



PROFESSIONAL
GROUP ON
RADIO
FREQUENCY
INTERFERENCE

NEWSLETTER

Number 13

September 1960

MESSAGE FROM THE CHAIRMAN

PGRFI has just completed its second full year of operation.

In this two year period it has grown from an initial membership of 150 to 719. It has conducted two symposia; one on New York in 1959, with an attendance of 200 people; and one this past June in Washington, with an attendance of over 400. In addition, it has cooperated with the U.S.

Signal Corps and the Armour Research Foundation in the Interference Reduction Conference held in Chicago. Two copies of the TRANSACTIONS of PGRFI have been issued and a third is in preparation. Copies of the Interference Reduction Conference Proceedings have been distributed to all members since 1958.

It is the purpose of PGRFI to provide means by which engineers active in radio interference work can exchange ideas and in so doing advance the field as a science. In addition, it should provide the means by which other engineers and management personnel can become familiar with the problems which characterize this field of endeavor and to anticipate them as much as possible. Radio interference considerations can contribute substantially to the cost of electronic equipment, unless they are properly taken into account at the earliest possible moment.

To be of maximum service to the members, it is necessary to have the participation in PGRFI activities of all those interested in the field. One of the best means of exchanging information is through the TRANSACTIONS, which has been conceived as a high quality technical publication which would provide in as concise a manner as possible advances in the field on a current basis. In addition, it is planned to expand activities in the preparation of tutorial manuscripts. All members are encouraged to contribute papers describing their work in the field. In order to maintain our desired standards, these are subject to critical technical review and editorial comment, and the cooperation of the members in the procedures which have been established is appreciated. In addition, a correspondence column is available for handling brief technical notes of general interest with a minimum of publication delay.

As an additional service to members, plans are underway to publish a complete bibliography on radio interference in the very near future.

Please direct any suggestions you may have on the operation of PGRFI to any member of the Administrative Committee. You can be assured they will receive serious consideration.

R. M. Showers

LIST OF COMMITTEE CHAIRMEN 1960-1961

Awards	Harold E. Dinger
Chapters	Z. V. Grobowski
Constitution and Bylaws	Milton Kant
Education	C. W. North
Liaison with Other Organizations	Leonard Milton
Meetings	Herman Garlan
Membership	R. W. Fairweather

Newsletter
Nominations (1961)
Publications
Technical Advisory Committee
Technical Papers
PIRE Anniversary Issue
1961 Nat'l Conv. Program
1961 Nat'l Conv. Record

Rexford Daniels
To be named
O. P. Schreiber
H. E. Gauper
A. R. Kall
Z. V. Grobowski
John F. Chappell
O. P. Schreiber

ADVANCE PROGRAM

SIXTH RADIO INTERFERENCE REDUCTION CONFERENCE

Tuesday, October 4

8:00 A.M. Registration
9:00 A.M. Welcome - Main Auditorium
Introduction - S. I. Cohn
Armour Research Foundation
Chicago, Illinois

Welcome Address - H. A. Leedy
Executive Vice-President
and Director
Armour Research Foundation

Keynote Speaker - H. Randall
Office of the Assistant
Secretary for Defense
DDR and E
Washington, D. C.

10:00 A.M. **SESSION I - MISSILE AND SPACE CONSIDERATIONS**
Chairman - S. I. Cohn, Armour Research Foundation,
Chicago, Illinois

Atlas Missile I-E Systems -- Electromagnetic Interference Evaluation - J. SCHUKANTZ, Convair Division, General Dynamics Corp., San Diego, California.

Evaluation of Satellite Tracking System Performance in the Presence of Noise and Interference - R. W. CHITTENDEN and J. F. FRAZER, Melpar, Inc., Watertown, Mass.

Development of Radio-Interference Instrumentation for Satellites - J. E. BATZ, A. T. ASHBY, S. L. HALVERSON, M. E. ANDERSON, Armour Research Foundation, Chicago, Illinois.

12:00

Luncheon
Luncheon Chairman - R. M. Showers
University of Pennsylvania
Philadelphia, Pa.

Luncheon Address - "The FCC's New ISM Certification
H. Garlan, Federal Communications Commission, Office of the Chief Engineer, Washington, D. C.

2:00 P. M. SESSION IIA - ANTENNA MEASUREMENT SEMINAR
Chairman - E. Jacobs, University of Pennsylvania,
Philadelphia, Pa.

The AN/ASM-13 Antenna Pattern Measuring Equipment
I. FENICHEL, Bendix Corp., Baltimore, Md.

A Sphere Technique for the Measurement of Three-
Dimensional Radiation Patterns - F. J. MORRIS, Electro
Mechanic Co., Austin, Texas

Proposed Technique for Antenna Pattern Measurement -
M. W. SCHELDORF, Armour Research Foundation,
Chicago, Illinois.

