IEEE

NEWSLETTER

ELECTROMAGNETIC COMPATIBILITY GROUP

ISSUE NO. 44 JULY 1966

Rexford Daniels, Editor
Monument Street,
Concord, Mass.

NEW AD COM MEMBERS ELECTED

The new Administrative Committee members who will take office July 1st, 1966 for a period of three years are: J. Paul Georgi, Chas. A. Gregory, H. M. Schlicke, Sam. Skolnik and A. H. Sullivan, Jr. The AdCom members with their terms of office are as follows:

1967

John J. Egli
U. S. Army Signal Res. & Develop. Lab.
Ft. Monmouth, N. J.

Fred J. Nichols
Genistron, Inc.
6320 W. Arizona Circle
Los Angeles 45, Calif.

Zigmund V. Grobowski
Grobowski & Associates
1500 Massachusetts Ave., N. W.
Wash., D. C. 20005

Henry Randall
1208 Seaton Lane
Falls Church, Va.

Ralph M. Showers
Moore School of Elec'l Eng.
University of Penna.
200 South 33rd St.
Philadelphia 4, Pa.

1968

Stanton A. Bennett
Bureau of Yards & Docks
U. S. Navy
Wash. 25, D. C.

James J. Krstansky
IIT Research Institute
10 W. 35th St.
Chicago, Ill. 60616

John A. Eckert, Jr.
Norair Division
Northrop Corp.
Hawthorne, Calif.

Richard B. Schulz
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Airplane Div.
Ranton, Wash. 98055

Leonard W. Thomas
Electromagnetic Compatibility Analysis Center
Annapolis, Md. 21402

1969

J. Paul Georgi
EMC Analysis Center
Annapolis, Md. 21402

H. M. Schlicke
Allen-Bradley Co.
Milwaukee, Wis.

Charles A. Gregory
Atlantic Research Corp.
Shirley Hwy. & Edsall Rd.
Alexandria, Va.

Samuel Skolnik
USAF - RTD
Systems Engrg. Group
Wright-Patterson AFB, Ohio

A. H. Sullivan, Jr.
H R B Singer, Inc.
1000 Connecticut Ave. N. W.
Wash., D. C. 20036

CHAPTER ACTIVITIES

Los Angeles:

A meeting was held on March 17, 1966 and Prof. Jack G. Hewitt, Jr., University of Denver, spoke on "Instrumentation for Measurement of Stray Energy in Electroexplosive Devices" and Wm. J. Coleman, North American Aviation, S&ID, Downey, Calif, spoke on "Test of the Apollo Standard Initiation with Regard to the Radio Frequency Radiation Hazard."

Mohawk Valley:

This Chapter held a meeting on March 8, 1966 and Richard Parvin Military Prods. Group. Honeywell, Inc., St. Petersburg, Fla., spoke on "Technique Pattern" and Dale Samuelson, Fairchild Electro-Metrics, Amsterdam, N. Y., gave a talk on "New RFI Instrumentation."

New Orleans:

There were two meetings held by the IEEE G-EMC and G-A&P. The first one was on Feb. 17, 1966 with the following program: Salvador E. Long, The Boeing Co., New Orleans, La. and John H. Williams, NASA JFK Space Center, Fla., spoke on "A Gaussian Model for Representing First Order Perturbations of Lasers Wavefront Propagating in the Earth's Atmosphere" and Fred Harmon, Southwestern Engineering, Houston, Texas, gave a talk on "State of the Art in Lasers and IR Devices."

The second meeting was held on April 21, 1966 and Walter D. McKerchar, EMC Div., McDonnell Aircraft Corp., St. Louis, Mo. spoke on "The Phantom II - A Comprehensive Program for Electromagnetic Compatibility." The program included color motion pictures on EMC problems plus Gemini 6 and 7 Space Rendezvous.

Philadelphia:

A meeting was held on April 12, 1966 and Stephen Caine, Dept. of the Navy Bureau Ships, Wash., D. C., gave a talk on "New Tri-Service Military Standards on Electromagnetic Interference."

Seattle:

On Feb. 16, 1966 a meeting was held by this Chapter and Wm. E. Budd, Watkins-Johnson Co., Palo Alto, Calif., gave a talk on "Automated EMI Measurements."

Another meeting was held on March 9, 1966 and Merle G. Poland Bonneville Power Administration, Portland, Ore., spoke on "Radio Influence (EMI) Measurements on 1100 KV High Voltage DC Transmission Line."

EDITOR'S NOTE

Your editor automatically receives copies of all Newsletters published by other Groups. He must comment on their distinct improvements in context and appearance, since the editor's luncheon at the March convention, including our own - for which your editor can take no credit. This general improvement means that the Newsletters can now become more important vehicles for serving our members and that we should take as much advantage of this change as possible.

