Optical Wire Position Monitor – status report

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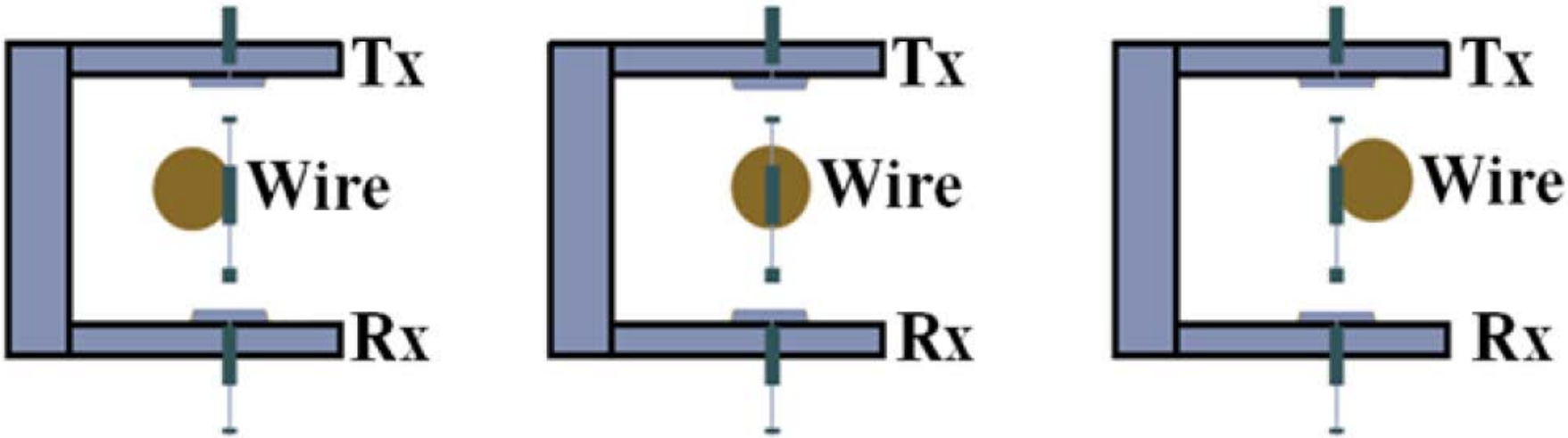
Outline

- Idea of the Optical Wire Position Monitor
- Application of the OPWM in the SPL Mock-up
- Conception tests and calibration at warm
- First test „at cold”
- Future steps

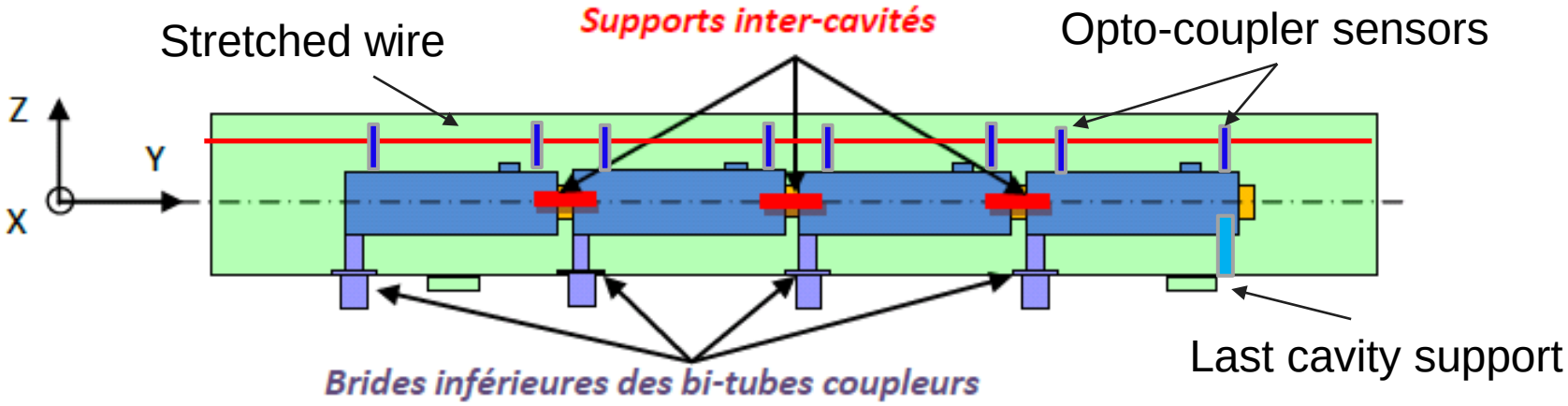
Optical Wire Position Monitor (OWPM)

- How does it work?



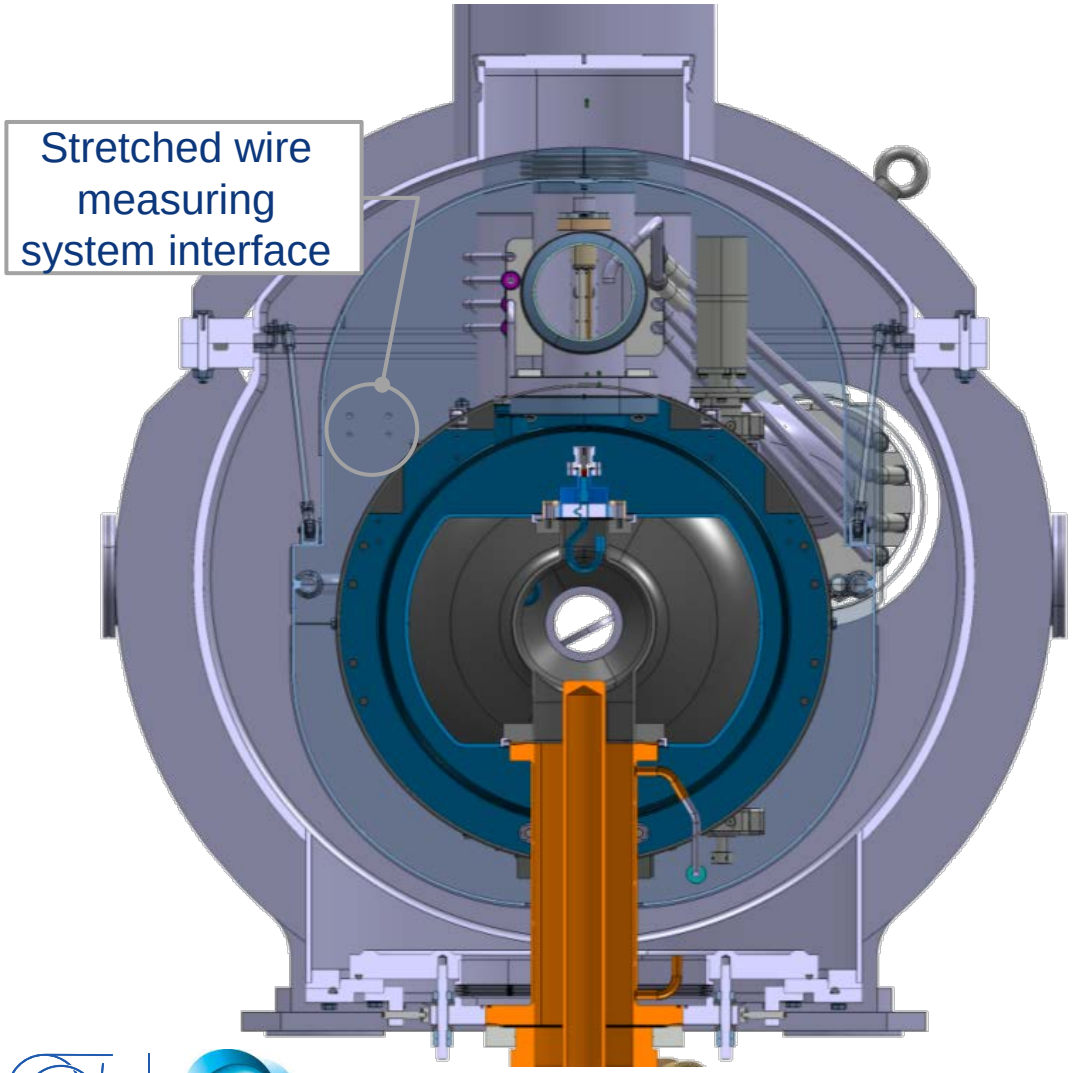
SPL SCM Cavity position monitoring specs:

