

RF structure and component updates

CLIC Project Meeting #44

Pedro Morales

26/04/2023

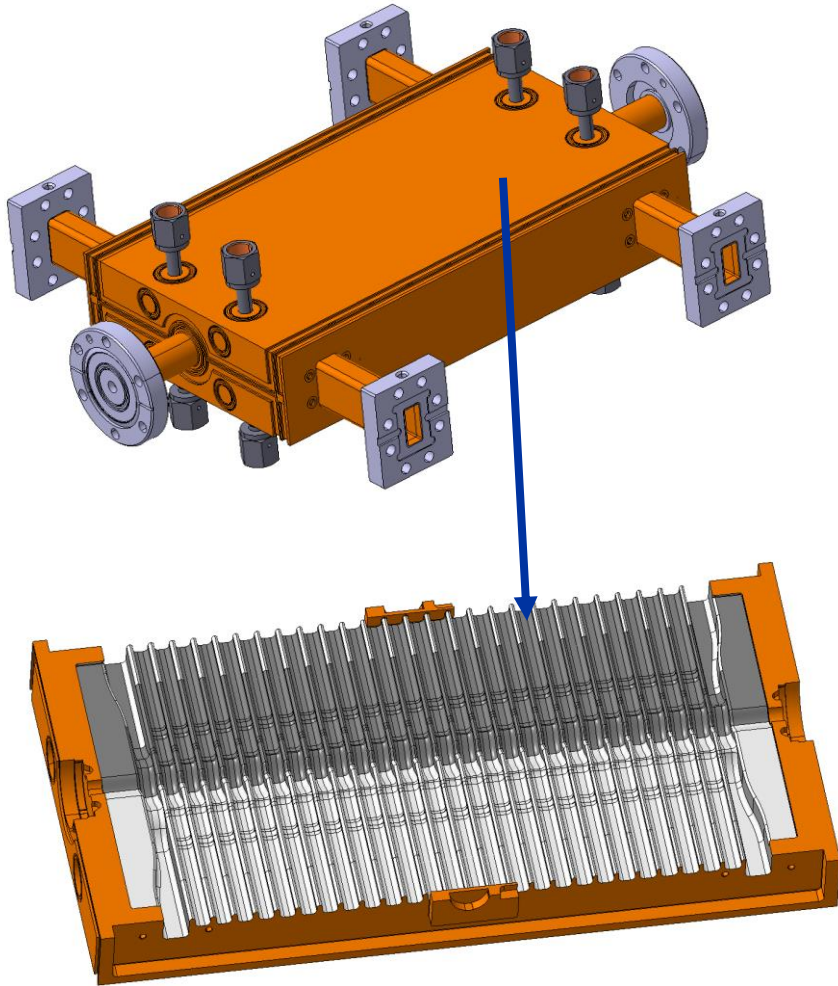
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- Halves TD26 structure
- **SmartCell CLIC-G Structure**
 - Structure design
 - Brazing mock-up
 - Tooling
 - SiC study
 - Copper characterization

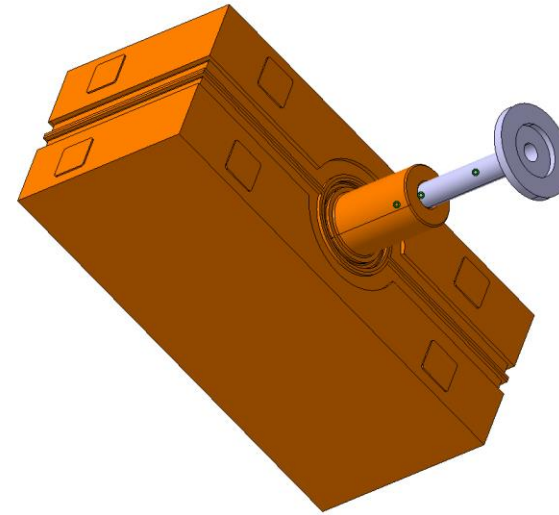
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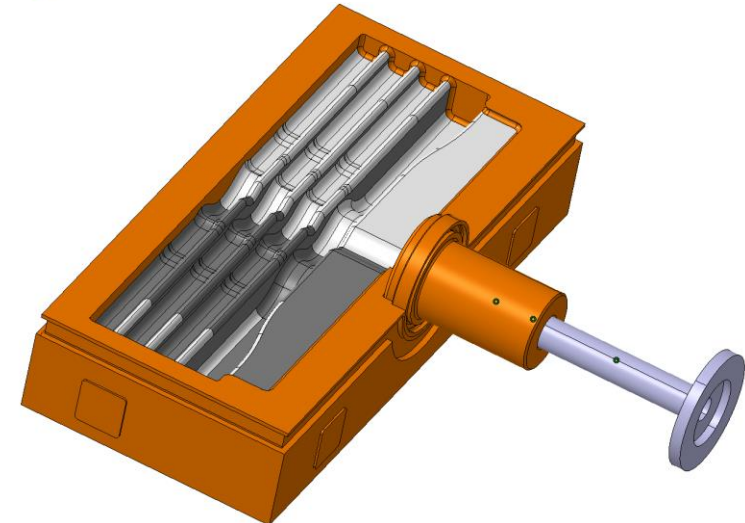
Halves TD26 structure - Small sum-up



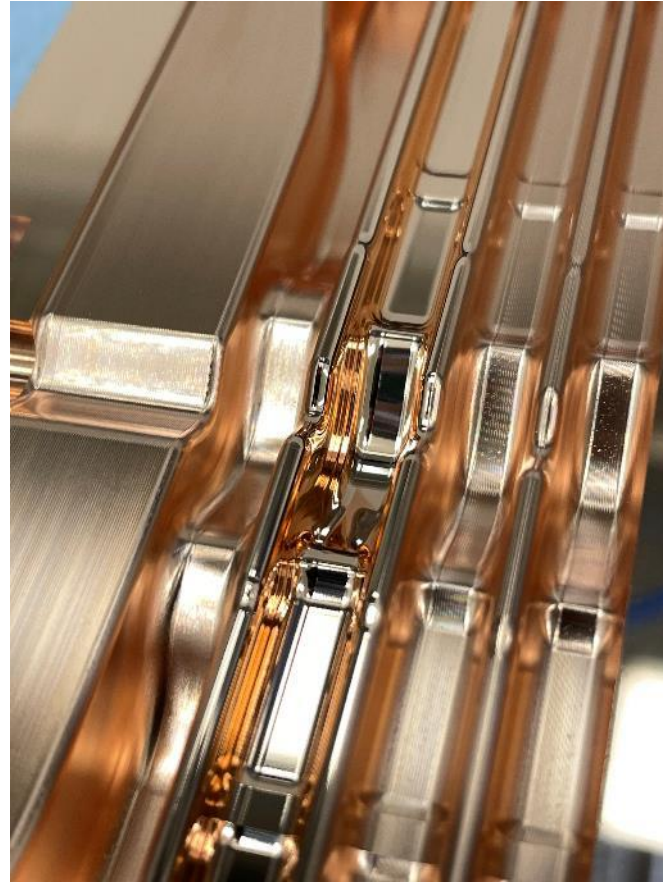
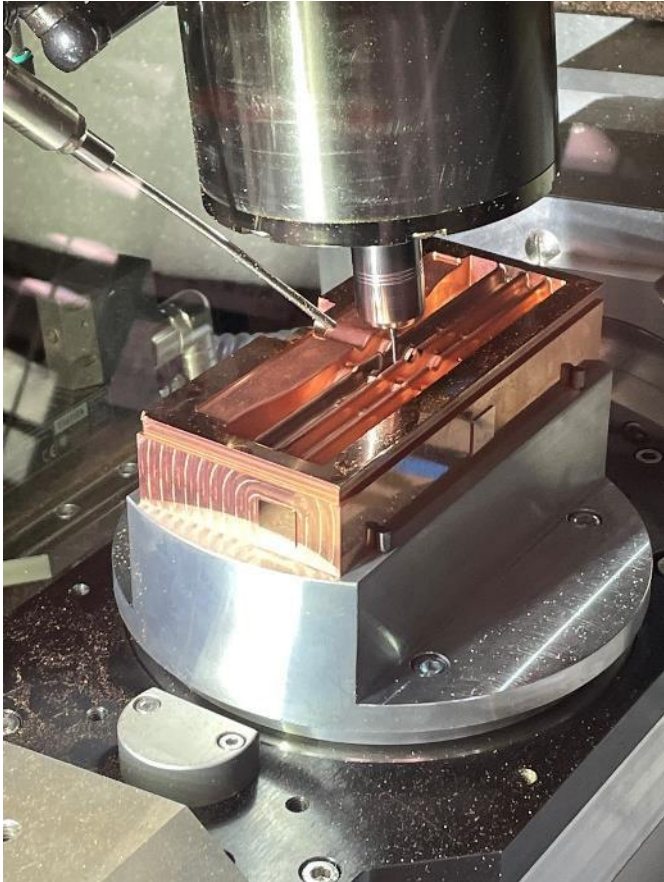
T26 structure in two halves



