Institute of Electronic Systems

Warsaw University of Technology
Department of Electronics and Information Technology

WUT

Largest and best Polish technical university

- 19 departments
- ~2 100 scientific staff
- ~36 000 students

Largest VUT department

- Faculty of Electronics and Information Technology
- 6 institutes
- 3400 students

Institute of Electronic Systems

- 5 Divisions
- 92 staff persons including:
  - 22 professors (including 3 tenured and 12 associate professors)
  - 29 assistant professors
- 44 PhD students
- 81 lectures
- ~Over 1000 m^2 laboratory and 1200 m^2 office space
- 72 pending research projects (status Dec. 2018)
- 190 publications (including 10 books and 70 journal papers), (in 2018)

Research Fields / ISE Divisions

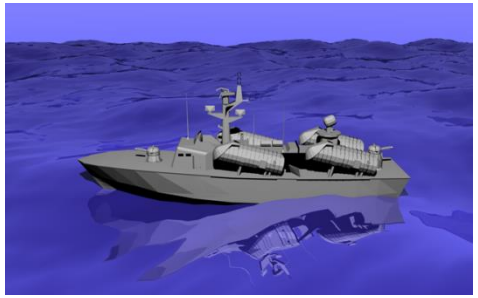
- **Circuit and signal theory**
- **Radar technique**
- **Microwave circuits and systems**
- **Electronic circuits and systems**
- **Sensors and microsystems**
- **Measurement systems**
- **Optoelectronics**
- **Biomedical engineering**
- **Artificial intelligence**

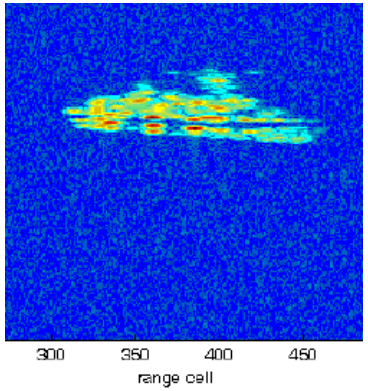
Circuit and Signal Theory Division
Microwave Circuits and Instrumentation Division
Electronic Circuits and Systems Division
Microsystems and Measurement Systems Division

Activities and Project Examples

Research Group on Radar Techniques

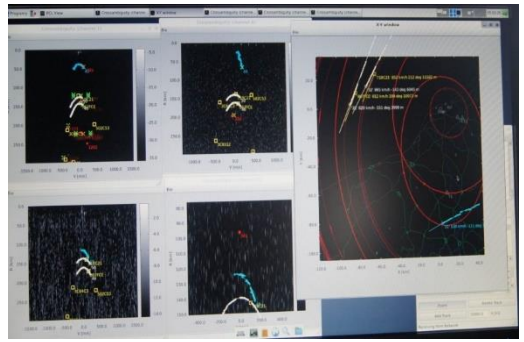
Radar systems simulator



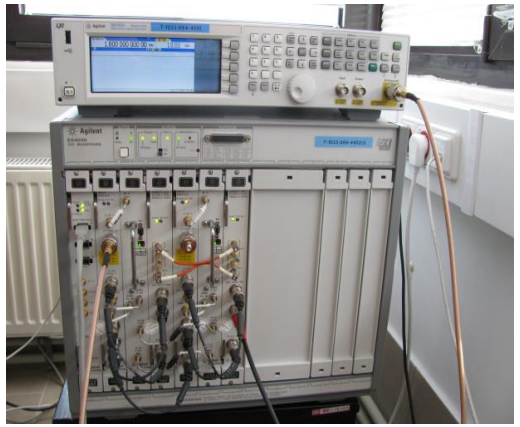


High resolution radar images (SAR, ISAR, InSAR, PolSAR)

Technology demonstrator of passive radar PaRaDe (Passive Radar Demonstrator)

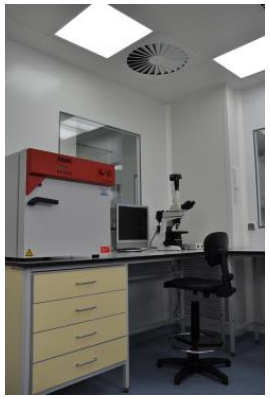
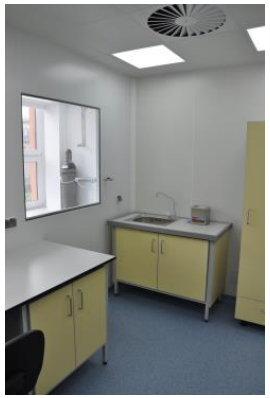


