NATIONAL RESEARCH UNIVERSITY
«MOSCOW POWER ENGINEERING INSTITUTE»

SCIENTIFIC RESEARCHES

2009—2010

Moscow MPEI Publishing House 2012

INSTITUTE OF POWER MACHINERY AND MECHANICS (IPMM)

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Institute Departments and Divisions

IPMM STEAM GENERATOR MACHINERY (SGM) DEPARTMENT

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9 lecturers,
4 researchers,
5 post-graduate students

Head of Department
Dr. Sci. (Techn.),
Professor Pavel V. ROSLYAKOV

■ Priority research activites

Research Supervisors

- **Development and implementation of the highly efficient environmentally**
- **friendly technologies for organic fuels firing**
  Professor Roslyakov P.V., Head of R&D Lab Molchanov V.A.
- **Reliability and operation effectiveness increase for the steam boilers of TPP**
  Professors Dvoinishnikov V.A., Iziumov M.A., Roslyakov P.V.
  Head of R&D Lab Molchanov V.A.
- **Development of computer-aided-design technologies for the power machinery equipment**
  Professor Iziumov M.A., Associated-Professor Kniazkov V.P.
- **Mathematical modeling of the nitrogen and sulfur oxides, the polycyclic benzene polycarbons process formation at fuel firing in the power engineering equipment**
  Professor Roslyakov P.V.
- **Development of the mathematical models and the software support for the estimation, substantiation and technical decision making at steam boiler design**
  Professors Dvoinishnikov V.A., Iziumov M.A.
- **Development of computer-aided expertise-diagnostic system for the steam boiler and its elements**
  Professor Dvoinishnikov V.A.
- **Development and implementation of continuos monitoring and the regulating systems for TPP harmful pollutants into the environment.**
  Professor Roslyakov P.V.

■ Agreements, contracts, projects

- Development of the technology for creation the automated continuos monitoring system of the power engineering objects pollution
- Development of the mathematical modeling methods for the heat-and-mass exchange
- processes at organic fuel firing
- The set of R&D investigations on the operation processes with reference to the problem of creation of modern power engineering equipment
- The R&D complex for the substantiation and expertise of the main engineering designingdecisions with reference to implementation of waste coupling schemes with gas-turbine unit
- Combined research of the boiler ecology features and development of recommendations to decrease the harmful wastes into atmosphere
- Development of small-toxic modes of fuel burning on TPP power boilers

Key publications

- *Roslyakov P.V., Ionkin I.L., Pleshanov K.A.* Effective burning of the fuel types with controlled chemical underburning. Heat and power engineering No1; 2009, p. 20—23
- *Dvoinishnikov V.A., Larkov A.V.* Mathematical modelling of the work process in boiler furnace with the circulating boiling bed. Heat and power engineering No1; 2009. P. 37—41.
- *Model* factory for thermal waste processing. The concept of creation. Tugov A.N., Moskvichev V.F., Iziumov M.A., Supranov V.M., Ivankov U.A. Domestic solid waste. No5. 2009. P. 38—43
- *Roslyakov P.V., Pleshanov K.A.* Highly effective fuel burning with ontrolled chemical underburning // The reports theses of the 15th international scientific and technical conference "Radio Electronics, Electrical and Power Engineering. 26—27 Feb. 2009 in 3 volumes. MPEI Publishing House. P. 255—256.
- *Lakhov V.A., Lakhov D.A., Egorova L.E.* The assessment of impact of MPEI TPP on the environment of the Lefortovo district // The reports theses of the 15th international scientific and technical conference "Radio Electronics, Electrical and Power Engineering. 26—27 Feb. 2009 in 3 volumes. MPEI Publishing House. P. 240—241.
- *Bulytchev D.A., Kniazkov V.P.* Startability comparison of vertical and horizontal boiler-utilizers with 140 MW heat power The reports theses of the 15th international scientific and technical conference "Radio Electronics, Electrical and Power Engineering. 26—27 Feb. 2009 in 3 volumes. MPEI Publishing House. P. 225—226.
- *Roslyakov, P.V., Pleshanov, K.A.* The implementation of fuel burning with controlled chemical underburning. The new in Russian Power Industry № 1. 2010.
- *Roslyakov, P.V., Pleshanov, K.A., Ionkin I.L.* Optimal conditions for fuel burning with controlled chemical underburning. Heat and power engineering № 4, 2010. P. 17—22.
- *Supranov V.M., Ryabov G.A., Mel'nikov D.A.* Investigation of facilities and reasonability of БК3-420-140-НГМ boiler transfer to the oxygen fuel burning. Electrical and Power Engineering № 4, 2010. P. 23—28.
- *Dvoinishnikov V.A., Popov E.A.* Investigation of the boiler-utilizer evaporating system's starting heat state influence on its operation characteristics during the launch. Electrical and Power Engineering № 4, 2010. P. 29—35.
- *Roslyakov, P.V., Pleshanov, K.A.* Increase of efficiency and ecological compatibility of boiler operation due to furnace process optimization and fuel burning with controlled chemical underburning. ENERGO 2010 // Works of All-Russian theoretical and practical conference "Increase of reliability and efficiency of electric stations and energy systems operation" Volume 2 — MPEI Publishing House, 2010. P. 231—234.
- *Roslyakov, P.V., Egorova L.E., Ionkin I.L., Pleshanov, K.A.* Realization of low-cost technologies decrease for harmful pollution during the organic fuel burning in TPP boilers. ENERGO 2010 // Works of All-Russian theoretical and practical conference "Increase of reliability and efficiency of electric stations and energy systems operation" Volume 2 — MPEI Publishing House, 2010. P. 227—230.
- *Roslyakov, P.V., Egorova L.E., Ionkin I.L., Lakhov D.A.* Adoption of the automated system of continuous control and regulation of harmful emission on the study-experimental TPP MPEI. ENERGO 2010 // Works of All-Russian theoretical and practical conference "Increase of reliability and efficiency of electric stations and energy systems operation" Volume 2 — MPEI Publishing House, 2010. P. 223—226.
- *Supranov V.M., Batorshin V.A., Melnikov D.A.* About operation capability PP-1900-25-570KT boiler of 600 MW power-generating unit in oxygen fuel burning conditions. Works of XVII international conference " Information facilities and technologies". Volume 3 — MPEI Publishing House, 2010. P. 196—206.

Partners

- «Power Machines» concern, Moscow
- «Power Machinery Alliance», Moscow
- Federal State Enterprise «Opytnoe Konstruktorskoe Buro «Hydropress», Podolsk town
- Moscow region
- «Machinery Plant ZiO-Podolsk», Podolsk town, Moscow region
- «Podolsk Machinery Plant», Podolsk town, Moscow region
- «All-Russian heat engineering R&D institute, Moscow
- «Energeticheskiy Institut named after Krzhizhanovskiy, Moscow
- ORGRES Company, Moscow
- «Institut Teploenergoproject», Moscow
- «Mosenergo», Moscow
- «Riazanenergo», Riazan city
- «Tatenergo», Kazan city
- «Chepetskiy mekhanicheskiy zavod», Glazov town
- «Latvenergo», Riga

IPMM STEAM AND GAS TURBINES (SGT) DEPARTMENT

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19 lecturers,
10 researchers,
8 post-graduate students

Head of Department
Doctor of technical sciences, professor
Vladimir G. GRIBIN

Priority research activites

Research Supervisors

- **Development and investigation of the steam and gas units of new generation with the ultra-super-critical steam parameters**
  Professors Kostiuk A.G., Trukhniy A.D., Gribin V.G.
- **Development of the calculation methods and investigation of the steam and gas units of heat-recovery type**
  Professors Trukhniy A.D., Gribin V.G.
- **Complex investigations of gas-dynamics of two-phase flows in elements of steam turbine settings of wide application**
  Academician Filippov G.A., Professor Gribin V.G., Associated-Professor Tishchenko A.A.
- **Aerodynamic perfection of turbo-machine setting elements: the blade apparatuses, the steam-distribution system, inlet, outlet and the transition jets and compactions of the steam and gas turbines of various purposes**
  Professors Zariankin A.E., Gribin V.G. Associated-Professor Dmitriev S.S.
- **Resource extension and reliability increase of the steam turbines**
  Professors Trukhniy A.D., Kostiuk A.G.
- **Flow computer modeling in the low-pressure cylinder setting of the powerful steam turbines**
  Professors Gribin V.G., Bogomolova T.V.
- **Development and perfection of the new regulating systems and modernization of the existing ACS for steam and gas units**
  Professor Bulkin A.E., Associated-Professor Vertelin S.N.

Agreements, contracts, projects

- Theoretical-calculation and experimental research of the promising power engineering units providing the high efficiency and reliability of the power equipment
- Development of the scientifically reasonable validation of the promising steam unit creation with the ultra-super-critical steam parameters. Complex researches on creation of new generation of steam-turbine units on ultra-high steam parameters
- Investigations of consumed and vibration characteristics of the new regulating valves for the steam turbines
- Experimental investigations and optimization of an outlet jet of the transport gas-turbine unit, operation methods in diffusers
- Research and calculation of the promising last stages of the steam turbines
- Investigations of the gas-dynamical elements of high- and medium-pressure setting for increasing the effectiveness of the powerful steam turbine stages
- Research and development of engineering solutions to increase the effectiveness and reliability of the setting elements for the powerful steam turbines
- Development of the system approach adaptation methods to designing the power engineering machines using the modern computer technologies

- Complex investigations the thermal-physical processes in two-phase media. Treatment of the promising systems of moisture-trap and decrease of losses due to moisture in the steam turbine setting

Key publications

- *Kostiuk A.G., Frolov V.V., Bulkin A.E., Trukhniy A.D.* Steam and Gas turbines for Electric plants (in Russian). Moscow, MPEI Publ., 2008, 350 p.
- *Bulkin A.E.* Automatic control of energy units (in Russian). Moscow, MPEI Publ., 2009, 507 p.
- *Gribin B.G., Nitusov V.V.* Collection of problems in gas-hydro-dynamics (in Russian). Moscow, MPEI Publ., 2007.
- *Trukhniy A.D., Krupennikov B.N., Troitskiy A.N.* Atlas of constructions of the turbine details. Textbook for universities. Third edition. In Russian and English. Moscow, MPEI Publ., 2007, 147 p.
- *Troyanovskiy B.M., Bogomolova T.V.* Alternate modes of the steam turbines (in Russian). Moscow, MPEI Publ., 2010.
- *Trukhniy A.D., Romaniuk A.A.* Calculation of the heat schemes of the heat-recovery steam-gas units. Textbook for universities (in Russian). Moscow, MPEI Publ., 2006. 40 p.
- *Kostiuk A.G., Gribin V.G., Trukhniy A.D.* Conception of steam turbines of new generation for the coal power engineering of Russia. Part 1. Economical and engineering substantiation of the conception (in Russian). Thermal Power Engineering, 2010.
- *Gribin V.G.* The PGT-450T operated at Kaliningradskaya heat and power plant // Gas Turbo Technology. 2007. V. 1. P. 10—15.
- *Petrunin B.N.* About a choice of overall dimension-type of new constructions at modernization of over-strip packing of the steam turbines (in Russian) // MPEI Vestnik, No 4, 2007. P. 14—17.
- *Zariankin A.E., Arianov S.V., Paramonov A.N., Storozhuk S.K.* New regulating valve with the pushing coupling rod for the turbine K-200-130 (in Russian) // Thermal Power Engineering. No 11, 2007.
- *Zariankin A.E., Zroichikov N.A., Arianov S.V., Rogeliov A.N.* Turbine of Nuclear Power Plant with outer steam super heater // Power system Engineering, Fluid Flow, Plzen, Czech Republic ES 2007. 6 — th Conference with international participation on. P. 229—237
- *Zariankin A.E., Paramonov A.N., Arianov S.V., Fichoriak O.M., Zariankin V.A.* Application of perforated shields in the chamber of regulating stage of the steam turbine with jet steam-distribution (in Russian) // Tiazhioloe mashinostroenie, 2007, No. 1, p. 10—15.
- *Zariankin A.E., Noskov V.V., Arianov S.V., Zariankin B.A.* Results of mathematical simulation of flows in the new stopping-regulating valve (in Russisan) // Armaturostrioenie, No. 4, 2007. P. 65—68.
- *Filippov G.A., Avetisian A.R.* Ways of efficiency increase of stage of large accuracy (in Russian) // Thermal Power Engineering, No. 4, 2009.
- *Filippov G.A., Avetisian A.R.* Calculation research of the moist steam flow in the combined exhaust of the steam turbines (in Russian) // Thermal Power Engineering, No. 6, 2010. P. 12—28
- *Filippov G.A., Gribin V.G., Tischenko A.A., Tischenko V.A., Gavrilov I.Yu.* Development of approach to laser diagnostics application for research of characteristics of poly-dispersed moist steam flows (in Russian) // Izvestia RAN. Energetics. 2010

- *Gribin V.G., Tischenko A.A., Korshunov B.A.* Research of inside-channel moisture separation in the turbine lattices (in Russian) // Thermal Power Engineering, 2010
- *Granovskiy A.V.* Analysis of physical processes and operation features of combined units with high-loaded stage of the gas turbine (in Russian) // Electrical Stations, 2010.
- *Filippov G.A., Gribin V.G., Tischenko A.A., Tischenko V.A., Gavrilov I.Yu.* Technique development of application of laser diagnostics to investigate the characteristic of moist-steam polydisperse flows. Power system engineering, Thermodynamics Fluid Flow EC 2010, June 17—18, 2010, Plzen, Czech Republic. 23—30 p.

Dissertations

- *Noskov V.V.* Experimental research of the flow mode on the vibro-dynamic state of the diffuser elements o the turbine setting. Cand. Sci. (Techn.) Dissertation. 2010.
- *Yurik E.A.* Research and development of ways for effectiveness increase of the low-pressure cylinders for condensation steam turbines. Cand. Sci. (Techn.) Dissertation. 2010.

Partners

- JSC "Power Machines" — «Leningradskiy metallicheskiy zavod», Sankt-Peterburg
- «Skoda» company, Czech Republic
- JSC Kaluga Turbine Plant, Kaluga-town
- R&D Enterprize TURBOKON, Kaluga
- Federal State Enterprise «SALUT», Moscow
- JSC Gas-Turbine Technologies, Rybinsk-town

Unique Equipment

- The experimental steam and air turbines having no the world's analogues: ET-12, ET-3M, ET-11, OT-1
- Experimental facilities for investigation of a flow in elements of the turbine path, rotating and fixed blade cascades, the control valves, and the exhaust hoods — aerodynamic tunnels BAT, BAT-1, BAT-2, steam-dynamic tunnels KVP-1,2 equipped by the unique optical measuring system (for studying the valves)
- Experimental facilities for investigation of the turbines vibration reliability — a setup for dynamical model of tightening and model of multi-span rotor

IPMM HYDROMECHANICS AND HYDRAULIC MACHINES DEPARTMENT (HHM)

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17 lecturers,
1 researchers,
3 post-graduate students

Head of Department
Doctor of Philosophy (Technical),
Professor Alexander M. GRIBKOV

■ Priority research activites

Research Supervisors

- **Mechanics of flowing media and theory of hydromachines —**
  Professor Morgunov G.M.
- **Computer and physical modeling of the optimized operating process of dynamic hydromachines —**
  Professor Morgunov G.M.
- **Fundamental research of functional properties and optimal structure-parametric synthesis of bulk hydromachines, hydro- and pneumo-drives and automatic means**
  Professor Morgunov G.M.
- **Research of effectiveness of engineering schemes of the power part and executing mechanisms for hydro-drives with motor and pump-motor regulation**
  Professor Golubev V.I., Associated Professor Zuev Yu.Yu.
- **Formation of theoretical bases, research and development of autonomous electric — hydraulic drives**
  Associated Professor Zuev Y.Y.
- **Development of a concept and the applied approach to expert estimation of the hydraulic machines being existed and developed**
  Associated Professor Zuev Y.Y.

■ Agreements, contracts, projects

- Research of problems and development of the engineering proposals on creation of hydraulic transmission with regulating hydromotors
- Investigation of effectiveness of engineering schemes of power parts and execution mechanisms of hydro-drives with motor and pump-motor regulation
- Paradigms of innovational structure-parametric synthesis of powerful hydro-energy machines

■ Key publications

- *Golubev V.I., Zuev Yu.Yu., Dragomirov D.V.* Investigation of characteristics of bulk hydraulic transmission with regulating two-motor aggregate (in Russian) // MPEI Vestnik, MPEI Publ., 2010. No2 P. 5—14.
- *Dragomirov D.V., Golubev V.I., Zuev Yu.Yu., Fedenkov V.V.* Research of hydromotor aggregate with extended range of stepless speed regulation (In Russian) // Stroitel'nye i dorozhnye mashiny, 2010. No4. P. 28—31.
- *Belash I.G.* Problems of reliability and effectiveness of hydroturbine equipment of hydro-Power Plant // Proc. of All-Russia Scient. Conf. "Increase of Reliability and Operation Effectiveness of Electric Plants and Electric Power Systems" — ENERGO-2010 (Moscow, 1—3 of June, 2010) In 2 volumes. — MPEI Publ. 2010. Vol. 2. P. 193—196.

- *Morgunov G.M.* Innovational solutions for objects using the renewable energy sources and impeller machines // Proc. of All-Russia Scient. Conf. "Increase of Reliability and Operation Effectiveness of Electric Plants and Electric Power Systems" — ENERGO-2010 (Moscow, 1—3 of June, 2010) In 2 volumes. — MPEI Publ. 2010. Vol. 2. P. 206—207.
- *Khovanov G.P., Volkov A.V., Parygin A.G., Naumov A.V.* Increase of energy effectiveness of used rotary pumps on the basis of surface modification of settings. // Proc. of All-Russia Scient. Conf. "Increase of Reliability and Operation Effectiveness of Electric Plants and Electric Power Systems" — ENERGO-2010 (Moscow, 1—3 of June, 2010) In 2 volumes. — MPEI Publ. 2010. Vol. 1. P. 207—210.
- *Orakhelashvili B.M.* Problems of development of small hydro-energy plants (In Russian) // Proc. of All-Russia Scient. Conf. "Increase of Reliability and Operation Effectiveness of Electric Plants and Electric Power Systems" — ENERGO-2010 (Moscow, 1—3 of June, 2010) In 2 volumes. MPEI Publ. 2010. Vol. 2. P. 208—210.
- *Volkov A.V., Pankratov S.N., Parygin A.G., Shoukal I.* Comparative analysis of hydro-dynamic properties of boost pumps (In Russian) // News in Russian Electrical Power Engineering. Monthly electronic journal, No 11, November 2009. P. 27—31.
- *Morgunov G.M.* To increase of energy effectiveness and reliability of super-powerful feeding pumps (In Russian) / Thermal Power Engineering, 2010.No12, P. 42—51.
- *Morgunov G.M.* Improvement of the main pump equipment used in large thermal power installations (In Russian) / ISSN 0040-6015, Thermal Engineering. 2010, vol. 57, № 12, P. 1042—1051.
- *Volkov A.V., Khovanov G.P., Zharkovskiy A.A., Pugachiov P.V., Parygin A.G.* Calculation-theoretical research of the pump characteristics with small high-speed coefficient (In Russian) // News in Russian Electrical Power Engineering. Monthly electronic journal, No 2, February 2010. P. 36—44.
- *Volkov A.V., Davydov A.I., Khovanov G.P.* Experimental investigations of the hydrophobization effect of surfaces and elements of rotary pumps (In Russian). // Promyshlennaya energetika. 2010. No 11. P. 41—44.
- *Golubev V.I., Zuev Yu.Yu., Dragomirov D.V.* Analysis of piezo-motors adaptability in the electric-hydraulic amplifiers (In Russian) // Collection of papers of Al-Russia scient. conf. "Dynamics of machines and operating processes". Cheliabinsk, CHGTU Publ., 2009.
- *Poplavskiy A.V., Zuev Yu.Yu.* Calculation algorithm foe basing parameters of the hydraulic tracking drive of the front support the flying vehicle undercarriage (In Russian) // Proc. of All-Russia scient. conf. "Hydraulic machines, hydrodrives and hydro-pneumo-automatics". 9 Dec. 2020, Moscow, MPEI Publ., 2010. P. 137—142.
- *Shilin D.V., Gribkov A.M.* Investigation of the system control algorithms on the basis of the proportional pneumatic drive (In Russian) // Proc. of All-Russia scient. conf. "Hydraulic machines, hydrodrives abd hydro-pneumo-automatics". 9 Dec. 2020, Moscow, MPEI Publ., 2010. P. 178—181.
- *Romanov D.B., Golubev V.I.* Research of static and dynamic characteristics of the hydraulic drive with proportional electrical control (In Russian) // Proc. of All-Russia scient. conf. "Hydraulic machines, hydrodrives and hydro-pneumo-automatics". 9 Dec. 2020, Moscow, MPEI Publ., 2010. P. 153—159.
- *Khovanov G.P., Pugovkin E.G., Volkov A.V.* Effectiveness increase for recuperation systems for redundant main pressure developed on the basis of rotary pumps (In Russian) // Proc. of All-Russia scient. conf. "Hydraulic machines, hydrodrives and hydro-pneumo-automatics". 9 Dec. 2020, Moscow, MPEI Publ., 2010. P. 146—147.
- *Khovanov G.P., Proshkin I.Yu., Volkov A.V.* Effectiveness increase of the low speed pumps by means of application of the biplane hydraulic-dynamic lattice in the pump working wheel (In Russian) // Proc. of All-Russia scient. conf. "Hydraulic machines,

hydrodrives and hydro-pneumo-automatics". 9 Dec. 2020, Moscow, MPEI Publ., 2010. P. 143—145.

- *Liamasov A.K., Orakhelashvili B.M.* Step-up transformer (In Russian) // Proc. of All-Russia scient. conf. "Hydraulic machines, hydrodrives and hydro-pneumo-automatics". 9 Dec. 2020, Moscow, MPEI Publ., 2010. P. 117—123.
- *Loktionov E.V., Cherkasskikh S.N.* Structural synthesis of the control system for pump feeding (In Russian) // Proc. of All-Russia scient. conf. "Hydraulic machines, hydrodrives and hydro-pneumo-automatics". 9 Dec. 2020, Moscow, MPEI Publ., 2010. P. 110—112.
- *Kudinov O.I., Ziubin I.A.* A machine for testing the concrete samples on compression (In Russian) // Proc. of All-Russia scient. conf. "Hydraulic machines, hydrodrives and hydro-pneumo-automatics". 9 Dec. 2020, Moscow, MPEI Publ., 2010. P. 99—101.
- *Kostin A.S., Ziubin I.A.* Proportional forcing valve on pressure up to 70 MPa (In Russian) // Proc. of All-Russia scient. conf. "Hydraulic machines, hydrodrives and hydro-pneumo-automatics". 9 Dec. 2020, Moscow, MPEI Publ., 2010. P. 96—98.
- *Ivasheko P.N., Golubev V.I.* Experimental bench of the movable regulated fountain with autonomous water supply (In Russian) // Proc. of All-Russia scient. conf. "Hydraulic machines, hydrodrives and hydro-pneumo-automatics". 9 Dec. 2020, Moscow, MPEI Publ., 2010. P. 66—70.
- *Zakharov I.C., Ershov V.N., Golubev V.I.* Development of the control system for the working liquid consumption in the hydrosystem using computer engineering (In Russian) // Proc. of All-Russia scient. conf. "Hydraulic machines, hydrodrives and hydro-pneumo-automatics". 9 Dec. 2020, Moscow, MPEI Publ., 2010. P. 61—65.
- *Glagolev D.A., Gumenny V.V., Sviridov P.O., Morgunov G.M.* Structural-parametric synthesis on pre-switched-on device of the pump installation for need of petroleum production (In Russian) // Proc. of All-Russia scient. conf. "Hydraulic machines, hydrodrives and hydro-pneumo-automatics". 9 Dec. 2020, Moscow, MPEI Publ., 2010. P. 36—42.
- *Glagolev D.A., Gumenny V.V., Sviridov P.O., Morgunov G.M.* Conceptual stage of development of the pre-switched-on device oa the pump installation for petroleum production (In Russian) // Proc. of All-Russia scient. conf. "Hydraulic machines, hydrodrives and hydro-pneumo-automatics". 9 Dec. 2020, Moscow, MPEI Publ., 2010. P. 30—35.
- *Gorbach A.V., Ostrovskiy V.L.* РазработкаDevelopment of the heat pump on the increased parameters (In Russian) // Proc. of All-Russia scient. conf. "Hydraulic machines, hydrodrives and hydro-pneumo-automatics". 9 Dec. 2020, Moscow, MPEI Publ., 2010. P. 43—46.

Patents

- Patent on the useful model № 92926. Hydrodrive / S.V. Volkov, V.I. Golubev, D.V. Dragomirov, Yu.Yu. Zuev, V.V. Fedenkov // Published 10.04.2010. Bull. № 10, 2010.
- Patent on the useful model № 81265. Rotary machine / G.M. Morgunov // Published 2009. Bull. № 7, 2009.
- Euro-Asia patent № 014075 B1. Rotary machine (variants) / G.M. Morgunov // Published 2010. WO 2007/120066.2007.10.25.
- Patent on the useful model № 2010132520\(045971). Working wheel of the rotary pump / Ryzhenkov V.A., Volkov A.V., Parygin A.G., Khovanov G.P. // Published 03.08. 2010.

Dissertations

- *Dragomirov D.V.* Investigation of energy-dynamic and regulating characteristics of the hydrodrive with hydromotor unit of extended regulation range. Canc. Sci. (Techn.) Dissertation, 2010.

Partners

- Central R&D institute of automatics and hydraulics, Moscow
- SPO «Gidromash», Moscow
- JSC «Rus Hydro», Moscow
- JSC «Mosenergo», Moscow
- JSC «OKB BN Connas», Moscow
- «Sigma», Czech republic
- «FESTO», Germany
- «Grundfos», Denmark
- «Company MAGI», Moscow

IPMM MACHINE DESIGN FUNDAMENTALS (MDF) DEPARTMENT

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14 professors and lecturers

Head of Department
Ph.D. Associated Professor
Anatoly I. SMIRNOV

Priority research activites

Research Supervisors

- **The study of design efficiency of the electrical equipment at the dynamic affects**
  Professor Kudryavtsev E.P.
- **Research of a strength and reliability of the construction elements made from the composites**
  Professor Nikolaev V.P.
- **The design of equipment for laboratory and scientific studies**
  Professor Nikolaev V.P.

Agreements, contracts, projects

- Investigation of the temperature affects influence on properties of composite materials on the basis of the polymer matrix
- Research of the general principles of application of armored composite materials in power machinery
- Development of complex equipment of the laboratory-class CAD on the lecture course "Fundamental of designing"

Key publications

- *Korzh D.D., Kuznetsov A.V.* Synthesis of the optimum structure of mechanisms. Moscow.: MPEI Publ., 2009. 32 p.
- *Baraev A., Smirnov A.I.* Research of movement breaks of parameters for flexible links. Moscow.: MPEI Publ., 2009. 5 p.
- *Nikolaev V.P.* Method of definition of mechanical characteristics of the reinforced materials with cylindrical anisotropy. A laboratory practical work. Moscow.: MPEI Publ., 2010. 45 p.
- *Nikolaev V.P., Schugorev V.N., Schugorev A.V.* Methods of experimental evaluation of crack resistance and plate girder construction elements of the composite material ". MPEI Vestnik, No. 5, 2009. MPEI Publ. 6 p.
- *Peremyev D.A., Frost S.F.* Atlas of structures. Worm-gearing. Textbook. MPEI Publ., 2010. 187 pp.
- *Grebenkin V.Z.* Choice of the reasonable device of the flexible cell of the wave gear with the disk-generator ". "Defense complex scientific and technical progress of Russia", No. 1, 2010. 9 p.

Partners

- *Federal* state unitary enterprise "Coordination-analytical center in the scientific and technical programs of Russian Ministry of Education" (FGUP "Center MNTP"), Moscow
- *Kuznetsov A.V., Korzh D.D.* Software for the solution of the problems of the mechanism synthesis at the stage of design studying in the field of power equipment

construction (in Russian) // Proc. of the 13th Intern.conf. of graduate and PhD students. In 3 vol. Moscow: MPEI Publishing house, 2007. Vol. 3, P. 250—251.

- *Korzh D.D., Khoroshev A.N.* Fundamentals of systems approach to the machine design (in Russian) // The bases of design and machine parts — XXI century: Proc. of All-Russia Conf. Oriol-town: Oriol STU, 2007. P. 64—70.
- *Korzh D.D., Nikolaev V.P., Pichugin V.S.* Strength and hardness of the reticulated structure elements made from the reinforced composite materials (in Russian) // MPEI Vestnik. 2008. No 3. P. 12—17.
- *Karpov A.A., Korzh D.D., Shuklin Yu.A.* Application of the computer technologies at the stage of general technical training of students (in Russian) // News of scientific—methodical commission for machine parts, applied mechanics and design bases of the Ministry of Eeducation and Science of Russian Federation and the Republican seminar "Mechanics" with KBGSKHA. Nalchik: Publishing house of FGOU VPO "Kabardino-Balkarskaya State Academy named after of V.M. Kokov", 2008. P. 16—19.
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- *Korzh D.D., Kuznetsov A.V.* Synthesis of the machanism optimum structure.. MPEI Publishing House, 2009. 32 p.

Patents

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- Patent 2332650 (RF) for the invention. The method of determining the body static moment / A.A . Kochetov, D.D. Korzh // BI. 2008. No 24.

Partners

- Federal state unitary enterprise "Coordination-analytical center for the scientific and technical programs of Ministry of Education and Science of Russian Federation" (FGUP "Center MNTP"), Moscow

Unique equipment

- The installation for shaft testing of a reticular structure for twisting
- The set of facilities for sample testing made from composite materials
- The CAD center
- The electronic weights for weighing the long blades of turbo machines

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16 lecturers,
1 scientific employee,
1 engineer,
10 post-graduate students.

Head of Department
Doctor of sciences (Tech.),
Professor Igor V. MERKURYEV

Priority research activites

Research Supervisors

- **The basic directions of scientific researches Supervisors of studies Mechatronics control systems using computer systems of real time scale**
  Professor Kobrin A.I.
- **Movement of mobile robots and non-holonomic electromechanical systems**
  Professor Martynenko Yu.G., Head of laboratory Orlov I.V.
- **Dynamics of sensitive elements of navigation systems and motion control**
  Professors Martynenko Yu.G., Podalkov V.V., Merkuryev I.V.
- **Computer modeling of systems of the connected bodies Development of computer training and supervising programs**
  Professor Kirsanov M.N., Associated Professors Osadchenko N.V., Koretskij A.V.

Contracts, contracts, projects

- Development of systems for control and oscillation mode adjustment for sensor' sensitive elements for the micro-electromechanical systems
- Creation of the theory, methods of testing and adjustment of micro-mechanical inertial sensors based on new physical principles and construction materials
- Development of an integrated system of orientation and navigation on the micro-mechanical gyroscopes and accelerometers
- Impact of non-linear elastic properties of the construction material, the finite deformation of elastic system dynamics and precession of the wave solid-state and micro-mechanical gyroscopes
- Development of algorithms for the calibration parameters, power and analytical error compensation of the circular vibratory micro-mechanical gyroscope

Key publications

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- *Sadovnichy V.A., Goryachev, I.G., Akaev A.A., Martynenko Yu.G., Okunev Yu.M., Vlakhova A.V., Bogdanovich I.J.* Application of methods of mechanics of contact interactions in the diagnosis of pathological states of soft biological tissues (in Russian). M.: MSU, 2009. 306 p.
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- *Sinyavskiy O.Y., Kobrin A.I.* Construction of adaptive robot control system and robot sensor information proceeding using spiking neural networks // Taiwan-Russian Bilateral Symposium on Problems in Advanced Mechanics. 2010. M.: Institute of mechanics of Lomonosov MSU, 2010. P. 218—227
- *Martynenko Yu.G.* Advanced problems in motion control of wheeled mobile robots. Taiwan-Russian bilateral Symposium on Problems in advanced Mechanics // M.: Institute of mechanics of Lomonosov MSU, 2010. P. 160—166.
- *Sinyavsky O.Y, Kobrin A.I.* Education spike neuron with a teacher in the task of detecting spatio-temporal pulse pattern (in Russian) // Neurocomputers. Development. Application. 2010, № 8. P. 69—76.
- *Sinyavskiy O.Y., Kobrin A.I.* Generalized Stochastic Spiking Neuron Model and Extended Spike Response Model in Spatial Temporal Impulse Pattern Detection Task // Optical Memory and Neural Networks (Information Optics), Allerton Press, New York, 2010. Vol. 19, № 4, P. 300—309
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- *Abdelrahman M.A., Osadchenko N.V.* Modeling of controlled motion crawling robots (in Russian) // MPEI Vestnik. 2010. № 3. P. 16—19
- *Gavrilenko A.B., Merkuryev I.V., Podalkov V.V.* Effect of low anisotropy of viscoelastic material on the precision characteristics of the wave solid-state gyroscope with a resonator in the form of a shell of revolution (in Russian) // MPEI Vestnik. 2010. № 3. P. 20—27
- *Ustinov V.F., Stepanov A.S.* Modeling the dynamics of a planar electrostatic micromotor (in Russian) // MPEI Vestnik. 2010. № 4, P. 12—19
- *Gavrilenko A.B., Merkuryev I.V., Podalkov V.V.* Experimental methods for determining the parameters of viscoelastic anisotropy of the cavity wave solid-state gyroscope (in Russian) // MPEI Vestnik. 2010. № 5. P. 13—19
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- *Maslov A.N., Merkuryev I.V., Podalkov V.V.* Software control of the movement of an elastic manipulator link (in Russian) // Izv. Kyrgyz state. Tekhn. Univ named Razzakov. 2009. № 16. P. 98—102

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- *Martynenko Yu.G.* Effect of shifting the center of mass on the dynamics of the robot with wheels roller-carrying wheels (in Russian) // Conf. "Mobile Robots and Mechatronic Systems." M.: MSU, 2009. P. 24—37.
- *Belotelov V., Martynenko Yu.G.* Control space motion of the asymmetric two-wheeled robotic platform (in Russian) // Conf. "Mobile Robots and Mechatronic Systems." M.: MSU, 2009. P. 70—85.
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- *Alexandrov V.A., Danilov M.M., Kirik, K.A., Kobrin A.I.* Hardware and software of mobile robot Energy // Int. Conf. "Extreme Robotics. Nano-, micro-and macro-robots. Adaptive and intelligent robots. 2010. P. 78—80.
- *Kobrin A.I., Martynenko Yu.G., Okunev Y.M.,* Modern methods of learning through creativity in management and mechatronics // Fourth All-Russia. of Scient. Conf. "Advanced Systems and Control Problems" Dombai. 2009. P. 225—227.
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- *Adamov, B.I.* Nonlinear stabilization of motion one-wheeled robot (in Russian) // Mechatronics and Robotics. Current state and development trends: Sat. Articles of All-Russian Conf. with elements of a scientific school for young people, Novocherkassk, Sept. 20—24. 2010 — Novocherkassk: LIC, 2010. P. 36—40.
- *Mikhailov D.V., Pankrat'eva G.V.* On the problem of the dynamics of the spherical robot (in Russian) / Mechatronics and Robotics. Current state and development trends: Sat. Articles of All-Russian Conf. with elements of a scientific school for young people, Novocherkassk, Sept. 20—24. 2010 — Novocherkassk: LIC, 2010. P. 42—48.

Patents

- *Martynenko Yu.G, Pismennaya E.V., Balahno M.V., Motin A.Yu., Komarov, P.A., Belotelov V.N.* Patent № 97080 for a utility model, "Transport car". Applied 23.04.2010. Publ.: 27.08.2010 Bull. № 24. P. 7—9.
- *Martynenko Yu.G., Pismennaya E.V., Belotelov V.N.*. Patent № 99370 for a utility model "Robokar" — № 2010116006/02; Applied 20.06.2010. Publ.20.11.2010. Bull. № 32. P. 5—7.
- *Martynenko Yu.G., Lavrovsky E.K., Balahno M.V., Komarov P.A., Romachkin A.M.* The program complex for calculating the optimal set of operating facilities. Cert. of State. registration program on the computer № 2010612405 on the application number 2009617528 from 28.12.2009 and the priority from 04.05.2010.
- *Martynenko Yu.G., Kapustina O.M.* Visualizing the dynamics of single-wheeled robot gyrostat. Cert. of State. registration program on the computer № 2010613345 on the application number 2010611747 from 06.04.2010 and the priority from 21.05.2010.

Dissertations

- *Abdelrahman Mohamed Abdelnasir Mohamed Zein.* Modeling of controlled motion of robots crawling on a smooth surface. Cand. Sci. (Techn) Dissertation. 2009
- *Vu The Trung Giap.* Effect vibration of the base and the elastic properties of the cavity on the dynamics of micro-mechanical gyroscopes. Cand. Sci. Dissertation (Techn). 2010
- *Belotelov V.N.* Dynamics and control of autonomous mobile robot with two coaxial wheels // Cand. Sci. Dissertation (Phys.-Math.). 2010

Partners

- Institute of applied mathematics names after M.V. Keldysh of the Russian Academy of Sciences, Moscow
- Institute of mechanics of the Lomonosov Moscow State University, Moscow
- Moscow Institute of electromechanics and automatics, Moscow
- The Federal State enterprise «Moscow design bureau "Mars", Moscow
- Arzamass Device Design Company, Arzamass
- Ramenskoe Device Design Company. Ramenskoe, Moscow Region
- Technological university Velizi, Paris, France
- University Jaotong, Shanghai, People's Republic of China
- University Tsinghua, Beijing, People's Republic of China
- University of Enschede, The Netherlands
- Federal Centre of science «Electropribor», Saint Petersburg, Russia

Unique equipment

- The equipment for evaporation of the thin diamond-type films
- The breadboard models of the mobile robots created according to the rules of the international scientific and technical festival «Mobile robots»
- The handle for display of efforts at computer modeling (a virtual reality)
- The software package «Universal Mechanism» for modeling dynamics of the complex systems of the connected bodies
- A strapdown asymuth and vertical device for research of modes of an initial exhibition and navigation

- The research bench for the dynamic and accuracy characteristics of a dynamically tuning gyroscope
- The research bench for processes of information transfer and reception in the multiprocessing and multitask systems of a real time

IPMM DYNAMICS AND STRENGTH OF THE MACHINES (DSM)

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24 lecturers,
10 post-graduate students

Head of Department
Ph. D. (Techn.)
Associated Professor Sergey F. KUZNETSOV

Priority research activites

Research Supervisors

- **Fracture mechanics**
  Associated Professor G.Kh. Murzakhanov
- **Stochastic dynamics and safety of machines and structures**
  Professor V.P. Chirkov
- **Dynamics and stability of the structures**
  Professor V.P. Radin

Agreements, contracts, projects

- Analysis of dynamical behavior of structures under seismic actions
- Study of stability and post-critical behavior of the deformable systems under substantially non-potential loading
- Development of methods of a damage analysis and safety assessment of the structural elements of the power-machine equipment in aggressive environment
- Development of assessment methods of structures and machine reliability operating under static and dynamic actions
- Reliability assessment of the gas pipeline systems operating in the complex climatic and geological conditions
- Development of the methodology of the operability and residual resource assessment of the steel cables using the results of diagnostic control
- Dynamics of non-linear multi-mass systems under impact and vibrating loads
- Development of Methods to Investigate Mechanical Conditions and Dynamic Response of Constructions Taking into Account Influence of Geometric and Physical Non-Linearity Factors
- Development of Mathematical Models of Deformation and Fracture Processes for Machines and Building Constructive Elements under Static and Dynamic Loadings

Key publications

- *Bolotin V.V., Radin V.P., Chirkov V.P. and Shchugorev A.V.* Stability of a pipeline section with an elastic support (In Russian) // Mech. Solids. 2009. 44 (1). P. 149—157.
- *Moorzakhanov G.Kh., Kasyanov K.G., Schugorev V.N.* Surface cracks behavior in the structural composite components (In Russian) // Tekhnologiya Mashinostroeniya. 2009. № 5. P. 5—9 .
- *Bolotin V.V., Trifonov O.V.* Construction of Discrete-Continual Models in Structure Analysis for Extreme Dynamic Loadings (In Russian) // Mech. Solids. 44 (6), 852—864 (2009).
- *Trifonov O.V.* Modelling of damage accumulation and failure of structural members subjected to strong seismic actions // Computational Mechanics. 2009. Vol. 44, № 4.

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- *Karimbaev K.D., Servetnik A.N.* Low-Cycle Fatigue Calculation of Gas Turbine Engine Disks under Flight Cycle Conditions (In Russian) // Strength of Materials. 2009. № 1. P. 129—133.
- *Tomarov G.V., Shipkov A.A.* Hydrodynamic Coefficients and Zones of Metals Local Erosion-Corrosion in Two-phase Flows of Fossil and Nuclear Power Plants pipelines and Equipment (In Russian) // Heavy Engineering. 2009. № 7. P. 10—15.
- *Lovchev V.N., Gutsev D.F., Tomarov G.V., Shipkov A.A.* Improvement and Optimization of Techniques for Monitoring Erosion-Corrosion Wear of Equipment and Pipelines at Nuclear Power Stations (In Russian) // Thermal Engineering. 2009. № 2. P. 40—47.
- *Okopny Y.A., Radin V.P., Chirkov V.P.* The Methods of Evaluation of the Boundaries of Stability Domains for Mechanical Systems under Non-Conservative Loading (In Russian) // Handbook. An Engineering Journal. 2010. № 4. P. 35—41.
- *Vorontsov A.N.* Wire ropes NDT discard criteria based on lifetime prediction model // Proceedings of the 15th North Sea Offshore Cranes & Lifting Conference, 27—29 April 2010, AECC, Aberdeen, UK, 10 p.
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- *Moorzakhanov G. Kh., Bystrova N.A.* Dynamic Fracture of Pipelines with Cracks // Testing. Diagnostics. 2010. № 6. P. 58—62(in Russian).
- *Tumanov N.V., Servetnik A.N.* Stress State Multilevel Simulation of Turbine Disk with Cracks and Stress Intensity Factor Evaluation (In Russian) // Strength and Destruction of Materials and Constructions: Proc. of VI Intern. Scient. Conf. Orenburg: OSU, 2010. P. 207—212.
- *Tomarov G.V., Shipkov A.A., Koreshkova N.S.* Calculated and Experimental Substantiation of Operating Conditions under which Adequate Erosion Resistance of Valves used in Power Units at Nuclear Power Stations Is Ensured (In Russian) // Thermal Engineering. 2010. № 5. P. 19—25.
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Patents

- Patent 85485 (RF). System for corrosion protection of the fossil power plant equipment / V.N. Semenov, G.V. Tomarov, A.A. Shipkov, S.A. Popov // Federal Service For Intellectual Property Patents and Trademarks, 10.2009

Dissertations

- *Stenina T.E.* Quasistatic State and Dynamic Disturbances of Above Ground Main Pipelines. Cand. Sci. (Techn.) Dissertation. 2010.
- *Shugorev A.V.* Influence of Frequency Content on Mechanical Systems Stability under non-potential Loading. Cand. Sci. (Techn.) Dissertation. 2010.

- *Kasyanov K.G.* Estimation of Load-Carrying Capability and Lifetime of Structural Composite Elements with Fiberings. Cand. Sci. (Techn.) Dissertation. 2010.
- *Koreshkova N.S.* Use of Asymptotical Method to Analyze Principal Mode Spectrum of Thin-Walled Constructive Elements in Magnetic Fields. Cand. Sci. (Techn.) Dissertation. 2010.

Partners

- Russian Academy of Architecture and Construction Sciences, Moscow
- The Institute of Machine Science of the Russian Academy of Sciences named after A.A. Blagonravov, Moscow
- The Limited Liability Company Scientific-Research Institute of Natural Gases and Gas Technologies — GAZPROM VNIIGAZ, Moscow
- JSC "All-Russia Research Institute of Inorganic Materials named after A.A. Bochvar" (VNIINM), Moscow
- Governmental Unitary Research and Production Enterprise "Central Institute of Aviation Motors named after P.I. Baranov (CIAM), Moscow
- Governmental Unitary Research and Production Enterprise — All-Russia Research Institute of Electromechanics with Plant named after A.G.Iosifian (VNIIEM), Moscow
- JSC «Diatex», Volgograd
- JSC «Techsoft», Moscow
- JSC «Intron-Plus», Moscow

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5 post-graduates,

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Dr. Sci. (Techn.), Professor
Victor K. DRAGUNOV

Priority research activites

Research Supervisors

- **Development of the complex of high-precision technologies for electron beam welding of dissimilar materials**
  Professor Dragunov V.K.
- **Development of the technology of the electron beam welding of thick components**
  Professor Dragunov V.K.
- **Development of methods for rapid diagnosis of structural and mechanical conditions of the metal industrial equipment**
  Professor Matyunin V.M.
- **Creation of automated devices for specimen-free control of the physical and mechanical properties of the metal of welded joints and coatings for various purposes**
  Professor Matyunin V.M.
- **Technologies for permanent joints with very different coefficients of thermal expansion and the phase-transition temperature by electron-beam technology**
  Associated Professor Khokhlovskiy A.S.
- **Developing and improving of the technology of rolling and calibration tool for production of hot-rolled pipes**
  Professor Golubchik R.M.
- **Technology of electron-beam welding of nonferrous metals**
  Associated Professor Goncharov A.L.

Contracts, projects

- The influence of plasma flows encountered during electron beam welding in the presence of electric magnetic fields on the electron beam parameters
- Development of control methods of the electron beam parameters during the electron beam welding of magnetized materials
- Investigation of the interaction of powerful electron beams with metallic materials, development of equipment and technological foundations of electron-beam welding of large thickness
- Improvement of the technology EBW internal constructions of ITER blanket
- Development of production bases EBW large-scale structures of austenitic steel 316 L (N)
- Investigation of the mechanical properties of the ropes before and after the operation
- Rapid diagnosis of heat network

Key publications

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- *Dragunov V.K., Goncharov A.L.* Modern development of electron beam welding (in Russian) // Rhythm. 2009. № 8. P. 28—30.

- *Martynov V.N., Khokhlovskiy A.S., Sliva A.P.,* Electron beam welding of steel, aluminum and titanium alloys components of great thickness (in Russian) // Welding production. 2009. № 12. P. 20—24.
- *Matyunin V.M., Demidov A.N., Dubov A.A., Marchenkov A.Y.* Determination of mechanical properties of the metal in the areas of stress concentration of mechanical engineering products (in Russian) // Metal technology. 2009. № 7. P. 19—22.
- *Matyunin V.M., Dubov A.A., Marchenkov A.Y.* The scaling factor in determining the hardness of materials (in Russian) // Factory laboratory. Diagnostics of Materials. 2009, № 9, P. 59—62.
- *Vigdorovich V.N., Kadyrov Ch.A., Karimbekov M.A., Oparichev E.B.* Effect of heat treatment on the properties angle-condensed films (in Russian) // Proc. of the Kyrgyz Technical University. Razzakov. Bishkek. 2009. № 17. P. 289—292.
- *Golubchik R.M., Merkulov D.V., Shelest A.E.* On the factor of the process for metal forming (in Russian) // Metals. 2009. № 1. Pp. 21—24
- *Golubchik R.M., Klempert E.D., Merkulov D.V. Medvedev E.K., Novikov M.V.* The use of test results on torsion in improving the conditions of billet conversion (in Russian) / / Deformation and Fracture of Materials. 2010. № 11. P. 40—45.
- *Golubchik R.M., Merkulov D.V., Klempert E.D., Medvedev E.K.* Application of the criterion of work spent in the screw rolling. (in Russian) // 2010. № 3, P. 7—13.
- *Muravieva T.P., Dragunov V.K., Sliva A.P., Goncharov A.L.* Structure and properties of welded joints of thin steel plates, made of electron-beam welding (in Russian) / Welding production. 2010. № 6. P. 38—42.
- *Dragunov V.K., Goncharov A.L. and Sliva A.P.* Spatial parameters of the electron beam in interaction with a magnetized target (in Russian) // Welding International. 2010. № 7. P. 552—556.
- *Shcherbakov A.V., Rubtsov V.P.* Control System synthesis for the heat regime of the molten pool in the electron beam welding installation (in Russian) // MPEI Vestnik. 2010. № 3. P. 78—85.
- *Dyakov A.F., Kantsedalov V.G., Berlyavsky G.P., Matyunin V.M.* Framework of the operational status of power equipment thermal and nuclear power plants (in Russian). — Moscow.: "Gornaya kniga". Energy, 2010. 570.
- *Matyunin V.M., Dubov A.A., Marchenkov A.Y.* Scale Factor in Determining the Hardness of Metall Materials // Juorganic Materials, 2010.Vol.46.N15. P. 1692—1695.
- *Oparichev E.B., Oparichev A.B., Vigdorovich V.N., Karimbekov M.A.* The classification of design and technological solutions film thermocouples for measuring (in Russian) "Izvestya Vuzov. Electronica". 2010. № 3 (83). P. 79—81.

Partners

- Federal State Unitary Enterprise "NIKIET named on M.A. Dollezhal"
- MSTU named of N.E. Bauman
- NPO Energomash, Khimki
- OAO MKB "Fakel", Khimki
- Higher Technical School of Constanz, Germany
- Institute of Electrical welding named on E.O. Paton, Kiev, Ukraine
- Technical University of Budapest, Hungary
- Physical-Technical Institute, Minsk, Belarus
- Institute of Engineering Sciences of RAS, Moscow
- State Research Center "Research and Production Association of mechanical engineering (NPO TSNIITMASH), Moscow

- Moscow inter-industry Association of Chief Welders

Unique equipment

- Electron-beam installation "Languepin" for metal welding with output power 45 kW
- Universal testing machine "Instron" for mechanical testing of materials with program management
- Stationary and portable devices for nondestructive rapid assessment of the physical and mechanical properties of structural materials
- Equipment for automatic, semiautomatic, and manual welding
- Laser Spectrometer "Matrix"

IPMM ENGINEERING GRAPHICS (EG) DEPARTMENT

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29 teachers

Head of Department
Associated-professor
Elena P. KASATKINA

Priority research activites

Research Supervisors

- **Geometrical Models and their Representations in Engineering Graphic**
  Professor Gornov A.O.
- **Developing of the Methods for Teaching in Engineering and Computer Graphic**
  Associated Professor Kasatkina E.P.

Key publications

- *Gordeyeva I.V., Kasatkina E.P., Stepanov Y.V.* "Digital Educational and Methodical Complex "Descriptive Geometry. Engineering Graphic". Proc. of Intern. Scient.-Academ. Conf. "Scientific and Methodic Problems of the Geometrical Modelling, Computer and Engineering Graphic in Higher Professional Education". Penza, Privolzhskiy Dom Znaniy Publ., 2009. P. 43—46.
- *Gordeyeva I.V., Kasatkina E.P., Stepanov Y.V.* Modern Problems and Outlooks of Teaching in Engineering Graphic. Proc. of Intern. Scient.-Academ. Conf. "Scientific-methodic Problems of Graphic Education at Technical University on the Modern Stage". 2010, Sept. 15—17. Astrakhan, ASTU Publ., 2010. P. 39—42.
- *Gornov A.O.* About Geometrical Modeling. Proc. of Intern. Scient.—techn. Conf. "Information Means and Technologies", 2010, Oct., 19—21. "Information Technologies in Engineering and Economic Education". Moscow, MPEI Publ., 2010, Vol. 3. P. 70—75.
- *Kasatkina E.P., Stepanov Y.V.* On the Methods for Extensive Teaching in Engineering and Computer Graphic. Proc. of Intern. Scient.—techn. Conf. "Information Means and Technologies". 2010, Oct., 19—21. "Information Technologies in Engineering and Economic Education". Moscow, MPEI Publ., 2010, Vol. 3. P. 88—94.

IPMM RESEARCH & DEVELOPMENT ACADEMIC CENTER OF GEOTHERMAL ENERGY (GTE)

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5 researchers,
2 engineers

Director
Ph.D. (Techn.), Senior researcher
Valery N. SEMIONOV

Priority research activites

Research Supervisors

- **Development of the laboratory and natural experimental benches, installations, devices, and a fundamental investigation fulfillment in area of an education and the multi-phase and multi-component media flows**
  Senior researcher Semionov V.N.
- **Development and equipment creation for the ecologically pure geothermal power plants**
  Senior researchers Semionov V.N., Tomarov G.V.
- **Fundamental researches of the multi-phase geothermal media flows in the elements of the geothermal power plant equipment**
  Senior researcher Semionov V.N.
- **Investigation of the physical-chemical processes of an erosion-corrosion in the two-phase and multi-component media and a metal choice substantiation for the equipment of a geo-power plant**
  Senior researcher Tomarov G.V.
- **Development of the protection methods for the TPP and geoPP equipment against the corrosion. erosion and scales**
  Senior researchers Semionov V.N., Tomarov G.V.

Agreements, contracts, projects

- Development of the scientific-technological fundamentals foe development of the binary geo-thermal power installation to utilize the geo-thermal heat-carrier
- Development of engineering solutions on the main technological equipment the extend the Mutnovskaya Geo-PP—1
- Development of engineering solutions for improvement of the technological scheme of the binary geo-thermal power installation
- Development of the dynamic mathematical model of evaporator-overheater and a condenser of the Pauzhetskaya binary geo-thermal power plant with power 2.5 MW
- Analysis of regimes and conditions of the local erosion-corrosion influence of the single-phase water flow upon construction steels of tubes of the condenser0-feeding tract ot the first unit of Balakovskaya NPP

Key publications

- *Tomarov G.V., Nikol'skiy A.I., Semionov V.N., Shipkov A.A.* Geo-thermal energetic projects in Russia (in Russian) // New in Russian Electric Power Engineering. 2009. № 3.
- *Lovchev V.N., Gutsev D.F., Tomarov G.V., Shipkov A.A.* Improvement and optimization of monitoring of the erosion-corrosion equipment and tube deterioration (in Russian) // Thermal Power Engineering. 2009. № 2.
- *Tomarov G.V., Mikhailov A.V., Velichko E.V., Budanov V.A.* Extention of the erosion-corrosion operating resource of the tube system of the heat-recovery boilers for the combined unit (in Russian) // Thermal Power Engineering. 2010. № 1.

- *Tomarov G.V., Nikol'sky A.I., Semionov V.N., Shipkov A.A.* Развитие Development of Russian geo-thermal power engineering technologies (in Russian) // Thermal Power Engineering. 2009. № 11.
- *Tomarov G.V., Nikol'sky A.I., Semionov V.N., Shipkov A.A.* Modern projects of geo-thermal stations in Russia // Proc. of Worldwide Geo-Thermal Congress. 2010. — Bali. Indonesia. 2010.
- *Tomarov G.V., Nikol'sky A.I., Semionov V.N., Shipkov A.A.* Geo-thermal system of heat supply of Viliuchisk (Kamchatka) // Proc. of Worldwide Geo-Thermal Congress. 2010. — Bali. Indonesia. 2010.
- *Tomarov G.V., Nikol'sky A.I., Semionov V.N., Shipkov A.A.* Development of the experimental geo-thermal power plant on Pauzhetka (Kamchatka) // Proc. of Worldwide Geo-Thermal Congress. 2010. — Bali. Indonesia. 2010.

Patents

- Russian Patent № 85569. Geo-thermal power plant with the binary cycle // V.N. Semionov, A.I. Nikol'skiy, G.V. Tomarov, A.A. Shipkov // Bull. 2009. № 22.
- Russian Patent № 85485. Protection system against corrosion of TPP contour elements / V.N. Semionov, G.V. Tomarov, S.A. Popov et al. // Bull. 2009. № 22.
- Russian Patent № 85613. Closed contour of power engineering installation / G.V. Tomarov, V.N. Semionov, A.A. Shipkov, A.I. Nikol'skiy // Bull. 2009. № 22.

Dissertations

- *Budanov V.A.* Optimized investigations and a choice of the reasonable schemes of co-generation power complexes: Cand. Sci. (Techn.) Dissertation, 2009

Partners

- JSC RusHydro, Moscow
- JSC Geoterm, Petropavlovsk-Kamchatskiy
- Federal Agency on science and innovations of Russian Federation, Moscow
- JSC Geoterm-EM, Moscow
- JSC GeoInkom, Moscow

Unique equipment

- Large-scale experimental units (steam turbines, separators, heat exchangers) exceeding the best world models
- Field experimental installations for the studying processes of an erosion-corrosion deterioration of the construction metals in the GeoPP working environments
- Laser testers for measuring a size of the moisture drops and sensors for determining the characteristics of the liquid skins
- Special instruments, tools and measurement systems with which the experimental plants and field stands are equipped and systems of the experiment automated control having no world analogues
- Experimental turbine ET-12
- Experimental turbine ET-3M
- Endoscope
- Endoscope for condition inspection of turbine setting elements
- Optical measuring complex for research of dispersion and moisture of the two-phase steam flows

INSTITUTE OF THERMAL AND NUCLEAR POWER ENGINEERING (ITNPE)

Institute Director

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Institute Departments

ITNPE

WATER AND FUEL TECHNOLOGIES (WFT) DEPARTMENT

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20 researchers,
9 engineers and technicians,
11 post-graduate students.

Head of Department
professor,
Alexsei A. PANTELEEV

Priority research activities

Research Supervisors

- **The water-chemical regimes on the TPP and NPP**
  Professor Petrova T.I.
- **Water preparation on the TPP and the high-mineralized foul water processing**
  Leading Researcher Vasina L.G.
- **Monitoring and systems of automated chemical control on TPP and NPP, mathematical modeling of the chemical-technological processes**
  Professor Voronov V.N.
- **Fuel and technological problems**
  Associated-Professor Bugrov V.P.
- **Personal computer software complexes development for the personnel training and qualification raising of the chemical workshops in the TPP and NPP**
  Professor Ochkov V.F.
- Development of systems for chemical-technology monitoring for thermal power engineering equipment of various types
- Ecology of thermal power engineering and industrial enterprises
- Complex energy-technological application of the fuel

Manuals and textbooks

- *Voronov V.N., Petrova T.I.* Water-chemical regimes of TPP and NPP (in Russian) // Moscow. MPEI Publ., 2009. 390 p.
- *Kopylov A.S., Ochkov V.F., Chudova Yu.V.* Processes and apparatuses of modern technologies of water treatment and their programmed calculations (in Russian) // Moscow. MPEI Publ., 2009. 223 p.
- *Voronov V.N., Verkhovskiiy A.E., Gotovtsev P.M.* Mathematical simulation of water-chemical regimes (in Russian) // Moscow. MPEI Publ., 2010.
- *Verkhovskiy A.E.* Calculation of water-chemical regimes of TPP (in Russian) // Moscow. MPEI Publ., 2010.

Dissertations

- *Isianova A.R.* Development of a mathematical model of deposit formation of corrosion products on the heat-transferring surfaces: Cand. Sci. (Techn.) Dissertation. 2009.
- *Repin D.A.* Optomozation of water-chemical regimes of the cooling systems of the turbine condensers: Cand. Sci. (Techn.) Dissertation. 2009.
- *Kiet S.V.* Development of approaches and devices for chemical check of the water heat-carrier on TPP: Cand. Sci. (Techn.) Dissertation. 2009.

- *Evsiutin A.V.* Research and modernization of the technology for preliminary water cleaning using aluminium oxychlorides: Cand. Sci. (Techn.) Dissertation. 2010.
- *Strebkova N.A.* Studying of organic composition behavior in the processes of sorpsion-desorption on anionites at water treatment: Cand. Sci. (Techn.) Dissertation. 2010.

Key publications

- *Vasina L.G., Boglovskiy A.V., Guseva O.V., Sidorova S.V.* Application of PK-2-aminate at arrangement of the water-chemical regime of Zakamskaya TPP-5 (in Russian). // News in Russian Electrical Power Engineering. Moscow: Energopress Publ., №5. 2009.
- *Voronov V.N. Kiet S.V., Bushuev E.N.* Application of analyzer APK-051 in systems of chemical-technological monitoring (in Russian). Thermal Power Engineering, № 7, 2009.
- *Voronov V.N. Kiet S.V., Larin B.M.* Reliability increase of the automated chemical control of feeding water and the condensate of he steam turbines (in Russian). // News in Russian Electrical Power Engineering. Moscow: Energopress Publ., №5. 2009.
- *Petrova T.I., Repin D.A.* Factor influencing on reverse system operation of TPP (in Russian). MPEI Vestnik. № 1. 2009.
- *Noev V.V., Repin D.A., Sitniakovskiy.* Effectiveness investigation of the membrane method of preliminary water cleaning for water-treatment installations on TPP and NPP (in Russian). // Water cleaning, Water treatment, Water supply, № 7 (19)/2009. Orion Publ. 2009.
- *Ochkov V.F., Orlov K.A., Kondakova G.Yu., Ochkov A.V.* Simulator for the heat network dispatcher (in Russian). Energetic, № 4
- *Ochkov V.F.* Optimization of the module water treatment installations (in Russian) // Water cleaning, Water treatment, Water supply, № 9 (21)/2009. P. 56—57. 2009.
- *Ochkov V.F., Melnikov I.A.* Programmable calculation of the carbon acid equilibrium in the water (in Russian) // Water cleaning, Water treatment, Water supply, № 8 (20)/ 2009. P. 52—52.
- *Ochkov V.F.* Programmable calculation of water chalking and coagulation (in Russian) // Water cleaning, Water treatment, Water supply, № 7 (19), 2009. P. 41—46.
- *Ochkov V.F.* Water in scientific, culturology and religious aspects (in Russian) // Water cleaning, Water treatment, Water supply, № 7 (19), 2009. P. 64—70.
- *Liogenkiy V.I., Ochkov V.F.* Modelind of physical systems: dimensional and non-dimensional models (in Russian) // Proc. of IV scient.-practical conf. "Mathematical and imitation modeling of systems", Kiev, 2009. P.241—245
- *Ochkov V.F.* Publication in Internet of thermal-physical properties of substances: problems and solutions at working with tables (in Russian) // Proc. of Academenergo, № 2, 2009
- *Ochkov V.F., Yankov G.G.* Th complex «Reference + Internet site» and the problem of knowledge transfer (in Russian) // Proc. of Academenergo, № 1, 2009
- *Ochkov V.F.* Response to the paper of Yakushin S.M. «We read SNiP 2.04.01-85*: "Inernal water-supply and severage of buildings"» (in Russian) (Water cleaning, Water treatment, Water supply, № 4 (16), P. 52—60. // Water cleaning, Water treatment, Water supply, № 6 (18), 2009. P. 73—75.
- *Ochkov V.F., Chudova Yu.V., Minaeva E.A.* Cloudy calculations for the chemical workshop of power plants (in Russian) // Thermal Power Engineering, № 7, 2009. P. 19—24
- *Ochkov V.F.* Construction of the thermodynamic cycle diagrams: step by step (in Russian) // Automation and IT in power engineering. №2—3, 2009. P. 6—15.

- *Voloschuk V.A., Ochkov V.F.* Research and analysis of some schemes of gas-turbine units and steam-gas units with the help of modern information technologies (in Ukrain) / / Integrated technologies and energy saving, № 2, 2009. P. 77—145.
- *Ochkov V.F., Orlov K.A., Kondakova G.Yu., Ochkov V.A.* Simulator ot the heat network dispatcher (in Russian)// Energetic, № 4, 2009. P. 38—41.
- *Ochkov V.F., Aleksandrov O.O., Voloshuk V.A., Dorokhov E.V., Orlov K.A.* Internet-sites of thermodynamic cycles (in Ukraine) // Vestnik of inzhenernoy akademii Ukrainy. №3—4, 2008. P. 31—36.
- *Ochkov V.F.* Mathcad 14 for students and engineers: Russian version of ИРМ-Peterburg 2009 (in Russian). ISBN 978-5-9775-0403-4
- *Korobov V.I., Ochkov V.F.* Chemical kinetics: introduction with Mathcad/Maple/ MCS (in Russian). Moscow.: Goriachaya Linia — Telecom Publ., 2009, ISBN 978-5-9912-0075-2.
- *Petrova T.I.* Evaluation of various parameter influence on the formation of deposits in boilers (in Russian). News in Russian Electrical Power Engineering. Moscow: Energopress Publ., 2010.
- *Voronov V.N.* Modernization of water-chemical regimes and the chemical control on the thermal power plants. Thermal Power Engineering, 2010 r.
- *Petrova T.I.* Optimization of water-chemical regimes of reverse systems for condenser cooling (in Russian). News in Russian Electrical Power Engineering. Moscow: Energopress Publ., 2010.
- *Gotovtsev P.M.* Autonomous energy center for utilization of agricultural enterprise wastes (in Russian) // Renewable kilowatt. 2010.
- *Voronov V.N.* Some issues of development of chemical-technology monitoring systems (in Russian) // Teploenergetik, 2010.