- Reduced dimension mock-up
- Test machinability and welding techniques

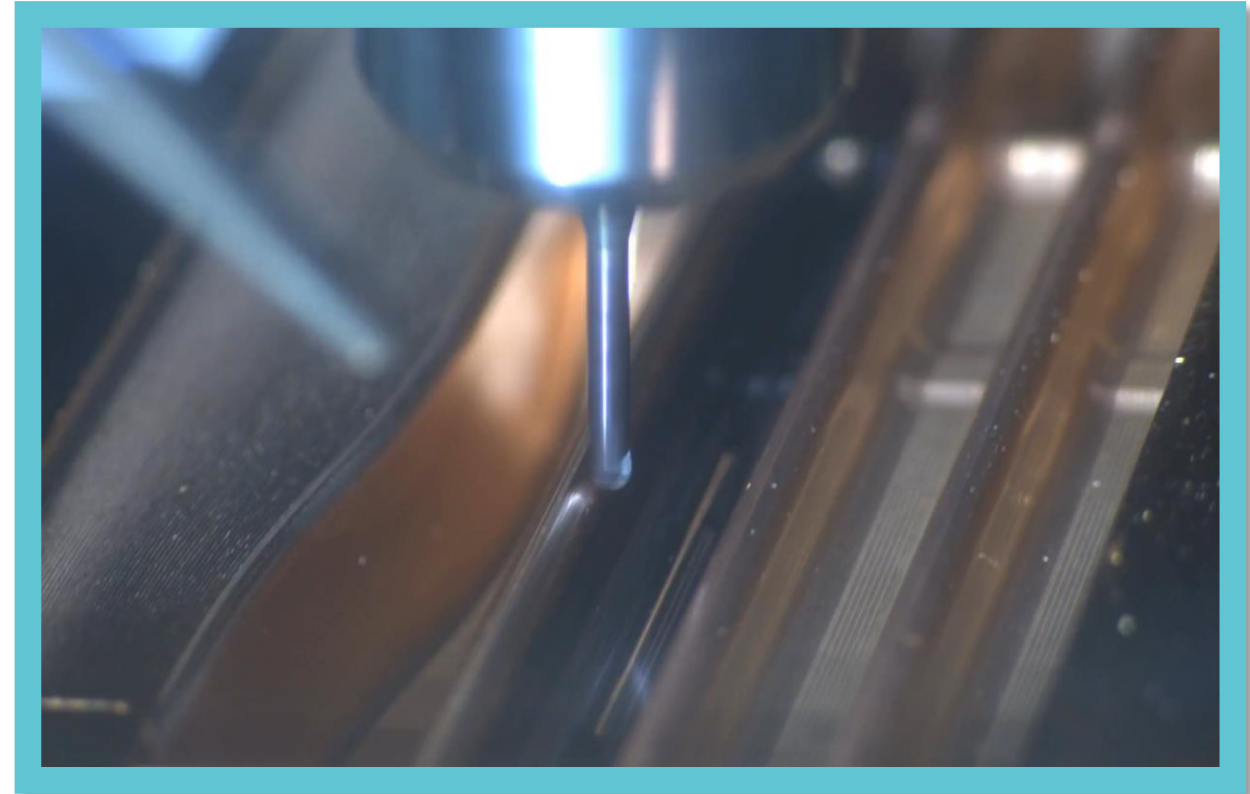


Halves TD26 structure - LT-Ultra process



Halves TD26 structure – Lessons learnt

- Before the results of welding and leak testing, we can say that the machining of this small mock-up has been a great exercise to test the capabilities of the industry on this kind of complex machining.
- With the current state of the art in UP-Machining a larger structure will require some attention and maybe some re-design since the parts will be heavier and longer.
- Apart from being a big part, difficult to get tolerances and alignment, there is a risk intrinsic to machining such a large part.



Halves TD26 structure - Reception assembly

Pictures with the pre-assembly to check that everything was correct upon reception.

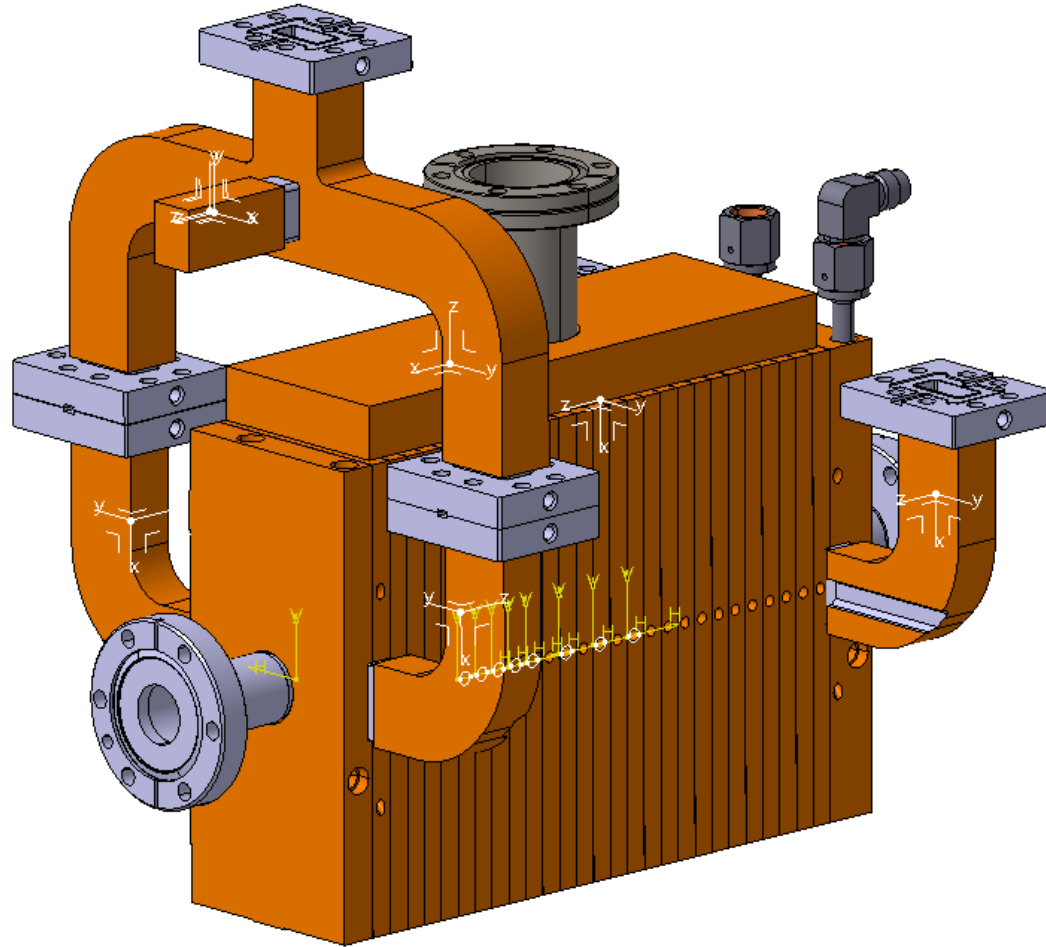


The final assembly will be done using EBW technology.
Managed directly by the MW.
We expect to have new results by the end of May.

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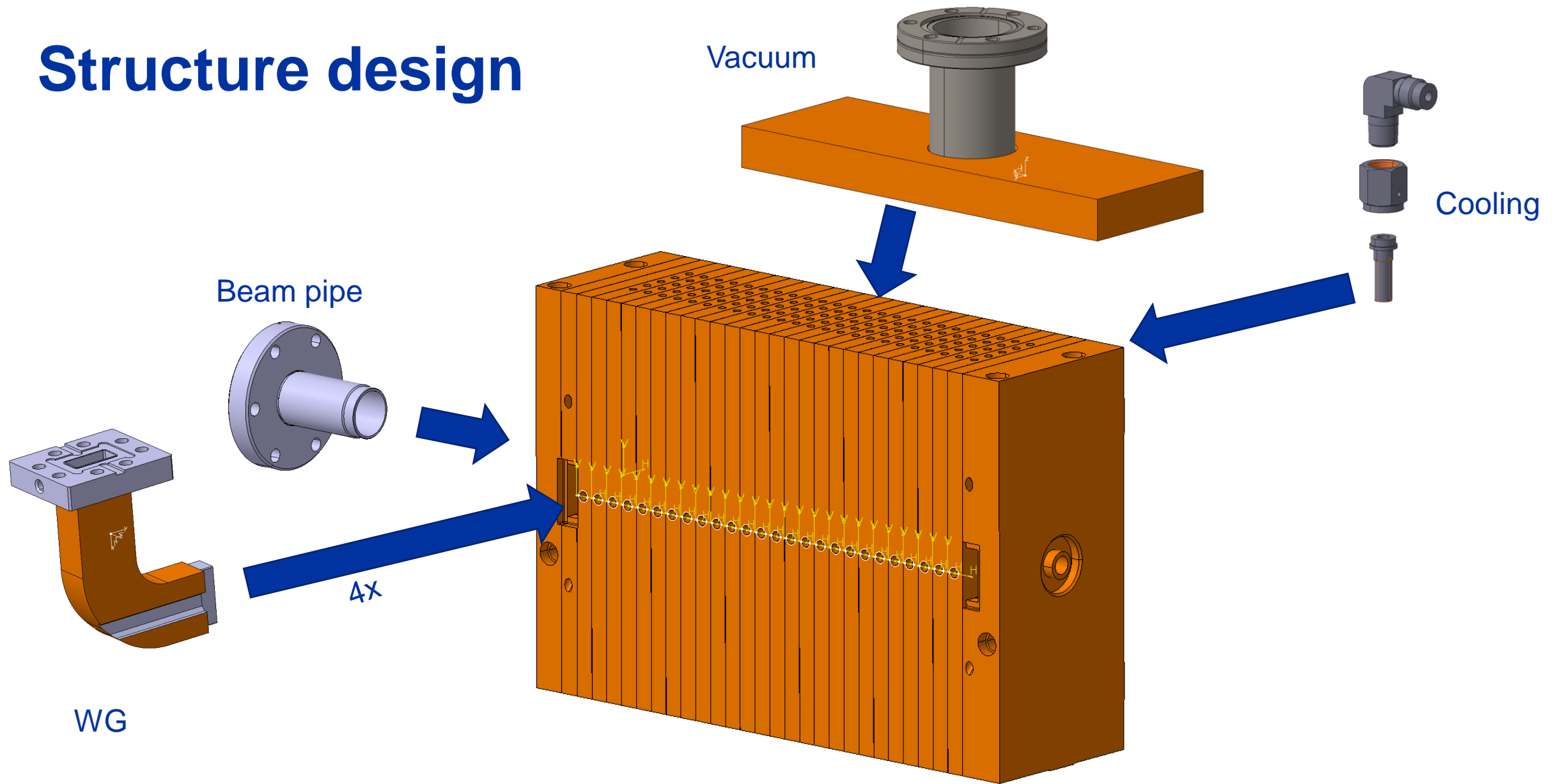
Structure design



Almost all components and geometries have remained frozen since last October when we launched the new mock-up fabrication.

The final design of the structure after the mock-up completion can be ready in 6 to 8 weeks.

