ANNOTATIONS

PHYSICS

Bobreshov A. M., Dyboy A. V., Nesterenko Yu. N., Razuvaev Yu. Yu.

THE STRUCTURE OF A VOLUME CHARGE IN GaAs MESFET AT THE BOUNDARY BETWEEN AN ACTIVE LAYER AND A SUBSTRATE, DOPED BY CHROME

The structure of volume charge at the boundary between semi-insulating substrate, doped by chrome, and canal of GaAs MESFET was analyzed by means of computational modeling. It was considered a four-level model of semi-insulating GaAs with deep levels. It was shown a determining role of deep acceptor levels in the forming of a volume charge.

KEY WORDS: metalized semiconductor field-effect transistor, gallium arsenide, volume charge, semi-insulating substrate, deep levels, computational modeling.

Gridnev A. E.

FORMING A SYSTEM OF FIELD CONCENTRATORS DURING ANODIC ALUMINA GROWTH AS A RESULT OF IMPACT IONIZATION

Electroluminescence during barrier anodic oxide growth on aluminum in different electrolyte was studied. The propagation of electronic avalanches generate a space charge forming a system of local field concentrators close to oxide/electrolyte interface. The anodizing solution determines field geometry, which be in accord with cell morphology of anodic alumina.

KEY WORDS: anodic oxide films, electroluminescence, electronic avalanches, field concentrators, porous alumina.

Zakharov A. V.

ESTIMATION OF PARAMETERS OF ABRUPTED RANDOM DISTURBANCE WITH UNKNOWN MOMENT OF APPEARANCE

Maximum likelihood algorithm of joint estimation of parameters of Gaussian random disturbance are synthesised. Asymptotically exact expressions of estimation characteristics are found. Bounds of applicability of these expressions are established experimentally by a method of statistical modelling on the computer.

KEY WORDS: random disturbance, maximum likelihood method, joint estimation, average error, variance.

Zakharchenko A. A., Petrov B. K., Kurganskii S. I., Klinskikh A. F.

ELECTRONIC STRUCTURE AND CONDUCTANCE OF SINGLE WALLED CARBON NANOTUBES «ARMCHAIR» TYPE IN APPROXIMATION OF FREE ELECTRONS

In this paper the model of single walled carbon nanotubes with metallic type of conductivity designed in approximation of free electrons is presented, the method of calculation of the electronic structure and conductance based on this model is described, results of calculation of electronic structure and conductance of single walled carbon nanotubes «armchair» type obtained using this model are presented.

Ivankov Yu. V., Ivanova O. A., Ivankova E.Yu., Levin M. N.

THE EFFECT OF WEAK MAGNETIC FIELDS ON POPULATION OF SPIN STATES OF THE RADICAL PAIRS

In the present work we calculated the time dependencies of radical pair spin states populations, as well as the time dependencies of amplitudes of the transitions between the states. The calculations were carried out for constant fields. The superfine interaction has been taken into account. The abovementioned characteristics were found out from solution of the Liouville equation for the radical pair spin density matrix. The oscillating character of the time relaxation of the spin levels partial populations and monotonic decrease of the full population were established.

Larionov A. N., Chernyshov V.V., Larionova N. N.

ANISOTROPIC ULTRASOUND PROPAGATION AND VISCOSITY OF NEMATIC LIQUID CRYSTALS UNDER CHANGEABLE STATE PARAMETERS

Theoretical validity of acoustic spectroscopy method of viscosity coefficients determination is presented. The dissipative coefficients of nematic liquid crystal and of nematic mixtures under changeable state parameters has been studied.

Levin M. N., Tatarintzev A. V., Ahkubekov A. E.

THE DEEP LEVEL TRANSIENT SPECTROSCOPY WITH SELECTION OF THE REGULARIZATION PARAMETER BY THE L-CURVE

We propose to use the L-curve approach for choosing the regularisation parameter in the Laplace-DLTS in order to exclude uncontrolled mistakes and increase

the reliability of results. The possibilities of the method are demonstrated by numerical analysis of relaxation of the model signal containing three close exponents and a noise component. It is shown that the proposed version of Laplace DLTS with the L-curve approach or the LL-DLTS is more reliable in comparison with the well-known Laplace-DLTS with choosing the regularization parameter by residual.

