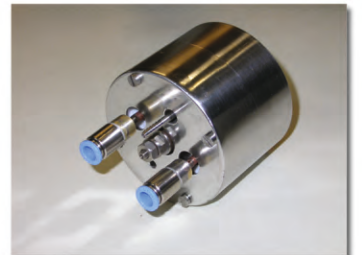
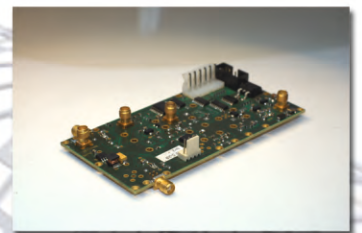


Belarusian State University of Informatics and Radioelectronics



R&D Activities





**BELARUSIAN STATE UNIVERSITY
OF INFORMATICS AND RADIOELECTRONICS**

– The largest national research, educational and innovation Center of the Republic of Belarus.

– Specialists training in 44 majors in the fields of computer, radio-, micro-and nanoelectronics. There are 37 majors in master's degree, 30 majors in PhD and 15 majors for postgraduates.

– More than 700 teachers at 10 faculties, 37 departments.

– More than 250 scientists in 37 laboratories and 10 centers.

– 11 research areas: from wireless devices and systems to the micro- and nanoelectronics.

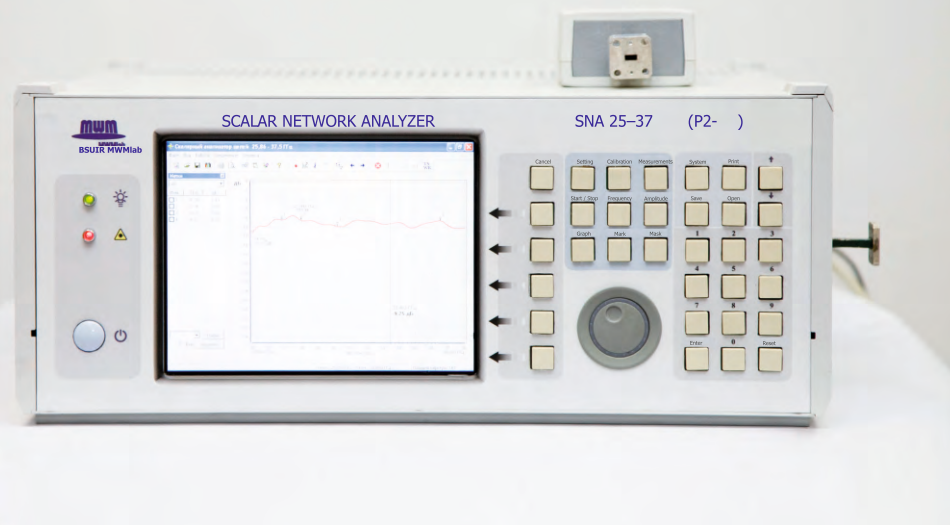
– Participation in international programs and projects of European Union (7th Framework Programme, Tempus IV), Union State (KOMPOMAT, Monitoring SG), the German Service for academic exchanges, International Association for the Exchange of Students for Technical Experience (IAESTE).

– Export of scientific and technical products to the China, India, Taiwan, Venezuela, Germany, France, UK, Belgium, Russia, Slovakia, Poland, Estonia, Armenia, Ukraine markets.

– Exported products: control and measuring microwave-range devices, radars of different purpose, the antenna and the transmitter modules of mm- range; software and technology of EMC REC; equipment for hydroacoustic communication, technology, materials and the structure of micro-and nanoelectronics, systems for remote monitoring of man-made technological objects.

www.science.bsuir.by

Белорусский государственный университет информатики и радиоэлектроники



Export

Vector network analyzers
Scalar network analyzers
Signal generators
Signal synthesizers
Microwave power meters
Field strength meters
«RVS-36P» contactless radio-wave pulse sensor / meter level

Foreign partners

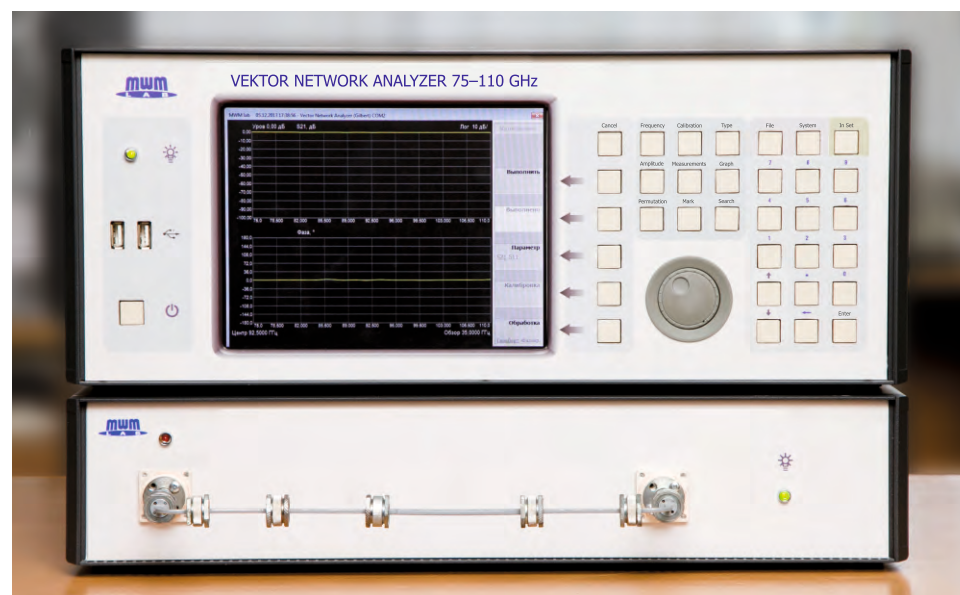
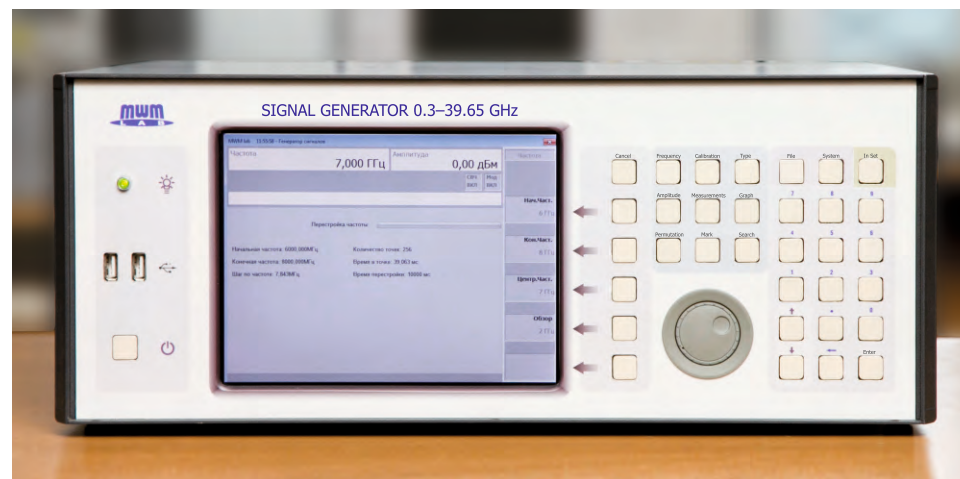
China, Venezuela, India, Taiwan, Germany, Great Britain,
South Korea, Russia, Ukraine

