

SCIENCE GAINS ITS
TRUE MEANING WHEN
IT IS BROUGHT TO LIFE
THROUGH SOLUTIONS
THAT IMPROVE
PEOPLE'S LIVES.



CEDIG
Centre
for Digitalisation



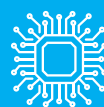
CEKROG
Centre for Social
and Technological
Transformations and
Circularity



CENT
Centre for
Advanced
Technologies



CETIP
Centre for Technology
Transfer and
Intellectual Property



CEQ
Centre for
Applied Quantum
Computing

We accelerate development, innovation, and the translation of scientific knowledge into market applications, enabling companies to create quality jobs, high added value, and prosperity.



According to the Statistical Office of the Republic of Slovenia, the Southeast Slovenia region has the strongest economy in the country, measured by its share of GDP and level of R&D investment.

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RUDOLFOVO - Znanstveno in tehnološko središče Novo mesto

Science gains its true meaning when it is brought to life through solutions that improve people's lives / [edited by Katja Sinur ; authors of the texts Slavko Arh ... [et al.] ; photos Boštjan Pucelj, Luka Rifelj, arhiv Rudolfovo]. - Novo mesto : Rudolfovo - Science and Technology Centre, 2026

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REPUBLIC OF SLOVENIA
MINISTRY OF HIGHER EDUCATION,
SCIENCE AND INNOVATION



Co-funded by
the European Union

{ Science gains its true meaning when it is brought to life through solutions that improve people's lives.



Rudolfovo is a public research institute established in 2022 by the Government of the Republic of Slovenia. Our name bears a historical stamp – it was once the name of Novo mesto, after its founder Archduke Rudolf IV of Habsburg. Like the city since its inception, we are building a place of knowledge, progress and integration for our common prosperity.

Our mission is to co-create, develop and transfer high-tech knowledge to the economy. We act as a bridge between science and practice – between research excellence and its effective, measurable application in the real world. Our vision is to become a leading research organisation in high technology, recognised as the link between science and its effective application.

In the short time since our founding, we have built a solid foundation and achieved important milestones.

Our research is carried out in five research groups:

- Centre for Digitalisation
- Centre for Social and Technological Transformations and Circularity
- Centre for Advanced Technologies
- Centre for Technology Transfer and Intellectual Property
- Centre for Applied Quantum Computing

The research work of the centres is based on modern research infrastructure in five laboratories ({LabTOP, {Lab3D, {LabX, {LabM and {LabE) and on an efficient Shared Services unit that ensures stable organisational support and a professional administrative environment.

We are proud of the many industrial, applied and basic research projects that we have won in direct agreement with industry and in highly competitive national and international calls for tenders. These

projects are not an end in themselves – their results are concrete solutions in industry, prototypes of advanced products and processes, new knowledge, scientific and professional publications, patents and innovations with clear added value. We are also in the process of setting up our first spin-off company, confirming our focus on knowledge transfer into practice.

South-Eastern Slovenia is one of the most economically successful regions in the country. Its strength is based on companies with high added value, a strong export orientation and stable profitability. At Rudolfovo, we are proud to contribute our share to this success story – with knowledge, innovation and partnerships that strengthen the competitiveness of the region and co-create our prosperity.


Prof. Dr. Janez Povh
Director of {Rudolfovo

Social sciences and technology

The researchers at Rudolfovo also study the impact and significance of new technologies on society, how technology is adopted in different social contexts, how technology can serve humanity, and how humanity affects the wider social and natural environment.

>300

employees

>40

industrial projects

11

international projects

14

national projects

6

innovation awards

>20

events organised by the institute annually

56

employees

3

doctoral
students

18

doctoral theses

25

practical training
placements completed
by students at the
institute

11

countries represented
among the employees



>240

publications

>1200

visitors annually

+126%

revenue growth in
2023–2025

33.18%

share of revenue from national,
international and industrial projects

{ Mission, vision, and values

Mission

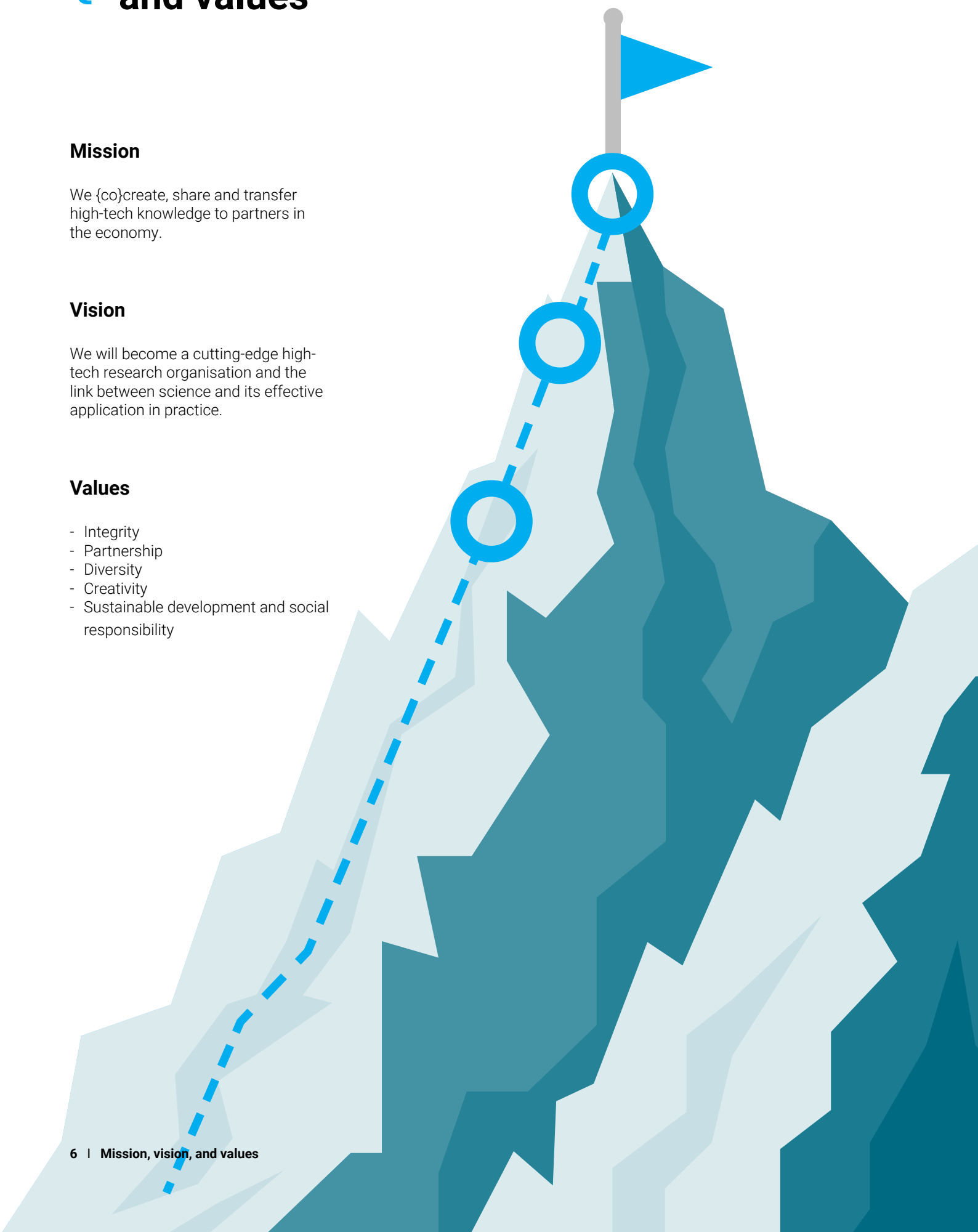
We {co}create, share and transfer high-tech knowledge to partners in the economy.

Vision

We will become a cutting-edge high-tech research organisation and the link between science and its effective application in practice.

