

## CONTENTS AND ABSTRACTS

### RADIO ENGINEERING RADAR AND COMMUNICATION SYSTEMS

**P. S. Pokrovskij, S. N. Kirillov.** PHASE DISCRIMINATOR WITH SOLVING FEEDBACK FOR RADIO SIGNAL WITH CONTROLLED COUPLING BETWEEN QUADRATURE COMPONENTS

Key words: phase discriminator, bandwidth-efficient modulations, radio signals with controlled coupling between quadrature components, S-curve.

For the case of prior known transmitted data, the task of initial phase evaluation of bandwidth-efficient radio signals by likelihood function maximization is described. The aim of the article is the development of phase discriminator with solving feedback for radio signals shaped by controlled coupling between in-phase and quadrature components. To simplify the evaluation algorithm in a receiver, a radio signal model that does not include interaction between quadrature components was chosen. The interaction is appropriate for bandwidth-efficient modulations (such as GMSK, FQPSK, TFM). On the basis of the model a phase discriminator was developed, two (two- and three- channel) functional schemes for practical implementation of this discriminator were proposed. Analytical equations to calculate S-curve, its slope, as well as correlation characteristics of output signal were received. Computer simulation showed the validity of the introduced equations and the efficiency of using this phase discriminator for synchronization circuits with solving feedback. It is shown that the use of the developed phase discriminator in comparison with the known discriminator of OQPSK-like radio signals provides the gain of not less than 12 percent for bandwidth-efficient radio signals that are realized in the class of signals with controlled coupling between quadrature components.

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**S. N. Kirillov, P. S. Pisaka.** ALGORITHM TO INSTALL A SINGLE CARRIER OF SPACE-ROCKET TECHNOLOGY PRODUCT TELEMETRY INFORMATION FROM TERRITORIALLY-DISTRIBUTED RECEIVING STATIONS

Key words: telemetry information, receiving stations, interfering factors, integration of telemetry information, improvement of processing quality.

The issues of telemetry information processing (TMI) adopted for several geographically distributed receiving stations (RS) of rocket and space technology (RST) products based on the results of flight tests are considered.

The aim of the article is to create an algorithm for the installation of a single carrier (ISC) TMI, adopted simultaneously on several territorially distributed RS in order to increase the volume of reliable information for the objective assessment of state of RST products. Usage of full-scale TMI has shown that the use of the proposed ISC TMI algorithm for information processing, adopted at the same time on five PS allows to increase the amount of information of telemetry parameter by 33,8% (with 51,6% to 85,4%) in average.

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**V. E. Drach, A. I. Luganskaya.** MODELLING OF HORN ANTENNA CHARACTERISTICS CHANGE CAUSED BY BARRIER PRESENCE

Key words: horn antenna, electromagnetic wave, electromagnetic field, directional pattern, gain, coefficient of ellipticity, barrier, fiberglass.

In real life, shading constructive elements (supports, pipes, stems, masts, etc.) are always located near antennae. The change of antenna characteristics caused by changing the position of a barrier in front of its radiation is investigated. The following antenna characteristics were researched: 3D radiation pattern, gain, polarization ellipticity, and magnitude of electromagnetic field in horn antenna. The simulation takes place at frequencies of 10 and 15 GHz, the material of a barrier is made of fiberglass and copper. A comparison is made of how the characteristics of horn antenna vary with frequency, as well as the thickness of barrier and its position.

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**B. I. Filippov.** A PRIORI RELIABILITY ANALYSIS OF RADIO ENGINEERING SYSTEMS WITH RESTORATION

Key words: aprioristic reliability, radio engineering systems (RES), state graph, reservation, streams of refusals and restorations.