Maritime airborne radar ARS-800 installed on BRYZA 1RM-Bis aircraft



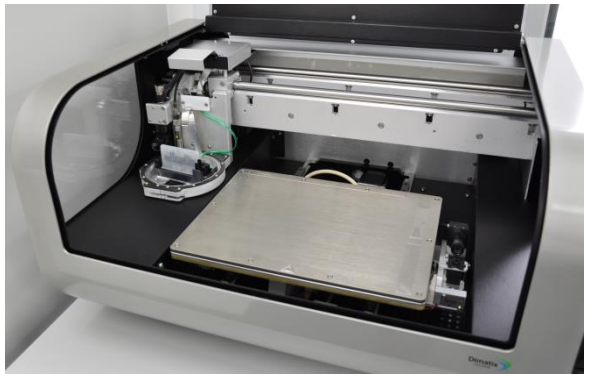
Microsystems and Sensors Research Group

Clean room laboratory

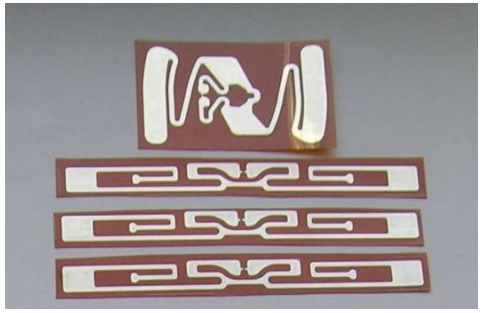
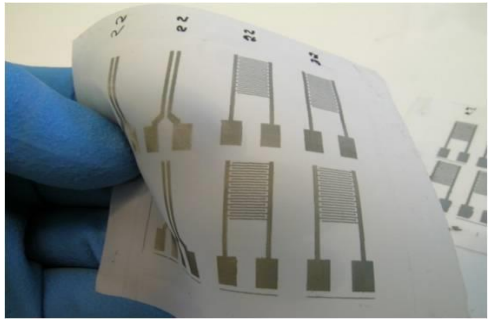
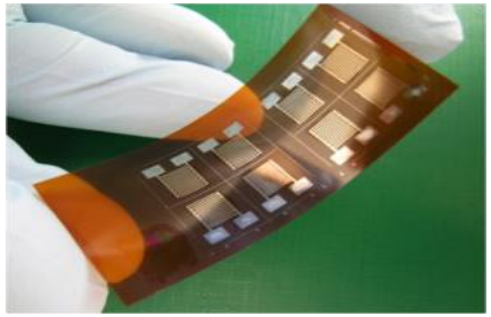




Ink-jet material printer DMP 2800 FUJIFILM Dimatix

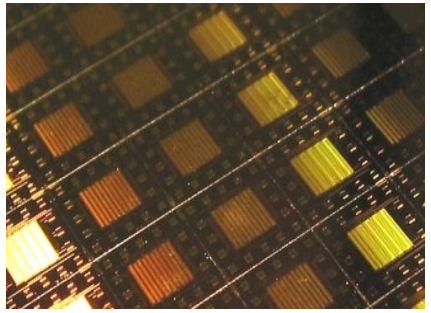
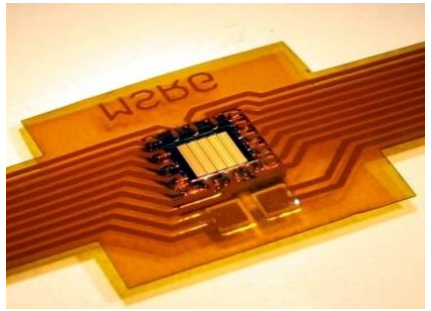
- Allows printing of different inks (conductive, resistive, semiconductive, dielectric polymers)
- The thickness of printed layers from tens of nanometers to hundred of nanometers



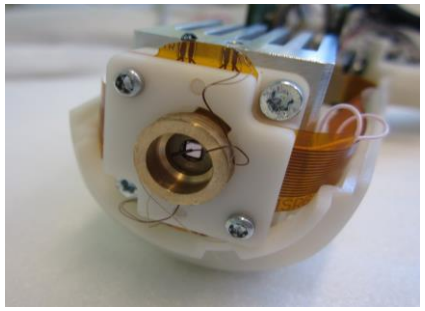
Flexible sensors and RFID antennas printed on PET, Kapton, textiles