Supplementary Presentations: A. L. ALBIN, Filtron Co.,
Flushing, N. Y., M. W. LONG, Georgia Institute of Tech-
nology, Atlanta, Ga., M. N. LUSTGARTEN, Rand Corp.,
Santa Monica, California.

To be followed by round-table discussion on
ANTENNA PATTERN MEASUREMENTS

2:00 P. M. SESSION IIB - SYSTEMS
Chairman - Maj. A. D. Blue, Headquarters USAF,
Washington, D. C.

Radio Interference and Susceptibility Study of a Solid State
Digital Computer Model - J. A. HARDER and R. L.
POWERS, International Business Machines Corp., King-
ston, New York.

Reduction of Radio Frequency Interference in the Sperry
Radar 10 - J. D. MANNING, Sperry Piedmont Company,
Charlottesville, Virginia.

Radio Frequency Interference Analysis and Reduction in a
Complex Radar Trainer System - F. KUGLER and E. S.
WARCHAIZER, Ark Electronics Corp., Philadelphia, Pa.

ICBM-Checkout Equipment Errors Due to Interference -
B. WEINBAUM, Convair, San Diego, Calif.

Wednesday, October 5

1:00 A. M. SESSION IIIA - SHIELDING I

Dedicated to C. S. "GUS" VASAKA

Chairman - R. W. Wright, Naval Research Laboratory,
Washington, D. C.

Commercial Mobile Radio Interference Shielding - J. D.
NOYES, Hallett Manufacturing Co., Los Angeles, Calif.

Radio Frequency Shielding Properties of Metal Honey-
comb Materials - D. J. ANGELAKOS, University of Cali-
fornia and Hexcel Products, Inc., Berkeley, California.

Evaluation of Conductive Glass Fluorescent Light Shield-
ing Applications, - H. M. SACHS, Armour Research
Foundation, Chicago, Illinois. - W. BENJAMIN, Corning
Glass Works, Corning, New York.

The Shielded Test Cells of the Titan ICBM Test Facility,
The Martin Co., Denver - A. R. KALL and F. KUGLER,
Ark Electronics Corp., Philadelphia, Pa.

2:00 A. M. SESSION IIIB - PREDICTION METHODS
Chairman - J. J. Egli, U.S. Army Signal Research and
Development Agency, Ft. Monmouth, New Jersey.

The Graphic-Manual Method of Interference Prediction -
J. H. VOGELMAN, Capehart Corp., Richmond Hill, N. Y.

The Use of an Automatic Parameter Assignment Algo-
rithm in Interference Control - A. H. PAYNE, Melpar,
Inc., Watertown, Mass.

Construction of Mutual Interference Matrices - T. T.
SPENGLER and I. E. PERLIN, Georgia Institute of
Technology, Atlanta, Georgia

Processing Non-Symmetrical Mutual Interference
Matrices - I. E. PERLIN, Georgia Institute of Tech-
nology, Atlanta, Georgia

Luncheon

Luncheon Chairman - Lcdr. R. G. Iverson
U. S. Navy, Bureau of Ships
Washington, D. C.

Luncheon Address - "The Army's Attack on the Ra-
Interference Problem" - Col.
G. F. Moynahan, Jr., Direct
Combat Developments USAEP
Ft. Huachuca, Arizona

2:00 P. M. SESSION IVA - SHIELDING II

Dedicated to C. S. "GUS" VASAKA

Chairman - S. Greenblatt, GPL Division, General
Precision, Inc., Pleasantville, New York

System Cabling: The Weakest Link in the Chain of
Interference Control - M. J. GORDON and M. B.
TOMME, JR., Convair, Fort Worth, Texas

The Shielding Effectiveness of Concentric, High Fre-
quency Transmission Lines - E. T. PFUND, JR.,
Technicraft, Thomaston, Conn., - J. E. RUSSELL,
Television Associates of Indiana, - B. SUVERKROP,
Air Research and Development Command, Wright-
Patterson Air Force Base, Ohio

A Proposed Standard for Testing the Shielding Effectiv-
ness of Coaxial Cables and Shielding Material - J. A.
ALLEN, U. S. Army Signal Research and Developmen
Agency, Fort Monmouth, New Jersey

The External Electromagnetic Fields of Shielded Tran-
mission Lines - J. D. MEINDL, U. S. Army Signal
Research and Development Agency, Ft. Monmouth, N.
E. R. SCHATZ, Carnegie Institute of Technology,
Pittsburgh, Pa.

To be followed by round-table discussion on
SHIELDING TECHNIQUES AND PROBLEMS

Other Participants: Speakers of Shielding I Session

2:00 P. M. SESSION IVB - INSTRUMENTATION

Chairman - W. Kesselman, U. S. Army Signal Research
and Development Agency, Ft. Monmouth, N. J.

