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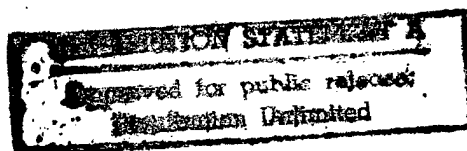
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USSR Report

ELECTRONICS AND ELECTRICAL ENGINEERING



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20 December 1984

USSR REPORT

ELECTRONICS AND ELECTRICAL ENGINEERING

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No 6, Jun 84)..... 40
- Radio and Modern Progress
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UDC: 621.37/39:534

THE VARIABLE HF OSCILLATOR BASED ON SURFACE ACOUSTIC WAVE RESONATOR

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84
(manuscript received 3 Feb 84 after revision) pp 63-64

KMITA, A. M., KUNDIN, A. P. and MAL'TSEV, O. A.

[Abstract] An HF oscillator based on an electrically-tuned surface acoustic wave resonator is investigated experimentally. The schematic diagram of the device is presented. The frequency tuning range of the SAW generator is tabulated for different supply voltages. A slight increase in the center frequency noted when the supply voltage increases is found to be caused by a concomitant reduction in the base-emitter capacitance of the active element. Figures 1; references: 2 Russian.

[45-6900]

UDC: 621.396.96

INTRINSIC POLARIZATION BASIS OF RADAR TARGET OBSERVED BY SYSTEM EMPLOYING DIVERSITY RECEPTION

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84
(manuscript received 28 Jun 83) pp 77-81

KAZAKOV, Ye. L. and SHISHKIN, Yu. M.

[Abstract] The characteristics of the intrinsic polarization basis of a target observed by a system employing diversity reception, with the elements of the scattering polarization matrix measured at a remote receiving location, are examined; methods are proposed for finding the elements of the matrix in that basis and its parameters. The concept of intrinsic polarization basis of a radar target during diversity reception is introduced: this is a basis in which the scattering polarization matrix of a target measured at a remote receiving location is diagonal. Methods for obtaining the elements of the target matrix in the intrinsic basis and its parameters are investigated in detail for the case of linear orthogonal bases. It is found that the intrinsic polarization basis of the target is generally elliptical and nonorthogonal for diversity reception. The methods employed make it possible to obtain the parameters of the intrinsic polarization basis and the elements of the scattering matrix in that basis for the case of diversity reception. Figures 2; references: 2 Russian.
[45-6900]

UDC: 621.396.96:621.391

SIGNAL SPECTRUM AS FUNCTION OF PARAMETERS OF ROTATION AND SPATIAL STRUCTURE OF OBJECT

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84
(manuscript received 15 Sep 83 after revision) pp 36-39

VOROB'YEV, V. I. and MASLAKOVA, N. A.

[Abstract] The complex echo-signal spectrum from an elongated moving object is examined. The relationship is established between the parameters of the echo signal spectrum at an arbitrary receiving point and the

parameters of movement and structure of the object for the case of a space-diversity radar system. The echo signal is assumed to be generated by a small number of elementary point reflectors secured to an object executing complex movement in a stationary Cartesian coordinate system. It is demonstrated by an example that the simultaneous use of data for measuring the spectrum width at two or more receiving points in a diversity system makes it possible to extract additional information about the object. Figures 2; references 6: 4 Russian, 2 Western.
[45-6900]

UDC: 621.396.965.8

DYNAMIC PROPERTIES OF SYSTEMS WITH CROSSTALK

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84 pp 42-43

KRASYUK, N. Ya.

[Abstract] A method is proposed for estimating the dynamic properties of tracking systems with arbitrary feedback by using the structure of the spatial direction finding characteristics represented, e. g., as cartographic projections onto the planes of coordinates θ and β . Expressions are derived for the angle of inclination of the zero levels of the spatial direction finding characteristics of the first and second channels with respect to θ . The trajectory of the representative point is investigated by the phase plane method for two types of tracking systems: one in which the actuating device serving each channel is described by an integrating section, and one in which the actuating device consists of integrating and inertial sections. References: 4 Russian.
[45-6900]

UDC 68/5.015

APPLICATION OF AUXILIARY SYSTEMS METHOD IN RADAR

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84
(manuscript received 11 Oct 83 after revision) pp 23-25

STRYUKOV, B. A.

[Abstract] The signal received in any radar system depends on the information parameters of frequency, phase and time lag, as well as on features of electromagnetic leakage. The present article shows how an auxiliary systems method for identifying dynamic objects with unobserved input can be modified for use in precision radar. The algorithms of the systems are shown, and then applied to radar tasks. The results indicate that the system makes it possible to eliminate all errors related to "target noise". Measurements of the position and nature of the target can be made with certain limiting conditions. Figures 2; references: 4 Russian.
[4-12131]

UDC: 621.371.334

COMPUTATION BY PHYSICAL ANALOGY OF SOME INTEGRALS ENCOUNTERED IN DIFFRACTION PROBLEMS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84 pp 81-82

PIMENOV, Yu. V.

[Abstract] An approach based on physical analogies is employed for the rigorous computation of two types of integrals commonly encountered in the asymptotic solution of problems of electromagnetic wave diffraction on ideally conducting non-closed surfaces regardless of the position of the observation point (in the near or far zone).

[45-6900]

UDC: 621.396.677

ASSESSING RELIABILITY OF PHASED ANTENNA ARRAYS BY FAST MODELING

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84
(manuscript received 7 Jun 83) pp 75-77

AFROMEYEV, A. S., KAPLUN, V. A., KUZ'MENKO, T. P., NAKONECHNYI, A. N.
and SAPALEV, V. I.

[Abstract] A fast modeling algorithm is proposed for high-reliability phased antenna arrays employed in an automated measurement system. The reliability indicator is the probability of reliable operation while the system is operating. Because the efficiency of the proposed algorithm increases over that of direct modeling as the number of elements and the element reliabilities increase, the algorithm is suitable for analyzing systems consisting of a large number of highly reliable elements. References:

4 Russian.

[45-6900]

UDC: 621.384.326.22

RECEPTION NOISE TOLERANCE OF OPTICAL MULTIPOSITION PULSE-POSITION MODULATION SIGNALS WITH INTERSYMBOL INTERFERENCE

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84 pp 86-87

YEMIN, V. I. and PETRICH, A. V.

[Abstract] An expression is derived for the error probability of a multi-position PPM signal as the optical pulse becomes wider. A receiving algorithm is proposed which employs repeated sampling of the signal during the observation interval. The region of signal and noise values for which the proposed method improves communications system noise tolerance is defined. An example is presented in which the noise tolerance of a system is computed assuming Gaussian variation in the signal strength at the output of the optical channel. It is demonstrated that the error probability does not exceed a certain value only within a fairly narrow range of signal strength, and that increasing the signal power can degrade signal detection noise tolerance significantly.

[45-6900]

UDC: 621.373-187.4.001

MULTIFREQUENCY SYNTHESIZER EMPLOYING PROGRAMMABLE LOGIC ARRAYS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84
(manuscript received 27 Aug 83 after revision) pp 50-51

DINGES, S. I. and SOLOV'YEV, M. Yu.

