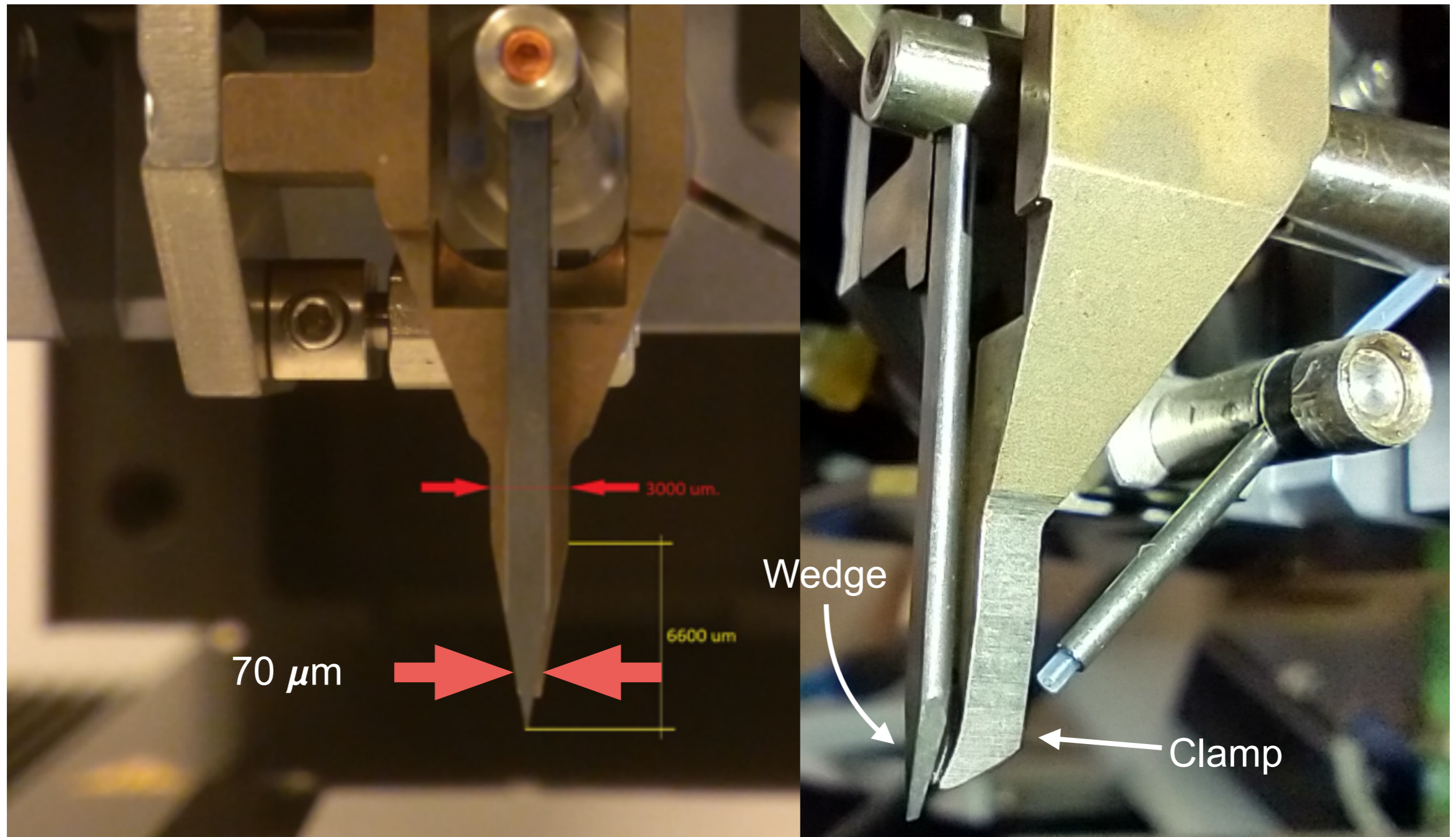


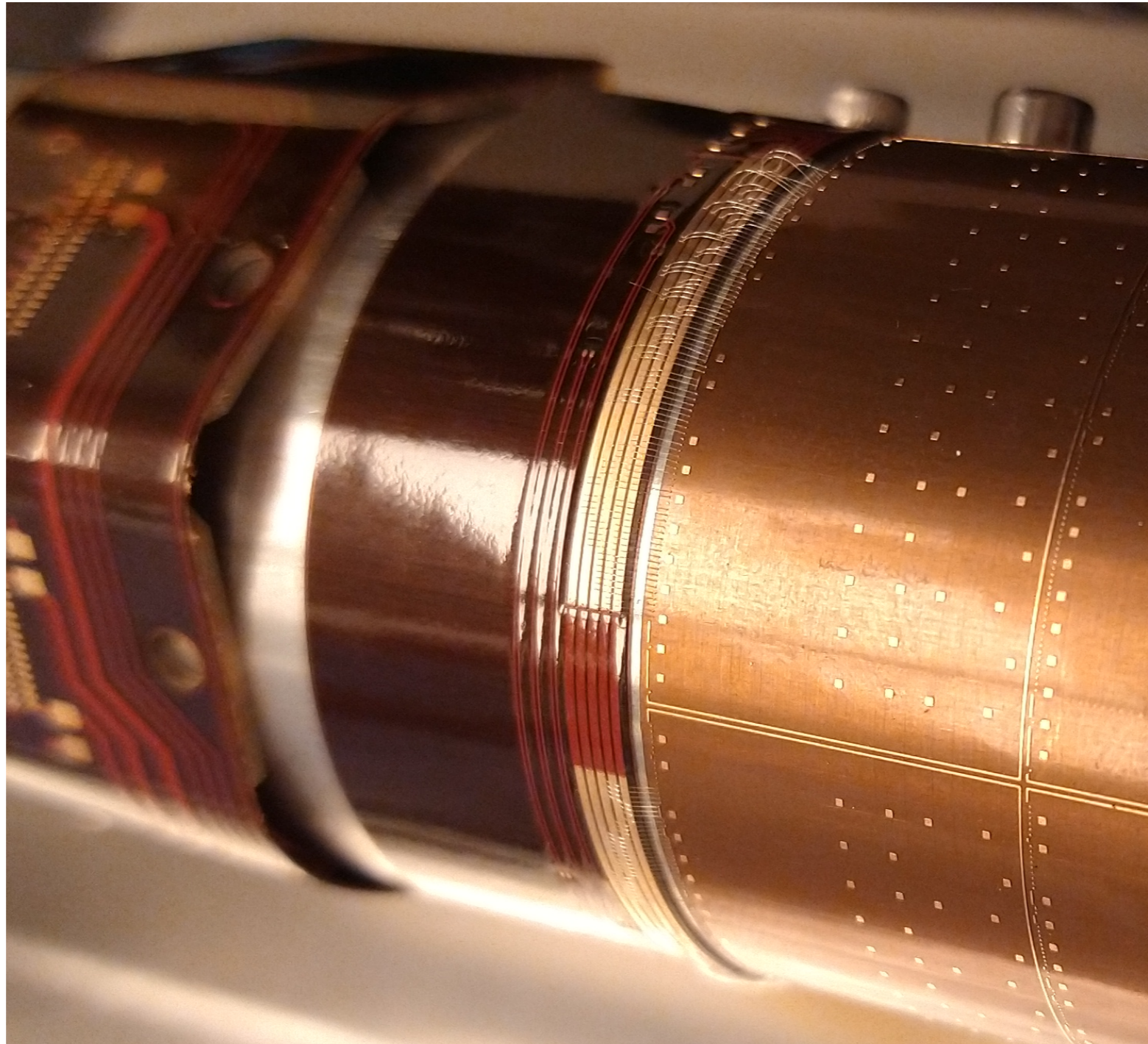


ITS3 activities in Bari

Bonding of the edge FPC



- The limit to the bonding density (distance between two adjacent bonding feet) is limited by the width of the wedge and clamp.
- Usual wedge thickness 100 μm
- In Bari 70 μm (modified for the ITS2 assembly)



- Distance between ALPIDE mini-pads and FPC border: ~ 1 mm
- Distances between FPC border and long pads: $\sim 30 \mu\text{m} - 4$ mm
- Bonds length span between ~ 1 mm - ~ 5 mm

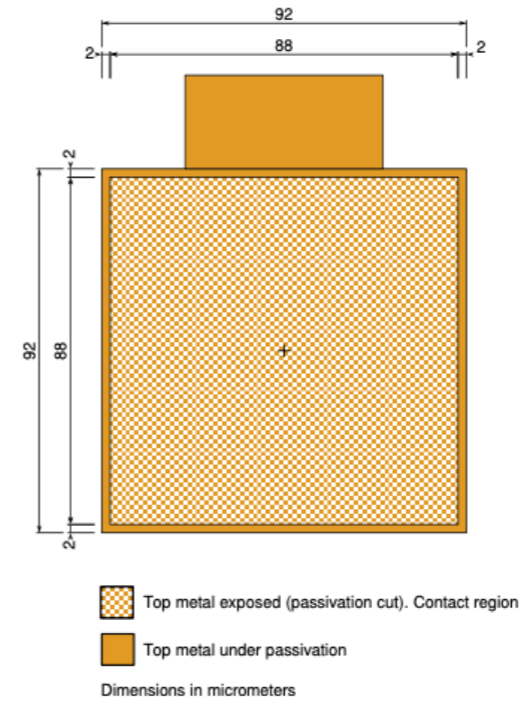
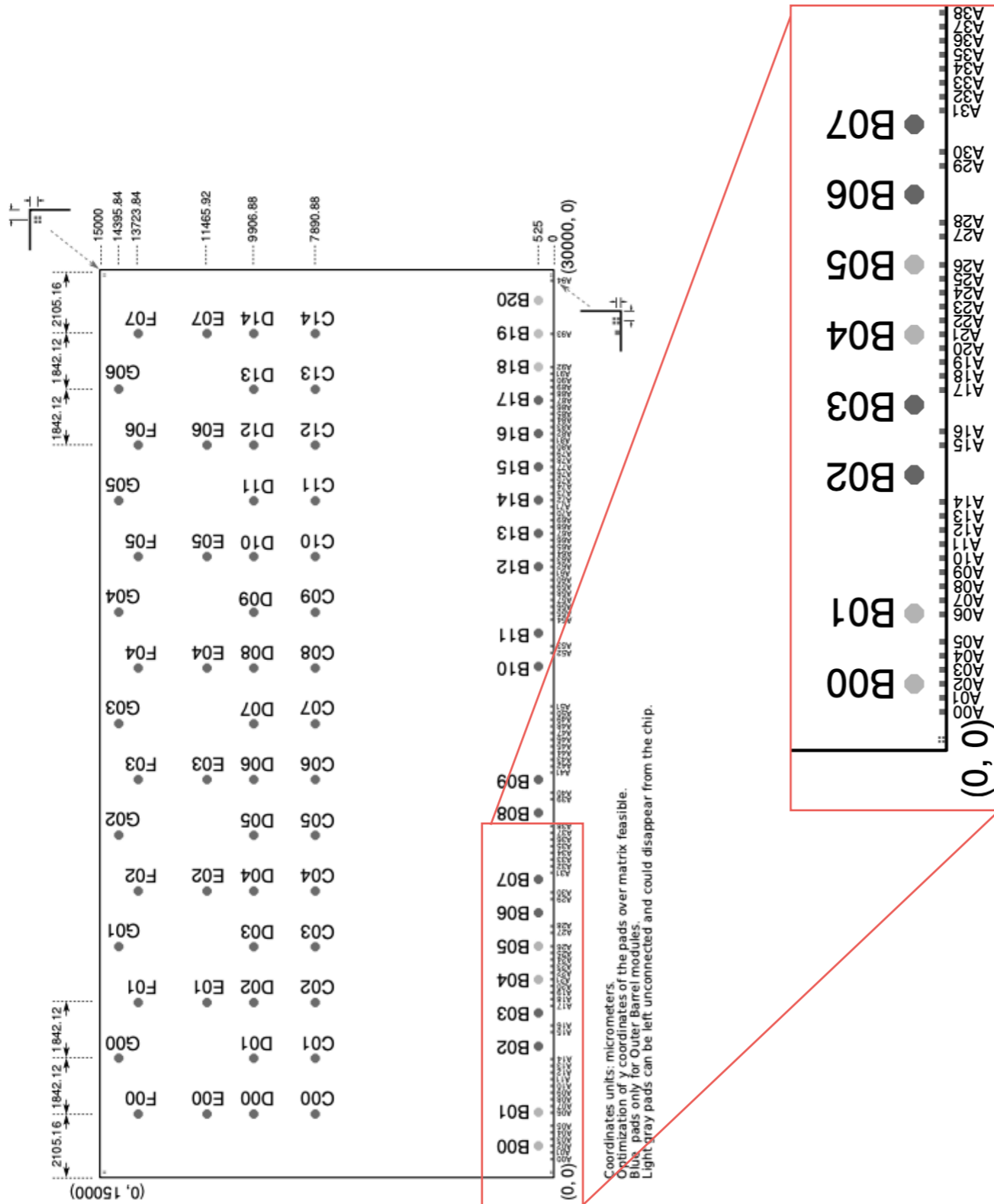
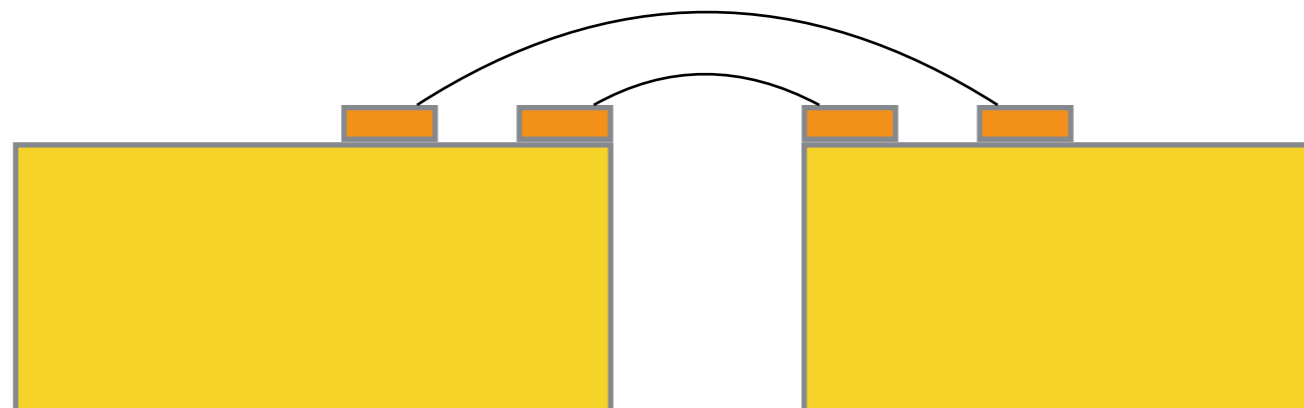


Figure 2.5: Geometry of type A pad.

$\sim 90\mu\text{m} \times 90\mu\text{m}$

Distance between pad center in the denser regions $220\mu\text{m}$

- Pasquale managed to bond at 80 μm distance but it's really at the edge
- Staggered pads could improve bonding density pushing on the bonding height
 - Limitation on the height from bonding strength (pull-force)
- Pads cannot be placed where its is needed to cool down by contact (carbon foam half-ring)





Super-ALPIDE

Super-ALPIDE mockup assembly

Dummy-super-ALPIDE	AVAILABLE	
Exoskeleton (V3)	AVAILABLE	Produced by Roboze
Mandrel (compatible with exo V3)	AVAILABLE	Homemade
Wedges/Longerons/Half-rings	AVAILABLE	Not in carbon-foam but in plastic
Tools for W/L/HR posit./gluing	AVAILABLE	Homemade, design from CERN
Edge-FPC	AVAILABLE	
Exo-FPC (V3)	AVAILABLE	
Exo-FPC gluing procedure/tools	AVAILABLE	

- New exoskeleton expected by Tuesday next week (by Roboze)