An Instrument for Measurement of High RF Power
Density - K. W. KNAPP and W. S. LAMBDIN, Empire
Devices, Inc., Amsterdam, New York

The Measurement of Electromagnetic Interference on
High Voltage Transmission Lines - J. D. GHESQUIER
The Hinchman Corp., Detroit, Michigan

A Noise and Field Intensity Meter for the Frequency
Range from 1 to 10 KMC - S. MANFANOVSKY and W.
LAMBDIN, Empire Devices, Inc., Amsterdam, N. Y.

AN/TRM-7 Unique Self-Calibrating F.I.M. - M. ENGI
SON, Polarad Electronics Corp., Long Island City, N.

Measurement of Low-Frequency Electromagnetic Inter-
ference - M. EPSTEIN, H. M. SACHS, and L. E.
SILVERMAN, Armour Research Foundation, Chicago,

Thursday, October 6

9:00 A.M. SESSION VA - SPURIOUS EMISSIONS I

Chairman - M. Ware - Office of the Chief Signal Officer,
Washington, D. C.

The Effect of Transmitter, Filter, and Antenna Impedance Variations on Transmitter Spurious Emissions - C. B. PEARLSTON, JR., Nortronics, Div. of Northrop Corp., Hawthorne, California.

The Distribution and Correlation of Transmitter Interference - R. N. BAILEY and C. E. BLAKELY - Georgia Institute of Technology, Atlanta, Georgia

Broadband, High Power Transmitter, Antenna Conducted Measurement Techniques - W. O. MORRISON and W. SCHWAGART, The Hallicrafters Co., Chicago, Ill.

Recent Advances in High Power Harmonic Filtering in Waveguides - R. H. STONE, General Electric Microwave Laboratory, Palo Alto, California

9:00 A.M. SESSION VB - CLASSIFIED SECTION

Chairman - L. Wilson, U.S. Navy, Bureau of Ships,
Washington, D. C.

Spurious Radiation Measurements on Radio Set AN/FPS-35 - M. KANT and P. HINCKLEY, Sperry Gyroscope Co., Great Neck, New York

Frequency Diversity Radar Radiation and Interference Evaluation - I. MAZZIOTTI, Polarad Electronics Corp., Long Island City, New York

GAM-72 Missile Interference Fixes - B. H. GARDNER, McDonnell Aircraft Corp., St. Louis, Mo.

Equipment Signatures-Detection and Identification of Electrical Devices by Radiation Characteristics - H. A. MYERS, Rand Corp., Santa Monica, California

12:00

Luncheon

Luncheon Chairman - W. Dean, Chief of Naval Operations
Washington, D. C.

Luncheon Address - "Interference Survey of a Large Missile Manufacturing Plant" - A. R. Kall, Ark Electronics Co., Philadelphia, Pa.

2:00 P.M. SESSION VIA - SUSCEPTIBILITY

Chairman - C. R. Miller, Rome Air Development Center,
Rome, New York

Some Practical Aspects of Audio Conducted Susceptibility Requirements and Test Methods - W. W. HILL, Westinghouse Electric Corp., Air Arm Div., Baltimore, Md.

Receiver Susceptibility Measurements by Pulse Techniques - W. T. CRONENWETT, The Electro-Mechanics Company, Austin, Texas

Determination of Radar Spurious Response Sensitivities J. J. KRSTANSKY and M. D. LIEBERMAN, Armour Research Foundation, Chicago, Illinois

2:00 P.M.

SESSION VIB - SPURIOUS EMISSIONS II

Chairman - H. Carter, Wright Air Development Division,
Wright-Patterson Air Force Base, Ohio

Good Design Practices for Reducing Interference Producing Properties of Receivers and Transmitters - R. B. MARCUS, V. H. RITTER, and J. G. TAYLOR, HRB-Singer, Inc., State College, Pa.

Field Electromagnetic Spectrum Signatures - F. J. NICHOLS, Genistron, Inc., Los Angeles, California

Corona Noise Models Based on Modulated Gaussian Noise
F. HABER and J. DIAMESSIS, University of Pennsylvania
Philadelphia, Pa.

NEW YORK SECTION OF IRE SPONSORING MEETING ON RF INTERFERENCE MEASUREMENT TECHNIQUES:

The New York Section of the IRE will sponsor a Panel Meeting on "Measurement Techniques in Radio Frequency Interference". The meeting will take place on November 2, 1960 at 7:15 P.M. in the auditorium of the Engineering Societies Building, 33 West 39th Street, New York City. Mr. Bernard Rosen will be the moderator of the meeting and the panel will consist of Messrs. N. D. Flinn, L. Milton and A. R. Kall.

It is hoped that the attendance will be large and all PGRFI members in the New York Metropolitan Area are encouraged to attend. This meeting should be especially important to all PGRFI members in this area for two reasons: (1) The technical information that will be disseminated by members of the panel and (2) A petition will be circulated in another attempt to form a New York Metropolitan Chapter. So, let's get everybody out to the meeting and show our colors.