Although your editor has some ideas of his own, he would greatly appreciate any and all ideas which any of our members may have. These could include formats, drawings, pictures, cartoons, specialized bibliographies, or any other contributions which any member may feel will be of value to the others. We now cover the entire electromagnetic spectrum and anything which interferes with its use. If you have any item of value, please send it along immediately, not tomorrow.

Rexford Daniels, Editor

EMC Symposium

GENERAL BLEYMAIER TO KEYNOTE 8TH EMC SYMPOSIUM

Gen. Joseph S. Bleymaier, Comdr., Air Force Western Test Range, Vandenberg AF Base, Calif., will be the keynote speaker at the 8th Electromagnetic Compatibility Symposium in San Francisco, July 11-13, 1966. Gen. Bleymaier will speak at 9:30 a. m. on July 11th, on many EMC topics (extract from one of Gen. Bleymaier's articles appears in this Newsletter).

RADC, Rome, N. Y., is sending their specially fitted C131, Airborne Antenna Pattern Measurement System AN/FSM-17 to San Francisco Internat'l Airport for viewing by the Symposium attendees. RADC will arrange to give briefings of the installation and also a possible demonstration of its capabilities. There will be some chartered buses from the San Francisco Hilton to the Airport on Monday evening July 11, 1966.

WASD Air Force, Wright-Patterson Air Field, Ohio, will have an exhibit under the direction of Charles Seth, SEACR, which will contain the latest specifications, copies of AF Studies, Handbooks, etc.

In the Symposium Committee, Mr. Jerry F. Kirk, Lockheed Missiles & Space Co., is the new Chairman of the Publications Committee replacing Mr. Richard Stone who is no longer available to serve in that capacity.

CHAPTER FORMED

CENTRAL TEXAS CHAPTER FORMED

A local Chapter of the IEEE G-EMC has been established within the Central Texas Section, and has been approved by the IEEE Executive Committee in New York. Wm. E. Corey, Secretary, Central Texas Section, P. O. Box 2296, San Antonio, Texas 78206, served as the organizer. The names and addresses of the Chapter Officers will be published as soon as received.

Standards

TRI-SERVICE COORDINATION OF ELECTROMAGNETIC INTERFERENCE STANDARDS & SPECIFICATIONS

A paper summarizing the work of the Tri-Service Working Group for the preparation of the new Tri-Service Electromagnetic Interference Standards has been prepared by Stephen Caine, Chairman, Dept. of the Navy, Bureau of Ships, Code 452H. In a letter of May 10, 1966 to the editor giving details on the coming publications, Mr. Caine stated in essence:

"As you may know, MIL-STD-463 Definitions & System of Units, Electromagnetic Interference Characteristics, preparing activity Army, has been coordinated with industry and is in its final printing. It will probably be available from the Army within 60 days The other two standards will be released for comments around June 1, 1966. All comments should be sent to the preparing activity (Navy for MIL-STD-461 Electromagnetic Interference Characteristics, Requirements for and Air Force MIL-STD-462 Electromagnetic Interference Characteristics, Measurements of) within 60 days so that final coordination can be achieved by November of this year."

Members of the Tri-Service Working Group are as follows:

Army - Guy D. Johnson, Army Electronics Command
Wm. DeNardi, Army Electronics Command

Navy - Frank Giordano, NASL
Stanton Bennett, Bureau of Yards & Docks
Richard D. Nussbaum, NADC
Fleming Lee, Bureau of Ships

