PROFESSIONAL GROUP ON RADIO FREQUENCY INTERFERENCE

NEWSLETTER

Number 23 September 1962

EIGHTH TRI-SERVICE CONFERENCE ON ELECTROMAGNETIC COMPATIBILITY

Armour Research Foundation, Chicago, October 30, 31 and November 1, 1962 at Museum of Science and Industry.

ADVANCED PROGRAM

Tuesday, October 30

8:00 A.M. Registration

10:00 A.M. Welcome

Welcome Address: J. E. McManus, Armour Research Foundation, Chicago, Illinois.

Keynote Speaker: J. M. Bridges, Director, Office of Electronics, Office of the Director of Defense Research, Washington, D. C.

10:50 A.M. Session I - General
Chairman: J. E. McManus

1. Technical Progress at the Analysis Center, S. I. Cohn, Armour Research Foundation, Annapolis, Maryland.

2. Management Responsibility in Obtaining an Electrical/Electronic Compatible Weapon System: F. J. Nichols, Genistron, Inc., Los Angeles, California.

12:00 Luncheon
Chairman: V. H. Disney, Armour Research Foundation, Chicago, Illinois.

Luncheon Address: Space Exploration with Scientific Probes: Oran W. Nicks, Director, Lunar and Planetary Programs, NASA.

2:30 P.M. Session IIA - Analysis and Prediction I
Chairman: D. Ports, Jansky and Bailey, Alexandria, Virginia.

1. Computer Reduction of Laboratory Data for Construction of MIC's: R. N. Bailey, Georgia Institute of Technology, Atlanta, Georgia.

2. Frequency Assignments for Duplex Systems: A. P. Jensen, R. Techs, I. E. Perlin, D. Hay, W. M. Graves, Georgia Institute of Technology.

3. An Interference Model - Description and Prediction Results: P. Oyer and T. Truske, Armour Research Foundation, Annapolis, Md.

4. The Computer Simulation of the Time-Amplitude Interference in a Multiple Search Radar Environment and Its Uses: J. A. Zoellner & M. C. Litzky, Armour Research Foundation, Annapolis, Md. M. Lustgarten, Rand Corporation, Santa Monica, Calif.

2:30 P.M. Session IIB - Instrumentation and Techniques I
Chairman: C. Rees, Bureau of Ships, Washington, DC

1. Microwave Impulse Generator Techniques: M. Engelson and A. Frisch, Brooklyn, New York.

2. Large Power Impulse Noise Generator for Evaluation of RFI Shielding and Filtering: D. B. Clark, U. S. Naval Civil Engineering Lab., Port Hueneme, California.

3. Preliminary Measurements for Measuring Systems Susceptibility: G. Barker & E.Gray, U. S. Naval Underwater Sound Lab., New London, Connecticut. R. M. Showers, University of Pennsylvania, Philadelphia, Pa.

4. Magnetic Induction Susceptibility at Power Frequencies: L. Clough and J. Salzetti, General Dynamics/Astronautics, San Diego, California.

Wednesday, October 31

9:00 A.M. Session IIIA - Instrumentation and Techniques II
Chairman: O. D. Stewart, Navy Air Navigation Electronics Project, Patuxent River, Maryland.

1. A Recent Advance in Microwave RFI Instrumentation: J. Mahoney, Stoddart Aircraft Radio, Hollywood, Calif.

2. A Rapid-Display Technique for Radio Interference Measurements: D. Fidelman, Electro-Magnetic Measurements Co., Farmingdale, New York.

3. A Carrier Cancellation Technique for Extending the Dynamic Range of Spectrum Analyzers: J. G. Holey, Lockheed-Georgia Company, Marietta, Georgia. J. R. Walsh, Georgia Institute of Technology, Atlanta, Ga.

4. The Laboratory Simulation Testing Facility: B. C. Pierstorff and A. I. Matheson, Radio Corporation of Amer. Burlington, Massachusetts.

9:00 A.M. Session IIIB - Analysis and Prediction II
Chairman: Dr. W. A. Edson, Electromagnetic Technology Corporation, Palo Alto, California.

1. Analysis of Receiver Spurious Response by Graphical Means: W. A. Kesselman, U. S. Army Signal Research and Development Laboratory, Fort Monmouth, N. J.

2. Laboratory Substantiation of Interference Prediction Techniques: L. W. Beard, Sprague Electric Co., North Adams, Massachusetts.

