Technical Publications by Bell System Authors Other Than in the Bell System Technical Journal

*Progress in Coaxial Telephone and Television Systems.** L. G. ABRAHAM.[1] *A.I.E.E., Trans.*, V. 67, pt. 2, pp. 1520–1527, 1948.

ABSTRACT—This paper describes coaxial systems used in the Bell System to transmit telephone and television signals. Development of this system was started some time ago, with systems working before the war between New York and Philadelphia and later between Minneapolis, Minnesota and Stevens Point, Wisconsin. Various stages in the progress of this development have been described in previous papers and the telephone terminal equipment has been recently described. This paper will outline how the system works and discuss some transmission problems, leaving a complete technical description for a number of later papers.

Use of the Relay Digital Computer. E. G. ANDREWS and H. W. BODE.[1] *Elec. Engg.*, V. 69, pp. 158–163, Feb., 1950.

ABSTRACT—This paper is concerned primarily with the operating features of the computer and its application to problems of scientific and engineering interest. The material herein has been derived largely from the experience gained with one of the computers during a trial period of about 5 months before final delivery. An effort was made during that time to try the machine out on a variety of difficult computing problems of varying character to obtain experience in its operation and to establish as well as possible what its range of usefulness might be.

Longitudinal Noise in Audio Circuits. H. W. AUGUSTADT and W. F. KANNENBERG.[1] *Audio Engg.*, V. 34, pp. 18–19, Feb., 1950.

ABSTRACT—The words "longitudinal interference" have often been used to explain the origin of unknown noise in audio circuits with little actual regard to the source of the interference. In this respect, the usage of these words is similar to the popular usage of the word "gremlins". We attribute to gremlins troubles whose causes are unknown without much attempt to delve deeper into the matter. Similarly in the audio facilities field, many noise troubles are attributed to "longitudinal interference" or "longitudinals" or even simply "line noise" without a clear understanding of the nature of the trouble or the actual meaning of the terms. The noise trouble, however, still persists irrespective of the name applied to it until its causes are thoroughly understood and the correct remedial action is applied. This

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paper describes and illustrates, with representative examples, various types of common noise induction in order to lead to an understanding of their nature. The paper includes, in addition, a discussion of simple remedies which may be employed for representative cases of noise troubles due to longitudinal induction.

Mobile Radio. A. BAILEY.[3] *A.I.E.E., Trans.*, V. 67, pt. 2, pp. 923–931, 1948.

*Stabilized Permanent Magnets.** P. P. CIOFFI.[1] *A.I.E.E., Trans.*, V. 67, pt. 2, pp. 1540–1543, 1948.

ABSTRACT—Permanent magnets are stabilized against forces tending to demagnetize them, by partial demagnetization. It is shown that, after such stabilization, the magnet operates at a point on a secondary demagnetization curve. This curve may be treated identically as the major demagnetization curve is treated in ordinary magnet design problems. Formulas are developed for determining secondary demagnetization curves from the major demagnetization curve when stabilization is achieved by magnetization of the magnet before assembly, and by an applied magnetomotive force after magnetization in assembly.

It will be shown that, when the magnet is partially demagnetized for the purpose of stabilization, its operating point lies on a curve which, for convenience, will be called a secondary demagnetization curve. The object of this paper is to discuss the derivation of secondary demagnetization curves for given conditions of stability against demagnetizing forces and their applications to magnet design problems.

*Relay Preference Lockout Circuits in Telephone Switching.** A. E. JOEL, JR.[1] *A.I.E.E., Trans.*, V. 67, pt. 2, pp. 1720–1725, 1948.

ABSTRACT—Occasions arise in telephone switching, particularly at common controlled stages, where calls compete for the use of equipment components or switching linkages. These call requests for service are received at random by circuits which must choose among and serve them on a one-at-a-time basis. Circuits which perform this function are known as "preference lockouts". Extensive use has been made of these circuits in manual, panel, and crossbar switching systems. This paper describes the design philosophies of relay preference lockout circuits based on some of these applications.

Piezoelectric Crystals and Their Application to Ultrasonics. W. P. MASON.[1] *Book*, New York, Van Nostrand, 508 pages, 1950.

