PROFESSIONAL GROUP ON RADIO FREQUENCY INTERFERENCE

NEWSLETTER

MBER 8 JANUARY 1960

Excerpts from Meeting of Administrative Committee IRE Professional Group on Radio Frequency Interference Park Sheraton Hotel, New York City June 15, 1959

A meeting of the IRE-PGRFI Administrative Committee was held on day evening, June 15, 1959 in the Gothic Room of the Park Shera- Hotel, New York City, the first day of the PGRFI-sponsored Semi- on Radio Frequency Interference. The meeting was called to order :15 PM by Chairman Harold Schwenk.

Attendance

The following members of the present Administrative Committee e present:

Messrs. S. J. Burruano, W. Q. Crichlow, R. W. Fairweather, V. Grobowski, A. R. Kall, M. Kant, J. P. McNaul, L. Milton, E. Pakala, B. Schenker, R. M. Showers, and Chairman Schwenk.

Other PGRFI members: R. Daniels, E. S. Warchaizer.

Minutes of Previous Meeting

The minutes of the previous meeting of March 23, 1959 were dis- uted to the members present. There were several minor correc- s suggested by the members present, and these were duly recorded he secretary.

Committee Reports

a) Membership Committee: Chairman Fairweather reported as follows:

As of March 31, 1959, we have 469 paid up members,
100 new members (unpaid)
3 student members
Total membership: 572

b) Meetings Committee: Chairman McNaul reported that he is continuing negotiations with the Signal Corps about the forth- coming Armour Conference and PGRFI participation in it. The Conference will be held October 6-7-8, 1959. The closing date for abstracts of proposed papers is July 1st.

c) Papers Committee: Chairman Showers reported generally slow returns on abstracts and papers. He expressed the hope that the present seminar will stimulate writing of papers.

d) Publications Committee: Chairman Schreiber, no report.

e) Chapter Activities Committee: Chairman Grobowski reported briefly on continued progress of the recently formed Washing- ton chapter.

f) Nominations Committee: Acting Chairman Kant, no report.

g) Constitution and Bylaws Committee: Chairman Kant, no report.

h) Awards Committee: Chairman Pakala, no report.

i) Liaison Committee: Chairman Milton, no report.

j) Technical Advisory Committee: Chairman Kall reported the first formal meeting of this committee was held on March 23, 1959 in the Waldorf Astoria Hotel, on the first day of the IRE National Convention, immediately following Session 4 devoted to papers on RFI. 8 members attended: Messrs. C. F. W. Anderson, J. Berliner, E. W. Chapin, M. T. Harges, F. Kugler, R. B. Schulz, A. R. Kall (chairman) and H. Schwenk, (ex-officio). We agreed to hold formal meetings once a year, the same day as the Administrative Committee meeting during the IRE National Convention.

Chairman Schwenk suggested that an appropriate activity for this committee would be a technical advisory study of the new Air Force specification on interference, MIL-I-6181D. Mr. Milton suggested that official copies of this specification could be obtained by writing Mr. N. D. Flinn at Wright ADC.

4. Unfinished Business

Dr. Showers, referring back to the matter of the present Seminar and the previous discussion on classified sessions, suggested that the chairman of this seminar committee prepare a report for the benefit of future seminar committees.

5. New Business

Lt. McNaul made two motions:

"That the Administrative Committee vote its thanks to all those responsible for today's Seminar (especially Dr. Showers, Mr. Burruano and Mr. Milton) for their excellent work."

"That we on the Administrative Committee, at the end of this first full year of our existence, express our appreciation to our outgoing chairman, Harold Schwenk, for his guidance of our efforts through this formative period."

Both motions seconded, passed unanimously.

Mr. Grobowski, chairman of the Anniversary Committee, announced the membership of his committee as follows: Messrs. Burruano, Daniels, Gauper, McNaul, Pakala, Schwenk (now ex-officio, full member as of 7/1/59), Showers. He now has a suggested list of some 15-20 proposed authors for the special IRE anniversary edition.

