



PROFESSIONAL
GROUP ON
RADIO
FREQUENCY
INTERFERENCE

NEWSLETTER

NUMBER 16

MAY 1961

To serve for three years:

PGRFI OFFICERS - Beginning July 1, 1961

Chairman: Harold E. Dinger *Code 5416*
U. S. Naval Research Laboratory
Washington 25, D. C.

Vice-Chairman: Rexford Daniels
Interference Testing & Res. Lab.
150 Causeway Street
Boston 14, Mass.

Secretary: Zigmund V. Grobowski
Jansky & Bailey
Broadcasting & Telecasting Bldg.
1735 De Sales St., N. W.
Washington 6, D. C.

Treasurer: Herman Garlan
Office of Chief Engineer
Federal Communications Comm.
Washington, D. C.

Administrative Committee:

To serve one year:

Rexford Daniels
Interference Testing & Res. Lab.
150 Causeway Street
Boston 14, Mass.

Otmar P. Schreiber
Technical Wire Products, Inc.
48 Brown Street
Springfield, New Jersey

Robert W. Fairweather
Material Laboratory
Navy Dept.
N. Y. Naval Shipyard
Brooklyn, New York

Leonard W. Thomas
Bureau of Ships
Navy Dept.
18th St. & Const. Ave., N. W.
Washington, D. C.

Leonard Milton
Filtron Company, Inc.
131-15 Lowler Avenue
Flushing 55, N. Y.

To serve two years:

Harold E. Dinger
Naval Research Lab.
Washington 25, D. C.

H. A. Gauper
General Electric Company
Schenectady, N. Y.

John J. Egli
Project Monmouth
U. S. Signal Eng. Labs.
Fort Monmouth, N. J.

R. B. Schulz
Armour Research Foundation
Technology Center
Chicago 16, Illinois

Herman Garlan
Office of Chief Engineer
Federal Communications Comm.
Washington, D. C.

Samuel J. Burruano
Systems Eng. Div.
Filtron Company, Inc.
131-15 Fowler Avenue
Flushing 55, L. I., N. Y.

Henry Randall
Office of Dir. of Defense
Research & Engrg.
The Pentagon
Washington 25, D. C.

Zigmund V. Grobowski
Jansky & Bailey
Broadcasting & Telecasting Bldg.
1735 De Sales St., N. W.
Washington 6, D. C.

Ralph M. Showers
Moore School of Elec. Eng.
200 S. 33 St.
Philadelphia 4, Pa.

W. E. Pakala
Westinghouse Elec. Corp.
Box 868
Pittsburgh 35, Pa.

DON'T LET 600 GET AHEAD OF YOU. READ BELOW

Electronic Design, April 26, 1961, had this to say in its "Washington Report" by J. J. Christie, Washington editor:

RFI - The Handwriting on the Wall

The Defense Department's Electromagnetic Compatibility Program, representing a long overdue effort to combat radio frequency interference from a military standpoint, is gaining momentum.

A big step forward in the program will come with the establishment of an RFI analysis center. This facility, which reportedly will be set up and administered by the Armour Research Foundation and located at Annapolis, Md., will be the focal point of efforts to develop techniques for measuring and predicting RFI environment and emission.

Meanwhile, DOD is collecting spectrum signatures on both new and existing equipments for experimental testing. It has let a few contracts and will award others this year to research measuring and predictive methods.

An example of the type of research required at this stage of the game is a project at Georgia Tech which seeks a short-cut means of measuring antenna field patterns. If efforts to measure far effects at close range are successful, Pentagon officials say the expense of such testing would be reduced by a factor of 10.

Once the nature of the data required for interference prediction and control can be ascertained and the best methods of obtaining it can be determined, it is expected that a considerable amount of R&D will be necessary to upgrade instrumentation capabilities.

As the program matures, manufacturers will be required to furnish spectrum signatures with breadboards and with prototypes. Eventually, DOD officials expect that spectrum signatures can be supplied with design proposals on the basis of circuit designs and components.

The Consequences for Industry of the RFI compatibility program eventually will be similar to those now resulting from the Pentagon's determined effort to impose quantitative reliability specifications.

Initially, as in the case of reliability, the impact of the RFI program will be felt primarily on the systems and equipment level- in the need for specialized personnel and the necessity for increased testing and inspection. But, it won't be long before new obligations permeate the components level. DOD experts believe that by 1963 designers of relays, tubes, transistors and other components will be dealing with RFI requirements. They also foresee a boom in filtering device developments.

A good indication of the growing awareness of the RFI problem is the expectation that some 600 engineers will attend the third national IRE symposium on the subject to be held in Washington June 12-13.

3RD PGRFI SYMPOSIUM - ADVANCE PROGRAM

Monday, June 12, 1961

9:15 Opening Remarks - D. R. J. White, Symposium Chairman

9:30 Key Note Address - The National Electromagnetic Compatibility Program - Maj. Gen. James Dryfus, Dir., J-6 - Communications-Electronics

MAIN PROGRAM

Monday, June 12, 1961

10:15 SESSION I - The RFI Problem from the Users' Viewpoint
Chairman - Mr. Ed Allen, FCC

- 1st - FAA Radar & ATC Interference - Mr. H. Burton, FAA
- 2nd - Missile Range Interference - Mr. R. Jones, Frequency Coordinator, AMR
- 3rd - Naval Radiation Hazards - Mr. John Roman, RCA Service
- 4th - Tactical Communications Interference
- 5th - Military Radar Interference
- 6th - Radio Astronomy Interference
- 7th - Commercial-Industrial Interference
- Panel Discussion - Seven Speakers Plus Three Invited Panelists

2:00 SESSION II - Data Needs and Data Formats
Chairman - Mr. S. Bailey, Jansky & Bailey, Inc.

