

# **2018 19th International Conference of Young Specialists on Micro/Nanotechnologies and Electron Devices (EDM 2018)**

**Erlagol (Altai Republic), Russia  
29 June – 3 July 2018**



IEEE Catalog Number: CFP18500-POD  
ISBN: 978-1-5386-5022-6

**Copyright © 2018 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP18500-POD
ISBN (Print-On-Demand):	978-1-5386-5022-6
ISBN (Online):	978-1-5386-5021-9
ISSN:	2325-4173

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# Table of Contents

## Section I. Semiconductor Physics and Technology. Photovoltaics Section Chair: **Viktor A. Gridchin**

1.	<b>Structure and Optical Properties of Nanocrystalline Titanium Dioxide Prepared via Pulsed Laser Ablation in Liquid</b> <i>Elena D. Fakhrutdinova, Antonina V. Palatova, Valery A. Svetlichnyi</i>	3
2.	<b>TCAD Simulation of the Influence of Grain Boundaries on the Temperature Dependence of Conductivity in Polycrystalline Silicon Films</b> <i>Vladislava I. Saburova, Victor A. Gridchin, Gennady N. Kamaev, Igor G. Neizvestny, Aleksey S. Cherkaev</i>	8
3.	<b>Investigation of Hf(Zr)O<sub>2</sub> Film Ferroelectric Properties Grown by Atomic Layer Deposition Method</b> <i>Ramin M. H. Iskhakzay, Vladimir Sh. Aliev, Vladimir A. Gritsenko</i>	12
4.	<b>Shapes of the Micron-Sized SiGe Islands Grown on Si(100) in Dewetting Conditions</b> <i>Anastasia E. Budazhapova, Alexander A. Shklyaev</i>	16
5.	<b>Influence of Technological Parameters on the Energy Efficiency of Oxide Solar Cells</b> <i>Kirill O. Nikolaev, Ekaterina A. Pecherskaya, Aleksei A. Shamkin</i>	19
6.	<b>Simulation of the Heterodyne Method for Measurement of the Second Derivative of the Current-Voltage Characteristic</b> <i>Nikita I. Lysenko, Vladimir G. Polovinkin</i>	22
7.	<b>Research of Atomic Layer Deposited HfO<sub>2</sub>/TiO<sub>2</sub> Multilayer Structures by Spectroscopic and Multiangle Monochromatic Null Ellipsometry</b> <i>Irina B. Mishchenko, Darya E. Petukhova, Mikhail S. Lebedev</i>	26
8.	<b>Examination of Schwoebel Barrier Influence on GaN Quantum Dot Formation</b> <i>David V. Shterenthal, Alexander N. Karpov, Nataliya L. Shwartz</i>	30
9.	<b>GaAs Substrates Langmuir Evaporation Kinetics</b> <i>Anna A. Spirina, Alla G. Nastovjak, Nataliya L. Shwartz</i>	35
10.	<b>An Evaluation of CMOS Inverter Operation Under Cryogenic Conditions</b> <i>Anton A. Cherepanov, Ilya L. Novikov, Vladislav Yu. Vasilyev</i>	40
11.	<b>Microelectromechanical Generator with Autostabilization Mode</b> <i>Valery P. Dragunov, Rodion E. Sinitiskiy, Dmitriy I. Ostertak</i>	44
12.	<b>Multifunctional Magnetophotonic Structure Creation Based on Magnetic Properties of Micro and Nanoscale Clusters</b> <i>Dmitry A. Bezuglov, Marina Yu. Zvezdina, Gennady P. Sinyavsky, Larissa V. Cherkesova, George N. Shalamov, Yuliya A. Shokova</i>	49
13.	<b>Analysis of the Technological Parameters Influence on the Reproducibility of the Active Dielectrics Properties</b> <i>Pavel E. Golubkov, Ekaterina A. Pecherskaya, Aleksey N. Golovyashkin, Aleksey A. Golovyashkin, Anatoliy V. Pecherskiy, Yuliya V. Shepeleva</i>	57
14.	<b>Mild Fluorination of Carbon Nanocages to Enhance the Supercapacitor Performance</b> <i>Aleksei V. Sosunov, Victor Henner, Gamini Sumanasekera</i>	62
15.	<b>Evaluation of Hall Effective Masses in Calcium Arsenide Monocrystal in Quantizing Magnetic Field</b> <i>Aleksey G. Moiseev, Konstantin N. Savinov</i>	65

## Section II. Radio- and Microwave Technology. Computer Science and Telecommunications Section Chair: **Svetlana V. Vorobiova**

1.	<b>Simulation and Comparative Analysis of Packet Delivery in Flying Ad Hoc Network (FANET) using AODV</b> <i>Alexey V. Leonov, George A. Litvinov, Evgeny V. Shcherba</i>	71
2.	<b>Simulation-Based Packet Delivery Performance Evaluation with Different Parameters in Flying Ad-Hoc Network (FANET) Using OLSR</b> <i>Alexey V. Leonov, George A. Litvinov, Dmitry A. Kornev</i>	79