Values

- Integrity
- Partnership
- Diversity
- Creativity
- Sustainable development and social responsibility



{ Strategic orientations

Excellence in scientific research

- Internationally recognised scientific publications
- Winning national and international projects funded by various research, infrastructure and other programmes
- Intellectual property protection by applying for patents

Development work for industry and industrial partnerships

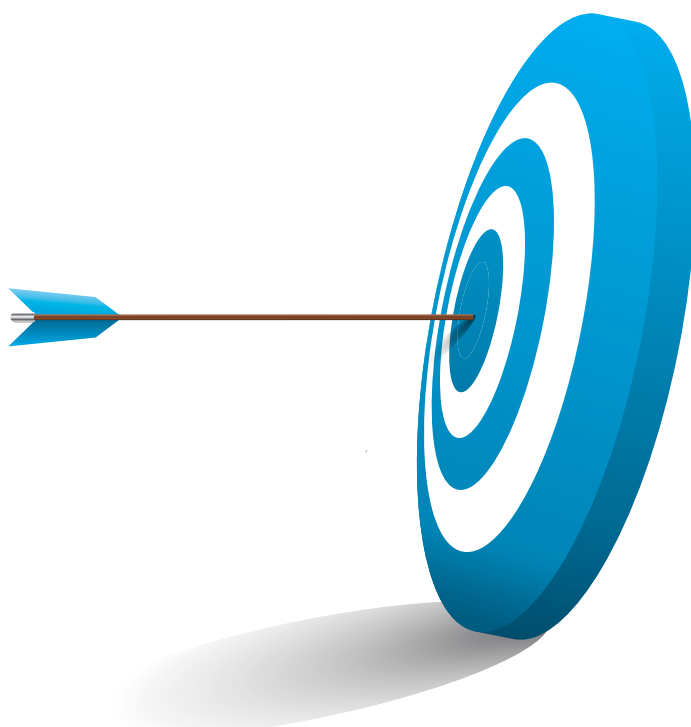
- Successful implementation of industrial projects already acquired and winning further new industrial projects
- Joining relevant international associations and organisations
- Innovation activity

Developing excellent professionals

- Finding new talent to work at Rudolfovo
- Further training and staff development
- Cooperation with higher education institutions in Slovenia and abroad
- International mobility of staff
- Gender balance at all levels of the organisational structure

Excellent performance and stakeholder satisfaction

- Ensuring the stable funding of the institute
- Increasing funding through national and international projects
- Investing in advanced research equipment
- Increasing the number of employees and fostering a good organisational climate



{ Finance

Stable growth.
Strategic consolidation.
European ambition.

Rudolfovo has more than doubled the scale of its operations in 2023–2025, and has consolidated its financial stability and development focus.

Development and diversification of sources of financing (cash flow)

Year	National projects	International projects	Market projects
2023	0.63%	0.02%	3.44%
2024	6.10%	8.52%	5.95%
2025	15.90%	9.39%	7.89%

In 2023–2025, Rudolfovo has moved from an initial funding phase to a diversified and competitive model, with national, international and industrial projects already accounting for a third (33.18%) of the total inflows.

This means:

- greater financial diversification,
- reduced reliance on founding funds,
- stronger integration with the European Research Area,
- increased confidence among business partners.

Rudolfovo is entering 2026 as a stable, financially efficient and internationally ambitious research institution with a fast-growing and structurally diversified funding portfolio.



The Rudolfovo team at the GZDBK 2025 awards ceremony, where the institute received Gold, Silver and Bronze awards for its innovations.



Stable and sustainable growth

Surplus of revenue over expenditure

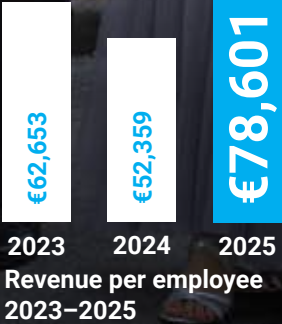


+479%

growth of the surplus in two years

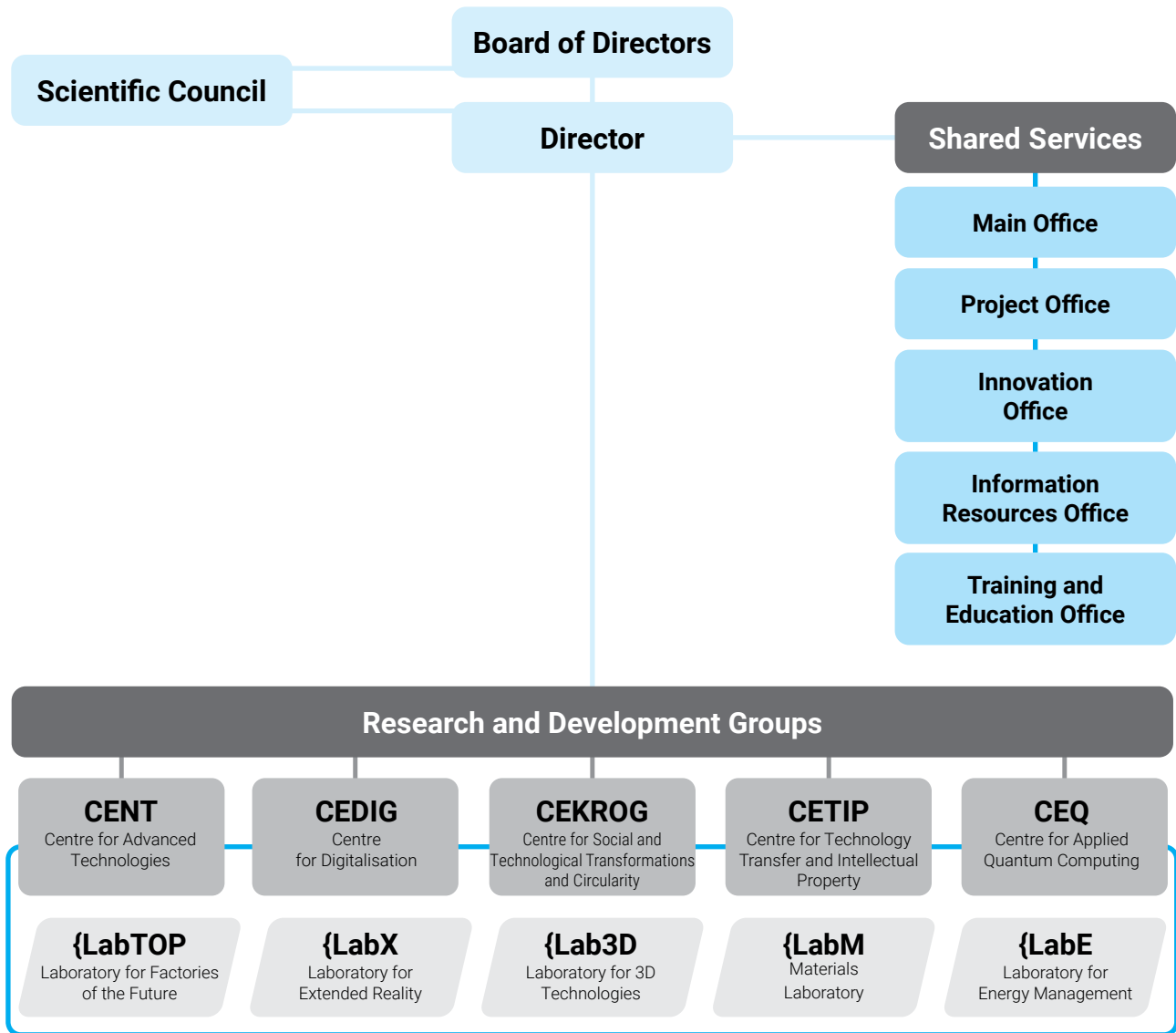
The share of the surplus of revenue over expenditure increased from 2.4% (2023) to 6.8% (2025). Financial efficiency has almost tripled over the 2023–2025 period.

Productivity



2025 represents a significant productivity leap after a phase of intensive staff expansion and the stabilisation of the organisational structure.

{ Organisational structure



{ Key projects of the institute



Innovation for higher quality pharmaceuticals

In collaboration with Krka, d.d., Rudolfovo has developed an innovative solution for the precise mechanical resistance testing of pharmaceutical tablets, combining robotics and artificial intelligence. The solution complements existing testing methods and provides additional insight into the properties of tablets, thereby contributing to the higher quality of pharmaceutical products. The innovation brings greater reliability and repeatability of measurements, while reducing costs and waste.



Virtual reality for advanced processes in the pharmaceutical industry

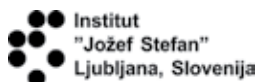
In collaboration with Iskra PIO, Rudolfovo has developed a solution for the use of virtual reality in the development and application of isolator technology in the pharmaceutical and biopharmaceutical industries. Supported by (LabX laboratory equipment, it enables the more efficient design of technological systems, improves development processes and strengthens the company's competitiveness in Slovenia and abroad.



Hybrid system for electricity consumption prediction and optimisation

As part of the Fortissimo project, we partnered with Robotina to develop a

software solution based on a hybrid architecture that combines edge computing and high-performance computing (HPC). The edge devices collect real-time data on electricity consumption, weather data and forecasts. These are then processed using the HPC infrastructure, where machine learning models are automatically retrained for each endpoint to predict future consumption. The aim of the system is to manage energy more efficiently and reduce electricity costs for the user.



