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USSR Report

ELECTRONICS AND ELECTRICAL ENGINEERING

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SOLUTION TO REVERSE REFRACTION PROBLEM

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 9, Sep 84 (manuscript received 21 Apr 83) pp 1658-1667

PAVEL'YEV, A. G.

[Abstract] The reverse refraction problem (determination of radial profile of refractive index in planetary atmospheres, such as Earth, from radio probe measurements) is formulated as a bistatic radar problem for a spherically symmetric medium. The modified refractive index $n(r)\frac{r}{\alpha}$ (α-radius at which the refraction angle as function of relative distance is measured) is assumed to reach extreme values at the upper boundary r_1 or at observation level. Before the corresponding Fredholm equation of the first kind can be solved, it must be well-conditioned in the Tikhonov sense. This is done here by two quasi-optimum integral transformation variants with respect to the measurement function and subsequent simplified regularization. The first method is two successive Fourier cosine transformations followed by an Abel transformation, with the possibility of discrete Fourier transformations and numerical Abel transformation. The second method is twofold discrete Fourier transformation. Both yield solutions readily evaluated by simple algorithms. Regularization is effected by approximating functions satisfying the two fundamental conditions for convergence required of the measurement function. Tables 1; references 22: 17 Russian, 5 Western (3 in Russian translation). [102-2415]

UDC 621.396.67.01

MAXIMUM ANTENNA POWER RECEPTION IN LOSSY MEDIUM

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 9, Sep 84 (manuscript received 13 Dec 83) pp 1668-1676

FEL'D, Ya. N.

[Abstract] The power problem of a receiver antenna in a lossy medium with the incident electromagnetic field of a wave from two current generators is

solved on the basis of circuit theory with no constraints on antenna directivity. Maximum antenna reception power is calculated on assumption that single-mode feeder channel is perfectly matched to receiver and that this maximum is finite as long as electrical conductivity of medium is not zero. The optimum radiation pattern of this antenna is then calculated in particular the field distribution on a surrounding surface for antenna in transmitter mode which ensures pickup of maximum power when antenna is in receiver mode. Figures 3; references: 4 Russian.
[102-2415]

UDC 621.396.677.85+535.317.2

DETERMINATION OF POINT SOURCE IMAGE FIELD STRUCTURE BY REAL RADIOOPTICAL ANTENNA

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 9, Sep 84 (manuscript received 23 Aug 82) pp 1677-1683

BAYBULATOV, F. Kh. and KUDRYASHOV, M. I.

[Abstract] The reverse electrodynamic problem (determination of field structure in point source image and design of a radiooptical antenna for this purpose) is solved rigorously by taking into account arbitrariness of active surfaces and corresponding variations in number of field components in real antennas. Firstly, field components in the geometric optic approximation are computed after replacement of antenna readings by an equivalent field on some surface in the image space. Secondly, field components and the average-in-time relative distribution of electric energy density in the image are computed by conventional electrodynamics methods, with the corresponding integral equations for an open region excluding its boundary transformed into equations for Kirchhoff-Kottler integrals. Theoretical results for a lense with large relative aperture were checked against experimental data for a lens cut on a lathe without finishing surface treatment. In the experiment, amplitude-modulated radiation from a microwave oscillator was passed through a stationary rectangular single-mode waveguide with 1.6x0.8 mm^2 cross section whose open other end simulated a point source. Analysis of results showed unequal energy density distributions along the two principal orthogonal coordinate axes in the large plane indicating partial polarization of radiation by the antenna focusing lens. The authors thanked B.Z. Katsenelenbaum for suggestions. Figures 2; references 7: 2 Russian, 5 Western (3 in Russian translation).
[102-2415]

UDC 537.6

EXPERIMENTAL STUDY OF MAGNETOSTATIC WAVE PROPAGATION THROUGH FILM WAVEGUIDES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 9, Sep 84 (manuscript received 2 Aug 82) pp 1691-1695

NOVIKOV, G. M. and PETRUN'KIN, Ye.Z.

[Abstract] An experimental study was made concerning magnetostatic wave propagation through thin and narrow waveguides formed by ferromagnetic films. The epitaxial films of yttrium-iron garnet were 9 um thick and 10 mm long with widths ranging from 0.1 to 1 mm. The magnetic field was applied parallel to films at an arbitrary angle to waveguide axis. Amplitude-frequency characteristics of magnetostatic waves were measured by a conventional standing-wave-ratio meter through an attenuator. Dispersion curves were plotted from the superposition of magnetostatic and electromagnetic waves, using amplitude-frequency characteristics of the resultant signals. Data showed excitation of backward surface magnetostatic waves in longitudinally magnetized films and backward and forward surface magnetostatic waves in obliquely magnetized films as well as a demagnetization effect with magnitude inversely proportional to film width and corresponding downward shift of lower frequency limit below which volume magnetostatic waves are also excited and coexist with surface magnetostatic waves. The downward shift was 31 MHz in 1 mm wide films and 370 MHz in 0.1 mm wide films and demagnetization effect was 0.001 T and 0.01 T respectively. Figures 4; references 7: 3 Russian, 4 Western.
[102-2415]

UDC 621.391.2

STATISTICAL CHARACTERISTICS OF ULTRASHORT-WAVE SIGNAL FAST PHASE FLUCTUATIONS BASED ON AMPLITUDE MEASUREMENTS ON SEA LANES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 9, Sep 84 (manuscript received 2 Feb 81) pp 1720-1725

RYBAKOV, B.S.

[Abstract] Statistical characteristics of fast phase fluctuations in ultrashort-wave signals (time correlation interval and rms magnitudes and ratio of maximum to minimum rms) were calculated from measurements over 225-420 km long sea lanes for signals with three different wavelengths (10, 36, 190 cm). Data were processed according to the general Gauss model applicable to a large class of communication channels with time fluctuations assumed to have a symmetric spectrum. Integral distribution functions characterizing monthly and yearly cycles as well as the wavelength dependence of the median time correlation interval were evaluated on this basis and separately for day and night. Figures 3; references 11: 10 Russian, 1 Western (in Russian translation).
[102-2415]

UDC 621.391

EFFICIENCY OF ADAPTIVE COMPENSATORS UNDER 'FLICKER' INTERFERENCE CONDITIONS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 9, Sep 84 (manuscript received 20 Sep 82) pp 1734-1739

ABRAMOVICH, Yu.I. and NEVREV, A.I.

[Abstract] Stochastic iterative algorithms of adaptive tuning were considered for compensators under "flicker" interference conditions. Analysis of filter optimization according to the stochastic steepest descent algorithm revealed that, in subcritical range, components of the initial approximation evaluating interference power at the filter output decrease much faster than interference components which are quasi-orthogonal to the correlation matrix. Thus while the radiation pattern dips fast within a given interference interval, it often deforms very slowly during tuning of the adaptive compensator for suppression of adjacent interference. In a constant flux of interference signals absence of "edges" can be predicted in steady state and insignificant prolongation of the stabilization process in transient state. This is proved analytically on the basis of a simple model, namely periodic change of interference pattern with two space interferences characterized by different correlation matrices each acting during different numbers of time intervals and with weighting filter tuned to the maximum signal-to-interference ratio criteria. Calculations based on mathematical simulation of the adaptation process under these conditions confirm the high efficiency of such compensators. Figures 3; references 7: 5 Russian, 2 Western.
[102-2415]

UDC 621.372:621.391.82

ESTIMATING NUMBER AND PARAMETERS OF SIGNAL COMPONENTS IN PRESENCE OF NOISE

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 9, Sep 84 (manuscript received 29 Oct 82) pp 1740-1744

KURIKSHA, A.A.

[Abstract] An algorithm is constructed for estimating the number and parameters of signal components in a signal noise mixture based on a minimum average risk criterion with special choice of cost function and a simplifying assumption on apriori distribution. Intuitively the number of signal components is expected to be the minimum most likely number not including "false" noise components. A cost function asymmetric with respect to the true number and parameter values is selected consisting of a principal part, a simple function of the number and signal component amplitudes and parameters and an additional term which is a constant multiplied by the sum of decision rules for a possible larger number of components. An increase of the

probability of correct detection when the estimated number of signal components is increased by one is the measure of likelihood. The minimum average risk function is maximized by maximum-likelihood estimates and by a reasonable assumption of quasi-uniform apriori distribution. Protection against overestimates is built into this algorithm since each addition of one to the estimated number of signal components increases the number of alternatives for selection of parameters while the error penalty for their number and values is assumed the same. The integral on the right-hand side of each inequality represents area under likelihood curve on the preceding estimation step. Stability of the risk criterion against noise, including noisy overshoots of the likelihood function, can be increased by raising the threshold proportionally to ratio of that area to that of the permissible error region. The procedure is illustrated by application to an additive mixture of signal and Gaussian white noise. Reference 6: 4 Russian, 2 Western.
[102-2415]

UDC 621.396.67

MODULAR FLOATING DECIMAL POINT OPERATIONS FOR ANTENNA ARRAY ADAPTATION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 9, Sep 84 (manuscript received 25 Jan 83) pp 1754-1756

KRYUCHKOV, V. V., LËVSHIN, V. P., STRUCHËV, V.F. and KHARITONOV, A.G.

[Abstract] An adaptive signal processing algorithm for antenna arrays is proposed with modular floating decimal point arithmetic operations usable when vector and matrix arrays are of common order and ensuring stable and efficient interference suppression at almost the same hardware cost as for fixed arithmetic. The interference suppression factor depends on calculation sequences and site of rounding, and on sample size which can be kept up by retaining only real part of denominator with discard of error-producing imaginary part and omission of rounding in summation of component scalar vector products since scalar multiplication of two vectors is base algorithm operation. A typical algorithm use is adaptive signal processing in phased antenna array after partial beam formation. The reflected signal envelope is assumed to have complex amplitude with zero mean normal distribution and random side lobe radiation pattern. Input signals are sampled by analog-to-digital converters, whose output signal mantissa is limited by input quantization step. Regularization factor increase leads to increase and stabilization of interference suppression factor, as sample size approximates and exceeds number of interference signals. When sample is small phased antenna array efficiency falls sharply where ideal machine arithmetic is approached as regularization factor increases to infinity. This is not the case with finite arithmetic so that regularized correlation matrix estimates are not needed. Figures 1; references: 4 Russian.
[1-2415]

UDC 621.396.67

DEVICE FOR RECORDING REAL TIME THREE-DIMENSIONAL STRUCTURE OF ELECTROMAGNETIC FIELDS IN NEAR REGION OF ANTENNA

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 9, Sep 84 (manuscript received 9 Apr 83) pp 1806-1809

DUDKIN, V.P., OBTEMPERANSKIY, Yu.S., PETROV, Yu.N. and CHAYKOVSKIY, V. Ye.

[Abstract] A device was built for real time recording and visual display of three-dimensional structure of electromagnetic field in near antenna region consisting of a scanner (cathode-ray tube with planar dielectric-semiconductor-metal screen and power supply) preceded by a video monitor, wideband amplifier, microwave detector, ferrite diode with tested antenna facing scanner screen or with receiver antenna facing probe, and microwave oscillator with possibility of two microwave sources and a radio objective. The scanner screen dielectric layer receives mechanical loads due to cathode-ray tube evacuation so that only a very thin semiconductor layer is needed and a heavy cathode and postacceleration system produce many high-energy exciting electrons. Scanner operates either by field perturbation or passive probing. With appropriate processing the device records either the amplitude-phase structure or intensity distribution and operates in millimetric range. Probe reflection coefficient is constant or varies when recorded field is modulated to probe frequency. Typical holograms were recorded experimentally in each equipment mode. The scanner parameters are: diameter of analyzer aperture 100 mm, complete frame analysis in 0.1 s, screen sensitivity 10^{-7} W/cm^2 and minimum resolution 2 lines/mm. Figures 2; references: 7 Russian.
[102-2415]

UDC 537.874.6

IDEAL CONDUCTION SPHEROID ELECTROMAGNETIC WAVE SCATTERING

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84 (manuscript received 9 Mar 83) pp 1857-1863

FARAFONOV, V. G.

[Abstract] An algorithm proposed for solving problem of diffraction of an arbitrarily incident plane electromagnetic wave on an ideally conducting spheroid is used to calculate wave scattering characteristics on spheroid. Incidence of the wave along spheroid axis of rotation and oblique incidence, are considered. Convergence of numerical results as a function of the number of terms in the field expansions is analyzed. Computer tests showed the algorithm to be highly effective. Figures 5, references 12: 10 Russian, 2 Western.
[110-6900]

UDC 621.396.677.49

THEORETICAL SYNTHESIS OF SPECIAL RADIATION PATTERN LINEAR EQUIDISTANT ANTENNA ARRAYS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84 (manuscript received 9 Jul 82) pp 1864-1870

MINKOVICH, B.M.

[Abstract] Linear equidistant antenna array synthesis problem is solved explicitly as a function of approximation interval sizes and intervals are adjusted to suppress spikes due to Gibbs phenomenon. The symmetrical pattern array synthesis method is extended to patterns with special shapes. A small side lobe asymmetrical sectorial pattern array is calculated and weighted mean square and interpolation synthesis show that orthogonal polynomial systems are effective for obtaining explicit solutions to synthesis problems in the case of linear equidistant arrays. Figures 2, tables 2, references 21: 13 Russian, 8 Western.
[110-6900]

UDC 537.874.6

ELECTROMAGNETIC WAVE SCATTERING BY CYLINDRICAL SCREEN WITH CROSS-SECTIONAL CONTOUR CUSPIDAL POINT

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84 (manuscript received 11 Jul 83) pp 2049-2051

NAZARCHUK, Z. T.

[Abstract] An approach is proposed for solving the two-dimensional problem of electromagnetic wave diffraction on an open cylindrical screen with cuspidal point on the cross-sectional contour by means of integral equations. An example is presented in which the contour is a polycubic parabola and convergence of the quadrature process is illustrated by tabulation of real and imaginary parts of scattered field longitudinal components at two points on the xOy plane. It is found that the cuspidal point can be disregarded when determining the field at distances of the order of λ from the scatterer for E polarization. No stable solutions can be found for the problem of H-polarization if the cuspidal point of the contours is disregarded. Figures 1, references 8: 7 Russian, 1 Western.
[119-6900]

UDC 621.371.537.86

LOCAL IONOSPHERIC IRREGULARITY EFFECT ON ELF RADIOWAVE PROPAGATION

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 27, No 10, Oct 84 (manuscript received 28 Feb 84 after revision)
pp 1227-1237

NIKOLAYENKO, A. P., Institute of Radiophysics and Electronics, Ukrainian SSR Academy of Sciences

[Abstract] The Stratton-Chu integral equation is used to solve the ELF radiowave propagation electrodynamic problem over an irregular spherical interval between the ground and ionosphere. The Stratton-Chu formula makes it possible to obtain field estimates in Born approximation with allowance for the vector nature of the electrodynamic field. Changes are investigated in the perturbation of the vertical electrical field component as the irregularity moves along the line between the source and the observer and across the propagation path. It is found that a local irregularity above the source or observer can change the field level significantly as compared with a uniform resonator, especially near the antipodes of the source. Figures 2, tables 1, references 10: 2 Russian, 8 Western.
[113-6900]

UDC 550.315.1
551.510.535

IONOSPHERE INFLUENCE ON MHD WAVE BUNDLE PROPAGATION

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 27, No 10, Oct 84 (manuscript received 11 Apr 84) pp 1238-1247

AL'PEROVICH, L. S. and FEDOROV, Ye. N., Institute of Terrestrial Physics, USSR Academy of Sciences

[Abstract] The horizontal propagation of geomagnetic variations with periods exceeding 30 seconds excited by bundles of hydromagnetic waves of varying polarization is investigated. The primary magnetic field is assumed to be orthogonal to the ionosphere and the earth's surface. Expressions are derived for fields at long distances from the source. When the distances are sufficient, the wave is found to travel along the ground at the Alfven velocity. Figures 2, references 11: 3 Russian, 8 Western.
[113-6900]

UDC 534.2:532.574

NONLINEAR BREAKING WAVE ENERGY PROBABILITY DISTRIBUTIONS AND ATTENUATION

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 27, No 10, Oct 84 (manuscript received 12 Dec 83) pp 1248-1255

GURBATOV, S. N., Gor'kiy State University

[Abstract] Asymptotic characteristics of noise waves propagating in a dispersion-free medium in which the propagation velocity is a nonlinear function of the amplitude are investigated. The case of monatonic wave velocity increase with amplitude is studied. A generalized solution is described for qualitative and quantitative analysis of random field statistical characteristics. Field probability distribution evaluation is examined for media exhibiting breaking types of nonlinearity and noise and periodic signal energy attenuation in such media is compared. References 12: 10 Russian, 2 Western.
[113-6900]

UDC 629.7:62-506.2.001

STOCHASTIC HUMAN-OPERATOR MODEL FOR OPERATOR CHARACTERISTIC ASSESSMENT IN RANDOM MOVING OBJECT TRACKING

Gor'kiy IZVESTIYA VYSSHIKH UCEHBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 27, No 10, Oct 84 (manuscript received 6 Sep 83) pp 1267-1271

KUROCHKIN, I. V. and MAL'TSEV, A. A., Gor'kiy State University

[Abstract] A stochastic model of an operator constructed for a problem of manual loop parameter optimization for stabilization of a dynamic object subjected to random environmental perturbations is employed to assess quantitative procedural characteristics of an operator tracking a dynamic object subjected to an additive mixture of white and "colored" noise. The dynamics of the object being tracked are described by a system of stochastic differential equations. The operator is assumed to observe only the coordinate of the object and the dynamic object state estimate is described by Kalman filter equations. The minimum possible operator error in tracking several objects, and the maximum number of randomly moving objects that an operator can track with the required accuracy, are estimated as an example of the proposed stochastic human-operator model. Figures 1, tables 1, references 7: 5 Russian, 2 Western.
[113-6900]

UDC 537.24:535.23

ELECTROMAGNETIC RADIATION FORMATION WITH REQUIRED SPECTRAL COMPOSITION AND POLARIZATION

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 27, No 10, Oct 84 (manuscript received 1 Feb 84 after revision) pp 1287-1291

BAGROV, V. G., NIKITIN, M. M., FEDOSOV, N. I. and EPP, V. Ya., Institute of Strong-Current Electronics, Siberian Department, USSR Academy of Sciences

[Abstract] A general theoretical solution is proposed for the single-particle inverse radiation problem. Electromagnetic radiation emitted in a given direction and created by one moving charge in the wave zone distant from charge is examined. The task is to find charge movement such that the radiation field electrical vector at the observation point is a preassigned function of time. As stated, this problem is equivalent to that of forming assigned radiation spectrum and polarization a priori. The results make it possible to solve the problem analytically but the nature of charge movement cannot be determined unambiguously from observed radiation. References 11: 8 Russian, 3 Western.
[113-6900]

