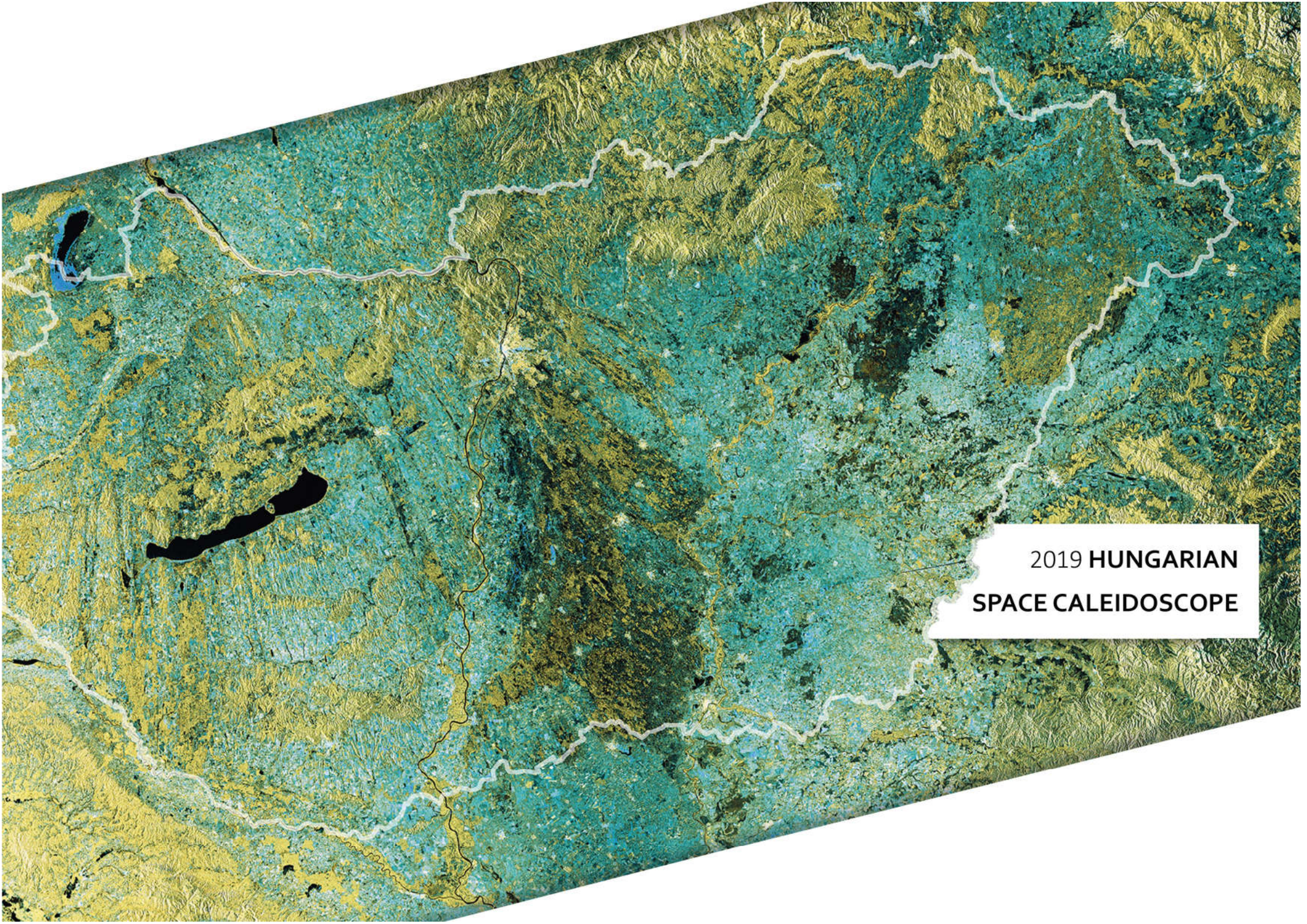
2019 HUNGARIAN
SPACE CALEIDOSCOPE

HUNGARIAN SPACE CALEIDOSCOPE

2019

IMPRESSUM

Hungarian Space Caleidoscope 2019

Editorial board:
Iván Almár, László Bacsárdi, Előd Both, Sándor Frey, Balázs Heilig, Ferenc Horvai, András Horváth, László Pap, Balázs Székely

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WELCOME FROM THE MINISTER

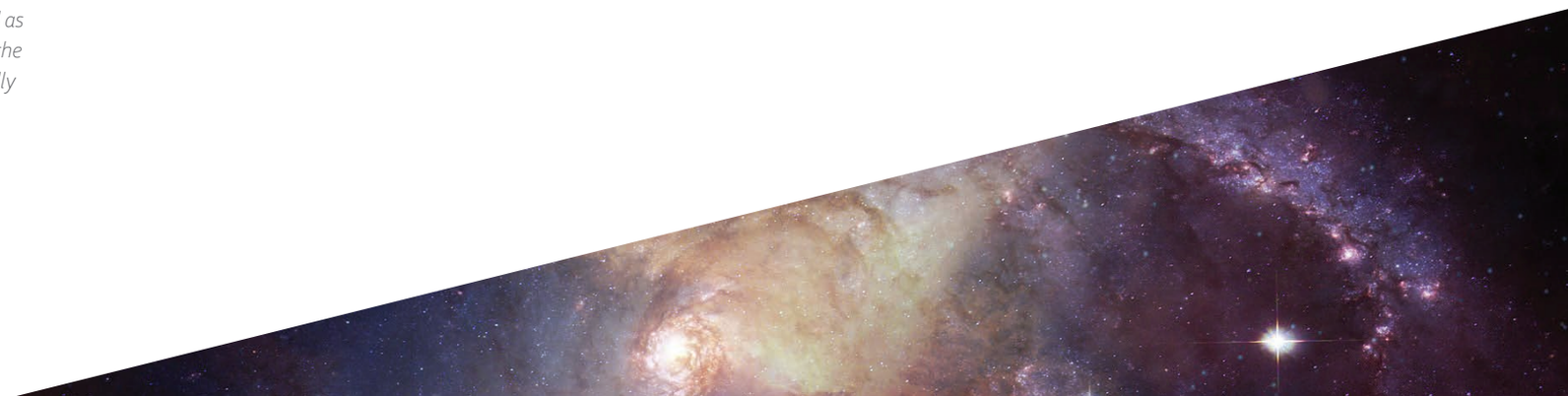
Peaceful utilization of outer space is in our global interest. Exploring space provided us with answers to a number of questions, problems and phenomena. The space industry is a sector that is developing in a most dynamic way. Its importance is notable, considering the 6-8 % growth it shows even during the worst economic depressions.

Hungarian universities, institutes and companies have accumulated a significant amount of world-class capacity, expertise and technology in this sector. The amount of Hungarian value added in international space industrial activity, cooperation and research projects is significant. In spite of this, Hungary and the Hungarian space sector has not received recognition worthy of their achievement, neither has it received an appropriate level of support. The Hungarian Government has decided to make a change on this front, and will maximize the Hungarian potential in space exploration and research.

One of the most significant decisions with regard to the space industry is the establishment of a department dealing with space exploration in the Ministry of Foreign Affairs and Trade, and the National Space Exploration Fund will also be established, on January 1 2020.

The purpose of this joint publication with the Hungarian Astronautical Society is to introduce the representatives of the Hungarian space sector and to encourage the establishment of joint development projects in the future.

Péter Szijjártó
Minister of Foreign Affairs and Trade



WELCOME FROM THE MINISTERIAL COMMISSIONER FOR SPACE RESEARCH

Space research is seeking answers to questions that are vital to all humanity. In this century, space technology has become part of our daily lives.

Today, every nation seeks to make the most of the opportunities offered by space in order to increase its economy, security, social development, capabilities and sovereignty.

Complex systems vital to world economy, important measurements, and observations of life on Earth, depend on the space sector, such as global telecommunication, the Internet, crop estimates based on Earth observation, meteorological services, or navigation.

New types of services are emerging, such as space weather forecast, and utilization of space resources. Experiments performed in weightlessness will revolutionize pharmaceutical production. A new race has begun for harnessing the Moon.

Hungary has high level of expertise in many areas of the field, of which we can build on enabling us to enter these new, innovative service areas.

The Hungarian space sector can be proud of its achievements so far. Hungarian instruments and service systems have been involved in major missions of the European Space Agency, such as the first successful landing mission to a cometary nucleus (Rosetta), the BepiColombo mission to Mercury, the ESEO satellite, and the Juice mission to Jupiter. Hungarian space dosimetry tools are measuring astronauts' exposure to radiation on board of the International Space Station.

The aim of this catalogue is to present the most outstanding companies, research institutes and internationally renowned engineers of Hungarian space research, who have been for decades in the forefront of international space research.

Orsolya Ferencz
Ministerial Commissioner for Space Research

WELCOME FROM THE EDITORIAL BOARD

On request of the Department for Space Research and Space Activities of the Ministry of Foreign Affairs and Trade, we provide an insight into the diverse activities of the Hungarian space sector which includes small and medium-sized enterprises, research centres and university research groups.

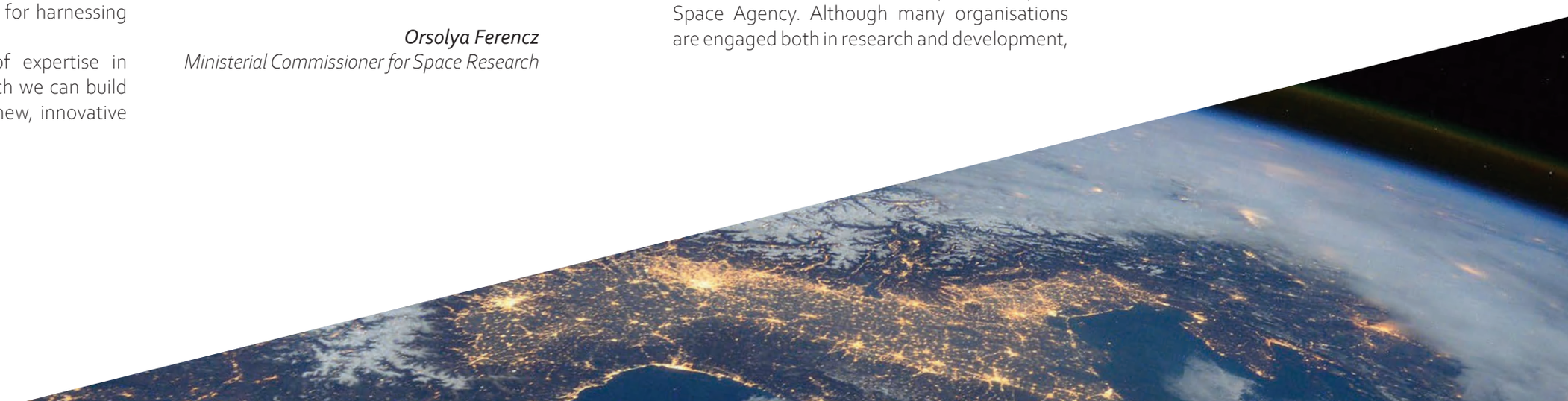
The members of the editorial board, Iván Almár, Előd Both, Sándor Frey, Ferenc Horvai, András Horváth, László Pap and Balázs Székely were responsible for the selection of the content for this publication. I am really thankful for their contribution. I would like to thank the work of the enthusiastic secretary of the editorial board, Balázs Heilig – we could not have collected the data without him.

The data in this publication refer to the financial year of 2018 and are provided by the organisations appearing in the publication. They provided their introductory text as well which has only been modified for stylistic and editorial purposes if necessary. This book identifies the key research areas and technological competencies of the organisations, the latter follow the classification used by the European Space Agency. Although many organisations are engaged both in research and development, we decided to highlight the most representative areas of their activity. To help our readers, we provided pictograms, code classification following the ESA Technology Competence List and overview tables.

We could not aim at completeness during the preparation of this publication. It was not our intention to introduce every Hungarian space research organisation in detail, and to highlight all of their technological competencies – though we trust that the number of Hungarian space-related organisations will be expanded in the next few years. We asked the organisations to mention only their most important projects, but there is a lot of information available on their websites about their achievements and their plans for the future.

I hope that the reader will find this publication interesting and will be amazed by the diversity of Hungarian space activities.

László Bacsárdi
Chair of the Editorial Board



SPACE ACTIVITY OF HUNGARY

Maybe surprising, but the Hungarian space activity has its roots immediately after World War II. In 1946, a small group of Hungarian physicists and engineers led by Zoltán Bay received an echo from the Lunar surface with their radar equipment. Our systematic space research began more than a decade later, with the visual and later photographic observation of the pioneering artificial satellites. As part of this activity, some groups joined the research of the Earth's upper atmosphere. In the meantime, enthusiastic young engineers and students tried to build small rockets and a satellite receiving station, but their work was forced to stop due to political reasons.

