PROSHUNIN, K.T., podpolkovnik meditsinskoy sluzhby, kand. med. nauk

Problems of modern compound treatment of tetanus; a review of literature. Voen.-med.zhur. no.10:34-38 '64. (MIRA 18:5)

PROSHUNIN, K.T.; GOLUBEV, N.V.; BARANOV, L.Ye.

Tracheostomy in the treatment of tetanus. Eksper. khir. i anest. 9 no.1:82-83 Ja-F '64. (MIRA 17:12)

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001343310006-0"

PROSHUNIN, N. YE.

Caucasus, Northern - Afforestation

We are growing rich forest belts. Les i step' 4 No. 6, 1952.

9. Monthly List of Russian Accessions, Library of Congress, September 195~~3~~2, Uncl.

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001343310006-0"

PROSHUNIN, N. YE.

PROSHUNIN, N. YE.

Afforestation-Caucasus, Northern

We are growing rich forest belts.
N. E. Proshunin. Les i step'
4, No. 6, 1952.

Monthly List of Russian Accessions, Library of Congress, September 1952. UNCLASSIFIED.

PROSHUNIN, Pavel Nikolayevich; DUBROVSKIY, V.A., red.; BALLOD, A.I., tekhn.red.

[RSM-8 tractor-drawn combine] Pritsepnoi zernovoi kombain RSM-8. Moskva, Gos.izd-vo sel'khoz.lit-ry, 1958. 174 p. (MIRA 11:7)
(Combines (Agricultural machinery))

PROSHUNIN, PAVEL NIKOLAYEVICH

Pritsepnoy zernovoy kombayn RSM-8 Grain combine trailer RSM-8
Moskva, Sel'khozgiz, 1958.

174 p. illus., Diagrs., tables.

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001343310006-0"

PROSHUNIN, P.N.

Work of the Special Design Bureau of the Rostsel'mash Plant on grain-harvesting machines shown at the All-union Agricultural Exhibition. Sel'khozmashina no.9:8-9 S '54. (MLRA 7:9)

1. Zamestitel' nachal'nika SKB zavoda Rostsel'mash.
(Combines (Agricultural machinery))

PROSHUNIN, P.N.

New cultivators. Trakt. i sel'khozmash. 33 no.11:25-27 N '63. (MIRA 17:9)

1. Nachal'nik Gosudarstvennogo spetsial'nogo konstruktorskogo byuro po sel'skokhozyaystvennym i vinogradnikovym mashinam.

PROSHUNIN, P. N.

29738

Sovyeshchaniye pyeryedovykh Kombaynyerov na zavodye Rostsyel'mash imyeni Stalina. (Mart 1949 g.) Syel'khozmashina, 1949, No. 9. S. 27-29

So: Letopis' No. 40

PROSHUNINA, D.V.

Purification of molasses alcohol for analytical purposes.
Farmatsev. zhur. 20 no.5:37-39 '65. (MIRA 18:11)

1. TSentral'naya nauchno-issledovatel'skaya aptechnaya laboratoriya Glavnogo aptechnogo upravleniya Ministerstva zdravookhraneniya UkrSSR. Submitted July 30, 1964.

ANTONENKO, E.M.; PROSHUNINA, S.A.

Methods for microseismic regionalization and their use for the regionalization of Dzhambul. Izv. AN Kazakh. SSR. Ser. geol. 21 no.2:42-56 Mr-Ap'64. (MIRA 17:5)

1. Institut geologicheskikh nauk imeni K.I. Satpayeva AN Kazakhskoy SSR, Alma-Ata.

FEDOTOV, D.K., inzh.; PROSHUTINSKIY, A.P., inzh.

Automatic control of the recirculation of the condensate of steam turbines. Prom. energ. 19 no. 4:26-27 Ap '64. (MIRA 17:5)

L 07268-67 EWT(1)/EWP(m)/EWT(m) WW/GD

ACC NR: AT6025308 SOURCE CODE: UR/0000/66/000/001/0072/0081

37
B+1

AUTHOR: Proshutinskiy, A. P.; Shugam, R. A.; Shishov, V. P.

ORG: none

TITLE: Self oscillations in a natural circulation loop during boiling

SOURCE: Moscow. Inzhenerno-fizicheskiy institut. leniye yadernymi energeticheskimi ustanovkami (Control of nuclear power plants), no. 1. Moscow, Atomizdat, 1966, 72-81

19

TOPIC TAGS: nuclear reactor coolant, boiling water reactor, nuclear safety, simulation test facility

ABSTRACT: The authors present the results of an investigation of the stability of a circulation loop by studying the self oscillations produced in two-phase systems under natural circulation, at pressures from atmospheric to ten atmospheres, and heat loads up to 800 x 10^3 kcal/(m^2hr). Principal attention was paid to the influence of the underheating of the water below saturation at the output in the heated section and of the pressure in the loop on the self oscillations, on their amplitude, on their frequency, and on the stability. The experiments were carried out in an experimental stand designed to investigate the hydrodynamics of two-phase streams in channels of various configurations. The tests consisted essentially of filling the stand with feed water and heating it electrically at different rates and under various pressures to disclose the conditions under which self oscillations in the liquid circulation

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set in. At constant heating, self oscillations set in at a temperature differential (below saturation) of 4 - 5C, but at 10 atm the differential rose to 23 - 25C, so that the pressure exerts a stabilizing influence. No oscillations were produced at heat fluxes in excess of 5.50×10^{13} kcal/(m^2hr) (at 2.9 atm). Conclusive results on the stability could be obtained only at low pressures, but even these results display the most important factors that influence the occurrence of self oscillations in a loop with natural circulation, and are useful from the point of view of reactor safety. Orig art. has: 8 figures.

SUB CODE: 18/ SUBM DATE: 27Dec65/ ORIG REF: 002/ OTH REF: 003

Card 2/2 pla

PROSHUTINSKIY, G.

On the eve of large-scale processing of meat. Mias. ind. SSSR 29 no. 4:27-29 '58. (MIRA 11:8)

1. Upravleniye promyshlennosti myasnykh i molochnykh produktov sovnarkhoza Moldavskoy SSR.
(Moldavia--Meat industry)

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

Nitrogen in steel. G. Ya. Veinberg and S. Proshutinskii. *Metallurg* 13, No. 2, 95-103(1938).—A study of a Bessemer converter showed that the N content in the metal increases steadily during the blow and amounts to 0.010-0.0164% at the end. A slight decrease occurs on deoxidizing. Absorption of N was greater at higher temp. In a Thomas converter the N increased from 0.0030 to 0.0224% during the blow. H. W. R.

9

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

9

The influence of oxygen on Armco iron. G. Ya. Veinberg and S. Proshutinskii. Stal 7, No. 1, 78-80 (1937).—Curves are presented showing that in Armco Fe contg. 0.017 to 0.143% O an increase in O content decreases tensile strength, elastic limit, elongation, impact resistance and sp. gr. and increases grain size.

H. W. Rathmann

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

PROCESSES AND PROPERTIES INDEX

7

Ca

Methods of determining nitrogen in steels. G. Ya. Veinberg and S. D. Proshutinskii. *Zavodskaya Lab.* 4, 390-7(1935).—Discussion of various proposed methods and the factors influencing the results. Bibliography of more than 57 references. Chas. Blanc

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

Ch

7

Rapid colorimetric method of determination of silicon in steel, for steel plant laboratories. S. M. Gutman and S. I. Proshutinskii. *Repts. Inst. Metals* (Leningrad) No. ~~15, [illegible]~~ German 1933). The method is based on that of Hayer and Feldknecht (C. A. 24, 1291 and 20, 101) and depends on the formation in soln. of a yellow compd. $SiO_2.12MoO_3.xH_2O$. One g. of steel filings is dissolved in a 500-cc. volumetric flask in 10 cc. HCl (1.19), 3 cc. HNO_3 (1.4) and 15 cc. H_2O. To the soln. is added 10-15 cc. H_2O, 50 cc. of 10% Na_2HPO_4 soln. and 10 g. $CaCO_3$; the mixt. is allowed to stand for 5-10 min. on a water bath and the soln. is made up to the mark. To 50 cc. of this soln. is added 0.5-1 g. powd. $(NH_4)_2MoO_4$ and 10 cc. of 10% HCl. The color is compared with that of a standard K_2CrO_4 soln., which is prepd. by dissolving 1.156 g. in 1 l. H_2O. One cc. of the standard soln. corresponds to 0.0001 g. Si. It takes about 25-30 min. to complete an analysis. In Cr-Ni steels the results by this method are too low. S. L. Madorsky

A S M - S L A METALLURGICAL LITERATURE CLASSIFICATION

PROCESSES AND PROPERTIES INDEX

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CA

The effect of hydrogen on the properties of iron. G. Ya. Veinberg and S. I. Pruhutinskii. *Metallurg* 13, No. 9, 31-6(1938).—Specimens of Armco Fe heated at 1200° in H for 2-10 hrs. and furnace-cooled showed no change in mech. properties. Specimens which were water-quenched after heating in H showed a decided decrease in elongation, reduction of area and impact resistance, and an increase in hardness. H. W. Rathmann

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

Ca

7

Methods for determining hydrogen in steels. G. Ya. Velmberg and S. I. Proshutinskii. *Zavodskaya Lab.* **6**, 102-7(1937).—A modification of the Gerke and Zolotareva (*C. A.* **29**, 5381[9]) method is described in detail. About 30 references. Chas. Blanc

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

GYUL', Kasum Kyazim ogly, prof.; PROSHYANTS, Grigoriy Gagigovich; KHURSIN, Leonid Aleksandrovich; YAKUBOVSKIY, G.I., red.; SHTEYNGEL', A.S., red.izd-va

[Handbook for shiphandlers in the Caspian Sea] Spravochnik dlia sudovoditelia Kaspiiskogo moria. Baku, Azerbaidzhanskoe gos. izd-vo neft. i nauchno-tekhn.lit-ry, 1957. 707 p. (MIRA 11:4)
(Caspian Sea--Navigation)

KATS, I.I.; PROSIKHIN, A.I.

