

Status update of MCC connectors



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(1)



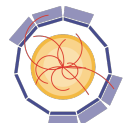
(2)



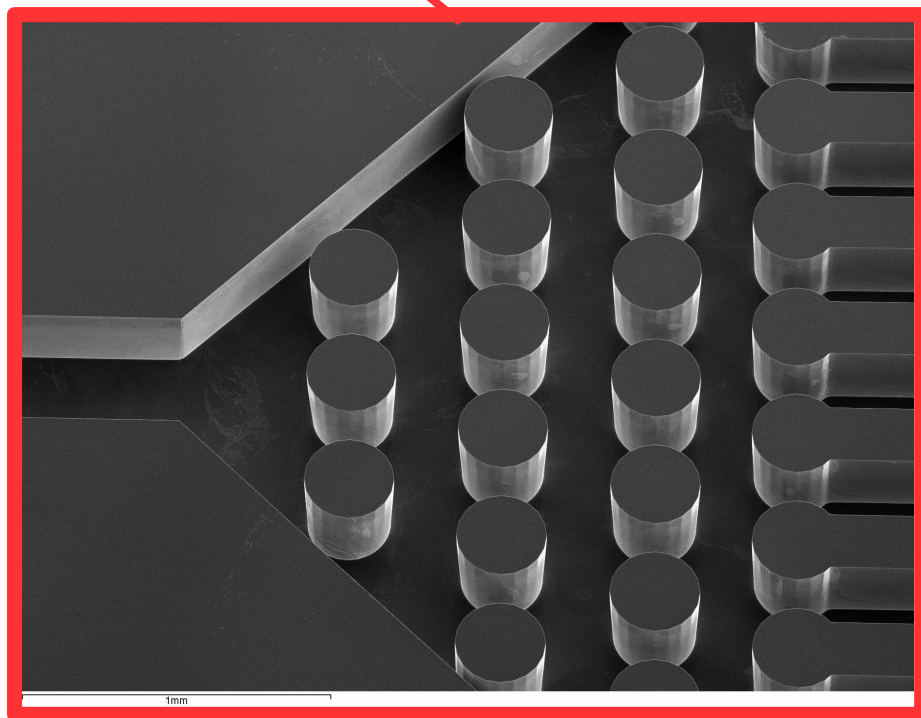
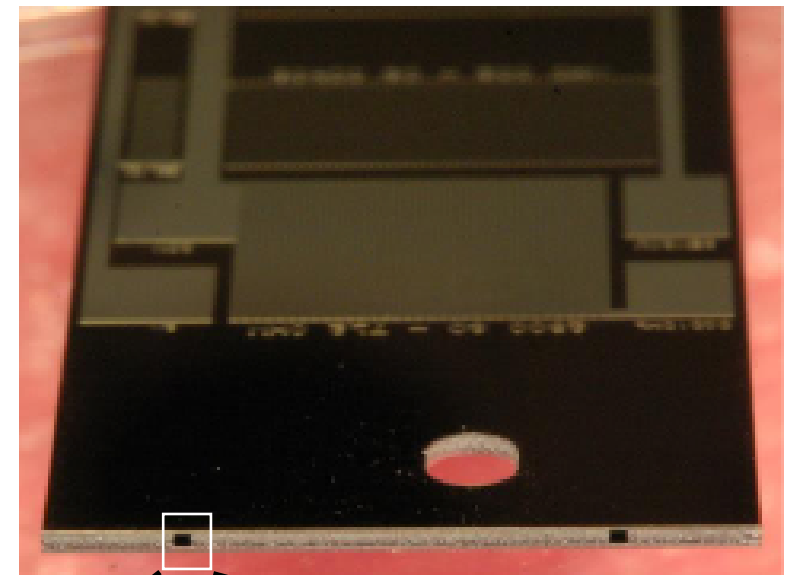
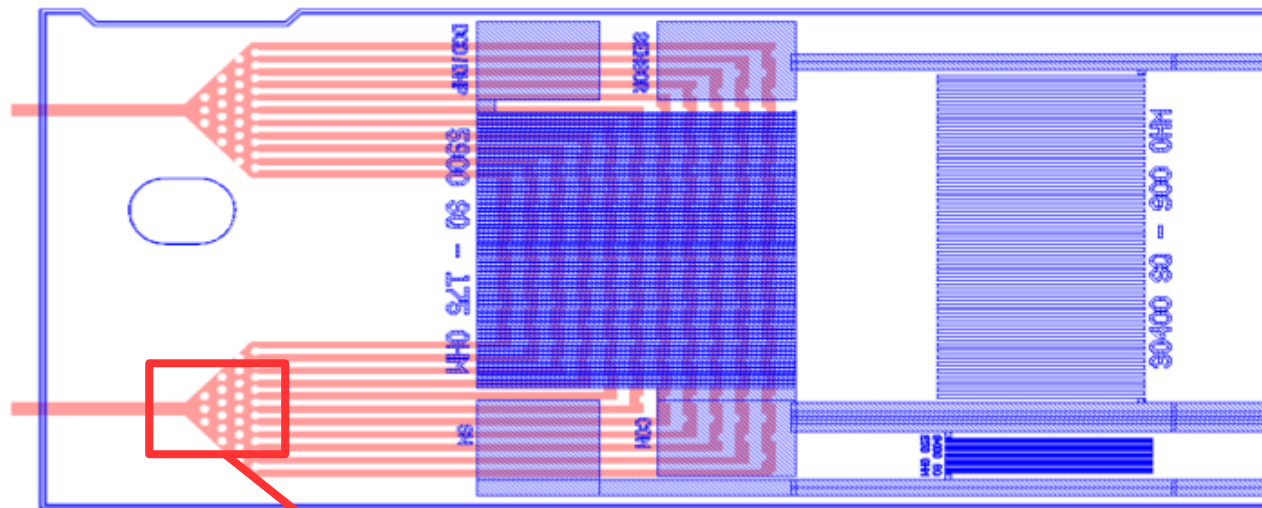
(3)

Outline

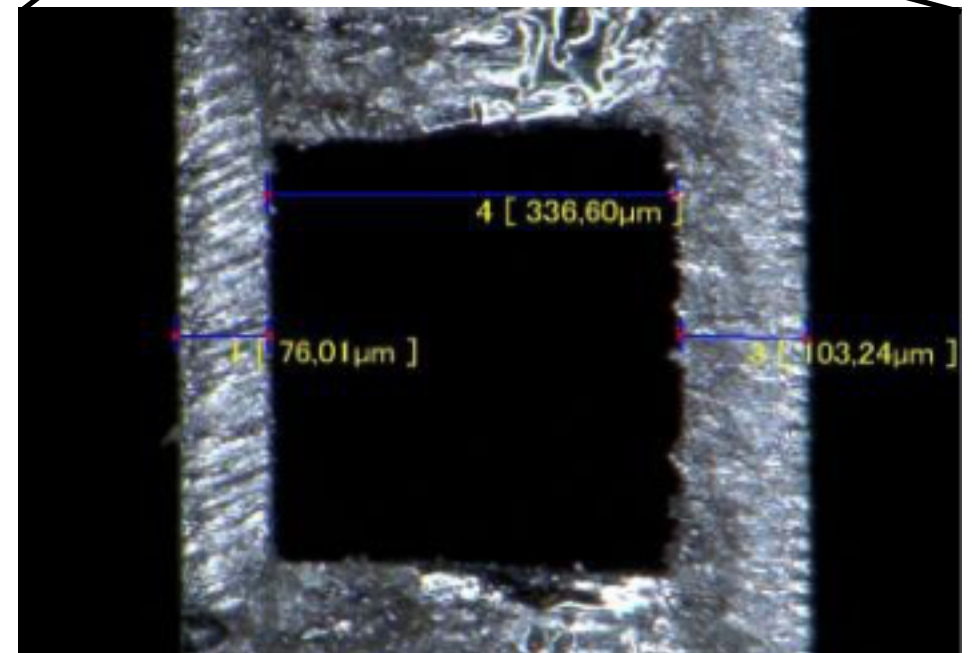
- 1 – Introduction
- 2 – MCC optimization
- 3 – Schedule
- 4 – Summary



Introduction

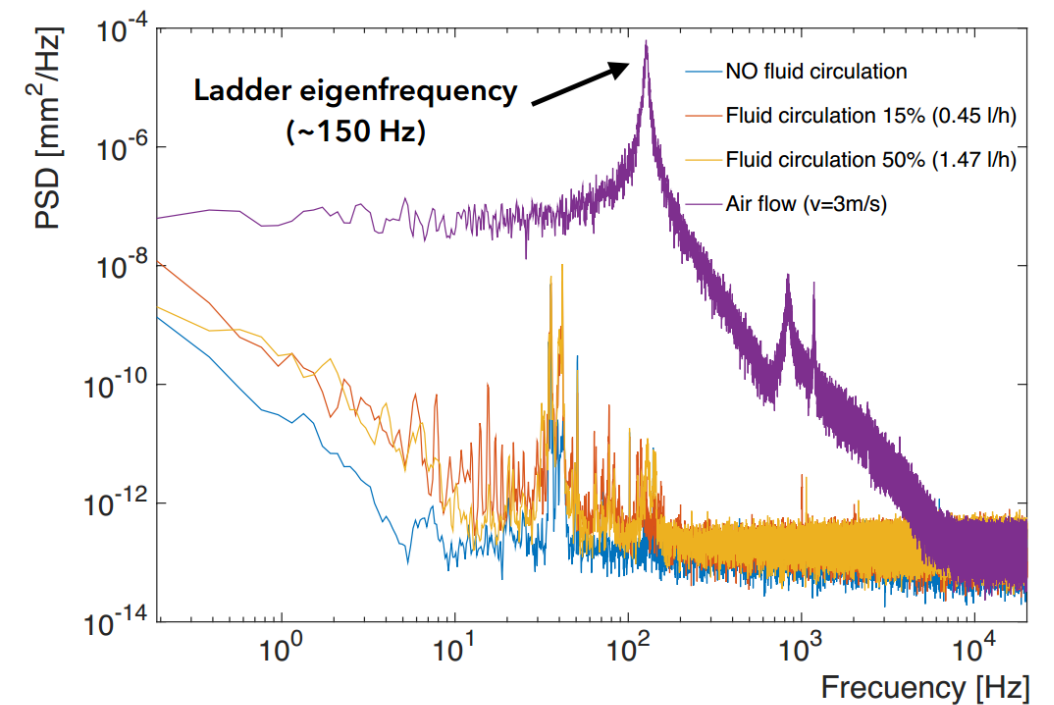
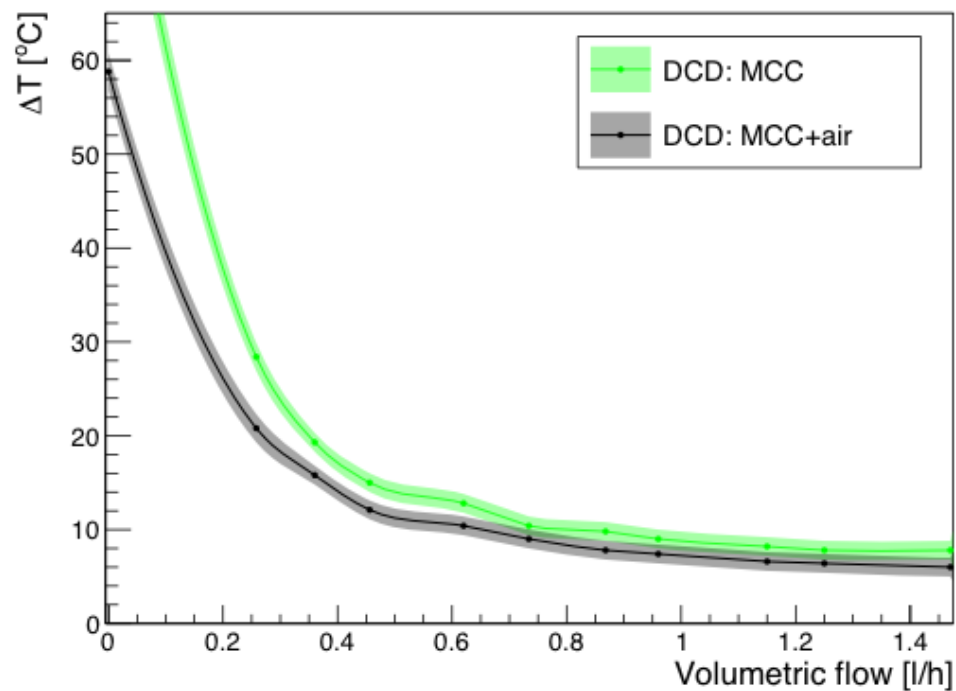
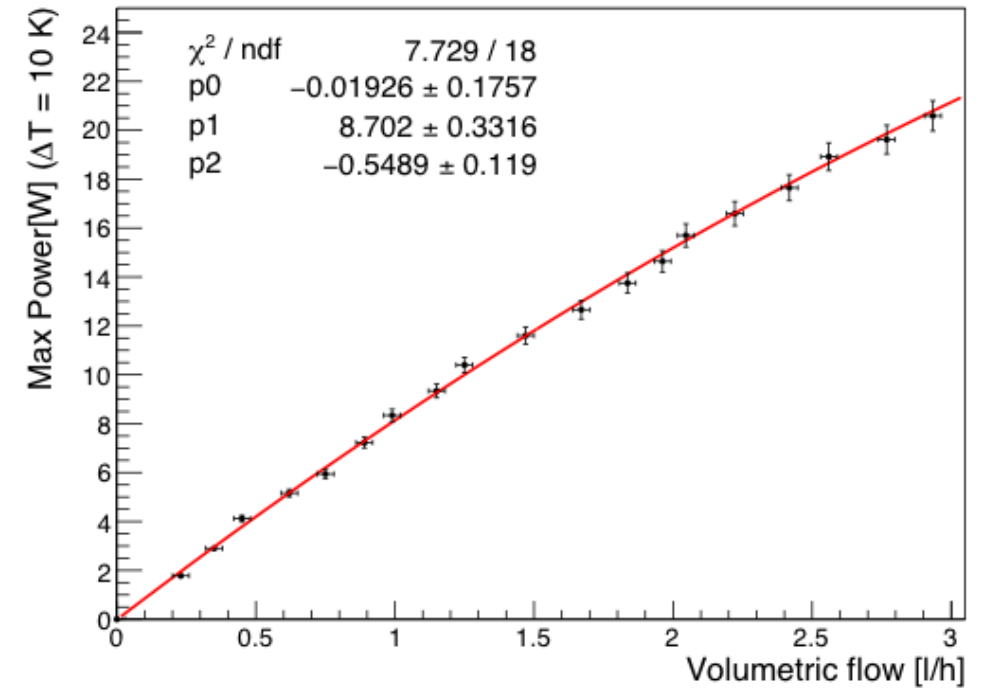
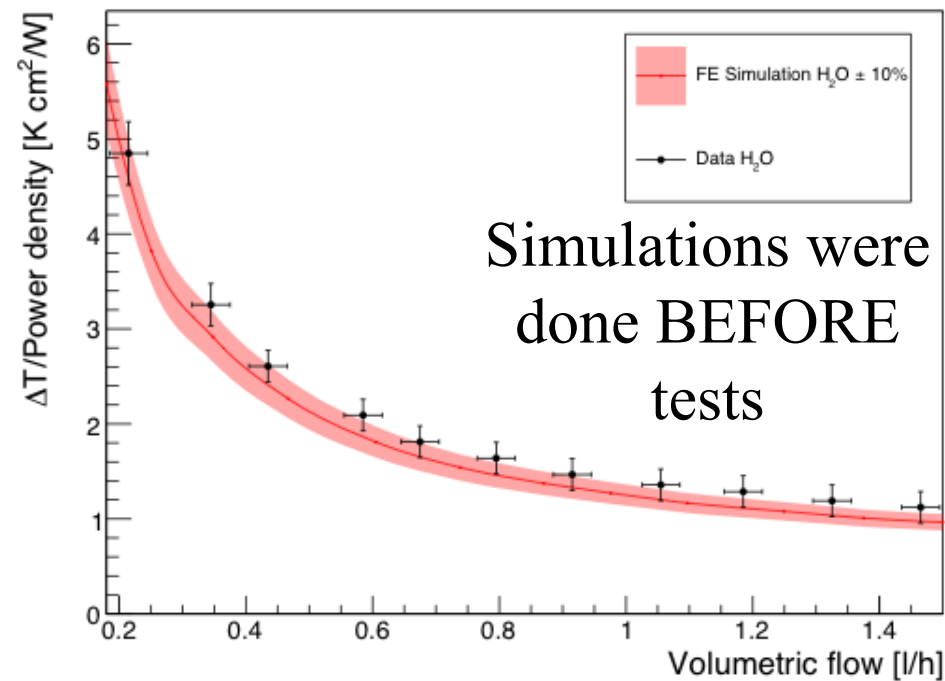