The first boom in our space activity happened in the 1960s, when Hungary joined the Intercosmos cooperation. The organisation provided the opportunity to send passive instruments first, then more and more elaborated electronic ones into Earth orbit. A turning point was the one-week spaceflight of the first Hungarian cosmonaut, also in the framework of the Intercosmos programme, on board of the Soviet Salyut-6 space station. This event temporarily raised a great public interest towards the space activity. Moreover, the Hungarian experts prepared a rich scientific programme for our cosmonaut, which determined the main fields of our space activity for decades. Among others our expertise in space dosimetry, space life sciences, remote sensing and material sciences have their roots in the background of the Hungarian cosmonaut's scientific programme. As a further culmination of our participation in the Intercosmos programme Hungarian experts built some scientific instruments for the Vega missions, reaching their targets well beyond Earth orbit.

After the termination of the Intercosmos cooperation, in the 1990s we took our first steps towards the European Space Agency (ESA), in the meantime widening our international cooperation in other directions, too. Thanks to this, dozens of Hungarian instruments could be sent into outer space, and later, as a European cooperating state of ESA, we could join several different ESA projects and missions. Hungarian experiments and instruments could be sent to the International Space Station, and in 2012 a European rocket launched the first Hungarian satellite. While earlier the Hungarian space equipment was built mainly in research institutes and at universities, an important achievement of these decades was the establishment of the independent Hungarian space industry based on private companies.

A recent upswing came in 2015, when Hungary joined ESA as a full member of the organisation. As a consequence, the Government provided a greater and more solid financial background to our space-related activities. With the administrative and technical help of ESA we are reaching a higher and higher level of participation in a wide range of ESA programmes. Parallel with this, our strategic goal is to widen our international cooperation. As a first step of these efforts we re-established our Government level space cooperation with Russia. The opening up of further directions is a task for the near future. In the meantime we continue to strengthen and widen our ESA cooperation, with the participation in further optional programmes of ESA, mainly in the fields where the societal impact is the highest.

Cluster

HATP

HUNAGI

HUNSPACE

COMPETENCES

Primary RESEARCH competence

Futher RESEARCH competences

Primary TECHNOLOGICAL competence

Further TECHNOLOGICAL competences

POINT OF CONTACT

Name

Phone

E-mail

ORGANISATION DETAILS

SINCE YEAR OF FOUNDING

HEADCOUNT (2018)
Space department employees / all employees

2018

YEARLY REVENUES (2018)
space department revenues/ all revenues
mFt = million Hungarian forint (HUF)
na: not available

2018

SPACE RESEARCH TENDERS
number between 2014 and 2018

14-18

RESEARCH COMPETENCES

- Astronomy and Astrophysics
- Biological, Medical, Life Sciences
- Geodesy
- Geophysics
- Material Sciences
- Meteorology
- Physics of Near Earth Space
- Space Physics
- Solar Physics and Solar System Exploration
- Space Communications and Navigation

TECHNOLOGICAL COMPETENCES

TD-1 On-Board Data Systems
- 1.1 Payload Data Processing
- 1.2 On Board Data Management
- 1.3 Microelectronics for digital and analogue applications

TD-2 Space System Software
- 2.1 Advanced Software technologies
- 2.2 Space Segment Software
- 2.3 Ground Segment Software
- 2.4 Ground Data Processing

TD-3 Spacecraft Electrical Power
- 3.1 Power system architecture
- 3.2 Power generation technologies
- 3.3 Energy storage technologies
- 3.4 Power conditioning and distribution

TD-4 Spacecraft Environment and Effects
- 4.1 Space Environment
- 4.2 Environment effects
- 4.3 Space Weather

TD-6 RF Payload and System
- 6.1 Telecommunication (sub-)Systems
- 6.2 Radio Navigation (sub-)Systems
- 6.3 TT&C (sub-)Systems
- 6.4 RF Payloads
- 6.5 Microwave and millimetre wave technologies and equipment

TD-7 Electromagnetic technologies and techniques
- 7.1 Antennas
- 7.2 Wave Interaction and Propagation
- 7.3 EMC/RFC/ESD

TD-8 System Design and Vertification
- 8.1 Mission and System Specification
- 8.2 Collaborative and Concurrent Engineering
- 8.3 System Analysis and Design
- 8.4 Verification and AIT

TD-9 Mission Operation and Ground Data Systems
- 9.1 Advanced System Concepts
- 9.2 Mission Operations
- 9.3 Ground Data Systems (MCS)

TD-10 Flight Dynamics and GNSS
- 10.1 Flight Dynamics
- 10.2 GNSS systems and ground-related technologies

TD-12 Ground Station System and Networks
- 12.1 Ground Station System
- 12.2 Ground Communications Networks

TD-14 Life and Physical Sciences
- 14.1 Instrumentation in support of Life Sciences
- 14.2 Instrumentation in support of Physical Sciences
- 14.3 Applied Life Science Technology
- 14.4 Applied Physical Science Technology

TD-15 Mechanisms and Tribology
- 15.5 MEMS technologies
- 15.6 Tribology technologies
- 15.7 Mechanism engineering

TD-16 Optics
- 16.1 Optical system engineering

TD-17 Optoelectronics
- 17.1 Laser Technologies
- 17.2 Detector Technologies

TD-18 Aerothermodynamics
- 18.2 Ground Based Facilities
- 18.3 Flight Testing

TD-20 Structures and Pyrotechnics
- 20.1 Structural design and verification methods and tools
- 20.6 Damage tolerance and health monitoring
- 20.10 Advanced structural concepts and materials

TD-21 Thermal
- 21.1 Heat Transport Technology
- 21.5 Thermal Analysis Tools

TD-23 EEE Components and Quality

TD-24 Materials and Processes
- 24.1 Novel Materials
- 24.2 Materials Processes
- 24.3 Cleanliness and Sterilisation

TD-26 Earth Observation / Remote Sensing

TD-27 Other

HUNGARIAN ORGANISATIONS

ADMATIS LTD.

address: 3535 Miskolc, Partos u. 16.
postal address: 3534 Miskolc, Kandó Kálmán u. 5.
web: *www.admatis.com*

Admatis Ltd. coordinates, manages space industry related projects from the mechanical-thermal design and analysis to the manufacturing and test phase under ECSS. CAD design, structural and thermal FEA modelling. The product line covers the satellite radiators, structural and thermal panels, MLI, other thermal hardware, ISO 7 cleanrooms, bake-out, TVC and thermal balance test, conversion coating line, painting booth.

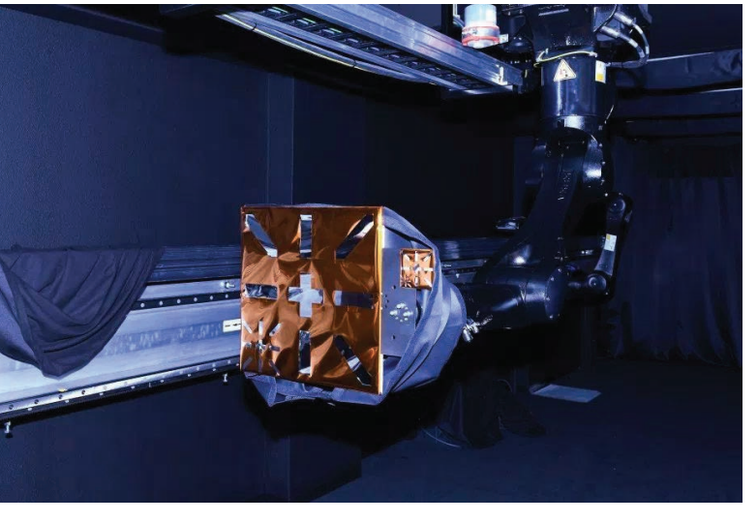
Main profile: structural and thermal hardware for satellites.

Main products and space qualified technologies:

- metallic, sandwich, SSM, thermooptical type radiators
- satellite structural parts
- internal and outer multilayer insulation
- special gluing technologies
- thermal vacuum treatment
- ground segment equipment (adapters, trolleys)
- environment-friendly surface treatment
- special markers

: Tamás Bárczy
: +36 70 218 3068
@ : tamas.barczy@admatis.com

SINCE: 2000
2018: 15 person
2018: 200 / 236 mFt



MAIN PROJECTS

- Cartridges and container for foaming the FOCUS experiment on ISS Columbus modul (2006–2010)
- Sentinel-2A and Sentinel-2B/ MSI/ MMTH-Metallic Mechanical and Thermal Hardware (2010–2013)
- Sentinel-2C and Sentinel-2D/ MSI/ MMTH-Metallic Mechanical and Thermal Hardware (2015–2017)
- CHEOPS FPA radiator + FEE radiator (2015–2016)

CERTIFICATION

- AS 9100D/ISO9001 certification
- ESA financial audit
- TVC chamber

AIRBUS DS GEO HUNGARY LTD.

address: 1095 Budapest, Soroksári út 48., Hungária malomudvar, 7. épület
web: *www.intelligence-airbusds.com*

Our company serves production of remote sensing data (satellite imagery), extensive image processing, utilisation and creation of value-added products based on imagery. We are equipped with high capacity server park and efficient image processing systems. In addition to image processing, we also provide GIS services solving unique tasks for specific demands.

The remote sensing data produced and processed by our company provide invaluable support, among many others in environmental, agricultural, forestry, natural resource research, disaster prevention, water management, defense, environmental change monitoring, urban planning, and other thematic mapping (in 3D as well) activities.

MAIN PROJECTS

- SPOTmap
- Google-map
- OneAtlas
- DUSIREF (ESA PECS)
- OWETIS (ESA)

: György Domokos
: +36 1 323 3750
@ : gyorgy.domokos@airbusds.hu

SINCE: 2000
2018: 36 / 40 person
2018: 388 / 390 mFt

address: 4026 Debrecen, Bem tér 18/c
postal address: 4001 Debrecen, Pf. 51.
web: *www.atomki.hu*

address: 1116 Budapest, Kondorfa u. 1.
web: *www.bayzoltan.hu*

The mission of Atomki is performing fundamental research in the field of atomic, molecular, nuclear, and particle physics, and strongly promote their applications in its state of the art laboratories in ion beam analytics, environmental physics and surface physics. The majority of the Hungarian ion-accelerators (covering the 500 eV–22 MeV range) is concentrated in its Accelerator Centre.

Main fields of the space related R&D at Atomki are radiation tolerance studies, material science research, development of instrumentation and methods as well as crio- and vacuum technics services. The Institute (with its accelerators) is a member of the Europlanet Society, and participates in the Europlanet H2020 integrated activities. Other infrastructures: a chamber for irradiating astrophysically relevant ices at Tandetron, four more facilities at different beamlines for irradiating meteorites and other materials of space origin or relevance (e.g., materials for satellites) under vacuum or atmospheric conditions.

: Zsolt Fülöp
: +36 30 539 7154
@: fulop@atomki.hu

: András Fenyvesi
: +36 30 694 3158
@: fenyvesi@atomki.hu

SINCE: 1954
2018: 6 / 208 persons
14/18: 2 projects

MAIN PROJECTS

- Hugin, Monin (ESA)
- SMART-1 (ESA)
- FOCUS, COLUMBUS, ISS (ESA)

LABS

- Ion accelerators, irradiation facilities
- Spectroscopy and surface physics laboratories, crio and vacuumtechnics facilities

Our goal is to contribute to competitiveness and efficiency by providing innovative services and by taking part in technology transfer projects. We offer our customers complex scientific and technological solutions in several areas of expertise. We would like to join space technology related projects by researching innovative materials and by developing material testing methods.

Our Engineering Division's competences and activities combine two areas: material sciences and material technologies. Their work consists of development of structural, functional materials/coatings, research of production methods and metallic/non-metallic materials. Our colleagues have an outstanding expertise in nanotechnology, ceramics, composites, crystalline and amorphous materials and development of surface coatings. We also examine the applicability of these technologies by production of specific products, components, and by using related numerical modelling, material testing.

MAIN PROJECTS

- BONES (ESA)

LABS

- Nanomaterials and Nanochemistry Laboratory
- Virtual Reality Laboratory
- Mechatronics Laboratory
- Mechacal Testing and Non Destructive Materials Testing Laboratory
- Software Centre

: Szabolcs Péter Orosz
: +36 30 984 0264
@: szabolcs.orosz@bayzoltan.hu

SINCE: 1993
2018: 5 / 200 persons
2018: 0 / 1900 mFt

TD-6
6.1
6.2 6.3
6.4; 6.5
TD-12
12.1

address: 1044 Budapest, Ipari Park utca 10.
postal address: 1325 Budapest, Pf. 164
web: *www.bhe-mw.eu*

The company was founded in 1991 to develop and manufacture RF and microwave systems for the aerospace, defence, and telecommunication industry. BHE has significant heritage in space technology; onboard and ground based space communication subsystems and equipment from VHF to Ka-band. SDR based de-/encoders, de-/modulators, up-/downconverters, GaN based SSPAs, command receivers, transmitters.

