

Belarusian State University of Informatics and Radioelectronics



R&D ACTIVITIES



**BELARUSIAN STATE UNIVERSITY
OF INFORMATICS AND RADIOELECTRONICS**
R&D Department

About us

We are a large state educational, scientific and innovation center in Belarus.

We are acknowledged as a Scientific Organisation by the Belarusian State Committee on Science and Technology and the Belarusian National Academy of Sciences.

We are a leading organization for research on protection against inadvertent interference and on electromagnetic compatibility of radioelectronics in Belarus.

Facts and figures

10 000+ students

10 faculties

35 academic departments

20+ B.Sc. programs

20+ M.Sc. programs

30+ PhD programs

Educational support

12 international educational center

45+ joint educational, research and production laboratories

9 branches of academic departments

at the Belarusian manufacturing companies

BSUIR science

6 research areas

350 researchers

30 R&D labs and groups

400+ international research projects

20 000+ scientific publications in RSCI, Scopus, and Web of Science

300+ patents

10+ international scientific conferences

BSUIR innovations

EMC technologies and software

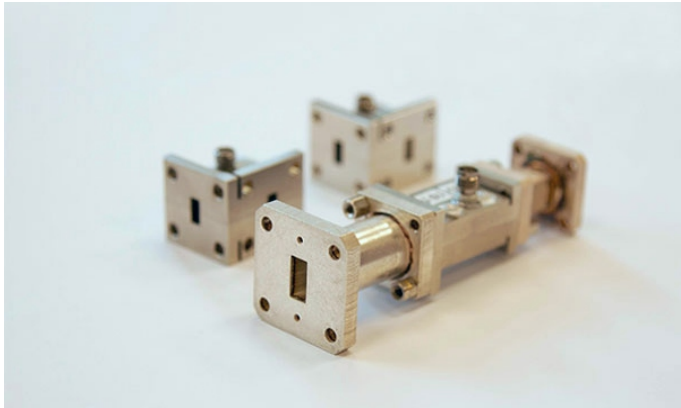
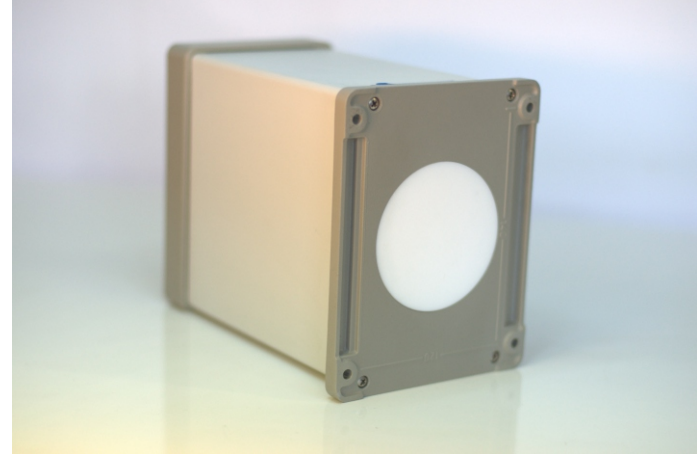
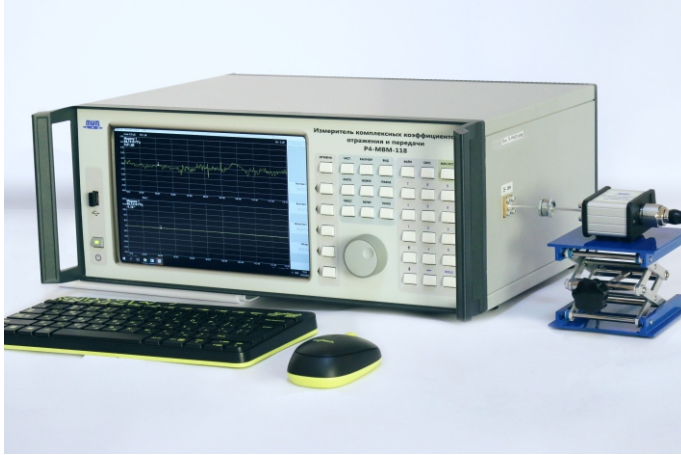
Measuring SHF devices

Ultrasonic technologies and devices

Hardware and software for information security

Speech signals processing technologies and software, etc.

More at science.bsuir.by/en/



SHF devices are included into the Belarusian and Russian State Registers of Measuring Facilities.

Equipment delivery time is min. six months.



mwmlab.by

Control, measurement and testing SHF equipment (0.01...220 GHz)

■ **MWMLab offers customized design, production and delivery of the following equipment:**

- Vector network analyzers VNA-MWM.
- Scalar network analyzers SNA-MWM.
- Signal generators G4-MWM.
- Microwave power meters PM-MWM.
- Calorimeters PMC-MWM.
- Contactless radiowave vibro sensors/
level meters.

■ **MWMLab offers the following services:**

- Metrological support at development, production and exploitation stages.
- Remote calibration of automated measuring devices and systems.
- Modification of measuring facilities according to client's requirements and special production conditions.

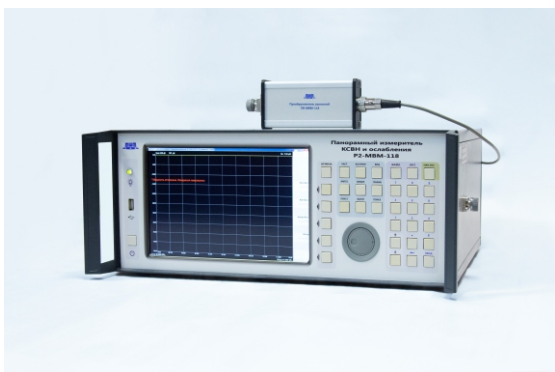
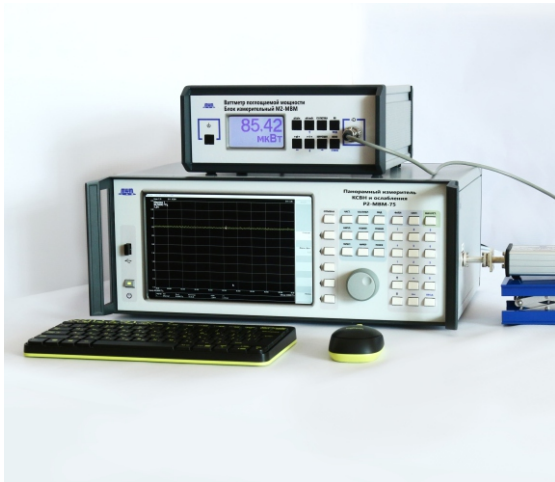
These devices are in demand
in *CIS, Europe and East Asia.*

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■ DEVELOPED AND PRODUCED:

- Standard of the electromagnetic oscillations power unit in the frequency range from 37.5 to 178.4 GHz (certification, calibration, verification of measurement wattmeters and converters).
- Standard of the electromagnetic oscillations attenuation unit in the frequency range from 37.5 to 178.4 GHz.
- Power flux density unit standard (certification, calibration, verification of antennas and power flux density meters).

■ MWMLab offers:

- Development and production of standard (etalon) systems for SHF measurements (i.e. measurements of power, flux density, frequency, VSWR, reflection and transmission coefficients).
- Testing of SHF devices within the lab's accredited sphere.
- Calibrating of EHF and SHF measuring devices.
- Design, production and repair of SHF measuring facilities within the frequency range from 0.01 to 220 GHz.



mwmlab.by

Measuring systems and standards



■ **MWMLab comprises the following units:**

- Testing laboratory of microwave measuring facilities.
- Calibrating laboratory of microwave measuring devices.
- R&D Lab on radioengineering systems and technologies of millimeter wave range.

The calibrating and testing laboratories are accredited according to the Accreditation System of Verification, Testing and Calibrating Laboratories in the Republic of Belarus.

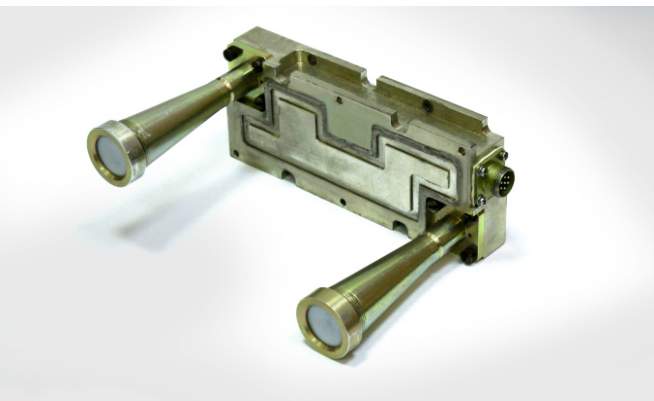
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3D mobile radar



Low altitude radio altimeter for high-speed carriers

■ **MWMLab is ready to develop, produce and deliver the following special-purpose equipment at customer's request:**

- Radar transmit-receive modules in the frequency ranges 9...18, 25...36, 94 GHz.
- Radar frequency synthesizers.
- Digital signal processing units.
- Low altitude radio altimeters in the wave length range of 8 mm and 2 mm for high-speed carriers and unmanned aerial vehicles (UAV).
- Radars including those based on active phased antenna arrays in the ranges 9...18, 25...26, 94 GHz.
- Automated Measurement System for Testing Radar Systems.
- 3D mobile radars.