UDC 537.86

CONTRIBUTION TO MULTILAYER SPHERICAL SCREEN THEORY

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian
Vol 27, No 10, Oct 84 (manuscript received 20 Sep 83) pp 1299-1305

AVRAMENKO, V. L. and KRASIL'NIKOV, V. N., Leningrad State University

[Abstract] The incidence of a plane electromagnetic wave on a sphere consisting of an arbitrary number of layers with different electrodynamic properties is examined and it is shown that the exact solution of the diffraction problem can be described and investigated analytically. The influence of the dielectric space between the metal layers on the shielding properties of a spherical shell is studied. If the width of the space is smaller than the thickness of the skin layer in the middle, the space has little influence on the shielding of the magnetic field. The influence of the space is also smaller in metals with high magnetic permeability if the width of the space exceeds the thickness of the skin layer in the middle. Figures 1, references: 8 Russian.
[113-6900]

UDC 621.371.25

ADIABATIC INVARIANT VALUE VARIATION UNDER SHORTWAVE BAND SUBCRITICAL CONDITIONS

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 10, Oct 84 (manuscript received 9 Jun 84) pp 1340-1343

SVISTUNOV, K. V. and TININ, M. V., Irkutsk State University

[Abstract] Radiowave propagation is considered in an irregular waveguide formed between a flat earth and a horizontally irregular ionosphere in which permitivity is described as a parabolic function of the altitude. It is shown that the adiabatic invariant can change significantly, primarily for near-critical trajectories where the change in the invariant may not be expontentially small. The behavior of the adiabatic invariant is studied numerically for the case of quasicritical propagation for a parabolic model of the permeativity in the general case in which $\varepsilon(x,z)$ is represented in the form of two Chapman layers. Analytical estimates and numerical experiments indicate that nonexpontential deviations of the adiabatic invariant can occur when the characteristic dimension of the horizontal irregularity is reduced, as well as under quasicritical conditions, for smoothly irregular waveguides. Figures 3, references: 9 Russian.
[113-6900]

UDC 535.325.4

COHERENT SPONTANEOUS EMISSION SPECTROMETER SENSITIVITY

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 10, Oct 84 (manuscript received 20 Jun 84) pp 1344-1346

VAKS, V. L., GERSHTEYN, L. I. and GERSHTEYN, M. L., Institute of Applied Physics, USSR Academy of Sciences

[Abstract] A comparative analysis is made of the sensitivity of two types of spectrometers: instruments employing coherent spontaneous radiation, and classical instruments in which absorption is detected by changes in the power of an electromagnetic wave passed through the gas under investigation. The sensitivities of both types of spectrometers are shown to be practically the same. A simple relationship is established between the electromagnetic wave power causing polarization in the gas, the coefficient of absorption and the power of the electromagnetic wave radiated by the gas. References 11: 8 Russian, 3 Western.
[113-6900]

UDC 621.396.96:321.391.96

SPECTRAL PROCESSING OF SIGNALS IN SUBSURFACE RADAR

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 11, Nov 84 (manuscript received 7 Apr 83) pp 2173-2178

ABBAKUMOV, S.Yu., ALEKSANDROV, A.I., METELKIN, V.N. and FINKEL'SHTEYN, M.I.

[Abstract] An effective method in subsurface radar, probing of multilayer media such as earth crusts or ice caps with signals having up to 100 MHz wide spectra, is "cepstral" processing (inverse Fourier transformation of the spectrum) of such signal in real time. The gist of this method is demonstrated on a homogeneous layer with a frequency characteristic of its reflection coefficient expressible as the sum of two frequency characteristics corresponding to passage of the upper signal and the lower signal respectively. The method is then applied to the logarithm of the signal energy spectrum, a relatively slow function of frequency. The method can be readily combined with digital methods of autoregressional spectrum analysis, to ensure a better resolution, which involves extrapolation beyond measurement "windows" and use of a "whitening" filter for retention of only noncorrelated discrete components. Such processing was done by computer for probing a 148 cm thick ice cap (approximately 0.4% salinity) with real signals in the form of almost single-period pulses of approximately 15 ns duration, with a fourth-order filter and with a weighting device of 157 MHz bandwidth. The results indicate that this processing easily separates signals reflected by the layer boundaries for determination of the layer thickness. They also indicate that the Marple algorithm of autoregressional spectrum analysis is less noise immune than the covariation algorithm and the autocorrelation algorithm. Figures 4; references 11: 7 Russian, 4 Western (1 in Russian translation).
[127-2415]

UDC 621.37/39:534:620.193.91

DEGRADATION OF SURFACE-ACOUSTIC-WAVE RESONATORS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 11, Nov 84 (manuscript received 12 Apr 82) pp 2101-2104

KREVSKIY, M.A., SANDLER, M.S. and YAKIMOV, A.V.

[Abstract] Degradation of SAW resonators is analyzed, the irreversible upward frequency drift in the case of interdigital transducers with aluminum pin-electrode is explained by logarithmic oxidation faster than normally but the irreversible downward frequency drift in the case of interdigital transducers with gold pin-electrodes is evidently caused by oxidation together with diffusional "smear". This latter mechanism is analyzed on the basis of a model which describes flicker fluctuations as a microprocess of thermodynamic aging. Calculations are made for the simplest oscillator

consisting of two identical interdigital structures on a delay line, each having N pin pairs. Its resonance frequency is determined by the condition of phase balance, which depends on the pin width d_1 and the structural period d as well as on the number of pin pairs and the reflection coefficient $\gamma h/\lambda$, the latter depending not only on the pin thickness h and on the wavelength λ but also on the acoustomechanical properties of both metal and substrate material ($\gamma = 1.3$ for gold on quartz, $\gamma = -0.5$ for aluminum on quartz). Numerical results for a typical 400 MHz resonator on an ST-cut quartz substrate with either aluminum or gold electrodes indicate quantitative relations between the frequency deviation and the electrode dimensions. Figures 2; references 9: 3 Russian, 6 Western (1 in Russian translation).
[127-2415]

UDC 621.396.67.01

EFFECT OF CYLINDRICAL RERADIATOR ON PARAMETERS OF ANTENNA AND ANTENNA ARRAY

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 11, Nov 84 (manuscript received 20 Apr 82) pp 2140-2147

LEVIN, B.M. and FOMINTSEV, S. S.

[Abstract] The effect of a cylindrical reradiator on the electrical characteristics of a nearby antenna array is analyzed by the method of an electrodynamic wire equivalent, which replaces the surface of a metal cylinder with a uniform array of thin longitudinal conductors so that the method of moments can be effectively used for determining current distributions and raidation patterns. An analytical solution of the problem is not possible for a cylinder of finite height. The numerical solution involving differentiation of a Pocklington itegral equation by the Galerkin method using a system of piecewise-sinusoidal basis functions was formulated in a universal program in FORTRAN-4 for a YeS 1022 computer. The ground surface is assumed to be ideally conducting and the antenna structure to be symmetric with respect to that surface. The circular cylindrical reradiator is replaced by eight uniformly spaced conducting strips along the generatrix each. The program yields the impedances of antenna radiator elements as well as the phase differences between currents in neighboring radiators. Illustrative calculations were made for a linear array of four vertical radiators parallel to the cylinder and for three frequencies in the short-wave range, with the cylinder height and diameter varied and with the distance from the cylinder axis to the nearest element in the antenna array varied from minimum to infinity. Figures 6; tables 5; references 4: 3 Russian, 1 Western.
[127-2415]

UDC 621.396.962:629.7

BASIC CHARACTERISTICS OF RADAR ANTENNA WITH SYNTHESIZED APERTURE TRACKING ARBITRARY MOTION OF AIRCRAFT

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 11, Nov 84 (manuscript received 26 Jan 83) pp 2164-2172

ITSKHOKI, Ya.S., SAZONOV, N. A. and TOLSTOV, Ye.F.

[Abstract] A problem in tracking the motion of an aircraft which carries a radar antenna with synthesized aperture are random phase fluctuations of the input signal. These fluctuations, caused by instability of the aircraft trajectory and elastic vibrations of the aircraft structure as well as by tropospheric effects and intentional interference, worsen the azimuth resolution and the accuracy of azimuth determination. This situation is analyzed here for the more general case of arbitrary motion of the aircraft and arbitrary observation angle rather than for rectilinear motion and lateral observation. The output signal serves as performance criterion, its waveform being determined principally by the radiation pattern of the real antenna and its modulus remaining approximately constant over the aperture synthesization time. On this basis, the trajectory of the phase center of the real antenna can be approximated with a quadratic parabola. For given wavelength and elevation angle, the best azimuth resolution attainable with signal processing by the "straight convolution" method (second target on observation line) is determined by the length of aperture synthesization time, the tangential component of aircraft velocity, and the form of the weight function. In the absence of phase fluctuations, the error of azimuth determination is in this case determined only the resolving power of the radar with synthesized antenna aperture. Signal processing by the "harmonic analysis" method introduces some defocusing, which worsens the resolution, even in the absence of phase fluctuations. Figures 1; references 11: 10 Russian, 1 Western. [127-2415]

UDC 621.396.96.08:621.391.82

DETERMINING PROBABILITIES OF TARGET-TRACKING INTERRUPTION AND RESUMPTION FOR OPTIMIZATION OF SCANNING-TRACKING METERS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 11, Nov 84 (manuscript received 23 Sep 83) pp 2271-2273

KATIKOV, V.M.

[Abstract] The parameters of signal detectors in scanning-tracking instruments which also include a monitoring detector can be optimized on the basis of mathematical models in the form of aggregate Markov chains, with all possible states of a meter consolidated into three unions: 1) states of search; 2) states of true readings; 3) states of false readings. A major

problem here are the probabilities of transition from one union to another. These probabilities in the scanning-tracking process are related to the probabilities of its interruption and resumption, which are calculated analytically from a partitioned matrix with stationary dwell probability elements as functions of correct detection and false-alarm probabilities. References: 5 Russian.
[127-2415]

UDC 621.396.1

NONCOHERENT SUPPRESSION OF INTERFERENCE SIGNALS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 11, Nov 84 (manuscript received 23 Sep 83) pp 2268-2270

KHINCHUK, M.T.

[Abstract] A method is proposed for suppression of interference signals appearing in a phased antenna array not alone but together with a useful signal. The method involves two operations, estimation of the unknown parameters followed by noncoherent compensation of the interference. It is demonstrated on a multisectional antenna array with two independent control levels, a radiation pattern shaper, and an energy-measuring receiver containing an analog-to-digital converter. Compensation is based on n series of k measurements, the radiation pattern changing from one series to another but remaining the same during each, with the array multiplier successively oriented toward each of k signal sources. Figures 1; references 4: 2 Russian, 2 Western (1 in Russian translation).
[127-2415]

UDC 621.396.96

CHARACTERISTICS OF RADAR OBJECTS DETECTABLE BY SUPERWIDE-BAND SIGNALS

Moscow RADIOTEKHNIKA in Russian No 11, Nov 84 (manuscript received, after completion, 5 Dec 83) pp 19-24

ASTANIN, L.Yu.

[Abstract] Use of superwide-band probing signals for detection of intricate objects is examined with the object scattering characteristic as the criterion. The resolving power of such signals is compared with that of narrow-band signals, especially high-resolution narrow-band signals. The global frequency characteristic of scattered signals or the pulse response will describe an object, especially when the polarized components of both probing signal and echo signal are taken into account. Changes in the global scattering pattern which are associated with the form and the orientation of the

object can result in superresolution, namely transformation of a single probing signal into a packet of pulses. A typical superwide-band signal is a short radio pulse, usually produced with the aid of a matched filter unless it is a simple one. The bandwidth of such a pulse is defined as 4-times the inverse of its duration and then referred to the carrier frequency so that the relative bandwidth becomes equal to twice the inverse of the number of carrier periods during the pulse. Both frequency characteristic and pulse response of an object are related to the Green function, in the space domain and in the time domain respectively, in the electrodynamic problem of scattering and diffraction with interference. Processing in the time domain makes it possible to identify an intricate radar object upon superposition of the pulse responses from elementary objects. Accordingly, use of superwide-band probing signals with a spectrum which covers the scattering characteristic of a radar object is an alternative to radio holography with space-domain analysis of a monochromatic field. Figures 4; references 6: 3 Russian, 3 Western (1 in Russian translation).
[141-2415]

UDC 537.876.45:621.372.8

REFLECTION COEFFICIENT OF 'HARROW' GRATING WITH CONDUCTOR STRIPS WITH RESPECT TO ELECTROMAGNETIC WAVES

Moscow RADIOTEKHNIKA in Russian No 11, Nov 84 (manuscript received, after completion, 18 Nov 83) pp 68-71

PONOMARENKO, V.I., MIROVITSKIY, D.I. and BUDAGYAN, I.F.

[Abstract] The reflection coefficient of "harrow" microwave gratings with conductors on a metal mirror base is calculated by a method not only more accurate but also less unwieldy than the conventional method of partial regions. Bar conductors of finite thickness are replaced with ribbon conductors of a form approximately describable by o-functions, which taper them to infinitesimally thin ones and thus reduces the three-dimensional grating to a two-dimensional one. The effective conductor thickness is now much smaller than the grating period and than the skin depth. Both reflection and absorption coefficients become independent of the frequency, and the transcendental dispersion equation for the propagation constant simplify as a result for easier solution by numerical methods. With the absorption layer superposable on the dispersion layer, the reflection factor is calculated specifically for waves with E-polarization, by reduction of the corresponding diffraction problem to an infinite system of linear algebraic equations. This system can be solved by the method of truncation, on the basis of asymtotic expansions, and will have a solution which satisfies the constraint of finite field energy. This is done here analytically for the case of normal incidence and numerically for a "harrow" ribbon grating with low surface impedance made of conducting material which absorbs radio-frequency radiation. Figures 2; references: 13 Russian.
[141-2415]

UDC 621.396.96

DETECTION OF LARGE OBJECT IN FRESNEL REGION OF ANTENNA BY MULTICHANNEL RECEIVER

Moscow RADIOTEKHNIKA in Russian No 11, Nov 84 (manuscript received 2 Jan 84) pp 71-74

KREMER, I.Ya. and KOSTYLEV, V.I.

[Abstract] Detection of a large diffusely reflecting object in the Fresnel region by a multichannel receiver tuned to a point object is analyzed, assuming that space-time white noise is present and that such a receiver is not an optimum one in this case. A plane object is considered, for simplicity, one which can extend from the Fresnel region into the far field. Reflection of the probing signal, whether only by the surface or also from within the volume of the object, is treated statistically and the central-limit theorem allows approximating the echo signal as a Gaussian one. Calculations for receiver channels with a Rayleigh distribution of parameters, assuming independent outputs from the channels, reveal that the correct-detection probability does not depend on the number of channels and is determined solely by the receiver-wide false-alarm probability. A multichannel receiver tuned to the signal from a point source is found to be a quasi-optimum detector of a large object under the given conditions. Figures 3; references 4: 3 Russian, 1 Western (in Russian translation).
[141-2415]

UDC 621.372.414

TUNING CHARACTERISTICS OF RESONATOR WITH FREQUENCY REGULATION BY MEANS OF DOUBLE-RING PLUNGER

Moscow RADIOTEKHNIKA in Russian No 11, Nov 84 pp 75-76

[Annotation of article No 326 deposited at Central Scientific and Technical Institute 'Informsvyaz'', 14 pp with 4 figures and 4 bibliographic references]

RYZHAKOV, S.M.

[Abstract] A tunable coaxial resonators is considered, with a noncontacting plunger which consists of two parallel identical plain metal rings on a common dielectric rod passing through a hole in each ring parallel to the resonator axis. The shape of its tuning curves graphically representing the dependence of wavelength on plunger position, both normalized to the resonator length, is found to be determined by the relative ring thickness and distance between rings as well as by the drop of wave impedance and by the capacitance at the open resonator end. A method of designing resonators for given frequency ranges is proposed on this basis.
[141-2415]

UDC: 621.396.677

INVESTIGATION OF THE NEAR FIELD OF REFLECTOR ANTENNAS

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY RADIOFIZIKA in Russian Vol 27, No 11, Nov 84 (manuscript received 6 Feb 84) pp 1482-1484

INSPEKOROV, E.M. and TODOREVA, G.I., Gomel' State University.

[Abstract] An approach is presented for investigating the near field of reflector antennas in which exact allowance is made for diffraction on the edges of the reflector. The procedure employed is a variation of the current method, which takes into account the influence of the finite thickness and radius of curvature of the edge, as well as that of radio-absorbing coatings. The current on the reflector is found by solving an integral Fredholm equation of the second kind. A two-dimensional problem with H-polarization is examined. It is found that deviations in the regions $y < F$ are minimized most effectively by using short-focus reflectors with increased radius of curvature of the edge. References 6: 5 Russian, 1 Western.
[147-6900]

UDC 621.371.25

SOME FINDINGS FROM AN INVESTIGATION OF THE EFFECT OF POWERFUL SHORTWAVE RADIATION ON RADIO WAVE PROPAGATION ON KIEV-YOSHKAR-OLA PATH

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY RADIOFIZIKA in Russian Vol 27, No 11, Nov 84 (manuscript received 3 May 84) pp 1477-1479

BOGUTA, N.M., IVANOV, V.A., KATKOV, Ye.V., MAKSIMENKO, O.I., MITYAKOVA, E. Ye., URYADOV, V.P., FROLOV, V.A. and ERM, R.E., Scientific Research radio Physics Institute.

[Abstract] This study describes experiments conducted during March-April 1982 and April-June 1983 to investigate the influence of powerful artificial ionospheric perturbation on decameter-band signals propagating between Kiev and Yoshkar-Ola. The amplitude fluctuation spectra of the probe signals were analyzed by computer, and the dispersion coefficient and fluctuation coefficient values were determined. The perturbation is manifested mainly as a change in the spectrum of the probe signals. Examples of three such spectra are presented. The degree of influence of the perturbation on the characteristics of the radio signals was found to depend upon ionospheric conditions: the perturbation effects were greater when the critical frequencies on the path were higher. The effects were recorded most frequently at the lowest frequency of f = 10.8 MHz. References 2 Russian.
[147-6900]

UDC: 537.31.33:538.221

MODULATION INSTABILITY AND SOLITONS OF ELECTROMAGNETIC WAVE ENVELOPES IN FERROMAGNETIC SEMICONDUCTORS

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY RADIOFIZIKA in Russian Vol 27, No 11, Nov 84 (manuscript received 3 Oct 83) pp 1460-1467

BASS, F.G. and NASONOV, N.N., Institute of Radio Physics and Electronics, Ukrainian SSR Academy of Sciences.