Autonomous laboratory

The automation of the Nanomaterials Laboratory with autonomous experiment control is an important step towards the faster development of new materials. The project involved combining conventional automation and robotics, and integrating laboratory instruments into a single computer-controlled system for running experiments.



DIGITOP

DIGITOP (Digital Transformation of the Robotic Factories of the Future) is a research and development programme for the introduction of robotics, artificial intelligence, ICT and Industry 4.0 and 5.0 concepts in manufacturing companies to automate and optimise processes and to make them more flexible. Rudolfovo is involved in the project as an important partner in the development of advanced digital twins and AI modules for advanced planning, energy efficiency and predictive maintenance. All these modules will be included as standard Pantheon MES modules.



QEC4QEA

QEC4QEA (Quantum Excellence Centre for Quantum-Enhanced Applications) is a European initiative funded as a European project led by the German Forschungszentrum Jülich, with Rudolfovo as the only partner from this part of Europe. As part of the project, Rudolfovo develops quantum algorithms for challenging optimisation problems in cryptography, logistics and combinatorial optimisation, and tests them on European supercomputers and quantum computers.



TURING

The TURING (Trustworthy Unified Robust Intelligent Generative Systems) project develops reliable, explainable and robust generative artificial intelligence models for applications in nuclear energy, particle physics and meteorology. Rudolfovo contributes its expertise in data analysis and evaluation to the project for the development of advanced AI models, and builds competences in the field of reliable artificial intelligence through international cooperation.



MSCA

The RhythmOfLife project, part of the MSCA – European Researchers' Night initiative, brings science closer to people across Slovenia in an accessible and interactive way, focusing on rhythms in nature and human life and the impact of research on health, the environment and society. As a partner, Rudolfovo co-designs the programme of events and activities and makes science and research more accessible to children, young people and the wider public in the region.

{ Human resources

We currently have 56 employees from eleven countries – Slovenia, Bosnia and Herzegovina, Croatia, Czech Republic, India, Iran, Moldova, Germany, North Macedonia, Syria and Serbia.

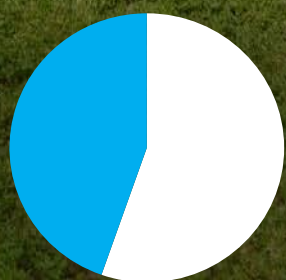
At Rudolfovo, we are committed to gender equality in the workplace. We support the transformation of the culture and processes that cause gender imbalance and inequality.

We are also committed to zero tolerance of discrimination and sexual harassment. This is why we integrate a range of activities (including training and development programmes), mentoring initiatives and flexible working arrangements into the work process.

These activities are designed to promote gender equality, dignity, respect and inclusion, and to ensure that all employees feel supported, safe, respected and valued.

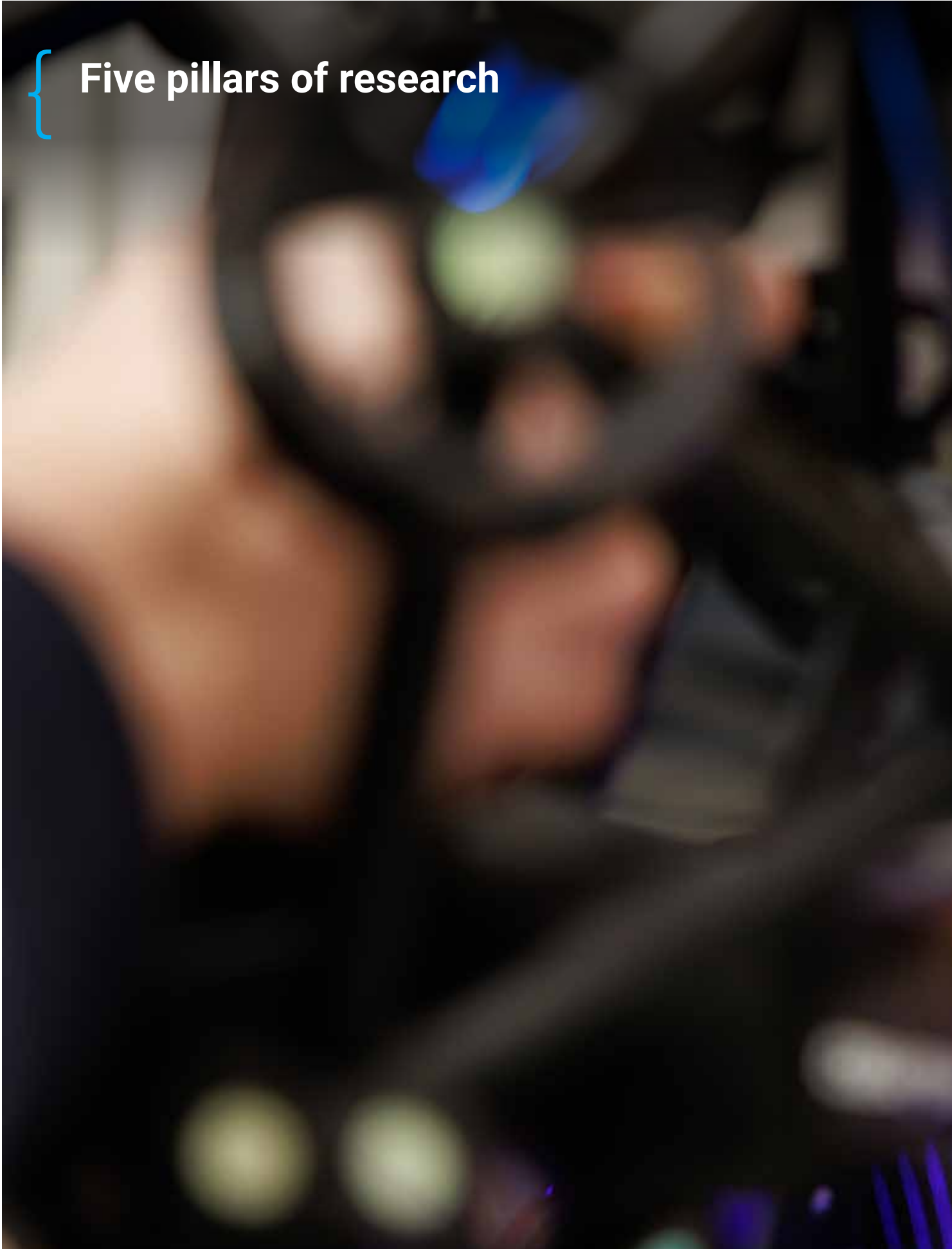


Rudolfovo staff at the 2025 Strategic Conference, dedicated to jointly shaping a vision for the development of the institute through 2030