Micro-channel pattern in handle wafer

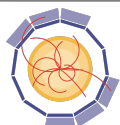


Inlet and outlet: $\sim 380 \times 340 \mu\text{m}$

Introduction

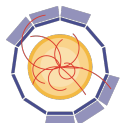


- More information is available in: <https://arxiv.org/pdf/1604.08776v2.pdf>

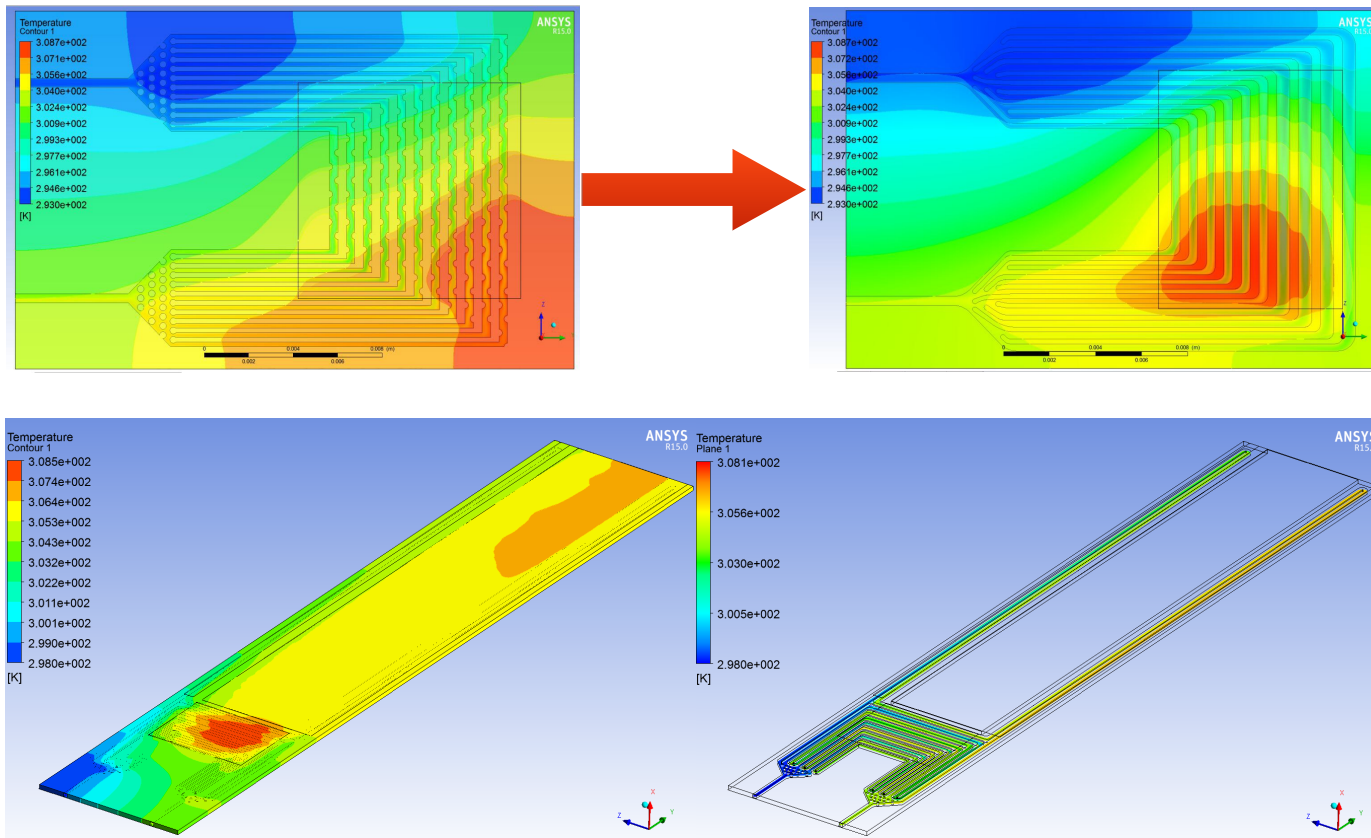


MCC optimization

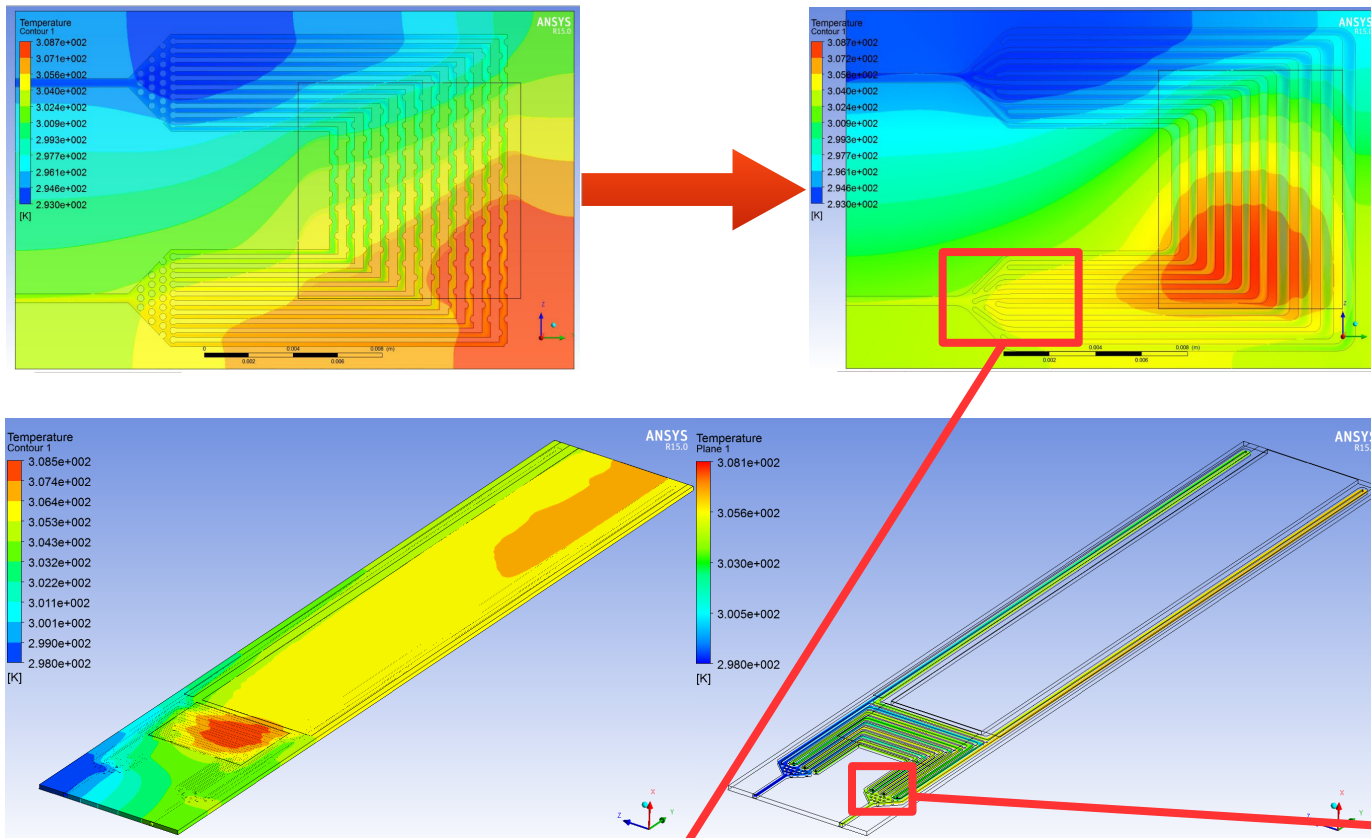
- Improvements:
 - Microchannels new layout
 - Reduction of material budget in connectors
 - Performance connectors material
 - Automatization and repeatability of gluing process
 - Mechanical performance comparison between single and double ladder