[Abstract] Nonlinear electromagnetic waves in a uniaxial ferromagnetic semiconductor located in a homogeneous magnetic field are considered. The propagation of nonlinear spin-spiral waves is analyzed within the framework of the hydrodynamic description of conductivity electron plasma. A material equation for the spin subsystem is the Landau-Lifshits equation, with allowance for inhomogeneous exchange, magnetic anisotropy and magnetic dipole interaction. Weakly nonlinear electromagnetic waves propagating along the magnetic field parallel to the axis of anisotropy of the semiconductor are analyzed. Solitons of the envelopes of spin-spiral waves are studied with no assumptions regarding the smallness of their amplitude. References 15: 12 Russian, 3 Western.
[147-6900]

UDC: 621.316.933.6

WIDE-APERTURE 'BLACK BOY' UHF NOISE EMITTER WITH 10^4 K BRIGHTNESS TEMPERATURE

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY RADIOFIZIKA in Russian Vol 27, No 11, Nov 84, pp 1431-1435

BUTAKOVA, S.V.

[Abstract] An emitter for antenna measurements that comprises an unphased waveguide-slot antenna array driven by gas-discharge noise generators is described. The emitter can be employed instead of a black disc to measure antenna parameters (gain in scattering, efficiency, polarization and phase characteristics). The metrological certification of the system in accordance with state standard GET-127 is described. An average emitter brightness temperature of 9350 K in an aperture approximately 10.8 λ in diameter is obtained. The mean square certification error when high precision polarized attenuators are used is less than 3%. The emitter provides a standard radiometric means for measuring antenna parameters. References 9 Russian.
[147-6900]

NEW ULTRASHORT WAVE FM RADIO STATION

Moscow VESTNIK SVYAZI in Russian No 9, Sep 84 pp 27-29

KAVTARADZE, D. K., deputy chief of the Republic Radio and Broadcasting Center (RRTPTs), ADAMIYA, B. Sh., chief of Tbilisi Radio and Television Station (RTBS) of (PRTPTs)

[Abstract] Most ultrashort (USW) range radio stations are of the "Dozhd'-2"-type developed in 1957-59 and modernized for stereo but quality is insufficient and a prototype "Dozhd-2" automated four-program FM station with 4kW power per program was developed in 81 at the Tbilisi Radio and Broadcasting Center. Designed for an FM broadcast at fixed frequency separation of not less than 0.78MHz with total power consumption of 45kW the station broadcasts simultaneously two stereo and two monophonic programs with one antenna. The "Dozhd'-4" test-run from Dec 25, 1982 to Nov 20, 1983 confirmed high quality performance. The station operates automatically and has an extensive control, blocking and signalling system, switching panels, and remote control facilities and back-up equipment. However, the control system is very complex requiring time-consuming detection of malfunctions. To increase automatic control system reliability some electronic components should be replaced by solid state devices. Block diagrams of the radio station and the separating four-program filter and equipment photos are given. Figures 4.
[108-12755]

UDC 621.397.6

TELECINE COLOR IMAGE TRANSMITTERS: STATUS AND OUTLOOK

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 11, Nov 84 pp 36-39

LUNEVA, Z.P., Moscow Institute of Electrical Communication Engineering, and NOVAKOVSKIY, S.V., Moscow Scientific Research Institute of Television

[Abstract] An essential component of a telecine transmitter of color images from either positive or negative film tape is the light-to-signal converter. Besides photomultipliers, three other basic types of such converters are now

used for transmitting images from 35-mm, 16-mm, or 8-mm film tapes. These are scanning-beam devices with memory, charge-coupled devices adaptable to NTSTs, PAL, or SECAM arrays and codes, and cathode-ray tubes with charge storage. Their applications in telecines include transmission from magnetic audio-video tape at television centers to regional and local television stations and broadcasting of artistic, documentary or current-events and amateur films. Improvements of converter performance were due to digital techniques, microprocessor-aided geometric and color correction, and microcomputer-aided automatic program control of transmitter processes such as gamma and aperture correction, quench matching and masking and arraying, with accompanying noise suppression. Present trends indicate eventual complete automation of television film making and broadcasting technology. References 11: 6 Russian, 5 Western.
[140-2415]

UDC 778.5:621.397.13]:621.3.037.372

DIGITAL METHODS OF RECORDING COLOR TELEVISION IMAGES ON FILM TAPE

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 11, Nov 84 pp 31-35

KRIVITSKAYA, R.Ya. and SEMENOV, V.M., All-Union Scientific Research Institute of Television

[Abstract] Three methods are now available for recording color television images on film tape, directly or after appropriate finish of signal processing. Conventional recording of images from the screens of three kinescopes with synthetic crystal face plates is still most effective for high fidelity. This method was improved by digital preprocessing of brightness color-difference signal. Frame-by-frame storage of these signals in the memory in digital form is followed by gamma and aperture correction and electronic correction of crossover distortions in the color layers of the film with fixing in accordance with specific emulsion procedures. The noise level in recorded signals is lowered in the process, while each frame is easily converted from interlacing memory readout to linewise scan with longer duration of the quench pulse. The newer method of recording color television images with line arrays of light-emitting diodes involves dichroic superposing mirrors and a movable scanning mirror. This method allows the use of standard movie cameras, simplifies interlacing-to-linewise conversion and the mechanical equipment, and lengthens exposure time while it shortens recording time. Digital recording by this method requires a decoder, a logarithm generator, a colorimeter array, an antilogarithm generator, an analog-to-digital converter, a delay line, a set of programmable digital nonlinear corrector-matching arrays, a time shifter for separating the two fields by 32 μs, and three modulators with a shift register each for R,G,B color signals respectively. The latest "image transform" method requires an audio-video recorder, a memory disk, a digital computer, and a decoder. The 9-step procedure includes preprocessing the total color television signal with reduction of noise level and time errors, followed by frame frequency conversion and setting the number of lines. The

total signal is then resolved into its brightness and color-difference components and phase errors and image blurring are also reduced. After extraction of R,G,B signals and colorimetric matching of TV camera and film tape, the simultaneous R,G,B signals are converted from interlacing to sequential triades of color-quotient frames with linewise scanning at triple frequency. Color-quotient signals are recorded with an electron beam on a smoothly moving black-and-white film tape under vacuum. While digital techniques improve the signal quality and simplify the control of processes, not requiring stabilization of circuits, image processing is still analog. Figures 5; references 10: 2 Russian, 8 Western.
[140-2415]

UDC 621.397.61:681.772.7]:621.397.132]:535.345.6

COLOR-ENCODING RASTER LIGHT FILTERS FOR SINGLE-TUBE COLOR TELEVISION CAMERAS

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 11, Nov 84 pp 44-48

IVANOVA, V.M., LYUBAVSKAYA, L.A., TARASOV, Yu.N. and CHERAPANOVA, M.N., Leningrad Institute of Electrical Communication Engineering imeni M. A. Bonch-Bruyevich

[Abstract] Raster light filters for strip or facsimile color encoding consist of two or three line arrays: one transmits red and green light, the second transmits blue and green light, the third, optional, transmits blue and red light. Optical color encoding is based on frequency separation of color signals and requires inclusion of a corrective light filter. The performance of filter structures is determined by the spectral characteristics of the color strips, these characteristics having been calculated here for a Standard System television receiver and a 6500 K white light reference source with the $L_R:L_G:L_B=0.3:0.59:0.11$ ratio of liminance coefficients. Three configurations for alignment of the light filters with the phototarget in a single-tube camera are evaluated, direct superposition by building the light filters into the phototarget being more expedient than placing the light filters in the plane of the intermediate image or using a fibrous face plate underneath the phototarget as entrance window. Multilayer interference coatings based on refractory oxide layers ensure the necessary spectral characteristics. The photolithographic technology has been adapted to such filters, reverse photolithography with masking and selective etching applicable here. Refractive oxide layers do not require strong etchants. Photoresist masks remaining stable thermally and chemically up to 250°C are much better than bimetal ones, they cut the processing time almost to one half. The technology has been verified experimentally. Figures 5; tables 2; references: 10 Russian.
[140-2415]

UDC 621.397.61:681.772.7]:621.397.132:535.67

IMPROVEMENT OF COLOR REPRODUCTION BY TELEVISION CAMERAS

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 11, Nov 84 pp 61-63

LURIYE, G.V., Latvian Radio and Television Center

[Abstract] Two colorimetric methods of checking and adjusting individual television cameras for accurate color reproduction are compared, namely vector measurements and comparison of signal levels in the R-G-B channels. A special color test table has been prepared which is more suitable for both methods than the 0569 table or other analogous tables used in other countries. This table lists the reflection coefficients of 10 color specimens ranging from yellow to violet and including white at 13 different wavelengths from 440 to 660 nm spaced 20 nm apart. On the basis of this table has been plotted the reflection spectrum of each reference specimen, for subsequent calculation of chromaticity coordinates relative to a D65 white light source. The vector method of checking the chrominance characteristics of NTSTs, PAL, or SECAM system signals is most appropriate for inspection of camera channels and encoders as well as for locating sources of color distortions and tolerancing the latter. This method involves applying one color-difference signal to the vertical-deflection amplifier and another one to the horizontal-deflection amplifier so that the vector diagram of the color test table will appear on the screen in the form of light spots whose location is determined by the chromaticity and the degree of saturation. After the camera has been pre-balanced relative to black and white, measurements are made first with both color connector and gamma corrector disconnected, then with only the color corrector connected. Comparison of signal levels involves postprocessing of the results, but it then yields the chromaticity coordinates of the reference specimens as well as the magnitudes of color errors. Measurements by this method are also made twice, with the color corrector first disconnected and then cconnected, the gamma corrector remaining disconnected each time. This method is useful for optimizing coefficients of the color corrector array. Figures 5.
[140-2415]

UDC: 77.021.137:535.37

LUMINESCENCE PHOTOGRAPHY

Moscow ZHURNAL NAUCHNOY I PRIKLADNOY FOTOGRAFII I KINEMATOGRAFII in Russian Vol 29, No 4, Jul-Aug 84 pp 307-315

NAZAROV, V. B. and ALFIMOV, M. V.

[Abstract] The development of luminescence photography is traced briefly, and descriptions are given of the photographic process and the principles underlying luminescence photography. It is found that luminescence

photography has certain advantages over other types of photography, including the possibility of recording an image on luminescent material so that it cannot be seen under natural light, but can be read out through a luminescent means. This property can be exploited for marking articles and for placing sound tracks on movie film. Luminescence photography can be used to record latent images without using chemical intensification. The use of luminescence photography is determined to a significant extent by the performance of the reproducing equipment. Figures 7, references 21: 17 Russian, 4 Western.
[22-6900]

UDC: 778.534.83(088.8)

SYSTEM FOR STABILIZING RATE OF FILM MOVEMENT IN HIGH SPEED MOVIE CAMERA

Moscow ZHURNAL NAUCHNOY I PRIKLADNOY FOTOGRAFII I KINEMATOGRAFII in Russian Vol 29, No 4, Jul-Aug 84 (manuscript received 6 May 1982; after revision 19 Nov 82) pp 241-243

KLYUKOV, Yu. M., Kazan Aviation Institute

[Abstract] A system for controlling film movement at a stabilized rate in a high speed movie camera is described. The use of three motors with a switching device makes it possible to bring the film up to speed with minimum waste. The control system is implemented with microcircuits. Figures 2; references: 3 Russian.
[22-6900]

IMPROVEMENTS IN WORK EFFICIENCY

Moscow VESTNIK SVYAZI in Russian No 9, Sep 84 pp 13-15

PUSTOVOYTOVSKIY, A.S., Chief engineer of Republic Radio and Television Broadcasting Center (RRTPTs) of Belorussian SSR Ministry of Communications

[Abstract] The first Belorussian SSR program was transmitted by one long-wave station and development of a second program led to requirements for additional frequencies and stations in MW range. Since 20 to 25 individual stations would be needed for the republic network, the Minsk Radio and Television Station and the Scientific Research Institute for Radio studied the feasibility of a complex combining MW radio transmitters with existing TV and UHF FM broadcast stations. A SRV 2 x 20-type MW transmitter was combined with TV stations of the "Uragan", "Len", "Don", "Yakor'" and "Zona" type and broadcasting stations of the "Dozhd'-2" type and a similar approach was used for new combined radio and TV stations in the towns of Myadel', Soligorsk and other sites. The project yielded savings of 2.5 million rubles, improved operational efficiency and led to reductions in technical staff. Equipment in the new complex is in a central control room allowing

remote operation of TV or broadcast stations from a control panel. During rebuilding of a station broadcasting transmitter four new transmitters were built which increased stations power six times, led to considerable economic savings and raised productivity. Oscillator power tube lifetimes are now being extended and hf circuit tubes are being replaced by transistors. Hf amplifiers were developed in regional laboratory with power capacity to 100 W in the ultrashort wave band. A stereo program "Mayak" is now transmitted to Minsk by inter-city link in addition to the Belorussian stereo program broadcast 6 hours a day. Figures 3; tables 3.
[108-12755]

CASSETTE TAPE RECORDER LEVEL METER

Moscow RADIO in Russian No 10, Oct 84 pp 33-35

IZAKSON, I., ZAIKA, V., KOLESNIKOV, P. and SALO, N.

[Abstract] This second installment of an article on cassette tape recorders describes the record level meter used to set the optimum record level for monophonic and stereophonic recording. The use of LED overload indicators with short integration time in conjunction with VU meters is described. Schematic diagrams of a two-channel level meter, and of a simplified version with a half-wave rectifier and no amplitude-frequency response correction in the high frequency region are given. The calibration process is explained. Figures 2.
[111-6900]

"GORIZONT Ts-257" CHROMINANCE MODULE

Moscow RADIO in Russian No 10, Oct 84 pp 35-39

BAKINOVSKIY, N. and SHPIL'MAN, Ye.

[Abstract] This is the third installment of a series on Gorizont Ts-257 equipment [not further identified]. The MTs-1 chrominance module can be employed with any color picture kinescope. The schematic diagram of the module and oscillograms taken at its characteristic points are presented and chrominance signal processing and derivation of red and blue color-difference signals are described. The schematic diagrams of the circuits that process the luminance signal and generate (matrix) the basic color signals are analyzed. Figures 4.
[111-6900]

DIGITAL CAPACITANCE METER

Moscow RADIO in Russian No 10, Oct 84 pp 46-48

PEVNITSKIY, S.

[Abstract] A digital capacitance meter based on an KR1006VI1 integral timer is described which converts capacitance from 100 pf to 4.999 μf to pulse duration (in four bands) and provides a four-digit readout accurate to within ±1%. The device provides automatic band selection, and has a maximum measurement time of 0.2 second and display time of 0.8 second. The schematic diagram of the device is explained, and timing diagrams demonstrating the operation of the meter are provided. The calibration procedure is explained step by step. Figures 3.
[111-6900]

RURAL THREE-PROGRAM WIRED-RADIO BROADCAST EQUIPMENT VARIANT

Moscow VESTNIK SVYAZI in Russian No 10, Oct 84 pp 32-33

VYKOV, M. V., LEVCHENKO, R. R. and NEFEDOV. O. M.

[Abstract] An inexpensive and reliable transmitter for class-2 broadcasting designated UPTVT-30 is described incorporating two identical channels, each with HF signal board, preamplifier, demodulator, power amplifier module and control and measurement panel. A multiplier-type FET modulator is employed. Testing showed good reliability and the system was recommended for installation at rayon centers, urban-type settlements and kolkhozes and sovkhozes and manufacture of similar devices with lower output power for smaller populated areas is discussed. Technical specifications are given. Figures 3, tables 1.
[109-6900]

UDC 621.391

TWO-SAMPLE NEUMANN-PEARSON RANK DETECTOR OPTIMIZATION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84, (manuscript received 28 Oct 82) pp 1948-1955

AKIMOV, P.S. and BARASHKOV, V. M.

[Abstract] An optimum two-input Neumann-Pearson noncoherent rank detector for a finite number of observations is synthesized by distribution of the ranked sample likelihood ratio for a hypothesis. The structural diagram of an optimum multichannel noncoherent rank detector employing channel time division is presented. The detector was found stable but slightly inferior to a detector which is optimum in Rayleigh interference, and slightly better than a detector based on rank sum. The distribution function of the rank statistic of the logarithm of the requisite ratio is analyzed for hypothesis H_0. Figures 2, references 7: 5 Russian, 2 Western.
[110-6900]

UDC 621.391.088

ESTIMATION OF ERROR IN RECONSTRUCTION OF LIMITED SPECTRUM SIGNAL RECONSTRUCTION ERROR FOR INTEGRAL SAMPLES.

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84 (manuscript received 13 Jul 82) pp 1961-1965

BAKIROV, N. K., SULTANOV, A. Kh. and TIMOFEYEV, A. L.

[Abstract] An expression was derived for estimating limited spectrum signal reconstruction error reconstruction from integral samples. The signal resulting from use of an ideal low-pass filter instead of a special correcting filter was analyzed. A mixture of valid signal and additive noise representing a steady process with known correlation function is examined and it was found that the error cannot be made arbitrarily small when noise is present at the input, meaning that the duration T cannot be reduced below a certain boundary without complicating hardware implementation and increasing the reconstruction error. The expression derived for reconstruction error

makes it possible to account for various error sources and to assess feasibility and effectiveness of using special correcting filters. References: 2 Russian.
[110-6900]

UDC 621.372.542

ANALYSIS OF CHARACTERISTICS OF ONE TYPE OF DIGITAL FILTER

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84
(manuscript received 7 Feb 83) pp 2052-2054

TITOV, A. V.

[Abstract] A method is examined for constructing low-pass digital filters with finite impulse response based on "elementary" Walsh filters. Walsh filter operation with impulse response consisting of a series of single pulses with duration N is analyzed and a method is presented for reducing sidelobe levels of filter amplitude-frequency response. It is shown that arbitrarily low sidelobe levels can be attained by connecting appropriate elementary filters in series. The absence of multiplication operations makes the present approach similar to that used for constructing filters with finite impulse responses based on frequency sampling with integer coefficients. Figures 3, references: 8 Russian.
[110-6900]

UDC 621.372.54:621.382

INEFFICIENT TRANSFER COMPENSATION METHODS IN TRANSVERSAL CCD FILTERS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84
(manuscript received 1 Feb 83) pp 2062-2064

NEZLIN, D. V. and SHURYEV, A. M.

