Warsaw University of Technology

Faculty of Electronics and Information Technology

WARSAW UNIVERSITY OF TECHNOLOGY

WUT

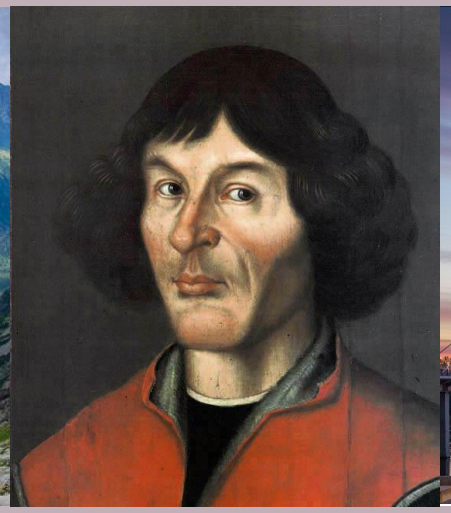
Location

Warsaw University of Technology (WUT) is one of the largest universities of technology in **Central Europe.**

Warsaw University of Technology is located in the capital city.
Warsaw is the heart of Poland.

Visiting Poland





❖ Poland is worth visiting. It offers beautiful landscapes – Tatra Mountains and Baltic Sea are only the highlights.

❖ **Poland is the homeland of people who influenced science and technology, for example: Nicolaus Copernicus – the astronomer and mathematician who formulated the model of the solar sys Maria Skłodowska-Curie – the physicist and chemist, doctor *honoris causa* of Warsaw University of Technology. She was the first woman in history to win the Nobel Prize. What is more, she was awarded twice – in 1903 with her husband Pierre Curie for research on radioactivity and in 1911 for her discovery of radium and polonium.**

WARSAW UNIVERSITY OF TECHNOLOGY – THE HISTORY

1826 – Foundation of the Polytechnic Institute. Stanisław Staszic was the man who played the most important part in creating process

1898 – Opening of Emperor Nicolas II University of Technology in Warsaw

1915 – Polish became the language of instruction at the Warsaw University of Technology

1944 – WUT was reactivated after The World War II

1951 – The Faculty of Communication was separated from the Faculty of Electrics. It was the beginning of the Faculty of Electronics and Information Technology

WARSAW UNIVERSITY OF TECHNOLOGY - STATISTICS

- Over 36 000 students
- 2500 academic teachers
- 19 faculties
- 32 fields of study
- Cooperation with over 180 foreign universities

The Main Hall ot WUT is one of the most significant places in Warsaw

Faculty of Electronics and Information Technology

WARSAW UNIVERSITY OF TECHNOLOGY

WUT

Faculty of Electronics and Information Technology in numbers:

- Over 3000 students and 200 PhD students
- Over 300 academic teachers
- 6 institutes
- 400 courses
- 50 laboratories

Faculty of Electronics and Information Technology
WARSAW UNIVERSITY OF TECHNOLOGY

STUDIES IN ENGLISH

The Faculty of Electronics and Information Technology offers full-time undergraduate and graduate **studies in English**

The area of study encompasses

1. *Computer Science*
2. *Telecommunications*

leading to:

B.Sc. Degree,

M.Sc. Degree

PH.D. STUDIES IN ENGLISH

The Faculty of Electronics and Information Technology offers full-time and part-time doctoral programmes leading to Ph.D. degree in the area of:

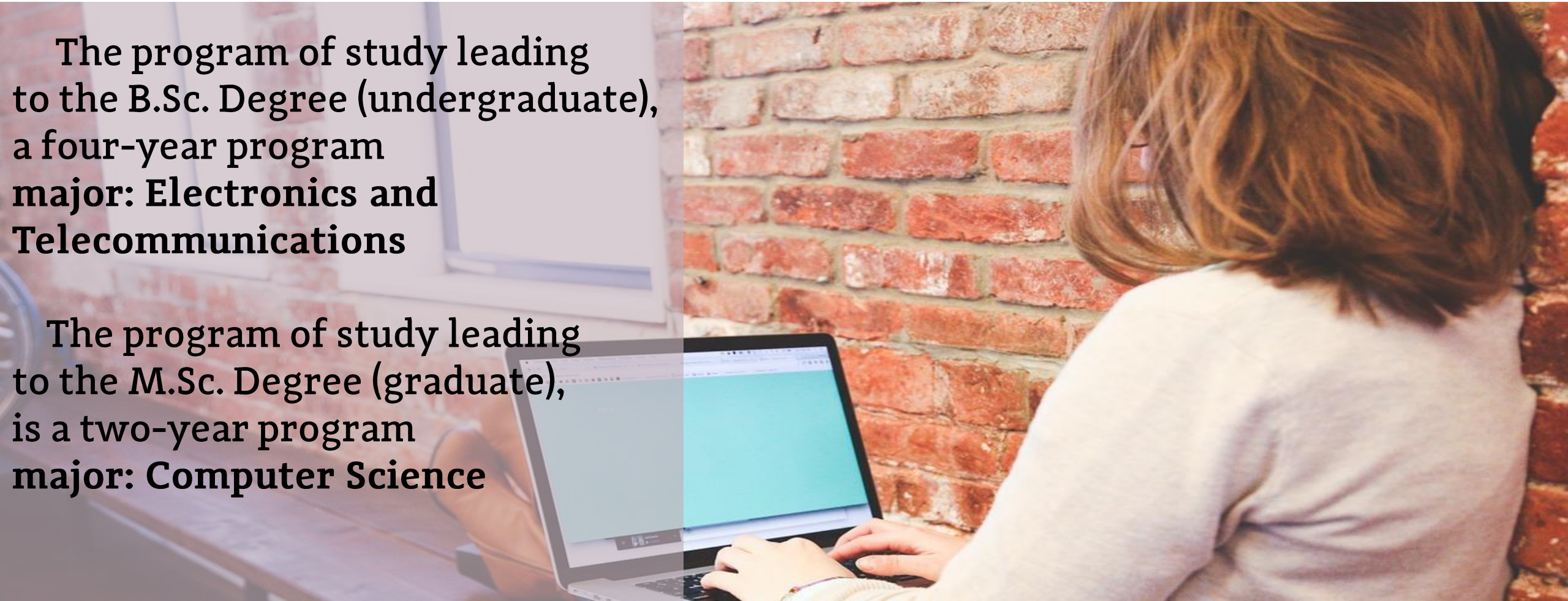
1. *Automatic Control*
2. *Computer Science*
3. *Electronics*
4. *Telecommunications*

E-LEARNING IN POLISH

We offer **Distance Learning in Polish** in cooperation with the **Center for Open Education – OKNO**

The program of study leading to the B.Sc. Degree (undergraduate), a four-year program **major: Electronics and Telecommunications**

The program of study leading to the M.Sc. Degree (graduate), is a two-year program **major: Computer Science**



STUDENTS RESEARCH CLUBS

Students carry on research under the supervision of Faculty staff and develop their scientific interest and practical skills. There are about 20 students research clubs.




INTERNATIONAL EXCHANGE

from academic year 2013/2014 to 2017/2018

268 of our students abroad

546 foreign students at our Faculty

13 cooperation agreements – Kyungpook National University (Korea); University of Ulsan (Korea); University of Luxembourg; University of Newcastle (Australia); University of Western Australia; University of Nottingham (UK); Bauman Technical University (Russia); Vilnius College of Higher Education (Lithuania); Polytech Nantes (France); Technische Universitaet Berlin (Germany); Universidade Nova de Lisboa (Portugal); Technische Universiteit Eindhoven (Netherlands), Toyama University (Japan)

17 courses within the ATHENS Programme (450 incomming students)

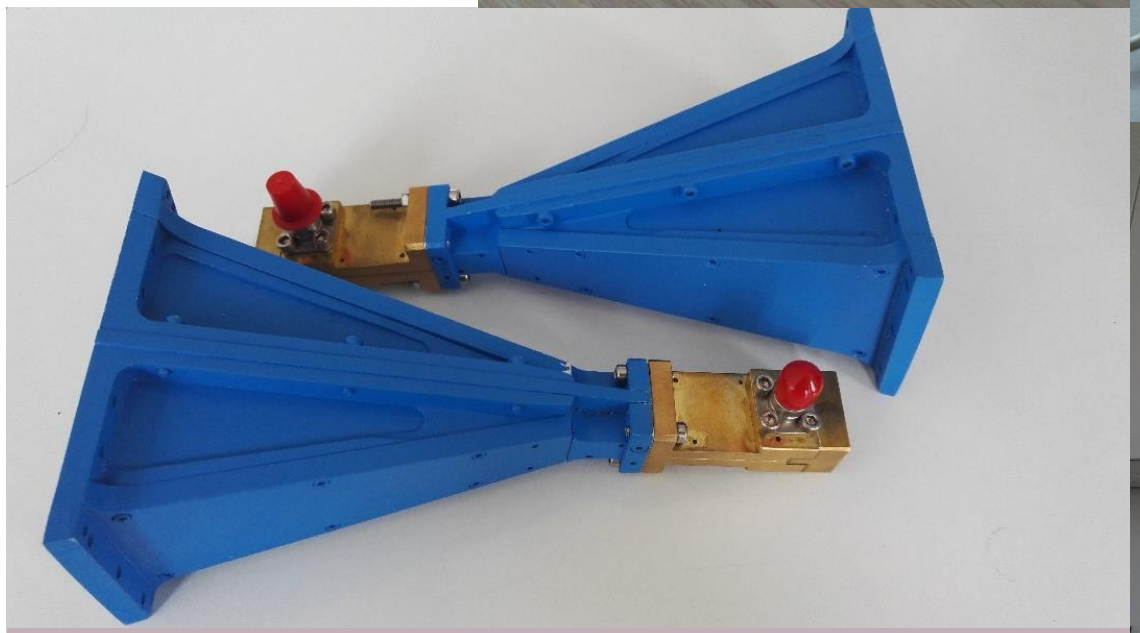
18 invited foreign professors lecturing at our Faculty

RESEARCH HIGHLIGHTS

Microwave/mm-wave techniques

Microwave and milimeter wave resonators for materials characterization

Resonant measurements of ferromagnetic materials

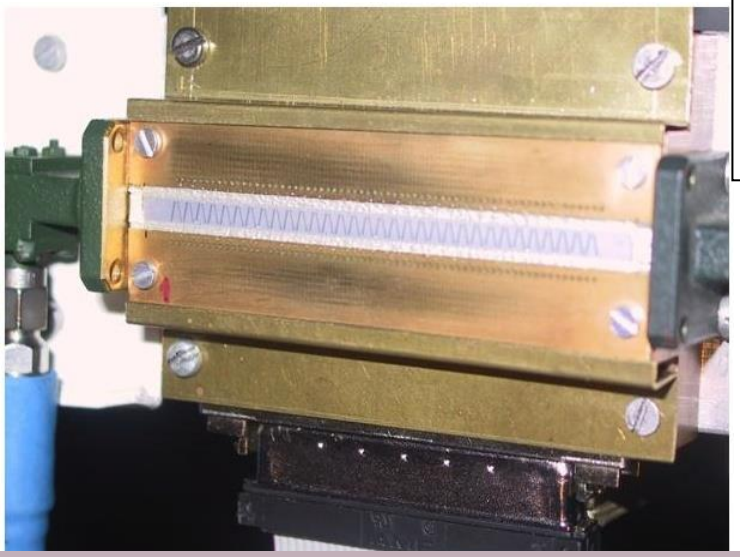


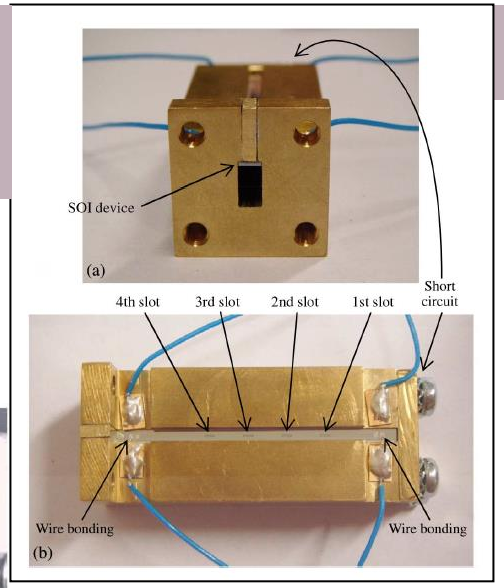
Development and characterization of milimeter wave antennas

Measurements of broadband flexible absorbers

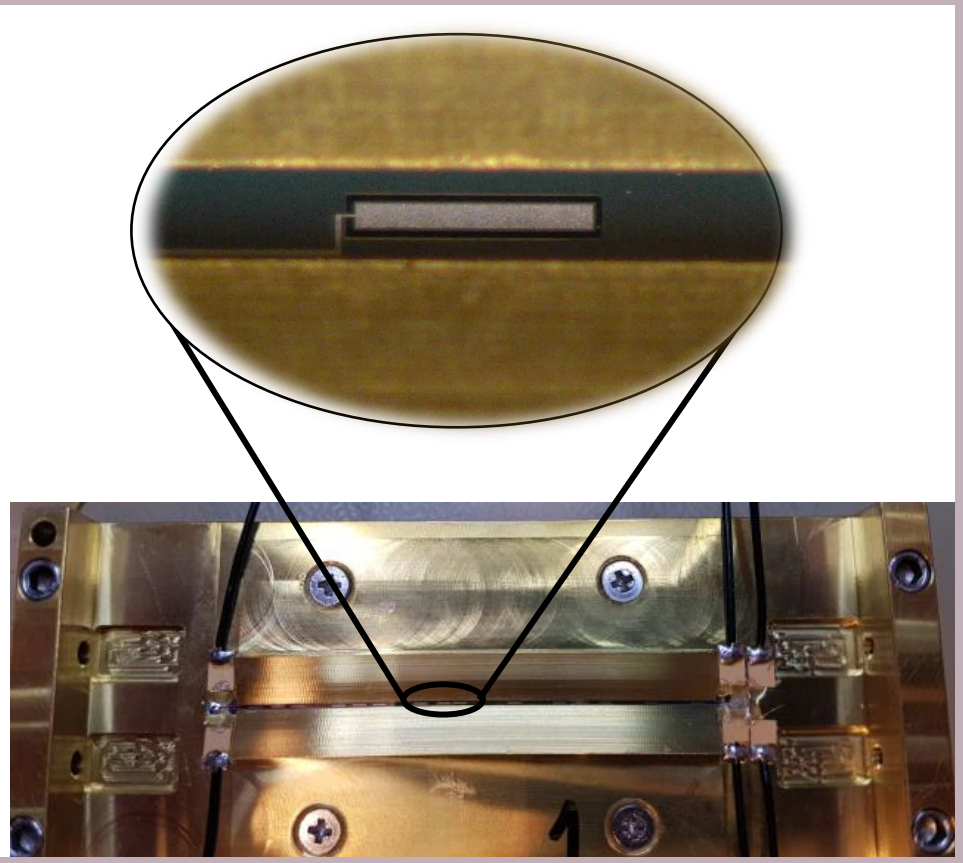
Smart Antennas

Smart antenna based on spatial multiplexing of local elements (35 GHz)