Devices for regulating the engine temperature of the DT-75 tractor. Trakt. i sel'khozmash. 31 [i.e.32] no.11:11-13 N '62. (MIRA 15:12)

1. Volgogradskiy traktornyy zovod.
(Crawler tractors)

PROSIN, A.V., nauchnyy sotrudnik.

Radio relay systems. Nauka i zhizn' 23 no.10:14-16 O '56. (MLRA 9:11)

1. Institut radiotekhniki i elektroniki Akademii nauk SSSR. (Radio relay systems)

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001343310006-0"

PROSIN, A. V.

"On the Maximum Permissible Frequency Band that can be Transmitted in Beyond the Horizon Tropospheric UHF Propagation,"

report presented at the Session on Radio Wave Propagation, All-Union Scientific Session of VNORiE, Moscow, 20-25 May 1957.

In his paper A. V. Prosin introduced the concept of the transient characterisitc of the Troposphere and defined this characteristic for the transmission of a step sinusoidal voltage for directional and non-directional antennas.

Electronic Design, 22 Jan 58

PROSIN, A.V.

PROSIN, A.V. [translator]; CHASTUKHINA, Yu.Ye. [translator]; SIFOROV, V.I., redaktor; DIKAREVA, A.I., redaktor; KORUZEV, N.N., tekhnicheskiy redaktor

[Problems of telecommunication by ultrashort waves. Translated from the English] Voprosy dal'nei sviazi na ul'trakorotkikh volnakh; sbornik statei. Perevod s angliiskogo A.V.Prosina. IU.E. Chastukhina. Pod red. V.I.Siforova. Moskva, Izd-vo "Sovetskoe radio," 1957. 369 p. (MLRA 10:9)
(Radio, Shortwave) (Ionospheric radio wave propagation)

PROSIN, A.V.

109-5-19/22

AUTHOR PROSIN A.V.

TITLE On the Calculation of the Cross-Noises Arising Due to Dis-Coordination of Feeder in Frequency-Modulation Radio-Relay Lines of Communication with Distant Propagation of Ultrashort Waves. (O raschete perekrestnykh shumov, voznikayushchikh vsledstviye rassoglasovannosti fidera v ChM radioreleynykh liniyakh svyazi, ispol'zuyushchikh dal'neye rasprostraneniye UKV - Russian)

PERIODICAL Radiotekhnika i Elektronika, 1957, Vol 2, Nr 5, pp 660-663 (U.S.S.R.)

ABSTRACT The works published on this problem offer no possibility of classifying the non-linearity of the passage of the whole radio-relay line by means of a measurement of the fading of non-linearity with harmonics. Here non-linear distortions caused by the discrepancy of the feeder are investigated. The author assumes that the feeder is homogeneous in all its length, that the reflection of energy takes place only from the ends of the feeeder in consequence of the discrepancy with the load, that the reflection coefficients are small, and that the oscillations reflected more than once from each end of the feeder line can be neglected. The author shows that if the condition $\Delta f_m < \frac{f_s}{2}$ is fulfilled the problem of determining the cross-noises, developing in consequence of the discrepancy of the feeder in frequency-modulation radio-relay lines of communication is reduced to the finding of the transition noises on the occasion of the passage of a multi-channel-frequency, modulation signal through a four-point

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On the Calculation of the Cross-Noises Arising Due to Dis-Coordination of Feeder in Frequency-Modulation Radio-Relay Lines of Communication with Distant Propagation of Ultrashort Waves. 109-5-19/22

switch with non-linear frequency-phase characteristics, i.e. the problem investigated by S.V.Borodich in "Elektrosvyaz'", 1956, 1,1o-21; f_s is the distance between the maxima of phase-distortion characteristic Δf_m is the maximum frequency deviation.
(2 illustrations and 4 Slavic references)

ASSOCIATION Not Given.
PRESENTED BY
SUBMITTED 3.3.1957
AVAILABLE Library of Congress.
Card 2/2

PROSIN, A. V.

Ю. В. [illegible]

Анализ схем многократного преобразования частоты.

II. СЕКЦИЯ РАСПРОСТРАНЕНИЯ РАДИОВОЛН

Руководитель Л. А. Жекулин

9 июня
(с 10 до 12 часов)

Совместное заседание с секцией общей радиотехники

А. В. Просин,
В. Ф. Губский

Некоторые вопросы теории разнесенного приема при рассеянном распространении УКВ.

А. В. Просин,
Г. Н. Слободянин,
Н. Я. [illegible]

Экспериментальное исследование разнесенного приема при дальнем тропосферном распространении УКВ.

(с 12 до 16 часов)

В. А. Введенский,
Н. А. Арманд

О механизме потерь усиления узконаправленных антенн при дальнем тропосферном распространении ультракоротких радиоволн.

А. В. Шабельников

К вопросу о применении метода возмущений при интерпретации задач некогерентного рассеяния и его связь со строгим дифракционным решением.

В. А. [illegible],
Ф. Г. Басс

К теории распространения радиоволн в среде со случайными неоднородностями над идеально проводящей плоскостью.

9 июня
(с 18 до 22 часов)

А. В. Мень,
С. Я. Брауде,
В. В. Горбач

Флуктуации фазового фронта при распространении дециметровых [illegible] над [illegible] раздела.

report submitted for the Centennial Meeting of the Scientific Technological Society of Radio Engineering and Electrical Communications im. A. S. Popov (VNORiE), Moscow, 8-12 June. 1959

PROSIN, A. V.

Совместное заседание с секцией распространения радиоволн

~~А. В. Просин,~~
В. Ф. Губский

Некоторые вопросы теории разнесенного приема при рассеянном распространении УКВ

А. В. Просин,
~~Г. И. [illegible],~~
В. Н. [illegible]

Экспериментальное исследование разнесенного приема при дальнем тропосферном распространении УКВ

(с 12 до 16 часов)

В. Ф. [illegible]

Об интегральном методе обнаружения импульсного сигнала на фоне шума.

И. А. [illegible]

Погрешности, возникающие в аппаратуре импульсно-кодовой модуляции

9 июня
(с 18 до 22 часов)

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С. М. [illegible] (Чехословакия)

Резонансные преобразования и некоторые их применения

Л. Г. [illegible]

Расчет частотных характеристик некоторых симметричных многополюсников.

Д. Е. [illegible]

К расчету переходных процессов при частотной модуляции.

10 июня
(с 10 до 16 часов)

Л. Л. [illegible]

Атомно-лучевые радиоспектры щелочных металлов.

В. Б. [illegible],
Г. С. [illegible]

Двухрезонаторные и многорезонаторные квантовые усилители.

В. М. [illegible]

К вопросу об использовании принципа параметрического усиления электромагнитных колебаний.

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Report submitted for the Centennial Meeting of the Scientific Technological Society of Radio Engineering and Electrical Communications im. A. S. Popov (VNORiE), Moscow, 8-12 June. 1959

APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001343310006-0"

PROSIN, A.V., Cand Tech Sci -- (diss)"Certain ~~questions~~ problems of radio relay lines of communication using long-range tropospheric ~~propagation~~ diffusion of ultra-short waves." Mos, Pub House of Acad Sci USSR, 1958, 14 pp. (Acad Sci USSR. Inst of Radio~~technics~~ Engineering and Electronics) 165 copies. List of author's works at end of text (11 titles) (KL, 39-58, 110)

SOV/1874

6(7)

PHASE I BOOK EXPLOITATION

Prosin, Aleksandr Vasil'yevich, and Aleksey Nikolayevich Tsvetkov

Radiorelaynyye linii svyazi (Radio Relay Systems) Moscow, Izd-vo AN SSSR, 1958. 106 p. (Series: Akademiya nauk SSSR. Nauchno-populyarnaya seriya) Errata slip inserted. 15,000 copies printed.

Resp. Ed.: V. I. Siforov, Corresponding Member, USSR Academy of Sciences; Ed. of Publishing House: E.M. Volkova; Tech. Ed.: I.N. Guseva.

PURPOSE: This book may be useful to technical personnel working with radio relay equipment and systems.

COVERAGE: The authors discuss problems of constructing radio relay communication systems for long-distance telephony and television transmission. They describe the function, principles of operation, and basic circuits of radio relay systems operating at a distance of the normal horizon as well as those using long-distance tropospheric and ionospheric propagation of ultra short-waves. No personalities are mentioned. There are no references.