MEMS semiconductor detector of fast dew point hygrometer

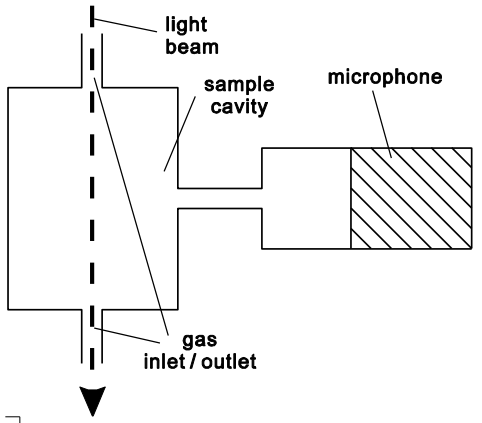
The hygrometer measurement head construction details



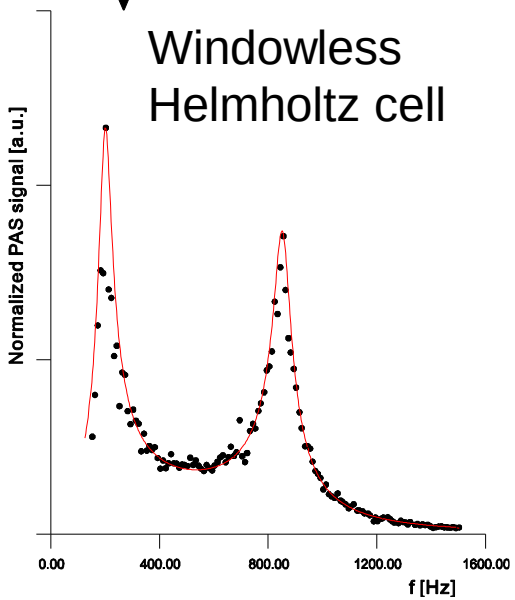

Autonomous boat for Dobczyce lake inspection - water pollution detection (Krakow water intake)

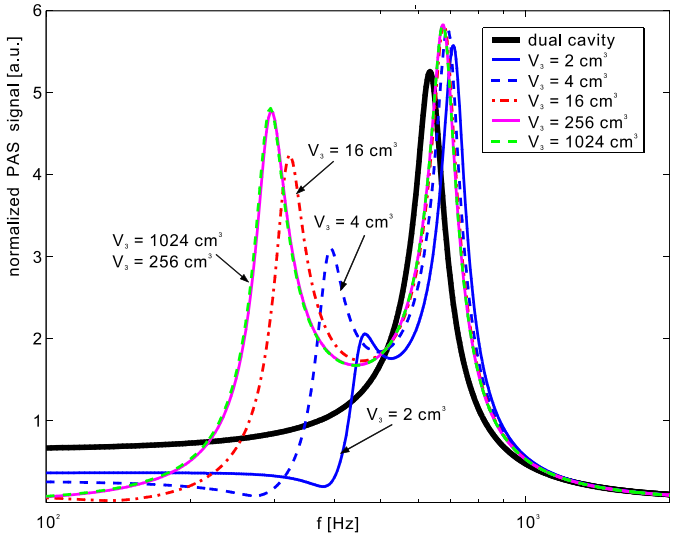
Research Group on Analogue Circuits - Pulse and Digital Equipment