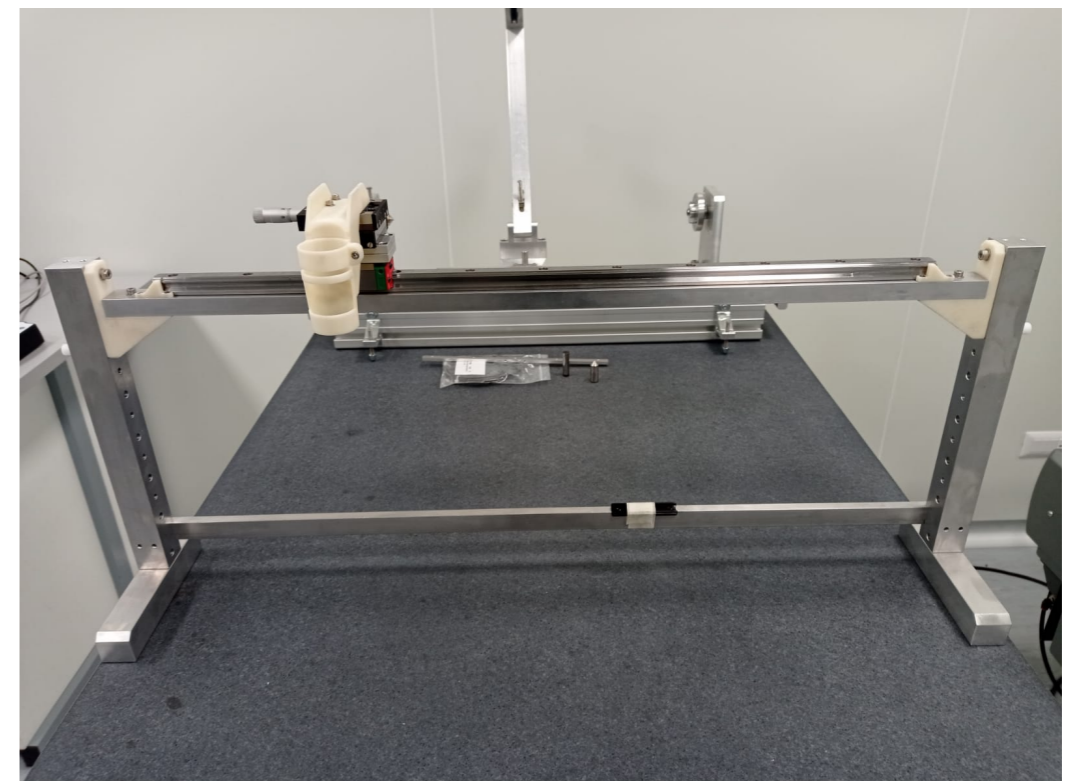
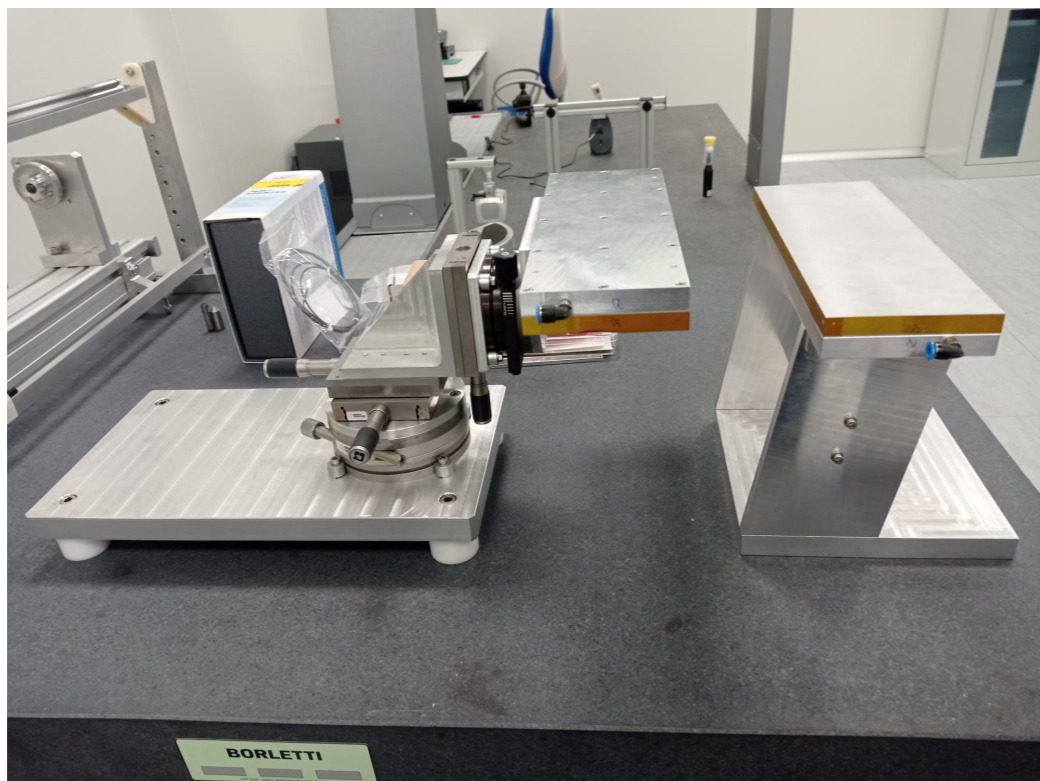
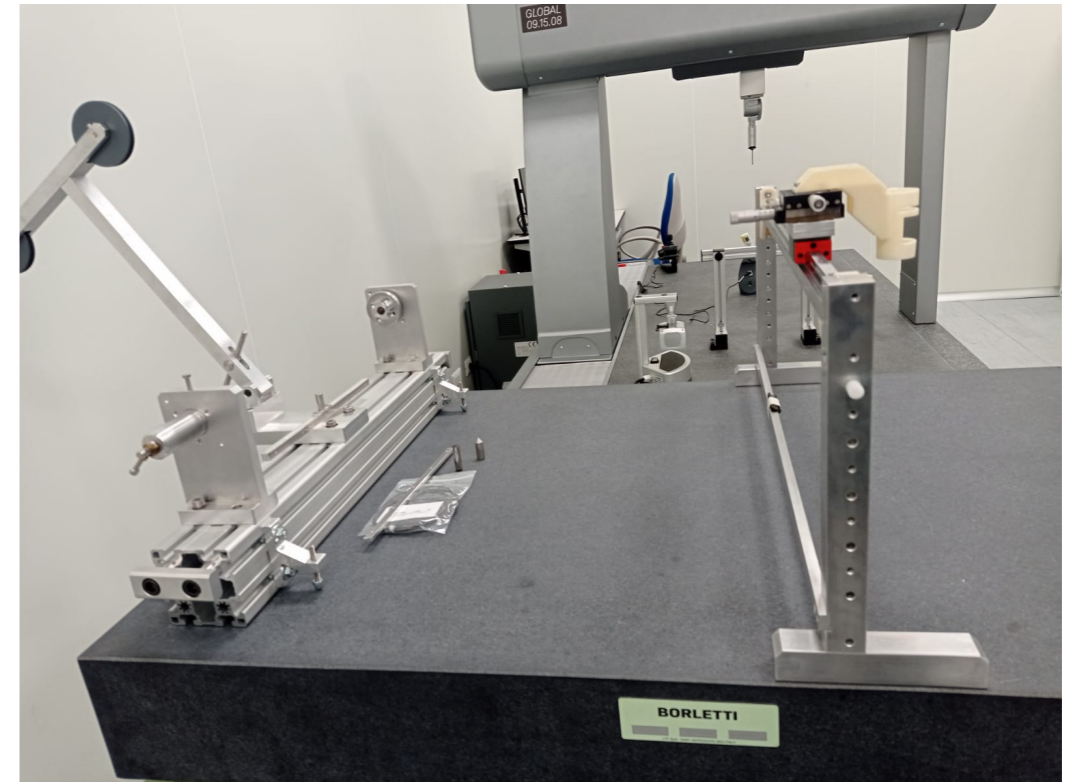


Super-ALPIDE assembly

Super-ALPIDE		Will be shipped from CERN
Exoskeleton (V3)	UNDER PRODUCTION	
Mandrel (compatible with exo V3)	AVAILABLE	
Tools for chip bending	UNDER PRODUCTION	
Large dimension silicon (for test)	AVAILABLE	
Carbon foam for W/L/HR + fleece	UNDER PRODUCTION	At CERN
Tools for W/L/HR posit./gluing	TO BE PARTIALLY RE-PRODUCED	With a longer mandrel some components need re-production
Edge-FPC	AVAILABLE	
Exo-FPC (V2)	AVAILABLE	
Exo-FPC gluing procedure/tools	AVAILABLE	

Bending/bonding tool

- Mandrel support with arm → AVAILABLE
- Micro-camera support → AVAILABLE
- Vacuum tool for chip flip → AVAILABLE
- Bonding machine plane → Under production
- Second rotary motor → Under purchasing

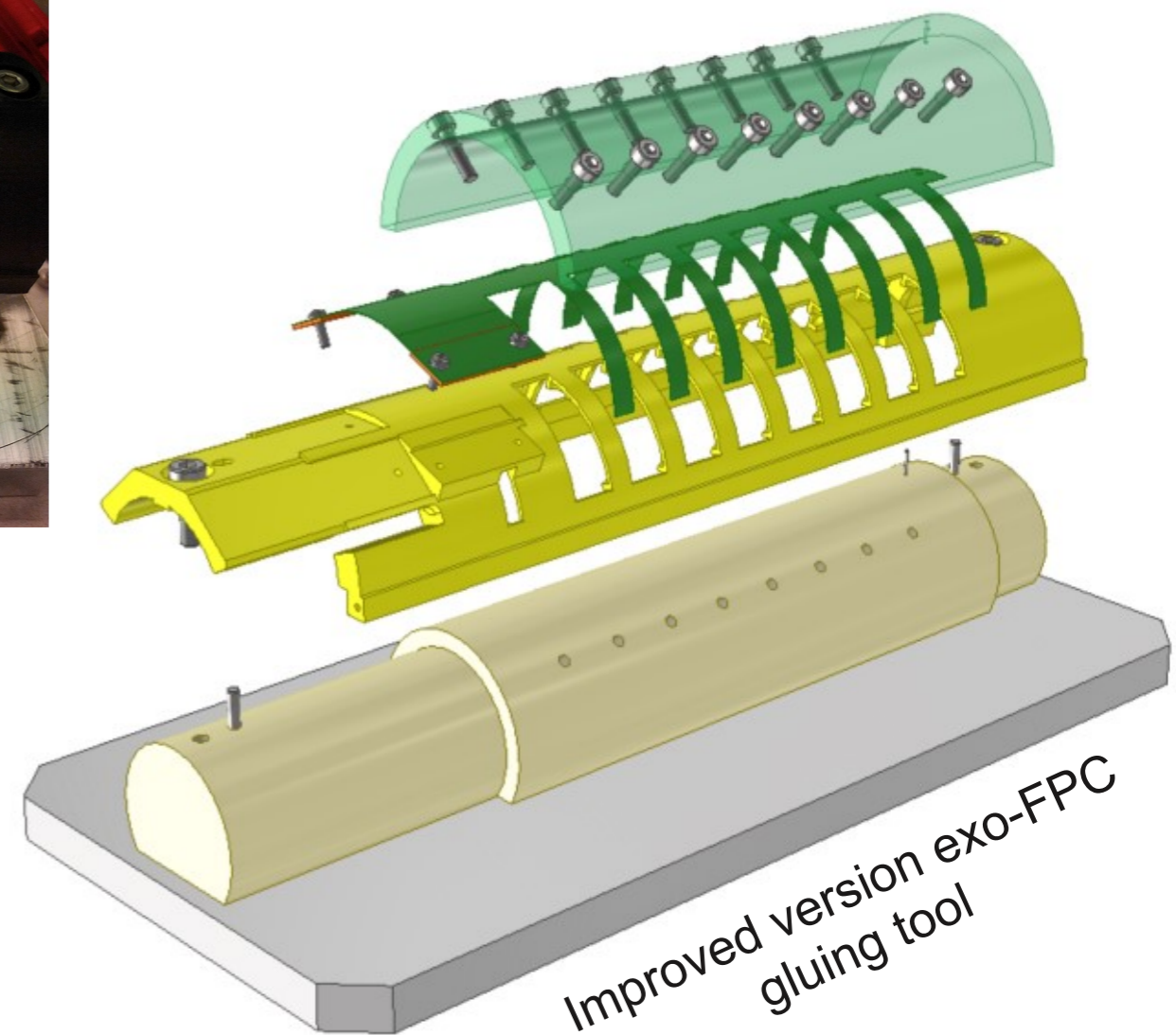
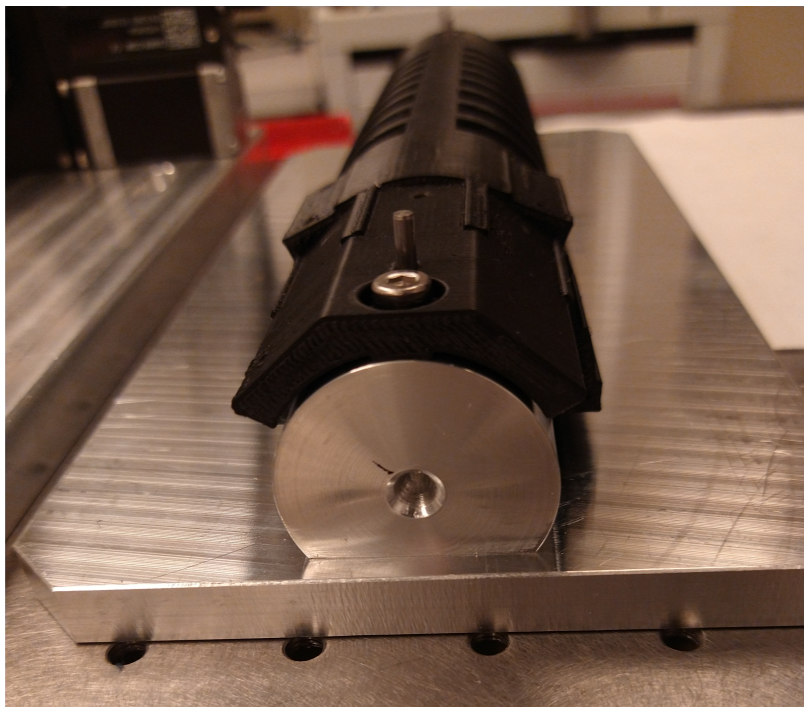
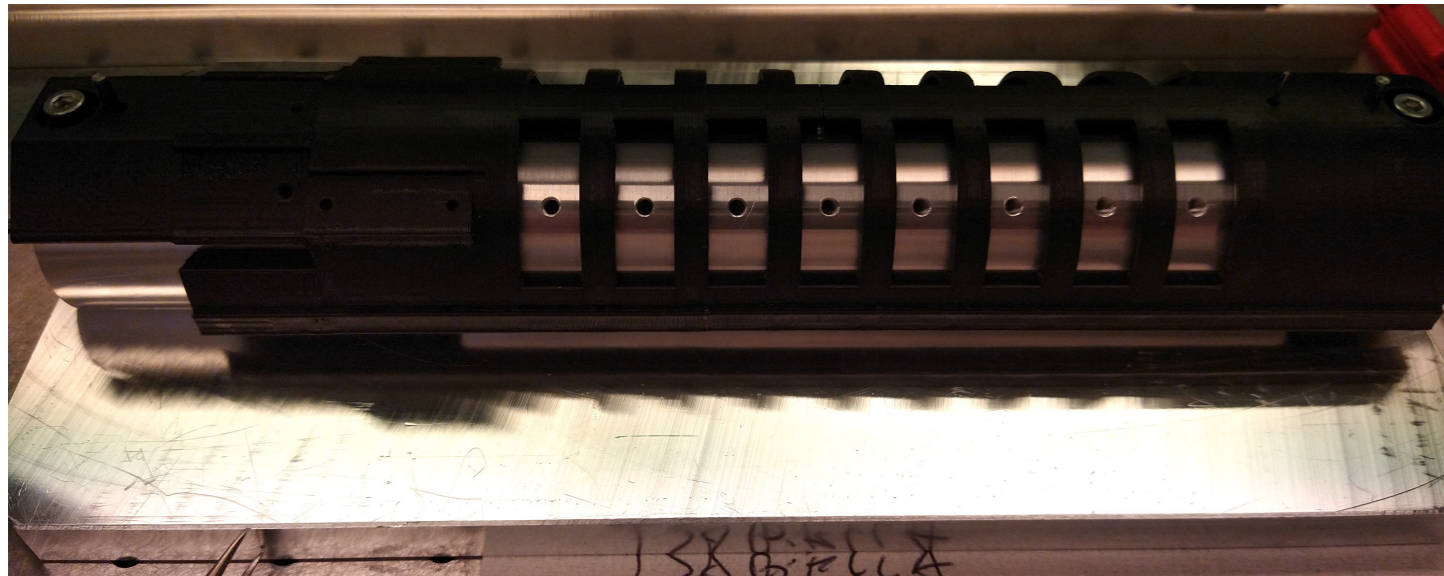


BACKUP



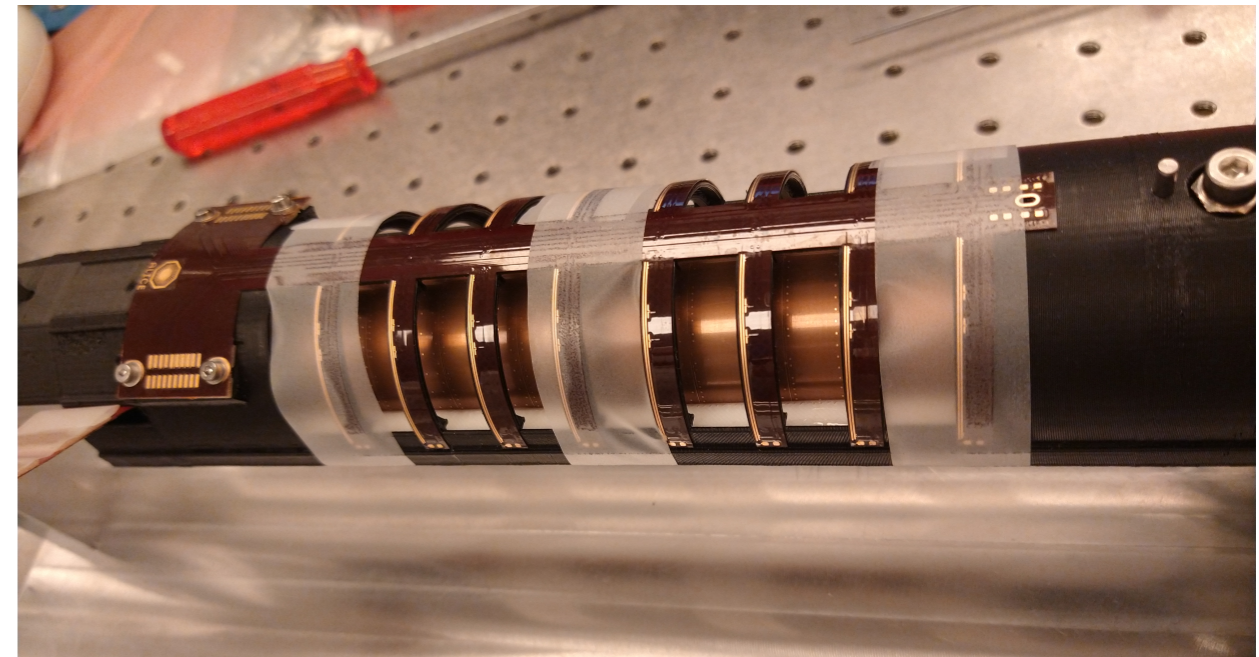
Exo-FPC gluing - Procedure and tools

- **New positioning/alignment tool**, better rest of the exoskeleton during exo-FPC placement → improve alignment