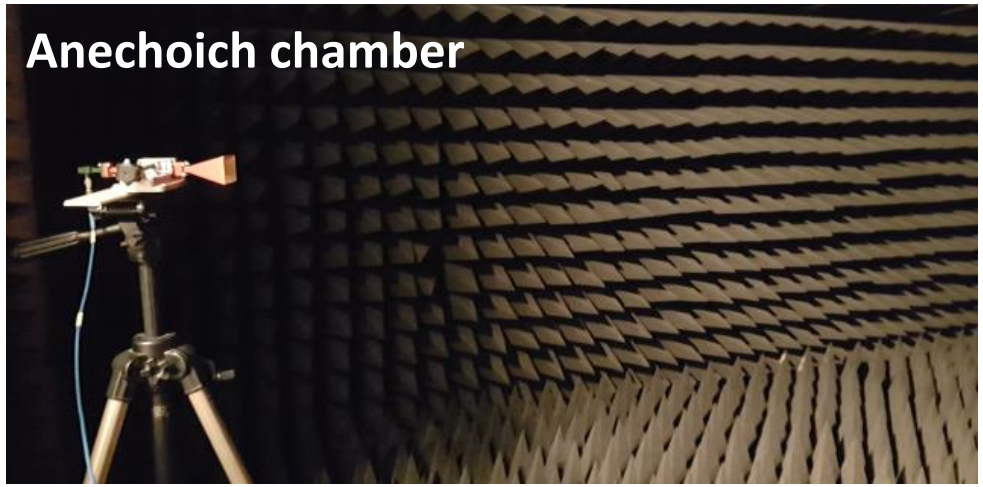
Reconfigurable beamforming antenna (28 GHz)

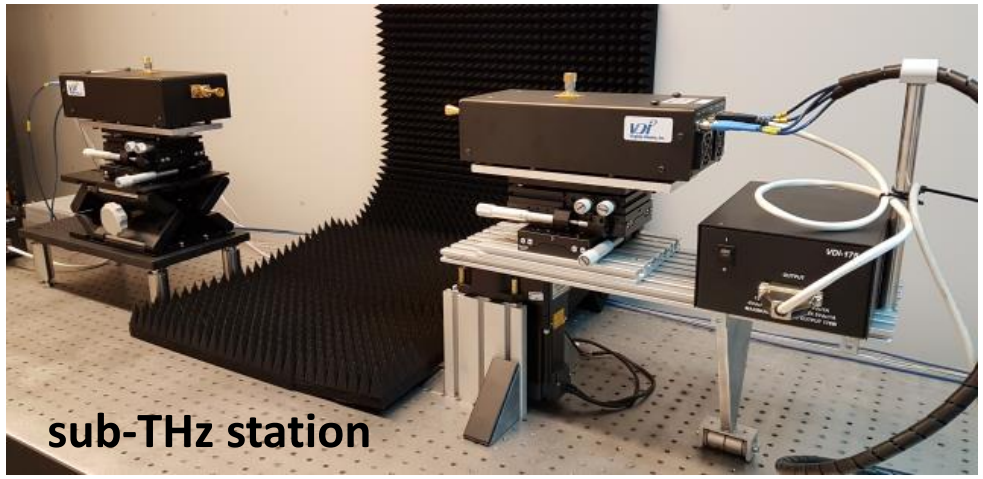


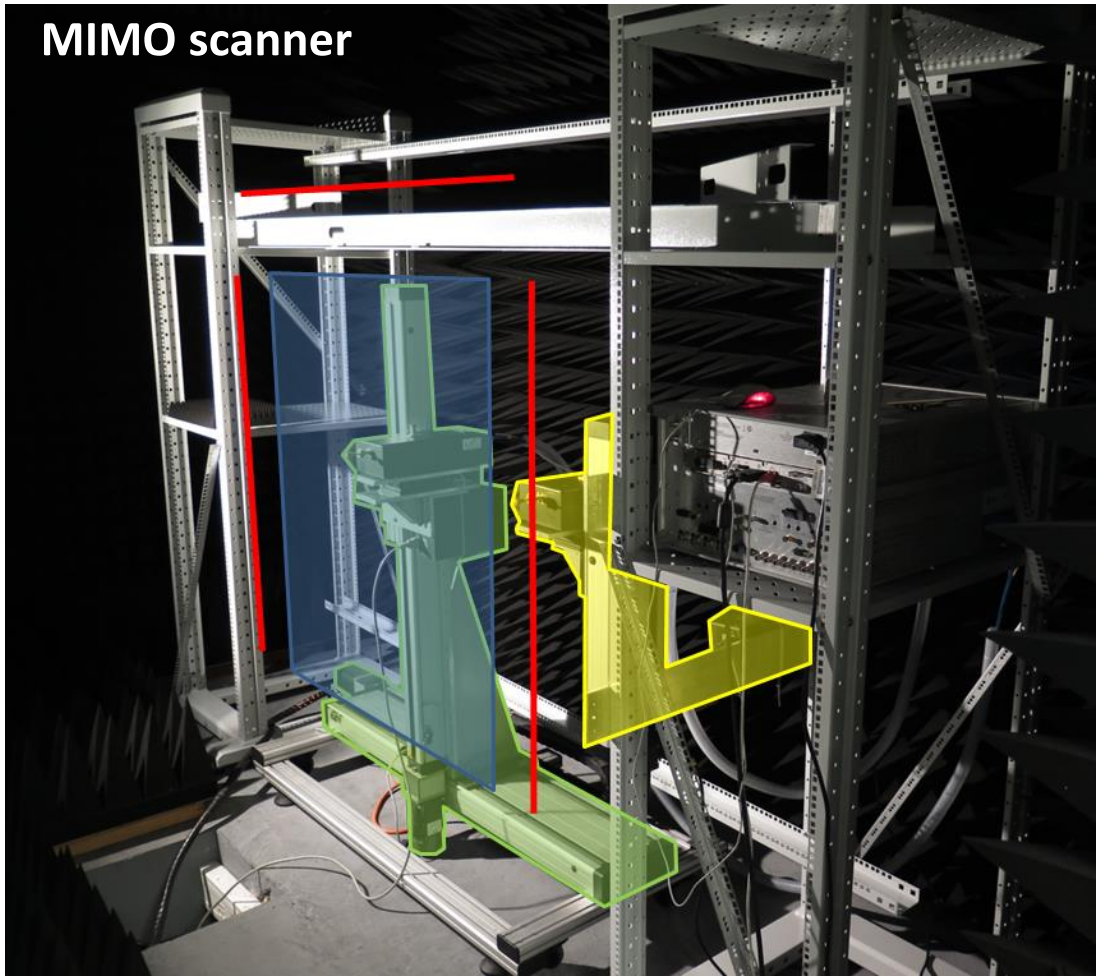
Antenna system with reconfigurable aperture(22 GHz)

From 2 GHz to 500 GHz Measurements

Antenna measurements in spatial, frequency and time domains







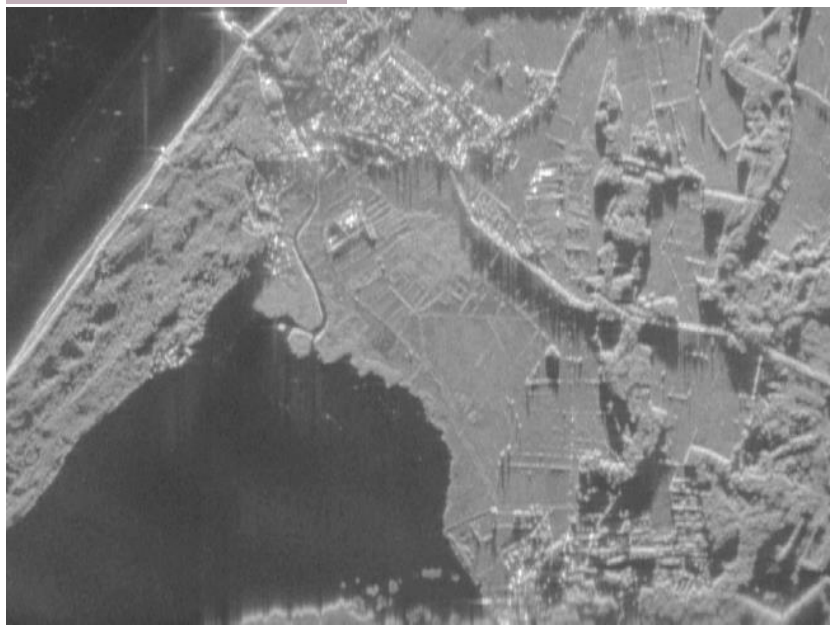
Radar Techniques

Bryza patrol aircraft, X-band radar (in cooperation with Polish industry)

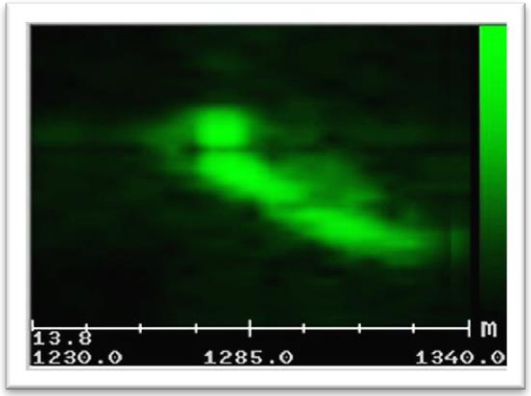
Radar operation modes:

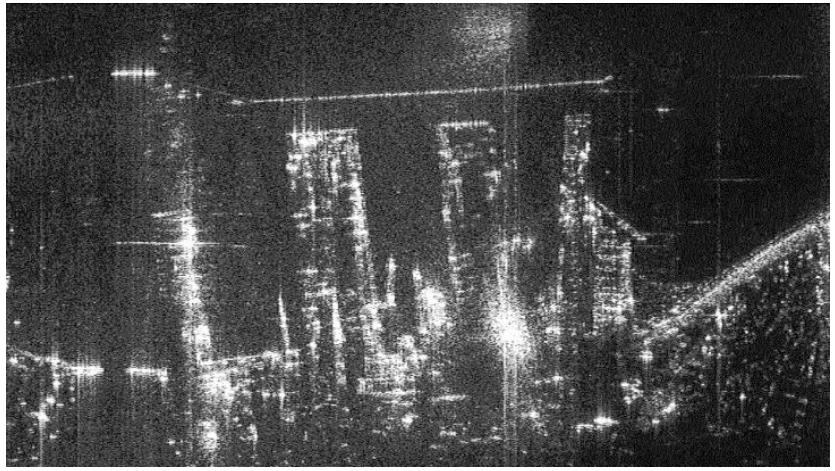
- patrol
- SAR (Synthetic Aperture Radar) – terrain imaging
- ISAR (Inverse SAR) – target imaging

SAR images



ISAR image





Radar Techniques

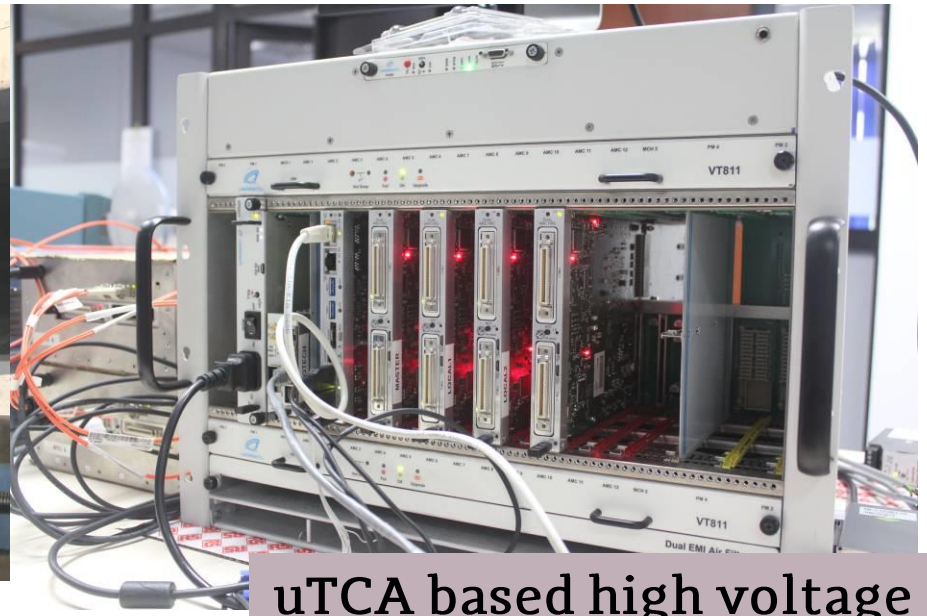
SARAPE project, European Defence Agency

94GHz SAR radar

SAR images, 15x15cm resolution

ELHEP – Electronics for High Energy Physics Lab.