Air Force - Fred F. Moore, RADC
Charles Seth, WPAFB

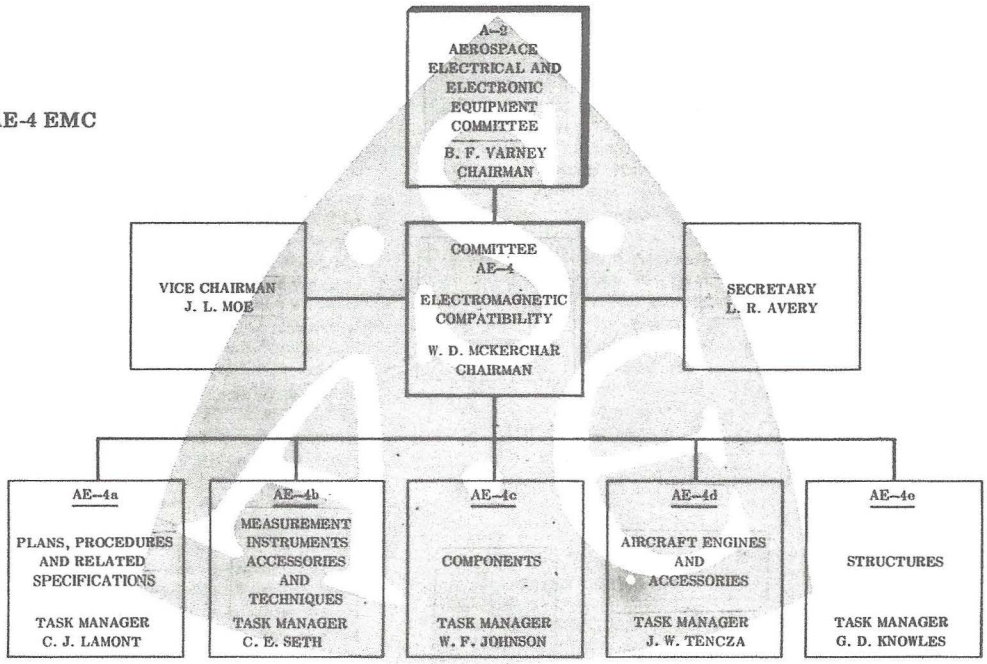
NASA - James Tolar, Geo.Marshall Space Flight Center
Charles Clarke, Manned Apollo Reliability

Copies of the above paper may be obtained by writing to Mr. Caine, Bureau of Ships, Code 452H.

SOCIETY OF AUTOMOTIVE ENGINEERS REVISES EMC COMMITTEE

Under the chairmanship of W. D. McKerchar, SAE Committee AE-4 Electromagnetic Compatibility has been revised as per the following Organization Chart:

SAE COMMITTEE AE-4 EMC



The Executive Committee is as follows:

EXECUTIVE COMMITTEE

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AE-4 LIAISON REPRESENTATIVES

On May 10th and 11th, a meeting was held at ECAC in Annapolis. Md., at which Rear Adm. R. H. Weeks, USN, DNC, and Mr. E. C. Wood, OSD (DDR&E) made the keynote addresses. In order that there can be close cooperation between IEEE G-EMC and SAE Committee AE-4, the Committee AE-4 Liaison Representatives are listed as follows:

COMMITTEE AE-4 LIAISON REPRESENTATIVES

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Dover, N. J.

J. J. Fisher, PREN-34
Bureau of Naval Weapons
U. S. Navy
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J. P. Georgi, ECAC
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Huntsville, Ala.

EMC CALLED PROBLEM FOR COM SYSTEMS

Electronic News, May 2, 1966, carried the following news item:

"Tucson. - Electromagnetic compatibility among future military and ground-based satellite systems operating in the same frequency band will require strict attention to engineering details, according to Julius L. Levatich, Communications Satellite Corp.

"Speaking before last week's IEEE Region Six annual conference, Mr. Levatich contended that international convention restricted operating frequency and output power of satellites.

"He added that to get compatibility in the future designers will have to take into consideration high levels of interference."

EMC CONSIDERATIONS IN SHIP COMMUNICATIONS SYSTEMS

A. G. Loveberg, U. S. Navy Electronics Lab., San Diego, Calif. 92152, delivered a paper under the above title, at the IEEE Region Six Conference, April 1966. Copies of the paper are available by writing to Mr. Loveberg. Excerpts from the Introduction to this paper are as follows:

"By 1960 the Navy and its laboratories became acutely aware that a systems attack on communications problems was the only way to avert paralysis of the total shipboard electronic installation being generated as a result of uncoordinated growth and complexity. The Navy studies of the problem culminated in 1960 with the formulation of an ad hoc committee for Navy wide communications. . . .

"That part of the program that addresses the afloat communications situation is being led by the U. S. Navy Electronics Lab. under direction of the Bureau of Ships. It is a united attempt among Navy organizations and private industry to cure the major communication problems associated with the shipboard environment, hostile as it is to electronic operation and effective system performance.

"Electromagnetic compatibility is perhaps the most complex and evasive of shipboard communication system design problems. Unique among military communication systems, the crowded assemblage of high power transmitters, high sensitivity receivers, and high speed processing in the space provided by a Navy ship results in severe isolation and noise reduction problems not capable of solution by familiar techniques such as the separation of transmitters and receivers.

"Under the communication system effort, the Navy Electronics Lab. is directly involved in the study of electromagnetic compatibility. These studies include, 1) the operation of receivers in the presence of strong undesired signals; 2) the development of techniques and designs for the reduction of transmitter spurious signals and out of band noise; and 3) the reduction of environmentally generated interference.

"A Systems Facility capable of testing, exercising, and operationally validating a total ship communication system is under development. It will provide the data for design and effectiveness analysis as well as the resolution of problems in interface and compatibility."