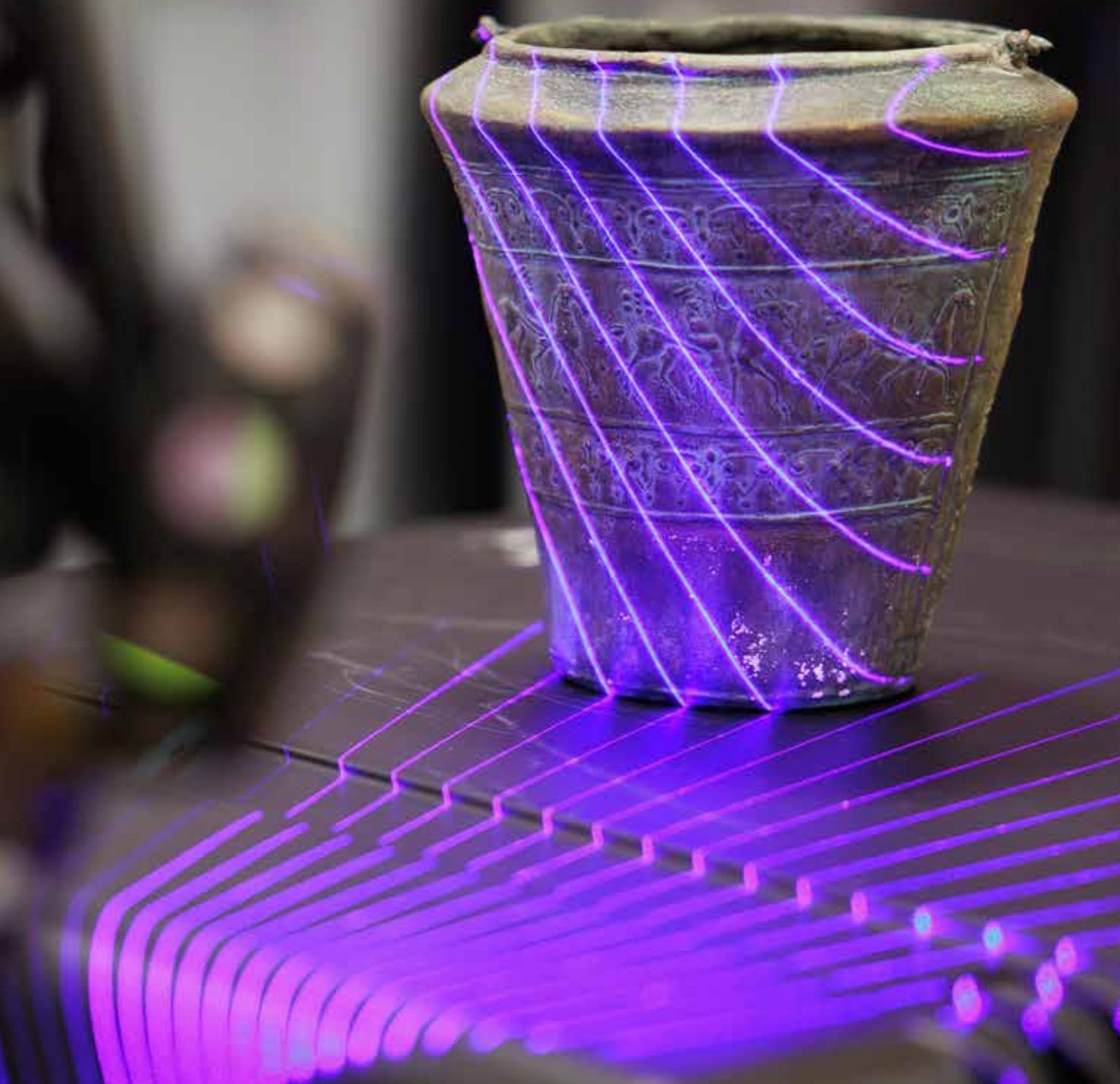
25 ♀
31 ♂

Gender representation of employees at Rudolfovo



{ Five pillars of research

The MetraSCAN BLACK Elite is a high-precision 3D laser scanner for making accurate measurements of complex objects.





Centre for Digitalisation



»At the centre, we are building the future of digitalisation – using advanced sensors, artificial intelligence and autonomous systems to create solutions that bridge science, industry and societal challenges.«

Head: Assist. Prof. Dr. Vesna Pungerčar

#

Digitalisation
Artificial intelligence
Autonomous systems
Advanced sensors
Optimisation algorithms
Industrial and infrastructure analytics

The Centre for Digitalisation (CEDIG) develops advanced solutions in the fields of digitalisation, artificial intelligence and autonomous systems. We work on the capture, analysis and interpretation of complex data using advanced sensors (LiDAR, multispectral and thermal sensors, 3D scanners). We develop intelligent algorithms for automatic recognition, segmentation and prediction, and implement them in hardware (drones, robotic systems and industrial platforms). We test our solutions in research, infrastructure and industrial environments, where we combine scientific excellence with practical applicability.

Key areas

- Digitalisation and materials (characterisation of materials using different sensors and cameras)
- 3D scanners, photogrammetry, thermal imaging, multispectral sensors and LiDAR
- Digitalisation and automation (automated processes in hardware and software – robotic arm, drone and humanoid)
- Digitalisation and artificial intelligence (smart digitalisation – use of different types of models, - self-learning, prediction and control)



Basic and applied research

- GREMO (national project, with RC-NM): development of automated 3D scanning with a robotic arm, sensor integration and AI for automatic product recognition and control.
- AI AND QUALITY CONTROL (with CNC Borštnar): application of artificial intelligence and robotics for the automated quality control of products in small-volume production, especially for components used in the automotive industry.
- SALGO (with the Technical University of Munich): development and testing of modular building blocks made of salt-alginate material, prototype production and degradation analysis by 3D scanning and LCA.

- SRC EDIH (EU project): Rudolfovo provides industrial innovation labs and support to SMEs in the deployment of AI, robotics and the advanced digitalisation of manufacturing.
- 3D-SCULPTURES (with the Božidar Jakac Gallery) – 3D digitalisation of 25 Božidar Jakac Gallery art sculptures, processing and preparation of 3D models for publication on the Sketchfab platform and the creation of an online gallery for analysis of the sculptures.

Partnerships

- AI4LAM – international interdisciplinary cooperation (AI in cultural heritage, knowledge exchange, project applications and the joint development of solutions).
- Slovenian Concrete Association (ZSB) – cooperation with the industry in the digitalisation of materials, 3D analysis and quality control of concrete products.
- Interdisciplinary projects with research institutions and industry – joint applications, test environments and knowledge transfer into practice.
- Cooperation with museums and libraries in Slovenia – 3D digitalisation of heritage, preparation of virtual collections and joint application projects.



Centre for Social and Technological Transformations and Circularity



»The transition to a circular economy extends beyond technological solutions, requiring a systemic understanding of economic, social, and political contexts. At the centre, we produce knowledge to assess where circular models are feasible and aligned with development objectives.«

Head: Assoc. Prof. Dr. Tamara Besednjak Valič

The Centre for Social and Technological Transformations and Circularity (CEKROG) conducts research and development on sustainable social and technological transformations related to the transition to a circular economy. Its work focuses on the analysis of circular economy models, industrial symbiosis, and the broader social, economic, and political drivers of sustainable development. Particular emphasis is placed on sustainable energy systems, energy efficiency, and the role of public policies in advancing the green transition. The Centre also examines innovation ecosystems and regional development, while developing conceptual and analytical frameworks for understanding complex transformations in the economy and society.

Key areas

- Societal aspects of technological and environmental transformations
- Transition to a circular economy and industrial symbiosis
- Sustainable energy systems and energy efficiency
- Regional development and innovation ecosystems
- Developing sustainable transition policies and strategies

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Socio-technological transformations

Circular economy

Industrial symbiosis

Sustainable energy systems

Circular policies

Regional development



Basic and applied research

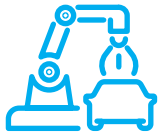
- Circular economy and industrial symbiosis research for more efficient resource management in industrial and regional systems.
- Analyses of the impact of European development policies on sustainable development, the circular economy and regional competitiveness.
- Research on sustainable energy systems, energy efficiency and the role of the energy industry in the green transition.
- Developing conceptual models for understanding social, technological and economic transformations in contemporary society.
- Analysis of innovation ecosystems and collaboration models to support sustainable development.

Partnerships

- Managing the ARIS national research project: Encouraging the development of Industrial Symbiosis Networks in Slovenia – transition to the circular economy, exploring the development of circular industrial ecosystems and the potential for the more efficient use of resources in the economy.
- Managing the ARIS national research project: GRAPEVALOR – Innovative strategies for the valorisation of grape pomace: anthocyanin extraction, pyranoanthocyanidin synthesis and energy use with life cycle analysis, which addresses the sustainable valorisation of grape pomace by exploiting bioactive compounds for the synthesis of stable natural pigments and assesses the environmental impacts of the processes through life cycle analysis.
- Participation in Horizon Europe TURING – Trustworthy Unified Robust Intelligent Generative Systems, which develops reliable, explainable and secure generative artificial intelligence systems for use in complex scientific and

technological environments.

- Participation in Interreg Danube Region Programme projects such as RuBIO – Rural bioeconomy initiative to boost the innovation and competitiveness of SMEs and DINAMIC DANUBE – Developing INnovative Alliances for Management, Innovation, and Collaboration in European BioEconomy, which promote the development of the bioeconomy, innovation ecosystems and sustainable regional development in the Danube region.
- Participation in the international project SMILE Incubator – Social Media Leadership Incubator for the Danube Region, which is developing a transnational incubator for social media leadership and fostering participation and digital competences of young people in rural communities in the Danube region.
- Interdisciplinary networking of researchers and cooperation with universities, research institutions and development organisations in Slovenia and the wider European Research Area.



Centre for Advanced Technologies



»State-of-the-art technology is most beneficial when we integrate it into our systems, enhance it with artificial intelligence and support it with our own algorithms.«

Head: Dr. Nika Brili

At the Centre for Advanced Technologies (CENT), we connect different robots, sensors, meters and production systems into a single system whose individual elements can communicate with each other, even though they may not speak the same language. We seek solutions to industry challenges by finding state-of-the-art equipment on the market and developing our own algorithms to integrate it into the system in the best possible way. At the Laboratory for Factories of the Future ({LabTOP}), we are continuously updating the demo factory to provide a modern environment for testing software solutions such as the MES system, digital twins, etc. At the Laboratory for Energy Management ({LabE}), we develop predictive and optimisation models for efficient energy use. At the Laboratory for Extended Reality ({LabX}), we monitor innovations at international trade fairs and bring them into the industrial environment.

