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USSR Report

ELECTRONICS AND ELECTRICAL ENGINEERING

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29 May 1984

USSR REPORT

ELECTRONICS AND ELECTRICAL ENGINEERING

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ALGORITHMS OF ADAPTIVE MARKOV FILTRATION OF NOISY SPEECH SIGNALS

Moscow RADIOTEKHNIKA in Russian No 12, Dec 83
(manuscript received, after completion, 8 Apr 83) pp 10-15

NAZAROV, M. V., PROKHOROV, Yu. N. and KOVYAZIN, V. I.

[Abstract] A complete Markov model of a noisy speech signal is formed by the conventional autoregression equation describing uncorrelated random processes in the voice channel and the simplest nonlinear autoregression equation describing a periodic signal from the voice source. This system of two equations is subsequently rewritten in vector form and, on this basis, the algorithm of Markov filtration is formulated following the method of invariant submersion with maximum a posteriori probability as criterion. The five consecutive steps of such an algorithm are one-step prediction, calculation of filter gain, filtration, evaluation of the a priori error-covariance matrix and evaluation of the a posteriori error-covariance matrix. The corresponding equations are solved sequentially for given initial conditions, the number of equations depending on the dimensionality of the model and the simplifying assumptions. Calculations are shown for the case of symmetric error-covariance matrices, with the autoregression coefficients described by difference equations of first and second orders. Estimates of correlation functions for the noisy input signal and the filtered output signal indicate the correctness and high efficiency of this algorithm, the estimate of the correlation function for the filtration error being that of a whitening process. Figures 6; tables 1; references 7: 5 Russian, 2 Western (1 Russian translation). [103-2415]

UDC 523.164.83+621.371:519

STRUCTURAL FUNCTION OF LUNAR RELIEF ACCORDING TO RADAR DATA

Gorkiy IZVESTIYA VYSSHIKH UCHEBNIKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 26, No 10, Oct 83 (manuscript received 31 Jan 83) pp 1194-1204

FUKS, I. M., Institute of Radiophysics and Electronics, UkSSR Academy of Sciences

[Abstract] Extensive radar studies of the moon were made in the nineteen sixties and seventies, using wavelengths from 8.6 mm to 19 m, and the data have been useful for high-resolution lunar surface cartography. A "composite" two-scale model has been proposed for interpretation of the data, specifically the dependence of the scattering cross section on the wavelength and the incidence angle. The lunar relief is described statistically relative to the radius-vector of a point on an ideal smooth spherical surface. The diffraction problem for radio waves at the moon is solved on the basis of this model. With normal deviations of the real surface from the ideal one assumed to have a fairly small dispersion, according to the Rayleigh criterion, this problem for the fine structure can be solved by the perturbation method. The directional pattern of scattering reveals at least two regions, each corresponding to a different scattering mechanism. Quasi-specular scattering prevails at low incidence angles, over the 15-30° sector for every wavelength, with a large decrease of the scattering cross section over this range. Diffuse scattering prevails at wide incidence angles over the 30-80° sector, with a small change of the scattering cross section over this range. From the slopes of $\sigma(\theta)\cos^4\theta = f(\tan\theta)$ curves of scattering cross section as a function of incidence angle, and from their dispersion, are derived the structural function describing the lunar surface $H(\rho) - C\rho^{5/6}$, namely the difference between the heights H of two points on the lunar relief separated by distance ρ , or the mean-square difference $D(\rho) = C^2\rho^{5/3}$ and the space spectrum $S(\lambda) = 0.446C^2\lambda^{-11/3}$ of the surface unevenness (structural constant $C \approx 0.051 \text{ cm}^{1/3}$). The author thanks S. Ya. Braude for indicating the similarity between these problems and the problem of determining the parameters of sea roughness with radio oceanographic methods. Figures 7; references 21: 12 Russian, 9 Western (2 in Russian translation)

[97-2415]

LOSS FUNCTION USED IN OPTIMIZATION OF ARRAY OF COUPLED TRACKING RADIOELECTRONIC SYSTEMS

Moscow RADIOTEKHNIKA in Russian No 12, Dec 83
(manuscript received, after completion, 19 Apr 83) pp 26-28

VAGAPOV, V. B.

[Abstract] A loss function is defined as a criterion for optimization of coupled multidimensional tracking systems, in preference to the two conventional complementary loss functions relative to the maximum tracking accuracy $L = \epsilon^2$ and the permissible range of tracking error $|\epsilon| \geq \gamma$, respectively. The new loss function is defined as $L = \frac{\epsilon^n}{\gamma^n}$, where $\epsilon/\gamma = \epsilon/\gamma$ and $n = 2k$ (ϵ - error, γ - permissible range of unilateral error). The penalty of error is calculated accordingly by solution of the corresponding equation of motion for the tracking system, specifically a second-order (velocity-acceleration) tracking system in which the discriminator output signal is an additive mixture of tracking error and interference. First such a one-dimensional tracking system is considered and next a two-dimensional system consisting of two such one-dimensional ones coupled through the error of their identical respective tracking loops. The mathematical expectation of this loss function has been calculated as a function of the slope of the discriminator characteristic, the curves for $n = 2, 4, 8$ having been normalized to minimum values of the corresponding loss function. Figures 2; references: 1 Russian.
[103-2415]

UDC 621.396.9

OPTIMIZATION OF TWO-COORDINATE SURFACE RADAR STATION BY COMBINATION OF TECHNICAL AND ECONOMIC INDICES

Moscow RADIOTEKHNIKA in Russian No 1, Jan 84 pp 33-34

GUBONIN, N. S.

[Abstract] This paper briefly summarizes the manuscript of an article containing 13 pages of text, including 2 tables, 5 figures and 6 bibliographic titles, which can be ordered from TsNTI (Center of Scientific-Technical Information and Propaganda) "Communications Information" where it is stored under No 266. Consideration is given to a two-coordinate surface radar station with circular scanning and automatic tracking of a passage of N_{ts} targets located in a fixed sector O_m with respect to the angle of elevation, and using a linear frequency-modulated pulse signal. A block diagram of the subsystems of the radar system is presented. The problem of vector optimization with respect to an absolute criterion of preference is solved for this radar. Figures: 5.
[124-6415]

SYNTHESIS OF DEVICES FOR OPTIMUM PROCESSING OF SIGNALS IN LOW-ALTITUDE
RADIO ALTIMETER

Moscow RADIOTEKHNIKA in Russian No 1, Jan 84 (manuscript received 12 Jun 83)
pp 50-53

MOISEYENKO, Yu. N.

[Abstract] The paper considers a way of increasing the precision and noise immunity of measurers of the flight altitude of flying vehicles by the use of algorithms for processing signals, synthesized on the basis of the Markov theory of optimum nonlinear filtration. Figures 3; references: 5 Russian.
[124-6415]

STABLE HETERODYNING SYSTEM IN RT-22 RADIO TELESCOPE FOR MILLIMETRIC-WAVE SPECTROSCOPY

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 26, No 10, Oct 83 (manuscript received 16 Mar 83) pp 1205-1209

GUSEV, V. A. and SOROCHEENKO, R. L., Institute of Physics imeni P. N. Lebedev, USSR Academy of Sciences

[Abstract] A heterodyning system has been developed at the Institute of Physics for an RT-22 radio telescope. The principal components are a Ch6-31 frequency synthesizer acting as local oscillator with frequency tuning, its frequency instability not exceeding 10^{-3} over a period of 0.2 s, followed by a phase filter. The latter consists of a low-noise (-94 dB/kHz) tunable (22.5-24 MHz) oscillator built with a field-effect transistor, a phase detector, a d.c. amplifier, and a low-pass filter. The system is provided with automatic phase-lock frequency control (35-37 GHz) and automatic frequency-lock frequency control (22-23 GHz), each through an appropriate feedback loop, operating each alone or both together. In the latter case the outputs from the phase detector and the frequency detector are added with weight factors in the d.c. amplifier. The system also includes an i-f (6 GHz) heterodyne consisting of a G4-82 oscillator and a Ch5-19 frequency synthesizer in the automatic phase-lock loop. The phase filter is a band-pass filter with an equivalent bandwidth of 100 Hz at the frequency of the reference signal. It effectively improves the overall signal-to-noise ratio. With this heterodyning system, the frequency stability of the telescope klystron can be maintained within $\pm 0.25 \cdot 10^{-6}$ in the automatic frequency-lock mode and within $\pm 1.7 \cdot 10^{-8}$ in the automatic phase-lock mode. The system was used for spectroscopy of G43-0.1 and L1534 (HC_3N in gas-dust cloud) masers. Figures 5; references: 2 Russian. [97-2415]

COLLECTIVE MODE OF EVOLUTION OF PLASMA PRODUCED BY OPTICAL BREAKDOWN IN AEROSOL MEDIUM

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 26 No 10, Oct 83 (manuscript received 29 Jun 82, after completion 24 Feb 83) pp 1220-1226

VDOVIN, V. A. and SOROKIN, Yu. M., Gorkiy State University

[Abstract] The collective mode of optical breakdown in an aerosol medium with attendant evaporation of the aerosol and the subsequent plasma evolution are analyzed theoretically on the basis of an approximate mathematical model. Its equation of heat conduction with distributed heat sources and equation of continuity are formulated with appropriate initial and boundary conditions for the temperature field, the velocity field, and the vapor flux field. Collective evolution and spark dynamics are simulated accordingly for an "inner" aerosol particle between two neighboring plasma microflares. The problem is solved with gas dynamic interactions in the system first disregarded according to the diffusion model of vapor flow and then included phenomenologically. In the latter case the strong temperature dependence of the diffusion coefficient is taken into account in the form of a three-halves power law at atmospheric pressure and the edge of the high-absorption region at every instant of time is defined by the maximum temperature gradient. A numerical solution for an aerosol in air has yielded space-time trajectories of the temperature peak and temperature profiles of the low-threshold breakdown region at various aerosol concentrations. An increase of the concentration, otherwise under the same conditions, is found to increase the maximum spark temperature and to shorten the transient period of formation of a uniformly heated plasma region. The model has been refined on the basis of experimental data. Figures 3; tables 2; references 17: 13 Russian, 4 Western. [97-2415]

UDC 621.396.96

ON THE POSSIBILITIES OF SINGLE-ANTENNA IONOSPHERE SOUNDING

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 28, No 11, Nov 83 (manuscript received 29 Dec 81) pp 2097-2101

SILAYEV, A. M.

[Abstract] The paper considers a difference from the approved processing, characteristic of radars with continuous radiation. Expressions are derived for an effective signal and for noise connected with switching. An analysis of these expressions makes it possible to conduct a comparison with radars using continuous irradiation and with pulse-modulation radars. It is concluded that to some degree the system considered for sounding the ionosphere with random switchings with transmission at reception is an intermediary

between a system with a continuous radiation of radio waves and a pulse-modulation system. In comparison with detection and ranging continuous signals, the regime considered in this paper makes it possible to reduce the number of antennas to one and to reduce the amount of noise from the direct transmission signal. This is attained at the cost of a decrease of the level of the most valid signal. In comparison with pulse-modulated systems, the possibility is realized of reducing the minimum sounding distance. The magnitude of the valid signal can both increase as well as decrease as a function of the station parameters. The author thanks A. V. Yakimov for attention to the work and for helpful comments. References 6: 4 Russian, 2 Western.
[111-6415]

UDC 621.396.677

ELECTRODYNAMIC ANALYSIS OF ACTIVE WAVEGUIDE-SLOT LINE BASED ON GaAs

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 28, No 11, Nov 83
(manuscript received 12 Feb 82) pp 2102-2107

LYUBCHENKO, V. Ye. and MAKEYEVA, G. S.

