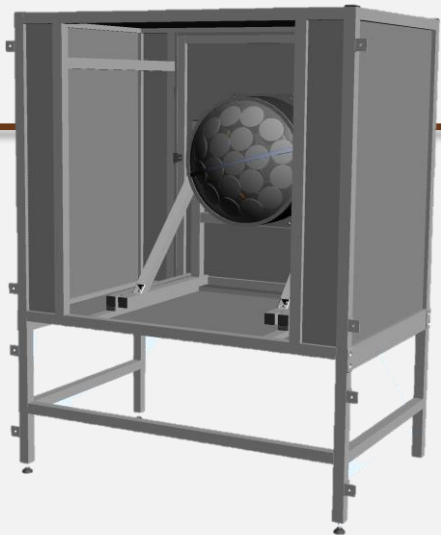




multi-PMT test stand at WUT

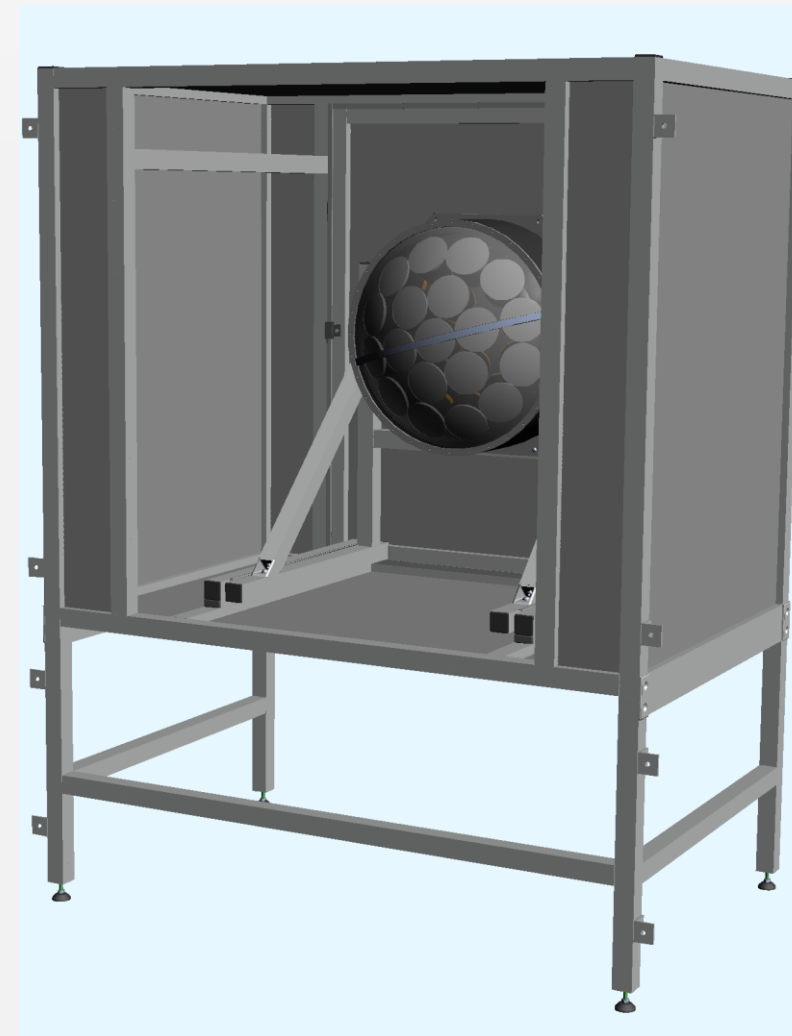
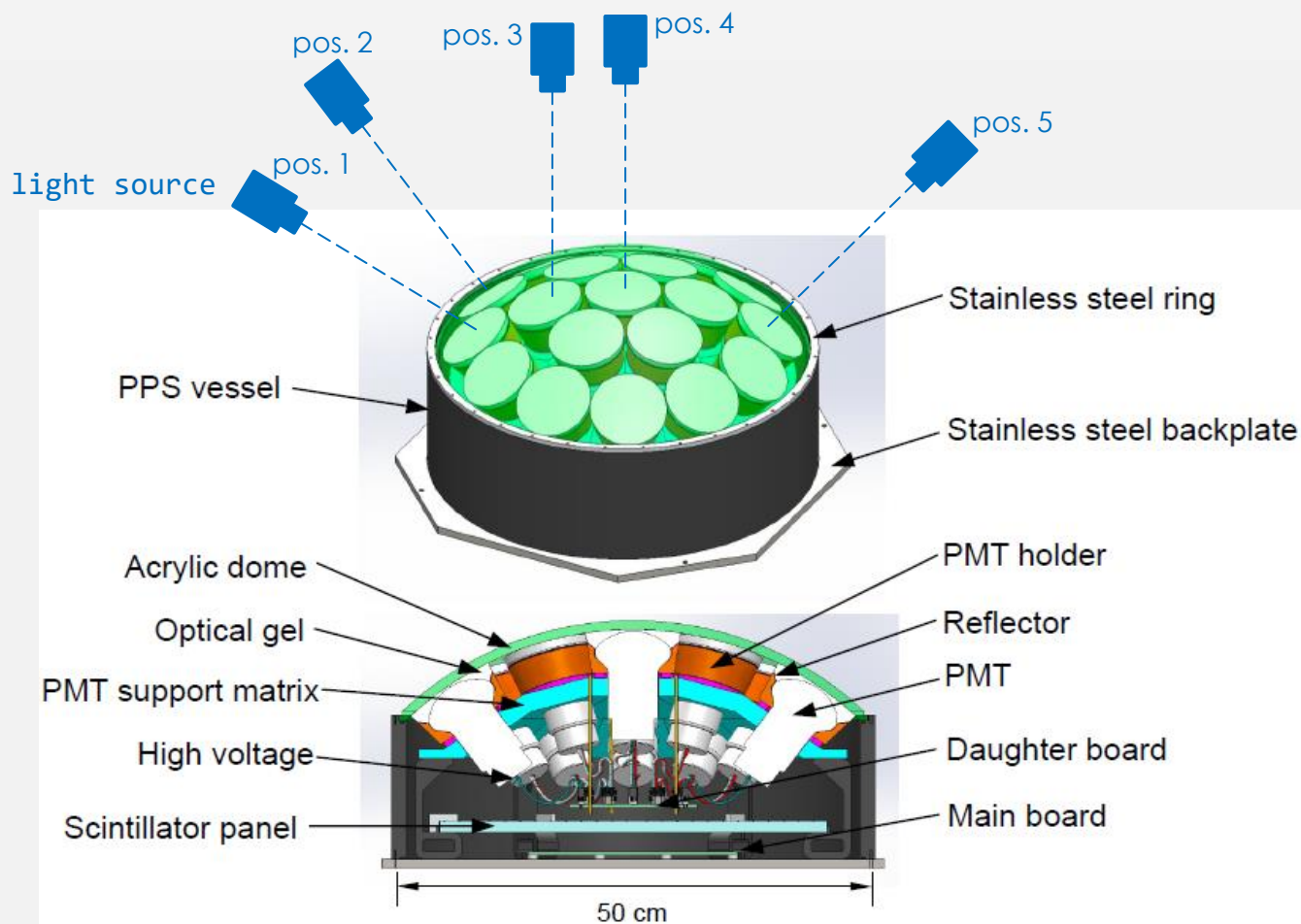


Piotr Lorens
Warsaw University of Technology



Purpose of the work:

- Fully automated measurement controlled by PC, and database interface.
- Enabling measurement of the entire multi-PMT area (all 19 photomultipliers)
- Examine each photomultiplier in the module independently with accurate control position of light source.
- Checking the correct functioning of the multi-PMT module.
- Controlling magnetic field within the measured volume.