Design and modeling of photoacoustic equipment

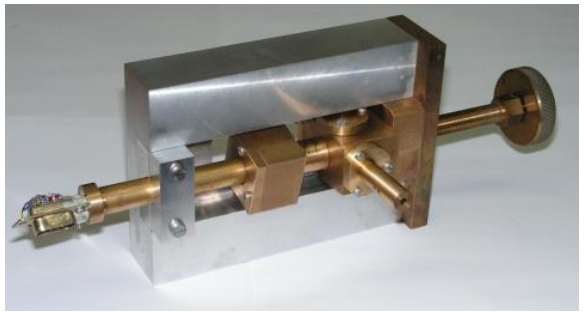


Windowless Helmholtz cell

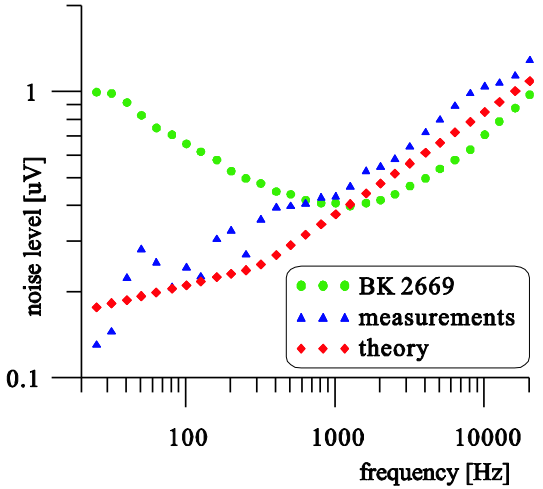




Multicavity Helmholtz cells



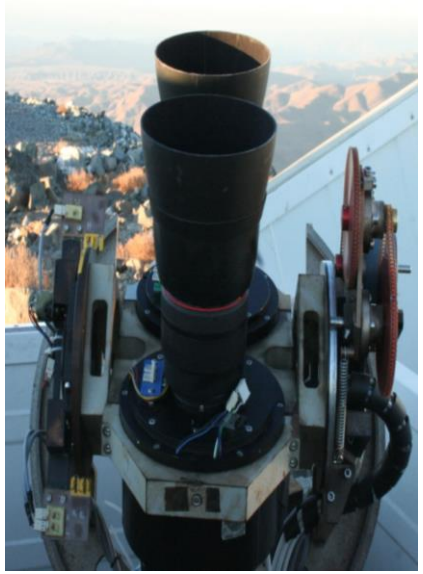
Ultralow noise microphone preamplifier

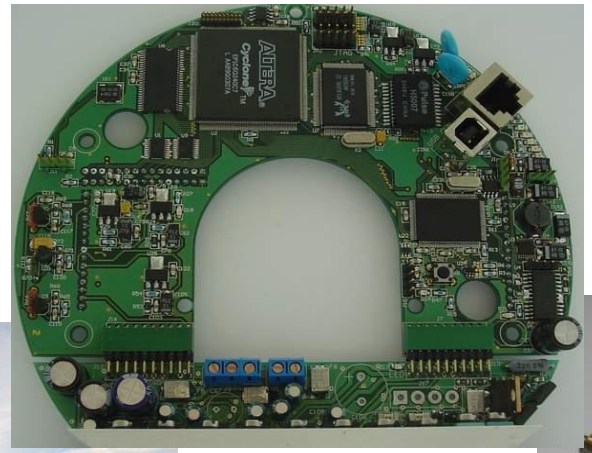


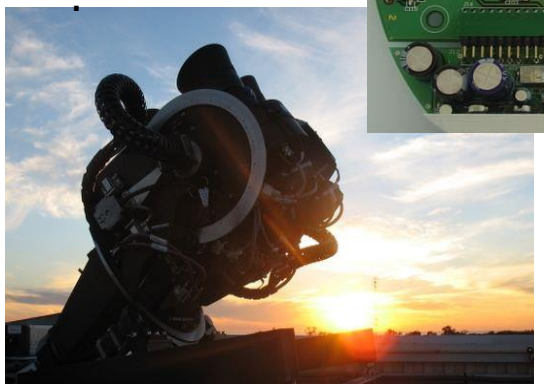
Research Group on Internet Measurement Systems, PERG Team

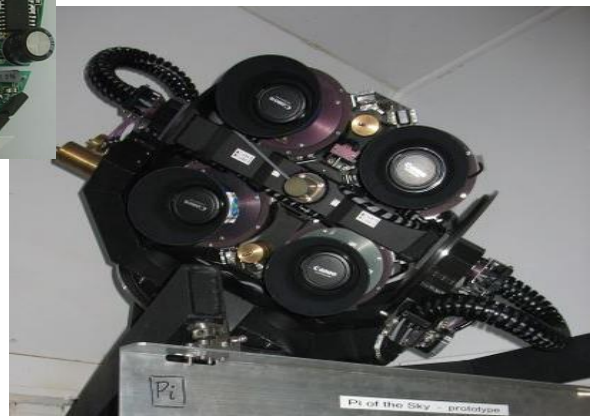
Pi of the Sky project

- Search for GRB events
- All visible sky
- On-line analysis
- Leading project of polish science
- Publication in Nature