<b>3.</b>	<b>The Complementary Buffer Amplifiers with Low Static Current Consumption for Low-Voltage Analog Microcircuits</b>	86
	<i>Alexey A. Zhuk, Anna V. Bugakova, Elena V. Ovsepyan, Nadezhda A. Dmitriyenko</i>	
<b>4.</b>	<b>Flexible Dynamical Control of Bandwidth Resources and Quality of Functioning/Services for 5G Heterogeneous Communications Using Universal Network Virtual Slicing Models</b>	90
	<i>Vera G. Drozdova, Alexander B. Markhasin</i>	
<b>5.</b>	<b>Use of Genetic Algorithm and Evolution Strategy when Revealing the Worst Case Effects of Crosstalk Propagation in PCB Bus of Spacecraft Autonomous Navigation System</b>	93
	<i>Ruslan R. Gazizov, Alexander M. Zabolotsky, Rustam R. Gazizov</i>	
<b>6.</b>	<b>Spectral Method of Synthesis of Geometric Models of Surface-Distributed Objects</b>	98
	<i>Vadim V. Artyushenko, Aleksey V. Kiselev, Andrey V. Nikulin, Maksim A. Stepanov</i>	
<b>7.</b>	<b>High Stability Microwave Radiometer</b>	104
	<i>Anton V. Ubaichin, Gregory G. Zhuk, Tilekbek Abdirasul uulu</i>	
<b>8.</b>	<b>The Problem of Biometric Identification of a Subject and Subject's Changed State: Perspectives of New Features Application in Analysis of Face and Neck Thermograms</b>	110
	<i>Samal S. Zhumazhanova</i>	
<b>9.</b>	<b>Determination of Critical Parameters of Binary Gibbs Random Field Based on Image Modeling</b>	114
	<i>Vasily N. Vasyukov, Anna Yu. Zaitseva, Irina A. Denisenko</i>	
<b>10.</b>	<b>Quantitative Measure of Phase Noise Assessment for Quartz Oscillators</b>	118
	<i>Pavel V. Sak, Galina V. Nikonova, Aleksandr V. Nikonorov, Aleksey O. Minin</i>	
<b>11.</b>	<b>The Differentiating Correction Circuits in Complementary Buffer Amplifiers</b>	122
	<i>Nikolay N. Prokopenko, Anna V. Bugakova, Andrey A. Ignashyn, Elena V. Ovsepyan</i>	
<b>12.</b>	<b>Differential Broadband Transimpedance Amplifier in 130 nm SiGe BiCMOS</b>	127
	<i>Anatoly V. Kosykh, Sergey A. Zavyalov, Rodion R. Fakhrutdinov, Konstantin V. Murasov, Ruslan A. Wolf</i>	
<b>13.</b>	<b>Wideband Double-Balanced Active Mixer Based on Gilbert Cell with Integrated Baluns in SiGe BiCMOS 130nm Technology</b>	132
	<i>Konstantin V. Murasov, Sergey A. Zavyalov, Anatoly V. Kosykh, Rodion R. Fakhrutdinov, Zhanat B. Sadykov, Ruslan A. Wolf</i>	
<b>14.</b>	<b>Spatial Interpolation of LTE Measurements for Minimization of Drive Tests</b>	136
	<i>Ruslan V. Akhpashev, Vera G. Drozdova</i>	
<b>15.</b>	<b>Security Checking Experiments with Mobile Services</b>	139
	<i>Anton D. Ermakov, Svetlana A. Prokopenko, Nina V. Yevtushenko</i>	
<b>16.</b>	<b>Problems of Neural Networks Training</b>	142
	<i>Grigory A. Fofanov</i>	
<b>17.</b>	<b>SCMA Codebooks Generation for Transmission on an Arbitrary Subcarriers Number</b>	145
	<i>Dmitriy A. Pokamestov, Yakov V. Kryukov, Eugeniy V. Rogozhnikov, Anatoliy Ya. Demidov, Renat R. Abenov</i>	
<b>18.</b>	<b>Examination of Physical Phenomena and Processes in Magnetophotonic Composite Media. Magnetophotonics Material Medium</b>	149
	<i>Larissa V. Cherckesova, George N. Shalamov, Alexander A. Shelud'ko, Boris A. Akishin, Vitaly M. Porksheyan, Irina S. Trubchik</i>	
<b>19.</b>	<b>Evaluation and Compensation of Systematic Errors of Matrix Simulator Calibration</b>	156
	<i>Alexey V. Kiselev, Artemy O. Podkopayev, Maksim A. Stepanov</i>	
<b>20.</b>	<b>The Analytical Dependence of the Range from the Angular Position of the Line-of-Sight for an Object Represented as Several Planes</b>	160
	<i>Andrey V. Nikulin, Vadim V. Artyushenko</i>	
<b>21.</b>	<b>A Distributed Object Model with Division into Space and Time Variables</b>	163
	<i>Alexey V. Kiselev, Maksim A. Stepanov</i>	
<b>22.</b>	<b>Spurious-Free Dynamic Range of CORDIC Based Digital Quadrature Demodulator</b>	167
	<i>Pavel I. Puzyrev, Kirill V. Semenov, Sergey A. Zavyalov</i>	
<b>23.</b>	<b>Orthogonal Multiple Chirp Modulation for Tasks of Robust Data Transmission</b>	172
	<i>Pavel I. Puzyrev, Vadim Y. Shein, Viktor V. Erohin</i>	
<b>24.</b>	<b>Experimental Research of PD/NOMA</b>	176
	<i>Yakov V. Kryukov, Dmitriy A. Pokamestov, Eugeniy V. Rogozhnikov, Anatoliy Ya. Demidov, Yulia S. Gromova</i>	

