for some time. More recently, they have moved out of the laboratory into the field and industry. Manufacturers of resistance bridges and digital voltmeters for dc and of reactance bridges for ac are now making wide use of ratio-measurement. This article discusses a method that minimizes uncertainty in dc ratio measurements. By means of circuit shielding, thermal isolation of switches and power supply, and circuit controls, it is possible to obtain resolution of one part in 10^7.

Sources of error

"The ordinary laboratory environment contains factors that make resolution in the microvolt range difficult even with ratio techniques. Added to electrical interference (both radiated and conducted) and temperature variations is operator error. Since operator habits are difficult to standardize to ideal measurement conditions, ways must be sought to improve measurement systems themselves. In following this approach, an analysis of the sources of error helps to determine the best methods of improvement.

"The basic physical phenomena which affect any dc measuring circuit are (1) voltage drops developed in connecting leads and switches, (2) thermal voltages and (3) ac interference."

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LOCATING GROUND FAULTS IN A SHIELDED ROOM

A 2-page article with the above title by Richard Rufer and George Tyler, Lawrence Radiation Laboratory, University of California, Livermore, Ca., appears in the January, 1968, issue of the Electronic Engineer. The sub-title and first two paragraphs are as follows:

"Since faults reveal themselves as centers of increased current and show higher potential, we can find them by passing direct current through the shielded room.

"Sometimes, when a shielded room is being built, a section of the wall develops a short to ground. If the room is nearly completed when this fault occurs, it is often impossible to find by visual inspection. Since shielded rooms have a very low resistance (approximately 0.001Ω from corner to corner), it is difficult to locate faults with an ohmmeter. (See Fig. 1.) However, an electrical method has proved itself to be a very satisfactory solution to this problem.

How to locate the fault

"By passing dc current through the room it is possible to find the point in the room which has the highest dc potential. This point will be at the fault. At a fault, the increased current flowing to the short is sufficient to produce several hundred microvolts. In Fig. 2, we have represented such a fault resistance R_f, and have shown just a few of the current paths leading to the point at fault. The voltage in the room will show a maximum at points where faults are located."

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SCR ZERO-POINT SWITCHING ELIMINATES RFI

John K. Buchanan, Motorola Semiconductor, Phoenix, Az., has a 3-page article, under the above title, in the January, 1968 issue of The Electronic Engineer. The sub-title and first two paragraphs are as follows:

"Switching transients in conventional SCR phase-control circuits generate RFI that can affect other circuits. Supress it this way.

"Every time an SCR is switched on at some phase angle above 0 or less than 180, the switching transient produces RFI. To minimize these transients and their adverse effect on nearby circuitry, two conditions should be met: the applied voltage should be switched 'on' as it passes through the zero point; and the circuit should be switched 'off' as the current passes through zero.

"The latter condition is met automatically with the natural commutation of the SCR in ac power circuits. The problem is to gate the SCR 'on' at the zero-voltage crossover point. This mode of operation also minimizes the di/dt factor that constantly plagues the SCR circuit design engineer. In conventional phase control circuits, turn-on surge currents can cause deterioration and eventual destruction of the device if not properly compensated. With zero point switching, the rate of change in current is strictly dependent upon the load response to a pure sine wave - not step function - and can be handled more reliably by less expensive devices."

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ARMY TESTS HEARING AIDS THAT BYPASS THE EARS

Richard N. Einhorn, News Editor of Electronic Design, has authored a 3-page article, under the above title, in the December 20, 1967 issue. The sub-title and first two paragraphs are as follows:

"Faced with the problem of maintaining even routine conversation in the ear-shattering din aboard Chinook helicopters and the airboats (Fig.1) used in Vietnam, the Army is evaluating experimental hearing devices that bypass the ears.

"Based on some quantum effect that apparently no one really understands, amplitude-modulated rf signals are routed through the skin into the nerves of the head, and the nerves themselves demodulate the carrier to extract the audio. The 'sounds' induced in the nervous system are almost indistinguishable from those entering the ears."

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REDUCING NOISE WITH INTELLIGENT CABLING

Paul von Loesecke, The Foxboro Company, Walpole, Ma., has authored a 4-page article, under the above title, in the August, 1967 issue of Instruments & Control Systems. The first three paragraphs are as follows:

"Noise distortion of measurement signals in computer systems is a common problem. There are several ways of reducing the effects, including line filtering, integrating, digital filtering, and improving the signal-to-noise ratio, but all leave an unacceptable margin of error without proper cable selection and installation. Noise levels in various cables under various conditions are described here, and the necessity for proper cabling emphasized.