[Abstract] This study investigates an approach to the problem of compensating for inefficient transfer in filters based on charge-coupled devices. Maximum output signal/noise ratio is attained by making the CCD filter as close to a matched filter as possible by finding the weight coefficient vector that minimizes the sum of squares of real impulse response deviations from that required along the entire time axis. A filter to compress a 63-element M-sequence is optimized as an example. The computer weight coefficients are almost the same as those obtained in an earlier study in maximizing signal/noise ratio output. The cross-correlation function of the signal and corrected filter is characteristics similar to the autocorrelation function of a matched filter for $\epsilon = 0$. The method makes it possible to synthesize a near-optimal filter with a relatively small amount of computation. References 5: 3 Russian, 3 Western.
[110-6900]

UDC: 681.382.026.43

DESIGN OF DIFFERENTIAL CIRCUIT FOR LSI N-THRESHOLD COMPARATOR

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian Vol 6, Jul-Aug 84 (manuscript received 1 Jun 83 after revision) pp 33-36

KONDALEV, A. I. and GRESHISHCHEV, Yu.M.

[Abstract] The static mode of the analog element of an N-threshold comparator (differential comparison circuit) is analyzed in order to find the relationship between the parameters that determine the static accuracy of the comparator and the number N and spacing of its threshold levels. Analysis of the differential circuit makes it possible to estimate the maximum number of threshold levels of the comparator and the word length of the analog-digital converter. The step of the threshold levels is at least 120 mV; therefore, the number N is limited by the acceptable dynamic range of the signal at the input to the comparator of the LSI analog-digital converter. Consequently, N_{max} = (5 V/120mV) - 1 $\simeq$ 42. If the quantity n $>$ 6, two or more comparators with the maximum number of thresholds can be employed in the low order bits; however, coding elements are required in this case. A similar treatment can be employed if the restrictions on the number N are determined by the acceptable value of U_o^N rather than the dynamic range. References 8: 4 Russian, 4 Western.
[178-6900]

DEVICE FOR REMOTE MONITORING OF RURAL AUTOMATIC TELEPHONE EXCHANGE OPERATION

Moscow VESTNIK SVYAZI in Russian No 9, Sep 84 pp 30-32

NEVEYKIN, V. I. and YATSENKO, V. I., senior engineers of Leningrad oblast' Industrial and Technical Communication Administration

[Abstract] A device was developed for remote monitoring of rural automatic telephone exchange operation from rayon center and for checking incoming and outgoing communication channel performance making possible remote access to the subscribers complex of unmanned exchanges and monitoring of local cord-sets, including outgoing communications from the exchange, by dialing numbers. The device includes a control unit installed at the desk of the monitoring personnel on duty at the rayon center exchange and a connecting unit at the unmanned exchange, and both units are connected to two subscriber sets at the exchange which are used normally unless not required for monitoring. Device operation is comprehensively described and block diagrams and electronic circuits are supplied. A list of resistors and a description of electronic components are included. The device is manufactured by the experimental electromechanics shops of the Leningrad industrial and technical communication administration. Figures 3, Tables 2.
[108-12755]

UDC 621.391:621.394.14

CODES OVER RESIDUE CLASS RINGS AND MULTIFREQUENCY PHASE TELEGRAPHY

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 9, Sep 84 (manuscript received 2 Aug 82, after revision 16 Jan 83) pp 1745-1753

NEMIROVSKIY, E.E.

[Abstract] Encoding an array of harmonic signals over a residue class ring, equivalent to multifrequency phase telegraphy, is considered for digital satellite communication. Purely algebraic properties of such codes are examined and related to radio engineering characteristics. Linearity, in a special sense, and maximality are established for codes with redundancy with special linearity implying that such codes are generally irregular. "Fast"

decoding of redundant codes and of nonredundant codes by the Winograde method is considered with application to Reed-Solomon codes over Galois fields with small p-parameter (p=2) in combination with p-positional phase telegraphy. A code word can be treated as a discrete Fourier transform of a code vector-row. Decoding involves first demodulation of symbols in the telegraph signals by means of phase demodulators and then decoding the internal "subtraction" code by calculus of residues methods before the external Reed-Solomon code is decoded by discrete Fourier transform by the Winograde method. The three-point discrete Fourier transform procedure reduces to two input additions, two multiplications, and two output additions. Tables 2; references 13: 1 Russian, 12 Western.
[102-2415]

UDC 621.396.96:621.391.26

EFFICIENCY OF STORING PULSE PRODUCTS IN COHERENT SIGNAL PACKETS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 9, Sep 84 (manuscript received 16 Feb 83) pp 1832-1833

LATUSHKIN, V.V.

[Abstract] The radial velocity of an object can be measured by means of a coherent signal packet from target to radar receiver but not by noncoherent storage of reflected signals. Pulses in signals from two successive periods are first superposed in time by means of a delay line and then multiplied and the product, which depends on the Doppler frequency of the signal packet, is subsequently compared with an appropriate threshold. Efficiency of such coherent pulse product storage is evaluated in terms of conditional false-alarm and correct-detection probabilities. Comparison of these and non-coherent storage characteristics showed that coherent storage is more energy efficient. Figures 1; references 3: 2 Russian, 1 Western (in Russian translation).
[102-2415]

UDC 621.372:621.391.82

EFFICIENCY OF AMPLITUDE SUPPRESSION OF SINUSOIDAL INTERFERENCE

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 9, Sep 84 (manuscript received 28 Mar 83) pp 1836-1838

DANILOV, V. A.

[Abstract] Polygonal approximation of nonlinear conversion is considered for amplitude suppression of non-Gaussian interference, specifically sinusoidal, with predominance of radio-frequency components in spectrum. Sinusoidal

interference is defined as additive mixture of Gaussian "white" noise and harmonic fluctuations with constant amplitude and frequency but random initial phase uniformly distributed over the $-\pi, \pi$ interval and arbitrary phase modulation. Statistical characteristics of this interference are functions of a parameter representing ratio of harmonic fluctation power to Gaussian noise power. The amplitude suppression factor characterizing efficiency of the nonlinear converter, i.e., signal-to-interference ratio at output divided by signal-to-interference ratio at input, is calculated taking into account converter amplitude characteristic relative to fundamental-frequency component and envelope distribution over interference. Results showed that amplitude suppression with a polygonal converter is somewhat less efficient than optimal amplitude suppression but simpler to implement than amplitude suppression with polynomial converter. Figures 3; references: 3 Russian.
[102-2415]

RURAL LONG-DISTANCE COMMUNICATION AUTOMATION

Moscow VESTNIK SVYAZI in Russian No 10, Oct 84 pp 28-29

KHONIN, V. V., Section Chief, LONIIS Laboratory and SHIFMAN, A. N., Senior Engineer

[Abstract] The first installment of a multi-part study discusses automatic number identification equipment in rural telephone networks and organization of recording and completion trunks from rural system subscribers with and without intermediate equipment. Recording-completion trunk connections by means of ATSK 100/2000 AMTS 2(3) and APM-20 exchanges are analyzed. Use of automatic number identification equipment at automatic exchanges and long-distance communication with automatic number identification are discussed.
[109-6900]

LONG-DISTANCE AMT-69/15 COIN OPERATED TELEPHONE

Moscow VESTNIK SVYAZI in Russian No 10, Oct 84 pp 30-31

GINENDLIN, G. M., SUKHOVERKHOV, Yu. Ye. and SHMIDT, Ye. L., Leningrad Long-Distance Exchange

[Abstract] The AMT-69/15 coin operated telephone replaced the unreliable MTA-15-2 long-distance coin operated telephones used in Leningrad. The AMT-69/15 is physically stronger, has a more durable dialing mechanism and operates in greater temperature extremes than the MTA-15-2. Modification of the AMT-69/15 for long-distance calling is described and testing of modified device showed reliability. Figures 3.
[109-6900]

PROGRESS OF ECONOMIC EXPERIMENT

Moscow VESTNIK SVYAZI in Russian No 10, Oct 84 pp 34-36

GRITSUK, I. M., Minister of Communications, Belorussian SSSR and VAZYL'CHIK, K. G., Chief, Planning-Financial Directorate, Belorussian SSSR, Ministry of Communications

[Abstract] The status and progress due to the economic experiment conducted in the Ministries of Communications of the Belorussian and Latvian SSSR are described. Objective of the experiment was to validate numerous suggestions for improved planning strengthening effects of economic factors on operational results of communications enterprises. The main indicator for comparison was combined tariff income. Implementation of management improvement measures had a beneficial effect on work productivity and quality and procedures for implementing similar experiments in other communications ministries are recommended. Tables 1.
[109-6900]

UDC 621.395.4

INTEGRATED ANALOG-DIGITAL EQUIPMENT FOR DIGITAL WIRE AND RADIO TELEPHONY

Moscow RADIOTEKHNIKA in Russian No 11, Nov 84 (manuscript received, after revision, 16 Dec 83) pp 4-12

GOROKHOV, V.A., BERGLEZOV, S.M. and KAZINOV, V. A.

[Abstract] Development of and trends in integrated analog-digital equipment on a microelectronic base for digital integrated-service communication networks, are reviewed, with specific reference to wire and radio telephony, considering technical as well as economic aspects. The structure and functional characteristics of this equipment are determined principally by the method of converting analog voice signals to digital, whether by the usual pulse code modulation or other such as delta modulation, and by realization of the analog interface BORSHT (Battery supply - Overload protection - Ringing of high-level signals - Supervision - Hybrid differential system - Testing subscriber's analog line). The architecture and circuitry of the PCM encoder-decoder depend on the method of analog-to-digital conversion, whether direct or relative. Integrated low-pass filters in IKM pulse-code-modulation equipment are now built either with switchable capacitors or with charge-coupled devices. The main trends of further development are extending the microelectronic base through special-purpose large-scale and very-large-scale integration with MOS-device or CMOS-device and arraying technology, and improving the performance as well as efficiency of digital data transmission over mobile radio telephone channels with reduced voice redundancy and use of single-chip microcomputers. Figures 5; references 12: 5 Russian, 7 Western (1 in Russian translation).
[141-2415]

UDC 621.396.62:621.372.632

CORRELATOR FOR MONITORING SPECTRAL CHARACTERISTICS OF RADIO FACILITY

Moscow RADIOTEKHNIKA in Russian No 11, Nov 84 (manuscript received, after abridgement, 4 Apr 84) pp 25-28

DYATLOV, A.P.

[Abstract] A special correlator is considered for monitoring the carrier frequency and the spectral characteristics of signals in a radio facility. Signals are picked up by a high-frequency amplifier-limiter through a receiver antenna. The amplifier-limited output signals are transmitted to a resolver through a multirange autocorrelational discriminator and also through a video-frequency detector with a threshold device behind. The resolver removes the ambiguity of frequency estimate and pseudoestimate. The discriminator is the essential component and the slope of its characteristic in each range determines the performance, particularly the accuracy, of the correlator. For a performance evaluation, the dispersion as well as the fluctuation error of carrier-frequency estimates are calculated for simple pulse signals and composite quasi-noise signals with unknown pulse duration and correlation time. The results indicate that the reliability of the correlator will be improved by reducing these two apriori indeterminacies. This can be achieved by means of a pulse duration meter and a correlation time meter, each operating in real time and each connected directly between amplifier-limiter and resolver in parallel with the discriminator and the detector. A delay line must then be inserted before the discriminator for matching the latter with those two meters, the magnitude of the time delay being determined by them. An adjustable delay line is preferable to a fixed one for more reliable monitoring. Figures 2; references: 4 Russian.
[141-2415]

UDC 621.391

BIASED ESTIMATORS IN MEASUREMENT OF RADIO SIGNAL PARAMETERS

Moscow RADIOTEKHNIKA in Russian No 11, Nov 84 pp 31-32

[Annotation of article No 403 deposited at Central Scientific and Technical Institute 'Informsvyaz'', 12 pp with 3 figures and 17 bibliographic references]

STEPANOV, M.G.

[Abstract] Use of biased estimators in radio engineering measurement of signal parameters is examined, specifically for the case of additive white normal interference. Change from conventional integral notation to vector-matrix notation reveals the feasibility of nonlinear regression analysis by either the Gauss-Newton method or the Newton-Rafson method. Particularly stochastic reduced James-Stein estimators are shown to be more accurate than unbiased ones: 1/2p times more accurate for a p-dimensional vector of measured parameters.
[141-2415]

UDC 621.396.666

NUMERICAL ANALYSIS OF AUTOMATIC GAIN CONTROL

Moscow RADIOTEKHNIKA in Russian No 11, Nov 84 (manuscript received, after completion, 30 Jan 84) pp 37-39

GOSTEV, V. I. and ALDAYEV, A. A.

[Abstract] A simple numerical method is proposed for evaluating the dynamic characteristics of automatic gain control systems. It easily takes into account nonlinearities resulting from amplifier saturation and introduced by the delaying voltage. Numerical integration of the expression for the control voltage, as function of the output voltage and the system error, yields the system response to any deterministic input voltage signal with any transfer function and weight function of the linear filter. The method is applicable to periodically and aperiodically variable gain control. Its algorithm has been programmed in PL-1 for a computer. Figures 2; references: 5 Russian.
[141-2415]

UDC 621.391.17

LOWER LIMIT OF ERROR PROBABILITY IN DISCRETE ADDITION OF BINARY SIGNALS FROM PARALLEL CHANNELS

Moscow RADIOTEKHNIKA in Russian No 11, Nov 84 (manuscript received, after completion, 10 Jan 84) pp 57-59

KONONOV, Ye. D.

[Abstract] Addition of binary signals from parallel channels with variable parameters and finite number of states is examined, specifically, discrete addition in diversity receivers. An algorithm of optimal addition is constructed for binary channels conforming to the Markov model and forming together a discrete vector channel and the probability of addition error is calculated assuming the states of this discrete vector channel to be exactly known. Weighted sampling, which improves the reliability in the case of duplications, is found to be optimal and simplifies appreciably in the case of independent constituent channels. The mean probability of addition error, obtained by averaging over all channel states, is the lower limit of this probability and characterizes the maximum possible interference immunity of discrete signal addition. As an example, the latter is evaluated for three statistically uniform and independent discrete states. References 5: 4 Russian, 1 Western (in Russian translation).
[141-2415]

UDC: 621.313.5:621.791.03:537.84

MHD WAVE GENERATOR WITH HELICAL DUCT FOR AUTOMATED PRINTED CIRCUIT BOARD SOLDERING OF RADIO ELECTRONIC EQUIPMENT

Riga MAGNITNAYA GIDRODINAMIKA in Russian No 4, Oct-Dec 84 (manuscript received 14 Feb 84) pp 120-123

GEL'FGAT, Yu.M. and SIMSONS, Yu.A.

[Abstract] This paper describes MHD wave generators with helical ducts capable of producing waves and jets of solder up to 500 mm wide. The rotating magnetic field generator is the standard stator of an asynchronous electric motor; the electromagnetic field produced is used simultaneously to create head and to melt and heat the solder in the active zone of the MHD generator. The MHD soldering equipment has been tested in mass and large series production; the systems can be easily added to assembly lines, or can be employed in stand-alone automated soldering lines in conjunction with fluxing, drying, washing and other installations. References 6 Russian.
[167-6900]

UDC: 621.396.6.002

LOGICAL METHOD FOR TESTING ELECTRICAL WIRING

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian Vol 6, Jul-Aug 84 (manuscript received 14 May 82) pp 55-59

PROKOF'EV, A. A., SAPOZHNIKOV, V.V. and SAPOZHNIKOV, Vl.V.

[Abstract] A logical method is proposed for testing electrical wiring that incorporates logical models for wiring defects and makes it possible to solve the problem of constructing a defect search test. The method employs standard checking and defect search tests. The diagnostic results are easily analyzed, and there is no need for making additional connections during the checking process. The test lengths are acceptable for practise. For these reasons, the proposed wiring testing method can be implemented comparatively simply, in terms of hardware and software. References 8: 6 Russian, 2 Western.
[178-6900]

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ELECTRICAL INSULATION

UDC [621.315.62.027.3:621.315.61].015.32

METHODS OF EQUALIZING ELECTRIC FIELDS IN HIGH-VOLTAGE DEVICES

Moscow ELEKTROTEKHNIKA in Russian No 11, Nov 84 (manuscript received 1 Dec 83) pp 55-57

GINZBURG, L.D., candidate of technical sciences, IBRAGIMOV, R.S., engineer, and KOROTKIN, B.A., engineer

[Abstract] Size and weight reduction of high-voltage devices depends on an insulation system which ensures a uniform, or almost uniform, electric field distribution over the surface. This in turn requires large metal backup parts and their monolithic bonding to the dielectric part, a source of high thermoelastic stresses. The problem of reducing these stresses is analyzed on the basis of the equation of elasticity for a monolithic insulator with metallized inside wall and metal mounting endpiece. According to the solution to this equation, the thermoelastic stress between dielectric and metal depends on the difference between their linear thermal expansion coefficients and on the ratio of their Young's moduli. Reliable performance requires that the thermoelastic stress be 20-50% lower than the ultimate tensile strength of the dielectric and the ultimate adhesive strength of the dielectric-metal bond, these levels being determined principally by the thermal relaxation characteristics of the dielectric. An evaluation of various materials and manufacturing methods indicates that both equalization of electric fields and minimization of thermoelastic stresses are attainable by using ceramic materials or polymer molding compounds for insulators, with a shielding brass mesh rolled into a wire ring for weakening the edge effect and raising the mechanical strength. With this technology it has been possible to reduce the insulator height and diameter by 50% and 25% respectively, the corresponding weight reduction ranging from 50% to 70%. Figures 5; tables 1; references: 3 Russian.
[137-2415]

UDC 621.316.933.8

DEPENDENCE OF ELECTRIC CURRENT THROUGH HUMAN BODY ON PARAMETERS OF 3-Ø NETWORK IN RANGE OF HIGH INSULATION ADMITTANCE

Moscow ELEKTROTEKHNIKA in Russian No 11, Nov 84 (manuscript received 24 Feb 84) pp 58-60

MOTUZKO, F.Ya., candidate of technical sciences, and TRUBITSYN, A.V., engineer, Moscow Institute of Radio Engineering, Electronics and Automation

[Abstract] The electric current I_h through a human body touching one phase of a 3-Ø network is calculated on the basis of the conventional equivalent circuit for the general case of unequal insulation admittances in all three phases. The two extreme cases here are all three insulation admittances approaching zero or infinity respectively. The theoretical relation in the latter case is not consistent with reality, in which an infinitely large insulation admittance presents a short circuit across the 3-Ø source and a fully effective shunt across the human body. The equivalent circuit is modified, accordingly, to include the internal source resistance r in series with the insulation admittance $Y=\frac{1}{R} = j\omega C$ in each phase. The current I_h normalized to its maximum absolute magnitude $|I_h|_{max}$ is then recalculated as function of the insulation resistance R over the $0<R<\sqrt{3R_h r}$ range (R_h - resistance of human body) so as to remain consistent over the entire $0 \leq Y \leq \infty$ range of insulation admittance. These calcualtions reveal that there exist two values of insulation resistance, R_{min} and R_{max}, corresponding to any permissible level of current $I_h < |I_h|_{max}$. Protection of the insulation against such a phase-to-ground fault in a 3-Ø network with isolated neutral is ensured by maintaining the insulation resistance above R_{max}. Protection of a person in such a situation could be ensured by reducing the insulation resistance below R_{min}. This method has not yet been adequately explored, because it requires a high-speed automatic fault locating and subsequent grounding of the affected phase. Calculations pertaining to this method of personnel protection are continued, to establish the dependence of current I_h on the insulation resistance of the touched phase and thus establish the safe range of this resistance when the resistance as well as the insulation admittance of this phase are different from those of the other two phases and those of the other two phases are equal. For the case of all phases having the same insulation admittance and resistance is also calculated the dependence of current I_h on the insulation resistance R and the insulation capacitance C for three ranges: 1) $\frac{1}{R} \gg \omega C$; 2) $\frac{1}{R} \ll \omega C$; 3) $\frac{1}{R}$ and ωC of the same order of magnitude. Results are presented graphically. Figures 6; references: 2 Russian.
[137-2415]

UDC 621.316.542.(008.8)

SELECTING MATERIALS FOR DIELECTRIC CARTRIDGE AND LIQUID METAL FOR SELFHEALING PROTECTIVE FUSES

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 11, Nov 84 (manuscript received 06 Oct 83) pp 84-89

ANDREYEV, V.A., KREZHEVSKIY, Yu. S. and KUZNETSOV, A.V.

