

Update in the design of the FTD mockup

I. Garcia
M.A. Villarejo
M. Vos

*with special thanks to Ladislav Andricek,
David Santoyo and José Manuel del Toro



VNIVERSITAT
ID VALÈNCIA

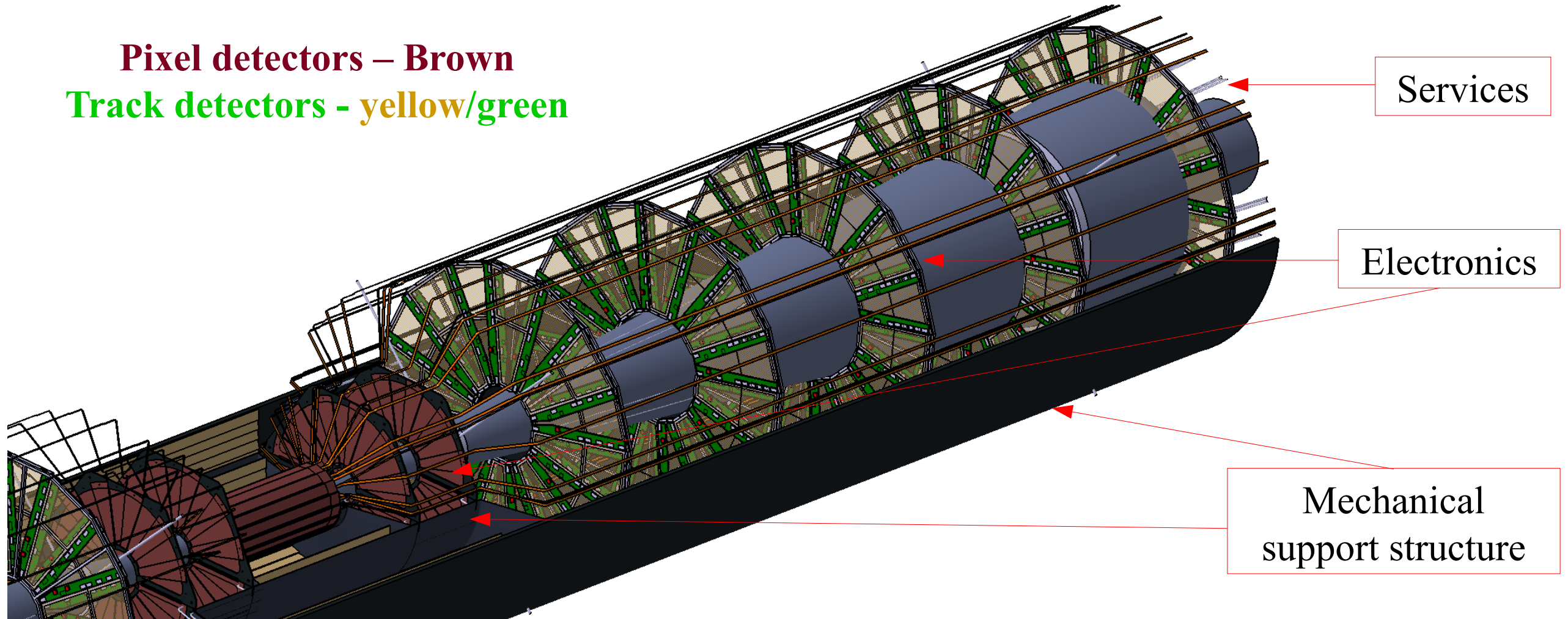
Outline

- Introduction
- Preliminary mock-up
- Results obtained
- Next mock-up upgrade
- Summary



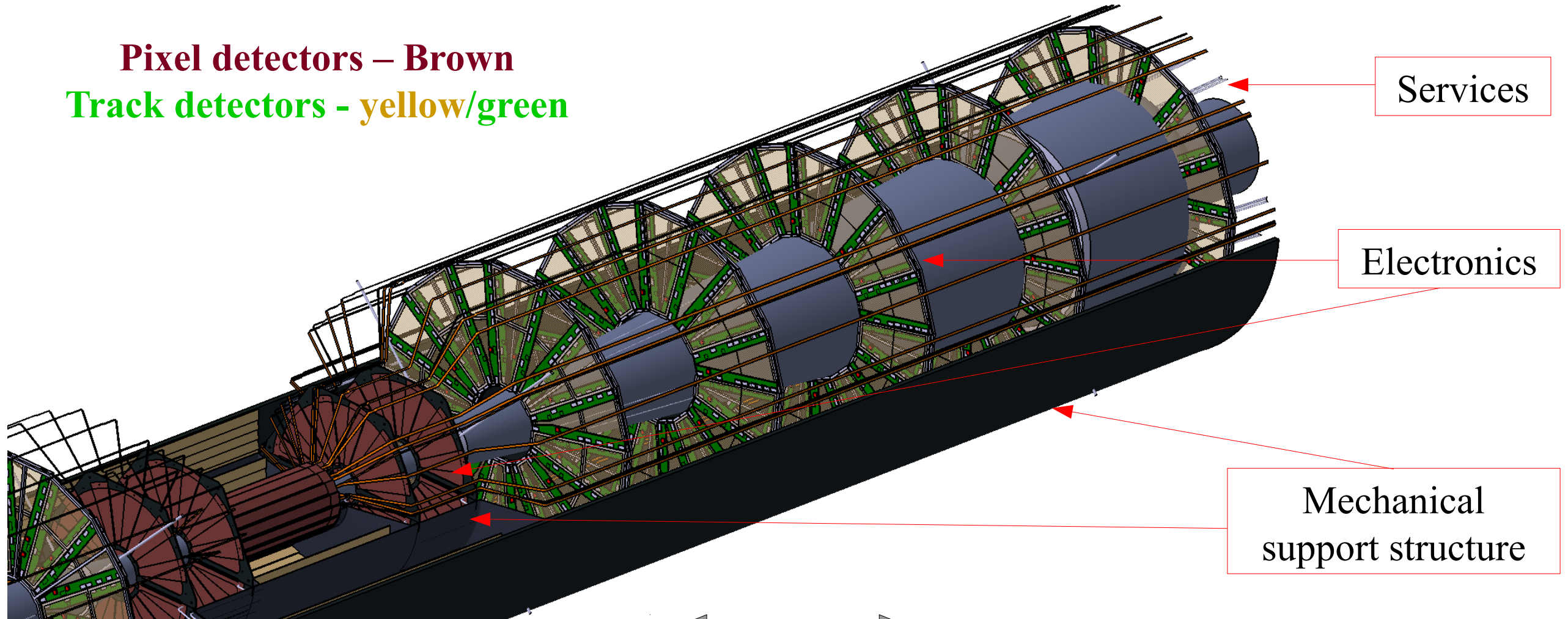
Introduction

Pixel detectors – Brown
Track detectors – yellow/green



Introduction

Pixel detectors – Brown
Track detectors – yellow/green



Integration

Materials

- Radiation length
- Mechanical properties
- Joints
- New materials
- ...

Services

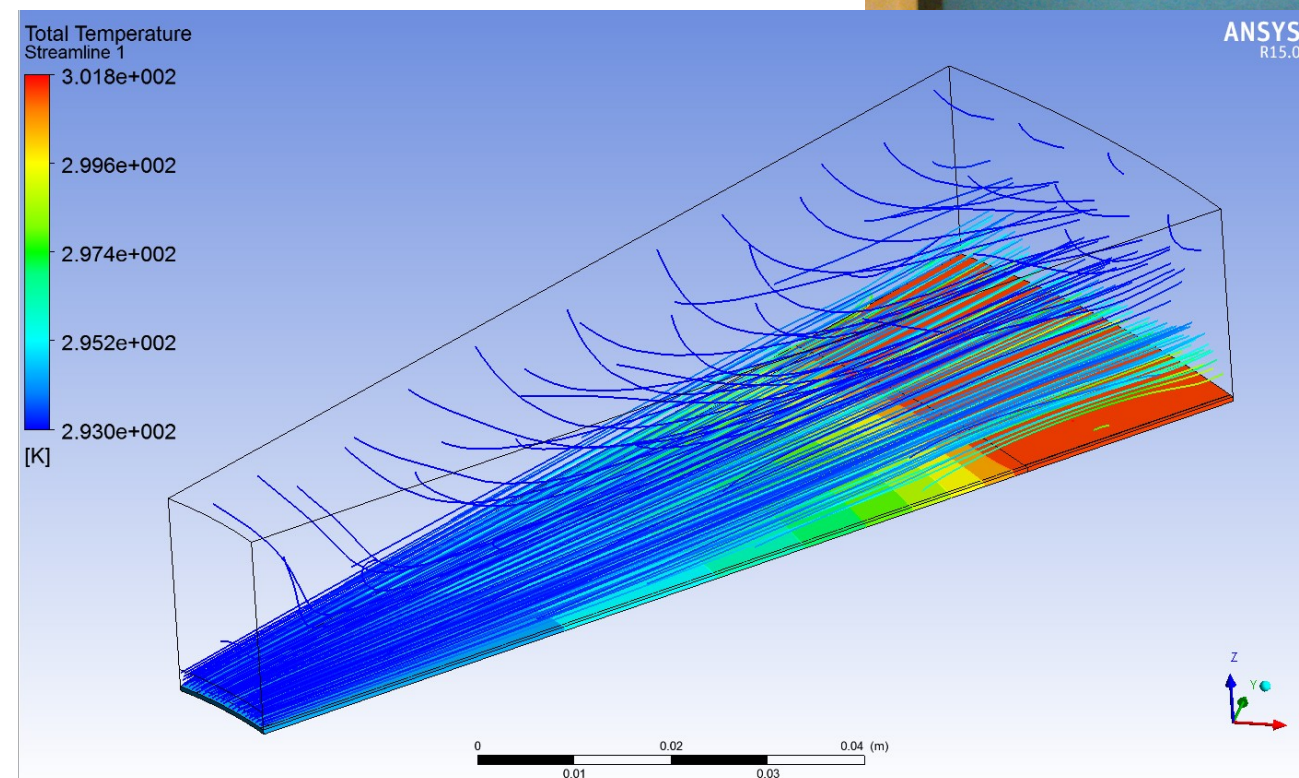
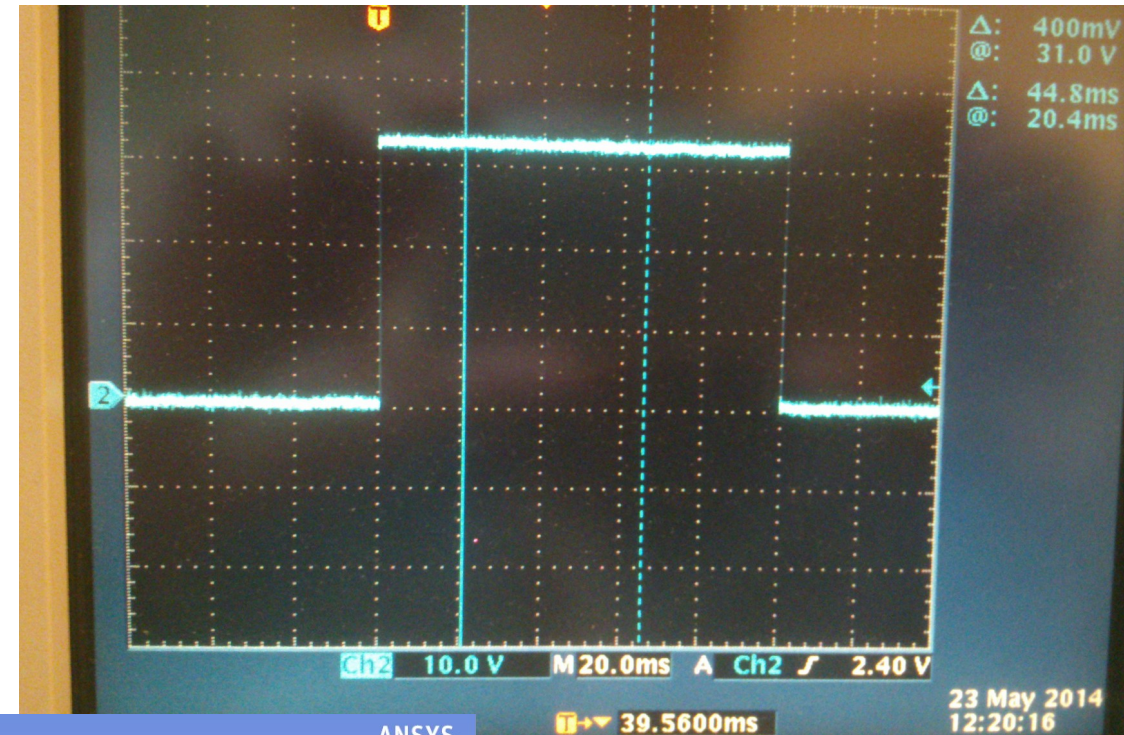
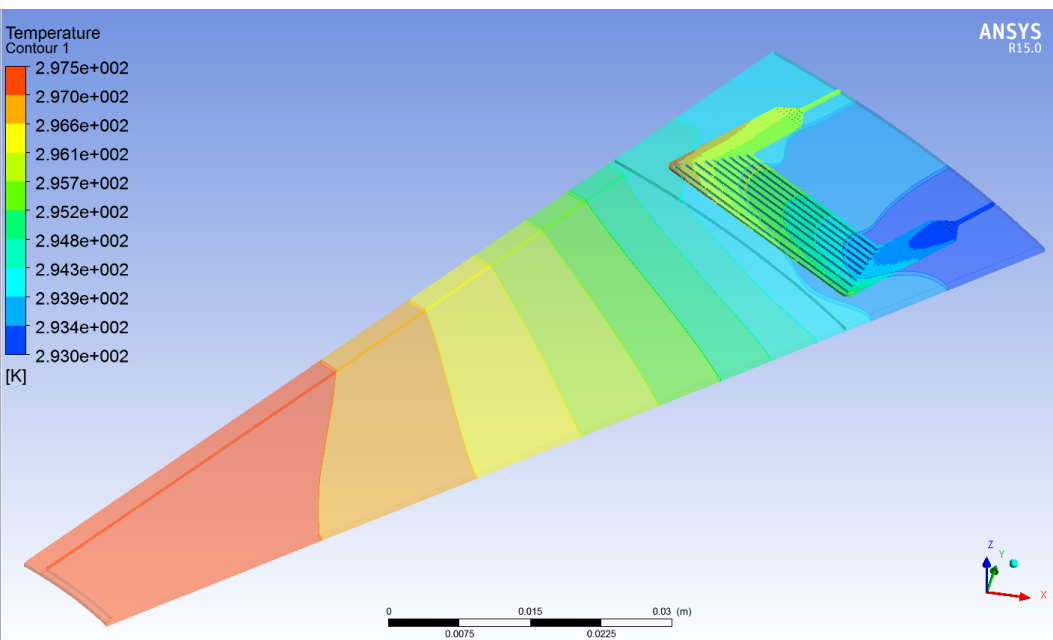
- Power to deliver
- Cooling strategy
- Layout
- ...

