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Research and development cooperation offer

Your R&D center



HR EXCELLENCE IN RESEARCH

Research and Development Team



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From Business Challenge to Validated Solution

We translate business problems into scientific questions – and back into business results.



Business Problem & Context

- We start from your business challenge: KPIs, constraints, environment, timeline.
- Clarify what needs to change: cost, reliability, performance, safety, automation, etc.
- Align on success criteria – what “good enough” means for you.

Scientific & Engineering Exploration

- Translate the challenge into precise research questions and hypotheses.
- Build an interdisciplinary team (signals, robotics, materials, antennas, etc.).
- Design experiments, simulations, and prototypes using our labs and infrastructure.

Back to Business & Implementation

- Convert results into clear recommendations and decision options.
- Show impact in business terms: risk reduction, performance gains, cost/effort trade-offs.
- Support further steps: prototyping, testing in real conditions, integration with your systems.

We speak both languages – management and R&D – and keep them aligned throughout the project.



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Forms of cooperation

Comprehensive concept development (TRL1-TRL8)

The group operates as an R&D department, forming an interdisciplinary team that manages the project from analysis, through design and implementation, to testing, providing laboratory facilities (without the commercialization and implementation phases).

Expert technical support (team extension)

We bring expertise to your team in selected areas in the following forms:

- temporary team extension,
- know-how transfer,
- training and work with a designated group of client-side specialists,
- strategic consultations and technology audits.

Project consortia with public funding

We create scientific and industrial consortia and jointly apply for external funding, including: NCBR, NCN, EU funds, and industry-specific and thematic programs. Wrocław University of Science and Technology assumes the role of scientific partner, technology leader, or research and development contractor.

Individual, flexible cooperation models

We offer the possibility of configuring a form of cooperation tailored to the client's needs, including:

- Doctoral, master and bachelor thesis, investigating the aspect of the business problems and testing solutions for it,
- Early-stage feasibility assessments, benchmarking, and small-scale experiments to evaluate solution directions

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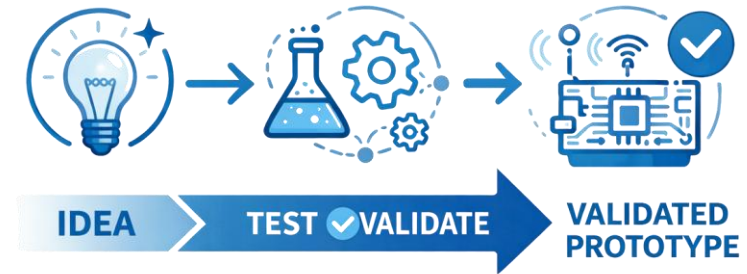
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Turning Research into Business Value



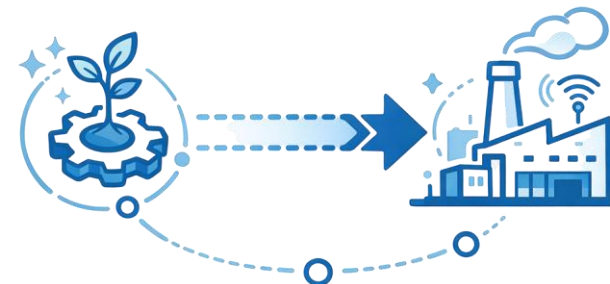
Build expert teams for complex technical challenges

Develop and validate prototypes



Provide decision-driven R&D results for business

Enable tech transfer and spin-off potential



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Comprehensive Research & Development Facilities

Embedded systems, electronics, and prototyping labs

Rapid development of PCBs, devices, sensors, and integrated hardware–software prototypes.

Robotics, automation & mechatronics infrastructure

Test stands, robotic platforms, motion-capture and control systems for validating robotic and industrial solutions.