[Abstract] Information on experimental samples of liquid metal self-reactivating fuses first appeared in foreign literature in 1970-1975. When the current is increased due to circuit overload, the liquid metal in the ceramic cartridge evaporates and the fuse disconnects from the power supply. After cooling the fuse is reactivated. Compared to regular fuses, liquid metal self-restoring fuses have many advantages, but their great shortcoming is instability of the protecting features due to changes in the characteristics of the dielectric cartridge after repeated operation. Various ceramic materials can be used for manufacturing the cartridges whose composition is determined by the base and the additions. Publications of foreign authors do not reveal the exact chemical composition of the ceramic material and manufacturing technology, as they provide information about the base only. Experimental studies were conducted in Ul'yanovsk polytechnic institute with dielectric cartridges made of quartz, corundum ceramics, steatite ceramics, cordierite ceramics, and ceramics based on beryllium oxide in combination with three liquid metals: eutectic alloy of indium-gallium-tin and alloy of potassium-sodium and sodium. The most favorable combinations were determined for breaking the electric arc in the dielectric cartridges. Further studies are recommended for finding best combinations of domestically developed material and metals. Figures 3; tables 1; references 3: 2 Western, 1 Polish in Russian translation. [151-12755]

UDC 621.382.2.029.53.001

RATE OF WIDENING OF STRONG-FIELD DOMAIN IN SUPERCRITICALLY DOPED GUNN-EFFECT DEVICES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 9, Sep 84 (manuscript received 21 Feb 83) pp 1820-1823

CHKHARTISHVILI, L.S., CHIGOGIDZE, Z.N. and KHUCHUA, N.P.

[Abstract] The widening of strong-field domains in Gunn-effect diodes is analysed on the basis of the Shoji model of electric dipole arrays, when the domain expands transversely simultaneously with longitudinal buildup in direction of electric bis field. The widening rate (about one order of magnitude higher than electron drift velocity in epitaxial n-GaAs layers) is calculated for the supercritical doping case and is found to increase with increasing electron concentration but less so with increasing layer thickness. In this case linear approximation of the velocity-field characteristic requires three rather than two different straight segments and diffusion current must also be taken into account. Resulting relation indicates feasibility of increasing charge carrier concentration beyond $5 \cdot 10^{16}$ cm^{-3} ceiling imposed by requirement of a current voltage characteristic with sufficiently large current drop. Figures 2; references 9: 1 Russian, 8 Western.
[102-2415]

UDC 537.533.3

INTRINSIC MAGNETIC FIELD OF ELECTRON BEAM

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 9, Sep 84 (manuscript received 27 Dec 82) pp 1845-1848

ZAFT, M.P. and MOLOKOVSKIY, S.I.

[Abstract] Intrinsic magnetic field of an electron beam was calculated for later application in relativistic electron devices. An axisymmetric beam was considered and, for simplicity, calculations were for an annular

volume element with internal elementary convection current. Vector potential and electron velocity components were transformed from Cartesian to a cylindrical system of coordinates and magnetic induction was established at observation points inside and outside the volume element. The self-consistent problem discretized in space was treated according to electron optics theory and solved by numerical methods, analogously to calculation of intrinsic electrostatic field, with an auxiliary grid for the beam propagation space, assuming space charge and electron velocity distributions to be known. Validity of procedure and algorithms was verified against analytical solutions of two test problems: 1) magnetic field of a long solid or hollow electron beam with uniform current density distribution; 2) magnetic field of long hollow revolving electron beam. The numerical procedure was programmed in FORTRAN for YeS computers. Figures 2; references: 5 Russian.
[102-2415]

UDC 537.531

STIMULATED EMISSION OF BOUNDED STRONG-CURRENT ELECTRON BEAM WITH LONGITUDINAL MAGNETIC FIELD MAGNETOSTATIC PUMPING

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84 (manuscript received 18 Jan 83) pp 1977-1984

GRIGOR'YEV, V.P.

[Abstract] The kinetic equation method is employed to analyze stimulated emission of a radius-limited strong relativistic electron beam propagating in a resonant system in the presence of a transverse spatially periodic and a uniform longitudinal external magnetic fields. The field of the emitted wave and the space-charge potential field are represented as eigenfunction expansions of a resonant system, assuming that type H waves, as well as E waves, can be emitted. Stimulated emission is investigated on the basis of a kinetic equation taking the state in a longitudinal magnetic field as the beam steady state. Cyclotron resonance with the pumping wave and the combination wave are investigated. It is found that an external focusing longitudinal magnetic field produces effective stimulated emission when the pumping wave is in resonance with the cyclotron frequency of the electrons in the beam and the focusing field, and when the conditions for cyclotron resonance with the combination wave are satisfied. References 12: 10 Russian, 2 Western.
[110-6900]

UDC 537.531

TUBULAR STRONG-CURRENT RELATIVISTIC ELECTRON BEAM INSTABILITY

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84
(manuscript received 16 Feb 83) pp 1985-1993

OVSYANNIKOVA, O. B., KAMENETS, F. F. and LEYMAN, V. G.

[Abstract] Tubular strong-current beam instability in a vacuum is investigated allowing for the gene region formation conditions which make it necessary to consider the transverse electron relativistic movement. Perturbations disturbing the homogeneity of the beam transverse to the magnetic field are investigated as the most rapidly increasing. The model employed assumes that the beam is an infinitely thin charged surface. Development of such perturbations in beams with finite thickness is analyzed numerically allowing for the influence of the conducting electrode and relativistic transverse movement. The instability is found to depend little upon the distance to the conducting electrode and stability improves significantly as the relativistic factor of the transverse movement is increased by increasing beam current. Figures 2, references 20: 11 Russian, 9 Western.
[110-6900]

UDC 537.8

FASTER-THAN-LIGHT SOURCES IN ELECTRON BEAMS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84
(manuscript received 1 Mar 82) pp 1994-1997

TSIKIN, B. G.

[Abstract] It is demonstrated that a flow of electrons moving over a retarding system and amplifying the surface electromagnetic wave loses some of its energy to the radiation of TEM-waves indicating that faster-than-light radiation sources exist in electron beams if slow current waves with monotonically varying amplitude are excited in them. The effect is caused by the occurrence of faster-than-light Fourier components in the variable component of the current as the amplitude varies. The present effect can be observed when bulk charge density decreases in modulated electron flows. Figures 9, references: 5 Russian.
[110-6900]

UDC 537.871.5:029.6

RADIATION POLARIZATION CONTROL BY VANADIUM DIOXIDE-BASED STRUCTURES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84 (manuscript received 20 Jun 83) pp 2067-2069

BILENKO, D. I., ZHARKOVA, E. A., DODGAUZ, V. A., KHASINA, Ye. I. and KHOL'NOV, Yu. V.

[Abstract] A polarizer is described that is produced by inducing space-time irregularities, such as lattice consisting of alternating bands of semiconducting and metal phases, in vanadium dioxide. The attenuation of the transmitted electromagnetic phase is investigated as a function of the heater voltage for different angles between the polarizer and analyzer. The bandwidth of the polarizer is good, and the device contains no moving parts or assemblies. Figures 2, references: 2 Russian.
[110-6900]

UDC 621.396:681.51

ANALYSIS AND IDENTIFICATION OF INERTIAL DEVICES

Moscow RADIOTEKHNIKA in Russian No 11, Nov 84 (manuscript received, after completion, 11 Nov 83) pp 12-18

SAFIULLIN, N. Z.

[Abstract] A hybrid theoretical and experimental model of nonlinear inertial devices is constructed for their identification and analysis such that its complexity does not increase excessively with increasing order of nonlinearity. A continuous and stable nonlinear receiver-amplifier with finite inertia is described by a finite sum of a Volterra series characterizing the response to a bounded input signal. Identification with either a real signal or a special test signal uses a double-trace memory oscilloscope or a stroboscopic unit. Multidimensional pulse response characteristics of a device are plotted in parametric form, most convenient for scanning and analysis. Analytical multiple integration becomes feasible after reduction of the number of unknown parameters. An analytical general expression was derived for the output signal from nonlinear inertial devices with weak oscillatory properties and input signal of arbitrary form. The results of identification and analysis are used for solving the model optimization problem, typically with respect to the mean-square error, including search for its global minimum by such methods as modified random search or complete sorting. A special algorithm programmed in ALGOL-60 reduces the computer time necessary for solution of the resulting system of linear equations, its stability being ensured by iteration or regularization. The procedure is demonstrated on a two-stage video amplifier with a KT316G transistor in the first and a KT326 transistor in the second. Calculations based on this linear model of

a fourth-order nonlinearity do not differ from measurements by more than 0.1%. Figures 4; references: 8 Russian.
[141-2415]

UDC: 681.333:621.38.001.57

USE OF SELF-ANALOGY PRINCIPLE TO MODEL BIPOLAR TRANSISTOR IN NON-QUASISTATIC MODE

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian Vol 6, Jul-Aug 84 (manuscript received 11 Jul 83 after revision) pp 96-98

DENISENKO, V.V. and POPOV, V.P.

[Abstract] An analog model is proposed for a bipolar transistor that employs the self-analogy principle and is based on a differential equation in partial derivatives that describes the carrier transfer process in the transistor base, permitting it to be used in the non-quasistatic mode. The method makes it possible to develop sufficiently simple electronic models of bipolar transistors that are suitable for investigating electronic devices for a wide range of control input durations. References 8: 7 Russian, 1 Western.
[178-6900]

UDC: 621.315.592:621.376

DEFLECTION OF IR-RADIATION IN n-InSb DURING TEMPERATURE-ELECTRICAL INSTABILITY IN MAGNETIC FIELD

Tomsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: FIZIKA in Russian Vol 27, No 11, Nov 84 (manuscript received 1 Aug 83 after revision) pp 35-40

ANTONOV, V.V., GUSAKOV, V.V., KATS, L.I., Saratov State University imeni N. G. Chernyshevskiy.

[Abstract] The study investigated the influence of a stationary magnetic field and heat release from the surface of the specimen on the nature of the current instability in electron indium antimonide and examined the possibility of using concentration inhomogeneity in the region of negative differential conductivity of the semiconductor to deflect IR-band electromagnetic radiation. The formation of an S-shaped voltage-current characteristic when an indium antimonide specimen is heated by direct current in the presence of an external constant magnetic field was examined. The width of the forbidden zone, concentration of the charge carriers, mobility and heat conductivity were taken into account as a function of temperature in calculating the voltage-current characteristic. The angle of deflection of the IR radiation along the cross section of the specimen was calculated. The experimental and

theoretical relationships between the angle of deflection and the current agree in order of magnitude, and indicate that temperature instability can be used to create IR-band laser radiation deflectors. References 8 Russian. [147-6900]

NEW TYPE OF IMPURITY DEFECTS IN SEMIINSULATING GALLIUM ARSENIDE

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 18, No 8, Aug 84 (manuscript received 16 Jan 84) pp 1363-1366

VORONKOV, V.V., VORONKOVA, G.I., KALINUSHKIN, V.P., MURIN, D.I., OMEL'YANOVSKIY, E.M., PERVOVA, L.Ya., PROKHOROV, A.M. and RAYKHSHTEYN, V.I., Institute of General Physics, USSR Academy of Sciences.

[Abstract] Local microinhomogeneities of semiinsulating n-type GaAs grown by the Chokhral'skiy method were investigated by small-angle scattering of radiation from a CO_2 laser. The specimens were doped with Cr and O, and exhibited specific resistance at 300 K of approximately (10^8 - 10^9) ohms·cm, with electron concentration of approximately 10^6 - 10^7 cm^{-3} and electron mobility of (1 - 7) X 10^3 $cm^2/V \cdot sec$. The charge carrier profile in the microinclusions observed is described by a Gaussian distribution. The light scattering patterns are investigated as a function of specimen temperature. The GaAs crystals are found to contain large-scale ionized impurities that are similar in their nature to the impurity clouds observed in Si and Ga. The occurrence of local regions with high free carrier concentration in semiinsulating GaAs can reduce the optical strength of the crystals significantly due to local absorption of radiation, and can influence the quality of microcircuits based on this material. References 7: 5 Russian, 2 Western.
[165-6900]

PICOSECOND PHOTOCONDUCTIVITY OF INDIUM ARSENIDE

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 18, No 8, Aug 84 (manuscript received 5 Mar 84) pp 1422-1424

ADOMAYTIS, E., DOBROVOL'SKIS, Z. and KROTKUS, A., Institute of Semiconductor Physics, Lithuanian SSR Academy of Sciences.

[Abstract] Optoelectronic switching in indium arsenide was investigated. Specimens made from an InAs single crystal doped with Cr and Zn, and of an undoped crystal, were prepared. The shape and amplitude of pulses passing through the indium arsenide specimen were examined for different amounts of radiant energy illuminating the specimen. The output signal is not proportional to the conductivity of the specimen. Indium arsenide is found to exhibit some fundamental shortcomings as a semiconductor, including low dark resistance and limited maximum amplitude of the output signal, which

restricts its use in optoelectronic switches to the region of small amplitudes. References 9: 3 Russian, 6 Western.
[165-6900]

DYNAMICS OF RECRYSTALLIZATION AND REDISTRIBUTION OF IMPURITIES IN SEMICONDUCTORS EXPOSED TO MILLISECOND LASER RADIATION

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 18, No 8, Aug 84 (manuscript received 19 Dec 83) pp 1446-1448

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[Abstract] This study investigates the kinetics of the action of millisecond laser pulses on semiconductors, and studies characteristics of melting, recrystallization and redistribution of impurities associated with the spike nature of laser radiation in the free lasing mode. The studies were performed by reflecting the sounding radiation from the illuminated surface of the crystal. It was found that, when the irradiation conditions are selected optimally, uniformly recrystallized layers with modified physical and mechanical characteristics can be obtained by exposing the specimens to millisecond laser pulses. The influence of segregation effects and impurity evaporation processes on the properties of the recrystallized layers is analyzed. It is found that uniform epitaxial layers with modified impurity distribution by depth can be obtained; millisecond pulsing also makes it possible to clean the crystal surface of absorbed layers and remaining reaction products formed during chemical treatment of the material. References 8: 3 Russian, 5 Western.
[165-6900]

ON THE NATURE OF CERTAIN ELECTRON TRAPS IN GALLIUM ARSENIDE

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 18, No 8, Aug 84 (manuscript received 5 Jan 84) pp 1450-1454

GLORIOZOVA, R.I., GRISHINA, S.P., KOLESNIK, L.I., OMEL'YANOVSKIY, E.M. and POLYAKOV, A.Ya., State Scientific Research and Design Institute of the Rare Earth Metals Industry.

[Abstract] The surface concentration of various deep centers in gallium arsenide was investigated as a function of the arsenic vapor pressure. It was found that the concentration of donors with levels of about E_c - 0.8 eV (so-called EL2 centers) and defects with levels E_c - 0.54 eV (so-called EL3 centers) increase with the arsenic vapor pressure as $P^{1/4}_{As_4}$. It was shown experimentally and analytically that the EL2 center can be considered an antistructural defect complex with some impurity acceptor. EL centers are associated with As_{i-as_i} or $As_{i-V_{Ga}}$ complexes. References 27: 2 Russian, 25 Western.
[165-6900]

UDC [62-83:621.313.2:621.382].001.2

PRINCIPLES AND PROBLEMS OF BUILDING D.C. ELECTRIC DRIVES WITH SYMISTOR CONTROL

Moscow ELEKTROTEKHNIKA in Russian No 11, Nov 84 (manuscript received 1 Mar 84) pp 2-6

POZDEYEV, A.D., doctor of technical sciences, IVANOV, A.G., candidate of technical sciences, and USHAKOV, I.I., engineer, All-Union Scientific Research Institute of Relay Construction

[Abstract] Reversible symistor (triac) converters are considered for d.c. electric drives. The main problem is the much lower reliability of symmetric thyristors than that of plain ones, owing to the possibility of spontaneous reversal in the absence of a resolution signal from the switching logic when the device is controlled by unipolar pulses or upon reversal of voltage polarity across the power terminals when the device is controlled by bipolar signals. Spontaneous symistor reversal can be prevented either by limiting the reverse dv/dt to the permissible commutation level or by delaying application of the reverse voltage till after recovery. The latter condition is achieved by means of saturable reactors. The authors propose using a polyphase laminated reactor core, with alternating solid and slit laminations, so as to combine these delaying reactors and the switching reactors with common windings. Two methods of controlling symistors were developed which not only improve their reliability but also reduce the size of such dual reactors involving, respectively, monitoring the point where the counter-emf wave in tersects the voltage wave across the switched-off rectifier or monitoring the voltage polarity across the switched-off symistor. The latter method is universal, inasmuch as it involves not only the load counter-emf but also the LRC load always included in protective circuit and is applicable to a.c. electric drives as well. The gist of controlling an m-phase symistor converter is varying the phase of control pulses and switching them as a 180° reversal occurs, this being achievable under any load depending on the polarity of the symistor voltage, the given direction of the converter current, and the output pulses from the phase regulator. These techniques have been proved out experimentally on series TS, TS14 and TS2 symistors. Experimental data and theoretical calculations indicate that most expedient for d.c. electric drives are symistors with a high switching $(dv/dt)_s \geq 100$ V/μs and a polarity-wise unambiguous control characteristic. Figures 6; references: 7 Russian.
[137-2415]

UDC 62-83:621.771.09:621.967.3

EXPERIENCE WITH DEVELOPMENT AND INTRODUCTION OF NEW ELECTRIC DRIVE SYSTEM FOR SLIDER-CRANK SHEAR BLADES IN CONTINUOUS-DUTY BLOOMING MILLS

