CZECH SPACE

DIRECTORY

2022/2023

Czech Republic
Ministry of Transport

Content

Prague, Czech Republic, is featured in this image captured by the Copernicus Sentinel-2 mission.

Organisation of Space Activities

Since 2011 the Ministry of Transport of the Czech Republic is the coordinator of all space activities in the Czech Republic. For effective and transparent coordination, the Minister of Transport established a Coordination Council as his permanent advisory and initiatory body.

The Coordination Council consists of high level representatives of the Ministry of Transport, the Ministry of Industry and Trade, the Ministry of Education, Youth and Sport, the Ministry of the Environment, the Ministry of Foreign Affairs, the Ministry of Defence and the Office of the Government of the Czech Republic. The Coordination Council has established cross-sectional committees as an interface with industry and academia – "Industry and Applications" and "Science Activities". The "Security and International Relations" Committee deals with security and international aspects of space activities.

The Ministry of Transport has been responsible for elaborating and delivering the National Space Plan to the Government of the Czech Republic. The document has been updated in cooperation with other relevant Czech ministries and bodies and the new plan was approved by the Government in October 2019. The National Space Plan 2020 – 2025 represents a basis for decision-making of further Czech involvement in space, support of industry and academia, and participation in European and international projects and programmes. The Czech Republic acceded to the European Space Agency (ESA) in November 2008 and the Ministry of Transport provides the only formal interface to the European Space Agency in the Czech Republic. The Ministry of Transport is also responsible for all space issues in the European Union, in particular the European space policy and the administration related to Galileo and EGNOS programmes.

Concerning Copernicus Programme, it shares its responsibility with the Ministry of Environment. The successful bid for the European GNSS Agency (GSA) seat in Prague has also been coordinated by the Ministry of Transport team. The GSA has transformed into the Agency for the EU Space Program (EUSPA) in 2021.

CZECH SPACE PORTAL

Space Strategy and Major Activities

The National Space Plan 2020 – 2025, which was approved by the government in October 2019, defines the long-term vision for the Czech Republic, which builds upon the two previous National Space Plans (from 2010 and 2014), i.e.:

- To have an international image of industrial and scientific excellence;
- To be a high value-added economy;
- To be competitive and innovative;
- To be capable of absorbing and retaining the intellectual capital it creates;
- To be an example of an excellent complementarity and cooperation between its industrial and academic tissues;
- To be an expert user of space resources and infrastructure in operational products and services (EO, navigation, etc.).

The main objectives entailed in this vision are:
- Czech Space Capacity and Capability Building to Increase Excellence and Competitiveness
- Active Position in International Relations to Increase Visibility of the Czech Republic

The plan also sets out specific goals, in particular to:
- maximise return-on-investment,
- be compliant with market trends and needs,
- create, protect and exploit IPR,
- be innovative and disruptive,
- foster excellence,
- create synergies between SMEs and large industries,
- increase the ratio of private investments,
- stimulate and accelerate technology and knowledge transfer.

Space activities of the Czech Republic include especially:
- Participation in ESA mandatory activities and especially in ESA optional programmes, which are the main tool for the development of Czech space activities.
- Participation in EU space programmes and in the EUMETSAT programmes.
- Securing ESA's support of space-related activities in the Czech Republic through a dedicated framework project.
- Development of space technologies, design, analysis and testing.
- Space applications development activities in several sectors, e.g. transport, industry, environment and resource management.
- Space-related scientific research at universities and institutes of the Academy of Sciences of the Czech Republic.

NATIONAL SPACE PLAN 2020-2025

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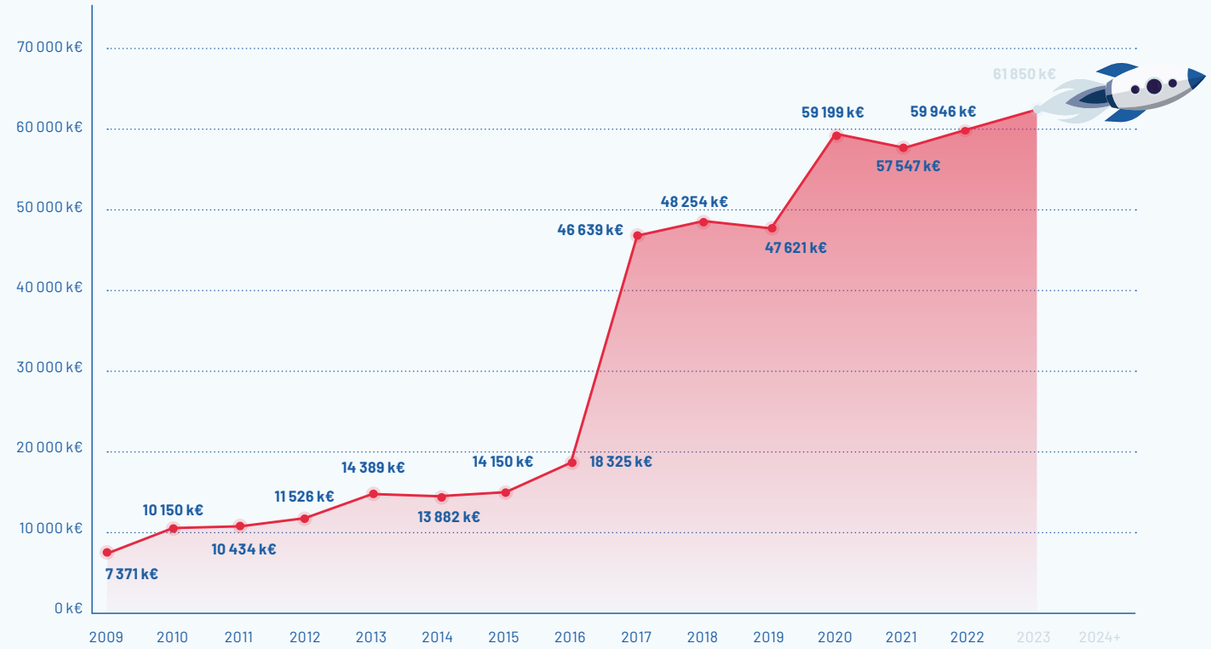
ARIANESPACE/OPTIQUE
VIDEO DU CSG/JM GUILLON
VA257 liftoff

Czech Republic Contributions to ESA



Timeline

Evolution of the Czech Space Activities

1978 First astronaut Vladimir Remek and satellite Magion

1996 ESA Cooperation Agreement signed

2008 ESA full membership

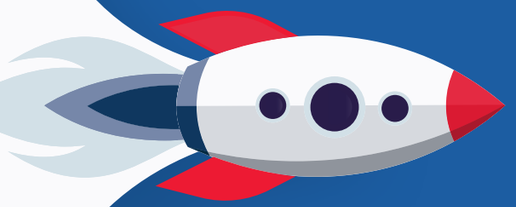
2010 IAC organised in Prague

2012 GSA moved to Prague

2018 First Czech Space Week

2021 EUSPA was established and replaced GSA in Prague

2022 Three Czech satellites launched in 5 months



Czech Space Capacities and Capabilities

Multi-Discipline Technologies

- **Design, Simulation and Testing of Mechanical Systems for Space Applications:** Stress, thermal and fluid dynamic calculations; Fatigue life and fracture mechanics evaluation; Design of highly loaded components and their optimization; Numerical computation involving complex physical effects; Climatic, mechanical and life-time testing of components, parts and materials; Additive manufacturing; Composite production and bonded sandwich structures, epoxy adhesives for extra high strength bonds; Production and delivery of qualified mechanical parts, assembled modules and subsystems.
- **Flight Hardware Design and Production:** Development of digital circuits and single-chip microcontrollers; In-flight use of wireless sensors; System health monitoring (SHM); Space hi-rel electronics cleanroom manufacturing activities; Products for crystal chemistry, growth of crystals for technical applications, optics including x-ray, acousto-optics, electro-optics etc.; Equipment for material sciences and technology in space; Development and manufacturing of apparatuses and devices according to specific requirements, including use of COTS components suitable for space environment.
- **Inertial Sensors for Space Application**
- **Electric Power and Controls for Space Applications:** Power management, including conversion and distribution; Electric actuation; Energy storage systems (including energy accumulation and generation); Thermal management;
- **Software:** On-board software (Flight Software for various missions; Complete software packages; StartUp SW, Mission critical SW & Application SW); Ground segment software (Satellite Control Systems, Mission Control System and EGSE; robotization of antennas and telescopes, control systems development, tracking software); Software development for the Earth Observation and Navigation Services Infrastructure.
- **On-board Systems:** avionics incl. hardware, software, network interfaces / data buses, modules to provide integrity of on-board data systems, integrated test-beds, AOCS.
- **Laser Technologies:** various laser instruments, laser communication, laser tracking of space debris (photon detectors), space resources prospecting and analysis.
- **Development of High Altitude Platforms/Pseudosatellites (HAPs)**
- **Midstream Segment:** Building of whole mission operation centres, uplink and downlink communication antennas and related infrastructure; Building and operation of data centres and archives, computational and dissemination platforms for EO or any other kind of space data; Big data computing, cloud computing.

Earth Observation (EO)

- EO data processing – multispectral, hyperspectral and SAR data. Development of new EO data based products (incl. integrated applications) based on EO data, e.g. SAR ground motion and infrastructure monitoring, SAR, multispectral and hyperspectral data for environment applications, agriculture, land use, land cover, monitoring or natural disasters, monitoring and modelling of atmosphere etc., development of new processing algorithms;
- Laser scanning data use / products development;
- Integration of EO data based information into GIS and customers systems, services for both midstream and end-users;
- Scientific EO data processing, e.g. GOCE, SMOS, SWARM and others;
- Machine learning and Artificial Intelligence for EO data processing; blockchain based services / technologies for EO;
- Spectroscopy, spectrometry, SAR interferometry, gravimetry;
- Calibration / Validation, development of Internet of Things (IoT) networks, which could serve for calibration and validation of EO data;
- Cryogenic and coolers for cooling of the payload on EO satellites;

Satellite Navigation

- Precise time and clocks (on-board management of atomic clocks or for precise time distribution through optical satellite networks); GNSS science (atmospheric effects on propagation of electromagnetic waves); space geodesy; precise orbit determination of satellites;
- Building and operation of GNSS permanent reference station networks (excl. manufacturing of the GNSS receivers / antennas); Developing software suites for real time monitoring performance of GNSS, across all international constellations and over extended periods, showing relative trends among different constellation developments;
- GNSS enabled applications in many domains (transportation and logistics, fleet management, intelligent transport systems, e-Call, drones, environmental protection, civil engineering, precise agriculture and forestry, personal tracking and health monitoring, location based services, sports, geo-marketing, media and entertainment etc.); autonomous mobility (automated and connected cars, precision agriculture by automated tractors and harvesting vehicles); crew management of police and rescue forces in crisis and emergencies.

Czech Space Capacities and Capabilities

Satellite Communication

- SatCom airborne terminals development for both civil and military aviation including unmanned aerial vehicles (UAVs), associated products like high power amplifiers, data links and security gateways (focus on safety critical air-ground data and voice communication for air traffic management);
- Secured quantum optical communication (unbreakable quantum encryption techniques, laser photon emitters and receivers and sensor heads);
- modelling of electromagnetic field propagation through the atmosphere;
- space and ground hardware development (super-capacitors, solar panels deployment mechanisms, antenna pointing mechanisms, propellant tanks and other components);
- Satellite TV, integrated applications.

Launchers and Propulsion Systems

- Mechanisms and composite and metallic structures; Low shock Hold Down Release Actuators;
- Monomers and polymeric materials (coatings, adhesives, casting resins); Synthesis and tailored surface modifications of nanoparticles; Nanocomposites and hybrid composites; Thermo-insulation materials; Multifunctional anticorrosive coatings;
- Embedded microcontrollers; In-flight use of wireless sensors; Structural health monitoring systems;
- Pyrotechnical systems; Separation systems for small satellites;
- Computational mechanics; System level design Launcher aerodynamics, aerothermodynamics, launch acoustics;
- Payload Fairing technologies; Isolation systems and payload comfort damping;
- High-performance Valves and control electronics;
- Inertial sensors for inertial navigation, on-board computer navigation and control systems Thrust Vector Control (TVC) technology based on electromechanical actuators;
- Electrically driven pumps for rocket propellants; High-performance valves for cryogenic rocket engines and their control electronics.

Space Situational Awareness (SSA)

- **Space Weather (SWE):** Provision of SWE services (Solar activity forecasts, Real-time Ionospheric monitoring, Daily geomagnetic forecasts, Radiation dosimetry); SWE sensors exploitation (Solar white light and H-alpha imaging, Solar radio observation, Ionospheric measurement, Geomagnetic observations); SWE Application development (Ionospheric disturbance detection and monitoring, Magnetospheric research, geomagnetic disturbance forecasts, Dosimetry applications for crewed space missions); SWE sensors development (various fields); SWE studies and modelling; SWE data processing;

- **Space Surveillance and Tracking (SST):** SST monitoring and cataloguing; SST data processing and Software applications development; SST Assets networking technologies; SST sensors development and qualification (optical and laser technologies); telescope control and processing software;
- **Near Earth Objects (NEO):** NEO observations & information provision; NEO mitigation support (incl. fireball monitoring); Advanced NEO spectroscopy technologies; Research and development in the field of special optics, optoelectronics systems and optical measurement methods, robotisation and remote control of telescopes; NEO Software development (tasking and scheduling of telescopes, long-term archiving and analysation of NEO data).

Space Science and Exploration

- Various scientific instruments, including e. g.: Langmuir probes, thermal plasma measurement units; Low frequency wave receivers; Wave analysers; Space radiation detectors; Micro-accelerometers; Single photon laser detectors; X-ray scintillation; Power supply and distribution units; Optical assemblies; Plasma wave instrument units for Solar Orbiter mission; Scientific data simulations; High-power lasers; High-resolution mass spectrometry etc.

The main Czech goals in academia in the field of space R&D area include:

- **For space physics:** plasma and radiation environment near Earth and in solar system, solar research, meteorite research, objects in solar system, stellar research;
- **For Earth sciences and EO data applications:** gravitational research, space geodesy, magnetospheric and ionospheric research, planetary atmospheric spectroscopy and analytical chemistry, atmospheric and hydrological research, mineralogical and carbon cycle studies, land cover and urban development, disasters management;
- **For life sciences:** biological research (algae grow) and radiation biological modelling, psychological aspects (stress) of spaceflight;
- **For telecommunication research and application:** atmospheric radio propagation, generic satellite navigation signal receiver development, indoor signal modelling, microwave onboard transmitters;
- **For propulsion systems research:** system analysis, innovative thermal protection, structural and thermal modelling, pyrotechnic devices;
- **For space platform systems:** small satellites systems, electronic and electromechanical systems, robotic systems, composite advanced materials, optical and polarization filters;
- **For ground segments:** satellite data processing architecture and method development, spacecraft ground control and testing procedures.

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The Pillars of Creation are set off in a kaleidoscope of colour in the NASA/ESA/CSA James Webb Space Telescope's near-infrared-light view. The pillars look like arches and spires rising out of a desert landscape, but are filled with semi-transparent gas and dust, and ever changing. This is a region where young stars are forming – or have barely burst from their dusty cocoons as they continue to form.

Industry

5M

- INDUSTRY
- MANUFACTURING
- R & D
- TESTING

5M s.r.o.

General description

5M s.r.o. is a medium-sized company operating in area of the development and manufacturing of composite materials, sandwich panels and related subsystems. 5M has a wide range of customers in space applications and aircraft manufacturing as well as in transport (trains, trams, buses). Investments to R&D are roughly 8% of the company annual turnover. 5M was awarded as the Company of the Year of 2010 in the Czech Republic.

Competences & Capabilities

Development and manufacturing of structural composite parts such as sandwiches and sturts. Development of mechanical subsystem for solar arrays, manufacturing of small size solar arrays. Design and manufacturing of radiation shielding. Development and supply of structural epoxy film and paste adhesives, epoxy resins, pre-impregnated fabrics (prepregs, semipregs). Development and manufacturing of composite and sandwich structures for optics.

Major Space Projects & References

- Programme: ESA
  Name: PLATO Service Module Structure Model Panel
  Prime contractor: 5M s.r.o.
  Subcontractors: OHB System AG, SAB Czech Republic
  Duration: 2020-2022

- Programme: ESA
  Name: Flexible Solar Array Mechanical Subsystem Development and EM for NOVACOM II
  Prime contractor: Thales Alenia Space France
  Subcontractors: 5M s.r.o., Frentech Aerospace, LK Engineering, BD Sensors and VZLU
  Duration: 2020-2023

- Programme: ESA
  Name: Flexible Solar Array Mechanical Subsystem
  Prime contractor: 5M s.r.o.
  Subcontractors: Thales Alenia Space France, Frentech Aerospace, LK Engineering, BD Sensors and VZLU
  Duration: 2019-2021

Space Related Equipment, Labs & Certificates

- AS/EN 9100:2009
- EN ISO 9001:2009
- POA PAR 21.G EASA 748/2012
- DIN 6701 A1
- IATF 16949

1

Contact

5M s.r.o.
Na Záhonech 1177
686 04 Kunovice
Czech Republic
www.5m.cz

Responsible for space and ESA projects

Ing. Richard Pavlica, Ph.D.
P +420 572 433 740
M +420 731 616 350
E richard.pavlica@5m.cz

Facility

- 17.000 m² of production space
  - 3000 m² of area with controlled temperature and air filtration
  - 100 m² clean room ISO 8
  - 300 m² of labs with controlled climate
- 250 employees

Equipment

- Autoclave up to 250°C, diameter 2000 mm, length 4000 mm
- Automated cutting of prepreg
- Laser positioning system for prepreg lay-up
- Several CNC machines up to part dimensions 7500 x 1400 mm
- Kuka robotic arm
- Ovens up to 250°C, dimensions of 6000 x 3000 x 2200 mm
- Presses up to 180°C, maximum dimensions 3000 x 1700 mm
- Pullpress up to 180°C for various tube diameters
- 9 pultrusion lines

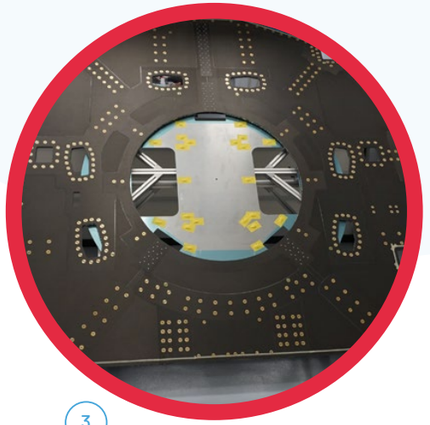
Labs

- Universal testing machines, load cells up to 100 kN equipped with environmental chamber for temperature range from -180°C to +250°C
- Thermal cycling chamber (-70°C to +180°C)
- Thermal vacuum cycling chamber (-210°C to +200°C)
- Thermal chamber with controlled humidity (10-95%)
- Outgassing Measurement Device
- CNC atmospheric plasma treatment 600 x 850 mm
- CTE measurement with DIL 822 (Dilatometer)
- DMA (Dynamic Mechanical Analyser)
- TGA 2 (Thermogravimetric Analyser)
- Rheometer Discovery HR1
- DSC 1 (Differential Scanning Calorimeter)

Quality Control

- CMM (maximum part dimensions 3000 x 1500 x 1200 mm)
- Optical microscopy
- Ultrasonic and thermographic non-destructive testing

2



3

[1] Radio telescope mirror made by 5M precise sandwich panels
[2] Plato – Top panel for Service module
[3] CFRP sandwich panel for magnetic divertor for Athena

ADVACAM

- INDUSTRY
- MANUFACTURING
- SOFTWARE
- SERVICES
- R & D
- TESTING

Advacam s.r.o.

General Description

ADVACAM is a spin-off SME of the IEAP CTU Prague and the Medipix Collaboration based in CERN founded in 2013. R&D, applications and projects are carried out for ESA, NASA, VZLU in cooperation with the IEAP CTU Prague, CERN and space groups CSRC/BD Sensors, Rigaku, EK.

Competences & Capabilities

ADVACAM produces advanced radiation imaging detectors and novel particle tracking cameras based on state-of-the-art Timepix and Timepix3 ASIC chip CERN technology. Highly integrated instrumentation and customized solutions are developed for a wide range of applications including space where low-power light-mass payloads are most valuable for high-resolution wide-range detection and monitoring of space radiation on board satellites for ESA and on the ISS/NASA.

1

Products & Services

- Design, development and manufacture of advanced radiation detection instrumentation
- Innovative techniques of radiation imaging, spectrometry, dosimetry and particle tracking
- Testing, characterization and calibration of radiation detectors including in-house radiation lab sources
- Non-destructive inspection, high-resolution X-ray imaging, X-ray CT of aerospace components

Major Space Projects & References

- Space Radiation Dosimeter for spacecrew onboard Gateway Lunar Orbit Space Station, contract ESA with EK
- Lunar soil inspection, NASA Moon Lander, with Univ of Lousiana USA
- Radiation Monitor, One Web telecommunication satellite
- Gamma-ray Tracker wide field-of-view for ESA Space Ryder, with Univ of Coimbra
- Focal-plane X-ray Imager, X-ray telescope payload in LEO orbit onboard Cubesat VZLUSAT-2
- Online radiation dosimeters MiniPPIX-TPX for spacecrew in LEO orbit onboard the ISS and NASA ORION mission
- Radiation Monitor for GEO-orbit telecommunication satellites contract ESA with IEAP CTU
- Pixel Detector Data Processing Engine, contract ESA
- Space Radiation Capabilities, Technologies and Payloads, contract ESA with VZLU, CSRC/BDSensors, Rigaku

Contact

ADVACAM s.r.o.
U Pergamenky 12
17000 Prague 7
Czech Republic
www.advacam.com

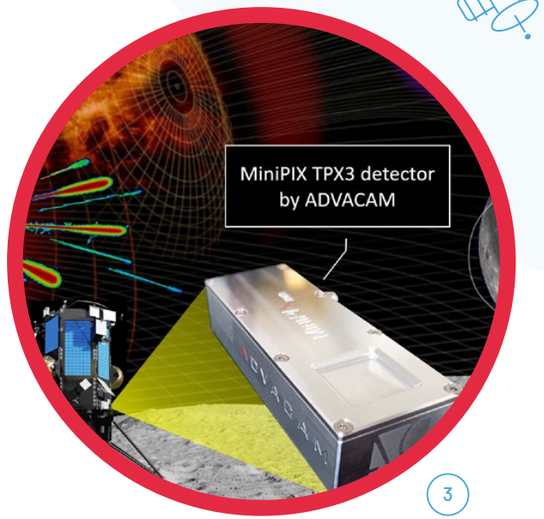
Responsible for space
and ESA projects

Doc. Ing. Carlos Granja, PhD.
M +420 601 270 076
E carlos.granja@advacam.cz

Space Related Equipment, Labs & Certificates

- Manufacture, testing, production overall ISO 9001
- Clean room space, packaging of semiconductor pixel detectors, wire-bonding, wafer and assembly testing and high-precision assembling and machining
- X-ray lab, X-ray prober stations, wire-bonding system, microscope soldering equipment, thermalized chamber, regulated cooling units, vacuum chamber, X-ray imaging and micro-CT systems, automatized robotic scanner

2



3

[1] Online radiation dosimeters MiniPIX TPX onboard the ISS
[2] MiniPIX TPX3 for Lunar Lander
[3] Lunar Lander mission

ALEEGO
IN THE AIR WE GO

- INDUSTRY
- SOFTWARE
- SERVICES
- R & D

ALEEGO s.r.o.

General Description
Founded in 2016, ALEEGO is a drone services company which enable companies to digitize their assets and turn aerial data into business intelligence.
ALEEGO works with enterprise from various field such as agriculture, oil and gas, power utility and other industries throughout Europe - collecting, processing and extracting real value out of aerial data to improve productivity, operational efficiency, and worker safety.

Competences & Capabilities
ALEEGO online platform count 70 drone pilots onboarded across Europe. The drone pilots registered on ALEEGO platform are qualified by the Operation Manager ensuring permits, equipment, insurance and capabilities are suitable for the customer depending on the mission.

Agriculture and forestry
- Identify weather or wildlife damages
- Plant health using multispectral camera
- Treatment with biological solutions by drone

Civil Work
- Quarries stock survey
- Project progress monitoring
- Inspection to ensure infrastructure safety.

Energy
- Quickly locate area of improvement
- Increase safety of employees and assets reliability
- Locate point of failure using thermal analysis

Industrial inspection
- Create 3D models
- Increase safety of assets
- Plan maintenance process

Renewables
- Inspection of wind and solar farms
- Detect defective photovoltaic cells and/or wind turbines
- Support the construction phase

Operations
- Request flight authorization to Civil Aviation Authorities (CAA)
- Ensure secured flight operation by setting flight procedures
- Securing data on cloud storage using blockchain

Contact

ALEEGO s.r.o.
Slapská 2115/1
100 00 Praha 10,
Czech Republic
www.aleego.com

Responsible for space
and ESA projects

Maxime Brivois
M +420 604.221.214
E m.brivois@aleego.com

Major Space Projects & References
ESA Kick-start project – Blockchain was implemented onto ALEEGO platform to secure confidential data from our customers and to ensure the ability to submit indisputable original mission documentation.
ESA Demonstration project – Locate defects or area of improvement on network of pipeline or powerline for Energy companies using Artificial Intelligence.

Space Related Equipment, Labs & Certificates
- GPS tracking device ideal for tracking of assets/vehicles: GSM connectivity, A-GPS sensor
- RTK ground station to improve GPS accuracy

asphericon

- INDUSTRY
- MANUFACTURING
- SOFTWARE
- SERVICES
- R & D
- TESTING

asphericon s.r.o.

General Description
asphericon is specialist and technology leader in field of aspheric components and optical systems. With the emphasis to using latest manufacturing technologies, continual innovation process, skilled workers and world class measuring equipment is asphericon able to provide high quality optical solution for more than 600 customers worldwide.

Competences & Capabilities
asphericon is the pioneer for the first completely digitized production process in photonics. Based on a worldwide unique, self-developed and patented control software for CNC manufacturing, asphericon combines all manufacturing parameters in a central database system. The result is an optimized and flexible manufacturing process for prototypes, single pieces and large series. asphericon accompanies its customers from optical design, production and coating, full-surface interferometric measurement and documentation up to the assembly of optical components as well as their optical characterization

Products/Services
Products: Custom Aspheres, Spheres, Mirrors, Freeforms, Durable Systems, Miniaturized Systems, High-NA Objectives
Services: Optical & Mechanical Design, Assembly, Coating, Metrology

Major Space Projects & References

Project IRPOL
- Description: infra-red polishing for high performance application
- Realization: polishing of precise aspheric components for infra-red applications with high end surface form tolerances (≤ 0,5 fr) and surface roughness (≤ 0,002 µm)

Project IRPOL 2
- Description: infra-red polishing for high performance application
- Realization: polishing of precise aspheric components for infra-red applications with high end surface form tolerances (≤ 0,45 fr) and surface roughness (≤ 0,001 µm)

Project: Sentinel 4 / Copernicus programme (ESA/EU)
- Description: High-resolution spectrometer
- Realisation: Aspheres, spheres with high-end surface form tolerances and surface roughness (≤ 0,5 nm), manufactured from demanding materials (CaF2, LAK9, SF6, SiO2)

Project: Sentinel 5 / Copernicus programme (ESA/EU)
- Description: High-resolution spectrometer system (UV – SWIR)
- Realisation: Ultra-precise optical components (spheres, cylinder) with irregularities ≤ 1fr

Contact

asphericon s.r.o.
Milířská 449
463 12 Jeřmanice
Czech Republic
www.asphericon.com

Responsible for space
and ESA projects

Ing. Karolína Sedláčková
M +420 777 511 624
E k.sedlackova@asphericon.cz

Space Related Equipment Labs & certificates
- Facility: 10 000 m² total area
- Clean room classes ISO 5 and ISO 7
- High-precision labs with controlled climate

Equipment:
- Optical Coatings (190nm-5100nm) Multi-wavelength interferometry
- Full surface tactile measurement Non-contact centre thickness measurement 2D/3D measurement
- Confocal 3D defect characterization Roughness measurement
- Wavefront measurement Measurement of MTF, PSF, Strehl ratio LID-/CRD measurement

Certificates:
- DIN ISO 9001:2015
- RoHS & REACH compliant production

ATC Space s.r.o.

- INDUSTRY
- MANUFACTURING
- R & D
- TESTING

General Description
ATC Space (ATS) was founded in 2017 as a 100% daughter of the German company Aerotech Peissenberg. ATS is active in the space business with vision to become centre of competence for milling and assembly operation structures and competences for space applications. Main experience of ATS is with aluminum machining and hand-made assembly parts of booster for ARIANE 6, named as ESR Rear and ESR Forward skirt.

Competences & Capabilities
The main competences of ATC Space in the space division are the machining (cutting and milling) of aluminum alloys, fulfilling required precision in the maximum tolerances. The components and parts produced in Klatovy are mainly on high stress structures and as a result directly responsible for the strength of the structure of space launcher Ariane 6.
In the assembly section, ATS operates as a reliable partner in the area of special assembly and riveting for primary structures in the scope of ARIANE 6.

The ARIANE 6 scope of work is performed in a dedicated facility, optimized according the requirements for a nominal production rate of 32 skirts per year, which was finalized in 2018. Always in the view of a high-tech and state of the art production - sustainable for the next 30 years, we set up a dedicated milling center with one of the most modern machinery and special assembly area with robotic. For the time being, we are producing and finalizing the products for flight number ten of flight hardware of the ARIANE 6.

All of the produced parts and components are tested and finally inspected in house by special means before they are released for delivery to the final customer.

In 2022 ATS Space had 37 employees and we are continuously recruiting with a targeted manpower that is 75 employees. Company turnover in full operational capability is planned 15 mil EUR per year in serial production.

Major Space Projects & References
- Ariane 6 – ESR Forward and ESR Rear Skirt
- HERA project – AIT Handling Adapter

Contact

ATC Space s.r.o.
Schiffauerova 940
339 01 Klatovy
Czech Republic
www.atc-space.cz

Responsible for space
and ESA projects

Ing. Tomáš Kroták Ph.D.
M +420 601 351 934
E tomas.krotak@atc-space.cz

- INDUSTRY
- MANUFACTURING
- SOFTWARE
- SERVICES
- R & D
- TESTING

Atos IT Solutions and Services, s.r.o.

General Description
In the Space sector, Atos Czech Republic has proven competence in providing EGSE systems and Ground-Support related software. Globally, Atos is a leader in digital services with pro forma annual revenue of circa €12 billion and about 100,000 employees in 73 countries. Serving a global client base across Manufacturing, Retail & Transportation; Space, Public Sector & Health; Financial Services; Telco, Media & Utilities business sectors.

Competences & Capabilities
Building on a successful history of projects since 1998, our space related activities include the development of software and hardware solutions for the European Space Agency (ESA) and leading satellite operators.
We offer expertise in EGSE: Power, Instrument SCOE, or various custom designed SCOES (e.g. Launcher navigation system test SCOE).
For Mission Control S/W, our team has experience with EGS-CC or with SCOS-2000 based systems, as well as Ground Station S/W.
A related team works on turnkey solutions for Satellite signal monitoring and interference location.

Products/Services
- Mission Control System & Ground Station Software
- Electrical Ground Support Equipment
- Products for EGSE / SCOE: resistor sensor simulator
- Satellite Monitoring & Geolocation Systems

Major Space Projects & References
In the past we have delivered projects such as:
- ESA/ESOC: Ground Support / MCS Software
- EGSE systems, e.g. Power SCOEs for EUCLID and NEO-Sat, Umbilical systems.
- Specialized SCOEs: Ultra-Stable-Oscillator SCOE for Galileo 2nd Generation, Navigation Module Test SCOE for the VEGA-C launcher

Among our customers we can count e.g.:
- Thales Alenia Space
- OHB
- Airbus
- ESA/ESOC

Space Related Equipment, Labs & certificates
Our hardware laboratory in Prague is certified for ISO: 9001:2015, 27001:2013, 45001

Contact

Atos IT Solutions and Services, s.r.o.
Doudlebská 1699/5
140 00 Prague
Czech Republic
www.atos.net

Responsible for space and ESA projects

Milan Novacek
M +420 731 429 827
E milan.novacek@atos.net

AŽD Praha s.r.o.

- INDUSTRY
- MANUFACTURING
- SOFTWARE
- SERVICES
- R & D
- TESTING

Contact

AŽD Praha s.r.o.
Žirovnická 3146/2
Záběhlice
106 00 Praha 10
Czech Republic
www.azd.cz

Responsible for space
and ESA projects

Ing. Peter Gurník
P +420 267 287 161
E gurnik.peter@azd.cz

General description

AŽD Praha, as a leading supplier of signalling systems and solutions to railway undertakings and railway infrastructure owners and managers, is highly motivated to provide its customers the most advanced systems and technologies, all developed and produced in its labs and factories. Besides the railway market, AŽD Praha serves also to road telematics, traffic control, property and personal security users and operators and, last but not least, manufactures and supplies also telecoms devices and systems. To achieve this goal, a vast range of research and development facilities are allocated in a number of AŽD Praha divisions and subsidiaries in the Czech Republic, Slovakia, Poland, Serbia and Bulgaria. These resources and staff are backed by a number of scientists in cooperating research institutes and universities in these countries. Expert knowledge of our staff is not limited just to signalling, control and telecommunications, but it spans a number of scientific disciplines from theory of safety codes, information and software theories used in safety critical systems, further to reliability theory, radio modulation theory, radio signal propagation and coverage analysis, EGNSS safety and dependability analyses, not to mention all.

In addition to the hundreds of privately funded research and innovation projects completed in the course of our evolution to the leading railway signalling company, our R&D divisions have participated in many national and international research projects, mostly funded by national or European bodies, like the European Space Agency, European Commission, Czech Ministry of Transport, Technology Agency of the Czech Republic or Czech Ministry of Industry and Trade. Thanks to our knowledge base, R&I capabilities and reputation AŽD Praha became an Associated member of the Shift2Rail JU in 2015. Since 2021 AŽD is a Founding Member of Europe's Rail JU, even being a member of its Governing Board. Europe's Rail is the only EU's major programme and joint undertaking for railway research and innovation activities. Besides that, AŽD Praha experts are regular and active contributors to the research and standardization activities in several international institutions, associations and consortiums – UNIFE/UNISIG, CENELEC, ACRI, CAT, etc.