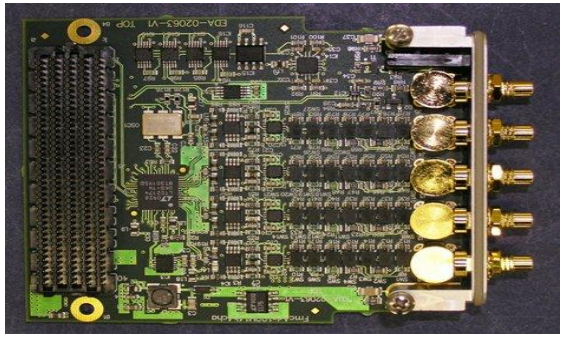






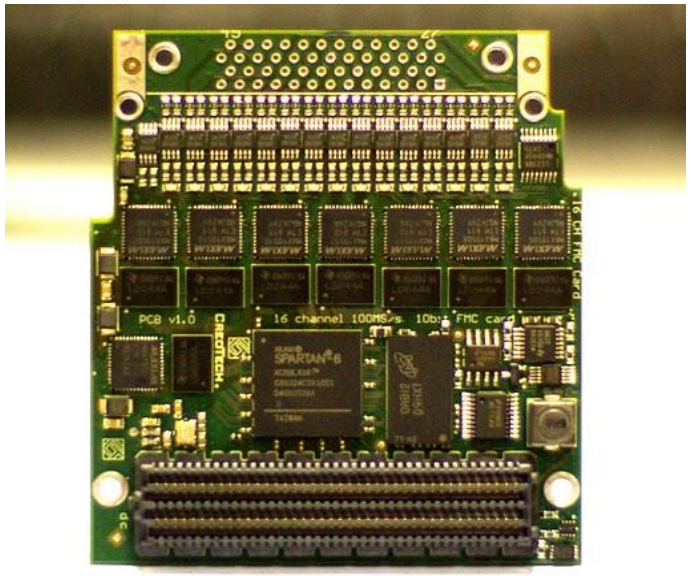


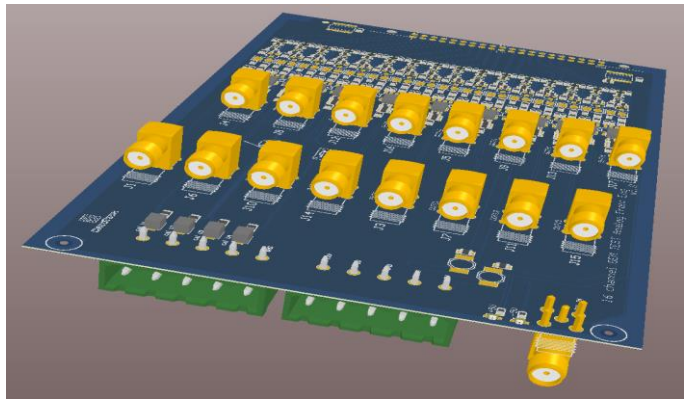
FPGA Mezzanine Card Development Cooperation with CERN