[Abstract] A multifrequency synthesizer based on programmable logic arrays is presented, which incorporates a code word generator in order to produce M-bit code words and a programmable logic array consisting of a storage device with K binary N-bit memory locations. The address lines of the programmable logic array are connected to the outputs of the code word generator; as the code words at the output of the generator change cyclically, the memory locations of the array are polled periodically. A synthesizer which produces four simultaneous pulse trains in the 850-1000 KHz

range with 50-KHz spacing is built on the basis of a K500 series microcircuit. It is found that the use of programmable logic arrays makes it fairly easy to generate a series of pulse trains with fixed frequencies; when the pulses of the sequence are arranged properly, a rather low stereo spectrum component level can be obtained at the frequencies of adjacent channels. Figures 2; references: 1 Russian.
[45-6900]

UDC: 621.373.42(088-8)

COMBINED FREQUENCY SYNTHESIS SYSTEM

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84
(manuscript received 19 Sep 83 after revision) pp 51-53

NIKIFOROV, I. V. and SHAPIRO, D. N.

[Abstract] A system employing concurrent passive and active digital synthesis with a single phase-locked loop is examined. A numerical example is presented. The maximum output frequency of a synthesizer employing this arrangement is limited only by the speed of the frequency divider. The size, weight and power consumption of the proposed device can be as much as 1.5-2 times smaller than existing synthesizers for the UHF band. Figures 1; references: 1 Russian.
[45-6900]

UDC 778.37(088.8)

DETERMINING AERODYNAMIC RESISTANCE IN REVOLVING MIRROR OPTIC ACCELERATORS

Moscow ZHURNAL NAUCHNOY I PRIKLADNOY FOTOGRAFII I KINEMATOGRAFII in Russian Vol. 29, No 3, May-Jun 84 (manuscript received 15 Dec 82) pp 168-173

D'YAKOV, N. F., NIKULIN, A. V. and TSUKANOV, A. A., Leningrad Institute of Precision Mechanics and Optics

[Abstract] Research on high-speed processes often involves movie cameras with optomechanical image commutation operating at 10^4 to $35 \cdot 10^6$ frames per second⁻¹. The Leningrad Institute of Precision Mechanics and Optics has developed the VK-12, a three-mirror optic accelerator camera which is the subject of the present article. Since rapid mirror revolutions sap the power of the electric motor, the role of air resistance in mirror revolutions is at the center of the study. Mirror speed was controlled by adjusting input voltage to the electric motor. The tests were conducted under natural air conditions, with varying numbers of mirrors producing the "load" on the motor. The energy expended was determined by registering centrifugal forces on the bearings and gear friction. Dynamic balancing adjustments were

successful in reducing the load to some degree. Aerodynamic air resistance on the mirrors was found to increase markedly as mirror revolutions increased. Thus aerodynamic resistance factors must be taken into consideration in designing such cameras, through calculations and experimental testing. Figures 3; references 8: 7 Russian, 1 Western.
[27-12131]

UDC 621.391.019.4

NOISE IMMUNITY OF OPTICAL SIGNALS RECEPTION WITH MINIMIZATION OF MEAN RISK

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84
(manuscript received 23 Mar 83) pp 75-78

TOLPAREV, R. G. and BORISOV, E. V.

[Abstract] An algorithm for decision-making based on a one-time observation of distinguishing and discovery of optical signals on a noise foundation failed to consider the difference between the observed signal and the signal threshold. The present article offers calculations to determine and give proper weight to that threshold, using mean risk as the index of operational quality. The algorithm is tested by measuring the contrast between diffraction and photoelectron count optical signals, with a Hauss approximation in the former and a Poisson in the latter. The relationships determined in the study make it possible to determine the limits of uncertainty by minimizing mean risk for receiving optical signals with an active pause, and to evaluate the rate of information transmission, taking decision rejection into account. Figures 4; references: 2 Russian.
[4-12131]

UDC 621.391.278

EVALUATION OF SIGNAL TRANSMISSION ACCURACY IN DIGITAL FIBER-OPTIC COMMUNICATION LINES WITH RELATIVE POSITION IMPULSE MANIPULATION

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84 (manuscript received 3 Jun 83)
pp 78-80

SHIROKOV, G. A. and BUKHINNIK, A. Yu.

[Abstract] Monitoring of accuracy in fiber-optic communication lines (VOLS) is essential for proper operations. The present article describes various methods and devices used to satisfy this aim. In general the devices are based on locating the source of specific operational breakdowns that cause transmission errors. The signal of relative position impulse manipulation (RPTM) is discussed as the linear component in checking transmission accuracy;

various modifications are summarized. "RPIM-1" is based on regulation of the interval between adjacent impulses, while "RPIM-2" introduces a barrier interval after each transmitted impulse. The algorithm for the latter prevents transmission of a second group of pulses when the distance between pulses is too short. Other parameters measured to determine transmission accuracy are the coefficient of error discovery, or the ratio of average discovered including false alarms and signal lapses, and synchronization difficulties. Tables 2; references 3: 2 Russian, 1 Western.
[4-12131]

UDC 621.373:621.397.332.1

TRANSIENT PROCESSES IN LINEAR TELEVISION SWEEP GENERATORS

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84
(manuscript received 11 Oct 83 after revision) pp 43-46

AZIMOV, Ye. I. and FRIDLYAND, I. V.

[Abstract] The operation is described of a transient process of a linear television sweep generator considered as a system of automatic control (SAC) of the third order, so as to analyze its functioning and to shorten the sweep feedback duration.* Transmission and correction of transmission factors are presented in mathematical form, followed by an example of sweep generator operation in color TV applications. Where actual values for sweep generator elements cannot produce the necessary duration in the transient process, various damping devices are recommended. If they are used, these devices must also be included in calculations of operational parameters. The purposes of 14 different expressions in the algorithm are explained. Figures 1; references: 7 Russian.
[4-12131]

UDC 681.335.2.088.6

APPLICATION OF DIGITAL SIGNAL PROCESSING FOR INCREASING DYNAMIC RANGE OF A DIGITAL-TO-ANALOG CONVERTER

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84
(manuscript received 9 Nov 83 after revision) pp 25-28

SEMENOV, O. B.

[Abstract] Signal transmissions by the pulse-code modulation (IKM) method are achieved by successive inclusion of an analog-to-digital converter (ADC)

*The conditions are determined in which it is possible to consider the generator as a SAC of the second order.

and a digital-to-analog converter (DAC) with the dynamic range of the IKM system determined by the signal-to-noise ratio (a definition of this noise is given). Use of an (A+B)-data bits ADC and a B-data bits DAC reduces the dynamic range of 6V decibels. The present article reports on research to determine and analyze methods permitting use of digital signal processing to reduce the noise of (A=B/B data bits ADC and B-data bits DAC systems. Both surrounding noise and instrument noise parameters are studied. The method diagrammed and summarized makes it possible to optimize the selection of suitable impulse characteristics of a digital feedback filter. A Philips microcomputer was used to demonstrate the effectiveness of the system. The methods described permit use of low-data bits, high-speed DAC for reproducing a wide range of signals. Digital interpolation was found to be impractical because it requires extremely high speeds for effective operation. The most effective method involved non-linear processing in both digital and analog areas as well as digital interpolation. Figures 4; references 6: 3 Russian, 3 Western.
[4-12131]

UDC 621.391.266:535.247.7

OPTIMUM FILTRATION OF SIGNALS IN TELEVISION GAGES FOR RAPIDLY PROCEEDING PROCESSES

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84
(manuscript received 27 Sep 83 after revision) pp 20-23

NIKOLAYENKO, V. A. and TETNEV, G. S.