Advanced signal-processing, GNSS & RF measurement setups

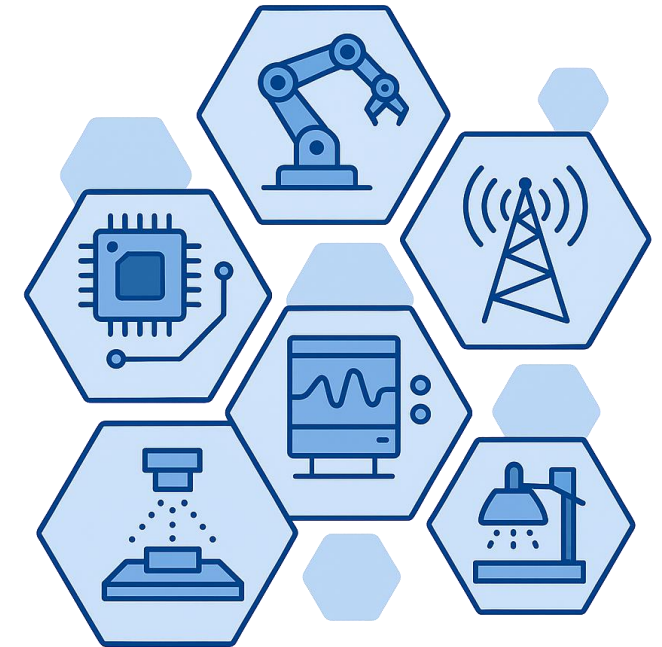
Facilities for interference analysis, time-synchronization testing, SDR development, and digital/analog signal verification.

Thin-film, materials & nanometrology laboratories

Surface engineering, material characterization, and high-precision micro/nano-scale measurements.

Environmental, EMC & testing according to standards

Validation of durability, noise/EMC compliance, and performance in operational environments.





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Competences catalog



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Competences

Thin Film Technologies Department

WHAT WE DO?

- **We add new properties to products.**

Protective, barrier, filtering, and conductive coatings offer greater durability and functionality.

- **We expand the capabilities of sensors and cameras.**

Increased sensitivity, selectivity, and spectral range; new detection capabilities.

- **We design coatings for specific products.**

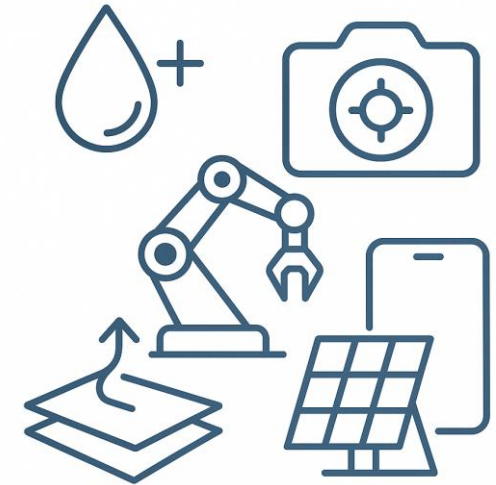
Solutions for electronics, photonics, medtech, and the precision industry.

- **We improve materials and components.**

Stability, repeatability, and improved performance.

- **We create solutions for PV, IoT, and mobile devices.**

Higher durability, environmental resistance, and efficiency.



WHO DO WE WORK FOR?

Electronics | Sensors | Photonics | IoT | Medtech | Biotech | PV | Energy | Advanced Manufacturing



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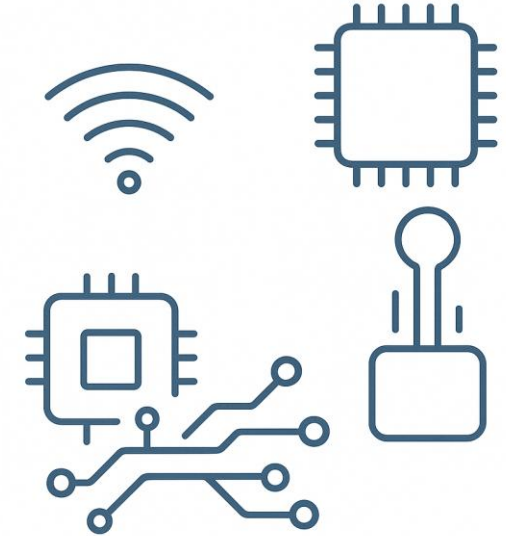


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Embedded Systems, IoT & Smart Sensors Division

WHAT WE DO?