The CENT team's core competences include:

- Integrating sensors, meters and robots into existing systems
- Developing platforms and advanced algorithms
- Programming and system architecture
- Digital twins, simulations and process optimisation

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Factories of the future
Automation, robotics and humanoids
Sensors
Energy management
Artificial intelligence and data analytics



Key areas

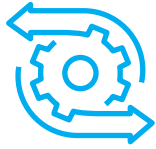
- Robotisation and automation of production systems.
- Integrating heterogeneous devices into unified platforms.
- Developing algorithms for efficient energy management.
- Virtual reality (VR), mixed reality (MR) and augmented reality (AR) for industrial applications.
- Developing algorithms for humanoid robots for integration into industrial or other environments.

Basic and applied research

- Automation of the Nanomaterials Laboratory with autonomous experiment control.
- Introduction of an advanced laser measurement system into the production line.
- Developing predictive maintenance and status monitoring of machinery.
- Using virtual reality and mixed reality to address challenges in industry and agriculture.
- Battery system diagnostics and the detection of degraded battery cells within the battery pack.
- AI models to predict electricity use and generation at 15-minute intervals.

Partnerships

- CENT is a partner in the large DigiTOP project, where it develops advanced modules for businesses together with IJS, Biostile, Datalab and other partners.
- CENT is a member of the international organisation ADRA (AI, Data and Robotics).
- CENT is a member of SRIP TOP and ACS+.
- Development cooperation with companies such as Revoz, Robotina, Datalab, JB Energija, Roletarstvo Medle, IskraPIO, Telekom and others.



Centre for Technology Transfer and Intellectual Property



»Innovation comes from courage and ideas, but its real impact only starts with the effective management of intellectual property and thoughtful technology transfer into practice.«

Head: Prof. Dr. Dolores Modic

We are exploring how new technologies and knowledge can be transferred most quickly and safely from research to practice; to business, to public institutions and society. We bridge the fields of technology transfer, intellectual property and innovation analytics (e.g. patent landscapes, trends, mapping innovation ecosystems and cooperation networks). We use a combination of data and qualitative methods to identify opportunities, risks and partnerships, especially in breakthrough technologies (e.g. quantum technologies).

We translate our findings into scientific papers and into useful tools, guidelines for decision-makers, training and digital solutions that support development planning and strengthen innovation ecosystems.

Key areas

- Technology transfer strategies
- Intellectual property
- Adoption of technologies
- Innovation ecosystems
- Academic entrepreneurship
- Applied research

#

Technology transfer (TT)
Intellectual property (IP)
Technology adoption
Academic entrepreneurship
Innovation systems
Qualitative and quantitative methods



Basic and applied research

The centre conducts both basic and qualitative research, for example:

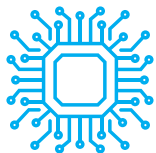
- AdoptQC provides multi-level models and (micro-macro) indicators to analyse the adoption of quantum technologies, including patent analysis.
- CSSInnoRadAR aims to establish a computational social science analytical platform for mapping the economic, political and public discourse on quantum technologies, and provides a broader insight into the spread of innovation in the quantum field.
- CRP-IL provides an analysis of IP and spin-out support, commercialisation pathways, patent pathways and recommendations for more effective knowledge transfer into practice, which we also address in practice within the KTO3 project, where we work with a number of Slovenian technology transfer offices.

- AI4VET4AI, CuLT and Digitop are focused on digital technologies, bringing e.g. digital tools and AI to education and cultural heritage – from prototype to deployment.

Partnerships

- In the field of research, our members collaborate with a number of renowned research institutions (e.g. University of Cambridge, Utrecht University, etc.), and we work in national and international project consortia, tailoring our results to the needs of our partners (analyses, prototypes and recommendations).
- Interdisciplinary work: we combine technological and social science aspects (e.g. legal, political and economic).

- Collaborative solution development: we conduct workshops, focus groups and interviews, and work with stakeholders to develop guidelines, learning materials and tools.
- Open knowledge transfer: we publish findings and share them through training, events and consultancy so they are understandable and immediately applicable.
- A bridge between research and practice: we connect researchers, companies and public institutions (from first idea to applied solution and knowledge transfer).



Centre for Applied Quantum Computing



*»Quantum computers
are becoming a reality.
We are exploring what can
actually be calculated with them.«*

Head: Prof. Dr. Janez Povh

At the Centre for Applied Quantum Computing (CEQ), we work on complex computational problems arising from practical optimisation or from the computation of complex data models. We are developing new algorithms to solve them – pure quantum and hybrid quantum-supercomputing algorithms – and test them on existing quantum computers and supercomputers. In this, we use quantum annealers, quantum computers with quantum gates, quantum emulators and Europe's top supercomputers.

We use the most powerful quantum computers available through the EuroHPC JU (D-Wave, IonQ, Pasqal and AQT).

The CEQ team's core competences include:

- mathematical modelling, the development of advanced algorithms, programming code for quantum computers and supercomputers,
- and the ability to use Europe's top quantum computers and supercomputers.

#

Quantum algorithms
Quantum-supercomputing algorithms
Practical optimisation
Mathematical optimisation
Quantum annealers
Digital quantum computers



Key areas:

- Translating practical problems into computational problems
- Developing advanced algorithms to solve hard computational problems.
- Coding these algorithms into efficient software code for quantum computers and supercomputers.
- Testing and running this code on Europe's top quantum computers and supercomputers.

