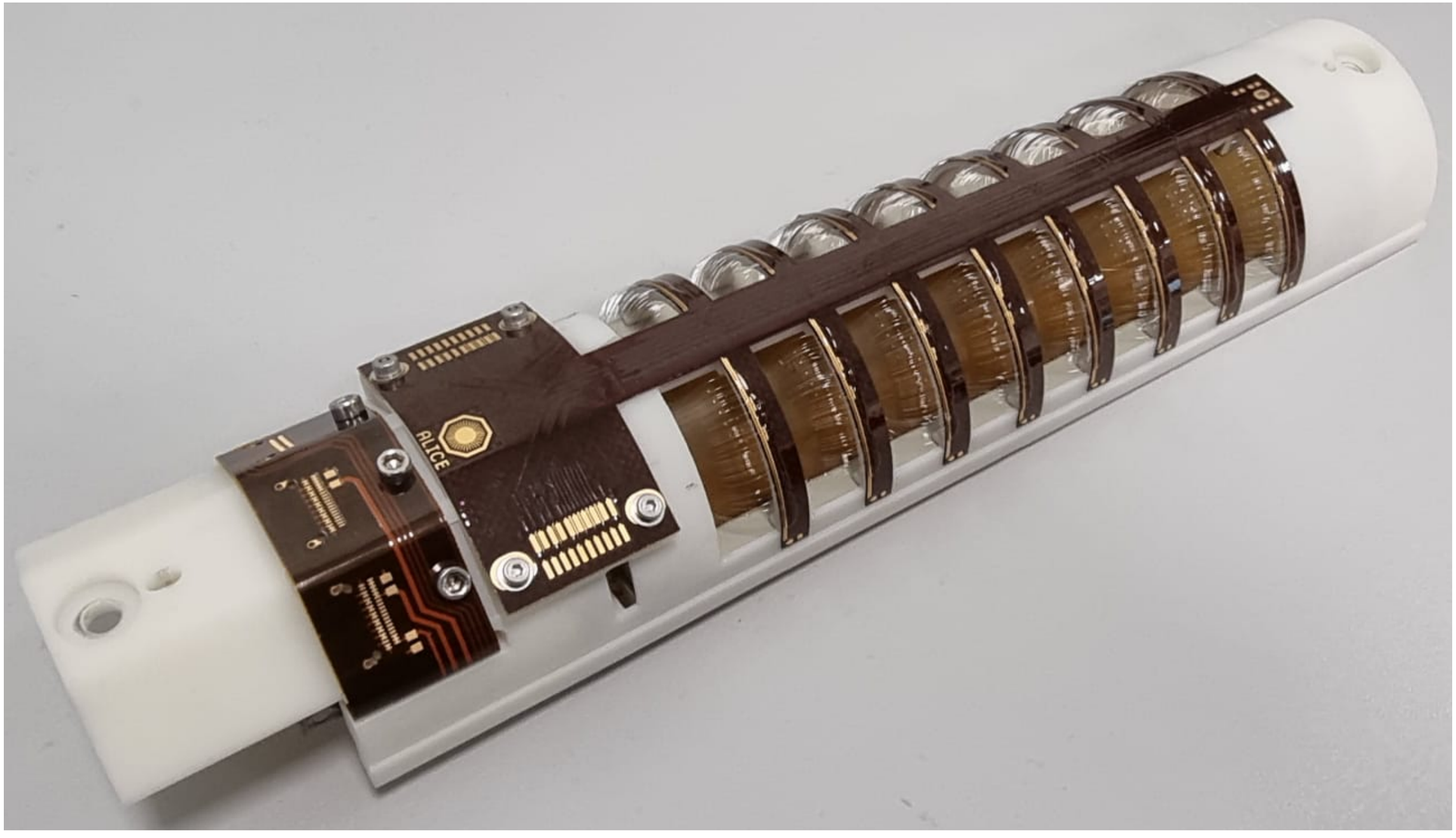
ITS3 activities in Bari

(1) Super-ALPIDE mockup assembly (v2)

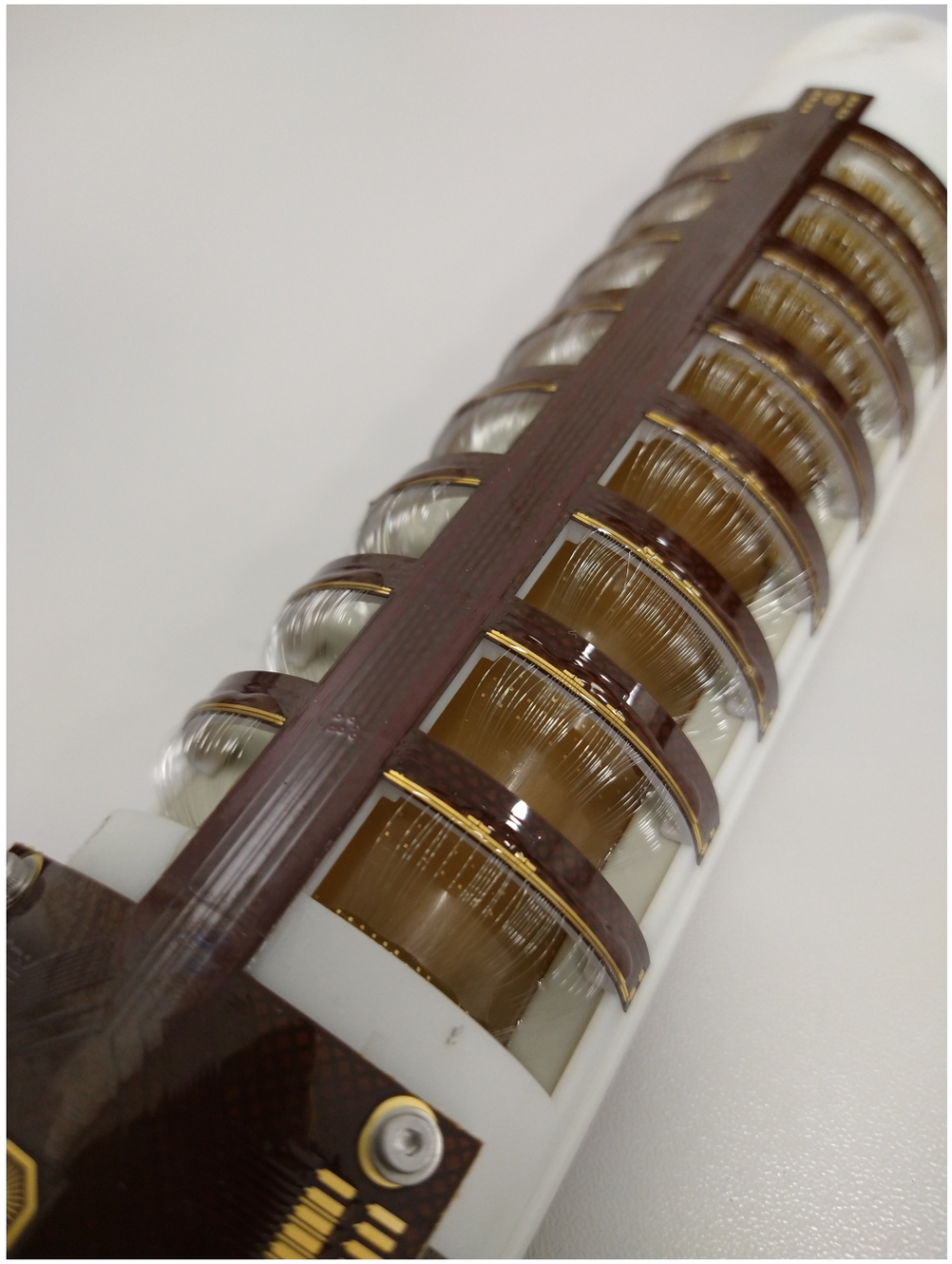
(2) Silicon piece bending

Super-ALPIDE mockup assembly - V2

Wire-bonding through exoskeleton

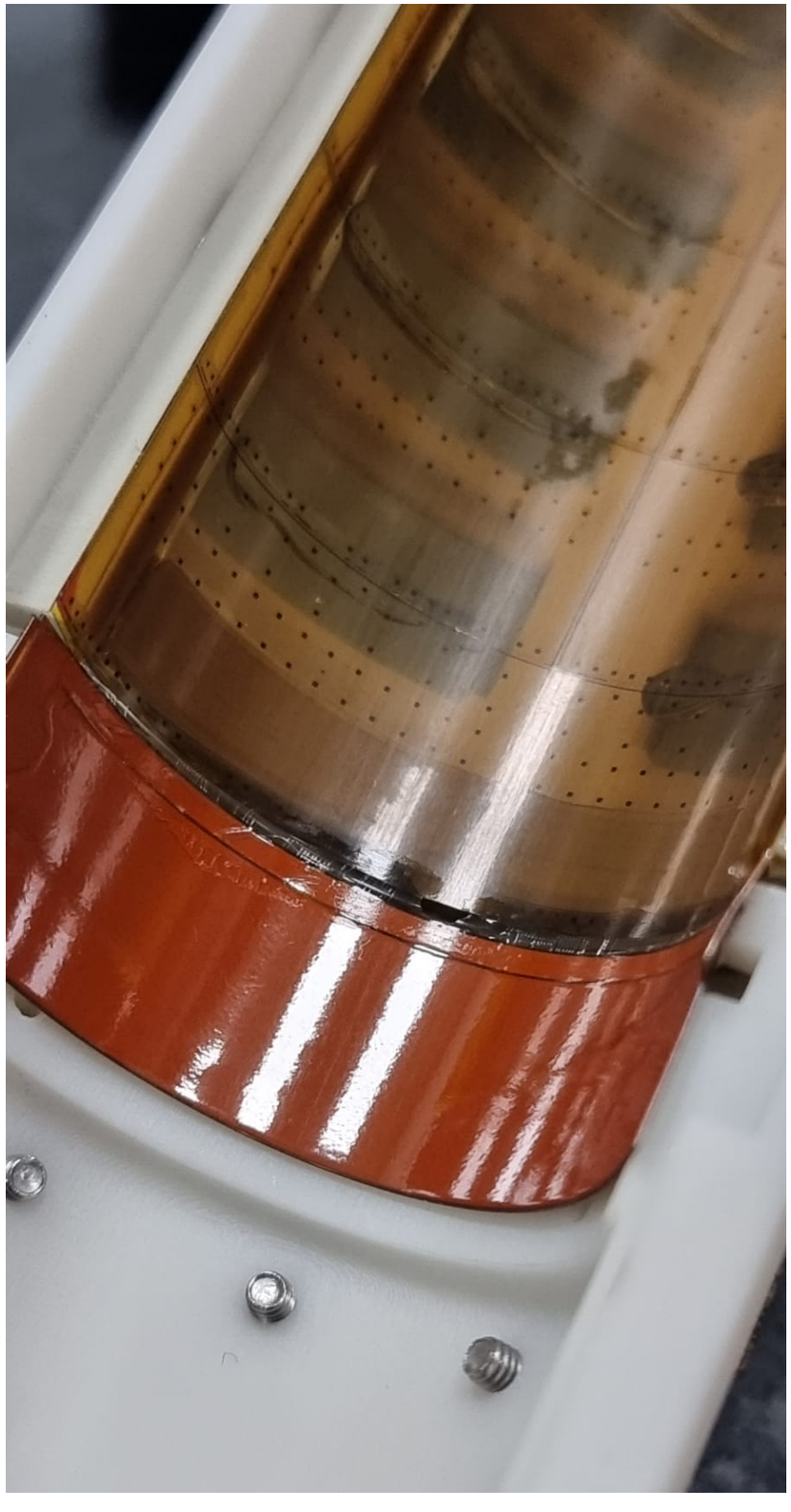


Super-ALPIDE mockup assembly - V2
Wire-bonding through exoskeleton

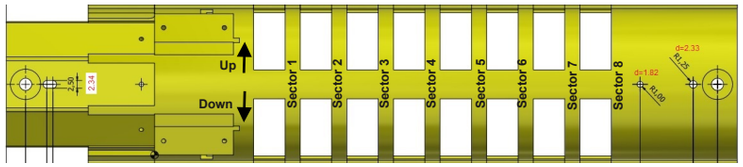


Super-ALPIDE mockup assembly - V2

Wire-bonding through exoskeleton



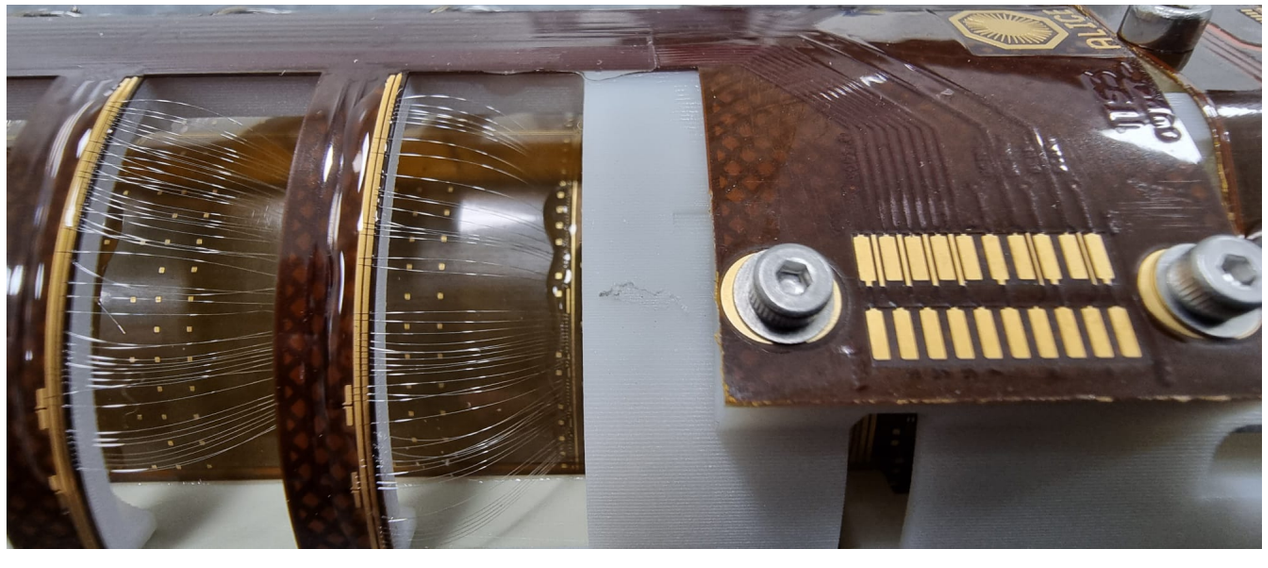
Super-ALPIDE mockup assembly - V2
Wire-bonding through exoskeleton



