ASTROCENT Research Group 3 Electronics and Data Acquisition and Processing

Mariusz Suchenek (msuchenek@camk.edu.pl)

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AstroCeNT—Particle Astrophysics Science and Technology Centre International Research Agenda
Nicolaus Copernicus Astronomical Center, Polish Academy of Sciences

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Group 3

Group 3 areas of competences:

a) FPGA/CPLD Programming – software

b) Programming of Microcontrollers and Processors - firmware

c) PCB Design

d) Linux Low-Level Software (PC, GPU - increasing the speed of operation)

Group 3 projects:

- Seismic sensors projects:
  - Autonomous seismic sensor (**ready**)
  - Active seismic sensor (prototyping)
  - Fiber seismometer (developing software for FPGA)
  - Mobile platform (G. Nieradka)
- Infrasound sensors (**ready**)
- Photo sensors data acquisition and processing, compression and pulse detection (modeling of algorithms)
- Heterogeneous computer (**almost 3/5**)

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What we can provide

1) Developing dedicated electronic for:

- High speed sensors
- High-sensitive electronics
- Front-end electronics for analog circuits dedicated to external sensor

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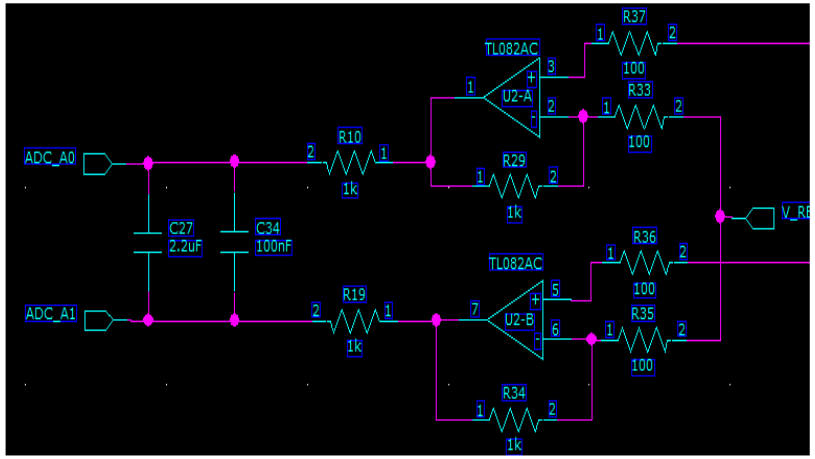
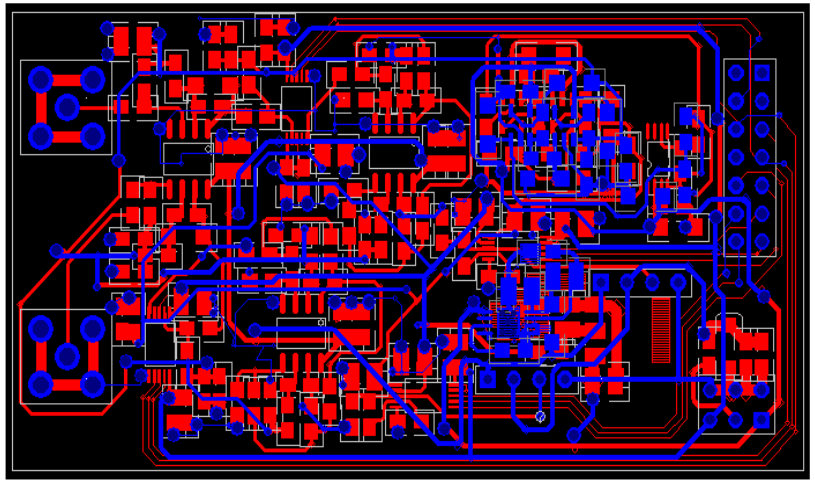
What we can provide

- Development: electrical diagrams, PCB, prototype devices, assembly
- We can provide pcb analysis, signal integrity, emc and thermal analysis,...
- Production of small series of devices
- Preparation documentation for production





