Budapest University of Technology and Economics
Faculty of Electrical Engineering and Informatics

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Faculty of Electrical Engineering and Informatics

Prof. Hassan Charaf
Dean

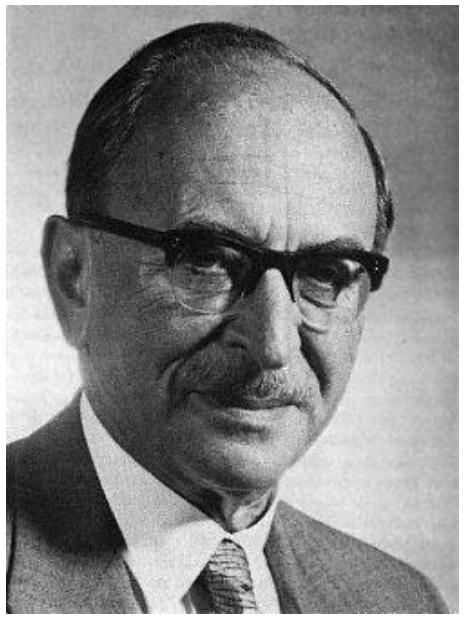
Basic facts about BME

- **21,000 students**
- **2000 international students**
- **1,500 teaching faculty staff**
- **22 buildings**
- **Eight faculties**
- **242+ years of tradition**

Nobel prize laureates from BME

Jenő Wiegner (1902-1995)
1963, Physics
(Albert Einstein prize
in 1970)

Gábor Dénes (1900-1979)
1971, Physics



György Oláh (1924-)
1994, Chemistry

New issues

2 new Nobel-prize

Karikó Katalin (1955-) 2023, Biochemistry: BME Neumann Professzor

Ferenc Krausz (1962-) 2023, Physics

Electrical Engineer (BME VIK), Physist (ELTE-TTK)

Faculties of BME

Faculty of
Architecture

Faculty of
Civil Engineering

Faculty of
Chemical Technology and Biotechnology

Faculty of
Economic and Social Sciences

Faculty of
Electrical Engineering and Informatics

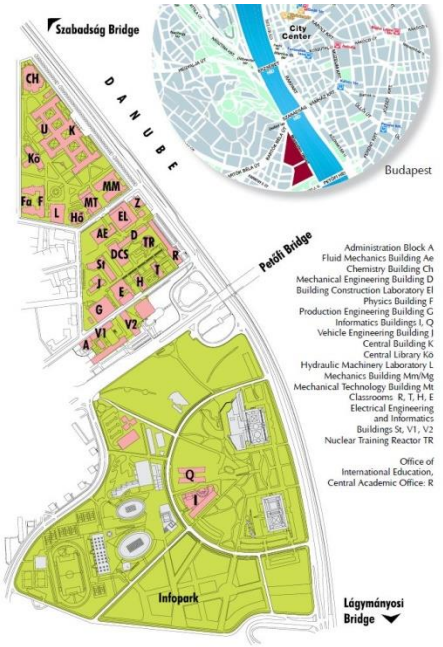
Faculty of
Mechanical Engineering

Faculty of
Natural Sciences

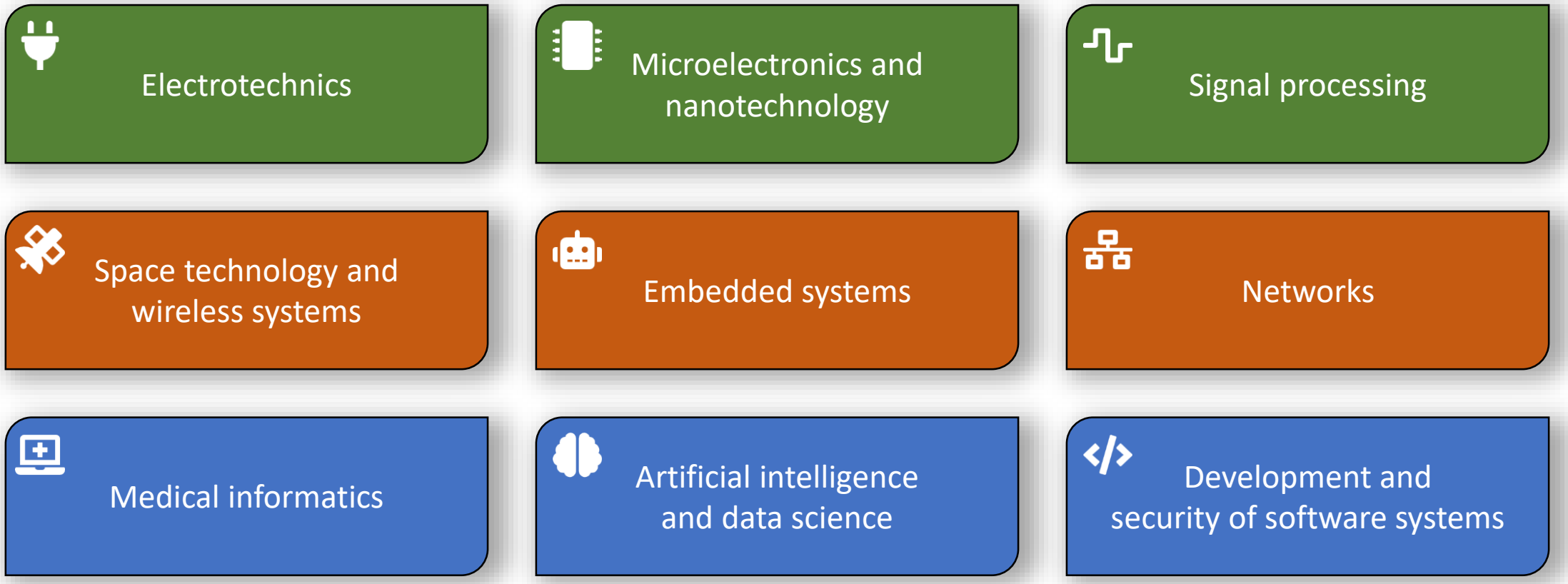
Faculty of
Transportation Engineering and Vehicle Eng.

