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USSR Report

ELECTRONICS AND ELECTRICAL ENGINEERING

(FOUO 4/82)

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ACOUSTICS SPEECH & SIGNAL PROCESSING

ELECTROACOUSTICS AND ULTRASONIC TECHNOLOGY

Leningrad IZVESTIYA LENINGRADSKOGO ORDENA LENINA ELEKTROTEKHNICHESKOGO INSTITUTA IMENI V.I. UL'YANOVA (LENINA): ELEKTROAKUSTIKA I UL'TRAZVUKOVAYA TEKHNIKA in Russian No 252, 1979 pp 93-97

[Abstracts for 17 articles from collection "Proceedings of Leningrad Electrotechnical Institute imeni V.I. Ul'yanov (Lenin): Electroacoustics and Ultrasonic Technology"]

UDC 620.179.16

ACOUSTIC SINGULARITIES OF METAL DEFECTS OF THE "DELAMINATION" TYPE

[Abstract of article by K.Ye. Abbakumov]

[Text] This article examines some acoustic models which can be used to estimate the coefficients of transparency of real defects of the "delamination" type based on the concept of a fissure with semi-adjacent boundaries. Formulas are obtained and analyzed for the coefficients of transparency for some special cases. One illustration, 3 bibliographic references.

UDC 620.179.16

CHOICE OF SPACING OF TRANSDUCERS IN ACOUSTIC TRANSMISSION FLAW DETECTORS

[Abstract of article by V.Ye. Artemov and S.K. Pavros]

[Text] An equation for the acoustic section of a transmission flaw detector is obtained in scalar approximation with the disc defect and transducers arranged non-coaxially. The results of the calculations allow an assigned sensitivity irregularity to be used to determine the spacing of transducers in the acoustic system of a multichannel device. Two illustrations, 3 bibliographic references.

UDC 620.179.16

EXCITATION AND PROPAGATION OF ULTRASOUND IN JET WAVEGUIDE

[Abstract of article by L.V. Verevkina, A.S. Golubev and V.A. Kashirin]

[Text] This article examines a composite cylindrical nozzle-jet waveguide. The problem is solved for the quasi-stationary mode for the case in which the width

of the waveguide significantly exceeds the wavelength. Versions of wave excitation from the end of the waveguide by plunger and focusing radiators are evaluated. Three illustrations, 3 bibliographic references.

UDC 620.179.16

RELIABILITY OF CONTINUOUS ULTRASONIC TESTING OF SHEETS WITH ROUGH SURFACE

[Abstract of article by D.D. Dobrotin]

[Text] This article examines the noise tolerance of ultrasonic transmission monitoring considering two-dimensional correlation connections of the results of testing at adjacent points. Expressions are presented which can be used to calculate the noise tolerance of transmission flaw detectors which scan the surface of the tested metal sheets in intervals smaller than the correlation interval of the amplitudes of the signals transmitted. One illustration, 6 bibliographic references.

UDC 620.179.16

ULTRASONIC METHOD OF MONITORING BIMETAL SHEETS USING NORMAL WAVES

[Abstract of article by K.V. Zharkov]

[Text] This article discusses a transmission method for testing bimetal sheets which is altered so that the receiving dipole receives the secondary normal wave occurring above a defect. The high sensitivity of the method is confirmed experimentally. Three illustrations, 2 bibliographic references.

UDC 534.232

INFLUENCE OF ASYMMETRY OF OSCILLATING SYSTEM OF POLE TRANSDUCER ON ITS CHARACTERISTICS

[Abstract of article by D.B. Dianov and N.Ye. Konstantinova]

[Text] The problem of two-way radiation of a piezoceramic pole transducer with a casing is examined theoretically. It is shown that the greatest radiation asymmetry in water over a wide frequency range is achieved by using a casing with a specific acoustic impedance of 6.10^6 kg/m^2 sec. A practically unidirectional transducer with a casing can be implemented for operation in a narrow frequency band. Six illustrations, 1 bibliographic reference.

UDC 534.8

FIELD STRUCTURE OF RING TRANSDUCER IN ULTRASONIC INTROSCOPE

[Abstract of article by Ye.A. Kirov and A.A. Perren]

[Text] This article examines results of investigating the near-field structure of a discrete ring radiator excited by an exponential pulse. The analytical

relationships obtained can be used to establish regularity of the influence of pulse length, number of sources and ring radius on the amount of pressure and pulse shape at any point in the field. Three illustrations, 4 bibliographic references.

UDC 534.231

ACOUSTICAL FIELD OF SYSTEM OF RECTANGULAR RADIATORS

[Abstract of article by V.A. Kolobkova, Ye.A. L'vova and A.S. Khimunin]

[Text] A method is proposed for calculating the acoustic pressure in an arbitrary region in the field of a system of flat rectangular plunger radiators with finite dimensions. The results of calculating the near-field structure of a focusing equidistant antenna array with various numbers of active elements are presented. Five illustrations, 3 bibliographic references.

UDC 620.179.16

NOISE CHARACTERISTICS OF PIEZOELECTRIC ELEMENTS IN TAPERED LAMB (RAYLEIGH) WAVE RECEIVER-TRANSDUCERS

[Abstract of article by Yu.T. Kuznetsov and L.A. Nikiforov]

[Text] This article examines the noise characteristics of piezo elements loaded to a half space. Based on numerical analysis of the frequency relationships of the active components of the output impedance, the noise characteristics of piezo elements loaded to a half-space of acrylic plastic or seal are examined. It is shown that a system of piezo elements loaded to acrylic plastic has extremely narrow bandwidth and has a significantly higher noise voltage level than for loading to steel. Some recommendations are given for reducing the noise level. Three illustrations, 2 tables, 3 bibliographic references.

UDC 534.143:537.634

EXCITATION MECHANISMS OF SURFACE WAVES IN FERROMAGNETIC METALS USING ELECTRO-MAGNETIC-ACOUSTIC METHODS

[Abstract of article by I.V. Il'in and A.V. Kharitonov]

[Text] This article presents results of numerical calculations of the amplitude of surface waves as a function of the magnitude and orientation of the polarizing magnetic field. Possible excitation mechanisms in iron-carbon alloys and in nickel are discussed. Three illustrations, 4 bibliographic references.

UDC 621.374.5

THERMOSTABLE ULTRASONIC DELAY LINES WITH RECTANGULAR ACOUSTIC CONDUCTORS OF MONOCRYSTALLINE QUARTZ

[Abstract of article by A.N. Kostyuk, M.M. Shevel'ko and L.A. Yakovlev]

[Text] This article examines the possibilities of creating ultrasonic thermostable delay lines with rectangular acoustic conductors of monocrystalline quartz. It is shown that thermostable lines with delay of up to 100 μsec can be created by changing the ratio of the dimensions of the acoustic conductor along the Y and Z crystallographic axes. To achieve delay times exceeding 100 μsec, the rectangular contour of the acoustic conductor must be rotated through a slight angle about the crystallographic X-axis of the quartz. Five illustrations, 8 bibliographic references.

UDC 534.24:548.55

REFLECTION OF ELASTIC WAVES IN LITHIUM NIOBATE CRYSTAL

[Abstract of article by A.N. Peregudov and V.A. Fedorov]

[Text] This article examines the problem of reflection of quasi-longitudinal and quasi-transverse waves propagating in the YZ plane of lithium niobate from the free boundary z = 0. The angular dependencies of the absolute values of the coefficients of reflection are calculated and analyzed. It is shown that the coefficients of reflection are complex quantities, and that a heterogeneous wave always occurs during reflection. Two illustrations, 2 bibliographic references.

UDC 620.179.16:534.615

ESTIMATION OF COEFFICIENT OF SOUND REFLECTION OF MATERIALS BY MEASURING ELECTRICAL RESISTANCE OF PIEZOTRANSDUCER

[Abstract of article by A.Ye. Kolesnikov]

[Text] A method is proposed for estimating the coefficient of sound reflection of materials by measuring the electrical resistance of a piezotransducer placed near the surface being tested. Ways are examined for implementing the method by using bridge circuits and self-excited devices. The advantages and disadvantages of the method are pointed out. Three illustrations, 4 bibliographic references.

UDC 621.317.029.52

ELECTRONIC SYSTEM FOR MEASURING ORTHOGONAL COMPONENTS OF ACOUSTIC FIELD WITH FOLLOW-ON COMPUTER PROCESSING OF RESULTS

[Abstract of article by L.I. Bayda, G.P. Belash, A.I. Valyayev, Ye.I. Kachanov and Yu.V. Yurkov]

[Text] This article examines the design principles of an instrumentation system with machine processing of measurement results. The structure of the device is presented and the possible sources of error are analyzed. The phase and amplitude errors of the instrumentation section as a whole are calculated by computer. Three illustrations, 3 bibliographic references.

UDC 534.8

EXPERIMENTAL DETERMINATION OF INFLUENCE OF PROBE ON DIRECTIVITY CHARACTERISTIC OF ANTENNA FOUND FROM NEAR-FIELD MEASUREMENTS

[Abstract of article by Yu.N. Bystrov and T.S. Komissarova]

[Text] Ths influence of the probe on the accuracy with which the antenna directivity characteristics are recovered is investigated experimentally. A comparison is made of the coherent- and incoherent-optical method of processing the data obtained from measurements in the near field of the antenna. Three illustrations, 8 bibliographic references.

UDC 534.8

INTEGRAL EQUATION METHOD APPLIED TO HOLOGRAPHIC METHOD OF DETERMINING ANTENNA DIRECTIVITY CHARACTERISTICS

[Abstract of article by Ye.D. Pigulevskiy and V.I. Senchuk]

[Text] The problem of connecting measurements in the near field with the antenna directivity characteristic is reduced to an integral Fredholm equation of the first sort. Expanding the iterative equation with respect to the Eigenfunctions of the symmetrical kernel, expressions are obtained for the root-mean square and linear deviation between the measured directivity characteristic and the actual characteristic. Four bibliographic references.

UDC 534.8

EXPERIMENTAL INVESTIGATION OF ANALOG OPTICAL PROCESSING OF ACOUSTIC FIELDS

[Abstract of article by A.F. Ryzhkov]

[Text] This article presents some results of comparative experimental investigation of coherent and incoherent analog optical methods of processing acoustic fields. Results of statistical processing of the experimental data obtained using these methods are presented. Three illustrations, 3 bibliographic references.

6900
CSO: 1860/147

AEROSPACE & ELECTRONIC SYSTEMS

SHIPBOARD SYSTEMS

Leningrad IZVESTIYA LENINGRADSKOGO ORDENA LENINA ELEKTROTEKHNICHESKOGO INSTITUTA IMENI V.I. UL'YANOVA (LENINA): KORABEL'NYYE KOMPLEKSY in Russian No 253, 1979 pp 147-153

[Abstracts for 29 articles from collection "Proceedings of Leningrad Electrotechnical Institute imeni V.I. Ul'yanov (Lenin): Shipboard Systems"]

UDC 621.296.677.7

RADIATION OF NON-SINUSOIDAL ELECTROMAGNETIC FIELDS

[Abstract of article by I.R. Ryabukhov]

[Text] The structure of the electromagnetic field of a Hertz dipole fed with current fluctuating according to sign functions is determined. Two bibliographic references.

UDC 621.391.266

TERMINAL PROCESSOR FOR RADAR SIGNAL WITH NON-SINUSOIDAL CHARACTER

[Abstract of article by M.V. Chernyshov]

[Text] A matched M-filter is used as a terminal device for processing a radar signal with a non-sinusoidal character. The article presents the functional diagram of the filter and describes its operation. One table, 3 illustrations, 2 bibliographic references.

UDC 621.391.133

CRITERION FOR DECENTRALIZED POWER REGULATION

[Abstract of article by V.I. Ral'nikov]

[Text] This article examines a criterion for decentralized power regulation in a group of radio electronic facilities. The existence and attainability of an equilibrium point is proved. The criterion encompasses a number of partial

criteria. Four bibliographic references.

UDC 654.16

FREQUENCY ASSIGNMENT METHODS

[Abstract of article by L.S. Mettus]

[Text] This article examines methods of assigning frequencies to radio electronic facilities which belong to a service or a group. A classification is presented. One illustration, 7 bibliographic references.

UDC 62-52:681.3:519.2

PHYSICAL MODEL OF FINITE AUTOMATA

[Abstract of article by V.F. Il'chenko]

[Text] This article examines the implementation of a physical model of Krinskiy automata with linear tactics. The functional diagram and operation of the model are described. Three illustrations, 1 bibliographic reference.

UDC 621.396.67

CHOICE OF SIGNAL POLARIZATION IN GROUPS OF RADIO LINKS

[Abstract of article by I.P. Kharchenko and A.D. Shishkin]

[Text] This article examines the problem of choosing signal polarization in grouping radio communication links in order to reduce crosstalk. It is shown that crosstalk can be reduced significantly by dividing the entire grouping appropriately into two groups with mutually orthogonal polarization. One table, 3 illustrations, 3 bibliographic references.

UDC 621.396

INVESTIGATION OF SENSITIVITY OF ALGORITHM FOR DIVIDING SUM OF HARMONIC SIGNALS

[Abstract of article by A.D. Viktorov]

[Text] This article investigates the sensitivity of an algorithm used to divide harmonic signals to the difference Δf_{ij} between adjacent frequencies. Results of calculating the actual losses $\gamma_{u^0 11}$ as a function of Δf_{ij} are presented for the steady-state mode. One illustration, 1 bibliographic reference.

UDC 621.396.06:519.251.8

CONSTRUCTION OF CHARACTERISTICS OF CORRELATION DISCRIMINATOR USING DIGITAL MODELING METHOD

[Abstract of article by V.I. Vettegren', Ye.M. Vinogradov and Yu.M. Shaparenko]

[Text] This article describes an algorithm for constructing characteristics of a correlation discriminator based on calculating the cross-correlation functions of the reference signal and the input mix of signals and pulsed noise obtained using the simulation modeling method. Two illustrations, 2 bibliographic references.

UDC 621.373.42

INVESTIGATION OF NONLINEAR AUTOOSCILLATING SYSTEM WITH DELAY FEEDBACK IN PRESENCE OF EXTERNAL NOISE

[Abstract of article by D.V. Chebotarev]

[Text] A digital model of an auto-oscillating system with delay feedback and nonlinearity of the "insensitivity zone" type is developed. The transient process by which self-excited oscillation is established in such a system is investigated in the presence of external noise. The statistical characteristics of the transient process are calculated as a function of the system parameters and intensity of the external noise. Six illustrations, 5 bibliographic references.

UDC 621.373.001.5

INVESTIGATION OF OPERATION OF PARAMETRIC OSCILLATOR WITH DELAYED FEEDBACK AT HIGH EXCITATION PARAMETER VALUES

[Abstract of article by Yu.L. Filimonov]

[Text] This article investigates the operation of a parametric oscillator with delayed feedback with high excitation parameter values which makes it possible to reduce the frequency setting time and the amplitude of the oscillations. The approximate impulse response is used to analyze the operating stability of the oscillator for various values of the excitation parameter. Two illustrations, 4 bibliographic references.

UDC 535.538.4

HYDROACOUSTIC INSTRUMENTATION SYSTEM FOR RADIO FIELD MODELING

[Abstract of article by V.A. Nazarov and A.A. Pogodin]

[Text] This article examines results of hydroacoustic modeling of radio fields when obstacles with resonant dimensions are placed in the field. Data are presented which provide evidence of the analogy between acoustic and optical fields and of the possibility of optical modeling of hydroacoustic problems. Five tables, 2 illustrations, 2 bibliographic references.

UDC 621.396

INVESTIGATION OF FREQUENCY SELECTIVITY OF HARMONIC SIGNAL SEPARATOR

[Abstract of article by A.F. Messel']

[Text] This article presents the results of modeling an algorithm for dividing harmonic signals on an M-222 computer, and investigates its operation with Δf_{ij} approaching $\Delta f_{ij\min}$. One table, 1 bibliographic reference.

UDC 621.396.62

SYSTEM FOR AUTOMATIC SELECTION OF WORKING ANTENNA WITH MAXIMUM SIGNAL

[Abstract of article by A.A. Andreyev]

[Text] This article presents the functional diagram of a system for automatic selection of a working antenna. The system provides high speed. One illustration.

UDC 621.396.961.06

ARRANGEMENT OF STANDARDS DURING FULL-SCALE MEASUREMENTS OF EFFECTIVE SCATTERING AREA OF RADAR TARGETS

[Abstract of article by S.S. Belyakov, P.P. Beskid and V.V. Leont'yev]

[Text] This article proposed a pulsed method for measuring the effective scattering area of radar targets and a methodology for placement of the standard. Three illustrations, 3 bibliographic references.

UDC 621.375.535

METHOD FOR PROCESSING LASER GONIOMETER INFORMATION

[Abstract of article by A.G. Vashchillo, V.G. Brykov and A.V. Mochalov]

[Text] This article presents the methodlogy and algorithm for processing redundant data from a laser goniometer which can be used during certification of the prism to extract and evaluate random fluctuations of the signals from the laser gyroscope and angular position indicator. One illustration, 2 bibliographic references.

UDC 621.373:535

INVESTIGATION OF INFLUENCE OF MAGNETIC FIELD ON RING LASER WITH PRISMS WITH TOTAL INTERNAL REFLECTION

[Abstract of article by P.V. Melekhov and G.V. Trofimova]

[Text] This article presents the results of investigating the influence of a magnetic field on a laser with prisms with total internal reflection. Five illustrations, 3 bibliographic references.

UDC 621.373:535

STATISTICAL CHARACTERISTICS OF LASER ANGULAR VELOCITY METER

[Abstract of article by Yu.P. Larionov]

[Text] It is shown that the presence of a noise component in the input signal of a laser angular velocity meter causes the mathematical expectancy of the beat signal frequency to shift. Three bibliographic references.

UDC 621.375:535

AUTOMATING CHECKING OF ANGLES OF MULTIFACETED PRISMS

[Abstract of article by K.B. Borodavko and A.S. Buravlev]

[Text] This article examines the electronic section of a laser goniometer and enumerates its fundamental errors. Two illustrations, 3 bibliographic references.

UDC 531.383(07)

LABORATORY PROTOTYPE FOR STUDYING GYROSCOPE NUTATION

[Abstract of article by S.A. Andronov and I.S. Chulkova]

[Text] This article presents the structure of a laboratory training prototype and proposes methods for determining the individual parameters of the construction through the parameters of nutation oscillations. Definition of an external pulse through the parameters of the oscillation is examined. Three bibliographic references.

UDC 621.12:532.5.041

ESTIMATE OF STATISTICAL PRECISION OF INDIRECT STABILIZATION SYSTEM

[Abstract of article by T.G. Ponikarovskaya]

[Text] This article analyzes the statistical precision of a multiply-connected automatic system. An expression is presented for calculating the dispersions of the deviations of the determining coordinates. Two tables, 4 bibliographic references.

UDC 527.2.(075)

A METHOD FOR CONSTRUCTING THE TRAJECTORY OF A VESSEL IN ITS TURNING CIRCLE

[Abstract of article by V.S. Chugunov]

[Text] This article examines a method for constructing the trajectory of a vessel in its turning circle based on solving dynamic equations of vessel

movement assuming the helm angle to be held constant. Two illustrations, 2 bibliographic references.

UDC 531.383

QUASI-OPTIMAL SYSTEM FOR AUTOMATIC CONTROL OF MOVING OBJECT WITH TWO CONTROL RULES

[Abstract of article by I.N. Kuzichev and Yu.P. Saydov]

[Text] This article examines the problem of moving an underwater vehicle from any initial position to some equilibrium state at optimal speed by using two control rules. Two illustrations, 2 bibliographic references.

UDC 519.95

OPTIMAL-SPEED CONTROL FOR OBJECTS OF SAME CLASS

[Abstract of article by V.P. Aksenov]

[Text] This article defines optimal-speed control using the maximum principle. An algorithm implemented on an M-222 computer is used to define the initial state vector $\Psi(t = 0)$ for a conjugate system which ensures the minimum of the transitional process. One illustration, 1 bibliographic reference.

UDC 519.216.2

CONSTRUCTION OF SHAPING FILTERS FOR STATIONARY AND NONSTATIONARY RANDOM PROCESSES

[Abstract of article by P.I. Saydov and S.V. Shepel']

[Text] This article examines problems of constructing mathematical models of random processes with assigned correlation function for modeling random phenomena on analog and digital computers. The results of modeling a random process on a digital computer are presented. Three bibliographic references.

UDC 621.317.7.361(088.8)

INFRA-LOW FREQUENCY-TO-VOLTAGE TRANSDUCER

[Abstract of article by A.V. Vlasenko, V.B. Dabydov and Yu.A. Toropov]

[Text] This article examines singularities of frequency-to-voltage conversion in the infra-low frequency range and presents the functional diagram of a device which is free of specified shortcomings. Two illustrations, 4 bibliographic references.

UDC 621.374

SOME PROBLEMS OF CONSTRUCTING PHASE-SENSITIVE RECTIFIERS WITHOUT TRANSFORMERS

[Abstract of article by K.V. Kolesnikov]

[Text] This article presents the circuit of a phase-sensitive rectifier without a transformer. Problems of tuning and adjusting the circuit are examined, and its specifications are given. One table, 2 illustrations, 2 bibliographic references.

UDC 629.1.054

EXPERIENCE IN PLANNING GYRO INSTRUMENT TESTING

[Abstract of article by A.D. Gromov and M.V. Solov'yev]

[Text] It is shown that the use of a factor dispersion analysis device makes it possible to determine the required accuracy for stabilizing interfering factors. Two tables, 1 bibliographic reference.

UDC 531.787

PRESSURE METER WITH FREQUENCY OUTPUT

[Abstract of article by Ye.B. Davydova and A.A. Fedoseyev]

[Text] This article examines the construction of a pressure meter with a crystal piezo resonator. One table, 1 illustration, 4 bibliographic references.

UDC 681.325.3

PRESSURE INDICATION CHANNEL

[Abstract of article by V.N. Kropin]

[Text] This article examines a frequency-digital code converter operating in the (0.5...10)·10 Hz range using series 133 and 155 microcircuits. The device uses a fractional divider in which the size of the divisor can be varied as a function of the type of meter used. The measurement result is read out on a display in units of the quantity being measured. One illustration, 3 bibliographic references.

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UDC 621.396.392.1(o75.3)

SHIPBOARD RADIO NAVIGATION DEVICES

Moscow SUDOVYYE RADIONAVIGATSIONNYYE PRIBORY in Russian 1981 (signed to press 26 Feb 81) pp 2-3, 334-336

[Annotation, foreword and table of contents from book "Shipboard Radio Navigation Devices", by Vasiliy Vasil'yevich Konovalov, Lyudmila Ivanovna Kuznetsova, Nikolay Petrovich Mel'nikov and Oleg Borisovich Prichkin, Izdatel'stvo "Transport", 18,000 copies, 336 pages]

[Text]

Annotation

This text presents the principles and singularities of modern shipboard radio navigation devices which are now used in the merchant marine.

Specific shipboard radars, radio navigation indicators, radio direction finders and navigation sets are described at the functional diagram level; the operating rules are given for the devices and the fundamentals of their use in navigation are presented.

This text is intended for students in maritime training schools of the Ministry of the Merchant Fleet, and can be used by students of higher marine engineering schools to study radio navigation devices, as well as participants in courses to improve the qualification of command staff. The third edition was published in 1974. 141 illustrations, 8 tables, 25 bibliographic references.

[This book was reviewed by V.A. Bogdanov.]

Foreword

Radars, hyperbolic radio navigation system indicators and radio direction finders are now used extensively aboard vessels in the merchant fleet. More than 10 different types of devices are in use which are based on complicated electronic circuits containing large numbers of tubes, transistors and integrated modules.

In modern technology, where complex electronic circuits are used, the latter can be studied thoroughly enough at the level of functional diagrams consisting of individual elementary sections, or modules, whose schematic diagrams are familiar. This principal extends to the radio navigation devices considered in the present

text, regardless of the component base on which they are constructed. In this case, the basis of the device circuit which is studied is the functional diagram, which reflects the connections between individual components and controls.

The operating principle of basic elementary circuits is studied in the course "Shipboard Radio Electronics"; the present text presents only general information regarding these circuits. Only pulsed and special-purpose circuits which have not been studied previously are examined in more detail here.

Sections 8.1, 8.2, 8.3, 8.4 and chapters 12, 14 were written by N.P. Mel'nikov, and chapters 6, 15, 19, 20, plus sections 11.5, 13.4, 18.5 and 18.6 were written by O.B. Prichkin. The rest of the work was written jointly by V.V. Konovalov and L.I. Kuznetsova. Overall editing was done by V.V. Konovalov.

The authors express their gratitude to V.A. Bogdanov, who made a number of comments and suggestions which helped to improve the book.

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ANTENNAS & PROPAGATION

UDC 621.369.67

ANTENNAS: COLLECTED ARTICLES

Moscow ANTENNY: SBORNIK NAUCHNIKH STATEY in Russian No 29, 1981 (signed to press 15 Apr 81) pp 187-191

[Abstracts for 24 articles from collection: "Antennas: Collected Articles", edited by A.A. Pistol'kors (editor-in-chief), Izdatel'stvo "Radio i svyaz'", 4500 copies, 192 pages]

UDC 624.97.629.78+522.59

ENGINEERING DESIGN TREATMENTS OF SPACE RADIO TELESCOPES

[Abstract of article by A.G. Sokolov and A.S. Gvamichava]

[Text] This book examines the basic arrangements used for orbital scanning of space radio telescopes and methods used to retain their theoretical form. The limiting dimensions of automatic scanning antennas are indicated, along with the requirements for materials used, basic methods of assembly and scanning under terrestrial conditions with simulated weightlessness, and the basic construction principles of mechanically scanning antennas. Some information is provided on the KRT-10, the first 10-meter antenna to be opened automatically in space. 5 illustrations, 4 bibliographic references.

UDC 621.396.677.861:629.19

FOLDING SPACE ANTENNA

[Abstract of article by A.F. Bogomolov, N.V. Bukarev, G.N. Vazhentsev, Yu.A. Kisanov, I.F. Sokolov [deceased], N. M. Feyzulla]

[Text] This article presents the results of developing a truss-type folding antenna for space. The design of the antenna is described, and weight relationships are presented. The limiting capabilities of this type of self-deploying antennas are estimated.

The results of mechanical and radiotechnical testing of a 5-meter model are presented, and the assembly and testing methods are given. 12 illustrations, 8 bibliographic references.

UDC 621.396.677.8

MATERIALS FOR REFLECTING SURFACES OF FOLDING SPACE ANTENNAS

[Abstract of article by Ye.A. Kisanov, N.M. Feyzulla, L.A. Kudryavin and V.A. Zavaruyev]

[Text] The requirements for the materials used in the reflecting surfaces of folding space antennas are determined. The possibility of using film, fiber and knitted materials is examined, with the advantages of the latter indicated.

The basic physical-mechanical properties of knitted metallic mesh with different weaves are presented. The results of measuring the radio reflection capability in the 1-10 GHz band are cited. 6 illustrations, 5 bibliographic references.

UDC 621.396.677.861

INFLUENCE OF DESIGN FEATURES OF TRUSS-TYPE FOLDING ANTENNAS ON THEIR RADIO TECHNICAL PARAMETERS

[Abstract of article by Ye.A. Kisanov and N.M. Feyzulla]

[Text] This article examines the influence of the design features of truss-type folding antennas - hexagonal aperture and approximation of reflector surface by flat triangular elements - on the surface utilization factor and directivity pattern.

It is shown that all technical treatments used for paraboloids with round apertures are applicable for reflectors with hexagonal apertures.

Engineering formulas are presented which characterize the influence on the surface utilization factor and directivity pattern of approximating the antenna surface with flat triangular elements. 4 illustrations, 5 bibliographic references.

UDC 621.396.93

ANTENNA FOR "CIRCULAR PERASCOPIC" RADIO TELESCOPES

[Abstract of article by N.L. Kaydanovskiy]

[Text] This article considers the possibility of simplifying variable-profile antennas significantly by eliminating radial movement and azimuth scanning in the reflecting elements of the main reflector while retaining a single elevation axis and using a secondary reflector with a focal line in the form of the involute of the horizontal section of the caustic of the surface of the main reflector where the primary radiator - a linear antenna array - is deployed. 8 illustrations, 15 bibliographic references.

UDC 621.396.67

ESTIMATION OF SIDELOBE LEVEL OF ANTENNA DIRECTIVITY PATTERN WITHIN SMALL RANGE OF ANGLES

[Abstract of article by O.A. Sudakov and V.P. Yakovlev]

[Text] Relationships are derived which interrelate the antenna directivity pattern power within a small range of angles and the maximum possible pattern sidelobe level in that range. 1 bibliographic reference.

UDC 621.371.334:621.396.677.833.001.24

COMPARISON OF TWO METHODS FOR FIELD CALCULATION IN PENUMBRA REGION

[Abstract of article by V.A. Borovikov and A.G. Eydus]

[Text] The example of diffraction of a directional cylindrical wave on a penumbra and rectangular wedge is used to compare two methods for calculating the field in the penumbra region - the uniform asymptotic theory which yields the precise field asymptote, and the uniform geometric theory of diffraction, which yields approximate formulas. The formulas of the uniform geometric diffraction theory are shown to have significant error. 4 illustrations, 16 bibliographic references.

UDC 621.396.67

SOLUTION OF INVERSE DIFFRACTION PROBLEM FOR HETEROGENEITIES NEAR ANTENNA APERTURE

[Abstract of article by G.A. Yerokhin, V.G. Kocherzhevskiy and A.A. Ryvlina]

[Text] The method of simulating impedance boundary conditions is used to solve the inverse diffraction problem for heterogeneities located near aperture antennas. Two basic statements of the problem are considered: 1 -- simulation for assigned scattering diagram; 2 -- simulation for assigned magnitude of complete scattering cross-section. The connection between the amplitude-phase characteristics of the scattered field and the scattering pattern and characteristics of the radiating antenna is obtained. Simulation of a heterogeneity with a small complete scattering cross-section is examined as an example. The results of numerical calculations and experimental investigations of a simulated heterogeneity are presented. 7 illustrations, 11 bibliographic references.

UDC 621.396.677.681.3.01

THEORY OF ADAPTIVE ANTENNAS UNDER CONDITIONS OF CORRELATED NOISE SIGNALS

[Abstract of article by O.S. Litvinov]

[Text] This article considers problems of the theory of an adaptive antenna array which receives correlated noise signals. The basic findings are obtained

with the help of analytical manipulation of the covariation noise matrix developed previously by the author. The process of suppression of correlated noise signals, fluctuation in the signal/noise plus interference ratio and duration of noise suppression are analyzed, along with questions of noise suppression when some of the noise is coming from the direction of the main maximum of the directivity pattern of the antenna array in the quiescent state. 1 illustration, 7 bibliographic references.

UDC 621.396.67

ANTENNA RADIATION IN PRESENCE OF NEARBY OBSTACLES

[Abstract of article by A.G. Kyurkchan]

[Text] This article examines the problem of antenna radiation in the presence of nearby obstacles. The problem is formulated as a system of integral equations of the second kind with respect to the antenna and obstacle patterns. This system is relatively easy to solve for cases of practical importance. An example is given of the asymptotic solution of this system of equations for the situation in which an absorbing screen is placed next to the antenna. The limiting capabilities with regard to reducing antenna side radiation with the help of such screens are determined. Experimental results are cited which agree satisfactorily with the theory. 7 illustrations, 6 bibliographic references.

UDC 621.396.677.31

A CLASS OF PARALLEL-SERIES DRIVEN ANTENNAS

[Abstract of article by G.N. Gromov, V.M. Kolupayev and N.Kh. Nikogosyan]

[Text] This article examines the basic characteristics of one type of parallel-series driven antennas - antennas in which the waves propagate in opposite directions in the feeder lines. The characteristics of this class of antennas are compared with the characteristics of ordinary center-driven traveling-wave antennas. 3 illustrations, 6 bibliographic references.

UDC 621.396.677.45

SELECTION OF OPTIMAL GEOMETRIC ELLIPTICITY FOR FLAT LOG-ELLIPTICAL SPIRAL ANTENNA

[Abstract of article by V.M. Mal'tsev]

[Text] The selection of optimal geometric elasticity for a flat log-elliptical spiral antenna is presented. The analytical results are based on using the current distribution obtained by solving an integral equation. 7 illustrations, 8 bibliographic references.

UDC 621.396.67

USE OF GRAPH THEORY TO SOLVE CERTAIN ANTENNA PROBLEMS

[Abstract of article by R.P. Nikulin]

[Text] This article is devoted to the problem of using graph theory in solving certain antenna problems. The example of a four-element director antenna is used to demonstrate the rules for transforming and simplifying graphs and determining the current amplitude in passive dipoles and finding the input impedance of an active radiator. Practical utilization of graph theory is demonstrated using the example of investigating a dipole with different branch lengths. Using the method of moments and the apparatus of graph theory, the input impedance is determined as a function of the relationship between the branches of a thin dipole with different branch lengths. 16 illustrations, 9 bibliographic references.

UDC 621.396.67.012.12

MODELING OF A PHASED ANTENNA ARRAY

[Abstract of article by D.V. Shannikov and L.A. Babenko]

[Text] A method is described for modeling a phased antenna array in a waveguide simulator using a single array radiator. The simulator is a waveguide with dielectric plates along the side walls. The results of calculating the radiation resistance of the post in the proposed simulator and in a waveguide with two "magnetic" walls are presented, which confirms that the conditions under which the radiator operates in these waveguides are practically the same. The experimental findings also confirm the possibility of investigating equidistant linearly polarized antenna arrays in the proposed simulator. 2 illustrations, 2 bibliographic references.

UDC 621.396.677

CALCULATION OF RADIATION CHARACTERISTICS OF PYRAMIDAL HORN ANTENNAS

[Abstract of article by S.A. Fedorova]

[Text] The amplitude functions of the directivity patterns and directional gain of sharp pyramidal horns are calculated by means of aperture integration in defining the field in the aperture using the approximating function method. The results of the calculations are compared with those obtained using the geometric diffraction theory for corner antennas and using aperture integration in finding the field in the aperture based on qualitative considerations. 8 illustrations, 13 bibliographic references.

UDC 621.396.67

CALCULATION OF BIMODAL HORNS

[Abstract of article by V.I. Abramov, I.F. Belov and T.N. Dobrynina]

[Text] This article examines an engineering methodology for calculating two types of bimodal horn radiators in which a ledge and dielectric tube are used as a superior type mode driver. A horn with a dielectric tube is shown to have greater

bandwidth. The results of experimental investigation of the characteristics of both types of horns are presented. 5 illustrations, 15 bibliographic references.

UDC 621.396.67

POLARIZATION CHARACTERISTICS OF PARABOLIC ANTENNAS

[Abstract of article by L.V. Knyazeva]

[Text] The relationships between cross-polarization and geometric antenna parameters and radiator characteristics are obtained using the current method to calculate the directivity patterns of parabolic antennas (single- and twin-reflector: Cassegrain and Gregory). 5 illustrations, 3 bibliographic references.

UDC 621.396.67.095

NOMOGRAMS OF POLARIZATION CHARACTERISTICS OF ELECTROMAGNETIC FIELD

[Abstract of article by Yu.N. Seryakov and S.A. Firsov]

[Text] Nomograms are developed for determining the polarization characteristics (coefficient of ellipticity ε and angle of inclination of ellipse of polarization β) using the values of the ratio of the orthogonal components of the electrical field and phase shift between them ϕ; nomograms for their errors are also developed. The connection between the measurement errors and polarization characteristic errors is presented. 5 illustrations, 3 bibliographic references.

UDC 621.396.671

PHASE CHARACTERISTICS OF ANTENNAS IN FRESNEL ZONE

[Abstract of article by V.A. Zemlyakov]

[Text] An analytical form for writing the phase distribution of the field at different distances from the antenna is obtained. Questions of using the relationships obtained for determining the coordinates of the antenna phase center using measurements in the Fresnel zone are considered. 1 illustration, 2 bibliographic references.

UDC 621.372.826:621.396.67

INTRINSIC WAVES IN TWO-DIMENSIONAL PERIODIC ARRAY OF RIBBED RODS

[Abstract of article by V.M. Krekhtunov and S.A. Morgulev]

[Text] The method of partial regions in rigorous electrodynamic statement is used to investigate electromagnetic wave propagation in a man-made metal dielectric formed by a two-dimensional periodic array of round metal ribbed rods. 5 illustrations, 5 bibliographic references.

UDC 621.37.544

NUMERICAL METHOD FOR ANALYZING COUPLED NONUNIFORM TRANSMISSION LINES

[Abstract of article by V.R. Shleye, K.Ya. Adbakirov, M.Ya. Voronin and T.A. Kondrat'yeva]

[Text] This article presents a numerical method for analyzing coupled nonuniform transmission lines which can be used to analyze microwave devices with uniform and nonuniform dielectric filling. 3 illustrations, 10 bibliographic references.

UDC 621.396

STRIPLINE AND MICRO-STRIPLINE П-RESONATOR MICROWAVE FILTERS

[Abstract of article by L.S. Osipov and B.B. Balandinskiy]

[Text] This article examines the advantages of microwave stripline filters with П-bent half-wave open ended resonators. A method is proposed for calculating the electrical parameters of П-resonator filters which can be used to develop filters based on balanced as well as unbalanced strip transmission lines.

The methodology for designing and calculating the geometric dimensions of П-resonator stripline filters is illustrated using an example. It is shown that the proposed methodology in combination with graphs and nomograms which are cited makes it possible to realize the required filter amplitude response with accuracy sufficient for engineering practice.

The derivation of the formulas for calculating the electrical parameters of П-resonator filters is given in an appendix. 8 illustrations, 7 bibliographic references.