Moscow ELEKTROTEKHNIKA in Russian No 11, Nov 84 (manuscript received 23 Jan 84) pp 6-9

FISHBEYN, V.G., engineer, All-Union Scientific Research Institute of Electric Drives

[Abstract] A new electric drive system was developed in 1974-75 for slider-crank shear blades in blooming mills which cut large blanks up to 120x120 mm^2 in cross section at high speeds up to 4 m/s. These shear blades must develop cutting forces in the 2.5-4.0 MN range and thus require high-power drives. Two such drives were set up at the All-Union Scientific Research Institute of Metal Processing Machinery in Kolpino, one for 2.5 MN shear blades installed in 1976 in the 950/850/75 continuous-duty blooming mill of the Special-Steels combine in Tyrgovist (Romania) and one for 4.0 MN shear blades installed in 1982 in the continuous-duty blooming mill of the West Siberian metallurgical plant. Kinematically both drives are designed to complete a cut during each revolution, which requires a downward speed regulation during the periods between cuts over an arc of travel shorter than 360°. Maneuvrability of synchronously rotating blades depends on the proper relation between dynamic characteristics of the drive, structure and performance of the control system, and necessary cutting precision. Each drive consists of a motor, a thyristor inverter, a frequency-to-voltage converter, and a photorelay. The drives operate with successively subordinate current, speed, and position control, each control loop containing the appropriate sensor and transducer (tachometer generator for speed control) with the regulator. Current and speed controls are analog. Position control is hybrid analog and digital, for which there are a Gray-to-binary code converter, three binary/decimal-to-binary code converters, two code-to-frequency converters, a digital-to-analog converter, and a code comparator. Rolled stock is cut into blanks to measure, as preset manually or by a control microcomputer, with a length counter and tracking rollers involved in the control system for zero-waste cutting with cleaning of the front edge. The microcomputer is also interfaced with two cutting-cycle programmers. Figures 1; references: 6 Russian. [137-2415]

UDC [621.316.37:62-83]-213.34

MODULAR DISTRIBUTOR FOR CONTROLLING GROUP OF ELECTRIC DRIVES

Moscow ELEKTROTEKHNIKA in Russian No 11, Nov 84 (manuscript received 23 Jan 84) pp 14-18

PARKHOMENKO, A.I., candidate of technical sciences, KOSHMAN, V.I., candidate of technical sciences, PETRICHENKO, V.F., candidate of technical sciences, OBOROTOV, V.D., candidate of technical sciences, and ABARA, L.P., engineer, All-Union Scientific Research Institute of Electrical Explosionproof and Mining Equipment

[Abstract] A series of modular distributors RASK was developed for controlling a group of electric drives in coal mines or other mines, where a large number of contractors must be protectively enclosed. It is the first of its kind ever built in the Soviet Union and worldwide, its main feature being fewer components with all the advantages derived therefrom. Unlike conventional distributors with three electromagnets for circuit closing, circuit opening, and zero-sequence protection respectively, a RASK distributor has only one main electromagnet for circuit closing. The other two functions are performed by small auxiliary electromagnets, their number being equal to the number of controlled drives and additional contactors being provided for their operation as intermediate relays. Such a distributor not only switches drives on or off, selectively and independently rather than sequentially, but also commutates the arc-quenching circuits. It is controlled through push-buttons, without special presetting devices, some automation being feasible with the use of time relays. All circuits can be controlled by current signals transmitted over two or three wires, either all or only some controlled circuits to be closed or opened, and all circuits can be opened simultaneously for zero-sequence protection. The advantages of fewer components are appreciable reduction of metal content, 60% less iron and 50% less of nonferrous metals than in conventional distributors, smaller drain of electric energy for internal consumption and less heating through elimination of contactor coils remaining under voltage for long periods of time. The RASK-160M distributor consists of six modules, which replace six 3-pole switches. Each module is designed for controlling 3-Ø a.c. circuits, for which are provided three pairs of movable power contactors, preferably in arc-quenching chambers, rated for a nominal current of 160 A. Interlocking is provided to prevent simultaneous closing of two or more modules, to allow 0.6 s time between closing of the first and closing of the sixth. Figures 2; tables 1; references: 2 Russian.
[137-2415]

UDC 621.313.13:62-83:621.313.2

ELECTRIC DRIVE MOTORS FOR INDUSTRIAL ROBOTS

Moscow ELEKTROTEKHNIKA in Russian No 11, Nov 84 (manuscript received 7 May 84) pp 33-35

FICHTNER, KLAUS, graduate engineer, German Democratic Republic

[Abstract] In robotized industrial plants it is possible to use electric motors in the technological process and also for control, assembly, transport, testing, and measurements. Particularly suitable for these applications are permanent-magnet d.c. motors. While such motors are manufactured at the VEB Kombinat "Elektromaschinenbau", a new special series RSM has been developed here for industrial robots with hinge joints in kinematic pairs. The complete drive includes thyristor or transistor controls with regulators and, if necessary, a line transformer as well as a servomotor with tachometer and odometer for speed, current, and position control. The drive is coupled to a robot tong through mechanical torque and force converters. In addition to a 0-4000 rpm speed regulation, without wobble at low speeds, and a high torque-to-weight ratio for repetitive short-time heavy duty, these low-inertia motors develop high starting and accelerating torques over the entire speed range. They operate from a 1-Ø 220 V a.c. line through a rectifier. Their reliability is high, a long mean time between failures being ensured by long life of brushes, slip rings, and ball bearings, by type IR 44 protection of electric circuits, and by prevention of resonance in the vibrating mechanical system. The motors are totally enclosed, or of open construction for better ventilation. Their windings have class F insulation for operation at ambient temperatures up to 40°C. Regulation is zonal: zone 1 for continuous operation, zone 2 for cyclic operation, zone 3 for starting and braking. Two motors of this series, RSM10 and RSM60, were designed for nominal speed of 2000 rpm at a supply voltage of 95 V d.c. Their weight is respectively 6 and 14.5 kg, their moment of inertia is respectively 9 and 40 $kg \cdot cm^2$. Both have an overload factor of 10. Figures 4; tables 1; references 5: 1 Russian, 4 East German.
[137-2415]

UDC 621.373:621.382.233

TWO-STEP PULSE TRIGGERING OF DYNISTOR POWER SWITCHES

Moscow ELEKTROTEKHNIKA in Russian No 11, Nov 84 (manuscript received 13 Feb 84) pp 42-46

GORBATYUK, A.V., candidate of physico-mathematical sciences, GREKHOV, I.V., doctor of physico-mathematical sciences, and KOROTKOV, S.V., engineer, Institute of Engineering Physics imeni A. F. Ioffe

[Abstract] The performance of reversibly switching power dynistors is examined on the basis of physical processes which occur in their structure

and determine their dv/dt and di/dt characteristics. Conditions for normal and most efficient operation are established by qualitative and quantitative analysis of available data. Pulse triggering of these thyristor-diode devices is considered, a particularly important parameter here being the lifetime of the high-conductance phase in "internal" p-N-n^+ diode segments from reverse injection till flow of positive anode current (reverse diode current). The length of this period is calculated according to the conventional simple theory of diffusion with charge storage, which is applied here to a semiinfinite model structure and the transient state with arbitrary waveforms of forward and reverse diode currents. The corresponding equation of ambipolar diffusion is solved for appropriate initial and boundary conditions for the hole concentration and its rate of change. A comparative evaluation of single-step and two-step triggering reveals the advantages of the latter mode with simultaneous uniform injection of initially induced charge. Figures 4; references 8: 7 Russian, 1 Western.
[137-2415]

UDC 621.382.233.026.001.5

EXPERIMENTAL DETERMINATION OF TURN-OFF TIME OF HIGH-VOLTAGE POWER THYRISTORS

Moscow ELEKTROTEKHNIKA in Russian No 11, Nov 84 (manuscript received 15 Aug 83) pp 50-53

GRIGOR'YEVA, G.V., engineer, KONYUKHOV, A.V., engineer, KUZ'MIN, V. A., doctor of physico-mathematical sciences, and CHESNOKOV, Yu.A., candidate of technical sciences, All-Union Institute of Electrical Engineering imeni V.I. Lenin

[Abstract] An experimental study of silicon power thyristors was made, for the purpose of determining the dependence of their turn-off time on the repetitive reverse voltage, on the rate of decrease of the forward current, and on the lifetime of holes. Three groups of thyristors were tested (width of n-base 560,570,610 um, width of p-base 90,90,70 um, electrical conductivity of n-emitter 170,180,160 ohm·cm) corresponding to T630, T173-1250, T353-800 four-layer devices rated for 2400-2800 V, 2600-2800 V, 2800-3200 V respectively. The data are evaluated on a theoretical basis, taking into consideration the dynamics of charge (minority carriers) b ldup and dissipation during reversals of anode voltage polarity. The results reveal significant differences in turn-off characteristics between the three groups of thyristors. They also indicate decreasing the life of holes for minimum turn-off time and thus maximum switching speed involves a tradeoff with a higher blocking-state pulse voltage and larger leakage currents. Figures 5; tables 2; references 7:
[137-2415]

UDC [621.315.5/.61:620.193.6].001.57

RECOMMENDATIONS FOR DEVELOPING SIMULATORS OF SOLAR RADIATION PENETRATING TO THE EARTH'S SURFACE

Moscow ELEKTROTEKHNIKA in Russian No 12, Dec 84 (manuscript received 15 Aug 83) pp 46-48

MASLOVETS, F.K., candidate of technical sciences

[Abstract] Smallsize chambers for testing various electrical systems and materials for effects of solar radiation are widely used, but are not suitable for testing large objects. Mecury-quartz, xenon or other type lamps can not generate the required intensity with an ultraviolet component in the 0.28-0.4 μm range. One of the shortcomings of the above sources of solar radiation is that their spectra contain wavelengths below 0.28 μm, which actually do not penetrate to the Earth's surface. Thus, by irradiating the materials there exists a possibility of producing processes not characteristic of the natural solar radiation and intensification of other processes can also occur. Tests were conducted in order to obtain a total intensity of simulated solar radiation of 1.6-1.8 cal/(cm^2·min), where 0.06 cal/(cm^2 min) lie in the ultraviolet region (0.28-0.4 μm), or, based on the photochemical activity, 5.4-5.5 mg/cm^2.h of decomposed oxalic acid at the chamber temperature of 80°C for an hour exposure. The radiation intensity was measured at each corner of a 500x500 mm^2 area for three different elevations. Analysis indicated that the test objectives were satisfied for the elevation of 600 to 700 mm from the chamber bottom. Figures 3, table 1; references 5: 4 Russian, 1 Western (in Russian translation).
[163-12755]

UDC [621.315.611:537.311/312].08.084.89

MEASURING RADIATION ELECTROCONDUCTIVITY OF SOLID DIELECTRICS EXPOSED TO PULSED IONIZING RADIATION

Moscow ELEKTROTEKHNIKA in Russian No 12, Dec 84 (manuscript received 22 Aug 83) pp 48-51

MAKEYEV, S. N. and SHMID, O.I., engineers

[Abstract] Radiation electroconductivity (REC) is one of the fundamental parameters describing the behavior of dielectric materials and metal-dielectric systems in a field of ionizing radiation. Therefore, it is important to develop improved methods for measuring this parameter. The objective of this study is to summarize the work done on measuring the radiation electroconductivity of solid dielectrics and metal-dielectric semiconductors (MDS) under the impact of ionizing radiation pulses in the 2000-0.03μs range. The existing methods are based on measuring the voltage across a reference resistor carrying current, which depends on the resistance of the sample and the externally applied voltage. A new method for measuring the REC under pulsed radiation in the 0.26-2600 kCl/kg gamma radiation energy range allows to reduce the level of induced voltage to a value not greater than 20 mV. Samples 10 to 2,000μm thick can be measured in the developed cells with external voltages of up to 5kV. Under conditions of pulsed gamma-neutron radiation an additional pulse appears at the leading edge of the conductivity signal. Electret charges, responsible for the polarization effects with pulsed gamma radiation are stored in the dielectric material of the measuring cell and in the measuring line. Figures 5, table 1; references 6: 5 Russian, 1 Western.
[163-12755]

UDC 621.372.81.09

ANALYSIS OF AUTOMATED LIGHT GUIDE PULSE DISPERSION MEASUREMENT

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84 (manuscript received 18 May 83) pp 2033-2038

BABKINA, T.V., GRUZOR'YANTS, V.V., KURYUZHIN, S.V., NEFEDOV, I. Ye., MALAKHOVA, G. A., OLEYNIKOV, A. Ya., PANKRATS, Ye. V., SMIRNOV, A. Ya. and KHALDINA, M. A.

[Abstract] A system is described for measuring light guide dispersion properties utilizing the temporal measurement method based on comparison of a short input pulse to a pulse which has passed through the light guide. The radiation source is an injection semiconductor strip laser operating in monopulse mode. Response and transfer functions are obtained by mathematical processing of input and output pulses which are recorded digitally by automated data acquisition using an IVK-3 instrumentation computer complex and

CAMAC equipment. The automated system reduces the time required for the experiment by an order of magnitude, improves accuracy and measures fiber optic light guide bandwidth to within approximately 5% at the 0.5 level in the 1 MHz band for a wavelength of 0.85 microns. The replicability of bandwidth measurement results is at least 6% at the 0.5 level and 20% at 0.2 level. Figures 5, references 9: 4 Russian, 5 Western.
[110-6900]

UDC 621.396.969.01

RECURSIVE TARGET COORDINATE SMOOTHING ALGORITHM

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84 (manuscript recieved 20 Apr 83) pp 2055-2056

BORISOV, E.V.

[Abstract] A fast recursive smoothing algorithm is derived in which the parameters are estimated in each measuring step using only the results of parameter measurements for that step in conjunction with estimates for preceding step. The proposed smoothing algorithm makes it possible to determine target movement parameters more quickly and simplifies devices for secondary processing of streams of weight or measurement information. References: 2 Russian.
[110-6900]

UDC 621.373.832.8

PROPERTIES OF NONMUTUAL ATTENUATORS EMPLOYING MINIMUM MAGNETOPLASMA REFLECTION EFFECT IN SUBMILLIMETER WAVEBAND

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84 (manuscript received 1 Nov 82) pp 2022-2028

KONONENKO, V. K. and KULESHOV, Ye. M.

[Abstract] Optimization of the parameters of a nonmutual attenuator employing the effect of minimum magnetoplasma reflection effect from a semiconductor is studied. Behavior of the relationship between direct and inverse losses of a nonmutual attenuator and the relationships of characteristic semiconductor frequencies and the frequency of the electromagnetic wave is investigated theoretically and experimentally. A method is proposed for calculating nonmutual attenuator parameters and it is then possible to increase the coupling significantly by using a semiconductor element with a quarter-wave dielectric film in the attenuator. Figures 5, references: 7 Russian.
[110-6900]

UDC 621.313.291.013.001.24

OPTIMIZING SHIELDING COILS OF SUPERCONDUCTING UNIPOLAR GENERATORS

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 11, 1984 (manuscript received 05 Nov 83) pp 30-35

GOTOVTSEV, N.P., ROMANOV, V.V. and FEDOSOV, M.I.

[Abstract] Optimal design method is discussed for shielding coils for superconducting unipolar electric generators in order to reduce undesirable effects of external magnetic fields. The integral value of the magnetic field "P" at the level of the ferromagnetic shield was taken as the optimization criterion. The optimum value was obtained by applying the gradient method with small increments. The developed algorithms were used for compiling a FORTRAN program producing optimal parameters for the shielding coils with the required accuracy and speed. Tables list the results of the numerical

computations for single pair and two-pair shielding coils obtained by Yes-1033 computer. By optimizing the configuration and position of the shielding coils a significant improvement was obtained in the magnetic field compensation in the region of the ferromagnetic shield, while the emf was reduced by about 10%. Due to the optimum configuration and position of the shielding coils, the mass and the dimensions of the ferromagnetic shield were reduced, resulting in a overall reduction of the generator size. Figures 2; tables 2; references 4: Russian.
[151-12755]

UDC 621.313

INTERNAL CONDITIONS FOR SELF EXCITATION OF SUPERCONDUCTOR DC GENERATORS

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 11, Nov 84 (manuscript received, after revision 11 Nov 82) pp 24-30

ALIYEVSKIY, B.L.

[Abstract] Relationships were developed for self-contained dc generators describing the conditions for the self-excitation in the case of parallel and series connections of the inductor winding made of the type II superconductor. The Hurwitz stability criteria were applied for the analysis of equations describing the electromagnetic process, and the conditions for the existence and stability of the mode which would be established after the excitation. The validity of the method was verified experimentally using results obtained for similar phenomena with conventional dc generators. For unipolar dc generators with superconducting inductors, the self-excitation and the stability conditions were modeled mathematically by applying the developed method. Computer modeling of the self-excitation conducted with EMU-10 and MN-7M computers also confirmed the validity of the obtained criteria. Figures 2; references 8: Russian.
[151-12755]

UDC 538.2

EFFECT OF CONDUCTOR PROFILE ON FORCE CHARACTERISTICS DUE TO MOTION OF A MAGNETIC FIELD SOURCE

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 11, Nov 84 (manuscript received 17 Mar 84) pp 8-12

ASTAKHOV, V.I. and BONDARENKO, M.V.

[Abstract] Algorithms were developed for computing the lift, lateral, and braking forces acting on a source of a magnetic field moving along a

conductor with complex profile. Numerical values of the acting forces were obtained for a rectangular configuration and different bend angles of the current conductor. Computations indicated that with an increased angle of the conductur bend ϕ, or an increased curvature K (V shaped profile or trough), the characteristics of the electrodynamic suspension system became worse. With a decreased bend angle ϕ or a decreased curvature K, the lifting force F_L and the coefficient $\eta = F_L/F_D$, where F_D is the braking force, increased and reached maximum for $\phi = -30°$ and $K = -3.2$. The maximum values of F_L and η were 73% and 10% greater, resepctively, than the values obtained for a flat conductor. Figures 5; tables 1; references 3: Russian. [151-12755]

UDC: 621.318.3.027

REGRESSION MODELS IN PROBLEMS OF OPTIMIZATION OF ELECTROMAGNETIC DEVICES

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian Vol 6, Jul-Aug 84 (manuscript received 1 Sep 82) pp 75-78

NOVIK, Ya.A., EGLAYS, V.O. and DIRBA, Ya.A.