About VIK

- Largest faculty of the university
- 5200 students (international: 13%)
  - 3900 BSc, 1300 MSc
- 350 academic staff, 270 with PhD
- Degree programs are taught in: HU, EN, DE



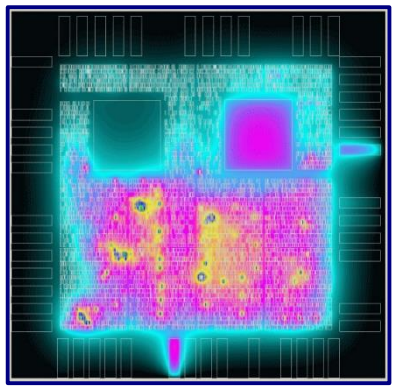
Research groups and fields

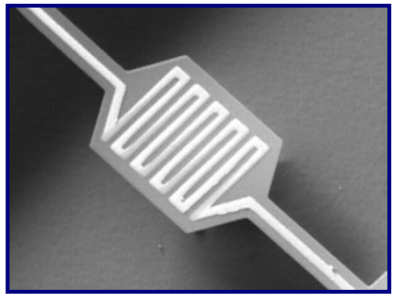


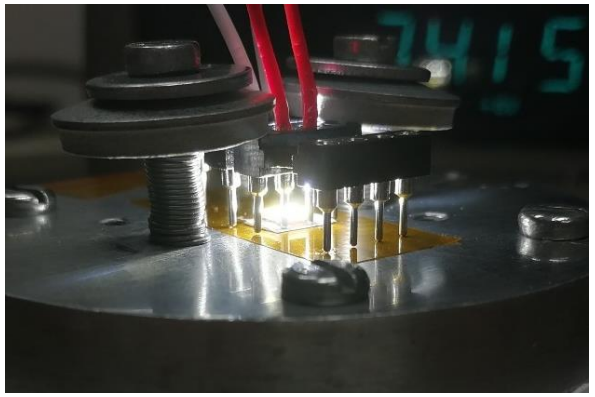
research.vik.bme.hu

Electrical engineering fields

Microelectronics
Thermal analysis
and reliability

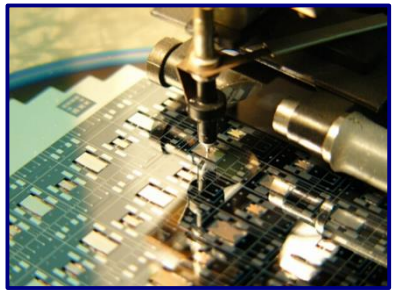






Solid-state lighting
Constant flux control
Multi-domain modeling

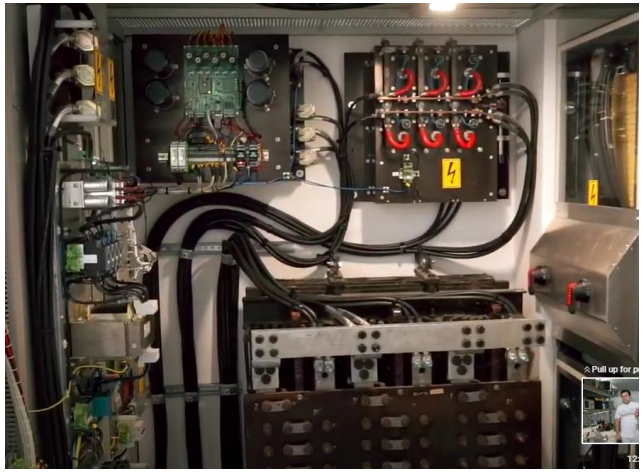
Electronic technology
Materials for soldering
Biodegradable circuits

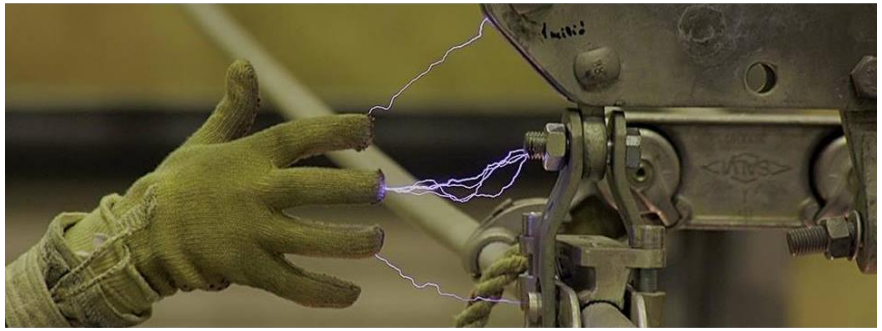


High power technology
Live line maintenance
Cables, diagnostic methods,
Protection against electric shock

Sensors and microfluidics
Biosensors, nanocomposits
Microreactors, flow chemistry

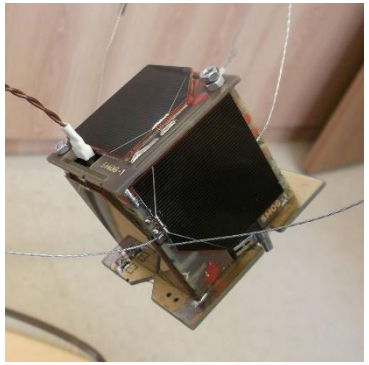
Power electronics
Converters, inverters
HIL and PHIL models





Telecommunication

SMOG-P
First
5x5x5 sized
satellite

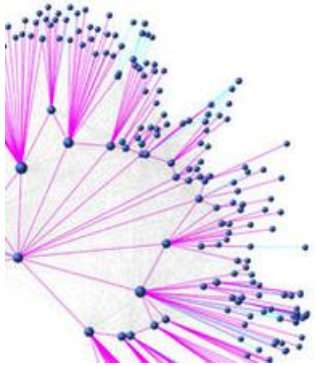


5G campus network
Private network for
research

Autonomous, communicating vehicles
Real demos in Budapest

Quantum communication channel
Attacks can not remain hidden
Working prototype, own development

Navigable networks
Adapting human navigation
strategies to computer
networks

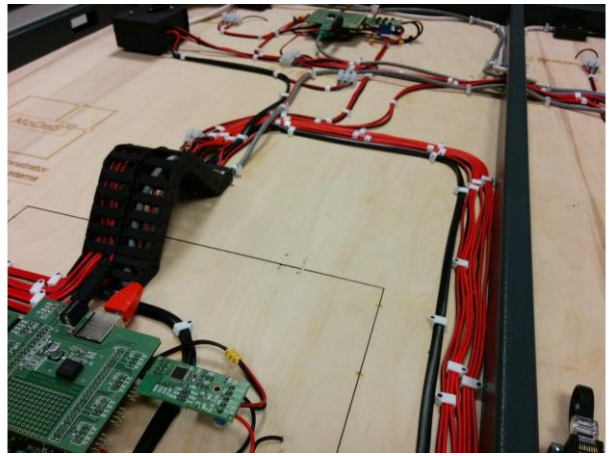


Network softwerization
Extreme low latency
High reliability

Informatics

Immersive driving
VR-based
Demo available

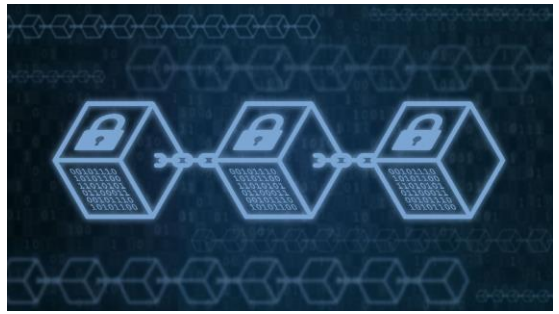
Critical system's design
Hmodel checking based on formal models, from source code



Artificial Intelligence
Numerous application at almost all fields

NVIDIA | GPU EDUCATION CENTER

Virtual Rubik's cube
Tech demo at CES



Blockchain
Reliability analysis of blockchain systems

Home / News & Blogs / Zero Day

Hungarian Lab found Stuxnet-like Duqu malware

By Ryan Naraine | October 21, 2011, 9:11am PDT

Summary: The Laboratory of Cryptography and System Security (CrySyS) in Hungary confirmed its participation in the initial discovery of the Duqu cyber-surveillance Trojan.