"Noise pickup (electromagnetic interference) in digital systems stems from the proximity of high-voltage, high-current cables which cause AC interference with DC signals, resulting in distorted measurement inputs. Figs. 1 and 2 show DC signals without and with noise superimposed.

"Noise rarely interferes with analog recorders or controllers because filtration by recorder pen inertia or electronics (controller circuit response time) integrates or smoothes it out. Lower frequency noise (2-5 Hz) affects control and recording performance, although these noises are usually the output of an instrument rather than electromagnetic pickups. Proper instruments should eliminate them."

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SYNTHESIZING LOW-FREQUENCY NOISE

G. Roberts, B. Finnie and G. Anderson, Hewlett-Packard Ltd., South Queensferry, Scotland, have authored a 4-page article in the August, 1967, issue of Instruments & Control Systems under the above title. Two paragraphs of interest are as follows:

"Noise is an ideal broadband test signal in that it contains all frequencies. Along with broadband frequency content, noise is also characterized by random variations in amplitude. However, 'natural' noise as a low frequency test signal is difficult to use because the pattern is not well-defined, is seldom continuous to zero frequency, and is unrepeatable.

NOISE SYNTHESIS

"Well-defined, low frequency noise waveforms can be synthesized. Since the existence of all frequencies within a band at the same time is one of the useful characteristics of noise, generating spectrum with many spectral components logically leads to the pulsed rectangular waveform, which Fourier analysis shows to be rich in harmonics. In such a waveform (Fig. 4) the spacing between the spectrum harmonics is inversely proportional to the waveform period, T. If the pulse repetition rate is reduced, the spectral lines crowd closer together suggesting that a spectrum approaching that of noise could be produced by a single pulse."

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GROUNDING AND CORROSION IN MILITARY CONSTRUCTION

Lt. Col. Lindsay M. Applegate, Army of the United States, Retired, has written a 3-page article in the Military Engineer, January-February, 1968, under the above title. The first two paragraphs are as follows:

"Grounding in electrical installations and other construction is perhaps the least analyzed, least understood, and most misapplied of all aspects of electrical design. The grounding in large power and commercial telephone systems and in a few other fields is included as part of co-ordinated electrical design, but in such applications as fuel systems, lightning protection, military communication, and missile emplacements, grounding is sometimes difficult to recognize as engineering, science, or art. The objectives of and reasons for grounding, in many cases, are obscure, but its effects on corrosion are clearly evident, particularly with respect to POL and gas line leaks.

"The six principal reasons for grounding structures and electrical circuits are:

"(1) To protect personnel from electrocution in case they themselves accidentally ground a circuit whose potential is different from the structure or earth with which the person is in contact.

"(2) To equalize potentials among components of electrical systems.

"(3) To decrease the potential difference between the earth and structures that may accumulate static electric charges.

"(4) To provide a path to ground for electric currents produced by lightning.

"(5) To provide a low-impedance connection through the earth between parts of an electric power system.

"(6) To minimize interference with or radiation from communications systems."

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RFI SUPPRESSION

Electromechanical Design has run two articles on "RFI suppression" in the November and December, 1967, issues. The November, 1967 issue contains a 4-page article by Donald V. Cook, Communications and Data Processing Operation, Raytheon Company, Norwood, Mass. The first two paragraphs are as follows:

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Mechanical design tips

"You can attain a tolerable level of rfi emission from electronic equipment enclosures if the outer metallic skin is thick and free of discontinuities and protrusions. However, attaining this level isn't possible if equipment has access covers, ventilation openings, controls, indicators and connectors. To provide for an acceptable degree of suppression and still include these equipment parts, you must find the source of leakage. Rfi leakage stems from:

"openings - discontinuities in a metal enclosure between noise source and the outside, holes, (access and ventilation) non-metals, slits, joints and seams;

"antennas - length of ungrounded metal protruding from an enclosure of ungrounded component hardware and control shafts; and

"conduction along signal and power wires."

The December, 1967, article was authored by David P. Costa, Mechanical Engineer, Port of New York Authority, and is three pages. The first paragraph is as follows:

Basic components

"Any electrical disturbance that interrupts or interferes with signal transmission, causing improper operation, indication or diminished performance, qualifies as radio frequency interference (rfi). To cope with and adequately suppress rfi, you have to recognize its presence, identify its type, locate the source and then take action to reduce or eliminate it. Five basic components can suppress rfi: capacitors, filters, resistors, shields and bonds."

