

JPRS 69192

3 June 1977

USSR AND EASTERN EUROPE SCIENTIFIC ABSTRACTS  
ELECTRONICS AND ELECTRICAL ENGINEERING  
No. 30

U S S R

EAST  
EUROPE

**DISTRIBUTION STATEMENT A**  
Approved for Public Release  
Distribution Unlimited

20000218 078

U. S. JOINT PUBLICATIONS RESEARCH SERVICE

Reproduced From  
Best Available Copy

#### NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [ ] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

#### PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22151. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available through Bell & Howell, Old Mansfield Road, Wooster, Ohio, 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

<b>BIBLIOGRAPHIC DATA SHEET</b>		1. Report No. JPRS 69192	2.	3. Recipient's Accession No.	
4. Title and Subtitle USSR AND EASTERN EUROPE SCIENTIFIC ABSTRACTS - ELECTRONICS AND ELECTRICAL ENGINEERING, No. 30				5. Report Date 3 June 1977	
7. Author(s)				6.	
9. Performing Organization Name and Address Joint Publications Research Service 1000 North Glebe Road Arlington, Virginia 22201				8. Performing Organization Rept. No.	
12. Sponsoring Organization Name and Address				10. Project/Task/Work Unit No.	
				11. Contract/Grant No.	
15. Supplementary Notes				13. Type of Report & Period Covered	
				14.	
16. Abstracts  The report contains abstracts and news items on electronic materials, components, and devices, on circuit theory, pulse techniques, electromagnetic wave propagation, radar, quantum electronic theory, development and devices, miniaturization techniques on electric power machinery, power transmission, and nuclear power developments.					
17. Key Words and Document Analysis. 17a. Descriptors  USSR Eastern Europe Antennas Electromagnetic Spectra Network Synthesis Instruments Lasers					
17b. Identifiers/Open-Ended Terms					
17c. COSATI Field/Group 9F, 9C, 9A, 20N					
18. Availability Statement				19. Security Class (This Report) UNCLASSIFIED	
				20. Security Class (This Page) UNCLASSIFIED	
				21. No. of Pages 99	
				22. Price PC A05	

USSR AND EASTERN EUROPE SCIENTIFIC ABSTRACTS  
ELECTRONICS AND ELECTRICAL ENGINEERING

No. 30

This serial publication contains abstracts of articles and news items from USSR and Eastern Europe scientific and technical journals on the specific subjects reflected in the table of contents.

Photoreproduction of foreign-language sources may be obtained from the Photoduplication Service, Library of Congress, Washington, D. C. 20540. Requests should provide adequate identification both as to the source and the individual article(s) desired.

CONTENTS

PAGE

ELECTRONICS

Amplifiers.....	1
Antennas.....	6
Communications, Networks; Data Transmission.....	10
Converters, Inverters, Transducers.....	26
Electromagnetic Wave Propagation; Ionosphere, Troposphere.....	27
Instruments and Measuring Devices; Methods of Measuring.....	30
Microelectronics; Integrated and Logic Circuits, General	
Circuit Theory and Information.....	37
Radars; Radio and Other Navigation Aides.....	43
Semiconductors; Luminescence; Solid State; Films.....	45
Theoretical Aspects.....	55
Components and Circuit Elements Including Waveguides and	
Cavity Resonators.....	56
Certain Aspects of Computer, Control, and Machine Planning	
Hard and Software.....	68
Certain Aspects of Photography and Television.....	84

ELECTRICAL ENGINEERING

General Production Technology.....	89
Electron Tubes; Electrovacuum Technology.....	90
Electrical Engineering Equipment and Machinery.....	94
Power Systems.....	96

ELECTRONICS  
Amplifiers

CZECHOSLOVAKIA UDC 621.375.7 621.396.43:621.396.946:621.62 621.396.621

INPUT AMPLIFIERS FOR GROUND STATIONS OF SATELLITE LINKS

Prague SLABOPROUDY OBZOR in Czech Vol 37, No 6, Jun 76 pp 274-281

ČESKÝ, TOMAS, Faculty of Electronics, Czech Technical University, Prague

[Abstract] Low interference amplifiers are needed for satellite telecommunications systems. Parametric amplifiers available at present are suitable for frequencies up to 94 GHz, with a width of the transmitted band up to 4.5 GHz. The "Intersputnik" station which opened in Czechoslovakia last year contains a four stage parametric amplifier with an overall gain of 40 dB; the first two stages are cooled with liquid nitrogen, the last two are not cooled. The parametric amplifier is technically and economically suitable for a low interference amplifier in widths above 4 GHz. It uses microwave semiconductors, and klystrons with a life of 8 to 10 thousand hours. Where a lower G/T factor is acceptable in bands above 12 GHz, a Schottky diode mixer is suitable; for frequencies below 12 GHz an amplifier using a field controlled by a GaAs transistor is suitable. Figures 8; references 11: 1 Czech, 2 USSR, 8 Western.

USSR

UDC 621.376.512

BROAD-BAND INTERCASCADE MATCHING OF MICROWAVE TRANSISTORS IN POWER  
AMPLIFIERS

Kiyev IZVESTIYA VUSOV SSSR: RADIOELEKTRONIKA in Russian Vol 19, No 11,  
1977 pp 43-46 manuscript received 18 Nov 74; after revision, 1 Oct 75

KOVALENKO, V. S., and KHOTUNTSEV, YU. L.

[Abstract] During the creation of multicascade broad-band transistorized microwave power amplifiers one of the principal problems is the problem of intercascade matching of transistors. In the present paper this problem is solved for the case of microwave transistors with a common emitter. The frequency properties are investigated of a matching circuit and its effect at the input of a transistor of the preceding cascade of the amplifier. General formulas are obtained for calculation of the magnitude of the elements of a matching circuit. From the results of the investigation made of an intercascade circuit, it is possible to see that for a calculation of its elements it is necessary to know the frequency dependence of the transistors which are matched, which determines the magnitude of  $Q$ , and the impedances of the transistors at the upper operating frequency of the amplifier for a specified level of the input power. With a correct choice of the magnitude  $Q < 1$  it is possible to realize a duplication of the frequency range of more than one octave with maximum flat amplitude frequency characteristics of the amplifier. Figures 3; tables 2; references: 6 Russian.

USSR

UDC 621.391.822

ANALYSIS OF NOISE AND TRANSMISSION PROPERTIES OF ACTIVE NETWORKS BY MEANS  
OF EIGENVALUE THEORY

Kiyev IZVESTIYA VUZ: RADIOELEKTRONIKA in Russian Vol 19, No 12, Dec 76  
pp 31-35 received 8 Dec 75; after revision, 12 Jan 76

ONISHCHUK, A. G., and FILIPPOVICH, G. A.

[Abstract] During the development of low-noise amplifiers the problem arises of determining conditions in which at the output of amplifiers, a maximum ratio of the signal-to-noise powers is assured. Solution of this problem is directly connected with the choice of a suitable method of quantitative evaluation of the noise characteristics of the amplifier. The present work demonstrates that application of the methods of eigenvalue theory to an analysis of linear noisy amplifiers makes it possible, not only to determine their potentially attainable possibilities with respect to assuring the

maximum ratio of the signal-to-noise powers in loads, but also to find the conditions in which these possibilities can be realized. Figures 3; references 7: 4 Russian, 3 Western.

USSR

#### ANALYSIS OF DISTORTIONS IN MULTICHANNEL CLASS D AMPLIFIERS

Kiyev IZVESTIYA VUZ:RADIOELEKTRONIKA in Russian Vol 19, No 12, Dec 76  
pp 73-75 manuscript received 17 Oct 75

ALEKSANYAN, A. A., SIVERS, M. A., PLYUSNIN, V. N., and MIRONYAN, S. A.

[Abstract] The principle of action of low-frequency Class D amplifiers is based on transformation of the signal being amplified into a sequence of duration-modulated pulses of timing frequency  $\omega$  with a subsequent power amplification of them, and separation of the low-frequency component (of the signal being amplified). It is shown in the literature that Class D amplifiers can be constructed according to multichannel circuits (similar to the circuits of a multiphase rectifier), which makes it possible substantially to reduce pulsations of the timing frequency and the combination distortions. The present short communication analyzes the advantages of multichannel amplifiers, assuming that there are  $N$  identical amplification channels in each of which the timing frequency is shifted with reference to the adjacent at an angle  $\varphi_N = \frac{2\pi}{N}$ , and the outputs of the amplifiers are connected with the load across decoupling devices (e.g., inductance). Expressions are found for the distortion factors of single-pulse ( $K_{f0}$ ) and two-pulse ( $K_{fd}$ ) signals. The dependences are presented of  $K_{f0}$  and  $K_{fd}$  on the number of amplifier channels for a percentage modulation of 100 percent with a ratio of the timing frequency  $\omega$  to the higher modulating frequency  $\Omega_H$  and the cutoff frequency  $\Omega_{CO} = \Omega_H$  equal to three. As follows from the dependences presented, in single-cycle amplifiers an increase of the number of channels leads to a sharp decrease of the distortions (up to  $60 \div 70$  db with four channels). In two-cycle amplifiers a two-channel circuit gives a benefit in distortions on the order of 15 db; a further increase of the number of channels does not give a significant benefit. Figures 1; references: 2 Russian.

USSR

UDC 621.396.61:621.396.2

EVALUATION OF PARASITIC MODULATION OF SIGNALS IN COMPOSITE MICROWAVE  
AMPLIFIERS

Kiyev IZVESTIYA VUZ:RADIOELEKTRONIKA in Russian Vol 19, No 12, Dec 76  
pp 50-54 manuscript received 2 Oct 75

DRAPIY, V.A.

[Abstract] Composite amplifiers are considered, which consist of dividers at  $n$  outputs,  $n$  separate microwave amplifiers and a summator. A criterion is proposed for evaluation of the parasitic modulation of signals in such composite amplifiers. It is found that distortion of the signals of a composite amplifier can be evaluated by squares, averaged with respect to a group of the channels, changes in time of the amplification factors, and the phase lengths of the individual amplifiers. References: 3 Russian.

CZECHOSLOVAKIA

OPERATIONAL AMPLIFIERS FROM SOVIET PRODUCTION

Prague SDELOVACI TECHNIKA in Czech Vol 24, No 12, Dec 76 pp 461-462

NK [Author's full name not given]

[Abstract] A diagram is given in which the main circuits of the simplest operational amplifier, the 1YT401, are shown. The feed voltage is 6.3 or 12.6 V. Voltage gains at an input impedance of 10 kOHM and a load of 750 OHM are on the order of 4,000. Other types of amplifiers have an increased gain and reduced output impedance. The number of stabilizing back-feed circuits is higher than in the simpler designs. Data concerning 10 amplifiers are given. Feed voltage is 6.3 to 12.6  $\pm$  10 percent, required current 4.2 to 12.0 mA, loading resistance 0.7 to 5.1 kOHM, voltage increase 800 to 2.10<sup>5</sup>, and operating temperatures -60° to +125° C. Simple diagrams of a non-inverting amplifier, addition circuit, Schmitt flip-flop circuit, modulator-demodulator, low frequency filter and a circuit for rotation of the phase signal are among those shown in the article. Figures 10; table 1; references: 1 Russian.

USSR

UDC 621.396.67

MINIMIZATION OF RADIATION PATTERN IN GIVEN DIRECTIONS BY THE METHOD OF  
COMMUTATION OF RADIATORS

Kiyev IZVESTIYA VUZ:RADIOELEKTRONIKA in Russian Vol 19, No 12, Dec 76  
pp 8-13 manuscript received 7 May 75; after completion, 3 May 76

INDENBOM, M. V., and FILIPPOV, V. S.

[Abstract] The necessity for forming a radiation pattern which becomes zero in given directions originates in the case of the use of highly-directional radiation, in particular in radio astronomy. The present work considers the possibility of obtaining such a radiation pattern by using a special principle of arrangement of radiators in a linear array, which is achieved both precisely and approximately by disconnection of part of the radiators. Evaluations are presented of the percentage of the above-mentioned "zeros" as a function of the number of radiators of the array, and the number of disconnected radiators and the segment of the angles in which zero values are formed. As an example, a directional diagram is obtained by modelling the method of commutation of radiators on an electronic computer during formation of three "zeros." The evaluations of the percentage of "zeros" which are found by the method of commutation of the radiators show the efficiency of the method during formation of "zeros" in a not very large segment of the angles around the direction of the principal maximum. It is advisable to use the method discussed in antenna arrays in which the arrangement of commutators is economically advantageous, than an arrangement for the same circuits of phase shifters or any other devices for control by the radiator currents. Figures 3; references 5: 4 Russian, 1 Western.

USSR

UDC 621.396.677

THE EFFECT OF IRREGULARITY OF ANTENNA FIELD RELIEF ON PARAMETERS OF COPHASED SHORT-WAVE ANTENNAS

Kiyev IZVESTIYA VUSOV SSSR: RADIOELEKTRONIKA in Russian Vol 19, No 11, 1977 pp 107-108 manuscript received 4 Mar 75; after revision, 4 Nov 75

KUBANOV, V. P., and SHERED'KO, YE. YU.

[Abstract] At present in selecting an antenna it is assumed that a combination of various unevennesses (relief) of an antenna field satisfies the requirements of the standards of technical planning. Absence of systematized knowledge concerning the effect of irregularity of the relief on the antenna parameters leads to definite difficulties in planning short-wave radio lines. Of the variety of possible profiles of the relief it is reasonable to distinguish the most typical, to which it is necessary in the first place to relate inclines and ascents. The method of consideration of inclines and ascents, regular in the limits of a section of the earth, and essential for re-emission of radio waves, is generalized in a previous work by one of the authors [Ye. Yu. Sherel'ko, ELEKTROSVYAZ', 1971, No 10]. The present short communication evaluates the effect of irregular longitudinal inclines on the parameters of the antennas CGD  $n/m$  RA used for short-wave radio broadcasting. An antenna of this type is an array of cophased excited horizontal band dipoles. In the array there are  $n$  levels and in each level  $m$  dipoles. The reflector is passive and aperiodic. Figures 2; references: 4 Russian.

USSR

FIELD IN THE NEIGHBORHOOD OF LIGHT-SHADE BOUNDARY WITH DIFFRACTION OF SPHERICAL WAVE AT A CIRCULAR OPENING

Kiyev IZVESTIYA VUZ: RADIOELEKTRONIKA in Russian Vol 19, No 12, Dec 76 pp 90-94 manuscript received 2 Jun 75; after revision 17 Apr 76

NARBUT, V. P.

[Abstract] During calculation of circle diagrams of optical type antennas (mirror, horn, slot) by the method of the geometrical theory of diffraction (GTD) the necessity arises for calculation of the field in the neighborhood of the light-shade boundary of an incident (primary) or reflected field, which, as a rule, emanates from a point source, i.e., the source of a spherical wave. Diffraction of a spherical wave at a circular opening is a standard (model) problem for such a type of antenna. During calculations of a diffraction field by the GTD method the widely-used nonuniform resolution of an edge wave is inadequate in the vicinity of the light-shade boundary

of a geometrical optical field. Consequently, in this area it is necessary to employ a uniform resolution, which in the case of diffraction of a plane wave into a half-plane is expressed with the aid of a Fresnel integral. In the present short communication the author assumes that the point source of a spherical wave is located on the axis of symmetry of a circular opening in an infinite conducting screen. In accordance with GTD the complete field in the neighborhood of the upper light-shade boundary of the incident field is equal to the sum of the fields: geometrical-optical and edge wave. The method utilized in the work was successfully employed for calculation of the so-called edge lobe of an axisymmetric mirror antenna and circle directional diagrams of a conical horn. Figures 1; references 5: 4 Russian, 1 Western.

USSR

UDC 621.396.677

INVESTIGATION OF RE-RADIATING ANTENNA ARRAYS

Kiyev IZVESTIYA VUZOV SSSR: RADIOELEKTRONIKA in Russian Vol 19, No 11, 1977 pp 31-35 manuscript received 21 Oct 74; after revision 5 Jun 75

SHUSTOV, L. N., and SKROBOV, I. S.

[Abstract] In the literature arrays are considered which re-radiate radio waves in the direction of their arrival at the same polarization as the incident wave. However, in a number of instances it is of interest to investigate the characteristics of an array, the transmission directional diagram of which does not coincide with the receiving diagram. Such arrays can find use for magnification of the effective scattering cross section of the target in two-position systems. In some cases passive antenna arrays may also be used, re-radiating radio waves with a polarization orthogonal to the polarization of the incident wave. In the present paper the results are given of theoretical and experimental investigation of such arrays. All the experimentally obtained characteristics coincide with a satisfactory degree of precision with the theoretical, which verifies the correction of the conclusions drawn in the work. Figures 4; references: 5 Russian.

USSR

MEASUREMENT OF THE POWER OF SIDEBAND RADIATION OF SW TRANSMITTERS

Moscow VESTNIK SVYAZI in Russian No 1, Jan 77 pp 18-21

KULIKOV, A. D., BLOKH, L. D., GLAZMAN, Ya. S. and MISHCHENKO, P. G.

[Abstract] A description is presented of a universal method of measurement of the power of sideband radiation of shortwave radio transmitters in shielded feeders of various designs. The method described is successfully used at the SUR-1 radio center and can be used at other radio transmission centers. The method is made applicable to various types of feeders by the introduction of a correction factor, the calculation of which is described. Once the correction factor is known, the power of sideband radiation in shielded feeders of various designs can be measured using the M2-22 and M2-23 sideband radiation meters. Figures 4.

USSR

UDC 621.376.3

EVALUATION OF THE EFFECT OF PARASITIC AMPLITUDE MODULATION ON FREQUENCY DETECTORS

Kiyev IZVESTIYA VUZ: RADIOELEKTRONIKA in Russian Vol 19, No 12, Dec 76  
pp 27-30 manuscript received 12 May 75; after completion, 23 Dec 75

GUDILIN, A. YE.

[Abstract] Parasitic amplitude modulation (PAM) is the most significant multiplicative interference of a magnetic recording reproduction channel, and consequently choice of the most interference-free detector for a system of magnetic recording with frequency modulation is important. It is shown in the literature that a pulse detector of the integrating type (PDI) is one of the least sensitive to the effect of PAM. The imperfectness of the characteristics of the limiter which transforms the frequency-modulated (FM) signal to frequency-pulse-modulated (FPM) serves as the principal cause of PAM at the output of a detector. In so doing the change of amplitude of the FM signal leads to a change of the duration of the fronts of the FPM signal. In the present paper, for an evaluation of the effect of PAM on frequency detectors, a method is proposed for separating out of pulse interference, which consists in the fact that the difference between output voltages of ideal and real limiters is considered as additive pulse interference, effective at the input of a low-frequency filter. Duration of the pulses of the separated out interference depends on the ratio of the amplitude of the FM signal and the level of limitation. PAM leads to pulse-width modulation of the separated out interference. The effect of PAM on the output signals of a PDI and a follow-up detector is evaluated on the basis of a circuit of automatic phase adjustment of frequency. It is found that the follow-up detector is significantly less sensitive (56 db) to the effect of PAM than the widely-used PDI. Figures 2, references: 5 Russian.

USSR

HARDWARE FOR TRANSMISSION OF SIGNAL INFORMATION THROUGH A COMMON CHANNEL

Moscow VESTNIK SVYAZI in Russian No 1, Jan 77 pp 13-14

STOYANOV, M. N., dr of Technical Sciences, and ZHARKOV, M. A., engineer,  
Central Scientific Research Institute for Communications

[Abstract] In electronic switching systems controlled by specialized computers, a common discrete communications channel is used for transmission of signal information. The use of such a common channel can reduce the time required to make connections, increase the utilization factor and quality of communication lines by eliminating the transmission of functional signals over these lines. This article discusses the technical and economic advantages of the use of common signal channels in centrally controlled switching systems. Figures 4.