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APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R001343310006-0"

Prosin, A.V.

DISTRIBUTION CURVES

"Distribution of the Envelope of the Amplitudes at the Output of a Selective System Under Accidental Frequency Deviations", by A.V. Prosin, Elektrosvyaz', No 1, January 1958, pp 9-14.

A method is given for determining the distribution curves for the envelope of the amplitudes at the output of selective systems owing to accidental swings of the voltage frequency. The distribution curves are obtained for the output of resonant systems consisting of n identical networks and n pairs of coupled networks, under the condition that the modulating voltage has a normal distribution and that the so-called quasi-stationary solution is used for the output oscillations. Simple formulas are obtained for the distribution function of a quantity that is the reciprocal of the voltage amplitude, and on the basis of these formulas it is possible to calculate the probability that the envelope will exceed a previously- specified value. The probabilities are plotted for various values of both the parameters of the selective systems and of the parameters of the messages, so as to make possible an estimate of the requirements that must be satisfied by the amplitude limiters.

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PROSIN, A.V.

Calculating long-distance communication channels for ultra-short waves. Nauch.dokl.vys.shkoly; radiotekh. i elektron. no.1:71-74 '58. (MIRA 12:1)

1. Institut radiotekhniki i elektroniki AN SSSR.
(Radio, Shortwave)

PROSIN, A.V.

Calculation of multichannel communication systems with frequency modulation and frequency multiplexing. Nauch.dokl.vys.shkoly; radiotekh. i elektron. no.1:75-80 '58. (MIRA 12:1)

1. Institut radiotekhniki i elektroniki AN SSSR.
(Radio frequency modulation--Noise)

PROSIN, A.V.

Energetic spectrum of frequency modulated oscillations during scattered propagation of ultrashort waves. Nauch.dokl.vys.shkoly; radiotekh. i elektron. no.2:19-22 '58. (MIRA 12:1)

1. Institut radiotekhniki i elektroniki AN SSSR.
(Radio, Shortwave--Transmitters and transmission)

S/112/60/000/009/006/006

6.4500

Translation from: Referativnyy zhurnal, Elektrotekhnika, 1960, No. 9, p. 403, # 6.8333

AUTHOR: Prosin, A. V.

TITLE: Cross-Talk Noises Arising in Radio Communication Links With Frequency Modulation Owing to Multi-Beam Propagation of Radio Waves or Mismatching and Discontinuity of Antenna Feeders

PERIODICAL: Sb. tr. Nauchno-tekhn. o-vo radiotekhn. i elektrosvyazi im. A. S. Popova, 1958, No. 2, pp. 168-208

TEXT: The aim of the present work is to investigate distortions of multichannel signals caused both by energy reflections from the feeder ends owing to mismatching of the loads and by energy reflection from many points along the mismatched feeder. Based on the correlation analysis, calculation formulae have been obtained to determine the noise-measuring capacity of cross-talk noises arising in some telephone channels of radio communication links with frequency condensation and frequency modulation owing to energy reflections from the feeder end or from its internal discontinuities. The expressions

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Cross-Talk Noises Arising in Radio Communication Links With Frequency Modulation Owing to Multi-Beam Propagation of Radio Waves or Mismatching and Discontinuity of Antenna Feeders

obtained can also be used for the calculation of cross-talk noises originating owing to multi-beam dispersion of radio waves. In the latter case the formulae are correct for two-beam propagation, if different amplitude ratios of the direct and reflected waves are concerned; and for multi-beam propagation if the intensity of the reflected beams is small in comparison with the intensity of the main beam. Based on the investigations carried out, the author gives practical recommendations for the reduction of cross-talk noises.

From the author's résumé

Translator's note: This is the full translation of the original Russian abstract.

Card 2/2

PROSIN, A.V.

Calculation of multichannel FM communication systems with frequency-division multiplex. Sbor. trud. NTORiE no.2:209-226 '58. (MIRA 16:6)

(Microwave communication systems)

PROSIN, A.V.

Calculating the dissipated power in connection with long-distance tropospheric propagation of ultrashort waves. Elektrosviaz' 12 no.8:13-21 Ag '58. (MIRA 11:8)
(Radio, Shortwave)

66312

SOV/162-59-1-6/27

~~6 (7), 9 (2, 9)~~ 9,9000

AUTHOR: Prosin, A.V.

TITLE: The Influence of Statistical Characteristics of the Turbulent Troposphere on the Scattered Propagation of Ultrashort Waves

PERIODICAL: Nauchnyye doklady vysshey shkoly, Radiotekhnika i elektronika, 1959, Nr 1, pp 43- 52

ABSTRACT: The author presents a generalized expression for the class of correlation functions of dielectric constant nonuniformities of air, which is correct for the anisotropic and the isotropic turbulency of the troposphere. This correlation function has the following appearance $B(\rho) = \overline{(\Delta\varepsilon)^2}\,\frac{2^{(1-p)}}{\Gamma(p)}\left(\frac{\rho}{l}\right)^p K_p\left(\frac{\rho}{l}\right)$ where $B(\rho)$ - correlation function of the dielectric constant; $\overline{(\Delta\varepsilon)^2}$ - intensity of fluctuation of the dielectric constant of air; l - extent of turbulent nonuniformities; K_p - modified Bessel function (Macdonald

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The Influence of Statistical Characteristics of the Turbulent Troposhpere on the Scattered Propagation of Ultrashort Waves

function); Γ - Gamma function; ρ - distance between two points in a turbulent flow, in which fluctuations of the dielectric constant are considered. The author analyzes the dependence of the effective cross section of scattering (coefficient of scattering) on the form of correlation function and energy spectrum of turbulent nonuniformities of the troposphere, on the extent of nonuniformities and on a number of other parameters. The results of different scattering theories are compared on the basis of the aforementioned correlation function. The author mentions T.Karman [Ref 1], the law of "two thirds" obtained by A.N. Kolmogorov [Ref 2] and A.M. Obukhov [Ref 3], V.N. Troitskiy [Ref 4], V.A. Krasil'nikov [Ref 5] and others. The author states that the analysis of the above formula will lead to the conclusion that almost all correlation functions which are used until now in different versions of the theory are special cases of this

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formula. The theoretical formulas for different correlation functions are confirmed experimentally (A.M. Obukhov [Ref 10], S.I. Krechmer [Ref 11], G. Birnbaum and H.E. Bussey [Ref 12]) which shows the correctness of the selection of the generalized correlation function of the dielectric constant of air. The author discusses briefly the scattering coefficient for the isotropic and anisotropic turbulency. He presents a compilation of formulas for correlation functions, energy spectrum and scattering coefficient, which are located on a special insert between pp 50 and 51. There are 1 diagram, 2 graphs, 1 insert, and 12 references, 7 of which are Russian, 1 English and 4 American.

ASSOCIATION: Institut radiotekhniki i elektroniki AN SSSR (Institute of Radio Engineering and Electronics of the AS USSR)

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The Influence of Statistical Characteristics of the Turbulent Troposphere on the Scattered Propagation of Ultrashort Waves

SUBMITTED: October 24, 1958

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66313
SOV/162-59-1-7/27

~~6 (7), 9 (2, 9)~~ 9.9000

AUTHOR: Prosin, A.V.

TITLE: The Calculation of Cross Distortion in Multi-Beam Wave Propagation

PERIODICAL: Nauchnyye doklady vysshey shkoly, Radiotekhnika i elektronika, 1959, Nr 1, pp 52-61

ABSTRACT: Based on the correlation theory of stationary random processes, a method was developed for calculating the power of cross noises, existing in multichannel radio relay communication lines with frequency modulation and frequency condensation. These noises are caused by the multi-beam propagation of radio waves or by mismatching and discontinuities of transmission lines. The formulas obtained are correct for a) two-beam propagation - with different ratios between amplitudes of direct and reverse waves (first case); b) for multi-beam propagation - if the intensity of the reflected beams is weak compared to the intensity of the basic beam (second case). The formulas may be

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used to determine cross noise caused by reflection within feeders. Existing papers dealing with this subject are reviewed briefly; for example that of V.A. Smirnov [Ref 2]. S.V. Borodich's formula [Ref 4] is used for determining the psophometric power of cross noises in telephone channels. The following conclusions are presented: 1. Antennas having a high directivity should be used in frequency-modulated radio relay communication lines using the tropospheric long-distance propagation of ultrashort waves. In this way, the delay time of single beams is decreased. Further, the probability is reduced that two powerful fields will exist simultaneously in the region of the effective scattering volume, whose presence is most dangerous from the viewpoint of cross noise. 2. In conventional radio relay lines neighboring stations operate within the limits of direct visibility. To reduce the cross noises, the communication system should be designed

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in such a manner that the intensity of each reflected beam is low compared to the intensity of the basic beam. 3) The relative importance of energy reflections by the transmission line terminals and by internal nonuniformities depends chiefly on the number of sections (number of internal nonuniformities) which compose the line. As a rule, in practice, the coefficients of reflection from the feeder ends are greater than the coefficients of reflection from internal nonuniformities. For short lines only cross noise should be taken into account produced by reflections of energy from the feeder terminals. For longer feeders, however, it is necessary to consider various other causes having an influence on the cross noise value. These causes are reflections within the feeder, reflections from the feeder terminals and internal line discontinuities, and the interaction of reflected beams with different delay times. The power of cross

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noises caused by these factors is commensurable with the power of noises caused by terminal reflections with feeders of medium length; it is considerably higher with great feeder length. 4) To reduce the power of cross noises, caused by mismatching or line discontinuities, first, the coefficients of reflection of feeder terminals and of internal discontinuities should be reduced to a minimum, then, the length of the sections should be increased out of which the feeder is composed. In addition, sections of different lengths or sections with a random spread of lengths should be used for reducing cross noise. There are 4 references, 2 of which are Russian, 1 American and 1 English.