KEY WORDS: MOS structure, spectroscopy, the deep level, numerical analysis, the model relaxation charge, the L-curve, Laplace DLTS.

Melnikov G. A., Melikhov Yu. F., Larionov A. N., Verveyko V. N., Verveyko M. V.

FORECASTING OF IR-SPECTRA OF A CLUSTER'S SYSTEMS

Within the bounds of the theory of an effective field and the suggested ratio for function of clusters distribution on number of particles contained in them the design procedure of rotary spectra in IR-area for simple and organic liquids is developed. The comparative analysis of a predicted spectrum of frequencies with available experimental data and results of computer calculations with application of various model potentials is carried out.

KEY WORDS: effective field theory, cluster, rotary spectra, simple liquid, organic liquid, frequency spectrum, model potential.

Novikov P. V., Latyshev A. N., Ovchinnikov O. V., Minakov D. A., Smirnov M. S.

EFFECT OF SUMLIGHT DECREASING BY PHOTOSTIMULATED LUMINESCENCE FLASH IN ZNS SINGLE CRYSTALLS

Using a method of photostimulated luminescence flash observed after decay of the fluorescence in ZnS single crystals, a mechanism of a decrease of the light sums highlighted from deep electron traps was studied. A number of evidences was obtained, which allow to propose that the most possible channel of the decrease is reduction of concentration of ionized luminescence centers. It is shown that the reduction occurs due to a recombination of electrons realized from shallow energy levels with depth 0.12 eV at these centers. At the same time, recombination of electrons localized at the deep energy level with free holes realized from shallow hole traps takes place too.

KEY WORDS: luminescence flash, sum light, zinc sulfide.

Parfenov V. I., Sergeeva E. V.

THE APPLICATION OF DISCRIMINANT PROCEDURE UNDER SYNTHESIS AND ANALYSIS OF COMMUNICATION SYSTEM, BASED ON MANIPULATION OF RANDOM PROCESS CHARACTERISTICS

The communication system, based on manipulation of statistical characteristics of random process (the excess and asymmetry coefficients), are considered.

The problem of extraction of useful information from the received oscillations formulates as the problem of detection of changing properties of random processes. The discriminant analysis methods are used for the extraction the useful information. Some versions of discriminant functions are considered. The characteristics of discriminant analysis procedure of examined algorithms are found by means of computer modeling. The comparison of found characteristics with the characteristics of optimal algorithm are carried out.

KEY WORDS: random signal, discriminant analysis, excess and asymmetry coefficients, algorithms of detection and estimation.

Nakhmanson G. S., Starodubtseva E. A.

THE MODELING OF THE MANIPULATED WIDEBAND SIGNAL RECEPTION IN THE MUTUAL INTERFERENCES BY THE CORRELATIVE RECEIVER IN THE INFORMATION CHANNEL OF COMMUNICATION

The developed algorithms for modeling of the phase manipulated wideband signals reception by the correlative receiver in the information channel of the communication are considered. It is taken into account supporting signal phase fluctuations, called by the synchronization channel noises. It is shown that the statistical modeling results are good coordinated with the analytical calculations.

KEY WORDS: phase manipulated wideband signal, communication system, synchronization, signal-noise ratio, error probability.

Radchenko Yu.S., Milyaev S.V.

ESTIMATION OF VECTOR OF IMAGES FRAGMENTS MOTION IN ASYNCHRONOUS SPECTRAL BASIS

In this paper vector of shift motion estimation algorithms in spectral domain are considered. Algorithms of an estimation are based on invariance of the generalized spectra of images to shift of signal. As basic functions Chebyshev polynomials and Hermit functions are chosen. Structure of extremal functional is investigated at analysis of different number of spectral modes. Procedure of finding of extremum as a "spectral discriminator" is suggested.

KEY WORDS: image processing, spectral analysis of signals, vector of image motion, shift motion estimation algorithms.

