PROFESSIONAL GROUP ON RADIO FREQUENCY INTERFERENCE

NEWSLETTER

NUMBER 10 APRIL, 1960

SECOND NATIONAL SYMPOSIUM
on
Radio Frequency Interference
June 13-14, 1960
Washington, D. C.

FIRST DAY: 13 June, Morning Session, 9:30-12:30 A. M.

Introduction:

A. Keynote Speaker: "Getting on Top of the Nation's RFI Prediction and Measurement Efforts".

B. Section on RFI Prediction

Chairman:

B1. "Characteristics Needed for RFI Prediction".

B2. "The Jansky and Bailey Computer Simulation Model".

B3. "The AMF Computer Simulation Model".

B4. "The Melpar Computer Simulation Model".

B5. "The GE Computer Simulation Model".

FIRST DAY: 13 June, Afternoon Session, 2:00-5:00 P. M.

C. Section on C-E Equipment Characteristic Measurements (Techniques and Instrumentation)

Chairman:

C1. "Antenna Patterns".

C2. "Aerial Pattern Measurements".

C3. "Communications Transmitter and Receiver Spectral Signatures".

C4. "Radar Transmitter and Receiver Spectral Signatures".

C5. "Strong Signal Receiver Problems".

SECOND DAY: 14 June, Morning Session, 9:00-12:00 A. M.

D. Round Table Discussion - "The Present Status of RFI and Compatability Standards".

Moderator:

D1. Guest Speaker:

D2. Air Force Standards

D3. Navy Standards

D4. Signal Corps Standards

D5. FCC Standards

SECOND DAY: 14 June, Afternoon Session, 2:00-5:00 P. M.

E. Section on Interference Considerations

Chairman:

E1. "The Army's Electronic Environmental Test Facility".

E2. "Making RFI Predictions in the Field".

E3. "Designing RFI Reduction into Equipments".

E4. "Propagation Phenomena".

E5. "Signal Acceptability Criteria".

The Sponsoring Committee of the 2nd National Symposium is as follows:

Chairman	- James S. Hill, Jansky & Bailey
Advisors	- Samuel J. Burruano, Filtron Company Nelson M. Cooke, Cooke Engineering Company Harold E. Dinger, Naval Research Laboratory John E. Durkovic, Aeronautical Radio, Inc. Christian L. Engleman, Engleman &Co., Inc. Zigmund V. Grobowski, Jansky & Bailey Henry Randall, Department of Defense Bernard Schenker, Jansky & Bailey Dr. Ralph M. Showers, University of Pennsylvani Leonard W. Thomas, Bu Ships, U. S. Navy
Vice Chairman	- Herman Garlan, Federal Communications Commission
Secretary	- Aaron H. Sullivan, Jr., Engleman & Co., Inc.
Finance	- Richard N. Bullock, Burlingame Associates
Program	- Donald R. J. White, Frederick Research Corporat
Public Relations	- Edward F. Mischler, National Engineering Servic
Registration	- Kirke G. Schnoor, Melpar, Inc.
Arrangements	- William C. Green, National Scientific Labs.
Hospitality	- Jack M. Carter, Jansky & Bailey
Banquet	- Joseph Berliner, Communications, U.S. Air Forc
Field Trip	- Jules Deitz, Federal Communications Commissio

Advance registration fee $2.00 PGRFI members, $3.00 IRE members, $5.00 non-members. An additional charge of $1.00 will be made if application received after June 6, 1960, or for payment at the door. Complete details of the program and requests for reservations, advanc

ıyment, etc. will be sent to all members about the middle of May. If tendance at this Symposium is to be combined with family vacations, - family trip to Washington, reservations should be made immediately ith the Shoreham Motor Inn, which is attached to the Shoreham Hotel, ashington, D. C.

