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Single-Sidebands in Communication Systems

A Bibliography

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OFFICE OF TECHNICAL SERVICES

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Part I

SINGLE-SIDEBANDS IN COMMUNICATION SYSTEMS

A Bibliography

Compiled by Mildred Benton

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NAVAL RESEARCH LABORATORY
Washington, D.C.

CONTENTS

Preface

Utilization of the single-sideband method of transmission in communication systems was conceived in 1915. Early tests showed that advantages could be attained over the conventional double-sideband operation. Single-sideband, suppressed carrier transmission provides a means of obtaining economy of spectrum, savings in power and reduction of selective fading. Since 1915 considerable effort has been devoted to the study and evaluation of single-sideband characteristics and to the development of single-sideband techniques. Many technical and popular articles have been written on the subject, the earliest recorded in this bibliography being the classic one by Colpitts and Blackwell which appeared in the Transactions of the American Institute of Electrical Engineers during 1921.

Scope

This bibliography represents an attempt to record the classified and unclassified literature on the subject, including periodical articles, books and research reports. The period covered is 1921-July 1956. Some articles, with emphasis on high-frequency crystal units and crystal lattice filters, are cited, due to the fact that development in single-sideband tuning has depended on advances in the quartz crystal manufacturing art.

Arrangement

In order to make the majority of the literature references, which are unclassified, freely available, the bibliography is presented in two parts. Part I includes the unclassified references (492 items); and Part II (classified SECRET) includes the classified references (62 items). The latter part may be obtained through the usual channels utilized for procuring classified material.

References are listed chronologically by author; research reports by corporate authors, and periodicals and books by personal authors. An author index appears on pages 91 to 95; a subject index on pages 96 to 99.

For periodical references, the normal form of entry is author, title, and journal, volume, pagination, and date, followed by a brief annotation, or abstract quoted from an abstracting journal. Abbreviations for journal titles are based on those used by the Library of Congress. A list of these abbreviations together with the journals which they represent appears on the pages immediately following the Preface.

The form of entry for books is author, title, pagination, place of publication, publisher and year.

Research reports are recorded in a similar manner except that place of publication follows the corporate author. The report number is also included, following date of publication, as well as the contract number, for sake of convenience in ordering or borrowing; and the security classification.

The majority of references have been examined. When examination was not possible, due to non-availability of the periodicals, entries located in abstracting journals were used. Because of this fact, some foreign language articles are recorded in English rather than in the original language. In every such instance, however, a note indicates the language in which the article is written.

Sources Consulted

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Annales des Télécommunications, 1946 - June 1956.
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Wireless Engineer, 1930 - June 1956.
and the Catalogs of the Technical Information Division, Library of Congress; the Bibliographic Research Section, Bureau of Aeronautics; and the Naval Research Laboratory.

Acknowledgment

Special thanks are due Mrs. Kathryne Kozak for assistance in finding material, and for preparing the author index and typing the bibliography.

Abbreviations Used in Citations to Periodicals

The following is a list of abbreviations used in citing references to periodicals, followed by the complete title of the periodical.

AWA Tech. Rev.	Amalgamated Wireless (Australia) Technical Review
Alta Freq.	Alta Frequenza
Am. Inst. Elec. Engrs. Trans.	American Institute of Electrical Engineers, Transactions
Ann. Radioelec.	Annales de Radioelectricité
Arch. Elek. Ubertrag.	Archiv der Elektrischen Ubertragung
Assoc. Computing Mach. J.	Association of Computing Machinery. Journal
Bell Lab. Record	Bell Laboratory Record
Bell Sys. Tech. J.	Bell System Technical Journal
Brown Boveri Rev.	Brown Boveri Review
Cables & Transm.	Cables & Transmission
Communs.	Communications
Communs. Engr.	Communications Engineer
Communs. News	Communications News
Dissertation A.	Dissertation Abstracts
Elec. Communs.	Electrical Communications
Elec. Rev.	Electrical Review
Elec. World	Electrical World
Electronic Eng.	Electronic Engineering
Elektrotech. Z.	Elektrotechnische Zeitschrift
Ericsson Rev.	Ericsson Review
Fernmeldetech. Z.	Fernmeldetechnische Zeitschrift
Field Engrs. Electronics Dig.	Field Engineers Electronics Digest
Franklin Inst. J.	Franklin Institute Journal
Funk-Tech.	Funk-Technik
Funktech. Mn.	Funktechnische Monatshefte
Génie Civ.	Génie Civil
Hochfrequtech. u. Elektroakust.	Hochfrequenztechnik u. Elektroakustik

Indian Inst. Sci. J.	Indian Institute of Science. Journal
Inst. Elec. Engrs. J.	Institute of Electrical Engineers. Journal
Inst. Radio Engrs. J. (Australia)	Institute of Radio Engineers (Australia) Journal
Inst. Radio Engrs. Proc.	Institute of Radio Engineers. Proceedings
Inst. Radio Engrs. Trans. Aero-naut. Navigational Electronics	Institute of Radio Engineers. Professional Group on Aeronautical and Navigational Electronics
Inst. Radio Engrs. Trans. CS	Institute of Radio Engineers. Professional Group on Communication Systems
Izvest. Elektroprom. Slab. Toka.	Izvestia Elektropromishlennocti Slabovo Toka
Marconi Rev.	Marconi Review
Onde Elec.	Onde Electrique
Philips Tech. Rev.	Philips Technical Review
Post Off. Elec. Engrs. J.	Post Office Electrical Engineers. Journal
Radio & TV News	Radio & Television News
Radio-Electronic Eng.	Radio-Electronic Engineering
RCA Rev.	RCA Review
Res. for Ind.	Research for Industry
Rev. Gen. Elec.	Revue Générale d'Electricité
Rev. Tech. C. F. T. H.	Revue Technique des Departements Radio de la Compagnie Francaise Thomas-Houston
Signal Corps Eng. Lab. Res. & Devlpmt.	Signal Corps Engineering Laboratory. Research and Development.
Soc. Fran. Elec. Bull.	Société Francaise des Electriciens. Bulletin
Sylvania Technol.	Sylvania Technologist
TV Eng.	Television Engineering
TV Soc. J.	Television Society. Journal
Tech. Mitt. Schweiz. Telegr. Teleph. verw.	Technische Mitteilungen Schweizerische Post Telegraphen und Telephonverwaltung
Telefunken Ztg.	Telefunken Zeitung

Telegr. Fernspr. u. Funktech.	Telegraphen Fernsprech und Funk-Technik
Telegr. u. Fernspr. Tech.	Telegraphen und Fernsprech Technik
Tele-Tech & Electronic Inds.	Tele-Tech & Electronic Industries
U.S. Patent Off. Off. Gaz.	U.S. Patent Office. Official Gazette
Veröff. Nachricktentechnik	Veröffentlichungen aus dem Gebiet der Nachrichtentechnik
Wireless Engr.	Wireless Engineer
Wireless World & Radio Rev.	Wireless World & Radio Review

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SINGLE SIDEBANDS IN COMMUNICATION SYSTEMS

A Bibliography

1956

1. Brown, J.N. COMMERCIAL ASPECTS OF SINGLE SIDEBAND. Radio & TV News 56:55-57, 94, illus., Jly. 1956.

2. Collins Radio Co., Cedar Rapids, Iowa. SINGLE-SIDEBAND COMMUNICATIONS SYSTEM. 15 December 1955 - 15 April 1956. 137p., illus., 1956. (Quart. Rpt. 2) (Rpt. IDR-395-8) (Contract AF30(635)-4504)
Reports essential completion of planning phase; and engineering activity in design phase.

3. Crosby Laboratories, Inc., Hicksville, N.J. SINGLE-SIDEBAND SIGNAL GENERATOR STUDY, by R.T. Nelson. 28p., May 5, 1956. (Quart. Rpt. 1) (Contract DA36-039-sc-70163)
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4. Fink, D.G. DANGER! RADIO SPECTRUM IS BURSTING AT THE SEAMS. Franklin Inst. J. 261:477-493, May 1956.
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5. Fischer, K. and Reinmeidl, J. ZUSATZGERAT ZUM EINSEITEN-BAND-EMPFANG. Elektronik 5:126-129, illus., May 1956.
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6. George, R.W. ELECTROMECHANICAL FILTERS FOR 100-KC CARRIER AND SIDEBAND SELECTION. Inst. Radio Engrs. Proc. 44:14-18, illus., Jan. 1956.
The electromechanical filter, employing a series of mechanically resonant elements mechanically coupled together, is of particular interest in the communications field because of the greatly increased use of single-sideband systems.
This article is devoted to a general review and discussion of such filters.

7. Gunter, F. B. A HIGH-POWER LINEAR AMPLIFIER FOR SINGLE-SIDEBAND APPLICATIONS. Inst. Radio Engrs. Trans. CS-4:98-102, illus., May 1956.
Discusses the design of a high-power linear amplifier intended for use as a power amplifier for single-sideband transmitters.

8. Gunter, F. B. SSB HIGH-POWER AMPLIFIER DESIGN. Tele-Tech & Electronics Inds. 15:108-109, June 1956.

9. Hoisington, D. B. A THREE-BAND S.S.B. EXCITER USING A MECHANICAL FILTER. QST 40:26-31, illus., Jan. 1956.
The single-sideband exciter described used the Collins filter in a circuit arrangement combining practically all the operating features single-sideband experience has shown to be desirable.

10. Honey, J. F. THE PROBLEMS OF TRANSITION TO SINGLE-SIDEBAND TECHNIQUES IN AERONAUTICAL COMMUNICATIONS. Inst. Radio Engrs. Trans. Aeronaut. Navigational Electronics 3:10-16, Mar. 1956.
The transition problem; review of AM and single-sideband communication systems; equipment modifications for improved compatibility; and a sample transition procedure.

11. Klass, P. J. MILITARY, AIRLINES PUSH SINGLE SIDEBAND. Aviation Week 64:62-65, 67, illus., Apr. 30, 1956.
Covers compatibility, single-sideband advantages, types, problems, feasible techniques, bi-mode operation and an explanation of terms used in connection with single sideband.

12. Klass, P. J. SSB TRANSCEIVER: MORE POWER, CHANNELS. Aviation Week 64:75-79, illus., May 7, 1956.
Characteristics of the new HF receiver, the AN/ARC 58 which is expected to provide a 40-fold (16 db.) increase in effective power as compared with the double-sideband (DSB) sets now used for long-distance military and airline communications.

13. Pappenfus, E. W. AN AIRBORNE SINGLE-SIDEBAND RECEIVER. Inst. Radio Engrs. Trans. CS-4:94-97, May 1956.
Presents design philosophies and circuits to be used in proposed single-sideband equipment.

14. RADIO HANDBOOK. 14th ed., 761p., illus. Summerland, Calif., Editors and Engineers, Ltd., 1956.
Ch. 14. Single-sideband transmission.

15. SAC TO INSTALL SIDEBAND SYSTEM ON BOMBERS. Army-Navy-Air Force Register 77:6, June 16,1956.

Cites advantages in communications to be gained by use of single-sideband by Strategic Air Command.

16. Schramm, C. W. NEW MILITARY CARRIER TELEPHONE SYSTEMS. Bell Lab. Record 34:21-24, illus., Jan. 1956.

As a result of development work, the armed services now have available four- and twelve-channel cable carrier systems that can operate together and can be used with companion radio relay links.

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17. Stanford Research Institute, Stanford, Calif. A COMPARISON OF AMPLITUDE MODULATION AND SINGLE-SIDEBAND COMMUNICATIONS, by J. F. Honey. 6p., illus., Aug. 6, 1956.

The purpose of this paper is to examine the relative merit of amplitude modulation (AM) and single-sideband (SSB) communications systems with special attention to airborne applications.

18. WWV MODIFIES BROADCAST. Electnonics 29:192, Apr. 1956.

Except on 25 mc, the tone frequencies of 440 and 600 cps from WWV are being operated experimentally as single-upper-sideband with full carrier. Power output from the single sideband transmitter is about a third the carrier power.

1955

19. American Radio Relay League. THE RADIO AMATEUR'S HANDBOOK. 541p., illus. West Hartford, Conn., American Radio Relay League, 1955.

Ch. 12: Single sideband.

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20. Baches, R. SINGLE-SIDEBAND EQUIPMENT FOR CARRIER-FREQUENCY TRANSMISSION OF REMOTE-CONTROL SIGNALS ON HIGH-VOLTAGE LINES. Elektrotech. Z. 76:145-148, Feb. 11, 1955.

In German.

"Describes equipment conforming to the usual restriction of transmitted power to 10 W and bandwidth to 30-375 kc/s. Each channel requires a bandwidth of 2.5 kc/s and the equipment is designed to

provide up to 18 both-way channels. Terminal equipment and intermediate amplifier bays are described and illustrated." Sci. Abs. 58 B:2698, 1955.

21. Bloch, H. COMPARISON OF METHODS OF MODULATION USED IN CARRIER EQUIPMENT. Brown Boveri Rev. 42:298-302, illus., Jly/Aug. 1955.
Carrier links over high-voltage lines can be operated on amplitude or frequency modulation. The various methods of modulation used (single- and double-sideband and frequency modulation) possess quite different operational characteristics, which the author compares in the present article, devoting particular attention to the investigation of susceptibility to noise, distortion and cross-talk attenuation.

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23. Boveri, T. PROGRESS AND WORK IN 1954. Brown Boveri Rev. 42: 3-75, illus., Jan/Feb. 1955.
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24. Brown, Adamant and Levine, R.H. SINGLE SIDEBAND FOR MOBILE COMMUNICATION. Inst. Radio Engrs. (Australia) Proc. 16:12-17, Jan. 1955.
It is intended to point out the advantages of employing this method of communication and indicate the relative simplicity with which it may be accomplished.
Reprinted from Convention Record of the IRE, Pt. 2, 1953, p. 123-128.
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A description of the design of transmitter similar to that mentioned in the author's book in Single Sideband Techniques but with a little more power output and using a toroid filter for sideband selection.

26. Bruene, W. B. LINEAR POWER AMPLIFIER FOR SSB TRANSMITTERS. Electronics 28:124-125, illus., Aug. 1955.
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27. Collins Radio Co., Cedar Rapids, Iowa.
SSB AMATEUR EQUIPMENT. 15p., illus., 1955.
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28. Collins Radio Co., Cedar Rapids, Iowa.
SINGLE-SIDEBAND COMMUNICATION SYSTEM. 2p., Sept. 15, 1955. (Interim Letter Rpt. IDR-395-1) (Contract AF30(635)-4504)
Reports on engineering plans, orientation for project and design.

29. Collins Radio Co., Cedar Rapids, Iowa.
SINGLE-SIDEBAND COMMUNICATIONS SYSTEMS, 15 August - 15 December 1955. 180p., Dec. 15, 1955. (Quart. Rpt. 1) (Rpt. IDR-395-4) (Contract AF30(635)-4504)
Presents the proposed plan of attack for the Air Force Single-sideband program. Goes into considerable detail both in system arrangement and in the circuits used for the individual functions.

30. Deane, W. W. SIMPLE SINGLE-BAND PREAMPLIFIER. MORE GAIN FOR THE RECEIVER. QST 39:36, 118., Sept. 1955.

31. Eitel-McCullough, Inc., San Bruno, Calif.
SINGLE SIDEBAND. 19p., illus., 1955. (Application B. 9)
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32. Franke, Fritz. SINGLE-SIDEBAND SYSTEMS. Radio & TV News 54:114, illus., Dec. 1955.
Engineering details on commercially available single-sideband equipment.

33. General Electric Co. Heavy Military Electronic Department, Syracuse, N.Y.
BETTER COMMUNICATIONS WITH SYNCHRONOUS DETECTION, by J.P. Costas. 24p., diags., June 1955. (RNA-7562)
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34. Goodman, Byron. MODEL 370 SINGLE-SIDEBAND RECEIVING ADAPTER. QST 39:42-43,136, illus., Nov. 1955..
Describes the adapter which utilizes the basic McLaughlin principle with the addition of a few useful operating features explained by the writer.

35. Goodman, Byron. PARADOX: S.S.B. SPLATTER AND MODERN RECEIVERS. QST 60:43, Feb. 1955.
The writer directs attention to the fact that more attention is being paid to the reception of single-sideband phone signals.

36. Grammer, George. RIPPLE ON THE S.S.B. 'SCOPE PATTERN. QST 39:42-43, illus., Sept. 1955.

37. Griese, H.J. MOGLICHKEITEN ZUR ENTZERRUNG DER REST-SEITENBAND-UBERTRAGUNG DES FERNESEHENS. Fernmelde-tech. Z. 8:94-103, Feb. 1955.
In German.
Translated title: Possibilities of equalization in vestigial sideband transmission of television.
Outlines a method of measuring the attenuation and group-delay characteristics of vestigial sideband filters and presents results obtained on 3 transmitter filters and on 3 receivers, together with video output oscillograms obtained with 500 kc/s square-wave video inputs of several amplitudes.

38. Güttinger, R. and Müller, H. CARRIER LINE TRAPS AND THEIR EMPLOYMENT IN INTRICATE SYSTEMS. Brown Boveri Rev. 42: 303-309, illus., Jly/Aug. 1955.
The article discusses certain aspects of the theory, tuning, dimensions, and application of the various types of trap produced by Brown Boveri.
The type of trap suitable for use with two parallel single-sideband links is suggested on p. 308.

9. Hall, J.R. A PHASE ROTATION SINGLE-SIDEBAND GENERATING SYSTEM. RCA Rev. 16:43-51, Mar. 1955.

A system is described in which a single control in one phase branch of the modulating circuit is used to maintain the amount of sideband suppression constant when the output frequency is varied.

40. Haneman, V.S. and Senders, J.W. CORRELATION COMPUTATION ON ANALOG DEVICES. Assoc. Computing Mach. J. 2:267-279, 1955.

The description of the power spectrum computer of the Naval Research Laboratory, Radio III, includes the statement that the input is single-sideband amplitude-modulated magnetic tape.

41. Holahan, James. SSB DESIGNED FOR AIR-GROUND COMMUNICATIONS. MORE VOICE CHANNELS PER METER, MORE TALKING POWER PER WATT. Aviation Age 24:40-51, illus., 1955.

Recent advances have made single-sideband systems practical, according to the Electronics Editor of Aviation Age, who reports his findings at Collins Radio Co., Cedar Rapids, Iowa.

42. Hraba, J.B. TRANSIENT SPEED RESPONSES OF TWO-PHASE SERVO MOTORS IN SUPPRESSED-CARRIER SYSTEMS. Dissertation Abs15:2147, 1955.

University of Illinois, 1955, dissertation.

Abstract states that the transient speed response of two-phase servo motors of conventional squirrel-cage design is investigated for operating conditions in which the control phase is energized with a suppressed-carrier signal and the reference phase with a 90-degree-shifted carrier signal.

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45. Laport, E.A. and Neumann, K.L. A NEW LOW-POWER SINGLE-SIDEBAND COMMUNICATION SYSTEM. RCA Rev. 16:635-647, illus., Dec. 1955.

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47. Levine, R. STUDY OF SSB TRANSMISSION FOR TACTICAL MILITARY APPLICATION. Signal Corps Eng. Lab. Res. & Devlpmt. 2:1-2, Aug. 11, 1955.
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48. McLaughlin, J.L.A. DYNAMIC RECEIVER SELECTIVITY. Electronics 28:128-132, Feb. 1955.
Details of system for electronic control of bandwidth in selectable single-sideband dual diversity receiver.

49. Massachusetts Institute of Technology. Lincoln Laboratory, Cambridge, Mass.
UHF LONG-RANGE COMMUNICATIONS SYSTEMS, by G.L. Mellen, W.E. Morrow, et al. 36p., Aug. 5, 1955. (Tech. Rpt. 91) (Contract AF(122)-458)
In the section on modulation techniques, there is a comparison of some of the methods of modulating a UHF wave with a multiplex signal. Single sideband is discussed on p. 18, indicating that it has several attractive advantages over FM and forecasting that "the future will see the development and application of single-sideband equipment in long-range UHF radio systems."

50. Mitchell, R.H. SINGLE SIDEBAND WITH THE BC-610 USING A POPULAR TRANSMITTER AS A LINEAR AMPLIFIER. QST 39:21, 102, diags., Nov. 1955.

51. National Company, Inc., Malden, Mass.
INSTRUCTION BOOK FOR SINGLE-SIDEBAND CONVERTER CV-216/URR. 71p., illus., Mar. 25, 1955. (NAVSHIPS 92456) (Contract NObsr-52642)

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Cites advantages offered by single-sideband transmission and reception for greater efficiency and safety.

53. Pappenfus, E. W. SINGLE-SIDEBAND TECHNIQUES FOR MARINE COMMUNICATIONS. Inst. Radio Engrs. Trans. CS-3:50-53, Mar. 1955.

54. Quervain, A. de. THE COMMUNICATIONS NETWORK FOR THE METTLEN LOAD DISTRIBUTING CENTRE. Brown Boveri Rev. 42:314-317, illus., Jly/Aug. 1955.
Outlines the structure of the communications network and the tasks which must be carried out. It is stated that all of these tasks are performed by carrier current channels operating on the single-sideband system, by which double-sideband channels are being gradually replaced.

55. Quervain, A. de. THE EMPLOYMENT OF CARRIER EQUIPMENT IN POWER SYSTEMS. Brown Boveri Rev. 42:251-261, illus., Jly/Aug. 1955.
An analysis and assessment of carrier equipment, using double- and single-sideband modulation.

56. Radio Corporation of America, Rocky Point, N.Y.
SINGLE-SIDEBAND TRANSMITTER/ADAPTER. Final Report, 1 October 1953 - 16 February 1955, by H.E. Goldstine. 21p., illus., Feb. 16, 1955. (Contract NObsr-64053)
The purpose of this report is to present the results of tests that have been made to evaluate the performance of the non-linear type of single-sideband transmitters.

57. Radio Corporation of America. RCA Laboratories Division. Industry Service Laboratory, Long Island City, N.Y.
ELECTROMECHANICAL FILTERS FOR 100 KC CARRIER AND SIDEBAND SELECTION. 10p., illus., June 2, 1955. (LB-981)

The electromechanical filter, employing a series of mechanically resonant elements mechanically coupled together, is of particular interest in the communications field because of the greatly increased use of single-sideband systems.

This bulletin presents both a general discussion of a torsional type mechanical filter and its termination by mechanical and electrical means, and a detailed description of two 100-kc filters, one 50 cycles wide and the other 3.1 kc wide.

58. Robberson, Elbert. SINGLE-SIDEBAND ROUNDUP. Radio & TV News 54:68-71, Oct.1955.

A quick look at single-sideband fundamentals.

59. Thomason, R.A. A MOBILE S.S.B. RECEIVER FOR 80 AND 40, USING A TUNING I.F. AND CRYSTAL-CONVERTER. QST 39: 33-35,136, illus., Mar.1955.

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Suggests that a simple means of obtaining maximum output signal is to use two audio tones of equal amplitude to modulate the single-sideband transmitter.