- 1st - Transmitters and Antennas - by Mr. Herb Sachs, Armour Research Foundation
- 2nd - Receivers - by Mr. Ken Heisler, Jansky & Bailey, Inc.
- 3rd - Propagation Media - by Mr. William Crichlow, NBS
- Panel Discussion - Three Speakers Plus Five Invited Panelists

Tuesday, June 13, 1961

9:00 SESSION III - Instrumentation Needs and Instrumentation Limitation - Chairman - Mr. Harold Dinger, NRL

- 1st - Instrumentation Needs - by Messrs. D. Ports, J. Hill, and K. Heisler, Jansky & Bailey, Inc.
- 2nd - Instrumentation Needs - by Messrs. J. G. Holey and C. Blakley, Georgia Inst. of Tech., Research Center
- 3rd - Instrumentation Limitation Below 1GC - by Dr. Haber, U. of Pa., and Mr. Eckersley, Ark Electronics, Inc.
- 4th - Instrumentation Limitation Above 1GC - by Dr. Fred Morris, Electro-Mechanics, Inc.
- Panel Discussion - Four Speakers Plus Four Invited Panelists

2:00 SESSION - Progress in Interference and Compatibility Programs
Chairman - Dr. Ralph Showers, University of Pa.

- 1st - Interference Coordination Aspects of Satellite Communications Systems - by Dr. S. G. Lutz, Hughes Res. Lab.
- 2nd - Dark Noise Generation of Super Power Tubes - by Mr. J. T. Coleman, RCA-Moorestown
- 3rd - Predicting Power Transfer Between Large Aperture Antennas at Close Range - by Mr. E. Jacobs, U. of Pa.
- 4th - Modeling Techniques for Interference Measurements - by Mr. C. R. Miller, RADC and Mr. J. Pullara, Melpar, Inc.

5th - A Sampling Technique for the Measurement of Multimode Harmonic Power - by Dr. E. M. T. Jones and M. E. D. Sharp, Stanford Research Institute

TUTORIAL PAPERS PROGRAM

SESSION 1 - Shielding, Filtering, and the Near-Field Problem

- 1.1 Enclosure Shielding in Radio Interference - C. B. Pearlston, Jr., Nortronics
- 1.2 RF Shielding Analogies - O. P. Schreiber, Technical Wire Products, Inc.
- 1.3 Effective Broadband Filtering for Interference Elimination in the Frequency Range from 10 Mcps to 10,000 Mcps - H. M. Schlicke, Allen-Bradley Co.
- 1.4 Interference Aspects of Fresnel Region Phenomena - B. Lindeman, Rome Air Development Center
- Alternate - Bonding and Radio Interference - C. B. Pearlston, Jr.

SESSION 2 - Instrumentation and Measurement Techniques

- 2.1 Bandwidth Relationship in IF Amplifiers - R. B. Schulz, Armour Research Foundation
- 2.2 RF Susceptibility Testing Techniques for Airborne Electronic Equipment - D. B. Clark, Douglas Aircraft
- 2.3 Interference Instrumentation - C. R. Miller, Rome Air Development Center
- 2.4 Instrumentation for the Measurement of Extremely Low Levels of Radiated Interference - J. P. Rutsey, The Hinchman Corp.
- 2.5 The Current Probe - A New Device in the Field of Radio Interference Measurement - H. E. Vleifers, USASRD, Ft. Monmouth
- Alternate - Documenting Probable Errors of Measured C-E Parametric Data - D. R. J. White, Don White Associates

SESSION 3 - Systems Problems

- 3.1 Some Practical Approaches in the Control of Interference in Airborne Weapons Systems - A. E. J. Dionne, Grumman Aircraft
- 3.2 Irradiation-Susceptibility Nomograph - F. Kugler and A. R. Kall, ARK Electronics, Inc.
- 3.3 Government Regulation of Unlicensed RF Equipment as a Means of Controlling RFI - L. Glen Whipple and Herman Garlan, FCC
- 3.4 Frequency Management in the Army Electromagnetic Compatibility Program - C. A. Gregory, U. S. Army Radio Frequency Eng. Office
- 3.5 A Discussion of the Site Effect Problem - D. C. Ports and T. R. Evans, Jansky and Bailey

HIGHLIGHTS OF ANNUAL ADMINISTRATIVE COMMITTEE MEETING MARCH 20, 1961

The formation of a Philadelphia Chapter was announced with officers as follows:

Chairman:	Conrad Fowler (American Electronics Laboratory)
Vice Chairman:	Fred Kugler (Ark Electronics Corporation)
Secretary:	Dr. Fred Haber (Moore School of Univ. of Penna.)
Program Secretary:	Harry W. Kenny (Ace Eng. & Machine Co., Inc.)

Active Chapters are now in Philadelphia, Rome-Utica, San Francisco and Washington, D. C., with efforts being made to form Chapters in Chicago, Los Angeles and New York.

The membership of PGRFI, as of February 28, 1961, was 922 paid members, 8 student members and 5 affiliates, making a total of 935 members. One year ago the total membership was 719.

The next issue of the Transactions will be May, 1961. The format will be the same as the May, 1960, issue. Al Kall, of Ark Electronics Corp., will be guest editor of the 1961 issue.

Preliminary estimates for publishing an extensive bibliography on RFI is close to \$5,000. Help in publishing this bibliography is going to be requested of the Professional Groups Committee of the IRE.