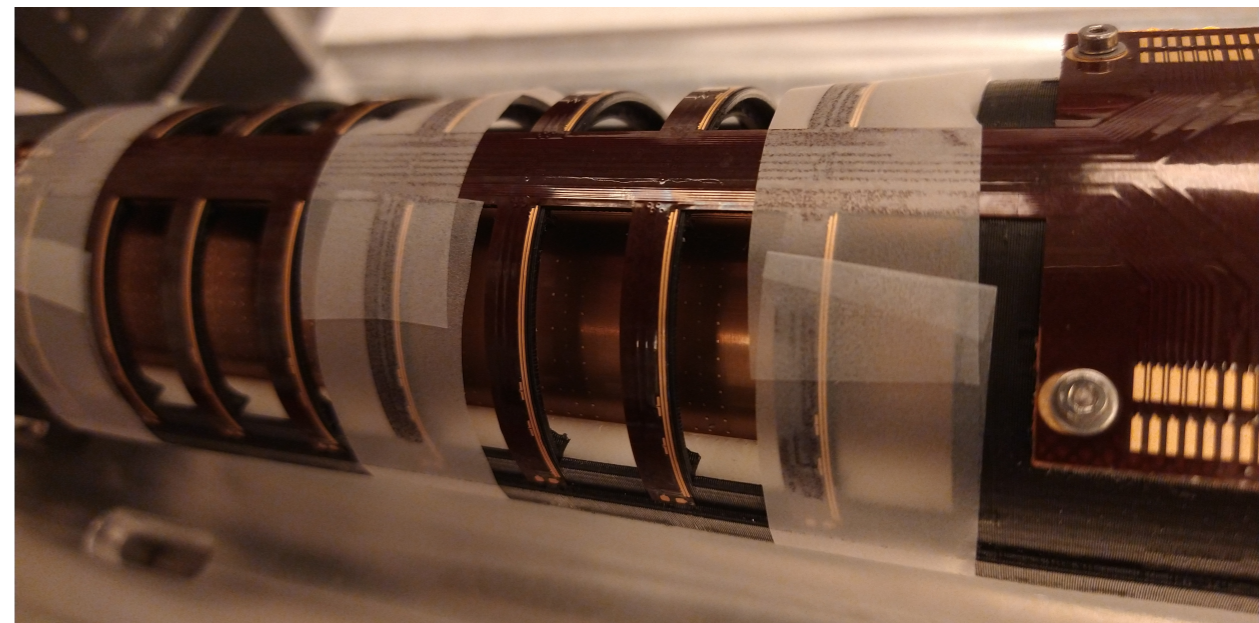




Exo-FPC gluing - Procedure and tools



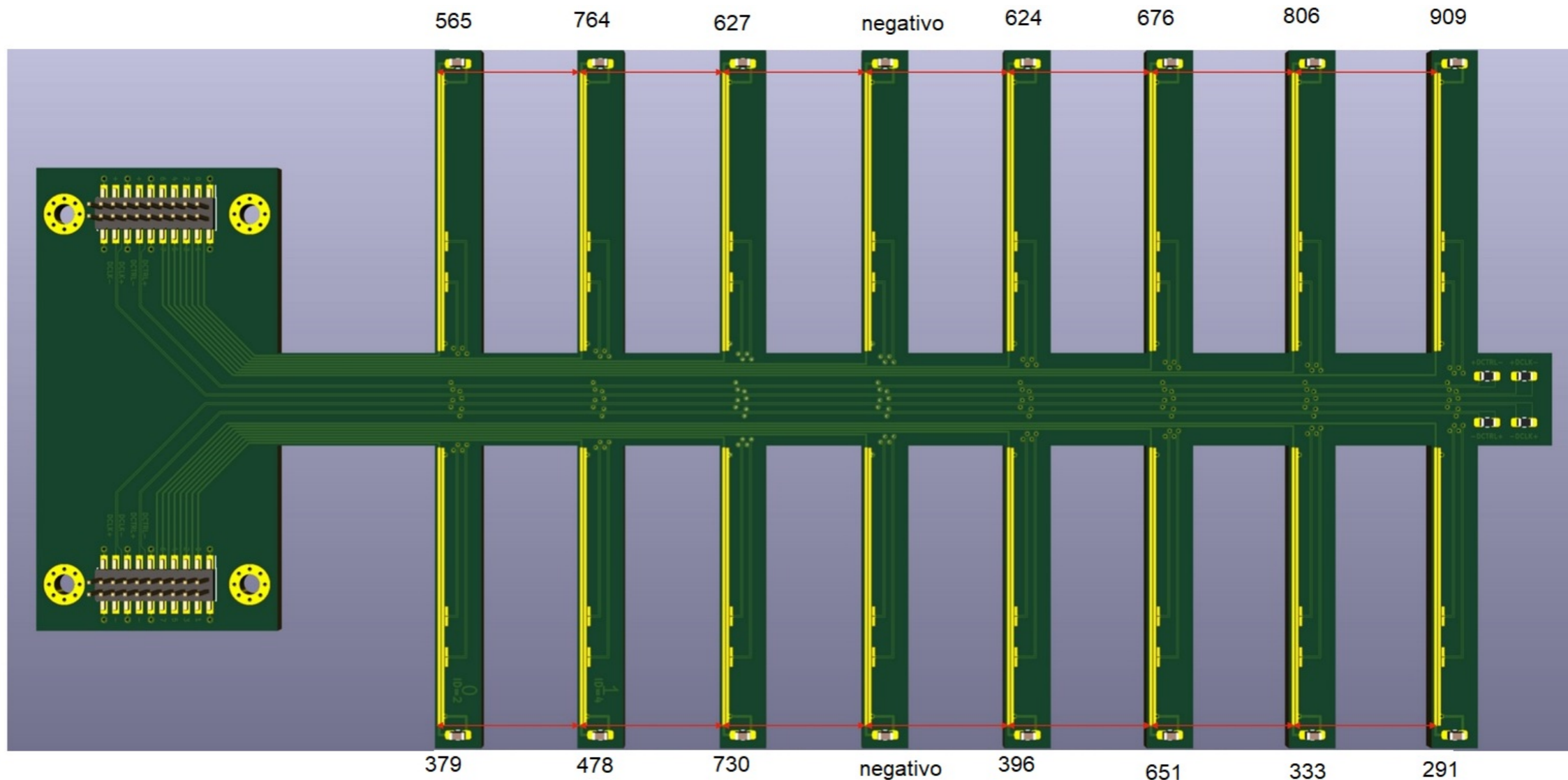
- Tape used to press exoskeleton to the longerons (on the side of the exoskeleton) during glue curing



Exo-FPC gluing - Procedure and tools

Distance between edge of the exoskeleton rub and the edge of the pad on the FPC (μm).

- “negative” means that the edge of the exoskeleton is not visible below the FPC



Alignment procedure seems good.
Largest deviations in the exoskeleton.

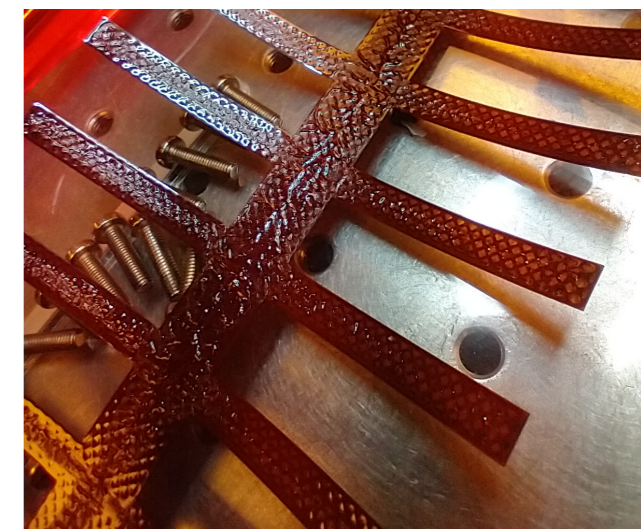
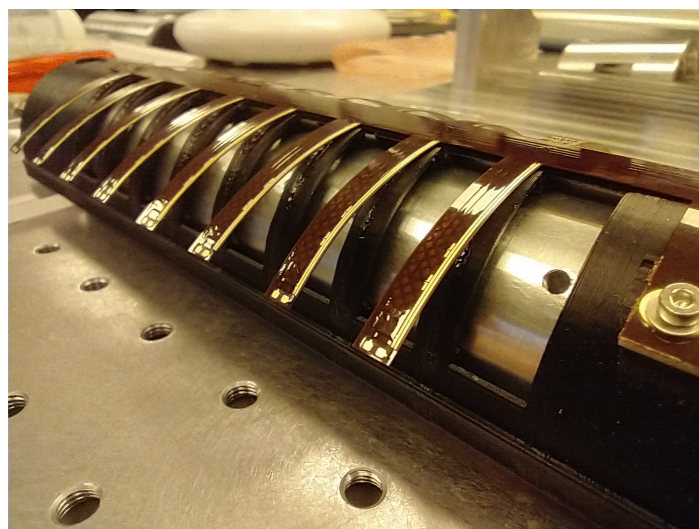
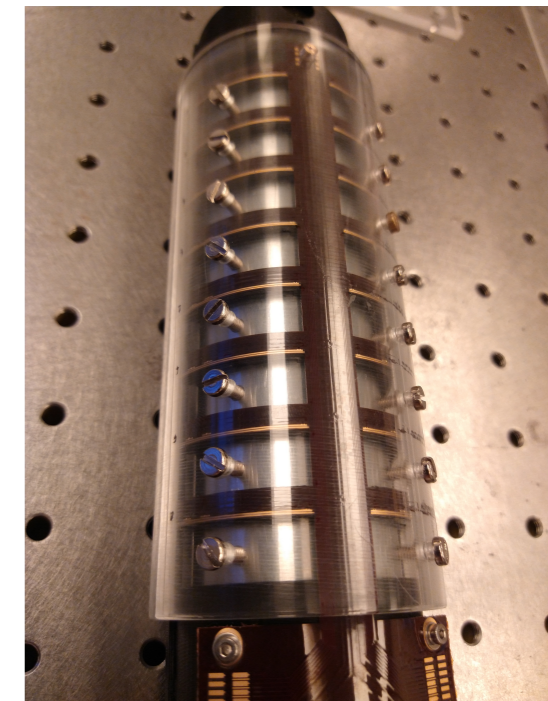
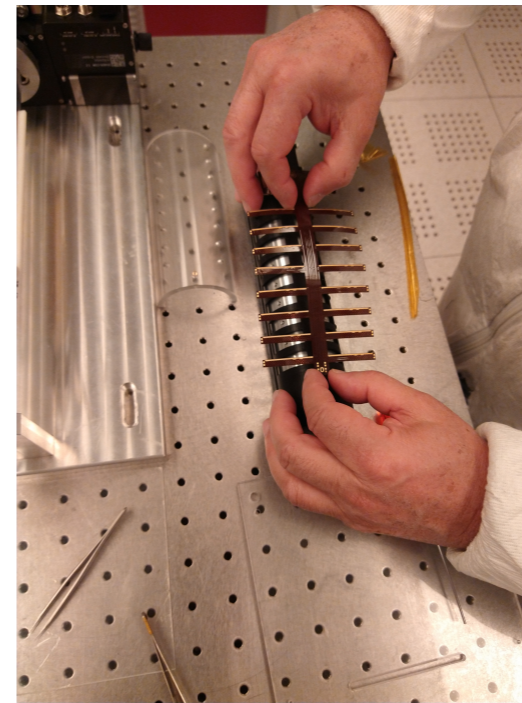
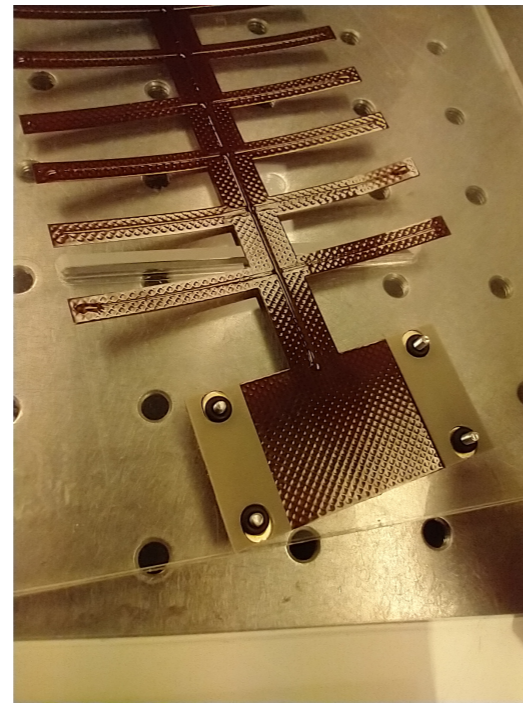
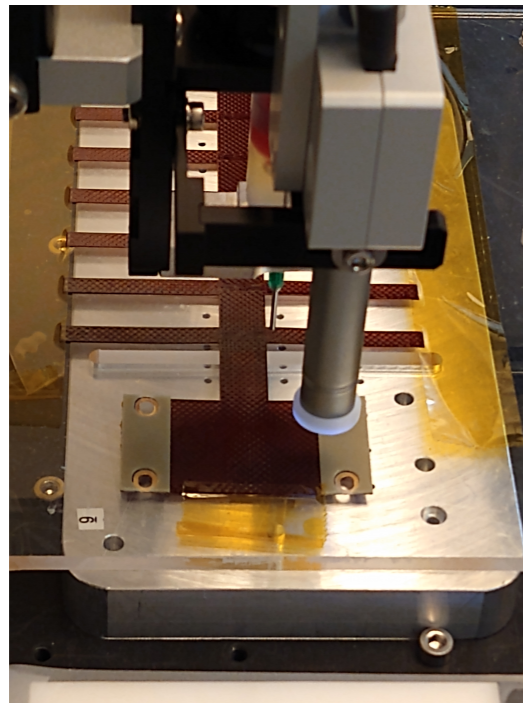
Expected distance = 651 μm

- 360 μm exoskeleton-to-FPC
- 291 μm FPC-to-PAD

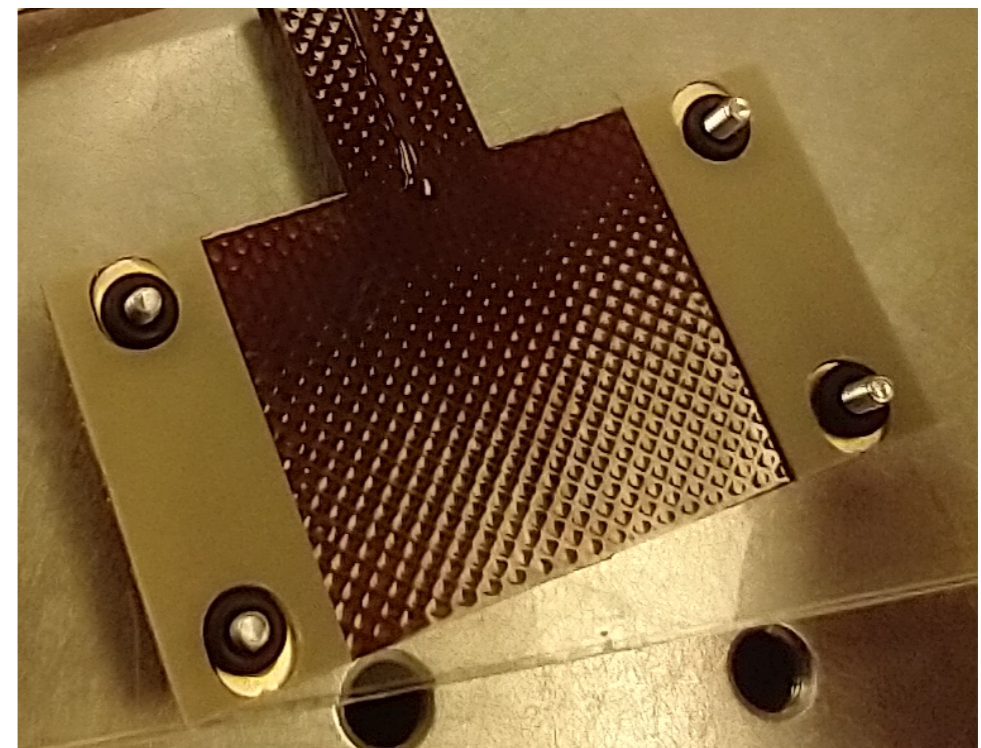
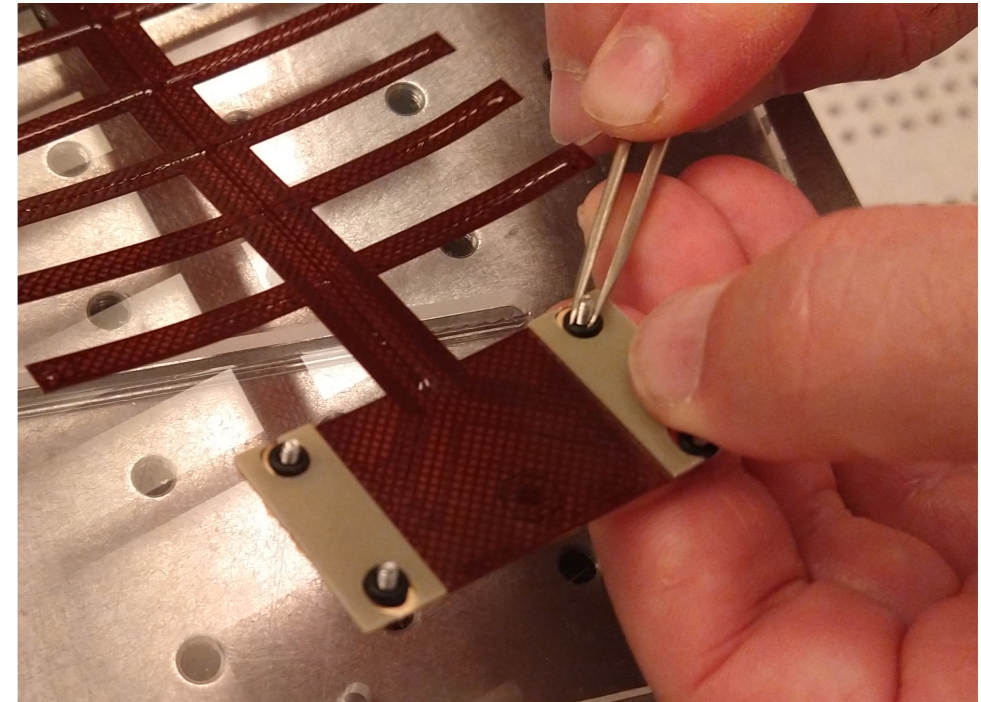
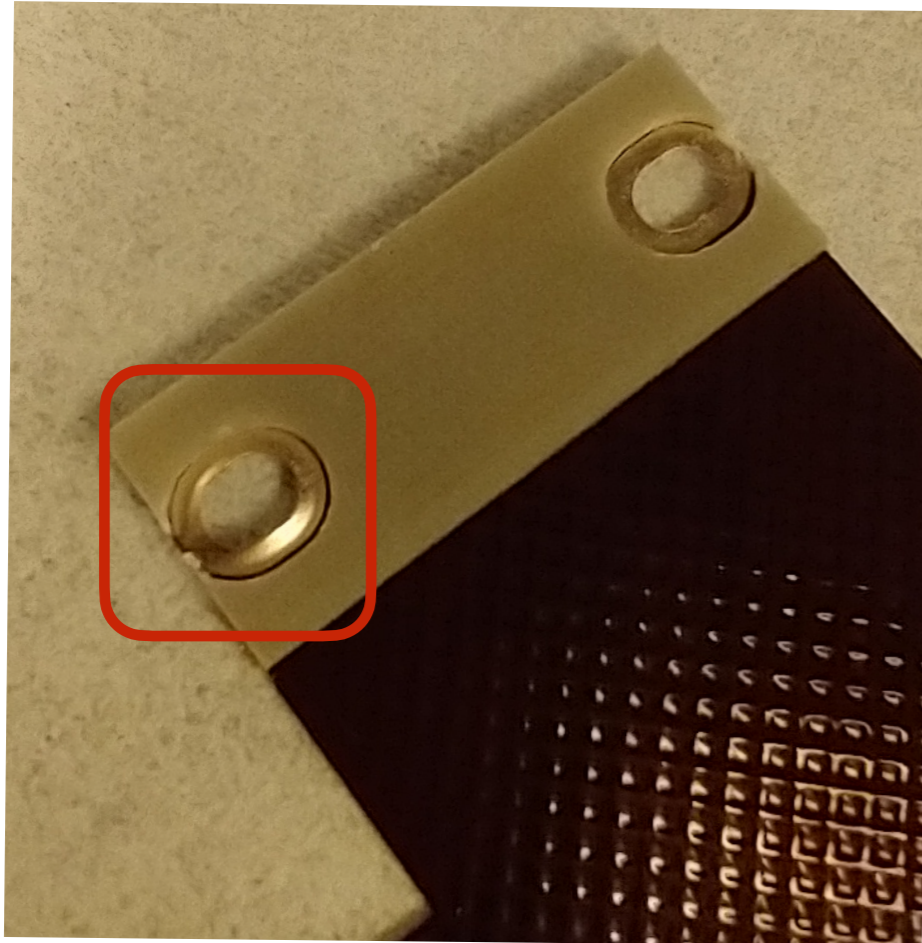
Exo-FPC gluing - Procedure and tools

First attempt:

- using Araldite2011
- glue distribution over the FPC using glue dispenser machine
- glue components mixing failed → allow glue distribution check