UDC 621.396.677

NUMERICAL ANALYSIS OF RADIO TRANSPARENCY OF PERFORATED METAL STRUCTURES

[Abstract of article by B.A. Panchenko and I.P. Solov'yanova]

[Text] This article presents the results of numerical calculations of the radio transparency of flat periodically perforated metal structures. General regularities in the behavior of the coefficient of transmission of a plane electromagnetic wave as the parameters of the structures change are formulated on the basis of numerical analysis. 7 illustrations, 6 bibliographic references.

UDC 621.396.67

INNOVATION IN TREATMENT OF TURNING ANTENNA SUPPORTS

[Abstract of article by V.S. Polyak]

[Text] This article demonstrates the dominant role of "dynamic" component of deformation movement of the focal axis of the antenna in the shape formation of the turning support and cites adequate limits for qualitative change of construction treatments. The shortcoming of traditional treatments are demonstrated from the viewpoint of the qualitative limits established, and the singularities of a new type of turning supports are examined which are significantly more economical and adaptable to manufacture. Examples of the technical implementation of the new design are also examined. 6 illustrations, 9 bibliographic references.

6900
CSO: 1860/188

RADIO WAVE PROPAGATION AND IONOSPHERIC PHYSICS

Novosibirsk RASPROSTRANENIYE RADIOVOLN I FIZIKA IONOSFERY in Russian 1981 (signed to press 17 Jun 81) pp 219-224

[Abstracts for 24 articles from book "Radio Wave Propagation and Ionospheric Physics", edited by Doctor of Physical and Mathematical Sciences Iosif Markovich Vilenskiy (deceased) and Candidate of Physical and Mathematical Sciences Arnol'd Grigor'yevich Fleyer, Izdatel'stvo "Nauka", 1250 copies, 224 pages]

UDC 550.388

NONLINEAR DISTORTION OF POWERFUL MODULATED RADIO WAVES

[Abstract of article by I.M. Vilenskiy and A.A. Kapel'zon]

[Text] This article investigates nonlinear distortions of powerful radio waves during propagation through the ionosphere. It is shown that as the transmitter power increases the amplitude modulation of the wave can drop to a few percent, while the coefficient of nonlinear distortions increases to tens of percent. Achieveable carrier frequencies are calculated for oblique propagation and trajectories on which the coefficient of nonlinear distortions of the signal does not exceed 20% are selected. 7 illustrations, 6 bibliographic references.

UDC 550.388

OBLIQUE PROPAGATION OF POWERFUL RADIO WAVES IN IONOSPHERE

[Abstract of article by O.I. Lipay and V.V. Plotkin]

[Text] This article examines oblique incidents of a powerful radio wave on a flat stratified isotropic ionosphere. Assuming weak absorption and heterogeneity, first-approximation equations are derived for the amplitude, phase and trajectory for waves with arbitrary power. These equations are integrated numerically for specific ionospheric models. It is shown that a powerful wave can be reflected from sharp artificial gradients which it creates in the region lying beneath the linear reflection point. Nonlinear perturbation of the radio wave and its amplitude are investigated. 1 illustration, 3 bibliographic references.

UDC 550.388

RADIO WAVE REFLECTION FROM ARTIFICIAL QUASIPERIODIC IONOSPHERIC HETEROGENEITIES

[Abstract of article by I.M. Vilenskiy and M.Ye. Freyman]

[Text] This article examines the propagation of weak radio waves in an isotropic ionosphere perturbed by a vertically incident and reflected powerful radio wave. The two-scale expansion method is used to derive a system of "truncated" equations which describes the reflection of radio waves from a quasiperiodic structure (array) in the region of the first Bragg resonance. A qualitative analysis of the solution of this system is given for two practically important cases. It is demonstrated that when the perturbing transmitter is powerful enough the coefficient of reflection from the array may be of the order of unity. 7 illustrations, 1 table, 26 bibliographic references.

UDC 660.388

INVESTIGATION OF LOWER IONOSPHERE USING PULSED CROSS-MODULATION METHOD

[Abstract of article by N.I. Izrayleva]

[Text] This article is devoted to an effective study of the lower ionosphere using a modified pulsed cross-modulation method. The theory of nonlinear interaction of high-power pulsed radio waves is developed. The cross-modulation coefficients are analyzed quantitatively as a function of the equipment parameters as well as the ionospheric parameters. Practical recommendations are given on the selection of optimal experimental conditions for achieving the highest cross-modulation coefficient values. The methodology developed for solving the inverse problem is applied to concrete experimental data on amplitude cross-modulation. It is shown that the modified pulsed cross-modulation method using powerful radio waves makes it possible to define the practically instantaneous profiles of the parameters of the lower ionosphere (electron concentration, collision frequency, etc.), and to study its dynamics and fine structure. 7 illustrations, 1 table, 40 bibliographic references.

UDC 550.388

ANALYSIS OF ABSORPTION AND PHASE OF SHORTWAVE RADIO SIGNAL REFLECTED FROM IONOSPHERE (PLANE MODEL, ARBITRARY STATE OF IONOSPHERIC LAYER)

[Abstract of article by E.I. Ginzburg, O.G. Zhuravskiy and I.I. Nesterova]

[Text] This article presents a method for calculating the parameters of a shortwave oblique radio signal reflected from an anisotropic ionosphere which can be used to study the earth's ionosphere using radio waves in that band. Calculations can be made for a radio path not over 3,000 km long (flat layer approximation), arbitrarily oriented with respect to the earth's magnetic field, for arbitrary ionospheric characteristics. The program described in the article can be used

to obtain all of the basic radio wave propagation characteristics over a broader frequency band from superlong waves to short waves. 4 illustrations, 4 bibliographic references.

UDC 550.388

INVERSE PROBLEM FOR WAVE REFLECTION FROM HETEROGENEOUS ISOTROPIC PLASMA LAYER

[Abstract of article by V.K. Berger and S.L. Gekhman]

[Text] This article examines the inverse problem for radio wave reflection from a two-dimensional heterogeneous weakly reflecting isotropic plasma layer. Expressions are derived which describe the electron concentration profile in the layer as a function of the parameters of the reflected wave. Two possible types of incident wave polarization are examined. It is shown that the solution obtained is valid in the high frequency region. 2 illustrations, 4 bibliographic references.

UDC 621.371.34

SIGNAL PHASE INSTABILITY DURING IONOSPHERIC PROPAGATION

[Abstract of article by L.K. Andrusevich and D.I. Sheynman]

[Text] The methodology and results of experimental investigation of signal phase instability in a short-wave channel are described. Conditional probability distributions are obtained for the amplitude and rate of signal phase variation tied to ionospheric conditions which are systematized in terms of characteristic features, making it possible to predict statistical signal characteristics using the predicted ionospheric parameters. The relationship between the velocity of phase variation and the instantaneous signal level is established experimentally. The rates of signal phase variation obtained experimentally are compared with those obtained on the basis of the theoretical Rayleigh model. 4 illustrations, 6 bibliographic references.

UDC 621.371

LINEAR APPROXIMATION METHOD FOR DETERMINING PHASE PROPAGATION VELOCITY OF SUPERLONG RADIO WAVES

[Abstract of article by A.G. Fleyer]

[Text] This article proposes a method for experimental determination of the mean phase velocity for arbitrary paths with a given orientation. The use of the method at points located more than 1000 kilometers in the direction of propagation from the radio transmitter when the underlying surface conductivity is uniform ensures that the measured phase velocity is practically independent of distance. The method can be used to cross-reference the time scales of any objects located along the direction coinciding with the placement of the synchroni-

zed standards, and for cross-referencing the object scales and time scale of any of the standards.

UDC 621.371

EXPERIMENTAL INVESTIGATION OF SEASONAL VARIATION IN PHASE OF SUPER-LONG WAVE SIGNALS

[Abstract of article by L.Ya. Vorob'yev]

[Text] This article investigates the seasonal variation in phase delays τ of super-long waves on long paths during periods with equal illumination. It is shown that spectral analysis of the diurnal phase variations $\Delta\tau$ makes it possible to determine the periodic components of the phase variation on paths with equal illumination. The primary regular components have periods of a year and of six months. During the day these variations relate to variations in the effective altitude of the lower ionosphere. The amplitude-phase characteristics τ_n at night are different from the daytime values for the corresponding process harmonics. 3 illustrations, 3 bibliographic references.

UDC 621.371

EXPERIMENTAL INVESTIGATION OF TRANSIENT SUPER-LONG WAVE PATHS

[Abstract of article by A.I. Shchavelev]

[Text] This article analyzes experimental data obtained on north-westerly propagation paths. Sufficiently reliable and representative estimates are found for the parameters of normal waves which characterize the process of re-excitation of these waves, in addition to some properties of the waveguide channel during propagation within the wide 50-65° north latitude belt. 1 illustration, 1 table, 14 bibliographic references.

UDC 621.371.334

NUMBER OF METEOR-TRAIL ECHOS OF THE EARTH

[Abstract of article by A.S. Vever and T.P. Danilova]

[Text] The relative contribution of different sections of the sky to the number of earth echo signals obtained via meteor trails is found. Meteors with azimuths opposite the sounding azimuth were most effective. 1 illustration 4 bibliographic references.

UDC 621.371.332.2:681.327.64

PROBLEMS OF RECORDING RE-REFLECTED IONOSPHERIC RADIO SIGNALS

[Abstract of article by S.K. Uralov]

[Text] This article examines different methods for recording signals taken from the receiver output during pulsed ionospheric sounding. The simplest method is magnetic tape recording using pulse frequency modulation. The use of a crystal-controlled pilot signal in the record-reproduce section during pulse frequency modulation recording makes it possible to reduce significantly the distortions caused by nonuniformity of the magnetic medium. When the signal is recorded on magnetic tape, computer interfacing is simplified significantly. 1 illustration, 2 bibliographic references.

UDC 621.396.24

ACCUMULATION OF OBLIQUE BACKSCATTER SOUNDING SIGNALS IN PRESENCE OF SEVERE RADIO INTERFERENCE

[Abstract of article by P.I. Fedos'kin]

[Text] This article examines the influence of severe pulsed radio interference on a receiver containing an envelope detector with square-law response and an accumulator with linear response with a range selector connected between them. An expression is obtained for the gain in accumulation of the oblique backscatter ionospheric sounding signal resulting from the action of pulsed interference. It is shown that this gain is usually between 1 and 4 dB. The false alarm probability is found as a function of accumulation time. 2 illustrations, 5 bibliographic references.

UDC 621.396.677

ELECTROMAGNETIC WAVE DIFFRACTION OF TRIAXIAL CONDUCTING ELLIPSOID

[Abstract of article by A.A. Botvinnik and Yu.I. Volkovysskiy]

[Text] An algorithm is described in detail for calculating the scattering field of a plane electromagnetic wave incident at an arbitrary angle on a triaxial ideally conducting ellipsoid. The algorithm uses the high frequency asymptote method. The beam method is used with the observation point located in the illuminated region. Keller's diffraction beam method is used to calculate the umbral field. An algorithm is described for finding the geodesic lines which the beam follows along the surface of the ellipsoid. In conclusion, the flow chart of the algorithm used to calculate the scattering fields is given, which serves as the basis for writing computer programs. 7 bibliographic references.

UDC 551.557

NEAR-POLE SYSTEM OF WINDS IN THERMOSPHERE

[Abstract of article by E.I. Ginzburg and L.V. Zhalkovskaya]

[Text] A mathematical formulation and numerical solution are provided for the problem of the system of thermospheric winds in the region near the poles. The system of equations consists of continuity and movement equations of a uniform

gas allowing for nonlinear terms, viscous forces, ion retardation and Coriolis forces in the latter. The density, temperature and pressure fields are assigned using Yakkiy's 1971 model. The influence of nonlinear terms, vertical flows and boundary conditions on the velocity field in the region near the pole is estimated. 9 illustrations, 17 bibliographic references.

UDC 551.510.596

INTERNAL GRAVITY WAVES AS TURBULIZATION SOURCE FOR LOWER THERMOSPHERE

[Abstract of article by E.I. Ginzburg and G.I. Kuzin]

[Text] A wave equation solution is found for short gravity waves in the vicinity of the reflection point for a linear atmospheric layer considering viscosity and thermal conductivity. It is shown that the vertical component of the short gravity wave wind velocity increases resonantly to values for which allowance must be made for nonlinear processes at a special point on the short gravity wave index of refraction located beyond the reflection point. It is proposed that this resonance effect is the source of turbulization of the medium. An analytical expression for the relative altitude profile of the coefficient of turbulent diffusion K_T is obtained on the basis of estimates of semi-empirical turbulence theory. Comparison of the altitude profiles of K_T obtained for different seasons with experimental profiles in the 50-130 km region shows satisfactory coincidence. 3 illustrations, 14 bibliographic references.

UDC 550.388:525

INVESTIGATION OF PERIODIC DISTURBANCES OF UPPER AND LOWER IONOSPHERE

[Abstract of article by A.G. Fleyer and L.Ya. Vorob'yev]

[Text] This article examines downward verticle propagation of periodic ionospheric disturbances according to measurements of the propagation time of exact-time signals received at synchronized points. A general relationship is found between the propagation velocity of periodic disturbances and frequency $V = V(\omega)$. Large-scale periodic disturbances with wavelengths of 50-120 km satisfy the dispersion relationship of $V(\omega)$ well. The results are compared with the findings of other authors. 1 illustration, 1 table, 6 bibliographic references.

UDC 523.037:525.7

METHODS FOR INVESTIGATING ELECTRICAL STATE OF FLYING OBJECTS AND THEIR SURROUNDING ENVIRONMENT

[Abstract of article by Yu. A. Bragin and N.M. Pushkin]

[Text] This article discusses the general principles behind the processes involved in electrization of flight vehicles, methods for investigating and reducing it, as well as measurements of the electrical properties of the environment. Man-made and natural spaceborn objects equipped with electrical field intensity transducers and electron-ion guns are recommended for use as probes

for investigating charged particles in space. 1 illustration, 27 bibliographic references.

UDC 523.037:525.7

ELECTRICAL STRUCTURE OF STRATOSPHERE AND MESOSPHERE ACCORDING TO MISSILE RESEARCH DATA

[Abstract of article by Yu.A. Bragin, A.A. Kocheyev, V.N. Kikhtenko, L.N. Smirnykh, A.A. Tyutin, O.A. Bragin and B.F. Shamakhov]

[Text] An empirical model of the electrical structure of the stratosphere and mesosphere is constructed on the basis of analyzing the results of direct missile measurements obtained for over 50 launches. The model includes the altitude dependence of electrical conductance, ion concentration and vertical electrical field component in the atmosphere. Certain tendencies of temporal and spatial fluctuation of these parameters are noted. The seasonal dependence of atmospheric electrical conductance obtained in the area of the "Molodezhnaya" Antarctic station is presented. 15 illustrations, 42 bibliographic references.

UDC 523.037:525.7

DIRECT MEASUREMENTS OF LOW FREQUENCY ($10^{-2} \approx 10^{2}$ Hz) OSCILLATIONS OF ATMOSPHERIC ELECTRICAL FIELD BELOW 25 KM

[Abstract of article by Yu.A. Bragin, R.M. Zinatulin, V.I. Struminskiy and V.F. Shamakhov]

[Text] This article presents data on the instrumentation and initial measurements of atmospheric electrical field variations ($10^{-2} \approx 10^{2}$ Hz) obtained using antennas raised on probe balloons to altitudes of approximately 25 km. It is asserted that the atmospheric electrical field "makes noise" at the fine frequencies which are clearly distinct from low-frequency "noise". The supposition that the main source of the variations is associated with the interaction between solar radiation and the earth's surface or near-earth atmospheric layer, i.e., that in the lower atmosphere, is substantiated. 2 illustrations, 10 bibliographic references.

UDC 551.594.12

GROUND MEASUREMENTS OF ATMOSPHERIC ELECTRICAL FIELD INTENSITY AND ELECTRICAL CONDUCTANCE

[Abstract of article by G.I. Endikov]

[Text] A possible connection between phenomena occurring in the lithosphere and the earth's atmosphere is proposed. A brief review of measurements and instruments for investigating atmospheric electrical field intensity and electrical conductance is given, along with curves of the daily behavior during good weather in July-August 1978 obtained during an expedition to Altay. 3 illustra-

tions, 9 bibliographic references.

UDC 551.594

BALLOON MEASUREMENTS OF HORIZONTAL COMPONENT OF ELECTRICAL FIELD, ION CONCENTRATION, ELECTRICAL CONDUCTANCE AND CORPUSCULAR STREAMS

[Abstract of article by L.N. Smirnykh, V.I. Struminskiy, V. M. Frolov, P. A. Kononov, A. I. Zhivoglyadov, S. A. Itskovich and R. D. Gaynutdinov]

[Text] This article presents methods and results of measuring electrical fields, ion concentration, electrical conductance and corpuscular streams in the atmosphere in the 0-40 km altitude region. The altitude dependence of the horizontal component of the conductance current is given. 10 illustrations, 12 bibliographic references.

UDC 551.510.53

BREAKDOWN OF ATMOSPHERIC OZONE BY NEGATIVE IONS

[Abstract of article by A.M. Zadorozhnyy and I.G. Deminov]

[Text] The observed reduction in ozone concentration in the polar region at altitudes of $\leq$50 km during release of high-energy solar flare protons and during geomagnetic disturbances are shown to be explainable by the interaction between O_3 and negative ions. The behavior of the ozone layer under disturbed conditions is investigated with the help of a numerical photochemical model of the stratosphere. 2 illustrations, 15 bibliographic references.

UDC 323.037:5257

RESULTS OF MISSILE MEASUREMENTS OF UV-RADIATION IN LOWER MESOSPHERE AND STRATOSPHERE

[Abstract of article by V.S. Degtyarev, G.A. Tuchkov and A.A. Tyutin]

[Text] This article presents the results of missile measurements of UV radiation in the lower mesosphere and stratosphere. An increase in radiation intensity (λ = 1000 - 3000 Å) below 40 km occurs with a maximum in the 25 km region. 3 illustrations, 4 bibliographic references.

6900
CSO: 1860/192

CIRCUITS & SYSTEMS

AUTOMATION OF DESIGN IN RADIO ELECTRONICS AND INSTRUMENT BUILDING

Leningrad IZVESTIYA LENINGRADSKOGO ORDENA LENINA ELEKTROTEKHNICHESKOGO INSTITUTA IMENI V.I. UL'YANOVA (LENINA): AVTOMATIZATSIYA PROYEKTIROVANIYA V RADIOELEKTRONIKE I PRIBOROSTROYENII in Russian No 235, 1979 (signed to press 19 Sep 79) pp 119-124

[Abstracts for 25 articles in journal "Proceedings of Leningrad Electrotechnical Institute imeni V.I. Ul'yanov (Lenin): Automation of Design in Radio Electronics and Instrument Building]

UDC 621.372.001.2:681.32

PROBLEM-ORIENTED GROUP OF APPLICATIONS PROGRAMS FOR AUTOMATED DESIGN OF ELECTRONIC CIRCUITS

[Abstract of article by V.I. Anisimov and V.V. Sokolova]

[Text] This article examines a problem-oriented group of applications programs intended for automating circuit design and oriented toward utilization by electronic circuit designers with no special computer knowledge. The language support of the group, along with its modular software, provide capabilities for expansion. One illustration, 3 bibliographic references.

UDC 621.372:681.318.56.001.24

PROBLEMS OF ORGANIZING AUTOMATED DESIGN SYSTEM FOR ELECTROMAGNETIC RELAY CIRCUITS

[Abstract of article by Yu.N. Strel'nikov]

[Text] The tasks of an automated design system include calculating, analyzing and optimizing the characteristics of the electromagnetic circuits used in neutral and polarized relays. The mathematical foundation for design consists of a system of nonlinear differential equations describing the dynamics of transient processes during actuation of the relays. This article describes the structure and composition of the software for the system and shows the information connections between the computational modules. One illustration, 3 bibliographic references.

UDC 621.372.011.71:681.3

STATISTICAL ANALYSIS BY COMPUTER OF AMPLITUDE-FREQUENCY CHARACTERISTICS OF LINEAR ELECTRICAL CIRCUITS

[Abstract of article by V.D. Zubov]

[Text] This article examines questions involved in finding the characteristics of the distribution principles of amplitude-frequency characteristic parameters: intrinsic attenuation, irregularity of attenuation, etc. A program is developed which can be used to define the characteristics of these principles for linear electrical circuits. An example is given of statistical analysis of an active RC-filter; the distribution of its attenuation irregularity is approximated by a Pearson curve of the first sort. One illustration, 4 bibliographic references.

UDC 681.142-523.8:621.372

USE OF GEOMETRIC PROGRAMMING IN PARAMETRIC SYNTHESIS OF ACTIVE RC-FILTERS

[Abstract of article by Yu.N. Ryabtsev]

[Text] The basic types of problems in geometric programming are examined. An algorithm for the problem for limitations of equalities is emphasized. The material is illustrated by an example of parametric synthesis of an active filter. The analysis confirms the expedience of utilizing geometric programming for problems of optimizing electronic circuits. One illustration, 7 bibliographic references.

UDC 681.3:621.372.061

SUBSYSTEM FOR AUTOMATED DESIGN OF LOW-NOISE LINEAR SECTIONS OF RADIO ELECTRONIC EQUIPMENT

[Abstract of article by Kh.G. Akopyants, Ye.V. Golubenko, L.M. Zlydina and L.B. Shusterman]

[Text] Algorithms are examined which are implemented in a group of applications programs for analysis and parametric optimization of low-noise electronic circuits in the frequency domain. A unified approach is taken for calculating circuit functions and their sensitivity via elements of the inverse conductivity matrix. Some characteristics of the group of programs are presented. Nine bibliographic references, 1 table.

UDC 681.3.181.4.001.2

MACHINE CALCULATION OF STABILITY OF LINEAR MICROCIRCUITS CONSIDERING PARASITIC COUPLING

[Abstract of article by I.B. Kazakov and A.A. Skosyrev]

[Text] A methodology is examined for calculating the stability of linear integrated circuits using a concentrated parasitic coupling model. Comparative results of

machine calculation and full-scale experimentation are presented, and acceptable values of parasitic coupling are determined using the example of an amplifier with emitter correction. One illustration, 8 bibliographic references.

UDC 681.516.77

AUTOMATION OF DESIGN OF NONLINEAR AUTOMATIC SYSTEMS IN PRESENCE OF DELAY

[Abstract of article by A.I. Drobyshev]

[Text] This article examines a methodology for synthesizing automatic systems with nonlinear dynamic correcting devices in the presence of delay. It is shown that the use of such correcting devices makes it possible to compensate for the delay effect, which significantly simplifies the problems involved in automated design of such systems. Four illustrations, 1 bibliographic reference.

UDC 681.5.015

DIGITAL MODELING OF DYNAMIC SYSTEMS WITH SEVERELY DIVERGING TIME CONSTANTS

[Abstract of article by V.Ya. Mamayev and Ye.N. Grafov]

[Text] A digital modeling method for dynamic systems of the "object-automatic control system" type is examined. The method consists essentially of selecting a unified integration step for the system of differential equations which describes the operation of the subsystem with slow dynamics (the object) and a subsystem with fast dynamics (the automatic control system), based on the requirements for the accuracy with which the object is modeled. Accuracy of modeling of the system as a whole is provided by correcting the parameters of the automatic control system. Three bibliographic references, 1 table.

UDC 685.5.037.6

AUTOMATION OF INVESTIGATION OF ABSOLUTE STABILITY OF AUTOMATIC CONTROL SYSTEM WITH TWO NONLINEAR ELEMENTS

[Abstract of article by L.A. Osipov and S.A. Kochetov]

[Text] This article examines digital computer investigation of the absolute stability of automatic control systems with two nonlinear elements. An algorithm is presented for investigating the absolute stability of the equilibrium position of such a system, as is an algorithm for determining the maximum acceptable values of the nonlinear element characteristics K1 and K2, making it possible to construct the boundary of the region of absolute stability on the plane of these parameters. Two illustrations, 6 bibliographic references.

UDC 681.516.77

DESIGN OF AUTOMATIC SYSTEM OPERATING UNDER INFLUENCE OF NONSTATIONARY HARMONIC NOISE

[Abstract of article by A.N. Sinyakov]

[Text] This article examines singularities of designing a nonlinear automatic system operating in the presence of harmonic noise. The amplitude and phase distortions introduced into the circuit when an adaptive nonlinear filter is used for noise suppression are estimated. The amplitude-phase distortions are derived as a function of the relationship between the frequencies of the noise and the valid signal which can be used as the basis for determining the most effective operating frequency region of the filter in the automatic system. Two bibliographic references.

UDC 681.32.001.2:681.32 + 519.814

CONSTRUCTION OF AUTOMATED SYSTEMS FOR SYNTHESIZING DIGITAL DEVICES USING SELF-TEACHING METHODS

[Abstract of article by A.F. Gubkin]

[Text] This article examines the principles of organizing automated systems for synthesizing digital devices and the use of the self-teaching method in their construction. A simple self-teaching method is described which can be used in SAPR [expansion not given, possibly time-pattern control system], as well as results obtained using it in one stage of synthesis. Seven bibliographic references, 1 table.

UDC 681.325.65

ALGORITHMIC MODULES IN LOGICAL MODELING SYSTEM

[Abstract of article by V.S. Fomichev and V.V. Mazurek]

[Text] This article examines the expansion of a logical modeling system by including modules whose operation is described in FORTRAN. The system permits representation of a mixed model of a scheme comprised of algorithmic, element and Boolean modules, which makes it possible to model hybrid devices. One illustration, 3 bibliographic references.

UDC 681.32

SYNTHESIS OF COMBINATION CIRCUITS OF AND-NOT, AND-OR-NOT ELEMENTS

[Abstract of article by V.S. Dudkin]

[Text] An approximate method is proposed for synthesizing combination circuits with minimal cost using AND-NOT, AND-OR-NOT logic elements considering the limitations on the parameters of these elements. One illustration, 7 bibliographic references.

UDC 621.396.64.001.2:681.3

ORGANIZATION OF AUTOMATED SYSTEM FOR DESIGNING INTEGRATED LINEAR MICROWAVE DEVICES ("MAPS" SYSTEM)

[Abstract of article by G.V. Petrova]

[Text] This article presents the organization of the "MAPS" system, its structural composition and functional designation; the basic characteristics of the system, its capabilities and function are given. One illustration, 5 bibliographic references.

UDC 621.3.032.266

FEATURES OF NUMERICAL ANALYSIS OF EOS OF SOLID-STATE ELECTRONIC INSTRUMENTS

[Abstract of article by V.V. Slavyaskiy]

[Text] The possibilities of increasing the accuracy with which the EOS [expansion not given] is calculated in the cathode region using the iterative grid method are examined. Results are given for numerical analysis of formation systems for obtaining the electron flux with constant cross-sectional current density at the system output. Four illustrations, 6 bibliographic references.

UDC 621.385.832:621.382.2.012

DEVELOPMENT OF PROGRAM FOR STATISTICAL MODELING OF NONLINEAR EFFECTS IN TARGET OF SOLID-STATE ELECTRONIC INSTRUMENT

[Abstract of article by B.V. Ivanov]

[Text] This article presents the basic equations, algorithm and program for statistical modeling of nonlinear processes occurring in the target of a solid-state electronic instrument for unidimensional approximation. In contrast to previous programs, the proposed program allows the influence of diffusion and recombination on the gain of the target. The main assumption is that Boltzmann's statistics are valid. Some of the capabilities of the program are illustrated through the results of completed calculations. Three illustrations, 10 bibliographic references.

UDC 621.385.6.001.24:681.32

NUMERICAL ANALYSIS OF GROUPING PROCESSES IN TRIODE-KLYSTRON WITH ELECTROSTATIC LENS

[Abstract of article by V.A. Meos and V.A. Fedorov]

[Text] This article presents the results of computer calculation of the operating modes of an electrostatically focused amplifier triode klystron. The influence of the lens on the electron grouping process is discussed. Four illustrations, 4 bibliographic references.

UDC 621.385.6.624.001.57:681.32

FREQUENCY BAND OPTIMIZATION OF MULTI-CAVITY KLYSTRON BUNCHER

[Abstract of article by G.P. Zybin, D.D. Suchalkin and V.L. Ukhanov]

[Text] An algorithm and program for optimizing a multi-cavity klystron buncher are developed. The optimization is done in two stages. First the electron efficiency is optimized at the center frequency. The data obtained from this are the initial data for the second stage, which consists of optimizing the frequency response. The results of optimizing the buncher of a four-cavity klystron are presented. Two illustrations, 6 bibliographic references.

UDC 621.385.632

ESTIMATES OF EFFICIENCY OF ALGORITHMS FOR CALCULATING SPACE CHARGE FORCES FOR CYLINDRICAL REGIONS

[Abstract of article by M.V. Nazarova and V.A. Solntsev]

[Text] This article compares the efficiency of three different programs used for solving Poisson's equation in a cylindrical region with simple geometry. It is shown that the solution time is approximately 0.07 seconds for each 100 nodes of the network for the direct methods considered, which corresponds to two iterations in the longitudinal/transverse-pass method. One illustration, 6 bibliographic references.

UDC 621.382.001

ANALYSIS OF RADIO ELECTRONIC EQUIPMENT DESIGNS USING DIGITAL COMPUTERS

[Abstract of article by B.N. Den'dobrenko]

[Text] This work examines methods for analyzing the designs of radio electronic equipment based on digital modeling of the field interactions of the design components. These methods make it possible to expand the capabilities of machine systems for designing radio electronic equipment. Five bibliographic references.

UDC 681.323.001.25

AUTOMATION OF TOPOLOGICAL PLANNING OF LSI CIRCUITS

[Abstract of article by A.N. Melikhov, V.M. Kureychik and V.A. Kalashnikov]

[Text] This article examines methods for automated designing of circuits used in computer structures. Problem-solving algorithms are presented for the structural design phase using the apparatus of graph theory. Models are described which are used for formal statement of design problems. One illustration, 3 bibliographic references.

UDC 681.3.00

CONSTRUCTION OF METHODOLOGY FOR AUTOMATING TECHNICAL DESIGN BASED ON THEORY OF PARAMETRIC SENSITIVITY

[Abstract of article by Yu.N. Kofanov]

A methodology is proposed for computer-aided design which is based on using parametric sensitivity functions for solving various design problems: selecting alternative structures for the designed entity, optimizing its parameters, investigating the dispersion of the parameters, etc. An example of machine design of radio electronic equipment is used to indicate ways of improving the subject methodology by unifying the calculation models of unlike physical processes occurring in the designed entity. Three bibliographic references.

UDC 681.32.001

USING THE METHOD OF ISOLATING ISOMORPHIC SUBGRAPHS WITHIN A GRAPH TO IMPROVE EFFICIENCY OF PLACEMENT ALGORITHMS FOR ELEMENTS OF DIFFERENT SIZES

[Abstract of article by A.M. Bershadskiy, A.B. Shcherban' and L.V. Igoshina]

[Text] This article examines one of the algorithms for the placement of components of different sizes on a substrate which produces precise solutions to the problem; a method is proposed for increasing its efficiency, which consists of reducing the amount of data processed. The basis is the principle of step-by-step solution of the placement problem, where the use of the method of isolating isomorphic subgraphs within a graph is suggested for dividing the problem into steps. Eight bibliographic references.

UDC 681.325.65

ONE IMPLEMENTATION OF PLACEMENT ALGORITHM

[Abstract of article by K.A. Sapozhkov, V.D. Bylkin and Ye.G. Bershadskaya]

[Text] This article examines the structure of a program for the arrangement of radioelectronic and electronic computer equipment in the installation space. The placement algorithm is based on breaking down the graph prior to plane triangulations. A methodology is described for preparation of the source data. The results of test calculations using the program are given. Four illustrations, 1 bibliographic reference.

UDC 681.32.001.2:681.3

DIGITAL MODELS OF RADIOELECTRONIC EQUIPMENT IN OPTIMAL DESIGN CONTROL SYSTEMS

[Abstract of article by Ye.N. Makvetsov and A.M. Tartakovskiy]

[Text] This article examines problems of constructing optimal control systems using digital models for solving problems involved in radioelectronic equipment design. The value of digital modeling, and its place in the overall system, are shown. Basic performance estimates of the digital models are formulated. One illustration, 3 bibliographic references.

6900
CSO: 1860/143

COMMUNICATIONS

UDC 621.315.052.63:621.395.44

CARRIER COMMUNICATION OVER 330-750 kV POWER TRANSMISSION LINES

Moscow VYSOKOCHASTOTNAYA SVYAZ' PO LINIYAM ELEKTROPEREDACHI 330-750 kV in Russian 1981 (signed to press 19 Jun 81) pp 2-4, 206-207

[Annotation, foreword and table of contents from the book "Carrier Communications Over 330-750 kV Power Transmission Lines", by Vyacheslav Khusainovich Ishkin and Isaak Iosifovich Tsitver, reviewed by V. T. Lavrushin, Energoizdat, 7000 copies, 208 pages]

[Text] This book examines problems associated with the design of systems for transmitting information over conductors in extremely high voltage power transmission lines. Included are: examination of the structural design characteristics of power lines as they determine the parameters of channel carrier paths, as well as circuits for interconnecting carrier channel equipment to conductors of power lines with split phases and grounded guard cables; analysis of the relationship of ice and frost deposits on conductors to losses in carrier paths; presentation of a probabilistic method for designing power line carrier channels and a construct for arranging frequency subdivision of a power network; introduction of information concerning carrier channel devices.

The book is intended for technical engineering personnel involved in the design and application of power line carrier communication channels, as well as for students specializing in the methodology of supervisory and technical control of power systems.

Foreword

The formation of the Consolidated Electric Power System of the USSR was achieved by unifying the power systems of Siberia and Central Asia with the European Electric Power System, and by the installation of trunk lines designed for the transmission of 500, 750 and 1150 kV. Current proposals call for the implementation of power lines capable of transmitting dc voltages of 1500 and 2200 kV.

Creation of the national Consolidated Electric Power System is closely connected to the introduction of ultramodern control systems employing computer-based technology. This in turn leads to quantitative and qualitative changes in the flow of information through the network, resulting in more exacting requirements for communications techniques within the power engineering field itself.

In this regard, the most important task to be confronted within the next five to seven years is the establishment of the Unified Power-Line Communications Network(UPCN), which will ensure the resolution of inherent problems of operational supervision and control of power facilities, as well as control of power system construction.

An important position within the overall framework of UPCN is reserved for carrier communication(CC) over electric power lines(PL), which, at the present time, is the primary method of communication employed in power systems, in fact, its importance continues to grow in step with the ever-widening use of super-high and ultra-high voltage power lines.

The aim of the present work is to illuminate the basic issues associated with the management of carrier communications over super-high and ultra-high voltage power lines. The text sets forth the results of theoretical and experimental investigations of the parameters of CC paths in such transmission lines, which were carried out chiefly at the "Energoset'proyekt"[All-Union Order of the October Revolution State Planning and Surveying and Scientific Investigatory Institute of Power Systems and Power Networks], as well as at a number of other scientific-investigatory organizations of the USSR Minenergo[Ministry of Power and Electrification](VNIIE[All-Union Scientific Research Institute of Electric Power Engineering]and NIIPT[Scientific Research Institute of Radio and Television]). Also included is a discussion of the characteristics of equipment employed in systems for transmitting information over extremely high voltage power lines.

The book is based primarily on new circuit designs proposed by the authors in recent years for the interconnection of equipment to electric power lines and on new methods for the design of power line CC channels, but also on new devices which provide for increased reliability and quality of information transmitted over electric power lines. Results of the work of a number of other researchers have also been used in the book.

Chapters 1, 3, 4 and 6 were written by V. Kh. Ishkin, chapters 2, 5, 7 and 9 by I. I. Tsitver; chapter 8, by I. I. Tsitver with N. V. Vavin; paragraph 2.1, by Tsitver with I. Ya. Mel'zak, and paragraph 2.2, by I. Ya. Mel'zak.

The authors request that all critical remarks concerning the book be directed to the following address: 113114, Moscow, M-114, Lock Box 10, Energoizdat.

Contents

9481

CSO: 1860/216

UDC 621.372.62

MULTICHANNEL FREQUENCY-SEPARATION DEVICES AND THEIR APPLICATION

Moscow MNOGOKANAL'NYYE CHASTOTNO-RAZDELITEL'NYYE USTROYSTVA I IKH PRIMENENIYE in Russian 1981 (signed to press 21 Oct 80) pp 2-3, 134-135

[Annotation, foreword, and table of contents from book "Multichannel Frequency Separation Devices and Their Application", by Oleg Vasil'yevich Alekseyev, Georgiy Aleksandrovich Grcshev and Gennadiy Georgiyevich Chavka, Izdatel'stvo "Radio i svyaz'", 3450 copies, 136 pages]

[Text] Principles of the theory and design of multichannel frequency-separation devices which are also called multiplexers are examined in this book. The principles of the construction and calculation of the basic elements which make up frequency-separation devices of various types for given frequency properties in elements with concentrated and distributed parameters are set forth. Some of these methods are based on optimization of frequency-separation device parameters using a computer.

Specific examples of the use of frequency-separation devices in various radio engineering devices and systems are given.

The book is intended for radio engineers involved in the development and design of modern radioelectronic systems who are working in the field of radio engineering and the theory of electrical circuits.

Foreword

Multichannel radioelectronic devices and systems with frequency separation of channels are widely used. A large number of examples of such systems and devices could be mentioned. They include: radio engineering communications systems, radar, and navigation which include several radio transmitters and receivers which use a single antenna at various frequencies; multiple program television centers which consist of a set of image and audio transmitters with a common antenna system; special broadband devices (amplifiers, matching circuits), in which a broad band is attained by adding the effects of relatively narrow-band components; devices for separating a set of signals (or a broadband signal) into components which do not overlap on the spectra and many others.

Some of the most important elements of such systems are multichannel frequency-separation devices, which are also called multiplexers. These devices provide separation (or adding) of frequency channels and elimination of the interaction between them (decoupling).