Competences & Capabilities

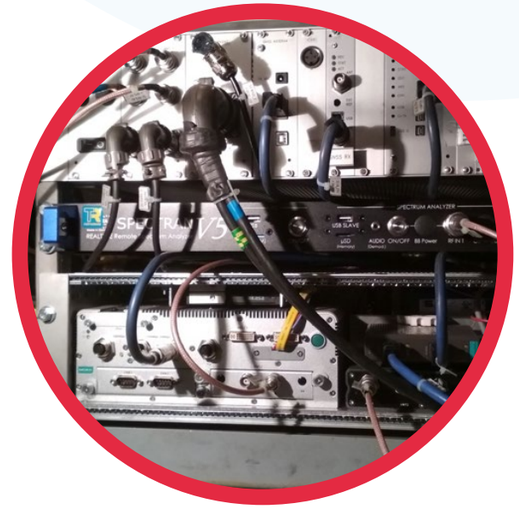
The majority of projects are focused to the complete applied research, innovation and development, validation and assessment of products which are then introduced into a production cycle. The state-of-the-art sample and serial production infrastructure allows us to manufacture prototypes ready to be tested and validated in our own company labs as well as in accredited labs anywhere in the world. Also projects with an innovation potential, not ready for market uptake, get interest and room in the company R&D labs or polygons, even at our own 2 rail test tracks in northern and eastern Bohemia.

Major Space Projects & References

- „Train Integrated Safety Satellite System (3InSat) Demonstration Project", funded by ESA in the course of the IAP Programme (project Nr. 4000105788/12NL/NR), 2012-2015
- „NGTC - Next Generation Train Control", funded by EC in the course of FP7 (project Nr. 605402), 2013- 2016,
- „RegioSAT – Enhancing railway safety on regional lines using satellite systems", funded by the Technology Agency of the Czech Republic (project Nr. TA01030124), 2014- 2016
- „STARS - Satellite Technology for Advanced Railway Signalling" funded by EC in the H2020-Galileo-2015-1 call (project Nr. 687414), 2016-2018
- „X2Rail-2 - Enhancing railway signalling systems based on train satellite positioning, on-board safe train integrity, ..." a Shift2Rail member's project funded by EC in the H2020-S2RJU-2017 call (project Nr. 777465), 2017-2020
- "CArrier Phase RESiliencE (CAPRESE) – "Techniques Supporting Resilience for High-Integrity Train Control Applications", funded by ESA in the course of the NAVISP Programme (project Nr. NAVISP-EL1-017), 2018-2020
- "TrainLOC – Conditions for deploying train locators based on GNSS systems on the railway network", funded by the Technology Agency of the Czech Republic (project Nr. TIRSMD707), 2019-2022.
- „X2Rail-5 - Start-up activities for Advanced Signalling and Automation Systems" a Shift2Rail member's project funded by EC in the H2020-S2RJU-2020 call (project Nr. 101014520), 2020-2023

Space Related Equipment, Labs & Certificates

- GNSS SIS stationary and mobile test sets
- GNSS RF signal analyzers and recorders
- Measurement and test rail vehicle and train set
- Regional rail test tracks > 50 km
- Inertial systems test bed
- Odometry systems test bed
- Climatic and EMC test chamber



- INDUSTRY
- MANUFACTURING
- R & D
- TESTING

BBT-Materials Processing, s.r.o.

General Description

BBT-Materials Processing, s. r. o (established in 1995) is a private SME technological company dedicated to development and production of high-performance IR polarization optics, phase delay components and acousto-optical substrates for a wide range of high-tech applications.

Competences & Capabilites

Our group is the world´s first to have discovered mercurous halides single crystals and their extraordinary properties. Mercurous chloride (Calomel, Hg2Cl2) is a unique material for IR optics, acousto-optics, polarizers, high power laser applications, etc.
We are developing Calomel high efficiency infrared polarizers and acousto-optical tuneable filters (AOTF) for hyperspectral imaging in the thermal infrared. BBT´s devices were operating on-board Salyut 6 - Soyuz and MIR orbital laboratories for 17 years!

1

Products/Services

- Polarizers (several types)
- Scrambles
- Polarizing beamsplitters
- Phase delay prisms
- Wedges
- Acousto-optical tuneable filter (TRL 4)
- Delay lines
- Laboratory measurements
- Custom products

Major Space Projects & References

- INTERKOSMOS – MORAVA I, II and III (1976-97) on board Salyut 6-Sojuz and MIR – material science.
- Space furnaces CSK and TITUS for MIR and FOTON.
- TITUS MPP Multi-Purpose Platform for ISS (International Space Station)
- RIM-MIR, TES and TEST-TES: A recalescence of Ag-Ge alloys on MIR using the CSK-1 furnace.
- MIR'92 (1992-3), EuroMIR'94 (1994-5), EuroMIR'95 (1995-6), GermanMIR 97 (1997), MIR 99 – PERSEUS (1999) - material experiments on MIR using the CSK-1 and TITUS.
- DEMON (2011-2014) Development of Quality Evaluation Methods for Calomel Optical Elements
- NAOMI (2010-12): New acousto-optic device based on calomel for hyperspectral imaging in space applications
- IAPETHOS (2014-16): Infrared advanced polarizer for Space applications
- THETIS (2016-17): TIR Hyperspectral Imager based on the Calomel AOTF (Acousto-Optical Tuneable Filter)

Contact

BBT-Materials Processing, s.r.o.
Doubicka 11
184 00 Prague 8
Czech Republic
www.calomel.cz

Responsible for space
and ESA projects

Ing. Cestmir Barta, PhD., CEO
M +420 420 602 266 467
E barta@calomel.cz

Ing. Ondrej Ballada
M +420 420 724 875 729
E ballada@calomel.cz

- CALIOPE (2018-2020) Calomel-based TIR optical AOTF breadboarding
- ECLIPSE (2018-2020) Development and production of Calomel IR polarizer and testing in relevant environment
- IAPETHOS2 (2018-2021) Infrared Advanced Polarizers for Space and other Applications 2
- TWINS (2022): Birefringent Fourier transform spectrometer for space applications
- Other projects within KONTAKT, PRODEX, FP7,EUROSTARS etc.
- IRCAPOL (under preparation) Development of infrared polarizing camera for EO
- VEGA (under preparation) Increasing the TRL level of the acousto-optical tunable filter based calomel for hyperspectral imagers and commercial applications
- BIRD (under preparation) Development and production of optical and acousto-optical components based on mercurous bromide

2

Space Related Equipment Labs & certificates

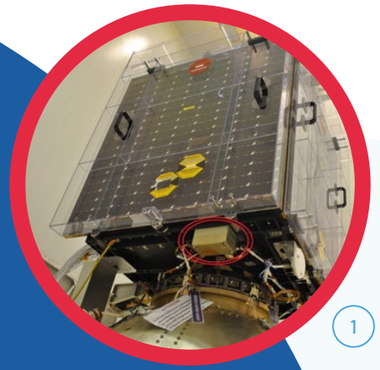
- Crystal growth units (VPT method)
- Crystal optics manufacturing.
- HW for testing and quality evaluation of optical and acousto-optical components:
  - Conoscope
  - Interferometer
  - IR Spectrometer
  - 2D HP imaging filter
  - HP integral measurement
  - Integral extinction ratio (VIS, IR)
  - COHERENT 9,3μm CO2
  - laser system (17W)
  - Optical microscope
  - Tyndall scattering
  - 2D optical Fourier transform
  - 2D depolarization imaging
  - MTF/PSF

3

[1] TITUS space facility on board MIR space station operated by French astronaut Jean-Pierre Haigeneré (Project MIR'99 – PERSEUS)(Photo CNES, France).
[2] Prototype of Calomel based acousto-optical tuneable filter (AOTF) for hyperspectral infrared imager.
[3] Calomel based Glan-Foucault polarizer for infrared region.

- INDUSTRY
- MANUFACTURING
- SERVICES
- R & D
- TESTING

BD Sensors s.r.o., CSRC Space Division



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General Description

BD SENSORS (≈200 employees, ≈13,5 mil EUR turnover) is a European leader in the field of Pressure Sensors Technology and is one of the leading SMEs in Electronics development and manufacturing for Space Applications. Having more than 25 years of "Space Heritage" via its "CSRC Space Division" BD SENSORS is experienced in PCB Assembly in accordance with ESA ECSS Standard.

Competences & Capabilities

Electronic Pressure Measurement

- Development and production of Pressure Sensors and Pressure Measurement Devices
- Complex solutions for Pressure Measurement Application (Industry, Aerospace, Space)
- Modern manufacturing technologies
- Electronics for Space Applications
- Development and production of Space Electronics
- Electronic Ground Support Equipment (EGSE)
- Power & Energy Storage
- Harness & Cabling Manufacturing and Testing
- Propulsions, PEPE Rocket Engine

Products & Services

Electronic Pressure Measurement

- Portfolio of +100 product types
- Customer Solutions
- Production range – 0,1mbar up to 6.000 bar
- Electronics for Space Applications
- Banks of Supercapacitors
- EGSE & Unit Testers
- Automated & manual FM PCB Assembly according to ESA ECSS Standards

Major Space Projects & References

- INTEGRAL, PSAC Unit
- SMART-1, EPDP Unit
- DEMETER, I/V Converter
- PROBA 2, DSLP&TPMU Units
- SWARM/TEASER, Micro-Accelerometer
- PROBA V, SATRAM Radiation Monitor
- RISETAT, Radiation Monitor
- CubeSats (VZLUSAT-1, VZLUSAT-2, BDSAT) PCB Assembly
- ISS / ACES, European Laser Timing Instrument
- Solar Orbiter, PWR for RPW & STIX Instruments

Contact

BD SENSORS, s.r.o.
Hradišťská 817
687 08 Buchlovice
Czech Republic
www.bdsensors.cz

Responsible for space and ESA projects

Ing. Marek Šimčák, Ph.D.
P +420 572 411 320
M +420 602 266 467
E marek.simcak@bdsensors.eu

- SABIP, Space Based ADS-B Payload Development
- BOSC, Banks of Supercapacitors for Space
- High Density Connectors for Space
- EUCLID, SVM Electrical Simulator and EGSE
- METOP SG/3Mi, Filter Wheel Controller
- NEOSAT, Thermal Vacuum Test Benches
- JUICE / APME, Manufacturing and Testing
- NOVACOM 2, Flexible Solar Arrays
- Space Rider/MDE, Modul Driver Electronics
- HITPIX, Space Radiation Monitoring
- I-HAB, Pressure Sensors for Space Application

2

Space Related Equipment Labs & Certificates

Equipment

- Cleanroom 100.000 class / 200 m^2 + 10.000 class
- Automated SMT line for FM PCB Assembly / ECSS-certified
- Manual soldering workstation for FM PCB Assembly / ECSS-certified
- Manufacturing process in accordance with ECSS standards
- Software Design & Design Tools (Altium Designer, Solidworks, Structures, Thermal)
- Accredited Calibration Laboratory, EMC Laboratory
- Temperature and Humidity Chamber

Cerificates

- ISO9001
- ECSS-Q-70-08, -38, -26 and -28
- Safe Enterprise
- Type Approval
- Inspection
- EN9100 in progress

3

[1] SATRAM_Proba-V
[2] BOSC EQM
[3] BD SENSOR_Pressure Sensors

Betrian a.s.

- INDUSTRY
- MANUFACTURING
- SOFTWARE
- SERVICES
- R & D
- TESTING

1

General Description

Betrian Group helps with standardization against vendor lock-in. Using Open source software and making special hardware units brings new technologies into the railway market in order to make trains safer and shift people and cargo from roads to the rails wherever suitable.

Competences & Capabilities

We use Egnos and Galileo (including RTK) for very precise navigation of trains - our vision is to build and certify positioning system for every train condition like tunnels, underground stations etc. Special goal is to develop a secondary safety system, so called RCAS - Railway Collision Avoidance System. More details about our RCAS system can be found on www.navsuite.cz.

While the RCAS system is a vision, our flagship NavCom is already in regular use by rail carriers in its first versions. We would like to develop this early bird together with ESA to the certified status mentioned before in this article. If this happens - there will be a solid base for the certified positioning system for the next generation European Train Control System.

Major Space Projects & References

NavCom is a location system capable of reliably detecting real-time position of the train with centimeter level accuracy. GNSS location data are converged in NavCom with data from gyroscopes and accelerometers included in the NavCom unit. Therefore, NavCom is capable of determining the exact position of the train also in tunnels. There are two production lines of NavCom. NavCom intended for fixed installation on the roof of the train. And NavCom X a small portable unit that is part of the driver's equipment.

NavTrain

train driver's passive assistant installed on drivers' tablets. NavTrain provides track conditions data and time schedule data related to the train location determined by the Galileo module in the tablet.

Contact

Betrian a.s.
Božetěchova 3021/19
612 00 Brno
Czech Republic
www.betriangroup.cz

Responsible for space and ESA projects

Stanislav Trtek
M +420 733 783 343
E nfo@betrian.cz

2

3

[1] SATRAM_Proba-V
[2] BOSC EQM
[3] BD SENSOR_Pressure Sensors

BizGarden

- INDUSTRY
- SOFTWARE
- SERVICES
- R & D

BizGarden s.r.o.

General Description
BizGarden s.r.o. is a private non-profit research organisation. Since its foundation in 2010, the company is focused especially on mobile services, utilisation of space technologies and signals in downstream applications and support of space downstream community. Our main focus is on business model generation and market research, internationalisation and networking.

Competences & Capabilities
BizGarden is specialised in non-technical research and innovation focused on market potential, business model generation and opportunities assessment for space technologies and services, design, development and market roll out of business models. We perform this research on international, national, regional and corporate levels.

Products/Services
- Professional support for start-up companies and intentions (Start Up)
- Specific and practically focused training in the area of research management
- Marketing activities
- Technology transfer
- Lobbying and representation
- Partnership in EU projects and dissemination of their results
- Support and consultancy in the areas of research and technology development promotion

Major Space Projects & References
- European Satellite Navigation Competition, Czech Award. (reference: Ministry of Transport CZ, Anwendungszentrum GmbH, Oberpfaffenhofen - Germany) - 2011-2014.
- EMMIA (reference: DG Enterprise and Industry, bavAIRia e.V. - Germany) 2011-2014
- Safety and Information Services for Ski Resorts in Emerging Markets - prime contractor on Feasibility Study within ESA ARTES 20 programme Integrated Applications Promotion. 2013-2015 https://artes-apps.esa.int/projects/sis-srem-fs
- SIS-SREM – Demonstration project within ESA ARTES 20 programme, Integrated Applications Promotion. 2015-2016 https://artes-apps.esa.int/projects/sis-srem
- Spin-off of SIS-SREM project Alpdest CEE, s.r.o. (founded 2015)
- AUDROS - Autonomous drone services in the CBRNE operations with ESA ARTES AIP programme, Feasibility Study 2018 - 2019, https://business.esa.int/projects/audros-1
- Spin-off of AUDROS project DRONHUB INNOVATIONS Sp. z o. o., https://dronhub.eu (Founded 2019)
- AUDROS - Autonomous Drone Services for Chemical, Biological, Radiological, Nuclear threats (CBRNe). Customer: European Space Agency & European Defence Agency. IAP Demonstration Project 2020 - ongoing, https://business.esa.int/projects/audros
- In 2020 BizGarden initiated the setup of Digital Innovation Hub Tourism 4.0 (https://www.t40.cz) which aim is to support digital transfromation in the travel industry in central Europe. Space technologies and space signals play a significant role in digital transfromation of travel industry.

1

Contact

BizGarden s.r.o.
Příkop 27/2a
602 00 Brno
Czech Republic
www.bizgarden.cz

Responsible for space and ESA projects

Ing. Ludek Kühr
P +420 605 822 228
E l.kuhr@bizgarden.cz

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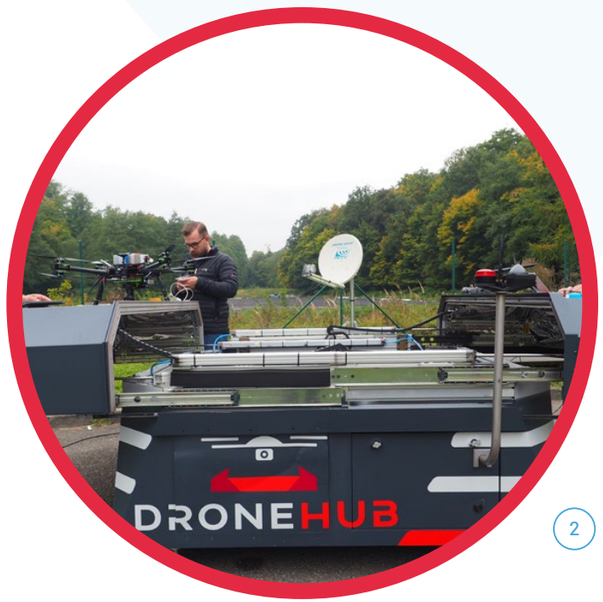
AUDROS
AUTONOMOUS DRONE SYSTEMS



2

[1] Dronehub with BRUS drone – drone hunter mission
[2] Dronehub with drone for CBRNe monitoring

CGI

- INDUSTRY
- SOFTWARE
- SERVICES
- R & D
- TESTING

CGI IT Czech Republic s.r.o.

General Description

CGI is among the largest IT and business consulting services firms in the world. Operating in hundreds of locations across the globe, CGI delivers end-to-end capabilities, from strategic IT and business consulting to systems integration, managed IT and business process services and intellectual property solutions, helping clients achieve their goals, including becoming customer-centric digital enterprises.

Competences & Capabilities

CGI is active in Earth Observation and GNSS since 2009 and since then became a strategic partner for various projects. With the European Space Agency (ESA) or the European Union Agency for the Space Programme (EUSPA), CGI cooperates on major projects.

Products/Services

- Earth Observation – development of own Earth Observation Monitoring Platform – CGI SatSight, several EO projects funded by ESA
- GNSS – several contracts for EUSPA mainly in the field of Security, Galileo PRS projects for CZ/SK national authorities, GNSS utilization in indoor navigation

Major Space Projects & References

- Projects for the EUSPA:
  - Exploitation Security Support
  - Galileo PRS Engineering Support
  - Galileo Operational Security Support
  - Corporate Security Support
- Galileo PRS experience:
  - Galileo PRS Pilot project in Czech Republic
  - Galileo PRS CPA Feasibility Analysis for Slovakian Ministry of Transport
  - System of distribution of PRS information for the National Security Authority
- ESA funded projects:
  - InCubed: CGI SatSight – EO Monitoring Platform
  - Proptech – Web-based solution for risk (pre)assessment and stability information
  - EO Video – platform for EO video data processing
  - NavIn – study on GNSS utilization in indoor navigation
  - „Le Cross" – improving safety at rail level crossings by using GNSS Technologies
  - EDRS Globe project – European Data Relay System
- Other GNSS and EO projects:
  - Copernicus User Uptake project
  - The Categorization of Threats to the Galileo Open Service and Measures to Mitigate them – Ministry of Interior

Contact

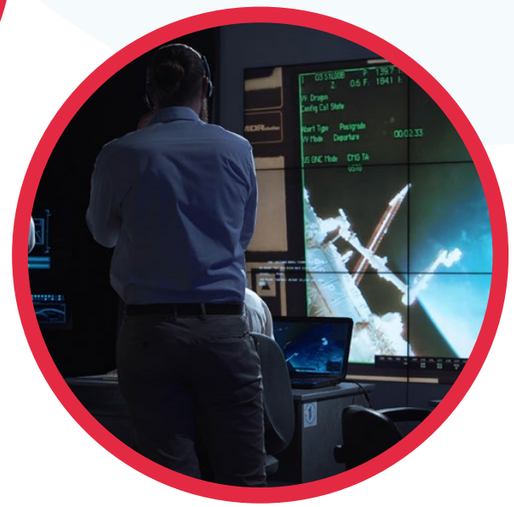
CGI IT Czech Republic s.r.o.
Laurinova 2800/4
155 00 Praha 5 – Stodůlky
Czech Republic
www.cgi.com

Responsible for space
and ESA projects

Ing. Jiri Novak
P +420 284 020 111
M +420 604 223 680
E jiri.novak@cgi.com

Space Related Equipment, Labs & Certificates

- Certificates:
  - SO 9001:2015 & TickIT
  - ISO 14001:2015
  - ISO 20000-1:2011
  - ISO/IEC 27001:2013
  - EUSPA Security Accreditation Board – PRS Support
- NSA "Secret" and "Confidential" Clearance including certified IS



CleverFarm, a.s.

- INDUSTRY
- SOFTWARE
- SERVICES
- R & D

General Description

CleverFarm addresses the challenge of helping to feed fast growing global population while the amount of available land for farming is reducing. In order to achieve materiel savings and yield increase, CleverFarm utilize in its unique way satellite data by long term historical analysis and continuous remote field scouting bolstered with IoT sensors and engaging analytics using artificial intelligence.

Competences & Capabilities

In the domain of satellite data processing, we have created the crop model allowing us determine the real biophysical conditions of the plants anywhere on the earth and further expand the services in precise crop nutrition, yield estimation and early warnings of crop damages caused by human and natural conditions. In other words, we show them what is happening on their fields, before it become physically visible. Most of the competitors use the basic vegetation indexes which are limited in the quality of the information provided, we combines in situ observation with mobile laboratory analysis and using machine learning allowing us to determine real plant conditions such as biomass volume, chlorophyll and water content.

Another service of using satellite data is providing farmers analysis of 20 years satellite data history to identify what crops they should grow to achieve the highest possible yields. And we do this while lowering their original resources. CleverFarm bolsters this historic data with IoT sensors - providing realtime information about the humidity, temperature, soil moisture and other critical information to improve crop yields. Farmers are able to use this data to predict pests and diseases in crops prior to an outbreak - allowing for them to apply pesticides only when needed.

Major Space Projects & References

- 350 paying customers(agriculture subjects) in the application
- Having 9 partners around the world to expand our products
- Cooperation with one of the leader in agriculture Syngenta
- Scalability in different segments like city greens and golf courses CleverFarm - data-based farm management. #Foodsafety

Contact

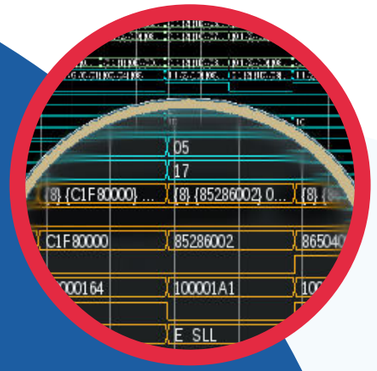
CleverFarm, a.s.
Vídeňská 188/119d
619 00 Brno
Czech Republic
www.cleverfarm.cz

Responsible for space
and ESA projects

Adam Zloty, CEO
M +420 776 111 859
E adam.zloty@cleverfarm.cz

daiteq

- INDUSTRY
- SOFTWARE
- SERVICES
- R & D
- TESTING



daiteq s.r.o.

General description

daiteq provides arithmetic extensions for optimal computation of floating-point as well as fixed-point arithmetic in LEON and NOEL-V processors, targetting areas of software-defined radio algorithms and image processing algorithms. Technology demos are available for the Xilinx, Microchip and NanoXplore FPGAs.

Competences & Capabilities

- Design and implementation of LEON and NOEL-V systems.
- Implementation in NanoXplore, Microchip, Xilinx.
- Floating-point computations. Support for GNSS processing in LEON2-FT and NOEL-V.
- Hardware accelerators for image processing applications and other data-parallel applications.
- Design of FPGA-based controllers.
- Benchmarking of embedded processors and systems.

Products

- SIMD-within-a-register (SWAR) extensions for LEON2-FT and NOEL-V. Target areas: GNSS, image processing, ANN, data encryption.
- Floating-point unit for LEON2-FT, LEON3, NOEL-V. The daiteq FPU supports a variety of floating-point formats, including packed formats, configurable at synthesis time. llvm extensions for SPARC and RISC-V. The extensions support the daiteq floating-point unit and the SWAR unit in LEON and NOEL-V processors.
- FMC-SRAM board for NanoXplore, Microchip and Xilinx FPGA demo boards.

Major Space Projects & References

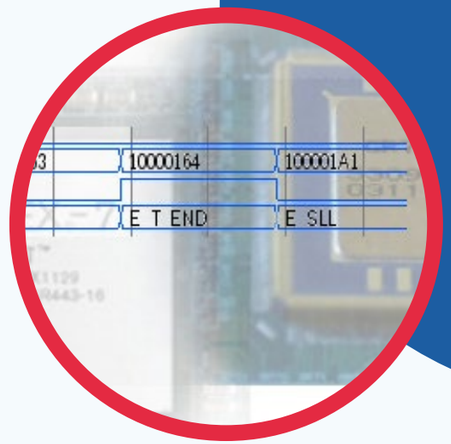
- TRP/ITI: Multi-threaded processor for space applications. Instruction set extensions for micro-threading in LEON2-FT
- EO: METOP SG: Design review of the 3MI Filter Wheel Controller Design.
- GSTP: ESA IP core extensions. Configurable floating-point and integer SIMD-unit for LEON2-FT and NOEL-V. Techmap for NanoXplore BRAVE FPGAs.
- EO: AGGA-4 IP core conversion. Modification of the AGGA-4 IP core to suit FPGA targets.

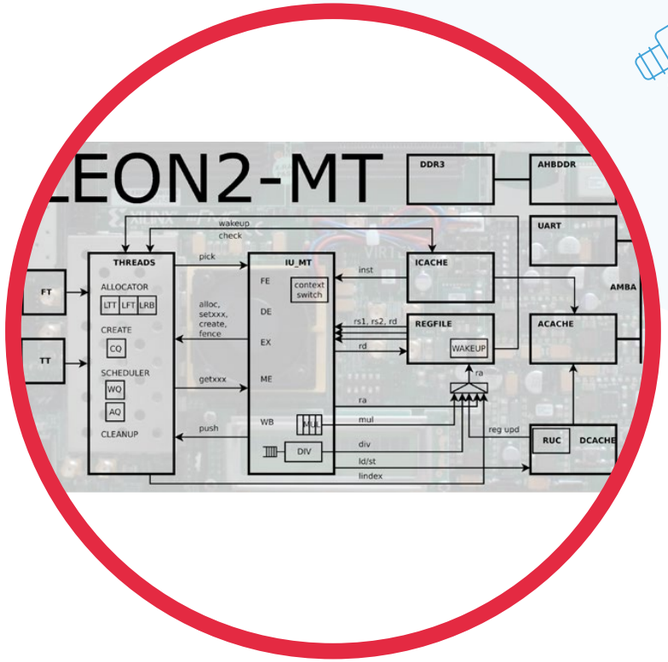
Contact

daiteq s.r.o.
K Hádku 1148
107 00 Praha 10
Czech Republic
www.daiteq.com

Responsible for space
and ESA projects

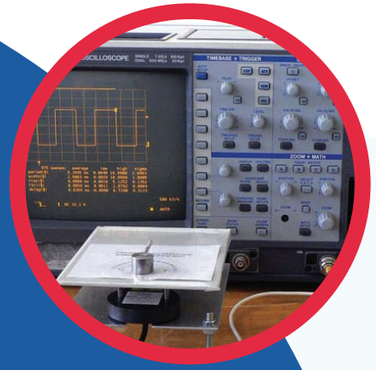
Ing. Martin Daněk, Ph.D.
M +420 732 732 094
E martin@daiteq.com





EGGO SPACE s.r.o.

- INDUSTRY
- TESTING



General description

EGGO Space offers a wide range of services and expertise including testing of EEE components, Industrial Screen-printing&Recycling of contaminated substances. The main range of Test Laboratorys activities consists of climatic, mechanical and Life time testing of components, parts and materials as well as interpretation and processing of results and defect analyses for electrical engineering and related industries. These tests serve customers from various industries including electrical, automotive and aerospace. One of the main activities of EGGO Test House is to provide support services in development or qualification for space devices or components as defined in fields of activity of the Czech National Space Plan, chapter 5.5- Devices and Components and Flight Hardware.EGGO became a member of the Czech Space Alliance at the start of 2011.

Competences & Capabilities

- Reliability testing
- Failure analysis
- Temperature/ humidity stress
- Mechanical stress, solderability
- Non-linearity measurements
- Corrosion test
- Evaluation testing of passive components (Supercapacitors, Tantalum capacitors, Resistors, Relays) as per ESCC standards (ESCC 2263000)
- Designing and manufacturing of electronic devices for special purpose machinery&test measuring equipment.

Major Space Projects & References

- Reliability Testing of AVX low ESR Tantalum capacitors types TPS and TPM for AVX/CNES project
- Contract no: 400010504/10/NL/PA- Low ESR Tantalum Capacitor Evaluation and Qualification . Contractor: AVX Corporation- Tantalum division, Subcontractor: EGGO Space s.r.o- responsible for the Evaluation of Tantalum Capacitors phase
- Contract no: 4000103977/11/NL/Cbi- Development of Test Facility Dedicated to Passives Components (The project was selected under the CZ industry incentive scheme by ESA&CZ government). Contractor: EGGO Space s.r.o
- Contract No. 4000105661/12/NL/NR ARTES 5.1 Evaluation of Supercapacitors and Impacts at system level. Contractor: EGGO Space s.r.o
- Contract No. 4000111435/14/NL/WE High Density Connector Suitability for Space Application ARTES 5.1. Contractor: EGGO Space s.r.o

Contact

EGGO Space s.r.o.
Dvořákova 328
563 01 Lanškroun
Czech Republic
www.eggo.cz

Responsible for space
and ESA projects

Dr. Ing. Petr Vasina, CSc.
E vasinap@eggo.cz

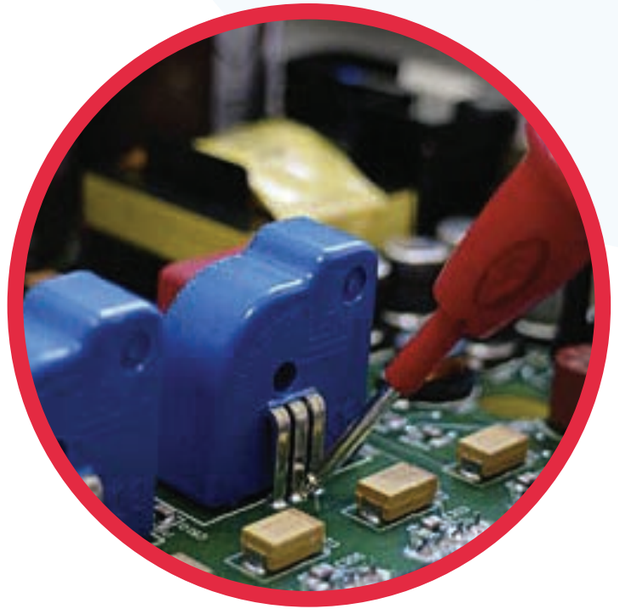
David Latif
P + 420 465 321 945
M 420 776 551 551
E latifd@eggo.cz

Further projects

- Measure maximum rating of components (physical limit)
- Identify limit of current technology and evaluate new technology for high vibration and shock
- Determine derating of components

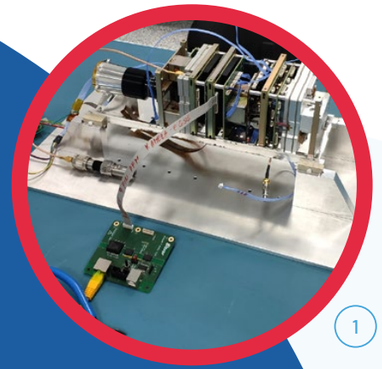
Space Related Equipment, Labs & Certificates

- Testhouse with large portfolio of the Test equipment including: Thermal chambers, Vibration apparatus, mechanical shock apparatus. etc
- ISO 9001:2009
- ISO 14001:2005



Eltvor Instruments, s.r.o.

- INDUSTRY
- MANUFACTURING
- SOFTWARE
- SERVICES
- R & D



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General Description

Eltvor Instruments, s.r.o. (Eltvor) is a startup company founded by three HW&SW design engineers who worked together on number of time&frequency R&D projects in the past. The Eltvor company was started with the mission to continue with the time&frequency products development, especially for industrial customers. Besides government and scientific users, Eltvor long-term strategy is to provide time-as-a-service for critical infrastructure, independent of GNSS.

Competences & Capabilities

The time&frequency products are based on the system block IPs (Intellectual Property) such as offset phase/frequency generation, micro-stepping and measurement. Eltvor ongoing development is targeting a laser Doppler instrument intended for industrial metrology and a simple multichannel time event meter mainly for quantum optics applications. Another Eltvor IP, namely compact camera HW&SW, proved handy in the course of VZLU's VZLUSAT-2 CubeSat development: it was donated by Eltvor to form this satellite's main payload, replacing less suitable and less mature solution.

The Eltvor team re-designed, manufactured and programmed a dual camera and tailored it for the VZLUSAT-2 in a 4 months time span, operating on-board since January 2022. The core strength of Eltvor team is in signal processing design and FPGA as well as CPU implementation, time&frequency measurement, RF system design and generic embedded computing centered mostly around C, Linux, FPGAs (namely Zynq and Microchip/Actel), and numerical prototyping and batch processing in Julia. Eltvor members originated in the past decade a unique design of ground-station satellite time-transfer modem deployed in several pieces to support accurate time dissemination in frame of operational satellite navigation system. Current Eltvor's portfolio of proven technology contains a microwave transparent (bent-pipe) transponder, as well as DVB-S2 transmitter, and microwave interferometer at 125GHz.