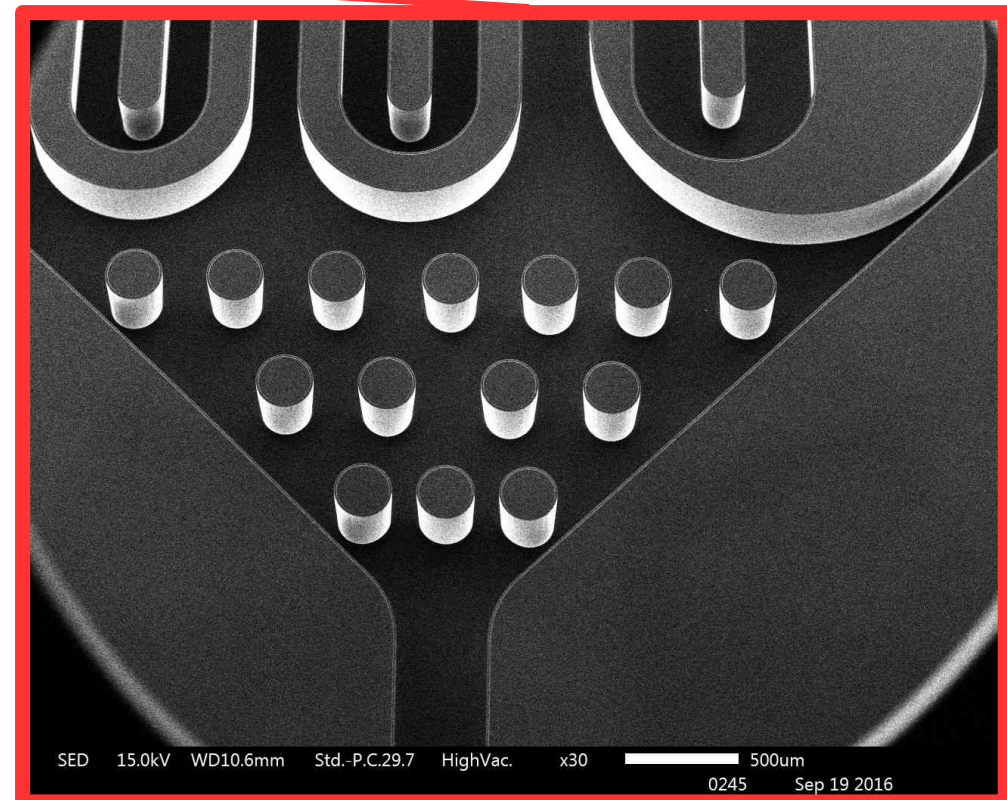
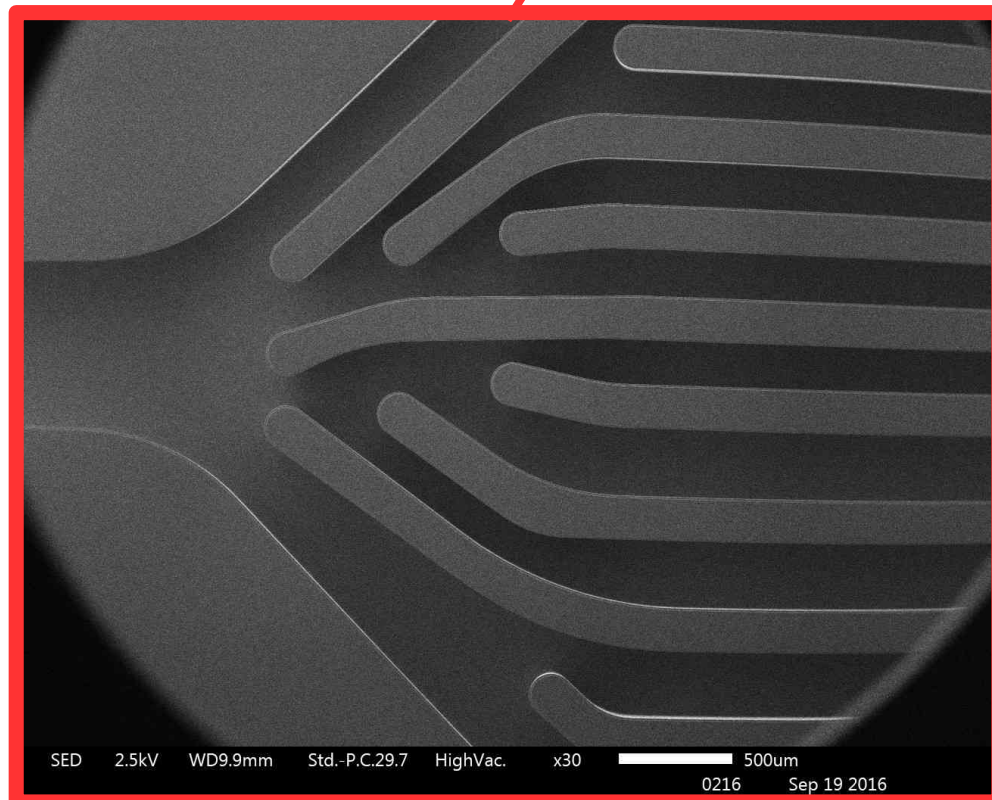
MCC optimization: layout



MCC optimization: layout

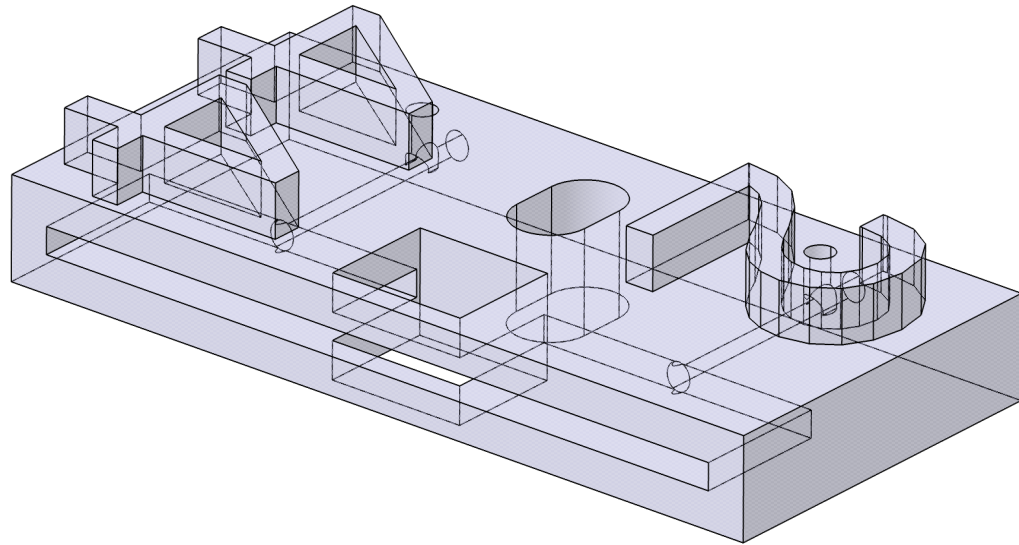


- New mcc layout have been manufactured:
- Optimized layout for mcc: simulations predict better performance
 - Mcc along all the heat sources
 - Same lab. experiments are expected