A SHIPBOARD INTERFERENCE SIMULATOR

The Clearinghouse for Federal Scientific and Technical Information Bulletin No. FA 66-189 Communications describes the simulator as follows:

"A Shipboard Interference Simulator. . . has been designed by the Navy Electronics Lab. which accurately reproduces the potential frequencies of interference derived from the intermodulation between any combination of simultaneous transmitter fundamental frequencies up to a total of 10. The relationship of interference-signal magnitudes is in reasonable agreement with similar signals actually measured aboard ship. NEL says the simulator has proved its worth as an aid in demonstration of intermodulation interference before Naval personnel concerned with shipboard communications problems. The simulator represents an analog computer with which detailed knowledge of intermodulation phenomena can be increased. . . W. M. Chase and T. L. Whalen, Navy Electronics Lab., San Diego, Calif., Jan. 1966, 26 pages. . . . Order Stock No. AD-630 989 SHIPBOARD INTERFERENCE SIMULATOR from Clearinghouse, U.S. Dept. of Commerce, Springfield, Va. 22151, price $2.00 (microfiche 50 cents).

ARE YOU SURE YOU'RE GETTING RG CABLE

Mr. John Holland and Mr. Robert Kramer, Quality Assurance Dept. Amphenol Cable Div., The Amphenol Corp. have written a 4-page article in Electronic Procurement, April 1966, under the above heading. The first three paragraphs are as follows:

"A great deal of confusion surrounds the connotations of the prefix 'RG' on coaxial cable used for radio frequency and power transmission. Because most designers believe the prefix indicates certain standard characteristics, and because they accept coaxial cables as hardware, they often learn too late that coaxial cable must be chosen with as much care as any other critical component.

"Compounding this problem is a trend toward careless usage of cable nomenclature, so that the terms 'RG-type' and 'RG-equivalent' take on the undeserved appearance of conventional MIL-spec designations. The use of subspecification materials, often in conjunction with subspecification manufacturing techniques, has flooded the market with highly unpredictable coaxial cable.

"For more than two years, Ampehnol Cable has studied a wide range of certified cable samples purchased directly from manufacturers. The results of this study have shed light on the exact effects of different materials on the performance of production coaxial cable, and what the designer should consider when specifying it. Sample cables from this study illustrate the various problems to be dealt with in light of the present state-of-the-art of coaxial cable."

SHIELDED LIGHT BEACONS FOR SPACE RENDEZVOUS

A 3-page article with charts and pictures appears in the May 1966 issue of E D N by Claude W. Brenner, Chief Engineer, Systems Div. Edgerton, Germeshausen & Grier, Inc., Bedford, Mass. A paragraph of interest is as follows:

"Light beacon for space vehicle consists of compact, high-intensity, wide-angle source designed to operate under extreme environmental conditions. Encapsulated package comprises d-c to d-c converter, energy-storage capacitors and triggering and timing circuitry for initiating and controlling light flashes. Horseshoe-shaped flashtube is exposed, but its electrodes are embedded in the encapsulation. For effective RFI suppression, both box and flashtube are shielded. Box shield consists of 6-mil aluminum-coated Mylar foil. Top cover is shielded with 40-mil aluminum plate. Flashtube shield consists of hemispherical screen of 12-mil Monel wire, which provides good shielding with minimum degradation of light."

SLEEVE FOR RF CABLES BRIDGES SHIELDING GAP

Electronic Design, in its May 10, 1966 Nasa Tech Briefs column, carried the following item:

"Problem: Eliminate the RF shielding gap between an RF cable (with braided-metal RF shielding) and a multipin connector.

"A grounding jumper across the gap between the terminated portion of the braided metal and connector, which is commonly used, does not provide adequate RF shielding across the gap.

"Solution: A sleeve assembly, installed between the connector and the terminated portion of the metal shielding.

"The sleeve assembly consists of a shortlength of braided metal enclosed in a heat-shrinkable plastic sleeve. The assembly is slipped over the terminated end of the cable and the base of the connector. Heat is then applied to shrink the plastic sleeve and force the inner metal braiding tightly around the mating components, thus forming a continuous RF shield. The sleeve assembly can be easily removed when necessary.

"This device may be used at any section of an RF harness where a shielding gap exists.

"For further information, contact: Technology Utilization Officer, Western Operations Office, 150 Pico Blvd., Santa Monica, Calif. 90406 (B65-10387)."

REDUCTION OF NOISE IN LOW-LEVEL MEASUREMENT & CONTROL SYSTEMS THROUGH PROPER USE OF ISOLATION DEVICES

Elcor, a division of Halliburton Co., 2431 Linden Lane, Silver Spring, Md. 20910, has brought out a 4-page discussion identified as Bulletin 95-765. The first two paragraphs are as follows:

"Ground systems are often networks of various common impedances that unwittingly provide for the injection, creation, and transference of noise. Noise levels in low-level systems are frequently many times greater than the signal. Innocent ground connections almost automatically applied may result in aggravation of the problem rather than curing it.