Structure design



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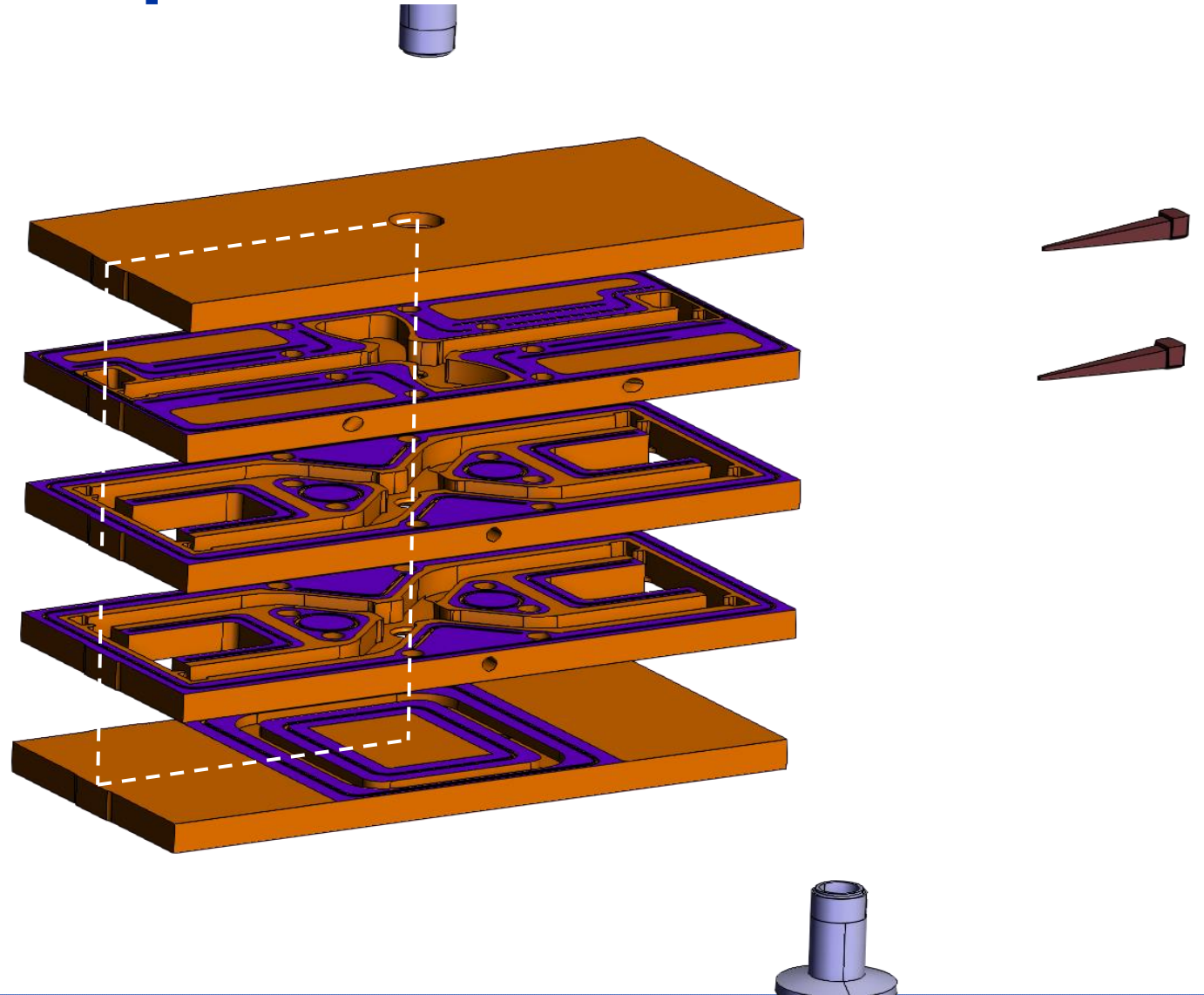
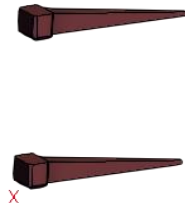
Brazing Mock-up – recap

We did already a mock-up previous to this one.

More details about it at this meeting last year:

<https://indi.to/zB6GH>

This new brazing test will be done using UP – machining on the production.



Brazing Mock-up

40 **Prototype update**
After investigating the problem, from the last prototype we have updated the mock-up with some features:
- Reducing the bending radius.
- Showing the correct material for each section.
- Clearing the bending path to the MP zone.
- Stop at the end of the section.

41 **Prototype update**
Regular coil

42 **Prototype update**
Regular coil
This change allows us to enter the groove around the bending radius.

43 **Prototype update**
Mixing coil
- Reducing the bending radius.
- Showing the correct material for each section.
- Reducing the bending path to the MP zone.
- Stop at the end of the section.

44 **Prototype update**
Mixing coil
This change allows us to enter the groove around the bending radius.

45 **Prototype update**
Coil design
- Reducing the bending radius.
- Showing the correct material for each section.
- Reducing the bending path to the MP zone.
- Stop at the end of the section.

46 **Prototype update**
Coil design
- Reducing the bending radius.
- Showing the correct material for each section.
- Reducing the bending path to the MP zone.
- Stop at the end of the section.

47 **Prototype update**
If we are going to go with two different materials, are we going to implement two different grooves?
If yes, are we going to increase the amount of material in the gold case (0.42mm) and reduce the amount in the silver case (0.42mm)?
Are we going to do two different 2D/3D groove layouts for each material?

48 **Prototype update**
After last meeting discussion I have tried to implement all proposals.
- Reducing the bending radius.
- Showing the correct material for each section.
- Reducing the bending path to the MP zone.
- Stop at the end of the section.

49 **Prototype update**
After last meeting discussion I have tried to implement all proposals.
- Reducing the bending radius.
- Showing the correct material for each section.
- Reducing the bending path to the MP zone.
- Stop at the end of the section.

50 **Prototype update**
Important to know there are going to be two different designs, one for gold and other for silver.
In each a very fine can understand the behaviour of each material with the proper conditions for each one.
Ratio always above 2
Curve: 180° and 180° with 2mm

51 **Prototype update**
Coil design
- Reducing the bending radius.
- Showing the correct material for each section.
- Reducing the bending path to the MP zone.
- Stop at the end of the section.

52 **Prototype update**
Coil design
- Reducing the bending radius.
- Showing the correct material for each section.
- Reducing the bending path to the MP zone.
- Stop at the end of the section.

53 **Prototype update**
After checking the design with the team, we decide to implement some new features in the prototype.
- Reducing the bending radius.
- Showing the correct material for each section.
- Reducing the bending path to the MP zone.
- Stop at the end of the section.

54 **Prototype update**
After checking the design with the team, we decide to implement some new features in the prototype.
- Reducing the bending radius.
- Showing the correct material for each section.
- Reducing the bending path to the MP zone.
- Stop at the end of the section.

55 **Prototype update**
Coil design
- Reducing the bending radius.
- Showing the correct material for each section.
- Reducing the bending path to the MP zone.
- Stop at the end of the section.

56 **Prototype update**
Coil design
- Reducing the bending radius.
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- Reducing the bending path to the MP zone.
- Stop at the end of the section.

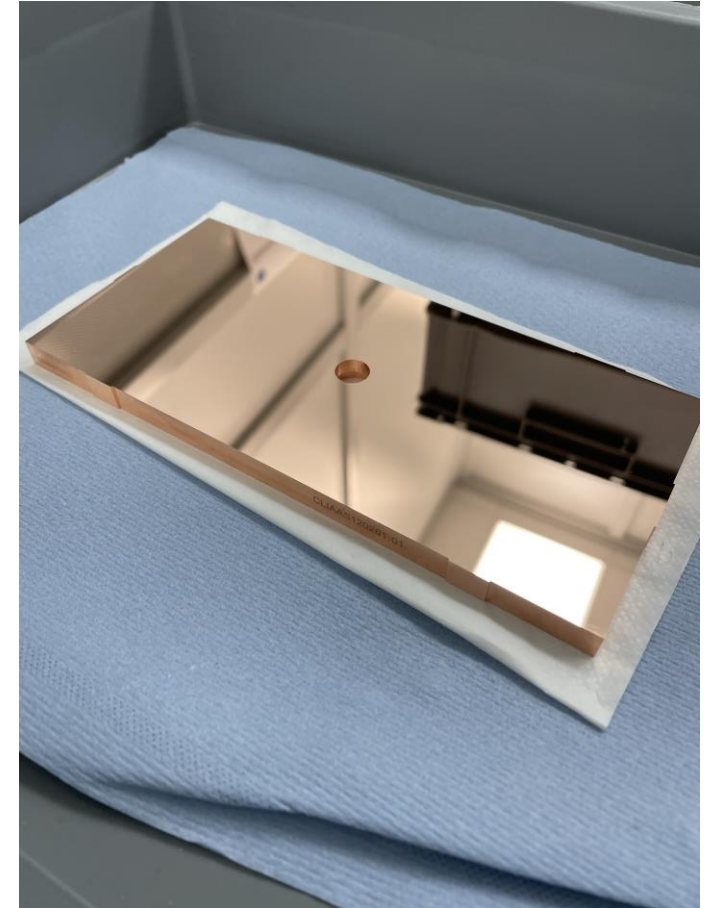
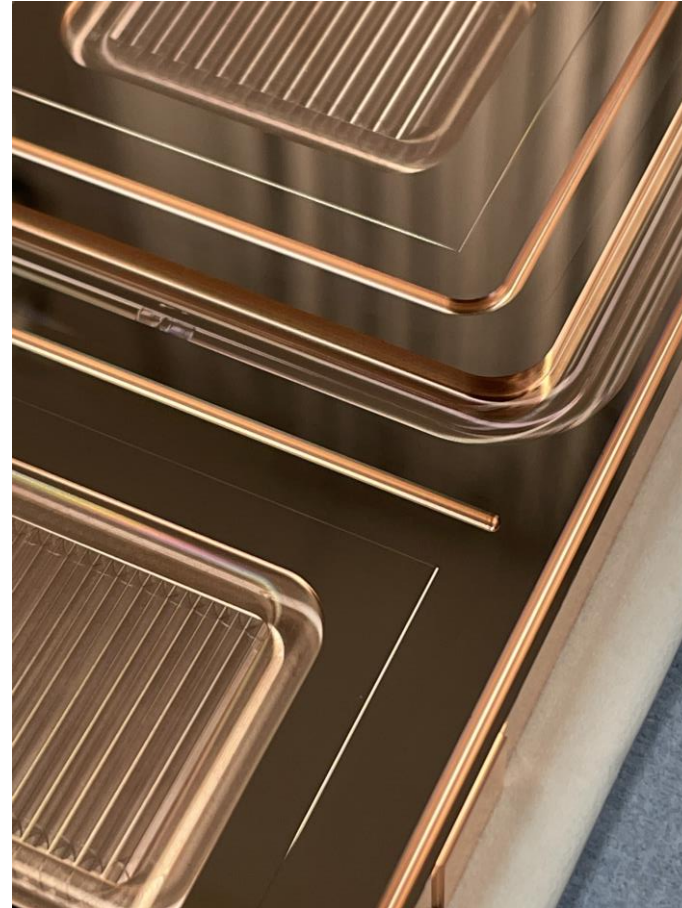
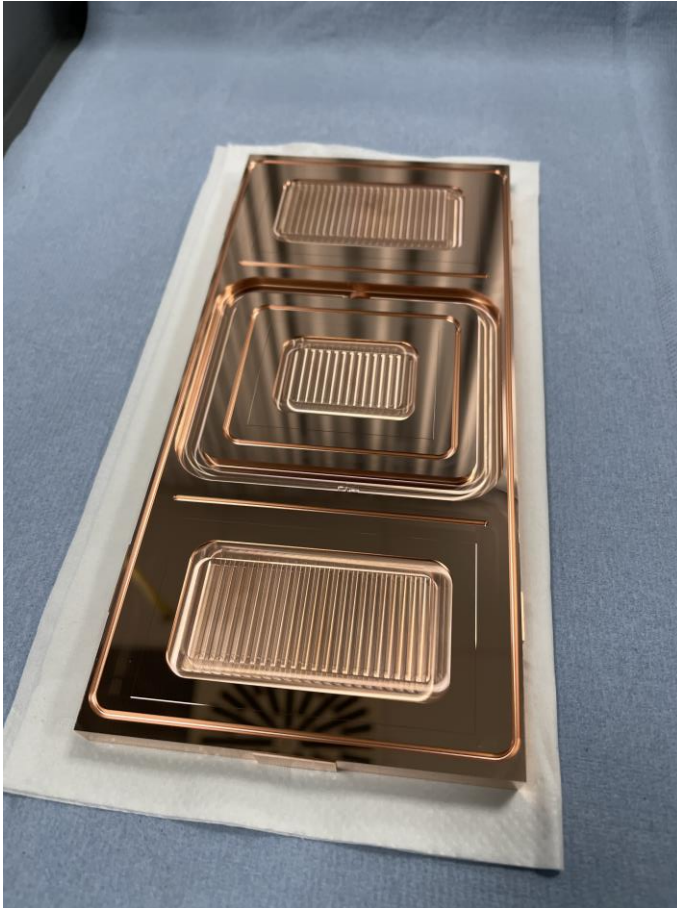
57 **Prototype update**
Coil design
- Reducing the bending radius.
- Showing the correct material for each section.
- Reducing the bending path to the MP zone.
- Stop at the end of the section.