MCC optimization: connector

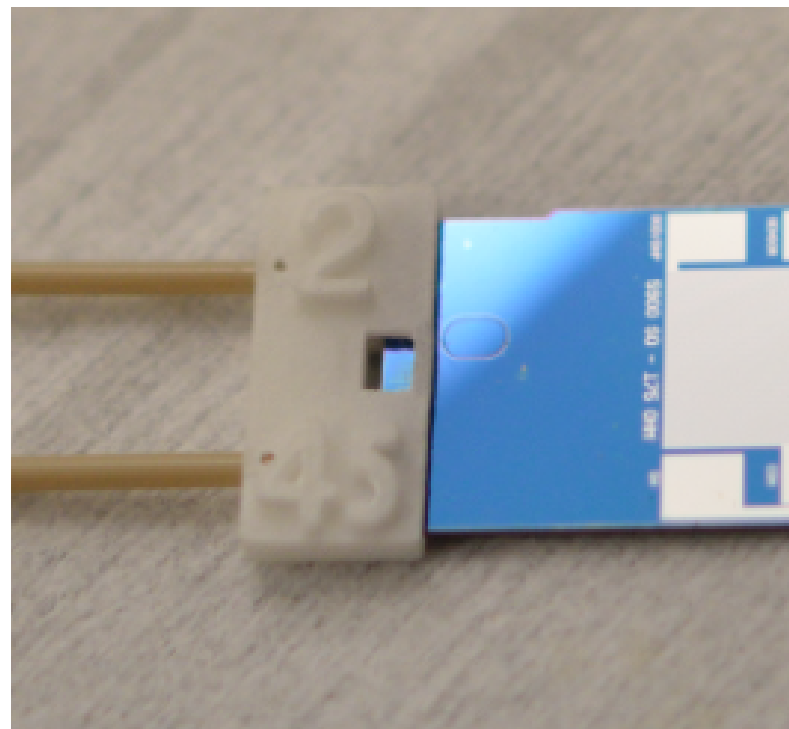
Design



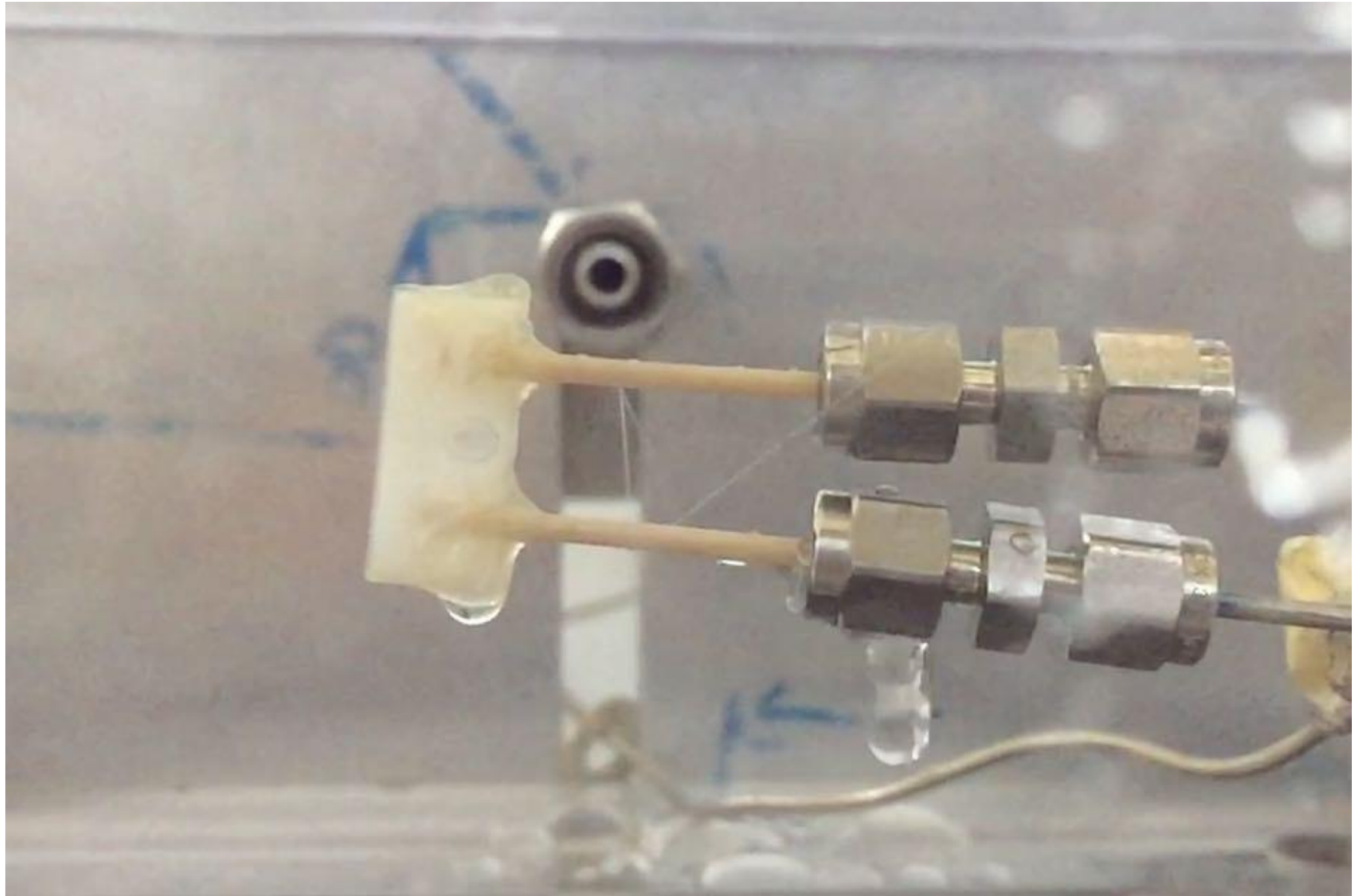
3D-Printing

$X/X_0=0,05\%$

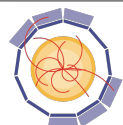
Gluing



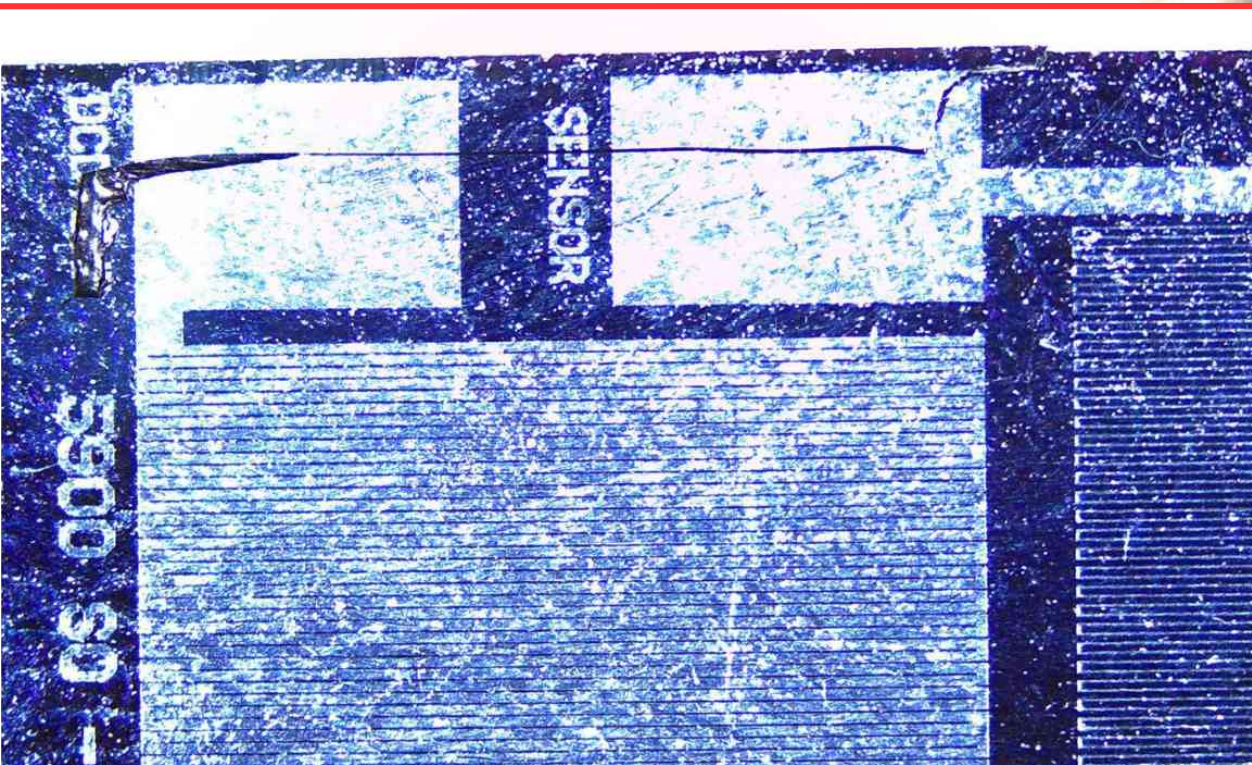
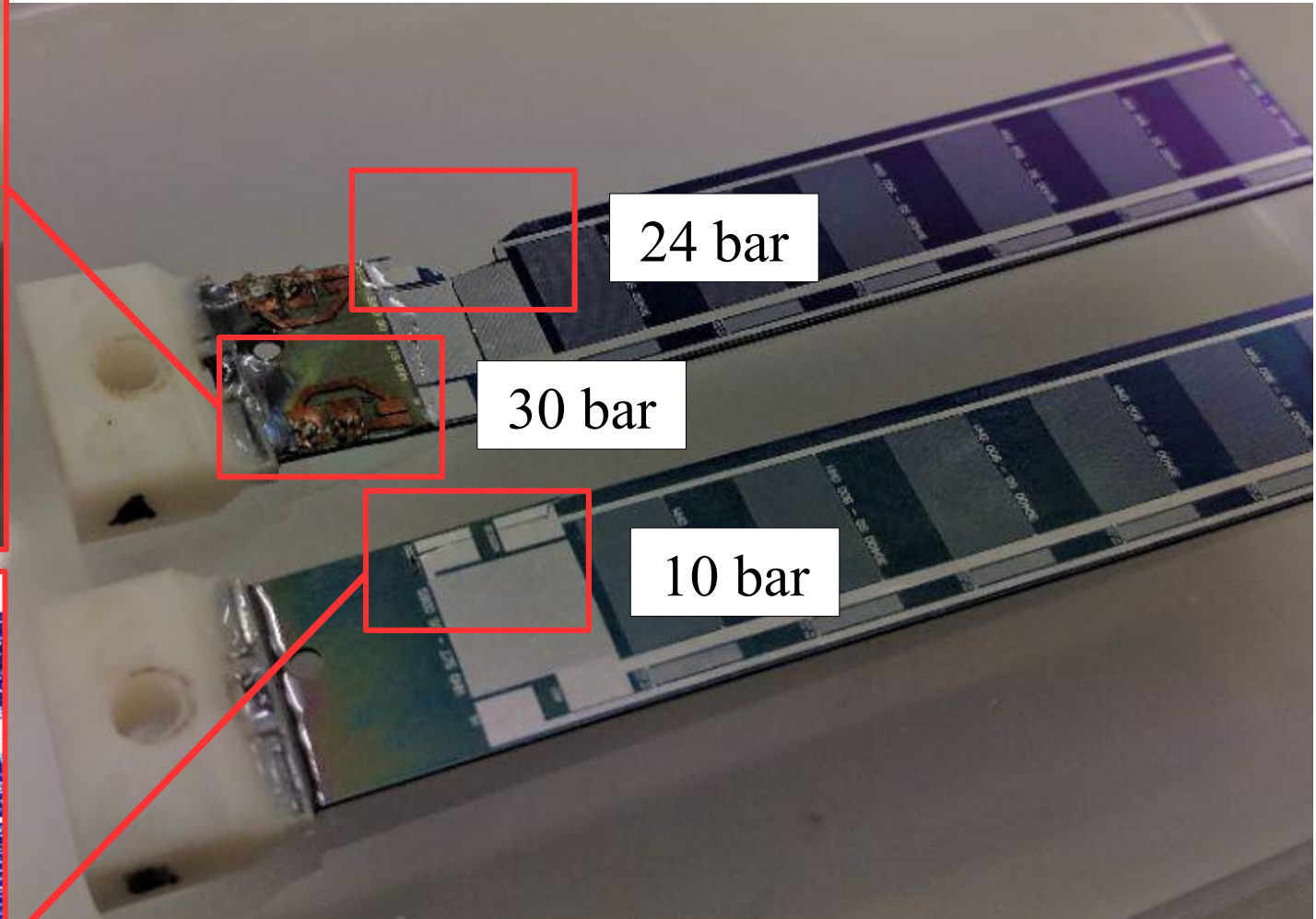
MCC optimization: pressure test



50 bar achieved



MCC optimization: pressure test



MCC optimization: tensile strenght



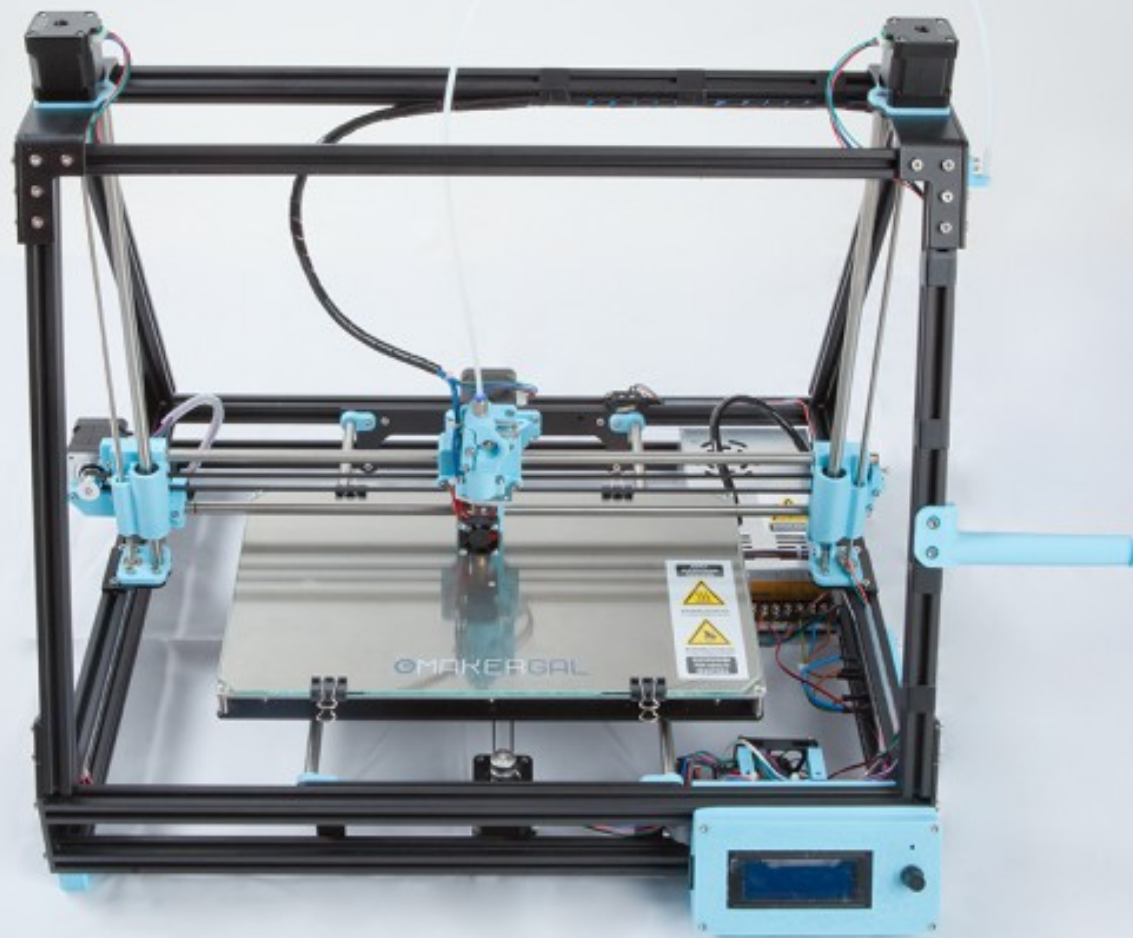
Different radiations levels

Two type of radiation:

- Neutrons
- X-Rays

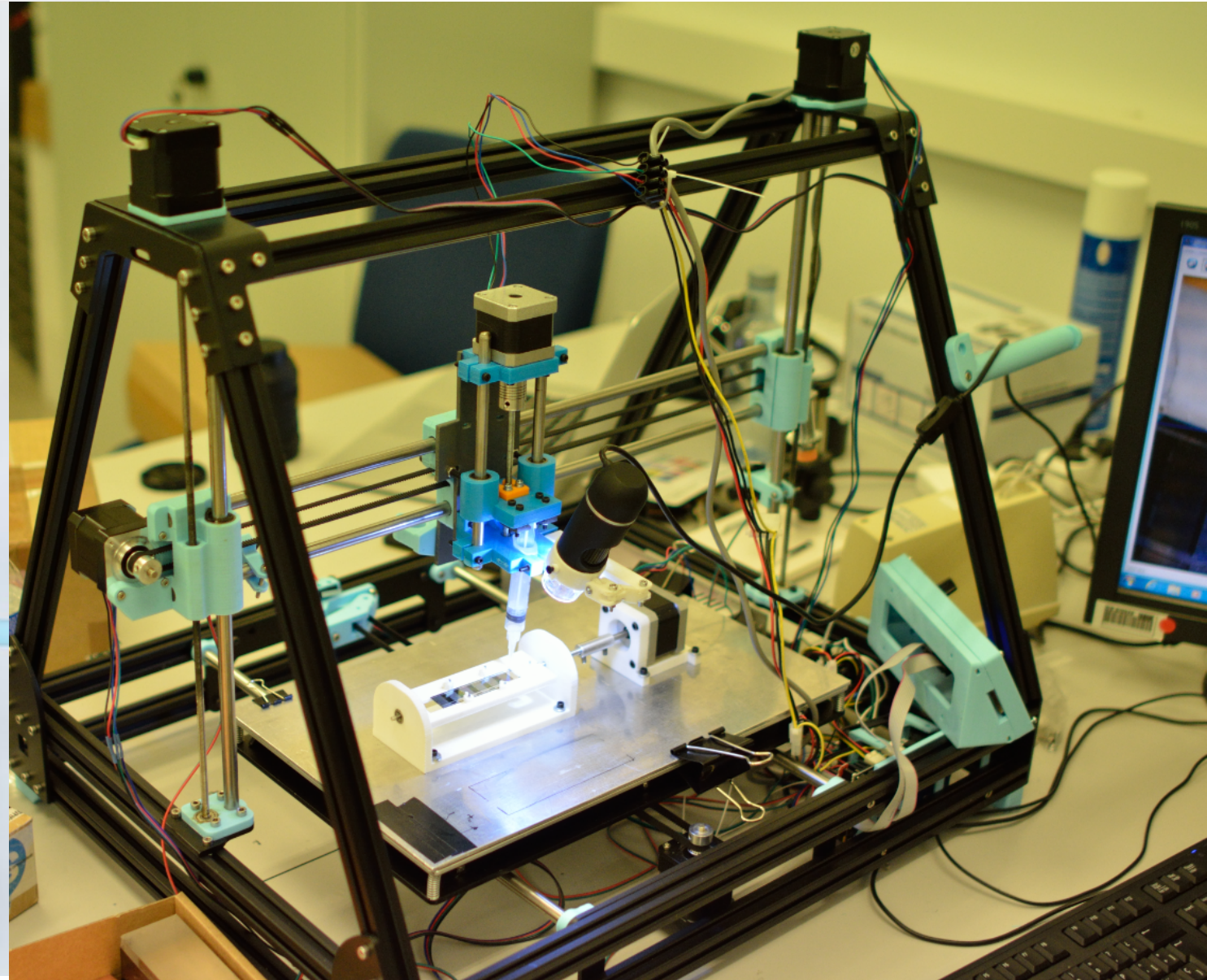
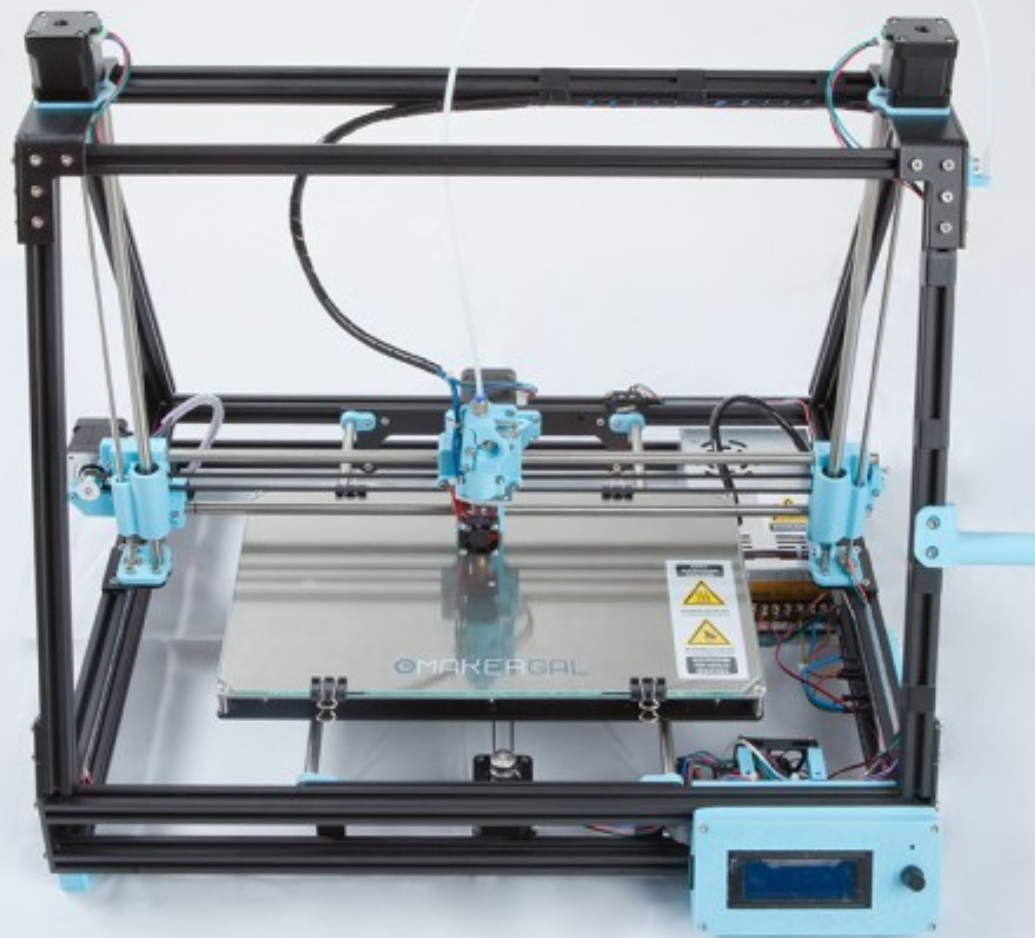
MCC optimization: gluing repeatability