The published literature contains many articles on frequency-separation devices, however, these are unrelated articles, authors' certificates and patents which are devoted to specific practical realizations and to studies of specific problems of their analysis and calculation.

Many very important aspects of the theory and design of frequency-separation devices have been inadequately examined. Among them are problems of designing frequency-separation devices using elements with concentrated constants, frequency separation devices with adjacent wideband channels, problems of providing frequency-independent matching of frequency-separation devices for all its inputs and other problems.

This book, which is devoted to multichannel frequency-separation devices, makes an attempt to examine systematically problems of the theory, design and calculation of frequency-separation devices and their component elements for various applications and frequency ranges.

The book is based on the modern theory of multiterminal electrical circuits and their calculation and design using a computer.

The book examines frequency-separation devices with concentrated elements and strip lines as well as principles of the construction and synthesis of frequency-separation devices which use noninterchangeable elements (circulators). Supplements to the book give circuits and tables of normalized values of elements of two- and multichannel frequency-separation devices.

The authors wish to thank Candidate of Technical Sciences A. Ye. Znamenskiy and Doctor of Technical Sciences Yu. L. Khotuntsev who made a number of valuable comments in reviewing the manuscript.

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9424
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UDC 621.372.632.001

FUNDAMENTALS OF FREQUENCY SYNTHESIS THEORY

Moscow OSNOVY TEORII SINTEZA CHASTOT in Russian 1981 (signed to press 5 Mar 81) pp 2-4, 263-264

[Annotation, foreword and table of contents from book "Fundamentals of the Theory of Frequency Synthesis," by David Naumovich Shapiro and Aleksandr Abramovich Pain, reviewed by A. S. Galin, Izdatel'stvo "Radio i svyaz'", 5000 copies, 264 pages]

[Text] The basic problems of the theory of constructing frequency synthesis systems are set forth. Their structural arrangements are analyzed and certain methods of the design and calculation of their elements are presented. Particular attention is devoted to advanced digital active and passive frequency synthesis systems. Aspects of the use of frequency synthesis systems in radiotransmitting and radioreception devices are examined as well as methods for measuring the basic parameters of the oscillations generated by them.

The book is intended for engineering technicians who must deal with frequency synthesis systems in their work. It can also be used by students of radio-engineering technical institutes.

Foreword

Frequency synthesis methods (the old name is methods of spectrum-crystal stabilization) began to be developed rapidly at the end of the 1940s.

It became necessary to improve frequency accuracy of radio transmitter emitted oscillations in the 1930s in order to avoid mutual interference. Sets of crystal vibrators, one for each working wave (hence the name "crystal-wave method") began to be used by radio stations. The vibrators were expensive, and in large quantities, up to one hundred per single radio station, their cost was very great, thus the number of stabilized frequencies remained very limited. It soon became obvious that it would be necessary to assure accurate tuning frequency for the receivers for non-searching establishment of communication and tuning-free reception, especially for the new types of operation such as carrier telegraphy and double frequency

telegraphy, single-band modulation, relative phase telegraphy, etc. This required further increases in the number of crystal vibrators used and therefore it stimulated the search for methods which would help one to assure the largest possible number of stabilized transmitter or receiver frequencies with minimal number of crystal vibrators. The mobile radio station RAT was established in the USSR in 1937 under the direction of G. A. Zeytlenk. Its transmitter was the first one to use the method of spectrum-crystal stabilization. The first foreign publication of the methods of spectrum-vibrator stabilization occurred in 1943 [3]. Many scientists and researchers of various countries participated in developing the theory and techniques of frequency synthesis in the ensuring years. Soviet specialists made significant contributions to this area of science and technology, chief among them being V. S. Dulitskiy (1912-1966).

Frequency synthesis theory has become an independent scientific discipline in recent years. It embraces frequency synthesis systems, devices which allow one to generate oscillations with any of a certain number of discrete frequencies or several such oscillations simultaneously with varying frequencies with frequency accuracy and stability which are determined by a single frequency standard.

The newest achievements of radio electronics are used in frequency synthesis engineering: semiconductor devices, integrated microcircuits, parametric systems, microprocessors, computers, atomic frequency standards, etc.

A number of monographs, a large number of articles in the periodical press, patents, advertising reports, manufacturers' brochures have dealt with frequency synthesis systems. Monographs of Soviet authors [36, 67, 77, 92] and a monograph translated from English [93] have been published in the Soviet Union. All these books are intended for specialists in this field.

This book is intended for engineers in radio electronics and electrical communications. It could also be profitably used by teachers and students of radio engineering departments of technical institutes. This book is based on lecture notes used by the authors at technical institutes.

In setting forth the theoretical problems the authors have tried to combine rigor and depth with accessibility. The choice of subassemblies and devices to be described was made with a view to present a minimum of illustration material which would present the basic problems of this branch of engineering, current possibilities of quality improvement and modern engineering solutions.

The engineering solutions discussed in the book and the examples given in it are primarily in a range of not more than several hundreds of megahertz. In principle the methods used at higher frequencies do not differ from the ones considered here. Of specific concern here are realization of the elements: oscillators, multipliers, dividers, adders, filters, etc. The limited scope of the book and the still inadequate personal experience of the authors in analyzing problems of this area do not permit them to cover this subject: devices which use surface acoustic waves in the range up to units of gigahertz are an exception to this.

Because frequency synthesis is a relatively new area of science and technology a unified generally accepted terminology is not yet available. There is only one standards engineering document [90] in the Soviet Union which regulates this terminology and it applies only within the Ministry of the Communications Industry. We have tried to adhere to this document, but in some cases it seemed best to introduce new terms for purposes of clear explanation. We do not expect that all specialists will adopt these terms. Development of a commonly adopted terminology will take some time.

We would like to thank: A. S. Galin for reading two drafts of the manuscript (his remarks which were ultimately accepted by the authors have undoubtedly improved the book); M. M. Zaretskiy, who made a number of valuable suggestions, and also A. A. Artamonov, V. D. Belov, L. N. Gertsiger, M. S. Gitman, V. I. Giuskin, I. N. Gurevich, Ye. Ye. Isakov, V. P. Korkoshko, V. Maynelyu, G. N. Motolygina, O. Ye. Smirnov, M. A. Smirnova, Ye. L. Khotimskiy and V. D. Tsepelevich for individual valuable remarks and L. S. Kop'yeva, M. V. Shapiro for help in designing the layout of the manuscript.

Send all comments to: 101000, Moscow, Glavpochtamt, a/ya 693.

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9424
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CHOOSING INTEGRATED CIRCUITS FOR DEVICES FOR DIGITAL PROCESSING OF SIGNALS

Moscow RADIOTEKHNIKA in Russian Vol 36, No 4, Apr 81 (manuscript received after revision 1 Jul 80) pp 22-31

[Article by V. I. Lebedev]

[Text] In recent years, the application of digital methods in processing signals through the introduction of digital filters, analog-digital converters (ATsP) and digital-analog converters (TsAP) has been expanding noticeably and comparatively rapidly. Integrated circuits which make it possible to solve the problems of the reliability, accuracy, size-weight, and cost indexes, are becoming the element base of traditional analog devices.

There are so many types of integrated logic circuits (ILS)* that it is not at all simple to select the needed circuit, especially because it is always interesting to use the most promising element on whose basis large-scale and superlarge-scale integrated circuits (BIS and SBIS) with more than 100 elements in one crystal are created.

These BIS and SBIS, along with simple and medium-scale integrated circuits (SMIS) are used in modern radioelectronic and microelectronic equipment (MEA) intended for digital processing of signals. Therefore, it is practical to speak of an expanded system of elements with identical element base within the system. When selecting standard elements of a system, it is necessary to be guided by certain criteria and properties examined below.

Basic Criteria for Selecting the Element Base. It is advantageous to use the following criteria for preliminary selection:

1. The speed of operation or the time of average delay $t_з$ of a pulsed signal determines the maximum frequency of discrete sampling of an analog signal.

*The handbook [1] alone contains 327 types of microcircuits combined into 48 series of digital IS [integrated circuits] and 32 series of analog IS. The Digital Integrated Circuits, DATA BOOK, 1978/79 lists more than 20,000 digital microcircuits, including operating and outdated circuits.

2. Switching operation $Pt_з$ determines the minimum power $P_{уд}$ per one element with a soundly selected $t_з$ and makes it possible to estimate the number of elements in a microcircuit (degree of integration), $N = P_{корп}/P_{уд}$, where $P_{корп}$ is the permissible power on the IS body.

3. Interference immunity makes it possible to select circuits with the necessary and sufficient margin of interference immunity $U_п$ matched with the level of internal interference, as well as external interference (for ILS).

4. Lasting drift of parameters (aging) is an important criterion under the conditions of long-term operation.

5. By combining linear and digital circuits on one crystal, it is possible to perform a deeper estimation of the prospects of the element base.

It should be said that none of these criteria can be absolute. The problem of selection is complicated also by the necessity of considering such important factors as the level of functional integration (number of functions performed by the homogeneous region of the semiconductor; minimum power determined without limitations on the frequency $F_{т.и}$ of switching, temperature power factor, possibility of obtaining a direct and an inverse output, changes in the average delay per logical function when the number of function performed by the device increases, etc.

The above criteria and factors were taken into consideration in selecting only four types from the known variety of logic circuits.

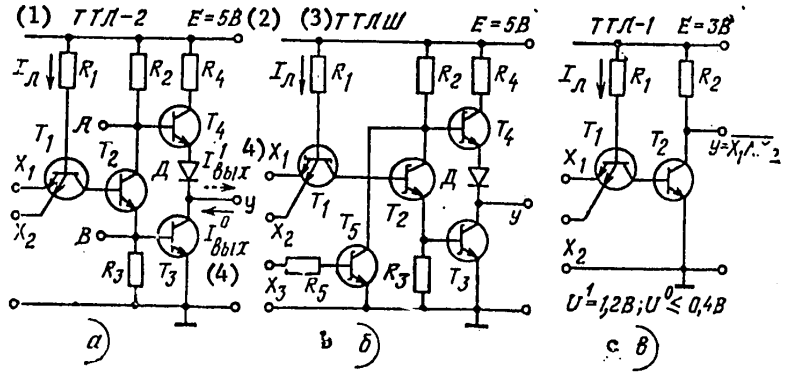


Figure 1

Key: 1. TTL
2. V
3. TTLSh
4. Output

Figure 1 shows transistor-transistor logic circuits (TTL) which are distinguished by their logical flexibility (AND-OR-NOT) a greater load capacity ($n > 10$), and a small value of the output resistance $R^0_{вых} < 100$ ohms. TTL-2 circuit (Figure 1a) has two inverters, T_2 and T_3. When a logic expander (separate microcircuit of the $T_1R_1T_2$-type) is connected to points AB, AND-OR-NOT is obtained; another microcircuit

without T_4, R_4, Д is used for forming a "wiring" OR. Signal levels $U^1 = E-2U_б \geqslant 2.4$ V, $U^0 = U_{КП} \leqslant 0.4$ V. The TTL circuit with Schottky barrier (TTLSh) (Sigure 1b) is characterized by a lower power (or a smaller delay); a circuit with T_5 is used in microprocessors for creating the third logical state -- "output disconnected". The TTL-1 circuit (Figure 1c) has one inverter for reducing the power; it is used in BIS. Its drawbacks are a higher value of $R^1_{ВНХ} = R_2$ and a low interference immunity.

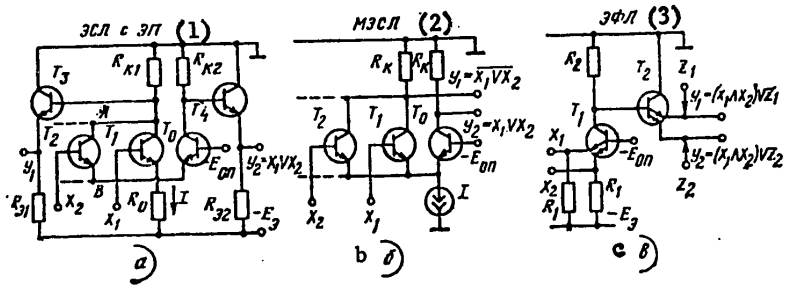


Figure 2
1. ESL s EP [emitter-coupled logic circuit with emitter followers]
2. MESL [small-signal ESL]
3. EFL [emitter-functional logic circuit]

Figure 2 shows emitter-coupled logic circuits (ESL) which are characterized by the highest operation speed ($t_з \leqslant 3$ nc), a comparatively high power ($P \approx 30$ mW per element), and the exsistence of a direct and an inverse outputs. The ESL circuit (Figure 2a) with emitter followers ($t_з \leqslant 1$ ns) performs logical functions OR, OR-NOT, permits logical expansion with respect to OR (in this case, it is necessary to connect a microcircuit-expander to points AB) and "wiring" OR when two ESL microcircuits are coupled at outputs ($R_{ВНХ} < 30$ ohms) through a coupling line. Levels of signals $U^1 = -U_б = -0.8$ V, $U^0 = -2U_б = 1.6$ V, $\Delta U = U^1-U^0 = 0.8$ V. The small-signal ESL circuit (MESL) (Figure 2b) is characterized by a smaller power ($P \leqslant 3$ mW) and a smaller value of $\Delta U = 0.5\,U_б = 0.4$ V at $t_з \approx 3$ ns. It is used in high-speed BIS. The emitter-functional logical circuit (EFL) (Figure 2c) does not contain an inverter (performs functions AND-OR) and is used for creating triggering and registering devices. Levels of signals $U^1 = -U_б$, $U^0 = -1.5U_б$.

Figure 3 gives integrated injection logic circuits (I^2L) with a high degree of integration, a low supply voltage $E \leqslant 1$ V, a broad range of currents $\Delta I = 10^8 \div 10^3$ A, and average operation speed ($t_з < 10$ ns). The standard I^2L-circuit (Figure 3a) performs the functions of "wiring" AND with inversion (as well as OR-NOT); signal levels form in the circuit of I^2L-elements without resistors, $U^1 = U_б$ (0,6÷0,7 V), $U^0 = \varphi_т \ln \frac{1}{\alpha_N} + I_н r_{пол}$ (<0,1 V). The I^2L circuit with Schottky diodes (DSh) at the input (Figure 3b) is characterized by a smaller difference of ΔU (0.4 V) and a higher operation speed. DSh can be connected in the collector circuit for uncoupling load elements. Injection-field logic (IPL) elements (Figure 3c) have a small

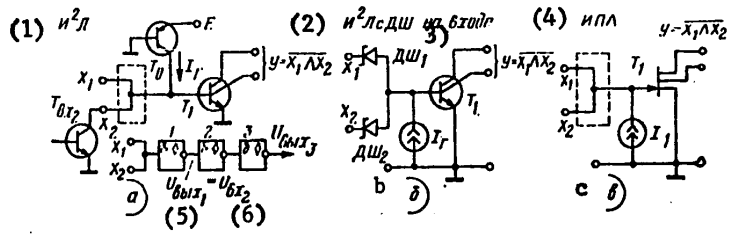


Figure 3

Key: 1. I^2L [integrated injection logic circuit]
2. I^2L with Schottky diodes at the input
3. Schottky diode
4. IPL [injection-field logic element]
5. Output
6. Input

value of $Pt_3 < 0.01$ pJ. However, their area of applications is limited at the present time by micropower devices in connection with the growth of $U^0 = I_H K^0_{вых} R^0_{вых} > 10^3$ ohms) in the milliampere range of current $I_П > 10^{-4}$ A.

It should be mentioned that the injection supply principle is promising not only in I^2L and IPL-circuits, but also in ESL and TTL, which is important for BIS.

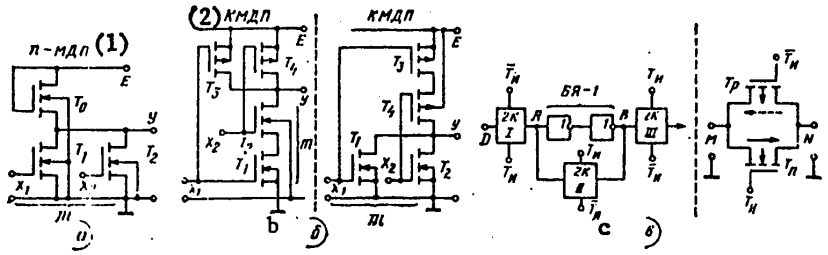


Figure 4

Key: 1. n-MDP [metal-insulator-semiconductor]
2. KMDP [complementary MDP]

Figure 4 shows MDP and KMDP-circuits which are distinguished by the lowest power in the frequency region $F < 1$ MHz, a high load capacity, and noncriticality to voltage E. The logic circuit OR-NOT based on n-MDP structures (Figure 4a) uses a nonlinear resistor T_o. Levels of signals $U^1 = E - U_{пор} \leqslant 8$ V, $U^0 \leqslant U_{пор} \approx 1$ V. The logic circuits AND-NOT (left) and OR-NOT (right) using KMDP-transistors (Figure 4b) make it possible to reduce the power substantially, to increase the degree of integration in BIS and SBIS, and to increase the number of logic inputs AND ($m > 10$). Signal levels $U^1 = E - U^0 \geqslant 8.5$ V, $U^0 < 0.5$ V. KMDP-circuits and two-directional keys (2K) (Figure 4c on the right) are used as a basis for flip-flop circuits. In the half-cycle D-flip-flop (Figure 4c, left), the reception and the delivery of the signal are divided into half-cycles by a discrete feedback circuit (2K II).

Table 1

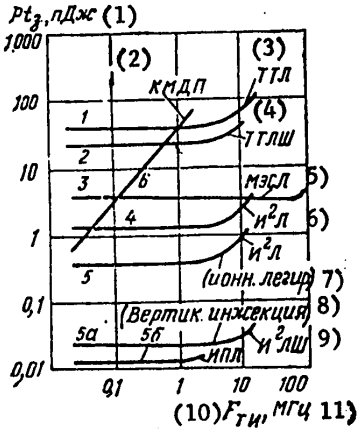
(1) Параметры	(2) Типы логических схем						
	(3) И²Л	(4) МЭСЛ	(5) ЭФЛ	(6) ТТЛШ	(7) КМДП	(8) ТЛНС	(9) ДТЛ
Pt_3, пДж (10)	0,1—1,0	2—5	1—3	30	50 *	400	1300
P_{min}, мкВт (11)	0,03	0,1	0,1	20	0,01	10	30
$\delta U_п = U_п/\Delta U$	0,20	0,45	0,20	0,25	0,45	0,30	0,25
$I_п/I_{ст}$ (ОУП) **	1	1	1	150	10^3	100	150

* At $F_{т.и}$ = 1 MHz

** OUP -- Relative level of current interference in the supply line -- ratio of the amplitude of the pulse current $I_п$ to the static supply current $I_{ст}$.

Key: 1. Parameters
2. Types of logic circuits
3. I^2L
4. MESL
5. EFL
6. TTLSh
7. KMDP
8. TLNS
9. DTL [diode-transistor logic circuit]
10. pJ
11. μW

A short explanation for figures 1-4 is given in the supplement. The results of the calculations of the main parameters of the most promising logic circuits for m = 4, n = 4 are given in Table 1 and in the curves of Figure 5 [3, 4]. It can be seen from the table and the curves that, with respect to the criterion Pt_3, preference should be given to I^2L circuits (then to emitter-functional EFL, small-signal ESL -- MESL, and then to TTLSh). The first place with respect to the speed of operation belongs to MESL-circuits, and with respect to the minimal power -- to KMDP-circuits (then to I^2L and micropower MESL).



Key: 1. pJ
2. KMDP
3. TTL
4. TTLSh
5. MESL
6. I^2L
7. (ionic doping)
8. (vertical injection)
9. I^2LSh
10. IPL
11. MHz

Figure 5

It should be added that the base I^2L-element takes up one half of the area occupied by the KMDP-element, and approximately one fifth of the area in comparison with the TTL-element. Functional integration of I^2L elements is the highest. With respect to the degree of integration, these elements are close to MDP-circuits, which were the main elements of BIS in the course of many years. However, I^2L circuits belong to average-speed circuits ($t_з = 5 \div 10$ ns). TTLSh-circuits are used most widely in other devices of average operation speed ($t_з = 5 \div 20$ ns) and average level of integration. Their logical flexibility, which is due to multiple emitter input transistors, the possibility of combining simple one-inverter (Figure 1c) and complex two-inverter (Figure 1a) elements in one crystal, as well as their wide use in REA [radio electronic equipment], explain the fact that developers of SMIS and BIS are oriented toward the TTL basis. However, the desire of the supporters of this basis to use it in the areas of high operating speed has led to the complication of the TTL-element, which is already complicated and has two and three series-connected p-n-junctions (in T_1,T_2, T_3 in Figure 1a), a relatively large value of the logic signal $\Delta U > 2$ V, and a supply voltage of $E = 5$ V.

The TTLSh-circuit (Figure 1b) has three stable equilibrium states ("1", "0" and "disconnected"). The "disconnected" state is obtained when T_5 is saturated, i.e., when the signal $X_3 = 1$ is delivered. In this case, T_4 and T_3 are turned off and information signals X_1, X_2 do not act upon the output. Consequently, it is possible to connect to this output other analogous TTLSh-circuits in one of which $X_3 = 0$, which makes it possible to transmit information to the load through the common main line, i.e., to realize the function of the "wiring" OR.

The TTL-1 circuit (Figure 1c) has only one inverter T_2, which reduces the power $P_{уд}$ and leads to an increase of $\sqrt{}$. However, the delay time in this case increase due to the increase of the output resistance $R^1_{вых} = R_2$. The DTL circuit is intended for working in REA with a higher margin of interference stability $U_п$ which is determined by the voltage on the displacement diodes and the number of these diodes. However, the greater is the $U_п$, the slower is the operation speed and the greater is the switching operation Pt_3.

The development of high-speed systems is conducted primarily with ESL elements which have $t_3 \leqslant 3$ ns and switching operation $Pt_3 \leqslant 5$ pJ.

Let us examine the dependence of Pt_3 on the circuit parameters using MESL-element as an example (Figure 2b). Considering that $P = EI$, $t_3 = R_K C_п$, $\Delta U = IR_K [\alpha - n(1-\alpha)]$, we obtain

$$Pt_з = E\Delta U C_п/[\alpha - n(1-\alpha)], \tag{1}$$

where

$$C_п = mC_в + n(C_в + C_к);$$

α -- current transmission factor of the emitter. It follows from (1) that, in order to reduce Pt_3, i.e., to reduce the power P at a prescribed speed of operation, it is necessary to reduce the supply voltage E and the value of the logic signal ΔU, as well as to bound at the top the number of loads n and inputs m. These conclusions were formulated earlier in work [4] and were confirmed in the series production of a microprocessor set using MESL and EFL-elements with $E = 2$ V [5] and

matrix BIS in the same basis. Analysis of the formulas for Pt3 obtained in [2] for other promising elements shows that the conclusion about the expediency of lowering E and ΔU in application to BIS is general. In other words, for digital processing of signals, it is necessary to select a small-signal and low-power element base, i.e., I^2L and MDP structures for medium and MESL for high operation speed.

In the area of low frequencies ($F_{т.и} \leq$ 1 MHz) and very low power levels ($P_{СТ} \leq$ 0.01 μW), KMDP-circuits are most effective. The development of circuits using MDP-structures progressed from p-channel through n-channel to KMDP (Figure 4b, c). In the latter, the combination of mutually supplementing p and n-channel transistors ensures a near-zero static power $P_{СТ} = EI_{УТ}$. When the switching frequency $F_{т.и}$ increases, the dynamic component of power begins to increase, being equal to

$$P_{дин} = E^2 (C_{вх} + C_м) F_{т.и} + E I_{скв} t_ф F_{т.и}, \quad (2)$$

where $C_{ВХ} = nC_{ВХ0}$ -- input capacitance of n load elements; $C_м$ -- gate, drain and circuit capacitance; $I_{СКВ}$ -- value of the current through both transistors of the key KMDP-circuit; $t_ф$ -- buildup time of the front of the output signal.

Power $P_{ДИН}$ is determined, first of all, by the recharge of the capacitance $C_{ВХ}$, from which it follows that the load capacity of KMDP-circuits depends on the frequency $F_{т.и}$:

$$n = \left(\frac{0{,}3 P_{зап}}{E^2 F_{т.и}} - C_м\right) / C_{вх0}. \quad (3)$$

Calculations by (3) indicate that, at E = 9 V, $F_{т.и}$ = 1 MHz, it is possible to obtain n = 10, while $n_{СТ}$ = 100.

In order to improve the operational characteristics and widen the frequency range, intensive studies are being conducted on new MDP-structures having smaller capacitances $C_{ВХ0}$ and a shorter channel length (D-MDP and V-MDP) [6]. KMDP-circuits with a lower supply voltage (E = 1.2 ÷ 1,5 V in microcircuits of the types K512 PS-2 and K512 PS-3 [7]) are also being developed and introduced. It should be stressed that bipolar and MDP-circuits do not exclude, but supplement one another, broadening the operation efficiency ranges of digital devices with respect to power and frequency. There exist devices in which the best properties of bipolar and MDP-circuits are combined. These are, for example, OZU [immediate-access memory] with MDP-memory matrix ensuring a low average power, and with ESL periphery (recording and reading amplifiers) ensuring a high operation speed in selecting information from the OZU crystal.

New Generation of Integrated Circuits. The composition of the series of integrated circuits is being expanded steadily by using circuits with greater numbers of components in the crystal from several dozens (IS) to hundreds (SMIS) and thousands (BIS and SBIS).

The four types of elements discussed above (TTL, ESL, I^2L, MDP) were used as a basis of the third and fourth generations of integrated circuits: BIS and SBIS. A considerable set of functions in these complex devices is performed by two methods:

1) matrix method of the organization of standard electronic assemblies in one crystal. Logic, trigger, register, adding, forming, and other circuits arranged in one crystal in statistically substantiated numbers are connected with one another according to customers' drawings during the stage of final metalization (the width of the metalization line characterizes the level of technology and decreases from 20 μm to 2-5 μm, as well as to fractions of μm). The matrix set of standard assemblies covers the set of functions used in practice due to the definite redundancy of the elements part of which is not always used;

2) the functional method, which is distinguished by a more limited, although not small, set of functions, but lesser redundancy. This method was realized in microprocessor sets (MPN) which contain: a central processor element performing arithmetical and logical operations; a microprogram control unit; a multimode buffer register; PZU [permanent storage], OZU, and other microcircuits. The distinguishing characteristics of MPN are as follows: a) the possibility of performing various tasks by means of programmed, and not instrument, retuning of the MP [microprocessor]; b) the modular principle of building up the number of processor elements, i.e., of increasing the number of digits and, accordingly, the accuracy; c) the main-line principle of transmitting information signals, i.e., the use of a limited number of microcircuit terminals for transmitting through each one of them a certain set of different information and address signals distributed in time. It is useful to note that a microprocessor is only a part of a microcomputer, its component designed in the form of a BIS and intended for processing digital information. These components are connected with the aid of ILS compatible with respect to the levels of logical one-output U^1 and zero-output U^0 signals. Consequently, integrated circuits of different generations supplement each other at the present time and must be considered jointly in this sense.

Table 2 shows the main properties and parameters of promising integrated circuits which were used as a basis for developing microprocessors. For example, [8] TTLSh was used as a basis for developing K589-type MP; I^2L -- for K582 and K584-type MP, KMDP -- for K587-type MP, n-MDP -- for K582-type MP.

I^2L-circuits were developed later than other IS, when it became necessary to satisfy the needs of BIS. Therefore, the third column of the table shows only the microprocessor (K584), although designs for particular uses contain I^2L-circuits of lower levels of integration, such as registers, frequency dividers, decoders, and others. The four-digit microprocessor K584 includes 1500 I^2L-elements, its power consumption is 750 mW (20% of this power is scattered in the crystal, and the remaining part -- in the external supply circuit); it works on a clock frequency of 1 MHz. Operation types are controlled by means of a 9-digit control word. The average time of operation performance is $\sim$ 1 μs. Eight and sixteen-digit MP in the I^2L-basis have been developed. Along with their advantages [technological effectiveness, low supply voltage (E_{min} = 0.7 V), wide range of operating supply currents (over 4 orders) and operating temperatures (Δ T = -60 $\div$ +125 degrees C)], the following disadvantages should be mentioned: a relatively low operating speed ($F_{T.И}$ = 1 MHz). Their low operation speed is due not only to the peculiarities of the element base, but also to the main-line principle of successive transmission of signals, which is characteristic of microprocessors as a whole [9]. For example, in the fastest MPN of the MS-10800-type, the frequency in the ESL basis $F_{T.И}$ = 20 MHz, while the switching frequency of the ESL of the triggers exceeds 350 MHz. The frequency

Table 2

Chatacteristics	Types of IS (and BIS)			
	TTL 100,500	ESL 133, K155	I^2L K584	KMDP 164, K176
Composition of series of integrated circuits (IS)	Logic elements AND-NOT, AND-OR-NOT, triggers, counters, registers, decoders, adders, OZU, PPZU [programmed permanent memory], a total of 42 types of microcircuits	Logic elements OR-NOT, OR, resistor assemblies, triggers, counters, registers, AU, OZU, PPZU (a total of 44 types of microcircuits)	Microprocessor set (ALU [arithmetic logic unit] + PLM, OZU, PZU...). MP contains triggers, registers, multiplexers as components of MP	Logic elements OR-NOT, AND-NOT, level translators, triggers, counters, registers, frequency dividers, decoders, OZU (a total of 28 types of microcircuits)
Logic potentialities	Logic expansion with respect to OR, "wiring" OR in TTL circuits with open collector, main-line principle in MP of K589	Logic expansion with respect to OR, "wiring" OR at emitter-follower outputs; two and three-step logic in MESL; MP of the MS10800-type	Microoperations: addition, subtraction, multiplication, division, conjunction, disjunction, exclusive OR, transition	Two-directional signal transmission in the keys and MP of the K587 type
Switching frequency of trigger circuits $F_{т.и}$, MHz	25	350	10	1
Power per logic element P, mW(at $F_{т.и}$= MHz)	10-15	30-30	0.1	$P_{дин} \sim F_{т.и}$; $P_{ст} < 10^{-5}$
Levels of logic signals U^1, U^0, V/V	2.4/0.3	-0.8-1.6	0.6/0.1	8.2/0.3
Supply Voltage E, B	5±5%	-5±5%	2-10	9±5%

potentialities of the element base are used more effectively in programmed logic matrices (PLM) [10], whose examination is an independent problem.

Conclusions

1. The element base for devices of digital processing for signals is selected with consideration for the technological efficiency on the basis of such particular criteria as speed of operation, switching operation Pt_3, and interference stability.

2. The most promising elements include elements which have the lowest switching operation Pt_3 in a prescribed frequency range. They are characterized by: a small value of supply voltage $E = 2 \div 3$ V, a small value of the logic signal $\Delta U = 0.2 \div 0.4$ V, the use of mutually supplementing transistors in resistorless circuits, the existence of a direct and an inverse outputs in one element.

3. The following are the most suitable and promising in the near future:

I^2L-circuits distinguished by the lowest value of $Pt_3 \leq 0.1$ pJ, the highest functional integration, a unique range of supply current (10^{-8}-10^{-3}) A, and the possibility of increasing the speed of operation from the average value ($t_3 = 10$ ns) to the highest ($t_3 = 2 \div 5$ ns). I^2L-circuits are technologically compatible with linear IS;

MESL-circuits with the highest operation speed ($t_3 < 3$ ns) in working in the area of weak saturation of the transistors, low signal level ΔU and supply voltage $E < 3$ V, branching logic in multistep circuits, compatibility with emitter-functional and emitter-follower logic circuits. By using the ESL basis, linear amplifiers were obtained with a threshold frequency of $f_{в.гр} \geq 300$ MHz with the amplification factor $K_0 = 5$ for a three-element cell;

KMDP- and n-MDP-circuits having the lowest static power $P_{СТ} < 0.01$ μW, noncriticality to supply voltage, a high integration, directly proportional dependence of the dynamic power and the Pt_3 factor on the switching frequency. It is planned to switch from a relatively low operation speed ($F_{т.и} = 1$ MHz) to a medium speed and later to a high speed;

TTLSh-circuits, which are characterized by the greatest variety of circuit engineering designs, the possibility of combining them with other types of ILS, and medium operation speed ($t_3 = 5 \div 20$ ns). Topological and energy limitations (4-8 components in one element, $Pt_3 \approx 30$ pJ) make it difficult to use the TTL basis widely in BIS and especially in SBIS.

These difficulties are overcome by introducing the principle of injection power supply not only in I^2L, but also in TTL and ESL bases.

4. The above four element base types are used: a) in the form of simple and medium-scale microcircuits (SMIS) for creating microelectronic and radioelectronic equipment; b) in microcircuits of the new generation -- matrix and microprocessor BIS. When creating devices on the basis of matrix BIS it is necessary to establish electrical coupling between the base elements of the crystal in accordance with the

prescribed function for performing final metalization. When creating microprocessor-type devices, along with BIS, series-produced IS and SMIS (most frequently in the TTL basis) should be used.

Supplement

Brief Explanations for Figures 1-4

1) TTL-circuits (Figure 1a, c) are switched from state 1 to state 0 at the output at $X_1 = X_2 = \ldots = X_m = 1$. The TTLSh circuit (Figure 1b) has three states: 1, 0, and "off". The "off"-state at $X_3 = 1$ is necessary for transmitting signals to the common main line bus from other TTLSh-circuits combined with the given circuit with respect to the output.

2) ESL-circuits (Figure 2a, b) operate when the current I is switched from the transistor T_0 to the information transistor (T_1 or T_2) under the effect of the signal $X_1 = 1$ or $X_2 = 1$. In the basic ESL-circuit (Figure 2a), two microcircuits are connected to the common load for the logic function "wiring" OR. MESL circuits (Figure 2b) operate without EP in the mode of weak saturation ($S < 1.1$) of the transistors at E = 2.4 V; it is permissible to include additional logic stages operating from one source of current I. EFL-circuits (Figure 2c) in the chain form a current switch analogous to T_0, T_4 (in Figure 2a); the operation speed of EFL is high because there is no inverter. In the trigger circuit, F = 500 MHz was obtained. On the basis of an odd number of ESL circuits (Figure 2a) covered by OOS [negative feedback), linear amplifiers were obtained with $f_{в.гр}$ 300 MHz, $K_U = 5$.

3) I^2L-circuits (Figure 3a, b) contain a p-n-p-injecting transistor (T_0) and an n-p-n-inverting transistor (T_1) combined with it; I^2L is switched from state 1 to state 0 at the output at $X_1 = X_2 = \ldots = 1$, when the injection current flows into the base region T_1, saturating it. The logic function "wiring" AND does not require any increase in the number of transistors when the number of inputs is increased. Modifications of I^2L with Schottky diodes at the input (Figure 3b) and at the output have a higher operation speed. The injection-field logic IPL (Figure 3c) is based on the modulation of the width of the vertical channel T_1 under the effect of the injection current I_1 controlled by the input signals; at $X_1 = X_2 = \ldots = X_m = 1$, the current is switched to T_1 and shifts the p-n-junction in the forward direction, opening the channel in such a way that signal Y = 0 forms at the drain.

4) KMDP-circuits (Figure 4b, c) contain resistorless keys using mutually supplementing transistors T_1, T_3 (T_2, T_4); for the AND-NOT circuit, at $X_1 = X_2 = \ldots X_m = 1$, T_1 and T_2 switch on along the gate, and T_3 and T_4 close in such a way that current $I_{CT} \approx 0$, and signal Y = 0. Residual voltage $U^0_{вых} < 1$ mV (in [1] this value is given with a margin $U^0_{вых} \leq 0.3$ V). In D-triggers (Figure 4a), along with simple keys, two-directional keys (2K) are used, realizing a discrete feedback.

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DIGITAL TECHNIQUES IN COMMUNICATIONS

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[Annotation, authors' foreword, editor's foreword and table of contents from book "Digital Techniques in Communications", by Emanuyel Prager, Bogumil Shimek and Victor Petrovich Dmitriyev, translated from Czech by E. A. Sultan-Zade, edited by V. V. Markov, Izdatel'stvo "Radio i svyaz'", 7000 copies, 280 pages]

[Text] The authors present the basic principles of using digital techniques in some areas of communication. Individual chapters treat analog-digital conversion, basic characteristics of digital transmission systems and digital techniques used in satellite communication systems. Special attention is given to the use of digital techniques in telephone stations and communication networks, as well as to the problems of data transmission. The book was written jointly with Czech specialists.

This book is intended for engineers and technicians engaged in the development and operation of digital communication systems.

Authors' Foreword

Up to the present time, low-frequency technique was used in rural communication networks and a high-frequency technique was used in the networks of higher levels. This structure was connected primarily with the transmission of voice signals -- telephone conversations.

With the increasing volume of the transmitted information of nonvoice signals and the development of digital techniques, there arose the desire to use these principles and solutions in transmission and switching systems. It is natural that this desire meant for some communication sectors (for example, techniques of telephone stations) to give up the use of electromechanical switchboards.

On the basis of the digital techniques, there developed an independent area of digital transmission for multiple use of communication lines. Digital techniques started being used gradually for switching at telephone stations. Classical methods of digital-analog conversion, IKM [pulse-code modulation], as well as some other methods, for example, various kinds of delta-conversion, are used. So far, both main directions of communication, i.e., transmission and switching techniques, are developing independently, although identical principles and solutions are used in some cases.

In the future digital technique can lead to further modernization and increased economy of communication networks due to the integration of the transmitting and switching equipment in a single complex system. This task is promising and can be realized at the present time. At the same time, there is a tendency toward the unification of the telephone, telegraph, and data transmission networks and later image transmission networks into a single network with the purpose of integrating all communication services.