58 **Prototype update**
Coil design
- Reducing the bending radius.
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59 **Prototype update**
Coil design
- Reducing the bending radius.
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60 **Prototype update**
Coil design
- Reducing the bending radius.
- Showing the correct material for each section.
- Reducing the bending path to the MP zone.
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Brazing Mock-up

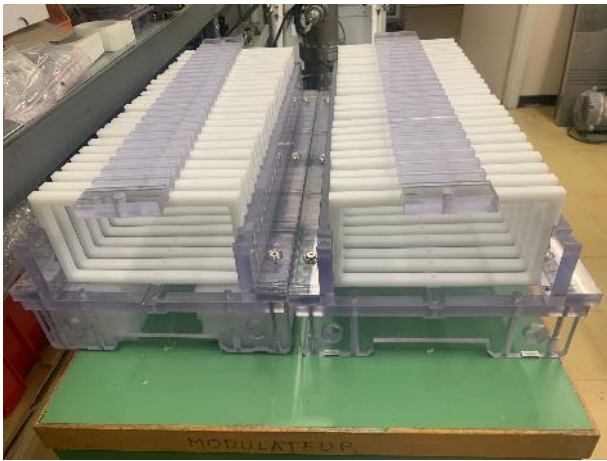


- Pre-machining done at CERN by MME, metrology ok and sent to UP-Machining
- First 8 cells completely finish and the next 12
- We expect to receive the parts here after UP machining by the beginning of June.

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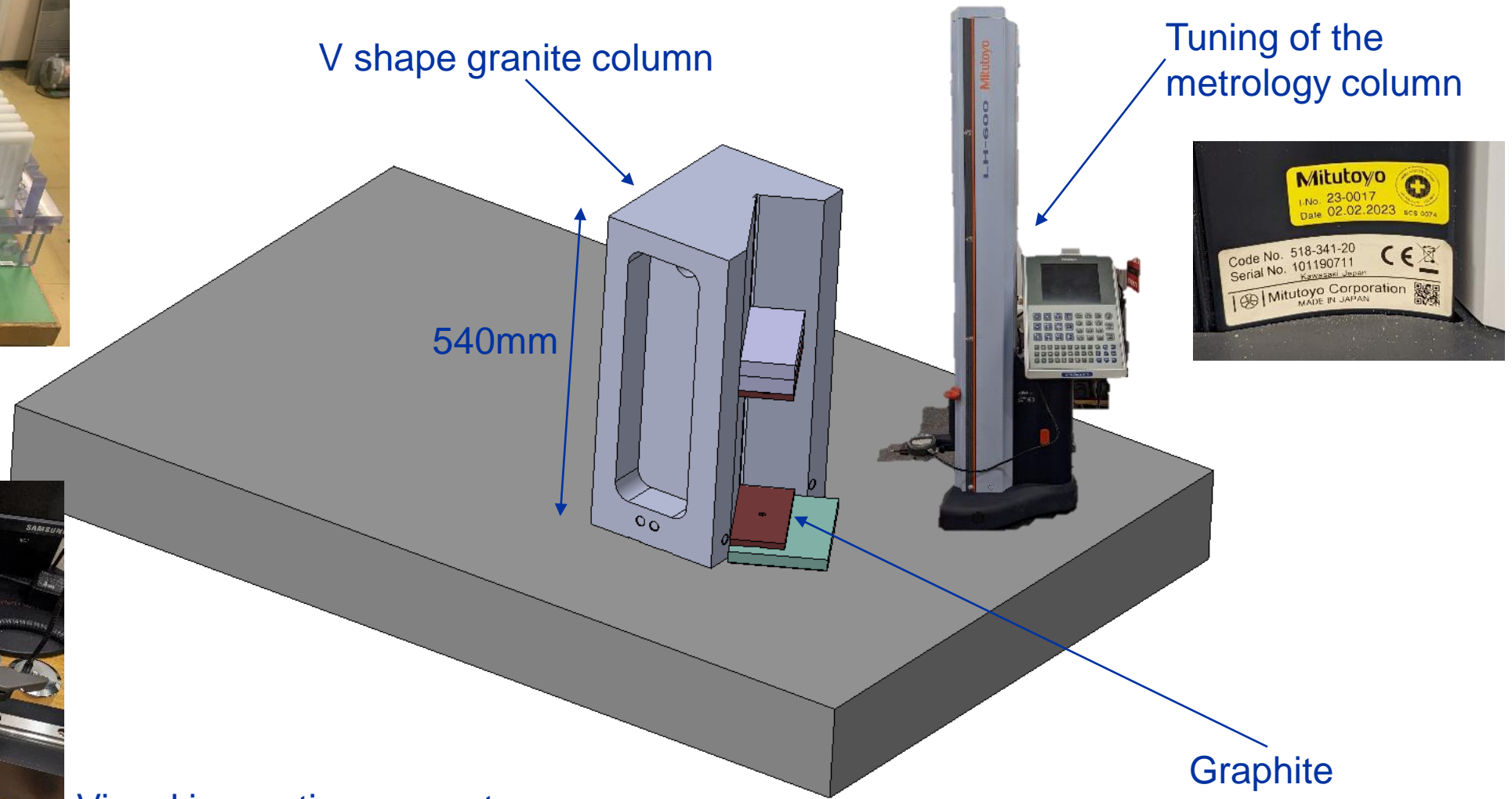
Tooling for the assembly – From circle to rectangle



Transporting and cleaning racks



Visual inspection supports



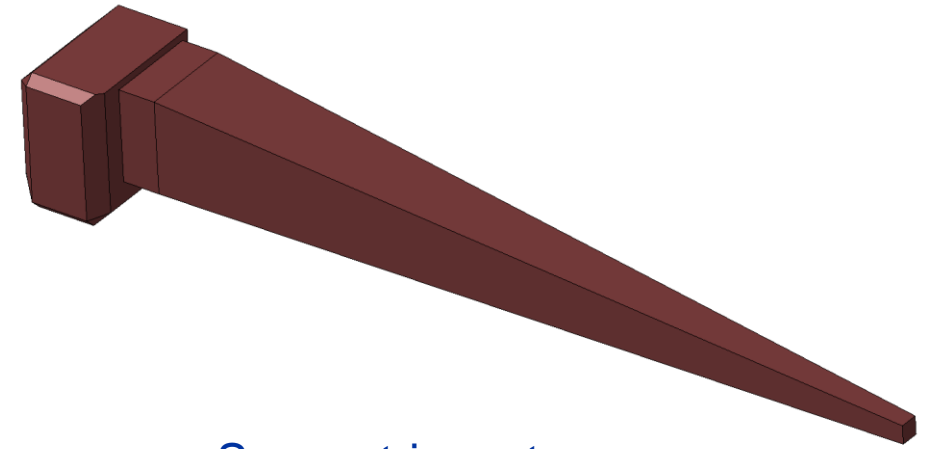
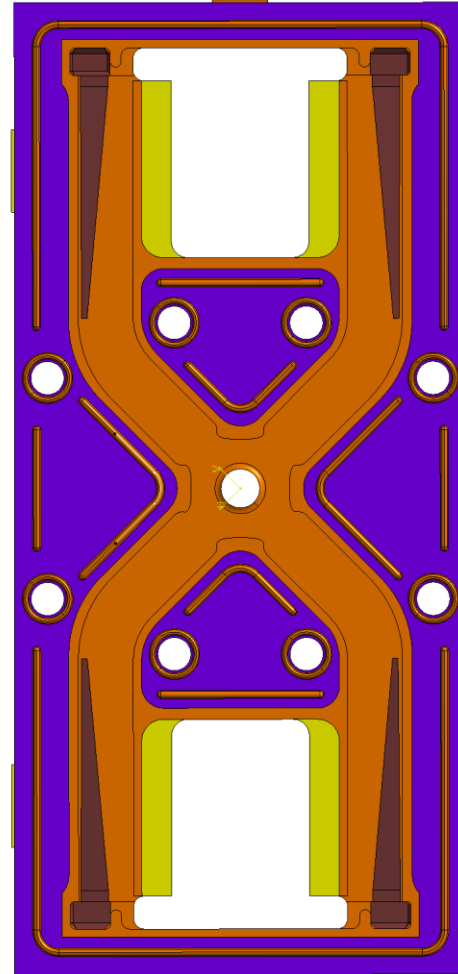
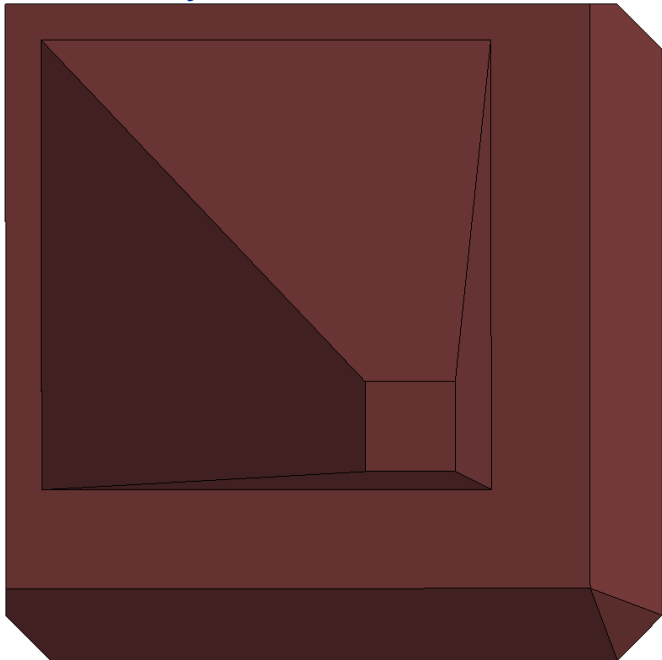
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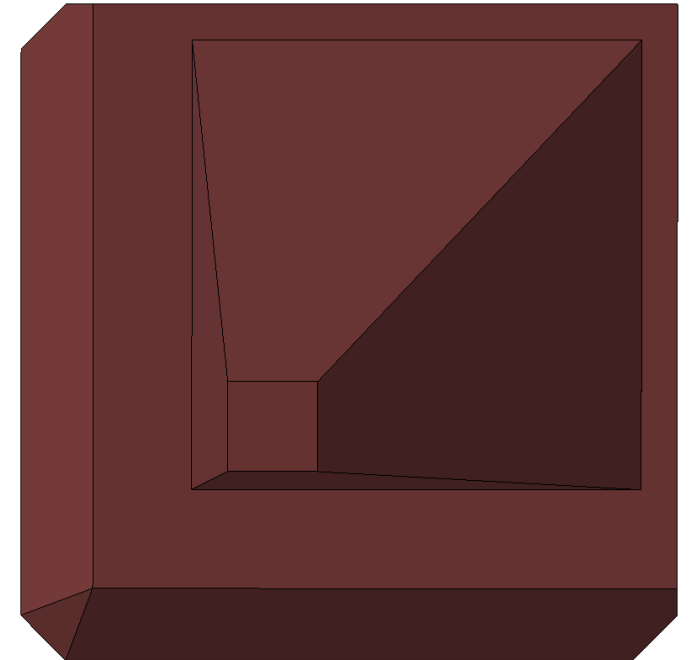
SiC Loads

