

**2020 HUNGARIAN  
SPACE CALEIDOSCOPE**

# HUNGARIAN SPACE CALEIDOSCOPE

---

2020

## IMPRESSUM

Hungarian Space Kaleidoscope 2020

Editorial board:

*Iván Almár, László Baczárdi, Előd Both,  
Sándor Frey, Balázs Heilig, Ferenc Horvai,  
András Ferenc Horváth, László Pap, Balázs Székely*

Editor:

*László Baczárdi*  
as chair of the editorial board

Layout, graphics:

*Tímea Blidár*

Publisher:

*Hungarian Astronautical Society (MANT)*  
1044 Budapest, Ipari park u. 10.  
www.mant.hu  
Budapest, 2020

Responsible publisher: *Attila Hirn*, Secretary General

The publication was supported by the Ministry of Foreign Affairs and Trade.

*Disclaimer. The data and pictures published in the book were submitted by the organisations listed in the book. The organisations are responsible for the accuracy of the information they provided as well as for the technical content which do not necessarily represent the opinion of the publisher. The text has been edited only stylistically by the editorial board.*

*Manuscript has been closed on 15 Aug 2020.*

HU ISSN 2732-2289

## WELCOME FROM THE MINISTER



The world is undergoing a rapid technological development; one of the flagships of this process is undoubtedly the space sector. Utilizing space and exploiting its benefits is not anymore the sole privilege of the classical space powers. Smaller countries that recognized the potentials in space also have appeared on the scene and with their outstanding engineering and technological competences they are ready to enter the competition in the space industry.

Hungary also belongs to these countries, which is clearly shown by the fact that many international space industry cooperation and research projects have significant Hungarian intellectual and technological added-value. The results achieved at international level clearly prove us.

Accordingly, the Ministry of Foreign Affairs and Trade of Hungary pays special attention to space research and the space industry based on it. Since the publication of last year's Space Kaleidoscope, we have signed Memorandum of Understanding on cooperation in space activities with Brazil, France, Israel, Portugal, Singapore, Turkey and with one of the most ambitious US

based space companies of recent years, Virgin Galactic Holding.

At the ESA Space 19+ Ministerial Council on 28 November 2019, Hungary doubled its subscription to ESA programs, signalling our strong commitment to strengthen our active participation in the European space activities.

We decided on the biggest step jointly with the Russian Federal Space Agency, Roscosmos: we are launching the most significant Hungarian space project of the last forty years, as a result of which we will again send a Hungarian research astronaut to space, this time to the International Space Station.

Our actions and results clearly show our commitment for Hungary to play its part more than ever before in the peaceful use of outer space. This is not only in our foreign policy, but also in our economic interest.

**Péter Szijjártó**

*Minister of Foreign Affairs and Trade*

## WELCOME FROM THE MINISTERIAL COMMISSIONER FOR SPACE RESEARCH



At the beginning of the third decade of the 21<sup>st</sup> century, humankind has reached a new level of technological development; space activities influence our everyday lives. The space sector is going through significant changes, and we are witnessing its rapid expansion even in the economies of emerging countries. We can also see the growing involvement of private sector actors in space related services, and also in the major investment projects. Hungary has high level of expertise in many areas of the field, and we have the capability to enter new, innovative service areas beyond those primary research and development directions where we are present already.

The growing importance of the space sector in the European economy is well illustrated by the fact that at the European Space Agency's (ESA) Council on Ministerial level in 2019 the Member States made an unprecedented financial commitment of 14.5 billion

euros for the following years to foster European space programmes. The ESA Council was decisive for the future of the Hungarian space activities: Hungary subscribed for new scientific and industrial programmes, and we strengthened the ongoing ones. Our increased contributions will be returned to the Hungarian research institutes and enterprises, thanks to the European Space Agency's "geo-return" principle. According to our commitments we are contributing to the European Exploration Envelope Programme with an amount of 14 million euros until 2022, the Space Safety Programme with 8 million euros also until 2022, the Earth Observation Programme with 14 million euros until 2028, the Telecommunications and Integrated Applications Programme with 16 million euros until 2025, the Navigation Programme with 3 million euros until 2022, to General Support Technology Programme with 6 million euros until 2022, the PRODEX Programme with 8

million euros until 2024. In total we have committed to pay around 69 million euros. The cooperation within the ESA framework and the significant increase of Hungarian contribution not only create the opportunity for our enterprises and researchers to participate in certain programmes, but fundamentally strengthen the Hungarian space sector and increase its competitiveness.

In 2020 several significant programmes have been launched in Hungary. In cooperation with Roscosmos (the Russian Space Agency) the Hungarian-Russian Joint Scientific Committee was established. The planning of the mission of the second Hungarian astronaut has been started precisely on the 40<sup>th</sup> anniversary of Bertalan Farkas's spaceflight, who was the first Hungarian cosmonaut, making Hungary the 7<sup>th</sup> nation to send a human into space.

2020 also brought another long-awaited and significant moment for the Hungarian space sector. With the financial cooperation of private and state investors CarpathiaSat Co., the first enterprise aiming to put the first Hungarian telecommunication satellite in orbit was established. The ambitious investments of Hungarian economic actors in space and telecommunication industry open new dimensions for Hungarian research centres,

universities and companies to increase their participation in the market segment of space activities.

We are witnessing a paradigm change in how multilateral institutions and governments think about security and defence policy issues related to the space sector. In this process the year 2019 was definitely a milestone, NATO defined space as an operational area, in addition to land, air, sea and cyberspace. The general trend is clear: nations seek to seize as much opportunities in space as possible, in order to increase their economic, social and security sovereignty.

Hungarian space research and space activities, with a heritage of more than 70 years, have serious potential. Our research centres and companies, with hard and dedicated work, have gained a notable international recognition for themselves and for Hungary. This publication introduces the Hungarian space sector's most successful enterprises, research centres and internationally acknowledged engineers, with results that have brought them to the forefront of the world for decades.

**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 created the first edition of Hungarian Space Kaleidoscope in 2019. Following its success, we provide an insight in 2020 as well 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 Ferenc 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 nice layout and the useful pictograms were designed by Tímea Blidár.

The data in this publication refer to the financial year of 2019 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. This book identifies the key research areas and technological competencies of the organisations, the latter follow the classification used by the European Space Agency (ESA). 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 further expanded in the next 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 Baczárdi*  
*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. 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

 Further RESEARCH competences

 Primary TECHNOLOGICAL competence

 Further TECHNOLOGICAL competences

### POINT OF CONTACT

 Name

 Phone

 E-mail

### ORGANISATION DETAILS

 YEAR OF FOUNDING

 HEADCOUNT (2019)  
Space department employees / all employees

 YEARLY REVENUES (2019)  
space department revenues / all revenues  
M HUF = million Hungarian forint  
na: not available

 SPACE RESEARCH TENDERS  
number between 2015 and 2019

### 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

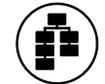
 **TD-2 Space System Software**  
2.1 Advanced Software Technologies  
2.2 Space Segment Software  
2.3 Ground Segment Software  
2.4 Ground Data Processing

 **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 Verification**  
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-19 Propulsion**  
19.1 Chemical Propulsion Technologies

 **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-25 Quality, Dependability and Safety**  
25.1 System Dependability and Safety

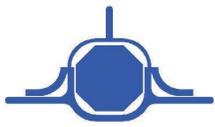
 **TD-26 Earth Observation / Remote Sensing**

 **TD-27 Other**



HUNGARIAN  
ORGANISATIONS

---



ADMATIS LTD.



AEDUS SPACE LTD.



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

address: 1025 Budapest, Józsefhegyi utca 28-30/A II. em 22.  
web: www.aedusspace.com

TD-24

24.2

TD-20

20.1

TD-21

21.1

21.5



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, thermo-optical 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

Aedus Space Ltd. was founded in 2014. The company has experience in laser technology design and process development, as well as in material science. It is present in energy, aerospace, defence, and medical industries with a special focus on the development and manufacturing of radiation protection materials and applications. Its activities include:

- Light composite armour material development
- Basic research (ceramic- and metal-based composites, grain size optimisation)

In-situ nanomaterial reinforcement of MMCs

- Radiation shielding material research
- Radiation types: neutron, proton, and gamma
- Automated soldering and de-soldering of space electronics
- Design and manufacturing of microfluidics for medical application
- Product development and manufacturing with laser, 2D-3D structures of superalloys and composite materials for energy industry



TD-24

24.1

TD-4

4.2

TD-14

14.3

TD-19

19.1

TD-20

20.9

TD-21

21.3

TD-25

25.1

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

**SINCE** : 2000  
👥 : 18 / 20 persons  
🏠 : 220 / 250 M HUF

### 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

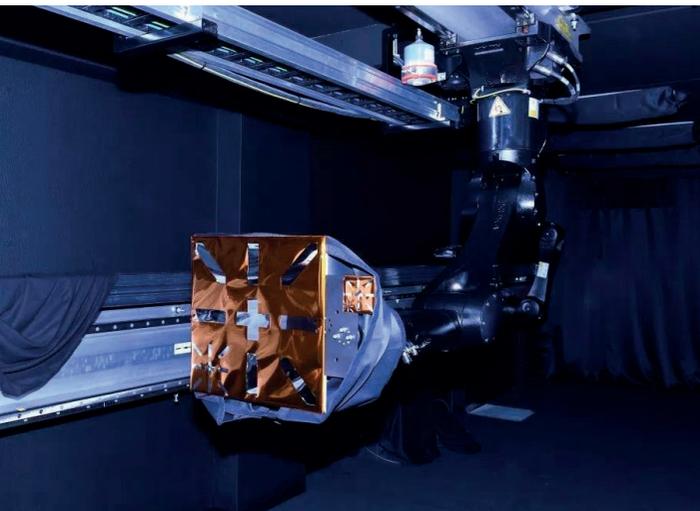
- AS 9100D/ISO9001 certification
- ESA financial audit
- TVC chamber

### LABS, CERTIFICATES

- EN ISO 9001:2015
- Laser technology laboratory for plastic welding
- Laser technology laboratory for electronics soldering
- Materials technology laboratory, furnace technology development

👤 : Szabolcs Bella  
☎ : +36 1 794 2070  
@ : szabolcs.bella@aedusspace.com

**SINCE** : 2014  
👥 : 3 / 6 persons  
🏠 : 0 / 111 M HUF





TD-26



address: 1095 Budapest, Soroksári út 48., Hungária malomudvar, 7. épület  
web: [www.intelligence-airbusds.com](http://www.intelligence-airbusds.com)

address: 4026 Debrecen, Bem tér 18/c  
postal address: 4001 Debrecen, Pf. 51.  
web: [www.atomki.hu](http://www.atomki.hu)

**ELKH**  
Eötvös Loránd  
Research Network



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.