OTES ON ADMINISTRATIVE COMMITTEE MEETING MARCH 22, 1960 NEW YORK CITY

The following were elected officers of PGRFI for the next year to ke effect at the next Administrative meeting:

Chairman - Ralph M. Showers, University of Pennsylvania

Vice-Chairman - Leonard Milton, Filtron Company

Secretary - Milton Kant, Sperry Gyroscope Company

Treasurer - R. W. Fairweather, U.S. Navy, Brooklyn, N. Y.

The following were elected members of the Administrative Committee:

Harold E. Dinger, Naval Research Laboratory
John J. Egli, U.S. Army Signal Corps, Ft. Monmouth, N. J.
Herman Garlan, Federal Communications Commission
H. A. Gauper, General Electric Company, Schenectady, N. Y.
Richard B. Schulz, Armour Research Foundation

The membership of PGRFI, as of the date of the meeting, was 2 members.

The Administrative Committee voted to accept the invitation of SPR to become a sponsor for its meeting to be held in the United tates in 1961. A donation of $50.00 was voted to help defray organizaonal expense.

59 RESEARCH HIGHLIGHTS OF THE NATIONAL BUREAU OF STANDARDS:

"Attenuation of Building Materials Measured". - In many practical mmunication problems, it is not possible to avoid transmitting radio ves through structures such as buildings, which have walls made of ıny materials. The question arises as to the effect of frequency, larization, angle of incidence, and various other factors upon the enuation of the electromagnetic energy passing through a wall.

A technique was developed for measuring attenuation in various ilding materials. A parallel wire grid was first used to assess the ethod and to determine diffraction around the edge of a sample. boratory measurements were made on wooden and masonry wall ıterials, and outdoor measurements were made on other building ıterials".

The above information appeared in the Journal of Research of the tional Bureau of Standards - D. Radio Propagation Vol. 63D, No. 1, ly-August 1959 under the title "Transmission and Reflection by a rallel Wire Grid" by Martin T. Decker.

"VLF Noise Effects Measured". - "A better understanding is eded of radio system performance in the presence of noise. To fill s need, measurements were made of the amplitude distribution of rrier plus thermal noise. Good agreement was found between these asurements and predictions based on a mathematical analysis. The tribution of carrier-to-atmospheric noise, however, was found to fer appreciably from thermal noise. This difference might be antiated from the distributions of atmospheric noise by itself. Instantaous frequency distributions were found to depart appreciably from ormal distribution. Under conditions of carrier plus atmospheric se, the shape of the instantaneous frequency distribution was found be similar to that obtained with carrier plus thermal noise.

A study was made of radio systems operating in the presence of rmal and atmospheric noise. Power requirements were calculated for various systems operating in the presence of typical limiting noise. In addition, the system performance factor was found very useful for comparing the performance of various systems at various transmission rates and bandwidths.

Theoretical investigations indicated that, under certain conditions multiple-frequency shift systems should perform better than binary frequency shift systems. A multiple-frequency system was designed and nearly completed. This system will permit experimental investigation of the system performance factor".

This research appeared in the Proceedings of the IRE, Vol. 46, No. 12, December, 1958, under the title "Performance of Some Radio Systems in the Presence of Thermal and Atmospheric Noise" by A. D. Watt, R. M. Coon, E. L. Maxwell and R. W. Plush.

"Frequency and Power Studied for VLF Standard Broadcast". - A Study was made of the power requirements and of an optimum frequen for a worldwide standard frequency broadcasting station. The expected transmission characteristics and atmospheric noise levels were calcula for the 8- to 100-kc band. When these factors are combined with carrie to-noise requirements for a given precision of frequency comparison, a minimum radiated power is indicated (in the order of 10 to 100 kilowatts for frequencies in the vicinity of 20 kc) to provide worldwide coverage. To obtain a 1 in 10^9 precision for these transmitter powers over typical paths, observations are required for 15 to 30 minutes".

This research appeared in the Journal of Research of the National Bureau of Standards - D. Radio Propagation Vol. 63D, No. 1, July-August 1959 under the title "Power Requirements and Choice of an Optimum Frequency for a Worldwide Standard-Frequency Broadcasting Station" D. Watt and R. W. Plush.

