PROFESSIONAL GROUP ON RADIO FREQUENCY INTERFERENCE

NEWSLETTER

NUMBER 5 MAY 1959

ITEMS OF SPECIAL INTEREST

1. Fifth Conference on Radio Interference Reduction and Electronic Compatibility.

This Conference will again be sponsored by the U. S. Army Signal Research and Development Laboratory and will be conducted by the Armour Research Foundation of Illinois Institute of Technology. Tentative dates are October 6, 7 and 8 or 7, 8 and 9, 1959 at Chicago. There will be two days of unclassified papers and a third day of classified papers sponsored by the Signal Corps.

2. Panel Discussion to be held in New York City.

A panel discussion is planned for June 15 and 16, 1959 to be held in New YorkCity. The subjects will be Prediction Techniques and Measurement Techniques. The first day will be unclassified and on the second day classified papers will be sponsored by a Government agency. Further details and attendance applications will be sent through the mail.

3. WADC Requests Comments and Suggestions on MIL-I-26600.

(1) This Center is planning to revise MIL-I-26600. The purpose of this revision will be to improve portions of the specifications that have not been satisfactory. The members of the IRE Professional Group on Radio Frequency Interference could provide valuable technical assistance by submitting suggestions to improve the specification. In addition to paragraph by paragraph comments; ideas on new approaches to the interference control problem, simplified and more powerful measurement techniques, eliminating tests of doubtful value, etc., are requested.

(2) All comments submitted should mention the problem area and the proposed method of revising the specification to eliminate the problem. Consolidated or individual comments can be submitted. A tentative deadline date of 1 May 1959 has been established; however, this date can be extended if necessary.

(3) All comments should be addressed as follows:

Commander
Wright Air Development Center
ATTN: WCLNTI, Mr. C. E. Seth
Wright-Patterson Air Force Base, Ohio

FOR THE COMMANDER:

N. D. FLINN
Chief, Interference Control Section
Identification and Data Conversion Branch
Comm and Nav Laboratory

The deadline date has been extended to June 1, 1959 in the hope that everybody will have time to send in comments and suggestions. It should also be noted that requests are made for new ideas on new approaches to the interference control problem, simplified and more powerful measurement techniques, eliminating tests of doubtful value, etc. This is one of the few times that everybody in our field will have a chance to say what they wish - without having to go through committees. We hope the response will be 100%.

4. The Society of the Plastics Industry Forms RFI Committee.

The Society of the Plastics Industry, Inc., 250 Park Avenue, New York 17, - Murray Hill 7-2675 - has formed an RF Interference Committee to cooperate with the Federal Communications Commission on interference problems arising from the use of high frequency heaters. The Society has requested that members of PGRFI be informed of its existence and that any mutual cooperation would be welcomed.

Members of the committee are as follows:

Mr. Gilbert Addis, Chairman
Bakelite Company
Bound Brook, New Jersey

Mr. John T. Bruggeman
Tung-Sol Electric, Inc.
200 Bloomfield Avenue
Bloomfield, New Jersey

Mr. Laurence G. Cumming
The Institute of Radio Engineers
1 East 79th Street
New York 21, New York

Mr. Charles W. Frick
American Institute of Electrical Engineers
1 Union Street
Schenectady, New York

Mr. W. T. LaRose
W. T. LaRose & Associates, Inc.
Troy, New York

Mr. George F. Macindoe
Consolidated Molded Prod. Corp.
329 Cherry Street
Scranton, Pennsylvania

Mr. R. L. Millham
General Electric Company
Technical Products Department
Electronics Park
Syracuse, New York

Mr. Milton Rothstein
Radio Receptor Company, Inc.
84 North 9th Street
Brooklyn 11, New York

Mr. Fred C. Sanders
Swellwear, Inc.
350 Fifth Avenue
New York 1, New York

A news item, of March 9, 1959, illustrates the seriousness of the problem. "Mr. Kiser stated that as a result of the interference the Federal Aviation Agency has been forced to forbid aircraft to use the air over a certain quadrant over metropolitan New York because of the dangers involved. This quadrant is shaped in the form of a piece of pie which is approximately ten miles around the round edge of the pie and fifty miles from the edge to the apex of the pie. It was testified that due to the unpredictable character of the radiowaves being emitted possible interference could go beyond the restricted quadrant. . . ."