1954

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Single-sideband carrier system with carriers spaced at 6 kc intervals.

64. Bourassin, L. LES SYSTEMES DE TRANSMISSION DE TÉLÉVISION À BANDES LATERALES ASYMETRIQUES. Onde Elec. 34:897-913, 1020-1040, Dec. 1954.

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Translated title: Vestigial sideband television transmission systems.

65. Boveri, T. PROGRESS AND WORK IN 1953. Brown Boveri Rev. 41: 3-74, illus., Jan/Feb. 1954.

Information about single-sideband installations and an illustration of 18 single-sideband power line carrier equipments, p. 71-72.

66. Bowser, A.P. MULTIPLEXING MICROWAVE COMMUNICATIONS CIRCUITS. Radio Electronic Eng. 23:15-17, 39, Nov. 1954.

Example of typical frequency division multiplex equipment by Lenkurt, which will provide up to 24 toll quality voice channels using single-sideband suppressed carrier methods.

67. Brieu, J.J. SIMPLIFIED SINGLE-SIDEBAND EQUIPMENTS. Pt. II. TH861 A AND B TRANSMITTER-RECEIVER. Rev. Tech. C.F.T.H. 18:37-40, Dec. 1954.

In French.

"Pt. II describes the special features of the transmitter-receiver Type TH861 A and B, designed for telephony and telegraphy between two fixed or mobile stations whose distance apart may be a few hundred km. The frequency coverage is 3-12 Mc/s, the operating frequency being derived from a quartz crystal. Frequency changing is effected in $<$ 1 min. by means of plug-in circuit units. Peak power to the feeder is 10W, the pass-band at 6 db is 300-3000 c/s and the attenuation of the sideband not used is at least 40 db. The processes in the transmitter are reversed in the receiver, the same quartz crystals being used. Synchronization between two TH861 sets is effected by an arrangement permitting slight adjustment of the local frequency used in reception. Such adjustment remains effective over long periods." Sci. Abs. 58B:3442., 1955.

68. Bronzi, G. STUDIO DEL MODULATORE BILANCIATO A TUBI PER RADIOCOMMUNICAZIONI A BANDA LATERALE UNICA. Alta Freq. 23: 335-346, 1954.

In Italian.

Translated title: Study of balanced modulator with tubes for single-sideband radio communication.

69. Brown, J.N. SINGLE-SIDEBAND TECHNIQUES. 112p., New York, Cowan, 1954.

The author has brought together, under one cover, information on single sideband. Material in the first five chapters is an edited and

rewritten version of the six-part series, "Getting Started on Single Sideband" that was published in CQ Magazine during 1953.
See Item 106 for articles.

70. Bruene, W. B. DISTORTION IN SINGLE-SIDEBAND LINEAR AMPLIFIERS, CAUSES, CURES AND METHODS OF MEASUREMENT. QST 38:24-28,136, Nov.1954.

71. Burns, R. F. SIDEBAND FILTERS USING CRYSTALS. QST 38:35-40,148,150,152, Nov.1954.
Designing lattice and half-lattice crystal filters.

72. Byk, M. SIMPLIFIED SINGLE-SIDEBAND EQUIPMENTS. Pt. III. TRANSMITTER TH863, AMPLIFIER TH911 AND RECEIVER TH864. Rev. Tech. C. F. T. H. 18:31-47, Dec.1954.
In French.
"Pt. III describes in greater detail the Type TH863 transmitter, which has a peak power of ~50W, an amplifier Type TH911, with a peak power of ~400W and the Type TH864 receiver. The TH863 transmitter covers the range 2.5-15 Mc/s in 4 overlapping ranges, each sub-range having its own plug-in circuit. The TH911 amplifier is designed to be driven by the TH863 transmitter, thus increasing its output power. The TH864 receiver covers the same total frequency range as the TH863 transmitter and has identical sub-ranges, with corresponding plug-in curcuits." Sci.Abs. 58B:3442, 1955.

73. Cacheris, John. MICROWAVE SINGLE-SIDEBAND MODULATOR USING FERRITES. Inst. Radio Engrs. Proc. 42:1242-1247, illus., 1954.
This paper describes an electronic single-sideband modulator for shifting the carrier frequency of a microwave signal by a fixed amount. The device is one of the first practical applications of the double-refraction properties of ferrites with transverse magnetic fields.

74. CARRIER TELEPHONE EQUIPMENT FOR MEDIUM-HAUL AND SHORT-HAUL APPLICATIONS. I. DEVELOPMENT AND DESIGN CONSIDERATIONS, by K. W. Harrison. II. A PROTOTYPE 8-CHANNEL CARRIER TELEPHONE TERMINAL EQUIPMENT, by K. C. King. TMC Tech. J. 5:5-31, Mar.1954.
"Accepting the premise that the limits of existing primary group and super-group bands should be observed, arguments are put forward in favor of a single-sideband suppressed-carrier system having a primary group of 8 channels with carriers spaced 6 kc/s apart instead of the conventional primary group of 12 channels with carriers spaced 4 kc/s apart." Sci.Abs. 59B:823, Feb.1956.

75. Delvaux, J.L. SIMPLIFIED SINGLE-SIDEBAND EQUIPMENTS. Pt. I. GENERALITIES. Rev. Tech. C. F. T. H. 18:33-35, Dec. 1954.

In French.

"Pt. I discusses the particular difficulties of producing relatively cheap low-power communications equipment and shows how the desired result has been achieved by limiting the number of telephony channels to only one and avoiding the use of a. f. c. in the receiver, in which the demodulation of the received wave is effected by means of a stable signal of large amplitude, produced locally." Sci. Abs. 58B:3442, 1955.

76. Fischer, K., Vesper, W. and Vogt, G. RADIO RECEIVER INSTALLATIONS FOR TELEGRAPHY AND SINGLE-SIDEBAND TELEPHONY IN THE OVERSEAS SERVICE. DEVELOPMENTAL PRINCIPLES AND PRACTICAL EXPERIENCE. Telefunken Ztg. 27:14-26, Mar. 1954.

In German.

77. Goodman, Byron. HOW TO TUNE A SINGLE-SIDEBAND SIGNAL. QST 38:20,110, Aug. 1954.

78. Goodman, Byron. THE 10B S.S.B. EXCITER. QST 38:44-45, Aug. 1954.

Cites several improvements for operating convenience added to the 10B Multiphase Exciter.

79. Grammer, George. THE A.M. EQUIVALENT OF SINGLE-SIDEBAND. HOW TO COMPARE THE TWO TYPES OF TRANSMISSION. QST 38:19-22,118, Jan. 1954.

80. Grammer, George. THE CASE FOR THE AB LINEAR. QST 38:26-31, 118, illus., Apr. 1954.

Whether or not to drive a tetrode linear into grid current is a question that can be argued both ways. This article outlines some of the factors favorable to Class AB operation and describes an amplifier that embodies the ideas under discussion.

81. Grammer, George. POST-PHASING DISTORTION. QST 38:40-41, 112, Feb. 1954.

82. Grammer, George. SINGLE-SIDEBAND ECONOMY. QST 38:42-43, Mar. 1954.

Compares amplitude modulation and single sideband.

83. Great Britain. Royal Aircraft Establishment, Farnborough, Hants. A COMPARISON BETWEEN S.S.B. AND D.S.B. LONG-RANGE AIRCRAFT HF/RT SYSTEMS, by G.W. Barnes. 21p., figs., June 1954. (Tech. Note 573)

In a series of flight trials over ranges up to 2000 n. miles, 80 % of the S.S.B. transmissions were satisfactory against 30 % in the case of D.S.B.

84. Griffin, D.A. DELAY-LINE PHASE SHIFT. A NEW APPLICATION FOR S.S.B. TRANSMITTERS. QST 38:12-15, illus., Mar. 1954.

85. Heller, H. SINGLE-SIDEBAND CARRIER-FREQUENCY TECHNIQUE AND ITS USE ON A 300 kV LINE. Elektrizitätiswirtschaft. 53: 303-307, June 5, 1954.

In German.

"A brief review of carrier frequency practice and a comparison of the operation of newly developed single-sideband apparatus with that of double sideband equipment, and its operation in parallel with the latter." Sci. Abs. 58B:119, 1955.

86. Lacy, W.H. ELEMENTS OF SINGLE-SIDEBAND TRANSMISSION. Field Engrs. Electronics Dig. 2:21-27, Apr. 1954.

87. May, C.D., Jr. DOUBLING SINGLE-SIDEBAND CHANNEL CAPACITY. Tele-Tech. & Electronic Inds. 13:126-128, illus., 1954.

Improvements in diversity reception and multiplexing equipment provide increased communications traffic handling facilities in existing circuits used by military.

88. Morcom, W.J. HIGH POWER COMMUNICATION TRANSMITTER. Electronic Eng. 26:237-240, 1954.

Single-sideband transmitter for world-wide service having remote control and four speech channels and operating in band 4 to 27.5 mc with 30 lw peak envelope power.

89. Morrison, H.L. PHONE SELECTIVITY FOR THE BC-312. Q5-ING WITH A DUAL-CRYSTAL FILTER. QST 38:19-23, 102, Feb. 1954.

Of interest to the builder of a crystal-filter single-sideband exciter.

90. National Research Council of Canada. Radio and Electrical Engineering Division, Ottawa, Canada.

AN ELECTROMECHANCAL SHIFTER FOR RADIO FREQUENCIES, by R.A. McFarlane. 3p., diags., May 1954. (ERB318) (NRC 3315)

Describes the goniometer method of producing the single-sideband signal..

91. Oger, E. UTILISATION DE LA CONTRE-REACTION SUR LES EMETTEURS À BANDES LATERALES INDEPENDANTES ET À DOUBLE BANDE. Ann. Radioelec. 9:329-341, Oct. 1954.

Translated title: Use of negative feedback in independent sidebands and double-sideband transmitters.

"The author first briefly reviews the general principles of independent sidebands transmission. He then studies the various causes of distortions and cross-talk in a transmitter used for transmitting two independent sidebands of two coherent bands. Having examined the use of negative feedback to reduce these distortions, the author describes a special device used on 2 kW and 20 kW S.F.R. transmitters and studies a phase-correcting network designed for a transmitter operating range between 375 and 28 Mc/s.

"The results obtained guarantee a cross-talk of less than 35 db for a peak power of 20 kW in independent sidebands transmission and a distortion of less than 35 db in A_3 double sideband transmission for an 80 % modulation depth and a carrier power of 500 kW (U.D.C.; 621.396.4)."

Brief summary also in Inst. Radio Engrs. Proc. 43:656, 1955.

92. Pajgrt, M. A RECEIVER FOR SINGLE-SIDEBAND H.F. TELEPHONE COMMUNICATION ON HIGH-VOLTAGE LINES. Slaboproudy Obzor. 15:268-280, 1954.

In Czechoslovakian.

"The receiver described is an integral part of a unit which comprises: (1) a transmitter, (2) d.c. power supplies operating from 220 V mains, (3) filters, (4) a telephone set, (5) a measuring equipment, and (6) a line-finding equipment consisting of relays. The system employs double amplitude modulation; the first carrier frequency is $F_1 = 7.2$ kc/s, the upper sideband being totally and the carrier partially suppressed; the second carrier F_2 lies between 40 and 300 kc/s, one of the sidebands and the carrier being suppressed. Each channel employs a band-width of 2.5 kc/s, the cross-talk attenuation between adjacent channels being 3N. The receiver has a sensitivity of 15 mV (on 110 kV lines), an input impedance of 120Ω, output impedance of 600Ω, non-linear distortion of $<5\%$ and an audio bandwidth extending from 300 c/s to 2.1 kc/s. The first carrier F_1

is employed to actuate an automatic gain control circuit in the receiver. Design of the receiver is discussed in detail and its performance is illustrated by a number of graphs and curves." Sci. Abs. 58B: 1286, 1955.

93. Radio Technical Commission for Aeronautics, Washington, D.C. THE APPLICATION OF SINGLE SIDEBAND TECHNIQUES TO AERONAUTICAL COMMUNICATIONS. 27p., Jan. 25, 1954. (Paper 11-54/DO 53)

Bibliography, p. 23-26.

A general review of the evolution of air-ground communications; the present DSB system; brief history of single-sideband radiotelephone communication; capabilities and status of development of single sidebands; design considerations of a single-sideband system; problems of conversion from double sidebands to single sidebands; single-side system equipment considerations; economic factors involved in a conversion of the present double-sideband system to a single-sideband system; present status of single-sideband development.

94. Rideout, V.C. ACTIVE NETWORKS. 485p., illus., N.Y., Prentice-Hall, 1954.

Demodulation of single-sideband signals, p. 365-366.

95. Schulz, E., Leypold, D. and Schreiber, H. DER SIEMENS EINSEITENBANDEMFÄNGER KW2/6. Frequenz 8:306-313, Oct. 1954.

Translated title: Siemens single-sideband receiver KW2/6.

"A detailed description of the Siemens receivers for the reception of 2.5 - 20 Mc/s and 4 - 28 Mc/s channels is given. They handle input signals from 0.2 to 20,000μ V and have a noise factor of 6 db. The receiver has a 2-valve r.f. amplifier with 3 tuned circuits and is of the double superheterodyne type, the intermediate frequencies are 2112 kc/s and 112 kc/s. The attenuation of the adjacent channel is >70 db, cross-modulation suppression 55 db. The automatic frequency control is of particular interest; a special crystal filter selects the pilot carrier, radiated by the transmitter, and uses it for the demodulator of the receiver and the operation of a.f.c. The a.f.c. control voltage is derived by phase comparison by means of a further crystal filter and is fed to a d.c. motor which readjusts the tuning inductance of the first oscillator." Sci. Abs. 58B:1332, 1955.

96. Simon, J.J. 813s IN A HIGH-POWER LINEAR. A PUSH-PULL AMPLIFIER FOR S.S.B. EXCITERS. QST 38:20-22,120, Jly. 1954.

97. Sommerfield, E.H. MODIFYING THE S-40 FOR S.S.B. RECEPTION. QST 38:42-43,128, Apr. 1954.

98. Stanford Research Institute, Stanford, Calif.
DEVELOPMENT OF A SINGLE-SIDEBAND SUPPRESSED-CARRIER COMMUNICATIONS SYSTEM. Interim Engineering Report, 1 April - 30 April 1954. 3p., May 10, 1954. (Rpt. 27) (Contract Noas-54-294-c)

99. Sturgess, H.E. and Newson, F.W. SINGLE-SIDEBAND MULTI-CHANNEL OPERATION OF SHORT-WAVE POINT-TO-POINT RADIO LINKS. AN INDEPENDENT SIDEBAND HIGH-POWER SHORT-WAVE TRANSMITTER. PART 4(a) - THE RADIO AND POWER UNITS; PART 4(b) - DESIGN AND PERFORMANCE. Post Off. Elec. Engrs. J. 46:140-143, Oct. 1953; 191-195, Jan. 1954.
Design and performance of independent sideband transmitter providing peak power output of up to 70 kw in range 4-22 Mc; although primarily intended for independent sideband operation using 2-channel drive, it can also be used for double-sideband telephony and CW and MCW telegraphy.

100. Weaver, D.K. DESIGN OF RC WIDE-BAND 90-DEGREE PHASE-DIFFERENCE NETWORK. Inst. Radio Engr. Proc. 42:671-676, Apr. 1954.
The phase-rotation method of generating a single-sideband amplitude-modulated signal requires the use of 90-degree phase-difference networks covering the audio frequency band. The purpose here is to present a design procedure for obtaining these networks and to discuss some of the practical matters which arise in their construction and alignment.

101. Weise, D.H. VISUAL DEMODULATOR FOR V.H.F., U.H.F. Radio-Electronic Eng. 23:17-18, 20, 38-39, 1954.
Details of television monitor which employs superheterodyne receiver with i-f bandshaping circuits to give vestigial-sideband characteristic.

102. Bauer, J.A. and Talmage, F.E. THE RCA BW-5A TELEVISION SIDEBAND RESPONSE ANALYZER. Broadcast News 75:32-33, illus., Jly/Aug. 1953.

103. Bell Telephone Laboratories, Inc., Whippany, N.J. PCM SYSTEM OPERATION OVER SPIRAL-FOUR CARRIER SYSTEMS: VESTIGIAL SIDEBAND TRANSMISSION, by E.D. Sunde. 6p., illus., May 12, 1953. (Tech. Rpt. 14) (Contract DA36-039-sc-151)

The theory underlying vestigial sideband transmission is reviewed, and a comparison made of tolerances to noise and transmission distortion of double-sideband PCM systems employing two pulse amplitudes.

104. Black, H.S. MODULATION THEORY. 363p., illus., New York, Van Nostrand, 1953.

Single sideband, p. 169-175.

105. Blanchard, R.B. MORE SUGAR-COATED SINGLE SIDEBAND. HOW TO TUNE S.S.B. ON ANY RECEIVER. QST 37:31-32, Oct. 1953.

106. Brown, J.N. GETTING STARTED ON SINGLE SIDEBAND. CQ 9: 27-33, Mar. 1953; 19-24, Apr. 1953; 27-30, June 1953; 32, Jly. 1953; 22-26, 62, 64, Aug. 1953; 19-22, Sept. 1953.

See Item 68 for book utilizing same material.

107. Crosby, M.G. LONG-RANGE COMMUNICATION TRENDS. Inst. Radio Engrs. Trans. CS 1:41-53, 1953.

The application of exalted carrier and single-sideband methods in a triple diversity system is illustrated.

108. Crosby, M.G. LONG-RANGE COMMUNICATION WITH SINGLE-SIDEBAND DIVERSITY UNITS. Communs. Engr. 13:29-30, 39, Jly/Aug. 1953.

The author contends that transoceanic communication can be accomplished dependably with single-sideband diversity equipment.

109. Dunnigan, F.A. and Kane, J.D. SINGLE-SIDEBAND CONVERTER. Tele-Tech 12:98, 194, Aug. 1953.

Describes the single-sideband converter developed for the U.S. Army Signal Corps by Hoffman Laboratories, Inc. The new unit makes possible multichannel teletype or facsimile operation with voice transmission on single LF. MF or HF carrier.

110. Eckhardt, C. W. THE SINGLE SIDE-SADDLE LINEAR. A 75-METER 807 LINEAR AMPLIFIER FOR S.S.B. QST 37:25-27, illus., Nov. 1953.
A low-power Class B linear for one of the new simplified single-sideband exciters.

111. Ehrlich, R. W. DESIGN NOTES ON A SPECIALIZED 'PHONE RECEIVER, CIRCUIT TRICKS FOR IMPROVING PERFORMANCE AND ENJOYMENT. QST 37:31-34, 128, illus., Apr. 1953.
A suggestion for selectable-sideband reception without double conversion.

112. Goodman, Byron. AN ALL-PURPOSE SUPER-SELECTIVE I.F. TRICKS WITH PARALLEL AMPLIFIERS OF DIFFERENT BANDWIDTHS. QST 37:23-28, 120, 122, illus., Mar. 1953.
Description of an i.d. amplifier designed to handle c.w., a.m. and single-sideband signals, utilizing the maximum usable selectivity in each case.

113. Goodman, Byron. DIODE MODULATORS. QST 37:39-42, illus., Apr. 1953.
Use in single-sideband transmitting techniques.

114. Great Britain. Ministry of Supply. Radar Research & Development Establishment, Malvern, Worcs.
A SINGLE-SIDEBAND SOURCE DEVELOPED FOR DOPPLER WORK AT RADIO FREQUENCIES, by J. H. Wood. 5p., illus., Aug. 1953. (Tech. Note 69)
A mixer is described which has an inherent output of only the sum or only the difference of the two input frequencies. An explanation of the principle is given and details of a model for mixing 208 Mc/s with 0-2 kc/s.

115. Hoffman Laboratories, Inc., Los Angeles, Calif.
CV-157/URR SINGLE SIDEBAND CONVERTER, by L. Schultz. Final Technical Report, 17 August 1951 - 20 November 1953. 152p., illus., 1953. (Contract DA36-039-sc-15422)
Object of the study: to design, develop, and produce a single-sideband converter.

116. Honey, J.F. PERFORMANCE OF AM AND SINGLE-SIDEBAND COMMUNICATIONS. Tele-Tech 12:64-66, Sept. 1953.
Report on findings that single sideband is better suited for long-range paths and is less likely to fade than conventional AM systems.

117. Lowry, W.R.H. and Genna, W.N. SINGLE-SIDEBAND MULTI-CHANNEL OPERATION OF SHORT-WAVE POINT-TO-POINT RADIO LINKS. PART 3 - AN INDEPENDENT SIDEBAND SHORT-WAVE RADIO RECEIVER. Post Off. Elec. Engrs. J. 46(Pt. 1) 19-24, illus., Apr. 1953.
"The design, construction and performance are described of a receiver suitable for long-distance links operating in the range 4-30 Mc/s, and designed for reception of the type of signal described in part 2 (2175 of July (Owen & Ewen)). Response is uniform to within 2 db from 100 c/s to 6 kc/s. The receiver closely approaches the limits of performance theoretically obtainable in respect to sensitivity, faithful reproduction, and freedom from avoidable interference." Wireless Eng. 30:2425, 1953.

118. May, C.D., Jr. DOUBLING TRAFFIC CAPACITY OF SINGLE-SIDE-BAND SYSTEMS. Inst. Radio Engrs. Proc. 41:418, 1953.
Summary only.

119. Meinel, E. MODE OF OPERATION OF THE 20/40 kw SINGLE-SIDE-BAND TELEPHONE TRANSMITTER OF THE FIRM OF TELEFUNKEN. Fernmelde Praxis 30:233-243, 1953.
In German.

120. Moses, R.C. SINGLE-SIDEBAND TRANSMISSION. I-II. Radio-Electronic Eng. 50:9-12, 29, Oct. 1953; 6-9, 30-31, Nov. 1953.
"Pt. I draws direct comparison between single-sideband suppressed carrier (s.s.s.c.) and double-sideband a.m. transmission from both theoretical and practical standpoints. It is shown that for the same amount of available power, the power output with s.s.s.c. is 8-10 x that of conventional a.m. Two methods of generating s.s.s.c. namely the filter and phase-shift methods are described and details are given of interference problems. Pt. II deals with the practical design of a 600 W output s.s.s.c. transmitter. Details are given of the active audio phase-shift network, balanced modulators, frequency converters and the power amplifier. Block and circuit diagrams, filter and phase characteristics and photos are given." Sci. Abst. 57B; 761, 1954.

121. Naval Air Test Center, Patuxent River, Maryland.
EVALUATION OF SINGLE SIDEBAND COMMUNICATION SYSTEM. Final Report. 44p., Nov. 20, 1953. (Rpt. 1)

Point-to-point tests were made using the Western Electric LE system single-sideband communicating equipment. The LE single-sideband receiver and the AN/ARR-15 double-sideband receiver were compared during long-range flights in which both were receiving the same double-sideband signal.

The single-sideband receiver proved greatly superior to the double-sideband receiver during test periods.