25. Processing of Signals with Orthogonal Frequency Multiplexing and Spread Spectrum at Low Signal-to-Noise Ratios <i>Eugeniy V. Rogozhnikov, Yakov V. Kryukov, Dmitriy A. Pokamestov</i>	180
26. Compact Dual-Frequency Microstrip Branch-line Coupler Using Artificial Transmission Lines <i>Denis A. Letavin</i>	185
27. Band-Pass Filters on U-Shaped Resonators <i>Denis A. Letavin</i>	189
28. Compact Crossover Based on Low-pass Filters <i>Denis A. Letavin</i>	192
29. Compact Branch-Line Coupler Based on an Inductor and a U-Shaped Capacitor <i>Denis A. Letavin</i>	195
30. Microstrip Diplexer Implemented on High-Pass and Low-Pass Filters <i>Denis A. Letavin</i>	199
31. Testing Microcontroller Based Physical Systems Using Finite Transition Models <i>Andrey V. Laputenko, Timofey D. Petukhov, Nikolai A. Vasnev</i>	203
32. Mathematical Model and Heuristic Methods for Solving the Multi-Criteria Scheduling Problems <i>Igor R. Zhdanov, Olesya A. Bubareva</i>	207
33. Ontology Integration in Complex Information Systems with Distributed Architecture <i>Olesya A. Bubareva</i>	212
34. Multi-Element Film Microwave Load <i>Gleb G. Savenkov</i>	216
35. Testing Digital Circuits: Studying the Increment of the Number of States and Estimating the Fault Coverage <i>Evgenii Vinarskii, Andrey Laputenko, Jorge López, Natalia Kushik</i>	220
36. An Interface Model of the Interconnection Between Integrated Circuit Chip Die and Printed Circuit Board <i>Andrey A. Antonov, Igor K. Surin</i>	225
37. 1.58 GHz Low Noise Amplifier Design and Verification in 130 nm CMOS Technology <i>Igor K. Surin, Andrey A. Antonov, Dmitry L. Shlemin</i>	231
38. Research of the Noise Immunity when Using the Fractional Frequency Reuse in the Mobile Satellite Service <i>Maxim S. Krasikov, Vladimir I. Nosov</i>	235
39. The Modified Dual-Frequency Dipole Antenna <i>Sergey A. Alekseyev, Anatoly P. Gorbachev</i>	241
40. Quasistatic Simulation of Ultrashort Pulse Propagation in the Spacecraft Autonomous Navigation System Power Circuit with Modal Reservation <i>Pavel E. Orlov, Artem V. Medvedev, Vitaliy R. Sharafutdinov</i>	244

### Section III. Sonic and Ultrasonic Devices: Physics, Electronics, Application Section Chair: **Vladimir N. Khmelev**

1. Application of Discrete-Phase Model for Gas-Cleaning Efficiency Calculation <i>Vladimir N. Khmelev, Andrey V. Shalunov, Roman N. Golykh, Vadim S. Klepov, Aleksey A. Deriglazov, Vasiliy E. Bazhin</i>	253
2. Features of Designing of a Specialized High-Frequency Ultrasonic Sprayer <i>Vladimir N. Khmelev, Viktor A. Nesterov, Dmitriy V. Genne, Andrey V. Shalunov</i>	259
3. Ultrasonic Disk Radiators at High Temperatures <i>Vladimir N. Khmelev, Viktor A. Nesterov, Andrey V. Shalunov, Roman N. Golykh, Alexey A. Nesterov</i>	265
4. Increasing the Uniformity of Amplitude Oscillations of Anisotropic Ultrasonic Disc Emitters for Gas Media <i>Vladimir N. Khmelev, Viktor A. Nesterov, Andrey V. Shalunov</i>	270
5. Radiators for Forming of High-Intensive Ultrasonic Vibrations In Gaseous Media <i>Vladimir N. Khmelev, Viktor A. Nesterov, Andrey V. Shalunov</i>	275
6. Experimental Researches of Process of Trapping of Particles by Centrifugal-Acoustic Gas-Cleaning Equipment <i>Vladimir N. Khmelev, Viktor A. Nesterov, Andrey V. Shalunov</i>	281
7. Increasing of Efficiency of Ultrasonic Vibration System Work for Cavitation Treating of Liquid <i>Vladimir N. Khmelev, Viktor A. Nesterov, Andrey V. Shalunov, Sergey N. Tsyganok, Alexey N. Slivin</i>	287