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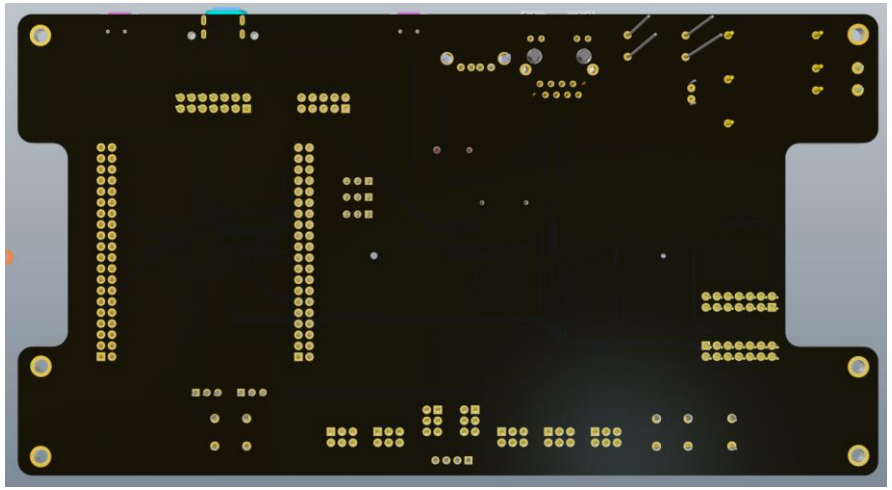
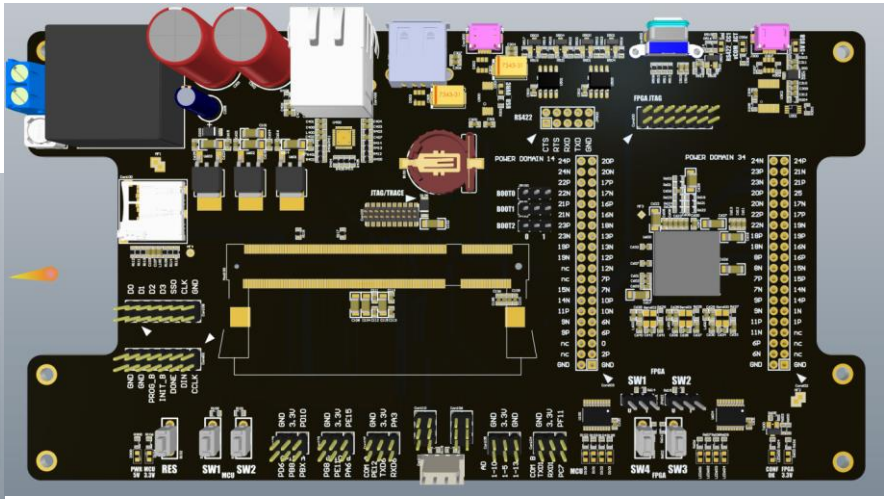
Example collaboration: PCB Design for MODIG company

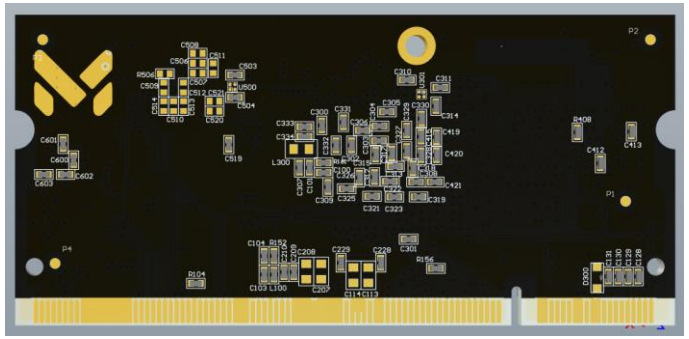
- Advanced high-speed electronics

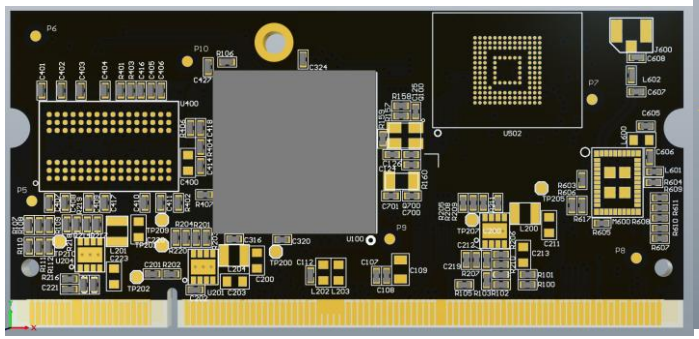
FPGA & 2x ARM (CORTEX-M and A)