122. Owen, F.C. and Ewen, A.B. SINGLE-SIDEBAND MULTI-CHANNEL OPERATION OF SHORT-WAVE POINT-TO-POINT RADIO-LINKS. Post Off. Elec. Engrs. J. 45:154-159, Jan. 1953.

"The present equipment is an improved form of that previously described (2395 of 1948 (Bray et al.)). It generates a low-power independent sideband signal comprising two 6-kc/s channels, one on each side of a reduced-level 3.1 -Mc/s pilot carrier, suitable for application to the final modulator and power-amplifier stages of a s.w. transmitter. Alternatively a single-channel double-sideband signal can be generated. The associated monitor receiver is designed to accept signals from the transmitter drive unit at 3.1 Mc/s or from the power-amplifier stages at radiation frequency." Wireless Eng. 30:2175, 1953.

123. Podszeck, H.L. and Schmid, A. TRANSMISSION POWER AND RANGE OF CARRIER-FREQUENCY COMMUNICATION EQUIPMENT FOR HIGH-VOLTAGE LINES. Elektrotech. Z. A.74:586-589, Oct. 11, 1953.

Multichannel single- and double-sideband transmissions using carrier frequencies in the range 30-450 kc are considered from the power efficiency point of view.

124. Poole, Leonard, Brown, J.N. and Ferguson, E.E. THE SSB MOBILE. CQ 9:15-22, illus., May 1953.

When used in place of the AM transmitter, the SSB Mobile features automatic receiver reinsertion on single-sideband reception, carrier reinsertion in transmitter to enable the "uninitiated" to copy on AM, and crystal control rubbering of approximately five kilocycles.

125. RADIO EQUIPMENT FOR PAKISTAN. Electronic Eng. 25:197, 1953.

Included in the equipment being sent to Pakistan by the Australian

Government in accordance with the Colombo Plan, are 17 single-side-band receivers.

126. Roberts, Ben. MECHANICAL BANDPASS FILTERS FOR I. F. RANGES. AN APPROACH TO THE IDEAL SELECTIVITY CURVE. QST 37: 22-24, illus., Feb. 1953.

The mechanical filter shows promise for use in many applications, including the simplification of single-sideband transmitter circuits.

127. Roberts, W. Van B. MAGNETOSTRICTION DEVICES AND MECHANICAL FILTERS FOR RADIO FREQUENCIES. QST 37:32-35, 110, illus., Aug. 1953.

Describes an i.f. filter for 'phone signals.

128. Russ, Ben. THE "LITTLE FIRECRACKER" LINEAR AMPLIFIER. A PAIR OF 6146s AND GOOD S. S. B. DESIGN PRACTICES. QST 37: 14, 104, 106, illus., Sept. 1953.

129. Skwirzynski, J. K. RESPONSE OF A VESTIGIAL SIDEBAND SYSTEM TO A "SINE-SQUARED" STEP TRANSITION. Marconi Rev. 16:8-24, 1953.

130. Stanford University. Electronics Research Laboratory, Stanford, Calif. A CIRCUIT FOR SELECTING AND AMPLIFYING WITHOUT TUNING ADJUSTMENT. A REDUCED CARRIER IN THE PRESENCE OF VOICE SIDEBANDS AND NOISE, by R. C. Morwood. 11p., Aug. 31, 1953. (Tech. Rpt. 10) (Contract W28-099-ac-131)

The proposal that "automatic" carrier exaltation could be provided by a number of paralleled narrow-band, adjacent filter channels with each channel arranged so as to transmit only signals stronger than a certain level, has been investigated in part.

Design of a laboratory model to illustrate this proposal is discussed.

131. Stanford University. Electronics Research Laboratory, Stanford, Calif. COMMUNICATION TECHNIQUES (MODULATION) PROJECT. 10p., illus., 1953. (Quart. Prog. Rpt. 14) (Contract W28-099-ac-131)

Progress is reported in the investigation of negative-reactance phase shifters for the purpose of cancelling phase distortion and delay in 90° wide-band audio phase shifters of the type used in single-sideband systems.

132. Stanford University. Electronics Research Laboratory, Stanford, Calif. COMMUNICATION TECHNIQUES (MODULATION) PROJECT. 7p.,

1953. (Quart. Prog. Rpt. 15) (Contract W28-099-ac-131)

Work on the multiple-tuned circuit "automatic" carrier exaltation system for single-sideband reception has been brought to a close with completion of a 9-channel assembly. Preliminary tests of transmission versus frequency, and of the volume-expansion action, have been satisfactory.

133. Stanford University. Electronics Research Laboratory, Stanford, Calif. COMMUNICATION TECHNIQUES (MODULATION) PROJECT. Final Report, 1 June 1951 - 31 August 1953, by O.G. Villard, Jr. 31p., Aug. 31, 1953. (Contract W28-099-ac-131)

Research during the period included automatic detection of single-sideband signals.

There is also presented in this report a listing of all technical reports, publications and patent disclosures prepared under, or in connection with, the project since its inception.

134. Stanford University. Electronics Research Laboratory, Stanford, Calif. RADIO FREQUENCY PHASE-DIFFERENCE NETWORKS: A NEW APPROACH TO POLYPHASE SELECTIVITY, by M.G. Cifuentes and O.G. Villard, Jr. 16p., June 30, 1953. (Spec. Tech. Rpt.) (Contract W28-099-ac-131)

A polyphase selective system suitable for single-sideband transmission or reception is described, in which the selective action takes place directly at radio frequency in such a way that a number of individual systems may be cascaded in situations where a very high degree of overall selectivity must be obtained.

135. Wright, Howard. LOW-PRESSURE MODULATION FACTS. DOWN-TO-EARTH TALK ABOUT RADIO TELEPHONY. QST 37:15-17, 110, illus., Jly. 1953.

Single-sideband techniques.

1952

136. Albert, A.L. THE ELECTRICAL FUNDAMENTALS OF COMMUNICATION. 2nd ed., 531p., illus. New York, McGraw-Hill, 1952.

Sidebands, p. 453-458.

137. Beanland, C.P. and Rockaby, F.I. THE MARCONI SINGLE-SIDEBAND RECEIVERS - TYPES HR92 AND HR93. Marconi Rev. 15: 60-70, 1952.

Special features and performance data.

138. Berry, F.M. THE SERIES BALANCED MODULATOR. A NEW CIRCUIT FOR TRANSMITTERS AND RECEIVERS. QST 36:46-47, Sept.1952.
The "series" balanced modulator for single-sideband work is presented because of its simplicity, good linearity, and excellent carrier suppression.

139. Blanchard, R.B. SUGAR-COATED SINGLE SIDEBAND. (S.S.S.S. OR A.M.I. BLUE?) QST 36:38-39,128, Oct.1952.

140. Bradburd, E., Alter, R.S., and Racker, J. VESTIGIAL SIDEBAND FILTER DESIGN. Tele-Tech 8:38-40,52, Oct.1952: 8:44-45,60-61, illus.,Nov.1952.

141. Bray, W.J., and Morris, D.W. SINGLE-SIDEBAND MULTI-CHANNEL OPERATION OF SHORT-WAVE POINT-TO-POINT RADIO LINKS. Post Off.Elec.Engrs.J. 45:97-103, Oct.1952.
"The article outlines the principles of single-sideband working, its advantages, and describes the basic techniques used for the transmission of multi-channel telephony and telegraphy." Sci.Abs. 56B: 752, 1953.

142. Cifuentes, M.G. A NEW METHOD FOR OBTAINING SELECTIVITY AT RADIO-FREQUENCIES BY MEANS OF FREQUENCY CONVERSION AND AUDIO-FREQUENCY NETWORKS. 123p.,illus., Stanford, Calif., Stanford University Press, 1952.
Ph.D. thesis.
Bibliography, p.119-123.
In connection with the problem of obtaining the selectivity needed in single-sideband reception, the author has worked out a new system called the "diode mixer method radio-frequency selectivity." It is a phase-rotation method, with the particular feature that the desired selectivity is obtained at the radio-frequency level. In order to achieve this result, two main steps are taken which are believed not to have been used before. One of them is the frequency discrimination effect of the diode mixer. The other is the development of what are called "radiofrequency constant phase-difference networks."
The present work is concerned mainly with the theoretical aspects of the method.

143. Crosby, M.G. EXALTED-CARRIER AND SINGLE-SIDEBAND DIVERSITY RECEIVERS. Inst.Radio Engrs.Proc. 40:232, Feb.1952.
Summary only.

144. Cuccia, C.L. HARMONICS, SIDEBANDS, AND TRANSIENTS IN COMMUNICATION ENGINEERING AS STUDIED BY THE FOURIER AND LAPLACE ANALYSES. 465p., diags., New York, McGraw-Hill, 1952.

Detection in single-sideband transmission, p. 432-433.

145. Dinsmore, Al. YRS-1 MODIFICATIONS AND EXPERIMENTS. QST 36:44,118,120, Nov. 1952.

An experiment with dual single-sideband reception.

146. Edwards, P.G. and Montfort, L.R. THE TYPE O CARRIER SYSTEM. Bell Sys. Tech. J. 31:688-723, illus., 1952.

Describes two carrier systems, type O and type N. An important difference is said to be the use of single sideband in the O rather than the double sideband in the N.

147. Ehrlich, R.W. HOW TO TEST AND ALIGN A LINEAR AMPLIFIER. ADJUSTMENT PROCEDURE FOR A S.S.B. AMPLIFIER. QST 36: 39-43,128, May 1952.

148. Great Britain. Royal Aircraft Establishment, Farnborough, Hants. A CONTROLLED CARRIER SINGLE-SIDEBAND SYSTEM FOR AIRCRAFT COMMUNICATION, by G.W. Barnes. 23p., illus., May 1952. (Tech. Note 521)

Advantages of applying single-sideband techniques to long-range aircraft communications on H.F. are discussed and related to the operating conditions of an airborne equipment.

149. Kahn, L.R. SINGLE-SIDEBAND TRANSMISSION BY ENVELOPE ELIMINATION AND RESTORATION. Inst. Radio Engrs. Proc. 40: 803-806, Jly. 1952.

The system described eliminates the need for costly linear r.f. amplifiers in the transmitter. The ph. m. component of the single-sideband signal is amplified by means of class-C amplifiers, while the a.f. envelope is separately detected, amplified and recombined with the r.f. signal at final stage. Experiments indicate that the performance of the system is equal to or better than that of the conventional transmitter with linear r.f. amplifier.

150. Kerwien, A.E. DESIGN OF MODULATION EQUIPMENT FOR MODERN SINGLE-SIDEBAND TRANSMITTERS. Inst. Radio Engrs. Proc. 40:797-803, Jly. 1952.

The transmitters considered are of the type using filters to suppress the unwanted sidebands. Factors discussed include balance requirements, frequency stability, choice of i.f. and methods of avoiding transmission of spurious signals.

151. Klenk, L.M., Munn, A.J. and Nedelka, J. A MULTICHANNEL SINGLE-SIDEBAND RADIO TRANSMITTER. Inst. Radio Engrs. Proc. 40:783-790, Jly. 1952.
Description of a transmitter designed for transoceanic communications and operating over the frequency band 4-23 Mc/s; four telephone channels are available. The main feature is the use of a servo-system permitting push-button tuning to any one of ten preselected operating frequencies in about 15 sec.

152. Long, R.E. CUTTING DOWN VFO DRIFT. SOME PRACTICAL POINTERS IN REDUCING EFFECTS OF TEMPERATURE. QST 36: 20-21, 114, 116, Aug. 1952.
Tips on drift prevention for single-sideband signals.

153. Long, R.E. THE MODIFIED SINGLE-SIDER. CQ 8:33-35, diags., Jan. 1952.

154. Lund, N., Rose, C.F.P. and Young, L.G. AMPLIFIERS FOR MULTICHANNEL SINGLE-SIDEBAND RADIO TRANSMITTERS. Inst. Radio Engrs. Proc. 40:790-796, Jly. 1952.
Design requirements for h.f. amplifiers with low interchannel modulation and adjacent-band radiation are discussed.

155. Meinel, E. METHODS OF OPERATION OF MODERN SINGLE-SIDEBAND TELEPHONE TRANSMITTERS. Fernmelde Praxis 29:506-508, Aug. 1952.
In German.

156. Meinel, E. MODE OF OPERATION OF THE 20 KW SINGLE-SIDEBAND TELEPHONE TRANSMITTERS OF THE FIRM OF C. LORENZ. Fernmelde Praxis 29:646-648, Oct. 1952.
In German.

157. Moses, R.C. EXALTED-CARRIER SINGLE-SIDEBAND RECEPTION. Radio & TV News 47:16-20, Mar. 1952.
Theory of operation and fundamental circuit design of an adapter for exalted-carrier single sideband communication reception.

158. Naval Research Laboratory, Washington, D.C.
A SYSTEM USING PHASE-MODULATION TRANSMISSION AND SINGLE-SIDEBAND RECEPTION FOR LONG-RANGE COMMUNICATION. PART II. SINGLE-SIDEBAND RECEIVER, by Bert Fisk and C.L. Spencer. 12p., charts, Jly. 15, 1952. (Rpt. 4007)

Comparison of a Navy Ar-88 receiver modified for single-sideband reception with other receivers designed specifically for such operation indicated that a satisfactory single-sideband receiver can be produced by adding a special adapter to a standard general-purpose receiver.

159. Oswald, J. TOTAL OR PARTIAL SUPPRESSION OF A MODULATION SIDEBAND. Cables & Trans. 6:165-173, Apr. 1952.

"Analysis of the characteristics of the envelope of an a.m. signal when the carrier wave and one sideband are suppressed. A definition is given of the mean and the maximum degree of modulation of a stationary aleatory signal with limited spectrum and Gaussian distribution. Passage of a modulated wave through a filter is considered, the theory showing the existence of the two components in quadrature which characterize the response of an arbitrary linear network to a modulated signal. The probability law of the signal envelope and the degree of modulation are slightly modified by the suppression of a sideband, so that a compression of the envelope levels results. The theory is applied to vestigal-sideband transmission of a television signal." Wireless Eng. 29:173, Aug. 1952.

160. Schlaack, N.F. SINGLE-SIDEBAND SYSTEM FOR OVERSEAS TELEPHONY. Electronics 25:146-149, Nov. 1952.
Bell Telephone Sys. Monograph 2055.

The system described operates in the frequency range 4-23 mc and provides four channels. Peak power output of the transmitter is 4 kw. Improvements with respect to earlier equipment include pushbutton selection of any of 10 preselected frequencies, use of varistors as modulators, a device to ensure full use of output whatever the number of channels in use, and reduction of out-of-band radiation and interchannel cross-talk, The companion receiver is described briefly.

161. Signal Corps Engineering Laboratory, Fort Monmouth, N.J.
MODIFICATION OF AMPLIFIER BC-340 FOR USE AS SSB AMPLIFIER, by R.H. Levine. 4p., Jan. 18, 1952. (Tech. Memo M-1422)

It is the purpose of this report to describe the operation of the modified equipment and to present data obtained in an experimental evaluation of the equipment, at Coles Signal Laboratory.

The conclusion stated that the power amplifier BC-340 is useful as a linear single-sideband amplifier and is capable of delivering approximately 10 kilowatts of peak envelope power throughout the frequency range of the D-156000 transmitter.

162. Stanford Research Institute, Stanford, Calif.
ADVANCED ENGINEERING RESEARCH STUDY OF METHODS AND EQUIPMENT FOR HIGH-LEVEL SINGLE-SIDEBAND GENERATION. Final Report, 1 June 1950 - 31 July 1951, by J.F. Honey, D.K. Reynolds and D.K. Weaver, Jr. 123p., illus., Feb.15,1952. (Contract DA36-039-sc-78)

As part of the investigation a radio transmitter has been constructed which generates a single-sideband signal in the frequency range of 1.5 to 3.0 mc and incorporates completely automatic tuning of all circuits.

This report includes a complete description of the transmitter and its performance as well as instructions for its operation. A section is devoted to the principle theoretical problems pertinent to the design of the high-level single-sideband transmitter. Another section presents the recommendations of the engineers concerning the present shortcomings of the equipment and future improvements that can be made.

163. Stanford University. Electronics Research Laboratory, Stanford, Calif.
COMMUNICATION TECHNIQUES (MODULATION) PROJECT. 6p., 1952. (Quart. Prog. Rpt. 11) (Contract W28-099-ac-131)

The voltage-controlled phase shifter designed to reduce the high losses in a single-sideband autocorrelation detector was completed. A method for producing automatic exaltation of a reduced carrier received by a receiver is outlined.

164. Stanford University. Electronics Research Laboratory, Stanford, Calif.
COMMUNICATION TECHNIQUES (MODULATION) PROJECT. 11p., illus., 1952. (Quart. Prog. Rpt. 12) (Contract W28-099-ac-131)

Work on the multiple-circuit automatic carrier-exalting system for single-sideband reception resulted in the development of a simple and economical automatic volume expander circuit using rectifying crystals.

165. Stanford University. Electronics Research Laboratory, Stanford, Calif.
COMMUNICATION TECHNIQUES (MODULATION) PROJECT, by O.G. Villard, Jr. 7p., illus., 1952. (Quart. Prog. Rpt. 13) (Contract W28-099-ac-131)

Investigation was continued of negative-reactance phase shifters for cancelling phase distortion and delay in 90° wide-band AF phase shifters of the type used in single-sideband systems.

166. Villard, O. G. CASCADE CONNECTION OF 90-DEGREE PHASE-SHIFT NETWORKS. Inst. Radio Engrs. Proc. 40:334-337, illus., 1952.
A method of connecting 90-degree audio phase-difference networks for use in selective-sideband transmission and reception is shown, whereby an overall performance is obtained which is analogous to the cascade operation of conventional filters.

167. Villard, O. G. and Rorden, W. L. FLEXIBLE SELECTIVITY FOR COMMUNICATIONS RECEIVERS. Electronics 25:138-140, illus., Apr. 1952.
Mentions the normal amplifier gain versus frequency characteristic with a sharp peak superimposed on top. Such a characteristic is useful for exalted-carrier reception of a. m. signals, or for reception of reduced-carrier single-sideband transmissions.

168. Webb, B. S. ALIGNING THE CRYSTAL-FILTER S. S. B. EXCITER. A STEP-BY-STEP TUNING PROCEDURE. QST 36:50-51, 122, Aug. 1952.

169. Westell, E. P. L. THE REDUCTION OF RADIATION FROM CARRIER COMMUNICATION CIRCUITS ON OVERHEAD POWER LINES. Inst. Radio Engrs. J. (Australia) 24:213-219, 1952.
An account of measurements of noise voltages on a multichannel single-sideband suppressed-carrier system.

170. Wright, P. N. CARRIER GENERATORS FOR S. S. B. RECEPTION. OUTBOARD RECEIVER ADDITIONS FOR SIMPLIFIED CARRIER INJECTION. QST 36:35-36, Dec. 1952.

171. Wright, P. N. THE RECEPTION OF SINGLE-SIDEBAND SIGNALS. QST 36:25-26, 112, Nov. 1952.
Practical pointers on two methods of operation.

172. Bloch, H. SINGLE-SIDEBAND EQUIPMENT AND HIGH-SPEED CYCLIC TELEMETRY FOR CARRIER-CURRENT OPERATION ON HIGH VOLTAGE LINES. Tech. Mitt. Schweiz. Telegr-Teleph. Verw. 29:298-305, Aug. 1, 1951.
In French and in German.
Description of Brown Boveri equipment exhibited at the 1951 Swiss Fair in Basle.

173. Cork, E.C. THE VESTIGIAL-SIDEBAND FILTER FOR THE SUTTON-COLDFIELD TELEVISION STATION. Inst. Elect. Engrs. Proc. 98(Pt.3) 460-464, figs., Nov. 1951.
To absorb the power of the unwanted sideband, a 5-kW liquid-cooled resistor having an incorporated power indicator has been supplied.

174. Crosby Laboratories, Inc., Mineola, N.Y.
ENGINEERING INVESTIGATION OF METHODS AND EQUIPMENTS FOR RECEPTION OF SINGLE-SIDEBAND SIGNALS. Final Report, 16 July 1950 - 9 February 1951. 49p., charts, Feb. 9, 1951. (Contract W36-049-sc-38263)
An engineering investigation to evaluate the merits of certain methods of reception of single-sideband signals and construction and delivery of experimental models of single-sideband receiver converters.

175. Goodman, Byron. A TWO-STAGE LINEAR R.F. AMPLIFIER. MORE POWER FOR YOUR S.S.B. SIGNAL. QST 35:13-16, Mar. 1951.

176. Grammer, George. D.S.R.C. RADIOTELEPHONY. QST 35:11-16, May 1951.
The type of phone transmission described in this article offers a very marked increase in sideband power output over amplitude modulation of the well-known type.

177. Great Britain. Post Office Engineering Department, London.
4-CHANNEL SINGLE-SIDEBAND HIGH-FREQUENCY RADIO-TELEPHONE SYSTEM, by J.H.H. Merriman, Z.B. Balchin and J. Rogers. 16p., diags., Jan. 1951. (Radio Rpt. 2050)

178. Great Britain. Post Office Engineering Department, London.
100 kc/s. NARROW BANDSTOP CRYSTAL FILTER FOR A SINGLE-SIDEBAND SYSTEM, by C.F. Floyd, E.R. Broad and D.E. Cridlan. 9p., Apr. 9, 1951. (Radio Rpt. 2064) (CRB ref. 51/1626)

Details are given of the design and performance of a narrow-band rejection filter for the suppression of a 100-kc carrier frequency. A quartz-crystal filter is employed, with 2 identical bridged-T sections, each of which has one crystal resonator in the shunt arm. The filter is hermetically sealed. The general form of construction is like that of other filters designed for single-sideband equipment. Satisfactory performance was achieved with the sample filters constructed.

179. Holloway, H.R. and Harris, H.C. PRECISION FREQUENCY GENERATORS USING SINGLE-SIDEBAND SUPPRESSED-CARRIER MODULATORS. Sylvania Technol. 4:64-67, Jly.1951.
Summary in Inst. Radio Engrs. Proc. 39:295, 1951.

180. King, K.L. A TWIN-CHANNEL SINGLE-SIDEBAND RADIO TRANSMITTER. Bell Lab. Record 19:202-205, Mar.1951.

181. Long, R.E. SUGAR-COATED LINEAR-AMPLIFIER THEORY, OR HOW TO KEEP A SINGLE-SIDEBAND A SINGLE-SIDEBAND. QST 35:22-27, Oct.1951.

182. Naval Research Laboratory, Washington, D.C.
A SYSTEM USING PHASE-MODULATION TRANSMISSION AND SINGLE-SIDEBAND RECEPTION FOR LONG-RANGE COMMUNICATION, PART I - PHASE MODULATION, by Bert Fisk and C.L. Spencer. 11p., illus., Oct.10, 1951. (Rpt. 3884)
A phase-modulator keyer-adapter has been designed to operate in conjunction with conventional CW transmitters that are equipped for frequency-shift keying. This adapter covers the frequency range 2 to 5 megacycles, delivers 5 watts RF power output to a 50-ohm load, introduces no frequency instability or frequency drift, and can be easily and accurately tuned and adjusted entirely by meter without the use of other instruments. It was designed, produced, and tested by NRL as one element of a multiple-tone transmission system utilizing single-sideband reception of phase-modulated transmissions.