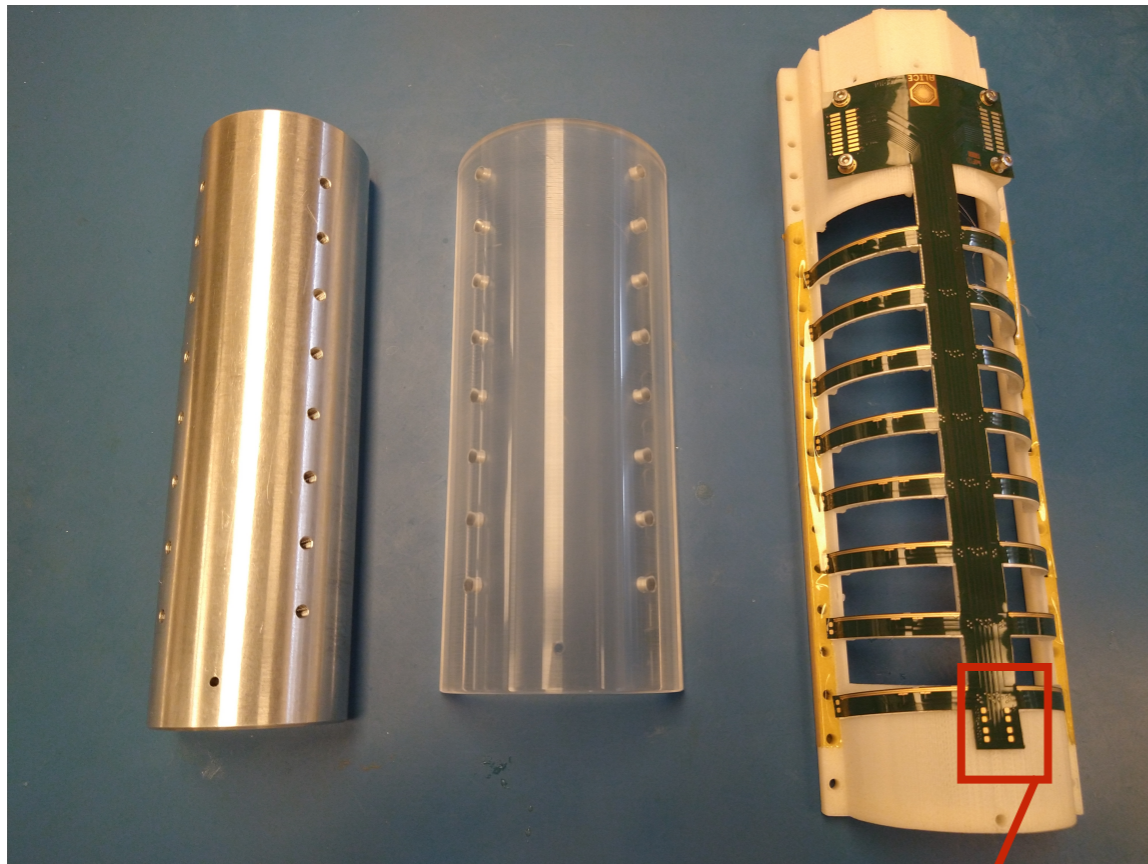


Exo-FPC problem



- Problem with “missing” stiffener under screw hole
- **Solved:** using a large enough washers between screw and FPC and an o-ring to fill the empty volume

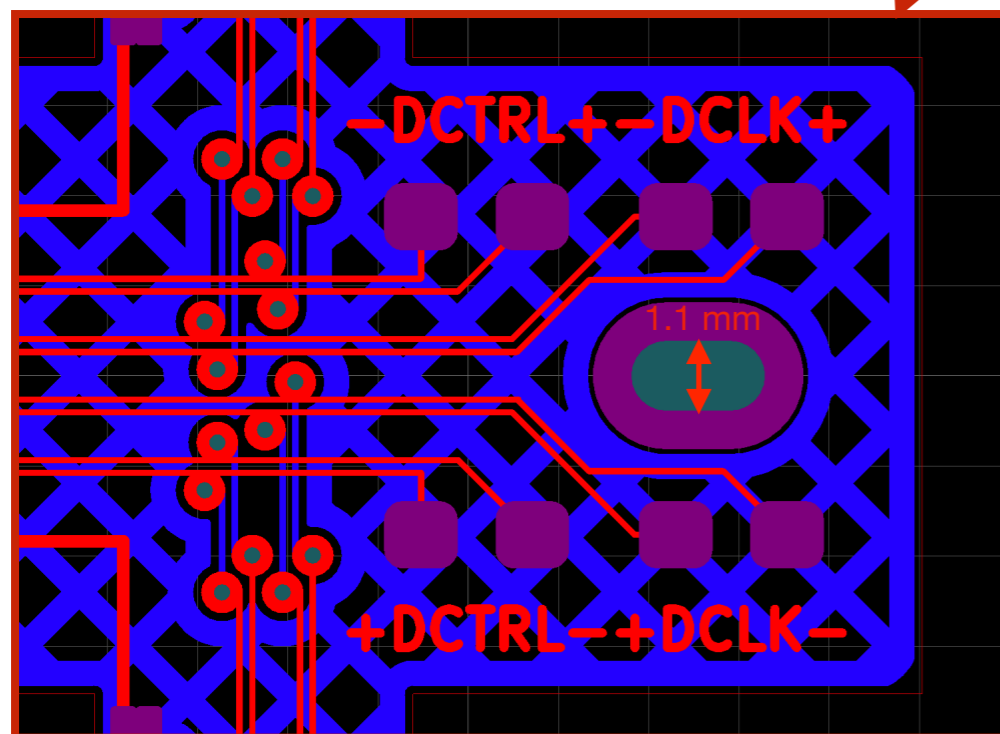
Exo-FPC gluing - Alignment



Holes for alignment pin:

- exoskeleton and tools: 2 mm diameter
- exo-FPC: 1 mm diameter

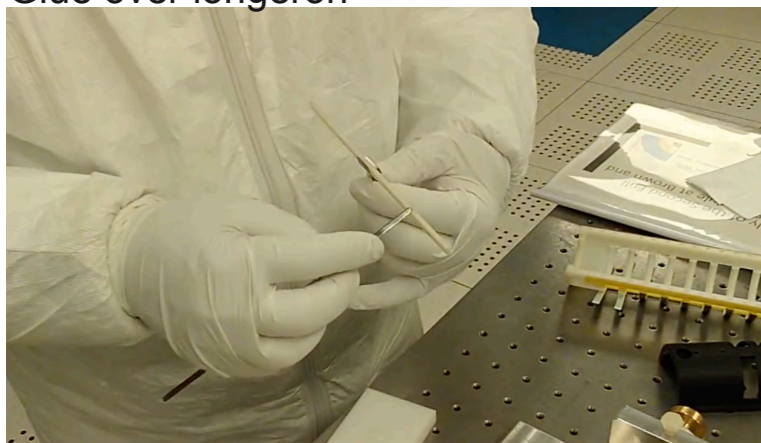
Solved: produced a variable diameter pin.



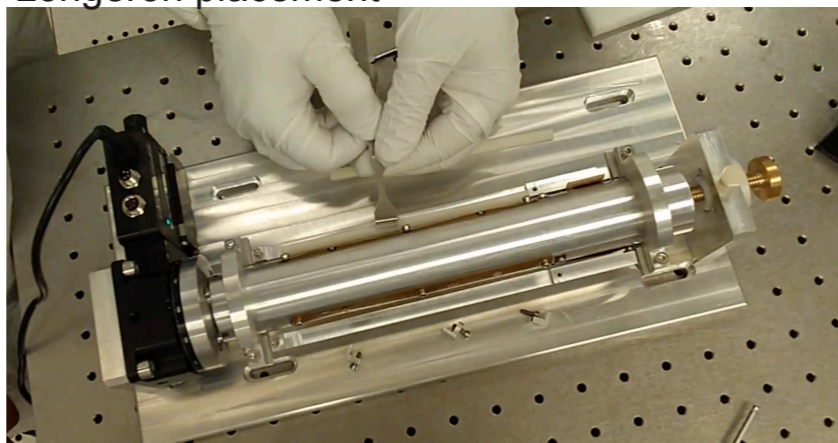
Assembly steps

- Place dummy-super-ALPIDE and edge-FPC on mandrel
- Wire-bonding between last two chips and edge-FPC
- Glue longerons and wedge over dummy-super-ALPIDE
- Glue half-ring over dummy-super-ALPIDE
- Glue exo-FPC over exoskeleton → **FAILED** (problem with alignment pin)
- Place the exoskeleton over mandrel and glue to supports
- Wire-bonding between central chips and exo-FPC

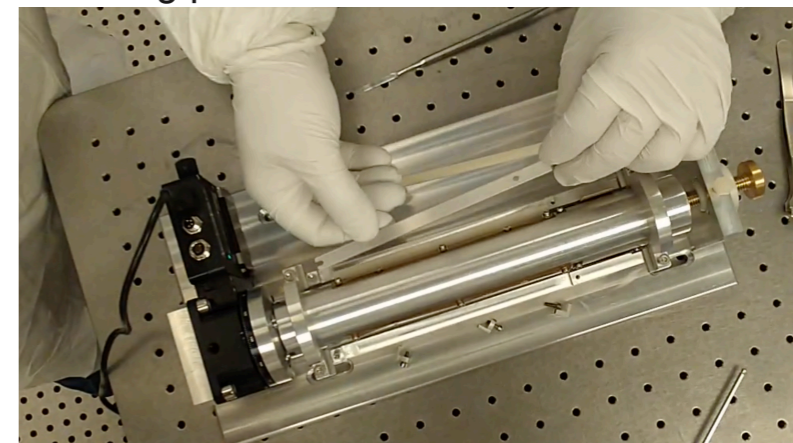
Glue over longeron



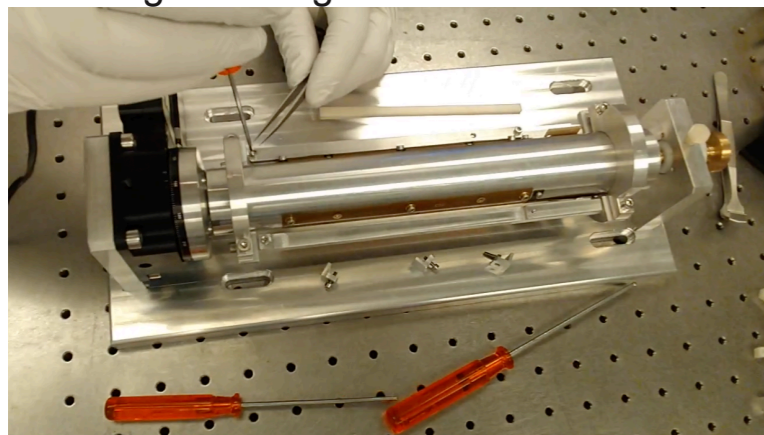
Longeron placement



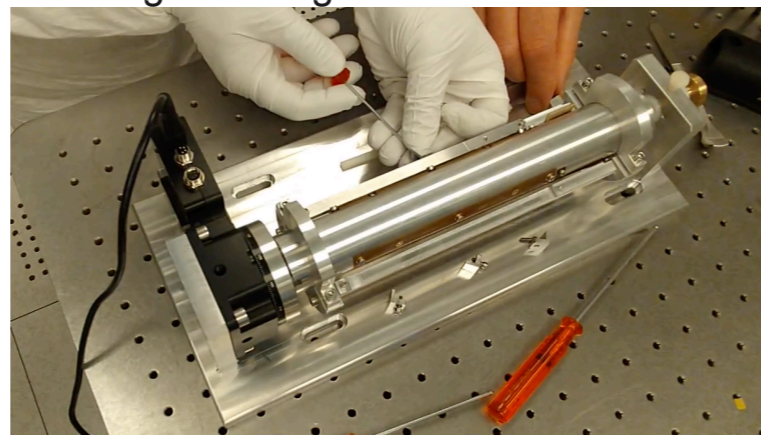
Blocking placement



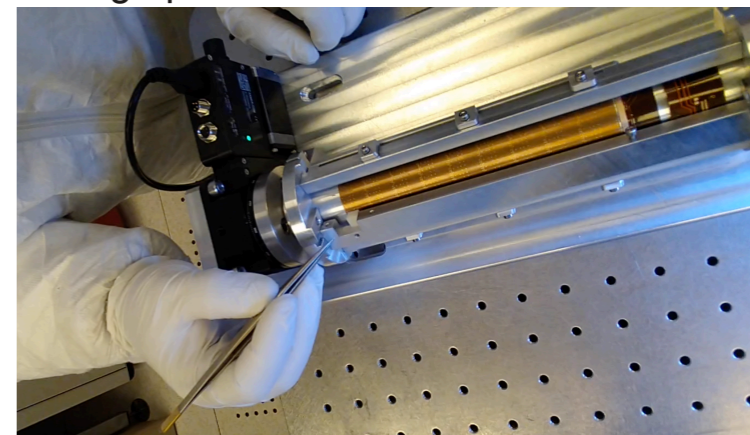
Blocking screwing



Blocking screwing



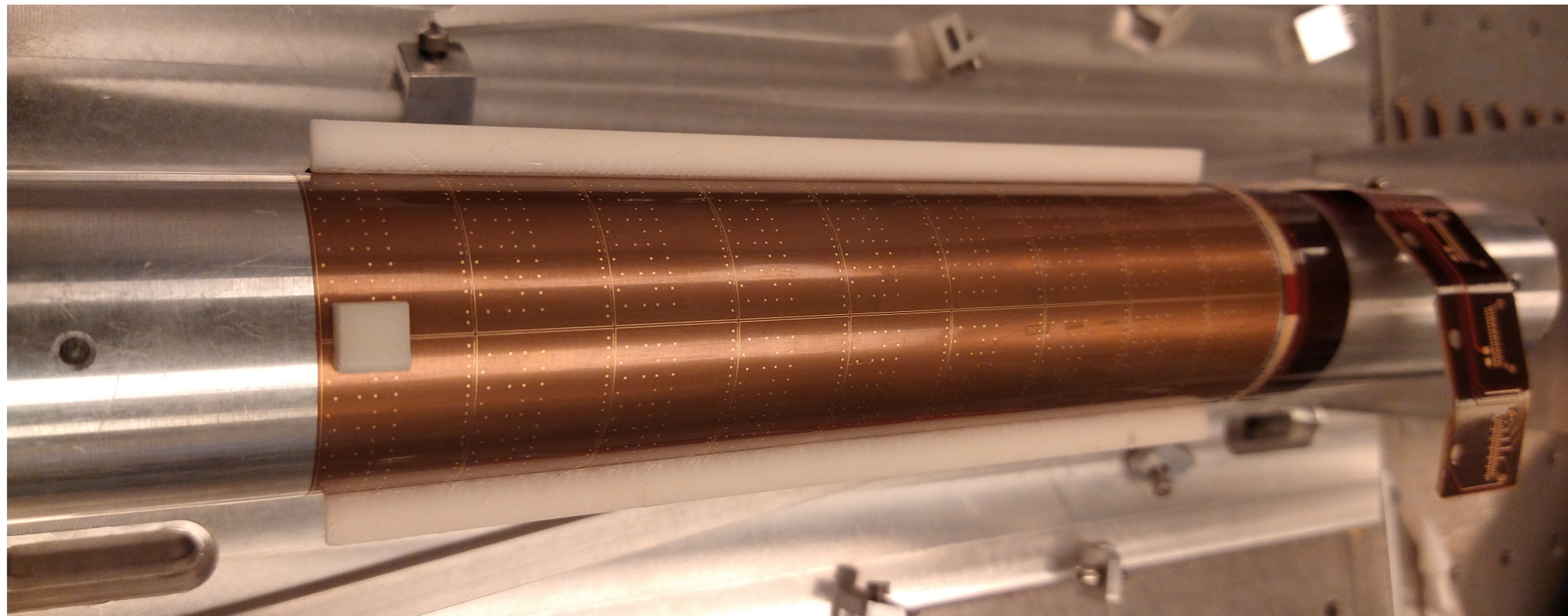
Wedge placement



Araldite - 90 minutes curing

Assembly steps

- Place dummy-super-ALPIDE and edge-FPC on mandrel
- Wire-bonding between last two chips and edge-FPC
- Glue longerons and wedge over dummy-super-ALPIDE
- Glue half-ring over dummy-super-ALPIDE
- Glue exo-FPC over exoskeleton → **FAILED** (problem with alignment pin)
- Place the exoskeleton over mandrel and glue to supports
- Wire-bonding between central chips and exo-FPC

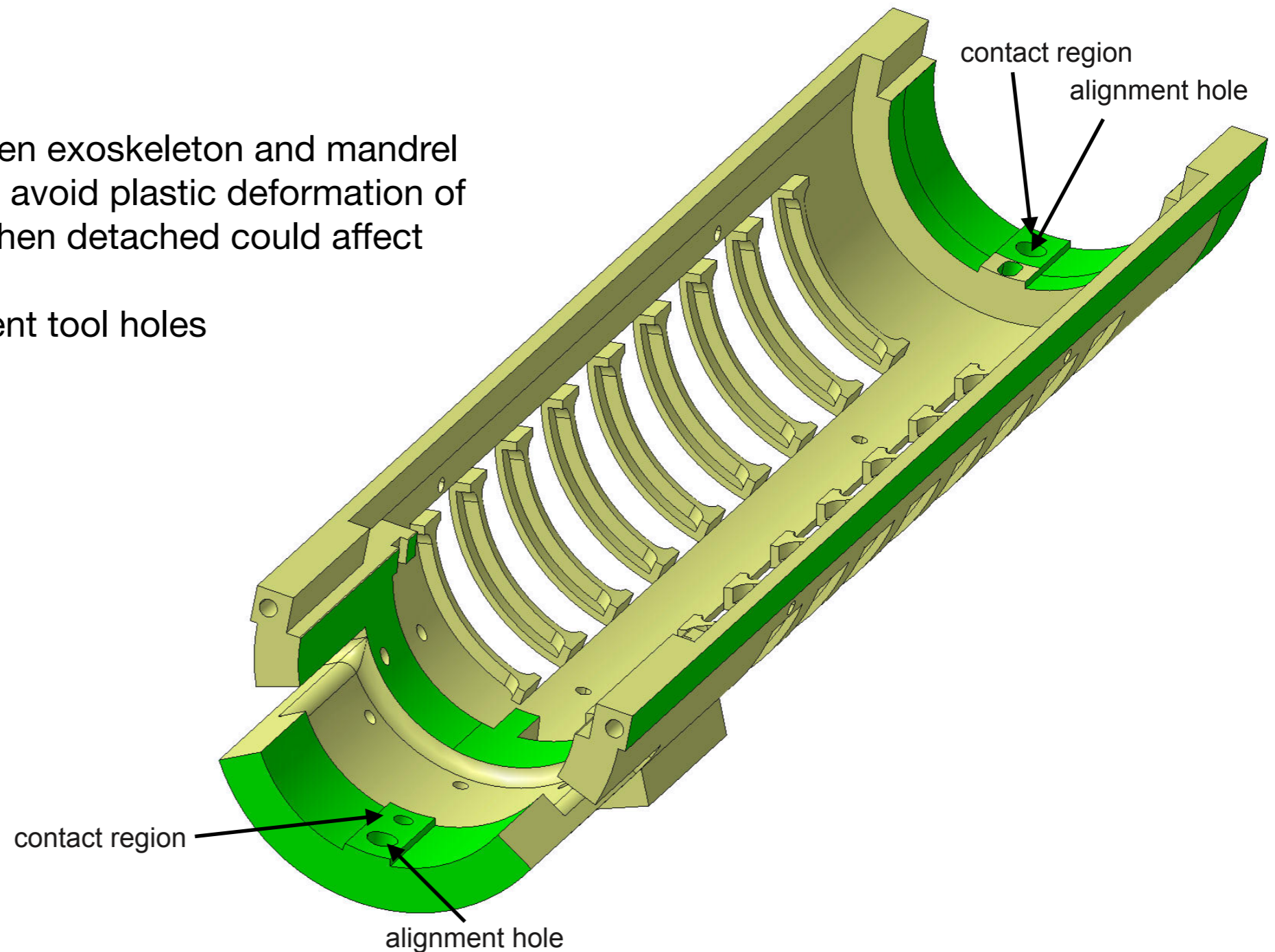




ExoskeletonV3

Main modifications

1. Contact regions between exoskeleton and mandrel reduced to minimum → avoid plastic deformation of the exoskeleton that, when detached could affect wire-bonds
2. Carbon wedge alignment tool holes