Soft X-ray T-GEM detector at JET tokamak (Culham/Oxford, GB) with fast histogramming based on FPGAs



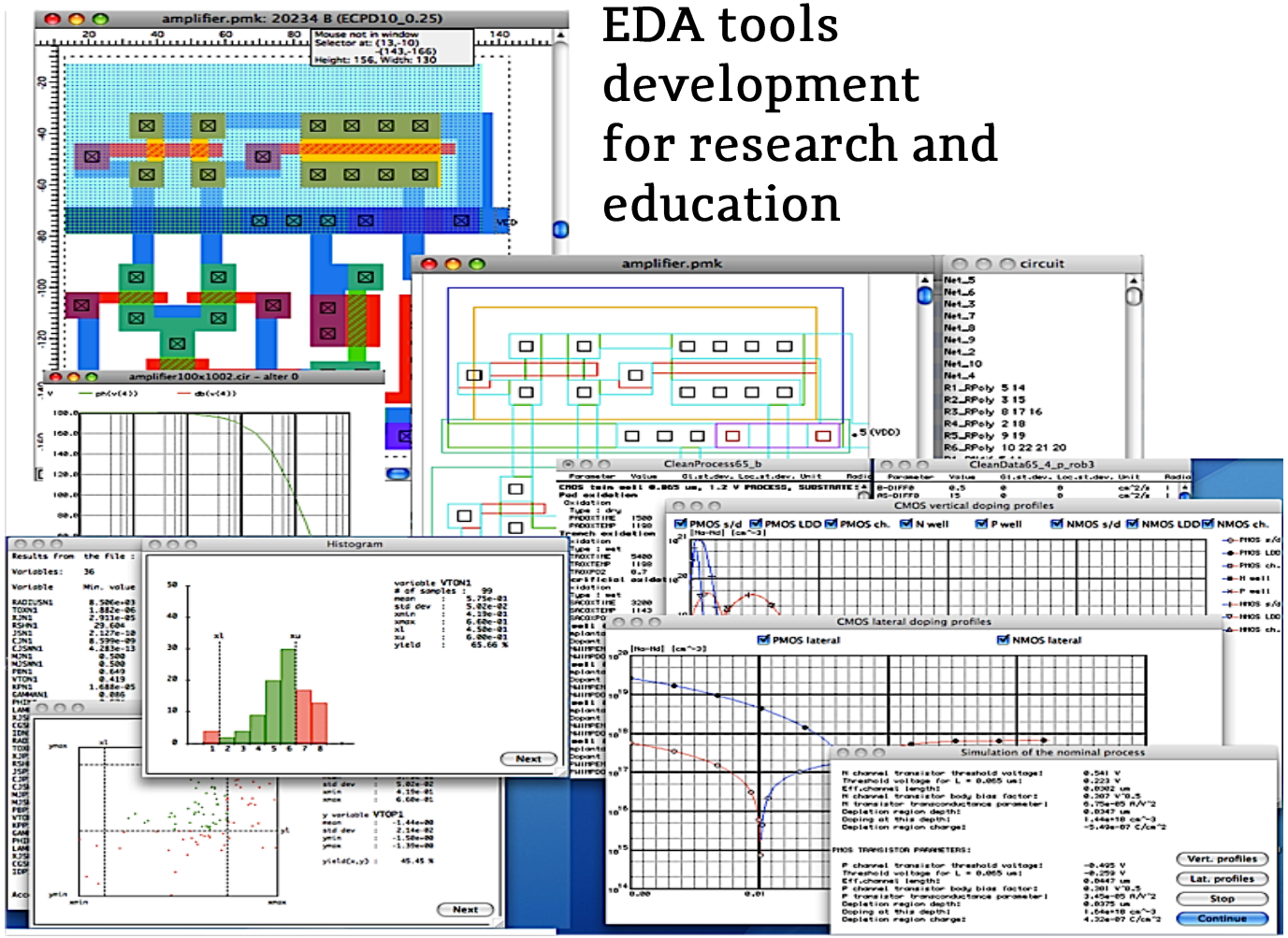
uTCA based high voltage diagnostic system for tokamaks

White Rabbit development

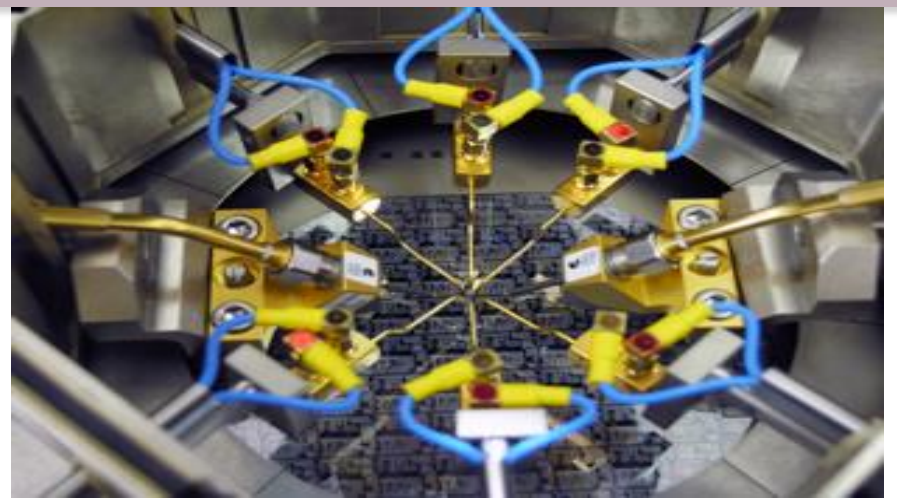
uTCA cubit controller for quantum computing

Microelectronic Integrated Systems
(1) IC design and testing labs

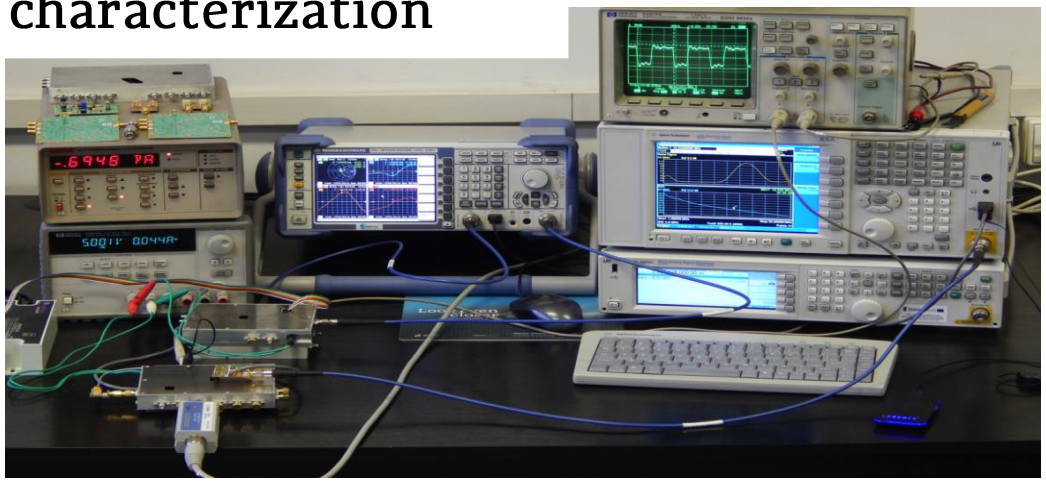
Design on Linux and MacOS platform



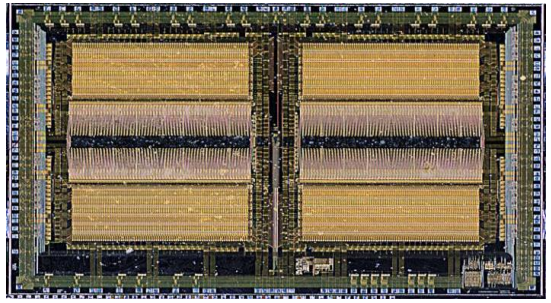
EDA tools
development
for research and
education



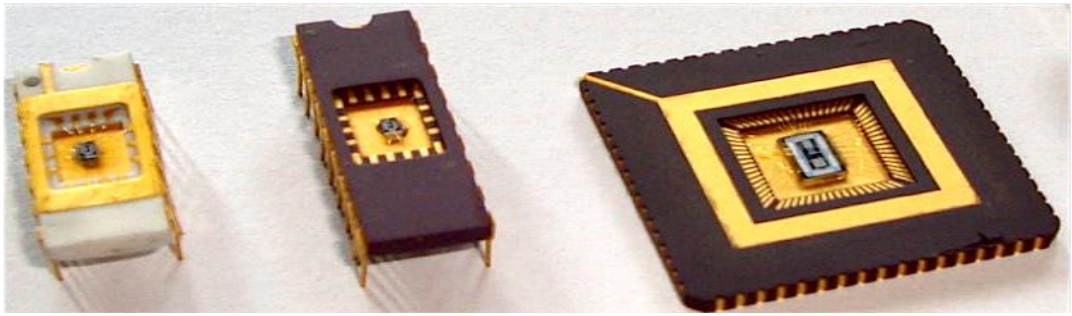
Highly accurate measurements for advanced testing and on-wafer characterization



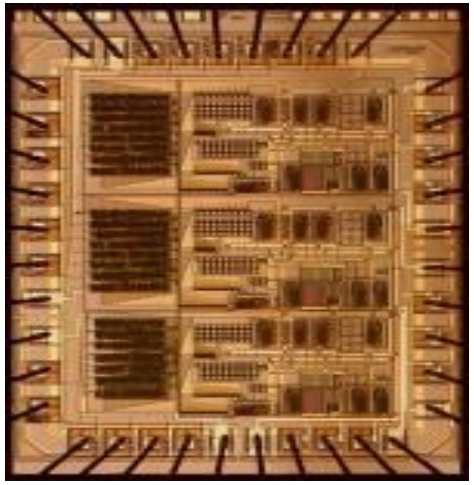
Microelectronic Integrated Systems (2)
Application Specific Integrated Circuits (ASICs)



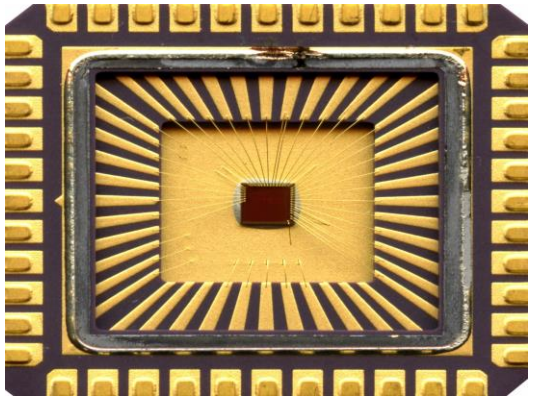
PAC – for real time data processing, LHC, CERN

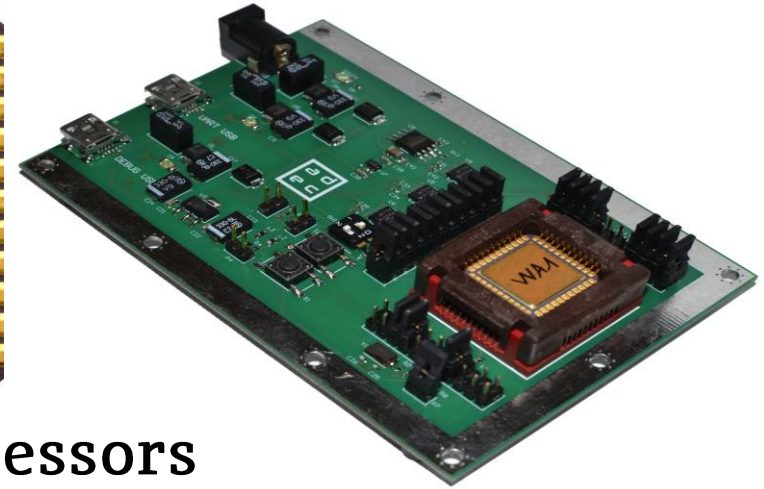


Design and development of ASICs for applications in medicine, telecommunication, scientific research, military techniques etc.