183. Navy Electronics Laboratory, San Diego, Calif.
TECHNICAL EVALUATION OF MODEL AN/FRT-7(XN-1) SINGLE-SIDEBAND RADIO SYSTEM. Final Report, by H.C. Werner and L.L. George. 78p., illus., May 18, 1951. (Rpt. 247)
Severe frequency stability requirements result in poor unwanted sideband rejection, making the AN/FRT-7 unsuitable for Navy use. Outphasing method of single-sideband generation and reception is feasible.

184. Nowak, E.F. VOICE-CONTROLLED BREAK-IN...AND A LOUD-SPEAKER. AN ELECTRONIC METHOD FOR OFFSETTING FEED-BACK. QST 35:64,128,130,illus., May 1951.

Attributes popularity of single-sideband operation to use of voice-controlled break-in, and describes the system in use at WIFAJ that permits loud-speaker with voice-controlled break-in.

185. Quervain, A. de. SINGLE-SIDEBAND TRANSMISSION AND ITS MULTIPLE UTILIZATION FOR CARRIER-CURRENT CHANNELS ON HIGH-VOLTAGE POWER LINES. Brown Boveri Rev. 38:208-219, Jly/Aug. 1951.

186. Rodwin, G. THE LD-RI SINGLE-SIDEBAND RADIO RECEIVER. Bell Lab. Record 29:169-172, Apr. 1951.

"Description, with block diagram, of a receiver for the range 4-23Mc/s which has an unbalanced 75Ω input and is capable of receiving single-sideband signals with carrier as much as 20 db below one of two equal tones which completely load the transmitting equipment. Special features of the receiver are the choice of either a variable-frequency oscillator or a crystal-controlled oscillator for the first beating oscillator, limiters for reconditioning the received carrier, a.f.c. circuit with very few adjustments, a squelch circuit which prevents operation of the a.f.c. circuit during deep fading, a common main amplifier for both sidebands and carrier, and selectivity and a.g.c. that results in minimum cross-modulation and maintains maximum signal/noise ratio. Stabilized power-supply units are fed from 115V, 50-60 c/x mains and take 500 W." Sci. Abs. 54B:3120, 1951.

187. Schlaack, N.F. THE LD-T2 RADIO TRANSMITTER. Bell Lab. Record 29:561-564, Dec. 1951.

Describes a new multi-channel single-sideband radio transmitter.

188. SINGLE-SIDEBAND COMMUNICATION. Res. for Ind. 3:4-6, Sept. 1951.

189. Stanford Research Institute, Department of Electrical Engineering, Stanford, Calif.
APPLICATION OF TECHNIQUES IN THE RECEPTION OF SINGLE-SIDEBAND TRANSMISSION SIGNALS. Final Report, 1 January 1950 - 31 March 1951. 66p., Mar. 30, 1951. (Contract AF28 (099)-153)

Each of the advantages of single-sideband operation as well as the problems it presents are discussed fully.

190. Stanford University. Electronics Research Laboratory, Stanford, Calif. COMMUNICATION TECHNIQUES (MODULATION) PROJECT. 18p., figs., 1951. (Quart. Prog. Rpt. 5) (Contract W28-099-ac-131)

A laboratory single-sideband signal generator for general purpose use has been completed.

191. Stanford University. Electronics Research Laboratory, Stanford, Calif. COMMUNICATION TECHNIQUES (MODULATION) PROJECT. 18p., illus., 1951. (Quart. Prog. Rpt. 6) (Contract W28-099-ac-131)

The possibility of detecting reduced-carrier single-sideband signals by autocorrelation techniques is investigated in the hope of finding a means for automatically exalting a reduced carrier with minimun delay at any frequency within a certain band of uncertainty.

192. Stanford University. Electronics Research Laboratory, Stanford, Calif. COMMUNICATION TECHNIQUES (MODULATION) PROJECT, by O. G. Villard, Jr. 8p., diags., 1951. (Quart. Prog. Rpt. 7) (Contract W28-099-ac-131)

Conventional approaches to the development of a detection system for simplifying the tuning of single-sideband transmissions are reviewed. One system involves simultaneous AM and FM detection for demodulation of carrier-less single-sideband voice signals.

193. Stanford University. Electronics Research Laboratory, Stanford, Calif. COMMUNICATION TECHNIQUES (MODULATION) PROJECT, by O. G. Villard, Jr. 9p., 1951. (Quart. Prog. Rpt. 8) (Contract W28-099-ac-131)

Publications resulting from the development work are listed with author's name and completion date. Debugging of experimental apparatus for examining proposed autocorrelation detector is in progress. Experiments near 1000 c. in an investigation of the parallel carrier-selecting filter system showed that Q's of the order of 200 are obtainable with simple steel-bar assemblies, but mechanical problems existed at higher frequencies because of the rapid decrease in Q and vibration amplitude. Attempts are being made to extend the operating frequency of the tunable selective amplifier to the RF range by combining the IF shunt version with a crystal-controlled converter.

194. Stanford University. Electronics Research Laboratory, Stanford, Calif. COMMUNICATION TECHNIQUES (MODULATION) PROJECT, by O. G. Villard, Jr. 6p., diags., 1951. (Quart. Prog. Rpt. 9) (Contract W28-099-ac-131)

A cancellation method is described for obtaining single-sideband selectivity which utilized RF phase-difference networks (analogous to AF phase-difference networks) in conjunction with a diode detector in which the input impedance to the RF source is a function of the impedance on the AF side. A preliminary model of the system appearec feasible. The amount of distortion introduced by the diode detector is to be determined.

195. Stanford University. Electronics Research Laboratory, Stanford, Calif. FLEXIBLE SELECTIVITY FOR COMMUNICATION RECEIVERS, by O.G. Villard, Jr. and W.L. Rorden. 11p., diags., Sept. 15, 1951. (Tech. Rpt. 8) (Contract W28-099-ac-131)

A simple electronic attachment for communication receivers is shown, which performs many of the functions of the conventional intermediate-frequency quartz crystal filter. The attachment may be connected without modifying the receiver in any way, and several may be added to a given receiver if desired.

It is possible with this attachment to obtain the normal receiver response characteristic with a sharp peak (perhaps two or three hundred cycles wide) superimposed on top. This composite characteristic is useful in the reception of reduced-carrier double- and single-sideband transmissions. The height of the peak -- and consequently the degree of carrier exaltation obtainable -- is readily adjustable.

196. Stanford University. Electronics Research Laboratory, Stanford, Calif. PHASE EQUALIZATION OF CONSTANT-PHASE-DIFFERENCE NETWORKS, by V.H. Grinich. 2p., charts, May 31, 1951. (Tech. Rpt. 5) (Contract AF28-099)-83)

197. Stanford University. Electronics Research Laboratory, Stanford, Calif. SINGLE-SIDEBAND RECEPTION TECHNIQUES PROJECT, by D.W. Tuttle, Jr. 2p., Feb 1, 1951. (Interim Eng. Rpt. 19) (Contract AF28-(099)-83)

Gives current status of work on various phases of the project.

198. Stanford University. Electronics Research Laboratory, Stanford, Calif. SINGLE-SIDEBAND RECEPTION TECHNIQUES PROJECT, by D.F. Tuttle, Jr. Final Report. 4p., June 30, 1951. (Contract AF28(099)-83)

Developmental work on high-quality single-sideband system design was concerned with correcting the phase-frequency distortion inherent in conventional constant-phase-difference networks. The theoretical treatment was generally limited to single-sideband receivers employing the constant-phase-difference network principle of sideband rejection. A compact design theory which simultaneously provides linear through phase and constant phase difference was not achieved. Such networks are possible, but the procedure is tedious and involves trial and error. The important specific results of the investigation were an improved theory of standard constant-phase-difference networks (with incidental filter applications), and an analysis of methods for obtaining phase equalization.

199. Stanford University. Electronics Research Laboratory, Stanford, Calif. A STUDY OF THE APPROXIMATION PROBLEM FOR LINEAR-PHASE, CONSTANT-PHASE-DIFFERENCE NETWORKS, by D. D. Cherry. 112p., diags., June 1951. (Tech. Rpt. 4) (Contract AF28 (099)-83)

The monthly reports of the work done under this contract have discussed the weakness of the standard type of constant-phase-difference network, as applied to single-sideband systems. They have inherently non-linear phase-frequency characteristics when considered as transmission networks alone. This makes them unsuitable for the transmission of waveshapes which must be preserved, although they are excellent for speech systems and others which are concerned only with the steady-state behavior. The study reported on here undertook to modify the standard design method to provide not only the sideband rejection feature, but also to provide good waveshape or "transient" transmission.

200. Stanford University. Electronics Research Laboratory, Stanford, Calif. WAVEFORM DISTORTION IN PHASE-ROTATION (SIDEBAND-CANCELLATION) SINGLE-SIDEBAND SYSTEMS, by V. H. Grinich. 9p., June 29, 1951. (Tech. Rpt. 6) (Contract AF28(099)-83)

Several single-sideband systems using constant-phase-difference networks are compared from the standpoint of their waveform transmission properties.

201. Swarm, H. M. THE GENERATION OF SINGLE-SIDEBAND SUPPRESSED-CARRIER SIGNALS BY A NEW BALANCING METHOD. Inst. Radio Engrs. Proc. 39:295, 1951.

Summary only.

202. Villard, O. G. SINGLE-SIDEBAND SIGNAL GENERATOR. U.S. Patent 2,576,429. 4p., Nov. 27, 1951.

It is the object of the invention to provide a single-sideband signal generator which does not require the use of a radio frequency phase shifting network or other phase shifting network requiring adjustment each time the frequency of operation is changed.

203. Weaver, C.E. and Brown, J.N. CRYSTAL LATTICE FILTERS FOR TRANSMITTING AND RECEIVING. PART I - GENERAL PRINCIPLES; PART II - A CRYSTAL-FILTER S.S.B. EXCITER. QST 35:48-51, June 1951; 52-56, Aug. 1951.

Detailed description of a single-sideband transmitter using a typical lattice.

204. Whitby, O. and Scheuch, D.R. OUTPUT ANALYSIS AND ALIGNMENT TECHNIQUES FOR PHASE-ROTATION SINGLE-SIDEBAND TRANSMITTERS. Am. Inst. Elec. Engrs. Trans. 70:209-212, 1951.

"Discussion with reference to the type of transmitter described by Villard (893 of 1949). The two balanced modulators are driven by r.f. voltages in quadrature. A.f. modulating voltages, also in quadrature, are applied in push-pull to the valve grids of each modulator. The anode-current pulses of all the four Eimac Type 4-250A valves used develop power in a common anode tank circuit. When properly operated, only one sideband is present in the output. Details of the alignment procedure are given, and a specially developed alignment indicator is described which consists essentially of a single-frequency test source of four quadrature a.f. modulating voltages and four gated phase-sensitive detectors, each one of which is assigned to the examination of one particular component in the detected output of the transmitter." Wireless Engr. 30:2481, 1953.

205. Wrathall, E.T. and Beanland, C.P. THE SINGLE-SIDEBAND SYSTEM OF HIGH-FREQUENCY RADIO TRANSMISSION. Marconi Rev. 14:2-22, illus., 1951.

Treats the subject in a simple and general manner. Brings together information from various sources.

1950

206. Albert, A.L. ELECTRICAL COMMUNICATION. 3rd. ed., 593p., illus. New York, Wiley, 1950.

Sidebands, p. 413.

207. Arends, J.L. AUTOMATIC FREQUENCY CONTROL FOR SINGLE-SIDEBAND RECEIVERS. Communs. News 11:101-119, Dec. 1950.

"Deals with various a.f.c. systems as applied in single-sideband receivers. A brief explanation is given of the fundamental operations of single-sideband receiver and transmitter, and the various elements of an a.f.c. circuit are discussed in detail, namely, the pilot filter, the amplitude limiter, the discriminator and the means for correcting the frequency of the local oscillator. Two forms of a.f.c. circuit can be distinguished. namely, the electronic system and the electromechanical system. When fading accurs, a combination of both systems is required for single-sideband reception. Special attention is paid to the mechanical a.f.c. system for which a 'flotor' has been designed. This is a small variable condenser of a special form in which fluid damping is applied. Further, attention is given to the phase relations in the a.f.c. circuit with regard to frequency variations. Special problems arising when a.f.c. is used in conjunction with frequency-shift telegraphy are briefly mentioned. An entirely electromechanical a.f.c. system which synchronizes on the 'off' frequency seems to be the best solution for this type of transmission." Sci. Abs. 54B:2854, 1951.

208. Bakeman, D.C. SINGLE-SIDEBAND AND SUPPRESSED CARRIER TECHNIQUES IN RADIO COMMUNICATION. 53p., Urbana, Ill. 1950.

MS thesis, University of Illinois.

The paper attempts to furnish complete up-to-date information on single-sideband suppressed carrier as well as giving the results of experiments conducted by the author. It includes a theoretical study, a description of equipment now being used, a review of results obtained by the amateurs, a report on experiments conducted to establishment a minimum requirement for equipment, and a discussion of possible new techniques.

209. Bell Telephone Laboratories, Inc., Whippany, N.J. MULTIPLEXING AND SWITCHING OF INTERSHIP COMMUNICATIONS ON SINGLE-SIDEBAND RADIO, by M.M. Bower. v.p., Oct. 30, 1950. (MM-50-8760-15)

210. Bradley, R.W. PACKAGING THE BASIC 'PHONE EXCITER. QST 34:28-29, June 1950.

Uses the unit described by Goodman in his article "The Basic Phone Exciter" as the basis for a more compact design suitable for the foundation of a kilowatt all-purpose transmitter.

211. Burnell and Co., Inc., Yonkers, N.Y. SINGLE SIDEBAND FOR THE AMATEUR. 13p., 1950(?)

The unit described forms the basic part of a single-sideband transmitter.

212. Crosby Laboratories, Mineola, N.Y.
ADVANCED ENGINEERING RESEARCH STUDY OF HIGH FREQUENCY COMMUNICATION METHODS. Final Report, 1 January - 31 March 1950. 47 p., figs., Mar. 31, 1950. (Contract W36-039-sc-38155)
Single-sideband system considerations, p. 34-37.
Modulated wave amplifier - a new system for the amplification of single-sideband signals.

213. Crosby Laboratories, Mineola, N.Y.
ENGINEERING INVESTIGATIONS OF METHODS AND EQUIPMENTS FOR RECEPTION OF SINGLE-SIDEBAND SIGNALS, by M.G. Crosby. 47p., illus., Jan. 16, 1950. (Quart. Rpt. 3) (Contract W36-039-sc-38263)
Progress on the investigation of the various functions of the single-sideband receiver resulted in the development of an improved all-electronic automatic-frequency-control system which appears to have all of the advantages of the motor-operated systems, but is simpler, easier to tune, and more flexible.

214. Crosby Laboratories, Mineola, N.Y.
ENGINEERING INVESTIGATIONS OF METHODS AND EQUIPMENTS FOR RECEPTION OF SINGLE-SIDEBAND SIGNALS, by M.G. Crosby. 36p., diags., 1950. (Quart. Rpt. 4) (Contract W36-039-sc-38263)

215. Crosby Laboratories, Mineola, N.Y.
ENGINEERING INVESTIGATION OF METHODS AND EQUIPMENTS FOR RECEPTION OF SINGLE-SIDEBAND SIGNALS, by M.G. Crosby. 43p., diags., 1950. (Quart. Rpt. 5) (Contract W36-039-sc-38263)
Design work on the single-sideband adapter unit, arranged for connection to a communications receiver, was completed to the stage where construction was begun on the first model. This model uses crystal single-sideband filters for sideband separation and will be capable of twin-channel operation accomodating a modulation band of from 400 to 3700 c. Testing of this model will start in the first month of the next quarter. A second model accommodating a 20-kc. bandwidth for single-channel single-sideband operation will utilize a phasing network type of design.

216. Darlington, Sidney. REALIZATION OF A CONSTANT PHASE DIFFERENCE. Bell Sys. Tech. J. 29:94-104, illus., 1950.

This paper bears on the problem of splitting a signal into two parts of like amplitudes but different phases. Constant phase differences are utilized in such circuits as Hartley single-sideband modulators. The networks considered here are pairs of constant-resistance phase-shifting networks connected in parallel at one end.

217. Edmunds, F.E. A CRYSTAL-FILTER S.S.B. EXCITER. SIMPLIFIED DESIGN WITH I.F. QUARTZ CRYSTALS. QST 34:11-14, Nov. 1950.

218. General Electric Co., Syracuse, N.Y.
LONG RANGE COMMUNICATION EQUIPMENT 500 WATT SINGLE-SIDEBAND TRANSMITTER AN/FRT-7(XN-1). Final Engineering Report. 309p., illus., 1950. (Contract W28-099-ac-98)
The transmitter will deliver at least 750 w. of average power continuously with reasonable linearity for signal envelope variations between 0 and 2000 w. for any operation in the 1.5- to 30-mc. range.

219. General Electric Co., Syracuse, N.Y.
SINGLE-SIDEBAND ADAPTERS FOR NAVY MODEL RBC AND RDM RECEIVERS. Final Report. 52p., diags., Mar. 1950. (Contract W28-099-ac-98)
The two adapters, operating from 115 v. 60 c., were to be similar to the Army adapter except for modifications which permitted reception of twin-channel single-sideband signals over an audio range of 100 to 12,000 c. Instead of 300 to 12,000, and allowed their use with RDM receivers at 455 kc. and RBC receivers at 400 kc.

220. Goodman, Byron. A SHARP I.F. AMPLIFIER FOR 'PHONE OR C.W. QST 34:13-17, illus., Dec. 1950.
The writer suggests a good approach to selectivity for both c.w. and 'phone.

221. Goodman, Byron. TUNING AND CHECKING S.S.B. SIGNALS. QST 34:34-36, Oct. 1950.

222. Hamilton, G.E. and Artman, R.G. AN ANALYSIS OF SINGLE AND DOUBLE SIDEBAND TRANSMISSION. TV Eng. 1:22-24, Jly. 1950.
"A brief mathematical analysis of the double- and the vestigial single-sideband transmission modes is presented and applied to the problem of the detector frequency response. Results indicate that in the double-sideband case this response should respond to modu-

lating frequencies only and some attenuation can be tolerated, whereas for single-sideband work an infinitely wide detector response is required." Sci.Abs. 53B:4288, 1950.

223. Hamilton, G.E. and Artman, R.G. TV TRANSMITTER. LOWER SIDEBAND MEASUREMENTS. TV Eng. 1:12-15, 25, Apr. 1950.
Theoretical and practical considerations involved in the measurement of spectral energy distribution of television signals. Methods employed in making measurements include RF excitation of input of modulated amplifier, sine-wave modulation of transmitter and synthetic video signal modulation of the transmitter.

224. Kirby, H.D.B. THE SINGLE-SIDEBAND SYSTEM OF RADIO-COMMUNICATION. Electronic Eng. 22:259-263, Jly. 1950.
"The processes of single- and double-sideband modulation are discussed; the reasons for the advantages of the former are, namely: (1) improved s./n. ratio at the receiver (9 db); (2) less band-width per channel; (3) freedom from distortion due to selective fading and multi-path propagation. A triple modulation method is described which allows rejection of the unwanted sideband to be carried out at a point where the sidebands are well spaced allowing economical filter design. Block schematics of the transmitter and receiver are given. Examples are given of a 300 W (peak) transmitter and receiver installed on the 'S.S. Caronia' and a triple diversity receiver for land use. Up to six telegraph channels have also been satisfactorily used on a single single-sideband link." Sci.Abs. 53B:3910, 1950.

225. Lloyd, W.M. SOME ASPECTS OF SINGLE-SIDEBAND RECEIVER DESIGN. TV Soc.J. 6:135-149, illus., Oct.-Dec. 1950.
The author attempts to answer some of the questions which present themselves during the design of a single-sideband receiver. The discrepancies which appear in the response of the receiver to a unit step are discussed theoretically in relation to those features of the frequency characteristics which give rise to them. The information is intended to assist the designer in setting a balance between economy and performance. The step-responses, obtained experimentally, of two typical receivers, are shown.

226. MacDiarmid, I. and Tucker, D.G. POLYPHASE MODULATION AS A SOLUTION OF CERTAIN FILTRATION PROBLEMS IN TELECOMMUNICATIONS. Inst.Elec.Engrs.Proc. 97(Pt. 3):349-358, Sept. 1950.

An important class of filtration problems in telecommunication is associated with frequency changing;it includes the generation and demodulation of single-sideband carrier channels and the elimination of image-frequency interference in heterodyne demodulators, such as the superheterodyne radio receiver or the conventional wave analyser.

227. McLaughlin, J. L. A. FOLDED SIDEBAND MODULATION. Electronics. 23:88-91, Mar. 1950.
Basic principles of a proposed system of radio communication in which several kilocycles of information bandwidth are transmitted in sequence in a narrow band on one side of a carrier, and interfering heterodynes are eliminated by shifting them to the unused side of the carrier.

228. Nibbe, G. H. AUDIO PHASE-SHIFT NETWORKS. QST 34:42-45, Jan. 1950.
Use of phasing method in single-sideband transmitters.

229. Stanford Research Institute. Department of Electrical Engineering, Stanford, Calif.
APPLICATION OF TECHNIQUES IN THE RECEPTION OF SINGLE-SIDEBAND TRANSMITTED SIGNALS, by O. W. Whitby. 2p., Jan. 1950. (Mo. Letter Rpt. 1) (Contract AF28(099)-153)
This first monthly report indicates that an orientation period and an attempt to get acquainted with various methods of intelligence transmission consumed the greater part of the time.

230. Stanford Research Institute. Department of Electrical Engineering, Stanford, Calif.
APPLICATION OF TECHNIQUES IN THE RECEPTION OF SINGLE-SIDEBAND TRANSMITTED SIGNALS, by O. W. Whitby. 2p., Feb. 1950. (Mo. Letter Rpt. 2) (Contract AF28(099)-153)
An outline of the chief problems and an indication of the topics to be investigated.

231. Stanford Research Institute. Department of Electrical Engineering, Stanford, Calif.
APPLICATION OF TECHNIQUES IN THE RECEPTION OF SINGLE-SIDEBAND TRANSMITTED SIGNALS, by O. W. Whitby. 5p., Mar. 1950. (Mo. Letter Rpt. 3) (Contract AF28(099)-153)
Progress report on reconstitution of the carrier; demodulators; 90° phase-difference networks; and questions pertaining to the reception of signals with phase-conscious modulation.

232. Stanford Research Institute. Department of Electrical Engineering, Stanford, Calif.
APPLICATION OF TECHNIQUES IN THE RECEPTION OF SINGLE-SIDEBAND TRANSMITTED SIGNALS, by O. W. Whitby. 4p., diags., Apr. 1950. (Mo. Letter Rpt. 4) (Contract AF28(099)-153)
Theoretical work in connection with the analysis of the operation of a carrier reconstitution circuit employing a phase-sensitive detector and a reactance-tube controlled local oscillator; also, a report of a short experimental program to obtain data on intermodulation distortion.