The book presents the fundamental principles of the applications of digital technique in communications. Individual chapters deal with the basic characteristics of the analog, digital-methods of conversion, principles of multichannel digital transmission systems, and the use of digital technique for switching and controlling promising telephone stations and communication networks, as well as with the problems of data transmission through digital channels.

One of the important areas of application of digital technique for transmitting voice and nonvoice information is communication through artificial earth satellites. A separate chapter deals with this area of communication.

The size of the book makes it possible to give only basic ideas about digital technique of communication and to map out further ways of its development. We should not disregard the tremendous effect of microelectronics on the development of digital technique, due to which it was possible in many instances to develop systems whose principles have been known already for a number of years.

The book is intended for engineers, technicians and scientists engaged in the development and operation of digital communication systems and can be useful also to students of institutes and teknikums in these areas.

The authors hope that this book will expand the information of the readers about this area of engineering and will thus contribute to its further development.

Editor's Foreword

Successful activities of modern human society are impossible without communication exchange. Regardless of where people have to work, exchange of communications among them is the basis of the organization of their activity.

Due to a number of reasons, in the second half of the twentieth century there appeared a necessity of scientific organization of exchange of communications. One of the main reasons is the fact that modern production has become so complicated and developed that, in order to control it, it is necessary to create automatic control systems using electronic computers (EVM). Formerly, electric communication systems ensured the transmission of information between people, but the introduction of EVM changed the situation in the part of the required types of communication. There appeared the need in the following types of communication: "man -- EVM" and "EVM -- EVM". This led to extensive transmission of information in the digital form, which is adapted the best for its introduction to EVM.

The tendency to using digital methods in the electric communication technique is explained not only by the wide applications of EVM. Transmission of information in

the digital form has a number of substantial advantages in comparison with its transmission in the analog form. The following are the main advantages:

wider possibilities of combining and processing different types of information converted into the digital form, since it is universal;

higher interference immunity of digital signals;

possibility of the regeneration of digital signals, which makes it possible to obtain high quality of transmission regardless of the length of the line and the number of intermediate stations;

possibility of the isolation, input and switching of information at intermediate stations in the digital form without any loss of quality;

stability of the parameters of channels formed with the aid of digital systems and the absence of the effect of overloading, which improves the quality of transmission in a switched communication network;

possibility of using standard, reliable and inexpensive integrated circuits, which decreases considerably the cost of the switching and multiplexing systems which are determining in the cost of the entire system;

greater effectiveness of the transmission of telegraphic signals and data signals in comparison with their transmission through analog channels.

It should be added that modern communication systems use such means of transmission as waveguide and optical-fiber communication lines, through which the transmission of signals can be the most optimal in the digital form.

The flow of digital information through communication systems is growing progressively. At the same time, the flow of analog information is also growing. In this connection, several ways are possible for designing systems intended for transmitting both analog and digital information flows.

The first path is the use of universal tracks and channels formed by standard systems with frequency division of channels. In this case, analog signals are transmitted by the usual method without additional conversion; digital information is transmitted through the same tracks equipped with adaptive harmonic correctors.

The second way is to transmit the conversion of all types of analog systems into digital signals and their transmissions through channels of wide-band systems in conjunction with digital information obtained directly from data transmission facilities.

The third way of constructing digital systems provides for a general nature of converting analog information into digital information in the communication sources themselves (for example, in a telephone set). In such a system, only switching, unification and division of digital information is realized.

Naturally, the first path was used first when it was necessary to transmit large flows of digital information. But this path was relatively low-effective. In this

connection, at the present time the development of communication systems progresses according to the second path. Therefore, books treating the basic principles of transmitting and switching digital signals are very important.

The publication of the book "Digital Techniques in Communications" written jointly by Soviet and Czechoslovak specialists is very timely. E. Prager is known to Soviet specialists as one of the authors of the book "Electronic Telephone Stations" which was translated and published by the publishing house "Svyaz'" in 1976.

So far, speech analog information is the initial information in most cases. When it is transmitted through digital channels, it must be converted into a digital form; inverse conversion is performed during reception. Here, an important role is played by analog-digital converters of various types. Problems of such conversion in application to speech signals, namely IKM [pulse-code modulation] conversion and delta-conversion are treated in Chapter 1 of the book.

In most cases digital channels are used for multichannel transmission of messages. In this case, time consolidation and separation of signals is used. These problems are also examined in Chapter 1. Apart from speech signals, digital channels are used for transmitting other analog information, such as radio broadcasting signals and wide-band signals of equipment with frequency division of channels. Problems of the transmission of such signals, as well as data signals, are discussed in Chapter 2. Chapter 3 deals with general principles of designing equipment with IKM and delta-modulation. The hierarchy of digital systems is discussed in Chapter 4. Communication lines for transmitting digital signals, namely cable, radio-relay, waveguide and optical fiber lines, are touched upon in Chapter 5 which is descriptive in nature. Readers wishing to familiarize themselves with these problems in more detail should refer to the appropriate literature.

A specific case of multichannel transmission of information in the digital form occurs in satellite communication systems. The satellite retransmitter is used by all earth stations of a given satellite communication system. Therefore, there arises the problem of multistation access, i.e., selection of a transmission and retransmission method ensuring a minimum of interstation interference and the highest effectiveness of the system as a whole. An important characteristic of the digital satellite communication system is its interference immunity at great lengths of intervals and limited power resources aboard the satellite. Interference immunity can be increased, for example, by using an interference-proof coding. All these problems, as well as the methods of linking ground and satellite communication lines are discussed in Chapter 6.

The remaining chapters of the book (7-10) deal with the switching of digital signals. Apart for the principles of switching, special attention is given to program control (including centralized control) of switching processes with the aid of controlling computers. These problems are examined with consideration for the creation of integrated digital systems and communication networks. Digital methods of transmitting control and interaction signals, as well as problems of transmitting and switching data signals, are also touched upon.

Comprehensiveness and descriptiveness are the distinctive characteristics of this book. It touches upon almost all problems of the applications of the digital

technique in information transmission systems. In this respect, this book is, to a certain degree, a reader and is very useful for acquiring a general knowledge of the problems of digital communication systems.

Chapters 1-5 and 7-10 were written jointly by E. Prager and V. Shimek. They were translated by E. A. Sultan-Zade. Chapter 6 was written by V. P. Dmitriyev. The bibliography was supplemented by the editor with Russian language publications. See List of Additional Bibliography.

Comments on the book are to be addressed to Izdatel'stvo "Radio i svyaz'", 101000, Moscow, Main Post Office, P.O. Box 693.

Contents

10,233
CSO: 1860/233

UDC 621.391.2:621.396

PROBLEMS OF RECEIVING AND PROCESSING SIGNALS FROM RADIO ENGINEERING SYSTEMS

Leningrad IZVESTIYA LENINGRADSKOGO ORDENA LENINA ELEKTROTEKHNICHESKOGO INSTITUTA IMENI V. I. UL'YANOVA (LENINA): PROBLEMY PRIYEMA I OBRABOTKI SIGNALOV RADIOTEKHNICHESKIKH SISTEM in Russian No 265, 1980 pp 137-148

[Abstracts for 36 articles from collection "Proceedings of Leningrad Electrotechnical Institute imeni V. I. Ul'yanov (Lenin): Problems of Receiving and Processing Signals from Radio Technical Systems", 148 pages]

UDC: 621.391.2

BINARY SEQUENCE SEARCH WITH MINIMAL SIDE LOBE SUPPRESSION LOSSES

[Abstract of article by V. P. Ipatov, Yu. A. Kolomenskiy and O. I. Kornilov]

[Text] This article examines problems involved in simulating binary signals which are optimal in terms of the criterion of minimum side lobe suppression losses. A program flow chart and results of the similation are presented. 1 illustration, 1 table, 4 bibliographic references.

UDC: 621.396.96

APPLICATION OF ORDER STATISTICS FOR PROCESSING RADAR SIGNALS

[Abstract of article by V. N. Smirnov]

[Text] This article examines singularities of the use of order statistics for measuring non-energetic signal parameters. It is shown that the factors which reduce estimation efficiency are sampling nonuniformity and random numbers of elements in the variation series. 3 bibliographic references.

UDC: 621.391.2

ADAPTIVE SIGNAL CLASSIFICATION ALGORITHM

[Abstract of article by G. M. Yefimov and L. Ya. Novosel'tsev]

[Text] The problem of classifying a set of observations under conditions of a priori indefinition with respect to the noise distribution parameters is

examined. Procedure characteristics found using the Monte Carlo method are presented. 1 illustration, 4 bibliographic references.

UDC: 621.396.985

ANALYSIS OF CLUSTERED MODEL OF TRACKING INSTRUMENT WITH SEARCH AND MONITORING

[Abstract of article by A. V. Adamchuk, V. M. Katikov and L. N. Medyntsev]

[Text] A discrete measuring device is analyzed which contains a tracking system, search device and monitoring detector. Expressions are derived which can be used to estimate the degree of influence of the characteristics of various sections of the measuring system on the measurement accuracy. 3 illustrations, 3 bibliographic references.

UDC: 621.376:621.396.986.4

INSTRUMENTAL ACCURACY OF PHASE MEASUREMENTS

[Abstract of article by I. M. Samoylov]

[Text] A comparative estimate is given for the influence of nonlinearity of the receiving section on the instrumental accuracy of phase measurements for various methods of determining the phase of the high frequency carrier of a signal. 2 illustrations, 1 bibliographic reference.

UDC: 621.396.969.18

MICROPROCESSOR IMPLEMENTATION OF SEARCH MODE IN DIRECTION-FINDING SYSTEM

[Abstract of article by V. V. Selivanov, S. V. Starygin and V. N. Timofeyev]

[Text] This article examines the singularities of organization and construction of the search mode in a microprocessor-based direction-finding system. The functional diagram of the hardware of the system is described, and a flow chart of the data processing program in the search mode is provided. 2 illustrations, 2 bibliographic references, 1 table.

UDC: 396.98.021

AUTOMATED SELECTION OF METHOD FOR DETERMINING COORDINATES IN CLOSE-RANGE RADIO NAVIGATION SYSTEM

[Abstract of article by V. I. Myasinkov and Yu. S. Yurchenko]

[Text] This article investigates the operating modes of a short-range radio navigation system with several beacons, and determines areas in which the ranging mode should be used. An algorithm is described for automatically selecting the direction-ranging or ranging modes. 2 illustrations, 2 bibliographic references.

UDC: 621.396.98.021

STABILITY OF INTERACTIVE OPERATION OF SEVERAL TRANSMITTERS AND RECEIVERS

[Abstract of article by N. N. Baskakov, V. K. Orlov, A. G. Chernyavskiy and V. I. Shlomin]

[Text] This article examines the loading of transmitters in a system of transmitting stations which are exchanging information with one another in the presence of intra-system and chaotic pulse noise. It is shown that when N transceivers are operating there is a load stability threshold. 5 illustrations, 2 bibliographic references.

UDC: 629.7.054.058.45

METHOD FOR DIGITAL SIMILATION OF DOPPLER SPECTRUM

[Abstract of article by V. A. Isayev]

[Text] One possible method of digital Doppler spectrum similation based on using a digital phase converter is examined. 2 illustrations, 4 bibliographic references.

UDC: 621.396.96

STATISTICAL MODELING OF KALMAN FILTER ERRORS IN PRESENCE OF MEMORY LOCATION FAULTS

[Abstract of article by Yu. N. Volovik, Yu. P. Grishin and L. V. Yefimov]

[Text] The statistical modeling method is used, for a second-order Kalman filter, to estimate the influence of faults in memory locations storing the values of the filter transmission matrix elements on the accuracy of the estimation. The precision characteristics of two different filter implementations are compared. 2 illustrations, 2 bibliographic references.

UDC: 621.396.96

THE PROBLEM OF SELECTING RECURSIVE FILTER COEFFICIENTS

[Abstract of article by A. V. Solov'yev and A. V. Titov]

[Text] This article examines a method of calculating the coefficients of a simple digital resonator based on identity of the impulse responses of the digital resonator and an analog prototype. 2 illustrations, 3 bibliographic references, 1 table.

UDC: 621.396.96

DIGITAL FILTER

[Abstract of article by A. V. Pochekayev]

[Text] This article presents a circuit for a nonlinear digital filter for automatic frequency tracking systems. 2 illustrations, 2 bibliographic references.

UDC: 681.06

CONSTRUCTION OF TESTS FOR DEVICES REALIZED IN SOFTWARE

[Abstract of article by V. V. Danilov and F. V. Filippov]

[Text] This article examines the problem of constructing tests for automata implemented in software. 4 bibliographic references, 1 table.

UDC: 007.52

ONE METHOD FOR REDUCTION OF AUTOMATA

[Abstract of article by A. N. Zhirabok and B. P. Podkopayev]

[Text] This article examines the problem of reduction of a fully defined automaton from the position of the mathematical apparatus of the algebra of pairs. An analytical division expression is derived which is used to reduce the automaton, and a reduction procedure is proposed. 4 bibliographic references.

UDC: 62-507.019

FUNCTIONAL DIAGNOSIS OF DIGITAL DEVICE WITH LIMITED INFORMATION REGARDING STATE VECTOR

[Abstract of article by N. V. Kolesov]

[Text] This article examines questions involved in synthesizing a testing automaton which executes functional diagnosis of a given digital device with limited information regarding the state vector. 3 bibliographic references.

UDC: 519.2 621.396.96

A GENERALIZATION OF ERLANG'S FORMULAS

[Abstract of article by V. G. Chernolesskiy]

[Text] A queueing system is examined. Erlang formulas are found for calculating the probabilities of the states of the queueing systems. The probability of failure to service requirements is found, as is the average number of channels involved in servicing requirements of both types. 1 illustration, 4 bibliographic references.

UDC: 621.361

TABLE OF PRIMITIVE THIRD-DEGREE POLYNOMIALS

[Abstract of article by Ye. N. Yevstaf'yev and B. Zh. Kamaletdinov]

[Text] This article presents results concerning the tabulation of primitive third-degree polynomials over Galois fields of order n=II. 1 illustration, 5 bibliographic references, 1 table.

UDC: 621.391.2

DETECTION OF MULTIFREQUENCY SIGNALS

[Abstract of article by V. M. Frolushkin]

[Text] Optimal invariant rules are obtained for detecting non-fluctuating multifrequency signals against the background of noise of unknown intensity. The effectiveness of the rules is shown. 6 bibliographic references.

UDC: 621.391

MODELING OF DIGITAL SIDE-LOBE SUPPRESSION FILTER

[Abstract of article by S. N. Britin and A. Ye. Nazimok]

[Text] This article contains the results of modeling digital side-lobe suppression filters based on BPF [explanation not given]. 3 illustration, 6 bibliographic references.

UDC: 621.391.2

RNM UNBIASED SIGNAL DETECTION RULE

[Abstract of article by V. N. Vasyukov]

[Text] An unbiased RNM [expansion not given] rule is synthesized for detecting the signal in a multichannel receiver. The probability of correct detection is found as a function of the useful parameter. 1 illustration, 2 bibliographic references.

UDC: 621.391.2

CONTRAST DETECTION OF SIGNAL WITH UNKNOWN FREQUENCY SELECTIVE FADING

[Abstract of article by A. I. Savina]

[Text] This article examines a two-step rule for contrast detection of a signal with frequency-selective fading which satisfies the requirements of invariance

with respect to a priori unknown parameters of the frequency selective fading and noise spectrum. 3 bibliographic references.

UDC: 621.391.198

STABLE ALGORITHM FOR DETECTING ASYMMETRY FEATURE OF SPEECH SIGNAL

[Abstract of article by V. N. Prokof'yev and L. D. Smirnov]

[Text] A two-step algorithm for detecting the asymmetry feature of a speech signal is examined. The false alarm probability is fixed, and does not depend upon the type of noise distribution. 2 bibliographic references.

UDC: 621.396.43

ESTIMATION OF NOISE TOLERANCE OF SATELLITE RADIO LINKS WITH STRUCTURAL MULTIPLEXING

[Abstract of article by V. S. Gutin]

[Text] This article examines a satellite communication system with structural multiplexing and complex phase-modulated signals. An expression is derived which describes the noise tolerance of the link and yields the connection between the energy characteristics of sections of the link, the base of the phase-modulated signals and the number of simultaneously transmitting earth stations. 7 bibliographic references.

UDC: 621.396.49

ESTIMATION OF CORRELATION OF SYSTEM NOISE IN ASYNCHRONOUS COMMUNICATION SYSTEM

[Abstract of article by V. A. Bol'shakov and K. Yu. Kolomenskiy]

[Text] It is shown that in asynchronous communication systems with independent identical recurrent streams of subscriber transmissions the correlation coefficient of the number of superimpositions of noise pulses on two different signal pulses is independent of the number of subscribers in the system. 1 illustration, 2 bibliographic references.

UDC: 621.391.254

METHOD FOR CALCULATING ENERGY GAIN FROM CASCADE CODING

[Abstract of article by Yu. A. Stankevich]

[Text] A method is presented for estimating the energy gain from using a cascade code as compared with nonredundant coding. 3 bibliographic references.

UDC: 621.391.254

ENERGY GAIN OF BLOCK CODES WITH MAJORITY DECODING

[Abstract of article by Ye. V. Pustygin]

[Text] A formula is derived for calculating the energy gain of majority-decoded block codes. A graph of the maximal energy gain as a function of the error probability at the decoder output is given. 1 illustration, 1 table, 2 bibliographic references.

UDC: 621.396.96

SOME FEATURES OF POLARIZATION CHARACTERISTICS OF IONOSPHERIC RADIO WAVES

[Abstract of article by L. A. Zhivotovskiy]

[Text] The graphic apparatus of spherical trigonometry is used to provide a qualitative analysis of the polarization characteristics of short radio waves, which demonstrated in principle the possibility of using these characteristics for identifying communications channels. 4 illustrations, 6 bibliographic references.

UDC: 621.3.011.7

NOISE PARAMETERS OF PHYSICAL EQUIVALENT NOISE CIRCUITS

[Abstract of article by N. V. Terpugov]

[Text] Solutions are presented for the noise parameters of transistors obtained on the basis of data from equivalent physical noise circuits. The analysis uses the spectral method. 3 illustrations, 5 bibliographic references.

UDC: 621.372.58.018.783

EQUIVALENT INDUCTANCE AS FUNCTION OF NONLINEAR DISTORTIONS IN GYRATOR

[Abstract of article by V. M. Shilkov]

[Text] The relationship between the equivalent inductance simulated by a capacitively-loaded gyrator and the coefficients of the harmonics of the dependent current sources forming the gyrator is found. 1 illustration, 3 bibliographic references.

UDC: 621.3.049.77

CALCULATION OF TEMPERATURE DRIFT OR MIS MICROCIRCUITS

[Abstract of article by V. N. Galkin]

[Text] Formulas are derived for calculating the temperature drift of integrated single-input and double-input differential amplifier stages as a function of the temperature properties of the specific slope and threshold voltage of the structures. 1 illustration, 1 bibliographic reference.

UDC: 621.375.087.9.083.6

SMALL-SIGNAL CHARACTERISTICS OF INTERNALLY COMPENSATED ADJUSTABLE AMPLIFIER

[Abstract of article by V. A. Pikulev and Yu. A. Yegorov]

[Text] This article examines the circuit of an adjustable differential amplifier with internal compensation. The node potential method with node exclusion is used to obtain the Y-parameters for different methods of connecting differential amplifiers. 3 illustrations, 1 bibliographic reference.

UDC: 621.3.011.73

INFLUENCE OF AMPLIFIER GAIN ON R-FILTER RESPONSES

[Abstract of article by A. A. Protasov]

[Text] This article examines the influence of amplifier gain on the responses of the second-order section of R-filters. A recommendation is given for the selection of amplifier gains. 1 illustration, 2 bibliographic references.

UDC: 535.3:621.384.3

CALCULATION OF OPTICAL SIGNAL ENERGY REFLECTED BY ATMOSPHERE

[Abstract of article by Yu. A. Tsikin]

[Text] A method is examined for calculating the energy of an optical signal reflected by the atmosphere for pulsed lidars. Recommendations are given on determining the atmospheric transmitivity. 1 illustration, 4 bibliographic references.

UDC: 621.376

A METHOD FOR INCREASING LINEARITY OF OPTICAL MODULATORS

[Abstract of article by D. M. Glebov]

[Text] A method is proposed for linearizing the modulation characteristics of electrooptical modulators using the linear Pockels effect. The operation of a complicated modulator is analyzed using Poincare sphere apparatus. 3 illustrations, 3 bibliographic references.

UDC: 621.396.2

RESOLUTION OF AZIMUTH SIGNALS OF SURVEILLANCE RADAR

[Abstract of article by P. A. Trofimov]

[Text] This article presents the results of calculating the obtainable coefficients of shortening of the azimuth signal and corresponding losses in the signal/noise ratio. 2 tables, 2 bibliographic references.

UDC: 621.372.54

CONSTRUCTION OF TRANSFER FUNCTIONS OF ARC-FILTERS WITH LIMITATIONS ON ATTENUATION AND WORKING PHASE CHARACTERISTICS

[Abstract of article by S. A. Bukashkin, Yu. M. Inshakov and Ye. A. Kasatkin]

[Text] This article examines questions of simulating ARC-filters with a linear phase characteristic in the presence of limitations on the attenuation characteristic, and provides recommendations for the construction of their transfer function. An example is given of an optimized 9th order transfer function with two complex-conjugate transmission nulls for the case of deviation of the working phase from linear. 2 illustrations, 4 bibliographic references.

6900
CSO: 1860/95

PROBLEMS OF DESIGNING RADIO TECHNICAL DEVICES

Moscow TRUDY MOSKOVSKOGO ORDENA LENINA I ORDENA OKTYABR'SKOY REVOLYUTSII ENERGETICHESKOGO INSTITUTA, TEMATICHESKIY SBORNIK: VOPROSY PROYEKTIROVANIYA RADIOTEKHNICHESKIKH USTROYSTV in Russian No 514, 1981 pp 116-120

[Abstracts for 16 articles from journal "Proceedings of Moscow Order of Lenin and Order of the October Revolution Energy Institute, Thematic Collection: Problems of Designing Radio Technical Devices", edited by A. F. Bogomolov, corresponding member of USSR Academy of Sciences]

UDC: 621.396.96

INVESTIGATION OF NOISE TOLERANCE OF OPTIMAL PHASE TRACKING SYSTEM WITH PERIODIC NONLINEARITY

[Abstract of article by P. A. Zherdev]

[Text] This article presents results of investigating the noise tolerance of an optimal multi-circuit nonlinear system for phase tracking of the average frequency of a continuous FM signal in the presence of strong noise. Examples of analyzing the noise tolerance based on the formulas derived are examined. 6 illustrations, 5 bibliographic references.

UDC: 621.396.96

RECEPTION NOISE TOLERANCE OF PHASE-SHIFT KEYED SIGNALS DURING EXTRACTION OF CHARACTER FREQUENCY FROM RECEIVED INFORMATION

[Abstract of article by A. V. Stepin]

[Text] A simple analytic expression is obtained for calculating the probability of character reception error as a function of the dispersion of the phase error of the character frequency reference oscillator. It is shown that when the noise band of the phase-locking system is selected appropriately the influence of inaccurate operation of the character synchronization on the reception noise tolerance of phase-modulated signals can practically be disregarded. 3 illustrations, 4 bibliographic references.

UDC: 621.396.96

COMPOSITION APPROACH IN MATHEMATICAL MODELING OF COMPLEX RADIO TECHNICAL SYSTEMS

[Abstract of article by V. L. Makarov, Yu. A. Belov, D. V. Ysovskiy and V. B. Shul'zhenko]

[Text] A composition approach is proposed for mathematical modeling of complex radio systems in which the mathematical model is constructed of basis of elementary models with the help of isolated compositions. 2 illustrations, 11 bibliographic references.

UDC: 621.396.96

PROBLEMS OF ADAPTATION OF DIGITAL INFORMATION TRANSMISSION SYSTEM USING SEQUENTIAL DECODING TO IMPULSIVE NOISE

[Abstract of article by A. S. Al'tman, L. A. Krasnov and V. A. Morozov]

[Text] This article demonstrates the advisability of using a high speed device for estimating the intensity of impulsive noise for controlling the channel which erases defeedable pulsed noise with various algorithms for controlling the erasure threshold (optimal and simplified). 2 illustrations, 9 bibliographic references.

UDC: 621.396,96

REDUNDANT CODING EQUIPMENT AND CODE SYNCHRONIZATION DURING SEQUENTIAL DECODING OF CONVOLUTIONAL CODES

[Abstract of article by R. S. Kravtsov, A. V. Moiseyev, Yu. I. Sidorchuk and A. N. Sorokin]

[Text] Two code synchronization methods are compared: with and without resynchronizing drop-ins. The advantages of operating with drop-ins are established. Experimental results are presented. 1 table, 1 bibliographic reference.

UDC: 621.396.96

HIERARCHICAL MEMORY IN DATA AQUISITION AND STORAGE SYSTEMS

[Abstract of article by V. G. Pod'yachev]

[Text] A principle is proposed for constructing a data storage system which uses a priori information to solve the following problems:
- reduction of volume of stored data obtained during operation;

- accelerating retrieval of necessary data contained among that stored;
- increasing accuracy of stored and output data. Some problems involved in realizing the proposed system are discussed. 2 illustrations, 3 bibliographic references.

UDC: 621.397.61

ALLOWING FOR VIDICON LAG IN TELEVISION TRACKING SYSTEMS

[Abstract of article by V. P. Vinogradov]

[Text] This article investigates the influence of vidicon lag on the operation of a television tracking system. On the basis of an approximate consideration of the fundamental physical processes occurring in a vidicon, which is valid when the object has low contrast, an approximate linear equivalent vidicon circuit is obtained as a section within a closed circuit in the system. Results of experimental testing are presented. 2 illustrations, 5 bibliographic references.

UDC: 621.397.61

INVESTIGATION OF TELEVISION TRACKING SYSTEM BASED ON TRIAXIAL MOUNT USING MATHEMATICAL MODELING METHOD

[Abstract of article by I. A. Vlasov, V. S. Denisov and V. P. Sizov]

[Text] Optimal filtering and control algorithms are obtained for a television tracking system installed on a triaxial mount. A discrete model is constructed, and the functional diagram of an optimal tracking system is presented along with some results of computer modeling for different initial positions of the mount. 5 illustrations, 5 bibliographic references.

UDC: 621.396.969.11

ALPHABETIC METHOD FOR DISCLOSING PHASE MEASUREMENT AMBIGUITY

[Abstract of article by G. I. Skrypnik]

[Text] This article explains an alphabetic method for disclosing ambiguity and multi-scale phase measurements based on an information approach to solving the problem of statistical estimation of cyclic measurements. Some properties of the state alphabet of a multi-scale system are examined, along with a simple decision circuit in the form of "samples" of the alphabet. The decision circuit is extended to the case of taking time samples, and some problems involved in practical implementation of the algorithm are discussed. 2 tables, 6 bibliographic references.

UDC: 621.396.969.11

ALPHABETIC DECISION CIRCUITS IN PROBLEM OF ELIMINATING CYCLIC MEASUREMENT AMBIGUITY

[Abstract of article by Yu. D. Popov]

[Text] The problem of eliminating ambiguity in cyclic measurements is solved with the help of alphabetic circuits. Measurements are proposed for decoding by the distance minimum and oblique samples which make it possible to obtain an estimate of the unknown parameter in fairly simple form. The question of optimal selection of the scaling coefficients of the measuring scales for the proposed methods is discussed. 4 bibliographic references.

UDC: 621.374.5 (088.8)

SPECTRAL CORRELATION PROPERTIES OF COMPLEX DISCRETE FM SIGNALS

[Abstract of article by B. A. Pashkov]

[Text] Analytical expressions are obtained for investigating the spectral-correlation properties and determining the basic parameters of complex discrete frequency-modulated signals having an arbitrary variable or constant digitization step in time and frequency. 2 illustrations, 5 bibliographic references.

UDC: 681.327

MEMORY MODULES FOR MICROPROCESSOR DEVICES

[Abstract of article by K. E. Asratyan, D. I. O. Atayev, A. A. Zharev and G. M. Kol'ner]

[Text] This article examines the requirements imposed on the memory devices in high speed microprocessor devices. A modified version of data exchange between the processor and memory is proposed. The basic characteristics of developed RAM, ROM and EPROM are presented. 2 illustrations, 1 bibliographic reference.

UDC: 621.373.826:621.396.96

POTENTIAL ACCURACY OF OPTICAL RANGE METER IN TURBULENT ATMOSPHERE

[Abstract of article by A. A. Bogomolov, Yu. N. Bugayev and A. V. Suyetenko]

[Text] This article examines the methodology and results of computer calculation of the potential accuracy of determining the time position of a weak optical pulsed signal in the combined presence of stationary additive noise and multiplicative noise. 2 illustrations, 2 bibliographic references.

UDC: 621.372.832

PHASE-STABLE FOUR-CHANNEL POWER DIVIDER USING STRIPLINES

[Abstract of article by V. A. Zhidkov, V. P. Trofimov and Ye. D. Fokin]

[Text] This article presents the circuits of a power divider and three-decibel tandem directional coupler implemented using coupled striplines with small dimensions and high electrical parameters. 5 illustrations 7 bibliographic references.

UDC: 621.396.677

SIMULATION OF HORN ANTENNAS WITH REACTIVE LOADS

[Abstract of article by A. S. Konrat'yev]

[Text] This article examines the problem of synthesizing the field and the aperture of an H-sectorial horn with passive loaded dipoles in the aperture and corregated conical horn. 5 illustrations, 1 table, 7 bibliographic references.

UDC: 621.396.677

THEORETICAL CHARACTERISTICS OF WIDEBAND SPIRAL RADIATOR

[Abstract of article by P. P. Sereda]

[Text] This article presents results of calculating a double conical spiral antenna. Radiation characteristics in the frequency band which it covers are investigated. 8 illustrations, 3 tables, 5 bibliographic references.

6900
CSO: 1860/179

PROBLEMS OF WAVE RADIO ELECTRONICS

Leningrad IZVESTIYA LENINGRADSKOGO ORDENA LENINA ELEKTROTEKHNICHESKOGO INSTITUTA IMENI V.I. UL'YANOVA (LENINA): VOPROSY VOLNOVOY RADIOELEKTRONIKI in Russian No 245, 1979 pp 70-76

[Abstracts for 19 articles from collection "Proceedings of Leningrad Electrotechnical Institute imeni V.I. Ul'yanov (Lenin): Problems of Wave Radio Electronics"]

UDC 621.372.837.4

MICROWAVE PHASE MODULATORS USING ORTHOGONAL FIELDS

[Abstract of article by Yu.Ye. Lavrenko and N. Al'fonoso]

[Text] This article examines three designs of microwave phase modulators for two-level antiphase modulation. The results of electrodynamic calculations for two modulators are presented. It is shown that the use of orthogonal fields makes it possible to obtain a simple, efficient modulator with sufficiently wide-band characteristics. Four illustrations, 3 bibliographic references.

UDC 621.372.888:621.372.8.049.75

ELECTROMAGNETIC WAVE COUPLING IN WAVEGUIDE WITH LONG NARROW SLOT

[Abstract of article by V.S. Alekseyev and K.F. Lavrenko]

[Text] This article examines the interaction between electromagnetic waves in a waveguide with a long narrow slot cut in its side wall using the coupled-wave method; the frequency properties of the energy re-radiation process are explained. Two illustrations, 6 bibliographic references.

UDC 621.372.61

WAYS OF IMPROVING TECHNICAL CHARACTERISTICS OF ELECTRICALLY-CONTROLLED STRIPLINE ATTENUATORS

[Abstract of article by I.G. Petelin]

[Text] This article presents the results of theoretical investigation of a full-section pin-diode stripline attenuator. It is shown that when several diodes are

connected in parallel in the center sections, the coefficient of reflection of the attenuator is reduced, while the induced attenuation increases; the operating bandwidth remains sufficiently wide -- over an octave with attenuation of up to 45 dB. Three illustrations, 3 bibliographic references.

UDC 621.372.833:621.372.8.049.75

BANDWIDTH ESTIMATE OF WAVEGUIDE-SLOT TRANSITION

[Abstract of article by V.S. Alekseyev and K.F. Lavrenko]

[Text] The operation of a waveguide-slot adapter is examined within the frequency band based on the coupled-wave method. The passband obtained theoretically and experimentally amounts to over 20-30%. Four illustrations, 3 bibliographic references.

UDC 621.372.837.4:621.396.669

MACHINE DESIGN ALGORITHMS FOR SLOT WAVEGUIDE MICROWAVE REGULATING DEVICES

[Abstract of article by A.A. Danilin]

[Text] This article examines a group of programs for automated design of slot waveguide switching modules with solid-state elements. The group includes programs for analyzing devices, programs for synthesis using assigned parameters and a program for refining the characteristics of the control elements used. The algorithms and method for using the group of programs are described. Two bibliographic references.

UDC 621.396.67.012.12

REDUCING INFLUENCE OF NOISE WITH HELP OF ADAPTIVE ANTENNA SYSTEM

[Abstract of article by M.V. Dmitryuk]

[Text] A modification is proposed for the method, familiar from the literature, used to compensate for noise coming from directions other than that of the signal using an antenna system made up of isotropic antennas. The modification consists of adding a basic unidirectional antenna to the system. The capability of suppressing noise is proved in this case as well. The tuning algorithm and structure of the adaptive processor remain unchanged. Two illustrations, 1 bibliographic reference.

UDC 621.396.677.833.2

DETERMINATION OF DIFFRACTION FIELD IN REGION OF FOCUS OF PARABOLOID OF ROTATION

[Abstract of article by V.N. Astakhov and V.A. Stepanov]

[Text] A field is located in the region of the focus of a paraboloid of rotation.

Thanks to the approximations used for the function in the expression beneath the integral, expressions are obtained for the field in the focal plane which can be used to determine the re-reflected field from reflector antennas. Two illustrations, 2 bibliographic references.

UDC 621.396.962.23

OPTIMIZATION OF VIBRATION DOPPLER DEVICE FOR MEASURING EFFECTIVE SCATTERING SURFACE

[Abstract of article by V.A. Slavskiy and A.M. Aleksandr]

[Text] This article examines ways of optimizing an autodyne Doppler system for measuring the effective scattering surface in the sense of obtaining a narrow signal spectrum, simplicity of mechanical construction, improved measurement accuracy and achieving the maximum signal/noise ratio. An optimal vibration amplitude is found which satisfies these conditions. Three illustrations, 3 bibliographic references.

UDC 621.391.8

DISTRIBUTION OF THE SQUARE OF HARMONIC SIGNAL ENVELOPES IN GAUSSIAN NOISE

[Abstract of article by K.P. Obukhov]

[Text] This article examines the integral and differential distribution of the sum of harmonic signals in Gaussian noise and its moments. The relationships between these characteristics and the number of signals and signal/noise ratio is found. Two illustrations, 6 bibliographic references.

UDC 621.391.273.029.67

OPERATION OF ACOUSTO-OPTICAL STORAGE SPECTRUM ANALYZER IN PRESENCE OF NOISE

[Abstract of article by K.P. Naumov]

[Text] This article examines the operation of an acousto-optical storage spectrum analyzer when the predominant noise is external; metrological characteristics of the analyzer are determined as a function of the signal/noise ratio at the input and the storage time. One illustration, 5 bibliographic references.

UDC 778.534.452:534:535

POSSIBILITY OF ACOUSTO-OPTICAL RECORDING OF FILM SOUNDTRACKS

[Abstract of article by I.A. Kruglov and V.A. Savin]

[Text] This article analyzes the possibility of using an ultrasonic diffraction light modulator for recording transverse soundtracks at high speed. Estimates of the parameters of the light modulator are obtained. One illustration, 3 bibliographic references.

UDC 535.4

SOLUTION TO PROBLEM OF LIGHT DIFFRACTION IN ULTRASOUND IN ANISOTROPIC MEDIUM USING RAMAN-NAT METHOD

[Abstract of article by A.A. Stashkevich]

[Text] A system of vector difference-differential equations is obtained which describe light diffraction on ultrasound in an anisotropic medium. These equations are a generalization of the classic Raman-Nat equations for the anisotropic case. One illustration, 3 bibliographic references.

UDC 539.143.43:621.391.272

ENERGY CHARACTERISTICS OF AUXILIARY EXCITATION SIGNALS IN SYSTEMS WITH ELECTRON SPIN ECHO

[Abstract of article by Yu.A. Gustov and M.T. Ivanov]

[Text] This article examines the possibility of reducing the amplitudes of excitation signals in the spin systems used in reflection simulators by substituting complex signals for the short control pulses. It is shown that this substitution reduces the peak values of the excitation signals and also reduces their energy. One illustration, 5 bibliographic references.

UDC 621.391.272.539.143.43

EVALUATION OF MASER EFFECTS DURING EXTRACTION OF ECHO SIGNALS

[Abstract of article by S.P. Repnikov]

[Text] This article examines the singularities of spin-type signal processors associated with the use of inverting radio pulses in them. Maser effects are estimated for a two-pulse operating mode: these effects are expressed quantitatively by the relationship $6 \simeq 1 + \sqrt{D}$, where D is the transient attenuation in the absence of inversion. Six bibliographic references.

UDC 621.377.624.6:539.143.43

SPIN ECHO IN CASE OF MAGNETIC FIELD WITH HETEROGENEITY VARYING OVER TIME

[Abstract of article by S.A. Baruzdin]

[Text] This article examines the formation of echo signals for the case of excitation by three radio pulses. It is shown that the echo signals are converted in accordance with the characteristic distribution functions of the complementary longitudinal heterogeneous magnetic field contained in the intervals between the exciting radio pulses. One illustration, 2 bibliographic references.

UDC 621.391.26:539.143.43

SPIN-ECHO AMPLIFICATION

[Abstract of article by V.A. Ivanov and E.O. Saakov]

[Text] This article examines the possibility of spin echo amplification in ferromagnets based on using stacked multi-layer thin magnetic films and multi-section circuits for removing the echo signals. Five bibliographic references.