8.	<b>Research of the Process of Ultrasonic Dispersing on the Example of Brown Coal and Peat</b>	292
	<i>Vladimir N. Khmelev, Sergey N. Tsyganok, Vladislav A. Shakura, Yuri M. Kuzovnikov, Denis S. Abramenko, Vladimir M. Kopanitsyn</i>	
9.	<b>Experimental Study of the Process of Low-Temperature Drying of Waste Wood By the Application of Ultrasonic Fields</b>	297
	<i>Vladimir N. Khmelev, Andrey V. Shalunov, Roman N. Golykh, Sergey S. Zorin, Viktor A. Nesterov</i>	
10.	<b>Apparatus for Ultrasonic Drying of Disperse Materials</b>	302
	<i>Vladimir N. Khmelev, Andrey V. Shalunov, Roman N. Golykh, Sergey S. Zorin, Viktor A. Nesterov</i>	
11.	<b>Realization of Results of Laboratory Researches in Industrial Scales</b>	308
	<i>Vladimir N. Khmelev, Sergey N. Tsyganok, Roman N. Golykh, Yu. M. Kuzovnikov, Viktor A. Nesterov</i>	
12.	<b>Intensification of the Process of Ultrasonic Extraction of Dehydroquercetin from Wood Waste</b>	312
	<i>Elena V. Averyanova, Marina N. Shkolnikova, Sergey N. Tsyganok, Vladislav A. Shakura</i>	
13.	<b>The Ultrasonic Device and the Positioning System of the Welding Tool for Welding of Automobile Bumpers</b>	318
	<i>Vladimir N. Khmelev, Alexey N. Slivin, Alexey D. Abramov, Viktor A. Nesterov, Dmitry V. Genne</i>	
14.	<b>Development of Power Circuit of the Ultrasonic Generator with Low-Voltage Power Supply</b>	322
	<i>Vladimir N. Khmelev, Roman V. Barsukov, Dmitry V. Genne, Evgeniy V. Ilchenko</i>	
15.	<b>The Study of Regularities of Ultrasonic Coagulation of Two-Phase Aerosol in Gas Flow</b>	327
	<i>Vladimir N. Khmelev, Andrey V. Shalunov, Roman N. Golykh, Viktor A. Nesterov</i>	
16.	<b>The Modeling of Ultrasonic Cavitation Depolymerization Causing Reducing of Polymer Viscosity</b>	333
	<i>Vladimir N. Khmelev, Roman N. Golykh, Galina A. Bobrova, Vladislav A. Shakura, Evgeniy V. Ilchenko</i>	
17.	<b>Improving the Performance of the Processes in the Systems "Gas-Liquid" Methods of High-Intensity Ultrasonic Effects</b>	338
	<i>Vladimir V. Khmelev, Roman N. Golykh, Galina A. Bobrova, Andrey V. Shalunov, Viktor A. Nesterov, Vladislav A. Shakura</i>	
18.	<b>Spray Shape Formation at Ultrasonic Spraying Process</b>	343
	<i>Vladimir N. Khmelev, Dmitry V. Genne, Andrey V. Shalunov, Viktor A. Nesterov</i>	
19.	<b>Measuring Instrument of Impedance Characteristics of the Ultrasonic Vibrating Systems</b>	347
	<i>Vladimir N. Khmelev, Roman V. Barsukov, Dmitry V. Genne, Evgeniy V. Ilchenko</i>	
20.	<b>The System of Frequency Matching of the Ultrasonic Generators with the Radiators in "Bulava" Apparatuses</b>	350
	<i>Vladimir N. Khmelev, Roman V. Barsukov, Eugeniy V. Ilchenko</i>	
21.	<b>Ultrasonic Devices for Aluminum Melt Processing</b>	354
	<i>Vladimir N. Khmelev, Sergey N. Tsyganok, Viktor A. Nesterov, Denis S. Abramenko, Mikhail E. Chigurov</i>	
22.	<b>The Two-Channel Instrumentation Amplifier Based on a New Radiation-Hardened Microcircuit MH2XA010-03 for Reading Signals of Differential Piezoelectric Converters</b>	358
	<i>Oleg V. Dvornikov, Valentin L. Dziatlau, Vladimir A. Tchekhovski, Nikolay N. Prokopenko, Arthur I. Gulin, Anna V. Bugakova</i>	
23.	<b>Radiation Pattern of Ultrasonic Transducer with Polymer-Powder Matching Layer</b>	363
	<i>Marsel Fazlyyyakhmatov</i>	
24.	<b>Hydro-Acoustic Communication Channel in the Underground Pipeline</b>	367
	<i>Dzhamilya A. Maltseva, Valery A. Zibrov, Aleksey G. Iliev</i>	