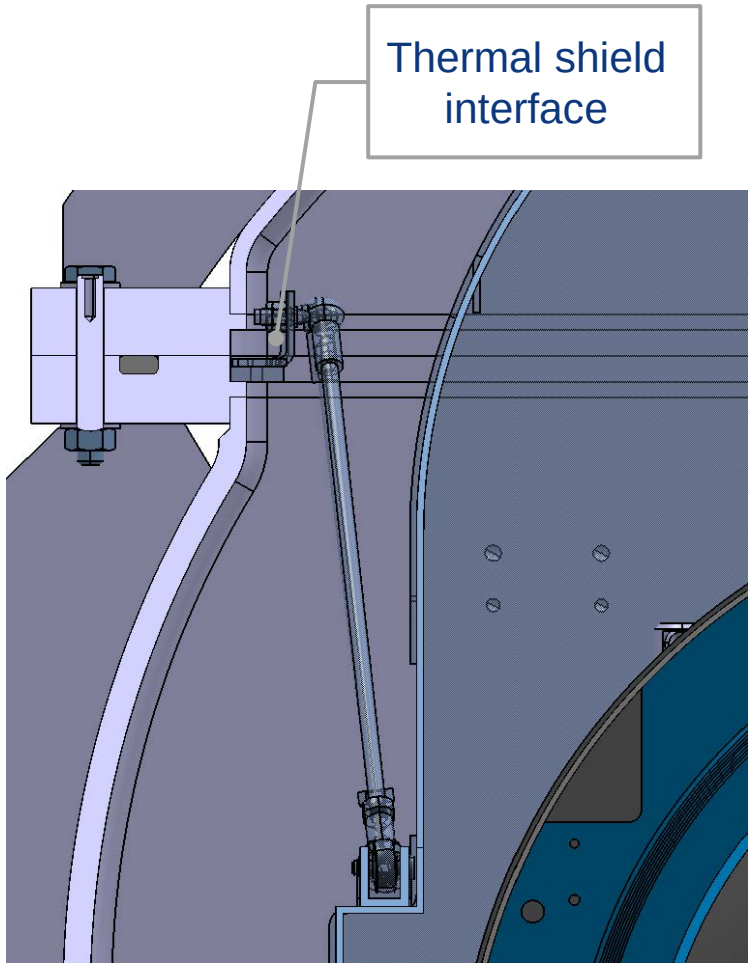
- Static position or slow movements: absolute movements (x,y,z) of each of 4 cavities during steady state operation and cool-down/warm-ups (300-2 K)
- Vertical range 0-2 mm
- Precision < 0.05 mm
- Resolution < 0.01 mm
- Possibly vibration measures (0-1 kHz)



Courtesy of V. Parma

OWPM position on the SPL SCM





Courtesy of CNRS

LED and photo-transistor

GaAlAs Infrared Emitters (880 nm)
Lead (Pb) Free Product - RoHS Compliant

SFH 484
SFH 485

SFH 484

Features

- Very highly efficient GaAlAs-LED
- High reliability
- Spectral match with silicon photodetectors

Silicon NPN Phototransistor
Lead (Pb) Free Product - RoHS Compliant

SFH 300 FA

Features

- Especially suitable for applications from 450 nm to 1100 nm (SFH 300) and of 880 nm (SFH 300 FA)
- High linearity
- 5 mm LED plastic package
- Available in groups

Applications

- Computer-controlled flashes
- Photointerrupters
- Industrial electronics
- For control and drive circuits

OSRAM

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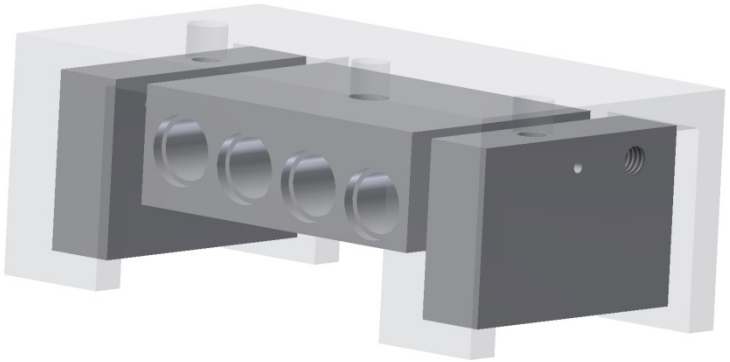
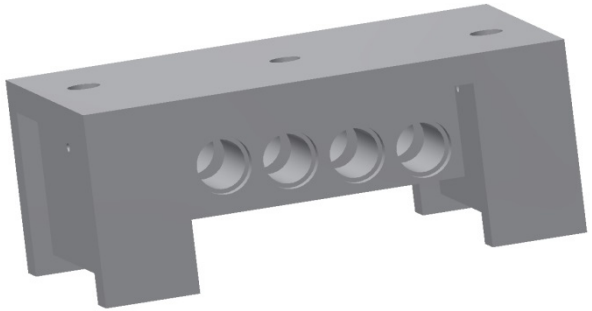
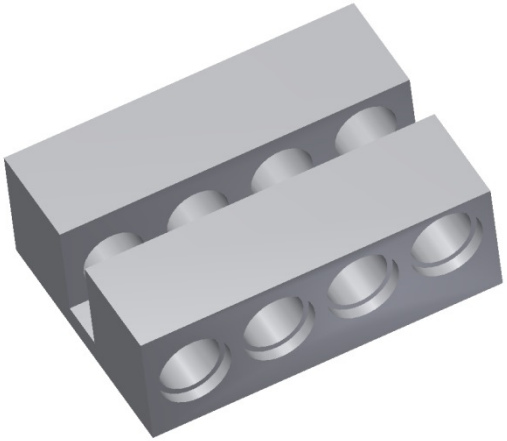
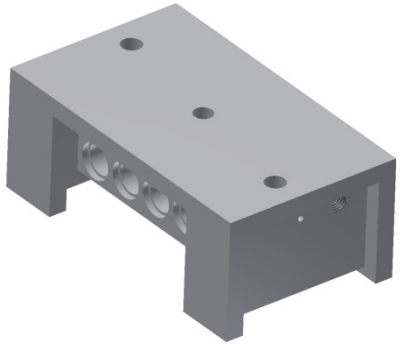
Sensor