The Treasurer submitted his Report as follows:

Financial Statement for the Period January 1 to December 31, 1960:

Balance from January 1, 1960. \$3,176.02

Receipts During Period:

IRE Publications Subsidy.	\$ 500.00
Group Fees.	1,719.80
Advertising.	600.00
Sale of Publications.	99.85
Surplus from Meetings.	1,138.53

Total Receipts. 4,058.18

Total Balance and Receipts. 7,234.20

Expenses During Period:

Publications

Transactions.	\$1,063.57
Newsletters.	706.74
Membership Service Charges.	708.12
Others.	70.00

Total Expenses. 2,548.43

Balance as of December 31, 1960. \$4,685.77*

*Less outstanding loan to:
1961 RFI Symposium \$500.00

Financial Statement for the Period January 1 to February 28, 1961:

Balance from January 1, 1961. \$4,685.77

Receipts During Period:

Group Fees.	\$ 175.41
Sale of Publications.	25.00

Total Receipts. 200.41

Total Balance and Receipts. 4,886.18

Expenses During Period:

Membership Service Charges. 233.72

Total Expenses. 233.72

Balance as of February 28, 1961. \$4,652.46*

*Less outstanding loan to:
1961 RFI Symposium \$500.00

Seven Newsletters appeared during the Calendar Year 1960.

The following Amendment to the By-Laws was adopted by the Administrative Committee as follows; that section 4, Article VI, be deleted and be replaced by the following:

"At the annual meeting the current Administrative Committee shall nominate officers for the following year. The officers shall be elected by the Administrative Committee by mail ballot within 30 days of the annual meeting."

1961 WESCON REQUESTS PAPERS ON RADIO FREQUENCY INTERFERENCE:

1961/WESTERN ELECTRONIC SHOW AND CONVENTION
August 22-23-24-25

Reply to: 926 Industrial Avenue
Palo Alto, California

To The Editor:

This letter is to request your assistance and cooperation in soliciting papers for a 1961 Wescon session on radio frequency interference. As you are no doubt aware, this is a late date for soliciting papers for Wescon, however, there is hope we may still be able to obtain sufficient response to justify a session on radio frequency interference.

If you have any personal knowledge of unpublished papers that may be of interest to us, we would certainly appreciate knowing about them and, if possible, receiving a copy, or abstract of same.

If you do not feel it is too late to do so, a request in the PGRFI Newsletter might still be appropriate. Of course, as you are no doubt aware, solicitation of papers for Wescon in no way implies that these papers will be used. Only after the papers have been reviewed and approved for presentation, and the authors are contacted and invited to present them, may they be used.

Thank you for any assistance you may be able to provide.

Very truly yours,

Peter F. Spencer
Member Technical Program
Committee, WESCON
Chairman, PGRFI,
San Francisco Section

GLOBECOM - Papers of Possible Interest:

The Fifth National Symposium on Global Communications, Hotel Sherman, Chicago, Illinois, May 22-24, 1961, has scheduled the following papers which may be of interest:

"Radio Wave Propagation Through the Earth's Deep Rock Strata - A New Medium of Communication" - by G. J. Harmon, Raytheon Co., Waltham, Mass.

"Noise and Transmission Level Terms in American and International Practice" - by H. H. Smith, ITT Communications Systems, Inc., Paramus, N. J.

"Mutual Interference Between Point-to-Point and Space Communications Systems" - W. J. Hartman and M. T. Decker, National Bureau of Standards, Boulder, Colorado.

"Designing Interference-Free Space Communication Systems Using Computer Simulation Techniques" - by D. R. J. White, Don White Associates, Bethesda, Maryland.

Copies of the paper by D. R. J. White may be obtained by writing to Donald R. J. White, Don White Associates, 7306 Honeywell Lane, Bethesda, Maryland. Mr. White also states that another paper titled "C-E Equipment Data Requirements for Interference Prediction and Control", which was delivered at the IRE 7th Regional 1961 Technical Conference in Phoenix, Arizona, is also available on request.

STODDART AIRCRAFT RADIO COMPANY REPORT AVAILABLE FROM OTS:

The Office of Technical Services, U.S. Department of Commerce, Washington 25, D. C., states that the following Report can be obtained on request:

"Final Report - Correlation Studies of Interference Measurement Techniques - Period: 2 Feb. 1959 to 15 June 1960. Vol. II of II volumes, Stoddard Aircraft Radio Co., Inc., 6644 Santa Monica Boulevard, Hollywood 38, Calif., Navy Department, Bureau of Ships, Electronics Division, Contract NObsr-77528, 2 February 1959".

Volume I - PB 154412-1 - Microfilm \$6.00 - Photocopy \$18.30
Volume II - PB 154412-2 - Microfilm \$3.90 - Photocopy \$10.80

FREDERICK RESEARCH TO PUBLISH RFI MONOGRAPHS:

Frederick Research Corporation, 2601 University Boulevard, West, Wheaton, Maryland, has published the first of a series of RFI Monographs by Donald Lightner. This Monograph contains comparisons of over 16 MIL Specifications and Parts 15 and 18 of the FCC Regulations. With the increasing importance of radio frequency interference work as a field of engineering, Frederick Research felt that a periodic publication presenting information and timely articles in RFI would be desirable to help bridge the gap between the information generated by many engineering and research programs and the technical material actually available to those working in the field. Since the number of copies will be limited, it is intended to first fill requests from those who are actually engaged in RFI work and then those who are not directly in RFI but are interested in the work being done. Subsequent printings will be increased as the demands require.

PREDICTING SPURIOUS TRANSMITTER SIGNALS:

Under the above title is a 3-page article by James G. Arnold, Defense Electronics Products, RCA, Camden, New Jersey, in the April 21st, 1961, issue of Electronics on page 68. The first paragraph states:

"Rapid increase in spectrum use makes control of spurious output an important characteristic in any r-f equipment. The need to insure interference-free transmission from transmitters has often been ignored in initial design stages by the substitution of a few rules of thumb and heavy reliance on good fortune".

UNGROUND SHIELD REDUCES EFFECTIVE CABLE CAPACITANCE:

Electronic Design, April 26, 1961, carries a short communication by H. W. McCord, Electron Tube Div., RCA, Harrison, N. J., under the above title. The first two paragraphs are as follows:

"Often it is convenient to locate a cathode follower stage near the high impedance circuit which drives it. But, if a shielded connecting cable is used with its shield grounded, the cable's input capacitance can affect the circuit frequency response.