## Section IV. Optoelectronic Devices and Systems: Physics, Electronics, Application

### Section Chair: Eugene V. Sypin

1.	<b>Study of High-Frequency Brightness Amplifiers Radial Profile</b>	375
	<i>Ilya S. Musorov, Anton E. Kulagin, Stanislav N. Torgaev, Daria S. Torgaeva, Maxim L. Gromov</i>	
2.	<b>Semiconductor Power Supply for Capacitance Copper Bromide Active Filters</b>	379
	<i>Pavel P. Gugin, Maxim V. Trigub</i>	
3.	<b>Development and Research of MOPA System Laboratory Model</b>	383
	<i>Nikolai A. Vasnev, Vasily V. Vlasov, Maxim V. Trigub</i>	
4.	<b>Digital Control Circuit for Synchronization of Two Metal Vapor Lasers. Development and Application</b>	387
	<i>Nikolai A. Vasnev, Valeriya V. Taratushkina, Maxim V. Trigub</i>	

5.	<b>Modeling of Concentration Electro-Optical Sensors for Gas and Coal Dust in Multi-Criterial Electro-Optical Device for Control of the Emergency and Pre-emergency Situations in Coal Mines</b>	391
	<i>Sergey A. Lisakov, Anton I. Sidorenko, Ivan S. Zorin, Eugene V. Sypin</i>	
6.	<b>Adaptation of the High-Speed Multipoint Electro-Optical System for Determining of Flame Spatial Coordinates at the Object of the Specified Form</b>	403
	<i>Sergey A. Lisakov, Andrey N. Pavlov, Eugene V. Sypin, Gennady V. Leonov, Andrey I. Kin, Alexey Yu. Sidorenko</i>	
7.	<b>Modeling of the Nonstationary Combustion Process of Methane-air Mixture in Coal Mines</b>	411
	<i>Sergey A. Lisakov, Andrey N. Pavlov, Eugene V. Sypin, Yuri A. Galenko</i>	
8.	<b>Experimental Determination of Response Time for Multipoint Electro-Optical System of Flame Detection and Determination of Its Spatial Coordinates</b>	421
	<i>Sergey A. Lisakov, Anton I. Sidorenko, Andrey N. Pavlov, Gennadiy V. Leonov, Eugene V. Sypin</i>	
9.	<b>Experimental Investigation of Nonstationary Combustion for Propane-Air Mixture in Pipe with Ring Partitions</b>	426
	<i>Sergey A. Lisakov, Anton I. Sidorenko, Andrey N. Pavlov, Yury A. Galenko, Eugene V. Sypin</i>	
10.	<b>Experimental Study on Verification of the Flame Spatial Coordinates Determining Adequacy by Multipoint Electro-Optical System</b>	433
	<i>Sergey A. Lisakov, Andrey N. Pavlov, Eugene V. Sypin, Gennady V. Leonov, Vyacheslav A. Shadrin</i>	

## Section V. Power Electronics and Power Engineering

### Section Chair: Gennady S. Zinoviev

1.	<b>An Analysis of Input and Output THD Factors of Matrix Converter</b>	441
	<i>Evgenny D. Baranov, Vladimir I. Popov, Roman I. Yakimov</i>	
2.	<b>Maximum Power Point Tracking Methods for the Solar Battery</b>	445
	<i>Irina A. Belova, Miroslav V. Martinovich, Vladimir A. Skolota, Ilya V. Zaev</i>	
3.	<b>Step-by-step Design of the Digital Closed Loop System of the Boost Voltage Converter</b>	452
	<i>Nikita A. Sevostyanov, Ivan V. Alexandrov, Roman L. Gorbunov, Denis V. Makarov</i>	
4.	<b>PWM on the Basis of Different Configurations of Reference Signals for a Multilevel Converter on H-Bridge</b>	458
	<i>Vladimir S. Meshalkin, Dmitry B. Kuguchev, Abilmansur R. Mansurov</i>	
5.	<b>Spectral Mathematical Model of AC-AC Converter</b>	463
	<i>Dmitry B. Kuguchev, Vladimir S. Meshalkin, Abilmansur R. Mansurov</i>	
6.	<b>Calculation of Hybrid Bus Power Demands by Standard Driving Cycles</b>	469
	<i>Alexander A. Shtang, Mikhail V. Yaroslavtsev, Wu Xiaogang, Sergei I. Dedov</i>	
7.	<b>Increasing the Length of Trolleybus Contact Line Sections by Installation of Stationary Energy Storage Posts</b>	473
	<i>Mikhail V. Yaroslavtsev</i>	
8.	<b>Aircraft Control System Immunity Study at the Direct Lightning Strike</b>	477
	<i>Igor V. Artemiev, Rustam R. Gaynudinov, Sergey F. Chermoshentsev</i>	
9.	<b>Fault Symptom Diagnostics for Coupling Capacitors Using the Analytic Hierarchy Process</b>	482
	<i>Vadim Z. Manusov, Dmitry V. Orlov, Javod S. Ahyoev</i>	
10.	<b>Analysis of Thyristors Operation in Longitudinal Compensation Devices for Distribution Networks</b>	488
	<i>Dmitry I. Panfilov, Michail I. Petrov, Pavel A. Rashitov, Michail G. Astashev, Alexander N. Rozhkov</i>	
11.	<b>Design Rules of the DC-DC Voltage Converter with the Two-Loop Feedback System</b>	493
	<i>Roman L. Gorbunov, Ivan V. Alexandrov, Sofya V. Zavodina, Nikita A. Sevostyanov</i>	
12.	<b>Short-Term Electricity Consumption Forecast in Siberia IPS Using Climate Aspects</b>	499
	<i>Anastasiya G. Rusina, Tamara A. Filippova, Anton E. Kalinin, Nikita S. Terlyga</i>	
13.	<b>Analysis of the Modern State of Power Converters for Wind Turbine Systems</b>	504
	<i>Alexander G. Volkov, Dmitry A. Shtein, Maksim A. Zharkov</i>	
14.	<b>Calculation of the Voltage Inverter Parameters in the Starter-Generator System of the Aircraft</b>	511
	<i>Regina Yu. Dubkova, Ilya S. Dubkov, Maksim A. Zharkov, Sergey V. Klassen</i>	
15.	<b>Mathematical Models for Analysis of Electromagnetic Processes in Thyristor Circuits of AC Voltage Regulators</b>	515
	<i>Aleksey V. Udobichenko, Evgenny V. Grishanov, Sergey V. Brovanov, Maxim A. Dybko</i>	
16.	<b>Development of a Mathematical Model of Variable-Voltage Variable-Frequency Aircrafts Electric Power System</b>	522
	<i>Maxim A. Khoroshev, Ilya V. Zaev, Denis V. Makarov, Vadim E. Sidorov</i>	