ASSOCIATION: Institut radiotekhniki i elektroniki AN SSSR (Institute of Radio Engineering and Electronics of the AS USSR)

Card 4/~~5~~4

S/058/61/000/006/054/063
A001/A101

6,9200

AUTHOR: Prosin, A.V.

TITLE: On the effect of the correlation function shape of troposphere turbulent non-homogeneities on the scattered propagation of ultrashort waves

PERIODICAL: Referativnyy zhurnal. Fizika, no. 6, 1961, 391, abstract 6Zh511 ("Sb. tr. nauchno-tekhn. o-vo radiotekhn. i elektrosvyazi im. A.S. Popova", 1959, no. 3, 108 - 117)

TEXT: The author derives a generalized expression for the correlation function of non-homogeneities of the air dielectric constant. He analyzes the dependence of the scattering effective cross section on the shape of the correlation function and energy spectrum of turbulent non-homogeneities of the troposphere.

[Abstracter's note: Complete translation]

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S/058/61/000/004/041/042
A001/A101

9.9300

AUTHOR: Prosin, A.V.

TITLE: Some problems in the theory of radio relay communication lines which utilize distant tropospheric propagation of ultrashort waves

PERIODICAL: Referativnyy zhurnal. Fizika, no 4, 1961, 421, abstract 4Zh644 ("Sb. tr. Nauchno-tekhn. o-vo radiotekhn. i elektrosvyazi im. A.S. Popova", 1959, no 4, 29 - 97)

TEXT: Several theories of scattering of ultrashort waves by turbulent inhomogeneities of the troposphere are adopted as a basis for considering a wide class of characteristics of distant tropospheric propagation of ultrashort waves in the cases of directional and non-directional antennas. Simple formulae are derived for determining the power of scattering. Losses in antenna gain are determined. Transition characteristics of the troposphere are found. A possible frequency band is determined which can be used for distant propagation of ultra-short waves. An expression is derived for the transmission coefficient of a

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Some problems in the theory of radio relay S/058/61/000/004/041/042
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quadripole which is equivalent to the troposphere. A formula is given for calculating cross noises in multichannel communication systems with frequency modulation. Expressions are presented for calculating the spread angles of scattered energy, extreme allowable antenna dimensions and correlation distances. Theoretical and experimental data are compared.

[Abstracter's note: Complete translation.]

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SOV/106-59-5-4/13

AUTHOR: Prosin, A.V.

TITLE: Transmission Distortions in Scatter Propagation of Ultra-Short Waves (Ob iskazheniyakh peredachi pri rasseyannom rasprostranenii ul'trakorotkikh voln)

PERIODICAL: Elektrosvyaz', 1959, Nr 5, pp 32-42 (USSR)

ABSTRACT: Transmission distortions in vhf tropospheric propagation are investigated using several theories of scatter of ultra-short waves by turbulent irregularities in the troposphere. The basic reason for such distortions is that due to scattering the electromagnetic field at the receiver consists of a multitude of waves, the propagation times of which differ due to differences in the lengths of the propagation paths. From simple geometrical considerations (Ref 1), the delay time of the separate rays is determined by Eq (1) and (2). (The symbols used in this article are as defined in the author's previous work, Ref 1.) With pulse transmission some "erosion" of the leading and trailing edges occurs (Ref 2 and 3). A similar picture occurs with transmission of a step of harmonic emf. Thus the troposphere acts on

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the signal like a four-terminal, band-pass filter which has the same frequency pass-band and the same transitory (transient) characteristics as the troposphere. From the theories of Villars, Weisskopf and Norton, an expression (Eq 4) is deduced for the transitory characteristic of the troposphere (E_1/E_m) when non-directional antennae are used. E_m is the maximum amplitude of the tropospheric wave for the steady-state scatter regime. Similarly, from the theory of Steras and Booker and Gordon (Ref 7), the transitory characteristic of the troposphere is determined by Eq (5). Functions (4) and (5) are shown in Fig 1 (curves 1 and 2). For comparison the transitory characteristic from Ref 8 is drawn in the same figure (curve 3). The shapes of curves 1, 2 and 3 do not differ significantly. On the basis of the theories of Villars-Weisskopf and of Machmore, the transitory characteristics of the troposphere are derived for the following cases:

1. Rectangular directional characteristics and the antennae axes forming an angle 0.5 α_0 with the

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horizontal (Eq 8 and Fig 2).
2. Rectangular directional characteristics and the antennae axes horizontal (Eq 9 and Fig 3).
3. Actual directional characteristic and the antennae axes forming an angle 0.5 α_0 with the horizontal (Eq 12 and Fig 4).
4. Actual directional characteristic and the antennae axes horizontal (Eq 14 and Fig 5-7).
From analysis of the expressions and the graphs, the following conclusions are made:
1. The transitory (transient) characteristics of the troposphere constructed on the basis of the different theories of scatter approximate each other, especially in the region of small values of the parameter $\frac{\alpha_0}{\varphi_0}$ i.e. for highly directional antennae.
Curves constructed on the basis of Troitskiy's theory give a somewhat different fall in the characteristic.
2. To reduce the duration of the transitory processes it is desirable to increase the directivity of the transmitter and the receiver antennae in the vertical

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plane. To reduce distortions and to increase the power, antennae with high directivity in the vertical plane and low directivity in the horizontal plane should be used. The fundamental reason for analysis of the transitory processes is to determine the "establishing" time t_y and the delay time t_o by which is meant the time between the step voltage at the input and the instant that the output voltage reaches the half-voltage point. The values of t_y and t_o are obtained from the transitory characteristics for the cases given earlier. From these values the pass-band of the equivalent four-terminal filter and its transfer coefficient are determined. Finally, on the basis of expression for the psophometric noise power due to non-linearity in the phase characteristic of a four-terminal network in a telephone channel as developed in Ref (17), an equation is obtained (Eq 34) for the cross-talk power arising in long-distance, tropospheric, vhf, frequency-modulated

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Transmission Distortions in Scatter Propagation of Ultra-Short Waves

transmission. A numerical example is given. There are 9 figures and 18 references, 15 of which are Soviet (some being translations of American works) and 3 English.

SUBMITTED: 2nd September 1957

Card 5/5

PROSIN, A. V., TSIBAKOV, B. S. SIFOROV, V. I.

"Investigation of the Properties of Radio Communications Channels Containing Statistically Inhomogenous Media."

Report presented at the 13th General Assembly of URSI - Commission VI, 5-15 Sep 1960, London UK

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A055/A033

9.9300

AUTHOR: Prosin, A. V.

TITLE: Dependence of the Dispersion Power on the Statistical Characteristics of the Turbulent Troposphere

PERIODICAL: Elektrosvyaz', 1960, No. 12, pp. 3-10

TEXT: Several theories exist to-day explaining the scattering of radio-waves by turbulent non-homogeneities of the troposphere in particular cases. In the present article, the author develops a generalized method taking into account all these theories and allowing to calculate the dispersion power in the cases of the anisotropic and isotropic turbulence. This generalized theory enables him to examine the dependence of the stray field (at the locus of reception) upon the correlation function of turbulent non-homogeneities, upon the width of their energy spectrum and upon the law governing the decrease in their intensities with altitude. In the development of his generalized theory, the author uses the formula giving the ratio of the dissipated power to the power in free space, and the generalized correlation function deduced by him in previous articles ("Radiotekhnika i Elek-

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Dependence of the Dispersion Power on the Statistical Characteristics of the Turbulent Troposphere

tronika", No. 1, 1959, and "Elektrosvyaz'", No. 8, 1958). He also refers to the works of Crain (Proc. IRE, No. 10, 1955), of Crain, Straiton, Rosenberg (Trans. IRE, Oct. 1953) and of Josephson and Carlgon. It was shown in these works that the dependence of $\overline{(\Delta\varepsilon)^2}$ on the altitude is not constant [$\overline{(\Delta\varepsilon)^2}$ being the fluctuation-intensity of the dielectric permittivity of the troposphere]. Since it is interesting to study the effect of this dependence upon the dispersion power and the losses in antenna amplification, the author, after assuming that

$$\overline{(\Delta\varepsilon)^2} = \frac{C}{H^n} \quad (3)$$

where C is the coefficient of proportionality [value of $\overline{(\Delta\varepsilon)^2}$ at 1 km altitude from the Earth's surface], H the altitude over the Earth's surface and n an arbitrary exponent, substitutes $\overline{(\Delta\varepsilon)^2}$ and the generalized correlation function into the expression giving the dispersion power, where also appears a factor F determining the dependence of the dispersion power on the direc-