Cooperation forms

Research Projects
Personnel training
Contracted development
of equipment

Contacts

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www.mwmmlab.com

Measurement, control, and test UHF instruments and equipment (1 MHz – 178 GHz)

Commercial offers

Metrological support of the design
and construction instruments and equipment

Automated measuring systems
regular remote calibration

Modification to the specific conditions
of production and customer requirements
with respect to the metrological characteristics

Equipment delivery – from 3 months





Satellite VSAT terminal

■ Export

Satellite VSAT terminal

■ Cooperation forms

Terminal development under Customer's specific requirements

Technical and functional capabilities expansion of the customer's communication system



Special purpose equipment

www.mwmlab.com

■ Export

Mobile terminals for radio relay and satellite communication systems
Transceiver modules for relay stations in the 9...18, 25...36, 94 GHz bands
Radar-based AF AR in the range of 9...18, 25...36, 94 GHz
Radio relay transmission line in a range of 94 GHz
Miniature radar

■ Cooperation forms

Development and manufacturing equipment and instruments according to the customer requirements



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Emitting part of the of power flux density measurement standard unit with automatic adjustment



www.mwmlab.com

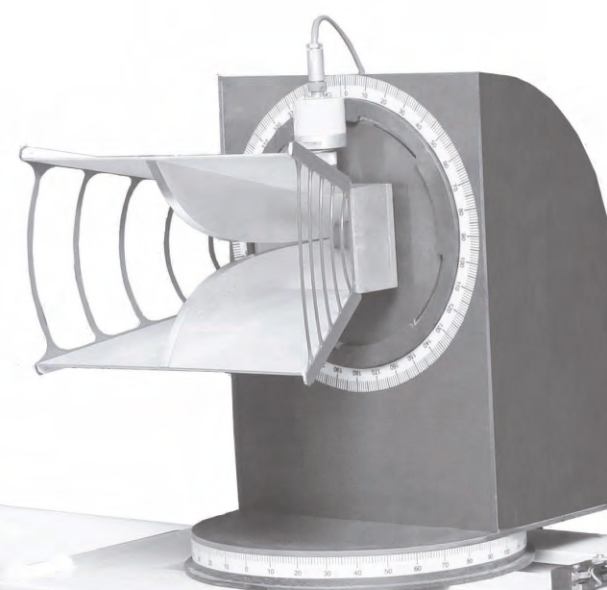
Measurement systems. Measurement standards



Equipment and UHF devices testing laboratory is accredited for measurement characteristics and parameters of UHF devices in the certification system of calibration and testing laboratories of the Republic of Belarus (Certificate № BY/112.02.1.0.0321 from 12.01.1998)

■ DEVELOPED AND PRODUCED

- Power measurement standard unit (certification, calibration, measuring power meters and transducers validation)
- Power flux density measurement standard unit (certification, calibration, antennas and power flux density meters validation)



■ Commercial offers

- Design and production of the standard systems in the field of UHF measurements (power flux density, frequency, VSWR, reflection and transmission coefficients) according to Customer requirements.
- Conduction of microwave devices tests in laboratory accreditation field.
- Provide 1 MHz – 178 GHz range UHF measurement instruments design, production and repair.

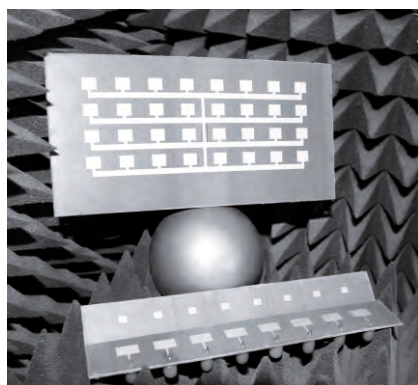


Power flux density measurement standard unit with automatic adjustment

■ Contacts

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Radio engineering systems of SHF and EHF ranges



■ The main activities

SHF and EHF bands advanced radar systems modeling and development

On-board and space radars including synthetic aperture radars development

SHF and EHF bands advanced antenna systems constructions modeling and development

SHF and EHF bands radar systems functional units development

Study the characteristics of underlying surfaces in the centimeter and millimeter ranges

Study objects radioluminous characteristics

Developed systems metrological study

■ Export

Aerial radar systems

Scanning phased antenna arrays

Reflector antenna systems, including scanning and monopulse antennas

SHF and EHF bands radar systems functional units

■ Foreign partners

India, China

■ Cooperation forms

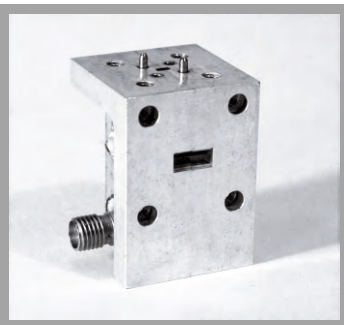
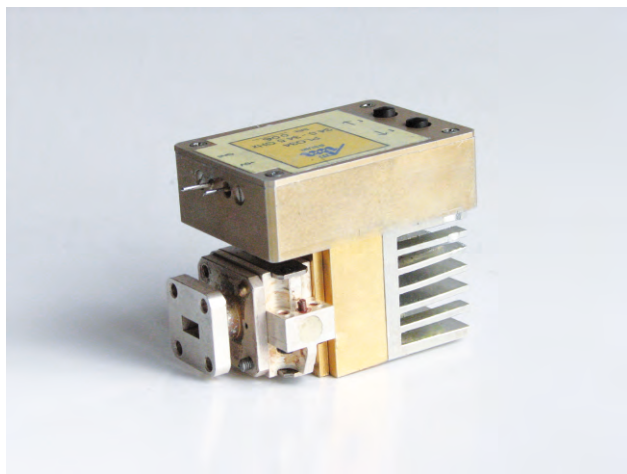
Contracted development of equipment

Training of personnel

■ Contacts

center1.6@bsuir.by
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Microwave and mm-wave components and assemblies



The main activities

Computer-aided design of integrated microwave devices

RF technologies, including production of antennas

Estimation, optimization, and synthesis of microwave antennas

Mathematical modeling and development of microwave assemblies

Foreign partners: India, Russia

Cooperation forms

Contracted development of equipment
Training of personnel

Export

Pin-switches, modulators, signal limiters

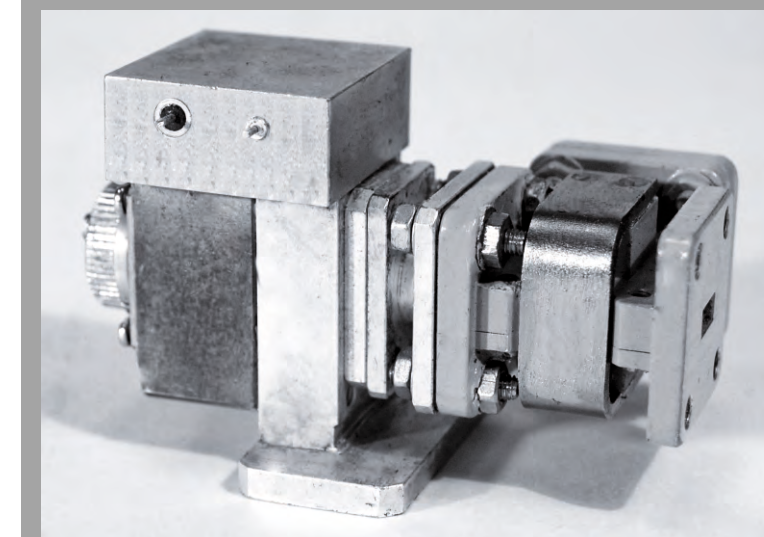
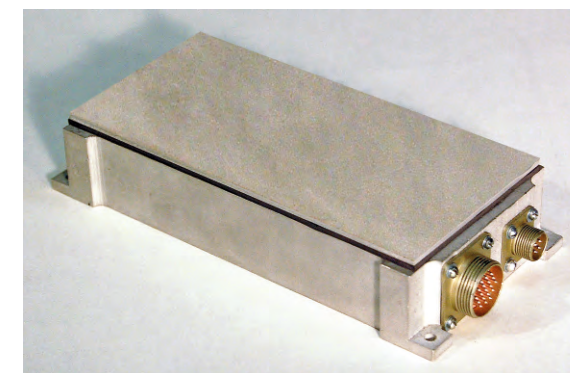
High-stable frequency synthesizers