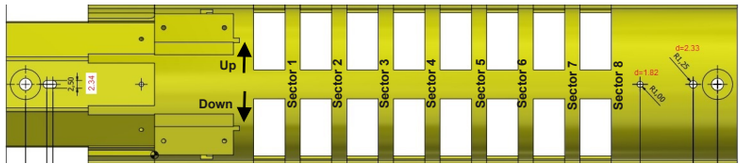
Sector 8 UP

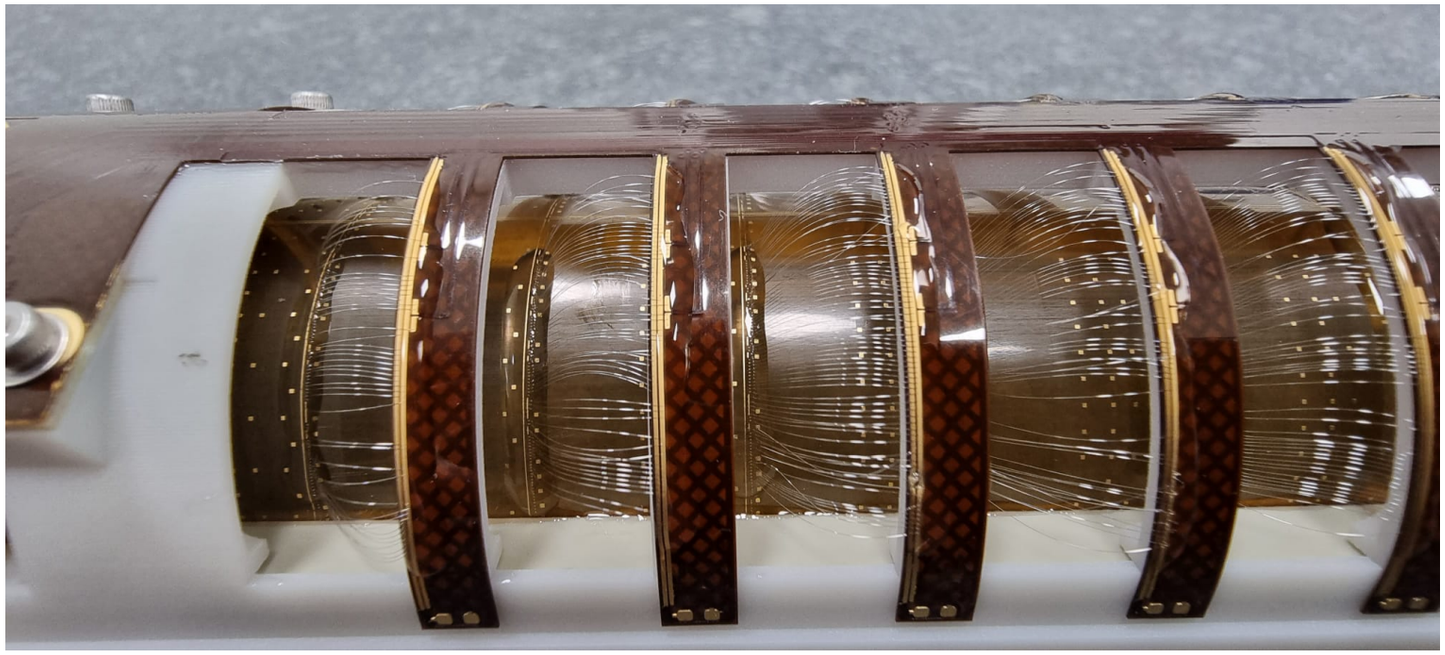
Sector 5 UP

SIDE UP

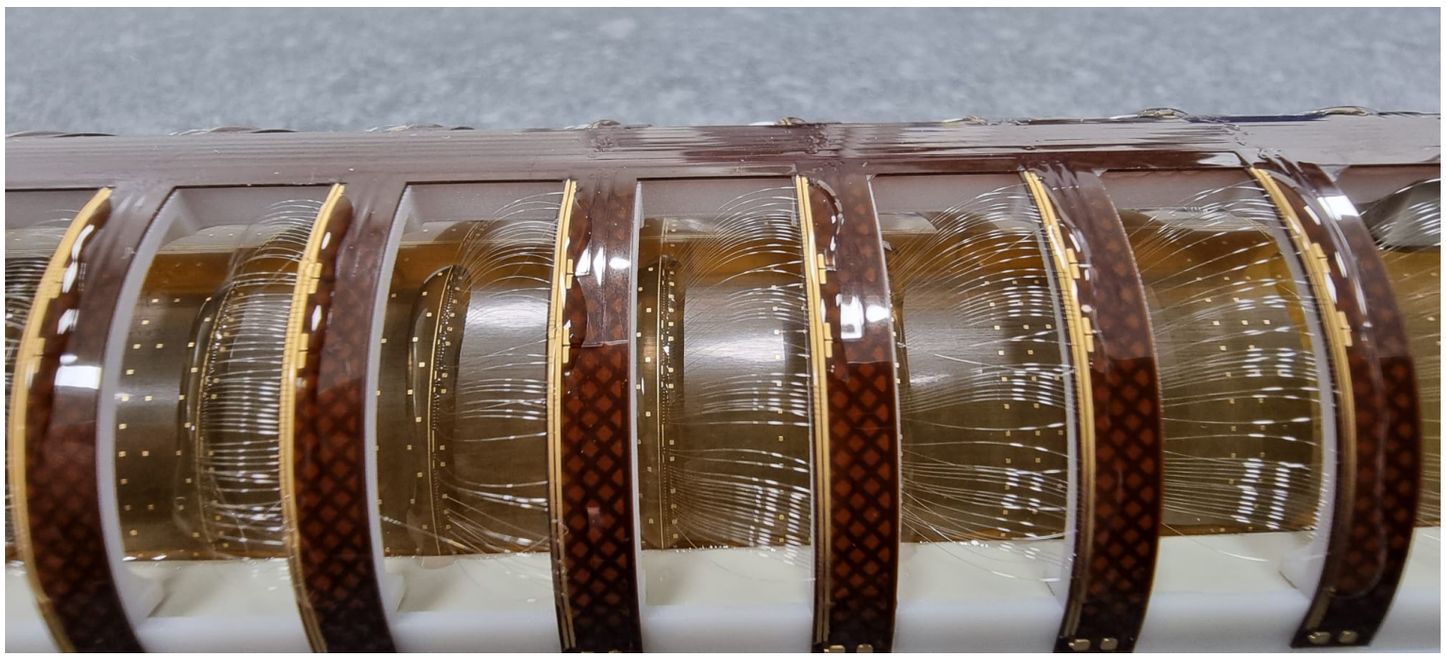


Super-ALPIDE mockup assembly - V2
Wire-bonding through exoskeleton



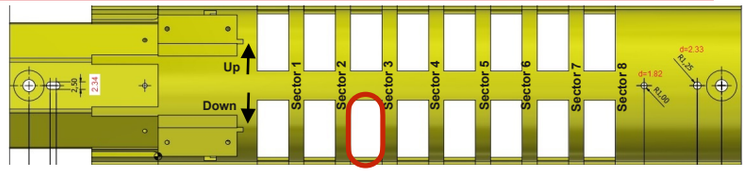


SIDE DOWN

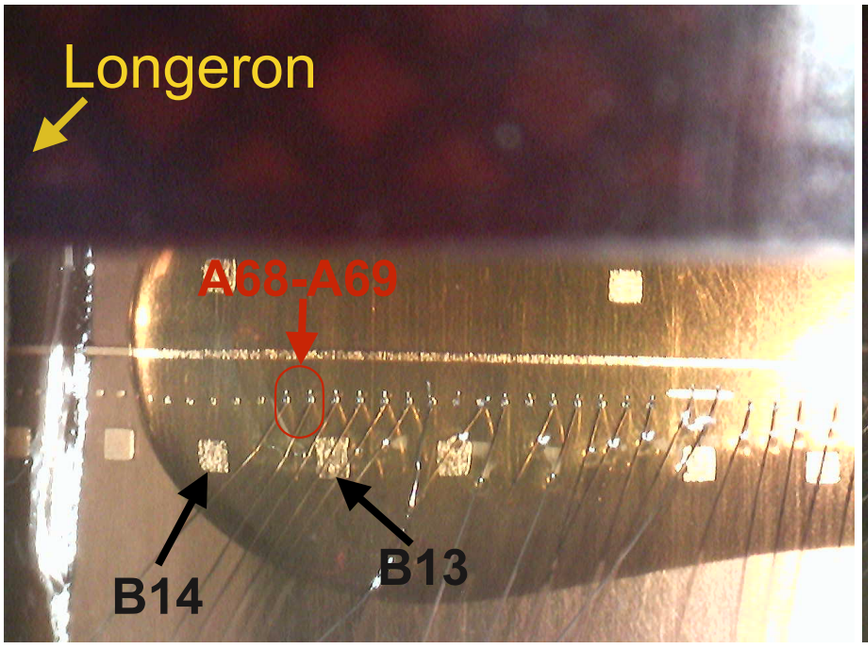


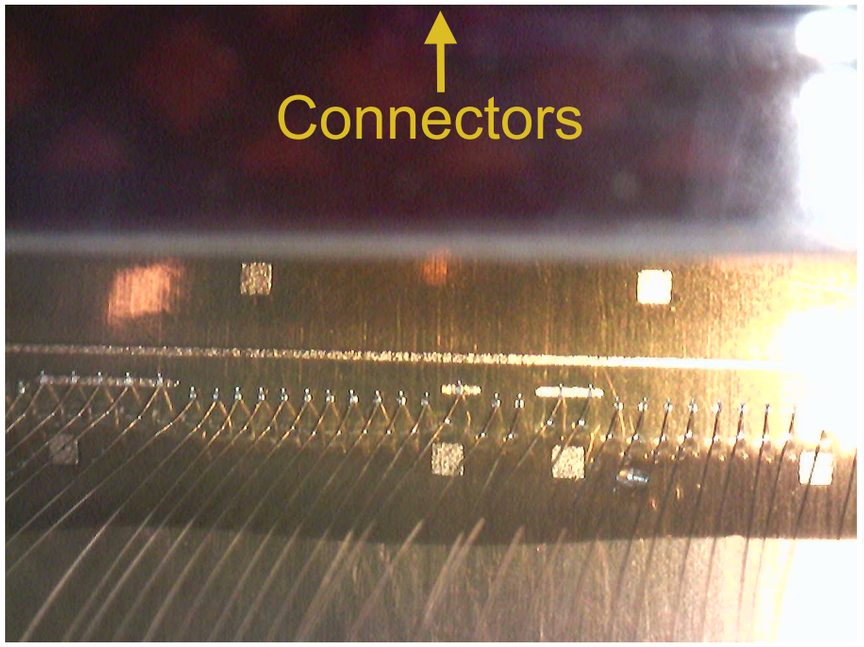
Super-ALPIDE mockup assembly - V2

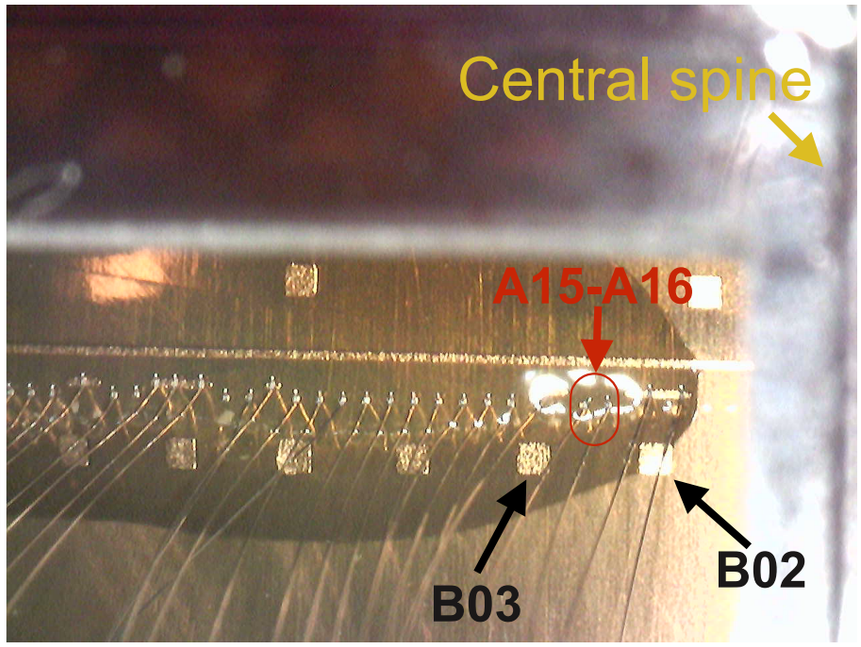
Wire-bonding through exoskeleton - Bonding scheme

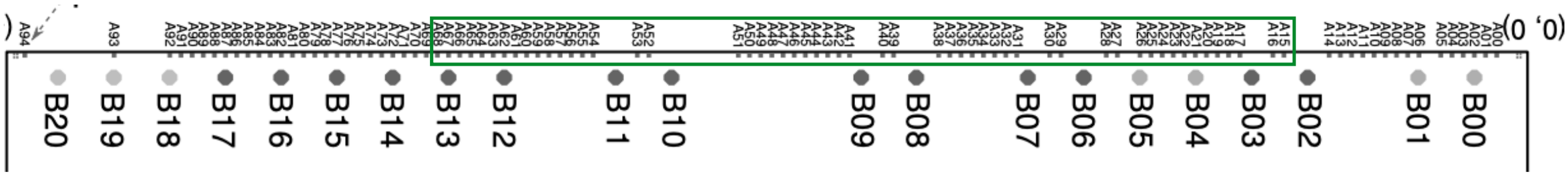


DOWN region (sector 3)







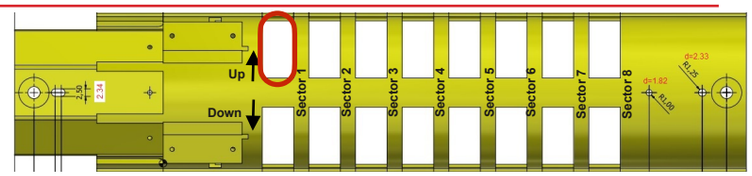


A17 - DVSS	A33 - SUB	A47 - CHIPID[3]	A63 - DVSS
A18 - DVDD	A34 - AVSS	A48 - PVSS	A64 - DVDD
A19 - PWELL	A35 - AVDD	A49 - PVDD	A65 - DVSS
A23 - DVSS	A38 - DVSS	A50 - PVSS	A66 - DVDD
A24 - DVDD	A39 - DCLK_P	A51 - PVDD	A69 - DVSS
A26 - POR_DIS_N	A40 - DCLK_N	A54 - DVDD	A70 - DVDD
A27 - AVSS	A41 - DVDD	A55 - CHIPID[2]	A71 - CHIPID[1]
A28 - AVDD	A42 - PWELL	A56 - DVSS	A74 - DVSS
A29 - DCTRL_P	A43 - DVSS	A58 - AVSS	A75 - DVDD
A30 - DCTRL_N	A44 - DVDD	A59 - AVDD	A76 - DVSS
A31 - DVSS	A45 - AVSS	A60 - DVSS	A88 - CHIPID[0]
A32 - DVDD	A46 - AVDD	A61 - DVDD	

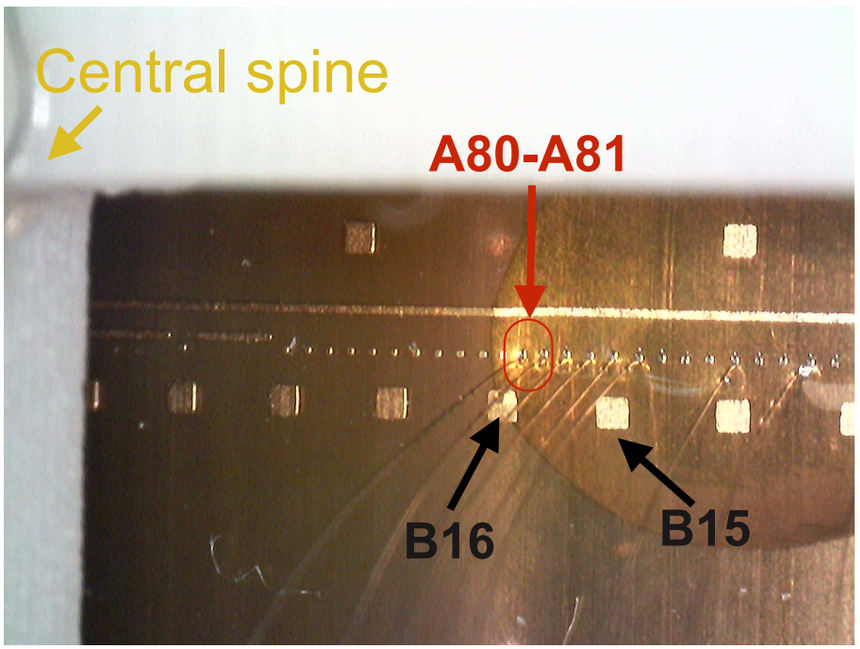
Pasquale could push to A72

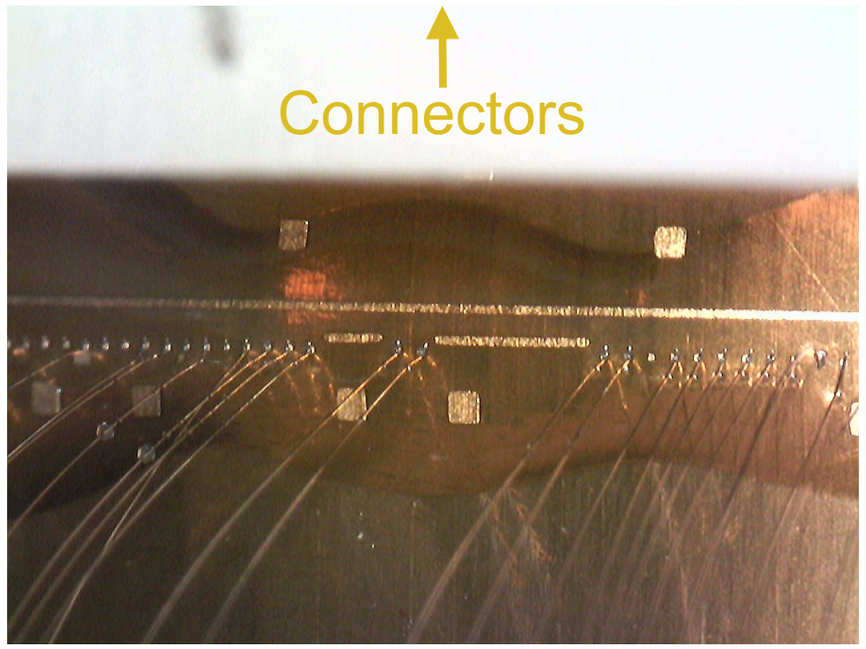
Super-ALPIDE mockup assembly - V2

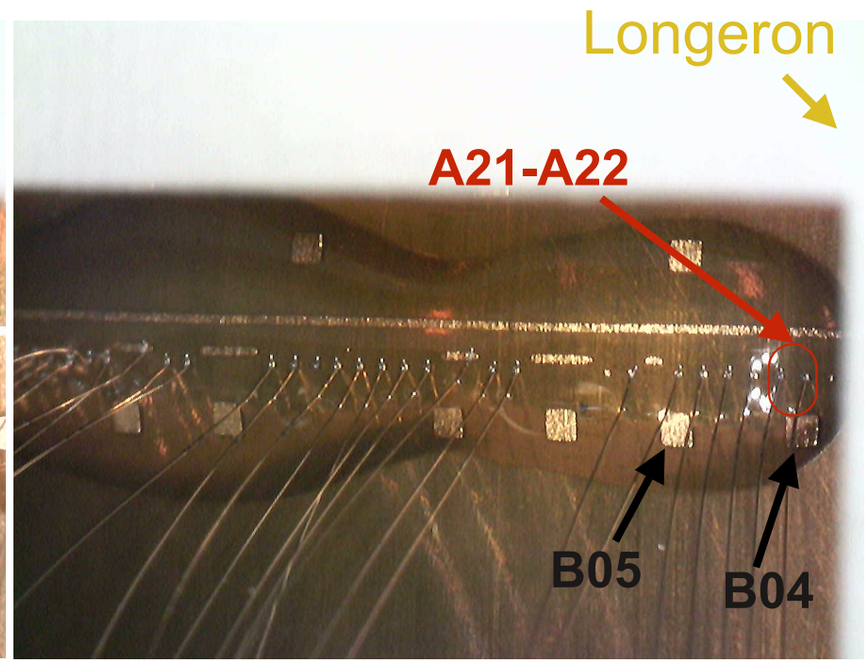
Wire-bonding through exoskeleton - Bonding scheme

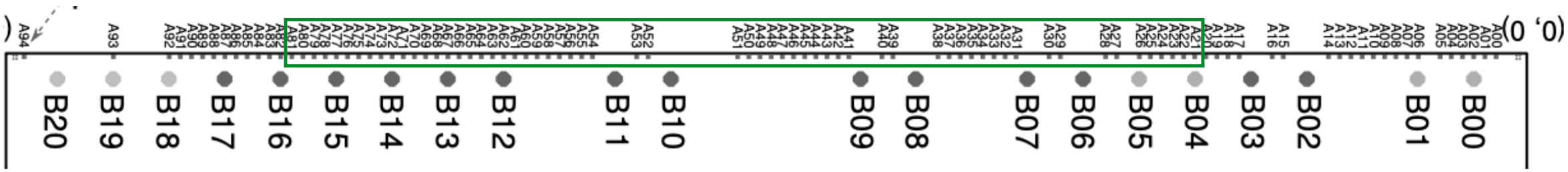


UP region (sector 1)









A17 - DVSS	A33 - SUB	A47 - CHIPID[3]	A63 - DVSS
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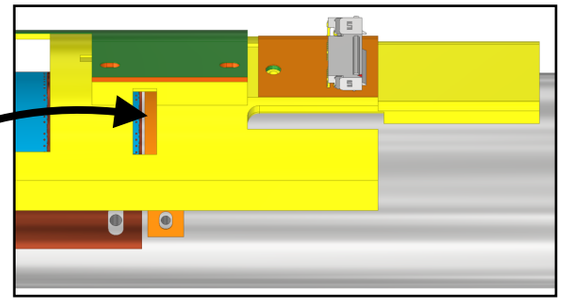
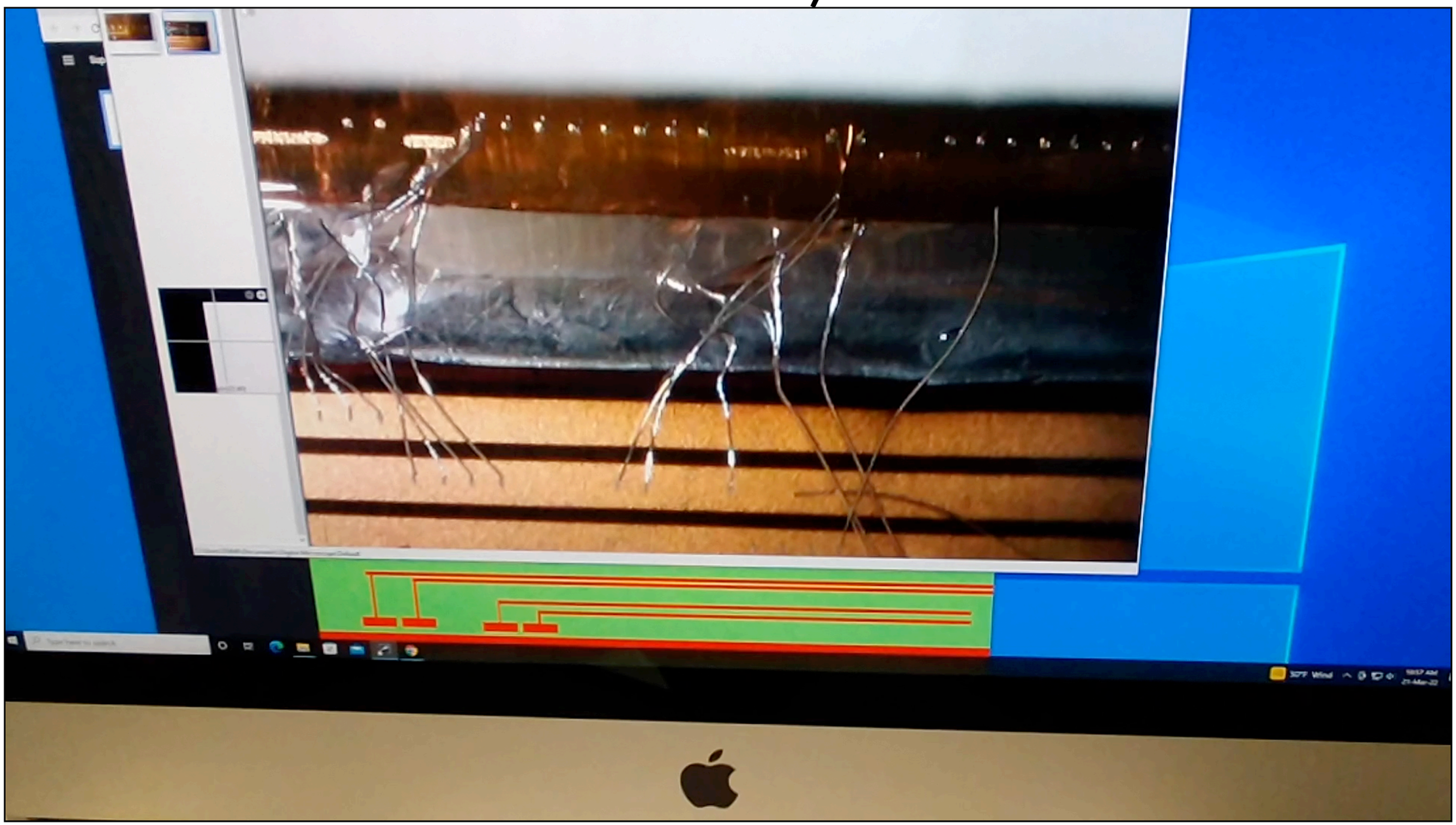
Super-ALPIDE mockup assembly - V2
Sylgard usage