ExoskeletonV3

Main modifications

1. Contact regions between exoskeleton and mandrel reduced to minimum → avoid plastic deformation of the exoskeleton that, when detached could affect wire-bonds
2. Carbon wedge alignment tool holes

Problem in this design

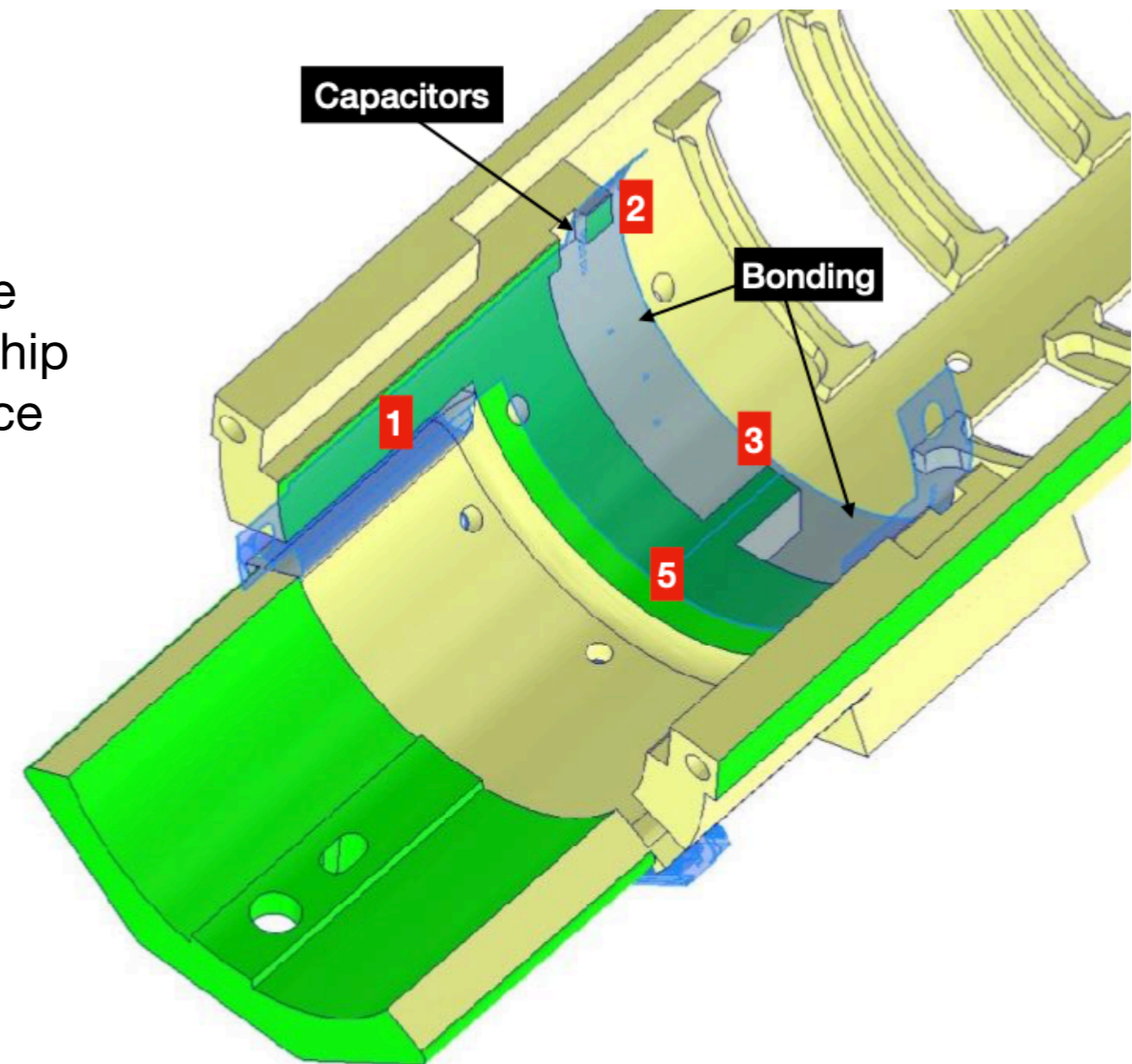
1. Edge-FPC gluing region: needs to be reset to the original thickness to grand edge-FPC and bent-chip to be at the same radius (and consequently reduce wire-bonds stress) → Notified to Gael

Small missing modifications

1. Exo-FPC alignment holes
2. Housing region for Exo-FPC connector stiffeners

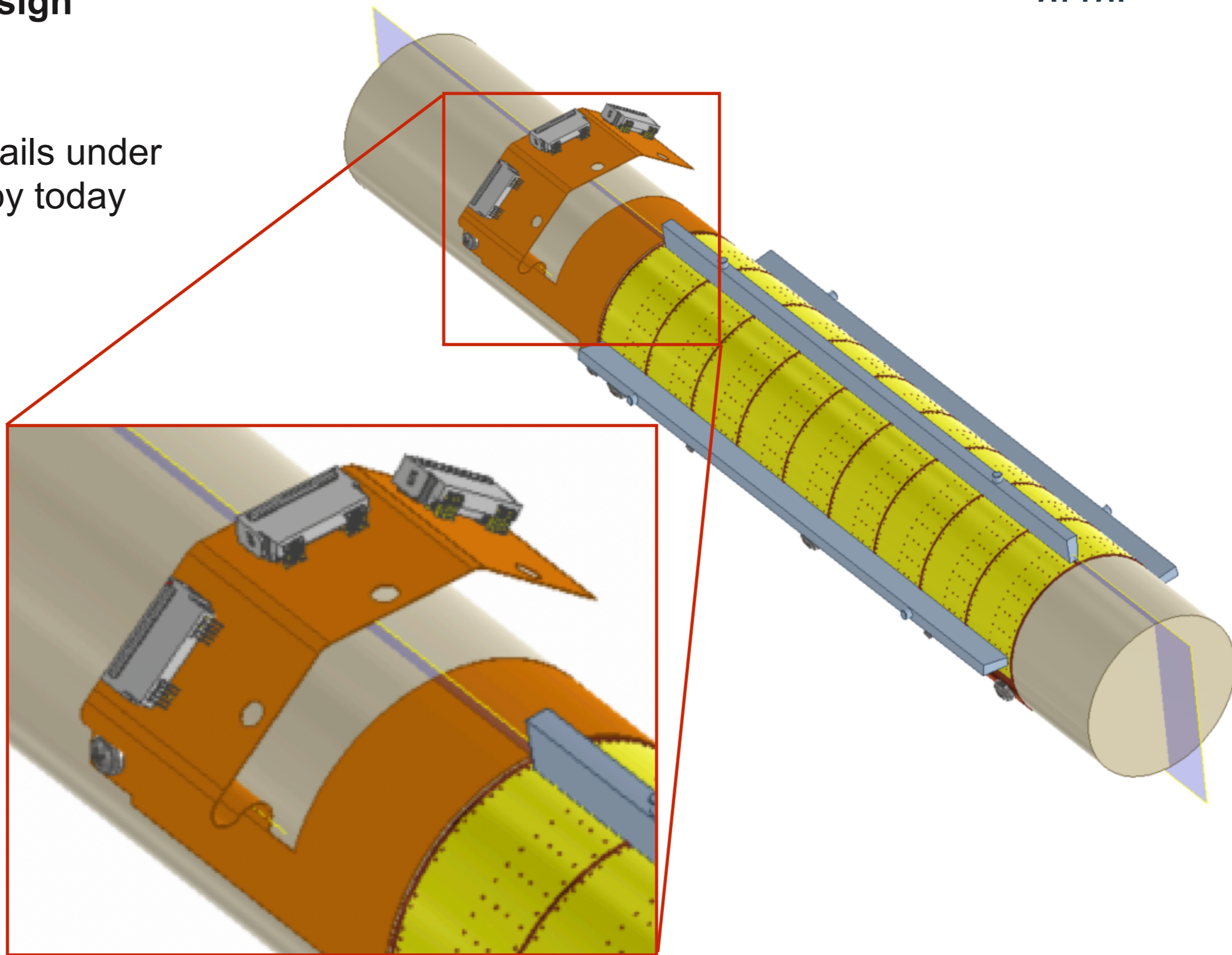
To be verified

1. Edge-FPC insertion neatness and simplicity

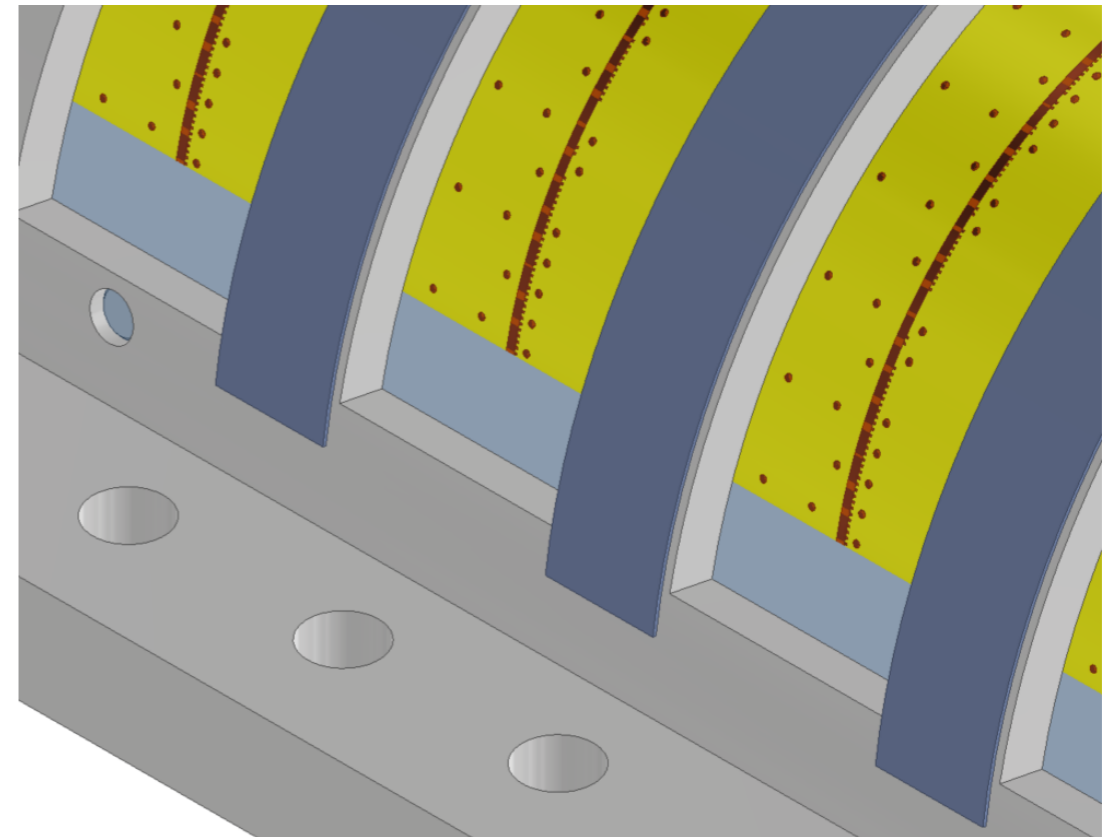
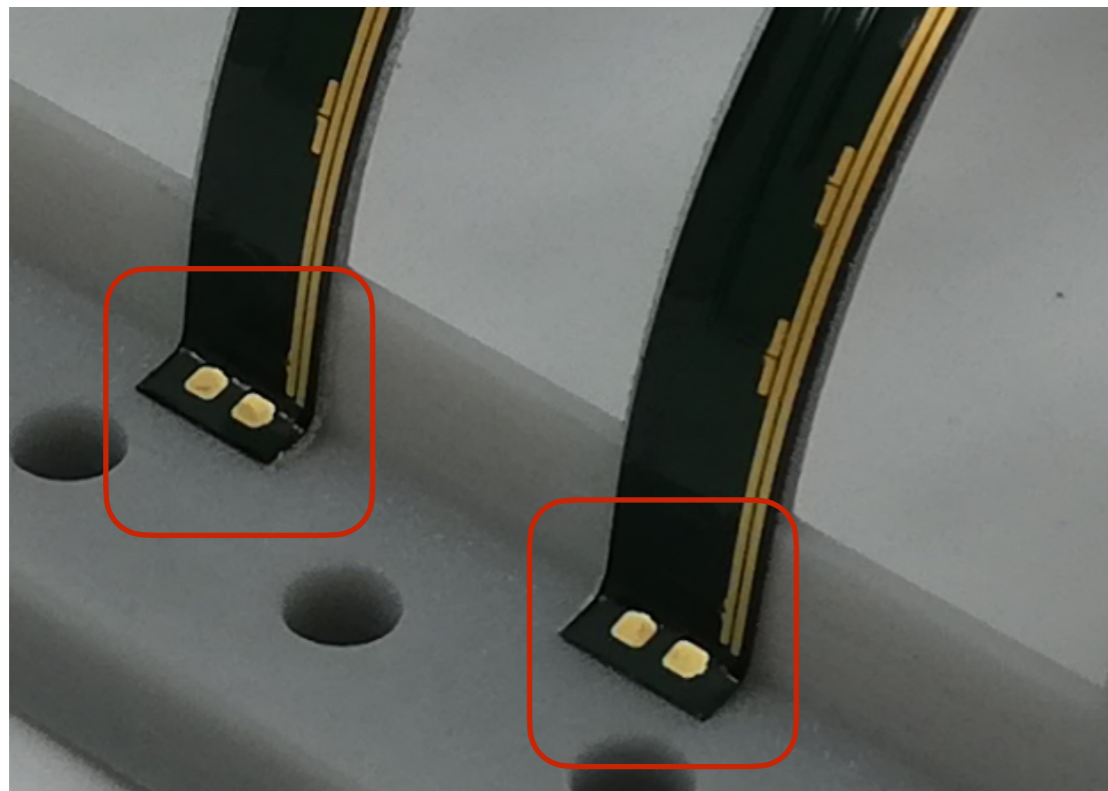
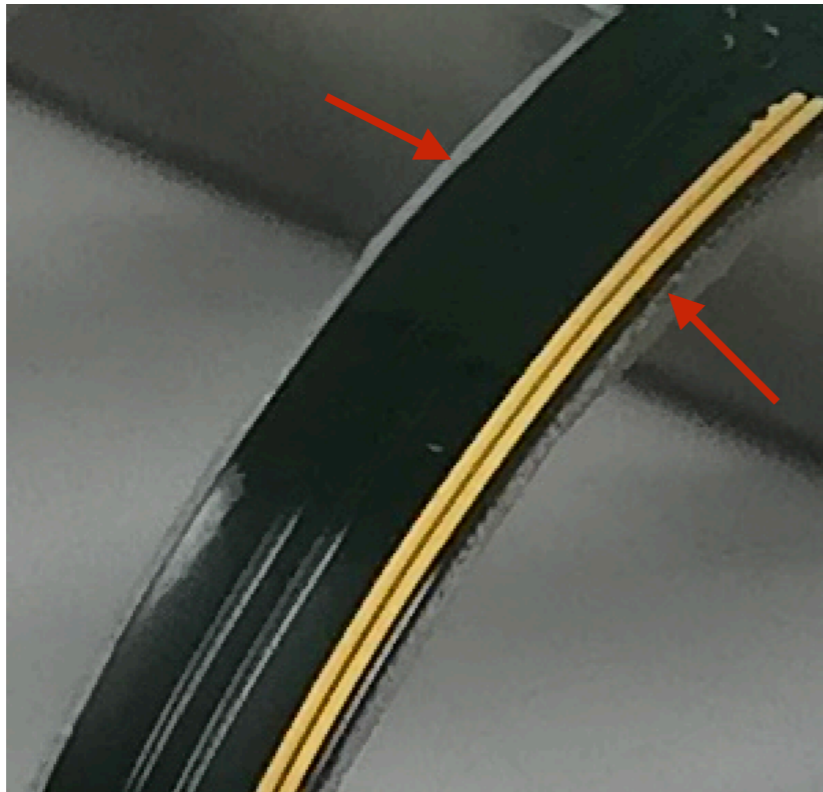