233. Stanford Research Institute. Department of Electrical Engineering, Stanford, Calif.
APPLICATION OF TECHNIQUES IN THE RECEPTION OF SINGLE-SIDEBAND TRANSMITTED SIGNALS, by O. W. Whitby. 3p., diags., May 1950. (Mo. Letter Rpt. 5) (Contract AF28(099)-153)
Technical progress on demodulators; noise; and 90° phase-difference networks.

234. Stanford Research Institute. Department of Electrical Engineering, Stanford, Calif.
APPLICATION OF TECHNIQUES IN THE RECEPTION OF SINGLE-SIDEBAND TRANSMITTED SIGNALS, by O. W. Whitby. 2p., Jly. 1950. (Mo. Letter Rpt. 7) (Contract AF28(099)-153)
Results of study of comparison of single- and double-sideband transmission.

235. Stanford Research Institute. Department of Electrical Engineering, Stanford, Calif.
APPLICATION OF TECHNIQUES IN THE RECEPTION OF SINGLE-SIDEBAND TRANSMITTED SIGNALS, by O. W. Whitby. 2p., Aug. 1950. (Mo. Letter Rpt. 8) (Contract AF28(099)-153)
A summary of findings relative to switched-diode demodulators.

236. Stanford Research Institute. Department of Electrical Engineering, Stanford, Calif.
APPLICATION OF TECHNIQUES IN THE RECEPTION OF SINGLE-SIDEBAND TRANSMITTED SIGNALS, by D. K. Weaver, Jr. 10p., diags., Sept. 1950. (Mo. Letter Rpt. 9) (Contract AF28(099)-153)
The design procedure for a 90° phase-difference network is presented and a schematic of the final network included.

237. Stanford Research Institute. Department of Electrical Engineering, Stanford, Calif.
APPLICATION OF TECHNIQUES IN THE RECEPTION OF SINGLE-SIDEBAND TRANSMITTED SIGNALS, by O.W. Whitby. 8p., illus., Oct. 1950. (Mo. Letter Rpt. 10) (Contract AF28(099)-153)
Discusses effect of combined phase and amplitude error.

238. Stanford Research Institute. Department of Electrical Engineering, Stanford, Calif.
APPLICATION OF TECHNIQUES IN THE RECEPTION OF SINGLE-SIDEBAND TRANSMITTED SIGNALS, by J.F. Honey. 2p., Nov. 1950. (Mo. Letter Rpt. 11) (Contract AF28(099)-153)
Reports progress of work on automatic frequency control of a regenerated carrier for the single-sideband receiver.

239. Stanford Research Institute. Department of Electrical Engineering, Stanford, Calif.
APPLICATION OF TECHNIQUES IN THE RECEPTION OF SINGLE-SIDEBAND TRANSMITTED SIGNALS, by D.K. Weaver, Jr. 2p., Dec. 1950. (Mo. Letter Rpt. 12) (Contract AF28(099)-153)
Technical progress is reported.

240. Stanford Research Institute. Department of Electrical Engineering, Stanford, Calif.
METHODS AND EQUIPMENT FOR HIGH-LEVEL, SINGLE-SIDEBAND GENERATION IN THE FREQUENCY RANGE OF 1.5 TO 30 MEGACYCLES. Final Report and Instruction Manual, December 1948 - March 1950. 39p., charts, Mar. 1, 1950. (Contract W36-039-sc-38199)
This is the fourth and final report covering an engineering research study of high-level single-sideband generation and the construction of two experimental models of a radio transmitter providing single-sideband operation over the frequency range of 1.5 to 30 megacycles and having a peak power capability of 500 watts.
The operation of the high-level transmitter is described and a detailed description of its component parts, including all circuit diagrams, is given.

241. Stanford University. Electronics Research Laboratory, Stanford, Calif.
CASCADE CONNECTION OF 90-DEGREE PHASE-SHIFT NETWORKS, by O.G. Villard, Jr. 11p., diagrs., May 15, 1950. (Tech. Rpt. 2) (Contract W28-099-ac-131)

The cascade connection makes possible the attainment of substantially improved rejection ratios. Provided that adequate performance can be realized in the remaining parts of the system, such as the modulators or demodulators, it appears that the phase rotation method can be made equal in performance to the best conventional band-pass filters as a means for obtaining sideband selectivity.

242. Stanford University. Electronics Research Laboratory, Stanford, Calif. COMMUNICATION TECHNIQUES (MODULATION) PROJECT, by O. G. Villard, Jr. 16p., diags., 1950. (Quart. Prog. Rpt. 2) (Contract W28-099-ac-131)

An investigation of the use of triodes in the high-level single-sideband balanced modulator circuit was undertaken.

243. Stanford University. Electronics Research Laboratory, Stanford, Calif. COMMUNICATION TECHNIQUES (MODULATION) PROJECT. 15p., figs., 1950. (Quart. Prog. Rpt. 3) (Contract W28-099-ac-131)

Circuits for single-sideband generation, based on phase-modulation sidebands, are shown.

244. Stanford University. Electronics Research Laboratory, Stanford, Calif. COMMUNICATION TECHNIQUES (MODULATION) PROJECT, by O. G. Villard, Jr. 16p., diags., 1950. (Quart. Prog. Rpt. 4) (Contract W28-099-ac-131)

Results are presented of a study of the Taylor system of high efficiency modulation (supermodulation). This system produces conventional amplitude modulation and is simple. Further research is needed before the degree of linearity obtainable and the best operating conditions can be specified in advance.

245. Stanford University. Electronics Research Laboratory, Stanford, Calif. CONSTANT-PHASE DIFFERENCE NETWORKS AND THEIR APPLICATION TO FILTERS, by D.K. Weaver, Jr. 60p., illus., Oct. 28, 1950. (Tech. Rpt. 1) (Contract AF28(099)-83)

A report on a useful corollary application which became evident during the development of the theory of constant-phase-difference networks and their application to the generation, transmission and reception of single-sideband signals.

246. Stanford University. Electronics Research Laboratory, Stanford, Calif. MAXIMALLY-FLAT PHASE-DIFFERENCE NETWORK DESIGN, by G.L. Matthaei. 27p., diags., Oct. 31, 1950. (Tech. Rpt. 2) (Contract AF28(099)-83)

The theory of networks which realize a constant difference in the phases of two outputs, over a wide band of frequencies, in the equal-ripple or Chebyshev manner is here extended to the limiting case of zero error and zero bandwidth. This is the maximally-flat or Taylor type of approximation. The electrostatic potential analogy is used, with an appropriate conformal transformation, to develop the mathematical theory, and a design procedure is developed. For application to single-sideband systems, a comparison is made of the performance of these and of the equal-ripple type. The maximally-flat type offers no advantage, in fact is inferior, in this application.

247. Stanford University. Electronics Research Laboratory, Stanford, Calif. SINGLE-SIDEBAND RECEPTION TECHNIQUES PROJECT, by D. F. Tuttle, Jr. 5p., illus., Jan. 31, 1950. (Interim Eng. Rpt. 7) (Contract AF28(099)-83)

An attempt to make the phase-equalization problem in 90^{o} network single-sideband systems easier, by using more complicated 90^{o} networks, has been made. Results indicate that practically no benefit is obtained by widening the frequency band over which 90^{o} phase difference is approximated.

248. Stanford University. Electronics Research Laboratory, Stanford, Calif. SINGLE-SIDEBAND RECEPTION TECHNIQUES PROJECT, by D. F. Tuttle, Jr. 3p., Feb. 28, 1950. (Interim Eng. Rpt. 8) (Contract AF28(099)-83)

Work was begun on a filter design which uses no coils.

249. Stanford University. Electronics Research Laboratory, Stanford, Calif. SINGLE-SIDEBAND RECEPTION TECHNIQUES PROJECT, by D. F. Tuttle, Jr. 5p., figs., May 11, 1950. (Interim Eng. Rpt. 10) (Contract AF28(099)-83)

Summary reports of the various phases of work in progress are given. Included are a phase equalization design and transient response curves supplementing Report 7, and certain performance characteristics supplementing previous constant-phase-difference network characteristics.

250. Stanford University. Electronics Research Laboratory, Stanford, Calif. SINGLE-SIDEBAND RECEPTION TECHNIQUES PROJECT, by D. F. Tuttle, Jr. 3p., figs., June 9, 1950. (Interim Eng. Rpt. 11) (Contract AF28(099)-83)

Outlines current work. No special results are said to be ready for detailed reporting.

251. Vigoureux, P. and Booth, C.F. QUARTZ VIBRATORS AND THEIR APPLICATIONS. 371p., illus. London, H.M. Stationery Office, 1950.

Bibliography, p. 357-364.

Single-sideband systems are mentioned in Chap. 14; Carrier generation for multi-channel carrier-systems; and in Chap. 17, Frequency selection.

252. Western Electric Co., New York, N.Y.
LD-T2 SINGLE-SIDEBAND RADIO TRANSMITTER. 317p., diags., 1950(?). (Instruction B. 1196)

Description and operating principles, circuit description, installation information, operation, maintenance and trouble location procedures.

253. Zimmerman, Franz. EINSEITEN BAND-MODULATION. Funk-Tech. 5:46-48, illus., Jan. 2, 1950.

Translated title: Single-sideband modulation.

In German.

1949

254. Bane, C.F. THE SINGLE-SIDER. CQ 5:13-18, 90-91, illus., May 1949.

255. Beale, F.S. OPERATIONAL EXPERIENCE WITH SINGLE-SIDEBAND POWER-LINE CARRIER EQUIPMENT. Tele-Tech 8:32-35, illus., June 1949.

System finds broad application when carrier spectrum is crowded and when circuits exhibit high attenuation, high noise-level, or heterodyne interference.

256. Berry, F.M. A FILTER DESIGN FOR THE SINGLE-SIDEBAND TRANSMITTER. QST 33:29-35, June 1949.

257. Crosby Laboratories, Mineola, N.Y.
ENGINEERING INVESTIGATION OF METHODS AND EQUIPMENTS FOR RECEPTION OF SINGLE-SIDEBAND SIGNALS, by M.G. Crosby et al. n.p., diags., 1949. (Quart. Rpt. 1-2) (Contract W36-039-sc-38263)

The advantages and disadvantages of several systems of detecting suppressed carrier single-sideband signals as applied to multichannel voice frequency communication equipment are to be investigated. Equipment is to be designed for performance equal to or exceeding that of existing single-sideband receiving equipment with significantly simplified operation and adjustment. A demodulator function model and a carrier filter, signal, and a.f.c. function model were completed.

258. Dagnall, C.H. and Rounds, P.W. DELAY EQUALIZATION OF EIGHT-KILOCYCLE CARRIER PROGRAM CIRCUITS. Bell Sys. Tech. J. 28: 181-195, illus., 1949.

The selection of a single-sideband requires sharp frequency discrimination; and when this discrimination is achieved with minimum-phase structures, it is of necessity accompanied by delay distortion. The article describes how equalizers may be added to each terminal to make the phase characteristic approach linearity and so permit at least ten links to be operated in tandem without excessive distortion.

259. Farkas, F.S., Hallenbeck, F.J. and Stehlik, F.E. BAND-PASS FILTER, BAND ELIMINATION FILTER, AND PHASE SIMULATING NETWORK FOR CARRIER PROGRAM SYSTEMS. Bell Sys. Tech. J. 28:196-220, 1949.

260. FREQUENCY ALLOCATION FOR FIVE CHANNELS AND RECOMMENDATIONS FOR RECEIVERS FOR ASYMMETRIC SIDEBAND RECEPTION. Electronic Eng. 21:163-164, May 1949.

261. Fromageot, A. and Lalande, M.A. CALCULATION OF BAND-PASS FILTERS USING PIEZOELECTRIC CRYSTALS IN LATTICE STRUCTURES. Elec. Communs. 26:305-318, 1949.

Channel-separating filters for single-sideband radiotelephony, p. 314-315.

262. General Electric Co., Syracuse, N.Y. LONG-RANGE COMMUNICATION EQUIPMENT. Interim Engineering Report January 1949. 8p., 1949. (Contract W28-090-ac-98)

Details of the exciter and high-level amplifier units.

263. General Electric Co., Syracuse, N.Y. LONG-RANGE COMMUNICATION EQUIPMENT. Interim Engineering Report February 1949. 5p., 1949. (Contract W28-099-ac-98)

Reports results of operational study to date.

264. General Electric Co., Syracuse, N.Y.
LONG-RANGE COMMUNICATION EQUIPMENT, by G.M. Reinsmith. Interim Engineering Report March 1949. 4p., diags., 1949. (Contract W28-099-ac-98)

The schematic diagram of the monitor unit as now constructed is enclosed with this report. This unit serves as a calibrator for the sideband generator as well as a demodulator of the transmitter output.

265. General Electric Co., Syracuse, N.Y.
LONG-RANGE COMMUNICATION EQUIPMENT, by G.M. Reinsmith. Interim Engineering Report June 1949. 2p., 1949. (Contract W28-099-ac-98)

The AN/GRC-25(XW-1) radio set which consists of a 500-w. single-sideband transmitter, a sideband adapter unit, and a diversity receiver system was completed. The AN/FRT-7(XN-1) transmitter will be the same as the AN/GRC-25(XW-1) transmitter with the exception of the modulating audio frequency range. It will consist of an exciter framework with 7 removable drawer-type units and a high-level framework housing a HV power supply, a power control drawer, and the high-lever linear amplifier and antenna-matching RF equipment. The components are in various stages of development.

266. General Electric Co., Syracuse, N.Y.
LONG-RANGE COMMUNICATION EQUIPMENT, by G.M. Reinsmith. Interim Engineering Report July 1949. 2p., 1949. (Contract W28-099-ac-98)

The prototype version of the 0.5° error phase shift networks was tested. Bench measurements revealed that power supply impedance was an important factor in the determination of the differential amplitude characteristic. Modifications in the network cathode and plate resistors resulted in less than 0.5% differential amplitude error over the 100- to 12,000 cps frequency range. A rejection ratio of better than 40 db was obtained with the networks installed in the monitor unit and trimmed for optimum unwanted sideband rejection.

267. General Electric Co., Syracuse, N.Y.
LONG-RANGE COMMUNICATION EQUIPMENT, by G.M. Reinsmith. Interim Engineering Report September 1949. 2p., 1949. (Contract W28-099-ac-98)

The exciter unit has been aligned and operated satisfactorily. In operational checks of the high level portion of the equipment, the final amplifier was subject to spurious oscillation in the 20- to 30mc. frequency range under certain combinations of settings of the tuning controls.

268. General Electric Co., Syracuse, N.Y.
LONG-RANGE COMMUNICATION EQUIPMENT, by G.M. Reinsmith. Interim Engineering Report October 1949. 2p., 1949. (Contract W28-099-ac-98)

Trap circuits installed in the final amplifier stage successfully squelched parasitic oscillations that had been occurring. Except for the heat runs final tests of the recalibrated dummy H_2O load were completed for 1.5, 2.5, 4.1, 6.5, 9.9, 13.3, and 17.54 mc. A triggered parasite at 22.1 mc. occurring only during shock excitation, which set up voltages that caused flashing of the band-change switch, must be suppressed before the final tests can be resumed.

269. Goodman, Byron. THE "BASIC" PHONE EXCITER. QST 33:11-17, Jan. 1949.

Single- or double-sideband or P.M. from one transmitter.

270. Goodman, Byron. A 75- AND 20-METER SINGLE-SIDEBAND EXCITER. QST 33:40-43, 102, 104, Nov. 1949.

A description of a single-sideband exciter that uses one of the preadjusted audio-phase-shift networks.

271. Great Britain. Royal Aircraft Establishment, Farnborough, Hants. SINGLE-SIDEBAND COMMUNICATION FOR AIRCRAFT AND OTHER MOBILE SERVICES, by G.W. Barnes. 31p., illus., 1949. (Tech. Note 450)

The advantages of employing single-sideband technique for mobile, particularly airborne, R/T stations on high-frequency circuits are described. The general problems associated with single-sideband transmission and reception are examined and the use of a pilot carrier to provide a.g.c. and a.f.c. at the receiver is considered.

272. Herrmann, J. von and Erben, J. EINSEITENBANDVERFAHREN ODER FREQUENZMODULATION IN DER EW-TELEFONIE? Frequenz 3:341-348, 1949.

In German.

Translated title: Single-sideband method or frequency modulation in the telephony on power lines?

Discussion of the relative merits of the two systems, with particular reference to corona interference and to distortion due to sideband clipping in FM systems.

273. Kirby, H. D. B. SINGLE-SIDEBAND RADIO-TELEPHONY. Wireless World 55:90-91, illus., Mar. 1949.

Tells of the first use of the system in marine communication.

274. Leconte, R. A., Penick, D. B., Schramm, C. W. and Wier, A. J. A CARRIER SYSTEM FOR 8000-CYCLE PROGRAM TRANSMISSION. Bell Sys. Tech. J. 28:165-180, 1949.

Employs a single-sideband carrier system applicable to broadband carrier facilities.

275. Lutsch, A. CONCERNING THE PROBLEM OF THE ADAPTABILITY OF THE SINGLE-SIDEBAND METHOD TO FREQUENCY MODULATED OSCILLATIONS. Fernmeldetech. Z. 2:347-351, 1949.

In German.

"A theoretical treatment of the subject shows that no simple demodulation process can be applied. Investigation of the AM which occurs in single-sideband systems indicates that the phase swing is limited to <1.7 radians, so that only narrow-band modulation is possible. Formulas are given for determining the behavior of the demodulated low-frequency curves, and distortion is discussed. From these considerations, single-sideband FM appears to be impracticable for communication purposes." Inst. Radio Engrs. Proc. Abs. and Ref., no. 743, 1950.

276. Mann, D. O. AN INEXPENSIVE SIDEBAND FILTER. NOTES ON THE FILTER-TYPE SINGLE-SIDEBAND EXCITER. QST 33:21-26, 104, 106, Mar. 1949.

277. Meinel, Eugen. EIN VERFAHREN DER VERZERRUNGSFREIEN DEMODULATION VON EINSEITENBANDSCHWINGUNGEN. Arch. Elek. Ubertrag. 3:37-46, diags., Feb. 1949.

In German.

Translated title: A method of non-distorting rectification of single-sideband oscillation.

278. Norgaard, D. E. VERSATILE SINGLE-SIDEBAND EXCITER. CQ 5:34-40, 90-91, Mar. 1949; 28-32, 76-77, illus., Apr. 1949.

Construction and adjustment details.

279. OPERATIONAL EXPERIENCE WITH SINGLE-SIDEBAND POWER-LINE CARRIER EQUIPMENT. Tele-Tech. 8:32-35, June 1949.

The system finds broad application when carrier spectrum is crowded and when circuits exhibit high attenuation, high noise level, or heterodyne interferences.

280. Pembose, G. S.F.R. 2-kW and 20-kW SINGLE-SIDEBAND TRANSMITTERS. Ann. Radioelec. 4:358-371, Oct. 1949.

"An illustrated description, with block and circuit diagrams. The advantages of single-sideband operation are outlined and the application of the normal suppression method to these transmitters is discussed. The use of quartz filters reduces the number of frequency conversions necessary to three, which are effected at 84 kc/s, at 2520 kc/s and at a variable frequency. Each transmitter has a frequency range of 3.75-23 Mc/s and includes an automatic quick-action frequency-selection device. C.w. and a.m. telegraphy, and telephony operation can also be arranged; in single-sideband working a 'pilot frequency' signal is transmitted for modulation purposes at the receiver." Wireless Eng. 27:777. 1950.

281. Reque, S.G. LINEAR R.F. AMPLIFIERS. THEIR DESIGN AND ADJUSTMENT. QST 33:15-20, May 1949.

Gives basic techniques for adjusting amplifiers used in single-sideband transmitters.

282. Rust, W.M. SINGLE SIDEBAND FOR THE AVERAGE HAM. QST 33:47-50, 88, 90, Aug. 1949.

The article describes an exciter, built mostly of junk-box parts, that is suitable for the average ham who might like to try single sideband with a minimum of cost and effort.

283. Sev, A. UN DISPOSITIF DE DOUBLE DIVERSITE POUR LA RECEPTION RADIOTELEPHONIQUE A BANDE LATERALE UNIQUE. Ann. Radioelec. 4:261-264, 1949.

In French.

Translated title: An arrangement of double diversity for radio reception by single sidebands.

Summary: "The author recalls the principle of diversity reception and sums up briefly its applications in single-sideband receivers. He then describes the principle characteristics of the system pertinent to S.R.F. In this system, the reference level is furnished in the two bands by the mean level of the carrier wave so that the commutation operates independently of the modulation transmitted by the sidebands."

284. SINGLE-SIDEBAND RADIO TELEPHONY IN THE "CARONIA". Engr. 187:145, illus., Feb. 4, 1949.

Use, advantages, designer and performance of single-sideband telephony on the Cunard White Star liner Caronia, believed to be the first passenger vessel fitted with transmitters and receivers for single-sideband telephony.

285. Stanford Research Institute, Stanford, Calif.
A RESEARCH INVESTIGATION OF METHODS AND EQUIPMENT FOR HIGH-LEVEL SINGLE-SIDEBAND GENERATION IN THE FREQUENCY RANGE OF 1.5 TO 30 MEGACYCLES. 22p., diags., Mar. 7, 1949. (Quart. Prog. Rpt. 1) (Contract W36-039-sc-38199)

The purpose of this investigation is to thoroughly investigate the problem of generating a single-sideband, suppressed-carrier, high-frequency radio signal applicable to multichannel, voice-frequency military communication.

286. Stanford Research Institute, Stanford, Calif.
A RESEARCH INVESTIGATION OF METHODS AND EQUIPMENT FOR HIGH-LEVEL SINGLE-SIDEBAND GENERATION IN THE FREQUENCY RANGE OF 1.5 TO 30 MEGACYCLES. 25p., diags., June 6, 1949. (Quart. Prog. Rpt. 2) (Contract W36-039-sc-38199)

This report covers all activity during the second quarter of an investigation into a method of generating a single-sideband suppressed carrier radio signal at a high power level in the 1.5 to 30 megacycle region. Progress is discussed under the following headings: Laboratory facilities and special test equipment; wide-band audio-frequency 90° phase-shift networks; measurement of audio phase shift; radio-frequency 90° phase shift networks; selection of tetrode; screen modulator; and automatic tuning control and alarm circuitry.

287. Stanford University. Electronics Research Laboratory, Stanford, Calif.
COMMUNICATION TECHNIQUES (MODULATION) PROJECT, by O.G. Villard, Jr. 18p., illus., 1949. (Quart. Prog. Rpt. 1) (Contract W28-099-ac-131)

A study was made of the possibility of applying negative envelope feed-back to balanced modulators for the reduction of spurious side-bands arising from nonlinear distortion. Tuning adjustments in the feed-back loop were eliminated by means of a novel aperiodic exalted-carrier detector connection. Results suggest that this technique may be applied to high-level single-sideband generators. If successful, this may make possible high-level single-sideband transmitters whose performance is comparable to the best low-level equipment produced to date.