Balanced mixers, frequency transducers

Microwave transistor power amplifiers

Low-noise receivers (converters, amplifiers) of C- and Ku-band communication satellite signals (geostationary and geosynchronous orbits)

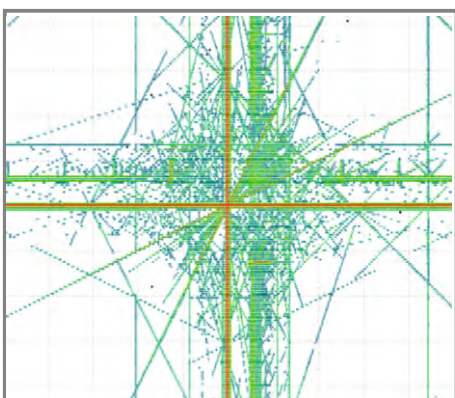
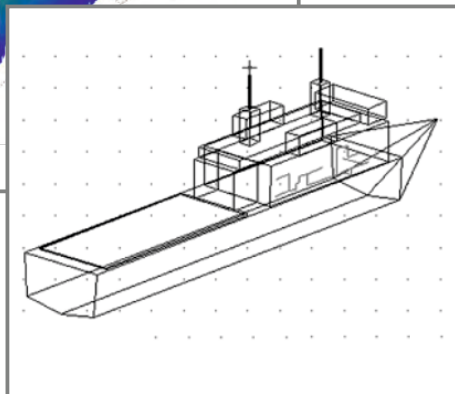
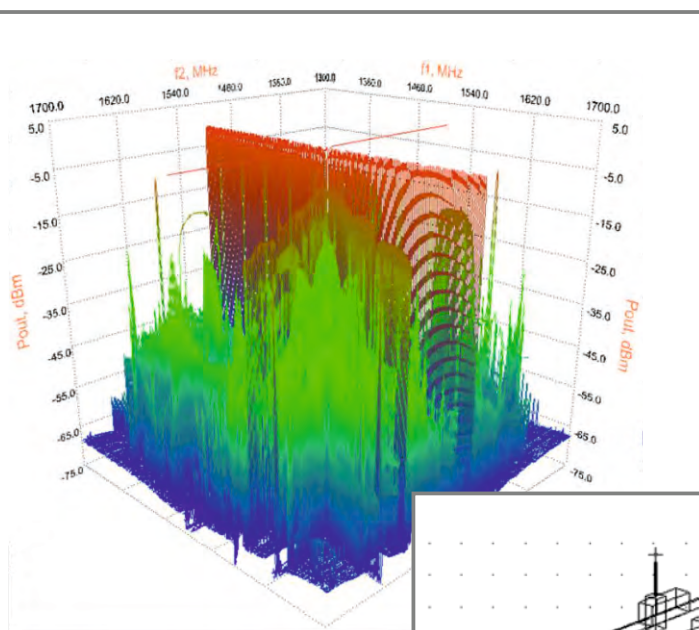
Millimeter- and centimeter-wave magnetron transmitters



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EMC for local groupings of radioelectronic facilities



The main activities

Research and development in the field of EMC analysis and design in local onboard and ground-based complexes of RF/microwave systems

Research and development in the fields of design, EMC analysis and synthesis in complexes of terrestrially-distributed RF/microwave systems using digital area maps

Development of technology and tools for discrete nonlinear simulation of radio devices and components

Development of approaches and tools for optimal frequency-space planning of radio networks with arbitrary spatial topology

Development of approaches and tools for measurements and control of EMC characteristics of radio devices and components

Export

EMC-Analyzer

multifunctional and powerful specialized expert system for cost-effective electromagnetic compatibility analysis and design in complex co-site systems and/or in spatially-limited ground/water areas

EMC Virtual Testing Area

cost-effective technique for intersystem electromagnetic compatibility analysis of spatially-distributed radio objects allocated at the ground / sea surface and / or in the air space

ADFTS

automated double frequency test system for measurement and simulation of radio-receiver EMC parameters

GIS-RF

specialized Geo Information Technology and Software for Radio Frequency Development and Design

DNA-EMC

leading and extra-highly efficient technique and software for nonlinear behavior simulation of radio receiver operation in severe electromagnetic environment

Foreign partners

China, South Korea, Great Britain, Germany, USA, Ukraine

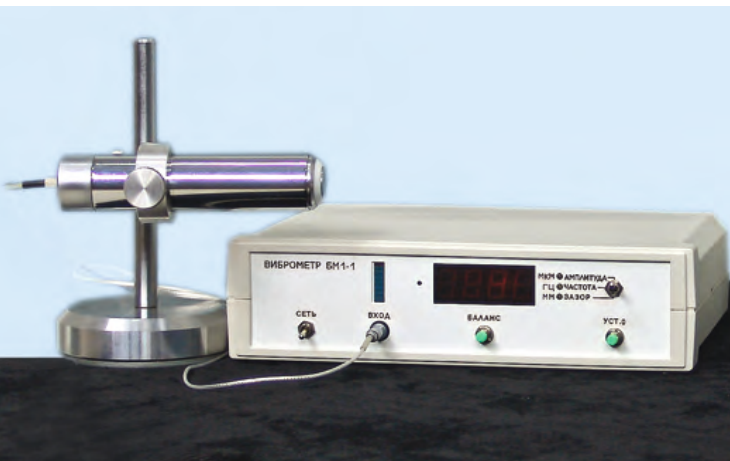
Contacts

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Cooperation forms

Research Projects
Personnel training
Contracted development of equipment





www.cavitation.bsuir.by Ultrasonic technologies and equipment

The main activities

Development of instruments for measurements and monitoring in powerful ultrasonic fields, and also of ultrasonic technologies and equipment

Development of software to control operation modes of ultrasonic facilities and other equipment

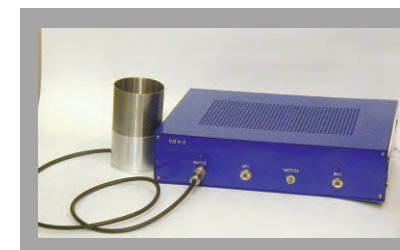
Optimization of operation modes for ultrasonic facilities