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 cryo- 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.

👤 : György Domokos  
☎ : +36 1 323 3750  
@ : [gyorgy.domokos@airbusds.hu](mailto:gyorgy.domokos@airbusds.hu)

**SINCE** : 2000  
👥 : 33 / 37 persons  
🏠 : 490 / 490 M HUF

MAIN PROJECTS

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



MAIN PROJECTS

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

LABS

- Ionaccelerators, irradiation facilities
- Spectroscopy and surface physics laboratories, cryo- and vacuumtechnics facilities



👤 : Zsolt Fülöp  
☎ : +36 30 539 7154  
@ : [fulop@atomki.hu](mailto:fulop@atomki.hu)

**SINCE** : 1954  
👥 : 6 / 208 persons  
🏠 : 3 projects





TD-24
24.1
24.2
TD-15
15.6
15.7
TD-17
17.1
TD-20
20.1
20.6
20.10
TD-21
21.5
TD-26



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

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.

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 UHF to Ka-band. SDR based de-/encoders, de-/modulators, up-/downconverters, GaN based SSPAs, command receivers, transmitters.

BHE's space activities are concentrated around SATCOM, focusing both on ground

and space segment. 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 and 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 (500Mbps...1Gbps).



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

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

📅 : 1993  
👥 : 0 / 222 persons  
💰 : 0 / 651 M HUF

MAIN PROJECTS

- BONES (ESA)
- LABS
- Nanomaterials and Nanochemistry Laboratory
  - Virtual Reality Laboratory
  - Mechatronics Laboratory
  - Mechanical Testing and Non Destructive Materials Testing Laboratory
  - Software Centre



MAIN PROJECTS

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

LABS, CERTIFICATES

- ISO 9001:2015
- AS9100D (EN 9100:2018)
- AQAP 2110:2009
- Assembly line, RF lab, cleanroom, EMC chamber, sweep table, thermal chamber

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

📅 : 1991  
👥 : 15 / 121 persons  
💰 : 797 / 2440 M HUF



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



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.



address: 1111 Budapest, Műegyetem rkp. 3.  
web: www.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.



TD-3



TD-2

2.4



TD-10

10.1



TD-15

15.5



TD-16

16.1



TD-21

21.5



TD-26

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

**SINCE** : 1992  
👥 : 2 / 2 persons  
🏠 : 0 / 6 M HUF

MAIN PROJECTS

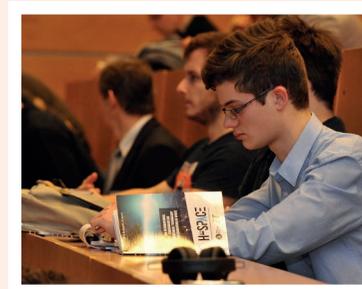
- SEAM; DPU; ELF-VLF wave instrument, cooperation with KTH (Sweden)
- BepiColombo PWI instrument package; ISDM module, ELTE, Kanazawa University (Japan)
- Vernov/Relec; SAS3-R; ELF-VLF wave instrument, ELTE, IKI (Russia)
- Chibis-M; SAS3-Ch; ELF-VLF wave instrument, ELTE, IKI (Russia)
- TriTel-SURE;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

MAIN PROJECTS

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

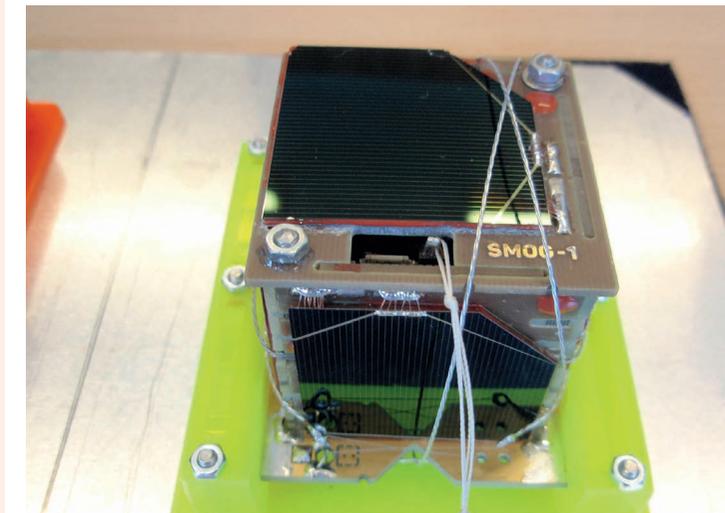
LABS

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



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

**SINCE** : 1782  
👥 : 74 / 2698 persons  
🏠 : 15 projects



address: 1111 Budapest, Bertalan Lajos u. 4.-6.  
web: [www.mogi.bme.hu](http://www.mogi.bme.hu)

address: 1111 Budapest, Egy József u. 18.  
web: [hvt.bme.hu](http://hvt.bme.hu)

The research areas of the Department include: mechatronics, control technology, robotics, optical instrumentation, measurement technology, informatics. We participated in the ground calibration of the Dawn spacecraft cameras, and the development of the calibration pipeline. We have carried out optical component tests of the Rosetta OSIRIS cameras and development tasks of the processing pipeline.

The optical laboratories of our department cooperated in the testing of the optical systems of ESA/NASA research missions. The established optical calibration procedures have been successfully implemented at the Rosetta/OSIRIS and the Dawn/FC instruments. In cooperation with other institutes, our staff members developed the image processing and calibration pipeline of the OSIRIS and Dawn cameras.

On-board hardware elements we developed for space applications have been launched more than 20 times. Major research and development directions: power management/distribution systems, radio communications, data collection, ground stations, construction and thermal problems, radio propagation and communication research. Within the Rosetta cometary program, we developed the power subsystem of the Philae lander. In 2019, after coordinating and performing developments for the Masat-1 CubeSat program, the SMOG-P

P picosatellite was placed into orbit as the first operational picosatellite that ever built. In the ESA's Alphasat program, we participate with wave propagation and communication experiments. Our students are working on ESA educational programs such as Rexus/Bexus and the ESEO satellite, launched in 2018, for which the power distribution unit and a payload for plasma diagnostic measurements were developed. Furthermore, our department is actively participating in the space-related education of the university.

👤 : Gábor Kovács  
☎ : +36 1 463 2602  
@ : [kovgab@mogi.bme.hu](mailto:kovgab@mogi.bme.hu)

**SINCE** : 1957  
👥 : 5 / 35 persons  
📅 : 3 projects

#### MAIN PROJECTS

- 1984 Vega: camera optical alignment, measurement
- 2004-2018 Rosetta: OSIRIS optical components, image processing
- 2007-2020 Dawn: Framing Camera calibration, image processing

#### LABS

- Optical calibration laboratory
- Spectral optical measurements laboratory

#### MAIN PROJECTS

- Rosetta Philae (ESA, 2004)
- Masat-1 (2012)
- Alphasat (ESA, 2013)
- ESEO (ESA, 2018)
- SMOG-P (2019)

#### 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  
☎ : +36 1 463 1559  
@ : [nagy@hvt.bme.hu](mailto:nagy@hvt.bme.hu)

**SINCE** : 1951  
👥 : 14 / 44 persons  
📅 : 8 projects

- TD-1 1.1
- TD-2 2.3 2.4
- TD-8 8.1
- TD-16 16.1 16.2;16.3
- TD-17 17.1 17.2;17.3
- TD-26

- TD-3 3.1
- TD-1 1.2
- TD-2 2.4
- TD-6 6.5
- TD-7 7.1 7.2;7.3
- TD-9 9.3
- TD-12 12.1
- TD-15 15.1
- TD-17 17.3



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

address: 1126 Budapest, Szendrő u. 49.

C3S LLC is a determining player in the international nanosatellite industry, supporting both scientific payloads and industrial demands by their solutions. Our activity encompasses 3-16U, high-reliability platform and subsystem design, as well as prelaunch simulation software and hardware and mission operation environment services. In large satellite projects, we participate as the designer of power distribution systems and payload synchronization. Long lifecycle and high availability characterise our in-house developed, redundant subsystems.

We develop our scalable platform for constellation purposes focusing on Earth Observation and IoT. By providing tailored space and technology for payloads of different sizes, we can foster diverse segments from crop growth monitoring through disaster damage mitigation to IOD demands. Our solutions contribute to the protection of our planet, agricultural improvement, and the better involvement of socially and economically isolated regions.