Laboratory of Cryptography and System Security
Budapest University of Technology and Economics
Department of Telecommunications
www.crysys.hu

A security lab attached to the Budapest University of Technology and Economics in Hungary has come forward as the mystery outfit that found the Stuxnet-like "Duqu" cyber-surveillance Trojan.

According to Symantec's initial report on Duqu [PDF], the malware sample was passed along by an unnamed "research lab with strong international connections," a statement that led to speculation about the origins and intent of the threat.

Security
Discovery and analysis of Duqu, a new class of malwares
Designing security protocols, Malware analysis

IT Security

- **Competences**
  - Design and analysis of security protocols
  - Privacy enhancing mechanisms
  - Security of cyber-physical systems
  - Industrial control systems
  - Formal methods in security engineering
  - Malware analysis
  - Honeypot development
- **Achievements**
  - Discovery, naming, and analysis of the **Duqu** malware
  - Analysis of other targeted malware campaigns
  - Our !SpamAndHex hacker team won the iCTF in 2014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Artificial Intelligence

- **Deep Learning** fundamentals
  - Deep Reinforcement Learning
  - Natural Language Processing
- **Applications**
  - Time series prediction and classification
  - Machine learning and data analytics for intelligent and automated cities
  - Anomaly detection
  - Computer vision, image processing
  - Sensor data analysis
  - Data and knowledge fusion, sensor fusion
  - Human-Computer Interactions
  - Audio mining, Speech Recognition
- Official NVidia GPU Education Center at the Faculty

Fault-tolerant systems

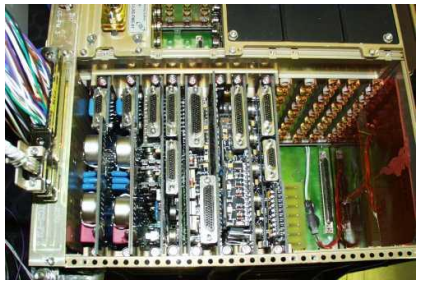
- Competences:
  - **Empirical system design and optimization**
    - Benchmarking, log analysis, exploratory data analysis, monitoring, system and process optimization, cloud and edge for CPS
  - **Model-based systems engineering**
    - Model-based testing, test and code generation, model transformation, developing critical and cyber-physical systems
  - **Verification & Validation**
    - Safety and resilience analysis, verification of distributed and autonomous systems, static code analysis, runtime verification
  - **Blockchain**
    - Design and development of blockchain-based systems and services

HYPERLEDGER

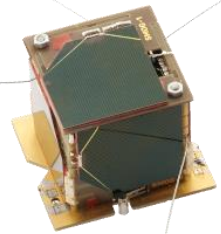
Space Engineering – our heritage

Vega program, flyby of Halley's comet, 1986:

ESA Rosetta mission, 2004-2016:



ESA Alphasat, Ka/Q/V band propagation
and communications experiment, 2013-:



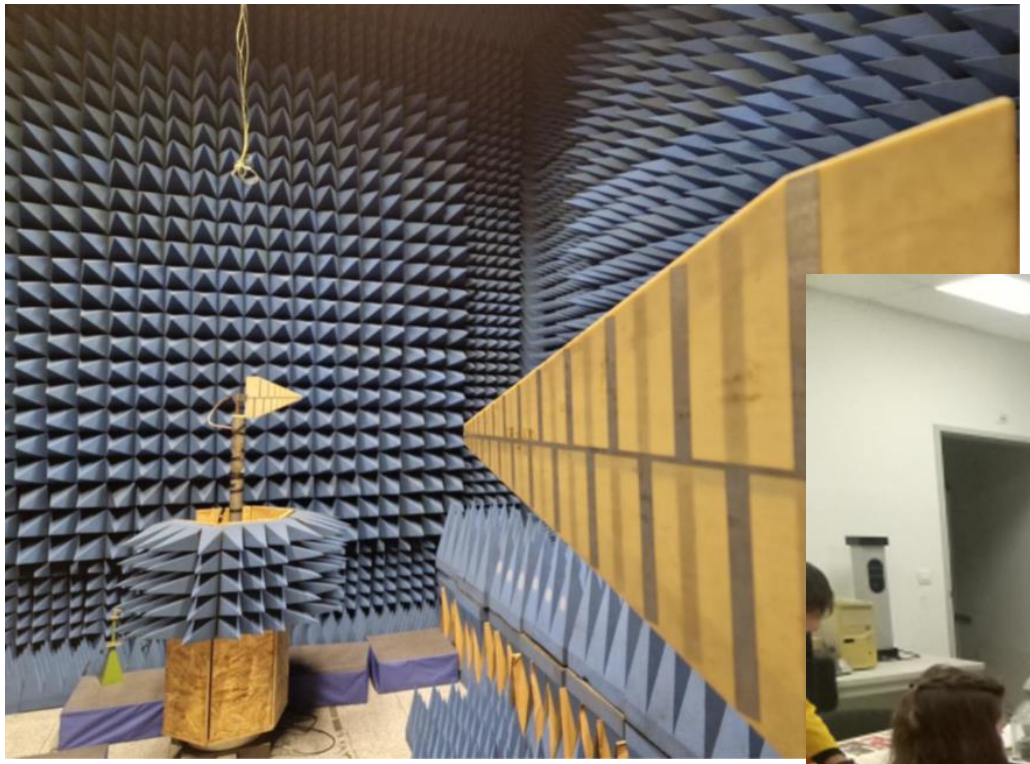
CubeSat and picosatellite missions: 2012-:

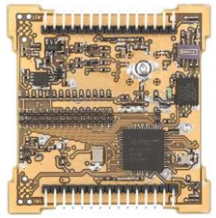
and many other projects…

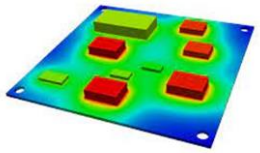
Space Engineering – MSc program at BME

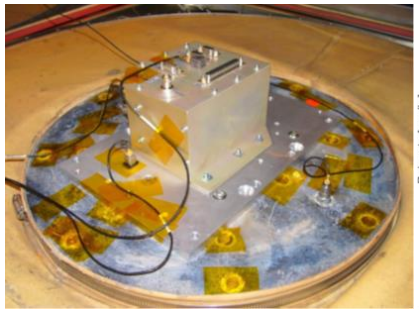
- The first **Space Engineering master program** in Hungary
- Started in 2022
- 2 years/4 semesters
- 26+ courses / 120 credits
- 4 weeks internship
- Coordinated by the Department of Broadband Infocommunications and Electromagnetic Theory