3. Analysis of Receiving System Degradation Caused by Interference: R. Mayher, Armour Research Foundation Annapolis, Maryland.

4. Radio Frequency Interference Prediction by the Use of Analog Computers and GEESE Techniques: K. G. Ger-

hart and L. Moses, General Electric Company, Syracuse, New York.

2:00 P.M. Session IVA - Spectrum Signature Measurements
Chairman: C. Ordonez, U. S. Army Electronic Proving Ground, Fort Huachuca, Arizona.

1. Advanced Techniques for Ground Spectral Measurements: R. Smith, Sperry Microwave Electronics Co., Clearwater, Florida. G. H. Tikijian, Rome Air Development Center, Griffis AFB, New York.

2. Some Aspects of L-Band Radar Compatibility and Spectrum Signature Measurements: K. H. Gerred and H. M. Reid, Navy Air Navigation Electronics Project, Patuxent River, Maryland.

3. Instrumentation for Spectrum Signature Measurement of Pulse Compression Radars: C. P. McCall and J. W. Savage, Jansky and Bailey, Alexandria, Virginia.

4. Spectral Power Distribution Measurements in High Power, Long Pulse Radar Transmitter Systems: R. F. Koontz, Jr., Radio Corporation of America, Moorestown, New Jersey.

2:00 P.M. Session IVB - Antennas and Propagation
Chairman: Dr. E. M. T. Jones, TRG Inc., Palo Alto, California.

1. Analysis of the Fresnel Region of a High Gain Satellite Communication Antenna System: D. W. S. Prims, Melpar, Inc., Falls Church, Virginia.

2. Patterns and Gains of Antennas at Harmonic Frequencies: O. M. Salati, University of Pennsylvania, Phila., Pennsylvania.

3. Spherical and Hemispherical Anechoic Chambers, R. C. Binford, Jr., University of Pennsylvania, Phila., Pa.

4. Some Aspects of VHF and UHF Coverage and Interference in Irregular Terrain: J. J. Egli, U. S. Army Signal Research and Development Laboratory, Fort Monmouth, New Jersey.

Thursday, November 1

9:00 A.M. Session VA - Suppression Devices
Chairman: Capt. O. Allen, Rome Air Development Center, Griffiss AFB, New York.

1. Blanking Equipment for the Suppression of Pulse Interference: W. B. Warren & D. G. Hobb, Georgia Institute of Technology, Atlanta, Georgia. R. Powers, Rome Air Development Center, Griffiss AFB, New York

2. A Low-Frequency Filter Inherently Free From Spurious Responses: J. E. Bridges & L. J. Greenstein, Armour Research Foundation, Chicago, Illinois.

3. A New Family of Absorptive-Reactive RFI Filters: J.F. Fischer and J. C. Senn, Genistron, Inc., Los Angeles, California.

4. Operational System Performance of a High Power Harmonic Filter: F. P. Ventolieri, Rome Air Material Area, Griffiss AFB, New York. R. H. Stone, General Electric Company, Palo Alto, California.

9:00 A.M. Session VB - Classified
Chairman: M. Ware, U. S. Army Material Command, Washington, D. C.

1. Interference Analysis of the AN/FPS-85 Space Detection and Tracking Radar: E. R. Freeman and H. M. Sachs, Armour Research Foundation, Annapolis, Maryland

2. Interference Problems Produced by the AN/FPS -24 Radar: J. T. Oblinger, HRB-Singer, State College, Pennsylvania.

3. An Interference Elimination Circuit for FM Voice Radio Sets: D. Ludwig, General Electronics Laboratories, Cambridge, Massachusetts J. A. Allen, U. S. Army Signal Research and Development Laboratory, Fort Monmouth, NJ.

4. NAG-1A/TSEC, Radiation Standard for Communication and Information Processing Equipment: D. G. Boak, National Security Agency, Washington, D. C.

2:00 P.M. Session VIA - Shielding and Bonding
Chairman: R. W. Fairweather, U. S. Naval Material Laboratory.

1. TheGrounding of Electronic Equipment: R. F. Ficcki, Radio Corporation of America, Camden New Jersey.

2. Implementation of Bonding Practices in Existing Structures: D. R. Lightner, White Electromagnetics, Huntsville, Alabama.

3. Near Field Shield Termination Criteria: H.W. Ervin, White Electromagnetics, Huntsville, Ala.

4. Corona Reduction Techniques in High RF Fields: W. Richards, White Electromagnetics, Bethesda, Maryland. R. Powers, Rome Air Development Center, Griffiss AFB, New York.