Agreements, contracts, projects

- Generalization of experience on optimization physical-technological processes on TPP and development of recommendations for reliability and effectiveness increase
- Analysis of water admixtures and deposits on heat-exchange surfaces of the water-heating boilers
- Generalization of experimental and industrial information on organic inhibitors of the scales for development recommendations for application in the heat-exchange equipment
- Increase of reliability and effectiveness of the TPP equipment at the expense of elimination of deposits and corrosion products from surfaces of the steam-water paths
- Development and implementation of the correction water treatment for the heat-network with purposes of the corrosion velocity of constructive materials decrease and reduction of sewage quantity
- Development of the monitoring system for medium corrosion activity using the computer engineering taking into account the thermolysis of organic compositions
- Informational services, analysis of equipment operation on TPP and development of the key actions on increase the equipment operation reliability
- Development of a simulator on water-chemical regime control at TPP and NPP
- Development of the PC software for gathering and analyzing the initial data on the working place of the chemical workshop chief
- Optimization of chemical-technological processes on TPP and NPP directed towards development of technologies with minimal sewage quantities

- Experimental research of the liquid film contamination on the surface of the turbine blades by the corrosion-active admixtures during the steam extension in the turbine
- Evaluation of organic composition influence in the steam-water path upon reliability of the equipment operation on TPP
- Development of conservation ways for energy equipment and deposit elimination
- Analysis of drinkable water and sewage

Unique equipment

- Analyzers for determination of the micro concentrations of the water impurities:
- Ion-chromatograph of Shimadzu Co
- Atomic-absorption spectrometer of Shimadzu Co
- Analyzer of general organic carbon of Shimadzu Co
- Sodium analyzer (Orion, USA)
- Analyzer of nano-particles Zetasiser Nano of Malvern instruments Ltd,
- Flowmeter of A&D Company Ltd
- Test rig for studies of a corrosion rate, an impurities behavior in water and steam at the operating parameters of the power generating equipment
- Cycle chemistry monitoring system
- Test rig for studies of a deposit formation
- Network calculation server with MathCad Application Server technology
- Experimental bench for introduction of the correcting reagents
- Experimental reverse-osmosis bench for a chemical desalination

ITNPE

THERMAL POWER PLANTS (TPP) DEPARTMENT

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21 lecturers,
9 researchers,
11 post-graduate students.

Head of Department
Ph.D., professor,
Valery D. BUROV

Priority research activities

Research Supervisors

- **Low-wasted technologies of the water-treatment and the foul-water processing on the basis of the thermal chemical desalting method**
  Professor Sedlov A.S.
- **Schemes and equipment development for the thermal water treatment**
  Professor Sedlov A.S.
- **Development of the resource and energy saving technologies on the TPP**
  Professor Sedlov A.S.
- **Development and optimization of the schemes and parameters of a gas turbine and a combined TPP**
  Associated-Professor Burov V.D.
- **Investigation of the investment economical efficiency at the TPP development**
  Associated-Professor Burov V.D.
- **Investigation of a gas-piston installation application in the power engineering**
  Associated-Professor Burov V.D.
- **Combine project expertise of the gas-turbine, gas-piston and combined TPP**
  Associated-Professor Burov V.D.
- **Optimization of the TPP operating regimes**
  Associated-Professor Il'in E.T.
- **Development of an automated monitoring method of the operating condition of the TPP equipment**
  Associated-Professor Dorokhov E.V.

Agreements, contracts, projects

- Development of water-consumption and water-setting, discussion in agencies, development and conclusion of agreement for water-consumption for kashirskaya TPP – the branch of JSC MOEK
- Development of instructions for arrangement the activity of generating companies of JSC «Gasprom» in the field of fuel application
- Development of individual specific norms for waste discharge on TPP-9, TPP-12 and TPP-22 of JSC «Mosenergo»
- Development of the model and research of treatment processes for wastes on the basis of the modern high-effective carboxyl cationites
- Theoretical and experimental investigations of high-mineralized water solution boiling ans improvement of an approach for steam-generating installation calculations
- Development of project solutions on installation the magnetic level indicators of the tank equipment at TPP-26 Mosenergo

- Development and substantiation of module evaporating installation application for the steam-gas power plants
- Development of instructions on calculation of rate of application of chemical reagents at production of 1 m^3 of the chemically-cleaned water for feeding the heat-supply and electric-supply systems on TPP in operation in JSC MOEK
- Comparison of SGT variants in the structure of SGT energy units at modernization of Nizhnevartovskaya TPP
- Evaluation of extension variants of Nizhnevartovskaya TPP using the combined units
- Development of recommendations for a choice of gas-turbine mechanical drives for application on the main pump stations of petroleum swap.
- Expertise of heat-supply reconstruction in Almetievsk-town with the combined unit application
- Calculation of ensured indices of the energy unit PGU-450-RES for conditions on Urengoy TPP
- Analysis of engineering part and effectiveness calculation of the commercial proposal of «Revaho Agro Services ИМЭ on the construction of the gas-piston power plant of JSC «Agroinvitro»
- Calculation of effectiveness indices of the steam-gas unit of Adler TPP for different variants of technical water supply
- Calculation of the heat scheme of the gas-turbine TPP on the basis of the gas-turbine unit of company Kawasaki
- Development of creation conception for an energy object on JSC «Sayanskimplast»
- Expertise of the construction project for the steam-gas unit of power 410 MW at Nevinnomysk TPP
- Evaluation of commercial and financial effectiveness of reconstruction project for thermal-water-treatment of Tobolsk TPP
- Calculation of heat scheme variants for conditions of Adler TPP on the basis of steam-gas energy units
- Expertise of technical water supply system variants for the steam-gas unit PGU-800 of Nizhnevartovsk TPP
- Calculation of ensured indices of the steam-gas unit of overflow type for the second unit of Tumen TPP-1
- Calculation of technical-economical indices of the steam-gas unit for conditions of Yuzhno-Uralsk TPP
- Calculation of the heat scheme variants for conditions of the branch OGK-3 of Yuzhno-Uralsk TPP
- Creation of theoretical fundamentals for calculation and optimization of hybrid power plants with application of the fuel elements
- Development of the main technical solutions for replacement of the gas turbines on TPP Liublino

Key publications

- ***Thermal*** electrical power plant: manual / V.D. Burov, E.V. Dorokhov, D.P. Elizarov et al. Moscow.: MPEI Publ., 2009. 466 p.
- ***Gas-turbine*** and steam-gas installations for thermal power plants / Tsanev S.V., Burov V.D., Remezov A.N. Moscow.: MPEI Publ., 2009. 584 p.
- ***Internet-calculations*** of thermal-dynamic cycles / Dorokhov E.V., Aleksandrov A.A., Ochkov V.F. et al. // Thermal Power Engineering. 2009. № 1. P. 77—80

- ***Improvement*** of calculation-analytical work in the workshop of adjustment and testing of TPP. / Dorokhov E.V., Kozlov S.I., Sedlov A.S., Il'in V.A. // Electrical stations. 2009. № 7. P. 11—15.
- ***Razionalization*** of calculation-analytical work in the workshop of adjustment and testing of TPP // Dorokhov E.V., Sedlov A.S.. Kozlov S.I., Il'in V.A. // Electrical stations. 2009. № 07. P. 18—23.
- ***Optimization*** of parameters of the heat schemes of condenser and thermal-clapping Steam-gas units with the heat-recovery boilers of three pressure / Devianin A.V., Tsanev S.V., Burov V.D. // Energosberegnie and vodogodgotovka. 2009. № 1. P. 23—27.
- ***Evaluations*** of internal relative effectiveness of parts and cylinders of the steam turbines of steam-gas units / Burov V.D., Dudolin A.A., Zakharenkov E.A., Ivanov S.A., Kasilov V.F. // MPEI Vestnik. 2009. № 3. P. 5—11.
- ***Methods*** for fuel afterburning in the heat schemes of the energy gas-turbine units / Tsanev S.V., Burov V.D., Pustovalov P.A. // MPEI Vestnik. 2009. № 3. P. 12—16.
- ***Energy*** characteristic of gas-turbine units with moist regeneration / Tsanev S.V., Burov V.D., Pustovalov P.A. // MPEI Vestnik. 2009. № 2. P. 11—15.
- ***Heat schemes*** of the hybrid power plants an approach to its calculation / Burov V.D., Zakharenkov E.A. // MPEI Vestnik. 2009. № 2. P. 20—27.
- ***Evaluation*** of effectiveness of steam turbines // Kasilov V.F., Dudolin A.A., Burov V.D. Tiazheloe mashinostrounit 2009. № 7. P. 17—19.
- ***Experience*** of development of the complex low-wasted system of water usage on Kazan TPP-3 / Fardiev I.Sh., Zakirov I.A., Silov I.Yu., Galiev I.I., Koroliov A.G., Shischenko V.V., Sedlov A.S., Il'ina I.P., Sidorova S.V., Khasiakhmetova F.R. // News in Russian Electrical Power Engineering, 2009, № 3, P. 30—37.
- ***Improvement*** of calculation-analytical work in the workshop of adjustment an testing of TPP / Dorokhov E.V., Kozlov S.I., Sedlov A.S., Il'in V.A. // Electrical stations, 2009, № 7, P. 18—23.
- ***Thermal*** and nuclear power plants: manual for universities / L.S. Sterman, V.M. Lavygin, S.G. Tishin. – 5th edition. Moscow, MPEI Publ., 2010. 464 p.
- ***Gas-turbine*** and steam-gas installations with steam injection: textbook / Tsanev S.V., Burov V.D., Dudolin A.A. – Moscow.: MPEI Publ., 2010. 80 p.
- ***Effectiveness*** of two-stage scheme application for heating the network water in the steam-gas installations / Evlanov A.V., Kasilov V.F., Dudolin A.V., Burov V.D. // Thermal Power Engineering. 2010. № 2. P. 58—63.
- ***Application*** of criterion approach at choice of gas-piston installations for electric supply of various categories of consumers / Burov V.D., Dudolin A.A., Makarevich V.V., Makarevich E.V. // News in Russian Electrical Power Engineering, 2010, № 2, P. 12—23.
- ***To question*** on the Carno-type Bryton cycle of energy gas-turbine installations / Tsanev S.V., Burov V.D., Pustovalov P.A. // Energosberezhenie i vodopodgotovka. 2010. № 6. P. 2—7.
- ***Modeling*** of thermal-hydraulic processes in the evaporator of natural circulation at post-critical mineralization of the concentrate and development the approach for its calculation / Kuzma-Kichta Yu.A., Sedlov A.S., Lavrikov A.V., Alekseev A.G., Tarasov V.M. / / Energosberezhenie i vodopodgotovka. 2010. № 2. P. 13—27.
- ***Ways*** of water consumption and water-setting reduction at TPP./ Shischenko V.V., Khasiakhmetova F.R. // Energosberezhenie i vodopodgotovka. 2010. № 2. P. 18—24.
- ***Experience*** of modernization of technologies of water desalination at TPP./ Sedlov A.C., Shischenko V.V., Larin B.M., Larin A.B., Potapkina E.N., Khasiakhmetova F.R. // Electrical stations, 2010, № 10, p. 13—22.

Dissertations

- *Devianin A.V.* Optimization of heat scheme parameters of three-contour gas-steam installations: Cand. Sci. (Techn.) Dissertation. 2009.
- *Zakharenkov E.A.* Research and optimization of schemes and parameters of hybrid power plants on the basis of fuel elements: Cand. Sci. (Techn.) Dissertation. 2009.
- *Sultanov M.M.* Regime optimization of the TPP equipment on energy effectiveness: Cand. Sci. (Techn.) Dissertation. 2010.
- *Khasiakmetova F.R.* Development and research of low-waste complexes of water-consumption on TPP: : Cand. Sci. (Techn.) Dissertation. 2010.

Partners

- JSC «MOSENERGO», Moscow
- Mosenergoproekt Design Institute, Moscow
- Moscow United Energy Company, Moscow
- HEPP-8, 22 of «MOSENERGO», Moscow
- JSC «Saturn-Gas Turbines», Rybinsk-town
- JSC «Energo-Constructive Corporation SOIUZЭ, Moscow
- JSC Siemens, Moscow
- JSC «Vserossiyskiy teplotehnicheskiy institut» (VTI), Moscow
- Berlin Technical University, Germany
- EMK Engineering Company, Moscow
- Joint Institute of high temperatures RAS, Moscow
- JSC TKZ «Krasnyi kotel'schik», Taganrog
- JSC «Firma ORGRES», Moscow
- Institute Teploelektroproekt, Moscow
- «Quarz» engineering company, Moscow
- JSC «KO-invest», Moscow
- JSC «TNK-VP Management», Moscow
- JSC «Sveko Soiuz Engineering», Moscow
- JSC Company TEP Engineering», Moscow
- JSC «Nizhnevartovskaya TPP», Nizhnevertovsk
- JSC «Gubernskiy gorod», Perm-town
- JSC «Aviadvigatel», Perm-town
- JSC Rosmiks, Moscow
- JS Optsin-K», Moscow
- JSC «Sayanskchimplast», Sayansk-town
- JSC GlobalElectroService, Moscow
- JSC Geningconsult, Moscow
- JSC «United engine corporation», Moscow
- JSC «Mobile TPP», Moscow
- JSC «MezhRegionEnergoStroy», Moscow

ITNPE

AUTOMATED CONTROL SYSTEM FOR THERMAL PROCESSES (ACSTP) DEPARTMENT

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30 lecturers,
3 researchers,
16 post-graduate students

Head of Department:
Dr. Sci. (Techn.),
Prof. Alexander V. ANDRIUSHIN

■ Priority research activities

Research Supervisors

- **Development of the energy strategies for the nearest and medium-term trends**
  Professors Kudriaviy V.V., Andryushin A.V.
- **Development of the creation and modernization conception for the integrated ACS of the power plants on the basis of the modern technical means**
  Professors Arakelyan E.K., Pan'ko M.A.
- **Development of the control system theory for the thermal power engineering and the technological objects control**
  Professor Rotach V.Ya., Associated-Professor Volgin V.V.
- **Investigation, calculation and the metrological feature perfection methods for the primary transducers of a complex structure used in the power engineering**
  Associated-Professor Ivanova G.M.
- **Development of the operation monitoring technological tasks, the technical diagnostic of the main and auxiliary equipment, the ACSTP tasks for the power plants**
  Professor Arakelyan E.K., Associated-Professors Mukhin V.S., Sabanin V.R., Smirnov N.I.
- **Operation regime optimization of the main and auxiliary equipment of the power plants**
  Professors Andryushin A.V., Arakelyan E.K.,
  Associated-Professors Makarchian V.A., Mezin S.V.
- **Development of fundamentals of the modern computer simulators for the operative personnel of the power plants**
  Professors Andryushin A.V., E.K. Arakelyan, Associated-Professors V.P. Zver'kov,
  V.F. Kuzishin, Senior Lecturer Kuznetcova A.V.
- **Control systems synthesis on the basis of the microprocessor controllers**
  Professor Rotach V.Ya., Associated-Professors Kuzischin V.F., Zver'kov
- **Development of the universal-purpose software for an efficiency estimation calculation of the power boilers operation on the mixed fuels**
  Associated-Professors Sabanin V.R., Smirnov N.I.
- **Power engineering optimization tasks decision with uncertainty and insufficiency of input data**
  Professor Arakelyan E.K., Associated-Professor Mezin S.V.
- **Organization and optimization of repairs at power station and in power system**
  Professors Kudriaviy V.V., Andryushin A.V.

■ Agreements, contracts, projects

- Development of an operative technique for the electrical load sharing between the power units

- Development of a network computer simulator for the TPP operating personnel training
- Technique perfection for a heat consumption measurement for a hot water and steam for a wide consumer range
- Algorithms development and software realization for the initial information reliability monitoring at the ACSTP of the TPP and NPP
- Development of the multi-criterion optimization problem solution methods in the power engineering

Key publications

- *Rotach, V.Ya.* Concept synthesis of automatic control systems specification (in Russian) // Automatization in industry, 2009, № 3.
- *Rotach, V.Ya.* Automatic control by heat power processes theory action borders expansion (in Russian) // Thermal Engineering, 2009, № 10.
- *Arakelyan, E.K., Mezin, S.V., Nevzgodin, V.S.* Steam-gas unit-450 start-up technology optimization (in Russian) // Thermal Engineering, 2009, № 11.
- *Aslanjan, A.Sh., Arakelyan, E.K, Pan'ko, M.A.* To an estimation of technical and economic efficiency of working out and introduction HPP ACSTP realized on the basis of program-technical complexes (in Russian) // MPEI Vestnik, 2009, № 1.
- *Mukhin, V.S., Shmelev, V.A.* The program-focused concept of the top level automated control system (ACS) (in Russian) // MPEI Vestnik, 2009, № 1.
- *Pikina, G.A.* One-dimensional single-phase stream hydrodynamics multipoint models (in Russian) // Thermal Engineering. 2009, № 4.
- *Arakelyan E.K, Rubashkin, A.S., Obuvaev, A.S., Rubashkin, A.S.* Modeling of processes in the steam-gas plant utilizing boilers natural circulation contours (in Russian) // Thermal Engineering, 2009, № 2.
- *Smirnov, N.I., Sharovin, I.M.* About a choice of optimality criterion in numerical methods of automated regulation systems calculation with PID-regulator (in Russian) // Industrial ACS and controllers, 2010, № 2.
- *Andryushin, A.V., Makarch'yan, V.A., Chernyev, A.N.* Program complex for loading distribution between the thermal power station equipment (in Russian) // Energy-saving and water preparation, № 4.
- *Parchevskiy, V.M.* Whether time has approached to operate nitrogen oxides emissions? (in Russian) // Electrical stations, № 10.
- *Pikina, G.A.* Forecasting typical algorithms for regulation (in Russian) // Thermal Engineering, 2010, № 11.
- *Andryushin, A.V., Polushkina, E.N., Shnirov, Ye.Yu.* Maintenance system development in territorial generated companies and joined generated companies after branch re-structuring processes finishing (in Russian) // Thermal Engineering. 2010. № 1.

Dissertations

- *Aslanjan A.Sh.* Methodological bases of the cost and efficiency of ACSTP modernization on power plans construction, Cand. Sc. (Tech.) Dissertation, 2010.
- *Arutjunjan T.M.* Methods of the measurements optimization in power plant's ACSTP on reliability and economy criteria construction, Cand. Sc. (Tech.) Dissertation, 2009.

Partners

- PROMGAS company, Moscow
- Mosenergo company, Moscow
- Research and Production Association NPTeplopribor, Moscow

- MZTA Company, Moscow
- Power Engineering Institute named after G.M.Krzhizhanovskiy (ENIN)
- Elektrogorsk Research Center for Safety of Nuclear Power Stations (ENITs VNII AES), Elektrogorsk, Moscow region
- Institute of Technical Processes, Automation, and Process Measurements of the Applied
- Sciences University, Zittau, Germany
- SIEMENS company, Germany
- INTERAUTOMATIKA company, Moscow
- ORGRES FIRM company
- SAS Institute Co., USA

ITNPE THERMAL ENGINEERING FUNDAMENTALS DEPARTMENT

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20 professors, assist. prof., assist.
5 researches
6 post-graduate students

Head of the Department
Ph.D., professor, Andrei A. SUKHIKH

Priority research activities

Research Supervisors

- **Complex investigation of thermophysical properties of ozone-friendly working substances for modern heat pumps and refrigerators**
  Professors Alexandrov A.A., Sukhikh A.A., Associated-Professor Utenkov V.F.
- **The investigation of thermophysical properties of water, water steam and water solutions for thermal engineering**
  Professor Alexandrov A.A.
- **Complex investigation of thermophysical properties of working substances and thermodynamic cycles of high temperature energy installations**
  Professor Sukhikh A.A.
- **The development of high efficiency heat transfer systems**
  Professor Pronin V.A.
- **Convective heat transfer intensification in the elements of energetic equipment**
  Associated-Professor Velichko V.I.
- **The development of mathematical and computer models for heat and mass transfer in two-phase binary mixtures**
  Professor Solodov A.P., Associated-Professor Ezhov E.V.
- **The investigation of thermodynamic cycles for steam-gas units**
  Professor Okhotin V.S.
- **Non-traditional energy resources**
  Professor Kazandjan B.I.
- **The numerical modeling of heat and mass transfer in the elements of energetic equipment**
  Associated-Professor Sidenkov D.V.
- **Hydrodynamics and heat transfer in swirl flows**
  Associated-Professor Tokarev Y.N.

Agreements, contracts, projects

- Experimental and theoretical investigation of thermophysical properties of working substances and fluids in high and low temperature installations
- Theoretical and experimental methods for investigation of thermophysical properties of working substances, fluids and materials
- Fundamental equations of state for technically important substances in liquid and gaseous phases including critical region
- Complex investigation of thermophysical properties, power cycles and thermo-hydrodynamics of swirl flows for working substances of fluorocarbon and hydrocarbon composition

Key publications

- *Sychiov V.V.* Differential equations of thermodynamics (in Russian) // Third ed., MPEI Publ., 2010.

- *Sychiov V.V.* Complicated thermodynamic systems (in Russian) // Fifth ed., MPEI Publ., 2009. 295 p.
- *Sukhikh A.A., Kuznetsov K.I., Zakopyrin M.A., Utionkov V.F., Skorodumov C.V.* Investigation of decafluorobutany density in the wide temperature and pressure range (in Russian) // Izvesyia VUZov. 2009, № 7, 8. P. 27—36.
- *Kuznetsov K.I., Skorodumov C.V., Sukhikh A.A.* Experimental research of PvT-surface of the working bodies of fluorocarbon structure (in Russian) // Energosnabzhenie i vodopodgotovka, № 2, April 2009. P. 28—32.
- *Sukhikh A.A., Zakopyrin M.A., Utionkov V.F.* Experimental research of thermal properties of binary misturees of fluoroether HFE347mcc with threefluorometan HFC23 and development of the multi-constant state equation of virial type (in Russian) // MPEI Vestnik, 2009, № 2. P. 16—21.
- *Okhotin V.S., Alekseev T.A.* Application of information about the thermodynamic classics in educational disciplines of the energy profile (in Russian) // MPEI Vestnik, № 3, 2009. P. 105—114.
- *Ustinov V.A., Sukhikh A.A.* Investigation of heat-exchange processes on the micro-structured surfaces in the evaporator of heat-pumping unit (in Russian) // Energosnabzhenie i vodopodgotovka, 2010. № 2 (64), P. 43—46.
- *Solodov Фю3ю* Contact condensation: inter-phase turbulence and heat-and-mass exchange (in Russian). // Proc. of Vth Russian national conf. of heat-and-mass exchange. In 8 volumes. (October 25–29, 2010, Moscow). 2010. Vol. 4. P. 298—301
- *Solodov A.P.* Differential model of heat-and-mass exchanger (in Russian). // Thermal processes in engineering. «Nauka i tekhnologii» Publ., № 8. Vol. 2. 2010. P. 364—370
- *Abrosimov Yu.G., Pronin V.A., Hoang Zahn Bihn.* Reduction of hydraulic resistance of forcing pipe line at introduction in the water flow of polyacrilamide gel admixtures (in Russian) // MPEIVestnik, № 3, 2010. P. 136—139.
- *Aleksandrov A.A., Dzhuraeva E.V., Utionkov V.F.* Temperature depression and dissolubility in the water solutions of natrium sulphate (in Russian) // News in Russian Electrical Power Engineering, 2010, № 10. P. 24 —30
- *Sukhikh A.A., Miliutin V.A., Antanenkova I.S.* Thermodynamic effectiveness of fluorecarbons as working bodies in heat-energy cycles of NPP (in Russian). // Electric Stations, 2010, № 10. P. 2—8.
- *Sukhikh A.A., Kuznetsov K.I., Utionkov .F.* Construction of state equation for decafluorebutane in the gas phase (in Russian) // Problems of Energetics, 2010, № 11—12. P. 24—29.
- *Nepomniashchiy V.O., Sidenkov D.V.* Evaluation of TNU application possibility in systems of the auxiliary of TPP (in Russian) // Proc. of Radio Electronics, Electrical and Power Engineering: XVI-th intern. Scient. Conference of students: in 3 volumes. Vol.3. Moscow.: MPEI Publ., 2010. P. 205—206.

Dissertations

- *Kuznetsov K.I.* Experimental-calculation research of thermodynamic properties of actafluorepropane and decafluorebutane: Cand. Sc. (Tech.) Dissertation, 2009.
- *Ustinov V.A.* Research of the heat-exchange processes on the micro-structured surfaces in the evaporator of heat-pumping unit . Cand. Sc. (Tech.) Dissertation, 2010.

Awards

- Award of Russian Government for 2010 in the field of education (Sychiov V.V., Aleksandrov A.A., Okhotin V.S., Solodov A.P., Zvetkov F.F., Velichko V.I., Utionkov V.F., Sukhikh A.A.)

Partners

- Kazan State Technological University, Kaxan
- State Academy of cold and food technologies, St-Peterburg
- All-Russia R&D center of standardization, informatization and certification of raw materials and substances, Moscow
- All-Russia R&D Institute of natural gases and gas technologies, Moscow region
- JSC «Podol'sk Machinery Plant», Podolsk-town
- Federal State UnitaryEnterprise «R&D Institute of Electrical Power Engineering named after Dollezhal, Moscow

Unique equipment

- The experimental installation of high precision level for determining of vapor-liquid equilibrium and volumetric characteristics of low boiling mixtures
- Educational and scientific unit «Heat pump TN-300»
- Educational and scientific unit «Heat pump TNSO2»
- Educational and scientific unit «ThermoCycler TCC-20»

ITNPE BOILER PLANTS AND POWER ENGINEERING ECOLOGY (BPPEE)

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14 lecturers,
10 researchers,
6 post-graduate students

Head of Department
Doctor of Science (Tech)
Prof. ZROYCHIKOV N.A.

Priority research activities

Research Supervisors

- **Research in the field of air pollution in industrial cities and energy complexes by emissions from power utilities and development of the automated data banks for equipment of TPPs and boiler-houses**
  Associated Professor Prokhorov V.B.
- **Development of catalytic TPP at complete prevention of nitrogen oxide emissions formation**
  Associated Professor Prokhorov V.B.
- **Development, research and implementation of high-efficient technologies for the staged burning of coal, gas and oil on the basis of aerodynamic optimization of the flame**
  Leading Researcher Arkhipov A.M.
- **Reliability, efficiency and ecological improvement of ash and slag removal and dust preparation systems at TPPs**
  Senior researcher, Director of CPPEE MPEI Putilov V.Y.
- **Optimization of fuel usage and heat supply**
  Associated Professor Izvekov A.V.
- **Noise reduction from power engineering equipment**
  Professor Tupov V.B.
- **Reduction of nitrogen oxides emissions from power engineering equipment and firing sterilization of waste waters**
  Professor Kormilitsyn V.I.
- **Increase in ash collecting efficiency in electrostatic precipitators**
  Senior Researcher Chernov S.L.
- **Aerodynamic optimization of TPP gas-air ducts and increase in operation reliability of chimneys**
  Associated Professor Prokhorov V.B., Senior Researcher Chernov S.L

Contracts, projects

- Development of the ecologically pure catalytic low-capacity power plant
- Conducting aerodynamic calculations of gas ducts of TPPs and boiler-houses, choosing the parameters of chimneys and external gas ducts for PGU-450T unit of Severnaya TPP and TPP-21 of the JSC «Mosenergo»
- Grant of the President of the Russian Federation on state support of the leading scientific schools «Research of aerodynamics of regenerative air-preheaters and environmental performance of TGMP-314 boilers with various technologies of natural gas and oil combustion»
- Grant of the Federal Agency for Science and Innovation «Monitoring and forecasting the changes in the atmosphere and hydrosphere, connected with operation of the Russian energy complex»

- Testing TGMP-314 boilers (power units 6—8) at natural gas burning with optimization of aerodynamic characteristics of gas-air ducts
- Testing of furnace chamber and burners of TGM-96 boilers (power units №№ 2—4 power units) with the staged natural gas combustion at TPP-23 of the JSC «Mosenergo»
- Development of the working documentation for noise suppressers at the inlets of primary and secondary air of power units 8 and 9 at Cherepetskaya SDPP
- Development of recommendations on noise reduction from gas ducts of exhaust-heat boiler E-57,5/12,0-7,4/0,6-520/280 for combined cycle gas turbine (CCGT-60) at Ufimskaya TPP-2
- Development of recommendations on noise reduction from gas ducts of exhaust-heat boiler of CCGT-220 at Ufimskaya TPP-5
- Development of recommendations on noise reduction from gas ducts of exhaust-heat boiler E-229/51,8-7,85/059-507/227 of CCGT-450 Urengoiskaya SDPP
- Development of the design documentation for noise suppressers of steam discharge after safety valves of exhaust-heat boiler of CCGT-410 at Nevinnomysskaya SDPP
- Development of the design documentation for noise suppressers for exhaust pipes of fast-response pressure-reducing and desuperheating station 1 (fast-response PRDS-1), PRDS of auxiliaries, high pressure steam pipeline, steam pipeline at the ligament of cold reheat of CCGT-800 at Kirishskaya SDPP
- Research of contribution of the main sources of noise of Seversky Tube Factory within the sanitary protection zone and development of recommendations on noise reduction meeting the sanitary standards
- Development of recommendations and working documentation for noise suppressers at the air-inlets of TGM-84 boiler №4 at TPP-9 of the JSC «Mosenergo»
- Implementation of the working documentation for noise suppressers on the safety valves of the power boiler 5 at the TPP-17 of the JSC «Mosenergo»
- Implementation of the working documentation for noise suppressers in external flue of the boiler 21 at the HPP-1 of the JSC «Mosenergo»
- Development of the working documentation for setting of the noise suppressers of boilers at the reconstruction of chimneys on District Heating Stations «Teplyi Stan» of the branch 7 «South-West» of the JSC «MOEK»
- Conducting of measurements to determine the acoustic efficiency of the sound-absorbing screens of transformers installed at the site of 110 kV outdoor switch-gear of TPP-16 of the JSC «Mosenergo»
- Development of the project on sanitary-protective zone being a part of the project «Reconstruction of educational and experimental power plant, creation of pilot and technological installations «Teplocentral» of Moscow Power Engineering Institute»
- Preparation of the working documentation for noise suppressers at blast fan air inlets of power boiler № 17 of TPP-12 of the JSC «Mosenergo» (address: 121059, Moscow, Berezhkovskaza quay, 16)
- Conducting the tests to determine the acoustic efficiency of noise suppressers at the inlet of blast fan of the power unit №5 of TPP-26 of the JSC «Mosenergo»
- Carrying out the field measurements, calculation of the acoustic discomfort zone size relating to the noise factor for SDPP-3, TPP-9, TPP-20, TPP-23, TPP-26, GTP-TPP Electrostal town

Key publications

- *Tupov V.B., Chugunkov D.V., Semin S.A.* Noise reduction from exhaust ducts of GTP with exhaust-heat boilers (in Russian)./ Heat power engineering, 2009, № 1, P. 24—27;

- *Tupov V.B., Chugunkov D.V.* Use of noise silencers at steam discharge on industrial plants (in Russian)./ Heat power engineering, 2009, № 8. P. 34—37.
- *Arkhipov A.M.* Possible ways of optimization of the staged coal combustion with low volatile content (in Russian) / Heat power engineering, 2009, № 1. P. 60—62.
- *Putilov V.Y. Putilova I.V.* Challenges, opportunities and ways of solving the problem on ashes and slags from TPPs in Russia (in Russian). Proceedings of the II International Scientific and Practical Workshop «Ashes from TPPs — removal, transport, processing, landfilling». April 23—24, 2009. Moscow, Russia. M.: MPEI Publishers, 2009. P. 119—124
- *Arkhipov A.M., Putilov V.Y., Lipov Y.M., Solovyev N.I.* About reasonability of transferring boilers to the dry bottom ash removal mode at TPP reconstruction (in Russian). Proceedings of the II International Scientific and Practical Workshop «Ashes from TPPs — removal, transport, processing, landfilling». April 23—24, 2009. Moscow, Russia. M.: MPEI Publishers, 2009. P. 196—201.
- *Putilov V.Y., Eremin K.V.* Prospects of producing high-quality ash and cenospheres from ashes of power coals having high L.O.I. on the basis of nanotechnologies (in Russian). Proceedings of the II International Scientific and Practical Workshop «Ashes from TPPs – removal, transport, processing, landfilling». April 23—24, 2009. Moscow, Russia. M.: MPEI Publishers, 2009. P. 202—208.
- *Putilov V.Y., Putilova I.V.* Problems Connected with Operation of the Web-site «Coal Combustion By-products from TPPs of Russia». Theses of the International Conference «World of Coal Ash», May, 4—7, 2009, Lexington, Kentucky, USA. P. 60.
- *Putilov V.Y., Agarwal V.K., Putilova I.V.* Erosive wear investigation in pneumotransport pipelines using fine silicon-containing materials. Theses of the International Conference «World of Coal Ash», May, 4—7, 2009, Lexington, Kentucky, USA. P. 106.
- *Serebryannikov S.V., Putilov V.Y.* / International Scientific and Practical Workshop «Ashes from TPPs — removal, transport, processing, landfilling» (in Russian) / Energy conservation and water treatment, 2009, № 3. P. 73—74;
- *Arkhipov A.M., Putilov V.Y.* Staged combustion of Kuznetsky coal on TPP (in Russian) / Heat power engineering, 2009, № 8. P. 52—57.
- *Prokhorov V.B., Konovalov V.K., Ermakov V.V.* / Investigation of a mechanism of gravitational outflow of ash from hoppers to optimize the design of the unit for removing the ash from ESP's hopper into the transport pipeline in the system of impulse pneumatic ash transport (in Russian) / Energy conservation and water treatment, 2009, № 4, P. 71—73.
- *Lepeev P.A., Naumov S.A., Verkhovskii G.E.* Automation of boiler start-up (in Russian) / Energetic, 2009, № 10.
- *Kormilitsyn V.I., Ezhov V.S.* Investigation of flue gas purification from nitrogen oxides at natural gas combustion (in Russian) / Energy conservation and water treatment, 2009, № 3.
- *Putilov V.Y., Arkhipov A.M., Putilova I.V.* Wplyw technologii spalania sproszkowanego wHgl w kot□ach z suchym dnem na emisjH NOx oraz na poziom strat prawenia w popiele lotnym. XVI MiHdzynarodow Konferencja "Popioly z energetiki", Zakopane, 21—24 pazdziernika, 2009. P. 35—57.aa
- *Putilov V.Y., Putilova I.V.* Problemy Zwiazane z Dzialalnoscia Portalu „Produkty Uboczne Spalania Wegla z Energetyki Rosyjskiej. XVI MiÍdzynarodow Konferencja "Popioly z energetiki", Zakopane, 21—24 pazdziernika, 2009. P. 393—402.a
- *Putilov V.Y., Agarwal V.K., Putilova I.V.* Erosive wear in pipelines at pneumatic conveying of fine silicon-containing materials. Online journal «Coal Combustion and Gasification Products»/ http://www.coalcgp-journal.org/papers/2009/CCGP-D-09-00010-Putilova.pdf.

- *Tupov V.B.* Experience of noise reduction from the power plants / II International Russian Scientific-Practical Conference «Protecting the public from high noise impact», 2009, St. Petersburg. P. 190—199.
- *Semin S.A., Tupov V.B.* Impact of GTP exhaust noise on the surrounding area / II Russian International Scientific-Practical Conference «Protecting the public from high noise impact», 2009, St. Petersburg. P. 441—446.
- *Sergey Semin and Vladimir Tupov* «Noise reduction in exhaust-heat boilers» // 16th International Congress on Sound and Vibration, Krakow, Poland, 2009, 10 p.
- *Vladimir Tupov and Dmitry Chugunkov* «Highly effective suppression of noise of transonic flows of steam at power boiler start-up» // 16th International Congress on Sound and Vibration, Krakow, Poland, 5—9 July 2009, 8 p.
- *Putilov V.Y., Arkhipov A.M., Putilova I.V., Uchevatov A.V., Roor A.V.* Complex solution of issues on increasing in the economic efficiency, ecological safety and beneficiation of ash and slag at pulverized coal combustion in power boilers at TPPs in Russia (in Russian). Proceedings of the III International Scientific and Practical Workshop «Ashes from TPPs — removal, transport, processing, landfilling». April 22—23, 2010. Moscow, Russia. M.: MPEI Publishers, 2010. P. 99—103.
- *Improvement* of the building-technical properties of ash and slag materials from heat power generation (in Russian). Kapustin F.L., Ufimtsev V.M., Vishnya B.L., Putilov V.Y. Proceedings of the III International Scientific and Practical Workshop «Ashes from TPPs — removal, transport, processing, landfilling». April 22—23, 2010. Moscow, Russia. M.: MPEI Publishers, 2010. P. 109—112.
- *Kapustin F.L., Ufimtsev V.M., Putilov V.Y.* Obtaining a passing mineral production at thermal power plants (in Russian) / Energetic, № 5, 2010. P. 7—9.
- *Putilov V.Y., Putilova I.V.* Properties of coal ash in Russia. Proceedings of the II EuroCoalAsh Conference 2010, May 27—28, 2010, Copenhagen, Denmark. P. 95—100.
- *Zroychikov V.A., Arkhipov A.M., Prokhorov V.B.* Reducing the aerodynamic resistance of the gas duct of TGMP-314 boilers at the TPP-23 of the Open JSC «Mosenergo» (in Russian)/ Proc. of the All-Russian Scientific-Practical Conference "Improvement of reliability and operational efficiency of power plants and energy systems" — ENERGO-2010 (№ 1), two volumes, Moscow, Russia. M.: MPEI Publishers, 2010. P. 71—76.
- *Bankov S.E., Zamolodchikov V.N., Lebedev D.V., Putilov V.Z., Radchenko V.F., Chryunov A.V.* Non-contact measurement of level of liquids and granular media in industrial tanks, short-range radar techniques (in Russian) / Proc. of the All-Russian Scientific-Practical Conference "Improvement of reliability and operational efficiency of power plants and energy systems" — ENERGO-2010 (№ 1), June 1—3, Moscow, Russia. M.: MPEI Publishers, 2010. P. 162—163.
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practical conference "Improvement of reliability and operational efficiency of power plants and energy systems" – ENERGO-2010 (№ 2), June 1—3, Moscow, Russia. M.: MPEI Publishers, 2010. P. 235—238.

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- *Arkhipov A.M., Putilov V.Y.* Influence of the quickest heating and ignition of Kuznetsky coal dust on a complex energy efficiency of boilers (in Russian)/ Heat power engineering, 2010, № 6. P. 12—19.
- *Arkhipov A.M., Putilov V.Y.* Influence of the staged Kuznetsky coal combustion on specific NO_x emissions (in Russian) / Chief electrician, № 6, 2010. P. 31—40.
- *Putilov V.Y., Putilova I.V.* A problem of handling ash from TPPs in Russia: Barriers, opportunities and solutions (in Russian) / Heat power engineering, 2010, № 7. P. 63—66.
- *Sergey Semin and Vladimir Tupov* «Optimal design of dissipative silencer for gas turbine noise reduction» 39th International Congress on Noise Control Engineering, Lisbon, Portugal, 13—16 June 2010, 10 p.
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- *Putilov V.Y., Putilova I.V.* Problems of handling ash and slag from Thermal Power Plants of Russia: barriers, possibilities, and ways of solving the problems (in Russian). Thermal Engineering, 2010, Vol. 57, No. 7. P. 617–621.
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Patents

- Utility patent № 84256, 2009. Hydrodynamic cavitation reactor / Lyskov M.G., Zroychikov N.A, Morozova E.A., Prokhorov V.B.
- Patent № 2377466, 2009, "Boiler Chamber" / Arkhipov A.M., Putilov V.Y., Soloviev N.I.

Dissertations

- *Konovalov V.K.* «Development of the economic technology for removal and pneumatic transport of ash from the hoppers of electrostatic presipitators of TPPs». Ph.D. (Tech.). M., 2009.
- *Verkhovskiy G.E.* «Increase in reliability of high pressure drum boilers due to injection system optimization». Ph.D. (Tech.). M., 2010.

Partners

- American Coal Ash Association (ACAA)
- CJSC «Energomash (Belgorod)-BZEM»
- European Coal Combustion Products Association (ECOBA), Germany
- CJSC «Complex Energy Systems», Moscow
- Indian Institute of Technology (IIT Delhi)
- Moscow State Open University (MSOU)

- Moscow State Technical University (MSTU of N.E. Bauman)
- JSC «All-Russia Thermal Engineering Institute» (JSC «VTI»), Moscow
- JSC «INTER RAO ES»
- JSC «Institute VNIPIEnergoprom», Moscow
- JSC «Institute Energosetproekt», Moscow
- JSC «Mosenergo», Moscow
- JSC «MOEK», Moscow»
- JSC «Intersystem Electric Networks» (ISEN) of the Centre
- JSC «OGK-1»
- JSC «OGK-5»
- JSC «Seversky Tube Works»
- JSC «CKB Energoremont», Moscow
- JSC «ENIN», Moscow
- ОАО «Электросетьсервис ЕНЭС»
- JSC «Ekopolis», Moscow
- Polish Union of coal combustion byproducts (Polish CCP Union), Poland
- Company UralORGRES («Power Engineering Center of Urals»), Yekaterinburg
- SinENTC
- SRO «NP Energostroy»
- TPP-23 of the JSC «Mosenergo»
- University of Kentucky, USA

Unique equipment

- Two-channel analyzer Virte 3000 and other modern equipment for acoustic measurements

ITNPE NUCLEAR POWER PLANTS (NPP) DEPARTMENT

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12 Professors
10 Associated Professors
2 researchers,
14 post-graduate students
2 Lecturers
5 Employees of service staff

Head of Department
Doctor of Science (Techn.),
Professor Vladimir N. BLINKOV

■ Priority research activities

Research Supervisors

- **Life time evaluation and management of NPP engineering materials and equipment**
  Professor V.P. Gorbatykh
- **Investigation of transport and distribution of impurities in NPP steam generation equipment**
  Professor V.I. Gorburov
- **Analysis of NPP accidental regimes**
  Professor O.I. Melikhov
- **Thermal-hydraulics of NPP**
  Professor V.I. Melikhov
- **Modeling and calculation of the NPP technological schemes**
  Professor V.M. Zorin

■ Agreements, contracts, projects

- Comparative computational analysis of jet-pump designs and selection of best head-flow rate characteristics design (Customer JSC EREC)
- Development of blow-down regulation at NPP outage for decrease of radiation dose on Smolensk NPP (Customer Smolensk NPP)
- Safety and effectiveness of NPP operation ensuring due to life time management and diagnostic improvement (Customer JSC Rosenergoatom Concern)
- Experimental and theoretical modeling of thermalhydraulic processes in annular fuel rods (State budget supported project)
- Analysis of actual and design turbine plant parameters difference and characteristics improvement recommendations development (Customer Smolensk NPP)
- RBMK-1000 blow-down optimization in base load for water impurities concentration decrease (Customer Smolensk NPP)
- Mathematical models and computational tools development for equilibrium condition and defects growth in design elements problems solving (Customer JSC Rosenergoatom Concern)
- Thermal hydraulic and separation steam generator character ization for uprated VVER NPP (State budget supported project)
- Horizontal steam generator two-phase hydrodynamics optimization for new generation VVER-1500/1600 (State budget supported project)
- 3D computer code STEG validation and improvement for modeling NPP-2006 steam generator PGV-1000MK (Customer JSC Rosenergoatom Concern)
- Study of annular rods hydrodynamics and heat transfer for nuclear installations of new generation (State budget supported project)

- Verification of STEG code on experimental data obtained at OKB GP test facility (Customer JSC EREC)
- 3D steam generator thermohydraulic model for SOCRAT code (Customer IBRAE RAS)
- Development of information system for NPP of Rosenergoatom Concern decommissioning (Customer JSC Rosenergoatom Concern)

Key publications

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- Alhytov M.S., Baybakov V.D. Laboratory works on discipline «Nuclear and neutron physics» (textbook), MPEI, 2009. 62 p. (in Russian)
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- Blinkov V.N., Proskuriakov K.N. Human recourses perspectives for designing, construction and operation of NPP. Atomkon, N4, 2009. P. 55—61 (in Russian)
- Asmolov V.G. Main results of corium-steel in reactor vessel interaction investigation in MASKA Project for VVER-1000 severe accident. Nuclear Reactors Physics Series. Russian Research Center «Kurchatov Institute». Moscow, 2009. P. 3—25 (in Russian)
- Parfenov Yu.V., Melikhov O.I., Melikhov V.I., Elkin I.V. Thermalhydraulic Studies of the Steam Separation in Horizontal Steam Generator at RGV Test Facility. 17th International Conference on Nuclear Engineering, Brussel, Belgium. June 12—16, 2009. ICONE 17—75 276.
- Blinkov V.N., Davydov M.V. Further Evolution of the EREC-STRESA web Database. 17th International Conference or Nuclear Engineering, Brussel, Belgium. June 12—16, 2009. ICONE 17—75 296.
- Proskuriakov K.N., Novikov K.S., Galivec E.Y. Bandwidth of Reactor Internals Vibration Resonance with Coolant Pressure Oscillations. International Congress on Advances in Nuclear Power Plants, Tokyo, Japan. May 10—14, 2009. ICAPP-9273.
- Proskuriakov K.N., Parshin D.A., Novikov K.S. Sound Velocity in the Coolant of Boiling Nuclear Reactors. International Congress on Advances in Nuclear Power Plants, Tokyo, Japan. May 10—14, 2009. ICAPP-9275.
- Proskuriakov K.N., Novikov K.S. Data Mining of Fuel Assembly Vibrations Using Pressure Pulsation Measurements. Sixth American Nuclear Plant Instrumentation, Control and Human-Machine Interface Technology NPIC&HMIT 2009, Knoxville, USA, April 5—9, 2009.
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- Asmolov V.G., Blinkov V.N., Kovalevich O.M. The Foundations of NPP Safety (textbook), MPEI, 2010. 96 p. (in Russian).
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- Proskuriakov K.N., Novikov K.S. Determination of vibro-acoustic coolant and fuel bundles resonances in perspective reactors with increased power. Atomic Energy, 2010, N3. P. 151—155 (in Russian).

Dissertations

- *A.V. Gavriutin.* Selection of optimal decay time for discharged nuclear fuel. Cand. Eng. Sci. Dissertation, MPEI. 2009.
- *Maleki Farsani Asgar.* Storage of high level radioactive waste in deep underground site. Cand. Eng. Sci. Dissertation, MPEI. 2010.
- *S.V. Ivanov.* Modernization of RBMK blow down regulation at NPP outage on the basis of impurities distribution dynamics. Cand. Eng. Sci. Dissertation, MPEI. 2010.
- *K.S. Novikov.* Theoretical and experimental evaluation of internals and fuel bundles vibrations increase in VVER-1000. Cand. Eng. Sci. Dissertation, MPEI. 2010.
- *M.V. Davydov.* Severe accident high – temperature core – water interaction mathematical modeling for water – cooled reactors. Cand. Eng. Sci. Dissertation, MPEI. 2010.

Partners

- JSC «Concern Rosenergoatom», Moscow
- Smolensk NPP
- JSC «Atomenergoproekt», Moscow
- JSC «Atomstroyexport», Moscow
- JSC «Electrogorsk Research and Engineering Center on NPP Safety», Electrogorsk Moscow region
- Institute of Nuclear Energy Safe Development of Russian Academy of Science (IBRAE RAS)
- Unique equipment
- Analytical simulator of NPP with VVER-1000 reactor
- Subcritical uranium-water facility
- Set of research laboratory facilities for study of corrosion of the engineering materials of NPP
- Set for study of experimental facilities for two — phase flows in reactor pipes and equipment

ITNPE

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17 post-graduate students

Head of Department
Dr. Sci. (Techn.),
Professor Georgiy G. YANKOV

Priority research activities

Research Supervisors

- **Mathematical models, algorithms, universal program means and numerical modeling of complex heat and mass transfer processes**
  Prof. Yankov G.G.
- **Heat and mass transfer in highly intensive process of fluid – vapor phase transition**
  Prof. Yagov V.V.
- **Turbulence structure investigation**
  Prof. Sviridov V.G.
- **Thermodynamic properties of materials in vide range of parameters of state**
  Prof. Machrov V.V.
- **Hydrodynamics and heat transfer in liquid metal flows in magnetic field**
  Prof. Genin L.G.
- **Processes of heat and mass transfer under intensive heat and electromagnetic field action**
  Prof. Sinkevich O.A.
- **Reference data for thermodynamic properties of chemically reacting gases. Thermodynamics of nonequilibrium systems**
  Prof. Semenov A.M.
- **Heat and mass transfer in aqueous solution boiling. Intensification of heat transfer process in one- and two-phase media**
  Prof. Kuzma-Kichta Yu.A.
- **Condensation of clean vapor, vapors mixtures and vapor-gas mixtures on surfaces with heat transfer intensification**
  Docent Smirnov Yu.B.
- **Various methods of thermodynamic parameters measurements and initial conversion of physical parameters**
  Docent Miroschnichenko V.I.
- **Thermodynamic properties, technological characteristics and thermodynamic cycles of ozone-friendly substances**
  Docent Ustuganin E.E.

Agreements, contracts

- Organization and management of the Fifth Russian National Conference of Heat and Mass Transfer
- Modeling of heat and mass transfer in elements of new generation of power equipment
- Heat physics processes in multi- phase systems under intensive energy flow action
- Space solar power stations and their use for terrestrial ecological purposes with ability to prevent natural and industrial disasters

- Modeling and analysis data of physical and chemical processes in fuel cell with solid polymer electrolyte
- Mathematical description and numerical modeling of heat and mass transfer in integral setup « metallic hydride accumulator– fuel cell»
- Initial design and technical project of program complex for numerical modeling of air to fluid sectioned heat exchanger

Main publications

Textbooks

- *Machrov V.V., Miroschnichenko V.I.* Means of heat conductivity measurement in gases and fluids (for students with specialization 140400 «Technical physics»). MPEI. 2010. (in Russian)
- *Genin L.G., Listratov Ya.I., Sviridov V.G., Sviridov E.V.* Modeling of ideal and viscous fluid flows in physical laboratory. MPEI. 2009. (in Russian)
- *Kovalev S.I., Listratov Ya.I., Sviridov V.G., Sviridov E.V.* Automation of heat physics experiment. MPEI. 2009. (in Russian)
- *Lazarev D.O., Mika V.I., Yankov G.G.* Numerical solution of heat and mass transfer problems described by general equation of diffusion. MPEI. 2009. (in Russian)
- *Gabaraev B.A., Smirnov Yu.B., Cherepnin Yu.S.* Prospects and heat physics problems of nuclear energy industry. Part 1. Nuclear industry in the beginning of XXI century. MPEI. 2009. (in Russian)
- *Kovalev S.I., Listratov Ya.I., Sviridov V.G., Sviridov E.V.* Automation of heat physics experiment in physical laboratory. MPEI. 2009.

Journal articles

- *Yagov V.V.* Generic features and puzzles of nucleate boiling. Int. J. Heat Mass Transfer. 2009.
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- *Yagov V.V., Dedov A.V.* Heat transfer in film boiling in turbulent flow of uderheated fluid. Thermal Engineering. 2009. № 3.
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- *Borovskich O.V., Lazarev D.O., Yankov G.G., Artemov V.I.* Ribs efficiency for active volume of metallic hydride reactor. Thermal Engineering. 2009. № 3.
- *Artemov V.I., Lazarev D.O., Yankov G.G., Minko K.B.* Modeling of hydrogen desorption process in metallic hydride accumulator. Vestnik MPEI. 2009. № 5.
- *Fedorov V.A., Milman O.O., Artemov V.I., Fedorov D.V., Ananiev A.P., Kiruchin A.A.* New trend in highly effective condenser design for steam turbines. Vestnik MPEI. 2009. № 3.
- *Artemov V.I., Yankov G.G.* Numerical analysis of efficiency for sectioned air conditioner with air heat exchanger. Vestnik MPEI. 2009. № 6.
- *Sinkevich O.A., Potsepkin V.M., Poliakov A.F.* Instability of gas laminar pipe flow for certain class of axially symmetric perturbations with account of gas compressibility. High Temperature. 2009. V. 47. N 4.
- *Zilin V.G., Sviridov V.G., Razuvanov N.G., Ivochkin Yu.P., Listratov Ya.I., Sviridov E.V., Beliaev I.A.* Influence of secondary flow on liquid metal heat transfer inside

horizontal pipe in case of non homogeneous heating in the presence of magnetic field. Thermal Processes Engineering. 2009. V. 1.

- *Genin L.G., Sviridov V.G., Listratov Ya. I., Bulatov N.V.* Thermal Engineering Analysis of Heating Roads by Low-Potential Heat. Thermal Engineering. 2009.
- *Lavrikov A.V., Kuzma-Kichta Yu.A., Stenina N.A.* Laser Diagnostics of the Boiling Characteristics of Water and Water Solutions. Heat Transfer Research. 2009. V. 40. N 3.
- *Lavrikov A.V., Kuzma-Kichta Yu.A.* Research of aqueous solution boiling under high pressure and estimate of circulation conditions in boiling evaporator in case of overcritical mineralization. Thermal Engineering. 2009. N 4.
- *Bergles A.E., Kuzma-Kichta Yu.A.* Heat transfer in swirled boiling flows. Thermal Processes Engineering. 2009. № 12.
- *Kuzma-Kichta Yu.A., Parshin N.Ya., Fedik I.I., Schtefanov Yu.P., Bugrov D.A.* Heat exchanger with twisted hollowed pipes design. Thermal Processes Engineering. 2009. № 6.
- *Lazarev D.O., Minko K.B.* Modelling of hydrogen desorption process in setup « metallic hydride accumulator– fuel cell». Izvestia RAN Seriya Energetica. 2010. № 6.
- *Sinkevich O.A., Chikunov S.E., Glazkov V.V.* Processes in the Two-Phase Layer Near the Heated Surface of the Ocean and Generation of Atmospheric Vortices. Heat Transfer Research. 2010. V. 41. N 1.
- *Sinkevich O.A., Isakaev E..Kh., Spector N.O., Tazikova T.F., Khachaturova A.G.* Low temperature plasma generator with expanding channel in exit electrode research. High Temperature. 2010. V. 48. № 6.
- *Glazkov V.V., Kireeva A.N.* Effect of liquid-surface direct contact in quenching. High Temperature. 2010. V. 48. № 3.
- *Kuzma-Kichta Yu., Sedlov A.S., Lavrikov A.V., Konkov E.O., Alekseev A.G., Tarasov V.M.* Improvement of heat and hydraulic design of evaporator with natural circulation in case of overcritical mineralization in concentrated solution. Energosberezheniye. 2010. № 2.
- *Krug A.F., Kuzma-Kichta Yu., Komendantov A.S.* Critical heat loads data generalization in strip-swirled flows. Thermal Engineering. 2010. № 3.
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- *Bergles A.E., Krug A.F., Kuzma-Kichta Yu.A., Komendantov A.S., Fedorovich E.D.* Heat transfer intensification in swirled flows. Part 1. Heat transfer intensification in strip-swirled boiling flows. Thermal Processes Engineering. 2010. № 7.
- *Bergles A.E., Krug A.F., Kuzma-Kichta Yu.A., Komendantov A.S., Fedorovich E.D.* Heat transfer intensification in swirled flows. Part 2. Critical heat loads data generalization in strip-swirled flows. Thermal Processes Engineering. 2010. № 8.
- *Krug A.F., Kuzma-Kichta Yu., Komendantov A.S.* Correlation of Data on Critical Heat Loads in the Case of Flow Twisting in Straight and Helical Tubes. Heat Transfer Research. 2010. V.41. № 1.
- *Bazuk S.S., Popov E.B., Parshin N.Ya., Kuzma-Kichta Yu.* A. Secondary flooding of model fuel rod assembly of VVER. Thermal Processes Engineering. 2010. № 12.
- *Sinkevich O.A. , Isakaev E.Kh., Mordinskyi V.B., Tuftaef A.S., Chinnov V.F.* Power characteristic of plasma torch with expanding exit nozzle electrode. Welding industry. 2010. № 6.
- *Sinkevich O.A., Gerasimov D.N., GlazkovV.V., Ivanov P.P., Isakaev E.Kh., Chikunov S.E.* Space solar power stations: energy conversion problem and terrestrial applications. Vestnik MPEI. 2010. № 3.

- *Sinkevich O.A.* Nonlinear oscillations of vapor film in case of intensive heat flows. Fluid Dynamics (Izvestiya RAN. Mekhanika Zhidkosti i Gaza). 2010. № 5.
- *Sinkevich O.A., Deputatov L.V., Filinov V.S., Fortov V.E., Naymkin V.N., Vladimirov V.I., Mechalkin V.I., Rikov V.A.* Corona discharge in dusty nuclear-excitation plasma. Doklady Akademii Nauk. 2010. T. 435. № 3.

Patents

- *Genin L.G., Sviridov V.G., Razuvanov N.G., Sviridov E.V.* Electromagnetic velocity transducer in electricity conducting flow. Patent № 91179. RU 91179 U1. 27.01.2010.
- *Deniskin V.P., Ermachenko V.P., Kuzma-Kichta Yu.A., Kurbakov S.D., Parshin N.Ya., Fedik I.I., Chernikov A.S.* Method of fabrication of micro fuel-balls for nuclear reactor. Patent № 2368965C1. 27.09.2009.
- *Genin L.G., Sviridov V.G., Listratov Ya.I.* Facility for road surface heating (variants). Ratent RU 85783 U1. 31.03.2009.

Dissertations

- *Afonin S.Yu.* Boiling hydrodynamic of water, aqueous solutions and channel flow of water-glycerin mixtures with heat transfer intensification. (in Russian) Dissertation for candidate of technical science Moscow. MPEI. 2010.
- *Leksin M.A.* Film boiling heat transfer of underheated fluid. Dissertation for candidate of technical science Moscow. MPEI. 2009.
- *Yankov G.G.* Modeling of complex heat and mass transfer in elements of energy generating equipment. Dissertation for doctor of technical science. Moscow. MPEI. 2009.

Partners

- United Institute of High Temperature RAS, Moscow
- Russian National Scientific Center «Kurchatov Institute», Moscow
- The Federal State-Owned Unitary Enterprise "N.A. Dollezhal Research and Development Institute of Power Engineering", Moscow
- Moscow Aviation Institute
- Saturn scientific-production association, Rybinsk
- "Agilent Technologies", USA
- "National Instruments", USA
- «NPO Energomash», Khimky
- OAO «Proton – Permskie motori», Perm
- Tokyo Science University
- «CATI», Moscow
- TURBOCON, Kaluga
- OKB «GIDROPRESS», Podolsk
- IBRAE RAS, Moscow
- Unique installation in Heat Physics Department
- «Experimental mercury set-up for investigation of liquid metals heat and mass transfer in magnetic field». (listed as unique set-up by Minnayka RF)
- «Automatically controlled experimental set-up for investigation of turbulence structure»
- «Automatically controlled experimental set-up for investigation of aqueous solutions boiling»
- ANES applied program complex for numerical solution of non stationary 3-D equations of heat and mass transfer (aero hydromechanics, heat and mass transfer)

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11 post-graduate students.

Head of Department
Dr. Sci. (Techn.),
Professor Alexander T. KOMOV

■ Priority research activities

Research Supervisors

- **Experimental and theoretical research of interaction between the electrons and the light ions with the solid heterogeneous multi-component surfaces**
  Professor Afanas'ev V.P.
- **Experimental and theoretical research of hydrodynamics and heat-mass transfer into power installations**
  Professors Komov A.T., Varava A.N.
- **Quantum electrodynamics and optics**
  Professor Veklenko B.A.
- **Theoretical and experimental investigation of plasmatrons and plasma processes**
  Professors Nguen K.S., Chinnov V.F.
- **Theoretical research of solid's sputtering by ion bombardment**
  Associated-Professor Manukhin V.V.

■ Agreements, contracts, projects

- Research of hydrodynamics and heat transfer processes in an active zone of perspective nuclear reactors
- Experimental and theoretical research of hydrodynamics and heat-mass transfer in heat build-up devices of nuclear reactors and units of new generation
- Methods and means of increase of safety of nuclear reactors
- The hydrodynamics and heat transfer of the two-phase flows in the small diameter channels in the intensive mass forces conditions
- Heat and hydrodynamic characteristics of steam-and-liquid fluxes into porius medium with volumetric heat generation.
- Science-educational Centre

■ Key publications

- *Dedov A.V., Komov A.T., Varava AN., Yagov V.V.* Hydrodynamics and heat transfer in swirl flow under conditions of one-side heating. Part 1: Pressure drop and single-phase heat transfer . International Journal of Heat and Mass Transfer, Volume 53, Issues 19—20, September 2010, P. 4123—4131.
- *Dedov A.V., Komov A.T., Varava A.N., Yagov V.V.* Critical heat fluxes / International Journal of Heat and Mass Transfer, Volume 53, Issues 21—22, October 2010, P. 4966—4975.
- *Barat A.A., Manukhin V.V.* Calculation of Self-Sputtering Spectra of Thin Films by the Discrete Flow Method. Zhurnal Tekhnicheskoi Fiziki, 2009, V. 79, № 2, P. 117—124.
- *Veklenko B.A.* Boson peak and the evolution theory of electromagnetic field in dispersion media. Prikladnaya fizika. 2009. № 4, P. 5—18.

- *Veklenko B.A., Budak V.P.* The quantum nature of Longmire oscillation damping and bozon peak in plasma. Prikladnaya fizika. 2009. № 5, P. 5—11.
- *Gott Yu.V., Yurchenko E.I.* Steady-state self-induced current in tokamak. Physics of Plasmas, 2009, V. 16, № 11, 112502-1-112502-5.
- *Afanas'ev V.P., Afanas'ev M.V., Lisov A.A., and Lubenchenko A.V.* Measurement of the Isotope Composition of Hydrogen in Carbon Materials Using Elastically Scattered Electron Peak. Zhurnal Tekhnicheskoi Fiziki, 2009, V. 79, № 11, P. 106—112.
- *Nguyen-Kuok S.* Calculation of the cathode processes of the arc plasma torches. Journal of High Temperature Material Processes. V. 14, iss. 1, 2010, P. 25—38.
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- *Poznyak V.I., Gott Yu.V., Kakurin A.M., Piterskii V.V., G.N. Ploskirev, G. Valencia, T.V. Gridina.* ECH and ECE application for spectral analysis of the global plasma oscillations at tokamak experiments on T-10. The 16th Joint Workshop on Electron Cyclotron Emission and Electron Cyclotron Resonance Heating, Sanya, Chaina, April 12—15, 2010, P. 345.
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- *Afanas'ev V.P., Afanas'ev M.V., Lubenchenko A.V., Batrakov A.A., Efremenko D.S., Vos M.* Influence of multiple elastic scattering on the shape of the elastically scattered electron peak. Journal of Electron Spectroscopy and Related Phenomena. Volume 177, Issue 1, 2010, P. 35—41.