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Dependence of the Dispersion Power on the Statistical Characteristics of the Turbulent Troposphere

tivity of the transmitting or the receiving antenna. For non-directional antennae, F is equal to 1, and it becomes much smaller than 1 when the directivity increases. The reciprocal of F determines the losses in amplification, occurring with highly directional antennae. The author analyses the fomulae thus obtained by him for the dispersion power and for the losses in antenna amplification. This analysis allows him to reach several conclusions regarding the dependence of the dispersion power and of the losses upon the characteristics of the turbulent atmosphere. It also enables him to compare his results with those obtained by other dissipation theories. The results obtained by him are confirmed by experimental data. Here are some of his essential conclusions: 1) The form of the correlation function of the dielectric permittivity of the troposphere and the width of its energy spectrum affect the dependence of the dispersion power upon the distance, the wavelength, the extent of the turbulent non-homogeneities and some other parameters. For a sharper drop of the correlation function and for a wider spectrum of non-homogeneities, the dependence of the dispersion power on the

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Dependence of the Dispersion Power on the Statistical Characteristics of the Turbulent Troposphere

above enumerated parameters is less pronounced, and vice versa. 2) The character of the variations of the stray field (at the locus of reception) also depends on the variation of the fluctuation-intensity of the permittivity of the troposphere with altitude. The more rapid the drop of this intensity, the more rapid will be the decrease of the dispersion power with distance. 3) Under conditions of anisotropic turbulence, the dependence of the dispersion power on the various parameters does not change. 4) The magnitude of the losses in antenna amplification is affected by the form of the correlation function of the permittivity of air, by the width of its energy spectrum, and also by the character of the variations of $(\Delta \varepsilon)^2$ with altitude and by the degree of anisotropy of the turbulent non-homogeneities. Formulae expressing the dispersion power for different values of n and p (p being the index of the generalized function in the rectangular system of coordinates) in the case of isotropic turbulence and non-directional antennae are given in a table. There are 3 figures, 1 table and 5 references, 2 Soviet and 3 American or British.

SUBMITTED: January 6, 1960

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77786
SOV/109-5-2-19/26

AUTHOR: Prosin, A. V.

TITLE: On the Dependence of Power Scattering on Antenna Directivity. Brief Communication

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol 5, Nr 2, pp 330-333 (USSR)

ABSTRACT: Reference is made to a previous work by the author (Calculation of Power Dissipation in Distant Tropospheric Propagation of Ultrashort Waves, Elektrosvyaz', 1958, 8, 15), where the conclusion was reached that antennas with greatest vertical and lesser horizontal directivity are optimal for tropospheric scattering. Equation

$$\frac{P_2}{P_{fs}} = \frac{P_1}{P_{fs}} F(\alpha_h, \alpha_v). \qquad (1)$$

shows the ratios P_2/P_{fs} and P_1/P_{fs} of scattering power to power in free space for directional and

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On the Dependence of Power Scattering on Antenna Directivity. Brief Communication

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nondirectional antennas respectively; $F(\alpha_h, \alpha_v)$ is coefficient depending on the directivity, and equals 1 for nondirectional antennas, but is smaller than 1 for sharply directional antennas; α_h, α_v represent the angular width of directivity diagrams in horizontal and vertical planes respectively. A reciprocal of $F(\alpha_h, \alpha_v)$ determines losses of antenna amplification L. Figure 1 shows the general relation between L and α_h, α_v, where φ_o is one-half of zero dissipation angle. In area I a horizontal directivity has a greater influence on amplification losses, while in area II the vertical directivity is determining. The character of this dependence is easily determinable from physics of scattered propagation of ultrashort waves. For first approximated evaluations, Eq. (1) can be replaced by a simpler expression

$$\frac{P}{P_{fs}} = \frac{16K}{d^2} \sigma V, \qquad (2)$$

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where K is coefficient taking reflection from the earth into account; σ is scattering coefficient; d is distance between sender and receiver; V is scatter volume. The effective volume of tropospheric scattering V_{eff}, following the quadratic law of decreasing inhomogeneous intensities with increasing height, is a triangular prism as shown in Fig. 2, a and b. The dimensions of V_{eff} are

$$\left.\begin{array}{ll} l_d = ao = \frac{d}{2}, & l_w = dd_1 = \frac{1}{3}\frac{d^2}{R_{eff}}, \\ l_v = do = \frac{d^2}{8R_{eff}}, & V_{eff} = \frac{1}{96}\frac{d^5}{R_{eff}^2}, \end{array}\right\} \quad (3)$$

where R_{eff} is effective earth radius. Consequently the dissipation power of nondirectional antennas is

$$\frac{P_1}{P_{fs}} = \frac{1}{8} K\sigma \frac{d^3}{R_{eff}^2}. \quad (4)$$

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On the Dependence of Power Scattering on Antenna Directivity. Brief Communication

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Formulas for power calculation taking Eq. (2) and Fig. 2 into consideration are

$$\frac{P_s}{P_{fs}} = \frac{P_1}{P_{fs}} \frac{3}{4} \frac{\alpha_h}{\varphi_0} \left[1 - 2\left(1 - \frac{\alpha_v}{\varphi_0}\right)^2\right] \quad (0{,}5\varphi_v \leqslant \alpha_v \leqslant \varphi_v, \quad 0 \leqslant \alpha_h \leqslant \varphi_h). \qquad (5)$$

$$\frac{P_s}{P_{fs}} = \frac{P_1}{P_{fs}} \frac{3}{4} \frac{\alpha_h}{\varphi_0} \cdot 2\left(\frac{\alpha_v}{\varphi_0}\right)^2 \quad (0 \leqslant \alpha_v \leqslant 0{,}5\varphi_v, \quad 0 \leqslant \alpha_h \leqslant \varphi_h). \qquad (6)$$

From Eqs. (5) and (6) it may be seen that in the area $0.5\,\varphi_v \leqslant \alpha_v \leqslant \varphi_v$ the horizontal directivity more strongly influences the losses of amplification (corresponds to area I in Fig. 1), while for $0 \leqslant \alpha_v \leqslant 0.5\,\varphi_v$, the vertical directivity is governing (area II in Fig. 1). At present all practical communication systems based on tropospheric scattering operate in area I of Fig. 1, wherefore it is of importance to use antennas with greater vertical

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On the Dependence of Power Scattering on Antenna Directivity. Brief Communication

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directivity. Finally the author refutes mathematically the opinion of M. A. Yevdokimov (this Journal, 1959, 4,8, 1409), who presented different conclusions with regard to the required directivity of antennas. There are 2 figures; and 7 Soviet references.

SUBMITTED: September 26, 1959

Card 7/7

PROSIN, A.V.

Theory of cross distortions in long-distance tropospheric microwave propagation. Radiotekh. i elektron. 5 no.7:1052-1064 Jl '60. (MIRA 13:6)

(Microwaves)

82864
S/108/60/015/008/001/006
B012/B067

9.9000

AUTHOR: Prosin, A. V., Member of the Society

TITLE: Cross Distortions Occurring in Scattered Propagation of Ultrashort Waves in Multichannel Communication Systems With Frequency Modulation

PERIODICAL: Radiotekhnika, 1960, Vol. 15, No. 8, pp. 3-12

TEXT: On the basis of the theory of scattering of radio waves on turbulent inhomogeneities of the dielectric constants of air, a method of calculating the cross distortions in multichannel systems with frequency modulation was developed in this paper. On the basis of this method a relationship was observed between the power of transient noise and the parameters of the systems of tropospheric scattering. For determining the power of cross noise due to multiwire propagation of ultrashort waves the method of correlation analysis (Refs. 1,2) was used here. In this method formula (9) is obtained for the psophometric power of transient noise, formula (10) for the energy spectrum, and formula (11) for the correlation

Card 1/4 Deystvitel'nyy Chlen Nauchno-Tekhnicheskogo Obshchestva Radiotekhniki i Elektrosvyazi im. A.S. Popova.