"This equivalent input capacitance, and the effect on frequency response, can be reduced by tying the cable shield to the cathode follower input. Fig. 1, instead of to ground. Very little voltage difference then exists between the inner and outer conductors. Reactive

current is reduced to a small value".

MEDICAL ELECTRONICS NEWS is Published:

A new publication in the electronics field, titled "Medical Electronics News", is being published by Instruments Publishing Co., 845 Ridge Ave., Pittsburgh 12, Pa. Publication is circulated to customer-prospects by instrument manufacturers' agents, laboratory apparatus distributors, and electronic component distributors. The lists are made up of the customer prospects of these agents and distributors. It is available to others at a subscription price of \$6.00 per year.

SUNSPOT DECREASE TO CAUSE INCREASE IN INTERFERENCE:

The following article appeared in the Radio Section of the New York Times, April 16, 1961:

RADIO PROBLEM - Nature May Jam Short Wave Broadcasts by Jack Gould

Both Radio Moscow and the Voice of America face a formidable new problem in the conduct of propaganda warfare: their voices are going to be lowered by the freaky behavior of Mother Nature.

While specialists in political persuasion on both sides of the Iron Curtain probe for weaknesses in each other's arguments, one of their main tools, for surmounting international boundaries - short-wave radio - is relentlessly moving toward a period of prolonged crisis and possible chaos.

The number of channels available for international broadcasting actually may be reduced by more than 50 per cent in the next few years, according to estimates of United States Government engineers.

Competition for the remaining space on the air is expected to be so keen as to lead to new peaks of interference that probably will affect reception in most corners of the world. The cause of the scheduled decline in the effectiveness of short-wave radio is the cyclical variation in ultra-violet radiation from the sun, popularly known as sunspots.

When the sun is boiling with solar activity the radiation acts as a huge mirror against which radio signals are reflected back to earth over long distances. With the low period in sunspot activity now in the offing the "mirror" is shrinking and cutting down on the size of the usable spectrum.

Problem

Some channels now alive with foreign signals are expected to become wholly or partly dead for many hours of the day, thus reducing the time in which broadcasts can get through from one country to another.

In another year the number of usable hours on short-wave circuits between New York and Moscow could show a whopping drop of 68 per cent. Between San Francisco and Manila the decline in hours may be 56 per cent. The circuit between New York and London may be off by 50 per cent.

Aggravating the international radio problem in the midst of the ideological conflict on the airwaves is the eleven-year duration of a sunspot cycle; the low point will extend from mid-1962 through 1967. Some engineers also believe that the next high in the cycle may fall below past marks and that worsened conditions may continue through the balance of the century.

The forecast of propagation difficulties were contained in a comprehensive paper prepared by two specialists working for the Voice of America - George Jacobs, chief of the agency's frequency division, and Edgar T. Martin, engineering manager. In suggesting the possibility of "chaos" in short-wave radio, they explained how the solar cycle was expected to affect individual bands.

Four of the bands 15, 17, 21 and 26 megacycles have been usable most of the year from eight to fifteen hours a day. Two of these - 21 and 26 - are likely to be wiped out entirely and the other two usable

for only four to six hours. The usable time on the next two lower bands - 11 and 9 - may be cut by nearly 50 per cent. Only one band - 6 megacycles - may show an increase.

The net effect, in short, is that broadcasting activities, which are now spread over seven bands, will have to be crowded into three bands, two of which will be less useful than in the past.

The rising demands of all countries for space on the international short-wave band - for general broadcasting and other communications purposes is illustrated in statistics from the International Telecommunications Union.

Between 1953 and 1959 the union processed a total of 105,089 frequency assignments. The Messrs. Jacobs and Martin note that many engineers believe the saturation point in shortwave broadcasting already has been reached and that additional loading of the bands can only deteriorate the effectiveness of the medium.

Situation

Yet that is precisely what is in prospect with nature's curtailment of the number of usable channels that heretofore have carried "the bulk of the world's long-distance communications".

If only to hold its own in the war of ideas, the Voice of America urgently needs the new transmitting facilities now being erected. But the solar problem also points up the importance of companion informational activities, such as television films, libraries, etc.

From a technical standpoint a possible source of relief in the future is communication by satellites, which potentially could afford more long-distance channels than are now to be found in the full short-wave band. But whether such a system, with all its political and economic overtones, could be of much immediate aid and would seem doubtful.

The plight of short-wave radio indeed may point up a phenomenon of the Nineteen Sixties. With the whole world determined to talk at once, it's getting harder for any one voice to make itself heard.

BOOKLET ON NEW GROUNDING REQUIREMENTS:

The Arrow-Hart & Hegeman Electric Company, 103 Hawthorn St., Hartford 6, Conn. has brought out an 8-page booklet titled "Grounding Facts" in which are included the new code requirements under: - Article 210-21, Outlet Devices; Article 250-42, Fixed Equipment; Article 250-45, Portable Equipment. Illustrations of the new type plugs and receptacles are illustrated with the proper methods of wiring.

Copies of the booklet may be obtained from A. W. Creedon, Jr., Advertising Manager of The Arrow-Hart & Hegeman Electric Company.

IMPULSE GENERATOR - AN RFI MEASUREMENT TOOL:

Electronic Design, July 20, 1960, carried an article under the above title by Joseph Lorch, president of Empire Devices, Inc., Amsterdam, New York. The sub-title and first paragraph state:

"For accuracy, simplicity and speed during RFI tests, an impulse generator is the calibrating tool to use. Its versatility and application to both narrow-band and broad-band measurements are discussed together with the requirements for field intensity meters.