The development of radio-electronic industry leads to rapid growth of functionality of manufactured products and complication of radio engineering systems (RES) structure at simultaneous increase in the requirements to their reliability. The aim of this work is the development of general methods to research reliability of RES allowing to consider various algorithms of configuration and reservation of systems with restoration. The model of refusal stream for RES with restoration is accepted taking into account the introduced restrictions. The algorithm of differential equations formation to determine the probability of RES states with refusals and restoration is offered. Calculation of readiness function for RES with restoration without reservation is given. The order of calculation of readiness function, readiness coefficients and idle time for RES with restoration and duplication is shown.

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**D. I. Popov.** AUTO COMPENSATION OF DOPPLER PHASE MULTIFREQUENCY CLUTTER

Key words: auto-compensation, Doppler phase, multifrequency signal, multifrequency clutter, training sample, rejection filter, accuracy of auto-compensation, correlation matrices.

The principles of auto compensation and construction of Doppler auto-compensators of multifrequency clutter with inter-channel averaging of estimates are proposed. The aim of the paper is to analyze the accuracy of auto-compensation depending on frequency channel number and training sample size determined by the number of averaged samples in each frequency channel and correlation properties of the clutter in frequency channels. It is shown that inter-channel averaging of estimates significantly improves the accuracy of estimation and compensation of Doppler multifrequency clutter phase shifts. Correlation matrices are obtained at the outputs of rejection filters in frequency channels, which open up the possibilities of subsequent analysis of the efficiency of processing systems for multifrequency signals, taking into account the substantial increase in the accuracy of estimation and compensation of Doppler clutter phase shifts due to inter-channel averaging of the estimates introduced in auto-compensator.

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**A. Yu. Linovich, A. S. Nazvanov, D. A. Kiryanov.** ENHANCEMENT OF MULTIRATE ADAPTIVE FILTERING IN EQUALIZATION OF NON-STATIONARY SIGNALS

Key words: multirate signal processing, adaptive filter, filter taps transformation.

A problem to enhance multirate adaptive filtering in equalization problem of nonstationary signals is considered. It is demonstrated that two special transformations on filter taps of adaptive cores in multirate adaptive structure lead to high-level precision and performance and allows eliminating of additional delay caused by analysis/synthesis subsystem at the same time. The paper is supplied by experimental results for speech signals which help to estimate the efficiency of proposed multirate adaptive filtering structure. The aim of this scientific research is to increase the efficiency of multirate adaptive filtering in equalization problem of non-stationary signals.

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**COMPUTER ENGINEERING, INFORMATION SYSTEMS AND TECHNOLOGIES****V. P. Koryachko, D. A. Perepelkin, M. A. Ivanchikova, V. S. Byshov, I. Yu. Tsyganov.** SOFTWARE INFRASTRUCTURE AND VISUAL ENVIRONMENT OF DISTRIBUTED DATA FLOWS PROCESSING IN SOFTWARE DEFINED NETWORKS

Key words: software defined networks, software infrastructure, visual environment, distributed data processing, OpenFlow protocol, interaction interfaces, software architecture, SDNTopology, UML class diagrams.

Currently in the field of computer networks (CN) are very popular new innovative approaches based on the software defined networks (SDN) technology. SDN allow to provide a flexible approach to the processing and control of data flows in CN by separating the control plane and transferring data, as well as centralizing the representation of the whole network. Prototype of the software infrastructure and visual environment (SIVE) for distributed processing and transmission of data flows in SDN based on the OpenFlow protocol is proposed in this paper. The aim of the work are development of the SIVE architecture in description form of UML class diagrams, as well as creation of software methods for organizing of effective network interaction of various software systems in SDN based on the OpenFlow protocol. To validate the effectiveness and reliability of the proposed SIVE we developed software-hardware test bench based on HP Aruba 2920-24G

equipment with the attached MiniNet virtual environment module. Proposed in the paper SIVE is the basis for developing a large class of software systems and components for SDN.

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**S. V. Skvortsov, T. A. Fetisova, D. V. Fetisov.** PARALLEL DATA SEARCH ALGORITHMS AND THEIR IMPLEMENTATION ON THE CUDA PLATFORM

Key words: multiprocessor, device, graphic memory, kernel, block, thread, host, search, acceleration.