Chaotic – for secure telecommunication applications

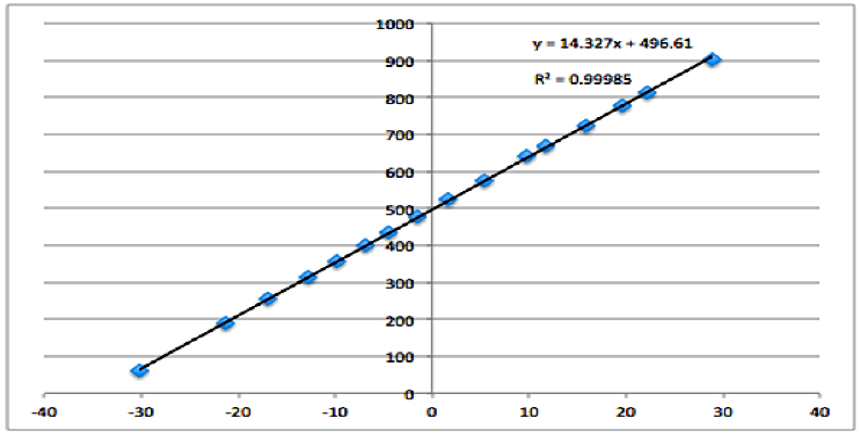




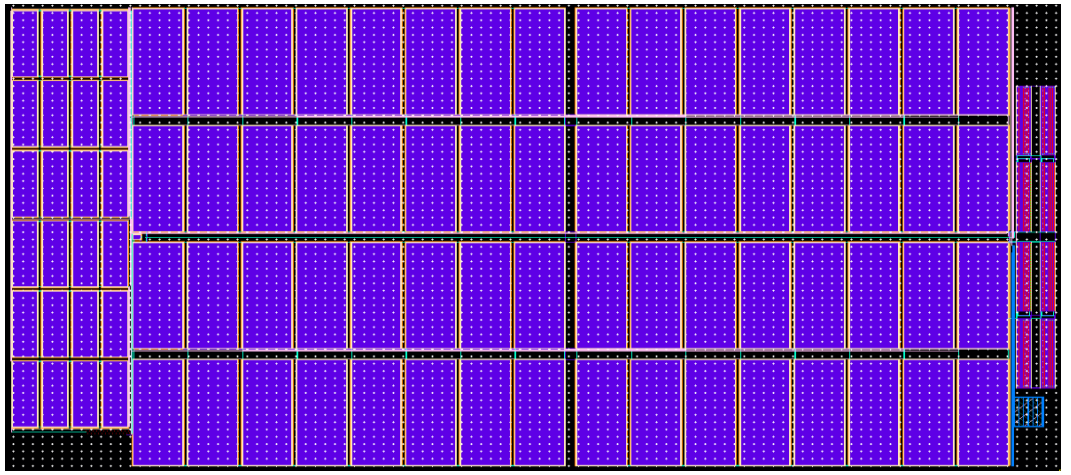
A family of 32 bit microprocessors of custom architectures dedicated to our SoCs

Microelectronic Integrated Systems (3)
Low noise amplifier for acquisition of bio-signals

Design and silicon prototype of the first in the world low frequency low noise amplifier in **28 nm FDSOI technology**



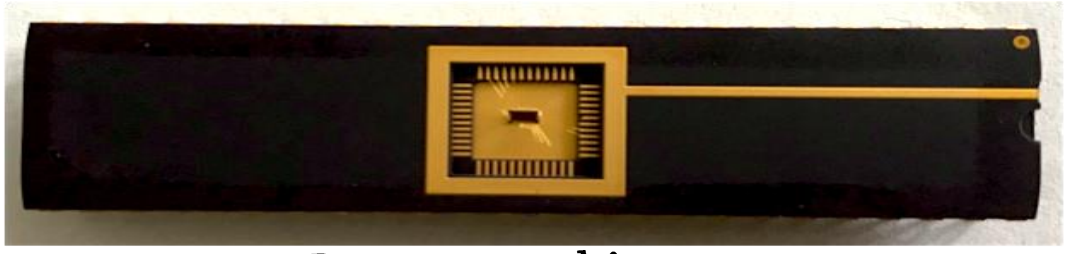
Circuit layout



Ideally linear voltage transfer curve due to internal feedback applied to the transistor back gate (FDSOI specific solution)

Compensation of input gate leakage due to innovative "quasi-Darlington" input stage

RMS noise: 3.1 µV (1 Hz – 10 kHz)

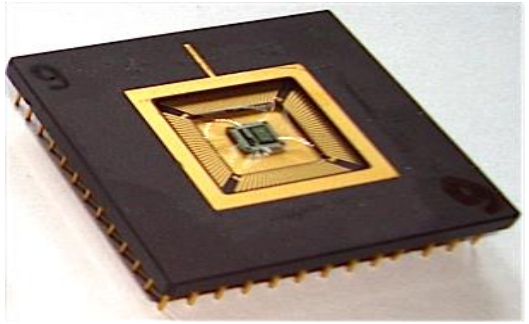


Prototype chip

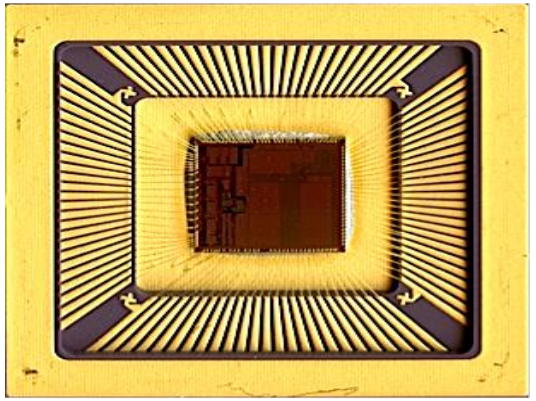
European project "THINGS2DO" (ENIAC GA 621221)

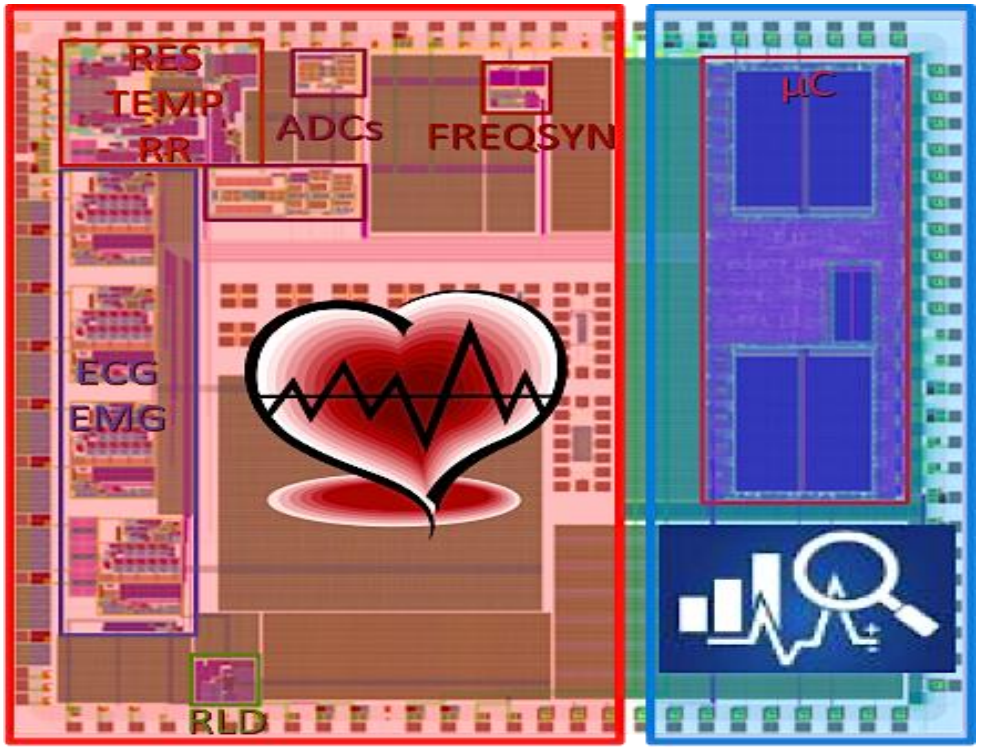
THINGS2DO

Microelectronic Integrated Systems (4)
ASICs for applications in medicine



Analcomp – fuzzy logic based controller for heart pacemakers

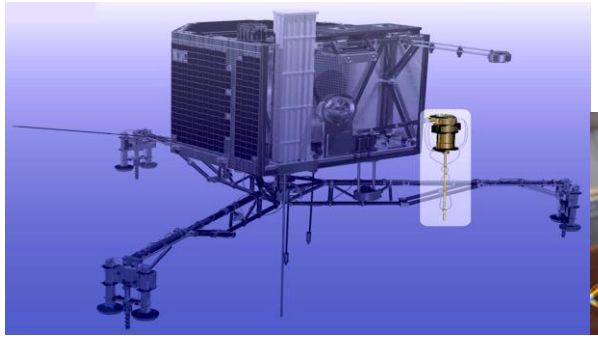


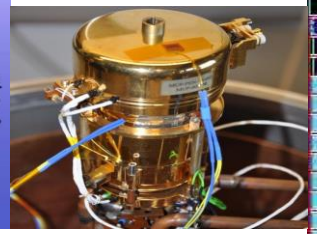


BioSoC & HeC
System on Chip for miniaturized Telehealth/Telemedicine wearables

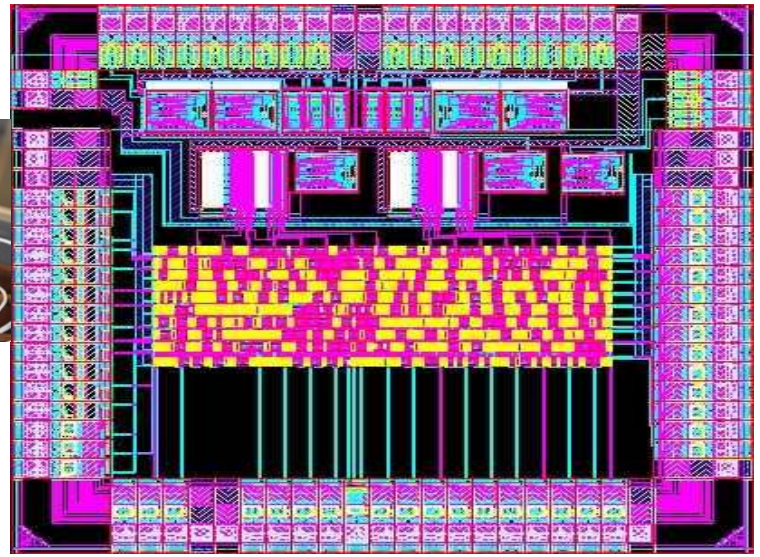
Microelectronic Integrated Systems (5)
ASICs for applications in outer space reserch and navigation

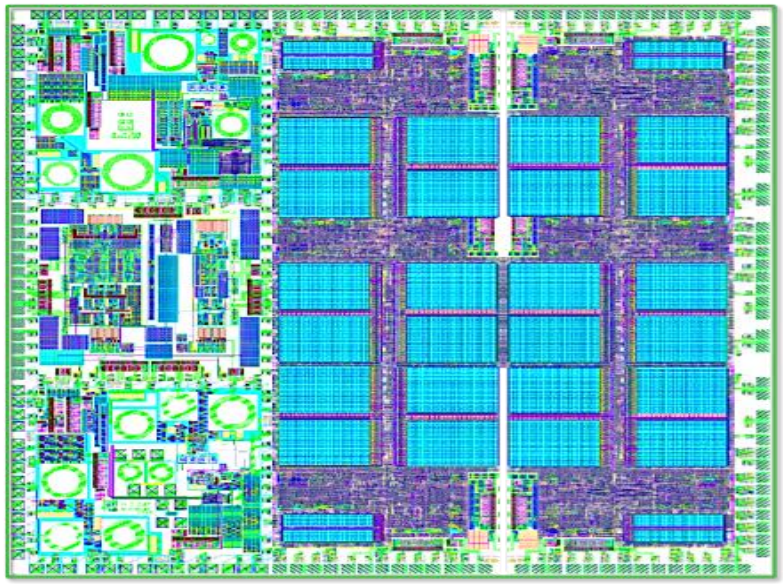
Rosetta mission





ASICs controlling operation of the comet penetrator and data transmission

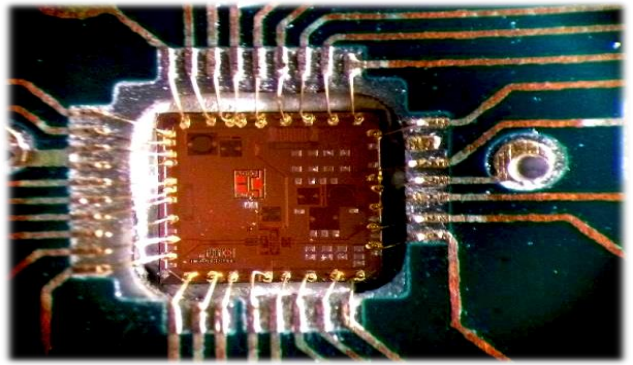




GNSS & NaviSoC

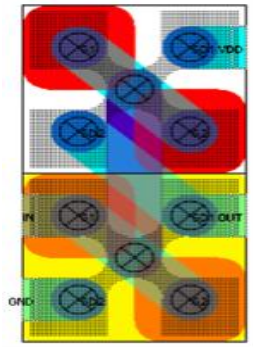
Single-chip solutions for precise satellite positioning

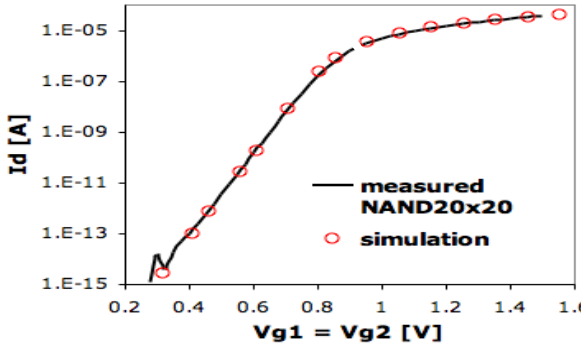
GPS L1/L5 + Galileo E1/E5
double-system,
multi-frequency,
multi-purpose receivers



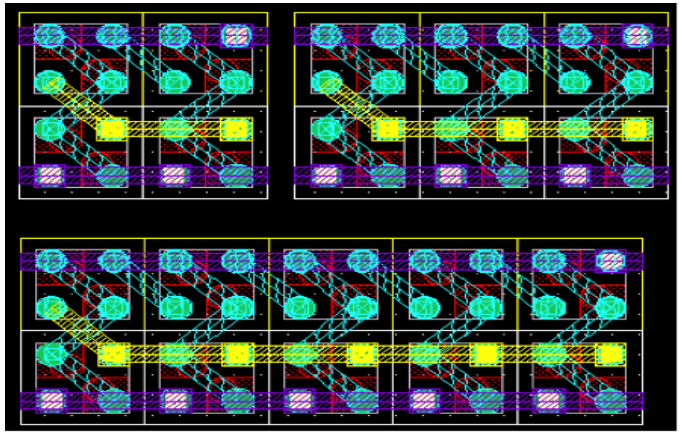
Microelectronic Integrated Systems (6)
VESTIC – a new ICs design/manufacturing paradigm