Cooling strategy

MCC – Not related

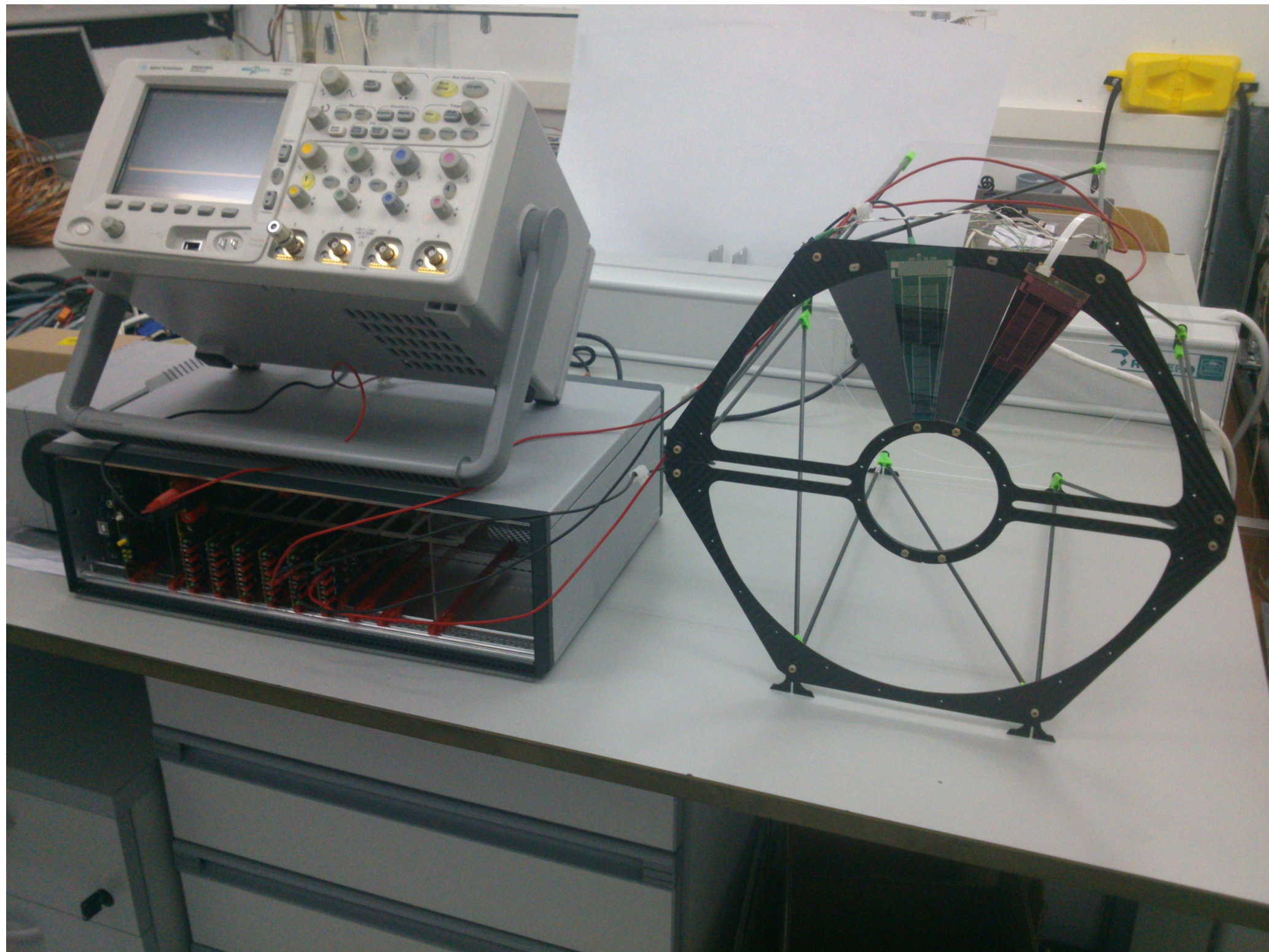
Air cooling

Power Pulsing

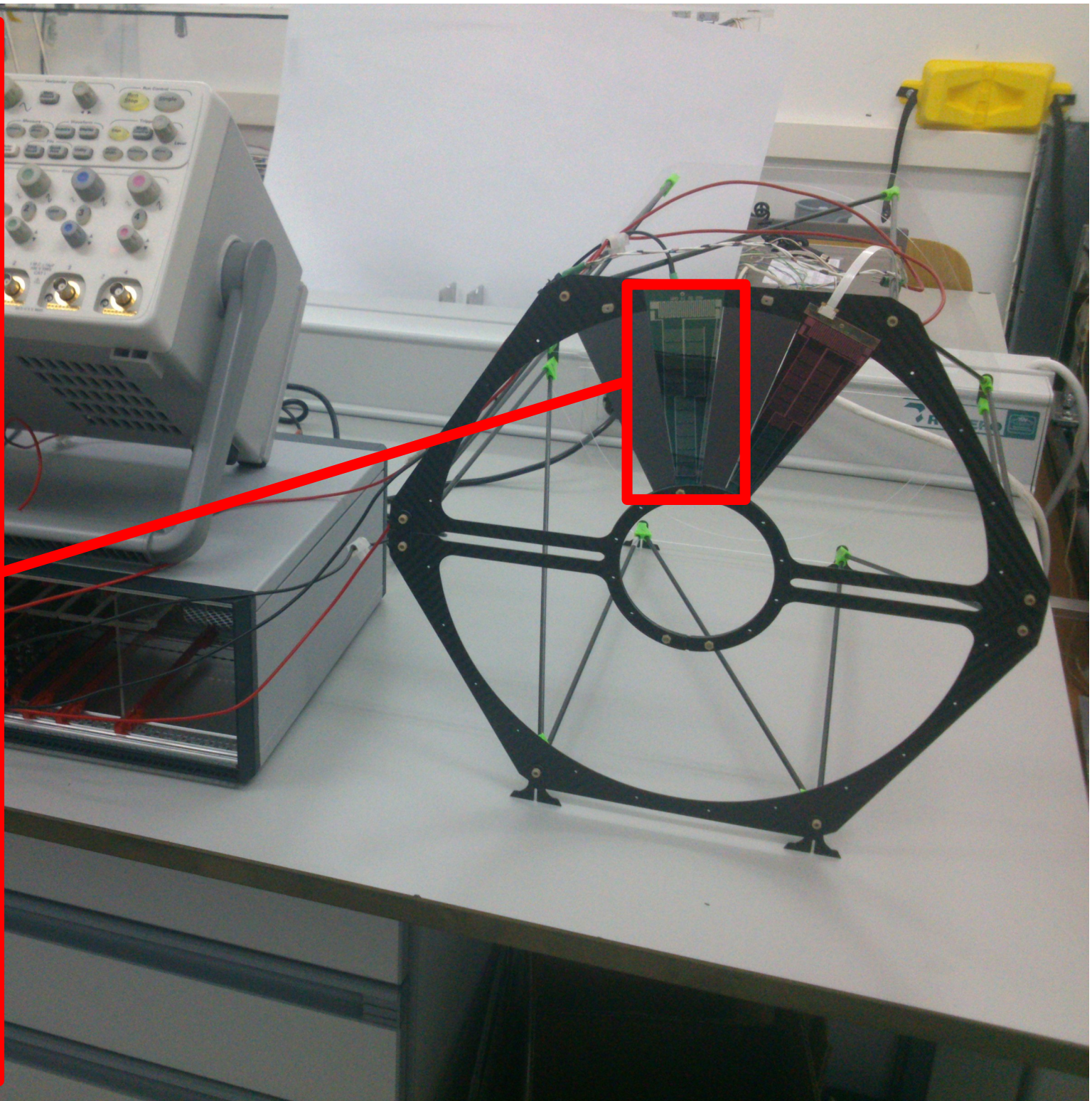
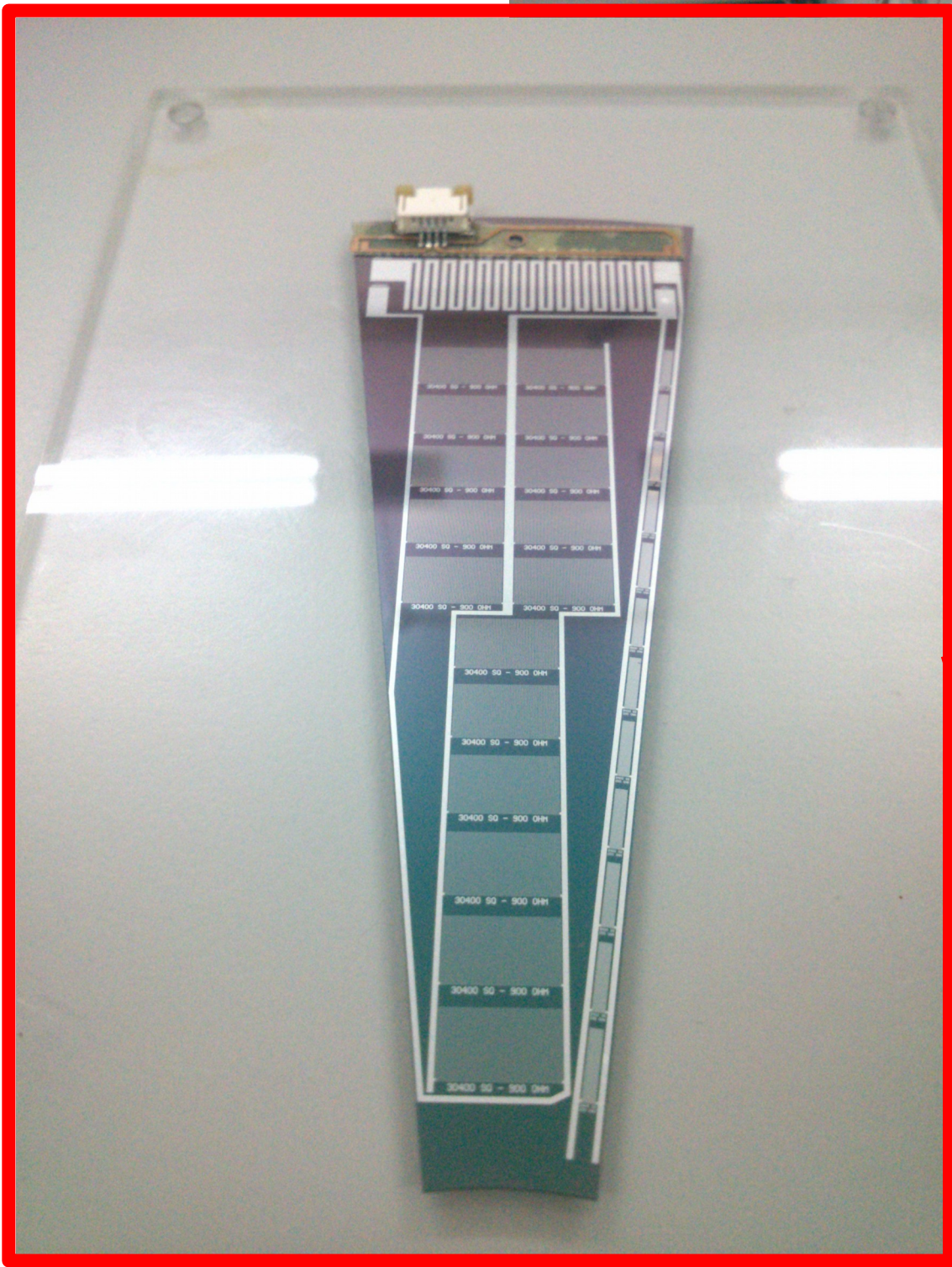


Preliminary mock-up

- **First experience**
- Temperature
- Temperature distribution
- Temperature deformations
- Vibrations (amplitude & frequency)
- Air cooling possibilities
- Mechanical loadings

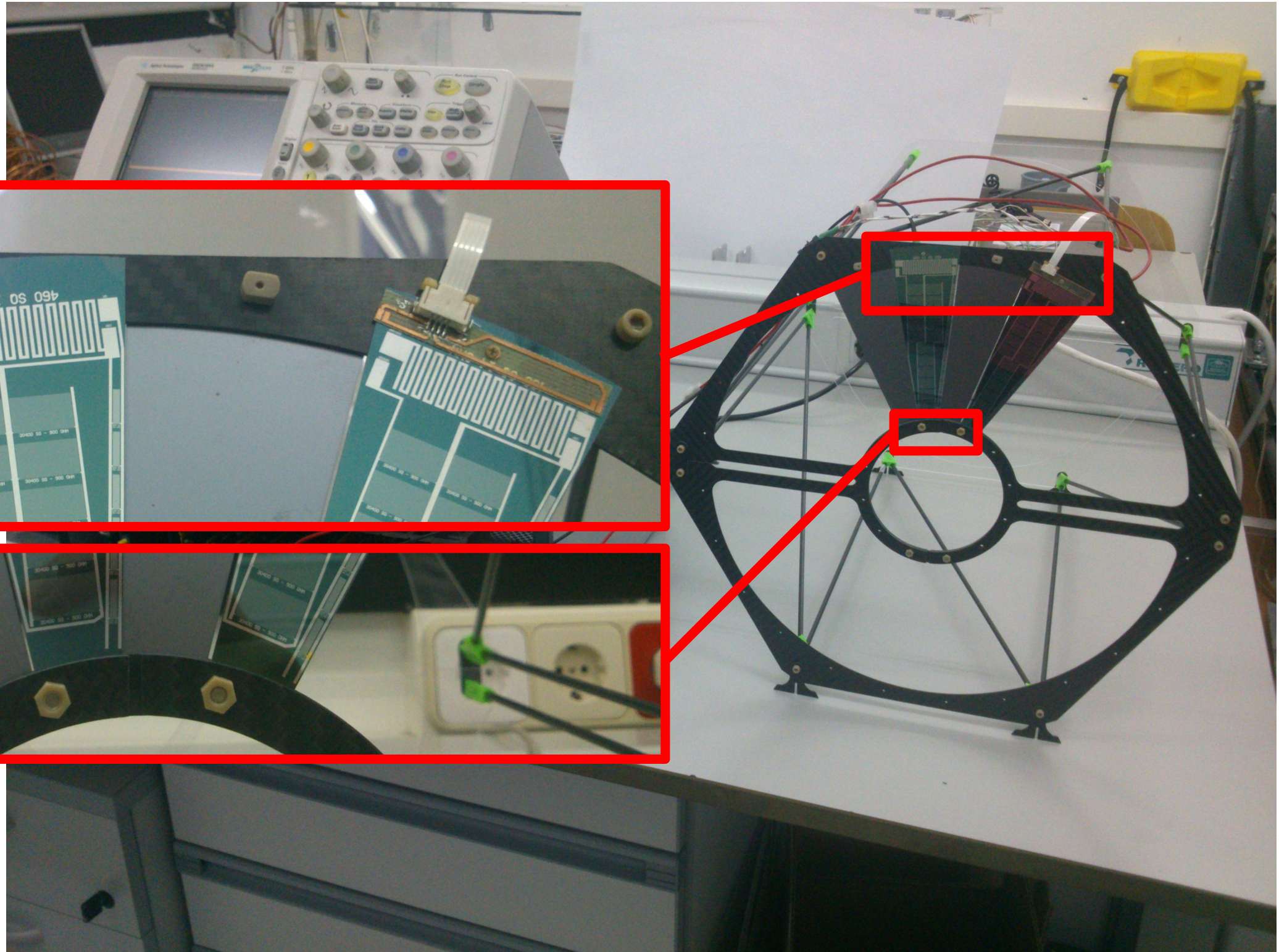


Preliminary mock-up



Preliminary mock-up

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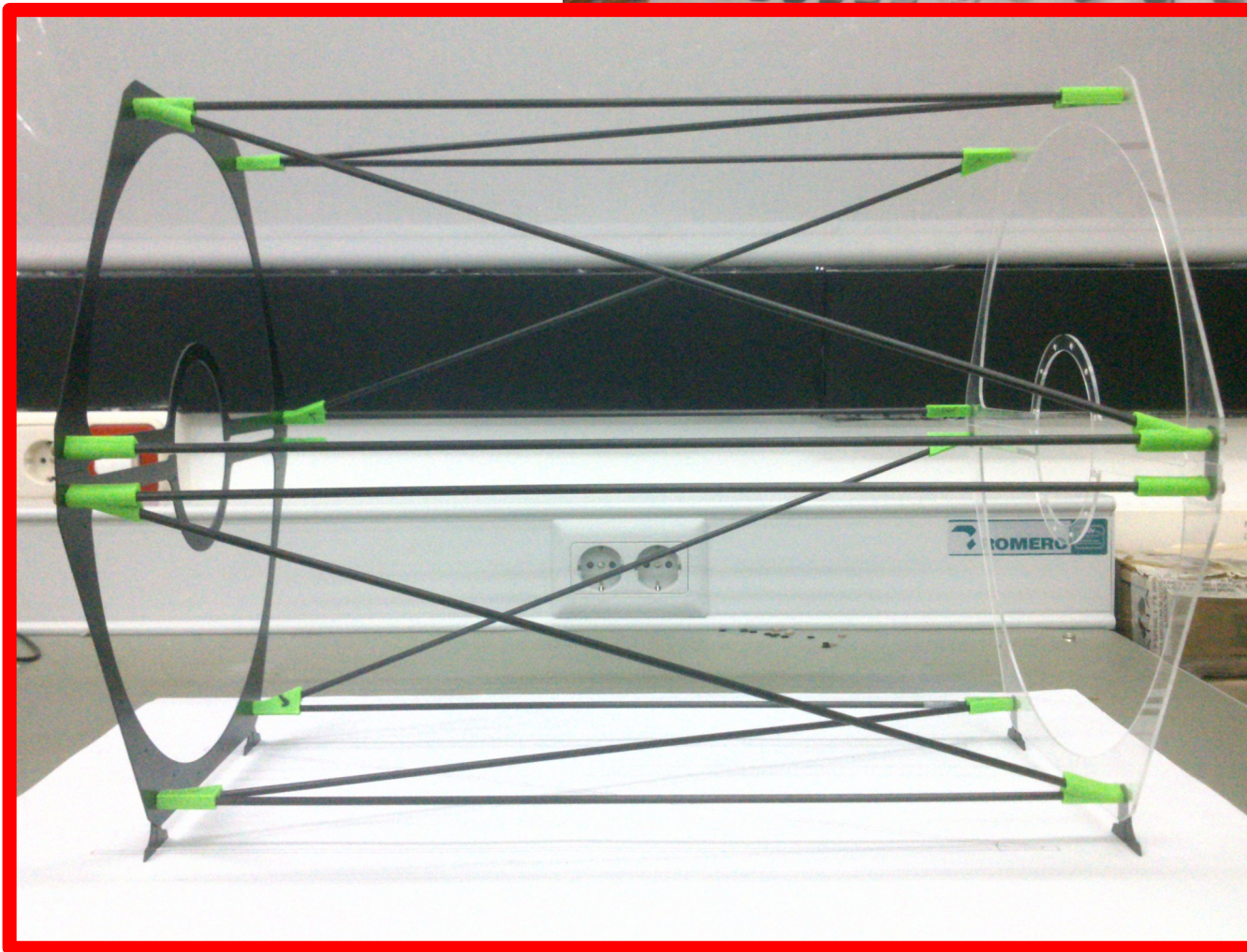