"Signal leads, the ungrounded conductors, of various types are given very careful attention: shunt capacitance, shielding, lead resistance, terminations, dielectrics, etc. It is a wonder that the grounded conductors in a system are not analyzed and protected with equal vigor. The ground system is too often assumed to be an entity that is nearly ideal, a body that has negligible resistance, noise, and almost no other faults. This stems, of course, from experience with rather small systems where short lead lengths and little complexity are encountered. Ground reference system problems were either too small to be significant, were small but not too troublesome, small but unrecognized as to source, or troublesome and yet not accurately related to cause. We are not trying to say that all noise comes from the ground system; this is far from the case. We do point out that it is part of the circuit and should not be taken for granted."

WESTERN TEST RANGE FIGHTS INTERFERENCE

Brig. Gen. Joseph S. Bleymaier, USAF, Comdr. USAF Western Test Range (Vandenberg AFB), wrote an article in AIR FORCE/SPACE DIGEST May 1966 under the title: USAF's Western Test Range, Hemisphere Shooting Gallery, Paragraphs of interest are as follows:

"One problem in the past has been radio interference. At Vandenberg, we are in one of the most heavily saturated radio regions in the United States. Our Frequency Control and Analysis Branch (FCA) is constantly on the alert to assure that frequencies to be used with a particular launch will not suffer interference. Aircraft patrol from San Diego to San Franci sco, to ensure that the booster will obey guidance commands from the ground and that the destruct command will be received if a malfunction occurs.

"On the ground, the FCA crews use trucks to locate local radio interference. These 'snoopers' have tracked down such unrelated 'pirate transmissions' as ham radio operators, hi-fi equipment in a department store, and even a doorbell in the nearby town of Lompoc!"

NOISE PROPERTIES OF A SUPERGENERATIVE PARAMETRIC AMPLIFIER

In the Proceedings of the IEEE, April 1966, page 704, starts a letter under the above title by J. Chramiec, Technical University of Gdansk, Telecommunication Dept., Gdansk, Poland. The first two paragraphs are as follows:

"Theory of noise of the superregenerative parametric amplifier (SPA) has been given by Wang and Wade (1). However, the authors have assumed tacitly the quench frequency much higher than the SPA static bandwidth (i. e., bandwidth measured using an unmodulated carrier). This assumption is rather unpractical, because it is difficult to achieve sufficiently high quench frequencies for SPA static bandwidths of the order of tens or hundreds of Mc/s. Moreover, the time required to damp the superregenerative oscillations limits the quench frequency.

"It is the purpose of this letter to give the general expressions for the SPA noise figure and noise bandwidth and to present the results obtained for a quench frequency much lower than the SPA static bandwidth."

IEEE SPECTRUM

ITEMS OF INTEREST IN IEEE SPECTRUM, FEBRUARY 1966

The Effects of Noise in Oscillators
by
E. Hafner

"An explicit expression for the output signal from an oscillator with several noise sources in the circuit is derived. This formula describes qualitatively and quantitatively the manner in which thermal and shot noise act to corrupt the performance of an ideal oscillator. The statistical properties of the signal are then evaluated, as it emerges from the oscillator state, after passage through an output filter and after being operated on by an ideal n-times multiplier. Expressions are derived for the short-term frequency stability, the power spectral density, and the power spectrum of the signal, as well as for the spectral density of the signal phase. The key to the results reported is an apparently novel perturbation technique that does not require smoothing of the instantaneous nonlinearity in the basic differential equation. Discussion of the solutions shows that the instantaneous nonlinearities cause the device to act simultaneously like a linear AGC oscillator and like a high Q passive tuned circuit, with each aspect accorded one half the total noise excitation. Possible implications of this effect for other types of transient conditions in oscillators are indicated briefly."

Noise Spectrum Characteristics of Low-Noise Microwave Tubes and Solid-State Devices
by
S. L. Johnson, B. H. Smith, D. A. Calder

"Experimental data on the FM and AM noise of low-noise microwave tubes, 'solid-state klystrons,' and solid-state chains of the types used in Doppler radars are presented. The tube types include magnetrons, klystrons, and triodes. Data on solid-state chains of the type consisting of a VHF crystal-controlled transistor oscillator, followed by a VHF transistor power amplifier and a varactor frequency multiplier are also presented. The spectral shape of the solid-state chain is shown to differ from those of the microwave tubes and that of the 'solid-state klystron,' Comparisons are made between the various devices."