288. Stanford University. Electronics Research Laboratory, Stanford, Calif. LOW-LEVEL, HIGH-EFFICIENCY MODULATION PROJECT, by O. G. Villard, Jr. 17p., illus., Jan. 15, 1949. (Quart. Rpt. 3) (Contract W28-099-ac-131)

Reports findings affecting single-sideband systems in connection with the 90-degree network investigation.

289. Stanford University. Electronics Research Laboratory, Stanford, Calif. LOW-LEVEL, HIGH-EFFICIENCY MODULATION PROJECT, by O. G. Villard, Jr. Final Report, 15 April 1948 - 15 April 1949. v. p., June 15, 1949. (Quart. Rpt. 4) (Contract W28-099-ac-131)

A new high-level, high-efficiency modulation system has been developed, having as its distinguishing features a carrier-level efficiency and an ease of adjustment and operation quite comparable to high-level plate modulation. The combination audio oscillator and band-pass filter should be useful in single-sideband voice reception.

290. Stanford University. Electronics Research Laboratory, Stanford, Calif. SINGLE-SIDEBAND RECEPTION TECHNIQUES PROJECT, by D. F. Tuttle, Jr. 5p., 1949. (Interim Eng. Rpt. 1) (Contract AF28(099)-83)

This contract is an extension of contract W28-099-ac-131 which included a study of single-sideband communication using 90° phase-shift networks instead of filters, and of W36-039-sc-38199 concerned with the design and construction of single-sideband transmitters. Under the present contract, phase distortion in single-sideband receivers is to be studied to aid the design of radio receivers for phase-sensitive systems.

291. Stanford University. Electronics Research Laboratory, Stanford, Calif. SINGLE-SIDEBAND RECEPTION TECHNIQUES PROJECT, by D. F. Tuttle, Jr. 3p., 1949. (Interim Eng. Rpt. 3) (Contract AF28(099)-83)

Methods were sought for making the through or transmission phase characteristic sufficiently linear with frequency so that wave forms could be transmitted. Theory indicates that, because of certain unique properties of the 90° phase-difference function, any unit design which includes phase equalization as well as the 90° feature can be broken down into networks of the present type combined with an equalizer which is the same in each path. The equalizer, then, would be equally effective if placed before the branching point, and apparently straight-forward equalization techniques may be helpful.

292. Stanford University. Electronics Research Laboratory, Stanford, Calif. SINGLE-SIDEBAND RECEPTION TECHNIQUES PROJECT, by D.F. Tuttle, Jr. 5p., 1949. (Interim Eng. Rpt. 4) (Contract AF28(099)-83.

The use of an all-pass phase equalizer in series with the 90° networks of a single-sideband transmitter is being investigated. The through-phase characteristics of the standard 90° network design made for the Stanford Research Institute transmitter were selected as typical, and data were obtained as to the order of magnitude of the complexity of the network which would be required to equalize this phase characteristic to be approximately linear with frequency

293. Stanford University. Electronics Research Laboratory, Stanford, Calif. SINGLE-SIDEBAND RECEPTION TECHNIQUES PROJECT, by D.F. Tuttle, Jr. 9p., diags., 1949. (Interim Eng. Rpt. 5) (Contract AF 28(099)-83)

High-quality equalization of the phase characteristic of a specific 90°-type of single-sideband system is considered. Application of the 'condenser-plate' technique, both (a) at audio frequencies and (b) partly at radio frequencies and partly at audio frequencies, indicates the need of an unreasonably large corrective network in each case.

1948

294. ADDING SINGLE-SIDEBAND SELECTIVITY TO THE COMMUNICATIONS RECEIVER. Radio News 39:54-55, June 1948.

A description of a new super-selective i.f. channel for use with present receiver.

295. Cheek, R.C. SINGLE-SIDEBAND FOR EVERYONE. CQ 4:17-22, Nov. 1948.

An uncomplicated s.s.s.c. exciter that makes use of a static wide-band audio-phase shifter developed by Westinghouse for single-sideband carrier-current equipment.

296. Curran, L.K. and Allen, J.F. SINGLE SIDEBAND COMMUNICATION SYSTEMS. Inst. Radio Engrs. (Australia) Proc. 9:25, Oct. 1948.

Summary of convention paper.

Part I. Introduction and description of receiver apparatus.

Part 2. Description of transmitting apparatus.

297. Dawley, R.L. AN S.S.S.C. TRANSMITTER ADAPTER. AN EXCITER USING THE "PHASING" PRINCIPLE. QST 32:40-49, illus., Jly. 1948.

298. Dinsdale, A. SINGLE-SIDEBAND SELECTOR. Wireless World 54: 244-247, Jly. 1948.

"A unit for attachment to communications receivers with an i.f. of $\backsim$ 455 kc/s and for use with modulated or c. w. signals is described. Either sideband can be used, or alternatively double-sideband reception can be obtained with a locally-reinforced carrier to reduce selective fading. The unit, which contains 14 valves, comprises an oscillator, two detectors with phase shifters and one a.f. stage. It is fed from the least i.f. stage of the receiver and itself feeds into the receiver's audio system. For satisfactory operation, the receiver's i.f. amplifier must be correctly aligned and the local oscillator free from slow drifts, erratic jumps and f.m." Sci. Abs. 52B:912, 1949.

299. General Electric Co., Syracuse, N.Y.
GROUND-TO-AIR LONG-RANGE COMMUNICATION EQUIPMENT. Interim Engineering Report, January 1948. 5p., 1948. (Contract W28-099-ac-98)

The report covers 90° phase shift circuits; selectable crystal oscillator and frequency convertor; low level linear amplifier; sideband generator unit; and single-sideband adapter.

300. General Electric Co., Syracuse, N.Y.
LONG-RANGE COMMUNICATION EQUIPMENT. Interim Engineering Report, March 1948. 4p., 1948. (Contract W28-099-ac-98)

Discusses laboratory tests of the sideband generator units.

301. General Electric Co., Syracuse, N.Y.
LONG-RANGE COMMUNICATION EQUIPMENT. Interim Engineering Report, June 1948. 11p., 1948. (Contract W28-099-ac-98)

Reports progress of work on single-sideband transmitter and adapter.

302. General Electric Co., Syracuse, N.Y.
LONG-RANGE COMMUNICATION EQUIPMENT. Interim Engineering Report, August 1948, and Report on HIGH-LEVEL SINGLE-SIDEBAND GENERATOR EDG 21133, September 10, 1948. 15p., illus., 1948. (Contract W28-099-ac-98)

Evaluation of the generator indicates that the high-level system of single-sideband generation seems to be a relatively simple system. Careful adjustment will yield a performance characteristic which is quite comparable to present single-sideband systems.

303. General Electric Co., Syracuse, N.Y.
LONG-RANGE COMMUNICATION EQUIPMENT. Interim Engineering Report, September 1948. 4p., 1948. (Contract W28-099-ac-98)
Includes a schematic diagram for the sideband selector unit.

304. General Electric Co., Syracuse, N.Y.
LONG-RANGE COMMUNICATION EQUIPMENT. Interim Engineering Report, October 1948. 6p., diags., 1948. (Contract W28-099-ac-98)
Further report on details of study.

305. Goodman, Byron. WHAT IS SINGLE-SIDEBAND TELEPHONY? A FEW FACTS ABOUT THE NEW 'PHONE TECHNIQUE. QST 32: 13-15, Jan. 1948.
The principles involved in s.s.s.c. transmission and reception.

306. Grammer, George. SINGLE-SIDEBAND POWER GAIN. QST 32: 42-43, Mar. 1948.

307. Hamilton, G.E. TV TRANSMITTER DESIGN. Communs. 28:12-15, 30, illus., May 1948.
In this article on design trends it is stated that since single-sideband transmission has been standardized, means must be provided for suppression of the unwanted portion. Progressive circuit attenuation or vestigial sideband filtering is currently employed for this suppression. In this method the r-f bandpass characteristic of all amplifiers following the modulated stage are adjusted so the upper sideband only is passed.

308. Jacobi, T.E. MULTI-CHANNEL RADIO TELEGRAPH SYSTEM FOR HIGH-FREQUENCY CIRCUITS. RCA Rev. 9:704-720, Dec. 1948.
In field tests of a number of frequency division multichannel systems for use in h-f range (3 to 30 Mc) it was found that f.m. subcarrier channels in conjunction with single sideband and space diversity provided the best method of those tried.

309. McLaughlin, J.L.A. SELECTABLE SINGLE-SIDEBAND RECEPTION SIMPLIFIED. QST 32:11-15, diags., Apr. 1948.

310. Najork, Jack. A SINGLE-SIDEBAND SELECTOR FOR HAM USE. Radio News 40:53-55,120,122-123, Aug. 1948.

Amateurs and DX-ers can enjoy advantages of single-sideband reception without using complex equipment through use of the Norgaard system of single-sideband selectors.

311. Nichols, A.H. A SINGLE-SIDEBAND TRANSMITTER FOR AMATEUR OPERATION. CIRCUIT DETAILS AND TUNING PROCEDURE FOR S.S.S.C. TRANSMISSION. QST 32:19-24, 28-31, 128, 130, Jan. 1948.

The design, construction and operation of a single-sideband suppressed-carrier transmitter are described. Intermediate frequencies of 9 kc/s and 550 kc/s are used and the transmitted frequency is 14.2 Mc/s. The two higher oscillator frequencies are crystal-controlled and each frequency stage has a balanced modulator and filter.

312. Norgaard, D.E. A NEW APPROACH TO SINGLE SIDEBAND. GENERATING S.S.S.C. BY THE "PHASING" METHOD. QST 32:36-42, June 1948.

Discussion of practical methods of generating a single-sideband suppressed-carrier signal without the need for sharp filtering and multiple heterodyning. One of the sidebands is removed by a process in which two audio channels with a constant phase difference of 90° are balanced.

313. Norgaard, D.E. PRACTICAL SINGLE-SIDEBAND RECEPTION. QST 32:11-15, Jly. 1948.

By using an automatic "lock-in," easy reception of an s.s.s.c. signal (with a small amount of pilot carrier) can be obtained. Tells how the system works and gives pertinent information for its construction.

314. Norgaard, D.E. WHAT ABOUT SINGLE SIDEBAND? WHAT IT OFFERS IN AMATEUR 'PHONE COMMUNICATION. QST 32:13-19, May 1948.

315. Polkinghorn, F. COMMERCIAL SINGLE SIDEBAND RADIOTELEPHONE SYSTEMS. Communs. 28:24-27, 1948.

Developmental history since 1915.

316. Rosentreter, E.W. SINGLE-SIGNAL SINGLE-SIDEBAND ADAPTER. Electronics 21:124,126,140,142-143, illus., Jly. 1948.

Full circuit details are given for the General Electric single-side-band selector. Principles of operation are discussed with references to the work of Villard and Dome. The selector unit is connected to the last i.f. stage of an existing AM receiver by means of a small proble and a short length of low-capacitance shielded cable.

317. Silver, McMurdo. ADDING SINGLE-SIDEBAND SELECTIVITY TO THE COMMUNICATIONS RECEIVER. Radio News 39:54-55,137-138, 140-141, June 1948.
Description of a super-selective i.f. channel for use with present receiver.

318. SINGLE SIDEBAND AND TETRODES. Communs. 28:22-23,36,illus., Dec.1948.
The applications of the tetrode to single-sideband transmission.

319. SINGLE-SIDEBAND CONVERTER. Electronics 21:156,158, Jly.1948.
Illustration and description of the Millen adapter unit.

320. SINGLE SIDEBAND; ITS PROS AND CONS. CQ 4:42-44, May 1948.

231. SINGLE-SIDEBAND POWER GAIN. QST 32:42-43, Mar.1948.

322. Stanford University. Electronics Research Laboratory, Stanford, Calif. IMPROVED MODULATION METHOD, 15 April - 15 July 1948, by O.G. Villard, Jr. 11p.,illus.,1948. (Quart.Rpt. 1) (Contract W28-099-ac-131)
Activity during the period was chiefly concerned with further study and evaluation of the four-tube high-level single-sideband generator.

323. Stanford University. Electronics Research Laboratory, Stanford, Calif. LOW-LEVEL HIGH-EFFICIENCY MODULATION PROJECT, 15 July - 15 October 1948, by O.G. Villard, Jr. 18p.,illus.,1948. (Quart.Rpt. 2) (Contract W28-099-ac-131)
Reports on a further test of the single-sideband plus carrier system and an investigation of the YRS single-sideband selector.

324. Taylor, P.K. SINGLE-SIDEBAND CRYSTAL FILTERS. Electronics 21:116-120,illus.,Oct.1948.
X-cut crystals are used in multiple-section filters for the upper and lower sidebands and the carrier frequency. The carrier filter

has a passband 16 cycles wide between 3-db points and the sideband filters are flat within 0.6 db for nearly 6 kilocycles.

325. TETRODES IN SINGLE-SIDEBAND TRANSMISSION AND IN CLASS C FM AND AM APPLICATIONS. Communs. 28:22-23, 36, illus., Dec. 1948.

326. Van der Wyck, C. T. MODERN SINGLE-SIDEBAND EQUIPMENT OF THE NETHERLANDS POSTAL TELEPHONE AND TELEGRAPH. Inst. Radio Engrs. Proc. 36:970-980, Aug. 1948.

After an introduction, a short description is given of the equipment developed before 1940, followed by a survey of the principles of the modern equipment. The way in which the automatic tuning in the receiver is accomplished is described in detail. A summary is given of the advantages of the modern equipment with respect to the earlier art. In an appendix, some theoretical considerations are given with respect to the automatic tuning control; particularly, the conditions for a stable circuit are derived.

Approximately the same article, in Dutch, with English summary appears in Tijdschr. ned Radiogenoot 12:127-149, Jly. 1947.

327. Villard, O. G. and Thompson, D. L. DETECTOR FOR SINGLE-SIDEBAND RECEPTION. QST 32:11-18, June 1948.

Eliminating the unwanted sideband by phase-shift networks.

328. Villard, O. G. A HIGH-LEVEL SINGLE-SIDEBAND TRANSMITTER. Inst. Radio Engrs. Proc. 36:1419-1425, Nov. 1948.

It is the purpose of this paper to describe a transmitter of the phase-rotation type in which the single sideband is generated at high level and good efficiency directly in the final stage.

329. Villard, O. G. SELECTIVITY IN S.S.S.C. RECEPTION. A BALANCED FREQUENCY-CONVERTER CIRCUIT FOR COMMUNICATIONS RECEIVERS. QST 32:19-22, Apr. 1948.

Explains why single-sideband transmission offers an opportunity for a big improvement in receiver selectivity.

330. Villard, O. G. A SIMPLE SINGLE-SIDEBAND TRANSMITTER COMBINING A.M. AND P.M. SIGNALS FOR SIDEBAND REDUCTION. QST 32:14-17, 112, 114, Nov. 1948.

331. Villard, O. G. SIMPLIFIED SINGLE-SIDEBAND RECEPTION. Electronics 21:82-85, illus., May 1948.

Accessory designed for use with a conventional communications receiver exhibits advantages when receiving ordinary code signals, as well as single-sideband phone. Selectivity is approximately doubled by employing a demodulating oscillator, balanced detector, two 90-degree audio phase-shift networks and a low-pass filter.

332. Villard, O.G. SINGLE-SIDEBAND OPERATING TESTS. SOME RESULTS - AND SUGGESTIONS FOR IMPROVING RECEPTION. QST 32:16-18,126,128, Jan.1948.

333. Watkins, E.L. SINGLE-SIDEBAND GENERATORS. Radio & TV News 40:7-9, Dec.1948.
A pair of balanced modulators in a phase rotation system may be used to give single-sideband output.

1947

334. Air Material Command. Watson Laboratories, Engineering Division, Red Bank, N.J.
SINGLE-SIDEBAND GENERATION. 20p., illus., Aug.14, 1947. (Memo Rpt. WLERL-1-7)
Presents information on the theory of single-sideband generation and concludes that as a result of the advances being made in single-sideband circuitry and in the general miniaturization of components, single-sideband transmission systems will provide increasingly superior and more reliable military communication, including ground-to-air and air-to-ground systems, as compared with double-sideband transmission.

335. Angwin, A.S. TELECOMMUNICATIONS IN WAR. Inst.Elec.Engrs. J. 94(Pt.IIIa):7-15, 1947.
In this general review of communications mention is made of the special attention given to the development and production of single-sideband equipments.

336. Bast, G.H., Goedhart, D. and Schouten, J.F. A 48-CHANNEL CARRIER TELEPHONE SYSTEM. Philips Tech.Rev. 9:161-170, illus., 1947.
The choice of upper or lower sidebands, p.165.

337. Bray, W.J., Lillicrapp, H.G. and Lowry, W.R.H. THE DESIGN OF TRANSMITTER DRIVES AND RECEIVERS FOR SINGLE-

SIDEBAND SYSTEMS. Inst. Elec. Engrs. Proc. 94(Pt. IIIA):298-312, 1947.

The following equipment is described: (a) a low-power drive stage; (b) a monitor receiver which enables either channel of the r.f. signal to be demodulated for tests of quality and distortion; (c) single-sideband receivers for single-aerial and triple-diversity-spaced-aerial operation at the receiving end of a radio link. The design, layout and performance of a typical receiver are discussed.

338. Bray, W. J., Lillicrapp, H. G. and Owen, F. C. THE FADING MACHINE AND ITS USE FOR THE INVESTIGATION OF THE EFFECTS OF FREQUENCY-SELECTIVE FADING. Inst. Elec. Engrs. Proc. 94 (Pt. IIIA): 283-297, illus., Mar/Apr. 1947.

Examples are given of the use of the equipment to assess the merits of double-sideband, single-sideband and the frequency-modulated transmission systems with telephony or telegraphy modulation, under conditions of severe selective fading and high noise level.

339. Cheek, R.C. COMPARISON OF AM, FM, AND SINGLE-SIDEBAND SYSTEMS ON AN EQUAL PEAK-POWER BASIS. Elec. World 127: 114, Apr. 12, 1947.

A tabulation.

340. Curran, L.K. A DOUBLE-DIVERSITY TWO-CHANNEL SINGLE-SIDEBAND RECEIVER. AWA Tech. Rev. 7:337-354, Oct. 1947.

Discussion of the advantages and requirements of such a system and of the receiving equipment at the Australian terminal of the London and San Francisco circuits.

341. Floyd, C. F. CRYSTAL FILTERS FOR RADIO RECEIVERS. Inst. Elec. Engrs. J. 94(Pt. III): 915-926, illus., 1947.

Channel and carrier filters for single-sideband receiver, p.917.

342. General Electric Co., Syracuse, N.Y.
GROUND-TO-AIR LONG-RANGE COMMUNICATION EQUIPMENT. Interim Engineering Report, September 1947. 4p., charts, 1947. (Contract W28-099-ac-98)

The period was spent, essentially, in the construction of breadboard first versions of single-sideband generating, amplifying, and receiving circuits.

343. General Electric Co., Syracuse, N. Y.
GROUND-TO-AIR LONG-RANGE COMMUNICATION EQUIPMENT.

Interim Engineering Report, November 1947. 4p., 1947. (Contract W28-099-ac-98)

The single-sideband transmitter study for the month of November was devoted to the design and selection of components for the high power R.F. stages; the rectifiers and and control portions of the transmitter.

344. General Electric Co., Syracuse, N.Y.
GROUND-TO-AIR LONG-RANGE COMMUNICATION EQUIPMENT. Interim Engineering Report, December 1947. 3p., 1947. (Contract W28-099-ac-98)

Work was devoted to component ordering for the higher power portions of the transmitter, to further investigation of 90^{o} audio phase-shift circuits, and to further laboratory construction and test of the low-level R.F. portions of the transmitter.

345. Green, E. DESIGN OF LINEAR AMPLIFIERS FOR SINGLE-SIDE-BAND TRANSMITTERS. Marconi Rev. 10:11-16, Mar. 1947.

Distortion of a modulated carrier in a transmitter due to varying input impedance of the power amplifier is avoided by using screen-grid driving valves with an impedance transforming network.

346. Hupert, J.J. FREQUENCY COMPOSITION IN NAVAL COMMUNICATION TRANSMITTERS. Inst. Elec. Engrs. J. 94(Pt. IIIA):405-417, diags., 1947.

In the section, on p. 418 entitled "Effect of valve operation and circuit design on suppression of unwanted frequencies" mention is made of single sidebands.

347. Lenehan, B. A NEW SINGLE-SIDEBAND CARRIER SYSTEM FOR POWER LINES. Am. Inst. Elec. Engrs. Trans. 66:826-830, 1947. Paper 47-112.

Essentially the same article appears with title: A NEW SINGLE-SIDEBAND CARRIER SYSTEM in Elec. Eng. 66:549-552, illus., June 1947.

This new method of single-sideband generation is based on the frequency addition principle. Apparatus consists of linear modulators combined with wide-range phase-splitting circuits to produce the signals.

348. McLaughlin, J.L.A. EXIT HETERODYNE QRM. QST 31:13-16, Oct. 1947.

Selectable single-sideband reception through operation of heterodyne-eliminating receiver.

349. Mumford, A.H. LONG-DISTANCE POINT-TO-POINT COMMUNICATION. Inst.Elec.Engrs.Proc. 94(Pt.IIIA):23-45, Mar/Apr.1947.

An authoritative article outlining the expansion of the long-distance point-to-point system during the war years and some of the advances in technique which have made for more reliable communication. The single-sideband system is described in detail.

350. Stanford University. Electronics Research Laboratory, Stanford, Calif. LOW-LEVEL HIGH-EFFICIENCY MODULATION PROJECT, 30 June - 31 August 1947. 3p., 1947. (Prog. Rpt. 13 and 14) (Contract W28-099-ac-131)

Work on the modulation system was finished during this period. It is stated that the low distortion and wide frequency response obtainable with this method of modulation are quite remarkable.

As a sideline, during the period, a system of high-efficiency modulation was tested out and demonstrated satisfactorily.

351. Stanford University. Electronics Research Laboratory, Stanford, Calif. LOW-LEVEL HIGH-EFFICIENCY MODULATION PROJECT, by O. G. Villard and F.E. Terman. Final Report, 1 July 1947. 83p., illus., 1947. (Contract W28-099-ac-131)

Services covering research and investigation leading to a system for obtaining low-level amplitude modulation with high power r-f amplification comparable in efficiency to Class "C" operation and capable of 100 % modulation with minimum distortion.

History of the project; experimental transmitter; design of system components; and ideas and proposals including modulating system, method of obtaining 90-degree phase-shift; high-level high-efficiency single-sideband generator; and single-sideband generation with phase-amplitude circuit.

Included as an appendix is a report on proposed system of high-efficiency modulation, by F.E. Terman.