- Equalizing the length of signal paths
- Signal integrity, emc and thermal analysis







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What we can provide

2) Preparation documentation for production

- large and small scale production

Prepare software and firmware:

3) Field-Programmable Gate Arra (FPGA)

4) microcontrollers and processors like ARM and GPU

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Possible areas of collaboration

Possible collaborations:

- **Developing accelerometer in MEMS technology**

Accelerometers operating for low frequencies, from 1 to 100 Hz, and even below **1 Hz to 100 Hz**

- **Fiber seismometer**

- Developing an optical time-domain reflectometer (OTDR)

- We can provide support in electronics, signal processing and software

- We are now developing software in VHDL for recording data from optical fibers

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Possible areas of collaboration

- **Mobile platform**

We are developing a mobile platform with a seismometer for site characterization. We want provide more environment sensors for the platform

- **High sensitivity infrasound sensor (pressure sensor)**

Working in the frequency range from DC (or very low frequencies) to around 100 Hz. We have our own sensor but we want to have a device with higher sensitivity, lower frequency range

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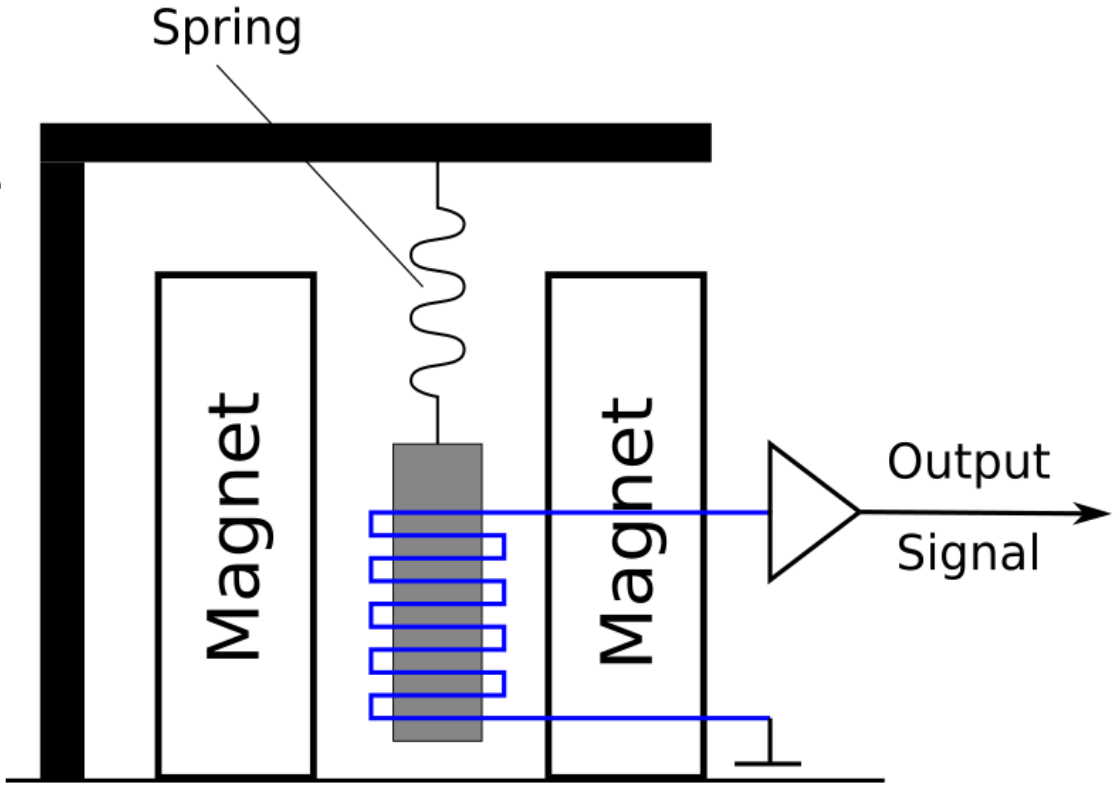
Seismic sensor, from pasive to active sensor

- Typical sensor – geophone (passive device)
- Spring with a coil (moving within the field of a permanent magnet)