"Radio Noise Data Gathered". - "Data were obtained from 15 stations in the worldwide network of radio noise recording stations. These data are hourly values of average power, average envelope voltage, and average logarithm of the envelope voltage, covering the frequency range from 13 kc to 20 Mc. *

To supplement data from this worldwide network with information on the detailed character of the noise, equipment was designed and constructed to measure the amplitude-probability distribution of the noise envelope. Measurements made with this equipment were used to develo a method that allows a determination of the complete amplitude-probabil ity distribution from the three statistical moments that are automatically recorded at the field stations.

Considerable progress was made on the development of an energy spectrum recorder that has been designed to sweep slowly across the spectrum and record continuously the average noise and signal power. This equipment will provide valuable information on noise levels as well as spectrum occupancy of signals. It will also provide propagation data over a large number of signal paths.

Methods were developed for isolating the three types of noise that influence recorded values. Manmade, atmospheric, and galastic noise reach the receiving antenna by ionospheric and groundwave propagation, and by direct radiation. Taking into account the prevailing propagation factors, the antenna pattern and source locations, these types of noise can now be analyzed separately".

The results of this research appeared in the Journal of the National Bureau of Standards - D. Radio Propagation, Vol. 64D, No. 1, January-February 1960 under the title "Determination of the Amplitude-Probability Distribution of Atmospheric Radio Noise from Statistical Moments" by W. Q. Crichlow, C. J. Roubique, A. D. Spaulding, and W. M. Beery.

* The Radio Noise Data has now been published in a Technical Note No. 18 issued by the National Bureau of Standards, Boulder Laboratories PB 151377 titled "Radio Noise Data for the International Geophysical Year July 1, 1957 - December 31, 1958 by W. Q. Crichlow, C. A. Samson, R. T. Disney, and M. A. Jenkins. $2.50.

"The high-altitude nuclear blasts of August 1958 were observed to change the atmospheric noise levels recorded at Kekaha, Hawaii. Immediately following each blast, increased ionospheric absorption reduced the recorded values by as much as 30 decibels (db) over a wide range of frequencies. The levels remained much lower than normal for several days after each blast. Related effects at other stations are being invest-

;ated".

This research appeared in the Journal of Research of the National ureau of Standards - D. Radio Propagation, Vol. 64D, No. 1, January-ebruary 1960, under the title "Effects of High-Altitude Nuclear Ex-losions on Radio Noise" by C. A. Samson.

Mr. William Q. Crichlow is Chief of the Radio Noise Section, adio Propagation Engineering Division, Central Radio Propagation aboratory, National Bureau of Standards, Boulder Laboratories, oulder, Colorado and is a member of PGRFI Administrative Commit-:e.

:LECTRONIC INDUSTRIES STARTS SERIES OF RFI ARTICLES:

In the March, 1960, issue of Electronic Industries, the first two rticles in a planned series of editorial features on radio frequency nterference are:

"Making Transmitters RFI-Free" by C. E. Blakely and R. N. Bailey, Research Engineers, Engineering Experiment Station, Georgia Institute of Technology, Atlanta, Georgia.

"Consider Interference in Systems Design" by Rocco F. Ficcki, Systems Engineer, RCA Service Co., Westmont, N. J.

Additional articles scheduled are:

"Interference in Receivers" by H. M. Sachs, J. J. Krstansky, Armour Research Foundation

"Interference to Satellites" by O. M. Salati, University of Pennsylvania

"Tranmission Lines (& Filters)" by D. C. Ports, Jansky & Bailey

"Interference in Propagation" by R. B. Schulz; L. Valcik, Armour Research Foundation

"Graphical Presentation of Filters" by M. H. First, Filtron Company

"Antennas" by E. Jacobs, University of Pennsylvania

"Man-Made RFI & FCC Enforcement" by FCC, Washington, D. C.