UDC 621.391

USE OF CONTROL INPUTS TO SUPPRESS PARASITIC ECHO SIGNALS

[Abstract of article by S.N. Skoblikov and V.B. Ustinov]

[Text] This article demonstrates the possibility of inputting radio signals and additional control video- or radio- pulses to a spin system in order to suppress parasitic signals for a processor operating using a three-pulse method. One illustration, 3 bibliographic references.

6900
CSO: 1860/146

SIGNAL AND IMAGE FORMATION AND PROCESSING

Leningrad IZVESTIYA LENINGRADSKOGO ORDENA LENINA ELEKTROTEKHNICHESKOGO INSTITUTA IMENI V.I. UL'YANOVA (LENINA): FORMIROVANIYE I OBRABOTKA SIGNALOV I IZOBRAZHENIY in Russian No 234, 1979 pp 87-90

[Abstracts for 18 articles from collection "Proceedings of Leningrad Electrotechnical Institute imeni V.I. Ul'yanov (Lenin): Signal and Image Formation and Processing"]

UDC 621.397.31

RESOLUTION OF CHARGE-COUPLED DEVICES

[Abstract of article by Ya.A. Ryftin]

[Text] By comparing the corresponding characteristics of charge-coupled devices and cathode-ray tubes it is proved that with the same frame format and number of lines per frame the longitudinal characteristics of tubes as well as their transverse characteristics are better than those of existing charge-coupled devices. However, because of the many advantages of charge-coupled devices they will undoubtedly provide the basis for future television technology. Four illustrations, 9 bibliographic references.

UDC 621.397.31

FORMATION OF VIDEO SIGNAL USING SOLID-STATE MATRIX-TYPE CONVERTERS

[Abstract of article by L.N. Grigor'yev, N.N. Stepnov and Ya.L. Shtermer]

[Text] This article examines the equivalent circuit of a matrix-type resistive light transducer and analyzes new possibilities for producing a video signal with a complex form. The possibility of using these transducers in television systems with spatial image processing is demonstrated. One illustration, 4 bibliographic references.

UDC 621.397.332.122

REPRODUCTION CHARACTERISTICS OF HIGH-FREQUENCY INTERLACED RASTERS

[Abstract of article by G.A. Eyssengardt]

[Text] This article examines the basic principles of constructing high-frequency interlaced rasters. The spatial frequency spectrum of line flicker is determined, and defined, as a function of the line slipping step and of time and spatial filtering. Six illustrations, 4 bibliographic references.

UDC 621.397.272

DESCRIPTION AND ANALYSIS OF COLOR IMAGES

[Abstract of article by R.Ye. Bykov]

[Text] This article examines a method for describing color television images based on color filtering followed by analysis of geometric, topological and dynamic characteristics. One illustration, 4 bibliographic references.

UDC 621.391.172

THRESHOLDLESS ALGORITHM FOR DETECTING IMAGE CONTOUR ELEMENTS

[Abstract of article by L.A. Shifrin]

[Text] A thresholdless algorithm is proposed for detecting the contour elements of an image. A thresholdless contour element analyzer is described which implements the proposed algorithm. Three illustrations, 3 bibliographic references.

UDC 621.391.172

NOISE TOLERANCE OF THRESHOLDLESS ALGORITHM FOR DETECTING IMAGE CONTOUR ELEMENTS

[Abstract of article by A.M. Monchak]

[Text] This article analyzes the noise tolerance of a thresholdless algorithm for detecting the contour elements in an image. It is shown possible to introduce decision blocking when the aperture is outside the brightness drop zone in order to reduce the false alarm probability. Three illustrations, 3 bibliographic references.

UDC 621.397.272

REGISTRATION OF TIME AND SPACE VARIATIONS OF IMAGE COLOR

[Abstract of article by N.A. Malinkin and K.A. Fedchenkov]

[Text] This article examines the maximum errors and results of experimental verification of a method for converting information on the brightness of television image elements to graphic form. Four illustrations, 2 bibliographic references.

UDC 621.397.13:621.3.087.45

DATA DISPLAY IN INSTRUMENTATION TELEVISION SYSTEM

[Abstract of article by D.A. Makarychev, V.A. Malykhin, G.G. Safiulina and Yu.N. Khomyakov]

[Text] A device is described which can be used to display and record primary video data and other supplementary parameters simultaneously in digital form. Three illustrations.

UDC 621.396.671

SIGNAL PROCESSING IN ANTENNA ARRAYS IN ORDER TO OBTAIN DIRECTIVITY CHARACTERISTICS WITH SPECIAL FORM

[Abstract of article by Yu.Ya. Yurov, V.S. Alekseyev and Yu.P. Salomatov]

[Text] This article examines the problem of determining the amplitude-phase distributions corresponding to the sum and difference of directivity characteristics of a special form. The expressions derived make it possible to use the pattern-formation circuits of monopulse antenna arrays for signal processing in order to obtain directivity characteristics of a special form. Three bibliographic references.

UDC 621.391.273:534.512:535

ACOUSTO-OPTIC CORRELATOR USING OPPOSING HYBRID ACOUSTIC BEAMS

[Abstract of article by Yu.V. Yegorov]

[Text] The operating theory of an acousto-optic correlation circuit with two ultrasonic light modulators is examined. A transparency synthesis rule is substantiated. Three illustrations, 6 bibliographic references.

UDC 621.391.272:535.318

CORRELATION METHOD FOR MEASURING SPEED OF ULTRASOUND IN SOUND CONDUCTORS OF ACOUSTO-OPTIC RADIO SIGNAL PROCESSING DEVICES

[Abstract of article by K.P. Naumov]

[Text] A method is described for measuring the propagation velocity of ultrasonic oscillations in the acoustic conductors of acousto-optic signal processing devices. The method is based on a correlation procedure. Three illustrations, 4 bibliographic references.

UDC 621.396.96:621.391.26:534-8

LIGHT DIFFRACTION ON ULTRASOUND DURING PROCESSING OF SIGNALS WITH ARBITRARY FORM IN ACOUSTO-OPTIC PROCESSOR

[Abstract of aritcle by A.A. Stashkevich]

[Text] A generalized Raman-Nat equation is derived which describes the angular spectrum of the diffracted field for the case in which the acoustic perturbation has an arbitrary form in the direction of propagation of the soundwave. Three illustrations, 5 bibliographic references.

UDC 639.143.43:621.391.272

EVALUATION OF ECHO-PROCESSOR RADIO SIGNAL PROCESSING CAPABILITIES

[Abstract of article by V.B. Ustinov and E.O. Saakov]

[Text] This article examines some new versions of processing radio signals in echo processors which involve the use of a series of radio pulses, as well as return echos, as excitation signals. Seven illustrations, 4 bibliographic references.

UDC 621.391.272:539.143.43

TOWARD THE PROBLEM OF MINIMIZING PEAK POWER OF CONTROL PULSES USED TO EXCITE SPIN DEVICES FOR SIGNAL PROCESSING

[Abstract of article by Yu.A. Gustov and A.G. Igoshin]

[Text] This article examines the possibilities of reducing the peak power of control pulses in spin devices for signal processing, and presents examples of their implementation. Two illustrations, 7 bibliographic references.

UDC 621.391.272:539.143.43

ENERGY RELATIONSHIPS IN SPIN SIGNAL PROCESSORS

[Abstract of article by M.T. Ivanov and S.P. Repnikcv]

[Text] This article analyzes the energy levels in an oscillating system with a working substance, and discovers the mechanism of field energy loss during "resonator-substance-resonator" transitions. Two illustrations, 6 bibliographic references.

UDC 621.397.268:621.391.822

CALCULATION OF CORRELATION COEFFICIENT OF SIGNAL IN GAUSSIAN NOISE

[Abstract of article by V.A. Nelep and K.P. Obukhov]

[Text] A simple engineering formula is obtained which can be used to calculate the correlation function of an additive mixture of harmonic signal and narrowband normal noise. One illustration, 3 bibliographic references.

UDC 621.395.664.3

SIGNAL ESTIMATE ERROR IN DEVICE FOR "ERASING" CONCENTRATED NOISE WITH SIMPLE NARROWBAND CHANNEL FILTERS

[Abstract of article by Ye.A. Shuleshov]

[Text] This article presents the root mean square signal estimate error as a

function of the signal/noise ratio for devices with single-section and four-section narrowband filters which "erase" narrowband noise. Four illustrations, 5 bibliographic references.

UDC 621.397.36

MEMORY DEVICE FOR SPATIAL IMAGE FILTERING UNIT

[Abstract of article by S.A. Ioffe]

[Text] This article presents results of developing a capacitive memory module for the spatial image filtering device in a slow-scan television system. Two illustrations, 1 bibliographic reference.

6900
CSO: 1860/144

PROBLEMS OF RADIO SIGNAL RECEPTION AND PROCESSING

Leningrad IZVESTIYA LENINGRADSKOGO ORDENA LENINA ELEKTROTEKHNICHESKOGO INSTITUTA IMENI V.I. UL'YANOVA (LENINA): PROBLEMY PRIYEMA I OBRABOTKI SIGNALOV RADIOTEKHNICHESKIKH SISTEM in Russian No 259, 1979 pp 137-143

[Abstracts for 27 articles from collection "Proceedings of Leningrad Electrotechnical Institute imeni V.I. Ul'yanov (Lenin): Problems of Receiving and Processing Signals From Radio Technical Systems"]

UDC 621.396.677:621.396.96

OPTIMAL POLARIZATION FOR RADAR EMISSION AND RECEPTION

[Abstract of article by L.A. Zhivotovskiy]

[Text] This article presents one possible version of a functional diagram of the transceiving section of a radar which realizes maximum energy contrast against a noise background. One illustration, 5 bibliographic references.

UDC 621.385.832.522

INVESTIGATION OF INFLUENCE OF OPERATING MODE OF LI607 DISSECTOR TUBE ON SIGNAL/NOISE RATIO

[Abstract of article by V.A. Bystrov, G.N. Nosikova and K.Ye. Rumyantsev]

[Text] The results of investigating the influence of the inter-dynode voltage and focusing coil current on the signal/noise ratio at the dissector tube output are presented. Three illustrations, 2 bibliographic references.

UDC 621.396

PROBABILITY OF INTERNAL SYSTEM NOISE AFFECTING SIGNAL TRANSMISSION SEQUENCE IN ASYNCHRONOUS COMMUNICATIONS SYSTEMS

[Abstract of article by V.A. Bol'shakov]

[Text] This article estimates the probability that internal system noise in asynchronous communications systems will affect a sequence of signal elements.

One illustration, 3 bibliographic references.

UDC 621.396.9(088.8)

CALCULATION OF OPERATING CHARACTERISTICS OF DEVICE FOR DETERMINING TIME DANGER CRITERION IN AIRBORNE AIRCRAFT WARNING SYSTEM

[Abstract of article by L.A. Afanas'yev, A.K. Yanovitskiy and A.K. Bogukhval'skiy]

[Text] This article examines the operating characteristics for determining the probabilities of invalid and valid detection of a conflict situation by the digital device which computes the time danger criterion in an airborne aircraft collision warning system. Two illustrations, 3 bibliographic references.

UDC 621.391.2

POSSIBILITY OF AUTOMATIC RECOGNITION OF ONE CLASS OF NONSTATIONARY SIGNALS UNDER CONDITIONS OF A PRIORI AMBIGUITY

[Abstract of article by L.D. Smirnov]

[Text] This article describes the essence of a spectral-time contrast method which can be used to recognize nonstationary signals with discrete nonstationarity. One bibliographic reference.

UDC 621.391.2

USE OF CHARACTER-BY-CHARACTER INVERSION METHOD IN STATISTICAL SYNTHESIS OF COMPLEX PHASE-SHIFT KEYED SIGNALS

[Abstract of article by Yu.A. Stankevich]

[Text] A method is proposed for optimizing complex phase-shift keyed signals with binary coding sequences which leads to a reduction in the maximum lateral excursion of the autocorrelation function of the signal. Two bibliographic references.

UDC 621.391.2

SUPPRESSION OF LATERAL EXCURSIONS OF AUTOCORRELATION FUNCTIONS OF PHASE-SHIFT KEYED SIGNALS

[Abstract of article by V.A. Bogdanovich, V.S. Gutin and A.I. Savin]

[Text] A method is proposed for suppressing (rejecting) lateral excursions of the autocorrelation functions of phase-shift keyed signals based on use of the invariance principle. Two illustrations, 9 bibliographic references.

UDC 621.391.254

POWER GAIN FROM USING BOSE-CHAUDHURI-HOCQUENGEM CODES

[Abstract of article by Ye.V. Pustigin]

[Text] This article investigates the energy gain from coding as a function of the codeword length and number of correctable errors using Bose-Chaudhuri-Hocquengem codes. Two illustrations, 1 table, 3 bibliographic references.

UDC 621.372.58

BOUNDARY VALUES OF SENSITIVITIES OF GYRATOR INDUCTANCE PARAMETERS

[Abstract of article by V.M. Shilkov]

[Text] Expressions are derived for the sensitivity of gyrator inductance parameters to changes in the basic characteristics of the gyrator. Two illustrations, 2 bibliographic references.

UDC 621.3.049.77:621.373.48

MICROCIRCUIT FOR VOLTAGE-CONTROLLED PULSE OSCILLATOR

[Abstract of article by V.N. Galkin and V.A. Pikulev]

[Text] This article examines an integrated circuit for a voltage-controlled pulse oscillator implemented with complimentary MOS-structures. Formulas are given for the pulse repetition frequency. One illustration, 1 bibliographic reference.

UDC 621.372.57

FREQUENCY RESPONSES OF R-FILTERS

[Abstract of article by A.A. Protasov]

[Text] This article examines a method of calculating the frequency responses of R-filters through the Y-parameters of the passive section of the filter circuit and the Y-parameters of the amplifiers. Two illustrations, 2 bibliographic references.

UDC 621.391.2

SINGULARITIES OF DESIGNING RADIO TECHNICAL SYSTEMS USING MICROPROCESSORS

[Abstract of article by Yu.P. Grishin, Yu.M. Kazarinov and V.M. Katikov]

[Text] This article examines the processing of planning radio technical systems which use microprocessors for signal processing. Features of various design

stages are analyzed. One illustration, 1 table, 5 bibliographic references.

UDC 681.001.325:621.396.96

CHOICE OF ANALOG-DIGITAL CONVERTER PARAMETERS IN MEASURING RADIO SIGNAL PHASE

[Abstract of article by V.P. Medvedev and A.V. Titov]

[Text] This article examines the question of selecting the number of quantization levels for converting time-coincident radio signals to digital form in the presence of noise of various levels in terms of the tolerable phase measurement error. Four illustrations, 2 bibliographic references.

UDC 621.396.96

ANALOG-DIGITAL CONVERSION OF RADAR SIGNALS USING WALSH FUNCTIONS

[Abstract of article by V.N. Smirnov]

[Text] It is shown that the number of quantization levels used in analog-digital conversion of spectral coefficients in a Walsh basis can be reduced significantly while retaining the required accuracy of representation of the input signals. Two bibliographic references.

UDC 519.714.5

SPECTRAL PROPERTIES OF FUNCTIONS REALIZED BY ITERATED MAYTR STAGE

[Abstract of article by B.P. Podkopayev]

[Text] This article uses a system of Walsh functions to solve the problem of identifying, in spectrum language, the membership of a logical function to a class of functions realized by an iterated Maytr stage. Five bibliographic references.

UDC 621.396.62

SHORTENING FILTER WITH RECTANGULAR WEIGHT FUNCTION

[Abstract of article by Ye.N. Yevstaf'yev]

[Text] This article determines the gain and pulse response of a shortening filter with a rectangular response. One illustration, 5 bibliographic references.

UDC 621.391.2

PARTIAL ESTIMATION OF STATE OF DYNAMIC OBJECTS

[Abstract of article by A.I. Sokolov and Yu.S. Yurchenko]

[Text] This article solves the problem of reducing the order of a discrete linear filter by constructing a partial estimate of the state vector of the dynamic

object. Two illustrations, 5 bibliographic references.

UDC 621.396.98

ANALYSIS OF PROBABILITY CHARACTERISTICS OF ALGORITHM FOR MEASURING AZIMUTH IN SHORT-RANGE RADIO NAVIGATION SYSTEMS

[Abstract of article by A.V. Adamchuk]

[Text] This article examines a method for measuring azimuth in a short range radio navigation system without recovering the reference signal on board the platform. An expression is derived and analyzed for the conditional probability distribution of the estimate of the coarse azimuth reading. Three illustrations, 2 bibliographic references.

UDC 621.396.96.08

DISCRETE FILTERING ALGORITHM FOR SIGNALS WITH RANDOM DISRUPTIONS IN RADIO CHANNEL

[Abstract of article by Yu.N. Volovik]

[Text] This article examines the problem of constructing an optimal recursive filter in the presence of disruptions which cause random loss of signal. A version of a quasi-optimal filter is proposed. Three illustrations, 3 bibliographic references.

UDC 621.396.668

INFLUENCE OF REFLECTIONS ON ACCURACY OF AUTOMATIC TRACKING OF PERIODIC DISCRETE SIGNALS

[Abstract of article by I.M. Samoylov]

[Text] An estimate is given for the accuracy of automatic delay tracking of a periodic phase-shift keyed signal when an interfering signal caused by incomplete sidelobe suppression is present at the input of the phase-locked loop system. Five illustrations, 2 bibliographic references.

UDC 621.371.029.51

SIMPLIFIED METHOD FOR CALCULATING RADIO PULSE DISTORTIONS DURING PROPAGATION ALONG THE GROUND

[Abstract of article by B.V. Fedorov]

[Text] In order to simplify calculations, this article proposes approximating the amplitude-frequency characteristic of a radio wave propagation path with a step function, and the phase-frequency characteristic with a first- or second-power polynomial. Three illustrations, 2 bibliographic references.

UDC 621.396.96

MICROPROCESSOR-BASED PERIODIC PHASE-SHIFT KEYED SIGNAL SEARCHER

[Abstract of article by S.A. Larionov and V.D. Platonov]

[Text] This article describes a microprocessor device for searching for a periodic phase-shift keyed signal in the presence of severe multipath reflections. Four illustrations, 3 bibliographic references.

UDC 621.396.986.4+527.621.001.55

ACCURACY CHARACTERISTICS OF LOCATION FINDING USING AUTOMATIC COORDINATE CONVERTER BASED ON SMALL COMPUTER

[Abstract of article by N.A. Kornev and A.V. Pavlov]

[Text] This article presents the results of estimating the accuracy of location finding using a coordinate converter based on a 15 space VSM-5 computer for a case in which there is no correction for the influence of the secondary signal propagation phase velocity. One illustration, 1 table, 3 bibliographic references.

UDC 51.621.391

FUNCTIONAL DIAGNOSIS OF FAULTS IN DIGITAL SIGNAL PROCESSORS

[Abstract of article by N.V. Kolesov]

[Text] A procedure is proposed for synthesizing a device for functional diagnosis of the technological condition of a digital device which makes it possible to reduce the complexity of the diagnostic device. Three bibliographic references.

UDC 621.391.2

CALCULATION OF FALSE-ALARM PROBABILITY DURING CORRELATION ANALYSIS OF M-SEQUENCES

[Abstract of article by G.G. Kiselev, V.N. Nomokonov and D.O. Yakolev]

[Text] This article examines correlation analysis of M-sequences. Precise formulas are derived for the distribution of the result of accumulation and for the false-alarm probability. One bibliographic reference.

UDC 621.372.54.037:621.391.26

COMPUTATIONAL ROUND-OFF EFFECTS IN DFT DIGITAL FILTERS FOR SIDE-LOBE SUPPRESSION

[Abstract of article by S.N. Britin]

[Text] This article examines the processing of periodic discrete signals by digital filters for side-lobe suppression based on discrete Fourier transform

algorithms. One illustration, 7 bibliographic references.

UDC 621.396.93(088.8)+551.508.5

DETERMINATION OF VELOCITY VECTOR OF METEOROLOGICAL PROBE DURING INVESTIGATION OF VERTICAL WIND PROFILES

[Abstract of article by A.B. Vinogradov and K.V. Pavlenko]

[Text] This article examines the question of measuring the velocity vector of a meteorological probe using relayed signals from the "Omega" system; a system of equations is presented. Two illustrations, 2 bibliographic references.

6900
CSO: 1860/149

COMPONENTS, HYBRIDS & MANUFACTURING TECHNOLOGY

UDC 621.3.8.4.001.24(03)

MANUAL ON CALCULATION OF INDUCTANCE COIL PARAMETERS

Moscow SPRAVOCHNIK PO RASCHETU PARAMETROV KATUSHEK INDUKTIVNOSTI in Russian 1981 (signed to press 13 May 81) pp 2-4, 137

[Annotation, foreword and table of contents from book "Manual on Calculation of Inductance Coil Parameters", by Mikhail Vasil'yevich Nemtsov and Yuriy Matveyevich Shamayev, reviewed by Ye. I. Petrushenko, Energoizdat, 20,000 copies, 137 pages]

[Text]

Annotation

In this handbook methods are discussed for calculation of inductance coils with and without magnetic circuits, which are used during construction of elements of automatic, electrical and radioelectronics equipment. The handbook material is presented in the form of mathematical models, nomograms and tables. The handbook is designed for engineer-technical workers dealing with the development of radio electronic and electrical equipment.

Foreword

Inductance coils are widely used in different kinds of engineering devices and are typified by parameters which are determined by the electromagnetic properties of the magnetic conductors, the conditions of their magnetization, the mutual location of the coil turns, etc.

Consideration of a large number of factors, on which these parameters depend, leads to complex calculated models.

When using manual methods for calculating the parameters of inductance coils [1] their calculated models must be somewhat simplified. Simplification of the models naturally reduces the calculation accuracy and limits the area of application of the models.

Accuracy of parameter calculation can be improved and thus the area of their application can be expanded if one uses a computer for all of the computations thereby preserving the rigorousness of the calculated models.

The purpose of this book is to set forth the general methods for constructing rigorous calculated models of inductance coils without magnetic circuits and with magnetic circuits, and also a mathematical description of the models of their different designs.

Reference material in the form of nomograms and tables are given in order to aid in the calculation the parameters of the most popular design.

Rigorous mathematical descriptions of models and approximate calculation formulas are given for the calculation of the parameters of other coil designs. The error rate for estimating parameters from approximate formulas is 10-40%. The book contains four chapters. Chapter 1 is introductory and is devoted to determination of the physical meaning of the parameters and to formulations of the general mathematical methods of their calculation.

Chapter 2 and 3 contain reference material on calculation of internal and mutual inductances of the more popular kinds of designs of circuits and coils without magnetic circuits.

Chapter 4 contains reference material on calculation of inductance coils with magnetic circuits of varying designs: composite, open, and closed.

Chapters 1-3, and also sections 4-2--4-4 and 4-5b were written by M. V. Nemtsov, and sections 4-1 and 4-5a were written by Yu. M. Shamayev.

The list of principal designations matches the basic terminology used in the book. Moreover, individual designations can be used to define other concepts which are explained in each situation. Designations of the parameters with indices which refer to several monotypical elements are further designated with the number of the element in parentheses. For example, $h_{2(1)}$ is the pitch of the winding of turns in the layer of coil 1. All geometrical dimensions are indicated in this book by lower case letters, and the dimensions in relative units corresponding to them are indicated by matching upper case letters.

The authors are grateful to A. P. Nenashev who edited the manuscript.

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9424
CSO: 1860/118

UDC 621.382.2/.3.002

EQUIPMENT FOR SEMICONDUCTOR PRODUCTION

Moscow OBORUDOVANIYE POLUPROVODNIKOVOGO PROIZVODSTVA in Russian 1981 (signed to press 15 Jun 81) pp 2-4, 334-336

[Annotation, foreword and table of contents from book "Equipment for Semiconductor Production" by Pavel Nikolayevich Maslennikov, Konstantin Andreyevich Lavrent'yev (deceased), Aleksandr Davydovich Gingis, V. I. Kononov, I. V. Kirichenko, V. A. Nazarov, V. V. Rudnev, V. V. Stepanov, G. I. Kholin and V. S. Shcherbakov, edited by P. N. Maslennikov, reviewed by I. N. Rubtsov, Publishing House for Literature on the Designing and Production Technology of Radioelectronic Equipment, Izdatel'stvo "Radio i svyaz'", 5000 copies, 336 pages]

[Text] This book describes the designs of the equipment used most widely in semiconductor production and gives its basic specifications, formulates the requirements for the equipment, and gives practical recommendations for effective checking of the condition of the main types of equipment. It describes the principles of full mechanization and automation in the modern semiconductor industry. The most characteristic lines and production systems are described.

This book is intended for engineers and scientists connected with the production and application of semiconductor devices and integrated microcircuits.

Foreword

Due to the rapid growth of the output of discrete semiconductor instruments and integrated microcircuits, one of the main tasks of this industry is continuous improvement of technological and measuring equipment and full mechanization and automation of lines and systems as the main basis for their mass production. In connection with the qualitative changes which occurred in production technology of devices in recent years, there is an acute need in literature treating the equipment for semiconductor production.

This book describes the most typical domestic and foreign equipment used in the production of semiconductor devices. Primary attention is given to the technological equipment for mass-production-type transistors and semiconductor integrated microcircuits which are developed on the basis of planer technology.

The last three chapters of the book treat fully mechanized lines and systems for mass production of semiconductor devices and integrated microcircuits. They explain certain general problems of full automation and mechanization of semiconductor production, including the problems of systemic approach and optimization of the main

parameters of fully mechanized lines and systems in designing automated production processes, as well as problems of automation of transportation between operations and control of technological processes and production of semiconductor devices.

It is assumed that the reader of this book is familiar with the fundamentals of the technology of semiconductor production. Therefore, the problems of technology are not treated in the book and are touched upon only in some instances in connection with the necessity to explain the operating principles in more detail or structural characteristics of the described equipment.

In the opinion of the authors, this book will be useful to designers of equipment, production engineers and other workers of the semiconductor industry connected with its operation, as well as students of vuzes and tekhnikums of these specialties.

The introduction and Chapter 12 were written by P. N. Maslennikov; Chapter 1 -- by I. V. Kirichenko and P. N. Maslennikov; Chapter 2 -- by I. V. Kirichenko and K. A. Lavrent'yev; Chapters 3 and 4 -- by V. V. Rudnev; Chapter 5 -- by V. V. Stepanov; Chapter 6 -- by V. A. Nazarov; Chapter 7 -- by V. A. Nazarov and G. I. Kholin; Chapter 11 -- by G. I. Kholin; Chapter 8 and 13 -- by V. S. Shcherbakov; Chapter 9 -- by V. I. Kononov; Chapter 10 -- by K. A. Lavrent'yev and V. I. Kononov; Chapter 14 -- by V. V. Stepanov and A. D. Gingis; Chapter 15 -- by P. N. Maslennikov, V. A. Nazarov and G. I. Kholin.

The authors are greatly indebted to the reviewer, Candidate of Technical Sciences Docent I. N. Rubtsov and the editor, Candidate of Technical Sciences Professor D. B. Zvorykin (deceased) for their detailed analysis and valuable comments on the manuscript, as well as to all those who helped in selecting the materials for the book.

The authors will be grateful for all comments and suggestions of the readers to improve this book which have to be sent to the following address: 101000, Moscow, Chistoprudnyy bul'var 2, izdatel'stvo "Radio i svyaz'".

Contents

10,233
CSO: 1860/221

UDC 62.551.4

MULTIFUNCTIONAL ANALOG AUTOMATION REGULATING DEVICES

Moscow MNOGOFUNKTSIONAL'NYYE ANALOGOVYYE REGULIRUYUSHCHIYE USTROYSTVA AVTOMATIKI in Russian 1981 (signed to press 4 Jun 81) pp 2-7

[Annotation, table of contents and introduction from book "Multifunctional Analog Automation Regulation Devices" by Aliy Umyarovich Yalyshev and Oleg Ivanovich Razorenov, Izdatel'stvo "Mashinostroyeniye", 7000 copies, 400 pages]

[Text]

Annotation

This book presents the fundamentals of the theory and design of electrical analog regulating devices with pulsed and continuous output signals. The book indicates the areas of application of regulating devices, presents the construction schemes of automatic regulation systems using both proportional and integrating actuating mechanisms; it also examines problems of designing non-arcing automatic regulation systems, as well as systems for supervisory and direct digital control. The architecture of modern regulation devices is analyzed, and their functioning algorithms described; the derivation of analytical expressions is given, and the actuators of typical regulation principles are synthesized; problems of designing functional units and modules of regulation devices are examined; dynamic properties and functional capabilities of industrial regulation devices using microelectronic integrated circuits is given.

The book is intended for engineering and technical workers specializing in the area of electronic regulators and automatic systems for controlling technological processes.

[This book was reviewed by D.M. Agranov and L.I. Shipetin.]

Table of Contents

Introduction

The increased capacity and output of industrial installations and units, their intensified operating modes, and the appearance of technological processes which are new in principle and are fairly complex require broader development, and introduction in various branches of the national economy, of automated control systems based on the integrated electrical automation technical equipment which is included in the State System of Industrial Instruments and Means of Automation.

The current stage of development of automated process control systems is characterized by heightened requirements and functional support and viability of technical equipment at all levels of application in hierarchically structured automatic process control systems. These requirements make it necessary to improve operating reliability significantly and to expand the functional capabilities of primarily those devices which are used to organize automated process regulation systems. The efficiency of various automated process control systems depends to a significant degree upon the sophistication of the regulation equipment used at the middle and bottom levels of their multilevel structure.

Electrical analog regulating devices comprise a significant group of technical automation devices which are included in these systems. The use of analog electrical regulating devices in automatic regulation systems makes it possible to improve significantly the quality of automatic control, to increase the speed and precision of technological processes and to improve the technical-economic

indicators of the regulation equipment as a whole. Analysis of the development of domestic and foreign electrical general-purpose instrument systems for automatic monitoring, regulation and control of technological processes shows that the following two types of regulation devices are most widely used in the USSR: regulation devices which produce a dc signal for control purposes, and those with a pulsed output signal whose parameters correspond to GOST 21693-76. The first of these types of regulation devices is designed to operate together with proportional actuating mechanisms and positioners, while the second is to be used with integrating actuating mechanisms. Electrical actuating mechanisms with output element (shaft, rod) which moves at a constant speed are used most widely as integrating actuating mechanisms.

Thanks to the changeover to a new microelectronic component base, there has now been significant progress in the area of electronic regulator building. Use of integrated circuits has required the use of new technical treatments in developing analog regulating devices, and has often made it possible to use treatments which were technically and economically unjustifiable when discrete radio components were used.

Microelectronic analog regulating devices are characterized by good static, dynamic and metrological parameters; they are convenient and reliable in operation, the artistic and aesthetic layout of front panels and operating controls is modern, and the devices are multifunctional in terms of the type of operations executed. There are modifications of analog regulating devices which are designed to operate jointly with electronic computers and controllers in the so-called supervisory and direct digital control modes (as a "hot" reserve element).

Regardless of the increasing use of microprocessor equipment and digital controllers in the area of process automation, the role of electrical analog regulation devices in modern automatic process control systems is not lessening; rather, it is increasing because these devices are gaining new functional capabilities, their operating characteristics are improving, their circuitry and design treatments are being simplified along with a significant increase in reliability through the use of specialized microassemblies and solid-state operational amplifier matrices.

While the main area of application of computers is comprised of multi-loop and multi-level hierarchical automatic process control systems with centralized control, and that of microprocessor devices and multichannel digital regulators based on them is comprised of automatic process control systems with distributed control, we should expect the future use of multifunctional analog electrical regulation devices, chiefly in decentralized automatic control and regulation systems, and in local automatic process regulation systems in which these regulation devices are now used most extensively.

The development of automatic control and regulation technology is thus creating the necessary prerequisites for further growth in the automation of production processes and improving the quality of production.

In this connection, it becomes specially important to study the fundamentals of the theory and principles of designing technical equipment for regulating technological processes.

The periodic press has contained no recent publications which provide sufficient material on modern electrical analog regulating devices with continuous and pulsed output signals. Therefore, the present work has attempted to generalize and systematize the present scattered information on multifunctional analog regulation devices.

The primary attention of the work is devoted to analyzing functional and electrical circuits, and examining the static-dynamic characteristics and functional capabilities of such regulating devices, the operating principle and circuit treatment of which are based on extensive utilization of operational amplifiers.

6900
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ELECTROMAGNETIC COMPATIBILITY

SELECTED ABSTRACTS OF ARTICLES FROM COLLECTION 'DEVICES OF ELECTROMAGNETIC AND SWITCHING ENGINEERING', TRANSACTIONS OF MOSCOW POWER ENGINEERING INSTITUTE No 502, 1980

Moscow TRUDY MOSKOVSKOGO ORDENA LENINA I ORDENA OKTYABR'SKOY REVOLUTSII ENERGETICHESKOGO INSTITUTA, TEMATICHESKIY SBORNIK: APPARATY ELEKTROMAGNITNOY I KOMMUTATSIONNOY TEKHNIKI in Russian No 502, 1980 (signed to press 20 Apr 81) pp 75-80

UDC 621.316.542

MATHEMATICAL MODEL OF DISCONNECTING SHORT-CIRCUIT CURRENTS IN AUTOMATIC SWITCHES WITH AN ARC BLOW-OUT CHAMBER

[Abstract of article by Tayev, I. S., Gorshkov, Yu. Ye., Popova, Ye. P. and Ragulin, I. A.]

[Text] The authors discuss the problems of the optimization of the arc blow-out chamber of automatic switches on the basis of a mathematical model of disconnecting short-circuit currents. Differential equations in the mathematical model are solved by the Runge-Kutta numerical methods, and the problem of optimization is solved by the complex Boks method with the use of an electronic digital computer.

UDC 621.822.5:621.318.2(088.8)

CALCULATION OF THE REPULSIVE FORCE OF TWO RECTANGULAR PRISMS

[Abstract of article by Bul', B. K., Gavrilov, G. G. and Krasnykh, A. A.]

[Text] On the basis of the field theory, the authors derived a formula for calculating the repulsive force of two symmetrically arranged and oppositely magnetized rectangular prisms having different dimensions and made of different highly coercitive materials. The authors compare the calculated and experimental dependence of the repulsive force which showed a good agreement between calculations and the experiment.

UDC 621.314.224

INVESTIGATION OF THE EFFECTS OF THE BULGING FIELD ON THE VALUE OF INDUCTION IN A TOROIDAL MAGNETIC CIRCUIT OF A CURRENT TRANSFORMER WITH A NONMAGNETIC GAP

[Abstract of article by Chunikhin, A. A. and Stroganov, B. G.]

[Text] The article presents the results of studies on the distribution of induction in the steel of a toroidal magnetic circuit of a current transformer depending on the angular coordinate, the value of the nonmagnetic gap and the number of nonmagnetic gaps. The authors noted the necessity of considering the above distribution of induction in calculating current transformers, as well as the possibility of calculating the inductance of the scattering of the secondary winding caused by the presence of the bulging field.

UDC 621.318.560.015

EFFECT OF ASYMMETRY ON THE MAGNETIC CHARACTERISTICS OF CLAPPER-TYPE SEALED-CONTACT RELAYS

[Abstract of article by Shoffa, V. N. and Grigoryan, A. Kh.]

[Text] The authors examine the effect of asymmetry on the magnetic characteristics (external $U_{бш}$ and internal $U_{бт}$ differences of magnetic potentials, external $\Lambda_{бш}$ and internal $\Lambda_{бт}$ magnetic conductance) of clapper-type sealed-contact relays. It is shown that, at prescribed length of the sealed contact and arrangement of the winding on the sealed contact, there is a definite ratio of the lengths of contact cores at which the relay has the highest sensitivity. And vice versa, for a definite ratio of the lengths of contact cores, there is an optimal arrangement of the winding.

UDC 621.316.57.027.2

THE USE OF PROTECTIVE ELECTRICAL DEVICES AGAINST OVERLOAD CURRENT IN HYPERBARIC SECTIONS OF UNDERWATER OBJECTS

[Abstract of article by Nesterov, G. G., Sukonkin, S. Ya. and Berdenikov, A. I.]

[Text] The authors propose a method for correcting the protective characteristic of automatic switches for working in hyperbaric sections of underwater and above-water objects and complexes with a helium gaseous medium. The results of their calculations are compared with respect to the heat transfer coefficient with the operation of switches in transformer oil and in water.

UDC 621.316.006.63.001.5

TRANSIENT PROCESSES IN A TRACTIVE ELECTROMAGNET CONTAINING A PERMANENT MAGNET WHEN IT IS MAGNETIZED AND DEMAGNETIZED FROM AN ALTERNATING VOLTAGE SOURCE

[Abstract of article by Shopen, L. V. and Savinov, V. P.]

[Text] Transient processes are examined in the winding of a tractive electromagnet controlled by a thyristor connected in series with the winding of the electromagnet and a source of sinusoidal voltage. The authors determined the effect of the connection angle of the thyristor and the quality factor of the electromagnet per current pulse in the winding (for the amplitude and average value of the pulse, its

length, and volt-second integral). A program of computations performed on a "Nairi-2" digital computer is given.

UDC 621.318.12

COMPUTATION OF RATIONAL DIMENSIONS OF PERMANENT MAGNETS

[Abstract of article by Korobkov, Yu. S.]

[Text] The author describes a method of calculating the dimensions of a permanent magnet when its material is known and the operation of the magnet is ensured at a point with the maximal energy. This method makes it possible to select the material of the magnet for the same conditions if its overall dimensions are known. Variants of computations are illustrated with examples.

UDC 621.317.015.5:621.316.933.1.001.5

DEVICE FOR TESTING ELECTRICAL EQUIPMENT

[Abstract of article by Sokolov, V. P. and Vavrzhenkevich, L. M.]