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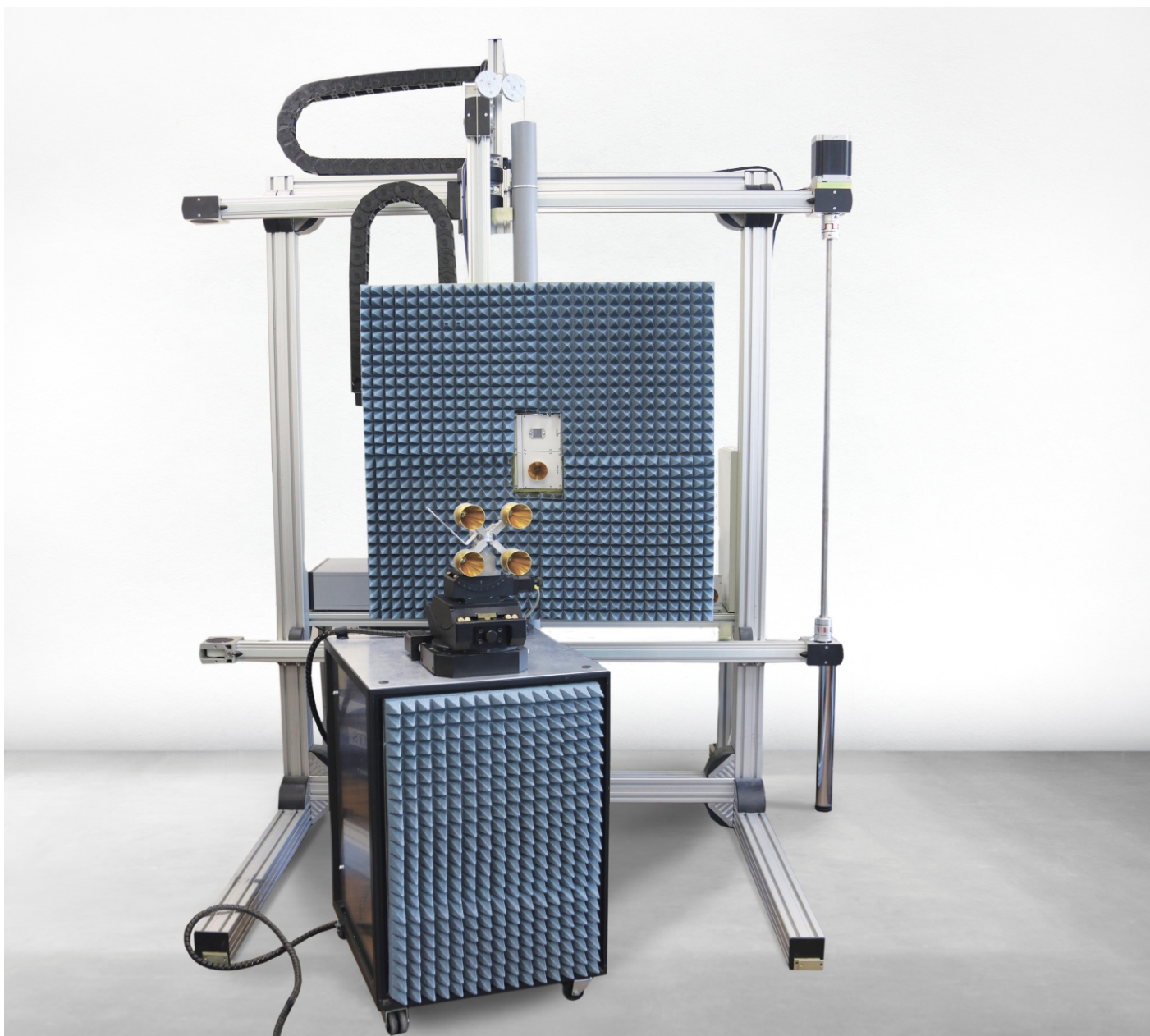
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Special-purpose equipment



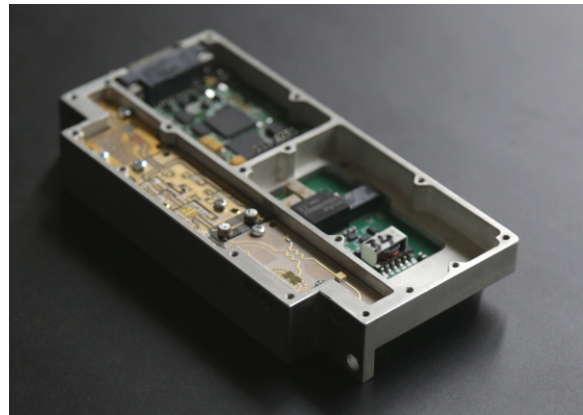
Automated Measurement System for Testing Radar Systems

■ **We offer customized development of:**

- Onboard radars of centimeter and millimeter wavelength ranges.
- Space onboard radars with synthesized aperture for the Earth surface monitoring.
- Self-contained functional SHF units and digital processing units of radioelectronic systems.
- Antenna systems:
 - phased antenna arrays
 - digital antenna arrays
 - small-sized dual-reflector dish-shaped antennas with dielectric hybrid mode radiator (including scanning antennas)
 - monopulse antenna systems
 - biconical omni-directional antennas.
- Software for antenna systems simulation.
- Vibration-proof functional units for onboard radioelectronics.
- Acousto-optic devices.



Biconical omni-directional antennas



Transmit-receive module of X-range

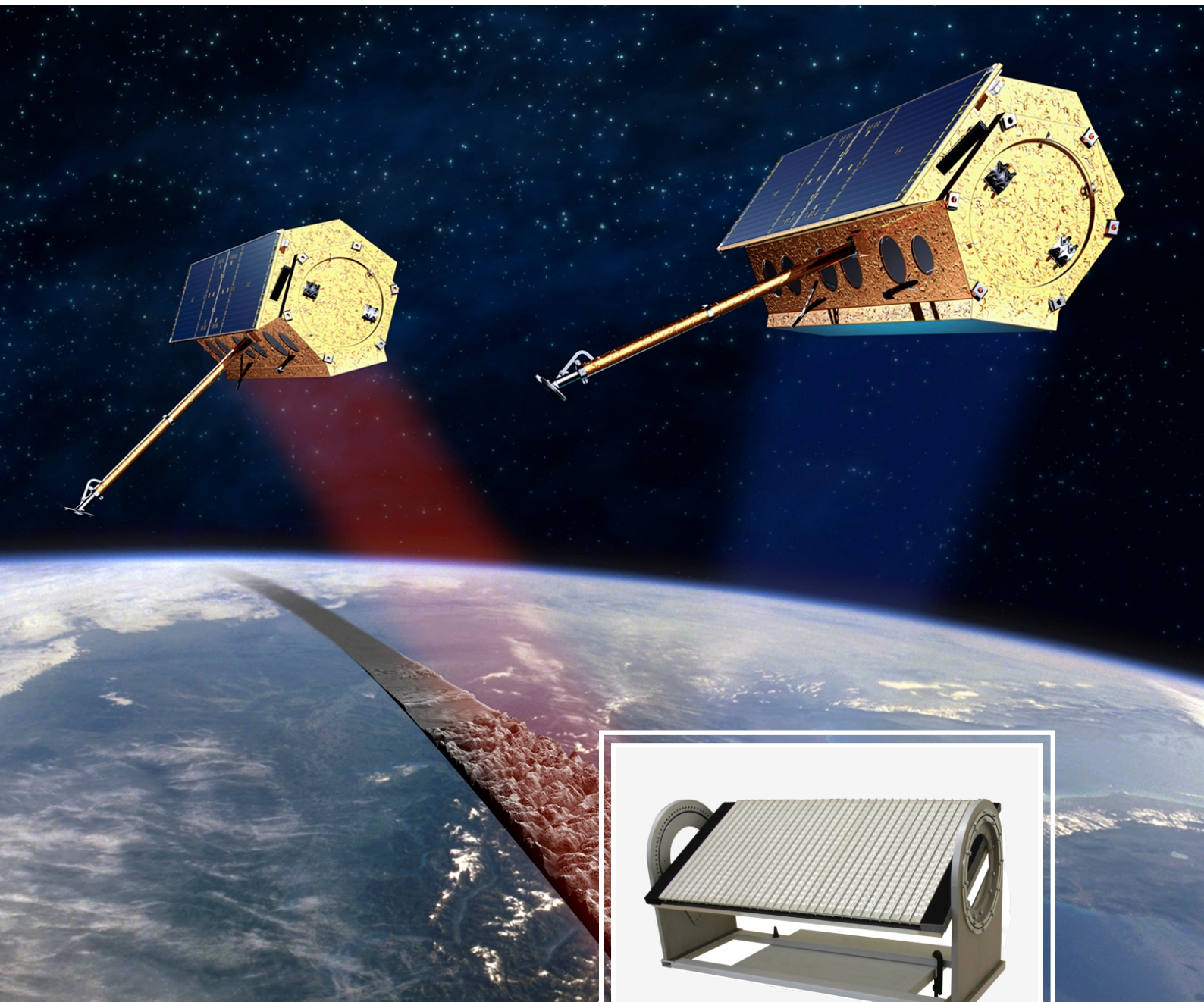
■ **We offer the following services:**

- Development and delivery of experimental models and prototypes with design and engineering documentation of the developer.
- Customized training on production technology.