MEASURING STATION

The key parts:

- XYZ robot:
 - 3 stepper motors with drivers, linear guides with rollers and carriages, PCB with control software,
- Magnetic field measurement module
- Pan&Tilt module

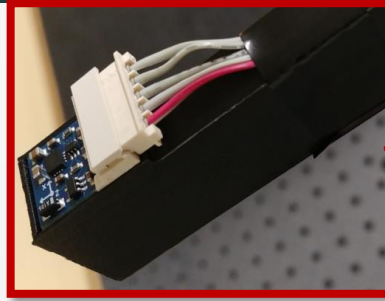


Fig. Magnetic field sensor

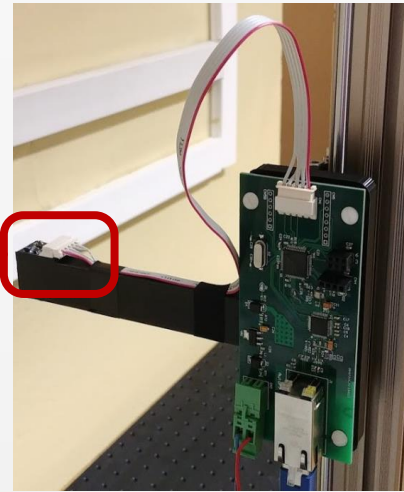
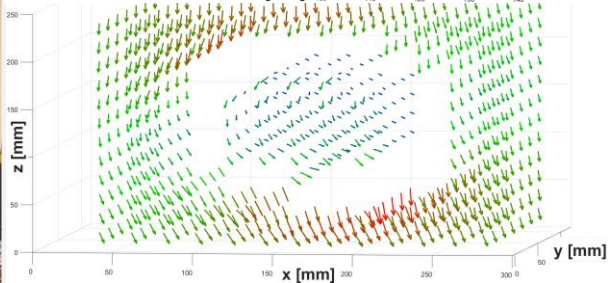
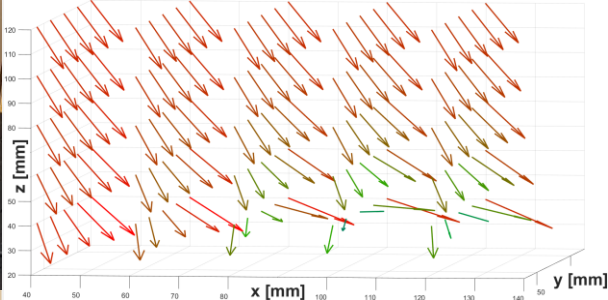
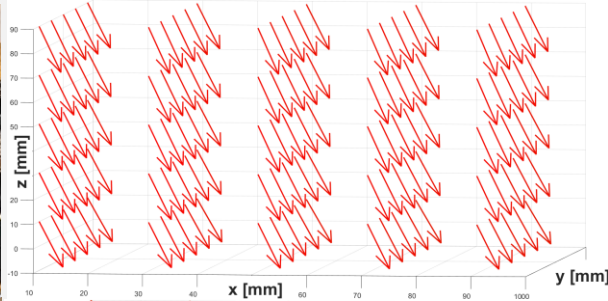
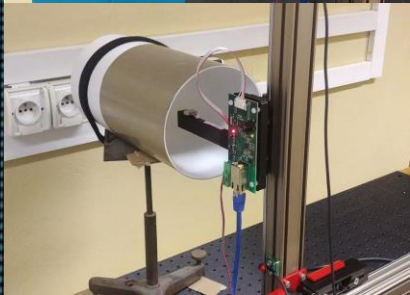
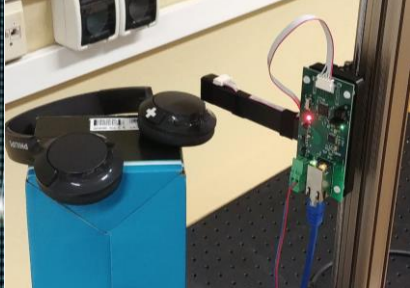
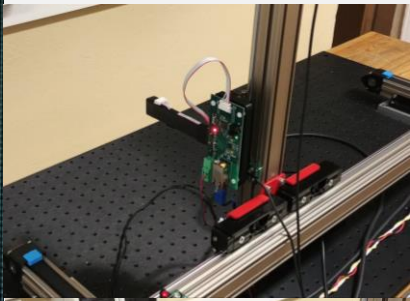
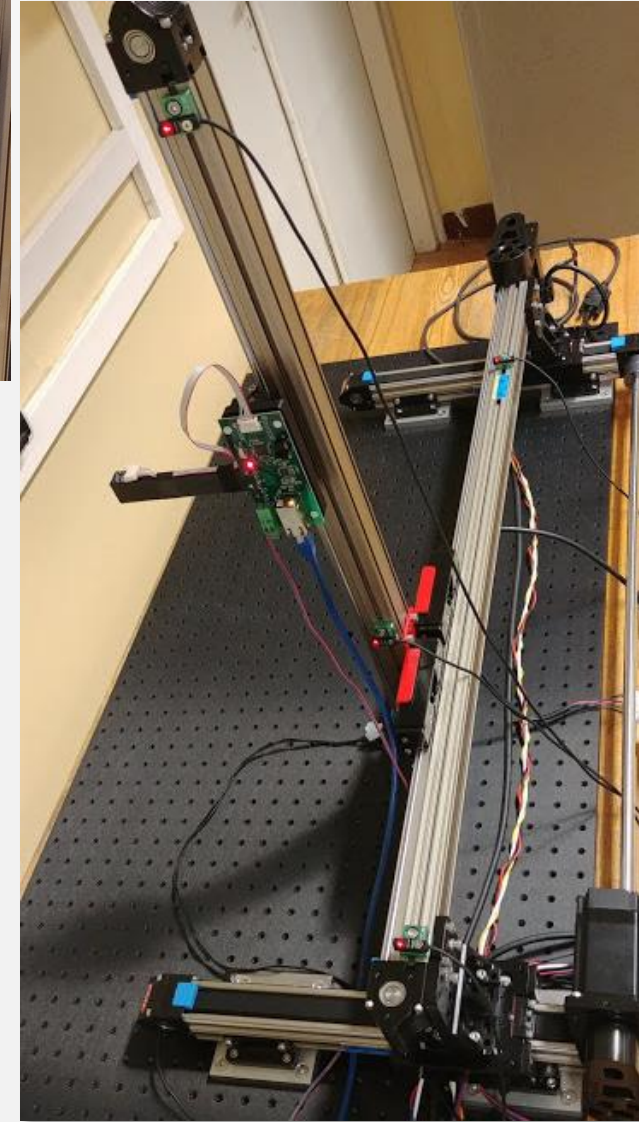


Fig. Measurement module



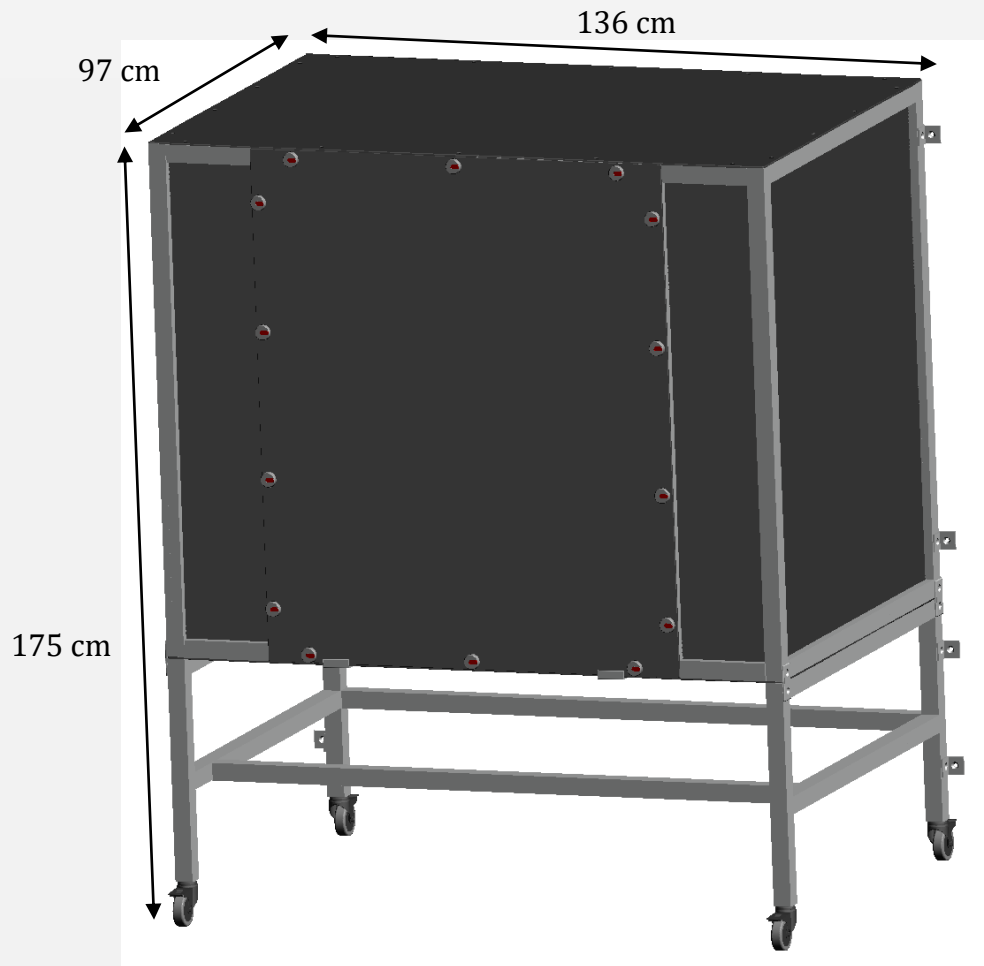
- Without any objects in the measured volume
- With headphones in the measured volume
- Effectiveness of the magnetic shield



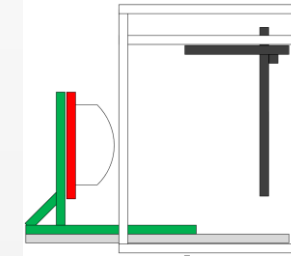
THE HOUSING AND FRAME FOR THE MULTI-PMT AND ROBOT XYZ

Main parts of the measurement setup:

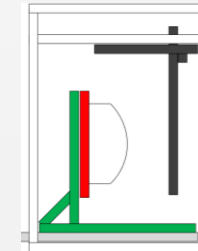
- Frame on rails for multi-PMT (green)
 - allows easy replacement of tested modules
- Frame for robot XYZ
- Plates for shading the area around the multi-PMT module
- The estimated cost of this frame is about 2500 EUR (net).