Naval Research Laboratory Bibliography Available:

The Office of Technical Services, Department of Commerce, Washington 25, D. C., has published a 131-page bibliography of unclassified Naval Research Laboratory reports, numbers 1,000 to 5,000. Number is PB151428 at $2.75 per copy.

"Noise in Electron Devices" - A New Book:

Louis D. Smullin and Herman A. Haus, both of the Massachusetts Institute of Technology, have edited a book under the above title.

Contents:

Shot Noise from Thermionic Cathodes; - C. F. Quate, Bell Labs.
Low-Frequency Noise in Vacuum Tubes - Flicker Effect; - A. van der Ziel, University of Minnesota.
Signal and Noise Propagation Along Electron Beams; - H. A. Haus.
Noise In Grid-Control Tubes; - T. E. Tapley, Bell Labs.
Low-Noise Traveling-Wave Tubes; - R. W. Peter, David Sarnoff Research Center
Semiconductor Noise; - A. van der Ziel.
Noise in Transistors; - W. H. Fonger, RCA Labs.

413 pages, price $12.00.

Papers of General Interest at Coming Joint Meeting URSI-IRE:

The following papers of general interest, will be delivered at the Joint Meeting URSI-IRE, Willard Hotel, Washington, D. C. on May 5th and 6th, 1959:

Fundamental Limitations of External Noise; - H. H. Grimm, General Electric Company.
On the Region of Origin of Solar Radio Noise Bursts; - T. R. Hartz and C. O. Hines, Radio Physics Lab., Defense Research Board, Ottawa, Canada.

Papers of Interest in IRE Transactions on Instrumentation:

The following papers, which appeared in the December 1958 issue of the IRE Transactions on Instrumentation, are of interest:

H. ZUCKER, Y. BASKIN, S. I. COHN, I. LERNER, and A. ROSENBLUM, Design and Development of a Standard White Noise Generator and Noise Indicating Instrument -- Page 279

The design and development of a standard white noise generator in the frequency range from 0 to 1000 mc are presented. The basis of the generator is Nyquist's Law which relates the noise output of a resistor to its temperature. The noise generator consists of a low reflection termination heated in a coaxial furnace. The basis of the design of the low reflection termination is presented together with experimental impedance measurements. The operating temperature of the generator is currently 1300°C. The techniques used in the development of a resistive material to withstand high temperatures are presented together with the temperature characteristics of the termination. The thermal emission effects which occur at the operating temperature of the generator are analyzed, and possible causes for deviation of the generator from a true standard are considered.

The design of an instrument to measure the linearity of the generator's noise power output as a function of its temperature and the design of a noise indicating instrument to measure the noise output of generators at spot frequencies in the frequency range from 10 to 500 mc are given.

P. A. HUDSON and C. M. ALLRED, A Dry, Static Calorimeter for RF Power Measurement -- Page 292

A new calorimetric type standard RF wattmeter has been developed at the National Bureau of Standards. Its dynamic range extends from 20 milliwatts to 12 watts and overlaps the range of another standard, a 100μw to 100 mw thermistor bridge. The frequency range is from dc to 300 mc and approximately 40 minutes is required between readings.

The wattmeter is a transfer standard between accurately known values of dc power and the RF powers to be measured. A complete description of the instrument is given. Analysis of errors indicates a maximum uncertainty of ±(0.5 per cent +2 mw) in the measured RF power. In comparison measurements with other independent methods, agreements of ±0.5 per cent or better were obtained. This accuracy represents an improvement of one order of magnitude over the best presently available commercial instruments designed for the above power and frequency ranges.

W. E. PAKALA and R. M. SHOWERS, Principles and Application of Radio Interference Measurements -- Page 297

Methods for measurement of radio interference from noncommunications equipment have been revised for adoption as an American standard. The improvements have been accomplished as a result of more than 15 years of development in instrumentation and techniques. In instrumentation more rigid specifications are placed on bandwidth characteristics, detector time constants, and methods of calibration, among others. In techniques, more attention is devoted to the effects of environment, including use of impedance stabilization networks and shielded enclosures. Current work directed toward future improvements in standardization is outlined.

Notes Taken at Meeting of PG Editors, March 24, 1959:

This year there will be a change in the distribution of Convention Records. Last year the particular portion of the Convention Record that published papers of direct concern to a professional group were distributed to that professional group at no charge. This will not be done for the 1959 Convention Record. However, individual professional group members can buy their particular portion of the Convention Record at approximately one-half the normal price. For PGRFI the portion of the Convention Record containing Sessions 2, 4, 30 and 37 will be of direct interest. This portion contains the Sessions of direct interest to PG on Communications Systems, PGRFI and PG on Vehicular Communications. Th prices for this portion of the Convention Record are as follows: Professional Group members $.80; IRE members $1.20; Libraries $3.20; non-members $4.00.