There being no further business, the chairman adjourned the meeting at 9:00 PM.

The following is the most recent financial statement as presented to the Administrative Committee at Chicago, October 7, 1959. The accompanying Minutes have not yet been approved, as yet.

PROFESSIONAL GROUP ON RADIO FREQUENCY INTERFERENCE
Treasurer's Report
FINANCIAL STATEMENT FOR THE PERIOD JAN. 1 to AUG. 31

BALANCE FROM JANUARY 1st			$ 1,597.20
RECEIPTS DURING PERIOD:			
IRE Publications Subsidy		$ 259.84	
IRE Matched Funds for New Groups		791.82	
Group Fees		795.16	
Advertising		700.00	
Sale of Publications		21.60	
TOTAL RECEIPTS			2,568.42
TOTAL BALANCE AND RECEIPTS			4,165.62
EXPENSES DURING PERIOD:			
Publications			
*1959 Transactions		$ 649.82	
*Newsletters		129.70	
Membership Service Charges		144.10	
Others:			
Brochures	$ 127.50		
Labor & Postage	96.04	223.54	
TOTAL EXPENSES			1,147.16
BALANCE AS OF AUGUST 31st			$ 3,018.46

Eligible for IRE publications subsidy
e: This balance does not include receipts and expenses of our June Seminar.

Respectfully submitted,

Robert W. Fairweather,
Treasurer

ADMINISTRATIVE COMMITTEE MEETING JANUARY 8, 1960.

The Administrative Committee meeting is called for January 8th at) AM at Headquarters of IRE, New York City.

EDUCATIONAL COMMITTEE TO MEET ON JANUARY 7, 1960 IN NEW YORK.

The Educational Committee of PGRFI has been called together by Charles W. North, Chairman (Martin Company, Orlando, Florida) for dinner meeting, 6:30 PM, at the University Club, 1 West 54th Street, New York City. A program will be discussed for preparing and preparing educational material on interference and component compatibility to members of PGRFI and to educational institutions. This program will be presented the following day at the Administrative Committee meeting:

The members of the Educational Committee are:

Dr. R. M. Showers University of Pennsylvania Philadelphia, Pa.	Nelson M. Cooke, President Cooke Engineering Company Alexandria, Va.
A. R. Kall Ark Engineering Company Philadelphia, Pa.	Rexford Daniels Interference Consultants Boston, Massachusetts

ROME-UTICA PETITIONS FOR PGRFI CHAPTER.

John A. Worthington, Jr., Rome Air Force Depot, Rome, N. Y., reports that there are 25 signers of the petition to the Rome-Utica Section for the formation of a local Chapter of PGRFI.

ARMOUR

FIFTH CONFERENCE ON RFI AND ELECTRONIC COMPATIBILITY.

Electronic Design, October 28, 1959 (page 14), has written up the high-lights of the Armour Conference in Chicago, October 6-8, 1959, as follows:

"The Fifth Conference on Radio Interference Reduction and Electronic Compatibility, held in Chicago (Oct. 6-8), heard this warning by G. P. Sutton, chief scientist of the Advanced Research Projects Agency in Washington:

'Failure to achieve a satisfactory and relatively interference-free environment may seriously compromise the effectiveness of our defence system.... Radio interference may mean the loss of lives, expensive equipment or strategic advantage.'

In a keynote address to 300 engineers at the conference, Mr. Sutton urged more general consideration of problems of frequency allocation, radiated power requirements, antenna directivity and other factors to minimize interference.

A multi-fold increase in launched space vehicles for weather observation, scientific exploration, biomedical investigations and communication repeater stations is scheduled for the near future, Mr. Sutton indicated. Unless spectrum allocation is determined in advance and undesired emission eliminated, he asserted, chaos will result. Telemetry data may be rendered useless and valuable scientific programs voided, he warned.

Three Vital Phases in RFI Reduction

In the military area, as altitudes, velocities and mobility of vehicle increase, communication-electronic (C-E) systems increase in complexity, power output and spectrum utilization, the conference was told. A. H. Sullivan, Jr. of Engleman & Co., Washington, predicted that 'in time, interference aspects may predominate over all other considerations in engineering C-E systems.'