Super-ALPIDE mockup assembly - V2

Wire-bonding to edge-FPC and Sylgard usage

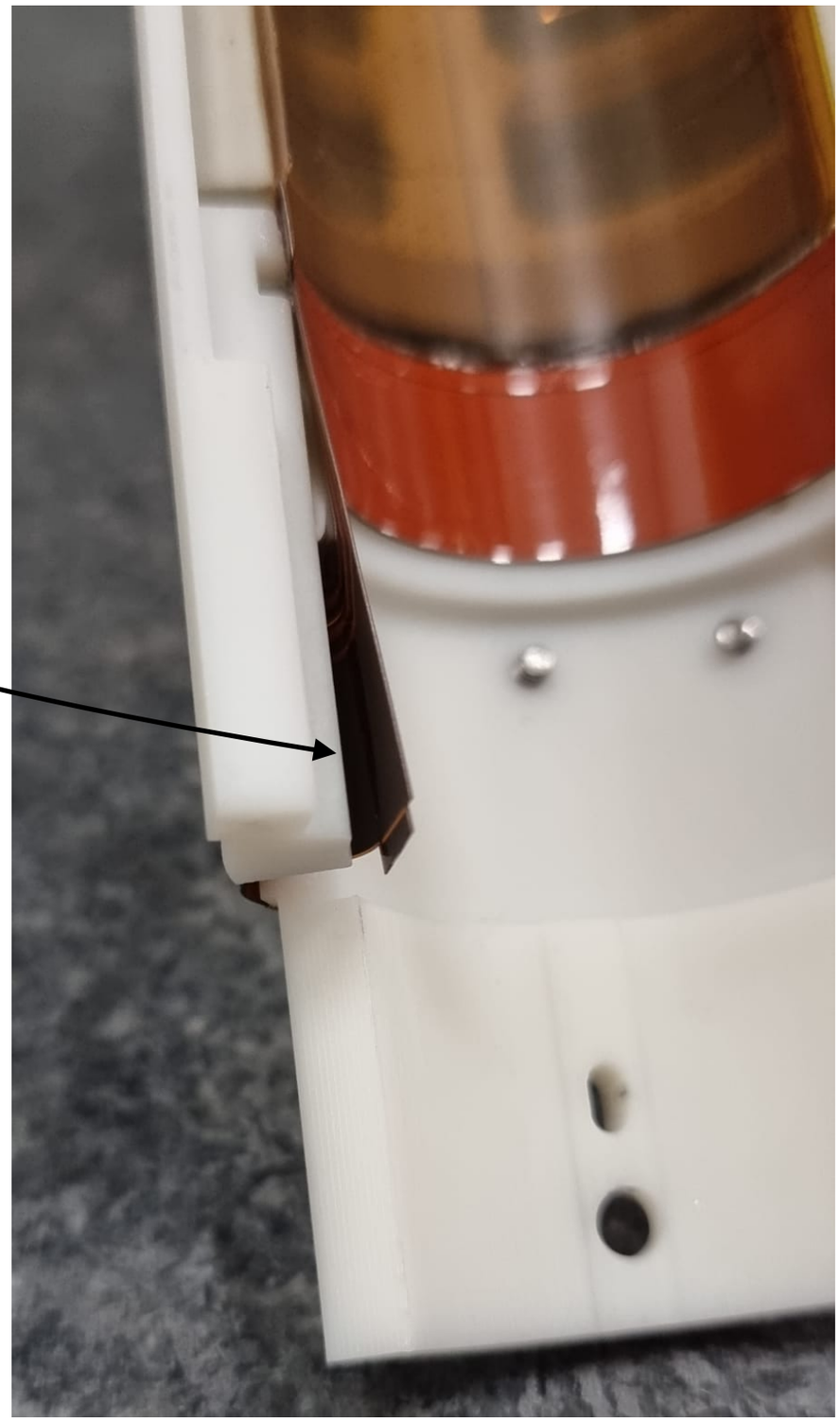




Super-ALPIDE mockup assembly - V2

Wire-bonding to edge-FPC and Sylgard usage

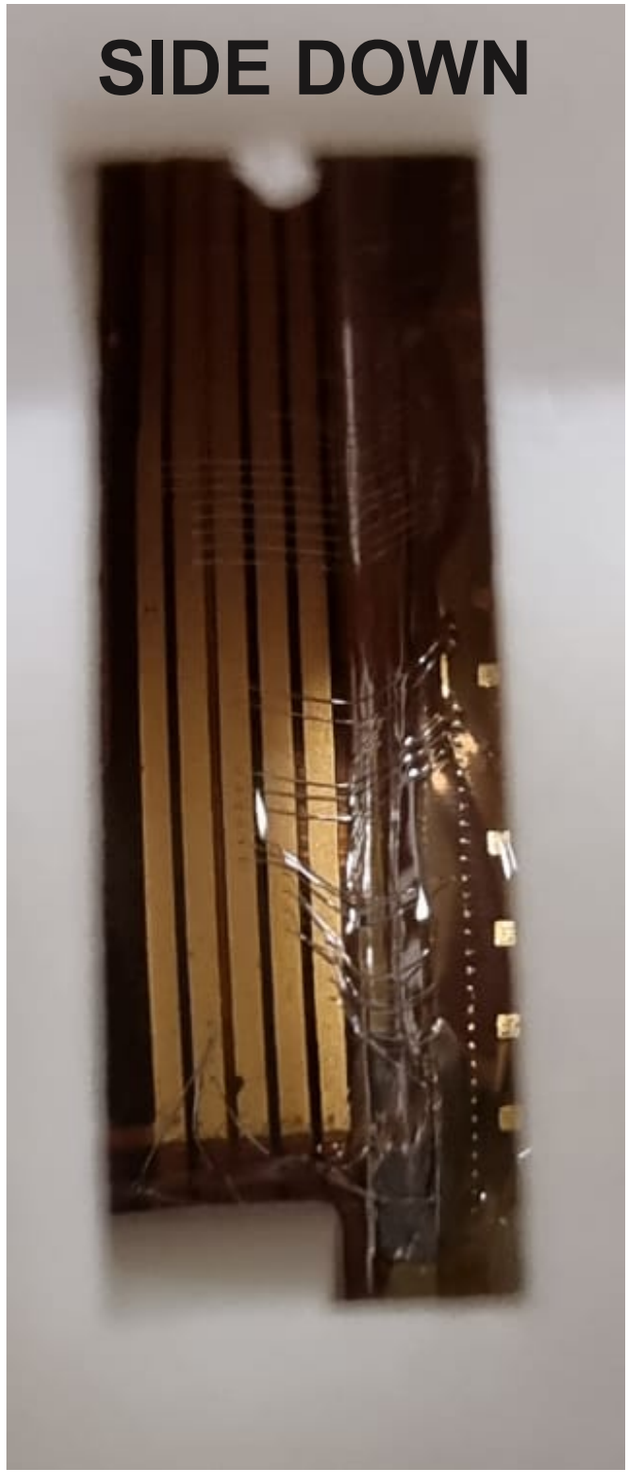
Mistake!
Missing gluing of the edge-FPC



Exploring usage of detaching spray to be applied in the region below wire-bonding between chip and edge-FPC.

Super-ALPIDE mockup assembly - V2

Wire-bonding through exoskeleton



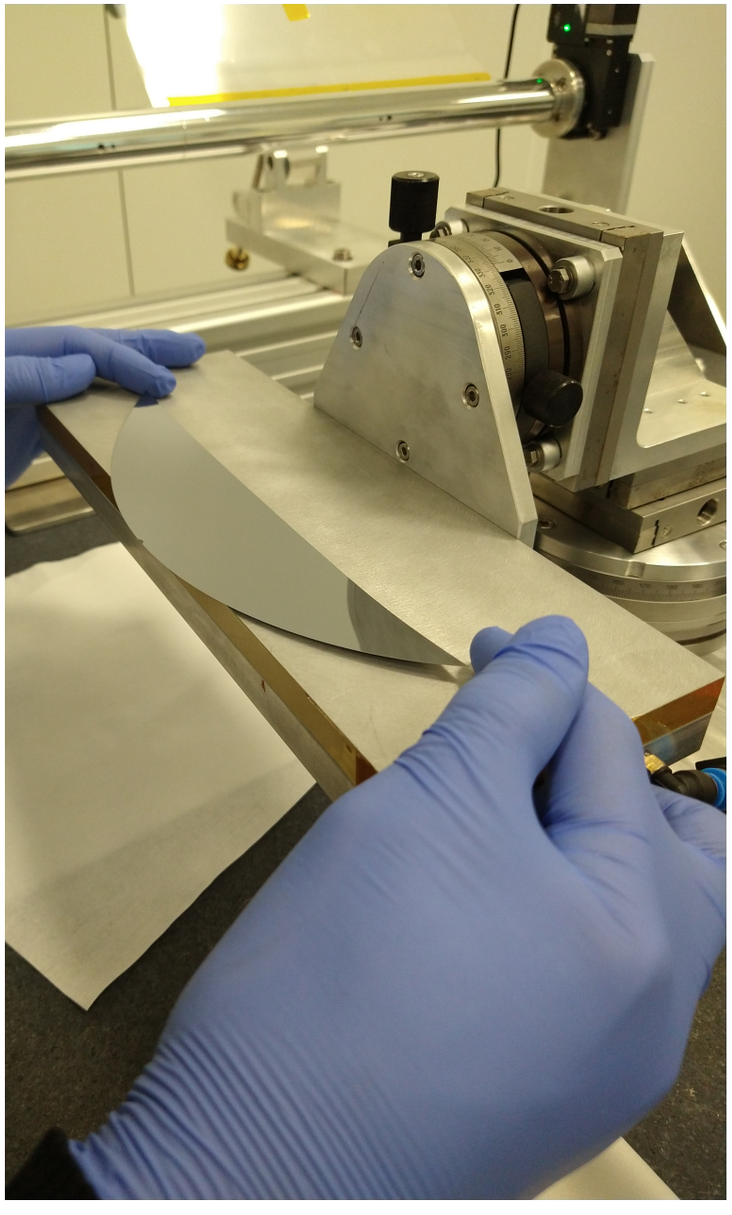
Super-ALPIDE mockup assembly
Next assembly, V3

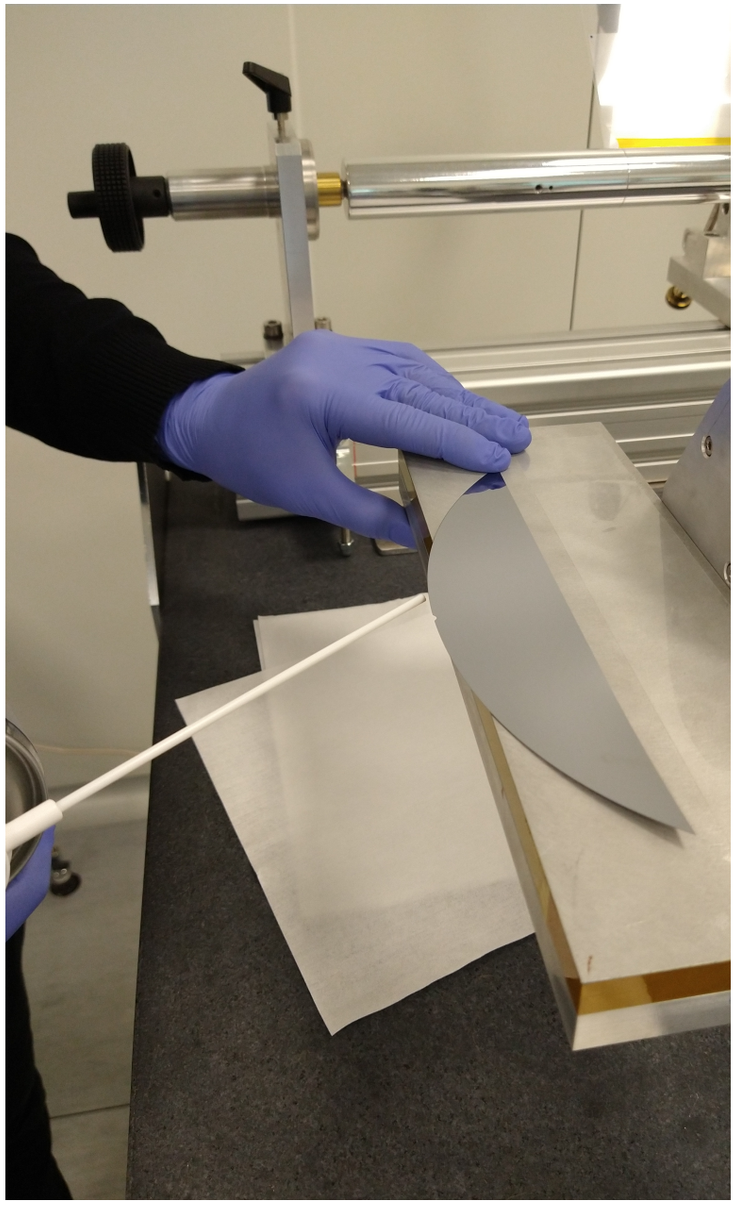
Super-ALPIDE mockup assembly - V2		
Dummy-super-ALPIDE	AVAILABLE	Aligned to the mandrel using bending tool
Exoskeleton (V4)	UNDER PROCUREMENT	Produced by MET
Mandrel (compatible with exo V3)	AVAILABLE	Final one, outsourced
Wedges/Longerons/Half-rings	UNDER PROCUREMENT	Produced by MET
Tools for W/L/HR posit./gluing	AVAILABLE	Final ones, homemade (design at CERN)
Edge-FPC	AVAILABLE	
Exo-FPC (V3)	AVAILABLE	
Exo-FPC gluing procedure/tools	AVAILABLE	Homemade

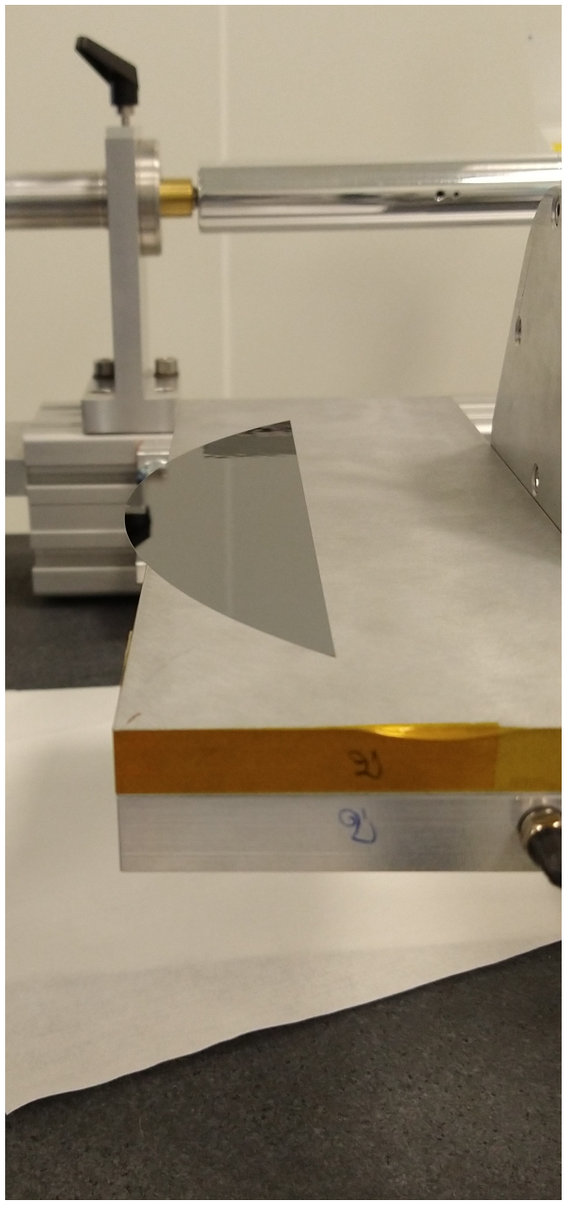
+ Final bonding scheme
+ Much care in all the steps

Week 12 - Silicon piece bending exercise
Week 13/14/15 - Super-ALPIDE mockup assembly V3