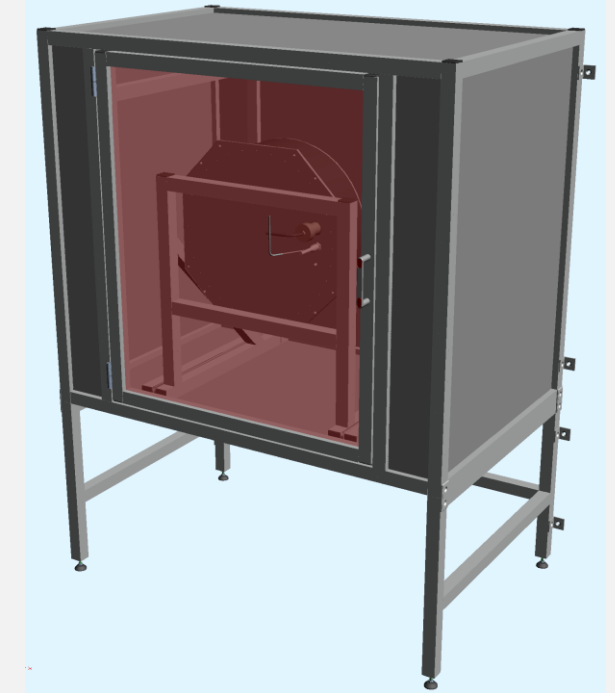
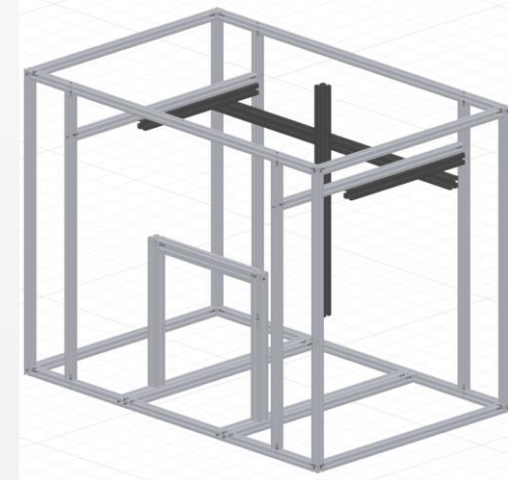
workshop crane



During replacement

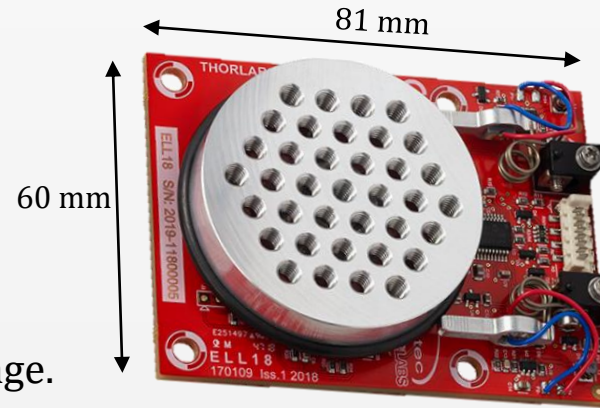


During measurements

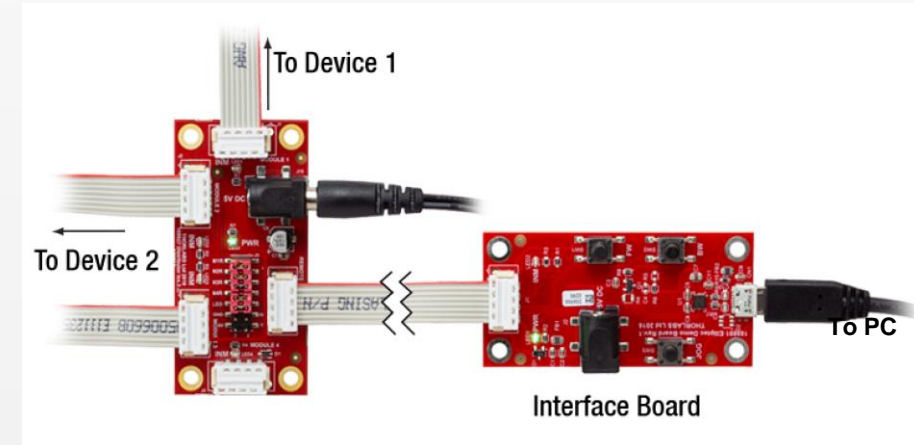


Main parts of the Pan&Tilt module:

- ELLB - Control Bus Distributor
- ELL18/M - Rotation Stage x2
- Interface Board
- 3D printed mount adapter for robot XYZ carriage.
- 3D printed parts creating Pan&Tilt movement and holding optic fiber



ELL18/M - Rotation Stage

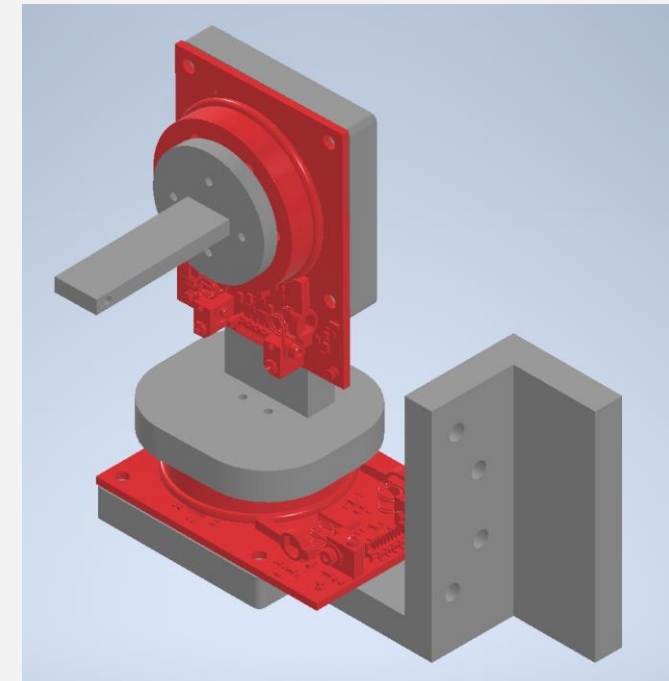


Interface Board connected to Control Bus Distributor

Properties of the module:

- Minimum Motor Holding Torque 0.015 Nm (150 g/cm)
- Provides a multidrop TTL RS-232 interface (point to point TTL RS232)
- Max Load 200 g (centered)
- Max Speed 430 °/s
- Rotation stage weight 80 g