Dissertations

- *Petrova M.A.* Application of digital laboratories to the educational physical experiment for high school. Cand. Sci. (Pedagogical) Dissertation, 2009
- *Dedov A.V.* Heat transfer and hydrodynamics of single- and two-phase flows in the intensive mass forces conditions under the one-sided heating. Doctor Sci. (Techn.) Dissertation, 2010.

Partners

- National Research Center «The Kurchatov Institute», Moscow
- «Institute of High Temperatures» Scientific Association, Russian Academy of Sciences (IVTAN), Moscow
- Bauman Moscow State Technical University (Bauman MGTU), Moscow
- St. Petersburg State Technical University, Saint-Petersburg
- Research Institute of Nuclear Physics of the Lomonosov Moscow State University (NIIYAFMGU), Moscow
- State Scientific Center «TRINITY», Troitsk, Russia
- Efremov NIIEFA, Saint-Petersburg
- State Unitary Enterprise «The Dollezhal Research and Design Institute for Power Engineering» (FGUP NIIKIET), Moscow
- Joint Institute for Nuclear Research, Dubna, Moscow region
- Ioffe Physical and Technical Institute, Saint-Petersburg
- Max Plank Institute, Germany
- Australian National University, Sydney
- Chalmers institute, Sweden

Unique equipment

- Analytical test facility based on electronic microzonde ntk-uspm-reels with characteristic loss spectrometry of backscattered electrons
- Test facility for Investigation of material properties using the spectroscopy of the reflected electrons
- Test desk for the secondary ion mass-spectrometry
- Spectral-photo-metrical experimental facility
- Test desk for investigation of the heat transfer crisis in the nuclear fusion beam receivers designed for operation at the high density of the energy. The automatic data acquisition system on the base of KAMAK standard and MEK 625.1 instrument interface
- Experimental setup and arch DC plasmatron of 3—4 kW in power for investigation of the free plasma arch

- Experimental setup and the high-frequency inductive plasmotron with frequency 27 MHz, power 4—5 kW for investigation of an non-equilibrium plasma of the corpuscular and molecular gases
- Test desk for investigation of the heat transfer and hydrodynamics in nuclear reactor's fuel elements
- Test desk for investigation of the heat transfer in the small diameter channels in the intensive mass forces conditions.

ITNPE HIGH TECHNOLOGY CENTER AND LOW TEMPERATURE (HTCLT) DEPARTMENT

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Dr. Sci. (Techn.),
Professor, and RF
Head of LT Department
Winner of State RF Award
Government Award Alexander S. DMITRIEV

Priority research activities

Research Supervisors

- **Development of the liquid droplet radiation space heat-exchangers**
  Professor Dmitriev A.C., leading researcher Bukharov A.V.
- **Nano-technologies: nano-electronics and nano-energetic**
  Professor Dmitriev A.S., Associated-Professors Mikhailova I.A.
- **Development of the cryogenic corpuscular mono-disperse targets for the**
- **accelerating technology and nuclear fusion**
  Professor Dmitriev A.C., leading researcher Bukharov A.V.
- **Investigations of the heat processes in nano-structures**
  Professor Dmitriev A.C.
- **Research of the heat exchange and hydrodynamic in the cryogenic liquids in channels**
  Professor Klimenko A.V., senior researcher Sudarchikov A.M.
- **Investigation of the gas- and steam-dust mixtures in the non-equilibrium conditions**
  Professor Krukov A.P.
- **Studying of the non-equilibrium transfer processes on the inter-phase surface gas-condensate including micro- and nano-structures**
  Professor Krukov A.P.
- **High technologies in the vacuum engineering and the nano-technologies**
  Professor Nesterov S.B.
- **Investigations of the mixture thermal-dynamical properties and the low-temperature vapor-liquid cycles at operation on the mixtures**
  Associated-Professors Lunin A.I., Mogorychny V.I.
- **Investigations of the capillary instabilities of the drops and streams in the non-equilibrium conditions**
  Associated-professor Ginevskiy A.F.
- **Development of technology for the mono-disperse micro-spheres production from the rare-earth metals and alloys**
  Leading researcher Ankudinov V.B.

Agreements, contracts, projects

- Investigations of the thermal-dynamical properties of the cryogenic mixtures
- Studying of a stream desintegration in the non-equilibrium conditions

- Investigations of the drop flows hydrodynamics and heat-exchange in vacuum
- Technology of the mono-disperse micro-spheres from the rare-earth metals and alloys
- Research and development in the area of the nano-emission electronics: a nano-emitter for creation of the ultra-bright energy-saving displays
- Research and development of the new cryogenic and refrigerating machines on the basis of the cryogenic mixtures
- Research of a heat transfer in nano-structures
- Studying of the non-equilibrium transfer processes on the inter-phase surface gas-condensate

Key publications

- *Alekseev T.A.* Information support for calculation of systems of cooling of the radio-electronic equipment. Public House MPEI. 64 p. 2009.
- *Lunin A.I., Mogorychnyj V.I., Kovalenko V.N.* Application of multicomponent working bodies in низкотемпературной to the technician The manual. Public House MPEI. 64 p. 2009.
- *Kulikov A.C., Korolev P.V.* The collection of problems at the rate «Mechanics of diphasic systems». The manual. Public House MPEI. 54 p. 2009.
- *Kortsenshtein N.M., Samujlov E.V., Yastrebov A.K.* A new method of modeling of volume condensation of Supersaturated Vapor. Thermophysics of high temperatures. T. 47. № 1. P. 89—100. 2009.
- *Kortsenshtein N.M., Samujlov E.V., Yastrebov A.K.* Dynamics of function of distribution of drops in the sizes at gradual creation of a condition of a supersaturation for various modes of growth of drops. Colloidal Journal, V. 71. № 5. P. 623—631. 2009.
- *Kortsenshtein N.M., Samujlov E.V., Yastrebov A.K.* Influence of interphase heat exchange on kinetics of relaxations of supersaturated vapor. Reports of Academy of Sciences, V. 429. № 2. P. 180—184. 2009.
- *Kryukov A.P., Levashov V.Yu., Shishkova I.N.* Evaporation in mixture of vapor and gas mixture. International Journal of Heat and Mass Transfer 52(2009) 5585—5590.
- *Kryukov A.P., Korolev P.V.* Methods of the description of the condensed systems. The manual. Public House MPEI. 64 p. 2010.
- *Yastrebov A.K.* About use of nonequilibrium boundary conditions for condensation research at sudden contact of a cold liquid and sated steam. Univ. Reports, Energy. № 6. P. 21—29. 2010.
- *Kryukov A.P., Levashov V.Yu., Pavljukevich N.* Condensation from vapor-gas mixes. Engineering-physical Journal. V. 83. № 4. P. 637—644. 2010.
- *Kryukov A.P., Puzina J.J.* A substantiation of experimental researches of processes heat&mass transfer at boiling of superfluid helium in the conditions of a microgravity at the international space station. Electromecanics questions. Works of NPP VNIIEM. v. 112 (2009), № 5. P. 45—53.
- *Bukharov A., Buscher M., Fedorets P., Gerasimov G., Chernetsky G.* Using of cryogenic corpuscular targets in the experiments for particle acceleration and in the experiments for study of the interaction of laser radiation with matter. The 11 Cryogenics 2010 — IIR International Conference, Published by icaris ltd., praha., czech republic. P. 25—28. 2010.
- *Dmitriev A.S.* Thermophysical Problems of Nano Power Engineering. Part 1. Thermal Engineering, 2010, V. 57, No 12. P. 1008—1017.

Patents

- *Ankudinov V.B., Maruhin J.A., Ogorodnikov V.P., Ryzhkov V.A.* The regenerative heat exchanger of the bottom step of the cryogenic gas car. Useful model. The patent of the Russian Federation № 84510 from 10.07.09.

Dissertations

- *Astashina M.A.* Structure of molecular streams in difficult objects taking into account gas evolution of surfaces: PhD Thesis. M, 2009.
- *Balashov A.V.* Studying of characteristics of matrix heat exchangers as a part of throttle systems at work on mix coolants: PhD Thesis. M, 2010.

Partners

- Association «Kholodbytmash», Moscow
- «Geliymash» company, Moscow
- «Kriogenmash» company, Moscow
- FGUP «Keldysh R&D center», Moscow
- FGUP «Institute of theoretical and experimental physics», Moscow
- Russian scientific center «Kurchatov Institute», Moscow
- Dresden technical university, Germany
- «Edvard product department cryogenics Inc.», USA
- «IPD cryogenics Inc.», USA
- «Cryomach Inc.», USA
- «Sumitomo» company, Japan
- «Daikin» company, Japan
- Russian-Chinese technological park
- Research nuclear center Ulich, Germany

Unique equipment

- Cryogenics center
- Thermal chamber for the refrigerating equipment testing
- Setup for the helium isotop film behavior studying
- Setup for the super-fluid helium research
- Setup for studying of the streams and drops of the various liquids in vacuum
- Setup for research and production of the metal mono-disperse micro-spheres
- Setup on the ultra-fast freezing
- Nano-technological equipment for education "NanoEducator"
- Equipment for education in the field of the nanotechnologies "Nano Integra"
- Scientifically-educational complex on studying of wettability on nanostructures at low temperatures
- Scientifically-educational complex on research of processes heat transfer into nanostructures

INSTITUTE OF PROBLEMS IN ENERGY EFFICIENCY (IPEE)

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Departments and Divisions of Institute

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21 lecturers,
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11 post-graduate students.

Head of Department
Doctor of technical sciences,
Winner of RF Government Award,
Professor Viacheslav A. RYZHENKOV

Priority research activities

Research Supervisors

- **Increasing of energy efficiency, reliability and exploitation resource of heat and power equipment on the basis of nanotechnologies**
  Professor Ryzhenkov V.A.
- **Development of independent complexes of power supply of the isolated consumers on the basis of using petro-thermal resources**
  Professor Ryzhenkov V.A.
- **Analysis, investigation and rationalization of mutual producing heat and cold combined cycles. Increasing of efficiency of air and gas supply systems at enterprises. Analysis, research and rationalization of expander-generating units schemes**
  Associated-Professor Kalinin N.V.
- **Energy saving at industrial products manufacturing (high-efficient heat schemes, heat-and-mass exchange intensification). Heat technological systems and complexes of the industrial and municipal enterprises**
  Professor Shelginskiy A.Ya.
- **Non-traditional and renewable energy sources. Environment protection from pollutions of industrial enterprise and power engineering units**
  Associated-Professor Motulevich A.V.
- **Increasing of reliability and exploitation effectiveness of power engineering and pumping equipment. Hydrodynamic investigations of dynamic pump settings, development of methods increasing exploitation reliability for pumping equipment of thermal power engineering units**
  Professor Volkov A.V.
- **Development of high-effective hydrodynamic recuperation systems using the redundant main pressure of technological liquids**
  Professor Volkov A.V.
- **Methodology development of functional surfaces modification of engineering equipment for heat supply systems on basis of using ionic and plasmic and surfactants technologies**
  Professor Volkov A.V.
- **Heat transformer operation modes analysis (heat pumps and refrigerators)**
  Associated-Professor Martynov A.V.
- **Mathematical modeling and optimization of the energy-technological schemes of metallurgical complex on energy and ecology criteria**
  Professor Sultanguzin I.A., Senior Teacher Khromchenkov V.G.

- **Estimation of influence on the environment in accordance with technique Impact Pathway**

  Professor Sultanguzin I.A.
- **Energy audit and rationalization of heat-and-energy supplying systems in industrial enterprises. Application of energy saving technologies**

  Senior Teacher Khromchenkov V.G. , Associated-Professor Yavorovskiy Yu.V.
- **Calculation and optimization of domain gas superfluous pressure recycling systems on the basis of gas turbines**

  Senior Teacher Khromchenkov V.G.
- **Optimization of construction, heat schemes and exploitation modes of thermal power engineering installations, implementation of resource and energy saving technologies and equipment**

  Professor Kulichikhin V.V.
- **Analysis, research and rationalisation of steam supplying systems in industrial enterprises**

  Senior Teacher Romanov V.I.
- **Development and research of microturbine drives and superchargers of various application**

  Associated-Professor Katenev G.M.
- **Increasing of energy efficiency of producing, distributing and consuming of heat energy for industrial enterprises and communal services. Development of technologies providing the elimination of thermal and hydraulic unbalance of heat supply systems**

  Associated-Professor Yavorovskiy Yu.V.
- **Determination of efficiency of using modern heat insulation materials and heat insulation constructions in heat supply systems. Diagnosis of technical condition of heat insulation of heat supply systems and power engineering equipment, determination of heat losses**

  Senior Teacher Khromchenkov V.G., Associated-Professor Yavorovskiy Yu.V., Senior Teacher Prischepov A.F.
- **Research of thermal properties of thin-film heat insulation coating**

  Senior Teacher Prischepov A.F.

Agreements, contracts, projects

- Development and creation of heat insulating coatings with hollow microspheres to reduce heat losses (MPEI (TU))
- Increasing energy efficiency of transportation systems, distribution and consumption of heat energy based on nanotechnology (MPEI (TU))
- Developing solutions to improve the efficiency of heating systems (MPEI (TU) — ISPU)
- Developing solutions for efficient heat and electricity isolated buildings and installations by the combined use of traditional sources and gas-piston units (MPEI (TU) — OIVT RAN)

Key publications

- *Ryzhenkov V.A., Pogorelov S.I., Naryadkina N.A.* About the necessity and possibilities of operational monitoring of the degree of aggressiveness of the operating and the technological environments of power and technology systems // Energy and water treatment. 2009. № 4 (60). P. 2—6.
- *Ryzhenkov V.A., Fedorov V.A., Kachalin G.V., Mednikov A.F.* Increasing the corrosion resistance of high-stage turbine blades / Reliability and security of power engineering. 2009. № 2 (5). P. 34—39.

- *Volkov A.V., Davydov A.I., Khovanov G.P.* About the using of superhydrophobic to increase the energy efficiency of centrifugal pumps / Pumps and equipment. — № 6 (59). 2009. P. 48—51.
- *Ryzhenkov A.V.* Modification on nano-level of functional surfaces of equipment of pipe networks / Nanotechnology in Power Engineering, Nanomechanics and Nanoplasm: Second International Forum on Nanotechnology "Rusnanotech '09", October 6—8, 2009. Moscow, P. 156—157.
- *Ryzhenkov V.A., Naryadkina NA* Identification and determination of the concentration of potentially dangerous compounds in the operating and technological environments used in power technology complexes / IRTC CIT Conference "Modern Information Technologies". Vyp. 10. Penza, 2009. P. 74—79.
- *Motulevich V.P.* Optimization of industrial systems / Reliability and security of power engineering. 2009. № 1 (4).
- *Shelginsky A.Y.* The main tasks of industrial power engineering and the problems of training / Reliability and security of power engineering. 2009. № 2(5).
- *Zhao Tszinlin, Shelginsky A.Y.* System of heat supply of buildings using heat of solar radiation // Reliability and security of power engineering. 2009. № 2 (5).
- *Zhigulina E.V., Kalinin N.V., Khromchenkov V.G. Mogorychny V.I., Lunin A.I.* Calculation of processes in units and plants using natural gas by varying its parameters and the composition / Reliability and security of power engineering. 2009. № 2 (5).
- *Ryzhenkov V.A., Fedorov V.A., Kachalin G.V. Mednikov A.F.* Increasing the corrosion resistance of high-stage turbine blades / Reliability and security of power engineering. 2009. № 2 (5).
- *Zhigulina E.V., Kalinin N.V., Khromchenkov V.G., Yavorovskiy Y.V.* Thermodynamic analysis of schemes of expander-generator units at thermal power plants // Reliability and security of power engineering. 2009. № 3 (6).
- *Zhigulina E.V., Khromchenkov V.G., Yavorovskiy Y.V., Mishina E.A.* Determination of heat losses and their effects on the heating system / Reliability and security of power engineering. 2009. № 4 (7).
- *Volkov A.V., Pankratov S.N., Parygin A.G., Shoukal I.* Comparative analysis of hydrodynamic properties of booster pumps PD650-160 and 250QVD355-40 // Electronic journal "New in Russian power engineering." 2009. № 11. S. 27—31.
- *Martynov A.V.* Determination of energy efficiency of installations, units and systems // Chemical Industry. 2009. № 5.
- *Martynov A.V., Ryzhenkov V.A., Kutko N.E., Nikiforov D.V.* About the possibility of using the heat energy of deep rocks of the Earth to heat and electricity supply of isolated consumers // Energy and water treatment. 2009. № 1 (57).
- *Martynov A.V., Nikiforov D.V.* Reliability and efficiency of devices, installations and systems // Reliability and security of power engineering. 2009. № 5 (8).
- *Ryzhenkov V.A., Volkov A.V., Parygin A.G., Volkova T.A.* About increasing the efficiency of heating systems based on the conversion of excess pressure in water mains to electricity // Energy and water treatment. 2010. № 1 (63). P. 32—34.
- *Ryzhenkov V.A., Kurshakova A.V., Anakhov I.P., Zagretdinov I.S., Gorokhov O.V.* About the efficiency of thermal power equipment protection from atmospheric corrosion during the period of repairs and lengthy downtime // Reliability and security of power engineering. 2010. № 1 (8). P. 43—46.
- *Ryzhenkov V.A., Volkov A.V., Parygin A.G., Volkova T.A.* Increasing the reliability and efficiency of district heating systems based on efficient use of excessive main pressure // Reliability and security of power engineering. 2010. № 2 (9). P. 45—47.

- *Ryzhenkov V.A., Prishchepov A.F., Loginova N.A., Kondrat'ev A.P.* Determination of the thermal conductivity of the thin-film insulation coating with different diameters of gas-filled microspheres // Reliability and security of power engineering. 2010. № 2 (9). P. 60—64.
- *Ryzhenkov V.A., Seleznev L.I., Mednikov A.F.* Phenomenology of erosive wear of the material of structural steels and alloys with liquid particles. Heat and power engineering. 2010. № 9. P. 12—16.
- *Ryzhenkov V.A., Naryadkina N.A.* About the influence of the quality of operating and technological environments on the rate of corrosion of structural materials of pipeline systems of energy and technological complexes in modern conditions // Energy — Theory and Practice: Fifth International Conference for young scientists and specialists. 2010. P. 112—115.
- *Ryzhenkov V.A., Grigoriev S.V.* About the perspective of using petrothermal heat energy of the earth for efficient energy supply of isolated consumers of the Russian Federation // Energy — Theory and Practice: Fifth International Conference for young scientists and specialists. 2010. P. 326—329.
- *Ryzhenkov V.A., Kurshakov A.V., Bodrov A.A*. Methods and equipment for determining the topography and the rate of erosion wear of blades of wet steam turbine stage. All-NPK — ENERGY-2010 "Improving the safety and operational efficiency of power plants and energy systems." 2010. V. 1. P. 97—98.
- *Ryzhenkov V.A., Mednikov A.F., Kachalin G.V*. About the formation of heat-resistant and thermal barrier coatings on the surface of steam and gas turbines. All-NPK — ENERGY-2010 "Improving the safety and operational efficiency of power plants and energy systems." 2010. V. 1. P. 99—102.
- *Ryzhenkov V.A., Kurshakov A.V., Anakhov I.P., Pogorelov S.I.* Increasing the efficiency and reliability of thermal and nuclear power plants through the application of SAM technology. All-NPK — ENERGY-2010 "Improving the safety and operational efficiency of power plants and energy systems." 2010. V. 1. P. 131—135.
- *Ryzhenkov V.A., Mednikov A.F., Kachalin G.V., Lebedev A.I., Lavrenov R.N.* Determination of erosion, abrasion and corrosion resistance of structural materials elements of steam turbines with surface hardening and protective coatings. All-NPK — ENERGY-2010 "Improving the safety and operational efficiency of power plants and energy systems." 2010. V. 1. P. 136—139.
- *Ryzhenkov V.A., Pulner I.P., Shcherbakov S.N., Kurshakov A.V., Anakhov I.P., Lukin M.V.* About the increasing the efficiency of heating systems by blocking the corrosion processes and thermal barrier to prevent the accumulation of deposits on heat transfer surfaces. All-NPK — ENERGY-2010 "Improving the safety and operational efficiency of power plants and energy systems." 2010. V. 1. P. 233—236.
- *Ryzhenkov V.A. Prishchepov A.F., Loginova N.A., Kondrat'ev A.P.* Determination of the thermal conductivity of thin-film insulation coatings for various diameters of gas-filled microspheres. All-NPK — ENERGY-2010 "Improving the safety and operational efficiency of power plants and energy systems." 2010. V. 1. P. 248—251.
- *Volkov A.V., Khovanov G.P.* Influence of surface modification of the flow part of centrifugal pump on operating and certain types of losses // 6 Int. NTK Hydraulic machines, hydraulic and Hydro. The present state and development prospects." 2010.
- *Volkov A.V., Piskunov M.M., Khovanov G.P.* The problem of increasing the reliability of submersible pumps for oil extraction // 6 Int. NTK Hydraulic machines, hydraulic and Hydro. The present state and development prospects." 2010.
- *Volkov A.V., Zharkovsky A.A. Kurikov N.N., Pugachev P.V., Khovanov G.P., Shabrov N.N.* Numerical research of viscous flow in centrifugal pump with spatial visualization results // 6 Int. NTK — 2010.

- *Volkov A.V., Khovanov G.P., Zharkovsky A.A., Pugachev P.V., Parygin A.G.* Computational and theoretical research of the characteristics of pumps with a low-speed coefficient // New in the Russian power industry. 2010. № 2. P. 36—44.
- *Volkov A.V., Parygin A.G., Khovanov G.P., Naumov A.V.* Increasing energy efficiency of centrifugal pumps on the basis of surface modification of flow parts. All-NPK — ENERGY-2010 "Improving the safety and operational efficiency of power plants and energy systems." 2010. V. 1. P. 207—210.
- *Volkov A.V., Ryzhenkov V.A., Shcherbakov S.N., Parygin A.G., Volkova T.A.* Increasing the efficiency of heating systems based on the recovery of excessive main pressure into electrical energy. All-NPK — ENERGY-2010 "Improving the safety and operational efficiency of power plants and energy systems." 2010. V. 1. P. 211—213.
- *Volkov A.V., Yavorovskiy Y.V., Khromchenkov V.G. Pankratov S.N.* Energy losses in transmission heat systems due to thermal and hydraulic unbalance. All-NPK — ENERGY-2010 "Improving the safety and operational efficiency of power plants and energy systems." 2010. V. 1. P. 214—217.
- *Sultanguzin I.A., Isaev M.V.* Three-dimensional modeling of combustion in coke oven battery // Coke and Chemistry. 2010. № 8. P. 34—38.
- *Sultanguzin I.A., Potapova A.A.* Application of heat pumps in the heating system of industrial enterprise and the city / Metallurg. 2010. № 9. P. 75—78.
- *Sultanguzin I.A., Isaev M.V.,Kurzanov S.Y.* Optimization of coke and steel production by energy and ecologicalcriteria // Metallurg. 2010. № 9. P. 51—55.
- *Sultanguzin I.A., Isaev M.V., Lupenko V.G., Nazarov N.N.* Increasing of reliability and efficiency of coke production / Reliability and security of power engineering. 2010. № 9. P. 67—69.
- *Sultanguzin I.A., Isaev M.V. Kurzanov S.Y.* Reducing energy consumption and harmful effects on the environment while optimizing coke and steel industries // Proceedings of the universities. Iron industry. 2010, № 12.
- *Shelginsky A.Y., Kladov I.V.* Improving energy and technological system of production of extractional phosphoric acid / Energy — Theory and Practice: Fifth International Conference for young scientists and specialists. 2010. P. 82—85.
- *Khromchenkov V.G., Yavorovskiy Y.V., Poluektova T.Y.* Optimization of the thickness of the thermal insulation of pipes of heat networks // Energy — Theory and Practice: Fifth International Conference for young scientists and specialists. 2010. P. 105—107.
- *Shelginsky A.Y. Trofimova E.V.* Development of energy-saving trends in producing of sulfuric acid // Energy — Theory and Practice: Fifth International Conference for young scientists and specialists. 2010. P. 124—128.
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Patents

- A utility model patent number 87751, IPC F01D 15/10 2006 (01), recorded 10/20/2009 in the application № 2009117791 from 14.05.2009, the expander-generator unit / Zhigulina E.V. Zharkova M.V., Khromchenkov V.G., Yavorovsky Y.V., Kalinin N.V.
- Patent number 2368891 registered on request 27.09.2009 № 2008114407 from 16.04.2008, the method for determining the strength of metallurgical coke / Gyulmaliev A.M., Kalabin G.A., Karunova E.V., Sultanguzin I.A., Yashin A.P., Isaev, M.V.

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- A utility model patent number 99544, MPK F02 C 6 / 00, 12.04.2010 Gas turbine units / Ryzhenkov V.A., Martynov A.V., Kutko N.E., Grigoryev S.V.

Dissertations

- *Isaev M.V.* Improving the power and technological efficiency of coke oven battery on metallurgical plant on the basis of three-dimensional modeling of thermal processes: 05.14.04 — Industrial power. 2010
- *Loginova N.A.* Determination of the efficiency of thin-film insulation coatings applied to heating systems: 05.14.04 — Industrial power. 2010

Partners

- The university of France "Ecole de mine de Paris"
- Joint-stock company "Metallurgical industrial complex "Severstal"", Cherepovets
- Technical university of Berlin, Germany
- Technical university, Dresden, Germany
- University of Piza, Italy
- Open Joint-Stock Company «Mosenergo»
- United Energy Company of Moscow (MOEK)
- «Sigma», Czech Republic
- International committee on heat and mass exchange, Ankara, Turkey
- Institute of solar techniques, Rappersville, Switzerland
- Shubauer technological institute, Tokyo, Japan
- Scientific planning and production association «Ecotep» (Moscow)
- Armstrong International Inc., USA
- Turbine Plant, Kaluga
- Ministry of Municipal Economy of Moscow Region
- Scientific Center named after Keldysh
- Moscow Oil-Processing Plant
- research-and-production enterprise "Teplotex", Ivanovo
- Memorial institute Battelle (USA)
- MBB Innotech GmbH

Unique equipment

- Dual-purpose heat pump
- Air liquefier
- Nonadiabatic vortex tube
- Reciprocating expander with internal valve-actuating gear
- Complex of the portable instruments for carrying out heat engineering measurement (including infrared systems)
- Test site for investigation of formation process speed of the thermal-barrier deposits on the heat exchanging surfaces
- Test site with hydrodynamical recuperation system using the redundant main pressure of technological liquid
- Test site for thermal insulation efficiency determination

HEAT-AND-MASS TRANSFER PROCESSES AND FACILITIES (HMTPF) DEPARTMENT

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20 post-graduate students

Head of Department:
Ph. D. (Techn.), Professor
Andrey B. GARYAEV

Priority research activities

Research Supervisors

- **The stationary and non-stationary two-phase heat exchange and hydrodynamics. The heat exchange at the liquid film boiling**
  Professor Pavlov Yu.M.
- **The numerical modeling of the non-stationary hydrodynamic processes of a heat exchange in the turbulent flow of incompressible and compressible fluid in the channels. The modeling of the turbulent transfer of momentum, heat and mass in the free thermo-concentration convection**
  Professor Valueva E.P.
- **The mathematical modeling, calculation and experimental research of the characteristics of a turbulent heat exchange and a friction in the elements of the technical devices**
  Professor Sergievskiy E.D.
- **Transport processes research in the industrial devices with the physical and chemical transformations and spreading of the admixtures in the atmosphere**
  Professor Garyaev A.B.
- **Development of the ways of economy of thermal energy at the industrial enterprises. Thermal clearing of industrial sewage of organic and inorganic impurity. Methods of an intensification of heat exchange**
  Professor Efimov A.L.
- **Development, investigation and modeling elements of heat regime provided systems for the autonomous objects and the artificial climate installations**
  Professor Sasin V.Ya.
- **Development and investigation of the power supply systems based on the expansion-generator engines**
  Professor Agababov V.S.
- **Development of perspective systems and recycling methods of low power heat of industrial and household sources**
  Associate Professor Yakovlev I.V.

Agreements, contracts, projects

- The methodology of the thermal image sensor survey of the electrical equipment in the residential, public and office buildings
- The methodology of the thermal image sensor survey of the translucent building barrier for determination of thermal losses
- Settlement-experimental research of the cooling process with evaporation and test of the laboratory sample of the heat exchanger for systems of turnaround water supply
- Investigation of the steam condensation from a gas-vapor mixture in the thermo-using arrangement and the heat-exchangers by the deep heat utilization in the leaving gases

- Development of a method of calculation of processes of carrying over on the basis of model of a faltering intermediate layer taking into account influence of zones of recirculation
- Development of technological decisions on decrease in hydraulic resistance, algorithm of calculation of thermal capacity, preliminary programs of selection and calculation of thermal capacity and hydraulic calculation, a technique of selection and calculation of the intensified heat exchangers
- Development and research of methods of an intensification of heat exchange in channels of liquid heat power heat exchangers in conditions of turbulent heat-transfer agent
- Mathematical modeling of heat-and-transfer processes in energy saving technological devices of thermochemical processing of gas fuel
- Development of technological models of the intensified liquid heat exchangers
- Physical modeling of a boiling liquid crisis in channels in the field of high pressures
- Investigation of heat exchange and resistance at non-stationary turbulent flow of a compressed liquid in the channel in the conditions of resonant fluctuations of the expense

Key publications

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- *Valueva E.P.* Calculation oh heat exchange and resistance at the turbulent stabilized flow in a pipe of an electrowire liquid in it is longitudinal a magnetic field // TVT, № 1, 2009. P. 101—107.
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- *Yurkina M.Yu., Efimov A.L.* Generalization of the Data on Heat Transfer and Resistance for a Flow in Profiled Channels and Heat Exchangers // Journal of Heat Transfer Research. Begell house, inc. publishers. 2009. V. 40. Issue 3. P. 225—234.
- *Garyaev A.B., Tceplayeva E.V.* Use of warmth of damp gases in systems of a heat supply of the enterprises // Volume of scientific — practical conference composite book " Scientific researches and their practical application. A current state and ways of development 2009", V. 2, Technical sciences — Odessa: Chernomorie, 2009. P. 80—84.
- *Garyaev A.B.* The decision of the equation of diffusion for impurity distribution to a free turbulent stream // Teploenergetica, V. 4, 2009. P. 51—53.

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- *Dudnik N.M., Garyaev A.B.* Modeling of process of film condensation of steam from gas-vapor mixes of various structure on an external surface of vertical pipes of heat exchangers // Teploenergetica, 2010, № 6. P. 63—68.
- *Garyaev A.A., Yakovlev I.V.* Estimation of efficiency of application of thermal pumps in processes of convective drying // MPEI Vestnik, № 3, 2010. P. 63—70.
- *Hoang H.K., Glazov V.S., Sergievskiy E.D.* Heat transfer processes and the geometric configuration analysis of the recuperator "Field's tube" for a glass melting furnace // MPEI Vestnik, № 1, 2010. P. 13—18.
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- *Arbatskiy A.A., Glazov V.S., Sergievskiy E.D., Hoang H.K.* How to increase intensity of heat exchange // Molochnay promishlennost 2010 № 4. P. 72—73.
- *Trushakov R.V.* Influence definition on fuel consumption in region of transition from the centralized power supply to the independent // Lesnoy vestnik 2010 № 4 (73). P. 65—69.
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Patents

- Patent 73461 RF. МПК F 28 F 1/10. Heat-exchange tube / E.D. Sergievskiy, A.N. Krylov, A.S. Vlasenko // BI. 2008. No 14.
- Patent 73462 RF. МПК F 28 G 13/00. Heat-exchanger / A.B. Garyaev, A.N. Krylov, E.D. Sergievskiy // BI. 2008. No 14.
- Patent № 81301 RF, (51) МПК F28D 1/04. Heat-exchanger "Pipe in a pipe" / A.B. Garyaev, A.N. Krylov, E.D. Sergievskiy (RF). 1 p.: pic.
- Patent № 81302 RF, (51) МПК F28F 1/40. Metal tubes with flutes for use in heat exchangers with condensation / A.B. Garyaev, A.N. Krylov, E.D. Sergievskiy (RF). 1 p.: pic.
- Patent № 85614 RF, (51) МПК F25B 11/02. Detander-generator engine with two-level intermediate heating of gas / A.V. Koriagin, R.V. Soloviev (RF). 3 p.: pic.

Dissertations

- *Yurkina M.Yu.* Perfection of heat exchanger of water systems of a heat supply increase of power efficiency: Cand. Sci. (Techn.) Dissertation. 2009.
- *Soloviev R.V.* Definition efficiency of detander-generator engines at use of secondary power resources of the industrial enterprises: Cand. Sci. (Techn.) Dissertation. 2010.
- *Trushakov R.V.* Development of methodology of definition of influence of use of own power sources of the industrial enterprises on the general fuel consumption of the area: Cand. Sci. (Techn.) Dissertation. 2010.
- *Dudnik N.M.* Investigation of process of condensation of steam from gas-vapor mixes of various structure in the heat exchangers: Cand. Sci. (Techn.) Dissertation. 2010.

- *Byi Man Tu.* Investigation of heat-and-hydraulic processes in self-oscillatory pumps of thermal action with reference to systems heat-and cold supply: Cand. Sci. (Techn.) Dissertation. 2010.
- *Hoang H.K.* Investigation of difficult heat exchange in "Field's tube" in energy saving circuit of a glass melting furnace: Cand. Sci. (Techn.) Dissertation. 2010.

Partners

- Kazan Research Center of RAS (Research Center of Energy problems)
- R&B Association Termek
- TechnoInzgPromStroi

Unique equipment

- Measuring complex for an automated data acquisition in the process of the thermophysical investigations of International Instruments Company
- Climatic chamber of the thermal-and-moisture treatment of air for testing the refrigeration-and-drying units

IPEE CHEMISTRY AND ELECTROCHEMICAL POWER ENGINEERING (CEPE) DEPARTMENT

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5 researchers,
8 engineers,
12 post-graduate students.

Head of Department
Dr. Sci. (Techn.),
Professor Nikolay V. KULESHOV

■ Priority research activities

Research Supervisors

- **Investigations and development of the electrolytic cells, the fuel cells with alkaline and hard-polymer electrolyte**
  Professor Kuleshov N.V.
- **Development of the portable fuel elements**
  Professor Korovin N.V.
- **System analysis and optimization of the electrochemical power installations**
  Professor Nesterov B.P.
- **Development of the lithium current sources with a polymer electrolyte**
  Professor Smirnov S.E.
- **Electrochemical problems of hydrogen power industry**
  Professor Nefiodkin S.I.
- **Investigations of the bio-fuel cells**
  Associated-Professor Osina M.A.
- **Nano-technologies in the fuel cells**
  Associated-Professor Yashtulov N.A.

■ Agreements, contracts, projects

- Carrying out of scientific researches by collective of the scientifically-educational center in the field of creation of the integrated systems elektrolyser-metal-hydride system of cleaning and accumulation of hydrogen-fuel cell
- Carrying out of search research scientific works in the field of hydrogen power and electrochemical technologies scientific equipment Joint MPEI Center "Hydrogen Energetic and Electrochemical Technologies»
- Experimental and mathematical methods of research of PEM fuel cells and electrolysers
- Research of processes in solid-phase electrodes on a basis lithium-metalphosphate
- Research and development of devices of the automated chemical control of water technological environments of the industrial enterprises on the basis of the contactless method based on new physical principles of measurements
- Development of scientific bases of creation of electrodes for perspective electrochemical devices
- Synthesis and research cathode nanomaterial for the lithium accumulator
- Research and development of solid-phase lithium accumulator

Key publications

- *Korovin N.V.* «The Basic chemistry»: the Textbook for technical directions and specialities of high schools, "Higher school", 12 ed., 2010, 557 p.
- *Kuleshov N.V.* Water: effects and technologies (chapter Water electrolysis) // Open Company scientifically publishing center "Engineer", Open Company "Oniko They", 2010. 488 p.
- *Korovin N.V., Ladovsky A.V.* Research of a portable charger on the basis of fuel cells with indirect oxidation boronhydride sodium // Bulletin MPEI №2, 2010.
- *Osina M.A.* Structure and electrocatalytic properties of a composit material a peroxidase-nafion // Electrochemistry. Volume. 45, № 8. P. 1—8. 2009.
- *Smirnov S.E., Putsylov I.A., Smirnov S.S.,* ect. Application polysulfone in lithium sources of a current // Plastic Weights. 2009. № 4. P. 44—46.
- *Smirnov S.S., Smirnov K.S., Savostyanov A.N.* Sintez of perspective cathodic materials of the lithium accumulator // Natural and technological sciences. 2009. № 4. P. 105—109.
- *Smirnov S.E., Putsylov I.A., Jashtulov N.A.* Influence of ultrasonic processing on electrochemical and structural parameters of the cathode on the basis of MnO_2 // Magazine of applied chemistry. 2009. Volume. 82. № 7. P. 1181—1184.
- *Smirnov S.S., Juorin V.A., Kiselyov M.R.* Synthesis and electrochemical properties bronze lithium-vanadic // Magazine of applied chemistry. 2010. V. 83. № 7. P. 1109—1113.
- *Jashtulov N.A., Gavrin S.S., Tanasjuk D.A.,* etc. Synthesis and size control nanoparticles of a palladium in a liquid phase and in the adsorbed condition // Rus. J. Inorg. Chem. 2010. V. 55. P. 180—184.
- *Smirnov S.S., Juorin V.A., Kiselyov M.R.* Development of a method of synthesis bronze lithium-vanadic // Bulletin MPEI. 2010. № 5. P. 43—47.
- *Nefedkin S.I., Holichev O.V., Bogomolova A.S.* ect. Investigation of catalytic ink on the basis of platinum, obtained in vacuum magnetron sputtering / 9 Int. Frumkin Symposium "Material and Electrochemical Technologies" 24—29 oct. 2010 Moscow, Collection of papers. P. 119.

Patents

- The patent. The certificate on useful model. № 84629 published 10.07.09. Korovin N.V., Kolodij E.A., Slavnov J.A., Zaharenkov E.A. «Hybrid electrochemical power installation with division of a working substance».
- The patent of the Russian Federation № 2383970 published 10.03.2010. An electrode of a lithium source of a current. Smirnov S.E., Putsylov I.A., Smirnov S.S., is awarded Gold medal of 38th International salon of the inventions, the new technics and the goods "Geneva-2010"

Dissertations

- The dissertation on competition of a scientific degree of Cand. Tech. Sci. on a speciality 02.00.05 — Electrochemistry Kuleshov V.N. Research and development of element base of new generation for low temperature water electrolyzers. 2009

Partners

- "Kurchatov Institute" Russian Scientific Center, Moscow
- United Institute of High Temperatures RAS, Moscow

- Institute of Chemical Physics and Electrochemistry, Russian Academy of Sciences, Moscow
- ENERGIA company, Elets city
- SPA "ROTOR"
- URALKHIMMASH company, Yekaterinburg
- Al'tern scientific-and-production association (SPA Al'tern), Elektrougli, Moscow
- «Hydrogenics Corporation», Guermany
- «Stuartenergy» Belgium
- ESIP — University of Poitiers, French

Unique equipment

- Joint MPEI Center "Hydrogen Energetic and Electrochemical Technologies"
- Wide-band potentiostate-galvanostate SOLARTRON SI1287, UK
- The analyzer of gas sorption NOVA 1000e (USA)
- Complex of the equipment for synthesis disperse (including nanostructured) elements of electrochemical devices
- Spectrometer the laser issue «Laes matrix spectrometer»
- Raster electronic microscope with energy-dispersion analysis Jeol JSM-6380LA (Japan)

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44 teachers,
15 post-graduate students

Head of Department
Doctor of technical sciences,
Professor Nikolay D. ROGALYOV

Priority research activities

Research Supervisors

- **Investigation of organizational and economical aspects for development of technologies for hydrogen application in power engineering**
  Professor Rogalev N.D.
- **Development of pricing mechanisms and tariff regulation on retail markets of power and heat in view of energy efficiency factor**
  Professor Zubkova A.G. Professor Kurdiukova G.N.
- **Investigation of methodological aspects of power companies assets management**
  Professor Volkova I.O.
- **Development of models and methods of the power companies investment activity strategic planning**
  Professor Zubkova A.G.
- **Development of organizational economic mechanisms of industrial technologies transfer**
  Professor Rogalev N.D.
- **Development of legal, institutional, economic mechanisms involving intellectual property into economic circulation**
  Professor Rogalev N.D.
- **Development of effective thermal schemes by capacity more than 150 megawatt**
  Professor Rogalev N.D.
- **Development of the strategy of the generating companies in the wholesale power and capacity market**
  Professor Rogalev N.D.
- **Development of a system model of power gas integration economic potential assessment**
  Professor Rogalev N.D.

Agreements, contracts, projects

- Development of models and definition of parametres of the big capacity atomic power station hybrid power units using hydrogen fuel
- Development of organizational tools of technical university innovative potential
- Thermal processes modelling, optimisation of circuit and constructive decisions for development of new hydrogen technologies with reference to modernised and under construction power stations
- A study of technological and economic aspects of using hydrogen as a fuel resource for power plants of high-power coal power stations, working on a hybrid principle: using coal and hydrogen
- Development of system model of estimation of power gas integration economic potential

Key publications

- *Lebedev I.P., Bologova V.V., Rekaeva E.P.* Modern lines of corporate governance group business formations development.: MPEI Publishing House, 2009. 5 p.
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Partners

- «NIIgazekonomika» company, Moscow
- MPEI Science Park, Moscow
- «ESKOTEK» company, Moscow
- Moscow machine-building industrial enterprise «Salut», Moscow
- «INVEL» company, Moscow
- Russian-Chinese Technopark «Druzhba», Moscow
- «ENTEK» company, Moscow

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4 Researchers;
7 Post-graduate students.

Head of Department
Ph. D. (Techn.),
Professor Tatyana A. STEPANOVA

■ Priority research activities

Research Supervisors

- **Intensive energy-saving in the thermal processes**
  Professors A.D. Klyuchnikov, T.A. Stepanova
- **Development of the thermal process systems for the energy-intensive industries (ferrous- and nonferrous metallurgy, production of construction materials, machine building, etc.)**
  Professors A.D. Klyuchnikov, I.P. Morozov, Associated-Professors S.K. Popov, V.N. Kuzmin
- **Development of the new-generation process equipment: the smelting chambers (furnaces) for the various processes, the high-temperature smelt/recovery and smelt/oxidation reactors, the heating- and thermal furnaces, the heat generators, the fuel burners, the components of regeneration- and external heat systems, the steam piston engines, the components of the small heat power plants**
  Professor T.A. Stepanova, Associated-Professor V.A. Ippolitov, Senior Researchers V.S. Dubinin, V.I. Volkov
- **Development of the energy- and material-saving, the environment-friendly method for treatment of the solid domestic waste, based on the intensive energy-saving concept**
  Professor T.A. Stepanova
- **Development of the energy-related fundamentals and algorithms to manage the industrial- and consumption wastes with account of the advanced, system-based resource- and energy-saving methods**
  Professor T.A. Stepanova
- **Development of the energy-related fundamentals and algorithms to manage the local fuel flows in the RF regions with account of the advanced, system-based energy-saving methods**
  Professor T.A. Stepanova, Head of Research Lab V.A. Tumanovsky, Associated-Professor V.P. Albul
- **Development, research and approbation of the new thermal principles to implement the technological processes; the structural and parametric optimization of the thermal patterns used for processing of the raw materials and for heating and thermal treatment of the sub-products and products**
  Head of Research Lab V.A. Tumanovsky
- **Development of the energy-saving thermal patterns and the energy-saving process equipment for production of the construction materials**
  Professor B.A. Sokolov, Associated-Professor V.N. Kuzmin
- **Development and use of the highly efficient liquid ceramic insulation in the thermal processes**
  Head of Research Lab V.A. Tumanovsky, Head of Training Lab A.I. Gusinsky
- **Energy audit of the industrial enterprises, definition of actions to improve the fuel energy balance of the enterprises and regions, saving of the fuel**

energy resources on the basis of the advanced energy-related upgrade of the thermal processes used for production of the cast iron, the steel, the nonferrous- and rare metals, the mill products, the cement, the glass, the ceramic products and the mineral fertilizers

Professor I.P. Morozov, Lead Researcher V.M. Smirnov

- **Development of the thermal neutralization (incineration) units to treat the wastes, including the highly toxic wastes**

  Professor T.A. Stepanova, Senior Researcher V.I. Volkov, Associated-Professors V.A. Ippolitov, I.M. Bernadiner
- **Certification- and other tests of the gas- and liquid fuel burners and other gas equipment**

  Professor I.P. Morozov, Lead Researcher V.M. Smirnov, Head of Research Lab V.A. Tumanovsky
- **Thermal reprocessing of the solid low-grade fuel (burning, gasification, pyrolysis, coking)**

  Professor A.A. Belyaev
- **Mathematic simulation of the thermal plants and systems**

  Associated-Professor S.K. Popov
- **Development of the process technologies and devices to obtain the water-fuel emulsions for environmental protection applications**

  Senior Researcher V.I. Volkov, Associated-Professors V.A. Ippolitov

Agreements, contracts, projects

- Analysis of toxic and super toxic chemical compounds and substances and estimated definition their heats of combustion with respect to high temperature rendering harmless wastes
- Investigation and development of advanced thermal processing technologies and recycling man-made structures and wastes on the thermal power plants (TPP) and other energetic facilities
- Technical support of thermal deactivation oily solid combustible waste
- Development of baseline data for improvement design of rotary kiln to improve the reliability and performance
- Issue of the Terms of Reference for works under the project for refurbishment of some components of Ammofos VZ-45 TU-05furnace

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Patents

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Dissertations

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- *Petin S.N.* Development of perspective model for power- and ecologically effective manufacture of hydrogen on the basis of natural gas and a combination of processes in black metallurgy

Partners

- JSC Gazprom promgaz
- Industry Center of Implementations, RF Ministry of Transport Routes
- Moscow Start-up Administration Energotekhmontazh, Russia
- All-Russia Research Institute of Chemical Industry (VNIIKhT), Moscow
- Research Institute of Fertilizers and Fungicides (NIUIF), Moscow
- Scientific Production Association (NPO) Tekhenergokhimprom, Moscow
- Moscow Aviation Institute (State Technical University)
- JSC Ammofos, Cherepovets
- Production Association (PO) Spetsialnye Tekhnologii (Special Technologies), Ekaterinburg
- International Academy of Science of Environment and Safety (MANEB), St. Petersburg

Unique equipment

- Bench for the certification tests of the gas burners and other gas devices with heat power of 1 MW
- 30 kW electric generator, with the Capstone (USA) gas turbine drive
- Bench for investigation and test of the low-power (100 kW or less) gas- or liquid fuel boilers
- Thermographic spectral laboratory — 2200
- The device for definition of the water content in oil products (VAD-40M)
- The device for definition of the water content in firm materials (VAD-40M)
- Flue gas analyzer KM9106 «Quintox»
- Portable single and three-phase power analyzer CIRCUTOR AR.5L
- Temperature measuring instrument Testo 925
- Portable professional thermal anemometer Testo 425
- Multi-functional measuring instrument for A/C Testo 435-2
- High-speed calorimeter of burning БКС-2Х
- Universal centrifuge Sigma 2-16P

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Priority research activities

- Methodology of energy audits
- Information technologies
- Scientific-methods problems of energy efficiency
- Center of collective usage of scientific equipment for a wide complex of investigative and diagnostic works

Agreements, contracts, projects

- Investigation and elaboration of fuzzy models and methods of knowledge' formation and treatment inside intellectual systems for decisions support
- Investigation and elaboration of association methods and means for data analysis and modeling for solving tasks connected with decisions support systems
- Modernization of functional subsystem for automation of industrial processes of current financing upon conditions of permanently changing regulatory and legal framework
- Elaboration of subsystem for reference data and information surveys collection for running financing' informational-analytic system
- Elaboration and implementation of system for monitoring of energy saving and natural resources saving projects in educational institutions
- Creation, testing, and introduction of procedural framework, informational support and software for calculation of state financing normative standards for institutions of professional education
- Elaboration and system-based support of complex automated managing system for book-keeping reports and activities, as well as for state financed contracts execution in frame of federal purpose-oriented programs and all-national project "Education"
- Introduction of specified system of information support for processes of placement and execution of government orders
- Analysis of legislative documentation concerning budgetary obligations of state owned enterprises, and creation of prototype of information system for monitoring execution of obligation taken by subsidiary institutions managed by the Ministry of Education Science
- Elaboration of details of target hierarchic model for distribution of financial means in fields of education and science; element's generation foe integrated version of complex automated system for control of budget' execution of the Ministry of Education and Science in accordance with the model created
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- *Stefantsov A.G.* Methodical support of modernization of the informational system of current financing of educational institution under the jurisdiction of the Rosobrazovanie (in Russian) / A.G. Stefantsov, A.S. Vorobiev, I.E. Podol'skaya // Information technologies of simulation and control. 2009. № 5 (57). P. 641—645.
- *Approach* to arbitrary request formation to the data base of information-analytical system (in Russian) / A.I. Gavrilov, G.A. Zhebrunov, M.Yu. Kolosov, E.A. Tikhonova // Information technologies of simulation and control. 2009. № 7 (59). P. 949—956.
- *Models* of associative memory and its implementation in multi-coordinate associativwe medium (in Russian) / V.V. Borisov, V.L. Titov, I.E. Podol'skaya, M.Yu. Kolosov // Information technologies of simulation and control. 2009. № 7 (59). P. 916—920.
- *The information-analytical* system for determination of expenses on financial support of the budget institutions (in Russian) / A.V. Rozhdestvenskiy, V.L. Sinakov, A.V. Bobriakov, A.G. Stafantsov // Informatization of education and science. 2010. № 4 (8). P. 172—184.
- *Klimenko A.V.* Application of modern information technologies for improvement of energy efficiency of the budget economic branches (in Russian) / A.V. Klimenko, A.V. Bobriakov // Thermal Power Engineering. 2010. № 12. P. 6—12.
- *Bobriakov A.V.* Development of information-analytical systems for monitoring of realization of regional and municipal energy saving programs and improvement of energy effi-

ciency (in Russian) // Proc. of V-th intern. Seminar of young scientists "Energy saving — theory and practice. Moscow: MPEI Publ., 2010. P. 209—215.

- *Bobriakov A.V.* Information monitoring support of realization of energy saving measures in budget branches of economy (in Russian) / A.V. Bobriakov, A.I. Gavrilov, A.N. Shtyk // Energobezopasnost anf energosberezhenie. 2010. № 5. P. 21—26.
- *Monitoring* of user actions in information systems of the branch level (in Russian)/ A.G. Stefantsov, E.A. Tikhonova, M.V. Raskatova, A.N. Shtyk // Information technologies of simulation and control. 2009. № 3 (62). P. 388—395.
- *Realization* of components of the branched system of report generation (in Russian)/ S.P. Manchkha, A.N. Shtyk, A.I. Gavrilov, E.S. Baryshnokov // Information technologies of simulation and control. 2010. № 3 (62). P. 299—306.
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- *Vagin G.Ya., Dudnikova L.V., Zeniutich E.A., Zlobin A.A., Mal'tsev A.P., Medvedeva I.Yu., Romanov G.A.* et al. «Approach to provide energy examinations (energy audit) of educational institutions», Guiding document of the Russian Ministry of Education and Science (in Russian), Nizhny Novgorod, NGTU, 2009, 188 p.
- *Dvorkin V.S., Romanov G.A.* «Prospects of energy-management development in Russia» (in Russian), Electrika, № 4, 2010.

Patents

- Partners
- The Ministry of Education and Science of the Russian Federation
- LLC "ECORIS-NEI"
- LLC "Modern Information Technologies"
- LLC "IBS Expertise"
- Department of Fuel and Energy Complex, city of Moscow
- CJSC "Tatgazenergo"
- OJSC "Gazpromenergo"
- Association of engineers for heating, ventilation, and air conditioning
- Association of energy managers

Unique equipment

- Mobile diagnostic laboratory (MDL) for energy and environmental audit is designed and suitable for solving complex tasks during the processes of instrumental energy measuring/ audits of energy producing and distributing utilities, objects of social sphere, as well as industrial enterprises
- MDL consists of specialized transport vehicle based on micro-bus "Volkswagen Crafter", certified stationary and mobile complexes for measuring and analysis of many electric and heat parameters, water consumption data, characteristics of environment, including flue gas analysis, as well as of soft-and hardware-program complex . Moreover, laboratory comprises both installations for testing and calibration of various kinds of equipment, and means for cordless information connections, including omnidirectional antenna and access points for Wi-Fi

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7 researchers,
3 engineers.

Head of Lab
Corresponding Member
of Russian Academy of Sciences
Doctor of technical sciences,
Professor Vladimir V. KLIMENKO

Priority research activities

- Study of the world energy development regularities: energy consumption evolution, fuel mix variation, resource basis, influence on atmosphere and climate
- Investigations of Russian energy development perspectives: greenhouse gases and pollutants emission estimation, possibilities of Kyoto Protocol obligations fulfillment and economical mechanisms usage potential, expected climate change influence on power industry
- Study of the environmental aspects of various branches of economy, particularly, energy conservation technologies evolution in production and consumption of different energy resources
- Study of anthropogenic influence on the atmosphere: reconstruction of time series for major greenhouse gases and pollutants emissions in various sectors of world and Russian economy, development of the scenarios of the possible man-made influence on chemical and radiation balance of atmosphere, the ways of reduction of this negative influence
- Climate variation modeling and forecasting at global and regional scale, in particular, estimation of the anthropogenic contribution into climate variations
- Studies of the feedbacks in the system «man-climate»: estimation of possible climate variation consequences for various human activity areas (in electricity production, in heat-supply systems, nuclear power plant objects, construction industry, transportation); development of the new approaches for mitigation of the future climate change effects on economy of Russia
- Studies of past climate and its connection with the civilization evolution: paleoenvironmental research (past climate reconstruction based on palynological, dendrochronological and other approaches), historical climatology (past climate reconstruction on the basis of historical written evidencies)

Agreements, contracts, projects

- Modeling of Climate Change in Russia for Energy Consumption Forecasting
- The Study of Natural and Social-Demographic Factors Determining Energy Development
- Development of the Scientific Basis for Innovation Development of the Russian Power Industry in the Second Stage of Kyoto Protocol Providing Environment and Energy Security
- Development of the Scientific Basis for Sustainable Development of Energy Sector of the Northern Regions of Russia under Conditions of Environmental and Climatic Change
- Monitoring and Forecasting of Atmosphere and Hydrosphere Change Connected to Energy Complex of Russia
- Providing the Security of Russian Energy Complex under Conditions of Environmental and Climatic Change

- The Study of Climate Change in the Russian Arctic Taking into Account Energy Exchange Anomalies in the World Ocean
- Development of the Statistical Method of Forecasting Monthly Temperatures in the Russian Arctic Taking into Account North Atlantic and Arctic Oscillations
- Study of the Possibilities of Forecasting of Climate Parameters of the Cold Season for Energy Needs
- Modeling and Forecasting of Applied Climatic Parameters for Heat and Electricity Consumption Forecasting in Petropavlovsk-Kamchatsky

Key publications

- *Klimenko V.V.* Climate: Lost Chapter of the World History (in Russian). Moscow: MEI Publ., 2009. 408 p.
- *Klimenko V.V., Tereshin A.G., and Mikushina O.V.* Global Energy and Climate of the Planet in the 21st Century in the Context of Historical Trends (in Russian) // Russian Journal of General Chemistry, 2009. Vol. 79. No. 11. P. 2469—2476.
- *Klimenko V.V.* Reconstructing the Climate of Russian Arctic over the Last 600 Years Based on Documentary Evidence. In: Battle on the Ice. Arctic Shelf in the World Politics and Economy in the twenty-first century (in Russian). Moscow: Tribuna, 2009. P. 232—237.
- *Beznosova D., Tereshin A., Klimenko V.V.* Energy Development of Russia in the 21st Century under Environmental and Resource Constraints (in Russian) // Proc. 9th International Conference 'Engineering and technological research for sustainable development'. Moscow, Russia, 2009. P. 5—9.
- *Klimenko V.V., Solomina O.N.* Climatic variations in the East European Plain during the last millennium: state of the art. In: The Polish Climate in the European Context: An Historical Overview (edited by R. Przybylak, J. Majorowicz, R. Brбzdil, and M. Kejna). Berlin: Springer Verlag, 2010. P. 71—101.
- *Klimenko V.V.* A composite reconstruction of the Russian Arctic climate back to A.D. 1435. In: The Polish Climate in the European Context: An Historical Overview (edited by R. Przybylak, J. Majorowicz, R. Brбzdil, and M. Kejna). Berlin: Springer Verlag, 2010. P. 295—326.
- *Klimenko V.V., Tereshin A.G.* World energy and climate in the twenty-first century in the context of historical trends: clear constraints to the future growth // Journal of Globalization Studies. 2010. Vol. 1 No. 2, P. 30—43.
- *Klimenko V.V., Tereshin A.G.* World Energy and Global Climate after the Year 2100 (in Russian) // Thermal Engineering, 2010. Vol. 57, No. 12. P. 1035—1041.
- *Klimenko V.V., Tereshin A.G., and Mikushina O.V.* Providing the sustainable development of the energy complexes of Northern Russian regions under the climate change (in Russian) // Proc. of the Final 2010 Conference of the Federal Program «Resources and Environmental Management». P. 30—33.

Dissertations

- *Tereshin A.G.* Global and Regional Aspects of the Interactions in the System «Energy Complex — Environment»

Partners

- P.P. Shirshov Institute of Oceanology, RAS, Moscow
- A.M. Obukhov Institute of Atmospheric Physics, RAS, Moscow
- Institute of Geography, RAS, Moscow

- Geology Faculty of Lomonosov Moscow State University,
- Geography Faculty of Lomonosov Moscow State University,
- Historical Faculty of Lomonosov Moscow State University
- Energy Strategy Institute, Moscow
- Academy of Economical Security, Moscow
- Agency for Balance Planning in Power Industry
- Research and Project Institute "VNIPIenergoprom"
- Westphalian University, Munster, Germany
- Rhein University, Bonn, Germany
- Alexander von Humboldt Foundation, Bonn, Germany

R&D DEPARTMENT "MANAGEMENT PROBLEMS IN ENERGY AND RESOURCE SAVING" (R&D MPERS)

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4 researchers,
11 engineers.

Head of MPERS
Leading researcher,
Ph. D. Boris F. REUTOV

Priority research activities

Research Supervisors

- **Development of a scientific-methodic basis of the energy savings control including the development of the formation principles of the federal, regional and municipal energy saving programs, of creation and the implementation principles for the normative-lawful, organizational-financial and technological policy in an energy saving area**

  Leading researcher Reutov B.F.

- **Scientific-methodic investigations and an informational-analytical system for the native developments, technologies and materials demonstration in the area of the energy saving control with the usage of the modern informational technologies**

  Senior Researcher Antropov A.P.

- **Monitoring fulfillment of the R&D and design projects in the field of energetic and energy saving at realization of federal, regional and branched prorams of energy saving**

  Junior researcher Shashkin A.P.

- **Fulfillment of R&D projects on research the application principles of ecologically pure substances and materials in the modern energy-efficient equipment**

  Junior Researcher Antropova E.S.

Agreements, contracts, projects

- Development of the mathematical model of thermodynamic interaction of gas-condensate fluids at natural thermobaric conditions
- Preparation of the analytical review of the state and development prospects of wind-energetic in the world, fulfillment of WE resource analysis and its distribution of the Russian territory
- Scientific investigations on preparation of development prediction providing the economic and technological competitiveness for exit on the world market of hydrogen technologies
- Thermodynamic and scheme investigations, technical-economical analysis of technology effectiveness and the promising market of developing high-temperature hydrogen steam-generation aggregates on multi-purpose destination
- Development of scientific and technological fundamentals for creation of binary geothermal energy installation for utilization of the geothermal heat-carrier
- Execution of the patent, technical-economical and marketing researches of the market status for unified complexes for control, monitoring, diagnostics, prediction of resources and protection electrical equipment of the system for energy take-off from "large energetic" for building and constructions and the analysis of the market potential
- Development of the engineering condition project on the experimental sample of the control system of high-voltage (6,3 kV) CHRP, programs and methods of preliminary testing. Economical investigations

- Fulfillment of the monitoring of the scientific and technological development in the field of energetic and energy saving at realization in 2011—2013 measures "Research and developments on the priority directions of the scientific-technological complex of Russia for 2007—2012"

Partners

- Federal State Unitary Enterprise "All-Russia Electrical Engineering Institute named after Lenin, Moscow
- United Institute of High Temperatures of RAS, Moscow
- South-Ural State University, Cheliabinsk-town
- State University "Moscow Institute of Electronics", Moscow
- Non-commerce partnership "Engineers for heating, ventilation, air-conditioning, heat supply and constructive thermal physics", Moscow
- JSC "NPO Termek", Moscow
- JSC "Zelenograd innovation-technologies Center, Moscow
- Group of innovation companies INSOLAR, Moscow
- International partnership on hydrogen energetic
- International partnership "Methane to markets"
- UN program of development in Russia
- Global ecology fund
- European Economic Commission of UN

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Institute Departments

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26 lecturers,
8 research engineers,
20 post-graduate students

Head of Department
Dr. Sc., Professor
Vladimir Ya. GECHA

Priority research activities

Research supervisors

- **Development of highly-effective AC electric machines**
  Associated-Professor Fisenko V.G.
- **Development of mathematical models and methods of analysis of electro-mechanical power converters**
  Professor Kopylov I.P.
- **Development of methods of analysis and design of electric machines for dynamic operating conditions**
  Professor Bespalov V.Ya.
- **Design and development of controlled electric machines with wide range of regulation**
  Associated-Professor. Kuzmichev V.A.
- **Development of methods of analysis of horsepower electric machines**
  Associated-Professor Moschinskii Yu.A.
- **Analysis and design of non-conventional electric power sources**
  Associated-Professor Kotelenets N.F.
- **Reliability analysis of electric machines and research of electric machines with increased reliability**
  Associated-Professor Ambartsumova T.T.
- **Development of high-speed high-power voltage stabilizers based on thyristor-transformer schemes**
  Associated-Professor Korobkov S.A.
- **Development of high-speed methods of analysis of transient processes in electric machines with solid-state converters**
  Associated-Professor Shirinskii S.V.

Contracts, grants and projects

- Development of calculation methods and analysis of ponderomotive forces and surface effect of electromechanical converters
- Design of series slow-speed, high-power switched-reluctance motors for nonferrous metallurgy
- Study of characteristics of low- and mean-power electronic voltage stabilizer.
- Study of characteristics of combined fast-acting cryogenic proportioning electromagnetic valve
- Analysis of technical decision for designing of off-line megawatt electrical power system

Key publications

- *Briantsev A.M., Briantsev M.A., Diageleva S.V., Karimov R.R., Makletsova E.E., Negrishev A.A.* Sources of 110—500 kV reaction power on the base of controlled by

excitation padding reactors and batteries of capacitors (in Russian). Energoexpert, № 2, 2009. P. 76—79.