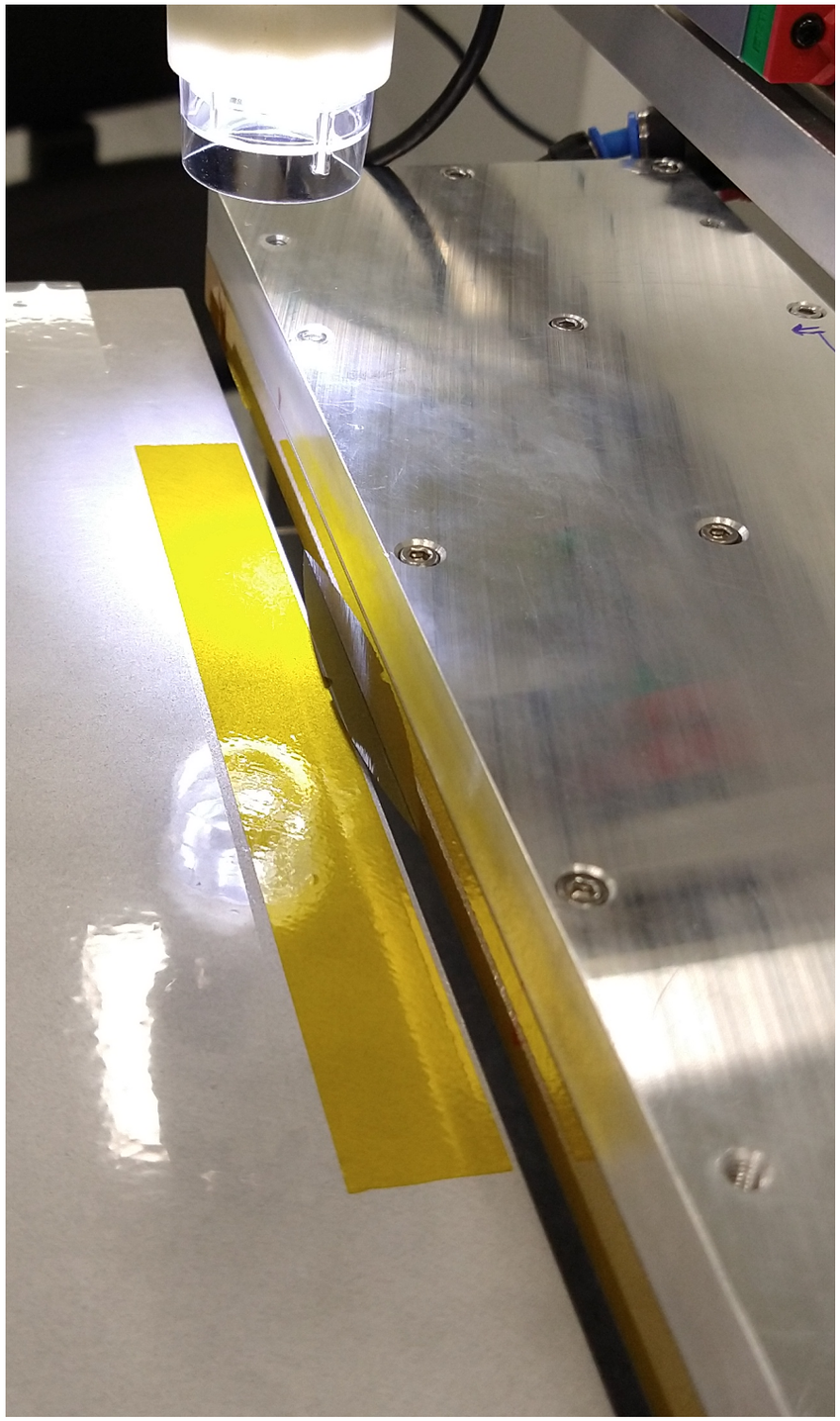
Bending of silicon piece - Attempt 1

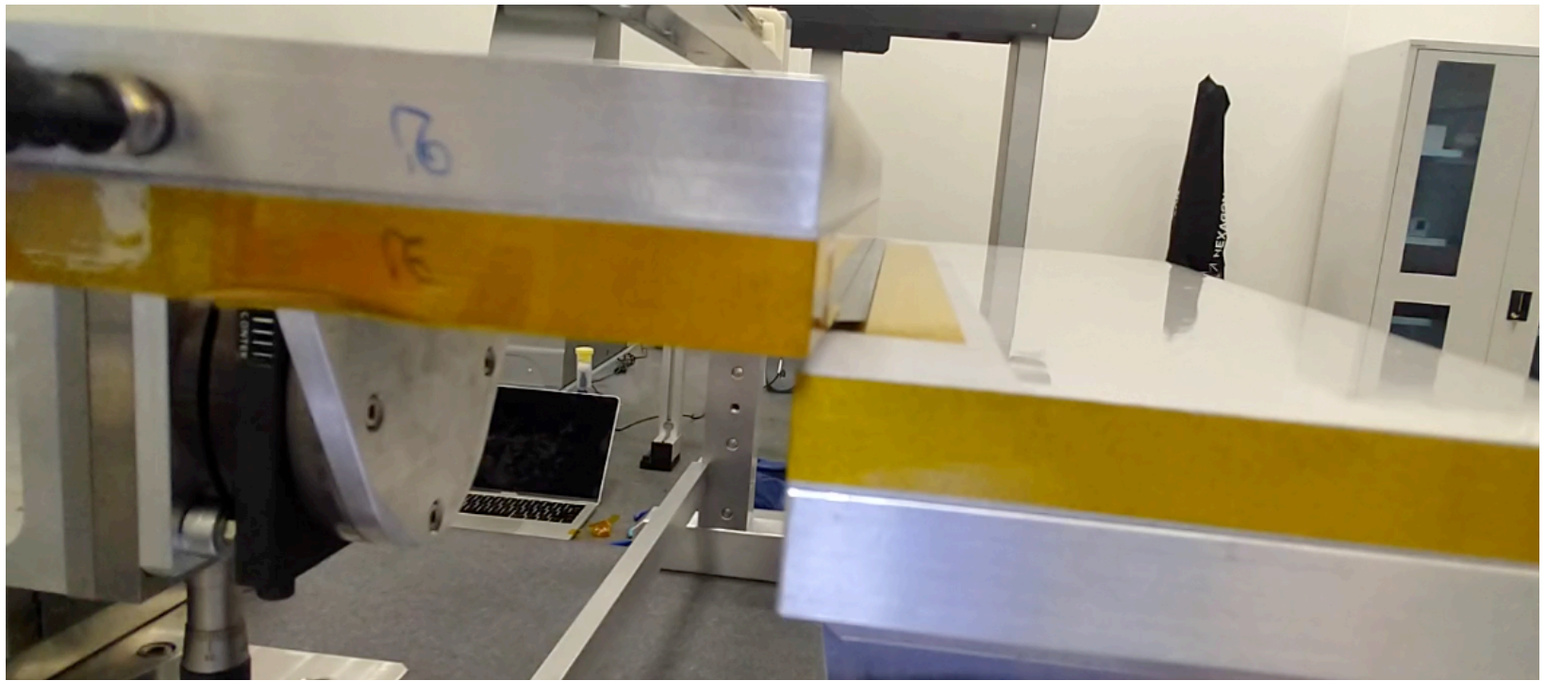


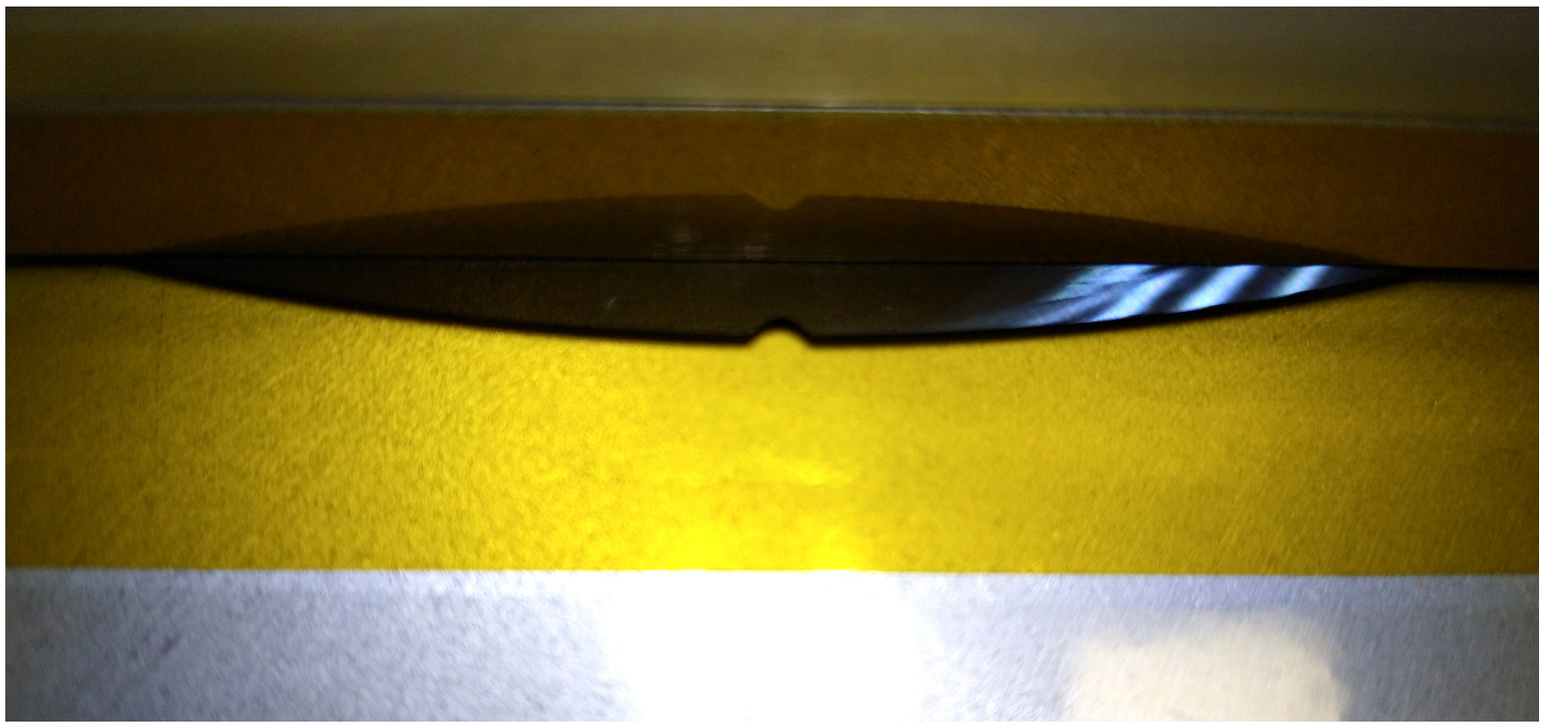




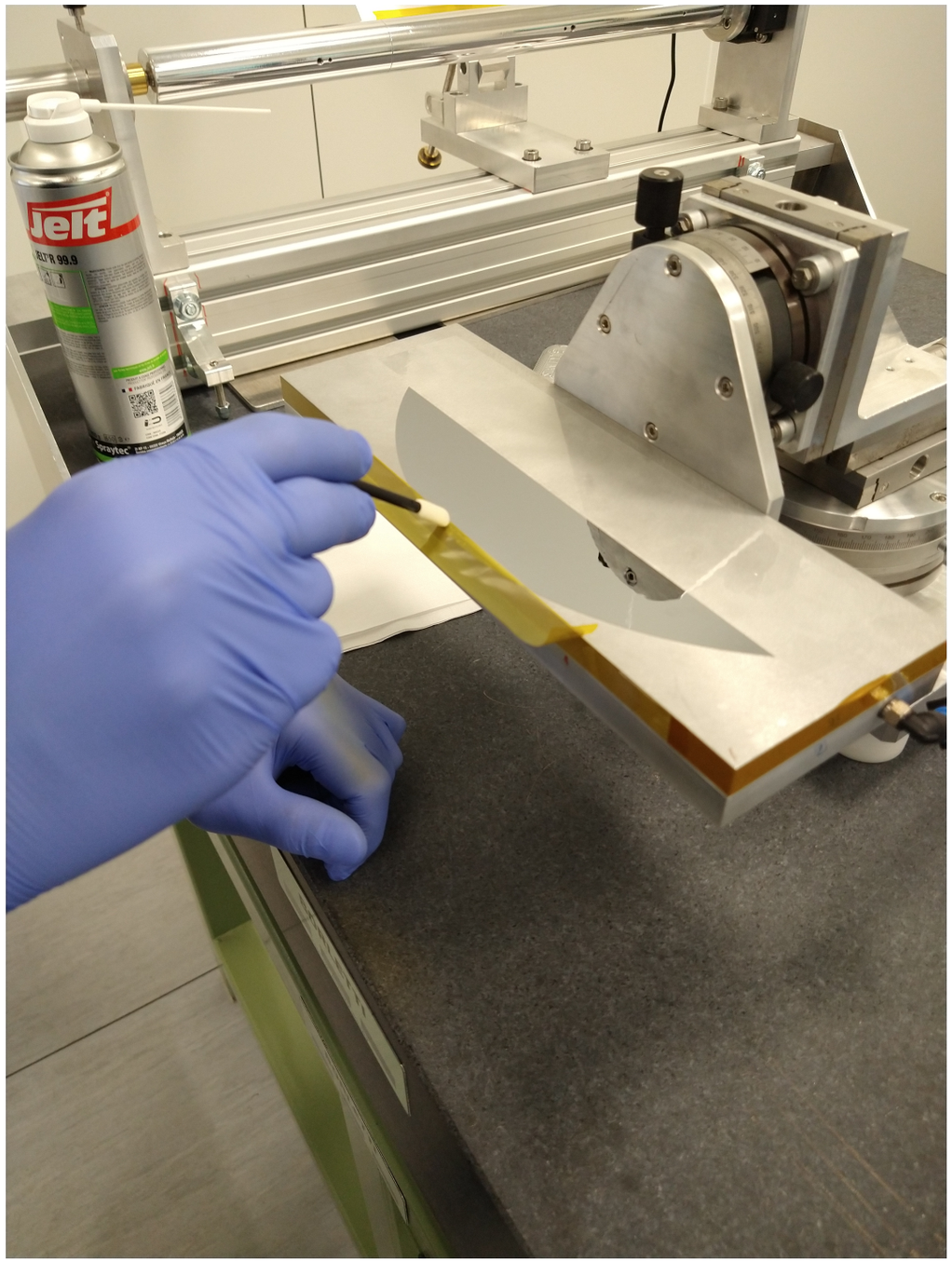
Bending of silicon piece - Attempt 1

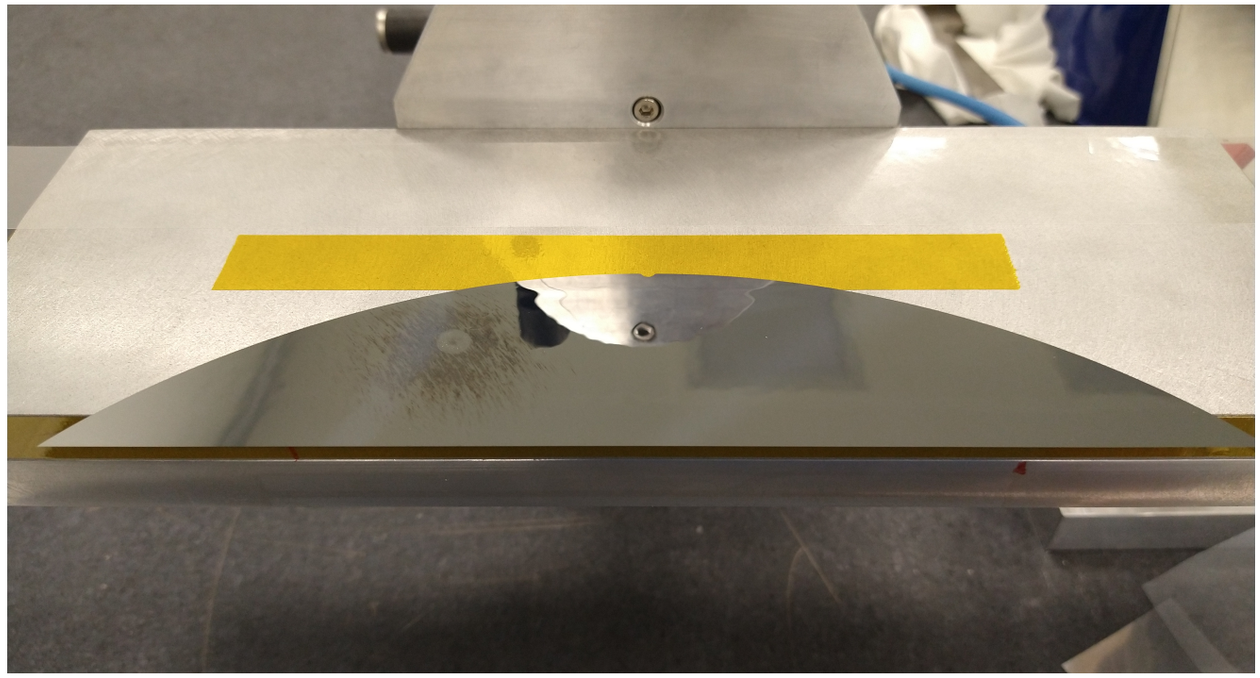


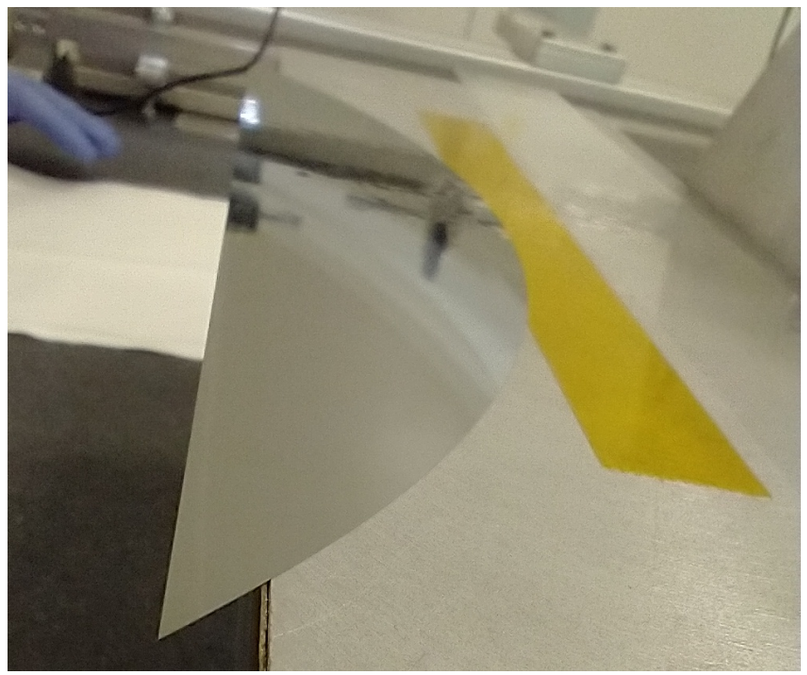




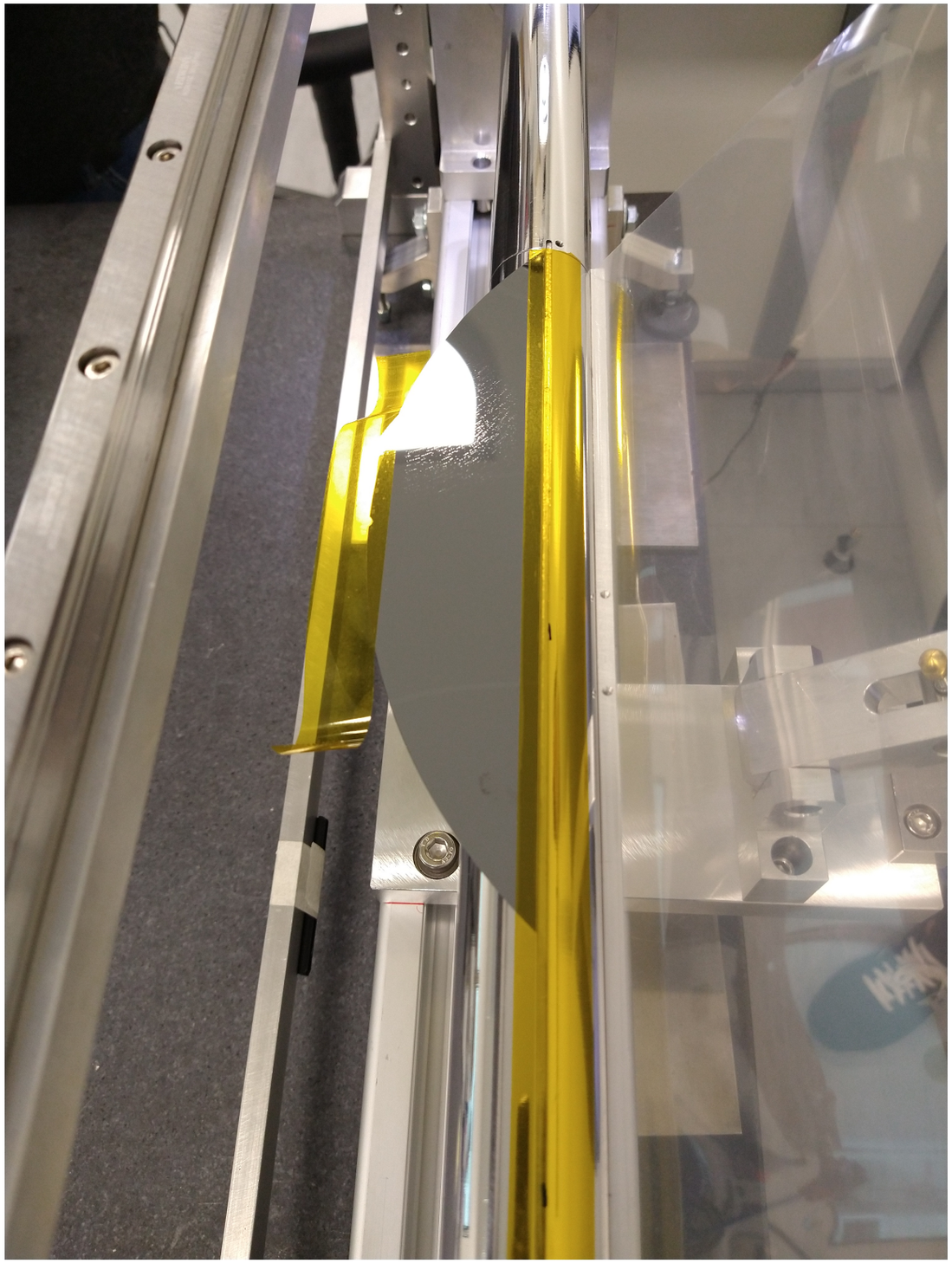
Bending of silicon piece - Attempt 1

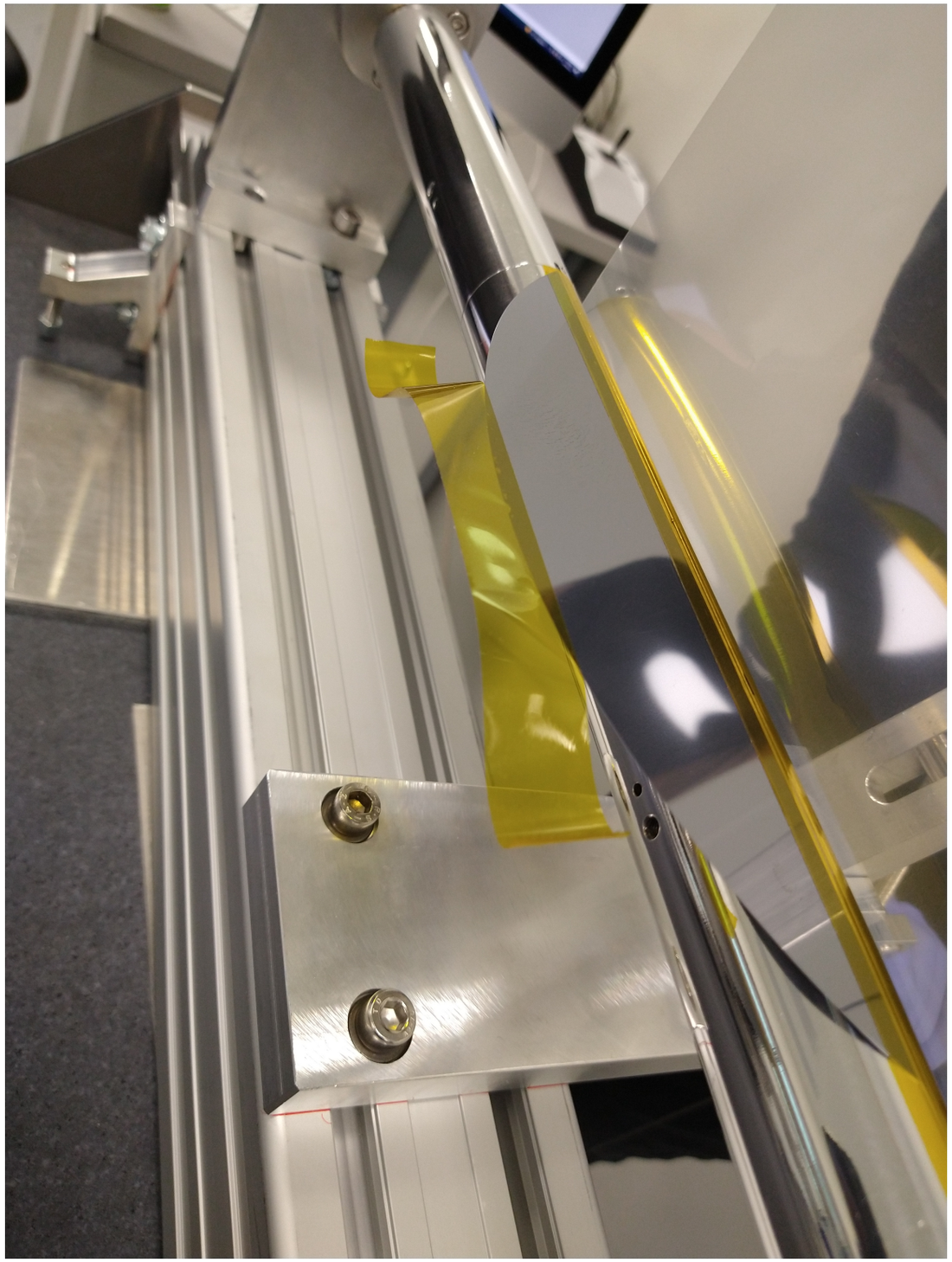




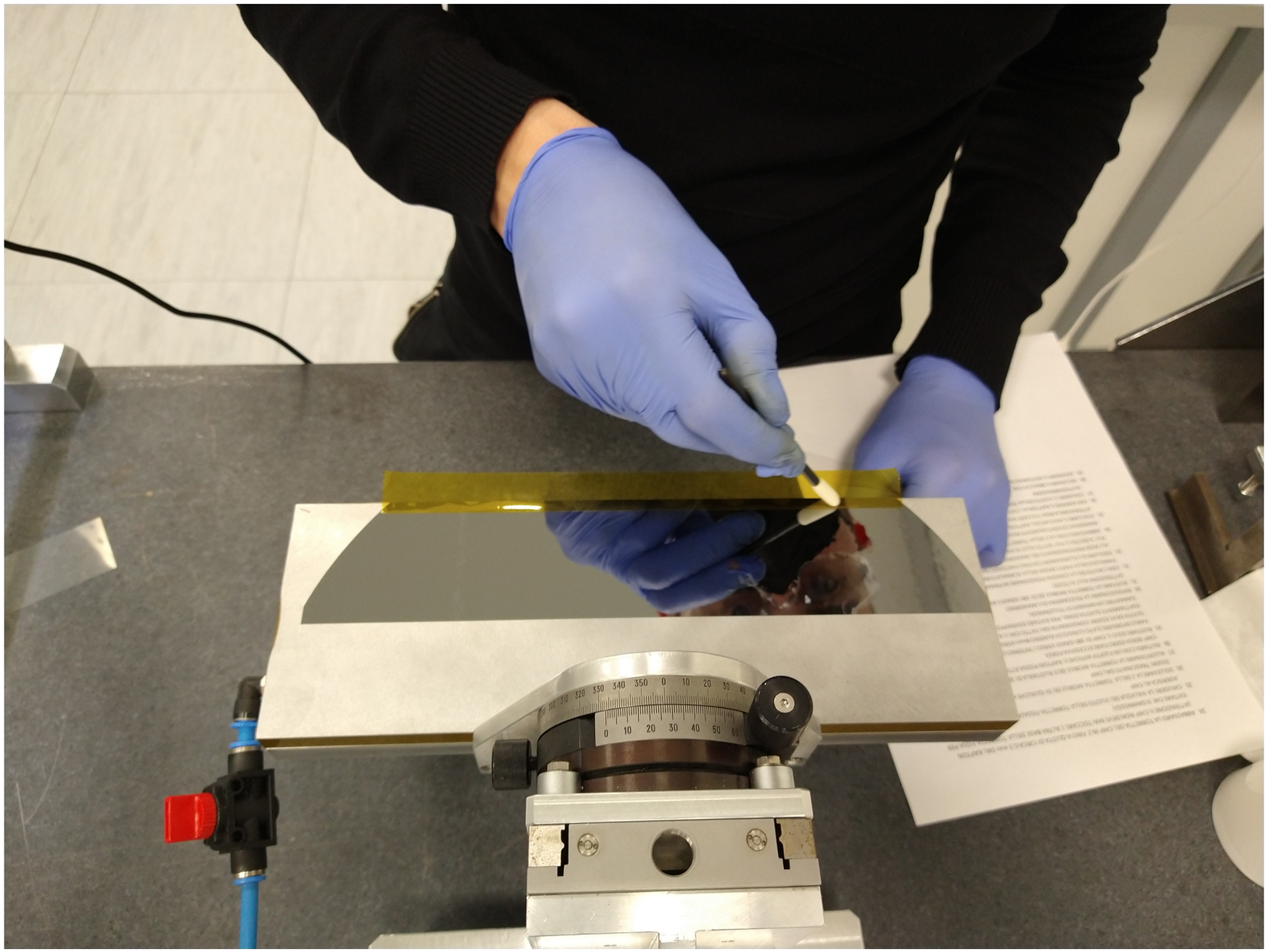


Bending of silicon piece - Attempt 1

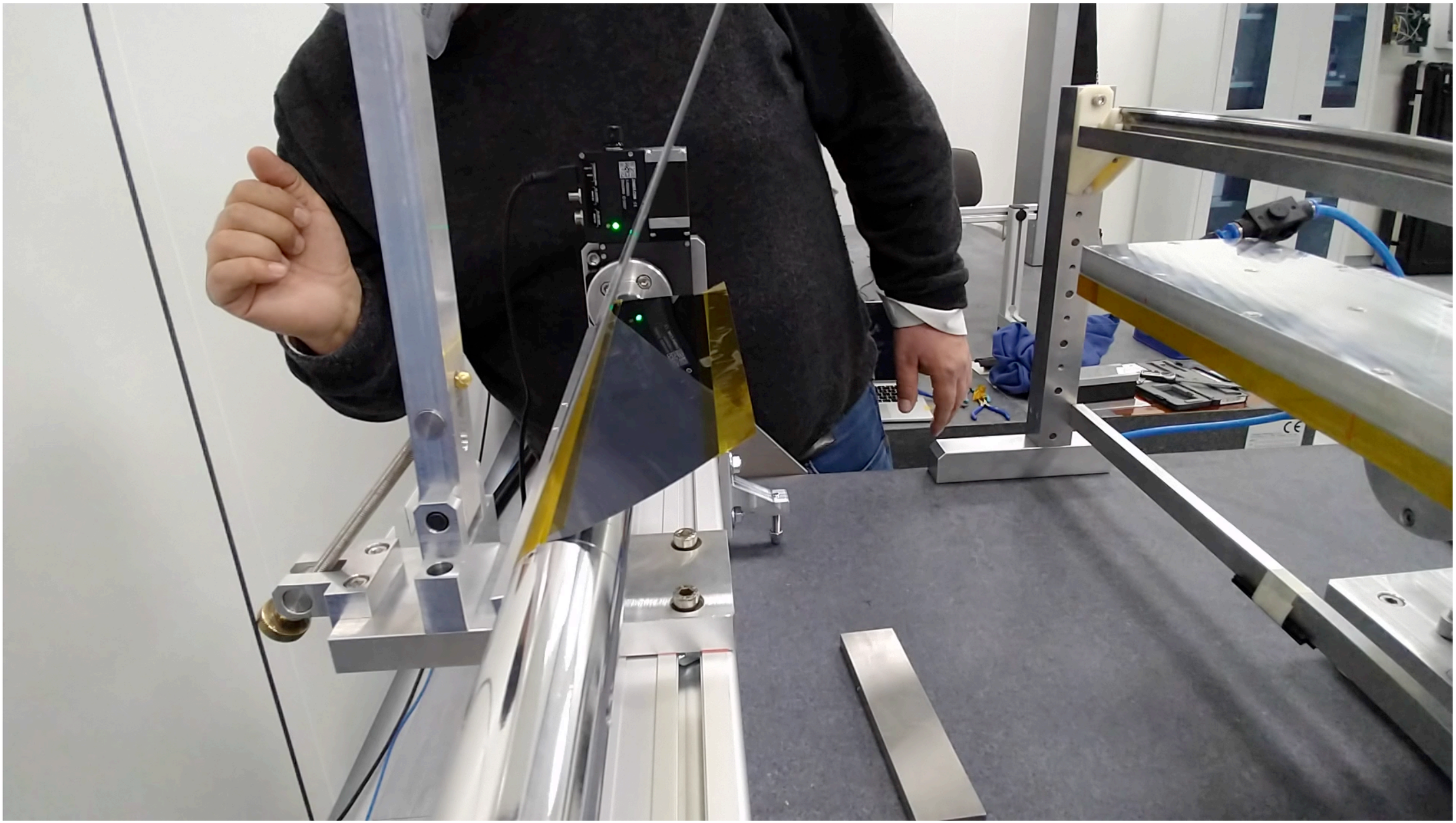