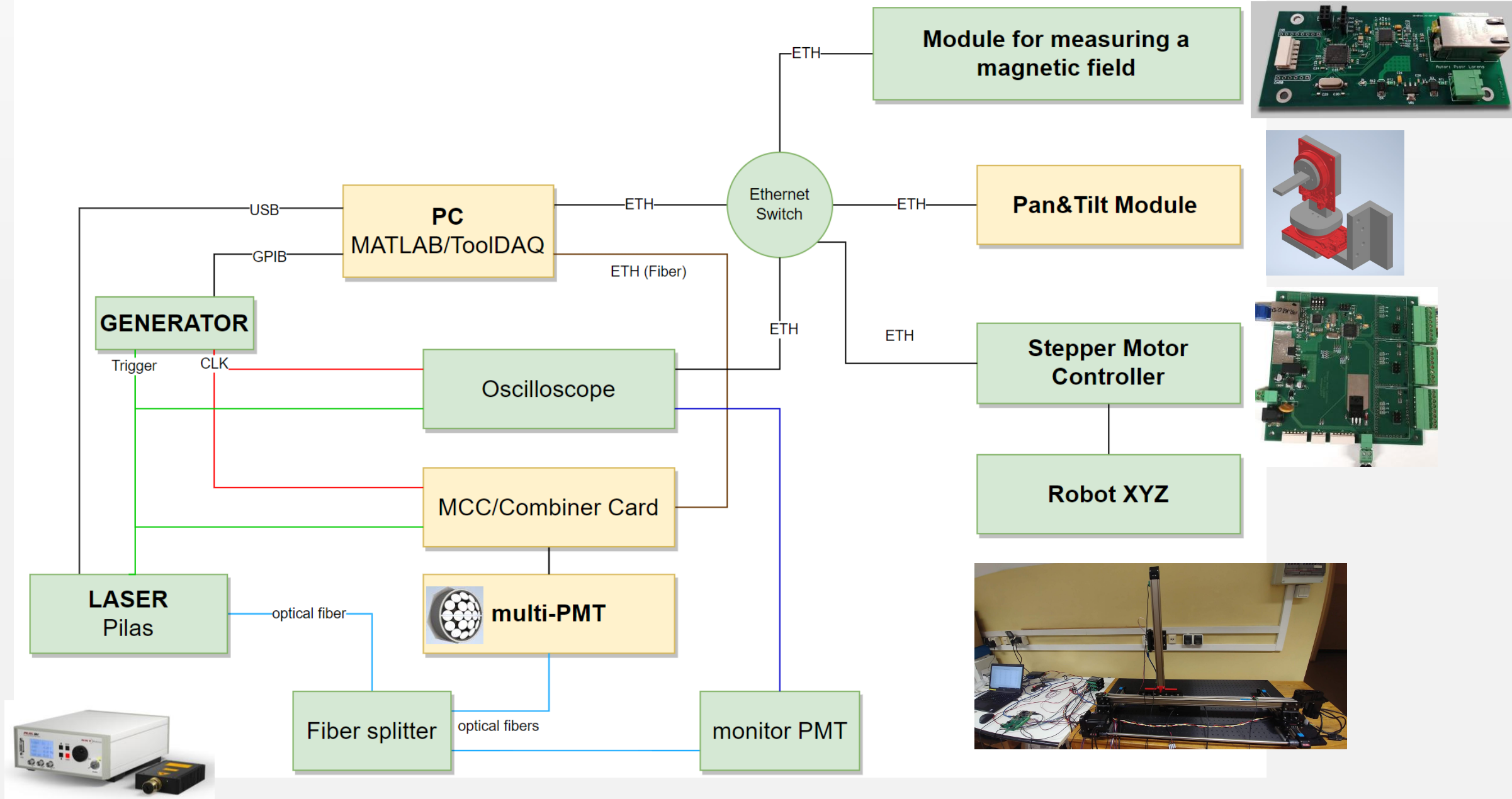
Full cost of the module is about 800 EUR



Initial project of the Pan&Tilt module

BLOCK DIAGRAM OF THE MEASUREMENT SETUP OF MULTI-PMT

6



Tentative block diagram of the measurement setup of multi-PMT

Completed work:

- Assembly and launch of a triaxial XYZ robot
- Design and construction of a magnetic field measuring module
- Integration of the above module with the robot (enabling magnetic field mapping in 3D structure)
- Design of a light tight box, including mounting for robot

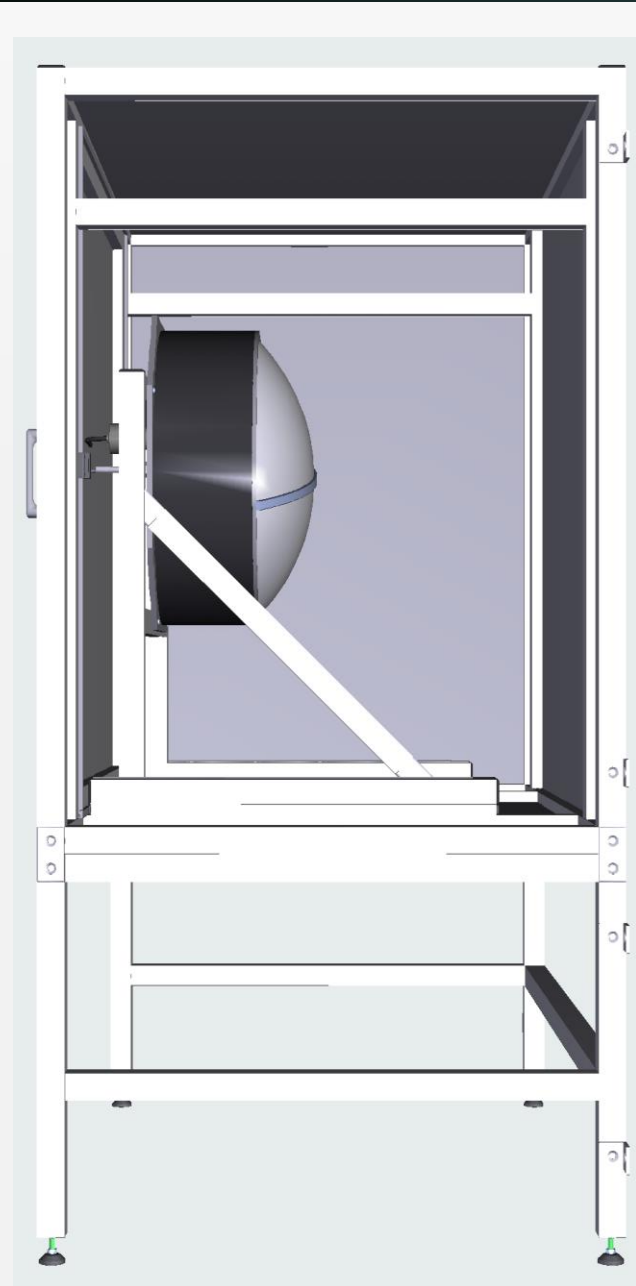
In progress:

- Extend the robot with a Pan & Tilt module (ordering parts from Thorlabs)
- Housing and frame for the multi-PMT and robot XYZ (waiting for contract authorizations in the legal department)
- Control software

To do :

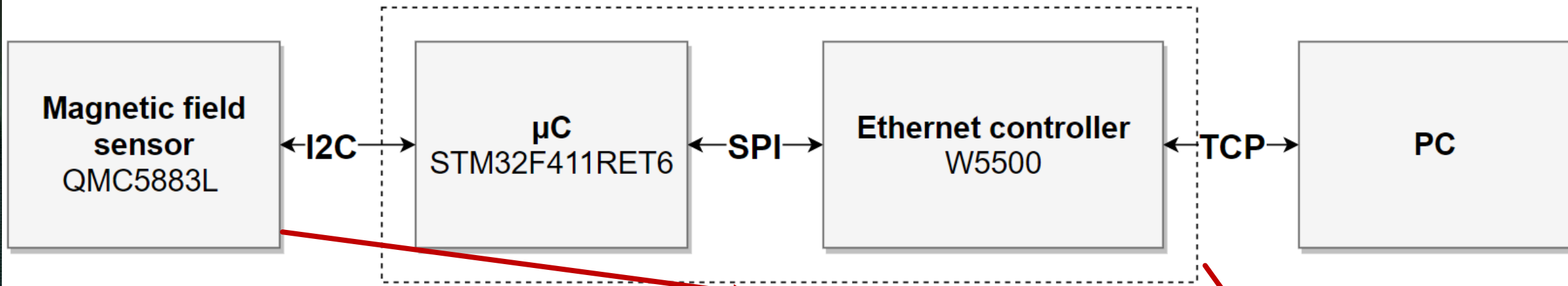
- Completion of measuring station (hardware + software)
- Planning of detailed characterization and measurements
- Planning and execution of measurements