- Vibrations

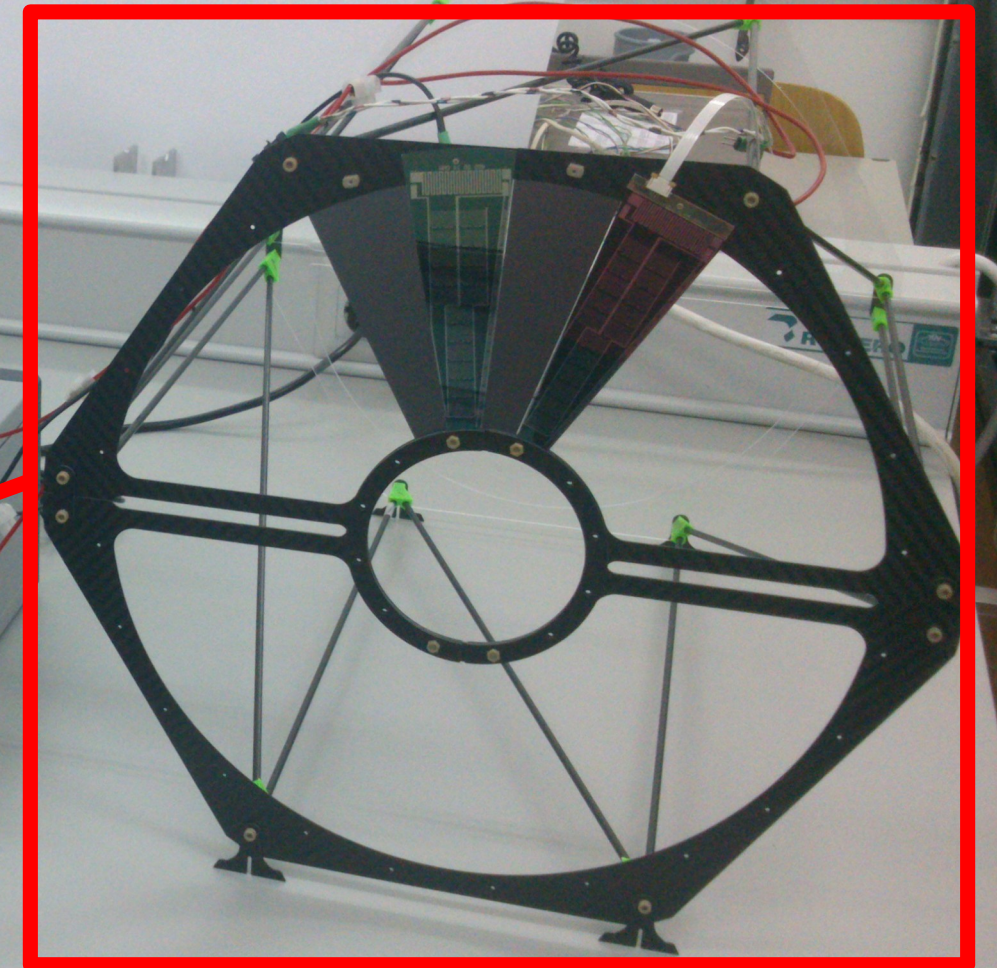
- Mechanical loadings

Preliminary mock-up

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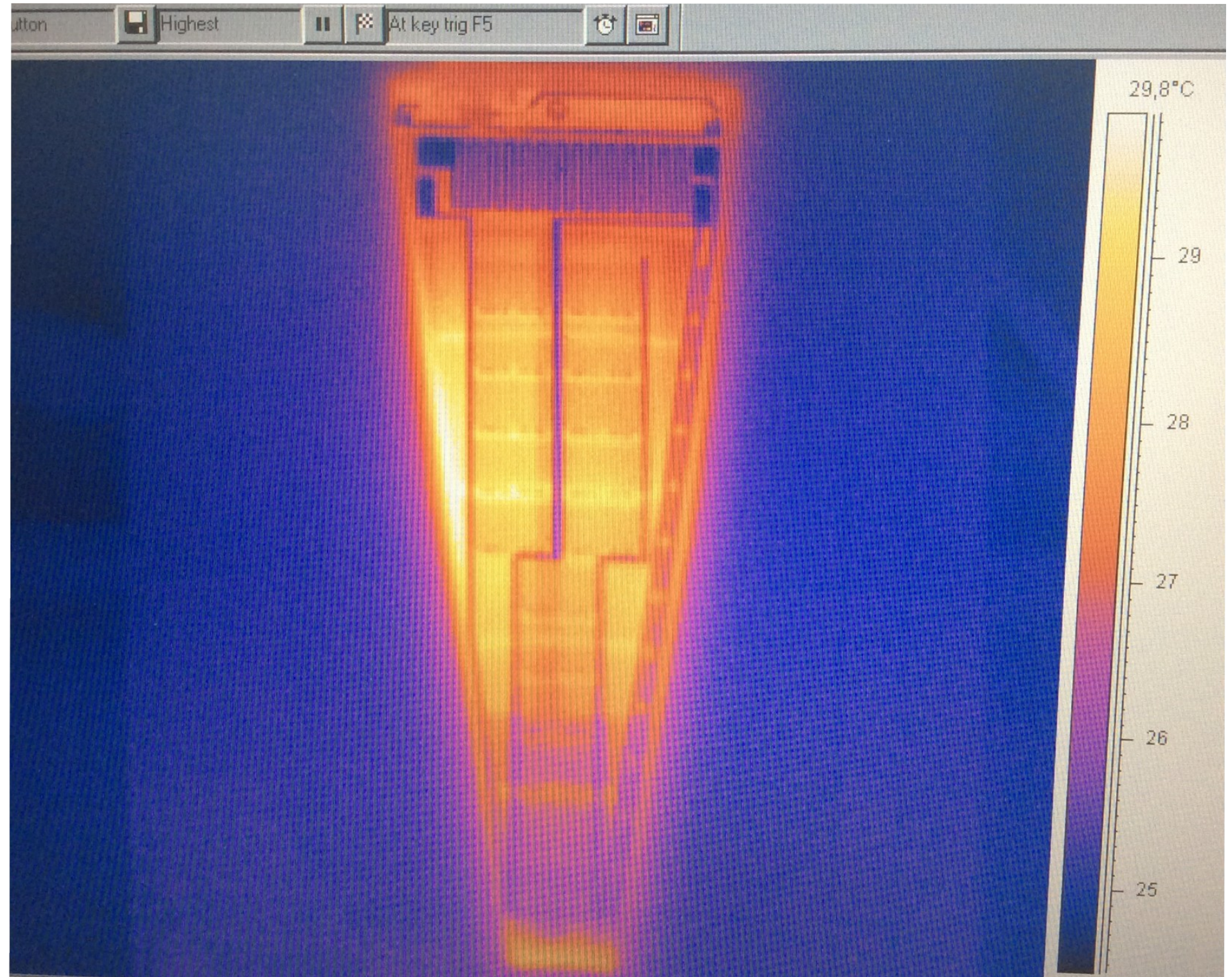