This part turned out to be very expensive because of different factors.

- Material
- Head
- Body

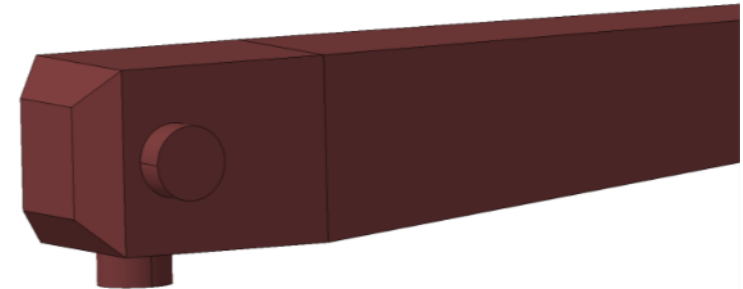
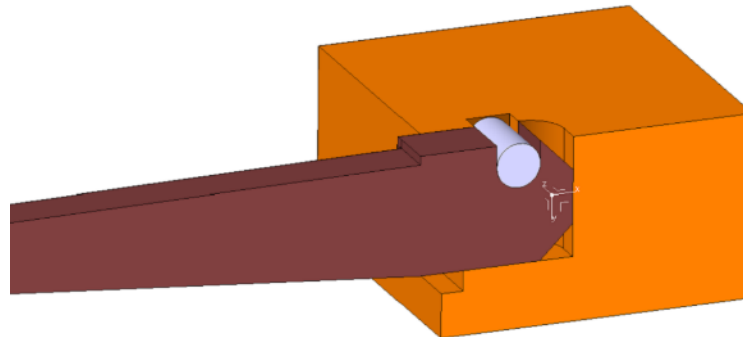
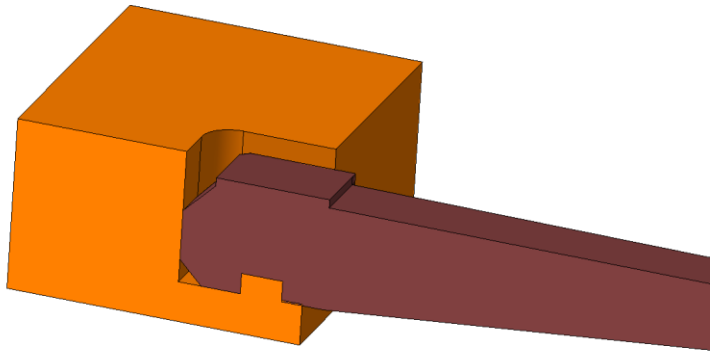
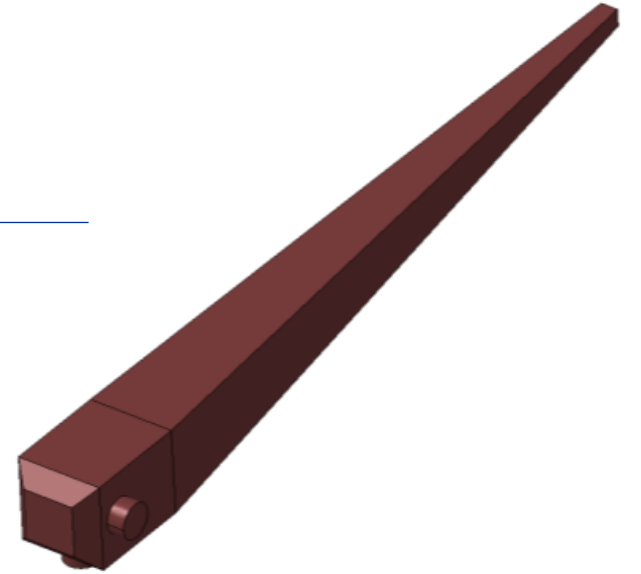
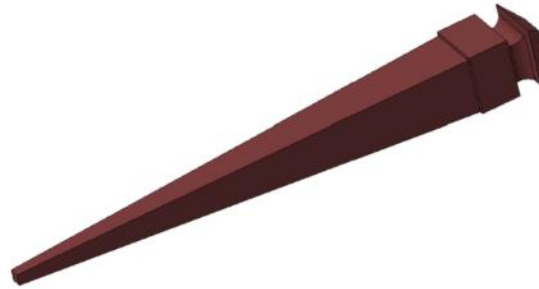
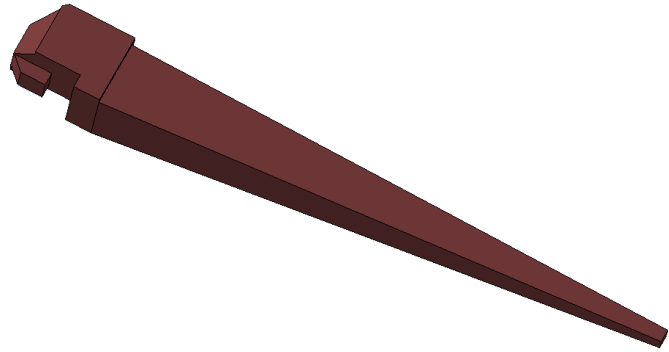


Symmetric part



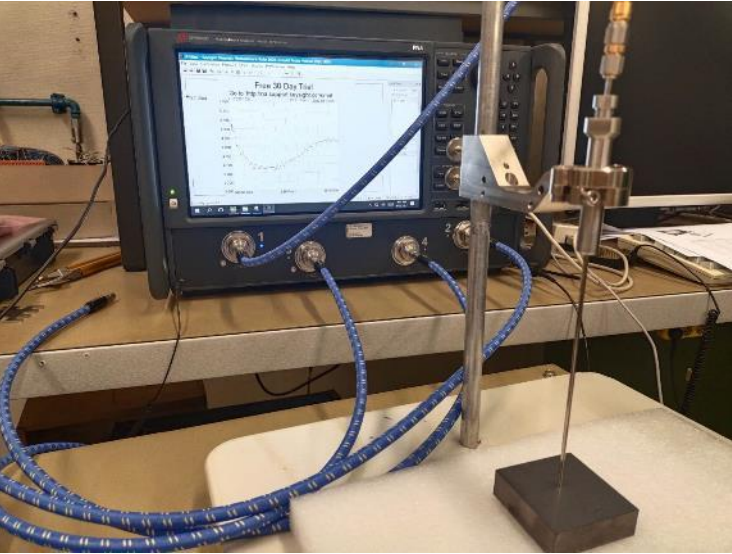
SiC Loads - Alternatives

No changes in price



SiC Loads – Material problem

Detected a lack of consistency in the SiC materials used up to now. One of the most commonly used Ekasic P changed some of the components



#	Description
1	Performance probe
2	Performance probe short

Characteristic of the material we need are not commonly provided by the industry

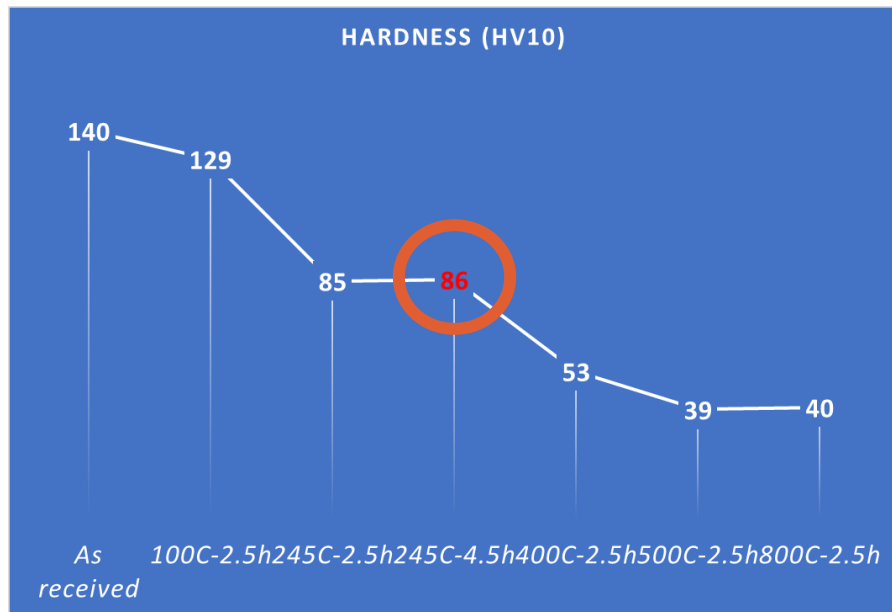


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Copper characterization – From 3D forged to what?

Our current cycle. 245C – 4,5h
from laminated copper.