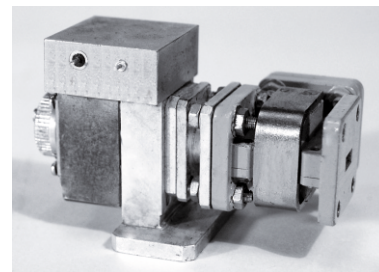
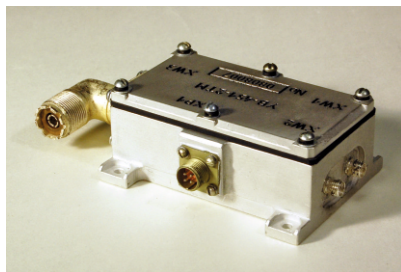
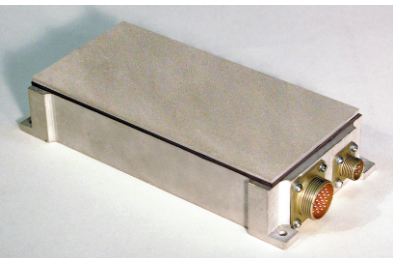
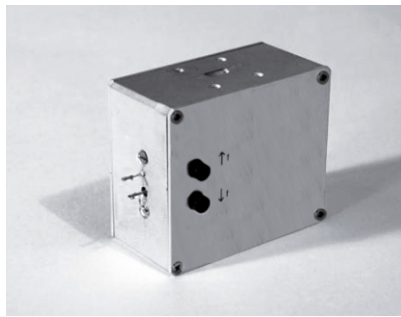
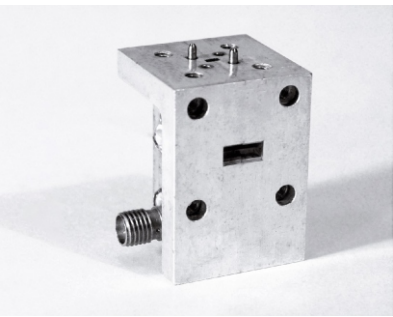
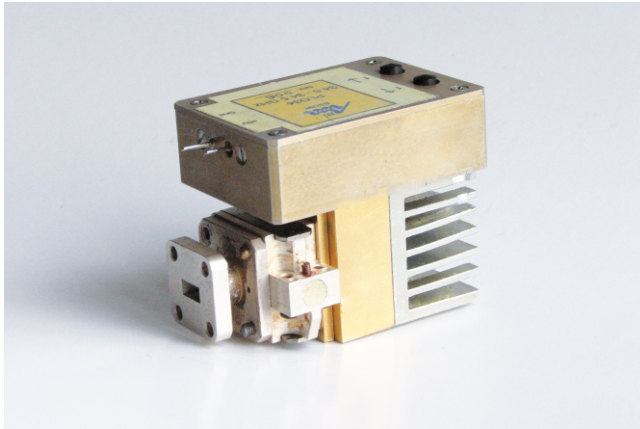
These products are in demand in [China](#).

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Radioelectronic systems of centimeter and millimeter wavelength ranges



Base panel of an active phased antenna array of a radio locator with synthesized X-range aperture, including for space devices



■ We offer customized development of:

- Balanced mixers, harmonic mixers, frequency mixers.
- Pin-switches, modulators, signal limiters.
- High-stable frequency synthesizers.
- Low-noise signal converters for satellite receiving station.
- Microwave low-noise amplifiers.
- Microwave transistor power amplifiers.
- Magnetron transmitters, signal generators.
- Radar for subsurface probing (georadar).

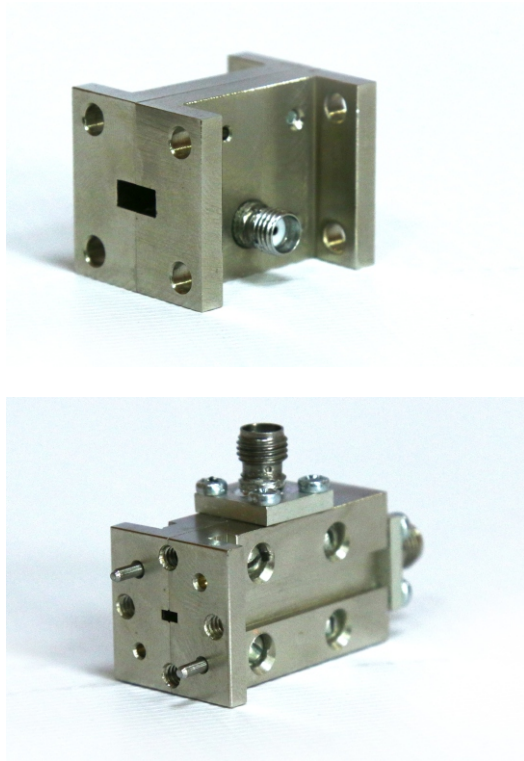
These products are in demand in [Russia](#),
[China](#), [India](#).

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Basic devices, components and modules for microwave and EHF ranges



■ To meet specific customer requirements, we develop:

- Polarization attenuators.
- Verification standards.
- Detector heads.
- Directional waveguide couplers.
- Measuring cells.

■ We offer the following services:

- Development of basic devices, components and modules of SHF and mm-wave range.
- Conducting performance measurements and calibration of blocks, assemblies, and components used in microwave measuring systems.



EMC Lab has successfully completed over 100 customized projects related to analysis and solutions development for electromagnetic compatibility, electromagnetic safety, electromagnetic protection and electromagnetic ecology of complex onboard and ground-based groupings of radioelectronic facilities.

Their customers came from [China](#), [Russia](#) and [India](#).

EMC Lab is ready to redesign their products on customer request, as well as to supply customized products and technologies with the development documentation.

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■ **EMC Lab services:**

- Research and development activities related to analysis and finding solutions for the problems of electromagnetic compatibility, electromagnetic safety, electromagnetic protection and electromagnetic ecology of onboard and local ground-based groupings of radioelectronic facilities, territorial groupings of radio systems of various services and geographically-distributed radio networks.
- Development of technological solutions, software, special-purpose expert systems and specialized automated test complexes for electromagnetic compatibility, electromagnetic safety, electromagnetic protection and electromagnetic ecology challenges.
- Applied research on analysis and support of electromagnetic compatibility, electromagnetic safety, electromagnetic protection and electromagnetic ecology. Finding customized solutions for the problems in related areas.
- Expert analysis of electromagnetic compatibility (BSUIR is a principal organization of the Republic of Belarus authorized to conduct research on problems of electromagnetic compatibility of radioelectronic facilities).
- Technology transfer, export of software and services in the areas related to analysis, testing and solutions development for electromagnetic compatibility, electromagnetic safety, electromagnetic protection and electromagnetic ecology.
- Detailed examination of radio receivers and radio frequency components by dual-frequency testing method.
- Testing of electronics of various purposes on susceptibility to powerful ultrashort electromagnetic impulses.

Electromagnetic compatibility. Electromagnetic security. Electromagnetic protection and ecology. Technologies. Software. Testing and expertizing

■ EMC Lab INNOVATIVE TECHNOLOGIES:

– DLA EMC

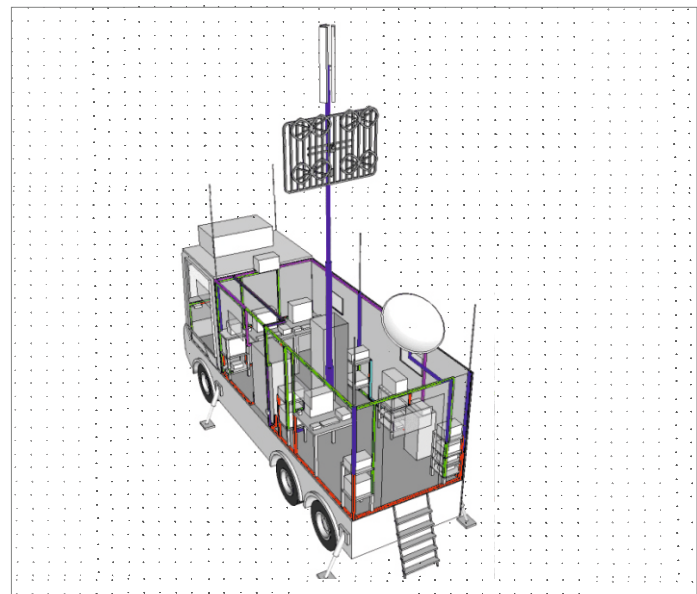
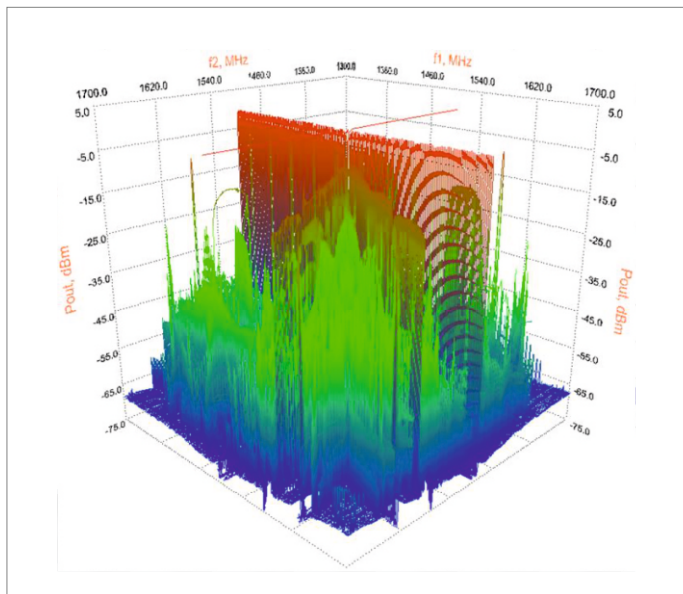
Technology for discrete linear analysis of intrasystem electromagnetic compatibility of complex onboard and ground radioelectronic systems