Theoretical and practical issues of parallel data search algorithms and their implementation on CUDA platform are considered. The relevance of this topic is caused by constant increase in the volume of processed information at present time, as well as the demand for increased speed of data processing. The aim of the work is to modify the known algorithms for finding data in one-dimensional array for their use on CPU, followed by the analysis of the efficiency of parallel versions of software modules developed. Thus, the results show that the use of graphics accelerator can significantly increase the speed and, accordingly, the acceleration of applications using data search algorithms. As the amount of data and thread blocks used increases, the performance time of multithreaded application on graphics accelerator is significantly reduced compared to serial implementation on CPU.

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**N. N. Levchenko, A. S. Okunev, A. V. Klimov, D. N. Zmejcev.** BUILDING VARIANTS OF CONTENT ADDRESSABLE MEMORY OF KEYS FOR PARALLEL DATAFLOW COMPUTING SYSTEM «BURAN»

Key words: content addressable memory, matching processor, computations planning, comparison of keys.

The problem of preventing the overflow of content addressable memory of keys of matching processor in parallel dataflow computing system is considered. The aim of the work is the development of hardware-software methods that allow to exclude overflow of content addressable memory of keys of matching processor. The relevance of this work is the need to create a domestic high-performance computing system based on a dataflow computing model that provides high real performance on actual tasks when scaling to hundreds of thousands or more cores. In this case, non-standard hardware solutions must be applied. The methods for preventing the overflow of content addressable memory of keys are compared. Variants of constructing content addressable memory of keys of matching processor are proposed. The results of these variants comparison are presented; advantages and disadvantages are noted. The results of modeling developed methods and variants of organizing content addressable memory of keys of matching processor confirm the efficiency and correctness of the approaches proposed. As a result of the research conducted, the architecture of content addressable memory of keys of matching processor and the method that prevents its overflow are selected.

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**L. A. Demidova, I. A. Klyueva.** RANDOM FOREST ALGORITHM IN THE PROBLEM OF IMPROVING SVM CLASSIFICATION QUALITY

Key words: intelligent classification algorithm, SVM algorithm, k-nearest neighbors algorithm, random forest algorithm, support vector, kernel function, kernel function parameter, regularization parameter, hybridization.

The aim of the work is to improve the quality of objects SVM classification (Support Vector Machine) by hybridizing the SVM classifier with the random forest classifier (Random Forest, RF) used as an auxiliary. Clarification of the classification solutions obtained during the development of the SVM-classifier on the basis of initial dataset is performed for the objects located in experimentally determined subareas near the hyperplane separating the classes and including both correctly and erroneously classified objects. In the case of improving the quality of objects classification from the initial dataset, the proposed hybrid approach to the classification of objects is recommended for the classification of new objects. When developing the SVM-classifier, fixed default parameter values are used. A comparative analysis of classification results obtained during computational experiments in the hybridization of the SVM classifier with two auxiliary classifiers – random forest classifier (RF-classifier) and k-nearest neighbor classifier (kNN classifier), for which the parameter values are determined randomly, confirms the expediency of using these classifiers to increase quality SVM-classification. It was found that in most cases, the random forest classifier works better in terms of improving the quality of SVM classification in comparison with kNN classifier.

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**V. V. Kirakovskiy, A. N. Korotaev, A. M. Belitsky, A. N. Pytkin.** ESTIMATING THE STATE OF GEOLOGICAL ENVIRONMENT OF LOCALITY URBAN SYSTEMS USING PROBABILISTIC MODELS

Key words: locality urban system, probability model, Kolmogorov equations for probabilistic states.