USSR

UDC 621.391

NOISE IMMUNITY OF BINARY COMMUNICATION SYSTEM WITH RE-REQUEST IN CHANNELS WITH VARIABLE PARAMETERS

Kiyev IZVESTIYA VUSOV SSSR: RADIOELEKTRONIKA in Russian Vol 19, No 11, 1977 pp 113-115 manuscript received 22 Sep 75; after revision, 3 Mar 76

GOL'DFEL'D, L. N.

[Abstract] The present short communication determines the optimum algorithm of reception in the forward and reverse channels of systems of transmission of discrete information (STDI) with resolving feedback [reshayushchaya obratnaya svyaz'], operating in a continuous channel with variable parameters, and analyzes the performance figures of a system of such type. It is found that use of resolving feedback in STDI makes it possible to obtain a considerable increase of noise immunity. This increase is larger the better the state of the reverse channel. Figures 1; references: 2 Russian.

USSR

UDC 621.391.1

EFFECTIVE METHOD OF FORMATION OF THE SPECTRUM OF A SIGNAL FOR DATA TRANSMISSION

Moscow ELEKTROSVYAZ' in Russian No 1, Jan 77 pp 54-56 manuscript received 23 Jan 75

KURITSYN, S. A., PERFIL'YEV, E. P. and PONOMAREV, V. I.

[Abstract] A trend has recently been noted toward replacement of analog shaping filters for data transmission apparatus with discrete or digital devices performing the same functions. The operation of discrete and digital shaping filters is generally in the time area. Digital echo modulation allows formation of the signal spectrum in a limited frequency band using discrete signal processing elements. However, echo modulation results in a deterioration of the utilization of the communication channel frequency band and makes operation of the modem transmitter in the driven mode impossible. The method suggested in the paper has all the advantages of digital echo modulation without its disadvantages. The method primarily consists in separate formation of the signal envelope and the filling oscillation, with subsequent recombination, and secondly in the introduction of a stepped approximation of the envelope of an elementary pulse. The case of shaping of a signal with linear dependence of the characteristics of the amplitude spectrum in the cutoff area and with an ideal phase-frequency characteristic is analyzed. A 4800 bit/s audio frequency line is studied. Figures 4; references 5: 3 Russian, 2 Western.

EAST GERMANY/SOVIET UNION

THE SOVIET TT12 DIGITAL TRANSMISSION SYSTEM

East Berlin FERNMELDETECHNIK in German Vol 17, No 1, Jan 77 p 37

ROLLMANN, W.

[Abstract] This brief note is based on an article by A. I. Golovatenko, S. I. Tarbayev, and L. I. Shakhvorost entitled "Fundamental Construction of the TT12" published in VESTNIK SVYAZI, 1976, No 5. The digital transmission system, called Dnyepr, is intended for use within one zone (each Union Republic is divided into several zones). A bandwidth of 0.3 to 3.4 kHz is needed for its operation. The system is designed on the basis of the group principle. Twenty-four duplex channels at a telegraphy speed of 50 Baud and up to 12 connections at a speed of 100 Baud are feasible. At 200 Baud, up to 6 connections may be had. The various versions available are presented in tabular form. One module accommodates up to 12 channels, and up to 6 modules may be combined in a single rack. Tables 1; references 1.

CZECHOSLOVAKIA

DETERMINATION OF RESISTANCE TO INTERFERENCE OF REPEATERS OF SYSTEMS WITH PCM

Prague SDELOVACI TECHNIKA in Czech Vol 24, No 12, Dec 76 pp 451-453

HAJEK, ANTONIN, engineer

[Abstract] Long lines of systems with PCM which transmit digital signals consist of cables and repeaters. The purpose of the repeaters is to increase the intensity of these signals, which are weakened by passing through a long run of the cable. The number of errors occurring in the transmission of signals is a function of the intensity of interference. The ratio of errors to the number of correctly transmitted signals should be on the order of  $1:10^6$ . Interference is either internal, caused by heat generation in the cable and by reflections from non-homogeneous cable material, or external caused by currents passing in the proximity of the cable. The largest number of errors occurs in the proximity of telephone switchboards, TV and radio transmitters, and high-voltage cables. The nature of the PCM system is important in the elimination of interference. The TESLA KPK 32 single-cable system mainly suffers from interference at its near end where the average value of dampening decreases approximately 4.5 dB per octave with increasing frequency. Consequently, for an increase in transmission a two-cable system is needed. Then the average value of dampening decreases approximately 6 dB per octave, with increasing frequency. For highest transmission rates, coaxial cables are needed. Then most of the interference is caused by heat generation in the cable. The author determines the resistance of the repeaters using a method where interference is caused by a sinusoidal current with a frequency 1 kHz lower than one half of the transmission frequency  $F_0$ . For a 32-channel PCM system with a transmission frequency  $F_0 = 2048$  kHz, the frequency of the interfering current is 1023 kHz. For a PCM system containing 100 repeaters, the errors of a single repeater should be on the order of  $10^{-8}$ , when a value of  $10^{-6}$  is required for the entire system. The acceptable value for the difference between the peak value of the undisturbed signal and the effective value of the interference current is 30 to 32 dB. In one method of determining the resistance, measurements are made at the location of the repeater's output; in the other at the input. Figures 5, References 5: 3 Czech, 2 Western.

USSR

UDC 621.391.2

OPTIMUM FILTRATION OF NON-INTERRUPTED COMMUNICATION UNDER EFFECT OF PULSE INTERFERENCE

Kiyev IZVESTIYA VUZOV SSSR:RADIOELEKTRONIKA in Russian Vol 19, No 11, 1977  
pp 11-19 manuscript received 20 Jun 74

SMIRNOV, V. A., and YAKOVLEV, A. I.

[Abstract] The paper discusses filtration of mixed multidimensional Markovian processes in the case where the signal received and the interferences are characterized, in addition to a number of constant parameters, by discrete parameters taking a finite set of values. The paper obtains more general and simpler algorithms of filtration of mixed Markovian processes than are obtained in non-interrupted time. The method of applying the relations obtained to synthesis of optimum receiving devices is illustrated by an example. Figures 1; references: 7 Russian.

USSR

UDC 621.391.2

RECURRENT ESTIMATION ALGORITHMS OF NONLINEAR FILTRATION OF GAUSSIAN PROCESSES

Kiyev IZVESTIYA VUZ:RADIOELEKTRONIKA in Russian Vol 19, No 12, Dec 76  
pp 36-44 manuscript received 15 May 75; after revision, 12 Mar 76

DOLGOV, V. I.

[Abstract] The problem is considered of the transformation of discrete algorithms of filtration of Gaussian processes to the recurrent form. The relationships obtained are confirmed by practical examples. It is concluded that the recurrent algorithms of filtration of Gaussian processes obtained make it possible to achieve processing of information in the rhythm of its entry. An especially efficient recurrent method of presentation of filtration equations is found for processes with Markov characteristics. Here there are in view, both the character of the process being evaluated and the character of the process reflecting the fluctuation effect in the communication channel and determining the form of the likelihood function. Use of recurrent algorithms in real conditions will yield errors connected with the errors of approximation of real processes by Markovian normal processes, and the proportion of errors of approximation with the precisions attainable during the use of recurrent algorithms should supply the answer to the advisability of using one or another algorithm or the necessity for its complication. References: 8 Russian; 2 Western.

USSR

UDC 621.396.232.1:621.382.8

INFLUENCE OF RELIABILITY OF A MATCHED FILTER ON INTERFERENCE STABILITY OF RADIO SYSTEMS

Moscow ELEKTROSVYAZ' in Russian No 1, Jan 77 pp 73-75 manuscript received 11 Jul 73

SMIRNOV, N. I. and ZALICHEV, N. N.

[Abstract] When a complex signal changes rapidly or is constructed of a random sequence of infinite length, optimum processing of the complex signal can be achieved by a modified discrete matched filter, a so-called electronically tunable discrete matched filter. As the carrier wave is modulated, the sequence is recorded in a reference register. If at any time the sequence received matches the reference sequence, logic signals appear at the output of AND elements summing the input signal and the internally generated reference signal. The failure rate of electronically tuned discrete matched filters is determined, with their composition considered. The influence of individual flip-flops on the signal-to-noise ratio is found to be variable. The permissible length of the reference register depends on the reliability of an elementary cell, the permissible deterioration of the signal-to-noise ratio at the output of the filter and the required reliability of the entire device. With a fixed probability of proper detection of the signal and reliability of the electronically tuned filter, an increase in the length of the sequence leads to an increase in the necessary reliability of each element. The optimum version of filter design, considering reliability and cost, is that for which the shift registers are made with LIC, while all other elements are made of integrated microcircuit chips. Figures 3; references: 7 Russian.

USSR

UDC 621.391.8

DISTORTION OF PHASE DISTRIBUTION LAWS BY DISCRETE DELAY LINES

Kiyev IZVESTIYA VUZ:RADIOELEKTRONIKA in Russian Vol 19, No 12, Dec 76 pp 55-58 manuscript received 8 May 75; after revision, 4 May 76

VESHKURTSEV, YU. M. and BRONSHTEYN, B. G.

[Abstract] During organization of measurements of an irregular phase difference, a predominate position is occupied by a circuit in which a reference oscillation is formed by means of a delay of the signal in time. The most promising development for such a circuit is the use in it of a discrete delay line (DDL). However, use of a DDL leads to a distortion of the phase distribution law of the signal analyzed. An evaluation of the degree of

distortion for particular cases has been considered in the literature. In the present work solution of the problem is extended to the general case where fluctuations of the phases of the output signals of the DDL are independent random processes. A general expression is derived which describes the operation of a DDL, and makes it possible to determine the causes of distortion of irregular components of the phase of a signal in a DDL. An analysis of the degree of distortion is made of the phase distribution laws. A quantitative calculation of the distortions was conducted on a "NAIRI-2" electronic digital computer. Figures 2; references: 5 Russian.

USSR

UDC 621.391.8

INVESTIGATION OF GENERALIZED PROBABILITY OF MODEL OF SIGNAL AMPLITUDE

Kiyev IZVESTIYA VUZ:RADIOELEKTRONIKA in Russian Vol 19, No 12, Dec 76  
pp 83-85 manuscript received 11 Jul 75; after revision, 2 Feb 76

GORKIN, YU. S., and RADZIYEVSKIY, V. G.

[Abstract] The probability densities of the amplitude and phase of a plane vector with normally distributed quadrature components have found wide application during the solution of a number of problems of contemporary radar and radio communications. Appropriate analytical expressions are found in the literature for the probability densities of the amplitude with the presence of correlation between the quadratures  $x$  and  $y$ , which in the general case have various dispersions  $\sigma_x^2 \neq \sigma_y^2$  and a mean value  $x_0 \neq y_0$ .

However, calculations according to these formulas, even with the use of an electronic computer, display significant complications because of the necessity for calculating certain cumbersome series--modified Bessel functions. The present short communication derives an expression for the probability density, the numerical integration in which, unlike the summation of infinite series, does not display particular complications for contemporary electronic computers, which makes it possible not only to compare a generalized probability model of amplitude with well-known laws, in particular by means of an analysis of the coefficient of skewness and excess, but also to use the derived expression for direct practical calculation. Figures 3; references: 6 Russian.

USSR

UDC 621.391.14

STATISTICAL PROPERTIES OF PERIODIC CORRELATION FUNCTIONS OF DISCRETE  
FREQUENCY SIGNALS

Kiyev IZVESTIYA VUZ: RADIOELEKTRONIKA in Russian Vol 19, No 12, Dec 76  
pp 3-7 manuscript received 6 Oct 75

VARAKIN, L. YE.

[Abstract] Discrete frequency (DF) signals are a sequence of non-overlapping elements (radio pulses or composite signals) with various carrier frequencies. Such signals are also called signals with frequency-shift operation or discrete frequency modulated. The present paper determines the probability distribution law and the static characteristics of a number of coincidences for periodic correlation functions of DF signals of the first order. The solution of this problem is of value, not only for determining the statistical properties of random systems of DF signals, but for determining the statistical characteristics of mutual noise in radio engineering systems with DF signals, Figures 3; tables 2; references: 12 Russian.

USSR

UDC 621.391.161

PRECISION OF EVALUATION OF A SIGNAL PARAMETER FORMED BY OPTIMAL DISCRIMINATORS

Kiyev IZVESTIYA VUZ: RADIOELEKTRONIKA in Russian Vol 19, No 12, Dec 76  
pp 85-89 manuscript received 23 Jul 75; after revision, 2 Feb 76

KULIKOV, YE. I., and NAKHMANSON, G. S.

[Abstract] Evaluation of signal parameters on a background of noise with the aid of a discriminator have been discussed in the literature, with discriminators considered for the most part which correspond to a simple loss function. The present short communication considers the maximum precision of evaluations of signal parameters formed by discriminators which correspond to continuous and right-angled loss functions. Expressions in a first approximation are derived for bias, dispersion and efficiency of an evaluation of the parameters of a signal formed by a discriminator which corresponds to a continuous loss function. Graphs are presented of dependences calculated by the formulas obtained, of the dispersions and efficiencies of separate evaluations of the duration and transient condition during reception on a background of white noise with a spectral density  $N_0$  of the radio signal. Similar dependences are obtained for the characteristics of evaluations formed by a discriminator which correspond to the loss function  $C(y,1) = C_0 - \exp[-(y-1)^2/\tau_0^2]$ . Figures 4; references: 5 Russian.

USSR

UDC 621.393.6

RESULTS OF TESTING OF INFORMATION TRANSMISSION APPARATUS USING METEOR  
RADIOTELEGRAPH COMMUNICATION CHANNELS

Moscow ELEKTROSVYAZ' in Russian No 1, Jan 77 pp 44-47 manuscript received  
9 Mar 76

DEMIN, E. A., CHINENKOV, L. A., MAKAROV, A. A., BORISOV, YU. I.,  
GAVRILENKO, V. S., GARSKOV, G. KH., CHERNETSKIY, G. A., SHAROV, K. A. and  
SHCHERBAKOV, B. P.

[Abstract] Meteor-scatter communications were tested during the summer time, utilizing frequency-keyed transmissions operating at 2 and 4 KBaud, in 150 sessions of 1 hour each, the last 10 minutes of each hour being used to check and calibrate parameters of the transmitting and receiving equipment. Results of the tests are presented. The mean transmission rate and the information reliability loss factor are calculated. Because no dropouts or false insertions were observed in the entire test, the information reliability loss factor was primarily determined by transformation errors and amounted to  $3.5 \cdot 10^{-5}$ . The use of memory systems and operator-controlled memory dump into the transmission line allowed operation at 90 percent of the hardware operating speed of the teletype equipment with a meteor-scatter filling factor of 4 percent. Acceptable delay times were achieved in all cases. Figures 8; tables 1; references: 2 Russian.

USSR

UDC 621.394.3

CALCULATION OF THE NUMBER OF CHANNELS UPON COMBINATION OF MESSAGE SWITCHING  
CENTERS WITH CHANNEL SWITCHING EXCHANGES

Moscow ELEKTROSVYAZ' in Russian No 1, Jan 77 pp 37-39 manuscript received  
1 Dec 75

KRAVCHENKO, E. N. and SERGEYEVA, T. P.

[Abstract] Telegraph networks and data transmission networks have both channel switching and message switching centers. The number of communication channels in a channel switching network is calculated on the basis of the planned maximum load by the use of Erlang nomograms. Because when channel and message switching centers operate jointly the servicing systems are mixed, involving refusal of requests and queueing, traditional methods of calculation of the number of communication channels required are inaccurate, and a special method of calculation of the number of required channels is required. This article presents such a method, but it does not consider

channels incompletely accessible in heavy load situations, a problem which arises in channel-switching telegraph exchanges. Figures 2; tables 2; references: 4 Russian.

USSR

UDC 621.394.147

EVALUATION OF NOISE IMMUNITY OF FREQUENCY TELEGRAPHY WITH "QUALITY DETECTOR"

Kiyev IZVESTIYA VUZOV SSSR:RADIOELEKTRONIKA in Russian Vol 19, No 11, 1977 pp 51-55 manuscript received 3 Feb 75; after revision, 1 Mar 76

KUZ'MIN, B. I.

[Abstract] A reduction of the accuracy of reproduction of output information in a system by virtue of the effect of noise is determined, both by the intensity of the noise and by the rules of its distribution. In this case a significant problem is the derivation of simple working formulas for calculation of the probability of distortion of an accepted binary digit in the form of an erroneous solution or an obliteration as a function of the rules of distribution of the noise parameters. Impulse noise is one of the main troublesome factors during transmission of discrete information with respect to commutated lines and with respect to some radio channels. The present paper formulates the problem of determining the probability characteristics of "indirect" methods of detection of errors in discrete systems. This is illustrated by a solution for frequency telegraphy channels with controlling impulse noise. Figures 3; references 8: 7 Russian, 1 Western.

USSR

UDC 621.394.763

THE LOAD ON SUBSCRIBER LINES OF THE SUBSCRIBER TELEGRAPH NETWORKS

Moscow ELEKTROSVYAZ' in Russian No 1, Jan 77 pp 40-43 manuscript received 20 Jan 75

MALINOVSKIY, S. T., KOZHINA, G. I., DEART, V. YU. and TSAREVA, I. B.

[Abstract] The load of subscriber telegraph lines and exchanges was analyzed for a number of years (1965-1974) based on the materials of annual studies of all subscriber telegraph exchanges performed on Tuesday, Wednesday and Thursday of the third week in March. Data produced by these surveys are presented in tabular and graphic form. The data indicate that 30 percent of the subscriber lines have peak load factors of about 0.1 Erlang, indicating under-utilization of subscriber lines. At the same time, another

30 percent of the subscriber lines have loads of 0.3 to 0.7 Erlang, which causes overloading of these subscriber lines and a stream of nonproductive calls. The load per subscriber line, based on statistical investigations, cannot be used as a criterion for determination of servicing norms, because it does not reflect the true situation of operation of the network. Figures 3; tables 4.

USSR

"MECHANICAL VOICE" DEVICE FOR AUTOMATIC LONG-DISTANCE TELEPHONE EXCHANGES

Moscow VESTNIK SVYAZI in Russian No 1, Jan 77 pp 21-22

BARANOV, YU. A., DOBROVOL'SKIY, V. V. and ORLOV, V. G. Moscow Electrotechnical Institute of Communications

[Abstract] A "mechanical voice" device has been created in the Laboratory for Automatic Information Devices of the Scientific-Research Sector of the Moscow Electrotechnical Institute of Communications. This device is intended for transmission of service information required in various stages of making automatic long-distance telephone connections. Operating as a part of the automated long-distance telephone exchange, this magnetic recording device can reduce non-productive utilization of long-distance channels, improve their quality characteristics and increase subscriber satisfaction. The device includes two magnetic voice recording units (one as a reserve unit), an automatic switching device and a unit for rerecording of information originally recorded under studio conditions on magnetic drums. Figures 2.