[Abstract] Among various methods and technologies for analyzing and recording rapid processes in the optical wave lengths, TV operations have a number of advantages, one of the basic ones being film-free registration of radiation with simultaneous automatic data processing. The present article offers a synthetic presentation of an optimum structural pattern. Frequency, signal and noise characteristics are also covered. Some interference because of background distortion is attributed to parasitic components related to field distortions and target defects, as well as generator and synchronization flaws. Power supply interference is also noted. Coordination of transmission succeeded in reducing signal-noise interference. Use of coordinated filtration with proper selection of the scanning standard increased that ratio above 10 decibels, the maximum accurate measurement on the scale. Figures 3; references: 6 Russian.
[4-12131]

UDC: 621.372.018.78

APPROXIMATE ANALYSIS OF SECOND-ORDER TRANSIENTS WITH ZERO INITIAL CONDITIONS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84 pp 92-93

GRISHAKOV, G. I.

[Abstract] The approximate relationship between time t and signal level x for transients in electrical circuits described by the differential equation $a_2 x'' + a_1 x' + x = 1$ with a constant coefficient $a_1 > 0$, $a_2 > 0$ for $x(0) = 0$, $x'(0) = 0$ is found. It is assumed that the general form of the approximating function $t(x)$ is defined, but that its parameters c_k are unknown ($k=0, 1, \dots, n$). A criterion is proposed for finding c_k . In approximating the aperiodic processes, the integral characteristics of the signal are computed by substituting the expression for x and integrating by parts. It is found that a more accurate approximating function is obtained from the simple approximation by replacing the unit function $1(x)$ with a step function. The advantages of the X-characteristic method over the integral moment method in solving similar problems are noted. References: 1 Russian. [45-6900]

UDC: 621.372.62

NEW CONSTRUCTION PRINCIPLES FOR OSCILLATOR POWER SUMMING DEVICES

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84
(manuscript received 10 Jan 84 after revision) pp 17-23

LONDON, S. Ye. and TOMASHEVICH, S. V.

[Abstract] Wideband single-stage multichannel devices for adding equal powers from an arbitrary number of oscillators are analyzed for the reflection coefficient in the working condition and for the decoupling between different inputs. The multiphase symmetrical excitation method is used to find these parameters. A device is described in which the oscillators are connected indirectly between the starting points of adjacent conductors

in adjacent lines so that all of the power from the oscillators enters the common load when the amplitudes and phases are the same, but the inputs are shunted by the series inductances of the adjacent conductors of the adjacent lines. A schematic diagram of the device is presented. The principle of indirect connection of oscillators opens up new possibilities for the construction of summing devices. Figures 7; references 7:
6 Russian, 1 Western.
[45-6900]

COMMUNICATIONS

UDC: 621.394.62:621.391.23.019.4

EXPERIMENTAL INVESTIGATION OF DIGITAL CIRCUIT FOR DECISION AND TIMING
SYNCHRONIZATION DEVICES EMPLOYED IN BINARY RELATIVE PHASE-SHIFT KEYED
SIGNAL RECEIVER

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84 (manuscript received 10 Feb 83)
pp 87-89

AKIMOV, V. N. and PARAMONOV, A. M.

[Abstract] Digital decision devices and timing synchronization devices employed in dual PSK receivers are investigated experimentally. It is found that the error probability drops as the bandwidth of the low-pass filter is increased from 0.7 to 3.0; the curves corresponding to the actual case are practically the same as the curve corresponding to ideal synchronization, i.e., the operating performance of the synchronization device within the range of low-pass bandwidth values examined is so good that the performance of the decision device is practically unaffected. Increasing the bandwidth of the low-pass filter further degrades the operation of the synchronization device enough so that it begins to effect the performance of the decision device. This indicates that there is a region of bandwidth values for the low-pass filter for which there is a gain in the potential noise tolerance signal-to-noise ratio. Figures 2; references: 2 Russian.
[45-6900]

UDC: 621.391:621.376.56

EFFECT OF DIGITAL ERRORS AND THRESHOLD PROPERTIES OF PULSE-CODE
MODULATION SYSTEMS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84 (manuscript received 6 Dec 83)
pp 67-70

YURCHENKO, A. G. and GRIGOR'YEV, R. F.

[Abstract] A piecewise-linear approximation is proposed for the anomalous error pulse amplitude for bit errors in PCM signals as a function of the amplitude of the coder input signal. It is found that systems employing

natural and semi-inverted codes must make allowance for errors in at least the two high-order bits when the relative level of the signal input to the coder is in a region of -15 dB, because their contributions to the total dispersion of the anomalous error pulses are comparable. The comparatively low information redundancy of PCM signals makes it possible to reduce the noise tolerance threshold of real PCM systems to 6-7 dB by redistributing energy among the bits and by erasing incorrect samples at the decoder output. The noise tolerance of digital systems can be improved by using the statistical properties of the signals in delta-modulation and differential PCM schemes, among others. Figures 2; tables 1; references 17: 13 Russian, 4 Western (2 in Russian translation).
[45-6900]

UDC: 621.391:621.372

ANALYSIS OF RADIO ENGINEERING SYSTEMS WITH INCOMPLETELY DESCRIBED SUBSYSTEM

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84
(manuscript received 10 Dec 83 after revision) pp 39-41

RIZKIN, I. Kh.

[Abstract] A heuristic procedure is described which can be employed in the machine analysis of radio systems when needed information about some part of the system (subsystem) is lacking. The procedure is based on studying the effect of varying the subsystem on the performance indicators of the system. The approach is related to, but more general than, the "worst-cast" and similar methods. The flowchart of the algorithm is traced and explained. A PDL (Procedure Definition Language) version of the algorithm is presented in an appendix. References 5: 2 Russian, 3 Western (in Russian translation).
[45-6900]

UDC: 621.391.827.25

ESTIMATION OF REQUIREMENTS FOR ACCEPTABLE NOISE RADIATION LEVEL OF COMMUNICATION TRANSMITTERS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84 (manuscript received 24 Oct 83 after revision) pp 34-36

BURKOV, I. A.

[Abstract] An analysis is presented of an estimate of the acceptable and maximum requirements for the numerical values of standardized characteristics with allowance for the distinctive features underlying the standardization of the parameters of other equipment (receivers, for the case of transmitters)

with which compatible operation must be ensured, as well as the basic electromagnetic situation indicators. A formula is derived which can be used to find the acceptable transmitter noise radiation level as a function of the characteristics of the receivers and the interference background. An example is presented for single sideband and frequency-modulated radio-telephone systems. It is found that the strength of the interference background has a significant influence on the noise strength starting at values 15-20 dB below the receiver sensitivity; the influence of the degree of receiver blocking by the primary radiation from the transmitter is felt below that limit. Figures 1; references: 8 Russian.
[45-6900]

UDC: 621.391.24:621.376.54

FORMATION OF RADIO SIGNALS WITH LOW OUT-OF-BAND RADIATION

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84
(manuscript received 1 Sep 83 after revision) pp 8-11

FILATOV, K. V. and POKROVSKIY, Yu. O.

[Abstract] A theoretical analysis is made of the effects of quantizing the lengths and shifts of partial radio pulses on the shape of the signal spectrum; recommendations are given for the optimum number of quantization levels needed to achieve the desired out-of-band radiation level in a given frequency band. Formulas are derived for the spectra and relative out-of-band energy for radio signals generated by pulse-width modulation of partial radio signals. Numerical examples are presented for a signal consisting of 64 partial signals with $M=2^t$ positions varying from 2 to 16,384 in each time interval. The signal envelope prototypes employed are Kaiser-Bessel, Hamming and Hann envelopes. It is found that the bit length of the codes for the durations and shifts of the partial signals have a decisive influence on the out-of-band radiation level of the signal formed. The technical difficulty of implementing a signal generator employing digital pulse width modulation is determined only by the wavelength, and is independent of the way in which the envelope is approximated. Figures 4; references 4: 2 Russian, 2 Western (1 in Russian translation).
[45-6900]

EFFICIENCY OF DIGITAL CELLULAR MOBILE COMMUNICATIONS SYSTEMS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84
(manuscript received 21 Dec 83 after revision) pp 12-16

CHVILEV, G. D. and GURVITS, V. L.