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.

- TD-3
- 3.1-3.4
- TD-1
- 1.1-1.3
- TD-2
- 2.1-2.4
- TD-6
- 6.1;6.3
- TD-8
- 8.1-8.4
- TD-9
- 9.1-9.3
- TD-12
- 12.1-12.2
- TD-15
- 15.4;15.7
- TD-18
- 18.1,18.4
- TD-20
- 20.1;20.2
- 20.10
- TD-21
- 21.5
- OTHERS



: Alexandra Széll  
 : +36 20 278 1223  
 : alexandra.szell@c3s.hu  
  
 : 2012  
 : 41 / 43 person  
 : 381 / 480 M HUF

**MAIN PROJECTS**

- RADCUBE mission prime, 3U platform and ground station development.
- PLATO 2.o AEU and SMILE SXI PSU development.
- S-band SatCOMM system and 6-12U platform structures development
- AI accelerator-based space avionics development

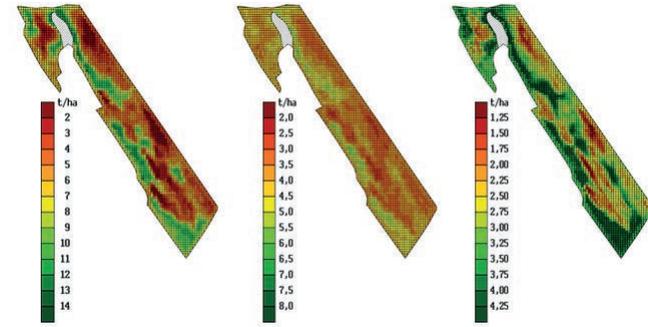
**LABS**

ESA certified soldering operators, trained at ESA accredited courses. Our manufacturing processes comply with ECSS-Q-ST-70-08C, ECSS-Q-ST-70-28C, ECSS-Q-ST-70-38C, ECSS-Q-ST-70-01C, ECSS-Q-ST-70-12C, ECSS-Q-ST-70-60C standards. Electronic laboratory equipped with calibrated instruments and a climate chamber suitable for thermal cycle tests supports our development and manufacturing activity.

**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  
  
 : 2011  
 : 5 / 5 persons  
 : 42 / 42 M HUF



Precision yield maps derived from satellite data (2013:maize, 2014:barley, 2017:sunflower)





address: 1112 Budapest, Budaörsi út 45.  
web: [www.geochem.hu](http://www.geochem.hu)



address: 9400 Sopron, Csatkai E. u. 6-8.  
web: [www.ggki.hu](http://www.ggki.hu)



TD-26

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 bore-hole-wall imager instrument to support the field test of the ExoMars rover. Peak-identi-

fication 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 targeting 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.

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.

TD-14

👤 : Ákos Kereszturi  
☎ : +36 30 343 7876  
@ : [kereszturi.akos@csfk.mta.hu](mailto:kereszturi.akos@csfk.mta.hu)

**SINCE** : 1955  
👥 : 2 / 28 persons  
🏠 : 48 M HUF

#### 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

#### 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)

👤 : Árpád Kis  
☎ : +36 99 508 350  
@ : [kis.arpad@csfk.mta.hu](mailto:kis.arpad@csfk.mta.hu)

**SINCE** : 1957  
👥 : 16 / 62 persons  
🏠 : 9 projects





# RESEARCH CENTRE FOR ASTRONOMY AND EARTH SCIENCES, KONKOLY OBSERVATORY

address: 9400 Sopron, Csatkai Endre u. 6-8.  
postal address: 1121 Budapest, Konkoly Thege Miklós út 15-17.  
web: [www.konkoly.hu](http://www.konkoly.hu)



address: 4032 Debrecen, Egyetem tér 1.  
postal address: 4002 Debrecen, Pf. 400  
web: [www.unideb.hu](http://www.unideb.hu)



# UD-SPACE – UNIVERSITY OF DEBRECEN SPACE RESEARCH PROGRAM



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.

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 diagnostic 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.



TD-9  
9.2

TD-1  
1.1  
1.2

TD-14  
14.2

TD-26

👤 : Róbert Szabó  
☎ : +36 1 391 9322  
@ : [szabo.robort@csfk.mta.hu](mailto:szabo.robort@csfk.mta.hu)

: 1899  
 : 25 / 80 persons  
 : 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

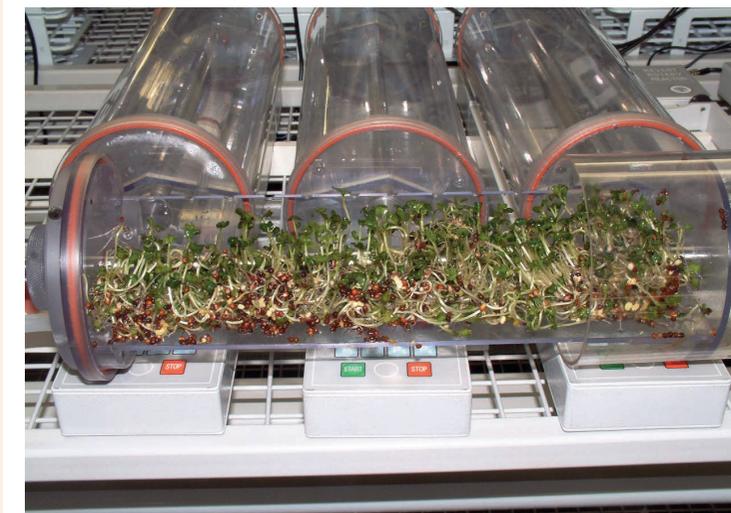
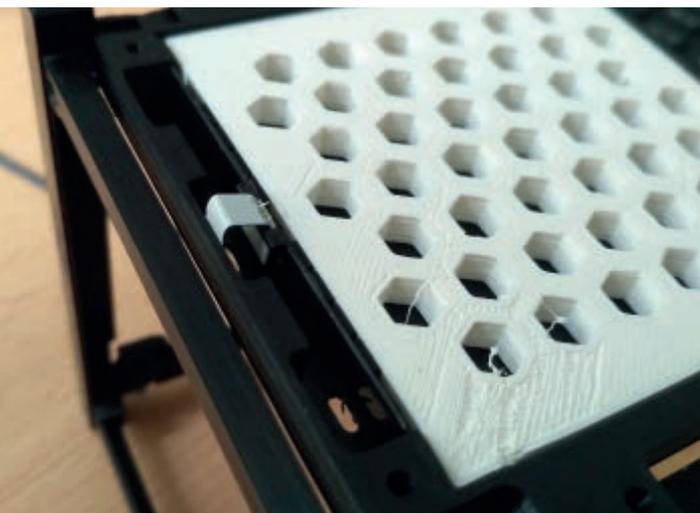
- Small cryostat in which small (approx. 2x5 cm) electronics can be tested at 4 K temperature
- Design and manufacturing of high-energy particle detector payload for CubeSat platforms
- Ground-based imaging, photometry and spectroscopy at the Piskés-tető Mountain Station Observatory, all-sky monitoring with the Fly's Eye camera system, digitalised photo plate archive spanning many decades

## 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](mailto:science@unideb.hu)

: 1978  
 : 54 / 110 persons  
 : 20 projects





address: 3529 Miskolc, Egyetemváros  
web: [www.matsci.uni-miskolc.hu](http://www.matsci.uni-miskolc.hu)



address: 1117 Budapest, Pázmány Péter sétány 1/A.  
web: [sas2.elte.hu](http://sas2.elte.hu)



TD-4

4.1

4.3

TD-1

1.1

TD-7

7.2

TD-14

14.2

14.4

TD-26

The Research Group was established in 1996 as a part of Materials Science Institute of University of Miskolc. The main activities include the study of the phase transformation in the alloys, primarily the investigation and simulation of solidification. For the investigation, the Institute has modern equipment. The Research Group organises the international solidification (SG) conferences.

The Research Group established a laboratory for solidification, designed and built equip-

ment. A piece of their equipment is able to stir the molten metal during solidification using rotating or travelling magnetic fields. The unique parameters of the equipment make it possible to carry out experiments as in no other laboratory. They developed a solidification technology which was later taken over by other teams, as well, and applied at space experiments. The SGMU team organised the SOLGRAV (Solidification & Gravity) international solidification conference in Miskolc-Lillafüred.

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.

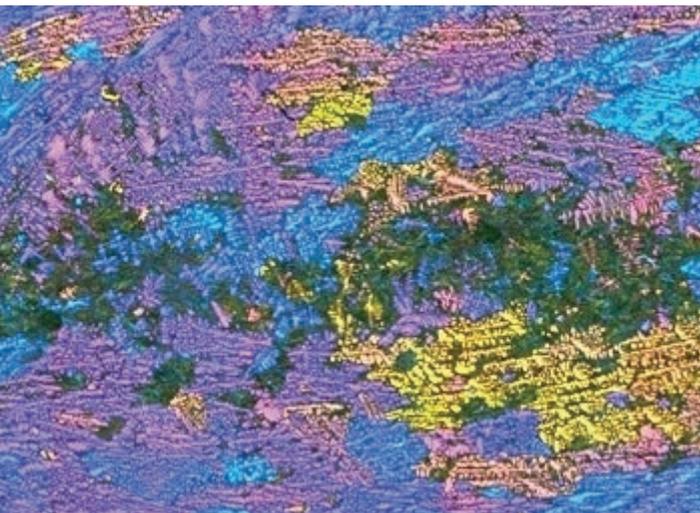
We established and operate the global Automatic Whistler Detector and Analyzer Network (AWDANet), that is capable to monitor the electron density of the plasmasphere in near real-time – a key parameter for wave-particle interaction.