BHE's space activities are gathered around SATCOM, focusing both on ground and space segments. Main competencies covered are RF/microwave design and in-house manufacturing of satcom equipment – such as SDR based de-/encoder, de-/modulator, up-/downconverter, GaN based SSPA, command receiver, transmitter, synthetic aperture radar- up to Ka-band, RF and environmental testing, as well as validation according to ISO AS and ECSS standards. Our competencies are constantly enhanced towards higher frequency bands (Q/V-band), higher power levels (1...5 kW), and higher data rates (500 Mbps...1 Gbps).

: János Solymosi
: +36 1 233 2138
@ : solymosi@bhe-mw.eu

SINCE: 1991
2018: 32 / 121 persons
2018: 950 / 2251 mFt

MAIN PROJECTS

- Vesselsat, Mangalyaan (India Mars Orbiter Satellite)
- Chandrayaan I & II (India Moon Missions)
- International Space Station – Zvezda S-band power amplifier

LABS

- Assembly line, RF lab, cleanroom, EMC chamber, sweep table, thermal chamber

CERTIFICATION

- ISO 9001:2015
- AS9100D (EN 9100:2018)
- AQAP 2110:2009

TD-1
1.1
1.2
1.3
TD-2
2.2
2.3
TD-14
14.2

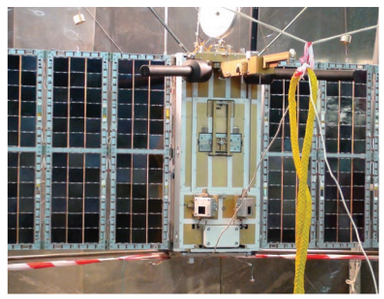
address: 2167 Vácduka, Pálya u. 1.
web: *www.bl-electronics.hu*

MAIN PROJECTS

- SEAM; DPU; ELF-VLF wave instrument, cooperation with KTH (Sweden); (2019-)
- BepiColombo PWI instrument package; ISDM module , ELTE, Kanazawa University (Japan) (2018-)
- Vernov/Relec; SAS3-R; ELF-VLF wave instrument, ELTE, IKI (Russia) (2014)
- Chibis-M; SAS3-Ch; ELF-VLF wave instrument, ELTE, IKI (Russia) (2012-2014)
- TriTel-SURE; TriTel; 3-axis silicon detector dosimeter, MTA-EK (2012-2013)

LABS

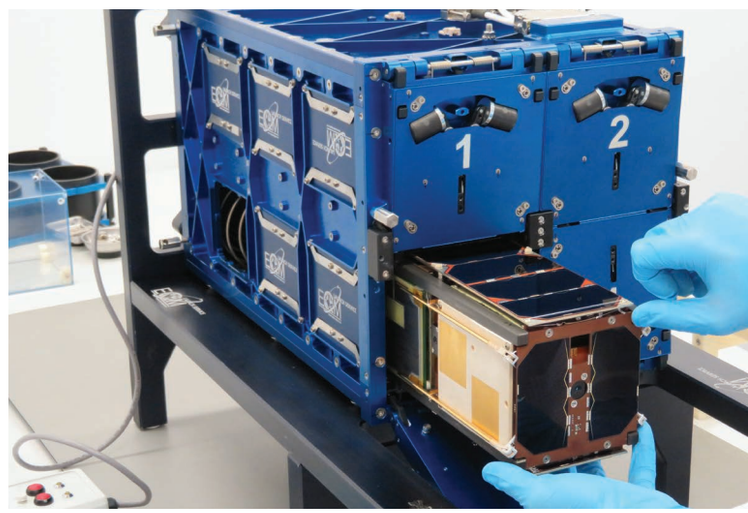
- ZG-212 zero gauss chamber (internal dimensions: 0.3m×0.9m)



BL-Electronics provides technology and development background support to scientific institutes and laboratories for the development and implementation of instruments and equipment related to their research. We are primarily involved in space activities, but also in other areas. The company's most important area of activity is the development of satellite on-board instruments.

: Terézia Szél
: +36 1 950 5476
@ : info@bl-electronics.hu

SINCE: 1992
2018: 2 persons
2018: 0 / 1.31 mFt



address: 1111 Budapest, Műegyetem rkp. 3.
web: *www.bme.hu*

address: 1111 Budapest, Egry József u. 18.
web: *hvt.bme.hu*

The Budapest University of Technology and Economics (BME) is a prestigious higher education institution in Hungary. Its main mission is to educate professionals for the industry, to perform scientific research, which encompasses fundamental and applied research, technological product and service development, and exploitation of results making up the innovation chain.

For decades, various research groups have been performing space research related activities, from basic research to technology development through the actual implementation of diverse devices and services, as well as various forms of education and trainings. Our staff members contributed to many space missions and space services in various fields. The first Hungarian CubeSat has been built at the university and it is the home of the first Hungarian picosatellite as well.

: Kálmán Kovács
: +36 1 463 3417
@ : kovacs.kalman@eit.bme.hu

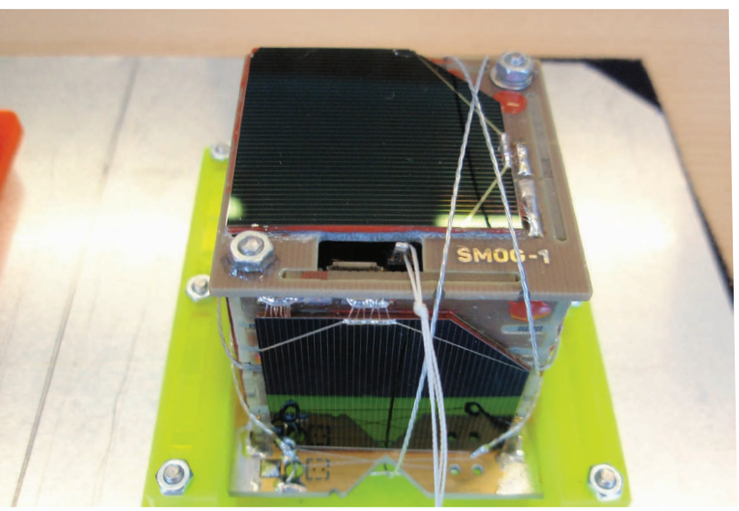
SINCE : 1782
2018 : 70 / 2611 persons
14/18 : 11 projects

MAIN PROJECTS

- ESEO
- Masat-1
- Rosetta
- SMOG-1
- Vega

LABS

- BME Ground station
- Surface Mount Technology (SMT) Lab



The equipment we developed for space applications have been deployed more than 20 times in space. Major research and development directions: power management/distribution systems, on-board transmitters/receivers, measurement data collection, ground stations, construction and thermal problems, radio wave propagation and communication for space applications.

Within the successfully completed Rosetta cometary programme, we developed the power subsystem of the Philae lander. After coordinating and performing developments for the Masat-1 Cubesat programme, we are working now on the SMOG-1 and SMOG-P picosatellites. In the ESA's Alphasat programme, we have radiowave propagation and communication experiments. Our students developed the power distribution unit and a payload for plasma diagnostic measurements for the European ESEO satellite launched in 2018. Our department actively participate in the space-related education of the university.

MAIN PROJECTS

- Vega (Intercosmos,1986)
- Rosetta Philae (ESA, 2004)
- Masat–1 (2012)
- Alphasat (ESA, 2013)
- ESEO (ESA, 2018)

LABS

- anechoic chamber (0.1-80 GHz)
- thermal and climatic chamber (-75/+150°C and 10-98% rel. humidity)
- signal generators and measurement devices (DC-80 GHz)

: Lajos Nagy
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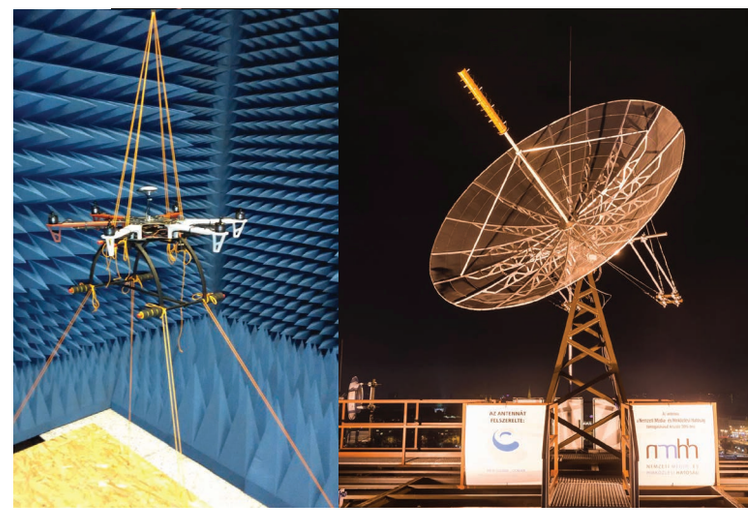
@ : nagy@hvt.bme.hu

SINCE : 1951
2018 : 14 / 44 persons
14/18 : 7 projects



C3S ELECTRONICS DEVELOPMENT LLC.

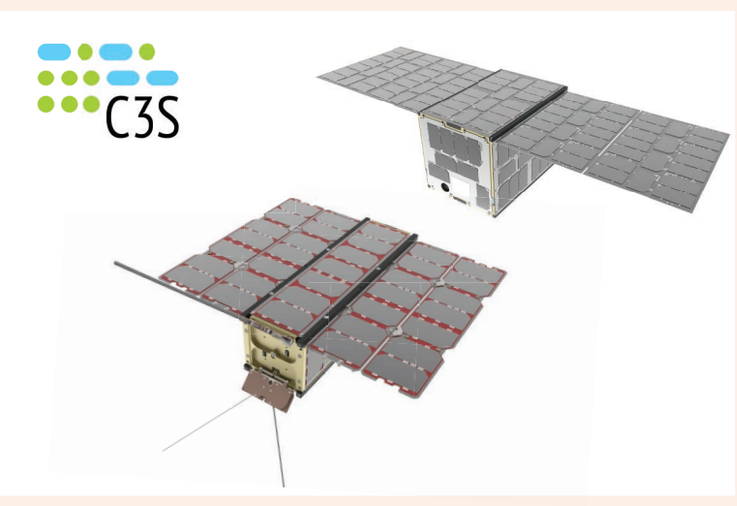
address: 1097 Budapest, Könyves Kálmán krt. 12-14.
web: *www.c3s.hu*

C3S LLC. is a notable actor of the European nanosatellite industry. Its mission planning activity covers 1-12U HiRel platform and subsystem design including OBC, EPS and communication system development, pre-launch testing, simulation software and hardware environment and mission operation environment. C3S is experienced in medium satellite power supply and payload controller development.

Our primary goal is to develop 3, 6 and 12U CubeSat platforms that support Hungarian and international scientific payloads and industrial demands throughout the missions. 3U RADCUBE mission will be launched in 2021 with the aim to carry and operate RadMag cosmic radiation dosimeter. One already tangible result of the project is a test environment hardware; that knowledge can usefully be transferred to university education. Our nano- and medium satellite projects are characterised by high availability (redundant systems) and prolonged lifecycle, thus we develop our subsystems in-house.

: Alexandra Széll
: +36 20 278 1223
@ : alexandra.szell@c3s.hu

SINCE : 2012
2018 : 38 / 41 persons
2018 : 365 / 421 mFt



MAIN PROJECTS

- RADCUBE mission – 3U platform and mission development
- PLATO 2.0 mission – AEU development
- SMILE mission SXI PSU development
- S-band SatCOMM system in VEKOP programme
- HERMES – ground station and communication network
- 6-12U platform structures development – KFI programme

COSIMA LTD.

address: 1126 Budapest, Szendrő u. 49.

COSIMA Ltd. develops competitive solutions for Earth observation data applications in the agriculture. The centre of its know-how is the measurement of the parcels' crop production and its prediction. The applications range from precision to regional extent. Recent developments provide substantial support to the precision farming efficiency. The activity is recognised in the EU and the US.

The innovative solutions of COSIMA based on the quantitative evaluation techniques of Earth observation satellite data provide extra benefits for their users. The developed new methods are internationally unique and competitive too. These solutions add benefits for the users (farms, grain buyers, seed producers, integrators and national administration) through the complex crop yield measurement, yield-prediction and quantitative vegetation assessment and also the unique analysis of the cultivation data. The improved efficiency applies at the precision level to national, regional extent.