USSR

ANALYSIS OF THE QUALITY OF SERVICING OF CALLS AT AUTOMATIC LONG-DISTANCE TELEPHONE EXCHANGES

Moscow VESTNIK SVYAZI in Russian No 1, Jan 77 pp 15-17

ZVEREV, B. V. and KLIBANER, A. B., engineers

[Abstract] The load level and quality of servicing of calls are continuously monitored at automatic long-distance telephone exchanges. Analysis of data produced by this monitoring provides a basis for adjustment of the operation of the equipment and improvement of the methods of planning of these exchanges. This article familiarizes the reader with the results of observation of the load and quality of servicing of calls at a type ARM-20

automatic long-distance exchange in Leningrad. Exchanges of this type have been put in operation in the largest cities of the USSR. Analysis of the quality indicators shows a significant difference between actual and predicted values, which is explained by problems with the methodology of planning of automatic long-distance exchanges and the impossibility in many cases of providing the required number of communications channels in a given direction. However, the quality indicators of the exchange itself do meet the standards, indicating that the control devices are operating properly: improvements in call servicing can be achieved by better prediction of the number of calls, both originating and transit, in the various directions serviced by the station. Figures 6.

EAST GERMANY

QUASI-KEY SELECTION WITH TTL CIRCUITS

East Berlin FERNMELDETECHNIK in German Vol 17, No 1, Jan 77 pp 31-32

LAMM, K.-J., Chamber of Technology, Hoyerswerda, and BORNER, H., Ilmenau

[Abstract] Quasi-key selection in pushbutton calling of numbers means that there is a delay between the end of the (high-speed) selection and the end of the (slow) pulse-series output. The key-selected numbers are entered in a memory in coded form and read out at a rate corresponding of the switching beat. This article describes the quasi-key selection system using the electronic logic with TTL circuits, originally reported in the dissertation of K.-J. Lamm (Ilmenau Technical University, 1975). There are 12 keys, and a beat center which derives eight different beats from a 320 Hz base beat. The prototype was constructed as a telephone pushbutton dialer and is used for evaluation purposes. The sequence frequency of the start pulses is 10 Hz; the pulse ratio is 1.6:1; the pulse duration is 61.5 msec; the pause duration is 38.5 msec. There are 20 integrated circuits. Use trials are currently in progress. Figures 1; tables 1; references: 2 German.

EAST GERMANY

TRAFFIC MEASUREMENTS WITH THE ESDM 31 TEST-VALUE ACQUISITION AND PROCESSING SYSTEM

East Berlin FERNMELDETECHNIK in German Vol 17, No 1, Jan 77 pp 20-24

MAYER, H., Chamber of Technology, Institute of Postal and Telecommunication Affairs, Radio Works State Enterprise, Erfurt

[Abstract] The ESDM 31 system is a third-generation unit for digital measurement and test-value display. It is used for traffic measurement in the program-controlled telephone exchange system scheduled for introduction by the German Postal Service. It operates on the basis of the bundle scan method and is compatible with the Unified Computer System (ESER) computers such as the KRS 4200; its use eliminates the need for the current-time measuring method presently being used. The bundle-scan method is based on the evaluation of the potential of the traffic measuring lines by cyclic scanning of bundles or part bundles. The design, construction, operation, performance, and applications of the system are described and illustrated. The advantages include easy adaptability, ability to use commercial equipment and manufacturer service, data reduction by combination, and the ability to use the system for other purposes. However, a disadvantage is the need for regularly checking the individual traffic current circuits. Figures 9; references: 2 German.

CARRIER-FREQUENCY TRANSMISSION TECHNIQUE ON THE INSULATED-GROUND WIRE OF HIGH-VOLTAGE POWER TRANSMISSION LINES WITH THE FB 441 EQUIPMENT IN THE Z12F-TFE MODE OF OPERATION

Budapest HIRADASTECHNIKA in Hungarian Vol 28, No 2, Feb 77 pp 56-61  
manuscript received 20 May 76

SCHMIDTMANN, S., German Democratic Republic

[Abstract] The insulated ground wire (TFE) is an asymmetric air wire which has lower damping per kilometer than the conventional air wire because of its larger cross section. A novel coupler for such wires, consisting of a ferrite-ring core and transformer, was developed. The coil of few convolutions performs in practice like a grounding means for the 50 Hz ground currents. The carrier frequency on the TFE wire transforms to the high-frequency coil through the field of the ferrite core. The carrier-frequency signals reach a cable leading to the carrier-frequency unit on the station. The transmission equipment used was of the FB 441 type, designed for the carrier-frequency system Z12/V24; it may be used for standard and TFE lines. Twelve telephone channels may be transmitted through the TFE line in the 36-143 kHz band; multichannel TV, data and telemetry signals may also be transmitted. Trials under actual conditions of use were carried out: they demonstrated the satisfactory performance of the approach employed. Figures 9; references: 6 German.

## THE ERROR OF AN AFC SYSTEM, INDUCED BY THE NOISE EFFECT

Kiyev IZVESTIYA VUZ:RADIOELEKTRONIKA in Russian Vol 19, No 12, Dec 76  
pp 97-99 manuscript received 1 Jul 76; after revision, 25 Oct 76

KHODAKOVSKIY, V. A., and ZDANOVICH, N. P.

[Abstract] The precision of operation of an AFC system depends on the actuating signals and the parameters of the system. Analysis of the operation of an AFC system is made considerably more difficult in the case of the effect, together with the effective signal, of fluctuation noise. It is of interest to evaluate the error caused by the presence of noise and this error has been experimentally determined in the literature. In the present short communication a method is proposed for evaluation of the mathematical expectation of additional residual misalignment caused by the effect of noise. Figures 2; references: 7 Russian.

EQUIVALENT CIRCUITS OF NEGATIVE RESISTANCE CONVERTER

Kiyev IZVESTIYA VUZOV SSSR:RADIOELEKTRONIKA in Russian Vol 19, No 11, 1977 pp 56-60 manuscript received 21 Feb 75; after revision, 12 Apr 76

KUKK, V. A., and SHIFF, G. I.

[Abstract] Negative resistance converters (NRC) are one of the foremost devices in the class of active converters of immittance (impedance and admittance) intended for miniaturization of selective circuits in contemporary electronic equipment. Ordinarily an ideal NRC is described by actual parameters and, on a basis of this, equivalent circuits of a NRC are determined, and the possibilities are investigated of consideration or correction (compensation) of parasitic elements in practical achievements. This makes consideration of the frequency properties of real NRC impossible, e.g., during analysis of the stability of any circuit. In the present paper some possibilities are investigated of representation of an actual NRC in the form of an ideal NRC, in combination with some parasitic passive elements. During this the properties of an actual NRC are represented by a matrix of impedance parameters in the form of rational fractional functions of the first order. For description of the NRC a model is used in the form of a two-port (circuit with two inputs). One port (the left pair of terminals) is called by convention the input, the other the output. Figures 3; references 6: 3 Russian, 3 Western.

# Electromagnetic Wave Propagation; Ionosphere, Troposphere

HUNGARY

UDC 537.876.23

PROPAGATION OF ELECTROMAGNETIC WAVES IN INHOMOGENEOUS MEDIA. THE METHOD OF THE INHOMOGENEOUS BASE MODES

Budapest HIRADASTECHNIKA in Hungarian Vol 28, No 2, Feb 77 pp 50-55  
manuscript received 2 Oct 76

FERENCZ, CSABA, Government Committee on Space Research

[Abstract] A monochromatic solution of the Maxwell equations is sought in the form  $\bar{F} = \bar{F}_0 e^{j(\omega_0 t - \varphi)}$ , where  $\bar{F}$  denotes the electromagnetic parameter sought (featuring the electric field strength, shift vector, magnetic induction, and magnetic field strength),  $\omega_0$  denotes the circular frequency of the signal,  $t$  denotes the time, and  $\varphi$  denotes the phase. The method used is that of the inhomogeneous base modes for bianisotropic media. It is found that if solutions of the form sought exist in fact, they can be obtained by this method. An advantage of this approach is that the divergence equations may be eliminated because they are automatically fulfilled. Insofar as the Appleton-Hartree equation is concerned, it is demonstrated that there is no such dispersion equation which would be met; thus, it is theoretically unsuitable for more precise studies. The method of inhomogeneous base modes is also suitable for the solution of problems which are between quasi-homogeneous and inhomogeneous in character. The method yields the analysis of the elementary wave modes which develop. These studies also open up a way for the examination of the resultant wave modes. References 20: 5 Hungarian, 4 Russian, 4 German, 7 Western.

USSR

UDC 621.371.332.1

FLUCTUATIONS IN THE DIRECTION OF PROPAGATION OF A MULTIMODE SIGNAL  
REFLECTED FROM THE IONOSPHERE

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 12, 1976 pp 2486-2490  
manuscript received 8 Sep 75

GAYLIT, T. A., GUSEV, V. D., and PRIKHOD'KO, L. I.

[Abstract] A study is made of the fluctuations in the direction of propagation of the multimode ionospheric signal caused by multiskip propagation along the radio route. Expressions are obtained for the distribution parameters of the angles of arrival of the summary signal. The dependence of the parameters on the mode numbers and range of the radio route is analyzed. The results obtained indicate a significant difference in fluctuations in the direction of propagation of the multimode signal from the fluctuations of the unimodal signal, and they must be considered when determining the accuracy and interpreting the experimental measurements. Figures 5; references: 5 Russian.

HUNGARY

EFFECT OF FADING PROCESSES ON MICROWAVE RADIO RELAY CONNECTIONS

Budapest BHG ORION TRT MUSZAKI KOZLEMENYEK in Hungarian Vol 22, No 5, 1976  
pp 198-209

CSERNOCH, JANOS, graduate physicist, docent second-degree of KKVMF  
[expansion unknown], technical and scientific consultant of the Main  
Microwave Department of Orion Radio and Electrical Enterprise

[Abstract] A review is presented of primary fading phenomena, secondary fading phenomena, diversity reception, the mathematical treatment of fading phenomena (fast fading, slow fading, and composite fading), fading statistics, telephone and television transmission fading, and accompanying-sound transmission phenomena. In order to secure fading statistics, one must monitor the distribution function of the fading, the number of fading events exceeding certain limit levels, auxiliary damping as a function of rain intensity, cross-correlation coefficient with the variables (temperature, pressure, moisture content) of the atmosphere, and diversity effects (frequency diversity and field diversity) as well as cross-correlation between various diversity channels. Examples are presented to illustrate the various calculations involved. Figures 11; references 5: 2 Czech, 1 German, 2 Western.

Instruments and Measuring Devices;  
Methods of Measuring

EAST GERMANY

METHOD FOR THE SIMULTANEOUS MEASUREMENT OF TWO NON-ELECTRICAL VALUES WITH A SINGLE SENSOR, ILLUSTRATED BY THE EXAMPLE OF THE LP 101 PHOTOTRANSISTOR

East Berlin MESSEN STEUERN REGELN in German Vol 20, No 1, Jan 77 pp 35-38

WIEGERT, H.-J., Technical Cybernetics and Electrical Engineering Section, Otto von Guericke Technical University (director: KRAPMITZ, R., professor, dr of engineering), Magdeburg

[Abstract] Simultaneous measurement of two values with a single sensor necessitates two measurements under qualitatively different measuring conditions. We require a sensor in which parameter change occurs differentially over the partial sensor sensitivities. Such effect exists in sensors with p-n transitions. A transistor structure is preferable because the sensor characteristics may be significantly influenced by the operational voltage. In the example described, a Tesla KP 101 phototransistor was used; its collector current is a function of illumination intensity, temperature, and operational voltage. The experimental setup is described and its performance, including error characteristics, evaluated. The experiments indicated that the phototransistor is suitable for the simultaneous measurement of illumination intensity and temperature in view of the differential parameter sensitivity of the partial sensor characteristics. A detailed description of this subject is contained in the author's dissertation of the same title as this article (Magdeburg Technical University, 1973). Figures 5; references: 3 German.

HUNGARY

STATISTICAL MEASUREMENTS ON RANDOM SIGNALS

Budapest BHG ORION TRT MUSZAKI KOZLEMENYEK in Hungarian Vol 22, No 5, 1976 pp 219-225

KERPAN, ISTVAN, dr, graduate electrical engineer, transmission engineering specialist, head; TEMESVARI, ZSOLT, graduate electrical engineer, associate professor; and KORALEWSKY, VILMOS, graduate electrical engineer, assistant professor, Department of Line Communications Technology, KKVMF [expansion unknown]

[Abstract] This article discusses the following matters in a general way: (1) the concept and development trend of stochastic measurements; (2) the combination of the major stochastic characteristics of the signals; (3) brief

description of the stochastic instrument supply from domestic and foreign sources; and (4) the goals and work of the authors' department in the field of stochastic measurements. Among the domestic instruments discussed are the EMG NTA-1024 multichannel analyzer (Type 31 024), the NE-2432 averaging converter (type 32 434), the EMG 4741-1 correlator, the ICA 70 multichannel analyzer, the KFKI NIA 200 stochastic analyzer. The department's activities include measurement of the characteristics of random signals. When procuring new instruments, an evaluation is made to establish whether it is also suitable for the measurement of stochastic properties. A stochastic signal analyzer is being built for operation in conjunction with the TPAi small computer as a target peripheral unit. Analog instruments such as the BK 2425 (Nruel-Kjaer) are also used. Figures 4; references 10: 6 Hungarian, 4 Western.

## MEASUREMENT OF PARAMETERS OF FERROELECTRIC FILMS IN SHORT-WAVE PART OF CENTIMETER RANGE

Kiyev IZVESTIYA VUSOV SSSR: RADIOELEKTRONIKA in Russian Vol 19, No 11, 1977 pp 109-111 manuscript received 1 Aug 74; after revision, 15 Dec 75

BELYAYEV, V. M., MIRONENKO, I. G., RYZHKOVA, L. V., and SEREBRENNIKOV, G. F.

[Abstract] It is shown in the literature that measurements in the microwave range of the parameters of planar capacitance structures based on films of  $\text{SrTiO}_3$  and  $(\text{BeZrSr})\text{TiO}_3$  indicated real promise for their practical use. The present short communication gives the results of measurements of the natural Q-factor and the resonant frequency of a resonator filled with the materials in question. The abnormally large value of the dielectric constant of a ferroelectric in combination with the small thickness of the film makes it possible to fulfill the resonator in the form of a section of waveguide, partially filled by layered dielectric. Figures 2; tables 1; references: 4 Russian.

CZECHOSLOVAKIA

MEASUREMENTS OF MICROWAVE CONDUCTIVITY OF MATERIALS BY THE METHOD OF  
RESONANCE INPUT IMPEDANCE

Bratislava ELEKTROTECHNICKY CASOPIS in Slovak No 27, No 10, 1976  
pp 738-750 manuscript received 20 Dec 75

KNEPPO, I. and WEIS, M., engineers, Institute of Electrical Engineering,  
Slovak Academy of Sciences, Bratislava

[Abstract] The authors developed a new method for the determination of losses in the intensity of microwaves passing through various materials. The method is based on a comparison between the resonance input impedances of the investigated resonator and a reference resonator connected to the circuit through a bridge. The material tested is inserted into a hollow resonator, and thus it is possible to determine accurately changes caused by passage of the waves through a material, even if the absolute value of the input impedance of the resonator is not known with great accuracy. The method described is mainly suitable for determination of losses in dielectrics with low resistance. Experimental errors are caused by mechanical inaccuracies of the tuning mechanism which results in inaccurate tuning of the bridge to the minimum of the output signal, maladjustments of the detector, lack of symmetry of the hybrid cell T, and the effect on the frequency of oscillations of the range in which the operation is conducted. The method is not affected by parasitic frequency modulations of the microwave generator and has a natural elimination of temperature influence caused by the bridge connection. The instrumentation required is not expensive. A generator of stabilized frequencies, a meter for accurate determinations of frequencies, and a milli-Watt meter are not needed. The signals produced by changes in the quality of the waves are in the form of voltage changes which are easily amplified when high accuracy readings are required. The parameters of the investigated material may be easily recorded as a function of changes in physical factors such as temperature, pressure, intensity of light, time, and electromagnetic fields. Figures 5, tables 1, references 4: 2 Czech, 1 Russian, 1 Western.

CZECHOSLOVAKIA

A COMPACT MEASUREMENT UNIT

Prague SDELOVACI TECHNIKA in Czech Vol 24, No 10, Oct 76 pp 374-376

BORCIK, JIRI and SIMEK, JAN

[Abstract] The measurement unit MT 100 was developed at the Institute for Physics of the Czechoslovak Academy of Sciences. It is a special unit designed for treatment of analog data supplied from five locations of input sensors. The time basis of each channel is a minimum of 1.2 sec. Connection to memory is maintained for this period of time; this avoids problems connected with sudden changes in the voltage or occurrence of polarization at the input to the MT 100 voltmeter. The unit incorporates 30 integrated circuits of domestic manufacture. The controlling recorder and the channel recorder also perform the function of counters. Intervals between measurements are 12 to 600 seconds. The unit offers the advantage of reducing the periods of time needed for measurements, recording the results of measurements on magnetic tapes, and provides a typed output of the collected data. Measurements series which could not in the past be conducted because the time required was too long for the collection of data, can be made with the new measurement unit. The unit can also accommodate some changes in the subjects of measurements. Figures 2.

USSR

UDC 531.787.913.087.92

FILM STRAIN RESISTOR FOR TEMPERATURES TO 1000°C

Moscow PRIBORY I TEKHN. EKSPERIMENTA [Experimental Instruments and Equipment] in Russian No 2, 1976 pp 213-215

[From REFERATIVNYY ZHURNAL ELEKTRONIKA I YEYE PRIMENENIYE No 9, 1976 Abstract No 9B585 Author's Abstract]

GUSEV, YU. A., OLEYNIK, A. V., and ANIKIN, A. YA.

[Text] A description is presented of film strain resistors with an operating temperature to 1000°C which do not differ structurally from the wire or foil ones, and consisting of a binder layer on which a sensitive element-resistor is applied by one of the methods of obtaining conducting films.

USSR

UDC 621.382

EFFECT OF GEOMETRY OF A SMALL AREA CONTACT ON THE SENSITIVITY OF THERMO-ELECTRIC INDICATORS OF MICROWAVE RADIATION

Kiyev IZVESTIYA VUZOV SSSR: RADIOELEKTRONIKA in Russian Vol 19, No 11, 1977 pp 20-24 manuscript received 10 Feb 75

SVETLICHNYY, V. M., SATYUKOV, A. I., PLAKSIY, V. T., and KHILOV, V. P.

[Abstract] In the literature, during calculation of the sensitivity of thermoelectric indicators of microwave radiation with hot charge carriers, it is ordinarily assumed that the geometry of a small area contact, in the vicinity of which heating up of electron gas takes place, is close to hemispherical. An investigation of the characteristics of indicators in which the geometry of this contact is different from hemispherical lead to a reconsideration of the previously supported opinion that hemispherical geometry is optimum from the point of view of assuring maximum sensitivity. The problem of the effect of the geometry of a small area on the sensitivity is also of definite interest in the case of another type of indicator where the conventional thermoelectric effect in semimetals is used. In the present paper an analysis is made of the effect of the geometry of the small area contact of indicators of microwave radiation with hot carriers, and indicators with a metal-semimetal, on their sensitivity. It is shown that in devices with hot carriers a plane geometry of small area contacts is preferable, whereas in the case of devices on a base of a metal-semimetal contact the sensitivity weakly depends on the geometry of the latter. Figures 4; references: 6 Russian.

## REVERSIBLE IMPULSE COUNTERS BASED ON BLOCKING THYRISTORS WITH CATHODE LOAD

Kiyev IZVESTIYA VUZ:RADIOELEKTRONIKA in Russian Vol 19, No 12, Dec 76  
pp 80-82 manuscript received 2 Sep 75; after revision 3 Dec 75

SKARZHEPA, V. A., and MOROZOV, A. A.