Foreign partners

Great Britain, The Netherlands, Italy, France, Russia, Ukraine

Cooperation forms

Research Projects
 Personnel training
 Contracted development of equipment



Export

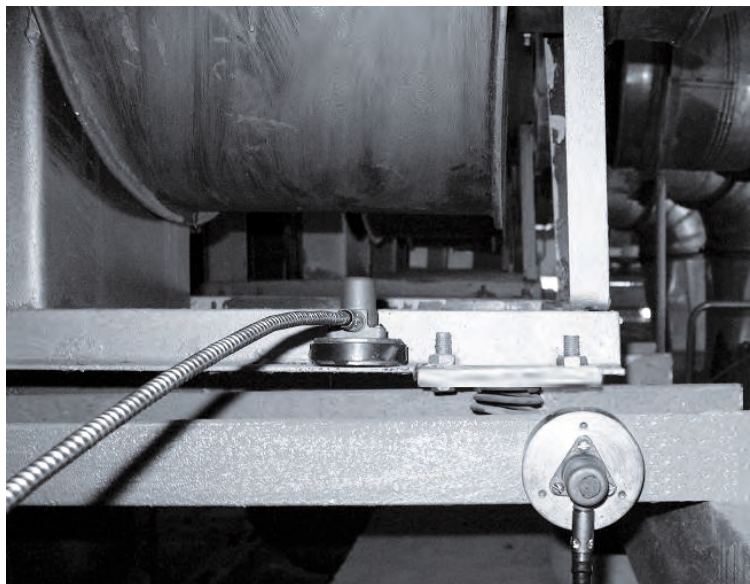
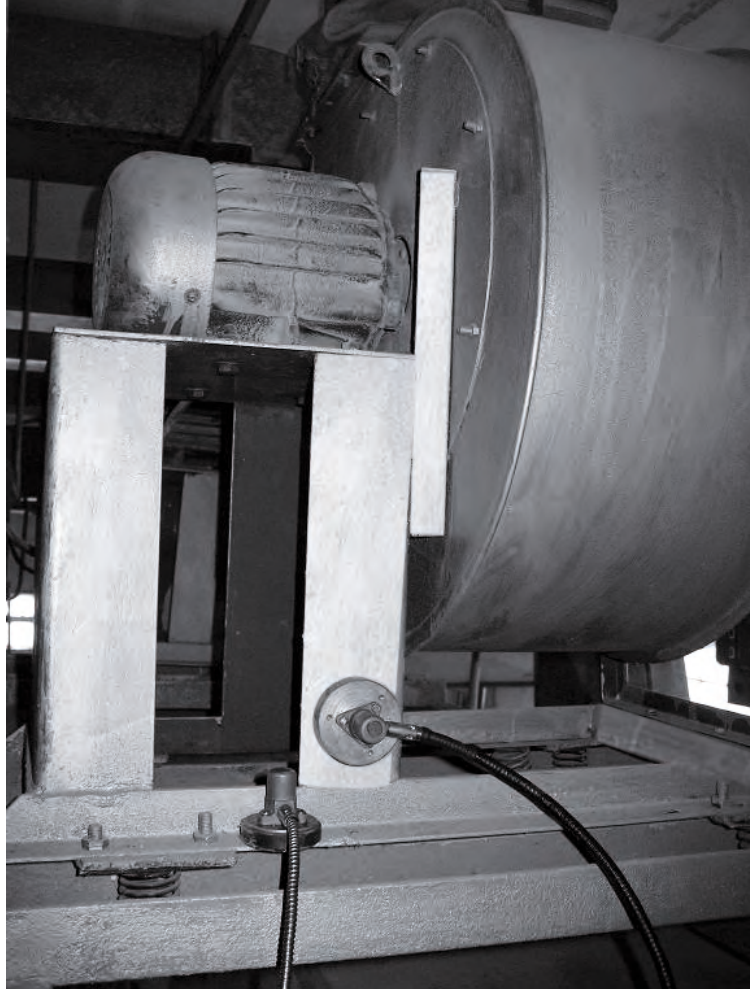
- Cavitometers
- Noncontact vibrometers
- Generators
- Dispergators



Contacts

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Vibration measuring transducers for engine mounting platform vibration control

Vibration diagnostics and protection systems and devices

The main activities

Applied metrology

Vibration monitoring of mechanism and buildings

Development of multi-functional systems and portable vibration measurement and control devices

Vibration safety of operation for rotary mechanisms

Comprehensive estimation of the technical condition of machinery and mechanisms with troubleshooting diagnostics

Products

Multilevel monitoring system of rotor machinery vibration condition

Mobile measuring and computing complex for vibration diagnostics of buildings and constructions

Vibration control and protection system of "Lukoml" family

Portable system to evaluate the vibration condition of technological objects

Vibration test management system



"Tembr" mobile measuring and computing complex

Partners

Industrial sector of the Republic of Belarus:
Republican HPS, HPP;
Ministry of Energy,
Ministry for Emergencies



Single-channel vibration meter with safety shutdown on vibration function

Contacts

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Wideband absorbers of electromagnetic radiation

Export

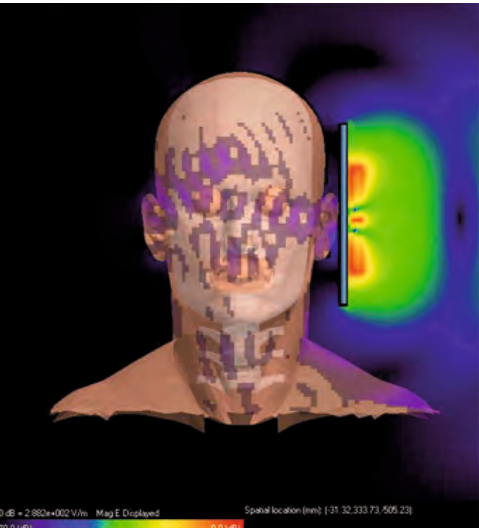
Devices for users' protection from computer and medical equipment personal computers, laptops, mobile phones EMR.

Individual protective coating to protect man from EMR

Devices to protect biometric passports from unauthorized access and high-power electromagnetic radiation

Special materials to construct buildings and structures, tiled areas, create dedicated rooms to reduce the EMR level

Special materials to reduce objects of military equipment radar visibility, the protection of electronic equipment from the damaging effects of electromagnetic weapons



We develop [wideband absorbers of electromagnetic radiation](#) developed on the basis of machine-knitted fabric with a microwire, fibrous materials with incorporated nano-scale metallic clusters, machine-knitted fabric with thin-film coatings, capillary-porous materials with incorporated liquid mortar volumes, composite materials with powdery fillers.



Cooperation forms

Contracted development of equipment and materials

Training professionals to engage in joint production projects

Research projects

Special materials for construction and tiling

Export

Shielding building materials on a shungite-concrete basis

Construction mixtures, plasters, screeds, brick and masonry mortar, filled with the shungite-concrete dielectric filler. Have high shielding (up to 20 dB at a thickness of 5 mm in the range of 0.3 to 120 GHz) and mechanical properties, high chemical resistance and thermal conductivity. Standard technology of manufacturing and application. Materials do not require special equipment, can be used in conjunction with other building materials. Environment safe.

Shielding materials based on powdered wastes of iron making, in particular cupola gas purification sludge.

Molded into rectangular-sectioned pieces. Product mass is 3 kg. Size: 250x120x65 mm. The project gives the solution to the problem of iron powder waste disposal.

Integrated panels of complex electromagnetic-acoustic protection.

