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USSR Report

ELECTRONICS AND ELECTRICAL ENGINEERING

No. 100

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ELECTRONICS AND ELECTRICAL ENGINEERING

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ACTIVE METHODS OF NOISE SUPPRESSION

Moscow VESTNIK SVYAZI in Russian No 9, Sep 82 pp 40-41

RYSIN, Yu. S., docent, Tashkent Electrotechnical Institute of Communications, and KOVAL',V. P.,senior scientific associate

[Abstract] Active noise suppression is based on the principle of interference, with an acoustic source such as a microphone installed for phase inversion at the most strategic location within a room or hall so as to establish desired noise attentuaaon "silence" zones. Low-frequency noise in the 200-300 Hz range is most effectively suppressed in this way. There are various means available for implementing this principle. The classical device is a "closed box" with a loudspeaker feeding into the inside space. A tunable "Helmholtz resonator" box has an adjustable-size hole in one wall, usually on the loudspeaker side, and also compensates nonlinear distortions near the fundamental resonance frequency of that loudspeaker. In a "standing wave" phase inverter the noise is attenuated by air friction and by eddies along the box walls. A magnetic delay line is designed to match and utilize the time characteristics of the ear. An electronic compensator includes a voltage amplifier, a filter, a phase inverter with power amplifier, a feedback microphone, and a compensating loudspeaker. Equipment has been developed and laid out at the Institute for testing and evaluating the various noise suppressors. Figures 5.
[35-2415]

UDC 551.508.85:551.578.7

RADIO CHARACTERISTICS OF HAIL-STORM CLOUDS

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZEVEDENIY: RADIOFIZIKA in Russian Vol 25, No 6, Jun 82 (manuscript recieved 25 Aug 81) pp 716-718

KARMOV, Kh. N. and TKHAMOKOV, B. Kr., High Altitude Geophysical Institute

[Abstract] Experimental radiometric data on hail and rain clouds are analyzed in order to establish whether radar can be used as an aid for locating and anticipating the zone of hail formation and its subseqnent buildup. Measurements were made of thermal radiation from clouds at 3.3 and 8.4 cm wavelengths, while the radar parameters at 10 and 30 cm wavelengths were measured simultaneously. The characteristics of a hail-storm cloud passing over the proving ground on 17 June 1978 were recorded in terms of radio brightness temperature as a function of time for various modes of precipitation and its space-time distribution in the cumulonimbus. The results indicate tentatively that, as the radar reflectivity of a condensate cloud increases, the radio brightness temperature also increases in all regions of such a cloud. In hail clouds the radio brightness temperature rises slowly within the hail nucleation zone, much slower at the precipitation front than in the wake, and the intensity of radio emission is low but the radar reflectance here can be as high as in the precipitation zone. The authors thank A. P. Naumov for steady interest and helpful comments. Figures 2; references: 9 Russian.
[55-2415]

UDC 621.3.072.2

OPTIMIZATION OF STRUCTURE OF STABILIZATION SYSTEM FOR SATELLITE BY MEANS OF ELECTRIC MOTOR-FLYWHEEL

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZEVEDENIY: ELEKTROMEKHANIKA in Russian No 6, Jun 82 (manuscript received 29 Sep 81) pp 727-730

BELEN'KIY, ARON DAVIDOVICH, engineer

[Abstract] Angular stabilization of a satellite can be provided when its angular velocity is known, information about the latter usually being provided by a "pseudovelocity" signal. On this premise, a uniaxial stabilization system

is described which used an electric motor-flywheel with a linear characteristic responding to control torque as input signal. It is assumed that angular displacement of the satellite and rotational velocity of the flywheel are directly measurable, the readings of both are accompanied by mutually noncorrelated "white" noises. Two suitable structures for such a system are considered. The "pseudovelocity" signal produced by a differentiating corrective component in one and by a tachometer generator on the flywheel in the other. The stabilization error and its dispersion are calculated for both structures, including the constant component caused by perturbing torques and the random component caused by noise in the angle transducer. There also is noise in the tachometer generator in the second structure. Two practical criteria are selected for comparative evaluation of the two structures, namely the smallest maximum total stabilization error with the same response speed of both, or a minimum rms random error component with the same constant error of both. In either case the structure with a tachometer generator is optimum under certain conditions, namely appreciable dry friction at the flywheel shaft. Figures 2; references: 3 Russian. [53-2415]

UDC 621.391.8

MATCHED FILTER USING PRINCIPAL MAXIMUM OF SIGNAL FOR ESTIMATE OF ITS OCCURENCE MOMENT

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 9, Sep 82 (manuscript received 29 Mar 81, after revision 6 Jan 82) pp 86-88

DOLININ, N. A.

[Abstract] This brief communication is a follow-up of 1977 and 1980 papers written by N. A. Dolinin (see above). The first is concerned with the occurence moment of optical signals; the second with a scanning receiver of optical signals. The present communication considers the use of a particular matched filter examined in the text for determination of the occurence moment of an optical signal in a passive localization system--e.g., with the object of determining the angular direction to a target. The natural infrared radiation in the 10.6 micrometer range is taken as the target. For a distance to the target of 200 km, an error is obtained in determination of the occurence moment at 0.17 mc^2, and the optimum circuit considered in Dolinin's 1977 report, for the same conditions and parameters, gives an error in determination of its occurence moment of 0.011 mc^2. Figures 3; references: 5 Russian. [25-6415]

UDC 621.396

USE OF A PRIORI INFORMATION CONCERNING STRUCTURE OF CORRELATION MATRICES FOR ADAPTATION PROBLEM

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZEVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 9, Sep 82 (manuscript received 20 Apr 81, after revision 21 Sep 81) pp 71-73

KOSHEVOY, V. M.

[Abstract] The author notes that one of the possible approaches to a solution of problems of Doppler and spatial selection of targets is an adaptive approach consisting of the evaluation of unknown parameters of noise, and in a farther construction of a processing algorithm in the same way as for known noise parameters. The effectiveness of such algorithms depends on the number of independent samplings, separable for evaluation of unknown parameters (volume of instruction sampling). The present brief communication explains how the use of a priori information concerning the structure of correlation matrices makes it possible to increase the effectiveness of adaptive algorithms with a small volume of instruction sampling. It is shown that use of supplementary information concerning the structure of correlation matrices makes it possible to increase the effectiveness of adaptive algorithms and to a large degree is greater the more information is used concerning the structure of the correlation matrix. On the other hand such supplementary information also leads to an increase of the computational effectiveness of algorithms, connected with a decrease of the number of operations expended on an evaluation of the correlation matrix. Tables 1; references 6: 3 Russian, 3 Western.
[25-6415]

UDC 621.396.96

ACCURACY OF SUBOPTIMAL ESTIMATE OF COORDINATES OF MOVING TARGET IN FRESNEL ZONE

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82 (manuscript received 30 Dec 80) pp 1648-1651

GERMAN, A. M.

[Abstract] A study was made of the accuracy of estimating the coordinates of a "slowly" moving target in the Fresnel zone with multipositional coherent reception against a background of the internal noise of the hardware using a receiver device which is optimal for determination of the coordinates of a nonmoving target. The permissible range of target velocity projections is determined for which this measurement is reliable. Accuracy of quasi-optimal estimation of target range considering information on the curvature of the wave front of the reflected signal is compared with the accuracy of optimal and quasi-optimal estimates of range based on signal delay time. The analysis is applicable to the case of measurement of coordinates where the trrget speed cannot be measured. The target speed may be rather great in such cases. Figures 3; references: 3 Russian.
[32-6508]

UDC 621.396.969.14

DETERMINATION OF OBJECT MOVEMENT SPEED ESTIMATE DISPERSION IN FRESNEL ZONE

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82 (manuscript received 7 Aug 81) pp 23-26

SHELUKHIN, O. I. and KERNOV, Yu. P.

[Abstract] The design of long-range radars intended to estimate the parameters of objects detected leads in many cases to the need to solve the problem of estimating the motion parameters in which the curvature of the leading edge of both incident and reflected waves must be considered. This article determines the dispersion of the velocity estimate of an object in the Fresnel zone. An equation is derived for this purpose in which a second order approximation can be achieved by utilizing the first two terms, with increasing numbers of terms refining the estimate. References: 7 Russian.
[40-6508]

UDC 522.59

RATAN-600 RADIO TELESCOPE IN REGION OF LOW BASIC NOISE

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 7, Jul 82
(manuscript received 3 Apr 81) pp 1268-1273

BERLIN, A. B., GASSANOV, L. G., GOL'NEV, V. Ya., KOROL'KOV, D. V., LEBED', V. I., NIZHEL'SKIY, N. A., SPANGENBERG, Ye. Ye., TIMOFEYEVA, G. M., YAREMENKO, A. V.

[Abstract] During the period March-June 1980, with the use of the RATAN-600 radio telescope, a block diagram and partial photograph of which are shown, a 3-month cycle of observation was made of selected areas of the sky. A stationary antenna was mounted at a declination of +4°54'. The investigation was concerned with the spatial distribution of weak sources of radio emission (deep survey). In this survey at a 7.6 cm wavelength a sensitivity was realized: With respect to the antenna, a temperature of 0.0025 K (build-up of 1 sec) and with respect to flux density of $0.6.10^{-29}$ W/m^2 (build-up of 120 sec). The noise temperature of the radio telescope--radiometer amounted to $T_{system}=38\pm2$ K. It was possible to obtain this temperature because of the use of the following measures: 1) Use of new cooled receiving device ($T_{noise}=11.5$ K); 2) Reduction of noise temperature of antenna to the level $T_{noise}=11.5$ K; 3) Reduction of losses in radiometer input channel to 0.14 db. The present paper describes these three components of the system. The authors express their thanks to Yu. N. Pariyskoy for statement of the problem and assistance in the work; Yu. N. Konovalov, A. V. Makelev, v. M. Petroshevich for participation in operation of the equipment; V. A. Kapranov, I. M. Lovkova, L. L. Shteyn, Ye. D. Baranov, A. N. Dudoladov, and Yu. S. Pavlov for assistance during the period of observations. Figures 6; references 8: 6 Russian, 2 Western. [28-6415]

UDC 537.874.6

DIFFRACTION OF PLANAR ELECTROMAGNETIC WAVES IN CORNER AREAS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82
(manuscript received 27 Jun 80; after correction 10 Sep 81) pp 1493-1499

KORNEYCHIK, V. V., PROTSKO, S. V. and KHAPALYUK, A. P.

[Abstract] The diffraction of electromagnetic planar waves in mirror symmetrical corner areas with ideal conducting boundaries is studied using a modification of the reflections method called the method of partial planar waves (PPW). This allows not only a rather simple production of a solution to diffraction problems but also determination of the characteristic reflecting properties of the areas in question. For each of the mirror symmetrical corner areas the solution of the diffraction problem is a linear combination of a finite number of planar waves making up its PPW system. The number of waves in the system is one more than the number of reflections in the area necessary to fill the space one time and is determined by dividing the full solid angle by the solid angle corresponding to the area in question. Figure 1; tables 3; references 8: 7 Russian, 1 Western in translation.
[32-6508]

UDC 537.876.23.029.7:551.510.5

INFLUENCE OF THERMAL DISTORTION ON LASER BEAM CLOUD MEDIUM CLARIFICATION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82
(manuscript received 10 Mar 81) pp 1457-1461

GORDIN, M. P. and STRELKOV, G. M.

[Abstract] An analysis is presented of the process of clarification of a moving water aerosol by a beam which has passed through the atmospheric layer beneath the cloud for the case of a collimated gaussian beam. The results of numerical modeling of the process indicate that the primary contribution to thermal distortions is that of the atmospheric layer beneath the cloud, which decreases the clarifying capacity of the beam. The effectiveness of clarification of the aerosol layer is determined primarily by the value of $\Phi(L)$ at the lower boundary of the cloud. An equation is derived which describes the transmission of the beam through the cloud layer. Figures 3; references 17: 13 Russian, 4 Western.
[32-6508]

UDC 538.56:519.25

PROPAGATION OF LIGHT IN PRECIPITATION

Gor'key IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 25, No 4, Apr 82 (manuscript received 5 Jan 81; after completion 3 Aug 81) pp 391-400

BOROVOY, A. G., Atmospheric Optics Institute, Siberian Division, USSR Academy of Sciences

[Abstract] The propagation of light through precipitation in the atmosphere is studied on the basis of the general theory of multiple scattering of waves. The condition where the particle diameter is much greater than the wavelength allows production of a number of precise results in a rather compact form. It is shown in particular that the component referred to as the shadow forming field which plays a predominant role in light intensity fluctuation in precipitation, can be naturally extracted from a multiply scattered field. The shadow forming field is described with good accuracy by the approximation of a Markov random process in which the coefficients in the equations have simple geometric significance. References 26: 22 Russian, 4 Western (1 in translation).
[39-6508]

UDC 551.510.535+550.388

GENERATION OF ARTIFICIAL LOW-FREQUENCY RADIATION BY AURORAL IONOSPHERIC CURRENTS

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 25, No 4, Apr 82 (manuscript received 17 Mar 81) pp 378-383

LARIN, V. F., OSTAPENKO, A. A. and SMIRNOV, V. S., Polar Geophysics Institute, Kola Branch, USSR Academy of Sciences

[Abstract] The purpose of this work is numerical modeling of nonlinear processes in a heterogeneous magnetically active absorbing plasma in the lower ionosphere, irradiated by powerful modulated HF electromagnetic radiation. The LF fields are estimated ignoring the dielectric and conducting properties of the ionosphere. The source is represented as a horizontal dipole located on the conducting earth. The dipole moment at 2.5 KHz is calculated as 10^{11} Gs·cm^3. Such a dipole located at an altitude of 70 km, the height of the nonlinear current, creates a maximum field at the surface of the earth of about 10^3 $\mu\gamma$. This is more than an order of magnitude greater than the field observed experimentally. The divergence of calculated and experimental results may be explained by the finite dimensions of the source. The authors express their appreciation to D. S. Kotik, S. V. Polyakov and V. O. Rapoport for helpful discussions of a number of questions considered in the paper. Figures 6; references 10: 7 Russian, 3 Western (1 in translation).
[39-6508]

UDC 551.596.1

EXCITATION OF ACOUSTOGRAVITATIONAL WAVES BY SOURCES MOVING THROUGH ATMOSPHERE AT AN ANGLE TO THE HORIZON

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 25, No 7, Jul 82 (manuscript received 13 May 81) pp 750-760

GRIGOR'YEV, G. I. and SAVINA, O. N., Scientific Research Institute of Radiophysics, Gor'kiy

[Abstract] Generation of acoustogravitational waves by sources moving through the atmosphere is analyzed, Cerenkov radiation being the principal mechanism here. A source with given mass, energy and momentum is assumed to be moving at constant velocity at some angle to the horizon. The radiation power is calculated from the law of energy conservation, with perturbations of pressure, velocity and density far from a source described in terms of the Green function which satisfies the Brent-Vyaisyali fourth-order differnntial wave equation. The excitation field is also calculated, subsonic perturbations found to occur only during supersonic motion of a source and within the Mach cone diverging in the direction of the velocity vector. The kinematic relations characterizing acoustogravitational waves are determined only by the dispersion characteristics of the medium and the conditions of Cerenkov synchronism. Figures 8; references 14: 6 Russian, 8 Western.
[56-2415]

UDC 555.382.2

PERIODIC PERTURBATION OF IONOSPHERIC F LAYER BY POWERFUL RADIO WAVES

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 25, No 4, Apr 82 (manuscript received 2 Jul 81) pp 466-467

KOLESNIK, A. G., and LUSHCH, S. V., Siberian Institute of Physics and Technology, Tomsk University

[Abstract] A model of the ionospheric F layer proposed by A. G. Kolesnik (see above) in a February 1982 report is used to predict disturbances in the layer upon periodic application of a powerful radio wave under conditions approximating experimental conditions. Disturbances in the nocturnal ionosphere were modeled and it was concluded that the accumulating effect of oscillating quanta of nitrogen allows results to be achieved equivalent to constant heating. The most sensitive parameters of the ionosphere plasma are electron concentration and nitrogen oxide ion concentration. Figures 2; references 7: 4 Russian, 3 Western.
[39-6508]

UDC 621.371.25

EXPERIMENTAL STUDY OF EFFECTIVE ELECTRON ENERGY LOSS UPON INELASTIC COLLISIONS WITH MOLECULES IN LOWER IONOSPHERE

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZEVEDENIY: RADIOFIZIKA in Russian Vol 25, No 4, Apr 82 (manuscript received 16 Mar 81) pp 367-377

KROTOVA, Z. N. and RYZHOV, V. A., Scientific Research Institute of Radio Physics

[Abstract] An experimental study is presented of the variation of δ_{eff} as a function of effective electron temperature in the D area of the ionosphere. The study was based on surface measurement of various characteristics of powerful radio pulses reflected from the lower plasma layers at an altitude of about 100 km. The structure of relative changes in amplitude and phase of the high frequency carrier of a reflected pulse at 1.35 MHz was studied. With vertical incidence of the waves upon a heterogeneous ionospheric layer, the reflected signal structure at the point of reception is determined by the nature of propagation of a comparatively narrow beam of radio waves. In the low energy area the loss of electrons primarily results from excitation of rotary quanta. Analysis of experimental data on the frequency of inelastic collisions with molecules, cross modulation characteristics of temperature relaxation of electrons in a nitrogen plasma as well as calculation of rotational level excitation cross sections of molecular nitrogen and oxygen are considered. The electrodynamic characteristics of the plasma are calculated using elementary theory formulas. The use of precise formulas would result in no significant changes in the calculated variation of δ_{eff} as a function of electron temperature. Figures 9; tables 1; references 24: 9 Russian, 15 Western (1 in translation). [39-6508]

UDC 621.371.332

MEASUREMENT OF SNOW COVER REFLECTION FACTOR IN SHORTWAVE PORTION OF MILLIMETER BAND

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82 (manuscript received 20 Apr 81) pp 1641-164

BABKIN, Yu. A., ISMAILOV, A. T., NOVIKOV, S. S. and STROGANOV, L. I.

[Abstract] An estimate is presented of the effective reflection factor of the underlying surface at wavelengths of 1.15 and 2 mm for near horizontal propagation over snow-covered surfaces based on an experimentally produced interference field structure in the verti al plane. Measurements were performed over a 510 m path covered with a layer of dry snow 60 cm thick. The complex profile of the path prevented the use of previously published calculation equations which assume a strictly horizontal propogation path. The true values of the reflection coefficient are significantly lower than the calculated values. The relative accuracy of calculation for any given point is not less than $\pm$5%. The mean

values of reflection factor were 0.32 for the 1.15 mm wavelength, 0.22 for the 2 mm wavelength. Figures 2; references: 3 Russian.
[32-6508]

UDC 621.396.22:621.371.332.1:551.510.52

DEPTH OF POLARIZATION FADING OF SIGNAL POWER SCATTERED ON THERMAL FLUCTUATIONS OF IONOSPHERIC ELECTRONS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 7, Jul 82
(manuscript received 9 Feb 81) pp 1425-1428

TKACHEV, G. N.

[Abstract] The author notes that investigations of the ionosphere widely use measurements of the angle $\emptyset$ of the angle of rotation of the polarization plane of incoherent scattered signals. However, these measurements are hindered by the depolarizing effect of the scattering volume. As a result of worsening precision of measurement of the angle $\emptyset$, and with the depth ϵ of the polarized fading of the signal power approaching zero, measurements of the angle $\emptyset$ become impossible. A formula is found in the literature for the depth ρ in the case where sounding of the ionosphere is accomplished by "smooth" rectangular radio pulses and a transmission band Δ_{F_n} of the receiver equal to the width of the spectrum of the scattered signal. The present brief communication examines how ρ changes during sounding of the ionosphere by wide-band radio pulses. The analysis is conducted with four assumptions. From the relationships obtained and numerical evaluations, it follows that with the use of wide-band sounding radio pulses, ρ as a rule is increased as compared with the case of emission of smooth pulses of the same duration. This increase will be significant when the width of the peak of the indeterminancy function with respect to the axis of the frequency is larger or equal to the width of the spectrum of fluctuations of electron concentration and the level of residues of a compressed pulse of smaller magnitude $(1 + 0.4\Delta FT)^{-1}$. The depth of polarized fading is evaluated for three standard radar signals. A figure shows the results of a numerical evaluation of ρ for: 1)Smooth radio pulses; 2)Radio pulse with noise suppression phase modulation; and 3)Modulation of phase by a 13-position Barker code. Figures 1; references 5: 4 Russian, 1 Western.
[28-6415]

UDC 538.311

ASYMPTOTIC METHODS OF ANTENNA APERTURE FIELD DISTRIBUTION RESTORATION BY MEASUREMENT OF NEAR FIELD ON CURVED SURFACE

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 25, No 4, Apr 82 (manuscript received 13 Apr 81) pp 447-452

BELOV, Yu. I., Scientific Research Institute of Radio Physics

[Abstract] A study is made of an approximate solution to the inverse problem of electrodynamics, determination of the amplitude-phase distribution in the aperture of an antenna by processing data from measurement of the tangential component of the near field over a certain surface. It is demonstrated that the field calculation algorithm can be reduced to computation of the spectrum of the near field, adjustment of the results for the amplitude-phase factor and conversion of the coordinates. The author thanks V. I. Turchin for constant attention during writing of this paper and N. M. Tseytlin for consideration of the results obtained. Figures 4; references 8: 6 Russian, 2 Western (1 in translation).
[39-6508]

UDC 621.396.67.01

DIRECTIONAL PROPERTIES OF FOLDING REFLECTOR ANTENNAS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82 (manuscript received 25 Jun 81) pp 1519-1526

AZYUKIN, A. V. and KLASSEN, V. I.

[Abstract] A single reflector parabolic antenna consisting of a number of identical reflecting sections generated by intersection of a parabolic cylinder by two planes is studied. The radiation pattern and basic polarization of the field of the antenna are calculated. The optimal position of the radiators on the antenna axis is determined. Most characteristic properties of the radiation pattern of such antennas can be predicted from simple physical considerations without using computer calculations. The variation is directionality, side lobe amplitude and beam expansion upon scanning are calculated. A photograph is presented of a model of a 12-section folding parabolic antenna and results of experimentation using the model are presented. The authors thank B. Ye. Kinber for discussion of the paper and helpful remarks, as well as M. M. Izmaylov for assistance in the calculations. Figures 9; references 8: 4 Russian, 4 Western (1 in translation).
[32-6508]

UDC 621.396.67

QUANTIZATION ERRORS IN ADAPTIVE ANTENNA ARRAYS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 25, No 9, Sep 82 (manuscript received 19 Jun 81, after revision 13 Nov 81)
pp 38-42

GRUBRIN, I. V., ZAROSHCHINSKIY, S. I. and SAMOYLENKO, V. I.

[Abstract] The paper is concerned with finding an analytical expression to be used in determining the capacities of weight coefficients in adaptive antenna arrays. In so doing it is assumed that an adaptive processor (analog or digital) does not introduce errors and the latter are completely determined by discrete weight coefficients, implementing the weighing. An analytical relation is derived which makes it possible to determine the average deterioration of the signal-to-noise ratio at the output of an active antenna array which is brought about by quantization of weight coefficients. For determination of the maximum deterioration in the signal-to-noise ratio, possible after completion of adaption process, it is necessary to conduct machine modelling. The results are presented of modelling quantization errors on a M-4030 digital computer. Figures 3; references 5: 2 Russian, 3 Western.
[25-6415]

UDC 621.396.67.01

TRAVELING-WAVE ANTENNA WITH ELECTRIC SCANNING

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82
(manuscript received 8 Jun 79; after correction 16 Mar 81) pp 1653-1655

VENDIK, O.G., MIRONENKO, I. G. and RYZHKOVA, L. V.

[Abstract] A study is made of an antenna which consists of a multilayer dielectric structure. Photolithography is used in order to apply metallic electrodes to the surface of a ferroelectric film, forming a dual period system of oppositely directed strips. In areas with narrow gaps (50 micrometers) a high-voltage electric field is created in the film, changing its dielectric permeability. The electrodynamic characteristics of the antenna are also determined by an array of broader slots with a period of $\sim\lambda/2$. An experimental model is created using a ferroelectric film of solid strontium and a barium titinate solution. Experimental studies of the model in the 8-mm band produced an SWR of not over 1.4 in the 10% frequency band for the entire scanning sector. A beam with a width of 10 to 11° was shifted over a scanning sector of 75° by changing the control voltage. The authors thank V. F. Vzyatyshev for helpful discussion of the work. Figures 3; references 8: 5 Russian, 3 Western.
[32-6508]

UDC 621.396.67:621.391.812

GAIN IN SIGNAL STABILITY WITH USE OF ADAPTIVE RECEIVER ANTENNAS IN LONG-RANGE TROPOSPHERIC TRANSMISSION LINES

Moscow ELEKTROSVYAZ' in Russian No 9, Sep 82 (manuscript received 4 Mar 81) pp 44-46

FROLOV, O. P.

[Abstract] An adaptive receiver antenna in a long-range tropospheric transmission system is considered. It has an aperture large in comparison with the correlation radius so that it detects less of relative power fluctuation and its median adaptation factor decreases sharply while becoming a statistically distributed quantity. The effectiveness of such an antenna in this kind of communication system is evaluated in terms of maximum payoff, assuming a unity adaptation factor under any external action. Calculations are based on a Rayleigh field intensity distribution and corresponding gamma-distribution of power at any point in the antenna aperture, a consequence of scattering of waves by inhomogeneities in the troposphere. The integral power distribution is calculated next, the result indicating that a larger aperture is equivalent to more independent receiver channels and thus provides a more stable communication link. Two designs of receiver antenna sets for tropospheric transmission lines are compared, the one consisting of a single antenna with ideal adaptive devices featuring a higher median power in the aperture than the one with two spaced antennas and an adder. Figures 1; references: 4 Russian.
[19-2415]

UDC 621.396.673.4:621.372.011.73

DECOUPLING OF EQUIDISTANT ANTENNA ARRAYS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82 (manuscript received 3 Apr 81) pp 1643-1646

SODIN, L. G.