"For measurement of broad-band and narrow-band interference, the impulse generator offers advantages of accuracy, compact size, equipment simplicity and lower cost compared to a signal generator. In addition, the impulse generator does not require the frequent recalibration necessary for signal generators during extensive field use. The wide range versatility of the impulse generator can be noted in that two units can cover the range from 150 kc to 10,000 mc."

Copies of this article may be obtained by writing Mr. Lorch on your company letterhead.

EVALUATING RADIO RECEIVER SUSCEPTIBILITY TO INTERFERENCE:

The above article by B. T. Newman, General Electronic Laboratories, Inc., Cambridge, Mass., H. Cahn and R. Keyes, U. S. Army Signal Research and Development Laboratory, Fort Monmouth, New Jersey, appeared in the April 14, 1961 issue of Electronics. The sub-title and first paragraph are as follows:

"Test procedures and equipment show how to compare the abilities of radio receivers to function in a crowded or artificially jammed spectrum.

"The ever-increasing dependence upon radio communication and the ever-mounting crowding of the radio spectrum have accelerated the demand for high-performance receivers that can operate with maximum resistance to interference. Thus, there is a need for testing specifications, methods and standards by which a receiver can be graded. This paper describes methods for testing voice-communication receivers - a-m, f-m and single sideband (ssb) - and for objectively grading receiver performance in interference".

TWO PAPERS OF INTEREST AT CHICAGO SPRING CONFERENCE:

The Chicago Spring Conference on Broadcast and Television Receivers, to be held on June 19 and 20, 1961, at the O'Hare Inn, Chicago, Ill., will contain two papers of possible interest. They are:

- Impulse Noise Suppression in FM Receivers - N. Parker (Motorola, Inc.)
- A Noise-Immune Sync and AGC Circuit - R. N. Rhodes, W. Dietz (RCA)

PGRFI MEMBER APPOINTED TO JTAC:

Richard P. Gifford, Manager of the Communication Products Department of General Electric, Lynchburg, Virginia, has been appointed a member of the Joint Technical Advisory Committee (JTAC) to fill the vacancy created by the death of Dr. John V. L. Hogan. Mr. Gifford is presently chairman of the IRE Professional Group on Vehicular Communications and a member of PGRFI.

INTERFERENCE FROM SWITCHING TRANSIENTS:

Sprague Electric Company's Filter Application Notes No. FL-1 contain the following information under the above heading:

"An increasing percentage of our screen room time is being spent in suppressing the transient interference set up by a switching operation. It may be a simple toggle, or a thermostat. Often it's a relay or a stepping switch. Basically, the problem is the same. There is a voltage pulse and the r-f component can be a substantial one. The voltage being switched is a factor as is the current density at the contacts, the type of switch action, the nature of the load, etc.

"Specifications MIL-I-26600 and MIL-I-6181 B, together with their predecessors, exempt transients which occur not more than 'twice per normal operational period', and relax the specification by 20 db for those transients which occur not more often than once in three minutes. MIL-I-16910A (Ships) under paragraph 3.4.3 has a somewhat more complex schedule of allowed deviations. In any case, approval has to be obtained before a deviation is usable and approvals are harder to come by than they used to be.

"A coaxial type 'L' filter containing a 0.5uF Thru-Pass Capacitor and 100uH coil, mounted in an RF tight housing around the switch, is often more effective than a larger filter in spite of the much more impressive insertion loss curve of the latter. Generally, orientation of L and C should be as indicated by the schematic below".

A copy of FL-1 containing additional information on specific filters can be obtained from Sprague Electric Company, Interference Control Field Service Department, Marshall Street, North Adams, Massachusetts.

Letters to the Editor:

"Military Interference Coordinators"

"Dear Sir:

"I have just read Mr. Turner's fine article, 'An Insurance Policy covering RFI', in the January issue of SIGNAL, as well as your 'editor's note' expressing AFCEA interest in the Cooperative Interference Committee Program.

"In elaboration of the CIC Program, I would like to mention the effective work being done by the Area Frequency Coordinators maintained by the military services at their test ranges. The problem of radio frequency interference and inter-action between electronic equipment is probably nowhere greater than at the missile test ranges. To deal with this critical problem, Area Frequency Coordinators have been established at the Pacific Missile Range, Pt. Mugu; at White Sands Missile Range, New Mexico; at the Army Electronic Proving Ground, Ft. Huachuca, Arizona; and, at the Atlantic Missile Range, Cape Canaveral, Florida. The Pacific Missile Range Coordinator, maintained by the Navy, is responsible for the area enclosed within a radius of 200 miles of the Administration Building at Pt. Mugu; the White Sands Coordinator, maintained by the Army, is responsible for the area comprising the State of New Mexico and other U. S. territory within 150 miles radius of the Headquarters Building at White Sands; the Ft. Huachuca Coordinator, also maintained by the Army, is responsible for the entire State of Arizona; the Atlantic Missile Range Coordinator, maintained by the Air Force, is responsible for the areas within a radius of 200 miles of the Headquarters Building at Patrick and Eglin Air Force Bases.

"Basically, these Area Frequency Coordinators are responsible for coordinating military frequency usage at the respective test ranges and within the areas delineated in the preceding paragraph, if there is a possibility of harmful interference being received from or caused to test range operations. The Area Frequency Coordinators maintain detailed records of frequencies used in their areas and provide a most valuable service to those responsible for communications-electronics operations. They have proved to be very resourceful in arranging time sharing of frequencies, recommending technical adjustments of equipments, and tracking down interfering signals. It is hardly necessary to emphasize the vital role played by those responsible for radio frequency interference control during a count-down or missile launch.