Mendel Max 3D XL

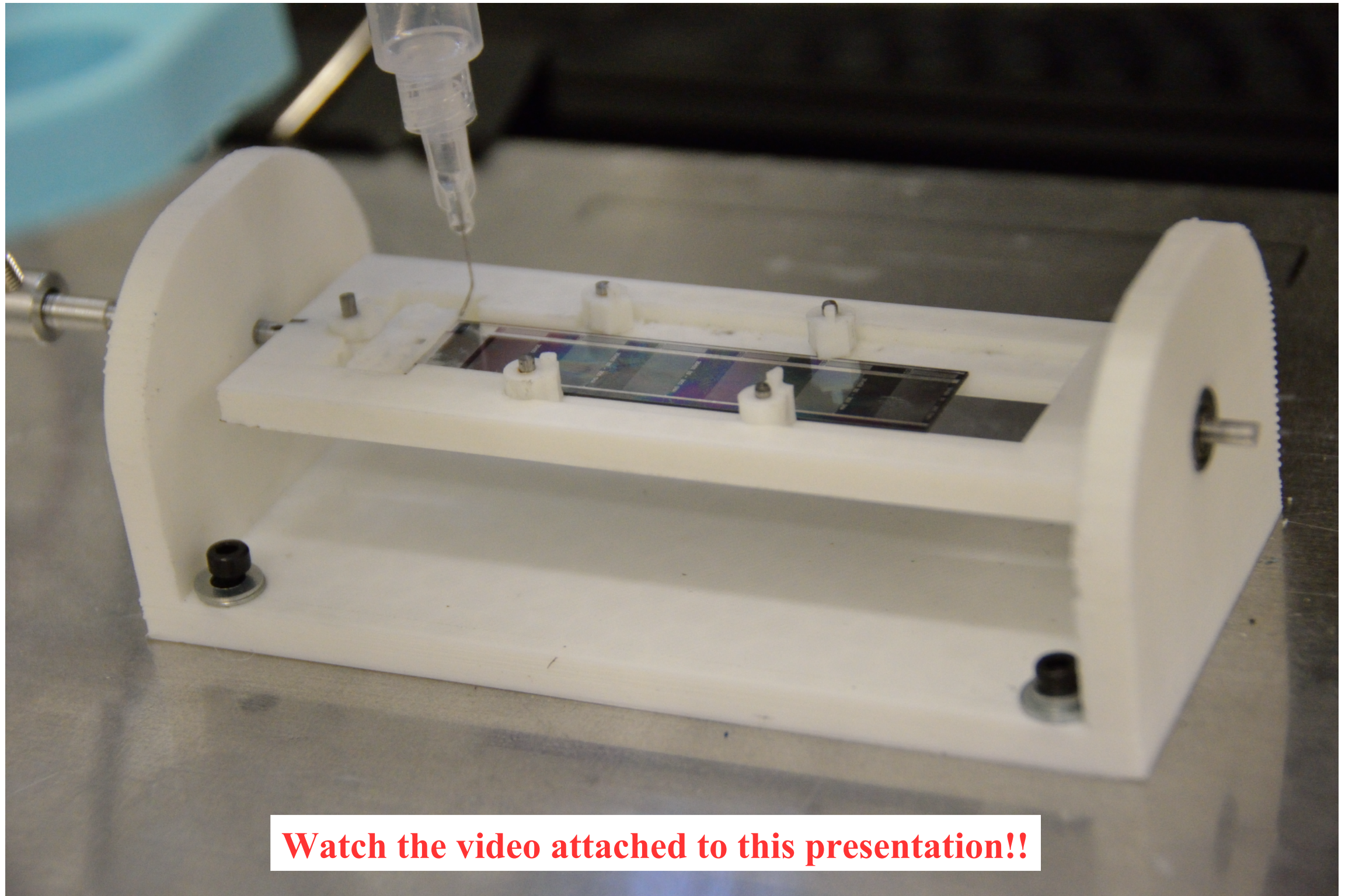


MCC optimization: gluing repeatability

Mendel Max 3D XL



MCC optimization: gluing repeatability



MCC optimization: gluing repeatability

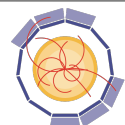
1

2

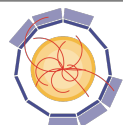
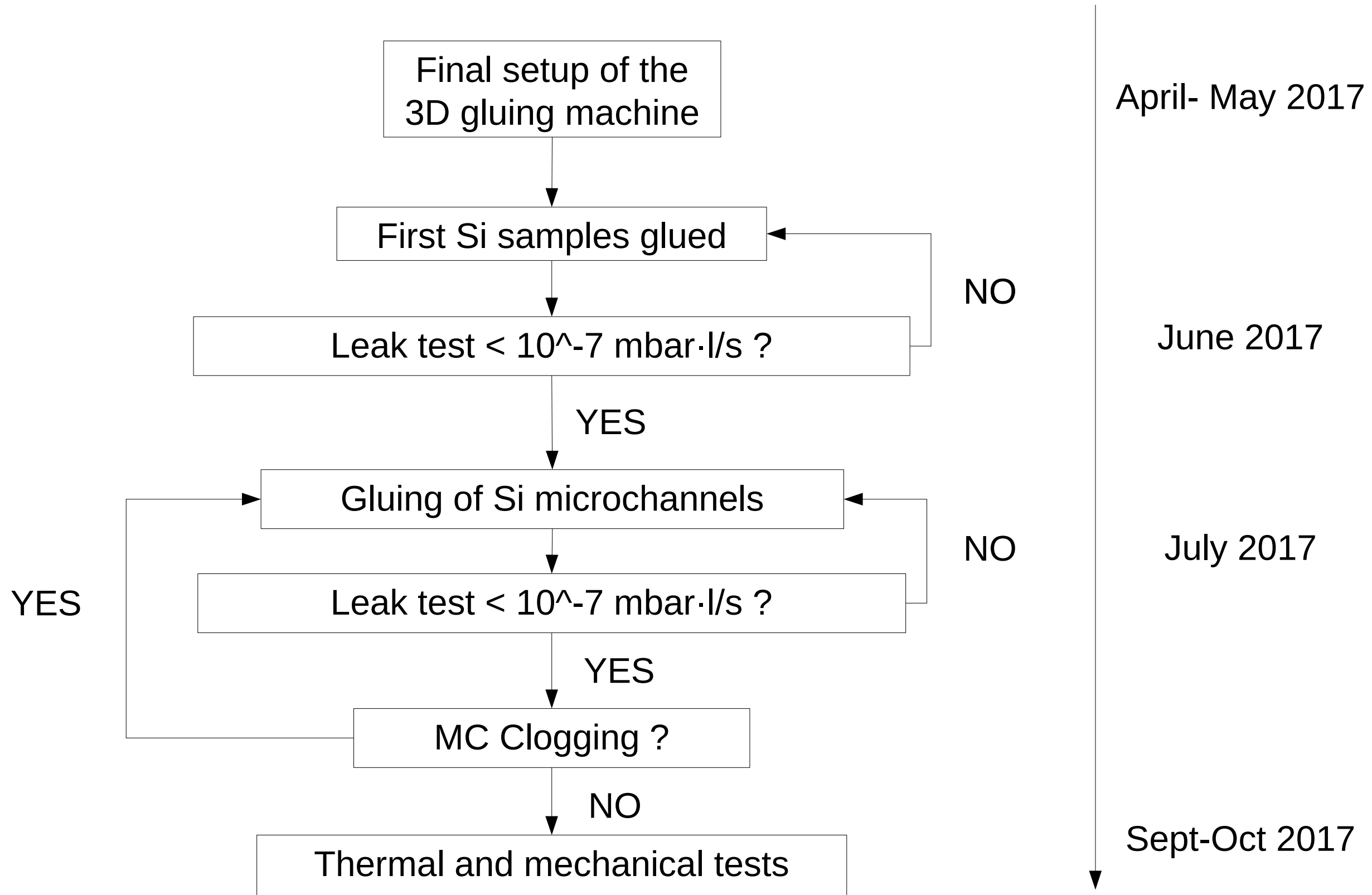
Watch the video attached to this presentation!!

3

4

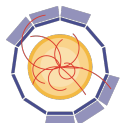


Schedule

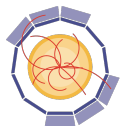


Summary

- Microchannels new layout designed and manufactured
- Gluing repeatability system is on its final testing stage
- Optimization (material budget) and validation (pressure, radiation hardness) of 3D printed connector almost done: machined connectors prototypes are ongoing
- New mcc layout will be tested very soon
- It is possible to reduce more the material budget achieving better mechanical performance