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

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

👤 : András Roósz  
☎ : +36 45 565 201  
@ : [femroosz@uni-miskolc.hu](mailto:femroosz@uni-miskolc.hu)

📅 : 1996  
👥 : 4 / 10 persons  
📄 : 2 projects



#### MAIN PROJECTS

- Columnar-to-Equiaxed Transition in SOLidification Processing (CETSOL)
- Microstructure Formation in CASTing of Technical Alloys under Diffusive and Magnetically Controlled Convective Conditions (MICAST)

#### LABS

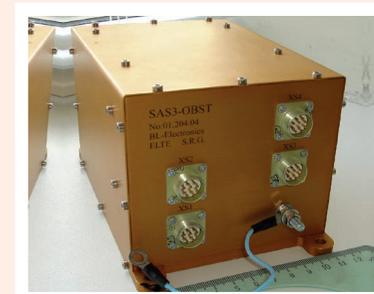
- Solidification equipment with rotating magnetic field
- Computer tomograph
- Transmission electron microscope
- Scanning electron microscopes, X-ray diffractometer

#### MAIN PROJECTS

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

#### LABS

Automatic Whistler Detector and Analyzer Network



👤 : János Lichtenberger  
☎ : +36 1 372 2934  
@ : [spacerg@sas.elte.hu](mailto:spacerg@sas.elte.hu)

📅 : 1970  
👥 : 11 / 11 persons  
📄 : 6 projects





# CENTRE FOR ENERGY RESEARCH

address: 1121 Budapest, Konkoly-Thege Miklós út 29-33.  
postal address: 1525 Budapest, Pf. 49  
web: [www.ek-cer.hu](http://www.ek-cer.hu) [www.spacedosimetry.com](http://www.spacedosimetry.com)



address: 4281 Létavértes, Bem J. u 6/A.  
web: [www.envirosense.hu](http://www.envirosense.hu)

# ENVIROSENSE HUNGARY LTD.



Centre for Energy Research (EK) is a member of the Eötvös Loránd 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 ser-

vice instruments, esp. for space weather and dosimetry. Activities with TRL higher than 4 are conducted by its spin-off company REMRED Ltd. EK provides radiation analysis services including radiation environment description for different missions/orbits using SPENVIS, OLTARIS and CREMEg6 tools, radiation transport calculations with the GRAS Monte Carlo tool using Geant4 to provide estimation of TID and LET spectra, and technical support for TID tests at its campus

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.

TD-14
14.1
14.2
TD-1
1.1
TD-4
4.1
4.2
4.3

: Attila Hirn  
 : +36 1 392 2291  
 : [spacelab@ek-cer.hu](mailto:spacelab@ek-cer.hu)  
 : SINCE : 1991  
 : 7 / 362 persons  
 : 13 projects



**MAIN PROJECTS**

- Rosetta/Philae
- Vega-1,-2
- ISS Russian Segment service dosimetry system
- Phobos-1, -2
- RadMag-L Space Weather Instrument Development

**LABS, CERTIFICATION**

- ISO 9001:2015
- Irradiation Facility (neutron, alpha and gamma radiation sources)

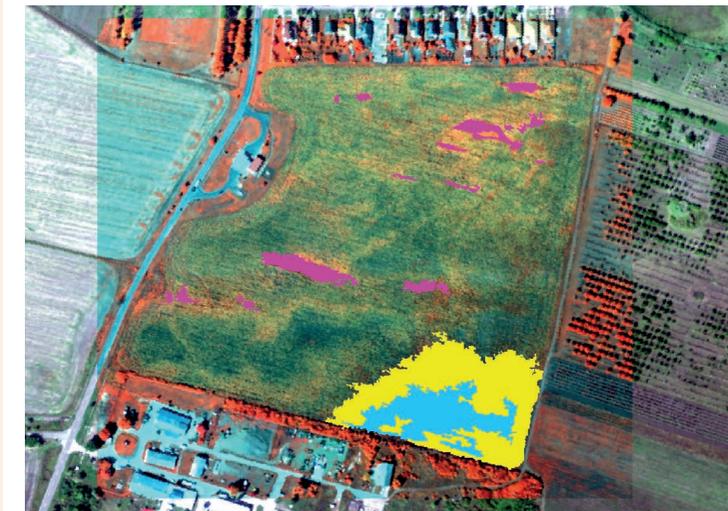
**MAIN PROJECTS**

- 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

: Orsolya Gyöngyi Varga  
 : +36 30 169 2353  
 : [orsolya.varga@envirosense.hu](mailto:orsolya.varga@envirosense.hu)  
 : SINCE : 2009  
 : 5 / 16 persons  
 : 120 / 330 M HUF





address: 3300 Eger, Eszterházy tér 1.  
postal address: 3300 Eger, Leányka u. 6.  
web: [www.uni-eszterhazy.hu](http://www.uni-eszterhazy.hu)

The research group was formed in early 2019 with competencies in (i) astronomy, astrophysics and (ii) meteorology. There are nine experts working in the group, six of them are also involved in research, which is currently limited to area (i). At the same time, the group highlights the results of science in both areas in science teacher training and the doctoral school of education.

The scientific research fields in astronomy include two areas: studies of planetological

aspects in terrestrial samples as well as laboratory experiments, and computer modelling of planetary motion. This basic research in the natural sciences, through knowledge of the behaviour of matter and life under extreme conditions, can later find industrial, agricultural, and environmental applications. Meteorological knowledge enhancement focuses on satellite observations and understanding of climate change, towns with fragmented relief, and natural vegetation processes.

address: 1077 Budapest, Wesselényi utca 16.  
web: [www.geodat.hu](http://www.geodat.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 control, 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 efficiently 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).



👤 : Arnold Gucsik  
☎ : +36 30 630 7297  
@ : [gucsik.arnold@uni-eszterhazy.hu](mailto:gucsik.arnold@uni-eszterhazy.hu)

📅 : 2019  
👥 : 9 / 9 persons  
📄 : 0 project

MAIN PROJECT

- ESA HERA Impact Simulation Working Group

LABS

- Meteorite samples
- Rock and mineral collection
- Mineralogical thin sections
- Hyperspectral camera
- Stereo microscope
- Optical microscope

MAIN PROJECTS

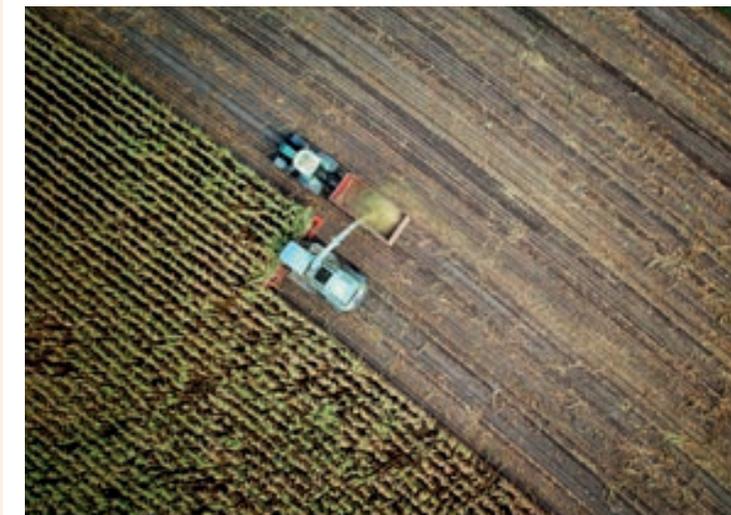
- Control with Remote Sensing (CwRS) in Germany for federal states
- Update of the German Land Parcel Identification System (LPIS)
- Agricultural Biomass Monitoring (EUREKA applied research)
- Recycling resource management with Earth observation decision-support information (REMEDI)
- Demonstrating EO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

CERTIFICATES

- TÜV ISO-9001, ISO-27000
- TÜV ISO-9001, ISO-27000

👤 : Péter Hargitai  
☎ : +36 30 602 1020  
@ : [geodat@geodat.hu](mailto:geodat@geodat.hu)

📅 : 1997  
👥 : 12 / 20 persons  
📄 : na / 292 M HUF



TD-26



address: 2132 Göd, Kacsóh P. u. 13.  
postal address: 1775 Budapest, Pf. 29  
web: [www.geo-sentinel.hu](http://www.geo-sentinel.hu)

TD-10

10.2



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.

address: 4220 Hajdúböszörmény, Külső-Hadházi u. 24.  
web: [www.goodwilltrade.hu](http://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.