The problem of supporting decision-making on buildings and structures placement using probabilistic models is considered. The safety of living on this territory depends on the results of the above accommodation, which confirms the relevance of this task. The aim of the work is to assess the state of geological environment locality urban systems with the help of probabilistic models. With such an assessment, it is possible to give a qualified, reasonable answer to the question of expediency and safety of carrying out urban development works on this territory. A methodological approach based on the representation of possible geodynamic states of geological environment of an urban system of a locality as a simple stream of events with subsequent construction of a mathematical model in the form of the system of Kolmogorov's differential equations is proposed.

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## COMPUTER AIDED DESIGN SYSTEMS

**A. L. Stempkovskiy, D. V. Telpukhov, A. I. Demeneva, T. D. Zhukova.** DESIGN FLOW OF CONCURRENT ERROR DETECTION SCHEMES FOR COMBINATIONAL CIRCUITS

**Key words:** fault tolerance, reliability, concurrent error detection, combinational circuits, vulnerability, non-detecting ability, error injection.

The use of methods of concurrent error detection is the traditional approach to ensuring the fault tolerance of combinational circuits. The theory of error-correcting coding is the mathematical basis for these methods. Various error-correcting codes are the basis for structural redundancy, providing detection properties and in some cases – correcting errors. However, the issues, which are related to the automation of designing concurrent error detection schemes and in particular to the selection of the most effective error-correcting code for constructing such schemes, are insufficiently studied. In the paper, formulas for various schemes of concurrent error detection are obtained for calculating the probability of missing an error in the case of single errors. The use of this analytical assessment allows you to choose the best system of concurrent error detection without the need to perform a simulation of each scheme separately. The aim of the work is to develop software and design flow for designing concurrent error detection schemes with the selection of the best error-correcting code taken into account.

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**V.M. Kureychik, I.B. Safronenkova.** DECISION-MAKING UNDER CRITERIA UNCERTAINTY FOR MULTILAYER BOARD DESIGNING PROCESS

**Key words:** decision-making, decision-making under uncertainty, ontology, uncertainty consideration method, generalized loss function, multilayer printed boards.

The present paper deals with the problem of decision-making under criteria uncertainty. In this context decision-making under uncertainty, types and conditions of uncertainty were examined. The decision-making under uncertainty problem was formalized. A modification of the mathematical decision support method under uncertainty via ontologies was proposed. A critical distinction of the proposed method is ontology usage as its base elements. The main aim of current work is the development of decision-making method under criteria uncertainty with the use of ontologies in the area of multilayer board designing. This method is focused on improvement of technical-economic values of the examined domain. The experiment of ontology inclusion showed its effectiveness. This permits to systematize and integrate the knowledge of the domain area.

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**V. M. Kureichik, Ye. S. Sinyutin, T. G. Kaplunov.** FORECASTING THE STATE OF TECHNICAL SYSTEMS USING GENETIC ALGORITHMS

**Key words:** Genetic algorithm, prediction, time series, diagnostic control, chromosome, population, prediction accuracy, crossing-over, mutation, dichotomy, Fibonacci numbers, extrapolation, algorithm.

In this article, a genetic algorithm for predicting the states of technical systems is given. An original approach to forecasting the states of technical systems is described. The approach is to find future values by extrapolating current observation results. Prediction can be considered as a diagnostic control at zero extrapolation time, or as a general diagnosis case.

The developed genetic algorithm includes a number of steps, such as generation of the first generation, crossing, mutation, selection. The operators of crossing-over and mutation are modified with respect to the classical ones with the aim of increasing the efficiency of work. The crossover operator is based on the dichotomy method. The break point in the mutation operator corresponds to the number of the Fibonacci series. This approach allows us to minimize the number of random events. The paper presents the results of testing the algorithm on the task of predicting the temperature of central computer processor.

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**S. F. Tyurin.** TRANSISTOR CIRCUIT ANALYSIS OF THE ALMOST CORRECT ADDER

Key words: Conventional Mirror Adder (CMA), Almost correct adder (ACA), Approximate XNOR-based Adder.