[Abstract] Random access to radio channels by mobile subscribers of cellular systems employing dynamic frequency channel distribution and code division of channels is compared. A criterion is introduced which characterizes the operating performance of the system in terms of the probability of failure to serve subscribers with given noise tolerance (error probability) and a fixed frequency band and transmission rate. It is found that the probability of denied service becomes smaller as the number of channels increases in a system employing dynamic frequency allocation, because the probability of all channels being busy at the same time for a given traffic load is lower; the probability of denied service in a code-division system increases as the size of the service zone increases. All other conditions being equal, it is found that code-division systems should be employed when the traffic is heavy, and dynamic channel allocation should be used when subscriber activity is low. If the system performance is superior, dynamic allocation should be used regardless of the amount of traffic, because a code division system will perform significantly worse. Figures 2; references: 5 Russian, 1 Western (in Russian translation).

[45-6900]

UDC 621.391.1.037.3

MODIFICATION OF KOTEL'NIKOV AND FOURIER SERIES IN TASKS OF SIGNAL SYNTHESIS AND ANALYSIS

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84
(manuscript received 17 Sep 83 after revision) pp 64-67

BOLDIN, B. K. and BOLDIN, D. B. (deceased)

[Abstract] The finite function of the Fourier series and its transformation in a complex exponential basis by the Kotel'nikov series has fundamental importance for transmitting digital information by signals in a finite spectrum, and in synthesis and analysis of signals. The present article reviews Kotel'nikov's work and points out difficulties remaining for its practical application. Further classification of limitations shows that the even and odd parts of the system developed are complete and can be used in expanding and analyzing even and odd components of the signal, with approximation of signals by the final sums of trigonometric functions. Tables 1; references 6: 5 Russian, 1 Western.

[4-12131]

EVALUATION OF PARAMETERS OF STATES RESISTANT TO EFFECTS OF IMPULSE NOISE

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84
(manuscript received 17 Nov 83 after revision) pp 68-70

SHELUKHIN, O. I.

[Abstract] The author evaluates parameters of the state of dynamic objects that are resistant to the effects of impulse interference described by the Markov chain. Non-linear supplements to previous transformations are suggested; the starting point is the equation for the state of a dynamic object as described by a system of contrasts $x(k+1) = \phi(k) x(k) + v(k)$ where $x(k)$ is the vector of the status measured by $n \times 1$ at a point in time k , and $\phi(k)$ is a transitional matrix of the system measured by $n \times n$, and $v(k)$ is the noise vector. The calculations show the optimum evaluation of the vector of the state of the dynamic system, with the effects of impulse noise being generally nonlinear. The effectiveness of filter evaluation is calculated with a further set of formulas. The algorithm is based on random interference, with other operations being compensatory in nature. Figures 3; references: 4 Russian.
[4-12131]

EVALUATION OF NOISE IMMUNITY OF TRANSMISSION OF CONTINUOUS MESSAGES WITH AID OF QUANTIZATION AND ONE CLASS OF ANALOG CODING

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84 p 71

BRONNIKOV, V. N.

[Abstract] This preliminary report tells of study of improving noise immunity in continuous transmission of information, including the threshold where the signal-to-noise ratio is critical. A non-linear analog coding process is used to show the overall quantum significance and quantization error in the process. The interference in the model was added random noise. Results showed that with small input, signal-to-noise ratios could be effective, although significant band expansion was necessary. Figures 1.
[4-12131]

NOISE IMMUNITY OF TWO COMBINED ALGORITHMS FOR RECEPTION OF SIGNALS WITH REDUNDANCY

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84 p 72

NAUMOV, A. N.

[Abstract] During transmission of discrete messages coded with redundancy on most channels the maximum noise immunity is provided by the "whole message" method of using the most reliable vector for transmission. The combined digital algorithm method (KAPTS) proposed in the present article, also called the "Kagan-Fink algorithm", was developed for double codes that utilize the relative simplicity of the Kagan-Fink algorithm. Results indicate that the algorithm can be used successfully for this purpose. It provides highly error-free encoding and orthogonal equations with high noise resistance. The major "modified rank algorithm" can also be used in combination with the Kagan-Fink algorithm, or they can be used separately with equal success for variety.

[4-12131]

ANALYZER OF COMMUNICATIONS CHANNEL RELIABILITY BASED ON MICROCOMPUTER

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84 (manuscript received 30 Jun 83) pp 73-74

KROTOV, A. V. and TSIRLIN, D. V.

[Abstract] Development of information systems requires, among other things, evaluation of reliability, understood as production quality not significantly worse than the input quality. The present article describes a device based on a microcomputer that can measure temporary signal distortions, calculate their statistical characteristics and evaluate channel reliability. Measurement consists of two parts: measurement of time intervals between telegraph transmissions and processing of the data in order to give results in useful form. Because the first stage is in digital form and is entered into the microcomputer, it was unnecessary to use a phase device, which was replaced by simple data processing. If necessary, the user can also return to earlier data that is in storage. Figures 1; references: 1 Russian.

[4-12131]

CONCERNING CHARACTERISTICS OF SHIFT AND COMPOSITION

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84 (manuscript received 25 Oct 83)
pp 59-61

BESSARABOVA, A. A. and KLYKOV, M. V.

[Abstract] M-sequences are used in broadband systems of radio communications and radar, and most of its properties have been studied. The present paper seeks to fill the gap in knowledge that, nonetheless, exists concerning two of those properties, shift and composition. Calculations are presented that define the number of cyclic shifts obtained by summing given shifts of M-sequences. A method for calculating such shifts on the basis of the initial configuration is also presented, but is regarded as incompletely developed. The relationships developed make it possible to expand the capabilities of M-sequence generators, and may also be used in analyzing correlational properties of component sequences. Figures 1; references 6: 3 Russian, 1 Japanese and 2 Western (in Russian translation).
[4-12131]

UDC 621.396.61:621.376

FREQUENCY MODULATION SIGNAL SHAPERS BASED ON DIGITAL PHASE SYSTEMS OF AUTOMATIC-FREQUENCY CONTROL

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84
(manuscript received 21 Jul 83 after revision) pp 31-33

TYAZHEV, A. I.

[Abstract] Digital phase systems of automatic-frequency control (AFC) are widely used in devices for shaping and detecting FM signals. The present article diagrams and describes a FM signal shaper-modulator that includes a double dial and a resistor digital-analog transformer, a comparator and an output band filter. The modulator functions with synchronism of the AFC, when the frequencies of the pulse repetition rate from the outputs of the comparator and the third separator pulse fronts are alike. Pulse length is also shortened by the shaper. Input voltage can be of only one polarity, and the digital integrator must be used in order to achieve full pulse response compensation. The devices described can be produced as a digital micro-assembly requiring no adjustment during preparation and regulation in operation. Figures 3; references: 5 Russian (1 Russian report is concerned with foreign electronics).
[4-12131]

DIGITAL SIGNAL DEMODULATORS WITH SINGLE-SIDEBAND

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84
(manuscript received 18 Aug 84) pp 3-9

AKCHURIN, E. A.