There will be a change in the distribution of the WESCON Convention Record. Since they will reduce the total number of papers presented, to stimulate panel discussion at the Show, the Convention Record will be printed and distributed at WESCON, permitting members of the various panels time to review papers and be ready with discussion. The distribution again will not be free to PG members, but will be available at a reduced rate.

Issue Raised on Allocating Radio Bands:

Electronic News, March 2, 1959, carries the following item under the above title:

"Rep. Oren Harris (D. Ark.) has questioned whether full use of broadcasting space by commercial interests and the Federal Government can be achieved under divided Federal responsibility for allocating available radio spectrum space.

"He heads the House Interstate and Foreign Commerce committee, which has received a $150,000 fund to conduct an extensive spectrum usage study.

"Mr. Harris last week observed that demand for spectrum space is expected to grow at such speed that it is dubious whether the divided responsibility between the President and the Federal Communications Commission for allocating frequencies can do an efficient job.

"He indicated his belief that a specific new Federal agency may be needed to handle the whole job, just as Congress created the Federal Aviation Agency to handle air space usage by military and private planes. . . ."

Russian Translations:

Electronic Design, January 21, 1959, mentions the following translations of interest:

Measurement of Weak Signals Having Continuous Spectra, by V. S. Voyutskiy and A. I. Slutskovskiy, RE 9/58, p. 25-29, 3 figs.

"The sensitivity and accuracy of measurements of weak signal having continuous spectra is limited essentially by the random noise in the measuring apparatus. Two basic methods are presently used to cope with this limitation. In one, the noise is measured separately and subtracted from the overall reading of the apparatus. In this method the null setting of the output instrument becomes dependent on the gain of the system and on the noise level of the output. Its effectiveness is therefore dependent on the degree with which the

noise remains constant during the measurement time.

"Another method involves low-frequency amplitude modulation of the measured weak signal prior to amplification. The weak sinusoidal variation of the modulation frequency, obtained at the detector output, is separated with a narrow-band filter. The amplitude of this simusoidal variation is proportional to the signal intensity. Although this modulation method eliminates the null drift due to variation in noise level, fluctuations in the gain coefficient of the apparatus, which affect the calibration, are not eliminated. . . ."

Further explanations are given with two schematics.

Calculation of Internal Noise of Transistor Receivers, by V. V. Pavlov, RE 19/58, p. 30-37, 5 figs., 1 table.

"After deriving expressions for the noise factors of grounded-collector, grounded-emitter, and grounded-base circuits, the author reports test results obtained with various types of Russian and foreign transistors."

A schematic of a test of single transistor stage is given.

26 Section Filter Network:

Electronic Industries, February 1959, page 73, carries a description of a 26 section filter network. Opening paragraph states: "R. F. interference and noise pulses in a special radar relay switch have been eliminated by Astron Corp., East Newark, N. J., with a complex network of filters." A schematic of the network is given.

Another Instance of Interference to Guided Missiles:

The Saturday Evening Post, April 25, 1959 in an article titled "The Men Who Chase Missiles Down Range" states:

"The base (Grand Bahama) is also charged with monitoring the air waves before a test, to be sure that no electronic interference may occur. It once discovered that the tower at Tampa airport was sending out a signal which caused a target drone, cruising off Grand Bahama, to drop its flaps. . . ."

A Static Eliminator Can Be Possibly Adapted for Other Than Printing Uses:

The Graphic Arts Monthly, April 1959 carries a news item from The British Printer, England, as follows:

"Static elimination of presses and bagmaking machines is the function of a new equipment recently introduced by Cawkell Research and Electronics Ltd., England. The standard installation consists of a control box with two anti-static heads. When the heads are connected across a high-voltage AC supply, a stream of ionized air is produced in the vicinity, which serves to neutralize any static charge on material passing the head. The two heads are normally mounted one above and one below the moving material. Standard heads are available with effective lengths up to four feet."

Items of Interest in Electronic Industries, April 1959:

Page 52 - Trees Stop UHF Signal

"Howard Head, consulting engineer to the Association of Maximum Service Telecasters, reported to that Association's members on a study his organization had made of the effect of trees on the strength of a television signal.