[Abstract] A study of decoupling systems for linear antenna arrays has shown that in the general case multipoles with frequency-dependent elements are required to implement them. A multipole is developed which yields approximate fr quency-independent decoupling of linear equidistant antenna arrays of identical radiators. As an illustration, data are presented for a 5-element antenna consisting of thin halfwave parallel dipoles with the distance between neighboring dipoles $\lambda/2$ and $\lambda/4$. The problem is reduced to establishment of symmetry conditions which must be imposed on the impedance matrix so that the eigen vectors can be selected independent of the specific values of matrix elements. Figures 2; references 9: 8 Russian, 1 Western.
[32-6508]

UDC 621.396.677

STUDY OF SHIELDING PROPERTIES OF PARALLEL CONDUCTOR REFLECTOR

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 25, No 8, Aug 82 (manuscript received 14 May 81, after completion 6 Oct 81)
pp 21-24

INSPEKTOROV, E. M.

[Abstract] In calculating the field at a short distance from an antenna with a parallel conductor reflector, one must consider such factors as diffraction at the edges of the reflector, the reflector profile and its properties. In order to solve this problem the reflector is replaced by a surface with an assigned equivalent surface impedance defined as the average ratio of tangential components of the field vectors. The current on the impedance surface is then determined by solving an integral Fredholm equation. The calculations show that the equivalent impedance is different in areas of light and shade. The close field in the shaded area is studied for two varieties of reflector. The first is a flat grid with rounded edges and a size of 3.9 λ; the second was a cylindrical profile with rounded edges. In general, if the amplitude of the diffracted field in the shaded area is relatively great, the field in the shaded area may be significantly attenuated by replacement of the continuous reflector with a system of parallel conductors. Figures 3; references: 4 Russian.
[36-6508]

UDC 621.396.677

CONSIDERING RADIATOR DIRECTIONALITY IN OPTIMIZING LINEAR EQUIDISTANT SYMMETRICALLY EXCITED ANTENNA ARRAYS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82
(manuscript received 25 Mar 81) pp 1504-1512

MINKOVICH, B. M.

[Abstract] It is assumed that a linear equidistant symmetrically excited antenna array (LESAR) is optimal if its radiation pattern minimizes the weighted power in the side lobes. The basic algorithms used to design the LESAR for isotropic and directed radiators are similar, but the computation techniques differ, particularly for LESAR with even and odd numbers of radiators. The optimal radiation pattern is determined in explicit form (it is shown that for isotropic radiators this pattern corresponds with the solution of the Dolph problem). The task of LESAR synthesis is reduced to determination of the Fourier coefficients of a partial Fourier sum. Figures 7; referencss 13: 8 Russian, 5 Western (1 in translation).
[32-6508]

UDC 621.396.677

DIFFRACTION ON FINITE GRID OF PARALLEL CONDUCTORS

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 25, No 4, Apr 82 (manuscript received 18 May 81) pp 468-469

INSPEKTOROV, E. M., Gomel' State University

[Abstract] The method of integral equations is used to study an array with rather small values of d and a, corresponding to various types of reflectors used in antenna devices. A flat grid struck by a flat wave and a cylindrical grid struck by a near cylindrical wave are analyzed. Edge effects, localized within the two or three outermost conductors, are studied. It is found that near the array the amplitude of E_z and H_x are determined by the transmission factor for an infinite grid. With increasing distance from the grid as the transmission factor of the field increases the field does not increase but decreases and may be less than for a continuous reflector. Compensation begins near the grid at points where the level of diffracted field is quite high and is conserved over distances 10 or more times greater than the grid dimensions. Figures 4; references: 6 Russian.
[39-6508]

UDC 621.396.677.49

INFLUENCE OF REJECTOR FILTER ERROR ON GAP DEPTH IN ANTENNA ARRAY RADIATION PATTERNS WITH COHERENT OPTICAL PROCESSING

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 8, Aug 82 (manuscript received 6 Feb 81, after revision 23 Jun 81) pp 14-21

GRINEV, A. Yu. and TEMCHENKO, V. S.

[Abstract] An estimate is presented of the effect on the depth of gaps in the direction toward interfering signals, of random phase heterogeneity, inaccuracy in placement of the filter in the direction toward the noise, distortion of filter boundaries caused by finite optically controlled transparency resolution, and distortion of the amplitude-phase distribution at the antenna array-receiver module-space-time light modulator level. A table is presented of these values allowing a judgement to be made concerning possible suppression of interfering radio signals using the spectral method of implementation of controlled gaps in the direction of the interfering signals in the reception pattern of an antenna array. Figures 5; tables 1; references 10: 9 Russian, 1 Western.
[36-6508]

UDC 621.396.677:510.5

ACCELERATION OF ANTENNA ARRAY ADAPTATION

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 25, No 8, Aug 82 (manuscript received 13 Mar 81; after revision 23 Sep 81)
pp 92-94

GRUBRIN, I. V., ZAROSHCHINSKIY, O. I. and SAMOYLENKO, V. I.

[Abstract] A study is made of a method of accelerating the convergence of the process of adaptation of antenna arrays with a change in the convergence factor based on the specifics of the gradient search for the extreme. The results of modeling show that algorithms represented by the two equations presented in the article with variable step can achieve a significant acceleration of convergence of the process of adaptation of antenna arrays by increasing the convergence coefficient at the beginning of the process of adaptation. These algorithms can also be used in an unsteady noise situation, in which case the dynamic adaptation error is decreased. Figure 1; references 9: 6 Russian, 3 Western. [36-6508]

UDC 621.396.969.14:535.417

MEASUREMENT OF MOTION PARAMETERS USING METHOD OF COMPARISON OF WAVE FRONT STRUCTURES

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 25, No 9, Sep 82 (manuscript received 11 May 81) pp 82-84

CHULYUKOV, V. A.

[Abstract] This brief communication notes that Doppler methods used in obtaining information concerning motion parameters are based on the assumption that an object scattering radiation is a point and the radiation received has a flat phase front. Although in many cases the approximations in question are correct, in a wide variety of areas of science and technology real situations arise where these assumptions become untrue. In this case one of the required conditions for Doppler measurements of speed is small dimensions of the input aperture of the recording device. As an example, the case is considered of motion of a point source of electromagnetic waves of the optical range. In so doing it is considered that the waves reaching the input aperture of the photo detector have a spherical phase front. Relationships are derived from which it is seen that with an increase of the radius of the input aperture, the contrast of the Doppler signal on a background of a constant component is rapidly decreased. Obviously the requirement for small dimensions of the input aperture of the recording device for a Doppler measurer of speed limits the field of their use. The necessity for taking into account phase curvature of the wave front of radiation of a scattered or reflected moving medium leads to the necessity

for use of such methods of recording of a given radiation and methods of processing a received signal. This makes it possible to use any space--time structure of the latter for separation of information on motion parameters. A device which records radiation with conservation of the spatial distribution of its phase characteristics differs by such a possibility of use of the spatial structure of the received signal. Because the latter does not remain constant in time by virtue of the movement of the medium in question, then the recording device which has the potential to make a comparison of the wave front structures makes it possible by the results of comparison to evaluate the movement parameter. A comparison of the wave front structures can be accomplished with the aid of a recording device which has integrating with respect to time properties. Figures 1; references 5: 3 Russian, 2 Western (1 in translation). [25-6415]

UDC 631.325.5:681.3

SYNTHESIS OF RADIATION PATTERN OF ANTENNA WITH ZERO INTENSITY IN GIVEN DIRECTION BY MEANS OF COHERENT OPTICS

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 25, No 6, Jun 82 (manuscript received 11 Mar 81) pp 688-694

BOCHKAR', Ye. P., KUL'BEDA, V. Ye., SUDAKOV, O. A. and YAGODIN, V. O., Moscow Physico-Technical Institute

[Abstract] It is shown how to synthesize a radiation pattern of an adaptive antenna with zero intensity in a given direction by means of a coherent optical processor. Such a device is already being used for simulation of microwave antennas. The sought quantity, the filter function, is determined by means of a Fourier transformation of the original field distribution and subsequent convolution. For simplicity the problem is treated as a one-dimensional one, and the feasibility of using a most easily realizable filter is theoretically established. Such a filter distorts, appropriately, the radiation pattern within a small vicinity of the null direction. A mask with sharp edges is found to be suitable for this purpose. This has been confirmed experimentally using a glass plate on which a transparent 1 mm wide ($2\omega = 1$) thin MgF_2 film-wedge had been deposited. The phase shift introduced by this mask was measured with an interferometer accurately within 6%. The wedge was moved mechanically in the direction perpendicular to the original radiation pattern until the signal from the photomultiplier had reached its minimum, corresponding to 180^o phase shift ($\beta = 1$) of the incident wave. The results of this experiment indicate that a quarter-wave plate can be used for synthesis of a null direction in the radiation pattern of a uniform field distribution. This was done in real time with a filter built on an acoustooptical delay line, using an LG-38 single-mode laser as a radiation source and a 55 micrometer wide slit as an antenna model. The amplitude-phase mask was produced by means of a $PbMoO_4$ single crystal excited by a $LiNbO_3$ converter and serving as an acoustooptical modulator, the carrier frequency of ultrasound (19 MHz) corresponding to acoustic velocity

c = 3.8 mm/microsecond and wavelength Λ = 0.2 mm. The filter parameters were monitored by the shape of the radio pulse entering the converter in the delay line. The minimum attainable level in the null direction, limited by optical noise, was -25 dB. Figures 6; references 7: 6 Russian, 1 Western (in translation).
[55-2415]

UDC 621.397

UTILIZING STATISTICAL PROPERTIES OF DIGITAL SIGNAL IN DIGITAL TELEVISION SYSTEMS

Moscow ELEKTROSVYAZ' in Russian No 9, Sep 82 (manuscript received 4 Mar 81) pp 28-34

KOGAN, S. S.

[Abstract] Eight statistical properties of a digital television signal, in terms of relations between probability $P^{(i)}(10)$ (change of message in (i-1)-th digit without change of message in i-th digit) and probability $P^{(i)}(01)$ (change of message in i-th digit with no change of message in (i-1)-th digit) are established and proved for the case of monochromatic transmission. They can be utilized in the SECAM system of color television transmission, making it possible to control the performance quality of analog-to-digital converters, efficiently to code television signals for reducing the speed of transmission of digital signals, to simulate digital television signals, to scramble or unscramble digital television signals, and to cyclically (statistically without time markers) synchronize the receiver end of the television system. Figures 6; tables 2; references 11: 10 Russian, 1 Western.
[19-2415]

UDC 621.397.13

ANALYSIS AND SYNTHESIS OF STEREOSCOPIC PICTURES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 7, Jul 82 (manuscript received 24 Dec 80) pp 1413-1419

BALAKSHIY, V. I.

[Abstract] The paper considers a procedure which includes simultaneous transmissions of video signals through two television channels, amplitude and phase scanning of the light picture and the subsequent reproduction at the receiving end of the system of the original image with the aid of a space-time light modulator. The principal circuits of an acoustooptical scanning device, and

the amplitude-phase space-time light modulator are presented and explained. Conversion of a light image into an electrical signal and reproduction of a stereoscopic picture are discussed. It is shown that on the base of known devices it is possible to create a television system for transmission of stereoscopic pictures. Figures 3; references 6: 5 Russian, 1 Western.
[28-6415]

'TMS-81' MEASURING COMPLEX FOR TELEVISION TRANSMITTERS

Moscow ELEKTROSVYAZ' in Russian No 9, Sep 82 (manuscript received 16 Feb 82) pp 24-27

NAYMAN, I., CSSR

[Abstract] Television stations produced by "Tesla-Gloubetin" (CSSR) include a TMZ-81 set for measuring transmitter performance parameters. The set consists of an MNZ 21 wideband instrument for measuring nonlinear distortions, an MDZ 2 instrument for measuring differential distortions with a test signal or a subcarrier signal, an APP 31 sideband analyzer, a GSM 1 selective level meter with heterodyne generator, a VMV 21 millivoltmeter for measuring noise and interference in the image signal, an MLC 1 instrument for measuring the amplitude difference and the time shift between brightness signals and between color signals by the compensation method with $\sin^2 20T$ signals as well as for measuring distortions due to crosstalk between brightness and color channels, an NFG 21 low-frequency heterodyne generator containing a 14.4 quartz crystal oscillator and a variable 1.2-1.6 MHz oscillator with a set of mixers and dividers, a ZJ 1 image module containing a long-persistence kinescope with two d.c. amplifiers and a commutator, an MTR 31 instrument receiver, an MTO 11 single-channel wideband television instrument oscillograph, an OVJ 21 control module, and a GTS 11 generator of measurement and test signals. Figures 1; tables 1.
[19-2415]

NEW 'TESLA' SERIES OF METER-BAND TELEVISION TRANSMITTERS

Moscow ELEKTROSVYAZ' in Russian No 9, Sep 82 (manuscript received 16 Feb 82) pp 20-24

BEDNARZH, I., CSSR

[Abstract] A new "Tesla" series of meter-wave television transmitters, together with necessary measuring instruments, is now produced by "Tesla-Gloubetin" (C SR) for delivery to the Soviet Union. These are models Tesla I,III TV 20, Tesla I,III TV 10, and Tesla I-III TV 5 ("Zona-III") for, respectively, the first, the third, or first-third ranges with 20, 10, 5 kW power at the output from the video channel. The two larger 20 kW and 10 kW models are laid out identically, the only difference between them being the power tube in the second

stage of the two-stage amplifier module. The exciter includes, in addition, a mixer module with power regulation, a modulator module with i-f video channel and i-f audio channel, and a video correction modeule. There are rectified-voltage power supplied for the 6 kV terminal video stage as well as for the 4 kV terminal and preterminal sound track stages, a diplexer containing resonators and filters for combining image signals and sound signals, and a monitor module. The smaller 5 kW model is to replace the "Zona-II" in any of 12 channels. It includes a built-in air-cooled antenna equivalent and DTL integrated-circuit control logic. Its twin exciter consists of two sets of amplifier, mixer, modulator, and video correction modules, each identical to those in the larger models but modified for parallel operation and also including two synthesizers which produce signals for mixers with exact carrier-frequency mixing. All three transmitter models operate with internal automatic control of switching sequences for turn-on, turn-off, activation of standby equipment, and activation of protective equipment. Figures 2; tables 1.
[19-2415]

PROBLEMS IN TELEVISION TRANSMISSION OVER RUGGED TERRAIN

Moscow VESTNIK SVYAZI in Russian No 10, Oct 82 pp 29-31

TUNGUSHBAYEV, A.D., chief, Regional Administration of Radio and Television Broadcasting, KaSSR Ministry of Communications, and SARTBAYEV, A. D., candidate of technical sciences, director, Department of Radio and Electrocommunications, Alma-Ata Institute of Transportation Engineers

[Abstract] The main problems in planning and building the television network for the Kazakh SSR, where 10 out of the 19 oblasts are mountainous, are installation and operation of relay stations. They must be strategically located, preferably on a mountain, and have adequate power. One such station has been installed in eastern Kazakhstan 700 m above the surrounding territory. Another one is being installed on the Bol'shoy Chagan mountain 1500 m above the surrounding territory and covering a radius of 130-140 km. The relay station in the Alma-Ata oblast is located 3000 m above sea level, has a range of 35-40 km and a power of 100 W. Power and range must be optimally matched, depending on the pattern of obstructions, particularly critical being design and orientation of the antenna system. Another problem is reliability of power supply, self-contained sources of electric energy not requiring supervision for periods of 406 months being preferable for both large and small relays. An important consideration are costs of equipment, its installation and operation as well as reliability assurance. A passive relay has been found to be most economical. A typical one consists of two rows of grids on nine support posts, occupying an area of 80 x 2.81 m^2, with the antenna array containing a mesh of wire 2 mm in diameter and galvanized forming 15 x 15 mm^2 cells. A relay of this type is operating near the rest home not far from Alma-Ata, another one with a 4 x 3.5 m^2 antenna near the "Medeo" sports stadium.
[50-2415]

PROBLEMS IN DEVELOPMENT OF SOUND BROADCASTING

Moscow VESTNIK SVYAZI in Russian No 10, Oct 82 pp 32-34

SHAMSHIN, I. A., chief engineer, Moscow Municipal Radio Rediffusion Network

[Abstract] In order to proceed with further development of sound broadcasting, it is necessary first to re-examine critically two prevailing notions: "the more, the better" and "better less but higher quality". On this basis, a choice has to be made as to expand radio (wireless) or cable broadcasting and the answer should be both. In extending the network, over rural areas especially, one must consider utilization of other existing transmission systems and equipment in appropriate frequency bands and their combinations (long-wave, medium-wave, short-wave, ultrashort-wave). A very important component of a sound broadcasting system is the receiver. Its design and performance must continue to improve, to meet consumer demand as to reliability and fidelity of reception, and portability of equipment. The receiver must also be integrated into digital transmission systems, the latest trend, and other means of mass communication. It must keep pace with demographic trends and an improving standard of living. [50-2415]

UDC 681.7.068.4

DIAGONAL JONES MATRIX OF DISTURBED BIREFRINGENT OPTICALLY ACTIVE SINGLE MODE FIBER LIGHT GUIDE

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82 (manuscript received 2 Jul 81) pp 1472-1477

BAZAROV, Ye. N. and POLUKHIN, A. T.

[Abstract] A method is developed for extending the Jones matrix for a regular single mode fiber light guide with constant birefringence parameters and optical activity over length to irregular guides. The essence of the method is a transition to a coordinate system in which the equations for the electric wave vector components are split and the Jones matrix is diagonalized. The method is based on derivation of a transform which splits the propagation equation for the electric wave vector components in an irregular, nondichroic single mode fiber light guide, thus greatly simplifying determination of the diagonal Jones matrix components. The authors thank Ye. I. Sverchkov and G. I. Telegin for a helpful discussion of the work. References 5: 2 Russian, 3 Western (1 in translation).
[32-6508]

UDC 534.284

CONTROL OF CENTER FREQUENCY OF NARROW-BAND MATCHED SURFACE-ACOUSTIC-WAVE FILTER

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 82 (manuscript received 2 Feb 80)
pp 58-61

ZNAMENSKIY, A. Ye. and MURATOV, Ye. S.

[Abstract] A method is proposed for technologically controlling the center frequency in the passband of high-precision narrow-band matched SAW filters. It involves synthesis of the required amplitude-frequency characteristic through cascading of such a filter and a comb filter, each with the appropriate transfer function to yield the required transmission rate. Bilateral regulation of the center frequency is achieved with a simple configuration of comb filter sections and appropriate partial removal of the metallization coating. The method is demonstrated theoretically on a filter consisting of a sideband interdigital receiving transducer and an interdigital transmitting transducer with equidistant spacing of fingers and uniform aperture. The method has been proved experimentally on a single-stage matched filter with a passband Δf=0.240 MHz (transmission rate R = 0.240 $\pm$ 0.010 Mbaud): its center frequency f_0, originally 69.990 MHz, was shifted to 70.001 MHz with the passband narrowing to 0.232 MHz. The method is more precise than the conventional method of adjusting the velocity of surface acoustic waves on the metallization coating of a certain thickness. Figures 6; references 6: 3 Russian, 3 Western.
[49-2415]

UDC 621.372.54.037.372

EFFECTIVENESS OF CHEBYSHEV DIGITAL NONRECURSIVE REJECTOR FILTER SYSTEMS FOR MOVING TARGET SELECTION

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82 (manuscript received 9 Jul 81)
pp 33-36

KOZLOV, I. A. and SAVCHENKO, S. P.

[Abstract] The impossibility of combining high rejection quality with uniform transmission in the Doppler frequency band in nonrecursive alternate period compensation rejector filters requires a search for new digital rejector filters

with improved characteristics. Chebyshev digital rejector filters (DRF) can be used for this purpose. Their characteristics are studied. Chebyshev DRF are optimal among filters having equal magnitude pulsations in the rejection band and one pulsation in the transmission band and they maximize the attenuation in the rejection band with limitations on filter order. The calculations performed showed that third and fourth order DRF can be most highly recommended. Independent use of higher order filters for this purpose is limited by the decrease in transmission bandwidth and difficulties in practical implementation of the expected improvement of noise suppression caused by the influence of level quantization errors. Figures 3; references 4: 3 Russian, 1 Western.
[40-6508]

UDC 621.372.57

OPTIMIZATION OF GYRATOR BASED ACTIVE RC FILTER STRIP ELEMENT SENSITIVITY

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82 (manuscript received 15 Jul 81) pp 48-50

SEMENOV, K. A. and BAKHVALOV, V. N.

[Abstract] Optimization of the sensitivity of the strip element of an ARC filter based on a gyrator is studied. Optimization of multiparameter sensitivity is based on the criterion of the quadratic sum of parametric sensitivities P. Minimization of P corresponds to a decrease in circuit dispersion function with normal and uniform distribution of element parameters, and a decrease in the dispersion of the circuit function caused by uncontrolled excursions of influencing factors such as temperature coefficients. The optimization conditions found can be extended to the entire range of operating frequencies of the element. Figure 1; references: 3 Russian.
[40-6508]

UDC 621.372.542

HIGH-SPEED DIGITAL FILTERS WITH SUCCESSIVE PROCESSING OF BIT DATA

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 9, Sep 82 (manuscript received 4 May 81, after revision 15 Jun 81) pp 25-30

OSINSKIY, L. M. and GLUSHKO, O. V.

[Abstract] The paper is concerned with the problem of showing that high-speed systems of digital filtration can effectively be realized on the basis of successive processing of bit data. This position is supported by coherent variations of the structural organization of digital filters and devices for rapid Fourier transforms, with successive processing and comparison of their high-speed response of digital filtration systems using parallel processing of

data. It is shown that the variations of successive systems of filtration presented can assure high-speed commensurable with the high-speed of processing data in parallel systems. The significant reduction is taken into account of equipment cost in arithmetical units and transmitting channels during successive systems of digital filtration, even with sufficiently high requirements on the frequency of the input signal arrival. Figures 5; tables 3; references 5: 4 Russian, 1 Western in translation.
[25-6415]

UDC 621.372.542:621.376.56

DELTA-MODULATION IN SPECTRAL ANALYSIS EQUIPMENT

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 7, Jul 82 (manuscript received 9 Jul 81) pp 1352-1361

POGRIBNOY, V. A.

[Abstract] The paper considers the special features of the use of delta-modulation (DM) in special processors for spectral analysis. The development of new algorithms for the functioning of nonrecoursive and recoursive digital filters with DM (DFDM) for such special processing is considered. Recommendations are given with respect to the use of the operation of thinning out in DFDM, and calculation of the pulse characteristics of nonrecoursive DFDM. References 14: 13 Russian, 1 Western in translation.
[28-6415]

UDC 621.391.82

MAXIMIZATION OF SIGNAL-TO-NOISE RATIO FOR TRANSMISSION SPEEDS ABOVE NAIQUIST SPEED

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82 (manuscript received 12 Oct 81) pp 64-65

ZYUKO, V. A.

[Abstract] A study is made of the problem of optimizing a reception filter with complex transmission coefficient given a fixed operating signal so as to maximize the signal-to-noise ratio at the output of the reception filter for transmission speeds above the Naiquist speed. Noise is assumed to be the summary power of additive noise and interference between characters. It is assumed that the transmission channel is ideal. If it is not, this can be considered by relating the complex channel transmission coefficient to the spectrum of the operating channel. References: 3 Russian.
[40-6508]

UDC 621.391:537.86:519

STATISTICAL ANALYSIS OF ADAPTIVE FILTER CHARACTERISTICS WITH PREDICTION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82
(manuscript received 31 Aug 81) pp 1563-1570

MAL'TSEV, A. A. and POZUMENTOV, I. Ye.

[Abstract] An analysis is presented of the statistical characteristics of an adaptive transversal predicting filter with complex weight coefficients in the delay line leads. The system in question under certain conditions has better operating characteristics than an adaptive transversal filter with true weight characteristics. The input signals are considered to be several random processes plus wideband noise. Conditions are defined which allow determination of the optimal values of all nonregulated parameters. References 13: 7 Russian, 6 Western.
[32-6508]

UDC 621.396

INFLUENCE OF FLUCTUATION NOISE ON PHASE LOCKED LOOP SYSTEM NOISE BAND

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 25, No 8, Aug 82 (manuscript received 26 Dec 80; after revision 25 Dec 81)
pp 101-103

DOLGIKH, M. S.

[Abstract] The method of statistical linearization is used to produce expressions to estimate the interference stability of a second order pulse phase locked loop system with arbitrary pulse phase discriminator characteristic shape. A system with a sawtooth discrimination characteristic is modeled on a computer. The quasi-linear method is used to study the variation of noise band of the system as a function of noise intensity. The results produced agree with the experimental studies indicating the threshold nature of the increase in phase error dispersion. Critical noise levels leading to loss of synchronism are determined. Figure 1; references: 7 Russian.
[36-6508]

USE OF KALMAN-BUSSIE ALGORITHM FOR OPTIMAL LINEAR FILTRATION OF OPTICAL SIGNALS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82
(manuscript received 4 Jul 80; after correction 17 Dec 81) pp 1647-1648

SOLODOV, A. A.

[Abstract] The problem of linear filtration of optical signals considering both the inertial properties of the photodetector and the presence of thermal noise in the receiver arises frequently. It can be solved using the linear statistical dependences between the output current of the photodetector and the intensity of the light field received. These dependences can be established by statistical linearization of the photodetector equations. The concept of statistical linearization is rather fruitful for photodetector equations written in terms of state variables. Statistical linearization of photodetector equations is performed for a specific case. Equations are derived which completely define the solution of the problem of optimal linear filtration of optical signals, described by the intensity $\lambda(t)$. References 4: 3 Russian, 1 Western. [32-6508]

RESULTS OF ACTIVITIES OF FOURTEENTH ITTCC INVESTIGATIVE COMMISSION

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 82 pp 56-57

SIVAKOV, V. T. and BAL'KIN, G. F.