ITEMS OF INTEREST IN ELECTRONIC INDUSTRIES, July 1960:

On Page 42 - "INTERFERENCE to Internal Revenue Service domestic communication was identified by FCC monitors as originating from a station in Rio de Janeiro, over 4,000 miles away."

On Page 88 - Filter Calculations Made Easy - "The three-element section is the cornerstone of modern filter practice. Various methods can be used to aid the mechanics of filter attenuation calibration.

One method is to represent the attenuation graphically and obtain answers from the resulting curves. Graphical calculation, however, has an important drawback: there must always be some distance between two neighboring curves. This not only makes it impractical to draw curves for all possible combinations of band-pass conditions, but it also amplifies the possible error.

A second method is far quicker and more accurate: information required for any filter calculation can be set up on a slide rule having special scales and the solution then read directly from the slide rule. Such rules have been constructed by their designers - Anatol I. Zverev and Herman J. Blinichkoff, Manager and Engineer, respectively, in the Network Synthesis Section, Electronics Div., Westinghouse Electric Corp., Baltimore, Maryland".

On Page 93 - Analysis of RFI in Transmission Lines and Filters by Delmer C. Ports, A. R. Howland, Jr., and Robert M. Moore of Jansky & Bailey, Inc., Washington 7, D. C.

This is the sixth in a planned series of editorial features on Radio Frequency Interference. The first two paragraphs state:

"The physical connection between a radio frequency generator or receptor and an antenna frequently takes the form of a transmission line or waveguide and therefore cannot be considered a direct connection in the usual sense of the term. Distributed impedance parameters are present at all frequencies and a special study of the system from an interference viewpoint is required. In an interference situation a definite chain of events is observed. This chain starts at the generator with the formation of spurious r-f power. This power then passes through the coupling mechanism to the radiator, thence by radiation or by direct coupling and propagation mechanisms to the receiving location, and on to the receiver where it appears in combination with the desired signal.

This article discusses the transmission line as a complex, frequency dependent, coupling mechanism introduced between the antenna and transmitter. It outlines the basic factors associated with transmission line effects, their characteristic nature, and the extent of their influence. The general physical characteristics of transmission lines and filters which are associated with the analysis or control of interference

situations are also presented. Particular attention is afforded to unpredictability of certain of these characteristics and their significance in terms of the deviations observed in measured spectrum signatures. Such unpredictability must be considered in any approach to a usable interference solution".

On Page 163 - A Meter for Measuring Magnetic Interference Fields, H. Wiechmann. "Hochfreq." Jan. 1960. 4 pp. "A field strength meter is described for measuring interference from low frequency magnetic fields. The instrument is described in detail, including the circuit diagram. Mathematical expressions are given for performing and analyzing actual measurements. (Germany)."

On Page 164 - Are Radar Radiations Dangerous? Charles B. Sovil. "Brit. C&E." May 1960. 3 pp. "Since the advent of radar, rumors have circulated about the harm which u.h.f. electromagnetic waves can cause to health - that they can cause sterility and other damage. For obvious reasons such rumors were discounted during the war and experts are on record as stating categorically that no harm of any kind could befall humans exposed to electromagnetic waves. With the projected BMEWS, super power radar stations in the news, the rumors are again in circulation. It is therefore timely to examine the problem and to endeavor to form some conclusions as to whether or not radiation from a radar station can do any harm to the human body. (England)."

PROCEEDINGS OF THE NATIONAL ELECTRONICS CONFERENCE '59:

Proceedings of the National Electronics Conference 1959 (Vol. 5) are available at \$10.00 each from National Electronics Conference, Inc., Room 2104, 228 North LaSalle Street, Chicago 1, Illinois. The book contains all of the technical papers and addresses presented.

The 109 technical papers cover electronic research, development and application of antennas, circuits communications, computers, electron tubes, engineering management, instrumentation, magnetic amplifiers, materials and communication, microwave, radar, servomechanisms, solid-state devices, parametric amplifiers and, engineering and speech.

ITEMS OF INTEREST IN IRE PROCEEDINGS, July 1960:

Correspondence - Page 1321

Noise of Measure of Lossy Tunnel Diode Amplifiers - by A. an Der Ziel, Electrical Engrg. Dept., University of Minnesota, Minneapolis 14, Minn. - "An important question in tunnel diode amplifiers is how much the noise figure is deteriorated by circuit and device losses. It is the aim of this note to show that a very simple answer to this question becomes possible by using a series equivalent circuit of the junction."