[Abstract] Aspects of the synthesis of regression models for solving the optimization problem are examined using a direct current electromagnet as an example. A regression equation for the magnetic flux in the armature as a function of the geometric dimensions and currents in its windings is synthesized by computer in the form of a polynomial using different combinations of elementary functions, and then excluding the terms having less influence on the end result of the approximation. The accuracy of the formula obtained was tested experimentally on a model of an electromagnet based on a BVP-105 switch operating in static modes. The joint use of magnetic field analysis results and regression models is found to be very effective for optimizing electromagnetic devices. References 8 Russian. [178-6900]

UDC 621.372.8.049.75

STRIP AND MICROSTRIP LINE PERIODIC HETEROGENEITIES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84
(manuscript received 18 Mar 83) pp 1877-1886

LERER, A. M., LERER. B. M., RYAZANOV, V.D., and SLEDKOV, V. A.

[Abstract] A quasistatic method is described for analyzing periodic heterogeneities in single and coupled strip lines and microstrip lines. An ALGOL program on a BESM-6 computer calculated the running inductance and capacitance, wave impedances and delay coefficients for single and coupled strip lines and microstrip lines with periodic heterogeneities of arbitrary form. The analyzed quantities are investigated as a function of distance (from side shield to the strip), number of terms in the series and number of approximated functions. The method demonstrates good convergence and requires little machine time and results were verified experimentally. Figures 7; references 11: 6 Russian, 5 Western.
[110-6900]

UDC 621.317.794

THIN-FILM BOLOMETER POWER TRANSDUCER ELECTRODYNAMIC ANALYSIS AND EXPERIMENTAL INVESTIGATION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84
(manuscript received 24 Apr 83) pp 1917-1926

GARB, Kh. L., NIKOLAYEV, P. V., FRIDBERG, P. Sh. and YAKOVER. I. M.

[Abstract] A bolometric power transducer consisting of metal holders and thin resistor film in a single-mode rectangular waveguide is examined and a system of integral vector equations for surface currents on the transducer element is derived and solved by Galerkin's method. Asymptotic methods are derived for equivalent circuit shunt impedance and a method is described for calculating matrix elements containing slowly converging dual series. The frequency behavior of quantities mod S_{11} and mod S_{21} is investigated for the

heterogeneity represented by metal holders and resistive film. Measurements confirm that the model of a holder with thickness of 0 is valid. Agreement between the experimental and theoretical findings verified the proposed model. Figures 3, tables 3, references 11: 10 Russian, 1 Western.
[110-6900]

UDC 621.372.57.029.6

POWER COMBINATIONS MICROWAVE AMPLIFIER LOADING CHARACTERISTICS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84
(manuscript received 24 Jul 81) pp 1966-1970

ZAYENTSEV, V. V. and MINKIN, M. A.

[Abstract] Possible improvements in loading properties of amplifiers combining, in a common load, the power from an arbitrary number of amplifiers based on noncoherent adders with relatively small phase shift were studied. Loading properties are described by the ratio of the power output by the system into an unmatched load to matched condition power. It was found that multichannel noncoherent channel adders with phase difference of π/n at the low end of the working frequency band allow effective compensation for input reflections and improve amplifier loading properties. Figures 3, references: 5 Russian.
[110-6900]

UDC 621.382.2.029.64

INFLUENCE OF HIGHER TYPES OF OSCILLATIONS ON PISTON-TUNED WAVEGUIDE GUNN OSCILLATOR FREQUENCY

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84
(manuscript received 4 May 83) pp 2057-2058

LITSOV, A. A., USANOV, D.A., BEZRUCHKO, B.P. and VAGARIN, A. Yu.

[Abstract] The influence of higher types of oscillations on the piston-tuned waveguide Gunn oscillator frequency is investigated theoretically and experimentally. Diode loaded impedance is investigated for the case of higher types of oscillations existing near holder and interacting between holder and piston only in terms of the basic type of H_{10}, and for the case of interaction between the piston and holder in terms of the basic as well as attenuating higher types of oscillation. Calculated and experimental frequency behavior are found to agree sufficiently well but it is essential to allow for interaction of higher types of oscillations in order to explain the nature of the relationship between Gunn oscillator frequency and the position of the shorting piston when the distances between the holder and piston are sufficiently small. Figures 2, references 6: 3 Russian, 3 Western.
[110-6900]

UDC 621.372.823

ANALYSIS OF ELLIPTICAL WAVEGUIDES IN CYLINDRICAL REFERENCE BASIS

Moscow RADIOTEKHNIKA in Russian No 11, Nov 84 (manuscript received, after abridgment, 4 Mar 84) pp 64-67

VESELOV, G.I. and PLATONOV, N. I.

[Abstract] Analysis of elliptical waveguides and determination of their eigenfunctions by the classical method of coordinate surfaces and angularly periodic Mathieu functions in an elliptical system of coordinates is very cumbersome, despite the availability of function tables and universal computer programs. A much simpler method of solving this problem of electrodynamics is generalized separation of variables in a cylindrical system of coordinates, which yields series of circular cylindrical waves which satisfy the corresponding homogeneous Helmholtz equation and are periodic with respect to the angular coordinate. For illustration, this method is applied here to an ideal elliptical waveguide with a homogeneous filler occupying the entire cavity and to a coaxial elliptical waveguide with a tubular filler. In an elliptical reference basis the eigenfunctions of both waveguides would appear in closed form. The critical values for E-modes correspond to eigenvalues of two-dimensional problems for the equation $d^2V/dx^2+ d^2V/dy^2+ k^2V= 0$ with zero-value Dirichlet conditions at contours bounding the respective regions. Determination of eigenfunctions for the corresponding simply-connected region reduces to solving a homogeneous system of linear algebraic equations. As the order of this system increases, the eigenvalues always approach certain exact limits - whether the cylindrical series converge everywhere in the elliptical annular region or only within that part of it bounded by the intersecting circular cylinder. Figures 1; references 10: 6 Russian, 4 Western (2 in Russian translation).
[141-2415]

UDC 621.315.211.3.027.8.015.3

SELECTING ELECTRIC FIELD INTENSITIES FOR OPERATING AND TESTING OIL-FILLED HIGH-VOLTAGE CABLES

Moscow ELEKTROTEKHNIKA in Russian No 12, 84 (manuscript received 2 Nov 83) pp 29-32

GLEYZER, S.Ye., cand of tech. sci., OBRAZTSOV, Yu. V., engineer, PESHKOV, I.V., doct. of tech. sciences, GOLDOBIN, D.A., cand. of tech. sciences, KADOMSKAYA, K.P., doct. of tech. sciences, KHANUKOV, M.G., eng., PINTAL', Yu. S. , cand. of tech. sciences.

[Abstract] High voltage cables are used in power-distributing networks in cities, for delivering power to large industrial centers, and for hydroelectric power plant output lines. Most cables in cities are practically not affected by lightning-caused overloads, therefore the admissible intensity of the electric field for a given line voltage is the determining factor for selecting cable dimensions and the type of insulation. High voltage cables are also used for the 0.5 - 1.5 km short lines carrying 220 - 500 kV between transformers and open air substations at large hydroelectric power plants and these lines can be affected by lightning. Analysis was conducted for all types of 220 and 500 kV cables at hydroelectric power plants, and for 110 and 220 kV cables in city networks. Near-range and distant lightning effects were examined along with the effects due to switching under most unfavorable conditions. If the short-range lightning-caused overloads were eliminated at substation approaches by perfecting the cable-protecting system, overloads due to lightning at hydroelectric power plants and network substations would not be greater than 1.2 times the residual voltage at the protecting installations. For 110 and 220 kV cables in the city power-distributing network, lightning-caused overloads are not significant which is supported by the fact that the protecting devices in large cities were never triggered in more than 25 years. The commutation-caused overloads do not exceed 2.5 times the line voltage in all cases. Electric properties of cable insulation under pulsed conditions were also examined. 76 values of the field intensities causing breakthrough of the cable insulation under identical conditions were analyzed, and it was found that breakthrough was strictly radial and was not a function of the oil pressure in the 0.025 - 1.0 MPa range. At the present time the accepted value of the electric field intensity for the earlier-installed and presently manufactured cables with 40 years lifetime is 10 and

15 MV/m for low pressure and high pressure cables, respectively but due to better manufacturing technology within the last 20 years, the electric strength of the insulation has been improved, and the average value under pulsed conditions is now 100 MV/m. When testing 110 kV cables manufactured in 1977-83, the value of 116 MV/m was obtained. Theoretical justifications for establishing the ultimate values of admissible intensities for all voltages are important not only for proper selection of the cable insulation, but also for determining the feasibility of constructing cables with voltages of 750 and 1100 kV capacity. Figures 3; table 1.
[163-12755]

UDC 621.315.2.051.029.45/5

COMMON INDUSTRIAL CABLE USE FOR HIGH-FREQUENCY POWER TRANSMISSION

Moscow ELEKTROTEKHNIKA in Russian No 12, 84 (manuscript received 9 Feb 84) pp 34-36

SIDYAKIN, V.F., candidate of technical sciences, and GOCH, V.P., engineer. Sevastopol' Instrument Construction Institute.

[Abstract] High-frequency electrical power (1-100 kHz) finds growing application in various areas of technology: machine building, chemical, welding, etc. At the present time KVSP and AVAVG type cables are manufactured for transmission of high-frequency electric energy, and rigid coaxially oriented copper tubing is employed as conduit. No high frequency cables are produced by industry which can provide flexible low-voltage linkage between the source and the user. A simple method is described for developing high-frequency conduits using common industrial cables. Two problems must be solved: reducing losses due to the surface effects, and reducing the overall induction of the conduit to a required value. The experimentally tested method demonstrates the feasibility of constructing high-frequency conduits with current-carrying capacity of up to 1000 A or higher, where the specific inductance of the conduit can be decreased below the value of special coaxial cables, and the cost of conduit manufacturing and installation reduced. The high-frequency conduits exhibit all the features of regular electric lines and can be made flexible, oil resistant and waterproof, etc. Their installation and connection to the source and load is significantly simplified. Figures 2; references: 3 Russian.
[163-12755]

UDC 621.315.21.013.001.24

EFFECT OF NONSTEADY ELECTROMAGNETIC FIELD ON CABLE

Moscow ELEKTROTEKHNIKA in Russian No 11, Nov 84 (manuscript received 9 Nov 83) pp 53-55

ABRAMOV, K.K., candidate of technical sciences, All-Union Scientific Research Institute of Cable Industry

[Abstract] The behavior of cables in nonharmonic nonsteady electromagnetic fields is analyzed from the standpoint of effective shielding. Solution of the corresponding general boundary-value problem, in accordance with field theory, leads to Fourier integral transforms with respect to the axial coordinate and time. For cylindrical wave propagating through a cable this solution becomes the integral analog of the solution to nonhomogeneous telegrapher's equations, the latter quite accurately describing the field-induced process when the impedance components which depend on the time frequency are independent of the space frequency along the cable axis. The solution covers the external sheath-ground circuit as well as the internal conductor-shield circuits. Several typical sources of influencing electromagnetic fields are considered specifically. In the case of a quasi-point source with dimensions much smaller than its distance from the cable it is permissible to regard the electromagnetic field as a quasi-steady one. In the case of a plane electromagnetic wave obliquely incident and exponentially decaying along the cable axis the problem simplifies, its solution not requiring determination of the space spectrum. In the case of a transient electromagnetic field the corresponding initial-value problem can be solved by means of a Laplace rather than Fourier transformation. Particularly interesting is the response of a cable to an electromagnetic impulse in the axial direction $E_z = \delta(t)$. This problem is solved here, assuming a cable sheath not insulated from the ground. A ground with high electrical conductivity and an insulated cable sheath can then be treated as limiting cases. The solution serves as basis for calculating the response of a cable to an electromagnetic pulse of any form. Figures 1; references 6: 5 Russian, 1 Western (in Russian translation).
[137-2415]

UDC 77.052.5:541.182.2/3

PHOTOGRAPHIC RECORDING OF TRAJECTORIES OF AEROSOL PARTICLES BY METHOD OF MULTIPLE EXPOSURE

Moscow ZHURNAL NAUCHNOY I PRIKLADNOY FOTOGRAFII I KINEMATOGRAFII in Russian Vol 29, No 6, Nov-Dec 84 (manuscript received 21 Mar 83, after final edition 20 Dec 83) pp 409-413

MIKHOVICH, N.S., PETROV, B.I. and TOPOROV, Yu. P., Institute of Experimental Meteorology, Obinsk

[Abstract] A photographic method is proposed for recording aerosol particle trajectories and barrier collision behavior analysis with two straight ISP-70 capillary flash lamp sources forming plane-parallel light beams striking target from opposite sides which increases particles illumination and eliminates shadows. Switching electronics include a quartz-stabilized 432 kHz reference-pulse generator, four bindary digital frequency dividers (three with decoders), two coincidence circuits and two triggers and amplifier-driver with KT704A transistors feeding 400 V pulses to GMI-83V modulator flashers. ISP-70 lamp ignition is by 18-20 kV pulse of 25-30 us duration from amplifier. Aerosols are illuminated by light flashes from both lamps with an adjustable repetition rate (27, 54, 108, 216 Hz). Particles to 10 μm and moving as fast as 25 m/s can be tracked. Aerosol motion was recorded experimentally on grade-29 photographic film, with ASP-3M developer. An error analysis of measurements made with a KIM-3 coordinates reader, based on the "photographic film - objective - light beam" geometry indicates an accuracy within 3%. Figures 3; references: 6 Russian.
[107-2415]

UDC 771.53

THIONINE-BASED LIGHT-SENSITIVITY OF ORGANIC LAYERS

Moscow ZHURNAL NAUCHNOY I PRIKLADNOY FOTOGRAFII I KINEMATOGRAFII in Russian
Vol 29, No 6, Nov-Dec 84 (manuscript received 21 Jun 82) pp 401-404

BRODZELI, M.I., GILEL'S, A.M., DEKANOZISHVILI, G.G., YELIGULASHVILI, I.A., MAKHARADZE, T.N. and SARAYDAROVA, Ts. M., Institute of Cybernetics, GSSR Academy of Sciences, Tbilisi

[Abstract] 20 μm layers of four polymer materials (cellulose nitrate, cellulose acetate, polymethyl methacrylate, polyvinyl alcohol) received thionine concentrations of 10^{-3}-10^{-2} mole/dm^3 and were illiminated by He-Ne laser at λ_i=633 nm with power density of 3 mW/cm^2 for up to 10 min. Absorption spectra were recorded in air and vacuum. Diffraction gratings (simplest holograms) were recorded and reconstructed for determination of diffraction efficiency (ratio of light beam first order difrraction to reference light beam intensity). Maximum diffraction efficiency in relation to relative thionine concentration or layer thickness was recorded. Optical density λ_o = 610 nm light was measured after exposure to λ_i = 633 nm light as function of the exposure time. Results showed irreversible destructive discoloration of thionine in air and reversible photoreduction of thionine in vacuum, except for cellulose nitrate where thionine also irreversibly destructively discolored in vacuum. Figures 4; references 4: 3 Russian, 1 Western. [107-2415]

UDC 771.513.535.34

GELATIN ABSORPTION SPECTRUM IN 40-300 NM REGION

Moscow ZHURNAL NAUCHNOY I PRIKLADNOY FOTOGRAFII I KINEMATOGRAFII in Russian
Vol 29, No 6, Nov-Dec 84 (manuscript received 27 Feb 84) pp 471-472

KRAVCHENKO, A.V. and CHERKASOV, Yu.A.

[Abstract] The absorption spectrum of gelatin in the 40-300 nm region was studied by a special method. Thick and thin gelatin films were prepared by centrifuging aqueous emulsions on quartz substrates. Thick (8 μm) films were removed from substrates and mounted in special frames. Thin (175 nm) films were left on the substrates. Ultrathin films (~50 nm), neutral for water emulsions and transparent in $\lambda < 250$ nm range, were prepared on 10 um thick multicellular copper meshes with 85% porosity, then dipped in 1% aqueous emulsion and dried. Transmission was measured by VM-2 monochromator and FEU-39A photomultiplier with glow discharge in inert gas (He, Ne, Xe, Ar for 40-170 nm wavelengths) or hydrogen (for 170-300 nm wavelengths) as ultraviolet source. Absorption coefficients as functions of wavelengths were calculated to within 5%. The absorption spectrum consisted of four overlapping bands (peaks at 260, 195, 115, 80 nm) with absorption coefficient increasing

steeply from $4 \cdot 10^2$ cm^{-1} at $\lambda \lesssim 250$ nm to 10^5 cm^{-1} at 200 nm. The results were interpreted in terms of a triplet exciton level $-[(O=)C(-)NH]-_n$ (450 nm - 2.65 eV) and transitions $n \rightarrow \pi^*, \rightarrow \pi^*$ (260 nm - 4.8eV), $-\pi \rightarrow \pi^*$ (195 nm - 6.5 eV), $-\sigma \rightarrow \sigma^*$ (115 nm - 10.8 eV), $-\sigma \rightarrow \sigma^*$ (80 nm - 15.5 eV). Figures 1; references 5: 2 Russian, 3 Western (1 in Russian translation).
[107-2415]

UDC 621.373.826

RANDOM FREQUENCY PERMUTATION RING LASER OPERATION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 10, Oct 84 (manuscript received 21 Apr 83) pp 1971-1976

SVIRIDOV, M. V.

[Abstract] Ring laser angular displacement measurement error caused by coupling between counter-propagating waves is studied; and it is found that phase permutation, defined as the integral of the frequency permutation, does not always completely eliminate the zone of parametric synchronization (the zone of insensitivity to rotation). When process bandwidth is sufficient, measurement error can be represented approximately by a random function with uncorrelated increments and known diffusion coefficients. The analytical method is based on first approximation of the averaging method and on findings on random deviations from an averaged system. References 9: 8 Russian, 1 Western.
[110-6900]

UDC 681.7.068

NOISE IN FIBER-OPTIC RING INTERFEROMETER CAUSED BY SPECTRAL FLUCTUATIONS OF INTERFERING WAVES

Moscow RADIOTEKHNIKA in Russian No 11, Nov 84 (manuscript received, after completion, 7 Dec 83) pp 76-80

POLUKHIN, A.T. and TELEGIN, G.I.