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Cross Distortions Occurring in Scattered Propagation of Ultrashort Waves in Multichannel Communication Systems With Frequency Modulation

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function. The correlation function of cross noise is studied, and equations (24) and (25) are derived as initial formulas for determining it. Together with formulas (9) and (10) these equations represent, in a general form, the dependence of transition distortions on the statistical characteristics of the turbulent troposphere and multichannel communication, as well as on the parameters of the system of tropospheric scattering. Since, in the general case, formulas (10), (24), and (25) can only be solved by numerical integration the power of cross noise is determined here only for the most interesting case of the systems of tropospheric scattering. Formula (49) for the psophometric power of cross noise is given for an exact solution, and formula (50) gives an approximate solution. On the basis of the investigation carried out the following is concluded: To reduce cross noise, antennas should be used with higher directivity in the vertical plane and a lower one in the horizontal plane. An intensification of directivity of antennas essentially reduces the transient noise only for $a < 0.75$

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Cross Distortions Occurring in Scattered Propagation of Ultrashort Waves in Multichannel Communication Systems With Frequency Modulation

($a = \frac{\alpha_0}{\varphi_0}$, where $\varphi_0 = 0.5\ \Theta_0$, and Θ_0 is the zero scattering angle (Fig. 1)). For $a > 0.75$, nondirectional antennas may be used from the point of view of cross noise. Cross noise increases rapidly with increasing length of traces and increasing number of transmission channels. The statistical characteristics of the troposphere influence cross noise. The more smoothly the correlation function of turbulent inhomogeneities declines, and the narrower the spectrum of such inhomogeneities, the smaller are the distortions. The more rapidly $(\Delta\varepsilon)^2$ decreases with height, the smaller are the distortions. $\Delta\varepsilon$ is the deviation of the dielectric constants from their mean value in the corresponding point of space. The use of different kinds of fading-reducing reception with an addition of signals makes it possible to reduce the power of cross noise to one-half. In a transmission from more than 120 channels over distances of more than 300 km it is very difficult to fulfill the recommendations given by the MKKR (International

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Cross Distortions Occurring in Scattered Propagation of Ultrashort Waves in Multichannel Communication Systems With Frequency Modulation

Consultative Commission on Radio Communications) (Ref. 12) even by using fading-reducing reception and pencil-beam antennas. It is pointed out that the results of the present paper are in agreement with those of paper (Ref. 9) as to quality and order of magnitude. Recommendations are given for a more accurate determination of the cross distortions. There are 8 figures and 13 Soviet references.

SUBMITTED: December 14, 1959

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E140/E163

AUTHOR: Prosin, A.V.

TITLE: Calculation of the interchannel noise power in long-distance tropospheric propagation systems

PERIODICAL: Radiotekhnika i elektronika, Vol.6, No.1, 1961, pp.14-24

TEXT: The article constitutes an extension of the author's previous work (Ref.1), determining the interchannel distortion arising in scatter-propagation systems with frequency modulation due to the presence at the point of reception of a constant and scattered field, with relatively small delay of the constant wave. The analysis assumes the correlation functions for turbulent inhomogeneous air introduced in the author's previous work (Ref.2). The following conclusions are arrived at. (1) In multichannel communication lines using frequency modulation and frequency-division of channels, with tropospheric scatter propagation of UHF, the maximum interchannel noise occurs with scattering of the radio waves on turbulent tropospheric inhomogeneities. With this propagation mechanism the interchannel noise increases very rapidly with increase of half length. (2) The presence at the point of

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Calculation of the interchannel noise power in long-distance tropospheric propagation systems

reception of a constant field component in addition to the scattered field with relatively low time delay increases the magnitude of inter-channel distortion. Therefore, to have a more exact quantitative idea of the interchannel noise power, it is necessary to have exhaustive experimental data on the statistical characteristics of the troposphere - data on the correlation function of turbulent inhomogeneities of the dielectric constant of the air, the scale of these turbulent inhomogeneities, the variation of intensity of inhomogeneities with height, etc. There are 4 figures, 1 table and 8 Soviet references.

SUBMITTED: July 16, 1960

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24893

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D207/D304

9.9300

AUTHOR: Prosin, A.V.

TITLE: On evaluating the pass-band of the troposphere in long-distance USW propagation

PERIODICAL: Radiotekhnika i elektronika, v. 6, no. 8, 1961, 1392 - 1394

TEXT: In the present article, the author determines the pass-band of the troposphere in the presence of the receiving end of a constant and a random diffused field. Let the amplitudes of signals at frequencies f_1 and f_2 satisfy the generalized Rayleigh distribution

$$W_2(u_1, u_2) = \frac{u_1 u_2}{\sigma^4(1-R^2)} e^{-\frac{u_1^2+u_2^2+u_{01}^2+u_{02}^2-2u_{01}u_{02}R}{2\sigma^2(1-R^2)}} \times$$

$$\times \sum_{m=0}^{\infty} e_m I_m\left[\frac{Ru_1u_2}{\sigma^2(1-R^2)}\right] I_m\left[\frac{u_{01}-Ru_{02}}{\sigma^2(1-R^2)}u_1\right] I_m\left[\frac{u_{02}-Ru_{01}}{\sigma^2(1-R^2)}u_2\right]. \quad (1)$$

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where u_1 and u_{z1}, and U_{01} and U_{02} are amplitudes of total and constant signals at frequencies f_1 and f_2 respectively; σ^2 - dispersion of orthogonal components of random field vector; $R^2 = R_{13}^2 + R_{14}^2$; R_{13} and R_{14} - correlation coefficients of orthogonal components of the random field vector $\varepsilon_o = 1$; $\varepsilon_m = 2$ for $m > 0$; I_m - Bessel function of the m-th order of the imaginary argument. The analysis is restricted to the case when $u_{01} = u_{02} = u_0$. The probability distribution function is found next for the ratio of two amplitudes, the distribution of which satisfies Eq. (1). The probability density $W_2(u_1, K_1)$ where $K_1 = u_2/u_1$ is determined first. After changing variables u_1, u_2 for new variables u_1, k_1 the Jacobean of the transformation is equal to u_1. Then the two dimensional differential function of distribution of quantities u_1, k_1 is

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equal to

$$W_2(u_1, k_1) = \frac{k_1 u_1^3}{\sigma^4(1-R^2)} e^{-\frac{u_1^2(1+k_1^2)}{2\sigma^2(1-R^2)}} e^{-\frac{u_0^2}{\sigma^2(1+R)}} \times \tag{2}$$

$$\times \sum_{m=0}^{\infty} \varepsilon_m I_m \left[\frac{R u_1^2 k_1}{\sigma^2(1-R^2)}\right] I_m \left[\frac{u_0 u_1}{\sigma^2(1+R)}\right] I_m \left[\frac{u_0 k_1 u_1}{\sigma^2(1+R)}\right].$$

Integral

$$\int_0^\infty e^{-at} I_o(bt)\, t dt = \frac{2a\Gamma(1.5)}{(a^2 - b^2)^{1.5}\sqrt{\pi}} \tag{8}$$

is obtained and subsequently

$$W_1(k_1) = \frac{2k_1(1-R^2)}{(1+k_1^2)^2\left[1 - R^2\left(\frac{2k_1}{1+k_1^2}\right)^2\right]^{1.5}}. \tag{14}$$

The probability is found next for the occurrence that the ratios of amplitudes $k_1 = u_2/u_1 \leqslant K$ or $k_2 = u_1/u_2 \leqslant K_1$ where $K \leqslant 1$, an

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assumed ratio of amplitudes. Differential distribution functions of quantities k_1 and k_2 are equal. Hence taking into account the impossibility of simultaneous occurrence of k_1 and k_2

$$P_1(k<K) = 2(1-R^2)e^{-z\frac{2}{(1-R)}} \sum_{m=0}^{\infty}\sum_{k=0}^{\infty}\sum_{l=0}^{\infty}\sum_{n=0}^{\infty}\sum_{s=0}^{\infty} \varepsilon_m (-1)^s z^{(m+l+n)} \times$$
$$\times R^{(m+2n)} \frac{(m+k+n)!\,\Gamma(2+2m+2k+l+n)\,(1+m+k+l+s)^{-1}}{k!\,l!\,n!\,s!\,\Gamma(m+k+1)\,\Gamma(m+l+1)\,\Gamma(m+n+1)\,(m+k+n-s)!} \times$$
$$\times [1-(1-K^2)^{-(1+m+k+l+s)}]. \qquad (16)$$

is derived. For communication lines with very distant intermediate stations the magnitude of z is often $z \ll 1$ which corresponds e.g. to $\gamma < 1$ and $R > 0.7$. If so the expression (16) simplifies to the form of

$$P_1(k<K) = e^{-z\frac{2}{(1-R)}} \left[1 - \frac{1-K^2}{\sqrt{(1+K^2)^2 - 4R^2K^2}}\right]. \qquad (17)$$

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On evaluating the pass-band ...

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According to I.A. Gusyatinskiy (Ref. 2 Iskazheniya signala pri rasprostranenii UKV za predelami pryamoy vidimosti (Distortion of Signal with Beyond the Horizon UHF Propagation) Sb. Trudov. N11 MS SSSR, 1959, 1, 15, 15) for $z < 1$. The correspondence between R and the coefficient of frequency correlation of the signal amplitudes is determined by

$$R_{a\gamma}(\Delta f) \simeq R^{2e^{-\gamma^2}} = R_a(\Delta f)^{e^{-\gamma^2}}, \quad (18)$$

in which $R_a(\Delta f)$ - the coefficient of frequency correlation of signal amplitudes in the presence of a random component of the field at the receiving end. The complete expression for Δf_2 and analysis of its parameters are given in A.V. Prosin (Ref. 4: K raschetu moshchnosti perekrestnykh shumov v sistemakh dal'ney svyazi (Evaluation of Cross-Over Noise Power in Long Distance Communication), Ratiotekhnika i elektronika, 1961, 6, 1, 14). There are 1 figure and 4 Soviet-bloc references.

SUBMITTED: March 27, 1961

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S/109/61/006/009/015/018
D201/D302

6,9200

AUTHOR: Prosin, A.V.