Correspondence - Page 1324

Optimum Noise Performance of Parametric Amplifiers - by J. L. Kotzebue, Watkins-Johnson Co., Palo Alto, Calif. "In the literature there exist various analyses for the noise performance of parametric amplifiers. It has been shown, for example, there is a minimum noise figure for the ideal negative-resistance parametric amplifier at room temperature given by the ratio of pump to idle frequency, while for the pure up-converter there is no such minimum. When one begins to include the effects of various circuit losses, however, the expressions rapidly multiply into a maze of conductances, circuit Q's, and frequency ratios. The result is quite often one of confusion in trying to determine in practice just how low a noise figure one can expect. It is the purpose of this note to present in brief form the results of some analysis done in an attempt to answer this question. It is planned to submit the details of this analysis for publication at a later date."

Correspondence - Page 1342

Direct Reading Noise Figure Measuring Device - by George Luck, Crosley Division, AVCO Corporation, Cincinnati, Ohio - "The basic principles used at present in direct reading noise figure meters can be modified to improve the performance.

"The principle of gating an auxiliary noise source into the input is maintained in the proposed scheme, but instead of measuring

voltages, the modified version measures power".

Abstracts and References - Page 1368

Noise-Voltage Measurements on Transformer Laminations - G. Strasser. (Nachrichtentech. Z., Vol. 9, pp. 134-137: March 1959; "A noise-meter circuit for the frequency range 900-2100 cps is described. Curves of noise voltage as a function of field strength, and signal/noise ratio as a function of excitation are given for different lamination materials".

ITEMS OF INTEREST IN ELECTRONIC DESIGN, August 3, 1960:

Interference Key to Space Frequency Controversy: page 4.

Under the above heading is discussed the AT&T request for new space frequency allocations in the 1 - 10 kmc band.

Designing Low-Noise Transistor Circuits: page 86.

The above paper is by Paul J. Beneteau, Design Engineer, Fairchild Semiconductor Corp., Mountain View, Calif. The sub-head states:

"Papers on noise are usually fairly complex and loaded with mathematical equations and derivations. A brief description of noise sources and their origin, considerations in circuit design and a typical design example involving a low-noise application is presented as a practical guide to the design engineer".

Natural Interference In Space Systems: page 90.

The above paper is by James F. Lee, Branch Leader, Radiator and Propagation Branch, Melpar, Inc., Watertown, Mass. The sub-head states:

"As the number of artificial earth satellites increases, projected plans for exploration beyond the earth's atmosphere may be hampered by natural interference levels encountered. Therefore careful consideration must be given to the problems stemming from radio noise of cosmic origin, the principal source of natural interference to be expected."

BRIDGING THE GAP BETWEEN ELECTRICITY AND CHEMISTRY:

Under the above title, Automatic Control, August 1960, carries a five-page article by F. E. Moore, Manager, Analyzer Group, The Foxboro Company, Foxboro, Mass. The sub-head reads:

"When the fundamentals of electrochemical analysis, including conductivity, pH, ORP, capacitance and amperometry are understood, selection of the proper instrument for a specific application as well as the troubleshooting of existing installations are simplified. This article tells how to select the appropriate analyzer for specific application requirements. It also covers operating principles and other information which the user must know to make analyzers work effectively".

The author states that further investigation into this gap will greatly benefit component compatibility.

EIA REPORT ON BANDS ABOVE 890 Mcs:

SIGNAL, August 1960 carries the following news item:

"EIA REPORT TO FCC on the radio frequency needs for space communications in the bands above 890 mcs holds that satellite communications systems and surface point-to-point communications systems can operate on the same frequencies without causing harmful interference to each other. The Microwave Section of the Electronic Industries Association presented its findings in public hearings conducted by the Federal Communications Commission, July 18."

FREQUENCY ALLOCATIONS - THE ITU CONFERENCE - GENEVA 1959

SIGNAL, August 1960, contains a digest of the results of the above Conference by Albert L. McIntosh, Army Frequency Manager, U. S. Army Radio Frequency Engineering Office, OCSigO.

MILITARY CIRCUITS WILL HAVE TO GO BROADBAND OR DIE IN A BATTLE ENVIRONMENT:

Electronics, August 5, 1960, page 31, carries a single page story on the above subject under the title: "Broadband Phantom By-Passes Spectrum Crowding".

The first three paragraphs are:

"Promising approach to the problem of an increasingly crowded electro-magnetic spectrum is broadband transmission, says John P. Costas, consulting engineer for General Electric's heavy military electronics department.

"The orthodox approach has been use of narrower and narrower bandwidths to squeeze in more channels. This procedure has merit in commercial applications where strict control over stations is exercised by a central authority Costas says. 'The military communications planner, however, faces an environment so radically different from that found in most commercial practice that a different approach to systems design is called for.'

"The military user can not save bandwidth with the hope that only friendly users will benefit by his economy. The spectrum belongs just as much to hostile or friendly forces. Continued narrowing of transmission bandwidths will lead to serious system breakdown due to poor reliability resulting from interference. 'Military circuits will have to go broadband or die in a battle environment,' Costas says."