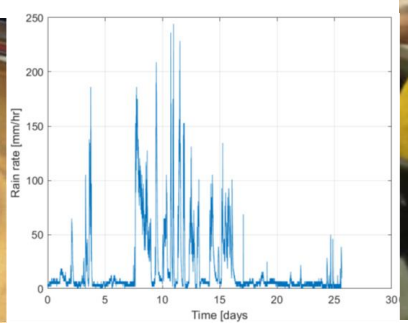
Space Engineering – Laboratory measurements





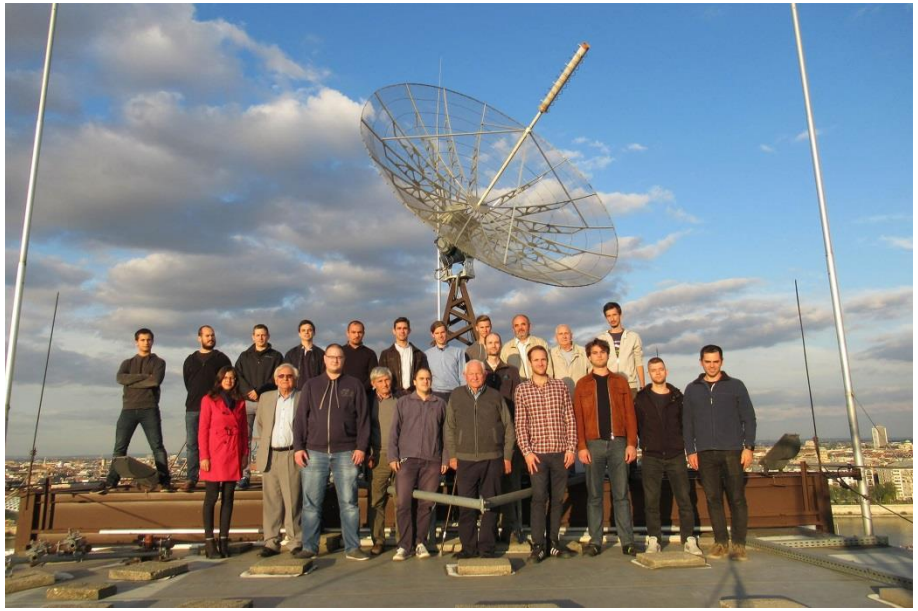


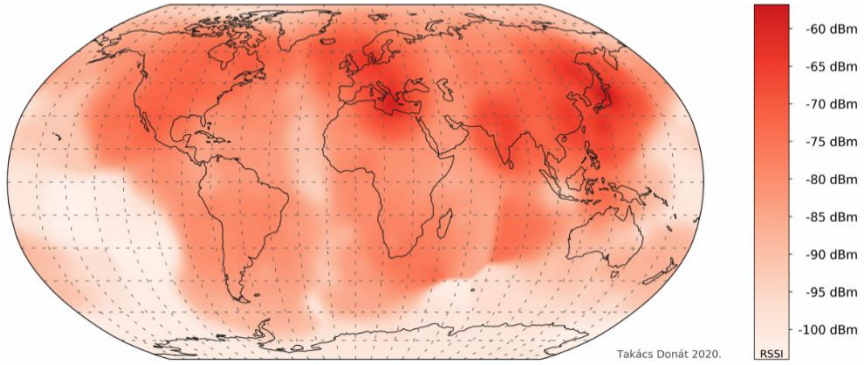


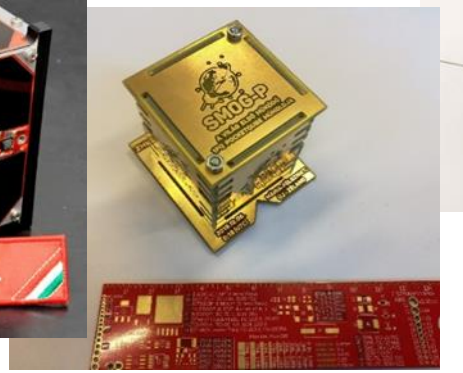


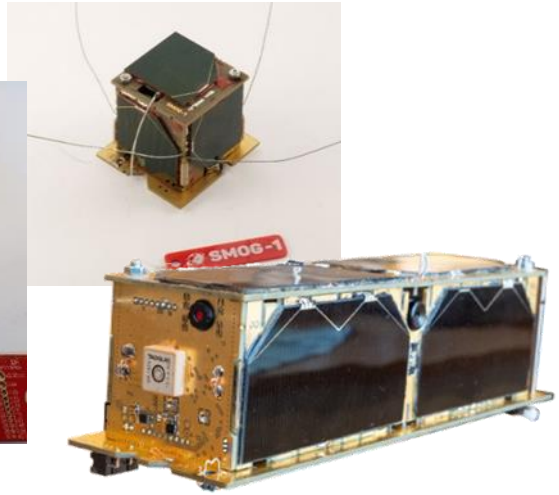
The laboratory dedicated for Space Engineering education was funded by the RRF-2.1.2-21 project with ~1Mi EUR

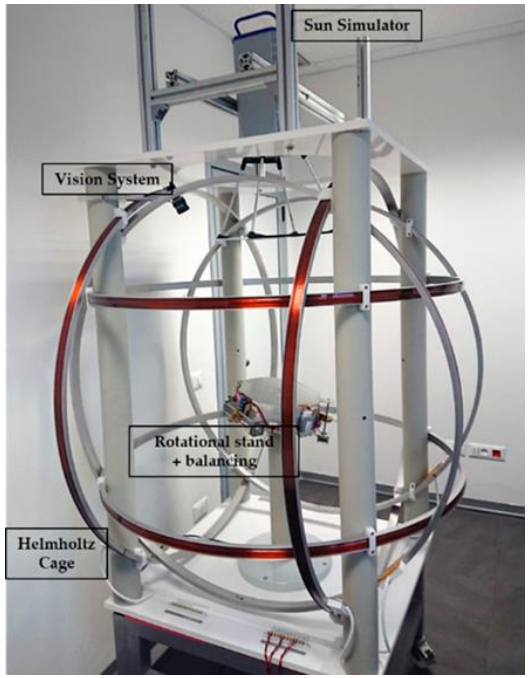
Space Engineering – CubeSat/PicoSat technology