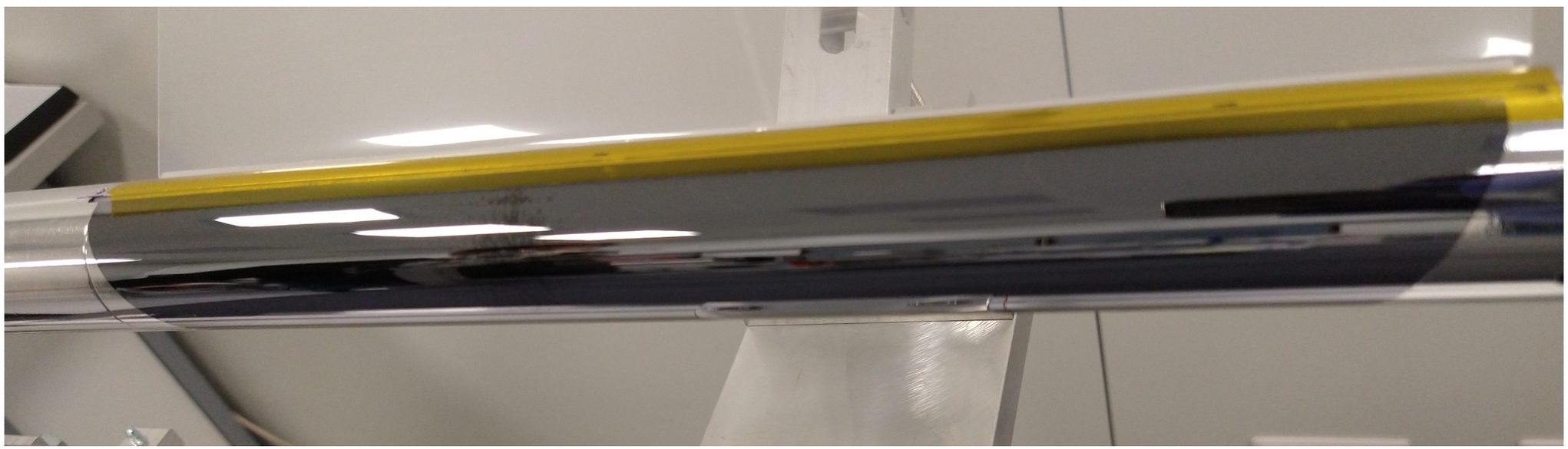
Bending of silicon piece - Attempt 2



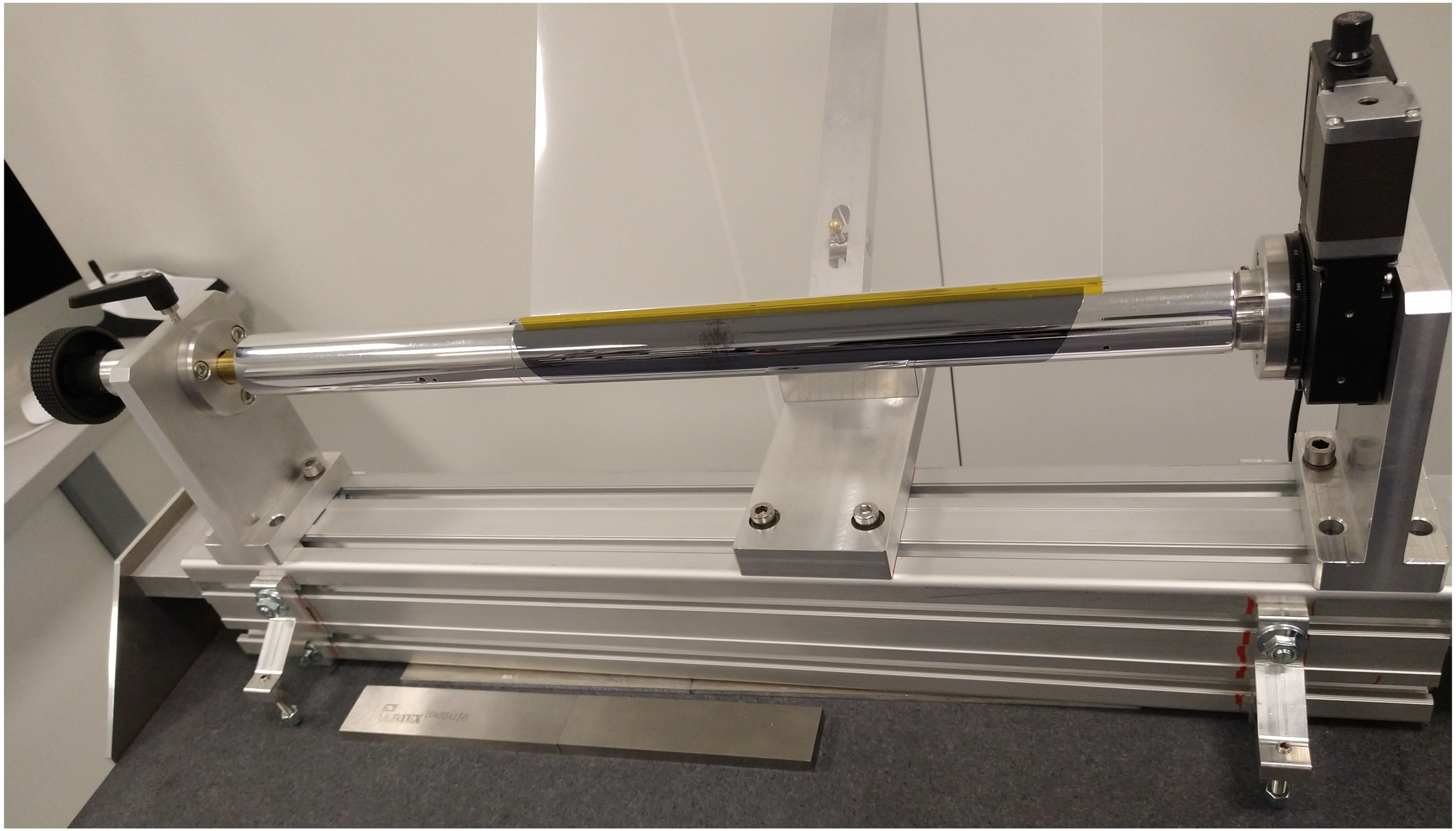
Bending of silicon piece - Attempt 2



Bending of silicon piece - Attempt 2



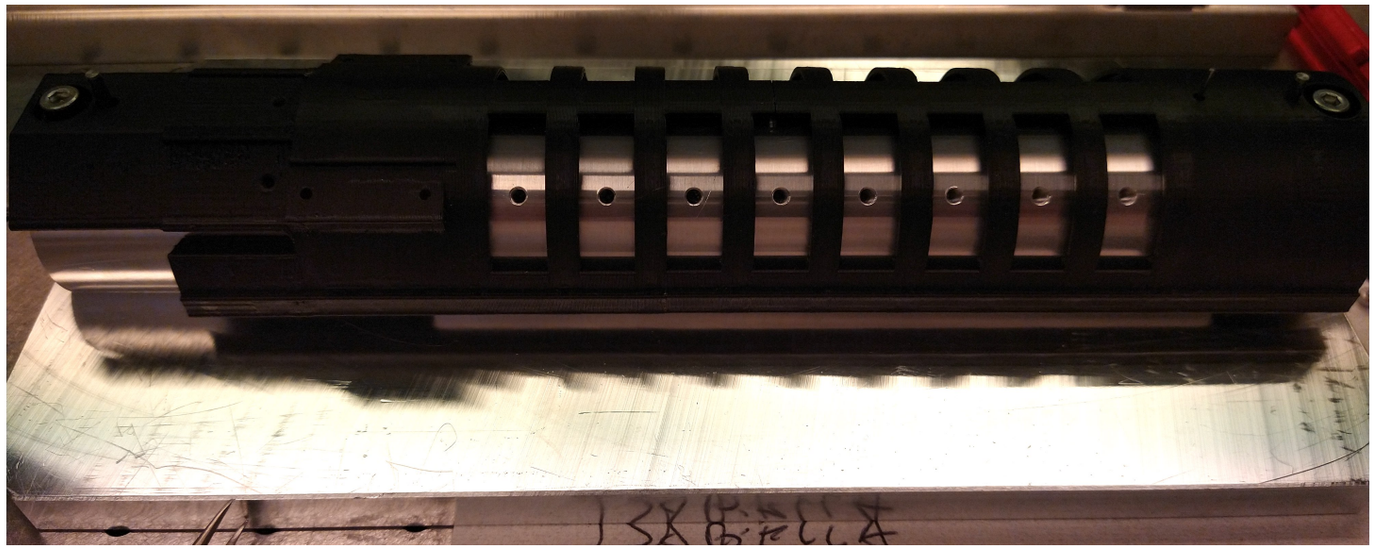
Bending of silicon piece - Attempt 2

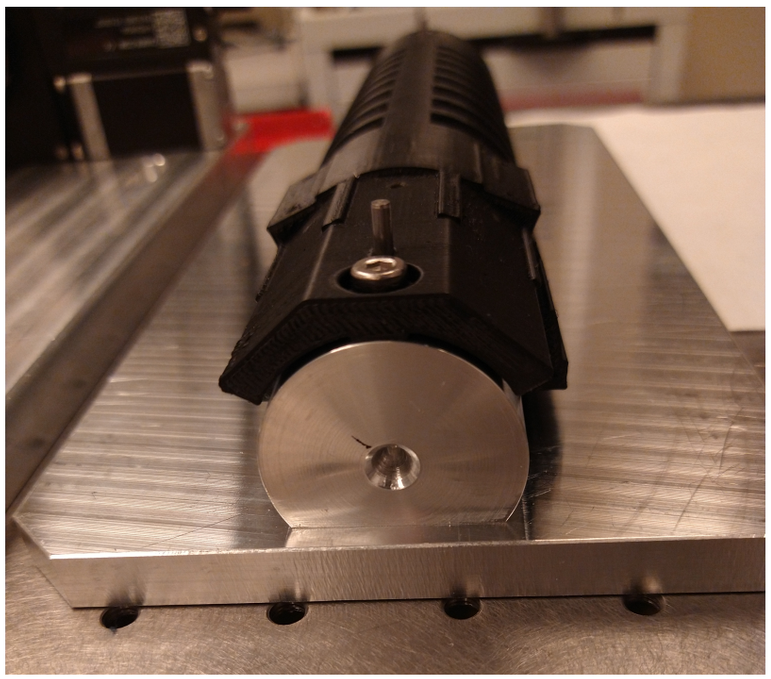


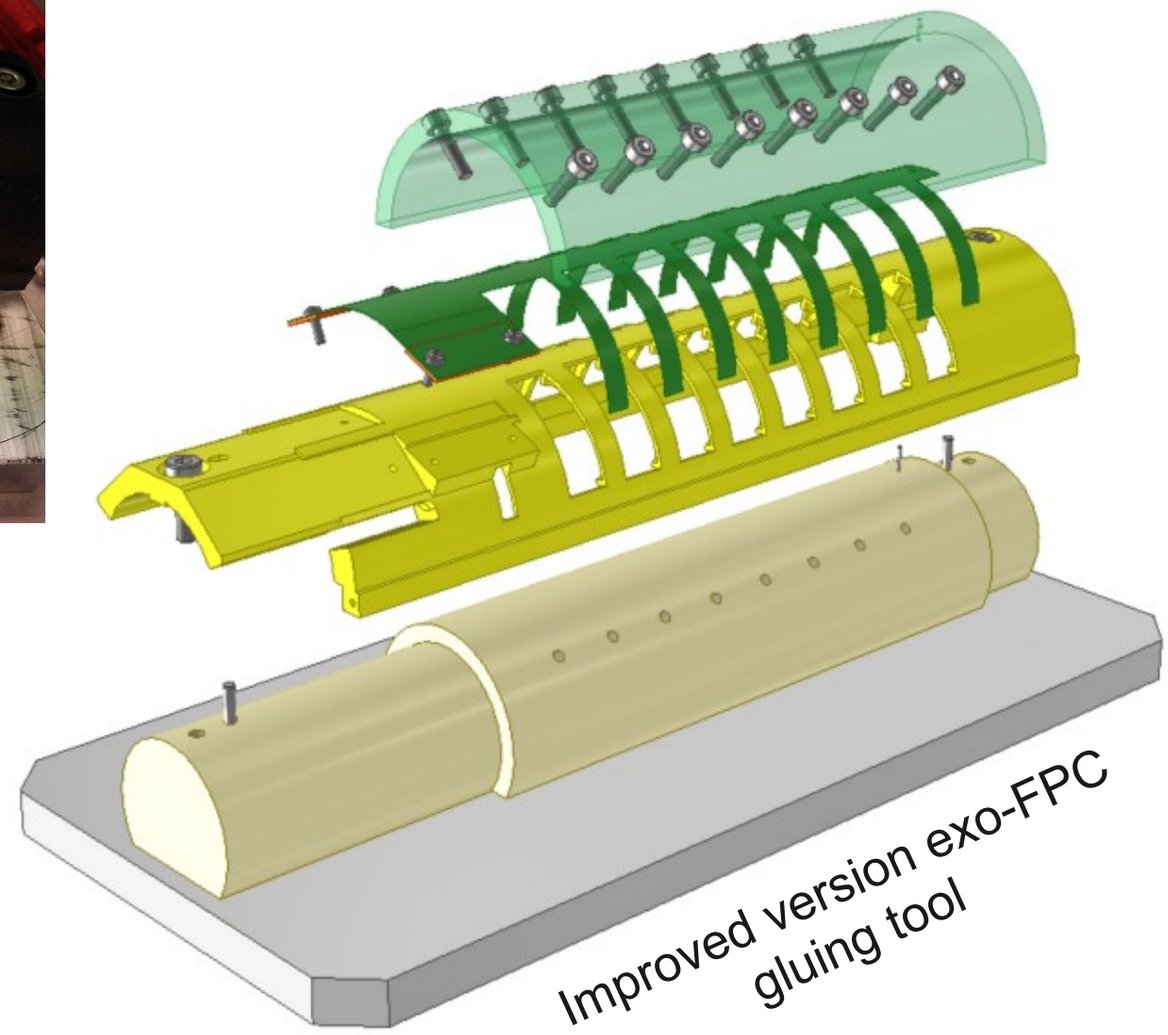
BACKUP

Exo-FPC gluing - Procedure and tools

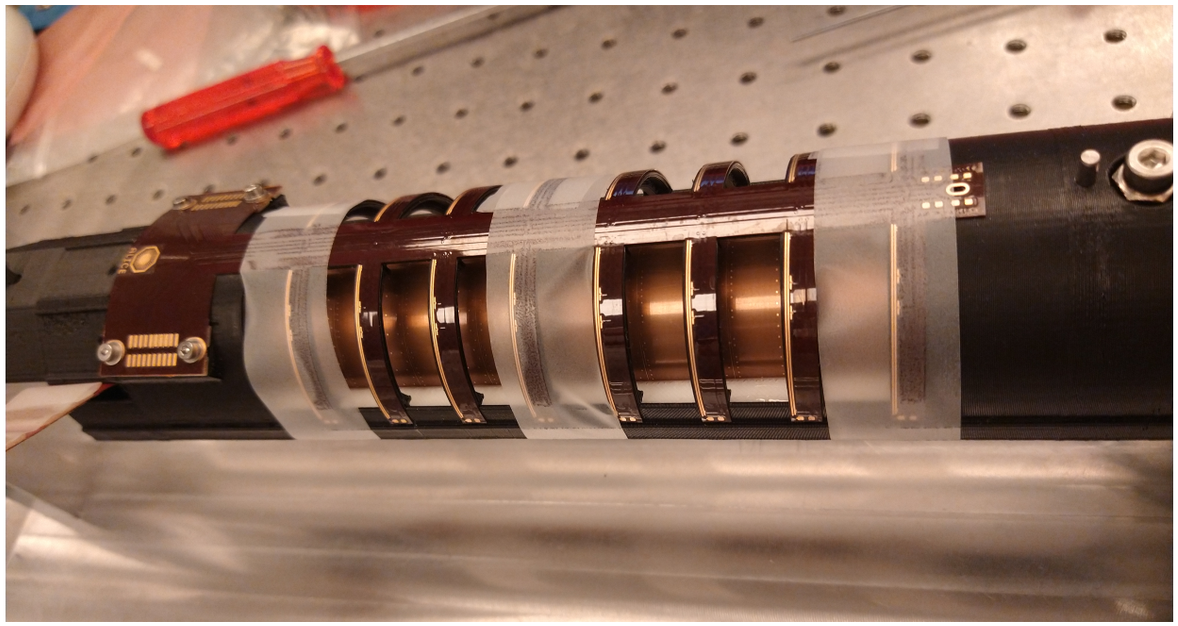
- **New positioning/alignment tool,** better rest of the exoskeleton during exo-FPC placement → improve alignment