Thank you for your attention

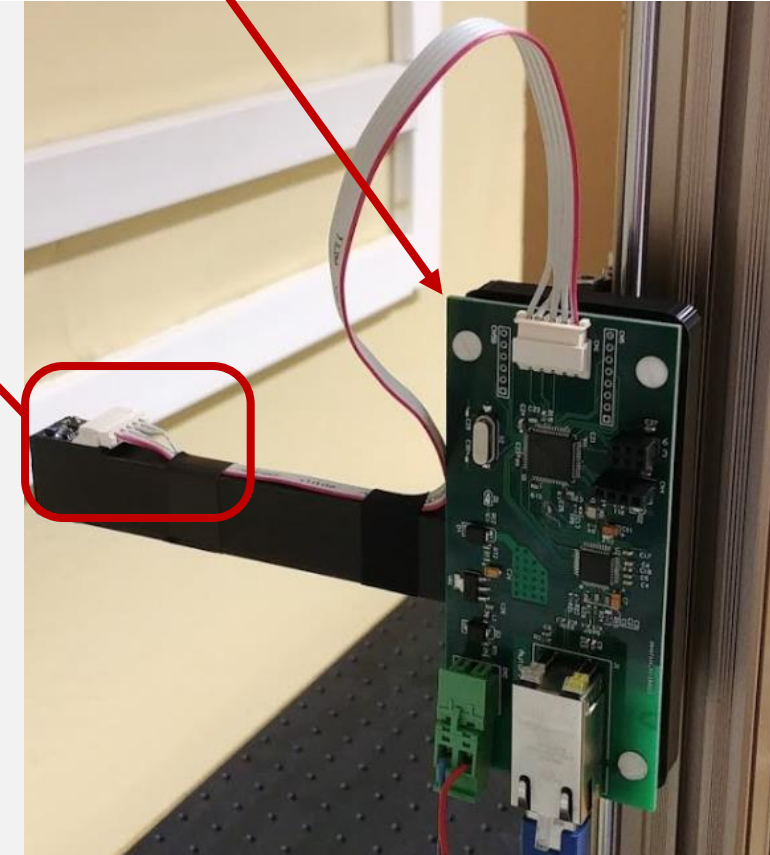
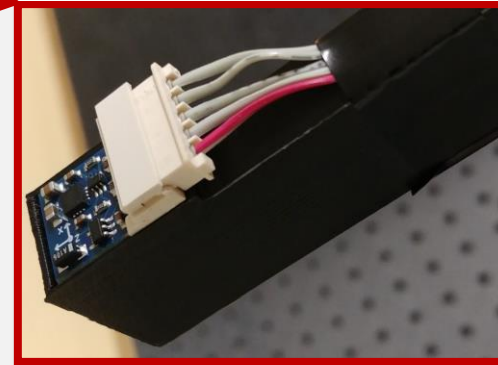