"Instrumentation" by Dr. R. M. Showers; F. Haber, University of Pennsylvania

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NTERNATIONAL ABSTRACTS FROM ELECTRONIC INDUSTRIES, MARCH, 1960:

"Effect of a Strong Interfering Signal on the Input of a Radio Re-eiver", L. M. Kononovich, "Radiotekh", 14, No. 11, 1959. 7 pp. A :rong sinusoidal signal outside the receiver frequency band can de-rease or increase the gain of the RF and even Mixer stages owing to anges in their biasing. The selection of the most suitable tubes and asing for greatest interference resistance and higher gain are suggest-i. The best biasing for minimum secondary modulation is given. ubes with the minimum mutual conductance to anode current ratio at ero biasing are found to be the most noise-proof. It is shown that with suitable selection of tubes and operating conditions it is possible to btain a larger signal to noise ratio at the output of the amplifying stage an at its input. Calculations were confirmed experimentally. (USSR).

"Minimum Spacings Between Interfering Television Broadcasting :ations", H. Edan & K. H. Kaltbeitzer. "Rundfunk", Dec. 1959. 6 pp. armful mutual interference within a network of television broadcasting :ations can be suppressed by maintaining minimum spacings between terfering stations. The article gives directives for evaluating such pacings, taking into account appropriately that different kinds of inter-:rence differ in harmfulness. (Germany).

"Transmission of a Pulse Signal and Fluctuation Interference Through a Voltage Limiter and Integrator", B. N. Mityashev. "Radiot 14, No. 10. (1959.) 8 pp. The effect of interference can often be reduced by the use of a special voltage limiting stage. In this article the conditions under which such a stage produces an improvement in the signal to noise ratio at the integrator output are analyzed. It is assum that the voltage is fed to the input of the limiter from the output of a linear nonreactive detector, preceded by an ideal band-pass filter and that fluctuation noise has at the input of the filter a uniform spectral density. Limiting voltage level for a minimum noise to signal ratio ar given. (USSR.)

DATA OF INTEREST IN APRIL 1960 ISSUE PROCEEDINGS OF THE IRE

"Extraterrestrial Noise as a Factor in Space Communications" by Alex G. Smith, University of Florida, Gainesville, Fla.

The summary states: - "Present-day refinements in communicat systems make it appear that extraterrestrial noise sources may establ a fundamental limitation on long-range communications. The various mic and solar system radio sources are considered with respect to the intensities, spectral distributions, and temporal characteristics. The most severe forms of interference occur in the long-wavelength region of the radio-frequency spectrum, so that the future of space communic tions probably lies in the perfecting of low-noise microwave systems".

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

The summary states: - "The use of active and passive relays is considered for application to long-distance global trunk communication with particular emphasis on economic utilization of the media from the traffic capacity viewpoint. Active and passive techniques are compare with regard to power requirements, coverage, mutual interference, a ability to exploit wide-band modulation systems to reduce interference With the emphasis on microwave transmission, narrow beamwidths, and a multiplicity of relays, channel allocations of the future will nece sarily be determined by spatial considerations, in addition to specifyir frequency bands. Examples with typical global paths, and assumed ac and passive systems are illustrated. It is concluded that, although a great increase in transmission capacity is forecast with the new tech-niques, a much broader scope of coordination will be necessary to con trol interference".

"Signal-to-Noise Considerations for a Space Telemetry System" by R. W. Rochelle, National Aeronautics and Space Administration, Washington, D. C.

The summary is - "A Signal-to Noise comparison is given betwe the pulse-frequency channels and the pulse-width channels for the FM/ PDMAM telemetry system. It is shown that the pulse-frequency chan-nels have either a higher signal-to-noise ratio or greater information rate capability than the pulse-width channels".