- **We design embedded systems from concept to production.**
Real-time software (C/C++), microcontrollers (ARM, STM32, NRF52, ESP32, ATSAM), embedded Linux, secure bootloaders, and IoT-ready architectures.
- **We design advanced electronic hardware.**
PCB design multi-layers, digital & analog circuits, GNSS and communication modules, BLE/IoT devices, and full HW/SW co-design.
- **We optimize engineering processes from prototype to field deployment.**
Requirements engineering, architecture design, implementation workflows, testing frameworks, CI/CD automation, device simulation, and cloud integration (Azure IoT Hub, MQTT, Modbus, REST, ...).



WHO DO WE WORK FOR?

Automotive | Medtech | Space | IoT | Telecommunications | Industry | Energy | Research & Innovation



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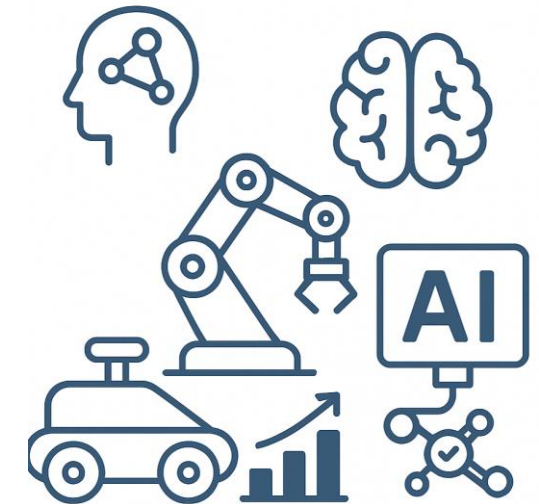
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Cybernetics and Robotics Department

WHAT WE DO?

- **We develop advanced robotic systems.**
Integration of mobile and stationary robots, use of autonomous platforms, manipulators, cobots, and development of dedicated robotic systems.
- **We automate and optimize industrial processes.**
Robotization of manufacturing lines, adaptive and force-control systems, predictive controllers, and industrial robot programming.
- **We enable intelligent perception and AI-based interpretation.**
Vision systems, AI vision, image processing, 3D reconstruction, SLAM, and multi-sensor data fusion (lidar, RGB-D, sonar, IMU).
- **We design autonomous systems and multi-robot solutions.**
Localization, mapping, mission planning, coordination of multi-robot teams, and advanced robotic architectures.



WHO DO WE WORK FOR?

Industry | Automation | Advanced Manufacturing | Robotics | Medtech | Space | Defense | IoT | Energy | Logistics | Research & Innovation



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Nanometrology Department

WHAT WE DO?

- **We verify material quality.**
Assess nanostructures, thin films and components for required parameters and consistency.
- **We detect defects and performance risks.**
Identify cracks, delamination, impurities and structural issues that impact reliability.
- **We evaluate advanced components.**
Mechanical and electrical testing of MEMS/NEMS, sensors and micro-devices.
- **We build custom measurement electronics.**
Precision signal-processing and control circuits for test setups and prototypes.
- **We support product development with actionable data.**
Clear reports and recommendations that reduce risk and speed up R&D decisions.



WHO DO WE WORK FOR?

Industry | Research & Innovation | Metrology Institutes |



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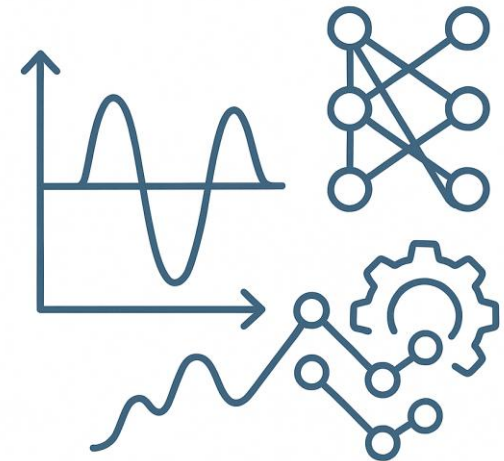
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Digital Signal Processing and Machine Learning Division

WHAT WE DO?