Products/Services

- VCVS2: CubeSat-compatible OBC/DPU
- VCAM1M3-BW, VCAM1M3-RGB: 1.3MPix BW and RGB cameras
- NXDAC: custom electronic board populated with rad-hard European components: EVX12DS130B DAC and nanoXplore NG-MEDIUM FPGA
- Custom instrument development in electronics&photonics with cutting-edge performance for both terrestrial and space segments

Contact

Eltvor Instruments, s.r.o.
Kamarýtova 5
39002 Tábor
Czech Republic
www.eltvor.cz

Responsible for space
and ESA projects

M + 420 732 280 497
E eltvor@eltvor.cz

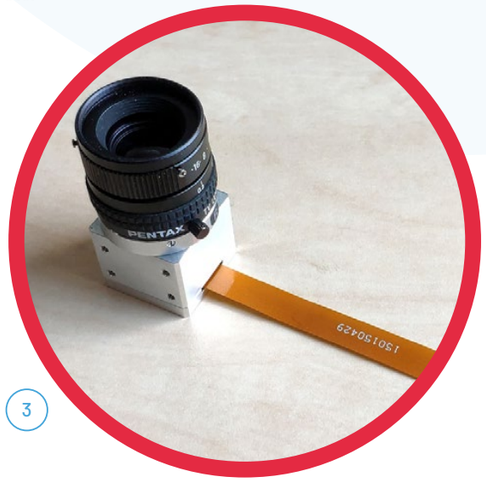
2

Major Space Projects & References

- main payload of VZLUSAT-2 satellite: two cameras (HW&SW) for Earth observation
- control computer board for the X-ray imaging detector onboard VZLUSAT-2.
- Digital Modem for Two-Way Satellite Time Transfer in the frame of ESA NAVISP program
- The Eltvor core team worked in the leading engineering roles on several ESA projects in the past:
- comparison of optical time-transfer links for GNSS
- optimal clock ensembling algorithms
- manufacturing of a portable timing device

Space Related Equipment, Labs & Certificates

- open-source flow for software (C, Linux kernel, u-boot and Julia) and hardware (KiCad for PCB design) development
- Xilinx proprietary (Vivado) as well as open-source (GHDL) tools and IP blocks for FPGA depvelopment
- standard equipment for electronics instrument prototyping, small series production and characterization such as spectrum analyser, vector network analyser, high-speed oscilloscopes, power supplies, soldering stations, etc.



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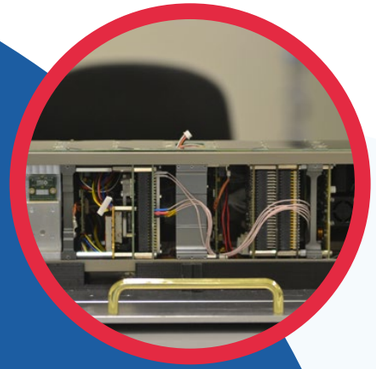
[1] An upload of flight software to the satellite (August 2020) with Eltvor EGSE.
[2] Eltvor's CubeSat Earth observation camera module Vitacam/vcam1m3
[3] Eltvor's CubeSat Earth observation camera module Vitacam/vcam1m3

esc Aerospace s.r.o.

- INDUSTRY
- MANUFACTURING
- SOFTWARE
- R & D
- TESTING



General description
esc Aerospace is a leader in the field of space qualified on-board hardware and software in Europe and is one of the leading SMEs in innovative R&D projects with a focus on Space and Defence.

esc Aerospace is experienced in the areas of Avionics, Autonomous Robotics, C-UAS and GNC systems.

Competences & Capabilities
- On-board systems: Space Qualified flight software
- Avionics & Space Qualified On-board Computer (OBC, OBDH)
- Radiation monitors & sensor systems (Ionizing radiation hardened detector payloads)
- Quantum Key Distribution (QKD) - QKDSat
- Applications: Secure & resilient communications leveraging SATCOM
- Test systems (EGSEs/SCOEs)

Major Space Projects & References
- TRITON-X – heavy platform satellites
- SpacePix® – radiation monitors
- Space Rider – affordable and routine access to space
- LVICE2 – study the yet unexplored dust clouds at Earth-Moon Lagrange points L4/L5 and the solar wind turbulence in the Lunar wake – esc Aerospace's own Ambic mission to the Moon with 12U satellite
- ExoMars – SW verification and validation
- 5 generations of RPAS/UAS avionics – VTOL, microUAS, LMAMS
- Solar Orbiter – STIX Instrument On-board flight software
- SWARM ACCelerometer
- OBSW-RAC – Space qualified flight software: On-board software reference architecture consolidation. On-board software reuse in a systematic manner, following activities CorDeT and Domeng
- SENTINEL-4 – Performance Assessment Tool for the S4/UVN Instrument
- MTG – Meteosat Third Generation
- DOC – Demise Observation Capsule
- MetOp-SG – bootloaders

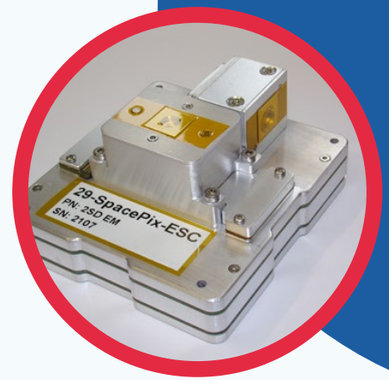
Contact

esc Aerospace s.r.o.
Čs. armády 14,
160 00 Praha 6
Czech Republic
www.esc-aerospace.com

Responsible for space
and ESA projects

Ing. Richard Sysala
P +420 284 683 784
M +420 604 347 014
E richard.sysala@evolvsys.cz

Space Related Equipment,
- esc Aerospace applies ECSS standards:
  - ECSS-E-ST-40C Space Engineering – Software
  - ECSS-E-ST-70C Ground systems and operations
  - ECSS-M-ST-80C Risk management
  - ECSS-Q-ST-20C Quality Assurance
  - ECSS-Q-ST-80C SW Product Assurance
- laboratory and manufacturing assembly room / factory 4.0., IoT., equipped with oscilloscopes, DAQ stations, spectral and data analysers, signal generators and soldering stations.



Frentech Aerospace s.r.o.

- INDUSTRY
- MANUFACTURING
- R & D
- TESTING

General description
Production and delivery of parts and modules for aircraft and space industry, design and development of subsystems for the satellites, participation in ESA and ESO projects.

Competences & Capabilities
Frentech Aerospace s.r.o. is a state of art company, very well equipped with modern and productive CNC machines, air-conditioned inspection room with three CMMs by Mitutoyo, Clean Room ISO 7 and ISO 5 with thermal testing chamber and CMM machine.
The company is focused on production of parts and assembled modules mostly for aircraft and space industry. Beside this line of business also delivers its products for demanding fields such as instrument technology, microelectronics, nanotechnology and radar technique, production of special machines, medicine and vacuum devices.
Recent development is focused on design, development and construction of subsystem for satellites and other subsystems for Space industry. In this field the company cooperates with Thales Alenia Space, Airbus Defence and Space and ESA projects.
Frentech Aerospace s.r.o. cooperates with Technical universities and Czech academy of science and also with companies in Czech Republic and foreign companies.

Products/Services
- Precision machining – delivery of precision part for satellites, launchers and aircrafts
- Delivery of Solar Array Deployment Mechanisms
- Delivery of specific structures (cryostat structures, components for optics systems)
- Production and assembly of space mechanisms
- Development of space mechanisms including deployment systems (ESA and commercial projects)
- Testing activities (thermal-vacuum testing, geometrical, mechanical leak-proof, particulate and molecular control)
- Application of tribological coatings for aerospace
- Bake-out and thermal balance testing
- Qualification of screws for space

Major Space Projects & References:
- Iridium NEXT, O3B/GB2
- NEOSAT
- MTG
- ExoMars
- J-BOOM (ESA)
- JUICE
- MetOp
- VEGA launchers
- Ariane launchers
- E-pump for cryogenic rocket propellants
- ATHENA Magnetic Diverter
- Rotary Actuator for Space Applications

Contact

Frentech Aerospace s.r.o.
Jarní 48
614 00 Brno
Czech Republic
www.frentech.eu

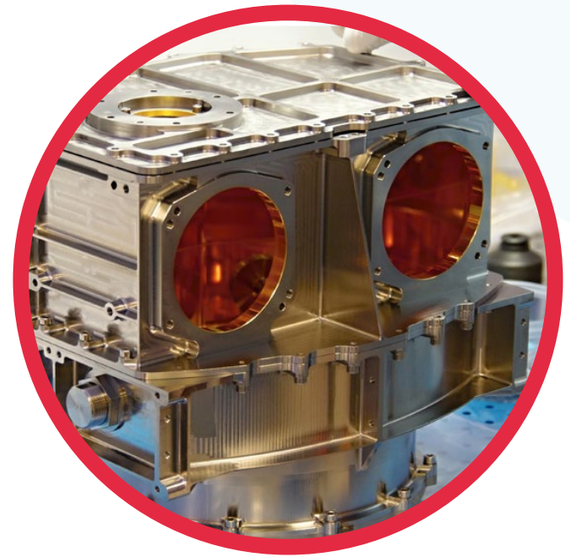
Responsible for space
and ESA projects

Pavel Sobotka
P + 420 545 425 710 (11)
E pavel.sobotka@frentech.eu

Several pictures of typical products
Space Related Equipment Labs & certificates

Key equipment
Clean room ISO7/ISO5, thermal and thermal vacuum chamber, CMM, molecular and particulate evaluation, bake-out with TQCM monitoring, equipment for mechanical and functional testing of space mechanisms

Certificates
- ISO9001
- AS9100 D
- ISO14001
- QSF-A (Airbus)
- CQT 448 (Thales Alenia Space)



G.L. Electronic s.r.o.

- INDUSTRY
- MANUFACTURING
- SERVICES
- R & D
- TESTING

Contact

G.L. Electronic s.r.o.
Hrázky 804
768 11 Chropyně
Czech Republic
www.glelectronic.cz

Responsible for space
and ESA projects

Luděk Graclík
P + 420 530 512 522
M + 420 735 753 053
E ludek.graclik@glelectronic.cz

General Description

G.L. Electronic (SME), an independent Czech company, has been providing complete implementation of Hi-Rel electronic devices and assembly of cable harnesses in the aerospace industrial sector since 2008. The company also offers testing services in ISO8 certified clean rooms and in a testing laboratory accredited according to the international standard ČSN EN ISO/IEC 17025:2018.

Competences & Capabilities

The production of electronic devices takes place within the framework of ESA standards and ECSS standards in ISO8 certified clean rooms. The production is carried out by technicians certified according to ESA standards. G.L. Electronic is specialized in two manufacturing segments: Aerospace segment – production of Hi-Rel electronics for aerospace devices and instruments. Ground segment & EGSE – complete electrical assembly, mechanical integration and testing of rack boxes for harnesses TVAC with testing instruments.

Products/Services

Products

- assembly, repair and modification of PCBs (level EM, EQM, FM)
- assembly of cable harnesses

Services

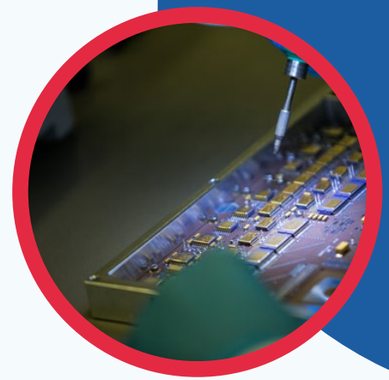
- quality control according to ECSS specifications
- technical and consulting support in the field of design
- bonding and conformal coating
- final routing and integration of harnesses
- testing: climate and vacuum chamber, electrical testing of harnesses (continuity and insulation test and double-wire measuring for 258 points), wire tension test, microsection of crimped joints, endoscopic visual inspection

Major Space Projects & References

Harness manufacturing, testing and integration

- HERA: FM, in cooperation with OHB-I
- TRITON-X: FM, in cooperation with OHB-I Luxspace
- BIOMISSION, in cooperation with SAB Aerospace
- AHA for ROSE-L: FM, in cooperation with Airbus
- VEGA C Harness, in cooperation with SAB Aerospace
- VEGA SSMS, VV18: FM, in cooperation with SAB Aerospace
- NAOS: EGSE, in cooperation with OHB-I
- JUICE MGAMA: EQM/FM, in cooperation with Sener
- VEGA SSMS POC Dispenser VV16: FM, in cooperation with SAB Aerospace/AVIO/ESA
- METOP SG MWI: EM/FM, in cooperation with OHB-I
- S-GEO-(EGSE): FM, in cooperation with CGS-OHB
- SSIS – VERTA/VESPA, in cooperation with SAB Aerospace/ASI/ESA

- LARES, in cooperation with CGS/ASI/ESA
- ESAIL: EGSE/FM, in cooperation with Luxspace OHB
- ISSPresso, in cooperation with Argotec



PCB hand soldering assembly

- SOLAR ORBITER: RPW/TDS & SWA/PAS-CEM, in cooperation with Czech Academies
- EXOMARS: WAM, in cooperation with Academy of Sciences (UFA)
- EXOMARS: EQM/FM, in cooperation with Leonardo
- CDAM: EQM, in cooperation with OHB-I
- EUCLID: EM/EQM/FM, in cooperation with OHB-I
- JUICE-LRF: BB/EM/F, in cooperation with Academy of Sciences ČR
- ARGOS 4: CPU-NGA for Steel Electronique
- PROBA-3: devices for SERENUM (VZLU)

Kourou, French Guyana, 2008-2020

- Vega SSMS POC Dispenser: final integration of cables to the dispenser on the top of the VEGA rocket
- Mangousta: electrical installation of security camera system with IR sensors and integration of A/V systems
- Vega & Soyuz launching pads: technical support to CGS/ Telematic Solution, electrical installation of phone, audio and video signalling, safety (gas leak), partial integration of rack boxes, installation of optical cables

Space Related Equipment Labs & Certificates

Cleanroom

- ISO 8, class 100 000
- Cleanroom production and storage area: 210 m^2
- Continuous temperature and humidity measurement
- Portable 3-channel laser meter of dust particles. Measurement range: 0.3µm, 0.5µm, 5.0µm
- Integration hall with a 2000 kg crane for flight HW: 150 m^2, ISO 8

Certifications

- ISO 9001:2015 (Quality Management System)
- ČSN EN ISO/IEC 17025:2018 (requirements for the competence of testing and calibration laboratories)
- ECSS-Q-ST-70-08/18/26/28/38 for CAT2 & CAT3 (ESA trained and certified technicians)
- IPC-J-STD-001 (Requirements for Soldered Electrical and Electronic Assemblies)
- IPC-A-610 (Acceptability of Electronic Assemblies)
- Extension of ESA verification process of SMD hand soldering of flight level PCB, 2020-2021
- DELTA Verification process of SMD hand soldering of flight level PCB, 10/2019 (ESA)
- Verification process of SMD hand soldering of flight level PCB, 3/2018 (ESA)
- Verification process of SMD hand soldering of flight level PCB, 6/2015 (CNES)

GINA
SAVE LIVES THROUGH TECHNOLOGY

- INDUSTRY
- SOFTWARE
- SERVICES
- R & D
- TESTING

GINA Software s.r.o.

General Description
GINA Software is a technology company developing and providing a public safety and security management system called GINA. The company was established in 2010 and since then has become a specialist in provision of AVL systems and field cooperation applications used by Public Safety and Defence Agencies, Humanitarian Organizations, Oil & Gas and Mining Industries.

Competences & Capabilites
The main goal is to Allow tactical coordination between commanders and field units over the same map. Respond faster & make informed decisions using the most reliable situational awareness platform.

The ultimate tool for reaching this goal is an interactive map providing constant real-time visibility of all units from variety of devices combined in a single interface with advanced features such as history of movement, data visualization, automatic reporting, video surveillance and data analysis.

In addition to that, GINA has developed an in-vehicle public safety field cooperation application featuring incident information, navigation, live data feeds, video streaming and field informational support tool.

Products/Services
- GINA Central – a modern tactical AVL software providing real-time information.
- GINA Tablet/Mobile – a emergency response/field response app.
- GINA GO – a location tracking app with panic button.

Major Space Projects & References
- Search and Rescue Operations (Haiti ,Japan, Lebanon, Czech Republic)
- Fire and Rescue Services of the Czech Republic, Slovakia, Germany, Switzerland.
- Deployment for Security Organizations
- Deployment for European Commission
- ESA FIRTS RESPonse Project (118 Verona Italy)
-

Space Related Equipment Labs & certificates
- Assets & Vehicle Tracking devices: Rugged GPS tracking devices, GSM connectivity, A-GPS sensor, Programmable buttons, Configurable Tracking frequency.
- Mobile Terminals: Robust device with ergonomic design for whole day usage, enabling extension by accessories: Smartphone features, GPS location sharing.
- Iridium Satellite Terminal: Unique solution for intelligent tracking over satellite and mobile networks: Iridium/GSM/3G network connectivity, Price equivalent to personal satellite trackers, Predictive location sending, Interactive map.

Contact

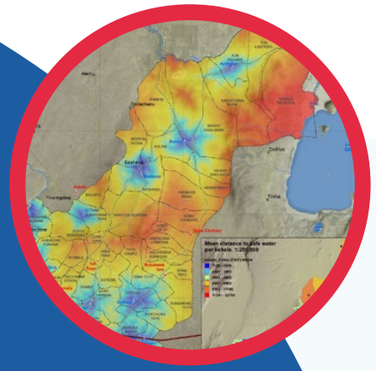
GINA Software s.r.o.
Purkyňova 649/127
612 00 Brno
Czech Republic
www.ginasystem.com

Responsible for space
and ESA projects

Ing. Jiří Janíček
P +420 511 205 240
M +420 604 953 204
E janicek@ginasystem.com

GISAT s.r.o.

- INDUSTRY
- SOFTWARE
- SERVICES
- R & D
- TESTING



General Description

Gisat is committed to supporting sustainable living and using Earth resources by providing innovative information services that enable us to make better decisions about our environment. We transform complex remote sensing data into insights ready to serve your decision making and to embed geospatial dimension in your own businesses.

Competences & Capabilities

Gisat is the first privately run geo-information service in Czechia. We act globally and provide solutions in a wide range of thematic application domains. Combining remote sensing, artificial intelligence and big data analytics we operate a complete value-chain to unleash the power of Earth Observation data at one place. Our online platform solutions introduce ready-to-use spatial data exploration tools and integrate them into clients' decision-making mechanisms. We provide our service and products to a diverse group of clients that includes international & financial Institutions, public & state authorities and businesses worldwide.

Products/Services

- Agriculture
  Operational agricultural monitoring and food production assessment serving farmers, industry, governments and agencies
- Sustainable Urban Development
  Geospatial solutions for livable and vibrant cities and regions
- Geohazards Mapping And Monitoring
  Risk assessment support via up-to-date information about hazard status and insight into its evolution in space and time
- Utility And Infrastructure
  Early identification of risks and support to planning, construction and maintenance of utility and infrastructure assets
- Environmental Monitoring And Natural Accounting
  Monitoring services providing critical support for our challenging commitments targeting the resilience of ecosystems and society

Major Space Projects & References

Dozens of research and commercial projects provided to industry, governments, public institutions and international agencies (ESA, EC, EEA, JRC, EUSC, World Bank, ADB, IADB).

Space Related Equipment Labs & certificates

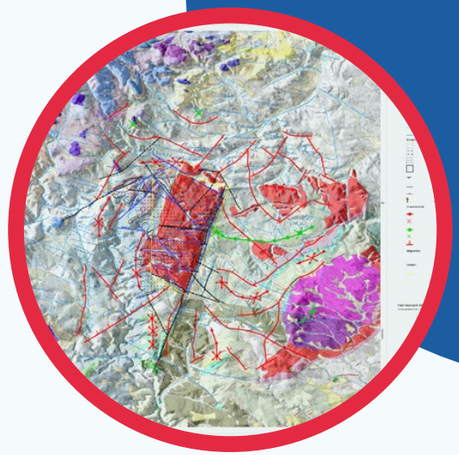
The company is ISO 9001 & ISO 14001 certified to guarantee the quality of provided services and to reflect the responsibility in environmental impacts of its activities.

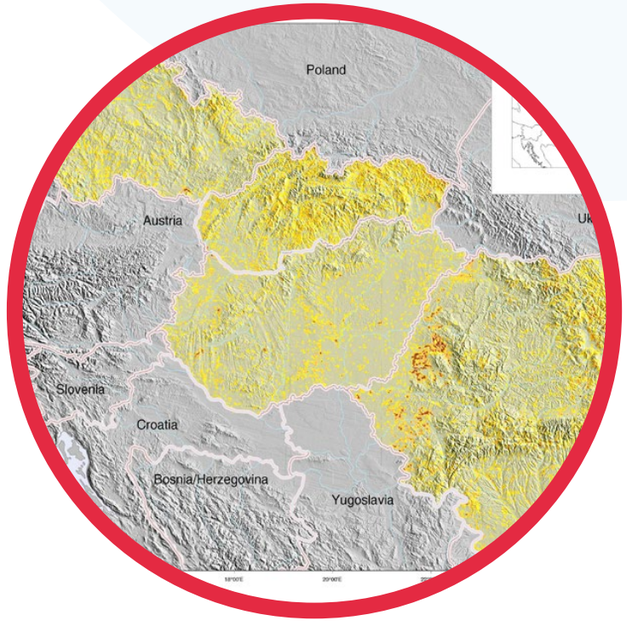
Contact

GISAT s.r.o.
Milady Horakove 57
170 00 Praha 7
Czech Republic
www.gisat.cz

Responsible for space
and ESA projects

Ing. Lubos Kucera
P +420 271 741 935
E lubos.kucera@gisat.cz





- INDUSTRY
- SERVICES
- R & D

GNSS Centre of Excellence, z.s.p.o.

General Description

GNSS Centre of Excellence (GCE) is a non-profit association founded by Czech Railway, Air Navigation Service Provider, Road and Motorway Directorate, and Czech Railway Infrastructure Administration. GCE is not only an association or a consultation company but has technically experienced personnel working on R&D projects.

Competences & Capabilities

GCE's mission is to accelerate the development and deployment of Galileo and EGNOS through active cooperation with its members that are Universities, Research Institutes, R&D companies incl. SMEs. GCE has competencies in development, testing and deployment of GNSS-based product, services and applications, expertise on GNSS technology, project management, background research, monitoring of trends and opportunities in GNSS.

Product / Services

GNSS and aviation:

- RNP Approaches & PinS publication and implementation

GNSS and RFI:

- RFI detection & mitigation
- Critical infrastructure protection

GNSS and rail:

- Utilisation GNSS in rail signalling systems

Project Management competencies:

- Management of large & complex projects under different granting schemes
- Competencies in HORIZON2020 granting process
- Procurement process of the ESA and EUSPA
- National granting schemes & procurement processes
- PM competences and consultation

Contact

GNSS Centre of Excellence, z.s.p.o.
Navigační 787
252 61 Jeneč
Czech Republic
www.gnss-centre.cz

Responsible for space
and ESA projects

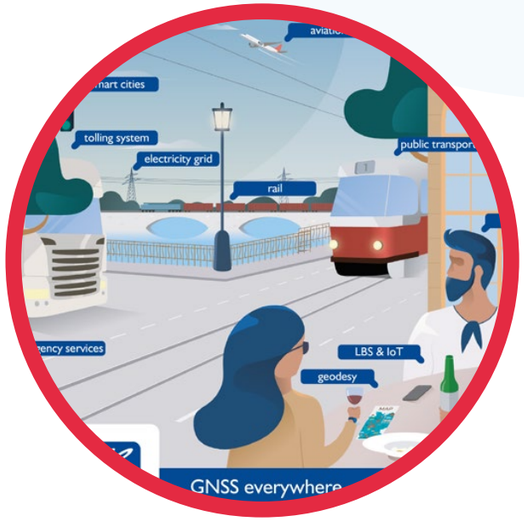
Dr. Tomáš Duša
M +420 774 13 33 32
E tomas.dusa@gnss-centre.cz

Major Space Projects & References

- Project: GNSS vulnerability & mitigation in the Czech Republic – ESA NAVISP project to support Czech Republic's activities towards safe and robust GNSS utilisation for critical infrastructure operators and state and governmental institutions. Real-time on-field testing campaigns understand impact of the GNSS RFI.
- Project: GNSS RFI detection at highways – develop a static GNSS RFI detection system to be used at tolling gantries complemented with hand-held detectors for a police.
- Project: Implementation of PinS procedures and Low level routes in Czech airspace – utilise a functional way for broad implementation of PinS and LLR in Czech aviation.
- Project: TrainLOC – creating conditions for the implementation of GNSS on a railway network for GNSS based signalling systems and safe localisation of trains

Space Related Equipment, Labs & Certificates

GNSS receivers´ performance and robustness testing at unique Czech's railroad testing circuit



Honeywell

- INDUSTRY
- MANUFACTURING
- SOFTWARE
- R & D
- TESTING

Honeywell International s.r.o.

General Description
Honeywell has a long and proud heritage in the Czech Republic. Since opening its first office in 1962, Honeywell has expanded to operate from three locations in the Czech Republic: Prague, Olomouc and Brno. In space sector, Honeywell provides innovative products that have contributed to the mission success of many different and varied space platforms.

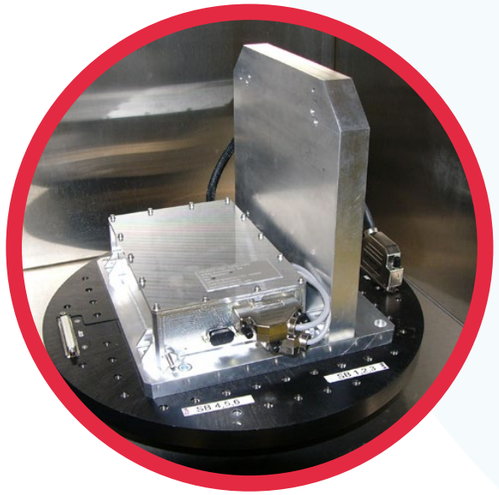
Competences & Capabilities
Honeywell provides various solutions and products required for accurate momentum control, pointing, guidance and navigation, data control and other satellite, launch vehicle, missile, and interceptor products. Close cooperation with ESA also led to several breakthrough solutions and technologies in the field of satellite communication.

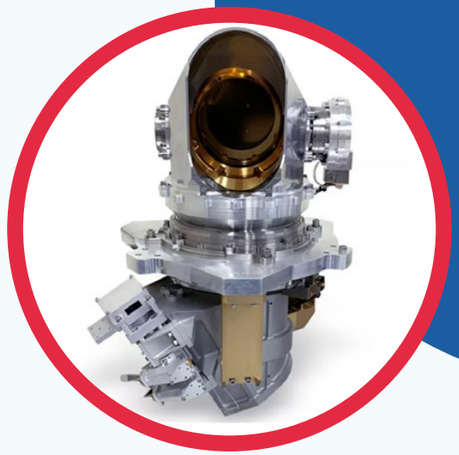
Utilizing this experience and a dedicated development laboratory, Honeywell has expertise leading to a high probability of mission success, regardless of the spacecraft challenge presented.

Products / Services
Leveraging our industrial and research capability across the Czech Republic, Honeywell serves space users with state-of-the-art products and services in number of areas:

- Satellite Guidance & Attitude Control
- Momentum Control Systems & Control Moment Gyros
- MEMS Inertial Sensors & Units
- Antenna pointing mechanisms
- Satellite Communication & Optical Communication

Space Related Equipment, Labs & Certificates
Various test beds are enabling Honeywell to support its customers in risk-reduction testing of new dynamic and structural control systems for new satellite programs. With the Advanced Momentum Control Array System (AMCAS) Honeywell offers: Upfront modeling and simulations Validation of modular and scalable designs Experimentation with various attitude, momentum and vibration control scenarios and interactions Verification of new control schemes and code Testing of hardware and software in an open or closed looped test environment





Contact

Honeywell International s.r.o.
V Parku 2325/16,
148 00 Prague - Chodov
Czech Republic
www.aerospace.honeywell.com

Responsible for space
and ESA projects

Ing. Ludek Nechleba, M.B.A.
M +420 234 625 980
P +420 602 698 039
E ludek.nechleba@honeywell.com

Huld s.r.o.

- INDUSTRY
- MANUFACTURING
- SOFTWARE
- SERVICES
- R & D

Contact

Huld s.r.o.
Namesti Winstona
Churchilla 1800/2
Zizkov – Praha 3
Czech Republic
www.huld.io

Responsible for space
and ESA projects

Helena Kalenska
M +420 734 424 818
E helena.kalenska@huld.io

General description

Huld is a European technology design house with over 450 employees and 11 offices in Finland and the Czech Republic. With us, you build intelligent solutions that last for tomorrow – and beyond. Huld offers an internationally unique combination of software and product development expertise. We bring more intelligence to our customers' business – and to the entire world. We always work for a more intelligent future, and care about the world around us.

Competences & Capabilities

Huld has attracted the best experts experienced with providing high-reliability software solutions for many of Europe's most ambitious space missions and customers like Airbus D&S or OHB. Our purpose is to provide technological design expertise to our customers on their journey beyond tomorrow, safely & securely. By combining design thinking, agile methodologies, and technological insights we help our clients to reach the next level of their product development. We digitalise industries and business operations and support our clients in their next generation product development by designing and developing usable, sustainable, and intelligent equipment, all this by ensuring their compliance to the strictest safety requirements. We have broad experience with ESA projects but also new space projects focusing on embedded software, GNSS technologies or ISVV.

Products and Services

- Onboard Software
- Onboard Data Processing
- Ground Processing
- Independent Software Validation and Verification
- Test Software & Simulations
- Development & Validation Services
- Space Security
- Mechanical Engineering

Major Space Projects & References

- Milani CubeSat is part of deep space mission Hera. The CubeSat will be deployed at Didymos/Dimorphos binary asteroid system. It will operate autonomously for 3-6 months near the asteroid and capture scientific data including hyperspectral images. We are responsible for On-Board Software and Data Processing Unit development. The DPU fulfills industry standards as well as includes experimental AI algorithms to measure image quality. The AI is optimized for reliable operation in deep space missions.

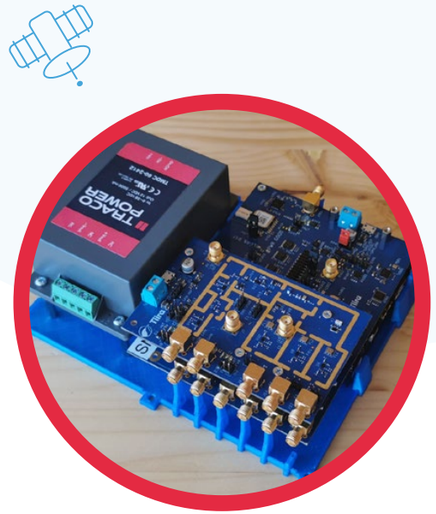
Results from fully automated tests

- HERA AI FDIR project's goal is to design and develop AI-based failure detection application. The AI will be deployed on Hera OBC and allow faster and better anomaly detection and prediction. The AI is optimized to run in limited resources provided by Leon platform.

- The TIIRA project addresses the first step towards the standalone GNSS/Galileo receiver with open-source solution and resulted in a Minimum Viable Product and a commercially viable solution for cooperative navigation targeted to a premium mass market.

TIIRA GNSS receiver

- Orbitcon is a full-fledged mission control system (MCS) customized for SmallSats. It offers standard interfaces and easy mission instantiation. The service is hosted in a cloud environment, accessible globally, with all tools needed to cover a whole lifecycle of a mission. To enable quick expansion of the service, we will encourage the connection of existing Ground Stations (GS) via predefined interfaces, i.e. Space Link Extension (SLE). In parallel, we develop a modular reference design that can be used for a nascent Ground Stations (GS). The design covers VHF, UHF, and S-BANDs and is available as an open architecture too. The reference GS design guarantees seamless integration with our MCS.
- Plato the PLAnetary Transits and Oscillations of stars mission. Huld is the Spacecraft Software Prime in a consortium led by OHB.
- BIOMASS Support CSW - Biomass was selected as the 7th Earth Explorer mission to reduce uncertainty in the worldwide spatial distribution and dynamics of forest Biomass to improve current assessment and future projection of the global carbon cycle. Huld was involved in the development of Payload management within CSW and responsible for the development of software components and software support.
- Sentinel-4 UVN – The Sentinel-4 mission is a part of the COPERNICUS programme, whose overall objective is to support Europe's goals regarding sustainable development and the global governance of the environment. We participated in the implementation of a validation test for MIL-STD-1553B data bus (Milbus), the main bus for command and control of instrumentation and platform units.
- BepiColombo ISVV - BepiColombo is Europe's first mission to Mercury. Our engineers participated in ISVV of three of those components - central software, failure control electronics and solid-state mass memory.
- Sentinel-4 L1bPP - The S4 UVN L1b Prototype Processor (L1bPP) project aims to develop an L1b prototype data processing software (a data processor). Huld engineers participated in the core development team.
- SCA - The MetOp-SG Scatterometer was a follow-up to the MetOp ASCAT and a wind mode of the Active Microwave Instrument (AMI) on the ESA Earth Remote Sensing satellites ERS-1 and ERS- 2. Huld developed the DCU ASW together with the Prime (Airbus DS). Implementation, including Detail Design, Coding and extended Unit testing, was done at Huld premises.



- INDUSTRY
- SOFTWARE
- R & D

Iguassu Software Systems, a.s.

1

General description

Iguassu Software Systems (ISS)
software solutions for ESA, Eumetsat, Spaceopal, ESSP, EUSPA, TAS, Airbus DS and other international customers.

Core expertise SBAS/Galileo, SSA (robotic & fly-eye telescopes, asteroid detection), Ariane 6 software

Competences & Capabilities

In space technologies since 1994 e.g. Meteosat TP MCC CF, SCOS, ground segment systems ESOC, ESRIN, IRIDIUM terminal test software, MSG, MCF, MSG PGS etc.
Since 2005 (ESA membership) ISS has been developing space software solutions for

- MEOLUT (Medium Earth Orbit Local User Terminal (MEOLUT) for GJU with Indra
- GNSS. E.g. SBAS performance tools for ESA, Collision Risk Estimation & Automated Mitigation (CREAM#3), Machine learning to model GNSS. For EUSPA we work e.g. on Galileo HAUT, EGNOS V2 support and EGNOS V3
- SSA – robotic telescope test bed, fly-eye telescope, optical sensors qualification, telescope data processing chain, European Optical Network
- Sat-com (Antares with TAS-I & Indra), IRIS (INMARSAT)
- Launchers - Ariane 6 telemetry onboard processing software, and ground segment s/w

We can also work in Spanish, German and Portuguese, with basic French, and Japanese

Commercial products

Our software runs in the TAS-F EGNOS simulator (5 year maintenace contact), CNES, ESA, West Africam ANS, ESSP(EGNOS operator), Romanian Space Institute, UK Lighthouse Authority, Telespazio, CNES, and even in the Japanese government institute (QZSS) ENRI.