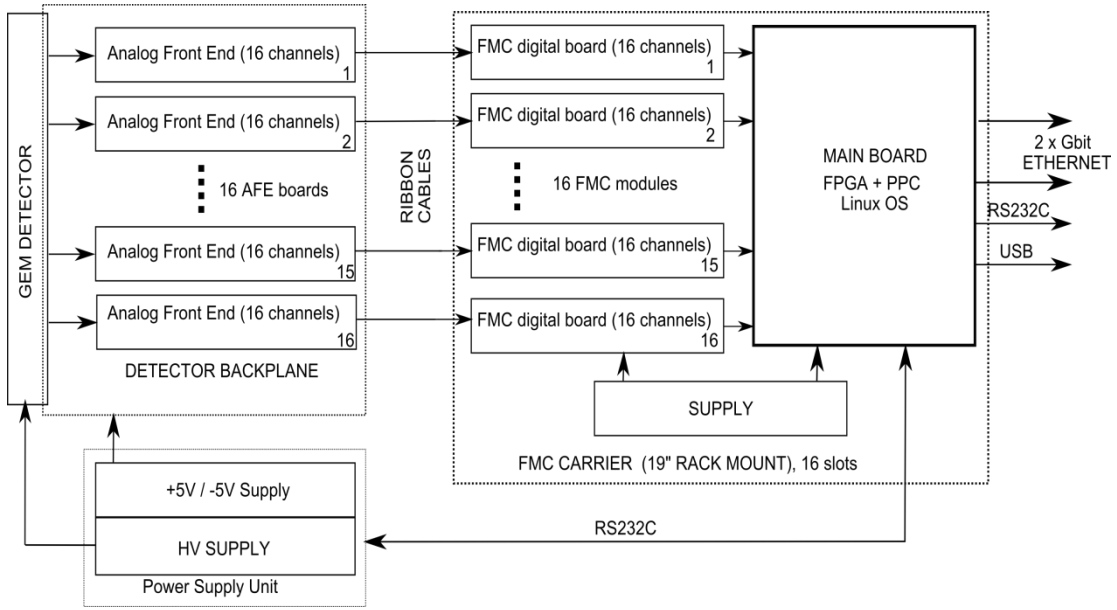


Research Group on Internet Measurement Systems, PERG Team

JET Nuclear Synthesis Reactor High Voltage Power Supply and Control Electronics

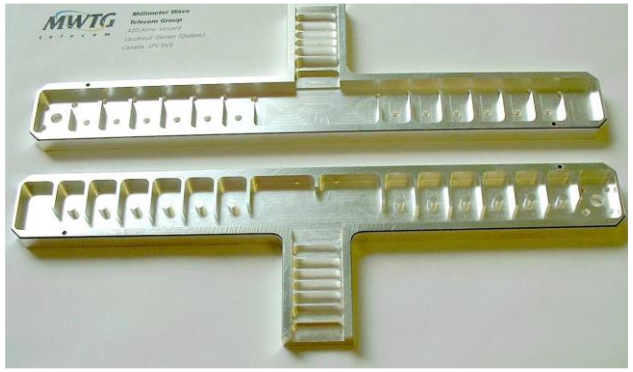




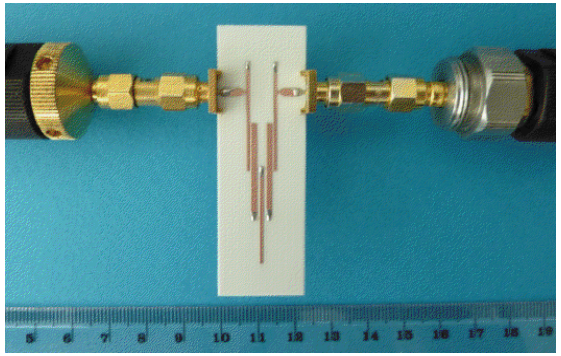


Microwave Circuits and Instrumentation Division

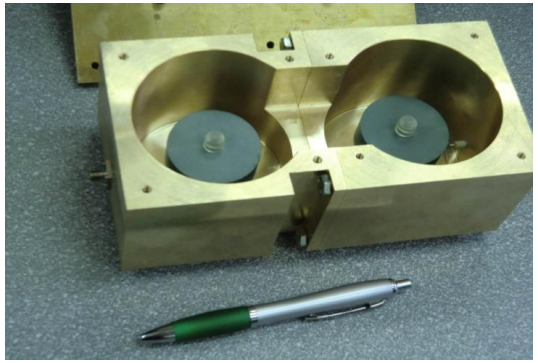
Microwave Filters



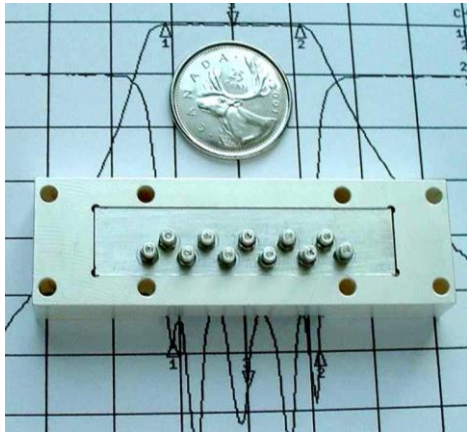
Waveguide diplexer with low pass input for 13 GHz, size 150x85x15 mm, designed for MWTG, Canada



Ultra Wide Band filter for 2000 MHz, bandwidth 600 MHz (39%)

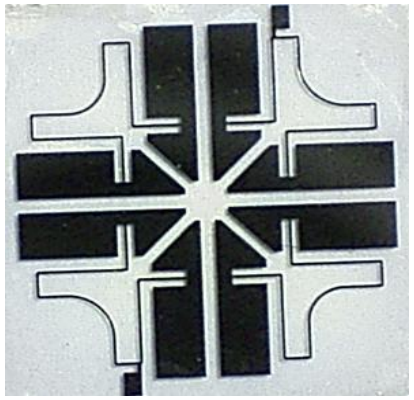


High quality filter for 1300 MHz, bandwidth 360 kHz (0.028%), IL=1.5 dB, thermal stability 2 ppm/°C, designed for DESY, Germany



Waveguide filter for 22 GHz, size 50x13x10 mm, designed for MWTG, Canada

HTS YBCO dual mode waveguide filter for 3900 MHz, bandwidth 40 MHz (1%), size 22x22x10mm designed for Bosch, Germany