[Abstract] The 14th International Telegraph and Telephone Consultive Committee (ITTCC) Investigative Commission worked during the 1977-80 period on improvements in facsimile equipment. In its activities participated a USSR delegation, which had made five contributions in the area of analog and digital devices. The main three targets of the Commission's work are problems concerning all types of facsimile equipment (definitions, tables, review), problems specifically concerning design and performance characteristics (analog and digital), and problems concerning utilization of communication networks for facsimile services (procedures and power requirements). Basic 15 recommendations on facsimile transmission and equipment were reviewed: 5 old ones were retained without change (T.1, T.2, T.12, T.15, T.20), 6 were modified (T.0, T.3, T.10, T.10b, T.11, T.30), and 4 new ones were adopted (A.21, T.4, T.21, T.35). For the 1981-84 period the Commission has been charged by the seventh ITTCC Plenary Assembly to work on telematic services ("Teletex", "Telefacs", "Datafacs", "Bureaufacs", and "Videotex"), including hybrid facsimile and symbol-by-symbol transmission of documents, and developments in "electronic" postal service. Figures 1; tables 1; references: 4 Russian.
[49-2415]

UDC 539.2:621.397

HYBRID OPTICAL-DIGITAL INFORMATION PROCESSING SYSTEMS USING CHARGE COUPLED DEVICES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82 (manuscript received 15 Apr 81) pp 1622-1630

YESEPKINA, N.A., KOTOV, B. A., KOTOV, Yu. A., MIKHAYLOV, A. V., PRUSS-ZHUKOVSKIY, S. V. and SKISHKIN, A. I.

[Abstract] A study is made of hybrid CCD-based devices. The pecularities of such systems, their operating principle and design specifics of linear

CCD photodetectors are analyzed. Systems for matching CCD lines with computers are presented and a hybrid system for radio astronomy is briefly analyzed. A block diagram of the hybrid optical-digital system for processing of radio signals is presented. The main elements include an optical processor with a laser, a CCD line acting as an optical to electrical information converter, an interface and a digital computer. A block diagram and photograph of a spectrograph are presented. The spectrograph was tested on the RATAN-600 radio telescope, and results of observation of the 21-cm neutral hydrogen line are presented. Hybrid CCD-based optical-digital systems are of interest for any area where spectral analysis of wideband signals is required. Figures 6; references 17: 10 Russian, 7 Western (2 in translation).
[32-6508]

UDC 621.3.052

INTERFERENCE IMMUNITY OF DISCRETE SIGNALS TRANSMITTED BY 'SLIDING INDEX WITH ACKNOWLEDGMENT' METHOD

Moscow ELEKTROSVYAZ' in Russian No 9, Sep 82 (manuscript received 12 May 81) pp 53-56

ADZHEMOV, A. S.

[Abstract] Transmission of discrete signals requires matching the latter with the synchronous digital channel. An asynchronous method of achieving this is by means of "sliding index with acknowledgment", but error multiplication degrades the fidelity of data transmission. For the purpose of optimizing the reception, an estimation is made of the interference immunity of this method. The total distortion of a discrete signal on its way from sender to receiver is evaluated for the case of a sliding index with two refining symbols and with coding of the significant moment according to ITTCC Recommendation R.111, letting the number of symbols in the code combination be n=3. The distribution of distortions is calculated on this basis, and reception by the strobing method is evaluated from the standpoint of optimization. The results indicate that error multiplication becomes most intense when the channel speed is equal to the signal speed and the number of successive missing symbols in a code sequence is one. Increasing either the ratio of channel speed to signal speed or the number of successive missing symbols will asymptotically decrease the average number of incorrectly received signal elements per missing symbol and thus improve the fidelity of transmission. Figures 4; tables 2; references 3: 2 Russian, 1 Internat'l.
[19-2415]

UDC 621.39

ITTCC RECOMMENDATIONS ON NEW ELECTRICAL COMMUNICATION SERVICES (SURVEY)

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 82 (manuscript received 30 Dec 81) pp 49-55

YETRUKHIN, N. N.

[Abstract] In addition to conventional services of telephone and telegraph communication and of data transmission, new services have been introduced which can be provided by electrical communication networks and which involve document (graphical data) transmission from man to man or from data bank to man. These "telematic" services, according to ITTCC terminology (1980 plenary session), require more complex terminal equipment with broader capabilities. They include "Teletex" (transmission of correspondence over general-purpose switching telephone network or data network, ITTCC recommendations F.200, S.60, S.61, S.62, S.70), "Telefacs" (transmission of correspondence over general-purpose switching telephone network, ITTCC recommendations F.160, F.170, F.180, T.2, T.3, T.4, T.10, T.10b, T.21, T.30), "Datafacs" (transmission of correspondence over switching data network, ITTCC recommendation F.180), "Bureaufacs" (transmission of correspondence over general-purpose switching telephone network or data network or over leased channels), and "Videotex" (transmission of information from data banks over general-purpose switching telephone network). All pertinent recommendations are published in the ITTCC Yellow Book. Figures 5; tables 4; references 8: 6 Russian, 2 Western.
[49-2415]

UDC 621.372

DIGITAL FREQUENCY-DEPENDENT DEVICE FOR SWITCHING INFORMATION CHANNELS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 9, Sep 82 pp 33-34

BUNYAK, A. M., candidate of technical sciences, and LUPENKO, A. N., engineer

[Abstract] A device for switching information channels has been invented (USSR patent disclosure No 839,053) which features not only high speed but also immunity to interference and frequency fluctuations caused by indeterminacy of the switching band when the signal frequency becomes equal to the switching frequency. Its basic element is a digital switch of frequency bands with "hysteresis", consisting of a limiter, a main counter, an OR logic, a trigger, and a reference counter. The main counter controls the trigger and the latter controls the scale factor of the reference counter (nominal scale factor $N=2^k$, k denoting the number of digits in both counters) so that switching will occur at a lower frequency when the signal frequency of operation is demonstrated, first with no coupling between trigger and reference counter and then with addition of feedback from trigger output to counter input. The three basic design modes are: 1) most often given total indeterminacy zone Δf_G^* and

necessary "hysteresis" band Δf_H, determine nominal scale factor N and absolute change of scale factor n; 2) given Δf_H and N, determine n; 3) given Δf_G^* and N, select n. The switch of frequency bands can be built entirely with digital microcircuits and, having a rather homogeneous structure, is adaptable to monolithic large-scale integration. Figures 3; references: 2 Russian.
[51-2415]

UDC 621.372.061

PASSAGE OF PULSE SIGNALS WITH LINEARLY VARYING FREQUENCY THROUGH RETARDING SYSTEM WITH DIELECTRIC

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 25, No 6, Jun 82 (manuscript received 22 Jul 81) pp 723-724

STETSENKO, A. I., CHERPAK, N. T. and SHAMFAROV, Ya. L., Institute of Radiophysics and Electronics, UkSSR Academy of Sciences

[Abstract] An experimental study was made of an amplitude-modulated microwave signal of meander waveform and linearly variable frequency passing through a dielectric retarding structure for a paramagnetic maser amplifier. Generation of a backward wave, which depends on the dielectric permittivity of the active medium as well as on the height of the active crystal and the clearance from crystal to lateral shield wall, is undesirable from the standpoint of diode operation. Existence of such a wave would be manifested by a splitting of the signal envelope into two pulse sequences. This has been confirmed by measurements of the coefficient of decoupling between ferrite elements at frequencies within the passband of the dielectric (leucosapphire and ruby) comb structure. Figures 2; references: 2 Russian.
[55-2415]

UDC 621.372.832.029.65

TWO HALF-PERIOD DETECTION REGIMES IN MILLIMETER BAND MIXERS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82 (manuscript received 14 Jul 80) pp 1658-1660

DRYAGIN, Yu. A. and MEZENTSEV, V. P.

[Abstract] The time approach to analysis of millimeter band mixers states that mixing is simply amplitude detection of the summary oscillation and separation of the beat (intermediate) frequency, indicating the desirability of using dual half period detectors. In the millimeter and submillimeter bands the gain may be quite significant. Two-junction detection eliminates generation and reradiation of the first and all odd harmonics of the summary signal. Another advantage of the system is reduced output impedance of a dual mixer. In the

millimeter and submillimeter bands it is simplest to achieve dual half-period detection in mixers with loop coupling, with the inductance of the loop compensating for the barrier capacitance of the diode structure while the loop simultaneously acts as a transformer for the impedances of the waveguide and the mixer itself. The design of a dual loop mixer and its equivalent circuit are presented. Dual loop mixers are widely used in receivers for the short-wave end of the millimeter band developed at the Institute of Applied Physics, USSR Academy of Sciences. This work does not discuss the method of suppression of heterodyne noise. Figure 1; references 9: 8 Russian, 3 Western (1 in translation).
[32-6508]

UDC 621.372.852

PHASE-SHIFTER OF CONSTANT PHASE DISPLACEMENT FOR METER BAND

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 9, Sep 82 (manuscript received 18 Jun 80, after revision 16 Jun 81) pp 94-96

STECHENKO, V. M.

[Abstract] The author notes that broad-band phase shifters with a constant phase displacement consist of two phase shifters, the phase difference of which in the operating frequency range remains practically constant $Q_1(\omega) - Q_2(\omega) \approx Q_0$. In the meter wave band it is possible to use low-freqeency and high-frequency filters, bridge T-shaped quadripoles, circuits with inverting transformers and connected inductances as phase shifters with an unsymmetrical connection with respect to the earth. The present brief communication investigates and reports on the above types of phase shifters for the meter band. Figures 2; references: 4 Russian.
[25-6515]

UDC 621.376.4

ADAPTIVE QUASI-COHERENT DISCRETE SIGNAL DEMODULATORS FOR CHANNELS WITH FADING

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 9, Sep 82 (manuscript received 6 May 81, after revision 19 Oct 81) pp 8-13

BELOUSOV, N. N. and MARTIROSOV, V. Ye.

[Abstract] Discrete signals of the following form are considered:

$$s(t;\lambda,\alpha) = (1 + \Delta - \lambda)s_1(t;\alpha_1) + (\Delta + \lambda)s_0(t,\alpha_0),$$

where t = current time; λ = discrete information on parameters which can take the values 0, 1, -1 at intervals of time (0,T); T = duration of elementary sample of signals $s_1(t;\alpha_1)$ and $s_0(t;\alpha_0)$; α = vector of parameters not carrying information concerning transmitted communications; Δ = constant magnitude $0 \leq \Delta \leq 1$. The following models of the signals are studied in the present paper: 1) Amplitude phase-shift keying; 2) Phase shift keying; and 3) Frequency shift keying. Equations are introduced for: 1) A mixture of phase and amplitude modulated signal with noise. The problem is considered of constructing algorithms of the quasi-coherent treatment of the two mixtures above with the object of isolating the discrete parameter λ . A synthesis is accomplished of a demodulator of the discrete parameter λ for a channel with fading. A figure shows a generalized structure of the circuit of an adaptive demodulator. The special features of the structure are noted. Figures 3; references 7: 6 Russian, 1 Western.
[25-6415]

UDC 621.376.239

BALANCED WIDEBAND MODULATOR

Moscow ELEKTROSVYAZ' in Russian No 9, Sep 82 (manuscript received 13 Apr 80) pp 46-49

ZAKIROV, V. I., VOROB'YEV, B. F. and KALININA, M. A.

[Abstract] A balanced wideband modulator for analog transmission systems with amplitude modulation is shown which ensures at least 46 kB suppression of parasitic conversion products as well as of carrier-frequency and modulating-frequency signals. Its basic components are two integrated circuits and two bipolar silicon transistors (2T326B and KT349A), ws well as 4 resistors for ensuring constant-current operation of the first microcircuit and 4 resistors for balancing carrier-frequency signals and modulating-frequency signals, respectively. The first microcircuit 140MA1B is a multiplier of analog signals, with two transistors forming a differential emitter-follower. The second microcircuit 159NT1B contains two identical transistors grown on a common crystal and forming two emitter-followers. The performance characteristics of this modulator have been measured: the input current is almost independent of the load, the intermediate frequencies lie within the 0-20 MHz range, the amplitide-frequency characteristic is linear within 1% over this range, the residual carrier-frequency voltage does not depend on the residual modulating-frequency voltage but, as a function of the modulating-frequency voltage, peaks sharply at the selected latter voltage of 130 V. The frequency spectrum of the output signal corresponding to carrier frequency f_c=18 MHz and modulating frequency f_m=0.5 MHz was also measured, all components at combination frequencies of up to the 5th order inclusively having been found to be adequately attenuated. Figures 6; tables 2; references: 3 Russian.
[19-2415]

UDC 621.391

ASYMPTOTIC FORMULA FOR PROBABILITY OF INCORRECT MULTIALTERNATIVE DISCRIMINATOR OF ORTHOGONAL SIGNALS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 7, Jul 82
(manuscript received 23 Jan 81) pp 1326-1331

FISHMAN, M. M.

[Abstract] The paper obtains an asymptotically (signal-to-noise ratio $q^2 \to \infty$) precise formula which expresses the dependence of P_o (probability) on q^2 and on K (orthogonal determined signals) by means of elementary functions. In so doing, for a conclusion and proof of the formula, methods of the theory of asymptotic expansion are used. An asymptotically precise formula is derived and compared with the upper and lower estimates known earlier. A demonstration of the asymptotic formula is given in an appendix to the paper. References 11: 9 Russian, 2 Western in translation.
[28-6415]

UDC 621.391

INVARIANT SIGNAL DETECTION WITH EXPOSURE TO PASSIVE INTERFERENCE

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 7, Jul 82
(manuscript received 2 Jun 80) pp 1332-1337

BOGDANOVICH, V. A.

[Abstract] The author notes that in the case of combined exposure to fluctuation noise and passive interference, problems often occur in the detection of signals. Examples of this are interference reflections in detection and ranging systems, and intersymbol and interchannel interference in communications systems. Consequently, there is an interest in observation rules with a minimum a priori data on passive interference when there is only a set given of its possible realizations without determination for them of the probability of distribution. The present paper obtains such rules on the basis of the statistical principle of invariance. Their observation characteristics are resistant to the action of passive interference. Analysis of the rules obtained shows that their use is justified if the extent of the interference zone on the plane time--frequency is comparatively small in comparison with the duration and width of the signal spectrum, and if the level of the passive interference considerably exceeds the level of the fluctuation noise. In the remaining cases detectors with a matched filtration of the signal without rejection of passive interference have practically the same effectiveness as that in the detectors received. References: 6 Russian.
[28-6415]

UDC 621.391

ROLLING CODING EFFICIENCY IN CHANNEL WITH INTERSYMBOL INTERFERENCE

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 7, Jul 82
(manuscript received 4 May 81) pp 1338-1341

ARKHANGEL'SKIY, V. A., BEREZKIN, V. V., GOTLIB, V. M. and KHATSKELEVICH, Ya. D.

[Abstract] The paper is concerned with an evaluation of the relative energy gain for a rolling code (RC) with a Viterb algorithm of decoding in a comparatively narrow-band Gaussian channel with the parameter $\Pi = \Delta f \tau_B$ (Δf = channel bandwidth with respect to radio radio frequency: τ_s = duration of symbol) close to unity, and a maximization of L_{otn} (gain) by an optimum choice of the speed R. The effectiveness is shown of the use of a rolling code with decoding according to Viterb in comparatively narrow-band channels with interference symbols. In spite of the increase of the level of interference because of a decrease of the duration of symbols, on the whole reception of an effective code assures a considerable comparative (in comparison with a nonredundant code) gain. In the case of modelling on a computer, it is shown that the optimum choice of code speed with Δ/τ_s makes it possible to obtain a relative energy gain of more than 4 dB with a probability of error less than 10^{-5}. The authors thank T. F. Dubov and A. A. Yegorova for modelling work on a digital computer. Figures 6; references: 3 Russian.
[28-6415]

UDC 621.391

RANDOM SIGNAL RECEPTION WITH UNKNOWN POWER SPECTRUM WIDTH

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82
(manuscript received 6 Apr 81) pp 1554-1562

TRIFONOV, A. P. and GALUN, S. A.

[Abstract] A study is made of the problem of detection of a random signal and estimation of its power spectrum width against a background of gaussian white noise with the assumption that the unknown power spectrum width falls within an a priori interval and that the signal is processed using the method of maximum likelihood. Approximate expressions are derived for the characteristics of a maximum likelihood receiver. Figures 3; references 10: 9 Russian, 1 Western.
[32-6508]

UDC 621.391

OPTIMAL RECEPTION OF DIGITAL OPTICAL SIGNALS IN COMMUNICATIONS SYSTEMS WITH DIRECT PHOTODETECTION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82
(manuscript received 14 Apr 80; after correction 21 Dec 81) pp 1606-1612

SOLODOV, A. A.

[Abstract] The problem of optical reception of optical signals with a nonideal photodetector and thermal noise is solved on the assumption that the input random process is quite intensive. This allows a gaussian approximation to be used for the photodetector output current, characteristic for certain special optical communications lines. The case of an array of photodetectors, most promising in modern optical systems, is also studied. The actual properties of the detectors are considered using their description by differential equations. This approach allows determination of the structure of the receiver implemented in the multidimensional space of states and determination of its operating quality. Calculation equations are produced for the particular case of a simple unidimensional system. References 15: 9 Russian, 6 Western.
[32-6508]

UDC 621.391.2

ASYMPTOTICALLY MOST POWERFUL INVARIANT CRITERIA FOR SOME SIGNAL DETECTION PROBLEMS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 7, Jul 82
(manuscript received 19 Jan 81) pp 1318-1325

OVCHAROV, Yu. N.

[Abstract] The author considers the use of asymptotic methods in order to obtain the asymptotically most powerful criterions, invariants to the changes of scale and shift or only the scale, which are called in the paper "Changes in the first or second type," respectively. The asymptotically most powerful invariant criterions are obtained with the use of the method of regular synthesis of criteria invariant to the changes indicated. Use of the methods considered to solve the problem of signal detection on a background of noise of an unknown level is demonstrated. The results of the work obtained for one-sided alternatives are used with corresponding changes and for problems of detection, satisfying alternatives of a more general form. References 12: 10 Russian, 2 Western in translation.
[28-6415]

UDC 621.391.3

DIGITAL PROCESSING OF NARROW-BAND SIGNAL CHARACTERISTICS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 9, Sep 82 (manuscript received 15 Apr 81) pp 73-75

ZHOGAL', A. V. and SVALOV, Yu. L.

[Abstract] This brief communication demonstrates the possibility of constructing the envelope and phase of a narrow-band signal by a discrete read-out of the same signal. This is accomplished with he use of a theorem developed in a 1968 paper by A. L. Zinov'yev and L. I. Filippov. It is shown that for any narrow-band signal only one envelope can be constructed, but an unlimited number of pairs of quadrature components can be. References: 3 Russian.
[25-6415]

UDC 621.391.7

DATA TRANSMISSION OVER COMMUNICATION NETWORKS WITH CHANNEL SWITCHING

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 82 (manuscript received 6 May 82) pp 19-25

SHVARTSMAN, V. O.

[Abstract] Conventional channel switching for data transmission which ties up an appreciable part of network resources for the entire load period can now be replaced with more efficient fast channel switching. This involves time sharing, with adequate provisions for interference immunity. Important features of channel switching are a high degree of transparence, i.e., the possibility of using terminal data equipment with any bit sequences, codes, formats, and algorithms, and easy hookup to subscriber networks. Networks with channel switching suitable for data transmission can be analog or discrete (digital) ones, the latter being either synchronous (with two-level structure) or asynchronous. Asynchronous discrete networks have either space switching or time switching, the latter with transparent asynchronous input (sliding index with acknowledgment) or opaque asynchronous input (staffing). Networks with channel switching available for data transmission are the AT-50 for transmission of telegraph signals at 50 bits/s by 5-element code and start-stop correction with 7.5 elements/symbol, the PD-200 for transmission of discrete signals at up to 200 bits/s without limitations on code and on synchronization method, the nationwide telephone communication system (OGSTFS), the one most highly developed and automated at this time, and departmental telephone communications systems using OGSTFS channels. Figures 3; references 7: 6 Russian, 1 Western.
[49-2415]

UDC 621.391.17+621.378.3

OPTIMAL SIGNAL RECEPTION IN DIGITAL OPTICAL COMMUNICATIONS SYSTEMS CONSIDERING ABSENCE OF LASER RADIATION ENERGY STABILIZATION

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82 (manuscript received after completion 16 Oct 81) pp 75-77

ALISHEV, Ya. V.

[Abstract] A digital laser communications system is considered in which there is no stabilization of the laser radiation energy level. The procedure for computing the minimum error probability of signal recognition is studied, assuming that a 1 corresponds to a right circularly polarized wave, a 0 to a left circularly polarized wave. An equation is presented which is an algorithm of the operation of an optimal receiver. The results of synthesis can be used to plan actual digital optical information transmission systems using power-unstabilized laser radiators with an accuracy of 1% or better. Figures 2; references 5: 4 Russian, 1 Western.
[40-6508]

UDC 621.391.8

ESTIMATE OF FM SIGNAL RECEPTION NOISE TOLERANCE WITH WHITE NOISE AND FM NOISE PRESENT

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82 (manuscript received 4 Jul 81) pp 53-55

SERDYUKOV, P. N. and BURDEZEYKO, B. P.

[Abstract] An important practical problem, estimation of the quality of filtration of an information parameter transmitted by frequency modulation against a background of both white noise and frequency modulated noise, is studied. A priori equations are presented for the signal and noise parameters. The method of averaging solutions, a combination of statistical modeling and solution of equations for a posteriori cumulants, is used. Figures 4; references 4: Russian.
[40-6508]

UDC 621.391.28

INTRODUCING ELECTRONIC STATIONS IN RURAL TELEPHONE NETWORKS

Moscow ELEKTROSVYAZ' in Russian No 9, Sep 82 (manuscript received 4 Nov 80) pp 9-12

MURDASOV, A. B.

[Abstract] Coordinate and decade-step automatic telephone stations in rural telephone networks are to be replaced with "Istok" analog-digital unified communication system equipment, one major advantage being the continuously decreasing cost of electronic components against the constant cost of electromechanical ones. The main problem in the changeover to electronic equipment is tie-in with other existing equipment over a long transition period. An analysis of network layout schemes and installation schedules indicates that the present radial-nodal structure with direct connections is suitable for electronic stations as well, a ring structure requiring further study. Transmission systems with frequency division of channels and with physical circuits must be eliminated and only transmission systems with pulse-code-modulation equipment used for interconnecting electronic stations. Installation of the latter should begin with the digital system. Figures 1; references: 7 Russian. [19-2415]

UDC 621.394

AUTOMATION OF TELEGRAM FORWARDING OVER SWITCHING NETWORKS

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 82 (manuscript received 26 Apr 82) pp 45-49

KALININ, B. S., RUBTSOV, V. M. and SANDOMIRSKIY, A. Ye.

[Abstract] Only 35% of outgoing telegrams reach their ultimate destination directly. The rest are received at intermediate points for additional handling and forwarding to terminals in switching direct-connection or subscriber telegraph networks. Hardware and software have been produced for automation of the forwarding process, in order to ensure fast, reliable, and economical service. This APK "Telegraf" system which utilizes an "Elektronika NTs-32" switching processor based on K587 dialing microprocessor, eliminates holdover of telegrams through adequate tracking and logging, eliminates duplication at the hardware level and ensures retransmission in case of loss. The system has a modular structure for processing telegrams from several independent stations, and all basic formal procedures have been automated. The APK "Telegraf" system is designed for hookup to 32 telegraph channels, for transmission at 50, 100, and 200 baud by the International Telegraph MTK-2 Code. It can process telegrams with a mean length of 350 symbols and maximum length of 3000 symbols, at a channel capacity of 0.12 telegram/s, with 43% minimum margin and 5% maximum

distortion. The hardware includes an incoming log, an outgoing log, a dispatcher for station control, an indexer, a device for feeding telegrams to the APK "Telegraf" from nonswitching channels and a device for discharge of telegrams not transmitted over switching networks. The software consists of functional programs and an equipment inspection test. The system was pilot operated and debugged in 1981 at the Central Telegraph of the USSR Ministry of Communications. Subsequently it has processed over 3 million telegrams in 1982 alone. Figures 3; tables 1; references 3: 2 Russian, 1 Western (in translation).
[49-2415]

UDC 621.391.828:535

RECOGNITION OF OPTICAL SIGNALS WITH POLYNODAL PROBABILITY DISTRIBUTION

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82 (manuscript received after completion 18 Dec 81) pp 14-19

VOROB'EV, V. I.

[Abstract] A study is made of the problems of classification of random checkerboard images observed in two-dimensional image noise using pattern recognition theory. A three-dimensional checkerboard model is also used in order to study the problem of simultaneous recognition of superimposed images of random objects partially shadowing each other, frequently encountered in applied geodesy. This problem arises in the synthesis of remove devices for measurement of the movement parameters of extended flashing objects located in a set of three-dimensionally distributed extended interfering reflectors. This article presents its analytic solution on the example of a quasi-complete differentiation of volumetric optical images recorded by a mosaic of noncoherent photodetectors acting as photon counters. It is assumed that the parts of the random objects in the mosaic resolution elements are nontransparent and may have different brightness coefficients. The statistical properties of the signals are described by randomized polynomial distributions. A simple algorithm is suggested for estimating the parameters of random i ages with polynodal statistical signal properties and its effectiveness is determined. The author is grateful to Professor A. S. Vinitskom and Professor V. P. Vasil'yev for discussion of the work and for counsel. Figures 4; references: 4 Russian.
[40-6508]

UDC 621.391.832

NONLINEAR CONVERSION OF SEVERAL RANDOM SIGNALS

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82 (manuscript received 17 Jun 81) pp 50-53

DEYEV, V. V.

[Abstract] A study is made of the conversion of the sum of frequency distributed quasi-deterministic and narrow band steady normal signals by a nonlinear device with a complex amplitude characteristic. The transmission of five quasi-deterministic signals through such a device is analyzed as an example.
Figure 1; references: 5 Russian.
[40-6508]

UDC 621.394.1

DEVELOPMENT OF TELEGRAPH COMMUNICATION IN USSR

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 82 pp 12-18

BRONNER, B. V. and KOROL', V. I.