- EVORA – real-time GNSS performance monitoring, multi-constellation, dual frequency (MCDF)
- SBAS Simulator II – volume simulator, MCDF
- SENDAI – long term GNSS performance monitoring statistics and data mining too, MCDF

Clients, partners.

ESA (ESOC, ESRIN, ESTEC, EGNOS Project Office Toulouse), Eumetsat, GJU/Indra, ACS-I, CAM GmbH, Iridium sub., SciSys-UK, Indra-E, Integral-F, TriPolus-UK, Airbus SD-D&F, TAS-F, TAS-I, GMV-E&R&PL, Sybilla-PL, Integricom-NL, Vega-D, Quasar-E, Clemessy-F, Critical Software-D&P, Telespazio-F, Ariane Group, ESSP, SpaceOpal, ENRI-Japan, ASEC-NA-West Africa....

Contact

Iguassu Software Systems, a.s.
Evropska 120
160 00 Prague 6
Czech Republic
www.iguassu.eu

Responsible for space
and ESA projects

Petr Bares, Managing Director
M +420 603 85 44 77

Jiri Doubek, chief engineer and deputy MD
E mailus@iguassu.eu

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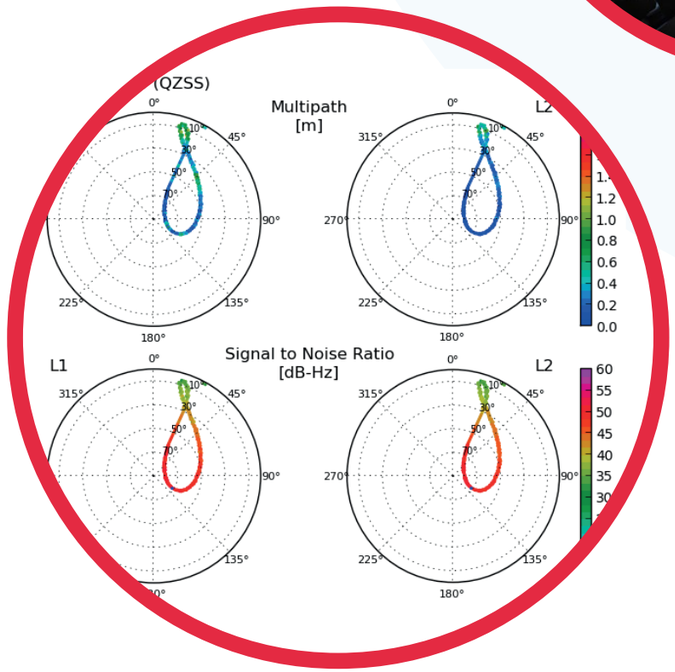


[1] Ariane 6
[2] Flyeye telescope

KYOCERA AVX Components Czech Republic s.r.o.

- INDUSTRY
- MANUFACTURING
- SERVICES
- R & D
- TESTING

General description
KYOCERA AVX Components Corporation is a leading international manufacturer and supplier of advanced electronic components with 33 manufacturing facilities in 16 countries around the world. The company offers a broad range of devices including Capacitors, RF/Microwave Components, Sensors, Controls, Circuit Protection Devices, Connectors and Antennas Solutions.

KYOCERA AVX Components Czech Republic s.r.o.
KYOCERA AVX Components Czech Republic s.r.o. is a subsidiary of KYOCERA AVX Components Corporation, which is headquartered in Fountain Inn, South Carolina, USA, and made up of three divisions, which include:

- The KYOCERA AVX in Lanškroun develops and produces capacitors with a major share worldwide. For more than 15 years has produced ESCC qualified SMD tantalum capacitors. The capabilities include: solid and wet tantalum, conductive polymer, and niobium oxide technologies for consumer, wearable, telecommunications, automotive, high reliability, medical, and special aerospace applications.
- The KYOCERA AVX in Uherské Hradiště produces a wide range of passive component products, including multilayer ceramic capacitors, film capacitors, termistors, varistors, and power capacitors, and serves key customers from the automotive, transportation, telecommunications, and as well as for industrial, military and space.
- The KYOCERA AVX in Bzenec focuses on interconnect solutions, which primarily consists of automotive and industrial.

Globally, KYOCERA AVX has the industry leading position in high-reliability tantalum capacitors, and is the largest supplier of high-reliability solid and Wet tantalum capacitors for medical and military/aerospace applications with the industry's widest range of medical, COTS-Plus, MIL specifications, and space level products. The division is a global leader in MnO2 solid electrolytic technologies, which include the smallest case size MnO2, the highest temperature up to 230°C, and the lowest DCL product offering. KYOCERA AVX's Division plants for given product lines are strategically located in the Czech Republic, El Salvador, Japan, Thailand and the USA.

KYOCERA AVX Lanškroun
Since 1998, there have been many technological upgrades and innovations introduced by the R&D team, beginning with the high-temperature tantalum capacitors (up to 175°C) for automotive applications. Today's product ranges offer an extension of the capacitors to 200°C in the surface mount style or 230°C as the hermetically sealed or Wet radial style option. Another major achievement of AVX Lanškroun was the introduction of extremely stable performance capacitors based on niobium oxide (NbO) anode material instead of traditional tantalum. In 2004, the plant's capabilities were further extended to include conductive polymer technology. AVX was the first company to market with several new polymer technologies, such as the highest voltage in the industry, over 100Vr (Elektra award 2010), the smallest case size 0402, the highest reliability polymer in hermetically sealed package for extended lifetimes (Elektra award 2015); and the highest energy density. KYOCERA AVX's product portfolio also expands on new ESA space qualification for low ESR polymer TCS series.

Contact

KYOCERA AVX
Components Czech Republic s.r.o.
Dvořákova 328
563 01 Lanškroun
Czech Republic
www.kyocera-avx.com

Responsible for space
and ESA projects

Slavomir Pala
P +420 465 358 129
E slavomir.pala@kyocera-avx.com

Ing. Jaroslav Tomáško
P +420 465 358 682
E jaroslav.tomasko@
kyocera-avx.com

KYOCERA AVX is acting worldwide in various space programs, however, on EU we have established supplier position for the European Space Agency (ESCC Generic Specification No. 3012), and offers surface mount tantalum capacitors, TAJ ESCC released in 1993, TES ESCC released in 2013 and polymer capacitors TCS ESCC, released in 2020. During 2010 through 2013, hermetic packaging of conductive polymer capacitors from the TCH series was developed in cooperation with the European Space Agency (ESA) for space-level applications as a part of the Czech Incentive Program, and the ESCC specification is currently underway. In cooperation with ESA, KYOCERA AVX offers new TAC microchip product range enabling to downsize tantalum capacitor case down to 0603. The space-oriented developments also provide design engineers with options to downsize, enabling significant reductions in both payload and physical space, which are extremely beneficial in aerospace applications.

Major Space Projects & References (where the capacitors developed and manufactured in Lanskroun were used)

- NASA Artemis project - back to the moon:
  part of Artemis project is Multi Purpose Crew Vehicle and Service module on the Orion. The service module was designed and built by the European Space Agency and we have TES/TAJ-ESA design in on this.
- INDIA -Chandrayaan mission:
  TCH/TES on the ISRO Pragyan Rover.
- Part on low orbit satelites projects:
  GEO/LEO/MEO
  Various range of PN portfolio (Cots Plus)
- 630pcs TBM Tantalum Capacitors are Powering Laser of ChemCam Module On Curiosity Mars Rover
  350pcs TBM Perseverance - design in laser supply boarding in Supercam
- Part on TURKSAT Satellite Programme. (TES, TAJ-ESA)

Meet performance requirement for:

- Voyager Space Probe
- Mars Rovers
- ISS
- Shuttle

SMD tantalum and conductive polymer capacitors, WET tantalum and special tantalum capacitors, ceramic capacitors, EMI filters

- Space: ESCC3012/001, ESCC3012/004, ESCC3012/006 T-level, SRC/SRW9000
- Defense: DSCC/DLA, COTS-Plus

Space Related Equipment, Labs & Certificates

- ESA qualified Lanškroun plant
- Certificates:
  IECQ-CECC
  IATF 16949:2016 – Automotive product
  ISO 9001:2015 - Quality management system
  ISO 14001:2015 - Environmental management system
  Sony Green Partner Award
  ESCC 3012/001 - SMD Solid Tantalum Chip Capacitors
  ESCC3012/004 - Low ESR Tantalum Chip Capacitor
  ESCC3012/006 - Polymer Solid Electrolytic Multianode Capacitor
- MIL-PRF-790

MCE Slaný s.r.o

- INDUSTRY
- MANUFACTURING
- SERVICES
- R & D
- TESTING

General Description

Founded in 1991, MCE Slaný s.r.o. is the largest steel structure construction company in the Czech Republic. Specializing in bridges, heavy steel construction, and large-scale weldments, MCE Slaný is a subsidiary of the Austrian HABAU GROUP. MCE is dedicated to meeting our customer requirements in steel structure construction with customized, individual solutions. MCE Slaný is an expert, all-in-one general contractor whose Hi-Tech projects include deliveries of Airbus assembly and handling products, supply of aerodynamic and aero-acoustic tunnels for Mercedes-Benz and BMW, and delivering on demanding, non-traditional projects for both assembly and production.

Competences & Capabilities

We manufacture reliable and high-quality steel structures and our proven best-practices, advanced production technologies, and highly-qualified professional workforce ensure compliance and satisfaction from start to finish. We specialize in medium and heavy steel construction with materials up to 690 MPa, including special steels such as HARDOX. We deliver comprehensive project security from technical support and equipment development to all stages of construction, including oversized transport, assembly, and installation. Our customers, Airbus, ABB, and Siemens are world leaders in innovation and technology.

Major Space Projects & References

All-inclusive production of the deflector shield for the ELA 4 Launch Ramp of the Ariane 6. Weighing ca. 650 tons, plus ca. 120 tons in parts, MCE Slaný developed or assisted in every stage of the project including but not limited to: Device development (and calculations) 3D model production Production

- Deflector shield assembly and water-cooling system performance
- Metallizing all components via hot-dip galvanizing
- Finish coat
- Overseas packaging
- Transport
- Final assembly (Kourou, French Guiana)
- Manufacture and supply of Toolox spare parts

Space Related Equipment, Labs & Certificates

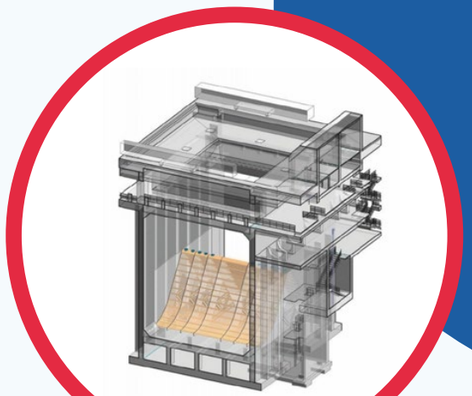
- 10,000 tonnes of steel structures per year
- 440,000 hours of production capacity per year
- 35,600 m^2 of production area
- 3 paint shops
- Maximum parts manufactured dimensions (100 tons, 30 x 7 x 4.5m)
- Staff and devices for NDT testing UT, MT, PT, all level 2
- ISO 9001ISO 14001BS OHSAS 18001EN ISO 3842-2, EN 1090-1, -2 EXC -4EN 15085 CL -1 M

Contact

MCE Slaný s.r.o
Netovická 538
27401 Slaný
Czech Republic
www.mce-hg.com

Responsible for space
and ESA projects

Ing. Igor Chorovský
P +420 312 510 104
M +420 724 106 243
E igor.chorovsky@mce-hg.com



Meopta – optika, s.r.o.

- INDUSTRY
- MANUFACTURING
- SOFTWARE
- SERVICES
- R & D
- TESTING

General description

- Global manufacturer of precision optics.
- Specializied in the design, engineering and assembly of complex optical, opto-mechanical and photo-electronic systems.
- Innovative, total solutions for the consumer, industrial and military markets.

Competences & Capabilities

- Long tradition of producing high quality precision optics and mechanics for components, subsystems and full turn/key systems.
- Development process from the development of an initial prototype through the serial production of a final product.
- Team of outstanding designers and engineers.
- Guarantee of the highest level of quality and performance in manufacturing.

Major Space Projects & References

The main ESA projects:

- TESLA OH-OB (Prism&band filters design, development, production, coating, and qualification).
- Flex (Mirror&coating design, development, production, and qualification).
- OHB - SHS project (Optical and mechanical design, development, production, and qualification).

Space Related Equipment, Labs & Certificates

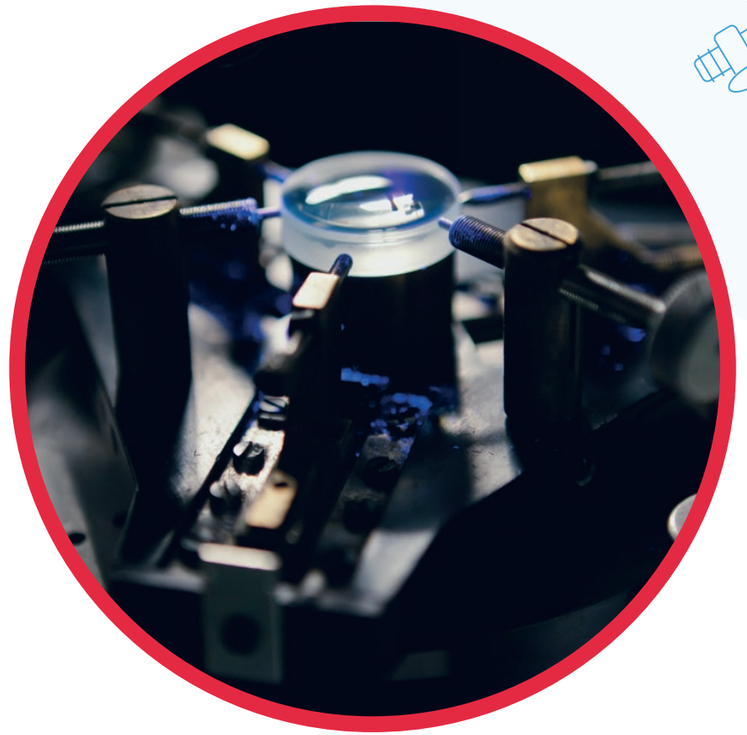
- Manufacturing area of 58.000m^2.
- Clean rooms with class up to 10 (equivalent ISO 4) + AMC control.
- In house testing equipment (excluding thermal vacuum and radiation).
- More information about our lab possibilities: www.testinglab.meopta.com
- Certificates: ISO9001, ISO14001, AQAP2110

Contact

Meopta - optika, s.r.o.
Kabelikova 1
750 02 Prerov
Czech Republic
www.meopta.com

Responsible for space
and ESA projects

Libor Grygar
P +420 581 242 621
M +420 603 228 774
E Libor.Grygar@meopta.com



OHB Czechspace s.r.o.

- INDUSTRY
- MANUFACTURING
- SERVICES
- R & D
- TESTING

General Description

Situated in Brno, Czech Republic, OHB Czechspace is a member of the space and technology group OHB SE, one of the leading forces in Europe's space sector. OHB Czechspace focuses on supplying spacecraft and launcher structures as well as its mechanical ground support equipment according to the customer's specifications.

Competences and capabilities

OHB Czechspace performs the development, design, verification, procurement, test conduction and belonging product assurance tasks. The company's success is based on a team of experienced engineers with deep knowledge and passion for innovation.

Services

Mechanical Design

Design of structural items and systems from the conceptual phase to detailed design according to the customer's requirements and standards.

- Material Selection
- Mass Estimation
- Selection of Standard Parts
- Drawing Generation
- Definition of Electrical Grounding
- IRD Generation

Structural Analysis

Analysis and verification of space products, such as structural items, sub-assemblies, satellite systems, electronic equipment. All verification according to ECSS Standards if required.

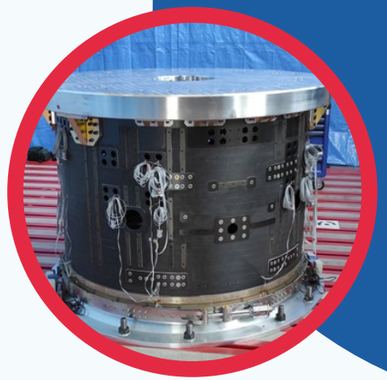
- Generation of FE models
- Static Analysis (linear and non-linear)
- Dynamic Analysis – modal analysis, random vibrations and acoustic analysis
- Stress Verification
- Thermo-elastic Analysis
- Deformation Analysis
- Stability Analysis
- Design Optimization
- Sandwich Panel Insert Verification
- Bolt Verification
- Weld Analysis
- Fracture Mechanics and Fatigue Analysis
- Generation of Condensed Models
- Model Correlation with Test Data

Contact

OHB Czechspace s.r.o.
Purkyňova 648/125
Brno 61200
Czech Republic
www.ohb-czech.cz

Responsible for space
and ESA projects

Dr. Ondrej Krepl
P +420 511 156 321
M +420 777 799 502
E ondrej.krepl@ohb-czech.cz



Procurement

Procurement of all metallic and composite structural items.

- Central Tube
- Sandwich Panels
- CFRP Laminate Designs
- Metallic Items
- Mechanical Ground Support Equipment
- Strut Assembly Design

Mechanical Test Conduction

Lead of different types of mechanical tests, such as modal, vibration, static, or shock testing.

- Coordination of the test facility
- Co-operation on the test preparation
- Preparation of the test procedure and definition of the sensor
- Design of test adapters and supporting structures
- Lead of the test activities
- Evaluation of the test data
- Reporting of the test results

Major Space Projects & References

OHB Czechspace has been awarded various contracts within European Space Agency (ESA) programmes.

HERA - Planetary Defence Mission (Phase B1 & B2/C/D/E)

- Development, design, verification and supply of the complete spacecraft's structural subsystem and mechanical ground support equipment.
- Support of the spacecraft's vibrational test campaign (sine and acoustic vibration).

PLATO - PLAnetary Transits and Oscillations of stars (Phase B2/C/D/E1)

- Structural analysis of the spacecraft's central tube, planning and execution of its static load test, FE model correlation.
- CO2M - The Copernicus Earth Observation Mission (Phase B2/C/D)
- Detailed verification of the satellite's structure.

DLTS – Dual Launch Truss Structure (ESA Study)

- Feasibility study of a light-weight dual launch truss structure for the Ariane 6.2 rocket.

OPTOKON, a.s.

- INDUSTRY
- MANUFACTURING
- SOFTWARE
- SERVICES
- R & D
- TESTING

General description

OPTOKON, a.s. is a 100% Czech owned joint- stock company with over 30 years of experience in the information and communications technology market. OPTOKON develops and manufactures connectivity solutions for high-quality communication networks. The company significantly contributes to operational reliability and safety in global voice, data and video transmission through its fiber optic systems. The high product quality and forward-looking system designs means that OPTOKON ensures that networks are fit for the future and that investments remain sound in the long term. OPTOKON connectivity solutions are used in offices, data centers, by network operators, in homes, in industry and the military, where OPTOKON NATO approved solutions dominate the global market. The OPTOKON Czech and Malaysian calibration laboratories offer accredited calibration services.

Our Testing Division carries out mechanical, thermal and EMC tests according to standard EN ISO / IEC 17025.

Competences & Capabilities

Main areas of activity include:

- Connectors, Cable Assemblies
- Cable Management Systems
- Splitters, WDM, CWDM & DWDM
- Data Network Equipment
- PON Solution
- Fiber Optic Test Equipment with Bluetooth wireless and USB control
- OPTOKON Ruggedized Harsh Environment Optical Network Products
- Optical, hybrid and special cables for mobile and tactical use
- Service and Calibration Center

OPTOKON specializes in the production of military tactical components for use in harsh environmental conditions, aerospace and broadcasting and currently supplies the military forces of more than 20 countries with high quality military tactical components using unique Expanded Beam technology.

Major Space Projects & References

- Astronomical Institute ASCR- Telescop interconnection, fiber optic infrastructure

Space Related Equipment, Labs & Certificates

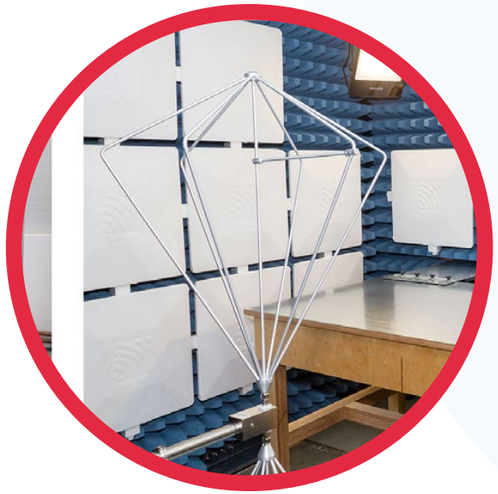
- OPTOKON Research & Development Innovation Department
- Testing climatic chamber for individual test methods, according to the standard ČSN EN ISO/IEC 17025
- Accredited Calibration Laboratory No. 2315
- EN ISO 9001:2015 Certified Quality system
- EN ISO 14001:2015 EMS system in all processes
- AQAP certified

Contact

OPTOKON, a.s.
Červený Kříž 250
586 01 Jihlava
Czech Republic
www.optokon.com

Responsible for space
and ESA projects

Ing. Jiří Štefl
P +420 564 040 111
E stefl@optokon.com



ProjectSoft®

- INDUSTRY
- SOFTWARE
- SERVICES
- R & D

ProjectSoft HK a.s.

General description
ProjectSoft is an automation and engineering company focused on technology processes, information and robotic systems. Our customers are prestigious scientific institutes, space agencies and different industries all over the world.

Competences & Capabilities
ProjectSoft belongs among the top suppliers of automatic technology processes, information and robotic systems. Our customers are industrial enterprises and scientific institutes. The essential part of our activities is implemented in the food industry. We own and create our know-how for the robotization and control of astronomical devices. We have developed and have been improving our system for the visualization of technological processes. We supply entirely new technologies and also provide reconstructions and refurbishments of existing technologies or their parts. We provide a wide range of services – from machinery equipment design and supply, energy distribution systems, through automation parts up to information systems. Yet our work doesn't end with the project's delivery.

Products/Services
- Feasibility studies, creation of visions
- Supplies of complete technology
- Supplies of parts of technology and apparatuses
- Reconstructions and modernisation
- Supplies of measuring and regulation devices and electro devices
- Energy optimisation
- Technological engineering
- Development and creation of software equipment
- Training of operators and specialist staff
- Service provided by our non-stop help desk

Major Space Projects & References
- Four 2-meter telescopes made by Carl Zeiss Jena were robotized by our company.
- Robotization of 1,54m Danish telescope - full reconstruction and remote control of the Danish 1.5m telescope at ESO's La Silla Observatory in Chile. The telescope is remotely controlled from Europe, without any on-site presence of
- Robotization of OGS 1m telescope The main objective of the project was to extend and improve the precision of tracking of objects moving in the vicinity of the Earth. That includes not only active artificial satellites but also satellite debris and small solar system bodies. The project results can be used for related purposes – for example in ground stations for Meteosat of the 3rd generation, GMES satellites or optical ground stations.
- ProjectSoft´s fully robotized observatory BluEye 600 is an ultra-speed Alt/Az installation (speed of moving is up to 90°/sec) telescope with a diameter of the mirror of 0.6m. The installation which is exclusively based on industrial components including PLC Beckhoff is equipped with the most modern direct-drive control. The complete equipment can serve not only for astronomy but also for example for watching gamma flashes, for laser terminals or telemeters, for searching cosmic dust/satellites and so on.
- Robotization of ESO 1,52m telescope on La Silla observatory in Chile. The project is part of the PLATO Spec ground-based support for exoplanetary space missions.
- The control system for the William Hershel telescope is the biggest project of our astronomy department. The telescope mirror diameter is 4.2 m, its size was the third largest at the time of its construction and is still the second largest in Europe. The telescope building is on La Palma island, close to the peak Roque de Los Muchachos. The project goal was to replace the very old control system of the telescope, mainly the control of all telescope motors. The part of the delivery was, among control cabinets, cabling, software and project also very complicated commissioning and tuning of all motors and their controllers, caused by the very high demands for the telescope accuracy.

Space Related Equipment, Labs & Certificates
- Certificates: ISO9001

Contact

ProjectSoft HK a.s.
Eliščino nábřeží 375
500 03 Hradec Králové
Czech Republic
www.projectsoft.cz

Responsible for space
and ESA projects

Ing. Tomáš Turek
P +420 495 052 153
E tomas.turek@projectsoft.cz

Rigaku Innovative Technologies Europe, s.r.o.

- INDUSTRY
- MANUFACTURING
- R & D
- TESTING

1

General Description

Rigaku Innovative Technologies Europe s.r.o. (RITE) belongs to the Rigaku Corporation group (Tokyo, Japan). RITE is European center of excellence for the design, development and manufacturing of X-ray optics, X-ray detectors and X-ray sources, as well as other related scientific products for industry and research.

Competences & Capabilities

RITE expertise and experience focuses on various optical technologies (especially replicated and Multi-Foil X-ray Optics), X-ray imaging and X-ray sources. RITE and its specialists can, due their long experience, test facilities and measurement devices, offer consultations and expertise in these fields.

Products/Services

- X-ray optics (Lobster Eye, Kirkpatrick-Baez system, ellipsoidal, parabolic and Wolter I optics)
- X-ray detectors
- Major Space Projects & References
- VZLUSAT2 mission - X-ray optical payload equipped with Rigaku X-ray Optics and miniaturized TimePix detector with CdTe sensor (www.vzlusat2.cz)
- VZLUSAT1 mission - Experimental verification of space products and technologies on nanosatellite (www.vzlusat1.cz)
- Wide X-ray System for X-ray imaging with detector Timepix – rocket experiments (assembled at Penn State University), co-operation with CTU
- Space radiation capabilities, technologies and platforms for small spacecraft and CubeSats (SR-CTP) - the second-generation Czech CubeSat was built at the QEM level which includes radiation composite shielding, X-ray optics telescope coupled to a pixel detector Timepix as X-ray focal plane detector, and outgassing sensors
- Novel X-ray Optics Technologies for ESA X-ray Astrophysics Missions – ESA PECS Applications of Kirkpatrick Baez Imaging Systems in Space – co-operation with Colorado, Iowa University and CTU

Space Related Equipment, Labs & Certificates

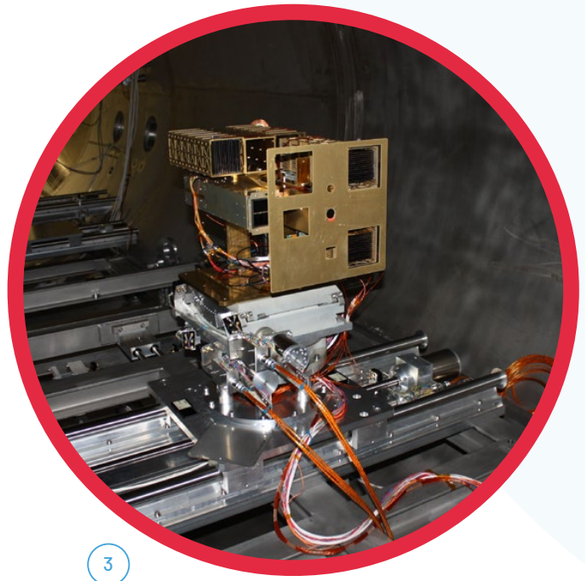
- AFM, SEM and confocal microscope
- Contact profilometer
- Software for design and ray-tracing of X-ray optics for space and laboratory applications
- X-ray optical test bench
- X-ray optical vacuum test bench
- Laboratory equipment for X-ray detectors and X-ray optics characterization

Contact

Rigaku Innovative Technologies Europe, s.r.o.
Za Radnicí 868
252 41 Dolní Břežany
Czech Republic
www.rigakuoptics.com

Responsible for space and ESA projects

doc. Ing. Ladislav Pína, Dr.Sc.
M +420 603 253 864
E ladislav.pina@rigaku.com



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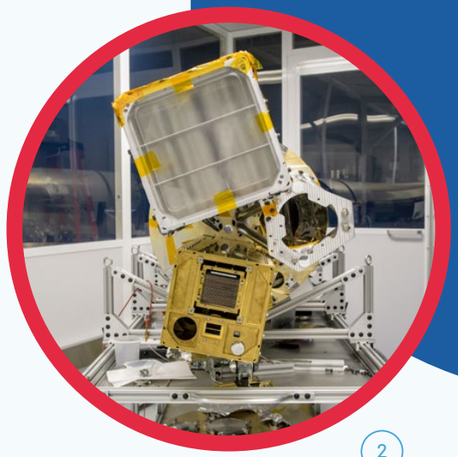

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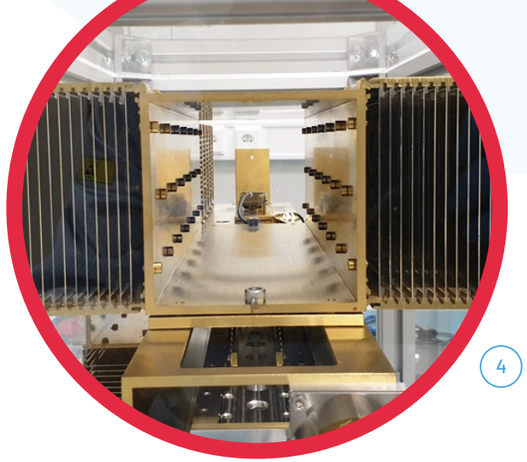

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[1] 1D X-ray optics for VZLUSAT-1, on orbit since June 2017
[2] Rocket experiment - Wide X-ray System for X-ray imaging with detector Timepix (launch 2018).
[3] SR-CTP project, tests at Panter test vacuum facilities (Germany, 2021).
[4] Long focal X-ray KB optics for SRCTP project.

S.A.B. Aerospace s.r.o.

- INDUSTRY
- SERVICES
- R & D
- TESTING

1

General Description

S.A.B. Aerospace s.r.o. is a SME located in Brno, Czech Republic, operating since 2014, one of the most experienced Czech space companies. Its main focus is development of satellites, launchers components, and MGSE. SAB holding also includes branches in Italy, Poland, and Romania.

Competences & Capabilities

S.A.B. Aerospace is an ESA registered supplier, also has been audited to deliver with the major players such as Thales, and Ariane Group. The core business is design of mechanical structures and thermal control systems for satellites and launchers as well as development of microgravity facilities.

SAB has been developing a network of verified subcontractors and suppliers from the Czech Republic and other European countries, including hardware and software providers.

Products/Services

PROJECT OFFICE
- Project Management
- System Engineering
- Product Assurance
- Procurement Management

ENGINEERING
- Mechanical Design
- Structural Analysis
- Thermal Analysis and TCS design
- Mission Analysis
- System Integration
- Microgravity facilities

ASSEMBLY/INTEGRATION AND QUALIFICATION
- MAIT
- Environmental test campaign (external facility)

LAUNCH SERVICES
- Complete launch service

Contact

S.A.B. Aerospace s.r.o.
Technická 23
61600 Brno
Czech Republic
www.sabaerospace.cz

Responsible for space
and ESA projects

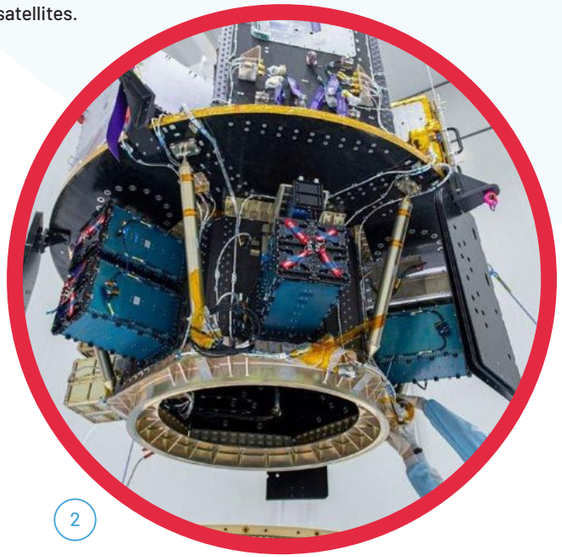
Inna Uwarowa
M +420 734 257 296
E iuwarowa@sabaerospace.cz

Major Space Projects & References

- VEGA SSMS Dispenser – a launcher structure enabling a launch of multiple small satellites on board of VEGA flight. Recurring project.
- PLATO – Scientific mission PLATO is a M-class mission, which will search for exoplanets. SAB is responsible for design and procurement of the service module (SVM) structure.
- Microgravity - Biomission 2019 – development of space laboratories for experiments on the ISS and IOSLAB - pressurised facility for the Space Rider.
- ROSE-L – Copernicus radar satellite for Earth Observation. SAB is responsible for the design of the satellite structure and Thermal Control System TCS, procurement and MAIT.
- ARIANNE 6 Sequencer. Development of the sequencer for multiple launch services on board Ariane 6.
- SLAVIA – Scientific project related to the space resources prospection. SAB is a prime and system integration for the mission.
- IOSHEX – In-Orbit Servicing System based on the SSMS structure. SAB is a prime contractor.
- LCS4 – Development of the low cost separation system for small satellites.

Space Related Equipment Labs & certificates

- Clean room ISO8
- ISO 9001:2009 certified
- Audited by ESA, Thales, Ariane Group



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[1] PLATO mission (image: esa.int)
[2] SSMS being mounted on the top of VEGA Launcher (Image: esa.int)

Serco Czech Republic

- INDUSTRY
- SOFTWARE
- SERVICES

General Description

Serco Czech Republic is a Czech company belonging to Serco Group, the public services expert employing more than 50,0000 people specialising in the delivery of essential public services and managing over 500 contracts worldwide. In Czech Republic, Serco operates since 2020 with space being the core business.