2:00 P.M. Session VIB - RFI Control
Chairman: M. Morelli, Washington, D. C.

1. RFI Integration: M. Revzin, Loral Electronics Corporation, New York, New York.

2. Proposed Radar Spectrum Occupancy Design Standard: J. Roman and F. Murphy, Bureau of Ships, Washington, D. C.

3. A "Packaged" MIL-Spec. RFI Test Facility: B. DeNardi and S. Weitz, U. S. Army Signal Res. and Development Lab., Fort Monmouth, N. J.

4. GEELA's Role in the AF Interference Reduction Program: T. P. Długolecki and D. R. Clark, Ground Electronics Engineering, Installation Agency, Griffiss AFB, New York.

Nominations for PGRFI Administrative Committee Membership

The PGRFI Nominations Committee hereby notifies the membership that nominating petitions for the election of five (5) members to the PGRFI Administrative Committee for a three year term commencing July 1, 1963 will be accepted up until January 1, 1963. The by-laws concerning these nominations are as follows:

ARTICLE VI

Section 1: On or before December 1 of each year all members of the Professional Group on Radio Frequency Interference shall be notified that nominations for members of the Administrative Committee are open. This shall be done either by notice in a Newsletter or by direct notification of each member by post card or letter.

Section 2: Nominations shall be made by petition. The nominating petition for each nomination submitted shall contain at least 15 PGRFI members' signatures together with a short (not more than 100 words) biography listing the affiliation and

background of the individual nominated. All nominations must be in the hands of the Nominations Committee by January 1 of each year. If the Nominations Committee receives less than 10 names (two for each vacancy) or if the Nominations Committee sees fit to make nominations in addition to those received from the members, it shall be within the authority of the Nominations Committee to do so. Not less than 2 names for each vacancy shall be submitted by the Nominations Committee.

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

Each nominating petition (signed by at least 15 PGRFI members and accompanied by a biographical sketch of not more than 100 words) should be sent before January 1, 1963, to the Chairman of the nominating committee:

Harold E. Dinger, Code 5416
Naval Research Laboratory
Washington 25, D. C.

The present membership of the Administrative Committee and the dates of membership expiration follows:

1963: Harold E. Dinger, John J. Egli, Herman Garlan, H. A. Gauper, R. B. Schulz.

1964: Samuel J. Burruano, Z. V. Grobowski, W. E. Pakala, Henry Randall, Ralph M. Showers.

1965: S. A. Bennett, James Hill, A. R. Kall, L. W. Thomas, D. R. J. White.

The above notice in this Newsletter complies with the requirements in Section 1 and will be the only notification for 1962 nominations which will be sent to members by the PGRFI Group.

OFFICERS OF WASHINGTON CHAPTER FOR 1962-63

Chairman:	Aaron H. Sullivan, Jr. Frederick Research Corp.
Vice Chairman:	Rupert Haskins Naval Research Laboratories
Secretary:	W. Gerald James Melpar, Inc.

NOISE-FIGURE SLIDE RULE AVAILABLE

Airborne Instruments Laboratory, Division of Cutler-Hammer, Inc., Deer Park, Long Island, New York, has made up a noise-figure slide rule using source resistance ohms, diode current milliamps and rms noise voltage $\mu v/mc$ bandwidth. Formulas are given on the reverse side for diode noise generator, for argon and neon noise generators, for hot-cold noise generator and for effective noise temperature. Instructions are also given on the reverse side for the use of the slide rule. Requests for this slide rule should be directed to J. F. Bisby, Manager, Commercial Sales, at the above address, on company letterhead and a slide rule will be sent without charge.

ARTICLE ON ECAC

A two-page article has been written by Sy Vogel, Associate Editor, Electronic, August 17, 1962, page.20. The first two paragraphs state:

"Annapolis, Md.--Analysis of radio frequency interference (rfi) problems in a Space Detection and Tracking (Spadat) area will be undertaken by Department of Defense's Electromagnetic Analysis Compatibility Center (ECAC). This new project involves analysis of factors involving Spadat radar, uhf radar, f-m telemetry, f-m radio relay, ground/air a-m voice radio, drone controls, missile-destruct links and television.

Work on specific projects is undertaken in addition to ECAC's prime mission of compiling and coordinating spectrum signatures and environmental data for a data base to be used in the military's overall battle against rfi.

