Estudios termomecánicos para futuros colisionadores

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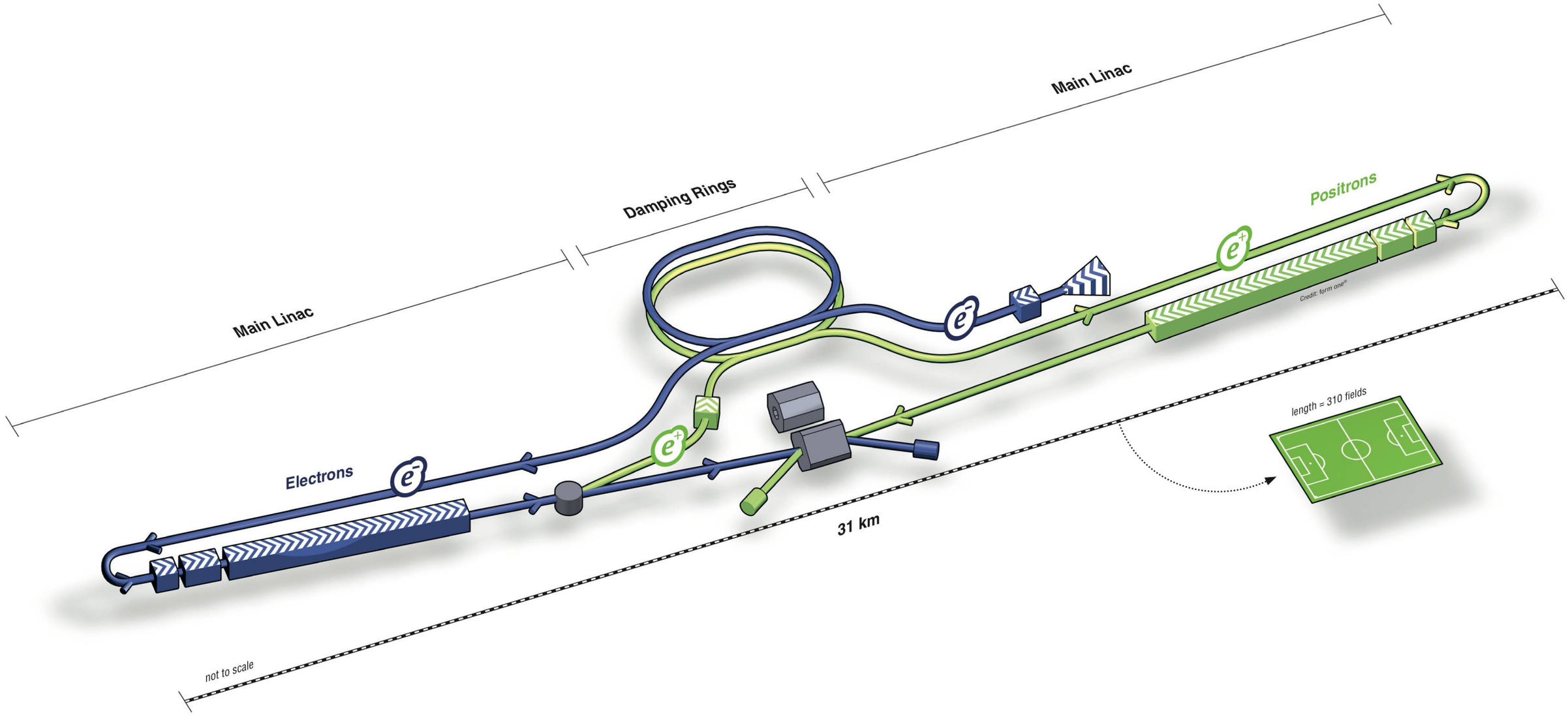
(1) (2) (3) (4) (5)

Outline

1- Soporte de fibra de carbono para los sensores de silicio con refrigeración por aire

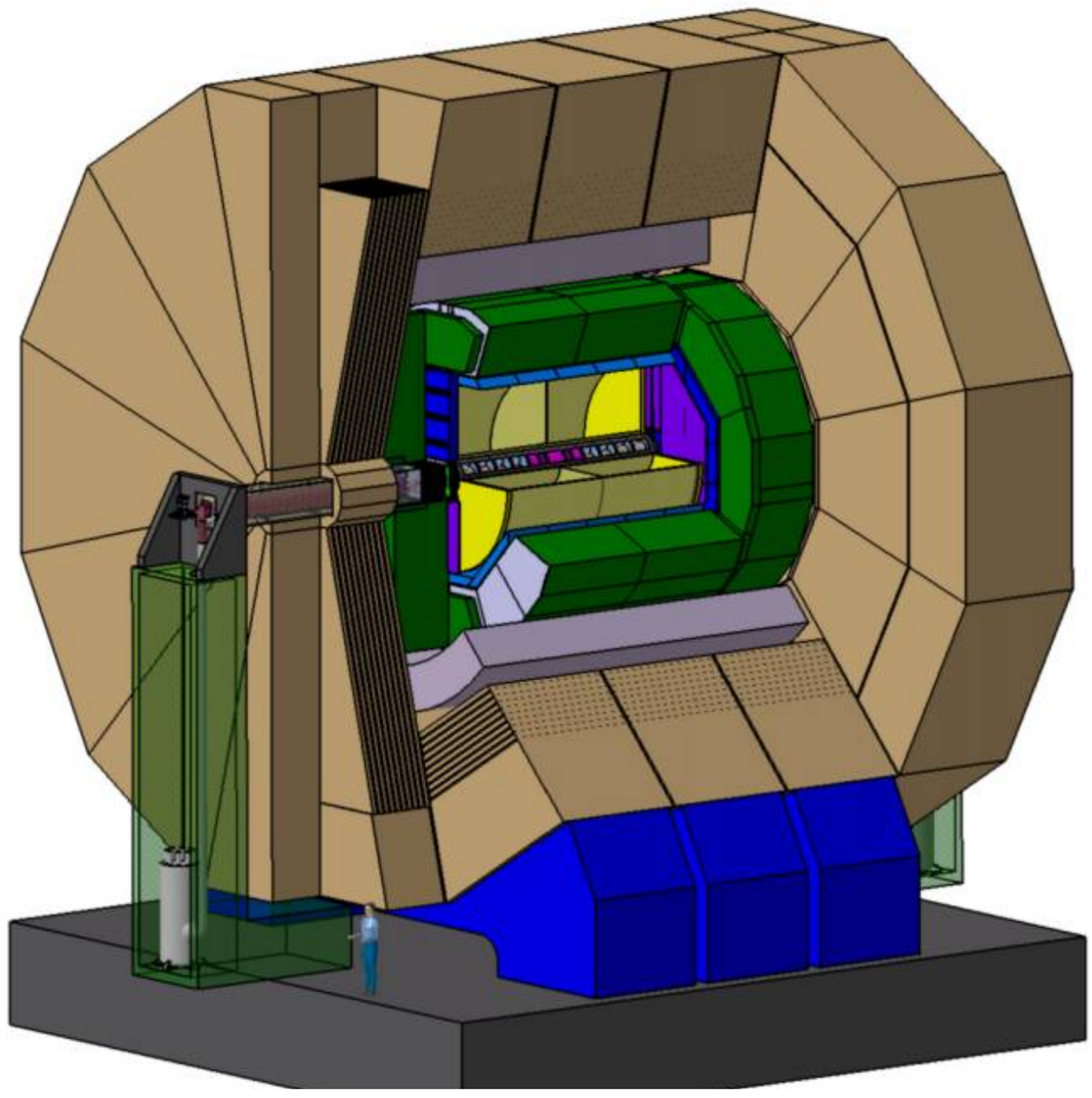
2- Estudios termomecánicos en microcanales embebidos en sensores de silicio



Linear e- e+ accelerator

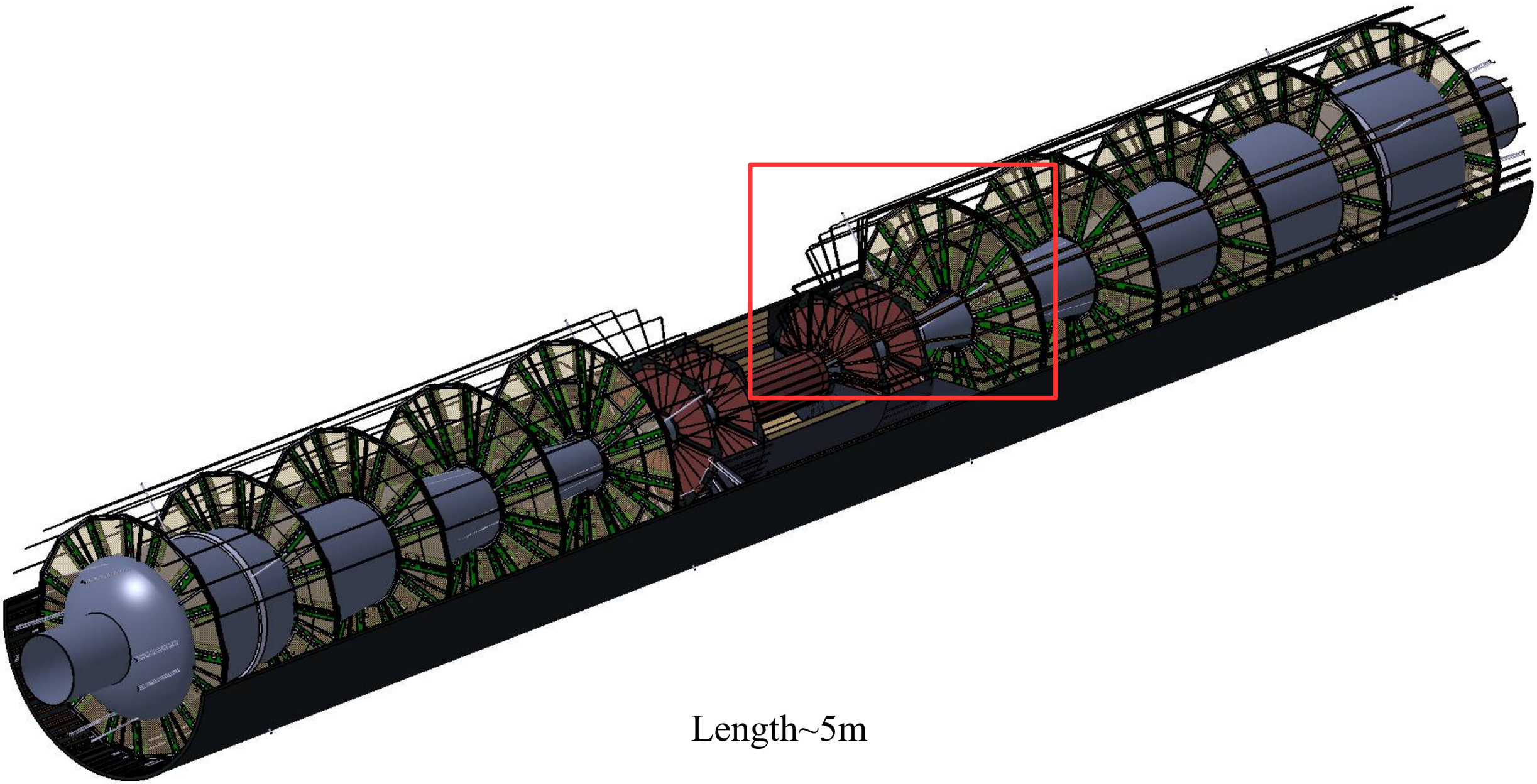
Complement of the LHC at CERN

It will contribute to explore the physics beyond the Standard Model



The ILD detector systems have many layers surrounding the point where the beams collide

We will focus in the inner most region (the first layer)