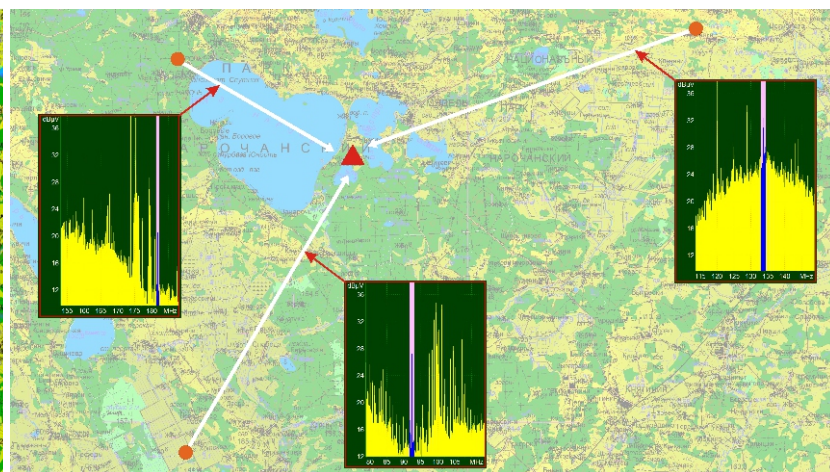
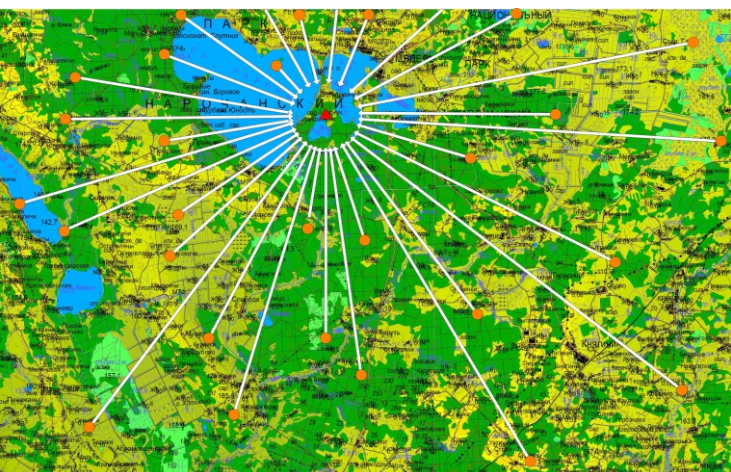
The technology is based on the integral system criteria of electromagnetic compatibility, and unique models and methods of discrete linear analysis of electromagnetic compatibility of radioelectronic devices operating in severe electromagnetic environments, as well as on the unique interactive procedures for refining pessimistic models of potentially dangerous parasitic electromagnetic communications (antenna — antenna, antenna — wire, wire — wire, etc.).

– DLA EMP

Technology for discrete linear analysis of electromagnetic protection of complex onboard and ground radioelectronic systems against strong electromagnetic interference

The technology is based on the electromagnetic protection criteria for the frequency and time domains, and unique models and methods of discrete linear analysis of electromagnetic protection, as well as on the unique methods and algorithms for electromagnetic protection system design and testing. This technology provides a smart solution for the design and analysis of the protection system for onboard and ground radioelectronic systems against strong continuous and impulse electromagnetic interference.





– ADFTT

Technology for automated dual-frequency testing of radio receivers and components

The technology is based on two testing signals sweeping in frequency, unique methods for processing and 2D/3D visualization of the test results. It enables obtaining comprehensive information about all really existing channels and possible damage effects on radio receivers at the antenna input, as well as information about the nonlinearity of the tested units.

– GIS-RF

Specialised geo-informational technologies for electromagnetic environment simulation, analysis and support of electromagnetic compatibility for large territorial groupings of radio systems

Technologies are based on digital maps of the respective area, geo-informational platforms, and the ITU-R Recommendations on radiowave propagation models in various conditions. These technologies provide smart solutions for a wide range of tasks, such as radio spectrum management, analysis and support of intersystem electromagnetic compatibility, frequency-spatial planning in various frequency ranges, as well as of tasks related to electromagnetic safety, electromagnetic protection and electromagnetic ecology.

– DNA EMC

Technology for discrete non-linear analysis of radio systems electromagnetic compatibility

The technology is based on refined higher-degree polynomial models to describe the nonlinearity of radio receivers and radio frequency components (i.e. radio frequency amplifiers, mixers, etc.), as well as on discrete models and unique high-performance algorithms for non-linear modeling of radio receivers and RF components behavior under complex multi-signal undesirable interference.

– Technology for system analysis of electromagnetic ecology and electromagnetic security of mobile (cellular) communications in 2G, 3G, 4G, 5G, ...

The technology is based on a unique methodology for the assessment of electromagnetic background intensity generated by the cellular communications equipment of the base station and its subscribers. Initial data for the assessment of the electromagnetic background intensity can be taken from the forecast of the electromagnetic load to be created by the cellular communications equipment on the given territory or from the forecast of the traffic density of mobile communication systems that are providing wireless information services to the people on the given territory.



■ EMC Lab INNOVATIVE PRODUCTS

– EMC-Analyzer

Special software for analysis of intra system electromagnetic compatibility of complex onboard (i.e. on an airplane, ship, car, etc.) and local ground-based (i.e. at an airport, sea port, communication and control center, etc.) groupings of radioelectronic systems. It is based on the DLA EMC and DNA EMC technologies, is designed as an expert analysis system and can be used at any stage of the life cycle: e.g. during the design of a radio system grouping, or during its exploitation or modernization.

– VTA

Virtual Testing Area (virtual polygon)

The VTA hardware and software complex is designed for electromagnetic compatibility analysis of radio systems of various services (radio communication, radio location, radio navigation, etc.) that are integrated into large territorial (regional) groupings. The VTA complex is based on the DLA EMC, DNA EMC, GIS-RF, ADFTT, and Augmented Reality technologies. It enables conducting a comprehensive multivariate EMC analysis, as well as semi natural simulation and decision-making support on issues related to electromagnetic compatibility of various geographically-distributed radio systems.

– ADFTS

Automated Double-Frequency Test System

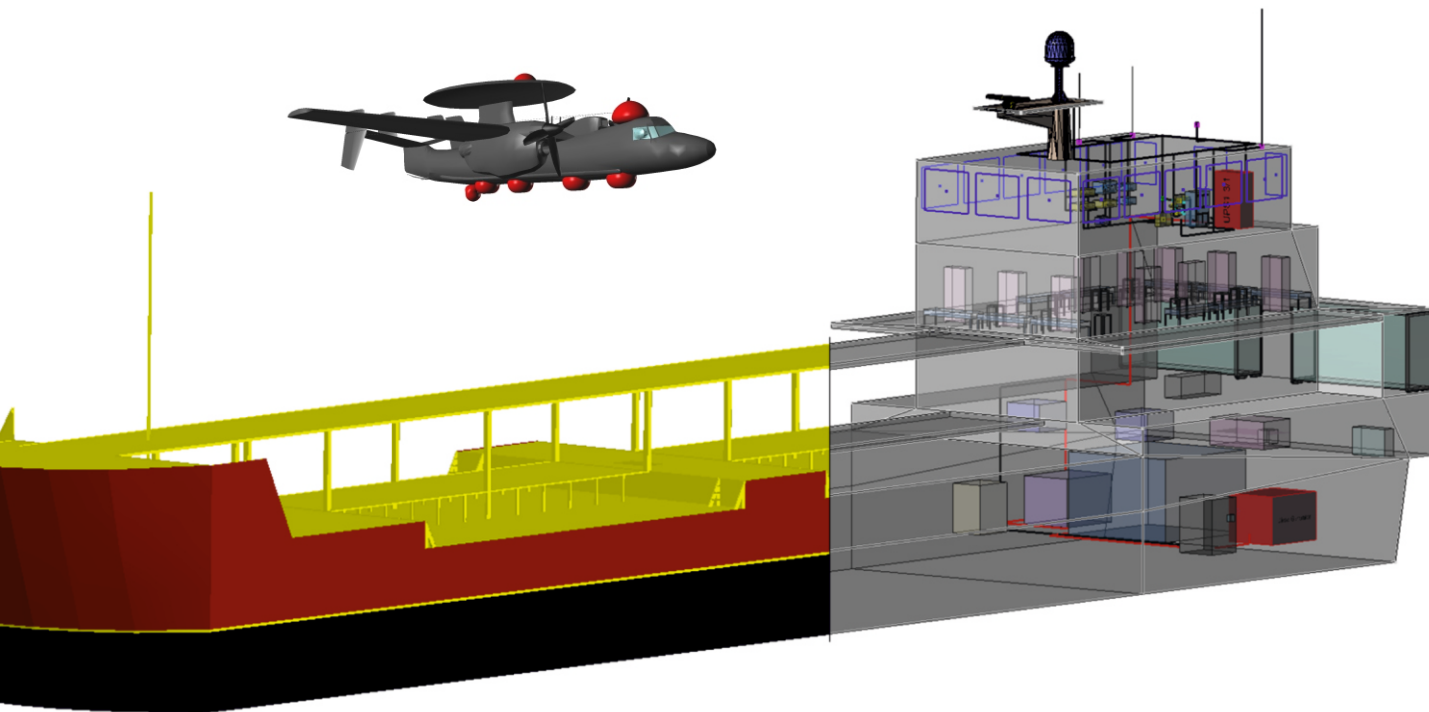
The ADFTS hardware and software complex is designed for experimental analysis and support of selectivity, non-linearity and electromagnetic compatibility of radio receivers and radio frequency components (i.e. radio frequency amplifiers, mixers, etc.). The ADFTS complex is based on the ADFTT technology, and it enables obtaining comprehensive information about the parameters of radio receivers and radio frequency components so as to support the decision-making process in issues related to electromagnetic compatibility.