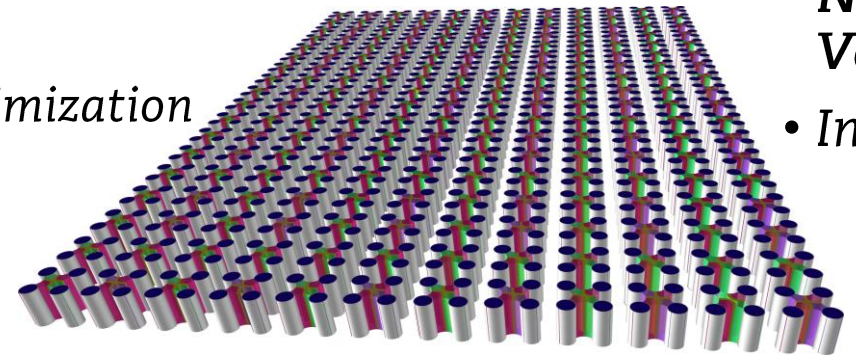
- *Full layout regularity*
- *3D device and interconnect structures*
- *Possible process simplification and minimization of number of masks*



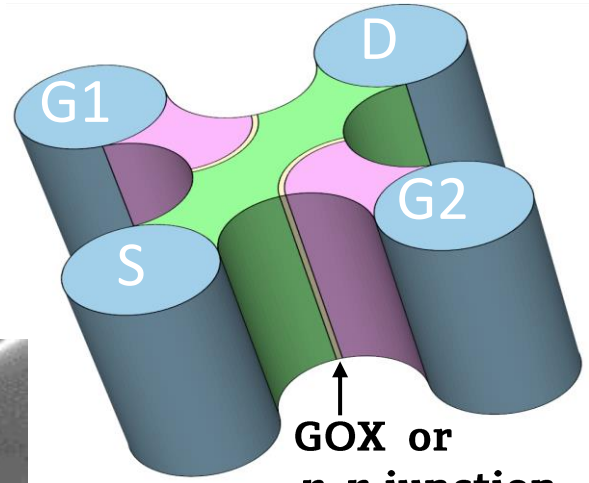


CADENCE and IMiOCAD design tools

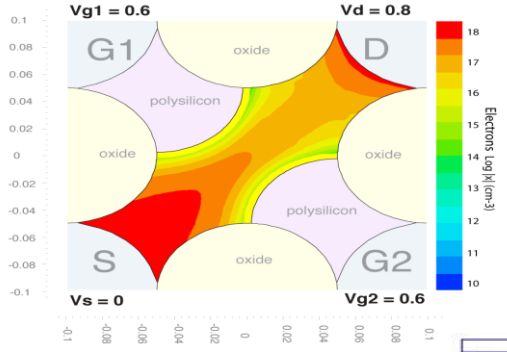


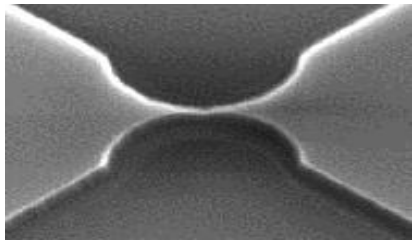


- ***New twin gates junction less Vertical Slit FET***
- *Integration of all kinds of devices*

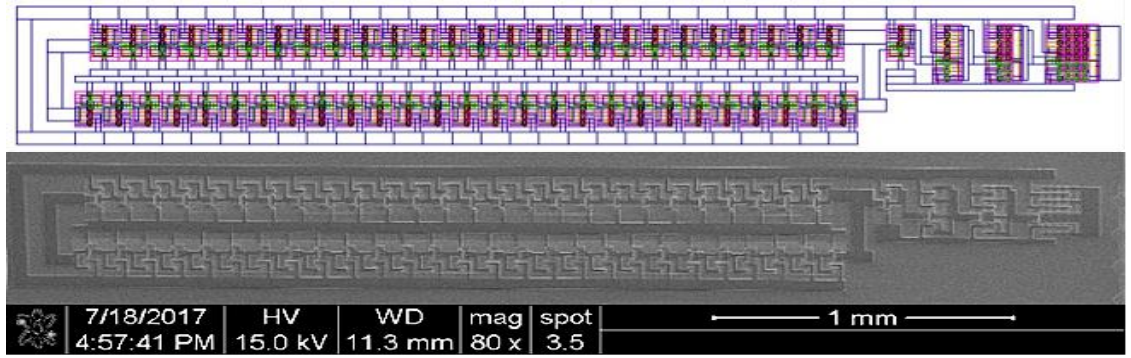


TCAD simulations

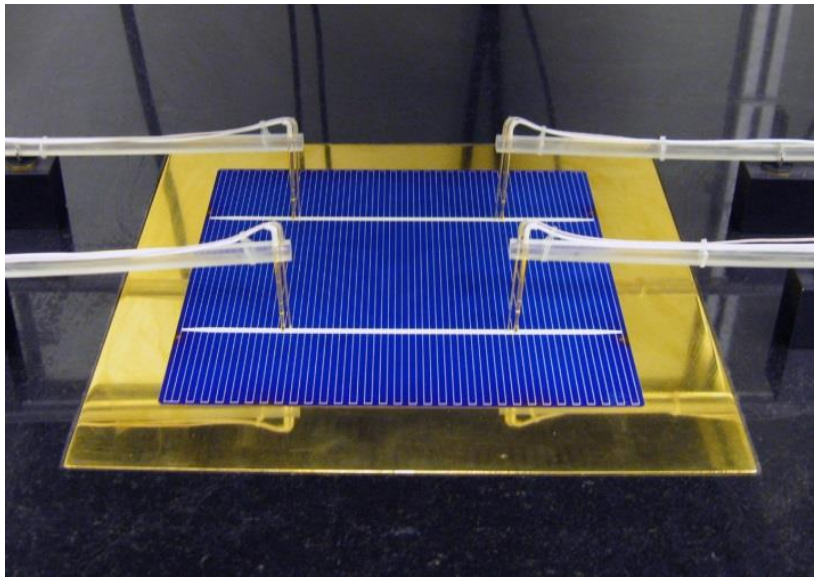




Test modules (e.g. Ring oscillator) – cooperation with Institute of Electron Technology



Photovoltaics

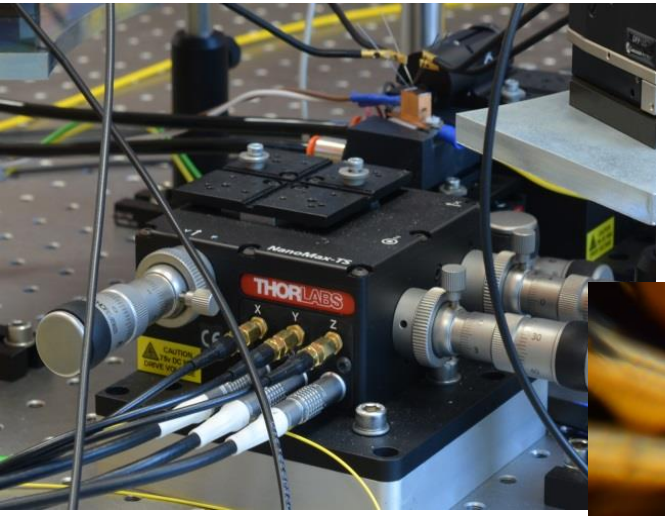


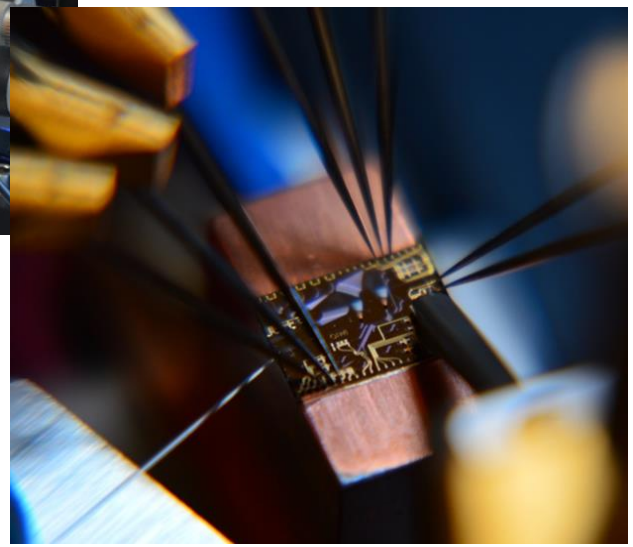
characterization of new materials for PV cells

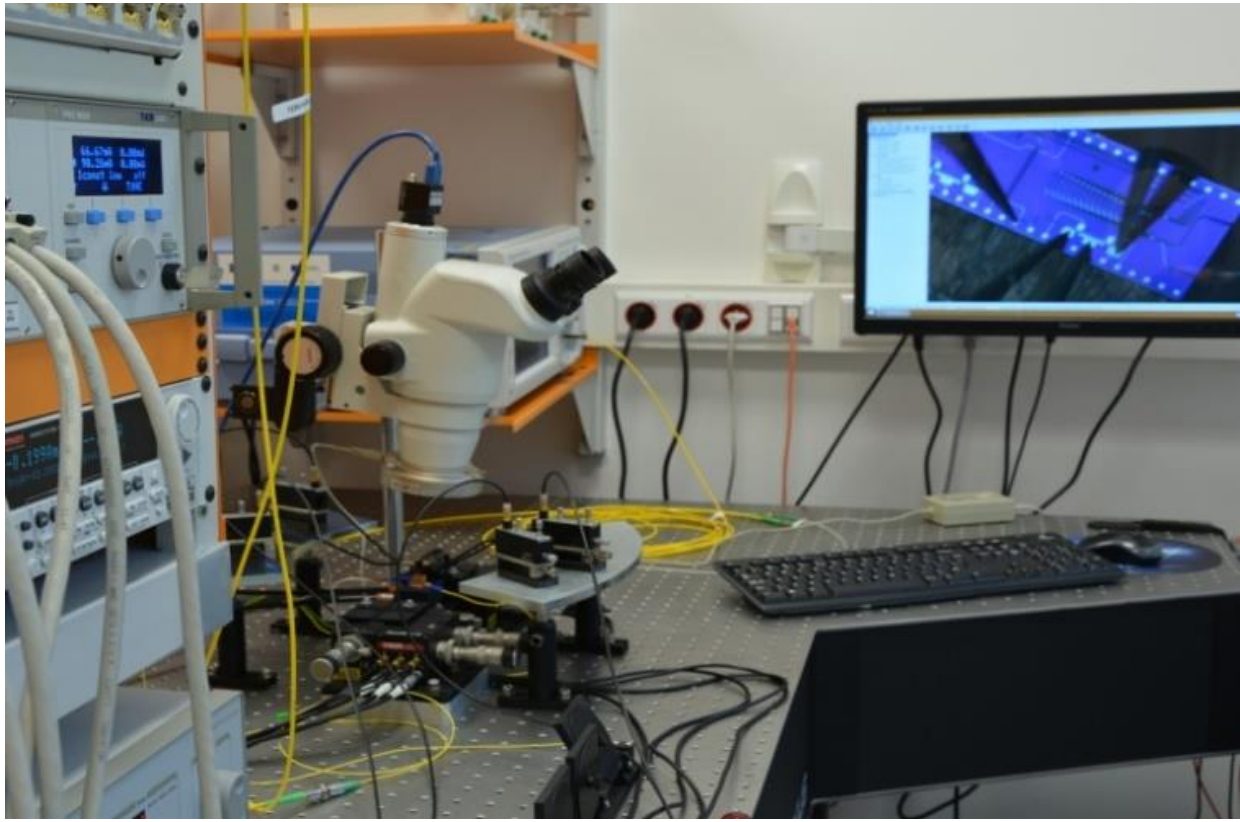
data analysis and energy rate predictions

design and development of photovoltaic systems

Application specific photonics integrated cuircuits (aspics)







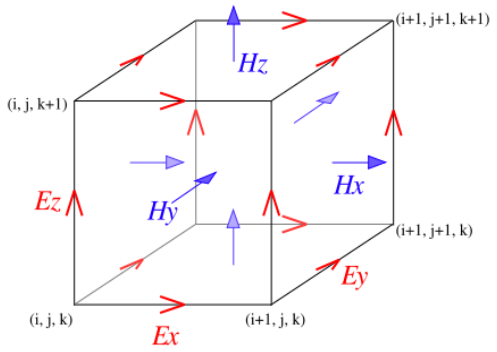
EEDH - Eastern Europe Design Hub (the only ASPICs-oriented R&D centre in EE)

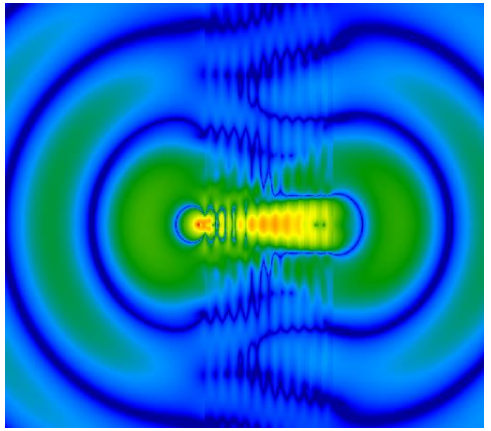
Design and characterization of ASPICs for telecommunication, medical and military applications

Subwavelength photonic structures

Innovative structures including coatings based on metamaterials serving variety of photonic applications, including:

- Novel detection systems,
- Active spectral and angular filtering,
- Increasing solar cells efficiency.