TITLE: Evaluating the reliability of tropospheric communication systems with correlated fadings

PERIODICAL: Radiotekhnika i elektronika, v. 6, no. 9, 1961, 1578 - 1580

TEXT: In the present article, the author determines the reliability of a long-distance communication system with two diversity signal receptions. He assumes that there exists at the receiving end both the constant and dispersed field and that fadings at different channels of diversity reception are correlated. According to

$$H_n = (1 - S_n)\ 100\ \%, \qquad (1)$$

$$S_n = \underbrace{\int_0^{u_{01}} \int_0^{u_{02}} \dots \int_0^{u_{0n}}}_{n} W_n(u_1, u_2, \dots, u_n)\, du_1, du_2, \dots, du_n. \qquad (2)$$

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it is then sufficient to determine a two-dimensional integral distribution function

$$S_2 = \int_0^{u_{d1}} \int_0^{u_{d2}} W_2(u_1, u_2)\, du_1 du_2, \qquad (3)$$

in which the differential function of distribution is given by

$$W_2(u_1, u_2) = \frac{u_1 u_2}{\sigma^4 (1 - R^2)} e^{-\frac{u_1^2 + u_2^2 + u_{01}^2 + u_{02}^2 - 2u_{01}u_{02}R}{2\sigma_2 (1 - R^2)}} \times$$

$$\times \sum_{m=0}^{\infty} \varepsilon_m I_m \left[\frac{R u_1 u_2}{\sigma^2 (1 - R^2)}\right] I_m \left[\frac{u_{01} - R u_{02}}{\sigma^2 (1 - R^2)} u_1\right] I_m \left[\frac{u_{02} - R u_{01}}{\sigma^2 (1 - R^2)} u_2\right]. \qquad (4)$$

u_1 and u_2, u_{01}, u_{02} - corresponding amplitudes of the overall and constant signals appearing the first and second diversity reception channel respectively; σ^2 - dispersion of orthogonal components of random signal vectors; $R^2 = R^2_{13} + R^2_{14}$; R_{13} and R_{14} - the correlation coefficients of orthogonal components of the random field vec-

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tor; $\varepsilon_0 = 1$; $\varepsilon_m = 2$ for $m > 0$; I_m - the Bessel function of the m-th order of imaginary argument. Only the practical important case $u_{01} = u_{02} = u_0$ is considered. The approximate solution of Eq. (3) is found first. First the Bessel functions of an imaginary argument as a series

$$I_n(x) = \sum_{k=0}^{\infty} \frac{1}{k!\,\Gamma(n+k+1)} \left(\frac{x}{2}\right)^{n+2k}. \qquad (5)$$

is substituted into Eq. (4) where Γ - the gamma-function. Hence

$$S_2 = (1 - R^2)\, e^{-\frac{2z}{1-R}} \sum_{m=0}^{\infty} \sum_{k=0}^{\infty} \frac{\varepsilon_m R^{m+2k}}{\Gamma(k+1)\,\Gamma(m+k+1)} z^m \times \qquad (6)$$

$$\times \left[\sum_{l=0}^{\infty} \frac{\Gamma(m+k+l+1)}{\Gamma(l+1)\,\Gamma(m+l+1)} z^l I(u_1, p_1)\right] \left[\sum_{n=0}^{\infty} \frac{\Gamma(m+k+n+1)}{\Gamma(n+1)\,\Gamma(m+n+1)} z^n I(u_2, p_2)\right].$$

is obtained, in which I(u, p) - partial gamma function,

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$$S_2 = (1 - R^2)\, e^{-\frac{2z}{1-R}} \sum_{m=0}^{\infty} \sum_{k=0}^{\infty} \frac{e_m R^{m+2k}}{\Gamma(k+1)\Gamma(m+k+1)} z^m \times \tag{15}$$

$$\times \left[\sum_{l=0}^{\infty} \frac{\Gamma(m+n+l+1)}{\Gamma(l+1)\Gamma(m+l+1)} z^l I(u, p) \right]^2,$$

$$S_2 = (1 - R^2) \sum_{k=0}^{\infty} [R^k I(u, p)]^2. \tag{16}$$

are derived and particular cases resulting from Eq. (15) follow. It is stated that with a random field at the receiving end, the reliability of a two-signal diversity system depends upon the correlation coefficient between the two signals, significantly only when $R > 0.6$. It follows that in practice very often $z \ll 1$. For $z \ll 1$ from Eq. (6)

$$S_2 = e^{-\frac{2z}{1-R}} \left\{ (1 - R^2) \sum_{k=0}^{\infty} R^{2k} I(u_1, p_1) I(u_2, p_2) \right\}. \tag{25}$$

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can be obtained. For $u_{t_1} = u_{t_2} = u_t$

$$S_2 = e^{\frac{2z}{1-R}} \left\{(1 - R^2) \sum_{k=0}^{\infty} [R^k I (u, p)]^2\right\}. \qquad (26)$$

Analysis of the expressions given by the author including (25) and (26) shows that the reliability of a communication system with diversity reception is materially increased with increase of the power of constant signal with respect to that of the random signal. The least reliability is obtained when at the receiving end there exists only the random field components. The increase of the correlation coefficient between the diversity signals considerably decreases the reliability of communication. There are 3 references: 1 Soviet-bloc and 2 non-Soviet-bloc. The references to the English-language publications read as follows: N.A. Huttly, Use of the tetrachoric cross-correlation in hypotheses concerning auto correla-

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ted fading signals, statistical methods in radio wave propagation, Proc. of a symposium held at the university of California, Los Angeles, June 18-20, 1958, 154 - 175; Staras, Diversity reception with correlated signals, J. Appl. Phys. 1957, 27, 3.

SUBMITTED: March 27, 1961

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30303

9.9300

S/109/61/006/011/018/021
D201/D304

AUTHOR: Prosin, A.V.

TITLE: Transition noise in a two-beam propagation of radio-waves

PERIODICAL: Radiotekhnika i elektronika, v. 6, no. 11, 1961, 1932 - 1936

TEXT: The signal at the receiving end of a VHF tropospheric propagation system is a superimposition of two or more waves having different amplitudes and phases. This effect is due to multi-path propagation and in FM and frequency compression communication lines, this effect leads to transition noise in communication channels. In the present short communication the author presents a generalized procedure of evaluating noise, occuring in a two-path propagation of waves for a special case when the tr[illegible]er frequency is automatically tuned to the optimum operating point at the phase characteristic of a two-beam channel. S.V. Borodich (Ref. 1: Electrosvyaz, 1956, 1, 10) has shown that the psophometric pow-

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er P_n of transition noise, due to the non-linearity of phase characteristic of a four-pole in a telephony channel at a point with zero reference level is given by

$$P_n = 10^9 \frac{\Delta F_c K_p^2}{\Delta F} \Omega_c^2 \cdot 6\varphi_3^2 \Delta \omega_c^4 e^{6b_{av}} y_3(\beta, \sigma) + \ldots ncm \qquad (10)$$

in which the phase characteristic is approximated by the polynomial of

$$\varphi(\Delta \omega) = \varphi_0 + \varphi_1 \Delta \omega + \varphi_2 \Delta \omega^2 + \varphi_3 \Delta \omega^3 + \ldots + \varphi_n \Delta \omega^n + \ldots \qquad (4)$$

Using Eq. (10) and the expressions for phase distortions, the equation for evaluating transition distortion for a two-beam propagation is obtained as

$$P_{nm} = \frac{10^9}{6} \frac{k^2(1-k)^2}{(1+k)^6} \frac{\Delta F_c K_p^2}{\Delta F} \Omega_c^2 \tau_d^6 \Delta \omega_c^4 e^{6b_{av}} y_3(\beta, \sigma) + \ldots \qquad (11)$$

Here ΔF_c - bandwidth of the telephone channel; K_p - psophometric

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Transition noise in a two-beam ... S/109/61/006/011/018/021 D201/D304

coefficient (K_c = 0.75 at ΔF_c = 3.1 Kc/s); $\Delta F = F_2 = F_1$ - the bandwidth of all channels; F_2 and F_1 - the upper and lower limiting frequencies of the multi-channel communication $\Omega_c = 2\pi F_c$; $\Delta\omega_c = 2\pi f_c$; Δf_c - the effective frequency deviation per channel; b_{av} - difference in nepers between the level of measurement of a single channel (according to CCIF $b_{av} = -1.72 + 0.5 \ln N$, where N - number of telephone channels $y_3(\beta, \sigma)$ - a certain factor determined from graphs in fig. 6.2 of (Ref. 2: Inzhenerno-tekhnicheskiy spravochnik po elektrosvyazi, VII, Radioreleynyye linii, Svyaz'izdat, 1956). In real VHF communication systems the magnitude of time delay does not exceed fractions of microsecond. (τ_d - relative delay time between the two beams) and thus τ_d satisfies easily the condition of

$$m_{me}\Omega_2\tau_3 \ll 1, \qquad (12)$$

where m_{me} - the effective modulation index. The analysis of Eq.