- *Kotelenets N.F., Ivanov A.S.* Use of overpressure of district heating systems for generation of electrical energy (in Russian). Energosberegenie i energoeffektivnost. № 3 (27), 2009. P. 13—15.
- *Zhelbakov I.N., Zamolodchikov V.N., Sasin V.Ya., Sleptsov M.A., Smolskiy S.M., Shirinskii S.V.* Problems of advanced education of foreigners of MPEI (TU). MPEI Vestnik (in Russian). № 3, 2009. P. 99—104.
- *Gecha V.Ia., Ulin S.E., Dmitrienko V.V., Grachev V.M., Boiartchuk K.A.* Compressed xenon gamma-ray spectrometers for detection and identification of radioactive and fissile materials (in Russian). Proceeding of VNIIEM. «Elektromehanika questions». Vol. 114. P. 45—50.
- *Zakharenko A.B., Chernuhin V.M.* Magnetic field analisis of direct current salient-pole and cylindrical rotor machine (in Russian). Proceeding of VNIIEM. «Elektromehanika questions». Vol. 115. P. 15—18.
- *Bespalov V.Ia., Kachalina E.V.* Comparison characteristics of 3- and 2- phase induction motors of electrical frequency controlled drive (in Russian). Elektrichestvo. 2010. № 7. P. 45—48.
- *Diageleva S.V., Briantsev A.M., Briantsev M.A., Karimov R.R., Lurie A.I., Makletsova E.E., Negrishev A.A.* Reaction power controlled sources on the base of controlled by excitation padding reactors and batteries of capacitors (in Russian). Elektrotehnika. 2010. № 4. P. 11—19.
- *Ivanov-Smolenskii A.V., Goncharov V.I., Tein Naing Tun.* Finite element analisis application for synchronous machine study designing (in Russian). "Elektromehanika" University Transactions. 2010. № 2. P. 71—76.
- *Goncharov V.I., Tein Naing Tun.* Solid core watt loss of electrical machine calculation by elementary models (in Russian). "Elektromehanika" University Transactions. 2010. № 1. P. 24—29.
- *Kotelenets N.F., Ivanov A.S.* Study of induction generator power network connect process (in Russian). Elektrotehnika. 2010. № 9. P. 13—15.
- *Gecha V.Ia., Zakharenko A.B.* Solid armature magnetoelectric brake (in Russian). Elektrotehnika. 2010. № 10. P. 11—16.
- *Zakharenko A.B., Chernuhin V.M.* Calculation of submersible magnetoelectric motor characteristics by finite super element analysis (in Russian). Elektrichestvo. 2010. № 12. P. 43—46.

Dissertations

- *Kazmin E.V.* Calculation and optimization characteristics of surface rotor permanent magnet magnetoelectric machines. – Ph.D. thesis. 2009.
- *Tein Naing Tun.* Electromagnetic calculation of electric machines by field analisis. Ph.D. thesis. 2010.
- *Kachalina E.V.* Frequency controlled induction motors of excavator. Ph.D. thesis. 2010.
- *Diageleva S.V.* Controlled by excitation reactors. Ph.D. thesis. 2010.

Partners

- All-Russian Research and Design Institute of Electromechanics (VNIIEM), Moscow, Russia
- Kriotek company, Ltd., Moscow, Russia
- Pskovelectromash company, Pskov, Russia
- Elektrosila company, St.-Petersburg, Russia

- All-Russian Research and Design Institute of Electrical Engineering Industry (VNIPTYIEM), Vladimir, Russia.
- Yaroslavl Electromechanical Plant, Yaroslavl, Russia
- Crosna company, Moscow, Russia
- Electromagnetic systems and technologies company, Moscow, Russia
- General Motors Corporation, Detroit, USA
- Ford Motor Company, Dearborn, Michigan, USA
- Olton Drives, Lids, UK
- Holek, Ridderkerk, Netherlands
- Technical University of Eindhoven, Netherlands
- Norwegian University of Science and Technology – NTNU, Trondheim, Norway
- Sophia Technical University, Sophia, Bulgaria
- University of Calgary, Calgary, Canada
- Wisconsin-Madison University, Madison, Wisconsin, USA
- Colorado University, Denver, Colorado, USA
- University Del Vale, Cali, Columbia
- University of Punta Arenas, Chili
- Tsinghua University, Beijing, China
- North China Technical University, Beijing, China
- Dong Fong Works, China
- University of Lille, France

Unique equipment

- Stand for testing characteristics of linear induction motor.
- Stand for testing characteristics of thyristor-transformer voltage stabilizer
- Computer-based stand for automatic testing of electric motors
- Stand for testing characteristics of high-speed commutator motor
- Stand for testing characteristics of combined cryogenic fast-acting electromagnetic proportioning valve

DEPARTMENT OF PHYSICS OF ELECTRICAL MATERIALS AND COMPONENTS AND AUTOMATION OF ELECTRIC-TECHNOLOGY COMPLEXES (PEMAEC)

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32 lecturers,
2 researchers,
16 post graduate students.

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Dr. Sci. (Techn.), Professor
Sergey V. SEREBRIANNIKOV

Priority research activities

Research supervisors

- **Development of composite radio-absorbing materials and coverings**
  Professor Serebriannikov S.V., Associated-Professor Cheparin V.P.
- **Investigations of isolating materials and coverings**
  Professor Serebriannikov S.V., Associated-Professor Borodulin V.N.
- **Development of bio-compatible materials for medical applications**
  Professor Arsen'ev P.A.
- **Development of nano-materials for hydrogen energetic**
  Professor Arsen'ev P.A.
- **Development of equipment and technologies for synthesis of new high-temperature oxide materials**
  Professor Balbashov A.M.
- **Development of equipment for inductive low-temperature heating**
  Professor Kuvaldin A.B.
- **Development of control systems for electrical technology installations on the basis of computer and microprocessor engineering**
  Professor Rubtsov V.P.
- **Development of principally new electrical-technological processes for creation of pure and composite materials, fulfillment of coverings, solution of ecological problems**
  Professor Rubtsov V.P.
- **Construction and technology optimization for manufacturing communication cables**
  Associated-Professor Riazanov I.B.
- **Development of Web-applications and electronic textbooks for remote education**
  Associated-Professor Sutchenkov A.A., Professor Tikhonov A.I.

Agreements, contracts

- Creation of radio-absorbing coverings
- Synthesis, physical-chemical investigations of new electrical and radio materials and technologies of its application in the specific products
- Investigations and development of new specific materials for electrical and power electrical equipment
- Development of technological equipment for crusibleless zone growth with radiation heating
- Electronic textbooks on material sciences

- Investigation of the influence of electrical-technology processes onto the environment and reduction of uts negative consequences
- Investigation of operation modes of inductive technological installations
- Investigations of technology for vacuum plating of conductive coverings
- Development of automatic control systems for covering provision installations
- Development of improved control systems for vacuum arc furnaces
- Influence of nano-particles of oxide materials on properties of heterogeneous condensed media used in electrical engineering and radio electronics

Key publications

- *Kholodny S.D., Serebriannikov S.V., Boev M.A.* Methods of testing and diagnostics in electric isolation and cable engineering (in Russian). Moscow: MPEI Publ., 2009, 232 p.
- *Evtushenko Yu.M.* Chemistry of dielectrics (in Russian). Moscow: MPEI Publ., 2010, 168 p.
- *Peshkov I.B.* et al. Cables and wires. Fundamentals of cable engineering (in Russian). Moscow: Energoatomizdat Publ., 2009, 470 p.
- *Kustov E.F., L.I. Bulatov, V.V. Dvoyrin, and V.M. Mashinsky.* Molecular orbital model of optical centers in bismuth-doped glasses Opt. Lett. 34 1549-1551, (2009)
- *Razdobreev I., Ivanov V.Yu., Bigot L., Godlevski M. and Kustov E.F.* Optically detected magnetic resonance in Bismuth-doped silica glass. 34 17 2691-2693 (2009)
- *Kustov E.F., Kalinnikov V.T., Novotortsev V.M.* Unitary symmetry and classification of the states n-spin clusters. Magnetic and Thermodynamic parameters, Russian J. Inorg. Chem. 54 , #14, P. 1—79 (2009).
- *Serebriannikov S.V., Smirnov D.O., Cheparin V.P., Rumjantsev P.A.* Properties of composites on the basis Z-type ferrites. International Conference «Functional Materials» (ICFM-2009). Abstracts / Ukraine, Crimea, October 5—10, 2009. P. 309
- *Kustov, E.F.* Composition and space structure of nanoshells, J.Compt. and Theor. Nanoscience. 6, 692—705 (2009)
- *Kuvaldin A.B., Fedin M.A.* Calculation of the form of the liquid melt surface and its influence on an electrical mode of the inductive crucible furnace (in Russian) / Elektrichastvo, № 4, 2009. P. 47—53.
- *Kuvaldin A.B., Lepioshkin A.R., Lepioshkin S.A.* Testing method for turbo machine disks and rotor bandages using the inductive heating (in Russian)/ Elektrichestvo, № 7, 2009. P. 33—38.
- *Kuvaldin A.B., Strupinsky M.L., Khrenkov N.N., Fedin M.A.* Calculation of electric and energy characteristics of the rod inductor for ferromagnetic load heating (in Russian) / Elektrichestvo, № 10, 2009. P. 54—61.
- *Strupinsky M.L., Khrenkov N.N., Kuvaldin A.B.* The method of electrical-physical properties determination of the steel tubes (in Russian) / Elektrotekhnika, № 8, 2009, P. 55—60.
- *Kuvaldin A.B.* Proc. of XII Intern. Conf. «Electromechanics, Electrical Technologies, Electrical materials and components" (in Russian) / Elektrometallurgia, № 2, 2009. P. 46—48.
- *Alferenok A.A., Kuvaldin A.B.* Numerical simulation of the heat-and-mass transfer in the channel of the inductive furnace for cast iron melting (in Russian) / Elektrometallurgia, № 4, 2009. P. 22—29.
- *Kuvaldin A.B.* Plasma electrical technology installations (in Russian) // Elektrometallurgia, № 6, P. 45—47.

- *Kuvaldin A.B.* Relevant problems of the theory and practice Актуальные проблемы теории и практики индукционного нагрева (in Russian) // Elektrometallurgia, № 10, P. 45—47.
- *Meleshkin V.L., Poloiko F.S., Savalyk N.A., Pograbissky M.Ya., Luzhbin A.S.* Complex automation of installation for bright annealing of non-ferrous rolling. (in Russian) // Elektrometallurgia, № 1, 2009. P. 35—42.
- *Rubtsov V.P., Nekhamin I.S.* Investigation of the influence the rectified voltage rippling upon burning stability of the electric arc (in Russian). MPEI Vestnik, 2009. № 2, P. 110—116.
- *Rubtsov V.P.* Consideration of nonlinear characteristics of the DC arc furnace at stability investigation of ignition and burning of arc (in Russian). Elektrichestvo, № 11, 2009.
- *Fedin M.A.* Development of the control system for the liquid melt temperature in the inductive crucible mixers according to indirect parameters (in Russian) // MPEI Vestnik, 2009, № 5. P. 54—59.
- *Rubtsov V.P.* Investigation of arc ignition and burning stability in electric DC furnaces (in Russian) // Elektrichestvo, №3, 2010. P. 40—46.
- *Rubtsov V.P., Shcherbakov A.V.* Monitoring of the heat melting mode for corrosion-resistant steel at precision pulse electron-beam welding (in Russian) // Elektrometallurgia, №4, 2010. P. 18—23.
- *Kruchinin A.M.* On an issue to electric mode designing of the arc steel-melting furnace on the basis of heat-exchange arc model (in Russian) // Elektrometallurgia, № 7, 2010. P. 2—8.
- *Maslov S.I., Tikhonov A.I.* Development and application of electronic educational resources in the Moscow Power Engineering Institute (Technical University) // Informatio technologies in providing the new quality of higher education (in Russian). Proc. of All-Russia scient.-techn. Conf. April 14—15, 2010, Moscow, MISIS Publ. Series: Analytical reports, P. 1—20.
- *Kalinnikov V.T., Kustov E.F., Novotortsev V.M., Serebriannikov S.V.* Dispersion of nano-structures. Four-dimension formula composition-structure-properties-dispersion. Russian J. Inorg. Chem. V. 13. P. 1—71.
- *Razdobreev I., Hamzaoui H., Ivanov V.Y., Kustov E.F., Capoen B., Bonazaaoui M.* Optical spectroscopy of bismuth – doped pure silica perform. Opt. Lett. 2010 May 1, V. 35 (9). P. 1341—1343.
- *Kustov E.F., Bulatov L.I., Dvoyrin V.V., Mashinsky V.M., and Dianov E.M.,* Crystal field and molecular orbital theory of MBm centres in glasses, Journal of Physics B: Atomic, Molecular and Optical Physics, vol. 43, no2, paper 025402 (10pp), 2010 (doi:10.1088/0953-4075/43/2/025402).
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- *Kustov E.F., Novotortsev V.M.* Structure and Optical properties of nanocrystals and quantum dots with diamond, lonsdaleite, sphalerite and wurtzite structures. Journal of Computational and Theoretical Nanoscience (2010) Vol. 7, P. 1531—1545.

Dissertations

- *Ivashin A.D.* Development of the control system for the process of covering plating in electron-beam installation / Cand. Dissertation (Techn), 2009.
- *Yashchenko S.A.* Modernization and investigations of the electric isolation system of heating-resistant class in tractive electrical motors used in extreme conditions / Cand. Dissertation (Techn), 2009.

- *Smirnov D.O.* Composition radio absorbing materials on the basis of ferrimagnet compositions / Cand. Dissertation (Techn), 2009.
- *Nekhamin I.S.* Development of the control system for DC arc furnace / Cand. Dissertation (Techn), 2009.
- *Alferenok A.A.* Development of inductive channel furnace with control of liquid melt motion in the channel / Cand. Dissertation (Techn), 2009.
- *Fedin M.A.* Development of the control system for temperature mode of inductive crucible mixers / Cand. Dissertation (Techn), 2009.
- *Elizarov ЛюФю* Modernization on the electric-hydraulic power regulator for the DC arc furnace / Cand. Dissertation (Techn), 2010.
- *Kuznetsov A.Yu.* Improvement of cable properties with the central optical module / Cand. Dissertation (Techn), 2010.
- *Lwin Naing Chzo.* Simulation of cable and wire aging under condition of the tropic climate / Cand. Dissertation (Techn), 2010.
- *Lepioshkin S.A.* Development of inductors and approach to calculate of effective heating modes of rotating disks / Cand. Dissertation (Techn), 2010.

Patents

- *Rubtsov V.P., Elizarov K.A.* Device for control of the evaporation process in the electron-beam installation. Russian patent of useful model № 80086, Bull. № 2, 2009.
- *Kuvaldin A.B., Pogrebisskiy M.Ya., Fedin M.A.* Russian patent on the useful model № 95213 «Device for control of inductive crucible mixer». Bull, № 16, 2010.
- *Pogrebisskiy M.Ya., Fedin M.A.* Device for control of inductive crucible mixer. Russian patent on the useful model № 95213. Bull. № 16, 2010.

Partners

- Institute of Electronics of Bulgarian Academy of Sciences, Sofia, Bulgaria
- Chenstokhovsky Polytechnical University, Poland
- Technical University of Ilmenau, Germany
- Tyuan Technological University, PR of China
- Military-Medical Academy of Russian Ministry of Defence, St.-Peterburg

Unique equipment

- Equipment for synthesis of high-temperature oxide compositions by means of the method of optical zone melting
- Equipment for thermal-graphical and micro-calorimeter analysis
- Inductive heating installation using the cryogenic inductor cooling
- Electron-beam installation for melting the refractory materials
- Vacuum high-temperature electric resistance furnace
- Electronic educational complex for electrical material sciences including the electronic textbook, virtual laboratory practical work, means for knowledge checking, administrative system

DEPARTMENT OF ELECTROTECHNICAL COMPLEXES OF SELF-CONTAINED OBJECTS

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13 lecturers,
7 research workers,
12 post-graduate students

Head of Department:
Dr. Sci. (Tech.), Professor
Sergei I. MASLOV

Priority research activities

Research supervisors

- **Power supply systems for self-contained objects and sources of secondary supply**

  Professor V.G. Eremenko
- **Automation of research and development associated with electromechanical and electrotechnical systems with the use up-to day information and communication technologies**

  Professor S.I. Maslov
- **Structure, algorithmic and parametric synthesis of resource- and energy-saving power-electronic devices with advanced electromagnetic compatibility for switch-drive and electronic energy systems of self-contained objects**

  Professor G.S. Mytsyk
- **Wide application electric drives on the basis of hysteresis electric motors and deformable structural composite nano structured magnetic materials and alloy materials**

  Senior Lecturer S.U. Ostanin
- **High-speed electrical and turbo-jet machines on the base of synchronous machines with permanent magnet excitation on the leaf gas-dynamic bearings and power-electronic devices for energy drive systems**

  Senior Researcher M.U. Rumyanzev
- **Electromechanical systems on the basis of inductor electromechanical converters and synchronous machines with permanent magnet excitation**

  Chief Researcher A.M. Rusakov

Agreements, contracts, projects

- Development of devices for self-contained power supply of spacecraft
- Low-voltage high-current sources
- Power supply system of the distributed power pulsed loads
- Research and development of the data-communication system for the automation of educational experiments on the base of electrical engineering, electronics, electromechanics and electromechanical systems with a possibility of remote access
- Development and introduction of the complex system for individual practical training of the experts in the field of natural science, technique and technology on the base of distributed network of educational complexes for general professional training in the system of public technical education with a possibility of remote access
- Development of electronic devices and systems, including military applications
- Development of scientific base for creation of new generation electric drive systems for realization of rotor and centrifugal technologies

- Development of electromechanical systems on the basis of hysteresis motors for textile, chemical and atomic industry and absorbent technology
- Research and modeling of the progressive electromechanical systems for different purpose centrifuges and separators
- Research and development of the high-speed electrical and turbo-jet machines – centrifugal compressors and alternators on the base of switch drive with permanent magnet excitation on the leaf gas-dynamic bearings
- Development of self-contained power supply systems on the base of power- converter devices
- Development of methods and means for research and design of ac electronic electromechanical systems on the basis of inductor electromechanical converters and synchronous machines with permanent magnet excitation
- Development of electric drives for oil production equipment, micro cryogenic systems, power pumps for heat-station
- Development of electric traction generators and drivers for different transports
- Development of generators for self-contained power plants, such as wind-driven generators, hydroelectric generators, and supply line-feeding generators

Key publications

- *Informatisation* of engineering education: MPEI electronic educational resources. Reference book. Issue 4 (in Russian) / Edited by S.I. Maslov. "MPEI Publishing house ", 2009. 190 p.
- *Sugrobov A.M., Chernov A.E.* Intelligent systems of motor transport vehicle power supply (in Russian) / "Gruzovik", 2010. № 4. P. 3—6.
- *Yeremenko V.G.* Stabilization of voltage transducer in the impulse load power-supply system (in Russian). "Power supply", 2009. № 2. P. 33—36.
- *Yeremenko V.G., Varlamov V.O., Yablochkin S.I.* Voltage rectification device of L-Ion accumulators and it's simulation in Pspice (in Russian). Proceedings of international conference "Automobile and tractor construction in Russia: priorities of personnel development and education" (17 of November 2010). P. 51—56.
- *Berilov A.V., K'o Zo Lin, Maslov S.I., Mytsyk G.S.* Frequency stabilization system on the base of asynchronized synchronous generator (in Russian). "Electricity". 2010. № 10. P. 34—43.
- *Berg A.V., Berilov A.V., Mytsyk G.S.* Modernization of aerodrome lighting (in Russian). "Herald of the MPEI", 2010, № 5. P. 61—72.
- *K'o Zo Lin, Mytsyk G.S.* Comparative analysis of brushless electric generators structure (in Russian). "MPEI Vestnik", 2010, № 5. P. 85—96.
- *Rumyantsev M.Yu., Zakharova N.E.* at al. High-speed turbo-generator for lower-power standalone power installations with use of low-potential heat (in Russian). Proceedings of All-Russian theoretical and practical conference "Reliability and efficiency growth of electric power plants and energy systems operation" (1—3 of June 2010). Volume 1. P. 240—244.
- *Rumyantsev M.Yu.* Lower-power standalone power installations on the base of high-speed turbo-machines (in Russian). Materials of IX All-Russian scientific and technical conference "Scientific aviation reading, dedicate to the memory of N.E. Zhukovsky" (16—17 of November 2010). P. 193—195.
- *Maslov S.I., Tarasov V.N., Ostanin S.Yu., Sizyakin A.V.* Experimental research of different capacitor hysteresis electric drive structures (in Russian). Materials of IX All-Russian scientific and technical conference "Scientific aviation reading, dedicate to the memory of N.E. Gukovsky" (16—17 of November 2010). P. 189—191.

- *Ostanin S.Yu.* Application perspectives of rotor technologies in electrotechnical complexes of aircraft devices (in Russian). Materials of IX scientific and technical conference "Scientific aviation reading, dedicate to the memory of N.E. Gukovsky" (16—17 of November 2010). P. 191—193.
- *Tarasov V.N., Sizyakin A.V.* Control method of excitation of synchronous hysteresis motor (in Russian). "Electricity". 2009. № 1. P. 26—31.

Patents

- Patent 2380810 RF. Submersible motor / Santalov A.M., Khotsyanova O.N., Khotsyanov I.D., Poshvin E. V. 2010.
- Patent № 2364916 RF. Alternating current regulator-stabilizer / Berg A.V., Berilov A.V., Miroshnichenko A.V., Mytsyk G.S., 2009.
- Patent № 2366068 RF. A method for converting direct voltage into alternating voltage / Konyahin S.F., Tsishevskiy V.A., Berilov A.V., Mytsyk G.S., Hlaing Min U., 2009
- Patent № 2361354 RF. A method for controlling of multimotor hysteresis drive / Tarasov V.N., Sizyakin A.V. at alias.
- Patent 81011 RF. Direct current generation system / Konyahin S.F., Mytsyk G.S. 2009
- Patent 82886 RF. Alternating current regulator / Berg A.V., Berilov A.V., Miroshnichenko A.V., Mytsyk G.S. 2009
- Patent № 81535 RF. The generator for wind-driven power plant / Rusakov A.M., Rusakova V.N. at alias.
- Patent № 81536 RF. The generator rotor for wind-driven power plant / Rusakov A.M., Rusakova V.N. at alias.
- Patent № 81537 RF. The generator stator for wind-driven power plant / Rusakov A.M., Rusakova V.N. at alias.

Dissertations

- *Hlaing Min U.* Research of efficiency of using of intermediate high-frequency conversion at the construction of static converters. Dissertation ... Cand. of technical sciences degree. M., 2009.
- *Sizyakin A.V.* Development and research of energy-efficient electric drive on the base of hysteresis motor with single-phase mains supply. Dissertation ... Cand. of technical sciences degree. M., 2010.

Partners

- Izhevsk State Technical University, Izhevsk
- Kyrgyzsky State Technical University, Bishkek
- Krasnoyarsk State Technical University, Krasnoyarsk
- Moscow Ordzhonikidze State Aviation Institute (MGAI), Moscow
- Moscow Bauman State Technical University (MGTU), Moscow
- Baykov Metallurgy and Materials Technology Institute (IMET) of The Russian Academy of Sciences, Moscow
- Federal State Unitary Enterprise «Bardin Central Scientific Research Institute of Ferrous Metallurgy», Moscow
- Branch of the Federal State Unitary Enterprise «The Operating Centre of Ground-based Space Infrastructure» «Kuznetsov Scientific Research Institute of Applied Mechanics», Moscow
- Federal State Unitary Enterprise «Ural Electrochemical Works», Novoural'sk, Russia

- Federal State Unitary Enterprise «All-Russian Scientific Research Institute of Synthetic Fibre with Experimental Works», Tver, Russia
- Russian innovation fuel and energy Company (RITEK Company), Moscow
- Borets manufacturing company, Moscow
- Safonovo electric machine-building plant, Safonovo, Russia
- Tushino machine-building plant, Moscow
- Sarapul generator plant, Sarapul, Russia
- Electromash Company, Moldova, Tiraspol
- Industrial Union " Energiya", Belarus, Grodno
- Mitchurin plant "Progress", Mitchurin, Russia
- Aviation Electronics and Communication Systems, a public corporation, Moscow
- TSENTROTEKH-EKhZ Scientific-and-Technical Center «Centrifugal technology», St. Petersburg
- Development bureau "Electrochemical works», Nizhni Novgorod, Russia
- Federal State Unitary Enterprise «Prozhektor Leading Experimental Design Bureau», Moscow
- Yakor' Experimental Design Bureau, Moscow
- Federal State Unitary Enterprise «NPO Mashinostroyenia», Reutov-town
- Lomonosov Scientific Research Institute of Mechanics, Moscow
- Lomonosov Scientific Research Institute of Computing Complexes, Moscow
- All-Russian Scientific Research Institute of Electromechanics, Moscow

Unique equipment

- Equipment for the Polytechnic Internet-laboratory "Electrical engineering and electronics foundations"
- Automatic laboratory complex «Electromechanical and electrotechnical systems" with remote access by computer networks
- Automatic laboratory complex "Power supply systems of self-contained objects" with remote access by computer networks

DEPARTMENT OF ELECTRICAL AND ELECTRONIC APPARATUSES (EEA)

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17 teachers,
24 scientific researchers,
6 post-graduate students

Head of the Department
Ph. D., professor Pavel A. KURBATOV

Priority research activities

Research Supervisors

- **Investigation and development of energy converters for superconducting magnetic energy storage and non conventional energy sources**
  Professor Rozanov Yu.K.
- **Investigation and development of power quality regulators for power systems**
  Professor Rozanov Yu.K., Associated-Professor Riabchitski M.V.
- **Investigation and development of systems with electromechanical and power electronic control apparatuses on the basis of microprocessor based and microelectronic facilities**
  Ph. D. (Techn) Kvasniuk A.A.
- **Development of software and methods for calculation and design of electromagnetic systems**
  Professors Shoffa V.N., Kurbatov P.A.
- **Investigation and development of electromagnetic systems and technologies for oil industry**
  Professor Kurbatov P.A.
- **Application of high-temperature superconducting materials in electrical apparatuses**
  Professor Kurbatov P.A.
- **Fundamental investigations of Physical phenomena and development of system with liquid-metallic compositional materials**
  Professor Degtiar V.G.
- **Investigation of artificial intellect systems for selection of electric apparatuses and its reliability estimation**
  Professor Godzgello A.G., Senior Researcher Kalashnikova A.V.
- **Investigation and development of power supply systems with continuous remote monitoring of operation parameters of system and power quality**
  Associated-Professor Khruslov L.L.
- **Investigation and development of high voltage vacuum circuit breakers and contactors**
  Professor Belkin G.S.

Agreements, contracts, projects

- Development of power converters for ensuring power supplying of essential consumers
- Development of a fully controlled power electronic converter for superconducting magnetic energy storage (SMES)
- Investigation of techniques for ensuring of static and transient stability of power systems by means of superconducting devices
- Research simulation and development of power converter elements for reactive power compensation in distribution networks

- Development of design concepts of new electrical and electronic apparatus in power supply systems with renewable energy sources

Key publications

- *Electrical* and electronic apparatuses (in Russian) / E.G.Akimov et al Vol.1. Electromechanical apparatuses. ed. by A.G. Godzhello., Yu.K. Rozanov. Publishing Center "ACADEMIA". 2010. 352 p.
- *Electrical* and electronic apparatuses / A.P.Burman et al Vol.2. Power electronic apparatuses (in Russian). ed. by Yu.K. Rozanov. Publishing Center "ACADEMIA". 2010. 320 pp.
- *Electrical* and electronic apparatuses. Complex of virtual labs. Workbook (in Russian) / A.V. Kalashnikova, D.N. Nechaev, V.V. Sazonov. MPEI Publishers, 2010. 55 p.
- *Akimov E.G, Korobkov Y.S., Sokolov V.P., Talanov E.V.* Selection and application of low voltage electrical apparatuses for switchgears, control and automation systems. Workbook (in Russian). MPEI Publishers, 2009.
- *Akimov E.G.* Selection, design and installation of electrical installations of buildings (in Russian). Handbook, SmartBook, 2009.
- *Godzhello A.G, Raynin V.E., Kalashnikova, A.V.* Electrical apparatuses. Part 1. Handout for lectures on "Electrical and electronic apparatuses" (in Russian). MPEI Publishers, 2009.
- *Akimov E.G.* Modernization or retrofitting of the switchgears (in Russian) // News of Russian Power Engineering (electronic edition), Issue 2, 2010.
- *Akimov E.G.* Trend of development and new technical solutions for 6 (10) kV switchgears (in Russian) // News of Russian Power Engineering (electronic edition), Issue 4, 2010.
- *Baranov N.N., Makarov V.S., Seropyan G.V.* On the development of thermoelectric cooling modules, and the prospects for its development based on nano-structured materials (in Russian) // Electrotechnika, Issue 8. 2010.
- *Baranov N.N.* Electromagnetic radiation of mobile phones (in Russian), Newsletter of Academy of Electrotechnical Sciences, Issue 1(7), 2009.
- *Belkin G.S., Romochkin J.G.* The method of equivalent heat sources for the heat calculation of the conducting parts of electrical apparatuses (in Russian) // Elektrichestvo, Issue 10. 2010. P. 2—10.
- *Godzhello A.G., Degtyar V.G., Maslov S.I., Moskalenko V.V., Filikov V.A.* The training of specialists-electricians with qualification of Masters of Electrical Engineering (in Russian) / Elektrotechnika. Issue 8. 2009.
- *Godzhello A.G., Nechaev D.N., Popova E.P.* Analysis of earth faults protection schemes in distribution networks with multiple sources (in Russian), MPEI Vestnik. No 8, 2010. P. 86—89.
- *Gribanov S.V., Kulaev Yu.V., Kurbatov P.A., Matveev V.N., Nizhelsky N.A., Poluschenko O.L.* Calculation of magnetic systems with high-temperature superconducting elements (in Russian) // Elektrichestvo. Issue 2. 2009.
- *Dergachev P.A., Kuznetzova E.A., Kulayev Y.V., Kurbatov P.A.* Evaluation of interaction in magnetic systems of magnetic resonance tomograph system (in Russian) // ICEEE-2010, Proceedings, 19—25 September 2010, Alushta, Ukraine.
- *Zhavoronkov M.A., Tkachenko S.A.* Estimation of the temperature of contact system of vacuum chambers (in Russian) / Electrotechnika. Issue 11. 2010. P. 32—35.
- *Kiselev M.G., Ryabchitsky M.V., Krainov V.O.* Compensation of unbalanced currents in three-phase power supply systems (in Russian) // Technical electrodynamics: Special issue. Power electronics and energy efficiency. Vol. 4. Kiev. 2009.

- *Korobkov Y.S.* Magnetically operated contacts (in Russian) // Potential. Issue 2. 2010. P. 52—58.
- *Kryukov K.V., Sazonov V.V., Kvasnyuk A.A.* Utilization of the PV converters in power supply systems (in Russian) // Proc. of All-Russian Scientific and Practical Conference ENERGO-2010. Vol. 2. Moscow.
- *Krukov K., Rozanov Y., Kvasnuk A., Sazonov V.* Photovoltaic Power Conditioning System With Novel DC-DC Converter // Proc. of EPE-PEMC 2010, 6—8 September 2010, Ohrid, Republic of Macedonia.
- *Kurbatov P.A., Dergachev P.A.* Methods of fine-tuning of the magnetic system of magnetic resonance tomograth by movable poles (in Russian) // Elektrichestvo. Issue 4. 2010. P. 36—41.
- *Raynin V.E., Kobozev A.S.* Improving the protective characteristics of low voltage circuit breakers (in Russian) // Elektrotechnika. Issue 2. 2009.
- *Raynin V.E., Kobozev A.S.* Circuit breakers with enhanced protective characteristics for improving of the protection of low voltage distribution networks (in Russian) // Elektrotechnika. Issue 11. 2010. P. 18—24.
- *Rozanov Yu.K.* Power flows in AC and DC circuits (in Russian) // Elektrichestvo. Issue 4. 2009.
- *Rozanov Yu.K., Kvasnyuk A., Kryukov K.V.* Regulation the power flows in the grid-connected PV power supply system (in Russian) // Technical electrodynamics: Special issue. Power electronics and energy efficiency. Vol. 4. Kiev. 2009.
- *Rozanov Yu.K., Lepanov M.G., Kiselev M.G.* Non-active power compensation in power supply systems (in Russian) / Proc. of All-Russian Scientific and Practical Conference ENERGO-2010. Vol. 2. Moscow.
- *Rozanov Yu.K., Lepanov M.G., Sazonov V.V.* Control strategy of multilevel current source converter (in Russian) // Technical electrodynamics: Special issue. Power electronics and energy efficiency. Vol. 4. Kiev. 2009
- *Rozanov Yu., Kopylov S., Lepanov M., Kiselev M.* Enhancement of Dynamic Stability of Power Systems Using a Converter with SMES // Proc. of EPE-PEMC 2010, 6—8 September 2010, Ohrid, Republic of Macedonia.
- *Rozanov Yu.K., Krukov K.V., Lepanov M.G., Kiselev M.G.* Control of power quality and energy flows of electric system (in Russian) // Proc. of ICEEE-2010, 19—25 September 2010, Alushta, Ukraine.
- *Shoffa V.N. Medzinsky B.* Effect of the control methods and operating modes on dynamic behavior and lifetime of reed relays (in Russian) // Proc. of The II-nd Int. Conf. Magnetically operated contacts (reed relays) 2009. Ryazan. Russia.
- *Shoffa V.N.* Design and manufacture features of miniature and subminiature reed relays (in Russian) // Proc. of The II-nd Int. Conf. Magnetically operated contacts (reed relays) 2009. Ryazan. Russia.
- *Shoffa V., Miedzinski B., Habrych M., Dzierzanowski W.* Problemy zagrozen srodowiskowych il sposobow prawidlowego ich pomiaru. Poland, Katowice. Mehanizacja i automatyzacja gornictwa № 7 (461), lipiec Poland. Katowice, 2009.

Dissertations

- Luong Thu Fong Reactive and distortion power compensation in ship and marine power supply systems: Ph.D. thesis, Moscow, 2009.
- Gribanov S.V. Development of the high-temperature superconductor magnetic bearing: Ph.D. thesis, Moscow, 2010.
- Dergachev P.A. Synthesis of optimal structures of magnetic field sources of electrical devices: Ph.D. thesis, Moscow, 2010.

- Ivashchenko, V.S. The methods to improve the selectivity of the low-voltage circuit breakers: Thesis. Ph.D. thesis, Moscow, 2010.
- Gaykazyan T.K. Research and development of multi-module high-voltage DC-DC converter: Ph.D. thesis, Moscow, 2010.

Patents

- Patent №2379819 RUS. Control strategy of three-phase bridge converter / Yu.K. Rozanov, M.V. Ryabchitsky, M.G. Lepanov, M.G. Kiselev // Registered 20.01.2010.

Partners

- OJSC «Federal Grid Company of Unified Energy System» (OJSC FGC UES), Moscow
- Non-Commercial Partnership Innovations in Power Engineering, Moscow
- OJSC Research and Development Center of Power Engineering (OJSC R&D center of PE), Moscow
- Sister company of OJSC R&D center of PE — VNIIE, Moscow
- Sister company of OJSC R&D center of PE — Research center VVA, Moscow
- S&P All-Russian R&D Institute of Electromechanics (S&P VNIIEM), Moscow
- State Center «Andreev Acoustical Institute», Moscow
- State Unitary Enterprise «All-Russia Electrical Engineering Institute named after Lenin», Moscow
- Andreyev Acoustic Institute, Moscow
- Millitary-engineering academy of Strategic Rocket Forces named after Peter the Great, Moscow
- State Unitary Enterprise «Golovnoe osoboe konstruktorskoe Buro Projector», Moscow
- ABB Russia, Ltd, Moscow
- CJSC Symmetron Group, Moscow
- CJSC Schneider Electric, Moscow
- FIRELEK Ltd, Moscow
- Interelektrokomplekt, Ltd (IEK, Ltd), Moscow
- «Hightech — Power Systems», Ltd, Moscow
- OJSC Electrozavod, Moscow
- OJSC Power electronics of Siberia, Novosibirsk
- OJSC Electrotechnical group «Ruselprom», Moscow
- CJSC «Electric motor drive and Power electronics» (CJSC ELSIEL), Moscow
- Russian Electrotechnical company, Ltd (REK, Ltd), Moscow
- CJSC UZO-electro, Moscow

Unique equipment

- Hole acoustical installations for oil and gas condensate producing intensification
- Vacuum test bench for electrical apparatuses up to 5 kA
- Equipment set for electrical apparatuses testing under high pressure condition
- Equipment set for low-voltage apparatuses and UPS

ECOLOGY ENGINEERING AND PROTECTION OF LABOR (EEPL) DEPARTMENT

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21 lecturers;
3 scientific employees;
7 service staff;
2 post-graduate students

Head of Department
Ph.D. (Techn.)
Associated-Professor
Olga E. KONDRATIEVA

Priority research activities

Research Supervisors

- **Creation of the unified ecology monitoring system**
  Associated-Professor Kondratieva O.E., Professor Medvedev V.T., Associated-Professor Makal'skiy L.M.
- **Electric safety**
  Professor Medvedev V.T., Associated-Professor Karalyunetz A.V.
- **Electromagnetic compatibility**
  Professor Kolechitskiy E.S.
- **Development and implementation of the diagnostics system for the broncho-pulmonary diseases**
  Professor Malyshev V.S., Associate-Professor Borovkova A.M.
- **Scientifically-methodical support of the certified testing and the certification systems for labor protection in organization**
  Associated-Professors Kondratieva O.E., Karalyunetz A.V.
- **Development and implementation of the automated systems of the checking and management technological process to ecological directivity**
  Associated-Professor Makarov A.K., Associated-Professor Karalyunetz A.V., PhD (Techn.) Bukharov D.G.
- **Development sensor of a new generation for the harmful substance determination in an environment**
  Associated-Professor Monakhov A.F.
- **Vibro-acoustics of the electromechanical systems**
  Professor Medvedev V.T., Professor Malyshev V.S.

Agreements, contracts, projects

- Development of system of the ecological monitoring within the framework of making the Centre of the ecological monitoring and ecological safe technology in energetic
- Author's accompaniment (Design accompaniment) of the serial issue of the «Milta» device
- The search studies and development of the methods of the vibro-acoustics parameters' reduction of the electric machines for the special objects
- The study of an influence of the electrical and technological processes on environment and development of the principle of the reduction their negative influence
- Development of the computer diagnostic complex "Pattern" for monitoring of the personal's health conditions

- The Study of the levels of the dangerous and harmful production factors on worker places for undertaking of their qualifications and development recommendation on reduction these levels
- Audit and the certification in the field of the protection labor
- Development of the facilities of the means of a personal protection
- against influence of the harmful and dangerous production factors
- Development of the rules, methodical instructions, normative and managing documents in the field of the labor protection

Key publications

- *Ecological* monitoring of the environment: Scholastic material (in Russian) / MPEI; [A.V. Karalyunetz and others.]. M.: MPEI publishing house, 2009.
- *Supervision* of the environment and protection from given by activity of the person contamination: Scholastic material (in Russian) / MPEI; [V.V. Skibenko and others.]. M.: MPEI publishing house, 2009.
- *Kolechitskiy E.S., Korolev I.V.* About using of the individual device of protection from influence of the industrial frequency electric field (in Russian) / MPEI Vestnik, № 1, 2010
- *Electric* safety. The Theory and practice: Scholastic material (in Russian) / MPEI; [P.A. Dolin and others.]. M.: MPEI publishing house, 2009.
- *Electric* safety. The reference information: Scholastic material (in Russian) / MPEI; [E.S. Kolechitskiy and others.]. M.: MPEI publishing house, 2009.
- *Malyshev V.S., Borovkova A.M.* Instrumental provision for quantitative estimation of the professional risk of the breathing diseases on enterprise of energy (in Russian) // Russian electric energy branch news. 2010. № 4. P. 50—58.
- *Makal'skiy L.M., Zhitkov A.N.* Integral estimation quality of the drinking water (in Russian) // MPEI Vestnik, № 3, 2010, P. 140—144
- *The Microprocessor* systems in ecological monitoring. The reference materials: Scholastic material (in Russian) / MPEI, [A.K. Makarov]. M.: MPEI publishing house, 2009.

Dissertations

- *Borovkova A.M.* Development of the scientific base hardware-program method of the estimation of the influence harmful production factors on personnel in energy: Cand. Sci. (Techn.). Dissertation: Moscow, 2010.

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25 lecturers,
12 post-graduate students.

Head of Department
Dr. Sci. (Techn), Professor
Valery K. LOZENKO

Priority research activities

Research Supervisors

- **Management of quality systems and systems for power engineering management**

  Professor Lozanko V.K.

- **Management of state and municipal purchases — organization and execution of competitive tenders**

  Professor Vedeneev G.M.

Key publications

- *Vedeneev G.M., Efimov A.R., Lisin P.V.* Reference hand-book of the state customer. The practice of procedure fulfillment, the complete set of documentation, operation reporting in accounting (in Russian) — Forum Media Publ., St-Peterburg, 2010, 240 p.
- *Vedeneev G.M., Lavrova Yu.P., Ivanov A.Yu.* The state or municipal contract (development in accordance with juridical norms mentioned in appropriate normative acts) (in Russian) — VShE Publ., 2010.
- *Voronov D.A.* Prediction of electric energy consumption as the basis for stable economy development of the region (in Russian) // MicroEconomics №6 / Moscow «MicroEconomics Publ.», 2009. P. 22—26
- *Voronov D.A.* Forecasting of the demand for electric energy as an instrument of effectiveness increase of power electrical engineering functioning under conditions of a crisis (in Russian) // Proc. of All-Russia scient. conf. «Effectiveness increase of consumer electrical economy under conditions of resource restrictions (Moscow, 16—20 of November 2009) / Under edition of B.I. Kudrin and V.Yu. Matiunina. In 2 vilumes: Vol. 1 — Electrical Supply, Vol. 2 — Electrical Equipment and Management. Moscow: Tekhnetika Publ., 2009. Vol. II. P. 230—233
- *Zvezdin A.L., Panteleev A.C.* Bookkeeping and taxes account of the mutual activity: practical guidelines (in Russian), «Bukhalter uchiot Publ», 2009.
- *Kozlov V.A., Lozenko V.K.* Innovative approach to evaluation of document support degree for manager activity (in Russian) // Innovation management – 2009. № 3. P. 212—218.
- *Kozlov V.A., Lozenko V.K.* Document support of the fulfillment process of the internal audit (in Russian) // 17th International Scientific Conference CO-MAT-TECH 2009, Slovakija, Trnava, 22—23 October 2009. 0,7 п.л.
- *Kozlov V.A., Lozenko V.K.* Ninth principle of the quality management system — «documental support of the activity» // Controlling. 2010. № 4 (37).
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- *Petrova S.B.* Directions of youth policy in universities (in Russian), Collection of papers «Ekaterina conference — VIII» Moscow: NIEB Publ, 2009. P. 29—30.
- *Chicherov E.A., Titov P.M., Shilin V.A., Voronov D.A., Popov G.E., Korshunov Yu.V., Briaszheva M.A., Kovaliova S.A.* Prediction of energy consumption in Moscow

region to 2012 with evaluation of prospects up to 2020. (in Russian) // APB Y Publ., 2009. 602 p.

- *Shilin V.A.* Prospects of application of the long-term meteorology predictions with the aim to prepare the effectiveness increase of fuel resource applications (in Russian) // Proc. of All-Russia scient. conf. «Effectiveness increase of consumer electrical economy under conditions of resource restrictions (Moscow, 16—20 of November 2009) / Under edition of B.I. Kudrin and V.Yu. Matiunina. In 2 vilumes: Vol. 1 — Electrical Supply, Vol. 2. — Electrical Equipment and Management. Moscow: Tekhnetika Publ., 2009. Vol. II. P. 233—235.
- *Shilin V.A., Korovko P.A.* Hydro-meteorological information as the reserve of optimization of energy supply of customers (in Russian) // Far-East energy customer, № 2, 2009. P. 28—31.
- *Shilin B.A.* Kioto protocol under conditions of economical crisis: opening opportunities and latent risks (in Russian) // Microeconomics № 4 / Moscow: «Microeconomics Publ.», 2009. P. 49—51.
- *Kozhukhovsky I.S., Shilin V.A., Chicherov E.A.* Prospects of meteorological information application for needs of energy industry (in Russian) // Proc. of the first intern. scient. practic. Conf. «Application of hydro-meteorological information for needs of Russian energy industry. Moscow: APBE Publ., 2009, P. 27—28
- *Shilin V.A., Chicherov E.A.* Development of automated system for decision making and risk identification on the basis of hydro-meteorological information (in Russian) // Proc. of the first intern. scient. practic. Conf. «Application of hydro-meteorological information for needs of Russian energy industry. Moscow: APBE Publ., 2009, P. 29—31.

Dissertations

- *Ageev M.K.* Instruments of innovational organizational development. Dissertation of Cand. Sci. (Econ.). Moscow, 2010.
- *Waguli* Jei Emma Dolphin. Innovations in the control systems of companies of power electrical engineering complex of Cote-D-Ivuare. Dissertation of Cand. Sci. (Econ.). Moscow, 2009.
- *Dien Huang Thieu.* Realization on innovation macroeconomic policy of Vietnam in the field of nuclear power engineering. Dissertation of Cand. Sci. (Econ.). Moscow, 2010.
- *Kolesova E.V.* Innovation methods of formation and evaluation on intellectual capital of the institutoin. Dissertation of Cand. Sci. (Econ.). Moscow, 2009.
- *Kononenko V.A.* Modernization of economic mechanism of creation of attractive investment climate for power engineering companies. Dissertation of Cand. Sci. (Econ.). Moscow, 2010.
- *Korshunov Yu.V.* Methods and procedures of investment program formation on the basis of long-term prediction of electrical loads. Dissertation of Cand. Sci. (Econ.). Moscow, 2010.
- *Kurochkin D.S.* Innovational mechanism of effectiveness increase of the process approach to enterprise management. Dissertation of Cand. Sci. (Econ.). Moscow, 2009.
- *Muborkasheva D.T.* Innovational strategies of business aviation market development under conditions of the system crisis. Dissertation of Cand. Sci. (Econ.). Moscow, 2010.
- *Petrova S.B.* Formation of the strategic management system for investment activity in non-state university. Dissertation of Cand. Sci. (Econ.). Moscow, 2009.
- *Popov E.V.* Methods of investment attraction and evaluation i innovational centewrs of unified avia-constructive corporation of Russia. Dissertation of Cand. Sci. (Econ.). Moscow, 2010.

- ***Tul'chinskaya Ya.I.*** Development of the investment stimulation mechanism in construction of energy-generating enterprises in the frames of the wholesale market of electric energy and power of Russia. Dissertation of Cand. Sci. (Econ.). Moscow, 2010.
- ***Fadeeva G.V.*** Modernization of management methods of investment activity in constructions (as an example of regions of Siberia and Extreme North). Dissertation of Dr. Sci. (Econ.). Moscow, 2010.

Partners

- JSC «MPSK Holding», Moscow
- JSC «Mosenergo», Moscow
- JSC «MPSK of Siberia», Omsk
- RDA «Tupolev», Moscow
- JSC Missile-Space Complex «Energia», Koroliov, Moscow region
- RDA named after Lavochkin, Moscow
- National fund of expert training, Moscow
- Association of finance-industrial groups, Moscow
- Electromashexport, Moscow
- Pro-Invest Consulting, Moscow
- Institute of industrial development (InformElectro), Moscow
- Academy of national economy at government of Russia, Moscow
- Academy of State Service, Moscow
- State University of Management, Moscow
- Novosibirsk Electrical Engineering Institute , Novosibirsk
- International Independent Ecology-Politology University, Moscow.
- Russian Association of Business Education, Moscow
- Higher School of Economics — Institute of purchase and selling management, Moscow
- Department on competitive policy of Moscow (Tender Committee), Moscow
- Currency-financial division of Moscow
- Hangzhou Technical University, Hangzhou, China
- Nilsebrok-College, Kopenhagen, Denmark
- Technical university of Gabrovo, Bulgaria
- Slovakia Technical university in Bratislava
- Middlesex university business school
- University of Greenwich
- London metropolitan university
- London school of Economics

DEPARTMENT OF AUTOMATED ELECTRIC DRIVE (AED)

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21 lecturers,
15 researchers,
20 post-graduate students.

Head of Department
Ph.D. (Techn.), Professor,
Yuri N. SERGIEVSKIY

Priority research activities

Research Supervisors

- **Systems of technological parameter regulation for industrial installations by means of electric drive**
  Professors Osipov O.I., Masandilov L.B.
- **Development of methods and technical means providing the resource- and energy-saving by means of electric drive**
  Professors Ostrirov V.N. and Kozachanko V.F., Associated-Professor Ladygin A.N.
- **Power and control components (including universal microprocessor controllers) for electric drive**
  Professors Ostrirov V.N. and Kozachenko V.F.
- **AC electronic-inductor electrical drive**
  Professors Bychkov M.G., Ostrirov V.N. and Kozachenko V.F.
- **Precision double-channel electric drive on the basis of piezo- and magnetostriction motiors**
  Leading Researcher Nikol'skiy A.A.
- **Systems of precision motion reproduction on the basis of multi-coordinate electric drives with the gated motors**
  Senior Researcher Balkovoy A.P.
- **Approaches, technical means and services in the field of electric drive testing and its components**
  Professor Sergievskiy Yu.N., Associated-Professor Ladygin A.N.
- **Approaches, technical means and services on qualification arising of the field of electric drive**
  Professor Sergievskiy Yu.N., Associated-Professor Ladygin A.N.
- **Standards, expert software and approaches to informational support of the life cycle of electric drives**
  Professor Sergievskiy Yu.N., Associated-Professor Ladygin A.N.

Agreements, contracts, projects

- Determination of prospects of electric drive and its component development, creation of new knowledge database in the field of electric drive
- Investigation of modes and development of operation algorithms of the control station for the group of pumping aggregates
- Development of promising engineering solutions of mass regulated electric drive of gated-inductor type
- Modernization of electric drive of pumping installation on the basis of the complete energy and resource-saving device with the frequency transformation
- Development of calculation methods of object-oriented gated-inductor electric drives
- Development of the controller for gated-inductor electric drive
- Testing and certification of the low-voltage complete devices, electronic converters and electric motors
- Investigation of dynamics and development of the construction principles of self-educated mechatronic systems with piezo-compensators

- Development of precision electric drive on the basis of gated electrical motor with permanent magnets
- Development of frequency-regulating asynchronous electric drive with vectoral control
- Development of state standard projects in the field of electric drives and their components

Key publications

- *Electric* drive and control systems (in Russian) // MPEI Trudy. Issue 684. Moscow: MPEI Publ., 2009. 66 p.
- *Electric* drive in mechatronic technologies (in Russian) // Reports of scient.-pract. seminar. Moscow: MPEI Publ., 2009. 96 p.
- *Il'inskiy N.F., Moskalenko V.V.* Electric drive: energy- and resourse-saving: textbook for university students (in Russian) / Moscow: Academia Publ., 2009. 208 p.
- *Anuchin A.S., Aliamkin A.S., Drosdov A.V., Kozachenko V.F., Tarasov A.S.* Embedded high-performance control systems. Practical course for software development and debugging for signal microcontrollers TMS320x28xxx in integrated medium Code Composer Studio (in Russian). Textbook. Moscow: MPEI Publ., 2009. 287 p.
- *Bychkova E.V., Sarach B.M., Shtin E.N.* Utilization experience of regulated electric drive in the system of hot-water supply (in Russian) // MPEI Vestnik. 2009. № 1. P. 152—157.
- *Ostrirov V.N., Silaev F.A.* Development of power supply of the railway car with autonomous electric supply system (in Russian) // Elektrika. 2009. № 8.
- *Tsasenkin V.K., Slivinskaya G.A., Tolstykh O.A.* Direct Drive with High Motion Performance / 54th Internationales Wissenschaftliches Kolloquium Technische Universitдt Ilmenau // Sept. 2009.
- *Электропривод* и системы управления (in Russian) // MPEI Trudy. Issue 685. Moscow: MPEI, 2010. 72 p.
- *80 anniversary* of MPEI scientific and pedagogical school of thoughts in the field of electric drives (in Russian) // Reports of scient. and academic seminar. Moscow: MPEI Publ., 2010. 80 p.
- *Balkovoy A.P., Tsatsenkin V.K.* Precision electric drive with gated motors (in Russian). Moscow: MPEI Publ., 2010. 327 p.
- *Nikolskiy A.A., Bychkova E.V.* Development of self-educated double-channek electric drives with linearized piezo-compansators in the precision channel (in Russian) // Elektrichestvo. 2010. № 10. P. 44—50.
- *Nikolskiy A.A., Koroliov V.V., Murinets D.Yu.* Peculiarities of profile checking of the piston cross-sections on circular-meters with the reference spindle rotation (in Russian) // Izmeritel'naya tekhnika. № 2. 2010 P. 28—35
- *Nikolskii A.A., Korolev V.V., Murinets D.Yu.* Features in the Control of the Cross-sectional Profile of Pistons on Out-of-round Gauges with Model Rotation of the Spindle // Measurement Techniques, Vol. 53. № 2. P. 156—165, 2010
- *Nikolskii A.A.* МетодMethod of cross-sectional profile recovery at measurements on the circular-meters with reference spindle rotation (in Russian) // Izmeritel'naya tekhnika. № 2. 2010. P. 51—64

Patents

- *Nikol'skiy A.A., Koroliov V.V., Katsevich V.L.* УстройствоDevice for accuracy increase for turning treatment of non-circular articles. Russian patent № 2360779. Publ. 10.07.2009.

- *Sarach B.M., Bychkova E.V., Prudnikova Yu.I.* Device for multi-post accumulator charge. Russian patent on the useful model № 91482. Publ. 10.02.2010
- *Sarach B.M., Bychkova E.V., Prudnikova Yu.I.* Installation for multi-post accumulator charge. Russian patent on the useful model № 91481. Publ. 10.02.2010
- *Nikol'skiy A.A., Koroliov V.V., Katsevich V.L.* Device for accuracy increase of turning treatment of non-circular articles. Russian patent № 2393952. Publ. 10.07.2010.
- *Nikol'skiy A.A., Koroliov V.V., Katsevich V.L.* Method of checking of piston form and device for its providing. Russian patent № 2403535. Publ. 10.11.2010.
- *Kozachenko V.F., Ostririv V.N., Rusakov A.M., Remezov A.N.* et al. Low-noise gated-inductor motor. Russian patent on the useful model № 99663. Publ. 20.11.2010
- *Kozachenko V.F., Aliamkin D.I., Lashkevich M.M.* et al. The system of vector sensorless control of the multi-phase electric motor. Russian patent on useful model # 99911. Publ. 27.11.2010

Dissertations

- *Tolstykh O.A.* Development and research of calibrated electric drive with the gated motor: Dissertation for cand. sci. (techn.), 2010.
- *Shtin E.N.* Effectiveness increase of circulation systems of hot-water supply by means of electric driive: Dissertation for cand. sci. (techn.), 2010.
- *Babkin E.A.* Modernization, investigation and diagnostics of the control systems for the asynchronous frequency-regulated electric drive of mechanisms of drilling rig: Dissertation for cand. sci. (techn.), 2010.

Partners

- JSC «Elektroprivod», Moscow
- JSC «All-Russian R&D Institute of electromechanics, Moscow
- JSC «RUSELPROM», Moscow
- JSC «NIPTIEM», Vladimir
- JSC «MOEK»
- JSC «Rudoavtomatika», Zhelesnogorsk, Kursk region
- FGUP «VNIINMASH», Moscow
- Moscow Office of Siemens Company, Germany
- Moscow Office of Shneider Electric Company, France
- Technical university of Ilmenau, Germany

Unique equipment

- The universal bench for testing of converters, motors and complete electric drives at normalized parameters of network and load parameters
- Thermal moisture chamber with device for testing on vibro-strength and vibro-stability
- Computerized bench for automated electrical motor testing
- Universal bench for investigations of parameters and characteristics of articles with complicate form (including the vibro-bench V400LT, power amplifier DSA1-2K and the bench «Etalon -1MSh (L761)» for adjusting the technological processes on non-circular turning and the urgent form diagnostics of rotation bodies)

DEPARTMENT OF ELECTRIC TRANSPORT (DET)

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14 lecturers
3 researchers
8 post-graduate students, 1 candidate

Head of Department
Ph.D., Senior Researcher
Vladimir A. GLUSHENKOV

Priority research activities

Research Supervisors

- **Development of electric drives for autonomous rolling-stock**
  Senior Researcher Trofimenko V.I., Associated-Professor Kolobov M.G.
- **Development of electric equipment for trams and trolley-buses**
  Senior Researcher Glushenkov V.A.
- **Development of electric supply systems and traction substations**
  Professor Sleptsov M.A., Associated-Professor Dolaberidze G.P.
- **Development of rail and special rolling-stock**
  Senior Researcher Trofimenko V.I.
- **Automatic control systems for the main transport**
  Professor Tulupov V.D.

Agreements, contracts, projects

- Investigation of the reversible traction converter for rolling-stock of the urban electric transport
- Investigation of the traction converter for the trolley-bus with the motor of the combined excitation
- Development of the traction electrical equipment for the trolley-bus with IGBT regulators
- Development of the traction electrical equipment for the urban rolling-stock
- Development of the converter for the traction electric drive of the trolley-bus
- Development of the complete traction electric equipment for the tram-car drive with the reduced floor level
- Development and manufacture implementation of the efficient electric drives on the basis of inductor motors for auxiliary needs of rolling-stock of the urban electric transport
- Development of ecologically pure efficient electric drives on the basis of collector free AC motors using the promising semiconductor devices
- Development of specific electrical equipment, assembling, testing and evaluation of energy parameters of the experimental section of electric train EP2C
- Adjustment and testing of experimental sets of the traction electric equipment with asynchronous drive of different destination
- Protection of DC cables of the ground urban electric transport
- Development of asynchronous traction electric drives for cars
- Development and implementation of the powerful series of converters for the traction asynchronous drive of different destination
- Development of the traction drive with the linear asynchronous motor of the transport mini-system
- Choice of the conception of traction electric drive construction with a system of electric energy recuperation and energy unit on the basis of the electric-chemical generator with hydrogen-air fuel elements for the experimental sample of the urban bus of small capacity

- Development and implementation of the traction converters for trolley-buses and electric buses
- Development of theoretical principles for transport system creation with combined energy units and intellectual support of the life cycle
- Development of conceptual suggestions and fundamentals of energy efficiency and ecological safety growth of electrical engineering complexes and systems
- Development of construction concept for electric drives with the recuperation and energy accumulation system for urban public transport
- Development of theoretical fundamentals and choice of evaluation criteria of the operation efficiency of urban transport facilities with a hybrid drive
- Development of theoretical principles for creation of high-speed transport systems for megapolis with energy effective cycles

Key publications

- *Zhdanovich Ch.I., Plishch V.N., Pokrovskiy Yu.Yu., Sleptsov M.A. (under edition of Frolov N.N.)* «Mechanical equipment of a tram and a trolley-bus». Textbook for students. (in Russian) TulGU Publ., Tula, 2008. 179 p.
- *Prechisskiy V.A., Martishin S.A.* «Electrical transmission of the diesel locomotive with microprocessor control». Textbook for students (in Russian). Moscow: MPEI Publ. 2008. 68 p.
- *Glushenkov V.A., Rumiantsev M.V.* Traction drive for transport means with capacitor accumulator (in Russian). Electrika, № 12, 2008. P. 12—14.
- *Borisov I.D., Dolaberidze G.P.* Imitation model of the DC cable line 0.6 kV (in Russian). Izvestia Tul'skogo universiteta. Technical Sciences. Issue 1. I 2 parts. Tula GU Publ., 2009. P. 68—74.
- *Dubinin A.V., Bykov A.A., Kolobov M.G.* Hybrid transport (in Russian). Scientific-technological collection «Municipal economy» Issue 88. Series: Technical Sciences, Kiev. Tekhnika Publ., 2009. P. 275—280.
- *Ulitin V.G.* The problem of the redundant energy application on the urban electrical transport (in Russian) // Scientific-technological collection «Municipal economy» Issue 88. Series: Technical Sciences. Kiev. Tekhnika Publ., 2009. P. 266—271.
- *Rumiantsev M.V., Glushenkov V.A.* Traction drive of transport means with capacitor accumulator (in Russian) // Ibid. P. 259—263
- *Martishin S.A., Prechisskiy V.A.* Investigations of asynchronous traction drive operation in the underground car (in Russian) // Ibid. P. 329—332.
- *Garbuziuk V.S., Tulupov V.D.* Alternative systems of energy-saving traction DC electric drive (in Russian) // Proc. of Intern. Scient. Conf «Problems of Electrical Engineering, Electrical Power Engineering and Electrical Technologies»– Toliatti: TGU Publ., 2009. Part 1. P. 62—65.
- *Borisov I.D., Dolaberidze G.P.* Energy accumulators in the electric supply system for urban electric transport. (in Russian) // Ibid. p. 181—182.
- *Nikolaev Yu.D.* High-frequency resonant protection system for DC cable lines 0.6 kV against short-circuit to the ground (in Russian) // Ibid. P. 111—114.
- *Rumiantsev M.V., Glushenkov V.A.* Optimization of electric equipment parameters of the transport means with the hybrid power unit (in Russian) // Ibid. P. 236—240.
- *Rashek Yu.V., Tulupov V.D.* Ways of improvement of the energy saving system of the traction electric drive for DC electric trains (in Russian) // Ibid. P. 336—339.

- *Tulupov V.D., Garbusiuk V.S.* Estimation of effectiveness and opportunity of the mass implementation of energy-saving DC electric trains (in Russian) / MPEI Vestnik, № 5, 2010. P. 73—80.
- *Andreev D.V., Savina T.I.* Central point of the remote control of the traction sub-station with usage of the modern digital engineering (in Russian) // Proc. of 15th Intern. Conf. of students «Electromechanics, Electrical Technoklogies Electrical Materials and Components». Moscow: MPEI Publ., 2009. Part 2. P. 180—181.
- *Moskaliov M.V., Osipov V.E.* Development of distributive device for urban electric transport (in Russian) // Ibid. P. 193.
- *Bykov A.A., Kazakov I.S., Kolobov M.G.* Traction drive of electric car (in Russian) // Ibid. P. 181—182.
- *Dubinin A.V., Kolobov M.G.* Hybrid transport (in Russian) // Ibid. P. 184—185.
- *Mamatov A.I., Sleptsov M.A.* Microprocessor control system for the traction gated-induction drive (in Russian) // Ibid. P. 191—192.
- *Rumiantsev M.V., Glushenkov V.A.* Optimization of parameters of electrical equipment for transport means with hybrid power unit (in Russian) // Ibid. P. 195—196.
- *Chinakov S.V., Glushenkov V.A.* Transport means with hybrid drive (in Russian) // Ibid. P. 200—201.
- *Sorokin M.A., Marchenkov A.P.* Traction-energy indices of underground cars with asynchronous drive (in Russian) // Ibid. P. 196—197.
- *Khudiakov V.A., Tulupov V.D.* Modernization of electrical equipment and energy index increasing for DC electric train (in Russian) // Ibid. P. 199—181.
- *Lavren'tiev S.B., Marchenkov A.P.* Microprocessor control system for traction asynchronous electric drive (in Russian) // Ibid. P. 188—189.
- *Rashek Yu.V., Tulupov V.D.* Reduction of the total number of start-regulating apparatus on the electric train with energy-saving system of traction electric drive (in Russian) // Ibid. P. 193—194.
- *Khmarskiy V.N., Rumiantsev M.V., Glushenkov V.A.* Traction converter for electric drive of transport means with the hybrid energy unit (in Russian). Proc. of Intern. Scient-Practical Conf. «Energy and resource-saving in industry and transport» Partenit (Crimea, Ukraine), 5—9 of October, 2009. Kiev, Paton Institute, 2009. P. 18—19.
- *Bykov A.A., Kolobov M.G.* Fuel elements on the car (in Russian). Proc. of XVI-th Intern. Scient-Technol. Conf. of Students «Radio Electronics, Electrical and Power Engineering». Moscow: MPEI Publ., 2010. Vol. 2. P. 205—206.
- *Vasina A.S., Marchenkov A.P.* Static converter for the underground car (in Russian) // Ibid. P. 206—207.
- *Dubinin A.V., Kolobov M.G.* Development of computer model of the rechargeable battery and the model of super-capacitor (in Russian) // Ibid. P. 209—210.
- *Le Suan Khong, Tulupov V.D.* Modernization of power circuits of DC electric rolling-stock (in Russian) // Ibid. P. 210—211.
- *Mosin A.S., Garbuziuk V.S.* Modernization of traction drive of DC electric locomotive (in Russian) // Ibid. P. 213—214.
- *Moskaliov M.V., Osipov V.E.* Compact traction substation of ground urban electric transport (in Russian) // Ibid. P. 214—216.
- *Nguen Ch. L., Osipov V.E.* Development of structural diagram of the bench for diagnostics of power semiconductor devices (in Russian) // Ibid. P. 216.
- *Rumiantsev M.V., Glushenkov V.A.* Parameter optimization of electrical equipment of transport means with the hybrid power unit (in Russian) // Ibid. P. 217—218.