[Text] The authors examined the problems of designing devices for testing electrical equipment under pulsed action of testing voltage. They give the substantiation and method of computation of the maximum parameters of pulsed testing voltages.

UDC 621.317.72:621.317.32

TOWARD THE OPTIMIZATION OF ELECTROMAGNETS ON A MAGNETIC SUSPENSION FOR TRANSPORTATION FACILITIES

[Abstract of article by Beloshistov, Yu. R., Kerner, V. L., Kuzhekin, I. I., Makarychev, Yu. M., Poberezhskiy, L. P. and Ryzhov, S. Yu.]

[Text] The authors examine the statement of a problem connected with the development and studies of electromagnets for suspensions in transportation. They give the results of preliminary studes: dependence of the ratio of the tractive force of the electromagnet to its weight on the value of the magnetic induction in the working gap, as well as the restoring force of the electromagnet on the value of the lateral displacement of the electromagnet in relation to the rail.

UDC 621.316

ON THE PROBLEM OF THE STABILIZATION OF THE CHARGE CURRENT OF A CAPACITIVE ACCUMULATOR OF AN INDUCTION-DYNAMIC DRIVE OF CONTACTS OF A SYNCHRONOUS HIGH-VOLTAGE SWITCH

[Abstract of article by Kopachkov, A. R.]

[Text] Stabilization of the charge current of a capacitive accumulator (YeN) from a supply source (IP) of sinusoidal voltage through a fullwave rectifier at constant time of the charge circuit of YeN of more than 1 s makes it possible to ensure the YeN charge to the necessary voltage during the required time from IP of one eighth or one tenth lower power than with a charge from IP without stabilization of the charge current.

UDC 621.3.06.001.1

INVESTIGATION OF DYNAMIC CHARACTERISTICS OF A MEMBRANE SEALED CONTACT WITH THE AID OF AN ANALOG COMPUTER

[Abstract of article by Puchkov, A. S., Chicheryukin, V. N. and Sulakshin, V. V.]

[Text] This work gives the results of studies of the tractive dynamic characteristics of a membrane sealed contact obtained in simulating the basic dynamics equations on an analog computer of the type MN-7M. The shapes of the dynamic curves are analyzed with changes in the magnetomotive force, reduced mass and regidity of the membrane, as well as for various values of the effective resistance of the field winding. The obtained data make it possible to approach in a more substantiated way the methods of calculator of some parameters of a membrane sealed contact with consideration for the dynamics of its moving parts.

UDC 621.316.543:658.562.012.7

ANALYSIS OF TECHNOLOGICAL CONTROL METHODS OF THE CONTACT SYSTEM OF PACKET-TYPE SWITCHES AND PV AND PP SERIES SWITCHES

[Abstract of article by Kharichkina, V. V. and Godzhello, A. G.]

[Text] The authors analyze the shortcomings of the existing control method for assembled contact systems of packet-type switches and PP and PV series switches which is based on measuring the separation force. Due to insufficient reliability of this method, undetected faulty items reach the consumer. It is shown that the existing method monitors not the value of the contact pressure, but the frictional force in the contacts, and should be replaced with a method ensuring direct measurement of the contact pressure.

UDC 621.316.542

ON COMPUTATION OF SYNCHRONIZING ELECTROMAGNETS ON AN ELECTRONIC DIGITAL COMPUTER

[Abstract of article by Tayev, I. S. and Akimov, Ye. G.]

[Text] The authors propose a small-sized high-speed drive for a synchronous switching device based on a direct-type alternating current electromagnet with a Ш -type magnetic circuit and additional pole terminals. A method is given for calculating the electromagnetic drive with the use of the Euler numerical integration method. As a result of the computations of the synchronizing electromagnet on an electronic digital computer, the authors determined its basic structural dimensions and the electromagnetic characteristics.

UDC 621.86.062

ON DETERMINING THE PARAMETERS OF MAGNETIZING COILS OF PERMANENT MAGNETS BY A HALF-PERIOD VOLTAGE PULSE

[Abstract of article by Izotov, A. Z.]

[Text] The author gives the results of analysis performed with the aid of an electronic digital computer and calculated relations for determining the number of windings of the magnetizing coil of magnetic systems with permanent magnets switched to a half-period pulse of sinusoidal voltage.

UDC 621.316.542

COMPUTATION OF INDEXES OF CONTACT ARC-SUPPRESSION SYSTEMS OF CURRENT-LIMITING AUTOMATIC SWITCHES

[Abstract of article by Gorshkov, Yu. Ye.]

[Text] The author treats the problems of computing the indexes of contact arc-suppression systems of current-limiting automatic switch for a prescribed current limiting coefficient. He gives algorithms and results of their computation on an electronic digital computer. It shown that there is a set of solutions in selecting the intexes of contact arc-suppression systems and that the optimal solution can be achieved if energy factors are taken into consideration.

UDC 621.316.9.018.783

PROBLEMS OF TOLERANCE CONTROL IN MASS PRODUCTION OF OXIDE-ZINC RESISTORS OF OVERVOLTAGE LIMITERS

[Abstract of article by Nabatov, V. F., Morgunov, V. A. and Bokovikov, V. K.]

[Text] The authors analyze a system of tolerance control of a parameter determined indirectly: nonlinearity coefficient of oxide-zinc resistors. They show that it is possible to have several variants of tolerance control schemes for the nonlinearity coefficient by parameters measured directly: current and voltage. It is shown that a preferred scheme variant can be selected only on the basis of computations of the probabilities of false acceptance of faulty items and false rejection of good items.

10,233
CSO: 1860/181

ELECTRON DEVICES

PROBLEMS OF OPTICAL ELECTRONICS

Leningrad IZVESTIYA LENINGRADSKOGO ORDENA LENINA ELEKTROTEKHNICHESKOGO INSTITUTA IMENI V.I. UL'YANOVA (LENINA): VOPROSY OPTICHESKOY ELEKTRONIKI in Russian No 247, 1979 pp 101-110

[Abstracts for 23 articles from collection "Proceedings of Leningrad Electrotechnical Institute imeni V.I. Ul'yanov (Lenin): Problems of Optical Electronics"]

UDC 535.8:535.231.6

METHOD FOR REDUCING INERTIA OF COMPENSATED RADIATION RECEIVER

[Abstract of article by V.K. Grunin]

[Text] This article examines a method for reducing the inertia of a compensated radiation receiver based on simultaneous irradiation of the active and compensating elements which are characterized by a defined parameter relationship. It is proved possible to reduce the measurement time by a factor of 2 with a measurement error not exceeding 1%. Three illustrations, 2 bibliographic references.

UDC 621.362:551.508.21

ESTIMATE OF ERROR IN MEASURING BEAM FLUX USING THERMOELECTRIC RECEIVER WITH IKS-27 FILTER

[Abstract of article by B.N. Gul'kov and N.N. Sozina]

[Text] This article examines the possibility of using an IKS-27 filter to measure the thermal radiation of natural sources (ground, atmosphere) when the environmental termpature varies from 213 to 333 K. Correction coefficients, which account for incomplete pass-through of the filter beyond the spectral transparency region of 18-30 μm and 18-40 μm, are calculated.

It is shown that when the IKS-27 filter is used the error in measuring beam fluxes will be lower than when the KRS-5 filter with multilayer coating produced by the Eppli Company is used. Two illustrations, 1 table, 3 bibliographic references.

UDC 621.317.794:621.362.26

SOME PROBLEMS OF RADIATION FILTERING IN THERMOELECTRIC RECEIVERS

[Abstract of article by V.N. Yegorova]

[Text] This article examines methods of radiation filtering in a compensated-type thermoelectric receiver using a combination of different filters. It is shown possible to use selectively absorbing coatings of the receiving areas in order to obtain the required receiver spectral sensitivity. The error of receivers for radiation from the UV-portion of the spectrum with combined filters and coatings is estimated. Recommendations are given for the use of a thin-film coating on the input filter in order to create a DV [long-range] radiation receiver. Three illustrations, 5 bibliographic references.

UDC 621.317.794

INVESTIGATION OF SOME PHYSICAL PROPERTIES OF THIN METAL FILMS

[Abstract of article by V.A. Danilov and Yu.Z. Levin]

[Text] This article presents the results of experimental investigation of thin films of an alloy of 99.4% bizmuth and 0.6% lead made using the thermal evaporation method in a vacuum. The relationships $R = f(T)$ and $\alpha = \phi(T)$ are taken, and a proposed mechanism for the conductivity of these films is given. New methods are investigated for determining the coefficient of absorption and temperature coefficient of resistance of bolometric films. Two illustrations, 5 bibliographic references.

UDC 621.372.5:535.33

DEVICE FOR INVESTIGATING PARAMETERS OF LONG-WAVE INFRARED RECEIVERS

[Abstract of article by V.A. Maslov and Yu.M. Shakunov]

[Text] This article examines a simple device for determining the spectral sensitivity of receivers for the wavelength band extending from 15 to 150 μm which is based on isolating different spectral intervals using the residual beam method. Data from calculating the brightness of the useful long-wave radiation and the short-wave background are given for the case of two and three reflections of residual rays from crystals. In order to eliminate radiation of the short-wave background, the device uses polyethylene-based combined filters. Three illustrations, 1 table, 4 bibliographic references.

UDC 536.521.2:621.383.4

IR-RADIOMETER FOR UNMODULATED RADIATION WITH SIGHTING LIGHT BEAM

[Abstract of article by B.V. Vasil'yev, A.G. Medvedev, A.V. Minashkin and V.V. Mirgorodskiy]

[Text] This article examines the constructing of an IR-radiometer with an unmodulated light flux designed for measuring the surface temperature of objects (in the vicinity of room temperature). The radiometer has automatic compensation for variation in readings caused by temperature oscillation, as well as a system for optical sighting of the surface being monitored. The radiometer has temperature resolution of 6 μV/K and angular resolution of 1/10 rad. Three illustrations, 3 bibliographic references.

UDC 535.312.15:621.384.3

ANALYSIS OF REFLECTION METHOD FOR MEASURING RADIATING CAPACITY AT NEAR-ENVIRONMENTAL TEMPERATURES

[Abstract of article by M.B. Stolbov]

[Text] This article analyzes the influence of the radiation flux from the background, receiver and specimen on the accuracy of measuring radiating capacity using the reflection method, and estimates the required illumination temperature: a modified method is proposed which can be used to reduce the illumination temperature and to eliminate the influence of indefinition of the indicatrices of the reflection and variations of the background flux. Two tables, 7 bibliographic references.

UDC 621.8:535.214.4+621.384.3

INVESTIGATION OF INFLUENCE OF DEGREE OF VACUUM AND REFLECTED RADIATION ON PRECISION OF MEASURING RADIATING CAPACITY USING CALORIMETRIC METHOD

[Abstract of article by V.L. Ivanov]

[Text] An experimental setup is described for investigating the integral hemispherical radiating capacity, using the calorimetric method, of several specimens simultaneously; the influence of the degree of vacuum and reflected radiation on the measurement accuracy is analyzed. The results of measuring specimens of nickel and stainless steel are presented. Three illustrations, 6 bibliographic references.

UDC 535.8:535.214.4:621.384.3

DEVICE FOR DETERMINING INTEGRAL RADIATION CAPACITY OF MATERIALS HEATED TO 500°C IN VACUUM

[Abstract of article by V.F. Kusakin]

[Text] A device is described for investigating the normal integral radiating capacity of materials in the 100-500°C temperature range based on a radiation measurement method. The accuracy with which the coefficients of radiation are measured is 7%. Two illustrations, 6 bibliographic references.

UDC 535.33:535.312

INVESTIGATION OF REFLECTING CAPACITY OF NATURAL AND MAN-MADE OBJECTS USING LASERS

[Abstract of article by T.Yu. Sheveleva, M.A. Kropotkin, N.B. Leus and V.A. Ivanov]

[Text] He-Ne and CO_2 lasers are used to investigate the spatial distribution of radiation reflected by sand, soil, brick, concrete, asphalt and foam- and vegetation-covered water at wavelengths of 0.63, 1.15, 3.39 and 10.6 μm. The influence of moisture content on the reflecting capability of these materials is studied using the device with a hemispherical reflector. The hemispherical coefficients of reflection of these objects are studied. The influence of moisture content on the coefficients is investigated. Two illustrations, 1 table, 4 bibliographic references.

UDC 621.396

MAXIMUM SENSITIVITY OF QUANTUM MECHANICAL PHYSICAL FIELD TRANSDUCER FOR MARINE RESEARCH

[Abstract of article by Ye.G. Pashchenko and V.V. Tikhonov]

[Text] This article determines the maximum sensitivity of a superconducting magnetic field transducer using the principle of quantum interference for underwater research. Vibration interference is considered, and the design of the transducer is examined. Four illustrations, 8 bibliographic references.

UDC 548.734

QUANTUM MECHANICAL INVESTIGATION OF CAPTURE OF CURRENT CARRIERS ON ATTRACTING CENTERS IN POLAR SEMICONDUCTORS

[Abstract of article by V.N. Abakumov and Z.N. Sokolova]

[Text] A quantum mechanical calculation is made for the capture section of a free charge carrier on an attracting hydrogen-like center assuming that the excess energy of the carrier is transmitted to the lattice by means of emission of the polar optical phonon. Survival time formulas are derived for equilibrium and monoenergetic carrier distribution. The theoretical results are compared with experimental data for p-GaAs. One illustration, 5 bibliographic references.

UDC 548.734

SOME POSSIBILITIES OF UTILIZING SIMULTANEOUS DIFFRACTION OF X-RADIATION FOR STRUCTURAL ANALYSIS OF HETEROEPITAXIAL LAYERS

[Abstract of article by N.A. Bert, S.G. Konnikov and B.Ye. Umanskiy]

[Text] This article examines the possibilities of using simultaneous diffraction of X-radiation in the wide diverging beam method for studying the structural perfection of heteroepitaxial films. The results of determining the mismatch of

permanent lattices are presented, along with the size of the permanent layer lattice, as well as the deformation and stresses occurring in the heterostructures. The capabilities of the wide diverging beam method are examined for observing blocking in heteroepitaxial layers; the dimensions and angle of disorientation of the blocks are estimated. Two illustrations, 4 bibliographic references.

UDC 621.382.132

ELECTRICAL PROPERTIES OF Au-pCaP SURFACE BARRIER STRUCTURES

[Abstract of article by O.A. Omar and V.A. Popov]

[Text] The volt-ampere and volt-capacitive characteristics of Au-pCaP structures were investigated. The height of the barrier ϕ_w was found from the characteristic data. The disagreement between the values for ϕ_v determined from the volt-capacitive and volt-ampere characteristics indicates the existence of intermediate dielectric layers in these structures. It is shown that the electrical characteristics of specimens with a low concentration of small donors Nd = 10^{16} cm^{-3} differ significantly from analogous characteristics for specimens with Nd = 10^{17} cm^{-3}. This difference is explained by the presence of deep centers. Three illustrations, 1 table, 6 bibliographic references.

UDC 621.315.592

ELECTRICAL ACTIVATION OF PHOSPHOROUS IMPURITY IN ION-ALLOYED GERMANIUM AFTER LASER PROCESSING

[Abstract of article by O.N. Voron'ko, A.B. Klyukvin and Ye.V. Mikhayluts]

[Text] This article presents the results of investigating germanium alloyed by the phosphorous method of ion bombardment using different methods for follow-on processing. Thermal annealing and laser annealing were used in free generation and monopulse modes. It was established that laser annealing in the monopulse mode is most effective, which may be associated with the increased role of the process of photoionization in activating the impurity. One illustration, 1 table, 4 bibliographic references.

UDC 681.335.2.001.5:621.382

INVESTIGATION OF DRIFT OF SHORT BUNCHES OF CARRIERS IN SOLID-STATE MICROELECTRONIC DEVICES

[Abstract of article by A.A. Dakhnovich, M.K. Kovaleva and N.V. Kozhus']

[Text] The change in the form of a bunch of carriers moving through a semiconductor due to diffusion and drift processes is determined. It is shown that in this case the distortion in the spectrum of a pulse at the output of the device is analogous to the distortion in the spectrum of the signal at the output of a linear two-port network with exponential amplitude-frequency and linear phase-frequency

characteristics. Four bibliographic references.

UDC 621.387.3

PLASMA SIGHT FOR SCREEN OF CATHODE-RAY TUBE

[Abstract of article by O.V. Skurskiy and V.V. Chernigovskiy]

[Text] This article examines some problems involved in creating a plasma sight for the screen of a cathode ray tube using electrodeless high frequency gas discharge. Its advantages over existing types of analogous devices are demonstrated. The construction of the device, configured as a separate transparent screen, is described; some experimental data from investigating finished models are given. Two illustrations, 1 bibliographic reference.

UDC 533.951.7

THEORY OF SURFACE-WAVE PLASMA GENERATOR

[Abstract of article by V.T. Barchenko, O.V. Dolzhenko and M.V. Kuzelev]

[Text] This article investigates the problem of exciting surface electromagnetic waves in a resonator filled with a thin tubular plasma, a monoenergetic relativistic tubular electron beam. The linear increment of surface plasma waves in this system, and the resonator excitation startup current, are determined. The single-mode operating condition of the generator is discussed. Two illustrations, 4 bibliographic references.

UDC 621.327.52

INVESTIGATION OF TRANSIENT CHARACTERISTICS OF RADIATION OF DKSSH LAMPS DURING PULSE MODULATION OF DISCHARGE CURRENT

[Abstract of article by A.P. Sazanov]

[Text] This article considers problems of the ability to modulate the radiation from short-arc xenon superhigh-pressure lamps as applied to the problem of recording information on light-sensitive layers.

The inertia of the variation of radiation during pulse modulation of the discharge current of a DKSSH-75 lamp is investigated experimentally. Two illustrations, 2 bibliographic references.

UDC 621.385.832:088.8

SCATTERING CAPACITY OF ELECTROPHORESIS SUSPENSIONS

[Abstract of article by A.A. Vostrov]

[Text] This article considers the proposition that there exists a resistance

which hinders precipitation and which can serve as a measure of the scattering capability of electrophoresis suspensions. Experimental results which confirm these assumptions are given. One table, 2 bibliographic references.

UDC 669.293.37

COMPOSITION OF GAS PHASE AND CHARACTERISTICS OF NIOBIUM PENTACHLORIDE EVAPORATOR

[Abstract of article by A.N. Alekseyev]

[Text] The Nb-Cl-H system is analyzed thermodynamically in the operating range of an $NbCl_5$ evaporator. The equilibrium composition of the gaseous phase is calculated. Analytical expressions are derived for the evaporator parameters. The analysis of the evaporator parameters makes it possible to calculate fully the equilibrium process of precipitation of a niobium film and its compound from chlorides by recovering them with hydrogen. One illustration, 4 bibliographic references.

UDC 621.371.715

SYSTEM FOR THERMOSTABILIZATION OF LOW-TEMPERATURE RATIO PYROMETER

[Abstract of article by V.V. Bondarenko, A.M. Vasilevskiy, A.A. Zharov and I.Ch. Mashek]

[Text] This article presents the results of developing and investigating a thermostabilization system for the optical head of a low-temperature ratio pyrometer. The system provides temperature stabilization of the internal space of the optical head of the pyrometer to within at least 0.05°C at a temperature of 35°C with environmental temperature varying between 10 and 30°C. One illustration, 1 bibliographic reference.

UDC 621.398:551.508

USE OF THERMOELECTRIC RADIATION RECEIVERS FOR INVESTIGATING UNDERWATER LIGHT FIELD

[Abstract of article by V.I. Troshkov]

[Text] This article proposes using the LETI radiation thermal element for integral measurements of underwater illumination in combination with a system of actinometric receivers. The following basic advantages are noted: nonselectivity of the receivers in the 0.3-3.0 μm band, and high sensitivity - 50 $mV/cal \cdot min^{-1} \cdot cm^{-2}$. An expression is given for the sensitivity of the pyranometer under water, along with results from measuring underwater and above-water irradiance. Three illustrations, 3 bibliographic references.

6900
CSO: 1860/145

UDC 621.383

MEASUREMENT OF OPTOELECTRONIC DEVICE PARAMETERS

Moscow IZMERENIYE PARAMETROV PRIBOROV OPTOELEKTRONIKI in Russian 1981 (signed to press 8 Jul 81) pp 2-5, 19-21, 208, 245-246, 264, 306-307, 332, 335, 363-365

[Annotation, foreword, tables and table of contents from book "Measurement of the Parameters of Optoelectronic Devices", by Nikolay Fedorovich Geda, reviewed by Doctor of Physical and Mathematical Sciences M. I. Yelinson, Doctor of Technical Sciences A. V. Iyevskiy and Candidate of Technical Sciences V. P. Dmitriyev, Izdatel'stvo "Radio i svyaz'", 6000 copies, 366 pages]

[Text] The author gives the classification of incoherent optoelectronic devices and determines the optimal system of their parameters. He examines methods of measuring the parameters and the designing principles of information and measuring complexes controlled by electronic computers. Metrological aids for the designing and manufacturing of incoherent optoelectronic devices are discussed. Scientific principles of methods for metrological facilities of enterprises are developed.

The book is intended for specialists working in various areas of radio electronics, as well as for undergraduate and graduate students specializing in this area.

Foreword

Resolutions of the 26th CPSU Congress, as well as decisions of the party and government, defined the raising of production effectiveness as the main task and indicated the necessity of systematic improvement of the quality of production and improvement of the production control system.

In order to solve this complex problem, it is necessary to have reliable information on the quality of initial materials, the state of technolcgical process, and parameters of finished products. Measurements are the main source of such information at all stages of production. By achieving the necessary level of accuracy and reliability of measurements during the stages when the quality of the product is formed (initial materials, technolgical processes) it is possible to switch from monitoring the quality of finished products to quality control and, consequently, to conduct the production process on a profitable basis.

In recent years, the problem of obtaining reliable results of measurements of parameters in semiconductor electronics has become quite acute. This was caused by a rapid growth of the requirements for the accuracy of measurements, appearance of new

parameters, and the necessity of automated measurements in organizing mass production of electronic engineering products (IET).

Since IET are articles supplied to enterprises of all sectors of the national economy producing and operating various instruments, the problem of ensuring identical measurement of parameters in the manufacturing of IET by the manufacturer and during the receipt control by the consumer is also of paramount importance.

The requirements of ensuring a steady improvement in the accuracy of measurements of the parameters and uniformity of their measurement, particularly in the absence of standardized methods of measuring new types of IET for promising radio electronic systems and complexes, are not always met. Some theoretical problems of metrological aids for developing and manufacturing IET have not been worked out thoroughly.

The intensive and, to a considerable extent, independent development of individual branches of industry led to the appearance of discordances of some terms, normalized metrological characteristics, and sometimes even to discordances of standards. Some problems of metrological means have not been included in the State System for Standardization of Measurements (GSI) but are distributed over other systems. This does not contribute to the solving of modern problems of improving the quality of products, growth of the effectiveness of mass production of IET, as well as to the improvement of the technical and operational characteristics of electronic devices and systems in which they are used.

There are a number of published articles, but no basic works treating the measurement of the parameters and metrological means for developing and manufacturing incoherent optoelectronic devices. The purpose of this book is to fill this gap to some extent and make it possible for the reader not only to obtain information on individual special problems, but also to see the problem as a whole: along with detailed examination of the parameters, methods and means of their measurement, to familiarize oneself with the concept and ideas introduced by optics into electronics, prospects for the development of instruments of incoherent optoelectronics, and areas of their applications.

Purposeful examination of a broad range of new problems treated in the book made it necessary to examine them in an integrated manner: the first chapter explains the possibilities of incoherent optoelectronics ensuring the attainment of maximum characteristics of systems of radio electronics and instrument-building, gives the classification of devices and their terminology, and examines principles of the development of an optimal system of parameters. Subsequent chapters present physical principles of the operation of incoherent optoelectronic devices, areas of their applications, systems of parameters and methods of their measurement, problems of the development of working means of measurements with consideration for the necessity of automated measurements in mass production of instruments.

Special attention is given to the problems of measuring photometric parameters and metrological facilities, since measuring these parameters in mass production is connected with many technological and designing complexities and the absence of the appropriate level of metrology. Whenever necessary, the author analyzed the state of metrological standardization, expanded and refined certain concepts, and concentrated his attention on unsolved problems.

At the present time, there is a great deal of discord in available literature on incoherent optoelectronics with respect to terminology and classification. The classification developed by the author divides products of incoherent optoelectronics by their functional significance and degree of complexity with consideration for the prospects for their development.

The bibliography given here is not at all complete. For example, there are many publications on the physical principles of operation of the elements and devices of optoelectronics and their areas of applications. The author deemed it possible to do without traditional references, giving only a list of recommended literature.

The author is deeply grateful to Professor Yu. R. Nosov, doctor of technical sciences and to Candidates of Technical Sciences A. B. Gittsevich and V. K. Kostomarov for their suggestions and help in working on the monograph.

The author is also grateful to Professor M. I. Yelinson, doctor of technical sciences, Professor A. F. Kotyuk, doctor of technical sciences, Professor V. N. Sretenskiy, doctor of technical sciences, A. V. Iyevskiy, doctor of technical sciences, and V. P. Dmitriyev, candidate of technical sciences, for their valuable suggestions for improving the book.

Table 1.1

Parameters of Some Radiating Diodes Produced by Soviet Industry

Type of Instrument	Forward current, mA	Forward voltage, V, not over	Radiation power, mW	Brightness of glow candela/m^2	Luminous intensity, Mcd	Color of glow wavelength, μW
AL101A	10	4.5	-	20...80	-	Yellow
AL101B	20	2.5	-	20...80	-	"
AL102A	5	3.2	-	10...50	-	Red
AL102B	20	4.5	-	40...120	-	"
AL102V	20	2.8	-	150...400	-	Green
AL102G	10	3.0	-	20...100	-	Red
AL102D	20	2.8	-	400...800	-	Green
AL103A	50	1.3	1.0...5.0	-	-	λ_{max}=0.91 ...0.95
AL103B	50	1.3	0.6...1.5	-	-	
AL106	80	1.6	1.0...6.0	-	-	
AL107	100	1.6	1.0...7.0	-	-	
AL108	100	1.5	1.4...1.6	-	-	
AL109	20	1.2	0.2...0.6	-	-	
U-14	10	3.8	-	10...50	-	Red
U-15	20	3.8	-	20...120	-	"
U-17A	10	1.35	1.0...4.0	-	-	λ_{max}=0.91 ...0.95
U-17B	10	1.35	0.5...1.0	-	-	
U-18A	20	1.2	0.2...0.8	-	-	
U-18B	20	1.2	0.1...0.6	-	-	
AL301A	10	3.0	-	10...50	-	Red
AL301B	10	3.8	-	20...80	-	"
AL307A	10	2.0	-	-	0.15...0.6	"
AL307B	10	2.0	-	-	0.9...1.8	"
AL307V	20	2.8	-	-	0.4...1.5	Green
AL307G	20	2.8	-	-	1.5...3.5	Red
AL307D	10	2.5	-	-	0.4...0.8	Yellow
AL307Ye	10	2.5	-	-	1.5...1.9	"
AL307I	10	2.5	-	-	0.4...0.6	Orange
AL307L	10	2.5	-	-	1.5...2.6	"
AL310A	10	2.0	-	-	0.6...2.5	Green
AL310B	10	2.0	-	-	0.25...0.6	Red

Table 1.2

Parameters of Some Types of Indicators Produced by Soviet Industry

Type of indicator	Forward current mA	Forward voltage, V, not over	Brightness of glow cs/m^2	Luminous intensity μcd	Height of segment sign, mm	Color of glow
Four-element indicators						
ALS326A	20	2.5	-	not below 150	7.0	Red
ALS326B	20	2.5	-	not below 150	7.0	"
ALS327A	20	3.6	-	100...150	7.0	Green
ALS327B	20	3.6	-	100...150	7.0	"
Seven-element indicators						
AL304A	5	2.0	over 350	-	3.0	Red
AL304B	5	2.0	200...350	-	3.0	"
AL304V	10	3.0	60...350	-	3.0	Green
AL304G	10	3.0	over 350	-	3.0	"
AL305A	20	4.0	over 350	-	7.0	Red
AL305B	20	4.0	200...350	-	7.0	"
ALS312A	10	2.0	350	-	7.0	"
ALS313	5	1.65	-	57	2.5	"
ALS314A	5	2.0	over 350	-	7.0	"
ALS314B	5	2.0	200...350	-	7.0	Red
ALS320A	10	2.0	-	not below 400	5.0	"
ALS320B	10	2.0	-	not below 600	5.0	"
ALS320V	10	3.0	-	not below 150	5.0	Green
ALS320G	10	3.0	-	not below 250	5.0	"
ALS321	20	3.6	-	100...160	7.0	Yellow-green
ALS324A	20	2.5	-	over 350	7.0	Red
ALS324B	20	2.5	-	200...350	7.0	"
ALS332	20	2.5	-	over 1000	12.0	"
ALS333	20	2.0	-	180...260	12.0	Red
ALS334	20	3.3	-	not below 400	12.0	Yellow
ALS335	20	3.5	-	not below 250	12.0	Green
Thirty-five-element indicators						
AL306 A, V	10	2.0; 3.0	over 350	-	9.0	Red
AL306 B, G	10	2.0; 3.0	200...350	-	9.0	Red
AL306 D, Zh	10	3.0	120...200	-	9.0	Red
AL306 Ye, I	10	3.0	60...120	-	9.0	Red Green
ALS340A	10	2.5	-	100...150	9.0	Red
Seven-element indicator with a control circuit						
K490IP1	-	-	-	150...200	2.5	Red
Two-discharge seven-element indicators						
ALS330 D,Ye	3	1.85	-	not below 70	3.75	Red
ALS330 I,K	3	1.85	-	not below 70	5.0	"
Three-discharge seven-element indicators						
ALS329 D,Ye	3	1.85	-	not below 70	2.5	Red
ALS329 M,N	3	1.85	-	not below 70	3.75	Red

Table 1.2 (Cont'd)

		Four-discharge seven-element indicators			
ALS329 Zh,I	3	1.85	- not below 70	3.75	Red
AL308A	10	1.65	- not below 50	2.5	"
ALS311B	10	2.0	- not below 100	2.5	"
		Five-discharge seven-element indicators			
ALS3.1A	10	2.0	- not below 100	2.5	Red
ALS328A, B	3	1.85	- not below 70	2.5	Red
ALS328V, G	3	1.85	- not below 70	3.75	Red
		Nine-discharge seven-element indicators			
ALS318	5	2.0	- not below 160	2.5	Red
ALS322	5	1.65	- 60...80	9.0	"
		Five-segment linear scale element			
AL317A	10	2.0	- 160...350	1.6	Red
AL317B	10	2.0	- over 350	1.6	"
AL317V	10	3.0	- 80...160	1.6	Green
AL317G	10	3.0	- over 160	1.6	"

Table gives luminous intensity per one sign element

Table 8.1

Most Important Parameters of Radiating Devices

Article	Parameter	Designation	Measuring ranges	Measuring methods
Discrete radiators and matrices	Forward voltage	$U_{пр}$, V	1.5...3	GOST 18986-73
	Back current	$I_{обр}$,A	$10^{-8}...10^{-5}$	GOST 18986.1-73
	Luminous intensity	$\mathcal{J}$, cd	$(50...1200)10^{-6}$	OST 11.336.012.76
	Power	P, W	$(0.1...20)10^{-6}$	OST aA0.336.001-74
Single-discharge sign indicators	Forward voltage	$U_{пр}$, V	1.5...2.5	GOST 18986.3-73
	Back current	$I_{обр}$,A	$10^{-7}...10^{-6}$	GOST 18986.1-73
	Luminous intensity	$\mathcal{J}$, cd	$(30...500)10^{-6}$	OST 11.336.022-76
Single-discharge sign indicators with cross switching	Luminous intensity	$\mathcal{J}$, cd	$10^{-7}...10^{-6}$ $(30...500)10^{-6}$	OST 11.336.022-76
Scales	Forward voltage	$U_{пр}$,V	1,5...3	GOST 189986.3-73
	Back current	$I_{обр}$,A	$10^{-8}...10^{-6}$	GOST 18986.1-73
	Luminous intensity	$\mathcal{J}$, cd	$(50...1000)10^{-6}$	OST 11.336.022-76
Multidischarge sign indicators with cross switching for multiplex operation mode	Forward voltage	$U_{пр}$, V	1.5...2	GOST 18986.3-73
	Back current	$I_{обр}$,A	$10^{-7}...10^{-6}$	GOST 18986.1-73
	Luminous intensity	$\mathcal{J}$, cd	$(0.5...5)10^{-3}$	OST11.336.022-76
	Spread in luminous intensity	k, per unit value	1...3	$\mathcal{J}_{max}/\mathcal{J}_{min}$
Screen elements	Leakage resistance between segments and discharges	R_{cc},R_{pp}, Ohm	$(10...100)10^3$	GOST 22440.2-77

Table 8.3

Static Parameters of Produced Optocouples and Optoelectronic Microcircuits

Parameter, measurement unit	Letter designation	Parameter norm	Instrument whose parameter is measured
Input voltage, V	$U_{вх}$	1-2	30D101, A0D101, 30D109, A0D109, 249LP1, 249KN1, K249LP1, B206A, B191A, 30T102, A0T102
Insulation resistance, Ohm	$R_{из}$	$10^9...10^{10}$ $10^9...10^{10}$ 10^{11} $(1...2)10^8$	30T102, A0T102, 30D109, A0D109, 249LP1, K49LP1 B206A, 249KN1, 295KT1, K295KT1, A0T110
Back current of photodiode, μA	$I_{обр}$	0.15...2.0	30D101, A0D101, 30D109, A0D109, B206A, B191A
Current transmission factor, %	K_1	over 0.65	30D101, A0D101, 30D109, A0D109, B206A, Optron
Back current drift of photodiode	$\delta I_{обр}$		30D101, A0D101, 30D109, A0D109, B206A
Increment of output current, μA	$\Delta I_{вых}$	$\geqslant 0.7$	B191A
Output voltage, V, corresponding to			
"0"	$U^0_{вых}$	$\leqslant 0.4$	249LP1, K249LP1
"1"	$U^1_{вых}$	$\geqslant 2.3$	249LP1, K249LP1, "Dakron-1"
Current, mA:			
on	$I_{вкл}$	$<10...20$	295KT1, K295KT1, A0U103
off	$I_{выкл}$	$\leqslant 10...20$	296KT1, K295KT1, A0U103
Current in closed state, mA	$I_{закр}$	< 10	295KT1, K295KT1, 2U106
Voltage in open state, V	$U_{откр}$	$\leqslant 2.5$	295KT1, K295KT1, 2U106
Interbase resistance, kOhm	$R_{б1\ б2}$	4...12	30T102, A0T102
Transmission factor	η	0.5...0.9	2U106
Residual voltage of emitter junction, V	$U_{ост\ э}$	$\leqslant 3.8$	30T102, A0T102
Change of transmission factor, %	$\Delta\eta$	$\geqslant 20$	30T102, A0T102
Holding current, mA	$I_{уд}$	$\leqslant 6$	2U106
Leakage current of emitter junction μA	$I_{ут\ э}$	$\leqslant 0.5$	30T102, A0T102
Performance check	-	-	295KT1, K295KT1
Residual voltage, V	$U_{ост}$	$\leqslant 1.5...2.5$	A0U103, A0T110, 249KN1
Output leakage current μA	$I_{ут}$	$\leqslant 0.1...1$	A0U103, A0T110, 295KT1

Table 9.1

Metrological Means of Electrical Time Parameters of Optoelectronic Products

Parameters	Measuring instrument error, %, absolute units		Standardization level
	Working	Reference	
	Static		
Input voltage	0.2...3	0.05	GOST 22440.2-77
Input current	0.2...3	$5 \cdot 10^{-4} I_{BX} + 10^{-10} A$	GOST 22440.3-77
Output voltage (of logical level, residual voltage)	0.2...3	$5 \cdot 10^{-4} U_{BHX} + 10^{-5} V$	GOST 22604.1-77
Output current (dark current, leakage current, short-circuit current, switching current)	0.5...5	$5 \cdot 10^{-4} I_{BHX} + 10^{-10} A$	GOST 22440.5-77
Current transmission factor	0.5...5	$10^{-3} K_I$	GOST 22604.3-77
	Dynamic		
Time:			
on	10...15	$5 \cdot 10^{-2} t + 1$ ns	GOST 22440.8-77
off	10...15	$5 \cdot 10^{-2} t + 1$ ns	"
Duration:			
front	10...15	$5 \cdot 10^{-2} t + 1$ ns	"
cut-off	10...15	$5 \cdot 10^{-2} t + 1$ ns	"
	Coupling		
Capacitance between output and input	0.05C+ +0.02 pF	10^{-3}	GOST 18986.4-73 (with supplement)
Insulation resistance	5...15	1.5...3	GOST 22440.9-77
Insulation voltage	2...3	0.2	GOST 22440.2-77

Table 9.4

Indexes of Control Confidence and Effectiveness

Terms	Definitions	Conventional symbols	Sources
	For erroneous rejection of a defective item		
Probability of "undetected fault"	Conditional probability of obtaining "go" decision in checking a parameter whose value, in reality, does not correspond to the requirements of technical documentation.	$P_{НО}$	GOST 19919-74
	Percentage of the total number of components which were measured, had deviations beyond both boundaries, and were accepted among effective components.	m	GOST 8.051-73
Undetected rejects	Probability of accepting a defective item as effective.	-	Materials on methods of application. GOST 8.009-72
Outgoing quality level	Fraction of defective items in an accepted batch.		GOST 15895-70
Fraction of defective items	Ratio of defective items to the total number of checked items.	-	GOST 15895-70
Consumer's risk	Probability of accepting a batch of items with a rejectionable quality level.	-	GOST 15895-70
Rejectionable quality level	Incoming quality level, to which, according to the control plan, corresponds a low probability of accepting a bad batch of items.	$Q_{ВХ}$	GOST 15895-70
	Probable value of the size deviation beyond each tolerance limit in erroneously accepted components.	C	GOST 8.051-73
	Value characterizing the emergence beyond the upper or lower tolerance limit.	d	GOST 8.051-73
	For erroneous rejection of an effective item		
Probability of a "false failure"	Conditional probability of a "no-go" decision in checking a parameter whose value does correspond to the requirements of technical documentation.	$P_{ЛО}$	GOST 19919-74

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Table 9.4 (Cont'd)
Indexes of Control Confidence and Effectiveness

Terms	Definitions	Conventional symbols	Sources
	Percentage of the total number of components which were measured and have deviations within the permissible levels, but were rejected.	n	GOST 8.051-73
Ficticious rejection	Probability of rejecting an effective item.	-	Materials on methods of application. GOST 8.009-72
Risk of the supplier	Probability of rejecting a batch of items with an acceptance quality level.	-	GOST 15895-70
Acceptance quality level	Incoming quality level to which, according to the control plan, corresponds a relatively low probability of rejecting an effective batch of items.	$q_{\text{ВНХ}}$	GOST 15895-70

Table 10.1

Materials for Semiconductor Radiators

Тип соединения (1)	Полупроводник (2)	Ширина запрещенной зоны, эВ (3)	Тип соединения (1)	Полупроводник (2)	Ширина запрещенной зоны, эВ (3)
$A^{III}B^{V}$	GaAs	1,45	$A^{II}B^{VI}$	ZnSe	2,7
	GaP	2,25		ZnS	3,8
	AlAs	2,16		ZnO	3,2
	InAs	0,46		ZnTe	2,3
	GaSb	0,70		CdS	2,5
	InP	1,34		CdSe	1,8
	AlP	2,42		CdTe	1 6
	GaN	3,50	$A^{IV}B^{IV}$	α — SiC	5,8
				β — SiC	2,35

Key: 1. Coupling type
2. Semiconductor
3. Width of forbidden zone, eV

Table 10.2

Characteristics of Semiconductor Materials for Photoreceivers

Вид фотоприемника (1)	Материал (4)	(5) W_q, эВ	(6) λ, мкм	(7) $\lambda_{гр}$, мкм	(8) μ_n, $см^2/(В \cdot с)$	(9) τ·μ, $см^2/В$	(10) Диапазон удельных сопротивлений, Ом·см	(11) Достигнутое быстродействие, с
Фоторезисторы (2)	CdS	2,4	0,52	0,7	350	0,1...0,2	10^7...10^{10}	10^{-3}
	CdSe	1,7	0,72	0,85	600	(5...6)10^{-3}	10^3...10^9	10^{-3}
	ZnS	3,7	0,34	0,4	70	700	10^4...10^{12}	10^{-3}
(3)	Si (Zn)	1,1	0,75...0,85	1,1	1200	10^{-6}...10^{-5}	10^4...10^9	10^{-4}
	Si (Au)	1,1	0,7...0,9	1,1	1200	1...0,1	10^4...10^9	10^{-7}
Фотоприемники с *p—i—n*, *p—n*-перехо-дом	Si	1,16	0,8...0,9	1,1	1200	—	10^3...10^6	10^{-10}
	Ge	0,74	1,55	1,8	1900	—	10^3...10^6	10^{-9}
	GaAs	1,44	0,8	0,85	900	—	10^3...10^7	10^{-10}
	InAs	0,36	3,3	3,6	850	—	10^3...10^7	10^{-10}
	PbS	0,56	2,1	2,7	250	—	10^3...10^8	10^{-3}

Key: 1. Photoreceiver type
2. Photoresistors
3. Photoreceivers with p-i-n, p-n junctions
4. Material
5. eV
6. λ, μm
7. λ_{gr}, μm
8. $cm^2/(V \cdot s)$
9. cm^2/V
10. Specific resistance range, ohm·cm
11. Achieved operation speed, s

Contents

10,233
CSO: 1860/124

INSTRUMENTATION & MEASUREMENTS

UDC: 621.317

SELF-CALIBRATING MEASURING INSTRUMENTS

Kiev SAMONASTRAIVAYUSHCHIYESYA IZMERITEL'NYYE PRIBORY in Russian 1981 (signed to press 8 May 81) pp 2-4, 202-203

[Annotation, foreword and table of contents from book "Self-calibrating Measuring Instruments", by S. G. Taranov, Izdatel'stvo "Naukova dumka", 204 pages]

[Text]

Annotation

This book explains the theory and principles of constructing self-calibrating wideband and selective measuring amplifiers, as well as stabilized alternating current sources. A classification of self-calibrating measuring instruments is provided. A method is given for analyzing the stability of self-calibrating measuring instruments, which are nonlinear, non-autonomous, nonstationary automatic control systems described by nonlinear differential equations with variable coefficients. A time quantization method is proposed for analyzing transient processes. The information characteristics of instruments are determined.