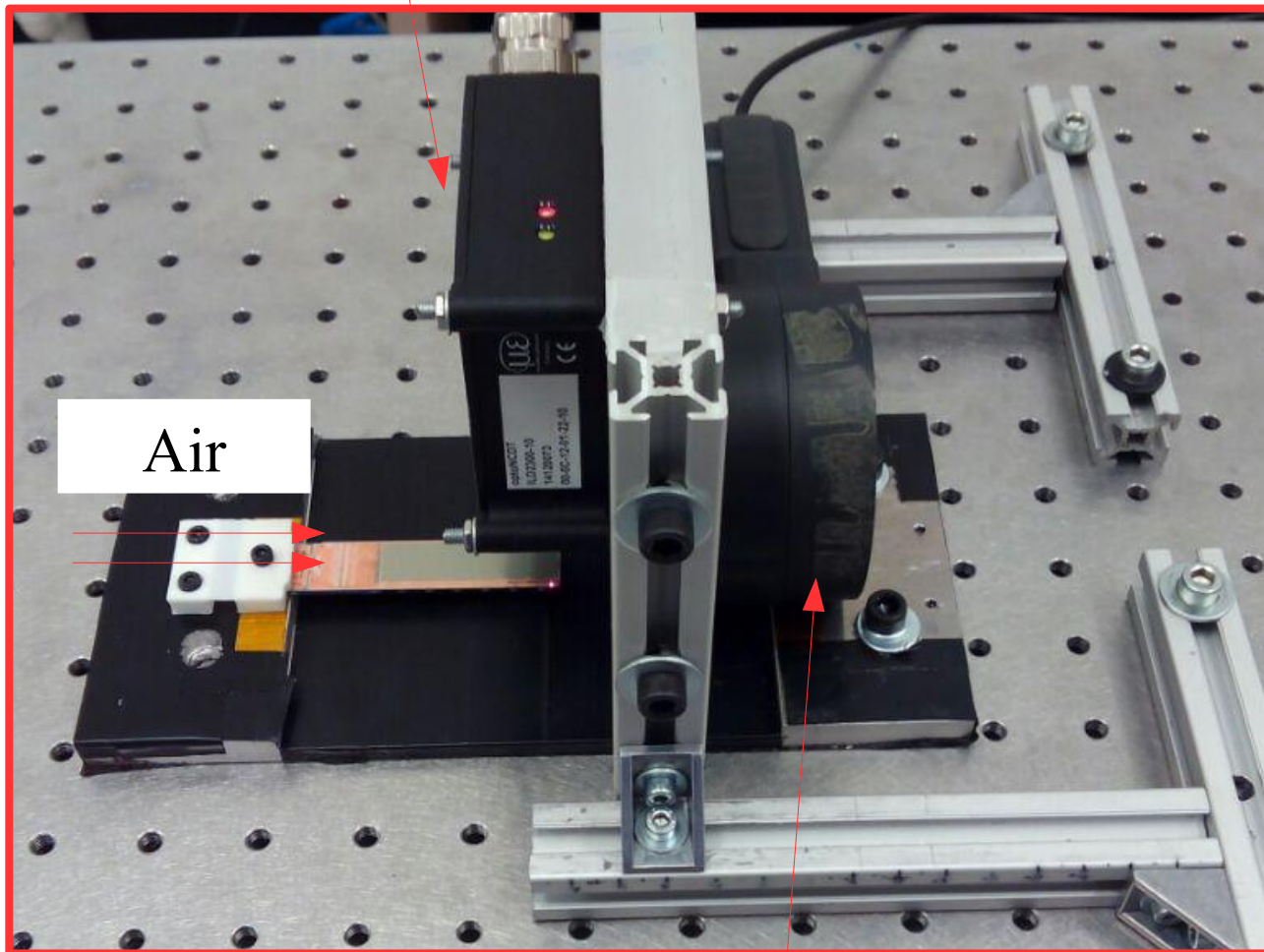


Back up

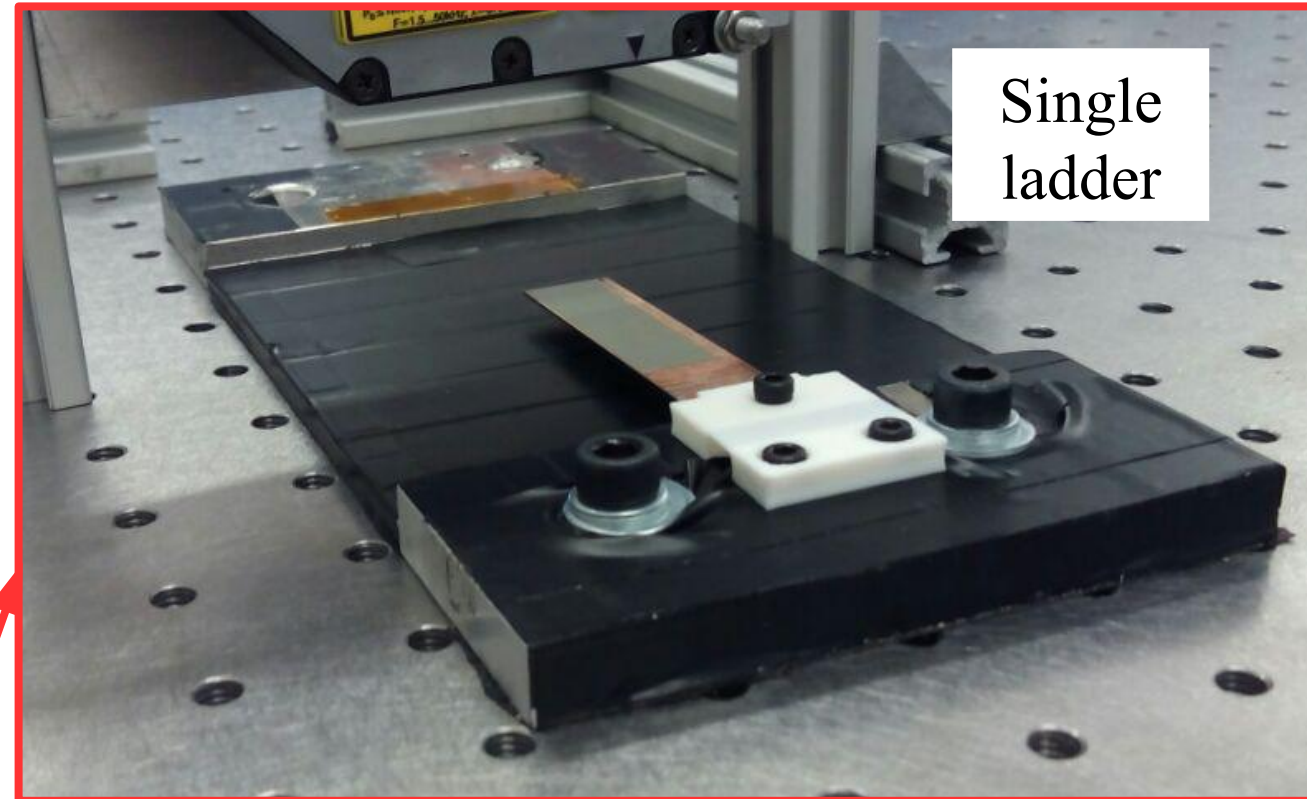


Microchannel cooling

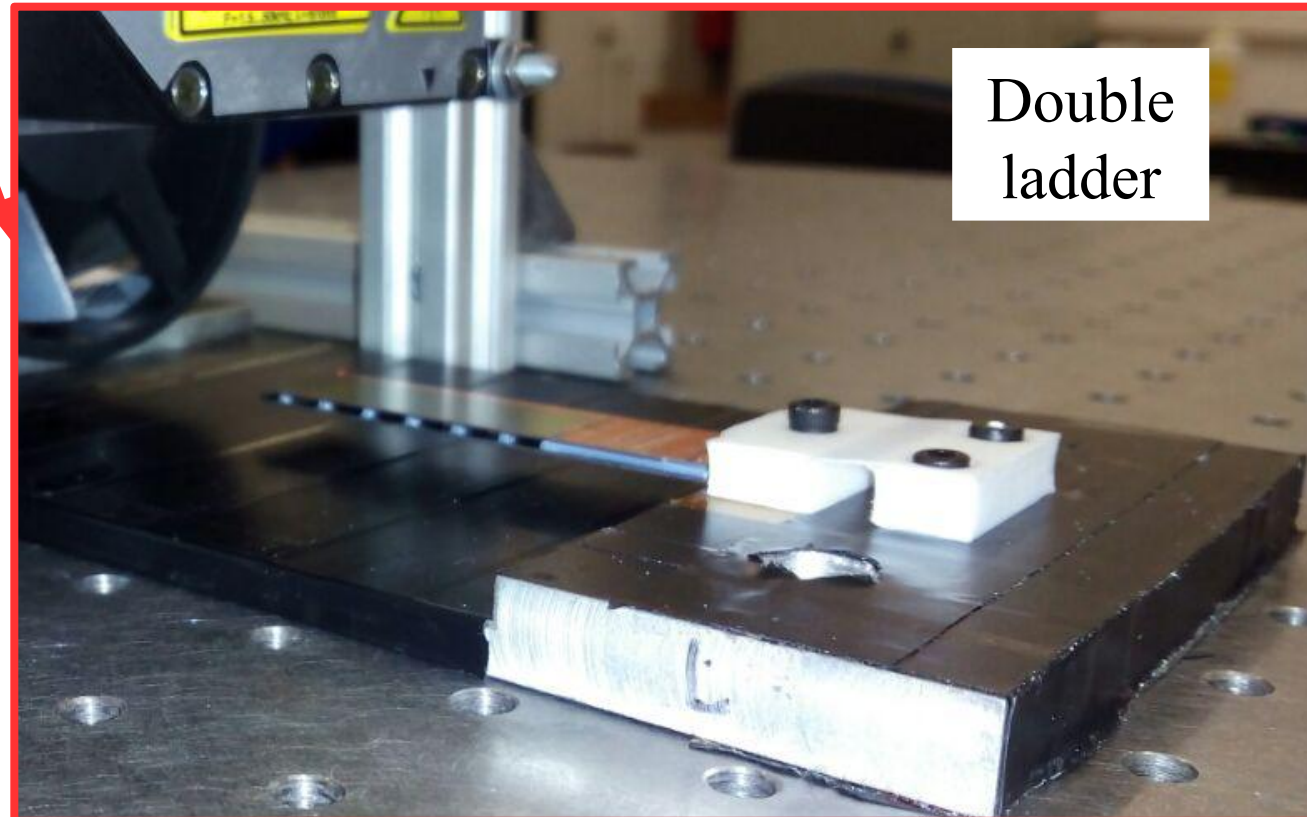
Laser displacement sensor



Anemometer

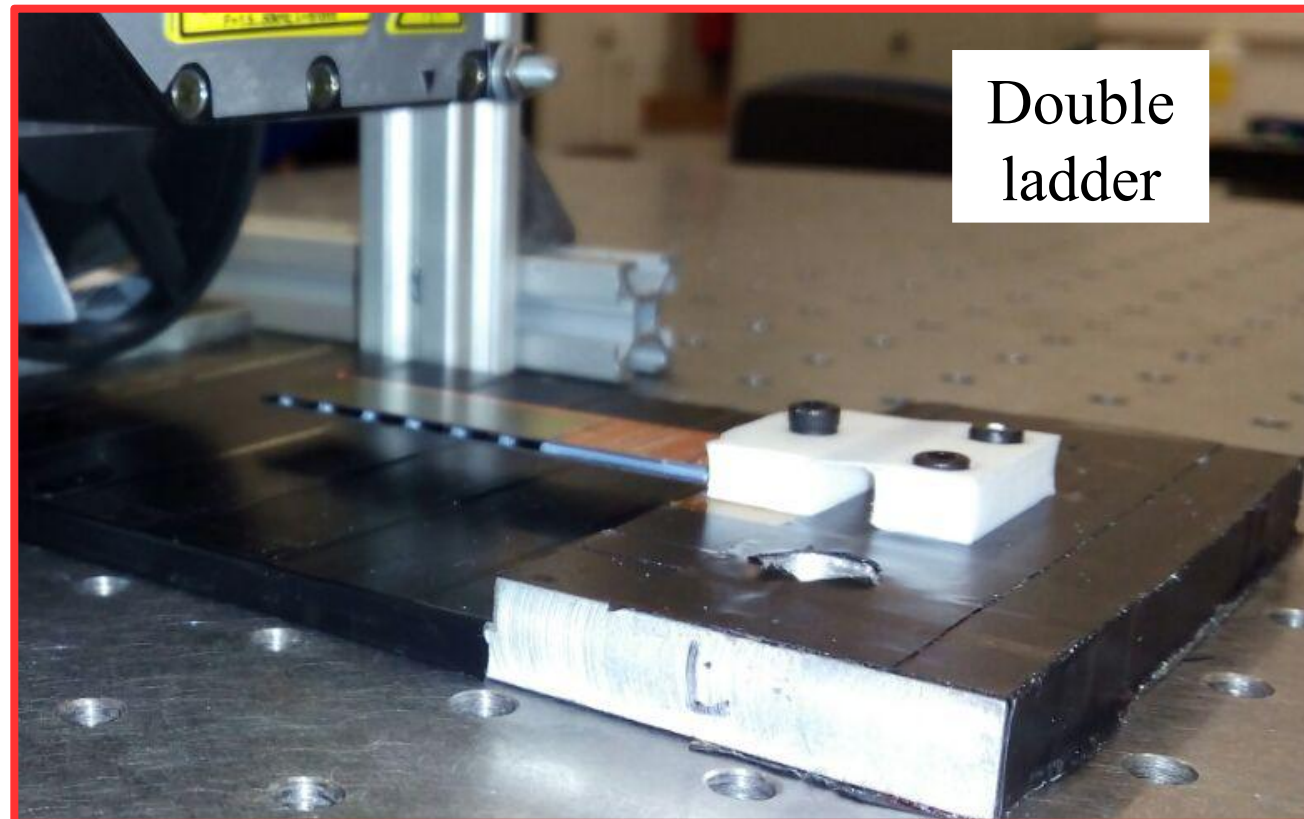