[Abstract] The history of telegraph communication is reviewed from 21 October 1832, when P. V. Shilling performed his first experiment in Petersburg (tsarist Russia), through World War I and the Civil War, then in the USSR from the nineteen twenties through the nineteen fifties and sixties to the past decade and the present time. Landmark resolutions were adopted by three CPSU Congresses (23rd, 25th, 26th), their subsequent implementation keeping in step with growing demand in terms of both volume and quality of service. Those adopted by the 26th CPSU Congress pertain to improvement and expansion of general-use (OP) telegraph and AT-50 subscriber telegraph networks and PD-200 data transmission systems, including reliability of service and reliability of equipment as well as automation and eventual use of facsimile techniques. These resolutions will be implemented on a scientific-technical and economical basis, with utilization of available modern technology and with provisions for anticipated future growth.
Figures 6; references: 9 Russian.
[49-2415]

STAGES OF TECHNICAL PROGRESS IN TELEGRAPHY

Moscow VESTNIK SVYAZI in Russian No 10, Oct 82 pp 5-8

MARTSENITSEN, S. I., chief, Main Telegraph Administration, USSR Ministry of Communications

[Abstract] One hundred and fifty years of telegraphy are reviewed from the first invention of an electromagnetic telegraph by Pavel L'vovich Shilling in Petersburg (tsarist Russia) in 1832 and the 25-km long telegraph communication line built by B. S. Yakobi in 1843 up to 1982, this second year of the 11th Five-Year Plan period. At the present time the general-purpose telegraph network in the USSR covers about 90,000 enterprises serving the public and the national economy. The trend has been toward increased automation of direct-connection and telegram processing systems. Helpful in this are large hardware-software complexes based on "Elektronika NTs-03" microcomputers serving the urban and regional exchange offices "Izbyt" and "Neind." Modern equipment is built with electronic devices and the maximum possible microcircuit integration. It includes "Interval" data format converters, TAKT, KANT, RITM, KONTUR for line inspection and control developed at the Central Scientific Research Institute of Communications (Yerevan and Kiev branches), TsKS-T and ETK-KS concentrators in message switching systems now operating at rates of 50 or 100 baud and scheduled to operate at a rate of 200 baud in 1983. In addition, terminal equipment is being modernized, and OUKS-T equipment for message switching between two telegraph sets and interaction with either TsKS-T or ETK-KS are already developed and in production. Subscriber telegraph and data transmission have expanded greatly during the 1976-80 period nationwide and worldwide, including the international "Telex" system and the PD-200 data transmission system. The latest trends are increased utilization of satellite communication systems and further development of facsimile newspaper and correspondence transmission over general-purpose networks, as well as introduction of "electronic" postal service. [50-2415]

UDC 621.394.3:681.3

SWITCHING CENTER FOR TELEGRAPH COMMUNICATION OPERATING BY PRINCIPLE OF SPLIT DIVISION

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 82 (manuscript received 1 Jul 82) pp 25-29

BAZILEVICH, Ye. V., PRAMNEK, G. F. and KLEPIKOV, V. P.

[Abstract] A switching center for telegraph communication has been built which consists of two equivalent branches, each containing one YeS-1033 Unified System computer, two magnetic-disk storage control devices coupled to 3 disk drives each, 1 magnetic-tape storage control device coupled to 4 tape winding mechanisms, 1 alphanumeric printout and a set of displays. The storage devices each feed a selector channel, and have access to any of the two computers. Data exchange

between computers proceeds through two channel-to-channel adapters. The center operates by the principle of load splitting, i.e., dividing the incoming flux of telegrams between the two computer complexes, the software having been programmed accordingly. The center also provides four extra services: dispatch, special delivery, indexing, directory. The transmission capacity if 5-6 telegrams per second through 480 available channels, telegraphing speed 50-100 baud, queuing storage capacity up to 10,000 telegrams, power requirement up to 90 kW. The main problems in operation are failures, 20% of them traceable to the software, which will require debugging during pilot operation. Another important requirement for reliable operation is fail-proof power supply, provided here through two independent feeders. The failure rate has already been reduced from 8 to 25 hours between failures, with a mean recovery time of 15 minutes. Figures 1; references: 3 Russian.

UDC 621.394.14

ESTIMATING NOISE IMMUNITY OF LINE IMAGE TRANSMITTING SYSTEMS WITH COMPRESSION BASED ON CHARACTER RECOGNITION

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82 (manuscript received 9 Oct 81) pp 20-23

ALPERIN, Ye. D.

[Abstract] The distinguishability of a character transmitted by facsimile depends primarily on the number of lines in the character distorted by interference. A comparison of character recognition criteria is performed for systems using data compression algorithms based on two source models: the independent area model and the Markov source model. A cumbersome expression is produced of limited applicability for engineering calculations. It is determined that the lower bound of distinguishability can be used as the basis for a simpler equation which assumes that improper reception of a code character distorts an entire line. Figures 4; references 6: 3 Russian, 3 Western. [40-6508]

UDC 621.394.44

TRENDS IN DEVELOPMENT OF CHANNEL FORMING TELEGRAPH SYSTEMS

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 82 (manuscript received 6 May 82) pp 32-36

KOROP, B. V., MAMONOV, Ye. S., ZHEVLYUK, K. S. and USOV, I. S.

[Abstract] Development of channel equipment for telegraph networks in the USSR is reviewed, from the 1920s until the past decade. The present state of the art in general-purpose and subscriber as well as data transmission systems is viewed from the standpoint of capabilities, applications, utilization of

modern technology such as satellite communication lines, and meeting International Telegraphy and Telephone Consultive Committee (MKKTT) standards. These developments have been proceeding and continue to proceed from trunkline to regional, urban and rural levels, from primary to secondary multiplexing of tone-frequency channels, from few-channel to multichannel equipment, from low-speed (50 baud) to high-speed (75-1200 baud) transmission, from code-independent to code-dependent (start-stop) and then to universal channels, from analog electron-tube relay systems to digital semiconductor systems with transistor relays and then to integrated-microcircuit systems with digital processing and parameter stabilization. The last transition has so far occurred through three generations of equipment. The fourth-generation equipment now proposed should comprise a single universal line for operation at speeds of 50-2400 baud and with maximum utilization of channel capacity. The trend of improvements in mass-size, energy, economic, and service performance indicators as well as in equipment production techniques should continue throughout the forthcoming development stages. Tables 1; references: 25 Russian.
[49-2415]

UDC 621.394.76

AUTOMATION OF TELEGRAPH EQUIPMENT INSPECTION AND DIAGNOSIS

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 82 (manuscript received 13 Apr 82) pp 40-45

VRAZHNOV, V. N., ABUGOV, A. G. and YELISEYEVA, M. Ya.

[Abstract] Automation of technical and statistical inspection, in order to obtain more efficient maintenance and repair of telegraph equipment, is to proceed in three stages: 1) Development of complete test equipment and its installation in workshops during the current Five-Year Plan period; 2) Introduction of computers for processing and analyzing operational data, for diagnosis of equipment and fault location, during the 12th Five-Year Plan period; and 3) Complete automation of all inspection and diagnostic processes with hardware and software directly built into the telegraph equipment. Technical inspection will be effected functionally by means of built-in devices or external recording instruments, directly by testing, and indirectly on basis of recorded data and traffic analysis. Statistical inspection will be effected "from the user's standpoint" by two complementary means: with artificial load and with real load. All available inspection equipment (TAKT, KANT, RITM, ART, POISK, KIA-A) is already suitable for processing of data from a computer such as the YeS-1033 Unified System model. Figures 1; references: 5 Russian.
[49-2415]

UDC 621.394.662(088.8)

CALCULATION OF QUASI-SYNCHRONOUS MATCHING DEVICE PARAMETERS

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82
(manuscript received after completion 19 Nov 81) pp 26-29

TRIODIN, P. A.

[Abstract] The determining factor in the design of matching devices for transmission of discrete information from various independent sources through a single synchronous pulse channel is the ratio of the rates of incoming information from the individual sources and its output into the communications channel, which represents the throughput capacity of the channel. This article presents an analysis of the principles of design and calculates the basic parameters of quasi-synchronous input matching devices for such channels. Calculation equations are derived for determination of the parameters of such a device. The device utilizes the principle of recording incoming pulse streams in memory, which is read into the communications channel as required by the parameters of the channel. A block diagram of the functioning of the device is presented. Analysis of the equations produced indicates the expediency of using quasi-synchronous methods for matching sources with digital network communications channels. Figures 2; references: 4 Russian.
[40-6508]

UDC 621.395.341

PRINCIPLES OF CONSTRUCTING CENTRALIZED TECHNICAL SERVICE SYSTEM FOR RURAL TELEPHONE NETWORKS

Moscow ELEKTROSVYAZ' in Russian No 9, Sep 82 (manuscript received 21 Jul 80)
pp 13-16

YELEKOYEVA, E. K.

[Abstract] Centralization of technical service for rural telephone networks, with provisions for both continuous and periodic inspection, contributes not only to improvement of maintenance quality but also to reduction of maintenance labor and cost. Equipment for such a technical service is located at the central station and at unattended nodal and peripheral points of a zone. It includes modernized service-signal transmitter sets, a service-signal receiver set, a recording-storing-and-indicating device, an automatic answering set, a register checking device, a device for quality inspection, a device for coin-booth telephone inspection, a device for continuous inspection, a transfer switch and tie-in with either one of two general-purpose telephone lines in either direction, and a matching device for ensuring compliance of district technical service with oblast technical service. Transmitters and receiver are designed to accommodate at least 20 different service signals. Figures 2; references: 3 Russian.
[19-2415]

UDC 621.395.341

SYSTEM FOR LONG-DISTANCE TRANSMISSION OF TECHNICAL-SERVICE SIGNALS FROM FACILITIES IN RURAL TELEPHONE NETWORK

Moscow ELEKTROSVYAZ' in Russian No 9, Sep 82 (manuscript received 21 Jul 80) pp 16-19

KOZLOVA, G. P. and ZABOROVA, L. T.

[Abstract] A system has been organized for transmission of technical-service signals from unattended facilities in rural telephone networks to the technical service center. Signals in 20 different codes are availbble to indicate faults requiring either emergency or preventive maintenance, such as plug-up or fade-out in the first category and deviations from normal performance levels in the second. Maintenance covers automatic telephone stations as well as coin booths, power supply equipment, radio lines, overhead lines, underground cables, weather service and security service. The equipment for technical service includes modernized transmitter sets at nodal and peripheral points, two connecting lines from each, and a receiver set with appurtenances at the center. Figures 3; references: 3 Russian.
[19-2415]

UDC 621.395.345:621.3.019.3

RELIABILITY ASSURANCE IN 'ISTOK' INTEGRAL ANALOG-DIGITAL UNIFIED COMMUNICATION SERVICE SYSTEM

Moscow ELEKTROSVYAZ' in Russian No 9, Sep 82 (manuscript received 31 Oct 80) pp 4-8

MISULOVIN, L. Ya., BAKLANOV, Yu. A. and SILIN'SH, Ya. Ya.

[Abstract] The basic reliability requirements which the "Istok" new integral analog-digital unified communication service system can meet are: not more than 2 h shutdown time in 20 years, 10^{-4} probability of missed connection because of equipment failure, and 0.1 defect per subscriber line per year. Such reliability indicators are achieved by design, production, and operation of the equipment. The favorable design features include minimization of hardware, installation of peripheral and interstation standby control equipment with program data storage, built-in hardware and software redundancy, protection against damage and extreme influencing factors, diagnostic and inspection hardware and software, selection of reliable components and moderate operating modes. This is illustrated by the load factor distributions for typical resistors, capacitors, transistors, and the failure rate distributions for typical resistors, capacitors, diodes, coils, transformers, relays, microcircuits, connectors, twisted and soldered connections. In the production stage reliability is ensured by accelerated mechanical and environmental testing as well as by

accelerated aging. In operation reliability is ensured by a hierarchical service structure with a general-purpose computer at the top level. All these measures contribute to reliability indicators 3-4 times higher than those of existing automatic telephone system equipment. First production units of this equipment are being installed in Lielvarde (LaSSR) and in Saratov. Figures 3; tables 2; references: 3 Russian.
[19-2415]

UDC 621.396.23

METHOD OF EVALUATION OF SYSTEM NOISE IMMUNITY WITH PSEUDORANDOM RADIO FREQUENCY SWITCHING USING REDUNDANT CODES

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 25, No 9, Sep 82 (manuscript received 7 Apr 81, after revision 1 Dec 81)
pp 75-77

LYUDVIG, V. A. and CHUDNOV, A. M.

[Abstract] This brief communication considers a system of information transmission in which symbols incoming from an information transducer are coded by a block binary (n,k,t)-code. Here n = length of block, k = number of information symbols; t = maximum rate of assured errors which are corrected. In succession the symbols are transmitted in accordance with a determined form of manipulation at pseudorandom selected frequencies. At reception, registration of the elements at the code combination is initially accomplished, and subsequently its decoding. A method is proposed for calculation of the noise immunity of a system with pseudorandom radio frequency switching which makes it possible to determine with respect to the bounds of existence of codes the upper and lower evaluation of the transmission speed of the code, assuring a prescribed noise immunity. For this it is sufficient to determine the parameters n, k, t from the corresponding boundaries. The upper and lower evaluations of the transmission speed of codes is calculated on a base of the use of the existence of the known bounds of existence: the upper bound of Khemmis and the lower bound of Varshamov--Gilbert. Figures 2; references 5: 4 Russian, 1 Western in translation.
[25-6415]

UDC 621.396.43:621.3.019.3

INDICATORS FOR ESTIMATING RELIABILITY AND QUALITY OF TECHNICAL SERVICE IN RADIO RELAY LINE SYSTEMS

Moscow ELEKTROSVYAZ' in Russian No 9, Sep 82 (manuscript received 6 Aug 81) pp 41-43

RAKOV, A. I.

[Abstract] Performance indicators for estimating the reliability and the quality of technical service in radio relay line systems must be unique, universal, comparative, and comprehensive with regard to reliability as well as maintainability. The channel downtime factor is not comparative, the referred channel downtime factor is not universal, the duration of technical downtime of a radio relay trunk (in minutes) per 100 hours of operation per 100 km of radio relay line meets all these requirements, but only the ratio of actual to expected trunk downtime factor meets also the requirement of objectivity. A quality factor characterizing the performance of radio relay lines is defined on this basis which involves averaging over trunks with weighting of their lengths. References: 6 Russian.
[19-2415]

UDC 621.396.67

SYNTHESIS OF RADIOTRANSPARENT FLAT LAYERED MEDIA

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 8, Aug 82 (manuscript received 21 Aug 81, after revision 1 Dec 81) pp 97-99

SKURSKIY, P. P., KAMINSKIY, V. V. and SHUMILO, T. V.

[Abstract] The task is formulated of synthesizing a radiotransparent flat layered medium, and a machine method is suggested for its performance. The algorithm for determining the coordinates of the hypersurface sought is briefly described. As an example, the solution is presented to a problem of synthesizing a radiotransparent three layered medium for the sector of incidence angles between zero and 70° for perpendicular polarization of the incident planar electromagnetic wave. The method suggested allows the synthesis task to be performed for any type of flat layered medium regardless of the frequency band. Figures 2; references 7 Russian.
[36-6508]

UDC 621.396.67

BANDWIDTH PROPERTIES OF NOISE COMPENSATOR WITH MULTI-TAPPED DELAY LINE

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 9, Sep 82 (manuscript received 3 Apr 81) pp 77-79

NIKITCHENKO, V. V. and POPOVSKIY, V. V.

[Abstract] This brief communication investigates the effectiveness of compensation of broad-band noise in a two-channel noise compensator with a phase shifter based on a multi-tapped delay line. The object of the work is to establish the restrictions which are imposed on the degree of compensation of the width of the noise spectrum. A block diagram is presented of the unit investigated. Figures 2; references 2: 1 Russian, 1 Western.
[25-6415]

UDC 621.396.96:621.391

GENERALIZATION OF METHOD OF REVERSE APERTURE SYNTHESIS IN CASE OF ARBITRARILY ROTATING OBJECT

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 7, Jul 82 (manuscript received 19 Jun 80, after revision 23 Nov 81) pp 1309-1317

MANUK'YAN, A. A.

[Abstract] The paper considers the problem of determining the parameters of rotation and the parameters of the geometry of an object with respect to the time of realization of backward scattering of a narrow-band signal with a wavelength λ of many smaller dimensions of the object (high-frequency region). It is assumed that the reflected signal is formed by a small number of local nonuniformities rigidly connected with the surface of the object. The following items are discussed: 1) Forming of single one-dimensional portrait; 2) Union of one-dimensional protraits; 3) Connection of Doppler frequencies with parameters of rotation. General Case; 5) Connection of Doppler frequencies with parameters of regular precessions; 6) One particular case of rotation; and 7) Exact characteristics of method. It is shown that the proposed method of geometrical and kinematical parameters is essentially a generalization of the method of a synthesized aperture in the case of unknown parameters of a rotating object. Processing of the signal in a small interval of time makes it possible to eliminate nonlinear distortions resulting from dependence of the amplitudes of the local nonuniformities on the aspect, and a joint processing of the Doppler frequency, even if for one local nonuniformity, relative to different moments of time, and makes it possible to evaluate the parameters of rotation and geometry with exact characteristics proportional to $(\lambda/L)^{3/4}$. The author thanks A. A. Kurikshe and V. D. Shilin for discussion of the results and for helpful council. Figures 1; references 10: 8 Russian, 2 Western.
[28-4415]

UDC 621.396.96:621.391.26

ALGORITHM FOR RECURRENT ESTIMATION OF PARAMETERS OF SIGNAL WITH RANDOM DROPOUTS WITH UNCERTAINTY

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82
(manuscript received 12 Jul 81) pp 59-61

VISHNYAKOV, V. A.

[Abstract] A study is made of a recurrent algorithm generated from a likelihood equation with certain limitations on the form of probability density functions, simplifying the procedure of computing an unknown parameter. The estimate of the maximum likelihood of the parameter v of a signal with random dropouts based on a discrete sample with mutually independent components is determined from the maximum of a function presented in the text. The accuracy properties of the optimal and recurrent estimation algorithms are compared. The simplicity of implementing the recurrent algorithm and the good qualitative characteristics indicate that it is expedient for use in practice even for small sample volumes. If the signal-to-noise ratio is much greater than one the algorithm is even simpler because simplified determination of a posteriori probabilities can be used. Figures 2; references: 2 Russian.
[40-6508]

UDC 621.396.96:621.391.26

ADAPTIVE ALGORITHM OF NARROW-BAND SIGNAL DETECTION IN NOISE OF UNKNOWN SPECTRUM POWER AND FORM

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 25, No 9, Sep 82 (manuscript received 2 Jun 81, after revision 25 Sep 81)
pp 14-20

PESHKOV, V. P.

[Abstract] The problem is considered of detecting a set of narrow-band Gaussian random signals which are received in conditions of a priori indeterminancy with respect to the band, the central frequency of its component on a background of noise of an unknwon spectrum power and form. An adaptive algorithm of detection is proposed for such a set of narrow-band Gaussian random processes, the spectral density of the components of which are nonzero only in some frequency band $\Delta\omega_m \ll \omega_m$. In this case the central frequency $\Delta\omega_m$ and the band $\Delta\omega_m$ of the narrow-band components are unknown. Also unknown are the form and intensity of the spectral density of the stationary Gaussian interference. An analysis made of the noise immunity of a synthesized algorithm, both by means of models and by real signals, shows that use of smoothed minimal order statistics from the working sample of the spectrum makes it possible to create an evaluation of the spectral density of the interference, omitting the effect of the narrow-band components of the signal. The algorithm obtained, invariant with respect

to the form and intensity of the interference, makes it possible to solve the prob em of calculating the thresholds of detection with nonwhite interference as well as to achieve adaptation with respect to the band for all narrow-band components of the signal. The adaptive algorithm of detection presented is easily realized on a computer. It can be recommended for the solution of detection of acoustic signals. Figures 3; references: 9 Russian.
[25-6415]

UDC 621.396.237

ESTIMATION OF ERROR PROBABILITY DURING LIMITED OBSERVATION PERIOD IN RADIO CHANNELS WITH FADING

Moscow ELEKTROSVYAZ' in Russian No , Sep 82 (manuscript received 10 Mar 82) pp 49-51

SERGEYEV, O. I. and FIKS, Ya. A.

[Abstract] Discrete-data radio transmission channels with signal fading and "white noise" interference are considered. The possible spread of error probability during a limited measurement time is estimated, assuming this spread to be caused by randomness of the signal-to-interference ratio and fluctuations of this ratio to be caused only by signal fading. The analysis is based on equivalent staggered reception with independent fading in each branch and on the simple case of optimum coherent addition of signals but a noncoherent resolving system. Calculations reveal that the spread during measuring periods of conventional length can be wide, relative to the theoretically expected error probability, the rms deviation of the latter becoming possibly larger than its mathematical expectation. In that case the lower confidence limit ought to be regarded as absence of errors. Figures 1; references: 3 Russian.
[19-2415]

UDC 621.396.938:527.8

DETECTION OF RADIO SIGNALS REFLECTED FROM EXTENDED STATISTICALLY ROUGH SURFACES

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 9, Sep 82 (manuscript received 28 Apr 81, after revision 16 Dec 81) pp 43-47

CHIZHOV, V. I.

[Abstract] The paper is concerned with the problem of detecting signals scattered by extended surfaces. The principal items discussed are: 1) Mutual ambiguity function; 2) Detection of signals in the case of absence of resolution with respect to speed; and 3) Detection of signals in the case of presence of resolution with respect to distance and speed. The investigation conducted

makes it possible to determine the special characteristics of detection of signals in the case of reflection from an extended surface and to develop requirements for resolution of a sounding signal with respect to distance and speed resulting from the necessity for agreement with the irradiated section of the surface. Figures 3; references: 3 Russian.
[25-6415]

UDC 621.397.121:07

NEWSPAPER TRANSMISSION SYSTEM WITH THIRD-GENERATION EQUIPMENT

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 82 (manuscript received 2 Jun 82) pp 29-31

KUDRYAVTSEV, R. A., KOMKOVA, A. S., YELSUKOV, V. F. and KOZACHENKO, Yu. M.

[Abstract] The existing nationwide system for transmitting newspaper pages (OGSPG) now includes 46 receiver stations and will include approximately 90 by the year 1990. Regular transmission of 15 Central [political centers] and weekly newspapers is effected by the facsimile method with "Gazeta-2" equipment built in 1965-69, via "Orbita", "Orbita-RV", and "Moskva" satellite communication systems, PRAVDA being delivered to 90% of all subscribers on the same day. Third-generation facsimile equipment is now being developed for further network branchout and higher fidelity of page transmission. Particularly important is terminal equipment suitable for operation with offset print and a 36 lines/cm (standard in the USSR) grid. A scanner with circular sweep has been found to be most efficient for transmission of large numbers of newspaper columns. Figures 1; references: 5 Russian.
[49-2415]

UDC 654.14:65.011.56

AUTOMATION OF TELEGRAPH NETWORK CONTROL

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 82 (manuscript received 13 Apr 82) pp 37-40

PARIKOZHKA, I. A., BERSHTEYN, P. V. and KOZHEMYAKIN, P. I.