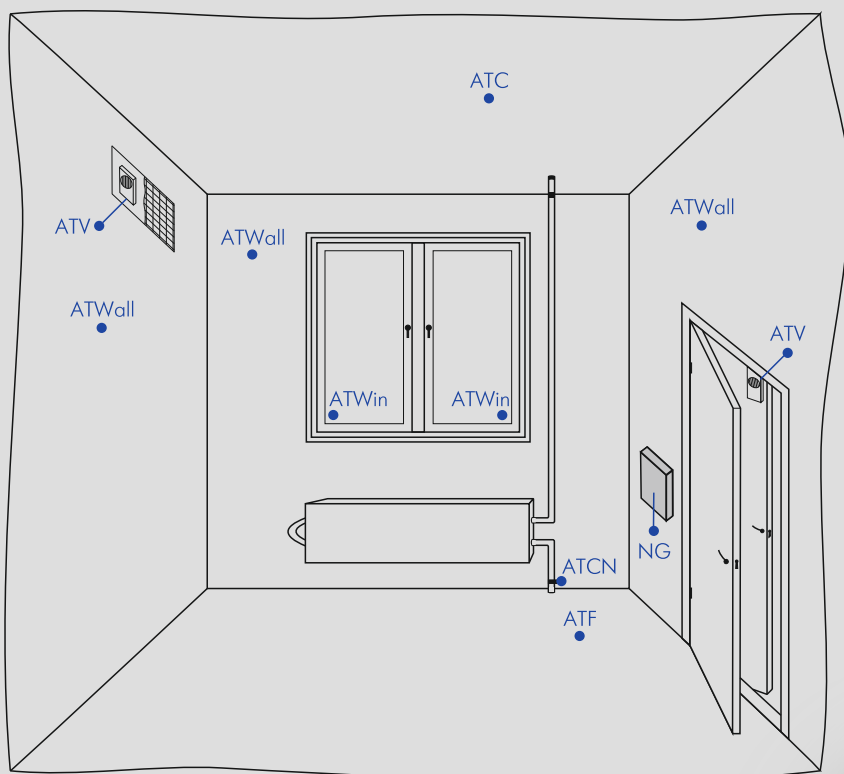
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Standard layout of the noise generator (NG) and acoustic transducers to be mounted in the room walls (ATWall), windows (ATWin), ceiling / floor (ATC \ ATF), ventilation channels (ATV), communication networks (ATCN)

– PRIBOI

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

Operation principle:

Creation of 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.

The kit supplied includes: acoustic (at least 10 pcs.) and vibro-acoustic (at least 30 pcs.) converters (weight not exceeding 0.15 kg).

Size: 280x60x200 mm, weight is not more than 3 kg.



■ We offer the following services:

- Manufacturing and supply of the device with subsequent maintenance.
- Staff training on information protection.

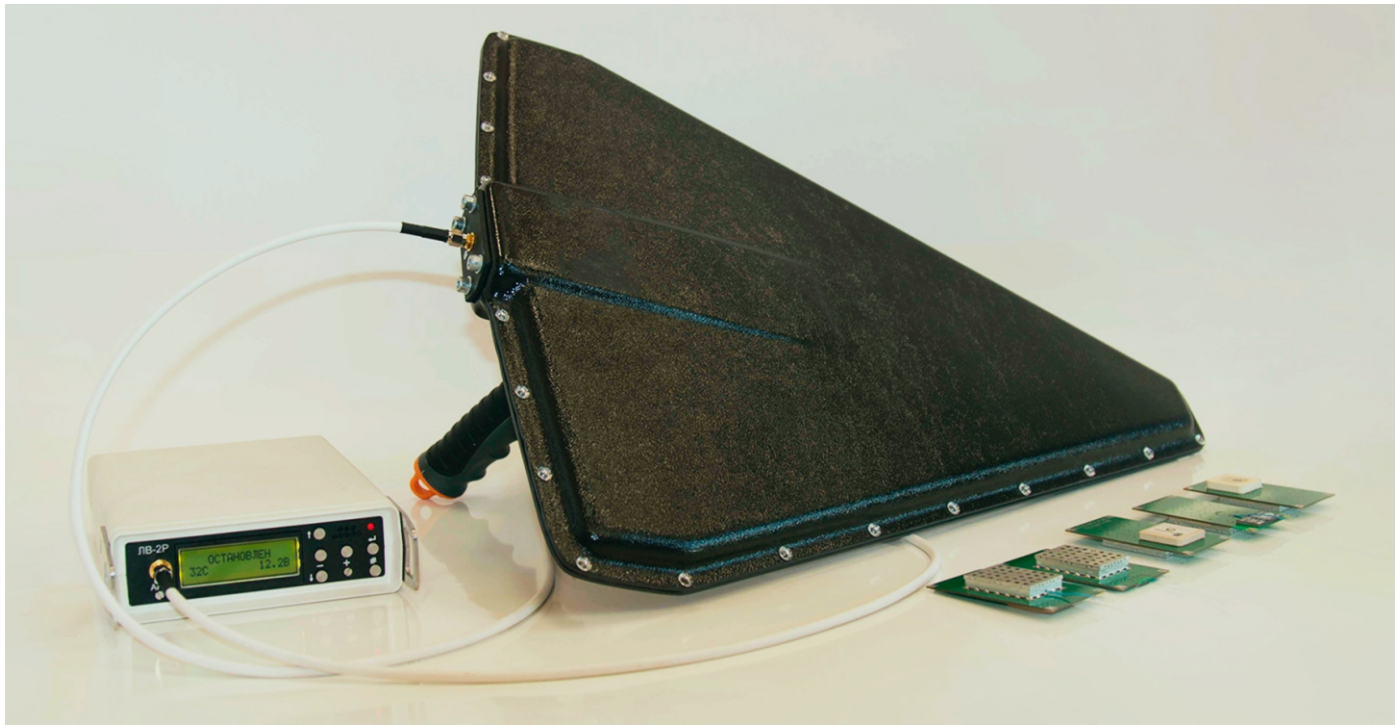
- We are interested in joint research projects in the development of the technology to generate speech-like signals in foreign languages.

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Information protection



– LOCATOR **to detect devices of unauthorized** **information collection**

Locator can be used to localize radiocontrol devices or other operating units which have a radio control channel.

The operational principle is similar to the principal of a non-linear locator.

The main difference lies in the necessity to consider the possibility of missing the "target" due to the discrepancy in the polarization of the locator antenna and antenna of radio control devices.

– DETECTOR **hardware and software complex to test** **computing equipment for the presence** **of devices of unauthorised opportunities**

The detector includes:

- a tract of provoking electromagnetic and acoustic signals;
- a measuring tract;
- a control computer.