17. <b>The Regulation, Protection and Control System for Magnetolectric Generator with Combined Excitation</b> <i>Maxim V. Balagurov, Petr A. Bachurin, Abilmansur R. Mansurov, Dmitry B. Kuguchev, Vladimir S. Meshalkin, Valery Y. Surov</i>	528
18. <b>Modernization of the Weinberg's Converter for the Implementation of a Charge-Discharge Device in the Power Supply System of a Spacecraft</b> <i>Yuriy A. Shinyakov, Valery D. Semyonov, Maxim P. Sukhorukov, Dmitriy Li, Danila B. Borodin, Vagiz A. Kabirov</i>	533
19. <b>Research on Cross-Regional Interaction in Converter-Dominated Distribution Grids</b> <i>Teng Jiang, Uwe Rödel, Julian Willkomm, Oleg V. Nos, Steffen Schlegel, Dirk Westermann</i>	540
20. <b>Base Switch Element for High-Power High-Voltage Converters</b> <i>Igor P. Voronin, Elena M. Dukhnich</i>	545
21. <b>Research and Development of Resonant Converter for High-Voltage Spacecraft Power Supply Systems with Accumulator Battery</b> <i>Mariya M. Chernaya, Yuriy A. Shinyakov, Evgeniy V. Yaroslavtsev, Evgeniy Yu. Burkin</i>	551
22. <b>Hybrid Microgrid in Islanded Operation Based on Renewable Energy Sources</b> <i>Mojtaba Abbasi, Alexander G. Garganeev</i>	555
23. <b>New Approach for Thyristors Switched Capacitors Design for Static VAR Compensator Systems</b> <i>Dmitry I. Panfilov, Ahmed E. ElGebaly, Michael G. Astashev, Alexander N. Rozhkov</i>	560
24. <b>Load Leveling for a Diesel Generator Using an Energy Storage and Instantaneous Power Theory</b> <i>Maksim A. Dybko, Sergey V. Kuchak, Petr A. Bachurin, Sergey V. Brovanov, Sergey A. Kharitonov</i>	567
25. <b>Step-by-Step Design of Two-Loop Control System for Boost DC-DC Converter</b> <i>Ivan V. Aleksandrov, Nikita A. Sevostyanov, Roman L. Gorbunov</i>	574
26. <b>SVPWM Capacitor Balancing Method for Single-Phase Three-Level NPC Impedance-Source Inverters</b> <i>Tatiana E. Shults, Alena S. Filatova, Maxim A. Dybko, Oleksandr O. Husev</i>	580
27. <b>Study of a Dual-Loop Subordinate Control System for a DC-DC Converter with Galvanic Isolation</b> <i>Sergey V. Klassen, Tatiana S. Klassen, Dmitry A. Shtein, Alexander G. Volkov, Regina Yu. Dubkova, Sergey V. Luft</i>	585
28. <b>Evaluation of Electrical Parameters in the System "Synchronous Generator with Permanent Magnets - Active Rectifier"</b> <i>Sergey A. Kharitonov, Andrey S. Kharitonov, Petr A. Bachurin</i>	593
29. <b>Simulation of a Metal Vapor Active Media Power Supply</b> <i>Ilya S. Musorov, Dmitriy N. Ogorodnikov, Stanislav N. Torgaev, Gennadii S. Evtushenko</i>	598
30. <b>The Condition of Self-Oscillation in Distributed Power Supply Systems. Low-Level and High-Level Excitation Signal Modes</b> <i>Vladimir F. Dmitrikiov, Dmitry V. Shushpanov, Alexander Y. Petrochenko, Mikhail A. Alekseev, Zinaida V. Zaitseva</i>	602
31. <b>Detecting Voltage Swell, Interruption and Sag</b> <i>Vladimir A. Skolota, Gennady S. Zinovev</i>	606
32. <b>Mathematical Analysis of the Multiport Converter Operation Algorithm</b> <i>Vadim E. Sidorov, Dmitry A. Shtein, Dmitry V. Korobkov, Ilya V. Zaev, Maxim A. Khoroshev</i>	612
33. <b>Three Phase AC Voltage Cuk Converter with Galvanic Isolation</b> <i>Andrey V. Sidorov, Gennady S. Zinoviev, Alexey V. Udovichenko</i>	617
34. <b>PMSM Analysis in dq Axis at Starter Mode as the Part of ISG</b> <i>Alexander N. Reshetnikov, Elena V. Reshetnikova</i>	620
35. <b>DC/DC Boost Converter with Additional Inductance for the Space Power Supply System</b> <i>Andrei V. Geist, Andrey V. Sidorov, Dmitry V. Korobkov, Alexander G. Volkov</i>	623
36. <b>Buck DC-DC Converter with Neural Network Sawtooth-Similar Carrier Signal Generator</b> <i>Miroslav V. Martinovich, Ilya V. Zaev, Maxim A. Khoroshev, Vadim E. Sidorov, Irina A. Belova, Vladimir A. Skolota</i>	629