- **We turn raw signals into actionable insights.**
Tailored DSP and ML algorithms that improve detection accuracy, automate classification, and enable smart recognition in real-world systems.
- **We build intelligent algorithms that understand complex data.**
Custom models that reveal patterns, anomalies, and relationships hidden in multi-sensor or high-dimensional signals.
- **We enhance products with smarter detection, classification, and recognition.**
Embedded or cloud-ready algorithms that improve accuracy, automate decisions, and enable new system capabilities.



WHO DO WE WORK FOR?

Industry | Research & Innovation



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Audio Signal Processing Department

WHAT WE DO?

- **We improve the quality of loudspeakers, microphones, and audio systems.**
Modeling, measurement, and optimization of distortion, frequency response, directivity, and overall sound performance.
- **We design advanced audio hardware and digital acoustic devices.**
Loudspeaker systems, digital-input audio modules, acoustic transducers, and ultrasonic components.
- **We develop intelligent audio-processing algorithms.**
Sound enhancement, spatial audio, acoustic scene reproduction, audio synthesis, and smart microphone techniques.
- **We shape and optimize acoustic environments.**
Room acoustics design, noise diagnostics, and optimization for studios, theaters, broadcasting spaces, and industrial sites.



WHO DO WE WORK FOR?

Audio & Acoustics Industry | Consumer Electronics | Broadcasting & Media | Automotive | Industrial & Manufacturing | Construction & Architecture | Medical & NDT | R&D Labs



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Antennas Department

WHAT WE DO?

- **We design, prototype, and measure advanced antenna systems.**
Antennas for broadcasting, wireless communication (WLAN, WiMAX), mobile networks, radionavigation, and radar systems.
- **We analyze and optimize antennas using advanced simulation tools.**
Computational electromagnetics, numerical modeling, synthesis of antenna structures, and performance optimization.
- **We develop complete antenna subsystems.**
Matching networks, feeding structures, phased-array control circuits, and measurement validation in laboratory conditions.
- **We support government, municipal, and industrial partners.**
R&D projects in telecommunications, radiocommunication systems, network development strategies, and antenna-system modernization.



WHO DO WE WORK FOR?

Telecommunications | Broadcasting | Mobile Networks | Satellite Navigation |
Defense & Security | Government & Municipal Units | R&D Institutions | Industry



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Electromagnetic Compatibility & Radio Testing (LKE)

WHAT WE DO?

- **We reduce electromagnetic interference risks.**
Emission and immunity tests for devices, systems and installations operating in demanding electromagnetic environments.
- **We verify and improve shielding and electromagnetic performance.**
Measurement of shielding effectiveness and EM parameters of materials, devices and objects.
- **We support product development with flexible testing and lab access.**
Pre-compliance and non-standard tests at the development stage, plus rental of EMC equipment and facilities for R&D projects.
- **We provide EMC & RED expertise for your team.**
Consulting, test plans, documentation support and specialised training on EMC/RED requirements and test methods.



WHO DO WE WORK FOR?

Electronics & Electrical Equipment Manufacturers | Industrial Automation & Control | Medical & Therapeutic Equipment | Measurement & Metering Devices | Energy & Renewables | Transport & Mobility (Rail, Automotive, Aviation, UAVs) | Telecom & IoT | Certification & Notified Bodies | Research & Innovation

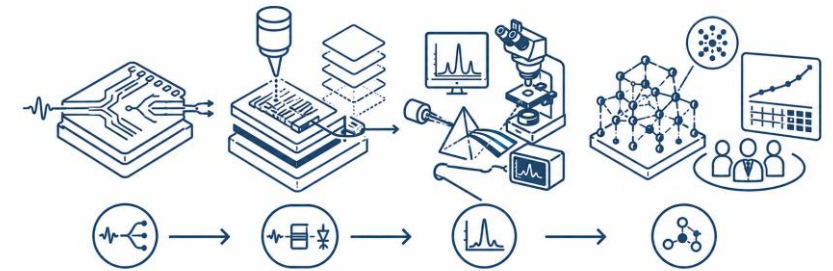


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Department of Experimental Physics

WHAT WE DO?