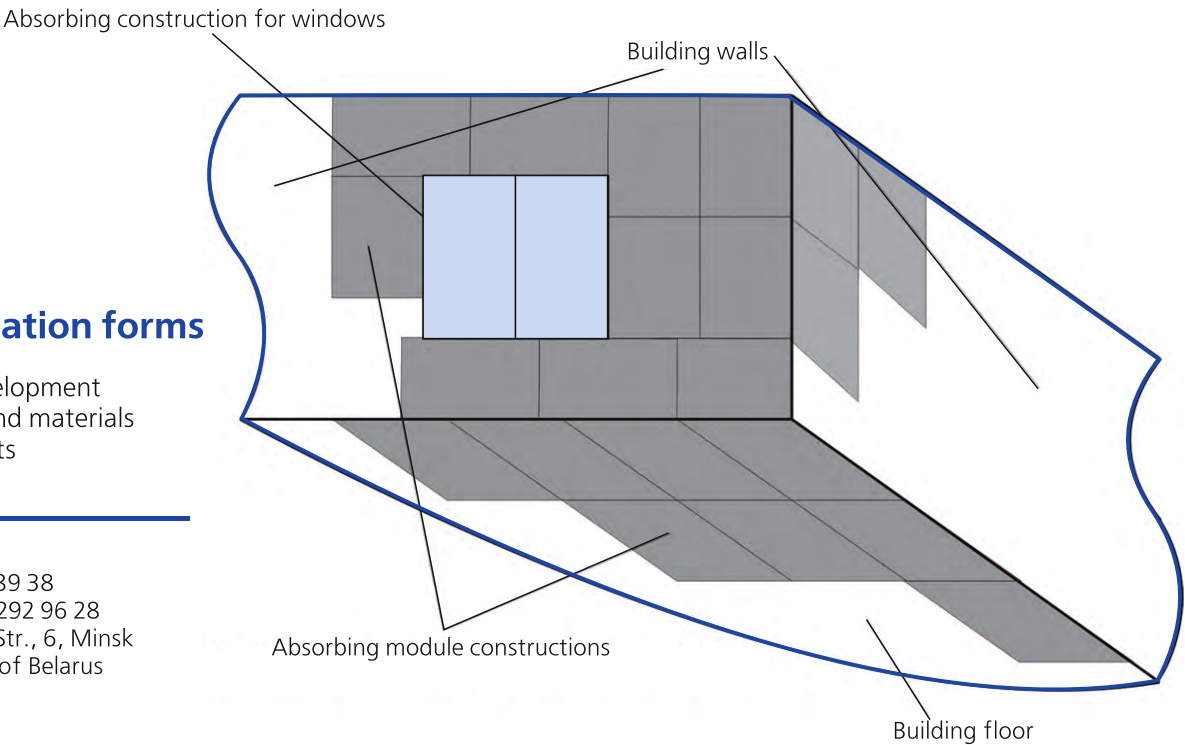
Multilayer construction for suppression of acoustic and electromagnetic waves.

Cooperation forms

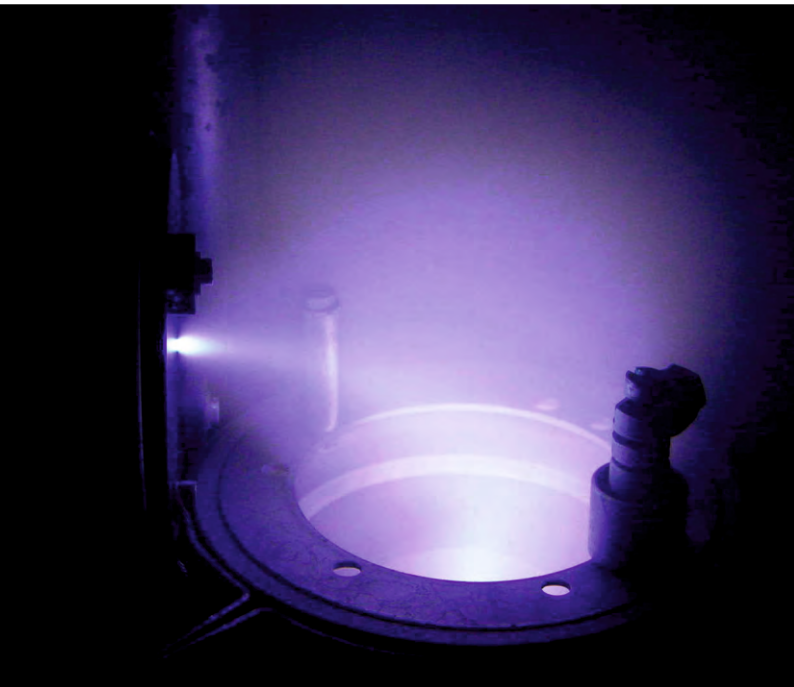
Contracted development of equipment and materials

Research projects

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Beam technologies and equipment



■ Plasma ion-beam and electronic technologies in instrumentation and engineering

Multifunctional modular vacuum mechanisms development

■ Technology of controlled vacuum-plasma treatment with LF and microwave discharge

Working out technological modes of vacuum-plasma treatment with LF and microwave discharge on customer premises equipment

■ Organic and inorganic IR heating and treatment materials technology

Development and shipping of a system for energy efficient thermal treatment (dehumidification) of various organic and inorganic materials



■ Nonequilibrium plasma generators for vacuum LF and microwave discharge

Shipping of low-temperature nonequilibrium plasma LF and microwave discharge generators in a low vacuum premises



■ Partners

China, South Korea

■ Contacts

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220013 Republic of Belarus

Composite coatings with the matrix of precious metals (silver, gold) under pulsed electrolysis forming technology

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Energy-saving equipment for electroplating

Commercial offers

- Production of the following equipment that meets specific customer requirements

Energy-saving equipment with software control to implement cathode / anode processes at a constant pulse and alternating current

Sources of complex shape current (voltage) pulses sequences for coating in a single technological cycle. The coating consists of up to 10 sequentially applied micro- and nanolayers with different composition and physical properties

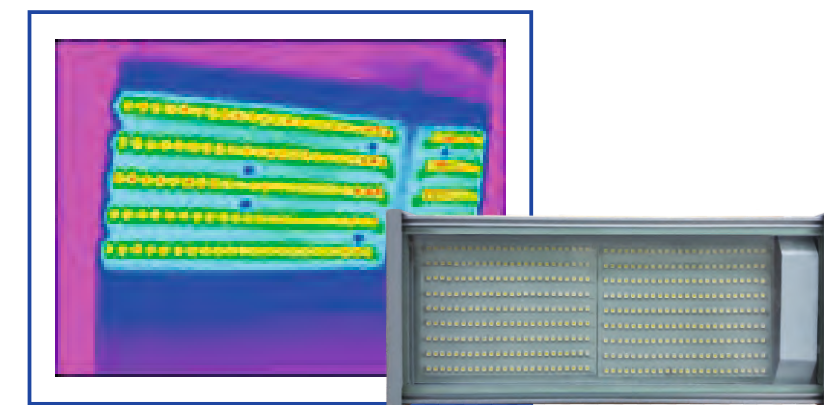
- Carrying out equipment installation and launching into commercial operation, personnel training, service and support
- Development of protective coatings applying alternative processes with the help of cathode / anode electrochemical technologies

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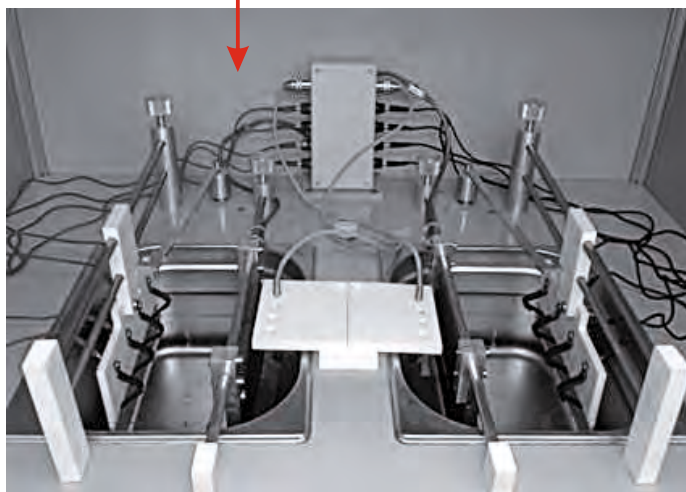
LED panels on aluminum boards