[Abstract] It is shown in the literature that use of blocking thyristors (BT) in multicycle counters makes it possible to increase substantially the noise immunity and economy of digital scaling circuits. Use of counters based on BT in a reversible performance gives a still greater effect. As in the nonreversible version, reversible counters based on BF are fulfilled with one thyristor in discharge. An extension of the functional potentialities is attained by means of duplication of the carry circuit, including the passive elements in an overwhelming number of circuits. In contrast to reversible counter circuits based on triode thyristors for control of the direction of scaling of reversible circuits based on BT, methods are used, connected only with switching of the control circuit of the thyristors. Such methods are: switching of the timing bus of the forward and reverse scaling to a control circuit, use of controlled switches in carry circuits, and change of the switching of a timing bus. The first two methods are used for two-cycle counters, the third for three-cycle. The three methods are discussed and a circuit diagram of each is presented. The circuits considered were investigated under laboratory conditions on the base of KUL02Ye thyristors with a supply voltage of 120 V and a load current of 40 mA. The maximum frequency of operation of the counters amounted to 15 kHz. Figures 3; tables 1; references: 1 Russian.

Microelectronics, Integrated and Logic  
Circuits, General Circuit Theory and Information

HUNGARY

UDC 621.3.049.771.14:681.325.65

TECHNICAL AND ECONOMICAL ASPECTS OF HIGHLY COMPLEX INTEGRATED CIRCUITS AND  
MICROPROCESSORS

Budapest HIRADASTECHNIKA in Hungarian Vol 28, No 1, Jan 77 pp 1-12

KOVACS, MAGDOLNA, dr, and SAUFERT, JANOS, Research Institute for the  
Communications Engineering Industry

[Abstract] On the basis of references in the literature, the authors review the following subjects: interactions between the manufacture of electronic components and devices in the digital technology field; development of system engineering as reflected by the increase of the degree of integration; changing role of integrated circuits; the software versus hardware ratio; laws governing the development processes in digital technology, and calculation and presentation of the level-raising movements; digital devices built from highly complex circuits (microprocessor systems, the Motorola M6800 microprocessor system, the Intel 8080 microprocessor system; the micro-computer system; microprocessor families and fields of application); economic evaluation of the use of highly complex circuits (increasing the degree of integration from the device manufacturing point of view); technical and economic comparison of microprocessor devices made with conventional IC complement and with new microprocessors designed for the same function (comparative studies carried out in the US on the basis of Intel data, comparative calculations on the basis of domestic data, examination of the non-quantifiable factors); developments in the manufacture of LSI circuits and microprocessors; and domestic applications of microprocessor families. Figures 18, tables 8, references 26: 14 Hungarian and 12 Western.

## PROPAGATION OF SEQUENCE OF PULSES IN COMPLEX ELECTRICAL CIRCUITS

Kiyev IZVESTIYA VUZOV SSSR: RADIOELEKTRONIKA in Russian Vol 19, No 11, 1977  
pp 36-42 manuscript received 30 Jun 75

FARKHI, S. L., professor, TOE [expansion unknown] department (kafedra)  
of Sofia Higher Machine-Electrical Engineering Institute imeni V. I. Lenin,  
People's Republic of Bulgaria.

[Abstract] It is possible to conduct an investigation of transient and stationary processes in linear electrical circuits during propagation of a sequence of pulses with the aid of a discrete Laplace transform, or on the basis of the superposition principle and a Dyamel integral. However, during analysis of multi-dimensional cases it is better to use the method of variable states. In the present paper analytical dependences are presented for a multidimensional vector of variable states when the pulses have an identical form. An evaluation is made of the error from the above in the case of an approximate calculation of integrals in finite expressions. A table is presented of finite results for various forms of pulses. The transient processes during the distribution of bilateral width-modulated square-wave signals are investigated. Figures 1; tables 1; references 8: 5 Russian, 2 Bulgarian, 1 Western.

HUNGARY

UDC 519.876.5:621.3.011.71:621.3.004.6

LOCALIZATION OF SINGLE FAULTS IN LINEAR CIRCUITS

Budapest HIRADASTECHNIKA in Hungarian Vol 28, No 2, Feb 77 pp 33-41  
manuscript received 7 May 76

GEFFERTH, LASZLO, Institute of Communication-Technology Electronics,  
Budapest Technical University

[Abstract] A review is presented of methods based in various ways on the Bode bilinear expressions. Applications of the bilinear transformation are outlined; this approach utilizes the circle-maintaining property of the transformation. A special case of this approach may be used for resistance and reactant networks. An approach that may be used with advantage for multiple-gate structures is based on the relationship between differential and high-variability sensitivities. Two methods for fault simulation are discussed. One is the "classic" case of the fault dictionary; the other is the so-called voting method which establishes the faulty component on the basis of a special fault dictionary. The diagnostic methods described may be used for the localization of single faults in analog, linear, concentrated-parameter, and time-variant circuits. The new method described for preparing the fault dictionary utilizes the linear relationships and permits the variation of the parameter values of the circuit between zero and infinity. In the event that there are undistinguishable components, the methods described treat their totality as a single component, from which the offender must be identified by other means. Tables 6, figures 9, references 13: 2 Hungarian, 11 Western.

## CONVERSION ALGORITHM OF BRANCHES OF LINEAR ELECTRICAL CIRCUIT

Kiyev IZVESTIYA VUZOV SSSR: RADIOELEKTRONIKA in Russian Vol 19, No 11, 1977  
pp 61-68 manuscript received 31 Mar 75; after revision, 26 Jan 76

SHAKIROV, M. A.

[Abstract] The paper considers the principles of replacement in circuits, of z-branches by y-branches (and vice versa) and their use for calculation of linear electric circuits. A physical interpretation of certain numerical methods of algebra is obtained on the basis of transformation of electrical circuits by a conversion of their branches. It is shown that it is possible to place the procedures of Gaussian elimination used for calculation of determinants, reciprocal matrices and the solution of systems of linear equations, in accordance with a transformation, by the method of successive conversion of the branches of a specific form of an electrical z-circuit which consists of separate networks, not connected with one another conductively. Figures 2; tables 2; references: 3 Russian.

CZECHOSLOVAKIA

UDC 621.382.049.771 621.382.049.774.3

DESIGN OF ISOLATED DEVICE GROUPS OF INTEGRATED CIRCUITS

Prague SLABOPROUDY OBZOR in Czech Vol 37, No 5, May 76 pp 223-229

RIZEK, STANISLAV Institute of Radiotechnology and Electronics,  
Czechoslovak Academy of Sciences, Prague

[Abstract] The author describes a method for the determination of isolated groups of elements of bipolar monolithic circuits. Optimum distribution of elements within an integrated monolithic circuit into groups of elements is possible by means of epitaxial planar technique using an epitaxial layer of the n type. When an epitaxial layer of the p-type formed on an n-type substrate is used, it is enough to change the signs of the potential in all of the circuit connections, and interchange all of the diffusion functional regions of the n and p type. For the solution of these problems a computer program in the Fortran language was developed; it may be used to find quasi-optimum solutions. This ISOB program requires an input of several experimentally determined factors, which cannot be developed theoretically. An example describing distribution of elements in a low-frequency final amplifier is given. Figures 8: tables 10, references 4: 2 Czech, 2 Western.

CZECHOSLOVAKIA

EAST GERMAN LOGICAL INTEGRATED CIRCUITS

Prague SDELOVACI TECHNIKA in Czech Vol 24, No 1, Jan 76 pp 23-31

-pav- [Author's full name not given]

[Abstract] The highly developed East German electronic industry produces several series of TTL and MOS logical integrated circuits, which have no equivalents in Czechoslovak production. The TTL circuits are produced in three typical series: D10, E10, and D20. They correspond to the Texas Instrument series SN 74. The D types operate at temperatures of 0 to 70°C, the E types between -25 and +85°C. The D 122 C circuit equals the Texas Instruments SN 7522 circuit. D 146 equals the TI 7446, and D 147 equals the TI SN 7447 circuit. D 181 C equals the TI SN 7481 circuit. The D 191 C is equal to TI SN 7491. D 192 C and D 193 C replace the TI SN 74192 and 74193. The D 20 series corresponds to the TI series SN 74 H. D 491 D, and D 492 D correspond to the TI SN 75491 and 75492 circuits. The U 10 series corresponds to General Instruments' MEM 1000 series. U101D equals the MEM 1000, U102D - MEM 1002, U103D - MEM 1005, U104D - MEM 1008, U106D - MEM 1013, U107D - MEM 1014, U108D - MEM 1015, U109D - MEM 1022, U311D - MEM 3055PP, and U352D - MEM 3064B. U105D equals MEM 2001, SMY 50 equals MEM 511, SMY 51 corresponds to the MEM 550, and SMY 52 to the MEM 517. Figures 16, tables 8.

USSR

UDC 621.396.6.181.48

INTEGRATED CIRCUITS BASED ON MDS-TRANSISTORS

Leningrad IN-T POVYSH. KVALIFIK. RUKOVODYASHCHIKH RABOTNIKOV I SPETSIALISTOB SUDOSTROIT. PROMSTI [Institute of Advanced Qualifications for Leading Workers and Specialists of the Shipbuilding Industry] in Russian 1975, 26 pp, illustrations, 3 kopecks, printed in Rotaprint

[From REFERATIVNYY ZHURNAL ELEKTRONIKA I YEYE PRIMENENIYE No 9, 1976 Abstract No 9B466 by V. I. Brodskiy]

LASHEVSKIY, R. A.

[Text] Basic trends in modern microelectronics are considered. The mutual effect of the technological, circuit engineering and systems engineering steps in planning and design is emphasized. Special attention is given to integrated circuits based on MDS-transistors which are promising for construction of large integrated circuits. Problems of using the latter in automation devices are discussed.

SCATTERING OF ELECTROMAGNETIC WAVES ON ACOUSTIC FORMATIONS OF THE ATMOSPHERE  
IN THE FIELD OF A MOVING POINT SOUND SOURCE

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 12, 1976 pp 2623-2626  
manuscript received 6 Oct 75

KUZNETSOV, B. T.

[Abstract] The movement of a sonde or the wind with a stationary sonde leads to variation of the frequency of a sound wave as a result of the Doppler effect. In the general case the sound wave spectrum has a complex form even if the sound source is harmonic. The parameters of the standard radiowave on uniformities created by a moving source of sound differ from the parameters of the radiowaves scattered on nonuniformities from a stationary source which must be considered when creating MARLS (Meteorological Sonic Radar). A source is considered which moves uniformly and rectilinearly with low velocity, that is,  $\beta \ll 1$  where  $\beta = v_0/v$ ;  $v_0$  is the speed of the sound source,  $v$  is the speed of the sound in the atmosphere. From the expressions presented it follows that the resonances for the components of the scattered field are observed for different frequencies of the sounding signal, and the power flux densities for these components have different magnitude. When building the MARLS radar it is necessary to consider the speed of the sound source and in the case of a stationary source, the speed of the wind. For a point sound source in the radio and sound wave spectrum, components must be present that satisfy the expression obtained for the condition to be satisfied for resonant scattering of the radiowaves. Figures 1; references 8: 6 Russian, 2 Western.

USSR

UDC 621.315.592

DEFECT FORMATION IN SILICON AT INCREASED IRRADIATION TEMPERATURES

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 10, No 9, 1976  
pp 1670-1674 manuscript received 1 Mar 76

BOLOTOV, V. V.; VASHL'YEV, A. V.; and SMIRNOV, L. S., Institute of Semiconductor Physics, Siberian Department of the Academy of Sciences, USSR, Novosibirsk

[Abstract] A study is made of the variations in the concentration of the charge carriers (n,p) and the lifetime of the nonequilibrium charge carriers ( $\tau$ ) and n- and p-type silicon in the case of irradiation by electrons with an energy of 1.7 MeV in the temperature range of 20 to 600°C and subsequent annealing to  $\sim$ 600°C. The significant effect of the irradiation temperature on the rate of introduction of defect centers and the nature of the subsequent annealing is demonstrated. A variation in mobility in the p-type silicon irradiated at 600°C, an increase in the proportion of stable defects with an increase in the irradiation temperature, and a number of other effects were detected. An analogy is drawn with the behavior of germanium, and an explanation is presented for the results obtained considering the known complexes of the defects. The annealing stage of the recombination centers in the p-silicon ( $\sim$ 350°C) is difficult to relate to any known type of defect complexes. The types of complexes introduced by the irradiation at temperatures above 300 to 400°C also remain unknown. The decrease in mobility on irradiation in the 300 to 600°C range in p-silicon indicates that larger defects are introduced at high temperatures. Figures 4; references 23: 10 Russian, 13 Western.

USSR

UDC 621.315.592

GENERATION OF THE SECOND ACOUSTIC HARMONIC AND EXPLOSIVE INSTABILITY OF ACOUSTOELECTRONIC WAVES

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 10, No 9, 1976  
pp 1691-1695 manuscript received 27 Jul 75; in final editing, 12 Mar 76

KRASIL'NIK, Z. F., Gor'kiy Scientific-Research Radio Physics Institute

[Abstract] A discussion is presented of the conditions of excitation of the second acoustic harmonic in a piezoelectric semiconductor when a monochromatic pumping wave falls on the crystal. It is demonstrated that if the pumping intensity is sufficiently large so that for the length of the crystal the harmonic succeeds in growing to amplitudes comparable to the pumping

amplitude, the nonlinear increment of the harmonic increases, and the waves are amplified in an "explosive" manner. The relation is determined for the maximum nonlinear wave increment as a function of the pumping wave frequency and the supercriticality. Figures 2; references 10: 5 Russian, 5 Western.

USSR

UDC 621.382.002

MONITORING THE DEPTH OF OPENING OF EPITAXIAL STRUCTURES ON POLYCRYSTALLINE SUBSTRATES BY MICROWAVE MEANS

Moscow RADIOTEKHNIKA. RESP. MEZHVED. TEMAT. NAUCH.-TEKH. SB [Radio Engineering, Republic Interdepartmental Thematic Scientific-Technical Collection] in Russian No 38, 1976 pp 109-114

[From REFERATIVNYY ZHURNAL ELEKTRONIKA I YEYE PRIMENENIYE No 9, 1976 Abstract 9B832 Summary]

GORDNENKO, YU. YE.

[Text] The possibility of using the  $N_{012}$  resonator measuring converter to monitor the depth of opening of the epitaxial structures on polycrystalline substrates is substantiated theoretically and experimentally. The simplest form of conversion characteristic occurs on enlarging the substrate to a quarterwave. A matching dielectric transistor is used to control the inclusion of the specimen in the resonator. The theoretical principles were tested experimentally by measuring the depth of the opening during layer by layer removal of the structure from the specimen.

USSR

UDC 621.382.002

ION DOPING AS A METHOD OF PRODUCTION OF SEMICONDUCTOR DEVICES

Moscow V. SB. ELEKTRONIKA I YEYE PRIMENENIYE T. 7 (ITOGI NAUKI I TEKH. VINITI AN SSSR)(Electronics and Its Application -Collection of Works [Results of Science and Technology. All-Union Institute of Scientific and Technical Information, Academy of Sciences, USSR]) in Russian 1976 pp 5-49

[From REFERATIVNYY ZHURNAL ELEKTRONIKA I YEYE PRIMENENIYE No 9, 1976 Abstract No 9B618 by M. A. Kopolev]

INOZEMTSEV, S. A.

[Text] A detailed survey is presented with respect to the application of ion doping in semiconductor technology. The physico-technological

peculiarities of the process, the equipment for ion doping, and the use of ion doping for the production of specific semiconductor devices are considered. Figures 21; references 110.

USSR

UDC 621.382

DISCRETE CHARGE TRANSPORT IN DCC STRUCTURE WITH A LATENT CHANNEL

Moscow TR. MOSK. FIZ.-TEKHN. IN-TA. SER. RADIOTEKHN. I ELEKTRON. [Works of Moscow Physico-Technical Institute, Radio Engineering and Electronics Series] in Russian No 9, 1975 pp 109-117

[From REFERATIVNYY ZHURNAL ELEKTRONIKA I YEYE PRIMENENIYE No 9, 1976 Abstract No 9B460 by V. A. Skorikov]

POSPELOV, V. V.; FUKS, B. I.; and KHAFIZOV, R. Z.

[Text] On the basis of an ordinary model which permits evaluation of the potential distribution at the control electrode of a device with charged coupling with a latent channel, expressions are obtained, and procedures are developed for evaluating the concentration distribution of the impurity of the ion-doped p-channel on a substrate of n-silicon, and the relative losses of charge in the case of multiple pumping of the charge in both directions.

On the basis of the graphs of the relative charge losses, values of the voltages are obtained which correspond to the appearance of free electrons on the surface, shielding the surface potential barrier, and the beginning of their displacement over the surface, which amounted to +4 v and -1 v. These values permitted an evaluation of the density of the surface states equal to  $6 \times 10^{11} \text{ cm}^{-2}$ .

The experimental studies were performed on specimens with two control and two resolving electrodes with gaps between the electrodes of 1-2 microns with an oxide thickness of 1100 Angstroms. The thickness of the p-layer was 2 to 5 microns, the specific resistance of the substrate was 20 ohm-cm. The measurements were performed at a frequency of 20 kHz with an amplitude of the measured signal of 30 mv on a 1 kOhm load. Figures 4; references 4.

USSR

UDC 621.382.002

METHOD OF PRODUCING LARGE-AREA ALLOY DIODE STRUCTURE

Ryazan' V. SB. FIZ. POLUPROVODI. I MIKROELEKTRONIKA [Physics of Semiconductors and Microelectronics - Collection of Works] in Russian No 2, 1976 pp 115-118

[From REFERATIVNYY ZHURNAL ELEKTRONIKA I YEYE PRIMENENIYE No 9, 1976, Abstract 9B760 Summary]

SUROVTSEV, I. S.; STRYGIN, V. D.; GOL'DFARB, V. A.; and SYNOROV, V. F.

[Text] Experimental results are presented with respect to the production of high- and medium-power alloy rectifiers with preliminary sealing of the structure. The sealing was accomplished by the method of fusing the periphery of the structure in the field of the high-frequency inductor. This makes it possible to give up use of a clamping holder and furnaces with a special environment. Figures 3; references: 3.

USSR

UDC 621.382.002

HIGH TEMPERATURE CONTACTS ON P-TYPE SiC LAYERS

Novosibirsk V. SB. FIZ. I TEKHN. POLUPROVODNIKOV (Physics and Technics of Semiconductors - Collection of Works) in Russian 1976 pp 36-41

[From REFERATIVNYY ZHURNAL ELEKTRONIKA I YEYE PRIMENENIYE No 9, 1976 Abstract 9B712 Summary]

ZINOV'YEV, V. B.

[Text] The possibility is considered of producing temperature fused contacts in diffused and epitaxial layers of p-type silicon carbide from alloys based on gold with various doping impurities. It is shown that contacts made of Au + Al + Td (90 + 8 + 2 atomic percent) alloys produced at a temperature of 1120°C and a time of 30 seconds have the best properties. Figures 2; references 4.

TEST STAND FOR DETERMINING STATIC PARAMETERS OF SEMICONDUCTING DEVICES  
AND ERGONOMIC REQUIREMENTS ON ITS EXPLOITATION

Moscow PRIBOROSTROYENIYE. RESP. MEZHVED. NAUCH.-TEKHN. SB [Instrument  
Building-Republic Interdepartmental Scientific-Technical Collection] in  
Russian No 20, 1976 pp 82-86

[From REFERATIVNYY ZHURNAL ELEKTRONIKA I YEYE PRIMENENIYE No 9, 1976  
Abstract 9B846 Summary]

DUGANOV, G. V.; ANDREYEV, V. A.; POPOV, V. P.; CHALYY, M. V.; and  
CHMOVZH, V. V.