The race for energy efficiency of digital electronics is gaining momentum. The concept and the term «Green computing» is introduced. Professor Alex Yakovlev from the University of New Castle (he was in the past one of the members of the group of V.I. Varshavsky – developers of aperiodic automatic machines in the USSR) proposed «energy modulated computing». Its essence lies in the fact that the speed of computation, and perhaps their accuracy, is directly related to the sufficiency of energy resources. For example, with a small traffic on the bridge, a power source that generates energy by using design vibrations provides only «slow» calculations of the control unit and video cameras, but this is enough. As the traffic increases, so does the generation of energy, which also provides more intensive calculations in the analysis of traffic. It turns out that in order to reduce energy costs, it is possible in some cases to allow some loss of quality, even at the level of arithmetic blocks, by using approximate calculations (Approximate computing) with the help of a substantially smaller number of transistors. In the article, CMOS circuits of a one-digit exact and inexact binary full adder are investigated.

The aim of the work: is to study logic functions of CMOS circuit of a one-digit exact and inaccurate binary full adder: transfer function (majority function) and addition function by module two. The degree of their difference from the functions of exact adder is estimated and the simulation of adder operation is performed.

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**D. S. Bogdanov, I. A. Bogdanova.** ISSUES OF MODERN PRINTED CIRCUIT BOARD DESIGN

Key words: printed circuit board, design element calculations, tolerance, standard deviation, electrical current load, track width, net branch, autorouting.

The article studies the problem of keeping standard requirements and methods for printed circuit board design up to date. The aim of the work is to reveal obsolete approaches for printed circuit board design, inaccurate formulas and algorithms. It is also aimed to reveal tolerance and simplifications within calculations and modeling, which are unnecessary under current circumstances. Separate parts of standards and principles, which require reassuming and optimization first, are listed. For each tolerance the possible reason for approving this tolerance is studied, and it is questioned if these reasons are still actual, and if there are some other recent circumstances requiring the approval of new kinds of tolerance. The general issue of accordance between computer models of electrical circuits and real distribution of electrical current within branches of the same net is studied. The article is concluded with the necessity of changes in standards and modeling principles.

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**E. S. Anikin, A. O. Zvonov, A. G. Yanishevskaya.** MATHEMATICAL BASICS OF REINFORCED HOSE CAD AT CONSTRUCTIVE DESIGN LEVEL

Key words: strength calculations, composite materials, chemical engineering, specialized CAD, mathematical modeling.

The mathematical support of reinforced hose (RH) CAD is considered, namely, RH mathematical models used for strength calculations. The relevance of the study is due to the need to expand the RH design automation. Only automation tools for general engineering are used currently in this area: CAD for geometric modeling, general CAE analysis systems. CAE modules oriented to work with composite materials, appeared in the last decade, are based on finite element models obtained from geometric models. The aim of the paper is to create RH analytical models suitable for strength calculations. Such models for six RH designs are obtained and considered. Conclusions are drawn that the obtained models, implemented into specialized CAD module, can be used to accelerate RH preliminary design.

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**INSTRUMENT-MAKING AND INFORMATION-MEASURING SYSTEMS****D. V. Avramenko, V. G. Andreyev.** PHOTOPLETHYSMOGRAPHIC SIGNAL SPECTRUM ANALYSIS USING MODIFIED PRONY'S METHOD

Key words: modified Prony's method, photoplethysmogram, spectral parametric estimation, digital processing of biomedical signals, redefined system of Yule – Walker equations, quasi-inverse matrix, weighted vector, non-invasive diagnostics.

The problem of spectral estimation of photoplethysmographic signal is considered. The aim of the work is to improve the quality of spectral analysis of multifrequency light reflections from biological tissues by a

modified Prony's method and to assess the dynamics of heart rate on a short (tens of heart attacks) sample of observations. The method of observed data description by the sum of exponential functions is analyzed. It is shown that the  $\Delta F$  values of relative deviations of estimated dominant frequencies from the true ones are significantly reduced (from 2 to 4 times) by using the modified Prony's least squares method as compared to the autoregressive spectral analysis method, which smoothly changes its intensity of Y process of light reflections from biological tissues for noninvasive diagnosis of patient's health.