- Mechanical loadings



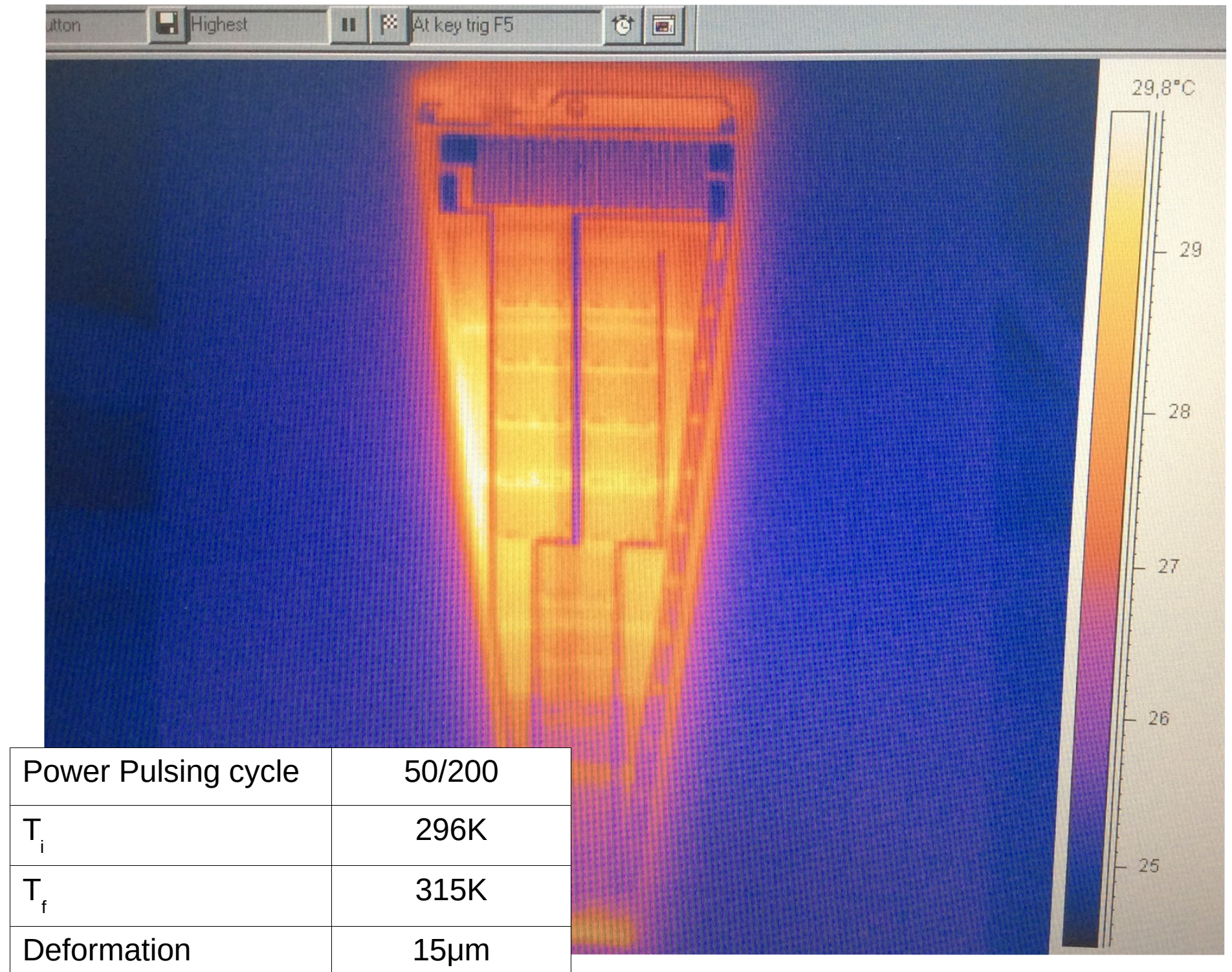
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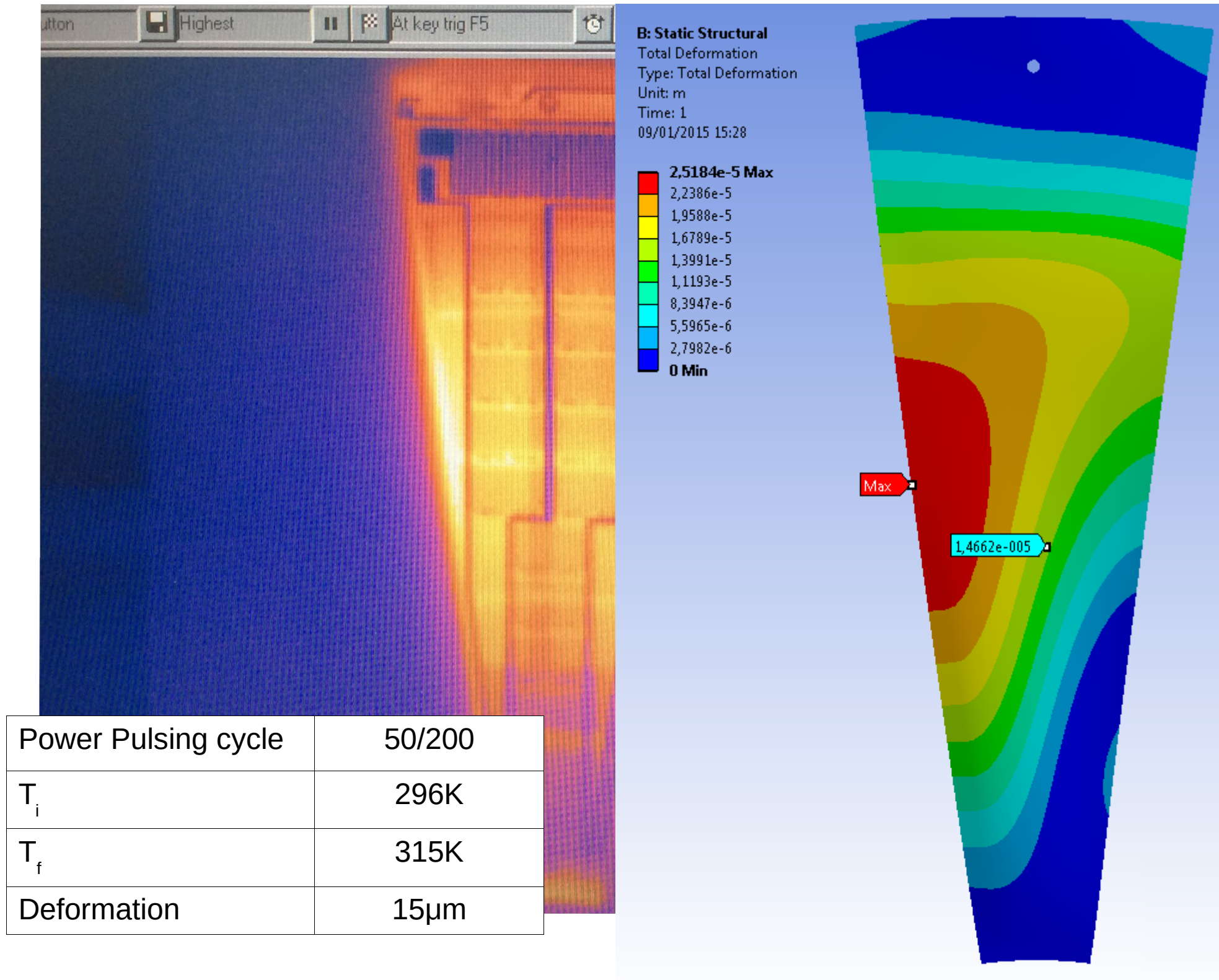
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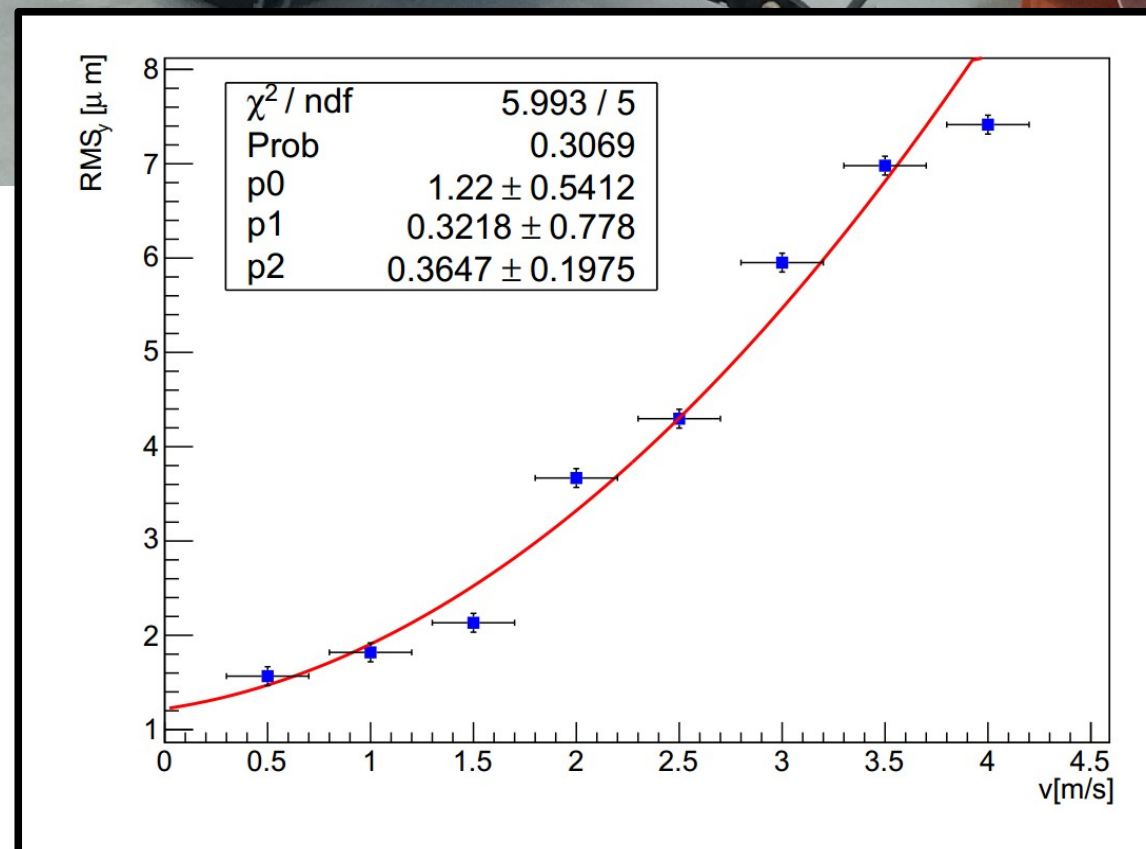