■ **Research areas:**

- Fundamental research on the physics of high-power ultrasound including but not limited to cavitation, ultrasonic capillary effect, and sound luminescence including in the suspensions of nanoparticles and during the formation of nanostructures.
- We develop methods to make measurements in high-power ultrasonic fields, as well as methods to control the modes of ultrasonic technological processes in liquids.
- We develop software to control the operating modes of ultrasonic equipment.
- We develop special-purpose ultrasonic technologies and equipment, such as to process and format suspensions of nanoparticles, or to apply high-power ultrasound, dispersing and emulsifying techniques in medicine.
- We provide on demand services on the optimization of operation procedures in ultrasonic equipment.
- We are open for joint collaboration under research and development projects.



cavitation.bsuir.by

Ultrasonic technologies and equipment

■ **We develop and produce the following equipment on customer request:**

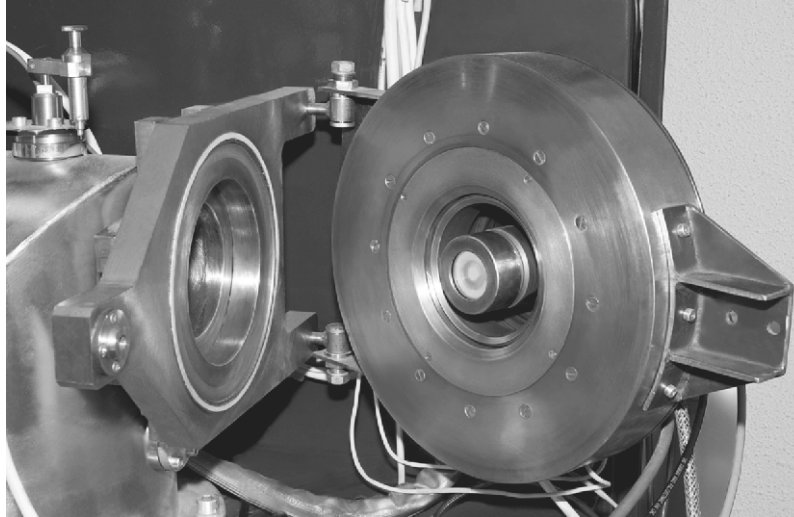
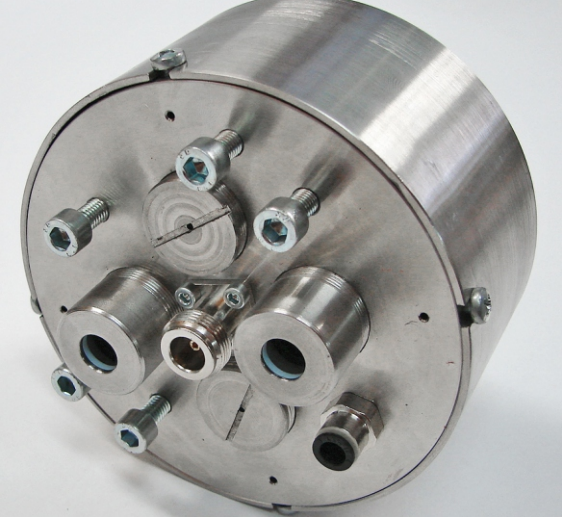
- Cavitometers including high-temperature ones.
- Ultrasonic low-frequency cavitation systems.
- Contactless digital vibrometers.
- Ultrasonic dispersers.
- Ultrasonic high-frequency generators.
- Ultrasonic baths.
- Sonoluminescence setups.

Equipment delivery time is min. three months, collaboration on a contract basis.

These devices are in demand in *CIS and Europe*.

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■ **Research areas:**

- Sputtering ion sources, double-beam ion sources, sources for ion-beam assisted deposition (IBAD).
- Magnetron sputtering systems, unbalanced magnetron sputtering systems, magnetron sputtering at low pressures.
- Processes of reactive ion-beam and magnetron sputtering.
- Processes of unbalanced magnetron sputtering.
- Ion beam neutralization methods.
- Ion and plasma deposition of multilayer optical structures with high resistant parameters.
- Deposition and composition of high-k and low-k dielectrics.
- Deposition and composition of magnetoresistive thin films.
- Ion-beam polishing of optical units.

■ **We offer customized development of the following equipment:**

- Magnetron sputtering systems with targets sized from 2.5 cm (1") to 17.0 cm (7") as well as extended magnetron sputtering systems with targets sized up to 100 cm (40").
- Sputtering ion sources for thin films deposition based on accelerator with anodic layer or on end-Hall accelerator: i.e. sputtering ion sources, double-beam ion sources, sources for ion-beam assisted deposition.
- Systems for operational parameters control of charged particle fluxes (e.g. ion energy, ion current density) and of neutral atoms (deposition rate).

Equipment is developed using state-of-the-art computer simulation methods and unique software.

These devices are in demand in [Russia and China](#).

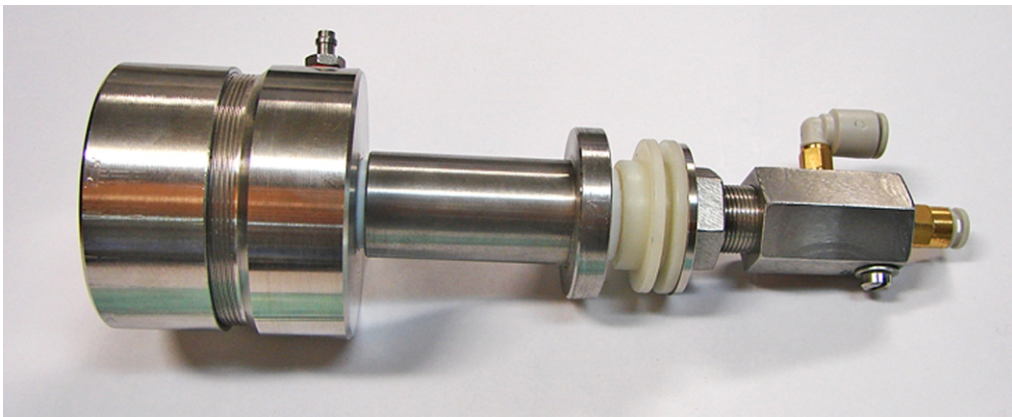
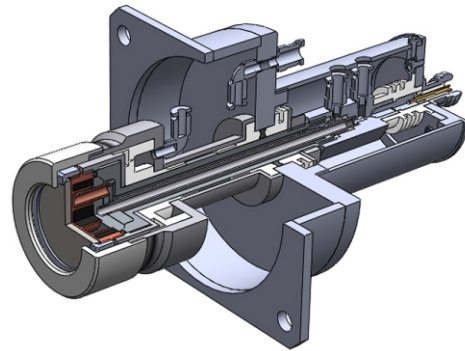
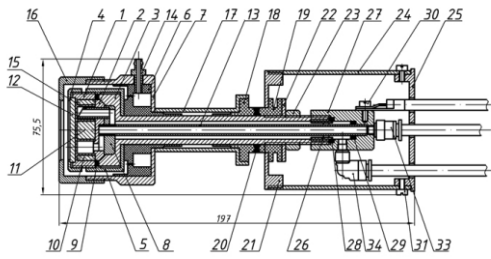
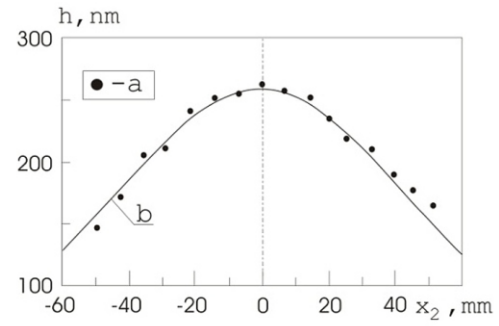
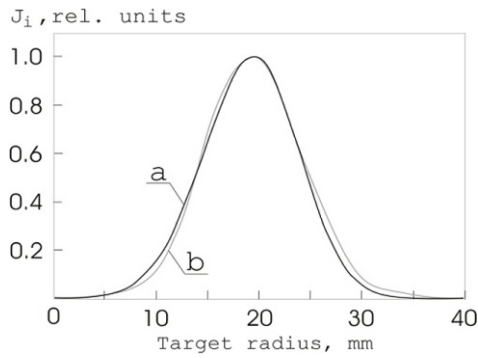
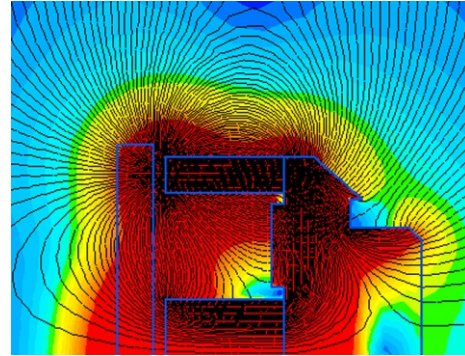
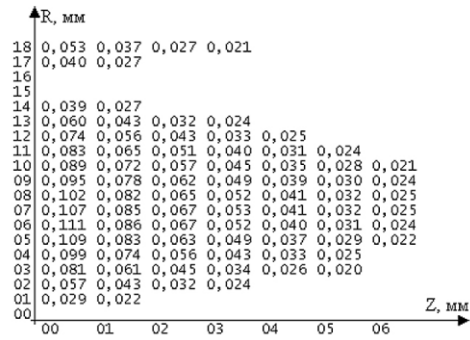
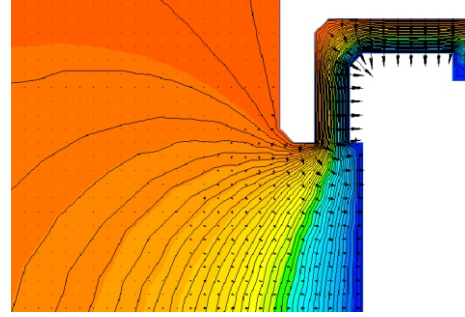
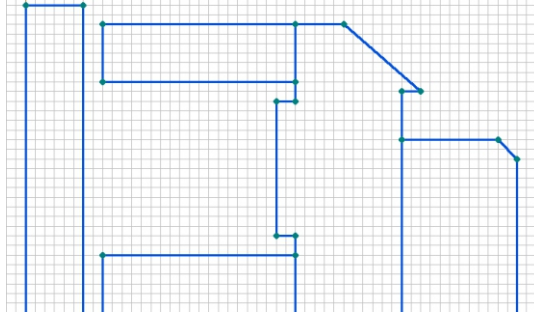
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Ion and plasma processing. Equipment





■ **The following software modules were developed and implemented to simulate ion and plasma equipment and processes:**

- Simulation of electric and magnetic fields aimed at optimizing magnetic systems of ion and plasma equipment.
- Calculation of solenoids (electromagnetic units).
- Modeling of magnetron target erosion.
- Calculation of the distribution profiles of the deposition rate for extended and axial magnetrons, magnetrons with several spraying areas taking into consideration various camera geometry and methods of the substrate movement.
- Calculation of the component composition of the deposited films upon sputtering of mosaic targets.
- Process simulation of reactive magnetron sputtering.
- Calculation of magnetron sputtering systems including the unbalanced ones (i.e. level of unbalance, distribution of ion current density, etc.).