[Abstract] The dependence of noise in a fiber-optic ring interferometer on the time coherence of the light source is evaluated on the basis of theoretical relations and experimental data. The theoretical analysis applies to interference of wave trains from a spectral line of finite width, rather than of monochromatic waves generated by splitting of the light beam at the fiber entrance. A fiber with centers of symmetry and a Gaussian spectral line are assumed here. The experiment was performed with a discrete interferometer using a single-mode fiber of 400 m total length and a helium-neon laser. The results confirm that output noise generated by interfering wave trains decreases as the source becomes less coherent or when the spectral line is widened by insertion of modulating fibers into the loop. Figures 5; references 7: 5 Russian, 2 Western (1 in Russian translation).
[141-2415]

INVESTIGATION OF REVERSE BRANCH OF VOLTAGE-CURRENT CURVE OF GaAs HIGH-VOLTAGE p-n STRUCTURE

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 18, No 11, Nov 84 (manuscript received 28 Mar 84) pp 2029-2035

KOROL'KOV, V.I., OSIPOVA, R.S., PONOMAREV, S.I., STEPANOVA, M.N. and TSVILEV, G.I., Physical-Technical Institute imeni A.F. Ioffe, USSR Academy of Sciences

[Abstract] The temperature behavior of the reverse branches of the voltage-current curves of p-n junctions based on lightly doped gallium arsenide, capable of operating with reverse voltages of up to 1.5 kV and at temperatures of up to 250°C, is investigated. The diodes employed were $p^+ - p^o - n^o - n^+$ structures obtained by liquid epitaxy. The volumetric component of the reverse current was measured by means of a guard ring at temperatures ranging from 20 to 250°C and voltages of 2 - 1500 V. The measured volumetric component of the reverse current disagreed with that predicted by the Shockley-Noyce-Sah theory, which assumes that the rate at which electron-hole pairs is generated is independent of the electrical field intensity. The present analysis shows, however, that this assumption does not always hold when the rate of emission of charge carriers depends strongly upon the field. It is concluded that the anomalies observed in the field and temperature behavior of the reverse current of p-n junctions in lightly doped gallium arsenide can be explained by the field dependence of the rate of emission of electrons from deep levels. References 22: 9 Russian, 13 Western.
[139-6900]

INFLUENCE OF EMBEDDED ELECTRICAL FIELDS ON TEMPERATURE STABILITY OF PARAMETERS OF Al-Ga-As HETEROPHOTOELEMENTS

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 18, No 11, Nov 84 (manuscript received 1 Mar 84) pp 1979-1984

ALLAKHVERDIYEV, A.M., ANDREYEV, V.M., DZHELEPOVA, N.B., YEGOROV, B.V. and SULIMA, O.V., Physical-Technical Institute imeni A. F. Ioffe, USSR Academy of Sciences

[Abstract] The saturation current I_o and idling voltage U_{xx} in heterophotoelements employed in high-efficiency solar concentrators are examined in order to determine the influence of embedded elongated electrical fields caused by hole concentration gradients. It is found that the temperature variation in U_{xx} is less when the field is present than when it is absent. The element with the best temperature stability is an $Al_{0.14}Ga_{0.86}As$ p-n-junction element with a thin diffusion p-region and large hole concentration gradient obtained by liquid film epitaxy and diffusion of zinc from the vapor phase. At elevated working temperatures, $Al_xGa_{1-x}As$ (x = 0.1 - 0.15) p-n-junction photoelements with strong embedded elongated electrical fields are found to be preferable. References 8: 6 Russian, 2 Western.
[139-6900]

UDC 621.382.13

HIGH-FREQUENCY CHARACTERISTICS OF BALLISTIC BIPOLAR HETEROJUNCTION TRANSISTORS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 11, Nov 84 (manuscript received 20 Sep 83) pp 2250-2256

RYZHIY, V.I. and FEDIRKO, V.A.

[Abstract] The effect of ballistic or quasi-ballistic motion of charge carriers in thin NPN structures on the frequency characteristics of devices built with such structures is analyzed for bipolar transistors with a base layer of submicron thickness and with a sharp emitter-base heterojunction, considering specifically ballistic motion of electrons through the base region and the base-collector junction. The electron distribution function is determined in the $\delta f(x,p)e^{-j\omega t}$ form (x,p - normal coordinate and momentum of an electron). Energy and momentum calculations are made on the basis of the band structure and the linearized equation of noncollision kinetics, assuming the Kane dispersion law in the two-band approximation and a high conductance of the base layer with consequently quasi-neutral electron processes in it. The space distribution of the high-frequency current density $\delta_j(x)$ is calculated for type-1 and type-2 ballistic bipolar heterojunction transistors with $\delta_B >> T$ and $\Delta_B >> T$ respectively (T- temperature in units of energy, δ_B - energy jump at N-P emitter-base junction, Δ_B- energy drop across P-base layer). The frequency dependence of the gain is calculated

for both types in a common-base circuit and in a common-emitter circuit. The gain characteristic of a common-base amplifier begins to depend appreciably on the electron transit time through the base at frequencies above the inverse of that transit time. The gain of a common-emitter amplifier is an oscillatory function of frequency, with maxima occurring at multiples of the inverse of the electron transit time through the base but their magnitude decreasing as the electron transit time through the collector increases. Numerical data for a transistor heterostructure with an InSb layer yield an upper cutoff frequency as high as 500 GHz. Figures 1; re ferences 15: 6 Russian, 9 Western (1 in Russian translation).
[127-2415]

UDC 621.315.55:537.312.62

SENSITIVITY OF SQUIDS BUILT WITH LOW-CAPACITANCE JOSEPHSON TUNNEL JUNCTIONS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 11, Nov 84 (manuscript received 14 Jan 83) pp 2224-2233

ZORIN, A.B.

[Abstract] The dynamic characteristics of squids built with a single low-capacitance Josephson tunnel junction or with two such junctions are analyzed, assuming also a low-inductance interferometer ring. Relations are derived on the basis of the microscopic theory, which agrees with the resistive model at temperatures lower than half the critical and at frequencies much lower than the energy-gap frequency. The resolving power and the energy "yield" sensitivity of such squids are calculated, taking into account not only low-frequency fluctuation noise but also the squid reaction on the signal source. The author thanks K.K. Likharev for attentiveness and discussion of the results, also V.V. Danilov for helpful suggestions. Figures 3; references 22: 7 Russian, 15 Western.
[127-2415]

UDC 621.373:621.382.2.029.64

EXTERNAL LOCKING OF IMPATT-DIODE POWER OSCILLATORS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 11, Nov 84 (manuscript received 5 Jul 83) pp 2179-2185

GERSHENZON, Ye.M., LEVITES, A.A., PLOKHOVA, L.A. and SMETANIN, A.I.

[Abstract] A single-stage oscillator with nonlinear delay in the feedback loop is analyzed for locking by an external signal. The results are applied to silicon IMPATT-diode (p^+-n-n^+) oscillators in the 0.5-1 W power range operating in the self-excitation mode. Calculations are based on the

equivalent circuit with three voltage generators in series: one produced in the hole transit region, one produced in the electron transit region, and one compensating the field difference between the real p-n junction and the equivalent multiplier layer. On this basis are determined its amplitude-frequency phase-frequency, power-frequency characteristics as well as the dependence of the locking band on the load, the latter being characterized by the ratio of starting current to diode supply current, taking into account the amplitude dependence of the delay angle and the frequency dependence on the diode resistance. The results indicate that the oscillator performance droops only slightly in the range of load ratios lower than optimum but droops appreciably in the range of load ratio higher than optimum. In the latter case reconciliation of theoretical data with experimental data requires a more precise and intricate equivalent circuit. Figures 5; references 10: 6 Russian, 4 Western.
[127-2415]

UDC 621.315.55:537.312.62

MAXIMUM ATTAINABLE SENSITIVITY OF D.C. SQUIDS BUILT WITH JOSEPHSON TUNNEL JUNCTIONS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 11, Nov 84 (manuscript received 18 Mar 83) pp 2216-2223

SNIGIREV, O.V.

[Abstract] The performance of d.c. squids built with Josephson tunnel junctions is analyzed on the basis of the ideal equivalent circuit with the junctions unshunted and on the basis of the fundamental relation according to which a variation of the magnetic flux produces a change in the critical current and consequently a variation of the high-frequency component of the voltage signal (of the duration of voltage pulses), the low-frequency component of the voltage signal being passed by a narrow-band filter. The dynamic characteristics of a low-inductance interferometer, analogous to those of a single Josephson tunnel junction, are calculated first for a device without noise. They are then calculated for a device with fluctuation noise, the effect of the latter depending largely on the ratio of fluctuation intensity to rate of current buildup. A lower bound is established for the energy sensitivity of the device, this lower bound being found to be much higher with high-frequency pumping near the upper frequency limit and not much different than that for a conventional squid with shunted Josephson tunnel junctions. The author thanks P. Gutmann, V. Koze (?) and K.K. Likharev for discussions leading to this study. Figures 3; references 14: 2 Russian, 12 Western.
[127-2415]

UDC 621.383.81.001.2:517.54

STANDARDIZATION OF SCHWARZ-CHRISTOFFEL TRANSFORMATION FOR ENGINEERING DESIGN OF SEMICONDUCTOR AND HYBRID INTEGRATED-CIRCUIT ELEMENTS

Moscow RADIOTEKHNIKA in Russian No 11, Nov 84 pp 55-57

[Annotation of article No 419 deposited at Central Scientific and Technical Institute 'Informsvyaz'', 10 pp with 2 figures and 17 bibliographic references]

YASHIN, A.A.

[Abstract] With the feasibility of conformally mapping a semiconductor or hybrid structure into a calculable two-dimensional region by means of the Schwarz-Christoffel transformation established, a universal algorithm can be constructed on the basis of Maxwell's electric-magnetic-thermal similarity principle for engineering design of integrated-circuit elements. The design procedure involves conformal mapping of the original region into a polygon and then the latter into a rectangle with uniform field distribution, where conductances and capacitances are easily calculated, using each time tabulated standard mapping functions. Subsequent synthesis of a device requires inverse conformal mapping. Typical devices adaptable as integrated-circuit elements are high-resistance film resistors with periodic serration, distributed-resistance film attenuators with high transformation ratio, coplanar microstrip lines, bipolar transistors, directional couplers with distributed coupling to microstrip lines for microwave bulk devices, and quasi-regular smooth matching transitions from asymmetric to coplanar microstrip lines. Figures 1; tables 1; references 3: 2 Russian, 1 Western (in Russian translation).
[141-2415]

UDC 541.135

EXPERIMENTAL INVESTIGATION OF ACOUSTIC WAVE ELECTRICAL EXCITATION IN ELECTROLYTE SOLUTION

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 10, Oct 84 (manuscript received 14 Mar 84 after revision), pp 1349-1352

MALAKHOV, A.N. and CHEREPENNIKOV, V.V., Gor'kiy State University

[Abstract] The electrical excitation of acoustic oscillations in an electrolyte solution in a rectangular container was investigated experimentally. A solution of sodium chloride was employed with a radiator consisting of a metal grid of steel wires 3.3 mm in diameter. An equation is derived for vibrational velocity potential and is solved for a rectangular container with no initial conditions, rigid boundaries and free surface obtained by the Fourier method. Predicted and experimental values agree satisfactorily. The use of a wire grid radiator such as that employed in the present study is suggested for creating standard hydroacoustic fields to be used, inter alia, for calibrating hydroacoustic sensors. Figures 3, references: 5 Russian.
[113-6900]

UDC 621.37/39:534

ACOUSTOOPTIC DEMODULATOR OF PHASE-KEYED SIGNALS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 29, No 11, Nov 84 (manuscript received 15 Sep 82) pp 2266-2268

PUGOVKIN, A.V., KRAKOVSKIY, V.A. and KOLCHINA, G.A.

[Abstract] An acoustooptic demodulator of phase-keyed signals has been developed which processes the instantaneous signal spectrum within the aperture of the acoustooptic modulator. Its advantages over autocorrelational and correlational acoustooptic demodulators are a wide frequency range with high interference immunity in that range and structural simplicity.

The acoustooptic processor consists of a laser which sends a beam through an objective to the acoustooptic modulator and a lens behind the latter which focuses the modulator output signal on a space filter before the photoreceiver. Analysis of phase-keyed signals involves primarily detecting their code sequences, which here reduces to detecting minima or maxima of the photoreceiver response as function of the radio carrier frequency Ω_c and of time t. This response is the integral of the diffracted-light field intensity, a function of the space frequency of the optical signal ω_x multiplied by the velocity of sound v as well as of the radio carrier frequency and of time. Allowance is made for blurring of the photoreceiver point spot. Experiments and measurements have revealed that wideband demodulation with a single photoreceiver requires a space filter with a frequency mismatch or observation zone $\alpha = (\Omega_x - \Omega_c)D_\pi/v > 0.5$ ($\Omega_x = \omega_x v$, D- diameter of light beam) so as to avoid a sharp dip during the transient period $t > 0$. Figures 3; references: 3 Russian.
[127-2415]

UDC 621.396.969.1

DEVICES FOR SMOOTHING DIGITAL RADIO ENGINEERING DATA AFTER MEASUREMENTS

Moscow RADIOTEKHNIKA in Russian No 11, Nov 84 (manuscript received 10 Feb 84) pp 81-82

BORISOV, E.V.

[Abstract] Three devices for smoothing digital radio engineering data during secondary processing after measurement are described, such smoothing being necessary on account of inevitable overshoots and anomalous distortions. Each device includes an averaging filter. In the simplest version, adequate where anomalous distortions appear infrequently, the nonrecursive averaging output filter is preceded by a summator and the latter is preceded by the input comparator-subtractor with a bilateral digital limiter between them. Negative feedback from filter to comparator is compensated by positive feedback from filter to summator. When anomalous distortions appear in packets, which produce a systematic error and cause the filter to yield a biased estimate of the measured parameter, then insertion of an OR gate behind an adjustable inhibitor in parallel with a generator of random numbers between the bilateral limiter and the summator will correct this problem. Both versions operate according to algorithms which assume that the dispersion of measurement errors is known. When the dispersion of measurement errors is variable, then adaptive adjustment of the bilateral limiter is required instead of the inhibitor and the OR gate. Adaptive adjustment based on measurement of the dispersion of normal errors is achieved by means of a squarer and another averaging filter forming a feedback loop around the bilateral limiter. Figures 5; references: 3 Russian.
[141-2415]

UDC 621.313.13-213.34.002.5

DEVELOPMENT OF MECHANICAL TREATMENT IN MANUFACTURING EXPLOSION-PROOF MOTORS

Moscow ELEKTROTEKHNIKA in Russian No 12, 84 (manuscript received 1 Jan 84) pp 18-19

GUTENKOV, G.M., ZENYUK, E.M., engineers, and SMIRNOV, S.D., candidate of technical sciences.

[Abstract] Explosion-proof induction motors are mainly used for the electrical drives of engines and mechanisms operating in the coal, oil, chemical, gas and other hazardous explosion-prone industries. Minilektrotekhprom factories manufacture a great variety of explosion-proof types of motors. A new series of motors satisfying modern requirements must be developed by the industry during the 11th and 12th five-year periods. The mechanical treatment of components and units for manufacturing induction type explosion-proof motors constitutes the main factor in assuring the explosion-protection features, accuracy, quality and reliability of the motors. The prospects of developing mechanical treatment technology can not be examined without taking into account the nature of the industry responsible for manufacturing the motors. The existing low level of manufacturing automation is one of the reasons for the high labor cost of the product. Several automation and standardization procedures were suggested for improving the manufacturing technology of explosion-safe motors.
[163-12755]

UDC 621.313.333:629.113.6

4APA2E160S4BU1 INDUCTION MOTOR FOR ELECTRIC CARS

Moscow ELEKTRONIKA in Russian No 12, Dec 84 (manuscript received 18 Jan 84) pp 2-3

RADIN, V.I., and ZAGORSKIY, doctors of technical sciences; CHEBURAKHIN, I.M., candidate of technical sciences, KLIMENKO, Ye.P., engineer, KOROLEV, V.A., candidate of technical sciences, TSYGANOVA, N.I., VLASOV, S.I., ISACHENKO, A.V., engineers, RADIONOV, N.I., candidate of technical sciences, SHIBAYEV, Yu. A., engineer

[Abstract] A frequency controlled three-phase squirrel-cage induction motor was developed as an electric car drive powered by a static frequency converter. Performance of the induction motor with electric cars is more reliable and economically advantageous than dc motors. The fundamental nominal data of the developed motor parameters are listed in the text, and conform to pertinent GOSTANDARDS. Some special requirements were satisfied with the design, due to particular features of the drive operation including provisions for a continuous voltage control, when the converter is operating in the pulse-width modulation mode, and smooth frequency control in the 0.8-100 Hz range, corresponding to changes of the synchronous angular frequency in the 24-3,000 rpm range; ability to operate for at least two minutes on an incline, and the capacity to develop a momentum of M=3M when starting. Temperature control of the stator for turning-off the motor if temperatures reach a critical point is also provided. The stator and rotor of the developed induction motor conform to the series produced 4A160S4U1 motor. To provide maximum motion efficiency, the optimum number for stator winding N was selected based on electromagnetic computations for a nonsinusoidal voltage source with frequency f=50Hz, voltage U=110 V, power P=15kW, and for a sinusoidal source f=75, 100 Hz. In addition to the energy characteristics great attention was given to testing the thermal conditions of some motor units by placing thermocouples at critical points. Since the motor is mounted in the lower section of the car chassis and is exposed to a direct effects of dirt, water or snow, there were special design considerations. Figures 3; tables 3, references 3: Russian. [163-12755]

MATERIAL RESOURCE CONSERVATION

Moscow VESTNIK SVYAZI in Russian No 10, Oct 84 pp 20-21

L. D. BADAL'YAN, Director, Yuryev-Pol'skiy "Promsvyaz'" Plant

[Abstract] Ferrous metals, electricity and fuel were conserved and economic mode by implementing innovative suggestions at the Promsvyaz' Plant. Individual workers used cards to indicate materials and labor saved so as to promote conservation initiative. Reduced metal consumption by improved design and standardization of series VUK rectifiers is described: more than 5 tons of ferrous metal and 3237 man-hours were saved annually. Waste metal was used for making small parts. Plant management and work group cooperate to achieve increased material and energy economies. Tables 2.
[109-6900]

UDC 621.313.322.014.31

COMBINED OPERATION OF SHOCK GENERATOR WITH CAPACITOR BATTERY FOR PRODUCING ARC IN WATER

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 11, Nov 84 (manuscript received 27 Apr 82) pp 43-48

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[Abstract] Non-explosive sources of seismic oscillations are being widely used throughout the world but are less common in the USSR. However, this method of seismic prospecting is now under intensive development, since electrohydrolic sources are preferred for studying geological profiles at a depth of 500-1,000 meters. The application of this source is based on generating a strong electric discharge in liquid. Analytical studies were conducted on the feasibility of producing more powerful pulses by a combined operation of a shock generator with a series connected capacitor battery. It was shown that the efficiency of the combined operation rose with increased energy of the capacitor battery. Optimum values for battery energy, voltage and the angle for engaging the generator were obtained. When battery energy was W_o=25-50kJ, voltage U_o=5kV, generator emf E_m=2.5kV at

the frequency of 50 Hz and the initiation angle α=60°, pulse amplitude increased by the factor of more than 1.75, compared to the conditions when the arc was powered by the shock generator alone. Employment of truck-mounted shock generators producing pulse energy of up to several hundred kilojoules is feasible and economically sound. Figures 4; tables 4; references 9: Russian.
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