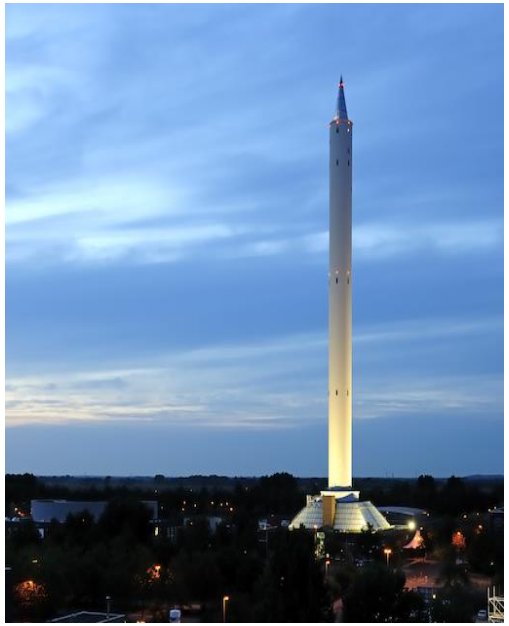


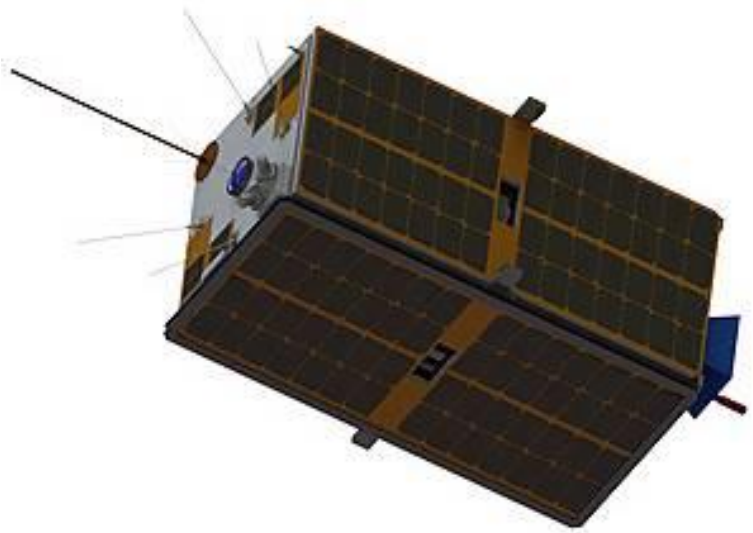




Space Engineering – ESA Student programs

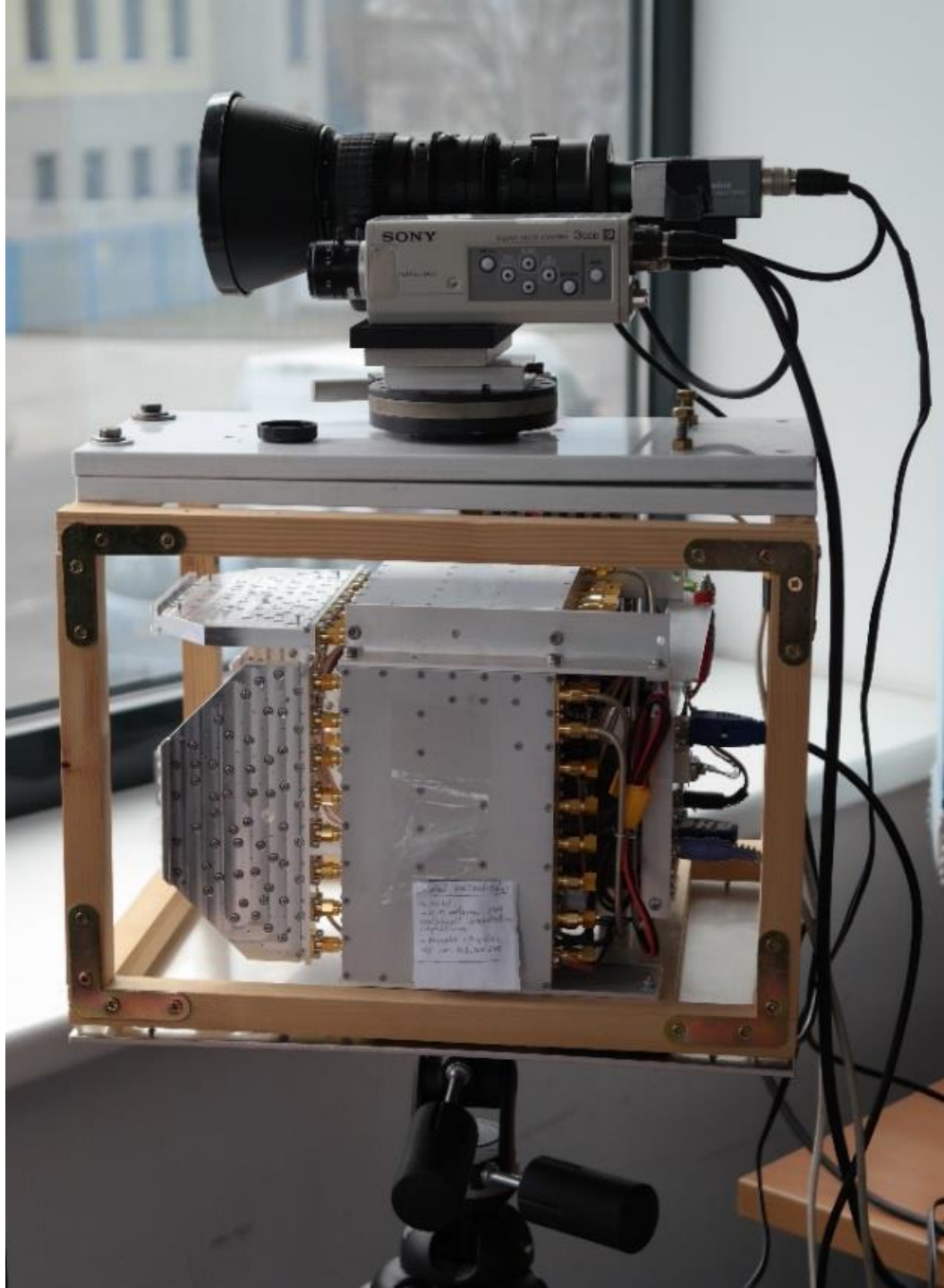
- Hypergravity experiments
- Microgravity experiments
- Rocket and balloon flights
- Satellite programs