He presented three vital phases in planning an interference-free C-E system:

Prediction of interference, based on known data and measurements concerning (1) system and equipment performance, (2) ambient electromagnetic environment and (3) propagation and frequency data.

Engineering the C-E system for maximum compatibility with the electromagnetic environment, based on data furnished by prediction.

After installation of the system, reducing existing interference not forseen during the prediction phase.

Prediction Techniques Described

Relatively small systems or individual pieces of equipment can conceivably be 'cleaned up', the conference heard, by effective shielding, adequate filtering and rerouting of cables and leads. For major military installations, however, RFI headaches must be reduced to a minimum during the initial planning stage.

Site selection, equipment to be used, operating frequencies assigned - all must be evaluated for minimum interference interaction, it was stressed.

C. E. Vlakely of the Georgia Institute of Technology outlined the method of constructing Mutual Interference Charts from which a systematic selection of operating frequencies can be obtained for adjacent equipment with maximum freedom from interference.

Missile Hazards Noted

A film depicting numerous missile launchings - some successful, some failures - offered grim evidence of the potential dangers of RFI.

H. R. Austin of Motorola, Inc., Chicago and F. E. Rock of General Electronics Lab., Inc., Cambridge, Mass., presented a paper on the interference possibilities open to a satellite communications system from mutual, galactic, terrestrial and airborne sources.

H. Kiberg of RCA Service Co., Patrick Air Force Base, Florida, ıcussed the RFI detection system at the Atlantic Missile Range and ssented slides depicting the complex and varied instrumentation in e.

Electrically ignited pyrotechnic devices are used in missiles and ·craft as one-shot energy sources for destructors, explosive bolts, ıction seats and other actuators, it was noted. The hazards of stray ıctromagnetic radiation triggering such devices and precautions being ·en were covered by B. Weinbaum of the Convair Division, General namics Corp., San Diego.

The conference was sponsored by the Army Signal Research and Evelopment Labs and was conducted by the Armour Research Foundaın in cooperation with the IRE Professional Group on Radio Frequency Terference."

RADAR CALIBRATION THROUGH THE USE OF SOLAR NOISE.

The above paper was delivered by J. A. Kuecken, of the Avco Corration, Cincinnati, Ohio, at the IRE Canadian Convention October 59. The following are the first two paragraphs:

"The advent of supersonic aircraft and automatic data handling syson and intercept plotters (eg SAGE) has placed increasingly stringent quirements upon the accuracy of early warning and height finder lar data.

In the usual radar system, it is possible to check the calibration of of the electronic circuitry with internal or portable electronic test ır. However, the antenna and its associated servo system bear the ire burden of angular bearing accuracy. The only sense most radar stems have regarding the bearing and elevation angles of a target is ıally obtained from the physical position (or aiming angles) of the ·enna in the 'on target' position. This relationship between the physl position of the antenna structure and the bearing angle of the anna beam is usually calibrated at the factory; however, throughout : remainder of the life of the system it is generally never checked. is calibration, or antenna boresight, is often suspect and the method scribed herein provides a simple and effective means of checking the ibration of the antenna as installed."

RF ENERGY AND ELECTRICAL BLASTING CAPS.

The following are references to material dealing with RF energy i blasting caps:

"Radio Frequency Energy a Potential Hazard in the Use and Transrtation of Electric Blasting Caps" (Revised Edition) published by titute of Makers of Explosives, 250 East 43rd Street, New York 17, w York, 1956, Pamphlet No. 20.

"Safety Report on R. F. Detonation of Explosives" by William E. :Natt, Motorola Systems Engineering Department, Motorola Newsım, January-February, 1952.

"Code for the Manufacture, Transportation, Storage and Use of Exısives and Blasting Agents" July 1959, National Fire Protection Asciation, 60 Batterymarch Street, Boston 10, Massachusetts, price: y cents.