[Text] A description is presented of the structure of an industrial test stand for determining the static parameters of power semiconductor diodes and thyristors. A discussion is presented of the basic technical and ergonomic requirements which were considered during development of the test stand. The stand is intended for input monitoring of semiconductor devices at a section of the Department of Technical Control. Schematic diagrams of the basic modules of the stand are presented. Figures 3; references 4.

HUNGARY

UDC 546.681'19:621 373 51 029 64:621.382.2

GaAs-BASED GUNN DIODES FOR THE 7-10 GHz FREQUENCY RANGE

Budapest HIRADASTECHNIKA in Hungarian Vol 28, No 2, Feb 77 pp 42-49  
manuscript received 13 Jul 76

Mrs ANDRASI, ANDOR; BARNA, ARPAD; BARNA, B. PETER; BELEZNAY, FERENC;  
MOJZES, IMRE; PODOR, BALINT; SEBESTYEN, TIBOR; STARK, GYULA; SZENTPALI,  
BELA; and SZEP, IVAN, Research Institute of Technical Physics, Hungarian  
Academy of Sciences

[Abstract] In the first phase of its effort to develop GaAs-based Gunn diodes for the Hungarian electronics industry, the Research Institute of Technical Physics developed a method and equipment for the production of such diodes which provide at least 30 mW microwave output with an efficiency of 1 to 6 percent in the 7-10 GHz frequency band under continuous operation. The high-purity GaAs layer is grown epitaxially by means of the liquid-phase method. The contacting system is Au-Ge-Ni (88 percent by wt. Au + 12 percent by wt. Ge)+5-10%percent Ni; it is vapor-deposited under  $10^{-7}$  torr at a thickness of  $0.4 \mu$ . The diodes were characterized in terms of d.c. and low-frequency parameters, heat resistance, and high-frequency parameters, using test procedures and equipment developed for these purposes. The manufacturing technologies may be adapted to other GaAs-based semiconductor components. Trials of the diodes at the Research Institute of Telecommunications indicated that they are comparable in performance characteristics with diodes presently available on the market. Table 1; figures 12; references 24: 11 Hungarian, 2 German, 11 Western.

USSR

UDC 621.382.2

OCCURRENCE OF DC EMF AND CURRENT IN GUNN DIODES IN SUPERTHRESHOLD MICROWAVE FIELDS

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 10, No 9, 1976 pp 1647-1650 manuscript received 11 Nov 75; in final editing, 6 Jan 76

BARANOVSKIY, S. N.; KAZANTSEV, A. I.; and POGOREL'SKIY, A. M., Novosibirsk Electrical Engineering Institute

[Abstract] A description is presented of experiments to study the formation of DC emf and DC components of the current in Gunn diodes in strong microwave fields. For microwave voltages on the diode exceeding the threshold value for origin of the domain of a strong field, rectification of the microwave current by the diode takes place. Thus, whereas in a weak electric field of the volt-ampere characteristic of the diodes investigated is symmetric, in strong electric fields (above the threshold values) the volt-ampere characteristic becomes asymmetric. In order to explain the asymmetry of the volt-ampere characteristic leading to rectification of the microwave current and the occurrence of a constant emf on the diode (or a current in the closed network of the diode with respect to direct current), the effect is analyzed of the structure of the diode on the nature of its selfheating in the operating state. It is demonstrated that the selfheating and the temperature gradient occurring in this case in the direction from the anode to the cathode can lead to asymmetry of the volt-ampere characteristic of the diode and the appearance in the case of DC emf and current. Figures 2; references 9: 5 Russian, 4 Western.

USSR

UDC 621.382.3

PECULIARITIES OF THE TRANSMISSION OF A CURRENT AND THE PARAMETERS OF THE BAND DIAGRAM OF  $\text{Cu}_{2-x}\text{S}$ -CdS HETEROJUNCTIONS

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 10, No 9, 1976 pp 1745-1747 manuscript received 21 Oct 75

PAVELETS, S. YU.; and FEDORUS, G. A., Institute of Semiconductors, Academy of Sciences, Ukr SSR

[Abstract] The experimental demonstration of the existence of a discontinuity in the conductivity bands  $\Delta E_c$  on the  $\text{Cu}_{2-x}\text{S}$ -CdS heterojunction which limits the emission of the electrons from the CdS to the  $\text{Cu}_{2-x}\text{S}$  was previously presented by the authors. The magnitude of  $\Delta E_c$  for the heterojunctions investigated turned out to be 0.12 to 0.15 eV which corresponds to  $E_g = 0.9$  eV. It is known that for the most narrow-band phase of copper sulfide  $\text{Cu}_2\text{S}$ , in addition to the indicated value of  $E_g$ , values of 1.08 and

1.2 eV are presented in the literature. This difference in the published data can be connected with the fact that they are obtained on layers grown by different methods. In order to discover the correctness of this proposition and also to study the peculiarities of the transmission of the current as a function of the composition of  $\text{Cu}_{2-x}\text{S}$ , a study was made of  $\text{Cu}_{2-x}\text{S}-\text{CdS}$  heterojunctions obtained by several technological methods. When determining the parameters of the band diagram of the  $\text{Cu}_{2-x}\text{S}-\text{CdS}$  heterojunction, a method of analyzing the volt-ampere characteristics was used for realizing the thermal emission mechanism of the current transmission. An analysis of the volt-ampere characteristics when realizing the thermal emission (TE) and emission recombination (ER) mechanisms offers the possibility of determining the basic parameters of the band diagrams of the  $\text{Cu}_{2-x}\text{S}-\text{CdS}$  heterojunction and an evaluation of the width of the forbidden band of the  $\text{Cu}_{2-x}\text{S}$  for the heterojunction obtained by various versions of the vacuum method. For the chemical method of obtaining a  $\text{Cu}_{2-x}\text{S}-\text{CdS}$  heterojunction, even with maximum high temperatures (to 420°K), the tunnel currents predominate. In this experiment  $\text{Cu}_{2-x}\text{S}$  phases were observed with forbidden band widths of 0.9, 1.08 and 1.2 eV. Figures 3, references 5: 4 Russian, 1 Western.

USSR

UDC 621.382.3.016.22

#### LIMITING POWER DISSIPATED BY A TRANSISTOR IN A PERIODIC REGIME

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian 1976 pp 2645-2646 manuscript received 8 Oct 75

KERNER, B. S.; and SINKEVICH, V. F.

[Abstract] In a number of cases the density of the limiting mean power dissipated by a transistor  $P_{lim}$  on a variable signal can significantly exceed  $P_{lim}$  in a static regime. The possibility of a significant decrease in  $P_{lim}$  on a variable signal by comparison with the static regime is indicated in the present paper. This situation is realized when, for example, the collector current and voltage vary with time in opposite phase so that for a relatively large average collector current, the transistor for a significant part of the period is in the most stable state with relatively small current and high voltage from the point of view of pinching of the current. In the periodic signal regime with a period appreciably less than the characteristic relaxation time of the temperature, the limiting power dissipated by the transistor  $P_{lim}$  for which the transverse thermal instability occurs varies significantly depending on the temporary form of the collector

current and voltage in the phase ratio between them, i.e., it is determined by the parameters of the external circuit; here  $\bar{P}_{lim}$  can be both greater than and essentially smaller than  $P_{lim}$  in the static regime. The least values of the limiting power dissipated by the transistor  $\bar{P}_{lim}$  must be expected in the regimes in which the basic part of the power is generated in the transistor at points in time when the voltage is large. This situation is possible, for example, in linear amplifiers, for self-excitation of the transistor or mismatch of the transistor with load. The authors thank V. L. Aronov and N. S. Mostovlyanovsiy for helpful discussions of the work. References: 4 Russian.

USSR

UDC 621.382.032.273

STUDY OF THE SECONDARY EMISSION OF EMITTERS BASED ON ALKALI HALIDE COMPOUNDS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 12, 1976 pp 2574-2577  
manuscript received 17 Sep 75

YASNOPOL'SKIY, N. L.; and SHABEL'NIKOVA, A.E.

[Abstract] Emitters with the largest values of the secondary emission factor  $\sigma$  for streaming ( $\sigma_{max} = 11 - 13$  for a primary electron energy  $E_p = 3.6-4$  keV) differing sharply from the value of  $\sigma$  for reflection ( $\sigma_{max} = 20$  for  $E_p = 2.4$  keV) were obtained on CsCl layers (with large density  $\rho$  and large magnitude of the effective atomic number  $z_{eff}$ ). Emitters were obtained on LiF layers (with small  $\rho$  and  $z_{eff}$ ) with approximately identical magnitude of  $\sigma_{max}$  for streaming 5.5-6.8 with  $E_p = 2.5-3.5$  keV and  $\sigma_{max}$  for reflection 6.3-7.2 for  $E_p = 0.7-1$  keV. The optimum thickness of the layers and  $E_p$  corresponding to the largest  $\sigma$  for streaming are determined. The correlation is established between the thickness of the layer corresponding to the maximum  $\sigma$  for the given energy  $E_p$  of the primary electrons and the magnitude of their transverse streaming as a function of  $E_p$ . Figures 4; References: 3 Russian.

USSR

UDC 621.382.323

MONOLITHIC INTEGRATED PAIR OF FIELD-EFFECT TRANSISTORS WITH CONTROLLING P-N JUNCTION

Kiyev IZVESTIYA VUZ: RADIOELEKTRONIKA in Russian Vol 19, No 12, Dec 76  
pp 75-77 manuscript received 28 Aug 75; after completion, 18 Nov 75

VORONOV, S. A., KOZLOV, YU. G., and OZHOGIN, M. A.

[Abstract] This short communication considers the principal stages of production of a monolithic integrated pair of field-effect transistors with a controlling p-n junction. The basic parameters of the devices obtained are presented. Eight integrated pairs of field-effect transistors were investigated, and on the basis of these investigations it is concluded that the spread of the currents of the drain for the transistors of one pair amounts to not more than 10 percent, the spread of the steepness - 3 percent, and the unbalance of the voltages of cutoff  $\Delta U_0 = 20-100$  mV. Production and approval of an integrated pair of field-effect transistors with a controlling p-n junction was successfully attained as the result of use of ion implantation which made it possible with high reproducibility to obtain homogeneous low-doped layers of a semiconductor. Certain deficiencies mentioned in the communication are not so serious as to hinder further growth of such devices. Figures 1; tables 2; references: 3 Russian.

USSR

UDC 621.396.6-181.48

STUDY OF THE PROPERTIES OF FILM RESISTORS BASED ON METAL-DIELECTRIC MIXTURES FOR HIGH TEMPERATURE INTEGRATED CIRCUITS

Ryazan' V. SB. FIZ. POLUPROVODN. I MIKROELEKTRONIKA [Physics of Semiconductors and Microelectronics - Collection of Works] in Russian No 2, 1976 pp 91-95

[From REFERATIVNYY ZHURNAL ELEKTRONIKA I YEYE PRIMENENIYE No 9, 1976  
Abstract 9B829 Summary]

YEPANESHNIKOVA, I. K.

[Text] A study is made of resistive films obtained with thermal decomposition of metallo-organic compounds. The method makes it possible to vary the surface resistance of the films within a broad range. The thermal coefficient of resistance of the resistors is  $(10^{-3}$  to  $10^{-4}) \text{ deg}^{-1}$  in the temperature range of 25-400°C. Figures 3; references 11.

## Theoretical Aspects

CZECHOSLOVAKIA

UDC 537.523.4

### MODELLING OF A LONG SPARK AT A SWITCHING SURGE

Prague ELEKTROTECHNICKY OBZOR in Czech Vol 65, No 9, Sep 76 pp 525-527

VEVERKA, ANTONIN, Member of Academy

[Abstract] Formation of a discharge at a switching surge between a rod and a plate in a flash-over distance over one meter comprises a streamer zone and a leader. The streamers are connected to the rod. When current density in a streamer reaches a critical value the streamer is converted to a leader. The distance between the electrodes is bridged, and a flash over takes place. The voltage drop in the leader is small because of the high conductivity of its path due to thermal ionization. The momentary voltage of the switching surge between the electrodes does not change. The capacitance of the leader is that of a vertical rod in relation to the plate. Development of a leader may be modelled by a sliding arrangement with insulation of a constant thickness. Calculation of the capacitance of the stem is demonstrated. Figures 2; tables 1; references: 2 Western.

HUNGARY

### USE OF MACROPHYSICAL AND ELECTRON-OPTICAL STUDIES IN THE FIELD OF LOW-VOLTAGE SWITCHING COMPONENTS

Budapest BHG ORION TRT MUSZAKI KOZLEMENYEK in Hungarian Vol 22, No 5, 1976 pp 193-197

Mrs DEKANY, LASZLO, dr, graduate chemical engineer, candidate of technical sciences, chief engineer, GYVO [expansion unknown] at BHG [Beloianisz Communication-Technological Factory]

[Abstract] This article is the text of the author's lecture delivered at the Department of Electrical Engineering at Mejo University in Nagoya, Japan, on 4 September 1976. Macrophysical and scanning electron-microscopical studies were carried out to evaluate the validity of the assumption that there exists a so-called physico-chemical contact site. This site is assumed to surround the actual purely electrical contact area and moves with it in each switching operation within the mechanical contact region. Samples were tested with clean, oxide-containing, sulfide-containing, and silicone-contaminated contacts. There was evidence for the existence of the physico-chemical contact site, although at the magnifications used it could not be photographed. It was also established that the frittling voltage is affected by the physico-chemical state of the surface and that this voltage is increased by a silicon dioxide layer. The existence was confirmed in conditions up to 60 V, 50 mA, 0.5N, and up to eight switchings. Figures 10.

Components and Circuit Elements Including  
Waveguides and Cavity Resonators

POLAND

UDC 621.3.049.75:621.039.8

A UNIT FOR ISOTOPIC QUALITY INSPECTION OF PRINTED CIRCUIT TRACKS DESCRIBED

Warsaw POMIARY AUTOMATYKA KONTROLA in Polish Vol 23, No 1, Jan 77 pp 21-22

SEKOWSKI, STEFAN, m.a.; Institute of Precision Engineering, Warsaw

[Abstract] The switch to printed circuitry in modern electronics industry caused Poland to produce at present about 200,000 m<sup>2</sup> of printed circuits annually and by 1978 production will increase to about 500,000 m<sup>2</sup>. Consequently, inspection of the quality of coatings on printed circuit tracks has become of great importance and urgency. The Institute of Precision Engineering has developed a method of measurement and then designed and manufactured a series of BLS units for a rapid and nondestructive investigation of the thickness and quality of coatings on printed circuit tracks. The article describes a BLS unit permitting direct observation of the measurement field and discusses its metrological characteristics. Figures 3; references 9: 5 Polish, 4 Western.

## ACTIVE FILTERS WITH LOW Q-SENSITIVITY

Kiyev IZVESTIYA VUZ:RADIOELEKTRONIKA in Russian Vol 19, No 12, Dec 76  
pp 59-65 manuscript received 17 Mar 75; after revision, 14 May 76

PLESHKO, A. D.

[Abstract] At present, one of the most pressing problems in the theory of active filters is the problem of developing filters with low Q-sensitivity of the poles  $Q_p$  or null  $Q_n$  of their transfer function. Several circuits with low (or null) Q-sensitivity are known from the literature. The principal shortcoming of these circuits lies in the fact that for their realization a controlled source (current or voltage) with a very large amplification factor  $K$  is required. It is possible to show that for  $Q_p \geq 1$ , the value  $K \sim Q_p^2$  is necessary. Consequently, the above circuits are difficult to realize in practice. As a result of the large amplification factor, such filters also have a small frequency range. In order to avoid use of a controlled source with a high  $K$  in a circuit, realization of a biquadrate section on the base of a 3rd-order filter has been proposed in the literature, in the transfer function of which null is reduced with the pole. The method of synthesis of such a section is based on optimum expansion of a polynomial of the 3rd order into the sum of two polynomials with real roots. The present work considers a method of expansion of a polynomial of the numerator or denominator of a transfer function of a 3rd-order filter, assuring null Q-sensitivity of a pair of complex-conjugate roots of a polynomial for a variation of some element of the circuit. Circuits of active rejector and band-pass filters are realized on the basis of imaginary phantom nulls. Consequently, the Q-sensitivity of the poles to a change of the amplification factor does not exceed unity. The principal shortcoming of circuits, achieved on the basis of the method of phantom nulls, as compared with circuits of analog simulation and circuits of the second order based on a negative controlled source, is the high Q-sensitivity to passive elements. The method considered in the present work makes it possible substantially to reduce the sensitivity of circuits constructed in accordance with the method of phantom nulls. In particular, it is possible to achieve a very low Q-sensitivity to all capacitances, which is particularly important for hybrid-film technology. It is possible to use such circuits for operation in the high-frequency field where circuits of analog simulation are difficult to apply because of the frequency limits of operational amplifiers. Figures 2; references 7: 1 Russian, 6 Western.

USSR

UDC 621.372.54

### ACTIVE REJECTOR FILTERS WITH PIEZOELECTRIC RESONATORS

Moscow ELEKTROSVYAZ' in Russian No 1, Jan 77 pp 68-72 manuscript received 29 Jun 76

ZELYAKH, E. V. and NOVIKOV, A. A.

[Abstract] This article studies a method of construction of active rejector piezoelectric filters and a method of calculation of their characteristics. The filters are based on an active RC circuit with a transmission factor which is independent of frequency. By replacing the capacitance in the circuit with a piezoelectric resonator, the desired frequency characteristic can be achieved with a narrow delay band. As an example, a filter was planned to satisfy the following requirements: effective transmission band 30,000 Hz to 59,750 Hz and 60,050 Hz to 150 KHz; effective stop band  $59,900 \pm 1$  Hz;  $\Delta a = 0.1$  db;  $a_{\min} = 17$  db;  $a_0 = 0$ . Frequency characteristic of attenuation of transmission of the filter is presented. Figures 4; tables 2; references: 1 Russian.

USSR

UDC 621.372.542

### LOW-PASS FILTERS FOR MEASURING TRANSDUCERS

Kiyev IZVESTIYA VUZOV SSSR: RADIOELEKTRONIKA in Russian Vol 19, No 11, 1977 pp 77-82 manuscript received 1 Apr 74; after revision, 16 Mar 76

SOKOLOVA, N. A. and TSYVINSKIY, V. G.

[Abstract] The presence of a priori information concerning filterable signals is characteristic for measuring transducers. The selection of slowly changing (steady) components can serve as an example when the form of the amplitude-frequency characteristic within the transmission band does not play an important role and the speed of response of the filter (settling time of steady components at its output) acquires the paramount value. The present work is devoted to an analysis of low-pass filters and a search for optimum polynomial filters which are considered with respect to a combination of two characteristics: settling time and cut-off frequency. It is shown that the optimum is a filter which is described by a polynomial with multiple roots. Of all polynomial filters considered they are closest to the theoretical limit--the bell filter. For values of errors less than one percent, a filter with a  $\Pi$ -shaped frequency characteristic is considerably worse than filters with multiple roots. In addition "ladder" filters are considered as the simplest in achievement. For "ladder" filters an increase

of the number of sections makes it possible to decrease the error of the filter to some limit which is determined by a line with distributed parameters and exceeds the error of an "uncoupled" filter of the second order. Some realizations of filters with multiple roots on operational amplifiers are proposed. Figures 3; references: 3 Russian.