Commercial offers

- Production and supplying the following finished goods: LED strips, lamps and spotlights
- Technology transfer of thermally conductive circuit boards based on anodized aluminum with copper metallization manufacturing
- Production and supplying special purpose semiautomatic equipment for anodizing processes
- Electrochemical processes manufacturing site organization



Thermal image of running spotlight



The fragment of thick anodizing unit with control operation box.
Electroplating bath

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Moving man-made objects remote monitoring systems

Railway transport. Tractors. Road-building and self-propelled agricultural machines

– Vehicles sector monitoring system

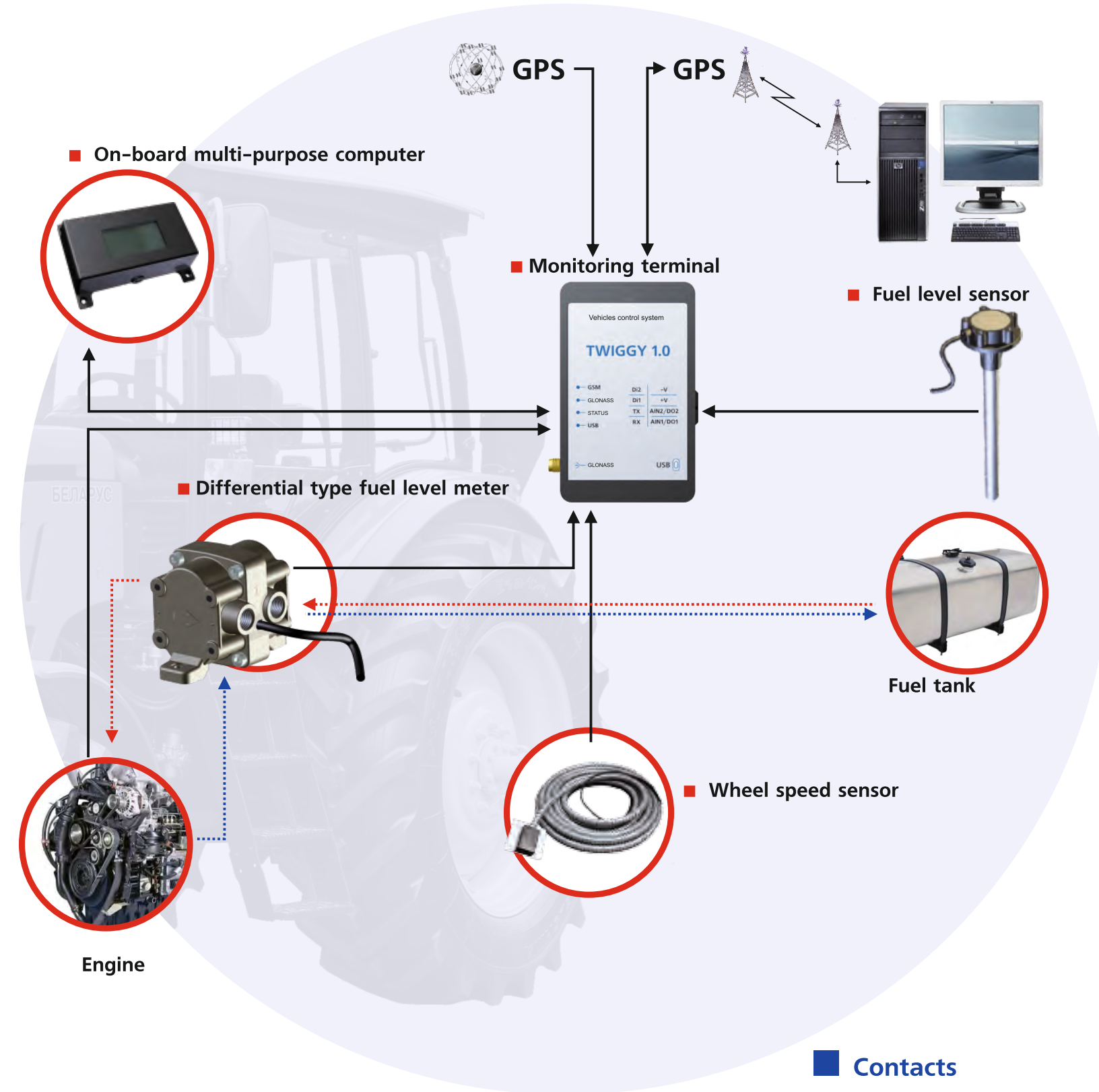
Auxiliary equipment and sensors: multifunctional transport monitoring terminal TWIGGY; on-board computer; radio identifier; camcorder; fuel level sensor; fuel level meter; temperature, pressure, rotation, operation time, angle, axle load, tilting sensors

- Remote monitoring of the moving object parameters in real time mode: accounting and valuation of fuel consumption over a certain period of time and for a separate type of work, the calculation of the mass of fuel, etc.
- Assess the effectiveness of the man-made object use
- Automatic detection of abnormal situations
- Fast response to the problem, emergency situations prevention

System components (fuel level sensors) are installed on commercially made production of industrial enterprises of the Republic of Belarus

■ Commercial offers

- Monitoring systems development and supply for specific Customer requirements (hardware and software package.)
- Technical support. Service maintenance
- Personnel training: equipment assembling, operators training



■ Contacts

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TRASSA-Lokomotiv

railway transport monitoring system



■ Integration with locomotive subsystems:

- Information subsystems
- Security systems
- Locomotive electrical transmission control and regulation systems

■ Binding to engineering infrastructure:

- Binding locomotive to the objects of engineering infrastructure
- Engineering objects parameters monitoring
- Power systems control and analysis information support
- Technical audit, inventorying, certification and listing of engineering infrastructure objects

Commercial offers

- Development and supply of monitoring systems (hardware and software)
- Technical support
- Customer service
- Personnel training: equipment mounting, operators training

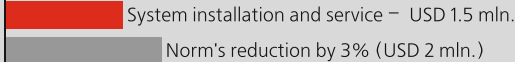
■ Contacts

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Minsk, 220037, Belarus

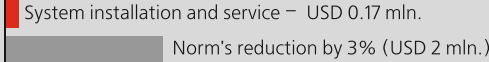
Return on the project in case of 100 locomotive sections being equipped

by preventing unauthorized diesel fuel siphoning and consumption rates optimization
(based on the consumption rate of 80.000 L \ month per locomotive if fuel cost is 0,7 USD \ L)