RADIO NOISE SPECTRUM PAPERS TO BE PUBLISHED.

The Harvard University Press, 79 Garden Street, Cambridge 38, ıss. announces publication of the papers delivered at the Radio Noise ectrum Conference sponsored by Harvard College Observatory and ld April 22, 1958 at Cambridge, Mass. The information supplied by : Harvard University Press is as follows:

"THE RADIO NOISE SPECTRUM edited by Donald Howard Menzel, rector of Harvard College Observatory. Trim size: 6 x 9 - printed ·ket 220 pages; line cuts and halftone illustrations. Price: $6.00 - ·t discount. Publication date: May 1960. This volume reviews the ıtus of our knowledge of the sources of radio noise, presents papers experts in the field, and is both a survey of the entire field and an roduction to further specialized work on specific topics. The conbutors come from government and academic laboratories throughout : country, and among the topics discussed are 'Man-made Radio Noise', 'Radio Noise from Meteors', 'Solar Radio Interference', 'Noise of Planetary Origin', 'Correcting Noise Maps for Beamwidth', and 'Cosmic Radio Noise'."

NEW ANTENNA FOR STODDART NM-30A.

Stoddart Aircraft Radio Company, Inc., 6644 Santa Monica Blvd., Hollywood 38, California, announces a No. 91280-1 Discone Antenna patterned after a Signal Corps desing to meet the requirements of Signal Corps specifications MIL-I-11683A and MIL-S-10379A. The Suppression and General Engineering Branch of the Signal Corps at Fort Monmouth has indicated that the new discone in combination with the Stoddart NM-30A equipment is suitable for making broad-band interference measurements within the frequency range of 40 to 400 megacycles.

R-F SHIELDING OF FLUORESCENT LAMPS.

Electrical Manufacturing, November 1959, carries a two-page article with illustrations and graphs under the above title by Ernest F. Weinberger, Electronic Scientist, and Gerald A. Roca, Electronic Technician, Naval Material Laboratory, New York Naval Shipyard. The article describes the use of aluminum honeycomb grill and a conducting glass cover.

RADIO INTERFERENCE STUDY PACT GIVEN GE.

Electronic News, November 9, 1959, contained the following news item under the above title:

"Utica, N. Y. - General Electric's light military electronics department here is working on its first 'space-type' contract - a study program into the disturbances in radio reception associated with the passage of orbital bodies.

IMED officials confirmed the study contract with the Air Force Cambridge Research Center, Cambridge, Mass., but said details we classified. They declined to disclose the dollar value of the contract

The study of these disturbances is commonly referred to as 'Robe Rumble'."

NATIONAL BUREAU OF STANDARDS ANNOUNCES NEW PREFIXES "GIGA", "TERA", "NANO" AND "PICO".

The Wall Street Journal, November 6, 1959, carried the following news item:

"....now the National Bureau of Standards has announced it is standard to use the prefix 'giga' to denote units of 1,000,000,000 and the prefix 'tera' for units of 1,000,000,000,000. A gigavolt, for example is 1,000,000,000 volts. For fractions, the Bureau says to us the prefixes 'nano' and 'pico'. A billionth of a second, for instance, is one nanosecond. A picosecond would be 0.000,000,000,001 secon

FINDING RADIO-FREQUENCY INTERFERENCE LEVELS.

Under the above title in the November 27, 1959 issue of Electroni (page 71), James G. Arnold, Surface Communication Div., RCA, Ca den, New Jersey, has written a 3-page article containing graphs and formulas on this problem. The sub-head reads:

"Here's how to estimate intermodulation products imposed on a transmitted frequency by an interfering transmitter."

UNDERGROUND CORROSION OF ANCHOR RODS.

The Rural Electrification Administration of the United States Department of Agriculture has issued REA Bulletin 169-30, September, 1958, which contains practical information on the causes of underground corrosion of electric system components and corrective measures. It also discusses the types of earth which accelerate corrosi

Copies may be obtained from Superintendent of Documents, Gover ment Printing Office, Washington 25, D. C. Price: 20¢.