MAGNETIC FIELD MEASUREMENT MODULE

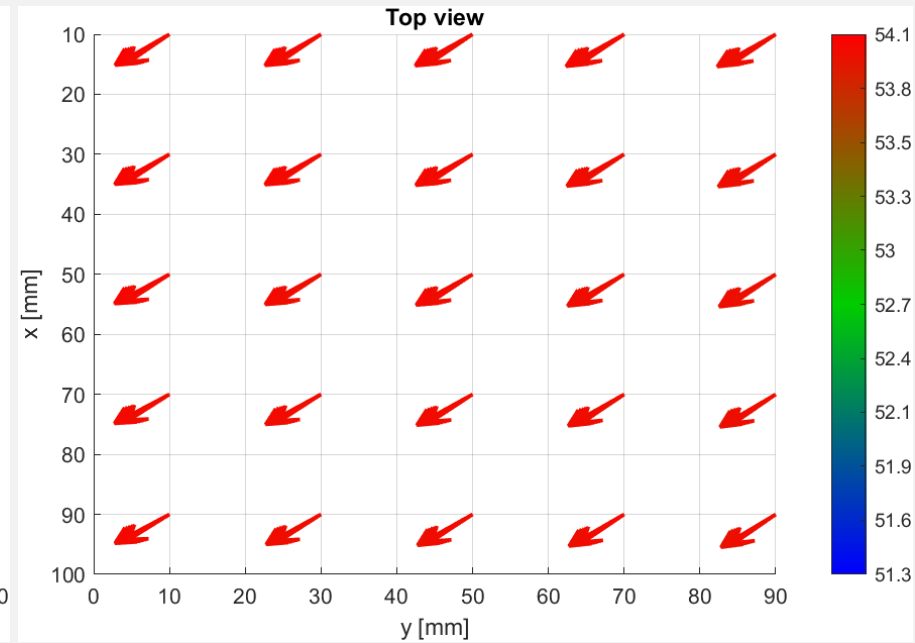
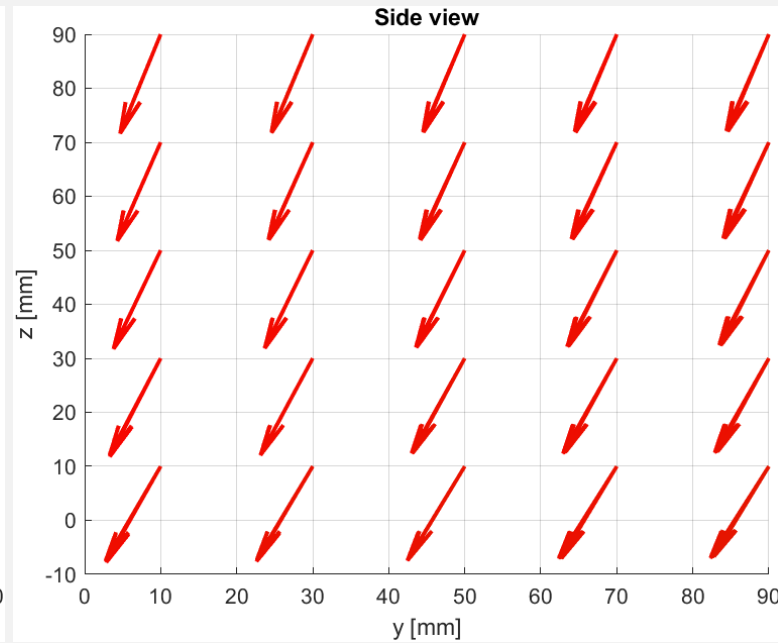
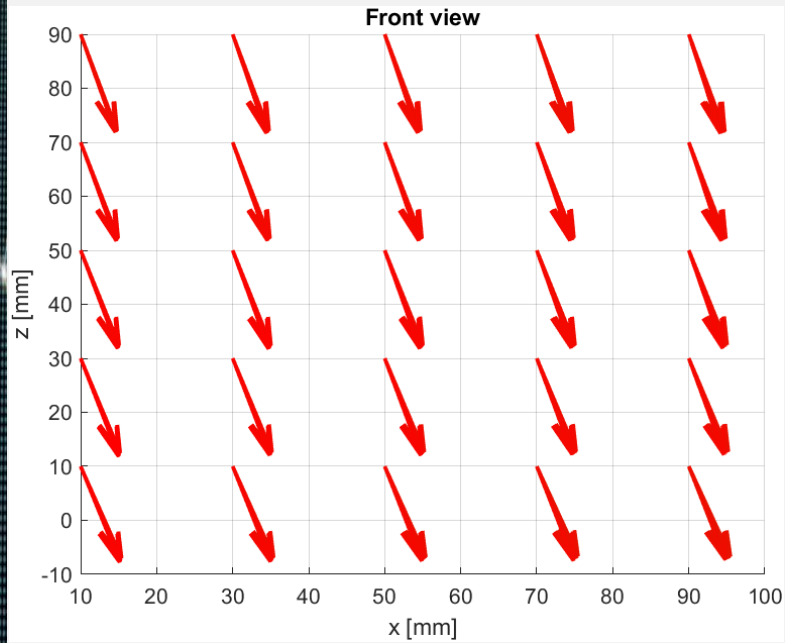
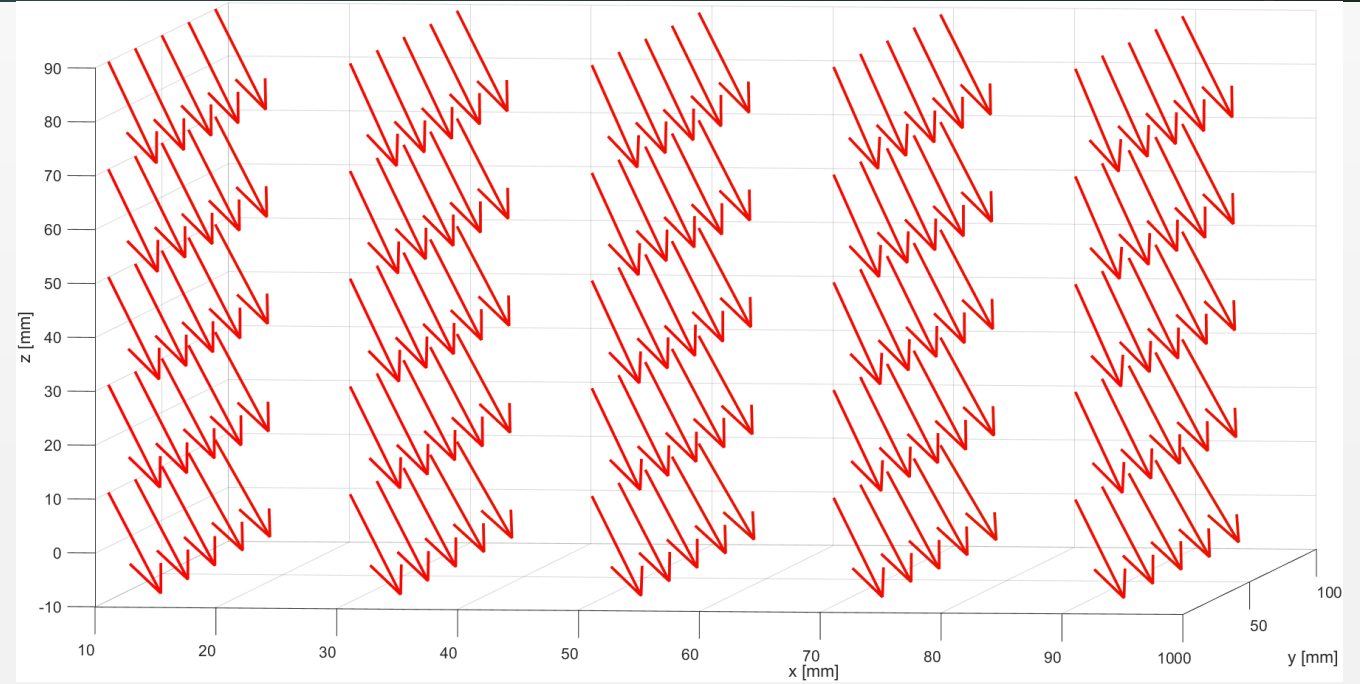
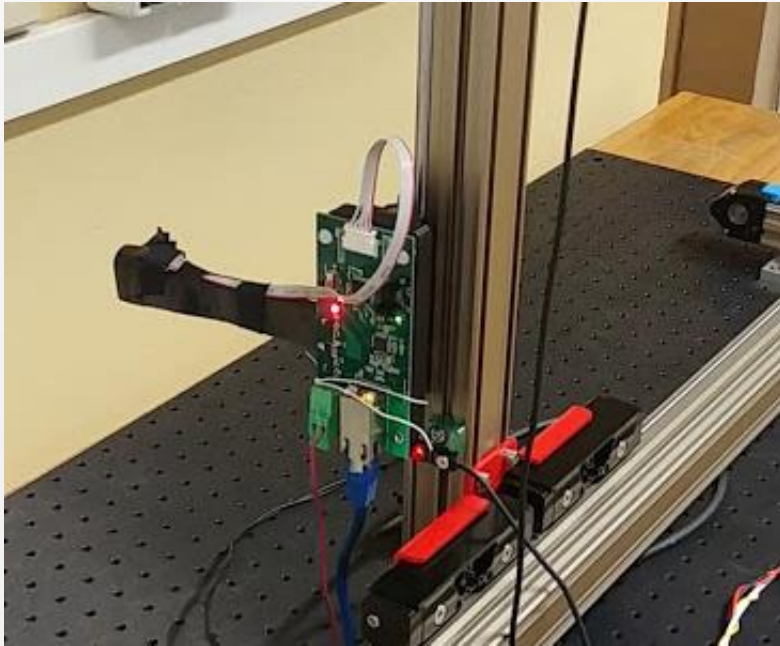
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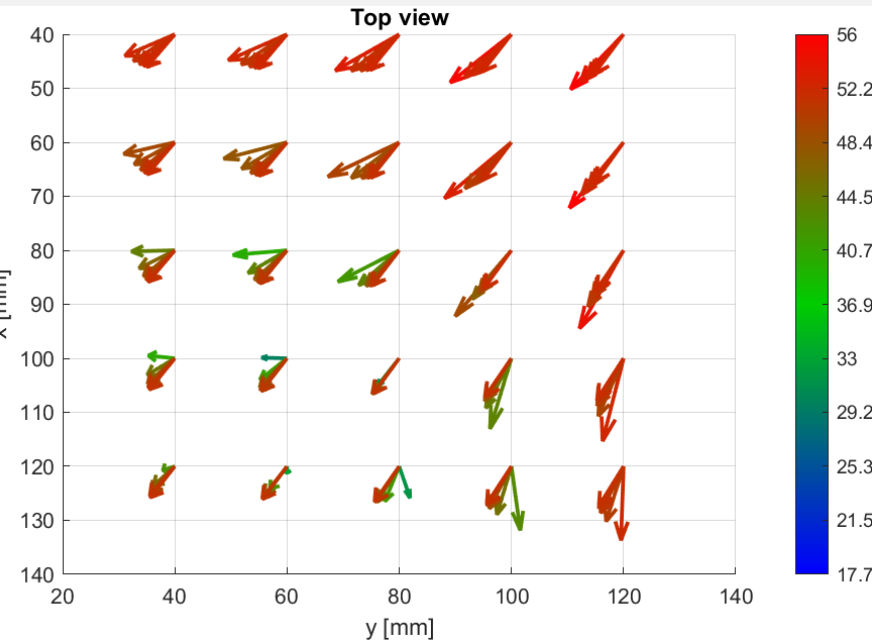
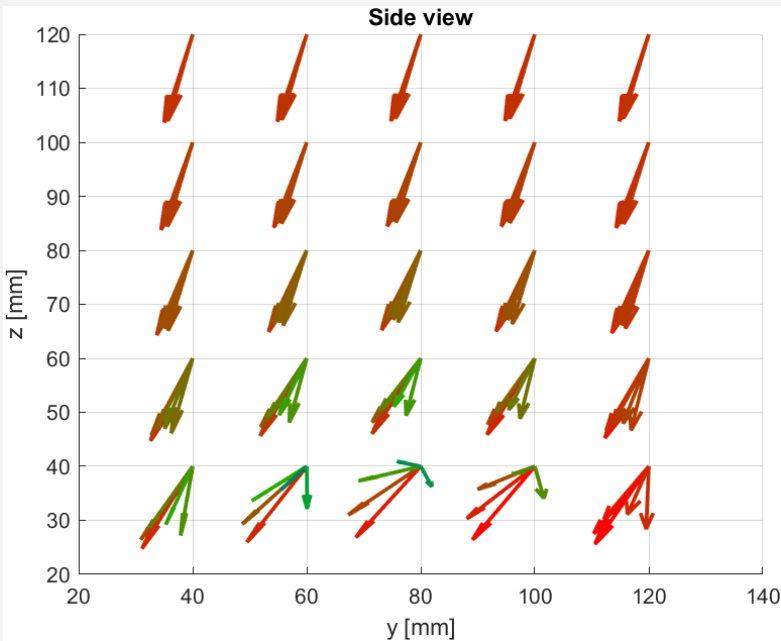
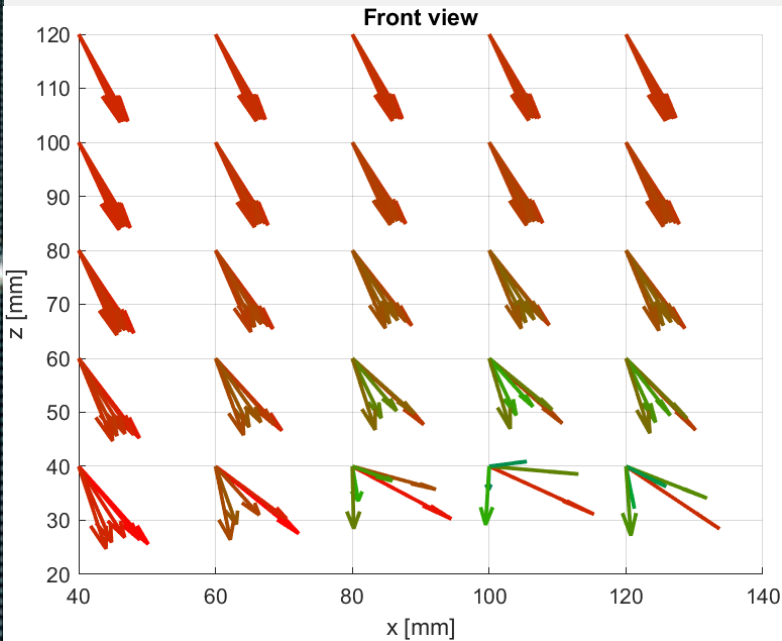
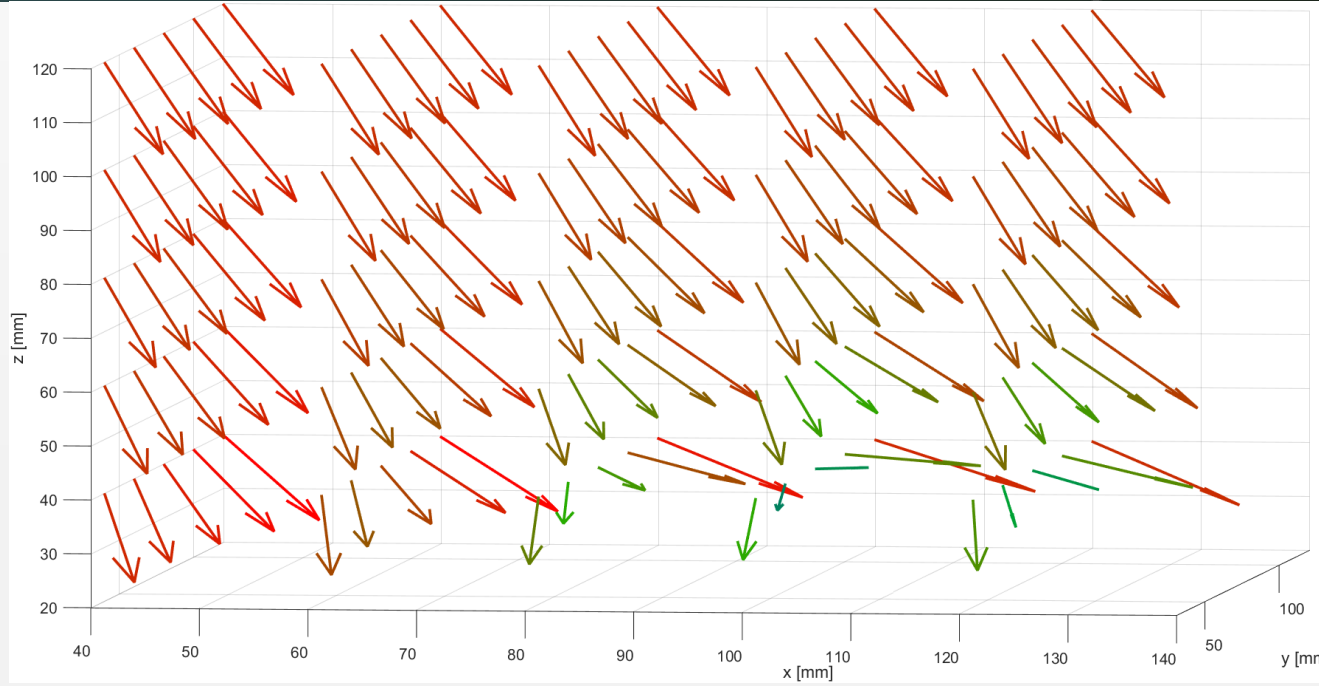
- Wide Magnetic Field Range (**± 8 Gauss**) and (**± 2 Gauss**)
- 16 Bit ADC With Low Noise AMR Sensors,
- **5 Milli-Gauss** Field Resolution
- The dimensions of the board are 14x13 mm²
- **I2C Interface** with Standard and Fast Modes
- Fast Data Communications (Maximum **200Hz** Data Output Rate)