*Television Terminals for Coaxial Systems.** L. W. MORRISON, JR.[1] *Elec. Engg.*, V. 69, pp. 109–115, February, 1950.

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ABSTRACT—The broad features of operation of the L1 Coaxial System for the transmission of television have been discussed in a recent paper (L. G. Abraham, "Progress in Coaxial Telephone and Television Systems", AIEE Transactions, Vol. 67, pp. 1520–1527, 1948). It is the purpose of this paper to describe, in somewhat more detail, the factors influencing the design of the coaxial television terminals and the features of the equipment now in service in the Bell System's Television Network. The television terminals here described were placed into network service in 1947, but in basic form are similar to experimental models developed prior to the war and used in early television transmission studies over the coaxial cable.

Alternate to Lead Sheath for Telephone Cables. A. PAONE.[3] *Corrosion,* V. 6, pp. 46–50, February, 1950.

*Bridge Erosion in Electrical Contacts and Its Prevention.** W. G. PFANN.[1] *A.I.E.E., Trans.,* V. 67, pt. 2, pp. 1528–1533, 1948.

ABSTRACT—The size of the molten bridge which forms as two contacts separate depends upon the contact material and the current. The molten bridge has two diameters, one in each contact. By pairing dissimilar contact materials an asymmetric bridge is created, in which the bridge diameters are unequal and with which is associated a self-limiting transfer tendency. Under certain conditions the use of unlike pairs can prevent the continued transfer of material from one contact to the other.

*Chess-playing Machine.** C. E. SHANNON.[1] *Sci. Am.,* V. 182, pp. 48–51, February, 1950.

*Military Teletypewriter Systems of World War II.** F. J. SINGER.[1] Bibliography. *A.I.E.E., Trans.,* V. 67, pt. 2, pp. 1398–1408, 1948.

ABSTRACT—This paper reviews the evolution of military teletypewriter communications since 1941 and briefly describes some of the important systems that were developed during the war by Bell Telephone System engineers for the armed forces.

*Optimum Coaxial Diameters.** P. H. SMITH.[1] *Electronics,* V. 23, pp. 111–112, 114, February, 1950.

ABSTRACT—The derivation of the optimum ratios is briefly described and optimum values are indicated to one part in ten thousand. In all cases the medium between conductors is assumed to be a gas with a dielectric constant approaching unity, and any effect of inner conductor supports upon the optimum conductor diameter ratio for a given property has been neglected.

*General Review of Linear Varying Parameter and Nonlinear Circuit Analysis.** W. R. BENNETT.[1] *I.R.E., Proc.,* V. 38, pp. 259–263, March, 1950.

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ABSTRACT—Variable and nonlinear systems are classified from the standpoint of their significance in communication problems. Methods of solution are reviewed and appropriate references are cited. The paper is a synopsis of a talk given at the Symposium on Network Theory of the 1949 National I.R.E. Convention.

Some Early Long Distance Lines in the Far West. W. BLACKFORD, SR.[4] and J. F. HUTTON.[4] *Bell Tel. Mag.*, V. 28, pp. 227–237, Winter, 1949–50.

*Radio Propagation Variations at VHF and UHF.** K. BULLINGTON.[1] *I.R.E., Proc.*, V. 38, pp. 27–32, January, 1950.

ABSTRACT—The variations of received signal with location (shadow losses) and with time (fading) greatly affect both the usable service area and the required geographical separation between co-channel stations. An empirical method is given for estimating the magnitude of these variations at vhf and uhf. These data indicate that the required separation between co-channel stations is from 3 to 10 times the average radius of the usable coverage area, and depends on the type of service and on the degree of reliability required. The application of this method is illustrated by examples in the mobile radiotelephone field.

*Speaking Machine of Wolfgang von Kempelen.** H. DUDLEY[1] and T. H. TARNOCZY. *Acoustical Soc. Am., Jl.*, V. 22, pp. 151–166, March, 1950.

Perception of Speech and Its Relation to Telephony. H. FLETCHER[1] and R. H. GALT.[1] *Acoustical Soc. Am., Jl.*, V. 22, pp. 89–151, March, 1950.

ABSTRACT—This paper deals with the interpretation aspect and how it is affected when speech is transmitted through various kinds of telephone systems.