[Abstract] Automation of telegraph network control which is to be provided for general-purpose and subscriber systems as well as for data transmission systems includes adaptation to changes in the situation, both anticipated and actually occurring. The control system covers a main center, territorial centers, and exchange offices with channel switching or message switching. The system has a distributed structure, with dynamic characteristics adequate for responding to fast changes and with equipment capable of handling an ever increasing load

volume. In the first stage, the main requirement for automation of this control system is means of programmed optimization of network structure; and traffic control. Such a program of optimal synthesis is now developed for a general-purpose telegraph network with message switching. Additional requirements are availability of a data bank, automation of design analysis, gathering and processing of information on the state of network and traffic. With the aid of computers, many optimization problems and most difficult information-engineering problems can be solved within a short time. The main objectives of this automation are reducing the labor content of control operations with attendant improvement of service quatity and cost effectiveness. The next stage of the automation process will be maximizing the utilization of programmatic methods for computer-aided dynamic control. Figures 1; references 9: 8 Russian, 1 Western.
[49-2415]

UDC 681.325

VOLTAGE-TO-TIME CONVERTER

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 9, Sep 82 pp 31-32

ASHANIN, V. N., engineer, and GUTNIKOV, V. S., candidate of technical sciences

[Abstract] A voltage-to-time interval converter for compression of input signals has been invented (USSR patent disclosure No 801,245) which is built with series K553UD2 microcircuits and D220A switching diodes. The device consists of two stages, an integrating compressor of input signals followed by an integrating time-to-pulse converter. Its operation is controlled by a time-base voltage from a standard TTL or DTL circuit and proceeds in two steps of equal duration: formation of a half-period pulse and conversion of its area to a time interval. The input stage contains an OR logic and two amplifiers with negative feedback, a reference voltage being applied to the second one, the output stage contains two amplifiers with negative feedback and a null detector. The performance of this device features high speed (10^4 s^{-1}) with short transients and high reliability. Its accuracy is determined essentially by stability of the reference voltage and the time base, the basic error not exceeding 0.1%. The speed can be increased further by use of operational amplifiers. Figures 3; references: 4 Russian.
[51-2415]

IMPROVE RELIABILITY OF 'DUMKA' EQUIPMENT

Moscow VESTNIK SVYAZI in Russian No 9, Sep 82 pp 31-32

PARKHOMOV, Yu. P., PRUSSAK, S. P. and SIYANKO, V. M., associates, Central Scientific Research Institute of Communications, Kiev branch, ROMANENKOVA, L. I., senior engineer, Main Telegraph Administration, USSR Ministry of Communications

[Abstract] DUMKA duplex universal multiplex-channel telegraph equipment with time division and a high-speed (9600 bits/s) modem is the first of its kind produced, since 1980, and installed in the Soviet Union. It is capable of providing 72 code-dependent and code-independent tone-frequency channels operating at rates of 50-200 baud. Although its reliability is fairly high, meeting the GOvernment STandard 21656-76 with 5250 operating hours between failures, it does not perform as well as carrier telegraphy equipment with frequency shift keying. Most equipment failures have been found to occur in the auxiliaries, especially in the power supply, and are traceable to design and manufacturing errors. The main causes of performance failure are phase jitter and phase jumping Gaps in messages and splitting of signals can be avoided, either by precise regulation or special protection. The first method eliminates trouble at the source and does not require additional hardware, but is operationally difficult to implement. The second method, easily implemented, facilitates operation. Both methods are, therefore, expediently combined. DUMKA equipment is based essentially on group principles and thus is more complex than carrier telegraphy equipment, and this must be taken into consideration in its installment and operation. Tables 4.
[35-2415]

IMPROVED INSPECTION OF PUNCHED TAPES IN REGIONAL DATA GATHERING, PROCESSING AND TRANSMITTING SYSTEMS

Moscow VESTNIK SVYAZI in Russian No 10, Oct 82 pp 35-36

MIKHALEV, S. N., chief, Production Laboratory of Postal Communication System, Kirovograd Production-Engineering Administration of Communications, and KHROMEY, N. N., senior engineer, repair of "Onega-III-Ze" electronic complexes

[Abstract] In the "Onega" system for handling postal orders in regional and local offices the documents are processed in three stages: 1) Primary processing; 2) Collection, inspection, and then transmission to and exchange between zonal computer centers; and 3) Final inspection of order processing operations. In primary processing, all data needed for subsequent processing are stored on tapes. Thorough inspection of these tapes is necessary before data are transmitted to the order control office. This is done with logic by UK-Sbor equipment. There is, however, still a high level of possible error caused by mismatch of requisition data pertaining to "beginning of day" and "end of day" reports. An auxiliary device for correcting this has been developed which compares the reports throughout their length, except for identifying symbols. It does this

using an intricate system of trigger logic circuitry and a direct-access memory. The hardware includes MLT resistors, series 155 logic microcircuits, series K186PU1 microcircuits, a KD521G diode, an AL307BM light activated diode, a D814V stabilitron, a KT203A triode, K10 and K50 capacitors. Figures 1. [50-2415]

DEVELOPMENT OF NEWSPAPER TRANSMISSION NETWORK OVER COMMUNICATION CHANNELS

Moscow VESTNIK SVYAZI in Russian No 10, Oct 82 pp 38-29

PRILEPINA, A. I., chief, newspaper transmission service over photocommunication network, "Order of Lenin" USSR Central Telegraph

[Abstract] Nationwide distribution of newspapers on the day of issue began in 1964. Newspaper columns were first transmitted from Moscow to Novosibirsk, Irkutsk, Khabarovsk with Soviet-made low-speed "Gazeta-1" equipment, to Leningrad with imported low-speed equipment, and to Kiev, Minsk, Tashkent, Kuybyshev, Sverdlovsk, Rostov-na-Donu, Krasnodar, Khar'kov with high-speed equipment. Since 1970 newspapers have been transmitted over phototelegraph channels by means of "Gazeta-2" equipment operating with optico-mechanical scanning at a rate of one column in 2.12 minutes. The transmission was extended to Alma-Ata and Saratov (1970), Volgograd and Chelyabinsk (1971), Kazan', Perm', Donetsk, L'vov (1972), and Gor'kiy (1973). Intensive introduction of high-speed "Gazeta-2" equipment marks the third stage of phototelegraph development, with the addition of Ul'yanovsk, Tselinograd, Dnepropetrovsk, Simferopol', Odessa (1976), Riga, Omsk, Tbilisi, Krasnoyarsk, Karaganda, Dushanbe, Barnaul, Zaporozh'ye, Novosibirsk (1977) (Novosibirsk converted from low-speed to high-speed system), Ufa, Minvoda, Frunze, Voroshilovgrad, Kishinev, Baku (1978), and Yerevan (1979). Transmission via the communication satellite "Raduga" and ground station "Orbita" began in 1977, Moscow-Irkutsk line established in 1978 and Moscow-Krasnoyarsk line established in 1979. The outlook for transmission of newspapers via satellite from Moscow to Siberia and the Far East is promising. Meanwhile, printing and distribution of newspapers are also being decentralized to 41 points (20 cities in the RSFSR, 11 capitals and 10 large indus rial towns in the other republics). Since 1979 republican newspapers in the native language of the Kazakh SSR have been printed in Alma-Ata and transmitted from there to Karaganda and Tselinograd. A similar arrangement is planned for the Ukrainian SSR, while transmission from Moscow via satellite will be extended to Kemerovo, Amkhabad, and Arkhangel'sk. [50-2415]

OUTLOOK FOR DEVELOPMENT OF MULTICHANNEL TRANSMISSION SYSTEMS

Moscow ELEKTROSVYAZ' in Russian No 9, Sep 82 pp 51-52

[Abstract] The present status of cable communication lines in primary trunk and intrazonal networks and the outlook for their modernization were discussed at the February 1982 session of the Scientific-Technical Council to the USSR Ministry of Communications. While these networks are now operating essentially with analog transmission equipment, a trend toward digital transmission with use of pulse-code modulation (PCM) equipment has already begun during the 11th Five-Year Plan period. Scientific-technical and experimental-design research concerning digital transmission over optical fiber cables began during the 10th Five-Year Plan period and still continues. This development affects both reconstruction of existing networks and addition of new trunks, one essential ingredient being a higher degree of multichanneling. A base is being established now for making the transition most economical and least disruptive. Specific recommendations have been made concerning production and installation of PCM equipment and coaxial-pair cables to be matched for maximum cost and performance effectiveness. Guidelines need also be established for extending digital methods of transmission over radio relay and satellite communication lines.
[19-2415]

MAINLINE DECAMETER RADIO COMMUNICATIONS AND STATIONARY RADIO CENTERS

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82 pp 90-91

KUZ'MIN, B. I.

[Abstract] The small capacity long line radio communications network of the USSR utilizes decameter lines, tropospheric and ionospheric scatter lines and meteor scatter lines extensively. Though decameter lines have lower reliability than other types of long lines, they are economically quite favorable, primarily due to low power requirements and the use of simple and inexpensive equipment. The characteristics of decameter radio communications are described. An important problem for today is modernization of radio centers for the use of adaptive decameter radio relay lines, a subject which has been discussed at several scientific and technical conderences held in the Soviet Union since 1973. The last such conference was held in Leningrad on 18 March 1981. Problems of operation of radio centers and improvement of communications equipment were discussed at SUR-1 in Moscow and SUR-2 in Leningrad. The next such conference is planned for November of 1982.
[40-6508]

UDC 621.314

NEW VOLTAGE TRIPLERS

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian
No 7, Jul 82 (manuscript received 28 May 80, after completion 25 Mar 82)
pp 848-852

BEREZOVSKIY, ANATOLIY FILIPPOVICH, candidate of technical sciences, docent, and BEGUNOV, VYACHESLAV NIKOLAYEVICH, candidate of technical sciences, docent, both from Yaroslavl Polytechnic Institute

[Abstract] The authors have earlier invented a single-phase single-cycle voltage rectifier-tripler with a still load characteristic and small ripple on the d.c. side (USSR patent disclosure No 656163). They have subsequently developed the two-phase single-cycle version (USSR patent disclosure No 748733). The circuit across the secondaries of two transformers consists of three capacitors and five diodes, with the load resistor in parallel with the third capacitor and both in series with the fifth diode in the "diagonal" branch. The third capacitor is charged from the other two as well as from the a.c. sources, while the other two capacitors are charged from the a.c. sources only. In this way, most of the energy is supplied from the a.c. sources and the internal resistance of the rectified-voltage source is small. With one transformer removed and the two outer diodes between secondaries shunted, this two-phase device is converted to a single-phase one. Performance characteristics have been calculated and measured. Both theoretical and experimental data confirm the advantages of this device over the Roginskiy voltage tripler (V. Yu. Roginskiy, 1972), to which must be added shorter transient periods, fewer circuit components (one capacitor and one diode less), and the possibility of using two sources with different voltages. A typical application is for an electric air filter. Figures 2; tables 1; references 5: Russian.
[37-2415]

UDC 621.372

FEEDBACK RETURN DIFFERENCE

Moscow ELEKTROSVYAZ' in Russian No 10, Oct 82 (manuscript received 2 Apr 80) pp 61-63

MOKEYEV, B. N. [deceased]

[Abstract] Feddback return difference for any amplifier component, the ratio of the determinant of the amplifier immitance matrix with this component to its determinant with this component missing, is an important characteristic on the basis of which amplifiers with feedback can be comparatively evaluated. This is demonstrated on such an amplifier consisting of an active four-pole network and external feedback through a passive four-pole network. Expressions for input impedance, output impedance, and current gain are derived from the equivalent-circuit equations with either a short circuit or an open circuit on the source side and on the load side, respectively. After the author's death, A. F. Beletskiy assisted in editing and publishing the manuscript. Figures 2; references: 1 Western (in translation).
[49-2415]

UDC 621.372.832

METHOD OF CALCULATING BRANCH-GUIDE DIRECTIONAL COUPLERS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 7, Jul 82 (manuscript received 8 Dec 80) pp 1362-1365

ANDREYEV, V. A. and KHIZHA, G. S.

[Abstract] The paper is concerned with a calculation of symmetrical branch-guide directional couple s with use of the Adamar transform. Because a branch-guide directional coupler is a device with four inputs, consideration is given to the special case of the Adamar matrix. The methods described make it possible to obtain new relations and to simplify calculation of symmeteical directional couplers. Figures 2; references 2: 1 Russian, 1 Western.
[28-6415]

UDC 621.391.837:778.3

INFORMATION CRITERIA FOR QUALITY ESTIMATE OF IMAGE RECEIVERS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 25, No 9, Sep 82 (manuscript received 13 Apr 81, after revision 18 Nov 81)
pp 88-90

KARAPETYAN, B. O.

[Abstract] In this brief communication, formulas are derived which can serve as a basis for calculation of the information parameters of image receivers. This makes it possible to take into account the real parameters of characteristics and distribution, as well as noise and other items. The various criteria for evaluating receivers are deduced from them: information capacity (in bits), information density (in bits, mm^2) and a number of others. By these expressions, in particular, the information characteristics were calculated (but not shown) in the communication of some image receivers which are used in astronomy. As an example, data are presented with respect to information capacity per frame, e.g., electron camera 30200 bits. It is concluded that the generalized information criteria presented objectively take into account the interdependency and the effect of individual parameters on the quality of a device as a whole and supplement the system of parameters and characteristics ordinarily used for evaluation of image receivers. References 8: 3 Russian, 5 Western (1 in translation).
[25-6415]

UDC 771.531.17:772.99

PL-SM HIGH-SENSITIVITY HOLOGRAPHIC PLATES

Moscow ZHURNAL NAUCHNOY I PRIKLADNOY FOTOGRAFII I KINEMATOGRAFII in Russian
Vol 27, No 4, Jul-Aug 82 (manuscript received 12 Aug 81) pp 293-295

KAPLUN, L. Ya., KLIMZO, E. F. and SERGEYEVA, E. N., All-Union State Scientific Research and Planning Institute of Chemico-Photographic Industry, Moscow

[Abstract] An experimental study was made in order to determine the feasibility of increasing the diffraction efficiency of present holograms on PL-3 plates with a space frequency of 1000 mm^{-1} above 2.5% without decreasing the energy

exposure below $H_{D=0,5+D_0}$ = 100 erg/cm^2 in light of an He-Ne laser (λ = 633 nm). Both preparation and spectral sensitization of the extrafine-grain emulsion were optimized for this purpose. Emulsion produced by the controlled two-jet emulsification process with excess silver ions and then physically cured for 60 min at 47°C was chemically sensitized with sodium thiosulfate and aurihydrochloric acid containing 10^{-3} mole Au and $2 \cdot 10^{-3}$ g-atom Au per 1 g-atom Ag respectively. Its properties were stabilized by addition of 1 g 5-methyl-7-oxy-1,3,4-triazoindolicin per 1 g-atom Ag prior to attainment of the required pAg level. As spectral sensitizers were used merocyaninocyanin and two derivatives of 3-alkyl rhodanine in optimum concentration ($5 \cdot 10^{-4}$ mole/g-atom Ag) for λ_{max} = 633 nm and λ_{max} = 694 nm respectively, with various activators. Measurements were made with an FSP-41 sensitometer behind a KS-14 glass filter at T_{color} = 2850 K and with an ISP-73 spectrosensitometer according to the $D = 0.5 + D_0$ criterion. Exposed plates were developed in D-19 developer. The most effective activator was found to be sodium salt of 4,4'-bis(4,6-dioxyphenyl-1,3,5-triazinyl-2-amino) stilbene-0,0'-disulfoacid, but increasing the concentration of silver ions increased the photosensitivity even slightly more, both effects not being additive. The diffraction efficiency could be increased to 4.3%. Extending the development time for PL-ZM plates to 9 min was found to increase their photosensitivity by 50-80%, with an attendant 20% increase in scattering noise at the peak diffraction efficiency. Tables 1; references 8: 7 Russian, 1 Western. [52-2415]

UDC 62-526

AUTOMATIC SELECTION OF MEANS OF NONLINEAR CORRECTION FOR AUTOMATIC SYSTEMS

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 7, Jul 82 (manuscript received 16 Apr 81) pp 812-815

MIKHALEV, ALEKSANDR SERGEYEVICH, doctor of technical sciences, professor, Belorussion State University, and POZDNYAKOVA, SVETLANA LEONT'YEVNA, graduate student, Far-Eastern Polytechnic Institute

[Abstract] A method of automating the design of nonlinear automatic control systems which includes analysis as well as synthesis, namely continuous evolutionary parametric structural synthesis. The latter proceeds in four stages. In the first stage every free motion of the system is stabilized and expedient realizable means of nonlinear correction are determined. In the second stage these nonlinear correctors are parametrically synthesized on the basis of transient performance as criterion, in the third stage the necessary accuracy of forced motion under standard conditions is ensured through complementation of the structure with additional nonlinear elements and couplings. In the fourth stage the structure and the characteristics of the correctors are finally refined taking into account possible parasitic nonlinearities. This method of synthesis is demonstrated on a switch-type (discontinuous) corrector representing a large class of such devices, all reducible to six basic variants. The complex equation describing the frequency criterion of stability is transformed to a system of two real equations, whereupon the coefficients of harmonic linearization as well as the frequency at the desired stability limit and the corresponding generalized corrector performance parameter (angular interval of nonlinear signal distortion) are calculated. These calculations have been programmed in ALGOL-60 for an M-222 computer, using the R00651 program for solving systems on nonlinear equations. In a typical application, the quasi-relay mode of correction is found to be optimum in terms of smallest phase shift at highest frequency. Figures 1; tables 2; references: 2 Russian.
[37-2415]

UDC 621.3.078

IDENTIFICATION OF ACTING CONTROL OBJECTS

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian
No 5, May 82 (manuscript received 25 Mar 81) pp 580-585

KALOYANOV, GRUD DIKOV, senior instructor, Bulgarian Chemico-Technological Institute (Bulgaria), and PLYUTTO, VICTOR PAVLOVICH, candidate of technical sciences, docent, Moscow Chemico-Technological Institute

[Abstract] One of the most expedient methods of identifying control objects for the purpose of optimizing the regulator adjustment parameters is to determine the period of natural oscillations and the critical gain in the closed-loop automatic control system with a proportional regulator as well as the net delay time in an open loop system. The process dynamics in this "improved method of undamped oscillations" can be described by the transfer function

$$W(p) = \frac{K_q}{p^q(Tp+1)} e^{-p\tau}$$

with three degrees of freedom (K - gain, T - time constant, τ - delay time, q = 1,0,-1). With additional a priori information available, the object can be approximated with more intricate mathematical models such as

$$W(p) = \frac{K_q}{p^q(Tp+1)^n} e^{-p\tau}$$

in the case of n noninteracting capacitances with almost equal time constants. This transfer function can, and must be replaced for identification with the more general one $W(p) = \frac{1}{(Tp)^{\sim}} e^{-p\tau}$ when $\sim$ is an integer or $\sim = 1/2$. For identification of the object, the automatic control system is driven to its stability limit. The identification algorithm covers a large class of objects, with or without a priori information about q and n. The next step is to calculate the amplitude-phase characteristic of the object and its slope with respect to the real negative axis in the complex plane of the fundamental model. This method should be useful to the petrochemical and oil processing industry, where 35% of all automatic control systems scheduled for installation do not function properly, and 14% of these are caused by difficulties in determining the adjustment parameters. Figures 4; tables 2; references 4: 2 Russian, 1 Polish (in translation), 1 Western (in translation).
[54-2415]

UDC 621.316.729.01

INVESTIGATION BY MODELLING METHOD OF EFFECTS OF INERTIA ON CAPTURE BANDWIDTH IN PHASE AUTOMATIC FREQUENCY CONTROL LOOP WITH PROPORTIONAL--INTEGRATION FILTER

Kiev IZVESTIYA VYSSHIKH UCHEBNY KH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 25, No 9, Sep 82 (manuscript received 24 Mar 81, after revision 8 Feb 82)
pp 92-93

RUSSKIKH, N. P.

[Abstract] The author notes that determination of the captive bandwidth in a phase automatic frequency control (PAFC) is connected with considerable analytical difficulty. This increases with enlargement of the system order. No calculating formula exists for determination of the capture bandwidth in a PAFC, even with the simplest filters and allowance made for inertia in its loop. Consequently, it is advisable to use modelling in order to determine the capture bandwidth and the effect of the system parameters on its magnitude. The present brief communication gives the results of an investigation of the capture bandwidth in a PAFC of the third order, with a proportional-integrating filter. The results are obtained by modelling on a digital unit. A block diagram of the digital model is presented and its make up described. The communication concludes that the results of modelling have a significant value during planning and can be used as reference material for introduction of limitations on the permissible inertia units entering into the PAFC loop or for determining the capture bandwidth in a PAFC loop of the third order. References: 2 Russian.
[25-6415]

UDC 681.513.2

SELECTION AND ANALYSIS OF METHOD OF DESIGNING INVARIANT SYSTEM FOR DIRECT DIGITAL CONTROL OF DYNAMIC OBJECTS

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian
No 7, Jul 82 (manuscript received 2 Jun 82) pp 806-811

ZHUKOVSKIY, VLADIMIR GRIGOR'YEVICH, candidate of technical sciences, docent, YEVCHENKO, ALEKSANDR IVANOVICH, section head, and BYKADOROV, IGOR' NIKOLAYEVICH, engineer, All from Public Design Engineering Office "Orbita" at Novocherkassk Polytechnic Institute

[Abstract] Discrete control of dynamic objects by a system maximally invariant with respect to continuous perturbation can be achieved through partial compensation of the perturbation by means of piecewise-constant stepwise control. Here an algorithm of compensation is constructed which yields an approximate realization of the discrete component of the control system so as to ensure invariance over the entire control range, i.e., absolute invariance according to the "minimum mean-square error" criterion. The algorithm involves ideal differentiation of the perturbation signal and calculation of transients. It is constructed to allow for lengthening the control period and thus reducing the load on the digital computer. Figures 3; references: 4 Russian.
[37-2415]

UDC 621.365.535.001.4

COMPUTER-AIDED (ISKRA-124 KEYBOARD COMPUTER) DESIGN OF HIGH-FREQUENCY SELF-EXCITABLE OSCILLATORS FOR HEATING DIELECTRIC MATERIALS

Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 82 pp 33-35

VAYSFEL'D, E. G., engineer, All-Union Scientific Research Institute of High-Frequency Currents imeni V. P. Vologdin

[Abstract] The expressions for natural frequencies, transmission coefficient, and feedback factor of a self-excitable oscillator yield its feedback inductance, regulating capacitance, and plate capacitance. All these relations are written in a form suitable for design of such an oscillator on an ISKRA-124 keyboard computer, a slow machine which offers a high degree of input flexibility. The procedure is demonstrated on the design of VChD oscillators (typical model 3.5 kV - 81 MHz) for preheating plastic or other dielectric materials in various manufacturing processes. Such an oscillator features a capacitive transformation of voltage between plate and load. The main and first problem is to calculate the three natural frequencies, with load and standard circuit parameters given, which is done through stepwise discrete evaluation of the dimensionless amplitude-frequency characteristic. The sequence of operations is simple, calculations have been programmed, and a typical tabulation of data is shown. Use of the better ISKRA-125 computer should make it possible to greatly extend the scope of design and performance calculations. Tables 1; figures 4.
[38-2415]

UDC 533.951

NONLINEAR THEORY OF AMPLIFICATION OF ELECTROMAGNETIC WAVES BY ELECTRON BEAM PASSING THROUGH LAYERWISE NONHOMOGENEOUS PLASMA

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 25, No 6, Jun 82 (manuscript received 17 Aug 81, after completion 28 Jan 82)
pp 712-714

BALAKIREV, V. A., BUTS, V. A., OGNIVENKO, V. V. and TOLSTOLUZHSKIY, A. P.

[Abstract] A relativistic monoenergetic electron beam is considered which is propagating through a plasma whose density varies periodically along the axis of the cylindrical metal container in a strong external longitudinal magnetic field. The amplification of electromagnetic waves in this waveguide is calculated for the case of steady beam injection. From the wave equation describing the distribution of the longitudinal electric field component an equation is derived for the fundamental space harmonic, and the latter is supplemented with equations of motion for beam particles in Lagrangian variables. The resulting system of equations, linearizable in the case of small amplitudes only, is solved numerically for several arbitrary amplitudes of excitable oscillations. Figures 1; references: 7 Russian.
[55-2415]

UDC 535.36

LOW-FREQUENCY SCATTERING OF FLAT ELECTROMAGNETIC WAVE ON IDEAL CONDUCTING ELLIPTICAL DISK

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 25, No 4, Apr 82 (manuscript received 5 Nov 81) pp 470-472

MURATOV, R. Z.

[Abstract] The object of diffraction is an ideally conducting elliptical disk. Results are presented from computation of several terms of the low-frequency expansion for fields scattered upon incidence of a flat wave in free space upon the disk. The final equations for the field scattered by the elliptical disk

in the near zone are not included. It is noted that it is only expressed through the external potential factors of the elliptical disk, determined in a previous work. References 10: 6 Russian, 4 Western.
[39-6508]

UDC 538.574

PARAMETRIC MIXING OF ELECTROMAGNETIC WAVES IN SUPERLATTICES

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 25, No 6, Jun 82 (manuscript received 10 Apr 81) pp 702-707

ORLOV, L. K. and ROMANOV, Yu. A., Physico-Technical Scientific Research Institute at Gor'kiy University

[Abstract] Parametric mixing of electromagnetic waves of the type $n\omega_1 = \omega_3 - \omega_2$, $n = 2,4,\ldots$ (Here ω_1 = frequency of pumping wave, ω_2 = frequency of idle wave, ω_3 = frequency of signal wave) in a strongly nonlinear dissipative superlattice is analyzed. Such a superlattice constitutes a nonlinear active medium with certain electron vibrations within narrow minibands acting in the role of absorbed phonons. Departure from the Manly-Row relation is shown to result in an exponential signal buildup during the merger process ($\omega_3 = 2\omega_1 + \omega_2$) as well as during the decay process ($2\omega_1 = \omega_3 + \omega_2$). The analysis is based on Maxwell field equations describing the evolution in space of parametrically coupled waves. Calculations are made for a strong transverse pumping wave with the electric field vector parallel to the superlattice period propagating in the plane of superlattice layers. The results reveal that dissipative parametric instability and superheterodyning are the principal mechanisms of wave amplification. The maximum increments of gain are of the same order of magnitude in both processes and within the $\omega_1\tau$ = 1-10 range depend only slightly on the collision frequency τ^{-1}. Figures 4; references 12: 10 Russian, 2 Western.
[55-2415]

UDC 538.574.32

RADIATION FROM CHARGED FILAMENT AT MOVING DIFFUSE BOUNDARY BETWEEN TWO MEDIA

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 25, No 7, Jul 82 (manuscript received 23 Nov 81) pp 815-819

DAVYDOV, V. A. and KOLESOV, V. V., Moscow State University

[Abstract] Electromagnetic radiation is considered which filaments carrying electric charges emit in media with a dielectric permittivity $\varepsilon = \varepsilon_0 + \varepsilon_1(r,t)$, where $\varepsilon_1(r,t) \ll \varepsilon_0$ (r-radial coordinate, t-time) and where the perturbation $\varepsilon_1(r,t) = \Delta\varepsilon \frac{e^{\alpha(-vt)}}{1+e^{\alpha(z-vt)}}$ represents a plane diffuse boundary between two media

moving at velocity v in the positive z-direction (1/ - characteristic width of diffuseness zone). The intensity of this radiation is calculated according to perturbation theory, in the first order, for a filament first of infinite length and then of finite length carrying electric charge of linear density σ and inclined at angle β to the z-axis. The results reveal that, as the velocity of the boundary approaches infinity, the radiation intensity becomes inversely proportional to the velocity squared. As the length of the filament approaches zero, the radiation intensity becomes proportional to the length squared. Radiation from a finite filament is generated at arbitrarily low velocities of the boundary, as long as the latter passes through the beginning and the end of the filament. The authors thank B. M. Bolotovskiy for helpful discussion of the results. References: 4 Russian.
[56-2415]

UDC 621.318

SYNTHESIS OF ELECTROMAGNETIC FINITE-ACTION MECHANISMS

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 7, Jul 82 pp 827-834

LYUBCHIK, MIKHAIL ABRAMOVICH, doctor of technical sciences, docent, Khar'kov Polytechnic Institute

[Abstract] Synthesis and optimization of electromagnetic finite-action mechanisms are analyzed with regard to criteria, constraints, and performance parameters. The generalized optimization criterion is first broken down into optimization of variable factors, of controlling factors, and of execution (structure). The general principles are applied to a d.c. plunger-type electromagnet operating in the pulse mode from a storage capacitor through a switch. It is designed for minimum activation energy, minimum mass of active materials (copper, steel), and maximum impact energy upon closure. The corresponding equations of motion and dynamics are solved and the appropriate correction functions are calculated, assuming a tapered air gap. The generalized optimization problem is solved by the method of random search or by the method of steepest descent, the two contradictory criteria of minimum activation energy and minimum active material being reconciled by a tradeoff in the Pareto set. The prodedure has been programmed for a YeS-1022 Unified System computer, using standard subroutines. Figures 3; tables 1; references: 1 Russian.
[37-2415]

UDC 621.396.67

DETERMINATION OF AMPLITUDE-PHASE DISTRIBUTION OF CURRENT ON FLAT SURFACE FROM EXPERIMENTAL ELECTROMAGNETIC FIELD MEASUREMENTS

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 25, No 4, Apr 82 (manuscript received 24 Mar 81) pp 440-446

KOROTKOV, V. S., Scientific Research Radio Physical Institute

[Abstract] A study is made of the restoration of amplitude-phase distribution of current on a flat surface based on the results of measurement of amplitude and phase of the electrical component of the near order field on an arbitrary scanning surface in the wave zone. The solution is based on the use of the Lorenz lemma. The results of mathematical modeling are presented in tables and graphs. The methodologic error of holographic methods of restoration of currents in elementary equidistant antenna arrays can be reduced to less than 0.5% in both amplitude and phase. The author thanks N. M. Tseytlin and V. I. Turchin for discussion of the results of the work and for helpful counsels. Figures 2; tables 5; references: 6 Russian.
[39-6508]

UDC 537.533.3

POSSIBILITY OF INCREASING BEAM COMPRESSION IN ELECTRON-OPTICAL SYSTEM WITH CENTRIFUGAL FOCUSING

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 7, Jul 82
(manuscript received 15 Apr 81) pp 1408-1412

DROZDOVA, N. V. and LEBEDEV, S. V.