[Abstract] Digital methods for processing signals constantly become more common in communications because of low cost, reliability and stability. The present article describes a simple single-sideband demodulator for such use. Demodulation processes are analyzed in order to determine the most effective high-speed algorithms for its operation, without using multiplication operations in data processing. Theoretical presumptions and a series of three algorithms are summarized. The third selects discretization frequency, changes signs as needed for operation, obtains parallel values for successive operations with cosine or sine components for precise or linear-interpolated data, and obtains successive digital values by alternative selection from the previous successions. Use has shown this algorithm to be more precise as well as more rapid than those previously employed. Design of the actual digital device is diagramed and described. Figures 4; references 5: 4 Russian, 1 Western.
[4-12131]

UDC 621.373.52:621.314.572

OPTIMAL REGULATION LAWS OF STEEPED-SINUSOIDAL VOLTAGE

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84 (manuscript received 18 Jul 83)
pp 81-84

GRIGORYAN, M. O. and POZIN, M. B.

[Abstract] Class D multichamber converters with sinusoidal output voltage, such as inverters, generators and AM amplifiers, are receiving increasing interest because of their advantages over single-chamber types. The present article suggests principles for optimal regulation of stepped-sinusoidal voltage based on the dependence between current phase step angles. Optimization of the criterion of minimal levels of the maximum number of higher harmonics with the frequencies closest to the basic harmonic frequency lies at the heart of these laws. If stepped-sinusoidal voltage in all chambers or cells is equal, then at intermediate and low power they can be filled with the same values. Calculations are supported by data from stabilized converters and generators. Figures 4; references: 5 Russian.
[4-12131]

UDC 621.396.6.049.77

USE OF EVALUATION OF COMPLEXITY OF UNITS OF RADIOELECTRONIC DEVICES IN
AUTOMATED PLANNING

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84 (manuscript received 11 Oct 83
after revision) pp 91-94

TOPOL'SKIY, N. G., EYDEL'NANT, V. M. and KRIVORUCHKO, V. F.

[Abstract] Computer planning of complex radioelectronic systems begins with the development and modeling of functional principles in order to determine technical requirements. The present article presents aspects influencing that planning. Factors include defining hybrid integral components of such a system, formulation, selection, and adaptation of the most effective model components and planning of load and technical

product parameters. The types of filters, amplifiers and broad-band transistor amplifiers required are summarized, and an example of application is given. The calculations are considered to be useful for planners in increasing the effectiveness of automated design of radioelectronic systems, lowering both costs and planning time. Figures 4; tables 2; references: 3 Russian.
[4-12131]

TWO MEANS OF TRAFFIC BETWEEN SINGLE-CRYSTAL AND SINGLE-PLATE MICROCOMPUTERS
OF "ELEKTRONIKA S5" FAMILY

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84 (manuscript received 9 Mar 83)
pp 14-19

GAL'PERIN, M. P., NESTERENKO, S. A. and REZNIK, A. E.

[Abstract] The prospects for developing distributed control systems based on single-crystal and single-plate microcomputers place new importance on intermachine communications. Limited input-output resources in single-crystal microcomputers further emphasize the need for shared time. The present article presents two possible approaches to such traffic. According to the first, any single-crystal microcomputer (SCMC) can be connected directly to any other microcomputer of any type, with each SCMC having both receiving and sending buffers. The second approach uses on SCMC as a retranslator for exchanging information between single-crystal and single-plate microcomputers. A criterion in selecting the approach to use should be the average period of service per series channel. If traffic in one direction must be optimized, the criterion should be the average service time for that traffic direction. Figures 6; references 6: 5 Russian, 1 Western (in Russian translation).
[4-12131]

ELECTRICAL INSULATION

UDC [621.315.222:621.315.616.9]:622.323

EFFECT OF TECHNOLOGICAL AND USE FACTORS ON CHARACTERISTICS OF POWER CABLES FOR OIL EXTRACTION

Moscow ELEKTRICHESTVO in Russian No 7, Jul 84 (manuscript received 27 Jan 83)
pp 31-37

MESENZHNİK, Ya. Z., candidate of physico-mathematical sciences and
OSYAGIN, A. A., engineer, Tashkent

[Abstract] Cables supplying power to motors in drill holes are a key link in oil extraction. The dependability can be tested with high accuracy in an imitation thermobar mixture of water and liquid hydrocarbons, which duplicates the maximum conditions to which such cables will be subjected. The present article presents data on the technological factors influencing electrical insulation materials, including temperature and stress in the polymer molecules of the casing. Temperature of drying granulates and extrusion procedures were shown to be significant in cable reliability. Use characteristics studied included insulation cracking, electrical voltage effects on flaws in cable insulation, changes in longitudinal hermeticity, effects of thermobar load on the electrical resistance of insulation, and corrosion factors. General conclusions include the recommendation that 12Ch18N10T steel be used as cable armor for oil extraction power source cables. Figures 4; tables 4; references: 11 Russian.
[2-12131]

UDC: 621.372.81:535.1

PRECISION ELECTROOPTICAL DEFLECTOR BASED ON CORRUGATED LIGHT GUIDE

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84 (manuscript received 3 Oct 83 after revision) pp 83-86

VAYSLEYB, Yu. V. and BRAUDE, V. B.

[Abstract] A corrugated light guide applied to an electrooptical substrate to which electrical control voltage is applied is proposed for changing the direction of radiation in antenna arrays by changing the propagation velocity of the driving wave along the array. Expressions are derived for the slope of the deflector characteristic. It is found that the deflection angles which can be obtained with electrooptical materials now available are extremely small; therefore, the device in question cannot compete with existing thin-film deflectors in terms of beam deflection and number of resolved positions. However, the device is promising for use as a variable explanar coupler in various integrated optical devices. The deflector is also advantageous in that the radiation can be output from the light guide directly into space with no additional elements (prisms), which allows it to be viewed as a planar optical antenna with precision adjustment of the radiation direction. Figures 4; references 8: 7 Russian, 1 Western.
[45-6900]

MULTICHANNEL ELECTROOPTICAL MODULATORS FOR DIGITAL INFORMATION STORAGE AND PROCESSING SYSTEMS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84 (manuscript received 21 Dec 83)
pp 23-27

ARKHONTOV, L. B., DANILOV, A. A., KISELEV, B. S., KOBLOVA, M. M.,
KORT, S. I., MIKAELIAN, A. L., SHKITIN, V. A. and YANYUK, V. I.

[Abstract] Multichannel electrooptical modulators based on Z-cut single crystals of lithium niobate with up to 100 channels are investigated. Formulas are derived for modulator geometry based on the specific requirements for the parameters and technological manufacturing capabilities. Two modulators are described, one with 16 and the other with 100 channels, and an optical system aperture of 35 mm. The characteristics of the devices are investigated in the beam of a helium-neon laser, and are found to have low optical losses and high speed with relatively small control voltages ($<100V$). The deficiencies of the device include the possibility of optical damage to the substrates because of photorefraction in lithium niobate, which restricts the use of such modulators to the short-wave region of the visible spectrum when the power density of the laser radiation is high. Figures 5; references 9: 8 Russian, 1 Western.

[45-6900]

DESIGN OF COMPLEX SYSTEMS WITH PERMANENT MAGNETS

Moscow ELEKTRICHESTVO in Russian No 7, Jul 84 (manuscript received 7 Apr 81)
pp 26-31

KOGEN-DALIN, V. V. and KURBATOV, P. A.