Vacuum Fusion Furnace for Analysis of Gases in Metals. W. G. GULDNER[1] and A. L. BEACH.[1] *Anal. Chem.*, V. 22, pp. 366–367, February, 1950.

Complex Stressing of Polyethylene. I. L. HOPKINS,[1] W. O. BAKER[1] and J. B. HOWARD.[1] *Jl. Applied Phys.*, V. 21, pp. 206–213, March, 1950.

Noise Considerations in Sound-Recording Transmission Systems. F. L. HOPPER.[2] References. *S.M.P.E., Jl.*, V. 54, pp. 129–139, February, 1950.

*Radiation Characteristics of Conical Horn Antennas.** A. P. KING.[1] *I.R.E., Proc.*, V. 38, pp. 249–251, March, 1950.

ABSTRACT—This paper reports the measured radiation characteristics of conical horns employing waveguide excitation. The experimentally derived gains are in excellent agreement with the theoretical results (unpublished) obtained by Gray and Schelkunoff.

The gain and effective area is given for conical horns of arbitrary proportions and the radiation patterns are included for horns of optimum design.

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All dimensional data have been normalized in terms of wavelength, and are presented in convenient nomographic form.

Microwaves and Sound. W. E. KOCK.[1] *Physics Today*, V. 3, pp. 20–25, March, 1950.

ABSTRACT—A recent development shows that obstacle arrays, modeled after the periodic structure of crystals, refract and focus not only electromagnetic waves, but sound waves as well. The behavior of periodic structures can be investigated by microwave and acoustic experiments on such models.

Interference Characteristics of Pulse-Time Modulation. E. R. KRETZMER.[1] *I.R.E., Proc.*, V. 38, pp. 252–255, March, 1950.

ABSTRACT—The interference characteristics of pulse-time modulation are analyzed mathematically and experimentally; particular forms examined are pulse-duration and pulse-position modulation. Both two-station and two-path interference are considered. Two-station interference is found to be characterized by virtually complete predominance of the stronger signal, and by noise of random character. Two-path interference, in the case of single-channel pulse-duration modulation, generally permits fairly good reception of speech and music signals.

*Electron Bombardment Conductivity in Diamond.** K. G. MCKAY.[1] *Phys. Rev.*, V. 77, pp. 816–825, March 15, 1950.

*Perception of Television Random Noise.** P. MERTZ.[1] References. *S.M.P.E., Jl.*, V. 54, pp. 8–34, January, 1950.

ABSTRACT—The perception of random noise in television has been clarified by studying its analogy to graininess in photography. In a television image the individual random noise grains are assumed analogous to photographic grains. Effective random noise power is obtained by cumulating and weighting actual noise powers over the video frequencies with a weighting function diminishing from unity toward increasing frequencies. These check reasonably well with preliminary experiments. The paper includes an analysis of the effect of changing the tone rendering and contrast of the television image.

*Loudness Patterns—A New Approach.** W. A. MUNSON[1] and M. B. GARDNER.[1] *Acoustical Soc. Am., Jl.*, V. 22, pp. 177–190, March, 1950.

Bell System Participation in the Work of the A.S.A. H. S. OSBORNE.[3] *Bell Tel. Mag.*, V. 28, pp. 181–190, Winter, 1949–50.

*New Electronic Telegraph Regenerative Repeater.** B. OSTENDORF, JR.[1] *Elec. Engg.*, V. 69, pp. 237–240, March, 1950.

Correlation of Gieger Counter and Hall Effect Measurements in Alloys Con-

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*taining Germanium and Radioactive Antimony 124.** G. L. PEARSON,[1] J. D. STRUTHERS,[1] and H. C. THEURER.[1] *Phys. Rev.*, V. 77, pp. 809–813, March 15, 1950.

*Optical Method for Measuring the Stress in Glass Bulbs.** W. T. READ.[1] *Applied Phys., Jl.*, V. 21, pp. 250–257, March, 1950.

Programming a Computer for Playing Chess. C. E. SHANNON.[1] References. *Phil. Mag.*, V. 41, pp. 256–275, March, 1950.