ECAC OPPORTUNITY BOOKLET AVAILABLE:

The Electromagnetic Compatibility Analysis Center (ECAC), Annapolis, has printed up a booklet titled, "Your Opportunity at ECAC". Copies of this booklet and other information about ECAC may be obtained by writing to the following:

Stanley M. Ream
Armour Research Foundation of Illinois Institute of Technology
Electromagnetic Compatibility Analysis Center
USNEES / Annapolis, Maryland. Tele: COlonial 3-2611, Ext. 8461

Ronald C. Seipp
Armour Research Foundation of Illinois Institute of Technology
10 West 35th Street / Chicago 16, Illinois
Telephone: CAlumet 5-9600 - Extension 321

Wayne L. Kent
Armour Research Foundation of Illinois Institute of Technology
1 Rockefeller Plaza / Suite 1283 - 1299
New York 20, New York
Telephone: JUdson 2-3414

Anatole M. Schwieger
Armour Research Foundation of Illinois Institute of Technology
Rusthoekstraat 37, Scheveningen
The Hague, Netherlands / Cable: Arned
Telephone: 559-700

GROUNDING IN HIGH POWER TRANSMITTER DESIGN

The following paragraph is being reprinted courtesy of Electronic Industries, copyright 1962 Chilton Publication, from the article, "High Power Transmitter Design", by G. H. Tallmadge, Senior Project Engineer, Radiation at Stanford, Palo Alto, California.

Grounding and Monitoring

Grounding and Monitoring clutter often present problems in large systems. There is no ideal solution for grounding problems. Obviously, all major units must be grounded for equipment and personnel safety reasons. When large transient currents with high rates of rise are involved, ordinary wire is not the best connector because of its relatively large inductance. One should use wide, thin strips of copper. Strips 40" x 0.010" are not unreasonable. It is often wise to choose the circuit with the most severe current problems and make this the central ground point for the entire system, taking care to have radial ground connections to the peripheral equipment. Closed ground loops are to be avoided if possible because hundreds of amps can be induced in them. Also, thousands of volts can be developed across even a five-foot piece of copper 24" wide. The latter is the main reason for having only a single ground point which preferably should be attached to rods sunk into the earth. Coax shields are often the cause of multiple ground loops. It is not always necessary or advisable to

ground both ends of the shields.

No matter how substantial ground connections are between units which may be spread over large areas, there will be some 60 cps voltage difference between the units. As much as two or three volts may be more or less unavoidable. Finding the exact source can be an impractical prospect due to the hundreds or even thousands of wires that thread through the equipment. Hence, it is advisable to keep oscilloscope waveforms over 20 or 30 v. where possible.

Detected r-f waveforms present a problem because they usually can't be greater than one to three volts. In this case one can use an "inside-outside dc block". This is a high pass filter in both the center conductor and shield of the coaxial block.

These pass only r-f signals, thus blocking 60 cps transmission. A quarter wave length shorted stub can be used to establish a dc return for the crystal.

The conclusion to be drawn from these comments is that few new principles are involved in putting together higher power transmitters. However, much more care must be directed at what used to be secondary effects and there is room for considerable ingenuity in circumventing them.

ANTENNA NOISE AND PROPAGATION

Part III of Problems of Space Communication, titled, "Antenna Noise and Propagation", by C. T. McCoy, Research Division, Philco Corporation, 4700 Wissahickon Avenue, Philadelphia 44, Pennsylvania appears in the July 1962 issue of Electronic Industries. The subtitle states:

"Though our series has treated linear and non-linear receivers, this article deals with noise for linear receivers only. But the effects of ionosphere reflection, troposphere refraction, and atmosphere absorption are also thoroughly discussed."

ARTICLES OF INTEREST IN ELECTRICAL DESIGN NEWS AUGUST 1962

Starting on page 72 is a 10 column write-up on "Polyform - A New Approach to Electromagnetic Shielding Enclosures", by Brian Butterfield, Manager of Industrial Engineering, Barber-Colman Co., Aircraft and Missile Division, Rockford, Illinois.

The first three paragraphs are:

Introduction

The necessity for electromagnetic shielding may arise from any electronic apparatus producing a flux which, because of its proximity to other equipment, may induce an undesirable current or magnetic unbalance within it.

Inductions may interfere with such items as inertial guidance platforms where the gyro torque motor, spin motor, dualsyn or other similar equipment is critical and induced currents or external fields could affect their calibration and/or operation.