- *Satsiuk V.V., Savina T.I.* Prospects of new power semiconductor gate utilization in rectifying-inverter converters (in Russian) // Ibid. P. 218—219.
- *Tiu M.D., Savina T.I.* Rectifying-inverter converter for underground in Hanoi-city (in Russian) // Ibid. P. 220—221.
- *Ulitin V.G., Sleptsov M.A.* Problem of redundant energy recuperation usage on the urban electric transport (in Russian) // Ibid. P. 222.
- *Tselikin Yu.N., Glushenkov V.A.* Application of the gated motors in the traction drive of the low-floor tram (in Russian) // Ibid. P. 223.
- *Chinakov S.V., Glushenkov V.A.* Application of the gated motors in the traction drive of the low-floor trolley-bus (in Russian) // Ibid. P. 223—225.
- *Chuzhov D.P., Prechisskiy V.A.* Prospects of the hybrid electrical transmission application on the shunting diesel locomotives (in Russian) // Ibid. P. 225—226.
- *Chuzhov D.P., Prechisskiy V.A.* Peculiarities of electric-chemical capacitor application in the hybrid electrical transmission of the shunting diesel locomotive (in Russian) / Proc. of V-th Intern. Scient. Conf. of Yourth «Tinchurin Conference», Kazan, 2010 Part 3. P. 41—42
- *Dubinin A.V., Kolobov M.G.* Development of the computer model of rechargeable battery (in Russian) // Ibid. P. 43—44.
- *Chinakov S.V., Rumiantsev M.V., Glushenkov V.A.* Electrical equipment of transport means of the medium capacity (in Russian) // Ibid. P. 55—56.
- *Dubinin A.V., Kolobov M.G.* Development of a computer model of the battery and supercapacitors model // Proc. of 13th International Conference on Electomechanics, Electrotechnology and Electromaterial Science. Alushta, Crimea, Ukraine 2010, P. 134—135.
- *Rumiantsev M.V., Glushenkov V.A.* Electrical equipment of vehicles with hybrid propulsion system // Ibid. p. 130—131.
- *Borisov I.D., Dolaberidze G.P.* Stores of energy recuperation recovery in traction electrical power supply of city electric transport // Ibid. p. 135.
- *Rashek Yu.V., Tulupov V.D.* Service reliability of energy-efficient suburban dc electric multiple-unit train // Ibid. P. 131—132.
- *Moskaliov M.V., Sleptsov M.A.* Modeling of electromagnetic conditions on traction substations of city electric transport // Ibid. P. 133.
- *Mamatov A.I., Sleptsov M.A.* Application of spline-approximation of inductance curve while modeling switched reluctance motor // Ibid. P. 132.
- *Borisov I.D., Dolaberidze G.P.* Accumulators of redundant energy of recuperation in the traction electric supply of urban electric transport (in Russian) // Proc. of XL All-Russian scient.-practical conf. with elements of scientific school for youth, Moscow, 2010, P. 47—48
- *Mamatov A.I., Sleptsov M.A.* Application of spline-approximation of the induction curve at modeling of the gated-inductive motor (in Russian) / Ibid. P. 98—100.

Patents

- Russian patent on the useful model № 78988. Device for frequency current protection of cable lines. Authors: Dolaberidze G.P., Nikolaev D.Yu. Publ. Bull.. № 34 dated 10.12.2008, 2 p.
- Russian patent on the useful model № 89034. Transport means with energy accumulator. Authors: Dubinin A.V., Kolobov M.G., Kazakov I.S. Publ. Bull. № 34 от 2009, 2 p.

Partners

- JSC «Dynamo», Moscow
- JSC «St-Peterburg trolley-bus plant», Sankt-Peterburg
- JSC «Trolley-bus plant», Engel's, Saratov region
- JSC «Zaporozhie Electric Apparatus plant», Zaporozhie, Ukraine
- JSC «VologdaElectroTrans», Vologda
- JSC «Trans-Alfa», Vologda
- JSC «Ratep», Serpukhov, Moscow region.
- JSC «TatElectroMash», Naberezhye Chelhy
- State Company «Mosgortrans», Moscow
- State Company «Gorelectrotrans», Sankt-Peterburg
- State enterprise «Moskovski Metropoliten», Moscow
- JSC «Krosna», Moscow
- Mosgortransyiiproject, Moscow
- Moscow rail-way, Moscow
- Moscow Locomotive plant, Moscow
- R&D Institute of the plant «Electrotiazhmash», Kharkov, Ukraine
- JSC «All-Russian R&D Institute of electrical locomotivy construction», Novocherkassk
- JSC «Scientific-Industrial Association «Novocherkassk elecrical locomotive plant», Novocherkassk
- JSC Plant Raduopribor, Sankt-Peterburg
- Design Bureau «Yuzhnoe», Dnepropetrovsk, Ukraine
- Scientific-technological Center «Temp», Moscow
- R&D «Dynamo», Moscow
- R&D Institute of urban electric transport, Moscow
- JSC «Technical Center of Electric transport service», Moscow
- Jont-Venture «Tatra-Yug», Odessa, Ukraine
- R&D enterprise «Energia», Moscow
- Moscow Industrial Association «Aggregate»
- "Maikop trolley-bus division"
- JSC "RKK Energia", Koroliov
- JSC «Moscow Committee on science and technology», Moscow
- JSC «TransElectric», Moscow
- JSC «Konopus», Zlatoust

Unique equipment

- Bench for testing of traction electric drives for trolley-buses and the motor-wheel machines
- Installation for physical modeling of electric drives with inertial mass for transport means
- Bench for testing of electric drives with gated traction motors
- Bench for simulation of the diesel-generator unit for cars with motor-wheels
- High-voltage bench for testing and checking of powerful semiconductor devices
- Bench foe testing the car electric drives
- Bench for testing of high-voltage static converters for proper needs in tram and trolley-bus

- Installation for testing of the motor-compressor with the inductor motor for trolley-bus or rolling-stock of underground
- Installation for testing of electric drives of the trams and trolley-buses
- Bench for testing of traction motors for trams and trolley-buses by means of recurrent operation
- Bench for testing of electrical drives of DC and AC for motor-wheel machines
- Bench for testing of the traction drives of the Moon research vehicles, self-propelled trolleys
- Bench for testing of the linear asynchronous drive
- Bench for testing and debugging of microprocessor systems for traction AC and DC drive control

POWER SUPPLY OF INDUSTRIAL ENTERPRISES (PSIE) DEPARTMENT

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E-mail: ESPP-all@mpei.ru; ESPP@mpei.ru

19 lecturers,
2 researcher,
22 post-graduate students.

Head of Department
Ph. D. (Techn.)
Associated-Professor,
Sergey A. TSYRUK

Priority research activities

Research Supervisor

- **Electromagnetic compatibility of the electrotechnical complexes with the nonlinear characteristics**
  Associated-Professor Tsyruk S.A.
- **Automation of the calculation-experimental investigations of transients in the power supply systems of the industrial enterprises**
  Professor Gamazin S.I.
- **Energy consumption parameters determination and forecasting for the existing and rebuilt enterprises with an optimization of the mounted and repaired electric equipment structure**
  Professor Kudrin B.I.
- **Electromagnetic compatibility of the power converter devices with the electric supply system of the industrial enterprises**
  Associated-Professor Bure I.G.
- **Energetic research of the enterprises, the organizations and the offices**
  Associated-Professor Kondratiev A.V.
- **System monitoring of power consumption indicators and objects power efficiency at work in the electric power markets**
  Associated-Professor Matiunina Y.V.
- **Electrical supply of the industrial enterprise consumers from the autonomous supply sources**
  Associated-Professor Hevsuriani I.M.

Agreements, contracts, projects

- Conception development and theoretical application substantiation of ways of economy of electric energy and increase of its quality at the industrial enterprises
- Research and development of the theoretical bases of an electric energy saving and an electric consumption regulation at the enterprises with the continuous technological process
- Conception development and the theoretical optimization substantiation of the electric consumption regimes and the electric energy saving at the enterprises with the continuous technological process
- Development of the new generation of fast-acting microprocessor transfer switch device and hybrid filters
- Development of the issues «Consumers' electric energy decrease» and «Decrease of the peak consumption» of the city special program of the electric energy consumption in the city of Moscow during 2009—2013 years
- Optimization of a power consumption by improvement of electromagnetic compatibility of networks of general purpose and consumers of the electric power of objects

Key publications

- *Bodrukhina S.S.* Technical exploitation rules in questions and answers. Study guide. Moscow: KNORUS, 2009. 158 p.
- *Bystritsky G.F.* The general power engineering. Study guide. 2nd edition. Moscow: KNORUS. 2010. 296 p.
- *Ancharova T.V., Rashevskaya M.A.* Power supply of the industrial enterprises. The collection of problems. Moscow: MPEI Publishing House, 2009. 64 p.
- *Hevsuriani I.M.* Industrial enterprises power supply system alignment works organization. Study guide. Moscow: MPEI Publishing House, 2009. 20 p.
- *Kudrin B.I.* «Promishlennaya energetika» and an electric economy // Prom. energetika, 2009, No 8. P. 2—9.
- *Kudrin B.I.* Industrial enterprises power supply: Study guide. Moscow: Publishing center "Teplotechnik", 2009. 698 p.
- *Kudrin B.I.* Technical philosophy or technology philosophy: post-non-classical vision / Science. Philosophy. Society. Materials of V Russian philosophical congress (Novosibirsk, 25—28 August 2009). T. 1. Novosibirsk: Parallel, 2009 (531 p.). P. 316.
- *Kudrin B.I.* Ontology and gnoseology of a technical reality. MPEI Vestnik, 2009, No 3. P. 117—120.
- *Kudrin B.I.* The electrical savings concept in government standard and its practical realizability / About the project of the Federal law «About power savings». Moscow: Technetica, 2009. P. 30—46.
- *Reference* book about power supply and an electric equipment enterprises and public buildings / Under general redaction S.I. Gamazina, B.I. Kudrin, S.A. Tsyruka. Moscow: MPEI Publishing House, 2010.
- *Matiunina U.V., Novikov S.S.* Mutual relations normal-right base in the electric power markets. Study guide. Moscow: IPKgossluzhby, 2009. 64 p.
- *Bure I.G., Hevsuriani I.M.* Protection construction speciality from single-phase short circuit in distributive networks under 1 kV // MPEI Vestnik No 5. 2010. P. 48—54.
- *Tsyruk S.A., Kosharnaia U.V., Evgrafov S.A., Ponarovkin D.B., Stepanov D.I., Jatsenko E.S.* Subsubscribers load influence on level of losses of the electric power in enterprises network // Prom.energetika, 2010. No 8. P. 9—15.
- *Ragutkin A.V., Raubal E.V., Kladova T.V.* New approach to a choice of cables in electric installations to 1 kV with various systems of grounding // Prom. energetika, 2010. No 8. P. 16—21.
- *Solovev S.V.* Research of electric installations protection devices from pulse overvoltage on imitating model // Prom.energetika, 2010. No 8. P. 22—24.
- *Kondratev A.V., Hevsuriani I.M.* Industrial enterprises power supply system installation organization. Study guide. Moscow: MPEI Publishing House, 2010, 4,0 p.
- *Kudrin B.I.* The third scientific picture of the world. St. Petersburg: SPbGUP, 2010. 2,0 p.p.
- *Bystritsky G.F.* The general power engineering. Study guide for average technical education. Moscow: Publishing house KNORUS, 2010. 18,5 p.
- *Kireeva E.A.* Power supply and an electrical equipment of chops of industrial enterprises. Moscow: Publishing house KNORUS, 2010. 23,0 p.
- *Kireeva E.A., Tsyruk S.A.* Relay protection and automatics of electropower systems. Moscow: Publishing center "Academy", 2010. 18 p.

- *Ancharova T.V.* Industrial enterprises power supply. The collection of problems. Methodical guide. Moscow: MPEI Publishing House, 2010. 3,75 p.
- *Kireeva E.A., Bystritsky G.F.* Reference book power engineer of the enterprises, establishments and the organizations. Moscow: Publishing house "Kolos". 2010. 50,25 p.

Dissertations

- *Zelenkova L.I.* Methodology development of maintenance of quality of electro-energy from voltage 0,4 kV to 220 kV in the conditions of power reforming. Dr. Sci. (Techn.) Dissertation. Moscow, 2009.
- *Pahomov A.V.* Methodology of forecasting of the monthly expense of electric energy of consumers of region for monitoring and acceptance of strategic decisions on a power consumption. Cand. Sci. (Techn.) Dissertation. Moscow, 2009.
- *Guzhov S.V.* Methodology development of a design of the established modes of electric networks of external illumination taking into account nonlinear characteristics light-emitting diode fixtures. Cand. Sci. (Techn.) Dissertation. Moscow, 2009.
- *Egorov M.S.* Methodology development of a design and recommendations about increase of residual voltage in networks 6—10 kV systems of an electrical supply of the metallurgical enterprises. Cand. Sci. (Techn.) Dissertation. Moscow, 2009.
- *Ragutkin A.V.* Methodology development of indirect contact protection working efficiency check in electric installations under 1 kV at an electrical supply from static type uninterruptible power supply. Cand. Sci. (Techn.) Dissertation. Moscow, 2009.
- *Gumirov D.T.* Estimation of short-term failure of electrical supply influence for work of consumers of the oil-extracting enterprises and working out of device AVR for their reliable power supplies. Cand. Sci. (Techn.) Dissertation. Moscow, 2010.
- *Raubal E.V.* Methodology development of indirect contact protection working efficiency check in electric installations under 1 kV with various systems of grounding. Cand. Sci. (Techn.) Dissertation. Moscow, 2010.

Patents

- «The Program complex»Transients at non-full-phase modes of systems of an electrical supply»». Authors Gamazin S.I., Tsyruk S.A. Certificate about the state registration of the computer program № 2009613025. The legal owner of MPEI (TU) (RU). The demand № 2009611746. Receipt date on April, 21st, 2009. Registered in the catalogue of the computer programs on June, 10th, 2009
- «The Program complex «Park-Goreva Transients»». Authors Gamazin S.I., Tsyruk S.A. Certificate about state registration of the computer program № 2009613026. The legal owner of MPEI (TU) (RU). The demand № 2009611747. Receipt date on April, 21st, 2009. Registered in the catalogue of the computer programs on June, 10th, 2009
- «The Program complex «Transients at asymmetrical short circuit»». Authors Gamazin S.I., Tsyruk S.A. Certificate about the state registration of the computer program № 2009613027. The legal owner of MPEI (TU) (RU). The demand № 2009611748. Receipt date on April, 21st, 2009. Registered in the catalogue of the computer programs on June, 10th, 2009

Partners

- «Electroproekt», Moscow
- Polytechnic University, Wroclaw, Poland

- West-Siberia metallurgical plant, Novokuznetsk
- «Orgenergogaz»
- «TNK-BP Menegment»
- High school of electricity «Supelec»

INSTITUTE OF ELECTRIC POWER ENGINEERING (IEPE)

Institute Director

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Institute Departments

ELECTRICAL POWER PLANTS DEPARTMENT (EPP)

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20 lecturers,
5 research fellows,
11 post-graduates.

Head of Department
Ph.D (Techn.), Professor
Yury P. GUSEV

Priority research activities

Research Supervisors

- **Scientific basis of electrical installations design development, principles and PC software for short-circuit currents calculation development**
  Professor Gusev Yu.P.
- **Modes of operation and diagnostic of electrical power plants and substations primary electrical equipment**
  Professor Starshinov V.A.

Contracts

- Development of short-circuit currents calculation model for regional distributional grid JSC «MOESK»
- Preparation to certification of short-circuit currents calculation procedures of ETAP software in STC NRS
- Development of the branch standard «UEG substation auxiliaries. Typical designing patterns»
- Development of the branch standard «(Auto)transformers quantity, capacity desigion guidelines at substations with high voltage 220—500 kV»

Key publications

Articles and conference papers

- *Borodkin A., Gusev Y.P., Trofimov A.V.* Laboratoty system for electrical installations automatic control system (ACS) study (in Russian). Modern automation technologies. № 4. 2009. P. 64—67.
- *Borisov R.K., Gusev Y.P.* Substation auxiliaries DC systems diagnostics (in Russian). Energoexpert. № 1. 2010. P. 40—45.
- *Borisov R.K., Gusev Y.P., Julikov S.S.* Substation auxiliaries DC systems state astimation (in Russian). Energoexpert. № 3. 2010. P. 41—43.
- *Asainov D.N., Gusev Y.P.* Gas-turbine station (GTS) dynamic stability and electrodynamic withstandability studies (in Russian). Vestnik MPEI, 2010. № 2. P. 55—61.
- *Gusev Y.P., Cho G.Ch.* Guidelines development for designing and operation of new generation electrical power plants auxiliaries (in Russian). Proceedings of all-Russian scientific and practical conference ENERGO-2010 Vol. 2. P. 19—22.
- *Lopatin V.V., Trofimov A.V.* Project development features of ACS in operating capacities (in Russian). Teploenergetika, 2010. № 10. P. 23—26.
- *Alexandrov A.S., Jukov V.V.* Application of diesel gensets as bypass power source in GTS auxiliaries (in Russian).. Radiotechnics, electronics and power engineering: 16-th international scientific and practical conference of students and post-graduates. Abstracts. Vol. 3. P. 402—404.

- *Antonov A.A., Gusev Y.P.* Study of heating process of XLPE cables during double short-circuit faults based on thermal conductivity equation (in Russian). Ibid. P. 404—405.
- *Artamonov P.V., Drobyshevskiy A.A., Polyakov A.M.* Frequency instanation of frequency analysis procedure for transformers mechanical deformations diagnostic apparatus. Radiotechnics, electronics and power engineering: 16-th international scientific and practical conference of students and post-graduates. Abstracts. Vol. 3. P. 405—407.
- *Artemov O.M., Gusev Y.P.* Methods of the asynchronous motors influence estimation for the switching capacity and protection sensitivity revision (in Russian). Ibid. P. 407—408.
- *Volkov M.S., Timonin I.A., Gusev Y.P.* Substation auxiliaries DC-network overvoltage protection (in Russian). Ibid. P. 410—411.
- *Dolin S.A., Trofimov A.V.* Experimental and analytical procedure for rigid busbar toughness revision with wind-induced resonance consideration (in Russian). Ibid. P. 411—412.
- *Dolin A.P., Egorova L.E.* Design value influence to rigid busbar wind-induced and electrodynamic toughness (in Russian). Ibid. P. 413—414.
- *Gusev Y.P., Monakov Y.V.* Electrical power plants and substations auxiliaries DC-network isolation monitoring devices testing (in Russian) / Ibid. P. 422—423.
- *Savilov S.N., Jukov V.V.* Study of turbine-driven asynchronous generator influence to short-circuit currents in electrical power plant (in Russian) / Ibid. P. 429.
- *Cho G.Ch.* New approaches in electrical power plants and substations auxiliaries design. Abstracts of Russian-Korean scientific conference dedicated to 20th anniversary of diplomatic relations. P. 10—14.

Dissertations

- *Ignatov V.V.* Electrical grid dividing to short-circuit currents limiting and estimation of it's influence to power system operation states. Ph.D dissertation. Moscow, MPEI, 2010

Partners

- JSC Federal grid company of UES (FGC of UES)
- JSC Moscow regional grid company (MOESK), Moscow
- JSC ABB Automation
- JSC Firma ORGRES, Moscow

Unique equipment

- Educational, research and testing center (ERTC) of EPP department consists of the low-voltage equipment laboratory, the high-voltage equipment laboratory, the laboratory of electrical facilities automatic control systems
- The low-voltage equipment laboratory equipped with the chargers, inverter, DC and AC switchgears and the DC current source by way of super-capacitors battery with the unique capacity of 40F. Also there are several automation-equipped working places equipped with the digital oscillators FLUKE, regulated load banks, laptops, switching units for short-circuit fault experiments carrying out
- The high-voltage equipment laboratory is equipped with the switchgear and control gear, unique set of switch and relay units. Every vacuum breaker drivegears and protection units installed in cubicle differ from each other. Also there are several automation-equipped working places equipped with the digital oscillators, infrared image converters, meggers, laptops with the specialized software for transient process

in power electrical systems study — EMTP RV Package (Canada), switching units for short-circuit fault experiments carrying out

- The laboratory of electrical facilities automatic control systems is equipped with the automation-equipped working places for ACS devices study. Due to wide range of ACS devices installed in the lab there are possibilities to carry out controller programming tasks and different configuration and operation modes study
- In 2010 the newest automatic control system for electrical facilities of electrical power plants and substations was installed in EPP department lab. This system integrates in united information and control model all equipment in operation of all EPP department labs. This system consists of ACS server, network means, specialized software, personal automation-equipped working places, digital protection units of power generation units, transformers, auxuliaries and transmission lines, low-voltage AC switchgear controllers, DC switchgear controllers, medium voltage AC cubical switchgear controllers

DEPARTMENT OF ELECTRICAL POWER SYSTEMS (EPS)

Phone: +7 495 673-03-40

The staff of the department includes
30 lecturers
30 research fellows
37 post-graduate students

Head of the department
Ph.D., Associate Professor
Yuri V. SHAROV

Priority research activities

Research Supervisors

- **Development of methods and means for ensuring economics reliable and stable operations of EPS**

  Associated-Professor Y.V. Sharov
- **Development of methods and means of improving EPS stability**

  Professor V.A. Stroev
- **Scientific basis of EPS structure, parameters and operating conditions optimization**

  Associated-Professor S.V. Shulgenko
- **Development of methods and means for ensuring reliability of EPS and electrical Power supply systems**

  Professor Yu.A. Fokin
- **Flexible AC transmissions systems (FACTS)**

  Associated-Professors S.Y. Syromiatnikov and Y.P. Ryghov,
  Senior research fellow O.N. Kuznetsov
- **Energy storage applications for improving efficiency and reliability of EPS**

  Senior research fellow D.V. Nikitin
- **Investigation of microprocessors based emergency control devices operations on the physical models of EPS**

  Senior research fellow S.Yu. Syromiatnikov
- **The problems of electromagnetic compatibility of technical devices and power quality provision**

  Leading research fellow I.I. Kartashev
- **Optimization of electric energy losses level in electrical networks**

  Associated-Professors G. V. Shvedov
- **Automation of operation and maintenance of distribution networks**

  Associated-Professor V.N. Tulsky
- **Developments of FACTS based on saturation controlled shunt reactors**

  Professor A.M. Briantsev
- **Perfection of calculation methods for mechanical properties assessment of transmission lines**

  Professor G.K. Zarudsky
- **Optimization of the structure and parameters of electrical power supply systems**

  Professors E.A. Konyikhova and T.B. Leshchinskaya
- **Automatic control of intersystem ties with asynchronized electromechanical frequency converters**

  Professor N.I. Zelenohat

Agreements, contracts, projects

- Development of schematic solutions and software for charging-sub charging devices
- Investigation of operating conditions of electrical network containing self-compensated overhead transmission line in combination with controlled shunt reactor. Estimation of technical and economic efficiency of the line
- Analysis of operational experience and faults statistics of modern electrical equipment for use in reliability calculations
- Analysis of means of ensuring reliable short circuits clearing in 100-275 kV networks schematic solutions including
- Analysis of experience in the use of phase shifting devices in Power systems of Italy, France, Belgium, Holland, Ireland, Germany, Great Arian and expert estimation of load flow calculations for 220kV tie connecting power systems of Urals and Siberia
- Analytical survey of the use of controlled series capacitive compensation devices in foreign power systems and analysis of the solutions for the application of these devices on 500 kV overhead transmissions lines
- Estimation of the areas of applications of various devices and means of control of 220 kV overhead transmissions lines of increased capacity with the account of their lengths and transmittance power
- Development of methodical guides for the use of high temperature conductors in overhead transmission lines
- Estimation of the areas of application of various devices and means of control of 220 kV overhead transmissions lines of increased capacity with the account o their lengths and transmitted power
- The measurements of power quality indexes in control point in the form of protocols (for each day), the results of measurements of load power in the form of daily diagrams and tables in electronic form. The estimation of power quality in controlled feeders
- Development of methodical guides for the use of high temperature conductors in overhead transmission lines
- Working out of technical assignment and time schedule for the construction of electric transmission line between Russia and South Korea
- Development of methodological basis for the synthesis of control algorithms for power transfers along intersystem ties
- Analysis of mathematical models of new controlled elements in electrical networks (FACTS). The synthesis of UPFC control structure and estimation of its efficiency
- Working out of operational rules for control centers of federal grid power systems of Russia (FQC) for ensuring required voltage levels
- Investigations on a physical model of the lasses in electrical network as influenced by electrical energy quality
- Organization of seminars-meetings and exanimations for the estimation of current level of technical competence of FGC substations masters
- Analysis of advantages of compact overhead transmission lines as compared to ordinary lines, analysis of their operational characteristics, expediency of the use of new device — controlled 220 kV shunt reactor

Key publications

- *Kartashev I.I., Podolsky D.S.* System approach to the control of electrical energy quality (in Russian). «Electricity» magazine, 2009, № 5. P. 2—7.
- *Kartashev I.I., Podolsky D.S.* Methodology of metering devices optimal allocation in electrical energy quality monitoring (in Russian). MPEI Vestnik, 2009 № 2. P. 82—88.
- *Zelenokhat N.I., Zelenokhat O.N.,* Pressured discrete control of synchronous generator electrical braking in power systems (in Russian). MPEI Vestnik, 2009, № 26. P. 72—76.
- *Briantsev A.M., Briantsev M.A., Diagileva S.V., Kalugina S.V., Karymal R.R., Lyrie A.I., Makletsova E.E., Negrishev A.A.* Controlled reactive power sources containing saturation controlled shunt reactors and capacitor banks (in Russian)– «Electrical Engineering», 2010, № 4. P. 11—19.
- *Zelenokhat N.I.* Technological reason of Sayano-Shuschenskaya hidro power station emergency (in Russian). MPEI Vestnik, 2010, № 1. P. 35—41.
- *Stroev V.A., Golov P.V.* Models for the analysis of transient in power system (in Russian). Proceedings of the Russian academy of sciences. Power engineering series 2010, № 6. P. 66—74.

Dissertations

- *Baataryn Purevsuren.* Development of control algorithms and investigation of using electrical algorithms and investigations of using electrical braking for improving transient stability in developing energy deficient power system. 2009
- *Latupov D.D.* Investigation of operating condition and stability of EPS containing controlled electrical transmission. 2009.
- *Poludnitcin P.Yu.* Working out control algorithm of controlled shunt reactors for EPS stability improvement 2009.
- *Podolsky D.S.* Working out of methodology of electrical energy quality monitoring in electrical networks 2009.
- *Lianzberg S.V.* Working out and the choice of excitation control algorithms structures for synchronous generators in power systems 2010.
- *Nekukar A.R.* Analysis of operational characteristics of controlled transmission lines with distributed series capacitive compensation 2010.
- *Osipov Ya.N.* Working out of reliability analysis method of large circuits with the use of generalized parameters. 2010.
- *Fainitsky O.V.* Working out of operational commutation control methodology in 110—500 kV networks aiming at reducing overloads and improving reliability. 2010.

Partners

- JSC «Russian Electrotechnical Institute»
- JSC «Federal Grid Company of United National Power Systems»
- Scientific-Technical Center of Electrical Power Engineering
- JSC «Interregional Networks Company Holding»
- JSC «Moscow regional Network Company»

Unique equipment

- Systems of excitations and speed of rotation control for synchronous generators of electrodynamics model
- Electrodynamics (physical) model of EPS
- Physical model of controlled shunt reactor
- Physical model of thirstier-controlled series Compensation
- Automated system of electro-physical experiment
- Charging-surcharging unit ensuring direct current voltage of 220V with currents up to 80 A
- Hardware and software complex «Direct Current source» DCS-MPEI.80
- Automatic voltage regulator AVR

HIGH-VOLTAGE ENGINEERING AND ELECTROPHYSICS (HVEEF) DEPARTMENT

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27 lecturers,
7 researcher,
6 post-graduate students.

Head of Department Ph.D. (Techn.),
Sergey I. KHRENOV

Priority research activities

Research Supervisors

- **Lightning protection of the constructions, the energetic objects and the flying vehicles**
  Senior Researcher Temnikov A.G., Leading researcher Borisov R.K.
- **Investigation of an electric strength of the high-voltage energy equipment isolation. High-voltage equipment testing**
  Associated-Professor Pintal' Yu.S.
- **Diagnostic methods for an inherent insulation of the high-voltage equipment**
  Professor Krivov S.A., Associated-Professor Pintal' Yu.S., Senior researcher Khrenov S.I.
- **Design of an internal isolation of the power transformers and reactors**
  Senior Lecturer Larin V.S.
- **Overvoltages in the electric systems and protection against it**
  Senior lecturer Matveev D.A.
- **Development of software for solution of the applied electrical power engineering problems**
  Senior Lecturers Matveev D.A., Kalugina I.E.
- **Investigation of a corona discharge in air and its technological application**
  Professor Vereschagin I.P.
- **Investigation of the electric-physical processes at surface and barrier discharge in gases and its technological application**
  Professor Krivov S.A., Leading Researcher Sokolova M.V.
- **Mathematical modeling and calculations of the electric fields**
  Professor Vereschagin I.P., Associated-Professor Beloglovskiy A.A.
- **Investigations of the electric-physical processes in discharges from an artificial cloud of a charged water aerosol**
  Associated-Professor Temnikov A.G.
- **Diagnostic methods for the grounded sub-station devices**
  Senior Researcher Zharkov Yu.V.
- **Modeling and investigations of the discharge phenomena in the electrically active clouds using the strongly charged aerosol formations**
  Associated-Professor Temnikov A.G.
- **Electromagnetic compatibility on the electric power engineering objects**
  Leading Researcher Borisov R.K.
- **Instigation of the applying processes for the charged powder materials in a static electrical field**
  Senior Researcher Khrenov S.I.
- **Electrostatic separation of the free-flowing materials**
  Professor Krivov S.A.

Agreements, contracts, projects

- Development of the experimental complex for physical simulation of power engineering object defeat processes by the lightning and for investigations of efficiency of different measures for lightning protection using the artificial clouds of the charged aerosol
- Project № 1.2/6234 of Russian Ministry of Education and Science «Investigations of formation mechanisms of the surface electrical charge, influence of surface properties and structure of solid dielectrics upon electric-physical processes in the gas charge» in the frames of «Development of scientific potential of higher schools (2009-2010)»
- Experimental determination of the permissible testing intensities in RIP-isolation of the capacitor type
- Grant of the President of Russia for state support of young scientists «Development of mathematical models and calculation methods of the impulse streamer corona»
- Development of new methods for calculations and evaluation of streamer corona influence on operation of energy equipment and for methods of this influence reduction
- Diagnostics of the urgent DC system on substations of JSC branch of «Moscow United Electric Network Company»
- Expertise of reasons of the transformer YECTB-160000.35-UHL4 ignition, which was supplied by «Electro Plant» to JSC «AMURMETALL»
- Development of multi-functional program package for calculation of lightning-protection of energy objects
- Development of determination method for moist-content and redundant resource of the solid isolation of powerful and measuring transformers for 110 kV and higher on the basis of absorbing characteristics
- Development of mathematical and engineering support and provision of comparable testing of the individual measuring system for complete influence of electromagnetic field
- Diagnostics of the system for operating DC of substations of the branch of JSC «Moscow United Electric Network Company
- Analysis of job descriptions of employees of technical service of JSC (FSK of EES)
- Development of the object list of professional-engineering competence of employees of technical service of JSC (FSK of EES)
- State contract № 02.741.11-2014 «Organizational-engineering support for fulfillment All-Russian scientific school for participants of the program «Participator of youth scientific-innovation competition»
- Development of physical-mathematical models for stages of electrical discharge in the air
- State contract № 1117 «Investigation of lightning and storm clouds influence mechanisms on the nose radio-transparent airplane radomes to decrease the risk of their destruction and failure of radio navigation equipment inside of it»
- RFFI grant «Experimental-theoretical investigation of ways for operation resource increase and effectiveness growth of formation of charged and chemically active particles in the plasma-chemical reactor»
- Development of software and methodic to conduct computerized laboratory investigations for studying the transient wave processes
- «Inspection on system of DC operation on substations № 378 «Central». № 396 «Yauzskaya», № 330 «Mendeleevo», № 164 «Losinka» of the branch of JSC «Moscow United Electric Network Company»
- Analysis of lightning bursting influence on the lightning proofness of ultra-high-voltage lines in the frames of State Contract № 02.516.12-6020 «Investigation and

development of the creation technology for energy-saving system for transmission and distribution at voltage over 1 million volt with participation of Chinese organizations»

- State Contract № P1076 «Development of technology for fuel granules and secondary raw material treatment obtained as a result processing of used car tires in the frames of federal oriented program «Scientific and Pedagogical Staff on innovational Russia» on 2009-2013
- Organizational-technical support of conducting the international with elements of scientific school for youth «Relevant problems of electromagnetic processing of materials»
- State Contract № 13.G25.31.0044 «Development of the electrical equipment set and basing technologies to increase reliability and lightning-proffness of air lines and substations for distribution network 6—10 kV»

Key publications

- ***Influence*** of model hydro-meteors on characteristics of the discharge final stage from the artificial cloud of charged water aerosol (in Russian) / A.G. Temnikov, A.V. Orlov, L.L. Chernenskiy et al. / GTF. 2009. Vol.79. № 10. P. 36—44.
- ***Influence*** of hydro-meteor model on the discharge final stage from the cloud of the charged water aerosol (in Russian) / A.G. Temnikov, A.V. Orlov, L.L. Chernenskiy et al. / GTF. 2009. № 10. P. 1437—1445.
- ***Vereshagin I.P., Tkachenko V.M., Chekalov L.V., Pashinin I.V.*** Features of collecting of the charged aerosols in the textile electric filters (in Russian) / A.G. Temnikov, A.V. Orlov, L.L. Chernenskiy, V.N. Bolotov, V.P. Pisarev (in Russian) // Electronic journal «News in Russian electrical power engineering». 2009. № 1. P. 1—20.
- ***Vereshagin I.P., Tkachenko V.M., Chekalov L.V.*** To substantiation of the smoke electric filter application with increased inter-electrode distance (in Russian) // Elerktrichestvo. № 2. 2009. P. 25—31.
- ***Vereshagin I.P., Tkachenko V.M., Chekalov L.V.*** Scientific fundamentals of creation of new generation of electric filters (in Russian) / Izvestia AEN, 2009, № 1, P. 19—22.
- ***Pavlenko A.M., Beloglovskiy A.A.*** About the efficient approach to calculation of self-consistent electrical fields with volumetric charge (in Russian) // Elerktrichestvo. 2009. № 5. P. 13—21.
- ***Vereshagin I.P., Beloglovskiy A.A., Pashinin I.V.*** Mathematical models of processes in corona discharge (in Russian) // Electronic journal «News in Russian electrical power engineering». 2009. № 5. P. 5—17.
- ***Vereshagin I.P., Beloglovskiy A.A., Pashinin I.V.*** Investigation of streamer propagation and the volumetric charge dissipation in the system of the «grounded rod in external electrical field» (in Russian) // Electronic journal «News in Russian electrical power engineering». 2009. № 7. P. 28—40.
- ***Kurbanov E.D.*** Modification of the fiber-glass surface in the barrier electrical discharge in the process of glass-fiber plastic manufacture (in Russian) // Elerktrichestvo. 2009. № 2. P. 32—36.
- ***Kurbanov E.D.*** Electric-discharge activation of the glass-fiber braid in the torch discharge i the air during glass-fiber plastic manufacture (in Russian) // MPEI Vestnik. 2009. № 1. P. 146—151.
- ***Garin Yu.V., Kurbanov E.D.*** Solid dielectric activation and disruption processes at impact of strong electrical fields (in Russian) // MPEI Vestnik. 2009. № 2. P. 68—71.
- ***Kurbanov E.D.*** Electric-discharge activation of the composition material surface in the torch discharge // MPEI Vestnik. 2009. № 2. P. 77—81.

- ***Kurbanov E.D.*** The dielectric attachment role in formation of nano-second pulse discharge in the dense air (in Russian) // Elerktrichestvo. 2009. № 4. P. 60—65.
- ***Kurbanov E.D.*** Physical processes at the impulse disruption of dielectric media (in Russian) // Elerktrichestvo. 2009. № 6. P. 12.
- ***Kurbanov E.D.*** Combined surface processing of glass-fibers by non-equilibrium electrical discharges in the technology of glass-fiber material manufacture (in Russian) // MPEI Vestnik. 2009. № 3. P. 17.
- ***Kurbanov E.D.*** About influence of the gas gap parameters on the discharge zone on nano-second discharge in the air (in Russian) // Problems of Energetic. Baku. 2009 / № 1. P. 55—58.
- ***Kurbanov E.D.*** Electrical disruption of water in millimeter and sub-millimeter gaps (in Russian) // Problems of Energetic. Baku. 2009 / № 1. P. 55—58.
- ***Papers*** in Encyclopedia «Electrical Engineering Encyclopedia» in 4 volumes (in Russian) / R.K. Borisov, I.P. Kuzhekin, D.A. Matveev et al. / Under edition of A.F. D'yakov. Vol. 3. Moscow. MPEI Publ., 2009.
- ***Investigations*** of the surface discharge emission in the dry air (in Russian) / M.V. Sokolova, K.V. Kozlov, S.A. Krivov et al // Letters to GTF. 2009. Vol. 35. № 5. P. 22—28.
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- ***Artamonov A.F., Paniushkin A.V.*** Influence of powder paintwork composition dispersion on the painting process (in Russian) // Promyshlennaya okraska. 2009. № 4. P. 34—36.
- ***Electromagnetic*** compatibility and lightning protection in electrical power engineering: textbook for universities (in Russian). A.F. D'iakov, I.P. Kuzhekin, B.K. Maksimov, A.G. Temnikov; under edition of A.F. D'iakov / Moscow: MPEI Publ., 2009, 455 p.
- ***Kurbanov E.D., Kuzhekin I.P., Hashimov A.M., Bndyakov A.S.*** The physical processes in water by affect of high-voltage short-front pulses // 5th International Conference on Technical and Physical problems of power engineering, TPE-2009, Spain, p. 245
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- ***M.V. Sokolova, K.V. Kozlov, S.A. Krivov, P.S. Manylov, V.G. Samoilovich.*** Spatial distribution of light emission of surface discharge from multi-stripped electrode in dry air and Ar // International Symposium on Plasma Chemistry (ISPC-19), 2009, Bohum, Germany, Paper No. P1.3.14
- ***Sharov Yu.V., Subbotina G.I., Belousov S.V., Tul'skiy V.N.*** Which should be the competence of power engineering specialist? (in Russian) // Elektroenergia. Transmission and Distribution. 2010. № 2. P. 96—98.
- ***Water:*** effects and technologies (in Russian) / V.V. Bagrov, A.V. Desiatov, Kazantseva NN. Et al. Engineer Publ., Oniko-M. 2010.
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- *About* distribution of the electric field near the electrode edge at the surface discharge (in Russian) / S.A. Krivov, V.S. Larin, M.V. Sokolova et al // Letters to GTF. 2010. Issue 3. Vol. 36. P. 68—75.
- *Sokolova M.V., Krivov S.A., Skuratov M.V.* Surface discharge at increased air temperature (in Russian) // Letter to GTF. 2010. Issue 11. Vol. 36. P. 24—30.
- *Sokolova M.V., Krivov S.A., Temnikov A.G.* About the interaction mechanism of the surface electric discharge with dielectric barrier (in Russian) // Elektrichestvo, 2010. №7. P. 10—19.
- *Temnikov A.G., Chernenskiy L.L., Orlov A.V., Poliakova O.V.* Experimental examination of the effect of artificial charged aerosol clouds on the model of nose airplane radomes (in Russian) // Letter to GTF. 2010. Vol. 36. № 18. P. 40—47.
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- *Complex* for determination of particle sizes of micron range in aerosol flow by laser small-angle method (in Russian) / V.S. Sysoev, M.U. Bulatov, D.I. Sukharvskiy, M.Yu. Naumove et al // Promising materials. 2010. № 8. P. 178—182.
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- *Annenkov V.Z.* Impulse resistance of grounding electrodes at secondary lightning discharge (in Russian) // Elektrichestvo, 2010. № 5. P. 14—18.
- *Sokolova M.V., Kozlov K.V., Krivov S.A.* The influence of Dielectric Films on the Macro- and Microscopic Properties of the Barrier Surface Discharges. Book of Confr. Papers of 12-th Int. Symp. on High Pressure Low Temperature Plasma Chemistry (NAKONE-12). Slovakia. 2010. Vol.1. P. 84—88.
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- *Sysoev V.S., Makal'skiy L.M., Sysoev M.V., Sidenko V.V.* Application of effects of optical laser radiation interaction with the aerosol particles to determine their sizes (in Russian) // Ibid. P. 34—39.
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- *Beloglovskiy A.A., Vereshchagin I.P.* About effective calculation of three-dimension fields of electric discharge in the air (in Russian) // Ibid. P. 110—115.
- *Surface* electrical discharge in the air and the influence on it the surface properties of the dielectric barrier (in Russian) // M.V. Sokolova, A.N. Mitin, S.A. Krivov et al. // Ibid. P. 143—149.
- *Borisov R., Kolomiets E., Smirnov M., Koliushko G.* Lightning protection efficiency determination method for power engineering objects. 30th Internartional Conference on Lightning Protection — ICLP-2010 (Cagliari, Italy — September 13th—17th, 2010). Paper 1026.
- *Temnikov A.G., Chernenskiy L.L., Orlov A.V., Polyakova O.V.* Experimantal investigations of possible physical mechanisms of interaction of lightning and

thounderclouds with the nose radomes of aircrafts models using artificial charged water aerosol cloud // Ibid. Paper 1162.

- *Borisov R.K., Kolechitskiy E.S.* About criteria of lightning protection effectiveness of power engineering objects (in Russian) // Second Russian Conference of Lightning Protection, (Moscow, 2010) / Report 3.6.1.
- *Borisov R.K., Kolomiets E.V.* Methods and means for reliability determination of the lightning protection of power engineering objects (in Russian) // Ibid., Report 3.6.2.
- *Temnikov A.G., Chernenskiy L.L., Orlov A.V., Poliakova O.V.* Experimental investigations of possible physical mechanisms of lightning and thunderclouds interactions with nose radomes of aircrafts on models using artificial clouds of charged water aerosol (in Russian) // Ibid. Report 4.5.
- *Temnikov A.G., Chernenskiy L.L., Orlov A.V., Poliakova O.V.* Experimental investigation of influence of the upper thunder cell and the ground using artificial clouds of the charged water aerosol (in Russian) // Ibid. Report 5.1.
- *Borodulin A.N., Molochnikov A.V., Kuzhekin I.P.* Investigation of characteristics of nonlinear over-voltage restrictors of 10 kV voltage class (in Russian) // Proc. of scient.-practical conf. «Increasing of reliability and operation effectiveness of electrical stations and energy systems ENERGO-2010» (Moscow, MPEI). Vol. 2.
- *Mitin A.N., Sokolova M.V.* Optimization of the surface discharge and its effectiveness at application of coverings from dielectric films (in Russian) // XL All-Russian Scientific-Practical Conference «Fedorovskie chtenia-2010» (Moscow, 16-19 of November 2010). P. 51—52.

Partners

- FGUP «State Scientific Center of Russian Federation — Physical Energy Institute named after A.I. Leipunskiy», Obninsk
- Non-commercial Partnership «Innovations in electrical power engineering»
- FGUP VEI named after Lenin, Moscow
- JSC «Electrozavod», Moscow
- JSC «ELNAP»
- JSC . «Iskra ZaöËite[a] Slovenia,
- FGUP «Design Bureau of transport machinery», Moscow
- JSC «NTC of electrical power engineering», Moscow
- JSC Moscow plant «Isolator» named after Barkov
- JSC NIIOGAS, Moscow
- Unique equipment
- Pulse voltage generator 1000 kV (certified)
- Source of alternate current WP 200/400 (certified)
- Four-component generator of lightning current (certified)
- Generator of charged aerosol
- Installation for partial discharge measurement in the isolation
- Generator of high voltage of high frequency (300 kV, 100 kHz)
- Generator of pulse currents 8/20 microsecond
- Generator of pulse currents 10/350 microsecond
- Double forming line 100 kV
- Generator of nano-second pulses of high voltage 100 kV, pulse duration 60—300 ns

RELAY PROTECTION AND POWER SYSTEM AUTOMATION DEPARTMENT (RP AND PSA)

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3 researchers,
10 post-graduate students

Head of Department
Dr.Sci. (Techn.),
Corresp. member of RAS
professor Anatoly F. DYAKOV

Priority research activities

Research Supervisors

- **Development of theoretical basis and implementation of integrated microprocessor relay protection, automation, control systems for power engineering objects of ultra-high voltage 330—750 kV**

  Professor Dyakov A.F.
- **Development of methods and principles of settings choice for complexes of relay protection and system automation**

  Professor Bylichev A.V.
- **Microprocessor systems of relay protection and automation**

  Associated-professors Babykin V.V., Barabanov Y.A., Vasilyev A.N., Klimova T.G., Temkina R.V.
- **Software for short circuit currents calculation and computer-aided relay protection design system**

  Associated-professor Barabanov Y.A.
- **Electromagnetic compatibility of microprocessor systems of relay protection and automation**

  Professor Maximov B.K., associated-professor Artsishevsky Y.L.
- **Development of complex methods of fault location systems application on power transmission lines**

  Associated-professor Artsishevsky Y.L.

Contracts

- Development of methods of intellectual distribution high voltage grids realization
- Development of scientific basis of relay protection and automatic emergency control means integration in power systems
- Research and development of hypervector measuring converter of parameters of three-phase electrical grid for electrical unions steady state and transient modes control systems
- Research and development of principles of anti-fault control in power supply system of a district of megalopolis under separation of own power source for isolated operation with balanced load
- Short circuit currents calculation and issue of recommendations on relay protection operation sorting

Key publications

- *Dyakov A.F., Kuzhekin I.P., Maximov B.K., Temnikov A.G.* Electromagnetic compatibility and lightning protection in power engineering. Manual for universities (in Russian). Moscow: MPEI publishers, 2009.

- *Bulychev A.V.* Relay protection of distribution grids in examples and problems with answers: tutorial (in Russian) / A.V. Bulychev, A.A. Navolochny. — Cheboksary: Chuvash institute publisher, 2010. 202 pages.
- *Bulychev A.V., Navolochny A.A.* Relay protection in distribution electric grids: practical calculations guide (in Russian). Moscow: ENAS, 2010. 216 pages.
- *Dyakov A.F.* and others New approach to design of automated transient modes control system in power unions (in Russian). MPEI publishers. Transactions of Whole-Russian scientific and practical conference «Increase of reliability and efficiency of power plants and power systems operation» Energo 2010. June 1—3, 2010. Moscow, MPEI (TU). Volume 2. P. 158—161.
- *Dyakov A.F.* Main directions of increase of reliability and efficiency of power plants and power systems development (in Russian). MPEI publishers. Transactions of Whole-Russian scientific and practical conference «Increase of reliability and efficiency of power plants and power systems operation» Energo 2010. June 1—3, 2010. Moscow, MPEI (TU), volume 2. P. 88—92.
- *Maximov B.K* and others Evaluation of coordinates of hypervectors for EPS transients using Proni method (in Russian). MPEI Vestnukr, № 2, 2010, P. 42—46.
- *Maximov B.K.* and others Цахилгаан эрчим хучний систем дэх шилжилтийн процессыг гипервектороор дурслэх. «ENERGY INDUSTRY DEVELOPMENT AND ECOLOGY» conference, Ulan-Bator, Mongolia, May 26—27, 2010. 3 pages.
- *Artsishevsky Y.L.* and others A way of frequency «system component» compensation (in Russian). Colleges' news. Electromechanics, special edition, 2010, 4 p.
- *A.G. Dolgopolov* and others Protection of semiconductor converters for controlled bypass reactors. Power Technology and Engineering (formerly Hydrotechnical Construction). Springer New York. Volume 44, Number 1 / May 2010.
- *Zhuravlev D.M.* and others Frequency monitoring under changing of electrical regime parameters in vector form (in Russian). Colleges' news. Electromechanics, № 2, 2010. P. 63—67.
- *Dolgopolov A.G.* Features of protection of controlled shunt reactors of different types (in Russian). Power plants, 2009.
- *Bylichev A.V.* and others Calculation of unsteady regimes of power systems for relay protection using PSS/E software complex. Relay protection and power system automation (in Russian). Digest of reports of XX conference (Moscow, June 1—4, 2010). — Moscow: «Scientific, engineering and information agency». 368 pages. P. 234—239.
- *Bylichev A.V.* and others Use of hardware-software complex RTDS for adjustment and verification of relay protection and system automation facilities. Relay protection and power system automation (in Russian). Digest of reports of XX conference (Moscow, June 1—4, 2010). Moscow: «Scientific, engineering and information agency». 368 pages. P. 303—309.
- *Bylichev A.V.* New generation of relay protection. Requirements to primary signal converters. Power engineering news, № 5 (65), 2010. P. 48—52.
- *Melnikov P.V.* Methodical aids for «Personal computer in power engineering» course (in Russian). Moscow: MPEI publishers, 2009.
- *Rascheplyaev A.I.* and others Choice of generic functions for wavelet transform for evaluation of parameters of transients in power engineering (in Russian). Fedorovskie readings — 2010. XL Whole-Russian scientific and practical conference (with international participation) with elements of scientific school for youth (Moscow, November 16—19, 2010) / Ed. B.I. Kudrin, Y.V. Malyutina. Moscow: MPEI publishers, 2010. P. 107—109.
- *Y.L. Arcishevski* and others The leading index of the business plan on organ Energy industry development and ecology. The proceedings of the International Scientific

Conference on Energy Industry Development and Ecology, May 26—30, 2010 Ulaanbaatar, Mongolia. 119—121 p.

- *Zemcov A.A.* and others Providing reliability and quality of power supply under MI presence in integrated power and information grid (in Russian). Moscow: VIII International scientific and technical conference «Intellectual power engineering. Automation and high voltage equipment», TRAVEK—2010, Moscow.
- *Klimova T.G.* and others Analysis of coordinate systems for hypervector diagrams of aperiodic electrical quantities (in Russian). International scientific conference "Actual directions of development of applied mathematics in power engineering, energy efficiency, information and communication technologies". MVTU Bauman, Moscow (Russia), October, 27, 2010. 4 p.
- *Klimova T.G.* and others Application of wavelet transform for research of EPS transients (in Russian). International scientific conference "Actual directions of development of applied mathematics in power engineering, energy efficiency, information and communication technologies". MVTU Bauman, Moscow (Russia), October, 27, 2010. 4 p.
- *Kolobrodov E.N.* and others Realization of local counter-emergency automation functions on Rex-670 series terminals (in Russian). Digest of reports of 20th conference «Relay protection and power systems automation». Moscow: Scientific and engineering agency, 2010. P. 65.
- *Vostroknutov S.A.* and others Research and development of operating speed increase for relay protection and automation in sectionalized electric grid 6—35 kV (on example of MPEI TPP) (in Russian). Moscow: MPEI Vestnik, № 3, 2010.

Dissertations

- *Ge Tsun.* Research and development of algorithm of emergency data compression for increase of speed of information supply system of control processes in power engineering. Ph.D. dissertation. Moscow, 2009.
- *Zhuravlev D.M.* Research and development of hypervector electrical quantities representation in transient modes of power systems. Ph.D. dissertation. Moscow, 2010.
- *Voloshin A.A.* Development and analysis of automated control system of reactive power compensation means at substations. Ph.D. dissertation. Moscow, 2010.

Partners

- JSC «Energosetproekt Institute», Moscow
- JSC «Unified power engineering complex» Corporation
- JSC «Federal Grid Company of Unified Electric System» («FGC UES»), Moscow
- JSC «VNIIR», Cheboksary
- «Elster-Metronica» Ltd., Moscow

Unique equipment

- Test bed for verification and adjustment of automatic synchronizers for large synchronous generators switching-on to power system

NON-CONVENTIONAL AND RENEWABLE ENERGY SOURCES (NCRES) DEPARTMENT

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23 post-graduate students

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Professor MISRIKHANOV M.S.

Priority research activities

Research Supervisors

- **Theory and methods for substantiating the parameters of the installations and systems on the basis of the renewable energy sources**
  Professor Vissarionov V.I.; Professor Malinin N.K.
- **Theory and methods for substantiating the operating modes of the installations and systems on the basis of the renewable energy sources in the decentralized and centralized power supply systems**
  Professor Vissarionov V.I.; Professor Malinin N.K.
- **Ecological aspects for using the renewable energy sources**
  Professor Vissarionov V.I.; Professor Malinin N.K.
- **Developing the methods of an optimum control of the hydroelectric power station cascades, considering the social-ecological requirements**
  Professor Alexandrovskiy A.Y.
- **Developing the theoretical fundamentals for optimizing the operational modes and the designing controlling systems for the alternating-current machines and their devices on the basis of the non-traditional and renewable energy sources**
  Professor Tsgoev R.S.
- **Management of the protects of the creating complex technical-organizational systems on the basis of the methods and facilities of an information and automation of the project solutions**
  Professor Tiagunov M.G.; Professor Misrikhanov M.S.

Key publications

- *Alexandrovskiy A.Y., Murashov A.V., Dubinina V.G.* Requirements of fish industry and their assessment at developing the rules for using water resources of the water reservoirs of hydroelectric power station // Hydraulic engineering construction. No. 12. 2009. P. 41—45.
- *Tsgoev R.S.* Mathematical simulation of characteristics of windwheels // Electrical Technology No.11. 2009. P. 32—38.
- *Misrikhanov M.S., Sharov Y.V.* Estimation of the influence of disturbance on the stability of electrical power system // MPEI Vestnik No. 5. 2009. P. 42—49.
- *Vissarionov V.I., Volshanik V.V., Gamzatov G.M.* Characteristics of stream flow behind the driving wheel of hydraulic turbine depending on the parameters of draft tube // Hydraulic engineering construction No. 11. 2009. P. 37—44.
- *Afonin V.S., Малинин Н.К.* Research of power supply system of independent consumer, using ecologically clean low potential energy sources // Energy Savings — the theory and practice: Proceedings of the Fifth International School-seminar of Young Scientists and Experts. Moscow: MPEI Publishing House 2010. P. 290—295.
- *Bavin M.R., Vissarionov V.I.* Research of operating specificity of the installation, concentrating solar radiation, with further transfer of solar energy by optical paths and with

photovoltage transformation // Energy Savings — the theory and practice: Proceedings of the Fifth International School-seminar of Young Scientists and Experts. Moscow.: MPEI Publishing House 2010. P. 296—300.

- ***Vissarionov V.I.*** Power complexes of uninterrupted supply on the basis of renewable energy sources // Scientific and technical creativity of youth — a way to a society based on knowledge: The collection of scientific reports of II International scientifically-practical conference. Moscow State Building University, Moscow: MSBU, 2010. P. 43—49.
- ***Aung Ving Mo, Vissarionov V.I.*** Estimation of resources of wind power of Myanma // MPEI Vestnik No. 1, Moscow: MPEI Publishing House, 2010. P. 32—34.

Partners

- JSC «RUSGIDRO, Moscow
- JSC «Research and Development Institute of Power Installations», Moscow
- All-Russian Research and Development Institute of Agriculture Electrification, Moscow
- Technical High School, Constanz, Germany

Unique equipment

- Floating Aeratic Installation power supplied by the solar batteries

THEORETICAL FOUNDATIONS OF ELECTRICAL ENGINEERING (TFEE) DEPARTMENT

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3 post-graduate students

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Dr. Sci. (Techn.),
Professor,
Corresp.-Member of RAS,
Winner of RF Government Award
Pavel A. BUTYRIN

Priority research activities

Research Supervisors

- **Theory and calculation methods of the electromagnetic fields and the electrical circuits**
  Professor Demirchyan K.S.
- **Fundamental problems and the theories of an electromagnetic field**
  Professor Demirchyan K.S.
- **Theory and application practice of the virtual instruments in the electrical engineering**
  Professor Demirchyan K.S.
- **UHF electrodynamics**
  Professor Alekseichik L.V.
- **Theory and realization of the electrodynamic adaptive systems**
  Professor Butyrin P.A.
- **Creation of the adaptive electrodynamic systems for an ozone electric synthesis**
  Professor Gusev G.G.
- **Theory, methods and devices for the electromagnetic energy conversion**
  Professor Shakirzyanov F.N.
- **Diagnostics and identification of the electrical engineering and the electrical power objects parameters**
  Professor Butyrin P.A.
- **Theory and calculation methods of the non-linear circuits**
  Associated-Professor Karataev V.V.

Agreements, contracts, projects

- Theory development of the destabilizing disturbance localization for the electrical engineering and the electical power systems
- Development of methods and the virtual tools for parameter identification of the electrical engineering devices on the basis of the experimental data
- Development of the theoretical basis of diagnostics and the adaptive control for the electrical engineering systems with the disturbing perturbations
- Development of the structure principles of diagnostics and an adaptive control complex for the electrical engineering systems with the disturbing perturbations
- Development of the diagnostic approach for the transformers under loading on the basis of the operating currents and voltages
- Mathematical modeling of transitive and steady-state electromagnetic processes with use of piecewise-linear operators

- Inspection of an electromagnetic situation in a operating medium of the monitoring systems for a high-voltage equipment
- Development of the diagnostic approach for the transformers under loading on the basis of the operating currents and voltages
- Research of electrophysical parameters of dielectric resonators for RFRD
- Analysis and development of design decisions for carrying out of repair work of systems of an operative direct current of electric substations
- Development of the theoretical basis of diagnostics and quality management of the electric power of electric chains

Key publications

- *Butyrin P.A., Tolcheev O.V., Shakirzyanov F.N.* Electrical engineering (in Russian), textbook // Moscow: Publishing House «Academia», 6 edition, 2009.
- *Vaskovskaya T.A.* Diagnostics of linear electric chains piecemeal, textbook (tutorial) (in Russian) // Moscow. STC «Informregistr», 2009.
- *Butyrin P.A., Zaytseva N.N.* Analytical definition of indicators of quality of electric energy in chains with kusochno-constant and kusochno-sinusoidal EMF(in Russian) // Izvestia akademii elektrotekhnicheskikh nauk RF. 2009. No 3.
- *Andreev A.L., Butyrin P.A., Gorohov V.G.* Technics sociology (in Russian) // Moscow: Alpha-M, INPHRA-M, 2009, 286 p.
- *Butyrin, P.A.* Development higher electrical engineering education in Russian (in Russian) // Elektrichestvo. 2009. № 8. P. 6—11.
- *Shakirzianov F.N., Kh. Baochzhun, Kitaitsev A.A., Cheparin V.P.* The effect of nanotubes on electromagnetic waves absorption in composite radioabsorbing materials on the basis of hexagonal ferrites, Proceedings of the International Conference on Properties and Applications of Dielectric Materials. July 19—23, 2009, Harbin, Chaina. P. 1211—1214.
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- *Kozlov V.K., Galliev I.F., Alpatov M.E.* Analysis of informative diagnostic indicators of three-phase transformers (in Russian) // Collected reports of IV International scientific and technical conference «Power transformers and diagnostic systems», Moscow, 2009. (TRAVEK).
- *Shakirzianov F.N., Denisko A.V.* Normal waves in three-phase lines(in Russian) // Elektrichestvo. 2009. № 5.
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- *Electrical* engineering for initial vocational training (in Russian) // 7 edition, Moscow: Publishing House «Academia», 2010.
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- *Alpatov M.E.* Research of design diagnostic models of transformers (in Russian) // Collected reports of V International scientific and technical conference «Power transformers and diagnostic systems», Moscow, 2010. (TRAVEK).
- *Korenskiy V.V., Liakhomskiy A.V., Shakirzianov F.N., Karataev V.V.* Choice and maintenance of a rational mode of a contact network on an operative current (in Russian) // Elektrichestvo. № 2, 2010.
- *Demirchyan K.S., Demirchyan K.K., Kondratev K.S.* Global warming and «the politician of its prevention», «Biosphera», volume 2, № 4, 2010. P. 344—352.
- *Shakirzianov F.N.* and others. Protection of SHF and EHF detectors from destruction electromagnetic radiation// Collection of works XVIII International Conference Electromagnetic Fields end Materials, 2010, P. 297—300.
- *Alekseichik L.V., Pavlov N.V.* Dielectric resonators in chains of the microwave oven// Collection of works XVIII International Conference Electromagnetic Fields end Materials, 2010. P. 329—337.
- *Shakirzianov F.N.* The project HAARP and climatic anomalies// Collection of works XVIII International Conference Electromagnetic Fields end Materials, 2010. P. 338—340.
- *Shakirzianov F.N.* Graphene and photoresistive effect // Collection of works XVIII International Conference Electromagnetic Fields end Materials, 2010, P. 341—346.
- *Alpatov M.E.* Research of projective diagnostic models of transformers (in Russian) // Collected reports of IV International scientific and technical conference «Power transformers and diagnostic systems», 2010.

Partners

- Division of mechanics, machinery, control processes and energetic of RAS, Moscow
- Academy of Electrical Engineering sciences, Moscow
- «Ekologicheskiy Centr zavoda Khrunicheva» company, Moscow
- United Institute of Nuclear research, Dubna
- Sankt-Peterburg State Technical University
- Harbin Science and Technology University, Harbin, China

Unique equipment

- Hardware-software complex LabVIEW
- Practical educational complex on the lecture course "Theoretical bases of Electrical Engineering"
- Software complex ANSYS

DEPARTAMENT OF HIGHER MATHEMATICS (HM)

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78 lecturers,
1 post-graduate students

Head of Department:
Dr. Sci. (Phys. and math.), professor,
Member of the International Academy of Informatisation
Igor M. PETRUSHKO

Priority research activities

Research Supervisors

- **Branching processes in random environment**
  Professor Afanasyev V.I.
- **Infinite-order nonlinear differential equations and corresponding Banfach spaces**
  Professor Balashova G.S.
- **Inverse problems for differential equations**
  Professor Barashkov A.S.
- **Functional analysis**
  Professor Kirillov A.I.
- **Partial differential equations**
  Professor Petrushko I.M.
- **Development of methods for asymptotic integration of singularly perturbed differential, integral, and integro-differential linear and nonlinear equations systems**
  Professor Prohorenko V.I., professor Safonov V.F., professor Bobodzhanov A.A.
- **The homology and structural theory of rings and the arithmetic properties of analytical functions values**
  Professor Tuganbaev A.A., Assoc. Prof. Yanchenko A.Ya.
- **Harmonic analysis, coding theory, approximations**
  Professor Yudin V.P.

Agreements, contracts, projects

- Some problems of qualitative theory of differential equations and extremum problems of the functions theory
- Investigation of non-classical problems for partial differential equations in weight spaces

Key publications

- *Bobodzhanov A.A., Safonov V.F.* Singularly the indignant problems and a regularization method (in Russian) // M.: Publishing house MPI, 2010.
- *Arkhangelsk A.H.* About the bottom assessments of probabilities of evasion for the sums of random variables Bernulli (in Russian) // the Bulletin of the Moscow State University «Calculus mathematics and cybernetics». 2010. № 4. P. 172—179.
- *Afanasev V.I.* Brown a high jump (in Russian) // Probability theory and its application. 2010. Vol. 55. № 2. P. 209—225.
- *Afanasyev V.I.* New invariance principles for critical branching process in random environment (in Russian)// Advances in Data Analysis, Statistics for Industry and Technology. 2010. P 105—115.
- *Afanasev V.I.* Principle of invariancy for the critical process Galton-Watson reaching a high level (in Russian) // Probability theory and its application. 2010. Vol. 55. № 4. P. 19.