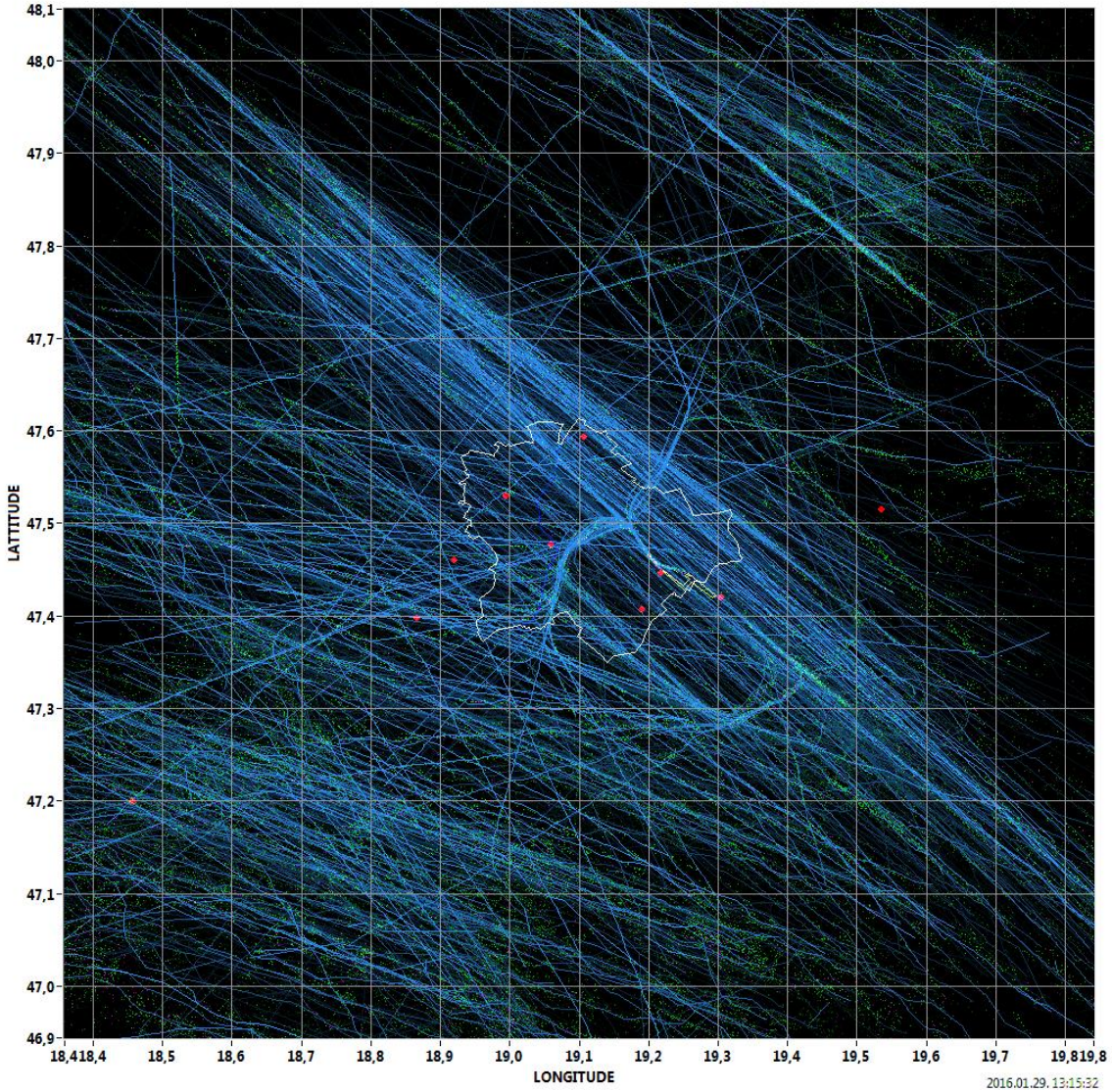
Sensors
Microwave Remote Sensing

- Wide Area MultiLATeration (WAMLAT)
- Passive radar
- Counter UAV radar
- Synthetic Aperture Radar



Wide Area MultiLATeration (WAMLAT)