IRE Transactions on Communications Systems , December 1959

"The Effects of Low-Noise Techniques on Tropospheric Scatter Communications" by A. Feiner and D. Savage

The summary states: - "The development of new low-noise ampl fiers has changed the emphasis in communication system design from considerations of receiver noise to considerations of external noise. The noise level of a maser can be as little as one-thousandth that of a conventional amplifier. The question arises how much of this improv ment is actually realized in an operating system and how much is lost to external noise. The answer has now been worked out at least for o type of system - a tropospheric scatter system operating in the 1000 t 2000 mc range. It has been found that the cooled-crystal technique wi provide a system improvement of 3 db, the parametric amplifier 9.5 and the maser 12 db. When the problems associated with liquid heliu operation of masers are taken into account, it appears that the param amplifier is the best choice".

Abstracts and References - Page 831

Circuits and Circuit Elements

"Noise of Resistors and Resistor Combinations without and with oad" - K. Lunze. (NachrTech., vol. 8, pp. 580-584; December 1958). oise due to current flow in carbon-film-type resistors is particularly onsidered. The increase over thermal noise is controlled by a factor hich depends on loading, film dimensions and the construction of the esistor; from this a formula derived which contains a constant dependnt on film material".

"Contribution to the Theory of Noisy Quadripoles - R. Paul, NachrTech., vol. 8, pp. 548-568, December, 1958). Detailed consieration of the parameters which determine the noise figure, particuarly of transistors. The effect of circuit configuration on noise figure discussed and typical circuit parameters for thermal-noise networks re tabulated. The noise characteristics of a single-stage transistor mplifier are investigated."

Page 833 - Geophysical and Extraterrestrial Phenomena

"Cosmic Radio Noise Absorption on 25 Mc/s and F. Scatter - K. . Ramanathan and R. V. Bhonsle. (J. Geophys. Res., Vol. 64, pp. 635-1637; October 1959). A close connection is suggested between the bserved anomalous enhancement of scattered VHF signals and the postnset increase in the attenuation of cosmic noise".

Page 842 - Transmission

"Interference Area of a Transmitter for Tropospheric-Scatter adio Links - A. Chinni (Alta Frequenza, vol. 27, pp. 825-832; Deember, 1958.) A nomogram has been constructed for obtaining the stance from a transmitter at which the interference field intensity xceeds a certain level for 0.1 per cent of the time, for any given frequency, radiated power, antenna gain and radiation pattern."

"The Noise of Diodes" - W. Drechsel. (NachrTech., vol. 8, pp. 38-541; December, 1958). Fundamental causes of LF and HF noise in emiconductor diodes are considered and the choice of diode characteristics for optimum performance in static, dynamic, and mixer operaon is discussed".

NOISE VOLTAGE NOMOGRAM:

Electronic Design, April 13, 1960, carries a nomogram under the ove title by David P. Costa, Naval Material Laboratory, N. Y. Naval dipyard, Brooklyn, New York. The text states in part:

"Frequently encountered in the design of electronic circuitry and the measurement of noise figure components is the determination of ise voltage given by Nyquist's equation

$$E = (4 K T R dF)^{1/2}$$

where:

E = noise voltage of resistive element, uv
K = Boltzmann Constant (1.38×10^{-23}) joules/K
T = temperature of resistive element, K
R = resistance of element, ohms
dF = frequency bands, cps

The nomogram provides a quick means for solving the above uation if any three of the four variables are known."

TRANSISTOR NOISE:

Electronic Design, April 13, 1960, carries an extract of an article B. Schneider and M. J. O. Strutt, Archiv der Elektrischen Uebertragung, Vol. 13, No. 12, December 1959, pp. 495-502, under the above le. Three figures are given as follows:

"Figure 1 - Noise figure as a function of frequency for a germaum transistor (solid line) and predicted noise curve for a low-current nsity (dotted line).

Figure 2 - Equivalent circuit for noise calculation of an unsymetrical pn diode with a high-current density.

Figure 3 - Frequency dependence of the factor given in Eq. 2".