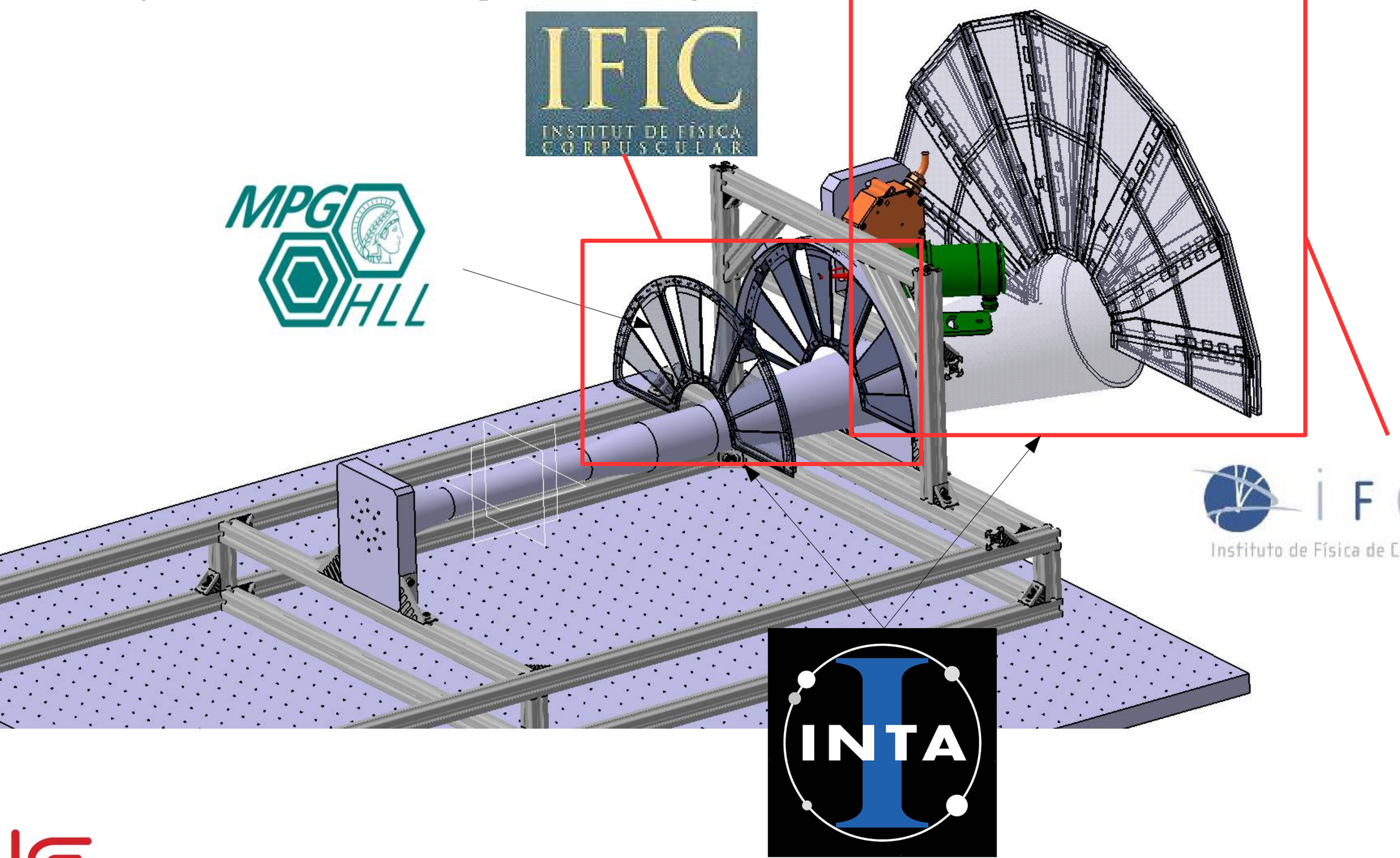
Length~5m

Diameter~0,64m

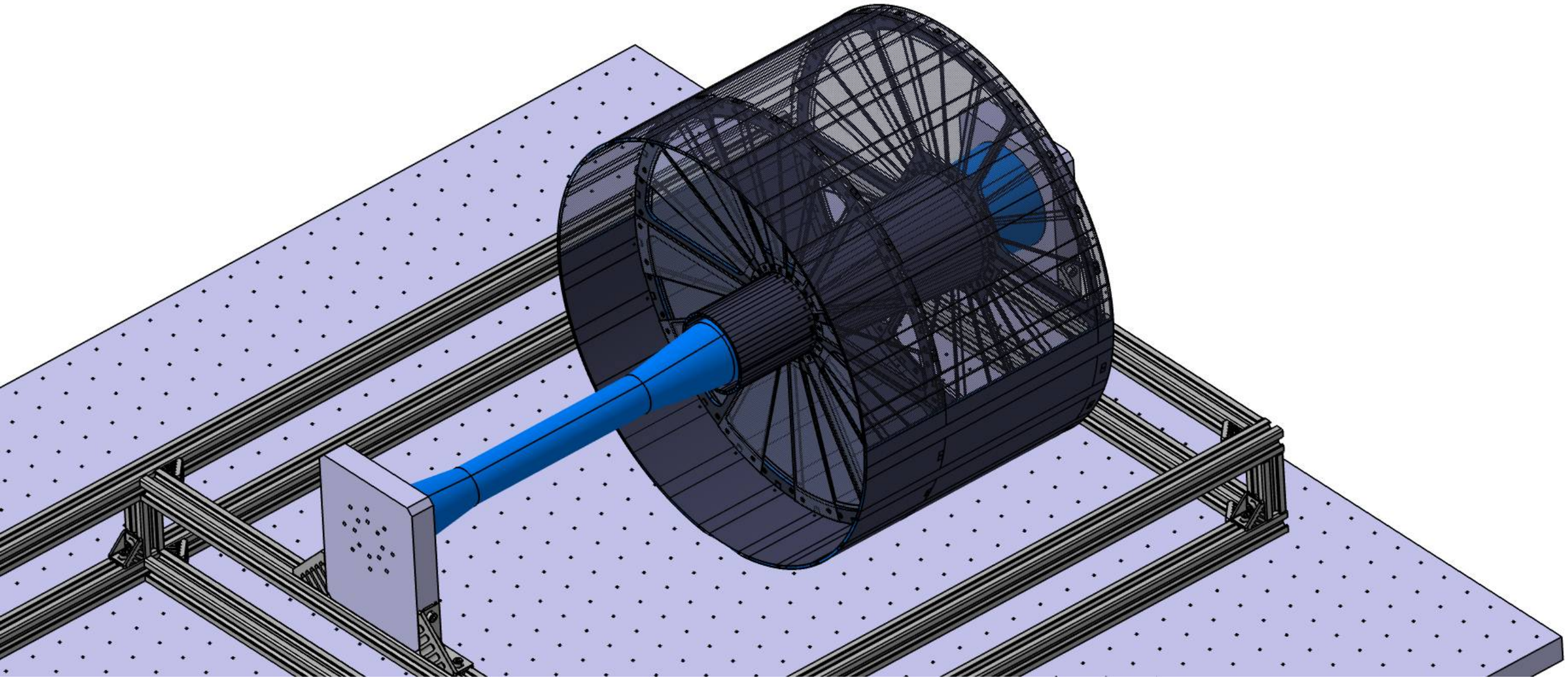
As light and rigid as possible

FTD Mock-up

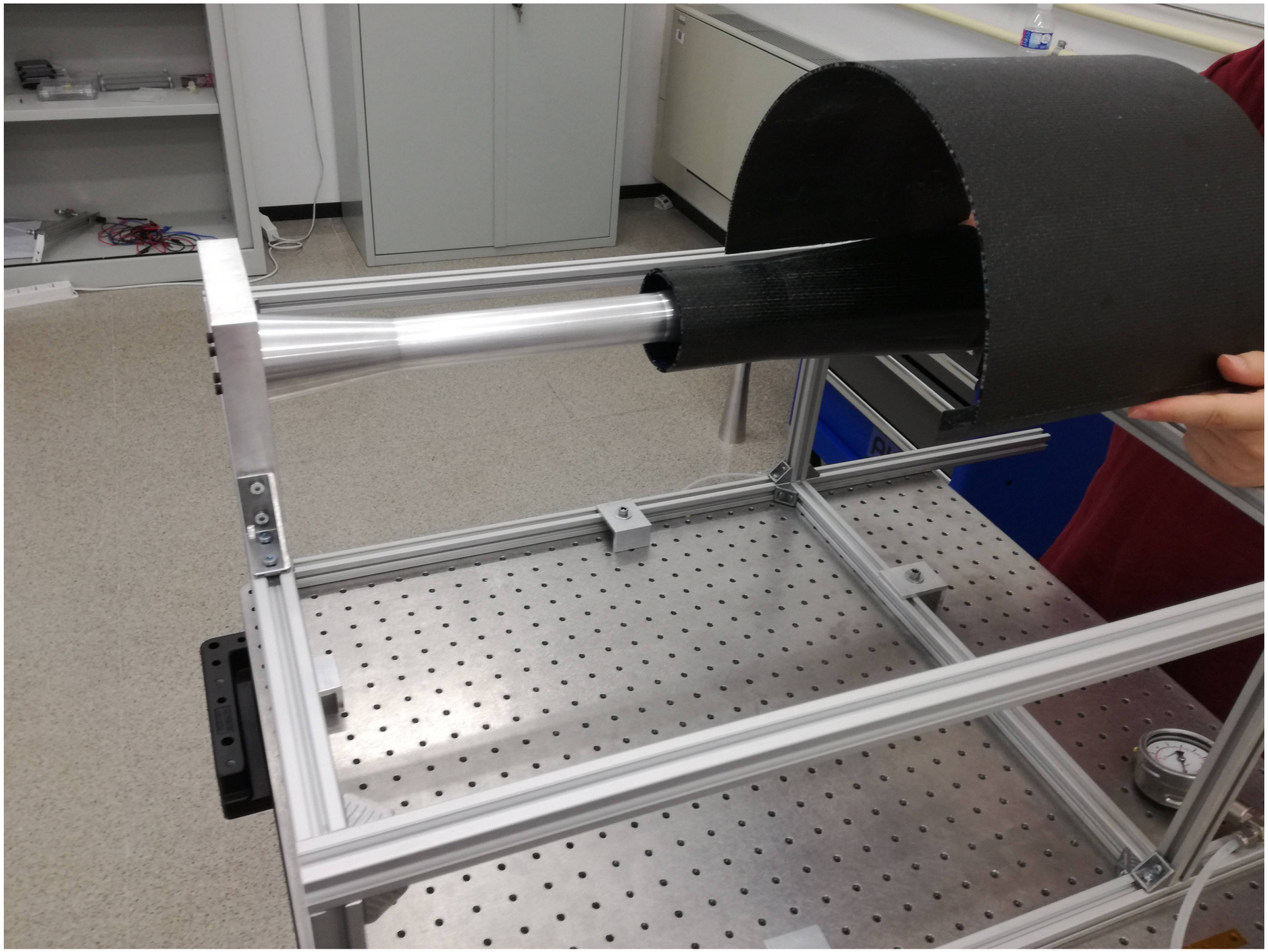
Objective: mechanical setup understanding