The book is intended for scientific and engineering-technical workers specializing in the area of information-measurement technology, and for specialists involved in developing electronic measuring instruments, 40 illustrations, 195 bibliographic references.

Foreword

The present stage of development of measurement technology is characterized by significant complication of the operating conditions of instruments — the variation of environmental temperature, pressure, humidity, supply voltage, radiation, etc., over an extremely wide range. In addition, the requirements for the parameters of measurement facilities, primarily accuracy, sensitivity, speed and reliability, have increased. All of this makes it necessary to complicate the schematic diagrams of the instruments. The overall trend in the improvement of electronic instrumentation is to utilize standardized integrated modules. As a rule, these standard modules have a significant parameter spread and time/temperature instability. The use of traditional methods to reduce errors — compensation circuits, manual calibration — are usually ineffective because of a number of familiar shortcomings.

The structural methods which have recently come to be used extensively for reducing additive and multiplicative errors are most radical. In order to reduce multiplicative error, instruments are used which have a closed functional diagram (single- and multi-section); these are linear, stationary and tracking automatic control systems.

Giving the advantages of these instruments their due, we must not forget their basic disadvantages: these include the complexity of implementing these circuits in instruments used to measure nonelectrical quantities, reduced sensitivity due to considerable negative feedback, expanded passband of selective devices, etc.

In the author's opinion, the most promising systems for reducing multiplicative errors caused by slow variation in the parameters of analog circuit elements are self-calibrating systems with and without fault tracing with continuous and periodic comparison. A number of problems remain unresolved for self-calibrating instruments (instruments in which the principle of self-calibrating measurement systems is realized).

1. Dynamic analysis, including stability and quality analysis. This problem is complicated by the fact that self-calibrating instruments are nonautonomous, nonlinear, nonstationary automatic control systems and are described by nonlinear differential equations with variable coefficients. In the general case, the latter are expressed through discontinuous functions.

2. Static analysis, which includes investigating the measurement equation and errors considering their probability-statistical nature.

3. The principles of constructing self-calibrating measuring instruments for measuring electrical quantities.

This book attempts to solve these problems. The book presents the results of the author's research in this area at the Institute of Electrodynamics of the Academy of Sciences of the Ukrainian SSR. Wideband and selective amplifiers, as well as stabilized alternating voltage sources, which are used extensively in instrumentation technology, are used as practical examples. All of the instrument circuits presented in the book were proposed with the author's participation, have been verified in practice; most of them have been introduced to industry. Because of limited space, the book does not include other examples, particularly self-calibrating instruments designed for determining magnetic quantities. The book attempts to systematize self-calibrating instruments in terms of various classification features. The harmonic linearization method has been developed furthest for analyzing stability; a time quantization method has been developed for performance analysis; error analysis is done considering the probability-statistical and information characteristics of the instruments. It should be noted that the use of the principle of self-calibrating systems for automating static multiplicative errors comes far from exhausting its capabilities. It is especially expedient to use this principle to reduce dynamic errors, particularly the additional dynamic errors which arise when environmental conditions change. In the latter

case, fault-tracing self-calibrating systems with a standard model may be the only means for solving this problem.

The author is grateful to F. B. Grinevich, Ukrainian Academy of Sciences academician, as well as Candidates of Technical Sciences V. V. Bryko and I.P. Grinberg, as well as Doctors of Technical Sciences A. D. Nizhenskiy, P. P. Ornatskiy, Yu. A. Shripnik and Yu. M. Tuz, who rendered invaluable assistance in the preparation of this book.

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CSO: 1860/160

SELECTED ABSTRACTS OF ARTICLES FROM COLLECTION 'ELECTRONIC ENGINEERING AND INSTRUMENTS', TRANSACTIONS OF MOSCOW POWER ENGINEERING INSTITUTE

Moscow TRUDY MOSKOVSKOGO ORDENA LENINA I ORDENA OKTYABR'SKOY REVOLUTSII ENERGETICHESKOGO INSTITUTA, TEMATICHESKIY SBORNIK: ELEKTRONNAYA TEKHNIKA I PRIBORY in Russian No 517, 1981 pp 87-92

UDC 621.385.832.031.36.001.5

CHANGES IN THE DIELECTRIC PROPERTIES OF TARGETS WITH ZnS LAYERS UNDER THE EFFECT OF ELECTRON IRRADIATION

[Abstract of article by Sharikov, G. A. and Sherstnev, L. G.]

[Text] Investigation and improvement of the dielectric properties of layers on which memorization or transformation of information takes place are very important tasks. In this work, the authors studied the changes in the specific resistance, secondary electron emission and capacitance of ZnS layers 0.45 μm thick under the effect of electron irradiation. Figures -- 2, bibliography -- 3 items.

UDC 621.372.852.13.001.5

MEASUREMENT OF THE POWER OF OUT-OF-BAND RADIATION OF MICROWAVE OSCILLATORS

[Abstract of article by Buryak, V. S. and Leonov, A. M.]

[Text] The authors examine the device and method for measuring the power of out-of-band radiation of microwave oscillators. Characteristics of the device in a wide frequency band are given. Figures -- 4, bibliography -- 2 items.

UDC 621.372.825.4.001.5

INVESTIGATION OF A TRANSISTOR MICROWAVE OSCILLATOR

[Abstract of article by Berezin, V. M., Guttsayt, E. M., Mal'tov, V. N., Skripov, A. A. and Yastrebov, A. B.]

[Text] This is a study of a transistor oscillator with connected microband circuits. The authors give calculated and experimental dependence of the oscillation wave length on the length of the collector circuit for various types of oscillation, as well as experimental energy characteristics of the oscillator. Figures -- 4, bibliography -- 3 items.

UDC 621.385.832

ON THE PROBLEM OF RESIDUAL TEMPERATURE IN ANODES OF POWERFUL ROENTGEN TUBES

[Abstract of article by Deniskin, Yu. D.]

[Text] The author analyzes the residual temperature on the axis of the focal path of a rotating anode of the roentgen tube with the aid of a thermal model of an anode which is a number of fixed sources in an infinite space with a moving heat-conducting medium. He obtained an expression for calculating residual temperature with the aid of which temperatures were calculated on a digital computer for three types of roentgen tubes produced in the USSR. Figures -- 2, table -- 1, bibliography -- 2 items.

UDC 621.385.032.94.08.001.5

ON THE EVALUATION OF THE EFFECT OF THERMAL VELOCITIES OF ELECTRONS ON THE CHARACTERISTICS OF THE PIERCE GUN WITH A SPHERICAL ANODE PLASMA BOUNDARY

[Abstract of article by Zhigarev, A. A. and Kamunin, A. A.]

[Text] The authors evaluated the effect of thermal velocities of electrons on the cathode on the output parameters of a modified Pierce gun. In the anode cavity of the gun, a plasma source is installed with whose aid it is possible to correct the "sagging" of the field in the anode opening due to the compensation of the volume charge of the beam by the field of positive ions of the plasma. It is shown that the consideration of the effect of the thermal spread of the velocities of electrons leads to the fact that at the output of the gun there are obtained finite values of such parameters as brightness, specific power of the beam, and some others. Figures -- 5, tables -- 2, bibliography -- 7 items.

UDC 621.385.032.94.08.001.5

SPECIAL CHARACTERISTICS OF THE USE OF FILM ELECTRODES IN VACUUM MICROGAPS

[Abstract of article by Anisimov, N. S., Lazarev, S. D., Peresleni, A. A. and Savin, V. N.]

[Text] It is shown that the electrical strength of a microgap is determined first of all by the state of the film electrode. The authors noted a considerable erosion of the metallic film on a ceramic substrate which occurs when the breakdown voltage is sufficiently low and does not permit to improve the quality of the vacuum insulation in the process of aging. The use of a sitallic substrate with a smoother surface increases the electrical strength of the microgap. Figure -- 1, bibliography -- i item.

UDC 621.385.032.04.08.001.5

MASS-SPECTROMETRIC STUDIES OF CONTAMINATION OF 29NK-VI ALLOY DURING MOUNTING AND ASSEMBLING WORK

[Abstract of article by Anufriyeva, V. F., Gonzhalov, N. N. and Yerzunov, A. I.]

[Text] The authors examine the effect of possible pollution during the mounting operations of EVP [electrovacuum devices] on the value and composition of the liberated gases. It is shown that the nature of the introduced pollution varies very greatly. The total amount of the liberated gases could increase ten-fold and more. The most dangerous pollution is that introduced by unprotected fingers. In this case, the flow of hydrogen increases three-fold, of carbon monoxide -- 12-15-fold, of carbon dioxide -- 5-6-fold, and of water vapor -- 1.5-fold. The presence of a peak was also noted with an atomic mass of 35 which is characteristic of chlorine-containing salt pollutions. Figure -- 1, bibliography -- 2 items.

UDC 621.385.032.94.08.001.5

INVESTIGATION OF GAS-FORMING COMPONENTS ON THE SURFACE OF 22 KhS CERAMICS

[Abstract of article by Anisimov, N. S., Likhachava, N. I. and Levina, T. I.]

[Text] On the basis of the analysis of composition and amount of gases liberated from 22 KhS ceramics for various kinds of preliminary processing and various factors of thermal effects, it was established that the main source of gases is organic contamination of the surface. Due to relatively high energies of the activation of desorption (10-16 kcal/mole), the liberation of such gas components as H_2O, CO, CO_2, can be prolonged. In order to lower the total amount of liberated gases in the work, it is recommended to use the process of high-temperature (1000 degrees C and higher) of baking ceramic details. Figures -- 2, bibliography -- 3 items.

UDC 621.385.832

DETERMINATION OF OPTIMAL PARAMETERS OF CONTRASTING GLASSES BY THE METHOD OF PHYSICAL MODELING

[Abstract of article by Obidin, G. I. and Valygina, K. V.]

[Text] The authors studied the effects of the transmission factor of glass of a screen on the distribution of brightness of the image on the screen of a physical model of an electron-beam tube under the conditions of different external flare spots by the photographic method. Characteristics are calculated for the evaluation of subjective perception of sharpness ("sharpness factor") and normalization of frequency-contrast characteristics of the mark-background transition. It is shown that, when small-dimension objects are detected under the conditions of large external flare spots, it is possible to recommend the best value of the transmission factor of glass equal to 0.7-0.8. Figures -- 6, bibliography -- 3 items.

UDC 621.315.592

PROSPECTS OF USING $Cd_xHg_{1-x}Te$ LAYERS IN AMPLIFIERS OF SURFACE ACOUSTIC WAVES

[Abstract of article by Mukhina, O. B., Gulyayev, A. M., Shnitnikov, A. S., Gavrilin, V. I. and Yemel'yanova, I. N.]

[Text] Layers of Cd Hg Te 80-100 nm in thickness were made on glass and lithium niobate and their electrical parameters were measured. In the structure of Cd Hg Te -- lithium niobate layers, an electron amplification of up to 40 dB was obtained with a drift voltage of 500 V. Changes in the amplification were studied when the structures were kept in the open air. Figures -- 2, bibliography -- 7 items.

UDC 621.315:621.382.002

OPTICAL PROPERTIES AND ELECTRIC CONDUCTIVITY OF PLATINUM LAYERS DEPOSITED BY CATHODE SPUTTERING

[Abstract of article by Kornetov, V. N., Mokrousov, V. V., Khanin, V. A. and Ostroumova, N. V.]

[Text] The authors studied the optical properties of thin layers of platinum deposited by the method of reactive cathode sputtering and determined the values of the actual and imaginary components of the coefficient of light refraction in the wavelength range of 400-1900 nm. Figures -- 3, bibliography -- 2 items.

UDC 541.133

OVERALL AND ELECTRON CONDUCTIVITY OF MONOCRYSTALS OF 0.9 ZrO_2-0.09 Y_2O_3-0.01 Ln_2O_3 COMPOSITION

[Abstract of article by Arsen'yev, P. A., Gruzdev, A. I. and Ryazantsev, A. D.]

[Text] By using the method of directed crystalization from open-air melt, the authors grew nonocrystals of hard solutions with a composition of 0.9 ZrO_2-0.09 Y_2O_3-0.01 Ln_2O_3; Ln -- a rare earth element. In a broad range of temperatures they measured the overall and electronic conductivity adhering to the Arrenius law. It was observed that the activation energy decreases as the atomic number of the rare earth element increases. Figures -- 2, tables -- 2, bibliography -- 3 items.

UDC 621.382.001.63:538.632

ANALYSIS OF A GALVANOMAGNETORECOMBINATION EFFECT WITH CONSIDERATION FOR CHARGE ACCUMULATION

[Abstract of article by Longinov, V. V., Solov'yev, A. K., Filatov, N. I. and Charykov, N. A.]

[Text] The authors analyzed the galvanomagnetorecombination effect without the use of the assumption about quasi-neutrality, which made it possible to account for the accumulation of charge in areas commensurable with the Debye shielding length. For semiconductors of intrinsic conductance, the authors proposed an analytic expression for determining relative changes in the resistance of the specimen under the effect of a magnetic field. Figures -- 3, bibliography -- 2 items.

UDC 621.382.181.48.001.24

THRESHOLD INTEGRATED CURRENT SWITCH

[Abstract of article by Belen'kov, N. M. and Makarov, V. A.]

[Text] The authors examine the structure of a threshold device based on four-layer p-n-p-n-structures designed according to planar technology. Qualitative analysis is made of input and output VAKh [current-voltage characteristics] and main parameters of domestic integrated microcircuits are given. Figures -- 5.

UDC 621.385.825.4.001.5

IMPROVEMENT OF MACHINE CALCULATION OF THE CHARACTERISTICS OF MAGNETRON OSCILLATORS

[Abstract of article by Guttsayt, E. M. and Marinina, L. G.]

[Text] Improvements introduced into computation relations, such as allowance for the dependence of the coefficient of secondary cathode emission on high-frequency voltage, led to a more correct reproduction of the current-voltage characteristics of the magnetron and its energy parameters depending on the changes of anode voltage and magnetic induction. Figures -- 4, bibliography -- 2 items.

10,233
CSO: 1860/180

MICROWAVE THEORY & TECHNIQUES

UDC 621.375.1.049.77

DYNAMIC WIDE-RANGE AMPLIFIERS IN MICROCIRCUITS

Moscow USILITELI S SHIROKIM DINAMICHESKIM DIAPAZONOM in Russian 1981 (signed to press 31 Mar 81) pp 2-3, 117

[Annotation, foreword and table of contents from book "Dynamic Wide-Range Amplifiers in Microcircuits" by Anatoliy Petrovich Lukoshkin, Innokentiy Germanovich Kirenskiy, Yuriy Yevgen'yevich Monakhov and Oleg Viktorovich Petrov, Izdatel'stvo "Radio i svyaz'", 20,000 copies, 120 pages]

[Text] This book examines the pecularities of constructing and rating dynamic wide-range amplifiers and aperiodic wide-band amplifiers in microcircuits. Practical diagrams and basic characteristics of non-linear dynamic wide-range amplifiers are provided. Microcircuits with broad application on the basis of a differential stage are described. This book is intended for engineers and technicians involved in designing radio-electronic equipment.

Reviewed by Ye. A. Bogatyrev.

Foreword

Dynamic wide-range amplifiers (DWA) are now the most important components in radio-electronic equipment used in various areas of science and technology. A considerable number of publications [items 1-12 in bibliography on page 114] have been devoted to the pecularities of theoretical research for DWAs, rating methods and practical implementation. The distinguishing feature of DWAs, as components of contemporary radio equipment, is the wide use of integrated microcircuits (IM). The general tendency towards comprehensive microminaturization and a systems approach during the design of radio-electronic equipment is characterized by the following: using existing IMs, improving circuit engineering and functional capabilities of individual amplifying stages on the basis of their integration, striving for functionally complete assemblies, sub-units and units [item 2 in bibliography on page 114]. Based on the above, one must consider circuit engineering and design engineering performance capabilities of individual amplifying stages and the

parameters of industrially-produced IMs when determining methods for constructing DWAs and when solving tasks involving assurance of the requisite indices and stability of amplifier performance under changing operational conditions.

In implementing DWAs, one must keep in mind their general peculiarity. This consists in the fact that demands for wide-band and inertia-free characteristics in an amplifier and the independence of its performance modes from changes in the level of the input signals come into conflict with the need for coordinating the dynamic wide-range of changes in the level of the input signals with the relatively narrow dynamic range of output signals. This circumstance is reflected in the selection of circuit diagrams for individual stages.

In connection with the above, this book examines methods for constructing aperiodic non-linear DWAs which assure stability in amplitude-frequency and phase-frequency performance modes during changes to the level of the input signal in a large dynamic range.

Based on an analysis of the research results, recommendations are made for selecting the most effective circuit engineering solutions.

A. P. Lukoshkin, together with O. V. Petrov, wrote the foreword and chapters one, two and six. I. G. Kirenskiy wrote chapters three and four; O. V. Petrov wrote chapter five; Yu. Ye. Monakhov wrote chapter seven.

The authors express their gratitude to N. P. Kochkin and S. G. Logvinenko for participating in experimental research, the results of which are cited in this book.

We ask that comments and suggestions about this book be addressed to: 101000, Moscow, Glavpochtamt [Main Post Office], a/Ya [P.O. Box] 693, izdatel'stvo "Radio i svyaz'". [Signed] The Authors

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CSO: 1860/215

MICROWAVE INSTRUMENTS AND TECHNIQUES

Moscow TRUDY MOSKOVSKOGO ORDENA LENINA I ORDENA OKTYABR'SKOY REVOLYUTSII ENERGETICHESKOGO INSTITUTA, TEMATICHESKIY SBORNIK: PRIBORY I TEKHNIKA SVCh in Russian No 494, 1980 (signed to press 20 Jan 81) pp 147-154

[Abstracts for 24 articles from journal "Proceedings of Moscow Order of Lenin and the October Revolution Energy Institute, Thematic Collection: Microwave Instruments and Techniques", edited by Doctor of Technical Sciences Professor V. F. Vzyatyshev]

UDC: 621.372.8:621.325.61

SELECTION OF WORKING WAVE TYPE IN PLANAR DIELECTRIC WAVEGUIDE

[Abstract of article by S. D. Yakukhin]

[Text] This article examines the properties of a planar dielectric waveguide on a metal dielectric substrate for two types of waves: E_I and H_I. After comparison and optimization with respect to thermal losses, recommendations are given as to the cases in which each type of wave can be used most profitably.

UDC: 621.372.826.029.65

INVESTIGATION OF CHARACTERISTICS OF LEAKING SURFACE WAVES DIRECTED BY A CURVILINEAR BOUNDARY BETWEEN TWO DIELECTRIC MEDIA

[Abstract of article by V. S. Dobromyslov and V. N. Yegorov]

[Text] This article presents results of numerical and experimental investigations of the dielectric resonator. The dielectric resonator is disk-shaped and placed between two metal planes perpendicular to its axis. The dielectric resonator is excited with axially homogeneous waves polarized perpendicular to the planes. A preliminary estimate is given for the metrological capabilities of this construction – precision measurements of the parameters of dielectrics and ferrites.

UDC: 538.612

SINGULARITIES OF FLAT GYROMAGNETIC WAVEGUIDE

[Abstract of article by A. V. Koldayev and A. V. Kryukov]

[Text] This article examines the singularities of surface wave propagation in a flat gyromagnetic waveguide. The dispersion equations are given and a classification of wave types is proposed. It is shown that with null magnetization these equations describe the E and H waves of a flat dielectric wave guide. The results of computer calculation of the characteristics of flat gyromagnetic wave guide waves are presented.

UDC: 621.372.8

RADIATION AND REFLECTION IN MULTI-SECTION DEVICES USING DIELECTRIC WAVEGUIDES

[Abstract of article by V. I. Kalinichev and V. S. Merkulov]

[Text] The cross-section method is used to analyze the characteristics of three-section waveguide junctions and devices with distributed coupling. The results of computer calculation in the approximation of weak losses are presented.

UDC: 621.372.8:621.315.61

DISPERSION PROPERTIES OF MICROWAVE PLANAR ELEMENTS

[Abstract of article by S. I. Podkovyrin and Ye. M. Starovoytova]

[Text] This article examines the possibilities of using quasioptical planar elements in microwave technology and the singularities of their analysis and design. The dispersion properties of planar lenses and prisms are analyzed. It is shown that by selecting the parameters appropriately it is possible to create planar elements whose characteristics have null dispersion in a defined frequency region, or even over a wide frequency band. It is thus possible to eliminate chromatic aberration of planar lenses.

UDC: 621.372.8

FLUID METHODOLOGY FOR EXPERIMENTAL INVESTIGATION OF INTEGRATED DIELECTRIC WAVEGUIDES AND FUNCTIONAL ASSEMBLIES

[Abstract of article by V. I. Artishchev and S. D. Yakukhin]

[Text] This article demonstrates the advantages provided by using a liquid dielectric, provides a foundation for the selection of the fluid and also examines a methodology which can be used to define such important parameters of an integrated dielectric waveguide as the dispersing characteristics and

distribution of the energy of the electromagnetic field of the wave over the layers of the waveguide.

UDC: 621.372.82

ANALYSIS OF CHARACTERISTICS OF DEVICES IN MULTI-WAVEGUIDES

[Abstract of article by V. S. Buryak]

[Text] This article examines a method for determining the power of individual types of waves in a multi-waveguide which joins two elements assigned by scattering matrices, as well as in the input and output waveguide devices.

UDC: 621.372.825.4.001.5

INVESTIGATION OF PHASED AND ANTI-PHASED OSCILLATIONS IN TWO-LEVEL PRINTED-CIRCUIT RELAY SYSTEMS

[Abstract of article by V. M. Berezin, E. M. Guttsayt, V. N. Mal'tov and A. A. Skripov]

[Text] This article discusses the results of investigating two-level meanders and opposing poles placed on dielectric substrates. The dispersion characteristics and coupling impedance curves of phased and antiphase oscillations propagating in these systems are calculated and measured. The influence of variation in the dimensions of the systems on their dispersion and impedance characteristics is investigated. It is shown that a two-level meander with an antiphase oscillation wave, and two-level opposing poles with phased oscillation wave, have properties which are close to those of systems of the coupled ring resonator network type.

UDC: 621.385.032.21

INVESTIGATION OF CAUSES OF ELEVATED LEVEL OF LOW FREQUENCY FLUCTUATIONS OF EMISSION CURRENT OF CATHODE ASSEMBLIES IN MICROWAVE DEVICES

[Abstract of article by M. D. Vorob'yev, V. I. Novoselets, O. A. Morozov and L. P. Smirnov]

[Text] Analog and digital methods are used to make a spectral analysis of the current fluctuations of porous metallic thermal cathodes in the $6 \cdot 10^{-2}$-10^{4} Hz range. It showed that at frequencies $f<10$ Hz the spectral density of the fluctuation increases sharply as the frequency drops. The fluctuation level is practically independent of the type of emitting circuit obtained in an electronic field-emission light microscope.

UDC: 621.385.032.94.08.001.5

NUMERICAL ANALYSIS OF SYSTEM FOR FORMING ELECTRON BEAM WITH STEPPED POTENTIAL DISTRIBUTION

[Abstract of article by A. A. Zhigarev and A. A. Kamunin]

[Text] A methodology is presented for analyzing an electronic-optical system with stepped distribution of the potential along the axis of the device, which forms an electron beam with energy of over 50 keV. The singularities of the forming system include high electric strength, ion protection of the cathode, and small beam dispersion with respect to the energies at the system output.

UDC: 621.396.001.5

SUPPRESSION OF THE STABILIZING FACTORS IN MULTICHANNEL MICROWAVE SECTIONS USING CROSS-COUPLED PHASE-LOCING SYSTEMS

[Abstract of article by A. M. Dubinskiy and V. A. Volkov]

[Text] This article examines different versions of interaction of phase-locking systems using the example of a multichannel microwave section consisting of single tuned-circuit resonant amplifiers with phase-locking systems. A model of a single-stage resonant amplifier with phase locking system is used. It is shown possible to improve certain characteristics of phase locking systems by creating additional coupling between them.

UDC: 621.396

FORMATION OF SIGNALS WITH SPACE-TIME STRUCTURE FURING EXCITATION OF MICROWAVE ANTENNA ARRAY WITH SET OF NONIDENTICAL SIGNALS

[Abstract of article by O. L. Iyevlev and M. V. Kapranov]

[Text] This article examines the formation of signals with space-time structure based on microwave antenna arrays excited by an ensemble of signals with non-identical time structures. Important new capabilities are demonstrated for the simplest type of such array excitation: the formation of oscillation with complex temporal properties in given spatial directions on the one hand, and the possibility of achieving substantial deformation of the temporal structure of these signals on the other.

UDC: 621.396.001.5

SYNCHRONOUS MODE OF AFC SYSTEM IN MICROWAVE ChT TRANSMITTER

[Abstract of article by S. G. Rikhter]

[expansion of ChT not given; possibly frequency telegraphy]

[Text] This article examines a nonlinear inertial phase-locking system in a microwave angle-modulated signal transmitter in a mode in which an abruptly varying reference signal frequency is tracked. It is shown that when the frequency jumps phase slippage often occurs, which can be classified as a temporary disruption in the synchronization of the phase-locked loop which causes transient processes to be extended and produces distortions in the information if the latter is contained in the variation of the frequency or phase of the synchronizing signal.

UDC: 621.396.001.5

DYNAMICS OF SIGNAL CAPTURE IN MICROWAVE PHASE-MODULATED SIGNAL SYNCHRONIZATION SYSTEM DURING LINEAR FREQUENCY VARIATION

[Abstract of article by N. N. Udalov and A. G. Solntsev]

[Text] This article examines a two-loop synchronization system for a microwave phase-modulated signal which tracks the carrier frequency of the input signal. A phase portrait of the system is constructed in energy-delay coordinates. The critical value of the rate of frequency change and initial boundary energy are determined. The duration of the transient process is calculated and corresponding graphs are presented.

UDC: 621.396.574.4

ANALYSIS OF STABILITY OF STATIONARY MODES IN PIECEWISE-LINEAR SYSTEMS

[Abstract of article by A. F. Ob"yedkov and A. A. Turkin]

[Text] This article examines problems of the stability of piecewise-linear systems of arbitrary order used to model electronic microwave circuits. It is shown that for a broad class of systems containing continuous nonlinear functions of one variable, calculation of the characteristic matrix does not require defining the eigen vectors in each linear interval, which simplifies the calculation significantly.

UDC: 621.372.4.029.6

EXPERIMENTAL INVESTIGATION OF STABILIZED FEEDBACK OSCILLATOR GUNN DIODE

[Abstract of article by D. P. Tsarapkin, A. A. Karachev and Ye. N. Ivanov]

[Text] This article examines Gunn diode feedback oscillator stabilized by an additional high-Q resonator resistively coupled with the original oscillating system. The results of investigating two prototype stabilized oscillators in the 2-cm band are presented. A mechanical frequency adjustment band of over 1 GHz is obtained.

UDC: 621.373.8:681.33.001.57

GENERATION KINETICS OF MICROWAVE AND OPTICAL-BAND QUANTUM GENERATORS WITH NON-UNIFORM EXPANSION OF LUMINESCENCE LINE OF WORKING SUBSTANCE

[Abstract of article by Yu. B. Il'in and V. N. Konstantinov]

[Text] This article examines the kinetics of optical quantum generators with nonuniform expansion of the spectral line of the working substance operating in the single-frequency quasistationary pulsed generation mode. The analysis is done by analog-computer modeling of the balance equations, which are transformed using the Pinch function method. The essence of the Pinch function method is presented.

UDC: 621.396.677

MODIFICATION OF METHOD FOR CALCULATING SCANNING DIPOLE ANTENNA MINIMIZING REQUIRED MACHINE TIME

[Abstract of article by G. T. Markov, V. V. Bodrov and V. I. Surkov]

[text] An integral equation is derived with respect to the plane of the electrical currents, represented as a system of n basis functions, for an infinite phased array with its elements arranged at the nodes of a triangular grid and having the appearance of a thin dipole with supports. The Galerkin method is used to solve the system of integral equations obtained. Because of the relative simplicity of the method and of the algorithm, the programs require significantly less machine time. The results of the calculations are presented.

UDC: 621.372.826

ELECTRODYNAMICAL MODEL OF TWO-DIMENSIONAL DIELECTRIC ANTENNA

[Abstract of article by Ye. N. Vasil'yev, A. V. Polynkin and V. V. Solodukhov]

[Text] The integral equation method is used to solve the two-dimensional problem of internal excitation of a dielectric plate by a parallel filament of phased electrical current. The relative contribution to the directivity pattern of the incident and reflective surface waves, as well as disturbed regions near the source and the ribs of the sheet, is analyzed.

UDC: 621.396.677

CHARACTERISTICS OF PERIODIC WAVEGUIDE ARRAY WITH MATCHING POLES

[Abstract of article by V. V. Bodrov, S. A. Voinov and L. A. Pavlova]

[Text] The currents on the vertical poles and apertures of waveguides in a phased planar array are determined by solving a system of integral equations using

Fourier transformation and the Galerkin method. The coefficient of reflection and directivity pattern of the phased array element are calculated numerically considering the cross-effect for the array geometry with which the "blinding" effect occurs.

UDC: 622.396.67.01

SIMULATION OF H-SECTOR HORN WITH REACTIVE LOADS IN ITS APERTURE

[Abstract of article by A. S. Kondrat'yev and A. F. Chaplin]

[Text] This article examines the simulation of a two-dimensional H-plane horn antenna with loaded dipoles in its aperture. A system of linear equations is obtained with respect to the dipole currents by assigning the field distribution. The condition of load reactance produces a system of quadratic limitations of the equality type for the dipole currents. The resultant system of linear and quadratic equations is solved using the method of minimizing the positively half-defined functionals. An example of solving the problem is presented.

UDC: 621.396.677.861

SUB-APERTURE METHOD FOR CALCULATING NEAR FIELDS OF FLAT RADIATING APERTURES

[Abstract of article by Yu. I. Orlov and S. K. Tropkin]

[Text] An effective method is proposed for calculating the near fields of aperture antennas having large electrical dimensions with irregular amplitude-phase excitation, which consists of dividing the surface of the aperture into sections (sub-apertures) within which the excitation is considered constant. The sub-aperture fields are calculated using asymptotic formulas based on Fresnel integrals. The results of calculations, the accuracy of which is confirmed by comparison with calculations using the fast Fourier transform method, are presented.

UDC: 621.396

INVESTIGATION OF COUPLING OF APERTURE ANTENNAS SEPARATED BY A SHIELDING OBSTACLE IN THE FORM OF A HILL

[Abstract of article by D. I. Zaichkin]

[Text] The familiar Green function of the problem of diffraction of a spherical wave on an impedance cylinder with large electrical dimension is used to calculate the coupling coefficient of aperture antennas aimed at one another and separated by a shielding obstacle. The obstacle is placed across the path. Its radius of curvature is significantly greater than the wavelength and much shorter than the path length. The aperture excitation distribution function is arbitrary. Numerical results are obtained for the coefficient of coupling of the apertures as a function of the electrical dimensions of the obstacle.

UDC: 621.396.673

ROD AND LOOP INSTRUMENTATION ANTENNAS WITH ANTENNA ATTACHMENTS

[Abstract of article by A. A. Kopylov]

[Text] This article analyzes rod and loop instrumentation antennas with antenna attachments in the form of rigidly coupled transformers. The most typical operating modes of instrumentation antennas are examined.

6900
CSO: 1860/178

SELECTED ABSTRACTS OF ARTICLES FROM COLLECTION 'PROBLEMS OF DESIGNING AND OPERATION OF THERMAL ELECTRIC POWER PLANTS', TRANSACTIONS OF MOSCOW POWER ENGINEERING INSTITUTE

Moscow TRUDY MOSKOVSKOGO ORDENA LENINA I ORDENA OKTYABR'SKOY REVOLUTSII ENERGETICHESKOGO INSTITUTA,TEMATICHESKIY SBORNIK: VOPROSY PROYEKTIROVANIYA I EKSPLUATATSII TEPLOVYKH ELEKTROSTANTSII in Russian No 505, 1980 (signed to press 18 Mar 81) pp 141-146

UDC 621.311.22:621.18

OPTIMAL DISTRIBUTION OF REGENERATIVE HEATING OF WATER BY THE 'INDIFFERENT' POINT METHOD AND ANALYTICAL METHOD IN TWO-STAGE INTERMEDIATE HEATING OF STEAM

[Abstract of article by Ryzhkin, V. Ya., Tambiyeva, I. N. and Korotkova,L. S.]

[Text] The authors analyzed the parameters of the "indifferent" point and optimal distribution of regenerative heating of water in circuits of turbine units with two stages of intermediate heating of steam. Generalized analytical expressions were obtained for the values of the heat decrease to the "indifferent" point and heating of feed water for which the results of computations are given.