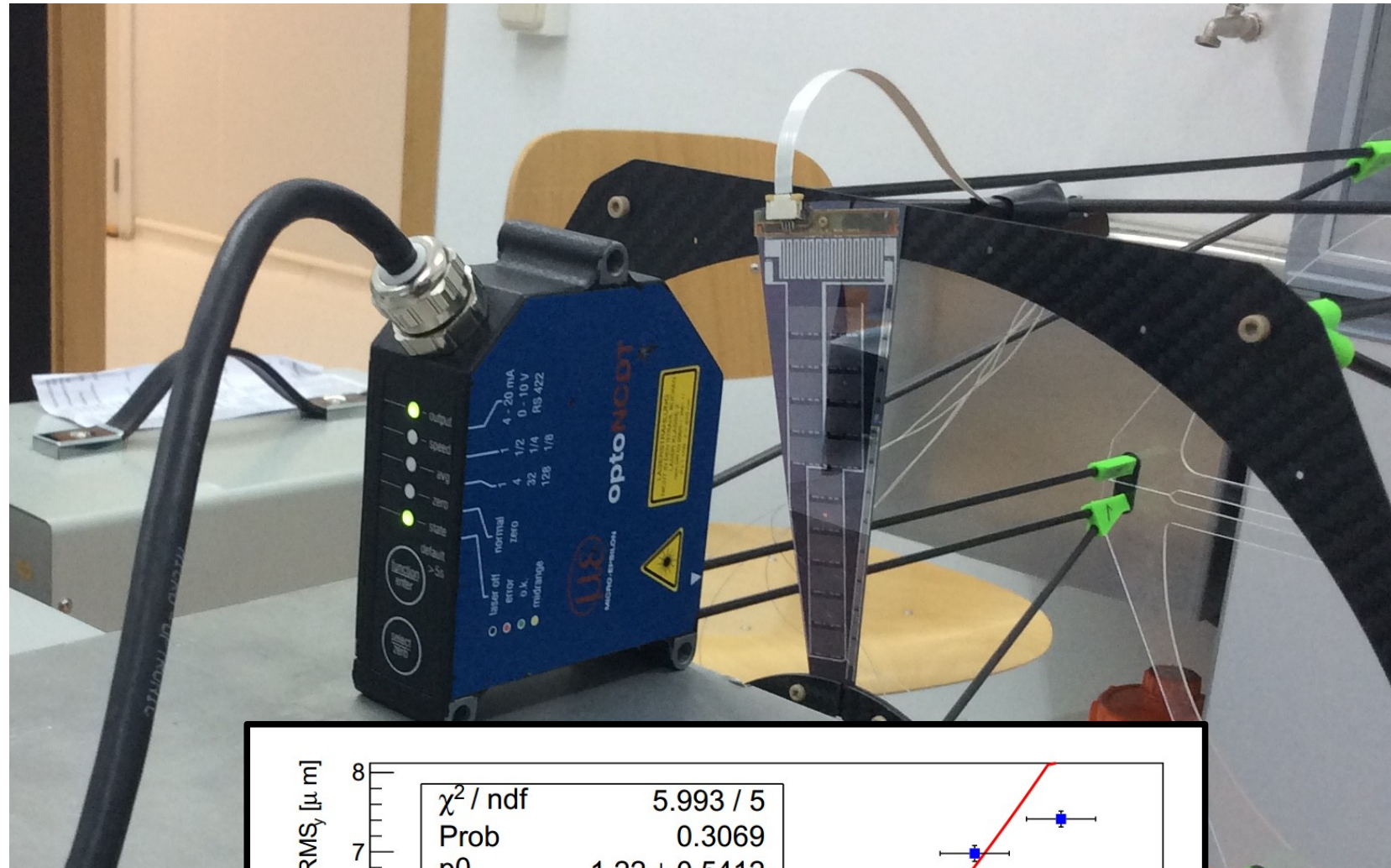
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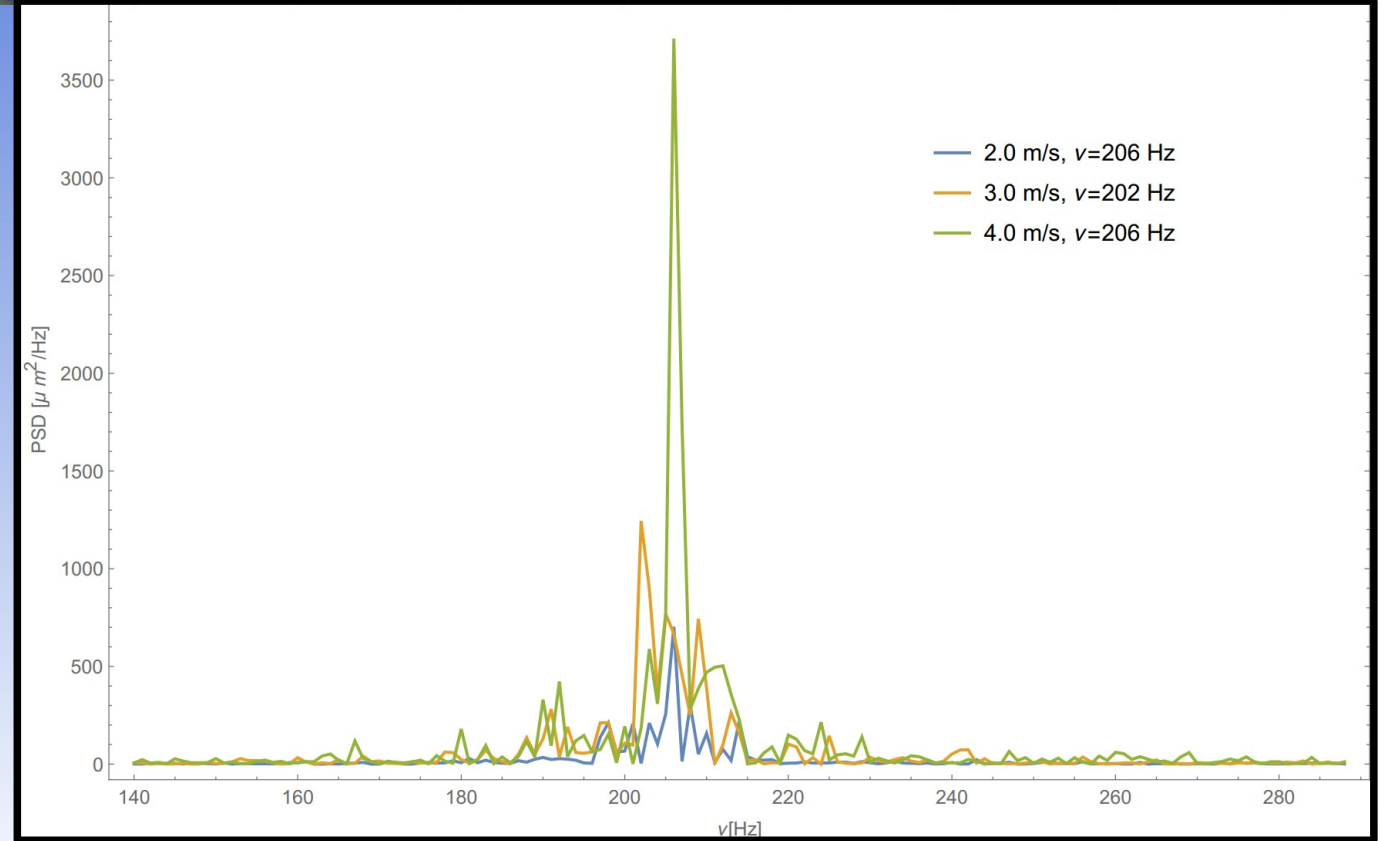
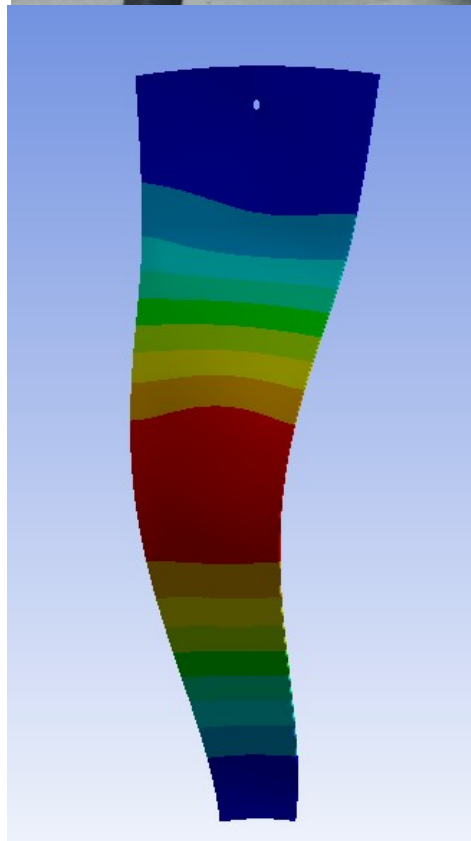
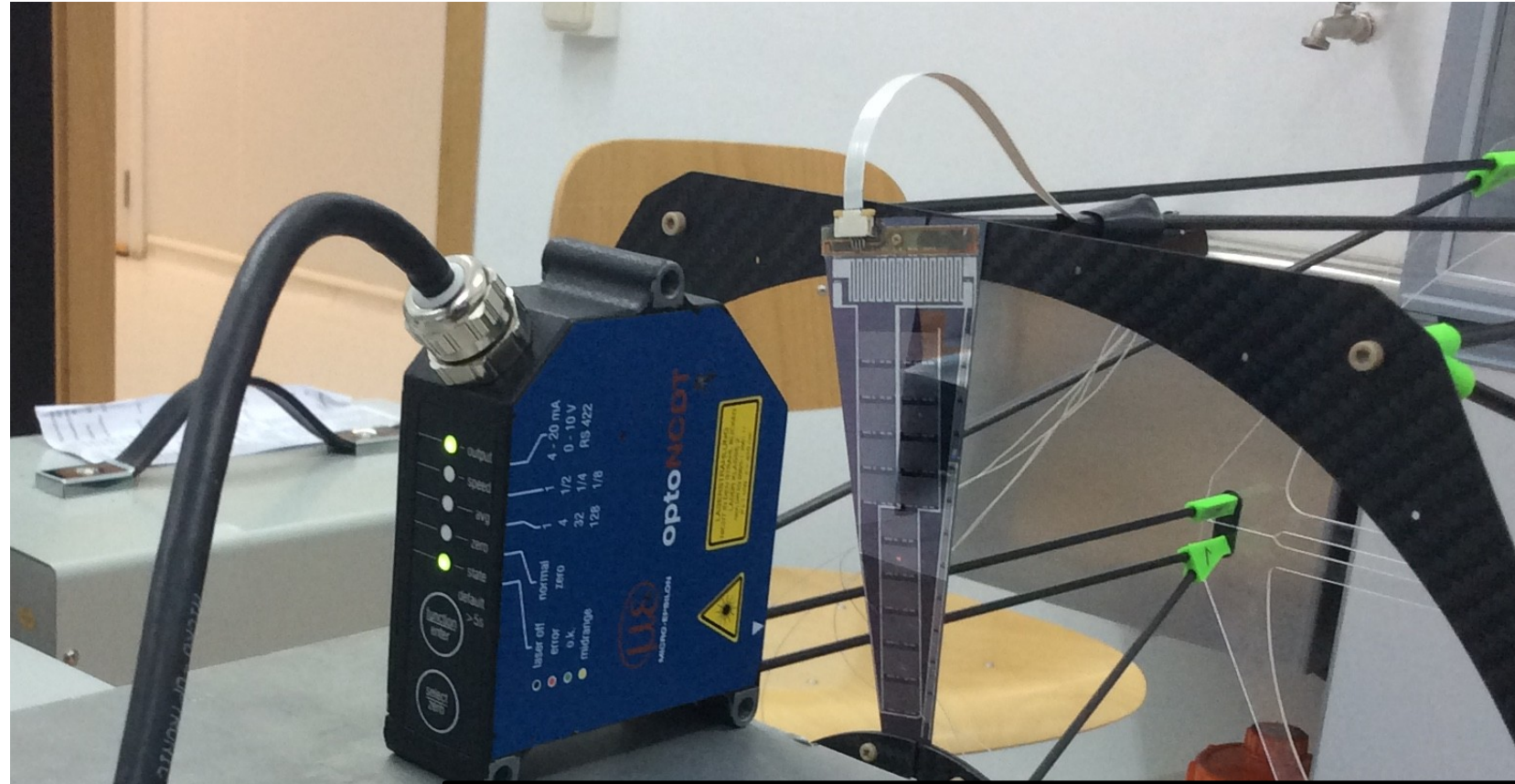