Rudneva V. E., Rudneva Val. E., Seredin P. V., Domashevskaya E. P.

THE INFLUENCE OF TECHNOLOGICAL PROCESSES ON ELEMENTAL COMPOSITION AND PARAMETER CONCORDANCE IN TERNARY ALLOYS OF EPITAXIAL HETEROSTRUCTURES $Ga_xIn_{1-x}P/GaAs$ (100)

The influence of the technological conditions in the process of obtaining of the epitaxial films was investi-

gated. According to the technological conditions (the layer growth temperature and the amount of phosphine) we determined the lattice parameters of the epitaxial alloys. Interval of the element composition x= 0,49÷0,56 was determined; also we defined a decomposition of the epitaxial alloys into a few similar compositions. The investigations of GaInP heterostructures on GaAs substrate were performed for the different stoichiometric ratios and the optimal conditions for obtaining of heterostructure with the best matched lattice parameters were determined. The sample satisfying this condition was EM 794 with element composition x = 0.51 (the layer growth temperature 700 °C and the amount of phosphine PH_3 in a gas flow 20 ml/sec).

KEY WORDS: epitaxial heterostructures, spinodal decomposition; semiconductors.

Seredin P. V., Domashevskaya E. P., Gordienko N. N., Glotov A. V., Zhurbina I. A., Arsent'ev I. N., Shishkov M. V.

ROLE OF BUFFER POROUS LAYER AND DYSPROSIUM IN GaInP:Dy/por-GaAs/GaAs(100) HETEROSTRUCTURE

In the samples with porous buffer layer the residual internal stresses caused by the difference in lattice parameters between the surface layer of ternary GaInP alloy and GaAs substrate are redistributed into the porous layer, which in this case plays a role of a "sponge" and completely removes the internal stresses.

KEYS WORDS: epitaxial heterostructures, porous layers, doping, internal stresses.

Solodukha A. M., Grigoryan G. S.

THE GRAIN BOUNDARY INFLUENCE ON DYNAMIC ELECTRICAL CONDUCTION OF FERROELECTRIC BARIUM-STRONTIUM TITANATE CERAMICS

Dependences of dielectric permeability and electric resistance on temperature and frequencies of a test signal for samples of the ferroelectric ceramic solid solutions $(Ba, Sr)TiO_3$ were investigated by impedance spectroscopy. Energy of activation of processes of conductivity and a dielectric relaxation was found. Areas of temperatures in a paraelectric phase of samples where the positive temperature factor of resistance (ПТКС) takes place were established. The electronic state density on grain boundary was calculated by a method based on Heywang Model.

KEY WORDS: ferroelectric ceramics, impedance spectroscopy, PTCR.

Trifonov A. P., Kutsov R. V.

DETECTION OF AN OBJECT WITH UNKNOWN PARAMETERS OF MOVEMENT BY ITS IMAGE

Synthesis and analysis of the maximum likelihood algorithms of detection of an object are carried out for the applicative model of interaction of moving object and background in conditions of a priori uncertainty concerning the parameters of movement. The cases of a priory ignorance of the velocity, the direction of movement and the velocity vector are considered. The influence of a priori ignorance of the parameters of movement and of the character of distribution of image intensiveness of a moving object on effectiveness of detection is investigated.

KEY WORDS: detection, applicative model, maximum likelihood algorithm, unknown parameters, velocity, traffic route, velocity vector, inhomogeneous image.

Schekochikhin A. V., Domashevskaya E. P., Karpov S. I., Stogney O. V.

INTERATOMIC INTERACTION AND MODES OF INFRARED SPECTRUMS IN AMORPHOUS NANOCOMPOSITES $(CO_{45}FE_{45}ZR_{10})_X (SIO_2)_{1-X}$

Through the identification of modes of vibrational infrared spectrums the interatomic interaction between elements of the metallic component and the dielectric matrix in amorphous granulated composites with a compound structure of the metallic component $((Co_{45}Fe_{45}Zr_{10})_x(SiO_2)_{100-x})$ is determined. A correlation between the intensity of mode fluctuations and magnetoresistive properties of amorphous nanocomposites is established.