[Abstract] The paper investigates an active waveguide-slot line (WSL) based on semiconductor substrates (gallium arsenide), taking into account the action of physical effects appearing during the application of a constant strong electrical field. The following items are considered: 1) Method of analysis of active semiconductor wave-guiding structure; 2) Parameters of WSL and field in dynamic approximation; 3) Propagation characteristics of electromagnetic wave in active WSL with presence of strong field domain; and 4) Influence of space charge waves. Figures 3; references 17: 13 Russian; 4 Western (1 in Russian translation).

[111-6415]

UDC 537.87

ON THE PROBLEM OF CYLINDRICAL ARRAY RADIATION THROUGH INHOMOGENEOUS DIELECTRIC LAYER

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 28, No 11, Nov 83
(manuscript received 9 Mar 82) pp 2273-2276

KASHIN, S. V. and SERGEYEV, V. N.

[Abstract] In a 1981 work of which V. N. Sergeyev was a coauthor, a method is considered for elimination of the amplitude control in a cylindrical phased-array antenna (PAA). The essence of the proposed solution involves combination of the cylindrical PAA with a ring-shaped radial-nonhomogeneous lens. It is shown that in an approximation of a geometric optics antenna system it is possible to assure circular scanning with a low level of fringe and backscatter

radiation, with control only by the phase method. The present brief report is a continuation of the 1981 paper. A two-dimensional cylindrical antenna array, surrounded by a ring-shaped layer of nonhomogeneous dielectric with an index of refraction, varies according to the law $n(r) = \frac{R_2}{r}$ where R_2 is the

exterior radius of the ring-shaped layer. In comparison with the traditional cylindrical PAA in which the radiative elements are positioned only on the illuminated surface, the antenna system considered here gives a gain and a flux density of power P_0 in the principal ray without significant deterioration of the directional properties of the system. Thus, use of the elements positioned on the shady side leads to an increase of P_0 by 63%. At the same time the directive gain weakly changes. Figures 3; references: 2 Russian. [111-6415]

UDC 621.372.8.01

CONCERNING Q OF A CYLINDRICAL DIELECTRIC RESONATOR SCREENED BY A WAVEGUIDE

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 28, No 11, Nov 83
(manuscript received 29 Apr 82) pp 2277-2279

VZYATYSHEV, V. F. and KALINICHEV, V. I.

[Abstract] A large number of works are devoted to screened dielectric resonators. Principal consideration in these works is given to a numerical investigation of the dependence of the elements of a scattering matrix on various parameters of the structure. The peculiarities of screened dielectric resonators are considered from a different aspect in this brief report: the dependence of the Q of oscillations with a different azimuth-index on the size of the screen waveguide, and the unusual nature of the quest for a Q of oscillations in a screened system and the Q of an unscreened dielectric resonator in free space are investigated. Figures 2; references: 4 Russian. [111-6415]

UDC 621.371.2

TRAJECTORIES OF RADIO WAVES IN LINEAR LAYER WITH ISOMETRIC INHOMOGENEITIES

Moscow RADIOTEKHNIKA in Russian No 12, Dec 83 (manuscript received 2 Feb 83)
pp 62-64

GOLYNSKIY, S. M. and KHLIBOV, G. N.

[Abstract] The trajectories of radio waves in a statistically nonhomogeneous medium such as a linear ionospheric layer are estimated, taking into account their perturbation by local inhomogeneities. Assuming that the trajectories do remain in the plane of incidence, the deviation of the most probable trajectory from its unperturbed path in accordance with Snell's law is calculated for three models of wave diffusion as a Markov process (D-diffusion

coefficient, n - refractive index): 1) $D = D_0 = \text{const}$ corresponding to refraction of obliquely incident waves by layer with isometric inhomogeneities: 2) $D = D_0/n^2$ corresponding to fluctuations of the electron concentration independent of altitude above the earth's surface; 3) $D = D_0(1-n^2)^2/n^2$ corresponding to a regular component of electron concentration fluctuating most intensely within the reflection zone and thus with a significant effect on scattering of waves. Numerical calculation of relative vertical deviation $\Delta z/z_0$ and horizontal deviation $\Delta x_{1,2}/z_0$ for short radio waves, as functions of the incidence angle over the $\theta = 10-60^\circ$ range for three values of the dimensionless parameter $D_0 z_0$ ($10^{-2}, 10^{-3}, 10^{-4}$), reveals that in a refracting layer with isometric inhomogeneities scattering is predominant in the direction opposite to that of refractive index gradient. The results can be useful for design and operation of radio communication lines, calculation of the maximum usable frequency, and other applications. Figures 4; references: 5 Russian.
[103-2415]

UDC 621.369.677

STATISTICS OF FIELD OF MULTISTAGE PHASED ANTENNA ARRAY

Moscow RADIOTEKHNIKA in Russian No 1, Jan 84
(manuscript received, after completion, 25 May 83) pp 14-18

ANTIPIN, A. G. and DOZORETS, L. A.

[Abstract] The paper considers the problem of determining the principal statistical characteristics of a multistage phased antenna array: the directional (radiation) pattern with respect to power, the average directive gain, and the dispersion of the directional pattern with respect to power with the presence of phase errors in the power supply system. It is assumed that errors in all channels are independent, are distributed according to normal law with a zero average and a dispersion σ_i^2 , where i is the number of stages; all modules inside the stages are statistically identical; and the amplitude of the gain factors of all channels are equal among themselves. The authors express their thanks to Professor Ya. S. Shifrin for valuable council during consideration of the manuscript of this paper. Figures 1, tables 1, references: 2 Russian.
[124-6415]

DETECTION OF SPACE-TIME SIGNAL WITH SCATTERING FROM BACKGROUND OF ISOTROPIC NOISE FIELD

Moscow RADIOTEKHNIKA in Russian No 1, Jan 84
(manuscript received, after completion, 19 Apr 83) pp 21-23

BOGDANOVICH, V. A.

[Abstract] The paper considers detection of a space-time signal, scattered in space, in time, and in frequency. The transmission channel is assumed to be linear and to have finite bandwidths L and F , where L is the dimension of the antenna aperture, F is the bandwidth of the radio section. The signal is considered to be narrow-band ($F/f_0 \leq 1$, f_0 is the carrier frequency), the antenna aperture is large ($L/\lambda_0 \geq 1$, λ_0 is the length of the wave of the carrier oscillations). An invariant principle of detection is obtained which ensures steady detection conditions in the case of a priori uncertainty with respect to the channel and the level of the noise field. References: 5 Russian.
[124-6415]

UDC 621.396.96:621.391.26

RADIOCHANNEL WITH CURVED ANTENNA UTILIZING THREE-DIMENSIONAL EXCITATION

Moscow RADIOTEKHNIKA in Russian No 1, Jan 84 (manuscript received 10 Jun 83)
pp 61-65

MAKSAKOV, N. F.

[Abstract] An antenna array is considered, in the structure of which enters a linear primary element (PE) with a sector θ_L for excitation of M receiving-transmitting modules, arranged equidistantly on a segment of a circle with a radius R . (A diagram of the antenna is presented.) The angular position of the i -th of them with reference to the optical axis of the system is determined as $\theta_i = \alpha_i \theta_L$, where $\alpha_i = (2i - M - 1)/2(M-1)$; $i = 1, \dots, M$; $\theta_L = 2 \arcsin(L/2R)$; L - an aperture of the antenna. The path difference Δ_R from the center and outer modules to the center of the PE exceeds the spatial correlation interval of the signal. Figures 6: references: 5 Russian.
[124-6415]

BROADCASTING/CONSUMER ELECTRONICS

CHARACTERISTIC FAULTS OF INPUT STABILIZING AND CORRECTING EQUIPMENT IN TELEVISION TRANSMITTER STATIONS

Moscow VESTNIK SVYAZI in Russian No 9, Sep 83 pp 31-32

SHABETNIK, V. D., candidate of technical sciences, chief engineer, Scientific-Research Institute of Radio Engineering

[Abstract] For the purpose of streamlining the input stabilization and correction in television transmitter stations, a thorough study has been made of faults occurring in the equipment and methods have been developed for their elimination. The input stabilizing and correcting equipment consists of five basic modules (KDU, KF, KDF, OP, VVU) and an automation module. As a general rule, the pulse top or other pulse distortions and parasitic excitation are eliminated through proper selection of fixed resistors or adjustment of variable resistors. Adjustable resistors are also used for setting and regulating the sync signal and the modulation. Distortions of the amplitude-frequency characteristics of modules such as peaking in the high-frequency range, for instance, and distortions of the transient response characteristics are eliminated by means of compensating choke coils. Distortions of the field-frequency pulse and the line-frequency pulse are eliminated by proper matching of resistors and capacitors. Following all recommendations and procedures should minimize the down-time of input stabilizing and correcting equipment. [69-2415]

UDC 621.391.837.621.397

METHOD OF FLICKER SUPPRESSION IN TELEVISION IMAGE

Moscow RADIOTEKHNIKA in Russian No 12, Dec 83 (manuscript received 6 Jan 83) pp 5-10

NOVAKOVSKIY, S. V., SOROKA, Ye. Z. and YULISH, A. N.

[Abstract] A method of flicker suppression in moving television images, namely conversion to higher frequency of fields in image reconstruction, is analyzed from the standpoint of improved filtration and interpolation with reduced distortion. A frequency converter is considered which consists of an analog-to-digital converter putting out 8-bit digital video signals, a synchronized frame

memory with storage and readout control, and a digital-to-analog converter putting out video signals to a video monitor. The signal conversions are tracked along this channel, whereupon the output field spectrum is calculated assuming a time spectrum of the original continuous image in the form of a cosine-squared pulse. Numerical calculations for step-up of 50-75 Hz field frequencies indicate that this method is practical and adequate. Figures 6; tables 1; references: 3 Russian.

[103-2415]

UDC 621.396.96:621.391.26

DISPERSION OF SEQUENTIAL DETECTION TIME FOR SIGNALS SUBMERGED IN
AUTOREGRESSIONAL INTERFERENCE

Moscow RADIOTEKHNIKA in Russian No 12, Dec 83 (manuscript received 18 Feb 83)
pp 54-56

GOL'FEL'D, G. B.