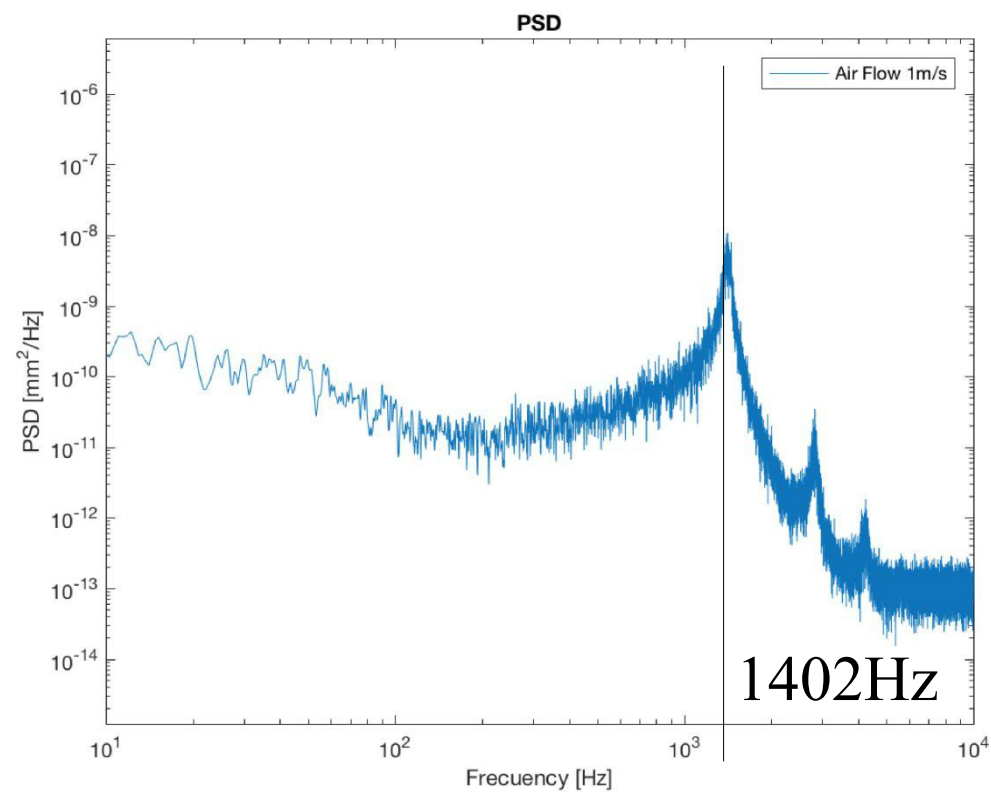
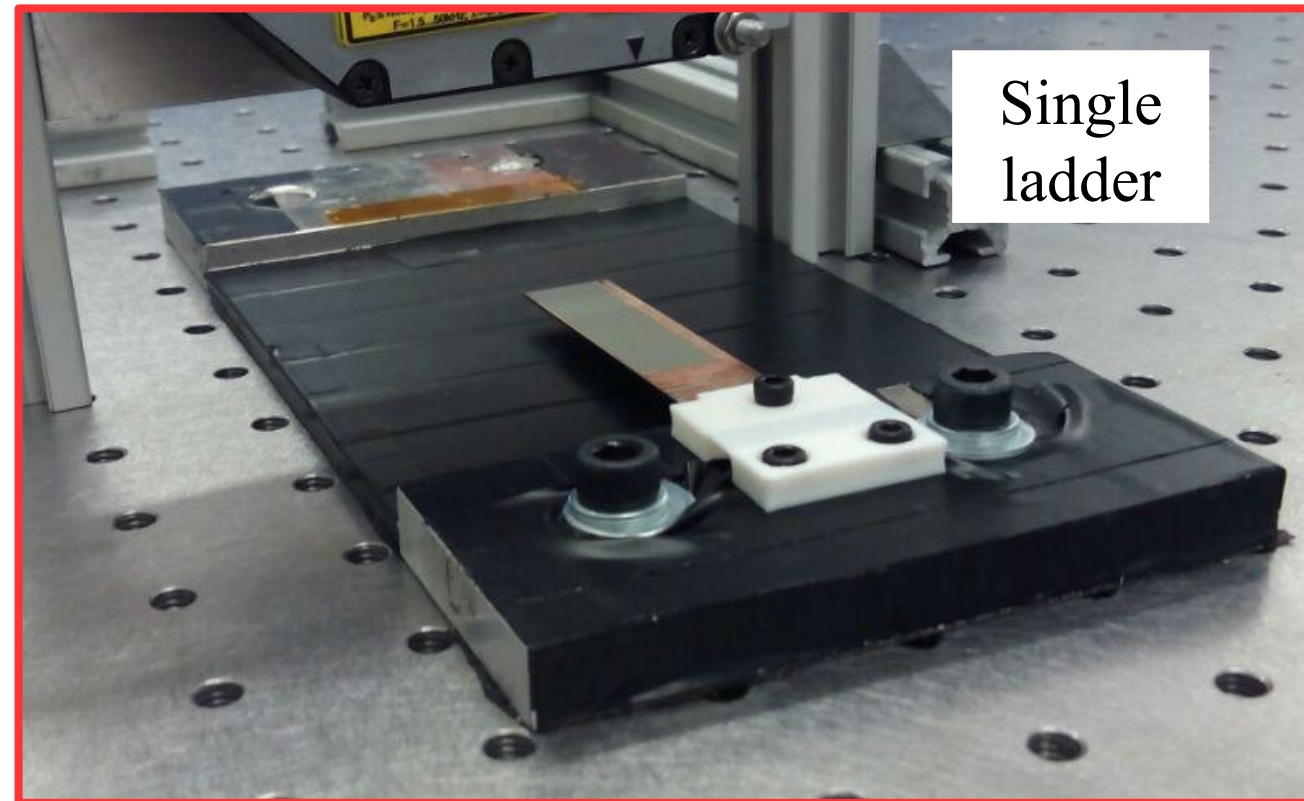
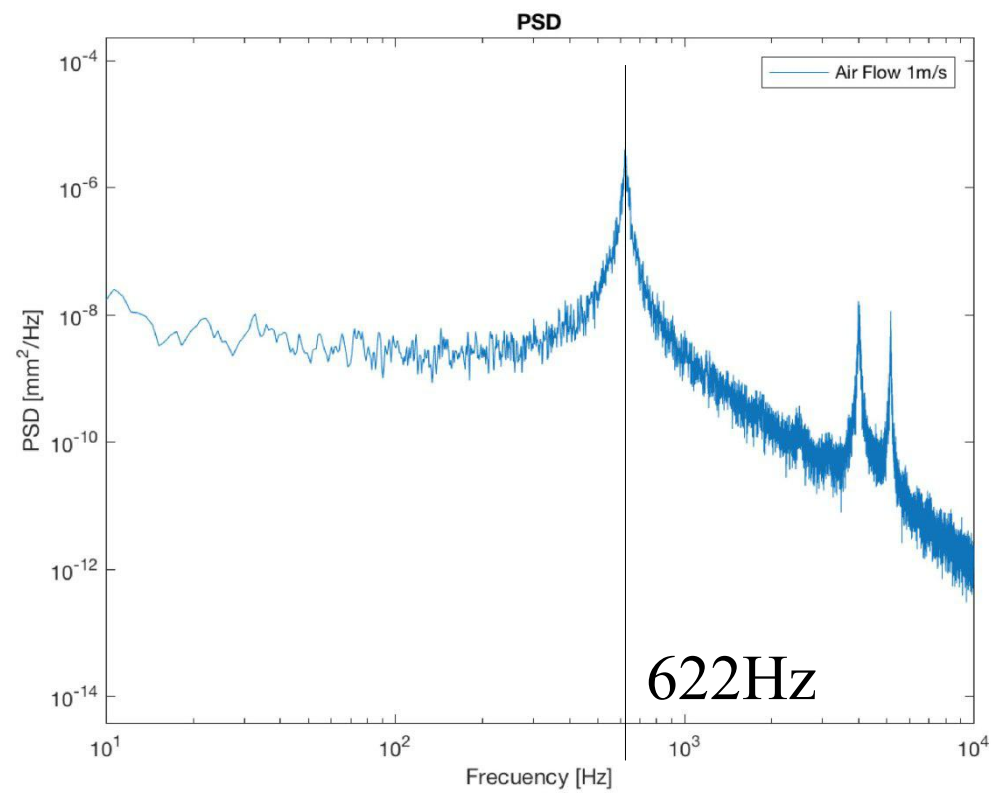


Single ladder

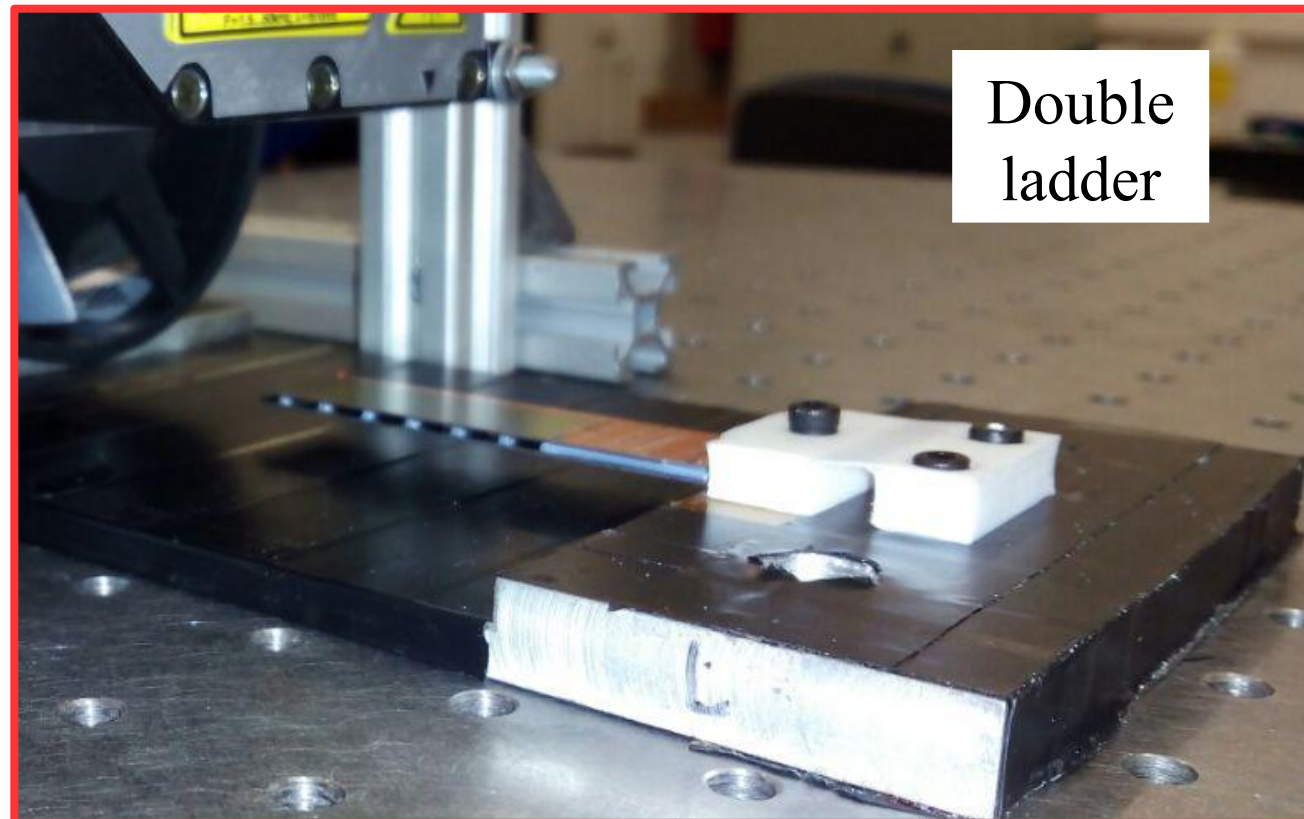
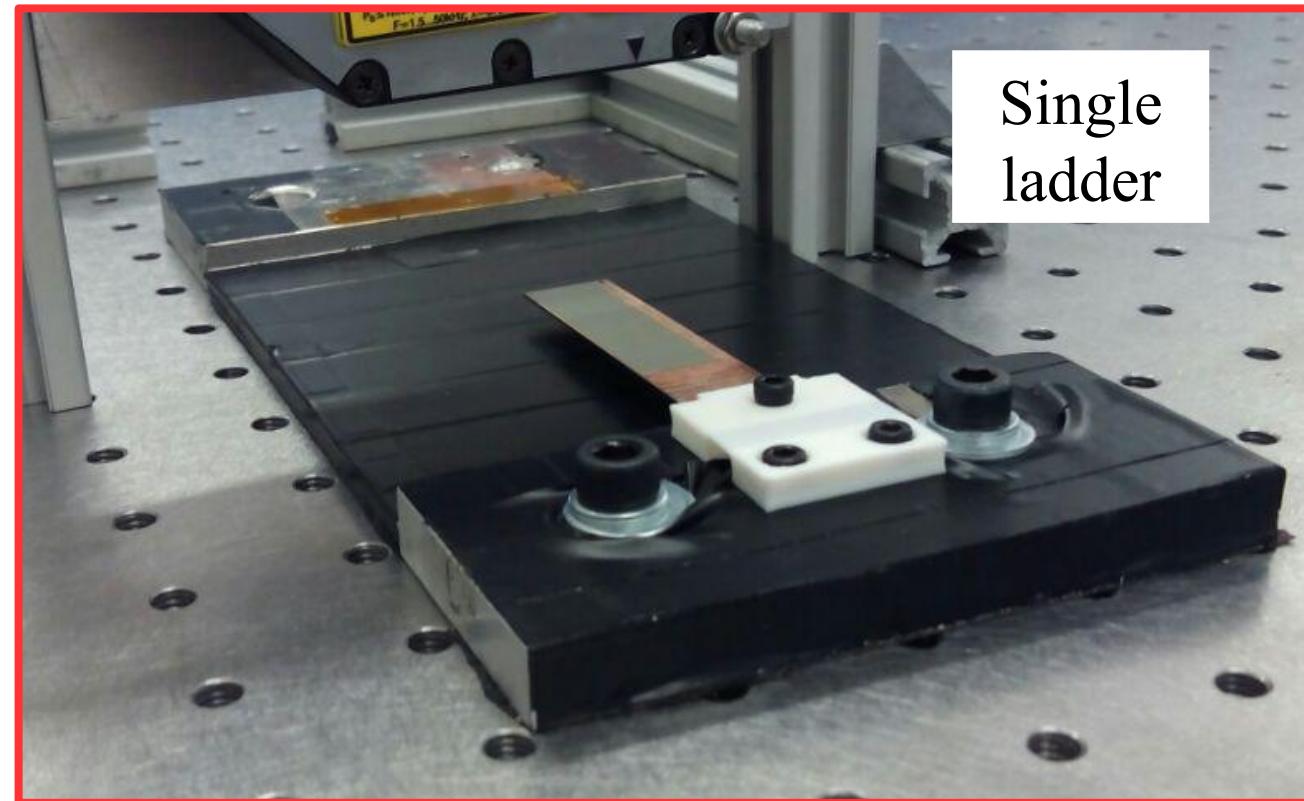
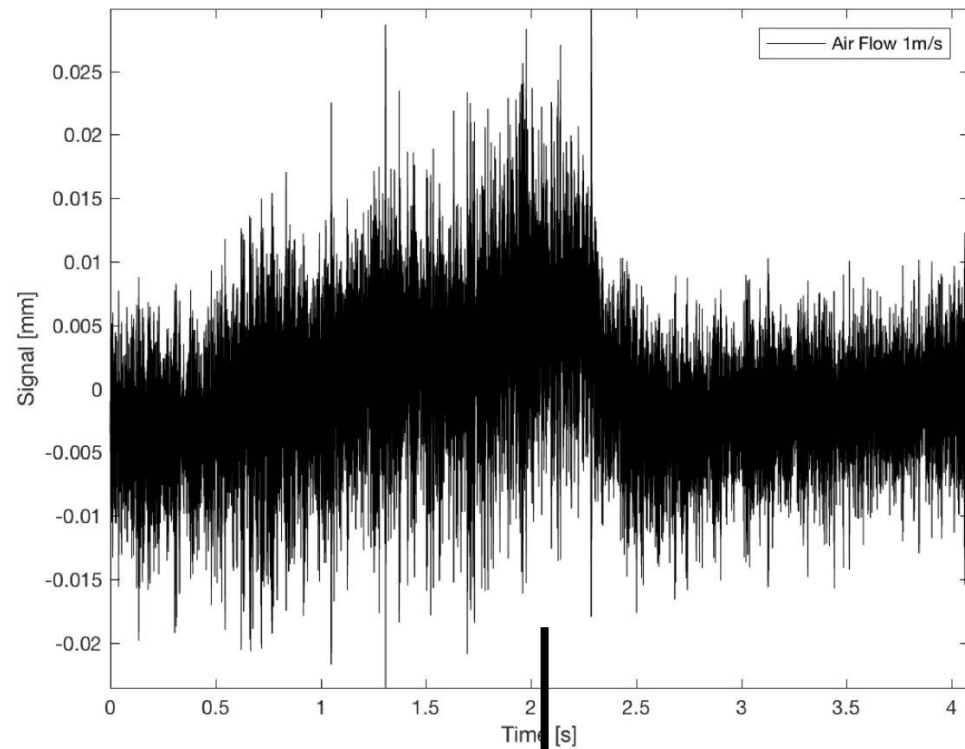