ITEMS OF INTEREST IN PROCEEDINGS OF THE IRE, JANUARY 1960

On page 130 are the following items of interest:

INTERFERENCE - A LOOK AT THE OUNCE OF PREVENTION
by - N. H. Shepherd and A. C. Giesselman

"One of the major interference problems in the field of vehicular communications is brought about by the concentration of a number of base station installations in a relatively small area, or even at the sam antenna site. Most cases of interference resulting from such multiple installations are difficult to analyze after the fact. A method is describ for predicting such interference before it occurs. Furthermore, as a method for alleviating radio interference problems due to frequency and geographic congestion, a technique is suggested for processing new applications for frequency assignment".

A REPORT ON INTERFERENCE CAUSED BY INTERMODULATION PRODUCTS GENERATED IN OR NEAR LAND MOBILE TRANSMITTERS - by N. H. Shepherd

"This report is a condensation of published papers combined with unpublished information on the subject of intermodulation products gene ration and interference created in or near land mobile transmitters. The following papers have been used in preparation of this report:

Radio Report No. 50, 'Investigation of Intermodulation Interferen in the 100-108 Mc/S Mobile Radio-Telephone Service'. Report prepare by C. H. Sturton assisted by G. J. Campbell and B. T. Harnett of the New Zealand Post Office.

'Interference Due to Intermodulation Products UHF Maritime Service', Special Committee No. 36 of the RTCM.

N. H. Shepherd, 'Bi-Dimensional Interference Analysis', Proceedings of the Third Conference on Radio Interference Reduction.

Each of these papers provides excellent material that is useful as a continual reminder of the effects of interference and practical techniques for tracking down and reducing interference. A particular type of interference, intermodulation, is troublesome to locate since it can be generated in a variety of devices".

FM INTERFERENCE AND NOISE-SUPPRESSION PROPERTIES OF THE OSCILLATING LIMITER
by - E. J. Baghdady

"An amplitude limiter with regenerative feedback can, under appropriate conditions, provide an effective tool for suppressing interference from undesired signals, as well as inter-station noise. The amount of positive narrow-band feedback that is prescribed for marked improvement in the stronger-signal capture performance causes the limiter to oscillate in the absence of an input signal. Although oscillatic results in automatic noise squelch, it also imposes limitations on the frequencies and minimum amplitudes of receivable signals, in the form of a locking frequency range and a locking threshold. The alleviation of these limitations requires careful design of the feedback phase characteristic. The theoretical discussion is followed by a summary of experimental data which brings out several important aspects of oscillating-limiter operation".

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On page 142 - WIDE-BAND RADIO-INTERFERENCE SUPPRESSION EQUIPMENT FOR LIFE INSTALLATIONS AND SCREENED ROOMS - M. Ortloff. (Electrotech. Z., Edn. B, vol. 11, pp. 136-39, April 21, 1959.)

"Various types of interference suppressors conforming to the German VDE specifications are described. They include units giving 60 db suppression in the range 150 kc-30 mc, and 80-100 db in the range 30-1000 mc, and adaptors to extend the range to lower and higher frequencies, e.g. for mains interference suppression in screened test enclosures".

PAPERS OF INTEREST AT U.R.S.I. - I.R.E. JOINT MEETING:

The following are some of the papers to be given at the URSI-IRE Joint Meeting to be held May 3-4, 1960 at the Sheraton-Park Hotel,

Washington, D. C.:

"The Protection of Frequencies for Radio Astronomy" by J. W. Findlay, The National Radio Astronomy Observatory, Green Bank, W. Virginia.

"Generated Lightning Atmospherics Researches" by E. A. Lewis, Air Force Cambridge Research Center; and M. M. Newman, J. R. Stahmann, and J. D. Robb, all of Lightning and Transients Research Institute, Minneapolis, Minnesota.