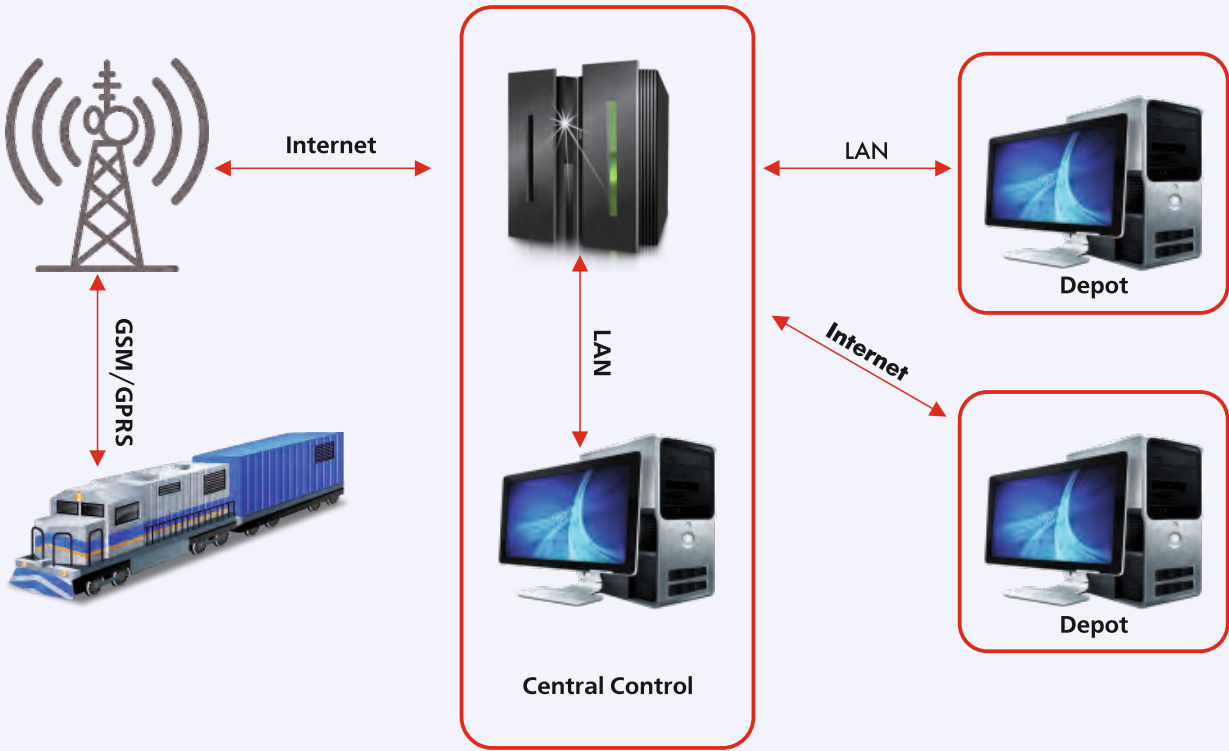
First year of system operating



Second year of system operating



■ System structure



■ Controlled parameters:

- fuel level, density, temperature, volume, mass
- specific fuel consumption
- machine oil and coolant temperature
- main generator voltage
- main generator load current
- main generator power
- air pressure in the break line
- locomotive controller positions
- locomotive position

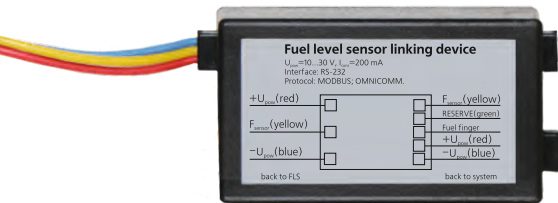
■ System equipment:

- automation box
- fuel level sensor
- fuel density \ temperature sensor
- indication module
- water and machine oil temperature sensors
- sensor for air pressure in a break line

Remote monitoring components

Export

- Fuel level, temperature, pressure and density sensors
- Differential type fuel consumption sensors
- Fuel level sensors couplers
- Fuel level sensors adders
- Two-channel vibration switches
- Data indication blocks



Fuel level sensor linking device

System components (fuel level sensors) are mounted on commercially manufactured production by the following enterprises of the Republic of Belarus: RUE "Minsk Tractor Works", OJSC "Beltransgaz" RUE "Gomelenergo" RUE "Gomselmash" RUE "Production Association" Belorusneft "

From 2008 more than **20.000** sensors have been supplied to the enterprises

Contacts

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Minsk, 220037, Belarus



Differential type fuel consumption sensor



Fuel level sensor

Rapid remote control tubes in foam insulation system



- Parameters monitoring: prediction of emergency situation on the basis of the dynamics change in the insulation resistance PI-tube and its early detection
- The minimum response time to an emergency situation occurrence
- Reliability and resistance to external influences
- Remote equipment maintenance: configuration, diagnostics, software updates, and parameters monitoring

The controller performs the damage indication of the measured values of resistors in place

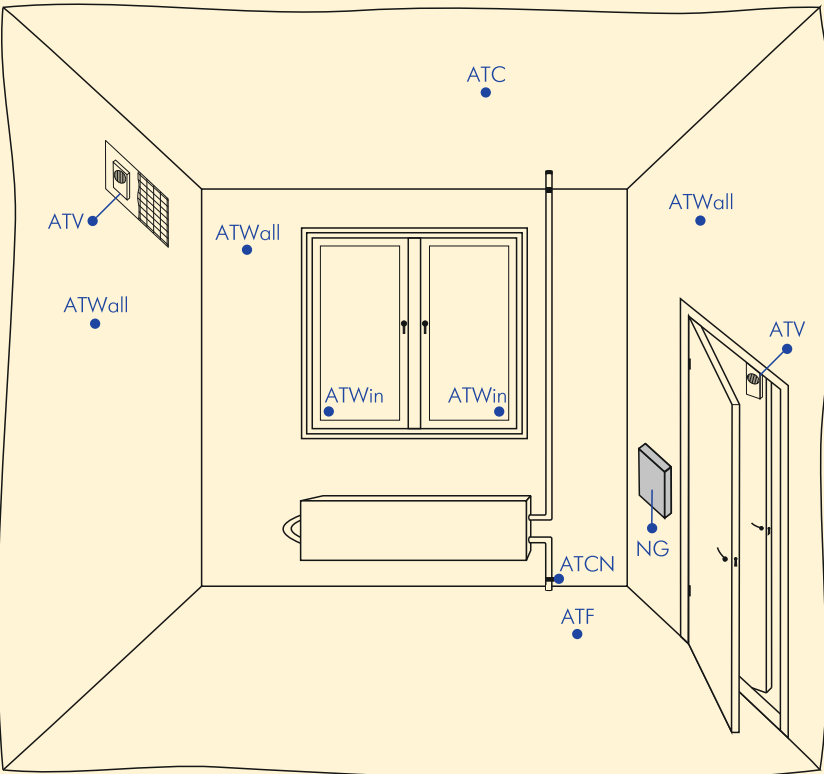
The data transmission channel:
GSM or Ethernet/RS485
Number of pipes connected: 2, 4

Each channel controller galvanically isolated

Detectable defects:
– insulation wettin
– signal wires loss
– signal wire closture with a metal pipe

- We provide the full range of monitoring system installation: from design to turn-key solutions** – the minimum version (monitoring parameters to control individual processes) to a control system (SCADA-system)

Speech information protection



Standard layout of the noise generator (NG) and acoustic transducers mounted premises walls (ATWall), windows (ATWin), ceiling / floor (ATC \ ATF), ventilation channels (ATV), communication networks (ATCN)

PRIBOI voice information leakage via acoustic and vibration channels from the room beyond the protection zone protection equipment

Operation principle:
Creation masking signals ("white noise", "speech-like signals", "white noise" + "speech-like signals") in a voice information leakage channels (windows, walls, ceilings, floors, vents, door vestibules, communication networks) corresponding to the formal properties of speech. The signals can be tailored to address a specific person.