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(11) shows that the maximum value of transition noise occurs in a channel with frequency $\Omega_c = \Omega_2$. For k = 0 and k = 1 there will be no noise. Maximum distortion occurs for $k_m = 2 - \sqrt{3}$. The mean value of noise P_{nav} was evaluated, assuming that P_{nm} varies in the same manner as k and τ_3 and may thus be considered also as a random stationay process. The value of this average noise power P_{nav} is derived as

$$P_{nav} = \frac{2}{3} 10^9 \frac{\Delta F_c K_p^2}{\Delta F} p \Omega_2^2 \tau_{dm}^6 \Delta\omega_c^4 e^{6b_{av}} y_3(\beta, \sigma) \int_0^1 \int_0^1 \frac{k^3 (1-k)^2}{(1+k)^6 (1+k^2)^2} \left(\frac{\tau_d}{\tau_{dm}}\right)^6 \times$$
$$\times dk d\left(\frac{\tau_d}{\tau_{dm}}\right) = 10^5 \frac{\Delta F_c K_p^2 p}{\Delta F} \Omega_2^2 \Delta\omega_c^4 \tau_{dm}^6 e^{6b_{av}} y_3(\beta, \sigma). \quad (17)$$

An example of transition evaluation is given. The multichannel system has: N = 240, ΔF_c = 3.1 kc/s; K_p = 0.75, ΔF = 1052-60 kc/s, F_2 = 1052 kc/s; b_{av} = 1, τ_{dm} = 0.2 usec, $y_3(\beta, \sigma)$ = 0.45. From Eq. (17) P_{sav} = 200 μμ Watt. In the appendix the derivation is given

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for the distribution function of a quotient of two variable random quantities, obeying the Rayleigh Law with parameters σ_1 and σ_2 as required (or obtaining the expression for the average noise power). There are 3 figures and 2 Soviet-bloc references.

SUBMITTED: June 20, 1961

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22727
S/108/61/016/005/001/005
B104/B205

9,9100

AUTHORS: Prosin, A. V., Igoshev, I. P., Levshin, I. P.

TITLE: Automation of the statistical evaluation of radio signals by electronic computers

PERIODICAL: Radiotekhnika, v. 16, no. 5, 1961, 64 - 70

TEXT: A description is given of a method for the statistical evaluation of experimental data by digital electronic computers. This method was developed for computers of the types M-2 (M-2) and БЭСМ-2 (BESM-2) of the Institut elektronnykh upravlyayemykh mashin AN SSSR (Institute of Electronic Control Machines, AS USSR) by the Institut radiotekhniki i elektroniki AN SSSR (Institute of Radio Engineering and Electronics, AS USSR) in a laboratory under the supervision of V. I. Siforov, Corresponding Member AS USSR, and the apparatus required was also built. The proper conversion of experimental data to be processed by electronic computers is discussed first. Fig. 1 shows the code of the M-2 machine; a signal and its conversion into a digital code are illustrated in Fig. 2. For the purpose of feeding data given in the code of the M-2 machine into

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the BESM-2 machine, it was necessary to build a special unit for the conversion of codes. The continuous signal in the unit used for discrete recording of such signals was converted into discrete values according to its level, which, in turn, were used to perforate a teleprinter paper tape. The use of a memory allowed the tape to record two different signals with the help of this unit. The unit performs recordings at two speeds, and records signals in the binary number system. The block diagram of the unit is shown in Fig. 3. The unit was used to analyze the statistical characteristics of various radio signals. The authors obtained one- and two-dimensional probability distributions of instantaneous signal values, as well as correlation functions, cross-correlation coefficients, mean fading rates, etc. A universal program worked out for calculating the statistical characteristics of signals, enabled the authors to determine all the characteristics named above within one cycle of calculations. The use of the above-described unit, which converts radio signals in such a way that they can be fed into computers, renders the system described especially useful for investigating the statistical characteristics of radio signals in troposphere and ionosphere research. There are 4 figures and 2 Soviet-bloc references.

Card 2/~~4~~ 2

SIFOROV, V.I.; PROSIN, A.V.

Accumulation of noises and fading in single-band radio relay lines. Radiotekhnika 16 no.8:3-5 Ag '61. (MIRA 14:7)

1. Deystvitel'nyye chleny Nauchno-tekhnicheskogo obshchestva radiotekhniki i elektrosvyazi.
(Radio relay systems--Noise)

PROSIN, A.V.

Theory of the passage of wide-band signals in ground space communication systems. Radiotekh. i elektron. 8 no.11:1822-1833 N '63. (MIRA 17:1)

PROSIN, A.V., kand. tekhn. nauk

"Molnia-1" in orbit. Priroda 54 no.6:115-116 Je '65. (MIRA 18:6)

1. Institut radiotekhniki i elektroniki AN SSSR, Moskva.

L 28503-66 EEC(k)-2/EWT(d)/EWT(1)/FCC GW/WS-2
ACC NR: AP6007149 SOURCE CODE: UR/0108/66/021/002/0002/0011

AUTHOR: Levshin, I. P. (Active member); Prosin, A. V. (Active member) 69 B

ORG: Scientific and Technical Society of Radio Engineering and Electrocommunication (Nauchno-tekhnicheskoye obshchestvo radiotekhniki i elektrosvyazi)

TITLE: Digital-computer simulation of a multipath channel with long-distance UHF tropospheric propagation

SOURCE: Radiotekhnika, v. 21, no. 2, 1966, 2-11

TOPIC TAGS: UHF wave propagation, multipath communication, computer simulation, digital computer, tropospheric radio wave, communication channel

ABSTRACT: The development of a discrete mathematical simulator of the tropospheric channel is reported. The simulator permits reproducing random characteristics of such a channel which may be useful in planning multipath radiocommunication lines. The simulator describes a fluctuating quadripole whose random amplitude-frequency and phase-frequency characteristics are statistically

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close to those of a real tropospheric channel. The received signal, as a combination of many random-amplitude, random-phase waves, is described by:

$$\dot{u}_{np}(t) = \sum_{\kappa=0}^{n(t)} a_\kappa(t)\, e^{i\omega(t-\tau_\kappa(t))} = \sum_{\kappa=0}^{n(t)} \dot{u}_\kappa(t).$$

From this formula, a complex transfer factor of the quadripole is derived. Physically, the received signal comprises these three components: coherent scatter, reflection from various layers, and incoherent scatter. The average period of variation of the coherent scatter is assumed to be 1.5—2 hrs or longer; of the reflection, 2—12 min; of the incoherent scatter, from a fraction to a few seconds. A simplified scheme of the machine algorithm of the tropospheric-channel simulator is shown. Simulated amplitude-frequency and phase-frequency characteristics and also group delay time determined for a 300-km 1000-Mc line agreed almost exactly with the experimental characteristics measured on such a line. Orig. art. has: 6 figures, 33 formulas, and 1 table.

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Card 2/2

ARMAND, N.A.; VVEDENSKIY, B.A.; GUSYATINSKIY, I.A.; IGOSHEV, I.P.; KAZAKOV, L.Ya.; KALININ, A.I.; KOLOSOV, M.A.; LEVSHIN, I.P.; LOMAKIN, A.N.; NAZAROVA, L.G.; NEMIROVSKIY, A.S.; PROSIN, A.V.; RYSKIN, E.Ya.; SOKOLOV, A.V.; TARASOV, V.A.; TRASHKOV, P.S.; TIKHOMIROV, Yu.A.; TROITSKIY, V.N.; FEDOROVA, L.V.; CHERNYY, F.B.; SHABEL'NIKOV, A.V.; SHIREY, R.A.; SHIFRIN, Ya.S.; SHUR, A.A.; YAKOVLEV, O.I.; ARENBERG, N.Ya., red.

[Long-distance tropospheric propagation of ultrashort radio waves] Dal'nee troposfernoe rasprostranenie ul'trakorotkikh radiovoln. Moskva, Sovetskoe radio, 1965. 414 p. (MIRA 18:9)

ACC NR: AM5027749 Monograph UR/ 20

Armand, N. A.; Vvedenskiy, B. A.; Gusyatinskiy, I. A.; Igoshev, I.P.; Kazakov, L. YA.; Kalinin, A. I.; Nazarova, L. G.; Nemirovskiy, A. S.; Prosin, A.V.; Ryskin, E. YA.; Sokolov, A. V.; Tarasov, V.A.; Tashkov, P. S.; Tikhomirov, YU. A.; Troitskiy, V. N. Fedorova, L. V.; Chernyy, F. B.; Shabel'nikov, A. V.; Shirey, R. A.; Shifrin, YA. S.; Shur, A. A.; YAkovlev, O. I.; Kolosov, M. A.; Levshin, I. P.; Lomakin, A. N.

Upper tropospheric propagation of ultrashort radio waves (Dal'neye troposfernoye rasprostraneniye ul'trakorotkikh radiovoln) Moscow, Izd-vo "Sovetskoye radio", 1965. 414 p. illus., biblio. 4000 copies printed.

TOPIC TAGS: radio wave propagation, tropospheric radio wave, radio communication, space communication, tropospheric scatter communication, signal processing, signal distortion, field theory

PURPOSE AND COVERAGE: This monograph is intended for specialists working in the field of radiowave propagation, designers of long-distance radio communication systems, and teachers and students of the advanced courses in schools of higher technical education. The monograph contains, for the most part, heretofore unpublished results of Soviet experimental and theoretical investigations in the field of long-distance tropospheric ultrashortwave propagation.

Card 1/10 UDC: 621.371.24