"A Sferic Incidence Azimuth Meter for Severe Thunderstorms" by D. C. Scouten, and H. L. Jones, Oklahoma State University, Stillwater, Oklahoma

"Some Measurements of Atmospheric Noise Levels at Low and Very Low Frequencies in Canada" by C. A. McKerrow, Department of National Defense, Defense Res. Board, Ottawa, Canada.

"A Comparison of Man-Made Radio Noise with Noise of Natural Origin at Several Feed Locations" by W. Q. Crichlow and R. T. Disney, National Bureau of Standards, Boulder, Colorado

"Bandwidth Conversion of Amplitude Probability Distribution of Atmospheric Radio Noise" by W. Q. Crichlow, A. D. Spaulding, and C. J. Roubique -- National Bureau of Standards, Boulder, Col

"Effects of Terrestrial Electromagnetic Disturbances on Wireline Communications" by R. Sanders, Hughes Communications Division, P. A. Box 90902, Los Angeles 45, California.

A METHODOLOGY FOR INTERFERENCE PREDICTION:

In Electronic Design, March 16, 1960, is an article on RFI with he above title by W. B. Floyd, Melpar, Inc., Boston, Massachusetts. The sub-head states:

"A description of a methodology for defining interference, contructing a model, and then utilizing coarse data as a means of predicting interference."

PREDICTION OF TRANSMITTER INTERMODULATION FROM SIMPLE MEASUREMENTS:

Also, in Electronic Design, March 16, 1960, appears another rticle on RFI with the above title by R. N. Bailey and C. E. Blakely, Georgia Institute of Technology, Engineering Experiment Station, Atanta, Georgia. The subhead states:

"The radiated intermodulation spectrum from a transmitter, due o another nearby transmitter, can be determined before an installation s made. By using data from a few simple measurements to predict nterference levels, expensive relocation and reassignment of transitters can be avoided."

SOLVING NOISE PROBLEMS IN DIGITAL COMPUTER MEMORIES:

An article with the above title appears in the March 25, 1960 issue f Electronics by A. H. Ashley and E. U. Cohler of Sylvania Electric roducts, Inc., Needham, Massachusetts. The sub-head states:

"Computer reading and writing should occur when the signal-to-Noise ratio is highest. Strobing pulses define these times. Instead of using a strobe pulse that is derived from the computer's clock, this System uses a drive-sampling core to generate precisely-defined strobes".

FCC CONTROL OF RFI:

In the March 30, 1960 issue of Electronic Design is an article with ne above title by Jules Deitz of the Federal Communications Commision, Silver Spring, Maryland. The sub-head states:

"The radio spectrum, bursting at the seams with activity is additionally burdened by a multitude of extraneous emissions. While the resent state of the art is not conducive to FCC control of lightning trokes and stellar emissions, the Commission is intent on thwarting man's contribution to the pollution of the radio spectrum".

GUIDING OF ELECTROMAGNETIC WAVES BY UNIFORMLY ROUGH SURFACES:

The IRE Transactions on Antennas and Propagation, December, 1959, Volume AP-7, carries an article under the above title by James R. Wait, of the National Bureau of Standards, Boulder, Colorado. The summary states:

"A simple derivation is given for the reflection of electromagnet waves from a perfectly-conducting plane surface which has a uniform distribution of hemispherical bosses whose electrical constants are ar bitrary. The spacing between the centers of the bosses is taken to be small, which is the justification for neglecting the incoherent radiation An approximate boundary condition is developed which must be satisfie in an average sense by the tangential fields on the reference plane.

The excitation of surface waves on the rough surface is then discussed. It is indicated that to a first order, a rough surface of the kind described here possess an inductive surface reactance and will support a trapped wave. The effect of finite conductivity of the bosses is to damp exponentially this trapped wave".