EAST GERMANY

THE USE OF THE FAST WALSH TRANSFORMATION FOR FILTER CALCULATIONS

East Berlin MESSEN STEUERN REGELN in German Vol 20, No 1, Jan 77 pp 15-16

WERZ, J., dr of engineering, Institute of Control Engineering, EAW [Electrical Apparatus Factory] State Enterprise, East Berlin

[Abstract] Because of the similarities that exist between fast Fourier and Walsh transformations, the method described by the author in Vol 19, No 12, 1976 pp 412-413 of this journal may be used for increasing the efficiency of various filter calculations by using fast Walsh transformations. At least insofar as mathematical considerations are concerned, frequency filters based on the Walsh functions, usually called sequence systems, are equivalent to the "standard" frequency filters; e.g., terms such as low-pass, band-pass, high-pass, and the like are defined as for the sequence systems. In the calculations, the problems encountered are similar to those encountered with linear, stationary systems. Accordingly, the author appropriately generalizes the results reported in the paper cited above. The method developed reduces significantly the number of the arithmetic operations required for the calculation of sequence low-pass filters. By generalizing the discrete variant of the shift theorem, more effective calculations may also be made of sequential high- and band-pass filters, especially if a digital computer is available for the calculations. References 4: 3 German, 1 Western.

## MAXIMUM PERMISSIBLE TRANSMISSION COEFFICIENT OF WAVEGUIDE CHANNEL

Kiyev INZVESTIYA VUZOV SSSR: RADIOELEKTRONIKA in Russian Vol 19, No 11, 1977  
pp 47-50 manuscript received 8 Dec 74; after revision, 18 Nov 75

VOROPAYEV, YU. P.

[Abstract] The energy properties of an actual waveguide channel are considered. It is assumed that the quadripole is described by the well-known wave matrices of dissipation  $S$  and transmission  $T$ . The resultant active powers  $P_1$  and  $P_2$  respectively are at the left (input) and right (output) arms of the quadripole. A relation is determined for the maximum permissible transmission coefficient of a quadripole with respect to power where the matrix is a characteristic transmission matrix. It is shown that an arbitrary dissipative quadripole assures transmission of maximum power only if it is completely matched with respect to input and output. Complete matching of a dissipative quadripole can be attained with the aid of a matching quadripole which is simultaneously placed at the input and output. The maximum possible transmission coefficients do not depend on the fact that there are matching quadripoles, or that there are not, and only the latter realize these limiting coefficients. All the nondissipative quadripoles are equivalent in the sense that they have a maximum permissible transmission coefficient equal to 1; knowledge of the maximum permissible transmission coefficient makes it possible to judge to what extent a specific waveguide channel is optimum as well as the advisability of optimizing these parameters with the aid of an exterior matching device. The results obtained can be a natural way of extending the case of multichannel waveguide circuits with an identical number of inputs and outputs. Figures 3; references: 3 Russian.

USSR

UDC 621.372.81.09

METHOD OF VARIATION OF CONSTANTS IN THE PROBLEM OF WAVEGUIDE EXCITATION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 12, 1976 pp 2615-2617 manuscript received 19 Apr 76

FEL'D, Ya. N.

[Abstract] A study is made in order to show that the Lagrange constant variation method known from the theory of ordinary differential equations can be extended to boundary problems for partial differential equations. This is done, using Maxwell equations as an example, when considering the problem of the excitation of a waveguide of arbitrary cross section by given side electric currents  $I$  and magnetic currents  $I^u$  distributed in some region of the waveguide between the cross sections  $z = z_1$  and  $z = z_2$ .  
References: 4 Russian.

USSR

UDC 621.372.81.09

RADIATION FROM AN OPEN-ENDED PLANE WAVEGUIDE WITH DIELECTRIC FILLING

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 12, 1976 pp 2608-2614 manuscript received 29 Sep 76

VOSKRESENSKIY, G. V. and ZHURAV, S. M.

[Abstract] A study is made of the problem of radiation from the open end of a plane waveguide and a plane waveguide with flange, filled with a uniform dielectric. The solution technique which is based on joining of the fields in the aperture plane of the waveguide and reduction of the functional equations of the Wiener-Hopf type to a system of linear equations, is analogous to the one previously used to investigate the problem of radiation from an empty waveguide with a flange. Some of the numerical results agree well with those presented previously where the generalized remainder method was used to calculate the coefficient of reflection of the basic wave from the aperture of a plane waveguide with a flange with partial filling of the structure with a dielectric. Figures 7; references 4: 3 Russian, 1 Western.

USSR

UDC 621.372.852.024

CALCULATION OF SPECTRUM OF CONTINUOUS WAVEGUIDE PHASE SHIFTER

Kiyev IZVESTIYA VUSOV SSSR:RADIOELEKTRONIKA in Russian Vol 19, No 11, 1977  
pp 96-98 manuscript received 9 Jul 75

MAKARENKO, A. S. and STEPANENKO, P. YA.

[Abstract] Continuous waveguide polarization phase shifters are widely used in microwave technics as a device for frequency shifting. An analysis of the spectrum of such a device is considered in a number of works in the literature but they only take account of one or two factors. The present short communication calculates the spectrum at the output of the device for frequency shifting, with the effect of all factors considered simultaneously. Graphs are shown of the results of the calculation, where the dependences of the level of the effective, carrier and image components of the output signal on the phase error of identical sections are presented. Figures 1; references: 5 Russian.

USSR

UDC 621.372.852.4

TRANSFORMATION OF POLARIZATION PLANE OF ELECTROMAGNETIC WAVE IN A WAVEGUIDE WITH THE AID OF A SYSTEM OF TWO COUPLED LOOPS

Kiyev IZVESTIYA VUSOV SSSR:RADIOELEKTRONIKA in Russian Vol 19, No 11, 1977  
pp 122-124 manuscript received 19 May 75

ORLOV, V. YE.

[Abstract] It has been shown in the literature that the use of loop communication units together with semiconductor microwave diodes makes it possible to improve their output characteristics significantly. However, two loops coupled between themselves, commensurable with the wavelength as an independent microwave waveguide system, has not been previously investigated. The present brief communication considers the possibility of transformation of the polarization plane of a microwave with the aid of the above-mentioned system, which in comparison with known designs of polarization transformers has considerably smaller dimensions and weight, which is particularly important during use of waveguide units in airborne equipment. Figures 2; references 5: 4 Russian, 1 Western.

USSR

UDC 621.372.825.09

PROBLEM OF WAVE DISPERSION IN PERIODIC WAVEGUIDES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 12, 1976 pp 2466-2472 manuscript received 30 Sep 75

KOROZA, V. I. and SUKHOVSKIY, YE. S.

[Abstract] A study is made of the wave dispersion in corrugated waveguides near the long-wave boundary of the lower pass band with the losses in the metal and in the medium taken into consideration. The formulas were obtained in explicit form for the complex propagation constant. A study is made of the effect of the losses on the wave dispersion and their damping. The calculation results are compared with published data. An axially symmetric waveguide irregular along the z-axis was used, on the surface of which ( $r = r(z)$ ) the Leontovich boundary condition is satisfied. The field is found in the form of the expansion in each transverse cross section of the waveguide with respect to some base system of functions. Consideration of the wave damping essentially changes the form of the dispersion curve near the critical frequency. The formulas presented define more precisely the qualitatively conclusions of A. L. Kosogor, et al [IZV. VUZOV MVSSO SSSR (Radioelektronika), Vol 15, No 1, 1972, p 59], obtained in an approximation of the method of equivalent quadrupoles. In particular, on the occurrence of damping, the concepts of passbands and blocking and the concept of the cutoff frequencies connected with them lose their precise significance. Figures 1; tables 4; references: 6 Russian.

USSR

UDC 621.372.832.8

MICROSTRIP K-BAND Y-CIRCULATOR

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 12, 1976 pp 2479-2481 manuscript received 29 Nov 75

MOSOYAN, K. S.; OGANESYAN, L. G.; and PETROSYAN, O. B.

[Abstract] The results are presented of an experimental investigation of the transitions and the decoupling devices of the K-band which have small losses and a wide passband, a wide-band waveguide microstrip junction, a microstrip circulator and a valve [ventil'] based on sapphire and ferrite substrates for the K-wave band. The following parameters are obtained: for the junction the voltage standing wave ratio  $\leq 1.15$  in a band of 15 percent; losses  $\sim 0.1$  decibels. The direct losses of the circulator are 0.5 decibels, the decoupling  $\sim 22$  decibels in the band. With respect to a level of the voltage

standing wave ratio  $\leq 1.2$  the circulator and valve have a 10 percent band. The developed wideband microstrip Y-circulators, valves and junctions can be used successfully in low-noise integrated microwave receivers. Figures 2; tables 1; references 7: 3 Russian, 4 Western.

CZECHOSLOVAKIA

MOVABLE RECORDER WITH INTEGRATED CIRCUITS MH 7474, MZK 105, and MZH 115

Prague SDELOVACI TECHNIKA in Czech Vol 24, No 10, Oct 76 p 388

TANISTRA, JIRI

[Abstract] A movable series recorder can be designed using a double bistable flip-flop circuit D, for instance of the type MH 7474. This integrated circuit samples the input conditions. The information input should have a time advance of at least 20 nsec against the hourly impulse. The shape and the length of the clock zero, and also the adjustment impulses must be controlled closely. A classical monostable circuit which is used in generation of impulses is subject to an easy interference during its start-up operation. The monostable flip-flop circuit MZK 105 is much more reliable. It is a monolithic integrated circuit of the DTL type, which is resistant to interference. Circuits of this type are provided with outside capacitors which increase their resistance to interference. The MZK 105 circuit may be used to generate impulses, and to shorten or lengthen input impulses. Figures 2.

CZECHOSLOVAKIA

DESIGN OF FAST VARIABLE FREQUENCY DIVIDERS CONSISTING OF INTEGRATED CIRCUITS DEVELOPED FOR FUTURE APPLICATIONS

Prague SDELOVACI TECHNIKA in Czech Vol 24, No 10, Oct 76 pp 365-370

FADRHONS, JAN

[Abstract] There is a need for the production of digital frequency synthesizers in Czechoslovakia. Variable dividers which would be fast enough for modern requirements are not produced in Czechoslovakia or any other Comecon country. The fastest available dividers with 10 and 11 modules are those of the British firm Plessey; they are ECL MSI type SP 8685 models operating at 500 MHz. Flip-flop circuits from the series Low Power Schottky 74LS with CMOS MM 74C192 counters are used for operations around 15 MHz. The new LSI circuits developed for portable radio transmitters show very low power consumption. The Hughes HCTR 0320 uses 5 mW in a 5 V circuit operating at up to 5 MHz. In a 12 V circuit it operates at up to 10 MHz. There is a great demand for fast variable LSI dividers for use in module controls through a common address and data collection system supplied directly from the microprocessor. Design of suitable software systems for control arithmetics for

a more complex digital synthesizer would lead to reduction in the size of equipment and in power consumption. In future, distance control of synthesizers will become possible. The firm Nitron offers a new LSI circuit (NC 6401) used for synthesizers in CB radio equipment which is provided with a phase detector for the control of the module of a fast divider. NiCd batteries are used for power supply. Figures 6, tables 1, references: 14 Czech.

CZECHOSLOVAKIA

UDC 621.377.63

EQUIPMENT, MANUFACTURE AND PROPERTIES OF MEMORY WIRES FOR NON-DESTRUCTIVE MEMORIES

Prague SLABOPROUDY OBZOR in Czech Vol 37, No 12, Dec 76 pp 583-588

FAKTOR, ZDENEK; MUNZ, VLADIMIR, Research Institute for Telecommunications, Prague

[Abstract] Results obtained during the manufacture of memory wires at the Blatna Works of TESLA, Lanskroun are described. The wires are used in the manufacture of NDRO memories which find applications in computers, telecommunications, automation techniques, and in military installations. The advantages of these memories are a long period of stability of the non-destructively read information for periods of tens of years, temperature stability, units with memory capacities exceeding  $10^5$  bytes, and densities exceeding 100 bytes per square centimeter. The stability for periods extending over long years is far in excess of that obtained with ferrite and semiconductor memories. The basic wire on which magnetic layers are deposited in the plating lines is made of CuBe<sub>2</sub>. This wire is cold drawn and annealed. The first steps in the plating line are polishing of the wire, removal of oil, and annealing. Wires made of AgCu and CuSn were also used successfully. Wires made of tungsten could be produced with a diameter of 0.050 mm; studies of this material are continuing. Polishing of the CuBe wire is conducted in a solution of phosphoric and chromic acids. The hard and soft magnetic layers are formed of 50Ni, 49Co, 1Fe, and 81 Ni, 19 Fe respectively. The individual magnetic layers are 0.7 to 1 micrometer thick. Changes in the thicknesses of the layers affect the characteristics of memory recordings. Figures 6, tables 1, references 7: 3 Czech, 4 Western.

CZECHOSLOVAKIA

APPLICATIONS OF STATIC MEMORY MOS RAM TYPE 1101

Prague SDELOVACI TECHNIKA in Czech Vol 24, No 3, Mar 76 pp 87-90  
BUDINSKY, JAROSLAV

[Abstract] The static semiconductor memory MOS RAM type 1101 may be used in the design of relatively simple memory systems. The  $\overline{CS}$  input of chip selection and the possibility of parallel connections of corresponding output data  $\overline{DO}$  and  $\overline{D\overline{O}}$  make an easy and simple design of the organization of the memory plane possible for any required byte capacity of a limited extent. Memory capacity may be increased by the use of additional identical addressed planes, and additional addressed bytes for the decoding of the required plane. A simple analysis of operational data shows that a substantial reduction of power input may be achieved in the static power consumption when an impulse power supply is used. Figures 9, references 3: 1 Czech, 2 Western.

USSR

UDC 681.325.3

ACCURACY OF ANGLE-CODE CONVERTER ON A BASE OF A ROTARY TRANSFORMER

Kiyev IZVESTIYA VUZOV SSSR:RADIOELEKTRONIKA in Russian Vol 19, No 11, 1977  
pp 115-118 manuscript received 23 Jun 75; after revision, 4 Mar 76

LAVRINCHUK, V. M., and KHORUNZHIY, A. I.

[Abstract] This brief communication considers the circuit of an angle-code converter, with direct conversion of the signals of a sine-cosine rotary transformer, and analyzes its errors and the possibility of their reduction. It is shown that the error of a function generator is practically eliminated in the case of the use of a discrete function generator in the composition of an autonomous angle-code converter or with the assistance of an electronic digital computer. The latter variation is advisable in systems including an electronic digital computer, and only in the case when an increase of the holding time of the interrogation does not lead to a worsening of the system characteristics. Figures 2; references: 3 Russian.

USSR

UDC 621.382.82:681.3

METHODS OF ADJUSTMENT OF THE VALUES OF COORDINATES MEASURED BY MEANS OF A COORDINATE READING MACHINE

Moscow MIKROELEKTRONIKA:SBORNIK STATEY in Russian No 9, 1976 pp 248-252

OGANES'YANTS, L. G. and SHCHEMELININ, V. M.

[Abstract] A study is made of the problem of adjusting the values of coordinates of LIC topology points measured by means of an automatic type EM-709 coordinate reading machine. The task of adjustment is formulated as a problem of reverse interpolation of a function of two variables. Formulas are produced for both linear and nonlinear adjustment. The two methods of adjustment can be easily included in an overall system for production and processing of information concerning circuit topology.

## METHOD OF MULTICHANNEL PROCESSING OF SIMPLEX CODES

Kiyev IZVESTIYA VUZ:RADIOELEKTRONIKA in Russian, Vol 19, No 12, Dec 76, pp 89-90 manuscript received 9 Jun 75; after revision, 5 Feb 76

LOSEV, V. V., and DVORNIKOV, V. D.

[Abstract] It is shown in the literature that a device for reception of simplex codes of a length  $N = 2^n - 1$ , which are generated by a  $n$ -order shift register, is a multichannel correlation receiver, the formal nature of operation of which involves multiplication from the left of the vector of the received signal  $X[x_0, x_1, \dots, x_{n-1}]$  in the matrix-circulant  $S$ , and determination of the components of the product which have a maximum magnitude. The lines of the matrix  $S$  are all cyclic permutations of one code word in which a substitution of the symbols  $0 \rightarrow 1, 1 \rightarrow -1$  is produced. For achievement of such a multiplication it is necessary to perform  $(N-1)N \approx N^2$  operations for addition of two real numbers. The large volume of calculations leads to complication of the equipment, by virtue of which the multichannel circuit is used rarely and for large values of  $N$ . It is known that in the case of a multiplication of the vector in a matrix of special form, in particular in an Adamar matrix, it is possible to reduce the volume of calculations significantly because of factorization of the matrix. Multiplication algorithms obtained during this are called "fast" transforms. Direct use of algorithms of "fast" transforms during reception of simplex code is impossible because the matrix-circulant  $S$  is not an Adamar matrix. In the present short communication it is shown that by permutation of lines and columns the matrix  $S$  can be transformed into a form permitting use of algorithms of "fast" transform. A technical realization of the correlator contains the following blocks: block for permutation of input data in accordance with a matrix  $Q$ , block for "fast" transform, block for permutation of output data in accordance with matrix  $P$ , and a block for choice of the maximum value. The number of necessary calculating operations is equal to  $\approx N \log_2 N$ . If words of the code are normalized in order of the increase of the information part, then the necessity for permutation of the output data is eliminated. References: 3 Russian.

PROGRAMMING SYSTEM ESKO 4000-HM OF THE HYBRID SYSTEM HRA 4041 (R 4000-SPOZA-MEDA 41 TC)

Prague AUTOMATIZACE in Czech Vol 19, No 11, Nov 76 pp 305-306

SHEFEL, KH, Technische Hochschule Ilmenau, Section for Mathematics, Computer Technology and Economic Cybernetics, ORZ [Organization and Computer Center]

[Abstract] The ESKO 4000-HM programming system was developed on the basis of the ESKO 4000-A system, and contains it as an integral part of its overall arrangement. In order that the new assembly would be suitable for the techniques of hybrid calculations, additional blocks had to be added to the original system. These additions include programs for block-oriented inputs and outputs using a SPOZA interface. The hybrid peripheral apparatus is controlled by the HYKO control system by means of a typewriter; special treatment of "Hybrid Programs" in time multiplex operation and the realization of an automatic course of hybrid calculations are provided (by a parallel operation of an analog and a numerical computer). A call for hybrid calculations can be accepted only by a hybrid calculation program. A hybrid interface can be serviced only by a hybrid program. When an error occurs during the execution of a hybrid program, HYKO is automatically activated, and the calculations are interrupted. HYKO is automatically activated when a hybrid program is completed. The parallel operation of a numerical and an analog computer is arranged so that all interruptions are eliminated, with the exception of those due to the interface and to the clock.

HUNGARY

POSSIBLE DATA TELEPROCESSING WITH THE MINSK 32 TYPE COMPUTER

Budapest BHG ORION TRT MUSZAKI KOZLEMENYEK in Hungarian Vol 22, No 5, 1976  
pp 226-228

HALMI, GABOR, graduate electrical engineer, group leader, Computer Technology  
Development Main Department, TRT [Telephone Factory]

[Abstract] The MINSK 1560 multiplexor (or its modernized version, the MINSK 1560M) serves as the data-transmission functions of the MINSK 32. The multiplexor has 4 so-called telephone channels and 28 telex channels. The multiplexor has no error-protecting unit, needed for dependable data transmission. A multiplexor providing this feature is under development. In order to ensure logical and level adaptation toward the modem, to provide error protection toward the line, and to provide adaptation by logic and level toward the MINSK 1560 (1560M), the Telephone Factory developed the TETA 1200 subscriber point and adapter for the MINSK 1560. It is a device performing adaptation for the subscriber points of the TERTA data teleprocessing product family. It is built of TTL circuits, and it permits reliable information exchange over a 1200 Baud telephone line between remote subscribers and the MINSK 32 through the telephone channel of the MINSK 1560 multiplexor. Figures 3, references 6: 3 Hungarian, 1 Russian and 2 Western.