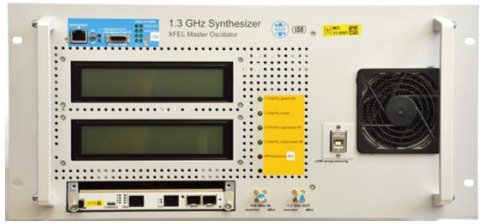
HTS YBCO filter on sapphire substrate for 2450 MHz, bandwidth 60 MHz (2.5%), size 8x8 mm designed for IF PAN

Microwave Circuits and Instrumentation Division

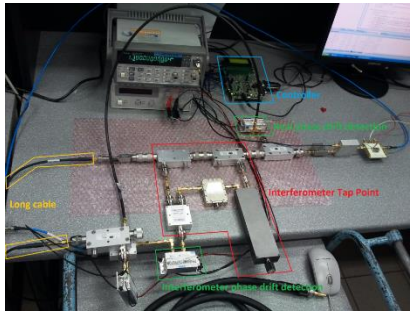
Long Term Collaboration with DESY Hamburg

Femto-second synchronization and phase reference distribution

European XFEL Master Oscillator System



Examples of E-XFEL Phase Reference System Components



Microwave Circuits and Instrumentation Division

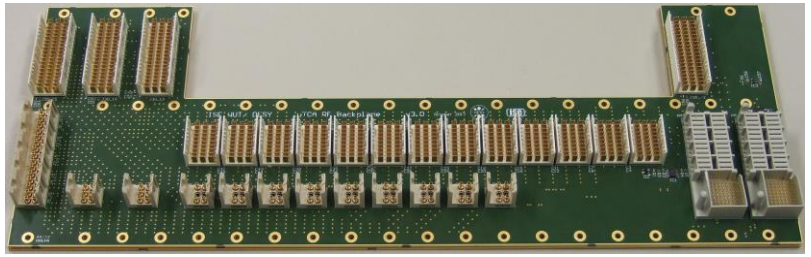
Long Term Collaboration with DESY Hamburg

Developments for LLRF control system based on MTCA.4 platform

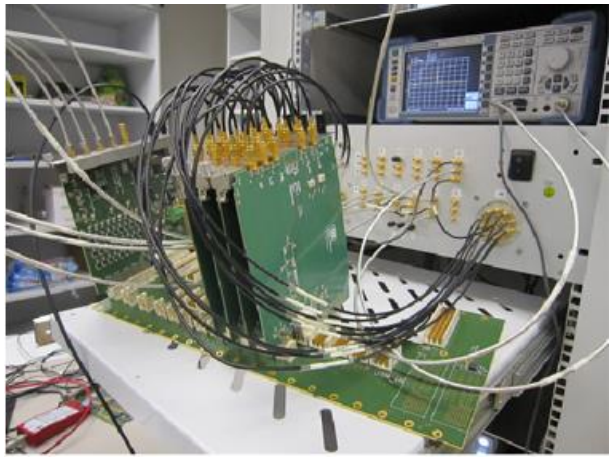
10-channel Downconverter 1.3GHz -> 54 MHz developed for DESY/Struck GmbH

1.3GHz Vector Modulator developed for DESY/Struck GmbH

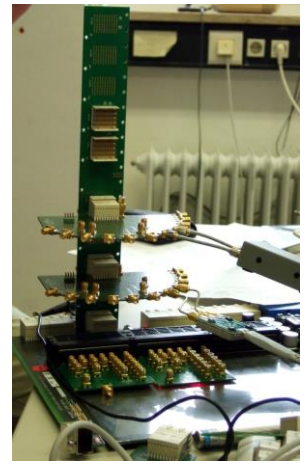
MTCA.4 RTM Backplane



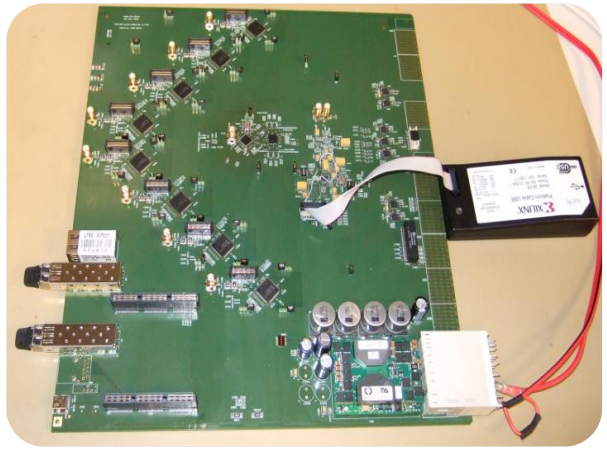
Automatic test stand for MTCA.4 RTM Backplane



ATCA Zone 3 Backplane tests



8-Channel direct 1.3 GHz signal digitizer ATCA



Phase Reference Line for ESS

Distribution of 2 frequencies (352.21 MHz and 704.42 MHz) from MO to the tunnel

Total length: ~600m.