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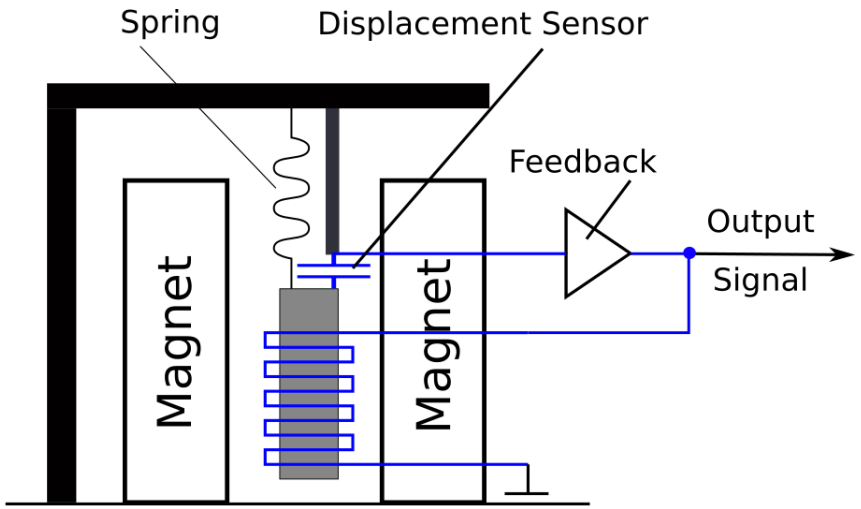
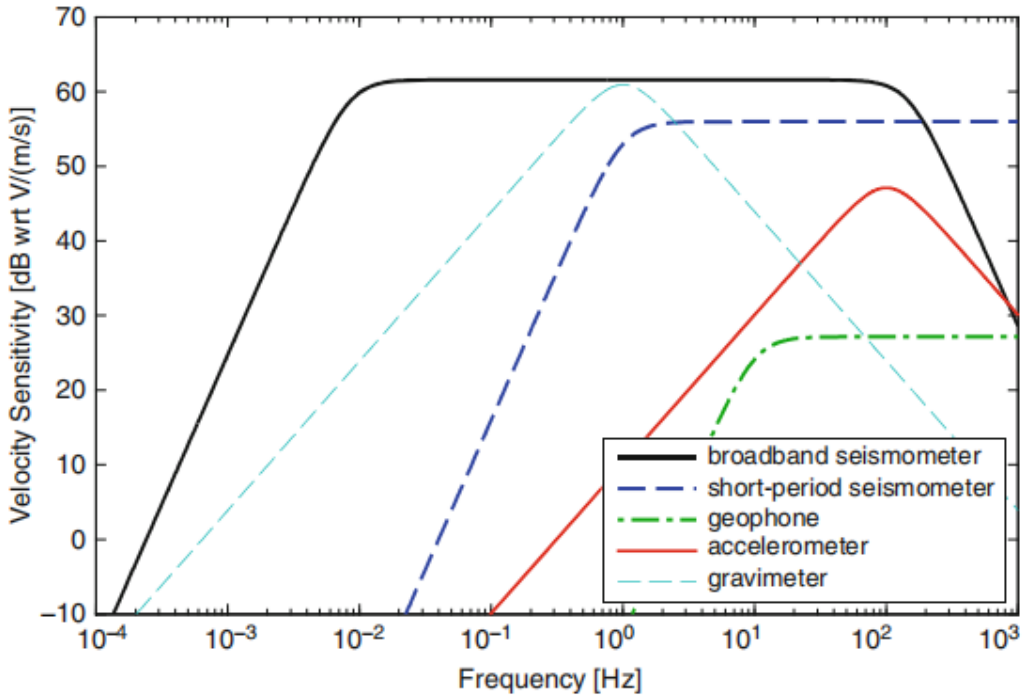
Possible areas of collaboration

Active seismic sensor

- We are looking for a dedicated displacement sensor
- Develop commercial product
- Higher sensitivity and lower frequency