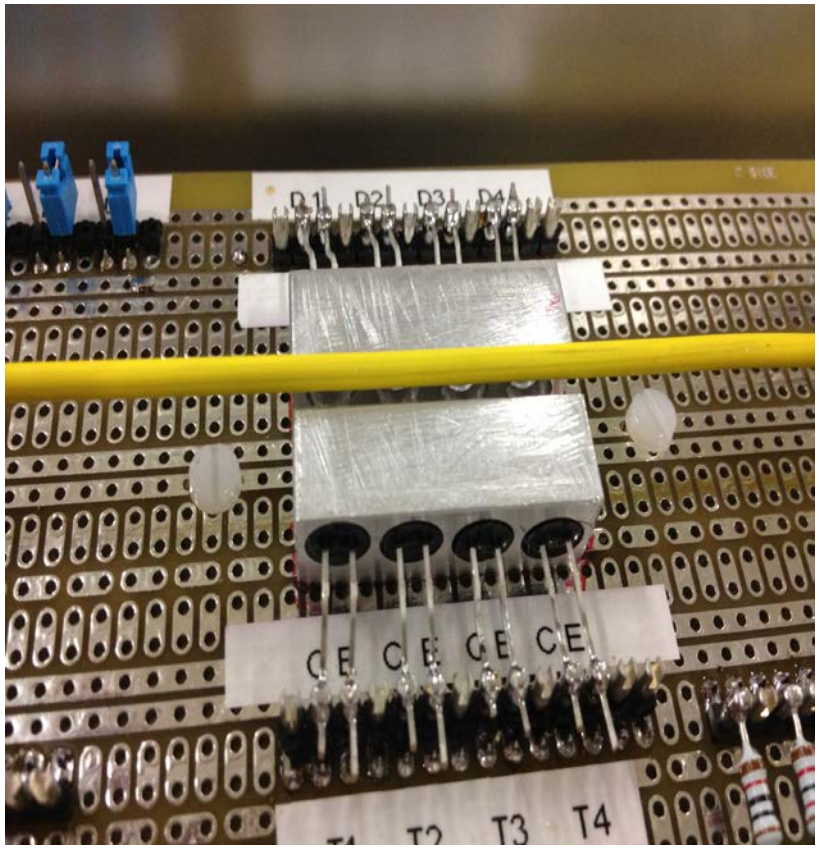




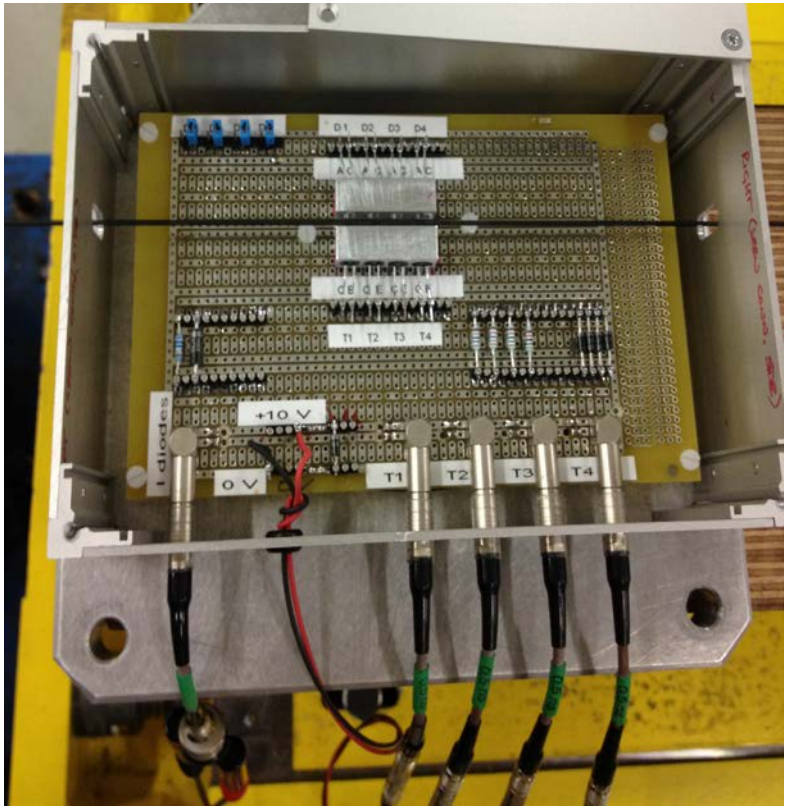




Tests setups



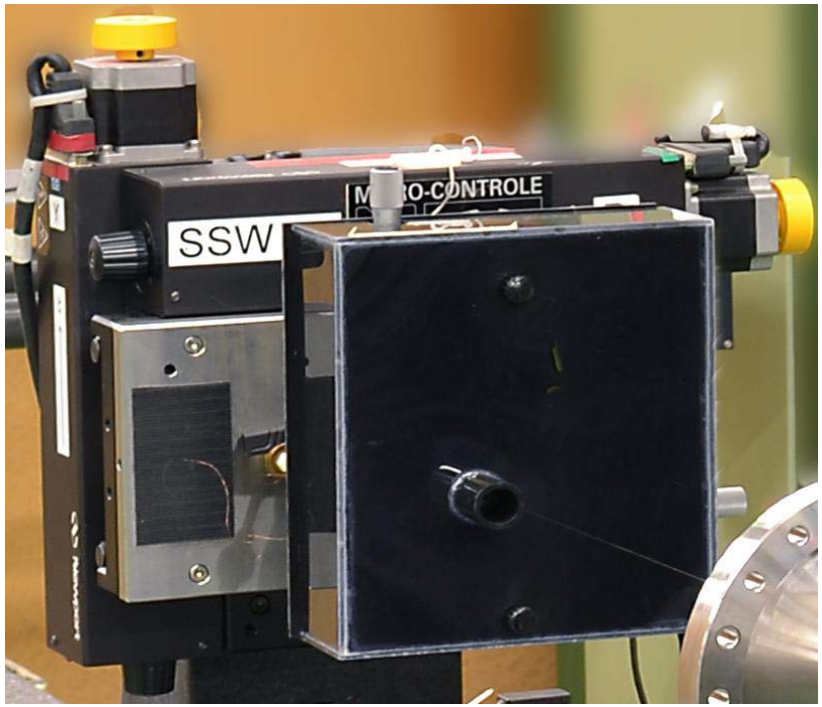
Test setup with 1.5 mm wire

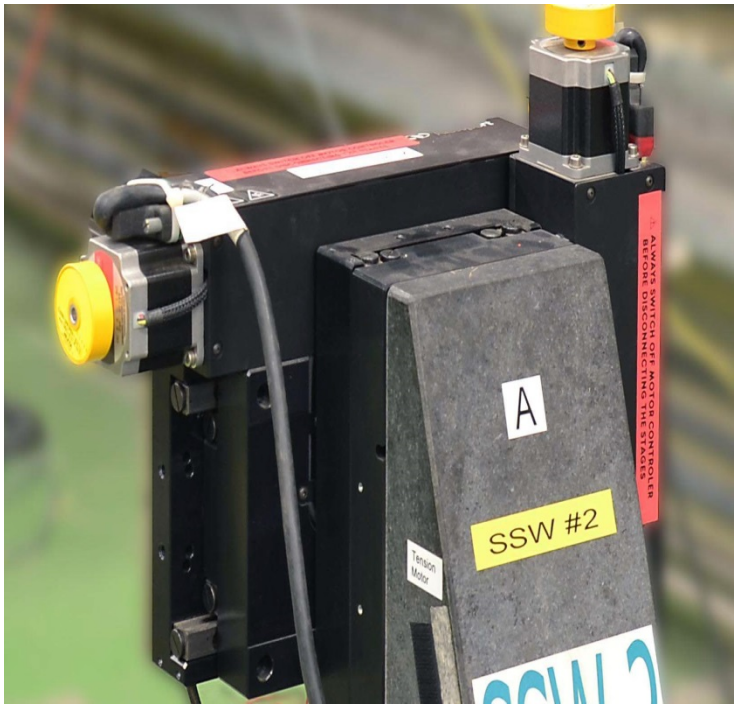


Box to shield the environment light noise, setup with 2.5mm wire

Courtesy of C. Petrone

Sensor characterization



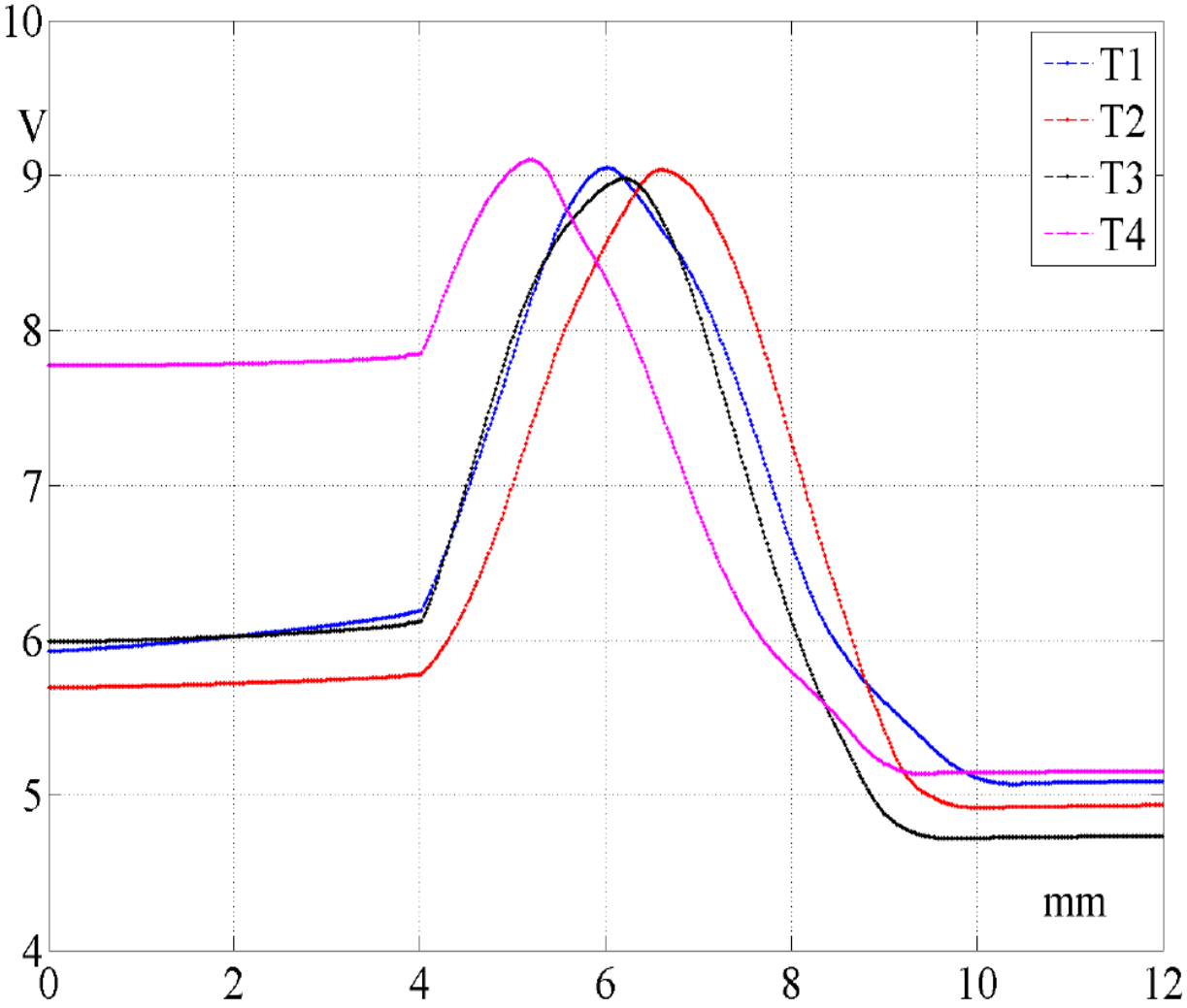


The high-precision, linear stages from Newport®, mounted in XY configuration, providing an accuracy of 1 µm on 150 mm maximum displacement. A motor controller, Newport® ESP7000, is used for acquiring the position through a linear encoder. A DC motor with a low-friction ball screw eliminates slip-stick effects and delivers displacements with 100-nm incremental motion capability. Manual adjustments can be made using a knob at the end of the motor.

An important source of the uncertainty is the parallelism of the stages. Using a Leica laser system, based on the optical interferometry effect, and level meters were used to adjust the parallelism.