KEY WORDS: vibration infrared spectrums, correlation, magnetoresistive properties, metallic component, dielectric component, intensity of mode.

MATHEMATICS

Kulikov A. A.

GENERALIZED SOLUTIONS OF B HYPOELLIPTIC EQUATIONS WITH VARIABLE COEFFICIENTS

In this paper we study the special spaces of test and generalized functions used in the general theory of singular differential equations containing the Bessel operator. Corresponding results are applied for the investigation of the fundamental solutions of B-hypoelliptic equations with constant coefficients and of the questions of local solvability and smoothness of generalized solutions of B-hypoelliptic equations with variable coefficients.

KEY WORDS: partial differential equations, general theory, generalized solutions, hypoellipticity, variable koefficients, singularity, the Bessel oherator.

Kiriyatzkii E. G.

ABOUT ONE FORMULA IN THE CLASS OF ANALYTICAL IN CIRCLE FUNCTIONS AND ITS APPLICATIONS

Is established the formula, which mufually conects the coefficients of Taylor holomorphic in circle $|z| < 1$ functions and $f(\omega(z))$, where $\omega(z;\zeta) = (z + \zeta)/(1 + \bar{\zeta}z)$. With the aid of this formula are evaluated the

coefficients of functions, to the belonging different classes.

KEY WORDS: holomorphic function, divided difference, derivate, coefficients of functions, class of functions.

Perov A. I.
THE PRINCIPLE OF GENERALIZED CONTRACTIVE MAPPINGS IN THE PSEUDOMETRIC SPACES

Sometimes it is convenient to use in the study of equations system (algebraic, differential or integral) not the ordinary metric spaces with the numerical metrics and classical principle of contracting mappings, but the pseudometric spaces, in which the pseudo-distance is measured with the help of nonnegative elements of some linear partial ordered space with the convergence, and the principle of generic contracting mappings, where the half- additive cone's self-mappings of the nonnegative elements, which are absolutely stable, stand as the majorant for the operator increment.

KEY WORDS: pseudometric space, semi-additive map, generalized contraction map, principle of contraction maps.

Korsunina V. V., Lopasov M. S.
DEFINITION OF THE INITIAL STRESS IN A FINITE ELEMENT METHOD

The main objective of the present paper is to concentrate on aspects that relate to a numerical solution of elasto-plasticity problem. It then describes a non-iterative modification of the initial stress method for solving elasto-plasticity problem in case when the hypothesis of the simple loading is could be applied. A numerical example of bending with stretching on a rigid die of an elasto-plasticity profile is considered with the use of the hypothesis of a plain deformation.

KEY WORDS: elasto-plasticity problem, numerical solution, initial stress method.

Tolpaev V. A., Kolesnikov A. V.
AN EQUATIONS FOR POTENTIAL OF p-ANALYTIC FUNCTIONS WITH CHARACTERISTICS $p = p_1(x) p_2(y)$

For p-analytic functions of G. N. Polojiy with characteristics $p(x,y)$ in the form $p = p_1(x) \cdot p_2(y)$, we giver new expressions via a potential $w(x,y)$ which satisfies special elliptic equation with variable coefficients depending on $p_1(x)$ and $p_2(y)$.

KEY WORDS: complex variable, general analytic function, potential, combined elliptic equations, harmonic function, metaharmonic function.

Kobychev K. S.
ESTIMATIONS OF BOUNDED SOLUTIONS OF PERIODICAL BOUNDARY VALUE PROBLEM IN $C([0, 2\pi], H)$ -METRICS THROUGH THEIR ESTIMATIONS IN $L([0, 2\pi], H)$ - METRICS

This work contains a priori estimation of bounded solutions of periodical boundary value problem; the integral representation of periodical function is derived. As a consequence constant operator is discussed.

KEY WORDS: periodical function, differentiation operator, norm estimation, fourier series, inverse operator, banach algebra, banach space, sobolev space, embedding theorem.