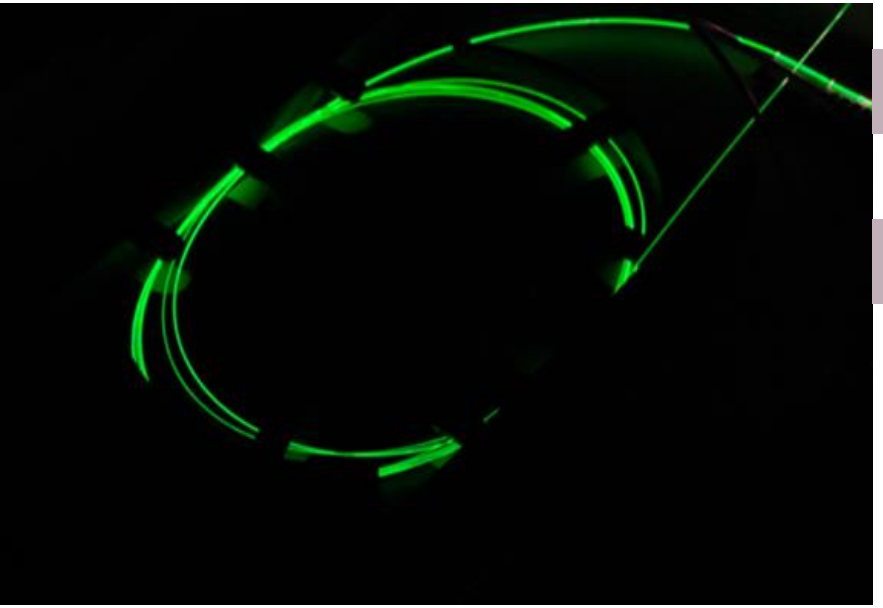




Advantageous:

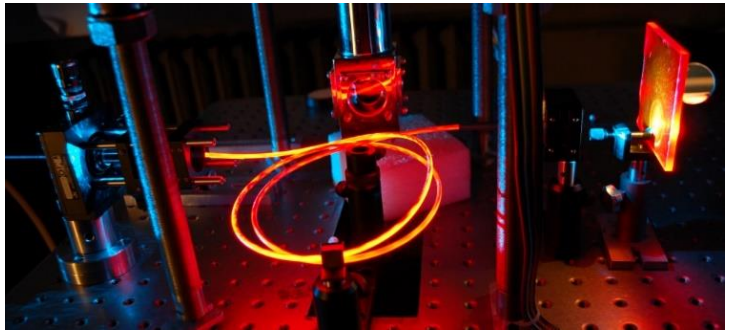
- Low power consumption
- CMOS compatibility
- Nanoscale dimensions
- Tailorable spectral range of operation

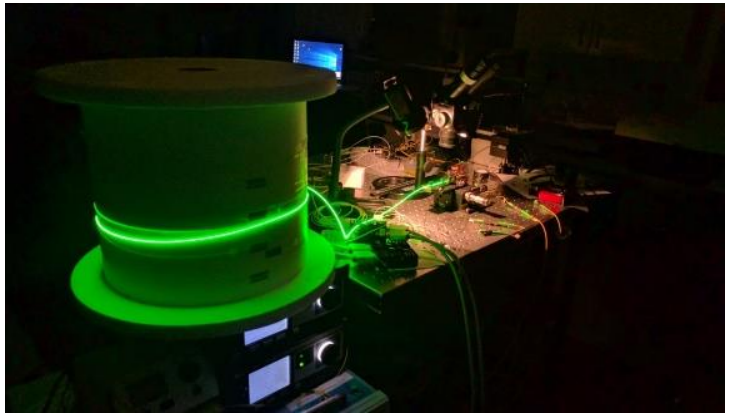
Fiber optic photonics



Short-wavelength fiber lasers (incl. up-conversion lasers)

NIR fiber lasers and amplifiers (incl. turn-key systems)



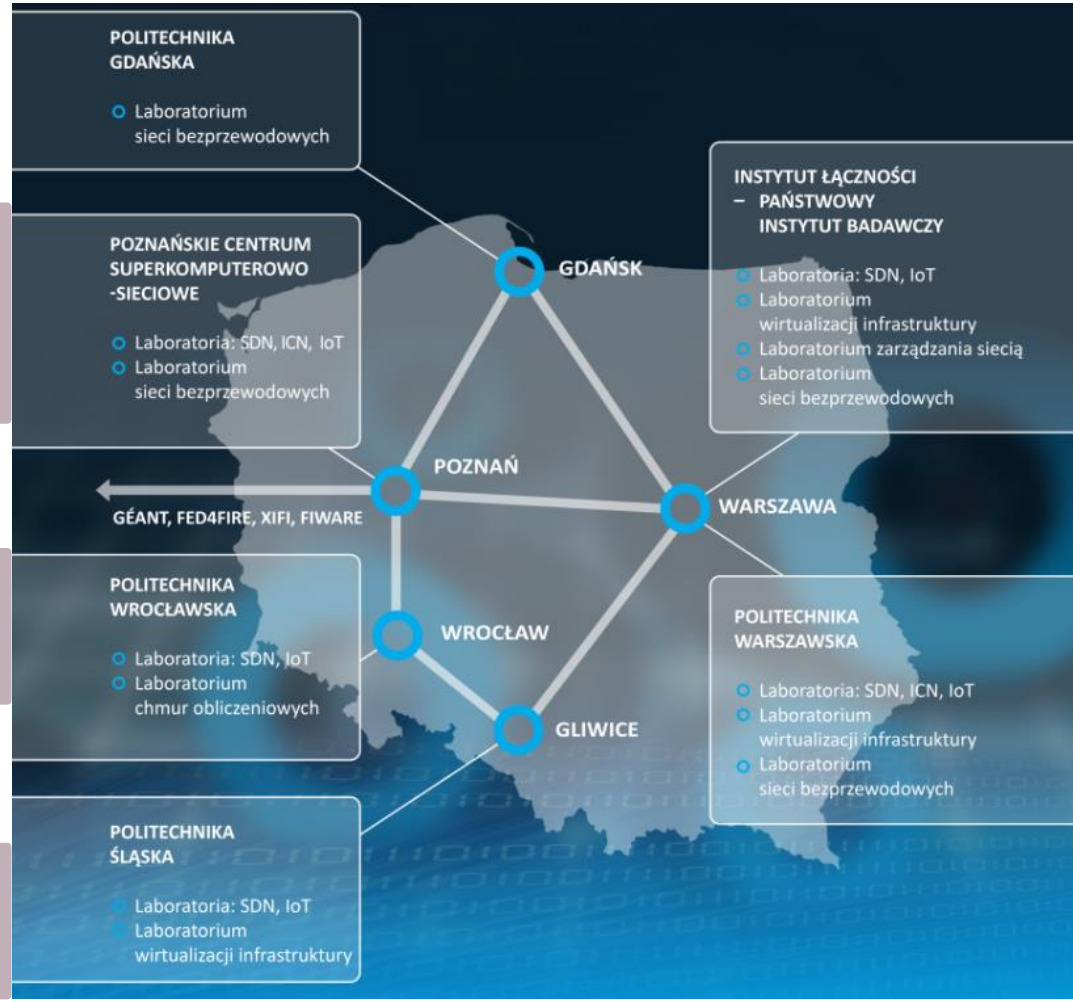


Polish Research Infrastructure for Experimentations on Future Internet Technologies

PLLAB 2020 is a distributed research infrastructure connecting 6 labs in Poland via dedicated optical 10Gbps.

Integrated with European Fed4FIRE research infrastructure

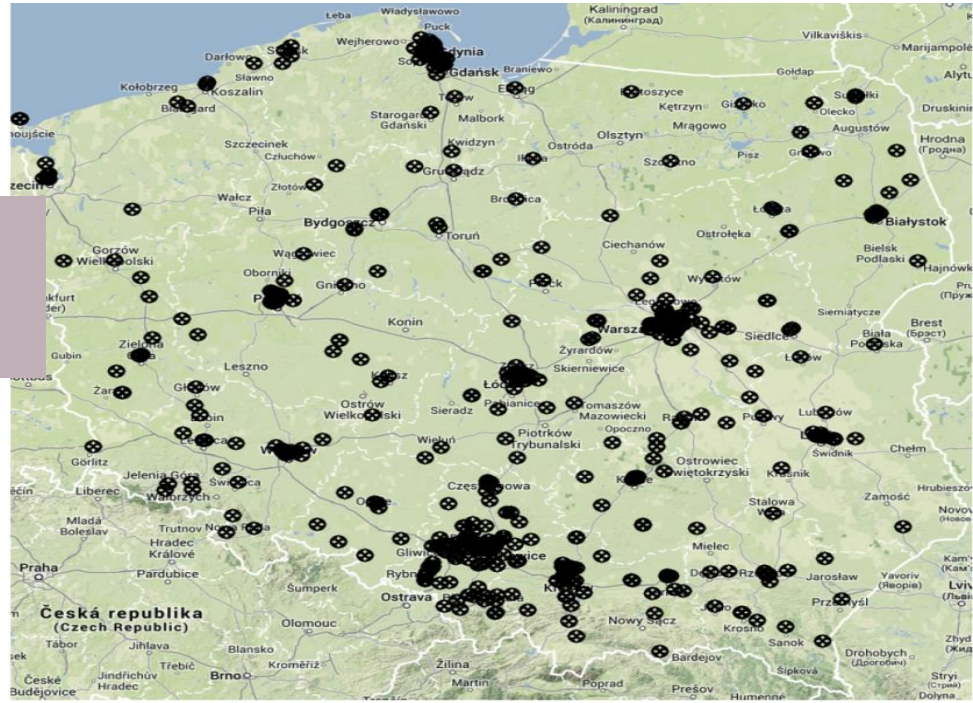
Remote access to experiments via portal: http://www.pllab.pl