MAIN PROJECTS

- Development novel solutions for crop monitoring and yield assessment for farm fields and at precision detail plus the application of COSIMA crop cells yield measurement
- Development and validation of COSIMA crop production forecast methodology for farms and also for precision farming
- COSIMA services to many farms and knowledge centres, cooperation with universities and consultancy in special projects

: Gábor Csornai
: +36 30 475 8018
@ : gabor.csornai@cosima.hu

SINCE : 2011
2018 : 5 persons
2018 : 3.9 mFt

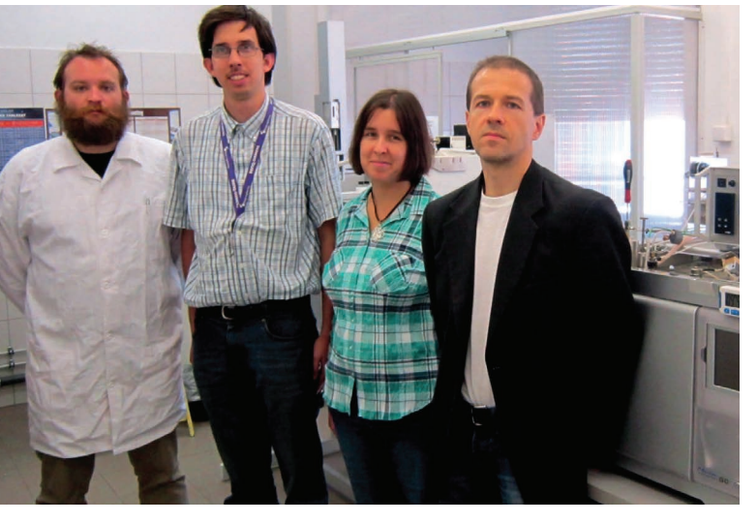
address: 1112 Budapest, Budaörsi út 45.
web: *www.geochem.hu*

The institute was originally established to carry out geochemical analysis, and in the last decades it has been developed into a unique national laboratory. The instrumental developments and the related research activity support the testing of space probe detectors and provide Earth-based laboratory references, currently working for the ExoMars rover, the Hera-, the Comet Interception and MMX space missions.

Activities: Development of a borehole-wall imager instrument to support the field test of the ExoMars rover. Peak-identification in infrared spectra of meteorite powders under space-relevant temperatures for the planned infrared detector of the Hera mission. The laboratories of our institute are able to test analogue materials and observational capabilities of detectors for Solar System missions target- ing solid surfaces. High-accuracy laboratory methods, as well as the understanding of various solid material-related laws may result in technical applications and have potential economic benefits.

: Ákos Kereszturi
: +36 30 343 7876
@ : kereszturiakos@gmail.com

SINCE: 1955
2018 : 2 / 28 persons
2018 : 48 mFt

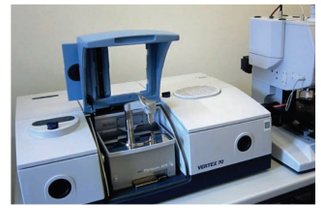


MAIN PROJECTS

- ExoMars rover
- HERA
- MMX
- Comet Interceptor

INSTRUMENTS

- Vertex 70 FTIR spectrometer and Hyperion 2000 microscope
- Praying Mantis DRIFT
- Shimadzu 3600UV-VIS-NIR spectrometer
- Rigaku DMax Rapid II
- Malvern Morphologi 3G ID



address: 9400 Sopron, Csatkai E. u. 6-8.
web: *www.ggki.hu*

The institute carries out fundamental research in the fields of geodesy and geophysics which have several geological and space related aspects. The MTA Széchenyi István Observatory supplements research activities as well as observations of various missions embedded in international collaborations. Geomagnetism and space geodesy based on Sentinel mission are the highlighted space research topics.

Research in space geodesy is focused on the development of satellite radar interferometry as well as in its application for monitoring surface deformations of tectonic and other mass movement related origin. Aeronomy studies transient atmospheric electromagnetic phenomena of the ionosphere-solid Earth cavity in ELF frequency band (Schumann resonance). Wide spectra of geomagnetism research cover dynamo modelling, the study of solar wind–magnetosphere interaction as well as several applications of geomagnetic deep sounding and induction risk assessment.

MAIN PROJECTS

- ESA Space Situational Awareness and space weather related COST actions
- EURISGIC (European Risk on Geomagnetically Induced Currents)
- Integrated Sentinel-PSI and GNSS technical facilities and procedures for the determination of 3D structure deformations caused by environmental processes (ESA PECS)
- Cluster and MMS missions
- Dayside Transient Phenomena and Their Impact on the Magnetosphere-Ionosphere (ISSI)

LABS, INSTRUMENTS

- Sentinel-1 domestic and international geodynamic networks
- ULF, ELF, VLF observations
- geomagnetic observations (INTERMAGNET)
- DPS4D ionosonde
- interplanetary magnetic field simulation laboratory (under construction)

: Eszter Szűcs
: +36 99 508 388
@ : szucs.eszter@csfk.mta.hu

SINCE: 1957
2018 : 16 / 62 persons
14/18 : 9 projects

address: 9400 Sopron, Csatkai Endre u. 6-8.
postal address: 1121 Budapest, Konkoly Thege Miklós út 15-17.
web: *www.konkoly.hu*

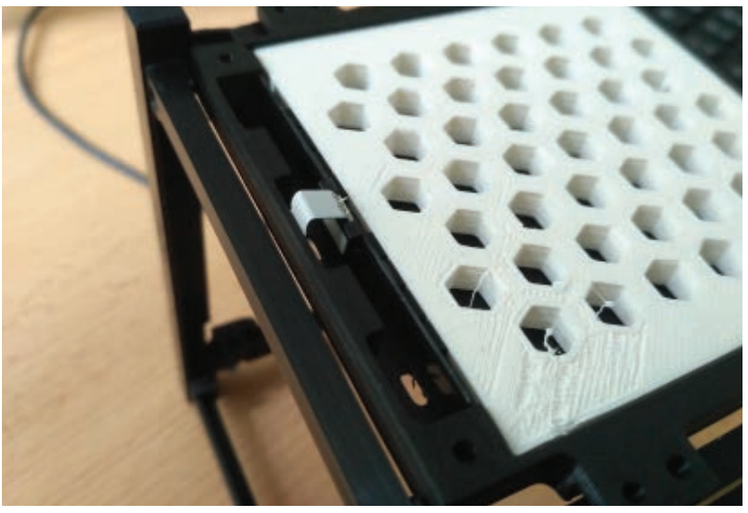
TD-9
9.2
TD-1
1.1
1.2
TD-14
14.2

Konkoly Observatory is a dynamically expanding research institute with two ERC, two GINOP, 5 Lendület grants. The main focus is top quality fundamental research in astronomy and astrophysics with a strong dominance of space astronomy. The institute has been scientific collaborator in the following ESA and NASA missions: ISO, Rosetta, CoRoT, Herschel, Gaia, CHEOPS, PLATO, ARIEL, Kepler/K2, TESS, and JWST.

Among the space competences of the institute one has to mention the scientific preparatory work for space astronomy projects and in-situ Solar System probes (ISO, Rosetta, Gaia, CoRoT, CHEOPS, PLATO, ARIEL, Kepler/K2, TESS). Scientists have also contributed to mission operation activities and calibration of instruments of infrared space telescopes (Herschel). Last but not least, the design and manufacturing of a fleet of nanosatellite probes (Camelot) that will monitor the full sky to search for high-energy astrophysical transient events is a new addition to the institute's space competence portfolio.

: Róbert Szabó
: +36 1 391 9322
@ : szabo.robert@csfk.mta.hu

SINCE: 1899
2018: 25 / 80 persons
14/18: 11 projects



MAIN PROJECTS

- Herschel, ESA's infrared space telescope (2009-2013)
- Kepler/K2, NASA's most successful exoplanet finder mission (2009-2018)
- Gaia, ESA's ongoing cornerstone astrometric space mission (2013-)
- CHEOPS, ESA's first (exoplanet finder) S-class mission
- Camelot, fleet of nanosatellite probes to search for high-energy astrophysical transients (currently in design phase)

INSTRUMENTS

- Small cryostat in which small (approx. 2×5 cm) electronics can be tested at 4 K temperature
- Design and manufacturing of high-energy particle detector payload for CubeSat platforms
- Ground-based imaging, photometry and spectroscopy at the Piszkés-tető Mountain Station Observatory, all-sky monitoring with the Fly's Eye camera system, digitalised photo plate archive spanning many decades

address: 4032 Debrecen, Egyetem tér 1.
postal address: 4002 Debrecen, Pf. 400
web: *www.unideb.hu*

TD-26

The University of Debrecen is a prominent institution of higher education in Hungary. The UD-SPACE program integrated the researchers working in the space domain in the past 50 years at the university. The six research groups focus on the different aspects of the human spaceflight including life science, medical and diagnostically aspects as well as on climate change.

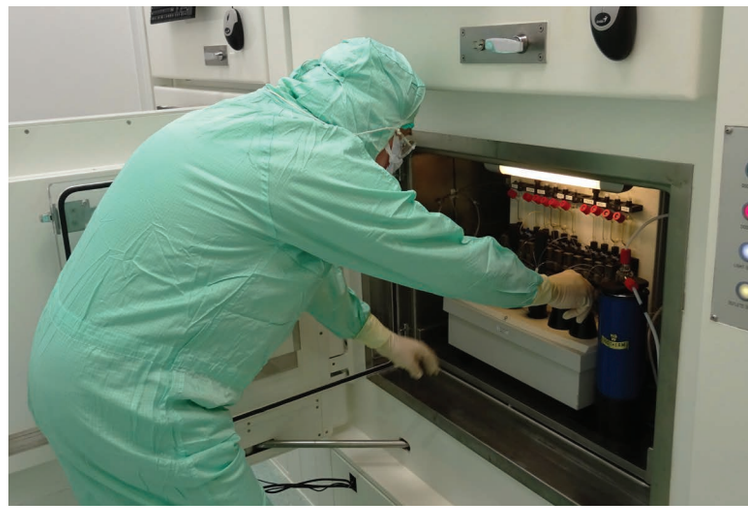
Besides the difficulties of technical feasibility space travel implies another important aspect, the long-term maintenance of the physical and mental health of the astronauts. In order to establish the optimal travel conditions, first we have to explore those mechanisms in the body by which the lack of gravity, limited nutritional options and social isolation exert their effects. In addition to the above, the six research groups of the university (UD-SPACE) also investigate the effects of cosmic radiation on electronic devices and the human body in a multidisciplinary manner.

LABS

- Laboratory for material sciences (TEM, SEM, AFM, RAMAN, SNMS, XPS, ALD, Thin layer technology)
- LSM 880 Airyscan confocal microscope with electrophysiological extension
- Nutrition Technology Innovation Centre with NÉBIH certificate (HU 1430)
- Vascular Biology Research Laboratory
- GIS Data Processing System
- Nuclear Medicine Radiochemistry and Preclinical Laboratory (cyclotron, complex radiochemical synthesis system, small animal PET camera).

: Zsolt Varga
: +36 52 512 900
@ : science@unideb.hu

SINCE: 1978
2018: 110 persons
14/18: 37 projects



EÖTVÖS LORÁND UNIVERSITY SPACE RESEARCH GROUP

address: 1117 Budapest, Pázmány Péter sétány 1/A.
web: *sas2.elte.hu*

Our group at the Department of Geophysics and Space Sciences was established in the 1960s. Our main research topics are space physics, the investigation of wave propagation in magneto-ionic medium, space weather (ionosphere, plasmasphere and radiation belts) using very low frequency (VLF) waves. Our other main area is satellite remote sensing: crop yield estimation and forecasting using optical and radar data.

We developed a family of wave instruments for ULF-VLF band measurements (SAS instruments) with the BL Electronics Ltd. The SAS's successfully flew on several satellites and on ISS.

We established and operate the global Automatic Whistler Detector and Analyzer Network (AWDANet), that is capable to monitor the electron density of the plasmasphere in near real-time – a key parameter for wave-particle interaction.

We developed an ultra-wide band solution of Maxwell's equations, valid for relativistic case also.

We developed a robust yield forecasting method for major crops that does not require ground truth data.