*'Polyform' Electromagnetic Shielding

This report describes a revolutionary method for producing an extremely complexly shaped magnetic shield which may be made to any configuration of almost any thickness even with negative draft angles and protrusions. The shields made in this way give shielding efficiency as good as or better than solid material for less weight, less space, less money and in less time.

*"Polyform" is a procedure for producing an electromagnetic shield by spraying metal either by plasma or metallizing gun. A patent has been applied for by Barber-Colman Co., Aircraft and Missile Division, where the process was developed.

On page 100 is a six column article, titled, "Low Loss Bandpass Filter Design", by Claude Strother, Jr., Research Lab., Lockheed Missiles and Space Company, Palo Alto, California.

The first paragraph states:

Use of modern network theory has provided convenient methods for designing bandpass filters. The required procedure is well established for Butterworth, maximally flat; and Tchebycheff, equal ripple designs. [1,2,3] The calculations are readily made once the required constants have been obtained; however, published data have given constants for up to six filter stages only and for ripple ranging from 1 to 3 db. Data for lower ripple, from 0.001 to 0.1 db, are provided and it will be shown how to extend the number of filter stages indefinitely.

SOVIET SCHEME FOR PIPELINE COM SYSTEM

Under the above title an article appeared in the August 20, 1962, issue of Electronic News which is reprinted by permission as follows:

"MOSCOW--Soviet scientist Yuri Kaznacheyev has come up with an idea for using the 20,000 miles of gas pipe lines in the Soviet Union for transmitting television and radio signals and telephone messages. The advantage of the new idea is that it would make all signals free from interference or disturbance.

"Dr. Kaznacheyev's experiments show that a gas pipe becomes a wave guide if its interior is coated by a film of copper or aluminum. This film will ensure the transmission, via a special chain of amplifiers, of up to 2,000 telephone conversations at a time. If spiral shaped ribs are made in the inside surface of the pipe it will be able to carry practically an unlimited number of conversations, as well as nearly 100 television programs.

"Radio, television and phone signals can be transmitted by this method for distances up to 750 miles. Direct TV links over distances about which scientists now only dream about will be feasible by the new method.

"Dr. Kaznacheyev said that development of the new gas pipes is a complicated problem but it will be superior to all present known methods of signal relays.

Explanation Offered for Angels on Radar Displays

The following article appeared on page 88 of the August 10, 1962 issue of Electronics. (A McGraw-Hill publication)

Angels or false targets on radar displays have lent credence to many flying saucer reports, as well as causing considerable confusion. The cause of angels has never been fully understood, although they are partly explained by sharp discontinuities of temperature and moisture in the atmosphere.

False targets are produced by backscattering from inhomogenities in the atmosphere only at short ranges, indicating the need for further explanation of angels. At Air Force Cambridge Research Laboratory, P. J. Harney analyzed results of many observations made at the laboratory and by the Weather Bureau and Wright Air Development Center. From this information, he suggests a model of the mechanism of false radar targets. The conditions necessary for producing angels are found typically in the Kansas area. On hot summer days, radar displays may be cluttered with angels, although there is not a cloud in the sky. The pattern of the clutter is quite similar to that of certain types of cloud populations found in Florida. This pattern results from a condition called Benard cell circulation. Although no clouds were present, it is suggested that this type circulation was present in Kansas.

Benard cell circulations produce concave reflecting surfaces at altitudes up to about 6,000 feet. The radar beam reflected by these dish-like surfaces produces angels. A number of these reflecting surfaces in a huge undulating layer would

present slowly changing aspects.

A low-angle radar beam under certain conditions could be reflected from one surface to another before returning to the radar. Because of the undulating nature of the reflecting surface, the target would appear to be moving rapidly. The model could also explain occasional transmissions of vhf and uhf signals over great distances.

ION ORBS WARN OF EXCESSIVE R-F FIELD STRENGTH

In the July 20, 1962 issue of Electronics is an article by Harry R. Meahl, General Engineering Laboratory, General Electric Company, Schenectady, New York, under the above title. The article describes tests of spheres filled with gas at low pressure, having no electrodes, and that would glow at low enough field strength to be useful. The first two paragraphs state:

"Omnidirectional r-f field-strength indicator has been developed that responds to frequencies from 50 to 500 Mc and probably to 3,000 Mc. No power supply is needed, and operation is not affected by changes in ambient temperature or relative humidity. The indicator responds to both c-w and pulsed signals independently of polarization.