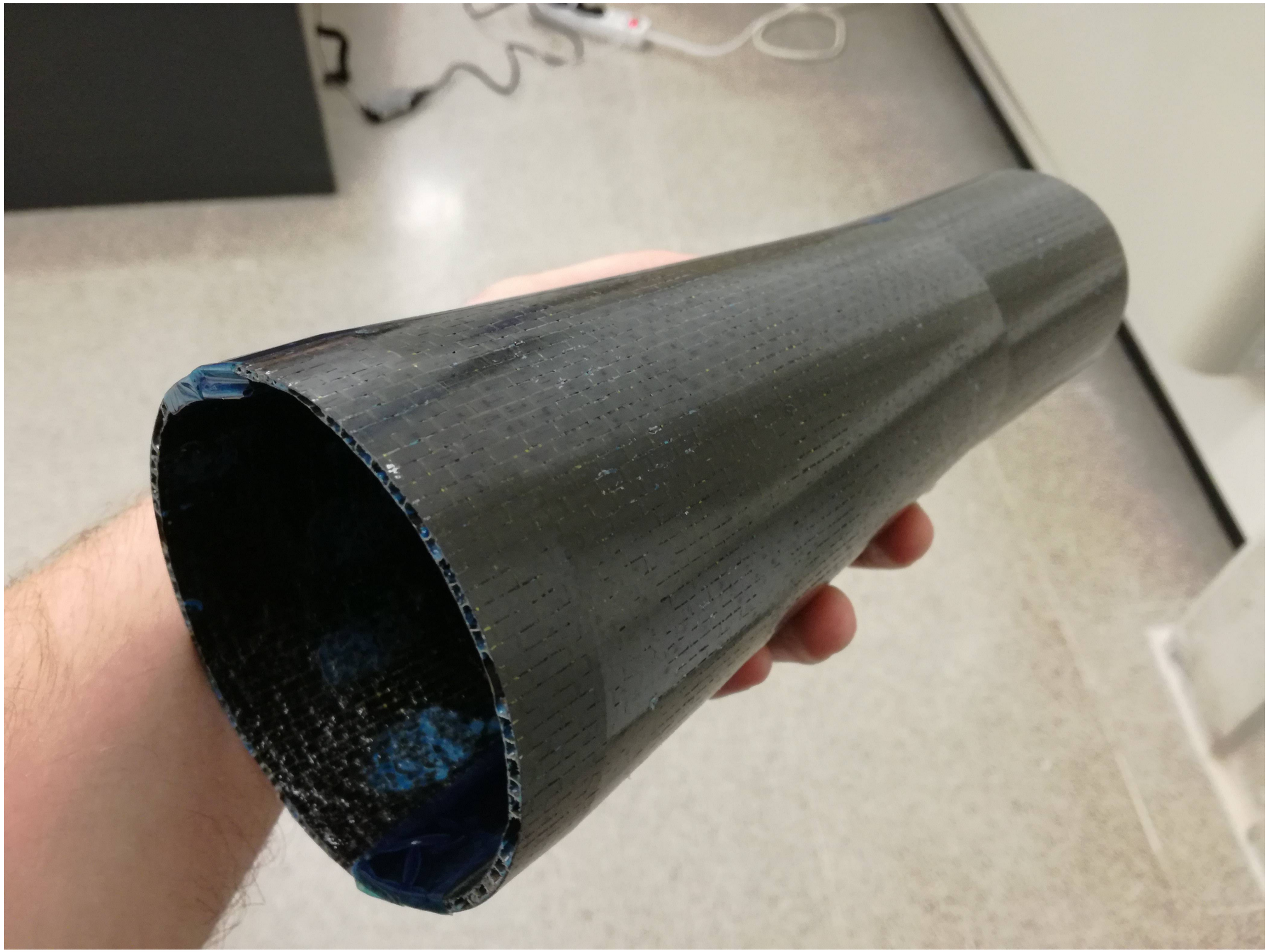
FTD Mock-up



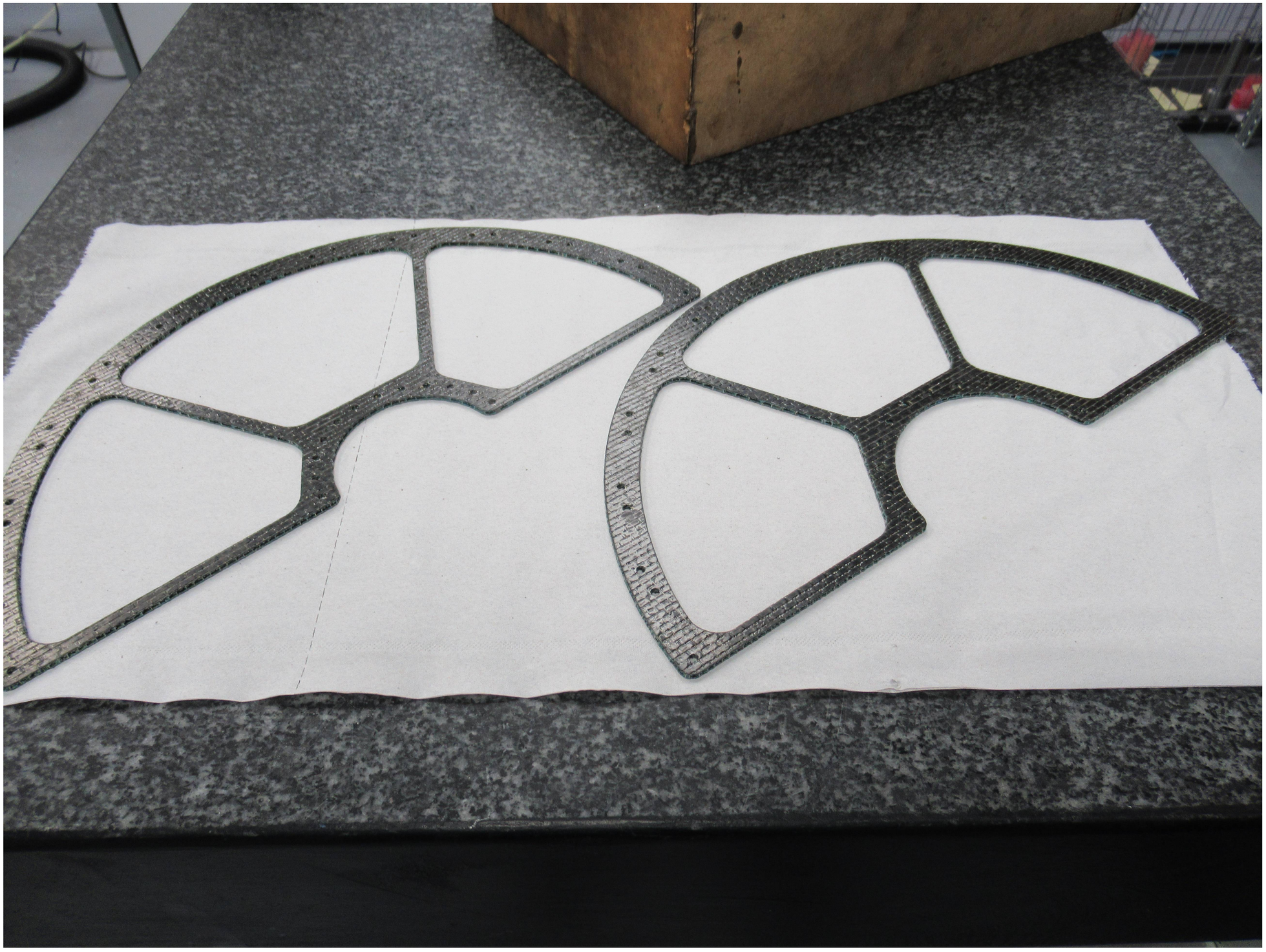
FTD Mock-up



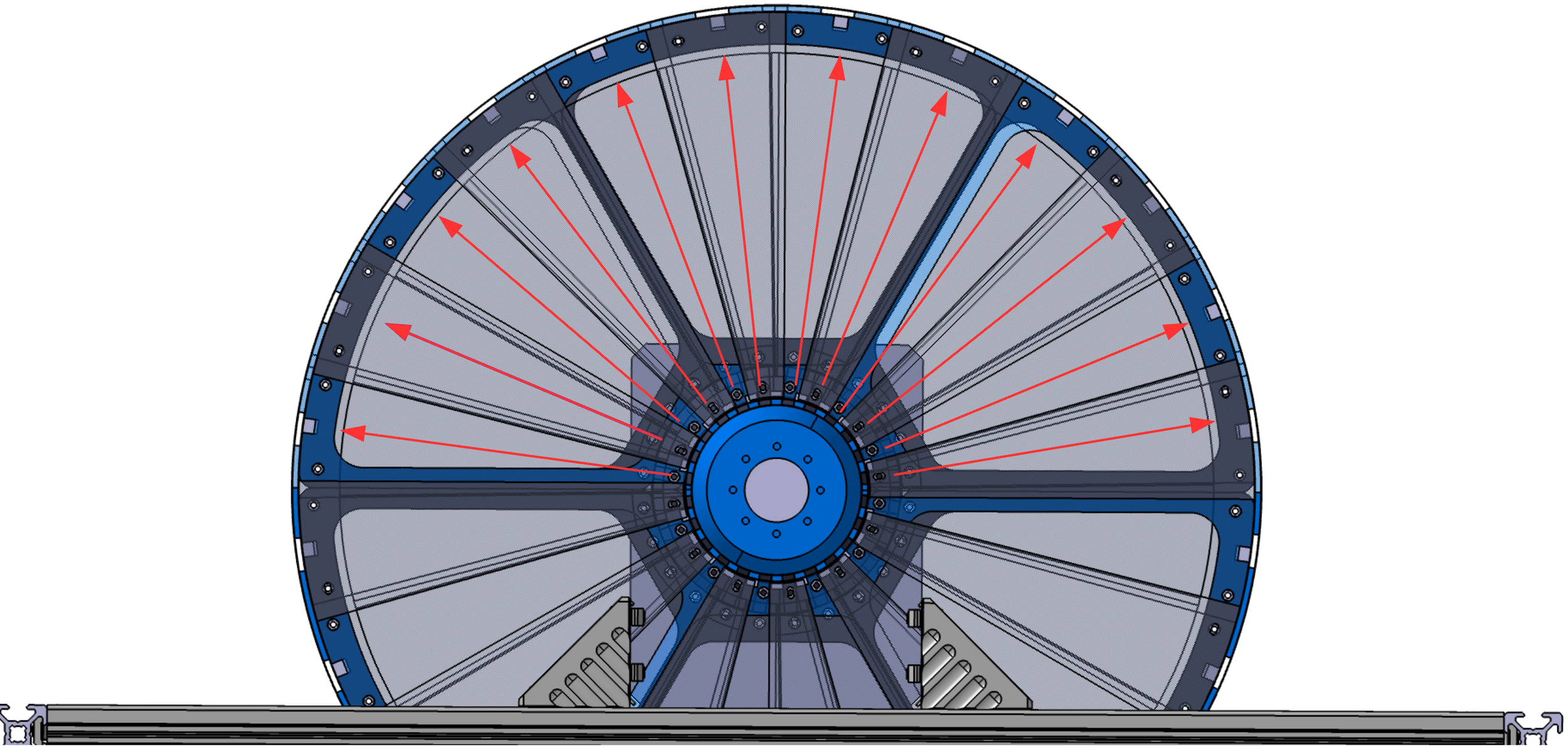
FTD Mock-up



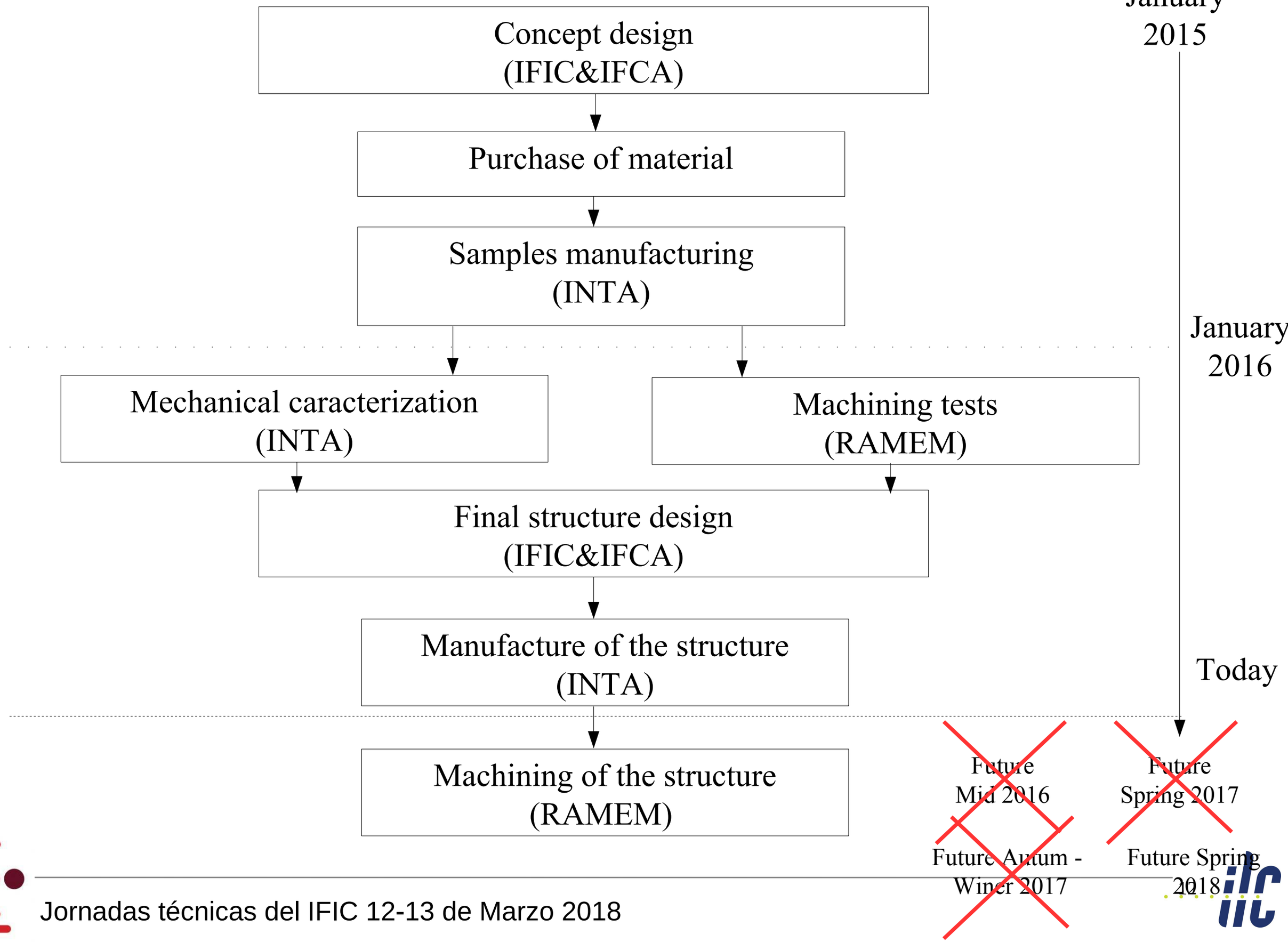
FTD Mock-up



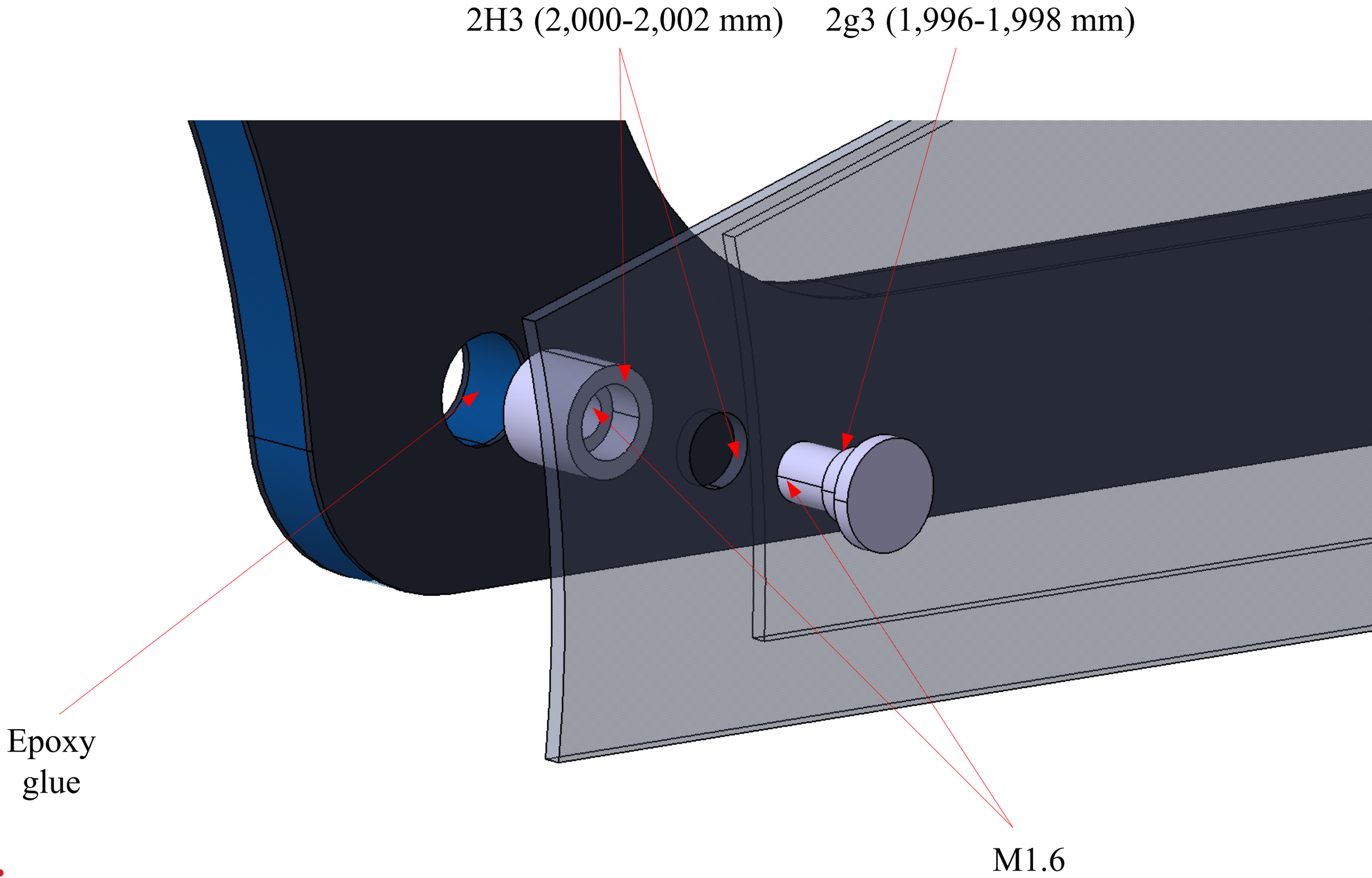
FTD Mock-up



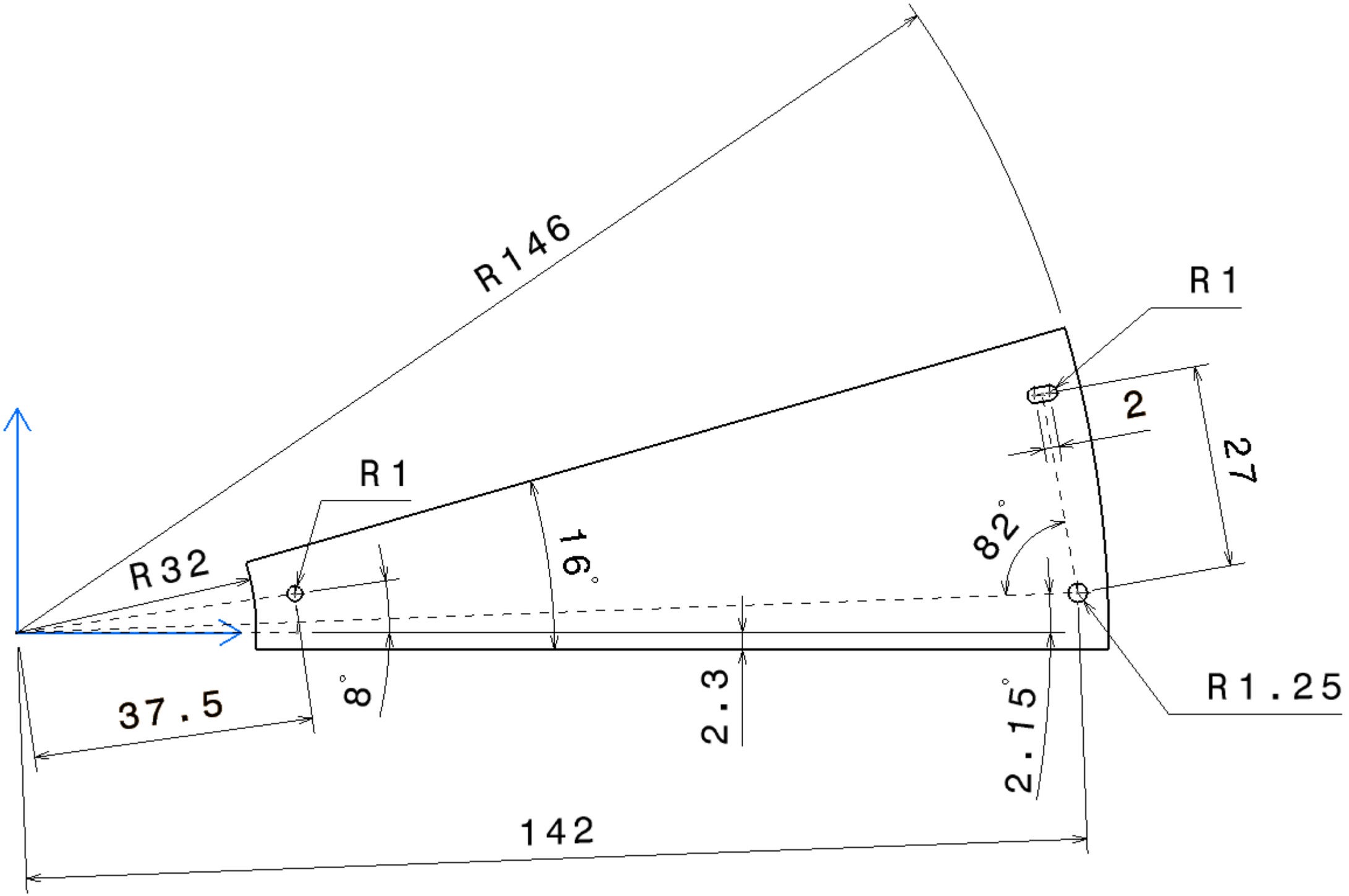
FTD Mock-up


Concept design
(IFIC&IFCA)
Purchase of material
Samples manufacturing
(INTA)
Mechanical caracterization
(INTA)
Machining tests
(RAMEM)
Final structure design
(IFIC&IFCA)
Manufacture of the structure
(INTA)
Machining of the structure
(RAMEM)
January
2015
January
2016
Today
Future
Mid 2016
Future
Spring 2017
Future Autum -
Winer 2017
Future Spring
2018