Baev A. D.
ABOUT THE SOLUTIONS A PRIORI ESTIMATION OF IN BAR GENERAL BOUNDARY PROBLEM FOR DEGENERATING HIGH ORDER ELLIPTIC EQUATION

In this paper the solutions *a priori* estimation of in bar general boundary problem for degenerating high order elliptic equation is ascertained in Sobolev's weight spaces.

KEY WORDS: degenerating high order elliptic equation, general boundary problem, a priori estimation of solutions.

Vorotnikov D. A.
ON THE INITIAL-BOUNDARY VALUE PROBLEM FOR EQUATIONS OF ANOMALOUS DIFFUSION IN POLYMERS

We study the system of partial differential equations which describes the diffusion of a penetrant liquid in a polymer. We construct weak solutions to the initial-boundary value problem for this system in a bounded domain.

KEY WORDS: anomalous diffusion, polymer—penetrant systems, topological degree, weak solution, nonlinear PDE.

Gel'man A. B.
ABOUT ONE CLASS OF MULTIVALUED MAPPINGS WITH NON-COMPACT IMAGES

In this paper a new class of multivalued mappings with convex closed but non-compact images is studied. Some new theorems about fixed points for mappings of this class were proved. At the end of the paper they are applied to the study of solvability of operator equations with surjective operators.

KEY WORDS: multivalued mapping, single-valued approximation, fixed point, topological degree, surjective operator.

Nguyen Manh Nung, Nguyen Thanh Anh

REGULARITY OF SOLUTION OF THE SECOND INITIAL BOUNDARY VALUE PROBLEM FOR PARABOLIC EQUATIONS IN DOMAINS WITH CONICAL POINTS

The purpose of this paper is to establish the well-posedness and the regularity of solutions of the second initial boundary value problems for general higher order parabolic equations in infinite cylinders with the bases containing conical points.

KEY WORDS: parabolic equation, initial boundary value problem, nonsmooth domains, generalized solutions, regularity.

Shepilova E. V.

ON APPROXIMATED SOLUTION OF THE SHREDINGER TYPE EQUATION A PROJECTIVE-DIFFERENCE METHOD WITH MODIFIED KRANK-NICOLSON SCHEME ON A TIME

A linear non-stationary problem of Shredinger type is solved approximately a projective-difference method in a separable Hilbert space. Discretisation of that problem on space is spent by the Galerkin method (with orientation to finite-dimensional subspaces). Discretisation of that problem on time is spent by the modified Krank—Nicolson scheme. Estimations of error for the approximated solutions are established. That estimations allow to receive not only convergence of the approximated solutions to exact, but also give numerical performances of a velocity of convergence.

KEY WORDS: Shredinger type equation, a projective-difference method, Krank—Nicolson scheme.

Karpova A. P., Sapronov Yu. I.

THE RESONANCE BIFURCATIONS OF SOLUTIONS OF SO(2)-EQUIVARIANT FREDHOLM EQUATIONS AND NONLINEAR DYNAMIC

Bifurcation of solutions of smooth SO(2)-equivariant Fredholm equations is studied of the Lyapunov–Schmidt method and the SO(2)–invariant method. The general research: the studieng of the normal forms of key equations in $\mathbb{R}^4$. This class includes equations of spring beam oscillations located on elastic foundations, autonomous systems of ordinary differential equations, hydrodynamical systems etc. The topic of the paper develops and extends the earlier research of B. M. Darinsky, Y. I. Sapronov and V. A. Smolyanov.

KEY WORDS: cycle, resonance, bifurcation, Lyapunov—Schmidt method, circle symmetry. MSC 70G40.

Dolzhenkov A. A.

NOT LOCAL BIFURCATIONAL ANALYSIS OF DOUBLE SG-EQUATION MODIFIED BY LYAPUNOV—SHMIDT METHOD

The way to not local study of the class of bifurcational tasks of variation counting is examined in this work which includes the most of the sample tasks of soliton mathematic and its natural generalization which is out of borders of this science. The main example in this work is double SG-equation. At the heart of this way is modified Lyapunov—Shmidt method and methods of analytical and numeral calculation which is realized in the system of computer mathematic.