*

ESTIMATE THE SOLAR NOISE

Norman Koch, Member of Technical Staff, The Bissett-Berman Corp. Santa Monica, Calif., has written a 2-page article in the March 1966 issue of Electronic Design, March 29, 1966 under the title "Estimate the solar noise of optical communication systems graphically. The results show noise depends on wave length and look angle." There are 4 graphs. The first paragraph is as follows:

"Solar noise originating from the sun's irradiance, may mask the signal that an optical communication system receives. But the magnitude of solar background noise can be quickly estimated with the following graphical technique."

*

TINY TRANSMITTER INVENTED

Science Digest, Feb. 1966, carried the following news item:

"An FM transmitter the size of a saccharin pill received patent 3,212,027 recently.

"The tiny transmitter, weighing half a gram without the battery, has only three components, one being a tunnel diode.

"The range of the transmitter is 50 to 100 feet. Power may be supplied by a battery or by radio waves.

"Inventor was Dr. Wen-Hsiung Ko, associate professor of electrical engineering of Case Institute of Technology in Cleveland, Ohio. The patent was assigned to the Research Corp. of NY.

"Medical research was the first field for application. Transmitters were implanted in rats and rabbits to report their muscle signals or circulation.

"The transmitters can also be attached to moving machinery to measure the forces during operations. Other industrial uses are expected."

IEEE Transactions on Aerospace and Electronic Systems

DETECTION OF KNOWN SIGNALS IN NONSTATIONARY NOISE

L. J. Taylor, Dept. of Defense, Baltimore, Md., has written a six-page article on the above subject in the IEEE Transactions on Aerospace & Electronic Systems, March 1966. The Abstract and first two paragraphs of the Introduction are as follows:

Abstract

"The basic design of a nonlinear, time-invariant filter is postulated for detecting signal pulses of known shape imbedded in nonstationary noise. The noise is a sample function of a Gaussian random process whose statistics are approximately constant during the length of a signal pulse. The parameters of the filter are optimized to maximize the output signal-to-noise ratio (SNR).

"The resulting nonlinear filter has the interesting property of approximating the performance of an adaptive filter in that it weighs each frequency band of each input pulse by a factor that depends on the instantaneous noise power spectrum present at that time.

"The SNR at the output of the nonlinear filter is compared to that at the output of a matched filter. The relative performance of the nonlinear system is good when the signal pulses have large time-bandwidth products and the instantaneous noise power spectrum is colored in the signal pass band.

Introduction

"The basic problem is to design a system to detect received signal pulses of known shape imbedded in noise. There are two parts to the solution of the problem. First, the transmitted pulses can be designed in some 'optimal' fashion. This approach will not be considered except to note that the signal pulses must have a large time-bandwidth product for the proposed solution to be successful. It will simply be assumed that the shape of the received signal pulses is known and the other part of the problem will be treated; that is, the receiving system will be designed.

"The problem, then, is to design a predetection filter to peak up the signal relative to the noise. The total signal would be passed through this system and the output would be monitored for threshold detection."

*

THE MOST OFTEN ASKED QUESTIONS ON SOLDERING

Howard H. Manko, Director of Solder Research & Development, Alpha Metals, Inc., Jersey City, N. J. had a 4-page article, under the above title, in the August 1965 issue of Electronic Packaging & Production. Paragraphs of interest are as follows:

"Despite the fact that soldering is one of the most reliable methods for joining electrical and electronic components, is versatile, low in cost, and fairly easy to use, it still remains somewhat of a mystery to many. Too few have reaped the many possible benefits.

"Once the designer, the engineer, and the production man have recognized that soldering is an exacting science and must be treated as such, much of the mystery and most of the problems with which it is associated should disappear. Unfortunately, the commercial transition from 'art' to 'science' is not as easy as it may seem, and many problems keep reoccurring despite the warnings, precautions, and simplified methods offered by those more intimately acquainted with the technique. In an attempt to overcome some of the misunderstanding underlying much of the trouble with soldering practice, and to bring readers up-to-date on the latest innovations in the field, we have compiled the questions most often asked of the customer-service laboratory and at recent seminars on sodering conducted by Alpha Metals. . ."

M. I. T. REPORT ON THE INFLUENCE OF THE EARTH'S SURFACE ON RADAR

An M. I. T. Report on the Influence of the Earth's Surface on Radar. . . offers discussions on the influence of a smooth earth and a rough earth, scattering from the ocean, and spherical-earth formulas. MIT made the study to provide radar designers with background material on how the idealized free-slace radar theory must be modified to take account of the earth's surface. This surface constitutes an important component of the propagation medium and plays a significant role in determining the extent to which a given design will prove useful. For the radar designer, the presence of the earth's surface has two important implications. First, due to the convexity of the surface, for any given height of the radar antenna a portion of the space above the earth will lie in shadow. Second, due to the reflective properties of the surface materials, a certain amount of the energy incident on the surface will be reflected and scattered back into the space above it. . . MIT's Lincoln Lab., Cambridge, Mass., for the Air Force, Jan. 1966, 77 pages, Order Stock No. AD-627 635 Influence of the Earth's Surface on Radar from Clearinghouse, U. S. Dept. of Commerce, Springfield, Va. 22151, price $3. 00 (microfiche 75 cents).