Double ladder

Microchannel cooling

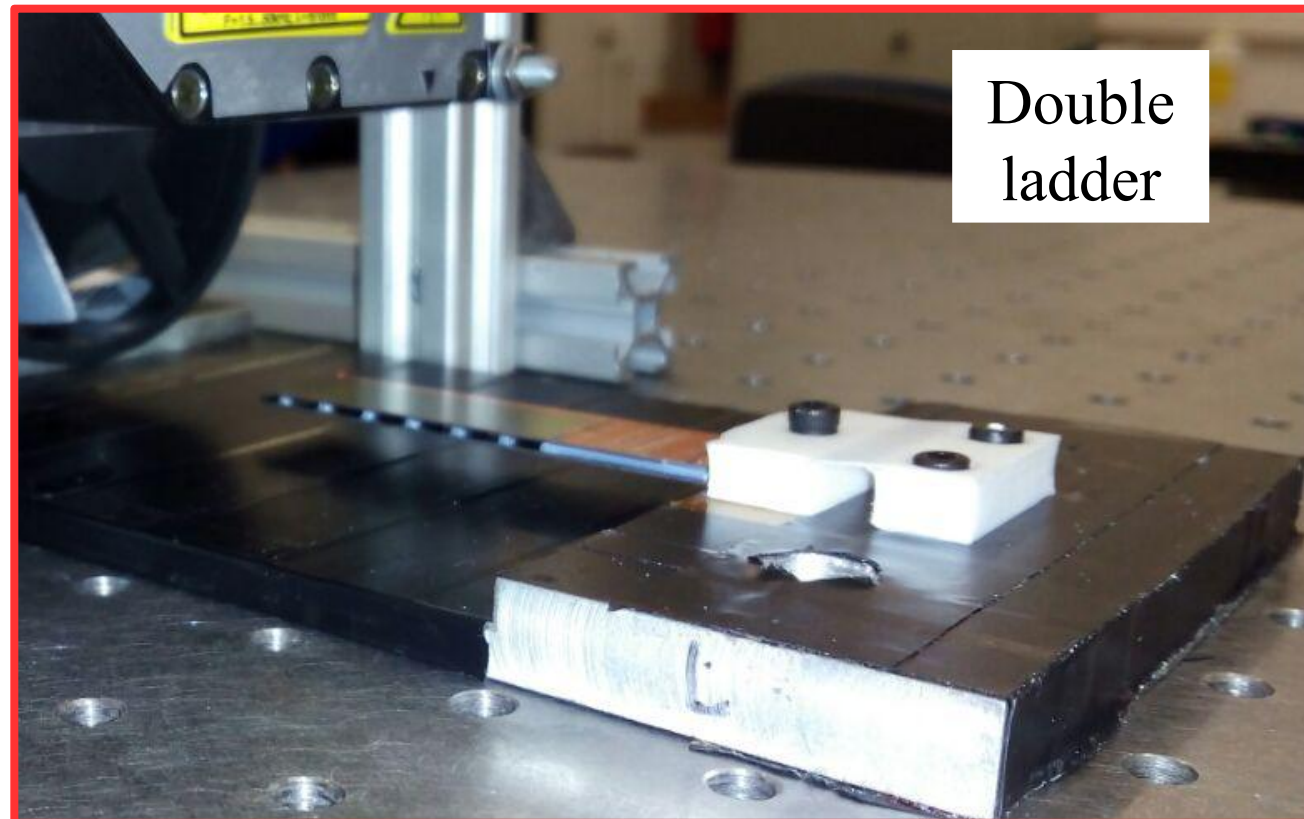
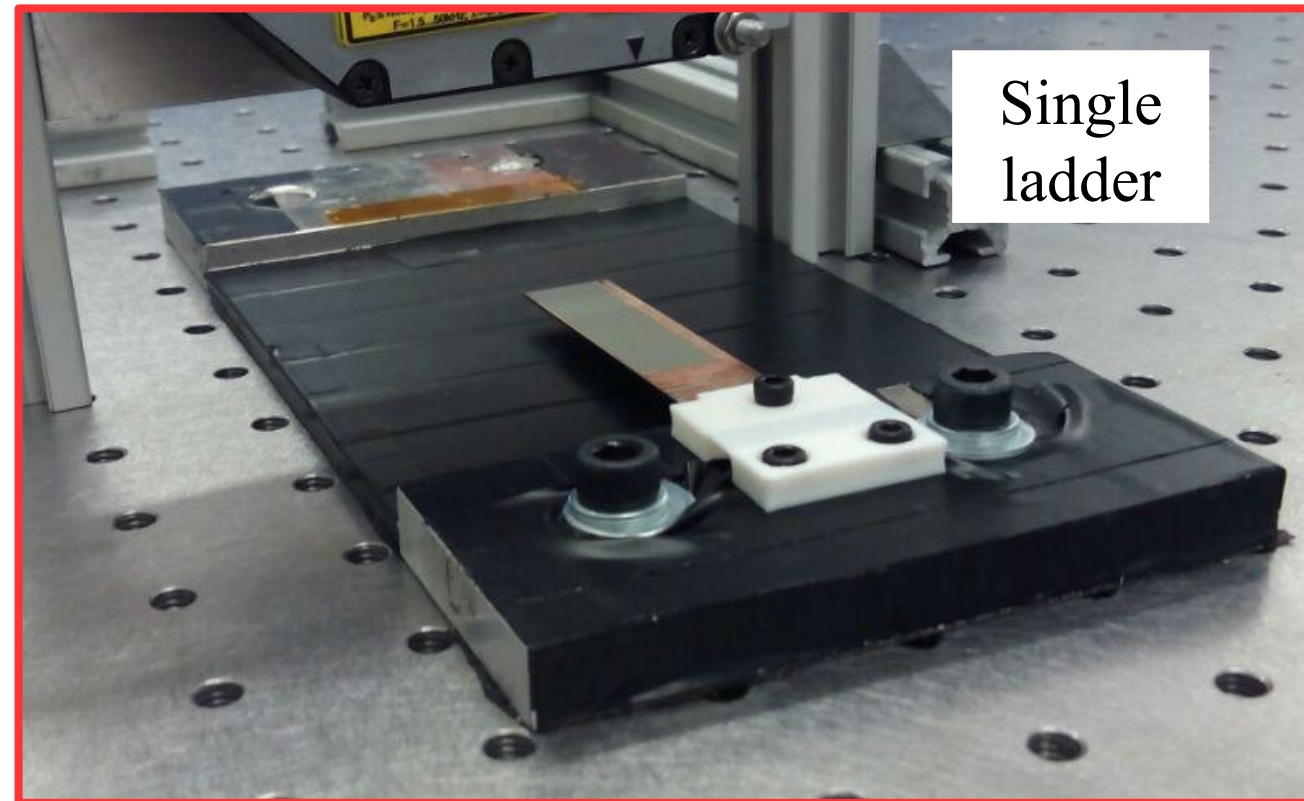
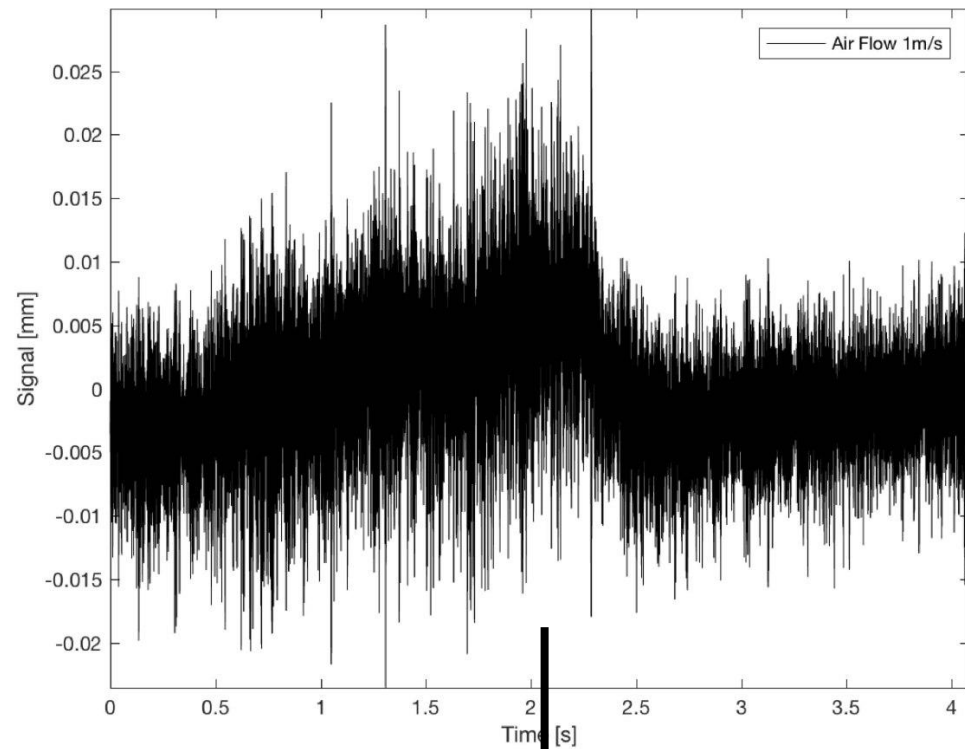


Microchannel cooling



$v=1\text{m/s}$	Peak2Peak	RMS
Single ladder	68 μm	7,2 μm
Double ladder	8,1 μm	2,2 μm

Microchannel cooling



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Single ladder	68 μm	7,2 μm
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3D printed spacer: 0,01% X/X_0 per ladder \longrightarrow **0,01% X/X_0 are 9 μm of Si approx.**