352. Terman, F.E. RADIO ENGINEERING. 3rd ed., 969p., illus., New York, McGraw-Hill, 1947.

Carrier-suppression systems, and single-sideband generation, p. 480-483; Detection of single-sideband signals, p. 542; Single-sideband receivers, p. 764.

353. Dome, R. B. WIDEBAND PHASE-SHIFT NETWORKS. Electronics 19:112-115, figs., Dec. 1946.
Applicable to single-sideband telephony accomplished directly at the final carrier frequency without multiple modulators or sharp cutoff filters.

354. Jones, T.A. and Pfleger, K. W. PERFORMANCE CHARACTERISTICS OF VARIOUS CARRIER-TELEGRAPH METHODS. Bell Sys. Tech. J. 25:483-531, illus., 1946.
This paper describes laboratory tests of certain carrier telegraph methods, including the single-sideband method, to determine their relative advantages from the standpoints of signal speed, and sensitivity to level change, carrier frequency drift interchannel interference, and line noise.
Single-sideband telegraphy has an advantage of providing somewhat higher speeds without increasing the band width. Whether it holds much promise for any general application in multi-channel systems utilizing narrow bands and moderate signal speeds is questionable in view of certain difficulties. For a single-sideband high-speed circuit, single-sideband telegraphy might be found worth while from the standpoint of economical use of the frequency spectrum.

355. Mumford, A.H. RECENT DEVELOPMENTS IN COMMUNICATION ENGINEERING. Inst. Elec. Engrs. J. 93(Pt. I):41-50, 1946.
Comparison of reception by means of the Musa and normal single-sideband equipment.

356. Rhode, S. NEW CARRIER-FREQUENCY SYSTEMS FOR TELEPHONY AND REMOTE METERING AND CONTROL ON POWER LINES. Ericsson Rev. 23:2-34, 1946.
Single-sideband working is used with carrier frequencies in the band 50 to 150 kilocycles.

1945

357. Cheek, R.C. A COMPARISON OF THE AMPLITUDE-MODULATION, FREQUENCY-MODULATION, AND SINGLE-SIDEBAND SYSTEMS FOR POWER-LINE CARRIER TRANSMISSION. Am. Inst. Elec. Engrs. Trans. 64:215-220, illus., May 1945.

358. Cheek, R.C. POWER-LINE CARRIER-MODULATION SYSTEMS. Westinghouse Engr. 5; 41-45, Mar. 1945.
A comparison of a-m, f-m, and single-sideband systems for power-line carrier transmission.

359. Cheek, R.C. A SIMPLE SINGLE-SIDEBAND SYSTEM. Westinghouse Engr. 5:179-183, Nov. 1945.

360. Honnell, M.A. SINGLE-SIDEBAND GENERATOR. Electronics 18:166-168, Nov. 1945.
Balancing out the undesired sideband in a vacuum-tube circuit eliminates need for selective filters in power-line carrier systems for telemetering or voice communications.

361. Landon, V.D. THEORETICAL ANALYSIS OF VARIOUS SYSTEMS OF MULTIPLEX TRANSMISSION. RCA Rev. 9:287-351, June, 1945; 433-482, Sept. 1945.
Single-sideband systems are included in the discussion.

362. Rose, C.F.P. A 60-KILOWATT HIGH-FREQUENCY TRANSOCEANIC RADIO TELEPHONE AMPLIFIER. Inst. Radio Engrs. Proc. 33: 657-662, illus., Oct. 1945.
The amplifier described is designed to operate as a 'class B' amplifier for transmitting either single-channel double-sideband or twin-channel single-sideband types of transmission.

363. SINGLE-SIDEBAND TRANSMISSION. Electronics 18:230-234, Feb. 1945.
Brief description of system developed by Westinghouse engineers.

364. War Department, Washington, D.C.
RADIO RECEIVING EQUIPMENT, SINGLE-SIDEBAND (WESTERN ELECTRIC TYPE D-99945). 9 parts, illus., May 24, 1945. (TM 11-884)
Includes Western Electric Co. Bulletins 982, 997P, 1093; Federal Mfg. and Eng. Co. Bulletin; X 75053-19C (Spl.) oscillator per D-166636 (moisture resistant); X-75056 Hickok model 560(Spl) tube tester per KS-9237; BSP. AB22. 334-100E loudspeaker equipment; BSP. C54. 501-100E loudspeaker-installation and maintenance; Maintenance parts.

365. Western Electric Co., New York, N.Y.
RADIO TRANSMITTER D-156000. 3v., 1945. (Instruction B. 985)
Describes radio receiving, single-sideband equipment.

1944

366. Holzler, E., Gecks, F.H. and Kamphausen, G. UBERTRAGUNG AMPLITUDEM UND FREQUENZMODULIERTER SCHWINGUNGEN AUF KURZEN WELLEN. Elektrotech. Z. 65:133-139, illus., Apr. 20, 1944.
In German.
Translated title: Transmission of amplitude and frequency modulation vibrations by short wave.

367. Marriner, E.H. SINGLE-SIDEBAND AUDIO TEST OSCILLATOR. Radio & TV News 52:51, 116, illus., Dec. 1944.
Compact tests unit to be used with single-sideband exciters having 90-degree phase-shift networks.

1943

368. Böttcher, F. SEITENBANDENSYMMETRIE BEI AMPLITUDEN-MODULATION. Hochfrequtech. u. Elektroakust. 61:12-19, Jan. 1943.
In German.
Translated title: Sideband asymmetry in amplitude modulation.

369. Cherry, E.C. THE TRANSMISSION CHARACTERISTICS OF ASYMMETRIC SIDEBAND COMMUNICATION NETWORKS. Pts. 1 and 2. Inst. Elec. Engrs. J. 89:19-39, Mar. 1943; 90:75-88, June 1943.
This paper deals with an investigation into some theoretical and practical aspects of the partial suppression of one or both sidebands in connection with asymmetric-sideband television broadcasting channels.

370. Küpfüller, K. EINRICHTUNG ZUR EINSEITENBANDÜBERTRAGUNG. Hockfrequtech. u. Elektroakus. 62:61, Aug. 1943.
In German.
Translated title: Arrangement for single-sideband transmission.
"A Siemens & Halske patent, D.R.P. 730,416, applied for 15/11/40 'to make the frequency requirements for the transmission of telegraphic and television signals, etc., only about half as great as in ordinary alternating-current telegraphy, the carrier frequency is displaced from the middle of the transmitted frequency band. The transient process can then be resolved into a rapid and a slow component, the latter being suppressed.'" Wireless Eng. 21:289, June 1944.

371. Terman, F.E. RADIO ENGINEERS' HANDBOOK. 1019p., illus., New York, McGraw-Hill, 1943.
Carrier-suppression systems and single-sideband generation, p. 551-552; Single-sideband and asymmetric-sideband transmission, p. 627; Single-sideband receivers, p. 659.

1942

372. Loyet, Paul. EXPERIMENTAL POLYPHASE BROADCASTING. Inst. Radio Engrs. Proc. 30:213-222, illus., May 1942.
A unique feature of the transmitter equipment is that while double-sideband currents (suppressed carrier) are supplied to the two sideband antenna pairs, the power amplifiers employed in the sideband amplifier channels amplify only single-sideband currents.

373. Stevens, A.M. OPERATING RESULTS ON THE NEW BUENOS AIRES-NEW YORK TWIN-CHANNEL SINGLE-SIDEBAND SHORT-WAVE RADIOTELEPHONE LINK. Elec. Communs. 20:186-192, Mar. 1942.

1941

374. Booth, C.F. THE APPLICATION AND USE OF QUARTZ CRYSTALS IN TELECOMMUNICATIONS. Inst. Elec. Engrs. J. 88(Pt. III):97-144, illus., 1941.
The short-wave single-sideband receiver is discussed on p. 114.

375. Brown, G.H. A VESTIGIAL SIDEBAND FILTER FOR USE WITH A TELEVISION TRANSMITTER. RCA Rev. 5:301-326, illus., 1941.
Records tests and observations made at time of installation in March 1939.

376. Buschbeck, W. and Rothe, P.G. DER TELEFUNKEN-EINSEITEN-BANDSENDER. Telefunken 22:23-35, illus., Dec. 1941.
In German.
Translated title: The Telefunken single-sideband transmitter.
The transmitter under construction is described and some of the problems connected with it are discussed.

377. Hahn, W. PLANUNG UND EINRICHTUNG EINER EINSEITENBAND-FUNKFERNSPRECHVERBINDUNG MIT ÜBERSEE. Telefunken 22: 11-22, illus., Dec. 1941.

In German.

Translated title: Planning and development of a single-sideband transoceanic radiophone connection.

The article discusses the German transoceanic connection; radiophone connections in general; particular characteristics of the single-sideband method; preparations for the single-sideband connection; development of the German transmitting and receiving equipment; and experiences with the single-sideband connection.

378. Holzler, E. and Leypold, D. EINSEITBAND-FUNKFERNSPRECH-VERBINDUNG MIT ÜBERSEE. Telefunken 22:50-58, illus., Dec. 1941.

In German.

Translated title: Single-sideband transoceanic radiophone connection.

Intermediate frequency equipment of transmitter and receiver serves for focusing the calls for transmission at much higher frequency and vice versa for defocussing when received. This equipment is described in detail and is shown in illustrations.

379. Kotowski, P., Rost, G., Sobotka, H. and Vogt, G. DER TELEFUNKEN-EINSEITENBANDEMPFANGER FÜR ZWEI GESPRACHSKANALE. Telefunken 22:36-49, illus., Dec. 1941.

In German.

Translated title: The Telefunken single-sideband receiver for two channels.

The construction, circuits, operation and performance of the receiver are described. The more important differences from ordinary receivers are pointed out. The wave-length is 14-60 m. It permits either the reception of two simultaneous single-sideband talks, or of a normal two-sideband talk.

380. McLaughlin, J.L.A. THE SELECTABLE SINGLE-SIDEBAND RECEIVING SYSTEM. QST 25:16-17, 74, illus., June 1941.

Briefly describes a heterodyne rejection circuit, semi-automatic in operation, and capable of removing several heterodyne beat-notes simultaneously.

381. Mason, W.P. ELECTRICAL AND MECHANICAL ANALOGIES. Bell Sys. Tech. J. 20:405-414, Oct. 1941.

A description of various types of filters. In radio systems quartz filters have been used extensively in separating one sideband from the other in single-sideband systems.

382. Ring, F. SINGLE-SIDEBAND TRANSMISSION OF TELEVISION SIGNALS. Funktech. Mn. 6:23-24, June 1941.

383. Sachse, H. DIE NIEDERFREQUENTEN ENDEINRICHTUNGEN FÜR EINE NEUE FUNKFERNSPRECHVERBINDUNG MIT ÜBERSEE. Telefunken 22:590-591, illus., Dec. 1941.

In German.

Translated title: The low-frequency terminal equipment for a new transoceanic radiophone connection.

This article includes the results of tests of a new single-sideband connection.

384. Salinger, H. A COAXIAL FILTER FOR VESTIGIAL-SIDEBAND TRANSMISSION IN TELEVISION. Inst. Radio Engrs. Proc. 29:115-120, 1941.

"The problem of building a filter of ladder or lattice type wherein the elements are replaced by coaxial lines is shown to be largely one of geometrical arrangement. A method of designing and constructing such filters is described. Using this procedure, an experimental filter of the ladder type has been built for the television channel of 66 - 72 megacycles. The cutoff sharpness at the lower edge of its frequency range is 32 db per per cent of frequency change. This can be achieved with a very compact filter structure. The general performance and range of usefulness of this filter type in television channels is discussed." - Summary.

385. Wheeler, H. A. THE SOLUTION OF UNSYMMETRICAL SIDEBAND PROBLEMS WITH THE AID OF THE ZERO-FREQUENCY CARRIER. Inst. Radio Engrs. Proc. 29:446-458, 1941.

"Unsymmetrical sideband problems are met in frequency modulation and single-sideband transmission. There has developed the urgent need of a simplified procedure for their solution. The 'vector envelope' of a modulated signal is reviewed with special attention to the simple cases of amplitude, phase, and frequency modulation, and of a single sideband. From this is developed the concept of the 'zero-frequency carrier' with combined amplitude and angle modulation. The solution is valid for any carrier frequency much greater than the total width of sidebands in the signal, regardless of whether the carrier is present. It yields directly the envelope of the envelope of the signal, as detected by a rectifier. It is applied to the general case of steady and transient modulation components. The simplified procedure is outlined in simple terms after rigorous derivation. It involves merely stating the input modulating signal relative to the zero-frequency carrier, putting it through the low-pass analog of the band-pass filter, and deriving the output modulating signal directly." - Summary.

1940

386. Carnahan, C. W. FM APPLIED TO A TELEVISION SYSTEM. Electronics 13:26, 30, 32, Feb. 1940.
Single-sideband transmission, p. 30.

387. Kallmann, H. E. and Spencer, R. C. TRANSIENT RESPONSE TO SINGLE-SIDEBAND SYSTEMS. Inst. Radio Engrs. Proc. 28:557-561, Dec. 1940.
The deformations which typical television transients suffer in single-sideband systems are shown.

388. Kell, R. D. and Fredendall, G. L. SELECTIVE SIDEBAND TRANSMISSION IN TELEVISION. RCA Rev. 4:425-440, Apr. 1940.

389. Nyquist, H. and Pfleger, K. W. EFFECT OF THE QUADRATURE COMPONENT IN SINGLE-SIDEBAND TRANSMISSION. Bell Sys. Tech. J. 19:63-73, Jan. 1940.
Gives experimental evidence that, for a given bandwidth, single-sideband transmission is distinctly superior to double-sideband in picture transmission. It also gives a theoretical discussion which indicates that this is not inconsistent with the observed fact that oscillograms with single-sideband transmission show considerable distortion.

390. Polkinghorn, F. A. A SINGLE-SIDEBAND MUSA RECEIVING SYSTEM FOR COMMERCIAL OPERATION ON TRANSATLANTIC RADIO TELEPHONE CIRCUITS. Bell Sys. Tech. J. 19:306-335, Apr. 1940.
Also in Inst. Radio Engrs. Proc. 28:157-170, Apr. 1940.

391. Singer, C. P. A MATHEMATICAL APPENDIX TO TRANSIENT RESPONSE OF SINGLE-SIDEBAND SYSTEMS. Inst. Radio Engrs. Proc. 28:561-563, Dec. 1940.

392. Wilson, J. C. and Wheeler, H. A. THE INFLUENCE OF FILTER SHAPE-FACTOR ON SINGLE-SIDEBAND DISTORTION. Inst. Radio Engrs. Proc. 28:253, May 1940.
Summary only, indicating optimum conditions approached when filter slope in region of carrier frequency is zero.

393. Wirkler, W.H. SINGLE-SIDEBAND AMPLIFIER-CIRCUIT. U.S. Patent Off. Off. Gaz. 517:364, Aug. 13, 1940.

Patent application of August 4, 1938, Assignor - Collins Radio Company, Cedar Rapids, Iowa.

Patent no. 2,211,040 issued August 13, 1940. A system for producing and amplifying two sets of sidebands which are in phone quadrature.

394. Zworykin, V.K. and Morton, G.A. TELEVISION. THE ELECTRONICS OF IMAGE TRANSMISSION. 646p., illus., New York, Wiley, 1940.

Single-sideband transmission and reception, p. 202-208.

1939

395. Aiken, C.B. and Loh, W.S. AN EXPERIMENTAL SINGLE-SIDEBAND TRANSMITTER. Communs. 19:10-11, 49, 50, Feb. 1939.

396. Bray, W.J. and Lowry, W.R.H. A NEW SHORT-WAVE TRANSATLANTIC RADIO RECEIVER. Post. Off. Elec. Engrs. J. 32:24-31, Apr. 1939.

For a transmission with two independent single-sideband speech channels occupying about the bandwidth of one double-sideband transmission.

397. Crosby, M.G. COMMUNICATION BY PHASE MODULATION. Inst. Radio Engrs. Proc. 27:126-136, illus., Feb. 1939.

Includes discussion of single-sideband reception.

398. Gabriel, J.C. SINGLE-SIDEBAND SHORT-WAVE RECEIVER. Bell Lab. Record 18:84-87, Nov. 1939.

399. Goldman, Stanford. TELEVISION DETAIL AND SELECTIVE-SIDEBAND TRANSMISSION. Inst. Radio Engrs. Proc. 27:725-732, 1939.

An examination of theoretical justification for adoption of selective sideband transmission in order to increase the picture detail which can be transmitted in a frequency channel of given width.

400. Haberkant, E. and Meinel, E. BEITRAG ZUR THEORIE UND TECHNIK DER DRAHTLOSEN EINSEITENBANDTELEPHONIE. Telegr. Fernspr. u. Funktech. 28:140-151, Apr. 1939.

In German.

Translated title: Theory and technique of single-sideband telephone.

"Single-sideband transmission with complete or partial carrier suppression for radio telephony or television as compared with double-sideband transmission offers great advantages. The principle one is that the single-sideband transmitter possesses telephonically a considerably higher effective power than a double-band sender. Further, only half the channel breadth is required, so that the pass range of the receiver can be reduced by half and the disturbance level is lowered to 1/2. With a single sideband with suppressed carrier, by superposing a suitable carrier amplitude at the receiver, the influence of the disturbance level can be still further lowered. Further, with carrier-less single-sideband transmission on short waves a certain secrecy is attained as only very accurately balanced crystals with high frequency constancy can be employed. The paper investigates how effectively the single-sideband telephone transmitter with radiated carrier can be controlled to give satisfactory reproduction of speech at the receiver. The theoretical enquiry is directed to the question what distortion by linear and quadratic rectification may be regarded as the practical limit. Further, the question whether disturbance by telephone transmitters operating on neighboring frequencies is essentially smaller than with double-sideband transmitters is experimentally investigated." Sci. Abs. 42. B:1732, 1939.

401. Hollywood, J. M. SINGLE-SIDEBAND FILTER THEORY WITH TELEVISION APPLICATIONS. Inst. Radio Engrs. Proc. 27:457-472, Jly. 1939.

"Given the phase and amplitude characteristics of a filter, a graphical method is presented for deriving the phase and amplitude characterisitics of the modulation envelope or video frequency response when a modulated carrier is impressed. Sources of distortion are briefly discussed. Several filter structures are considered as to their suitability for use in attenuating one sideband of a television signal. Radio frequency phase and amplitude characteristics are given, with notes as to the physical realisability of the structures. Resulting video frequency phase and amplitude characteristics are derived after demodulation, and in some cases the video frequency transient response resulting from a suddenly impressed carrier is given. Design formulae are given for a filter using transmission lines as circuit elements. Some problems in the application of a filter to the transmitter are considered. The gain of amplifier stages is treated for many types of video and radio-frequency amplifiers, for single- and double-sideband use, and for one- and ten-stage amplifiers, when meeting certain tolerances to a fixed maximum modulation frequency." Sci. Abs. 42. B:2217, 1939.

402. Koike, Y. DESIGN OF RADIO-FREQUENCY OUTPUT NETWORKS FOR BROADCASTING TRANSMITTERS. Nippon Elec. Communs. Engrs. 15:546-553, Feb. 1939.

Analysis of sideband cutoff due to resonance characteristics; filtering action on higher harmonics; and modulation distortion due to phase rotation of sidebands.

403. Koomans, N. ASYMMETRIC-SIDEBAND BROADCASTING. Inst. Radio Engrs. Proc. 27:687-690, Nov. 1939.

Cites great advantages over single-sideband transmission.

404. Nakai, T. ON AN EXPERIMENT OF PRODUCING SINGLE SIDE-BAND. Nippon Elec. Communs. Engrs. 16:587-590, May, 1939.

Attempt to find practical system using cancellation principle for suppression success to more than -40 db.

405. Nergaard, L. S. A THEORETICAL ANALYSIS OF SINGLE-SIDE-BAND OPERATION OF TELEVISION TRANSMITTERS. Inst. Radio Engrs. Proc. 27:666-677, 1939.

The effect of detuning a transmitter to suppress partially one sideband and increase the width for the other sideband is investigated.

406. Peterson, E. and Hussey, L. W. EQUIVALENT MODULATOR CIRCUITS. Bell Sys. Tech. J. 18:32-48, Jan. 1939.

Discusses single-sideband modulator.

407. Urtel, R. BEMERKUNGEN ZUM EINSEITENBANDBETRIEB IM FERNSEHEN. Telefunken 20:80-83, 1939.

In German.

Translated title: Observations regarding transmission of television by one single sideband.

1938

408. Anitov and Kenigsen. ON THE POSSIBILITY OF TWO-CHANNEL COMMUNICATION WITH A SINGLE CARRIER WAVE. Izvest. Elektroprom. Slab. Toka no. 8/9:14-20, 1938.

"It is shown that if two separate amplifiers, each with its own modulator, are excited by a common oscillator and operate into a common aerial and if the frequencies of the amplifiers are displayed in phase, then by the use of a suitable detecting circuit in the receiver the two signals can be separated. It is also shown that the common carrier frequency, or one of the sidebands in each channel, can be suppressed. Furthermore, it appears that the width of the band transmitted remains the same whether the carrier frequency is modulated by one only or by two signals simultaneously. Practical transmitting and receiving circuits operating on the above principle are discussed." Wireless Eng. 16:102, Feb. 1939.

409. Arman, L. T. and Hutton-Penman, P. R. THE APPLICATION OF A CONSTANT VOLUME AMPLIFIER TO A SHORT-WAVE SINGLE-SIDEBAND TRANSATLANTIC RADIO CIRCUIT. Post Off. Elec. Engrs. J. 31:104-107, illus., 1938.

The volume variations due to fading on this circuit are not fully compensated by normal methods of automatic gain control on the receiver, and the provision of a constant volume amplifier at the output of the receiver to remedy the defect is discussed. Two types of amplifier, one of which was developed for another purpose and was used experimentally, are described.

410. Benham, W. E. A NOTE ON ASYMMETRIC SIDEBAND PHASE DISTORTION. Wireless Engr. 15:616, Nov. 1938.

411. Bower, M. M. THE CARRIER TELEPHONE ALPHABET. Bell Lab. Record 16:208-212, tables, Feb. 1938.

As each new type of carrier telephone system has been developed it has been assigned a letter of the alphabet. These various systems are reviewed from a historical standpoint. Several are single-sideband systems.

412. Bown, Ralph. RESEARCHES IN RADIOTELEPHONY. Inst. Elec. Engrs. J. 83:395-402, illus., 1938.

Single-sideband transmission, p. 399-400.

413. Eckersley, P. P. ASYMMETRIC-SIDEBAND BROADCASTING. Inst. Radio Engrs. Proc. 26:1041-1092, illus., Sept. 1938.

Includes analysis of distortion due to asymmetry leading to design of special network; calculation of reduced sideband splash; comparison of Eckersley system and Koomans system.

414. Eckersley, P. P. A QUANTITATIVE STUDY OF ASYMMETRIC SIDE-BAND BROADCASTING. Inst. Elec. Engrs. J. 83:36-75, 1938.

The object of the asymmetric sideband system of transmission is to cut away part of one sideband without introducing audible harmonic distortion.