HIGH-FREQUENCY MEASUREMENT OF ELECTRIC FIELDS USING A TELEMETERING PROBE

James R. Barnum, Dept. of Electrical Engineering, Stanford University, Stanford, Calif, has authored a 7-page article in the IEEE Transactions on Instrumentation and Measurement, March 1968, under the above title. The Abstract and first paragraph are as follows:

"Abstract - When image plane construction is impossible, accuracy of fields strength measurements is greatly reduced by the presence of connecting cables and apparatus. This problem may be circumvented by telemetering the field information to a distant control station.

"This paper describes a system designed to measure relative electric field strengths at 26 MHz. The sensing probe employs a voltage comparision technique, and a telemeter whose output drops to a sharp null when a specific electric field is present at the probe. If calibration is desired, the specific field may be measured or deduced through probe circuit analysis.

"The system gives better than 0.1 dB accuracy if care is taken in positioning the probe. If a large scattering field obstacle is at least 10 meters from the probe, errors in relative field measurements will be less than 1 percent due to the presence of the probe.

"Various suggestions are given to decrease the effects of some sources of inaccuracy.

1. Introduction

"High-frequency measurement of electric field strength is difficult owing to the impossiblity of image plane construction. Unless extreme care is taken, connecting cables and apparatus will distort the resultant field pattern at the probe. Therefore, it is very desirable to eliminate all wires and cables connected to the probe. If this is done, some means must be provided to telemeter the field information at the probe to a distant control station."

SKIPPING THE HARD PART OF RADIATION HARDENING

In the March 4, 1968 issue of Electronics is a 6-page article by Joseph T. Finnell Jr. and Fred W. Karpowich, Missile Systems Division, Avco Corp., Wilmington, Mass., under the above title. The sub-head and first paragraph are as follows:

"Instead of testing each component individually, the designer can crank laboratory-measured device parameters into fairly simple equations to predict the responses of his circuit elements to radiation.

"The hard way to assess how circuit components will stand up to radiation is to test each one in a simulated environment. The easy way is to measure certain component parameters in the laboratory without radiation, and then crank the values obtained into some fairly simple equations. The equations express the relationships between these parameters and radiation-induced effects, and enable the engineer to predict a component's behavior under radiation."

MAGNETIC SHIELDING WITH A SUPERCONDUCTING SOLENOID

C.W. Schultz, School of Engineering, University of Connecticut, Storrs, Conn. 06268, has written a letter in the Proceedings of the IEEE, March 1968, under the above title. The Abstract is as follows:

"Abstract - A shorted superconducting solenoid will have no change in its net flux linkage in the presence of an applied magnetic field. To compensate for some field penetration into the solenoid, its central region will have an opposite proportional field. The effect is called 'overshielding.'"

New Products

New C-Band Filter

The AAI Corporation, Cockeysville, Md., 21030, has brought out a C-band filter whcih cuts out RFI at loads of 300 kW peak. The description is as follows:

"Model 51923-1 tunable filter follows previous L- and S-band models designed to beat RFI problem in a weather system such as AN/PPS-77. For use with any radar transmitter operating from 5.45 to 5.65 Gc, narrow low-loss passband and steep skirt selectivity combine to reduce interference with a neighboring system. When components are detuned, power is dissipated in a termination and not reflected back to transmitter. Filter is a sealed unit and can be pressurized at high power levels. Bandwidth at 3dB, 20±4 Mc; at 60 dB, 150 Mc max. Max insertion loss is 1 dB, and VSWR is 1.5 max. Power: 300 W cw; 300 k pk at 20 psig."

Biconical Antenna Simplifies EMC Tests

The Filtron Company, Flushing, N.Y. 11355, has brought out Model M-B100 biconical antenna which operates at frequencies between 20 to 200 Mc, and is designed for RFI/EMC testing according to MIL-STD-461 and 462. Measurements can be made over specified range without tuning the antenna for each frequency, thereby enhancing automatic testing procedures.

IEEE-GROUP CORRESPONDENCE, PHILADELPHIA SECTION

PHILADELPHIA G-EMC NEWSLETTER NO. 4, MARCH, 1968

Past Meeting: Records were broken again with nearly sixty persons present to hear Dr. Showers' presentation "New Concepts in EMC Instrumentation". The talk was so well received that it stimulated about an hour and a half of questions and discussions afterwards. We were all impressed by and grateful for the fine hospitality offered by the Franklin Institute in providing us with a tour of their research laboratories and a comfortable meeting room. There was also a delicious supply of refreshments provided by Magyar and Associates, and technical displays by Genisco Technology Corp., Hallett Mfg. Co., and Lectro-Magnetics Inc. Enjoyable and enlightening would be a mild description of the meeting.