[Abstract] Mathematical models of systems with permanent magnets generally focus on local details rather than examining the magnetic field in its entirety. Polarized ferromagnetic objects can be regarded as composites of magnetic dipoles, and scalar magnetic charges can be used to describe their features. The present article presents a model that includes an algorithm for the iterational process of determining magnetization in non-linear media, a high-production algorithm for integrating nuclei of integral equations on ferromagnetic surfaces, and construction of mathematical description of the geometric forms involved that can be used on a computer. These values are figures for permanent magnets of ferrite and barium, samarium and cobalt and other materials, for materials with varying magnetization, for components made of moderately magnetic materials and equipotential components of such materials. The new algorithm solves problems formerly present in the initial non-linear integral equation its effectiveness lies in limiting the areas for selection to magnetic characteristics, thus improving convergence and reducing the cycles of the iterational process. Figures 9; references 12: 11 Russian, 1 Western.
[2-12131]

CONFIGURATION OF MAGNETIC FIELD ON MAGNETIC HEAD

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84 pp 55-56

POGOSYAN, Ya. M., POGOSYAN, T. A. and OVSEPYAN, A. K.

[Abstract] A method is proposed for determining the configuration of the magnetic field of the head of a standard translucent electron microscope, placed in the diffraction chamber of the microscope with its working opening along the optical axis of the microscope. Distortion on the intermediate lens is attributed either to the "Lawrence force", the convergent image, or the divergent image. Mechanical contaminants are taken into account in assessing results. A single Lawrence microscope picture is sufficient when made by two images of the surface of the head, imposed on one photographic plate, in the absence of a field and a convergent image with a given magnitude of the magnetizing current. As that current is increased, the magnetic field is focused on the head and can be described as a Nicomedian conchoid. Figures 2.

[4-12131]

UDC: 621.396.622.2

DUAL BALANCED MICROWAVE MIXERS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84
(manuscript received 1 Sep 83 after revision) pp 73-75

SARAYEV, S. M.

[Abstract] It is demonstrated by analyzing the signal transmission conditions in a balanced mixer that quadrature and phase-antiphase hybrid junctions are suitable for use in dual balanced mixers. Two mixer circuits, each incorporating four diodes, are analyzed. It is found that the bandwidth properties are the same as those of two-diode mixers. The proposed dual mixer circuits provide better attenuation of combination interference than existing two-diode arrangements; their construction is simpler than existing loop mixers because no signal voltage decoupling circuit or intermediate-frequency circuit is needed. Figures 2; references: 5 Russian, [45-6900]

UDC 621.372.823

E_{01} -TYPE WAVE PROPAGATION IN MISMATCHED METALLIC WAVEGUIDE WITH LOSSES

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84 pp 74-75

LOSHAKOV, L. N. and IVANOVA, N. Ye.

[Abstract] Calculation of the interference of falling and reflected waves in long lines have received previous attention. The present article provides a more general summary of interference effects with dispersion-type waves. Maximum simplification is provided by a calculation of the wave propagation and energy flow on the basis of E_{01} -type waves, taking energy absorption in the wall and the medium into account. The algorithm developed is presented and described. It shows that thanks to the interference (sinus) member, the energy flow cannot be expressed by flow differences, but requires a different formulation. Interference tends to be greater in lower frequency ranges. References: 1 Russian. [4-12131]

MICRO-WAVEGUIDE TRANSFORMERS OF COHERENT-OPTICAL SIGNALS

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84
(manuscript received 18 Nov 83) pp 9-14

BUDAGYAN, I. F., MIROVITSKIY, D. I. and NAZAROV, V. L.

[Abstract] Data are presented on the development of Fourier transformers for optically compatible filtration devices, correlational and spectral analysis, and discrete-phase transformers intended for operation in analog-digital transformers, correlator-interferometers and other precision detectors. Contour and temperature factors involved in the functioning of such equipment are expressed in algorithms, which show among other things that Fourier transformers have a filter shift critical point far below that for lens transformers for laterally heterogeneous waveguides. The device used for experimental confirmation of the mathematical hypothesis is diagrammed and described. Fiber optics discrete-phase transformers for discretization and phase modulation of a given class of parameters are also diagrammed and discussed. The results indicated that the precision of hologram reproduction for diffusion and discrete-phase transformers was identical, as was the sensitivity to changes in activation angle. Signal-to-noise level was 10 decibels for diffusion transformers and 15 for the new device. Both constant and discrete processing of two-dimensional signals was done more efficiently on the micro-waveguide element base, and considerable space saving enhanced the simplicity of design for such installations. Figures 6; references 12: 7 Russian, 5 Western (2 in Russian translation).
[4-12131]

UDC 621.313.322-82.001.4

EXPERIMENTAL STUDY OF 294 MV·A HYDROGENERATOR WITH SOLID TERMINALS

Moscow ELEKTRICHESTVO in Russian No 6, Jun 84 (manuscript received 17 Dec 82)
pp 6-10

GLEBOV, I. A., KARPOV, G. V., KHARLAMOVA, Ye. F., LOSHKAREV, V. P.,
SHUR, G. I., EL'BERT, Ye. S., ZELENESKIY, Z. L. and ALIGISHIYEV, Z. A.

[Abstract] Four hydrogenerators installed at the Chirkeyskiy Hydroelectric Plant are described. Innovative features include air cooling and the use of special active materials. Tests were made of magnetic fields in the active zone, non-synchronic and pulsating fields, axial fields in the front zones, heat and vibration and durability factors. Results showed that synchronous fields were equal to those of regular generators, and non-synchronous fields were lower by 2-3 times. Dampening of non-synchronous spatial harmonic inductions were also comparable to generators of standard construction. Temperature values, and therefore heat effects, were less damaging than in standard designs. Asynchronous operation tests were made at 60, 125, 150, 200, 230 and 250 MWT, along with various synchronous operation tests. The comprehensive testing demonstrated that the solid terminal generator was extremely durable, even under extreme loads. Prolonged periods of service were possible with niminal power of up to $\cos \phi = 0.88$. With loss of excitation, the generator can be stopped with quick unloading without causing other power interruptions. Figures 3; tables 2; references 3: 1 Russian, 2 Western.

[24-12131]

UDC 621.396.176.001.24

METHOD FOR SELECTING ELECTRIC SUPPLY SYSTEM USING TREE GRAPHS

Moscow ELEKTRICHESTVO in Russian No 6, Jun 84 (manuscript received 3 Oct 83)
pp 46-48

SHAPIRO, B. I., candidate of technical sciences, VIKHOREV, V. M. and
GLADUNOVA, M. B., engineers, Novokuznetsk

[Abstract] Systems for supplying electricity to industry involve hierarchies of many stages including sources, transmission lines and users. More

precisely, step-down sub-stations, distribution and transformer stations and commutator apparatus are required. The present article offers a comprehensive approach to optimizing the efficiency of such electric supply systems for varying technologies and varying configurations. Technical parameters of individual types of electrical equipment form the top of the graph, with specific features forming the branches. Calculations based on this model show its effectiveness for determining the most economical electric production with minimum expenses for technical implementation. Figures 2; tables 1; references: 8 Russian.
[24-12131]

UDC 537.212.001.24

CALCULATION OF ELECTROSTATIC INDUCTION NEAR HIGH VOLTAGE ELECTRICAL POWER PLANTS

Moscow ELEKTRICHESTVO in Russian No 6, Jun 84 (manuscript received 2 Jun 83)
pp 53-56

GUSEV, Yu. N., candidate of technical sciences, Moscow

[Abstract] Powerful electric fields near power plants operating at 330 KWT and above have an impact on the ecology, including man and insulated conductors in contact with the ground, such as automobiles. Present methods for calculating such forces have limitations in application. This article describes a widely applicable approach for approximating analytical values of electrostatic induction in all practical situations, with an estimate of error. Data presented include fictitious distribution of surface charge and acceptance of the principle that heterogeneity has little impact on induced current and charge. Calculations are presented for equivalent height and surface area, coatings with flat lower surfaces, induction on automobiles and the coefficient of the screening effect of cable overhang as a protective device. Figures 2; references 6: 5 Russian, 1 Western.
[24-12131]