FTD Mock-up

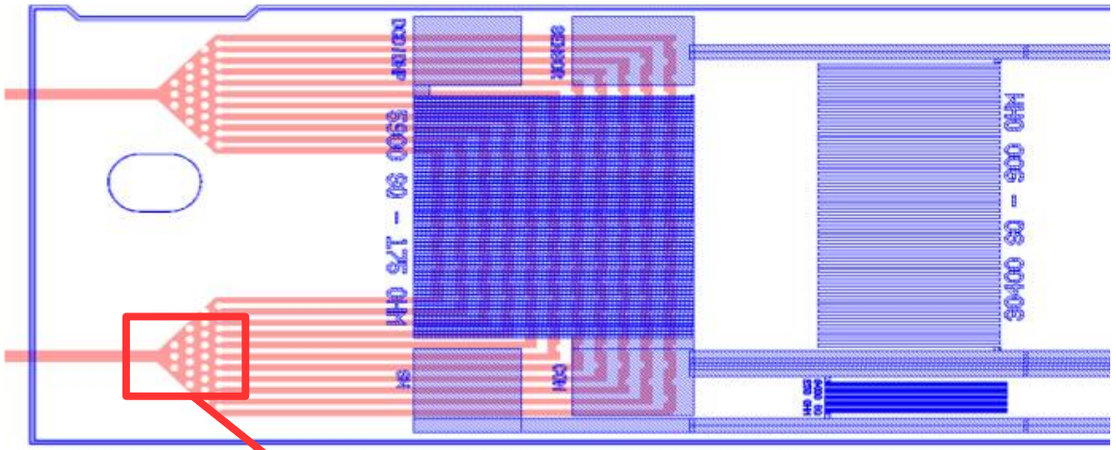


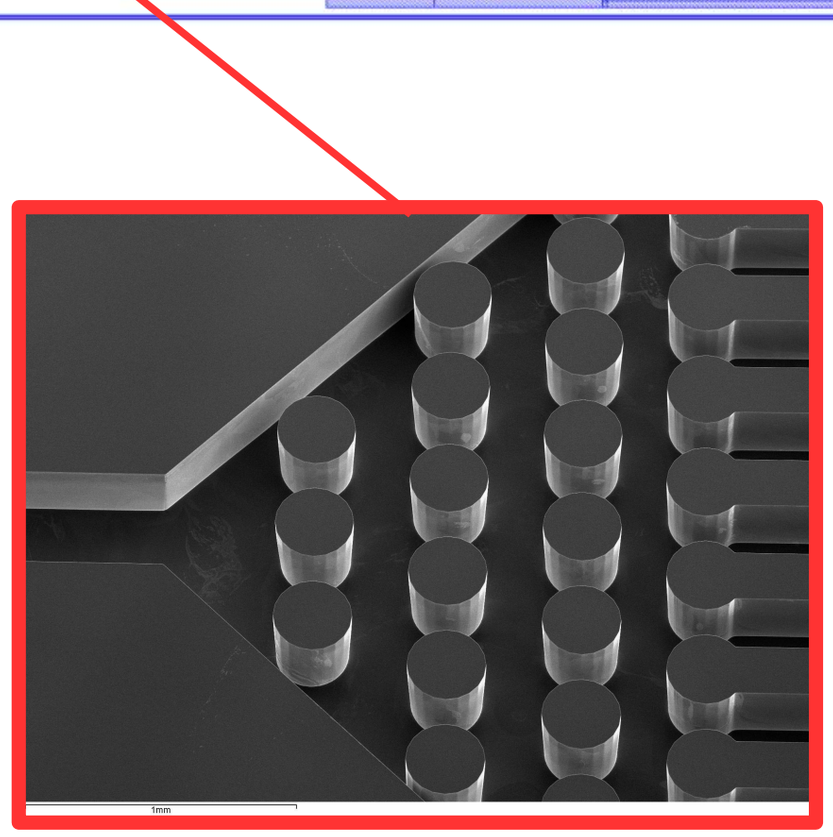
FTD Mock-up



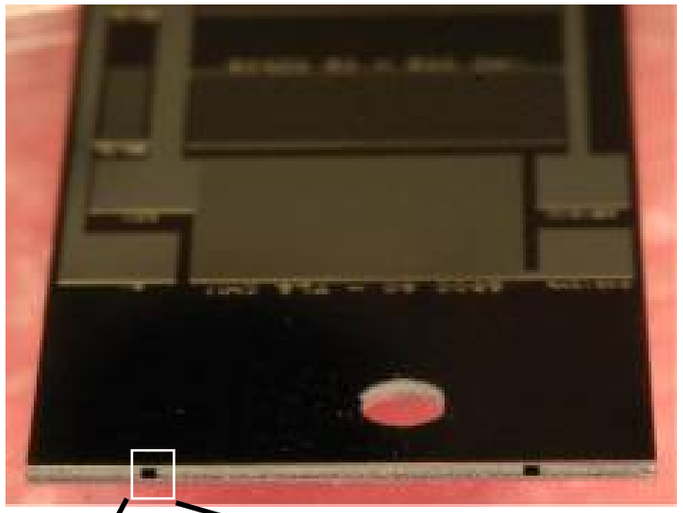
Introduction

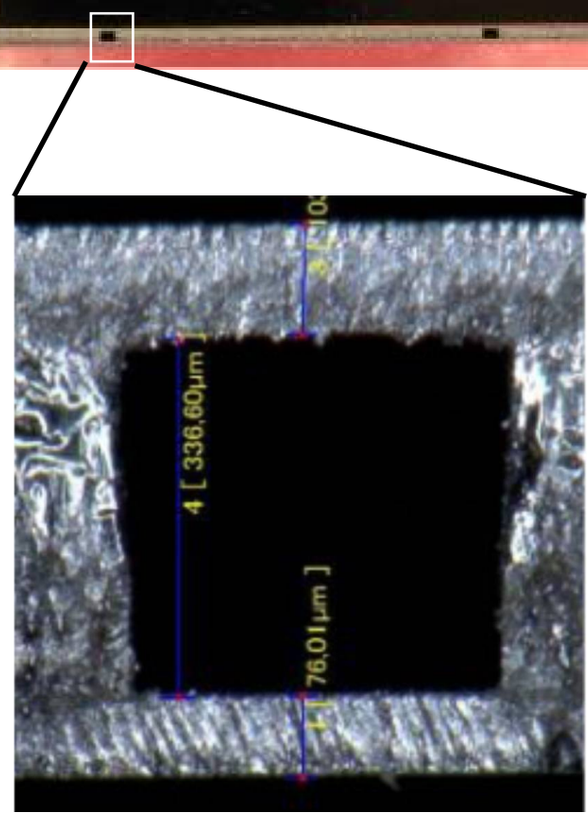
The resistive dummies with integrated micro-channels based in DEPFET layout design:





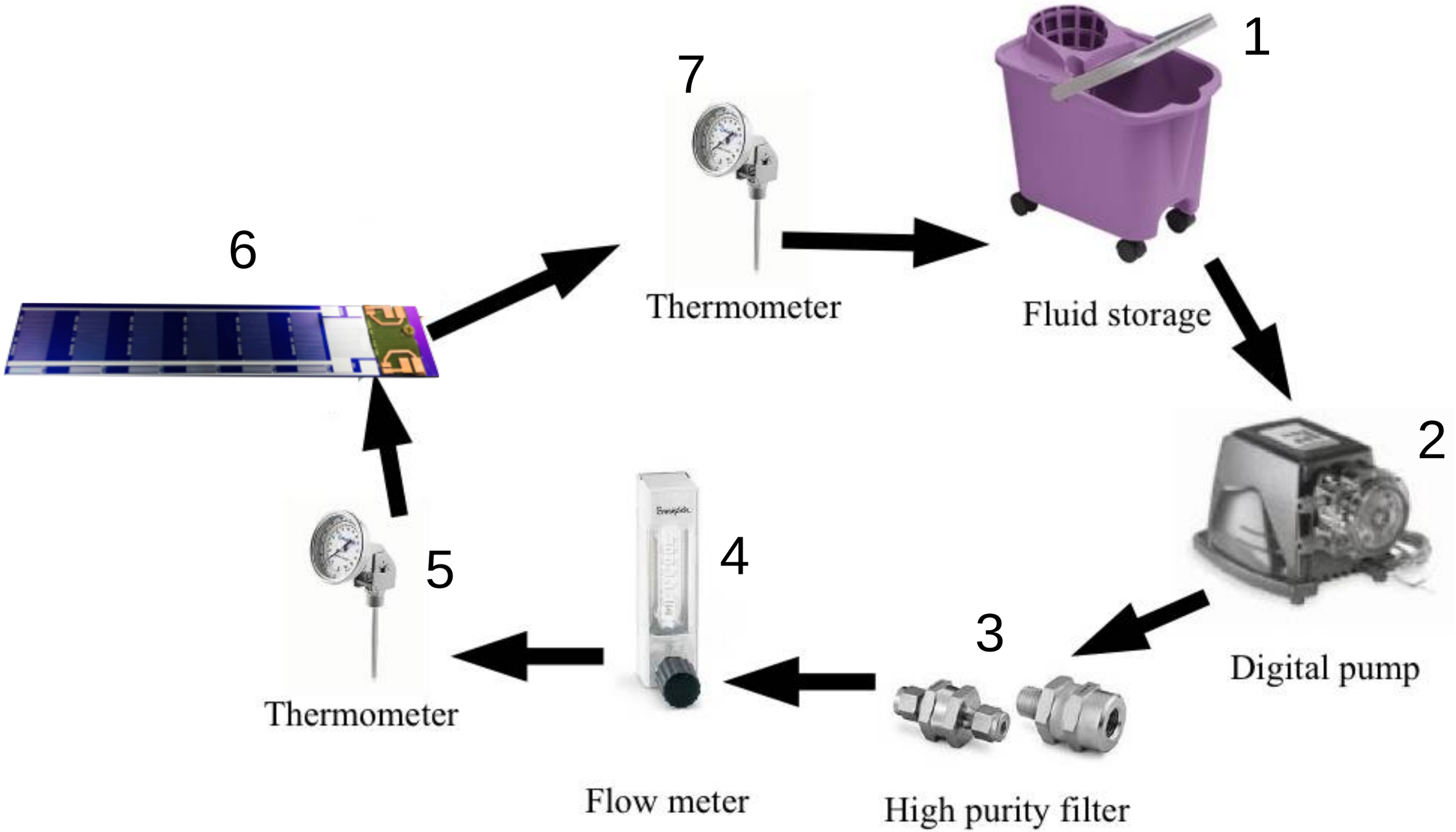
Micro-channel pattern in handle wafer



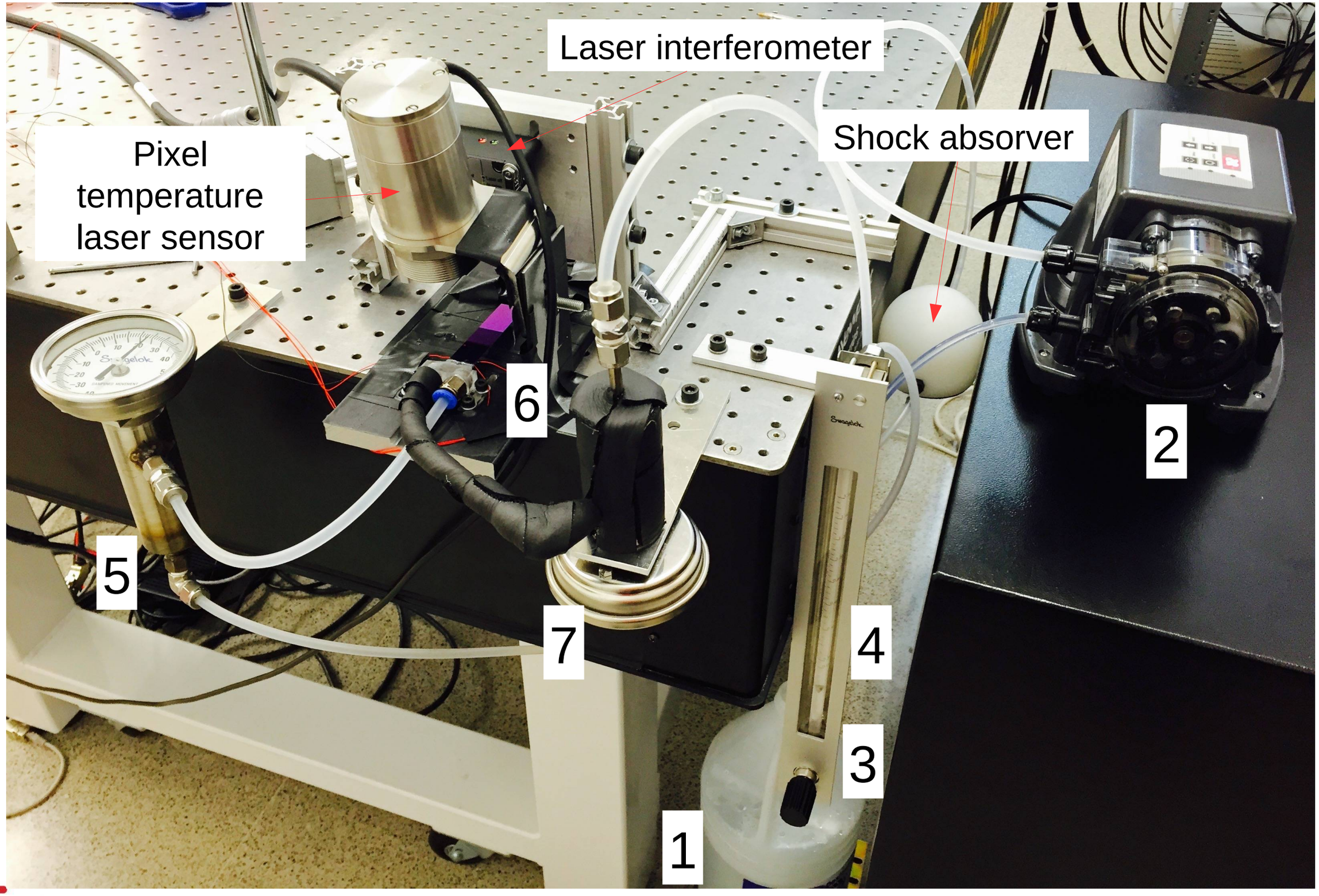


Inlet and outlet: ~380 x 340 µm

Introduction



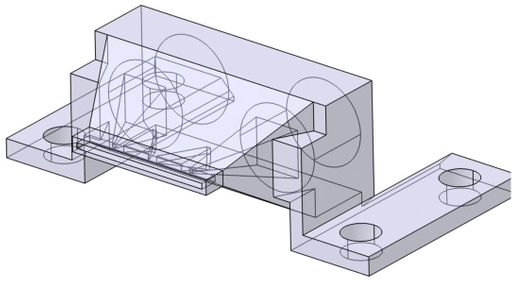
Introduction

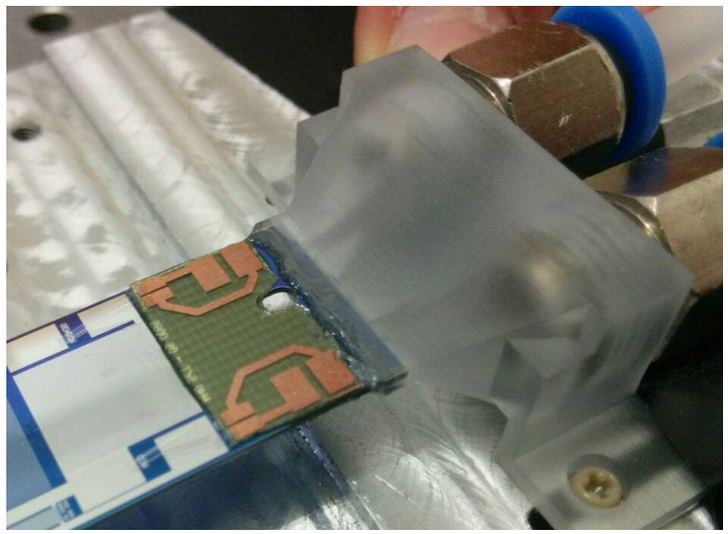


MCC optimization: material budget

Past (A long time ago,...)