TD-23



TD-14



TD-18



18.2

18.3

TD-20



20.10

TD-24



24.2

👤 : Péter Farkas  
☎ : +36 30 785 4075  
@ : [info@geo-sentinel.hu](mailto:info@geo-sentinel.hu)

**SINCE** : 2015

👥 : 2 / 2 persons

🏠 : 48 / 48 M HUF

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

MAIN PROJECTS

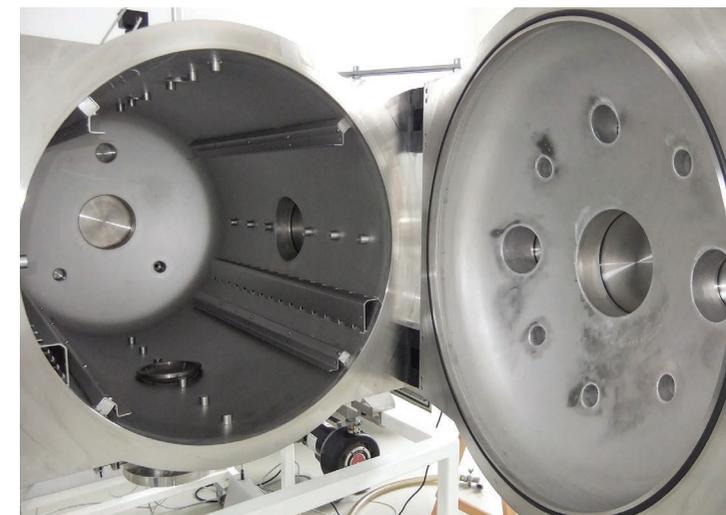
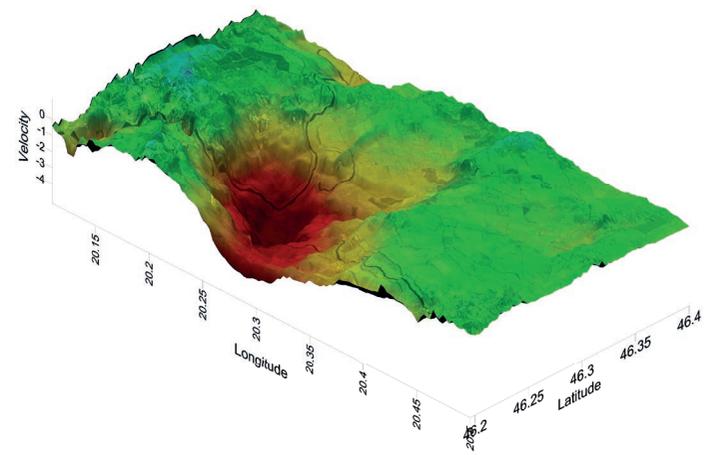
- Producer and supplier of cartridges for foaming the FOCUS experiment in ISS Columbus modul (2006-2010)
- Structural part producer and supplier of Sentinel-2A and Sentinel-2B (MSI) MMTH-Metallic Mechanical and Thermal Hardware (2010-2013)
- Producer and supplier of CHEOPS FPA radiator + FEE radiator (2016-2016)
- Helium leak 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](mailto:olahne.nora@goodwilltrade.hu)

**SINCE** : 1993

👥 : 23 / 23 persons

🏠 : 12 / 328 M HUF



address: 1121 Budapest, Konkoly-Thege Miklós út 29-33.  
web: [www.h-ion.hu](http://www.h-ion.hu)

address: 3519 Miskolc, Trencsényi u. 24.  
web: [www.innobay.hu](http://www.innobay.hu)

H-ION Ltd. started its first space industry related materials sciences projects in 2017. Currently we have one running project and three others in preparation. Our activity covers two main areas:

- materials science research and development – the creation of innovative materials with new structures and properties
- development and production of flow chemistry equipment and systems

Our space activity include:

Providing materials science research and

development services for high temperature functional and structural applications of thermal insulators and alloys. Development of thermal insulators for applications above 1500 °C. Design of material testing solutions in 1PQ-1U satellite size. Reactor design, construction, microfluidical experiments, and implementation of 1U size microgravity experiments. Research and development of geometry-independent electrical shielding insulators which can be applied as coated surface layers. Nanosatellite trajectory modification methodology research.

Our goal is to provide companies and government organisations with innovation-business development and economic development services. The company has a back-ground in engineering and physics, led by Norbert Babcsán. The company's professional back-ground 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 competence serves the better understanding of the impact of weightlessness. Space technology competence help to create Hungarian start-up companies.

TD-21  
21.3



TD-24  
24.1



TD-24  
24.1



👤 : Zoltán Czafik  
☎ : +36 30 768 5205  
@ : [zoltan.czafik@h-ion.hu](mailto:zoltan.czafik@h-ion.hu)

**SINCE** : 2011  
👥 : 6 / 24 persons  
🏠 : 18 / 671 M HUF

### MAIN PROJECT

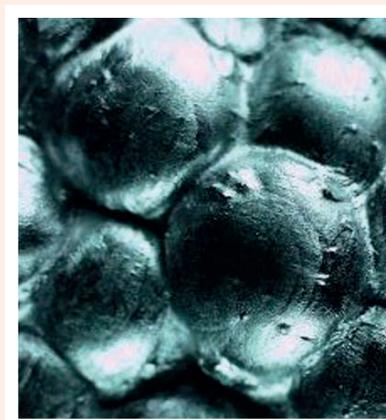
- ATL-1 2PQ nanosatellite

### LABS

- Zeiss Sigma-300 type electron microscope
- FOUNDRY-MASTER Optimum type spectrometer
- Metallurgy laboratory
- Vacuum operational melting furnace
- Microreactors

### 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



👤 : Norbert Babcsán  
☎ : +36 30 415 0001  
@ : [info@innobay.hu](mailto:info@innobay.hu)

**SINCE** : 2011  
👥 : 1 / 2 persons  
🏠 : 2 / 29 M HUF





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

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

TD-14

14.1

14.2

14.3,14.4

TD-4

4.2



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<sub>2</sub> 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

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.

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

📅 : 2013  
👥 : 6 / 9 persons  
🏠 : 60 / 148 M HUF

MAIN PROJECTS

- Development of miniaturized autonomous laboratory for advanced flow chemical reactor for microgravity and space applications (HU-ISR bilateral project)
- Chemical formulation experiments on ISS (SpaceX, CRS-19)



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

👤 : Mihály Veres  
☎ : +36 52 509 280  
@ : veresmihaly@isoptech.hu

📅 : 1997  
👥 : 6 / 38 persons  
🏠 : 0 / 591 M HUF



- TD-15
- 15.7
- TD-20
- 20.1
- 20.10



address: 9081 Győrújbarát, István utca 176.  
 postal address: 1056 Budapest, Váci utca 60.  
 web: [www.jglobe.hu](http://www.jglobe.hu)

Our main activity is production of prototypes, precision CNC machining (milling, turning, grinding, EDM), development, design and production of assembly lines, measuring devices and measuring instruments for space, automotive, packaging, plastics, medical, high-tech, tobacco and printing industries. Our machinery plant of 2800 square metres with modern machinery hall is suitable to meet the customers' needs.

Space: Manufacturing of RADCUBE outer box, PCB holders, and solar panel opener.

Manufacturing of RadMag instrument and telescope components and transport box. Designing and manufacturing of D3S RadMag cosmic radiation measuring instruments and telescopic systems.

In addition, Julius-Globe participated in the production of CNC machined parts for the Hungarian-made Panther 5 ventilator produced during the COVID-19 epidemic. It can be used for invasive ventilation in the intensive care units.

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



TD-26



TD-10

10.2

: Erika Rác  
 : +36 96 543 286  
 : [erika.racz@jglobe.hu](mailto:erika.racz@jglobe.hu)  
 : 1998  
 : 4 / 41 persons  
 : 9 / 1113 M HUF

MAIN PROJECTS

- D3S RadMag
- RadMag
- RADCUBE

CERTIFICATES

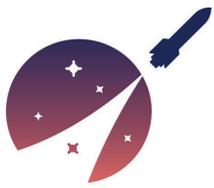
- ISO 9001:2015

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

: Ambrus Kenyeres  
 : +36 27 200 801  
 : [ambrus.kenyeres@lechnerkozpont.hu](mailto:ambrus.kenyeres@lechnerkozpont.hu)  
 : 1967  
 : 30 / 510 persons  
 : 6 projects





## HUNGARIAN ASTRONAUTICAL SOCIETY

address: 1044 Budapest, Ipari park u. 10.  
web: [www.mant.hu](http://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.

## MINING AND GEOLOGICAL SURVEY OF HUNGARY, DEPARTMENT OF GEOPHYSICAL OBSERVATORIES AND BASIC RESEARCH



address: 1145 Budapest, Columbus u. 17-23.  
postal address: 1590 Budapest, Pf. 95  
web: [www.mbfsz.gov.hu](http://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

👤 : Anna Krisztina Székely  
☎ : +36 20 935 2114  
@ : [iroda@mant.hu](mailto:iroda@mant.hu)

📅 : 1956

### MAIN PROJECTS

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



### MAIN PROJECTS

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

### LABS

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

### CERTIFICATIONS

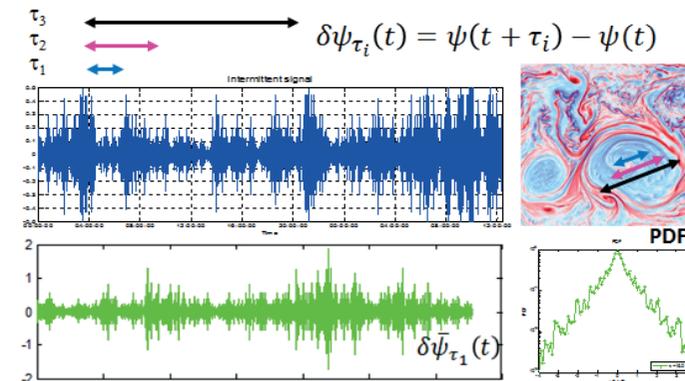
ISO 9001:2015

👤 : Balázs Heilig  
☎ : +36 87 448 501  
@ : [heilig.balazs@mbfsz.gov.hu](mailto:heilig.balazs@mbfsz.gov.hu)

📅 : 1954

👥 : 3 / 12 persons

📁 : 8 projects





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

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

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<sub>4</sub> 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.

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.