ITEMS OF INTEREST IN ELECTRONIC DESIGN DECEMBER 9, 1959.

On Page 27 - "Our Feb. 3 issue will carry a special report on ntrol of radio frequency interference."

Page 136 - "Detection of Signals in Noise"

"A detection criterion is formulated which leads to the design of tectors on the basis of much less a priori information. These non-rametric detectors are proposed as possible alternatives to the de-:tors studied in those situations where little a priori information is ailable. A concept known as asymptotic relative efficiency is em-yed to compare nonparametric detectors with some of the detectors estigated in the past. Using this criterion the efficiency of non-rametric detectors is found to be quite high. The application of the nparametric detection criterion to the detection of nonstationary sig-ls in noise is discussed. Nonparametric detectors are shown to ssess certain advantages in detecting such signals. Nonparametric thods for the Detection of Signals in Noise, Jack Capon, Columbia iversity, School of Engineering, New York, March 12, 1959, 234 pp, crofilm $10.20, Photocopy $36.30. Order PB 142327 from Library Congress, Washington 25, D. C."

Page 154 - "Special Glass Prevents RF Leakage Through Test Equipment Window"

"A problem existed in maintaining rf shielding across a glass dow in test equipment. The application required viewing a tape nsport unit and yet reduced radio noise emanating from the window a.

Successful results have been obtained using glass with a thin trans-t conductive coating applied. Such glass is manufactured by Pitts-gh Plate Glass Co. The hardened glass window has an area 12 in. 0 in. and a coating resistance of 15 ohms per inch square.

Connections are made to the glass by means of silver plating buss ips around the edge of the conductive coating. Attenuation figures ge from 30 db at 30 mc to 20 db at 10,000 mc. At frequencies be-30 mc the glass becomes more opaque. Best shielding properties obtained with lowest resistance coatings, but below 15 ohms per a square the reduction in transparency may become noticeable.

J. R. Marchant, Electronics Engineering Dept., Stromberg-lson Co., Div. of General Dynamics Corp., Rochester 3, N. Y."

Page 176 - "Variable Capacitance Paramp For Low Noise Without Refrigeration"

"In the race for lower and lower noise, we presently find the er far in the lead, since the noise associated with its basic ampli-g mechanism is negligibly small. Many applications, however, do require and cannot benefit from this ultimate in noise performance.

For these applications, the variable-capacitance 'parametric' lifier offers the advantage of simplicity. Its noise performance somewhere between that of vacuum tubes and masers yet, in con-it to masers, neither refrigeration nor a magnetic field are re-ed. If we are willing to introduce a moderate amount of refrigera-, that is, refrigeration to liquid nitrogen temperature, further im-rements in noise performance can be obtained."

Page 193 - "Measuring TV Receiver Interference"

"ASA has published a second supplement to the American Standard hods of Measurement of Interference Output of Television Receivers e Range of 300 to 10,000 kc. The supplement has been issued to ribe a new procedure for delivering an rf input signal to a TV or roadcast receiver to measure conducted interference. The net-k formerly used has been responsible for some inconsistency. ASA .25b-1959 is available at 50 cents per copy from the American dards Association, 70 East 45th Street, New York 17, N. Y."

NATIONAL INVENTORS COUNCIL REQUESTS HELP.

"Project 1101. Radio Noise Elimination. - A need exists for a od to eliminate radio noise, without distortion of the intelligible signal.

Present: All types of radio receivers are interfered by noise (man-made and nature-made). In transmitting speech, intelligible sound, frequencies or pulses; and staight continuous waves, interfering noise results in distortion of the received message. Thus, the guidance of missile systems and the accuracy of telemetered data are severely affected by noise. Today's techniques of eliminating radio noise in receivers, only limit or dampen the noise, or eliminate both, the noise and the intelligible portion (during occurrence of noise) of the signal."

ROTARY SWITCH CONTACT NOISE.