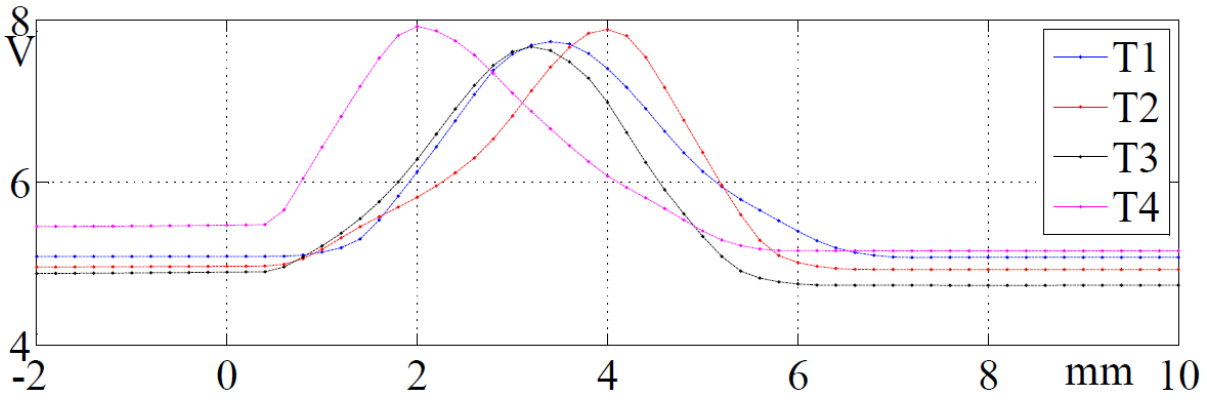
Courtesy of C. Petrone

Results

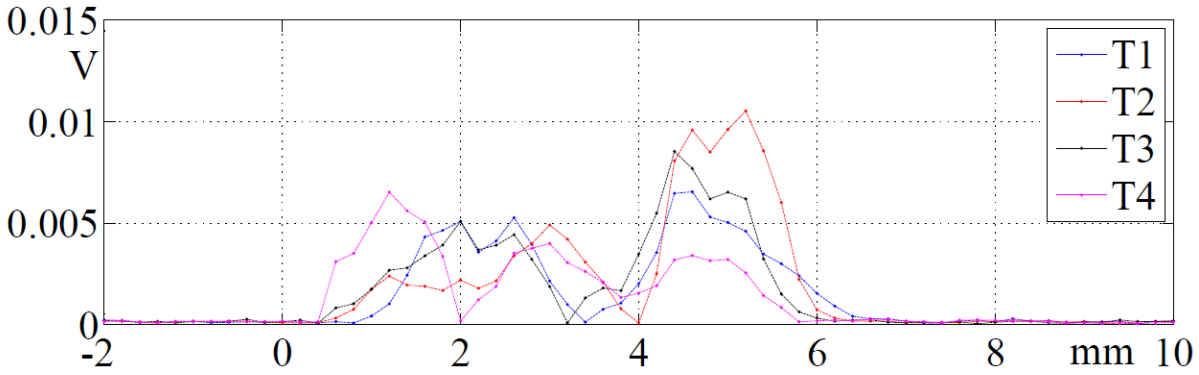


Output voltage signal variations according to the movement of the 2.5mm wire

Courtesy of C. Petrone



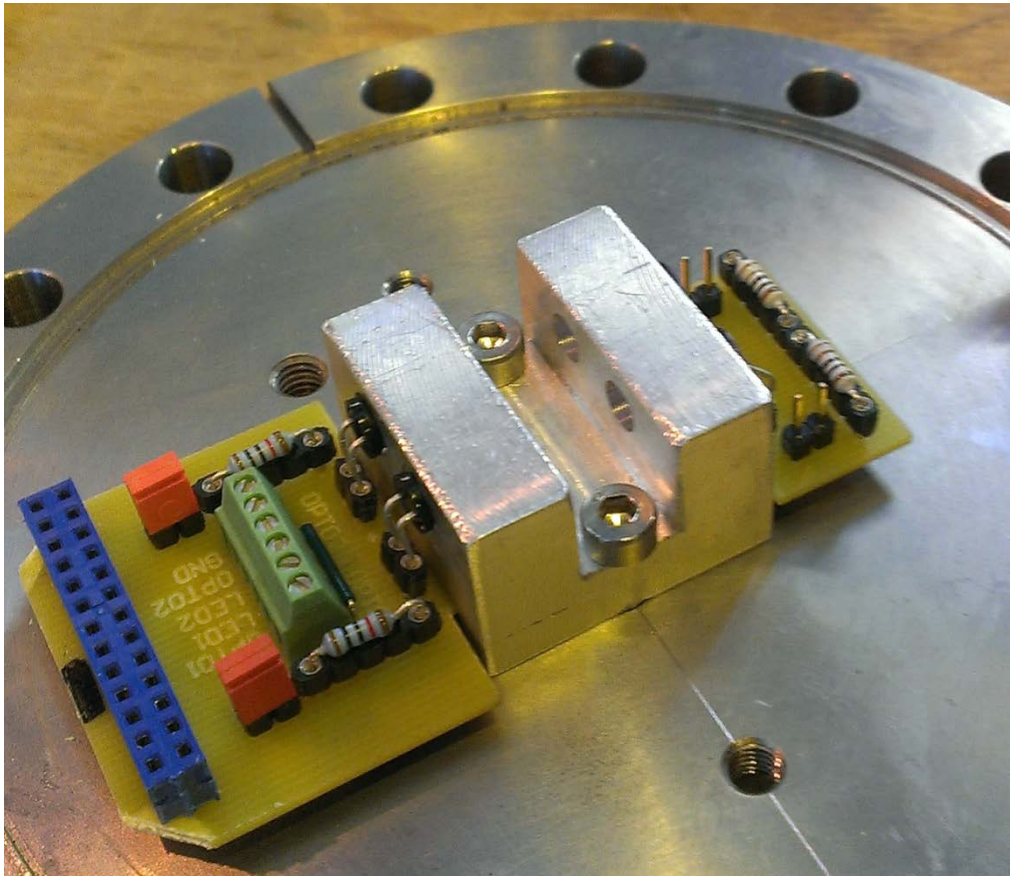
Output voltage signal variations according to the movement of the 1.5mm wire