This paper presents a quantitative analysis which forms a guide to practical design.

415. Fisher, H.J., Almquist, M.L. and Mills, R.H. A NEW SINGLE-CHANNEL CARRIER TELEPHONE SYSTEM. Am.Inst.Elec.Engrs. Trans. 57:25-33, illus., Jan.1938.

Also in Bell Sys.Tech.J. 17:162-183, 1938.

The system described is designated the Type H. Reduction in size and provision for operating on a-c supply simplify its installation, and its portability makes it well suited to provide emergency circuits.

416. Hayasi, T. and Yamagiwa, S. APPLICATION OF THE COMPOSITE MODULATION TO THE PROBLEMS OF SIDEBAND-WIDTH CONTRACTION. Nippon Elec.Communs.Engr. 13:436-444, Nov.1938.

"Theory and experiments on combination of (e.g.) amplitude and frequency modulation, involving the splitting of the band into two halves, one being inverted and displaced into the other." Wireless Eng. 16:195, Apr.1939.

417. Hellman, R.K. THE MODULATOR BRIDGE. Electronics 11:28-30, illus., Mar.1938.

Device applied to suppressed-carrier systems both at the receiving and transmitting station.

418. Koomans, N. SINGLE-SIDEBAND TELEPHONE APPLIED TO THE RADIO LINK BETWEEN THE NETHERLANDS AND THE NETHERLANDS EAST INDIES. Inst.Radio Engrs.Proc. 26:182-206, Feb. 1938.

Discussion: Inst.Radio Engrs.Proc. 26:1299-1301, Oct.1938.

419. Matsumae, Shigeyoshi, Amisima, Toyosi and Yoneyama, Masao. ON THE EXPERIMENT BY THE SINGLE-SIDEBAND MULTIPLEX RADIO SYSTEM BETWEEN TOKYO AND KAGOSIMA. Nippon Elec.Communs.Engr. 12:370-376, Sept.1938.

Describes the brief outline of the single-sideband radio transmitter and receiver and also gives the experimental results of the partial characteristics of each equipment and the overall characteristics of the radio circuit between Tokyo and Kagosima.

420. Oswald, A.A. A SHORT-WAVE SINGLE-SIDEBAND RADIOTELEPHONE SYSTEM. Inst.Radio Engrs.Proc. 26:1431-1454, Dec. 1938.

Also published as Bell Telephone Sys.Tech.Pub.B-1113, 1939.

"There is described briefly a short-wave single-sideband system which has been developed for transoceanic radio-telephone service. The system involves the transmission of a reduced carrier or pilot frequency and is designed to include the testing of twin-channel operation wherein a second channel obtained by utilising the other sideband. The paper indicates the reasons which led to the selection of this particular system and discusses at some length those matters which require agreement between the transmitting and receiving stations when single-sideband transmission is employed." Sci. Abs. 42. B: 393, 1939.

421. Roetken, A.A. A SINGLE-SIDEBAND RECEIVER FOR SHORT-WAVE TELEPHONE SERVICE. Inst. Radio Engrs. Proc. 26:1455-1465, Dec. 1938.

Also published as Bell Telephone Sys. Tech. B-1114, 1939.

422. Smith, J.E., Trevor, Bertram and Carter, P.S. SELECTIVE SIDE-BAND VS. DOUBLE-SIDEBAND TRANSMISSION OF TELEGRAPH AND FACSIMILE SIGNALS. RCA Rev. 3:213-238, Oct. 1938.

An investigation was conducted to determine both theoretically and experimentally the advantages and disadvantages of selective sideband as compared with double-sideband transmission of telegraph and facsimile signals.

423. Vilbig, F. EXPERIMENTELLE ÜNTERSUCHUNG DER VERSCHIEBUNG EINES THEORETISCH BELIEBIG GROSSEN FREQUENZBANDES UM EINEN BESTIMMTEN PHASENWINKEL. Telegr. u. Fernsprech. Tech. 27:560-561, Dec. 1938.

In German.

Translated title: Experimental investigation of the displacement of a frequency band of theoretically arbitrary width through a desired phase angle.

Concerns displacing the phase of a single auxiliary carrier frequency on which is impressed a single-sideband modulation by the given frequency band.

424. Vilbig, F. DIE WIEDERGEWINNUNG DES BEI EINSEITENBAND-MODULATION ÜNTERDRÜCKTEN SEITENBANDES. Telgr. u. Fernsprech. Tech. 27:321-324, Sept. 1938.

In German.

Translated title: The restoration of the sideband suppressed in single-sideband modulation.

"Theoretical and experimental treatment. It is found that by the addition of an auxiliary oscillation of twice the carrier frequency, and subsequent rectification, an image of the original sideband, true in frequency and phase, is obtained with practically no distortion. The use of a 'ring' modulator in place of an ordinary rectifier enables the first sideband to be suppressed at will." Wireless Eng. 16:142, Mar. 1939.

An abstract also appears in Sci. Abs. 41A:3557, Dec. 1938.

425. Zeitlenok, G. A. ON COMPARING THE EFFICIENCY OF MODULATION SYSTEMS WITH ONE AND TWO SIDEBANDS. Izvest. Elektroprom. Slab. Toka 10:18-19, 1938.

In Russian.

"In a paper in another journal it was suggested by the writer that various systems of modulation could be compared on the basis of the audio output given at the receiver. This method of comparison can easily be applied to two double-sideband modulation systems (with or without transmission of the carrier) since in this case the same output will be obtained so long as the power in the sidebands remains the same in both cases. It is shown, however, that when two modulation systems are compared with single- and double-sideband transmission respectively, the same audio output will only be obtained if the power in the single sideband is twice the power in the two sidebands." Wireless Eng. 16:84, Feb. 1939.

1937

426. Bown, Ralph. TRANSOCEANIC RADIO TELEPHONE DEVELOPMENT. Bell Sys. Tech. J. 16:560-567, 1937.

In this review of the technical side of the development of trans-oceanic radio telephone the following statement appears: "The transmission improvement of about 9 decibels(about 10:1 in power) offered by single-sideband suppressed-carrier transmission has been delayed in its application to short-wave transmission partly because of the high degree of precision in frequency control and selectivity necessary to its accomplishment. In recent years successful apparatus has been developed and proved satisfactory in trials. The introduction of single sideband into commercial usage is already in progress.

427. Dickieson, A.C. THE TYPE-H CARRIER TELEPHONE SYSTEM. Bell Lab. Record 16:76-79, illus., Nov. 1937.

Describes a system developed to fit the fields of use in a telephone plant. The single-sideband transmission is employed.

428. Espenschied, Lloyd. THE ORIGIN AND DEVELOPMENT OF RADIO-TELEPHONY. Inst. Radio Engrs. Proc. 25:1101-1135, 1937.
In his history of radiotelephony the author states: "Related to both vacuum tubes and the band conception were Carson's analysis of the modulated wave into the component carrier and sidebands and his invention of single-sideband transmission made as far back as 1915, and the general extension of the signal-band idea to high frequencies, which has meant so much to both wire carrier-current telephony and radiotelephony."

429. Hofer, R. THE OCCURRENCE AND MEASUREMENT OF SIDEBAND ASYMMETRY. Telefunken 18:71-83, Jly. 1937.
The conditions for a distortionless h.f. transmission are set forth and the various causes of disturbance of sideband symmetry liable to be present in valve transmitters are described.
A more complete author's summary may be found in Wireless Eng. 14:500, Sept. 1937.

430. Jackson, W. E. and Stuart, D. M. SIMULTANEOUS RADIO RANGE AND TELEPHONE TRANSMISSION. Inst. Radio Engrs. Proc. 25: 314-326, 1937.
Various methods of obtaining simultaneous service are discussed. The effect of linear and square-law detection used with single-side-band and double-sideband transmission of the range tone have been analyzed. The single-sideband method appears to offer the most practical solution to the problem when used with a linear detector.

431. Laport, E. A. CHARACTERISTICS OF AMPLITUDE-MODULATED WAVES. RCA Rev. 1:26-38, Apr. 1937.
Discusses single-sideband and suppressed-carrier transmission.

432. Poch, W. J. and Epstein, D. W. PARTIAL SUPPRESSION OF ONE SIDEBAND IN TELEVISION RECEPTION. Inst. Radio Engrs. Proc. 25:15-31, Jan. 1937.
Also in RCA Rev. 1:19-35, Jan. 1937.

433. Schaffstein, G. VERSUCHE MIT EINSEITENBANDMODULATION BEI FREQUENZABWEICHUNGEN DES ZUSATZTRAGERS. Telefunken 18:62-66, illus., Jly. 1937.
In German.

Translated title: Experiments on single-sideband modulation with frequency divergencies of replaced carrier at the receiver.

1936

434. Bellescize, Henri de. LES COMMUNICATIONS RADIO-ÉLÉCTRIQUES. 220p., Paris, Gauthier-Villars, 1936.
In French.
Translated title: Radio-electric communications.
Ch. III, p.128-136, in particular.

435. Johnstone, D. M. and Wright, E. E. A NOTE ON SIDEBAND PHASE DISTORTION. Wireless Engr. 13:534-536, Oct. 1936.
Analysis prompted by results in suppressed-carrier transmission; possible importance in i.f. circuit design in superheterodyne receivers.
See also editorial on p. 517-518.

436. Reynolds, F. W. A NEW TELEPHOTOGRAPH SYSTEM. Bell Sys. Tech. J. 15:549-574, illus., 1936.
The system makes use of single-sideband transmission.

437. Rodwin, G. A SINGLE-SIDEBAND SHORT-WAVE RECEIVER. Bell Lab. Record 14:405-410, Aug. 1936.

438. Schmid, A. THE MODE OF ACTION OF "RING" MODULATORS. Veröff. Nachrichtentechnik 6:145-163, 1936.
For carrier-current single-sideband suppressed carrier working.

439. SIDEBAND PHASE DISTORTION. Wireless Engr. 13:517-518, Oct. 1936.
Editorial. See also Item 435.

440. Siforov, V. I. BROADCASTING WITH CARRIER AND ONE SIDEBAND. Izvest. Elektroprom. Slab. Toka 10:1-12, 1936.
In Russian.
Author's summary: "The analysis of the radio-telephone transmission system with carrier and one sideband is given. The expediency of its application to broadcasting is considered. It is shown that in this case the ratio of signal intensity to interference, on changing from the usual system to the single-sideband transmission is reduced 2.7 times. Methods are given for reducing distortion and interference when receiving single-sideband transmission based on the decrease of

modulation in the receiver. It is shown that by the use of this method the selectivity of the receiver is greatly increased. The problem of the modulation and interference effect on the synchronous channel of the receiver is investigated; it is shown that synchronisation will be stable even when the modulation exceeds 100 %. The tendencies of further scientific research work on single-sideband broadcasting are described." Wireless Eng. 14:54, 1937.

1935

441. BROADCASTING WAVELENGTHS OF EUROPE. Nature 135:800, May 11, 1935.

Refers to suggestion to transmit only carrier wave and one set of sidebands, thus minimizing spectrum overlap.

See Item 442.

442. Eckersley, P.P. ASYMMETRIC SIDEBAND BROADCAST TRANSMISSION. Inst. Elec. Engrs. J. 77:517-541, 1935.

Includes discussion of transmission of a carrier and single set of sidebands; and phase modulation in single-sideband broadcasting.

See Item 441.

443. Green, E... BAND SEPARATION SYSTEM. U.S. Patent 2,020,409, Nov. 12, 1935. 9p., illus.

This invention relates to a method for dividing a band of frequencies and more especially to a method for dividing a frequency band by the use of phase discrimination without the use of electrical selection.

444. Polkinghorn, F.A. and Schlaack, N.F. SINGLE-SIDEBAND, SHORT-WAVE SYSTEM FOR TRANSATLANTIC TELEPHONY. Inst. Radio Engrs. Proc. 23:701-718, illus., Jly. 1935.

Describes the construction of a short-wave single-sideband carrier system of radio transmission. It also reports the results of comparisons made between this system and an ordinary short-wave double-sideband system between England and the Unites States. It was found that the single-sideband system gave an equivalent improvement in radiated power over the double-sideband system averaging eight decibels.

Also in Bell Sys. Tech. J. 14:489-508, 1935.

445. Schlaack, N.F. and Polkinghorn, F.A. A SINGLE-SIDEBAND SHORT-WAVE SYSTEM FOR TRANSATLANTIC TELEPHONY. Inst. Radio Engrs. Proc. 23:701-718, Jly. 1935.

446. SINGLE-SIDEBAND BROADCASTING. Wireless World 36:495, May 17, 1935.

1934

447. Affel, H.A., Chesnut, R.W. and Mills, R.H. TRANSMISSION LINES. Bell Sys. Tech. J. 13:285-300, illus., 1934.

The carrier apparatus described, p. 291-294, is single-sideband carrier suppressed, with prefectly synchronized carrier frequencies of 40.000 c.p.s.

448. Harbich, H. DIE RUNDFUNKVERSORGUNG DEUTSCHLANDS ALS TECHNISCHE AUFGABE. Elektrotech. Z. 55:685-688, Jly. 12, 1934.

In German.

Translated title: Germany's broadcasting service as a technical problem.

"In the subsequent discussion, p. 705-707, Schröfer refers to the work of Koomans in Holland on carrier and single-sideband transmission, and the attractions of such a plan." Wireless Eng. & Exper. Wireless 11:572, Oct. 1934

449. Mason, W.P. ELECTRICAL WAVE FILTERS EMPLOYING QUARTZ CRYSTALS AS ELEMENTS. Bell Sys. Tech. J. 13:405-452, 1934.

This article is referred to by Polkinghorn and Schlaack as the one which supplies information on construction of a low-frequency lattice-type filter using quartz crystals as elements in order to obtain the necessary attenuation to the carrier frequency and one sideband while passing the other sideband.

450. Murphy, F.M.G. A SYSTEM FOR SINGLE-SIDEBAND AND CARRIER BROADCAST TRANSMISSION. Marconi Rev. 50:8-15, Sept/Oct. 1934.

The system described was developed as a result of appointment of a C.C.I.R. sub-committee.

451. SINGLE-SIDEBAND WORKING. PRACTICAL METHODS AND FUTURE POSSIBILITIES. Wireless World 35:347-349, illus., Nov. 2, 1934.

452. WHAT CAUSES SIDEBANDS. A SYNTHETIC DEMONSTRATION. Wireless World 35:278-280, illus., Oct. 5, 1934.

Reviews the general subject of modulation and sidebands in view of possibility of single-sideband broadcasting.

1933

453. ANORDNUNG ZUR EINSEITENBANDMODULATION. Hochfrequtech. u. Elektroakust. 41:110, Mar. 1933.

In German.

Translated title: Arrangement for single-sideband modulation.

German patent No. 500,226, published September 29, 1932, by J. von Plebanski.

454. Degawa, Y. ON THE METAL MODULATOR OF SHUNT TYPE AND OF SERIES TYPE AND ON THE MODULATION LOSS OF RING MODULATOR. Nippon Elec. Communs. Engr. 19:129-132, 143-147, 1933.

For single-sideband carrier suppression working.

455. Hill, C.J.W. and Page, H. A LONG-WAVE SINGLE-SIDEBAND TELEPHONY RECEIVER FOR TRANSATLANTIC WORKING. Marconi Rev. 42:13-26, May/June; 43:12-17, Jly/Aug. 1933.

The various components and their functions in the single-sideband receiver are described. The receiver characteristics are shown graphically.

The receiver was constructed by the Marconi Company for the Post Office and installed at Baldock.

456. Kolesnikov, M. RADIOTELEPHONIE À BANDE LATERALE UNIQUE. Onde Elec. 12:237-249, 1933.

In French.

Translated title: Single-sideband radiotelephony.

A theoretical discussion of single-sideband radiotelephony is given. The circuits and methods of using single-sideband telephony are then discussed.

457. Reeves, A.H. THE SINGLE-SIDEBAND SYSTEM APPLIED TO SHORT-WAVE TELEPHONE LINKS. Inst. Elec. Engrs. J. 73:245-279, 1933.

The possibility of single-sideband radiotelephony as a commercial project and the various problems encountered in such a system are discussed. It is shown that in the absence of selective fading the question of synchronizing is fairly simple. Some experimental results are given.

458. SIDEBANDS OCCURRING IN FREQUENCY MODULATION. Electronics 6:341, Dec.1933.
Review of the Washington Engineering Experiment Station Bulletin on experiments in frequency modulation. Authors are E.D. Scott and J.R. Woodyard. The Bulletin number is 68 for 1933.

459. SINGLE-SIDEBAND RADIO TELEPHONY. Elec.Rev. 112:157-158, Feb.3,1933.
Further information on the design and construction of a long-wave single-sideband telephone receiver for transatlantic working.

460. LA TRANSMISSION RADIOTÉLÉPHONIQUE À ONDES COURTES A BANDE LATERALE UNIQUE ET AUTRES SYSTEMES. Soc.Franc. Elec.Bull. (Ser.5) 3:300-316, Mar.1933.
In French.
Discussion of report by M.E. Deloraine.
Relates to single-band telephony.
For complete report, see entry under Deloraine, Item 462.

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461. Colebrook, F.M. A NOTE ON THE FREQUENCY ANALYSIS OF THE HETERODYNE ENVELOPE: ITS RELATION TO PROBLEMS OF INTERFERENCE. Wireless Engr. 9:195-201,figs.,Apr.1932.
The analysis shows that a single-sideband system of broadcast transmission would not give, on rectification, a faithful reproduction of the original modulation, but would give rise to a number of extraneous difference frequencies, in addition to the introduction of harmonics.

462. Deloraine, E.M. LA TRANSMISSION RADIOTÉLÉPHONIQUE À ONDE COURTES A BANDE LATERALE UNIQUE ET AUTRES SYSTEMES. Soc.Franc.Elec.Bull.(Ser.5) 11:940-1009,1932.
In French.
Translated title: Short-wave radiotelephony transmission by single-sideband and other systems.
Bibliography, p.1008-1009.
Summary: Rev.Gen.Elec. 33:476-477, Apr.1933.

463. Burch, C.R. ON ASYMMETRIC TELEGRAPHIC SPECTRA (AND THE POSSIBILITIES OF SINGLE-SIDEBAND MORSE TRANSMISSION). Inst. Radio Engrs. Proc. 19:2191-2218, Dec. 1931.

Author's summary: "It is shown that single-sideband Morse transmission, if practicable, would relieve the present long-wave spectral congestion. Methods are developed whereby the wave shape of the single-sideband signals can be visualised when the original message envelope is given, and it is shown that the prolonged transmission of true single-sideband signals would in general necessitate the radiation of infinite amplitudes. Wave forms of approximations to single-sideband signals which evade this difficulty are determined: the wave form of the original message can be recovered without distortion from these 'asymmetric sideband' waves, the use of which, however, requires more power and also greater crest amplitudes than normal double-sideband transmission. The production and reception of asymmetric sideband waves is discussed."

464. DIE ANWENDUNG DES EINSEITENBANDSYSTEMS IN DER KURSWELLENTECHNIK. Hochfrequtech. u. Electroakust. 38:148-153, Nov. 1931.

In German.

Translated title: The application of the single-sideband system in short-wave technique.

After discussing difficulties and advantages of the single-sideband system, a detailed description is given of the equipment used in successful experiments recently carried out by French and Spanish interests.

465. Hofer, R. FREQUENZDURCHASSIGKEIT UND NICHTLINEARE VERZERRUNGEN FREMDGESTEUERTER TELEPHONIESENDER. Telefunken 12:17-33, 1931.

In German.

Translated title: Frequency pass factor (ratio of amplitude of anode current or potential for sideband to that for carrier wave) in telephony transmitters with master drive.

466. Ladner, A.W., Wilde, G. and Eckersley, T.L. THE UNEQUAL FADING OF CARRIER AND SIDEBANDS. Marconi Rev. 3:25-27, Jan/Feb. 1931.

Continuation of discussion in the author's "A study of wave synthesis by mechanical means, IV." See Item no. 469.

467. Letheule, P. LA RADIOTÉLÉPHONE À ONDES COURTES À BANDE LATERALE UNIQUE. Génie Civ. 99:205-211, Aug.29,1931.

In French.

Translated title: Single-sideband short-wave radiotelephony.

468. NEW TELEPHONY SYSTEM. SHORT-WAVE SINGLE-SIDEBAND DUPLEX WORKING. Wireless World 28:590-593, June 3,1931.

Description of apparatus used in a demonstration near Paris when speech was received from Madrid which was clear, intelligible, and of good and constant volume.

469. Reeves, A.H. LE SYSTEME DE COMMUNICATIONS RADIOTÉLÉ-PHONIQUES À BANDE LATERALE UNIQUE APPLIQUÉ AUX ONDES COURTES. Onde Elec. 10:476-512, Nov.1931.

In French.

Translated title: The radiotelephone system of communications using single sideband applied to short waves.

Also in Rev.Gen. de l'Elec. 30:406-413, Sept.12,1931; Inst.Elec. Engrs.J. 73:245-279, 1933, (See Item no. 455); Summary in Electrician 110:623, May 12,1933.

"Describes in some detail experiments carried out between Paris and Madrid, using the single-sideband system of modulation on a wavelength of about 15 m. Successful results were obtained." Sci. Abs. 35B:367, 1932.

470. SINGLE-SIDEBAND SHORT-WAVE WIRELESS TELEPHONY. Engr. 151:570-571, May 22,1931.

Also in Electrician 106:747-749, May 22,1931; Wireless World and Radio Rev. 28:590-593, June 3,1931.

"The new system was demostrated on May 21 at the experimental radio station of Le Matériel Téléphoniqe at Trappes (Paris). The difficulty of obtaining good synchronisation between the suppressed carrier at the transmitter and the local oscillator at the receiver is overcome by transmitting a continuous radio-frequency pilot wave in addition to the speech sideband, and this pilot is used at the receiver automatically to synchronise the frequency of the local oscillator. The pilot frequency lies some $400\sim$ outside the speech sideband, which has a breadth of some $300\sim$, and thus avoids any appreciable increase in total bandwidth. The bandwidth of the pilot itself is about $30\sim$ to cater for a maximum fluctuation of $\pm 15\sim$ of the carrier frequency in a period during which the synchronising circuit has not had time to take up a new stable position. The results show a commercial circuit with good quality and no interruption." Sci. Abs. 34B:2185, 1931.

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A discussion on the question of whether unequal fading of modulated component and carrier can occur in single-sideband transmission with carrier re-introduced in the demodulator.

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Proposes to overcome limitations in filter construction by employing a method of suppressing the sideband or side frequency which involves the use of a "balancing out" effect for the elimination of the undesired components.

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Single sideband, p. 1680-1687.

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A method of producing a single-sideband carrier modulated wave which compromises generating a modulating frequency band, converting said band into two portions which have the same frequency characteristics but in which there is between the components of the same frequencies occurring in the respective portions, a phase difference which is the same for all components, and utilizing such portions.

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