Competences & Capabilites

Serco's teams of engineers, consultants and operations specialists support a wide range of space and ground activities: from data archiving and exploitation, data processing; to systems design, operation and maintenance; data production quality control; and the scientific and technical support for EO satellite data exploitation projects. In addition, as part of our user-facing functions, we provide specialised EO Helpdesk and Service desk.

Beyond Serco Czech Republic, our European Space portfolio offers programme management and end-to-end service delivery across a wide range of activities in the Space domain, from developing, launching and operating satellites, to processing data and developing applications. Alongside satellite operations, Serco is a key actor in the domain of Earth Observation data, implementing and operating one of the largest data dissemination services worldwide, providing complete, free and open access to Copernicus Sentinel data, enabling more than 350,000 users to utilise data to meet their needs.

Products/Services

- Operational services and engineering support to satellite missions
- Real time and ground segment operations
- Software and system engineering,
- Data processing and dissemination
- User and IT support services

Major Space Projects & References

Our employees play an important role in supporting prestigious European programmes, such as the EGNSS and EU Copernicus programmes, where Serco Czech Republic provides key services for EUSPA to ensure the Market Uptake of EU Space Data and provides Operations and Evolution of Data Access and User Support Services to the European Space Agency as part of a Serco-led consortium.

Contact

Serco Czech Republic
Perlová 371/5, 110 00 Praha
Czech Republic
www.serco.com

Jacopo Ovarelli
T +420 773 062 682
E jacopo.ovarelli@serco.com

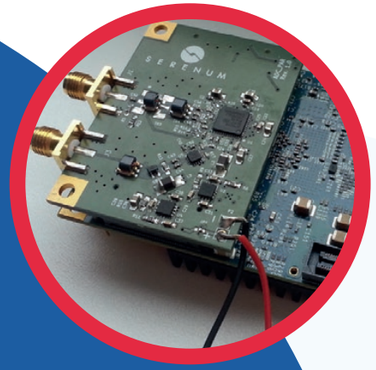
Gianmaria Giaconia
T +393 456 571 541
E gianmaria.giaconia@serco.com

Guido Vingione
P +393 484 917 892
E guido.vingione@serco.com

- INDUSTRY
- SOFTWARE
- SERVICES
- R & D
- TESTING

SERENUM, a.s.

General Description
Serenum Space is a CubeSat component and BUS manufacturer, integrator, and service provider based in the Czech Republic. We are a commercially oriented subsidiary of Czech Aerospace Research Centre, giving us the benefit of years of research in Space and Aviation industries and allowing us to bring premium value to academic, government, and commercial customers.



Products:
- CubeSat platforms
- Cubesat Components and Subsystems:
- VAC02 ADCS for CubeSats
- Reaction Wheels
- Sun Sensor
- Structures
- Flight software
- MGSE and EGSE

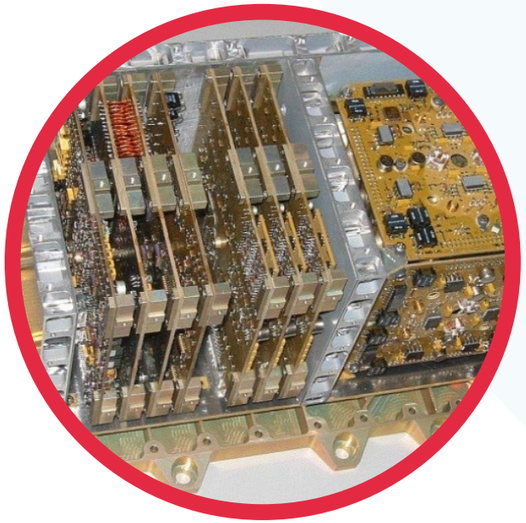
Services:
- Satellite qualification and acceptance testing
- Satellite as a service
- Custom space hardware and software development
- Consultation services
- Took part in and delivered subsystems for major space projects such as Proba 3 and SWARM
- Wide variety of test campaigns
- Delivered flight subsystems for multiple CubeSat missions

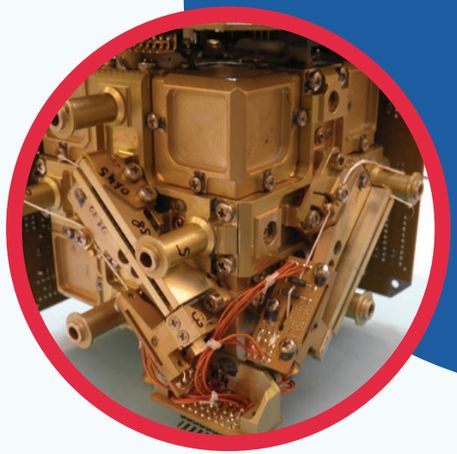
Contact

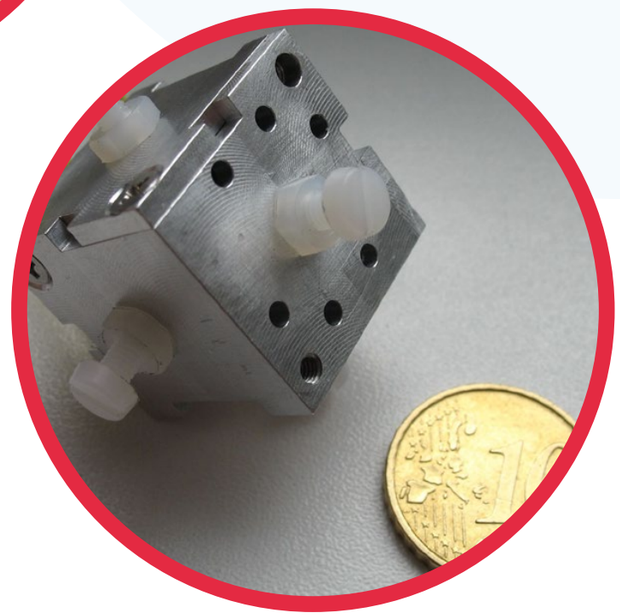
SERENUM, a.s.
Jana Babáka 2733/11
Královo Pole, 612 00 Brno
Czech Republic
www.serenumspace.com

Responsible for space
and ESA projects

Ondrej Sluka
M +420 724 391 956
E sluka@serenumspace.com







SPACEKNOW

- INDUSTRY
- SOFTWARE
- SERVICES
- R & D
- TESTING

Contact

SPACEKNOW, INC., odštěpný závod
Thámova 166/18, Karlín,
186 00 Praha
Czech Republic
www.spaceknow.com

Responsible for space
and ESA projects

Jaroslav Javornický, CEO
M +420 603 202 622
E javornicky@spaceknow.com

SPACEKNOW

General Description
SpaceKnow empowers decision-makers with ultra-large- scale planetary analysis. Our secret? A proprietary, AI- powered analytics engine, combined with the world's most comprehensive collection of earth observation imagery.
Our mission is to train machines to analyze satellite images to generate insights and to provide actionable intelligence.
Our AI-driven platform unlocks the power and potential of geospatial analysis. Space-Know is pioneering the use of space-based data that nowcasts the trends of the global economy and business activity and provides insights to financial markets, businesses, defense, government, and not-for-profits.

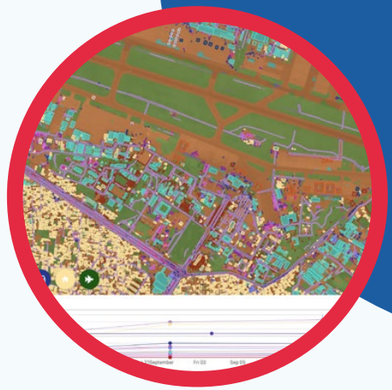
Competences & Capabilities
We offer analytics as a service: a fully automated and scalable cloud solution of any Area of Interest for a variety of objectives:
- Economic indexes (production monitoring) National security and safety
- Construction sites oversee
- Military operations (uncommon target detection) Industrial facility analysis
- Disaster site damage assessment Environmental changes
- Agricultural production
- Natural resources (e.g., coal storage, oil, water)

Products/Services
We apply image processing, computer vision techniques, machine learning, and deep neural networks to provide:
- Generalized change detection using both optical and SAR data
- Online object detection and count estimations
- Scene semantic segmentation into regions of interest
- Estimation of economic trends and design of econometric indexes
- Alerting & monitoring capability of any area of interest using near-real-time access to the world's most comprehensive collection of earth observation imagery

Major Space Projects & References
Top leading financial, industrial and defense players are among our key customers world-wide.

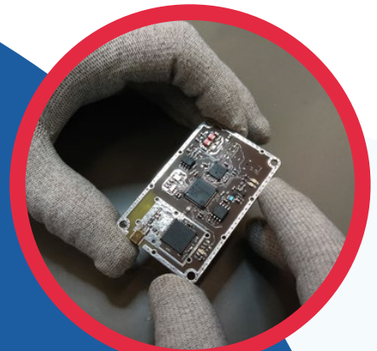
Space Related Equipment, Labs & Certificates
SpaceKnow utilizes cutting edge technology both in software and hardware domain and highly skilled researchers and data scientists in order to deliver our customers with actionable intelligence.

Our software solutions reflect the latest and most efficient trends within the Machine Learning & Artificial Intelligence fields, while our cooperation with leading providers of satellite data ensure up- to-date and high-quality imagery.



SPACEMANIC

- INDUSTRY
- MANUFACTURING
- SOFTWARE
- SERVICES
- R & D



SPACEMANIC CZ, s.r.o.

General Desctiption
Spacemanic is a turnkey nanosatellite solutions provider and CubeSat components manufacturer.

The company is focusing on design, development and testing of small satellite components based on the plug&play methodology.

Competences & Capabilites
Our main objective is to shorten the time needed for nanosatellite missions to move from the drawing board to space. With a proprietary line of subsystems, we lower the cost for launching the customer's payload, whole satellite or a fleet of satellites, making space accessible to scientific institutions, universities, and private customers with various budget sizes. Spacemanic provides all related services: launch campaign management, environmental testing, ground station software, and operations.

Products/Services
Full portfolio of plug&play nanosatellite components including:
- Celeste - GNSS receiver
- Eddie and Deep Thought - On-board computers
- Murgas – UHF/VHF transceiver
- Amun – Power supply unit for 1-3U CubeSats
- Cubesat structures
- Ra – solar panels

And many others...

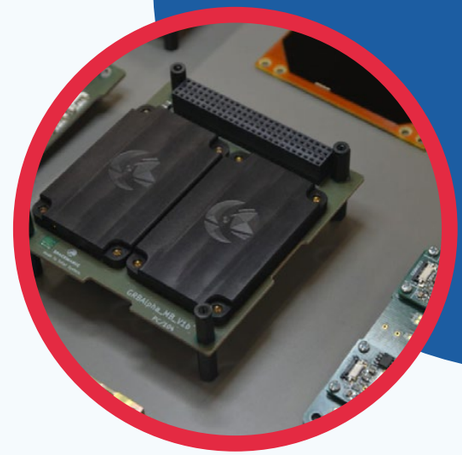
Major Space Projects & References
Nanosatellite missions:
- skCube
- GRBAlpha
- VZLUSAT-2,
- BDSat-1,
- Planetum-1

Contact

Spacemanic CZ s.r.o.
Purkyňova 649/127
612 00 Brno
Czech Republic
www.spacemanic.com

Responsible for space
and ESA projects

Daniela Jović
P +385 99 190 9472
E info@spacemanic.com



SYNPO, a. s.

- INDUSTRY
- MANUFACTURING
- R & D
- TESTING

General description

SYNPO is a research and manufacturing company focused on development and small-scale production of polymers and related materials. SYNPO closely collaborates with companies in the Czech Republic, EU, and worlwide. Synpo complies with ISO 9001:2015.

Competences & Capabilities

The research and development areas of the company includes:

- Synthesis of epoxy, alkyds, polyesters, and polyurethanes resins
- Formulation of novel types of paints, composites, and adhesives
- Development of nanostructured polymers and composites
- Synthesis of emulsion and solution polymers and acrylic dispersions
- Synthesis of polymers from biobased raw materials
- Targeted modification of nanoparticles

SYNPO has experience in technology transfer, from laboratory through pilot plant to manufacturing.

Products

Products of interest to the aerospace industry:

- Paints and coatings
- Composite materials
- Laminating resins
- Casting and sealing compounds
- Adhesives, sealants, and putties
- Functional resins for 3D printing
- Thermal protection systems
- Materials for cryogenic applications
- Antistatic and conductive composites
- Antimicrobial coatings
- High-temperature resistant
- Coatings with high abrasion resistance

Major Space Projects & References

Projects supported by ESA

- Development of coating for the rocket propellant tank
- Polymer materials based on epoxy filled foam
- Carbon Nanotube Composites

Space Related Equipment Labs & Certificates

Testing Laboratory of Analytical and Physical Chemistry, Testing Laboratory of Evaluation and Testing, Calibration Laboratory of Viscometry are accredited by the Czech Accreditation Institute, according to ČSN EN ISO / IEC 17025.

Contact

SYNPO, a.s.
S. K. Neumanna 1316
Zelené Předměstí
532 07 Pardubice
Czech Republic
www.synpo.cz

Responsible for space and ESA projects

Jan Hyršl, Ph.D.
P +420 466 067 142
M +420 602 407 418
E jan.hyrsl@synpo.cz

Analytical equipment for complex analysis of polymeric materials

- LC, LC-MS, GPC, GPC-MALS, GC, GC-MS, Pyrolysis GC
- FTIR, UV Vis spectroscopy
- AFM, FTIR microscopy
- Particle size distribution
- Chemical analyses

Evaluation and testing

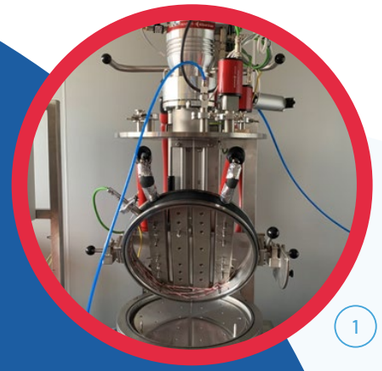
- DSC, MDSC
- TMA, DMA
- Climatic chambers including salt spray chamber
- Accelerated weathering tests
- Corrosion tests

Pilot plant production

- Polymerization reactors
- Pearl mills
- Dissolver
- Spraying techniques
- Cooling belt
- Kneading equipment
- Calenders, presses

TOSEDA s.r.o.

- INDUSTRY
- MANUFACTURING
- R & D
- TESTING



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General Description

TOSEDA s.r.o. is an SME providing contract research and development, testing services and small-scale production in the field of polymer chemistry and nanotechnologies. The mission is to fill the gap on the market with specialties that are commercially unavailable or produced out of the EU region.

Competencies & Capabilities

- Custom design, development, and commercialization of hi-tech polymeric and nano-composite materials targeted especially for space industry
- Registration at ESA (2012)
- Member of the Czech Space Alliance (2013)
- Nanotechnologies
  - Synthesis, surface modification and dispersion of nanostructures
- Polymeric and nanocomposite systems
  - Synthesis, formulation, testing
  - Composites, adhesives, elastomers, coatings, foams, aerogels, sensors etc.

Products /Services

Products

- Pads and pastes with extremely high thermal conductivity (electrically conductive and non-conductive versions)
- Nanohybrid transparent polyimide foils for thermo-optical applications (stability at 350 °C / 500 °C)
- Multifunctional „black" primer for thermo-optical applications
- One component epoxy adhesive (storability ≥ 1 year, curing ≥ 120 °C)
- Expandable adhesive curable at low temperature (≥ 70 °C)
- Barrier coatings and composites with improved resistance against liquid gasses (LH2...)
- Resins with extended pot life for out-of-autoclave manufacturing large and complex CFRP parts
- "Green" conformal coatings and potting materials for electronics
- Cryogenic insulation (foams, aerogels)

Major Space Projects & References

ESA projects

- Development of epoxy based syntactic foam encapsulant (2013-2016)
- Design of inner wetted thermal system for LH2 metallic tank (2014-2016)
- Thermal joint development for NEOSAT - Phase C (2017-2022)
- Extended pot life resins for out of autoclave processing for large and complex part (2017-2021)
- Electrically conductive "black" primer - CCN1: Extension for optical applications (2017-2022)
- Development of "green" polyurethane materials for use in spacecraft and launcher applications - CCN1: Extension towards applications as conformal coatings and potting material (2017-2022)
- Transparent polyimide films for thermo-optical applications (2020-2023)
- European resin for high voltage and high temperature space applications (2022-2024)

Space Related Equipment Labs & Certificates

- Outgassing (according to ECSS-Q-ST-70-02)
- ATOX (simplified method)
- UV irradiation
- AFM, SEM, optical microscopy, DMA, DSC, TGA, rheology, thermal and thermo-mechanical properties, FTIR, NMR

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Contact

TOSEDA s.r.o.
U Panasonicu 376
530 06 Staré Čívice
www.toseda.cz

Responsible for space and ESA projects

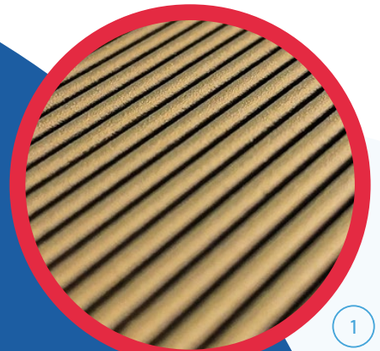
Ing. Tomáš Vlček, Ph.D.
M +420 721 967 071
E tomas.vlcek@toseda.cz

Ing. Jiří Zelenka, CSc.
M +420 605 407 306
E jiri.zelenka@toseda.cz

[1] Outgassing
[2] Testing of TOSEDA thermally conductive paste at TAS France
[3] Transparent nanohybrid polyimide foil
[4] Thermally conductive pad

TTS, s.r.o.

- INDUSTRY
- MANUFACTURING
- SERVICES
- R & D



1

General description

TTS (Thin Film Technological Service) is a small privately owned Czech company providing comprehensive service in the field of thin film deposition by PVD technologies and in the field of radiation analysis for space applications.

Competences and capabilities

TTS specialises in custom-made thin films for electronic and optical applications, thin film metallization and production of thin film components. It has more than 50 years of experience in design, development and production of thin films for which it uses the technology of magnetron sputtering, ion beam etching and UV photolithography.
In recent years its space related activities have focused on the development of coatings for the enhancement of properties of composite materials and on the use of trace moisture sensors in space. Some of its products (HAL2 moisture sensors and coatings) have recently been experimentally verified on board of VZLUSAT-1 nanosatellite.

Products and services

- Thin film technologies – deposition of wide range of metallic and non-metallic thin films, photolithographic patterning of thin films, ion beam surface treatment
- Moisture sensors – comprehensive solutions for trace moisture detection using TTS HAL sensors for both space and ground applications
- Radiation analysis – computer simulations of transport of particles through matter with the focus on space radiation environment and its effects on spacecraft

Major space projects and references

- Design and Testing of Far and Medium Ultraviolet Coatings (2020 - 2022); Prime contractor: TTS, s.r.o.; funded by ESA
- Space radiation capabilities, technologies and platforms for small spacecraft and CubeSats (2018 - 2022); Prime contractor: Rigaku Innovative Technologies Europe s.r.o.; funded by ESA
- Qualification of Shielding Applied to Structural Panel for JUICE (2014 – 2016); Prime contractor: 5M s.r.o.; funded by ESA
- Experimental verification of space products and technologies on nanosatellite VZLUSAT-1 (2013 - 2017); Principal Investigator: Czech Aerospace Research Centre, a.s.; Funded by Technology Agency of the Czech Republic

Space related Equipment, Labs and Certificates

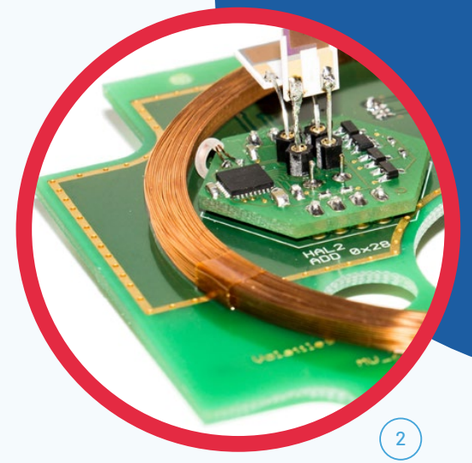
- PVD – 4 sputtering and ion beam devices
- Photolithography and wet processes
- Metrology – characterisation of thin films and calibration of moisture sensors
- Electronics laboratory
- Workplace of computer simulations for radiation analysis
- ISO 9001:2015 certificate

Contact

TTS, s.r.o.
Novodvorská 994/138
142 00 Praha 4
Czech Republic
www.tts-co.eu

Responsible for space
and ESA projects

Ing. Lenka Mikuličková
P +420 420 239 042 716
E mikulickova@tts-co.eu



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[1] metallisation
[2] Volatiles
[3] plasma

UNEX a.s.

- INDUSTRY
- MANUFACTURING
- SERVICES
- TESTING

1

General description

Metallurgical and engineering group UNEX is a world-known manufacturer and an experienced supplier of heavy engineering components and a long-term partner of numerous multinational industrial corporations. The experience and expertise of the people; together with modern technologies, robotised and automated workplaces, a number of heavy machine tools and extensive production facilities enable to efficiently produce high quality products for various industries according to drawings and requirements of the most demanding customers.

Competences & Capabilities

- Design and development work
- Castings production
- Die forgings
- Cutting and forming of materials
- Welding
- Machining
- Heat treatment
- Surface treatment and painting
- Quality control
- Servicing, completion and assembly

Products

- Bucket wheel excavators and mining equipment
- Welded steel parts and structures up to 120 t in weight and 40 m in length
- Castings from 50 g up to 20 t
- Die forgings from 2 kg to 25 kg

Major Space Projects & References

- manufacture of 16 sets of undercarriages and coupling components which will form part of the mobile building of a new Ariane 6 rocket launch platform at the Guiana Space Centre

Space Related Equipment, Labs & Certificates

More than 40 Czech and international certificates and permits demonstrates the quality of our company and products e.g. ISO 9001:2015, ISO 14001:2015, ISO 45001:2018, ISO 50001:2018, ... In the welding industry, we are certified according to the ČSN, EN and DIN standards, but we also have experience with welding according to the ASME IX, AWS D 1.1 and NORSOK M101.

Contact

UNEX a.s.
Brnicko 1032
783 91 Unicov
Czech Republic
www.unex.cz

Responsible for space
and ESA projects

Jaromír Radil
P +420 585 073 300
E jaromir.radil@unex.cz

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4

[1] © ESA/DUCROS David, 2016
[2] © Architecte Cardete & Huet/, 2016
[3] Eiffage Métal
[7] UNEX

UNITES
Designed to test

- INDUSTRY
- MANUFACTURING
- SOFTWARE
- SERVICES
- R & D
- TESTING

UNITES Systems a.s.

General Description
UNITES Systems a.s. is a private company located in the Czech Republic with more than 30 years of experience in development and production of dedicated test and measurement systems – ATE solutions for semiconductor devices and FCT/ICT platform for assembled PCB testing (PCBA). Currently (September 2022), we have 70 employees.

Competences & Capabilities
UNITES has developed mixed-signal tester – UNIMET 2020 (formerly known as SZ M3000 or UNIMET 3000) which is widely used in Space sector for component qualification and characterization of semiconductors.

Products & Services
- Mixed-signal laboratory testers for component qualification / incoming inspection
- Production testers for discrete semiconductors (MOSFETs, IGBTs, Diodes, Power Modules)
- Testers for new semiconductor technologioes (GaN, SiC)

Major Space Projects & References
- Testers in EEE labs: Airbus, ESA, Boeing
- Testers in characterization labs: General Dynamics, ISRO, Dassault, Diehl, Thales

Space Related Equipment Labs & Certificates
- ISO 9001
- UNIMET 2020 and M3000 testers, various DMMs like Keysight 34465A, PicoScope 6000 Series, Spectrum Analyzers, etc.

Contact

UNITES Systems a.s.
Kpt. Macha 1372
757 01 Valašské Meziříčí
www.unites-systems.com

Responsible for space
and ESA projects

Ondřej Běťák
M +420 602 555 872
E obetak@unites.cz

VZLU a.s.

- INDUSTRY
- SOFTWARE
- R & D
- TESTING

General Description
VZLU is a national center for research, development and testing in aeronautics and space. The primary mission of VZLU is to pursue fundamental industrial research and experimental development. Results and new knowledge generated by R&D activities are disseminated by publication, knowledge transfer or educational activities. In addition, VZLU supports the industry by providing engineering and testing services necessary for the development of new products.

Space activities of VZLU are concentrated in the Space Division.
The Space division focuses on research and development in the field of complete Space missions and Space technologies, its focus is on technologies applicable to the space segment of small satellites and the associated services and capabilities required for them. The division also includes a section focused on complete research, development, and production of composite materials for use in Aviation, Space, and other areas.

- Turnkey Space Missions with Small Satellites for LEO
- Strategic consultations for Space applications
- Research and development project for Space missions and subsystems
- Electronical and Software development
- Environmental testing
- Ground Stations and Mission operation activities
- Integration to Spacecraft – for various types of payloads
- Quvik – Small Satellite mission for Astrological prospections with UV telescope
- Ambic – Small Satellite EO mission for state users from Czech Republic
- Swarm – design and manufacturing of three micro-accelerometer units for 3 ESA EO satellites
- D3S – Nanosatellites for Space weather, cooperation on phases 0 and A
- Proba 3 – supplied front door assembly for ASPIICS chronograph

Software (licenses of the following SW tools are owned by VZLU)

- CATIA, Autodesk Inventor
- Nastran (MSC, NEi, Autodesk), Altair hyperworks, FEMAP, Ansys
- Matlab
- C, C++
- PADS, KiCAD
- Valispace

Clean rooms:

- ISO 8 - 39.6 m^2
- ISO 6 - 33.1 m^2

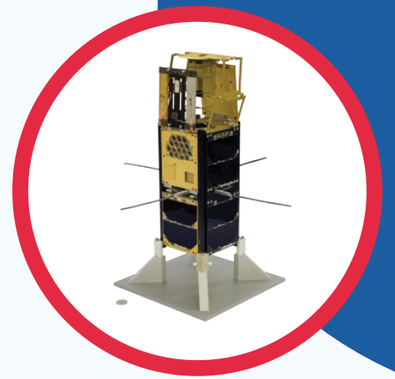
Contact

CZECH AEROSPACE RESEARCH CENTRE
Beranových 130
199 05 Praha – Letňany
Czech Republic
www.vzlu.cz

M +420 725 746 513
E space@vzlu.cz

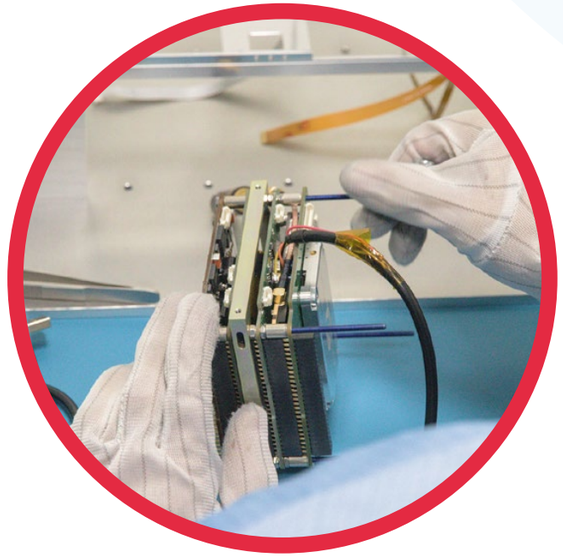
Equipment

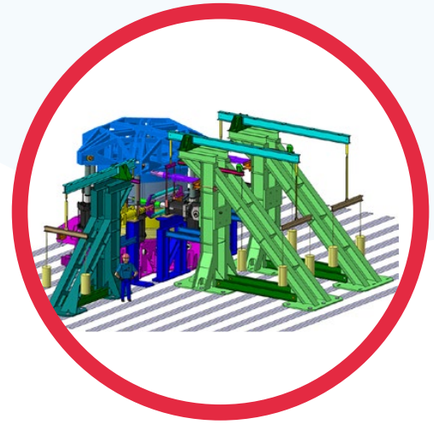
- Thermal vacuum chamber (<10-3 Pa, 1 meter cubic, temperature from -120°C to +150°C)
- Vacuum tunnel (<10-3 Pa, 10m length)
- Shock Table (10000 gSRS)
- Shakers (max. weight of the specimen under test 350 kg, usable frequency range 1 - 3000 Hz, peak sine force 22.2 kN, max. RMS random force 22.2 kN, peak shock force 66.7 kN, max. velocity 2 ms-1, max acceleration 600 ms-2



Certificates

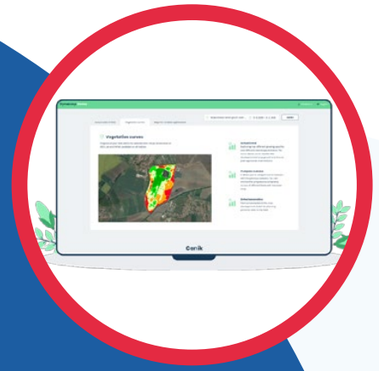
- Quality assurance certificate (LRQA) ISO 9001:2015.





World from Space s.r.o.

- INDUSTRY
- SOFTWARE
- SERVICES
- R & D
- TESTING



General Desctiption

World from Space is a company creating downstream applications based on Earth Observation and AI. WFS has experience with EO data processing (multispectral, SAR), data analysis and visualization, machine learning and integration of the resulting products into software and GIS platforms. WFS was founded in 2017 and currently employs 12 people.

Competences & Capabilites

- Automated cloud-based EO data analysis (AWS, SentinelHub, Eurodatacube, CreoDIAS, OVH Cloud etc.)
- Batch processing, analytical data store, distributed data store, Big Data Workflow, Load balancing
- Copernicus data processing, analysis and consulting (CDS, ADS, EFFIS, GDO, CLMS, CEMS etc.)
- Global field-level crop monitoring based on Sentinel-1 and Sentinel-2 fusion
- Raw optical data preprocessing (Level 0 - Level 2)
- Machine learning with EO data (eo-learn, pytorch, GAN, Tensorflow, etc.)
- Soil moisture and drought assessment based on Sentinel 1, Sentinel 2 and SMOS
- Urban EO monitoring – adaptation to climate change, vegetation, temperature, air quality, sustainability indicators
- Interactive web-based map applications, dashboards and stories
- Python, JS, GRASS GIS, QGIS, GDAL, SNAP, Hadoop, HBase, GeoWave, etc.

Products/Services

- DynaCrop (TRL9) - powerful crop monitoring for agricultural software platforms anywhere in the world. API, whitelable webapp (dynacrop.space)
- DynaCity (TRL8) - web application monitoring urban green, urban heat island, and air pollution
- UpGreen (TRL5) - predicting health state of urban green and proposing nature-based solutions to urban climate change adaptation (upgreen.org)
- Orbis (TRL3) - Czech Data Processing Pipeline for EO Missions

Major Space Projects & References

- ESA EO Clinic - 5 RFPs focused on EO data analysis for international development banks (2020-2023)
- ESA Urban Green - Feasibility study for the UpGreen product (2022-2023)
- ESA AMBIC - Ambitious Czech Satellites mission (phases 0,A,B1) (2022-2023)
- ESA TAVAP - Feasibility study for optimizatuion of use of plant growth regulators (2022-2023)

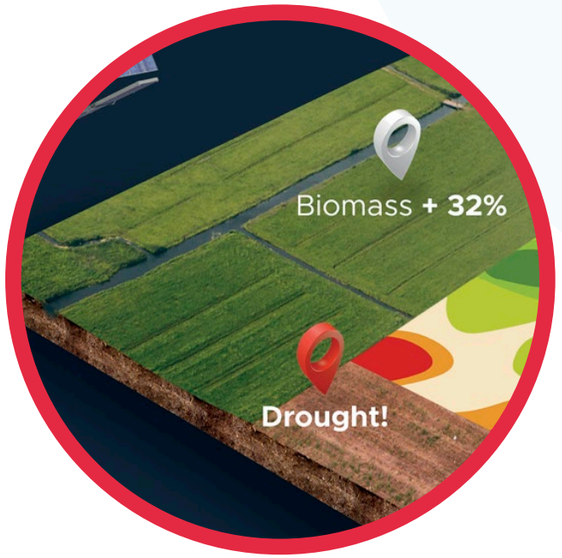
Contact

World from Space s.r.o.
Pellicova 624/3
60200 Brno
Czech Republic
www.worldfrom.space

Responsible for space
and ESA projects

Jan Labohý
M +420 603 546 994
E office@world from.space

- H2020 EuroGEO Showcases: Applications Powered by Europe. A cloud-based contribution to Earth Observation (2021-2023)
- Effective mapping of soil conditions and soil moisture to stabilize yields (2021-2024)
- LAICA - satellite vegetation monitoring using AI for SAR and optrical data fusion (2022-2023)

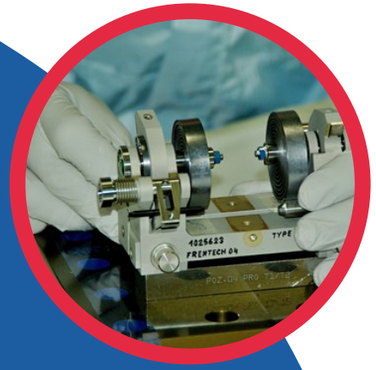


Terzan 1 is a globular cluster that lies about 22,000 light-years from Earth in the constellation Scorpius. It is one of 11 globular clusters that were discovered by the Turkish-Armenian astronomer Agop Terzan between 1966 and 1971 when he was working in France, based mostly at Lyon Observatory.

Czech Space Alliance (CSA)

CSA is an industry association of 16 companies, mostly SMEs established in 2006. The members are vying for space business, especially through ESA. The founding members, namely BBT, CSRC (now part of BD Sensors), and Science Systems (now Iguassu Software Systems) participated in ESA and other space projects since the 1990's.