Electrical Design News, November 1959, page 72, contains a short article under the above title by Charles A. Logan, Engineer, Instrument Development Laboratories, Inc., Attleboro, Mass. The first paragraph is as follows:

"In applying rotary switches as signal commutators, two noise figures are of concern. The first is applicable primarily in high-level (0-5v) systems and is concerned with the resistance of the contacts or the variation of contact resistance. The second is applicable to low-level (0-5mv) thermocouple or resistance thermometer systems and is concerned with self-generated or induced noise during the switching action."

ITEMS OF INTEREST IN ELECTRONICS, DECEMBER 11, 1959.

Page 53 - "Voice Radio Systems for High Noise Paths" by J. A. Greefkes and F. de Jager, Phillips Research Laboratories, N. V. Philips' Gloeilampenfabrieken, Eindhoven, Netherlands. The sub-head states "When other radio links fail because of noise, this system still works. Frequency and amplitude components of speech are transmitted on separate channels." The system is explained as follows:

"The basic idea of the new system is to split voice sounds into their frequency and amplitude components, to transmit the two types of information on separate channels, and then to recombine the separate components into the original sounds. This system is called FRENA, from the words frequency and amplitude.

Speech sounds are clipped up to 30 or 40 db. Intelligibility of the clipped speech is good and distortion is held down by clipping a single-sideband signal. Many of the distortion components fall outside the wanted frequency band."

Page 67 - "Sum and Difference Mixer Design Charts" by R. F. Baum, The W. L. Maxson Corp., New York, N. Y. The sub-head states "Interference charts quickly show which unwanted harmonics of two signals will cause interference. Fixed frequencies and a-m modulation can be handled." The first paragraph is as follows:

"When two frequencies are heterodyned in a nonlinear device, not only is the desired sum or difference frequency obtained but also a grea number of spurious responses. A filter, tuned to discriminate against undesired frequencies, usually follows the mixer. The circuit designer must still locate all the spurious responses to select the input frequencies and to determine the bandwidth and cutoff rate of the filter."

ITEMS OF INTEREST IN PROCEEDINGS OF THE IRE, DECEMBER 1959.

Page 2113 to 2115 - Correspondence from A. E. Bakanowski, W. M. Sharpless, B. C. DeLoach - Bell Telephone Laboratories on "Low-Noise Parametric Amplifier Using Germanium p-n Junction Diode at 6 KMC"; "An Extremely Low-Noise 6 kmc Parametric Amplifier Using Gallium Aresnide Point-Contact Diodes", and "X-Band Parametric Amplifier Noise Figures".

Page 2117 - Correspondence by Clinton G. Shafer, Ratheon Manufacturing Company, on "Noise Figure for a Traveling-Wave Parametric Amplifier of the Coupled-Mode Type".

3703

ASHINGTON CHAPTER OFFERS TO HOST NEXT PGRFI SEMINAR.

The Washington Chapter of PGRFI has offered to host the next RFI Seminar in Washington, D. C. It is planned to have this Semi- r held in the early Summer of 1960.

SOME THOUGHTS ON RF INTERFERENCE PREDICTION.

Delmer C. Ports, Vice-President, Jansky and Bailey, Inc., ashington, D. C. delivered a paper under the above title at the Mid- nerica Electronics Conference in Kansas City, November 5, 1959.

ITEMS OF INTEREST AT THE FIFTH NATIONAL COMMUNICATIONS SYMPOSIUM.

The following papers of interest were presented at the Fifth ational Communications Symposium in Utica, N. Y. on October 6 rd 7, 1959:

"Evaluation of Electromagnetic Interference Problems Using Computer Simulation Techniques" by D. R. J. White of American Machine and Foundry Co., Alexandria, Va.

"Interference and Channel Allocation Problems Associated with Orbitting Satellite Communication Relays" by F. E. Bond, C. R. Cahn and H. F. Meyer of Ramo-Wooldridge, Los Angeles, California.

PAPERS OF INTEREST AT 10th NATIONAL CONFERENCE, DECEMBER 3-4, 1959.