: János Lichtenberger
: +36 1 372 2934
@ : spacerg@sas.elte.hu

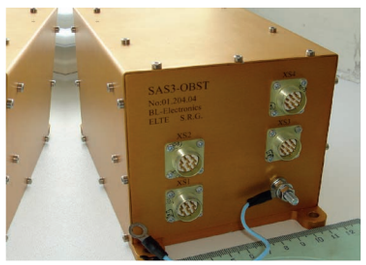
SINCE: 1970
2018 : 12 persons
14/18 : 11 projects

MAIN PROJECTS

- Active-Intercosmos 24: SAS1
- Chibis-M: SAS3
- RELEK: SAS3
- Obstanovka-1: SAS3
- PLASMON: AWDANet

LABS

Automatic Whistler Detector and Analyzer Network



CENTRE FOR ENERGY RESEARCH

address: 1121 Budapest, Konkoly-Thege Miklós út 29-33.
postal address: 1525 Budapest, Pf. 49
web: *www.energia.mta.hu*

Centre for Energy Research (EK) is a member of the Roland Eötvös Research Network. EK provides technical support for the Paks Nuclear Power Plant and the Hungarian Atomic Energy Authority. It operates the 10 MW Budapest Research Reactor and the Budapest Neutron Centre. The main fields of activities are R+D+I in the field of nuclear techniques, renewable energy research, technical physics and materials science.

EK has five decades of experience in developing scientific payloads (active and passive detector systems) and service instruments, esp. for space weather and dosimetry. The Space Research Laboratory, operated in accordance with the ECSS space industry standards, is part of the international space test community with an ISO7 cleanroom, thermo-vacuum and vibration facilities, electrical and mechanical workshops. It also provides radiation analysis services including radiation environment description for different missions and radiation transport calculations with Geant4/GRAS Monte Carlo tool.

: Attila Hirn
: +36 1 392 2291
@ : spacelab@energia.mta.hu

SINCE: 1991
2018 : 11 / 333 persons
14/18 : 8 projects

MAIN PROJECTS

- Rosetta/Philae
- Vega-1,-2
- ISS Russian Segment service dosimetry system
- Phobos-1, -2
- BIOPAN

CERTIFICATION

- ISO 9001:2015

LABS

- Space Research and Development Laboratories (ECSS conformity, ESD-safe environment, environment monitoring)
- Vibration Test Facility (IMV i250/SA5M, IMV LIMCAM)
- Thermal-Vacuum Test Facility (Climats Excal 1420-HE climate chamber)
- Cleanroom (ECSS-conform soldering station)

ENVIROSENSE HUNGARY LTD.

address: 4281 Létavértes, Bem J. u 6/A.
web: *www.envirosense.hu*

Envirosense Hungary Ltd. is a remote sensing specialist – focusing on the use of various remote sensing technologies (aerial, UAV, satellite) for several applications and target groups. The services of the company include data acquisition, data processing, product development and development and operation of automated map services based on remote sensing data.

The company's activities connected to EO focuses on the development of web-based information services to various fields of applications e.g. agriculture, environmental monitoring or insurance sector. These R&D activities include the upgrade of automated downloading, automated geotransformation process development, automated algorithm developments for vector and raster products as well as change detection and developments of alarm services. These map services can be expanded with other data sources (e.g., databases or sheets) and merged with aerial remote sensing data products.

: Orsolya Gyöngyi Varga
: +36 30 169 2353
@ : varga@envirosense.hu

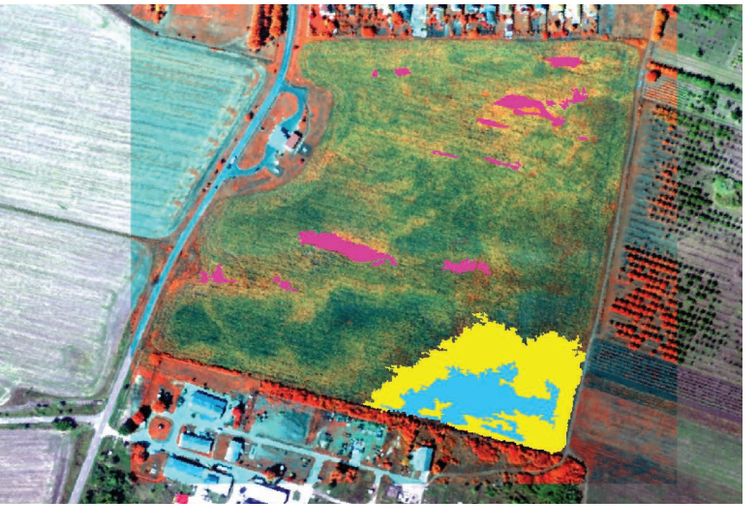
SINCE: 2009
2018: 5 / 15 persons
2018: 63,4 / 210,75 mFt

MAIN PROJECTS

- Upgrading of automated downstream systems, preprocess, data registry and categorisation
- Development of automated vegetation index map generating algorithms
- Development of an information service system for the agricultural insurance business based on multispectral satellite data
- Automated land-use classification based on multispectral satellite data

PLATFORMS

- Aerial platforms to collect additional remote sensing and reference data
- Full spectrum of supercomputing hardware and software



GEODATA LTD.

address: 1077 Budapest, Wesselényi utca 16.
web: *www.geoadat.hu*

GeoData Services offers high quality solutions for customers with geoinformation database requirements in the following areas: utilities, agriculture, land-use and territorial planning, and other professions, quality management and process controlling, Earth observation. Our purpose is to develop advanced technologies for our customers so that they can use their data in a more efficient way.

GeoData Services has been offering remote sensing services since 1997. According to our experience, remote sensing and Earth observation data can support tasks effectively in the following areas:

- State administration, examples are agriculture subsidy control, disaster recovery, environmental protection, land-use and areal planning
- Agriculture, examples are precision farming, yield estimation, eco and bio production
- Industry, examples are transportation, navigation, building construction, insurance.

MAIN PROJECTS

- Control with Remote Sensing (CwRS) in Germany for federal states
- Update of the German Land Parcel Identification System (LPIS)
- Agricultural Biomass Monitoring (EUREKA applied research)
- Recycling resource management with Earth observation decision-support information (REMEDI)
- Demonstrating EO image information mining solutions in mobile imaging domain (EO.TAG)

: Péter Hargitai
: +36 30 602 1020
@ : geoadat@geoadat.hu

SINCE: 1997
2018: 10 / 16 persons
2018: na / 261 mFt

GEO-SENTINEL RESEARCH, SERVICE AND CONSULTING LTD.

TD-26

TD-10

10.2

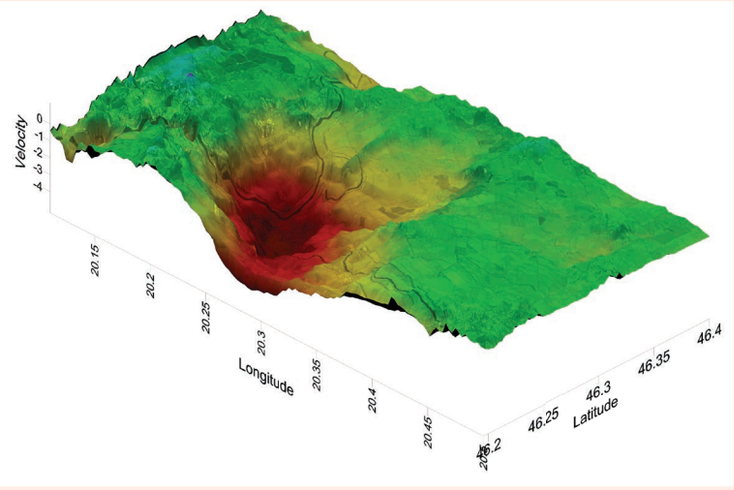
address: 2132 Göd, Kacsóh P. u. 13.
postal address: 1775 Budapest, Pf. 29
web: *www.geo-sentinel.hu*

The company is a leading provider of precise deformation monitoring services. We apply state-of-the-art satellite techniques including synthetic aperture radar interferometry and global navigation satellite systems. Team members have two decades of experience in leading scientific research and development projects and have space geodetic work contracts with industrial customers and ESA.

We have experience in satellite-based synthetic aperture radar interferometry using historical as well as current sensors at various frequencies, and GNSS measurements. These are applied for complex, high-precision deformation studies in industrial projects, as well as for scientific purposes, to understand natural hazards and the effects of anthropogenic activities. The applications include assessing and control of important infrastructures, planning and monitoring mining related activities, construction works, oil, gas and groundwater extractions, and several other fields.

: Péter Farkas
: +36 30 785 4075
@ : info@geo-sentinel.hu

SINCE: 2015
2018 : 2 persons
2018 : 45,9 mFt



MAIN PROJECTS

- Sentinels for Floodplain Hydrology, European Space Agency
- Sentinel-1 for Large-Scale Linear Infrastructure Systems, European Space Agency
- Boda Claystone Formation research programme GPS crustal movement study
- Space geodetic deformation studies of uranium industrial establishments

GOODWILL-TRADE LTD.

TD-23

TD-14

14.2

TD-18

18.2

18.3

TD-20

20.10

TD-24

24.2

address: 4220 Hajdúböszörmény, Bíró Péter utca 14.
web: *www.goodwilltrade.hu*

Our company is dealing with design and construction of special machines and the production of precision milled and turned parts.

Our space related activity concerns flight testing as we designed and developed vacuum chambers for space simulation, testing the spare parts which will be sent to the space.

We also developed the production technology of structural parts used in flying hardware and ground based facilities. We can produce thin wall structural parts made from high strength aluminium alloys. We can also produce spare parts from several special alloys like Inconel, Invar, Titanium alloys, Molybdenum and Tungsten alloys.

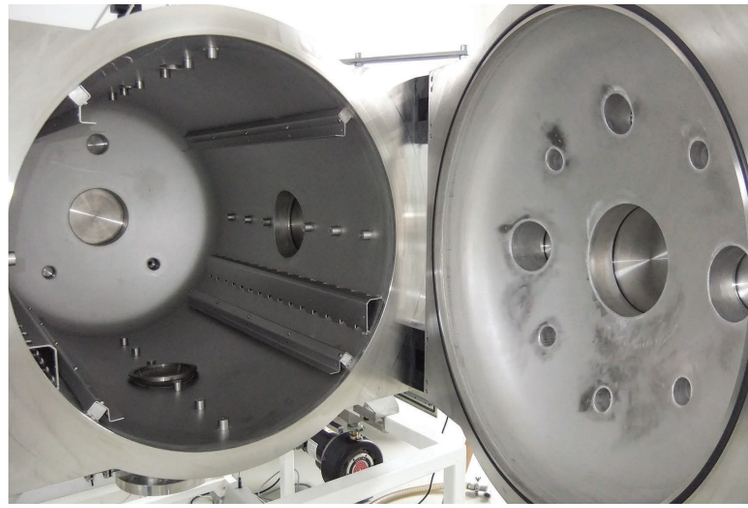
We are in cooperation with some research and development institutes in Hungary, and involved in projects concerning the instrumentation in support of physical sciences. We are experts in the development of those equipment that need vacuum conditions and gas handling during their operation. We designed and constructed a Super critical extractor equipment.

MAIN PROJECTS

- Producer and supplier of cartridges for foaming the FOCUS experiment in ISS Columbus modul (2006-2010)
- Structural part producer and supplier of Sentinel-2A and Sentinel-2B (MSI) MMTH-Metallic Mechanical and Thermal Hardware (2010-2013)
- Producer and supplier of CHEOPS FPA radiator + FEE radiator (2016-2016)
- Helium leek test
- Design and construction of a vacuum system for laser remote sensing of planetary atmospheric research

: Nóra Oláhné Szekeres
: +36 70 252 7293
@ : olahne.nora@goodwilltrade.hu

SINCE: 1993
2018 : 25 persons
2018 : 15.3 / 418.6 mFt



INNOBAY HUNGARY LTD.

address: 3519 Miskolc, Trencséni u. 24.
web: *www.innobay.hu*

: Norbert Babcsán
: +36 30 415 0001
@ : info@innobay.hu

SINCE: 2011
2018: 1 / 2 persons
2018: 2 / 31 mFt

Our goal is to provide companies and government organisations with innovation, business development and economic development services. The company has a background in engineering and physics, led by Norbert Babcsán. The company's professional background covers the fields of material, energy and space industry, supplemented with living material systems and processes.

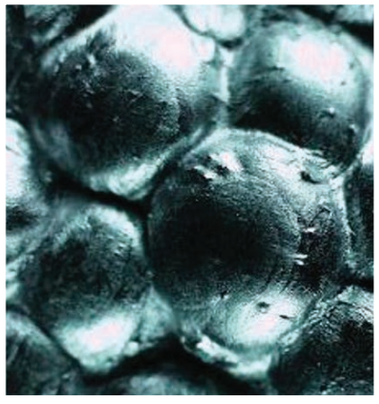
Previous space activities of Norbert Babcsán, the founder of Innobay Hungary Ltd.: microgravity experiments in the Bremen drop tower, participation in the establishment of the Space Generation Advisory Council, semiconductor single-crystal research with NASA, the first Hungarian parabolic flight, aluminum foams and technology innovations (Metal-Minipore, ALUHAB) and aluminium foam diagnostic method development (UMFA) projects for ESA.