The alliance was established to present the skills of its members at national and international events and establish dialogue and relationship with similar associations and space agencies, be they in Europe or beyond; help its members to develop business relationship with potential partners in other European Space Agency members states and beyond. Important part of our mission is to represent and to promote the interests of the space industry to the national decision makers, the media and other relevant associations or entities; co-operate with the ministries and all other official entities supporting space activities in the formulation of space policy and creation of suitable conditions for the growth of the space industry.



CSA covers by its members practically all sectors of Space applications:

- Design and simulations: L.K. Engineering s.r.o., SAB Aerospace s.r.o., TTS s.r.o
- Software development: esc Aerospace s.r.o., Iguassu Software Systems a.s.
- Electronics – components: AVX Corporation, BD SENSORS s.r.o., TTS s.r.o.
- Electronics – assembly: Atos, BD SENSORS s.r.o., esc Aerospace s.r.o., UNITES Systems a.s.
- Scientific instruments: BBT - Materials Processing s.r.o., Rigaku Innovative Technologies Europe s.r.o., ADVACAM s.r.o.
- Development of materials: 5M s.r.o., TOSEDA s.r.o.
- Mechanism and structures: 5M s.r.o.,, Frentech Aerospace s.r.o.
- Subsystem integration: 5M s.r.o.,, Frentech Aerospace s.r.o., SAB Aerospace s.r.o.
- Testing: 5M s.r.o., ADVACAM s.r.o., BD SENSORS s.r.o., EGGO Space s.r.o., esc Aerospace s.r.o., , Frentech Aerospace s.r.o., L.K. Engineering s.r.o., Rigaku Innovative Technologies Europe s.r.o., SAB Aerospace s.r.o., TOSEDA s.r.o., UNITES Systems a.s.

Beginning of Czech industry involvement to Space applications were single component and services even at excellent level. By the time, members of CSA increased competences and increase complexity of their products and involvement to supply chain of the most important Space players in the world such as Thales Alenia Space (TAS) or Airbus Defence and Space. Finally members of Czech space alliance are reliable partners for very complex subsystems now as structures of satellites or solar array mechanical subsystems. CSA role is to promote communication between all our members what brings closer cooperation of companies and also new challenges not only within Alliance.

CSA final destination is to be a platform for communication of government with all main industrial players at field of Space application in Czech Republic and built picture of Czech Space Industry as strong and reliable partner.

Contact

Czech Space Alliance

Richard Pavlica
Richard.Pavlica@5m.cz
www.czechspace.eu

Vega-C VV21 with LARES-2 ready for launch as the gantry is being retracted on 13 July 2022 at Europe's Spaceport in Kourou, French Guiana.

Academia

Astronomický ústav AV ČR

ACADEMIA
R & D
DESIGN
TESTING

Astronomical Institute, CAS

1

General Desctiption

Astronomical Institute of the Academy of Sciences of the Czech Republic is a professional research institution with focus on a wide range of research topics; from the immediate environments of the Earth to distant galaxies and black holes in their cores. The research activities are carried out in four scientific departments: Dept. of Solar Physics, Dept. of Stellar Physics, Dept. of Interplanetary Matter, and Dept. of Galaxies and Planetary Systems. Main areas of research activities include physical processes in the Sun, especially in solar flares, physical processes in stars, interaction of the interplanetary matter with the Earth atmosphere, asteroids and comets, dynamics of the Solar System bodies, formation and evolution of galaxies, and relativistic astrophysics.

Competences & Capabilities

Large international collaborations represent a significant part of the research activities of the Astronomical Institute. Scientists from the Institute are involved in many international projects of new-generation astronomical instruments for ground-based as well as space-based telescopes, the latter usually done in a close co-operation with the European Space Agency (ESA).

The Astronomical Institute takes the coordinating role in the programme 'Space for Mankind' of the Strategy AV 21 project of the Czech Academy of Sciences (www.vesmirprolidstvo.cz). This programme involves several other institutes of the Czech Academy of Sciences, prime universities and industry.

Major Space Projects & References

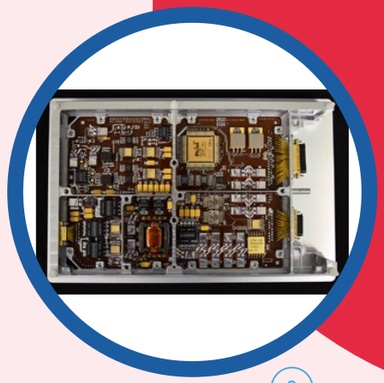
- Solar Orbiter – design, development and manufacture of the three scientific instruments on board: Spectrometer-Telescope In X-rays (STIX), Radio and Plasma Wave experiment (RPW), and METIS in collaboration with IPP TOPTEC. Mission launched in 2020, all the components made in the Czech Republic work perfectly.
- Coordination and the scientific part of the project "Front Door Assembly and Primary Objective together with Relay Optics" - done by national industrial partners, including participation in setting of the scientific requirements for the ASPIICS coronagraph onboard Proba 3.
- Design, development and delivery of radiation hardened low-voltage power supply for Radio and Plasma Wave Instrument (RPWI) on the JUICE mission (ESA).
- Lunar Dusty Environment and Plasma Package (L-DEPP) experiment for Lunar Lander: design study for complex instrumentation for dust and plasma analysis in the lunar near surface environment. Experiment was proposed as a potential payload for Lunar Lander mission (ESA). Project was funded under ESA open ITT contract.

Contact

Astronomical Institute,
Czech Academy of Sciences (CAS)
Fričova 298
251 65 Ondřejov
Czech Republic
www.asu.cas.cz

Responsible for space
and ESA projects

RNDr. Jiří Svoboda, PhD
P +420 226 258 428
M +420 777 214 434
E jiri.svoboda@asu.cas.cz



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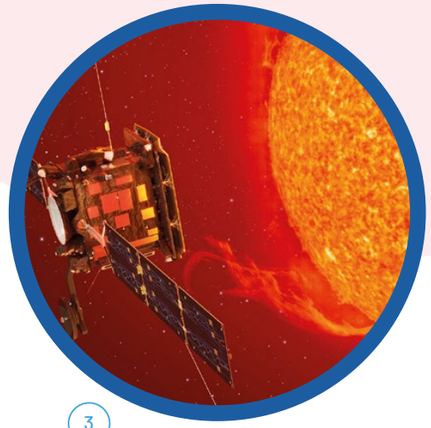
- The expert group of Solar Patrol Service (SPS) at Astronomical Institute becomes a member of ESA project „Space Weather Service Network (SWESNET) Development and Pre-Operation Part 1". Under this project services providing daily monitoring and information on solar activity are developed.
- ATHENA X-ray Integral Field Unit (X-IFU) – scientific and project management, collaboration with the IAP on development of warm front-end electronics of the instrument.
- ATHENA Wide-Field Imager (WFI) – scientific management, design of Galvanic Isolation Modules.
- eXTP (enhanced X-ray Timing and Polarimetry) – scientific and project management, collaboration with the industrial partners on mechanical design of the Detector and Collimator Frames
- LISA (Laser Interferometry Space Antenna) - scientific and project management of the development of the Fibre Switch Unit Actuators for the space-based gravitational-wave observatory
- Most of the above-mentioned activities are funded by PRODEX Experiment Agreement with ESA.

Space Related Equipment, Labs & Certificates

- Electronic lab equipped for breadboarding and testing activities related to space H/W development

Products/Services

- power supply units for STIX and RPW
- web pages that are part of SWESNET Portal providing suspot group classification, solar flare forecast, daily bulletin and synoptic images of the Sun.



3

[1] Solar_Orbiter_liftoff
[2] JUICE LVPS Flight Model Unit
[3] Solar Orbiter. Credit: ESA

cesnet

ACADEMIA
R & D
DESIGN

CESNET z. s. p. o.

General Desctiption

CESNET is an association of universities of the Czech Republic and the Czech Academy of Sciences. It operates and develops the national e-infrastructure for science, research and education which encompasses a computer network, computational grids, data storage and collaborative environment. E-infrastructure provides services to transfer, process and store data for the needs of Research and Educational community.

Since its foundation, the CESNET has been an operator of a national research and education network (NREN). In 1999 it expanded into the area of providing computing services and since 2012 it provides large-scale data storage services. This services are complemented with tools and for managing access to resources, communication security and data protection tools, and services for efficient collaboration between distributed users and teams. In addition, the Association has a status of a research organisation and over its twenty-year history it has reached significant milestones in the area of research. of advanced network technologies and applications from hybrid networking, cyber-security, programmable hardware, metacomputing to middleware and video transmissions.

Competences & Capabilities

- Network data transfer (100 Gbps)
- Data processing and data storage services
- High-performance computing
- Monitoring and security services
- Forensic analysis, penetration and infrastructure stress testing
- Online collaboration tools & Multimedia
- Identity management & Middleware
- Research and development in the field of information technology

Major Space Projects & References

CESNET operates national Data Hub system, which enables users fast and reliable transfer and access to the Sentinel mission's data (products). Located at CESNET, the Data Hub Relay is able to capitalize CESNET's high speed connection to GÉANT as well as CESNET's extensive experience in operating distributed infrastructures, storages and high throughput computing. The choice of data sets distributed through the Relay is driven by the needs of partners involved in the relay network, and by the needs of users active in the Czech Republic and surrounding regions.

Contact

CESNET z. s. p. o.
Zikova 4 CZ-16000
Prague 6
Czech Republic
www.cesnet.cz

Responsible for space
and ESA projects

Ing. Zdeněk Šustr
E datahub@cesnet.cz

Czech Hydrometeorological Institute

ACADEMIA
R & D
DESIGN
TESTING

Czech Hydrometeorological Institute

General Desctiption

Czech Hydrometeorological Institute (CHMI) is a central state institute of the Czech Republic in the fields of air quality, meteorology, climatology, hydrology, and water quality. The objective of CHMI's activity in the above fields is to establish and operate monitoring stations with the aid of a telecommunications networks. The related activities include building national networks for monitoring the atmosphere and hydrosphere, to assess observations, measurements and monitoring data and to create and maintain databases in a unified information system, to provide information to the public and to report to regional and national authorities/ institutions as well as to the EU bodies. CHMI consists of five divisions, including Meteorology and Climatology, Air Quality, and Hydrology Divisions.

Competences & Capabilities

The CHMI is authorized by the Ministry of the Environment to operate the State air quality monitoring network of the Czech Republic. It is also authorized to ensure in the long term the operation and development of the Air Quality Information System including the national air quality database. Among all of the core products of the Air Quality Information System Department, air quality maps play a particularly important role. The maps are constructed both using near real time data (up-to-date) and annual average data, with the underlying methodology based on the data fusion of the monitoring, modelling and other supplementary data.

Major Space Projects & References

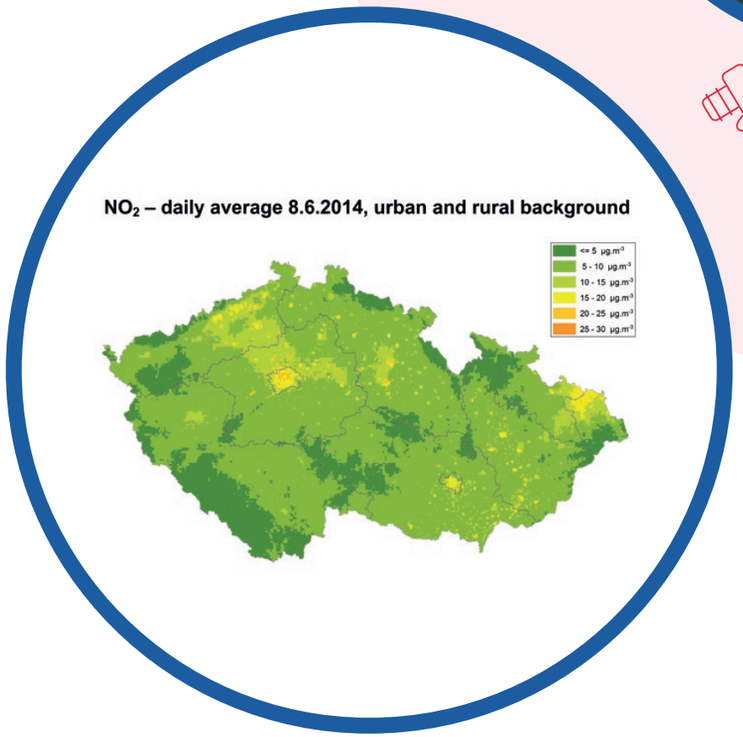
SAMIRA (Satellite based Monitoring Initiative for Regional Air quality) was a project funded by the European Space Agency. In the project, seven organizations from four counties (Norway, Czech Republic, Poland, and Romania) were involved, including CHMI. The overall goal of the SAMIRA project was to improve regional and local air quality monitoring through synergetic use of data from present and upcoming satellites, traditionally used in-situ air quality monitoring networks and output from chemical transport models. The examined pollutants were Particular Matter (PM10, PM2.5), Nitrogen Dioxide (NO2), and Sulphur Dioxide (SO2). The time steps were hourly, daily, and annual data.

Contact

Czech Hydrometeorological Institute
Na Šabatce 17
143 06 Praha 4
Czech Republic
www.chmi.cz

Responsible for space and ESA projects

RNDr. Jindřich Šťástka, Ph.D.
P +420 244 033 509
E jindrich.stastka@chmi.cz



ACADEMIA
R & D
DESIGN
TESTING

Department of Physical Electronics, CTU

Contact

CTU in Prague
dept. of Physical Electronics
Brehova 7
115 19 Prague 1
Czech Republic
www.lab.blazej.cz

Responsible for space
and ESA projects

professor Ivan Procházka
P +420 224 358 658
M +420 774 139 637
E ivan.prochazka@fjfi.cvut.cz

General Desctiption

Department of Physical Electronics is a technical university department with a long heritage in space related projects under various roofs of Interkosmos, NASA and other space agencies. The department was coordinating the world satellite laser ranging (SLR) network for 20 years, it contributed to planetary missions to Mars and to laser time transfer missions of CNES, NASA, China, and ESA mostly with detectors based on Single Photon Avalanche Diode (SPAD).

Competences & Capabilities

In pure space segment the department capabilities cover single photon counting in space (from EUV to near IR) for altimetry, ranging, lidar or laser time transfer, x-ray optics and diagnostics. In the ground segment it has a long term experience with picosecond instrumentation for SLR, i.e. picosecond photon counters, picosecond laser sources, sub-picosecond event timing, and in on-site timing calibration of SLR stations worldwide.

Products/Services

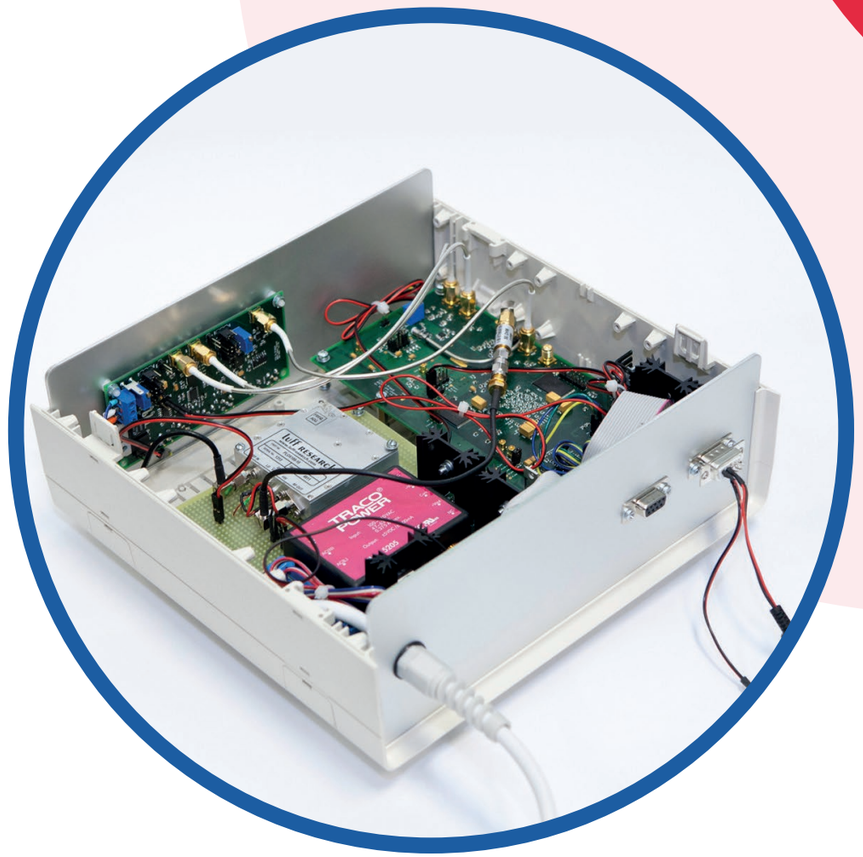
detectors for single photon counting (ranging, altimetry, lidar) in space in VIS and IR
single x-ray quantum detection, x-ray optics, and imaging methods for EUV and soft x-ray
sub-picosecond event timing

Major Space Projects & References

- Satellite Laser Ranging (SLR) – ground segment network (Interkosmos)
- Portable Calibration Standard for SLR network – (Czech and various national grant agencies)
- Mars 92, Mars Polar Lander 98 – planetary altimeter & LIDAR (Russia, NASA)
- T2L2 @ Jason2 – on-board detector for laser time transfer (CNES, NASA)
- LTT @ BeiDou 2 / Compass – on-board detectors for picosecond laser time transfer (China)
- X-ray Optics and Diagnostics – research activity (FP7Space)
- European Laser Timing (ELT) – on-board SPAD based detector for ISS module ACES – (ELIPS 3)

Space Related Equipment, Labs & Certificates

- Solid state single photon detectors with picosecond temporal resolution, multi-wavelenghts picosecond laser systems, femtosecond event timers, UTC GPS receivers, frequency sources, multipliers and distributors
- EUV tabletop source, single quantum detectors, spectrometers and imaging detectors



CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

- ACADEMIA
- R & D
- DESIGN
- TESTING

Department of Soil Science and Soil Protection

General Desctiption

Research of the Department covers a number of topics such as soil pollution, soil degradation by sealing and erosion, soil water dynamics, digital soil mapping using laboratory analysis, remote and proximal sensing. The department possesses various laboratory instruments for wet chemistry, soil physics, and field proximal sensors.

Competences & Capabilities

The Department contributes actively to the research of up-to-date problems related to soil degradation, conservation and protection. The main areas of activity related to space research include remote sensing of soils, imaging spectroscopy and VNIR field and laboratory spectroscopy.

Major Space Projects & References

The WORLDSOILS project aims to develop a pre-operational soil monitoring system to provide yearly estimations of soil orgnic carbon (SOC) at global scale, exploiting space-based Earth observation (EO) data, leveraging large soil data archives and modelling techniques. The ambition of the WORLDSOILS Monitoring System (WOSOMS) is to achieve a system with the following characteristics:

- Modular implementation to allow future extension to additional soil indices.
- Spatial resolution 100 m x 100 m globally and 50 m x 50 m over Europe.
- Use of large time series of a minimum of 3 years.

WORLDSOILS is an application project with funding from the European Space Agency (ESA) and executed by GMV, Université Catholique de Louvain (UCL), German Aerospace Center (DLR), International Soil Reference and Information Centre (ISRIC), German Research Centre for Geosciences (GFZ), Aristotle University of Thessaloniki (AUTh), Czech University of Life Sciences Prague (CZU) and Tel-Aviv University (TAU).
Project STEROPES of the European Joint Programme SOIL (https://ejpsoil.eu/) supported by the EC Horizon 2020 programme also aims in mapping SOC using mainly Sentinel-2 data. The project involves development of methods to reduce the effect of soil moisture, texture, salinity and plant residues on the SOC prediction.

Space Related Equipment, Labs & Certificates

Spectroscopy lab: FieldSpec-3 (ASD, 350-2500 nm) with field accessories
Portable X-ray fluorescence spectrometer Olympus Delta Premium

Soil moisture sensors:

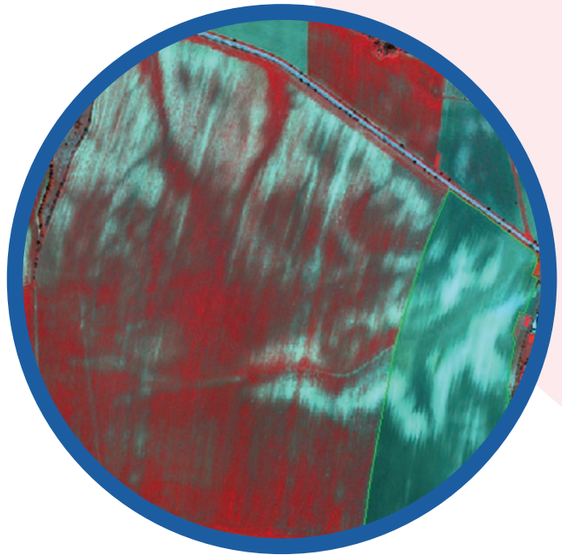
- SM200 with HH2 Moisture Meter
- PR2 Soil Moisture Profile Probe with HH2 Moisture Meter
- TMS2 field soil moisture devices for continuous monitoring

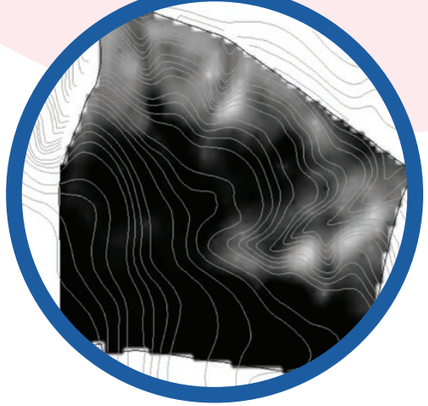
Contact

Department of Soil Science and Soil Protection
Faculty of Agrobiology, Food and Natural Resources (FAFNR)
Czech University of Life Sciences Prague (CZU)
Kamýcká 129
165 00 Prague-Suchdol
Czech Republic
www.af.czu.cz

Responsible for space and ESA projects

M.Sc. Asa Gholizadehy, Ph.D.
P +420 224 382 633
E gholizadeh@af.czu.cz





UNIVERSITY OF WEST BOHEMIA

ACADEMIA
R & D

Faculty of Applied Sciences

General Desctiption

The Faculty of Applied Sciences of the University of West Bohemia in Pilsen performs fundamental and applied research in the fields of mathematics, geomatics, physics, cybernetics, information technologies, computer science and mechanical engineering. Since 2015, the faculty has been operating an R&D centre with 200 employees. The centre is equipped with state-of-the-art instrumentation and labs. There are 120 doctoral students at the faculty which participate at its research activities. The faculty cooperates with many partners within the Czech Republic and abroad.

1

Competences & Capabilities

The research team of the faculty is competent in the areas of development of cybernetic control systems, identification, intelligent decision-making and communication systems; advanced computer and information systems; research and modelling of heterogeneous materials; testing of mechanical and biomechanical structures; novel nanostructured thin-film materials prepared using plasma processing; qualitative and quantitative investigation of mathematical models; geodesy and geotechnologies.

Major Space Projects & References

- Towards a better understanding of the Earth's interior and geophysical exploration research "GOCE+ Geoexplore II". Project STSE GOCE+ 4000103566/11 of the European Space Agency, 2011-2015 (main contractor and coordinator of 6 European institutions). The overall objective of the project was to combine GOCE gravity gradients with heterogeneous other satellite gravity information to arrive at a combined set of gravity gradients complementing (near)-surface data sets spanning all together scales from global down to 5 km useful for various geophysical applications and demonstrate their utility to complement additional data sources (e.g., magnetic and seismic) to enhance geophysical modelling and exploration.
- GOCE – specific tasks on fine gravity field structure of the Earth. PECS Project 98056 of the European Space Agency, 2007-2011 (member of the consortium). The objective of the project was to study the Earth's gravity field as derived from combination of satellite, aerial and surface data. Various functionals of the gravity field potential (gravity acceleration, geoid undulation, gravity gradients) were studied in order to detect signatures which could be linked to past as well as recent mass changes and surface deformations.
- Advanced algorithms and techniques for resilient time provision. EXPRO project E NAVISP-EL1-056 of the European Space Agency, 2022-2023 (subcontractor). The project is devoted to the accurate and reliable estimation of the ensemble time scale based on the statistical processing of an ensemble of particular time scales (clock measurements) which are of different accuracy and providers (physical clocks, internet time protocols, etc.).

Contact

Faculty of Applied Sciences (FAS)
University of West Bohemia, Pilsen (UWB)
Univerzitní 22
306 14 Plzeň
Czech Republic
www.fav.uwb.cz

Responsible for space and ESA projects

prof. Ing. Pavel Novak, PhD.
P +420 377 632 676
M +420 728 383 486
E panovak@kma.zcu.cz

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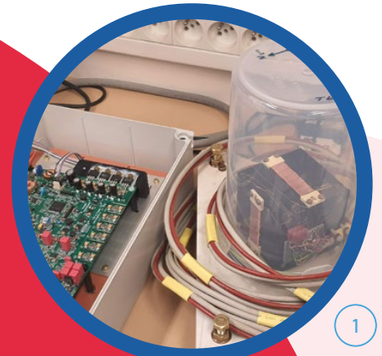
[2] COPYRIGHT © ESA

ACADEMIA
R & D
DESIGN
TESTING

Faculty of Electrical Engineering, CTU

General Desctiption

CTU is the leading technical university in the Czech Republic. The Faculty of Electrical Engineering (FEE) offers first-class education in the fields of electrical engineering, telecommunications, radio engineering, automation, informatics and computer science and engineering. (https://fel.cvut.cz/en/).



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Competences & Capabilities

The FEE has extensive research collaboration with top universities and research institutions worldwide. It offers innovative solutions to industrial partners, military and security institutions and security institutions, including participation in space research and work for governmental agencies. The faculty offers the study programmes taught in English: Electrical Engineering, Power Engineering and Management (BSc and Ing.), Communications, Multimedia and Electronics (BSc and Ing.), Cybernetics and Robotics (BSc and Ing.), Open Informatics (BSc and Ing.), Biomedical Engineering and Informatics (Ing. only), and Aerospace Engineering (Ing. only). The PhD programme is divided into 16 study branches. Graduates find top jobs in industry, research institutions, and at universities in the Czech Republic and worldwide (https://fel.cvut.cz/en/).

Major Space Projects & References

- MIMOSA - Triaxial magnetometer for Czech satellite.
- Space stations - cooperation with DLR Germany - Design and implementation of scientific experimental device at the orbital stations Mir and the ISS..
- ESA - participation in the satellite projects in operation (ESA INTEGRAL – since 2002).
- Participation in large satellite ESA ATHENA, M mission candidates THESEUS, ASTROGAM, and ESA-CAS mission SMILE.
- ESA PECS projects
- Direct ESA contracts.
- Cooperation with NASA – USA.
- Other contracts – e.g.Tester for micro accelerometer in collaboration with VZLU. The device is used within the satellite project SWARM.
- Satellite navigation
- Nano and Picosatellites
- EU projects
- LVICE2 project: within Czech/ESA ambitions projects
- EDA (European Defense Agency) NEUMANN project
- Cooperation with the South African Space Agency SANSA on the development of SQUID and fluxgate variometers: the prediction of magnetic storms
- Educational activities
- For full details please see https://fel.cvut.cz/en/research/space-activities.html

Contact

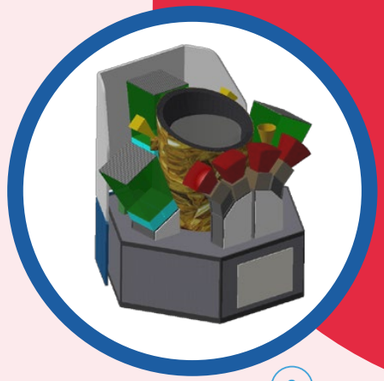
Faculty of Electrical Engineering
Czech Technical University
in Prague (CTU)
www.fel.cvut.cz

Responsible for space
and ESA projects

Doc. RNDr. Rene Hudec, CSc.
P +420 224 352 204
M +420 731 502 542
E hudecren@fel.cvut.cz

Space Related Equipment, Labs & Certificates

- Equipment for simulation of GPS and GLONASS constellations.
- Receivers of signals of navigation systems (GPS, GLONASS, Galileo, QZSS, EGNOS, MSAT, WAAS)
- Materials testing designs and laboratories
- Electronics and optical laboratories
- Equipment for magnetic testing and calibration of magnetometers
- Anechoic chambers: acoustics and electromagnetic
- Satellite data / image acquisition and processing



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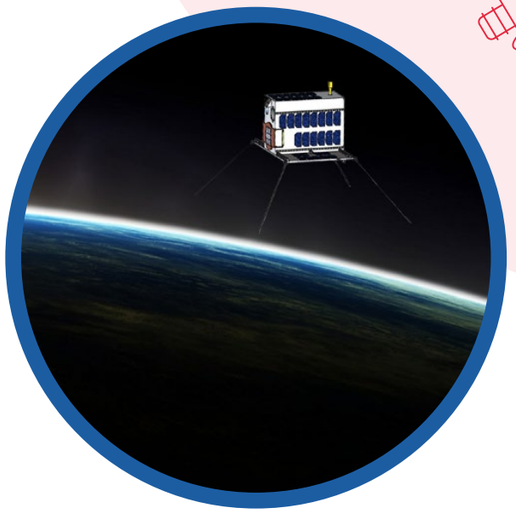

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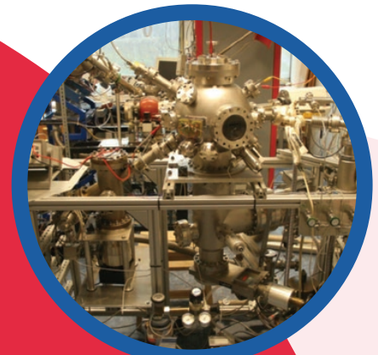
[1] Three-axial magnetometer with 3 pT/ÖHz noise at 1 Hz.
[2] ESA M7 candidate mission THESEUS
[3] Design of cubesatellite with payload for X-ray and UV astronomy

FACULTY
OF MATHEMATICS
AND PHYSICS
Charles University

- ACADEMIA
- R & D
- DESIGN
- TESTING

Charles University, Faculty of mathematics and physics



General Desctiption

The Space Physics Laboratory (SPL) was established in 1990 but the space research activities date down to 1970. SPL participated in numerous projects in frame of the former Intercosmos activity. From 2007, SPL participates in ESA projects dealing with processes in the interplanetary space. The participation is oriented on the computer modeling of the detector systems, design of measuring process, onboard software for device control and data processing. Manufacturing of the mechanical parts and electronics is arranged by cooperation with external partners.

Competences and capabilities

SPL is oriented on the fundamental research of processes in space plasma and the R&D activities are strongly coupled to these topics. We are engaged in the development of ion and electron spectrometers and energetic particle detectors. This development is mainly focused on high-speed measurements in the solar wind and planetary magnetospheres.

Major space projects & references

- PG1 – 1970, Intercosmos 3, exploration of radiation belts.
- ESA – 1976, Intercosmos 17, energy spectrometer for magnetospheric plasma study
- MONITOR – 1980, Prognoz 8, fast monitoring of the solar wind parameters
- BIFRAM – 1985, INTERSHOCK mission, a complex plasma spectrometer for investigations of shock waves
- MONITOR-3, VDP, MPS, VDPS - 1995/96, a complex of plasma spectrometers for four satellites of the INTERBALL mission
- BMSW (Bright Monitor of the Solar Wind) – 2011, SPEKTR-R mission
- SWA (Solar Wind Plasma Analyzer) – 2020, Solar Orbiter, detector unit for plasma spectrometer, in cooperation with IRAP, France
- LEES – (Low Energy Electron Analyzer) – Comet Interceptor, front end electronics, launch planned for 2026, in cooperation with IRAP, France

Space Related Equipment, Labs & Certificates

- Facilities for computer simulation of detector systems
- Experimental set up for investigations of space dust charging
- Facility for vacuum tests equipped with UV source and electron and ion guns

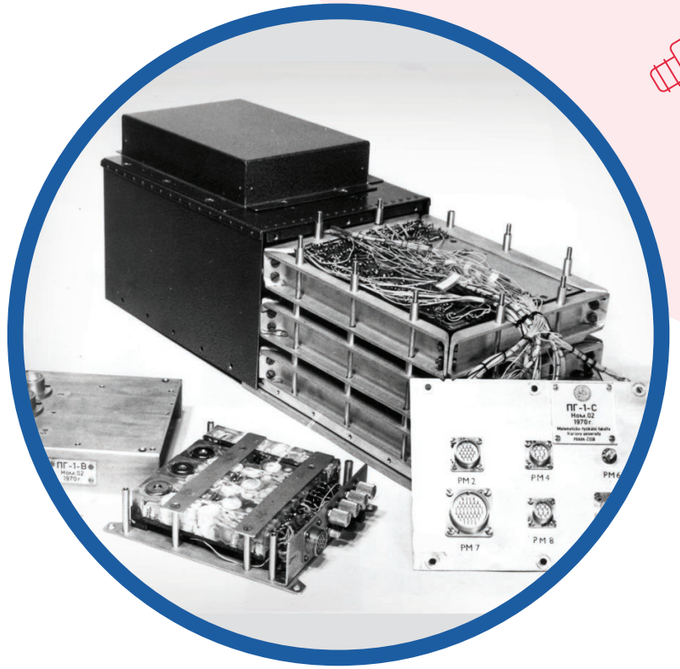
Contact

Space Physics Laboratory (SPL)
Faculty of Mathematics and Physics
Charles University
Ke Karlovu 3
121 16 Praha 2
Czech Republic
www.mff.cuni.cz

Responsible for space
and ESA projects

Prof. Jana Safrankova
P +420 221 912 301
E jana.safrankova@mff.cuni.cz

Figure captions
BMSW – Bright monitor of the solar wind
Dust – Laboratory for investigation of electrical properties of space dust
SOLO – Proton and alpha analyzer for Solar Orbiter mission during vibration tests
Comet – LEES analyzer for Comet Interceptor mission prepared for tests with electron beam.