Standard deviation on three measurements in a row

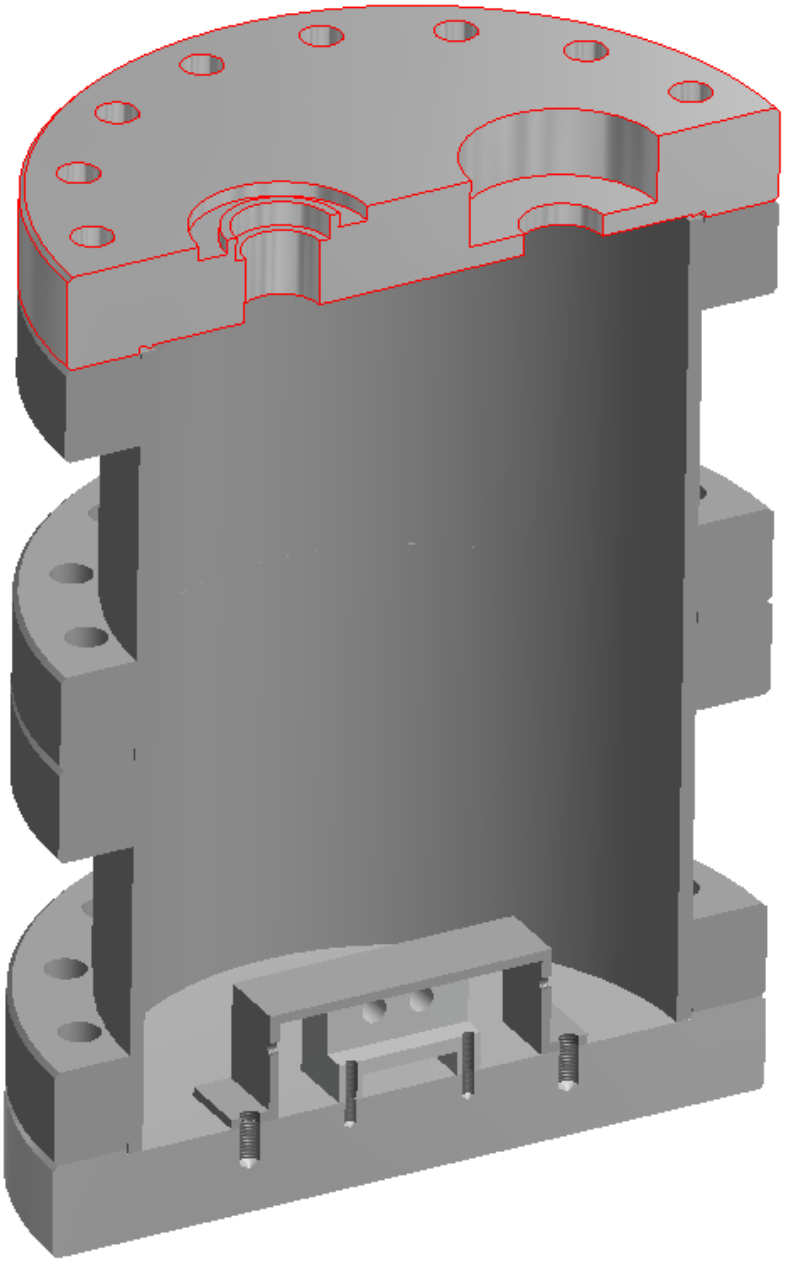
Courtesy of C. Petrone

Tests „at cold”