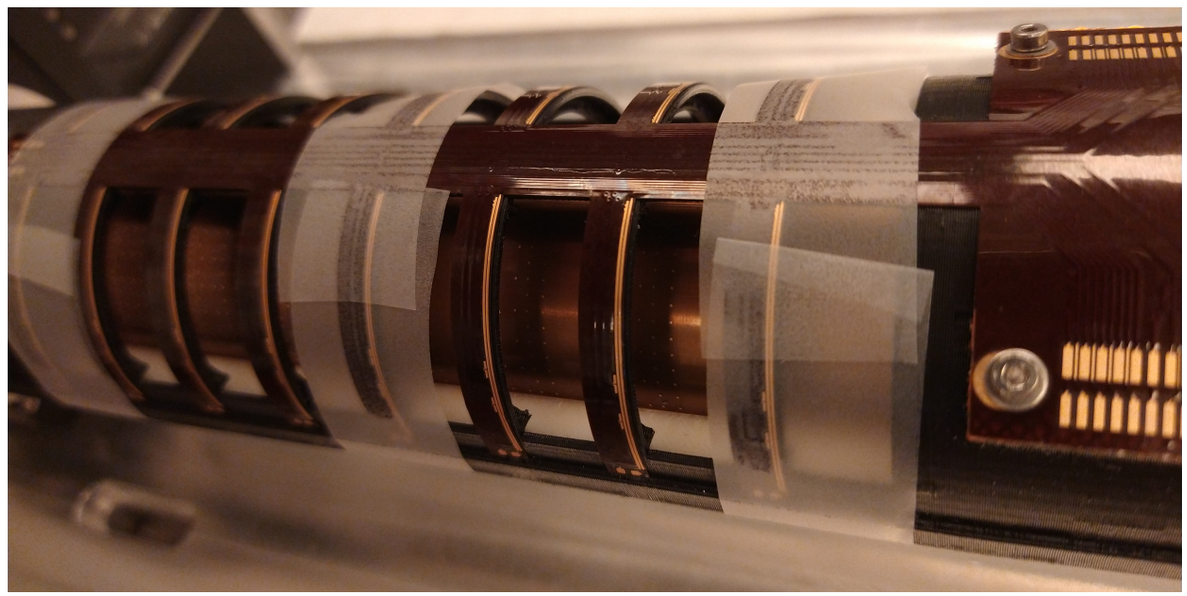




Exo-FPC gluing - Procedure and tools



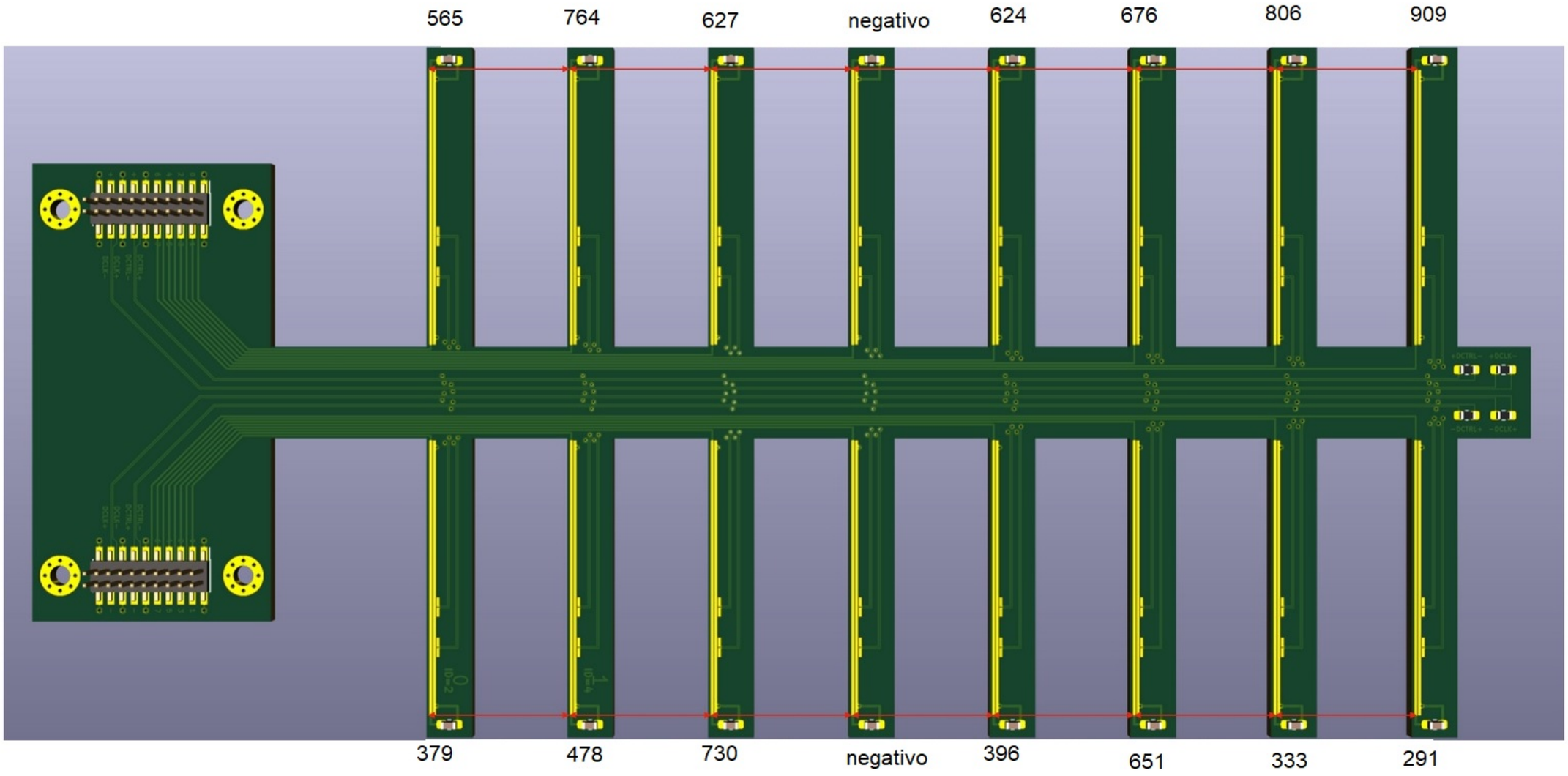
- Tape used to press exoskeleton to the longerons (on the side of the exoskeleton) during glue curing



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.

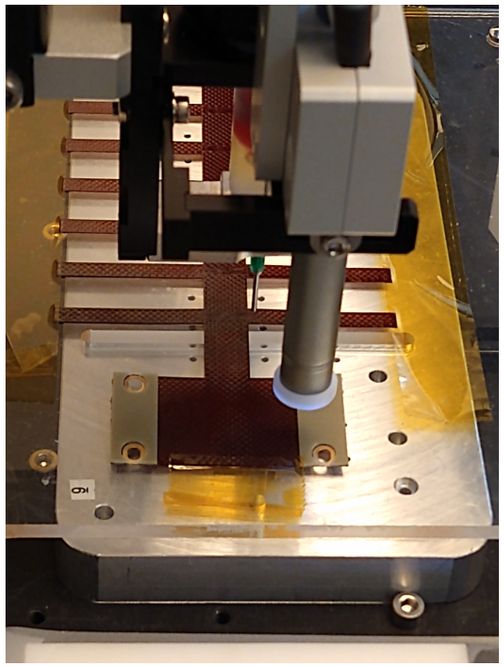
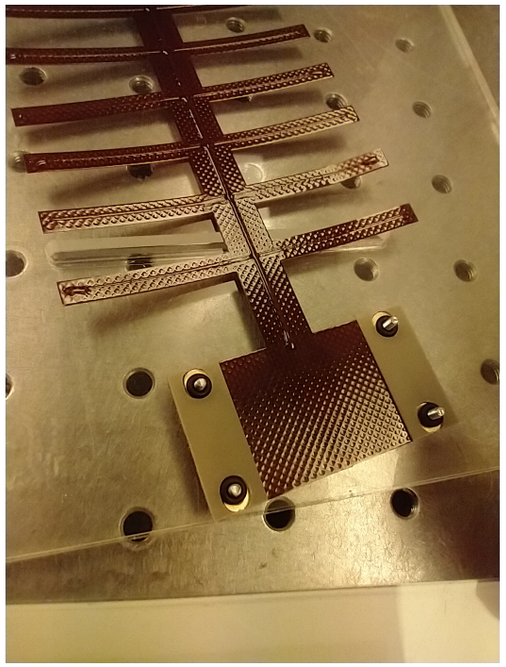
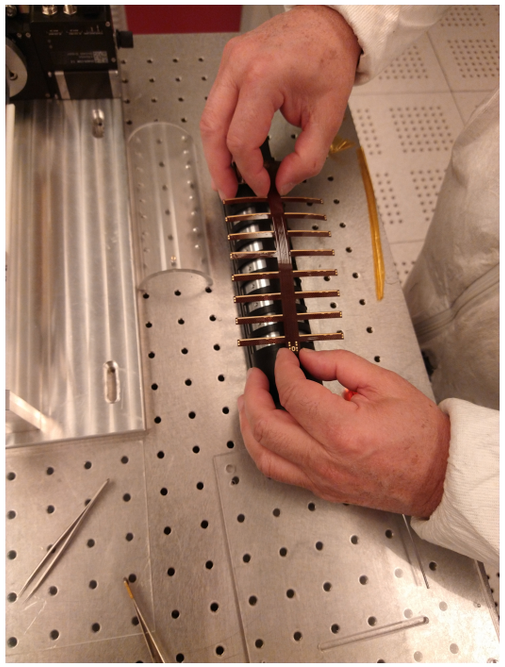
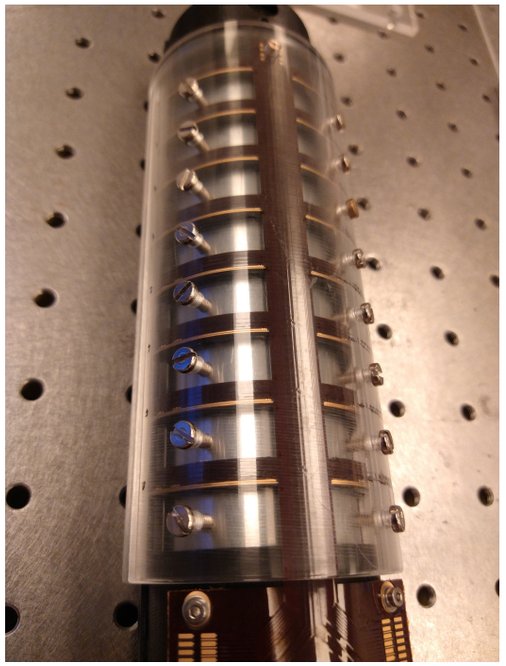
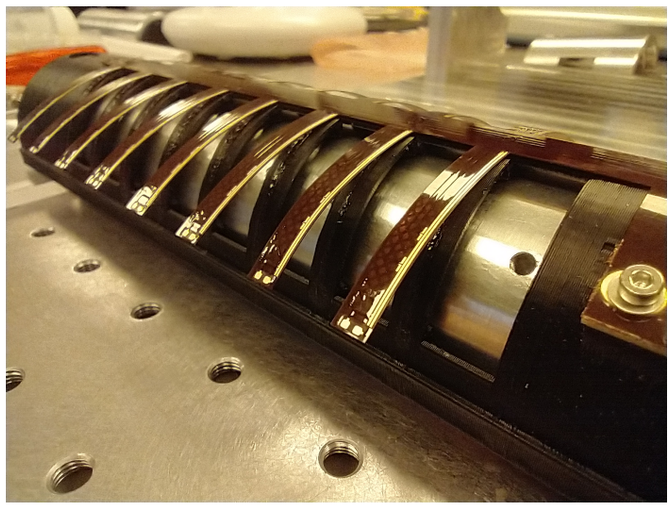
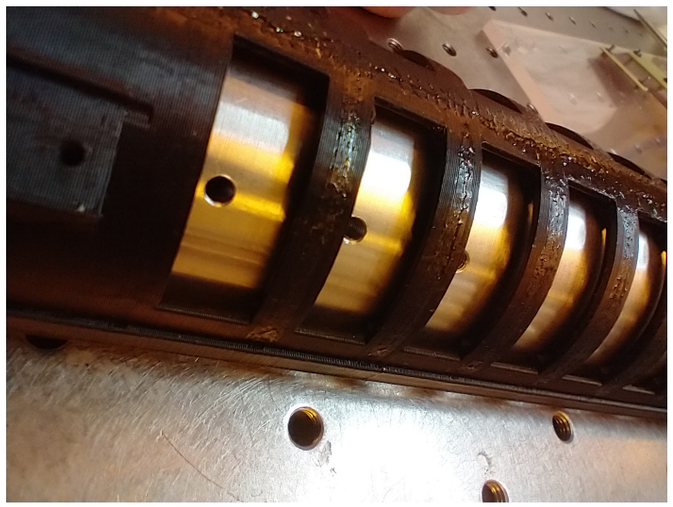
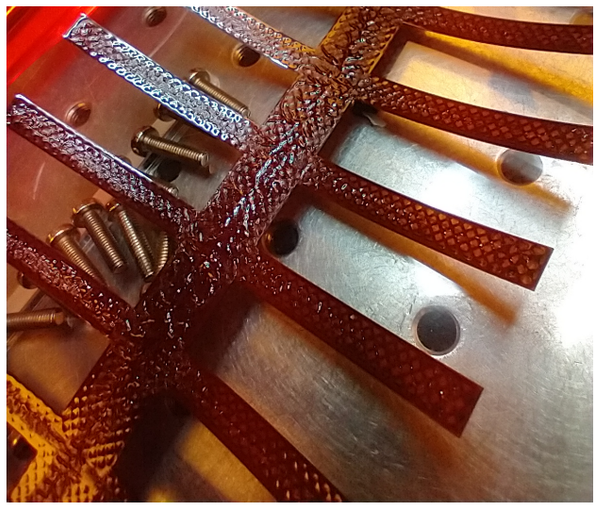
Expected distance = 651 μm