1 day tracks

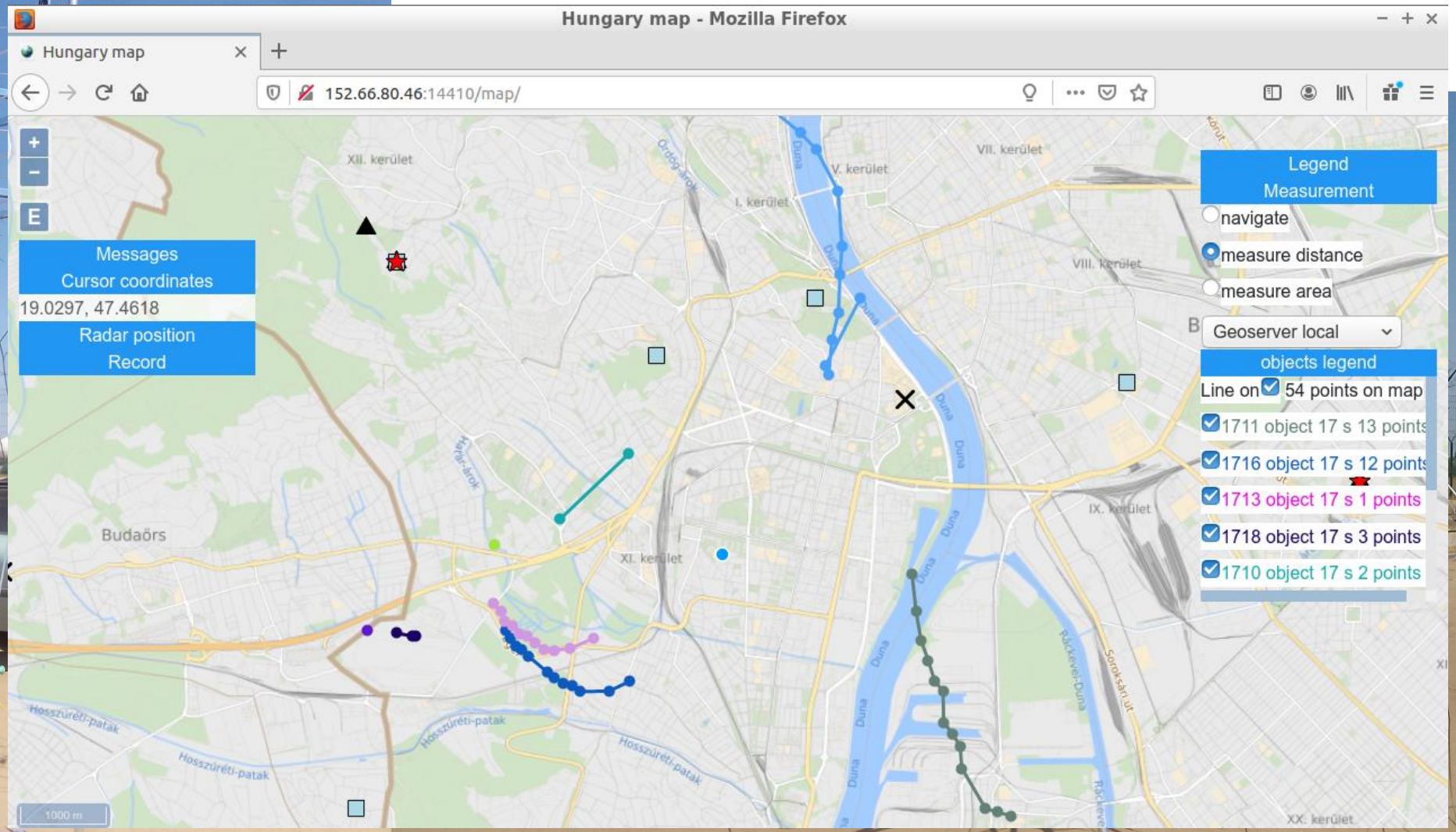


http://radarlab.hvt.bme.hu/~wamlat/

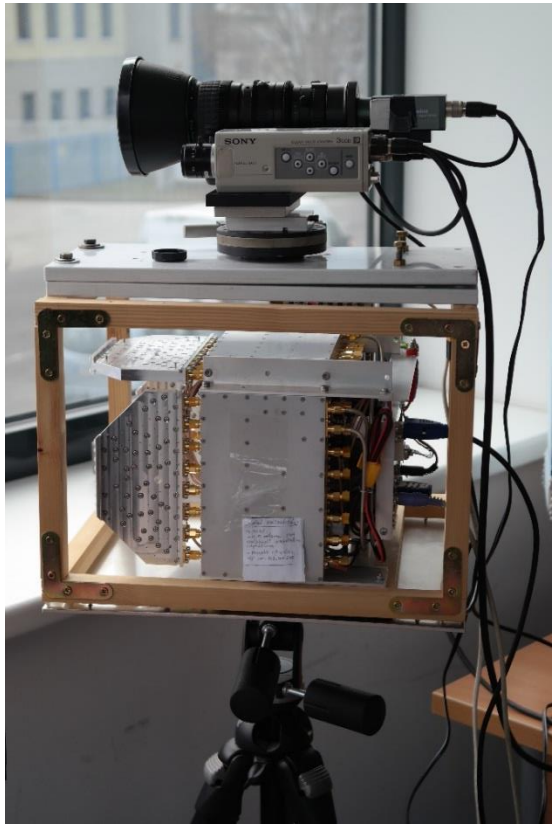
DVB-T

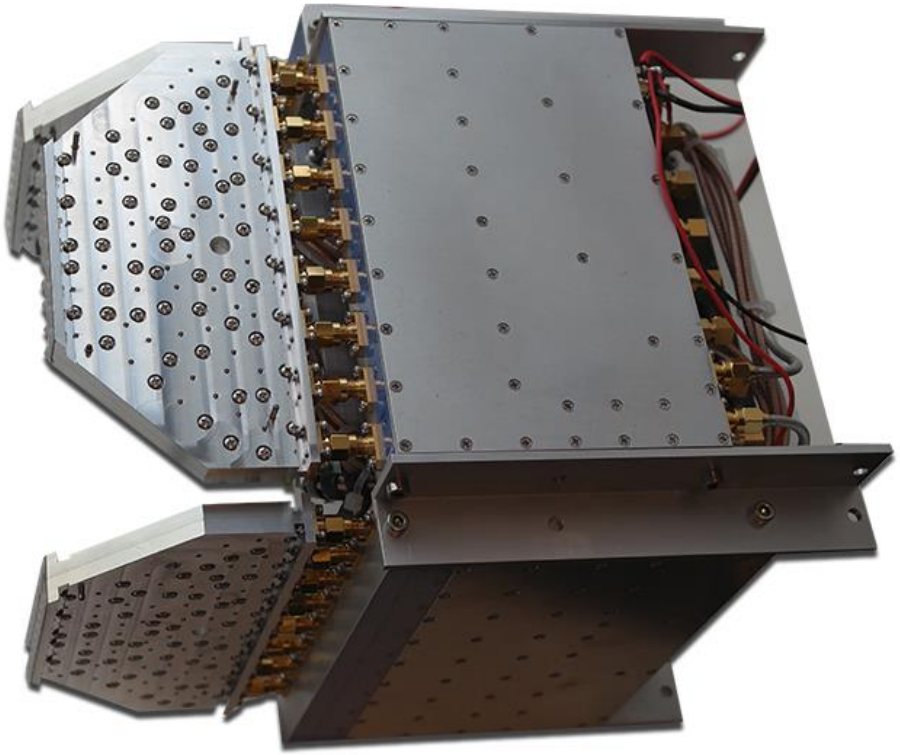
Passive radar development

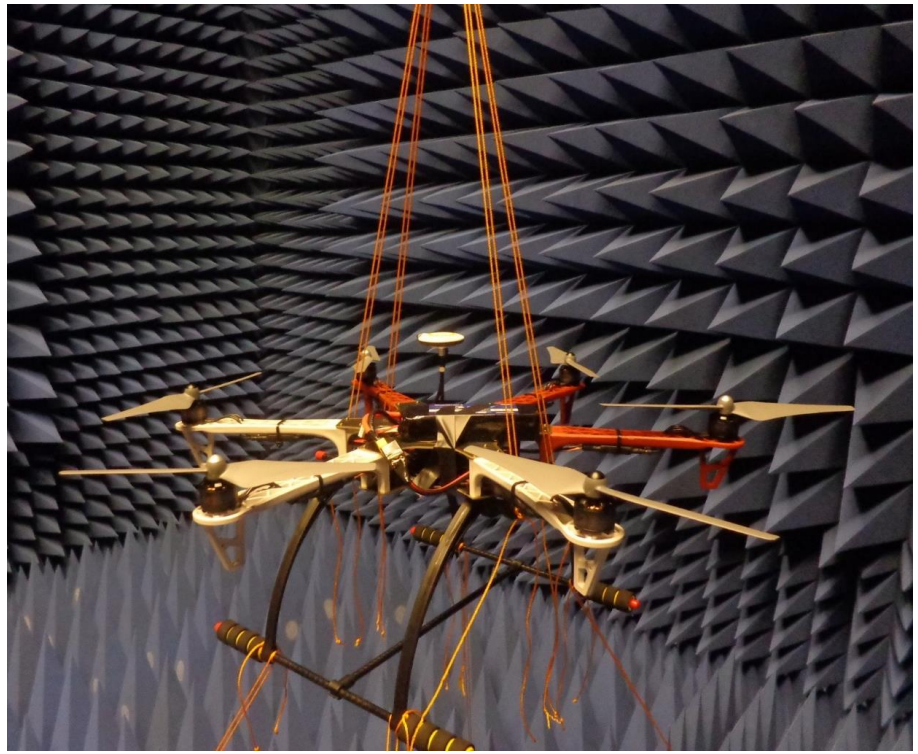