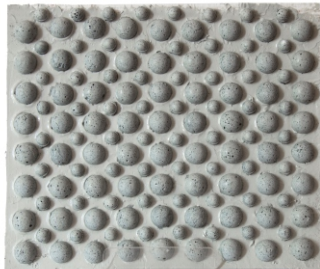
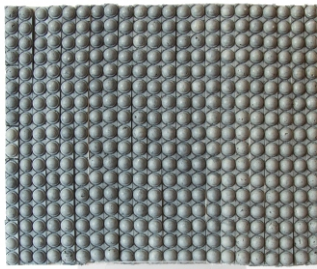
■ **We offer the following services:**

- Development of ion and plasma equipment of varying complexity, and deposition of thin films by ion-beam sputtering or reactive ion-beam sputtering.
- Design and production of multifunctional modular vacuum facilities.
- Diagnostics of electrophysical, optical, mechanical, and tribological properties of thin films.
- Modernization of vacuum equipment.
- Research and development of technological processes for thin films deposition.

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Broadband absorbers of electromagnetic radiation

- We develop broadband and frequency-selective absorbers of electromagnetic radiation in the microwave range based on electrically conductive fibrous and powdery materials.



- We are Interested in conducting joint research and development projects.
- We train specialists to participate in joint research, development, and production projects.

■ DEVELOPED AND MANUFACTURED:

- Materials for the construction of shielded buildings, premises, engineering structures.
- Construction materials that reduce the energy of electromagnetic radiation and are designed to be applied to walls, floors and ceilings of premises.
- Materials that reduce the level of radar visibility of military equipment, and protect radio-electronic equipment from electromagnetic weapons.
- Products that protect humans from the effects of electromagnetic radiation from stationary and portable personal computers, tablets, mobile phones, and medical equipment.
- Individual covering equipment to protect people from the effects of microwave range electromagnetic radiation.
- Devices for protecting information entered in biometric passports from unauthorized access.
- Flexible and solid-state modules for lining walls, floors, and ceilings of anechoic chambers.

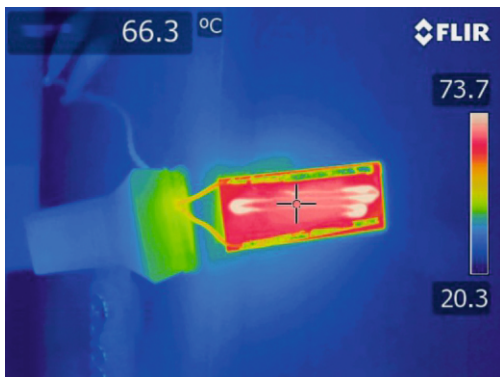
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New functional materials



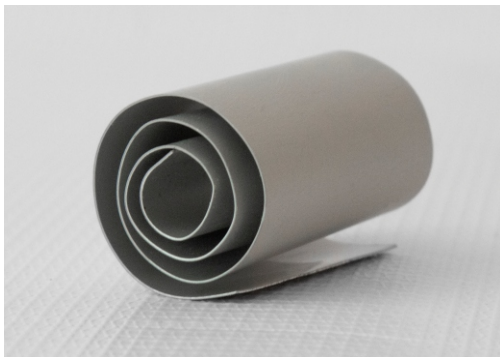
■ Developed technologies for the production of:

- Flat aluminum heating elements.
- Selective light-absorbing composite coatings.
- Screen films designed to maintain the confidentiality of information demonstrated on a display.
- A belt-type desiccant based on aluminum oxide nanofibers.
- Thermally conductive circuit boards based on anodized aluminum with copper metallization.



- Production and supply of specialized semi-automatic equipment for anodizing processes.
- Organization of a production site for electrochemical processes.
- Conducting R&D, scientific examination, consulting, and training of personnel.

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Micro- и nanotechnology

■ INTEGRATED MICRO- AND NANOSYSTEMS



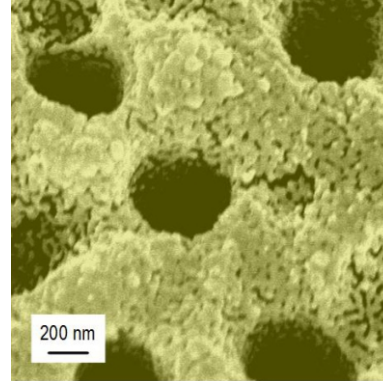
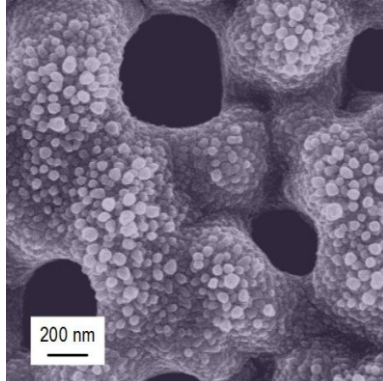
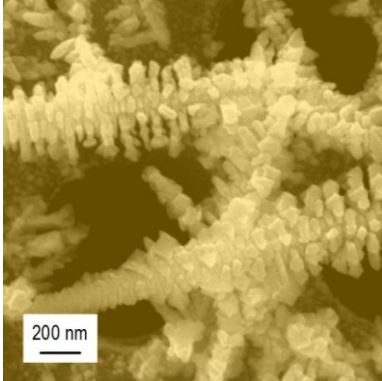
■ We offer the following services:

- Design and production of micro- and nanoelectronic devices.
- Synthesis and study of carbon nanotubes and organic molecular nanocrystals.
- Design and production of micro- and nanoelectronics based on carbon nanotubes and organic molecular nanocrystals.
- High temperature annealing up to 1000 °C of samples and materials in specified gas environments.

■ We offer services on the development and manufacture of vacuum processing equipment for deposition of thin films of organic and inorganic materials on experimental samples.

We provide services on equipment modernization and expansion of the gases used, depending on the customer's requirements and objectives.

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■ MATERIALS AND STRUCTURES OF NANOELECTRONICS

■ **Developed:**

– **Electrostatic jet and matrix solid propellant microthrusters for nanosatellites**

Created using the MEMS technology. They are used in moving systems for small spacecraft of the CubeSat format with dimensions of 1U – 3U.

– **Flexible copper electrodes for electrophoresis**

The electrodes are made of nanostructured copper foil incorporated into a soft polymer material, which ensures a tight fit to curved surfaces and resistance to repeated twisting and bending.

– **Multi-probe flexible contact devices for measuring electrical parameters of integrated circuits on a wafer**

Manufactured using the MEMS technology. The arrangement of contacts is specified for a specific configuration of contact pads on a semiconductor chip. The number of contacts can reach up to 4000 pcs/cm².

– **Integrated waveguides based on oxidized porous silicon**

Designed for creating optical interconnections between elements of integrated circuits or microassembly crystals, as well as in optical information processing systems. Have optical losses less than 1 dB/cm.

■ **We offer the following services:**

- Production of porous silicon by electrochemical anodization.
- Obtaining of arrays of silicon nanowires by metal-stimulated chemical etching.
- Galvanic and chemical coating of metal and semiconductor products and substrates with films of metals and alloys.
- Chemical and electrochemical formation of thin-film coatings from semiconductor compounds.
- Modeling of electrophysical and thermal processes.
- Measurement of parameters of semiconductor devices.
- Measurement of optical characteristics of semiconductor and dielectric materials.
- Measurement of electrophysical characteristics of photodetectors, photocatalytic coatings, electrodes of energy storage devices.

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■ NANO-ELECTRONICS AND ADVANCED MATERIALS

■ Research areas:

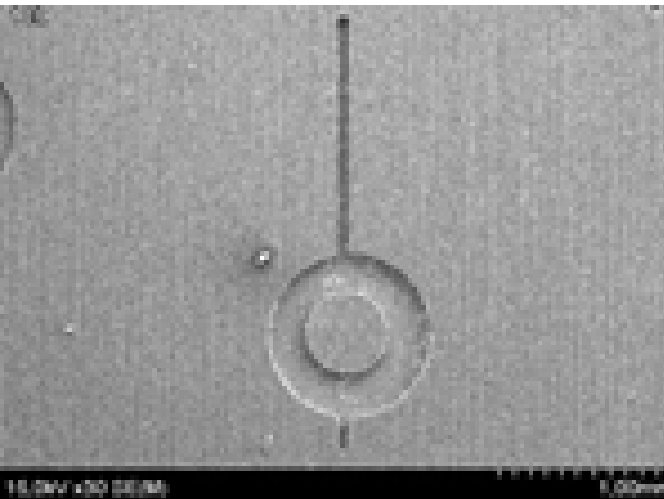
- Silicon and germanium nanostructures and their application.
- Nanostructured oxides of valve metals and their application for photocatalysis.
- Spintronics and quantum calculations.
- Semiconductor compounds for optoelectronics and photovoltaics.
- SPM-based studies and nanotechnologies.