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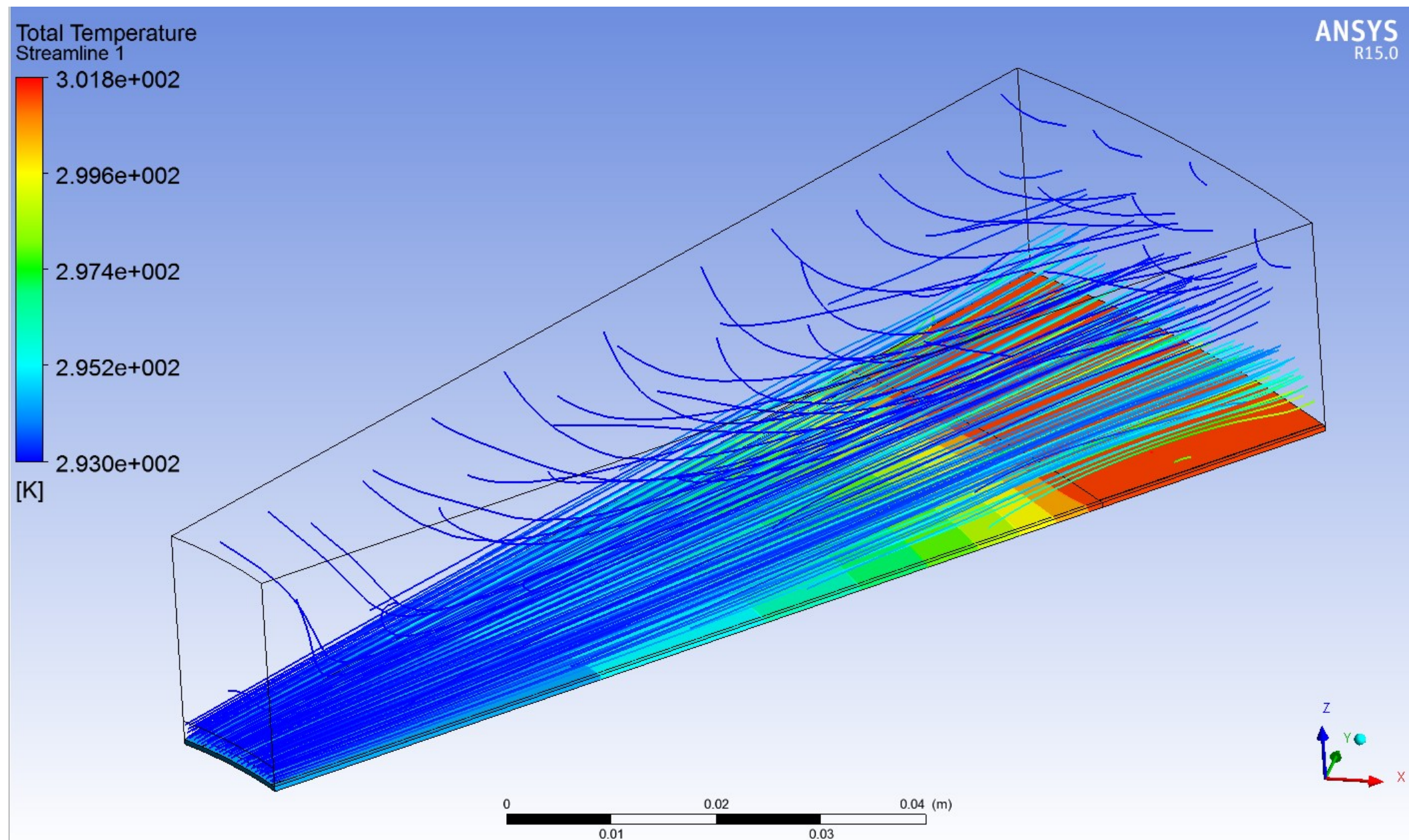
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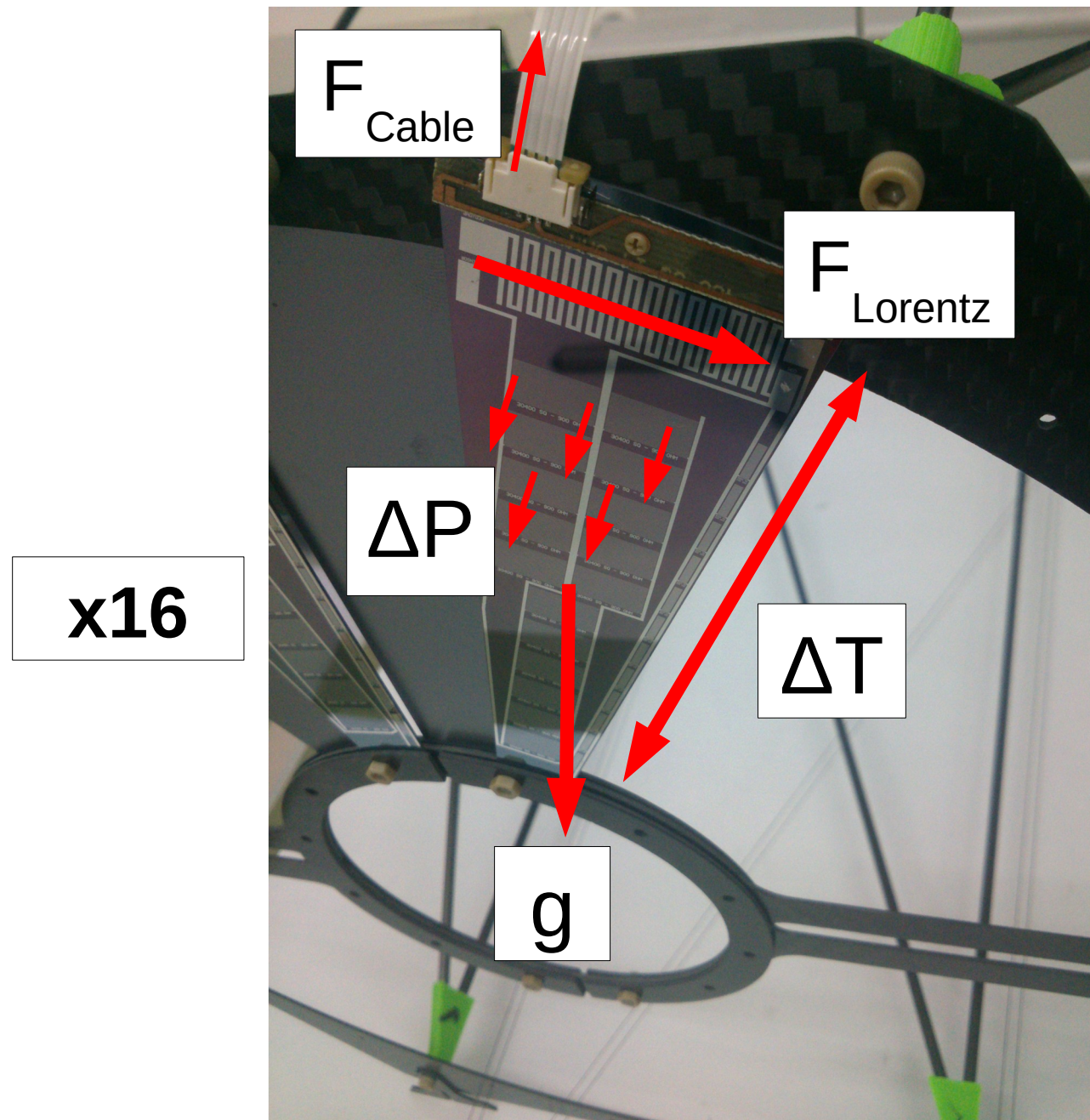
2.1 Current design