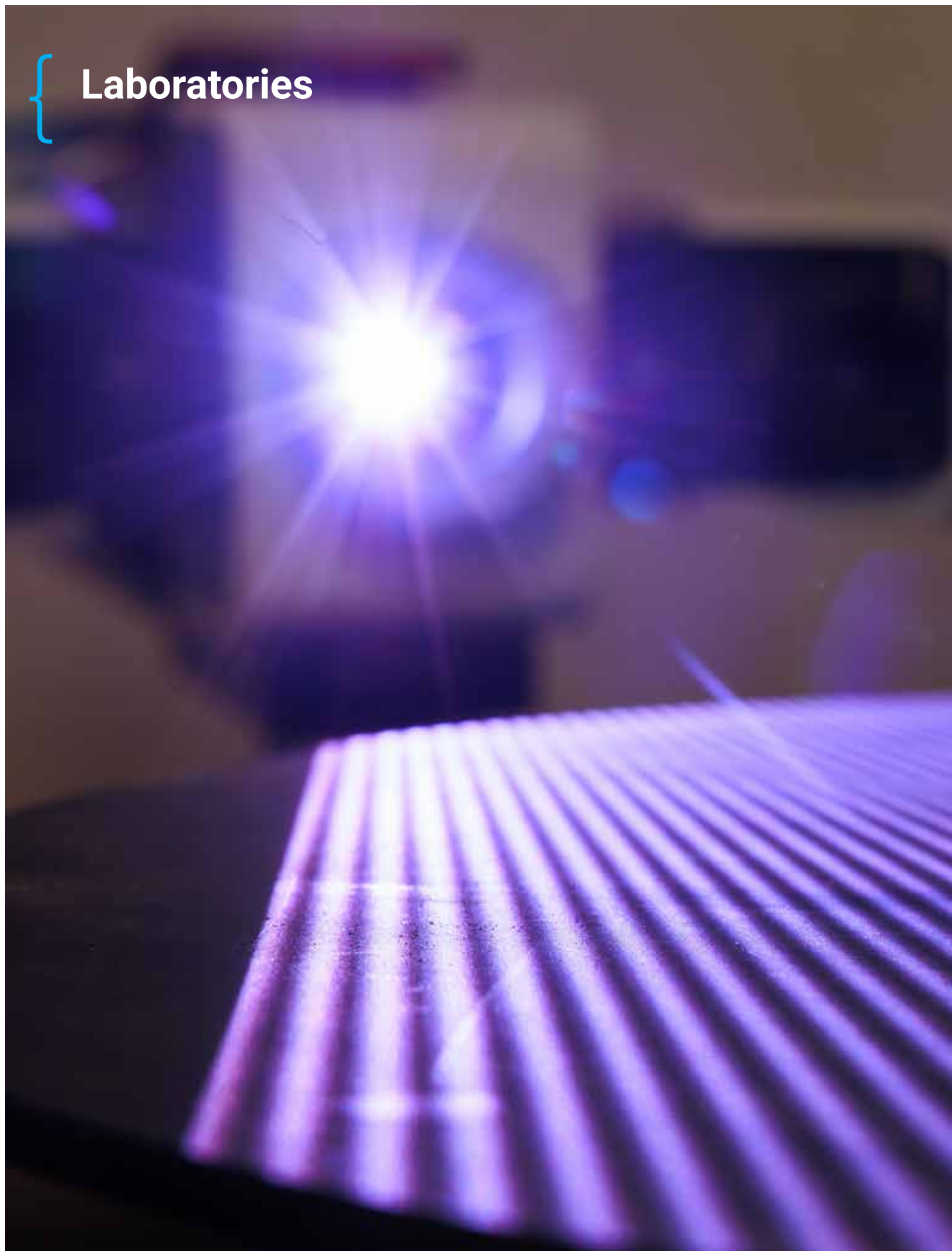
Basic and applied research

- At CEQ, we use quantum computers to solve the problem of factorising large numbers, which is crucial for the cryptographic security of electronic communications, and the scheduling problem, which appears in various forms in production optimisation, as well as the graph colouring problem and the maximum independent set colouring problem, which are among the hardest problems in mathematical optimisation.
- We have developed a hybrid quantum-supercomputing software package, QBIQ, which searches for local and global optima of hard optimisation problems, and runs on the Vega supercomputer and the D-Wave quantum computer at the Forschungszentrum Jülich research centre in Germany.

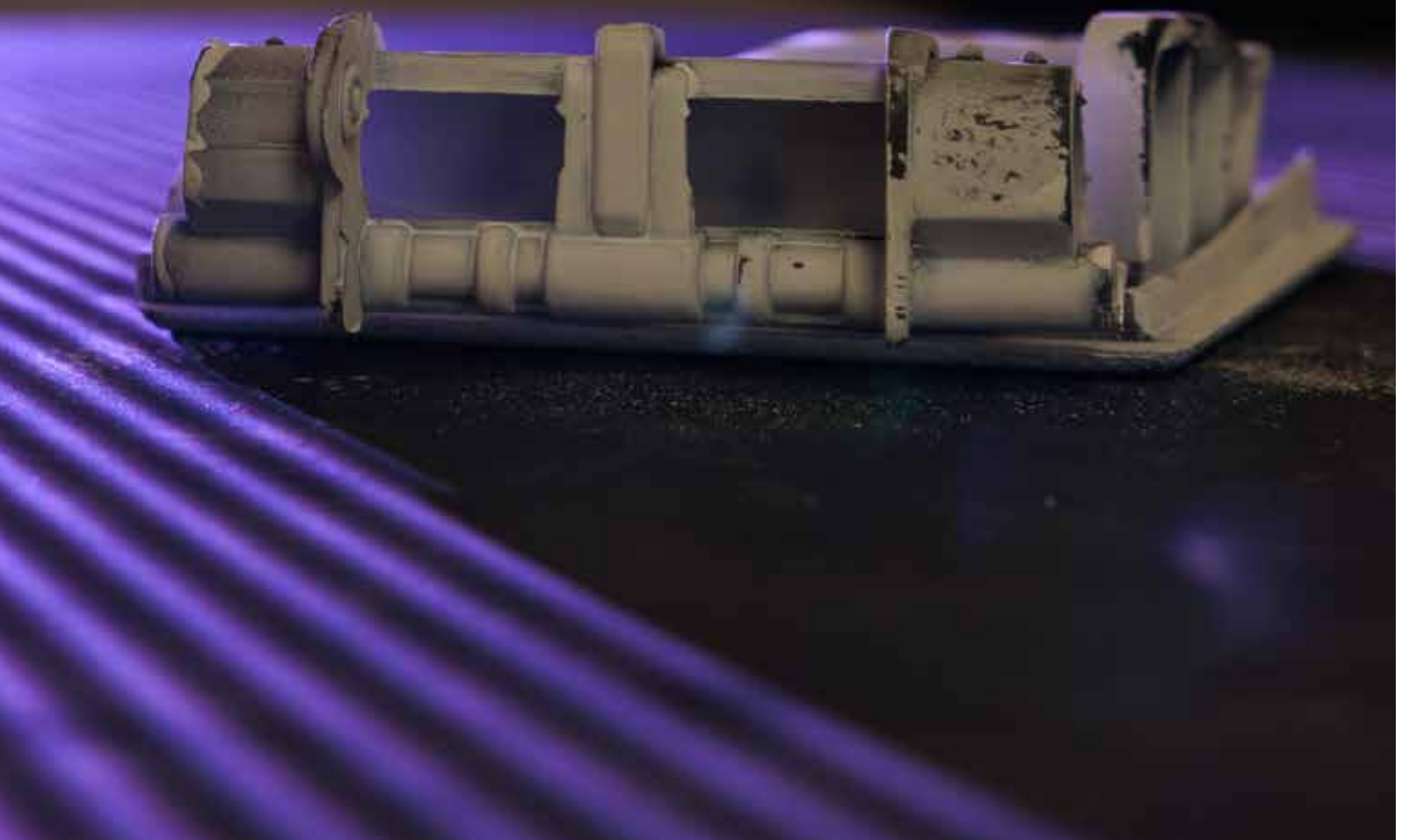
Partnerships

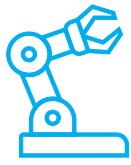
- CEQ is a partner in the Quantum Excellence Centre for Quantum-Enhanced Applications (QEC4QEA).
- CEQ is a member of the Slovene quantum science and technology community (QUTES).
- CEQ represents Rudolfovo in the European Quantum Industry Consortium (QuIC) and the Slovenian National Supercomputing Network (SLING).

{ Laboratories



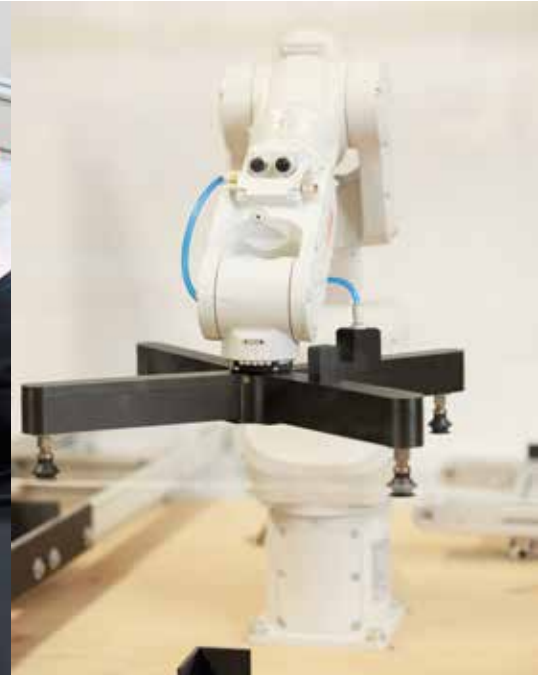
3D scanning of an industrial product with the structured light scanner.





Laboratory for Factories of the Future – {LabTOP

Administrator: Vinko Longar, vinko.longar@rudolfovo.eu



{LabTOP – Laboratory for Factories of the Future is dedicated to integrating industrial equipment from different manufacturers, from robots and sensors to complex production systems, into a single digital and data-driven environment. The lab has a demonstration smart factory for testing advanced software solutions such as digital twins, optimisation models and MES systems. The development of proprietary algorithms and the integration of state-of-the-art industrial equipment are carried out in conjunction with existing processes. Special emphasis is placed on automation, robotics and artificial intelligence. The laboratory allows solutions to be validated in a real-world environment before being transferred into industrial practice. Collaboration with industrial partners and research institutions supports the digital transformation of production and the development of new solutions.

Key research and development activities

- The robotisation and automation of production and laboratory systems
- Integrating quality control systems with machine vision and laser sensors
- Digital twins and production process simulations
- The development of an AI assistant for diagnosis and support in process troubleshooting
- Implementing AI algorithms to optimise production order allocation
- Testing, demonstrating and validating solutions in a demo smart factory

Equipment

- Industrial and collaborative robots:
- ABB IRB1100
- Yaskawa GP7
- Fanuc CRX-10iA
- FANUC R-1000iA/80F
- Omron i4D
- Omron LD60 mobile robot
- Cognex In-Sight 7800 machine vision system
- iRVision 3DV robotic vision system
- iComox predictive maintenance system
- Energy consumption monitoring and recording system
- Fanuc education cell with ER-4iA robot



Laboratory for Extended Reality – {LabX}

Administrator: Tomaž Jakša, tomaz.jaksa@rudolfovo.eu



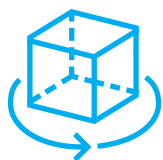
The Laboratory for Extended Reality ({LabX}) is an advanced high-tech laboratory for research and development in XR technologies. It combines cutting-edge virtual reality (VR), augmented reality (AR), mixed reality (MR) and extended reality (XR) equipment, enables the development, testing and validation of interactive digital environments and simulations, and supports industrial, research and educational projects. It also includes systems for haptic feedback and measuring physiological responses. The laboratory is a comprehensive platform for the development of innovative XR solutions.