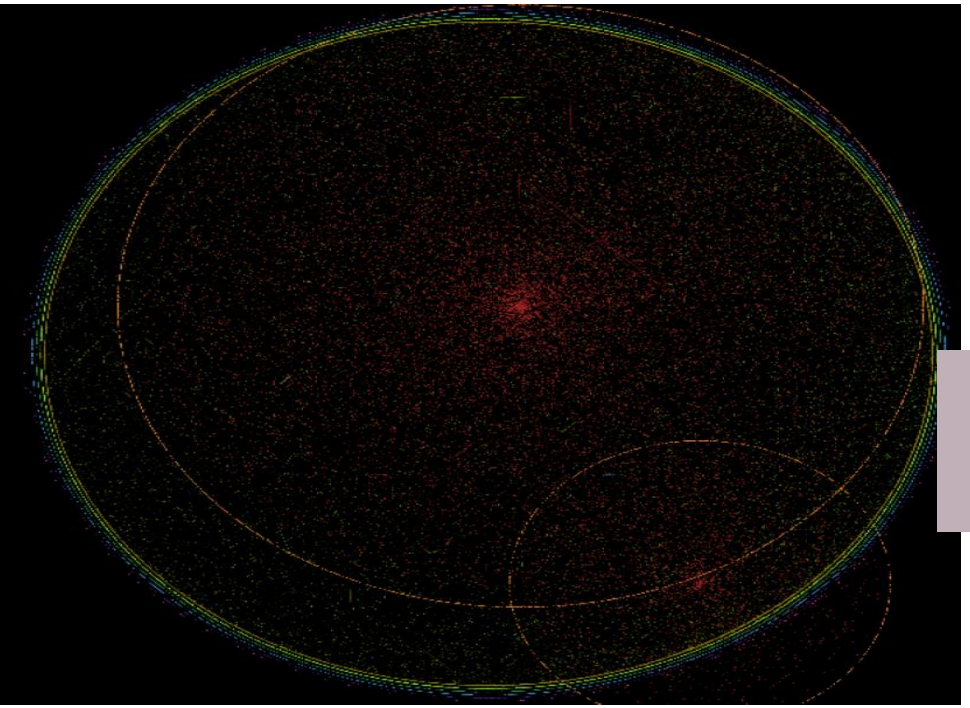


PL-LAB2020

Complex network analysis

structural resilience analysis for Polish autonomous systems (AS) network

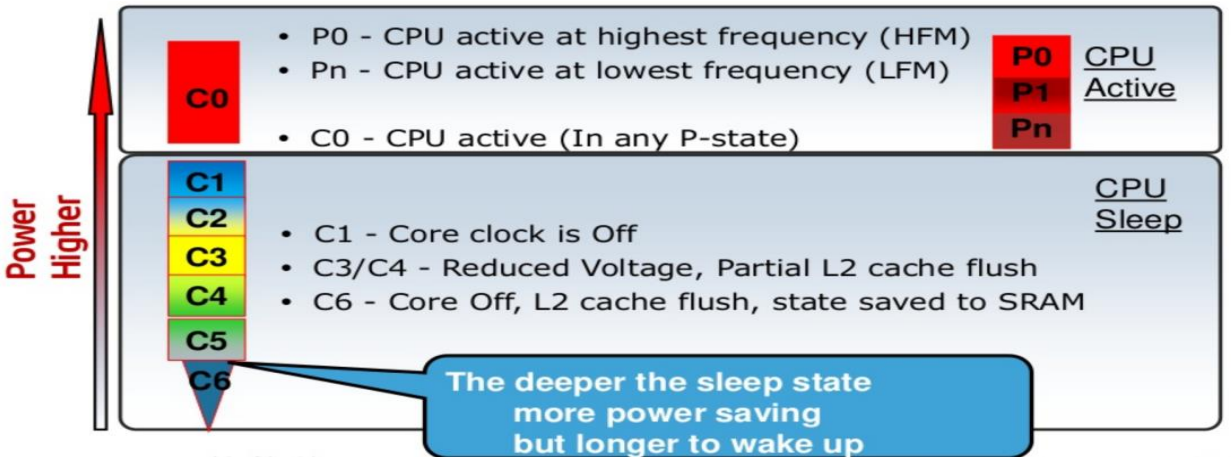


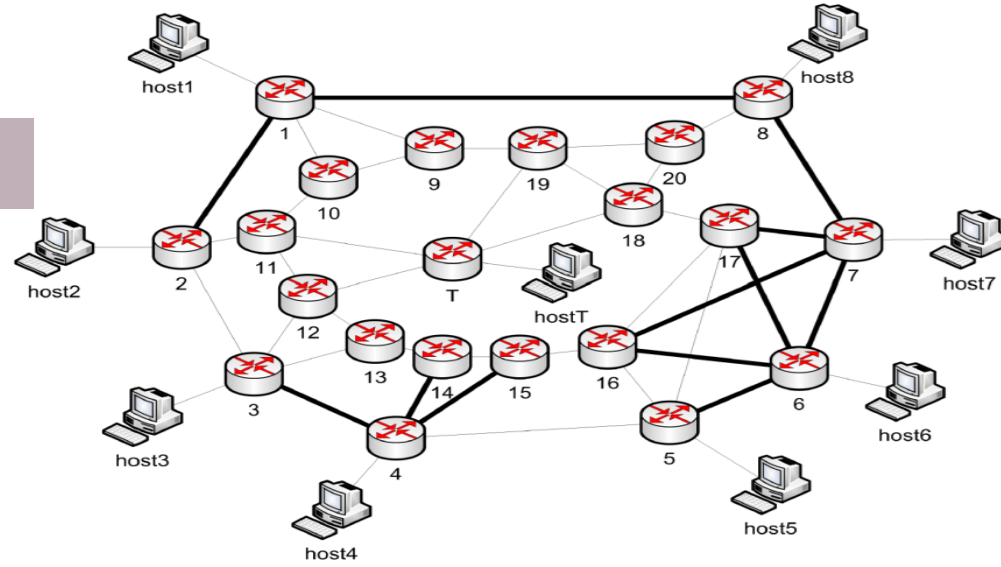


churn prediction for telco customers based on their social graph analysis

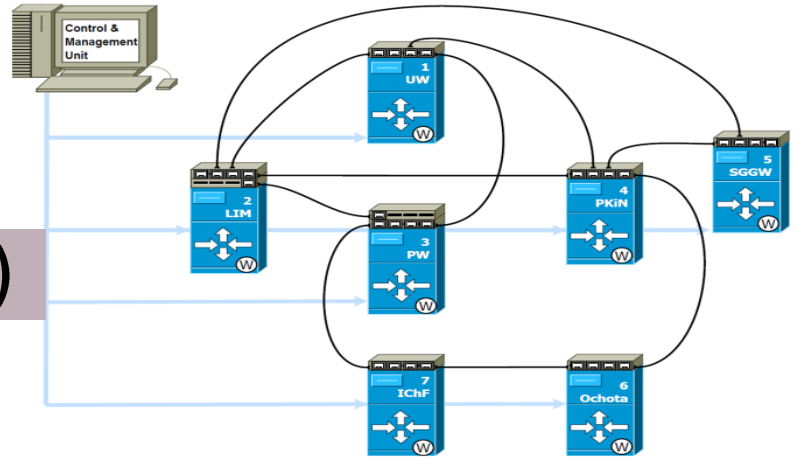
Energy-efficient network control

save energy by wise routing





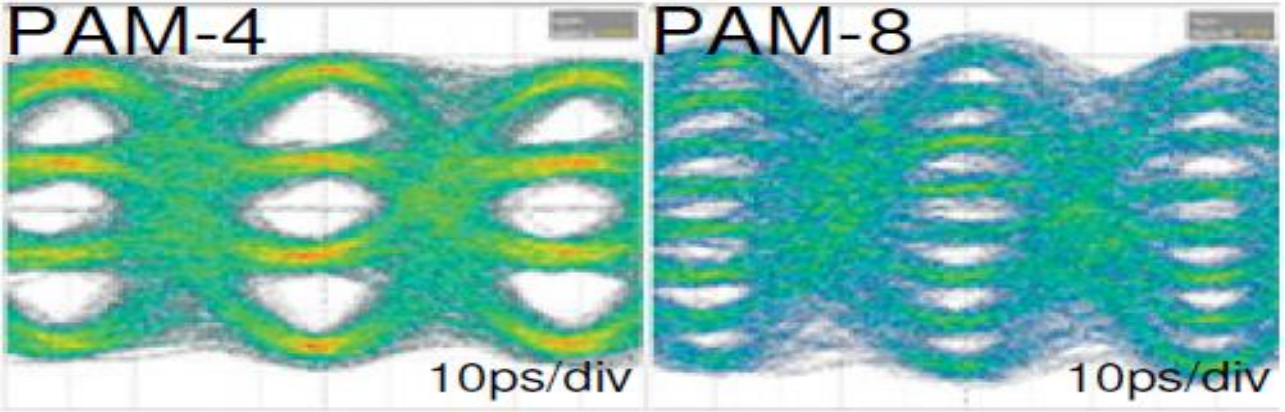
save energy by wise processor control



test in a dedicated testbed (@Econet FP7 project)

Telecommunication Systems

A world's record for short range optical data communication systems!

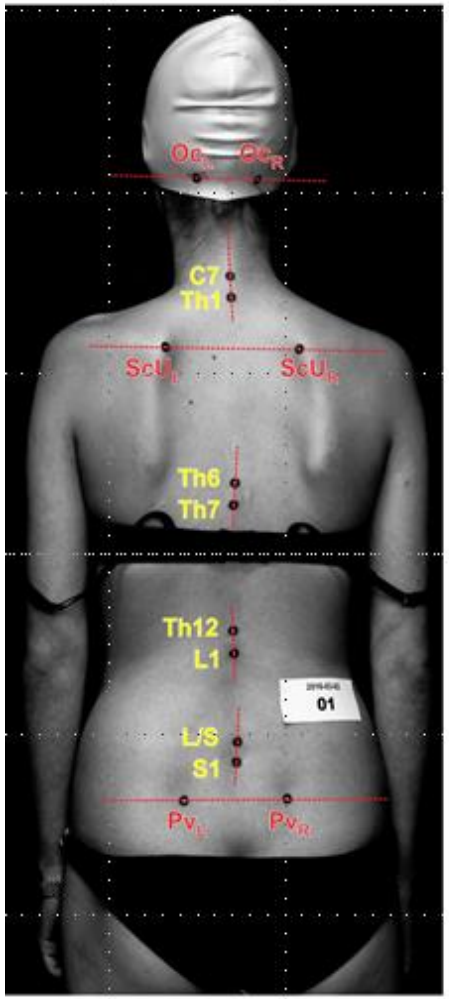


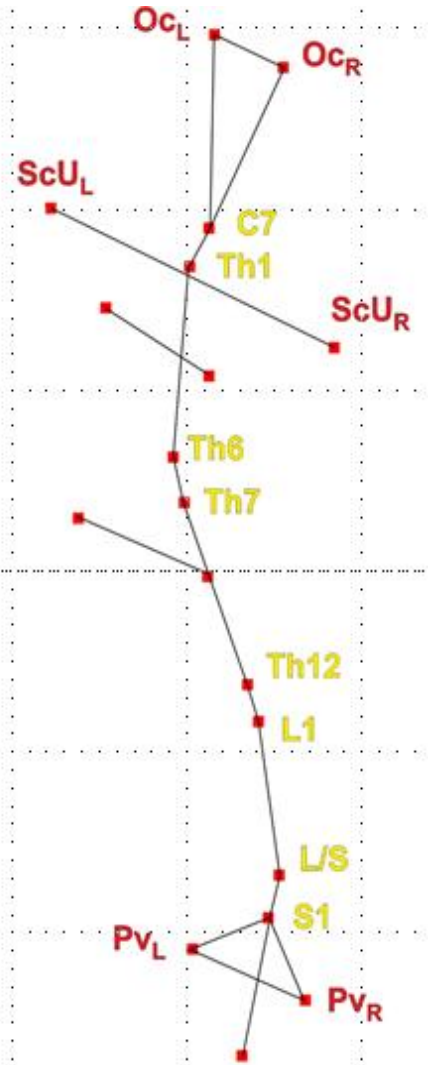
107 Gb/s transmission over 100 m and 54 Gb/s over 1 km of Multi Mode Fiber was achieved by our scientific team in 2016.

Optical system measuring selected body parameters for the purpose of physiotherapy and biomedicine

FEATURES:

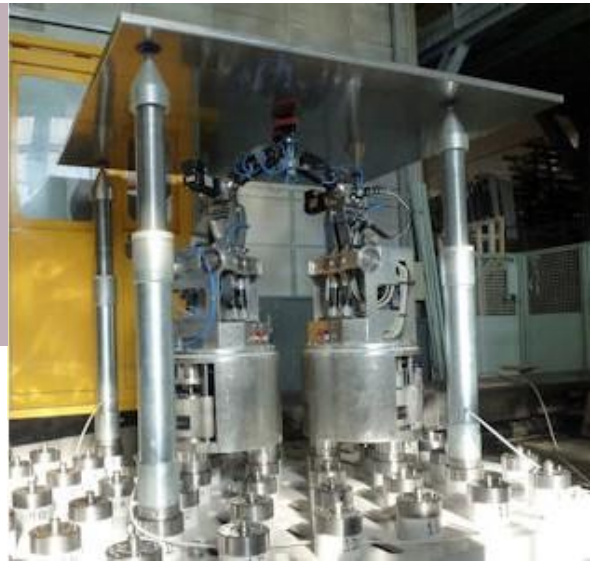
- Non-ivasive and non-contact method of evaluation of selected body parameters;
- Spatial position (x,y,z coordinates) of selected points are the result of measurement;
- No scanning: all points are measured simultaneously, lag free;
- System enables measurement of of the habitual posture – without any equipment stabilizing the musculoskeletal system of the examined, i.e.no forced position;
- System enabling the evaluation of dynamic changes of the posture caused by different factors;
- Differences between selected body positions or applied physical effort can be analyzed
- System is portable

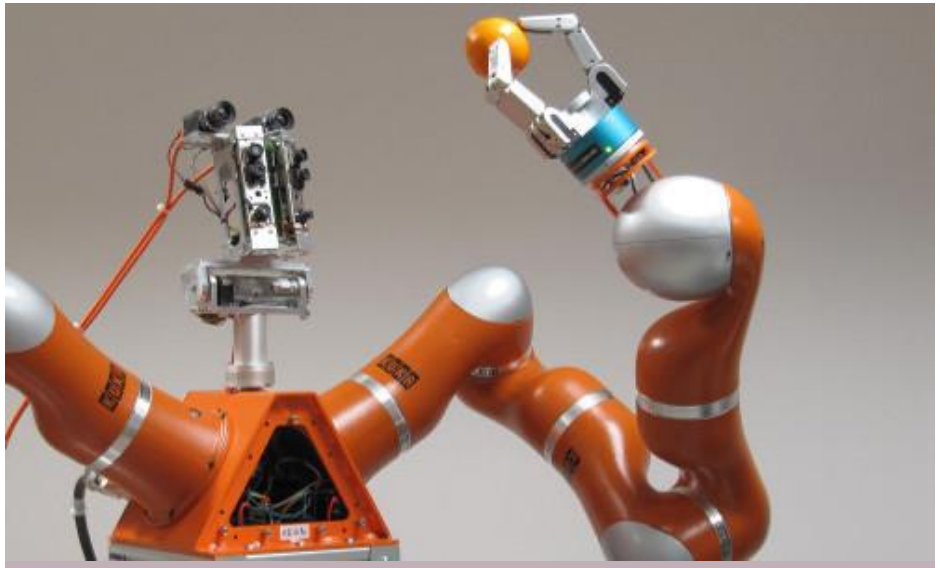




Robot Programming and Pattern Recognition Group

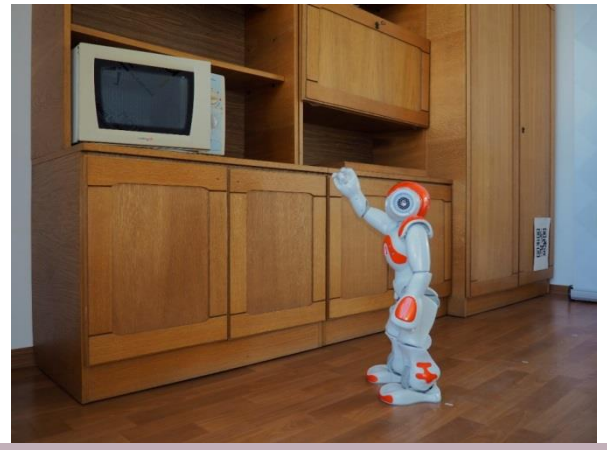
SwarmItFIX – Self-Reconfigurable Intelligent Swarm Fixtures composed of robots





RobREx - Autonomy in rescue and exploration robots

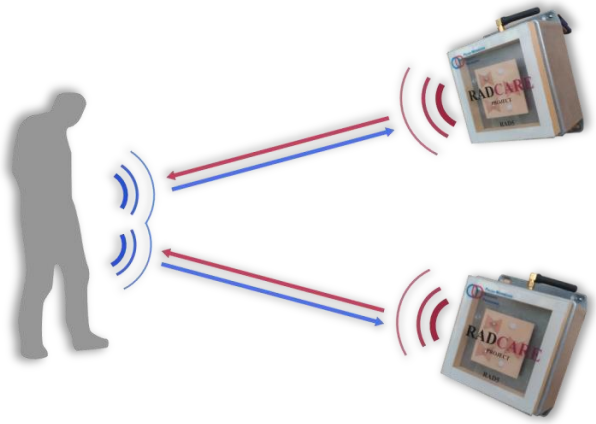
Methodology of design and implementation of multi-sensory robotic systems for service purposes - Sonata 3