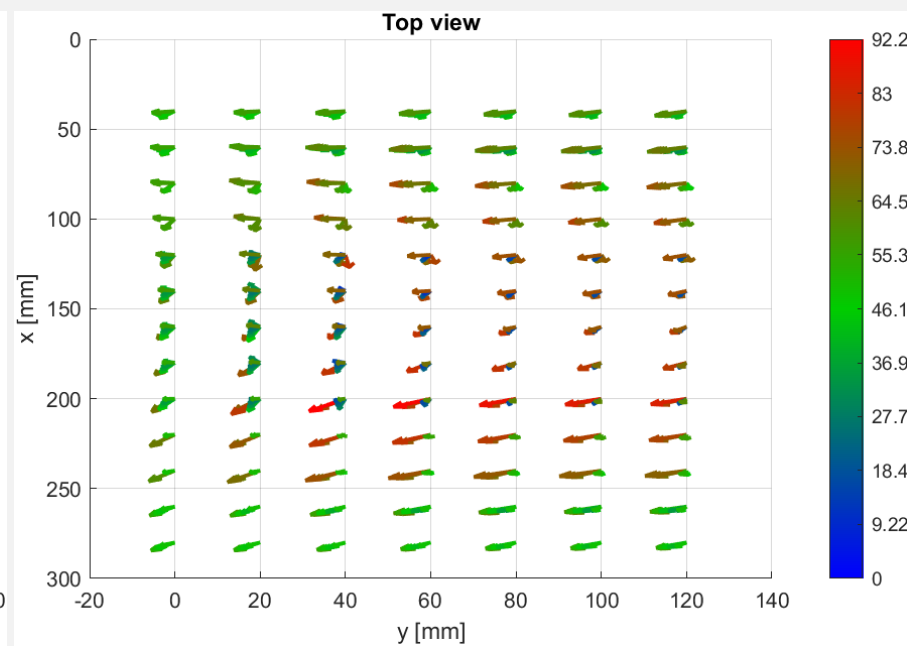
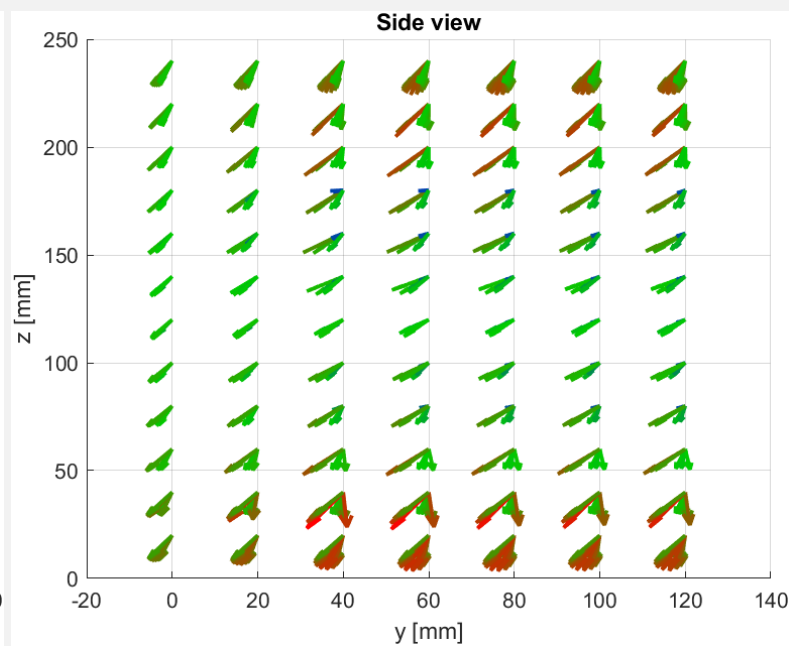
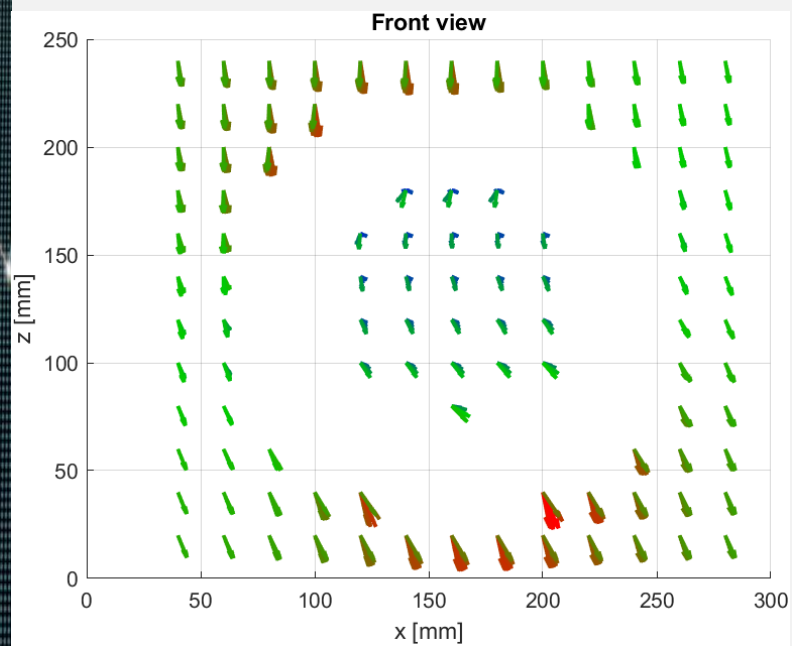
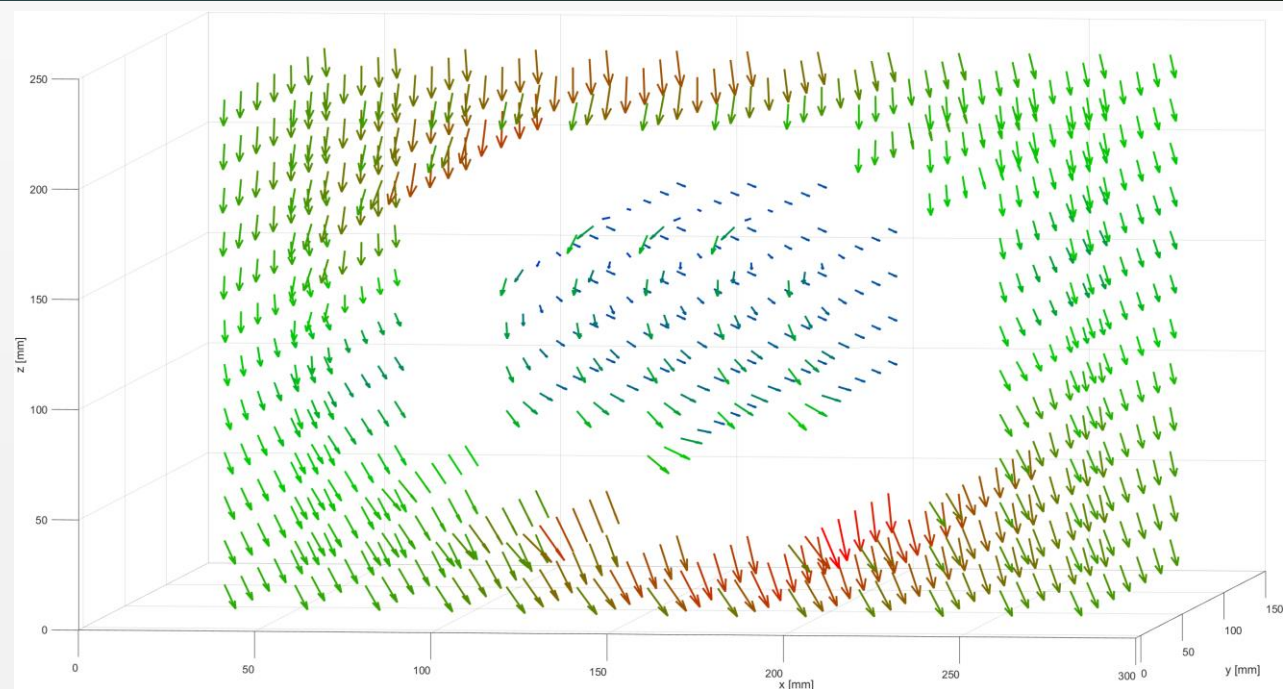
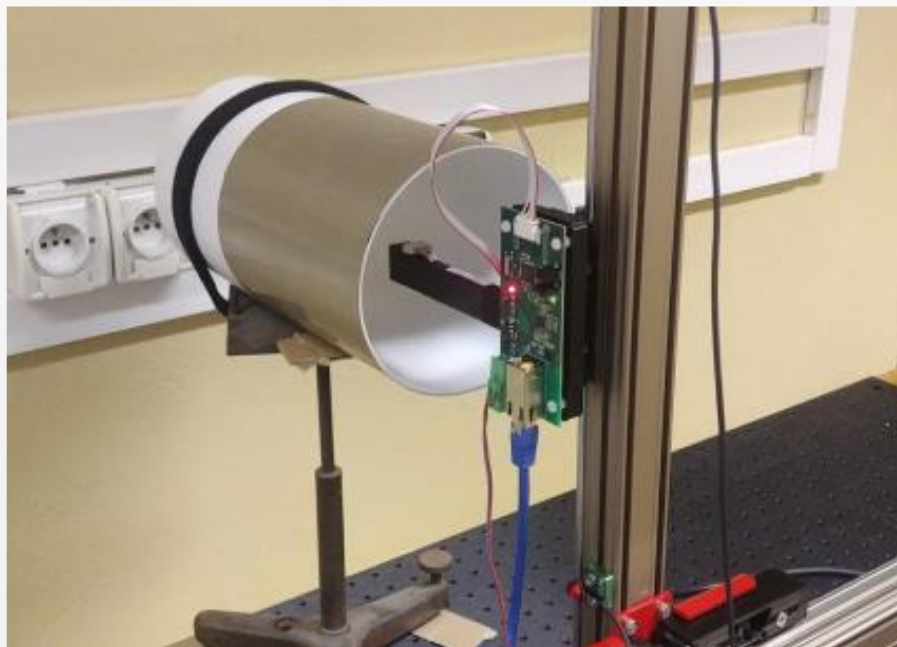
RESULTS (WITHOUT ANY OBJECTS IN THE MEASURED VOLUME)