Key research and development activities

- Developing and testing VR/AR/MR applications
- Simulations of industrial and work processes
- User experience and interaction research
- Integration of haptic and biometric systems
- Training in virtual environments

Equipment

- Varjo XR-3 (MR headset)
- Vuzix M4000 (AR headset)
- Bhaptics TactGlove (haptic gloves)
- SenseGlove haptic glove
- Meta Quest 3, Valve Index (MR headset)
- Microsoft HoloLens 2 (MR headset)
- Cyberith Virtualizer Elite 2 (motion platform)
- Tesla Suit, Emotiv Epoc X EEG (haptic suit), EEG headset



Laboratory for 3D Technologies – {Lab3D

Administrator: Dr. Slavko Arh, slavko.arh@rudolfovo.eu



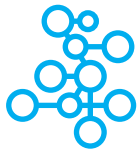
{Lab3D is a 3D digitalisation laboratory where the physical and digital worlds are linked by advanced 3D scanning technologies. It captures the geometry of objects in point clouds and meshes and processes the data for quality control, reverse engineering, 3D printing and the digital preservation of cultural heritage. Various devices are used (optical and laser 3D scanners, LiDAR, drone with LiDAR and photogrammetry). Automated scanning systems are also being developed, as is the use of artificial intelligence to analyse and optimise processes faster. Cooperation with industry and research institutions in Slovenia and abroad is being actively pursued.

Key research and development activities

- 3D digitalisation of objects and surfaces using optical, laser and LiDAR technologies
- Point cloud processing and 3D mesh reconstruction for accurate digital models
- Product quality control by the dimensional comparison of 3D scans and CAD models
- Reverse engineering to produce technical documentation and prepare for 3D printing
- Digitalisation of cultural heritage and the preparation of virtual galleries and multimedia presentations
- Drone data capture to inspect infrastructure, facilities and hard-to-reach locations
- Thermal and multispectral analysis for the detection of damage, anomalies and the degradation of materials, objects and large surfaces

Equipment

- ABB CRB 15000 Gofa collaborative robotic arm
- DEWESoft DEWE-43A Data Acquisition System (DAQ)
- Intel RealSense D435i stereo depth camera
- Thor3D Calibry handheld 3D scanner
- Vylo Raptor3DX industrial 3D scanner
- Industrial handheld 3D laser scanner – Creaform MetraSCAN BLACK Elite
- Leica BLK360 3D laser lidar scanner
- DJI Matrice M350 RTK drone
- DJI Zenmuse L1 3D laser lidar scanner
- DJI Zenmuse H20T high resolution thermal camera



Materials Laboratory – {LabM

Administrator: Assist. Prof. Dr. Vesna Pungercar, vesna.pungercar@rudolfovo.eu



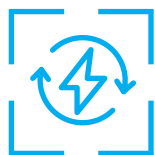
{LabM is a materials analysis and characterisation laboratory where advanced measurement methods are used to study the internal structure of materials. Non-destructive analysis is carried out using a CT scanner, which provides a detailed view of porosity, cracks and other microstructural features. This method is used for testing new materials and for the quality control of products in industry. CT analysis also allows components to be checked without disassembly and hidden defects to be detected. It also plays an important role in the field of cultural heritage, where it provides insight into the internal structure of artefacts without damaging them. It is also used in materials analysis in pharmaceuticals and other high-tech applications.

Key research and development activities

- Non-destructive analysis of the internal structure of materials and products
- Detection of porosity, cracks and defects in materials
- Dimensional analysis and quality control
- Component analysis of safety-critical elements
- Analysis of the tangible cultural heritage (internal structure and damage)
- Pharmaceutical applications (homogeneity and density analysis)
- R&D support for reverse engineering and prototype validation

Equipment

- Nikon Metrology XT V 160 CT scanner



Laboratory for Energy Management – {LabE

Administrator: Jure Kos, jure.kos@rudolfovo.eu



The laboratory specialises in the development and testing of energy systems and advanced energy management technologies. We focus on sustainable solutions that optimise efficiency and reduce negative environmental impacts.

The laboratory is equipped with advanced engineering equipment, including high-quality battery systems, solar panels, generators, inverters and control systems for energy management. In addition, we have a supercapacitor for testing and a V2X charging station – so we can also use EVs for electricity storage in our system.

Research and development activities

- Developing advanced energy management algorithms
- Research into different energy sources and energy storage solutions to optimise the use of resources

Equipment

- Battery system
- Solar panels
- Supercapacitor
- Petrol generator
- EV charger with V2X

Services

	Centres	Laboratories
Simulations for automated and robotic production lines		
Offline programming of robotic cells		
Prototype development, technology testing and demonstration		
Developing virtual, augmented and extended reality solutions		
3D scanning of various objects for 3D printing		
Quality control – dimensional comparison of scanned real objects with a 3D computer model		
Reverse engineering		
Creating parametric 3D models based on scanned objects		
3D scanning of objects to preserve a digital copy of these objects		
Nikon XT V 160 radiographic and CT scanning		
Electrochemical tests for different materials		
Carrying out LCA analyses		
Advice on using quantum computers to solve computational challenges		
Analysis of intellectual property protection		
Assistance in drafting patent applications, representation in trademark and design applications		Innovation Office
Assistance in the preparation and implementation of complex projects		
Advice and support		

{ Innovation Office

The Innovation Office is part of the Shared Services unit at Rudolfovo and carries out knowledge and technology transfer activities, linking research and development activities with industry and the broader social environment. Its mission is to promote innovation, support Rudolfovo researchers and partners in the development and commercialisation of research results, and strengthen cooperation between the scientific-research community and industry.

The Innovation Office provides expert support in protecting intellectual property (patents, designs, trademarks, copyrights), prepares assessments of the market potential of technologies, and advises on selecting appropriate knowledge transfer strategies. It is actively involved in establishing partnerships with industrial and other external stakeholders and supports the preparation and implementation of projects that include elements of innovation and knowledge commercialisation. Its key tasks also include identifying the innovation potential of research results; capturing innovation and inventions from employees; advising on cooperation, licensing, and technology transfer agreements; supporting the establishment of spin-out companies; organising training sessions and workshops in the fields of innovation, entrepreneurship, and intellectual property protection; and monitoring and analysis of innovation indicators.

Through its activities, the Innovation Office contributes to increasing the social and economic value of Rudolfovo's research achievements and strengthens its role as an important partner in the regional, national, and international innovation ecosystem. Since 2025, it has also been registered as a PATLIB centre within the European Patent Office network, which means that enterprises and citizens can visit the Innovation Office for advice on intellectual property matters. The first consultation is free of charge, and appointments can be arranged via email: info@rudolfovo.eu.

The Innovation Office's activities are funded through the Call for Proposals to support the activities of Knowledge Transfer Offices (JR KTO).

This publication is funded under the Public Tender for Supporting Knowledge Transfer Office Activities (JR KTO).



REPUBLIC OF SLOVENIA
MINISTRY OF HIGHER EDUCATION,
SCIENCE AND INNOVATION



Co-funded by
the European Union

{ Open science

Open science is at the core of research at Rudolfovo. It is based on transparency, accessibility and responsible knowledge management. In doing so, we follow the internationally established FAIR principles, which reinforce the long-term utility and value of research.

Rudolfovo is a consortium partner in the national project SPOZNAJ – Support for the implementation of the principles of open science in Slovenia. The project has contributed to the development of joint guidelines, support mechanisms and researcher competences in open access and research data management.