[Abstract] Electrostatic focusing and the forming of an electron beam with the aid of an exterior magnetic field are considered. Calculations are made to show that optimization of the geometry of transitory fields make it possible to improve the parameters of a beam and to increase the beam compression. Because the perveance of the beam is sufficiently large, then without an exterior magnetic field the noncompensated beam is considerably enlarged after crossover. Insertion of a beam into the magnetic field makes it possible to maintain the required size of the beam and to transfer it to considerable distances and in addition when necessary to accelerate it. The authors thank V. P. Il'in whose program (KSI-BESM-6) was used in all the calculations presented. Figures 4; references: 7 Russian.
[28-6415]

UDC 537.533.3

ESTIMATE OF INFLUENCE OF UNEVENNESS OF CURRENT-DRAWING FROM CATHODE ON LIFE TIME OF SYSTEMS WITH CENTRIFUGAL-ELECTROSTATIC FOCUSING

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 7, Jul 82
(manuscript received 7 Apr 81) pp 1448-1450

BERNASHEVSKIY, G. A. and FAYKIN, V. V.

[Abstract] The authors note that a distinctive feature of many electron-optical systems with centrifugal-electrostatic focusing (CEF) is the unevenness of withdrawal of current from the surface of the cathode. In a system with CEF the trajectory of the electrons is curvilinear, and if this curvature exists in the immediate proximity of the emitting surface of the cathode, then the current

density withdrawn from a cathode operating in a space charge regime inevitably must change with respect to the surface of the cathode. The present brief communication is concerned with an evaluation of the effect on the unevenness of current which is withdrawn from the cathode on the life time of a thermocathode in a system with CEF. The evaluation was conducted with the condition that the life time of a thermocathode is determined only by its operating temperature. Figures 3; references 6: 5 Russian, 1 Western.
[28-6415]

UDC 537.533.33:519.68

AUTOMATION OF ANALYTIC ELECTRON OPTIC LENS ABERRATION CALCULATION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82
(manuscript received 8 Sep 80) pp 1602-1605

NARYLKOV, S. G. and LYUBCHIK, Ya. G.

[Abstract] The appearance of so-called algebraic programming languages has lead to the development of analytic methods in nonlinear mechanics, quantum field theory and other areas. As a test problem the task of calculating geometric aberration coefficients of a two-dimensional magnetic quadrupole by the Shertser method is studied, using the language ANALITIK and a MIR-2 computer. The text of the program is presented in an appendix. The ANALITIK language is convenient for analytic calculation of aberrational problems in electronic optics. The authors of the language attempted to create a language close to the formalism of mathematical analysis. References 35: 19 Russian, 16 Nonrussian.
[32-6508]

UDC 621.382.3

NEGATRON WITH N-SHAPED VOLT-AMPERE CHARACTERISTIC

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82
(manuscript received 23 Jun 80) pp 1631-1634

GALUZO, V. Ye. and MATSON, E. A.

[Abstract] A negatron with N-shaped VAC is suggested, based on field-effect transistors, one of which operates with direct bias of the p-n gate junction. The operating principle of the negatron is as follows. At a certain positive voltage, shifting the p-n gate junction of the transistor forward, a current passes through its gate which is directly coupled to the voltage across the gate and the resistance of the channel of a second transistor. At zero output voltage the p-n gate junction of the second transistor is shifted forward and

the gate current passes through it, causing negative current to appear at the output. As the output voltage increases, the gate current of the second transistor decreases, the sink current of the first transistor increases and at a certain value of output voltage the sign of the current at the output of the negatron changes. Further increases in output voltage cause an increase in output current to its maximum, defined by the voltage across the gate of the first transistor. Then, because of the positive feedback circuit through the second transistor the increase in output voltage leads to a decrease in gate current and voltage across the gate of the first transistor to zero, decreasing the output current of the negatron to a certain minimum value. Mathematical expressions are presented describing the VAC of the negatron. Figures 4; references: 5 Russian.
[32-6508]

UDC 621.385.63.01

THEORETICAL ANALYSIS OF AMPLIFICATION OF WIDEBAND PULSES IN TRAVELING-WAVE TUBES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82
(manuscript received 25 Jun 81) pp 1582-1587

LAZERSON, A. G., MAN'KIN, I. A. and SHKOL'NIKOV, V. G.

[Abstract] Very short microwave pulses are amplified in traveling-wave tubes (TWT). Theoretical analysis is based either on generalization of the known nonlinear TWT equations for narrow-band signals or calculation of the pulse spectra based on their assigned amplitudes and phase envelopes. Orderly analysis of the processes by which the electron flow interacts with the traveling wave for short pulses is possible only using the unsteady theory of TWT. In the present work this theory is used in order to study the amplification of short pulses in linear and nonlinear modes, and to analyze the change of the interaction of their shape and spectrum over length. Numerical calculations are based on the equations of the unsteady theory of traveling-wave tubes which does not consider the influence of the forces of the space charge. The total length of an amplified radio pulse is significantly greater than that of the initial pulse. A video pulse is transformed to a radio pulse with a quasi-periodic carrier. The total length of a video pulse is increased because of transient processes at the edges, while the center portion is somewhat constricted. The development and decay of steady oscillations in the pulse occurs more slowly in the nonlinear mode than in the linear mode. Figures 6; references 10: 9 Russian, 1 Western.
[32-6508]

UDC 53.08(18

CONTACTLESS MOTION SENSOR

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82 (manuscript received after completion 9 Nov 81) pp 87-88

KHARITONOV, V. V., VOYTENKO, A. G., IVANOV, V. Ye. and SMOLENCHUK, V. S.

[Abstract] The Physics Department of the Belorussian Institute of Railroad Transport Engineers has developed contactless motion sensors for use in the manufacture of a magnetic weighing platform. The sensors consist of a parallel oscillating circuit and an electronic device. The input of the motion sensor receives an alternating 1 MHz voltage at constant amplitude. The object tested must have ferromagnetic properties or a ferromagnetic shield. As the object comes closer to the coil, the circuit is detuned and the voltage drop across it decreases. The voltage taken from the circuit is fed through a separating condenser to a detector consisting of two diodes. The output stage is an emitter follower transistor. Characteristics of the device and a schematic diagram are presented. Figures 5; references: 2 Russian.
[40-6508]

UDC 534-8.001.4

POWER SUPPLIED FOR ULTRASONIC ELECTROTECHNOLOGICAL EQUIPMENT

Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 82 (manuscript received 25 Dec 81) pp 59-61

PETUSHKO, I. V., engineer, and KORICHEV, A. A., engineer, All-Union Scientific Research Institute of High-Frequency Currents imeni V. P. Vologdin

[Abstract] A line of power supplies for technological ultrasonic equipment has been developed which includes 13 models with power ratings from 40W to 25 kW. Their operating frequencies are 22±1.65 kHz (40, 250, 400, 1600 W), 18±1.65 kHz (1000 W), dual 22±1.65 and 18±1.35 kHz (2-100 W, 400, 630 W, 10, 25 kW), 16±0.5 kHz (25 kW), variable 16.65-23.65 kHz (1600 W). Each model (except the 25 kW - 16kHz) is a transistorized ultrasonic generator with separate excitation,

consisting essentially of a multivibrator, a tuned voltage amplifier and a class B bridge or half-bridge power amplifier. The 25 kW - 16 kHz model contains a rotating intermediate 50/8000 Hz frequency converter. Six models have automatic frequency control by the conventional looking method, four models have both automatic frequency control and automatic gain control, three models have none. Automatic gain control is achieved by regulation of a variable attenuator through a mismatch signal amplifier with feedback from the generator output through a differential transformer - detector - integrator - comparator loop, or through a thyristor rectifier. The ultrasonic generators are designed to supply piezoceramic transducers (3 models) or magnetostrictive transducers (10 models). Output power is regulated either smoothly or stepwise. Smaller models operate with natural air cooling, larger models operate with forced air cooling, the 25 kW-16kHz model operates with forced water cooling. All models have electronic devices for overload protection. Figures 4; tables 1; references: 2 Russian. [38-2415]

UDC 62-83

DIGITAL CONTROL OF THYRISTOR-DRIVEN MOTOR THROUGH MICROCOMPUTER

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 6, Jun 82 (manuscript received 29 Sep 81) pp 676-685

IVANOVA, MARIANNA IGOREVNA, project engineer, RASKIN, LEV YAKOVLEVICH, candidate of technical sciences, chief of laboratory, BERNSHTEYN, ALEKSANDR YAKOVLEVICH, candidate of technical sciences, chief of laboratory, and SVETOV, FELIKS BORISOVICH, chief engineer, all from All-Union Scientific Research Institute of Electromechanics

[Abstract] The most promising trend in thyristor converters for electric drives with control through a microcomputer is toward use of standard hardware and software, rather than toward special-purpose controllers with large-scale integration of microprocessor assemblies. Especially promising is direct conversion of 3-phase currents, instead of conversion through rectifier-inverter banks, because of higher running efficiency and better starting performance, as well as better utilization of diodes. Control is effected along two channels, a line-frequency channel and a motor-speed (frequency) channel. The microcomputer shifts the phases of line-frequency firing pulses, distributes pulses over line-frequency diode groups, calculates the regulating action in the current loop, sets the speed of rotation and calculates the speed of rotation, determines and adjusts the advance angle with correction according to the load current, distributes pulses over motor-frequency diode groups, and calculates the regulating action in the motor-speed loop. Such a system of control has been realized in digital form, in order to ensure the highest possible response speed. It is built with Soviet-made standard V7-type control computer microequipment including two timers with a total of six counters, five of them accessible to the user, and an analog-to-digital converter. The software consists of seven programs: one main program (1140 μs) and six interrupt programs. The latter include

one for switching the system on and off (level 0) and level-2 (80 μs), level-3 (140 μs), level-4 (140 μs), level-5 (210 μs), level-6 (1170 μs) programs, level 1 not being accessible to the user. The entire system was tested experimentally on an 8 kW motor running at a nominal speed of 3000 rpm on 230 V supplied by a synchronous generator. Figures 8; references: 3 Russian.
[53-2415]

UDC 62-506.2

DATA PREPROCESSOR IN TECHNICAL VISION SYSTEM

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 9, Sep 82 pp 39-40

DVOROVKIN, V. Ye., engineer, and PANKOV, V. A., engineer

[Abstract] The most informative type of sensitizer for an industrial robot, capable of identifying objects as well as their position and orientation within the work area, are technical vision systems. Television systems for this application are now designed with either semiconductor photodiode arrays or charge-coupled diode arrays. In a field containing only a few objects without overlap, shadows and flashes, such technical vision systems can operate in the binary mode. A device has been developed for binary preprocessing of visual data from a 16 x 16 photodiode array, one which extracts data for calculating the coordinates of the geometric center of silhouettes with two axes of symmetry. It includes, in addition to the photodiode array, a control module, a buffer module, an abscissa determinator and an ordinate determinator. The control module generates "erase" pulses which set the photodiode array ready for recording a silhouette. The photodiode array feeds signals to a 16-channel 1-digit analog-to-digital converter synchronized by delay pulses tracking each address pulse, from there to a buffer register made of D-triggers and then to a multiplexer which also receives signals directly from a 16-digit counter in the control module. The multiplexer and the control module feed signals to registers of initial and final abscissas with memories for storing codes of minimum and maximum abscissas respectively and to registers of initial and final ordinates with memories for storing codes of maximum and minimum ordinates respectively. An averaging algorithm is available for determining the geometric center of asymmetric objects. This preprocessor has been built with series 155 microcircuits, also using series 198 and 521 components for control of the photodiode array. It operates together with the robot's control processor. Figures 1.
[51-2415]

UDC 621.31.3.029.5

RAISING TECHNOLOGICAL LEVEL OF PRODUCTION OF HIGH-FREQUENCY EQUIPMENT

Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 82 (manuscript received 25 Dec 81) pp 62-63

SHUKKEL', Yu. F., engineer, and KUSHCH, E. V., candidate of technical sciences, All-Union Scientific Research Institute of High-Frequency Currents imeni V.P. Vologdin

[Abstract] The technological level of production of high-frequency equipment, specifically induction heaters, has been rising during the 10th Five-Year Plan period and will continue rising during the 11th. This will involve re-equipping of almost all manufacturing plants for a higher degree of mechanization and automation, including programmed digital control and use of industrial robots, in order to ensure larger and better production of general-purpose and special-purpose components, implementation of new methods of treatment (heating, coating) and joining (soldering), as well as installation of inspection and test stands for more efficient and economical quality control. Concurrent scientific research activities will focus on development and application of new dielectric materials, optimization of inductor lining, new technology of decorating and electrically shielding plastic surfaces, replacement of silver solder with other solder powders and pastes, and ways to economize the use of nonferrous metals generally. [38-2415]

UDC 621.3.038.615:621.313.3

ENERGY CONVERSION IN ELECTROMAGNETIC BEARING

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 6, Jun 82 (29 Sep 81) pp 722-726

VEYNBERG, DMITRIY MOISEYEVICH, candidate of technical sciences, VERESHCHAGIN, VLADIMIR PETROVICH, candidate of technical sciences, and OB"YEDKOV, SERGEY IVANOVICH, engineer

[Abstract] Performance of an electromagnetic radial bearing, where an array of electromagnets surrounding the journal supports and controls the rotor in two degrees of freedom, is considered from the standpoint of energy conversion. Analysis by calculus of variations reveals that, with a given energy input, the maximum centering force in any direction necessary is attained by means of a piecewise-uniform electric loading (current distribution around the journal). Further calculations reveal that the necessary centering force can be produced with minimum electromagnet mass and energy input when the current distribution is four-sectoral. The average efficacy is highest with 90^{o} current sectors and optimum bearing control is achievable through regulation of the current in each sector. Figures 5; references 5: 3 Russian, 2 Western. [53-2415]

UDC 621.311.4:621.33

RESULTS OF AND OUTLOOK FOR IMPROVEMENT AND DEVELOPMENT OF ELECTRIC TRACTION MOTORS

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA
in Russian No 6, Jun 82 (manuscript received 26 Mar 82) pp 636-650

BOCHAROV, VASILIY IVANOVICH, candidate of technical sciences, senior scientific associate, deputy director, VELNII (probably All-Union Scientific Research Institute of Electrical Engineering)

[Abstract] Development and improvements of electric railroad motors in the past 35 years are reviewed from the standpoint of both design and performance. Traditional preferential use of rotating machines has always been justified by their many advantages and the compatibility of this construction with the wheel. The two basic types of these motors are those operating with continuous direct current and those operating with pulse current. A recent addition are linear counterparts: induction, inductor, and synchronous motors, the first two types in either single-sided or double-sided version. Improvements in the design of linear motors have been stimulated by availability of magnets with superconductor field windings and their possible use for both traction and suspension. The ultimate targets of further development of linear motors should be in the area of cost effectiveness, to be achieved by higher efficiencies (especially in the case of induction motors), minimization of mass and of edge effects, maximization of thrust with minimum attendant lateral forces, and high-efficiency cooling systems. Development of rotating motors should also continue, to meet modern railroad performance requirements, the main target being reduction of the volume-to-power (D_a^2L/kW) ratio. Tables 2; references 13: 12 Russian, 1 Western (in translation).
[53-2415]

UDC 621.313.333

AUTOMATION OF DRAFTING AND ENGINEERING WORK IN DESIGN OF INDUCTION MOTORS

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA
In Russian No 6, Jun 82 (manuscript received 29 Sep 81) pp 661-666

AYNBINDER, VLADIMIR ZEL'MANOVICH, candidate of technical sciences, senior scientific associate, All-Union Scientific Research Institute of Electromechanics

[Abstract] Engineering and drafting work for design of induction motors has been atuomated to the extent that technological and performance requirements as well as esthetic considerations and standardization can be satisfied. The process consists essentially of two stages: design of overall configuration and production of detailed drawings. The two goals are achieved through solution of the corresponding optimization problem as programmed for a YeS (Unified

System) on-line computer with alphanumeric display and graph plotter operating in dialog with the engineer. The products of this operation are prints of the general motor outline, of all motor components and subassemblies, all appearing with necessary dimensions and identifying parameters. Figures 2; references: 2 Russian.
[53-2415]

UDC 621.365.5.011.3:518.5

INDUCTANCE OF AIR GAPS IN PLANE-PARALLEL SYSTEMS OF CONDUCTORS AND MASSIVE BODIES

Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 82 (manuscript received 25 Dec 81) pp 19-23

PAVLOV, N. A., candidate of technical sciences, and PRONIN, A. M., engineer, All-Union Scientific Research Institute of High-Frequency Currents imeni V. P. Vologdin

[Abstract] For purposes of design based on mathematical simulation, one assumes a plane-parallel electromagnetic field in devices such as induction heaters for bodies with plane surfaces, current conductors for high-frequency welding, and even in cylinders of large diameter far away from the axis of symmetry. Here a mathematical model is constructed on the basis of a new concept: inductance of the air gap between conductors. Relations for magnetic flux and magnetomotive force are derived from the vector potential of the magnetic field, in accordance with Kirchhoff's both circuit laws, for subsequent calculation of the current density. For illustration, the method is applied first to a thin infinitely large conducting plate with surface resistance of 10^{-4} ohm per unit square area, then to an inductively coupled array of thin ribbon conductors in slots of a magnet structure separated by a massive ferromagnetic body. The algorithms are contained in the LUKS (sic) program (Induktivnost' L Universalnaya Kompleksnaya Zazora) written in FORTRAN for a YeS-1022 Unified System computer. The input data are current frequency, geometrical dimensions and relative arrangement of bodies, inductor voltages, electrical resistivity and magnetic permeability of materials of heated bodies as well as the field dependence of magnetic permeability. The problem is solved by discretization with subsequent formulation and evaluation of the inductance matrix. The output data are currents and power components (active, reactive), distributions of magnetic field and internal sources, power factor and efficiency. Figures 6; references: 3 Russian.
[38-2415]

UDC 621.365.63

CHARACTERISTICS OF END EFFECT IN INDUCTIVELY HEATED NONMAGNETIC HOLLOW CYLINDERS

Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 82 (manuscript received 25 Dec 81) pp 14-16

NEMKOV, V. S., doctor of technical sciences, DEMIDOVICH, V. B., candidate of technical sciences, NIKITIN, S. I., engineer, and ZAYTSEVA, I. A., en ineer, All-Union Scientific Research Institute of High-Frequency Currents imeni V. P. Vologdin

[Abstract] The end effect in a cylindrical inductor-load system for high-frequency heating of nonmagnetic ingots is analyzed, assuming a semiinfinite hollow cylinder with uniform longitudinal distribution of properties in a uniform electromagnetic field. The corresponding equations are solved for current density and power density, and for their distributions over the cylinder length, taking into account the skin effect as well as the effect of finite cylinder length at one end. The ratio of current density at ingot edge to current density at ingot surface far from the edge, the ratio of surface power density at ingot edge to surface power density far from the ingot edge, and the total power increment to compensate for the end effect are three lumped parameters in the problem, while surface or volume power density and current density are distributed parameters. The problem is solved numerically and experimentally. The results yield a dimensionless coefficient characterizing the effective increase of cylinder length equivalent to the end effect, as well as the dependence of this equivalent length increase on the ratio of outside cylinder radius to field penetration depth and on the cylinder wall thickness. A comparison of calculations and measurements with a search coil reveals a discrepancy not exceeding 3-4% at 1.3-18.6 ratios of outside radius to penetration depth. Figures 7; references 7: 6 Russian, 1 Western.
[38-2415]

UDC 621.396.2

DESIGN OF FUNCTIONAL UNITS OF RADIO ELECTRONIC EQUIPMENT WITH OPTIMUM CHOICE OF INSPECTION DEPTH AND NUMBER OF INTERBLOCK CONNECTIONS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 9, Sep 82 (manuscript received 7 Apr 81, after revision 30 Oct 81) pp 90-92

MARTYNENKO, O. N.

[Abstract] The author notes that among the methods of increasing the reliability and effectiveness of functioning of radio electronics equipment (REE) is technical diagnostics. Consequently, at the stage of technical planning of REE,

it is advisable to take into account the requirements of diagnostics. The present brief communication gives a joint solution of the problem of choice of functional blocks (FB) with allowance made for restoration strategy and the problems of arrangement of the FB. Restoration of REE ordinarily is accomplished by restoration of the failed FB. The level of the FB selected determines the inspection depth (the depth of localization of defects) which in turn affects the cost of the necessary inspection-measuring equipment and the degree of replacement. References: 6 Russian.
[25-6415]

UDC 537.8:62-791-2

MEASUREMENT OF ELECTRICAL FIELD OF CONDUCTION CURRENT IN LOW FREQUENCY BAND (SURVEY)

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 7, Jul 82 (manuscript received 9 Jul 80) pp 1249-1267

KOCHANOV, E. S. and ZIMIN, Ye. F.

[Abstract] The paper establishes the level of development of contemporary means for measurement of an alternating electrical field in a conducting medium and identifies the most promising means. The following points are considered: 1) Classification of primary converters; 2) Electrode primary converters; 3) Noncontact electrostatic primary converters; 4) Transformer transducers; 5) Optimization of electrical systems; and 6) Optimum agreement with respect to noise. The authors conclude that an alternating electrical field in a conducting medium can be completely determined. This is done by measurement of three components of the field intensity or the density of the conduction current. It is advisable to use electrode and transformer transducers as the primary converters of electrical devices. Transformer transducers with conducting thickness and dielectric shields are considered the most promising of them. Figures 9; tables 2; references 49: 38 Russian, 11 Western (3 in translation).
[28-6415]

UDC 621.317.76

CHARACTERISTICS OF RECIRCULATION TYPE SPECTRUM ANALYZER USING CHARGE TRANSFER DEVICES

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 9, Sep 82 (manuscript received 28 Jul 81) pp 51-64

BALYAKIN, I. A., YEGOROV, Yu. M. and RODZIVILOV, V. A.

[Abstract] A special feature of recirculation spectrum analyzers (RSA) is that with a comparatively small number of analysis channels ($\leq 40 \div 50$), they are simpler in comparison with digital devices realized on the basis of algorithms

of fast Fourier transforms, as well as in comparison with analogs. A functional diagram of a RSA is presented and its various parts are described. One of the basic units of the RSA is the immediate-access memory (IAM). It is shown that in those cases when it is necessary to obtain minimum dimensions, mass, and the power requirement of the equipment, use of discrete analog elements such as charge transfer devices (CTD) can prove to be more effective. Use of the CTD, as the results of investigation show, leads to a change in the characteristics of the spectrum analyzer (limitation of the band of the frequency analyzed, deterioration of resolution, appearance of systematic error in determination of frequency) which must be considered during planning of such devices. The effects of the parameters of a CTD on the characteristics mentioned above is considered. An analysis of the results obtained shows that use of CTD delay lines as an IAM in recirculation type spectrum analyzers leads to a change in the characteristics of the device. These affects limit the area of use of the delay lines on the devices with charge transfer and must be taken into account during a choice of the CTD elementary base in spectroanalyzers of the type considered. Figures 5; references 5: 2 Russian, 3 Western in translation. [25-6415]

UDC 621.396.67

ESTIMATING PARAMETERS OF MOTION IN FRESNEL ZONE

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 25, No 7, Jul 82 (manuscript received 14 Apr 81) pp 849-852

SHELUKHIN, O. I., Moscow Institute of Railroad Transportation Engineers

[Abstract] In some important situations the parameters of motion of a body can be measured only in the immediate vicinity of a reflecting surface. Here the accuracy of such measurements is estimated, assuming an instrument located within the Fresnel zone. The field intensity at the receiver $E(V,a,t)$ (V,a - velocity and acceleration of transmitter-receiver antenna set, t - time) is calculated, also the dispersion of its estimates based on presence of additive Gaussian noise $n(t)$ with spectral density $S(\omega)$ and correlation function $K(\tau)$ at the receiver. The results are referred to those for an optimum instrument. Uniform motion of the measuring instrument is found to introduce an additional field intensity component proportional to $e^{-ja_2V^2t^2}$, which increases the dispersion of velocity estimates. References: 5 Russian. [56-2415]

UDC 681.7.068:535.417

ELIMINATION OF FIBER OPTICAL INTERFEROMETER PHASE INSTABILITIES

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 25, No 8, Aug 82 (manuscript received 20 Apr 81) pp 76-78

ALIMOV, K. K., BUTUSOV, M. M., GULYAYEV, S. N. and SOLOV'EV, V. V.