"Trees standing in the way of a broadcast television signal can reduce the effectiveness of the UHF signal by as much as a factor of 0.1 or more. Even the shadows cast by trees can lessen the signal, Mr. Head stated.

"Tests leading to the conclusion were conducted at Salisbury, Md., by H. Head and his colleagues in a special MST project, with data subsequently submitted to the Television Allocations Study Organization for analysis and report to the Federal Communications Commission."

Page 72 - For R-F Measurements - Design and Build an Anechoic Chamber, by R. F. Kolar, Radio Corp. of America.

"When radio wave measurements are made at outdoor sites, the reflected energy causes measurements to be unreliable and weather conditions can be difficult on the engineers making tests. These problems are overcome by having your own anechoic chamber. Complete details for its design and construction are given."

Page 120 - Interference Caused by Intermodulation Occurring at High Frequency in a Superhetrodyne Receiver, by W. Rotkiewica and J. Temler, Prace Instytutu Tele-I Radiotechnicznego, Poland, Vol. 2, No. 3.

"The paper contains a description of phenomena accompanying high frequency signal intermodulation in a superheterodyne receiver, as well as a mathematical analysis and the results of investigations of these phenomena."

Relay Arc Suppression Circuits Shown:

Electromechanical Design, April 1959, carries an article on typical arc suppression circuits for relays.

Fig. 11 shows an R-C arc suppression circuit. When contact opens, inductive energy builds up in capacitor. On closing the contact, relay inrush current is limited by the resistor.

Fig. 12(a) shows an arc suppression circuit using a rectifier. The low forward resistance of the rectifier permits quick capacitor charge during the relay. Capacitor discharge on closing of the contact is limited by R.

Fig. 12(b) A-C version of the circuit of Fig. 12(a).

Field Strength Measurement Report Released by FCC:

The Laboratory Division of the FCC's Office of Chief Engineer has released a report L. D. 6. 3. 1 titled - Field Strength Measurements. The report contains much basic practical information of interest to engineers and other technical personnel engaged in making field strength measurements of all types. A copy of the report may be obtained from the Technical Research Division, Room 7506, New Post Office Building, Washington 25, D. C. upon individual request.

East German Special Conference on Noise:

Electronic Design, April 15, 1959, carries a series of excerpts, starting on page 150, of papers given before the East German Special Conference on Noise covering Transistor Noise, Noise in Semiconductor Diodes, and Resistor Noise.

Abstractor's Note states: The December 1958 issue of the (East) German magazine Nachrichtentechnik is devoted to the papers which were presented at a special conference on Noise held at Gera on August 20-21, 1958. The technical papers of that issue are briefly described below:

"Mathematical Methods in Noise Calculations" by K. Lunze, pp. 530-537. Calculation of spectrum on effective value of stochastic function. Calculation of noise figures in networks.

"Noise in Semiconductor Diodes" by W. Dreschsel, pp. 538-541. Abstract follows.

"Contribution to the Theory of Noisy Quadripoles" by R. Paul, pp. 548-568. General equivalent circuits of noisy quidropoles. Noise figures for important elements. Noisy components in systems. Examples of series, parallel and cascade connections.

"Equivalent Circuits for Noise Calculations of Transistors" by C. Winkler, pp. 542-547. Abstract follows.

"Noise in Oxide Semiconductors under load at Low Frequencies" by K. Leberwurst, pp. 568-579.

"Noise of Resistors and Resistor Combinations with and without Load" by K. Lunze, pp. 580-584. Abstract follows.

"Flicker Noise of Tubes at Low Frequencies" by H. Mutschke, pp. 585-590.

Squelch Circuits Shown for Citizen's Radio 11-meter Band:

Electronics, April 10, 1959 carries an article titled "Citizen's Radio Revision Spurs Equipment Design" by Leo G. Sands, Consultant. In the article are two circuits for reducing interference, Fig. 1. Squelch circuit for reducing noise interference, and Fig. 6. Noise limiter for ignition interference. These are for the 11-meter or 460-466 mc range.

New Uses for Quasi-Peak Measurements:

IRE Transactions on Instrumentation, March 1959, has a paper by Kamal Ya'coub, Moore School of Elec. Engrg., University of Pennsylvania, titled "Application of Quasi-Peak Detector to the Measurement of Probability Density Function."