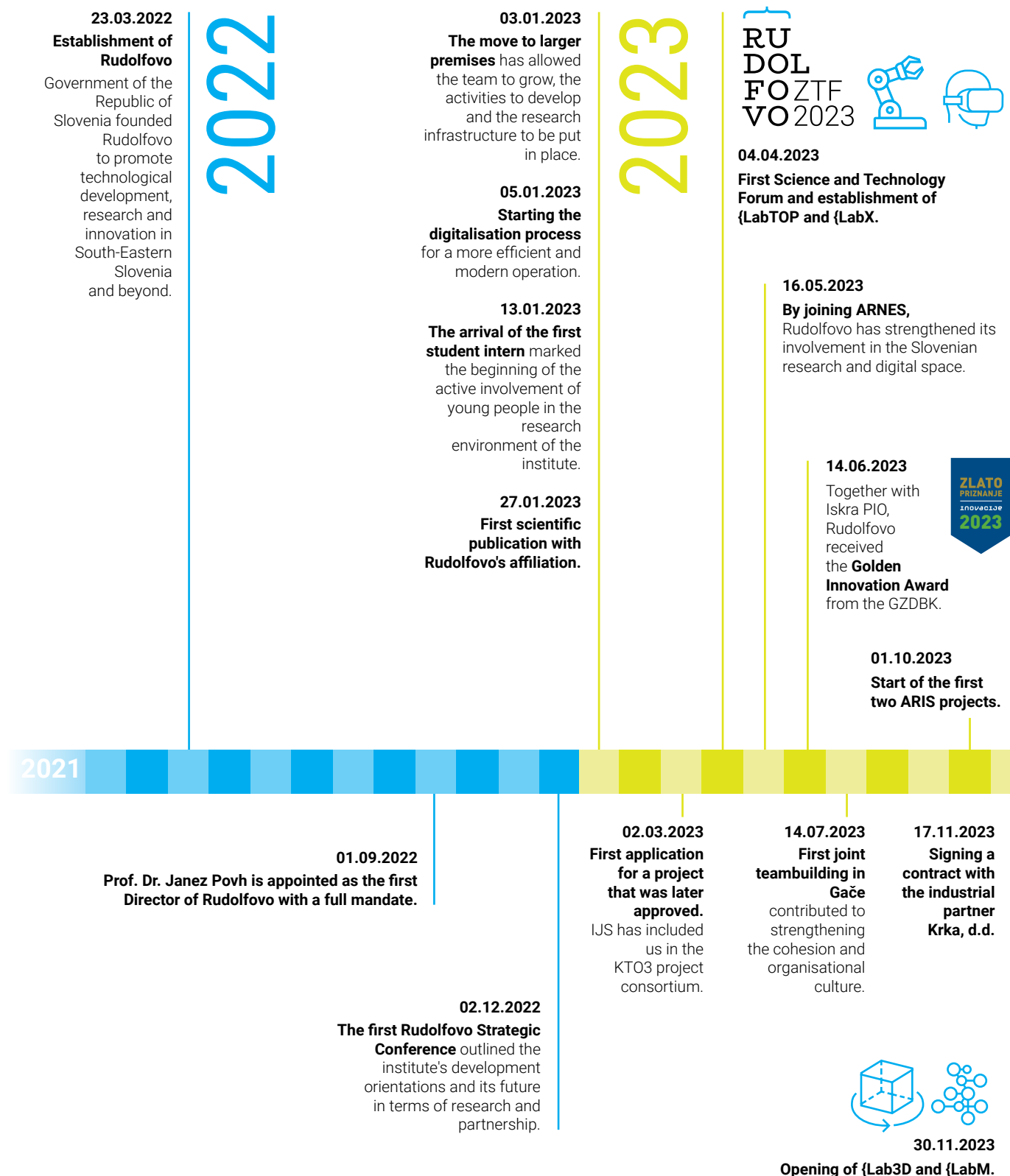
The experience gained and the structures put in place provide an important basis for the further development of open science at Rudolfovo. We are also part of the Slovenian Open Science Community (SSOZ), a national network that connects open science stakeholders in Slovenia and promotes the development of common standards and the exchange of good practices.

Open science is supported by an internal action plan and the Rules on Open Publications, the Rules on Research Data Management and the Code of Ethics. We have revised the job classification system to formally establish a dedicated position for an open science specialist within the institute. Expert support is provided through the Information Resources Office, where advice is provided in managing research data, drawing up research data management plans, selecting repositories and the licensing of results. We also provide researchers with open publication vouchers to further encourage open access publishing.

Research publications are archived in the Digital Repository of Slovenian Research Organisations (DiRROS), and we support research data management through our internal infrastructure and by encouraging the storage of such data in trusted repositories. This ensures its safe storage, traceability and long-term accessibility.

Open science at Rudolfovo reflects an ongoing commitment to transparent, responsible and inclusive research. It provides a foundation for long-term quality, collaboration, and the creation of broader societal value.

{ Timeline 2022–2026



2024

**RU
DOL
FOZTF
VO2024**



26.03.2024
Second Science and
Technology Forum and the
establishment of {LabE.

27.03.2024
Contract with the industrial
partner Revoz.



12.06.2024
Rudolfovo was awarded
the GZDBK Silver
Innovation Award and
the PGZ Silver Award.

2025



01.03.2025
Establishment
of the Centre
for Applied
Quantum
Computing.

**RU
DOL
FOZTF
VO2025**

25.03.2025
Third Science and
Technology Forum.

13.05.2025
Strategic Conference 2025
provided an overview of what has been
achieved and outlined the institute's future
development orientations.

2026

14.08.2024
Signing a contract
with the industrial
partner
Robotina d.o.o.

25.11.2024
First Horizon
Europe
project:
QEC4QEA
in the field
of quantum
technologies.

01.12.2024
Rudolfovo had grown to more than
50 employees by the end of 2024.

20.06.2025
Rudolfovo receives three GZDBK
Innovation Awards: Gold, Silver
and Bronze.



Achievements and awards

Over the past four years, Rudolfovo has strengthened its collaboration with industry and successfully translated research results into award-winning solutions. At competitions and contests organised by chambers of commerce, we have received several prominent awards, even when competing against the region's largest companies, with Rudolfovo standing out as the only public research institute.



Rudolfovo representatives took part in the Innovation Day 2023 at Brdo pri Kranju, where national awards were presented to the best Slovenian innovators.





Awarded projects include solutions with a direct impact on productivity, quality and sustainability. The Gold Innovation Awards confirm the breakthrough nature of collaborations with industry: an innovation developed with Krka uses robotics and artificial intelligence to make the mechanical resistance testing of pharmaceutical tablets more accurate and reproducible, reducing costs and waste. The Golden Award was also presented for the use of virtual reality in pharmaceutical and biopharmaceutical industry processes for the client Iskra PIO, supported by the equipment of the Laboratory

for Extended Reality ({LabX). These significant achievements are complemented by the Silver and Bronze Awards: helpAR, the first Slovenian remote assistance application featuring augmented reality and connection to PLCs, improves diagnostics and reduces maintenance costs; ThermoBoost, developed with Energetik, increases the efficiency of existing heating systems and has led to a patent application; the {LabE innovation is protected by a European trademark and service mark (EUIPO). The MES+ERP platform, developed with Datalab, is the first Slovenian

solution to seamlessly integrate MES and ERP systems, enabling companies to better control processes, use resources more efficiently and make decisions faster.

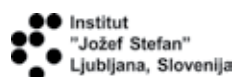
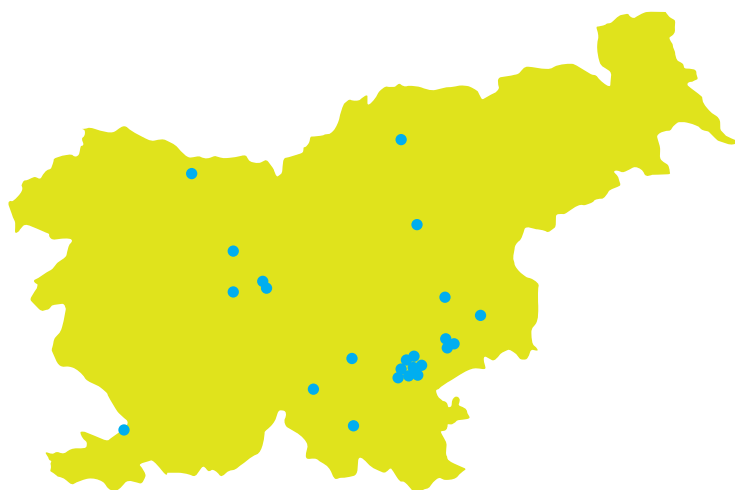
At the professional and academic level, Rudolfovo is also recognised for the achievements of its staff. Many of our researchers and mentors have received Nahtigal Awards at the Academic Evenings of the Dolenjska Academic Initiative Association.



The awards confirm the quality of Rudolfovo's work and its contribution to the development of knowledge, innovation and academic excellence in the region. The common denominator of all the achievements is the measurable transfer of developed solutions that increase the competitiveness of partners, support sustainability goals and demonstrate that science can generate concrete innovations with a direct impact on the development of the region.



{ References



Benefit from the availability of
our equipment and expertise
for your projects.

Connect with our world-class
researchers and let's innovate
together.

Co-create the future with us
– let's join forces to develop
joint projects.



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