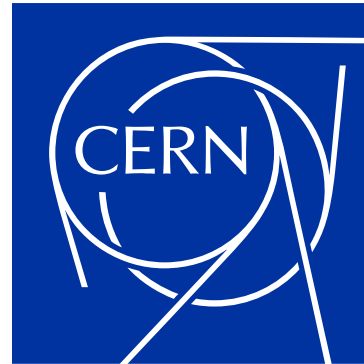


We will test 3 more options + the previous.
Exactly same design of the Matching cell

- Laminated Cu 245C – 4.5h
- Laminated Cu 500C – 2h
- 3D forged Cu 245C – 4,5h
- 3D forged Cu 500C – 2h



Thanks Ana Teresa and the team from materials, for the work here



Band
Prototypes
Production

Thank you for your attention and do not hesitate to ask any question.

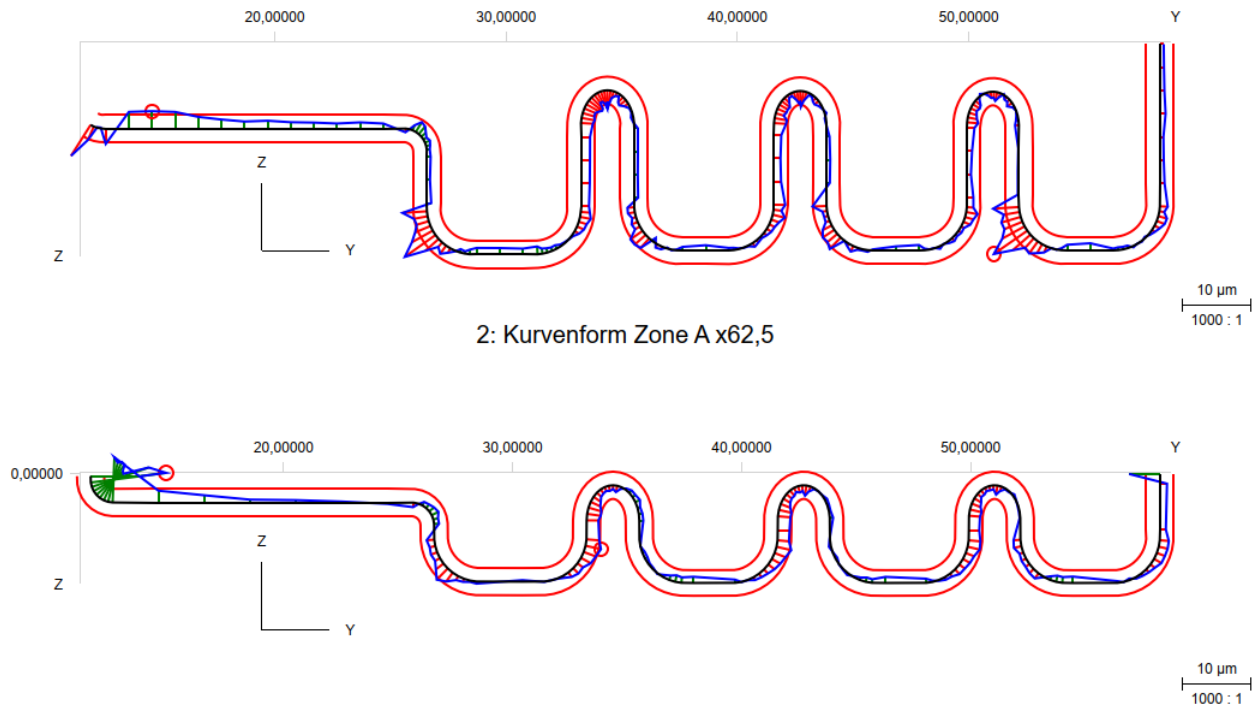
Thanks to Nuria Catalan Laseras and all the team for the help on the presentation and the pictures.

home.cern

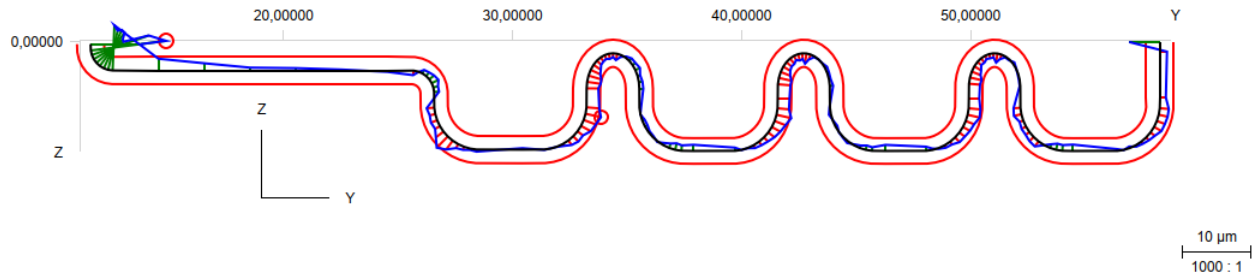
LT-Ultra Repeatability

T3

1: Kurvenform Zone A x73,5

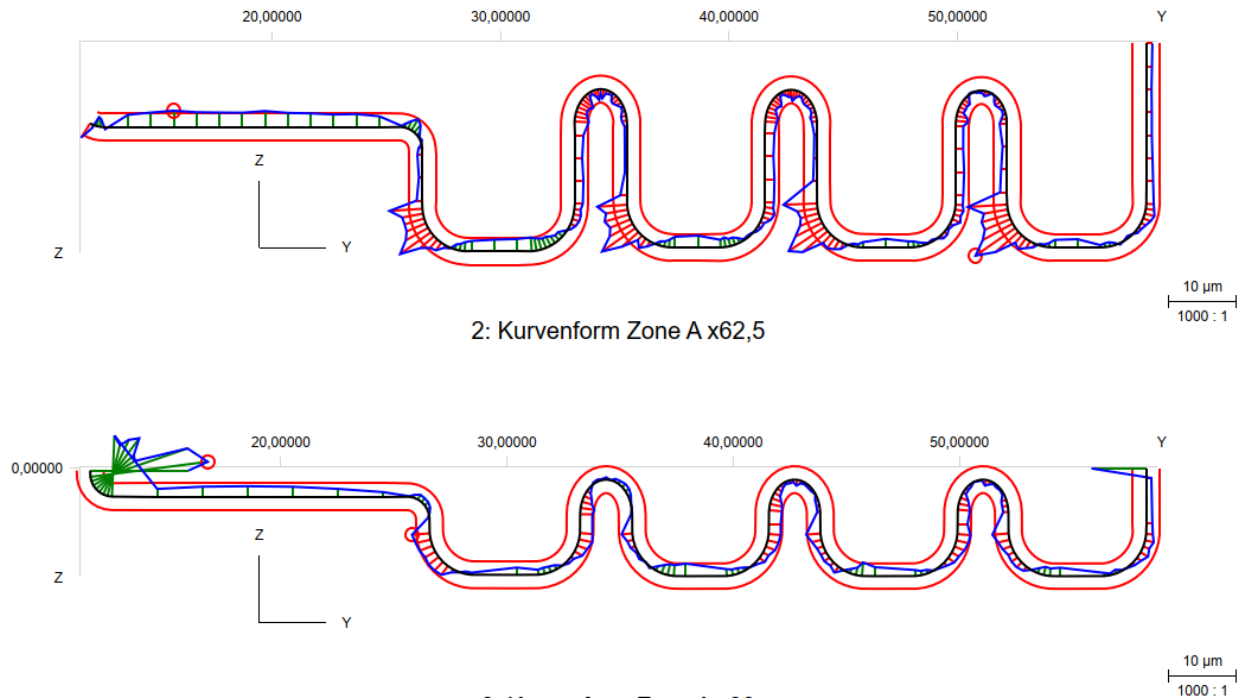


2: Kurvenform Zone A x62,5

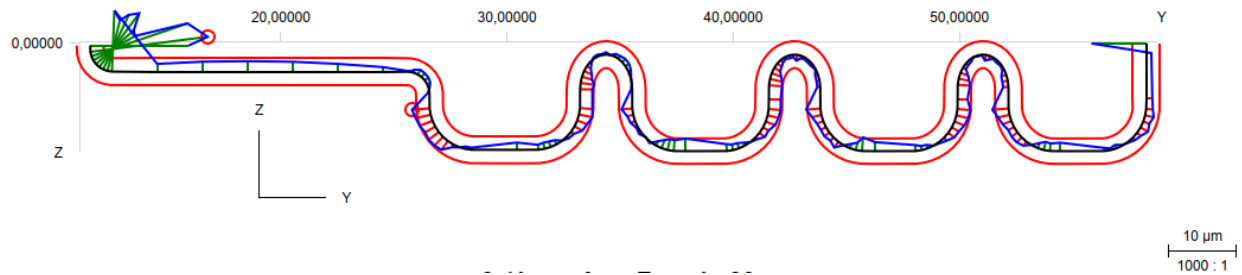


T4

1: Kurvenform Zone A x73,5



2: Kurvenform Zone A x62,5



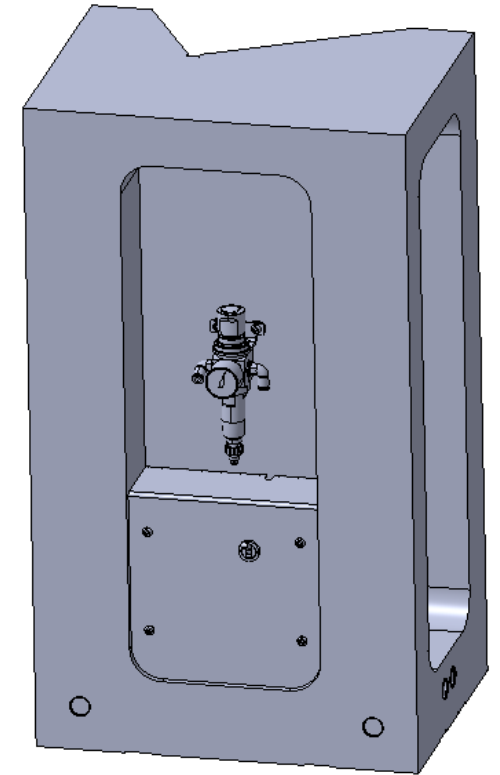
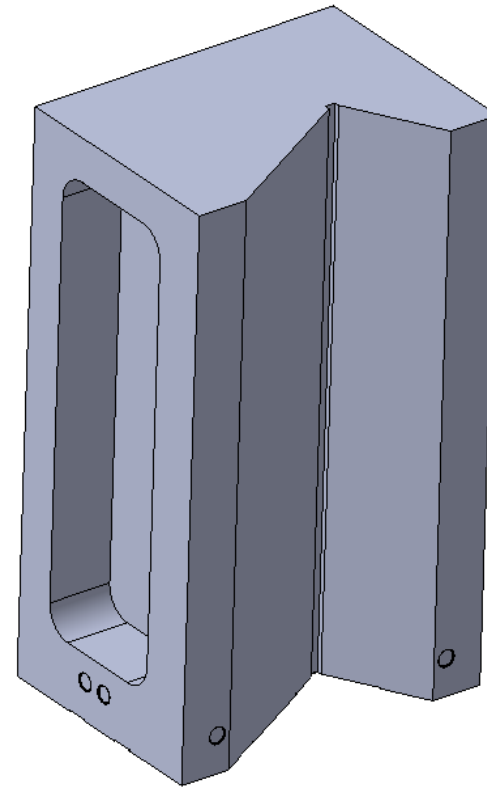
Tooling for the assembly