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

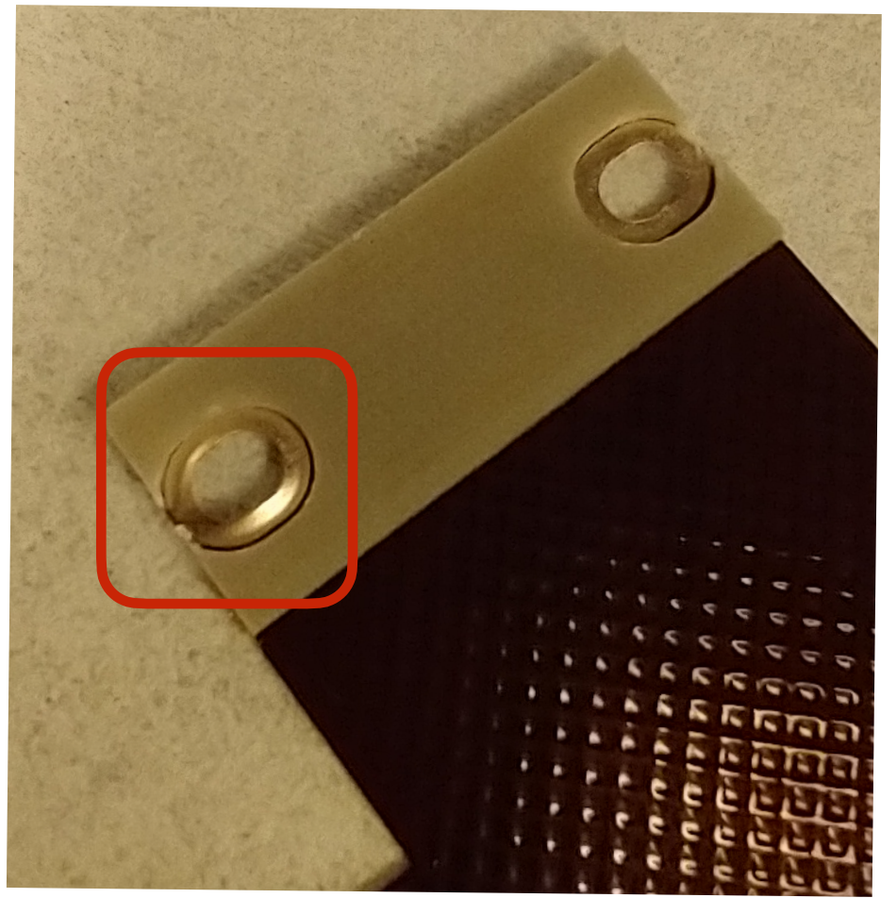
Exo-FPC gluing - Procedure and tools

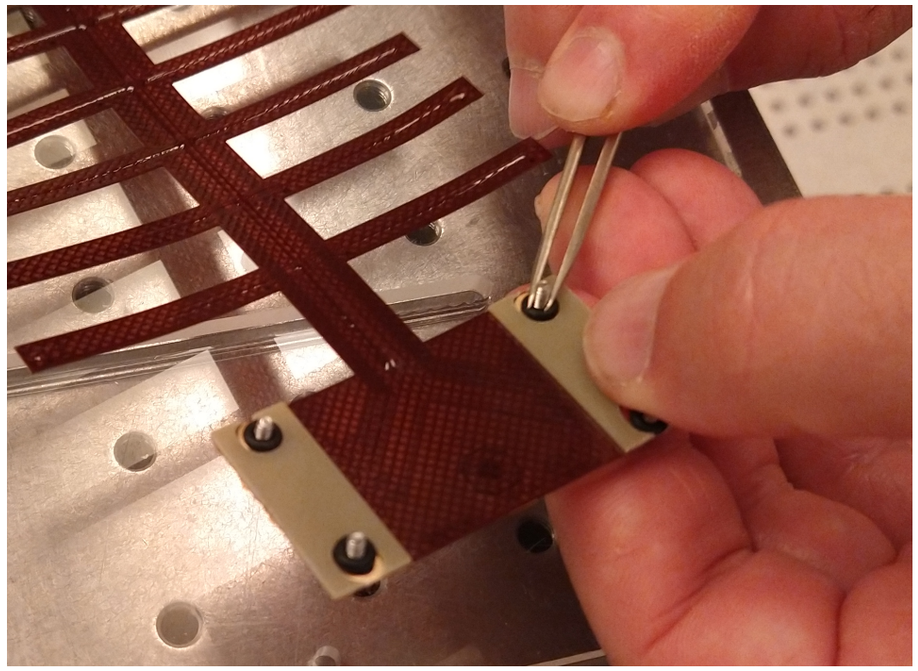
First attempt:

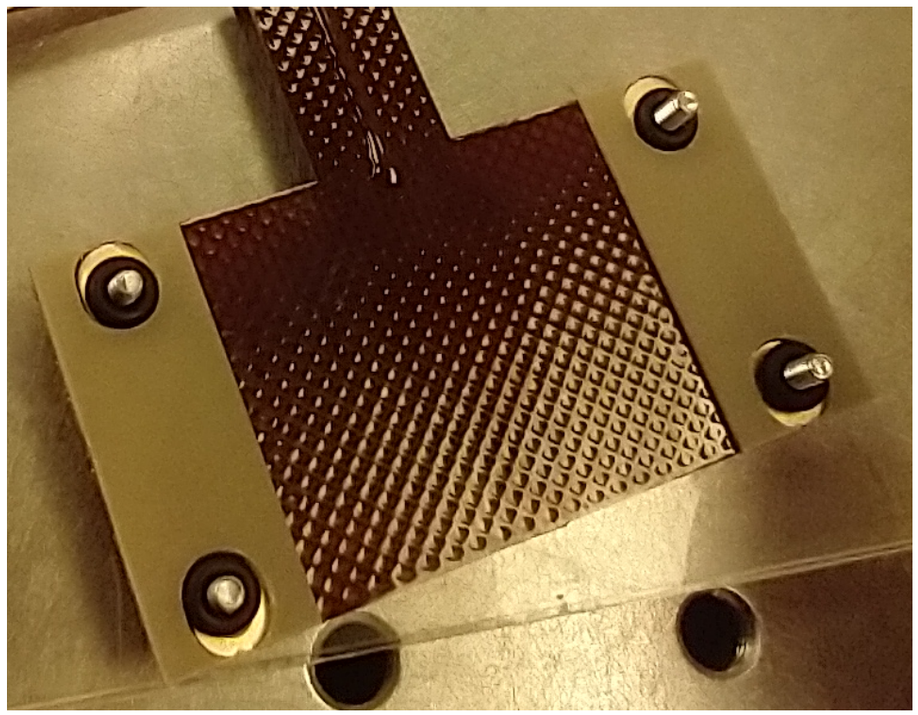
- using Araldite2011
- glue distribution over the FPC using glue dispenser machine
- glue components mixing failed → allow glue distribution check

Exo-FPC problem

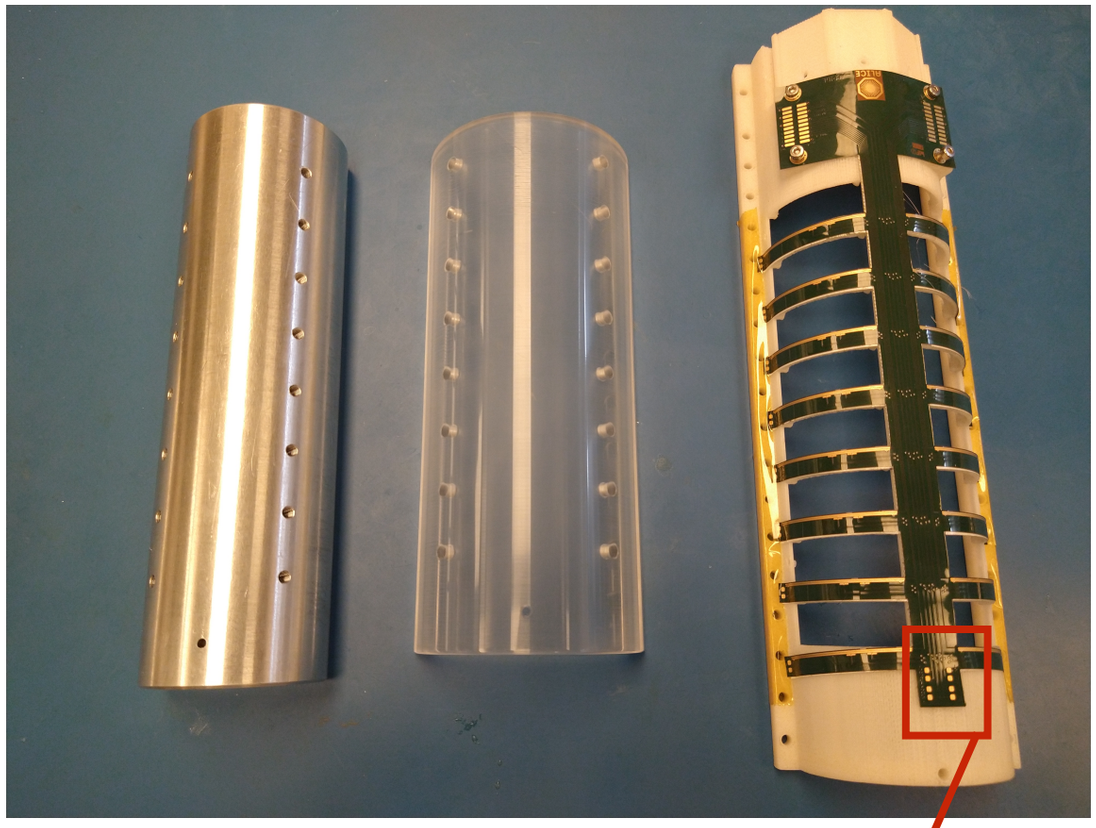


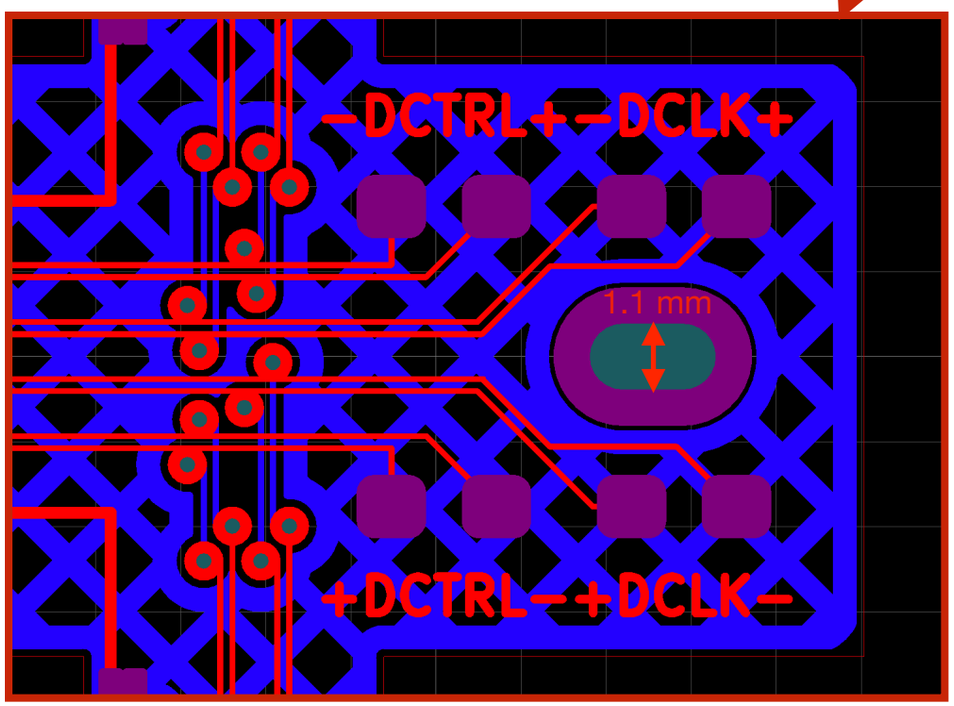




- Problem with “missing” stiffener under screw hole
- **Solved**: using a large enough washers between screw and FPC and an o-ring to fill the empty volume

Exo-FPC gluing - Alignment





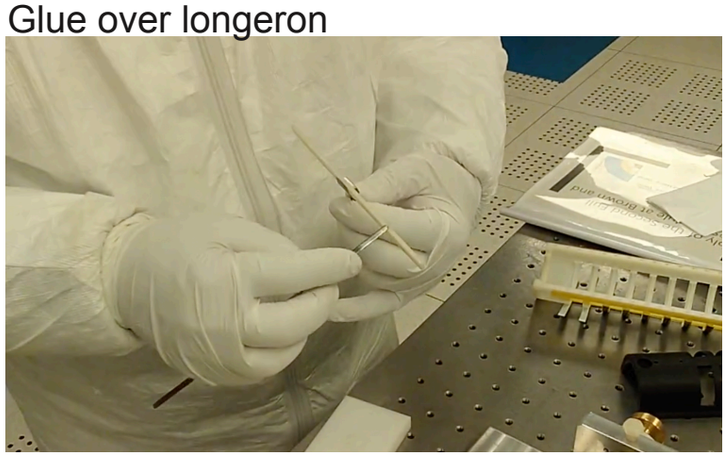
Holes for alignment pin:
- exoskeleton and tools: 2 mm diameter
- exo-FPC: 1 mm diameter

Solved: produced a variable diameter pin.

Assembly steps

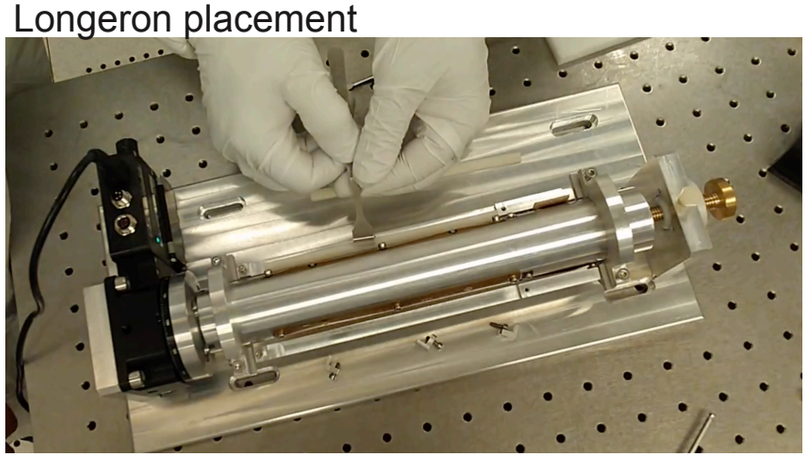
- ☑ Place dummy-super-ALPIDE and edge-FPC on mandrel
- ☑ Wire-bonding between last two chips and edge-FPC
- ☑ Glue longerons and wedge over dummy-super-ALPIDE
- ☑ Glue half-ring over dummy-super-ALPIDE
- ☐ Glue exo-FPC over exoskeleton → FAILED (problem with alignment pin)
- ☐ Place the exoskeleton over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