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- *Balashova G.S.* About conditions of an investment of spaces of infinitely differentiated functions certain on bidimentional торе (in Russian) // Spectral and evolution problems. International Scientific Journal. 2010. Vol. 20. P. 80—83.
- *Balashova G.S.* Design of functions on preset values of all derivatives in a point (in Russian) // XVIII world conference «Mathematics, economy, formation» // Publishing house SKNTS VSH JUFU. 2010. P. 61.
- *Guschin A.K.* About resolvability of problem Dirihle for the elliptic equation of the second order with boundary function from Lp (in Russian) // 2-nd world conference «Mathematical physics and its appendices». 2010. P. 107—108.
- *Yeliseyev A.G.* Asimptotika of the Singularly-revolted integrated equation Voltera (in Russian) // XXI world Scientific conference «Mathematical methods in technics and technologies». 2010.
- *Zavyalov B.I.* Asimptoticheski the homogeneous generalized functions along the trajectories defined by the general one-parametrical group of transformations (in Russian) // Reports of the Russian Academy of Science. 2010. Vol. 435.2. P. 160—163.
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- *Zimin O.B.* On a threshold of an epoch of New education? (in Russian) // Mathematics in formation. 2010. № 6. 5 p.
- *Kachalov V.I.* Gomomorfizmy of algebras of analytical functions (in Russian) // XXIII world Scientific conference «Mathematical methods in technics and technologies MMTT-23». 2010.
- *Kirillov A.I.* Invariant of a measure of diffusions with gradient drift (in Russian) // 2010. Vol. 47. P. 12—18.
- *Konaev U.A.* About features of the analysis of initial and regional problems for полиномиальных systems (in Russian) // Differential equations. 2010. Vol. 46. P. 1—5.
- *Konaev U.A.* About nonlinear Singularly the indignant problems in biology (in Russian) // / Mathematics modeling. 2010. Vol. 22.9. P. 105—107.
- *Maksimova O.V.* Assignable cases of variation from the viewpoint of statistics/Some preliminary results (in Russian) // 10-th European conference on business and industrial statistics. 2010
- *Rasulov A.B.* Integrated of concept and boundary problems for elliptic сис-subject matter of the second order with singularly point (in Russian) // Differential equations. 2010. Vol. 46.1. P. 1—7.
- *Petrushko I.M.* On the equation with reversible time direction (in Russian) // 13-th world Conference on electromecanics, electrotechnologies, to electromaterials and components. 2010. P. 156.
- *Tuganbaev A.A.* Completely integrally closed modules and ringes (in Russian) // J. Math. Sciences. 2010. Vol. 171.4. P. 213—228.
- *Tuganbaev A.A.* Submodules and direct summands (in Russian) // J. Math. Sciences. 2010. Vol. 164.1. C. 1—20.
- *Tuganbaev A.A.* Modules over rings of formal matrices (in Russian) // J. Math. Sciences. 2010. Vol. 171.4. P. 145—211.
- *Frolov U.N.* About factors of numbers Dirihle (in Russian) // XXIII world Scientific conference «Mathematical methods in technics and technologies MMTT-23». 2010. P. 156.
- *Yudin V.A.* About the multinominals least evading from zero (in Russian) // Mathematical note. 2010. T. 87.5. With. 796—800.

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- *Janchenko A.J.* About properties of some class of determinants (in Russian) // 13-th world Conference on electromecanics, electrotechnologies, to electromaterials and components. 2010. P. 157.

Partners

- Lomonosov Moscow State University (MGU), Moscow
- Steklov Mathematical Institute, Russian Academy of Sciences, Moscow

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Institute Departments

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30 lecturers,
researchers,
19 post-graduate students.

Head of Department
Doctor of technical sciences
Professor Valery M. BESEDIN

Priority research activities

Research Supervisors

- **Development of mathematical models and control algorithms for complicated objects**
  Professor Derzhavin O.M.
- **Development of mathematical methods and automation facilities for investigation and design of non-linear dynamic systems and processes**
  Professor Kolosov O.S.
- **Development of information technologies in real time on the basis of artificial neuron networks and self-organization principles**
  Professor Filaretov G.F.
- **Automation facility development on the basis of modern programmable controllers, optimization and modeling of dynamic systems**
  Professor Kolomeitseva M.B.
- **Development of adaptive and optimal control systems for complicated dynamic systems**
  Professor Egorov S.V.
- **Investigation of decision making support methods on the basis of statistical analysis of heterogeneous data. Development of information protection methods**
  Professor Borodiuk V.P., Associated-Professor Fomin G.A.
- **Development of dynamic systems analysis and synthesis methods based on fuzzy logic**
  Associated-Professor Anisimov D.N.
- **Intelligent informational technologies**
  Professor Tolcheev V.O.

Agreements, contracts, projects

- Development of dynamic systems analysis and synthesis methods based on fuzzy logic
- Investigation and development diagnosis methods and models intricate problem areas on base artificial intelligent
- Development of instruments for investigation of linear and non-linear controlled objects
- Development of synergetic control algorithms for non-linear dynamic systems
- Development of model creation methods and controlled objects optimization on the observation data
- Development of synthesis methods for artificial neuron nets to detect the spontaneous variation of the random processes characteristics
- Development of parametric and structure identification algorithms of linear objects
- Development of mathematical and software provision for solving the imitation modeling problem of continuous dynamic systems with interval uncertainty
- Investigations of decision making support methods on the basis of statistical analysis of heterogeneous data

Key publications

- *Tolcheev V.O.* Modified and generalized method of nearest neighbour for classification of bibliographical text documents (in Russian) // Zavodskaya laboratoriya. Diagnostica materialov. 2009. № 7. P. 21—26.
- *Borodyuk V.P., Krepkov I.M., L'vova A.V.* Results of MPEI (TU) enterprise computer network functioning analysis (in Russian) // Vestnik MPEI. 2009. № 2. P. 35—40.
- *Pikhletsky M.V., Mitrofanov V.E.* Robust control multi-connectional dynamic plants by example of heat distribution object (in Russian) // Vestnik MPEI. 2009. № 2. P. 41—45.
- *Kosinsky M.Y., Shikhin V.A.* Research of fuzzy models possibilities for automated systems operational reliability estimation (in Russian)
- *Anisimov D.N., Astakhova Y.Y., Vershinin D.V., Kolosov O.S., Zueva M.V., Tsapenko I.V.* Differentiation of eye retina pathology based on fuzzy logic (in Russian) // Mekhatronika, avtomatizatsiya, upravlenie. 2010. № 2. P. 56—60.
- *Lobanov V.Y., Fomin G.A., Fomina E.S.* Comparative research of interfactorial bonding force measure (in Russian) // Vestnik MPEI. 2010. № 3. P. 117—121.
- *Borodkin A.A., Tolcheev V.O.* Development of study-research program complex for processing and analysis of bibliographical text documents (in Russian) // Vestnik MPEI. 2010. № 1. P. 96—102.
- *Eliseev V.L., Filaretov G.F.* Procedure of non-stationary plant neuronet control system synthesis (in Russian) // Vestnik MPEI. 2010. № 3. P. 100—106.
- *Kosinsky M.Y., Shikhin V.A.* Procedure of electric power calculation systems reliability rates efficient estimation (in Russian) // Avtomatizatsiya v promyshlennosti. 2010. № 5. P. 66—70.
- *Kolomeitseva M.B., Agvami S.A.* Synthesis of multi-connect plant direct adaptive control algorithms by decomposition method with explicit reference model (in Russian) // Mekhatronika, avtomatizatsiya, upravlenie. 2010. № 8. P. 7—12.
- *Derzhavin O.M., Sidorova E.Y.* Research of nonlinear system on-line dynamic singular disturbance model based on first approximation equations (in Russian) // Mekhatronika, avtomatizatsiya, upravlenie. 2010. № 10. P. 22—27.
- *Kolosov O.S., Lepeshkin S.N., Sukhetsky A.P., Zimin V.A.* Specificity of dynamic plants and systems parallel total load operation (in Russian) // Mekhatronika, avtomatizatsiya, upravlenie. 2010. № 10. P. 27—33.
- *Pavlyuk G.P., Shikhin V.A.* Construction of control preset quality areas, based on statistical approach: intercepting models method (in Russian) // Mekhatronika, avtomatizatsiya, upravlenie. 2010. № 10. P. 39—45.
- *Anisimov D.N., Vershinin D.V., Kolosov O.S., Zueva M.V., Tsapenko I.V.* Diagnostics of dynamic plants by fuzzy logic methods using simulation models parameters (in Russian) // Mekhatronika, avtomatizatsiya, upravlenie. 2010. № 10. P. 45—50.
- *Kolosov O.S., Lepeshkin S.N., Griitsenko A.F., Zimin V.A., Makarov V.A.* Dynamic model of GPA for research, diagnostics and adjustment of compressor control sub-systems (in Russian) // Promyshlennye ASU i controllery. 2010. № 6. P. 14—18.
- *Anisimov D.N., Vershinin D.V., Kolosov O.S., Zueva M.V., Tsapenko I.V.* Construction of eye retina pathologies diagnostics systems by artificial intelligence with a glance retina dynamic model parameters (in Russian) // Vestnik MPEI. 2010. № 4. P. 26—33.
- *Anisimov D.N.* Formalization of transitively closed links elimination procedure while organizing of a hierarchical structure on a set of fuzzy situations (in Russian) // Vestnik MPEI. 2010. № 4. P. 34—40.

- *Anisimov D.N., Myakinkov D.A.* Routine of experiment when identification of nonlinear dynamic plants (in Russian) // Mekhatronika, avtomatizatsiya, upravlenie. 2010. № 11. P. 7—12.

Dissertations

- *Tolcheev V.O.* Systematization, development of methods and decision rules groups for bibliographical text documents classification: Dr. Sci. (Techn.) Dissertation. 2009.
- *Abdymanap A.* Development and research of efficiency increasing methods of moving object spatial search: Cand. Sci. (Techn.) Dissertation. 2009.
- *L'vova A.V.* A method of protected informational security risks analysis and control: Cand. Sci. (Techn.) Dissertation. 2009.
- *Khripkov A.V.* Research and using of integral-modulation methods for linear dynamic plants identification: Cand. Sci. (Techn.) Dissertation. 2009.
- *Pikhletsky M.V.* Development of construction models procedure and synthesis of multi-connected dynamic plants control in heating tasks: Cand. Sci. (Techn.) Dissertation. 2009.
- *Morozov R.B.* Development of mobile modulus for research of dynamics and adjustment of regulation algorithm for local automatics systems composed of modern distributed automated systems: Cand. Sci. (Techn.) Dissertation. 2010.

Partners

- «Mosenergo» company, Moscow
- Institute of Radio Engineering and Electronics, RAS, Moscow
- Ilmenau Technical University, Germany
- Chemistry-Technological Institute, Pardubice, Chech Rebublic
- RIA «Mosspetsavtomatika», Moscow
- RIA «Mars», Moscow

Unique equipment

- Tools package for neuron net investigation and design
- Hardware-software facilities for scientific research automation and equipment combined testing
- Equipment complex for investigation in real time of complicated dynamic objects with several nonlinear elements
- Technological equipment for investigation and design of automated control systems for technological processes

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25 lecturers,
5 research workers,
and 9 post-graduate students

Head of Department:
Victor V. TOPORKOV
Dr. Sci. (Tech.), Prof.

Priority research activities

	Research Supervisors
Distributed computations and systems	Prof. V.V. Toporkov
Computer-aided synthesis of discrete systems and hardware/software codesign	Prof. V.V. Toporkov
Modelling, analysis and synthesis of dynamical systems	Prof. G.S. Chkhartishvili
High-level synthesis	Assoc. Prof. V.A. Loginov
Methods of memory devices and systems design	Prof. I.V. Ognev
Databases design	Prof. G.A. Borodin
Systems on FPGA's	Assoc. Prof . A.P. Sharapov
Information security methods and means	Assoc. Prof. I.N. Andreeva
Intelligent systems	Assoc. Prof. M.V. Fomina

Agreements, contracts, projects

- Project no. 2.1.2/6718. The Analytical Department Target Program "The higher school scientific potential development"
- The Council on Grants of the President of the Russian Federation for State Support of Leading Scientific Schools (grant no. SS-7239.2010.9)
- The Russian Foundation for Basic Research (grant nos. 09-01-00095, 09-01-00076)
- The Federal Target Program "Research and scientific-pedagogical cadres of innovative Russia" (State contracts nos. P2227, 16.740.11.0038)

Key publications

- *Toporkov V.V.* Job and Application-Level Scheduling in Distributed Computing // Ubiquitous Computing and Communication (UbiCC) Journal. Special Issue on ICIT 2009 Conference — Applied Computing 2009. No.3. Vol. 4. 559—570.
- *Toporkov V.V.* Application-Level and Job-Flow Scheduling: an Approach for Achieving Quality of Service in Distributed Computing // Parallel Computing Technologies. Lecture Notes in Computer Science. Springer. 2009. Vol. 5698. 350—359.
- *Toporkov V.V., Toporkova A., Tselishchev A., Yemelyanov D., Bobchenkov A.* Economic Models of Scheduling in Distributed Systems // In: T. Walkowiak, J. Mazurkiewicz, J. Sugier, and W. Zamojski (eds.), Monographs of System Dependability (Vol. 1—

3). Dependability of Networks (Vol. 2). 2010. Wroclaw: Oficyna Wydawnicza Politechnki Wroclawskiej. 210 p.

- *Toporkov V.V., Tselishchev A.S.* Safety Scheduling Strategies in Distributed Computing // International Journal of Critical Computer-Based Systems. 2010. Vol. 1. No. 1/2/3. P. 41—58.
- *Toporkov V.V., Toporkova A., Tselishchev A., Yemelyanov D.* Scalable Co-Scheduling Strategies in Distributed Computing // Proceedings of the 2010 ACS/IEEE International Conference on Computer Systems and Applications, Hammamet, Tunisia, May 16—19th, 2010. IEEE CS Press, 2010. P. 18—25.
- *V. Vagin, M. Fomina.* Methods and algorithms of Information Generalization in Noisy Databases // Advances in Soft Computing. 9th Mexican International Conerence on Artifical Intelligence, MICAI 2010, Pachuca, Mexico, November 8—13, 2010. Proceedings, Part II/Eds. Grigori Sidorov, Arturo Hernandes Aguirre, Carlos Alberto Reyes Garcia. (LNAI 6438) Springer Ferlag, Berlin. P. 44—55.

Partners

- Russian Academy of Sciences
- Russian Foundation for Basic Research
- TIMA Laboratory, Grenoble, France
- Moscow State University
- European Organization for Nuclear Research (CERN), Switzerland
- Ilmenau Technical University, Germany
- University of Technology, Wroclaw, Poland
- Al-Zaytoonah University, Jordan
- Russian Ministry of Defence

Unique Equipment

- PDM-system ProENGINEER
- Logic simulator Vantage Spreadsheet
- High-level synthesis tools Synopsys
- MAXPlus II, Foundation Series tools for FPGA design
- GSSS tools for structure synthesis
- Dynamical systems simulator MASS
- Job management system MIMAPR for distributed computing

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23 lecturers,
4 researchers,
5 post-graduate students

Head of Department
Dr. Sci. (Techn.),
Professor Igor N. ZHELBAKOV

Priority research activities

Research Supervisors

- **Measuring facilities on the basis of the digital signal processing**
  Professor Zhelbakov I.N.
- **Investigation of the delta-sigma ADC**
  Professor Didenko V.I., associated-professor Solodov Yu.S.
- **Power transformer diagnostics**
  Professor Malinovskiy V.N.
- **Intellectual pressure sensors with the HART-protocol**
  Associated-Professors Evlanov Yu.N., Shatokhin A.A.
- **Level and consumption measurements by the ultrasonic methods**
  Associated-Professor Novikov V.A.
- **Measurement systems for monitoring and diagnostic of a high-voltage equipment**
  Senior Lecturer Bykov A.P.
- **Electrical variables measurement in the electric power systems**
  Associated-Professor Shatokhin A.A., Senior-Lecturer Makarychev P.K.

Agreements, contracts, projects

- Theoretical issues development of creating hardware-in-the — loop ensuring of information data measuring systems (IDMS) in Power industry (PI)
- Cooperation and the joint research-academic activity agreement with the purposes of an expert training on the control systems between MPEI (TU) and Federal State Unitary Enterprise MARS
- Adjustment and calibration of the magnetic thickness-meters MT2007
- Creation of algorithmic ensuring and software of multifunctional devices for the systems of fuzzy management of traffic flows
- Development of smart early alarm system concerning the probability of anthropogenic accidents at compressed air plants of gas and oil pipelines

Key publications

- *Zhelbakov I.N, Kontchalovskiy V.U, Solodov U.S.* Electrotechnical encyclopedia (in Russian). 4 v., under edition of Dyakov A.F. (senior editor), Volume 3. — MPEI Publishing House, 2009.
- *Tiukavin A.A., Dugushkin S.N.* Alternating current links for measuring of three- element two-terminal network parameters: Teaching aid tutorial (in Russian). — MPEI Publishing House, 2009.
- *Krug P.G.* Software through pictures in LabVIEW environment (in Russian): Tutorial. Moscow: MGUPI. 2009.

- *Krug P.G.* Modeling of artificial neuron nets: Tutorial. Moscow: MGUPI. 2009.
- *Semen V.F., Serov N.A., Shvedov E.N.* RLC meters learner's (users) guide (in Russian). MPEI Publishing House, 2009.
- *Didenko V.I., Ivanov A.V.* Metrological approach to the research of noise quantization of delta — sigma ACP (in Russian) // Measuring engineering. 2009. N 5.
- *Didenko V.I., Ivanov A.V., Teplovodskiy A.V.* Precise modeling of measuring devices (in Russian) // Transducers and systems. 2009. N 7.
- *Malinowskiy V.N., Muborakshoyev P.T.* Transformer converter for current-voltage of industrial frequency on the base of active elements (in Russian) // Devices and means of automatization. 2009. N 8.
- *Khoang V.N, Malinowskaya V.V., Malinowskiy V.N.* Device for measuring of transformator short circuit voltage in on-line monitoring mode (in Russian) // MPEI Vestnik. 2009. No 5, P. 18—23.
- *Khoang V.N., Muborakshoyev D.T., Khoang V.N.* Methods and Means of control and diagnostics of high capacity power transformators windings conditions (in Russian) // Electrotechnics. 2009. N 10. P. 36—42.
- *Malinowskiy V.N, Muborakshoyev D.T., Khoang V.N.* The control of Power transformators windings coil deformations (in Russian) // The journal of postgraduates and doctoral candidates scientific publications. 2009. N 1.
- *Shevchiuk V.P., Boldyriev I.A.* Metrological characteristics of information-measuring system for the definition of the degree of drier saturation (in Russian) // Metrology. 2009. N 12. P. 31—40.
- *Evlanov U.N., Shatokhin A.A.* The problems of designing and increasing of accuracy of smart pressure sensors // 19-th National scientific symposium with international participation "Metrology and Metrology Assurance 2009", September 10—14, 2009, Sozopol, Bulgaria. Proceedings of symposium, P. 132—135.
- *Krug P.G.* Monitoring of main gas pipelines using measuring – calculating systems (in Russian). // Industrial ACS and controllers. 2010. N 1, P. 43—49.
- *Krug P.G.* The usage of artificial neuron nets for valuation of objects technical state (in Russian).. // Industrial ACS and controllers. 2010. N 3, P. 20—22.
- *Krug P.G.* Automated control of preemergency and emergency situations at compressed air plants (in Russian) // Industrial ACS and controllers. 2010. N 7. P. 4—9.
- *Shatokhin A.A., Makarytchev P.K .* Registrar of voltages of triphase nets of alternating current (in Russian) // Electronics news. 2010. N 6 (86), P. 16—20.
- *Shevchiuk V.P., Boldyriev I.A.* The measuring system of drier saturation degree for absorption process managemeny (in Russian) // MPEI Vestnik. 2010. No 2, P. 127—132.
- *Zhelbakov I.N., Lupachev A.A., Than Htike* Oo The analysis of resistance measurements fast algorithm for diagnostics of power transformers (in Russian) // Metrology. 2010. N 9. P. 15—26.

Patents

- Patent № 84965 RF. Variable field device / Shevchiuk V.P., BoLdyriev I.A. 2009.

Dissertations

- *Khoang Van Niu.* The development and research of resistance measurement systems of transformer voltage winding pair: Cand. Sci. (Techn.) Dissertation. 2010.
- *Boldyrev I.A.* Development and research of the information measuring system for absorption process management: Cand. Sci. (Techn.) Dissertation. 2010.

- *Korovina O.A.* Indicators' calibrator of the electro energy quality: Cand. Sci. (Techn.) Dissertation. 2010.

Partners

- MIDAUS company (Microelectronic sensors and devices), Ul'yanovsk XENHUE KANGYU
- Control Systems Engineering INC, Ningbo, China Ilmenau Technical University, Germany
- Concern Rosenergoatom branch «Smolensk nuclear power plant», Desnogorsk
- «North-West HEPP», Sankt-Peterburg
- Branches «Severodvinskaya HEPP-1» and «Severodvinskaya HEPP-2» of
- «Arkhangelskaya generiruiuschaya compania»
- «BureyaGidroElektroMontazh», Blagoveschensk
- «Bratskiy aliuminievy zavod», Bratsk
- «Tumen'energo», «Bashkirenergo», «Vologdaenergo», «Irkutskenergo»

Unique equipment

- Automation system for an electric-physical experiment (SAEX/EF)
- Educational platform for NI ELVIS designing on the base of NI LabVIEW software through pictures environment
- Software testing packet for an analog-digital conversion in a dynamic mode
- Strain-gauge measuring complex for the composite materials diagnostics
- Secondary measuring transducer of LUSI-DI sensor
- Measuring system for the technical parameters control of the RUL transformers

IAGE DEPARTMENT OF ELECTRICAL PHYSICS OF INFORMATION SYSTEMS

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19 lecturers,
3 post-graduate students,
1 researcher

Head of Department
Ph. D. (Tech.), Professor
Yuri A. KAZANTSEV

Priority research activities

Research Supervisors

- **Digital systems for the electric energy quality and quantity monitoring in the high-voltage power networks**
  Professor Gevorkian V.M., Associated-Professor Mikhalin S.N.
- **Modeling and design of the compact passive and active microwave devices**
  Professor Gevorkian V.M., Associated-Professor Vishnyakov S.V.
- **Electromagnetic compatibility of the information systems in the electric and power engineering equipment**
  Professors Kazantsev Yu.A., Gevorkian V.M.
- **Algorithms and methods of the digital information processing**
  Associated-Professor Borodkin E.A.
- **Digital technologies of an information security**
  Associated-Professor Rytov A.A.
- **Digital multi-rate systems for the multidimensional signal processing**
  Professor Tchobanou M.K.

Agreements, contracts, projects

- Ku-band microwave filters design
- Electromagnetic field analysis with methods of multi-rate digital multidimensional signal processing
- Advanced high-precision measurement devices for high-voltage networks
- Identification of the consumers' partial influences on electric energy quality, real time analysis and synthesis
- Methods of analog and digital devices analysis and synthesis

Key publications

- *Tchobanou M.K.* Multidimensional multi-rate digital signal processing (in Russian) // M.: Technosphere, 2009, 300 p.
- *Yashin I.A., Gevorkyan V.M.* Principle of the design of secondary power supply source for high-voltage measurement instrumentation (in Russian) // Newsletters of an electrical engineering. № 1, 2009. P. 36—39
- *Tchobanou M.K.* Synthesis of biorthogonal digital filters by using the lifting scheme (in Russian) // 11th international conference and exhibition Digital signal processing and its applications (DSPA-2009), Moscow, 2009. P. 146—150
- *Baranov M.V., Douka D.S., Tchobanou M.K.* Method of compressed images refining using wavelet transform (in Russian) // 11th international conference and exhibition Digital signal processing and its applications (DSPA-2009), Moscow, 2009. P. 122—126.

- *Baranov M.V., Douka D.S., Tchobanou M.K.* Super-resolution method for compressed images (in Russian) // 11th international conference and exhibition Digital signal processing and its applications (DSPA-2009), Moscow, 2009. P. 126—130.
- *Bunin A.V., Gevorkyan V.M., Kazantsev Y.A.,* at al. Ku–band dielectric resonator filters complex analysis for 50—100W applications (in Russian) // 19th International Crimean microwave conference CriMiCo-2009, Ukraine, 2009. pp. T2. P. 477—478.
- *Titov A.A., Khalutin S.P.* Method of the extreme states. Symbolic analysis of the electrical circuits (in Russian) // Moscow, VVA publishing house, 2009. 54 p.
- *Gevorkyan V.M., Perevezentsev S.A.* Correction of the band-pass filter frequency response (in Russian) / Electronics, 2010. № 1. P. 35—43.
- *Bunin A.V., Gevorkyan V.M., Kazantsev Y.A.,* at al. C-band Diplexer on dielectric resonators (in Russian) / Electronics, 2010. № 3. P. 31—37.
- *Gevorkyan V.M.* Application of the complex measurement device to analysis of quality, quantity and partial contribution of consumers to distortion of quality of an electrical power in high-voltage networks (in Russian) // All-Russia conference «Efficiency and reliability of power plants and systems», 2010, V 2. P. 76—79.
- *Bunin A.V., Gevorkyan V.M., Kazantsev Y.A., Mikhalin S.N., Vishnyakov S.V.* Resonant Section for Ku-band High-Power Bandpass Filter // IEEE region 8 international conference oncomputational technologies in electric and electronics engineering SIBIRCON-2010, Irkutsk, 2010. P. 549—551.
- *Vishnyakov S.V.* Multidimensional Signal Processing for an Adaptive FEM Mesh Refinement // IEEE region 8 international conference on computational technologies in electric and electronics engineering SIBIRCON-2010, Irkutsk, 2010. P. 558—560.
- *Avetisyan A.A., Borodkin E.A., Kriushicheva L.V.* Compensation of frequency-depended attenuation of the reflected ultrasonic signal (in Russian) // 18th international conference ITS-2010, Moscow, 2010, V 2. P. 11—15.
- *Avetisyan A.A., Borodkin E.A., Kokova S.S.* Development of the algorithm of the synthesis of an envelope curve of ultrasonic signal (in Russian) // 18th international conference ITS-2010, Moscow, 2010, V 2. P. 16—19.
- *Borlyakov A.V., Gevorkyan V.M.* Detection of voltage pulses in high-voltage electrical networks under the condition of the intensive electromagnetic field influences (in Russian) // 18th international conference ITS-2010, Moscow, 2010, V 2. P. 28—35.
- *Vishnyakov S.V.* Application of multidimensional multi-rate signal processing schemes to FEM mesh refinement (in Russian) // 18th international conference ITS-2010, Moscow, 2010, V 2. P. 42—47.
- *Yashin I.A., Gevorkyan V.M.* Synchronization of measurement instrumentals in high-voltage networks (in Russian) // 18th international conference ITS-2010, Moscow, 2010, V 2. P. 48—55.
- *Karpov V.E., Platonova M.V.* Navigation system of mobile robot (in Russian) // 18th international conference ITS-2010, Moscow, 2010, V 2. P. 56—62.
- *Rytov A.A., Tchertov M.V.* Information embedded into an audio signal (in Russian) // 18th international conference ITS-2010, Moscow, 2010, V 2. P.112—119.
- *Scheglova E. I., Avetisyan A.A., Borodkin E.A.* Adaptive filtering of vascular oscillations (in Russian) // 18th international conference ITS-2010, Moscow, 2010, V2. P. 147—151.
- *Vishnyakov S.V.* Application of the wavelet-transform for electromagnetic field analysis with the finite-element method (in Russian)/ RAS journal. Power engineering, 2010, № 6. P. 40—45.
- *Vishnyakov S.V.* Basics of the theory of systems (in Russian) Moscow, MPEI publishing house, 2010. 56 p.

Patents

- Patent № 2364875 RF Method of an identification of the consumers' partial influences on electric energy quality / Gevorkyan V.M., Kazantsev Y.A., Mikhalin S.N. 2009.
- Patent № 2361335 RF Diplexer / Bunin A.V., Gevorkyan V.M., Kazantsev Y.A., at al. 2009.
- Patent № 81002 RF Diplexer / Bunin A.V., Gevorkyan V.M., Kazantsev Y.A., at al. 2009.
- Patent № 2399124 RF Band-pass filter / Bunin A.V., Gevorkyan V.M., Kazantsev Y.A., at al. 2009.
- Patent № 2399124 RF Band-pass filter / Bunin A.V., Gevorkyan V.M., Kazantsev Y.A., at al. 2010.
- Patent № 2397579 RF Band-pass filter / Bunin A.V., Gevorkyan V.M., Kazantsev Y.A., at al. 2010.

Partners

- State research center «All-Russia Electrical Engineering Institute named after V.I. Lenin», Moscow, Russia
- State Unitary Enterprise «R&D Institute of Automatic», Moscow, Russia
- Special Design Bureau of MPEI, Moscow, Russia
- «Huawei Technology Co., Ltd», China
- Norway University of Science and Technology, Trondheim, Norway
- State Unitary Enterprise «R&D center of precision devices», Moscow, Russia
- State Unitary Enterprise «Girikond», Saint-Petersburg, Russia
- State Unitary Enterprise «KB Luch», Rybinsk, Russia
- «Ceramics» Company, Saint-Petersburg, Russia
- Technological University of Tokio, Japan
- Technological University of Tampere, Finland
- California University of Santa-Barbara, USA
- «Electrozavod» Public Corp., Moscow, Russia

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15 engineers,
23 post-graduate students.

Head of Department
Dr. Sci. (Techn.), Professor,
Winner of the Educational Award
of the Russian President
Alexander P. EREMEEV

Priority research activities

Research Supervisors

- **Fundamental Problems of the Artificial Intelligence**
  Professors Vagin V.N., Eremeev A.P., Plesnevich G.S.
- **Models, Languages and Computer Systems of the Parallel Programming and Managing of the Parallel Processes**
  Professors Kutepov V.P., Falk V.N., Associated-Professor Shamaeva O.Yu.
- **Programming Theory, Functional and Logical Models and Languages and their Realization on the Computer Systems**
  Professors Kutepov V.P., Falk V.N.
- **Mathematical Support and Software of the Intelligent Systems: Control Systems, Decision Support Systems, Expert Systems, Tutoring Systems**
  Professors Vagin V.N., Eremeev A.P., Associated-Professor Bashlykov A.A., Varshavsky P.R., Kurilenko I.E.
- **Non-Classical Logic: Probability Logics, Fuzzy Sets, Neural Networks, Multi-Agent Systems**
  Professors Vagin V.N., Eremeev A.P., Plesnevich G.S., Associated-Professors Averkin A.N., Varshavsky P.R., Tarasov V.B.
- **Software of the Information Systems and Networks, INTERNET/INTRANET Technologies**
  Associated-Professor Lukanina V.I., Mikhaylov I.S., Chernov P.L.
- **Technologies of the Software Development and Verification, Information Security**
  Professor Khorev P.B., Associated-Professor Maran M.M.
- **Constructive Models, Classification, Analysis of the structures.**
  Associated-Professor Falk V.N.
- **Control tools for the large systems**
  Associated-Professor Akchurin R.M.

Contracts and projects

- Models and Methods of a Decision Search on the Basis of an Expert Knowledge in the
- Intelligent Decision Support Systems
- Research and Development of the Methods and Tools for the Concept Inductive
- Forming in the Intelligent Decision Support Systems
- Development of the Models, Methods, Languages and Software for the Cluster Systems
- Development of the Theory and Network Technologies for Tutoring and Decision
- Making.
- Development of the Structural Informatics Theory

- Enhancement of the Hardware-Software System Quality and Reliability

Key publications

- ***Intelligent*** systems (in Russian) // In Monograph edited by Kureychik V.M. with authors Eremeev A.P., Vinogradov O.V. Kurilenko I.E. et al. Fizmatlit, 2009. V. 3
- ***Intelligent*** systems (in Russian) // In Monograph edited by Kureychik V.M. with authors Eremeev A.A., Kurilenko I.E., Panteleev A.A. et al. Fizmatlit, 2009. V. 4
- ***Vagin V.N., Novoselov U.V.*** Diagnostics of the Atomic Station Blocks by using Multiagent approach (in Russian) // Programming Products and Systems. 2009, № 2. P. 108—112.
- ***Eremeev A.P., Podogov I.U.*** Supported Education Methods for Real Time Decision Making Systems (in Russian) // Vestnik of MPEI, 2009, № 2. P. 153—161.
- ***Eremeev A.P., Vinogradov O.V.*** Methods and Programming Tools for Managing Works in Production Systems Based on Fuzzy Decision Tables (in Russian) // Vestnik of MPEI, 2009. № 2. P. 166—174.
- ***Eremeev A.P., Kurilenko I.E.*** An Intelligent Programming Support Tools for Real Time Decision Support Systems (in Russian). Artificial Intelligence and Decision Making, 2009, № 1. P. 31—45.
- ***Varshavsky P.R., Eremeev A.P.,*** Modelling of the Case Based Reasoning in Intelligent Decision Support Systems (in Russian) // Artificial Intelligence and Decision Making, 2009, № 1. P. 45—57.
- ***Vagin V.N., Fomina M.B.*** Methods of Information Integration with Presence of Noisy Data (in Russian) // International Conference "Artificial Intelligence and Artificial Systems". Taganrog, Technical University, 2009. P. 69—71.
- ***Vagin V.N., Eremeev A.P., Dzegelenok I.I., Kolosov O.S., Frolov A.B.*** Today State and Development of the Artificial Intelligence Research Works in Moscow Power Engineering Institute (in Russian) // Programming Products and Systems, 2010, № 3. P. 3—16.
- ***Eremeev A.P., Mitrofanov D.U.*** Planning of the Search Process in Real Time Decision Support Systems Based on Intelligent algorithms (in Russian) // Vestnik of MPEI, 2010, № 2. P. 85—92.
- ***Vagin V.N., Fomina M.B.*** Algorithms of the Information Integration in Noisy Data (in Russian). Proceedings XXXVII International Conference "Information Technologies in Science, Education, Communication and Business". Yalta, 2010, P. 90—96.
- ***Vagin V.N., Hotimchuk K.Yu.*** Abductive Inference Algorithms in Case Based Environment (in Russian) // XII National Conference on Artificial Intelligence, Fizmatlit, 2010, P. 78—87.
- ***Eremeev A.P., Glagolev V.B.*** Supported Educational Tools for Course of Studies "Informatics of MPEI on the Base Internet Technology" (in Russian) // Proceedings of the IV International Conference "Information technologies in Education, Science and Production". Serpuhov, 2010. P. 314.
- ***Eremeev A.P., Kurilenko I.E.*** Logic of Branched time and Ways of its Realization (in Russian) // Proceedings of International Conference "Intelligent systems", AIS-IT № 10, Fizmatlit, 2010. P. 130—139.
- ***Eremeev A.A., Eremeev A.P., Panteleev A.A***. Temporal Data Model and Ways of its Realization Based on OLAP Technology (in Russian) // XII National Conference on Artificial Intelligence, Fizmatlit, 2010, V. 3. P. 345—253.
- ***Bredihin K.N., Varshavsky P.R.*** Search and Storing Case Data in CBR Systems Based on Distributed Case Libraries (in Russian) // XII National Conference on Artificial Intelligence, Tver, 2010, V. 2. P. 321—329.

- *Kurilenko I.E.* Implementation of Branched Time Logic (in Russian) // Proceedings of International Conference KII-2010, Fizmatlit, 2010. P. 38—46.
- *Kutepov V.P., Falk V.N.* Forms, Languages Criterions and Parameters of Complexity of the Parallelism (in Russian) // Programming Products and Systems, 2010, № 3. P. 17—27.
- *Kutepov V.P.,* Parallelism Through Different Perspectives (in Russian) // The 5-th International Conference "Parallel Computing and Control Problems". M., Institute of Control Sciences of Russian Academy of Science, 2010.
- *Vagin V.N., Eremeev A.P.* Methods and Tools for Modelling Reasoning in Diagnostic Systems // ISEIS 2009, Proceedings of the 11th International Conference on Enterprise Information Systems, vol. AIDSS, Milan, Italy, May, 2009. P. 271—276.
- *A. Eremeev, I. Kurilenko, P. Varshavskiy.* Application of Temporal Reasoning and Case-based Reasoning in Intelligent Decision Support Systems (in Russian) // International Book Series «Information Science & Computing», Number 10, Supplement to International Journal «Information Technologies & Knowledge», V. 3, 2009. P. 9—16.
- *V. Vagin, M. Fomina.* Methods and Algorithms of Information Generalization in Noisy Databases // Advances in Soft Computing. 9th Mexican Intern. Conference on AI, MICAI 2010, Pachuca, Mexico, November 8—13, 2010, Proceedings, Part II. / G. Sidorov, A.H. Aguirre, C.A.R. Garcia (Eds). Springer Verlag Berlin, 2010. P. 44—55.

Dissertations

- *Vinogradov O.V.* Methods and Programming Tools of Knowledge Presentation Based on Fuzzy Tables and Their Implementation in Intelligence Systems. Dissertation, M., MPEI, 2009.
- *Smagin S.V.* Models, Methods and Software for Managing of Infracting Delivers and Customers Based on Agent Oriented Approach and Dialogue Logics. Dissertation, M., MPEI, 2009.
- *Ibragim Ali Roshid.* Development of Methods and Programming Tools for Analysis of Similarity of the Acyclic Structures. Dissertation, M., MPEI, 2009.
- *Krujylov I.S.* Metods and Programming Tools for Enhancing Efficiency Group of Stars Discerning by Using an Autonomous Navigation. Dissertation, M., MPEI, 2010.
- *Dzasim Malath Rahim.* Development of the Methods and Programming Tools for Discerning and Complexity Analysis of the Acyclic Structures. Dissertation, M., MPEI, 2010.
- *Kalutskay A.P.* Modelling Interacting of Cognitive Agent With Environment on the Base Pseudo Physical Logics and Generalized Restrictions. Dissertation, M., MPEI, 2010.

Partners

- Computer Center of RAS, Moscow
- Institute of Programming Systems of RAS, Pereyaslavl-Zalessky
- Institute of Control Problems of RAS, Moscow
- Institute of System Analysis of RAS, Moscow
- Russian R&D Institute of Information Technologies and Computer-Aided Design Systems, Moscow
- Institute of Cybernetics of Ukrainian Academy of Sciences, Kiev, Ukraine
- Moscow Research Institute of Ophthalmology under Federal Agency on the High-Technology Medical Aid, Moscow

IACE COMPUTERS, SYSTEMS AND NETWORKS DEPARTMENT (CSN)

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31 lecturers,
12 post-graduate students.

Head of Department
Ph.D (Techn.),
Professor
Alexander F. KRIUKOV

■ Priority research activities

Research Supervisors

- **Network computer technologies. Development of models, performance estimation and parameter measurement for computer network units, its representation**
  Professor Abrosimov L.I.
- **Computer and network systems for knowledge evolution**
  Associated-Professor Afonin V.A.
- **Application of modern applied software packets for modeling and design of computer engineering facilities**
  Professor Balashov V.N.
- **Algorithms and compression methods for halftone images. Discrete processes modeling by means of GPSS language**
  Associated-Professor Gol'tsov A.G.
- **Design and creation of fault-tolerant computer networks**
  Associated-Professor Danilin G.G.
- **Modeling of multi-processor computer systems. Design of microprocessor systems for object control**
  Professor Deriugin A.A.
- **Search of new architecture principles for computer systems implementation. Data integration and knowledge extraction. Development of educational technologies**
  Professor Dzegelionok I.I.
- **Database design**
  Associated-Professor Dolotov V.G.
- **Speech technologies and teaching process automation**
  Associated-Professor Evseev A.I.
- **System design on the basis of modern micro-controllers**
  Associated-Professor Ivanov A.V.
- **Research and development of functional-distributed multi-processing systems for data proceedings**
  Senior Lecturer Kalinina G.A.
- **Design of microprocessor control systems**
  Associated-Professor Kaporsky A.V.
- **Development of Intranet of department**
  Professor Kriukov A.F.
- **Information security. Modern cryptography. Electronic digital signature. Electronic money. Steganography and stegano-analysis**
  Professor Melnikov Yu.N.
- **Investigation of modern principles for parallel data processing. Development of fault-tolerant computing systems**
  Professor Ladygin I.I.

- **Computation models and computing systems architecture**
  Associated-Professor Morokhovets Yu.E.
- **Design and modeling automation for digital systems on the basis of the equipment description languages VHDL and VERILOG**
  Associated-Professor Poliakov A.K.
- **Object-oriented programming in C++ and C#.**
  Associated-Professor Raskatova M.V.
- **Synergetic of CSN**
  Associated-Professor Fadeev N.N.
- **Parallel computing. High performance computing systems. Cluster computing systems (using cluster located in MPEI)**
  Senior Lecturer Filatov A.V.
- **Research and development of computer architecture with an internal high-level programming language**
  Associated-Professor Chernov S.A.

Agreements, contracts, projects

- Development of a model for asynchronous automatic data processing and its application to control problems of virtual reality
- Investigation of models and methods for optimization of parallel computing on cluster systems
- Development of algorithms for high precision computations in modular arithmetic

Key publications

- *Otsokov Sh.A.* Generalization of computation over the complex numbers with the exception of rounding errors (in Russian). Information Technologies. No. 6. 2009. P. 17—23.
- *Poliakov A.K., Aphanasiev R.A., Eminov M.C.* Program for calculating doses of fertilizers to the intended crop production in agriculture (in Russian) // Fertility No. 3. 2010. P. 44—49.
- *Kalashnikov S.G.* Analysis of characteristics of email traffic of MPEI (in Russian) // MPEI Vestnik. № 2. 2010. P. 93—100.
- *Vo Munn Tung.* Performance evaluation of cluster computing systems (in Russian) // MPEI Vestnik. № 2. 2010. P. 133—140.
- *Dzegelionok I.I., Otsokov Sh.A.* Algebraization of numeric representations in high precision supercomputing calculations (in Russian) // MPEI Vestnik. № 3. 2010. P. 107—116.
- *Evseev A.I., Nguen Van Xung.* Research and development of methods for speech signal processing for formant characteristics of the spectral slices (in Russian) // MPEI Vestnik. № 4. 2010. P. 45—49.
- *Dzegelionok I.I.,* et al Formation and development of the scientific school of artificial intelligence in the MPEI (in Russian) // Software and Systems, № 3 (91). 2010. P. 3—16.
- *Abrosimov L.I., Lebedj A.A., Kramarenko M.D.* Analysis of services mechanisms of network and transport layer of the OSI model implemented in UNIX systems (in Russian) // Proc. of XVII Intern. Conf. «Informational systems and technologies». M: Publishing house of MPEI. 2009. Vol. 2. P. 195—200.
- *Abrosimov L.I., Djuravel A.G.* Program for interactive formation of matrix of the topological structure of computer network (in Russian) // Proc. of XVII Intern. Conf. «Informational systems and technologies». M: Publishing house of MPEI. 2009. Vol. 2. P. 201—205.

- *Chernov P.A., Gol'tsov A.G.* Application of approximation in predictive image compression scheme (in Russian) // Proc. of XVII Intern. Conf. «Informational systems and technologies». M: Publishing house of MPEI. 2009. Vol. 2. P. 249—252.
- *Kharitonov V.Yu.* Model of consistency for distributed virtual reality systems (in Russian) // Proc. of III Russia Conf. «Methods and tools for information processing». M: Publishing house of Lomonosov Moscow State University. MAKS Press. 2009. P. 64—70.
- *Kalinina G.A., Morokhovets Yu.E.* Base model for custom software systems for distributed data processing (in Russian) // Proc. of XVIII Intern. Seminar «Modern technology in control, automation and information processing». M: MIREA. 2009. P. 208—209.
- *Orlov D.A.* Application of computations with calculation error exclusion for computation geometry algorithms // Proceedings of 4th International Conference on dependability of Computer Systems. DepCOS-RELCOMEX 2009. IEEE Computer Society, Los Alamitos, CA, USA, 2009. P. 290—295.
- *Kharitonov V.Yu.* A Consistency Model for Distributed Virtual Reality Systems // Proceedings of 4th International Conference on Dependability of Computer Systems DepCoS-RELCOMEX 2009. IEEE Computer Society, Los Alamitos, CA, USA, 2009. P. 271—278.
- *Kharitonov V.Yu.* Software Architecture of Distributed Virtual Reality System for Formation Flight Visualization // Proceedings of 3rd European Conference for Aero-Space Sciences. FTI, Versailles, France. 2009. P. 123—127.
- *Kalinina G.A., Morokhovets Yu.E.* Asynchronous automatic schemes — a model of distributed computing (in Russian) // Proc. of IV Intern. Conf. «Distributed Computing and Grid-technologies in Science and Education». Dubna: OIJI—2010. P. 376—383.
- *Abrosimov L.I.* The system of formal models of distributed structure (in Russian) // Proc. of Intern. Conf. «Distributed computer and telecommunication networks: Theory and Applications (DCCN-2010)». M.: Technosphera, 2010. P. 52—57.
- *Kondrat A.A.* Java-model of the architecture of computing systems, focused on optimizing the computation applications (in Russian) // Proc. of Intern. Conf. «Distributed computer and telecommunication networks: Theory and Applications (DCCN-2010)». M.: Technosphera, 2010. P. 355—358.
- *Kuznetsov D.S., Morokhovets Yu.E.* The use of peer to peer technology-based on MICROSOFT.NET FRAMEWORK 3.5 WCF for configuring the system of distributed data processing (in Russian) // Proc. of XVIII Intern. Conf. «Informational systems and technologies». M: Publishing house of MPEI. 2010. Vol. 2. P. 315—322.
- *Kriukov A.F., Kuzmina T.A.* Project management in the field of visual effects, design and graphics (in Russian) // Proc. of XVIII Intern. Conf. «Informational systems and technologies». M: Publishing house of MPEI. 2010. Vol. 2. P. 315—321.
- *Filatov A.V.* Design method for constructing software simulation models of computer system operation for testing implementations of concurrent programs (in Russian) // Proc. of XVIII Intern. Conf. «Informational systems and technologies». M: Publishing house of MPEI. 2010. Vol. 2. P. 333—341.

Dissertations

- *Pudov V.A.* Mathematical software system of mutual verification of knowledge with the ability to detect problematic situations. Cand. Sci. (Techn.) Dissertation, 2009.
- *Jankov S.G.* Research and development of methods for displaying tasks on the cluster systems with hierarchically heterogeneous switching environment. Cand. Sci. (Techn.) Dissertation, 2009.

- *Kalashnikov S.G* Development of a mathematical model of a mail server to upgrade the structure of the email system of the University. Cand. Sci. (Techn.) Dissertation, 2009.
- *Orlov D.A.* Organization of multi-threaded data processing with the exception of anomalies in solving problems of computational geometry. Cand. Sci. (Techn.) Dissertation, 2009.
- *Kharitonov V.Y.* Networking methods to ensure data consistency in distributed virtual reality systems. Cand. Sci. (Techn.) Dissertation, 2009.
- *Vo Munn Tung* Research of cluster computing systems and development models for fragments of parallel programs. Cand. Sci. (Techn.) Dissertation, 2009.
- *Nguen Van Xuang* Research and development of algorithms and software for automatic recognition of a limited set of commands Vietnamese speech. Cand. Sci. (Techn.) Dissertation, 2009.

Partners

- State Unitary Enterprise «All-Russia Electrical Engineering Institute named after Lenin», Moscow
- Research-Industrial Association «Volna», Moscow
- Institute of Microprocessor Systems, RAS, Moscow
- Research-Industrial Company «Agrostroi», Moscow
- Ilmenau Technical University, Germany

IACE MATHEMATICAL MODELING (MM) DEPARTMENT

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34 lecturers,
4 post-graduate students.

Head of Department
Dr. Sci. (Phys.-Math.),
Professor Andrey A. AMOSOV

Priority research activities

Research Supervisors

- **Non-classical boundary value problems of the mathematical physics and methods of their solving**
  Professors Amosov A.A., Dubinskii Yu.A., Zlotnik A.A.,
  Associated-Professor Cherepova M.F.
- **Numerical and asymptotical methods for solving of the mathematical physics problems**
  Professors Amosov A.A., Zlotnik A.A., Zhileikin Ya.M.,
  Associated-Professor Pereskokov A.V.
- **Mathematical modeling of the discrete systems: implementation of the large finite algebraic systems in a computer algebra, coding, cryptography, pattern recognition and diagnostics**
  Professor Frolov A.B., Associated-Professor Meshchaninov D.G..
- **Statistical methods of the digital information processing**
  Professor Goritskiy Yu.A.
- **Intellectual recognition systems, data bases**
  Associated-Professors Zubov V.S., Kniazev A.V.

Agreements, contracts, projects

- Non-classical boundary value problems of mathematical physics and methods of their solving
- Methods of solution of applied problems for the partial differential equations
- Development of methods for solving some classes of problems of the modern partial differential equations theory and investigation of their properties
- Asymptotic methods in some problems of continuum mechanics and radiative heat exchange
- Multiscale models in physics, biology and technologies: asymptotic and numerical analysis
- Boundary value problems normally solvable on Hausdorff and methods of their investigation
- Functional spaces of infinite order and their application in the well posedness analysis of the boundary value problems for pseudo-differential equations
- Non-classical problems for the partial differential equations appearing in physics and technologies. Theory methods of solving
- Methods for implementation of computer algebra algorithms in information security and pattern recognition systems
- Methods for hardware and software implementation of algebraic and logical operations in cryptographic protocols and pattern recognition systems

Key publications

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- *Amosov A.A.* Non-stationary nonlinear nonlocal problem of radiative-conductive heat transfer in a system of opaque bodies with properties depending on radiation frequency // Journal of Mathematical Sciences. 2010. Vol. 165. № 1. P. 1—41.
- *Amosov A.A.* Non-stationary radiative-conductive heat transfer problem in a periodic system of grey heat shields // Journal of Mathematical Sciences. 2010. Vol. 169. № 1. P. 1—45.
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- *Borovikov I.A., Dubinskii Yu.A., Il'kiv V.S.* Decomposition of the Sobolev space of infinite order into the sum of the solenoidal and potential subspaces (in Russian) // MPEI Vestnik. 2009. № 6. P. 110—115.
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- *Gashkov S.B., Bolotov A.A., Burtzev A.A., Zhebet S.Yu., Frolov A.B.*. On Hardware and Software Implementation of Arithmetic in Finite Fields of Characteristic 7 for Calculation of Pairings (in Russian) // Fundamentalnaya i Prikladnaya Matematika, 2009. Vol. 15. Issue 2. P. 75—111.
- *Gashkov S.B., Bolotov A.A., Burtzev A.A., Frolov A.B., Zhebet S.Yu.* On Hardware and Software Implementation of Arithmetic in Finite Fields of Characteristic 7 for Calculation of Pairings // Proceedings of International Conference on Dependability of Computer Systems DepCos-RELCOMEX 2009. Brunov, Poland, 30 June—03 July 2009. P. 261—270.
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- *Zlotnik A., Ducomet B., Goutte H., Berger J.F..* On one semi-discrete Galerkin method for a generalized time-dependent 2D Schrцdinger equation // Appl. Math. Lett. 2009. V. 22. P. 252—257.
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- *Zlotnik A.A., Lapuhina A.V.* Stability of a Numerov type finite-difference scheme with approximate transparent boundary conditions for the non-stationary Schrцdinger equation on the half-axis // Journal of Mathematical Sciences. 2010. Vol. 169. № 1. P. 84—97.
- *Zlotnik I.A.* On stability of finite scheme family with the approximate transparent boundary conditions for the time-dependent Schroedinger equation on the half-strip (in Russian) // MPEI Vestnik. 2009. № 6. P. 127—144.
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- *Cherepova M.F.* Regularity of the solution of the Cauchy problem for a higher-order parabolic equation (in Russian) // Differential Equation. 2010. Vol. 46. № 4. P. 540—549.

Dissertations

- *Zhebet S.Yu.* Investigation of software methods for implementation of operations in finite algebraic structures. Cand. Sci. (Tech.) Dissertation. M. 2009.
- *Goshev I.A.* Global solvability and two-scale homogenization of the system describing the longitudinal oscillations of a viscoelastoplastic Ishlinsky material. Cand. Sci. (Phys.-Math.) Dissertation. M. 2009.
- *Borovikov I.A.* Non-standard boundary value problems and direct decomposition of functional spaces. Cand. Sci. (Phys.-Math.) Dissertation. M. 2010.
- *Tigetov D.G.* Д.Г. Development and research probability models of interaction of rough surfaces during friction. Cand. Sci. (Tech) Dissertation. M. 2010.

Partners

- Lomonosov Moscow State University, Moscow
- Computing Center of RAS, Moscow
- Institute of Hydrodynamics of RAS Siberian branch, Novosibirsk
- Institute of Computational Mathematics of RAS, Moscow
- Institute of Applied Mathematics of RAS, Moscow
- Kazan State University
- Freiberg Mining Academy, Germany
- Mathematical Institute of Berlin Free University, Germany
- South Federal University, Rostov-on-Don
- Institute of Mathematics, Chesh Academy of Sciences, Prague
- Jean Monnet University, Saint-Etienne, France
- National Engineering School, Saint-Etienne, France

IACE ELECTRICAL ENGINEERING & INTROSCOPY DEPARTMENT

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20 lecturers,
2 researchers,
5 post-graduate students

Head of Department
Ph.D. (Tech),
Professor Valery P. LUNIN

Priority research activities

Research Supervisors

- **Numerical modeling of the electromagnetic testing procedures, the analysis algorithms of diagnostic signal, the defect characterization and parametrization**

  Professor Valery P. Lunin
- **Creating effective algorithms and software for electromagnetic inspection of nuclear power stations**

  Professor Valery P. Lunin
- **Methods for undertaking and analysis of magnetic testing and technical diagnostics data**

  Professor Aleksey D. Pokrovsky
- **Methods for an eddy current-thermal defectometry and quality testing**

  Ass. professor Leonid A. Chernov
- **Creating an interactive educational system in the electrical engineering**

  Professor Eduard V. Kusnetsov

Agreements, contracts, projects

- Study of regularities for generation and growing the defects in the heat exchanger tubes, an improvement nondestructive testing techniques of the heat exchanger tubes in the Nuclear Power Plants with WWER. Experienced-industrial test software-methodical provision for the eddy current systems, allowing evaluation of a deposit on the heat exchanger tubes
- Experimental check action on increasing a validity of the heat exchanger tubes supervision for the Nuclear Power Plants WWER-1000 and WWER-440
- Algorithms and software development for finding, characterization and estimation of the defect parameters of the heat exchanger tubes in the Nuclear Power Plants using wavelet analysis of eddy current signal
- Development of the theoretical basis in designing facilities of the eddy current, magnetic and electrical equipment. Automatic data processing is expected
- Design of the matrix converters for the eddy current and the magnetic nondestructive testing Device development for the crack evolution monitoring in the corrosion environment conditions

Key publications

- *Lunin V.,* Development of electromagnetic flaw detection methods based on solution of inverse problems during testing of nuclear power plant equipment, 10th European Conference on Non-Destructive Testing, Moscow, 2010. P. 94—95.
- *Zelenskiy M., Lunin V.* Development of a multisection eddy-current probe for testing of tubular objects, 54th International Scientific Colloquium: Proceedings Ilmenau, Germany, 2009. P. 125—131.

- *Shchukis E., Lunin V., Zelenskiy M.* Wavelet transform for eddy-current signal processing, 54th International Scientific Colloquium: Proceedings Ilmenau, Germany, 2009. P. 138—143.
- *Katankin R., Pokrovsky A.,* Research of eddy current method in testing level in the steel production (in Russian), Defectoscopy № 8, 2009. P. 31—37.
- *Lunin V., Zhdanov A., Shchukis E., Zelenskiy M., Gutsev D., Iovchev V.* Tests of eddy current systems software for increasing reliability of detection and classification of defect using experimental data (in Russian) — Proc. of VI Intern. Conf. "Safety, efficiency and economy of atomic stations with WWER", GIDROPRESS Publisher, Podolsk 2009. P. 78—85
- *Lunin V., Gorbatykh V., Golubev A., Serebrianikov B., Gutsev D., Iovchev V.* Trial tests of eddy current systems software for WWER steam generator tubes inspection (in Russian) — Proc. of VI Intern. Conf. "Safety, efficiency and economy of atomic stations with WWER", GIDROPRESS Publisher, Podolsk 2009. P. 86—92.
- *Zhdanov A., Lunin V.* Application of automatic processing eddy current signals from steam generator tubes during repair on atomic station (in Russian) — Conf. "Research in nuclear energy", GIDROPRESS Publisher, Podolsk, 2010.
- *Serebrianikov B., Lunin V.* Parameterization of electrocarrying deposites on tubes of nuclear steam generator (in Russian) — Conf. "Research in nuclear energy", GIDROPRESS Publisher, Podolsk, 2010.
- *Shchukis E., Lunin V.* Application of discrete wavelet-analysis for detection of diagnostic important fragments of signals in testing SG tubes (in Russian) — Conf. "Research in nuclear energy", GIDROPRESS Publisher, Podolsk, 2010.
- *Lunin V., Zhdanov A., Chegodaev V., Gutsev D., Iovchev V., Yakimychev S., Smirnov S.* Trial tests of eddy current systems software for WWER steam generator tubes inspection, (in Russian) — Proc. of VIII Intern. Seminar "Technical problems of horizontal steam generators", GIDROPRESS Publisher, Podolsk 2010.
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- *Kriukov A., Lunin V.* Suppressing lift-off eddy current signal using algorithmic approach (in Russian) // XVI International. sc.-tech. conf. "Information facilities and technologies". Moscow: MPEI Publishing House, M., 2010. P. 79—86.
- *Shchukis E., Lunin V.* Application of discrete wavelet transformation for indication of signals from constructive elements (in Russian) // XVI International. sc.-tech. conf. "Information facilities and technologies". Moscow: MPEI Publishing House, M., 2010, P. 152—160.

Partners

- Concern «ENERGOATOM»
- Fuel company "TVEL"
- JSC "Machine-building plant "ELEMASH", corporation TVEL, Elektrostal
- Research-and-production association "GIDROPRESS", Podolsk, Moscow region
- "Machine-building plant "ZIO-Podolsk", Podolsk, Moscow region
- Moscow scientific production association «Spectr»
- Bauman Moscow State Technical University (MSTU), Moscow
- «TransNeft»
- NIKIMT, Obninsk engineering center

- VNIIAES
- Research and design institute to technology (NIKIMT), Moscow
- Gosgortechnadzor, Russia
- JSC "GAZPROM"
- JSC "ORGENERGOGAZ", Moscow
- Federal institute of investigation and control of materials (BAM), Berlin, Germany
- Ilmenau Technical University, Germany
- Iowa State University, USA
- Fraunhofer nondestructive material investigations institute, Saar, Germany
- Konstanz high technical school, Germany

Dissertations

- PhD dissertation by H.Sasanpur «Increasing quality coefficients for x-ray nondestructive testing of steel objects»
- PhD dissertation by E.Shchukis «Increasing reliability for eddy current testing of steam generator tubes on the base of wavelet analysis and fuzzy logic algorithms»

Unique equipment

- Eddy current defectoscope with an axial through-coil converter for supervision of the nonferrous pipes TX-2000
- Multi-frequency eddy current crack detector with a matrix converter for the electric conductive objects ELOTEST PL-500
- Magnetic device for supervision of a steel tightrope INTROS
- Eddy current defectoscope for testing the loaded details ELOTEST M2 V3
- Equipment for magnetic supervision of the ferromagnetic products MP-U, WDV-10
- Ultrasonic system X-32 with a matrix converter on a face lattice
- Thermovision system Thermo Tracer TH9100PWV CAT1 NEC
- VideoEndoScopic system Snake Eye
- Pyrometer IMPAC IN15 plus
- Ultrasonic defectoscope M380
- Acustic-emission system AMSY-5
- Magnetic testing conditions indicator
- Software for the automatic systems of the eddy current supervision of the heat exchanger tubes for the Nuclear Power Plants with WWER-440 and WWER-1000
- Software for a finite element analysis of an electromagnetic field, the designing converters and a processing diagnostic signal supervision
- Package of the training programs in the field of electrical engineering, magnetic circuits, electromagnetic field analysis, nondestructive testing

INSTITUTE OF RADIO ENGINEERING AND ELECTRONICS (IREE)

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6 post-graduate students.

Head of Department
Dr. of Sci. (Techn.),
Professor Nikolay N. UDALOV

Priority research activites

Research Supervisors

- **Synchronization systems for the communication channels with the complex modulated and chaotic signals**
  Professors Udalov N.N.
- **Theory and calculation methods of the non-linear oscillating devices and the SHF functional devices with an extremely low phase fluctuation level**
  Professor Kuleshov V.N., Associated-Professor Boldyreva T.I.
- **Frequency synthesis, radio engineering measurement and secretive communication systems using the complex wide-band signals**
  Professor Belov L.A.
- **Oscillations sources in the microwave and millimeter-wave ranges with a low phase noise level**
  Professor Tsarapkin D.P.
- **Complex frequency filters in the SHF range**
  Professor Bogachev V.M.
- **Measuring and communication devices of the millimeter wave-length range**
  Associated-Professor Khriunov A.V.

Agreements, contracts, projects

- Investigation of a potential accuracy of the chaotic signals generation, synchronization and extraction from the interference
- Design and application of the precision radio signal sources for the sensors and the communication systems
- High-speed devices for generation the signals with the frequency and phase modulation
- Investigation and development of the low-noise miniature transistor UHF oscillators with an electronic frequency control

Key publications

- *Belov L.A.* Devices for UHF signals formation and its components (in Russian). MPEI Publishing House, Moscow, 2010. 320 p.
- *Balashkov M.V.* Harmonic analysis of voltages and currents of the transistor with correction circuit between a collector and a base (in Russian). MPEI Vestnik, № 1, 2009. P. 53—56.
- *Balashkov M.V., Bogachev V.M.* Comparison of analysis methods for transients and steady-state processes (in Russian). Radiotekhnika, № 1, 2009. P. 36—44.
- *Bogachev V.M.* Method of root locus with a complex parameter (in Russian). Radiotekhnika, № 1, 2009. P. 51—56.
- *Kravchenko V.F., Kravchenko O.V., Safin A.R.* Corpuscular functions in theory of probabilities and the random processes (in Russian). Achievements of Modern Radio Electronics, № 5, 2009. P. 23—37.

- *Safin A.R.* et al. Generalized Kravchenko-Kotel'nikov sampling theorem for interpolation of signals with complex shape. Proceedings of 2010 International Kharkov Symposium on Physics and Engineering of Microwaves, Millimeter and Submillimeter Waves, MSMW'2010, paper no. 5546004.
- *Safin A.R.* etc Atomic functions, phase locked loops with samples and Arnold tongues. 2010 International Kharkov Symposium on Physics and Engineering of Microwaves, Millimeter and Submillimeter Waves, MSMW'2010, art. no. 5546002.
- *Safin A.R.* et al. A new construction of solution of Schrodinger equation on the basis of atomic functions. Ibid. Paper no. 5546001.
- *Boldyreva T.I.* et al. Phase noise of the differential buffer amplifier on the bipolar transistors (in Russian). Elektrosviaz, № 3. 2010. P. 38.
- *Kononov A.V.* et al. Thermal feedback in transistor oscillators (in Russian). Radiotekhnika, 2010. № 12. P. 43.
- *Safin A.R.* et al. Corpuscular functions and phase-locked loop systems with samples (in Russian). Electromagnetic waves and Electronic Systems. 2010, № 5. P. 52.