- **We design photonic and quantum photonic devices.**
Modelling of light propagation in photonic integrated circuits (PICs) and semiconductor optical components.
- **We develop passive and active optical components for integrated photonics**
Fabrication of optical components for semiconductor PICs.
- **We provide testing of optical materials and devices using a variety of spectroscopic methods.**
Optical inspection of semiconductor materials and optical components from visible to mid-infrared spectra range (time-domain response, quantum-level response, high spatial resolution, high spectral resolution)
- **We support the development of photonic materials and structures.**
R&D projects with our partners, developing photonic materials from design and material validation through testing of photonic components.



WHO DO WE WORK FOR?

Semiconductor Photonic Materials | Photonic Integrated Circuits (PICs) and components | Quantum Photonic Devices | Telecom | Research & Innovation



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Example realizations of our experts

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Examples of the work of our team members

PWR Forge – One Tool for Embedded Software Development

What it does

Generates, builds, analyzes, tests and releases embedded (C/C++) software — all from a single CLI and a standardized Docker environment.

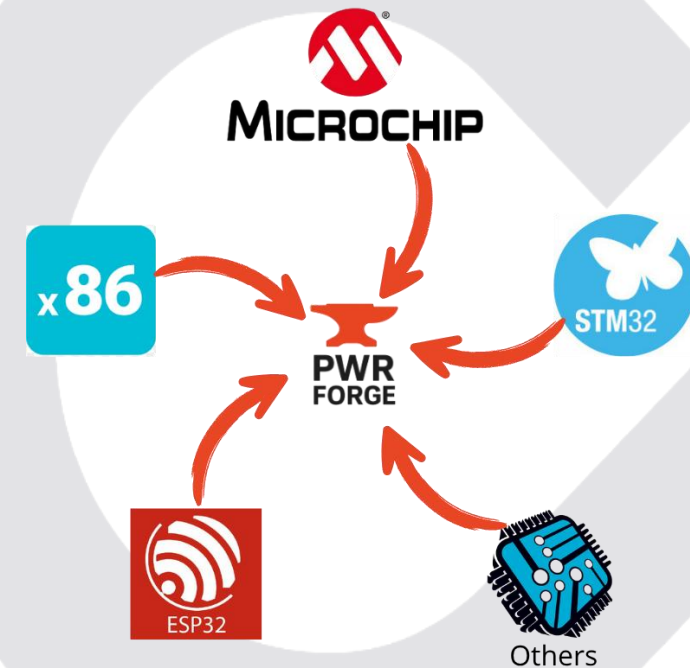
Why

Shortens the path from prototype to commercialization — one tool for rapid R&D and industrial-grade projects, reducing time-to-market and maintenance costs.

For whom

Students, researchers and professionals developing embedded and IoT systems.

Projects started at the university can be seamlessly reused in commercial startups and industry thanks to the same toolchain.





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Examples of the work of our team members

UCD – Industrial and sacred automation systems

Business Need

GPS signal interference and false data were observed in industrial automation systems used in border regions (e.g., eastern Poland). This interference led to incorrect time synchronization and loss of control in automated processes. A solution was needed that would maintain the integrity and reliability of the navigation signal without interfering with existing equipment.

Solution

A fully digital solution without modifying existing hardware – utilizing data from existing hardware – the microcontroller analyzes real-time data from the GPS module, including satellite signal parameters and spoofing data, and compares it with historical data and other reference sources.

How?

Development of a digital anti-spoofing algorithm operating in the embedded software layer.

Analysis of GPS signal characteristics and detection of anomalies in phase and time parameters.

Position and time synchronization based on historical data and stable transmission patterns.