(0.81% X/X_0)

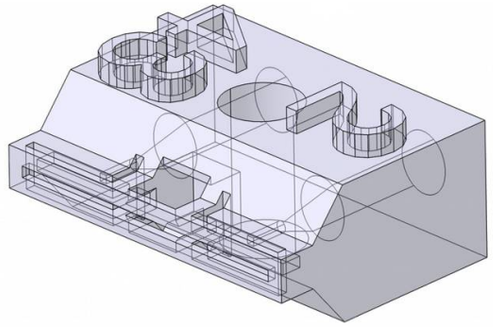


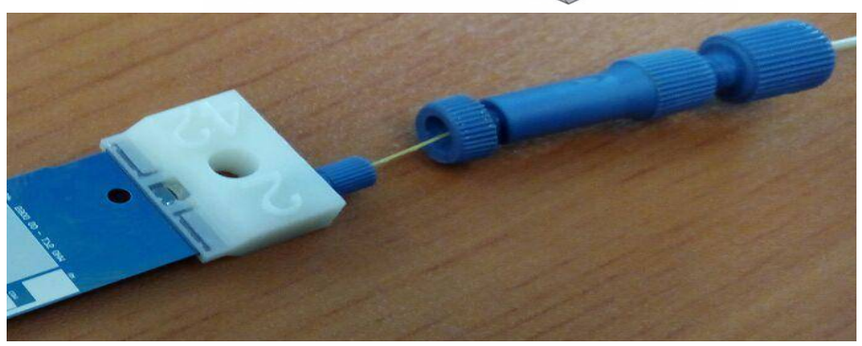


- First successful attempt
- Huge amount of material used: connector and metal fittings
- Mechanical fitting
- Non high performance glue

Past (A not so long time ago)

(0.2% X/X_0)

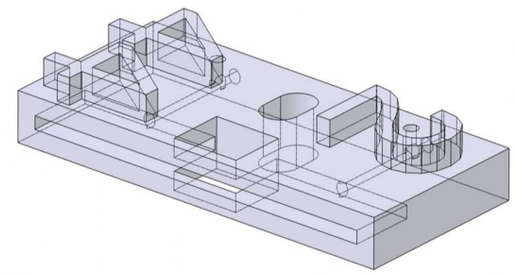


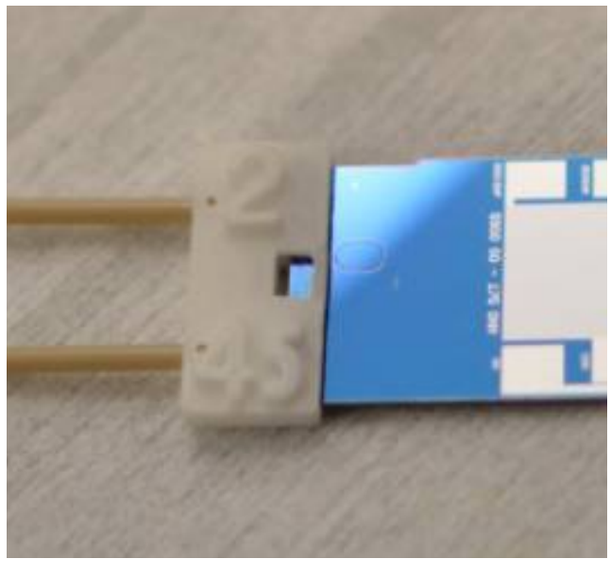


- Low amount of material used: connector and peek fittings
- Mechanical fitting
- High performance glue Araldite 2020 → low viscosity → clogging

Present

(0.05% X/X_0)

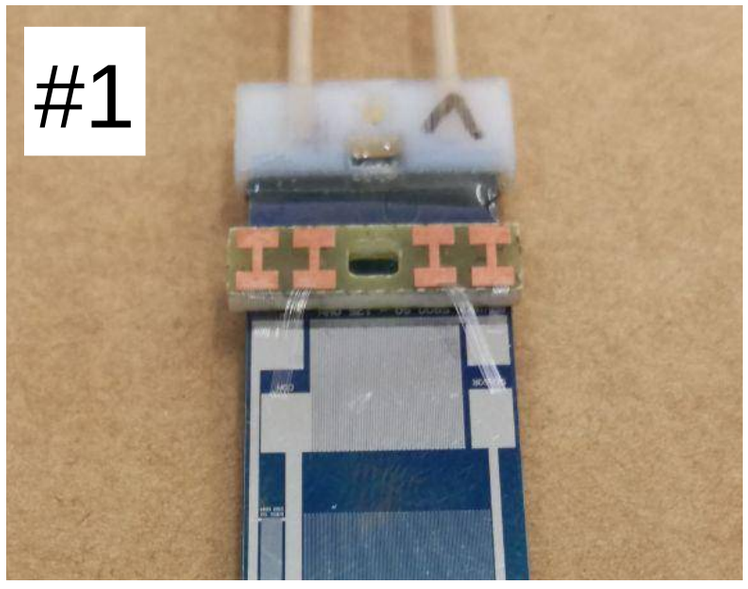


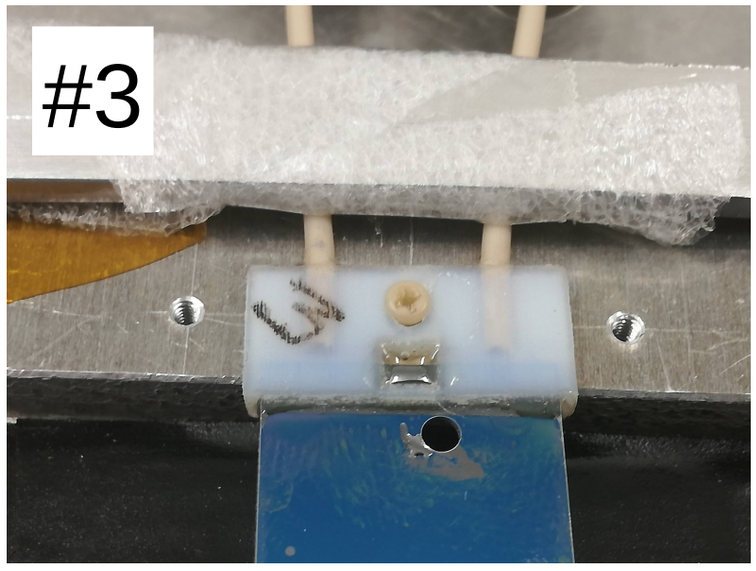


- Low amount of material used: connector and peek fittings
- Chemical fitting
- High performance glue Araldite 2011 → high viscosity → no clogging