- First experience
- Temperature
- Temperature distribution
- Temperature deformations
- Vibrations (amplitude & frequency)
- **Air cooling possibilities**
- Mechanical loadings



2.2 Future design

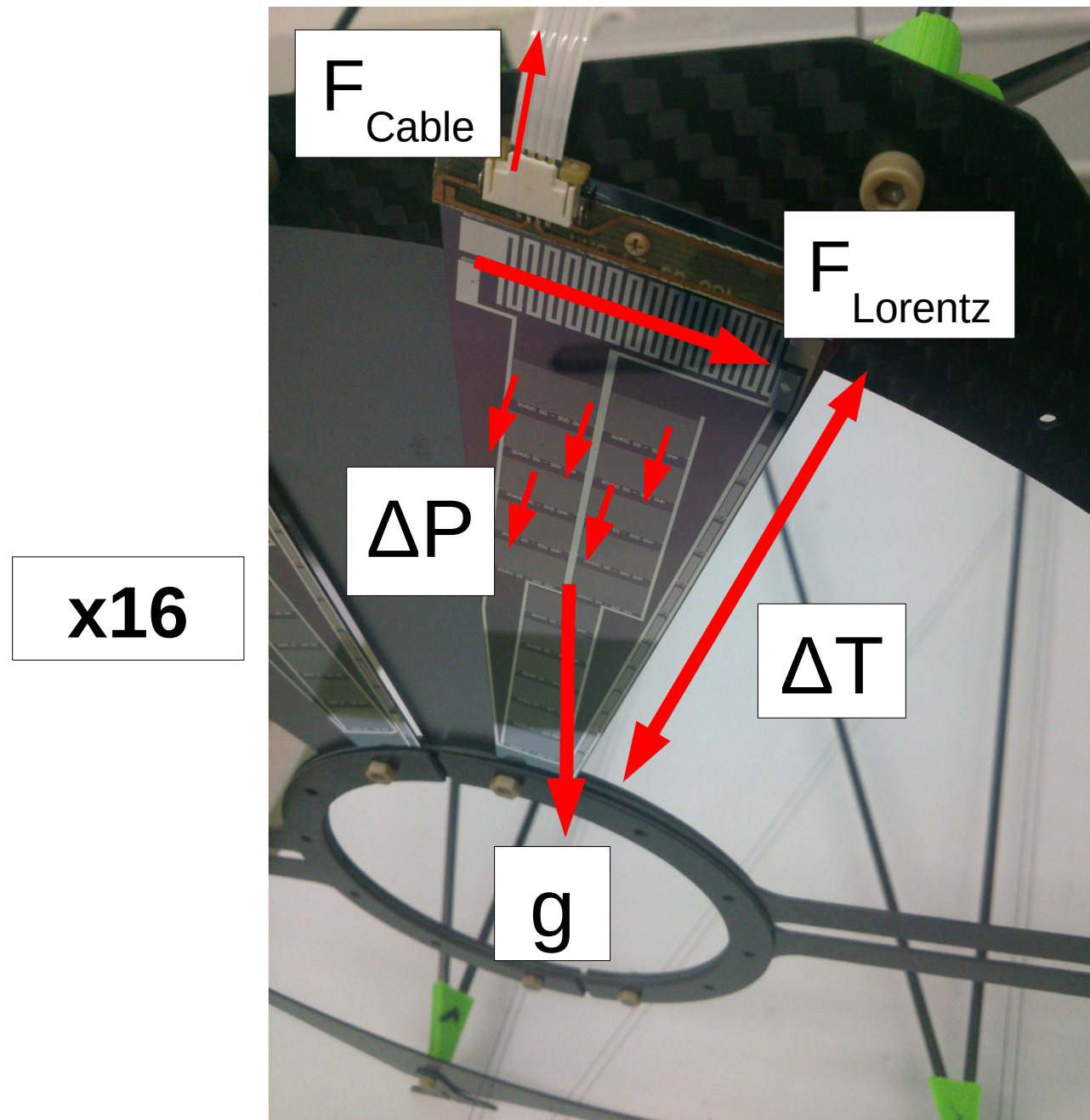
- First experience
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- **Mechanical loadings**



$F_{\text{Lorentz}} \sim 0,2\text{N}$	$F_{\text{cable}} \sim 0,05\text{N}$	No air viscosity
$\Delta T = 15\text{K} \Rightarrow F \sim 21\text{N}$	$g \sim 0,04\text{N}$	$\Delta P \sim 0,003\text{N}$