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**G. V. Abramov, L. A. Korobova, A. L. Ivashin, I. A. Matytsina. DEVELOPMENT OF DIAGNOSTIC MODULE FOR INFORMATION SYSTEM OF MONITORING HEALTH OF PATIENTS WITH PULMONARY DISEASES**

Key words: sound signals, analysis, correlation, fuzzy logic, inference rules, cough recognition, mathematical methods, information system.

The aim of the study was the development of an information system for diagnosing patients with pulmonary diseases. Within the framework of achieving this goal, the following tasks are accomplished. Patient's record using a dictaphone during the day, converting the audio information into a specific format is received. Parameters of cough fragments in the received patient record are determined. Criteria for cough-point recognition, analysis and processing of sound recording, and systematization of research results are developed. The mechanism of the system is as follows. Entire sound recording is divided into intervals of a certain length. They are divided into coughs and noises. Next, the noise is filtered out. The result of the system is the number of cough fragments in sound record. This system is recommended to be used by doctors for diagnosing the condition of patients, and also when monitoring treatment process.

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**A. A. Bolshakov, A. A. Kulik, I. V. Sergushov, E. N. Scripal. RESEARCH OF BACKUP CIRCUIT OF FLY-BY-WIRE SYSTEM TO CONTROL HELICOPTER TYPE AIRCRAFT**

Key words: fly by wire, hardware, software, mathematical model.

The article presents the results of studies of the working capacity of backup circuit to control the aircraft allowing to evaluate the correctness of technical solutions adopted in the process of designing fly by wire systems. Particular attention in this article is paid to the method of assessing the operability of backup circuit of fly by wire system. It is characterized by complex approach to testing its software and hardware, and also comparing the data obtained during the experiment with the results of mathematical modeling. The practical importance of the work consists in applying the results obtained and the methodology proposed in the production of fly by wire and complex control systems.

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## ELECTRONICS AND NANOELECTRONICS

**Do Quang Manh, B.A. Kozlov. THE EFFICIENCY OF ENERGY TRANSFER FROM PULSE PUMPING GENERATOR TO ACTIVE MEDIUM OF SMALL-SIZED TEA-CO<sub>2</sub> LASER**

Key words: TEA-CO<sub>2</sub> laser, pulse pump generator, pump energy, pulse radiation energy, efficiency of pump energy transfer from pulsed generator to laser active medium, CO<sub>2</sub>-laser mixture.

The conditions for the most complete transfer of energy from pulsed pumping generator to the active medium of small-sealed TEA-CO<sub>2</sub> laser are experimentally determined in a wide range of changes in the ratios between the components of working mixtures. It is established that the pumping efficiency reaches its highest values in working mixtures with increased content of molecular components. The main aim of this work is to establish experimentally the basic interrelationships between the efficiency of pump energy transfer from pulsed generator to the active medium of small-sized TEA-CO<sub>2</sub> laser with chemical composition of working mixture and the value of pump pulse voltage, as well as to determine the conditions for achieving maximum values of transmission efficiency.

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**Do Quang Manh, B.A. Kozlov. INITIAL FORMATION OF VOLUME PUMPING IN SMALL-SIZED TEA-CO<sub>2</sub> LASER**

Key words: TEA-CO<sub>2</sub> laser, preliminary ionization, VUV radiation, photo-ionization, critical photoelectron concentration, breakdown voltage,  $\gamma$  – processes.

The influence of initial chemical composition of CO<sub>2</sub>-laser mixtures at atmospheric pressure on the processes occurring at the initial stage of pump volume discharge formation is studied theoretically and experimentally. The energy costs for achieving the required level of initial ionization are experimentally determined

and the values of breakdown voltages in a wide range of changes in component composition of active medium of small-sealed TEA-CO<sub>2</sub> laser are measured.