Edge-FPC design

Very last details under completion by today



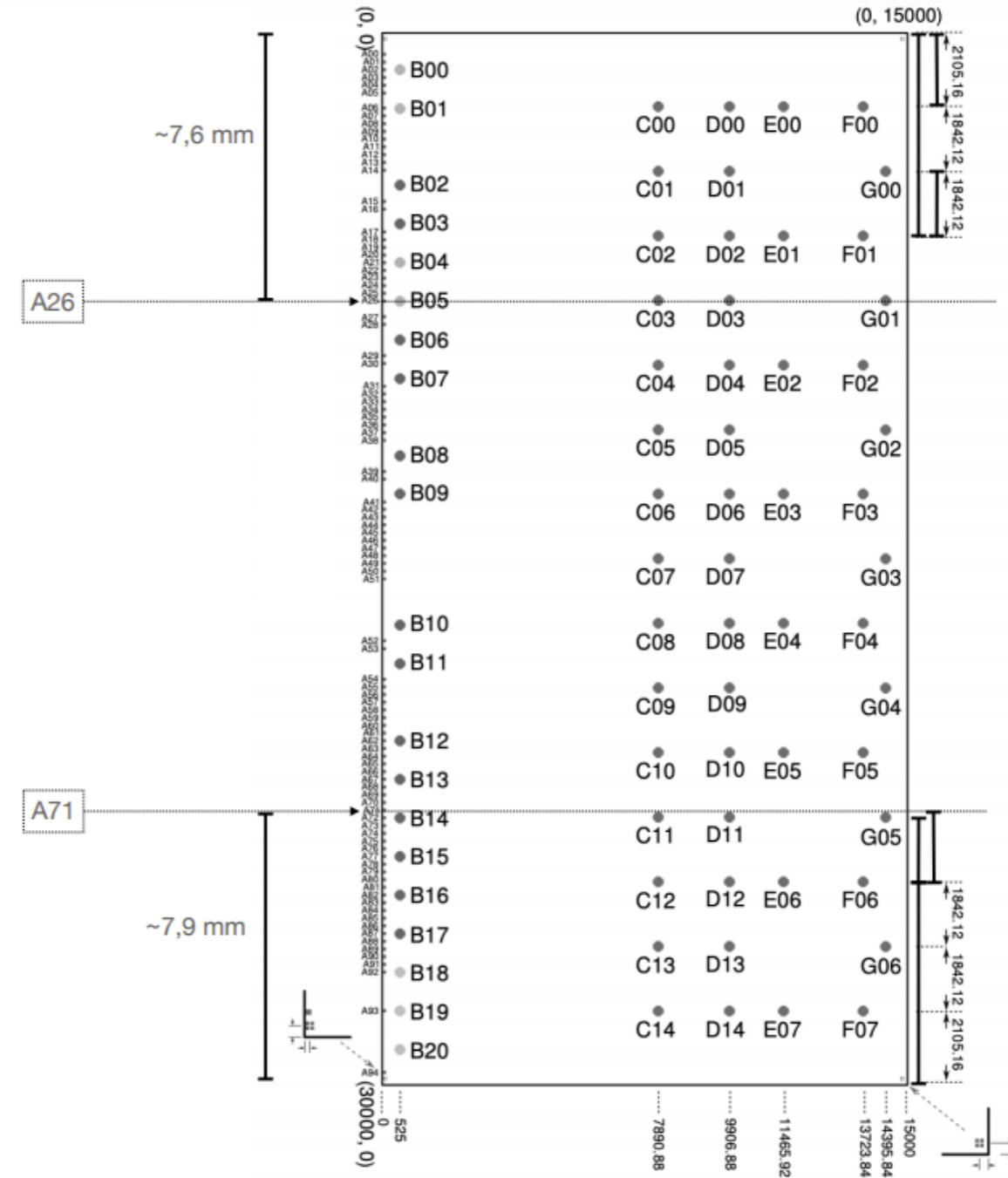
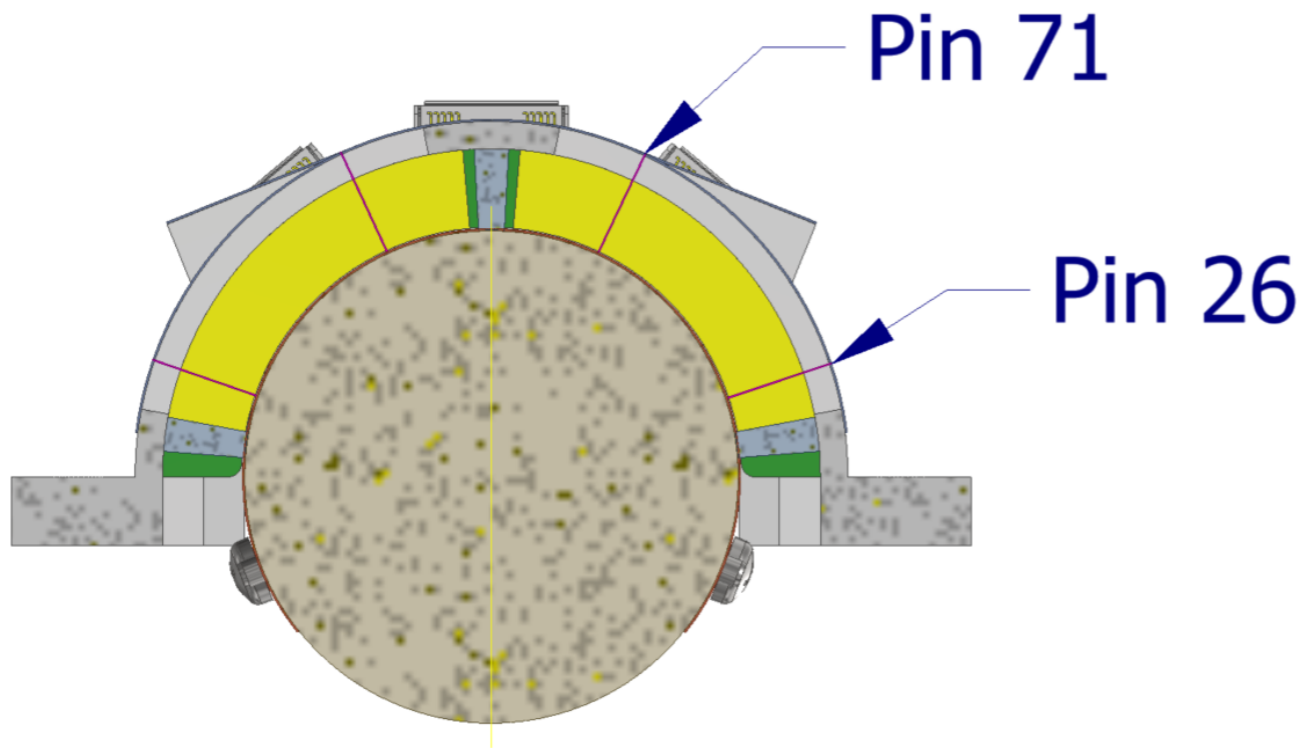
Super-ALPIDE FPCs support mechanics integration

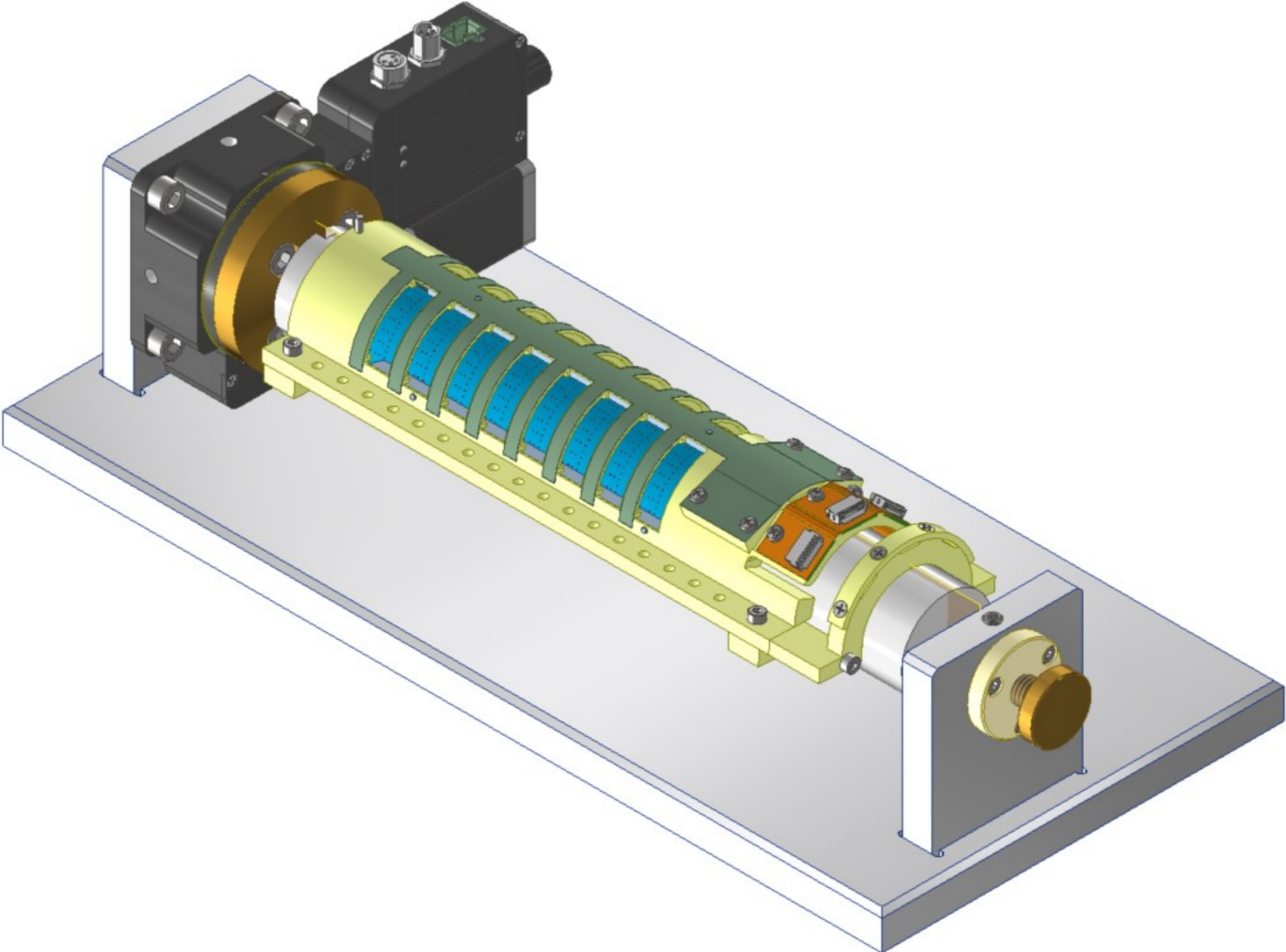


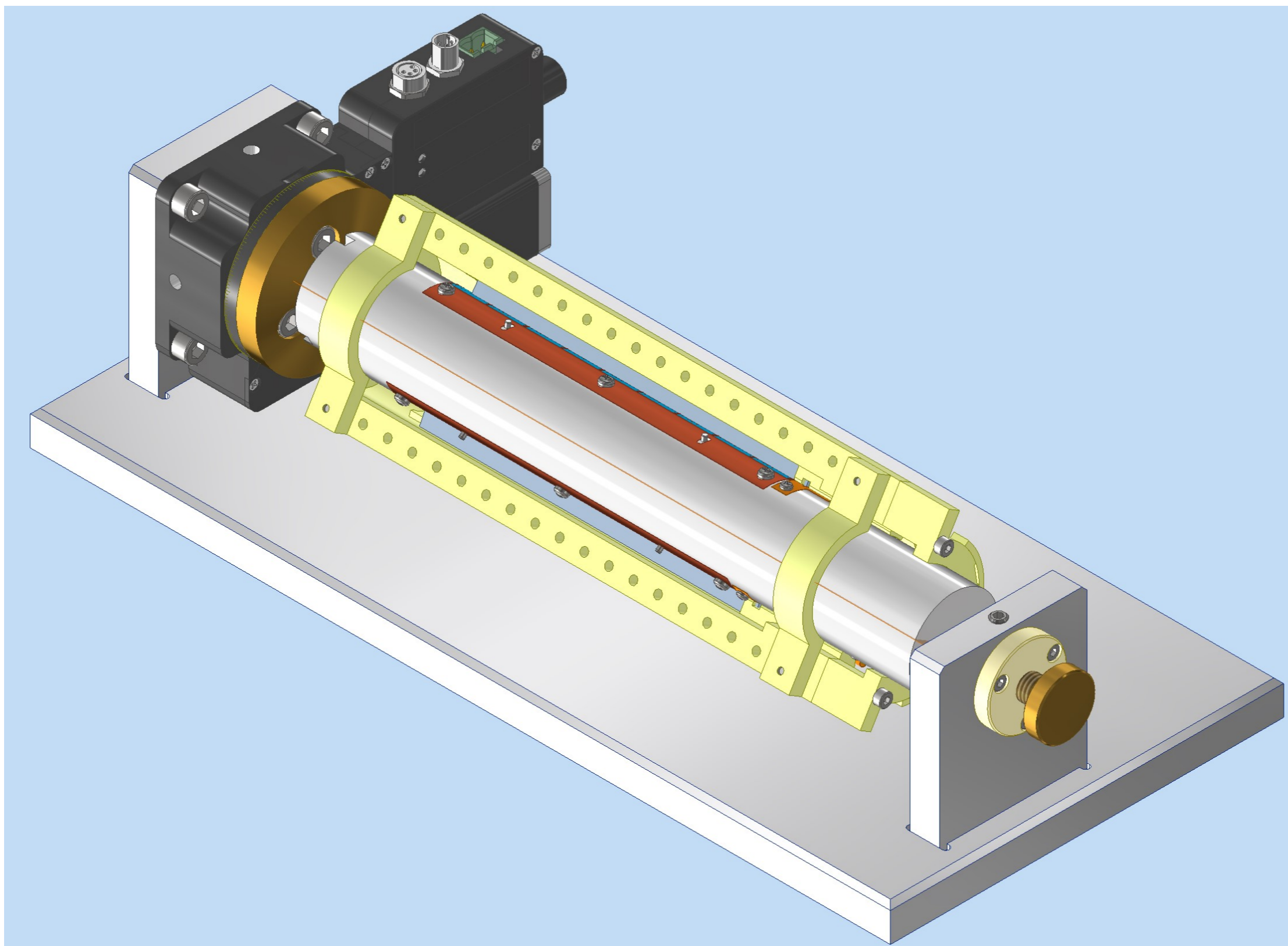
To be understood

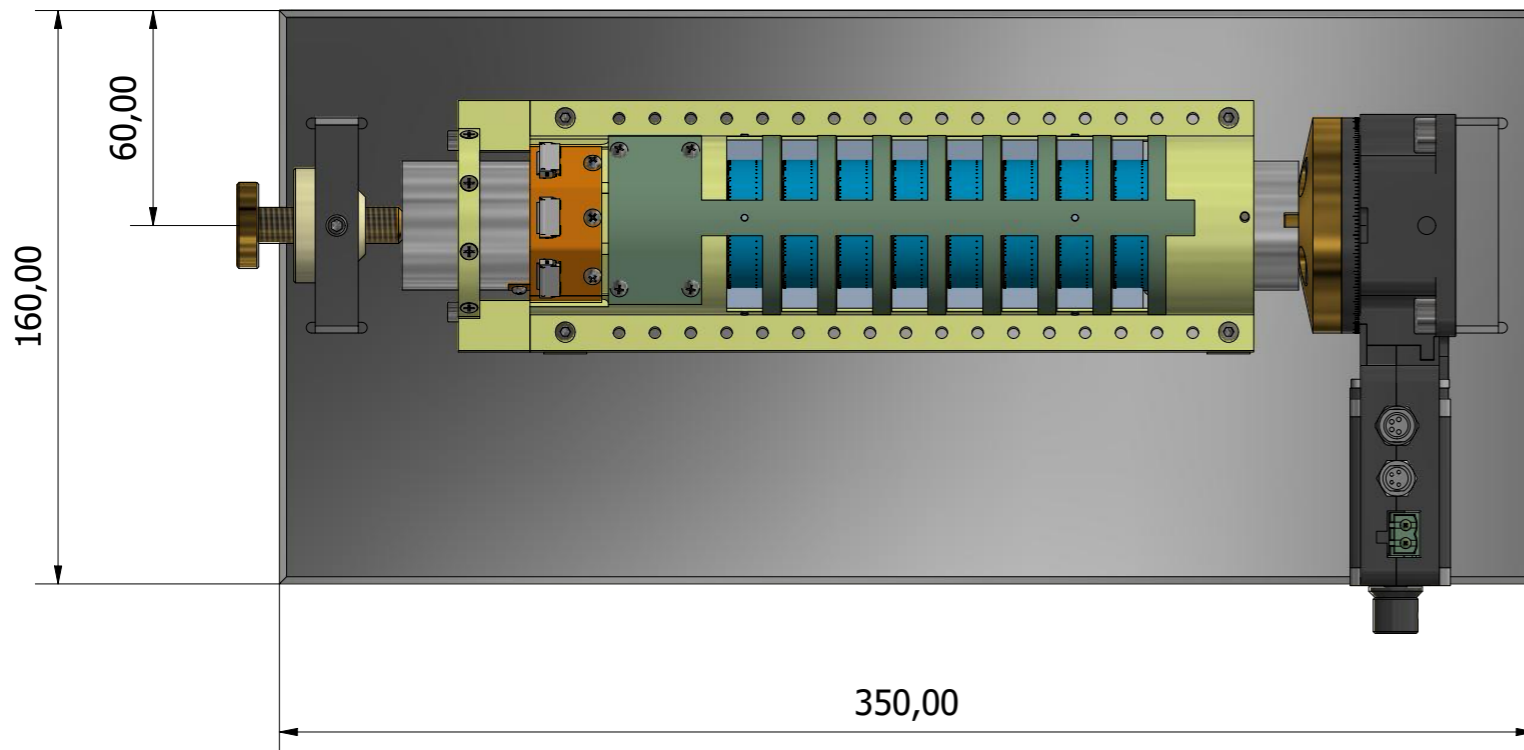
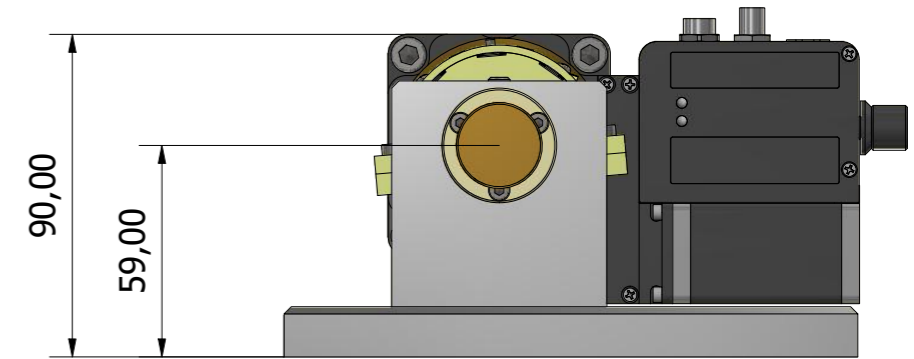
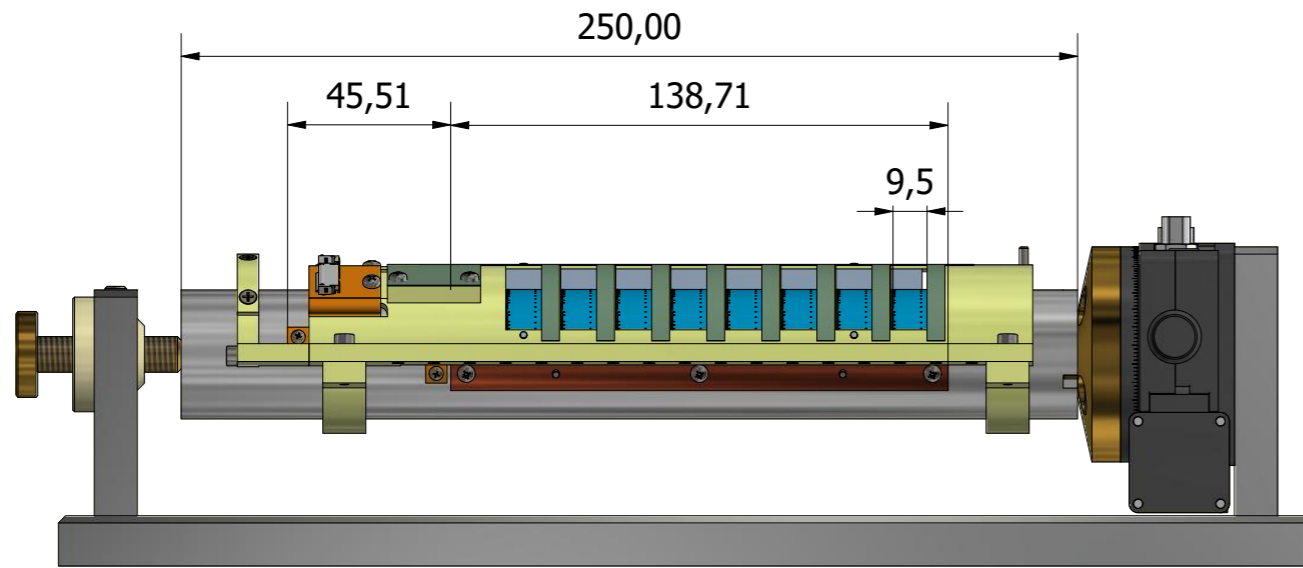
- One source: having used the 1mm thick exoskeleton (reduced radius) for an FPC designed for a 2 mm thick one