*

FAA EXTENDS BAN ON PORTABLE UNITS

Electronic News, April 18, 1966, carried the following news item:

"Washington - The Federal Aviation Agency recently proposed to expand its ban on portable electronic devices aboard aircraft during flight.

"The FAA prohibited use of portable FM radios on aircraft effective May 25, 1961, when the VOR equipment was being used for navigation.

"It now proposes to ban operation of any portable electronic device, such as portable TV receivers, citizens band transmitters, VHF radio receivers, etc., which might cause interference to navigation and communications equipment.

"The tighter rules would not apply to portable recorders, hearing aids, heart pacemakers, electric shavers or any other portable electronic device that is authorized by the air line.

"The new rules would apply to all aircraft when operated under instrument flight rules or an instrument flight plan, regardless of whether the VOR equipment was being used for navigation.

"Comments will be received until May 16."

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SOLAR RADIO NOISE: POTENTIAL INDEX TO ENVIRONMENTAL PREDICTION

Research Review, Office of Aerospace Research, March 1966 issue carries a 3-page story under the above heading. Paragraphs of interest are as follows:

"The sun radiates energy over a range of radio frequencies. At any given frequency, the strength or flux of these emissions changes rapidly and often unpredictably.

"How do changes in flux at certain frequencies correlate with solar and terrestrial effects?--solar proton showers, solar flares, magnetic storms, auroral displays, and radio communications blackout? Can certain characteristic changes in radio emissions be identified as precursors to these observed effects? Can they provide a basis for prediction?

"In a general, qualitative way we already know something of the positive relationships. But we don't have enough continuous long-term data to state these relationships with any degree of assurance. In January 1966, AFCRL began a study that may lead to precise formulations. Under this program, five different frequencies are monitored continuously from sunup to sundown seven days a week. . ."

ANTENNA LOBE SUPPRESSION STUDY

Descriptive paragraphs of interest are as follows:

"Antenna lobe suppression is extensively treated in a six-volume report described by a Federal evaluator as 'containing practical and useful information of value to manufacturers and users of antennas, especially at frequencies from VHF up.

"Available from the Clearinghouse, U. S. Dept. of Commerce the study was made for the Rome Air Development Center by Ohio State University. It covers the modification of horn antennas for low sidelobe levels, the E-plane radiation pattern of an antenna model for horn antennas, and radiating mechanisms in a reflector antenna system.

"Ohio State says that the use of choke slots or a corrugated structure in the walls of a horn antenna is effective in reducing the backlobe level of the horn. This type of modified horn may find many applications such as use in pattern ranges and radar cross section ranges.

"A radial wedge reflector, in addition to reducing spurious radiation, will greatly reduce RFI resulting from diffraction by the edges associated with a continuous reflector. The edges perpendicular to the E vector produce most of the edge diffraction. Since the elements of a radial wedge reflector are parallel to the E vector no significant edge diffraction should occur.

"To get the six volumes, dated Oct. 1965, order by the general title ANTENNA LOBE SUPPRESSION, from Clearinghouse, U. S. Dept. of Commerce, Springfield, Va. 22151, according to Stock No. and subtitles. (Qualified Government contractors may obtain DOD documents from the Defense Documentation Center, NASA documents from the National Aeronautics & Space Administration, and AEC documents from the Atomic Energy Commission).

"AD-623 072 VOL. I MODIFICATION OF HORN ANTENNAS FOR LOW SIDELOBE LEVELS, 52 pages, price $3. 00; AD-623 073 Vol. II E-PLANE RADIATION PATTERN OF AN ANTENNA MODEL FOR HORN ANTENNAS, 61 pages, price $3. 00; AD-623 074 VOL. III RADIATING MECHANISMS IN A REFLECTOR ANTENNA SYSTEM, 17 pages, price $1. 00; AD-623 075 VOL. IV THE H-PLANE RADIATION PATTERN OF HORN ANTENNAS, 48 pages, price $2. 00; AD-623 076 VOL. V GRATED REFLECTOR ANTENNAS FOR SPURIOUS RADIATION REDUCTION, 28 pages, price $2. 00; AD-623 077 VOL. VI DIFFRACTION BY CONDUCTING WALLS OF FINITE THICKNESS, 48 pages, price $2. 00."