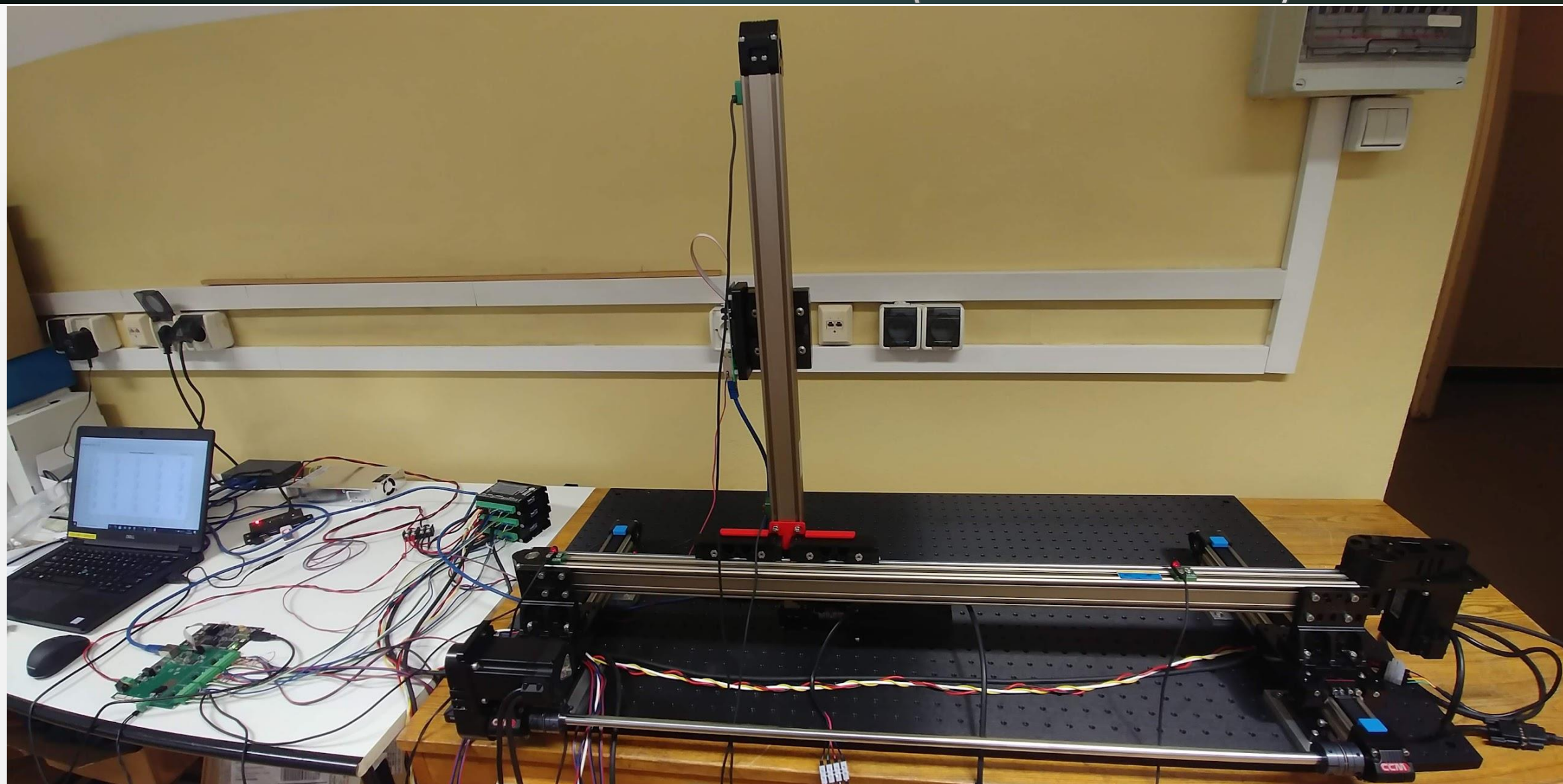


RESULTS (WITH HEADPHONES IN THE MEASURED VOLUME)



RESULTS (EFFECTIVENESS OF THE MAGNETIC SHIELD)





Rys. 11 Uruchomione stanowisko pomiarowe z robotem XYZ, umożliwiające automatyczne pozycjonowanie źródła światła podczas pomiaru charakterystyki fotopowielacza.