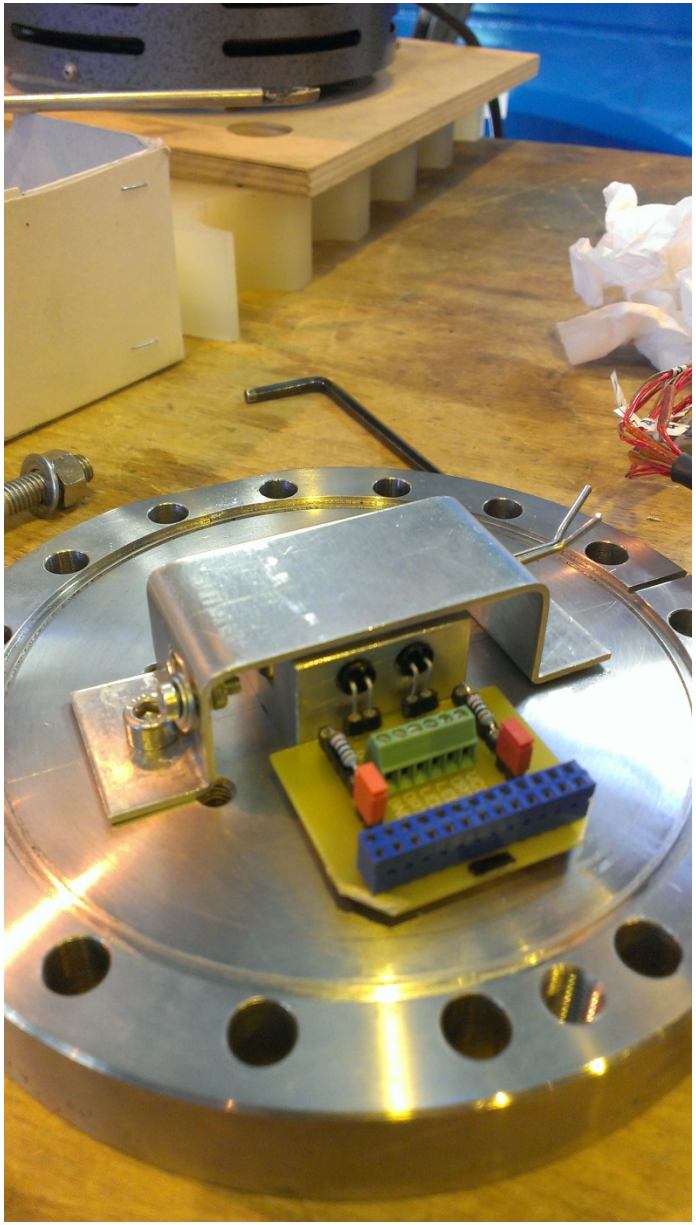


PCB with two sensors

Courtesy of K. Motala



Crossection of the cryostat



Test setup with fixed wire inside

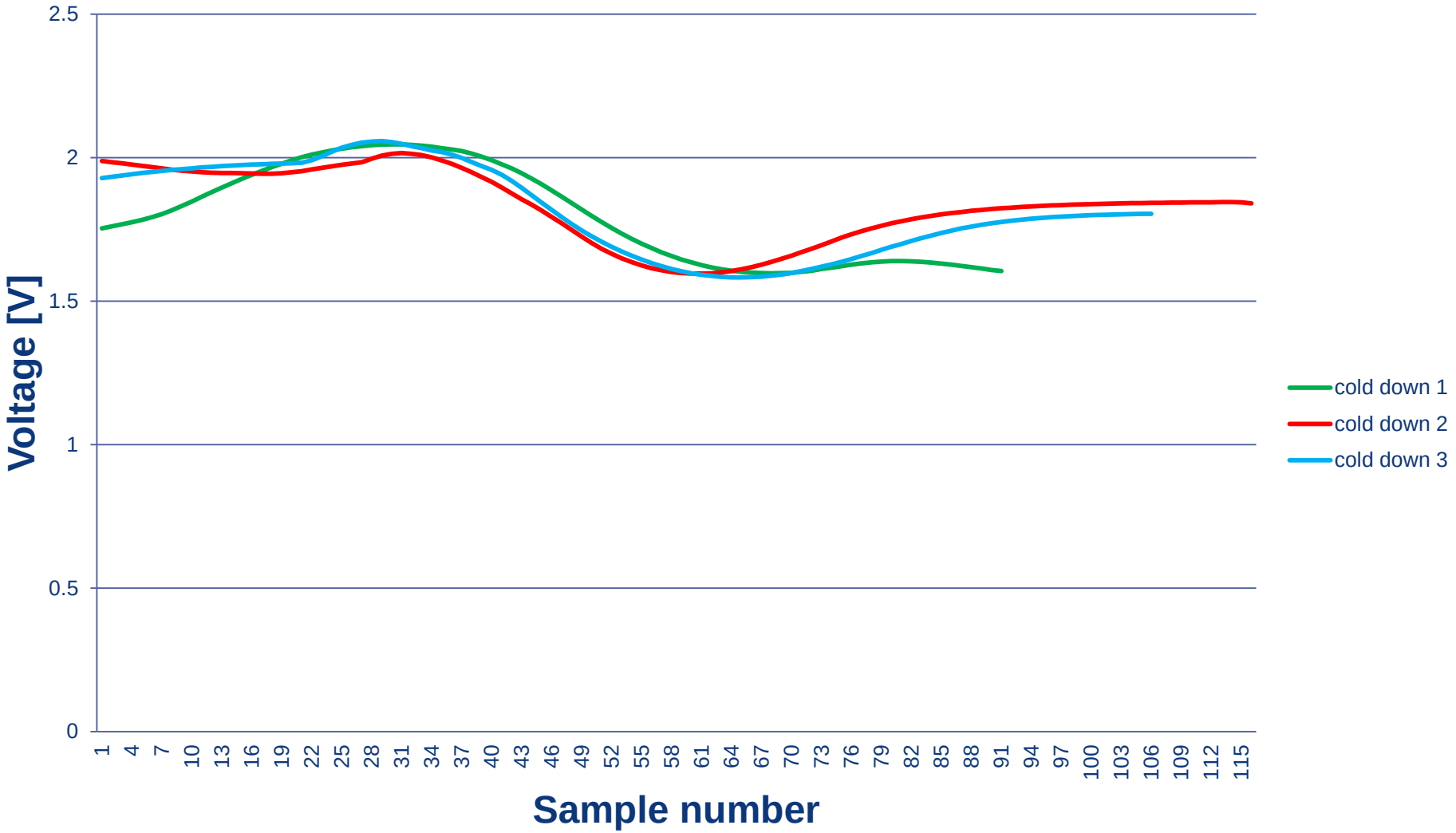
Courtesy of K. Motala

During the test

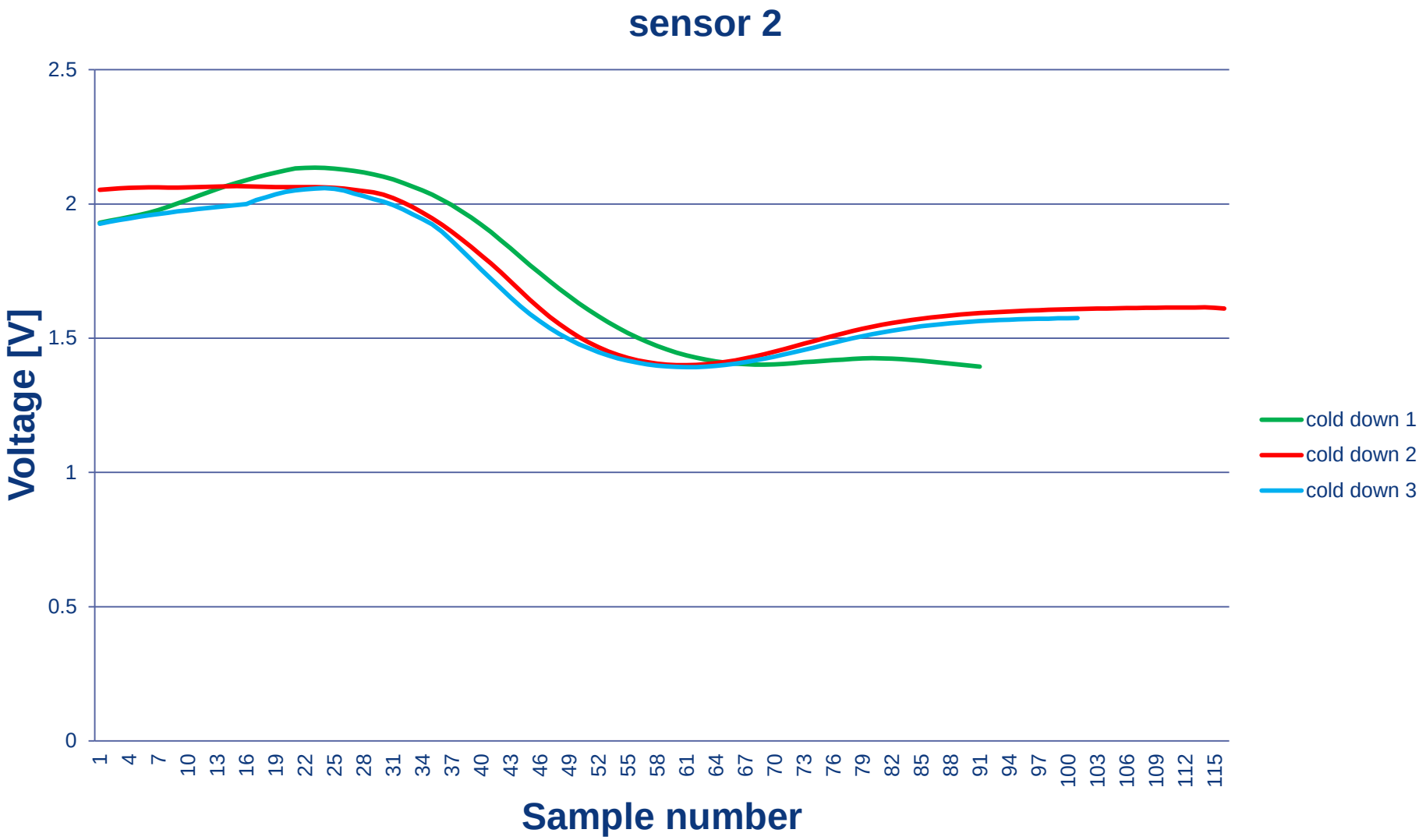
Courtesy of A. Vande Craen

Repetivity test 1 – resistors inside cryostat

sensor 1

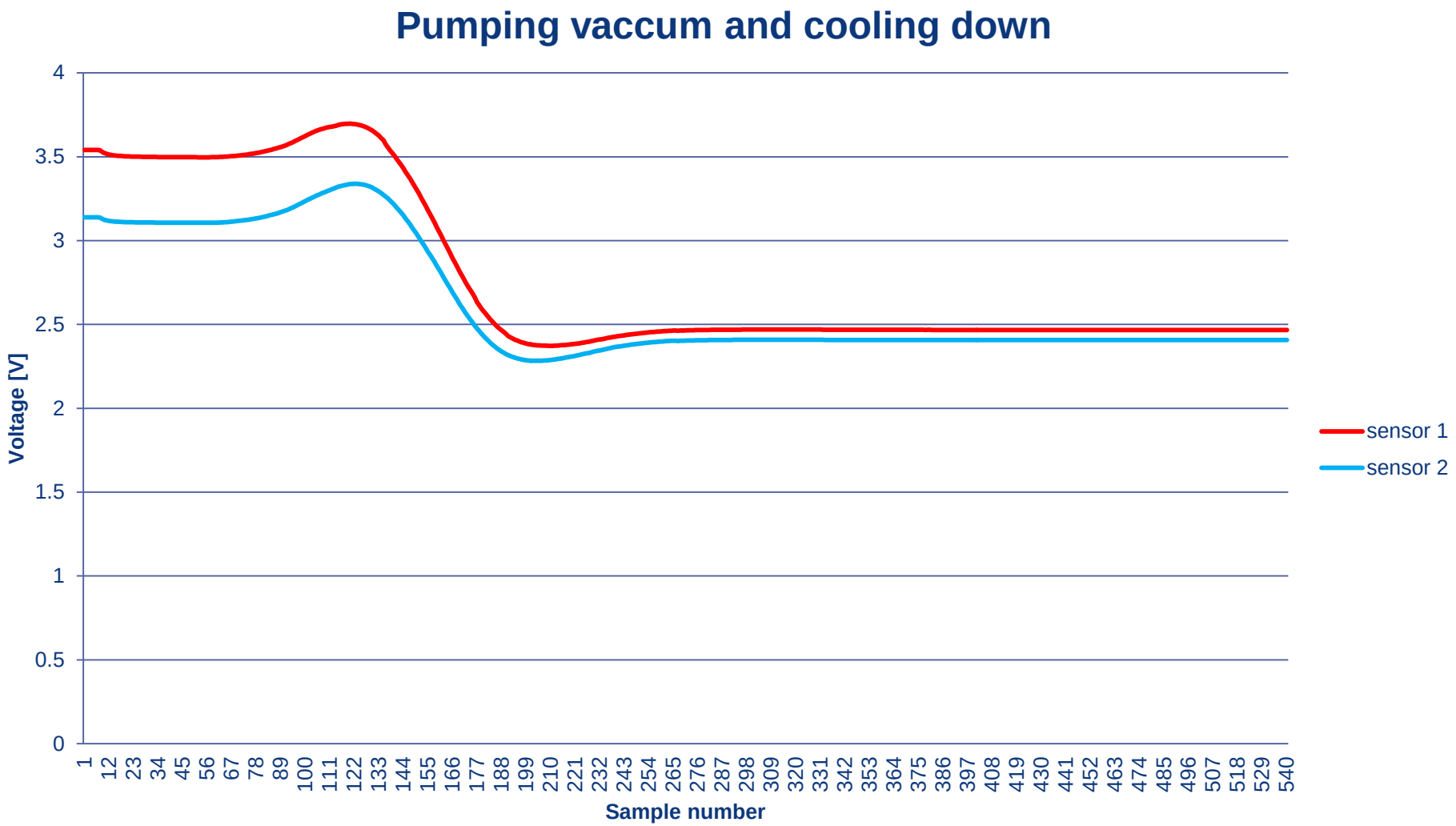


Samples were taken every 10 s