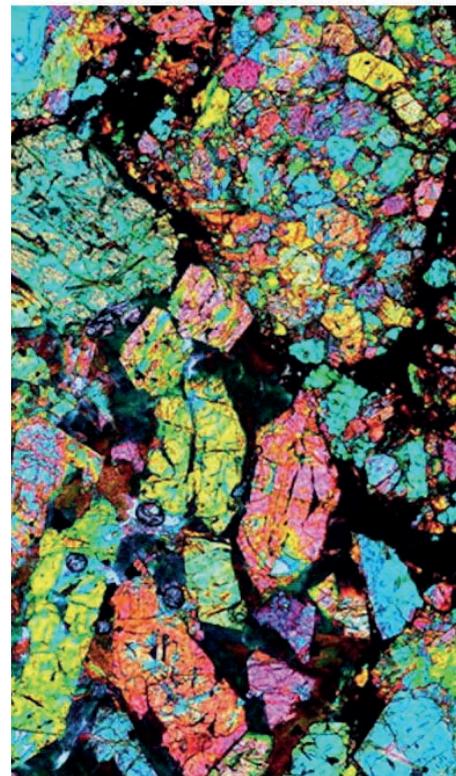
Conversion coating development as a substitution of Alodine. SURTEC650 is used in the development in a cooperation with ESA and Admatis. The new environment

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.

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

📅 : 2017  
👥 : 0 / 1 persons  
🏠 : 0 / 39 M HUF



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

📅 : 2008  
👥 : 4 / 4 persons  
🏠 : 50 / 65 M HUF





address: 1024 Budapest, Kitaibel Pál utca 1.  
postal address: 1525 Budapest, Pf. 38  
web: [www.met.hu](http://www.met.hu)

address: 8000 Székesfehérvár, Pirosalma u. 1-3.  
web: [www.amk.uni-obuda.hu/index.php/hu/](http://www.amk.uni-obuda.hu/index.php/hu/)



TD-26



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 agrometeorological studies and are assimilated into our limited-area numerical weather prediction models.

The Óbuda University has been established as the successor of Budapest-based technical colleges. The curriculum contains several courses on different fields of electronic, mechanical, and light industry engineering, engineering informatics, economics, among others. The research activity of the University is coordinated by the University Research, Innovation and Service Center (EKIK).

Research in the field of Earth observation and Remote Sensing is performed at the

Institute of Geoinformatics in Székesfehérvár. Space research activity covers fundamental and applied research levels as well. The institute is active in the fields of remote sensing, space gravimetry and GNSS, as well. Several international projects are conducted in the Institute, most of them focusing on educational aspects of Earth observation. The Institute organises the annual GISopen conference, which has a thematic space research section in the most recent years.



TD-26

: Eszter Lábó-Szapponos  
 : +36 1 346 4664  
 : [labo.e@met.hu](mailto:labo.e@met.hu)

: 1870  
 : 5 / 196 persons  
 : 6 projects

#### MAIN PROJECTS

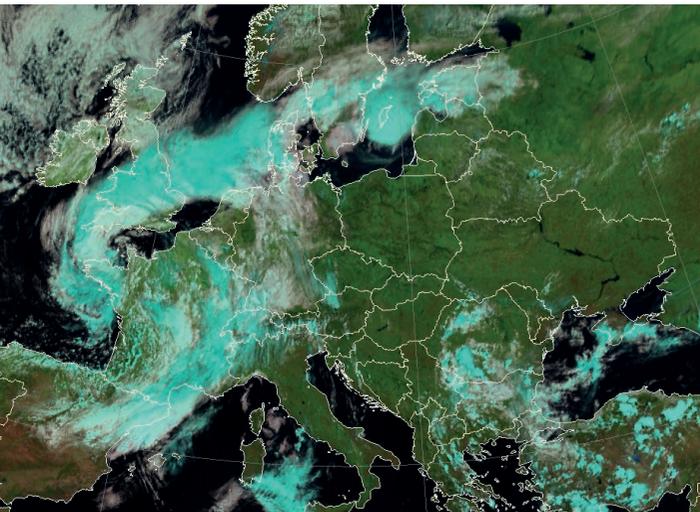
- EUMETTrain: International training project sponsored by EUMETSAT to support and increase the use of meteorological satellite data (participation of OMSZ since 2014)
- H-SAF: EUMETSAT Satellite Application Facility on Support to Operational Hydrology and Water Management (participation of OMSZ since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

#### MAIN PROJECTS

- IRSEL
- DSinGIS
- GE-UZ
- WAREMA
- VENUS

: Lóránt Földváry  
 : +36 22 200 414  
 : [foldvary.lorant@amk.uni-obuda.hu](mailto:foldvary.lorant@amk.uni-obuda.hu)

: 1972  
 : 6 / 12 persons  
 : 4 projects



- TD-12
- 12.1
- 12.2
- TD-1
- 1.1
- 1.2;1.3
- TD-2
- 2.3
- 2.4



address: 1119 Budapest, Fehérvári út 89-95.  
web: [www.pcbdesign.hu](http://www.pcbdesign.hu)

We are a professional engineering service provider. We provide system design, schematic capture, PCB layout, IBIS simulation, embedded software development and small series high-end prototyping services. Our key knowledge is designing rugged complex digital systems, with most advanced serial interfaces (10G+). We are proud to have customers from all over the world.

PCB Design Ltd. is involved in 30+ projects, where we design 100+ PCBs annually. With

Safran/Zodiac Aerospace (DE), we have been involved in the development of a modular data acquisition system that transmits telemetry data – including video – from space. We have developed a high-reliability 80Gb/s Ethernet Switch family for OnTime Networks (NO). These products are used in numerous flight tests. We design according to MIL-STD and DO standards frequently. The engineering team is also experienced in high reliability design and manufacturing techniques.

address: 1121 Budapest, Konkoly-Thege Miklós út 29-33.  
web: [remred.space](http://remred.space)

The primary mission of REMRED Technologies Ltd. is to develop, test and adopt technologies and techniques for space applications, particularly for space research instrumentation for national and foreign industrial users. The company provides specific space industrial services, like vibration and T-VAC testing of small space equipment according to ECSS, cleanroom (ISO7) soldering and assembly, space engineering consultancy and detailed design development of small space

equipment in the fields of mechanics, electronics and related software. REMRED Ltd. offers some specific instrumentation as space market products in the field of space weather, cosmic radiation and space dosimetry monitoring. The company has the expertise in coordinating activities related to flight models of specific small equipment and space research instruments from manufacturing through assembly until the end of acceptance testing, including specific calibration campaigns.

- TD-14
- 14.1
- 14.2
- TD-4
- 4.2
- 4.3
- TD-8
- 8.4

: János Lazányi  
 : +36 20 399 7184  
 : [janos.lazanyi@pcbdesign.hu](mailto:janos.lazanyi@pcbdesign.hu)  
 : 2014  
 : 7 / 21 persons  
 : na / 305 M HUF

MAIN PROJECTS

- Air- and spacecraft development: modular data recorder and communication equipment
- Ground system data processing equipment

LABS, CERTIFICATES

- ISO9001:2015
- Thermal chamber
- High-speed oscilloscope, signal generator, other instruments
- Experience in MILSTD and DO certification measurements

MAIN PROJECTS

- ISS Russian Segment Service Dosimetry System
- RadMag-L Space Weather Instrument Development
- Hungarian Neutron Monitor Ground Station Development and Establishment
- Comet Interceptor Mission Camera DPU Development

LABS

ECSS-conform

- Space Research and Development Laboratories,
- Vibration Test Facility,
- Thermal-Vacuum Test Facility,
- ISO7 Cleanroom for space equipment production and assembly

: István Apáthy  
 : +36 20 983 9394  
 : [info@remred.hu](mailto:info@remred.hu)  
 : 2016  
 : 5 / 5 persons  
 : 30 / 30 M HUF



TD-1

1.1

1.2

TD-2

2.2

2.3



address: 1121 Budapest, Konkoly-Thege M. u. 29-33.  
postal address: 1525 Budapest, Pf. 49  
web: [www.sgf.hu](http://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).

address: 6200 Kiskőrös, Batthyány u. 47.  
web: [www.space-apps.net](http://www.space-apps.net)

Remote sensing, IoT, machine learning and web-based technologies became accessible for every user. Space Apps is researching business perspectives in services based on the synergy of the four domains. In remote sensing, we started with automatic optical image processing, later turned to radar imagery. We use artificial intelligence methods to process data in our hybrid cloud. Additional local measurements are Supplied by our IoT devices.

Projects:

- BeeBox – ESA-BIC: The intelligent hive solution is benefiting from remote sensing, IoT, AI and web technologies, providing useful data for the beekeeper from his hive, and EO data from the surroundings. The first startup project selected by the ESA - BIC Budapest.
- Beeonosphere – GGI: Researching connections between bee behaviour and changes in the ionosphere.
- CropGuard – ESA: A platform developed for farmers to access fresh remotelysensed data of their fields.