KEY WORDS: bifurcation, Liapunov—Schmidt method, double SG-equation.

Azarina S. V., Gliklikh Yu. E., Obukhovski A. V.

MECHANICAL SYSTEMS WITH RANDOM PERTURBATIONS ON NON-LINEAR CONFIGURATION SPACES

The mechanical systems given on non-linear configuration spaces — smooth manifolds — in terms of Newton's second law and subjected to random perturbations of either forces or velocities, are considered. The machinery of mean derivatives is applied for obtaining well-posed description of the systems and for their investigation.

KEY WORDS: mechanical systems; random perturbation of force; random perturbation of velocity; set-valued force; mean derivatives; differential inclusion; Langevin equation.

Kritskaya E. A., Smagin V. V.

ON A WEAK SOLVABILITY OF THE PROBABILITY PROBLEM OF THE PARABOLIC TYPE WITH AN INTEGRAL CONDITION

In a Hilbert space for the abstract linear parabolic equation with the nonlocal integral condition on the solution, the theorem of existence and uniqueness of the weak solution is proved using the Galerkin approximation of the exact problem.

KEY WORDS: Hilbert space, Galerkin method, parabolic equation.

Glushko A. V., Ryabenko A. S.

ON MINOR ONE-DIMENSION ACOUSTIC OSCILLATIONS IN STRATIFIED FLUID IN SEMISPACE

The manuscript investigates initial-boundary value problem that describes minor oscillations of stratified fluid in semispace. Existence and uniqueness of solution is proved and asymptotes of solution at $t \to \infty$ are built.

KEY WORDS: asymptotic, stabilization, viscous liquids, stratified liquids, estimation.

Kuznetsov A. V.

BORDER OPTIMAL CONTROL FOR THE INITIAL-BOUNDARY PROBLEM FOR THE MODEL OF THE VISCOELASTIC FLUID WITH FULL DERIVATIVE.

The paper deals with border optimal control problem for the inhomogeneous initial-boundary problem for the Jeffereys model of the viscoelastic fluid in the bounded domain in $\mathbb{R}^n$, $n = 2, 3$. Results on global existence of the weak solution and weak optimal solution for the arbitrary sufficiently smooth initial data are obtained.

KEY WORDS: inhomogeneous initial-boundary problem, border optimal control, hydrodynamic of the viscoelastic fluid, Jeffreys' model.

Darinskii B. M., Kolesnikova I. V.,
Kostin D. V., Sapronov Yu. I.

BIFURCATION OF EXTREMAL IN MINIMAL POINTS WITH HOMOGENEOUS FEATURE OF THE FOURTH AND SIXTH ORDER

The review of results of research on a problem about a geometrical structure caustic and apportion bifurcation extremal Fredholm functionals (with parameters) in a vicinity of a point of a minimum with homogeneous feature of the fourth and sixth order is given. Cases of symmetry to pair or three switching involution are investigated mainly. Results are received on the basis of reductions of key function on $\mathbb{R}^2$ and $\mathbb{R}^3$ by means of Lyapunov—Schmidt's circuit and fundamental theorems of the theory of features of smooth functions.

KEY WORDS: extremal, bifurcation, caustic, Lyapunov—Schmidt method, type of singularity.

Priadko I. N., Sadovsky B. N.

ON A GRAPHIC METRIC FOR FUNCTIONS

In this paper the new "graphic" metric on set of all multifunctions acting from one metric space into another is defined. Functions are not necessarily defined on the same set, for example, net approximation in this metric can be close to initial function. The examples illustrating essential features of the new metric are considered. As an applied example the theorem of continuous dependence of an output of the nonideal relay from continuous inputs with uniform norm is proved.

KEY WORDS: graphic metric, Hausdorff metric, nonideal relay, continuous dependence of an output on an input.

Krivosheeva O. V.

SOME REMARKS ON DIFFERENTIAL INEQUALITIES

In this work some new statements on first order differential inequalities were obtained.

KEY WORDS: first order differential inequalities, Dini derivatives, Increment of a function in a Banach space.