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Examples of the work of our team members

MedBand – Remote rehabilitation system with precise 3D positioning

Business need

Patient rehabilitation requires the constant presence of a therapist, which limits the number of people who can begin therapy at the appropriate time. There was a need to create a system that allows remote monitoring of the correctness of exercises and real-time assessment of movement quality, without the physical presence of a specialist.

Solution

MedBand System – a wristband (hardware + software) supporting the process of physiotherapy and remote rehabilitation. The device records data from motion sensors (accelerometer, gyroscope, magnetometer), analyzes the patient's body position in 3D space and compares it with the pattern recorded by the therapist.

How?

Development of new algorithms for fusion of data from IMU sensors (accelerometer, gyroscope, magnetometer) and human body physiognomy, enabling accurate determination of body orientation and position in 3D space.

Analysis of movement trajectories, accuracy assessment, and automatic reporting of patient progress.



JUnit 5



python



Jenkins

GitHub

docker



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Examples of the work of our team members

Portable Die-Cut Robot

Business need

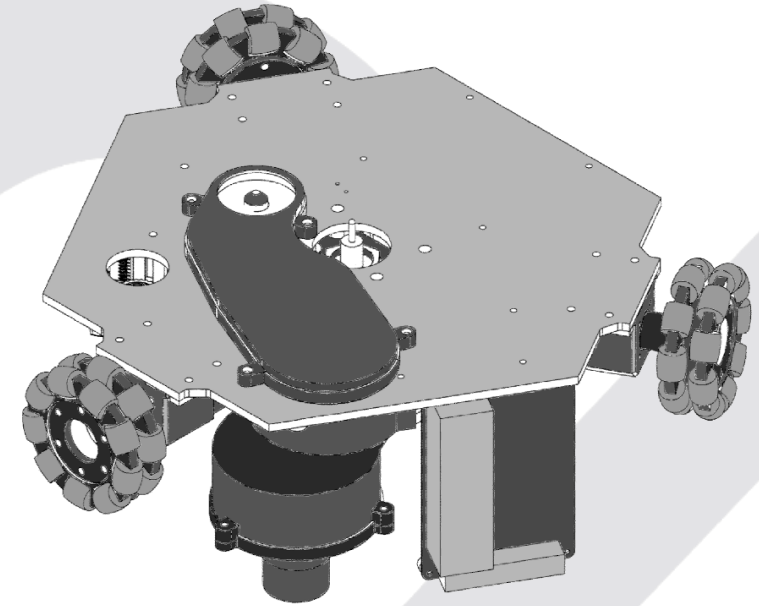
Packaging manufacturers need a faster, more efficient way to create and validate cardboard packaging prototypes. Currently, prototypes are produced on factory equipment and physically shipped to the customer for review. This multi-step, shipment-dependent loop causes long delays and slows down the entire packaging design process.

Solution

A portable plotter that creates packaging die-cut patterns on-site at the customer's location. The device is transportable in a standard passenger car, it enables immediate prototyping and real-time design adjustments—cutting development time from days to just hours.

How?

The system is a mobile robot that navigates precisely across cardboard sheets, equipped with a cutting tool (typically a laser) and a creasing device. The team designed the robot's kinematics, control architecture, and both low- and high-level algorithms, enabling it to produce complete die-cut prototypes directly from the digital design.



G-code





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Examples of the work of our team members

EMC & radio qualification of a microsatellite platform

Business need

A company developing a microsatellite needed to ensure that all onboard electronics and radio links would operate reliably during launch and in orbit. The satellite had to meet EMC and radio requirements, avoid interference between subsystems, and pass conformity assessment without late redesigns or schedule delays.