Reference: The French measuring techniques which Dr. Showers referenced in his presentation are included in a paper entitled "A Technique for Measuring Effective RFI Radiated from Electrical and Electronic Equipment", by K.A. Peebles and R.M. Showers, published in the 1967 EMC Symposium Record. Every EMC Group member as of last summer should have a copy of this paper in the Symposium Record. (pages 189 to 194)

Education: Few of us realize the difficulties involved in formulating a formal course in EMI/EMC. The subject matter crosses many disciplines, including antennas and transmission lines, wave theory and propagation, information theory, circuit design, instrumentation, and measurement techniques, etc. Nevertheless, we feel sure that a local university will offer an evening course if there is a sufficient amount of interest. Your G-EMC Chairman is now calling upon the nearly 100 Philadelphia G-EMC members, as well as the rest of the professional community, to express their interest. Please speak with your colleagues and associates and send me a letter or postcard with your name and/or a list of people who may be interested. If you have the time, jot down the list of subjects and material you would like to see presented. If you are an executive in your organization, please indicate how many personnel may participate or be sponsored by your company. This should be considered as a preliminary survey with no commitments attached. Those who respond to this request will be assured that they will be given advance notification of the proposed courses if offered. In order to survive professionally in a growing technology, we must grow with it. Your individual contributions can be measured through your interest and participation.

Spectrum Study Committee: A Spectrum Study Committee has been formed primarily for the purpose of disseminating reports and other information which had been gathered by Subcommittee 63.1.4 of the Task Group of the Joint Technical Advisory Committee 63.1 on "Side Effects of Electromagnetic Energy". It is the policy of the JTAC Task Groups not to give out any information except through final reports. A report should be available through the IEEE later this year. Rexford Daniels is the Committee Chairman.

1971 EMC Symposium: The AdCom was unable to reach a decision as to where to hold the 1971 Symposium during their meeting at the IEEE Convention in New York. There are three chapters in contention; Philadelphia, Washington and New York. The AdCom hopes to make the decision in Seattle during the 1968 Symposium when they will conduct their next meeting.

Information Retrieval: The third pilot issue of the EMC publications abstracts will be issued shortly by the AdCom Information Retrieval Committee. Once the format is finalized, these abstracts will be sent to all G-EMC members, probably on a bi-monthly basis. This will be an excellent addition to the benefits already offered to us by the IEEE and EMC AdCom. Milton Kant is the Committee-Chairman.

1968 Symposium: The 1968 Symposium will be held in Seattle, Washington on July 23-25. The advance member registration fee will be $27.00, which will include a banquet and luncheon ticket. A number of special events are being planned which will not conflict with normal operations of the Symposium. For example, there may be an optional salmon bake on Blake Island. This would involve a boat trip to the island, watching some Indian entertainment, and having a sumptuous repast of baked freshly caught salmon, native to the area. Also, a special exhibit on EMI will be displayed at the Science Pavilion of the Civic Center. The Symposium will be followed by an event crammed annual "Seafair Week". Seafair consists of a week full of boat races, parades, and special celebrations, such as the one at Seattle's Chinatown.

Quote: An article entitled "Is the IEEE helping you?" appeared in the March 14, 1968 issue of Electronic Design. It included a quotation from the IEEE President, Dr. Herwald, as follows: "It is my feeling that there are many individuals in IEEE who have not sufficiently appreciated that it is a voluntary organization and that as such, communications within it go along a two-way street. To get more out of the enhanced communications that are available to him, the individual must put more in...If you feel you are not getting enough out of your membership in IEEE, it may well be that you are not using the resources of the institute that really are available. It is up to you to seize the value of enhanced communications that our institute provides."

Volunteers: Messrs. Steve Garcia of Philco and Marty Berman of GE have volumteered to work on special committees of the G-EMC AdCom. There is still an excellent opportunity for anyone also who wishes to join his professional colleagues in active participation to assist on any of many sub-committees. It will only take an hour or so a week of your time, with the reward of group appreciation and personal satisfaction.

IEEE

ELECTROMAGNETIC COMPATIBILITY GROUP

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.
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