The following papers are scheduled for delivery at the 10th Na- nal Conference of the Professional Group on Vehicular Communica- ns to be given at St. Petersburg Beach, Florida, December 3-4, 59:

"Impulse Noise Reduction Circuit for Communication Receivers" W. F. Chow, General Electric Company.

"Spectrum Economy & Interference Reduction Through Use of a Multi-Area Coverage Plan" - W. A. Cornell & H. J. Schulte, Bell Telephone Laboratories

MOBILE INTERFERENCE SYMPOSIUM

The Effects of Vehicular Generated Interference on FM, DSAM, SSB Receivers

Suppression of Vehicular Interference

Procedures & Standards for Measurement of Vehicular Inter- rence - John F. Chappell, U.S. Army Signal Research & Develop- ent Laboratories - Moderator & Panel Members: W. S. Shipman, en Backman, Brooke Short & Stuart F. Meyer.

THE DESIGN AND USE OF A COPPER MAN FOR CLOTHING INSULATION ASSESSMENT.

A paper under the above title was given by F/L D. J. G. Soper and /O C. L. Allen of the Royal Canadian Air Force, Institute of Aviation edicine, before the IRE Convention, Toronto, Canada. Although the aper was primarily concerned with the development of protective lothing for very cold environments and not for electronic reasons, the onstruction of the dummy and the test methods may be of interest to hose engaged in the development of conductive clothing for electro- agnetic energy. Copies of the paper are available from the Technical eference Library, Institute of Aviation Medicine, RCAF, 1107 Avenue oad, Toronto, Canada.

PROBLEMS OF MODERN COMMUNICATIONS.

The October 23rd, 1959 issue of Electronics carried an article ith the above title. The final paragraph, which is of interest to PG- FI members, is as follows:

"Perhaps one of the most challenging problems of all is that of terference, both natural and manmade. The ever-increasing number f users of the r-f spectrum is creating a rapidly deteriorating situa- on which is under active study, but for which no clear solution yet xists. The answer lies somewhere in the realm of statistical technique, using the most sophisticated methods to learn, not only how to live with interference, but also something of its nature, extent, effects and control."

PAPERS OF INTEREST IN IRE TRANSACTIONS OF INSTRUMENTATION, SEPTEMBER 1959.

The following are papers of interest:

"Broad-Band Radio Frequency Interferometer" by J. W. Carr.

"In a steady state monochromatic interferometer the interference pattern is scanned by the detector and the absolute wavelength thus determined. In the system described here the interference pattern sweeps past stationary detectors in a manner which is related to the change in frequency. Thus when the total net change in the phase of the interference pattern is measured with respect to a given absolute reference, an absolute measure of frequency can be obtained. The band being scanned is divided into an arbitrarily large number of unit cells determined by the resolution. Pulse forming networks and logic circuits deliver the information in a manner readily adaptable to a binary counting system and substantially independent of the rate of change of RF frequency and signal amplitudes."

"Noise Measurement of Negative Resistance Amplifiers" by A. Brodzinsky and A. C. MacPherson.

"The usual methods for measuring the gain and noise figure of amplifiers using standard noise sources are not suitable when these devices have output impedances with a negative real part or when they are driven by negative resistance sources. Using the extended definition of noise figure of Haus and Adler, a modified procedure is described which employs an auxiliary passive dissipative network following the negative resistance device to transform the real part of the output impedance to a positive value. The necessary measurement and computational steps are outlined and the calculations are carried out for three specific networks covering the low frequency and microwave regions. It is also shown that, under certain conditions, the use of a passive dissipative network at very low temperature results in an overall noise figure (for a cascade containing negative devices) which approaches that of the first stage."

RADIATION MEASUREMENTS STANDARDIZED.

Electronic Design, November 11, 1959, page 224 carried the following news item:

"Standardized methods of test for determining rf radiation from broadcast radio and television receivers are established by this new IEC publication. These methods were established to make possible comparison of the results of radiation measurements obtained by different observers. The first section covers radiation at frequencies below 30 mc from am receivers and from television receiver time-base circuits. Frequencies between 30 and 300 mc are covered in a second section. Copies of this International Electrotechnical Commission standard are available from the American Standards Association, 70 East 45th Street, New York 17, N. Y. for $3.60 per copy. IEC Publication 106."