■ We have developed:

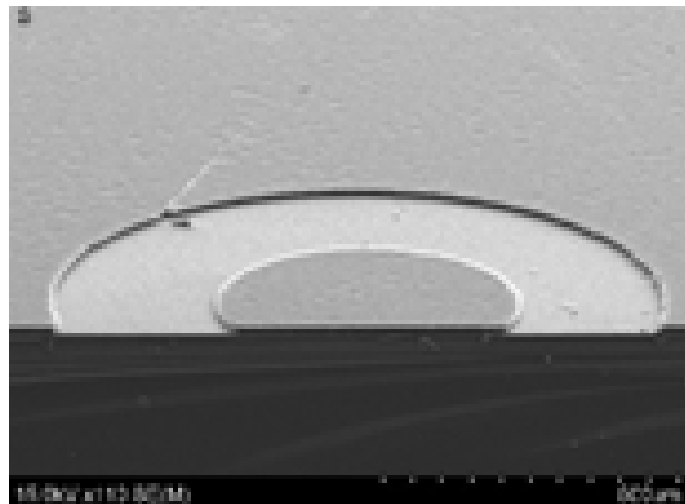
- **Design technology for spintronic elements of integrated circuits.**
- **Technology and materials for photocatalytic purification of water from organic contaminants in a flow-type reactor.**

Geography of cooperation: CIS and Europe.

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Imaging on aluminum

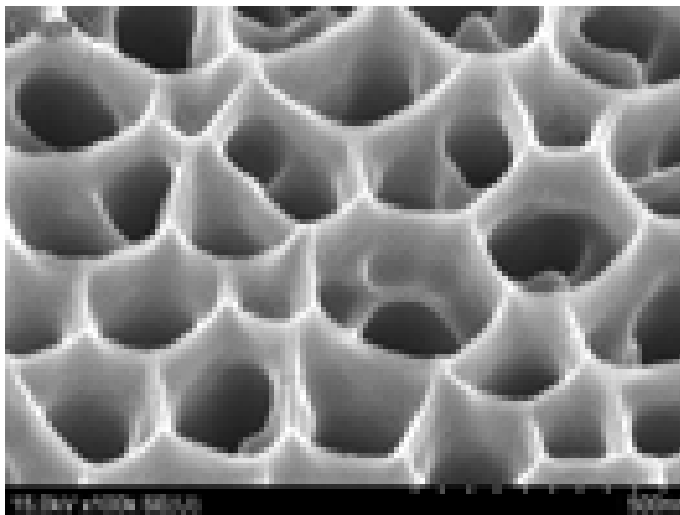


Imaging on aluminum

■ NANOPHOTONICS

■ Research areas:

- Sol-gel film structures.
- Luminescent structures with optical anisotropy and two-colour images based on porous anodic aluminum oxide.
- Film structures containing quantum points of silicon and germanium.
- Power-independent memory condenser structures and elements, including quantum points and magnetic ferroelectrics.
- Film devices converting X-ray radiation into visible light.
- Photocatalytically-active films for water purification systems.
- Nanostructured silicon powders with high-melting-point metals for combustion and photocatalysis.



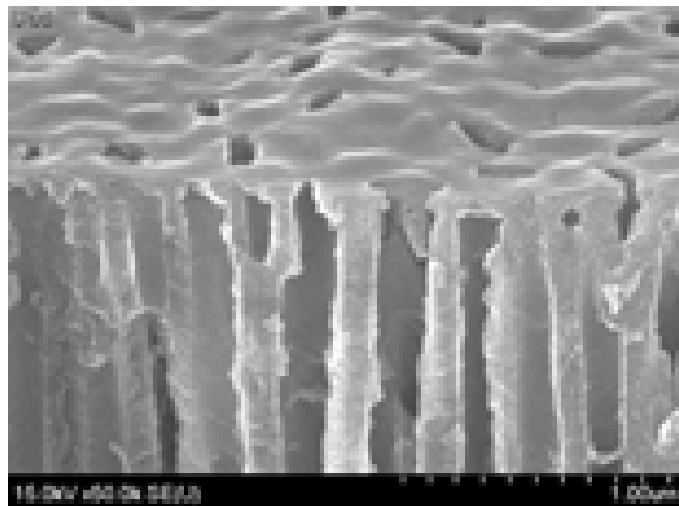
Matrix film converters of ionizing radiation

■ We offer the following services:

- Staff training in the field of sol-gel technology application in the development of optical converters and radiation filters.

Geography of cooperation: CIS and Europe.

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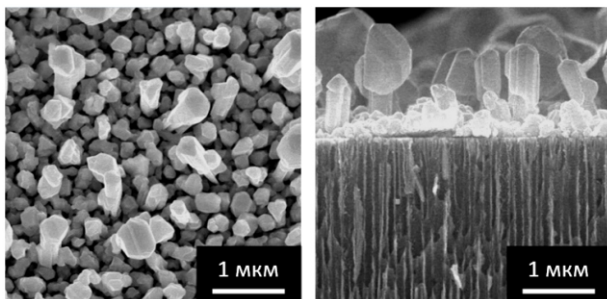
Matrix film converters of ionizing radiation

Applied plasmonics

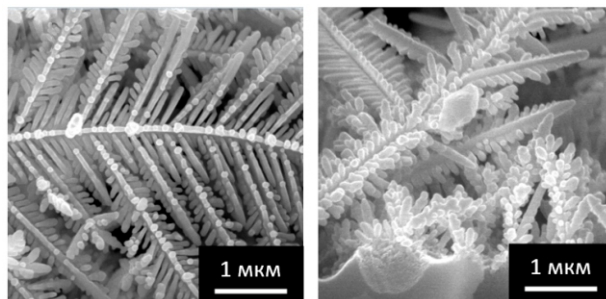
■ **SERS-active substrates have been developed**

to improve the sensitivity of Raman spectroscopy. They are used for the detection of single molecules and high-precision molecular analysis of liquid and gaseous media. The original geometry and composition of SERS-active substrates ensure amplification of the Raman signal from molecules in the analyzed media not only due to surface plasmon resonance in the micro- and nanostructures of the metal, but also due to the re-reflection of optical radiation in the cavities between them.

- We develop a protocol for the analysis of target analytes.
- We supply software for processing the results of spectral analysis, including databases of spectra of a number of analytes.
- We supply kits for self-production and testing of SERS-active substrates.
- We provide scientific and technical services (examination, consulting and personnel training).
- We are interested in carrying out joint research and development projects.



Examples of micro- and nanostructures in SERS-active substrates based on silver particles on nanostructured silicon



Examples of micro- and nanostructures in SERS-active substrates based on silver dendrites on nanostructured silicon



A set for teaching the methods of nanostructure synthesis from metals for high precision biosensors as well as for molecular analysis

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Energy-saving electrodeposition equipment

■ We offer custom design of the following equipment:

– Energy-saving program-controlled equipment for cathode/anode processing using a direct, impulse and alternating current.

– Generators of current (voltage) pulse sequences of complex shapes for coating in a single technological cycle.
The coating process may include up to ten sequentially applied micro- and nanolayers with various composition and physical properties.

■ We provide services on equipment assembly, launching into industrial operation, maintenance and support, as well as personnel training.

■ Alternative processes for the anode or cathode electrodeposition of protective coatings maybe developed on customer request.

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Computer-aided design of technological processes and device architecture

Design and simulation services

■ Research areas:

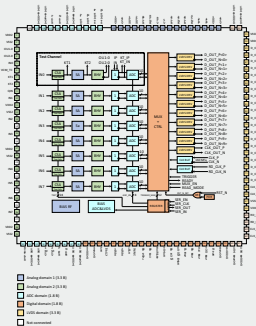
- Computer-aided design of technological processes and device architecture.
- Design and industrial manufacturing of customized (analog, digital and mixed) integral circuits.
- Quantum-mechanical and molecular-dynamic simulation of properties of functional materials and nanostructures.

■ Software available for use:

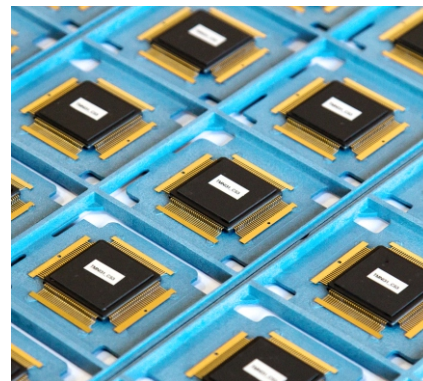
- Silvaco (for modelling of devices and technologies).
- VASP (for quantum-mechanical and molecular-dynamic simulation).

The R&D Lab possesses an academic licence on Silvaco software as well as is the only official group of VASP users in the Republic of Belarus.

- Systems for real-time monitoring of parameters of charged elements fluxes (ion energy and ion current density) and of neutral atoms (deposition rate).
- Cadence (circuit and system-level engineering).
- Open source software.



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