[Abstract] A study is made of the possibility of eliminating the harmful influence of phase fluctuations in a waveguide-optical two-arm interferometer during recording of acoustical oscillations. The influence of forced pause modulation in the reference arm during measurement of one of the harmonics on a signal is studied. An interferometer was constructed in order to test the method experimentally. The results showed that forced low frequency modulation of the phase in the reference arm allows significant stabilization of the signal at the output of the fiber optic interferemeter. This significantly improves the accuracy of measurements. Figures 3; references: 4 Western.
[36-6508]

UDC 773.92:541.14

FACTORS AFFECTING PROPERTIES OF PHOTORESIST SOLUTIONS AND LAYERS BASED ON NAPHTHOCHINONDIAZIDES

Moscow ZHURNAL NAUCHNOY I PRIKLADNOY FOTOGRAFII I KINEMATOGRAFII in Russian
Vol 27, No 4, Jul-Aug 82 (manuscript received 10 Dec 81) pp 278-283

TREUSHNIKOV, V. M., ZELENOVA, V. V., MAKSIMOVA, L. I. and KOSTROVA, O. S.,
Gor'kiy State University imeni N. I. Lobachevskiy

[Abstract] An experimental study was made in order to determine which factors other than the composition of photoresist layers and solutions based on naphthochinon diazides affect their properties and to what extent. Measurements with a spectrophotometer and a microinterferometer were made using the FP-RN-7 positive photoresist as base material, the ratio of op ical density to layer thickness and changes in this ratio serving as an indicator of photoresist behavior. A polymer, 2,6-di-(4'-azidobenzal)-cyclohexane was added as tracer (solution of 40 mg diazide in 10 ml dimethyl formamide). Commercial grade of this photoresist was also diluted to a 5:2 ratio in various solvents (ethyl cellosolv, methyl acetate, xylol, dimethyl formamide, acetoacetic ester, butyl acetate, toluene, acetone) and the solutions as well as layers of the photoresist alone were exposed to light at three wavelengths (345, 385, 410 nm), the ratios of respective optical densities also serving as quality indicators. An analysis of photochemical reactions occurring and of their kinetics, characterized by development speed and time, suggests that the photosensitivity of these photoresist layers, inversely proportional to the energy exposure, depends on their thickness and state. The increment of sensitivity, at a constant

development time, is found not to depend on the layer thickness but to vary widely depending on the solvent. The properties of this photoresist in large volumes of solution are nonuniform and the instability of these solutions seems to be attributable to their splitting into regions with different properties. Whether this is caused by formation of lyotropic liquid crystals or dissipative spatial or other structures is not known and should be investigated. Figures 1; tables 3; references: 9 Russian.
[52-2415]

UDC 533.9.03;537.56

STEADY MICROWAVE DISCHARGE IN QUASI-OPTICAL RESONATOR

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 25, No 4, Apr 82 (manuscript received 15 Apr 81) pp 385-390

VIKHAREV, A. L., IVANOV, O. A., SEMENOV, V. Ye. and STEPANOV, A. N.,
Institute of Applied Physics, USSR Academy of Sciences

[Abstract] A study is made of a steady microwave discharge in helium in an open resonator in the millimeter wave band. The resonator is formed of 2 circular spherical mirrors of identical curvature 15 cm in diameter, radius of curvature 10 cm, distance between mirrors 19 cm. Mirror perforation was used in order to inject power from the magnetron into the resonator with the use of a horn and lens system. The mirror perforation consisted of a square grid of apertures 1.55 mm in radius, 4 mm separation, 260 apertures total. The experiments indicated that this is a promising method of producing a plasma. The authors express their appreciation to V. V. Gil'denburg for helpful discussion. Figures 5; refernnces 16: 14 Russian, 2 Western (1 non-Russian in translation).
[39-6508]

UDC 551.510.535:621.371.25

DEPENDENCE OF FIELD INTENSITY OF COMBINATION-FREQUENCY SIGNALS ON DISTANCE FROM HEATING UNIT

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 25, No 6, Jun 82 (manuscript received 10 Nov 81) pp 711-712

BUDILIN, A. V., KOTIK, D. S., MITYAKOV, S. N., POLYAKOV, S. V., RAPOPORT, V. O. and SAZONOV, Yu. A., Scientific Research Institute of Radiophysics

[Abstract] An experiment was performed in autumn of 1980 involving measurement of the intensity of a microwave field as a function of distance from a hot transmitter. The signal at the combination frequency of 1562.5 Hz was measured simultaneously at two points, one stationary at a fixed distance of 48 km and

one movable at distances of 80, 120, 150, 230, 350, 450, 550 km from the transmitter. The two points did not necessarily lie in the same horizontal plane and, therefore, measurements were made at times of day when the natural ionospheric current source had approximately the same configuration. The experimental points deviate somewhat freom the theoretical curve describing a normal wave with an attenuation coefficient of 22.6 mm (sic. kilometer?). Figures 1; references: 4 Russian.
[55-2415]

UDC 621.3.049.77.001.2

STUDY OF MICROELECTRONIC THERMAL LINES

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 25, No 8, Aug 82 (manuscript received 14 May 81, after revision 28 Sep 81)
pp 52-58

GAPONENKO, N. P.

[Abstract] A study is presented of the possibility for a broad range of thermal line designs of increasing the transfer thermal impedance, and the ratio of heating of thermally sensitive elements to the power of the heat source. Depending on the type of thermal channel insulation, there are three main classes of thermal lines: those with heat conducting substrates, heat insulating substrates and air insulation. Production of high values of transfer thermal resistance in thermal lines using a thermal insulating substrate is difficult because of the technological limitations on the width and thickness of the crystal. Modern techniques allow construction of thermal lines on thermal conducting and insulating substrates. The time constant of the thermal coupling should be increased by simultaneously changing the parameters of both the crystal and the thermal insulating layer. If the material of the heat conducting body has a low heat conductivity coefficient, difficulties arise in selecting materials for the heat insulating base. Calculation of the thermal processes in multilayer lines with low values of heat conductivity coefficient of the insulating layer and the thermal sensing elements near the top surface of the crystal can be reduced to determining the temperature field in a single layer medium with heterogeneous boundary conditions at one surface and homogeneous boundary conditions at the other. In hybrid and semiconductor lines it is possible to produce transfer thermal resistances from heat sources to heat sensing elements of about 500 kW. Figures 3; references 9: 8 Russian, 1 Western.
[36-6508]

UDC 621.317.365

THIN MAGNETIC FILM MICROWAVE POWER CONVERTER

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 25, No 8, Aug 82 (manuscript received 8 Jan 81, after revision 24 Dec 81)
pp 88-89

MIRONENKO, V. P.

[Abstract] Thin magnetic films differ favorably from semiconductor analogs in their speed, lack of thermal emf and high resistance to radiation background. Use of these films for flux power converters, however requires the solution of a number of additional problems. It is determined that the signal of the film is generally described by a sum of nine components, each of which consists of several groups of cofactors determined by the amplitude of the microwave components of the waveguide field, trigonometric functions relating the direction of the magnetic field to the axis of the film, components of the film's magnetic susceptibility tensor, phase relationships between components of the microwave field and other factors. The measurement formula was experimentally tested by studying the influence of individual components from the resultant signal on a test stand in whic measurements were performed at various angles. The structurally sensitive element of a waveguide converter is the magnetic film in the form of a narrow strip located in the cross section of the waveguide near its wide wall so that the long axis of the film is colinear with the h_x component of the microwave field and its small axis coincides with the OY axis of the waveguide, and the direction of the controlled magnetic field H_0. Figures 2; references: 3 Russian.
[36-6508]

UDC 621.317.784

LIMITING PARAMETERS OF GALVANOGYROMAGNETIC MICROWAVE POWER PULSE CONVERTERS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 25, No 8, Aug 82 (manuscript received 28 Aug 80, after completion 13 Jul 81)
pp 85-88

VUNTESMERI, V. S.

[Abstract] A study is made of the maximum permissible parameters of an arbitrary galvanogyromagnetic converter, a ferromagnetic film magnetized to saturation by a constant magnetic field applied in the plane of the film at an angle to the OX axis. If a portion of the film is acted upon by a variable magnetic field and an alternating current flows through the plane of the film the ferromagnetic film acts as a parametric detector, the variable parameter of which is the resistivity tensor which changes in proportion to the microwave magnetic film. Electromagnetic energy is dissipated in the film. The energy density

in the volume of the film is determined by both magnetic and electric losses. An experimental check was performed for a ferromagnetic film in a homogeneous microwave field in a resonator based on a strip transmission line. The microwave power dissipated in the film was determined by the change in its temperature. The maximum sensitivity of the converter is determined, related to the square root of the frequency band. The maximum of sensitivity of the converter at room temperature is on the order of $5 \cdot 10^{-9}$ W$\cdot$Hz$^{-0.5}$, which agrees well with the experimental data. Figures 2; references 5: 3 Russian, 2 Western.
[36-6508]

UDC 621.372.8

METHOD OF ANALYZING RADIATED WAVE TYPES IN COUPLED MICROSTRIP WAVEGUIDES WITH STRONG COUPLING

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 8, Aug 82 (manuscript received 13 Jan 81, after completion 11 Dec 81) pp 84-85

YERMOLOV, P. P.

[Abstract] Based on the existing theory of a single microstrip waveguide, a study is made of a method of analyzing the higher types of waves of coupled microstrip waveguides for the particular case of radiated wave types and the strong coupling of two balanced waveguides. The presence of a slot causes the propagation constants of synphase and antiphase waves to become similar and increases the period of spatial beating. Calculation of the equivalent impedance of the slot can be performed by the variational method among others. Figure 1; references: 3 Russian.
[36-6508]

UDC 621.372.8.001.24

PROJECTION SOLUTION OF DISPERSION PROBLEM IN RECTANGULAR WAVEGUIDES WITH COMPLEX DIELECTRIC FILLER

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82 (manuscript received 23 Oct 80; after correction 1 Oct 81) pp 1462-1466

MIRONENKO, I. G. and SHAPIRO, A. M.

[Abstract] A study is made of a rectangular waveguide, the cross section of which is partially filled with a dielectric structure consisting of a ferroelectric film applied to a substrate of ceramic dielectric. The thickness of the film is usually not over $5 \cdot 10^{-4} \lambda$, the thickness of the substrate not over 0.03 to 01λ. The waveguide dimensions are less than 0.5λ. The delay of the

c/v mode may still be greater than 1. The primary modes in the waveguide are quasi-LE_{10} and quasi-LM_{01}. The projection solution of the dispersion problem of various wave types in this waveguide is analyzed. The accuracy of the computed solutions is determined by comparing them to solutions computed for transverse waveguide configurations for which precise analytic solutions exist. For cases where there is no strict analytic solution accuracy was determined from the ralative change in calculated delay values with increasing basis function number. Figures 3; tables 2; references 10: 4 Russian, 6 Western.
[32-6508]

UDC 621.372.85

CALCULATION OF ELECTROMAGNETIC FIELDS AND CRITICAL FREQUENCIES FOR WAVEGUIDES OF COMPOUND CROSS SECTIONS

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 25, No 7, Jul 82 (manuscript received 6 Jul 81) pp 820-826

ZARGANO, G. F., LYAPIN, V. P., MIKHALEVSKIY, V. S. and SINYAVSKIY, G. P., Rostov-na-Donu State University

[Abstract] Waveguides with L-, II-, H-, T-, rectangular frame, and cruciform cross sections are widely used in microwave devices. Accurate calculation of the electromagnetic field intensities and the critical frequencies prior to construction of experimental prototypes greatly simplifies the design procedure. These calculations are usually made by the method of partial regions, but singularities at sharp edges cause a slow convergence of the solution. Here this deficiency is eliminated by approximating the field at a collacation line with a complete orthogonal set of functions each accounting for the singularity. This approach is demonstrated on an L-section waveguide. The cutoff frequencies for H-modes and for E-modes are calculated by the Galerkin method first for a half-plane and then for a rectangular leg, the boundary conditions being satisfied by Chebyshev polynomials and by Hegenbauer polynomials, respectively. The calculations have been programmed in ALGOL on a BESM-6 computer, also including the wave impedance and the Poynting vector. Typical numerical data are shown for L-section and T-section waveguides. Figures 5; tables 3; references 5: 2 Russian, 3 Western (2 in translation).
[56-2415]

UDC 621.372.852

SYNTHESIS OF MICROWAVE PHASE SHIFTERS BASED ON REACTIVE ELEMENTS IN A WAVEGUIDE

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 8, Aug 82 (manuscript received 20 Feb 81, after revision 17 Dec 81) pp 32-36

DUBROVKA, F. F. and KUPRIY, A. M.

[Abstract] The problem is solved of synthesis of waveguide phase shifters with practically constant phase shift. The solution is performed in the single wave approximation using the apparatus of the theory of matrices with the following limitations: the longitudinal dimensions of the phase shifting elements are small in comparison to the wavelength in the line and the interaction between elements on higher wave types is not considered. The essence of the solution of the synthesis problem is that the conditions of providing the required constant introduced phase shift and absence of reflections at the input of the phase shifter near the band of frequency determines the required variation of standardized conductances of phase shifting elements as a function of frequency. The actual phase shifting elements are then selected. The values of standardized conductivities of real phase shifting elements, the distance between them and the mean frequency band with the minmmum deviation from the required frequency dependence of conductivity are determined. The results of synthesis were experimentally confirmed on models of phase shifters using transverse metal plates as phase shifting elements. Good agreement between theoretical and experimental data was achieved. Figures 3; 4 tables; references 6: 5 Russian, 1 Western. [36-6508]

UDC 621.372.852.3:621.372.837.4

HIGH POWER SOLID-STATE MICROWAVE LIMITERS

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82 (manuscript received 21 Oct 81) pp 3-8

LEBEDEV, I. V., ALYBIN, V. G. and AKOPYAN, V. A.

[Abstract] One task of solid-state electronics is the creation of semiconductor limiters in order to protect the input circuits of microwave receivers from high power input signals. In some cases a power limiter may be simply a controlled breaker, the operation of which is synchronized with the transmitter microwave pulses. However, passive limiters are prefereble. Multiple diode breakers and limiters have now been developed which satisfy today's requirements. In the decimeter waveband these devices usually consist of large numbers of diodes connected in parallel in a coaxial line with large cross section. The use of a waveguide resonant grate is one successful implementation of the multiple diode protective device, providing uniform power distribution, wide bandwidth

and favorable heat dissipation conditions. Another protective device uses two inverted limiters connected in T-shaped branches and one or more limiters connected directly, the inverted limiters acting as valves which open when the power level increases but close at low received microwave power levels. It is now possible to increase the input power rating of controlled and self-controlled solid-state microwave limiters by one or two orders of magnitude. If transmitter power is particularly great, controlled solid-state preliminary protective stages should be combined with self-controlled output stages for final protection from signals not synchronized with the transmitter pulses. Figures 9; references 15: 9 Russian, 6 Western.
[40-6508]

UDC 621.374.5

MICROCIRCUIT DELAY LINE DESIGN PRINCIPLES

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82 (manuscript received 11 Nov 81) pp 79-82

BELIKOV, N. I.

[Abstract] The construction of delay lines in the microsecond range with planar leads for operation with microcircuits can be best performed by using delay lines with quasi-distributed parameters, consisting of low-frequency filter elements with inductive phase adjustment of signal distortions. This allows the creation of small delay lines by dense placement of electronic elements and utilization of the mutual induction between neightoring inductance coils. Techniques for manufacturang of a 10-element microcircuit delay line, including a number of risers in the mold, moisture protection and composition of elastic compound, are discussed. Figures 5; tables 3; references: 6 Russian.
[40-6508]

UDC 621.313.333

METHODS OF MEASURING TORQUE-SPEED CHARACTERISTICS OF INDUCTION MOTORS

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 5, May 82 (manuscript received 3 Jul 80, after completion 6 Apr 81) pp 524-531

AKIMOV, LEONID VLADIMIROVICH, candidate of technical sciences, docent, and LITVINOV, OLEG IVANOVICH, senior scientific associate, both from Khar'kov Polytechnic Institute; BORZYAK, YURIY GORDEYEVICH, chief engineer, KOLESNIK, ANATOLIY DMITRIYEVICH, engineer, and SOSNITSKIY, IVAN IOSIFOVICH, chief of research department, all from Special Design Office, "Ukrelekfromash" [Ukrainian Electrical Machine Manufacturing] Association, Khar'kov

[Abstract] The torque-speed characteristics of induction motors are now measured either by the static method with d.c. balancing machines or by the dynamic method with tachometer generator, accelerometer, or torque meter during acceleration. Both methods have certain deficiencies because of inherent limitations of measuring equipment and procedure. The quasi-static method is proposed, as a better one than both, featuring not only automatic speed control but also the possibility of holding and varying the acceleration over a wide range from positive to negative through zero (static point). The method has been proved out on 4AKh71V2, 4ABC100L 12/4, 4AKh80A4 motors in the "Ekspress" test stand, including a d.c. machine with built-in tachometer generator and a thyristor inverter. The results of measurements by this method are excellently reproducible, even within the anomalous ranges of the curve, and their reliability has been confirmed by dynamic braking of a separate-exicited d.c. motor. There is no velocity error, according to tachometer tests with dry friction. Transients at high accelerations add only a dynamic error torque at high slips (2-0.7) and also an electromagnetic error torque at low slipe (<0.7), the total deviation of dynamic characteristic from static characteristic increasing as the slip decreases and largely exceeding the dynamic mechanical error, but no significant harmonic torques appear. From the standpoint of permissible temperature drift, the duration of a quasi-static test cycle depends on the rate of temperature rise in the tested motor as well as on its stall characteristics and number of poles. Best results are obtained by starting the measurements at synchronous peed aand then continuing at a slow deceleration rate. Use of available balancing machines for quasi-static tests requires stiffening their load characteristic by means of closed-loop fast-response speed control,

automating the measurements, locking the dynamometer, minimizing fluctuations in the tachometer signal, automatically maintaining the supply voltage level, and adding an automatic XY-plotter. Figures 5; tables 2; references: 7 Russian.
[54-2415]

UDC 621.396.62:621.372.632

SELECTION OF HIGH-VOLTAGE CONVERTER AND MULTIPLIER PARAMETERS

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82 (manuscript received 29 Dec 81) pp 36-38

KAMENKOV, V. S.

[Abstract] Great attention is now being given to the problem of improving secondary power supplies and decreasing their mass and size. There is as yet no precise mathematical model of the operation of a voltage multiplier under load at high frequencies. Testing of a voltage converter and high voltage multiplier with a multiplication factor 3 to 10 was used to produce an equation describing output voltage as the function $f(w_2)$ at 20 KHz and 30 KHz. Analysis of the equations indicates that the maximum number of turns in the secondary winding of the transformer depends on the number of stages of multiplication and the conversion frequency. Figures are presented showing curves which can be used to select the optimal number of multiplier stages with fixed values of capacitance, frequency and output voltage. Figures 4; references: 5 Russian, 1 Western in translation.
[40-6508]

UDC 621.373.5:621.378.3

MUTUAL SYNCHRONIZATION OF INJECTION SEMICONDUCTOR LASERS UNDER MULTIMODE CONDITIONS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 25, No 8, Aug 82 (manuscript received 18 May 81) pp 43-51

BRATCHIKOV, A. N. and GRINEV, A. Yu.

[Abstract] Mutual synchronization of several injection semiconductor lasers is a practical implementation of the systems approach to the solution of the problem of increasing laser radiated power. Successful solution of the problem is particularly necessary for the practical application of continuous lasers producing low power levels. The self-oscillating system of mutually coupled multimode injection eemiconductor lasers studied in this work has two types of mutual coupling coefficients: 1) Nonlinear interaction mode coupling coefficients within each laser; and 2) External mutual coupling coefficients of the modes of different lasers. The work is primarily dedicated to solution of the problem of steady synchronization of a two-element array of multimode lasers interchanging electromagnetic fields considering the constant coefficients of internal nonlinear interconnection of modes in each laser for biharmonic and three-mode operating conditions. Using the results produced for any given operating condition of the lasers and specific arrangement of external mutual coupling, it is possible to solve the problem of stability or instability of the system. Figures 5; references 8: 7 Russian, 1 Western.
[36-6508]

UDC 621.378.525

NOISE CHARACTERISTICS OF REGENERATIVE LASER AMPLIFIER FOR SPACE-MODULATED SIGNAL

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 25, No 8, Aug 82 (manuscript received 23 Feb 81) pp 81-83

YENIN, V. I.

[Abstract] A study is made of a regenerative laser. The pulse response of the laser to coherent illumination is determined in order to calculate the noise parameters. The spectral sensitivity of the laser can be defined as the

spectral density of the quasi-point input signal in an assigned spatial band for which the signal-to-noise ratio at the output is equal to 1. The best sensitivity is achieved with high reflection coefficients of the output mirror in the area of the optical axis of the amplifier. The optimum value of reflection coefficient from the standpoint of the signal-to-noise ratio is not the optimum for signal amplitude. Figures 2; references: 2 Russian.
[36-6508]

UDC 621.396.6:621.3.019.34

METHOD OF PREDICTING LSI APPARATUS RELIABILITY

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82 (manuscript received after completion 2 Dec 81) pp 67-71

SMIRNOV, N. I. and SHIROKOV, V. B.

[Abstract] The use of hybrid LSI chips has reduced failure rates by several orders of magnitude, making traditional methods of determining failure rates ineffective, because failure rate testing must continue for several years in order to accumulate a sufficient number of failures. This requires prediction of reliability during the design stage. The use of the weakest link model is suitable only for discrete component apparatus. In recent years the causal approach to LSI circuit reliability estimation has been used. This article suggests a method based on the actual correlation of elements such as transistor p-n structures, diodes, capicators, diffusion resistors, film resistors, inductances and connections between elements for prediction of failure rates. This method is based on traditional calculation of failure rates for individual elements combined with analysis of LSI production technology quality, and therefore eliminates the cumbersome process of detailed causal analysis of LSI failures. Tables 2; references: 10 Russian.
[40-6508]

UDC 534-8:615.478.6

ULTRASONIC MEDICAL EQUIPMENT FOR USE IN SURGERY

Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 82 (manuscript received 25 Dec 81) pp 42-44

BABIKOV, O. I., doctor of technical sciences, All-Union Scientific Research Institute of High-Frequency Currents imeni V.P. Vologdin

[Abstract] A line of ultrasonic surgical equipment for treating, cutting or joining, soft biological tissue has been developed at the Institute of High-Frequency Currents during the past 5 years. The instrument (scalpel, saw, raspator) made of VT3-1 titanium alloy is attached to the narrow end of a conically or exponentially tapering transducer rod, which on the other side passes through a fastening membrane at its nodal section and beyond that through a set of TsTS-24 piezoceramic rings in the handle. The older models are UZUM-1 and UZUM-3, the newer models are UZUM-4 (40 W 22 kHz) for general surgery, traumatology, gynecology and obstetrics, and UZUM-5 (6 W - 44 kHz) for ophthalmology, respectively. The power rating is adjusted by means of the size of the piezoceramic rings. These sets have undergone thorough clinical testing in various general and special hospitals in Leningrad. Ultrasonic sterilizers for surgical instruments are also currently being developed at the Institute of High-Frequency Currents. Figures 3; references: 1 Russian. [38-2415]

UDC 535.42

LIGHT DIFFRACTION ON HARMONIC ACOUSTIC WAVE IN ISOTROPIC MEDIUM

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 7, Jul 82 (manuscript received 20 Mar 81) pp 1422-1425

PARYGIN, V. N., TANKOVSKIY, N. S., and CHIRKOV, L. Ye.

[Abstract] It is shown in the literature that as a rule during analysis of light diffraction on an ultrasonic wave, a preliminary simplification of the problem is made where it is assumed that the ratio of the wavelengths of light and sound $\lambda/\Lambda \ll 1$. In addition, because of the slowness of the change of

amplitude with respect to the coordinate is neglected. It is impossible within the limits of the solutions obtained to evaluate the permissability of these approximations, which considerably reduces the value of the solutions. The present brief communication obtains a solution of the problem of light diffraction on a harmonic acoustic wave without the above mentioned disregards, which makes it possible to evaluate the limits of applicability possessed by the earlier solutions, as well as to obtain new qualitative results connected with the asymmetry of the diffraction maximums and the presence of diffraction "backwards". Figures 1; references 4: 2 Russian, 2 Western.
[28-6415]

UDC 535.242.13

CONTROL OF ACOUSTIC BEAM POSITION BY PIEZOCONVERTER ARRAY PHASING

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 8, Aug 82 (manuscript received 28 Apr 81; after revision 16 Nov 81) pp 95-97

PUGOVKIN, A. V. and KRAKOVSKIY, V. A.

[Abstract] A method is suggested for designing acoustooptical modulators with phased piezoconverter arrays, with consideration given to the dimensions of an individual array element as well as the length of the entire array. The method is based on an expression for effective diffraction. The structure of the ultrasonic field created by the phased array of piezoconverters is analyzed. The results of the calculations were used to manufacture an acoustooptical modulator for the 500 to 1000 MHz band with an exciter system consisting of two slots phase-shifted relative to each other. Arrays with the phasing suggested are more effective than planar counterphase arrays because they have greater total interaction length, and are very simple to manufacture. Figures 3; references 6: 3 Russian, 3 Western.
[36-6508]

UDC 537.611.2

COLLINEAR SPIN WAVE SCATTERING IN A PLATE WITH ACOUSTIC PUMPING

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 7, Jul 82 (manuscript received 25 Feb 81) pp 1366-1372

POPKOV, A. F.

[Abstract] The paper theoretically investigates the special features of the propagation of straight line bulk magnetostatic waves, allowing for their multimode structure in a magnetic plate with acoustic pumping. The effects are investigated of stable parametric interaction of waves when the speed of acoustic waves is considerably smaller than the speed of spin waves. The method

of singular disturbances is used during calculations. It is shown that with the existence of acoustic pumping, magnetostatic waves can be converted with sufficient effectiveness into reflected or transmitted waves which have a shift of frequency and wave number. These conversions take place most intensively in the case of realization of conditions of inelastic scattering of the corresponding waves. In the case considered of propagation of bulk magnetostatic waves in a plate, conversion of two different modes is possible. During this, if the acoustic wave is uniform with respect to the thickness of the magnetic plate, then the modes of identical parity interact. If the acoustic wave is nonuniform with respect to thickness, then mutual conversion of the mode of different parities is also possible. These affects have a similarity with conversion of optical waveguide modes in dielectric photoelastic waves with acoustic pumping. The author thanks P. Ye. Zil'berman for helpful discussions of the work. Figures 2; refernccs 19: 13 Russian, 6 Western.
[28-6415]

UDC 539.2.01

EFFECT OF SMEARING OF ELECTROMAGNETIC AND SOUND WAVE VECTORS ON STIMULATED ACOUSTO-OPTICAL INTERACTION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 7, Jul 82
(manuscript received 17 Mar 81) pp 1420-1422

AYUKHANOV, R. A., GULYAYEV, Yu. V. and SHKERDIN, G. N.