Our company's space research competency serves the better understanding of the impact of weightlessness. Space technology competence help to create Hungarian start-up companies.

MAIN PROJECTS

• Metal foam and equipment development by the melt route for low gravity test (Metal-Minipore)

• Aluhab- Metal minipore 2: Characterisation of bulk and shaped ALUHAB for space applications"



INNOSTUDIO INC.

address: 1031 Budapest, Záhony u. 7.
web: *www.innostudio.org*

InnoStudio Inc. is a member of the ThalesNano/Darholding Group, being one of the largest upstream technology networks in the CE region in Europe. It is a high-risk, high-gain corporation focusing on the development of flow chemical reactors for space, chemical and pharmaceutical applications, nanotechnology, agrochemical AI and drug discovery supported by IT technology.

Our research and core activities serve the development of innovative technologies for sustainability both on Earth and in space and ensure human well-being at long-term:

- flow chemical reactors for space applications and on-demand pharmaceuticals production for space applications
- application of nanotechnology for space plants production
- CO_2 sequestration and optimisation of its utilisation
- space mining via innovative flow technology method
- launch and management of the international Space Chemistry Consortium
- organisation of the regularly held international Space Chemistry Symposium

: Ferenc Darvas
: +36 1 880 8500
@ : ferenc.darvas@innostudio.org

SINCE: 2013
2018: 8 / 12 persons
2018: 74 / 196 mFt

ISOTOPTECH ZRT.

TD-14
14.1
14.2
14.3; 14.4
TD-4
4.2

address: 4025 Debrecen, Piac utca 53. 2/9.
postal address: 4001 Debrecen, Pf. 390
web: *www.isotoptech.com/hu/*

Our main profile is engineering research and development. Our basic activity is the monitoring of nuclear power plants and radioactive waste disposal facilities. Most of our customers require special methods and measurement techniques to solve their problems. This necessitates the up-to-date expertise of our researchers, as well as the continuous development of our analytical instruments.

Our activities and analyses require special methods and measurement techniques. In addition, many of our partners have unique requests which can't be fulfilled using only the methods described in literature. In some cases, we have to adapt the existing methods to the task, but most of the time we have to develop new and unique methods, equipment. Our well-equipped electronic and mechanical workshop can support our activities in this field.

: Mihály Veres
: +36 52 509280
@: veresmihaly@isotoptech.hu

SINCE: 1997
2018: 0 / 38 persons
2018: 0 / 389 mFt

LABS

- Elemental and isotope-ratio analytical laboratories
- Radiochemical and radioanalytical laboratories
- Electronic and mechanical workshops

CERTIFICATION

- MSZ EN ISO/IEC 17025: 2005
- MSZ EN ISO 9001: 2015
- MSZ EN ISO 14001: 2015

LECHNER NON-PROFIT LTD.

TD-26
TD-10
10.2

address: 1111 Budapest, Budafoki út 59. E/3. épület
postal address: 1592 Budapest, Pf. 585
web: *www.lechnerkozpont.hu*

The Lechner Knowledge Centre (LTK) was renewed by the integration of LTK and the former Institute of Geodesy Cartography and Remote Sensing (FÖMI) on the 1st of April 2019. The professionals of this new LTK have a very wide-ranging experience in the field of remote sensing, cadastre and regional planning, space-geodetic technologies (GNSS, InSAR).

National operational activity: integrated assessments with combined data sources

- RS: airborne/space-borne, optical, radar (fusion, polarimetry)
- Digital photogrammetry, 3-D analysis
- Official: LPIS, cadastral, topographic data
- Processing of big geospatial data
- Land cover monitoring and ecosystem mapping

Satellite Geodesy

- operation of the real-time GNSS positioning service (GNSSnet.hu)
- GNSS geokinematic investigations on national and European scale
- satellite radar interferometry for research purposes
- implementation of the Galileo satellite positioning system

LABS / INSTRUMENTS

- Active GNSS network (GNSSnet.hu - 35 stations)
- GNSS Geokinematic Reference Network (MGGA - 23 stations)
- SENTINEL-1 InSAR corner reflector network (SENGA - 8 points)
- Bernese and GAMMA software for scientific and commercial applications
- K-GEO Calibration Laboratory
- GNSS Analysis Centre (GNSSnet.hu, EPN, E_GVAP processing)
- GPS equipment pool for field measurements

: Dániel Kristóf
: +36 1 460 4090
@: daniel.kristof@ lechnerkozpont.hu

: Ambrus Kenyeres
: +36 27 200 801
@: ambrus.kenyeres@lechnerkozpont.hu

SINCE: 1967
2018: 40 / 438 persons
14/18: 5 projects

HUNGARIAN ASTRONAUTICAL SOCIETY

address: 1044 Budapest, Ipari park u. 10.
web: *www.mant.hu*

The main aim of our non-profit civil organisation is to raise public awareness about space exploration and applications, with special emphasis on the younger generations. We promote the interdisciplinary and state-of-the-art exploitation and research of outer space, facilitate professional collaborations, by means of providing an opportunity for space enthusiasts to meet, exchange ideas and work together. We represent Hungary in the International Astronautical Federation (IAF) since 1959. We collaborate with other international organisations, e.g. the Space Generation Advisory Council, and occasionally host domestic and international conferences. We publish books and newsletters, organise annual student competitions, summer space camps (since 1994) and space academy events (since 2015). We regularly participate in major public science popularisation events. The Society has a rich history and considerable know-how in space-related education and outreach.

: Anna Krisztina Székely
: +36 30 585 0867
@ : iroda@mant.hu

SINCE: 1956
:
:

MAIN PROJECTS

- Student space contest (since 1991)
- MANT Space Camp (since 1994)
- MANT Space Academy (since 2015)
- Space Day (since 1992)
- Hungarian Space Forum (Seminar on Ionospheric and Magnetospheric Physics) (since 1972)

MINING AND GEOLOGICAL SURVEY OF HUNGARY

address: 1145 Budapest, Columbus u. 17-23.
postal address: 1590 Budapest, Pf. 95
web: *www.mbfsz.gov.hu*

MBFSZ was established in 2017 by the successive fusions of Eötvös Loránd Geophysical Institute, Geological Institute of Hungary and Hungarian Mining Office. In Hungary, the survey is the prime authority for performing mining-related official tasks. Besides, the survey also conducts applied and fundamental research in several fields of geological and geophysical studies. MBFSZ maintains Hungary's geoscience database.

MBFSZ's space activity concerns fundamental research in the field of plasma dynamics in the terrestrial magnetosphere/ionosphere, as well as in the solar wind. The main focus is on the investigation of ULF plasma wave phenomena and on the monitoring and modelling of plasmasphere dynamics. We also concern nonlinear (incl. turbulent) plasma fluctuations in the space plasma. The studies rely both on field and spaceborn (Swarm, VAP, Cluster, Ulysses) observations. MBFSZ participates in projects devoted to the development of magnetometers and data acquisition systems for observatory use.

TD-4
4.1
4.3

MAIN PROJECTS

- EU FP7: PLASMON, STORM
- ESA PECS: Swarm for Space Weather
- ESA: EPHEMERIS (Swarm products for Space Weather)
- ESA SSA: Swarm Utilisation Analysis

LABS

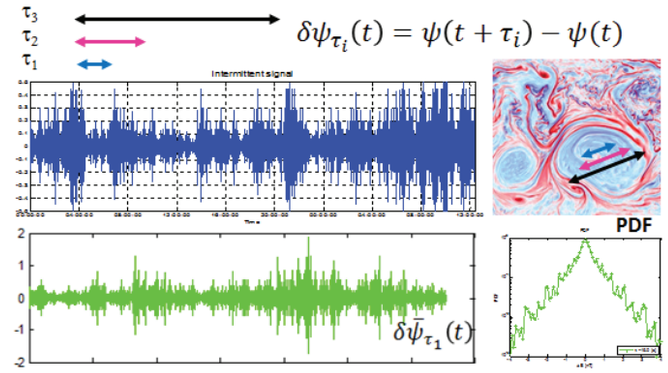
- Tihany Geophysical Observatory
- Coordinator of EMMA (European quasi-Meridional Magnetometer Array, 25 stations)
- Geomagnetic repeat-station network

CERTIFICATIONS

ISO 9001:2015

: Balázs Heilig
: +36 87 448501
@ : heilig.balazs@mbfsz.gov.hu

SINCE: 1954
2018: 3 / 11 persons
14/18: 9 projects



HUNGARIAN ASTRONOMICAL NON-PROFIT LTD.

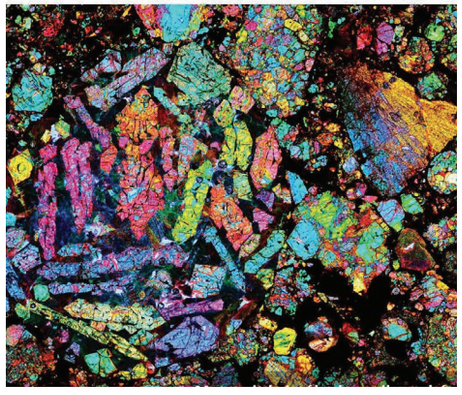
address: 9400 Sopron, Csatkai Endre u. 6-8.
web: *www.mcsnkft.hu*

The MCSN Ltd. is a non-profit company that works on the technological, scientific and outreach aspects of space. It has developed the technological facilities of the Svábhegy Observatory Interactive Astronomical Science Centre. Participated in the organisation of the 13th International Olympiad of Astronomy and Astrophysics in Hungary, and provides dissemination support for astronomical research institutes.

Scientific and technological improvements: development of polarisation, fluorescence and interferometric microscopic system for meteorite analysis linked to multimedia projection system; planet observing system for UV, IR and CH_4 bands; 3D projection system and background software facility that is able to convert space-probe recorded data to 3D format; development of interactive laser, spectroscopic and fluorescence instruments for demonstration.

: Áron Keve Kiss
: +36 30 358 5120
@ : magyarcsillagaszat@gmail.com

SINCE : 2017
2018 : 1 person
2018 : 0 / 6.14 mFt



MATMOD LTD.

address: 3534 Miskolc, Kandó Kálmán u. 5.
web: *www.matmod.eu*

MATMOD provides environment friendly surface treatment technologies for satellite hardware. The substitution of Alodine system is on focus. The SURTEC 650 chemical family is used to provide a corrosion resistant layer. The company has qualified processes for the treatment recognised by ESA and Airbus. The treatment is offered as a service with a combination of space quality paintings.

Conversion coating development as a substitution of Alodine. SURTEC650 is used in the development in a cooperation with ESA and Admatis. The new environment friendly conversion coating is qualified for the following aluminum alloys:1xxx, 2xxx, 5xxx, 6xxx, 7xxx.

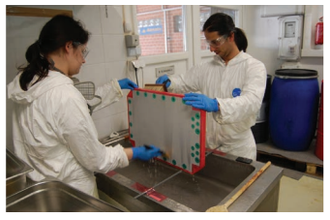
The treatment can be applied selective using special masking technology. The repair technology is also qualified. The coating can be top-coated internally with the following thermo-optical black or white paints: MAP PU1, MAP PUK, MAP SG121FD, Aeroglaze Z306. The conversion coating application and paintings are offered as a service for customers.

MAIN PROJECTS

• As a support entity of Admatis the materials science activities are in the focus that were used in Sentinel-2 and CHEOPS missions.

LABS

• The production line is available internally for SURTEC 650 treatment with all the required test facilities. Space qualified painting booth is also available at the site in cleanroom environment to allow the paint application within a couple of hours.