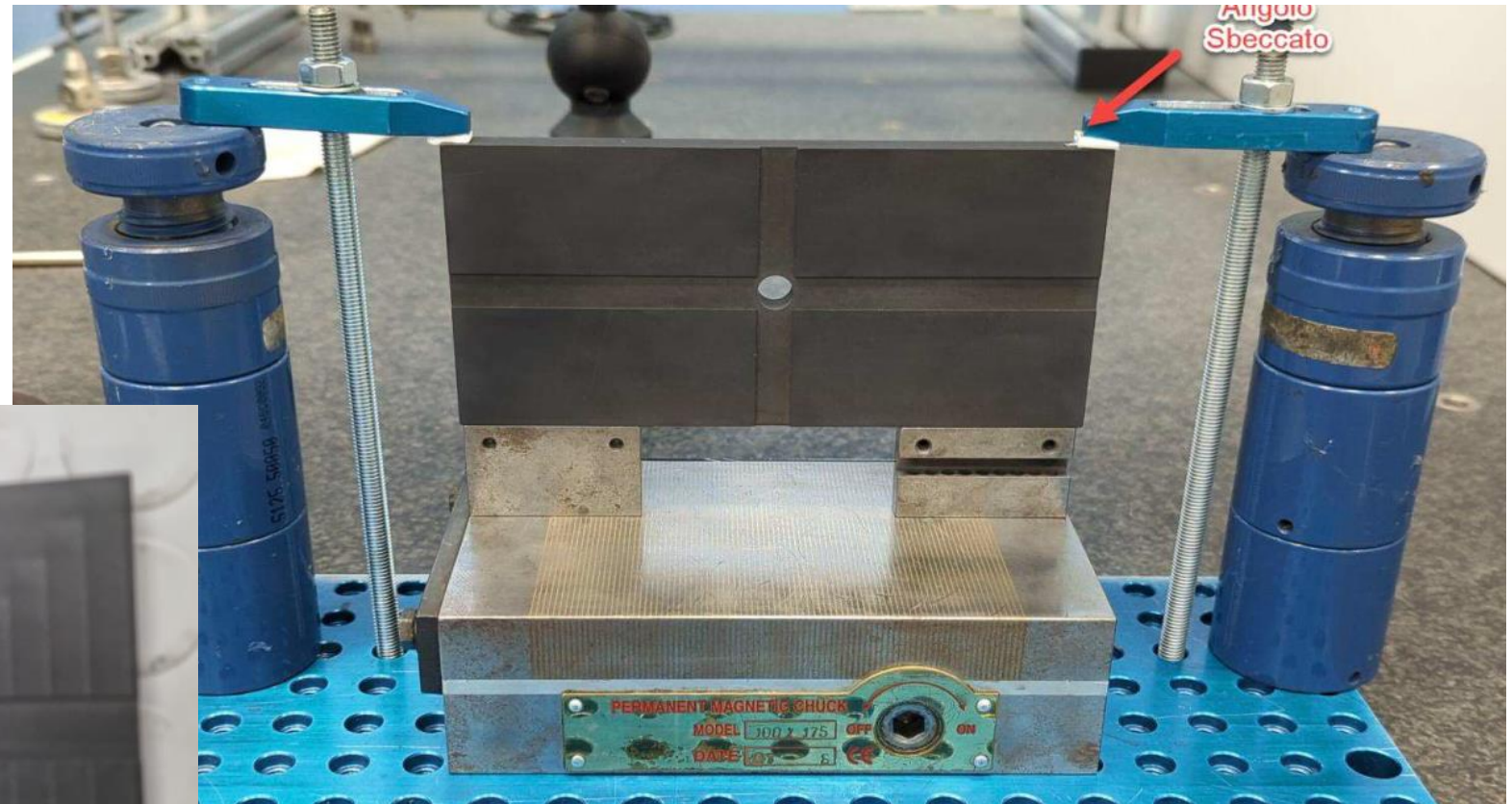
Air bearing system to move it easily.

Weight 58kg

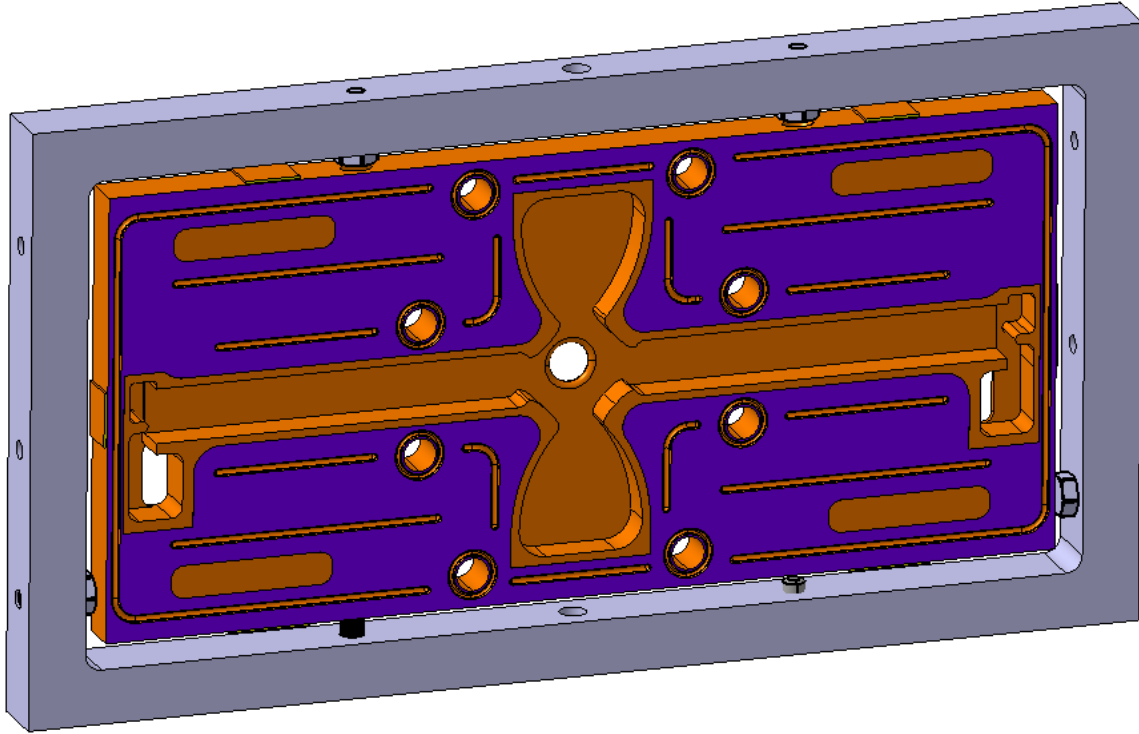
Adapting our air system to this with filters and some extensions