Patents

- *Belov L.A., Gorbunov V.A.* Device for coded frame synchronization. Russian patent, 2009.
- *Gusevskiy V.I., Gnedak V.I., Dovbnia I.C., Belov L.A.* Adaptive protection system against interference for the sets with reflective parabolic antennas. Russian patent, 2009.

IREE REF DEPARTMENT OF FUNDAMENTALS OF RADIO ENGINEERING (FRE)

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5 researchers,
6 post-graduate students.

Head of Department
Ph.D., professor
Viacheslav A. GRECHIKHIN

■ Priority research activites

Research Supervisors

- **Investigations of acoustic properties of the thin-film and foliated materials**
  Professor Lobov G.D., senior researcher Zhgoon S.A.
- **SAW resonators for materials with natural unidirectionality**
  Professor Lobov G.D., senior researcher Zhgoon S.A.
- **Sensors on the basis of the acoustic wave devices**
  Professor Lobov G.D., senior researcher Zhgoon S.A.
- **Development of digital methods of signsl processing in laser systems for flow diagnostic**
  Professor Grechikhin V.A.
- **Research of the features of optical-electronic registration systems on the basis of the matrix photo-receivers and development of methods for image processing**
  Associate Professor Razumov L.A.
- **Development of methods for the spatial-temporal processing of the wide-band signals in ultrasonic flaw inspection**
  Professor Kartashev V.G.
- **Physics and technology of open and semi-shielded dielectric wave-guides, functional units and circuits: research of phenomena and designing of devices — new tools for knowledge arrangement and for operation with knowledge**
  Professor Vziatyshev V.F.
- **Diffraction radio engineering devices and systems for radar and diagnostic technologies, measuring the object position, velocity and parameters: fundamentals and prospects of improving the functioning effectiveness**
  Professor Vziatyshev V.F.
- **Synthesis and generation of the sensing wave formations, the reception and recognition of informative wave formations in multi-channel radio interferometry high-speed processes: the conception of describing, the search and development of approaches and devices**
  Professor Vziatyshev V.F.
- **Development of functional devices for signal processing on the basis of SAW**
  Professor Shtykov V.V.
- **Development of algorithms to solve the diffraction problems using as a basis the Hermite-Gauss beams**
  Professor Shtykov V.V.
- **Development of the passive radar system for systems of guard, diagnostic and identification of objects on the basis of PC**
  Professor Shtykov V.V.

- **Development of universal measuring complex to execute the student laboratory works on the basis of PC at studying the courses of electrical and radio-electronic profiles**

  Professor Shtykov V.V.
- **Development of methods and means for signal processing and analysis in the problems of medical diagnostics**

  Associate Professor Kramm M.N.
- **Reconstruction of current sources in the area of the myocardium (solution the inverse problems of electrocardiography)**

  Associate Professor Kramm M.N.
- **Development of automated hardware-software complexes for investigations of radio engineering models and objects**

  Associate Professor Pollak B.P.

Agreements, contractss

- Investigation of controlling plating of the various dielectric layers on SAW resonators
- Investigation of controlling plating of the this films on SAW resonators
- Development of wireless systems for remote non-contact measurements of the physical parameters at power engineering equipment functioning
- Investigation of wave processes characteristics in acousto-electronic, opto-electronic and radio wave sensors
- Research and development of sense devices and wave-guide-beam converters on the dielictric wave-guides
- Synthesis and optimization of the multi-channel sense devices for typical formation of the gas-dynamic experiments
- Diffraction radio engineering devices and systems: fundamentals and prospects for increasing the functioning effectiveness

Key publications

- *Le Brizoual Laurent, Soussou Akram, Djouadi Mohammed Abdou, Elmazria Omar, Sarry Frederic, Zghoon Sergei.* Isolated Acoustic Wave Based on AlN/ZnO/diamond Structure for Sensor Applications. Proceedings of joint conf. EFTF-IEEE IFCS 2009. P. 305—308.
- *Omar Elmazria, Sergei Zhgoon, Laurent Le Brizoual, Frйdйric Sarry, Dmitry Tsimbal, Mohammed Abdou Djouadi.* AlN/ZnO/diamond structure combining isolated and surface acoustic waves. Applied Physics Letters. 2009. P. 233503 (1—3).
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- *Zhgoon S., Bhattacharjee K.* Isolated Waves as an Approach to Wafer Level Packaging. Proceedings of Forth Int. Symp. On Acoustic Wave Devices. Chiba, Japan 3—5 March 2010. P. 211—216.
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- *Le Brizoual Laurent, Elmazria Omar, Zhgoon Sergei, Soussou Akram, Sarry Frederic, Djouadi Mohammed Abdou.* Onde acoustique isolйe a base de la structure AlN/ZnO/diamant pour la rйalisation de capteurs. Resumees de la Confйrence Matйriaux 2010, 18—22 octobre, Nantes.
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- *Shvetsov A., Zhgoon S., Lonsdale A., and Sandacci S.,* «Deformation sensitive cuts of quartz for torque sensor,» 2010 IEEE International Ultrasonics Symposium Proceedings, in print.
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- *Grechikhin V.A., Raskovskaya I.L.* Analysis of the characteristics of a system for digital recording of optical signals based on an array photodetector // Measurement Techniques. Vol. 52, № 4. Springer, 2009.
- *Grechikhin V.A.* Potential accuracy of the modulation index estimation for thew signal with sinusoidal frequency modulation (in Russian) // Radiotekhnika, No 1, 2009.
- *Grechikhin V.A., Raskovskaya I.L.* Analysis of features of the optical signal's digital registration system of the basis of the matrix photo-receiver (in Russian)// Measurement Techniques, No 4, 2009.
- *Grechikhin V.A.* Methods for Doppler frequency estimation in the laser systems for flow research (in Russian)// 10^{th} Intern. Scient. conf "Optical methods for flow research". Moscow, June 23—26^{th} 2009.
- *Grechikhin V.A., Makshanov O.V.* Implementation and error estimation for wavelet-analysis of the signal of the laser Doppler vibration meter (in Russian) // Ibid.
- *Grechikhin V.A., Maltykh I.V.* Error analysis of sub-pixel algorithm for P/V image processing (in Russian)// Ibid.
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- *Zhuravleva N.A., Zhikhareva G.V.* Comparative analysis of algorithms for the heart dipole reconstruction (in Russian) // Ibid.
- *Shtykov V.V.* About application of personal computers at the training process for engineers (in Russian)// Ibid.
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- *Vziatyshev V.F., Permyakov V.A., Klyachin S.A., Nikolaenko D.V., Vladimirov S.V.* Dielectric wave-guide-beam converters for gas-dynamic experiments: diffraction operation principles and patterns (in Russian) // Ibid.
- *Mikhailov A.P., Vziatyshev V.F., Dmitriev N.I., Katin S.V., Kanakov V.A., Orekhov Yu.I., Rodionov A.V., Khvorostin V.I.* Multi-channel radio interferometry — the approach to diagnostic of edge changing for shock-wave and detonation processes / Conception and experimental confirmation (in Russian) // Ibid.
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- *Vziatyshev V.F., Vladimirov S.V., Kolomiets B.K., Krasnova L.I., Magaril C.M., Smolskiy S.M.* Education intelectualization and the technological support of graduates activity as the necessary condition of the innovation development of Russia (in Russian) // Proceeding of Intern. Conf. for the youth «Electronic culture. Information technologies of the future and modern electronic training. MODERN IT & (E-) LEARNING», Astrakhan State University, Oct. 6—8th 2009.
- *Vziatyshev V.F., Smolskiy S.M., Orekhov Yu.I., Permyakov V.A., Vladimirov S.V.* Diffraction millimeter-range devices on the open dielectric wave-guides and its systems:

physics of phenomena in near zone and some relevant applications (in Russian) // Proceedings of III All-Russia scientific conf. «Radar technology and radio communications». Moscow, IRE RAN, Oct. 26—30th 2009.

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- *Vziatyshev V.F., Shtykov V.V.* Determination of the wave features of the devices on the basis of measured parameters of the diffraction system: the integral equations method and error estimation (in Russian) // Proceedings of Popov RNTORES, No 65, 2010.
- *Gainulina E.Yu., Makarychev N.A., Shtykov V.V.* Software-hardware complex for measuring the amplitude-phase field distributions of the wave-guide-beam converters (in Russian) // Ibid.
- *Vziatyshev V.F., Katselenbaum B.Z., Orekhov Yu.I., Permyakov V.A., Smolskiy S.M.* Three years to physics and technique of diffraction millimeter-range devices. The way from the abstract project idea via the concept system (thesaurus), physics of wave phenomena and the system of specific models of devices to the transparent models of system and its decomposition with purpose to construct the new class of effective radio engineering diffraction systems (in Russian) // Izvestia VUZov, Physics, Tomsk: 2010, No 9/2.
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- *Gainulina E.Yu., Makarychev N.A., Orekhov Yu.I., Shtykov V.V.* Methods for investigations of diffraction radiation field of wave-guide-beam converters of millimeter range (in Russian) // Ibid.
- *Katselenbaum B.Z., Vziatyshev V.F., Gainulina E.Yu.* Diffraction wave phenomena in wave-guide-beam converters on the multi-mode dielectric wave-guides (in Russian) // Ibid.

Dissertations

- *Vladimirov S.V.* Dielectric wave-guide-beam converters on the multi-linked wave-guides: phenomena and principles of construction: Diss. ... Ph.D. Moscow, 2009.
- *Vinokurov D.S.* Processing of electrode lead signals with the aid of reconstruction of current dipole sources: Diss. ... Ph.D. Moscow, 2009.

Partners

- RF MD Company, Greensborough, North Carolina, U.S.A.
- JSC Phomos Materials, Moscow
- JSC "Radar MMS"
- Nancy University, France
- Sensor Technologies Ltd Company, U.K.
- Russian Foundation of Fundamental Research
- FGUP "R&D Institute of Measuring Systems (NIIIS) named after Sedakov"
- First Moscow State Medical University named after Sechenov
- Institute of Development of Biology named after Kol'tsov

- FGUP «R&D Institute of precise instruments»
- JSC "Ekran"

Unique equipment

- Technological complex for manufacturing the devices on the basis of metal, dielectric, and high-temperature super-conducting film materials by means of the method of vacuum evaporation anf photo-lithography
- Automated measuring bench for investigations the features of cryogenic UHF devices
- Measuring bench for measurements of frequency and temperature features of SAW devices on the basis of the Adgilent E5070A and Pycoprobe sensing probe.
- Hardware-software complex for investigation the features of electric signals and circuits
- Radio interferometer RI-3 for diagnostic of high-speed processes and for measurements of amplitude and phase variations of the diffraction wave formations in dielectric wave devices of millimeter range

DEPARTMENT OF RADIO RECEIVERS (DRR)

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16 lecturers,
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9 post-graduate students

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Dr. Sci. (Techn.), Professor
Yuri A. GREBENKO

Priority research activites

Rasearch Supervisors

- **Development of the promising radar methods and means for high-accurate remote measurements of vibration and small displacements of power engineering equipment elements**
  Professor Smolskiy S.M.
- **Development of radio measuring systems and devices for power engineering**
  Professors Smolskiy S.M., Bogatyrev Y.A.
- **Development of spatially distributed systems for collection, keeping, remote transfer and processing the information**
  Professors Bogatyrev Y.A., Grebenko Y.A.
- **System designing of uniform micro-electronic devices for signal processing**
  Professor Grebenko Y.A.
- **Synthesis of complex analog and digital filters on the similar sections**
  Professor Grebenko Y.A.
- **Development of multi-criteria methods of object comparison and choice in the uniform ensembles**
  Professor Kandyrin Y.V.
- **Development of methods and algorithms for variant ranking at various awareness degrees about the technical features of objects**
  Professor Kandyrin Y.V.
- **Development of methods of optimal queue formation to be under repair of the complicated equipment under the technical quality indices**
  Professor Kandyrin Y.V.
- **Development of new principles and soft-hardware means for remote diagnostics of functional condition of person**
  Senior researcher Fedorov V.A.

Agreements, contracts, projects

- Theoretical development of signal transmission and reception in wireless information-telecommunication systems
- Research of properties and effective reception and processing methods for radar and telecommunication signals
- Diffraction radio engineering devices and systems for radar and diagnostic technologies, measuring the object position, velocity and parameters: fundamentals and prospects of improving the functioning effectiveness
- Development of high-speed digital demodulator of frequency-modulated signal
- Development of coupling devices for digital units of analog signal processing with the communication lines
- Development of units for specific system of wire communication

- The circuit solution and implementation analysis for the microcircuits of high-speed operational amplifiers
- Development of control software packet for the system of light signaling
- Provision of capacity for work and reliability of engineering means for remote monitoring of functioning of the distributed reference junctions of guard radio complex MEGAPOLIS-RK

Key publications

- *Votoropin S.D., Noskov V.Ya., Smolskiy S.M.* Modern hybrid-integrated autodyne oscillators of microwave and millimeter ranges and its application. Investigations of frequency-modulated autodynes (in Russian) // Achievements of Modern Radio Electronics. 2009. No 3. P. 3—50.
- *Genefiko T.A., Lishak M.Yu.* Comparative analysis of digital algorithms for the adaptive spatial filtering (in Russian) // Radiotekhnicheskie Tetradi. 2009. No 38. P. 33—37.
- *Grebenko Yu.A.* Uniform devices for signal processing (in Russian). — Moscow: MPEI Publishing House. 2009. 183 p.
- *Grebenko Yu.A., AHKAR MYO* Design of digital complex filters by method of complex delay (in Russian) // MPEI Vestnik. 2009. No 1. P. 70—72.
- *Grebenko Yu.A., KO KO HTWE* Combined digital IIR-FIR filters with linear phase-frequency curve (in Russian) // Radiotekhnicheskie Tetradi. 2009. No 40. P. 40—42.
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- *Grebenko Yu.A. KYAW ZAY YA* Calculation of analog complex filters with consistent structure on the identical sections (in Russian) // Radiotekhnicheskie Tetradi. 2010. No 42. P. 45—48.
- *Grechikhin V.A., Zamolodchikov V.N., Smolskiy S.M.* On several possibilities of modern radio electronic application in the power engineering (in Russian) // MPEI Vestnik. 2010. No 2. P. 149—171.
- *Kandyrin Yu.V., Koshelev A.M., Krayachich A.V., Sazonova L.T.* Multi-criteria automated variant choice for component replace at repair of radio electronic devices (in Russian) // Radiotekhnicheskie Tetradi. 2009. No 38. P. 60—63.
- *Kandyrin Yu.V.,* Approach to select the replacement of failed components of the radio receivers with the help of factor-sets (in Russian) // Network Electronic Journal «System Engineering». MGIEM and World-Wide Distributed University (WDU) Publishing House. 2010. No 8. http://systech.miem.edu.ru/ogl-8.html
- *Komarov I.V., Smolskiy S.M.* Fundamentals of radar systems with continuous radiation of frequency-modulated oscillations (in Russian). Moscow: Hot Line — Telecom Publishing House. 2010. 392 p.
- *Mizirin A.V., Timashova T.G., Fedorov V.A., Khramtsov P.I.* Radar PULSAR complex and its usage opportunities for the integrated estimation of person organism condition (in Russian) // Meditsinskaya tekhnika. 2010. No 2. P. 13—20.
- *Noskov V.Ya., Smolskiy S.M.* Registration of autodyne signal in the power supply circuit for oscillator on UHF semiconductor diodes (Review) (in Russian) // Tekhnika i probory of UHF. Odessa, Ukraine. 2009. No 1. P. 14—26.
- *Noskov V.Ya., Smolskiy S.M.*. Modern hybrid-integrated autodyne oscillators of microwave and millimeter ranges and its application. Investigations of radio-pulse autodynes (in Russian) // Achievements of Modern Radio Electronics. 2009. No 6. P. 3—51.

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- *Noskov V.Ya., Smolskiy S.M.* Peculiarities of autodyne response of radio-pulse oscillator in the case of distributed reflecting object (in Russian) // Radiotekhnicheskie Tetradi. 2009. No 39. P. 68—75.
- *Noskov V.Ya., Smolskiy S.M.* General relations for the autodyne effect analysis in single-frequency oscillators (in Russian) // Radiotekhnicheskie Tetradi. 2010. No 41. P. 37—42.
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- *Rembovsky A., Ashikhmin A., Kozmin V., Smolskiy S.* Radio Monitoring: Problems, Methods and Equipment. Springer Science + Business Media. LLC 2009. New York. USA. 507 p.
- *Sazonova L.T.* Principles of automated systems design for the component selection of radio receivers (in Russian) // Network Electronic Journal «System Engineering». MGIEM and World-Wide Distributed University (WDU) Publishing House. 2010. No 8. http://systech.miem.edu.ru/ogl-8.html
- *Smolskiy S.M., Noskov V.Ya.* Thermal losses influence on the signal formation in autodyne SRR // Proceedings of XIX Intern. Crimea conf. «UHF Engineering and Telecommunication Technologies». 14—18 of Sept. 2009. Sevastopol. Ukraine. P. 805—808.
- *Smolskiy S.M., Noskov V.Ya.* Circuits for autodyne signal registration of the oscillators on Gunn diode // Ibid. P. 809—812.
- *Smolskiy S.M., Noskov V.Ya.* Operation principle of intro-pulse autodyne SRR with FM signals // Ibid. P. 813—816.
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Dissertations

- *Koshelev A.M.* Development of methods for structuring and variant selection in the problems of automated design of radio electronic equipment: Diss. on Ph.D. Moscow, 2009.
- *Krasnov M.I.* Algorithms and checking devices for extra-large integrate circuits for radio equipment: Diss. on Ph.D. Moscow, 2010.
- *KYAW ZAY YA* Complex active RC-filters on the identical sections: Diss. on Ph.D. Moscow, 2010.
- *AHKAR MYO* Complex digital filters on the identical sections: Diss. on Ph.D. Moscow, 2010.

Partners

- Federal State Unitary Enterprise «Central R&D Institute «Kometa», Moscow
- JSC «Special Research Bureau of MPEI», Moscow
- Federal State Unitary Enterprise «Russian R&D Institute of Space Instrumentation», Moscow
- JSC «Navy R&D Institute of Radio Electronics «Altair», Moscow
- Federal State Unitary Enterprise «Specific Scientific-Industrial Association «Eleron», Moscow

- JSC «R&D Institute of Instrumentation named after Tikhomirov, Zhukovskiy, Moscow region
- JSC «R&D Institute of Semiconductor Devices», Tomsk
- Russian Academy of Reliability, Moscow
- Bauman Moscow State Technical University, Moscow
- Volgograd State Technical University, Volgograd
- Ural State Technical University, Ekaterinburg
- Non-State Educational Institution «TAKIR», Moscow
- R&D Center «URION», Moscow
- Industrial-Engineering Company «ZASHCHITA», Moscow
- Company «M-Video-Service», Moscow
- Company «ADVANTEX», Moscow

Unique equipment

- Portable Measuring Radar Complex for remote diagnostics of person functional condition
- System for collection, processing and remote transmission of technological information on the power engineering objects at increased radio interference level

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10 lecturers,
7 post-graduate students

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Dr. Sci. (Techn.), professor
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Priority research activites

Research Supervisors

- **Satellite radio navigation systems**
  Professor Perov A.I.
- **Theory and methods of statistical synthesis of radio systems and devices at full and non-full a priori information**
  Professor Perov A.I.
- **System analysis of the complex radio systems**
  Professor Gubonin N.S.
- **Investigation of the satellite systems for information transmission**
  Associated-Professor Siziakova A.Yu.

Agreements, contracts, projects

- Development of structure of the prospective navigational signals for the specific consumers of GLONASS system
- Investigations of noise immunity of the satellite navigation equipment for military and specific purposes, means for the ground-based control complex and on-board information-navigation complexes of GLONASS system
- Research and development of effective methods and intellectual algorithms of the promising signal processing for satellite radio navigation system GLONASS in the consumer equipment providing the quality increasing of the navigation-temporary support
- Development of the complex algorithms and software-mathematical support for signal processing of the satellite radio navigation and inertial navigation systems in receiving-calculation module of on-board navigation equipment
- Development of the complicated functional unit of the code generation for signals of the authorized consumer of prospective GLONASS system
- Development and substantiation of the prospective navigational signals with code division for the space navigation GLONASS system and the optimal algorithms of their processing in the consumer equipment

Key publications

- *GLONASS.* Principles of construction and functioning (in Russian). 4th edition / Under edition of A.I. Perov, V.N. Kharisov. Moscow: Publishing House Radiotekhnika, 2010, 800 p.
- *Verba V.S., Merkulov V.I., Perov A.I.* etc. Evaluation of range and velocity in radar systems (in Russian). Part 3 / Under edition of Verba V.S., Merkulov V.I. Moscow: Publishing House Radiotekhnika, 2010, 472 c.
- *Perov A.I., Taman A.I.* Optimal decoding of data bits at reception of the 8-PM signal (in Russian) // Radiotekhnika, No 7, 2010, P. 93—99.
- *Boldenkov E.N.* Signal search algorithm by means of direct evaluation of shifting register state (in Russian) // Radiotekhnika, №7, 2010, P. 100—105.

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- *Zamolodchikov V.N.* Comparative analysis of the control algorithms for pointing the mobile objects on the basis of GLONASS data (in Russian) // Radiotekhnika, No 7, 2010, P.106—115.
- *Perov A.I., Taman A.I.* Optimal decoding of bits of data at signal reception with octal phase-shift keying (in Russian) // Radiotekhnika, No 5, 2010, P. 86—93.
- *Perov A.I., Korogodin I.V.* Synthesis and analysis of discriminators of phase difference signals received on the set of spatially spaced points (in Russian) // Radiotekhnika, No 7, 2010, P. 44—92.
- *Grechikhin V.A., Zamolodchikov V.N., Smolskiy S.M.* About some opportunities of application of the modern radio electronics achievements in power engineering (in Russian) // MPEI Vestnik, No 2, p. 141—149.
- *Pervachiov S.V., Kulikov R.S.* Digital PLL system with α, β, γ-filter adapting to the dynamic impact of unknown intensity (in Russian) // MPEI Vestnik, 2010, No 1, P. 66—72.
- *Pervachiov S.V., Kulikov R.S.* Adaptation accuracy analysis in the adaptive digital system at diffusion model of the dynamic impact // MPEI Vestnik, No 2, P. 66—72.
- *Kognovitskiy L.V., Smirnova A.M.* Asymptotic relations in the communication systems with the frequency channel division at impact of the interference concentrated on the spectrum (in Russian) // Radionekhnicheskie tetradi, 2010, No 42. P. 40—45.
- *Perov A.I., Boldenkov E.N., Bakit'ko P.V.* Analysis of the intersystem interference influence on the consumer equipment of the satellite radio navigation systems (in Russian) // Radiotekhnika, No 1, 2009. P. 20—28.
- *Perov A.I., Korogodin I.V., Lopatko O.E.* Combined coherent — non-coherent system for determination of the object orientation angles on the basis of the signals of the satellite radio navigation systems (in Russian) // Radiotekhnika, No 7, 2009. P. 88—98.
- *Perov A.I.* Analysis of intersystem interference in the satellite radio navigation systems with code channel division using the different navigation signals (in Russian) // Radiotekhnika, No 7, 2009. P. 121—128.
- *Perov A.I., Taman A.I.* Optimal character-oriented demodulation at reception of signal with the digital 4-PM modulation (in Russian) // Radiotekhnika, No 7, 2009. P. 110—112.
- *Boldenkov E.N.* Synthesis and analysis of the optimal algorithm for navigation signal reception under conditions of multi-path propagation (in Russian) // Radiotekhnika, No 7, 2009. P. 105—109.
- *Shatilov A.Yu.* Calculation approach of the noise immunity of the complex PLL in the consumer equipment of the satellite radio navigation system/inertial navigation system (in Russian) // Radiotekhnika, No 7, 2009. P. 113—120.

Patents

- Patent on the useful model No 84993. Measuring device for phase difference of radio signals / A.I. Perov, I. Korogodin. Registered at 20.07.09.
- Patent on invention No 2388001. Measuring device for phase difference / A.I. Perov, I. Korogodin. Registered at 27.04.10.
- Patent on invention No 2361232. Digital receiver for satellite radio navigation systems / A.I. Perov. Registered at 10.07.09.
- Patent on the useful model No 95207. Receiveng device for 8-PM signals with Grey code / Perov A.I., Taman A.I. Registered at 17.03.2010.

Computer programs

- Certificate on state registration of computer program No 2009612470. Imitation model of receiver intended for determination of object angular orientation on the basis of the signals of the satellite radio navigation system. Registered at 31.09.2009.
- Certificate on state registration of computer program No 2010613889. Imitation model of the signal receiver of the satellite radio navigation system combined with the inertial navigation system. Registered at 22.04.2010.
- Certificate on state registration of computer program No 2010613888. Program unit for fast search of GPS C/A signals. Registered at 22.04.2010.

Partners

- JSC «Russian Space Systems», Moscow
- JSC «R&D Institute of Space Instrumentation», Moscow
- JSC «Navigation Systems», Moscow
- Bauman Moscow State Technical University
- Moscow State University of Communications and Informatic
- Moscow State University «MIREA»

Unique equipment

- Equipment of space navigation system GPS for formation of interference signals.
- Universal combined with the inertial navigation receiver «Alpaka».
- Semi-natural modeling bench for effectiveness research of the consumer vavigation equipment of GPS/GLONASS

DEPARTMENT OF ANTENNA DEVICES AND RADIO WAVE PROPAGATION (ASRWP)

IREE

REF

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12 lecturers,
3 researchers,
8 post-graduate students

Acting Head of Department
Dr. Sci. (Phys.-Math.), Professor
Valery A. PERMYAKOV

Priority research activites

Research Supervisors

- **Principles of new antenna implementation for application in the modern radio engineering systems and devices of various purposes**
  Professor D.M. Sazonov, Associate Professor V.V. Bodrov
- **Mathematical simulation of antennas and UHF devices with the help of the modern mathematical packets**
  Associate Professor A.A. Kurushin
- **Investigations of radiation and propagation processes of the pulse signals**
  Professor V.A. Permyakov
- **Analysis of propagation processes and diffraction of waves with complex structure on the basis of the hybrid numerically-asymptotic methods**
  Professor V.A. Permyakov

Agreement, contracts

- Development of formation methods for electromagnetic fields of the given structure by the radiator system

Key publications

- *Manichev A.O., Kondratiev A.S., Balagurovskiy V.A.* Methods of phase formation of the expanded deep nulls in the pattern of the phased array with the random distortions of the amplitude-phase distribution (in Russian) // Antennas, No 9, 2009. P. 17—28.
- *Dorofeev I.V.* Numerical modeling of two-dimensional systems consisting of finite number of cylinders and the electromagnetic wave sources (in Russian) // Radiotekhnika, No1, 2009. P. 57—63
- *Gusevskiy V.I., Gnedak P.V., Dovbnya I.S., Belov V.A.* Null formation in the patterns of the reflector abtennas with the help of the passive diffuser (in Russian) // Radiotekhnika, No1, 2009. P. 9—13
- *Kondratiev A.S.* Phase-only synthesis of antenna arrays with quantized phase shifters (in Russian) // Progress in Electromagnetic Research Symposium. Russia, Moscow, 18—21 August 2009 (electron edition)
- *Permyakov V.A., Sorokovik D.V., Korykin A.N.* Qualitative analysis of dipole antenna impulse radiation (in Russian) // Progress In Electromagnetic Research Symposium. Russia, Moscow, 18—21 August 2009 (electron edition)
- *Experimental* method of direct problem solution for statistical theory of antennas (in conformity with the problem of noise immunity growth of the antenna systems) (in Russian)/ Balagurovskiy V.A., Kondratiev A.S., Manichev A.O., Polishchuk N.P. // Radioelektronnye sistemy. General Engineering series, vol. 2 (16), 2009. P. 34—41.
- *Manichev A.O., Balagurovskii V.A., and Kondratiev A.S.* "A method for Formation of Both Deep and Wide Nulls in the Radiation Pattern of a Phased Array Antenna that is Resistant to the Presence of Random Distortions of the Amplitude-Phase Distribution" (in

Russian) // Progress In Electromagnetic Research Symposium, Russia, Moscow, 18—21 August 2009 (electron edition)

- ***Permyakov V.A., Mikhailov M.S., Koriukin A.N., Sorokovik D.V.*** About the area formation with low value of electrical field on a finite distance from the radiator systems (in Russian) // IRE RAN , Proceedings 3-rd All-Russia Conf. «Radar technologies and radio communications», Moscow, Oct. 26—30th 2009, vol. 1, Moscow, 2009. P.17—21.
- ***Permyakov V.A., Vladimirov L.M.*** Electromagnetic wave diffraction on the infinite dielectric cylinder situated under the plane Earth surface (in Russian) // Ibid. Vol. 2. P. 66—70.
- ***Permyakov V.A., Zheksenov M.A., Komarov A.A.*** Comparison of diffraction fields from dielectric wedge obtained by the integral equation method and under approximation of uniform geometric theory of diffraction (in Russian) // IRE RAN, Proceedings 3-rd All-Russia Conf. «Radar technologies and radio communications», Moscow, Oct. 26—30th 2009, Moscow, 2009. P. 682—686, (electron edition).
- ***Permyakov V.A., Zheksenov M.A.*** Methods of calculation of the radio wave propagation in the town (in Russian) // Radiation and Dispersion of electromagnetic waves IREMV-2009. Proceedings of Intern. Conf. Taganrog-Divnomorskoe. 27th of June — 1st of July, 2009. P. 48—52.
- ***Three*** years to physics and technique of diffraction millimeter-range devices. The way from the abstract project idea via the concept system (thesaurus), physics of wave phenomena and the system of specific models of devices to the transparent models of system and its decomposition with purpose to construct the new class of effective radio engineering diffraction systems (in Russian) / Vziatyshev V.F., Katselenbaum B.Z., Orekhov Yu.I., Permyakov V.A., Smolskiy S.M. // Izvestia VUZov, Physics, — Tomsk: 2010, No 9/ 2. P. 116—120.
- ***About*** the negative experimental results on detection of slow longitudinal electromagnetic waves (in Russian) / Permyakov V.A., Bunin A.V., Khriunov A.V., Kubasov P.V. // Izvestia VUZov, Physics, — Tomsk: 2010, No 9/2. P. 120—125.
- ***Diffractional*** radio engineeting systems for short-range radar and diagnostics: the specifioc properties, wave phenomena, thesaurus (in Russian) / Vziatyshev V.F., Katselenbaum B.Z., Orekhov Yu.I., Permyakov V.A., Smolskit S.M. // Proceedings of IV All-Russian conf. "Radar Technology and Radio Communication" 29th of Nov. — 3rd of Dec. 2010, Moscow: IRE RAN, P. 123—127.
- ***Permyakov V.A., Koriukin A.N.*** On the alternative approaches to the polarization description of ultra-wide-band signals (in Russian) / MPEI Vestnik, 2010, No 2, P. 172—173
- ***Gutzeit E.M., Kurushin A.A., Maslov V.E.*** Electrodynamic analysis of the quota-wavelength multi-resonator systems with quantum points for creation of high-efficient light-emitting diode modules (in Russian) / MPEI Vestnik, 2010, No4, P. 63—70
- ***Denisenko G.A., Gutzeit E.M., Kurushin A.A.*** Electrodynamics Modeling of Nanosized Optical Systems (in Russian). 4th International Conference of Physics of Laser Crystals. Sudak, Crimea, 12—16 September 2010, Kharkiv-Sudak, / Physics Department Kharkiv National University for Radioelectronics, 2010., P. OC10.
- ***Bankov S.E., Davydov A.G., Kurushin A.A.*** Antenna-Filter (in Russian) / Radio Electronic Journal. Electron Edition, ISSN 1684—1719. Main Editor Academician Yu.V. Guliaev. No 4, April 2010.
- ***Bankov S.E., Bychkov A.N., Davydov A.G., Kurushin A.A.*** Multi-wired quadro-filar antennas (in Russian) / Ibid. No 9, September 2010.
- ***Kurushin A.A.*** Application of Floket channels fore simulation of the periodic nano-structure (in Russian) / Ibid. No 11, November 2010.

- *Kurushin A.A.* Designing of UHF devices using the Smith electronic diagram (in Russian) / Under edition of Dr. Sci. (Techn.), professor B.L. Kogan — Moscow, MPEI Publishing House, 2010. 120 p.

Patents

- *Balagurovskiy V.A., Kondratiev A.S., Sergeev E.A., Manichev A.O.* Russian patent No 2,343,495 "Method for determination of pattern of phased array". Priority from 30th of March, 2006. Registered at 10th Jan. 2009.
- *Balagurovskiy V.A., Vavilov V.A., Kondratiev A.S., Manichev A.O.* Russian patent No 2,373,620 "Method for phase formation of nulls in the pattern of phased array". Priority from 20th of Febr. 2008. Registered at 20th of Nov. 2009.

Partners

- Institute of Radio Engineering and Electronics of RAS, Moscow,
- Institute of Theoretical and Applied Electrodynamics of RAS, Moscow
- Special Research Bureau of MPEI, Moscow

IREE DEPARTMENT OF RADIO ENGINEERING DEVICES (RED)

REF

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12 lecturers,
5 post-graduate students

Head of Department
Dr. Sci. (Techn.), Professor
Aleksander I. BASKAKOV

■ Priority research activites

Research Supervisors

- **Principles of the remote monitoring of sea ice situation in the North latitudes of Russia for support the ecology and power engineering safety by aviation-space and ground-based radar systems**
  Professor Baskakov A.I.
- **Methods and algorithms for recovering the three-dimensional relief of the Earth surface with the help of combining of inteferometric radar using the antenna with synthesized aperture and the precise radio altimeters**
  Professor Baskakov A.I.
- **Research and development of radar systems of the remote sensing of Earth and planet**
  Professor Baskakov A.I., Associate Professor Lukashenko Yu.I.
- **Radar systems of subsurface sensing for checking the communications, railway and automobile road-way**
  Professor Baskakov A.I., Associate Professor Zhutiaeva T.S.
- **Fast Fourier transformation and its application in various systems**
  Associate Professor Lukashenko Yu.I.
- **Research and development of radar systems operating under the complicated interference situation**
  Associate Professor Zhutiaeva T.S.
- **Theory and technique of the optimal digital formation and processing of radio systems of arbitrary forms**
  Associate Professor Matiushin O.T.
- **Theory of the signals with continuous angular modulation for systems of the discrete information transmission via the communication channels with limited bandwidth**
  Associate Professor Matiushin O.T.
- **Theory and technique of construction of the discrete information transmission systems via the communication channels corrupted by interference**
  Associate Professor Matiushin O.T.
- **Research of the state and evolution changes of the biological objects by means of laser remote diagnostics**
  Associate Professor Briukhovetskiy A.P.
- **High-precision laser-television and laser-infrared systems of the trajectory measurements**
  Associate Professor Bugaiov Yu.N.
- **Networks and systems of the satellite communications**
  Associate Professor Bugaiov Yu.N.
- **Selection of the complicated targets on the interference background**
  Associate Professor Bugaiov Yu.N.
- **Problems of combining the radio engineering and laser-television systems for the high-precision trajectory measurements**
  Associate Professor Bugaiov Yu.N.

- **Algorithms investigations and development of the tracking devices and devices for image recognition on the basis of FPGA**

  Associate Professor Briukhovetskiy A.P.
- **Statistical radio engineering and radio physics, algorithms of optimal and quasi-optimal signal and image processing, computer simulation, information technologies**

  Professor Chernoyarov O.V.
- **Digital video-information systems**

  Professor Dvorkovich A.V.
- **Compression of video and audio information**

  Professor Dvorkovich A.V.

Agreements, contracts

- Fundamental research of the principles of remote monitoring of sea ice situation in the North latitudes of Russia for providing the ecology and power engineering safety by aviation-space and ground-based radar systems
- Development of engineering proposals on creation the radar systems for the high-precision estimation of ice situation in the areas of sea extraction and transporting the oil-gas resources
- Investigation of the state and evolution change of biological objects my means of laser remote diagnostics
- Research and development of the digital system for search and demodulation of radio signals with frequency modulation
- Investigations of processing algorithms and development of the noise-resistant digital system for search and demodulation radio signals with frequency modulation on two sub-carriers
- Investigations of processing algorithms and development of noise-resistant digital system for search and demodulation of the radio signals with frequency-pulse modulation

Key publications

- *Baskakov A.I., Grishechkin B.Y.* The potential of a space altimeter when measuring significant wave height, ISPRS Technical Commission VII Symposium 100 Years ISPRS Advancing Remote Sensing Science, Vol. XXXVIII part 7A, Institute of Photogrammetry and Remote Sensing, Vienna University of Technology, Vienna, Austria, July 5—7, 2010. P. 49—52
- *Baskakov A.I., Grishechkin B.Y.* Optimal algorithms for spaceborne altimeter, IGARSS 2010 IEEE International Geoscience and Remote Sensing Symposium, Honolulu, Hawaii, USA, July 25—30, 2010.
- *Baskakov A.I., Odsuren B.* Application of active-passive methods of geo-radar technology for the determination of the ground electric-physical features (in Russia). Proceedings of III All-Russia conf. «Ultra-high-band signals in radar technology, communication and acoustics— CPCA 2010». Problems of the remote sensing, propagation and diffraction of radio waves. Murom, June 2010.
- *Odsuren B.* Combining of radar system of sub-surface sensing to increase the self-descriptiveness and improving results by means of simulation of geo-radar receiving section (in Russian). Electron journal of IRE RAS, Radio Electronics, No 5, 2010.
- *Odsuren B.* Analysis of features of the antenna system of geo-radar (in Russian). MPEI Vestnik, 2009, No 1, P. 63—69.
- *Chernoyarov O.V., Rashitov M.F.* Reception effectiveness of the random pulse signals of the arbitrary form with unknown time of arrival (in Russian) // MPEI Vestnik. 2010, No 5, p. 102—111.

- *Chernoyarov O.V.* Estimation of time of arrival of the narrow-band random pulse of the arbitrary form (in Russian) // Radiotekhnika. — 2009. No 12. P. 12—18.
- *Chernoyarov O.V.* Optimal and quasi-optimal algorithms for estimation of the time of arrival of Gaussian random pulse (in Russian). Proceeding of XII Intern. Conf. on soft calculations and measurements. Vol.1.Sankt-Peterburg, 2009. P. 135—138.
- *Chernoyarov O.V., Appolonov I.V., Babkin A.V., Kaliuka V.I.* Statistical analysis of random pulse signals on the background of white and correlated interference uder conditions of parametric a priori uncertainty (in Russian) / Modeling of development of information-communication systems / Under edition of Babkin A.V. Sankt-Peterburg. 2009. 384 p.
- *Dvorkovich A.V., Likhobabin E.A.* Application of quasi-optimal algorithm for decoding LDPC-codes in the system of digital TV broadcasting of DVB-T2 standard (in Russian) // Digital signal processing and its application: Proceedings of 12 Intern. Conf. Moscow: 2010. Vol. XII P. 25—27

Patents

- *Briukhovetskiy O.V., Suetenko A.V.* Russian patent «Device of remote detection and identification of oblect of the organic and biological origin» No 20/10129924 dated 19.07.2010.

Dissertations

- *Odsuren B.* «Combining of the geo-radar with radiometer for increasing the self-descriptiveness and accuracy at sub-surface sensing». Diss. Ph.D, (Techn.), Moscow, 2010.

Partners

- JSC «Special Design Bureau of MPEI, Moscow
- JSC «Scientific-Industrial Enterprise «Salut»
- Federal State Unitaru Enterprise «R&D Institute of space instrumentation», Moscow
- Concern «ALMAZ-ANTEI», JSC «R&D Institute of instrumentation, Zhukovskiy, Moscow region
- R&D Insitute of precision instruments. Moscow
- Korean Polytechnic University, Seoul, Republic of Korea
- Zhilin University, Slovakia.

Unique equipment

- Automated checking-measuring radio engineering complex for arranging of mutual scientific researches, to support the student's Bachelor and Master investigations and for conducting the modern educational process on the digital TV programs with the elements of remote education

FABRIKANT PHYSICS (FP) DEPARTMENT

Ph.: +7 495 362-7755, fax: +7 495 673-0859

REF

36 lecturers,
8 researchers,
8 post-graduate students.

Head of Department
Ph.D. (Techn.) Professor,
Olga A. EVTIKHIEVA

Priority research activites

Research Supervisors

- **Laser gradient refractography**
  Professor Evtikhieva O.A.
- **Applied laser optics**
  Professor Ischenko Ye.F.
- **Laser diagnostics of microflows: application in energetic and thermophysics**
  Professor Rinkevichyus B.S.
- **Statistical optics and the laser diagnostics of a turbulence**
  Professor Smirnov V.I.
- **Investigation of the inelastic electron collisions with atoms and molecules**
  Leading Researcher Smirnov Yu.M.
- **Investigation of the semiconductor laser characteristics**
  Associated-Professor Koval' O.I.
- **Computer image processing for the optical methods of a flow diagnostic**
  Associated-Professor Skornyakova N.M.
- **Optical systems with a polarization heterogeneity**
  Associated-Professor Sokolov A.L.

Agreements, contracts, projects

- Development of thermal-graphical method and equipment for overheating check of energy equipment units and heat aggregates
- Investigations of laser methods for micro-flow diagnostics
- Modern measuring technologies for flight testing
- Development of the shadow background method for flow investigations
- Fundamentals of optical diagnostic methods of aerodynamic flows in the full-scale experiment
- Research of velocity and temperature fields in the micro-scale by optical methods
- Modern measuring technologies for the flight testing-2
- Development of optical-laser measuring technologies for solution of energy saving problems
- Organizational-engineering support for fulfillment of All-Russian conference with scientific school elements for youth «Optical methods for flow investigations»
- Development of the background image correlation method for diagnostics of deformations of large-scale surfaces
- Diagnostics of the near-wall liquid layer by methods of laser refractographics and the complete internal reflection
- Feasibility study of laser method application to measure of high-speed deformations of the solid bodies

Key publications

- *Optical* methods of flow research (in Russian) / under edition of Yu.N. Dubnishchev, B.S. Rinkevichus // Proc. of IX-th Intern. Scient. Conf. Moscow, MPEI Publ., 2009, 150 p.
- *Raskovskaya I.L., Rinkevichus B.S., Tolkachiov A.V., Shiriskaya E.S.* Refraction of the Bessel beam in the spherical temperature boundary layer (in Russian) // Optics and spectroscopy, 2009. Vol. 109, #6. P. 1016—1022.
- *Mikhaliov A.S., Rinkevichus B.S., Skorniakova N.M.* The laser interference method for parameter determination of gas bubble (in Russian) // Metrology (monthly appendix to the journal «Measuring Engineering»). 2009. #9. P. 3—14.
- *Evtikhieva O.N., Skorniakova N.M., Udalov A.V.* Accuracy examination of the shadow background method (in Russian) // Metrology (monthly appendix to the journal «Measuring Engineering»). 2009. #10. P. 31—40.
- *Lapitskiy K.M., Raskovskaya I.L., Rinkevichus B.S.* The calculation algorithm for refractograms of the plain laser beam in optically non-uniform medium (in Russian) // Measuring Engineering, 2009. #5. P. 25—29.
- *Nguen V.T., Raskovskaya I.L., Rinkevichus B.S.* Algorithms of the quantitative diagnostics of optical irregularities by the laser refractografics method (in Russian) // Measuring Engineering, 2009. #4. P. 24—28.
- *Grechikhin V.A., Raskovskaya I.L.* Analysis of characteristics of the digital registration systems for optical signals on the basis of matrix photo-receiver (in Russian) // Measuring Engineering, 2009. #4. P. 25—29.
- *Raskovskaya I.L.* Structured beams in laser refractographics problems (in Russian) // Radiotekhnika i elektronika. 2009. Vol. 54. #12. P. 1524—1531.
- *Raskovskaya I.L., Rinkevichus B.S., Tolkachiov A.V.* Laser refractographics (in Russian) // Laser Inform. Information Bulletin of Laser Association. 2009. # 11 (410).
- *Chunaev D.S., Konushkin V.A., and Karasik A.Ya.* Control of RadiatioSpatial Coherence under Synchronous Amplification on Crystalline LiF:F2 — Amplifier Laser Physics / 19. # 7. 1423 (2009).
- *Perforation* technologies of near-located micron holes using the neodymium LiF:F2-laser (in Russian) / T.T. Basiev, A.Ya. Karasik, V.V. Osika et al. // Quantum Electronics. 2009. Vol. 39. #7. P. 609
- *Tavrov A.V.,* Development of Spatial Coherene from an Extended Source in Successive Rotational Shearing Interferometers for Achromatic Stellar Coronography // Journal of Experimental and Theoretical Physics / 2009. V. 108. #6. P. 963—976.
- *Achromatic* deep nulling with three-dimensional Sagnac interferometer / K.Yokoshi, A.Tavrovm Ju. Nishikawa // Optical letters. 2009. V. 34. #13. P. 1985—1987.
- *Smirnov Yu.M.* Excitation of the even levels of the erbium atom existing without changing of a number of 4f-electrons // Optics and Spectroscopy. 2009. Vol. 106. №2. P. 200—206.
- *Smirnov Yu.M.* Excitation sections of the tungsten atom by electronic impact // Thermal Physics of High Temperatures. 2009. V. 47. #1. P. 17—25
- *Smirnov Yu.M.* Dissociative excitation of even sextet levels of the cobalt atom at electron collision with $CoCl_2$ molecules // Chemical physics. 2009. Vol. 28. #6. P. 9—15.
- *Smirnov Yu.M.* Excitation of triplet D-levels of the barium atom at collisions with electrones // Optics and Spectroscopy. 2009. Vol. 106. «№6. P. 869—875.
- *Smirnov Yu.M.* Excitation of $3F^0$-levels of the nickel atom by collisions with slow electrons // Journal of Applied Spectroscopy. 2009. Vol. 76. #5. P. 645—651

- *Smirnov Yu.M.* Dissociative excitation of single and quintet states of the nickel atom at collisions with e-NiBr2 // Chemical Physics. Vol. 29. 2010. # 2. February. P. 3—10.
- *Smirnov Yu.M.* Excitation of double SO-, PO-, DO-levels of the cobalt atom by electron impact // Optics and Spectroscopy. 2010. Vol. 108. №16. P. 25—32.
- *Smirnov Yu.M.* Excitation of the strontium atom in electron-atom interactions // Journal of Applied Spectroscopy. 2010. Vol. 77. #3. P. 325—333
- *Smirnov Yu.M.* Excitation sections of junctions of the thulium atom finalizing at levels 4f13(2f^0)6ы6з(330)(7.26O2)c J2=O1 // Optics and Spectroscopy. 2010. Vol. 109. №3. P. 366—372.
- *Smirnov Yu.M.* Dissociative excitation of odd quintet levels of the iron atom at collisions of electrons with molecules of iron dichloride // Chemical Physics. 2010. V. 29. #6. P. 3—7
- *Lukanin V.I., Chunaev D.S., Karasik A.Ya.* Dynamics of double-photon picosecond absorption in crystals of $ZnWO_4$ and $PbWO_4$ // Letters to GTF. 2010. V.91. #11. P. 625—620.
- *Raskovskaya I.L., Rinkevichus B.S., Tolkachiov A.V.* Diagnostics of convective processes in the boundary layer of liquid by the laser refractographic method // Engineering-Physical Journal. Minsk. 2010. V. 83. # 6. P. 1149—1156.
- *Pavlov I.N., Rinkevichus B.S., Tolkachiov A.V.* Laser irregularity visualizator of near-wall liquid layers // Measuring Engineering. 2010. # 9. P. 33—35.
- *Smirnov V.I.* Fundamental limitations of accuracy of mutual measurements of the optical field parameters // Measuring Engineering. 2010. # 9. P. 26—31.
- *Tavrov A.V., Orlov D.A., Vinogradov I.I.* // Measuring Engineering. 2010. # 9. P. 31—37.
- *Grechikhin V.A.* Spectral evaluations of signal parameters of laser Doppler measuring systems // Measuring Engineering. 2010. # 10. P. 37—42.
- *Poroikov A.Yu., Skorniakova N.M.* The analysis of correlation method of the background images for measurement of the metallic surface bend // Measuring Engineering. 2010. # 10. P. 43—46.

Patents

- Russian patent # 2009124185 dated 25.06.2009. Achromatic interference coronograph / A.V. Tavrov. 2009.

Dissertations

- *Mikhaliov A.S.* Optical-electronic complex of simultaneous parameter measurement of moved gas bubbles or liquid drops: Cand. Sci. (Techn.) Dissertation. 2009.
- *Lapitskiy K.M.* Decelopment of calculation and refraction pattern processing methods in the laser system of heat field visualization: Cand. Sci. (Techn.) Dissertation. 2009.
- *Tavrov A.V.* Physical and engineering fundamentals of achromatic interference coronographics: Cand. Sci. (Techn.) Dissertation. 2009.
- *Badamshina E.B.* Methods of production error compensation of circular optical resonators: Cand. Sci. (Techn.) Dissertation. 2009.
- *Nguen V.T.* Calculation of the screen illumination by an astigmatic beam at its propagation in the heterogeneous medium: Cand. Sci. (Techn.) Dissertation. 2009.
- *Udalov A.V.* Hardware-software complex for shadow background method for natural investigations: Cand. Sci. (Techn.) Dissertation. 2010.

Partners

- Aerospace Center «Piaggo», Genoa & Final, Italy
- Airport Braunschwage, Germany
- Institute of General Physics, RAS, Moscow
- Heat-and-Mass Exchange Institute, National Academy of Sciences of Belarus, Minsk, Belarus
- Thermophysics Institute, RAS Siberian Branch, Novosibirskк
- JSC ONERA», Toulouse, France
- JSC EVECTOR, Kunovich, Czech Republic
- Cranfield University, UK
- Lomonosov Moscow State University, Moscow
- Germany air-space agency, Gettingen, Germany
- German Division of EUROCOPTER, Germany
- The Netherlands Aerospace Center, Amsterdam, The Netherlands
- Joint Institute of High Temperatures, RAS, Moscow
- Sankt-Peterburg state technical university
- Levedev Physical Institute, RAS, Moscow
- French Division of AirBus, Toulouse, France
- French Division of EUROCOPTER, Mariagnan, France
- Baranov Central Institute of Aviation Motors, Moscow

Unique equipment

- Fiber-optics sensors for the air-hydrodynamic flow research
- Laser automated setup for the turbulence diagnostics
- Laser refractorgraphic system for investigation of the non-stationary heat micro-processes
- Laser setup for the flow velocity field measurement with the particle image method
- Installation for the inelastic collision investigations of electrons with atoms and molecules
- Installation for the shady background method for diagnostic of the power engineering equipment overheating
- Installation for the shady background method for diagnostic of the thermal micro-processes in the boundary layers

IREE ELECTRONIC DEVICES (ED) DEPARTMENT

FE

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15 lecturers,
5 post-graduate students,
4 engineers.

Head of Department,
Sr. Sci. (Techn.), Professor
Yuri A. KOVALENKO

Priority research activites

Research Supervisors

- **Engineering design and research of vacuum and solid-state microwave devices and instruments**
  Professor Lebedev I.V.
- **Development of new methods and facilities for ultrasonic flaw detection of the lengthy complex structure materials and products**
  Professor Kachanov V.K.
- **Engineering design of wideband mosaic piezoelectric transducers for noise-eliminating ultrasonic flaw detection of the composite materials and building constructions**
  Professor Kachanov V.K.
- **Fluctuation phenomena in electronic devices**
  Professor Vorobyev M.D.
- **Diagnostics and prognostication reliability of electronic engineering nodal elements**
  Professor Vorobyev M.D.
- **Thermal imaging**
  Associated-Professor Bodrov V.N.
- **Polychromic pyrometry**
  Associated-Professor Bodrov V.N.
- **Image processing**
  Associated-Professor Obidin G.I.

Agreements, contracts, projects

- Theoretical and experimental research of characteristics of new materials and modern electronics devices
- Scientific foundations development of sensor systems intellectualization with application of special signals and signal processing methods for research and monitoring of agents, processes and objects
- Development of new noiseless space-time signal processing methods in ultrasonic flaw detection
- Development of high-sensitive and high-accurate methods and facilities of ultrasonic check and diagnostics of building materials and constructions
- Research of multichannel ultrasonic diagnostics methods of heterogeneous building materials by one-sided access
- Research of principles and characteristics of versatile 3D mosaic electroacoustic converters
- Development of the theory and methods of the ultrasonic noise-eliminating non-destroying control and ultrasonic structurescopy of the complex-structure materials and products
- Development and research of low-level television and thermal imaging systems

- Analysis of diagnostics and structural optimization methods, performance upgrading of vacuum and plasma devices
- Search means to increase power efficiency and safety of high-power devices and components (according to guidelines for action of VEI)

Key publications

- *Lebedev I.V.* Electronic Devices and Systems Department of MPEI: As it was — Moscow, MPEI Publishers, 2009
- *Yudaev D.N., Vorobiev M.D.* The noise diagnostic of thermocathodes in electron-beam tube // Applied Physics. 2009
- *Yudaev D.N., Vorobiev M.D.* The electrofluctuation diagnostic of dispenser thermocathodes // High technologies 2009
- *Avramenko S.L.* The correlated method of velocity acoustic wave determination in large-size compact concrete products // Defectoscopy 2009. № 1. P. 23—36
- *Kartashev V.G., Sokolov I.V.* Characteristics and processing method of split signal // Radio Engineering 2009. №1. P. 45—50
- *Rodin A.B.* A synchronous detection application for increasing accuracy of complex-material products thickness measuring // Measurement Technique 2009. № 11. P. 49—52
- *Kachanov V.K., Avramenko S.L. and Kontsov R.V.* A multiplicative-correlation method of measuring the velocity of propagation of acoustic waves in large-size concrete products.// Measurement Technique 2009. № 11. P. 52—54
- *Timofeev D.V.* The velocity measuring method of ultrasonic longitudinal waves in large-size concrete products // Measurement Technique 2009. № 11. P. 54—56
- *Kartashev V.G., Konov M.M., Shalimova E.V.* Design strategies of a wideband ultrasonic antenna array // Radio Engineering, 2009. №. 40
- *Kachanov V.K., Sokolov I.V., Turkin M.V., Timofeev D.V., Fedorov M.B.* The non-linear signal processing in ultrasonic tomography of concrete frame // Defectoscopy. 2009. № 12.
- *Zaviyalov M.A., Belkin V.M., Sirovoy V.A.* Limits of validity of a spherical diode theory and a problem of calculation the dense non-uniformly scaled electron beams // Radio Engineering and Electronic 2009. V.54, № 4, P. 493—503
- *Kachanov V.K., Kartashev V.G., Sokolov I.V., Voronkova L.V., Rodin A.B., Timofeev D.V.* Problems and features of spatio-temporal processing of signals in ultrasonic control of complex structure material products // Defectoscopy. 2010, № 4, P. 3—18
- *Kartashev V.G., Kachanov V. K., Shalimova E.V.* The theory fundamentals of spatio-temporal signal processing in ultrasonic flaw detection of complex structure material products // Defectoscopy 2010, № 4, P. 19—29
- *Kachanov V.K., Sokolov I.V., Turkin M.V., Shalimova E.V., Timofeev D.V., Konov M.M.* Features of application of the method «focusing in a point» at ultrasonic tomography of complex structure materials products // Defectoscopy 2010, № 4, P. 30—44
- *Kachanov V.K., Sokolov I.V., Timofeev D.V., Turkin M.V., Shalimova E.V.,* The reflection plane detection in ultrasonic tomography of concrete frame // Defectoscopy. 2010, № 5, P. 36—44
- *Vorobiev M.D., Maslennikov O.U., Yudaev D.N., Orlova E.D., Solovieva S.A.* The electrofluctuational diagnosis of metal-oxide cathodes // Vacuum, plasma and quantum electronic. 2010., №1.,V.1
- *Bodrov V.N.* The application of mathematical statistics methods in temperature and thermal radiation spectrum measuring // High Temperature 2010., № 1.

- ***Kachanov V.K., Sokolov I.V., Voronkova L.V., Rodin A.B.*** The spatio-temporal processing of signals at the control of complex structure materials products // 8-th Intern. Conf. «Nondestructive inspection and technical diagnostics in industry». (Moscow, March 18—20, 2009). Moscow: «Spektr-Publ.» 2009. P. 45—47
- ***Kachanov V.K., Sokolov I.V., Rodin A.B., Timofeev D.V.*** The wideband low frequency and low aperture mosaic piezoelectric converter // 8-th Intern. Conf. «Nondestructive inspection and technical diagnostics in industry». (Moscow, March 18—20, 2009). Moscow «Spektr-Publ.» 2009. P. 113—115
- ***Yudaev D.N., Vorobiev M.D.*** The noise diagnostics of thermocathodes composed of electron beam gun // 39-th Intern. Methodological seminar: Fluctuation and degradation processes in semiconductor devices (Moscow 2009). Moscow. MPEI Publ. 2009 P. 35—41
- ***Yudaev D.N., Vorobiev M.D.*** The noise diagnostics of thermocathodes composed of electron beam gun // 9-th The All-Russian seminar «Problems of theoretical and practical electron and ion optics» (Moscow, Orion Research-And-Production Association, May 27—29, 2009), P. 29—34
- ***The one-row*** mode of full frame TV array // V.N. Bodrov, A.A. Vanynin, A.M. Knyazev, G.I. Obidin // 17-th International Scientific and Technical Conference «Modern television» (FSUE MDB Electron, March 2009, Moscow.). P. 23—24
- ***The bichromatic*** methods of temperature determination by TV spectropyrometer / V.N. Bodrov, S.V. Lebedev // 17-th International Scientific and Technical Conference «Modern television» (FSUE MDB Electron, March 2009, Moscow.). P. 27—29
- ***Bodrov V.N.*** About possibility of fast thermodynamic temperature contactless measurement method for unknown emissivity // The All-Russia conference «Physical and chemical properties of materials» (Tuapse, September 1—7, 2009). P. 12—14
- ***Bodrov V.N.*** New polychromic methods of optical pyrometry // Exit scientific session of Establishment of the Interdepartmental centre of analytical researches in area of physics, chemistry and biology at Presidium of the Russian Academy of Sciences (Zvenigorod, November 17—21, 2009). P. 15—17
- ***Zaviyalov M.A.*** et al. The research of electromagnetic oscillation effect in the microwave frequency range for yeasty cell culture // Scientific session MEPhI-2009, Moscow MEPhI, 2009, V.II. The nuclear physics and power, P. 176—179
- ***Zaviyalov M.A.*** et al. The spherical diode theory as testing instrument of trajectory analysis systems // The All-Russian Conference «Plasma emissive electronic» (Ulan-Ude 2009). Buryat scientific center SB RAS Publising house, P. 81—88
- ***Obidin G.I., Kaznacheev S.A.*** Simulating of imaging process with low photon flux // 18-th International Scientific and Technical Conference «Modern television» (FSUE MDB Electron, March 2010, Moscow.). P. 35—37
- ***Obidin G.I.*** Conception of developing cyclogram TV system // 18-th International Scientific and Technical Conference «Modern television» (FSUE MDB Electron, March 2010, Moscow.) c.p. P. 38—40
- ***Zaviyalov M.A., Lomachinski V.A., Prokopenko A.V., Filippovich V.P.*** The prospects of microwave energy usage in extraction processes // The All-Russian theoretical and practical conference «Modern biotechnologies of processing of agricultural raw materials and secondary resources» VNIIMS Uglich 2010 p.c. P. 111—113
- ***Avramenko S.L., Kachanov V.K., Sokolov I.V.*** A Multiplicative Method and A Correlation Method for Acoustic Testing of Large-Size Compact Concrete Building Constructions // Wave Propagation in Materials for Modern Applications, Edited by Andrey Petrin, INTECH, ISBN 978-953-7619-65-7,01.2010. P. 307—334
- ***Kachanov V.K., Avramenko S.L. and Kontsov R.V.*** A multiplicative-correlation method of measuring the velocity of propagation of acoustic waves in large-size concrete prod-

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- *Kachanov V.K., Sokolov I.V., Turkin M.V., Timofeev D.V., Fedorov M.B.* A multiplicative-correlation method of measuring the velocity of propagation of acoustic waves in large-size concrete products / Russian Journal of Nondestructive Testing. MAIK Nauka / / Interperiodica distributed exclusively. ISSN 1061-8309 (Print) 1608-3385 (Online). DOI 10.1134/S1061830 90912002X. 2010. P. 838—849. Springer Science+Business Media LLC. Chemistry and Material Science.
- *Kachanov V.K., Kartashev V.G., Sokolov I.V., Voronkova L.V., Rodin A.B. and Timofeev D.V.* Problems and features of spatiotemporal signal processing in ultrasonic testing of products manufactured from complexly structured materials / Russian Journal of Nondestructive Testing. MAIK Nauka // Interperiodi ca distributed exclusively. 2010. P. 235—248, DOI: 10.1134/S1061830 910040017.
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- *Kachanov V.K., Sokolov I.V., Timofeev D.V., Turkin M.V. and Shalimova E.V.* The detection of reflecting planes in ultrasonic Tomography of concrete building structures / / Russian Journal of Nondestructive Testing. MAIK Nauka/Interperiodi ca distributed exclusively. 2010. P. 342—349, DOI: 10.1134/S1061830 910050050. Springer Science+Business Media LLC. Chemistry and Material Science.
- *Kartashev V.G., Kachanov V.K. and Shalimova E.V.* The fundamentals of the theory of spatiotemporal signal processing as applied to problems of ultrasonic flaw detection of articles from complexly structured materials // Russian Journal of Nondestructive Testing. MAIK Nauka/Interperiodi ca distributed exclusively. 2010. P. 249—257. DOI: 10.1134/S1061830 910040029. Springer Science+Business Media LLC. Chemistry and Material Science.
- *Vorobjev M.D., Judaev D.N., Akimov P.I.* The fluctuation noise of thermionic cathodes // Proceeding of 8th International Vacuum Electron Sources Conference and Nanocarbon. 2010.
- *Judaev D.N.* The measuring system for estimation quality of the thermionic cathodes by current LF-noise // Proceeding of 8th International Vacuum Electron Sources Conference and Nanocarbon. 2010.

Patents

- Russian Patent 85664 from 10.08.09 of utility model. A patent application prosecution 2009117269/22 from 06.05.2009. Published by № 22, 2009. V.K. Kachanov, I.V. Sokolov, S.L. Avramenko «The device of ultrasonic wave velocity determination»
- Russian Patent 2354932 from 10.05.09 of invention. A patent application prosecution 2007118592/28 from 21,05.2007. Published by № 13, 2009. S.L. Avramenko, I.V. Sokolov, V.K. Kachanov «The resonance method of ultrasonic thickness measuring»
- Russian Patent 2348086 of invention registered by 27.02.2009. Zaviyalov M.A., Khazakov A.I., Martinov V.F., Tyuryukanov P.M. The electron-beam injector to high-pressure environment and the electron-beam facility based on it.
- Russian Patent 2330347 of invention registered by 27.01.2009. . Zaviyalov M.A., Khazakov A.I., Martinov V.F., Tyuryukanov P.M. The plasma-beam microwave device (variants)

- S.L. Avramenko, I.V. Sokolov, V.K. Kachanov . The method of acoustic wave propagation velocity determination in complex large-size concrete products. A patent application prosecution 2009113447/28 from 10.04.2009
- S.L. Avramenko, I.V. Sokolov, V.K. Kachanov . The ultrasonic wave velocity meter. A patent application prosecution 2009117269/22 from 06.05.2009

Unique equipment

- The facility for metrological certification of the highly sensitive optical receiver
- The universal facility for testing and certification of the color display electron-beam tube
- The facility for metrological certification of the piezoelectric converter
- The facility for measurement of physical-mechanical properties of concrete

IRE LIGHTING ENGINEERING (LE) DEPARTMENT

Tel/Fax: +7 495 362-7494

FE 24 lecturers, 7 postgraduates

Head of Department
Dc. Sci. (Techn.), Associated-Professor,
Andrey A. GRIGORIEV

Priority research activites

Research Supervisors

- **Development and creation of novel high-performance gas-discharge light sources in visible and UV spectrum**
  Professor Atayev A.E.
- **Mathematical methods of radiative transfer modeling in scattering and absorption media**
  Professor Budak V.P.
- **Realistic image modeling of 3D lighting scenes on computer monitor**
  Professor Budak V.P.
- **Parameter optimization of electro-optical visualization systems on the base of the statistical model of a visual organ**
  Associated-Professor Grigoryev A.A.
- **Development of statistical model of the color vision**
  Associated-Professor Grigoryev A.A.
- **Electro-optical systems for medicine**
  Professor Laryushin A.I.
- **Quality evaluation development of lighting and reproduction of color images**
  Associated-Professors Lebedkova S.M. and Snetkov V.Yu.
- **Research of influence of receiver and source spectral characteristic on photometric measurements uncertainty**
  AssociateD-Professor Petrov V.M.
- **Mathematical methods of physical process modeling in gas-discharge light sources and experimental investigation of processes in plasmas**
  Professor Reshenov S.P., Associated-Professor Eliseev N.P.
- **Development of high quality optical and light system of visible and infrared spectrum**
  Associated-Professors Rychkov V.I. and Yakushenkova T.I.