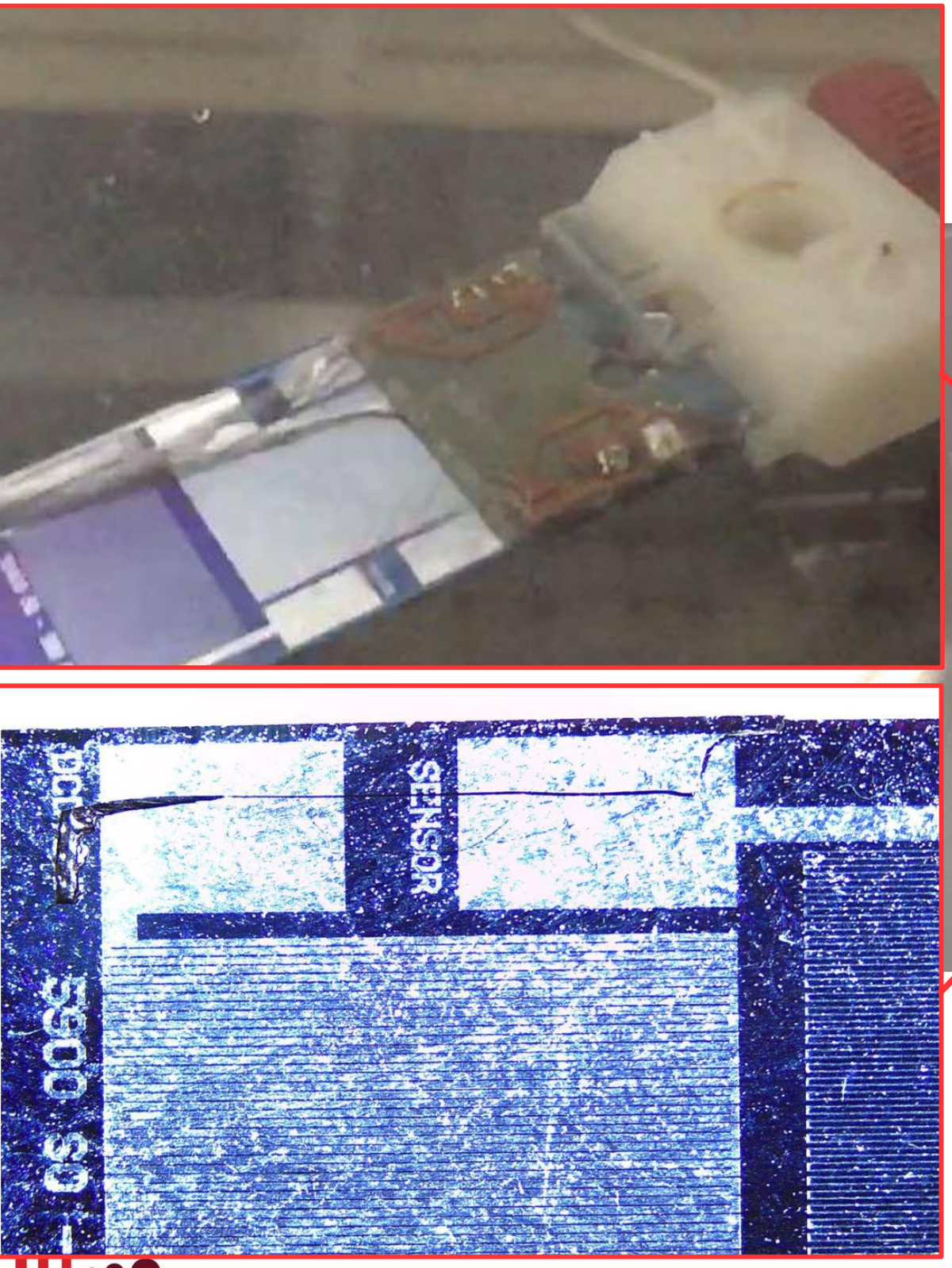
MCC optimization: Vacuum test

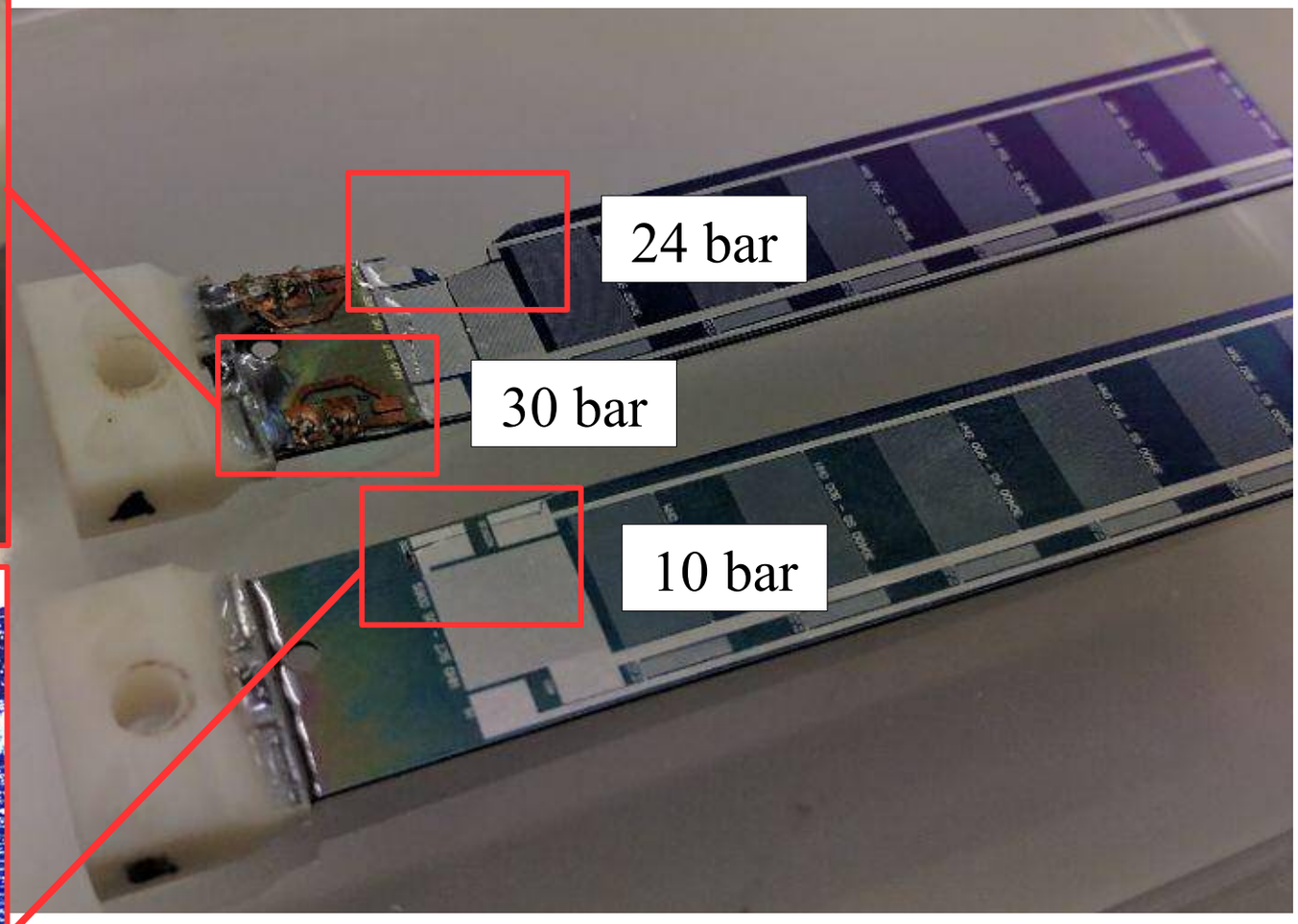
Sample number	#1	#2	#3	#4
Vacuum test [mbar l/h]	5,5e^-9	9,0e^-9	8,6e^-9	6,1e^-9