[Abstract] The problem of coherent sequential detection of signals submerged in passive interference is formulated statistically as the synthesis of a sequential procedure for testing the interference hypothesis against the unilateral signal+interference alternative. Since the sample size necessary for decision is a random quantity, it is desirable to shorten the procedure so as to avoid obscuring the Wald likelihood-ratio criterion. The dispersion of sequential detection time then becomes an important parameter, along with the mean detection time. Here both parameters are estimated from the law of alternation of Doppler phases for the case of readings forming an autoregression series of arbitrary order L ($L = 0, 1, 2, \dots$). As the correlation coefficient approaches unity, both mean and dispersion tend to zero for "optimum" targets and tend to infinity for "blind" targets. General expressions are derived for both in the case of mutually independent equally distributed random elements of the sequence or in the case of a stochastic signal with zero mean and correlational structure. References 5: 4 Russian, 1 Western.

[103-2415]

UDC 621.397.63

ANALYSIS OF OPERATION OF FREQUENCY SYNTHESIZER OF TELEVISION RECEIVER
WITH MICRO-ELECTRONIC COMPUTER IN A CONTROL CIRCUIT

Moscow RADIOTEKHNIKA in Russian No 1, Jan 84
(manuscript received, after completion, 10 May 83) pp 3-7

KRIVOSHEYKIN, A. V., and SMIRNOV, B. Ya.

[Abstract] The operation is analyzed of a digital frequency synthesizer in which a micro-electronic computer is included in a control circuit. [Such an application of micro-electronic computer makes it possible to bestow on it both

a control function and the function of realization of an algorithm of the operation of a digital frequency synthesizer during conducting of the necessary computing operations.] A procedure is examined for calculation of the basic units of the synthesizer, a circuit is proposed for their realization, and requirements on the micro-electronic computer are introduced. An analysis is made of the operation of the frequency synthesizer as a pulse system of control, and the conditions of stability and the principal relations which determine the duration of the transient process are obtained. The authors thank R. G. Britanishskiy, N. N. Izyumov and M. A. Khantverger for helpful consultations obtained by the authors during fulfilment of the work. Figures 3; references 9: 5 Russian, 4 Western (2 in Russian translation).
[124-6415]

UDC 778.5:621.397.13

REQUIREMENTS TO BE MET BY PARAMETERS OF HIGH-DEFINITION TELEVISION SYSTEMS FOR CINEMATOGRAPHY

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 1, Jan 84 pp 14-20

ANTIPIIN, M. V. and POLOSIN, L. L., Leningrad Institute of Cinematography Engineers

[Abstract] Requirements are discussed which digital high-definition television systems must meet in order to post-produce motion pictures with a quality at least as high as attainable conventionally from a 35 mm film. One parameter is format, 5:3 having been established as preferable to both 5:5 and 4:3 on account of better utilization of television transmitter tube and television optics, smaller losses, and better resolution without difficulties in conversion to the 4:3 format when required. Other parameters based on the eye response characteristics and on the dependence of the subjective (apparent) definition on the actual image resolution should, in accordance with the 1982 ITTCC recommendations, be: 1215 lines of the screen, frame speed 25/s, line frequency 30.375 Hz, relative time of line return stroke 0.125, relative time of vertical return stroke 0.0535, discretization frequency for brightness signal 13.5 MHz and discretization frequency for each color-difference signal 6.75 MHz (separate coding of brightness signal and color signals in 4:2:2 ratio), bandwidth for brightness signal 25.0 MHz, bandwidth for color-difference signals 12.5 MHz or smaller, clock discretization frequency 60.75 MHz, number of quantization levels in pulse code modulation 8, and data transmission rate 972 Mbit/s. Figures 6; tables 2; references 21: 14 Russian, 7 Western.
[105-2415]

DEVELOPMENT OF SOVIET TELEVISION NEWS REPORTING

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 1, Jan 84 pp 33-37

PETROPAVLOVSKIY, V. A. and POSTNIKOVA, L. N., All-Union Scientific-Research Institute of Television and Radio Broadcasting

[Abstract] Novel equipment developed in the Soviet Union for television news reporting is the UAZ-452A automobile television station with three television cameras and a "Kadr-103" transportable magnetic video recorder. Storage batteries located in a separate bus compartment serve as an independent power supply. The initial (1974-75) fleet of these stations with KT-203 black-and-white television cameras was augmented (1977) with UAZ-452A stations carrying KTR-302 color television cameras, the latter subsequently (1979) replaced by the more modern KTR-308 model. The automobile station also contains a microphone, dramatic audio and video control, black-and-white and color monitors, synchronization, director's control switching, technician's control panel and an external connections panel. Further developments are needed in order to improve the sensitivity of television cameras and for reducing the size and the weight of video recording equipment, while simultaneously expanding the scope of electronic recording facilities. Figures 6; references: 6 Russian. [105-2415]

UDC 621.397.2.037.372:006

ECONOMICAL POWER SUPPLIES FOR TELEVISION RECEIVERS

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 1, Jan 84 pp 38-45

AISSANI, Z. and BRILLIANTOV, D. P.

[Abstract] Television receivers available with screens in sizes of 11-31 cm (portable black-and-white), 25-31 cm (portable color), 47-67 cm (immovable black-and-white), and 59-67 cm (immovable color) draw a power ranging from 10 to 300 W, respectively, from the a.c. line. This power can be reduced by improving the efficiency of the power supplies, which now hardly exceeds 50%. Several developments, principally aimed at improving the transformer economy and performance, are: 1) transistorized stabilizers operating in the switching mode; 2) unstabilized converters which first rectify the low-frequency line voltage and chop the smoothed direct voltage into high-frequency pulses, then rectify those pulses and again smooth the direct voltage; 3) pulse converters stabilized by regulation of the output pulse repetition rate with pulse duration held constant, by regulation of the output pulse duration with pulse repetition rate held constant, or by simultaneous regulation of pulse repetition rate and pulse duration; 4) transformerless combination power supply and line-sweep generator, eliminating interference caused by switching of the power transistor. The most interesting among the various simpler and more intricate proposed circuits are those where the sweep generators are not under the line voltage. Figures 16; tables 2; references 7: 4 Russian, 3 Western and Japanese.

[105-2415]

TEAM ORGANIZATION OF AND REMUNERATION FOR LABOR BASED ON LABOR SHARE FACTOR

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 1, Jan 84 pp 53-55

VIL'GERT, R., Riga Motion Picture Studio

[Abstract] The team method of organizing and remunerating for labor is under consideration by management of the Riga Motion Picture Studio. This method, based on use of a labor share factor, can be successfully implemented only with high motivation of both specialists and workers. The three fundamental requirements for effective transition to the new system are stable interaction at all management and labor levels, maximum labor productivity and quality, and positive socio-psychological climate at the labor levels. Four criteria for increasing the labor share factor and ten criteria for decreasing it, and with the payment, have been established on the basis of experimental parallel running of the workshop for decorative processing equipment by the present method and the team method. Monthly monitoring of the labor share factor was replaced by monitoring after completion of individual jobs, which proved to strengthen both discipline and motivation because of an immediate rather than delayed and possibly overlooked reward or penalty. The problem still remains of incorporating pay bonuses for broader responsibility and larger output in a motion picture studio. Tables 1.

[105-2415]

CIRCUITS AND SYSTEMS

HOW TO CHECK LINE CHANNEL OF IKM-15 DIGITAL PULSE-CODE-MODULATION TRANSMISSION SYSTEM

Moscow VESTNIK SVYAZI in Russian No 9, Sep 83 pp 29-31

ABRAMOV, G. A., PTICHNIKOV, M. M. and SAVCHENKOV, Yu. P., coworkers, Central Scientific-Research Institute of Communications

[Abstract] A generator of test signals has been developed for checking the line channel of IKM-15 digital pulse-code-modulation apparatus in rural telephone networks. The test signal should preferably simulate the line group signal, a two-level or relative monopulse signal with not more than seven "1"s or seven "0"s in succession. Such a test signal can be generated by means of pseudorandom sequences describable by the analytical expression $x_i = x_{i_6} \oplus x_{i_7}$, its period being equal to 127 time-base intervals. It contains combinations of seven "1"s and "0"s in succession as well as all other possible combinations of "1"s and "0"s existing in the line group signal. The test signal generator consists of a relative-group reference generator, a pseudorandom-sequence generator and an output amplifier. Its components are built with series K155 integrated microcircuits, as well as appropriate analog microcircuits (NANDs and NORs) with higher load capacity and series K131/2/6 triggers can be used, as long as they produce output pulses of 3.0 ± 0.3 V amplitude and 0.98 ± 0.1 μ s duration with neither amplitude nor duration of overshoots exceeding 15%. The output stage contains MLT fixed resistors, an SP5-3 adjustable resistor, KM-56-N90 and K53-14-10V capacitors, a TIM 208 V or MIT transformer (or ULR-15 output transformer) with a D220B diode. The test signal generator for checking either a terminal station (VOLT) or an intermediate station (PS) of a line channel operates together with an interference generator, both feeding a line simulator. The signal parameters are measured at the transformer output and on the screen of a cathode-ray oscillograph. All equipment is designed for an operating frequency of 1.5 MHz and operating voltages up to 10 V. The line simulator is adjustable for 26 or 46 dB at 512 kHz, corresponding to respectively 4.0 and 7.2 km long regenerative line segments, with the necessary switching arrangement. Figures 5.
[69-2415]

NOISE OF $1/f$ FORM IN POLYCRYSTALLINE ALUMINUM FILMS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 28, No 11, Nov 83
(manuscript received 6 Jul 82) pp 2211-2216

POTEMKIN, V. V., BAKSHI, I. S. and ZHIGAL'SKIY, G. P.

[Abstract] The paper is devoted to an experimental investigation of the effect of the degree of dispersion of the structure of thin aluminum films at the level of $1/f$ noise and an analysis of a model of flicker noise due to modulation of the conduction of the crystal by fluctuations of the concentration of lattice vacancies. The method of investigation and the experimental results, with a discussion of the results, are presented. The authors thank M. Ye. Gertsenshteyn and A. V. Stepanov for discussion of the work and critical comments, I. N. Brylov for deposition of the films, and G. V. Bushuyev for assistance in conducting the structural investigations. Figures 3; references 17: 10 Russian; 7 Western (2 in Russian translation).

[111-6415]

UDC 621.391

EFFICIENCY COMPARISON OF QUASI-OPTIMUM DIRECTION FINDING ALGORITHMS USED FOR POINT SOURCES OF SIGNALS

Moscow RADIOTEKHNIKA in Russian No 12, Dec 83
(manuscript received, after abridgment, 14 Mar 83) pp 28-29

POCHUYEV, S. I.

[Abstract] Two quasi-optimum direction finding algorithms based on the Markov theory of optimal nonlinear filtration are compared with respect to efficiency, namely the algorithm of time processing in the Gaussian approximation for signals mixed with additive stationary white noise and the algorithm of space-time processing for signals mixed with uniform-in-space white noise. The radiation pattern of a direction finder is used as basis for comparative evaluation of the algorithms, a quadratic approximation of the radiation pattern allowing the useful signal at the output of the coherent detector to be represented as a space-time function continuously differentiable in the rms sense. Calculation of the error dispersion in each algorithm and of the convergence rate of each as function of the signal-to-noise ratio (assuming a constant signal amplitude) reveals that the second algorithm becomes increasingly more efficient than the first one as the signal-to-noise ratio decreases. Figures 1; references: 6 Russian.