UDC 62-83-52

SYNTHESIS OF VALVE ELECTRIC DRIVE INDIFFERENT TO FLUCTUATING LOAD

Moscow ELEKTRICHESTVO in Russian No 6, Jun 84 (manuscript received 19 May 82)
pp 56-58

MARGOLIN, Sh. M., candidate of technical sciences, Moscow

[Abstract] Stabilization of the mean motor rate and limitation of anchor fluctuations are important factors in the practical application of an electric drive with a fluctuating load on rollers. The present article discusses the

constant's dependency on losses in reduction, the amplitude of the harmonic component, and the mean rate of load fluctuation. The stabilization system based on the rate of aceentric reduction electric drive and other influences on steady operation are expressed as algorithms and discussed. Synchronized transmission apparatuses offer a second means of compensating for load fluctuations. In a reduction-free electric drive variant, mechanism inertia must be taken into account and the design is complicated by this requirement. Figures 3; references: 3 Russian.
[24-12131]

UDC 62-83.001.6

STUDY OF ELECTROMAGNETIC SERVO MECHANISM WITH PRESCRIBED DYNAMIC PROPERTIES

Moscow ELEKTRICHESTVO in Russian No 6, Jun 84 (manuscript received 11 Nov 82)
pp 59-61

KRAPIVIN, V. S., candidate of technical sciences, Moscow

[Abstract] A procedure for synthesis and experimental results of application are presented for a new type of electromagnetic servo mechanism, with electromechanical transformers of simple construction as one of their advantages. Calculations are presented for a mathematical model of the motor and the regulator that provides for control of the servo mechanism. The servo mechanism belongs to the class of systems with split movements, both fast and slow. The regulator, constructed on the principle of localization of function, provides for consistent operation regardless of power and other disturbances within a wide range. The servo mechanism itself is simple in design and can be used for power hydraulic distribution systems and other regulating apparatuses. Figures 5; references: 4 Russian.
[24-12131]

UDC 538.311:005

SYNTHESIS OF ELECTROMAGNETIC FIELDS UTILIZING ENVIRONMENTAL CHARACTERISTICS

Moscow ELEKTRICHESTVO in Russian No 6, Jun 84 (manuscript received 14 Oct 83)
pp 66-68

OSTREYKO, V. N., candidate of technical sciences

[Abstract] One approach to synthesizing potential fields is based on utilization of certain environmental principles of radio electronics and optics as related to potential and vortex electromagnetic fields. The present article reports on the possibility of employing these principles to produce quasistationary electromagnetic fields (EMF). Consideration is limited to sinusoidal variations in time. Conductors, current vector complexes,

and electrical and magnetic components of the EMF tested are analyzed mathematically, and an example of their application is presented. The suggested approach is regarded to be suitable for developing new formulations for planning power grids, screens and other electromagnetic installations. Practical applications will require new compact or laminated non-magnetic conductors, but other savings would more than compensate for these costs. Figures 2; references: 8 Russian.
[24-12131]

UDC 538.665.777.622.778

ELECTROMAGNETIC FIELD ACTION ON DISCONTINUOUS POLARIZED SUBSTANCE PARTICLES

Moscow ELEKTRICHESTVO in Russian No 6, Jun 84 (manuscript received 9 Jan 84)
pp 68-71

ZAKHAROVA, M. S., candidate of technical sciences, Denpropetrovskiy Mining Institute

[Abstract] Determination of pondermotive forces affecting polarized particles in an electromagnetic field is significant in the design of ore enrichment separators and separators for other mixtures, producing electric and magnetic filters, etc. Although mathematical calculations help in such determinations, in reality such particles often behave differently. The present article discusses the force affecting spherical particles in a quasi-homogeneous field, the force affecting spherical particles as a group of independent elemental dipoles in a discontinuous field, and "force F" affecting spherical particles that exhibit multipole properties. Dielectric spheres cannot, be portrayed however, by simply using the calculations proposed, so that further mathematical models are developed for them. Finally, the principles presented are valid in a three-dimensional field, but not if a plane is proposed in the model. Figures 3; references: 6 Russian.
[24-12131]

UDC 621.311.016.315.001.24

DAMPING SLIGHT LOW-FREQUENCY OSCILLATIONS IN COMPLEX ELECTRIC POWER SYSTEMS USING HIGH-POWER AUTOMATIC EXCITATION REGULATION

Moscow ELEKTRICHESTVO in Russian No 7, Jul 84 (manuscript received 25 Oct 83)
pp 55-58

BROSMANN, E., STROYEV, V. A. and KHACHATUROVA, Ye. A., Moscow

[Abstract] Modern electric power stations are large-scale installations producing large amounts of power per unit. Consequently, all components must be highly reliable in order to reduce down time to the minimum. To facilitate

such efficiency, some authors have developed data processing algorithms in order to determine coefficients of sensitivity and accuracy for such calculations through a frequential approach. Another approach tested involved use of algebraic methods for determining individual factors. Both of these procedures were shown to be insufficiently accurate, so that a new set of calculations to synthesize the stabilization structure of electric power plants was developed. It applies to complex electric power systems using high-power automatic excitation regulation and considers static reliability, transitional processes in the system, and other factors. Results showed that at least two power plant complexes were essential to assure provision of a dependable power supply. Figures 1; tables 6; references 13: 8 Russian, 5 Western.
[2-12131]

UDC 621.3.027.3:537.212.001.24(049.3)

CALCULATION OF ELECTRIC FIELDS OF HIGH VOLTAGE EQUIPMENT, MOSCOW,
"ENERGOIZDAT", 1983 BY KOLECHITSKIY, Ye. S.

Moscow ELEKTRICHESTVO in Russian No 7, Jul 84 p 77

KADOMSKAYA, K. P., LEVINSHTEYN, M. L., MAKAROV, V. M. and RAZHANSKIY, I. M.

[Abstract] This book review highlights insulation design, physical process in dielectric failure, and protection of personnel subjected to electric fields. The importance of data processing in contemporary analyses is stressed. Integral equations used to analyze spatial conductors are discussed; they receive practical applications in bar electrodes, screening devices and gas-insulated equipment. Various types of precision conductors using equivalent charge technology are described. Although certain shortcomings were noted in the book, the reviewers regard it to be a practical handbook for calculating complex high-voltage designs of electrostatic fields.
[2-12131]

UDC 621.311.016.2.001.24

EXPRESS METHOD FOR OPTIMIZING DAMAGE RESERVE POWER IN COMPLEX ENERGY
ASSOCIATIONS

Moscow ELEKTRICHESTVO in Russian No 7, Jul 84 (manuscript received 24 Nov 83)
pp 1-6

DUBROVINA, I. V., LYALIK, G. N. and SHLIMOVICH, V. D.