ABSTRACT—This paper is concerned with the problem of constructing a program for a modern electronic computer of the EDVAC type which will enable it to play chess. Although perhaps of no practical importance the question is of theoretical interest, and it is hoped that a satisfactory solution of this problem will act as a kind of wedge in attacking other problems of a similar nature and of greater significance.

Recent Developments in Communication Theory. C. E. SHANNON.[1] *Electronics*, V. 32, pp. 80–83, April, 1950.

ABSTRACT—In this paper the highlights of this recent work will be described with as little mathematics as possible. Since the subject is essentially a mathematical one, this necessitates a sacrifice of rigor; for more precise treatments the reader may consult the references.

A Symmetrical Notation for Numbers. C. E. SHANNON.[1] *Am. Math. Monthly*, V. 57, pp. 90–93, February, 1950.

*Capacity of a Pair of Insulated Wires.** W. H. WISE.[1] *Quart. Applied Math.*, V. 7, pp. 432–436, January, 1950.

*Echoes in Transmission at 450 Megacycles from Land-to-Car Radio Units.** W. R. YOUNG, JR.[1] and L. Y. LACY.[1] *I.R.E., Proc.*, V. 38, pp. 255–258, March, 1950.

*Simplified Derivation of Linear Least Square Smoothing and Prediction Theory.** H. W. BODE[1] and C. E. SHANNON.[1] *I.R.E., Proc.*, V. 38, pp. 417–425, April, 1950.

ABSTRACT—In this paper the chief results of smoothing theory will be developed by a new method which, while not as rigorous or general as the methods of Wiener and Kolmogoroff, has the advantage of greater simplicity, particularly for readers with a background of electric circuit theory. The mathematical steps in the present derivation have, for the most part, a direct physical interpretation, which enables one to see intuitively what the mathematics is doing.

*Helix Parameters Used in Traveling Wave-Tube Theory.** R. C. FLETCHER.[1] *I.R.E., Proc.*, V. 38, pp. 413–417, April, 1950.

ABSTRACT—Helix parameters used in the normal mode solution of the traveling-wave tube are evaluated by comparison with the field equations

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for a thin electron beam. Corresponding parameters for a thick electron beam are found by finding a thin beam with approximately the same r-f admittance.

*Effect of Change of Scale on Sintering Phenomena.** C. HERRING.[1] *Jl., Applied Phys.*, V. 21, pp. 301–303, April, 1950.

ABSTRACT—It is shown that when certain plausible assumptions are fulfilled simple scaling laws govern the times required to produce, by sintering at a given temperature, geometrically similar changes in two or more systems of solid particles which are identical geometrically except for a difference of scale. It is suggested that experimental studies of the effect of such a change of scale may prove valuable in identifying the predominant mechanism responsible for sintering under any particular set of conditions, and may also help to decide certain fundamental questions in fields such as creep and crystal growth.

*Mode Conversion Losses in Transmission of Circular Electric Waves Through Slightly Non-Cylindrical Guides.** S. P. MORGAN, JR.[1] *Jl., Applied Phys.*, V. 21, pp. 329–338, April, 1950.

ABSTRACT—A general expression is derived for the effective attenuation of circular electric (TE_{01}) waves owing to mode conversions in a section of wave guide whose shape deviates slightly in any specified manner from a perfect circular cylinder. Numerical results are in good agreement with experiment for the special case of transmission through an elliptically deformed section of pipe. The case of random distortions in a long wave guide line is analyzed and it is calculated, under certain simplifying assumptions, that mode conversions in a 4.732-inch copper pipe whose radius deviates by 1 mil rms from that of an average cylinder will increase the attenuation of the TE_{01} mode at 3.2 cm by an amount equal to 20% of the theoretical copper losses. The dependence on frequency of mode conversion losses in such a guide is discussed.

Acoustical Designing in Architecture. C. M. HARRIS[1] and V. O. KNUDSEN. *Book*, New York, John Wiley & Sons, Inc., 450 pages, 1950.

ABSTRACT—This book is intended as a practical guide to good acoustical designing in architecture. It is written primarily for architects, students of architecture, and all others who wish a non-mathematical but comprehensive treatise on this subject. Useful design data have been presented in such a manner that the text can serve as a convenient handbook in the solution of most problems encountered in architectural acoustics.

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