[103-2415]

EVALUATION OF CHARACTERISTICS OF SYSTEM OF SPACE-TIME PROCESSING OF SIGNALS
BY STATISTICAL SIMULATION METHOD

Moscow RADIOTEKHNIKA in Russian No 1, Jan 84
(manuscript received, after completion, 17 Mar 83) pp 28-30

AGODISYAN, Kh. S., BURYAK, V. A., NEILO, N. I. and PAPUSHIN, K. G.

[Abstract] Two reports in the literature describe digital hydroacoustic systems with strict limitation of signals, and present data with respect to the magnitude of losses as compared with a linear system. These data, however, are inconsistent and do not take into account subsequent time processing of the signals, which makes it impossible to draw reliable conclusions concerning the detection characteristics of these systems in the case of various forms of sounding signals and spatial correlation of reverberation noise. The present paper is concerned with: 1) An evaluation of the degree of deterioration of the detection characteristics of a system of space-time processing with a strict limitation as compared with a linear system, on a background of reverberation noise; 2) An evaluation of the effect of spatial correlation of reverberation noise on the detection characteristics; and 3) Determination of dependence of detection characteristics on the magnitude of the interval of sampling of the input signals, and selection of this interval. The evaluation made of the detection characteristics of a system with a strict limitation of signals as compared with the linear used the method of statistical simulation on an electronic computer. Certain special features of the input signals were taken into account during their simulation. Figures 1; references 4: 1 Russian, 3 Western (2 in Russian translation).
[124-6415]

CONCERNING CRITERIA FOR EVALUATION OF AMPLITUDE-FREQUENCY CHARACTERISTIC
OF TWO-SIGNAL SELECTIVITY OF RADIO RECEPTION CHANNEL

Moscow RADIOTEKHNIKA in Russian No 1, Jan 84 (manuscript received 14 May 83)
pp 34-36

TELEZHNYI, B. G.

[Abstract] The results of a qualitative evaluation of the nonlinear effects in an ultrahigh frequency receiver of the shortwave band based on an electron tube (6Zh1P), field effect (KP350) and bipolar (GT313) transistors, performed experimentally, are shown in a table. The table presents the permissible values of the amplitude of the AM noise acting at the AM receiver, the evaluation of which was conducted according to a list of various criteria. Tables 1; references: 3 Russian.
[124-6415]

INVESTIGATION OF ASYNCHRONOUS DETECTOR WITH SELF-PUMPING BASED ON GUNN DIODE

Moscow RADIOTEKHNIKA in Russian No 1, Jan 84 (manuscript received 7 Jul 83)
pp 37-38

LEVTEROV, A. N., RADCHENKO, A. F. and KROTOV, V. I.

[Abstract] Mixers used in the microwave range with self-pumping, based on semiconductor devices with negative resistance (sometimes called self-oscillating) can operate in the makeup of autodynes or microwave power indicators. However, in the literature information is practically absent concerning the use of such mixers in the shortwave part of the millimeter range. The present paper presents the results of an experimental investigation of the operation in this range of an asynchronous detector (AD) with self-pumping. In the investigation an expansion of the working frequencies is caused by the use of harmonics of the basic oscillation frequency in a system with a Gunn diode. In so doing, asynchronous reception of microwave signals makes it possible to reduce the requirements on the frequency stability of the mixer with self-pumping, which brings about the use in the AD of a nonresonance load. The AD investigated has a high sensitivity and makes it possible to simplify the circuit in which it is used--to exclude an intermediate-frequency amplifier. Figures 2; references 7: 5 Russian, 2 Western (1 in Russian translation).
[124-6415]

SYNTHESIS OF FREQUENCY SPECTRA BASED ON USE OF MULTILEVEL PULSE SEQUENCES

Moscow RADIOTEKHNIKA in Russian No 1, Jan 84
(manuscript received, after completion, 5 May 83) pp 45-47

ANAN'YEV, A. S. and POPOV, S. N.

[Abstract] The paper is concerned with the use of periodic multilevel pulse sequences (MPS) for synthesis of a discrete set of harmonic oscillations (frequency spectra). By MPS is understood a sequence of rectangular pulses with a repetition period T and with an identical duration of each pulse in a sequence equal to τ . The pulses can be positive, negative, and equal to zero. The number of pulses in a period equal to the ratio T/τ , is designated through M and is called the length of the sequence. The amplitude of the pulses V_m can have any value, but its change is possible only at fixed points of the time axis $t = m\tau$, where m is the number of pulses in a period T : $m = 0, 1, 2, \dots, M-1$. It is possible to use multilevel pulse sequences for both combined and separate synthesis of frequency spectra. As an example of the use of this method, it is required to synthesize MPS for a separate derivation of harmonic oscillations with frequencies of 84, 96, 108, and 120 kHz and with identical amplitudes. The specified frequencies are, respectively, the 7-10th harmonics of the frequency $f_0 = 12$ kHz. Figures 1; references: 3 Russian.
[124-6415]

METHOD OF ANALYSIS OF COMBINATION OSCILLATIONS OF ARBITRARY NONLINEAR SYSTEM
FOR SPECTRUM CONVERSION

Moscow RADIOTEKHNIKA in Russian No 1, Jan 84
(manuscript received, after abridgement, 30 Jun 83) pp 48-49

POPOV, P. A. and MOSHNINA, Ye. N.

[Abstract] During the formation of signals with specified amplitude-phase characteristics in frequency conversion systems, a problem arises with respect to secondary oscillations, which are the products of a nonlinear frequency conversion of the input action. The present paper is concerned with a method of harmonic analysis which makes it possible to obtain a general analytical expression for any of the spectral components of the output oscillations with the effect on the arbitrary characteristic of the nonlinear inertialess element of a polyharmonic signal. References: 4 Russian.
[124-6415]

COMMUNICATIONS

EFFECT OF INTRODUCTION OF NEW TECHNOLOGY

Moscow VESTNIK SVYAZI in Russian No 9, Sep 83 pp 24-25

AVDEYEV, A. I., engineer, Brest telegraph system

[Abstract] Recent innovations introduced in the Brest telegraph system include: 1) TT-48, TT-12, TT-144 channel equipment replacing the ChVT-2, TT-17 PZ, TT-17 P1 equipment for transmission at higher rates of 50, 100, 200 baud respectively; 2) installation of TVU-12M 12-channel equipment in urban areas for operation at any temperature and with little labor cost and 3) installation of PTS-5, AKT-PD, ATK-20U and similar switching equipment for transmission at rates up to 200 baud with any "Nikola Tesla" AT-PS-PD crossbar exchanges or ATA-57, APS-Sh exchanges. The crossbar exchanges will replace 10-step exchanges, doubling the capacity, while all main workshops and line segments will be equipped with "Interval", "Vremya", and "Chas" apparatus. Power supplies VSS-170/54, VSS-93/95, VU-36/250 have already been replaced by power supplies VU-66/140, VUK-67/140, VUK-170/13, and VUK-36/60 with an automatically-controlled diesel-generator plant and NT-220/15 current inverter. Since 1981, when the changeover began, operation of PD-200 subscribers' stations has yielded a net income of over 300 rubles per month. A study course and a handbook are being prepared for retraining the telegraph operators. Figures 2.

[69-2415]

FEATURES OF MECHANIZATION AND AUTOMATION OF LETTER PROCESSING, PART 1

Moscow VESTNIK SVYAZI in Russian No 9, Sep 83 pp 27-29

TITOV, V. K., senior engineer, Main Management of Postal Service, USSR Ministry of Communications

[Abstract] The technology of mechanized letter processing is compared with the technology of manual letter processing, automation being the next step of improvement. Mechanization and automation require special machines for such operations as stamp cancellation, sorting, tying, transporting, etc. The most important performance characteristics of these machines (MV-3, MPO, ShMN-2, ShM-4A, ShM-5, KRL, LShM-4, MAP-1, MPSU, USB-M, KAYa) are their productivity in terms of letters or parcels per hour and their power requirement. Complete

automation of letter processing, with exclusion of off-size items for special handling, covers three basic groups of operations: 1) preprocessing of all correspondence, 2) sorting of letters, and 3) processing of parcels. Conveyers transport letters and parcels from one processing point to the next. The paper will be finished in Issue 10 of VESTNIK SVYAZI. Figures 4; tables 1. [69-2415]

UDC 621.391

INVESTIGATION OF DURATION OF MULTICHANNEL SEQUENTIAL SIGNAL DETECTION PROCEDURE

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 28, No 11, Nov 83 (manuscript received 6 May 82) pp 2169-2178

FISHMAN, M. M.

[Abstract] The paper is concerned with a number of exact and asymptotically exact formulas for the distribution and for the average distribution of a multichannel sequential procedure (MSP) under conditions where the statistics formed in various channels of the multichannel system are independent. On the basis of the formulas found, the dependence can be investigated of the characteristics of the MSP duration on the degree of the probability of erroneous solutions, as well as the conduct of an analysis of the effectiveness of MSP in comparison with procedures of fixed duration. The following items are considered: 1) Distribution of duration of sequential detection; and 2) Asymptotic formulas for average time of sequential detection. Figures 1; references 9: 5 Russian, 4 Western (3 in Russian translation). [111-6415]

UDC 656.254.16

PORTABLE RADIO STATION OF RN-12B SYSTEM 'TRANSPORT'

Moscow AVTOMATIKA, TELEMEXHANIKA I SVYAZ' in Russian No 11, Nov 83 pp 3-6

VAVANOV, Yu. V., Chief of Laboratory of the All-Union Red Banner of Labor Scientific-Research Institute of Railroad Transportation, Candidate of Technical Sciences; and DAGAYEVA, N. Kh., Senior Scientific-Research Worker

[Abstract] The portable RN-12B "Transport" system radio set for improved railway service through alternate two-way radio linkage between moving or between moving and stationary users has five channels in the 151-156 MHz range with spacing between bands of 25 kHz, allowing intermodulated channel combinations for communication with various radio nets at RR stations or in between. Transmitter power is 1 V and there is phase modulation with boosting of the high-frequency response by 6 dB per octave, maximum frequency deviation of 5 kHz, transmitter frequency band is 300 to 3000 Hz, receiver output is 150 mV

and noise suppressor effectiveness is 40 dB. Operations are possible in the -25 to +50° temperature range. The unit consists of a receiver-transmitter (195 x 44 x 78 mm, 950 gr) connected to a manipulator pack (120 x 32 x 58 mm, 220 gr), containing a speaker-microphone and whip and flexible antennae and battery and charger. Push-buttons on the manipulator allow adjustment for transmission or reception and all users on the call frequency can hear exchanges. Serial production is now being introduced and the equipment is beginning to be used on the railways. It replaces Soviet, Czech and Hungarian units of various types (3-8 channels and transmitter power of 0.2-1 V) but the need for this type of equipment is not satisfied. Figures 3, tables 1. [100-12497]

UDC 656.254:621.395.5

THE K-24T TRANSMISSION SYSTEM

Moscow AVTOMATIKA, TELEMEKHANIKA I SVYAZ' in Russian No 11, Nov 83 pp 6-9

ZDOROVITSOV, I. A., Chief of Section, Design Office of Main Administration of Signaling and Communication, Ministry of Railroads, USSR, Chief Designer of Systems; POPOV, N. P., Chief Designer of Section; RELINA, Ya. A. and EBERT, V. Ya., leading designers

[Abstract] This paper is a continuation of articles from AVTOMATIKA, TELEMEKHANIKA I SVYAZ', 1983, Nos 1,3,5,8 and 10. The K-24T transmission system includes an intermediate post intended for parallel connection on cable lines multiplexed with a 12-channel system in the 60-180 kHz range with conversion to audio frequency and carries out direct signal transmission in the 12-112 kHz range, power supply transit and passage of service messages and remote-control signals on the state of system parameters from the intermediate post to the terminal. The post can be located at line points where numerous clients are located who require audio frequency systems and can be installed on the line at spacings of a minimum of 2 or a maximum of 19 km. Good operating conditions involve determination of attenuation. Suitable conditions are temperatures of 5-40°C and relative humidities of 80% at 25°. Power is DC at 24+4 V or AC at 220 V, DC consumption is 7 A and the signal unit uses 0.3 A and in emergency mode 2 A. AC consumption is 2A. The unit consists of a converter, signal transit line equipment, protector component and a signal block which generates failure data. Figures 3. [100-12497]

TIME CHARACTERISTICS OF SEARCH FOR COMPOUND SIGNALS WITH RESPECT TO DELAY

Moscow RADIOTEKHNIKA in Russian No 1, Jan 84
(manuscript received, after completion, 12 Jun 83) pp 53-55

FOMIN, A. A.