Solution

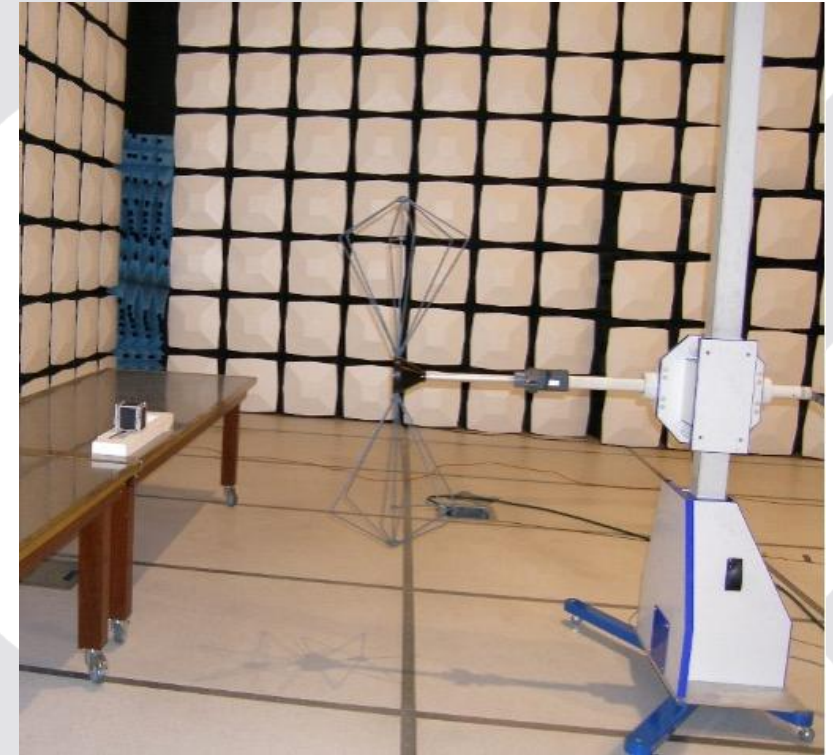
A complete EMC and RF test campaign carried out at the Electromagnetic Compatibility Laboratory (LKE) – from pre-compliance measurements during development to accredited tests of the flight model.

How?

Joint preparation of a test plan aligned with applicable EMC/RED and space-sector requirements

Execution of radiated and conducted emission tests, immunity tests (ESD, RF fields, surges, bursts) and verification of shielding effectiveness.

Identification of interference sources, proposal of design changes





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Examples of the work of our team members

Photonic circuits and quantum devices

Business need

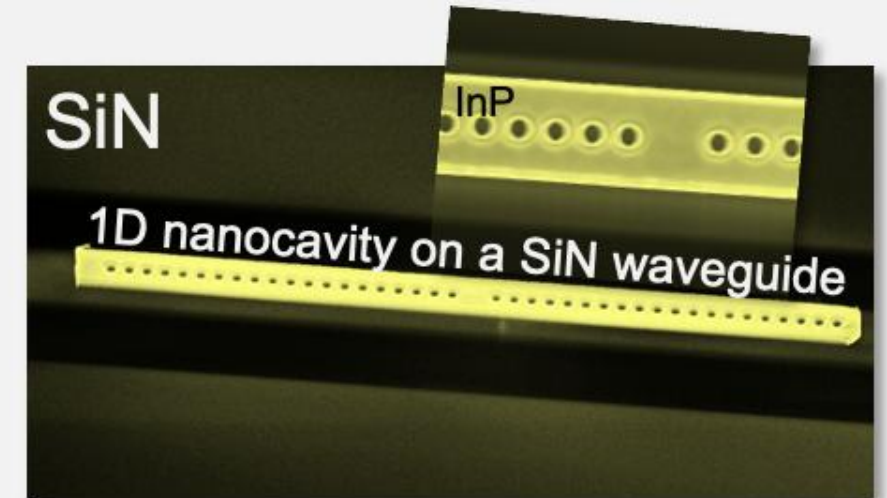
A company needs an element of a photonic integrated chip that can produce single photons for quantum key distribution in the telecom C-band.

Solution

We designed and co-fabricated the element, integrated it into the photonic integrated chip, and then conducted final device performance testing.

How?

We propose a device, calculate its crucial metrics using our computational capabilities, and manufacture the device using our advanced nanofabrication methods, followed by final spectroscopic validation.





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Contact

Thank you

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