TD-26

👤 : Gábor Tróznai  
☎ : +36 30 267 6576  
@ : [info@sgf.hu](mailto:info@sgf.hu)

**SINCE** : 1996  
👥 : 5 / 5 persons  
🏢 : 78 / 78 M HUF

### 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.

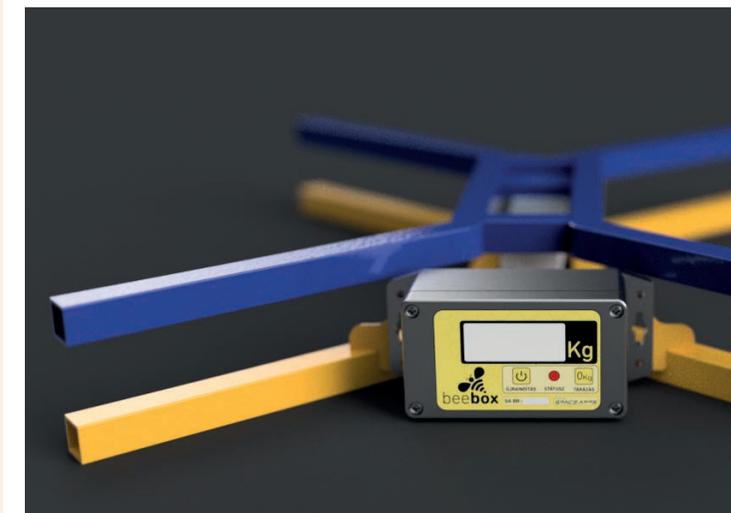
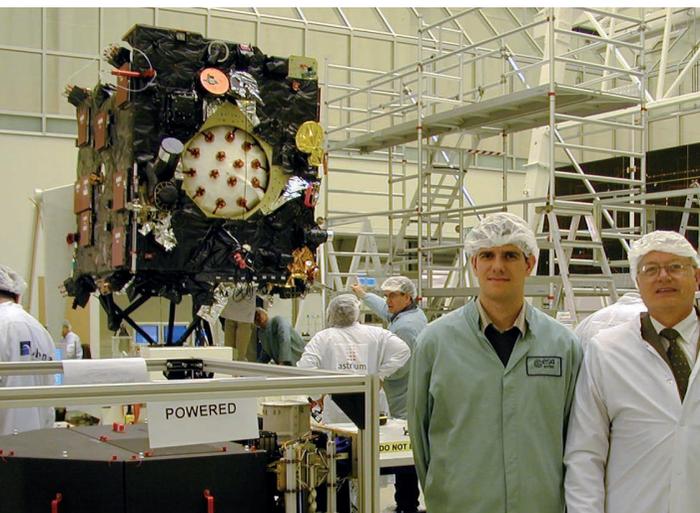
### MAIN PROJECTS

- BeeBox
- Beeonosphere
- CropGuard



👤 : István Arnócz  
☎ : +36 20 294 7278  
@ : [istvan.arnocz@space-apps.net](mailto:istvan.arnocz@space-apps.net)

**SINCE** : 2016  
👥 : 2 / 5 person  
🏢 : 7 / 7 M HUF





address: 6720 Szeged, Rerrich Béla tér 1.  
web: [www2.sci.u-szeged.hu/physchem/nld/](http://www2.sci.u-szeged.hu/physchem/nld/)



Our team at the Department of Physical Chemistry and Materials Science is interested in chemo-hydrodynamic instabilities in reactive systems. 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. We are currently participating in the oncoming TEXUS 57 sounding rocket where the flow-driven production of a complex material will be investigated.

Our expertise, besides the characterisation of hydrodynamic flows of reactive systems, is the experimental investigation of flow-driven complexation and crystallisation, and the related numerical calculations in three spatial dimensions. The outreach of the results goes beyond basic science. Our students, who are interested in pursuing activity in R&D, are not only able to solve complex problems independently, but also become experienced in interdisciplinary fields and can work in international collaborations.



address: 6000 Kecskemét, Balaton u. 17.  
web: [www.klinikaikozpont.u-szeged.hu/repulo/index\\_hu.htm](http://www.klinikaikozpont.u-szeged.hu/repulo/index_hu.htm)

The Department of AvMed in the University of Szeged has a leading role in research and gradual/postgradual education in aviation and space medicine since 2000, focusing on space-related physiological and psychological problems and spreading scientific information in cooperation with the Aeromedical Institute of Hungarian Defence Forces, participating in grants from EU, ESA and the Hungarian Academy of Sciences.

The lecturers of Dept. of AvMed were formerly actively involved in the specific and

successful process for selection of the first Hungarian cosmonaut, Bertalan Farkas, in the former Aeromedical Institute of the Medical Centre of Hungarian Defence Forces. The functional diagnostic test tools and instruments (esp. barochamber) provide venue for active research work even now, to evaluate the cerebral autonomous vasoregulation and oxygen utilisation integrated into Virtual Reality (space)flight settings (e.g. EVA), creating a photorealistic stressful situation for astronaut candidates.



TD-14

14.3

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

📅 : 2008  
👥 : 4 / 8 persons  
📄 : 2 projects

#### MAIN PROJECTS

- 56th ESA parabolic flight campaign
- MASER-13 (CDIC-3 module) sounding rocket campaign
- 73rd ESA parabolic flight campaign
- TEXUS 57 (CHIPY-Flower module) sounding rocket campaign



#### MAIN PROJECTS

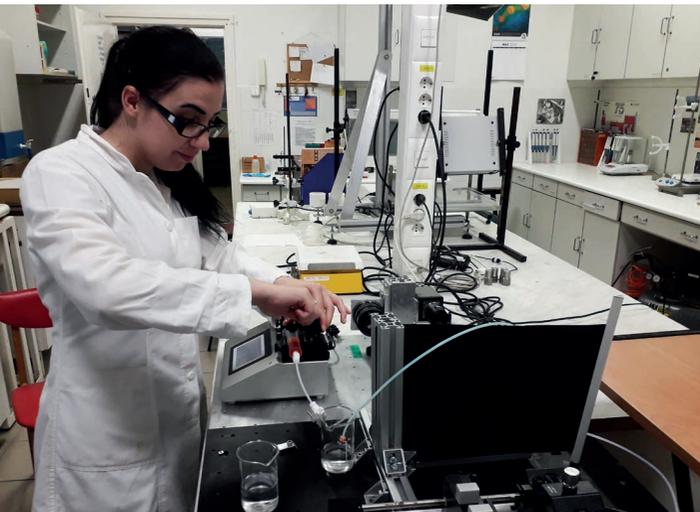
- VOLARE (GINOP-2.3.2-15)
- FIPOK (NKIH KFI 16)
- MTA DOMUS lab improvement

#### LABS, CERTIFICATES

- MSZ EN ISO 9001:2015
- MSZ EN 15224:2013
- barochamber
- exercise ECG
- tilting table
- pressure breathing test
- EASA (European Aviation Safety Agency) accreditation

👤 : Sándor András Szabó  
☎ : +36 30 815 0179  
@ : office.repurt@med.u-szeged.hu

📅 : 2000  
👥 : 4 / 5 persons  
📄 : 4 projects





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



address: 1121 Budapest, Konkoly Thege Miklós u. 29-33.  
postal address: 1525 Budapest, Pf. 49  
web: www.wigner.hu/en/institute-particle-and-nuclear-physics



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 Antarctica or the SIRIUS space simulation. 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. We also investigate the physiological impact of spaceflight-related stressors on the ISS and space analogues. With our expertise in cognitive neuroscience techniques we have demonstrated the detrimental effect of spaceflight on cognitive performance and brain electrical correlates of attention. Our results are applicable to everyday situations such as isolation in the elderly population or performance monitoring in stressful working conditions.

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.



TD-1

1.1

1.2;1.3

TD-2

2.2

2.3;2.4

TD-3

3.4

TD-4

4.1

4.3

Person icon : Bea Ehmann  
Phone icon : +36 1 382 6811  
Email icon : ehmann.bea@ttk.hu

SINCE : 1902  
Person icon : 7 / 491 persons  
2019  
Project icon : 3 projects  
15/19



MAIN PROJECTS

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

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

Person icon : Zoltán Németh  
Phone icon : +36 1 392 2222/1228  
Email icon : nemeth.zoltan@wigner.hu

SINCE : 1992  
Person icon : 16 / 171 persons  
2019  
Project icon : 10 projects  
15/19





address: 1121 Budapest, Konkoly Thege Miklós u. 29-33.

postal address: 1525 Budapest, Pf. 49

web: [www.wigner.hu/szilardtestfizikai-es-optikai-intezet](http://www.wigner.hu/szilardtestfizikai-es-optikai-intezet) [www.phasefield.hu](http://www.phasefield.hu)



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 fundamen-

tal 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.hu](mailto:granasy.laszlo@wigner.hu)

: 1999  
 : 5 / 154 persons  
 : 4 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)
- ESA MAP project PARSEC (2017 - ) (solidification experiments on ISS: in 2020/2021/2022)
- ESA MAP project METCOMP (2014 - ) (solidification experiments on ISS: 2020)

### 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

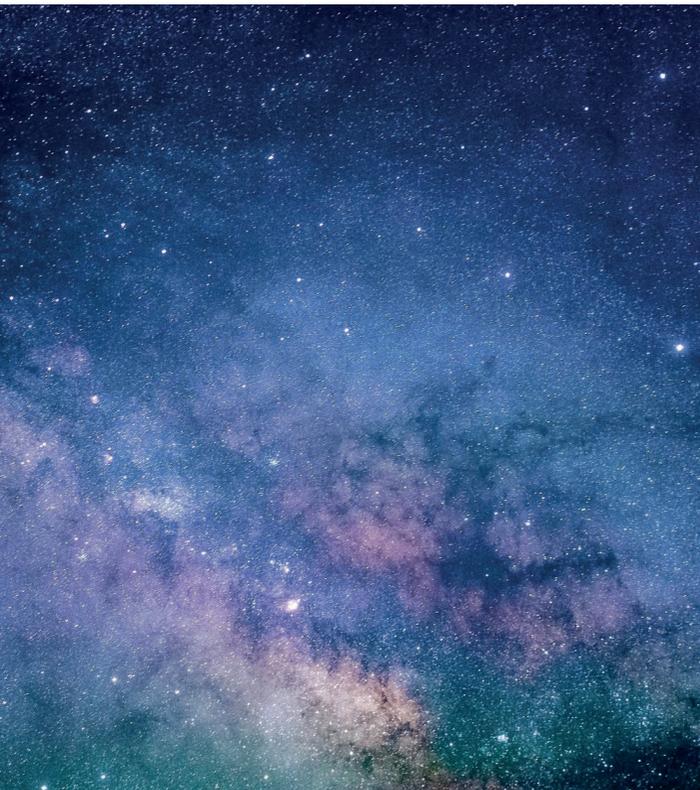
**HUNSPACE**  
**HUNGARIAN SPACE CLUSTER**