BREAKING THROUGH RADIO BLACKOUTS BY FORECASTING:

Electronics, August 5, 1960, page 35, carries a single page article by Thomas Maguire, New England Editor, under the above title. The first four paragraphs are as follows:

"New approach to radio blackouts in northern latitudes looks like a workable solution to Arctic communications problems.

"The propagation barrier resulting from ionospheric disturbances could cripple some of the vital components of national defense: command and control communications for the Strategic Air Command; delays handling information obtained from BMEWS and DEW-line radar; missile detection and guidance, fighter control.

"The new approach is suggested in a study made by the geophysics section of Avco's research and advanced development division at Wilmington, Mass. The study, sponsored by the propagation sciences laboratory of the USAF Electronics Research Directorate at Hanscom AFB, grew out of a project under which Avco investigated the possibilities of forecasting anomalous refractive, scintillation and absorption effects in northern latitudes (Electronics, p. 32, Apr. 10, 1959).

"Radio blackouts result from either electromagnetic radiation or solar particles emitted from solar storms. A few minutes after a solar flare, a pulse of electromagnetic radiation reaches the ionosphere causing a sudden ionospheric disturbance. Several hours later, solar particles reach the earth's polar ionosphere causing enhanced D-region ionization. About 24 to 36 hours after the flare a geomagnetic disturbance, often develops. This disturbance may last up to five days; during this time h-f radio communications with northern installations become ineffective."

THEME OF INTEREST IN PROCEEDINGS OF THE IRE, August 1960:

Noise in Oscillators - by W. A. Edson, General Electric Microwave Lab., Palo Alto, California. The summary states:

"Noise affects the behavior of oscillators in at least two important ways. During sustained oscillation, noise creates undesired perturbations or modulation in both the amplitude and the phase of the wave. The amplitude perturbations produce a continuous spectrum which in typical situations is quite weak and broader than the bandwidth of the resonator. The phase perturbations disperse the nominal frequency into a continuous distribution which is of the same form but much stronger and narrower than for the amplitude perturbations.

"During the initiation of oscillation, noise constitutes the starting voltage and therefore affects the time required for the wave to reach some pre-established amplitude. The resulting jitter in the starting time of pulsed oscillators is objectionable because it degrades the signal-to-noise ratio in systems employing super-regenerative receivers or pulse-time modulation. The time and spectral distributions of noise effects in typical oscillators are derived and discussed in the following sections."

Monochromaticity and Noise in a Regenerative Electrical Oscillator - by Marcel J. E. Golay, The Perkin-Elmer Corp., Norwalk, Conn. The second paragraph states:

"Since a regenerative oscillator is characterized by its coherent output, it is evident that the existence of this coherent output should be taken into account in any theoretical treatment of this oscillator purporting to discuss quantitatively the departure of the oscillator output from an ideal line frequency. Continuing this line of reasoning, it is also evident that there is a physical interest in determining the effect of this departure from perfect monochromaticity on the measurement of the oscillator frequency. Since the most accurate frequency measurements are made by observing the time elapsed during a given number of zero crossings of the oscillator output voltage, it is again evident that any amplitude modulation of this output voltage due to noise, while causing this output to have a noise energy spectrum of a given spectral width, is not at least in the first order, cause any error in the observation of the zero crossings. Thus, it is finally evident that any inquiry into the departure from monochromaticity of an oscillator cannot be fully satisfied merely by acquiring knowledge about the spectral distribution of the oscillator output, but should bear instead on the causes of irregularities in these zero crossings, which are the noise components of this output in quadrature with the coherent output."

Correspondence - Page 1478

Noise Performance of Tunnel-Diode Amplifiers - by Paul Penfield, Jr., Elec. Engrg. Dept., MIT, Cambridge 39, Mass. Part of the conclusions states:

"The fundamental noise-performance limit of tunnel diode amplifiers has been derived under the assumption that the only significant noise sources are: 1) shot noise of the dc tunnelling current; and 2) thermal noise of the series resistance. It is tempting to compare the noise-performance limit with that of a varactor parametric amplifier, since each uses a semiconductor diode and since the series resistance of each is important in setting the noise limits."

Correspondence - Page 1493

The Behavior of Nonlinear Oscillating Systems in the Presence of Noise - by C. L. Tang, John Parker Traveling Fellow of Harvard University, Institut für Theoretische Physik der T.H., Aachen, Germany. The first paragraph states:

"In view of the recent interest in the behavior of nonlinear oscillating systems in the presence of noise, I should like to call attention to the paper* by Rytov on this subject. While several methods are available for analyzing the behavior of oscillators in the presence of noise, it seems that the symbolic differential equation method of Rytov is straightforward and of considerable generality; furthermore, the solution so obtained may be systematically improved to any degree of accuracy. In the present note, this method will be outlined and used to derive some simple results for oscillators with a single tuned circuit."