Agreements, contracts

- Fast algorithm development of polarized radiative transfer in atmosphere — ocean system with refracting interface and arbitrary reflection law of underlying surface
- Development of equipment and methods of road surface luminance factor measurement

Key publications

- *Brill A.I., Budak V.P., Ilyushin Ya.A., Korkin S.V., Oshchepkov S.L.* Matrix form of VRTE solution for vertically stratified slab // PIERS Proc., 2009, August, Moscow, Russia. P. 775—780.
- *Budak V.P., Klimenko K.V., Klyuykov D.A.* Calculation of Light Field Created by Point Unidirectional Source in 3-Dimensional Scattering Media // AIP Conference Proceedings, 2009. Vol.1100. Proc. Int. Rad. Symp. (IRC/IAMAS) «Current Problems in Atmospheric Radiation (IRS 2008)», Foz do Iguacu, Brazil, 3—8 August 2008. Eds. Nakajima T., Yamasoe M.A. P.23—26
- *Budak V.P., Korkin S.V.* The Increase of Efficiency of Numerical Solution of the Vectorial Radiative Transfer Equation Based upon the Subtraction of the Anisotropic Part

// AIP Conference Proceedings, 2009. Vol.1100. Proc. Int. Rad. Symp. (IRC/IAMAS), Foz do Iguacu, Brazil, 3—8 August 2008. Eds. Nakajima T., Yamasoe M.A. P. 27—30

- *Budak V.P., Veklenko B.A.* Matrix Green's functions method in statistical optics // PIERS Proc., 2009, August, Moscow, Russia. P. 781—784.
- *Budak V.P., Veklenko B.A.* Boson peak, flickering noise, backscattering processes and radiative transfer in random media // Journal of Quantitative Spectroscopy Radiative Transfer, 2010, doi: 10.1016/j.jqsrt.2010.10.007
- *Budak V.P., Ilyushin Ya.A.* Development of the small angle approximation of the radiative transfer theory taking into account the photon path distribution function // Atm. and Ocean Optics, 2010. V.23, No 3. P.181—185.
- *Budak V.P., Klyuykov D.A.* Calculation of light field in 3D cylinder cloud for greenhouse gases monitoring via GOSAT // Proceedings of SPIE, 2009. V.7478. Remote Sensing for Environmental Monitoring, GIS Applications, and Geology IX, 74782N.
- *Budak V.P., Klyuykov D.A., Korkin S.V.* Complete matrix solution of radiative transfer equation for pile of horizontally homogeneous slabs // Journal of Quantitative Spectroscopy Radiative Transfer, 2010, doi: 10.1016/j.jqsrt.2010.08.028
- *Budak V.P., Korkin S.V., Korolev K.N.* To define the form of particles on a polarization state of the scattering optical radiation // Proceedings of SPIE, 2009. V.7475. Remote Sensing of Clouds and the Atmosphere XIV, 747519
- *Guttsait E.M.* Analysis of Normal and Anomalous Features of Coefficients Characterizing Deviations from the Inverse-Square Law in the Application of LED Modules // Journal of Communications Technology and Electronics, 2009. Vol. 54, No. 12. P. 1417—1434.
- *Guttsait E.M.* Analysis of the Illuminance Provided by LED Modules Placed at Large Distances from Illuminated Objects // Journal of Communications Technology and Electronics, 2009. Vol. 54, No. 1. P. 107—118.
- *Gutsait E.M., Kurushin A.A.* LED Modules with Electrodynamic Systems: Prospects for the Development Based on Nanotechnologies // Journal of Communications Technology and Electronics, 2010, Vol. 55, No. 8. P. 938—954.
- *Kokhanovsky, A.A., Budak, V.P., Cornet, C., Duan, M., Emde, C., Katsev, I.L., Klyukov, D.A., Korkin, S.V., C-Labonnote, L., Mayer, B., Min, Q., Nakajima, T., Ota, Y., Prikhach, A.S., Rozanov, V.V., Yokota, T., Zege, E.P* Benchmark results in vector atmospheric radiative transfer // Journal Quantitative Spectroscopy Radiative Transfer, 2010. V. 111, No 12—13, P. 1931—1946.
- *Popov O.A., Chandler R.T., Maya J.* Inductively-coupled Linear Light Source Operated at Frequencies of 2—14 MHz // Light & Engineering, 2009. Vol. 17, 1. P. 98—104
- *Sokoletsky L.G., Nikolaeva O.V., Budak V.P., Bass L.P., Lunetta R.S., Kuznetsov V.S., Kokhanovsky A.A.* A comparison of numerical and analytical radiative transfer solutions for plane albedo of natural waters // Journal of Quantitative Spectroscopy Radiative Transfer, 2009. Vol.110, N13. P. 1132—1146.
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- *Budak V.P., Vaslyaev V.A., Klyuykov D.A., Korkin S.V., Korolev K.N.* Complete model of radiative transfer in plane-parallel atmosphere-ocean system // Thermal processes in engineering. 2010. V.2. No9. P. 400—405. (in Russian)
- *Budak V.P., Zheltov V.S.* Lighting installation simulation by local estimation of Monte-Carlo methods // Light Engineering, 2009. № 1. P. 52—56 (in Russian)

- *Budak V.P., Ilyushin Ya.A.* Solution singularities elimination of 3D boundary value problems of radiative transfer theory // Thermal processes in engineering. 2010. V.2. No 10. P. 471—474. (in Russian)
- *Будак В.П., Илюшин Я.А.* Development of the small angle approximation of the radiative transfer theory taking into account the photon path distribution function // Opt. atm. ocean, 2010. V.23, No2. P. 102—105. (in Russian)
- *Budak V.P., Klyuykov D.A.* Calculation of thermal radiative transfer in 3D scattering media // Thermal processes in engineering. 2010. V.2. No8. P. 350—353. (in Russian)
- *Budak V.P, Mukhanov P.V.* Reflector profile optimization for specified light distribution // MPEI bulletin, 2010. No 1. P. 84—88. (in Russian)
- *Grigoryev A.A., Gordyukhina S.S.* Method for determination of K, Z, S — receptors responsivity on the basis of statistical model of visual organ // MPEI bulletin, 2010. No2. P. 174—178. (in Russian)
- *Gutsait E.M.* Analysis of normal and anomalous features of coefficients characterizing deviations from the inverse-square law in the application of LED modules // Radio technic and Electronics, 2009. V.54, No12, P. 1495—1512. (in Russian)
- *Gutsait E.M.* Analysis of illuminance provided by LED modules placed at large distances from illuminated objects // Radio technic and Electronics, 2009, V.54, No1, P.113—124. (in Russian)
- *Gutsait E.M.* Quantum stars on light engineering sky // Light Engineering. 2010, No1. C. 25—27. (in Russian)
- *Gutsait E.M.* LED modules with Electrodynamic Systems with quantum wires and points // Light Engineering, 2009, No3. P. 28—31. (in Russian)
- *Gutsait E.M., Kogan L.M., Sidorov A.M., Agafonova T.A.* Analysis of lighting fitting with circular LED effect // MPEI bulletin, 2009. No3. P. 94—98. (in Russian)
- *Gutsait E.M., Kurushin A.A.* LED modules with electrodynamic systems (prospects for the development based on nanotechnologies) // Radio Engineering and Electronics, 2010, V.55, No8, P.999—1016. (in Russian)
- *Gutsait E.M., Kurushin A.A., Maslov V.E.* Electrodynamic analysis of quarter-wavelength multi resonator system with quantum points for high performance LED modules creation // MPEI bulletin, 2010, No4. P. 63—70. (in Russian)
- *Martynov V.N., Mitin I.V.* Capability analyses of object on the basis of panoramic MPEI block // MPEI bulletin, 2010. No3. P. 127—131. (in Russian)
- *Nguen Kuang Hiep, Yakushenkova T.I.* Calculation and analysis of two mirrors composition // Proc. higher school. Instrument engineering, 2009. V. 52, No 3. P. 60—66. (in Russian)
- *Nguen Kuang Hiep.* Extra-axial surface efficiency for creation of optical system without dark field // MPEI bulletin. 2009. No4. P. 107—111. (in Russian)
- *Nikiforova V.A., Popov O.A.* Spatial parameter distributions of plasma in non-ferritic discharge of closed lamp // MPEI bulletin, 2010. No5. P. 111—117. (in Russian)
- *Popov O.A.* Inductively-coupled light source with two symmetric excitation loops operated at frequency 100—400 kHz and power 300—450 Wt // Light Engineering, 2009. No6. (in Russian)
- *Popov O.A., Nikiforova V.A.* Inductively-coupled non-ferritic light source operated at power 300—400 Wt and frequency 200 — 400 kHz // MPEI bulletin. 2010. No2. P. 159—164. (in Russian)
- *Svitnev S.A., Popov O.A.* Spatial parameter distributions of inductively-coupled discharge plasma exciting by induction coil placed on longitudinal section perimeter of discharge tube // Light Engineering. 2010. No3. P. 63—65. (in Russian)

- *Snetkov V.Yu., Shugarova L.N.* Models and principles of color harmony // MPEI bulletin, 2010. No4. P. 132—135. (in Russian)

Dissertations

- *Korkin S.V.* Mathematic model of polarized light reflection by remote sensing of turbid media: Thesis ... Candidate of Engineering. 2009.
- *Mukhanov P.V.* Development principles of computer-aided design system for non-image optics: Thesis ... Candidate of Engineering. 2010.
- *Nguen Kuang Hiep.* Development principles of small panoramic optical systems without dark field for photometric instruments: Thesis ... Candidate of Engineering. 2010.

Partners

- Public corporation «Lisma», Saransk, Republic of Mordovia
- Corporation «Electroluch», Moscow
- Public corporation «Moskovsky Elektrolampovy Zavod» («MELZ»), Moscow
- Slovak University of Technology in Bratislava (STU)
- University of Shanghai for Science and Technology (USST), People's Republic of China
- University of Science and Technology Beijing (USTB), People's Republic of China
- Orion Research-And-Production Association, Federal State Unitary Enterprise and State Scientific Center of the Russian Federation
- All-Russian Vavilov research lighting technology institute (VNISI of name of S.I. Vavilov), Moscow
- Technical University of Ilmenau, Germany
- Karlsruhe Institute of Technology (KIT), Germany

Unique equipment

- Installation for the automated research of spectral characteristics of light sources and reflecting materials
- National Instruments® Data Acquisition board PCI-6024E with software NI LabVIEW 8

IREE INDUSTRIAL ELECTRONICS (IE) DEPARTMENT

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23 lecturers,
9 post-graduate students.

Head of Department
Dr. Sci. (Techn.), Professor
Dmitry I. PANFILOV

Priority research activites

Research Supervisors

- **Research and development of electric supply sources for discharge lamps of high efficiency**
  Professor Panfilov D.I., Associated-Professor Poliakov V.D.
- **Microprocessor systems for illumination control**
  Professor Panfilov D.I., Associated-Professor Poliakov V.D.
- **Research and development of intellectual powerful modules and converting devices on its basis including with specific characteristics**
  Associated-Professor Tsarenko A.I.
- **Research and development of powerful semiconductor gates of new technology**
  Associated-Professor Voronin P.A.
- **Research and development of electric supply sources for electronic equipment of wide application**
  Associated-Professors Golikov V.Yu. and Nedoluzhko I.G.
- **Research and development of car electronic means**
  Professor Panfilov D.I.
- **Development of microprocessor means for industrial automation**
  Associated-Professor Remizevich G.V.

Agreements, contracts, projects

- Measurement of static and dynamic characteristics of experimental modules KCMT in the full range of its output parameters
- Federal Special Program «National technological base» for 2002—2006, section 11 «Technologies of power engineering and energy saving», direction 11.2 «Development of technology fundamentals for combined SIT-MOS transistors for power converting engineering. R&D № 2308020 on theme: «Development and producing of laboratory bench for inspection of dynamic parameters of combined SIT-MOS transistors and measurement results verification by means of inspection of IGBT dynamic parameters»I.
- R&D on theme: «Development of investigation methods and experimental determination of parameters of combined SIT-MOS transistors in modes of current high densities».
- R&D on theme: «Measurement of static and dynamic characteristics of experimental modules of combined SIT-MOS transistors in the full range of their output parameters».
- R&D on theme: «Development of testing approached for power modules in the mode of rigid switching, investigations and transistor operation analysis at inductive load».
- Development of analysis, investigation and optimization methods for multi-channel transistor structures in the mode of single testing
- Development of educational laboratory benches for investigation of power supplies of company Infineon
- Development of high-effective start-regulating devices for effective gas-discharge lamps for object illumination of Moscow
- Development of controlled electronic start-regulating apparatuses for arc sodium lamps

- Implementation of energy-saving technologies in the field of street illumination with application of new technologies and modern element base
- Development of pulse and sine signal sources for high-voltage testing of electrical equipment
- Development of demonstrative electronic start-regulating apparatus
- Development of electric supply systems for mobile objects
- Development of converters for supply the municipal electric transport
- Development of electric supply systems for hydrogen batteries
- Development of electric supply systems for aerodrome lighting engineering complexes
- Development of specific power supplies for powerful laser technological installations
- Development of power supplies for industrial electric arc welding
- Development of power supplies for xenon lamps in projection equipment
- Development of effective power supplies for personal computers
- Development of effective power supplies for cellular communication devices
- Development of the module for power measurement for the system of measurement and account of electric energy parameters on the electric substations 35/110 kV
- Development of diagnostic unit for the control system of heater automated operation
- Development and implementation of power supplies for unified series of energy-saving illuminating devices and electronic components (microprocessor modules) for street illumination control
- Analysis and development of methods for switching losses reduction in power semiconductor gates
- Development of control and diagnostic system for phase-shifting devices

Key publications

- *Panfilov D.I., Shevchenko A.C.* Experience of implementation of projects for street illumination modernization and the new engineering conception. Svetotekhnika, 4, 2010.
- *Chaplygin E.E., Kovyrzina O.O.* Current investigations of the arc steel-melting furnace with purpose of choice of optimal compensation scheme // Practical power electronics. 2009. #4. P. 5
- *Chaplygin E.E., Kovyrzina O.O.* Compensation of non-active components of the total power of arc steel-melting furnaces // Elektrichestvo. 2009. #11. P. 30—38.
- *Poliakov V.D.* Specific character of calculation of electronic ballast of discharge lamps of high pressure // Power Electronics. 2009 #4. P. 90—93
- *Poliakov V.D.* Power supply sources of discharge lamps of high pressure // Power Electronics. 2009 #5. P. 80—83
- *Astashov M.G.* Peculiarities of converter creation for gated-induction motors of the car systems // Electronic and Electric equipment of transport. 2009. #5—6. P. 3.
- *Astashov M.G.* Imitation models of gated-induction motors with configurated coils // Electronic and Electric equipment of transport —Publ. 2010. 96 p.
- *Rashitov P., Remisevich T.* Commutation mode analysis of thyristor AC bridge in Pspise environment. Power Electronics-Publ. 2010.
- *Poliakov V.D., Rozhkov D.B.* Intellectual electronic ballast of combined light-engineering device. Power Electronics-Publ. 2010r.
- *Panfilov D.I., Astashov MG.* Imitation models of gated-induction motors with configurated coiuls // Electronic and Electric equipment of transport Publ. 2009. #5—6. P. 3.
- *Voronin P.A., Voronin I.P.* Device for dynamic losses reduction in gated elements of three-phase voltage inverter // MPEI Vestnik, 2010, №4, P. 20—25.

- *Voronin I.P.* Structure of soft switching of gated elements of three-phase voltage inverter // Vestnik, 2010, №5. P. 97—101.
- *Voronin I.P., Voronin P.A.* Energy loss reduction in gated elements of converters // Modern electronics, 2010, №9, P. 46—49.
- *Voronin I.P.* Influence of switching methods for IGBT upon parameters of transients. // Proc. of XV-th Intern. Scient. Conf «Radio Engineering, Electronics, Electrical and Power Engineering». In 3 volumes. Vol. 1. MPEI Publ, 2009. P. 191—192.
- *Voronin I.P.* Types of soft switching in three-level autonomous voltage inverters // Proc. of XVI-th Intern. Scient. Conf «Radio Engineering, Electronics, Electrical and Power Engineering». In 3 volumes. Vol. 1. MPEI Publ, 2010. P. 242.

Patents

- *Voronin P.A., Voronin I.P.* Semiconductor device with soft switching. Russian patent on useful model № 84170. Registered at 27 of June 2009. Publ. 27.06. 2009. Bull. «Inventions and useful models», №18.
- *Voronin P.A., Voronin I.P.* Semiconductor device with soft switching. Russian patent on useful model № 84171. Registered at 27 of June 2009. Publ. 27.06. 2009. Bull. «Inventions and useful models», №18.
- *Voronin P.A., Voronin I.P.* Three-level inverter with soft switching. Russian patent on useful model № 92581. Registered at 20 of March 2010. Publ. 20.03. 2010. Bull. «Inventions and useful models», № 8.
- *Voronin P.A., Voronin I.P.* Three-pyase active rectifier with soft switching. Russian patent on useful model № 94780. Registered at 27 of May 2010. Publ. 27.05. 2010. Bull. «Inventions and useful models», № 15.
- *Voronin I.P.* Three-level inverter with soft switching. Russian patent on useful model № 96708. Registered at 27 of August 2010. Publ. 10.08. 2010. Bull. «Inventions and useful models», № 22.

Dissertations

- *Kondratiev D.E.* Three-phase rectifier with active correction of power coefficient and with bidirectional energy transmission. Dissertation on Ph.D. (Techn.). 2008.
- *Lebedev A.G.* Analysis and modeling of switching processes in transistor converters. Dissertation on Ph.D. (Techn.). 2009.
- *Panova O.S.* Development and modernization of non-active power compensation methods for arc steel-melting furnces. Dissertation on Ph.D. (Techn.). 2010.
- *Astashov M.G.* Research and development of converters for gated-induction motors with configurated coils. Dissertation on Ph.D. (Techn.). 2010.

Partners

- «Eltom», Tomilino, Moscow region
- JSC «R&D Institute of Distant Radio Communication», Moscow
- JSC «Transvit», Nizhny Novgorod
- FGUP «Nizhegorodskiy zavof Frunse» Nizhny Novgorod
- JSC «Plant «Stella», Zelenograd
- JSC «Reconstruction of green-house economy», Moscow
- Company «GE Lighting», USA
- Company «Infineon Technologies AG», Germany
- JSC «Prozhektor — Elektrotekhnika», Moscow

- State Unitary Enterprise «Prozhektor», Moscow
- R&D Institute of cinema and photo, Moscow
- R&D Center of technological lasers, Shatura, Moscow region
- JSC «Blesk-NVF», Moscow
- State Uniform Enterprize (All-Russian Electrical Engineering Institute named after Lenin Государственное унитарное предприятие «Всероссийский электротехнический», Moscow
- ABB Metronika, Москва
- JSC «AVTOVAZ», Toliatti
- LIAZ, Moscow region.
- KAMAZ, Naberezhnye Chelny
- R&D Institute «Auto Electronics», Moscow
- JSC «Electromodule», Belarus
- R&D Association PRORYV, Zhukovsky
- Plant «Pramo», Moscow
- Plant of car electronics, Kaluga
- R&D Association «Bolid», Koroliov, Moscow region.
- R&D Association Energia, Koroliov, Moscow region.
- JSC FreeScale Semiconductors, Moscow
- R&D Institute «VNIIEM» Moscow
- JSC «Pramo-Electro», Rzhev
- JSC «OPTOGAN», Sankt-Peterurg
- JSC «ENERGOMODULE», Moscow region, Troitsk
- JSC «Angstrem», Moscow

Unique equipment

- Laboratory-research complex from Motorola, USA
- Laboratory complex of power equipment from «Apator SA», Poland
- Intellectual-integrated modules from «Mitsubisi», Japan
- Digital phosphor oscilloscope from «Tektronix» series TDS3054 (bandwidth 500 MHz)
- Universal measuring complex of dynamic parameters of power transistors (the mode of single testing, communication of digital measuring data into PC, programmable control)
- Measuring system of dynamic characteristics of power modules with high-frequency current sensors of system «Pearson»
- Software for computer control of measuring process from «WSTRO» (Wave Star Software)

IREE SEMICONDUCTOR ELECTRONICS (SE) DEPARTMENT

FE

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PPE@mpei.ru

15 lecturers,
5 researchers,
5 post graduate students.

Head of Department
Dr. Sci. (Ttechn.), Professor,
Irina N. MIROSHNIKOVA

Priority research activites

Research Supervisors

- **Optoelectronics and IR detectors**
  Professor Miroshnikova I.N.
- **Physics of the non-crystalline semiconductors and devices on its base**
  Professors Popov A.I., Voronkov E.N.
- **Electronic microscopy, scanning tunnel and atomic-forced microscopy**
  Professor Popov A.I.
- **Development of the semiconductor sensors and investigation of the electrophysical and noise properties of the semiconductor devices and structures**
  Professor Guliaev A.M.
- **Investigations of the semiconductor compounds of the A_2B_6 type and the devices on its base**
  Professor Morozova N.K.
- **Investigation of the MIS structures and the field-effect-transistor properties**
  Professor Soldatov V.S.
- **Optical modulation spectroscopy of the semiconductors**
  Associated-Professor Khirin V.N.
- **Development of the powerful semiconductor devices**
  Associated-Professor Charykob N.A.
- **Solid-state UHF electronics**
  Professor Shnitnikov A.S
- **Electronic spectroscopy of the semiconductor surfaces**
  Associated-Professor Warlashov I.B.

Agreements, contracts, projects

- Electronic-microscopic and electronic-graphical investigations of the semiconductor materials
- Investigation of the nano-crystalline and amorphous semiconductor films and the structures on its basis
- Investigations of phenomena caused by carriers heating in the channel of MIS transistors and development of monitoring methods for MDS ultra-large IC stable to the «hot» carriers effects
- Investigation of heterogeneous reactions on the semiconductor material and structure surfaces

Key publications

- *Voronkov E.N., Gulyaev A.M., Miroshnikova I.N., Charykov N.A.* Solid-state electronic. Schoolbook // Moscow. Academia. 2009. P. 320

- *Voronkov E.N.* Solid-state electronic. Practical work. Schoolbook // Moscow. Academia. 2010. 128 p.
- *Popov A.* Disordered Semiconductors // Physics and Applications. Pan Stanford Publishing, 2010, 250 p.
- *Popov A.* Two generations of phase-change memory devices: differences and common problems // Phys. Status Solidi, v. B246, 2009, N 8. P. 1837—1840.
- *Mnatsakanov T.T., Tandoev A.G., Yurkov S.N., Levinshtein M.E.* Nonconventional quasineutral mode of carrier transport in semiconductors and semiconductor structures // Journal Appl. Phys. v. 105, N4, 044506, (2009).
- *Levinshtein M.E., Mnatsakanov T.T., Ivanov P.A., J.W. Palmour, Das M.K., Hull B.A.* Self-heating of 4H-SiC PiN diodes at high current densities // Material Science Forum, vols. 600—603. P. 1007—1010, (2009).
- *Mnatsakanov T.T., Tandoev A.G., Yurkov S.N., Levinshtein M.E.* Specific features of qusineutral carrier transport modes in semiconductors and semiconductor structures // Semiconductor Science and Technology v. 24, N 7, 075006, (2009).
- *Mnatsakanov T.T., Levinshtein M.E., Pomortseva L.I., Palmour J.W.* Fundamental physical limitations on the blocking voltage of a SiC rectifier diodes // Semiconductor Science and Technology. V. 24, N 12, 125010, (2009).
- *Voronkov E., Kozyukhin S.* Electrical Conductivity of Amorphous Films of Chalcogenide Compounds in High Electric Fields // Semiconductors, 2009, Vol. 43, No. 7. P. 921—924.
- *Morozova N.K, Danilevich N.D., Kanakhin A.A.* Self-activated luminescence spectra of CdS(O) in the Context of the Band Anticrossing Model //Phys Stat Solidi C. 7 №6, 1501—1503 (2010)
- *Danilevich N.D., Morozova N.K* Peculiar properties self-activated luminescence spectra of CdS(O) in the Context of the Band Anticrossing Model // Fizika i Tekhnika Poluprovodnikov, 2010, V 44,№ 4. P. 458—462
- *Miroshnikova I.N., Komissarov A.L., Miroshnikov B.N., Vasil'eva N.D.* Spectral and noise of PbS-based semiconductor photoresistors // Vestnik MPEI 2010, №4. P. 57—62
- *Miroshnikova I.N., Komissarov A.L., Miroshnikov B.N.* Noise of PbS-based semiconductor photoresistors // Measurement Techniques. 2010. Vol. 53. P. 620—623
- *Kozyukhin S.A., Popov A.I., Voronkov E.N.* Influence of chalcogenide glass electro physical parameters on threshold voltage for phase-change memory // Thin Solid Films, 518 (2010), P. 5656—5658.
- *Kozyukhin S., Voronkov E., Egarmin K.* Conductivity oscillations in Ge2Sb2Te5 films stimulated by phase transformations // Phys. Status Solidi C 7, No. 3—4, P. 865—868 (2010)
- *Eganova T.M., Voronkov E.N.* Thermally stimulated conductivity of the films g-As_2Se_3 // Newsletter MPEI № 4, 2010. P. 71—74
- *Shnitnikov A.S., Varlashov I.B., Korenkov I.V.* Comparison of 1-d and 2-d models for microwave control diodes // Proceedings 20-th International Crimean Conference "Microwave & Telecommunication Technology". Sevastopol, 2010

Dissertations

- *Anufriev Yu.V.* Investigation stage incorporating elements of non-volatile memory on the phase transitions: Cand. Sci. (Techn.) Dissertation. 2009.

Partners

- State unitary enterprise «Alfa», Moscow

- CJSC Proton-Electrotex, Orel
- JSC Moscow Plant Sapphire, Moscow

Unique equipment

- Complex for investigation of the solid state surface chemical structures by methods of X-ray electronic-, Auger-, UV- and mass-spectroscopy LHS-10
- Complex for the charging phenomena investigations in the MIS structures and transistors by methods of the volt-farad characteristics, thermo-stimulated ion currents, charge-pumping
- Automated complex for investigations of the semiconductor structures and devices noise features
- Installations for the optical properties investigations of the semiconductor materials by methods of IR-and electric modulation spectroscopy and spectrometry
- Technological equipment for the thin dielectric and semiconductor film mapping by methods of the ion-plasma, reactive-cathode and thermal sputtering
- Complex for the gas sensors investigations
- Raster and transparent electronic microscopes
- Tunnel microscope
- Atom-force microscope
- Analytical system based on transmission electron microscope Technai G2 20F S-TWIN

DEPARTMENTS UNDER RECTORATE

Departments

HISTORY AND CULTUROLOGY (HCS) DEPARTMENT

Ph.: +7 495 362-74-23

17 lecturers

Priority research activities

Research supervisors

- **World civilizations: the person, a society, culture**
  Professor Smirnova M.I, professor Krasnova L.I., senior lecturer Ermishina N.D.
- **Political relations in the Russian society: the power, democracy, the person**
  Professor Smirnova M.I.
- **Civilization's vector of modern Russia: spiritual processes, values and ideals**
  Senior lecturer Ermishina N.D.
- **Electronic culture and electronic training. An information technology in a humanitarian cycle of disciplines**
  Professor Krasnova L.I.; professor Smirnova M.I, senior lecturer Vinogradova G.Z.

Contracts

- Participation in the program of working out of electronic educational resources within the limits of realization of the innovative project. № 1.1.6.1.
- A theme № 7011680: ESMC at the rate «A Russian history»
- ESMC at the rate «Bases of humanitarian knowledge»

Key publications

- *Chernobaev A.A.* History of Russia. The textbook. 3 edit. Publishing house «The higher school», 2009. 637p.
- *Chernobaev A.A.M.* Historics of Russia of the XX-th century. The bibliographic dictionary. V. 3. Additional and correct. Moscow: Publishing house «Nestor», 2009.
- *Chernobaev A.A.* Chinese National Republic in 1950th years. The collection of documents. In 2 v. V. 1. A sight of the Soviet and Chinese scientists. – Moscow: Monuments of historical thought, 2009.
- *Chernobaev A.A.* The future will change a sight to all: Articles. Performances. Publications 2005-2010. Moscow: Meeting, 2010.
- *Chernobaev A.A.* Masters of Russian historiography: Michael Vasil'evich Lomonosov (1711—1765). Fotosubscribe//Historical archive. 2009.№ 2.
- *The Soldier,* the journalist, scientific (G.V.Petryakov. Articles, sketches, performances, interview). Memories of friends, colleagues, native. M: publishing house. Moscow: The prospectus, 2009.
- *Lefortovo* readings. Technical education history in Russia. / The eighth humanitarian student's conference. Reports. Moscow. April, 24-25th, 2008. M: Publishing house MPEI, 2009.
- *Ermishina N.D.* Russia in system civilization potokov / The international sociological congress. The collection of articles. Lisbon. September. 2009
- *Krasnova L.I.* Electronic educational resources as a part of an uchebno-methodical complex of the higher school. From experience of teaching of a subject matter «Introduction in history of world civilizations» at the Moscow power engineering institute. // Electronic culture. An information technology of the future and modern electronic training MODERN IT and (E) LEARNINIG/Sb. Works of the International scientific conference. 2009. Astrakhan.

- *Krasnova L.I.* «I remember his one story» (About M.F. Marjanovsky) // MPEI: history, people, years: the Collection of memories. In 3 volumes. Moscow: MPEI Publishing House, 2010. (A Series «Outstanding figures of MPEI»). V. 2
- *Loparyov A.V.* Globalization of a conflictness and transformation of political system // Sb. Proceedings "Global studies as area of scientific researches and teaching sphere". Release 3. The Moscow State University of M.V. Lomonosov. Faculty of global processes. M: MAX Press, 2009.
- *Mihajlov A.N.* Fantastic as Other cultures // The Fantasy and technologies (S.Lem's memory): Collection of Materials of the international scientific conference. Samara, 2009.
- *Pokachalov M.V.* and a problem of crisis of culture in theoretical views of Russian symbolists // Russian symbolism and world culture: Sb.. Proceedings. V. 3. Moscow: anekon-inform, 2009.
- *Smirnova M.I.* A historiographic paradigm of the Menshevist concept of formation of the Russian social democracy // Social democracy in the Russian and world history: generalization of experience and new approaches. M: Meeting, 2009.
- *Smirnova M.I.* A humanitarian component of new educational standards and an information technology // Bulletin MPEI. № 4, 2010.
- *Smirnova M.I.* M.F.Marjanovsky //: history, people, years: the Collection of memories. In 3 volumes. Moscow: Publishing House MPEI, 2010. (A Series «Outstanding figures MPEI»).V. 2.

Patents

- **Multimedia course** «A Russian history as the computer program». The copyright certificate № 2007210126.

Partners

- In 2009-2010 the chair continued cooperation on an exchange of scientific and academic-methodical experience with
- Department of History and cultural science of the Moscow Auto-Road Institute (an exchange of trainees)
- Department of philosophy and social sciences of the Kirghiz National University (Beshkek): reception of trainees
- Astrakhan State University: on an exchange of experience of use of IT technologies in educational process

DEPARTMENT OF PHILOSOPHY, POLITICAL SCIENCES AND SOCIOLOGY (PS&S)

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30 lecturers,
2 engineers

Head of Department
Dr. Sci. (Philosophy), Professor
Andrey L. ANDREEV

Main research directions

Research supervisors

- **Modern Russia in the Global Scope**
  Professor Andreev A.L.
- **Technoscience**
  Professor Andreev A.L.
- **Philosophy of the Modern Science**
  Professor Pechenkin A.A.
- **Methods of Social Research**
  Associated-Professor Kuzminov M.Y.
- **Ethics Problems**
  Associated-Professors Malinovskaya N.M. and Tkachenko O.V.
- **The Modern Russian Youth**
  Associated-Professor Selivanova Z.K.
- **Comparative political science**
  Associated-Professor Chepel S.L.

Agreements, contracts

- Federal special-purpose program of state contract #P 434 of May 12, 2010 «Social-cultural space of the innovative development of Russia» headed by Professor Andreev A.L.
- RFBR Project # 10-06-00193a, topic of «Technoscience as a factor of social-cultural changes: global scope and Russian experience» headed by Professor Klucharev G.A.
- RHSF Project # 08-03-00295a, topic of «Epistemic and ontologic aspects of reductionism» headed by Professor Pechenkin A.A.

Key publications

Monographs

- *Andreev A.L.* Russian education: social-historical scope. Moscow: Nauka, 2008. (in 2009 the book won the Social Ideas Award).
- *Andreev A.L.* Sociology of engineering – Moscow: Alfa-M., 2009.
- *Pechenkin A.A., Mandelstam L.I:* Research, Teaching and the rest of the life. Moscow: Logos, 2010.
- *Ivashov E.N.* Mechanisms, equipment for the production of semiconductors, materials and devices of electronics. – Moscow: PMT RDE publishing house, 2010.

- *Engineer's* philosophical dictionary. Editor Arefyeva G.S. Moscow: MPEI publishing house, 2010.

Articles

- *Andreev A.L.* Foreign policy perception of the Russians after the Caucasus crisis // Global Economy and International Relations. #5. M.: MPEI MR publishing house, 2009.
- *Andreev A.L.* Bogdanov. Gumilev. Solonevitch // Russian Philosophy. Encyclopedia. Belgrade: Logos, 2009 (in Serb-Croatian).
- *Andreev A.L.* Society reaction as a feedback mechanism in state administration // Proceedings of the scientific workshop «Problems of the modern state management in Russia» issue 6 (27). M.: Nauchniy Ekspert, 2009.
- *Andreev A.L.* Russian innovative development in the global educational scope. Moscow: RAS Vestnik, T.80, #2, 2010.
- *Andreev A.L.* On the characteristic of technoscience phenomenon // MPEI Vestnik, Moscow, 2010, #5.
- *Andreev A.L.* On the discussion of technoscience. Materials of the research/practice conference and the science school of young scientists and students. Education and science for steady development. Part 3. Moscow, 2010.
- *Andreev A.L.* Technoscience and education. Modern educational technologies and their application in the system of humanitarian training of engineers. Moscow, 2010.
- *Ivashov E.N.* Metrological navigation system of the modern equipment of electronic production // Materials of the new information technologies and quality management international forum Moscow: Kachestvo Fund, 2009.
- *Kalinin E.Y., Lyuskin M.B.* Post-classical approach to norm cognition // Materials of the Lomonosov Readings in MSU (21-22.04.2010). Moscow: MSU publishing house, 2010.
- *Klucharev G.A.* Education crediting in Russia: condition, problems, solutions // Finance and Business. Moscow, 2009. # 6.
- *Klucharev G.A.* Youth crime and risk groups (experience of sociological analysis) // Transforming Russia. Annual. ISA RAS. Moscow, 2009.
- *Klucharev G.A.* Additional education of adults: on the problem of efficiency // Social Research. Moscow, 2010, #2.
- *Pechenkin A.A.* History of physics-technical education in USSR, 1946-1991 // Report at the theoretical seminar of the Mathematics Department of Agder University (Kristiansand, Norway, December 2, 2009).
- *Pechenkin A.A.* The two dogmas of empiricism. Theory interpretation. The uncertainties of term translation. Ontologic relativity. Physics and philosophy. Philosophy of logic. // Encyclopedia of Epistemology and Philosophy of Science. Moscow: Kanon-plus publishing house, 2009.
- *Pechenkin A.A.* Reductionism in the scope of science history // Electronic Magazine #1. «Researched in Russia». 2009.
- *Pechenkin A.A.* B.P. Belousov and his reaction // Journal of Biosciences. T. 34. Bangalore: Indian Academy of Sciences, 2009.

- *Pechenkin A.A.* A historical essay on the origin of the Belousov -Zhabotinsky reaction / / Journal of Biological Theory. – Vienna: K.Lorenz Institute, 2009. T. 4. # 2.
- *Pechenkin A.A.* Ideology, philosophy, philosophy of physics (to the discussions on quantum mechanics interpretation), Moscow: MSU Vestnik. Series 7. Philosophy. #3, 2010.
- *Rachkov-Apraksin A.P.* The role of the language in the formation of scientific knowledge // Modern social psychology: theoretical and applied research. Moscow, 2009. # 3.
- *Rachkov-Apraksin A.P.* On the way to the language: epistemology of linguistics // Modern social psychology: theoretical and applied research. Moscow, 2010. # 1.
- *Rachkov-Apraksin A.P.* Personality in the social world // Collected works of the Second All-Russian science-practice conference Psychological-Educational Support of Personality Formation during the Inter-Generation Transition of Youth in the Educational Institutions of the Russian Federation. Moscow: MPSI, 2010.
- *Selivanova Z.K.* Ideals of the contemporary Russian youth and the information environment // Russia: trends and development prospects. Annual. Issue 5. Part 1. / Editor-in-chief Pivovarov Y.S. Moscow: INION RAS, 2010.
- *Selivanova Z.K.* Patriotism in the value system of the older teenagers // Materials of the Lomonosov Readings in MSU (21-22.04.2010). Moscow: MSU printing house, 2010.
- *Tkachenko O.V.* Problems of studying honor as social-cultural process and the routes of forming new research paradigm // Proceedings of the All-Russia scientific conference Structure and Dynamics of Culture in the Context of Synergy Paradigm, Saratov, 2009.
- *Tkachenko O.V.* Russian Lingvoculture and technocratism. The problem of university philosophy integration // Proceedings of the inter-university scientific-methods conference Philosophical Education in a Technical University: interdisciplinary links and the problems of profilization of teaching philosophy subjects. Ivanovo, 2009.
- *Tkachenko O.V.* Extremism and the problem of honor. Reference between law and morality // Proceedings of the inter-region research/practice conference Counter-Ethnic and Religious Extremism in the North Caucasus. Adygea University, 2009.
- *Tkachenko O.V.* Phenomenon of honor and social identity in the modern world // Proceedings of the inter-university research/practice conference Modern Youth: the Problems of Forming Citizen Identity. Chechnya State University, 2009.
- *Yudin I.V.* Information space and the transmission of cultural values in modern Russia // Vlast. Moscow, 2009. # 6.
- *Yudin I.V.* Russia-Japan War of 1904-1905: information battles // Asia and Africa Today. Moscow, 2009. # 9.
- *Yudin I.V.* Information-communication component in the work of state management bodies // Proceedings of the international research/practice conference Relevant Management Problem. 2009. Issue 1. Moscow: State University of Management, 2009.

Dissertations

- *Yudin I.V.* State information policy in the Russian Federation: mechanisms of implementation in the modern context. Political Science PhD Thesis.

Partners

- Philosophy and Sociology Departments of Technical Universities of Moscow and the Russian Federation (in terms of the Association of Social Sciences Departments of Technical Universities)
- Academy of Electro-Technical Sciences of the Russian Federation

RESEARCH CENTER «WEAR-RESISTANCE»

«POWER PLANT EQUIPMENT WEAR RESISTANCE IMPROVEMENT» RESEARCH CENTER

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19 research scientists
56 engineers
and 34 graduate students

Head of research center:
Russian Government Award Laureate
Dr. Sci/ (Techn.) Professor Vyacheslav A. RYZHENKOV

Priority research activities

Research supervisors

- **Erosion and corrosion processes study in structural materials; development of surface protection methods for thermal and nuclear power plants heat-and-power engineering equipment which would allow to protect the equipment from operating medium and environment attacks**
  Professor V.A. Ryzhenkov
- **Surface active agents (SAA) identification and concentration measurements in diverse aqueous media**
  Professor V.A. Ryzhenkov
- **Hydrodynamic process study; development of methods allowing to reduce hydraulic resistance in pipeline systems**
  Professor V.A. Ryzhenkov
- **Research on fluid particles interaction processes with solid surfaces**
  Professor L.I. Seleznev
- **Power equipment service life extension and reliability improvement through high-performance nanocomposite coatings application**
  Senior researcher G.V. Kachalin
- **Heat supply systems operating efficiency improvement**
  Senior researcher S.I. Pogorelov
- **Research on thermal barrier deposits formation on heat-exchanging equipment surfaces; development of methods to remove deposits and prevent corrosion products deposition**
  Leading researcher A.V. Kurshakov
- **Structural materials and protective coatings erosion resistance measurements during high-speed interaction with fluids**
  Senior researcher A.A. Bodrov
- **Hydrodynamic research on impeller pump wheelspaces; development of methods to improve pumping equipment operational reliability at heat-and-power engineering facilities**
  Leading researcher A.V. Volkov
- **Development of high-performance hydrodynamic recuperation systems driven by process liquid excessive rail pressure**
  Leading researcher A.V. Volkov
- **Electricity production from trunk pipeline excessive pressure recuperation**
  Leading researcher A.V. Volkov

Agreements, contracts

- Energy-saving technology of heat transportation, distribution and consumption
- Equipment and distribution network operating efficiency improvement through surface-active corrosion inhibitors application at district heating station-54 of «MOEC» (Moscow common energy company) JSC subdivision №7 «Southwest»
- Reliability and efficiency improvement at thermal and nuclear power plants cooling systems through operating media conditioning with SAA-molecules
- Research on turbine blades latent erosion period in wet steam turbine stages
- Nanocomposite coatings application for structural materials protection from erosion
- Research on boiler heating surface nanolevel modification processes, the processes being based on SAA adsorption from the actuating medium
- Research on SAA-molecules adsorbed into equipment and pipeline surfaces and on the influence adsorption exerts on heat and water supply network corrosion processes
- Heating system energy efficiency improvement through SAA-technology application: a school case study (school's location: town of Vorkuta, Severniy community, Yugo-Zapadnaya str. 5)
- Power saving during actuating and operating media pipeline transportation: development of a high-performance technology
- Application of the experimental «Erosia-M» hydraulic shock test bench for research on material surface destruction processes and promising nanocomposite coatings structure
- Technology and equipment development for energy efficiency improvement of heat, hot and cold water supply systems in buildings and facilities
- Technology and equipment development for in-operation heat supply systems enhancement allowing to eliminate heat and heat-carrier losses
- Research on heat and water supply systems excessive pressure conversion to electricity
- Study of texturized coatings influence on operating medium hydrodynamic interaction with a solid surface
- Research on heat engineering equipment surface nanolayer modification influence on thermal barrier deposits accumulation rate

Key publications

- ***Ryzhenkov, V.A.; Pogorelow, S.I.; Naryadkina, N.A.*** Energotechnological complexes: necessities and opportunities of corrosiveness monitoring in operating and technological media // Energosberezhenie i vodopodgotovka (Energy saving and water treatment). 2009. №4 (60). P. 2—6.
- ***Ryzhenkov, V.A.; Fedorov,V.A.; Kachalin, G.V.; Mednikov, A.F.*** Improving the corrosion resistance of turbine blades in high-temperature turbine stages // Nadezhost i bezopasnost energetiki (Reliability and safety in power engineering). 2009. №2 (5). P. 34—39
- ***Volkov, A.V.; Davydov, A.I.; Hovanov, G.P.*** On superhydrophobicity application for impeller pump energy efficiency improvement // Nasosi i oborudovanie (Pumps and equipment). № 6 (59). 2009. P. 48—51
- ***Ryzhenkov, A.V.*** Pipeline network equipment nanolayer surface modification // Nanotechnologies in power engineering, nanomechanics and nanoplasma: reports compilation from the 2nd International nanotechnology forum «Rusnanotech'09», 6th—8th of October, 2009, Moscow. P. 156—157.

- *Mednikov, A.F.; Voronkov, Y.A.; Gorlanov, S.A.; Lavrenov, R.N.; Mednikov, Al.F.* Prospects for nanocomposite coatings application aimed at vital power equipment components improvement// Nanotechnologies in power engineering, nanomechanics and nanoplasma: reports compilation from the 2nd International nanotechnology forum «Rusnanotech'09», 6th—8th of October, 2009, Moscow. P. 151—153.
- *Ryzhenkov, V.A.; Naryadkina, N.A.* On potentially dangerous compounds identification and content measurement in operating and actuating media used at energotechnological facilities // article compilation from CIT «Modern information technologies» International science conference, issue 10 — city of Penza, 2009. P. 74—79.
- *Volkov, A.V.; Ryzhenkov, V.A.; Parygin, A.G.; Volkova, T.A.* On heat supply systems efficiency improvement through delivery water excessive pressure conversion to electricity // Energosberezhenie i vodopodgotovka (Energy saving and water treatment). №1 (63). 2010. P. 32—34.
- *Volkov, A.V.; Hovanov, G.P.; Zharkovsky, A.A.; Pugachev, P.V.; Parygin, A.G.* Low-speed pump characteristics design-theoretical studies // Novoe v rossiyskoy elektroenergetike (Russian power industry innovations). № 2, 2010. P. 36—44.
- *Ryzhenkov, V.A.; Kurshakova, A.V.; Anahov, I.P.; Zagretdinov, I.Sh.; Gorohova, O.V.* On the efficiency of heat-and-power engineering equipment protection from atmospheric corrosion during repairs and lengthy downtime periods // Nadezhost i bezopasnost energetiki (Reliability and safety in power engineering). №1(8). 2010. P. 43—46.
- *Volkov, A.V.; Ryzhenkov, V.A.; Parygin, A.G.; Volkova, T.A.* District heating systems reliability and efficiency improvement through efficient use of excessive line pressure // Nadezhost i bezopasnost energetiki (Reliability and safety in power engineering). №2 (9), 2010. P. 45—47.
- *Seleznev, L.I.; Ryzhenkov, V.A.; Mednikov, A.F.* Engineering steels and alloys wear phenomenology during liquid particles erosion // Teploenergetika (heat and power engineering). №9, 2010. P. 12—16.
- *Ryzhenkov, A.V.; Lukin, M.V.; Suhova, E.A.; Hovanov, G.P.* Heat transport, distribution and consumption systems efficiency improvement // Akademiya energetiki (power engineering academy). №5 (37). 2010. P. 20—25.
- *Ryzhenkov, A.V.; Suhova, E.A.* Technology and equipment for heating system pipeline networks hydraulic resistance reduction // ENERGO-2010 theoretical and practical science conference report «Power plants and power systems increased reliability and operational efficiency» 1st—3rd of June 2010, Moscow, Power engineering institute. Volume 1. P. 244—247.
- *Kachalin, G.V.; Ryzhenkov, V.A.; Mednikov, A.F.* Increasing the life time of critical pieces of equipment at thermal and nuclear power plants through the use of protective ion-plasma coatings // ENERGO-2010 theoretical and practical science conference report «Power plants and power systems increased reliability and operational efficiency» 1st—3rd of June 2010, Moscow, Power engineering institute. Volume 1. P. 81—84.
- *Kurshakov, A.V.; Ryzhenkov, V.A.; Bodrov, A.A.* The technique and equipment for determining the turbine blade topography and erosive wear rate in wet steam turbine stages // ENERGO-2010 theoretical and practical science conference report «Power

plants and power systems increased reliability and operational efficiency» 1st – 3rd of June 2010, Moscow, Power engineering institute. Volume 1. P. 97—98.

- ***Mednikov, A.F.; Ryzhenkov, V.A.; Kachalin, G.V.*** On heat-resistant and thermal barrier coatings formation on steam and gas turbine surfaces // ENERGO-2010 theoretical and practical science conference report «Power plants and power systems increased reliability and operational efficiency» 1st—3rd of June 2010, Moscow, Power engineering institute. Volume 1. P. 99—102.
- ***Ryzhenkov, V.A.; Kurshakov. A.V.; Anahov, I.P.; Pogorelov, S.I.*** Improving the efficiency and reliability of thermal and nuclear power plants through the application of SAA –technologies // ENERGO-2010 theoretical and practical science conference report «Power plants and power systems increased reliability and operational efficiency» 1st—3rd of June 2010, Moscow, Power engineering institute. Volume 1. P. 131—135.
- ***Ryzhenkov, V.A.; Lebedeva, A.I.; Kachalin, G.V.; Mednikov, Al.F.; Lavrenov, R.N.*** Determination of erosion, abrasion and corrosion resistance of steam turbine component materials reinforced through surface hardening and protective coatings // ENERGO-2010 theoretical and practical science conference report «Power plants and power systems increased reliability and operational efficiency» 1st—3rd of June 2010, Moscow, Power engineering institute. Volume 1. P. 136—139.
- ***Volkov, A.V.; Parygin, A.G.; Hovanov, G.P.; Naumov, A.V.*** Increasing the energy efficiency of centrifugal pumps being used through wheelspace surface modification // ENERGO-2010 theoretical and practical science conference report «Power plants and power systems increased reliability and operational efficiency» 1st—3rd of June 2010, Moscow, Power engineering institute. Volume 1. P. 207—210.
- ***Volkov, A.V.; Ryzhenkov, V.A.; Sherbakov, S.N.; Parygin, A.G.; Volkova, T.A.*** Improving the heating systems efficiency through excessive line pressure recuperation to electricity // ENERGO-2010 theoretical and practical science conference report «Power plants and power systems increased reliability and operational efficiency» 1st—3rd of June 2010, Moscow, Power engineering institute. Volume 1. P. 211—213.
- ***Poolner, I.P.; Ryzhenkov, V.A.; Sherbakov, S.N.; Kurshakov. A.V.; Anahov, I.P.; Lukin, M.V.*** On heat supply systems efficiency improvement through corrosion processes blocking and prevention of thermal barrier deposits accumulation on heat-exchange surfaces // ENERGO-2010 theoretical and practical science conference report «Power plants and power systems increased reliability and operational efficiency» 1st—3rd of June 2010, Moscow, Power engineering institute. Volume 1. P. 233—236.

Patents

- Russian Federation patent #96968. A device for SAA concentration measurements in aquatic environments / Ryzhenkov, V.A.; Pogorelov, S.I.; Kuhareva, O.V.; Naryadkina, N.A. // B.E. 2010, №23.
- Russian Federation patent application №2010114072 dated April, 12th, 2010. Method of nanocomposite coating application on product surfaces / Ryzhenkov, V.A.; Mednikov, A.F.; Kachalin, G.W.; Medvedev, K.S.
- Russian Federation patent application №2010126759 dated July, 1st, 2010. A method of hydraulic resistance reduction in pipeline networks / Ryzhenkov, V.A.; Pogorelov, S.I.; Ryzhenkov, A.V.
- Russian Federation patent application №2010123343 dated June, 8th, 2010. A method of nanocomposite coating application on plane component surfaces and a device for its implementation (options) / Ryzhenkov, V.A.; Mednikov, A.F.; Kachalin, G.W.; Medvedev, K.S.

- Russian Federation patent application #2010123416 dated June, 9th, 2010. Installation for nanocomposite coatings application on plane component surfaces (options) / Ryzhenkov, V.A.; Mednikov, A.F.; Kachalin, G.W.; Medvedev, K.S.

Partners

- Western Urals power engineering specialists association, city of Perm
- PO Gidromash JSC, city of Moscow
- Moscow department of Science and Industrial Policy
- Moscow government Fuel and energy sector department
- Russian Academy of Sciences Baikov Institute of metallurgy and materials, city of Moscow
- Vtoraya generirujushaya kompaiya optovogo rynka elektroenergii (Wholesale electricity market Second-generating company) JSC (OGK-2 JSC), town of Troitsk
- Leningradkiy metallicheskiy zavod (Leningrad metal plant) JSC, St. Petersburgh
- Moskovskiy komitet po nauke i technologiyam (Moscow Science and technology committee) JSC, city of Moscow
- Mosenergo JSC, city of Moscow
- MOEC (Moscow common energy company) JSC, city of Moscow
- Silovye mashini (power machines) JSC, city of Moscow
- Yuzhnaya generirujushaya kompaiya — TGK-8 (Southern generating company TGK-8) JSC, city of Astrakhan
- Russian national nuclear power plant operation research institute
- Russian Federation Ministry of Science and Education
- Moscow region government Ministry of housing
- Innovatsii v elektroenergetike (ENVAL) (power engineering innovations) nonprofit partnership, city of Moscow
- NPO TSNIITMASH («Central Research Institute of Technology and Engineering» research and production company), city of Moscow
- M.V. Keldysh Research center, city of Moscow
- Russian pump manufacturer association, city of Moscow
- POMPA (pump) close corporation, town of Shelkovo
- NPVP „Turbocon» (Turbocon innovation enterprise) close corporation, city of Kaluga
- Sigma Group, Lutin, Czech Republic
- Nauchno-issledovatelskiy fiziko-chemicheskiy institut im. Karpowa (Karpov research institute of physical chemistry) Federal State Unitary Enterprise
- ENA JSC, town of Shelkovo

Unique equipment

- Ion-plasma vacuum unit with a two-cathode unbalanced planar magnetron system and an arc evaporator, allowing to deposit protective coatings; equipment for surface preparation and cleaning
- A plant for nanocomposite coatings formation
- A unique test bench for structural materials and protective coatings erosion resistance measurements during exposure to liquid particle impacts, in accordance with the guidelines on how to assess steam turbines rotor blades performance in the process of manufacturing, operation and repair (RD 153-34.1-17.462-00 ES Rossii corporation)
- An equipment package for corrosion research and testing

- A mobile plant for deposits removal and prevention of further deposition, which allows to simultaneously protect power equipment and pipelines from corrosion
- Microscopes: an optical inverted microscope with a microhardness-measuring attachment, a scanning probe microscope, a transmission microscope and a focused beam microscope
- A Buehler GmbH (USA) equipment package for sample preparation for metallographic studies
- A CSM Instruments SA tribometer for wear resistance and friction coefficient studies
- A Dektat 150 mechanical profilometer for surface profile topography logging and roughness measurements in subnanometer range
- A Vertex 70 Fourier spectrometer for materials and coatings composition determination

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Head of R&D Department
«MPEI Science Park»
Alxander V. KOVAL'

Priority research activities

Research supervisors

- **Development of scientific potential of universities.**
  Professor N.D. Rogaliov
- **Development of estimation methods of intellectual property objects**
  Head of Lab Solomatova M.V.
- **Consideration of energy resources (in the frame of modernization of housing and communal services**
  Head of Lab A.V. Koval'

Agreements, contracts, projects

- Development of algorithm of the estimation method choice for intellectual property objects, which were created in the technical university in the frames of the analytical departmental program «Development of scientific potential of universities» (2006-2008)
- Development of technical-economic substantiation of development of innovation company's cluster in the field of energy saving in the South-East Administrative region of Moscow
- Development of technical-economic substantiation of «Creation of innovation-technology Center of the South-East Administrative region of Moscow as the support infrastructure of the high-tech company cluster

Key publications

- *Rogaliov N.D., Zubkova A.V., Negomedzianova E.A.* Investment activity as an instrument the control the cost of generating company // Innovations, 2007. #7(105). P. 107-111.
- *Rogaliov N.D., Zubkova A.G., Frei D.A.* Planning of industrial program of combined-TPP under conditions of competitive relation development on the energy markets // Innovations. 2007. #1. P. 77-81.
- *Rogaliov N.D., Arutiunian A.A.* Classification of risks and risk-formative factors for generating companies. // MPEI Vestnik, 2007. #4. P.113.
- *Koval' A.V., Vasina E.M., Gasho E.G.* The role of energy-service companies in implementation of the complex programs of energy saving in housing and communal services of cities. Energosberezhenie, 2007. #6.
- *Rogaliov N.D., Solomatova M.V.* Investigation of cluster structures in the field of innovation activity. // Proc. of XIII Intern. Scient. Conf. «Radio Engineering, Electrical and Power Engineering». MPEI Publ. 2007. P. 547-549.
- *Solomatova M.V.* Approach to select R&D results of technical university for the future commercialization. // Proc. of Intern. Conf. «Innovatics-2007». Ulianovsk. 2007. P. 91-93.

Partners

- Association «Technopark», Moscow
- The Union of Innovation-Technology Centers of Russia, Moscow,

- Intitute of Innovations, Creativity and Capital, University of Texas in Austin, USA,
- Corporation BADA of Harbin Polytechnic Institute (China),
- Scientific-Academic Center on innovation activity at Twer University, Twer
- Scientific Park of Warwick University, UK
- Fund of assistance to small business companies in R&D area, Moscow
- Fund of assistance to innovation activity in universities, Moscow
- Russian-Chinese Technopark «Friendship»
- JSC «ESKoTech»
- JSC «InTESco»

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General Director
Igor V. KUZNIK

Priority research activities

- Development and implementation of the electronic units for the heat-counters (heat-calculators)
- Development and manufacture of the primary transducers for water, gas, oil-products consumption
- Manufacture of the temperature transducers of a resistive type
- Design, manufacture, attestation execution of the spill verifying setups
- Software development for the heat and heat-carrier registration automation
- Manufacture of the housing heat-counters and the water counters
- Creation of the normative documents

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2 Doctors of sciences,
11 Ph.D.

General Director
Dr. of Sci. (Phys.-Math.) Alexei A. PANTELEEV

■ Priority research activities

- Development of the modern complex systems of a water treatment for medicine, pharmaceutics, energetic, microelectronics
- Development of the ecologically pure technologies of a water treatment for the industrial thermal energetic

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General Director
Ph.D. (Techn.)
Sergey S. GROKHOVSKIY

Priority research activities

- Research of the dynamic characteristics of the vibro-frequency force sensors on the basis of the crystal piezo resonators
- Methods and facilities for the metrological parameter testing of the force-sensitive piezo resonators
- Development of an automated system for the constructive parameter modeling and calculations for the force sensor elastic elements
- Development of the adaptive control algorithms in the measuring systems using the piezo-crystal sensors

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General Director,
Ph.D. (Med.) Viacheslav M. SHAKHNAROVICH

Priority research activities

- Development, manufacture preparation and manufacture: equipment for a radio telemetry of special and general purposes
- safety devices and systems for a railway transport
- specific sensors and the special power sources
- technical facilities for the noninvasive medical and psycho-physiological diagnostics
- Special software
- Person-operator physiological condition monitoring systems and its condition control with the help of his operation maximal effectiveness achieving
- special device families with the biological feedback for training in a self-regulation and a treatment
- Company has its own premises and the qualified radio engineers, adjusters, assembling metalworkers, has a modern technological equipment. The most part of equipment developed by company is manufactured in its own workshops or on the basis of co-operation with the defense conversion enterprises. The manufacture is licensed. All products are certified. The branching acceptance of the products is organized in the company

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General Director
Ph.D. (Techn.)
Alexander B. KOZHIN

Priority research activities

- R&D execution for development of the high-tech and resource-saving technologies in the area of an energetic. R&D are fulfilled on the basis of the Steam and Gas Turbines Department laboratories of the Moscow Power Engineering Institute
- Development, modernization, manufacture and delivery to the thermal power plants of the deport units to an energetic equipment
- Constructing-and-mounting operation fulfillment; the outward and inward engineering net and the equipment mounting; mounting of the heat-power equipment, compressors, pumps and fans, gas cleaning equipment, technological metal constructions; start-adjusting operations for the heat-power equipment, refrigerating and compressor installations, water supply, sewerage and the heat supply systems; vibro-diagnostics of the TPP equipment
- Development of a software for PC

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General Director
Alexander V. KOVAL'

Priority research activities

- Design, assembling, adjustment of the heat and hot-water supply registration units «turnkey», guaranteed and after-guarantee service
- Mounting, adjustment and repair of the energy objects, the electrical and the thermal power engineering equipment
- Inspection of a particular condition of he heat-supply and heat-consumption in the region, recommendations development on a choice of the promising directions of heat-savings, heat-saving project execution
- Energy consulting and audit

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General Director, Scientific supervisor
Dr. of Sci. (Techn.),
associated-professor
Vadim N. OSTRIROV

Priority research activities

- Development of an electronic converter family for the electric drives and the power sources on the modern element base
- Development and investigations of the regulated asynchronous, gated and gated-inductor electric drives
- Experimental development, manufacture, guarantee and after-guarantee service of the electronic converters for the regulated asynchronous, gated and gated-inductor electric drives of the different purposes

Agreements, contracts, projects

- About 20 contracts on development, experimental development, manufacture and delivery of the electronic converters including for energetic, housing and communal services, the special systems, a transport including the export contracts

Unique equipment

- Automatic regulators for the dosing pumps ARDN-3
- Electronic converters for the gated-inductor electric drives up to 32,5 kW power with different number of phases (from 2 to 6)
- Energy saving complete equipment for the hot water supply pumps and for waste waters exhaustion pumps up to 400 kW power
- Regulated electric drive which has no analogues in the world up to 630 kW in power on the basis of a gated-inductor motor with an independent excitation
- Secondary supply sources from the contact net 6 and 10 kW in power for the modern subway cars
- Voltage regulators BRN for the secondary power supply sources of the passenger and rail-way cars with power up to 32 kW

Key publications

- *Dem'yanenko, A.V.; Zherdev, I.A.; Kozachenko, V.F.; Rusakov, A.M.* Non-contact inductor gated electrical machine with an electromagnetic excitation. Patent 2277284 (RU 2277284 C2). МПК H02K 19/10, H02K 29/00. BI No 15. 2006.
- *Korpusov, D.E.; Kozachenko, V.F.; Rusakov, A.M.* Gated-inductor electrical drive. Patent 53515 (RU 53515 U1). МПК H02M 5/40. BI No13. 2006.
- *Ostrirov, V.N.; Dmitriev, V.Yu.* Development and implementation of the native electronic converter devices for the regulated electrical drives and for the strong power sources. Privodnaya tekhnika, No 4, 2008.
- *Ostrirov, V.N.; Mil'skiy; K.V.* Reasonable circuits of the frequency converters for the powerful synchronous gated-electrical drives. Electronic components, No 11, 2008.

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President
Winner of RF State Award,
professor Vasily V. SUKHORUKOV

Priority research activities

- Development of the magnetic and electromagnetic methods and facilities on a non-destructive control of the steel ropes, pipe-lines, rubber-rope conveyer belts, steel reservoirs and the other potentially dangerous industrial objects
- Development of the vortex-current thickness-meters for galvanic coverings on dielectrics
- Development of the technical diagnostic systems for the main pipe-lines on the basis of the defect identification algorithms

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General Director,
Nikolay V. ARZAMASTSEV

Priority research activities

- Scientific-organizational, methodic and technical bases of the Russian-Chinese innovation co-operation infra-structure development

Arzamastsev, N.V.

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General Director
Ph. B. (Techn.),
Associated-Professor Igor S. PONOMARENKO

Priority research activities

- Development of the software complexes on automation of the electrical net control systems
- Development and manufacture of the measuring instruments for the electrical energy quality indexes analysis, the electronic components
- Development and manufacture of the DC system components for the electric stations and sub-stations
- Development and manufacture of the powerful voltage regulators, voltage regulators for the electrical lighting systems