2.2 Future design

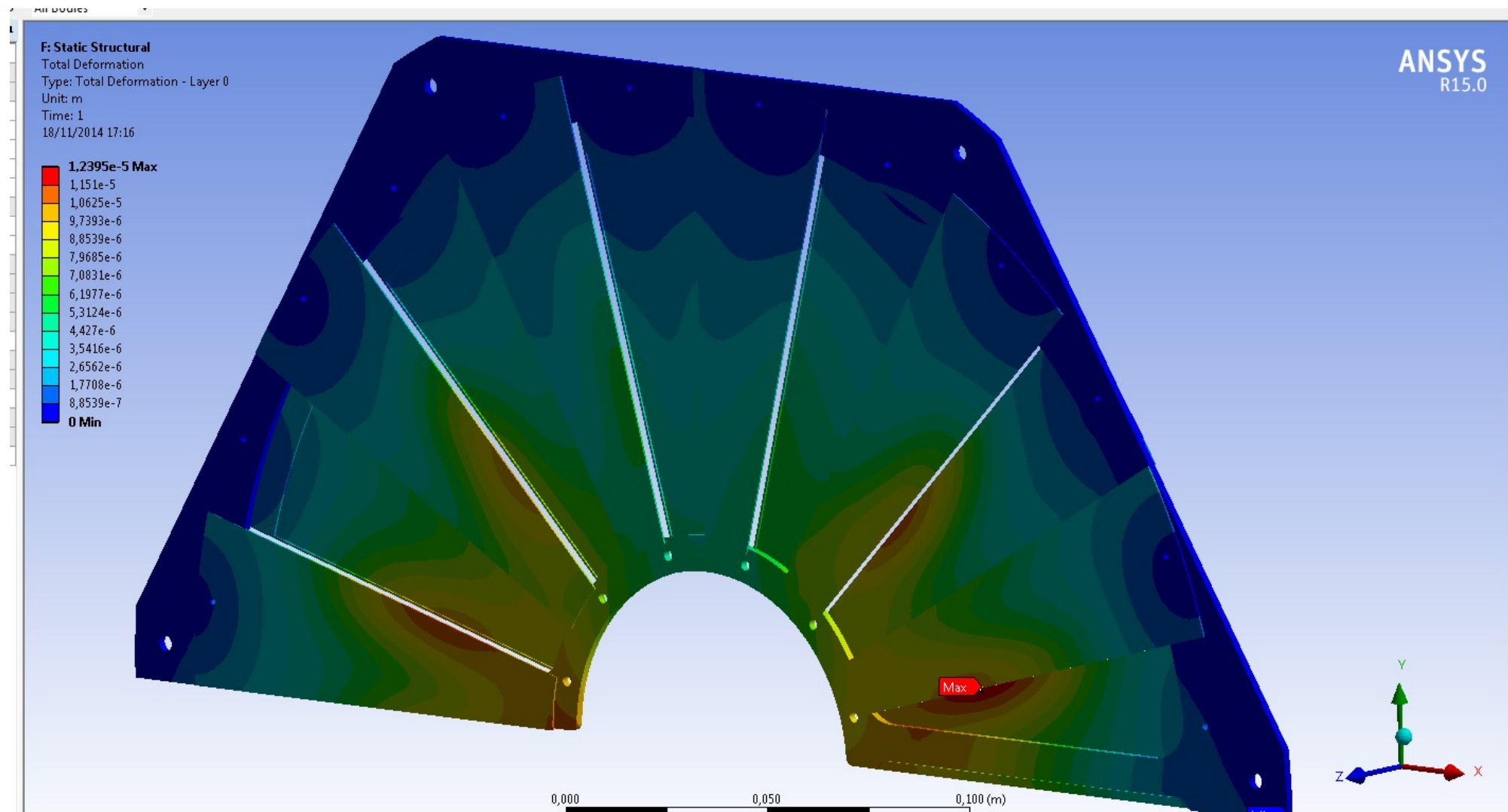
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$F_{\text{Lorentz}} \sim 1\mu\text{m}$	$F_{\text{cable}} \sim \mu\text{m}$ negligible	No air viscosity
$\Delta T = 15\text{K} \Rightarrow z = 15\mu\text{m}$	$g \sim \mu\text{m}$ negligible	$\Delta P \sim z = 60\mu\text{m}$

2.1 Current design

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- **Mechanical loadings**

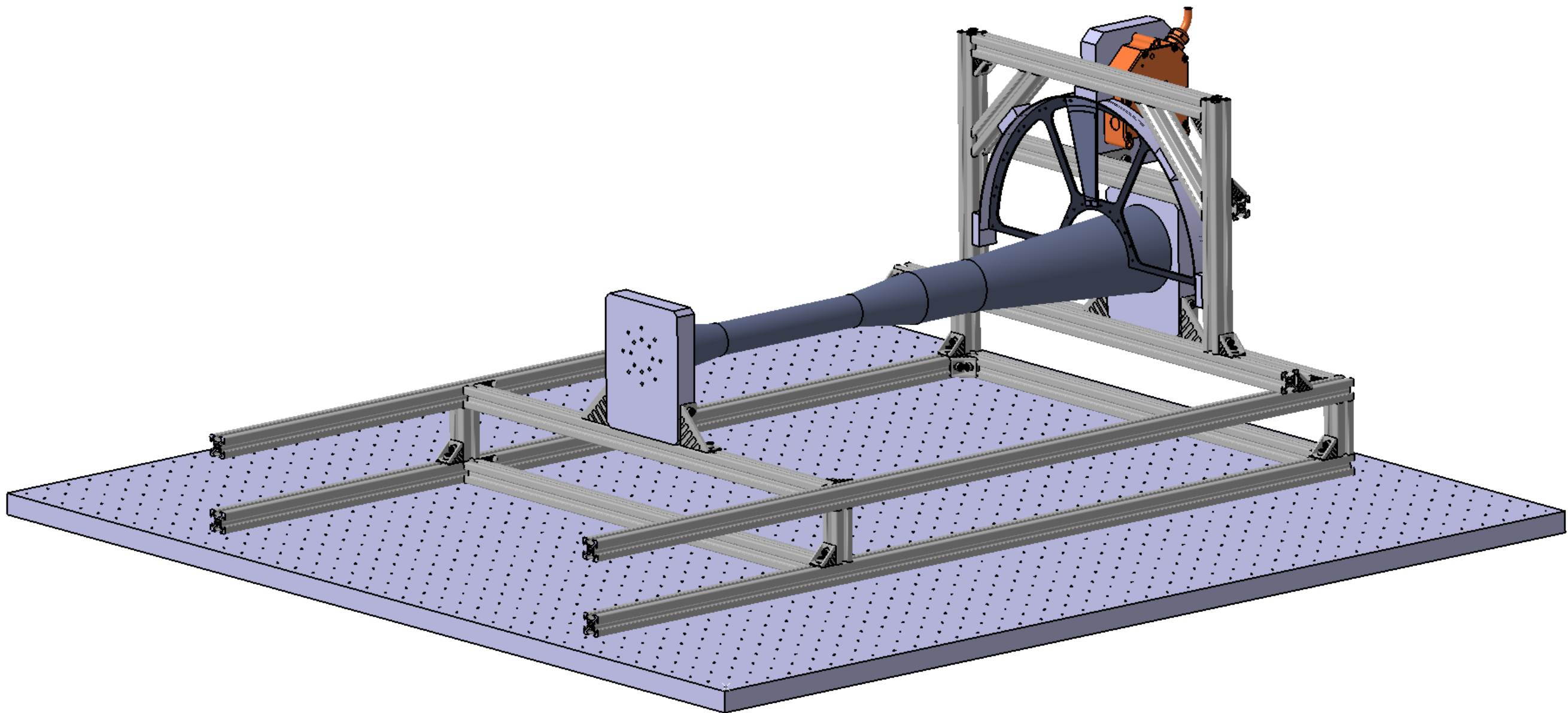


Stress: under its own weight

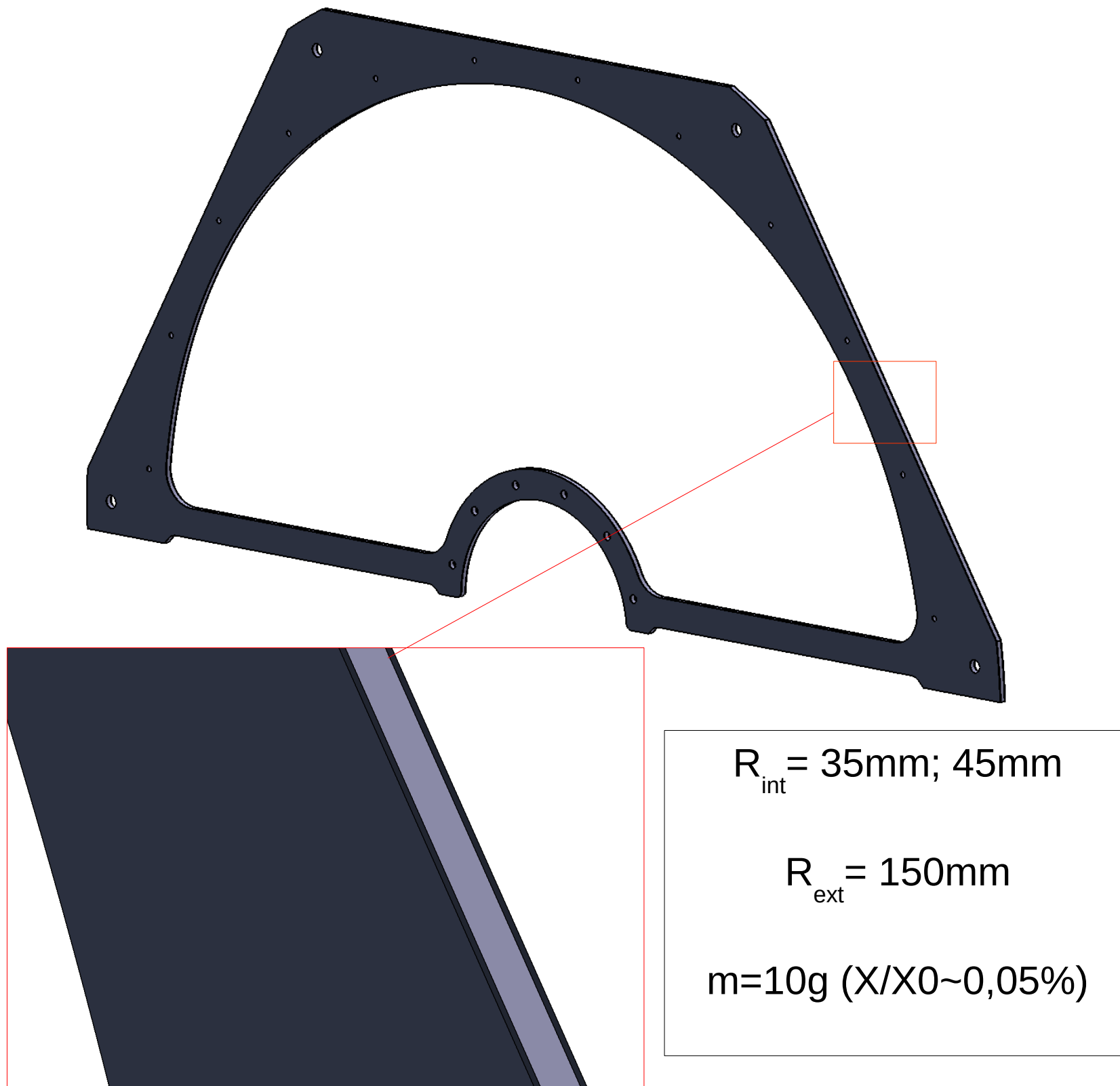
Thermal gradient: 15°C

1 mm of CFRP $[0,90]_4$

2.2 Future design



2.2 Future design



Summary

- Problems of the current mock-up:
 - Not enough mechanical stiffness
 - Method to screw the bolts not valid
 - Too much material
 - No precise control under the velocity of air
 - No special tooling used to measure vibrations
- First experience to build up a more realistic mock-up
- From IFIC we have the capacity to measure, post-process the results and simulate them.
- Promising results which must be confirmed with a new mock-up

Thank you