The main aim of this work is to determine the degree of influence of chemical composition of working mixture on the amount of energy expenditure for initial ionization providing homogeneous breakdown and on the values of breakdown voltage of gas-discharge gap in small-size TEA-CO<sub>2</sub> lasers with working gaps  $V_1 = 0.8 \times 0.8 \times 18$  and  $V_2 = 1.8 \times 1.2 \times 24$  cm<sup>3</sup>.

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**S. M. Karabanov, D. V. Suvorov, D. Yu. Tarabrin, O. A. Belyakov, A. S. Karabanov, E. V. Slivkin, A. E. Serebryakov, V. V. Klimakov.** MATHEMATICAL MODELING OF SILICON MELT VACUUM REFINING IN THE CONDITIONS OF MAGNETOHYDRODYNAMIC STIRRING

Key words: mathematical modeling, refining, silicon, magnetohydrodynamic stirring.

The paper presents research results of vacuum refining of silicon melt in the conditions of magnetohydrodynamic stirring. The results of silicon purification dynamics from impurities with high saturated vapor pressure at the temperature above the melting point of silicon are presented (for example, P, Zn, Na, Mg, Ca, Al, Cu). The influence of stirring speed on the rate of silicon purification is determined. Basic regularities and factors that limit the rate of cleaning are shown. The studies were carried out by mathematical modeling using COMSOL Multiphysics programs.

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**V. K. Bazylev, A. M. Zhidkov, V. A. Korotchenko, V. E. Skvortsov, S. A. Shlaypin.** THERMAL MANOMETER WITH CATHODE RESISTANCE MONITORING IN PULSE HEATING MODE

Key words: ionization pressure transducer, thermal resistance manometer, filament heating current, gas thermal conductivity.

A microprocessor vacuum gauge device was developed to ensure the inclusion of PMI-2 ionization transducer in thermal resistance manometer mode, in which the cathode incandescence decay is recorded after the lowered (1 V) voltage is turned on and the integral value of filament heating energy is determined during the transient process (2 s). Operating capacity of the prototype device was experimentally confirmed to be in the range of (10<sup>-3</sup> – 760) Torr with linear scale and relative error of about ± 25 %.

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**V. K. Bazylev, A. M. Zhidkov.** MAIN FACTOR DETERMINING THE LOWER BOUNDARY OF PRESSURE MEASUREMENT RANGE BY METHOD OF ELECTRON SCATTERING ON GAS MOLECULES

Key words: soldered magnetron, electron-electron collisions, electron scattering by gas molecules, measurement of residual gas pressure, crossed electric and magnetic fields.

The authors considered the influence of electron-electron collisions on the form of informative parameter dependence on gas pressure in the method of pressure measurement based on scattering of electrons by gas molecules in crossed electric and magnetic fields when the magnetic field has much more critical value. It is shown that electron-electron collisions limit the lower bound of pressure measurement using this method.

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**A. E. Chizhikov, V. V. Dyunov.** RESEARCH OF EXALTATION MODE INFLUENCE ON PHOTOLUMINOPHOR EFFICIENCY

Key words: luminophor light efficiency, exaltation mode, quantum efficiency, pulse duration, saturation mode.

The aim of the work is the research of influence on light efficiency of photoluminophor of Zn<sub>2</sub>SiO<sub>4</sub>:Mn having pulse and average intensity of gas discharge ultra-violet radiation. The research was conducted at the time when pulses were insufficient for transition of photoluminophor to the saturation mode. It is established that the greatest light efficiency is reached at small pulse intensity of exaltation in the wide range of average intensity provided by the change of frequency and (or) duration of discharge pulses in a cell. It is shown that the decisive impact on light efficiency is exerted by the decrease of quantum output of photoluminophor on flash location at the expense of highlighting action of radiation. Recommendations about the choice of exaltation modes providing either greatest light efficiency, or largest brightness are given.

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