Potential hazards to personnel are increasing because of greater radiated power from radar and other transmitters and the use of more than one transmitter at radar sites. In these environments, electromagnetic energy also causes malfunctioning or damage to commercially available field strength meters. A field strength indicator was sought having a variety of characteristics for use under these conditions."

ASTRONOMERS FIND H-BOMB MAKES NOISE

In Electronics, August 24, 1962, on page 12, is the following news item:

"U. S. Radio Astronomers in Jicamarca, Peru, have discovered long-lived radio noise from synchrotron radiation injected into the earth's magnetic field by the United States' July 9 high-altitude H-bomb test. They cite harm to radio astronomy and urge scientific and political review of future test plans "since the radio astronomers of the world will shortly become aware of the problem."

But high officials plan no change in test programs yet. The effect, they argue, is a calculated risk of the testing program, is minimal so far (double cosmic background on a quiet day) and blankets only the equatorial region where there is little radio astronomy. The effect--which influences work below 50 Mc--was detected with 6-megawatt pulse radar designed to probe the ionosphere and magnetosphere."

THE CAT

An article on Data Processing Systems under the above title was written by Manfred Clynes, Mnemotron Corporation, in the August 1962 issue of Instruments and Control Systems, on page 87. The subtitle states:

"Although CAT (Computer of Average Transients) was designed to sharpen the vision and perception of the scientist with regard to the signals received from biologic organisms it can find use wherever variables are noisy, where responses change, when time or amplitude distribution of events are required, where analysis of random behavior in terms of amplitude spectrum is needed, for analog to digital conversion, for comparison, for detection of time related responses of several variables, for accurate recording of fast waveforms, etc."

STRAY SIGNAL DELAYS VENUS PROBE ATTEMPT

An Associated Press dispatch dated July 22, 1962, states in part:

"Cape Canaveral, Fla. (AP)--A stray radio signal that burned out a fuse in the booster rocket's command destruct system Saturday forced a one-day postponement of an attempt to launch a Mariner I spacecraft to the vicinity of Venus.

The spurious radio signal entered the first-stage Atlas as the countdown was progressing early Saturday morning. Apparently it overloaded the fuse and it burned out. The fuse is part of a box through which a signal would pass to destroy the rocket in flight if the range safety officer detected something wrong.

Fuse Replaced

Technicians replaced the fuse quickly but it required considerable time to check out. So the shot was called off for the day.

Stray signals of the type often are caused by atmospheric phenomena picking up a signal from one source, such as a radio station, and introducing it into another radio outlet, such as the telemetry system in a missile. It happens very rarely at Cape Canaveral, officials reported."

Engineering Data on Conductors for Service at 500C (932F)

Electrical Design News, July 1962, carries an article under the above title by C. L. Carlson, Westinghouse Electric Corp., Materials Research Labs., East Pittsburgh, Pennsylvania.

The introduction is as follows:

Introduction

From a practical point of view, the terms "Conductor" and "Metal" are synonumous. Nonmetals are either semiconductors or nonconductors. The latter term is used interchangeably with insulator. Fig. 1 shows the relative magnitude of resistivities for these three groups. Table 1 presents pertinent published properties of pure metal conductors at the standard room ambient temperature of 20C (68 F).

Copper, as is well known, is an excellent conductor, indeed it is the world-wide standard, but it oxidizes readily in air at and above 250C (482F) unless adequately protected. Insulation systems retard but do not prevent this action. Not only is the conducting portion of an insulated copper wire progressively reduced in size by the formation of characteristically loose flaking copper oxide, but also the consequent increase in volume disrupts the insulation and permits accelerated oxidation to take place, resulting in premature failure.

Aluminum, too, has seen extensive service as an electrical conductor, not only in this country but also throughout the world. It has been used more extensively in Europe than here but, like copper, it has definite limitations--although of a different sort. Pure aluminum has a relatively low melting point (660C, 1220F) and at elevated temperatures it has quite low mechanical strength. Its oxidation, however, is a self-limiting process.

Of other feasible conductors, only silver has higher volume conductivity than copper, while gold follows immediately below copper. Both metals have extremely good metallurgical stability and, compared to other metals, quite good conductivity at elevated temperatures. These two precious metals, however, are usually eliminated from serious consideration as conductors because of their excessively high price.