USSR

UDC 621.317.7:621.382.82

INFORMATION-MEASUREMENT SYSTEM FOR STATISTICAL PROCESSING OF THE RESULTS OF MEASUREMENTS OF THE ELECTRICAL PARAMETERS OF INTEGRATED CIRCUITS

Moscow MIKROELEKTRONIKA:SBORNIK STATEY in Russian No 9, 1976 pp 311-322

VASENKOV, A. A., KAZENNOV, G. G., LYABIN, I. V., KOZLOV, V. P. and SUTYAGIN, A. A.

[Abstract] A description is presented of the hardware and software of an information-measurement system for statistical processing of the results of measurement of electric parameters of integrated circuits. The basic principles of operation of the system in the mode of automated programming of the operating test programs, man-machine dialogue, automatic measurement control and measurement result recording, sorting and statistical processing of measurement results are presented. The time operational characteristics of the system are presented in several system-operating modes. Figures 6; references: 5 Russian.

USSR

UDC 621.372.061:681.32

METHOD OF MACHINE ANALYSIS OF ELECTRIC CHARACTERISTICS OF LARGE INTEGRATED CIRCUITS

Moscow MIKROELEKTRONIKA:SBORNIK STATEY in Russian No 9, 1976 pp 147-157

SYPCHUK, P. P. and SSORIN, V. G.

[Abstract] The two most common approaches to the solution of the problem of the high cost of machine time and memory capacity required for the analysis of large integrated circuits are analyzed: the method of rarefied matrices and the multipolar subcircuit method. It is concluded that in order to assure high operating speed of analysis programs and a high limit of permissible complexity of circuits which can be analyzed, it is desirable to develop a program in accordance with the ideology of the rarefied matrix method. It is desirable to allow the circuit to be described as a set of individual components and subsystems, then develop the subsystems (i.e., represent them as sets of individual components) to the extent permitted by available memory. This combination of the method of rarefied matrices and the subcircuit method is used to generate an analysis program called PAUM [acronym for program for analysis of electronic circuits based on the junction method]. References 9: 8 Russian, 1 Western.

USSR

UDC 621.382.002

A POSSIBILITY FOR IMPROVING THE OUTPUT CAPACITY AND REDUCING THE NUMBER OF EXTERNAL LEADS OF INTEGRATED OPERATIONS UNITS

Moscow MEKHANIZ. I AVTOMATIZ. UPR. NAUCH.-PROIZV. SB. [Mechanization and Automation and Control Scientific-Production Collection] in Russian No 1 (85) 1976 pp 47-49

[From REFERATIVNYY ZHURNAL ELEKTRONIKA I YEYE PRIMENENIYE No 9, 1976 Abstract No 9B425 Summary]

SAMOFALOV, K. G.; TARASENKO, V. P.; and CHERKASHIN, F. A.

[Abstract] The possibility is considered of improving the information transfer rate from the operational unit to the buffer storage when using number systems with an artificial order of weights. It is demonstrated that the number of external leads of the indicated units can also be decreased in this case. Figures 1; references: 3.

USSR

UDC 621.382.3.061.001.2:681.32

ANALYSIS OF METHODS FOR MODELLING THE CHARACTERISTICS OF MOS TRANSISTORS FOR MACHINE DESIGN OF INTEGRATED CIRCUITS

Moscow AVTOMATIKA I TELEMEXHANIKA in Russian No 2, Feb 77, pp 153-160 manuscript received 16 Dec 75

IL'IN, V. I., KOGAN, V. L., LEMENTUYEV, V. A., POPOV, V. Z., and SONIN, M. S. Moscow

[Abstract] A comparison is made of several models of a MOS transistor, and the results of calculating various methods of using the models are evaluated. A simplified version is proposed. It is found that the machine calculations conducted and a comparison of the results with experiments show that with a change of the structural parameters of MOS transistors in the range ordinarily used for production of MOS integrated circuits, the error of calculation with respect to the proposed simplified mathematical model does not exceed 20 percent with a marked reduction of the expenditure of machine time. In the case of machine calculation of digital circuits which contain hundreds of transistors, it is advisable to use the simplified model. For circuits which contain several tens of transistors, the necessary precision of calculations can be assured only with the use of a complex model of a MOS transistor. During calculation of optimum parameters it is advisable to conduct the principal part of the calculations by the simplified model, and in the vicinity of optimum to correct the results according to the complex model. Figures 7; references 7: 5 Russian, 2 Western.

## ANALYSIS OF THERMAL FIELDS IN MONOLITHIC INTEGRATED CIRCUITS

Prague SLABOPROUDY OBZOR in Czech Vol 37, No 5, May 76 pp 216-222

TOMES, MILAN and TESLA, ROZNOV, National Enterprise, Roznov, p.R.

[Abstract] The problem of analysis of thermal fields in monolithic integrated circuits is very complex. A numerical solution must be based on an analytical model which uses several simplifying assumptions. These simplifications must be based on experimental data concerned with detailed interactions between partial problems dealing with heat transfer in monolithic integrated circuits. An experimental investigation of these problems is made possible by the use of semiconductor systems. Each system of special integrated circuits contains several morphological elements arranged for electrical and thermal measurements. Use of infrared radiometry requires the determination of emissivity of the used materials. Numerical solution by means of differential equations requires a great deal of effort. Principles used in solutions of problems of thin matrixes of large orders must be used. A fast and stable convergence of iterative steps is needed for an economical solution of the calculations. The purpose of the preparative work is the finding of suitable algorithms which can be used in the development of a computer program for the analysis of thermal fields in monolithic integrated circuits. Figures 11; tables 2; references 11: 2 Czech, 9 Western.

USSR

UDC 621.382.82.001

CALCULATION OF THE SENSITIVITY OF FUNCTIONAL PARAMETERS OF LINEAR INTEGRATED CIRCUITS

Moscow MIKROELEKTRONIKA:SBORNIK STATEY in Russian No 9, 1976 pp 173-183

YEGOROV, YU. B., MALYSHEV, I. V. and PROKHOROVA, T. S.

[Abstract] A study is made of problems of computer calculation of the sensitivity of the functional parameters of linear integrated circuits. Algorithms are suggested for calculation of the sensitivity of both static circuit parameters and parameters in the frequency area. Algorithms are analyzed for calculation of the sensitivity of resonant and boundary frequencies to changes in the parameters of circuit components. A brief description of a program for calculation of the functional parameters of LIC and their sensitivity is presented. Figures 3; references 7: 2 Russian, 5 Western.

USSR

UDC 621.382.822

METHOD OF LOGICAL-TOPOLOGIC PROJECTION OF 4-CYCLE MOS INTEGRATED CIRCUITS

Moscow MIKROELEKTRONIKA:SBORNIK STATEY in Russian No 9, 1976 pp 273-289

BULIN, S. V., ROMM, G. R., SHAPIRO, L. I. and SHENDEROVICH, Yu. I.

[Abstract] Topologic projection is the process of transformation of information concerning an electric circuit and the geometry of the circuit elements. This article analyzes how this process is organized in the SIMPRO-73 machine planning system, using the example of a four-cycle MOS circuit. The primary circuit elements are four types of logic valves. The basis of the method is separation of the electric circuit into fragments. The method is tested by modernization of a small electronic calculator. Figures 6; tables 3; references: 7 Russian.

USSR

UDC 621.382.822

CONSTRUCTION OF AUTOMATED SYSTEMS FOR MANUFACTURE OF PHOTOGRAPHIC PATTERN MASTERS

Moscow MIKROELEKTRONIKA:SBORNIK STATEY in Russian No 9, 1976 pp 27-33

SURGULADZE, D. K., DZHIBLADZE, N. I., DZHANELIDZE, G. A. and KHUCHUA, G. I.

[Abstract] The tendency toward the growth of the degree of integration, increasing crystal size and functional complexity of integrated circuits has resulted in a continuous increase in the complexity of the topologic art work required for photographic pattern masters and a significant increase in the requirements for quality of manufacture of these patterns. Modern automated systems for the manufacture of photographic pattern masters utilizing precision microphotographic production installations, program-controlled optical-mechanical devices which convert digital information concerning the topology of an IC to the corresponding optical equivalent, combined with medium-power computers, can operate as effective independent units. The structural organization of such a system is determined to a great extent by the method of transmission of control information from the computer to the optical-mechanical pattern generated. The particular system studied transmits information through a coaxial cable and buffer mating systems, with the primary logic functions performed by the computer, thus significantly simplifying the electronic control circuitry of the optical-mechanical device. Special measures are taken to increase interference stability. Figures 4; tables 1; references: 3 Russian.

USSR

UDC 621.396.6-181.48

METHODS AND ALGORITHM FOR ROUTING THE CONNECTIONS OF LARGE MONOLITHIC INTEGRATED CIRCUITS

Moscow METODY MASH. PROYEKTIR. TSIF. USTROYSTV I SISTEM [Methods of Machine Design of Digital Devices and Systems] in Russian 1976, pp 30-32

[From REFERATIVNYY ZHURNAL ELEKTRONIKA I YEYE PRIMENENIYE No 9, 1976 Abstract No 9B437 by V. I. Brodskiy]

IKRAMOV, S. A. and MAGRUPOV, T. M.

[Text] A discussion is presented of a procedure for fulfilling all of the routing criteria for the connections of large integrated circuits with respect to the final versions of the arrangement of the components obtained. The procedure is realized in four steps: 1) Construction of equipotential circuits with minimum conductor length; 2) Determination of the order of construction of the circuit; 3) Breakdown of the connections by layers; and 4) Dense arrangement of the conductors.

An algorithm is presented which permits selection of the method of constructing the minimum tree and shaping it during the process of designing the topology of large integrated circuits and on the basis of it, the modules and assemblies for computers. The advantages of the procedure and the algorithm are a significant decrease in expenditures of machine time, simplicity of machine realization, and obtaining effective results for a large number of points in the surface. The time for laying out one large integrated circuit on the BESM-6 computer is about 5 seconds.

USSR

UDC 621.396.6-181.48

ALGORITHM FOR ROUTING THE MICROASSEMBLIES OF LARGE HYBRID INTEGRATED CIRCUITS USING RELIEF MARKING OF THE OPERATING FIELD

Moscow METODY MASH. PROYEKTIR. TSIF. USTROYSTV I SISTEM [Methods of Machine Design of Digital Devices and Systems] in Russian 1976 pp 37-40

[From REFERATIVNYY ZHURNAL ELEKTRONIKA I YEYE PRIMENENIYE No 9, 1976 Abstract No 9B438 by V. I. Brodskiy]

ARUSTAMOV, S. A.; KLETSKO, YU. K.; and KHROBINSKIY, G. M.

[Text] A description is presented of an algorithm for routing conductors which commute the leads of the substrate crystals of large hybrid integrated circuits with use of the process of deposition of the dielectric between the conductors at the points of their orthogonal intersection. The algorithm considers the following process and structural restrictions: forbidding the intersection of conductors in the region which is internal with respect to the seating point, minimization of the intersection in the vicinity of the seating point, forbidding the layout of the path along the contact areas of the crystals.

The programs which implement the algorithm, together with the programs for forming the library of seating point masks form the routing block for the microassemblies of the large hybrid integrated circuits included in an automated technical design system based on the Minsk-32 computer.

USSR

UDC 681.3:621.382.82

EVALUATION OF AN AUTOMATED SYSTEM FOR TESTING OF INTEGRATED CIRCUITS BY MODELING THE COMBINED OPERATION OF THEIR DEVICES

Moscow MIKROELEKTRONIKA:SBORNIK STATEY in Russian No 9, 1976 pp 40-46

BATALOV, B. V. and LYABIN, I. V.

[Abstract] The principle and one realization of one method of modeling of an automated IC test system on a digital computer are demonstrated. The purpose of the modeling is to evaluate the system as a whole on the basis of the established quality criteria. Numerical results are presented from modeling of a one system version. The operational characteristics of the modeling program are briefly presented. The principle of modeling of the automated testing system is based on the following definitions and assumptions: 1) the actuating element should be independent, i.e., capable of receiving instructions from the controlling computer, performing them independently and reporting completion of work back to the computer; 2) the computer in the automated testing system is the device which supports the functioning of the actuating elements according to an assigned queueing discipline; 3) the actuating elements may be in any one of three states: reception, performance and waiting for instructions; and 4) the computer may be either of two states: issuing instructions to an actuating element and searching for an actuating element ready to work with it. Tables 2; references: 4 Russian.

USSR

UDC 681.3.007

ON THE STATE OF THE PROBLEM OF AUTOMATION OF THE DESIGN OF LARGE INTEGRATED CIRCUITS

Kiyev KIBERNETIKA in Russian No 6, Nov-Dec 76 pp 44-49 manuscript received 10 Sep 76

GLUSHKOV, V. M., DERKACH, V. P., and KIYASHKO, G. F.

[Abstract] A survey is presented of Soviet papers concerned with various aspects of work on the problem of automation of the design of large integrated circuits (LIC). The earliest paper cited in the bibliography of 30 items was published in 1969; the latest in 1976 (one paper). Sixteen of the 30 papers were published in Kiyev, presumably by members of the Institute of Cybernetics, Academy of Sciences, UkrSSR, or the Cybernetics Center of the Academy, publisher of the journal KIBERNETIKA in which the present article appears. The survey states that Soviet scientists began investigations in the field of automation of the design of circuits long before emergence of LIC, as far back as the early stages of development of

microelectronics and cybernetics, and by the present time have attained significant results. Two specific pieces of equipment are mentioned. In 1967 the Institute of Cybernetics created the "Kiyev-67" machine, especially "for control of highly-precise and efficient technological processes, suitable for accomplishment of automatic change-over from design to production of LIC components." The other machine is the "Kiyev-70" constructed for the integrated circuit series 155 and which assures "a precision of combination of microstructures not worse than 0.1 micrometer." References: 30 Russian.

USSR

UDC 681.72-192

CALCULATION OF INTERCONNECTIONS IN MULTICRYSTAL LARGE INTEGRATED CIRCUITS

Moscow MIKROELEKTRONIKA:SBORNIK STATEY in Russian No 9, 1976 pp 224-234

AVDEYEV, B. V., VASHAKIDZE, YU. N. and SHCHERBAKOV, V. YE.

[Abstract] The problem of calculation of the distortion of pulse signals at the interconnections of multicrystal LIC in its linear approximation is reduced to a boundary problem for matrix telegraph equations. The method of solution described is reduced to a set of programs for the BESM-6 computer. The results of calculation are compared with data from the literature. The application of the method to a particular problem is illustrated. Figures 4; references 9: 3 Russian, 6 Western.

USSR

UDC 681.306

AUTOMATED SYSTEM FOR PLANNING OF PHOTOGRAPHIC PATTERNS USING THE BESM-6 COMPUTER

Moscow MIKROELEKTRONIKA:SBORNIK STATEY in Russian No 9, 1976 pp 22-26

KAZENNOV, G. G., BATALOV, B. V., SHCHERBAKOV, V. YE. and YEREMINA, L. V.

[Abstract] A description is presented of a set of programs developed for the BESM-6 computer, designed to perform various tasks in the stage of planning of topology, testing and manufacture of photographic patterns for integrated circuit manufacture. Topology is encoded following the rules of the topology description language, input to the computer and translated. The library of topology programs includes topology testing, special topologic information conversion and topologic result output programs. The task of checking the

correspondence of the topology to the electric circuit consists in establishing isomorphism of the graph of the electric circuit and the graph of the circuit produced by topologic analysis. The special conversion program adjusts the contours of each layer to the assigned size and establishes corner points of all contours in the assigned sequence for proper exposure of the photographic material. The topologic information output program produces printed documents and punch tapes. References: 12 Russian.

USSR

UDC 681.326:621.382.823

EFFECTIVENESS CRITERIA FOR ALGORITHMS AND PROGRAMS FOR MACHINE ANALYSIS OF INTEGRATED CIRCUITS

Moscow MIKROELEKTRONIKA:SBORNIK STATEY in Russian No 9, 1976 pp 197-204

NORENKOV, I. P.

[Abstract] Methods are suggested for estimating effectiveness criteria of analysis algorithms and programs. Results are presented from application of the theoretical approach to estimation of the machine time required in the framework of the two main concepts of the construction of nonlinear integrated circuit analysis programs: the theoretical approach, consisting in the theoretical investigation of analysis algorithms, which can be reduced to determination of the basic factors influencing the effectiveness criterion and establishment of the functional dependence of the criterion on the set of main factors; and the experimental-deterministic approach, based on experimental determination of the value of the effectiveness criterion for a program being tested using a limited number of predetermined test circuits, reflecting characteristic peculiarities of some rather broad classes of circuits but differing in values of the influencing factors. Tables 2; references 8: 5 Russian, 3 Western.

USSR

UDC 681.327.11:621.382.825.001.2

SYSTEM FOR TESTING THE TOPOLOGY OF INTEGRATED CIRCUITS BASED ON A  
MINICOMPUTER USING DISPLAYS

Moscow MIKROELEKTRONIKA:SBORNIK STATEY in Russian No 9, 1976 pp 289-296

KAZENNOV, G. G., SHEPELEV, V. A., POPOVA, T. M. and VLASENKO, V. A.

[Abstract] A study is made of the problems of construction of automated topology planning systems using displays. A description is presented of such a planning system. The expediency of inclusion of an independent minisystem for debugging of the topology is analyzed. Problems of the construction of the software for the minisystem are studied. Operating experience shows that the use of the minisystem reduces the cost of debugging by 40 percent labor consumption by a factor of 3.5 and test cycle duration by a factor of 4. Figures 5; references 5: 4 Russian, 1 Western.

Certain Aspects of Photography and Television

USSR

UDC 522+621.397.9

MEASUREMENT OF THE THRESHOLD SIGNAL-TO-NOISE RATIO IN AN ASTRONOMICAL TELEVISION SYSTEM

Ashkhabad IZVESTIYA AKADEMII NAUK TURKMENSKOY SSR, SERIYA FIZIKO-TEKHNI-  
CHESKIKH, KHIMICHESKIKH I GEOLOGICHESKIKH NAUK in Russian No 6, 1976  
pp 115-117 manuscript received 25 May 76

ALEKSANDRIN, YU. S., ANISIMOV, V. F., PTITSYN, I. V., KHANBERDIYEV, A., and  
MELEYEV, KH., Physicotechnical Institute, Turkmen SSR Academy of Sciences

[Abstract] The threshold signal-to-noise ratio of images of varied quality in an astronomical television system can be determined by a method based upon comparison of the brightness of the images of a celestial body and a simulating electrical signal with a known signal-to-noise ratio on the screen of a video control unit. The value of this ratio, which corresponds to the visual threshold of stellar-image registration, is equal to 2; this is of particular importance during the automatic computer processing of such images. Figures 1; references 6: 5 Russian, 1 Western.

USSR

UDC 522+621.397.9

THE PERMEABILITY OF AN ASTRONOMICAL TELEVISION SYSTEM WITH AUTOMATIC INFORMATION PROCESSING

Ashkhabad IZVESTIYA AKADEMII NAUK TURKMENSKOY SSR, SERIYA FIZIKO-TEKHNI-  
KIKH, KHIMICHESKIKH I GEOLOGICHESKIKH NAUK in Russian No 6, 1976 pp 56-60  
manuscript received 25 May 76

ALEKSANDRIN, YU. S., ANISIMOV, V. F., PTITSYN, I. V., KHANBERDIYEV, A., and  
MELEYEV, KH.