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CHECKOUT BY 'SECONDARY SENSING': NO WIRING, NO TEST POINTS

In Space/Aeronautics, March 1966, J. E. Bridges, Sr. Engineer, IIT Research Institute, Chicago, Illinois, has a multi-page article under the above heading. The first three paragraphs are as follows:

"Checking out a system means communicating with its components. Such communication, however, is not all all easy, especially when the system consists of very many components as does virtually every advanced aerospace system or to provide extensive wiring specifically for checkout (which would add weight and complexity).

"A way out of this dilemma is offered by the side, or secondary, effects generated in any piece of machinery: anomalous electromagnetic currents and voltages, peculiar noises and pressures, and abnormal chemical vapors and dusts, and the like. These effects propagate along naturally existing paths of communications accessible without disassembly or special wiring.

"Secondary sensing, which makes use of these effects and paths, is not new. Since the beginning of the automotive age mechanics instinctively have paid close attention to strange odors and funny noises from engines. Along more sophisticated lines, BuWeps recently demonstrated that monitoring the wear debris in engine oil jet provides warning of impending engine failures."

New Products

Power Switch With Little R-F Interference

A switch for alternating-current power circuits, which can be opened and closed without generating excessively large interference transients, has been developed by the Genistron division of Genisco Technology Corp. 6320 W. Arizona Circle, Los Angeles 45, Calif.

The device senses when the a-c line voltage is zero, switches the control circuit on and allows current to flow to the load thereafter. If switch is closed at any other time in the a-c cyle, the sensing circuit waits until zero voltage is reached before it energizes the load.

When the switch is opened, the device waits until the load current is zero before turning the circuit off. This eliminates the abrupt discontinuity in voltage and current that causes high-frequency portions of conducted noise to be generated. The action of the switch also assures long life, since no damaging current surges occur. It also protects sensitive equipment, such as power semiconductors, from high-level switching transients.

The switch is of solid state design and uses long-life, silicon semiconductor devices that are conservatively rated. The mechanical section of the switch only handles milliamperes of current at low voltage.

New RFI Shielded Fuseholders Available

The Bussmann Mfg. Division, McGraw-Edison Co., St. Louis, Mo. 63107, has brought out a new shielded fuseholder. To accomplish both shielding and grounding, a threaded metal collar fits over molded body of fuseholder. This collar is grounded against metal panel when mounting nut is drawn up. A metal cap threads on to collar and encloses and shields fuseholder know. Further information may be obtained by requesting BUSS Form SFH-12.

Six New Conductive Coatings

The Electro Materials Corp. of America, 605 Center Ave., Mamaroneck, N. Y. has brought out six new conductive coatings which are as follows: Three Fired-On Conductive Silver Compositions; Conductive Silver Epoxy No. 15; Fired-On Conductive Platinum Gold Composition No. 170, and Conductive Silver Lacquer. These compositions have been formulated for application by the silk screen process.

Fairchild Introduces Automated Spectrum Surveillance System

An Automated Spectrum Surveillance System to cover the frequency range of 20 Hz to 1 GHz was demonstrated at the 1966 IEEE Show by Electro-Metrics Corp. subsidiary of Fairchild Camera & Instrument Corp. It is designed to be a fully electronically scannable spectrum surveillance system which can be used either in a laboratory set-up or corporated into a mobile van along with the proper antennas and other pick-up devices. Other applications include insertion loss measurements, searches for unwanted signals and numerous other requirements for scanning a portion of the frequency spectrum or for making a detailed analysis throughout a specified spectrum range. Additional information may be obtained from Fairchild Electro-Metrics Corp., 88 Church St., Amsterdam, N. Y. 12011.

New Portable Radio Frequency Probe

Missiles and Rockets, Nov. 1, 1965, describes the new portable radio-frequency probe as follows:

"A portable radio-frequency probe designed to detect latent defects in all types of electronic equipment is available from Honeywell, Inc., Minneapolis Aeronautical Div.

"According to developers, the device offers significant benefits in three critical areas of system performance and maintenance; higher reliability, reduced checkout time and reduced maintenance costs.

"The self-contained unit, under development at Honeywell for five years, is a broadband very-low-noise (less than 4 db) R-F amplifier that detects and measures noise in the 20 to 30-mc frequency range. It is center-tuned to 27 mc, a statistically proven noise peak. The unit consists of a pickup device, radio frequency and audio amplifiers, earphones, rechargeable batteries and cabling.

"In operation, the operator scans the system being checked with a pickup device, a R-F probe. R-F noise levels in the equipment can be monitored by earphones; for detailed analysis, information can be transmitted to an oscilloscope or recording device. It is generally necessary to stimulate the noise in a suspected device by lapping it with a non-metallic rod and comparing the noise level with that of other devices, developers point out."

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