Number of taps: 58

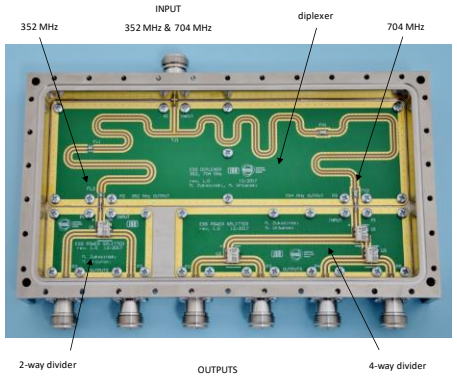
No of outputs: 294

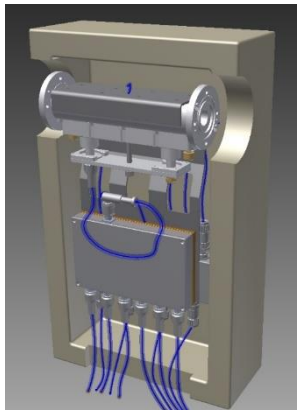
Power level at each tap: +17 dBm

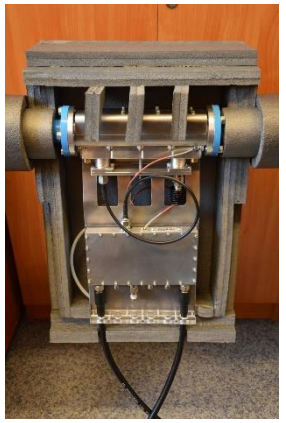
Stability requirement:

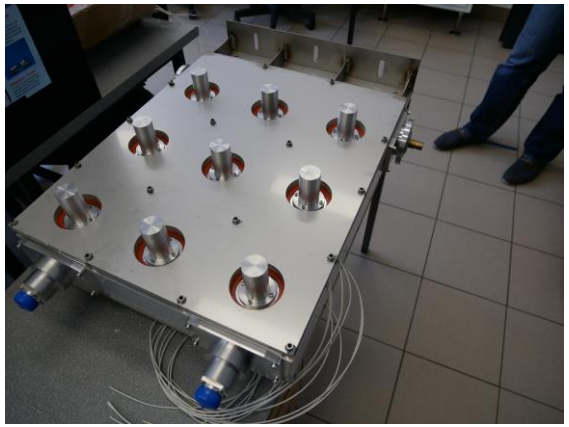
- 0.1° for short term(during pulse 3.5 ms)
- 2° for long term(hours to days) between any two points in the linac

Stabilization of temperature, air pressure and humidity for the line







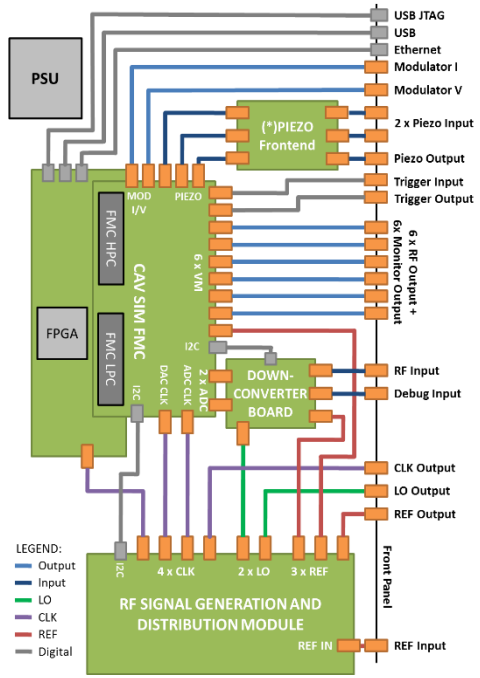


LLRF Control System for ESS

Concept and top-level design by Lund University

Hardware design and production by PEG (ISE, TUL, NCBJ)

120 MTCA.4 based systems to be delivered to ESS



ESS Cavity Simulator

LO Generation, MTCA.4 RTM

Thank You for Attention!