[Abstract] A 1977 paper [1] of which G. N. Shkerdin (see above) was the principal author, theoretically considers a stimulated acoustic-optical (AO) phenomenon which originates during diffraction of a powerful electromagnetic wave (EMW) on an acoustic wave. It is shown that the amplitude AB in the process of AO-interaction can substantially change. In other works from the literature, in one of which G. N. Shkerdin is a coauthor, a stimulated AO-interaction is experimentally investigated in a nonstationary diffraction regime. In [1] during solution of a system of linked equations for the amplitude AB, the Stokes and anti-Stokes component of an EMW in an approximation of continuous pumping obtained an integral equation which in a stationary diffraction regime has the following form:

$$f(x,y) = 1 + a \int_0^x dx_1 \int_0^y dy_1 f(x_1 y-y_1)[e^{-a_1 y_1} - e^{-a_2 y_2}]$$

The present brief communication considers a solution for this equation, which takes into consideration both the Stokes and anti-Stokes component of the EMW. The geometrical situation is assumed to be the same as in [1]. The calculations were made in an approximation of continuous pumping for the case of crystals with hexagonal symmetry with an axis C Z. The authors thank V. V. Proklev for discussion of the work. Figures 2; references: 3 Russian.
[28-6415]

UDC 62-523.8:534.832

ADAPTIVE SYSTEM FOR ACTIVE SUPPRESSION OF RANDOM WAVE FIELDS

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 25, No 6, Jun 82 (manuscript received 20 Mar 81, after consolidation 29 29 Oct 81) pp 657-667

ARZAMASOV, S. N. and MAL'TSEV, A. A., Gor'kiy State University

[Abstract] An adaptive (self-tuning) system is considered for active suppression of random wave fields in an acoustic waveguide, a system which regulates the radiator characteristics and minimizes the mean power of the residual field. It simulates real conditions of wave propagation, while "tracking" changes in field and medium parameters. The adaptive algorithm is constructed, assuming a scalar monochromatic field produced by an array of random sources in a homogeneous isotropic medium. The corresponding equation is derived for the weight factors matrix which, multiplied by the Green function matrix and the autocorrelation matrix for readings of primary instruments, appears in the compensation error matrix of the criterion functional. The operation of this system is analyzed, first in absence and then in presence of wave feedback. The performance of this system is demonstrated, for illustration, on active suppression of random waves behind an infinitely large plane screen with random distribution of elements upon passage through it of a plane wave. The authors thank A. N. Malakhov for interest in the study and discussion of the results. Figures 4; refernccs: 16 Russian.
[55-2415]

UDC 621.373:621.37/39:534

SPECTRAL CHARACTERISTICS OF GENERATOR WITH DISCRETE FREQUENCY TUNING BASED ON SURFACE ACOUSTIC WAVE RESONATORS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82 (manuscript received 22 May 80; after correction 27 Aug 81) pp 1656-1657

PASKHIN, V. M.

[Abstract] A model of a surface acoustic wave (SAW) generator with a central frequency of about 50 MHz and a discrete set of generation frequencies is studied. The device is a two-stage resonant amplifier with two SAW resonators in the feedback circuit. Noise characteristics were measured with preliminary conversion of the SAW generator signal to a microwave signal. Figures 2; references 4: 3 Russian, 1 Western.
[32-6508]

UDC 537.212

CONDUCTING RIBBON GRATING IN QUASI-STATIC ELECTRIC FIELD

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 5, May 82 (manuscript received 9 Sep 80) pp 518-523

PONOMARENKO, VLADIMIR IVANOVICH, junior scientific associate, Simferopol' State University

[Abstract] A conducting symmetric ribbon grating is considered in a uniform quasi-static electric field. The corresponding problem with mixed boundary conditions is solved by separation of variables, which yields equations in paired trigonometric series. These are replaced with an integral equation of the first kind containing a Cauchy series. The latter equation is solved by the regularization method with inverse transformation. Expressions are obtained, as a result, for calculating the current distribution and the equivalent impedance, the latter having a resistive component and a capacitive one. Figures 2; references 4: 3 Russian, 1 Western (in translation).
[54-2415]

UDC 537.312.62.029.6

MUTUAL SYNCHRONIZATION IN MULTIJUNCTION JOSEPHSON STRUCTURES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 27, No 8, Aug 82 (manuscript received 17 Mar 81) pp 1613-1621

OVSYANNIKOV, G. A., KUZ'MIN, L. S. and LIKHAREV, K. K.

[Abstract] A theoretical study is presented of the process of mutual synchronization in multiple junction Josephson structures and of the synthesis of multijunction structure synchronization most resistant to fluctuations and dispersion of junction parameters. An ordinary resistive model is used to describe Josephson junctions with low capacitance. The conditions under which the process of synchronization in a homogeneous ring circuit is most resistant to dispersion of autonomous voltages across the contacts are determined. The influence of low frequency conductivity is analyzed. Mutual synchronization

of Josephson junctions with low capacitance in multiple junction circuits greatly narrows the width of the generation line and increases the microwave impedance and Josephson generation power. Figures 4; references 9: 4 Russian, 5 Western.
[32-6508]

UDC 538.574.6

APPLICABILITY CRITERIA FOR GEOMETRICAL THEORY OF DIFFRACTION

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 25, No 7, Jul 82 (manuscript received 27 Jul 81) pp 805-814

KRAVTSOV, Yu. A. and ORLOV, Yu. I. [deceased], Institute of Physics imeni P. N. Lebedev, USSR Academy of Sciences

[Abstract] A heuristic approach is taken to establishment of the applicability limits for the geometrical theory of diffraction, an approach based on the concept of Fresnel domains of diffracted rays. Two-segmental virtual rays are considered, the first segment belonging to the primary family of diffraction rays (border rays, vertex rays, and slip rays) and the second segment joining the break point to the observation point. The boundary of a Fresnel domain is generally defined as the geometrical locus of break points for which the eikonal along virtual rays differs by a half-wavelength from the eikonal along a reference ray reaching the observation point directly. Two criteria of applicability are derived on this basis. The first one is that one section of the Fresnel domain be much smaller than the characteristic scale dimension of changes of any parameter in the problem such as amplitude of the incident wave or diffraction coefficient. The second one is that, in the case of many rays and especially with caustic surface or penumbra, the absolute difference between the eikonals of two rays passing through the observation point be larger than π/k (k - wave number). These criteria are first used in problems of diffraction at edges, with longitudinal and transverse scales of the Fresnel domain, determining the permissible proximity of border rays, determining the conditions where border rays become independent of the geometrical-optics field, or of vertex rays. These criteria are then used in problems of diffraction by smooth bodies, determining the Fresnel scales of slip rays, typical examples being a cylinder with variable curvature, a cylinder with a break in curvature, a smooth body with bending and flattening points. Associated problems are evaluating the field in a region where the geometrical theory is not applicable, determining the "instability" of diffraction rays in response to perturbations of initial parameters or surface shape, selection of an idealized model such as two spheres or a cone. The authors thank S. M. Rytov and participants of his seminar (Eighth All-Union Symposium on Diffraction and Propagation of Waves, L'vov, 21-23 September 1981) for discussions. Figures 12; references 22: 14 Russian, 8 Western (4 in translation).
[56-2415]

UDC 538.574.6

DIFFRACTION OF TWO DIMENSIONAL GAUSSIAN BEAMS ON REFLECTING GRID OF RECTANGULAR BARS

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 25, No 4, Apr 82 (manuscript received 7 Apr 81) pp 427-435

REZNIK, I. I., Institute of Radio Physics and Electronics

[Abstract] The basic physical results of studies of the diffraction of two dimensional wave bundles with gaussian field distribution as a function of geometric dimensions of a comb-type grid of rectangular bars and beam parameters are presented. The variation of reflection factor as a function of frequency is illustrated for normal incidence of gaussian wave beams of various widths. Comparing the reflection factor as a function of width of the channels and the height of the slots in the comb, it is noted that the minimum reflection factor differs from the minimum for a planar wave not only in level but also in channel width and slot depth at which the minimum is observed. The side lobe in the reflected field is found to increase with increasing angle of incidence of the wave. Figures 11; references: 3 Russian.
[39-6508]

UDC 539.216.2:538.221.53.098

EXPERIMENTAL DETECTION OF NEW DOMAIN BOUNDARY MOVEMENT MECHANISM IN FERRITE-GARNET FILMS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 8, Aug 82 (manuscript received 4 Mar 82) pp 99-100

IVANOV, L. P., LOGGINOV, A. S. and NEPOKOYCHITSKIY, G. A.

[Abstract] An experimental study is presented of the dynamics of domain boundaries in ferrite-garnet films in pulsed magnetic fields up to an effective uniaxial anisotropy field. The method of electronoptical high speed photography with a time resolution of about 8 ns and a space resolution of about 0.3 μm allows one or two dynamic domain configurations to be recorded in the process of application of a single magnetic field pulse. The specimens used were single crystal ferrite-garnet films grown by liquid phase epitaxy on $Gd_3Ga_5O_{12}$ substrates. Results are presented for a specimen of $(BiTu)_3(FeGa)_5O_{12}$ about 10 μm thick, cylindrical magnetic domain collapse field 107 Oe, band domain period 8.7 μm and effective uniaxial anisotropy field about 800 Oe. Saturation of domain boundary movement speed was detected at 12.5 m/s throughout the range of H studied. The observations indicated that in the initial stage of development of movement the velocity exceeds the domain boundary saturation velocity and is about 30 m/s for 330 Oe and about 50 m/s for 680 Oe. Figures 1; references 11: 6 Russian, 5 Western.
[36-6508]

UDC 621.3(478.9)

ELECTRICAL INDUSTRY OF MOLDAVIAN SSR

Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 82 pp 5-8

FILATOV, V. I., candidate of technical sciences, deputy chairman of MSSR State Planning Commission

[Abstract] Industry and agriculture in Moldavia have developed tremendously since this nation became part of the Soviet Union, and especially so under the leadership of Leonid N. Brezhnev. The scientific-technical base is provided by the Kishinev Polytechnic Institute. An important branch of Moldavian industry is metallurgy and the supporting electrical equipment construction, using raw materials and fuel supplied from other Soviet republics. While metal making and metal forming processes are becoming more efficient and economical so as to require less electrical energy and equipment per unit volume, electrical equipment is being improved and innovated. Notable theoretical and practical developments originating at the Department of Electrical Machinery include ferromagnetic static 3-phase frequency multipliers and phase multipliers, modifications of thyristor-magnetic converters, and face-type electric motors with the rotor combining the motor armature and the runner of the driven mechanism. Inventions in these fields are covered by 16 USSR patents. Further improvements are still needed in streamlining intraplant and interplant transportation, centralization and specialization of repairs, standardization of tools, and buildup of metal casting capacity. A great deal of work in these directions is done at the "Elektromash" plant (director G. F. Pologov) and the "Moldavisolit" plant (chief engineer A. R. Gerr) in Tiraspol'. A new line of electrical machines, namely controllable a.c. machines (machine-rectifier sets, asynchronized synchronized machines, diode-controlled motors) urgently needed by ferrous and nonferrous metal industries will soon be produced, for the first time in the Soviet Union, at the "Elektromash" plant. Tables 1; references: 5 Russian.
[38-2415]

UDC 621.3(474.5)

ELECTRICAL INDUSTRY IN LITHUANIAN SSR

Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 82 pp 8-11

RUSENKO, Yu. L., candidate of technical sciences, deputy chairman of LiSSR Council of Ministers

[Abstract] At the present time 19,000 people produce over 260 million rubles worth of goods annually at the 9 plants of the Lithuanian electrical industry, supported by engineering-design and scientific-research organizations. This is some progress since the pre-Soviet era, when the entire output in 1939 was only 1.3 million dry cells and storage batteries. Present production

also includes welding equipment (one third of USSR production) and small appliance motors (one fourth of USSR production). Most eminent are the 3 plants of the "El'fa" Association operating since 1948. They produce small motors, but phonographs and magnetic recorders will be added. Three other plants are run by the "Vil'nyuselektrosvar" Association, two plants in Lithuania and one branch plant in Kaliningrad. Its main plant in Utena produces electric furnaces and desiccators, and its plant in Vilnyus produces welding transformers. The remaining 3 plants are "Sirius" in Klaypeda producing dry cells and storage batteries, "Elektra" in Kaunas producing 1.5-4.0 kW and 6-14 kW induction motors (models A6,06 since 1957, model AOL2 since 1963, models D80,90,112 since 1969, models 4A80,90K since 1973), and "Elektrotekhnika" in Panavezhys producing cables and wire with polyester varnish insulation. The electrical industry in Lithuania has been and still is receiving a great deal of "know-how" support from organizations in the Russian SFSR, UkSSR, KazakhSSR, as well as Hungary and Bulgaria, already well established in their respective fields. The tasks before the Lithuanian electrical industry in the 11th Five-Year Plan period are to increase the mechanization and automation of production processes, to utilize labor and raw materials more efficiently and economically, to improve the product quality, and to introduce needed new product lines such as 2 models of washer motors, 1 model of refrigerator motors, 4 models of motors for magnetic tape recorders, "El'fa-201 Stereo" and "El'fa-001 Stereo" tape recorders, 2000 A welding transformers, diode-controlled welding generators to replace commutator-type ones, rectifiers for manual welding, "Prima"-grade and "Lyuks"-grade alkaline batteries (A313,332,343).
[38-2415]

UDC 621.313.3

ELECTROMECHANICAL PROCESSES IN TWO-ROTOR CRYOGENIC ELECTRICAL MACHINES

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 6, Jun 82 (manuscript received 2 Dec 81) pp 735-741

KOVARSKIY, MIKHAIL EFIMOVICH, senior scientific associate and RUBINRAUT, ALEKSANDR MOISEYEVICH, candidate of technical sciences, chief of laboratory, both from All-Union Scientific Research Institute of Electromechanics

[Abstract] A mathematical model is constructed for a two-rotor cryogenic electrical machine, with a free synchronous rotor carrying the superconductor field coils inside a hollow asynchronous rotor and the latter inside a toothless stator core. Torque from the turbine is transmitted to the asynchronous rotor through a shaft, leakage of magnetic flux is prevented by a ferromagnetic shield, leakage of heat to the helium-cooled superconductor coils is prevented by a thermal shield, an electromagnetic shield, and a layer of vacuum insulation under a metal jacket. Energy conversion through the rotating magnetic field is analyzed on the basis of emf equations for each elecrrical component and quations of motion for both rotors. These equations are solved simultaneously by the Hemming method, with inversion of the self-inductance matrix on each step. Two designs of such a machine are compared with respect to performance

on the specific example of a 200 kW generator. The one with a more intricate and larger structure has larger reactances and is less sensitive to fault transients. Figures 3; tables 1; references 10: 5 Russian, 5 Western.
[53-2415]

UDC 621.38:61

RADIO ELECTRONICS AND MEDICINE (POSSIBLE USE OF SOME ANALOGIES)

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 9, Sep 82 (manuscript received 5 Apr 82) pp 3-8

DEVYATKOV, N. D., GOLANT, M. B. and REBROVA, T. B.

[Abstract] The paper examines the possibility of using certain ideas from radio electronics and cybernetics in medicine and biology, and the development on the base of similar methods of approach to the solution of medical-biological problems. It is stressed that this subject is very extensive and consideration can only be given in the paper to a limited number of its aspects. The basic conditions for prolonged conservation of order in large systems are considered. In principle the conditions formulated pertain not only to radioelectronic systems or live organisms, but also to any large steadily operating system, e.g., to enterprises with external connections. Both large radio electronics systems and living organisms are complex systems, but obviously with very different degrees of complexity. Information aspects play a large role in assuring their continuous operation. An examination is made of the information system of organisms and how the system operates. An important step in this action was accomplished in a 1973 scientific session of the USSR Academy of Sciences which established (on the basis of an analysis of numerous scientific data) a number of basic regularities of the interaction of electromagnetic oscillations of low power with living organisms. A number of these regularities are listed. The paper concludes that on the basis of analogies it is possible in certain cases to simplify the approach to the solution of particular medical-biological problems. References 11: 8 Russian, 3 Western.
[25-6415]

UDC 621.313.322

DEPENDENCE OF FLOW RATE OF CRYOGENIC COOLANT IN ELECTRICAL MACHINES WITH SUPERCONDUCTOR WINDINGS ON THERMOPHYSICAL AND GEOMETRICAL CHARACTERISTICS OF CRYOSTAT

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 6, Jun 82 (manuscript received 2 Dec 81) pp 731-734

VESELOVSKIY, ANDREY SERAFIMOVICH, chief of scientific laboratory, LEBEDEVA, YELENA VLADIMIROVNA, junior scientific associate, and ROSHCHINA, NADEZHDA NIKOLAYEVNA, engineer, all from All-Union Scientific Research Institute of Electromechanics

[Abstract] For the design of a cryogenic system for superconductor windings in electrical machines it is necessary to determine how the coolant flow rate depends

on thermophysical properties and geometrical dimensions of the cryostat. A program of appropriate calculations has been written in FORTRAN for liquid helium as a coolant in a system containing two isothermal zones (cryostat temperature and room temperature), five junctions, three thermal bridges, two thermal shields, and one thermal resistance. The input data are: 1) Relative emissivity of the surface (metallic) participating in heat transfer; 2) Cross sections (thicknesses) or thermal bridges (tubes) 3) Intensity of heat extraction from thermal bridges; and 4) Stray heat leakage to liquid helium. The computer output is the helium flow rate as a function of each of these four parameters, taking into account loss of liquid helium because of evaporation. Despite the wide range of indeterminancy, the results of these calculations provide a sound basis for design of the cryostat, and for matching the coolant flow to a given superconducting magnet structure. Figures 2; references: 3 Russian.
[53-2415]

UDC 621.365.52

MAIN TARGETS OF ACTIVITIES IN HIGH-FREQUENCY ELECTROTHERMICS DURING 11TH FIVE-YEAR PLAN PERIOD

Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 82 (manuscript received 25 Dec 81) pp 12-14

SHAMOV, A. N., candidate of technical sciences, deputy director of scientific projects at All-Union Scientific Research Institute of High-Frequency Currents imeni V. P. Vologdin

[Abstract] High-frequency electrothermal equipment now produced by Soviet industry includes 4-500 kW 1000 Hz - 1.76 MHz generators for induction surface heat treatment, electric furnaces for low-oxidation or oxidation-free heating of forged and rolled stock, 100-1000 kW 0.44-1.76 MHz welders and 10 kHz (up to 2000 kW) welders, 60-1000 kW 0.44-13.56 MHz plasmotrons, and 1-60 kW 13.56-81 MHz welders for dielectric materials. For the 11th Five-Year Plan period the following are scheduled: intensification of scientific-research and experimental-engineering activities with a 20% better cost effectiveness, i.e., to achieve a 220 million rubles reduction of production costs by introduction of new equipment, and specifically a 50% increase in production of high-frequency and ultrasonic equipment. The targets of these activities are applications in ferrous metallurgy (plasmotrons for producing iron powder directly through reduction of iron ore, equipment for steel hardening, ultrasonic continuous-casting equipment, equipment for heat treating gas pipes, replacement of seamless pipes with less expensive welded ones), in nonferrous metallurgy (industrial production of silicon single crystals 90-125 mm in diameter for the Ekibastuz-Center 1500 kV d.c. transmission line), power industry (high-power high-frequency voltage sources such as those for fusion reactors, production of polycrystalline silicon and other materials), machine manufacturing industry (equipment for producing parts from powder material such as carbon plastics, induction heaters, induction surface hardeners, equipment for producing textiles from natural and synthetic fibers), and electrical

industry (modernization of high-frequency equipment and introduction of static frequency converters for robots and microcomputers, to reduce energy consumption, as well as introduction of special welders for storage battery assembly and cable assembly, improvement of periclase production in plasma jet and cold crucible). The planned activities should also include aiding the work shops in adaptation of new equipment. References: 1 Russian.
[38-2415]

UDC 621.372.85

MAGNETOSTATIC WAVES IN MULTILAYER STRUCTURES CONSIDERING FERRITE FILM WIDTH

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 25, No 8, Aug 82 (manuscript received 6 Jan 81, after revision 2 Nov 81) pp 36-43

BEREGOV, A. S.

[Abstract] A study is made of the properties of spin waves or magnetostatic waves propagating in a structure with a ferrite film separated from two metallic plates by layers of dielectric considering the width of the structure. It is shown that the magnetostatic potential can be represented as a combination of the natural waves which exist in the structure. The analysis allows estimation of the influence of the width of the ferrite film in the multilayer structure on the characteristics of the magnetic spin waves, which must be considered in planning of microwave devices. Figures 5; references 16: 6 Russian, 10 Western.
[36-6508]

UDC 621.391.24:519.27

EFFECT OF NORMAL FLUCTUATIONS ON NONLINEAR ELEMENT WITH COMPLEX PIECEWISE-LINEAR CHARACTERISTICS

Moscow RADIOTEKHNIKA in Russian Vol 37, No 8, Aug 82 (manuscript received 11 May 81) pp 39-41

BLATOV, V. V.

[Abstract] Various moments at the output of a noninertial nonlinear element with a characteristic consisting of N linear sectors are calculated for the case when the input is loaded by a steady stochastic normal process with known mathematical expectation and dispersion. Standard nonlinear elements can be considered as particular cases of the nonlinear element studied in this article. References: 2 Russian.
[40-6508]

UDC 621.396.67

TRAP EFFECT IN IRRADIATION OF OPEN SHIELD BY FIXED SOURCE

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 25, No 4, Apr 82 (manuscript received 3 Mar 81) pp 418-426

VELIYEV, E. I., VEREMEY, V. V., NOSICH, A. I. and SHESTOPALOV, V. P., Institute of Radio Physics and Electronics, Ukrainian Academy of Sciences

[Abstract] A detailed study is presented of an electrodynamic structure consisting of a source and resonant shield on the example of irradiation of a filament with a current located near an unclosed circular metal cylinder. The preservation of finite field amplitude within the resonator indicates that the hollow resonator with a small aperture has trap properties. The results presented indicate the need for careful attention in calculating radiation patterns at fixed frequencies. In studying attennas consisting of a source and a nonclosed shield, priority must be given to calculation of the frequency dependence of integral radiation field characteristics. Figures 6; references: 11 Russian. [39-6508]

RESULTS OF WORK OF 15TH IRCC PLENARY SESSION

Moscow ELEKTROSVYAZ' in Russian No 8, Sep 82 pp 36-40

BADALOV, A. L.

[Abstract] At the 15th IRCC Plenary Session in Geneva, 15-26 February 1982, there resolutions were adopted concerned with the following: 1) General problems of utilizing the radio frequency spectrum and controlling radio radiation; 2) Research in radio wave propagation for refinement and simplification of calculation methods; 3) Satellite radio communication and broadcasting with effective utilization of geostationary orbits; 4) Audio and television radio broadcasting; 5) Radio relay systems with straight visibility and radio communication systems in the first seven frequency bands; 6) Sea, air, and ground radio communication and radio navigation systems; 4) Space research and radio astronomy; and 8) Transmission of standard-frequency and time signals. Eleven investigative commissions were appointed to deal with these problems. Two joint IRCC-ITTCC commissions have also been appointed, one for dealing with transmission of audio and television radio broadcasting signals, and one for dealings with problems of terminology and dictionary. References 3: 2 Russian, 1 Western. [19-2415]

NTTM-82 EXHIBITION OF YOUNG CREATIVE ENGINEERING TALENT

Moscow ELEKTROSVYAZ' in Russian No 9, Sep 82 pp 59-63

MONINA, G.

[Abstract] Twenty six items were demonstrated by young creative engineering talent in the largest pavillion of the 1982 (23 April - 30 August) Exhibition of Achievements of the USSR National Economy. They are the "Retro" touch-dial telephone set, the "Ufa" souvenir telephone set, the ISS-1 reference-information system for data reception, storage, and transmission, a short-wave transceiver radio station, a simulator of impedance loads for transceiver power and sensitivity measurements, a digital instrument for audio-channel measurements under load, a stereophonic radio broadcasting set, a digital newspaper tele asting set for the "Orbita-RV" system, a control panel with subscriber telephone set for industrial plant management, a digital monitor of black-and-white images for industrial television, a universal simulator of wire communication lines, an integrated-microcircuit device for centralized inspection of rural telephone networks, the PP-UKP-TA diagnostic panel for inspection of universal printing-coding equipment, a photoelectronic transmitter for teaching radio telegraphers, an information-teaching microprocessor, a tuning stand for electron devices, and automatic desk "secretary", the "Signal-001" device for teaching radio telegraphers how to detect signals in similarly sounding "white noise", a commutator for checking telegraph sets in systems without direct connections, an instrument for measuring group delay time and frequency, a simulator of radio telegraph channels, an automatic plotter of antenna radiation patterns, the "Avtovyzov" automatic voice data transmitter, equipment for remote servicing of radio relay communication lines, and the D-AVU-10 equipment for time multiplexing with delta modulation. Figures 18.
[19-2415]

UDC 772.95+541.4

MECHANISM OF IMAGE FORMATION IN LIGHT-SENSITIVE LAYERS BASED ON COMPLEXES WITH CHARGE TRANSPORT

Moscow ZHURNAL NAUCHNOY I PRIKLADNOY FOTOGRAFII I KINEMATOGRAFII in Russian Vol 27, No 4, Jul-Aug 82 (manuscript 23 Oct 81) pp 298-300

MAL'TSEV, Ye. I., KRUGLOV, A. B., SHPILEVA, I. S. and VANNIKOV, A. V., Institute of Electrochemistry, USSR Academy of Sciences, Moscow

[Abstract] An experimental study was made of spectral changes caused by single pulses of ultraviolet radiation of 20 microsecond duration and over 400 J energy in 60 micrometer thick films of polyvinyl chloride (also in 0.5 and 1.0 mm thick films of dichloroethane solutions) containing an aromatic amine (diphenyl amine, dibenzyl aniline, diphenylbenzyl amine, indole, ethyl analog of Michler ketone) and CBr_4 acceptor electrons. Measurements were made in air, in the pulse photolysis laboratory of the Institute. Some were made with a 170 scanning

spectrophotometer which included automatic recording, data preprocessing by an IZOT 0310 computer, and visualization of fast processes. Some were made with a neodymium pulse laser in the Q-swieching mode (pulses of 15 ns duration and 0.1 J energy at λ = 353 nm and λ = 265 nm) which included high-speed spectrophotometric recording. In this way were determined th short-life spectra of optical absorption 0.2 and 2 s after exposure, characterizing the colored products of photolysis, and the kinetics of optical density in the ab orption band, The results reveal new light-sensitive final products forming by an intricate process on complexes with charge transfer. The time in which a stable image is produced depends on the rate of buildup of final products and not on the speed of the ultraviolet radiation source. Figures 2; references 4: 3 Russian, 1 Western. [52-2415]

CSO: 1860

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