ITEMS OF INTEREST IN ELECTRONICS, DECEMBER 4, 1959.

"NOISE" (page 4)

"Communication system designers are continually seeking out new ways to improve signal to noise ratio. A radio system for high noise paths has been developed at N. V. Philips' Gloeilampenfabrieken in Eindhoven, Netherlands. J. A. Greefkes and F. DeJager claim thei new system works at times when noise causes other radio links to fail.

Basic idea of the system is to split voice sounds into frequency and amplitude components, then transmit the two types of information on separate channels and, finally, recombine the separate components into the original sounds."

"NEW BIOLOGICAL EFFECTS OF R-F" (page 38)

"Research programs demonstrate that all biological effects of r-f are not traceable to heat. Studies aim now at causes. New resear

ɔiological effects of r-f energy is beginning to demonstrate the pos-
ility that living organisms present significant nonthermal reactions
various portions of the radio spectrum."

"TWT's and PARAMPS for LOW-NOISE RECEPTION" by D. A.
tkins and G. Wade, Stanford University, Stanford, Cal. (page 106)

"Recently developed techniques indicate that there is no theoretic-
limit to the noise reduction that can be achieved with traveling-wave
es. Comparison of twt's and parametric amplifiers leads to some
eresting predictions."

"RADAR JAMMING CHART" by Richard A. Wall, Systems Re-
ırch Laboratory, Motorola, Inc., Riverside, California (page 116)

"Improved radar interference nomograph provides solution to
-target jamming problem. Two examples are given. Most existing
nographs are unsuitable for radar interference calculations where
interference comes from a location other than that of the target.
:adar jamming nomograph is provided which is applicable whether
interference is located at the target or elsewhere."

ANALYSIS AND PREDICTION OF RADIO SIGNAL INTERFERENCE EF-
FECTS DUE TO IONIZED LAYER AROUND A RE-ENTRY VEHICLE.

Under the above title a paper was given by William C. Taylor,
Lockheed Missiles and Space Division, Sunnyvale, California, at the
959 National Symposium on Space Electronics and Telemetry, San
Francisco, California.

SUMMARY

"Principally this report treats the problem of transmission of
ctro-magnetic waves through the thermally-ionized layer of gases
the shock layer around a hypersonic missile. Giving simplified
ory, methods, and graphic aids for approximate predictions of the
oblem, it also presents some specific results for a typical hemi-
ere-cylinder vehicle shape. While details of the theory allowing
nputation of temperature and the concentration of electrons and
neutral particles are not given, a method which has been used is out-
lined and referenced.

It is concluded that a 200 mc signal will experience significant attenuation due to air ionization when peak re-entry velocities exceed about 11,000 or 12,000 ft/sec. Although it may not be true in every case, it is predicted that an increase in signal frequency above the 200 mc region for a midsection-radiated wave will lessen the attenuation problem of missiles with ranges up to and including "intermediate".

INTRODUCTION

Background and History

It has long been known that weakly ionized gases have significant effects upon electromagnetic propagation. Especially important have been the experiences and analysis connected with ionospheric propagation and reflection. It was not surprising then that difficulties in telemetering have been encountered with the ionization produced because of shock-heating of the air about a missile re-entering the atmosphere with great velocities. [1-5]

Varying degrees of success have been realized by various investigators in attempts to predict theoretically the quantitative effects of the ion sheath upon a transmitted signal. [6-10] Experimental data, i.e. signal strength data actually received from such transmitters during re-entry, is usable in analyzing the problem to some extent; however, there are several phenomena which may impair signal reception from the vehicle, and this fact makes the discernment of the various contributions difficult at best. There is every reason to believe, however, that thermal ionization of air is one of the most important of these causes, perhaps the sole serious one in many cases."

Kindly send all editorial contributions for inclusion in this Newsletter to:

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