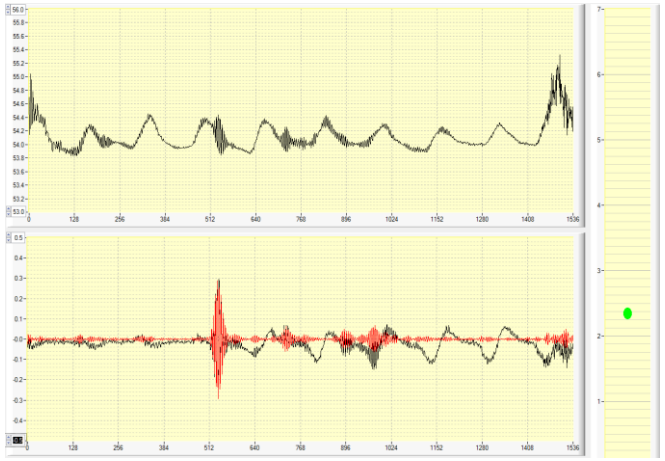


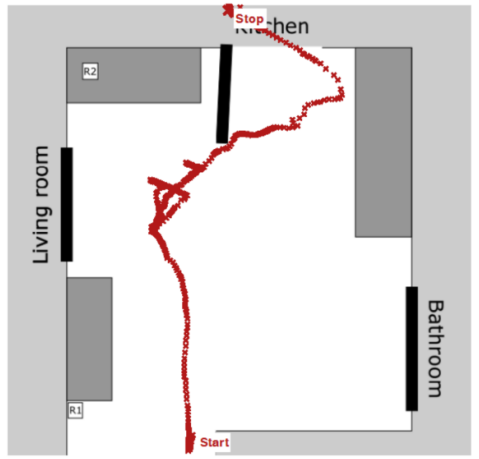
RAPP - Robotic Applications for Delivering Smart User Empowering Applications – cloud robotics

Care support for elderly and disabled people by radar sensor technology (RadCare)

Impulse-radar sensors – promising means for reliable monitoring of elderly and disabled persons in their home environment

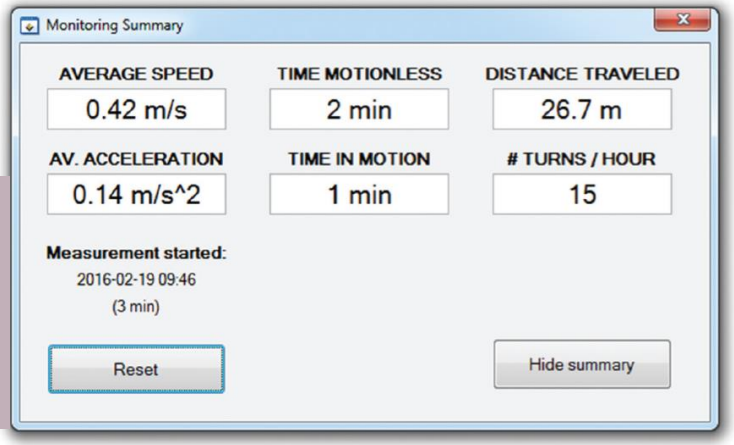




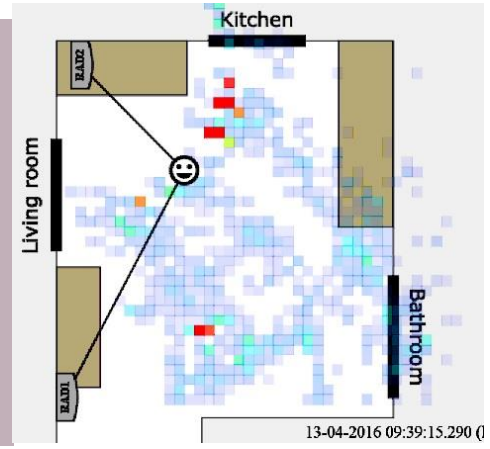


Long-term recording of data represenstative of day-and-night movements of a monitored person

Extraction of information characterising the evolution of the health status of the monitored person

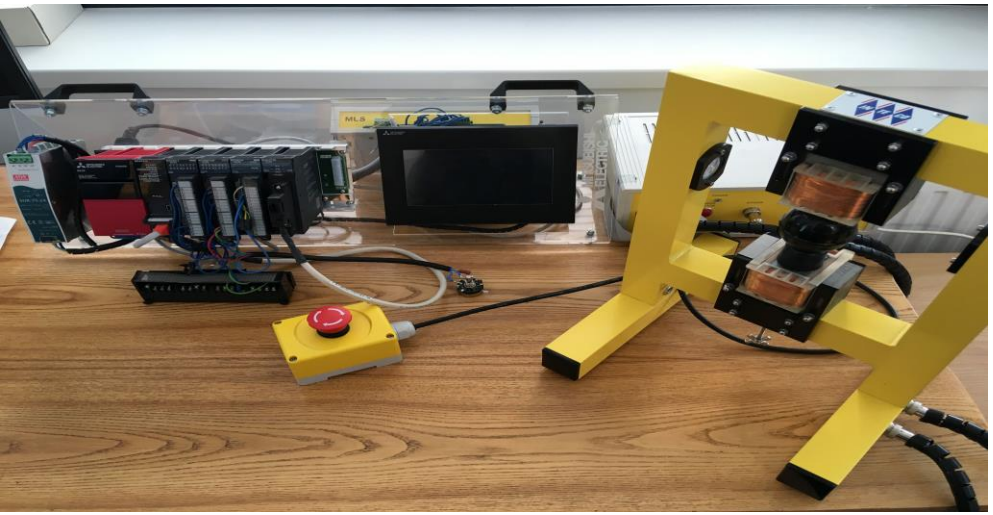


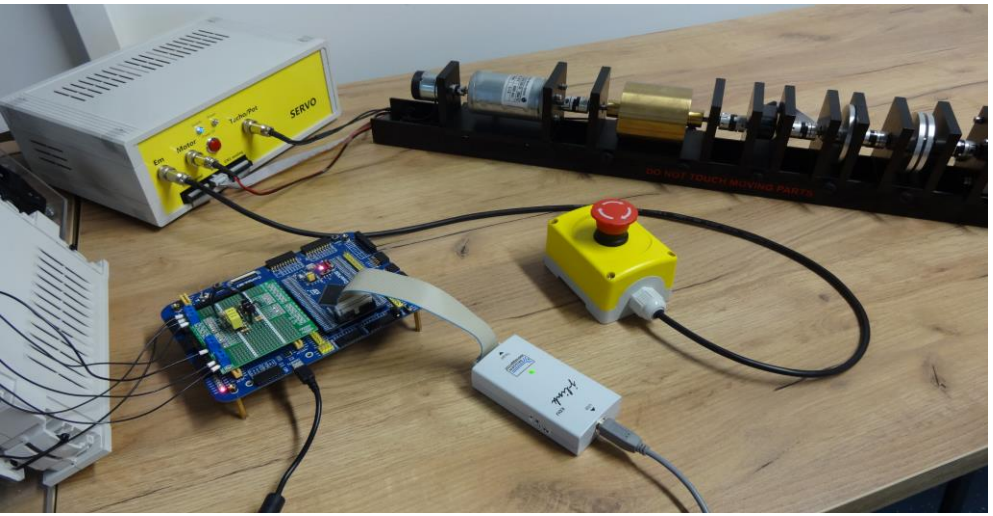
Detection of dangerous events, such as person's falls, and delivering the results of data processing to the healthcare personnel



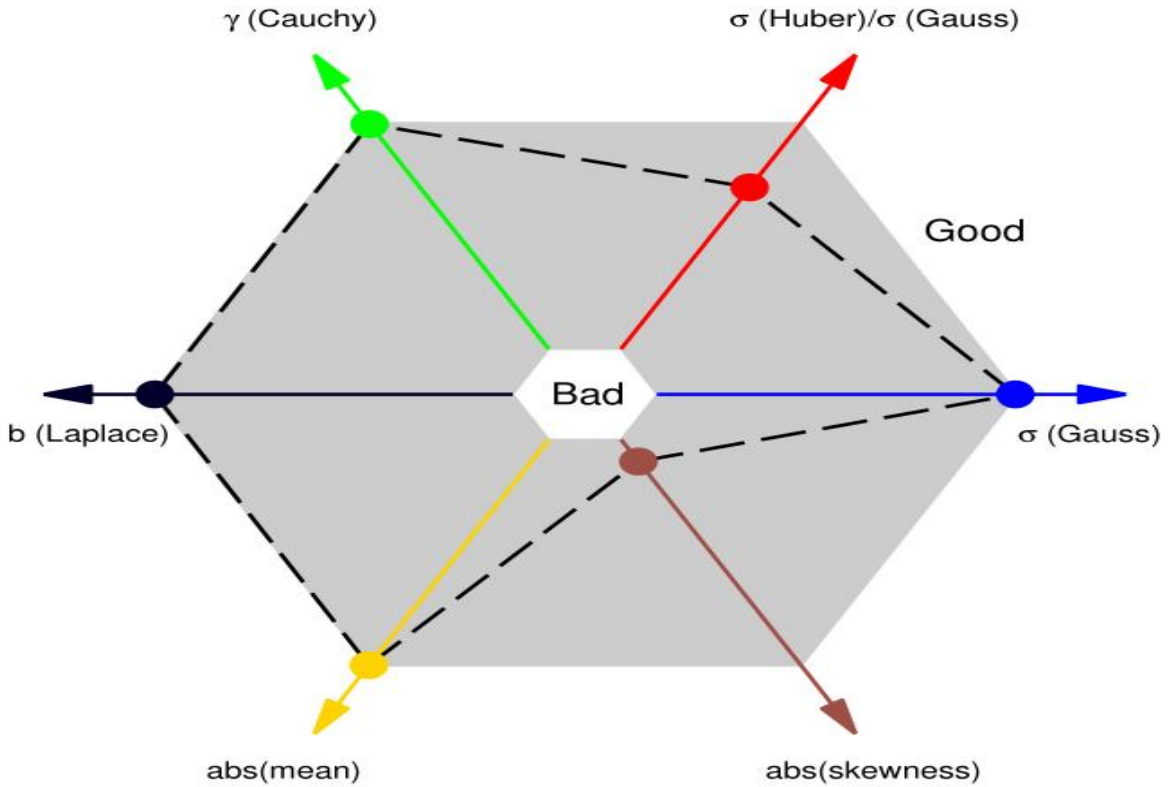
Algorithms for advanced process control

Nonlinear control algorithms for very fast processes, e.g. magnetic levitation and fast servomotor





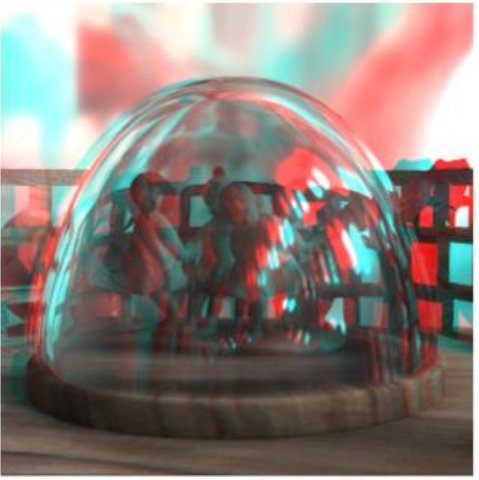
Multicriterial assessment of control quality in large-scale industrial applications



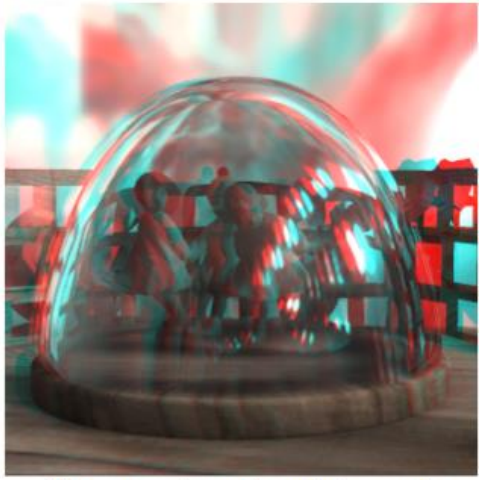
High quality realistic stereoscopic visualization and simulated holography

(a) Image without modification

(b) Optimized image

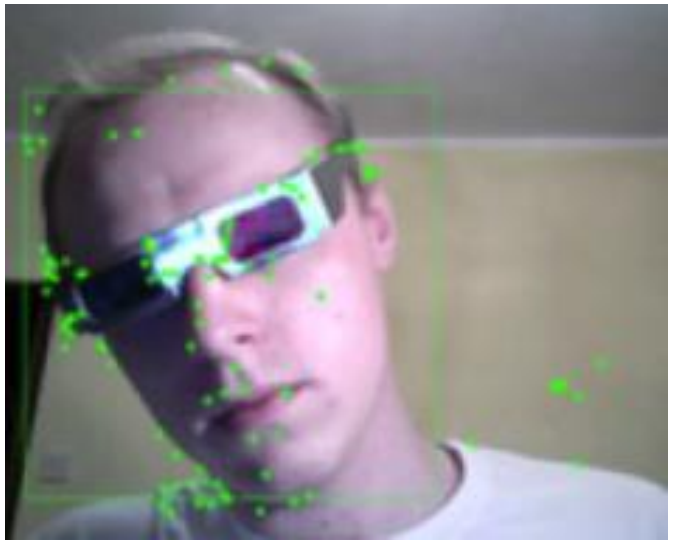


(c) Image without modification (anaglyph version)



(d) Optimized image (anaglyph version)

Perception based algorithms for analyzing and controlling disparity in high-quality realistic stereoscopic visualization (*partially in cooperation with Max-Planck Institute and MIT*)



Warsaw University of Technology

THANK YOU FOR YOUR ATTENTION!

c.zielinski@ia.pw.edu.pl