[Abstract] Known methods of determining the time characteristics of systems of search for compound signals with respect to delay make it possible to obtain sufficiently precise results in the case of operation under conditions of stationary interference. However, use of these methods for channels with nonstationary interference (e.g., subjected to multibeam propagation) often leads to calculation errors. On the basis of the theory of Markov chains, the present paper develops a general method for determining the average value and the dispersion of the time of a search for a compound signal with respect to delay, free from the deficiencies of other systems, and suitable for channels with stationary and nonstationary noise, with any number of steps of analysis. Figures 1; references 5: 4 Russian; 1 Western.
[124-6415]

NOISE IMMUNITY OF OPTICAL LINES WITH IMPRECISE LEVELS OF SIGNAL AND NOISE

Moscow RADIOTEKHNIKA in Russian No 1, Jan 84
(manuscript received, after abridgement, 10 Jun 83) pp 73-75

ANISIMOV, V. Yu. and BORISOV, E. V.

[Abstract] During planning of optical communication lines (OCL), it is necessary to evaluate their noise immunity for the anticipated levels of signal and noise, recorded at the output of the photodetector of the receiving section of the OCL for the interval of observation. Relations are available in the literature for evaluation of the noise immunity of OCL, determined by the average probability of error during reception of a message symbol when the expected average level of the signal and noise is precisely known. In the present paper, a method of evaluation is presented which is concerned with specified average levels of the signal and noise in the form of imprecise sets. Accessory functions characterize the degree of affiliation of the specified levels of signal and noise with the expected values for the planned OCL. This makes it possible to formalize the subjective concept of the planner with respect to the expected levels of signal and noise which is formed under the conditions of action of a large number of undefined factors. Figures 4; references: 4 Russian.
[124-6415]

PROCEDURE FOR CALCULATION OF STAGES WITH OPERATIONAL DIRECT-CURRENT AMPLIFIERS

Moscow RADIOTEKHNIKA in Russian No 1, Jan 84
(manuscript received, after completion, 11 Apr 83) pp 78-81

TARANETS, G. M., TONAKANOV, B. A. and YEFIMOV, N. S.

[Abstract] In choosing the elements of a stage, it is advisable to take as optimality criteria the minimum values of the sheer stress and its drift and the security of protection of operational amplifiers (OA). A method is proposed in the present paper by which elements of a stage with operational amplifiers are calculated and its parameters with respect to direct current are optimized. A number of calculations for the stage are recommended. Formulas are presented in the Appendix to this paper for calculation of stages with basic-type connections of OA. Figures 4.
[124-6415]

MICROPROCESSOR PARALLEL PROCESSING FOR DIGITAL FILTERS

Leningrad IZVESTIYA VYSSHIKH UCHEBNIKH ZAVEDENIY: PRIBOROSTROYENIYE in Russian Vol 26, No 7, Jul 83 (manuscript received 30 Nov 82) pp 37-41

SOTNIKOV, A. D., Leningrad Electrotechnical Institute of Communications imeni Prof. M. A. Bonch-Bruyevich

[Abstract] Contemporary digital data transmission systems and pulse code devices involving digital filters with analog/digital conversion to 512 kHz and more require higher speed processing. However, microprocessor digital filters were found to be slow because filtration algorithm processing was applied in series. Speed was increased by conveyor processing in parallel and the distribution arithmetic method involving simultaneous processing of analogous bits in different inputs. The system increases processing speed, requires a small permanent memory, can change filter characteristics by replacement of less than 10% of the memory and can process signals from a limiting frequency to several hundred kilohertz, thus increasing possibilities for microprocessor digital filters in communication equipment and other high-speed units. The paper is recommended by the Kafedra (Department Faculty) for Pulse and Computing Techniques. Figures 3, references 3: 1 Russian, 2 Western. [96-12497]

IMPROVEMENT IN ANALOG ERROR AUTOCORRECTION CIRCUIT

Leningrad IZVESTIYA VYSSHIKH UCHEBNIKH ZAVEDENIY: PRIBOROSTROYENIYE in Russian Vol 26, No 7, Jul 83 (manuscript received 21 Oct 82) pp 42-46

GRUSHVITSKIY, R. I., MANCHEV, B. A. and MURSAYEV, A. Kh., Leningrad Electrotechnical Institute imeni V. I. Ul'yanov (Lenin)

[Abstract] Analog and digital converter errors can be compensated by autocorrection circuits involving periodic monitoring and matching of output with a standard input by means of an associative memory component. The improved autocorrection circuit has a two-cycle associative memory with double amplification. It significantly improves correction precision and makes possible precise analog and digital converters without expensive components. The circuit

was used in a digital/analog converter with automatic nonlinear correction. The error of the original components and of the uncorrected circuit amounted to 5% and use of the circuit reduced the figure to 0.2%. The circuit used without a summator reduced the precision requirement of the amplifier but with a rise in commutation noise in the associative memory. The proposed auto-correction circuit reduced commutation noise to 0.2 mV from 3.5 mV and dropped the memory condenser capacitance to 1000 microfarads. The total error of the digital/analog converter did not exceed 0.02% of the signal scale. The paper is recommended by the Kafedra (Department Faculty) of Computing Technology. Figures 2; references: 6 Russian.
[96-12497]

UDC 621.391.822.4:621.372.001.5

PECULIARITIES OF MINIMIZATION OF MIXER NOISE FACTOR

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 28, No 11, Nov 83
(manuscript received 28 Dec 81; after amendment, 9 Dec 82) pp 2266-2272

ANISIMOV, Ye. N. and ASTASHKEVICH, B. A.

[Abstract] Wide use is now made of the methods of computer-aided design during the development of various radioelectronic devices, especially in the field of nonlinear semiconductor electronics. The characteristics of radioelectronic systems, earlier determined analytically, are now found with the assistance of computational methods concerned with many characteristics of systems. During this, the complex nature of an integral function gives rise to definite difficulties during its minimization. The present paper considers the peculiarities of minimization of such functions computed algorithmically, using as an example the noise factor of a weak-signal mixer based on a diode with a Schottky barrier. Items which hinder use of standard methods of minimization for solution of the class of problem considered are analyzed. A new method is realized in the form of a minimization program, a block diagram of which is shown in a table. The computing time stated in the table corresponds to the solution of the problem on a M-4030 electronic computer; the computing time for one value of an integral function amounted to 5-6 seconds. Use of the program for minimization of the noise factor of a mixer confirmed the high efficiency of the method and made it possible to obtain positive results. An attempt to determine the minimum of this function somehow from known methods ended in failure. Figures 1; tables 1; references 8: 6 Russian, 2 Western in Russian translation.
[111-6415]

CRITERIA FOR ACCURACY OF ROTARY TRANSFORMERS

Moscow ELEKTRICHESTVO in Russian No 1, Jan 84 (manuscript received 21 Dec 81)
pp 55-56

BOGDANOV, V. I., candidate of technical sciences, TAZOV, G. V., candidate of technical sciences, and KHRUSHCHEV, V. V., doctor of technical sciences, Leningrad Institute of Aviation Instrument Design

[Abstract] The performance of rotary transformers for electronic data processing is analyzed from the standpoint of accuracy. Systematic errors include the relative amplitude error caused by step-curve approximation of a sine wave, errors caused by asymmetry of the null points and by residual emfs at the null points, quadrature error, and error caused by a difference between the transformation ratios. Random errors in reproducing four functional relations characterizing the outputs of two secondary windings as functions of the rotor angle, with the two orthogonal primary windings excited alternately, are analyzed statistically with asymmetry of the magnetic circuit and of the electric circuits treated as a probabilistic quantity. The system of random functions is an at least four-dimensional one and treated here as such, in orthogonalization by the Gram-Schmidt method. As the accuracy criterion is selected the resultant vector, the sum of two vectors, characterizing the fluctuation of flux-linkages affecting all coupled coils. Correlation coefficients and dispersions obtained theoretically and experimentally for 16 variants of rotary transformers in accuracy classes 0.01 and 0.02, operating as phase shifters, x-y plotters, sine-cosine resolvers, synchro receivers or transmitters indicate that this criterion is a valid one. Figures 2; tables 2; references 9: 8 Russian, 1 Western (in Russian translation).
[110-2415]

CROSS SECTION FOR ABSORPTION OF PARTLY SHIELDED DIELECTRIC SPHERE

Gorkiy IZVESTIYA VYSSHIKH UCHEBNIKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 26, No 10, Oct 83 (manuscript received 24 Jan 83) pp 1276-1281

VINOGRADOV, S. S. and SULIMA, A. V., Institute of Radiophysics and Electronics, UkSSR Academy of Sciences

[Abstract] The effect of an ideally conducting spherical metal cup, as a shield, on the microwave absorption characteristics of a dielectric sphere is evaluated on the basis of the known solution to the diffraction problem for a plane electromagnetic wave propagating along the axis of cup and sphere. The Debye electric and magnetic potentials are calculated for the shielded segment of the sphere and for the unshielded remainder of the dielectric sphere, the cup lying either on the front surface or on the back surface of the sphere. The problem reduces to two coupled systems of linear algebraic equations of the second kind. The cross section for absorption, equal to the difference between total incident energy flux and scattered energy flux in accordance with power balance or conservation of diffraction energy, has been calculated as a function of kb (k - wave number in free space, b - radius of cup base circle). Numerical results indicate that within the resonance range (b - wavelength of incident radiation) correction must be made to include quasi-natural modes of the shield. A narrow shield behind the sphere increases the overall absorption level in the latter, while a narrow shield before the sphere has almost no effect on the absorption. Maximum resonance absorption is attained with an aperture angle at which the electrical Joule-effect losses become equal to the diffraction losses. Figures 5; tables 1; references 6: 4 Russian, 2 Western. [97-2415]

ACTION OF EXTERNAL INTERFERENCE-CARRYING FIELD ON NONUNIFORM MULTIWIRE SHIELD

Moscow RADIOTEKHNIKA in Russian No 12, Dec 83 (manuscript received 25 Apr 83)
pp 68-69

BONDAR', V. M.