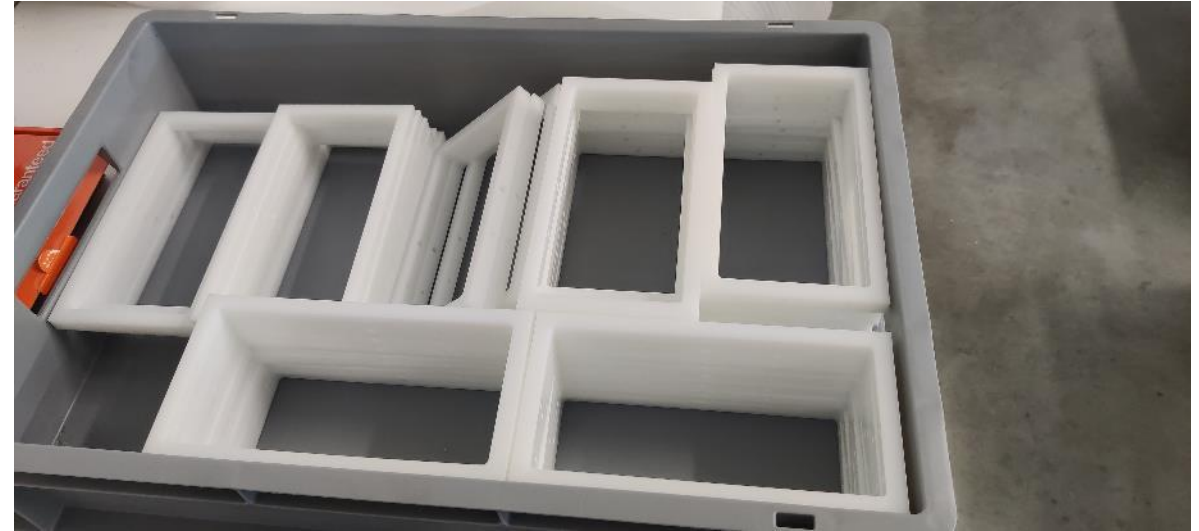
Tooling for the assembly



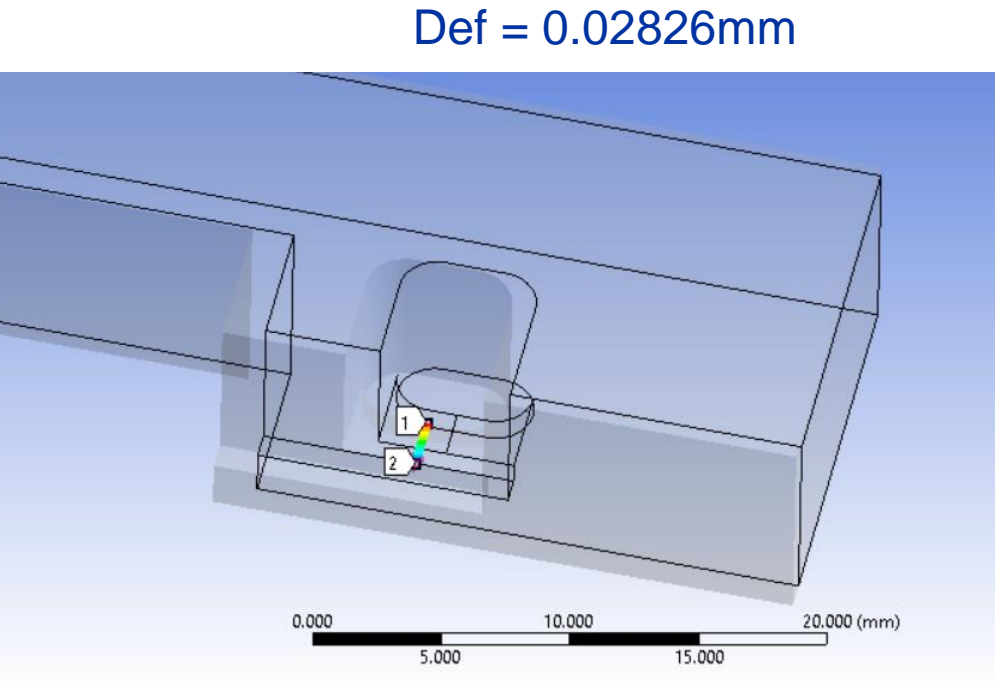
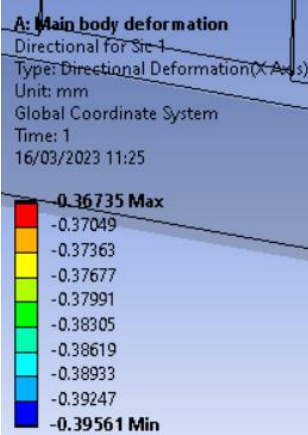
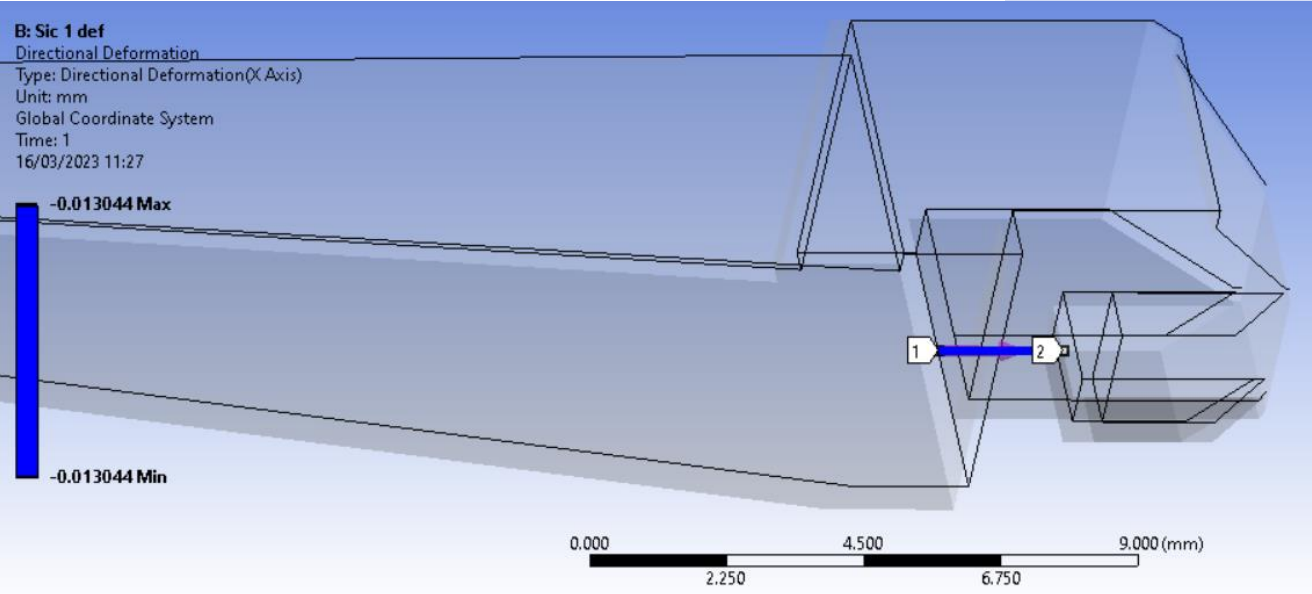
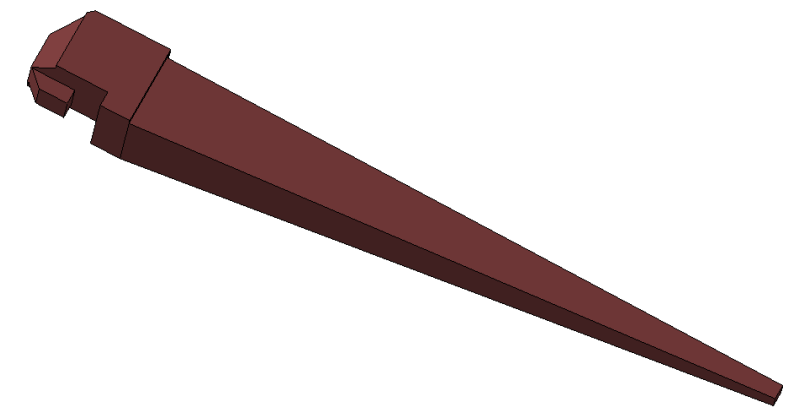
Tooling for the assembly



Compatible with previous frame.
Saving money, resources and time



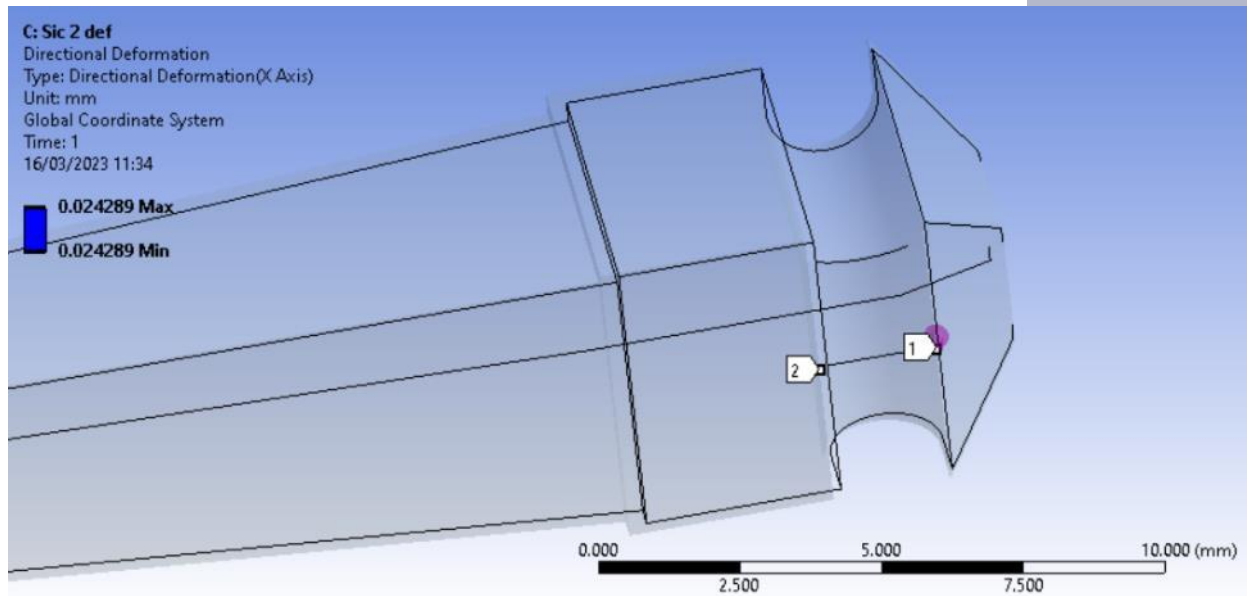
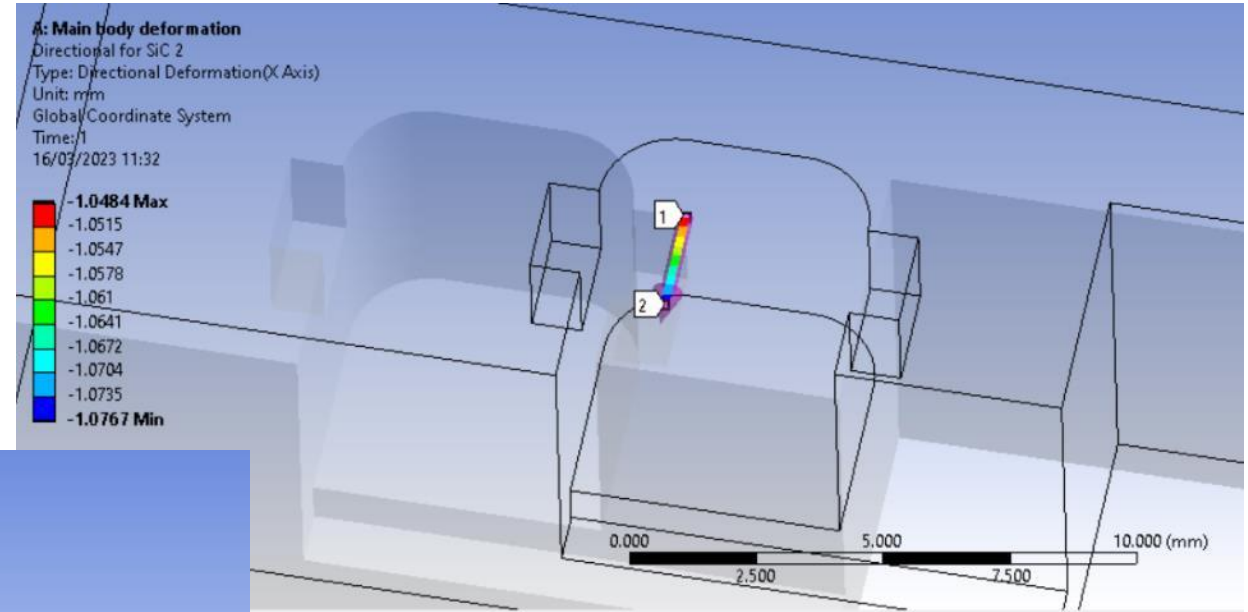
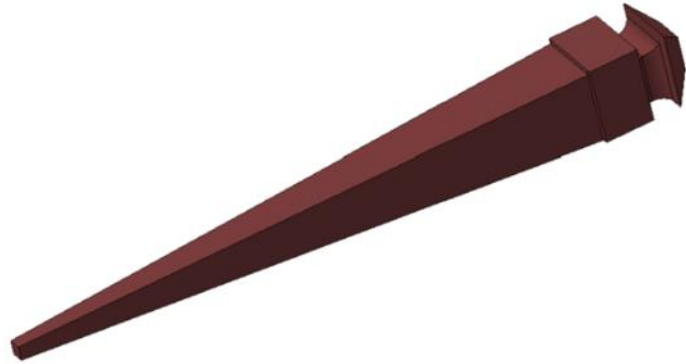
HOM Loads - Alternatives



Def = 0.013044mm

HOM Loads - Alternatives

Def = 0.0283mm



Def = 0.024289mm

Brazing Mock-up

We are now controlling the groove dimensions...