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 division
- Earth Observation division



**Founded: 2007**

**President: János Solymosi**

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

**web: [www.haif.org/HATP.html](http://www.haif.org/HATP.html)**

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

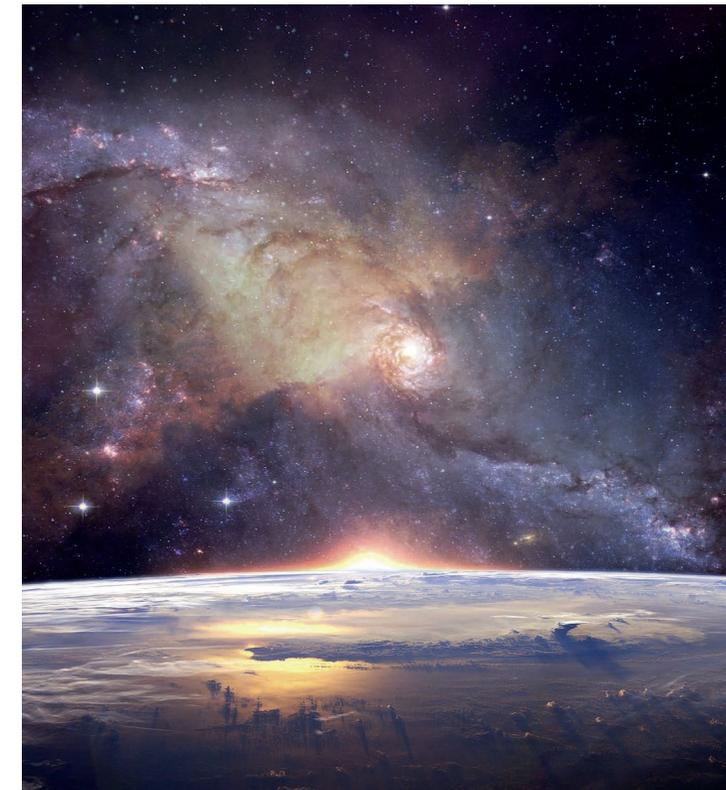
**Founded: 2007**

**President: Péter Hargitai**

**Address: 3534 Miskolc,  
Kandó Kálmán u. 5.  
e-mail: [hunspace@hunspace.org](mailto:hunspace@hunspace.org)**

**web: [www.hunspace.org](http://www.hunspace.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-19	TD-20	TD-21	TD-23	TD-24	TD-25	TD-26	OTHER	
ADMATIS																								
AEDUS				●							●					●	●	●			●	●		
AIRBUS HUNGARY																							●	
BAY												●		●			●	●			●		●	
BHE					●					●														
BL-ELECTRONICS	●	●									●													
BME		●	●						●			●	●					●					●	
BME HVT	●	●	●		●	●		●		●		●	●		●									
BME MOGI	●	●					●						●	●									●	
C3S	●	●	●		●		●	●		●		●			●		●	●						●
COSIMA KFT.																							●	
CSFK FGI											●													
CSFK GGI																							●	
CSFK KTM CSI	●							●			●													
DE-SPACE																							●	
EK	●			●							●													
ELTE	●			●		●					●												●	
ENVIROSENSE																							●	
GEOADAT																							●	
GEO-SENTINEL									●														●	
GOODWILL-TRADE											●				●		●		●	●				
H-ION																	●				●			
INNOBAY HUNGARY																					●			
INNOSTUDIO																								●
ISOTOPTECH				●							●													
JULIUS GLOBE												●					●							
LECHNER									●														●	
MBFSZ				●																				
MCSN											●													
MATMOD																					●			
OMSZ																							●	
ÓE																							●	
PCB DESIGN	●	●								●														
REMRED				●			●				●													
SGF	●	●																						
SPACE APPS																							●	
SZTE NLD											●													
SZTE RÜT											●													
TTK KIPI											●													
WIGNER RMI	●	●	●	●																				

## MAIN SPACE RESEARCH AREAS OF HUNGARIAN ORGANISATIONS

ADMATIS					●					
AEDUS		●			●					
ATOMKI					●				●	
BME			●							●
BME HVT										●
BME MOGI			●						●	
C3S										●
COSIMA KFT.					●					●
CSFK FGI					●					
CSFK GGI			●	●			●	●		
CSFK KTM CSI	●								●	
DE-SPACE		●			●					
EK		●			●					
ELTE		●					●	●		
ELKH-MISKOLC					●					
EKE	●					●				
ELTE						●	●			
GEOADAT						●				
H-ION					●					
INNOBAY HUNGARY			●							
INNOSTUDIO					●					
ISOTOPTECH					●					
JULIUS GLOBE						●				
LECHNER					●					
MBFSZ					●		●	●		
MATMOD					●					
OMSZ						●				
ÓE										
PCB DESIGN					●					
REMRED					●					
SGF										
SPACE APPS		●								
SZTE NLD		●								
TTK KIPI		●								
WIGNER RMI							●	●		
WIGNER SZFI					●					

# CONTENT

---

3	.....	WELCOMES
8	.....	SPACE ACTIVITY OF HUNGARY
10	.....	LEGEND
14	.....	ADMATIS LTD.
15	.....	AEDUS SPACE LTD.
16	.....	AIRBUS DS GEO HUNGARY LTD.
17	.....	INSTITUTE FOR NUCLEAR RESEARCH
18	.....	BAY ZOLTÁN NONPROFIT LTD. FOR APPLIED RESEARCH
19	.....	BHE BONN HUNGARY ELECTRONICS LTD
20	.....	BL-ELECTRONICS
21	.....	BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
22	.....	BME DEPT. OF MECHATRONICS, OPTICS AND MECHANICAL ENGINEERING INFORMATICS
23	.....	BME DEPT. OF BROADBAND INFOCOMM. AND ELECTROMAGNETIC THEORY
24	.....	C3S ELECTRONICS DEVELOPMENT LLC.
25	.....	COSIMA LTD.
26	.....	CSFK, INSTITUTE FOR GEOLOGICAL AND GEOCHEMICAL RESEARCH
27	.....	CSFK, GEODETIC AND GEOPHYSICAL INSTITUTE
28	.....	CSFK, KONKOLY OBSERVATORY
29	.....	UD-SPACE (UNIVERSITY OF DEBRECEN SPACE RESEARCH PROGRAM)
30	.....	ELKH-UNIVERSITY OF MISKOLC MATERIALS SCIENCE RESEARCH GROUP
31	.....	SPACE RESEARCH GROUP, ELTE DEPT. OF GEOPHYSICS AND SPACE SCIENCES
32	.....	SCIENCES CENTRE FOR ENERGY RESEARCH
33	.....	ENVIROSENSE HUNGARY LTD.
34	.....	EKU, RESEARCH GROUP OF PLANETOLOGY AND SATELLITE EARTH OBSERVATION
35	.....	GEODATA LTD.
36	.....	GEO-SENTINEL RESEARCH, SERVICE AND CONSULTING LTD.
37	.....	GOODWILL-TRADE LTD
38	.....	H-ION RESEARCH, DEVELOPMENT AND INNOVATION LTD.
39	.....	INNOBAY HUNGARY LTD.
40	.....	INNOSTUDIO INC.
41	.....	ISOTOPTEC ZRT.
42	.....	JULIUS GLOBE LTD.
43	.....	LECHNER NON-PROFIT LTD.
44	.....	MANT, HUNGARIAN ASTRONAUTICAL SOCIETY
45	.....	MINING AND GEOLOGICAL SURVEY OF HUNGARY
46	.....	HUNGARIAN ASTRONOMICAL NON-PROFIT LTD.
47	.....	MATMOD KFT
48	.....	OMSZ HUNGARIAN METEOROLOGICAL SERVICE
49	.....	ÓBUDA UNIVERSITY, INSTITUTE OF GEOINFORMATICS
50	.....	PCB DESIGN LTD.
51	.....	REMRED SPACE TECHNOLOGIES LTD.
52	.....	SGF TECHNOLOGY ASSOCIATED CO. LTD.
53	.....	SPACE APPS KFT.
54	.....	UNIVERSITY OF SZEGED, NONLINEAR DYNAMICS AND KINETICS GROUP
55	.....	UNIVERSITY OF SZEGED, DEPARTMENT OF AVIATION AND SPACE MEDICINE
56	.....	TTK, INSTITUTE OF COGNITIVE NEUROSCIENCE AND PSYCHOLOGY
58	.....	WIGNER, INSTITUTE FOR PARTICLE AND NUCLEAR PHYSICS
59	.....	WIGNER, INSTITUTE FOR SOLID STATE PHYSICS AND OPTICS
60	.....	HATP CLUSTER
61	.....	HUNSPACE CLUSTER
62	.....	MAIN SPACE TECHNOLOGICAL COMPETENCES OF HUNGARIAN ORGANISATIONS
63	.....	MAIN SPACE RESEARCH AREAS OF HUNGARIAN ORGANISATIONS