Faculty of Science

ACADEMIA
R & D

Faculty of Science, Palacký University Olomouc

General Desctiption

Palacký University in Olomouc is a university with long-standing tradition. Founded in the 16th century, it is the oldest university in Moravia and the second-oldest university in the Czech Republic. Today it is a modern higher education facility with a wide range of study programs and copious scientific and research activities. Almost 22 000 students are enrolled at its 8 faculties. Palacký University is one of the very top Czech universities, and ranks among the best universities of the world, according to international rankings.

Competences & Capabilites

The space-related research is being carried out at the Faculty of Science, which is a research-oriented faculty that offers Bachelor's, Master's, and Doctoral studies in various branches of Mathematics, Computer Science, Physics, Chemistry, Biology and Ecology, Earth Sciences. Since 2009, the majority of its worksites have been located in a newly constructed building close to the city center. Thanks to European funding and success in national grant competitions the Faculty managed to build modern facilities with state-of-the-art equipment. Currently, the Faculty has about 4 000 students.

The Faculty of Science has a lot of creative potential and it can be proud of its abundant profile of original scientific results, which push the limits of our findings, as well as of its multilateral international cooperation. Some of our research teams rank significantly on the international scale as well. According to the Methodology of the Research, Development, and Innovation Board, in 2011, the Faculty of Science ranked fifth among all the faculties and scientific institutions in the Czech Republic. According to a study conducted by the National Economic Institute in August 2012, the Faculty is the most efficient scientific worksite in the field of optics in the entire Czech Republic.

Contact

Faculty of Science, Palacký University Olomouc
17. listopadu 1192/12
771 46 Olomouc
Czech Republic
www.prf.upol.cz

P +420 585 634 060
E dekanat.prf@upol.cz

Major Space Projects & References

QUARTZ : ESA Scylight project aimed at development of satellite-based quantum key distribution system and service architecture, including core technologies and ground end-to-end testing. Project duration is 2018-2022, Faculty of Science of Palacky University is a part of an international consortium led by SES. The team of Palacky University is responsible for information-theoretical security analysis of quantum cryptography protocol to be developed and implemented within the project.

Super-Resolution via Spatial Mode Demultiplexing and its Applicability to Observational Astronomy: ESA Ariadna project realized in 2018. The team of Palacky University explored the concept of indirect super resolution imaging based on spatial mode demultiplexing, performed theoretical and experimental assessments of the method and studied its applicability to observational astronomy, with special reference to binary star systems and exoplanet detection.

CzechGlobe

ACADEMIA
TESTING

Global Change Research Institute CAS

General Desctiption

Global Change Research Institute of the Czech Academy of Sciences (CzechGlobe) aims to better understand the impact of global change on the atmosphere, biosphere and societal processes – the causes, impacts, adaptation and mitigation through the state-of-the-art instrumentation, techniques, co-creation approach and transfer of knowledge.

Competences & Capabilities

We use various Earth observation data for assessment of spatio-temporal changes of natural and man-managed ecosystems. Combination of in-situ, airborne (in house Flying Laboratory of Imaging Systems) and satellite (e.g. Copernicus services) observations help us to develop scaling schemes and methods for quantitative assessment of biochemical and structural properties of plants, estimates of plant biomass and carbon stocks, crop yields, evapotranspiration, soil moisture, drought stress, as well for analysis of urban thermal regime.

Products / Services

- www.intersucho.cz
- www.windy.com (drought intensity and soil moisture)
- www.klimatickazmena.cz
- www.firerisk.cz
- www.agrorisk.cz

Major Space Projects & References

CzechGlobe researchers have participated in following ESA funded projects:

- Black Sea and Danube regional initiative project DryPan aiming to improve seasonal forecast of drought and its impacts on crop yields using EO data.
- HyPlant Processing Experiment for development and testing of a processing chain for data from the airborne fluorescence demonstrator HyPlant.
- Hyperspectral analysis and heterogeneous surface modelling.
- Red edge positioning techniques for Earth observation optical missions that analysed the red-edge spectral region in Sentinel-2 data.

Since 2018 the CzechGlobe's airborne facility has been regularly involved in international campaigns supporting the future ESA Earth Explorer mission FLEX (Fluorescence Explorer).

Contact

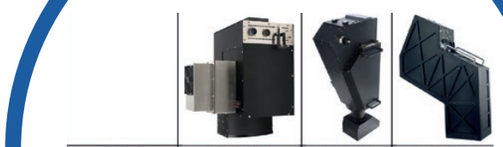
Global Change Research Institute CAS (CzechGlobe)
www.czechglobe.cz

Responsible for space and ESA projects

Ing. Lucie Homolová, PhD.
P + 420 511 192 227
E homolova.l@czechglobe.cz

Space Related Equipment, Labs & Certificates

- Aircraft Cessna 208B Grand Caravan
- Airborne hyperspectral sensors (CASI, TASI, SASI)
- Certification for HyPlant, a high-performance imaging spectroradiometer for vegetation fluorescence mapping
- Airborne and terrestrial laser scanners
- Laboratory and field spectroscopy equipment
- Laboratory and field instruments for measurements of plant ecophysiological properties and processes
- CzeCos research infrastructure (http://www.czecos.cz/)



Sensor	CASI-1500	SASI-600	TASI-600
Region	VNIR	SWIR	LWIR
Spectral range [nm]	380 - 1050	950 – 2450	8 000 – 11 500
Number of spatial pixels	1500	600	600
Max. spectral resolution [nm]	3.2	15	110
FOV [°]	40	40	40

IAP

ACADEMIA
R & D
DESIGN
TESTING

Institute of Atmospheric Physics, CAS

General Desctiption

The Institute of Atmospheric Physics of the Czech Academy of Sciences (IAP) is a public research institution oriented toward research of the atmosphere, ionosphere and magnetosphere of the Earth, ionospheres and magnetospheres of planets of the Solar system, and of the solar wind. Areas of expertise are related to space research in the domains of space plasma physics and space weather, including design and development of scientific instruments, in-situ experimental measurements, data analysis, theory, and numerical simulations.

Space Related Equipment, Labs & Certificates

- Electronics laboratory for development of spacecraft
- instrumentation;
- Vibration testing device;
- Thermal chamber;
- Vacuum chamber;
- ISO 7 clean room with thermal chamber;
- Faraday cage;
- Computer equipment including data storage.

Major Space Projects & References

- The Solar Orbiter probe (ESA): Development and implementation of the Time Domain Sampler module for Radio and Plasma Wave instrument.
- JUICE space probe (ESA): Wave analyzer and onboard processing module for low-frequency electromagnetic waves at Jupiter and its icy moons. Co-Principal Investigator of the Radio and Plasma Waves Instrument.
- TARANIS satellite (CNES): Development and implementation of a fast wave analyzer for the IME-HF instrument.
- ExoMars 2022 probe (ESA): Principal Investigator of the Wave Analyzer Module.
- Comet Interceptor Probe (ESA): Development and implementation of the Dust Analyzer & Processing Unit (DAPU).
- Vigil space weather mission (ESA): Development and implementation of the Data Processing Unit.
- Athena X-ray telescope (ESA): contribution to the hardware electronics of the X-ray Integral Field Unit.
- LISA gravitational wave mission (ESA): contribution to the hardware electronics of the Fibre Switch Unit Actuator

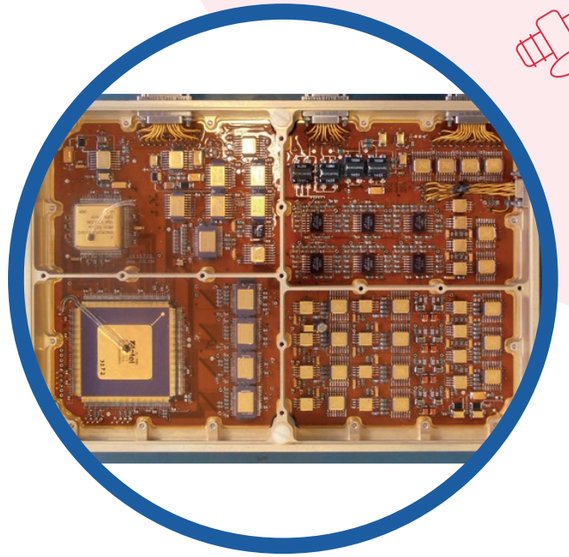
Contact

Institute of Atmospheric Physics CAS
Bocni II 1401
141 31 Prague 4
Czech Republic
www.ufa.cas.cz

Responsible for space and ESA projects

prof. RNDr. Ondrej Santolik, Dr.
P +420 267 103 083
E os@ufa.cas.cz

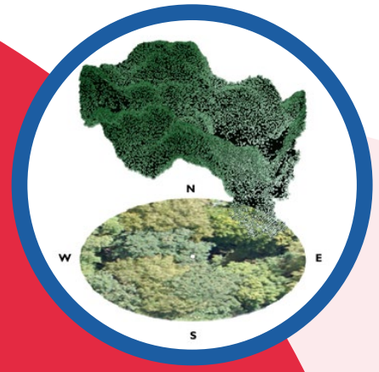
- Analysis of data from instruments where IAP personnel participate as Co-Investigators or collaborators in scientific teams (ESA/Cluster, NASA/Polar, NASA/Stereo, CNES/DEMETER, ESA/Double Star, NASA/Themis, NASA/Van Allen Probes, NASA/Cassini, NASA/Juno, JAXA/Arase).
- Spacecraft telemetry reception at the Panska Ves station.
- Ground-based measurements related to space research: A digital ionosonde, continuous Doppler sounding systems, broadband electromagnetic measurements of lightning discharges.



INSTITUTE OF BOTANY CAS

ACADEMIA
R & D
DESIGN
TESTING

Institute of Botany (IBOT), CAS



General Desctiption

The Institute of Botany carries out research at the level of species, populations, and plant communities. It specifically focuses on biodiversity and evolutionary trends among plants, the invasive behaviour of species, responses of plants and vegetation to environmental changes and the coexistence of various species in the ecosystem. Our applied research focuses on biotechnology, biofuels, bioindication and revitalisation.

Competences & Capabilities

Space biology

- evaluation of the physiological status of photosynthetic (micro)organisms
- studies of adaptation/acclimatisation mechanisms to various stresses

Regenerative life support systems

- algal mass cultivations
- mycorrhizal symbioses
- growth characteristics and primary production measurements
- algal assays and cyanotoxine detection
- bioremediation and revitalisation

Astrobiology

- isolation, cultivation, and characterisation of extremophilic phototrophic (micro)organisms
- detection of limits of survival
- studies of adaptation/acclimatisation mechanisms to various stresses
- in situ ecophysiological measurements in extreme environments
- biological samples on student stratospheric balloons

Major Space Projects & References

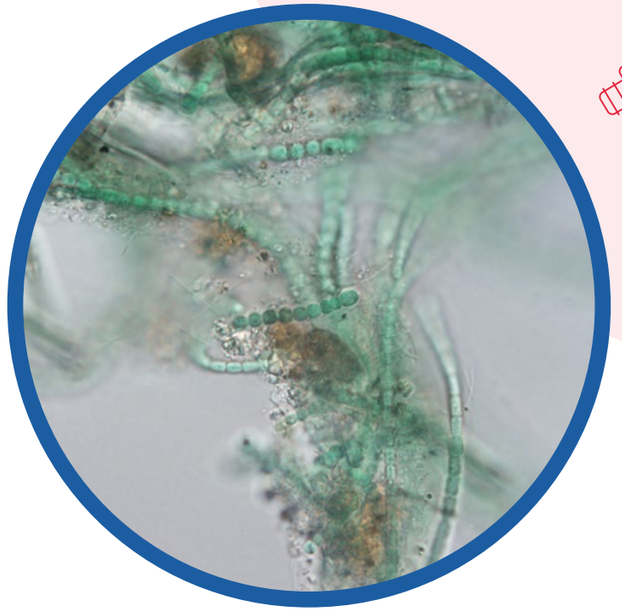
ArtEMISS - Arthrospira sp. gene Expression and mathematical Modelling on cultures grown in the International Space Station
CAREX – Coordination Action for Research Activities on Life in Extreme Environments
Evaluation of effects of radiation on algae and cyanobacteria

Contact

Institute of Botany
Czech Academy of Sciences
Zamek 1
252 43 Pruhonice
Czech Republic
www.ibot.cas.cz

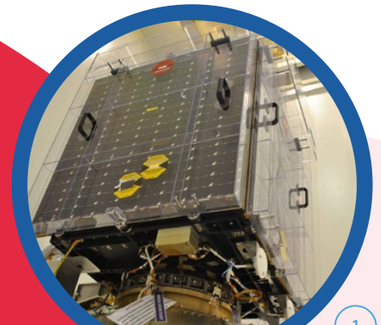
Responsible for space
and ESA projects

Mgr. Jana Kvíderová Ph.D.
P +420 384 721 156
E jana.kviderova@ibot.cas.cz



Institute of Experimental and Applied Physics, CTU

ACADEMIA
R & D
DESIGN
TESTING



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General Desctiption

The IEAP is a research institute of the Czech Technical University in Prague dealing with radiation detection and nuclear physics.

Competences & Capabilities

Main area of activity is R&D of semiconductor detectors and advanced instrumentation for radiation detection, novel methods of radiation imaging and spectroscopy and their applications in different fields such as medical imaging, material sciences and space. We also provide gamma-ray and neutron sources for calibration of space detectors.

Products/Services

- Miniature low-power radiation monitor HardPix for high-resolution detection, visualization and characterization of mixed radiation fields in space. Provides particle species, flux, energy spectra and doserate.
- Miniature low-power neutron spectrometer Neutron HardPix for localization of subsurface hydrogen in lunar regolith onboard rovers.
- Testing and calibration of Gamma-ray and Neutron detectors/payloads.

Major Space Projects & References

- Miniature quantum dosimeters onboard the ISS, visualization and detailed dosimetry of radiation inside the station. Five units deployed in 2012.
- SATRAM radiation monitor onboard ESA Proba-V, in operation since 2013 for high-sensitivity detection and monitoring of the mixed radiation field in LEO. Cooperation with BD Sensors. https://satram.utef.cvut.cz/
- Imaging detector for X-ray telescope onboard the Czech VZLUSAT-1 launched in 2017.
- RISEPix radiation monitor onboard the Japanese RISESAT launched in 2019.
- Two HardPix radiation monitors as part of ESA ERSA onboard the Lunar Gateway. Planned launch in 2024.
- Magnetic spectrometer PAN for measurement of high-energy particles up to 20 GeV in deep space.

Space Related Equipment, Labs & Certificates

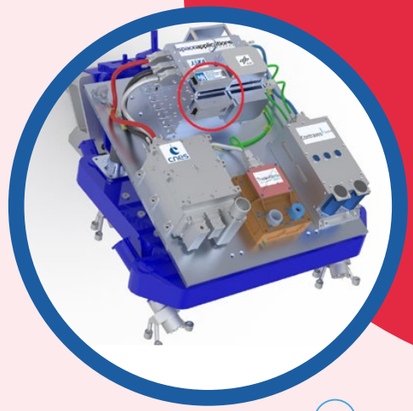
- Accelerator VdG (p, d, ESA-compliant source of tagged neutrons).
- 2 ESA-compliant sources for testing of gamma-ray sensitive devices/payloads.
- Clean room class ISO 5.
- Central detection and analytical lab equipped with HPGe detectors, Si, GaAs and CdTe pixel detectors.

Contact

Institute of Experimental and Applied Physics (IEAP)
Czech Technical University in Prague (CTU)
Husova 240/5
110 00 Praha 1
Czech Republic
www.utef.cvut.cz

Responsible for space and ESA projects

Mgr. Robert Filgas, Ph.D.
P +420 775 868 789
E robert.filgas@utef.cvut.cz



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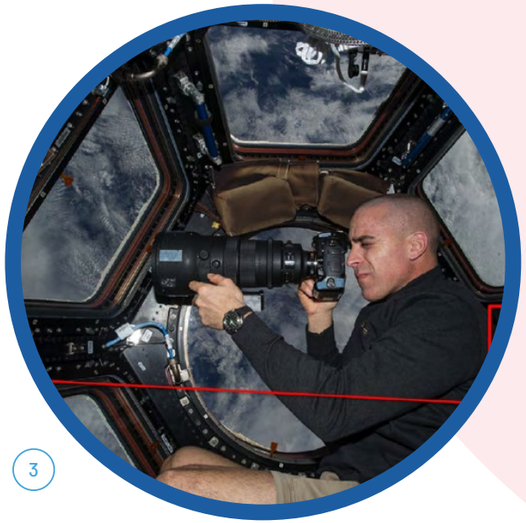

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[1] SATRAM radiation monitor (yellow box) attached to the bottom of ESA Proba-V satellite. Courtesy of ESA.
[2] Model of ERSA for Lunar Gateway with HardPix radiation monitors in red circle. Courtesy of Space Application Services.
[3] Astronaut Chris Cassidy near the IEAP CTU Timepix Radiation Environment Monitor on the ISS. Courtesy of NASA.
[4] Engineering module of HardPix radiation monitor.

toptec

ACADEMIA
R & D
DESIGN
TESTING

TOPTEC, Institute of Plasma Physics, CAS

General Desctiption

The TOPTEC Research Centre for Special optics and Optoelectronic Systems continues an almost 50-year-long tradition of research and development of special optics in the optical department of the Institute of Plasma Physics of the CAS. The TOPTEC Research Centre is engaged in the R & D of unique and application-specific systems (using the application of aspheric optics), development of ultra-precise mechanical components for optical systems, and development of thin films and measurement methods, all for scientific and industrial purposes.
The TOPTEC Centre has at its disposal new laboratories equipped with state-of-the-art technologies for research, development, machining, and measurement of special and ultra-precision optics and fine mechanics. It is staffed by a research team of 50 highly qualified and experienced specialists.

Competences & Capabilities

For several decades, unique optical components for various applications (including astronomy) have been developed and manufactured at the Turnov department of the Academy of Sciences, and its researchers have participated in space projects since the 1980s (Interkosmos).
The combination of many years of research experience and state-of-the-art technologies as well as equipment supporting our capabilities in opto-mechanical design, simulation, construction, manufacturing, and measurement of special optics, enables the TOPTEC Centre to provide comprehensive R & D solutions in the field of optics.
In addition, the TOPTEC Centre researchers carry out dozens of contractual research projects every year, both for commercial entities and scientific institutes from various fields of expertise (aerospace, automotive, astronomy, biomedicine, engineering etc.).

Major Space Projects & References

Optical elements of FLORIS telescope for FLEX (FLuorescence EXplorer) mission (for Leonardo S.p.A.) – complex optical analysis of the system, assembly of individual optical and mechanical elements and their further integration into a fully functional system. The analysis and tests include characterization of optical surface scattering functions, bonding of opto-mechanical interfaces to minimize vibration shocks on optics, vibration and thermal tests and final full optical characterization of the system. The aim of the mission is to map vegetation fluorescence to quantify photosynthetic activity which will improve the understanding of carbon movement between plants and the atmosphere.
ARIEL (Atmospheric Remote-sensing Infrared Exoplanet Large-survey) (for ESA) – TOPTEC involvement in the project includes the design, development and realization of common optics setup, including its holders and adjustment capabilities.The mission will measure the chemical composition and thermal structures of exoplanets, linking them to the environment of the host star.

Contact

Research Centre for Special Optics and Optoelectronic Systems TOPTEC
Institute of Plasma Physics of the CAS, v.v.i.
Sobotecká 1660, Turnov 511 01
Czech Republic
www.toptec.eu

Responsible for space and ESA projects

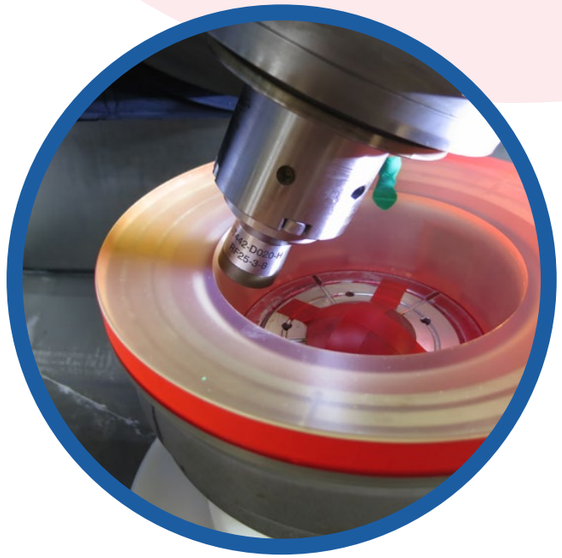
Mgr. Radek Melich, Ph.D.
P +420 487 953 917
M +420 776 783 952
E melichr@ipp.cas.cz

Optical Parts of the Coronagraph METIS on the Solar Orbiter Mission (for ESA) – the production of two main lightweight mirrors. The biggest challenge of the project lays in the necessity to meet the requirements on the optical quality of the mirrors – surface form (120 nm PV) and microroughness (0.3 nm) – while keeping their combined total weight below one kilogram.
Optics of the Coronagraph ASPIICS on the Proba-3 Mission (for ESA) – the overall optical design and tolerancing of the entire optical system (primary objective imaging the solar corona on the internal occulter and relay optical system re-imaging the corona on a detector), and its final production. Both optical systems have been designed and toleranced with respect to maximum performance while keeping a robust design.

Space Related Equipment, Labs & Certificates

The TOPTEC Centre is able to ensure the implementation of many R & D tasks related to requested projects ranging from design, analysis, and simulation, through very precise production to the testing of the results. For this purposes the TOPTEC Centre is equipped with:

- laboratories complying with standards for optical development incl. a clean room;
- a metrology lab with a wide range of measuring instruments, for example aspheric interferometer, 3D stitching profilometer, microscopes using different observation techniques, AFM microscopy, White Light Interferometer microscopy, goniometers etc.;
- software tools for design, numerical simulations, and topological optimization.



VSB TECHNICAL UNIVERSITY OF OSTRAVA | IT4INNOVATIONS NATIONAL SUPERCOMPUTING CENTER

- ACADEMIA
- R & D
- DESIGN
- TESTING

IT4Innovations National Supercomputing Center

General Desctiption

IT4Innovations National Supercomputing Center at VSB – Technical University of Ostrava is a leading research, development, and innovation center active in the field of high-performance computing (HPC) and data analysis (HPDA). IT4Innovations operates the most powerful supercomputing systems in the Czech Republic, which are provided to Czech and foreign research teams from both academia and industry. Together with the CESNET and CERIT-SC institutions, IT4Innovations constitutes e-INFRA CZ, a strategic research infrastructure of the Czech Republic.

IT4Innovations National Supercomputing Center at VSB – Technical University of Ostrava is a leading research, development, and innovation centre active in the fields of HPC, HPDA, and AI and their application to other scientific fields, industry, and society. IT4Innovations operates the most powerful supercomputing systems in Czechia and constitutes e-INFRA CZ, a strategic research infrastructure of Czechia.

Competences and Capabilities

The key research areas of IT4Innovations include big data processing and analysis, machine learning, development of parallel scalable algorithms, solution of computationally demanding engineering problems, advanced visualization, virtual reality, modelling for nanotechnologies, and material design.

Major Space Projects & References

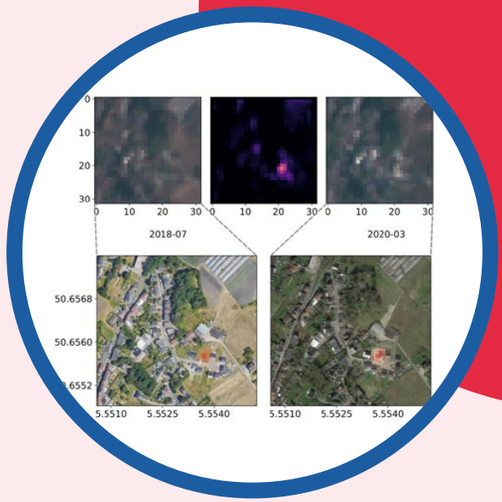
- The Urban Thematic Exploitation (U-TEP) is a web-based and open platform that integrates state-of-the-art processing, analysis and visualization services and enables any interested user to exploit EO data easily and with no data download complications.
- The BLENDED project focused on Urban Expansion monitoring for three European cities with the usage of time-series Multispectral and SAR data in a three-decade lifespan.
- Within the scope of Czech Copernicus Collaborative Ground Segment we are developing a system for effective nation-wide processing of Sentinel-1 satellite data by interferometric and polarimetric techniques for geodetic, geologic or forestry applications.
- Space Related Equipment Labs & certificates (stručně v odrážkách, s důrazem na certifikáty)
- IT4Innovations runs three supercomputers:
- Karolina (15.7 PFlop/s),
- Barbora (849 TFlop/s),
- NVIDIA DGX-2, a specialised system for AI computation (130 TFlop/s and 2 PFlop/s in AI).

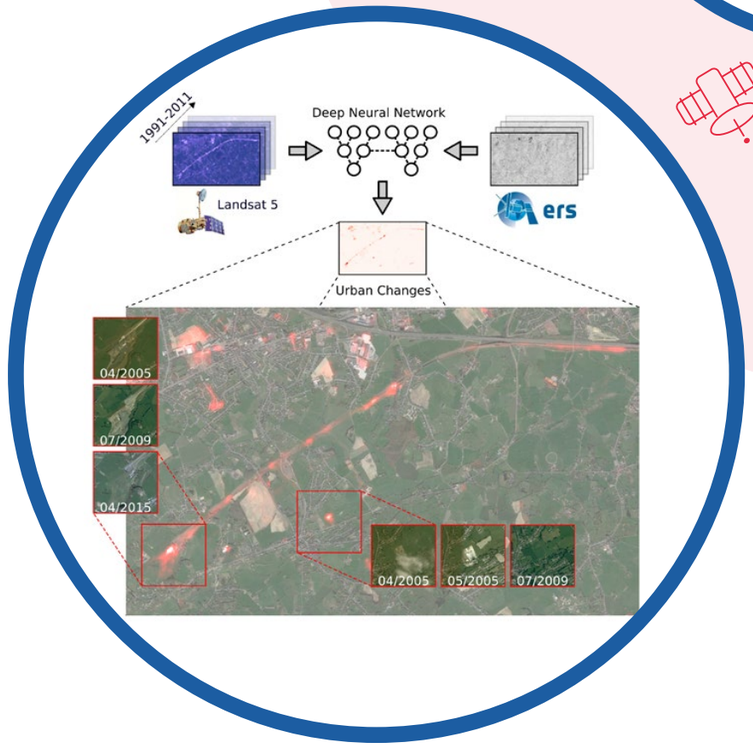
Contact

VSB – Technical University of Ostrava
17. listopadu 15
708 00 Ostrava
Czech Republic
www.it4i.eu

Responsible for space and ESA projects

Doc. Vít Vondrák
P +420 597 329 590
E vit.vondrak@vsb.cz





ACADEMIA
R & D
DESIGN
TESTING

Kleť Observatory

General Desctiption

The Kleť Observatory is a research institution belonging to few natural science centers of Southern Bohemia in the Czech Republic, supported by the South Bohemian Region and various grants. The observatory is situated south of the top of Klet mountain (at altitude of 1070 m), southwest from the town of České Budějovice. There are one hundred and fifty clear nights per year with a good astronomical seeing on the average, as shows data from photographic observations of minor planets and comets since 1968. The Headquarter of Kleť Observatory is located at the Observatory and Planetarium in České Budějovice.

Competences and Capabilities

Ground segment for Space Safety Programme -

Near Earth Objects (NEO)

- Confirmatory observations of newly discovered NEO candidates, especially fainter and fast moving objects as well as NEO candidates having larger ephemeris uncertainty (both lim. mag. about V = 22 mag. and larger FOV are benefits of 1-m KLENOT Telescope)
- Recoveries of NEOs in the second opposition
- Follow-up astrometry of poorly observed NEOs - Virtual Impactors" and PHAs, target of space missions or radar targets
- Cometary features. Analysis of possible cometary activity of newly discovered bodies.
- Search for new asteroids as a by-product. Educational and public outreach activities in related field (asteroid hazard, space safety)

Major Space Projects & References

Near Earth Object follow-up astrometry as the Cooperating Sensor of ESA-SSA-NEO segment (2014-2017 ESA contract).
Observational support from collaborating observatories with DEIMOS SPACE S.L.U, Madrid, Spain as the main contractor with ESA - further sub-contractors are from Germany and Spain (since 2019).

Observation statistics

- 2019 together 1394 positions of 154 NEOs (14 Atens, 81 Apollos, 59 Amors; incl.11 PHAs)
- 2018 together 2051 positions of 172 NEOs (18 Atens, 90 Apollos, 64 Amors; incl.17 PHAs)
- 2017: together 2865 positions of 274 NEOs (22 Atens, 148 Apollos, 104 Amors; incl.15 PHAs)
- 2016: together 3765 positions of 324 NEOs (40 Atens, 142 Apollos, 142 Amors;incl.24 PHAs)
- 2015: together 2350 positions of 231 NEOs (21 Atens, 124 Apollos, 86 Amors;incl.17 PHAs)

Contact

Kleť Observatory
Zátkovo nábřeží 4
370 01 České Budějovice
Czech Republic
www.klet.org

Responsible for space and ESA projects

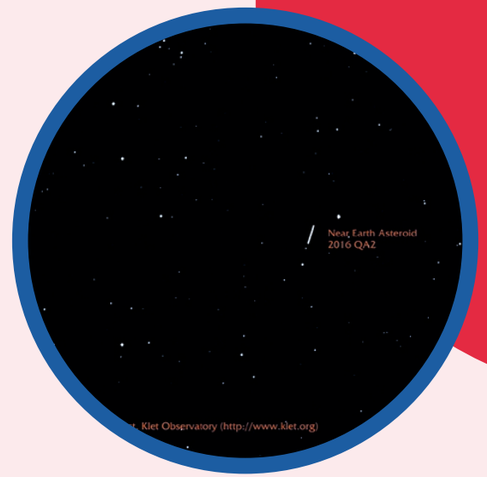
Ing. Jana Ticha
P +420 380 123 327
M +420 604 856 349
E jticha@klet.cz

References

Minor Planet Circulars(ISSN 0736-6884) and
Minor Planet Electronic Circulars (ISSN 1523-6714), (2013-2019)

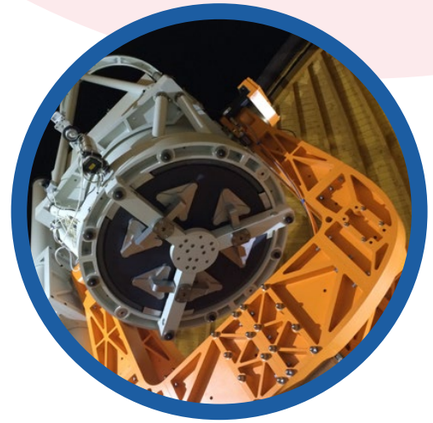
Ticha, J., Tichy, M.,Honkova, M. KLET OBSERVATORY PREPAREDNESS AND PLANS FOR PLANETARY DEFENCE (Proceedings 1st NEO and Debris Detection Conference, 22 January 2019 - 24 January 2019, Darmstadt, Germany, published by ESA Space Safety Programme Office)

Ticha, J., Tichy, M., Kocer, M.: KLENOT NEO FOLLOW-UP PROGRAM IN EUROPEAN FRAMEWORK (2015 IAA Planetary Defense Conference, Frascati, Italy, 2015)



Space Related Equipment, Labs & Certificates

- 1.06-m KLENOT telescope with 4-lenses corrector to obtain a plane FOV 0.63 x 0.63 degrees, computer controlled equatoreal mount, equipped with CCD camera
- FLI ProLine 230. Limiting magnitude of mV=22.0mag.
- The hardware and software equipment for KLENOT project consists of local network, servers and workstations for operating CCD camera, instantaneous visual detection, image processing, data reduction, identification of moving objects, ephemeris calculations and orbit computations. The Klet Software Package has been continually upgraded.
- In order to increase tracking accuracy of the KLENOT telescope mount the main gearbox was upgraded. New feature: HW + SW system for sidereal off-set tracking was installed in order to increase limiting magnitude of observed moving objects



ACADEMIA
R & D
TESTING

Nuclear Physics Institute of the CAS

General Desctiption

Nuclear Physics Institute of the CAS, public research institution, conducts research in a broad field of nuclear physics, experimental as well as theoretical. http://www.ujf.cas.cz

Competences and capabilities

Research related to space focuses mainly on simulation and measurements of cosmic radiation at high-mountain observatories, onboard aircraft, spacecraft, and satellites, application and development of active and passive detectors, radiation protection, individual monitoring of aircraft crew.

The largest experimental facilities of NPI are cyclotrons U-120M and TR-24, electrostatic accelerator Tandetron TN 4130MC, cyclic electron accelerator microtron MT25, and 300 kV accelerator mass spectrometer MILEA.

Products/Services

NPI provides services using beams of gamma rays and charged particles, including irradiation services for the subsidiary company RadioMedic Ltd. (production of radiopharmaceuticals), calibrations of dosimetry systems for radiotherapy hospital departments, dosimetry audits of therapeutic irradiation systems, calculations of level of irradiation for aircraft crews, radiocarbon dating of samples, monitoring activities of 14CO2 and 85Kr in the air.