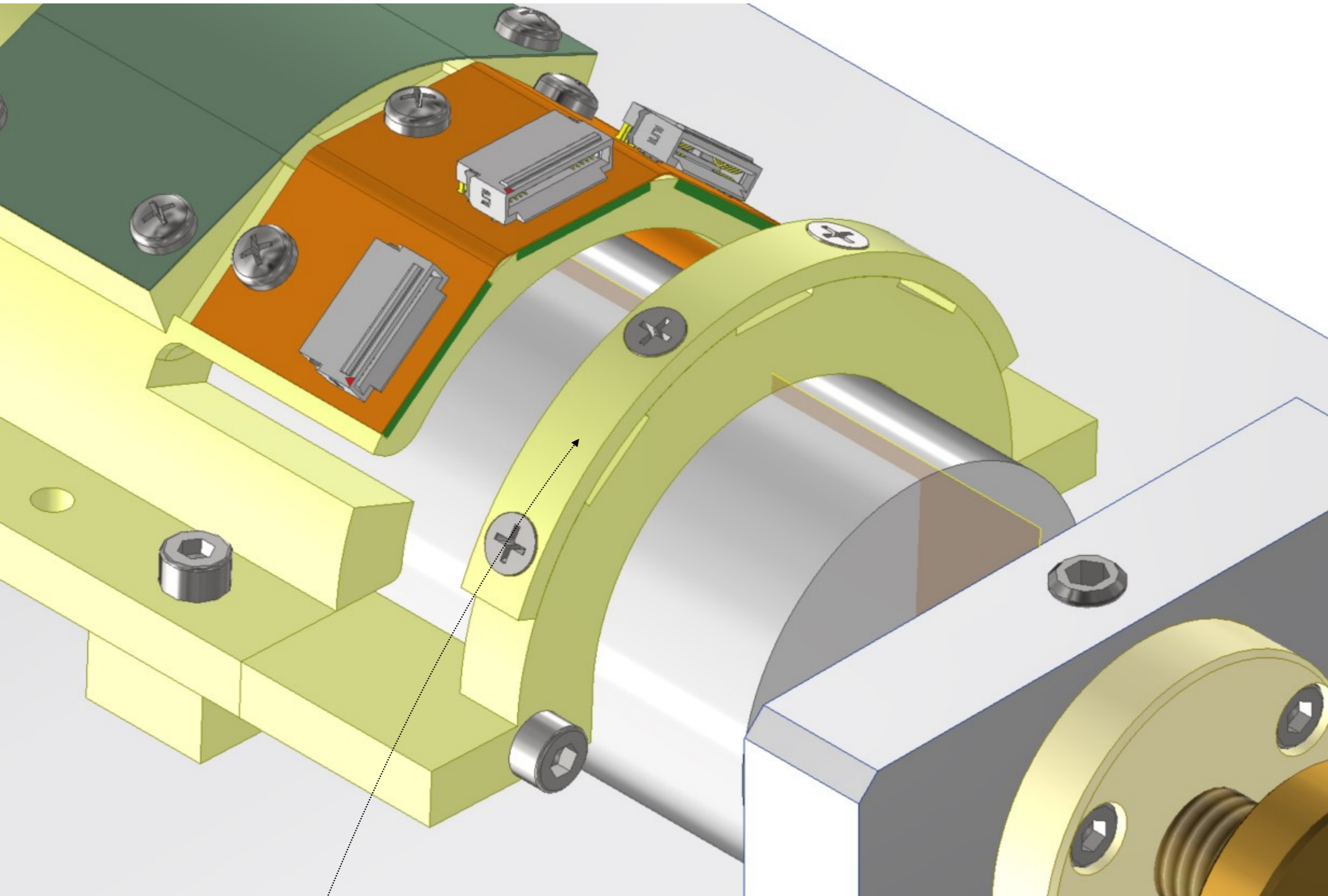
Super-ALPIDE FPCs support mechanics integration



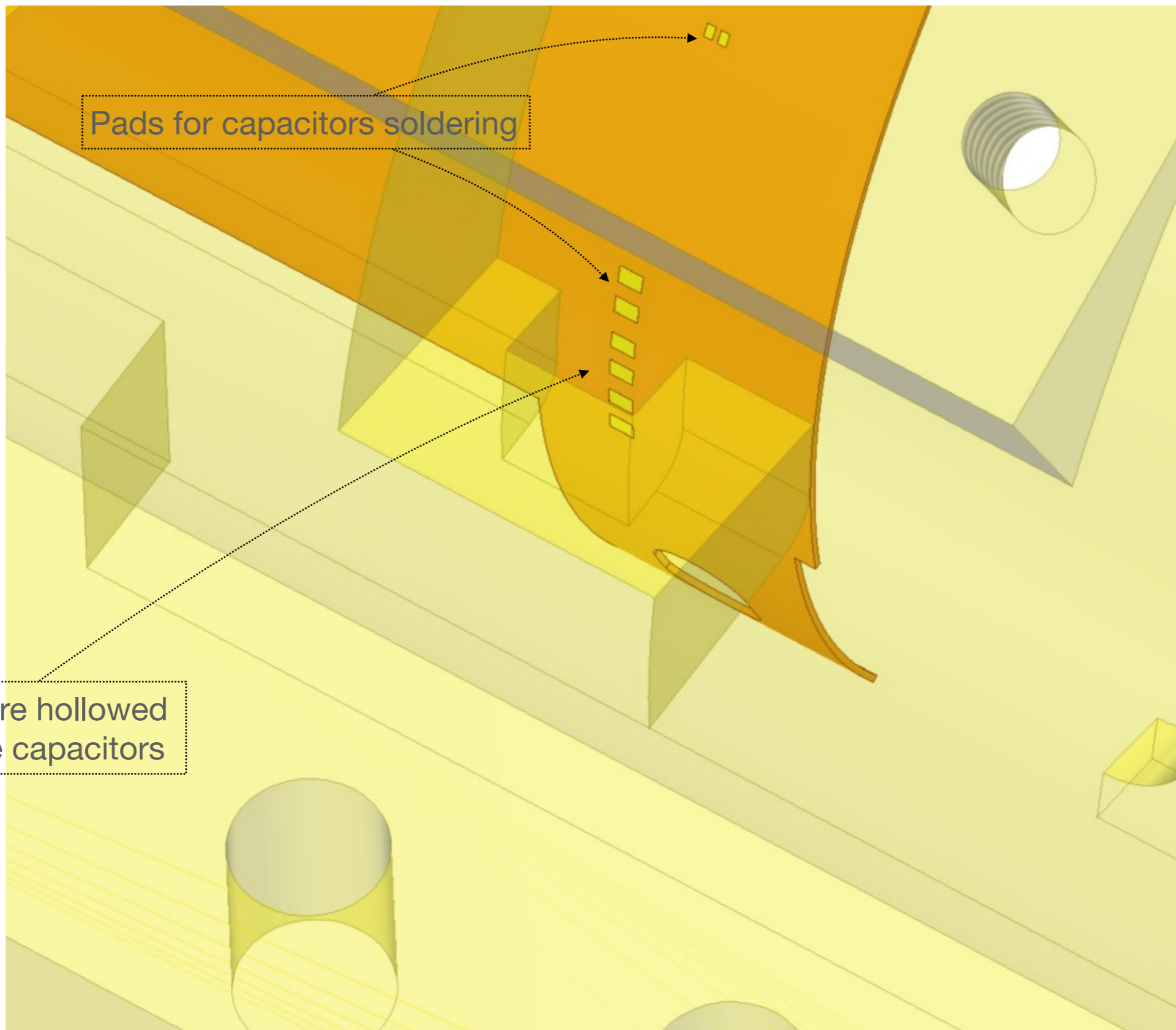








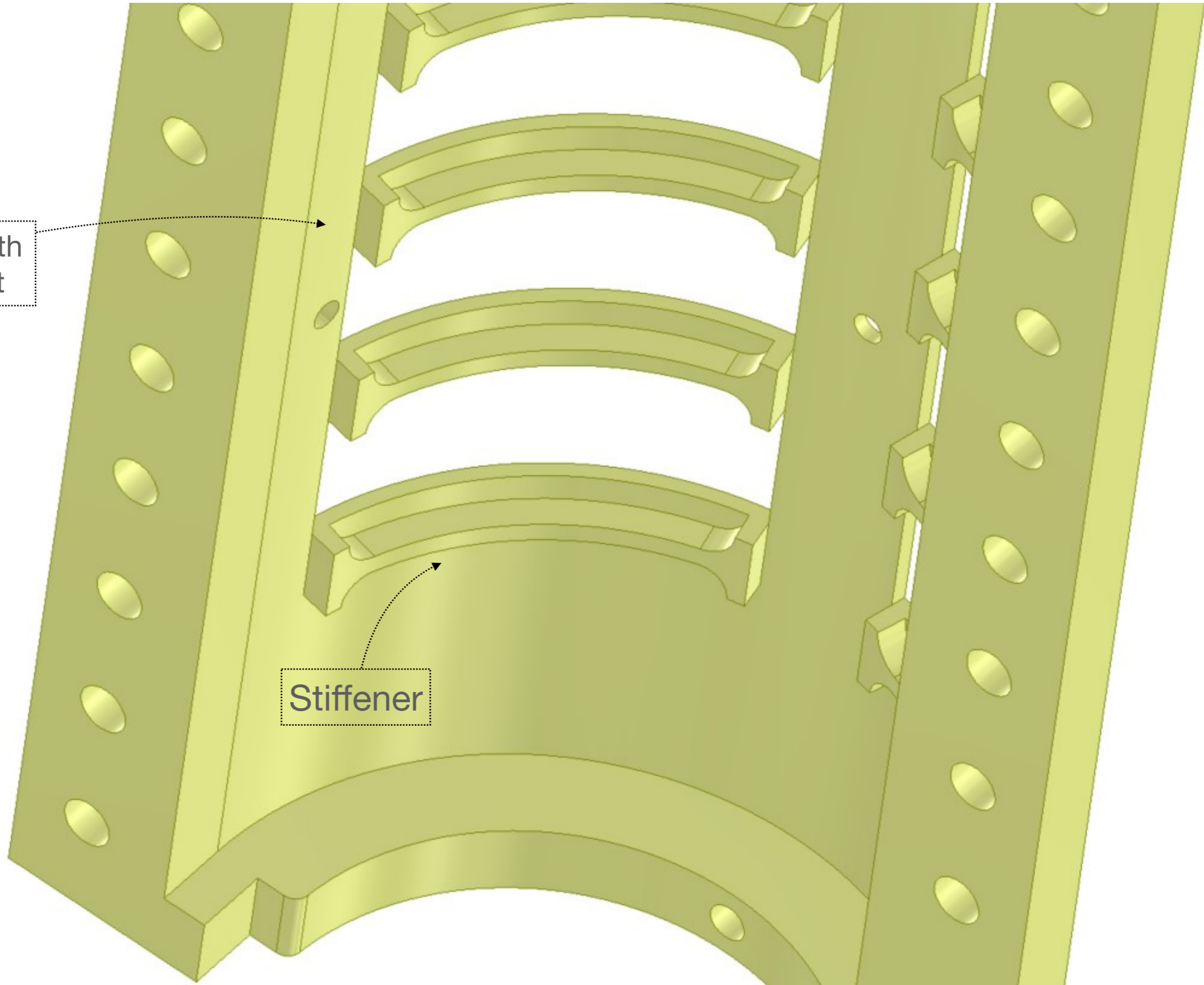
SAMTEC cables support and holder



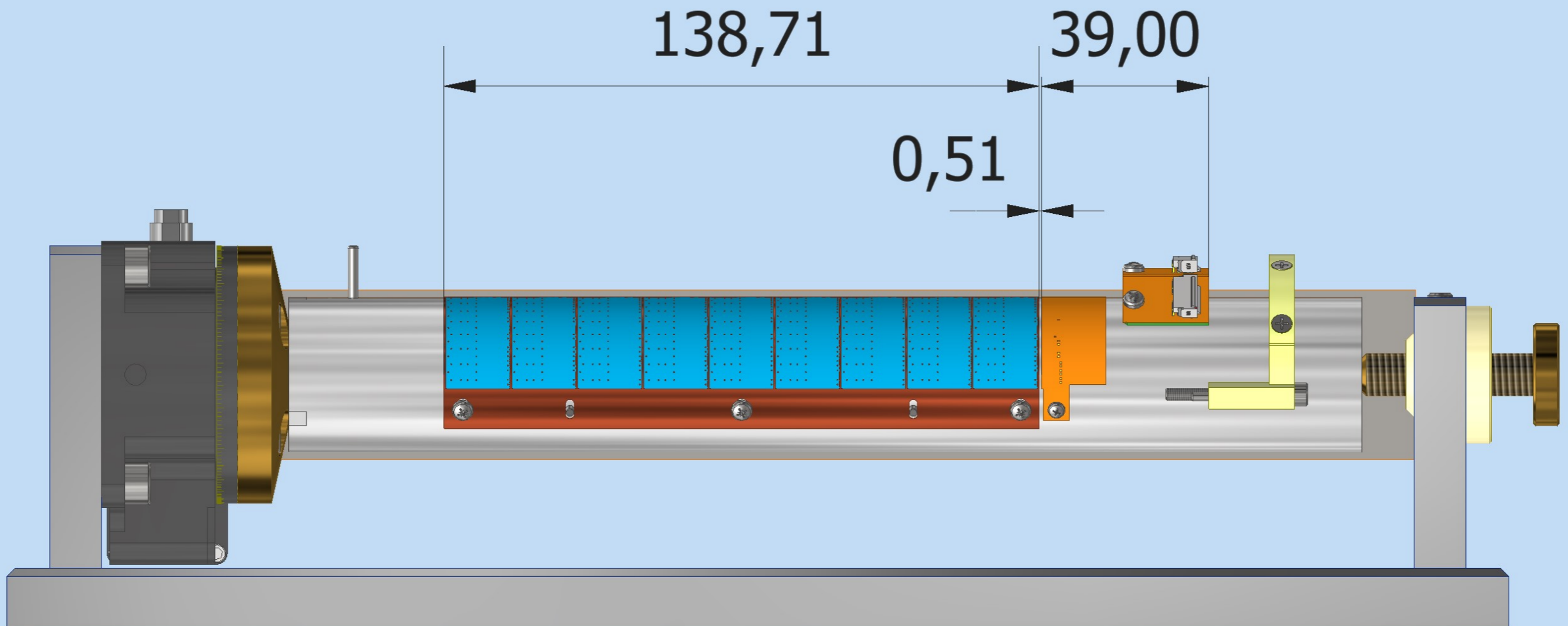
Pads for capacitors soldering

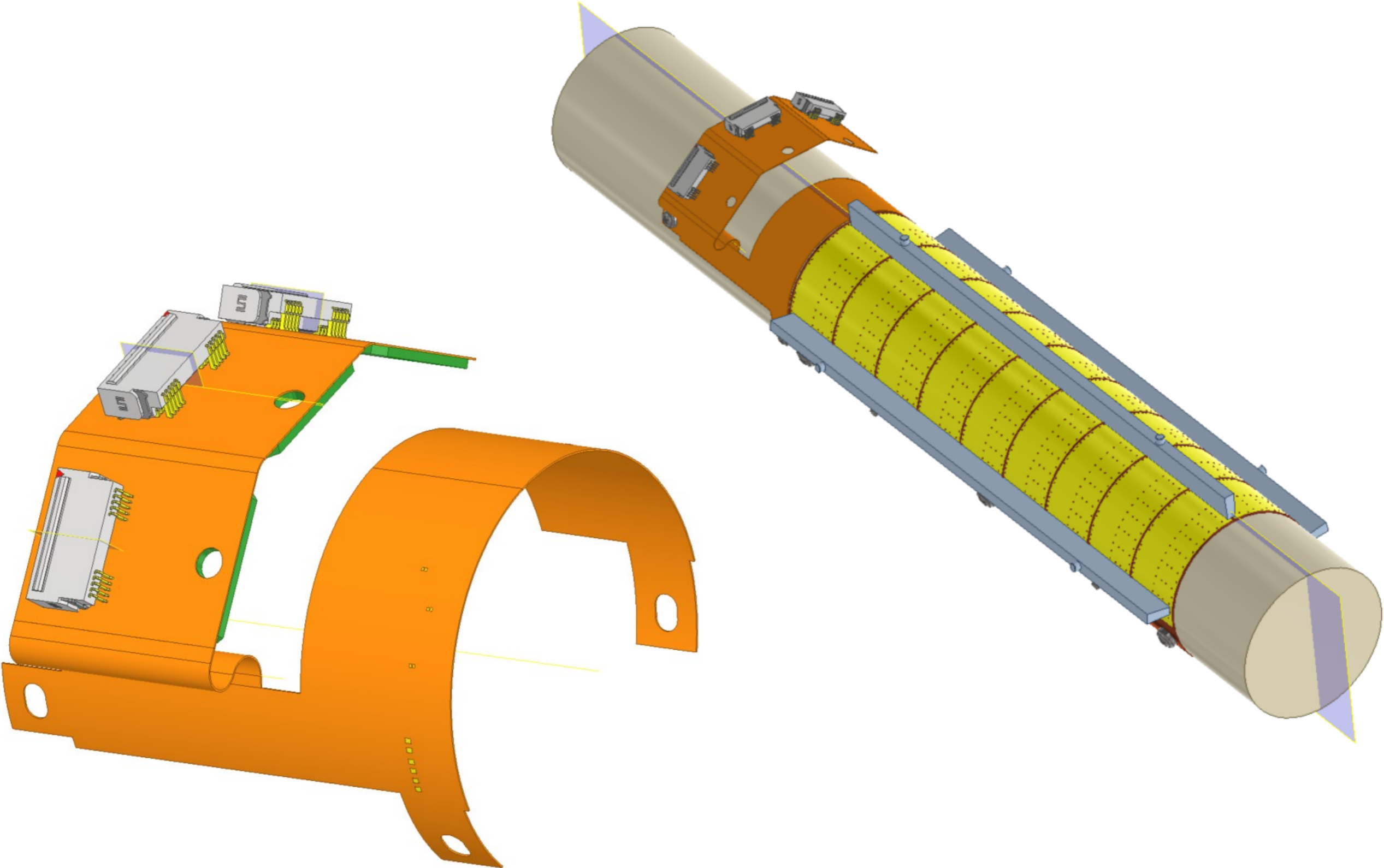
Support structure hollowed to not touch the capacitors