[Abstract] The end-point sensitivity of the television tubes in an astro-  
nomical television system is measured experimentally, and the permeability  
of the system is determined. It is found that the application of a tele-  
vision system for the automatic registration of star and meteor images  
decreases the permeability somewhat in comparison with visual registration  
on the screen of a video control unit. However, computer processing of the  
information makes it possible to eliminate photographing the screen and  
developing the negatives while patrolling meteor showers, and permits their  
coordinates to be determined by the computer. Figures 3; references:  
6 Russian.

## MEASUREMENTS IN DIGITAL TELEVISION SYSTEMS

Moscow ELEKTROSVYAZ' in Russian No 1, Jan 77 pp 2-10 manuscript received  
29 Jun 76

KRIVOSHEYEV, M. I. and VILENCHIK, L. S.

[Abstract] The tasks involved in measurement and control of digital television systems are formulated for the first time in the domestic literature, and methods for performing several of these tasks are outlined. Evaluation of image quality requires the use of special test images. In order to increase the objectivity of evaluation of image quality in the selection of digital TV parameters, subjective evaluations can be supplemented by instrumental measurement methods. The system distortions of digital television with PCM using 8 or 9 bit coding are slight. Consequently, existing methods and equipment can be used for measurement. However, special test signals and hardware are required for measurement of the ratio of the signal to the effective weighted fluctuating noise. Elimination of redundancy in digital TV signals requires special signal-testing methods. Tables 4, references: 8 Russian.

HUNGARY

UDC 621.391.883.2:621.397.132.127

IMPROVING THE SIGNAL-TO-NOISE RATIO IN THE SECAM SYSTEM

Budapest HIRADASTECHNIKA in Hungarian Vol 28, No 1, Jan 77 pp 24-28  
manuscript received 22 May 76

PALINSZKI, ANTAL, Institute of Communications-Technological Electronics,  
BME [Budapest Technical University]

[Abstract] In the SECAM system, the color information is transmitted by means of frequency modulation; thus, the usual methods employed in FM systems for improving the signal-to-noise ratio may be employed with appropriate adaptation. However, the calculation of the precise noise reduction value is difficult, and the methods reported for this purpose in the literature often provide incorrect results. The author presents a method for performing this calculation, and describes the effects of (1) the base band in terms of pre-emphasis and post-attenuation; (2) the amplifying effect of the bell-curve amplifier and the inverse sound curve amplifier; and (3) the joint effects of the base band and high-frequency pre-emphasis and post-attenuation. The true gain factor of the bell-curve amplifier in the transmission band shows a degree of asymmetry with respect to the frequency  $f_c$ ; however, the calculations assume a symmetric gain function. The actual signal to noise ratio may differ from the calculated value if the frequency of the modulated color auxiliary carrier differs significantly from  $f_c$  over a long period. Figures 11; tables 3; references 7: 2 Russian, 3 Hungarian, 2 Western.

CZECHOSLOVAKIA

DESIGN OF SECAM IDENTIFICATION CIRCUITS IN THE MCA 640 INTEGRATED CIRCUIT

Prague SDELOVACI TECHNIKA in Czech Vol 24, No 12, Dec 76 pp 455-456

POSPISIL, BOHUSLAV, engineer

[Abstract] The original design of SECAM identification circuits using transistors was completed and tests were conducted a year ago; a new design of these circuits is undergoing tests at present. The SECAM decoder is used with MCA 640 integrated circuits produced by TESLA at Roznov. These are used in new color television sets. Frequencies of 4,406 and 4,250 MHz are used in the tests. The study will include an evaluation of the effect of the identification signals of Czechoslovak TV stations on the performance of the corresponding identification circuits of TV sets. The purpose of the investigation is the development of maximum reliability in color TV sets. Figures 2.

USSR

UDC 621.397.13

A DIGITAL TELEVISION SIGNAL RECEIVER

Moscow ELEKTROSVYAZ' in Russian No 1, Jan 77 pp 11-15 manuscript received  
6 Jun 74

VETYUGOV, A. I. and MARKOV, Yu. V.

[Abstract] A study is made of one possible version of a digital TV receiver, designed for signals transmitted at 114.048 Mbit/s, allowing reception of television signals regardless of their statistical properties. A block diagram of the device, as well as photographs of an operating model are presented. Linear testing of an experimental group of the devices was performed in the millimeter waveband (using waveguides and radio relay transmissions). The interference stability of regeneration of digital signals was near the maximum theoretical stability and parasitic phase fluctuations were extremely low. The authors thank Ye. V. Ryzhkov for participation in discussion of the materials in the paper. Figures 5, references 4: 2 Russian, 2 Western.

USSR

UDC 621.397.13

MODERNIZATION OF TELEVISION TRANSMISSION STATIONS TYPE TV-5/1.5 kw

Moscow ELEKTROSVYAZ' in Russian No 1, Jan 77 pp 15-19 manuscript received  
26 May 76

LOKSHIN, A. M. and KOL'TSOV, A. A.

[Abstract] The authors suggest that the TV-5/1.5 kw television stations, among the most commonly used in the USSR TV network, be modernized by conversion of the final stages of the transmitter to a common grid circuit. This work can be performed by personnel of the station operating enterprises. The results of tests performed at a number of radio transmission stations have shown that modernization significantly improves the quality and operational indicators of these stations, and provides for high quality transmission of color television. The modernization version suggested has been approved by the Ministry of Communications, USSR, and is recommended for introduction at all operating stations. The article does not present specifications or design details of the modernization. This information is presented in detail in documentation which has been developed and will be sent to all transmitting stations utilizing this type of equipment. Figures 3, tables 2, references: 3 Russian.

USSR

UDC 621.397.611.2:621.397.65

JOINT AMPLIFICATION OF VIDEO AND AUDIO SIGNALS

Moscow ELEKTROSVYAZ' in Russian No 1, Jan 77 pp 19-22 manuscript received  
17 May 76

IVANOV, V. K.

[Abstract] TV relay stations, for reasons of simplification, should use combined amplification of both video and audio signals. Formulas are suggested for determination of the possibility of using a transistor in such a combined amplifier. Using these formulas, the working points of the transistor can be calculated and its suitability for use determined. Experimental testing of amplifiers has shown that the KT-907 A transistor can be used, which provides the required low level of intermodulation distortion at an output power of 2.4 w (peak power in video channel 1.15 w), and with a transistor of type KT-904 -- 0.735 w (0.35 w). Figures 2; references 4: 2 Russian, 2 Western.

ELECTRICAL ENGINEERING  
General Production Technology

EAST GERMANY

NONDESTRUCTIVE TESTING OF SOLDERED JOINTS. ESTIMATION OF THE QUALITY

East Berlin FERNMELDETECHNIK in German Vol 17, No 1, Jan 77 pp 18-20

HARZDORF, F., Electronic Technology and Precision Instrument Technology  
Section, Dresden Technical University

[Abstract] Visual and electrical testing methods for evaluating the quality of soldered joints are described. The visual criteria of a good joint are visible solder cone, solder flow over the entire contact area, solder surface smooth and shiny, solder core visible, coverage degree at least 50 percent. The electrical tests determine whether the resistance is adequately low and whether the current versus voltage diagram is linear. Thermovoltage components provide additional information for quality assessment. A test and evaluation sequence based on the above factors was described which permits the establishment of an overall quality indicator. Usually, a joint which rates high on the basis of the visual tests, also gives satisfactory electrical results. But for the first-rate joint, the thermovoltage components must also be satisfactory. Figures 6, references: 5 German.

HUNGARY

AUTOMATIC FINAL TESTING OF EQUIPMENT WITH MEDIUM NUMBER OF CHANNELS

Budapest BHG ORION TRT MUSZAKI KOZLEMENYEK in Hungarian Vol 22, No 5, 1976  
pp 229-233

BERCES, JUDIT, graduate electrical engineer, technologist, Microwave Electrical Technology Department, and SZAKACS, PETER, graduate electrical engineer, department head, Development Department, Orion Radio and Electrical Enterprise

[Abstract] The design, construction, operation, performance, and applications of an automated final tester of equipment with a medium number of channels, which rapidly and accurately measures much data and provides a written report, is described and illustrated with photographs and block diagrams. Automated, semi-automated, and manual operation is possible with the system. The measurements are performed station by station, and within a station channel by channel. Automatic operation is program-controlled. In the calibration mode, the system may be used for the fine adjustment of the equipment tested, using standard signals. Programming is not used in the semi-automated and manual operations. Use of the system provides significant saving in work and time. The system is now in actual use under production conditions. Figures 5.

CZECHOSLOVAKIA

UDC 621.383.292

CHANNEL RADIATION DETECTORS

Prague SLABOPROUDY OBZOR in Czech Vol 38, No 1, Jan 77 pp 24-29

BERANEK, IVAN; TESLA - Scientific-Research Institute for Vacuum Electronics, Prague

[Abstract] The principal applications of channel detectors of radiation, usually called channel electron multipliers, are in the detection of short-wave radiation with wave lengths of 0.01 to 150 nm, and in recording of charged particles with energies of 10 eV to 10 keV. Such radiation is absorbed by all solid materials, and consequently the channel electron multipliers are suitable for direct detection. These detectors also find use in satellites for space investigations, because they are simple, small, and have high mechanical strength. They are used as analyzers of electron energies, measurements of spectra of soft X-ray and ultraviolet sun radiation and for the detection of protons. Other applications are in fields for determination of densities of positive ions of the ionosphere, in mass spectroscopy, emission microscopy, and in nuclear spectrometry. They can be used in direct portrayal of X-ray pictures of the sun, and be connected to a suitable photocathode for vision in the dark. TESLA produces four types of these detectors, the 01 PG 42, 01 PG 43, 01 PG 52, and 01 PG 53. The principal electrical parameters of the last type are: total resistance  $10^8$  to  $10^{10}$  Ohms; amplification at 2.5 kV voltage,  $1 \times 10^7$  to  $2 \times 10^8$ ; amplitude discrimination, 0.1 to 0.7; internal interference at 2.5 kV voltage, 0.05 to 0.5 imp/sec. Figures 9, references 8: 7 Western, 1 unidentified (Acta Electronica)

CZECHOSLOVAKIA

UDC 621.383.64

MAGNETRON DEVELOPMENT AT THE TESLA VACUUM ELECTRONICS RESEARCH INSTITUTE

Prague SLABOPROUDY OBZOR in Czech Vol 38, No 1, Jan 77 pp 10-16

FRIC, VIKTOR; STARY, ZDENEK; DOHNALEK, JARMIL; TESLA - Scientific-Research Institute for Vacuum Electronics, Prague

[Abstract] A review of magnetrons currently produced by TESLA is presented; both CW and pulse operation tubes are covered. Fourteen magnetrons for pulse operation are described. The series numbers are SP 521; frequencies vary between 2689 and 9500 MHz, Vf output between 3 and 3500 kW, ignition voltage 6.3 to 22 V, current at start 0.6 to 10 A, anode voltage 3.8 to 58, anode current 3 to 150 A, pulse length microseconds 0.03 to 3, cooling by

air or by liquid. Seven magnetrons for continuous operation are reviewed. Series numbers are SA 51 and SA 52. Frequencies vary between 1250 and 2450 MHz, Vf output 0.08 to 50 kW, ignition voltage at start up 1.8 to 11 V, ignition current at start up 1.5 to 55 A, anode voltage 1.5 to 12, anode current max. 0.35 to 6 A, cooling air or liquid. Development of magnetrons is connected with the development of amplitrons which are similar to magnetrons but operate in wider microwave amplification bands. They are used in the design of radars of the second generation. Two pulse magnetrons for use in linear accelerators were developed at TESLA for operation in the 10 cm band; one of these has a high Vf output, the other a high average output. For medical and scientific applications TESLA offers continuous operation magnetrons with Vf ranging from 0.2 to 50 kW. These are the only magnetrons of their kind produced in the Soviet dominated countries, and compare favorably with apparatus available in Western countries. Figures 9, tables 2, references 47: 43 Czech, 4 Western.

USSR

UDC 621.385.21

PROBLEM OF THE COUNTER MOTION OF ELECTRONS AND IONS IN SPHERICAL AND  
CYLINDRICAL DIODES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 12, 1976 pp 2646-2649

BELKIN, V. M.; ZAV'YALOV, M. A.; and KAMUNIN, A. A.

[Abstract] It is known from the literature that compensation of the space charge of the electron flux by the counter flow of ions leads to the effect of an increase in the electron current. Sufficiently complete data have been presented for calculating the axially symmetric beams with the thermal emission cathode and plasma anode operating in a  $3/2$  regime. Data are presented in the literature on experimental testing of the numerical calculations. The present paper is a further development of these previous works. By a numerical calculation with a digital electronics computer, the solution is found to the internal boundary problem of the theory of formation of intense beams of charged particles, in the case of cylindrical and spherical diodes. The solutions presented can be used when designing optoelectronic systems with increased perveance of the electron beam. Figures 4; tables 2; references 6: 3 Russian, 3 Western.

USSR

UDC 358.6

EFFECT OF INTERACTION AT SECOND HARMONIC ON PHASE-AMPLITUDE CONVERSION  
IN A TWT

Kiyev IZVESTIYA VUZOV SSSR:RADIOELEKTRONIKA in Russian Vol 19, No 11, 1977  
pp 89-90 manuscript received 26 May 75

MALIVANCHUK, V. I., and OLEKH, N. YA.

[Abstract] Calculations were made of the dependences of the coefficient of phase-amplitude conversion at the saturation point of a TWT with a non-dispersing decelerating structure, on the ratio of the coupling resistances at the second and first harmonics. The calculations were carried out in accordance with the equations of one-dimensional nonlinear TWT theory in a two-frequency regime on a BESM-4 electronic computer. Graphs of the results are shown. From the data presented it follows that for the set of normalized parameters under consideration, interaction with the second harmonic substantially affects the phase-amplitude conversion in a TWT. Figures 1; references 4: 3 Russian, 1 Western.

## DISPERSION OF TWO COUPLED PARALLEL SPIRALS

Kiyev IZVESTIYA VUZOV SSSR: RADIOELEKTRONIKA in Russian, Vol 19, No 11, 1977 pp 25-30 manuscript received 7 Mar 75

ISHCHENKO, A. I., and KRAVCHENKO, G. G.

[Abstract] Use in a TWT of several coupled spirals instead of one spiral decelerating system makes it possible to increase considerably the attainable levels of output power or to reduce the supply voltage. In a multi-beam TWT with several spirals, the output power can be increased, both by virtue of summation of the microwave signals of the spirals and by virtue of an improvement of the characteristics of the decelerating system and the beams. An improvement of the characteristics is connected with an increase of the coupling resistance of each spiral because of addition of the interior field with the exterior fields of adjacent spirals as well as with a decrease of the parameter of the space charge  $4QC$ , if the current of a single-beam TWT is distributed among the spirals of a multibeam TWT. The present paper obtains the dispersion equation for two spiral deceleration systems in the case of an arbitrary degree of coupling between them. An analysis is made of the dispersion equation and the dispersion characteristics are calculated for a cophased and antiphased form of oscillations. The results of the calculations are presented in the form of three graphic dependencies constructed for various distances between the spirals. A method utilized for determination of two coupled spirals, which involves use of the theory of addition of Bessel functions, leads to a dispersion equation in the form of an infinite determinant. The determinant quickly converges which makes it possible to obtain a comparatively simple dispersion equation. The method given can be extended to the case of several coupled spirals with an arbitrary degree of coupling. Figures 4, references: 5 Russian.

## Electrical Engineering Equipment and Machinery

CZECHOSLOVAKIA

IMPULSE REGULATED POWER SUPPLIES

Prague SDELOVACI TECHNIKA in Czech Vol 24, No 11, Nov 76 pp 403-409

PARKAN, PETR and PATAK, ZDENEK

[Abstract] Small highly efficient transformers for voltages on the order of five volts are needed in computers and other electronic equipment. Transformers of the classical design operate at 40 to 50 percent efficiency; impulse regulators reach 60 to 90 percent efficiency and show low heat losses. They maintain stable output voltages even when voltage of the feed circuit varies. Practical applications within 50 to 400 Hz are known. The impulse regulators are produced at lower costs than ordinary design transformers, which they are eventually expected to replace. The frequencies at which these regulators operate are above those of the acoustic range. Converters used with impulse systems are: flyback converters, forward converters, and push-pull converters. These converters are designed as single or double acting. Converters in impulse regulated power sources are controlled by changes in the frequency of the converter, or by changes in the contact period at a constant frequency of the converter. The maximum current of the collector of a connecting transistor depends on the required output, performance of the transformer, and nature of the primary windings and on the induction coil in the filter of the apparatus. The network rectifier is provided with silicon diodes. Schottky diodes are used in impulse-controlled power sources of up to six volts. Because the transformers use very high frequencies their weight and overall dimensions are small. Cores of the transformers must have high values of maximum saturation, so that their size will be limited, they must have a high permeability which reduces the number of required windings, and have a high specific resistance of the core to prevent losses by eddy currents. The oscillation damper is magnetized by a d-c current and provided with an air space in order to prevent over-saturation of the core which would result in a reduced induction capacity. The feed-back, excitation, protective and other circuits vary widely in their design. The feed-back circuits are usually designed as hybrid, or as monolithic integrated circuits. Figures 13: references 4: 2 Czech, 2 Western.

EAST GERMANY

EFFECT OF SILICONES ON LOW-CURRENT CONTACTS

East Berlin FERNMELDETECHNIK in German Vol 17, Jan 77 pp 13-18

MARTIN, H., Institute of Communications Technology, East Berlin

[Abstract] Tests were carried out to evaluate the effects of the following factors on the performance of low-current contacts: material of the contact, type of relay, electrical loading of the contacts, and degree of silicone contamination. The contact resistance was measured by periodical determination of the resistance and by determination of the instances during which a limit resistance value of  $10 \pm 1$  ohm was exceeded. At low silicone-oil concentrations, temporary interferences may occur but they are no more serious than those caused by sulfide formation, dust, oxides, and the like. Control of contamination during manufacture can maintain the concentration at a tolerable level. The formation of deposits is facilitated as the degree of silicone-contamination increases. The amount of deposits formed depends on the contact loading. Relatively large inductive loads are of relatively small effect; however, ohmic and medium inductive loading favor the formation of insulating silicone layers. The burn-up and material-migration behavior is determined by the material properties and the contact loading under small to medium silicone concentrations. Highly contaminated contacts burn up more slowly. The formation of fully insulating silicone layers is remote under most operating conditions. Among the contact materials evaluated, the AgPd30 was found particularly reactive. Figures 9; tables 2; references 7: 6 German, 1 Hungarian.

## Power Systems

### CZECHOSLOVAKIA

#### PROPERTIES OF GLASS INSULATORS UNDER VARYING KINDS OF ELECTRICAL STRESS IN A SALINE FOG

Prague ELEKTROTECHNICKY OBZOR in Czech Vol 65, No 9, Sep 76 pp 527-532

PLECHANOVA, MARIE; and BERAN, JAROMIR, Power Plant Research Institute,  
Prague, Bechovice Laboratory

[Abstract] The problem of suitable glass insulators for the new 750 KV distribution grids in Czechoslovakia is discussed. The nature of pollution in the atmosphere affects the selection of the most suitable type of insulators. The Power Plant Research Institute at Bechovice conducted extensive tests with French glass insulators type F 12 AS and F 21 P, and with USSR insulators type PS 12 A. The French insulators appeared to be more suitable for use under Czechoslovak conditions. These insulators are provided with an extensive length of conductor. In the areas of chemical production works, not only the characteristics of the insulators but also the influence of voltages exceeding the design limits should be considered at frequencies of 50 Hz. In over-flashes on series of glass insulators in a saline fog the length of conductor leads plays a more important role than when porcelain-plate type insulators of the VZC type are used. Figures 12; tables 12; references 3: 1 Czech, 2 USSR.

CSO: 1860

- END -