"The duties of the Area Frequency Coordinator are very demanding and require highly competent personnel to carry them out. The Coordinator maintained by the Navy at the Pacific Missile Range, for example, is performing his duties in an area of extreme electronic density. We have only to read our daily newspapers to learn of the many successful launches from the Pacific Missile Range and its neighboring facilities as an attestation of the effectiveness of his work. The success of the Pacific Missile Range Area Frequency Coordinator can be attributed not only to the personal skill of the Navy personnel involved, but also to the excellent teamwork displayed by the Army, Air Force and Marine Corps personnel engaged in communications-electronics operations in the area. At the same time, we must pay tribute to the representatives of the civil interests in the Southern California area with whom the most cordial and cooperative working relationships have evolved, particularly with the local FCC Engineers-in-Charge in the Southern California Area.

"As you have indicated in your 'editor's note', control of radio frequency interference is recognized as a necessity. This is not only because of the debilitating effects of harmful interference but also the finite nature of the radio frequency spectrum which requires the most judicious use of frequencies in order to satisfy the steadily increasing requirements of our communications-electronics operations.

L. R. RAISH
Commander, U. S. Navy
Head, Radio Frequency
Spectrum Branch
Office of Naval Communications"

"SOLUTION TO RFI from high-power microwave transmitters has been developed by General Electric Company's Power Tube Dept. Scientists and engineers at the department's Traveling-Wave Tube Product Sec., Palo Alto, Calif., has perfected a technique for making waveguide power filters which are said to eliminate radio frequency interference caused by harmonics. The filters absorb the unwanted harmonic signals produced by all transmitting tubes, but still allow the intended fundamental frequency to pass through with its power undiminished."

"RFI PROBLEMS will be discussed at the 1961 conference of the Seventh Region of the Institute of Radio Engineers, April 26-28, at the Hotel Westward Ho, Phoenix, Ariz. Subjects and speakers include: "Problems Associated with Crowding of Frequency Spectrum", by Dr. D. E. Noble, Motorola, Inc.; "Control of Interference Between Satellite Communication Terminals and Surface Services", by Dr. W. L. Firestone, Motorola, Inc.; "Control of Surface-Service Interference with Communication Satellites," by Dr. S. G. Lutz, Hughes Research Laboratories".

"Amplitude-Probability Distributions for Atmospheric Radio Noise" by W. G. Crichlow, A. D. Spaulding, C. J. Roubique and R. T. Disney, National Bureau of Standards Monograph 23, issued November 4, 1960 is 22 pages long and may be ordered from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C. Cost is 22 cents.

"A series of standards to insure greater scientific accuracy through more uniform procedures and techniques in the use of laboratory instruments prepared by the Bureau of Naval Weapons is being published for the use of science and industry by the Office of Technical Services, Business and Defense Services Administration, U.S. Department of Commerce. The first 23 of approximately 300 standards in this series are now available. The remainder will be published by OTS during the year. The series is divided into three categories: Instrument Calibration Procedure, Cross-Check Procedure and Measurement System Operation Procedure. The standards may be ordered as a series of 23 for \$11.50 or singly for 50 cents each. The series is Standards Laboratory Procedure, Bureau of Naval Weapons, 1960; order PB 171-200 through 171-222".

AIR FORCE RELIABILITY HANDBOOK NOW AVAILABLE:

"The electronic equipment reliability handbook used by the U. S. Air Force's ground electronic equipment research and development center at Rome, N. Y., has been made available to industry.

"Rome Air Development Center (RADC) is the central agency responsible for all research and development related to Air Force ground electronic equipment.

"The handbook, called the 'RADC Notebook', contains specifications prepared by RADC covering both development and production models of electronic equipment and describes the Center's technique for predicting reliability of ground electronic equipment on a quantitative basis. The Notebook also discusses problems in organizing a reliability program and provides suggestions as well as case histories showing how the RADC reliability program can be implemented into an existing industrial operation.

"Separate sections in the handbook are devoted to reliability information services at RADC, Air Force specifications, the role of management in reliability programs, the mathematics of reliability and reliability prediction, and testing for reliability. The Notebook also discusses maintaining reliability in production, data feedback in the reliability program, and reliability factors in environment, components, and in mechanical, electrical and electronic design.

"The publication is 'RADC Reliability Notebook', October 1959, 275 pages. (Order PB 161 894 from the Office of Technical Services, Department of Commerce, Washington 25, D. C., \$4.)"

NEW BOOK ON "ELECTROMAGNETIC FIELDS AND WAVES":

The McGraw-Hill Book Company announces a book with the above title by R. V. Langmuir, Calif. Inst. of Tech., 227 pp. 77 illus., \$9.75. The description of the contents is as follows:

"Authoritative guidance on the mathematical methods and basic physics essential to a clear understanding of electrostatic and magnetic phenomena, and electromagnetic waves. Covers Maxwell's equations, radiation, wave-guides, spherical radiation, propagation in unusual structures, and much more".

ABSTRACTS OF IRE TRANSACTIONS:

Aeronautical and Navigational Electronics

"Radio Frequency Noise from Environment of Hypersonic Vehicles - Mahendra Singh Sodha (p. 119)

"The author has reviewed the state of art in estimating the radio frequency noise from the environment of a hypersonic vehicle and has pointed out areas requiring considerable effort. It can be safely said that the radiation due to the incoherent processes is less than that due to a corresponding black body. The possible mechanisms for excitation of and radiation by plasma oscillations need further investigation before anything conclusive can be stated regarding their role in the emission of RF noise. A conjecture has also been made about mechanisms for coherent radiation".

Communications Systems

"Propagation, Noise, and General Systems Considerations in Earth-Space Communications - Harold J. Pratt, Jr. (p. 214)

"As man's ability to escape the attraction of the earth's gravitational field increases, the science of earth-space communications becomes more and more important. In this paper, an attempt is made to analyze the relevant propagation, noise and general system aspects of earth-space systems and to predict the operating frequencies for maximum range.

"The earth's atmosphere is shown to be nearly transparent to the transmission of radio frequencies (RF) between 80 and 15,000 megacycles. The various sources of noise both internal and external to the earth-space communications system are investigated and a spectrum of system sensitivity is plotted. Maximum available transmitter power and practical antenna parameters are predicted for the 1965-1970 era.