: Pál Bárczy
: + 36 70 5768552
@ : pal.barczy@matmod.eu

SINCE : 2008
2018 : 2 persons
2018 : 28 / 38 mFt

OMSZ
HUNGARIAN METEOROLOGICAL SERVICE

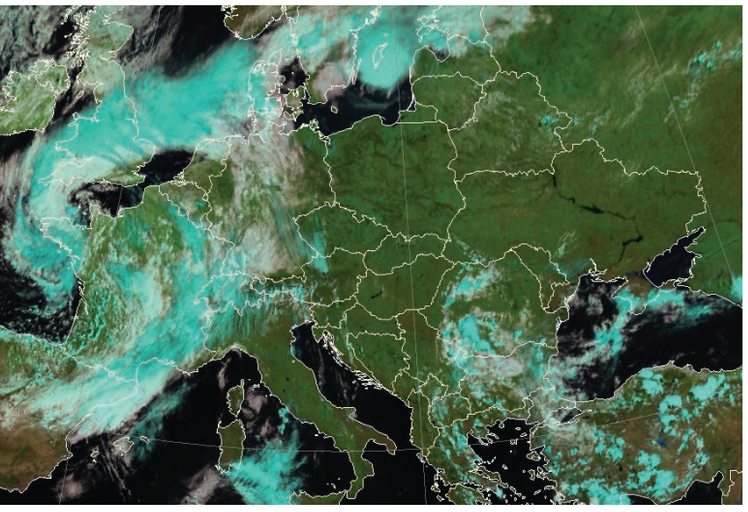
address: 1024 Budapest, Kitaibel Pál utca 1.
postal address: 1525 Budapest, Pf. 38
web: *www.met.hu*

OMSZ is a state-run institution responsible for short and long-range weather predictions, severe weather warnings, atmospheric environmental and climate information. It operates an extended ground-based and remote sensing measurement network and a complex ICT system. It maintains persistent research and development activities and operative co-operations with various international organisations.

The main applications of satellite data at OMSZ are related to short range weather forecasting; aviation meteorology and severe weather warnings, where especially imagery and products from geostationary Meteosat and polar orbiting NOAA and MetOp satellites are used. Satellite data are also applied in climatological and agrometeorologicalstudiesandareassimilated into our limited-area numerical weather prediction models.

: Eszter Lábó
: +36 1 346 4664
@ : labo.e@met.hu

SINCE: 1870
2018: 5 / 186 persons
14/18: 8 projects



MAIN PROJECTS

• EUMETrain: International training project sponsored by EUMETSAT to support and increase the use of meteorological satellite data (participation of OMSZ since 2014)
• H-SAF: EUMETSAT Satellite Application Facility on Support to Operational Hydrology and Water Management (participation of OMSZ since 2005)
• ImagineS: Implementation of Multi-scale Agricultural Indicators Exploiting Sentinels (2012-2016)
• INTRO (PECS): INTegrity of TROpospheric Models (2015-2016)

CERTIFICATION

• QUALITY ASSURANCE:
ISO 9001:2015
(Certificate Nr. HU02/0017, Issue 7.)
• Air Navigation Service Provider Compliance Certificate
(Nr. HU-052-MET).

REMRED SPACE TECHNOLOGIES LTD.

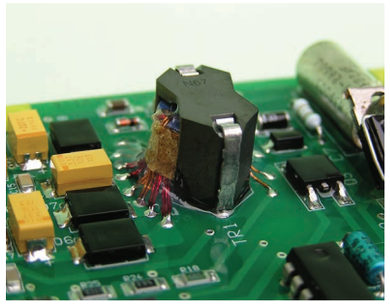
address: 1121 Budapest, Konkoly-Thege Miklós út 29-33.
web: *www.remred.hu*

REMRED is a spin-off company of the Centre for Energy Research to develop, test and adapt technologies and techniques for space applications, particularly for space weather and cosmic radiation studies for national and foreign industrial users to mitigate risks due to space weather effects and to better understand the ongoing processes in our cosmic environment.

The company offers consultancy service in the fields of general aerospace engineering, radiation effects by cosmic radiation on electrical components and living organisms and related mitigation techniques, electrical, software, mechanical and thermal engineering, space equipment AIV, especially for scientific payloads (space dosimetry and space weather instruments), verification test procedures according to ECSS standards.

MAIN PROJECTS

• ISS Russian Segment service dosimetry system
• DOSIS-3D on ISS
• ESEO-TRITEL



: István Apáthy
: +36 20 983 9394
@ : info@remred.hu

SINCE: 2016
2018: 2 / 3 persons
2018: 11,76 mFt

SGF TECHNOLOGY ASSOCIATED CO. LTD.

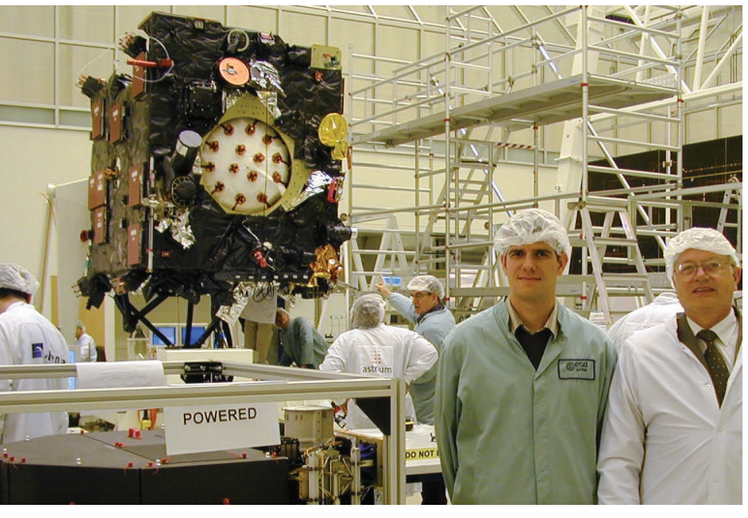
address: 1121 Budapest, Konkoly-Thege M. u. 29-33.
postal address: 1525 Budapest, Pf. 49
web: *www.sgf.hu*

SGF Ltd.'s main activity covers the development of reliable on-board control and data acquisition systems and their electrical ground support equipment for on-board scientific instruments. The funding for successful participation in space missions was ensured by Hungarian and European tenders and contractual orders from international research institutes.

SGF has contributed to several space missions with on-board software and hardware development like the two processor control computer with fault tolerant multitasking real-time operating system for Rosetta-Philae lander, or on-board control software for CaSSIS instrument of ExoMars-TGO probe, or control computers for instruments in Plasma Wave Complex (PWC) experiment on ISS. SGF has also produced Electrical Ground Support Equipment (SW & HW) for different scientific instruments in missions as Philae (SW simulator), MarsExpress, VenusExpress, BepiColombo, Solar Orbiter, JUICE and PWC (ISS).

: Gábor Tróznai
: +36 30 2676576
@ : info@sgf.hu

SINCE: 1996
2018: 5 persons
2018: 33.41 mFt



MAIN PROJECTS

- Significant participation in the hardware and software development of the Command and Data Management System (CDMS) on-board of Rosetta-Philae lander.
- Distributed computer system and software development and Electrical Ground Support Equipment (EGSE) production for the Obstanovka experiment operated on-board of ISS.
- EGSE development for SPICAM instrument of MarsExpress space probe.
- Automated calibration system (hardware and software) development for ASPERA experiment of VenusExpress space mission.
- On-board control and imaging software development for CaSSIS (Colour and Stereo Surface Imaging System) instrument of ExoMars space probe.

SPACE APPS KFT.

address: 6200 Kiskőrös, Batthyány u. 47.
web: *www.space-apps.net*

MAIN PROJECT

BeeBox

Remote sensing, IoT, machine learning and web-based technologies became accessible for the everyday users. Space Apps is researching the business perspectives in services based on the synergy of these applied science.

BeeBox - the intelligent beehive monitoring system is our first product, using local data measurement devices and remote sensed data together. This product helps the everyday life of beekeepers and researchers. The system monitors statuses in and around the beehive, and gathers remote sensed data on the surrounding vegetation. Our product was the first incubatee of the ESA BIC Hungary.

: István Arnócz
: +36 20 294 7278
@ : istvan.arnocz@space-apps.net

SINCE: 2016
2018: 1 person
2018: 13 mFt

UNIVERSITY OF SZEGED
NONLINEAR DYNAMICS AND KINETICS GROUP

address: 6720 Szeged, Rerrich Béla tér 1.
web: *www2.sci.u-szeged.hu/physchem/nld/*

Our team at Department of Physical Chemistry and Materials Science is interested in chemo-hydrodynamic instabilities arising at the liquid-gas interface. The experiments are always supported by calculations in three spatial dimensions. We have successfully utilised our expertise in fluid dynamics to participate in the 56th parabolic flight campaign of ESA in 2012 followed by the MASER-13 sounding rocket in 2015.

In our work we have shown the roles of instabilities in the hydrodynamics of reacting systems.

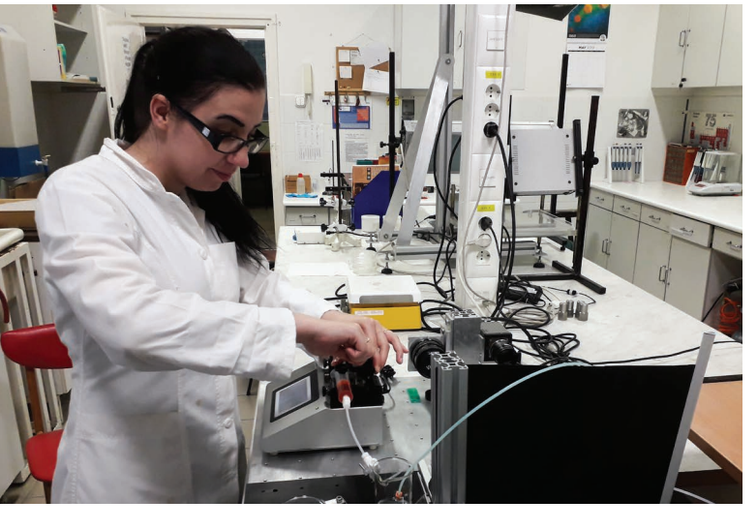
The outreach of the results goes beyond basic science. Our students, who are interested in pursuing activity in research and development, not only are able to solve complex problems independently, but also have acquired the experience in interdisciplinary fields and can work in international collaborations.

: Dezső Horváth
: +36 62 544 614
@ : horvathd@chem.u-szeged.hu

SINCE: 2008
2018: 3 / 7 persons

MAIN PROJECTS

- 56th ESA parabolic campaign
- MASER-13 suborbital sound rocket campaign
- CHYPI-Flower (future sounding rocket)



RESEARCH CENTRE FOR NATURAL SCIENCES
INSTITUTE OF COGNITIVE NEUROSCIENCE AND PSYCHOLOGY

address: 1117 Budapest, Magyar tudósok körútja 2.
web: *www.ttk.mta.hu/kpi*

The Institute concentrates on psychology and related topics of cognitive neuroscience. The Environmental Adaptation and Space Research Group studies psychodynamics of isolated small groups in terrestrial space-analogue simulations, such as the Mars500 or Antarctica. We also investigate the impact of spaceflight related stressors on cognitive performance and EEG on the ISS and space analogues.

Our group specialises in multi-language psychological content analysis based on Natural Language Processing technology. With these methods, we detected the effect of isolation on emotional and cognitive processes and group dynamics in the Antarctic space analogues. With our expertise in cognitive neuroscience techniques we have demonstrated the detrimental effect of spaceflight on cognitive performance.

Our results are applicable to everyday situations such as isolation in the elderly population or performance monitoring in stressful working conditions.

MAIN PROJECTS

- Neurospat ESA neuroscience experiment on ISS
- Cognipole ESA neuroscience experiment in Antarctica
- AGBRESA ESA neuroscience experiment in head-down tilt bed rest
- COALA/CAPA ESA psychological experiment in Antarctica
- MARS500/SIRIUS, space analogue experiment series in Moscow, Russia

: Bea Ehmann
: +36 1 3826811
@ : ehmann.bea@ttk.mta.hu

SINCE: 1902
2018: 6 / 480 persons
14/18: 6 projects

WIGNER RESEARCH CENTRE FOR PHYSICS, INSTITUTE FOR PARTICLE AND NUCLEAR PHYSICS

address: 1121 Budapest, Konkoly Thege Miklós u. 29-33.
postal address: 1525 Budapest; Pf. 49
web: *www.wigner.mta.hu/reszecske-es-magfizikai-intezet*

In the field of space research we focus on space physics, as well as hardware and software development for high reliability onboard instruments, systems and ground support equipment. We had participated in several successful space missions, which substantiates our involvement in upcoming missions. The instrument development and scientific research is funded by national and international grants.

The closest approach phase of the retrograde comet was not possible for the Vega probes with ground control. Our onboard tracking system was used instead, which was the first ever such event in the history of space research. Owing to our firm references we were contracted to develop the critical error tolerant computer of the Philae lander long before Hungary's ESA membership. We used our decade-long experience of hardware and software development to construct dozens of space equipment, including Obstanovka, which contains 12 sensors and 3 computers and is currently on board of the ISS.

: Zoltán Németh
: +36 1 392 2222/1228
@ : nemeth.zoltan@wigner.mta.hu

SINCE: 1992
2018: 29 / 167 persons
14/18: 11 projects

MAIN PROJECTS

- Vega space probes: onboard tracking and imaging camera; plasma physics instruments
- Cluster mission: ground based data processing and data storage.
- Rosetta spacecraft and Philae lander: Plasma instrument package. Hardware and software development of the central computer, the Command and Data Management System (CDMS) onboard the Philae lander.
- Cassini spacecraft: participation in the construction of the Cassini Plasma Spectrometer (CAPS) and Magnetometer (MAG) instruments
- Obstanovka experiment onboard ISS: hardware and software development of the Command and Data Management System.