THE PROPAGATION OF ELECTROMAGNETIC WAVES IN IONIZED GASES:

The IRE Transactions on Antennas and Propagation, December, 1959, Volume AP-7, also, carries an article under the above title by F. H. Northover, Dept. of Mathematics, Carleton University, Ottawa, Canada. The summary states:

"Recent studies lend support to the theory that whistling atmosph ics are caused by lightning flashes, the electromagnetic energy radiat by these being guided along discrete columnar ionic irregularities whi follow approximately the lines of force of the earth's magnetic field. Part I, the theoretical problems that arise are set forth and a general wave theory is developed which is first applied to the problem of propa gation through homogeneous compound streaming media. In Part II, t simplest case of 'standard type' propagation along stationary columns carefully examined, both for columns with a central ionic surplus and columns with a central ionic deficiency. Although both types of colum can guide electromagnetic energy when sufficiently well developed, it appears that the former type is a much more likely mechanism for the whistler propagation than the latter. In Part III, an attempt is made t show how a systematic theory might be developed for the case of axiall moving columns. It is hoped in subsequent papers to further extend th theory and also to deal with propagation of a more general type of dist ances along the columns".

FANO, CHU, ADLER WRITE TWO BOOKS FOR SPECIAL MIT E. E. PROGRAM:

John Wiley & Sons, Inc., 440 Park Avenue, South, New York 16, N. Y. announces the two following books:

"Electromagnetic Fields, Energy, and Forces" by M. I. T.'s Robert M. Fano, Lan Jen Chu, and Richard B. Adler - Price: $12.00.

"Electromagnetic Energy Transmission and Radiation" - by Adler, Chu, and Fano - Price: $14.50.

CALCULATION OF NOISE IN RADIO RECEIVERS:

Electronic Industries, April 1960, page 191, carried the followir description of the above paper by I. M. Ainbinder, "Radiotekh," V. 15 No. 1 (1960). 12 pp:

"On the basis of the reciprocity theorem and the fact that the noi level of linear systems is independent of output loading, design formul were developed for calculating noise in radio receivers including their antennas and feeder devices. The calculation method used permits one to determine the total noise in linear passive networks both with lumpe and distributed constants, and obtain simple formulas for calculating antenna noise including cosmic radiations noise and thermal noise due the surrounding media, the ground and other sources. With certain re servations this method can also be used for calculating noise in active networks. Instead of the normal noise factor the author uses the 'nois level factor' which is proportional to the level of the internal noise of the circuits under consideration. (U.S.S.R.)"

MORE ON TRANSACTIONS - - - CALL FOR PAPERS

The first special issue will be devoted to the topic "Human Factors in Reliability and Maintenance" and will appear in January 1961.

This special issue will follow the next general issue to appear September, 1960 and mentioned earlier in this newsletter. Guest Editors for this special issue are E. M. Bennett and J. W. Degan. Papers should be receive d by the Guest Editor by 15 September 1960. In March 1961 the second special issue on the topic "Automation of Human Functions" will be published. Guest Editor is T. Marill. Papers should be received by the Guest Editor by 15 October 1960. The special issues will not be devoted exclusively to the subject topic. Contributed papers and communications for these issues on other subjects are also invited.

The Maintenance and Reliability issue will contain papers dealing with theoretical and experimental studies of human factors aspects of reliability and maintenance problems, with development and application of human factors techniques and knowledge relevant to these problems, and with operational maintenance problems. Authors are invited to submit such papers for publication. They should be sent to E. M. Bennett, The Mitre Corporation, Lexington, Massachusetts.

"Automation of Human Functions" is to be understood as including all techniques whereby the load on the human operator of electronic systems may be assumed through increased automation of his task. Automatic pattern recognition, problem solving, and decision making are examples of subjects included in this topic. Papers need not make original contributions but may review material already published. Manuscripts should be sent to Thomas Marill, Bolt Beranek and Newman Inc., 50 Moulton Street, Cambridge, Massachusetts.

NEWSLETTER
IRE PROFESSIONAL GROUP ON
RADIO FREQUENCY INTERFERENCE
1 EAST 79 STREET, NEW YORK 21, N. Y.