"All of these factors are then combined and weighted according to the 'beacon' or 'radar' equations, and the optimum operating frequencies for maximum range one-way and two-way earth-space communications systems are shown to lie in the microwave region of the spectrum".

ABSTRACTS AND REFERENCES OF INTEREST FROM THE PROCEEDINGS OF THE IRE, MARCH, 1961:

"Relation between the Position and the Sense of Polarization of Solar Radio Storms - A. M. Malinge. (C. R. Acad. Sci., Paris, vol. 250, pp. 1186-1188; February 15, 1960.) Observations of the positions of solar storm centers made with the great interferometer at Nancy at 169 Mc have been related to measurements of polarization made at Nera, Netherlands, at 200 Mc. Results show that the radiation from storm centers in the northern solar hemisphere has a predominantly right-hand polarization, and that from the southern, a left-hand polarization."

"Reducing Interference in Ionospheric Sounding - K. Perry. (Electronics, vol. 33, pp. 118-120; May 27, 1960.) A special circuit is described for separating the desired pulses from interfering CW signals."

"A Controlled Interference Generator - W. E. Matthews and P. L. Mothersole. (Electronic Engrg., vol. 32, pp. 685-688; November 1960). Realistic interference signals used for investigating the performance of television receivers are generated from an electric motor and a motor-car ignition simulator. Details of the circuit and construction are given".

SAE PAPERS OF INTEREST:

Two papers were presented at the 1961 Society of Automotive Engineers National Automobile Week, Sheraton Cadillac Hotel, Detroit, Michigan, March 13-17, 1961, as follows:

"SAE Committee Activities in Connection with Radio Frequency Interference" by B. H. Short, Delco-Remy Division, General Motors Corporation, Anderson, Ind. No. 315A.

This paper discussed the history of television interference created by automobiles and trucks and gives a very interesting summary of the U.S. and international aspects.

"Instrumentation and Test Procedures" by Joseph Lorch, Empire Devices, Inc., Amsterdam, N.Y. - No. 315B.

This paper presented some of the measuring philosophy, equipment characteristics, and test procedures which have been evolved in the measurement of man-made radio interference. Illustrations of test equipment and measurement procedures are included in the paper.

Copies of the papers may be obtained from the Society of Automotive Engineers, Inc., 485 Lexington Ave., New York 17, N. Y., at 50¢ for SAE members and 75¢ for non-members.

Don White Associates Formed in Bethesda, Maryland:

Donald R. J. White, formerly vice president of Frederick Research Corporation, has formed his own technical consulting firm under the name of Don White Associates at 7306 Honeywell Lane, Bethesda, Maryland. The new firm specializes in the solution of system problems associated with increasingly complex military and industrial plans and operations and will emphasize radio frequency interference prediction and control.

Jack McShulskis, also formerly of Frederick Research Corp., is associated with the above firm.

FCC Amends Part 18:

Effective April 30, 1961, Form 724, Certificate of Compliance - Industrial, Scientific and Medical Equipment, is approved for use in certifying ISM equipment and Part 18, Industrial, Scientific, and Medical Service is thereby amended. Form 724 is available from the Commission's offices in Washington, D. C. or from any of its Engineering Field Offices. Outstanding changes are as follows:

"(f) The spectrum shall be investigated from the lowest frequency generated in the equipment up to the tenth harmonic of the fundamental frequency or to 5775 Mc whichever is lower."

"(k) A statement of the operating conditions that must be observed to ensure that radiation during routine operation does not exceed, within reasonable limits, the radiation that was measured and is reported herein."

"The certification required in Part I of FCC Form 724 shall be executed by the owner or lessee of the equipment, in the case of proprietorship; by one of the partners, in the case of a partnership; or by an officer or authorized employee in the case of a corporation. If Part I is signed by an authorized employee, an officer shall execute Part II of the certificate."

"The certification required in Part III of FCC Form 724 shall be executed by an engineer skilled in making and interpreting field strength measurements. The Commission may require such engineer to furnish proof of his qualifications".

"(a) The operator of industrial heating equipment that causes harmful interference to radio communications shall take prompt steps to eliminate the harmful interference (see # 18.2 (g) and # 18.8) and shall make an adequate investigation in the vicinity of the industrial heating equipment to ensure that the harmful interference has been eliminated."

"If the operator is notified by the Commission that the harmful interference is endangering the functioning of a radio-navigation or a safety service, he shall immediately cease operating the equipment. Operation on a temporary basis may be resumed, with the permission of the Commission's Engineer in Charge, for the purpose of eliminating the harmful interference and obtaining certification. Operation on a regular basis may be resumed after the harmful interference has been eliminated, the equipment has been properly certificated, and the final interference report required by # 18.122 has been submitted."

"If the operator is notified by the Commission that the harmful interference is obstructing or repeatedly interrupting an authorized radio service other than a radio-navigation or safety service, he shall take prompt steps to eliminate the interference. He need not cease operation unless specifically ordered to do so by the Commission. If ordered to cease operation, he may resume operation on a temporary basis with the permission of the Commission's Engineer in Charge for the purpose of eliminating the harmful interference and obtaining certification. Operation on a regular basis may be resumed after the harmful interference has been eliminated, the equipment has been properly certificated, and the final interference report required by # 18.122 has been submitted."

FCC Located the Santa Maria:

Signal, March 1961, (AFCEA) carries the following news item:

"FCC located the Santa Maria while patrolling the radio spectrum and monitoring signals. After hearing a message from the hijacked Portuguese liner on Jan. 24, the Federal Communications Commission monitoring stations fixed the positions of the vessel which enabled the Navy to follow up with sea, air and radio operations. The monitoring and direction-finding methods used in this instance are the same as those used by the FCC in determining the position of disabled ships and aircraft in search and rescue operations."