## Section VI. Medical Electronics

### Section Chair: Vladimir K. Makukha

1. <b>Characterization of Electrochemical Aptasensor for Lung Cancer Tumor Marker Determination</b> <i>Anastasiia V. Shabalina</i>	637
---------------------------------------------------------------------------------------------------------------------------------------	-----

2.	<b>Automated System for Bioimpedance Measuring</b>	641
	<i>Pavel E. Golubkov, Ekaterina A. Pecherskaya, Oleg V. Karpanin, Kseniya Y. Kraynova, Dmitriy V. Artamonov, Yuliya V. Shepeleva</i>	
3.	<b>Luminescence of Acupuncture Point in Darkened Area Under Optical Pulse Excitation of Adjoining Areas of Investigated Meridian</b>	645
	<i>Leonid G. Navrotsky, Liliya I. Lisitsyna, Alexander A. Blokhin, Alexander E. Kamardin, Svetlana V. Belavskaya, Elena L. Poteryaeva</i>	
4.	<b>Comparative Analysis of Acoustic Parameters of the Saarbruecken Database's Voice Records</b>	649
	<i>Darya V. Borovikova, Vladimir K. Makukha, Tatiana A. Shevchenko</i>	

## Section VII. Robotics, Mechatronics and Automation

### Section Chair: Oleg V. Nos

1.	<b>Hysteresis Clutch in the Electric Drive of Pipeline Valves</b>	655
	<i>Aleksandr G. Garganeev, Din K. Kyui, Evgeniy I. Kashin, Nadezhda Yu. Sipaylova</i>	
2.	<b>Bidirectional DC-DC Conversion Device Usage in Tram</b>	659
	<i>Anna V. Kulekina, Denis P. Vislogusov</i>	
3.	<b>Evaluation of Two-Sided Feed Scheme Efficiency for Tram Traction Network in Novosibirsk</b>	663
	<i>Evgeniy Y. Abramov, Andrey A. Petrov, Yuri V. Panchenko</i>	
4.	<b>The Basic Factors on Development of the Drive Control Subsystem for the Special Purpose Mobile Robot Named Geokhod</b>	667
	<i>Aleksandr V. Grigoryev, Irina Yu. Semykina, Aleksandr N. Ermakov, Ivan V. Chicherin, Vladimir V. Aksenov</i>	
5.	<b>The Control Technique for Cascaded H-bridge Multilevel Converter with Faulty Cells</b>	672
	<i>Oleg V. Nos, Ekaterina E. Abramushkina</i>	
6.	<b>Virtual Device for Processing the Signals from MEMS Pressure Sensors</b>	676
	<i>Alina M. Esimhanova, Galina V. Nikonova</i>	
7.	<b>On the Issue of the Arc Steelmaking Furnaces Operating Mode Stability at the Beginning of Melting</b>	681
	<i>Anatoliy M. Kruchinin, Mikhail Ya. Pogrebisskiy, Andrey S. Bulgakov, Andrey Yu. Chursin, Elena S. Ryazanova</i>	
8.	<b>Development of a Power Controller for an Induction Crucible Furnace of Industrial Frequency for Melting Magnesium</b>	686
	<i>Maxim A. Fedin, Alexander B. Kuvaldin, Alexey O. Kuleshov, Ivan E. Zhumurko, Ilya V. Korolev, Oleg A. Polyakov</i>	
9.	<b>Comparative Analysis of Measures to Improve the Quality of Electricity in Metro</b>	690
	<i>Andrey A. Petrov, Nicolay I. Schurov</i>	
10.	<b>Traction Network Current Rate Changing Analysis</b>	694
	<i>Anna V. Kulekina, Evelina G. Langeman, Sergey M. Kuznetsov, Boris V. Maloziyomov, Kamal C. Akberov</i>	
11.	<b>The Concept of Multiparameter Protection of System Elements Construction's «Traction Substation - Electric Traction Network - Electric Rolling Stock»</b>	700
	<i>Anna V. Kulekina, Sergey M. Kuznetsov, Boris V. Maloziyomov</i>	
12.	<b>Simulation Modeling of the Internal Combustion Engine Starting System Using a Supercapacitor Battery</b>	704
	<i>Boris V. Maloziyomov, Alexander V. Myatezh, Michail A. Smirnov</i>	
13.	<b>Synthesis of Full Order Observer by Akkermann Formula</b>	708
	<i>Kucher Ekaterina S.</i>	
14.	<b>The Comparative Analysis of the Maximum Slew Rate of the Output Voltage BJT and CMOS (SiGe TSMC 0.35<math>\mu</math>) Operational Amplifiers</b>	712
	<i>Nikolay N. Prokopenko, Nikolay V. Butyrlagin, Anna V. Bugakova</i>	
15.	<b>The Non-Linear Differentiating Circuits of Correction of Transient Process in Differential Operational Amplifiers</b>	718
	<i>Nikolay N. Prokopenko, Anna V. Bugakova, Aleksandr I. Serebryakov</i>	
16.	<b>Development and Testing of Plasma-Thermal Electric Furnace for Organic Waste Processing</b>	723
	<i>Anatoly S. Anshakov, Pavel V. Domarov, Aleksandr I. Alifarov, Valentin A. Faleev</i>	
17.	<b>Analysis of Electromagnetic Processes in the Induction Channel Unit</b>	727
	<i>Viktor N. Timofeev, Svetlana V. Kurnaeva, Maksim Y. Khatsayuk, Natalia S. Bugaeva</i>	
18.	<b>Methods of Energy Efficiency Evaluation for Output Voltage of the Single-phase Controlled Rectifier</b>	734
	<i>Vladlen V. Ivanov, Sergey V. Myatezh, Evelina G. Langeman, Andrei V. Kapustin, Irina K. Alekseeva</i>	