Major Space Projects & References

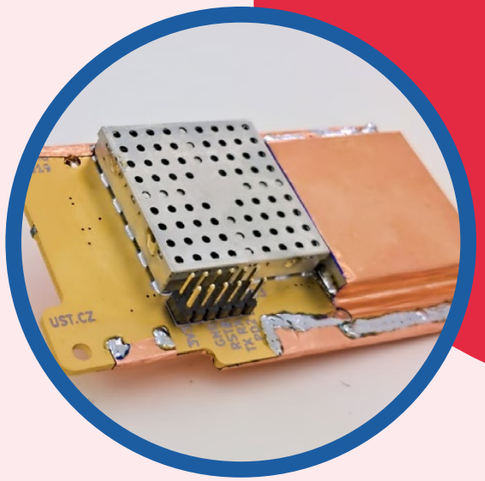
- DOSIS 3D (Dose Distribution Inside the International Space Station - 3D)
- MARE (Matroshka AstroRad Radiation Experiment)
- SOCRAT-R (3U CubeSat for monitoring of radiation environment and Space Weather at LEO)
- LVICE2 (Lunar Vicinity Complex Environmental Explorer, Czech ambitious missions)
- CRREAT (Research Center of Cosmic Rays and Radiation Events in the Atmosphere)
- RAMAT (Radiation resistant materials based on organic polymers for medical and space applications)
- BICZEPS (Advanced dosimetry for biological systems in near-earth space)
- Space Related Equipment Labs & certificates
- Passive detectors (various types of thermoluminescent and plastic nuclear track detectors) for measurements of integral dosimetric characteristics onboard International Space Station and return satellites
- Active detectors (Si-diode, LET spectrometer based on plastic scintillator and pixel detectors) for continuous monitoring of cosmic radiation
- Individual monitoring of aircraft crew – commercial service for Czech and Slovakian aircraft companies

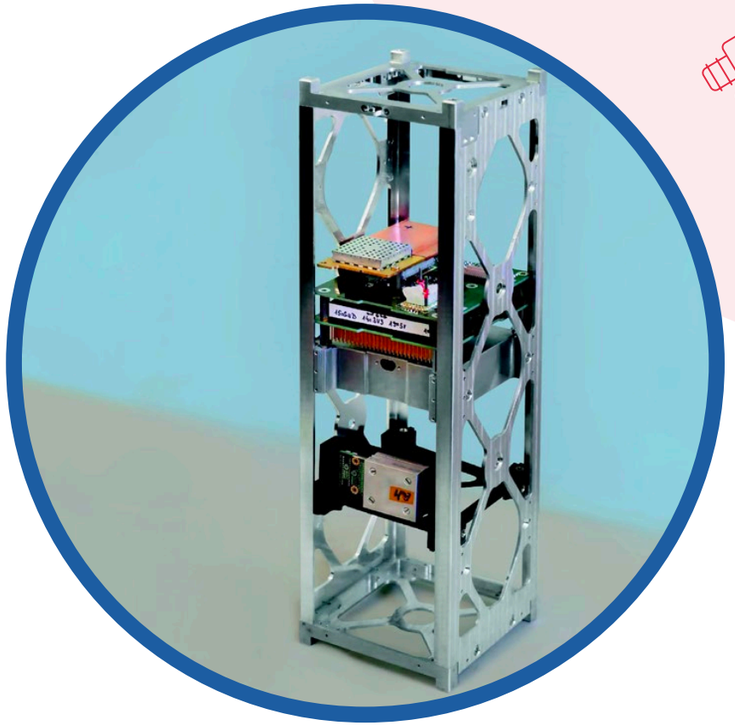
Contact

Nuclear Physics Institute of the CAS
Řež 130
250 68 Řež
Czech Republic
www.ujf.cas.cz

Responsible for space and ESA projects

Ing. Iva Ambrozova, PhD.
P +420 266 177 228
E ambrozova@ujf.cas.cz





planetum

- ACADEMIA
- R & D
- SERVICES

Planetum

General Desctiption
Planetum is a brand of the contributory organization Observatory and Planetarium of capital city Prague, which includes two observatories (Stefanik observatory, Dablice observatory) and one planetarium in Stromovka.

At observatories you can admire large telescopes. During the day you can look at the Sun using special telescopes, on clear nights you can observe the Moon, details of the planets, places where stars are born in the universe, or distant galaxies. In the planetarium, the universe is projected onto an artificial sky in the shape of a hemisphere. Both observatories and the planetarium have a rich selection of programs - from fairy tales for the little ones to documentaries on astrophysics and cosmology. You will also find unique interactive exhibits dedicated to the exploration of space and cosmonautics. You can sit in the cockpit of the space shuttle, explore the Apollo lunar lander and much more.

The planetarium is a time machine that can travel to the past and the future, a spaceship with which you can fly to the planets, among the stars or leave the Galaxy and look at our home from a distance of tens of billions of light years. All this thanks to modern digital technology that keeps moving forward. As early as 2023, the projection area will be transformed into a giant LED screen with an area of 867 square meters – the Prague Planetarium will have the first so-called LED-dome in Europe and the largest in the world. Planetum also became the first institution of its kind in the world to send its own satellite into orbit. The Planetum-1 satellite was launched on May 25, 2022, on a Falcon 9 rocket from Florida's Cape Canaveral. It is the first purely educational satellite in the world. In the foyer of the planetarium, you can take a look at its operations center.

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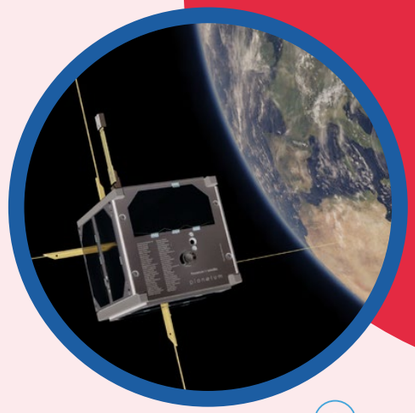

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Contact

Hvezdarna
a planetarium hl. m. Prahy
Kralovska obora 233
170 21, Prague 7
www.planetum.cz

Responsible for space
and ESA projects

Jakub Rozehnal
M +420 604 534 137
E rozehnal@planetum.cz

[1] Planetarium Prague
[2] Vizualization of the Planetum-1 satellite in Earth orbit)
[3] Dablice observatory
[4] Stefanik observatory

HVĚZDÁRNA
A PLANETÁRIUM
TEPLICE

ACADEMIA
R & D

Teplice Observatory

General Desctiption

Teplice Observatory is a part of the North-Bohemian Observatory and Planetarium in Teplice (NBOPT). NBOPT is a non-profit organisation funded by the Usti Region and is primarily focused on popularisation of astronomy and science. The observatory is located atop of the Sand Hill situated in the southeast part of the North-Bohemian town Teplice with a moderate light pollution and almost unobstructed view of the whole sky.

Competences & Capabilities

In research, the Teplice Observatory is focused on observations of artificial satellites and space debris, astrometry of minor bodies in the Solar System and occultations of stars by asteroids. The Southeast dome of the Teplice Observatory is equipped with the Sand Hill Optical Telescope (SHOT). The SHOT sensor is dedicated to the ESA SST activities based mainly on the ESA contracts and it will contribute to the upcoming EU SST programme.

Products/Services

- astrometry and photometry of artificial satellites and space debris (all orbits including GEO, MEO, LEO, HEO)

Major Space Projects & References

- SSA P2-SST-X: Support Observations and Sensor Qualification
- SSA P3-SST-III: Robotic Telescopes Demonstration
- SSA P3-SST-XIX SST: Sensor Data Acquisition for Endurance Tests and Valition Phase 2
- SSA S2P S1-SC-09: Support of the development of sensors, joint test and operation of a European Optical Network
- see also http://shot.hapteplice.cz

Space Related Equipment, Labs & Certificates

- The Sand Hill Optical Telescope (SHOT sensor): 0.43-m f/6.8 corrected Dall-Kirkham telescope (Planewave CDK17), precise German equatorial mount (10micron 3000HPS), scientific CMOS camera Kepler FL4040, 0.66x focal reducer, the resulting FOV 64 x 64 arcminutes (1.1 square degree), GPS E 13 50 48.2, N 50 38 18.0, 275 m MSL.
- A major SHOT sensor upgrade to a 0.6-m f/3 system with FOV 1.8 x 1.8 degrees is planned for 2023.

Contact

Teplice Observatory,
North-Bohemian Observatory and Planetarium (NBOP)
Koperníkova 3062,
415 01 Teplice
Czech Republic
www. hapteplice.cz

Responsible for space and ESA projects

RNDr. Zdeněk Moravec, Ph.D,
P +420 417 576 571
M +420 604 944 523
E moravec@hapteplice.cz

Galileo satellites placed on Soyuz launcher

Czech Republic Presence in the European Union

European Commission

DIRECTORATE-GENERAL FOR DEFENCE INDUSTRY AND SPACE (DEFIS)

The Directorate-General for Defence Industry and Space (DEFIS) leads the European Commission's activities in the Defence Industry and Space sector.

In the area of Defence Industry, DEFIS is in charge of upholding the competitiveness and innovation of the European Defence industry by ensuring the evolution of an able European defence technological and industrial base.

In the area of Space DG DEFIS is in charge of implementing the EU Space programme consisting of the European Earth Observation Programme (Copernicus), the European Global Navigation Satellite System (Galileo) and the European Geostationary Navigation Overlay Service (EGNOS).

CONTACT

DIRECTORATE-GENERAL FOR DEFENCE INDUSTRY AND SPACE (DEFIS)

European Commission
Rue de la Loi 130/Wetstraat 130
1049 Bruxelles/Brussel
Belgium

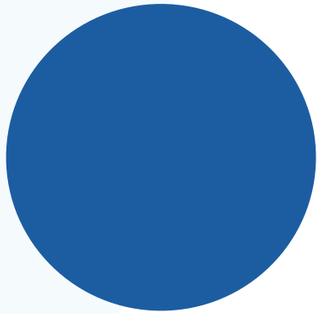
P +32 2 299 11 11

EU SPACE

EU SPACE PROGRAMME

The European Space Programme bolsters the EU Space policy in the fields of Earth Observation, Satellite Navigation, Connectivity, Space Research and Innovation and supports investments in critical infrastructure and disruptive technologies.

The following flagship components deliver European space-based services on a daily basis:
COPERNICUS is the European Earth Observation (EO) system. It supports the management of the environment, helps to mitigate the effects of climate change and ensures safety and civil security across Europe. Copernicus is the first world provider of 'big' space data.
GALILEO is a global satellite navigation and positioning system (GNSS) on which numerous EU economic sectors rely, from transport and agriculture to border management and search and rescue. Its 20cm accuracy makes Galileo a game changer for autonomous driving and commercial drones. Already more than 2.5 billion smartphones are Galileo-enabled.
EGNOS is the European Geostationary Navigation Overlay Service: a reliable navigation signal improving the navigation services to aviation, maritime and land-based users over 30+ countries, and already operational in 426 airports and helipads.



In February 2022, the European Commission proposed two new flagship initiatives to boost satellite-based secure connectivity and Space Traffic Management:
EU space-based secure connectivity system will ensure worldwide access to secure and cost-effective satellite communications services, for governmental communications and commercial use. It aims to protect critical infrastructures, support surveillance and crisis management, as well as enable high-speed broadband everywhere in Europe to best anticipate future challenges of our economy.
Space Traffic Management: The exponential applications of space services involve more and more satellites, thus more traffic in space. As the congestion of satellites and debris threaten the viability of space infrastructure, the European Commission and the High Representative of the Union for Foreign Affairs and Security Policy have presented an EU approach on **Space Traffic Management** (STM). This would further strengthen the Union's **space surveillance and tracking capabilities** (already providing collision avoidance services to more than 260 European spacecraft), and set clear standards and regulation for a safe, sustainable and secure use of space.

EUROPEAN UNION AGENCY FOR THE SPACE PROGRAMME (EUSPA)

EUSPA ensures that Europe meets its GNSS objectives and that the public benefits from European GNSS (EGNOS and Galileo). It also supports the development of applications based on Galileo, EGNOS and Copernicus, and coordinates user-related aspects of GOVSATCOM in support of key EU policy goals.

Its specific tasks are:

- managing EGNOS & Galileo service provision
- promoting downstream and integrated applications based on Galileo, EGNOS and Copernicus
- engaging the GOVSATCOM user community in shaping the service
- improving GNSS services & infrastructure

To accomplish this, EUSPA:

- ensure the safe and secure management of all space components
- supports research & innovation
- engages market stakeholders to develop innovative & effective GNSS applications
- leverages synergies between the space programme components
- makes sure that Europe's space-based services are secure, safe & accessible
- provides in-depth market analysis

Contact

European Union Agency for the Space Programme (EUSPA)
Janovskeho 438/2
170 00 Prague 7
The Czech Republic

P +420 234 766 000
Fax +32 2 296 72 38

Contact point resposible for EUSPA and Administrative Board Member

Ministry of transport of the Czech Republic
Nábřeží Ludvíka Svobody 1222/12
110 15 Praha 1
The Czech Republic

P +420 225 131 111
E posta@mdcr.cz
www.mdcr.cz

This image of Earth was compiled using tens of thousands of images from the Copernicus Sentinel-2 mission. with detail.

Czech Republic Presence in International Organisations

THE EUROPEAN SPACE AGENCY (ESA)

The European Space Agency (ESA) is Europe's gateway to space. Its mission is to shape the development of Europe's space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world. ESA is an international organisation with 22 Member States. By coordinating the financial and intellectual resources of its members, it can undertake programmes and activities far beyond the scope of any single European country.

ESA's purpose shall be to provide for, and to promote, for exclusively peaceful purposes, cooperation among European States in space research and technology and their space applications, with a view to their being used for scientific purposes and for operational space applications systems:

- by elaborating and implementing a long-term European space policy, by recommending space objectives to the Member States, and by concerting the policies of the Member States with respect to other national and international organisations and institutions;
- by elaborating and implementing activities and programmes in the space field;
- by coordinating the European space programme and national programmes, and by integrating the latter progressively and as completely as possible into the European space programme, in particular as regards the development of applications satellites;
- by elaborating and implementing the industrial policy appropriate to its programme and by recommending a coherent industrial policy to the Member States.

CONTACT

ESA HQ Bertrand
24 rue du Général Bertrand
CS 30798
75345 Paris CEDEX 7
France

P +33 1 53 69 76 54
Fax +33 1 53 69 75 60

Contact points responsible for ESA agenda and projects in the Czech Republic

Ministry of Transport of the Czech Republic
Nábřeží Ludvíka Svobody 1222/12
110 15 Praha 1
Czech Republic

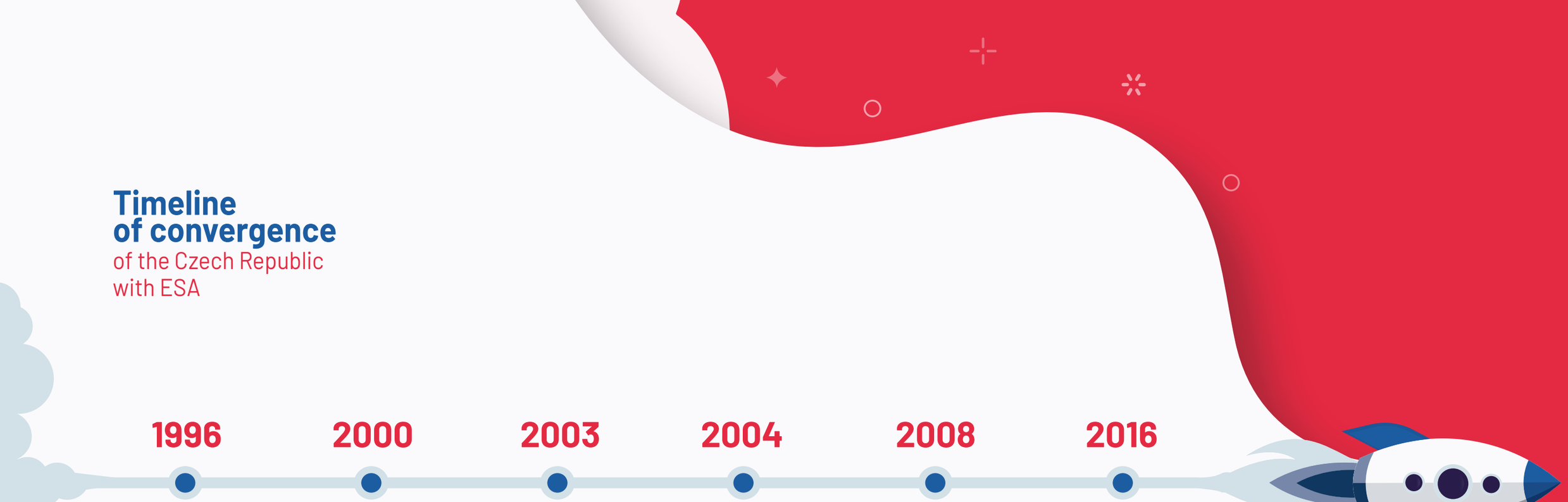
P +420 225 131 111
E posta@mdcr.cz
www.mdcr.cz

Ministry of Education, Youth and Sport (Space Science and Research)
Karmelitska 529/5
118 12 Praha 1
Czech Republic

P +420 234 811 111
E posta@msmt.cz
www.msmt.cz

Timeline of convergence

of the Czech Republic with ESA



1996

Framework Agreement on Cooperation between the Czech Republic and ESA signed.

2000

Treaty on accession to the PRODEX programme (2000) - this was exceptional because PRODEX is an optional ESA programme and as such reserved for Member States.

2003

Government Agreement on the accession of the Czech Republic to the ESA Plan for European Cooperating States (PECS) signed.

2004

Project Charter (PECS Charter) valid for 5 years.

2008

Full membership of the Czech Republic in ESA; the Czech Republic is the first Central and Eastern European country to be a full member of the ESA

2016

Hosting of the Living Planet Symposium 2016 in Prague, one of the largest Earth observation conferences in the world, with 3,500 participants / 1000 talks over 7 days.

Czech participation in ESA

- Approximately 500 projects in which Czech entities actively participated
- 50+ companies cooperating directly with ESA, dozens of Czech subcontractors
- 38 start-ups incubated in the ESA BIC business incubator
- Educational programmes for teachers and inspiration of pupils and students reaching over 10,000 teachers and 500,000 pupils and students.
- 23 research institutes and universities
- Participation in the preparation of 3 launchers and 30 ESA missions, both scientific and purely commercial.
- Under the leadership of the Ministry of Transport, a functioning ecosystem to support the development and exploitation of space activities has been created:

1 ESA BIC Czech Republic business incubator with offices in Prague and Brno. In 2021, it started its second five-year period of operation. The operator is CzechInvest. The purpose is to support new promising ideas and their application in the market practice, to support startups.

1 ESA Technology Transfer Broker, which searches for the application of space technologies in terrestrial applications. The operator is the Technology Centre of the Academy of Sciences of the Czech Republic. Negotiations are currently underway on the transfer of technologies to be adopted by Škoda Auto (batteries, sensors).

1 ESA Space Solutions Ambassador started its activities in 2022, its task is to promote space systems applications, and project opportunities of the ESA Space Solutions programme and to further increase the participation of small and medium-sized companies of the Czech Republic in the ESA programme.

1 Educational Centre on Space Activities, ESERO, (founded in 2016) whose aim is to train teachers and inspire students to study engineering and science.

The Czech Republic participates in ESA Optional Programmes in the following technology domains:

- general technologies (for example banks of supercapacitors, parts of gyroscopes for satellite stabilisation, development of new materials composite sandwich panels, solar panels, etc.).

- Earth observation (where the Czech Republic participates, for example, in the third-generation Meteosat meteorological missions, where it supplies cryogenics, in the optics for the main instrument of the FLEX mission, in the preparation of 6 new Sentinel satellites, in the processing of satellite data into applications, including applications using machine learning and AI, etc.).

- Satellite navigation (in particular satellite navigation applications and software development for satellite signal monitoring and measurement, etc.).

- Satellite telecommunications (Czech companies are involved in the development of the new NEOSAT telecommunications platform, Triton-X, QKD-Sat, Eagle-1 system for satellite communication between air traffic control and transport aircraft crews, development of applications for drones, etc.).

- Launch vehicles (computer software for special aerodynamic enclosures that protect the internal systems of the rocket during the atmospheric passage, valves and pumps for rocket engines, eight years of supply of parts for thermal protection of the nozzle for Ariane 5; the Czech Republic is also involved in the preparation of the next generation – Ariane 6 and also in the technology for the new Vega-C rocket, a device for launching satellites to detach from the launch vehicle).

ESA Initiatives in the Czech Republic

ESA BIC Czech Republic

ESA INITIATIVES

1

General Description

The Czech Republic is the brain & heart of the European space industry and satellite applications. European Space Agency Business Incubation Centre (ESA BIC) Czech Republic creates opportunities for space-related projects and re-purposing space technology. ESA BIC Prague was founded in 2016, and two years later, it was joined by a branch in Brno. Both incubators provide an incubation program for up to 2 years. The program includes financial support (50 000 EUR) and professional business and technical mentoring.

The ESA BIC incubator is a practical demonstration of the importance of investing in the space industry and scientific research. Hence discovering new cosmic horizons also expands our possibilities here on Earth. ESA BIC Czech Republic is part of the ESA Commercialisation Gateway network with more than 25 business incubation centres. They all work regionally to inspire entrepreneurs to turn space-connected business ideas into commercial companies.

More than 1200 startups have been supported by the network to this day. The local operator for the Czech Republic is the CzechInvest Agency in partnership with the City of Prague, the South Moravian Innovation Centre, the Ministry of Industry and Trade, the Ministry of Transport, and the South Moravian Innovation Centre.

Competences & Capabilities

- Incubation programme and financial support
- Technology seminars and competitions
- Space community network and mentors
- Scouting of new technologies and startups
- Business development

Major Space Projects & References

- Data Analytics Platform for Climate Resilience: international project focused on promoting use of EO data to enhance climate resilience (funded by ESA)
- Astropreneurs: acceleration programme to support startups by mentoring them on business and technical needs and helping them to access funding opportunities (funded by Horizon 2020 programme)
- Copernicus Incubation Programme: incubation programme to support startups working with Earth observation data (funded by Horizon 2020 programme)
- Copernicus User Uptake: project with the aim to spread awareness and motivate organisations to use data and services provided by Copernicus (funded by Horizon 2020 programme)
- Technical competitions and hackathons: Galileo Masters, Copernicus Hackathon, ActInSpace hackathon and others

Contact

CzechInvest
Štěpánská 567/15
120 00 Praha 2
Czech Republic
www.esa-bic.cz

Responsible for space
and ESA projects

Michal Kunes
E michal.kunes@czechinvest.org

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[1] Hydronaut
[2] Dronetag
[3] Vrgineers

TECHNOLOGY CENTRE CAS

ESA INITIATIVES

ESA Technology Transfer Broker

General Description

The Technology Centre of the Czech Academy of Sciences (TC CAS) was founded in 1994 and has quickly become an important national institution for research and innovation infrastructure which supports participation of the Czech Republic within the European Research Area.

The TC CAS offers technology transfer support for firms through the international Enterprise Europe Network and through ESA Technology Transfer Broker Programme. This includes both identifying suitable foreign technologies and offering Czech technologies that have been developed by firms, research institutions or on the basis of private activities of our inventors.

Major Space Projects & References

- The National Information Centre for European Research (NICER) organizes information events about the opportunities involved in EU Framework Programmes for research and development, publishes specialized publications and an electronic newsletter and operates an information portal www.fp7.cz about the 7th Framework Programme for Reserach and Developmnet and also about the successor EU Framework Programme for Research, Development and Innovation - Horizon 2020 - www.h2020.cz
- National ESA Technology Transfer Broker
- National annual space conference Gate2Space organizer

Competences & Capabilities

Our mission is to support the participation of the Czech Republic in the European Research Area, prepare analytical and conceptual studies for research and development, perform international technology transfers and support the creation and development of small innovation firms.

- TC CAS organisation scheme
- National Information Centre for European Research
- Department of Business Development
- Department of Strategic Studies
- Czech Liaison Office for Research, Development and Innovation (CZELO) in Brussels
- Economic-Administration Department
- Acceleration programme Business Runway

Space Related Equipment, Labs & Certificates

- Member of Czech space community
- H2020 Space projects advisory
- Access to ESA Technology Transfer Database
- Member of ESA Space Solutions Network

Contact

Technology Centre of the CAS
Ve Struhach 1076/27
160 00 Prague 6
Czech Republic

Responsible for space
and ESA projects

Aneta Jarmoliková
P +420 720 931 307
E jarmolikova@tc.cz

Ondřej Šimek
P +420 608 231 659
E simek@tc.cz

ESA INITIATIVES

ESERO Czech Republic

General Description

The European Space Education Resource Office (ESERO) is the key project of the European Space Agency (ESA) to support primary and secondary education in Europe. Its mission is to use space-related topics to initiate pupils´ interest in studying STEM subjects, and to support teachers by offering comprehensive portfolio of educational resources and trainings.

Major Space Projects & References

ESERO organizes annual series of national as well as regional trainings for primary and secondary school teachers. The trainings are, wherever possible, officially accredited as part of continual professional development qualifications and are focused on introduction of ESERO and ESA Education resources. ESERO also coordinates national rounds of ESA's competitions, such as CanSat: Build your own satellite, AstroPi: Send a code to the ISS, Climate Detectives: Investigate a climate problem in local environment and do something to improve it, and others.

Competences & Capabilities

ESERO Czech Republic is operated by SCIENCE IN and co-funded by Charles University, Czech Technical University in Prague, Palacky University in Olomouc, Astronomical Institute of the Academy of Sciences of the Czech Republic, Tereza Association and iQLandia. It collaborates with its national network of more than 300 primary and secondary schools where programmes are piloted and their implementation evaluated.

From 2021, ESERO consortium extends its operation to Czech Space Academy, taking up the role of a national contact point (NCP) for university space studies as well as the contact point of the ESA Academy in the Czech Republic. This guarantees a coherent and comprehensive approach to the ESA supported programmes throughout the whole primary education.

Contact

SCIENCE IN (CZ), s.r.o.
ESERO Czech Republic
Uvoz 161/22
118 00 Prague 1
Czech Republic
www.esero.sciencein.cz

Responsible for space
and ESA projects

Petr Mares
P +420 737 731 757
E petr.mares@sciencein.cz

THE EUROPEAN ORGANISATION FOR THE EXPLOITATION OF METEOROLOGICAL SATELLITES (EUMETSAT)

EUMETSAT, Europe's meteorological satellite agency, monitors the weather and climate from space. Based in Darmstadt, Germany, EUMETSAT provides its 30 member states šity meteorological imagery and data that are essential for keeping their communities safe and for the benefit of critical sectors of their economies.

Three Meteosat satellites in geostationary orbit deliver continuous observations of fast developing severe weather events over Europe, Africa and the Indian Ocean. Two polar-orbiting Metop satellites provide data of pivotal importance for forecasts up to 10 days ahead. The first of the next-generations satellites in these systems will be launched in 2022 and 2024, respectively.

EUMETSAT is a key partner in the European Union's Copernicus Earth observation programme. It operates the Copernicus Sentinel-3 and -6 ocean-monitoring missions, and will operate the upcoming CO2M mission, to monitor carbon dioxide emissions. Data from these, and EUMETSAT's own missions, are provided to the Copernicus climate, atmosphere monitoring and marine environment services. Along with European Space Agency and the European Centre for Medium-Range Weather Forecasts, EUMETSAT is a partner in the EU's DestinE initiative, creating digital twins of the entire Earth system.

Contact

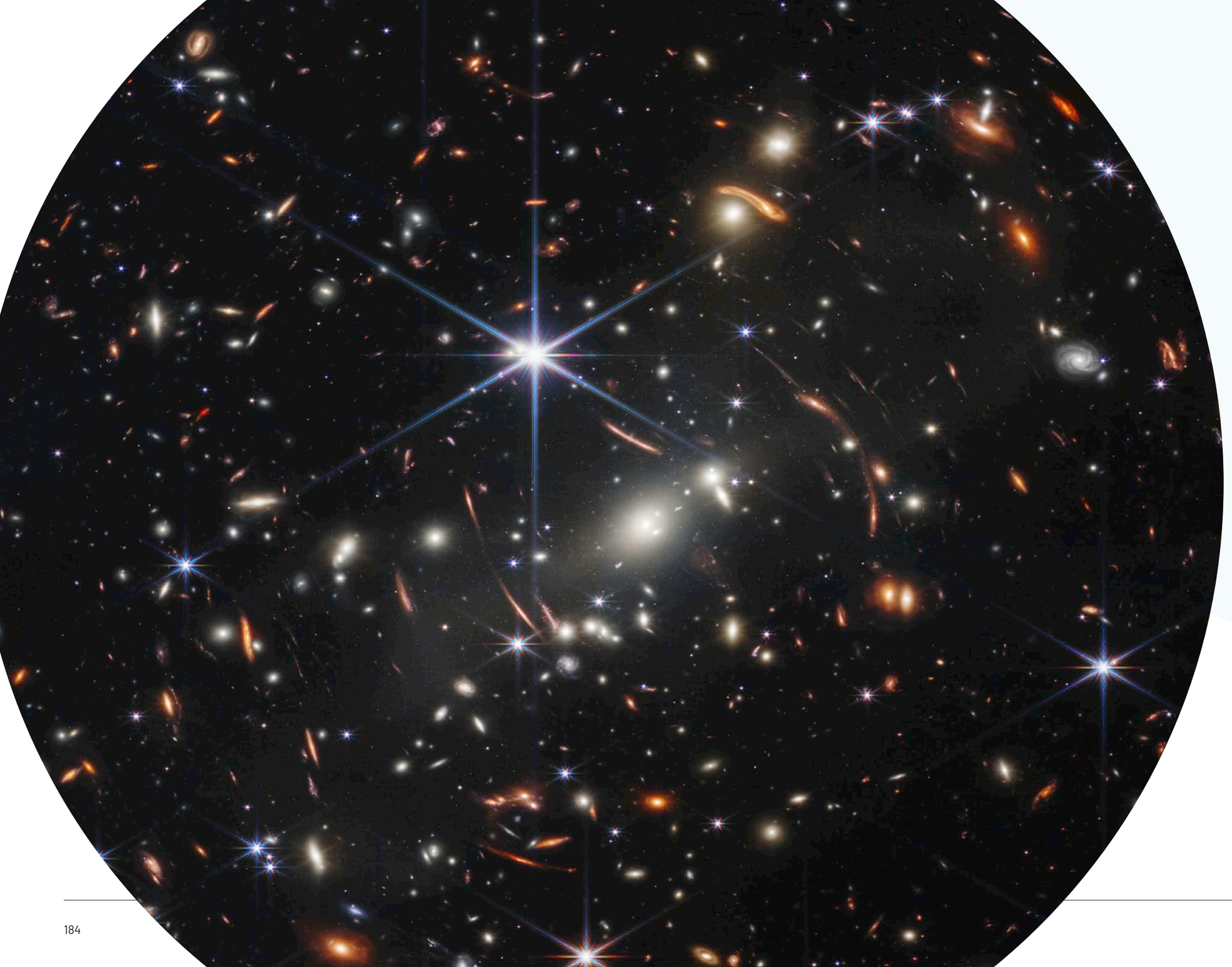
EUMETSAT
Eumetsat Allee 1
64295 Darmstadt
Germany

P +49 6151 8077

Contact point responsible for EUMETSAT agenda in the Czech Republic

Ministry of the Environment of the Czech Republic
Vršovická 1442/65
100 10 Praha 10
The Czech Republic

P +20 267 121 111
E info@mzp.cz



The NASA/ESA/CSA James Webb Space Telescope has produced the deepest and sharpest infrared image of the distant Universe to date. Known as Webb's First Deep Field, this image of galaxy cluster SMACS 0723 is overflowing with detail.

Field of Activities

INDUSTRY

COMPANY	MANUFACTURING	SOFTWARE	SERVICES	R&D	TESTING
5M					
Advacam					
Aleego					
asphericon					
ATC Space					
ATOS IT Solutions and Services					
AVX Czech Republic					
AŽD Praha					
BBT-Materials Processing					
BD Sensors, CSRC Space Division					
BizGarden					
CGI IT Czech Republic					
CleverFarm					
Czech Aerospace Research Centre - VZLU					
daiteq					
EGGO Space					
Ekotoxa					
Eltvor Instruments, s.r.o.					
esc Aerospace					
Frentech Aerospace					
GINA Software					
Gisat					
G.L. Electronic					
GNSS Centre of Excellence					
Honeywell International					
Huld s.r.o.					
IDEA-ENVI					
Iguassu Software Systems					
KB Micro					
L.K.Engineering					
MCE Slaný					
Meopta - optika					
Misterine					
NG Aviation					
OHB CZECHSPACE					
OPTOKON					
ProjectSoft HK					
Rigaku Innovative Technologies Europe					
S.A.B. Aerospace					
Serenum					
Sobriety					
Space Know					
SPRINX SYSTEMS					
Synpo					
Toseda					
TTS					
Unex					
UNITES Systems					
World from Space					
maxmechanik					
Rayservice					

ACADEMIA

ENTITY	R&D	DESIGN	TESTING
Astronomical Institute, CAS			
Global Change Research Institute CAS			
Institute of Atmospheric Physics, CAS			
Institute of Botany, CAS			
J. Heyrovsky Institute of Physical Chemistry, CAS			
Nuclear Physics Institute, CAS			
TOPTEC, Institute of Plasma Physics, CAS			
Department of Physical Electronics, CTU			
Faculty of Civil Engineering, CTU			
Faculty of Electrical Engineering, CTU			
Faculty of Mechanical Engineering, CTU			
Institute of Experimental and Applied Physics, CTU			
Faculty of Mathematics and Physics Charles University			
Faculty of Agrobiology, Food and Natural Resources, Czech University of Life Sciences Prague			
Faculty of Applied Sciences, University of West Bohemia in Pilsen			
Faculty of Science, Palacký University Olomouc			
CESNET z. s. p. o.			
NETME Centre Brno University of Technology			
IT4Innovations National Supercomputing Center			
Research Institute of Geodesy, Topography and Cartography			
Czech Hydrometeorological Institute (CHMI)			
Klet Observatory			
Planetum – Observatory and Planetarium of capital city Prague			
Teplice Observatory			

ACADEMIA

- Parts and Materials
- Subsystems and Equipment
- Instruments and Payloads
- Ground Segment
- Education and Capacity Development
- Downstream, Applications, Data processing

INDUSTRY

- Parts and materials
- Subsystems and equipment
- Instruments and Payloads
- Ground Segment
- Downstream, applications

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Czech Space Industry and Academia


CZECH SPACE
EST. 2020

Ministry of Transport of the Czech Republic

Nábřeží Ludvíka Svobody 12, P.O.BOX 9
CZ-11015 Praha 1
www.czechspaceportal.cz