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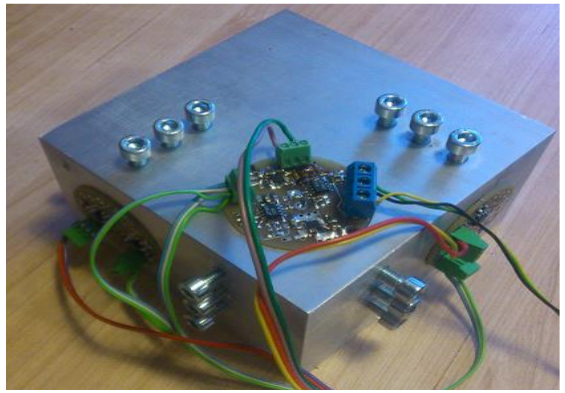
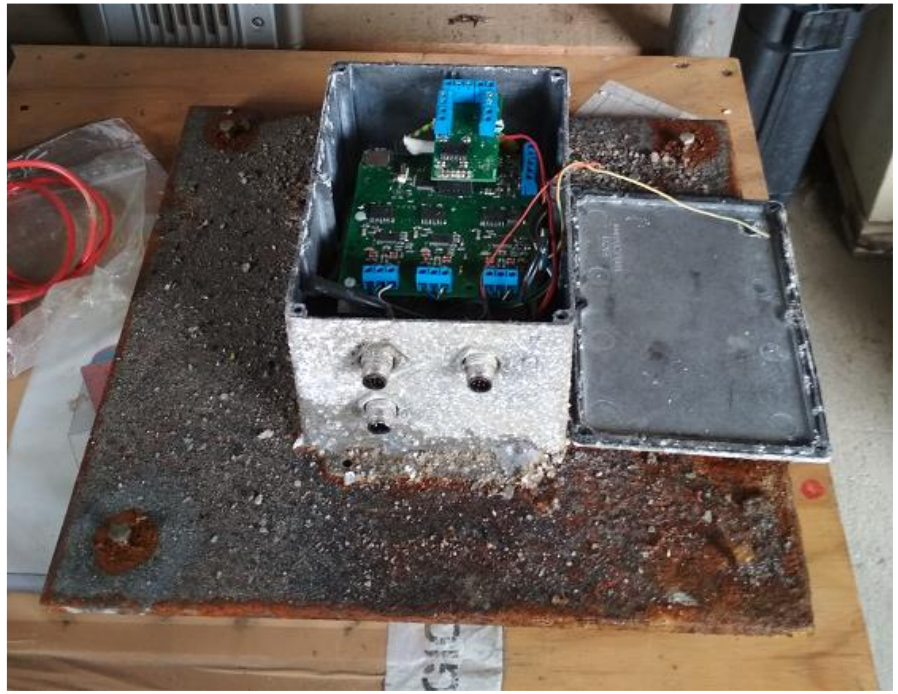
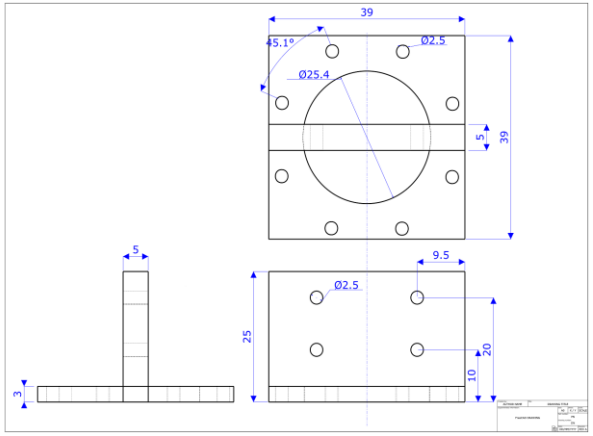
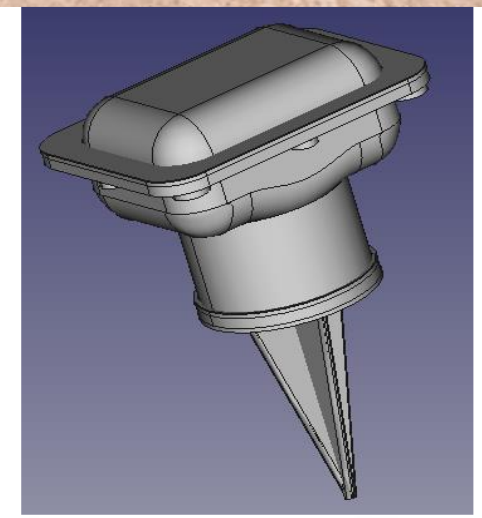
Developing hardware and mechanical elements and devices

- Housing, structural and mechanical elements









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Thank you for your attention

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