19. Improving the Idea of Development of the Single-Phase AC Rectifier with the High Power Factor <i>Vladlen V. Ivanov, Sergey V. Myatezh, Tatyana V. Myatezh</i>	738
20. The Robot System for Remote Robotics Hackathon <i>Aleksey A. Korchagin, Anton I. Sidorenko, Eugene V. Sypin</i>	745
21. The Participants' Work Checking Subsystem of the Remote Technological Competitions in Robotics <i>Anastasija A. Fokina, Nadezhda Y. Tupikina, Eugene V. Sypin</i>	748
22. Off-Line Legged Robot with Cross-Country Capacity <i>Nikita A. Gulyaev, Ekaterina V. Kazanceva, Vladislav Y. Shvetsov, Anton I. Sidorenko, Eugene V. Sypin</i>	755
23. Optimization of Vibratory Source Electromagnetic Drive Operating Process <i>Boris F. Simonov, Vladimir Yu. Neyman, Aleksey O. Kordubailo</i>	759
24. Analysis of Impact Interaction of Forces Impulses in an Electromechanical Vibratory System with Electromagnetic Excitation <i>Lyudmila A. Neyman, Vladimir Yu. Neyman, Andrei S. Shabanov</i>	763
25. The Processes of Energy Transformation in a Two-coil Synchronous Electromagnetic Shock Machine <i>Lyudmila A. Neyman, Vladimir Y. Neyman, Alexei V. Markov</i>	767
26. Structural Analysis of Vehicle's Hybrid Power System Based on Fuel Cell <i>Kirill I. Kulikov, Nikolai I. Schurov, Evelina G. Langeman</i>	771
27. Digital Filtration-Based Power Distribution between Windings of Traction Transformers <i>Pavel V. Morozov, Yury V. Morozov</i>	775
28. Increase of Flux Probable Paths Method Accuracy in Design of a Magnetic System with a Teeth-Slot Zone <i>Olga V. Rogova, Vladimir Yu. Neyman</i>	778
29. MHD Steering of Aluminum Melt in Cylindrical Bath by Means of Permanent Magnets System <i>Aleksandr I. Aliferov, David S. Vlasov, Vladislav A. Promzelev, Andrey E. Morev</i>	782
30. Energetic Parameters of Inductors for Induction Heating of Internal Cylindrical Surfaces <i>Alexander I. Aliferov, Roman A. Bikeev, Alexander A. Meleshko, Anton V. Knyazev, Sergio Lupi</i>	785
31. About One Approach to the Characteristics Assessment of the Wave Solid-state Gyroscope <i>Olga S. Khalyutina, Sergey P. Khalyutin, Vitaliy P. Khar'kov</i>	789
32. Induction Heating with Rotating Permanent Magnets: Experimental Results on an Industrial Installation <i>Fabrizio Dughiero, Michele Forzan, Sergio Lupi, Marcello Zerbetto</i>	793