In the past few years, service temperature requirements has gradually increased. Early service temperature goals of 100C (212F) were later advanced to 200C (392F) and then to 300C (572F) while required time at temperature varied from days to years. Current interest centers in a maximum service temperature of 500C (932F) with a continuous operating temperature of 375C (707F). It is more than likely that continuous operating temperatures will advance

to 500C (932F) in the near future. These higher temperatures are usually associated with periods of time ranging from ten to several hundred hours.

Classes of conductors considered for elevated temperature service include pure metals such as copper, silver and aluminum; composites such as nickel-coated copper and aluminum-clad copper wires, and alloys such as silver-nickel-aluminum and copper-nickel. Various types of insulation are applied regularly to these various conductors but the data in this article refer to bare (uninsulated) conductors only. The effects of temperature along or of aging these conductors in air at given temperatures are briefly discussed. These experimental data, as well as information culled from the literature are presented to provide back-ground engineering information for designers and engineers confronted with elevated-temperature service conditions.

Improved Electronic Differentiator Has Low Noise Factor

Under the above title, Electronics, July 27, 1962, carries an article by N. D. Diamantides, Goodyear Aircraft Corporation, Akron Ohio. The subtitle states:

"Time delay of added amplifier smoothes our irregularities caused by h-f noise."

ITEMS OF INTEREST FROM ELECTRONIC DESIGN
AUGUST 16, 1962

The following articles are of interest:

How the System Manager Should Approach the Problem of RFI, by Dr. Joseph H. Vogelman, Vice President, Research Development and Engineering, Capehart Corporation, Richmond Hill, New York.

The subtitle states:

"If a step-by-step program for controlling RFI is not begun early in the design of an electronic system, the system eventually may have to redesigned or put through costly RFI testing. The system manager should try as early as possible to predict the interference sources, sinks, worst-case magnitudes and the frequencies at which they will occur."

In the section headed, German Abstracts, is an abstract from an article by J. S. Vogel and M. J. O. Strutt, Archiv der Elektrischen Ubertragung. The first paragraph states:

Calculation of Noise in Transistor Mixers

"Starting with the physical sources of noise in junction transistors, the noise current components in the collector circuit of a frequency converter can be calculated from formulas for amplifier and mixer operation. As a result, a formula for noise figure and its dependence on operating conditions can be developed."

Under the section headed Patents, is a description of the following patent titled, Extracting Information from the Weaker of Two Signals, describing Anti-Capture Signal Receiving Apparatus. Patent No. 3,020,403, by K. C. Perkins (Assigned to General Electronic Laboratories, Inc.). The first paragraph states:

"An fm receiver selects the weaker of two applied signals: reception improves when the stronger signal has at least twice the amplitude of the weaker signal. Fundamentally, when two signals beat, the output follows the amplitude of the weaker signal. Novelty lies in slope detection of the two signals before they beat in an amplitude-modulation detector."

ITEMS OF INTEREST FROM ELECTRONIC INDUSTRIES
AUGUST 1962

In the letters to the Editor column is a discussion on "Shielding an Enclosure", by Cyril P. Durnovo, Automatic Electric International Inc., Geneva, Switzerland, Erik A. Lindgren, President, Erik Lindgren and Assoc., 4515 N. Ravenswood Avenue, Chic 40, Illinois, Manny Strunin, Adler Electronics, Inc., 1 Lefevre Lane, New Rochelle, New York and O. P. Schrei Vice President--Sales, Technical Wire Products, Inc., 1 Dermody Street, Cranford, New Jersey.

The discussion revolves around the useage of the ter "attenuation", "shielding effectiveness", and "insertion l with a final plea to the RFI industry to standardize on thei useage.

Electronic Shorts

An environmental file which will enable the military vices to study, predict and recommend solutions to the g ing problem of compatibility of combat electronic equipm will be compiled by Bell Aerosystems Co., Buffalo, New York. Types of information, known as environment file d to be gathered by Bell engineers under the Army contract includes data about geographical locations, terrain chara teristics, atmospheric effects, schedules of operation, a tenna orientations and operating frequencies.

Tele-Tips

Intermittent Interference was reported by coast and h bor radio stations in the New York area on the marine int national calling and distress frequency. It appeared infre quently and lasted but a few minutes. Finally FCC engine found that it occurred whenever a particular bridge over t Passaic River between Newark and South Kearny was ope The bridge carries an electrified railroad line. Repairs the 12,000 volt disconnect switch eliminated the trouble.