LABS

- Thermo-vacuum chamber
- Vibration stand
- EMC measurements, spectrum analysis
- Circuit development, simulation, analysis, PCB design (ORCAD 17.2)
- CNC mechanical workshop

WIGNER RESEARCH CENTRE FOR PHYSICS, INSTITUTE FOR SOLID STATE PHYSICS AND OPTICS

address: 1121 Budapest, Konkoly Thege Miklós u. 29-33.
postal address: 1525 Budapest; Pf. 49
web: *www.wigner.mta.hu/szilardtestfizikai-es-optikai-intezet*

We provide computational materials science support for microgravity experiments. Its aim is to model the polycrystalline microstructure for the materials and conditions used in the experiments. The methods applied range from classical density functional theories working on the molecular scale to the phase-field models applicable on the mezo-scale.

Within ESA collaboration, the research group provided/provides theoretical and computational support to fundamental and application oriented research projects aimed at developing new materials in microgravity environment. The projects were aimed at clarifying the role of crystal nucleation and growth in phase selection, the exploration of morphological transitions in TiAl alloys for aerospace applications, the development of materials for gas turbines working at elevated temperatures, etc. The knowledge generated so is expected to contribute to the development of new materials/technologies.

: László Gránásy
: +36 1 392 2222/3371
@ : granasy.laszlo@wigner.mta.hu

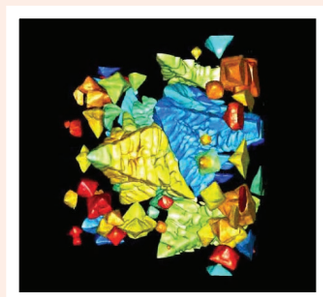
SINCE: 1999
2018: 5 / 139 persons
14/18: 2 projects

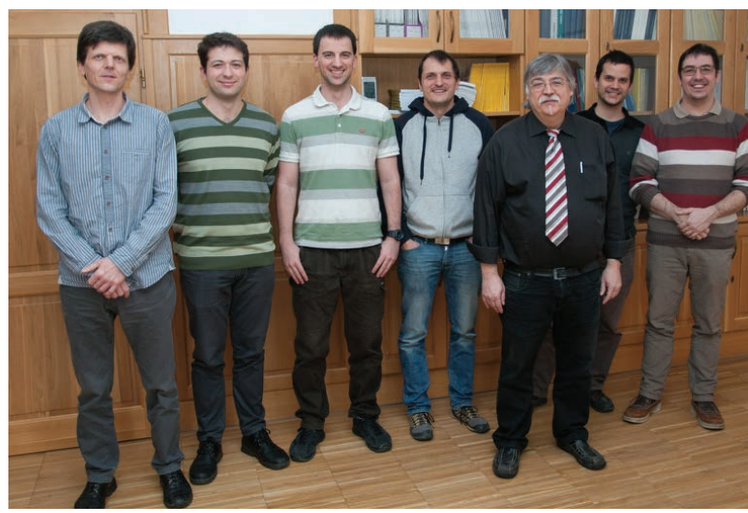
MAIN PROJECTS

- ESA PECS project "GRADECET" (2014-2017) (Microgravity experiment: MAXUS-9 sounding rocket)
- ESA PECS project „MAGNEPHAS III/ PARSEC" (2014-2016 (Microgravity experiment: ISS)"

LABS

CPU and GPU clusters





HATP
HUNGARIAN AEROSPACE TECHNOLOGY PLATFORM

The HATP is a non-profit organisation established in 2007 by institutes and companies involved in the research, development and manufacture of space related technologies, components, subsystems, payloads, sensors, software and carries out scientific research in different areas such as space weather or electromagnetic wave propagation in the plasmasphere. HATP represents Hungarian organisations, institutes and companies involved in space related activities and that have space heritage.

Our main aims are:

- To build domestic and foreign cooperation in space product development
- To provide novel solutions and develop new satellite applications
- To develop, manufacture, test and operate small satellites and the related ground infrastructure for scientific, remote sensing and communications applications
- To launch integrated research projects, to establish new R&D relationships with other organisations from different countries

Founded: 2007

President: János Solymosi

Address: 1044 Budapest,
Ipari park u. 10.
e-mail: solymosi@hatp.eu

web: *www.haif.org/HATP.html*

The members of the platform are listed on the platform's website.

HUNSPACE
HUNGARIAN SPACE CLUSTER

Hungarian Space Cluster was established in 2007 with the purpose to incorporate most of the actors of the Hungarian space industry. HUNSPACE brings together Hungarian space-oriented organisations and represents their interests both domestically and abroad. It is committed to supporting the visibility and market access of domestic space players. They organise supplier networks to successfully execute major projects.

The long-term strategy of the Cluster was adopted in November 2018. This includes participation in ESA programmes, and international cooperation in space industry.

The Cluster has four divisions:

- Satellite components division
- Electronics and Small Satellite division
- Science and Research divison
- Earth Observation division

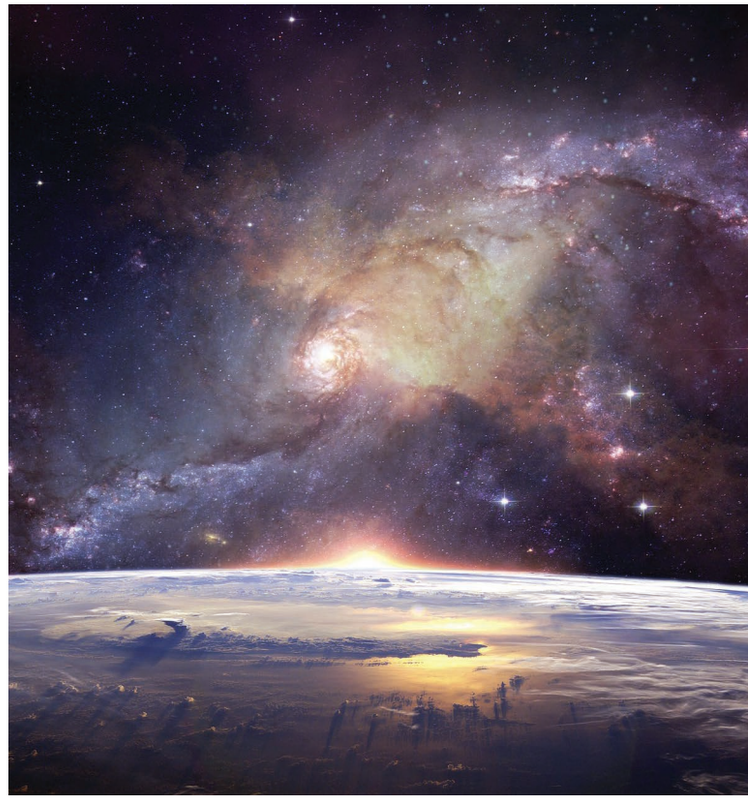
Founded: 2007

President: Péter Hargitai

Address: 3534 Miskolc,
Kandó Kálmán u. 5.
e-mail: hunspace@hunspace.org

web: *www.hunpsace.org*

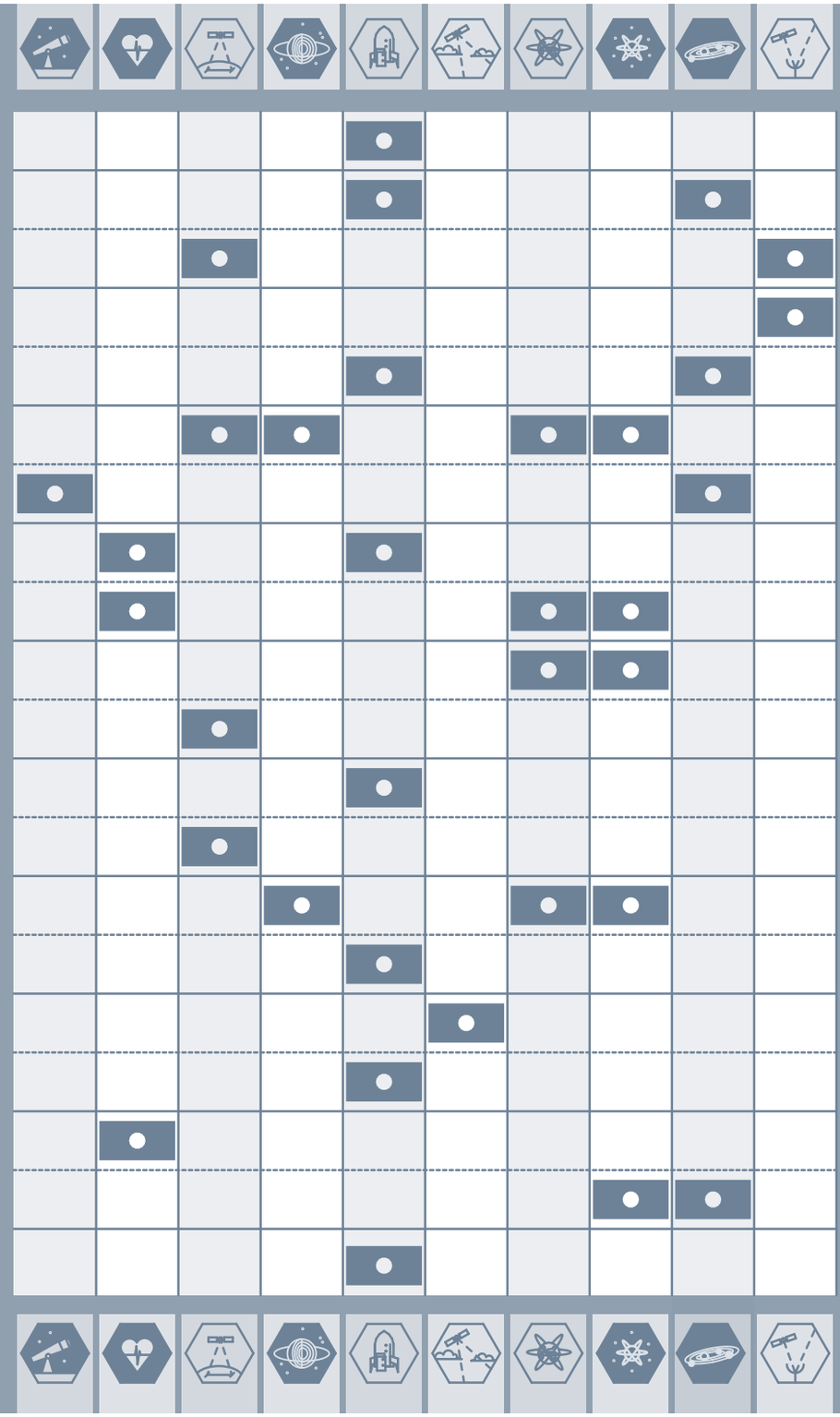
The members of the cluster are listed on the cluster's website.



MAIN SPACE TECHNOLOGICAL COMPETENCES OF HUNGARIAN ORGANISATIONS

	TD-01	TD-02	TD-03	TD-04	TD-06	TD-07	TD-08	TD-09	TD-10	TD-12	TD-14	TD-15	TD-16	TD-17	TD-18	TD-20	TD-21	TD-23	TD-24	TD-26	OTHER
ADMATIS																●	●		●		
AIRBUS HUNGARY																				●	
BAY												●		●		●	●		●	●	
BHE					●					●											
BL-ELECTRONICS	●	●									●										
BME		●	●						●			●	●				●			●	
BME HVT	●	●	●		●	●		●		●		●		●							
C3S	●	●	●		●		●	●		●						●					
COSIMA KFT.																				●	
CSFK FGI											●										
CSFK GGI																				●	
CSFK KTM CSI	●							●			●										
DE-SPACE																				●	
EK	●			●							●										
ELTE	●			●		●					●									●	
ENVIROSENSE																				●	
GEOADAT																				●	
GEO-SENTINEL									●											●	
GOODWILL-TRADE											●				●	●		●	●		
INNOBAY HUNGARY																			●		
INNOSTUDIO																					●
ISOTOPTECH				●							●										
LECHNER									●											●	
MBFSZ				●																	
MCSN											●										
MATMOD																			●		
OMSZ																				●	
REMRED				●							●										
SGF	●	●																			
SPACE APPS																				●	
SZTE FKAT											●										
TTK KIPI											●										
WIGNER RMI	●	●	●	●																	

MAIN SPACE RESEARCH AREAS OF HUNGARIAN ORGANISATIONS



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