[Abstract] Questions of preserving energy system dependability acquire increasing significance as electric power grows in economic importance in

the USSR. The present article presents a retrospective analysis of provisions for reserve electric energy and a method for making the best use of capacity in case of damages that would require such reserve capability. Planning a mathematical model requires minimizing factors to reflect generating power and reliability under extreme load, and consideration of optimal variations and influences on the energy system. The calculations generated are regarded as sufficient to provide the necessary reserve for a "concentrated energy system," i.e., one providing for industrial needs without discretionary consumption. A comprehensive optimization of demand in the event of damage or break-down requires proper assignment of production throughout the power grid involved. Grid limitations inherent in the system are also introduced into the mathematical model. Figures 2; tables 1; references: 5 Russian. [2-12131]

UDC 621.332.3:621.316.99.08

EFFECTIVENESS OF USING RAIL TRACKS AS ELEMENTS OF LIGHTNING PROTECTION
SYSTEM FOR RAILWAY ELECTRICAL EQUIPMENT IN PERMAFROST ZONES

Moscow ELEKTRICHESTVO in Russian No 7, Jul 84 (manuscript received 19 Dec 83)
pp 21-25

KOSAREV, B. I., doctor of technical sciences, KOSOLAPOV, G. N. and
KYSHNIR, A. I., candidates of technical sciences

[Abstract] The requirements of the Baykal-Amur mainline railroad have fostered the study of various aspects of construction in permafrost land. The present article reports on protection of electrical equipment from lightning under such circumstances. Analysis of non-stationary processes in tracks are complicated by frequent shifts in primary parameters; as a result, a new method for grounding high-voltage is presented. The algorithms developed were tested using FORTRAN-IV on a Soviet series YeS computer. Results indicated that failure to consider volume in the track-earth contact leads to serious errors in determining voltage near the electric power entry to the rails. The new calculations presented here reduce error to an acceptable 5-7%. The rails were found to be highly effective in carrying off lightning charges. An appendix discusses needs of electrical safety for the proposed grounding procedures. Figures 4; references: 9 Russian. [2-12131]

UDC: 681.7.068.04

TRANSFORMATION OF MODE COMPOSITION OF CIRCULAR OPTICAL WAVEGUIDE

Moscow RADIOTEKHNICA in Russian No 7, Jul 84 (manuscript received 18 Nov 83 after revision) pp 27-33

MIROVITSKIY, D. I., BONDAREV, L. A., BUDAGYAN, I. F., GRIGOR'YANTS, V. V., DUBROVIN, V. F. and SMYK, A. F.

[Abstract] Transformation of the mode composition and the radiation field that it determines during end-to-end excitation of a single-mode optical waveguide by a multimode waveguide is investigated. It is found that power exceeding that of the fundamental mode of the driving waveguide can be obtained at the output of the single-mode waveguide. The best conversion efficiency is achieved by selecting the length of the multimode waveguide in accordance with the distance between the coherent cross sections. If this condition is not satisfied and the mode phases are uniformly distributed random quantities, intervals are found to exist in which the mathematical expectation of the conversion efficiency exceeds unity. The findings can be used in microwave optics and holography, and can be employed for converting the radiation of multimode lasers, in which case the convertor is designed as a spiral waveguide section in order to facilitate the emission of modes of all azimuthal orders. Figures 4; references 13: 8 Russian, 5 Western (1 in Russian translation).
[45-6900]

SOLID STATE CIRCUITS

UDC: 621.317

SIMPLE DIGITAL INTEGRATED-CIRCUIT FREQUENCY METER

Moscow RADIOTEKHNIKA, in Russian No 7, Jul 84 (manuscript received 22 Jul 83)
pp 47-49

DVORSON, A. I.

[Abstract] Schematic and block diagrams of a digital frequency meter with superior operating characteristics are traced and analyzed. The frequency meter, which employs a single printed circuit board, can be built into practically any device, with the digital display on the front panel serving as a measured-frequency display as well as a digital scale. The device operates by counting the number of periods of the signal at the frequency to be measured over a standard time interval, and incorporates a shaper in series with an AND gate, a binary-decimal counter, a memory register and a digital display. The device is simple to fabricate and requires practically no additional adjustment. It can measure from 10 Hz to 10 MHz, and provides input sensitivity of better than 5 mV and error not exceeding 0.01%.

Figures 4; references: 3 Russian.

[45-6900]

UDC 621.374.55

OPTIMIZING PIEZOELECTRIC TRANSDUCER WIDTH OF ACOUSTO-OPTICAL DEVICES

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84 (manuscript received 12 Oct 82)
pp 51-52

KISELEV, B. S. and SALAKHUTDINOV, V. K.

[Abstract] A basic task in developing acousto-optical devices is selecting the geometrical dimensions of the ultrasonic transducer. The present article formulates recommendations for selecting the width of the acoustic transducer, in terms of the specific requirements for the distribution of acoustical energy in the interaction zone of the acousto-optical device (AOD). Wave analysis of the acoustical energy in the acoustic line is conducted in order to determine the sound wave length. The interaction between light and sound is traced to the Fresnel sound wave diffraction zone. The use of this approach without considering the nature of acoustic signal distribution and homogeneity requirements of the acoustic field in the interaction zone was thought likely to result in worse technical characteristics of the AOD. Consequently diffraction effects must be considered in selecting the width of the transducer and positioning of the interaction zone of sound with light. Figures 2; references 6: 4 Russian, 2 Western.
[4-12131]

UDC: 621.391

ACCURACY OF FM SIGNAL SPECTRUM WIDTH MEASUREMENT BY ACOUSTOOPTICAL SPECTRUM ANALYZER

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84 (manuscript received 2 Sep 83 after revision) pp 89-92

NAKHMANSO, G. S. and GUREVICH, A. S.

[Abstract] The accuracy of FM signal spectrum width measurement against the background of interference with the signal duration exceeding the size

of the aperture of the ultrasonic light modulator is analyzed. Expressions are derived for the statistical characteristics of the bias and dispersion of the estimate of the FM spectrum width. Measurement of the spectrum width of a linear frequency modulated signal against the background of white noise and internal acoustooptical spectrum analyzer noise is examined as an illustration. The minimum dispersion becomes smaller as the signal-to-noise and signal-to-internal noise ratios increase. The dispersion of the estimate of the spectrum width of a linear frequency modulation signal is influenced strongly by the relationship between the internal and external noise levels. Figures 3; references: 3 Russian.
[45-6900]

NEW ACTIVITIES, MISCELLANEOUS

SECOND ALL-UNION SCIENTIFIC AND TECHNOLOGICAL CONFERENCE "DEVELOPMENT OF THEORY AND TECHNOLOGY OF COMPLEX SIGNALS"

Moscow RADIOTEKHNIKA in Russian No 6, Jun 84 p 95

MARAKIN, L. Ye. and MATVEYEVA, O. V.

[Abstract] Recent intensive development of the theory and technology of complex (noise-like) signals that are widely used in modern radiotechnical systems, including communications, radio control, radio location and radio navigation, was the topic of the conference held at Sevastopol in December, 1983. The conference was attended by 152 participants from 23 Soviet cities. Papers were presented on methodology and equipment for forming and utilizing complex signals, including the new application of mobile radiotelephones, digital and analog synthesizers, Fourier processors and problems of developing the necessary technical and operation foundations for complex signal systems. Shortcomings in the field were also noted.
[4-12131]

RADIO AND MODERN PROGRESS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 84 pp 3-7

KOTEL'NIKOV, V. A., vice president, USSR Academy of Sciences

[Abstract] This paper, which incorporates material from an address presented at a Radio Day meeting held on 5 May 1984, traces the history, development and present use of radio and radio-based systems in the Soviet Union. The expansion of radio and television broadcasting is pointed out; the development of radar as traced from its inception to its present use in space exploration. The importance of mobile radio communications, satellite communications, radio navigation, electronics and modern medicine and the use of computers in all areas of human activity are discussed. The importance of the journal RADIO and of amateur radio is discussed. The prospects for fiber optic communications lines and the extensive use of computers are pointed out.
[45-6900]