* S. M. Rytov, "Fluctuations in oscillating systems of the Thomson type I and II," Soviet Phys., vol. 2 pp. 217-235; March, 1956; J. Exper. Theoret. Phys. (USSR), vol. 29, pp. 304-333; September, 1955.

A. T. PARKER FORMS OWN COMPANY:

A. T. Parker, formerly chief engineer of Stoddart Aircraft Radio Company, Inc., Hollywood, California, announces the formation of A. T. Parker and Associates, 5909 Melrose Avenue, Hollywood 38, California. The Parker organization states that it is oriented principally toward the broadband interference aspects, rather than the frequency allocation phase of RFI work.

RADIO FREQUENCY INTERFERENCE AND ITS AFFECT ON CIRCUITS CONTROLLED BY SNAP-ACTION SWITCHES:

Under the above heading was published an article in the MICRO SWITCH house-organ "Uses Unlimited", Vol. 12, No. 1. For those who would like to copy of this article, they may write to:

Editor, Uses Unlimited
MICRO SWITCH, A Division of Honeywell
Freeport, Illinois

INFORMATION ON USE OF OSCILLOSCOPES FOR TESTING, INSPECTION, AND SERVICING OF AUTOMOTIVE IGNITION SYSTEMS (SUPPRESSED AND UNSUPPRESSED):

The Bureau of Yards and Docks, U. S. Navy, has published BUDOCKS INSTRUCTION 11240 titled "Testing Radio Suppressed and Shielded Ignition Systems, information concerning". Five pages of hook-up diagrams for recommended oscilloscopes accompanies the following text:

General

1. The use of oscilloscopes for inspecting, analyzing and detecting deficiencies in automotive ignition systems can result in substantial savings in labor and material. When engines are suppressed and shielded (sealed systems), the use of oscilloscopes can be particularly advantageous due to minimum disassembly required.

2. Figures 1 through 5 illustrate each oscilloscope now available. These illustrations show how each oscilloscope is connected to an unshielded ignition system. The basic or normal pattern appears on the scope screen. Details of oscilloscope operation pertinent to the testing of suppressed and shielded system will be discussed separately. Each of the oscilloscopes shown will permit instant detection of the following deficiencies:

- a. Defective ignition coil
- b. Reversed polarity on coil connections
- c. Open primary circuit
- d. Excessive ignition system resistance
- e. Inadequate coil ignition capacity
- f. Excessive series gaps, poor connections, opens and leakage in high-tension distributing system.
- g. Leakage and breakdown of high-tension insulation
- h. Excessive condenser, series resistance
- i. Open condenser
- j. Excessive primary circuit leakage conditions
- k. Condenser leakage conditions
- l. Improper breaker point action
- m. Faulty distributor governor action
- n. Excessively high firing voltage
- o. Excessively low firing voltage
- p. Low ignition reserve
- q. Improper spark plug action
- r. Faulty valve action and compression

Specification MIL-A-21651 (DOCKS) 17 October 1958 covers analyzer, engine, oscilloscope, portable. Each of the oscilloscopes described herein meets the requirements of the specification. If additional accessory units or other instruments are required, they should be included in the procurement document.

It should be noted that oscilloscopes covered by this specification permit pick up of the ignition pattern from either primary or secondary circuits. Commercial oscilloscopes pick up ignition patterns as follows:

<u>Manufacturer</u>	<u>Model Number</u>	<u>Pattern Pick up</u>
Allen Electric Company	10-06	Primary and Secondary
Allen B. DuMont	901	Secondary
Heyer Industries	335	Primary and Secondary
Snap-on Tool Company	MT 615	Primary
Sun Electric Company	SS	Primary and Secondary

ADAPTORS FOR SUPPRESSED AND SHIELDED SYSTEMS

Figure 6 illustrates the streamlined adaptors necessary for testing suppressed and shielded (sealed) ignition systems. Selection of the required adaptors is dependent upon the oscilloscope used. Adaptors A-1 and A-2 permit a connection to be made between the spark plug and distributor by all oscilloscopes on all sealed ignition systems. These connections may be made at either the spark plug or the distributor. Adaptor A-3 is used on military (Army Ord) ignitors manufactured by Auto-Lite and Delco-Remy to permit connection to the primary coil connection. The military ignitors do not permit access to the coil-distributor wire and therefore can only utilize the primary pattern for checking. These adaptors may be procured from the manufacturers listed in the preceding paragraph.

Specifications and drawings of the adaptors are being prepared and will be distributed at an early date.

GEEIA CONDUCTS TWO-DAY INTERFERENCE INSTRUMENTATION STUDY:

The July 11, 1960 issue of ELECTRONIC NEWS carried an article on the two-day interference instrumentation study held at the Ground Electronics Engineering Installation Agency (GEEIA), Rome AFB, New York.