[Abstract] The shielding effect of multiwire meshes against an external interference-carrying field is calculated in terms of the attenuation coefficient

$A = 20 \log \left| \frac{1}{S} \right|$, with $S = \sqrt{P_{r,sh}/P_{r,0}}$, $P_{r,sh}$ and $P_{r,0}$ denoting the radial component of the Poynting vector with and without a shield, respectively. The shielding factor S is evaluated from the general solution to Maxwell differential equations, obtained according to the Bromvich method by superposition of two particular solutions (for transverse electric and magnetic waves, respectively). The shielding coefficient is found to depend not only on the shield structure but also on the form of the external electromagnetic field, namely on the ratio of its axial component to its tangential component. Accordingly, expressions are derived for flexible cylindrical single-layer and double-layer shields around cables, connecting wires, or cords. Figures 1; references 8: 6 Russian, 2 Western (in Russian translation).

[103-2415]

EFFECT OF MULTIFOLD TRAPPING OF CARRIERS ON TRANSIENT PHOTOCURRENT IN AMORPHOUS SEMICONDUCTORS

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 17, No 10, Oct 83 (manuscript received 14 Apr 83) pp 1817-1822

ARKHIPOV, V. I., POPOVA, Yu. A., and RUDENKO, A. I., Moscow Engineering and Physical Institute

[Abstract] This paper considers the conduct of the density of carriers under conditions of step-by-step generation (continuous illumination). It is shown that this conduct has some interesting features: in particular, the density of mobile carriers determining the transition photocurrent, passes through the maximum before its stationary level is established. The characteristics of the maximum and the form of the curve of the transition photocurrent depend on such important parameters as the "depth" of the energy distribution of local states, the rate of generation, the capture cross section and recombination, etc. Thus, by interpreting the experimental data on photoconductivity in terms of theory presented later, it is possible to obtain information concerning energy-band structure and the parameters of real disordered materials. Specimens of high-resistance materials, illuminated by light or exposed to the action of some kind of ionizing radiation, are considered. The illumination (or irradiation) beginning at the moment $t = 0$, continuously and uniformly with respect to volume generates G electron-hole pairs in unit volume in unit time. A uniform electrical field is maintained in the specimen. These conditions lead to the appearance of a transient photocurrent which can be measured directly by experiment. Calculation of it is the principal goal of this paper. Figures 1; references 13: 3 Russian, 10 Western.

[143-6415]

VARIATION OF CARRIER CONCENTRATION CAUSED BY BAND STRUCTURE RECONSTRUCTION
IN TELLURIUM AND TIN-DOPED $\text{Al Ga}_x \text{As}_{1-x}$ SOLID SOLUTIONS

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 17, No 10, Oct 83
(manuscript received 13 Sep 82) pp 1748-1751

MALYSHKIN, M. A., GALCHENKOV, D. V., GRANKIN, M. A., BONDAR', S. A. and
VIGDOROVICH, V. N.

[Abstract] This paper studies the nature of the distribution of the concentration of free electrons in epitaxial layers of $\text{Al Ga}_x \text{As}_{1-x}$ which were doped to various degrees by tellurium or tin. Study of the electrical properties of solid solutions was conducted on epitaxial layers with a thickness of 50-60 micrometers and a composition varying in the limits $0.3 \leq x \leq 0.6$. The layers were grown by the liquidphase epitaxy method in the temperature interval 1020-800°C. It is established that the complex nature of the distribution of the concentration of free electrons does not depend on the type of donor impurity. It results from a change of the structure of the conduction band with the composition of the solid solution as well as the interaction of a donor with G-, L- and X-donors of the conduction band. The data obtained show that during preparation of thick low-resistance layers, e.g., of the n-emitters of light-emitting diodes on a basis of "multipass" heterostructures in a system of solid solutions of $\text{Al Ga}_x \text{As}_{1-x}$, it is necessary to avoid use of solid solutions with compositions corresponding to minimum values of the concentration of free carriers. The authors thank L. I. Krutogolov, Ye. V. Nevstruyev, and S. A. Ryzhikh for conducting measurements. Figures 2; references 8: 3 Russian, 5 Western.
[143-6415]

1/f NOISE IN CONDITIONS OF HIGH GEOMETRICAL MAGNETORESISTANCES

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 17, No 10, Oct 83
(manuscript received 21 Apr 83) pp 1830-1834

LEVINSHTEYN, M. Ye. and RUMYANTSEV, S. L., Physico-Technical Institute
imeni A. F. Ioffe, USSR Academy of Sciences, Leningrad

[Abstract] The paper demonstrates that in conditions where a Hall voltage is absent and a high geometrical magnetoresistance appears in the magnetic field, this relation can be very great, even in moderate magnetic fields. Such a situation is realized in short ($L/d \leq 1$) specimens (L = distance between contacts, d = dimensions of contact). Measurements in such conditions make it possible with great completeness and certainty to judge concerning the origin of 1/f noise. Two types of specimens produced from epitaxial n-GaAs, which were measured at temperatures of 300, 200, and 77 K, are described. At 300 and

and 200 K the maximum value of the geometrical magnetoresistance $\Delta\rho/\rho_0$ amounted to ~ 1.2 and 2.75 , respectively. At 77 K, $(\Delta\rho/\rho_0)_{\max} \approx 15$. A con-

clusion is made concerning the volume nature of $1/f$ noise. The authors thank M. I. D'yakonov for assistance in the work and for numerous discussions; Sh. M. Kogan for consideration of the results. Figures 4; references: 12 Western. [143-6415]

UDC 621.315.592

NONLINEAR TRANSMISSION OF LASER RADIATION BY ZnTe MONOCRYSTALS AT HELIUM TEMPERATURES

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 17, No 10, Oct 83 (manuscript received 14 Sep 82) pp 1893-1896

ZYUL'KOV, V. A., GRIBKOVSKIY, V. P., IVANOV, V. A. and KATIBNIKOV, M. A., Institute of Physics, Belorussian SSR Academy of Sciences, Minsk

[Abstract] Saturation absorption in A^{II}B^{VI} semiconductors under the effect of powerful laser radiation at nitrogen and room temperatures has been investigated in a number of works, in which it is shown that the dependence of the transmission coefficient T on the intensity of the incident radiation I_0 is determined by the concentration of the impurity, the temperature of the crystal, and the energy position of the levels in the forbidden zone. Specimens ordinarily have residual absorption, maintained up the threshold of the material breakdown. The present paper investigates the nonlinearity of transmission in the region of helium temperatures, as the result of which it is possible to expect efficient bleaching of crystals with smaller levels of excitation in comparison with $T = 77 \pm 300$ K. This makes it possible to conduct a more detailed comparison of experimental data with the theoretical and to clarify the reasons for incomplete bleaching of semiconductors. The authors thank G. I. Rapinchuk for conducting calculations on an electronic computer. Figures 3; references 13: 11 Russian, 2 Western. [143-6415]

UDC 621.382.519.67

COMPLEMENTED SCHARFETTER-GUMMEL CONDITION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 28, No 11, Nov 83 (manuscript received 15 Jul 81) pp 2297-2298

PROKOP'YEV, A. I.

[Abstract] Machine modeling, based on the solution of a fundamental control system (FCS) is more and more widely used for analysis of semiconductor devices. However, in using particular numerical methods, mathematical limitations exist,

one of which is the Scharfetter-Gummel condition described in the IEEE Transactions in 1969: a scheme for a continuity equation, stable only at that time when the difference of potential between adjacent units of the network are not larger than the doubled thermal Boltzmann potential. The cases for applicability of this condition are not specified in the 1969 paper and meanwhile it is incomplete and not always valid. The present brief report is successfully concerned with complementing the formulation of Scharfetter-Gummel conditions for a continuity equation, in writing similar conditions for other methods of approximation of FCS, and also in an indication of the possible cases to which the Scharfetter-Gummel limitation does not extend. Tables 2; references 4: 2 Russian; 2 Western.
[111-6415]

UDC 621.382.2.029.64

COUPLING OF CURRENT AND FREQUENCY-MODULATED NOISE IN GUNN OSCILLATORS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 28, No 11, Nov 83
(manuscript received 12 Jan 82) pp 2294-2297

VOROB'YEV, M. D., SKLIZNEV, S. M., SMIRNOV, L. P. and POPOV, A. I.

[Abstract] This brief report is concerned with an experimental investigation of the correlation coupling of the frequency-modulated and current noise of Gunn oscillators at low frequencies of wave selections from the carrier F , as well as refinement of the relations which couple the absolute levels of the noise. A waveguide oscillator served as the object of the investigation, and a Type AA703 diode was used as the active element. The correlation coefficient of the frequency and current fluctuations ρ was measured by a method described in a 1977 paper. The results of measurement of ρ at various frequencies F are presented. As a whole the values obtained indicate the existence of an appreciable correlation of current and FM noise. Figures 2; references 6: 3 Russian, 3 Western (1 in Russian translation).
[111-6415]

UDC 621.565.58(088.8)

EQUIPMENT AND RESULTS OF TEST OF COOLER FOR ELECTRO-OPTICAL TRANSDUCER

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 2, Feb 84
(manuscript received 17 Dec 82) pp 117-119

VERDIYEV, M. G., candidate of technical sciences, docent, Dagestan Polytechnical Institute

[Abstract] As is known, one of the various methods for increasing the sensitivity of electro-optical transducers is cooling of its photocathode, which follows from the relationship for thermoelectron emission of photocathodes. At

present the thermoelectric method is the most promising, in connection with a low time constant, small overall size and weight characteristics, unrestricted life expectancy, noiselessness, simple control of cooler, etc. Existing constructions of thermoelectric coolers require a direct contact of the cold junctions of the thermopile with the photodiode, as the result of which their use is difficult because of a number of shortcomings. In connection with this, for the purpose in hand, the goal was to move the thermopile and the tube to a distance from one another. During development of the system of heat transfer from the photocathode of the optical transducer to the cooler--the cold junctions of the thermopile, preference was given to closed evaporation systems of heat transfer (evaporative thermal siphons--ETS) with the use of an intermediate heat carrier. This choice was determined by a number of circumstances listed in the paper. The authors conclude that ETS possesses high operational and thermodynamic characteristics, and the use of ETS as a highly-effective device for remote thermal commutation of the cold junctions of thermopiles and electron-optical tubes makes it possible to exclude the effect of the fields of a thermopile. As the results of tests showed, the technology described for exhausting the ETS and heat carrier systems is sufficiently effective.

Figures 2; references: 5 Russian.