621.311.22.002.5.004.13

FUNDAMENTALS OF THE PARAMETRIC METHOD FOR STUDYING THE COMPOSITION AND OPERATION MODES OF POWER UNITS OF THERMAL ELECTRIC POWER STATIONS DURING THE PERIODS OF DAILY LOAD DROPS

[Abstract of article by Vedyayev, V. A. and Dang Ngok Tung]

[Text] The authors propose a parametric method for solving the problem of determining the optimal composition and operation modes of power units during low-load periods. This method is used to find not only the optimal solution but also a set of solutions close to the optimal solution.

UDC 621.165.2.57

INVESTIGATION OF THE MANEUVERABILITY AND IMPROVEMENT OF STARTING SCHEDULES OF DISTRICT-HEATING STEAM TURBINES

[Abstract of article by Trukhniy, A. D., Kochetov, A. A., Shreder, K. and Stebunov, A. I.]

[Text] This article give the results of calculations for the improvement of starting schedules of turbines from the viewpoint of reducing low-cycle fatigue of the rotor. Modes of starting from various thermal states are examined and starting schedules using an improved technology and mixers are proposed.

UDC 621.175

ANALYSIS OF POSSIBILITIES OF INCREASING THE DELIVERY OF HEAT BY DISTRICT-HEATING TURBINE UNITS

[Abstract of article by Kosmin, V. M., Kosmina, N. M., Makagonov, L. V. and Michurov, Yu. P]

[Text] On the basis of the analysis of operation modes of turbine units at Kazan' TETs-2, recommendations are given for selecting optimal variants of the reconstruction of turbine units when they switch to an inferior vacuum and counter pressure.

UDC 621.181

SELECTION OF ECONOMICAL SOLUTIONS IN RECONSTRUCTING CONDENSATION ELECTRIC POWER STATIONS INTO HEATING TETs

[Abstract of article by Girshfel'd, V. Ya. and Khayman, D.]

[Text] The authors examine heating TETs on the basis of reconstructed turbines K-210-130 and K-500-166 which are installed at GDR Electric Power Stations. They gave multifactor analytical characteristics of reconstructed turbines which made it possible to carry out work on the optimization of the temperature of the network water in the supply line for the district-heating coefficient $\alpha_{TETs} = I$ and different distances of TETs from residential areas.

UDC 621.311.22

SELECTION OF SMOKESTACKS OF POWERFUL THERMAL ELECTRIC POWER STATIONS WITH THREE-SIDED INLET OF GAS DUCTS

[Abstract of article by Volkov, E. P. and Chuprakov, A. I.]

[Text] The authors give equations describing the movement of air in the atmosphere and show similarity criteria of simulating the scattering processes of admixtures. They examined a special case of simulating scattering processes of a passive admixture in isotropic turbulent streams. They give results of experimental studies in a wind tunnel on measurements of the intensity of the stream turbulence beyond various turbulence-producing grids and the energy spectrum of the stream are given. They showed the similarity of spectra of the atmosphere and those obtained in the experiments on turbulent streams.

UDC 621.165.536.423.4

INVESTIGATION OF ENERGY AND DISCHARGE CHARACTERISTICS OF A CIRCULAR TURBINE GRID ON WET STEAM

[Abstract of article by Filippov, G. A., Povarov, O. A., Nikol'skiy, A. I. and Semenyuk, A. V.]

[Text] The article gives the results of studies on a nozzle grid installed in an experimental turbine beyond the two-rim velocity stage. The effect of the dispersion of moisture and the processes of moisture formation on energy and discharge characteristics is shown.

UDC 621.186.4

DETERMINATION OF THE TEMPERATURE FIELD IN A PIPELINE WHEN HEATED UNEVENLY ALONG THE CIRCUMFERENCE

[Abstract of article by Yelizarov, D. P., Grosberg, Yu. I., Fedorovich, L. A., Aparkina, Ye. I. and Popov, A. B.]

[Text] The authors give a method and results of a numerical solution of the problem of an unsteady temperature field for a heat-transfer coefficient which is uneven along the circumference of the pipe.

UDC 621.311.22.002.5
UDC 621.197.1.001.5

PREPARATION OF ADDITIONAL WATER AT INDUSTRIAL TETs WITH THE AID OF A MULTISTAGE EVAPORATION UNIT

[Abstract of article by Abramov, A. I., Tishin, S. G. and Kapyrina, I. P.]

[Text] The article gives the results of studies on the possibility of making up the losses of steam and condensate at the Kramatorsk TETs with the aid of a multistage evaporation unit. The authors give the results of thermochemical tests of the unit which showed that TETs can make up losses of steam and condensate fully with the evaporation unit.

UDC 621.165.001

STUDIES ON AXIAL STRESS IN DRIVING TURBINES AND WAYS OF PROTECTING THRUST BEARINGS

[Abstract of article by Drokonov, A. M. and Si'ayev [? Sivayev], V. M.]

[Text] This article gives the results of studies on the effects of an open axial clearance near the blading root, radial clearance along the rotary shroud, relative pitch of the rotor blades, and the degree of partiality in relation to the value of axial stress. The system of automatic regulation of the axial force acting upon the thrust bearing is examined.

UDC 621.165.51.146.24

CAUSES OF VIBROACOUSTIC NOISE IN VALVES OF STEAM TURBINES

[Abstract of article by Zaryankin, A. V. and Tolkachev, B. P.]

[Text] The authors analyzed possible causes of the appearance of vibroacoustic noise in valve systems. They gave a scheme of the perforated MEI [Moscow Power Engineering Institute] valve with a lower level of noise and a device for passive quenching of external pulsations of pressure of the working substance.

UDC 621.165.001.5

ON CALCULATING AN UNSTABLE RESILIENT ELEMENT

[Abstract of article by Demidov, V. S.]

[Text] The author gave a method and results of calculations of the characteristics of a thin straight-line strip with rectangular cross section which is the elastic element of the vibration pickup.

UDC 621.165-54.001.5

EVALUATION OF THE RELIABILITY OF ELECTROHYDRAULIC CONTROL SYSTEMS OF TURBINE FEED PUMPS

[Abstract of article by Kalashnikov, A. A. and Tortseva, V. M.]

[Text] The authors proposed a classification of statistical material on failures of SAR [automatic control system] assemblies. They gave calculations of the reliability of electrohydraulic SAR of a steam turbine for the drive of a feed pump which showed that the controlling part and the electric pump are less reliable than the actuating hydraulic part. They examined SAR designs with redundancy of less reliable assemblies of the system. It is shown that the use of redundancy increases substantially the reliability of the SAR and makes it possible to bring it closer to the reliability of hydrodynamic SAR.

UDC 621.181.87

ON THE CAUSES OF DESTRUCTION OF PROTECTIVE ROU SCREENS

[Abstract of article by Zaryankin, A. Ye., Robozhev, A. V., Karashchuk, V. Ye. and Polukhin, V. F.]

[Text] The authors give the results of experimental studies on the causes of destruction of protective screens in series-produced ROU [pressure reducing and cooling units] of the Vezhokovskiy Accessories Plant. It is shown that the destruction of protective screens occurs as a result of the combined effect of temperature stresses and vibration.

UDC 532.62(045)

CHARACTERISTICS OF PRIMARY ELECTRICAL TRANSFORMERS OF FILM THICKNESS FOR VARIOUS TYPES OF PROFILE OF FILM FLOW

[Abstract of article by Fedorov, A. S., Yeryshkin, A. V. and Lyubimov, V. A.]

[Text] The authors give characteristics of primary electrical transformers of the thickness of liquid film during disruptive and wave modes of film flow. When there is a sudden change in the thickness of the film, the conductivity of the transformer changes smoothly, and pulling occurs. During the wave mode of flow, the transition to shorter waves is accompanied by a drop in the sensitivity of the transformers toward the amplitude of the sinusoidal wave.

UDC 621.311.22:669.922.001

ON SIMULATING THE SPREAD OF HARMFUL IMPURITIES OF THERMAL ELECTRIC POWER STATION IN THE ATMOSPHERE

[Abstract of article by Volkov, E. P.]

[Text] The author gives equations describing the movement of air in the atmosphere and shows similarity criteria for modeling the processes of the scattering of impurities. He examined a special case of simulating scattering processes of a passive impurity in isotropic turbulent streams. He gives results of experimental studies in a wind tunnel for measuring the intensity of a turbulent stream beyond various turbulence-producing screens and the energy spectrum of the stream. He shows that the spectra of the atmosphere and the spectra of turbulent streams obtained in the experiments are similar.

UDC 697.34.001.(047)

METHOD OF DETERMINING THE WORKING RESERVE OF A COOPERATING ENERGY SYSTEM IN THE HUNGARIAN PEOPLES REPUBLIC

[Abstract of article by Levan, A.]

[Text] The author proposes a method for determining an economical power reserve when the combined variance of the entire system will be equal to the square root of the sum of square variance of individual systems. This will make it possible to avoid creating unnecessary installed capacities and save a considerable amount of capital investments.

UDC 621.311.25:621.039

DEPENDENCE OF THE AMOUNT OF RESIDUAL WATER ON THE INITIAL THERMODYNAMIC PARAMETERS AND GEOMETRICAL CHARACTERISTICS OF A VESSEL DURING INSTANTANEOUS SEAL FAILURE IN THE SYSTEM

[Abstract of article by Kipshidze, M. Ye. and Zaryankina, N. P.]

[Text] This article gives basic experimental data in the form of the dependence of the relative amount of residual water on the initial thermodynamic parameters and geometrical characteristics of the vessel during unsteady discharge of boiling liquid.

10,233
CSO: 1860/183

TRANSPORTATION

SELECTED ABSTRACTS OF ARTICLES FROM COLLECTION 'CONVERSION TECHNIQUES IN ELECTRIC DRIVES AND ELECTRIC TRANSPORT', TRANSACTIONS OF MOSCOW POWER ENGINEERING INSTITUTE No 506, 1980

Moscow TRUDY MOSKOVSKOGO ORDENA LENINA I ORDENA OKTYABR'SKOY REVOLYUTSII ENERGETICHESKOGO INSTITUTA, TEMATICHESKIY SBORNIK: PREOBRAZOVATEL'NAYA TEKHNIKA V ELEKTROPRIVODE I ELEKTRICHESKOM TRANSPORTE in Russian No 506, 1980 pp 133-140

UDC 621.335.43

SECOND GENERATION OF ELECTRONIC CONTROL SYSTEMS IN ELECTRIC TRACTION DEVICES

[Abstract of article by Yefremov, I. S. and Trakhtman, L. M.]

[Text] The authors examine the problems of using microelectronics and microprocessor techniques in the modern rolling stock of railroad and city electric transportation facilities.

UDC 621.335.2.024.001.4.001

INVESTIGATION OF CURRENT PULSATIONS OF DIRECT-CURRENT TRACTION MOTORS IN ELECTRICAL TRANSPORTATION FACILITIES WITH FREQUENCY-PULSE CONVERTERS

[Abstract of article by Shevchenko, V. V., Bure, I. G., Nachinkin, B. N. and Kevsuriani, I. M.]

[Text] This article treats the problem of operation of traction motors when they are fed from a frequency-pulse converter. Expressions are given for determining the maximum current pulsation of traction motors when they are fed from a multiphase frequency-pulse converter.

UDC 621.314:621.38.004.13

CONTROLLING THE BREAKING AND CONTROLLABILITY LOSS OF THYRISTORS OF A CONVERTER UNIT

[Abstract of article by Zagaynov, N. A., Osipov, V. Ye. and Voronin, I. V.]

[Text] The authors developed and studied new types of protection for converter units of traction substations of city electric transportation facilities against circuit breaking and loss of controllability of thyristors.

UDC 621.335.43:621.314

METHOD OF IMPROVING DYNAMIC PROPERTIES OF A CLOSED CONTROL SYSTEM OF THYRISTOR CONVERTERS

[Abstract of article by Kos'kin, O. A. and Suslov, B. Ye.]

[Text] This article describes a circuit for controlling the speed of direct-current traction motors by a thyristor converter. The control system of the converter is designed with the use of an integrator.

UDC 625.282:621.314.2.001.5

METHOD OF EXPERIMENTAL STUDIES OF ELECTROMAGNETIC PROCESSORS IN A FREQUENCY CONVERTER IN THE TRACTION AND BREAKING MODES

[Abstract of article by Anders, V. I., Kolobov, M. G. and Bogatin, A. A.]

[Text] The authors examined the principles of experimental studies of complex systems of electric drives containing elements with fast and slow processes. A method is given for selecting measuring instruments and ways of registering various processes occurring in the circuit of the frequency converter.

UDC 621.314.2.001.57

CORRECTING THE SYSTEM OF AN ELECTRIC DRIVE WITH A SELF-CONTAINED VOLTAGE INVERTER

[Abstract of article by Sandler, A. S., Kudryavtsev, A. V. and Nikol'skiy, A. A.]

[Text] The authors examined the selection of a regulator and feedback signals for correcting electric drives with self-contained voltage inverter. Results of calculations are compared with experimental results. They give oscillograms for the regulator turned on and the processes of load drop and increase in the corrected system.

UDC 621.313.333

ANALYSIS OF THE OPERATION OF THE ELECTRIC DRIVE SYSTEM THYRISTOR VOLTAGE REGULATOR -- ASYNCHRONOUS MOTOR AT SUPERSYNCHRONOUS SPEED

[Abstract of article by Masandilov, L. B. and Rozhankovskiy, Yu. V. and Mazuz El'b-Ali]

[Text] In order to ensure satisfactory operation of the system at supersynchronous speed, it is proposed to connect additional resistors parallel to AD [asynchronous motor] to the TRN [thyristor voltage regulator] output. Mechanical characteristics are given in the absence and in the presence of resistors, as well as relations for calculating their resistance. Various schematics of TRN operating at supersynchronous speed are compared.

UDC 621.313.333

THYRISTOR VOLTAGE REGULATOR AS AN ELEMENT OF AN AUTOMATIC CONTROL SYSTEM

[Abstract of article by Sorbatov, R. S. and Bazayev, V. G.]

[Text] The authors gave a model of a thyristor voltage regulator as a element of an automatic control system.

UDC 621.314.632:62-83

ANALOG-DIGITAL SIMULATION OF A RECTIFYING ELECTRIC DRIVE WITH A CURRENT REGULATION SYSTEM WITH MAXIMUM OPERATION SPEED

[Abstract of article by Ladygin, A. N. and Kholin, V. V.]

[Text] The authors propose an analog-digital model of a rectifying electric drive. The analog-digital model was used to test control algorithms for the VP-D system with high-speed current regulation. The results of simulation confirm the possibility of regulating current in one sampling interval of the rectifying converter in the absence of limitations.

UDC 621.314.5

LINEARIZATION OF CHARACTERISTICS OF RECTIFYING CONVERTERS IN THE MODE OF INTERMITTENT CURRENTS WITH THE AID OF STANDARD PHYSICAL MODELS

[Abstract of article by Ponomarenko, A. I.]

[Text] The author proposes a method for the linearization of the characteristics of rectifying converters with the aid of standard physical models. The method is checked experimentally.

UDC 621.337(088.8)

THYRISTOR CONVERTER WITH FORCED SWITCHING FOR ALTERNATING-CURRENT ELECTRICALLY DRIVEN ROLLING STOCK

[Abstract of article by Karpov, Yu. A.]

[Text] The author shows the possibility of improving the traction-energy indexes of alternating-current electrically driven rolling stock by using thyristor converters with forced switching. Their operation process is examined in a concrete circuit of a converter of this type with a common center of forced switching to three forcibly closing thyristor arms which ensures stability of the blocking time of the thyristors in a broad range of load changes.

UDC 629.414.1:621.436-61.004.18

INTEGRAL VALUES OF THE EFFICIENCY AND THE RECUPERATION EFFECTIVENESS FACTOR OF ELECTRIC TRANSMISSION WITH A PULSED CONVERTER OF SHUNTING DIESEL LOCOMOTIVES WITH AN ELECTROMECHANICAL ACCUMULATOR

[Abstract of article by Bkhatt, D. L. and Mayorov, F. M.]

[Text] The use of electromechanical accumulators (EMA) in electric transmissions with pulse converter makes it possible to reduce considerably the consumption of fuel in shunting diesel locomotives and increase the power utilization coefficient of its diesel-generating unit. This work determines the basic indicators of transmission and EMA with consideration for the characteristics of the shunting operations. The results of the authors' calculations confirmed the possibility of improving the fuel and energy indexes of shunting diesel locomotives with the use of combined power supply.

UDC 621.396

CALCULATION OF THE EQUIVALENT MOMENT FOR REDUCTORLESS DRIVES OF RADIO TELESCOPES

[Abstract of article by Tsatsenkin, V. K.]

[Text] In radio telescopes with a reductorless drive, the fundamental component of the load moment is determined by the wind. By using the weight function which allows for the changes in the position of the antenna in space, it is possible to represent the wind load as a random function normalized to a steady function. When calculating the equivalent moment of the motor, the method of controlling the automatic guidance system is taken into consideration.

UDC 621.316.72:621.314.63

FULLY CONTROLLED RECTIFIER CONVERTER FOR DIRECT-CURRENT ELECTRIC DRIVES

[Abstract of article by Bulatov, O. G. and Shitov, V. A.]

[Text] The schematic of a fully controlled rectifier converter is given. Algorithms for its control with respect to the minimum circulating current are proposed.

UDC 621.316.72.1

A THYRISTOR-CAPACITOR DIRECT-CURRENT CONVERTER FOR AN ELECTRIC CAR

[Abstract of article by Bulatov, O. G., Labuntsov, V. A., Tsarenko, A. I. and Polyakov, V. D.]

[Text] The authors examine the schematic of a new electric car. They give the realized traction characteristics.

UDC 621.313.22

THE USE OF LARGE-SCALE INTEGRATED CIRCUITS OF MICROPROCESSORS IN THE CONTROL SYSTEM OF PULSED CONVERTER OF VOLTAGE OF A TRACTION ELECTRIC DRIVE OF THE SUBWAY SYSTEM

[Abstract of article by Obukhov, S. G., Markin, V. V. and Remizevich, T. V.]

[Text] The authors proposed a system for controlling voltage by a thyristor-pulsed regulator with the use of microprocessors.

UDC 621.335.2-833.6.001.5

AN AUTOMATIC CONTROL SYSTEM FOR ALTERNATING CURRENT ELECTRIC DRIVES CONTAINING A NONLINEAR CONVERTER

[Abstract of article by Prechisskiy, V. A., Novikov, V. A., Chernyshov, V. A., Trofimenko, V. I. and Barten'yev, O. V.]

[Text] The dynamic characteristics of the system heat engine -- synchronous generator -- asynchronous motors depend substantially on the characteristics of the excitation system of the synchronous generator. This work examines an excitation system containing a synchronous exciter and a controlled rectifier. It studies the effects of intrinsic resistance of the synchronous exciter and the reactions of the armature of the synchronous generator on the nature of transient processes of the electric drive.

UDC 621.313.333

TRANSIENT PROCESSES IN A MAGNETIC-THYRISTOR CONVERTER

[Abstract of article by Anisimov, V. A.]

[Text] The author examines transient processes in a magnetic thyristor converter. Computation formulas are given.

UDC 621.314

TRANSIENT PROCESSES IN A RESONANCE INVERTER WITH LOW-FREQUENCY MODULATION

[Abstract of article by Gorbachev, G. N. and Krivonosov, V. N.]

[Text] On the basis of the analysis of transient processes in a series resonance inverter with reverse diodes, the authors developed a control logarithm for the inverter at low-frequency modulation used for regulating the average value of the output power.

UDC 621.313.39

OPTOELECTRONIC ROTOR POSITION SENSOR

[Abstract of article by Anders, V. I., Boldov, A. N. and Safronov, A. V.]

[Text] The authors describe the design of a rotor position sensor of a 200W noncontact thyratron motor. The sensor is designed with the use of light guides. The electronic schematic of the sensor is given.

UDC 621.313.39

BUILT-IN DIGITAL PHOTOELECTRIC POSITION SENSOR

[Abstract of article by Balkovoy, A. P., Piskunov, A. G. and Kazachenko, V. F.]

[Text] This article describes the design of the position sensor of a linear step-by-step thyratron motor, the sensor is designed with the use of light guides. The electronic schematic of the sensor is given.

UDC 621.335.2:621.337-52.001.5

CURRENT REGULATOR FOR THE ARMATURE OF A THYRATRON MOTOR

[Abstract of article by Gavrilov, Yu. N.]

[Text] This article treats a current regulator for the armature of thyratron electric machines designed on the principle of self-adjusting circuits. The formula of the transfer function of the regulator is derived.

UDC 621.316.72:621.314.63/004.69

SPECIAL CHARACTERISTICS OF DESIGNING A RECTIFIER CONTROL SYSTEM FOR TRACTION PURPOSES

[Abstract of article by Ustinov, A. V., Zykov, Yu. A., Tsvetkov, Yu. L. and Shadrin, V. A.]

[Text] A rectifier control circuit based on determining amplifiers is proposed.

10,233
CSO: 1860/182

UDC 621.313.333+621.3.013+537.811

TERMINAL EFFECT IN LINEAR INDUCTION ENGINES

Riga KONTSEVOY EFFEKT V LINEYNYKH ASINKHRONNYKH DVIGATELYAKH: ZADACHI I METODY RESHENIYA in Russian 1981 (signed to press 5 May 81) pp 4-6, 261

[Annotation, foreword and table of contents from book "The Terminal Effect in Linear Induction Engines: Tasks and Methods To Resolve Them" by Ayvar Yanovich Vilnitis and Mikhail Serafimovich Drits, Izdatel'stvo "Zinatne", 1,000 copies, 262 pages]

[Text] As work developed in the area of high-speed surface transportation equipped with linear engines, the terminal effect in the linear induction engine [LIE] was defined as one of the factors which most greatly influenced the engine's efficiency as a whole.

In this monograph, the status of this issue in our literature and in foreign literature is reflected. The theory of the terminal effect is examined in approximating the small nonmagnetic gap (one-dimensional theory). A two-dimensional theory has been developed for solving engineering tasks which exceed the capabilities of this approximation. This theory is based on a device using Fourier series and integrals and is intended to describe equipment with a nonmagnetic gap and working medium of any thickness. It is also intended to adequately account for dispersion of a field, investigate the capabilities of compensating for the terminal effect and other problems, whose examination in a one-dimensional approximation gives unsatisfactory results. The limitations in applying this theory are indicated.

This book includes 68 illustrations and a bibliography with 247 titles.

Editor's Foreword

It would seem that A. Ya. Vilnitis and M. S. Drits' monograph, offered to the reader, is devoted to a narrow problem in the theory of linear induction (asynchronous) electric machinery--the so-called terminal effect. This term designates the aggregate of phenomena connected with the final length of a magnetic circuit and a machine's coil area. This aggregate leads, in the final analysis, to wave distortion in a travelling magnetic and electrical field and has a substantive impact, in a number cages, on the performance of equipment.

In fact, the terminal effect is one of the central and most complex problems in the theory of linear electric machinery. Actually, a considerable number of works, which continue to increase even now, have been devoted to this problem. Nevertheless, a final solution to the problem has still not taken shape.

A famous Soviet scientist, Professor A. I. Vol'dek, is the founder of the systematic study of the terminal effect. He developed the one-dimensional theory, the simplest and most obvious theory, which permits one to quantitatively express and evaluate the basic rules of the terminal effect. A. I. Vol'dek was also one of the first to develop proposals for compensating for the negative influence of the terminal effect.

In recent years, many works have been published which are devoted to the two-dimensional and three-dimensional study of the terminal effect. However, different approaches to solving this task on the part of various authors, the immense number of results and unwieldly computations do not always allow one to make effective use of the results of this research.

In connection with increased attention to planning and practical use of linear induction machinery (including induction pumps for general works about the terminal effect. Previously-published summary works about this problem have become obsolete now. In this reagrd, one must welcome the appearance of A. Ya. Vilnitis and M. S. Drits' book. The authors' goal is to systematically and physically set forth, in a strict manner, the basic problems and consequences of the terminal effect. The book begins with a general survey of the status of the problem, in which the authors endeavored to evaluate existing trends in developing the theory of the terminal effect. The one-dimensional theory is further examined. In doing this, the authors take the approach indicated by A. I. Vol'dek. However, they do not simply provide a review of A. I. Vol'dek's works, but systematically study this problem while devoting proper attention to strictness in formulating the problem and the methods of resolving it. In so doing, they obtain new results and provide an interpretation of them. Graphically displaying the limitation of the one-dimensional theory, the authors proceed further in researching the two-dimensional theory and obtain additional data.

Of course, this book, offered to the reader, does not nearly settle the problems of the terminal effect in its various aspects. Nonetheless, I think that the reader who is interested in questions of developing a thoery of linear induction machines and their practical use in resolving engineering tasks, will find much that is useful in this book.

One of the book's authors, candidate of technical sciences A. Ya. Vilnitis, is already well-known to many readers, due to his works on the theory on induction pumps. He took the initiative in putting this book together and wrote the basic part of the monograph. M. S. Drits did all the basic computations in the book and wrote two paragraphs in the final chapter.

[Signed] Ya. Ya. Liyelpeter,
corresponding member of the
LaSSR Academy of Sciences

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CSO: 1860/214

UDC 537.311.33

RECOMBINATION PROCESSES IN SEMICONDUCTORS AT HIGH EXCITATION LEVELS

Moscow TRUDY ORDENA LENINA FIZICHESKOGO INSTITUTA IMENI P.N. LEBEDEVA AKADEMII NAUK SSSR: REKOMBINATSIONNYYE PROTSESSY V POLUPROVODNIKAKH PRI VYSOKIKH UROVNYAKH VOZBUZHDENIYA in Russian Vol 128, 1981 (signed to press 26 Jun 81) pp 2, 103-144

[Annotation, bibliography, table of contents and abstracts from periodical "Works of the Order-of-Lenin Physics Institute imeni P.N. Lebedev, USSR Academy of Sciences: Recombination Processes in Semiconductors at High Excitation Levels", edited by Academician B.M. Vul, Izdatel'stvo "Nauka", 1,200 copies, 144 pages]

[Text] ANNOTATION

This collection of works is devoted to an urgent problem in semiconductor physics: recombination processes at high excitation levels. In the first article the author describes a project in which he investigated the processes of interzonal recombination in semiconductors that are used extensively in electronics, such as silicon and germanium, as well as in indium arsenide and tellurium. At high excitation levels, the dominant process in these semiconductors is interzonal Auger recombination. In the second article the author presents the results of investigations of the processes of radiative recombination in undoped crystals of silicon, telluride and cadmium selenide and the transition of exciton states in these semiconductors into electron-hold states. He also studies the induced emission of light by undoped rectizonal semiconductors.

In this collection there is also a bibliographic list of works written by the employess of FIAN [Physics Institute imeni P.N. Lebedev] from 1962 to 1979.

This publication is designed for scientific workers and graduate students working in the field of semiconductor physics, and can also be useful to students in higher courses in VUZ's who are studying semiconductor physics.

UDC 019.942:537.311.33

BIBLIOGRAPHIC LIST OF SCIENTIFIC WORKS WRITTEN BY EMPLOYEES OF THE LABORATORY OF SEMICONDUCTOR PHYSICS, PHYSICS INSTITUTE IMENI P.N. LEBEDEV, USSR ACADEMY OF SCIENCES[1]

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[1]The compiler and editor of this bibliography is Candidate of Physical and Mathematical Sciences B.N. Matsonashvili. For works written from 1933 to 1961, see: TRUDY

Dielectrics, Semiconductors, Superconductors: 1962-1979

Dielectrics

1962

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ABSTRACTS

UDC 621.315.592

INTERZONAL RECOMBINATION PROCESSES IN SEMICONDUCTORS AT HIGH EXCITATION LEVELS

[Abstract of Article by Galkin, G.N.]

[Text] The author develops a method for identifying interzonal recombination processes that is based on an analysis of the dependence of the concentration of excess charge carriers at high excitation levels and the dependence of the intensity of the recombination radiation, as well as its quantum output, on the rate of charge carrier generation. He investigates interzonal recombination processes and determines the coefficient of interzonal Auger recombination for silicon and germanium, which are widely used in semiconductor electronics and are characterized by indirect interzonal transitions, as well as for indium arsenide and tellurium, which are semiconductors with zone structures characterized by direct interzonal transitions. He also determines the coefficient of interzonal radiative recombination for silicon, germanium and indium arsenide. Figures 39; references 178.

UDC 535.37+537.311.33

EXCITONS IN SEMICONDUCTING CRYSTALS AT HIGH EXCITATION LEVELS

[Abstract of article by Nolle, E.L.]

[Text] The author investigates nonequilibrium processes (with special emphasis on luminescence) in undoped semiconductors under strong excitation by an electron beam, when the relaxation of the excitation is determined by the intrinsic properties of the crystal lattice's electron subsystem, which is coupled with the exciton states. In this case, he establishes that recombination of the excess current carriers is determined by the excitons and the processes involved in their interaction, while the internal quantum efficiency of the intrinsic luminescence caused by the excitons is close to unity in direct-zone semiconductors. He also shows that for superhigh concentrations of excitons, when there is a substantial overlap of their wave functions, the exciton states are converted into electron-hole plasma states because of their collective interactions. At such concentrations, in direct-zone semiconductors there occurs induced radiation with an external quantum efficiency that is close to unity. Therefore, pure semiconductors can be used as light sources in (for example) lasers. Figures 25; references 75.

UDC 019.942:537.311.33

BIBLIOGRAPHY OF SCIENTIFIC WORKS WRITTEN BY EMPLOYEES OF THE LABORATORY OF SEMICONDUCTOR PHYSICS, PHYSICS INSTITUTE IMENI P.N. LEBEDEV, USSR ACADEMY OF SCIENCES

[Abstract of bibliography compiled and edited by Matsonashvili, B.N.]

[Text] This bibliography is a list of works written by employees of FIAN's Laboratory of Semiconductor Physics in the years 1962-1979; it contains 1,176 titles.

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COMMUNICATIONS DURING 11TH FIVE-YEAR PLAN

Moscow RADIOTEKHNIKA in Russian Vol 36, No 11, Nov 81 pp 4-5

[Article by Yu. B. Zubarev, USSR deputy minister of communications]

[Text] The 64th Anniversary of the Great October Socialist Revolution has now passed. During this year, the entire country has lived under the influence of the 26th Congress of the Communist Party of the Soviet Union, which summarized the results of the 10th Five-Year Plan and adopted national development plans for the 11th Five-Year Plan. Major tasks have been placed before Soviet Science in terms of accelerating scientific-technical progress and improving the welfare of the Soviet people; specific tasks have been defined for individual branches.

Under the guidance of the directives of the 25th CPSU Congress, communications workers achieved major successes during the 10th Five-Year Plan: they fulfillled assignments with respect to the most important technical-economic indicators, they improved the efficiency and quality of operation of communications facilities, and fulfilled and overfulfilled assignments for the development of technical facilities. A significant step was made in creating nationwide Unified Automated Communications System (YeASS). The extent of long-distance telephone channels increased in 1980 by more than a factor of 1.9 over 1975, and a number of critical cable and radio relay links were put into operation, including a multichannel radio relay link along the Baykal-Amur Main Railroad Line.

Thanks to the expansion of the network of communications channels and construction of long-distance telephone exchanges, the level of automation of long distance telephone communications, to which more than 60% of city telephone subscribers now have access, has increased. Most rayon centers have automatic telephone communication with their oblast centers. The assignment for the development of telephone communications in cities and rural areas was overfulfilled: the number of network subscribers increased by about 6 million. The assignment to double the network used to receive newspaper columns phototelegraphically at decentralized printing locations was fulfilled ahead of schedule. This method in contrast to delivering newspaper plates by air, has accelerated the printing of newspapers at remote locations and made it independent of weather, thus speeding their delivery to readers. For example, the

newspaper PRAVDA is now delivered to 90% of subscribers on the day it is published. Prototype message switching centers (TsKS-T) have been put into operation. The indicators for bringing channel switching capacities of the Nationwide Data Transmission Network (OGSPD) and telegraph network have been overfulfilled, and the subscriber telegraph and Telex network have been expanded. The development of radio broadcast and television stations has made it possible to provide the first radio broadcast program to the entire country, and the second program to 80% of the country; territory containing 86% of the country's population is covered by television broadcast. The entire television transmitting network provides color transmission, and the network which feeds central television programs via the new "Raduga", "Ekran" and "Gorizont" communications satellites has been expanded significantly. The wire broadcast network continued its development, with over 80 million wired-radio outlets in place by the end of the Five-Year Plan, including 40 million three-program outlets. A significant amount of work has been done to develop postal enterprises and enterprises of Soyuzpechat': a large number of new post offices and communications departments have been put into operation, 108 junction enterprises have been mechanized, and 99% of city delivery sections have been switched over to mechanized delivery.

The need for accelerating the scientific and technical progress of all branches of the economy stands out in the resolutions of the 26th Congress. With respect to communications, this is especially emphasized on the part of forming the national unified automated communications system. During the 10th Five-Year Plan, the USSR Ministry of Communications together with the Ministry of Industrial Communications Facilities and the Ministry of the Electrotechnical Industry accomplished a great deal of work in creating new technical communications facilities which will provide the basis for further development of communications during the 11th Five-Year Plan.

In order to develop the primary backbone communications network, high-capacity coaxial cable transmission systems have been created: the K-1920-P, which transmits, over a normal cable (2.6/9.4 mm) with four type KMB-4 tubes, 3840 voice-grade channels; and the K-3600 system which permits groups of up to 17,500 channels to be accomodated on a type KMB-8/6 cable. The 4 and 6 GHz KURS radio relay equipment allows up to 720-1300 or more telephone channels to be organized over 4 to 6 working trunks, as well as television transmission. The MDVU-40, "Gruppa", "Orbita-RV", "Ekran", "Moskva" and other geostationary satellites, which carry television, telephone, radio broadcast and newspaper column channels, have been developed for the backbone system. The "Molniya" system, which transmits via satellites in high elliptical orbit, which makes it possible to transmit programs and maintain telephone communications with high-latitude locations in the country, is still in operation.

Beside the previously developed K-300, K-120 and K-60 analog communications systems, intra-oblast primary networks are making extensive use of the newly created IKM-120 time-multiplexed systems for a standard balanced cable (to replace or augment the K-60) and the IKM-480, which uses a small coaxial cable

(1.2/4.6 mm), which can carry digital signals at 8.448 and 34.368 Mbps (120 and 480 telephone channels, respectively). This equipment has undergone testing on specially built experimental communications links. Since the testing indicated satisfactory results of operating the new communications sytems, they have been recommended for industrial production. Radio relay equipment operating in the 2 and 8 GHz range has been created for these systems which can carry 300 voice grade channels or television channels in the KURS trunk, and "Oblast'" equipment for telephone communication.

New digital IKM-12 (soon to be IKM-15), IKM-30, "Zona", and IKM-120 (which saves significant amounts of cable and copper) are in extensive use for local, city and urban telephone networks. Time-multiplexed radio relay link equipment will be introduced — the "Elektronika-11Ts" which operates in the 11 GHz range and has a 8.448 Mbps pcm multiplexing system. This system is now being tested on an experimental link.

Switching equipment is an important component of secondary communications networks. During the 11th Five-Year Plan, new quasielectronic stations which were developed late in the 10th Five-Year Plan and have been put into production, will be put into operation along with the already well-developed K 50/200 and 100/2000, ATSK-U and AMTS cross-bar switching equipment already in use in all branches of communications (rural, rayon, city and long distance). This includes the "Kvarts" exchanges for city and long distance communications, and the "Istok" for rural and rayon networks.

Channel switching equipment in direct-dialing, subscriber telegraph and data transmission systems will continue to be introduced into telephone communications. In addition, a message switching system — a new highly efficient telegraph communications system — will also be introduced more extensively. The first years of operation have already affirmed its high technical and operational indicators. The new "Kurok" electronic telegraph switching exchange, which is expected to be put into operation by the end of the Five-Year Plan, is also under development. Telegraph equipment is being improved significantly: the development and assimilation of 50 and 100 baud electromechanical alphanumeric teletype machines is reaching completion. The use of ink-type facsimile machines ("Shtrikh") will be developed further. The development of radio broadcast and improvement of its quality will occur primarily on the basis of existing technical facilities, as well as re-equiping existing stations. In order to develop television networks, a group of high performance remote-controlled unattended transmitters has been created: the "Il'men'-2", the ATRS-5/1, television relays, etc.

The development of all communications branches during the 11th Five-Year Plan will thus occur to a significant extent on the basis of new technology. In addition, besides introducing new facilities which have already been created, it remains to develop and create new, more sophisticated communications technology. The main tasks in this area are determined by a goal-oriented integrated program which provides for the creation of the next generation of coaxial cable systems — the K-10800 frequency multiplexed system, the IKM-1920 time-multiplexed

system, as well as mastery of the production of IKM-480 equipment. An important direction for technical progress in the area of developing transmission systems is the creation of a fiber optic communications system. Experimental optical links carrying digital streams at 2.048 and 8.448 Mbps which were created during the 10th Five-Year Plan have indicated the applicability in principle of the components and optical cables which have been developed. During the 11th Five-Year Plan, fundamental problems of creating equipment and cables for operational fiber optic links must be resolved so that they can be introduced extensively by the end of this, and the beginning of the 12th Five-Year Plan.

The integrated program defines tasks of developing and producing equipment, as well as a number of indicators regarding the volume of introduction, which imposes definite obligations for the construction of new communications facilities on the part of introducing new technology.

Work is underway to create the new generation of "Elektronika-svyaz'" radio relay equipment for oblast communication links in all frequency ranges allocated for those purposes. The development is being done on the basis of the latest achievements of domestic radio electronics, microminiaturization and stripline technology. It is expected that these will be introduced extensively by the end of this Five-Year Plan.

The tasks imposed by the 26th CPSU Congress are grandiose. Soviet communicators, recognizing the responsibility they bear for the further development and perfection of communications facilities and systems and their role in managing the national economy, will apply all of their efforts and knowledge in order to fulfill honorably the plans of the party and of the people.

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