Site adaptation and well-planned installation of ground electronic equipment were demonstrated as key elements in the successful reduction of electromagnetic interference.

RADAR TRANSMITTER AND RECEIVER SPECTRAL SIGNATURES:

The above paper, which was presented at the 2nd National Symposium of PGREFI on June 13, 1960 has been reproduced by the Armour Research Foundation. The paper was given by H. M. Sachs and J. J. Krstansky, of Armour Research, and the Abstract follows:

"This paper discusses the determination of radar equipment performance characteristics, as they relate to the radio-interference prediction problem. Emphasis is given to the measurement of spurious receiver responses, forward transmitter power, and antenna pattern characteristics. Some of the problems peculiar to the measurement techniques involved, particularly with regard to multi-mode effects, are discussed. The experimental variations of the radar parameters as functions of frequency, system tuning, and the effect of certain components of the system are reviewed. The possibility of representation of some of the interference parameters on a statistical basis is discussed".

Copy may be obtained from Mr. H. M. Sachs, Armour Research Foundation, 10 West 35th Street, Chicago 16, Illinois.

INTERFERENCE IN RAILWAY LINE-SIDE TELEPHONE CABLE CIRCUITS FROM 25 KV 50 C/S TRACTION SYSTEMS:

Electronic Industries, August 1960, mentions an article with the above title by A. Rosen, in ATE Journal, October 1959, 21 pp. The summary states:

"Experience already gained, particularly on the Continent of Europe, in the solution of the problem of interference in railway line-side telephone cable circuits from electrical traction systems is briefly reviewed. The relevant C. C. I. F. recommendations on the general problem of this type of interference are then stated. A calculation is made of the induced e. m. f. due to magnetic induction and analysis are given of the effectiveness of electromagnetic screening by cable sheath and by an external conductor. (England)."

PRELIMINARY REPORT ON COKE-AGGREGATE CONCRETE:

The U. S. Naval Research Laboratory, Washington, D. C., is making a study of coke-aggregate concrete as a shield to electromagnetic radiation. The Abstract to the interim report, NRL Report 5473 states:

"The electromagnetic behavior of a coke-aggregate concrete as a shield to radiation has been investigated. Measurements have been taken on a sample within the frequency range from 1 to 1000 Mc.

"The loss-versus-frequency characteristic can be predicted with reasonable accuracy by the adaptation of classical propagation theory to the transmission of electromagnetic waves through an imperfect conductor. With a knowledge of the approximate value of complex permittivity and a measurement of direct-current conductivity, substitution of these parameters into a general equation will then yield the total insertion loss at the desired frequency."

CONTROLLING RFI SUSCEPTIBILITY IN RECEIVERS:

ELECTRONIC INDUSTRIES plans to run an article, under the above heading, in its September 1960 issue. Their description of the contents of the article follows: "With good design it is usually possible to produce receivers that have low susceptibility to undesired signals. Some of the factors to consider in the receiver's design are sensitivity, selectivity, spurious responses, intermodulation, and cross modulation as well as standard shielding considerations. Part VI in the continuing RFI series in Electronic Industries."

US 43-7
FEB 1971
H 0010

New Products:

Radio Interference Filter:

A radio interference filter has been developed by the McMillan Laboratory, Inc., Ipswich, Mass. to provide 100 db+ from 14 KC to 45,000 MC. for continuous operation, conductor to ground, 250V, 0-400 CPS. Current capacity is 30 and 60 amps and weight 13 lbs. Affiliated Products, Inc., Beth Ayres, Pa. is their sales agent. Ask for data sheet 12559-3.

Non-metallic Conductive Plastic:

Abbey Plastics Corporation, 420 Main Street, Hudson, Mass., has developed a non-metallic conductive vinyl compound known as Abbey #100. It has a resistivity of 8 ohm-cm³ in some applications. At the present time it is being made into conductive gasketing and tubing, high voltage conductor shielding, shielding on microphone cable and as a replacement for metal in coaxial cables. Send for Technical Bulletin on Abbey # 100.

Protective Suit and Electro-magnetic radiation meter:

An RF radiation protective suit that affords complete protection from harmful biological effects of electromagnetic radiation and a new lightweight self-contained instrument for making accurate power density measurements of radar and transmitting equipment have been developed by the Filtron Co., Inc., 131-15 Fowler Avenue, Flushing 55, N. Y. For further information on the suit write to Systems Engineering Div., and for further information on the meter write to Mr. Sam Perry, Marketing Division, at above address.

NOTE:

As there is a two-weeks to a month's time-lag on getting Newsletters processed and into the mail, please send in information to be included in a Newsletter as soon as possible. Also don't be bashful about letting people know what you have said and done. It saves the editor much time in follow-ups when he hears about it.

Rexford Daniels, Editor
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