[129-6415]

PULSE AND INTERVAL DISTRIBUTOR WITH SENSOR CONTROL

Moscow AVTOMATIKA, TELEMEKHANIKA I SVYAZ' in Russian No 11, Nov 83 pp 9-11

SOKOLOV, V. I., dotsent, UEMIIT (expansion unknown), candidate of technical sciences, BALIYEV, W. K., assistant, candidate of technical sciences, KONDRATEV, N. S., chief engineer, Poletayevo Division of South Ural Road, and IVANOV, B. N., chief RTU (expansion uncertain)

[Abstract] Sensors instead of wafer switches are now used on some multichannel devices for channel selection and have been applied to a unit for pulse and interval measurement. Pulses formed by a distributor during the measurement of code transmitter parameters or by a time pulse generator are fed into an inverter and pass to the counting circuit. The results are shown on the digital display of the instrument after binary-decimal conversion. The distributor operates by means of triggers consisting of a field-effect transistor and a bipolar transistor. A touch on the sensor lowers gate potential in the field-effect transistors. Current flowing through the base of the bi-polar transistor keeps the trigger open. Touch contact is made with a plate protecting the transistors from static charges. The equipment is being successfully used in the Poletayevo Division.

[100-12497]

UDC 621.3.019.3:621.38

ASSURANCE OF UNITY OF TESTS OF SEMICONDUCTOR PRODUCTS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 83 pp 11-13

YELYUTIN, A. V., KHOLODNYI, L. P., GENKINA, R. I., and KAGANOVSKIY, I. P.

[Abstract] In the general case, it is shown that formulation of the problem of guaranteeing reliable checking of the quality of semiconductor materials, i.e., the problem of assurance of unity of tests, reduces to three variations: 1) Allowance for the above parameter is rigidly established by the users; 2) With a known error of unitary measurement and a definite evaluation of the material quality, it is necessary to set up a minimum reliably checked allowance for the given parameter; and 3) With a specified allowance for the parameter and an already selected quality of the material, it is necessary to determine what the error must be of an individual measurement which assures reliable checking with a given tolerance and accepted evaluation.

[117-6415]

UDC 53.088.3:621.396.969.1

EVALUATION OF PRECISION OF TRIANGULATION METHOD OF DETERMINING COORDINATES

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 83 p 37

PAVLOVA, N. V. and KONDAKOVA, Z. V.

[Abstract] A 1958 paper by A. G. Saybel substantiates the advisability of evaluating the precision of the triangular method of determining the coordinates of terrestrial objects by the value of the average square error with a fixed base. On the basis of this, the present paper considers a method for finding such an error of determination of coordinates for the case where the base is known with an error substantially smaller than the distance to the object. It is shown that the error of determining the coordinates of an object is increased if the error of measuring the base is taken into account. Figures 1; references: 1 Russian.

[117-6415]

USE OF FIBER LIGHT GUIDES FOR EVALUATION OF PRECISION CHARACTERISTICS OF PULSED LASER RANGE FINDERS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 83 pp 38-40

DANIL'CHENKO, V. P. [deceased], KASHCHEY, V. A. and POSPELOV, L. A.

[Abstract] The results of a study of the metrological properties of fiber light guides (FLG), which appeared in a 1974 paper by D. Markuze theoretically made it possible to validate the possibility of their use in devices intended for certification of contemporary pulsed range finders. Using this as a base, the present paper investigates the effect of fluctuations of the parameters of a Gaussian light beam which has been introduced into a FLG, on the precision of measurement of the time delay by a light guide of an optical pulse. The authors conclude that the evaluations obtained show the outlook for the use of FLG in devices for metrological certification of pulsed range finders. FLG make it possible almost completely to eliminate systematic error of distance measurement, and by the method of built-in control to solve the problem of effective evaluation of the precision characteristics of a range finder. Figures 2; references 6: 3 Russian, 3 Western (2 in Russian translation). [117-6415]

UDC 389.14:539.1:536.1

EFFECT OF CERTAIN GEOMETRICAL PARAMETERS ON METROLOGICAL CHARACTERISTICS OF MULTICHAMBER BLACK BODY

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 83 pp 40-42

TOLSTYKH, G. N., NALIMOV, V. N. and VERTUSHKIN, V. K.

[Abstract] It is shown that during creation of a model black body (BB) with a large radiating surface, multichannel principles are mostly used, i.e., one large space is replaced by a group of small spaces or cells. The design of a BB proposed in the literature (which does not have the shortcomings found in many other proposals) is shown to be an aluminum plate, the radiating surface of which is closely dotted with square pyramids. This makes it possible to conserve the good conditions of heat transfer to the elements of the radiating surface and to improve the radiation characteristics by a considerable decrease of the effect of the vertexes of the pyramid on the radiation factor and an increase of the size of the radiating strip. In the process it is necessary to find a pitch of the cut of the radiating surface elements such that, allowing for the nonuniformity of the temperature at the height of the pyramid, the error or reproduction of the BB radiation by a real radiator would be minimum. The effect of the pitch on the metrological characteristics of the BB is investigated. References 14: 12 Russian, 2 Western (1 in Russian translation). [117-6415]

PHOTOELECTRIC MASTER MEANS OF MEASUREMENT OF ENERGY AND MAXIMUM POWER OF PULSED LASERS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 83 pp 53-55

GLAZOV, A. I., MITROFANOV, T. M., TIKHOMIROV, S. V. and TYUTYUNNIK, V. G.

[Abstract] This paper considers two types of master means of measurement (MMM)--of energy and maximum power--based on the photoelectric principle for conversion of laser radiation. In so doing, the advisability appeared of realizing the technically economic solution of constructing a MMM by modernization and a suitable selection of operational pulse photometers, optimization of their structure, type of operation, service conditions, and reduction of instrumental error by taking the effect of the noninformation parameters of the radiation into account. The results of metrological certification of FEL-3 and FPL photometers, and a description of the devices are presented. Figures 2; tables 1; references: 7 Russian.

[117-6415]

UDC 621.375.826.081:519.21

PRECISION PHOTOMETER FOR MEASUREMENT OF LOW LEVELS OF MAXIMUM POWER OF PULSES LASER RADIATION

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 83 pp 55-57

KOSTIN, V. A., STYSIN, V. Ye., TIKHOMIROV, S. V., KHATYREV, N. P. and YAKOVLEV, V. A.

[Abstract] At present, effective means for measurement (EMM) of low levels of the maximum power of optical radiation in the nanosecond range are not manufactured. Only individual experimental models, developed by various enterprises for their special needs are available. Such a situation obviously does not satisfy contemporary requirements, and, consequently, the problem of development and industrial production of such EMM is an urgent one. The principal requirements and their characteristics and parameters are as follows: effective spectral range, 0.5-0.6 micrometer; range of measurement of power, 10^{-8} - 1 Watt; pulse duration, 1 - 10^4 nanosecond; error of measurement of maximum power, 15-30%. The authors consider the construction principles for the means of measurement of low levels of maximum power of pulsed laser radiation, using as an example the development of a photoreceiving device (FPU), which fulfills the function of a comparator in a standard. A number of photomultiplier tubes and certain types of p-i-n photodiodes produced by Soviet industry are investigated. The principles of construction of pulse photometers and the characteristics of highly-precise photometers are presented. References: 8 Russian.

[117-6415]

MEASUREMENT OF FLUX DENSITY OF SOUND ENERGY

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 83 pp 67-68

VOVK, A. Ye., KLIMOV, S. P. and TYUTEKIN, V. V.

[Abstract] A method is proposed for determining the flux density of the sound energy \bar{W} with the use of a system of unidirectional reception in space. The method is an extension of two papers published by the same authors in 1975 and 1977. Figures 2; references 6: 4 Russian, 2 Western.
[117-6415]

UDC 538.56:535.31

OPTIMUM TIME OF DAY AND NIGHT FOR MEASURING DISTANCES IN TURBULENT ATMOSPHERE WITH OPTICAL RANGE FINDERS (CASE OF HIGH RISE OF LASER BEAM ABOVE GROUND SURFACES)

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 26, No 10, Oct 83 (manuscript received 18 Feb 83) pp 1307-1308

CHUDNOVSKIY, V. S., Institute of Terrestrial Physics, USSR Academy of Sciences

[Abstract] Accurate measurement of distances larger than 10 km with optical (laser) range finders presents a problem in geodetic research, mainly because of imprecise data on the air temperature along the path of electromagnetic waves. An analysis of this problem for a modulated laser beam in a turbulent atmosphere by the method of smooth perturbations has yielded a relation for fluctuations of the signal eikonal $\overline{\Delta S^2} = 1/4 \sqrt{2\pi} \bar{\sigma}_\epsilon^2 L_\epsilon D$ (ϵ - dielectric permittivity of air, $\bar{\sigma}_\epsilon$ - dispersion of its fluctuations, L_ϵ - characteristic scale of air nonhomogeneity, D - measured distance). On the basis of an evaluation of $\bar{\sigma}_\epsilon$ and L_ϵ as functions of temperature fluctuations, histograms of temperature errors have been plotted for diurnal 24 h periods in Central Asia (Tadzhik SSR) which indicate that deviations from a linear temperature profile are largest from 11 AM to 2 PM and smallest from 8 to 11 AM and from 5 to 8 PM. Measurements made during those morning and evening hours should, accordingly, be accurate within $0.5 \cdot 10^{-6}$. Figures 2; references: 4 Russian, 1 Western (in Russian translation).
[97-2415]

USE OF MICROPROCESSOR TECHNIQUES IN FREQUENCY MEASURING ORGANS

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 2, Feb 84 (manuscript received 9 Sep 82) pp 23-27

GUROV, N. S., candidate of technical sciences and CHUVYCHIN, V. N., candidate of technical sciences, Riga Order of Labor Red Banner Polytechnical Institute

[Abstract] A frequency-controlled unloading device (AChR) is multifunctional with complex measuring and logical parts, and with rigorous requirements on the precision and stability parts. The authors of this paper consider the possibility of constructing frequency measuring organs based on microprocessors, for an AChR with expanded functional possibilities as compared with those in existence. The authors conclude that an increase of the effectiveness of an automatic frequency controlled unloading device requires consideration of many additional factors in addition to the values of the present frequency in the system. In so doing, the AChR device turns out to be sufficiently complex. Use of a microprocessor system for an AChR makes it possible to construct a device which satisfies contemporary requirements. By the possession of a sufficiently high precision, a microprocessor system makes possible tuning out a different type of disturbances at the input of the measuring frequency organ. The paper is presented by the Kafedra (Department Faculty) of Automated Electrical Systems. Figures 2; tables 1; references 3: 2 Russian, 1 Western. [129-6415]

ELLIPSOIDAL MAGNETOSTATIC SHIELD

Moscow ELEKTRICHESTVO in Russian No 1, Jan 84 (manuscript received 10 Oct 82)
pp 29-32

ZARUDI, M. Ye., doctor of technical sciences, Moscow Institute of Radio
Engineering, Electronics and Automation

[Abstract] An exact expression is obtained for the shielding factor applicable in general to ellipsoidal magnetostatic shields with arbitrary orientation of axes relative to a uniform external magnetostatic field. An ellipsoidal shell is assumed to have confocal outside and inside surfaces, the corresponding Laplace field equation for the magnetic scalar potential is formulated in both elliptical and rectangular coordinates, and this equation is solved by separation of variables for the appropriate boundary conditions. The solution contains Lamé functions of the first kind and of the second kind, the latter regular at infinity, the shielding factor being expressible in terms of their ratios. The expression for the shielding factor is simplified by introduction of the depolarization or demagnetization factor for both outer and inner ellipsoids. This expression is put in a form readily adaptable to special cases of spherical and spheroidal (prolate, oblate) as well as cylindrical and other shields. Figures 1; references 14: 8 Russian, 6 Western (3 in Russian translation).