NEW TECHNIQUES:

Joining Copper Parts:

Electromechanical Design, March 1961, carries an article under the above title.

"Electrical & Thermal Conductivity Enhanced in Bond Without Interface"

"Exploring new ways to use copper base materials, Chase Brass & Copper Co., Waterbury, Conn., has devised a new technique for joining copper to copper and certain alloys to copper. Cost savings, easier production methods and improved performance are among the chief advantages.

"In the Chase process two or more copper components can be joined together with a homogeneous bond which is as strong as or stronger than the base metal. A special coating on the metal surface diffuses into the parts to be joined and under proper conditions produces a bond without an interface. Joints made in this manner retain virtually all of the high electrical and thermal conductivity of copper.

"The new technique will also provide substantial savings in some applications where costly joining materials have heretofore been used. For example, major elements of advanced electronic equipment for

radar, missiles and space satellites incorporate complex assemblies of copper which cannot be made properly with common low cost joining techniques. It is anticipated that the diffusion bonding process will be particularly useful in applications of this type wherein joints must be vacuum tight, free of high vapor pressure constituents and capable of operating at elevated temperatures.

"Tests on diffusion bonded joints have shown them to be markedly superior to self soldered joints in respect to tensile, shear and fatigue properties. Corrosion resistance in many media is also expected to be appreciably higher. According to Mr. Glenn P. Bakken, President of Chase, three methods for making diffusion bonded joints have been developed. The first method pertains to application of the special coating to a copper mill product or fabricated part prior to joining by diffusion bonding. In the second method, at least one of any two components to be joined is made of copper strip coated prior to final rolling. In the third method an insert made of thin gauge, precoated strip, coated on both sides, is used to join any two components made of uncoated copper strip or other mill form. Thus the Chase process provides a high degree of flexibility since one of the three methods may be more advantageous than the other two in any given application.

"Possible fields of application for the process include motors, generators, transformers, switchgears, relays, control equipment, electronic tubes, high frequency power generators, microwave devices, semiconductors and heat exchangers.

"Chase welcomes inquiries from those interested in the process; experimental size samples and literature are available."

NEW PRODUCTS

New Conductive Materials:

The Conducto-Lube Company, 8603 S.W. 17th Avenue, Portland 19, Oregon, has developed a highly conductive lubricant for use in conducting hinge joint switches and high speed Air blast breakers. It contains pure silver and it is stated that it will prevent knife blade switches from "balling up" and "freezing", and clips from overheating and losing their tension.

The Schwartz Chemical Co., Inc., 5001 Second St., Long Island City, N.Y., has developed a black adhesive coating which conducts static charges away from metals, glass, some plastics and porous materials. It is called "Rez-N-Glue" No. 159 and has a synthetic rubber base.

The Advance Process Supply Co., Inc., 2315 W. Huron St., Chicago 12, Ill., has developed a conductive black ink with good adhesion and flexibility. Two types are Conductive Ink Board Formulation EL-787 and Conductive Ink Thermo-Plastic Formulation EL-796.

New Contact Cleaner:

Gaig Laboratories, Inc., 46 Stanwood Road, New Hyde Park, L.I., New York, has developed several products to reduce contact resistances, sparking of brushes on commutators, and improve performance of contacts and collector rings. They are called Cramolin and Cramolin Paste.

Line Conductors and Line Filters Integrated into One Package:

The McMillan Industrial Corp., Brownville Avenue, Ipswich, Mass. has developed what are claimed to be the first radio interference suppression cables in which a low pass filter is contained within a shielded cable and suppression is given in the VLF through the UHF bands. It has been named the Quiet Line and offers R.F.I. suppression in a light, flexible, space-saving form requiring no additional "black boxes". Manufacture is on special order because of tailoring to specific application.

New Empire Devices, Inc. Products:

Empire Devices, Inc., Amsterdam, New York, very kindly listed, at the IRE Show, their new products for R.F.I. Control.

Tuning Unit 14 Kc to 150 Kc Cat. No. T-X/NF-105
Corner Reflector Antenna, Model RD-105
Rejection filters from 150 Kc to 400 Mc
Clamp-On Probe, Model CP-105
Antenna, A Single log periodic antenna to be used
to cover the entire frequency range from 1.0
to 10.0 KMC.
Standard Antenna Set, Model SA-301 10 KC to 30 MC.
Correlation with NBS standard field to within 1%
of any frequency in above frequency range.
Attenuator Selection Chart showing Average Power
Dissipation from DC to 10 KMC of 1 to 50 Watts.

NEW BOOKS

Electromagnetism and Relativity; With Particular Reference
to Moving Media and Electromagnetic Induction - Second
Edition, E. G. Cullwick, New York: Longmans, Green &
Co., Inc., 1959. 291 pp. \$12.50.

"For advanced students and teachers of physics and electrical engineering. Knowledge of basic electromagnetic theory and of vector analysis is assumed, but relativity theory is developed in the text. Treatment is from a physical viewpoint stressing the fundamentals of electromagnetic physics within the framework of relativity and including a thorough examination of the theory of electromagnetic induction".

A WORD TO THE WISE ON NEGATIVE IONS:

Over the last year, your editor has accumulated quite a file of reports on negative ions and their reactions on people. Most of the information is from a medical standpoint but there seems to be slowly emerging an interference angle because many of the same sources - which create interference - also create positive ions which are claimed to be injurious to people. If this be true, then there is increasingly strong evidence that spurious electromagnetic energy may be doubly objectionable - not only to equipments but also to humans. Your editor would like to publish any information, both pro and con, to this effect and, hence, solicits any and all information which might bear on the subject. Have our foreign members any information?

Rexford Daniels, Editor
PGRFI Newsletter
Monument Street
Concord, Massachusetts



NEWSLETTER

IRE PROFESSIONAL GROUP ON

RADIO FREQUENCY INTERFERENCE

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