Systems--Wise

The Department of Defense has told the FCC that one the basic defense requirements for CONELRAD no longer exists. The DOD reevaluated the requirement and found it no longer essential to minimize the use of radiation on no Government transmitters as navigational aids to an enem

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New White Electromagnetics, Inc., Bulletin Available

The Technical Bulletin, Volume 2, No. 3, published l White Electromagnetics, Inc., 4903 Auburn Avenue, Beth 14, Maryland, is now available to those writing in for it. Its title is "Effectiveness Evaluation of Communications-Electronics Systems in Tactical Electromagnetic Environments".

National Bureau of Standards Reports Available

The following reports by G. D. Gierhart, L. G. Haus J. E. Farrow, and M. T. Decker are now available from Government Printing Office:

NBS Report 7272 - Insertion Loss of a Brick Wall at 1

NBS Report 7273 - Insertion Loss of a Frame Wall at

PGRFI Comments on its Status in the Merged Society

Now that IRE and AIEE have merged, the new society IEEE is looking into the problem of consolidating the IRE P fessional Groups and the AIEE Technical Committees. On May 17, 1962, Dr. Weber, slated to become President of I triple E, circulated a memorandum to all Professional Groups setting forth one way in which such a consolidation could be consummated.

On August 16, 1962, Herman Garlan, PGRFI Chairma submitted the following statement to IRE Headquarters regarding Dr. Weber's proposal.

HERMAN GARLAN

Comments Concerning the Status of PGRFI in the IEEE

In his memorandum dated May 17, 1962, Dr. Weber set out some five approaches to the problem of merging the IRE Professional Groups with the AIEE Technical Committees. PGRFI is in complete accord with these objectives particularly with the one of keeping the total number of PG's under the merged association below 35.

However, we disagree with his proposal to merge RFI (G-27) with PGCS (G-19) and PGVC (G-6) from IRE and with Communication Switching (9b) and Mobile Radio (9e) from AIEE into a new PG dealing with Radio Communication Systems.

We believe this proposal overlooks several important aspects of radio interference and should be restudied.

1. Putting radio interference into the general category of radio communication system carries the implication that only radio communication systems suffer from radio frequency interference and tends to play down the fact that other radio systems suffer interference as well--broadcasting, radar systems, radio navigation, etc. In fact, every radio system is susceptible to RFI to a greater or lesser extent.

2. RFI cannot be associated solely with communications, since RFI must treat with all electronic systems including computers and data processing as distinct from merely the transmission of RF energy. Furthermore, the electric power people -- both generation, transmission and use -- must use RFI techniques. And this is becoming of ever greater importance as industry uses more automation and as our economy becomes more electrified.

3. RFI is a field of interest that cuts across nearly all other areas in electricity and electronics. Hence, it is not appropriate to fit it into any of the existing groups, either IRE or AIEE. For example, RFI is concerned with circuit theory, information theory, field theory. It is concerned with the specialized instrumentation used to measure interfering fields.

4. The subject of RFI is sufficiently specialized and of growing importance that it warrants individual treatment and retention of the term "Interference" or "RFI" in the title of the Group. In this way, all interested parties, whether communications people or power people, will be able to use its output.

5. Finally, having studied the list of PG's in IRE and TC's in AIEE, it is our studied conclusion that the Professional Groups cannot be combined directly with the Technical Committees except in a few obvious cases, such as broadcasting and mobile communications. It is our opinion that the TC structure is inherently different from the PG structure, and that merger should be achieved by adding PG's to cover the fields of interest in the AIEE.

Accordingly, in view of the growing importance of controlling RFI and in view of its unique situation in that it is involved with all electronic and electrical equipment, we hold that RFI should be retained as a separate field of interest under its present name.

Herman Garlan, Chairman - PGRFI

PRACTICAL TECHNIQUES FOR NOISE-FIGURE MEASUREMENTS

Under the above title Joseph F. Klarl and Harry W. Lamberty, Military Engineering Division, Microwave Equipment Sections, Admiral Corp., Chicago, Illinois, have written an article in the August 30, 1962, issue of Electronic Design. The sub-title states: "Noise figure can be determined rapidly by using an uncalibrated detector and an output meter".

EDITOR'S NOTE

This is a special issue of the Newsletter to provide the members of PGRFI with the Advance Program of the 8th Tri-Service Conference on Electromagnetic Compatibility in order that they may get travel requests approved in time.

Rexford Daniels, Editor
PGRFI Newsletter
Concord, Massachusetts.