The Introduction states:

"Present interference-measuring instruments are built mainly on the principle of a superheterodyne receiver with the IF stage being followed by different detectors which measure average, rms, peak and quasi-peak values of the time function.

"The proper use of this equipment demands some understanding of its response to the various kinds of interference likely to be encountered. Conversely, the reading of these several detectors can furnish some insight into the type of interference being measured; this is essentially the reason for incorporating more than one detector circuit.

"Recently it has become evident that better use can be made of experimental data concerning noise if these data describe the statistical qualities of the noise. The reading of any of these detectors is dependent on the statistical characteristics of the noise being measured, but the sum of information obtained in this way is often not sufficient for the solution of interference problems. While a very detailed set of statistical data is impractical, it is true that in many cases, the first order probability density function is adequate for the calculation of interference.

"However, it requires more information to find this function than can be obtained with the existing detectors; we proposed to find the added data by varying the time constants of the quasi-peak detector."

Error-Correction Code for Bursts of Errors:

Electronic Design, March 4, 1959, carries an article with the above title. The first paragraph states:

"Lightning flashes and other electrical disturbances which cause static and noise on communication lines may result in groups or bursts of errors in the data being transmitted over these lines. These errors can be largely eliminated by a new error-correcting code developed by Dr. D. W. Hagelbarger of Bell Telephone Labs. The terminal equipment required for this new code is simple and inexpensive, and synchronization is relatively easy to maintain."

Underwriters' Laboratories Standards on Grounding and Bonding:

The Underwriters' Laboratories Standard for Grounding and Bonding Equipment, ASA C33.8 has been approved as an American Standards for Safety by the American Standards Association. These Requirements cover grounding and bonding equipment for use in connection with interior wiring systems in accordance with NEC. Requirements include ground clamps, bonding devices, grounding and bonding bushings, water-meter shunts, armored grounding wire, ground rods, and the like. This Standard can be helpful to those having grounding problems.

R-F Measurements on Ferrite Cores:

Electrical Manufacturing, April 1959, carries an article on the above subject by Pietro P. Lombardini and Richard F. Schwartz, of the University of Pennsylvania. It is a study presented of several effective means of measurements at frequencies from 2-1/2 to 30 mc of the relative permeability and quality factor, Q, of ferrite ring samples ranging in size from 3/4 to 2-5/8 inch in diameter.

Two Articles of Interest in Journal of Applied Physics, Dec. 1958:

Noise in Oxide Cathode Coatings, by H. J. Hannam and A. van der Ziel.

A discussion of noise measurements at 8 mc and 30 c. The HF measurements show thermal noise at high and low cathode tem peratures with a pronounced noise peak caused by shot noise where pore conduction changes to grain conduction. At LF the results sh that the pores are inherently noisier than the grains.

New Mechanisms for the Generation of Flicker Noise, by F. Fisher and I. P. Valko.

The effect of cathode porosity on flicker noise in valves has been investigated, and results confirm the theoretical predictions · Lindemann and van der Ziel.

VLF Controls Garage Doors:

Electronics, April 17, 1959, page 62, carries an article, un the above title, as follows:

"Radio-controlled garage-door operator designed by Delco Radio division of General motors operates in the frequency range between 5 and 10 kc. Fifty channels in this frequency range can be used, with 100 cps for each channel.

"Most present-day phantom operation of such units occurs on these devices using higher frequencies. In the higher r-f frequenc phantom signals can originate from long distances, many coming f aircraft.

"In the 5 to 10-kc range, it is difficult to radiate signals over long distances because good antennas must be several miles in leng Because this frequency range falls into the short-range communications category, it is more suitable for garage door controls whe ranges are measured in feet. Possibility of interferences with est lished services are practically eliminated. . . ."

Differential Amplifiers Can Rescue Millivolts of Signal from Volts of Noise:

Under the above title, William G. Royce, Kin Tel Division of Cohu Electronics, San Diego, Cal., authors a four page article in Electronic Design, April 1, 1959. The first two paragraphs are:

"Floating differential dc amplifiers are better than signal-en amplifiers for rejecting noise in an instrumentation system. The differential amplifier can distinguish between millivolts of signal a volts of noise.

"The disadvantage of the single-ended amplifier is that it nee a filter in its input to reject noise. The filter attenuates noise, bu it also attenuates the signal."

Rexford Daniels, Editor
PGRFI NEWSLETTER
Monument Street
Concord, Massachusetts