Samples were taken every 10 s

Test 2 – resistors outside cryostat



Samples were taken every 10 s

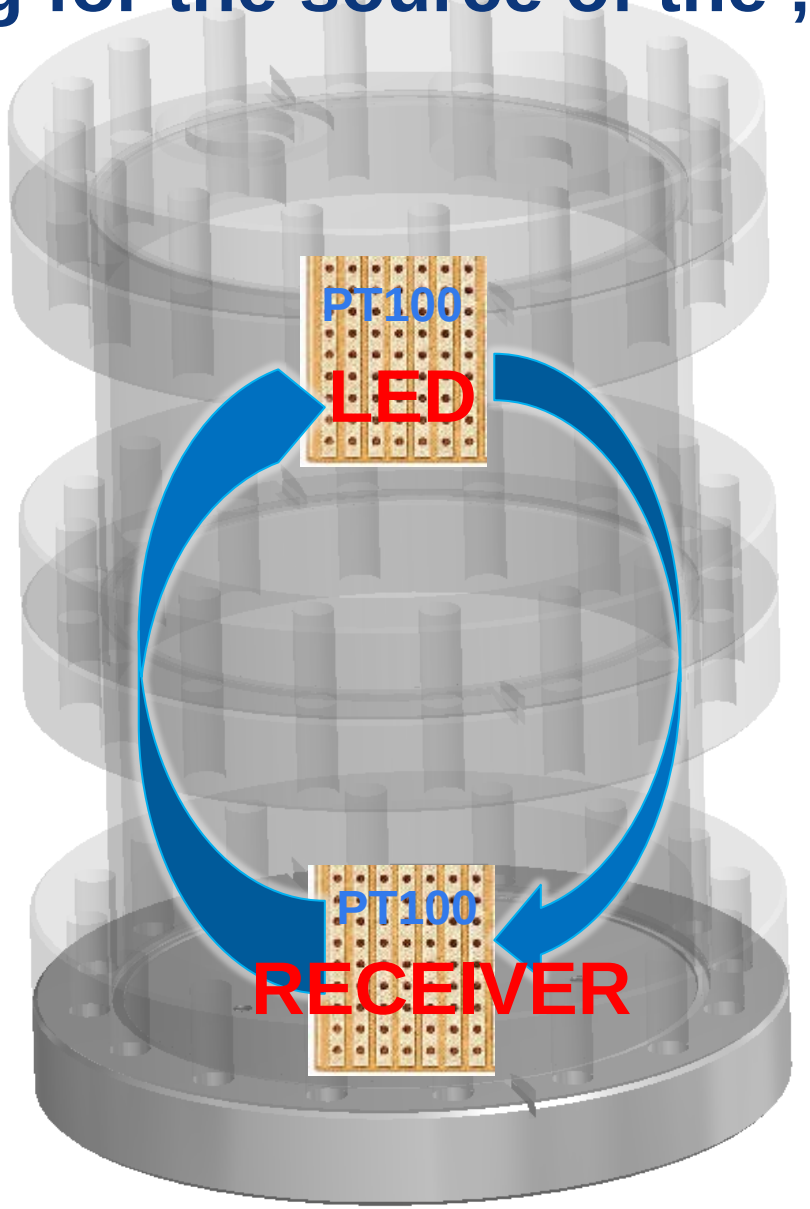
Future tasks

- Understand the shape of the curve and corelate it with T(s)
- Calibration „at cold”
- Test in liquid helium
- Design of the final sensor and test is on the SPL mock-up

Thank you for your attention!

Spare slides

Looking for the source of the „weird” signal



Calibration „at cold” – test proposal