In the kit supplied includes: speakers (at least 10 pcs.) And vibro-acoustic (at least 30 pcs.) converters (weight not exceeding 0.15 kg).

Size: 280x60x200 mm, weight is less than 3 pounds.



■ Cooperation forms

Manufacturing and supply the device with subsequent maintenance.
The delivery time of equipment – 1 month

Provide specialists training to participate in joint research projects

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■ Commercial offers

We are interested in joint research projects in the development of the generating speech-like signals technology in foreign languages

Application-oriented projects		Contacts
Radio engineering systems and facilities	Radio equipment, systems and telecommunications networks. Design, development, planning, modernization	science@bsuir.by
	Radio equipment based on surface-active agent	
	Hardware and software facilities for signal receiving and processing in an intensive non-Gaussian interference channels	
Data transmission and processing systems	Infowave fields. Impact on biological objects and systems	
	Hardware-software complex for mathematical and physical modeling of radio-electronic facilities	
	Computer system for various signals generation – imitation	
	Hydroacoustic communication and navigation equipment for different purposes	
	Telecommunication systems. Information security	
	Multi-service local mobile networks building technology	
	Technology of multidimensional information encoding of multimedia data security	
	Software for compression and increasing of noise immunity of high-velocity space information stream	

Application-oriented projects		Contacts
Advanced information technologies and management systems	Dual-channel real-time spectrum analyzer; 8th-channels multipurpose real-time spectrum analyzer	science@bsuir.by
	Portable dual-channel spectrum analyzer for diagnostics of rotating machine; 64th channels spectrum analyzer based on the parallel pipeline FFT processor	
	Low rate speech coding based on the accurate separation of tonal and noise speech signals components and psychoacoustical optimisation	
	DSP-based hands-free radiotelephony system with combined noise reduction and acoustic echo cancellation for mobile (car) environment	
	Multi channels noise reduction and dereverberation algorithms for automatic speech recognotion systems	
	Audio coding and watermarking with a masking threshold adapted wavelet packet transform based on run-time reconfigurable processor architecture	
	Hybrid audio/speech coding based on a combination of three different signal processing techniques: sinusoidal, matching pursuit with frame-based psychoacoustic optimized wavelet packet dictionary and bark-scaled adapted wavelet packet noise analysis	
	Digital processor for lossless to losy image coding based on quaternion algebra	
	Text to speech synthesis system with extended functionality: voice morphing techniques mentioned above can be applied in order to get multivoice speech	
	Development of problem-oriented processors based on DSP and / or FPGA solutions for the multimedia data processing tasks: 1) encoding (compression) and decoding of video (standard ITU-T H.264 (ISO / IEC MPEG-4 Part 10)); 2) system encryption of multimedia data	
Application-oriented projects		Contacts
Advanced information technologies and management systems	Development and use of clusters and FPGA implementation on the basis of their homogeneous and heterogeneous multiprocessor computing systems for solving problems of high-performance distributed parallel processing: 1) the solution of inverse problems of cryptography, cryptanalysis (finding key encryption algorithms); 2) image Processing	science@bsuir.by
	Development of a wireless communication subsystem based on the Bluetooth and Wi-Fi	
	Self-testing computing systems, integrated systems, crystal-based systems	
	Dongle-based software security system	
	Digital modules testing hardware	
	Digital modules pseudo-comprehensive tests synthesis system	
	A system for self-testing Mass-storage devices modules synthesis	
	Iddq-tests synthesis system	
	PLD-based complex for testing, debugging and digital systems projects verification	
	Terrestrial surface satellite images topographical cast system	
	Image search and textile fiber analysis system for forensic examination	
	A system for counting number of pedestrians passing by the video surveillance camera for possible dense people movement	
	Layerwise topology recovery of integrated circuit chip colored digital images system	

Application-oriented projects		Contacts
Advanced information technologies and management systems	Experimental system with software based on the computing modules of homogeneous computing environment for symbol images recognition	
	Experimental system for radar signals processing, objects recognition and wideband signals modeling using computing modules OCS and “SKIF” cluster	
	Parallel processes for intellectual systems construction	
	The intelligent transmission control based on neural networks	
	Neural computer “RADIMICH 1”	
	Holonomic automatic systems	
	Motor-wheels based mobile system	
	Precision actuators with position sensors	
	Universal spatial movement system on planar or rotary modules	
	Technological processes and production management system	
	Intellectual systems design tools and technologies	
	Multiantenna intellectual systems	
	Computational linguistics, natural-language communication systems and multimodal intellectual interface	
	Intellectual computer technologies for business processes reverse engineering	
	Distance learning intellectual computer technologies	
	Intellectual computer technologies in health care	
	Intellectual computer technologies for social research	
		<i>science@bsuir.by</i>

Application-oriented projects		Contacts
Micro- and nanoelectronics	Nanoelectronic Device simulation system “NANOVED”	<i>science@bsuir.by</i>
	Bipolar and unipolar devices of integrated circuits	
	Devices based on single-electron tunneling effect	
	Devices based on resonant tunneling effect	
	Devices based on quantum wires and including carbon nanotubes	
	End-to-End Statistical Analysis and Optimization in microelectronics and other applications	
	Technology/Device/Integrated Circuits/System Design using Silvaco, Cadence, Synopsys and Mentor Graphics software packages	
	SPICE-parameters extraction and Physical models parameters verification	
	Magnetic Random Access Memory simulation	
	Ab initio simulation of nano-demensional objects: Graphene, Ni ₂ MnGa, TIMEX ₂ materials for solar cells and MEMS	
	Devices design simulation in modern complexes technology \ device \ circuit \ system design environment and special software modules for measurement equipment maintenance in a computerized software – hardware environment	
	Carbon nanotubes synthesis and applications	
	CNT-Grafen nanostructures	
CNT-Network		
CNT-Femtosecond laser interaction		

	Application-oriented projects	Contacts
Micro- and nanoelectronics	Organic solar cells	<i>science@bsuir.by</i>
	Equipment for carbon nanotube synthesis	
	Multichannel laser pattern generator EM 5299	
	SERS-based Sensing	
	Integrated Optical Waveguides	
	Layer Transfer Technology	
	Thick Metallization for MEMS	
	Microthruster for Nanosatellites	
	ZnO Structures	
	Ni Nanowires Array	
	Metamaterials and nanotechnologies	
	Si-based LCOS and LED microdisplays and Integrated optocouples	
	Active matrix LCDs and backlights	
	Electrogenerated Chemiluminescence Display	

	Application-oriented projects	Contacts
Micro- and nanoelectronics	Technology of metal and semiconductor clusters in a compression plasma formation	<i>science@bsuir.by</i>
	Uniform deep doping of semiconductors with various elements of the periodic table	
	Alumina templates with through nanoholes on metal (Sn, Pt, Au) and semicondors	
	Electrodeposition of metal (Ni, Fe, Co) and CVD of metal oxide into the alumina pores	
	CVD of carbon nanotubes (CNTs) in alumina pores	
	Synthesis of Semiconductor nanostructures	
	Nanostructurd Columnlike Metal-Oxide Films	
	Silicon and Germanium nanostructures and their applications	
	Nanostructured oxides of valve metals and their applications for photocatalysis	
	Spintronics and Quantum computing	
	Semiconducting materials for optoelectronics and photovoltaics	
	Scanning probe investigations and nanotechnologies	
	Sol-Gel processes	
	Porous silicon (PS)	
	Porous Alumina	
	Porous oxides of refractory metals (Ti, W)	