FM



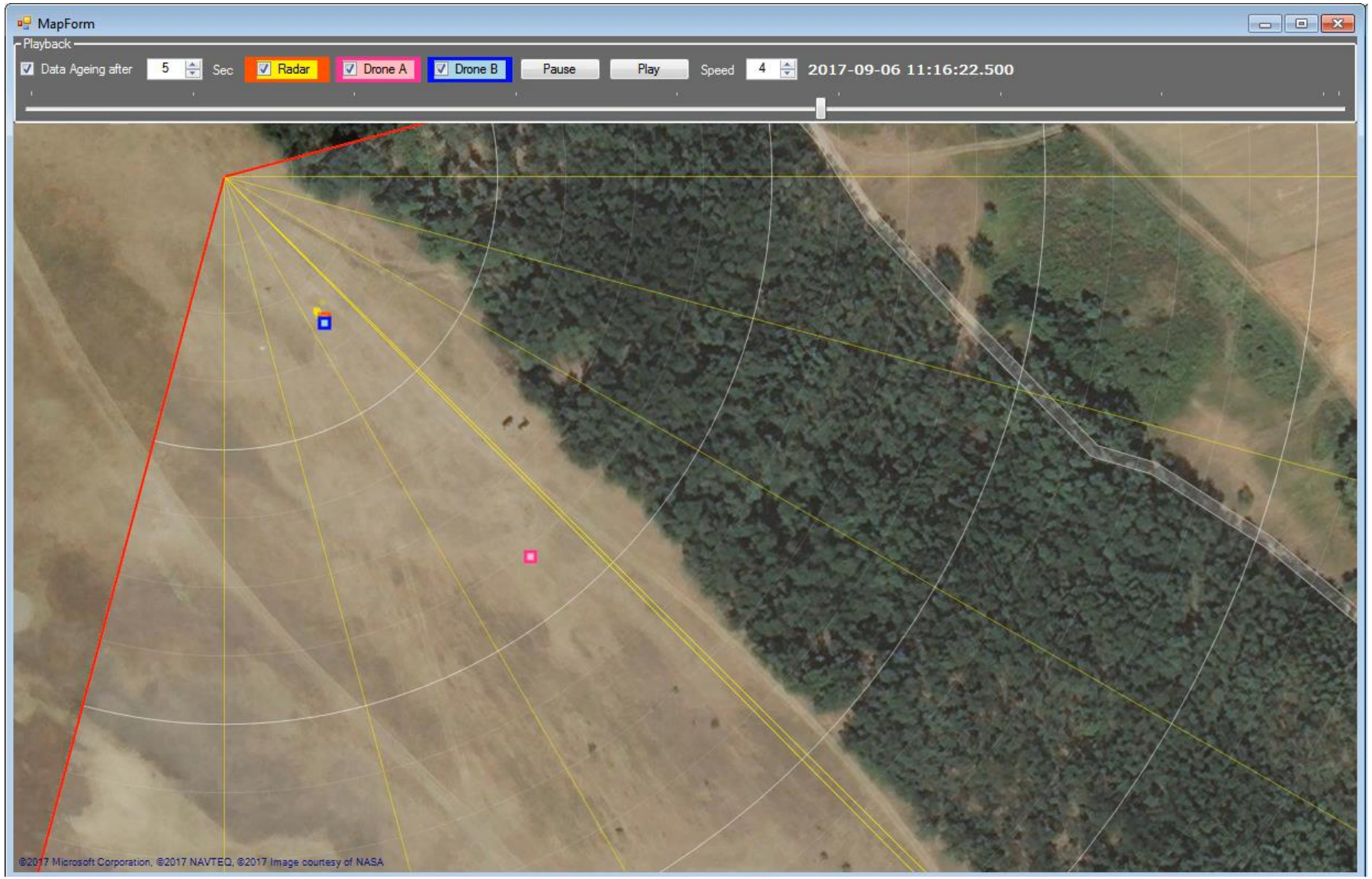
Counter UAV radar development



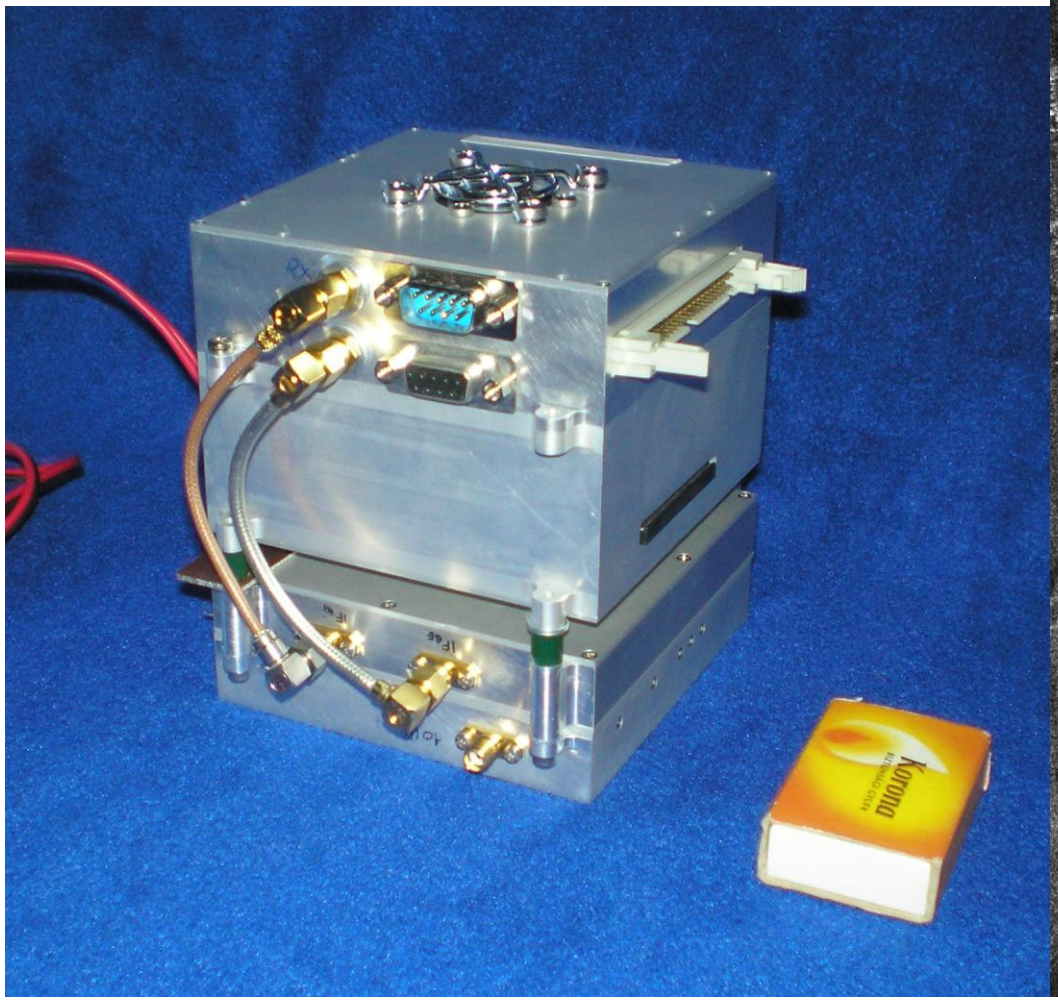




Counter UAV radar



Synthetic Aperture Radar development



SAR imaging

Inverse SAR imaging