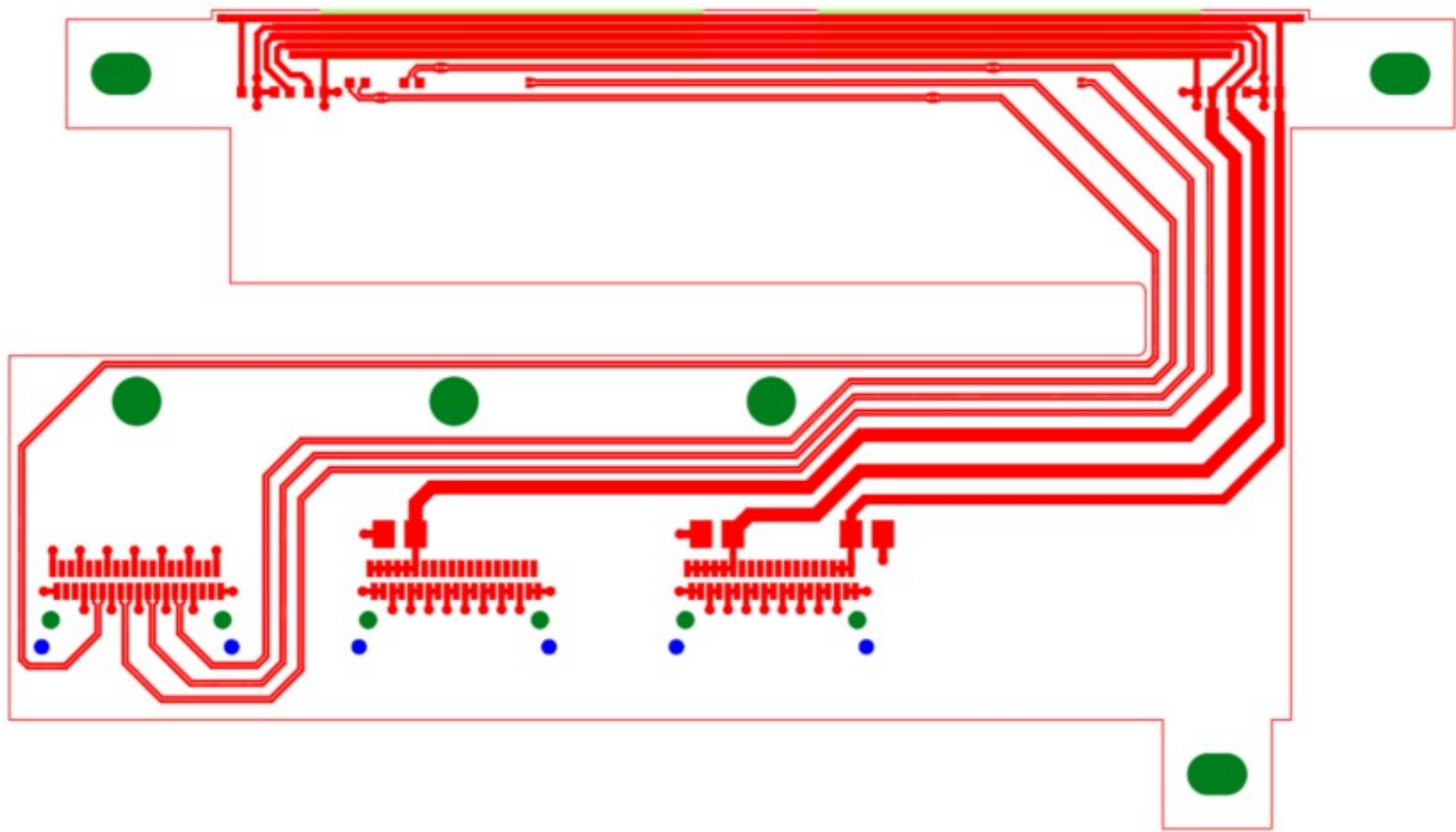
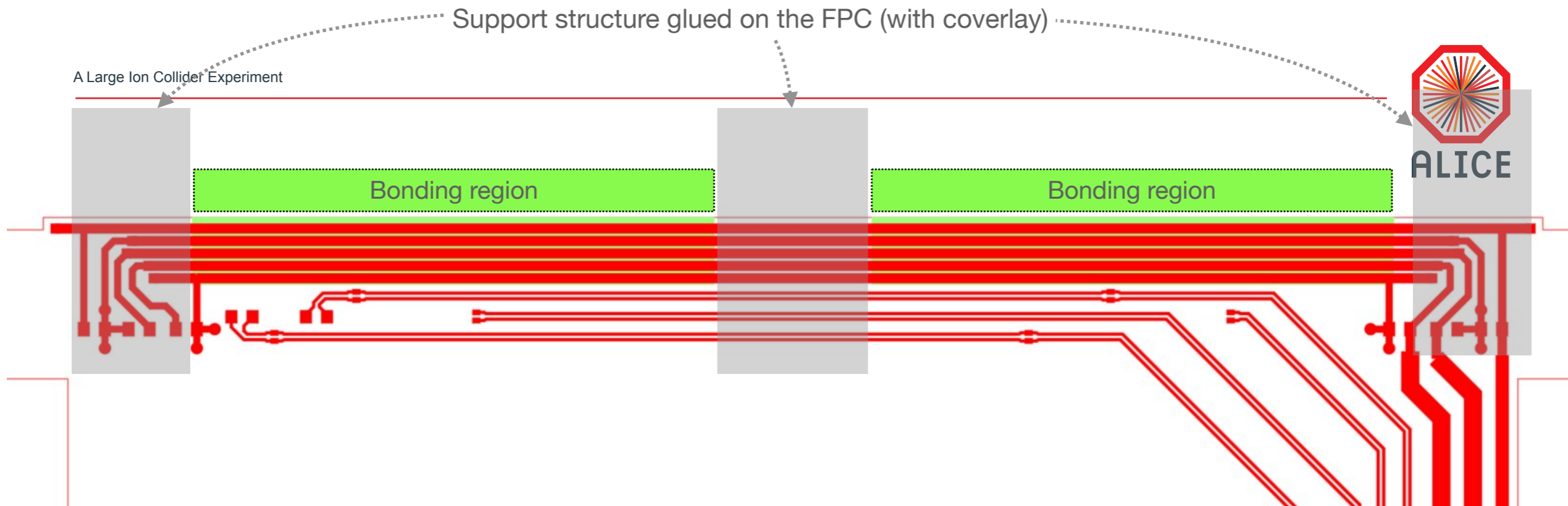
Do not interfere with wedges placement



Stiffener

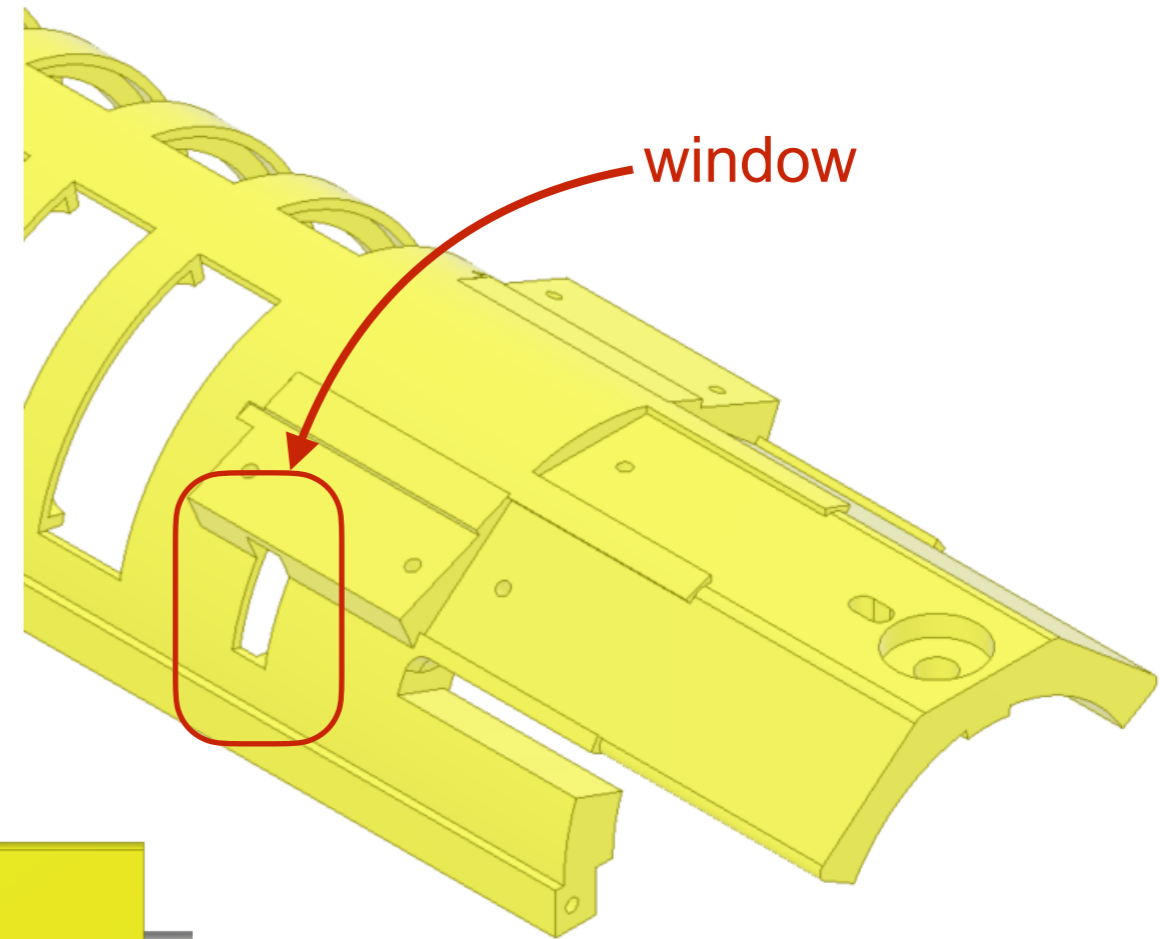
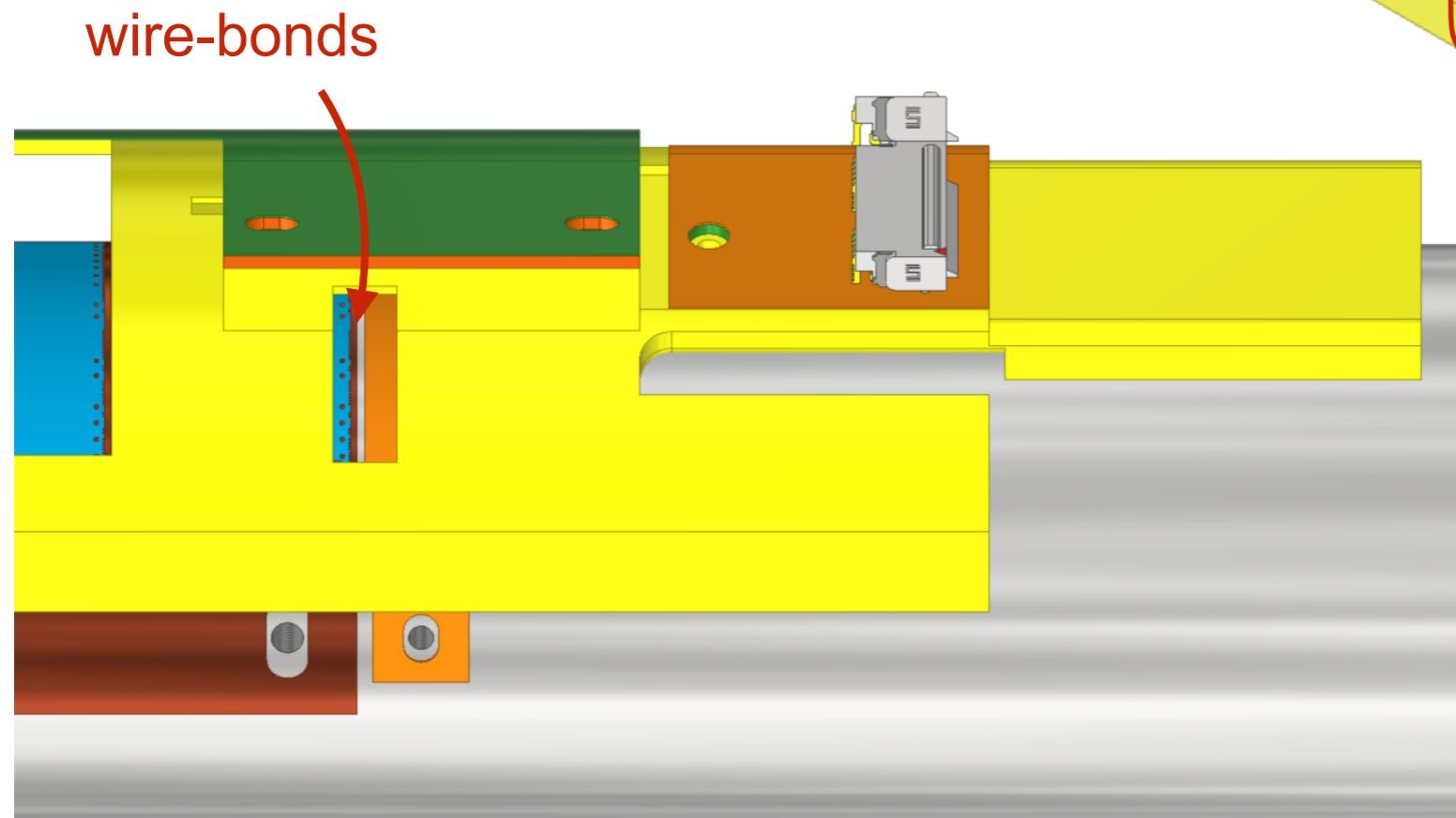




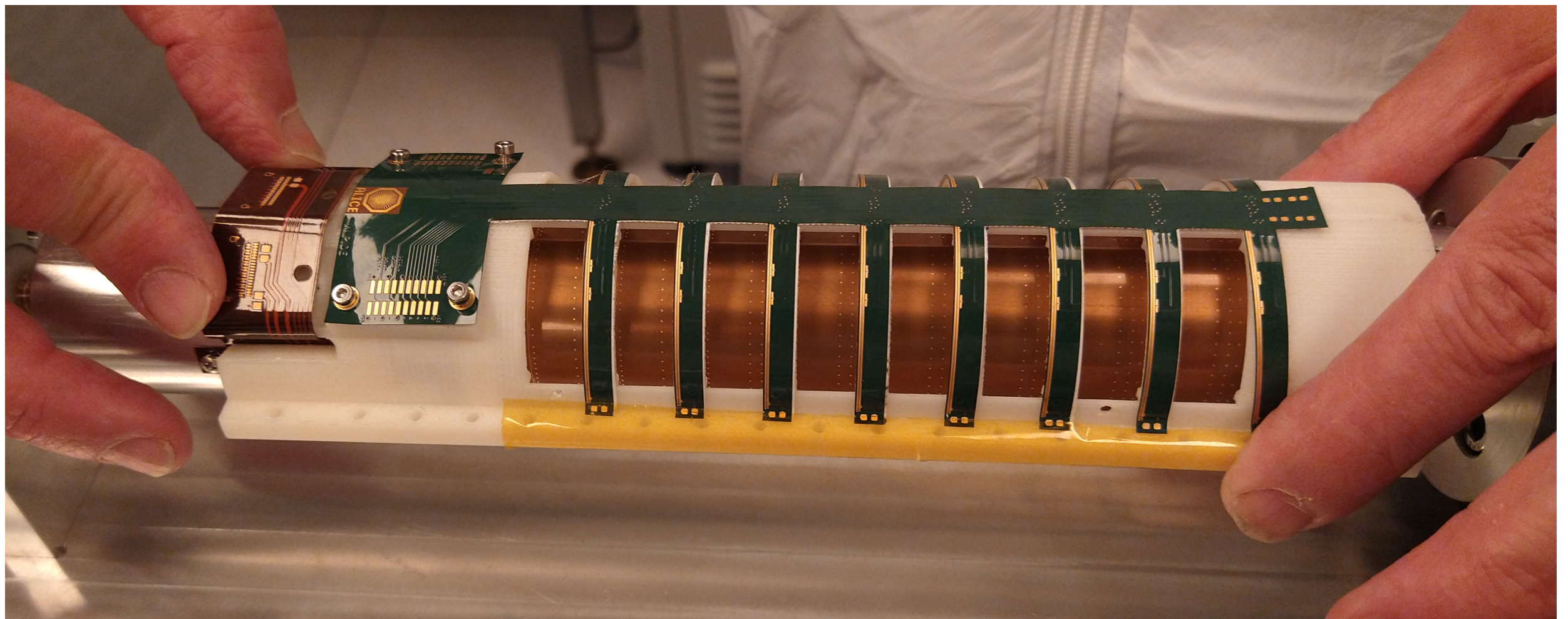


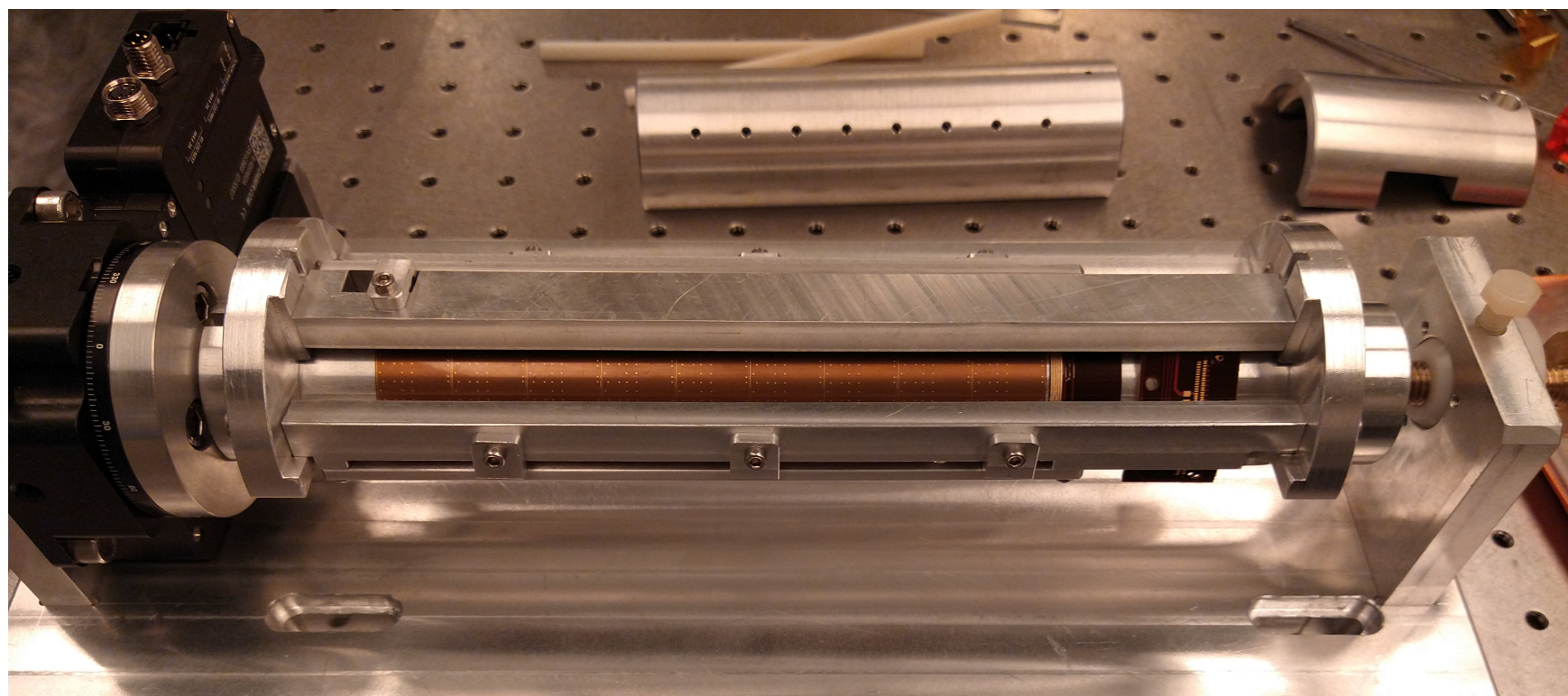


exoskeleton modification look at the bonds



Exoskeleton and Edge-FPC matching (very first mechanical verification)





Gluing tool for longerons and wedge

Gluing tool half-ring