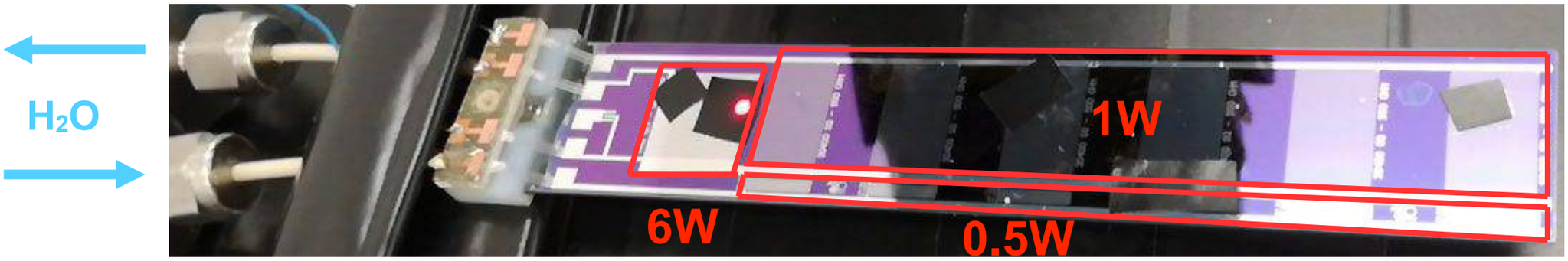


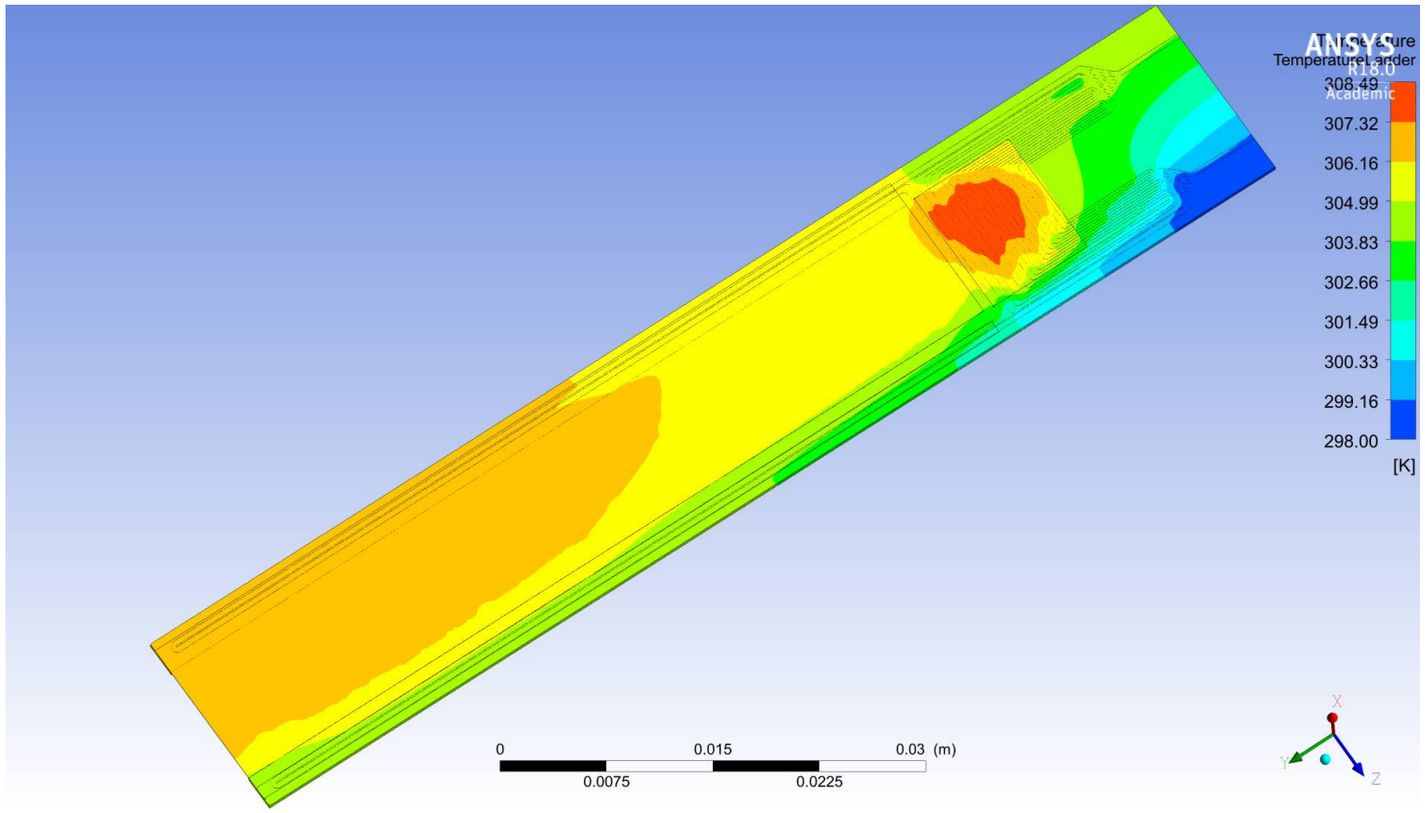
MCC optimization: pressure test

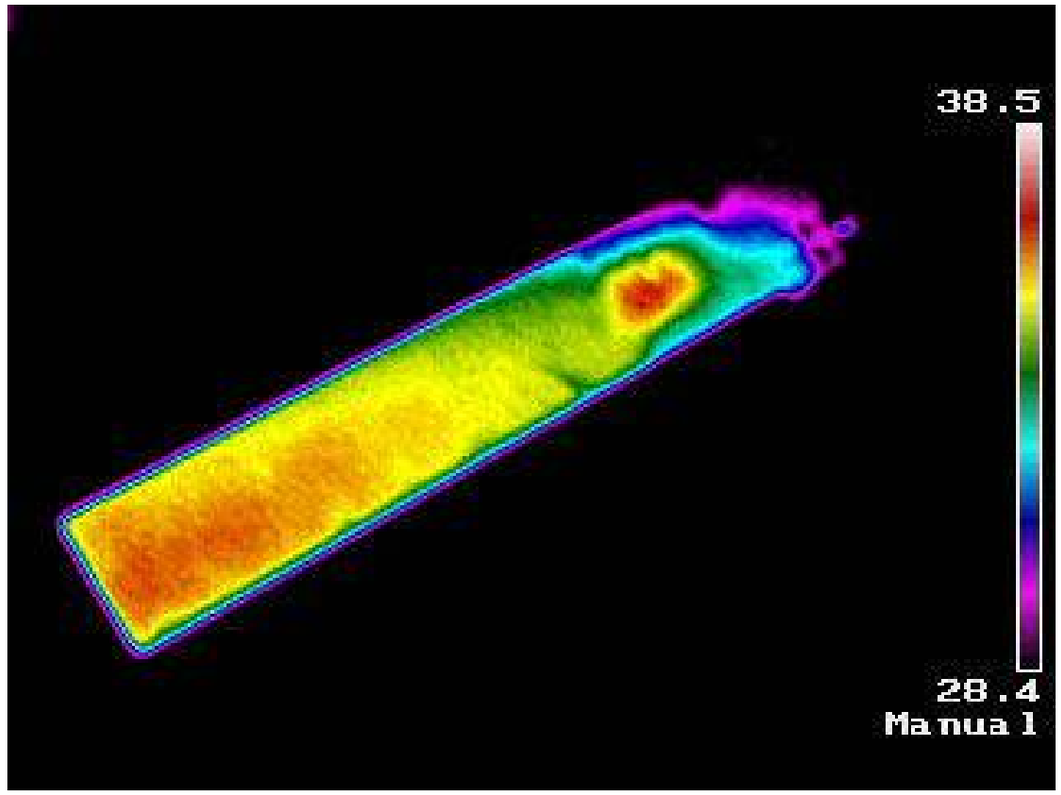




MCC optimization: new channels layout

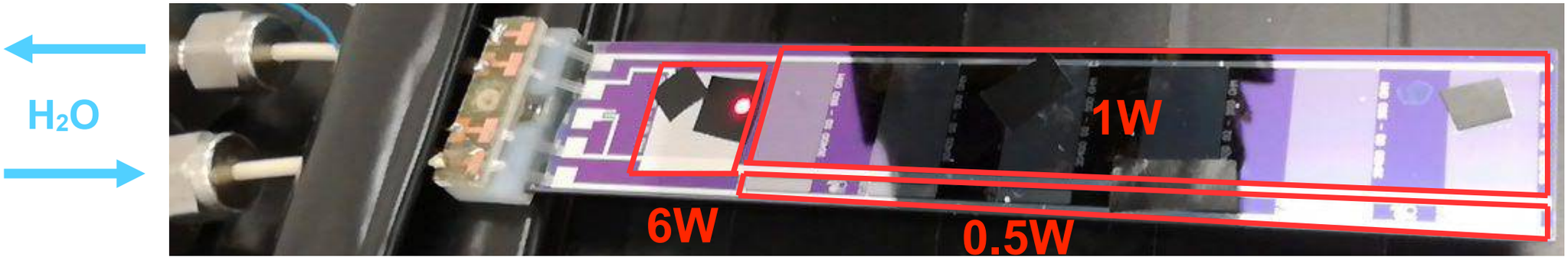


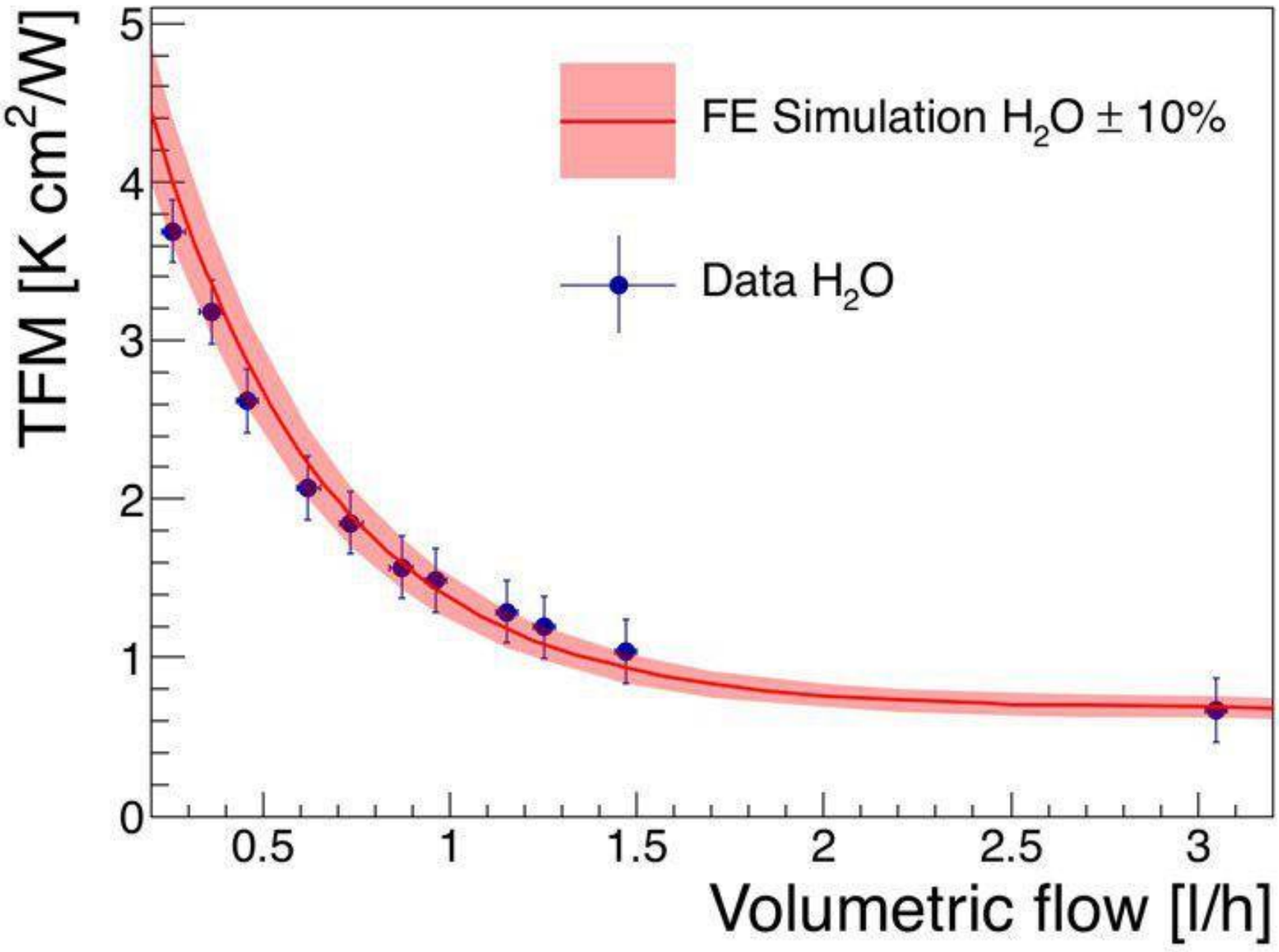




- Inlet in the simulation is the outlet in the test
- Thermal camera inside black box
- Simulation ΔT=10,5K and test ΔT=10,1K

MCC optimization: new channels layout





Test accuracy:
- Vol. Flow: +/- 0.04 l/h
- Temperature: +/- 1K
- Power: +/- 1% W

Simulation accuracy:
- No radiation
- Infrarated HTC
- Positioning of the measuring point

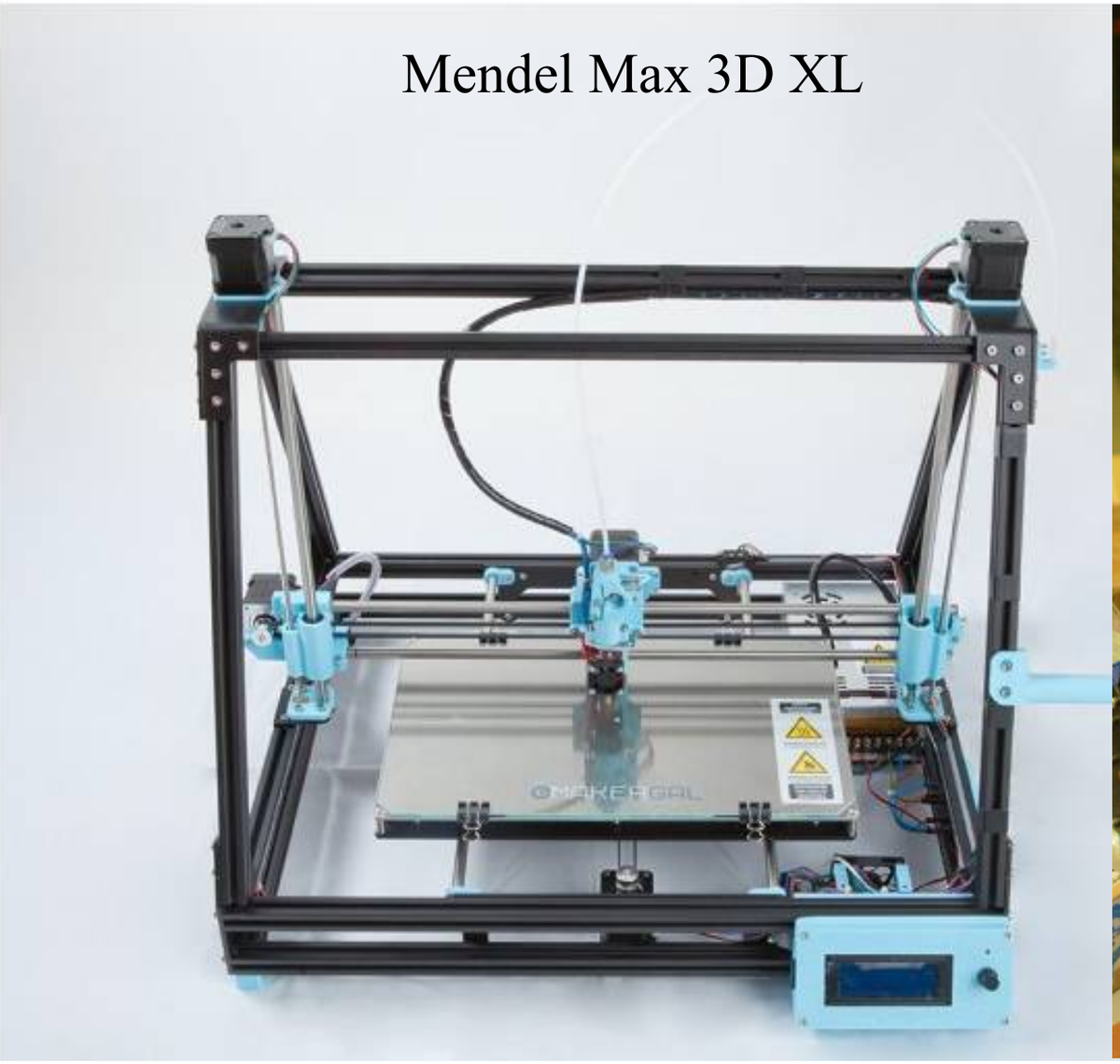
Mcc dummy cooled non-stop for 2 days with no leaks and no clogging

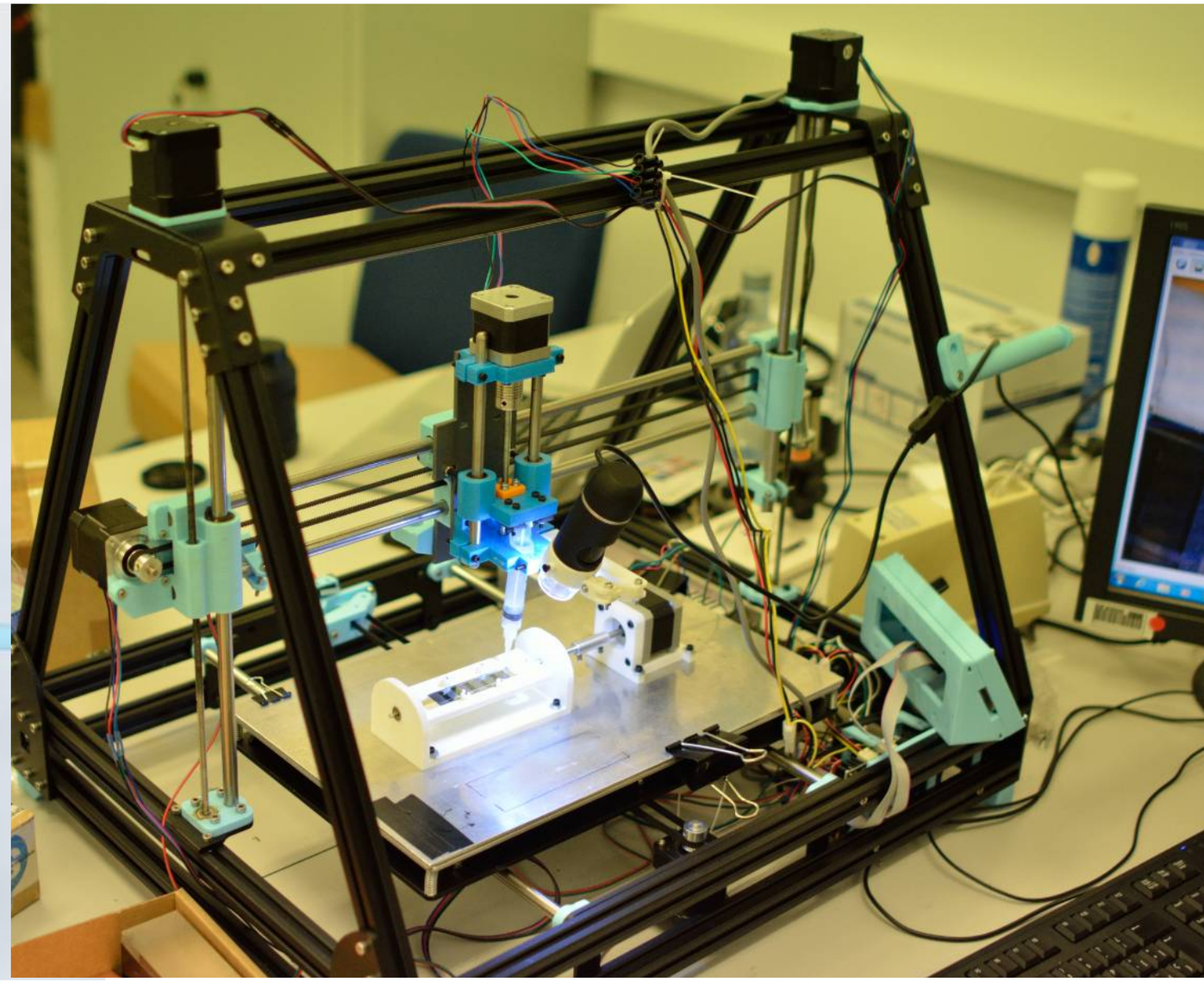
Good agreement with FE simulation within 10% error

In low Vol. Flow, tests are very sensitive to the Vol. Flow error

In high Vol. Flow, test are very sensirive to the Temp. error

MCC optimization: automatization





- Low cost machine
- Open hardware and software
- Needing to adapt tooling for needle and glue syringe