[110-2415]

TWO-STAGE REGENERATIVE MICROWAVE AMPLIFIERS WITH REDUCED NONLINEAR DISTORTIONS

Moscow RADIOTEKHNIKA in Russian No 12, Dec 83
 (manuscript received, after abridgment, 2 Apr 83) pp 64-67

TEKSHEV, V. B.

[Abstract] Performance characteristics of reflection-type regenerative microwave amplifiers using Gunn-effect diodes, IMPATT diodes, or tunnel diodes with reduced third-order intermodulation are calculated, assuming a sinusoidal voltage across the nonlinear element of negative-conductance diodes or a sinusoidal current through the nonlinear element of negative-resistance diodes. The saturation power, equal to the nominal power of the signal source, at which the power transmission coefficient differs by 1 dB (or any other acceptable amount) from the small (sinusoidal)-signal power transmission coefficient, is calculated first for the simplest case of an amplifier consisting of an ideal circulator and an active nonlinear element, with the nonlinearity approximately

of the polynomial kind $i = i_0 + \sum_{k=1}^n \alpha_k u^k$ (i - current u - voltage), and for an

input signal consisting of a fundamental component and a third harmonic only. Two real nonlinear elements with a soft oscillation characteristic (dependence of element conductance g on signal amplitude U) are considered next:

1) $g = g_0 + \frac{3}{4} U^2$; 2) $g = g_0 + \frac{5}{8} U^4$. An analysis reveals that the saturation power is most effectively increased by staging. Subsequent calculations reveal that the power of third-order intermodulation components does not depend on the matching circuit and that the power transmission coefficient varies only slightly with varying gain distribution over amplifier stages, its optimum value therefore not being critical. Figures 1; tables 1; references:

4 Russian.

[103-2415]

PHASE INVERTER BASED ON DIELECTRIC STRIPLINE WAVEGUIDE WITH MOBILE METAL PLATE

Moscow RADIOTEKHNIKA in Russian No 1, Jan 84 pp 71-72

MURMUZHEV, B. A.

[Abstract] This item briefly summarizes the manuscript of an article containing 11 pages of text, 6 figures, and 12 bibliographic titles, which can be ordered from TsNTI (Center of Scientific-Technical Information and Propaganda) "Communication Information" where it is stored under No. 248. The results are presented of the calculation and experimental investigations in the 110-170 GHz frequency range of the parameters of a phase inverter which contains a dielectric stripline waveguide (DSW) with an imbedded in a substrate dielectric waveguide and a plane metal plate, mobile perpendicularly to the upper surface of the DSW. According to the author, this phase inverter has better parameters with respect to direct loss ($\alpha = 2$ db), input standing wave ratio (≤ 1.05) and precision of indication of the phase difference magnitude ($\pm 3^\circ$), as compared with foreign analogs.

[124-6415]

AUTOMATIC MEASUREMENT OF BANDWIDTH OF MICROWAVE RESONATORS

Moscow RADIOTEKHNIKA in Russian No 1, Jan 84
(manuscript received, after completion, 13 Apr 83) pp 84-86

METSNER, Ye. P.

[Abstract] An analysis is made of the characteristics of a device considered in a 1983 report by the author and A. N. Bogashov. The device is designed for simultaneous automatic measurement of the resonance frequency and the bandwidth of a microwave resonator, the operation of which is based on the phase method of measurement of Q. The essence of the method consists in measurement of the phase difference of the envelopes of the AM microwave signal after passage through the resonator during tuning of the microwave oscillator to its resonance frequency. The phase method of measuring Q makes it possible to accomplish automatic measurement of the resonance frequency and the bandwidth of this microwave resonator with an error of $\Delta \omega$ of $\sim 1\%$. Figures 2; references 11: 5 Russian, 6 Western (1 in Russian translation).

[124-6415]

TRANSFORMERS WITH VOLTAGE REGULATION FOR ELECTRIC SUPPLY NETWORKS

Moscow ELEKTRICHESTVO in Russian No 1, Jan 84
(manuscript received 26 Apr 83) pp 1-5

YAKIMETS, I. V., candidate of technical sciences, NAROVLYANSKIY, V. G.,
candidate of technical sciences, and MATVEYKIN, V. M., engineer, Institute of
Power Engineering imeni G. M. Krzhizhanovskiy

[Abstract] Power transformers for electric supply networks are described in which the necessary voltage regulation and compensation of reactive power are effected through switching of the magnetic flux by means of superconducting shields. The principle is demonstrated on two single-phase transformers, one with two windows (3-arm core) and one with three windows (4-arm core). In the first case, primary and secondary are wound on the same outer arm, an auxiliary coil and a shielding loop with controllable superconductive inductance are wound on the center arm, and the bare other outer arm serves as a magnetic return path. In the second case, primary and secondary are wound on both outer arms, an auxiliary coil and a shielding loop are wound on each of the two inner arms, and the two shielding loops are connected in parallel across the variable inductance. The performance characteristics, including the shielding action, are analyzed on the basis of appropriate equivalent circuit diagrams and the corresponding system of Kirchhoff equations. Voltages and currents are calculated with the aid of matrix notation. With the shield impedance ratio $Z_{sh}/j\omega L_{sh}$ variable from 0 to ∞ , it is possible to regulate simultaneously the transformer input impedance and output voltage. Both no-load and load characteristics are plotted theoretically and compared with experimental data. Figures 6; references: 6 Russian.
[110-2415]

STABILITY OF FUSES UNDER CYCLIC LOAD

Moscow ELEKTRICHESTVO in Russian No 1, Jan 84 (manuscript received 17 Mar 83)
pp 46-49

NAMITOKOV, K. K., doctor of technical sciences, IL'INA, N. A., candidate of technical sciences, and SHKLOVSKIY, I. G., candidate of technical sciences, Kharkov

[Abstract] Thermal stresses in fuses, stimulated by the high degree of mechanical stiffness and the cause of low stability under cyclic current loads, can be reduced by reducing the stiffness of the fuse element, which is typically a strap welded to contact caps at both ends. Analysis according to the theory of beams, with a fuse replaced by an equivalent array of unequal plates in series and parallel, indicates that the stiffness can be reduced by increasing the length and decreasing the cross section. Accordingly, a thin strap is considered consisting of flat and bent segments. Simple bending (rectangular, triangular, parabolic, semicircular, circular) and multiple bending (meander, sinusoidal, rectified-sinusoidal, second-order periodic) have been evaluated theoretically, by numerical methods on a computer, and experimentally. The results indicate that bent fuse segments are less stiff than straight segments, that the relation between stiffness and amplitude of the bend is an inverse-power law with the amplitude to a power much higher than squared, that the decrease of overall stiffness is approximately proportional to the number of bends, and that rectangular (meander) or circular bending reduce the stiffness most efficiently, inasmuch as such contours envelop the largest areas on the basis of fixed length. The stiffness depends also on the modulus of elasticity, as confirmed by data on fuses made of copper, silver, or aluminum. Figures 3; tables 2; references: 2 Russian.

[110-2415]

UDC 621.317.333.4:681.3.06

ALGORITHM OF CHOICE OF FORM AND LOCATION OF SWITCHING DEVICES FOR RELIABLE ELECTRICAL SUPPLY OF IMPORTANT AGRICULTURAL CONSUMERS

Minsk IZVESTIYA VYSSHIKH UCHEBNIKH ZAVEDENIY: ENERGETIKA in Russian No 2, Feb 84 (manuscript received 3 Nov 82) pp 19-23

PORTNOY, G. A., engineer, PRUSS, V. L., candidate of technical sciences, and NICHIPOROVICH, L. V., candidate of technical sciences, docent, Belorussian Order of the Labor Red Banner Polytechnical Institute

[Abstract] A major role in solving the food supply program is played by the giant agricultural consumers of electrical energy, which with respect to responsibility pertain to the I and II categories. Among the principal reliability indices of the electrical power supply for such consumers is the duration of accidental and planned disconnections. The present paper considers

an algorithm for solution of a problem based on an evaluation of T - the duration of the process of detachment of the 10 kV incoming transmission line from the fault and restoration of its power supply. The authors conclude that the algorithm considered is a basic program for an electronic computer. This makes it possible not only to select the quantity, form, and location of switching devices which are needed to guarantee the reliability norm of the electrical power supply for an enterprise of II category consumers serviced by a given power line but also with a shortage of the necessary equipment, and to determine the priority of their installation, in terms of the loss by the national economy resulting from disconnection of a consumer. This algorithm, in combination with two references (in each reference, two of the three authors listed are coauthors of the present paper) forms part of an automated system of planned calculations intended for the solution by equipment control of the equipment of a distributing network. The paper is presented by the Kafedra (Department Faculty) of the Electrical Power Supply of Industrial Enterprises, Cities, and Agriculture. Figures 2; references: 6 Russian.
[129-6415]

INVESTIGATION OF PLANE PHASED ARRAY OF PIEZOELECTRIC TRANSDUCERS WITH ONE-LOBE DIRECTIVITY DIAGRAM

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 28, No 11, Nov 83
(manuscript received 6 May 82) pp 2292-2294

MOSKALEV, V. M., OBOZHENKO, Yu. L., SMIRNOV, Ye. N. and YAKOVLEV, V. A.

[Abstract] One of the principal limitations on a band and, consequently, also on the resolution of acousto-optical deflectors is applied by the necessity for matching of the angular position of the optical and acoustic beams. For expansion, the frequency bands use scanning of the acoustic beams by phased arrays of piezoelectric transducers. Plane arrays with a fixed phase shift have a two-lobe directivity diagram (DD), and in each lobe only 40% of the acoustic power is concentrated. For realization of a one-lobe DD, either an exterior phasing circuit for each element of the array is used, or each array is made stepwise, which complicates the construction of the transducer and its manufacture. A phase array with a one-lobe DD described in a 1978 report and its shortcomings are considered. In order to eliminate them, the authors use relatively thick (up to 1 mm) buffer layers of materials, the speed of sound in which is characterized by a small magnitude, and the acoustical impedances are close to the impedance of an acoustic line. The phase characteristics of each buffer is made linear. A sketch of such an array is presented and its components are listed and described. An acoustic-optical deflector, for which TØ8 glass served as the acoustic line (the speed of sound was $3.92 \cdot 10^{-3}$ m/sec; the acoustic impedance was $1.66 \cdot 10^7$ kg/[m²·s]) was prepared for an investigation of the characteristics of such an array. The angular characteristics of the sound beam were investigated with the aid of a sounding parallel light beam. It is concluded that the investigation conducted in this brief report shows that in plane geometry, the creation is possible of a phased array of piezoelectric transducers with a one-lobe DD, operating on a solid-state delay line. Figures 2; references 2: 1 Russian, 1 Western.
[111-6415]