Glue over longeron

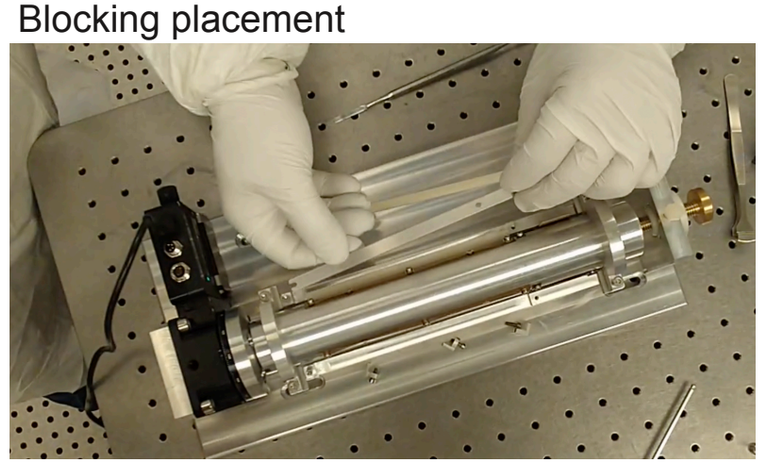


Araldite - 90 minutes curing

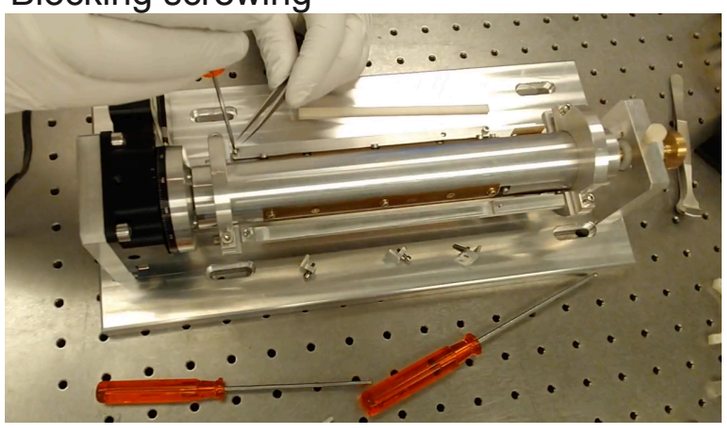
Longeron placement



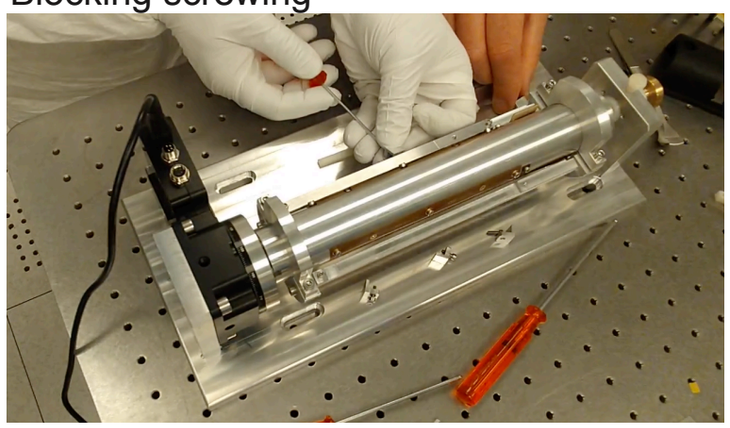
Blocking placement



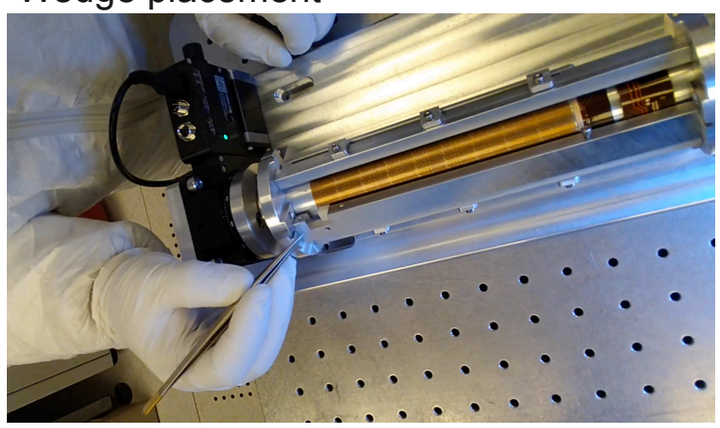
Blocking screwing



Blocking screwing

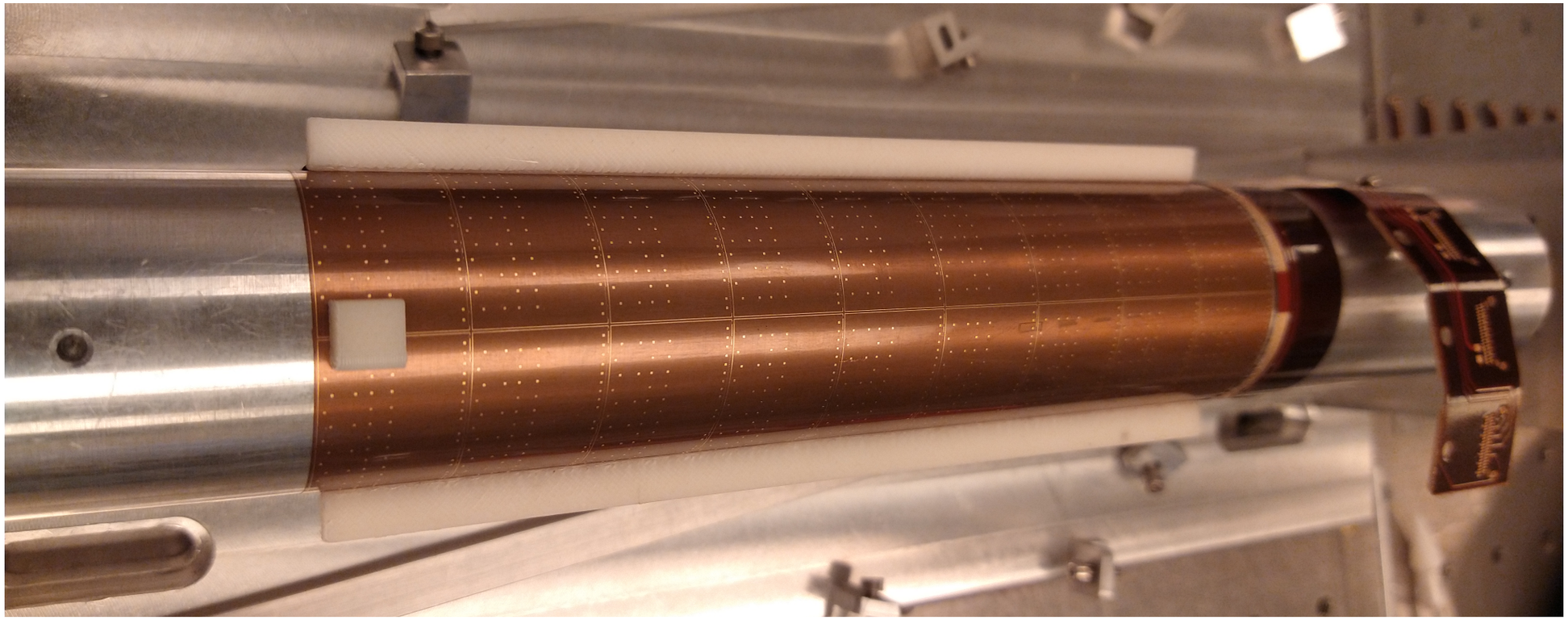


Wedge placement



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

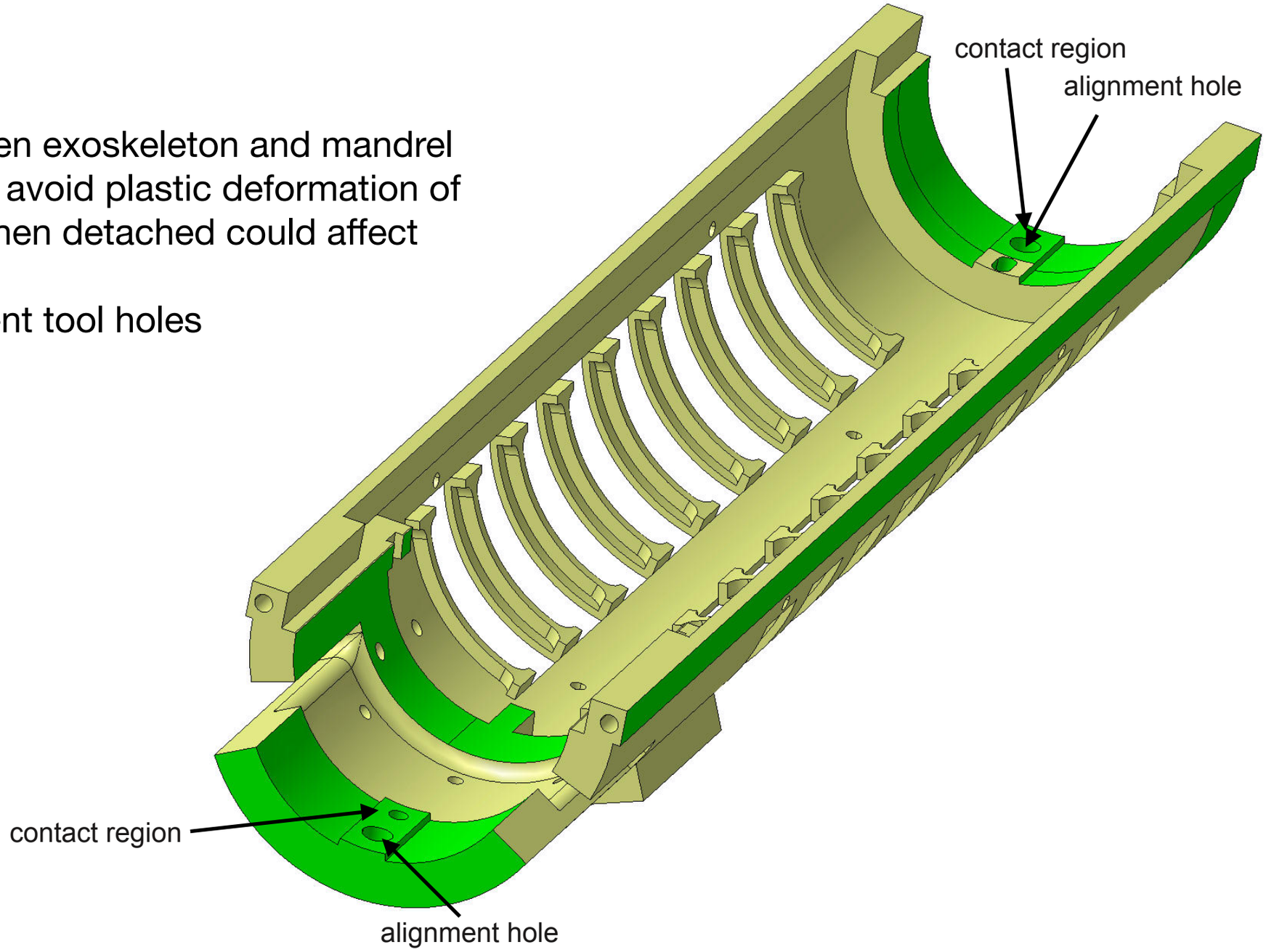


Araldite - 90 minutes curing

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

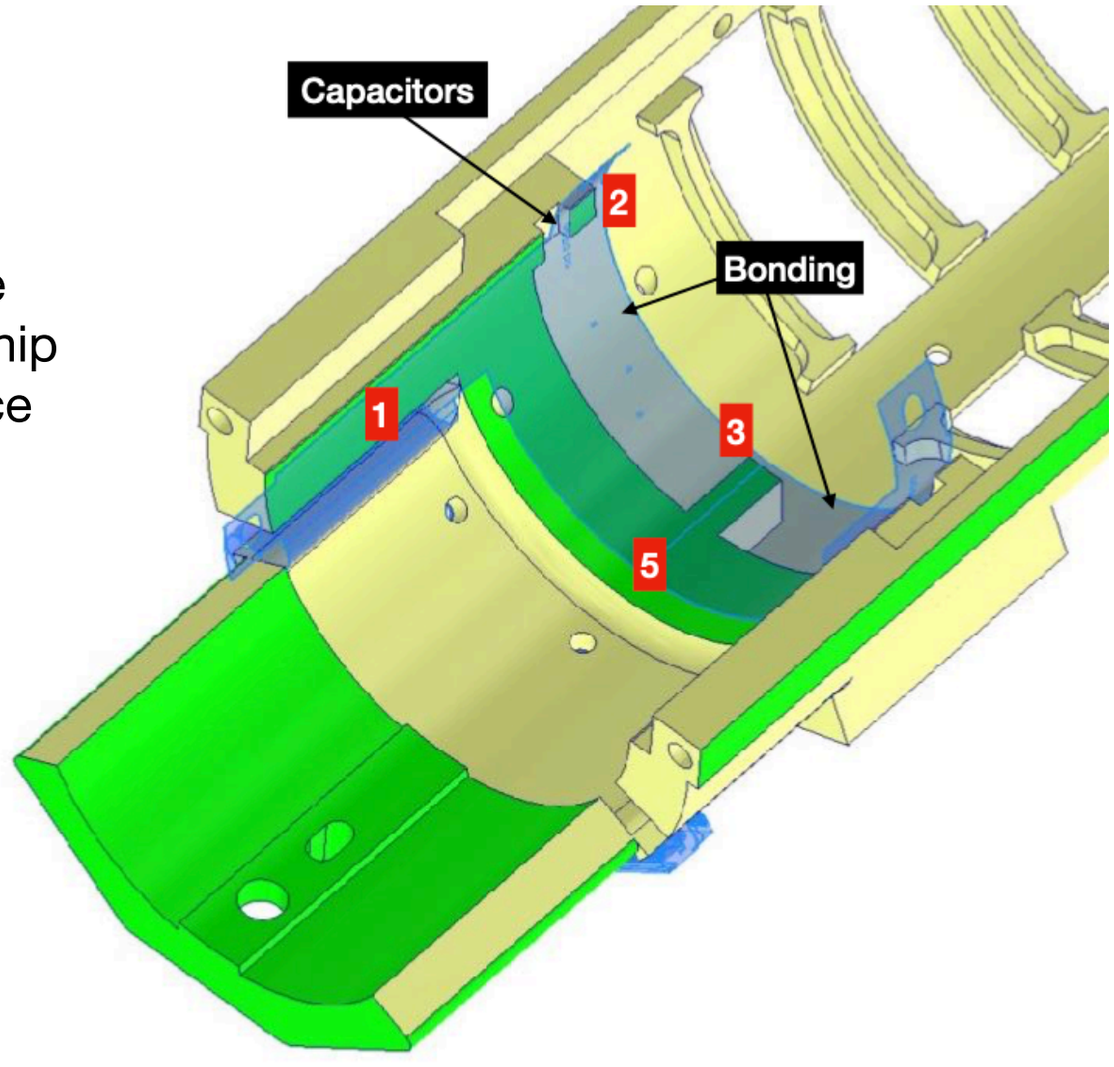
1. Edge-FPC gluing region: needs to be reset to the original thickness to grand edge-FPC and bent-chip to be at the same radius (and consequently reduce wire-bonds stress) → Notified to Gael

Small missing modifications

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

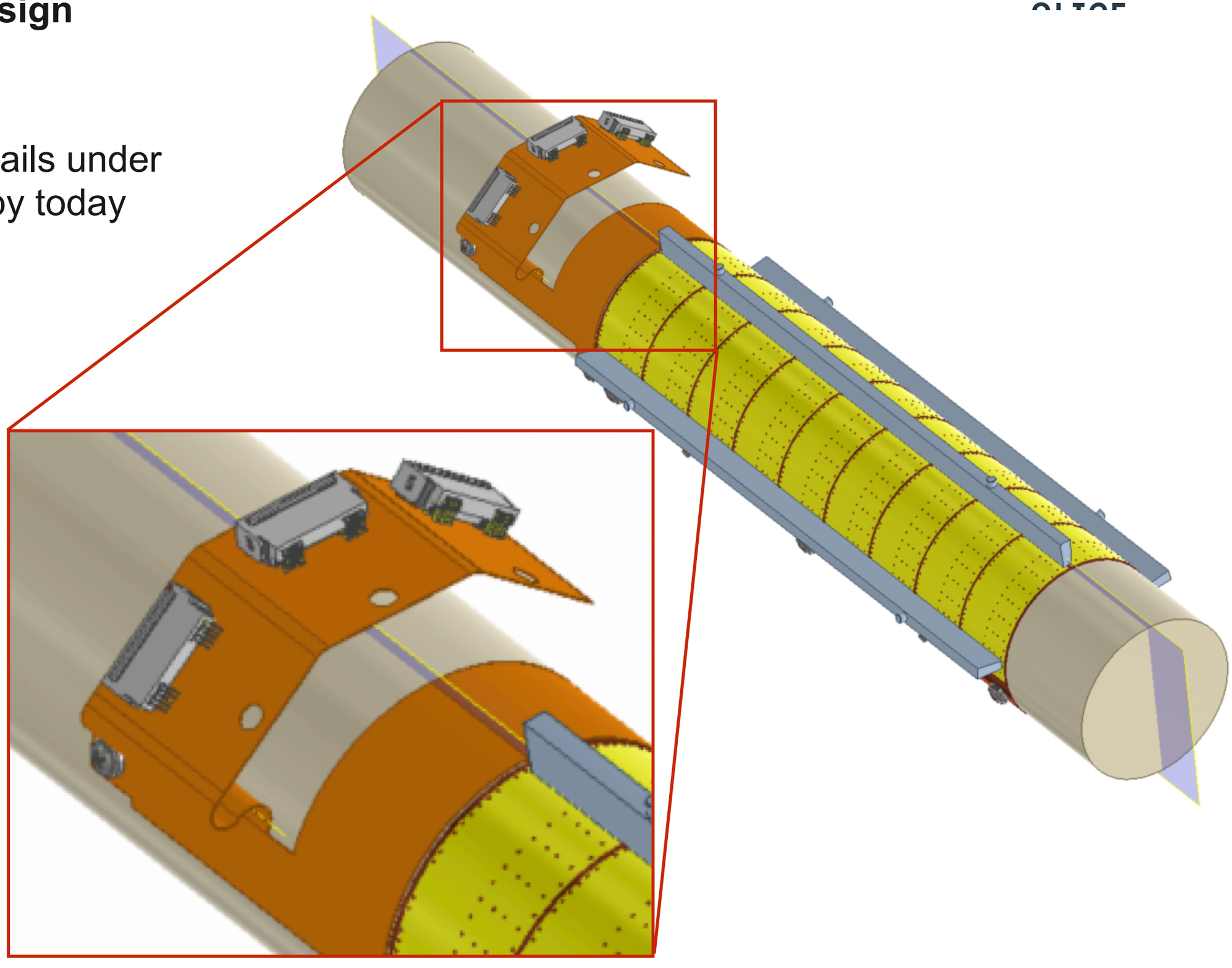
To be verified

1. Edge-FPC insertion neatness and simplicity

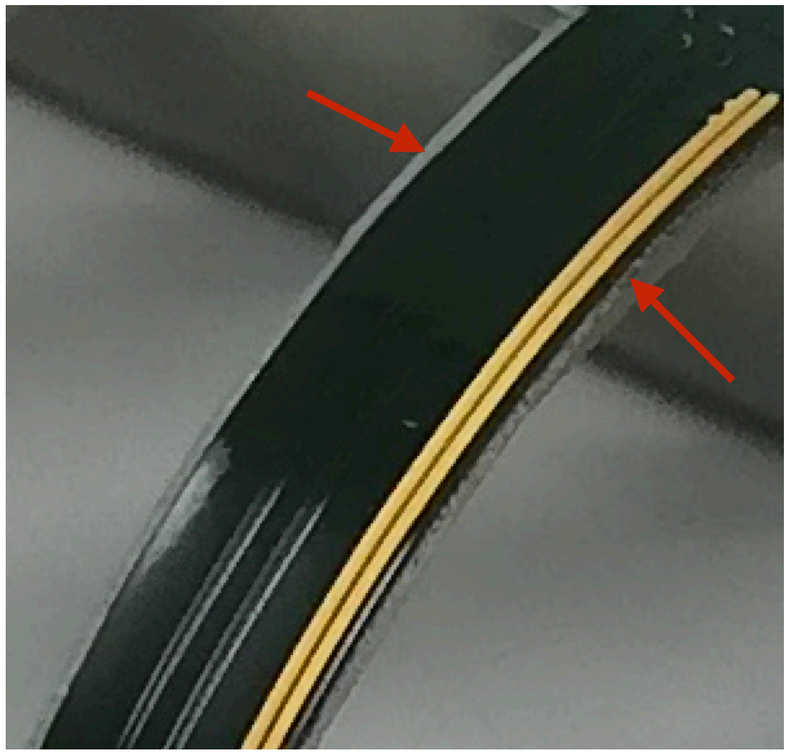


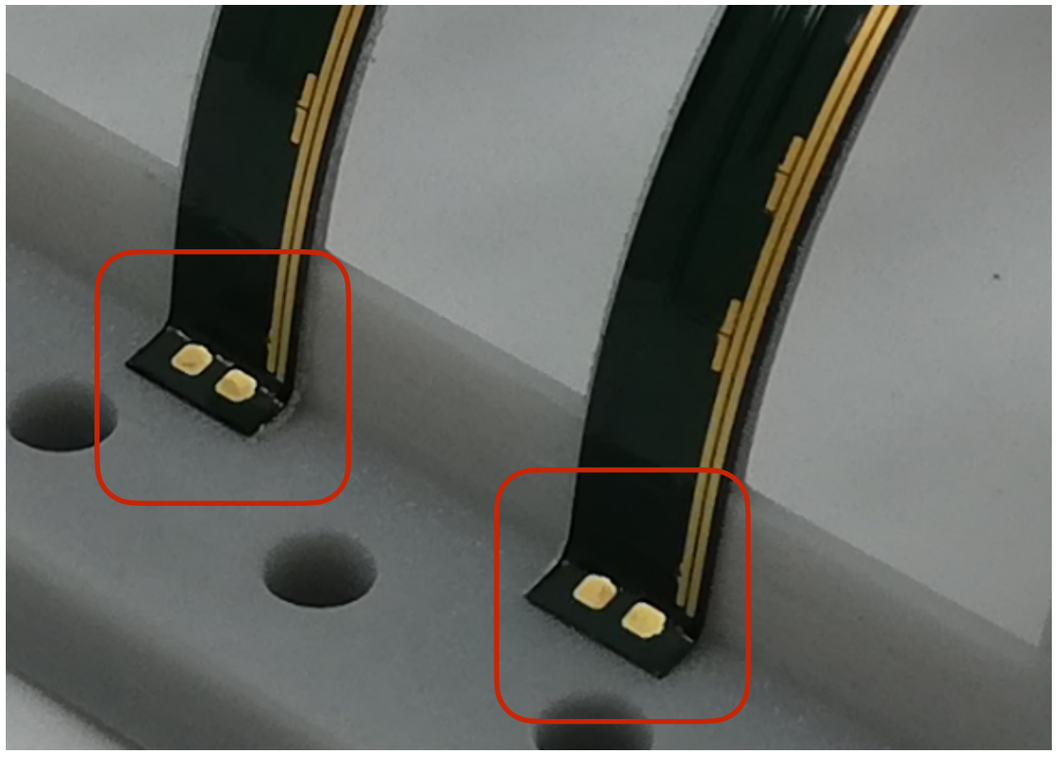
Edge-FPC design

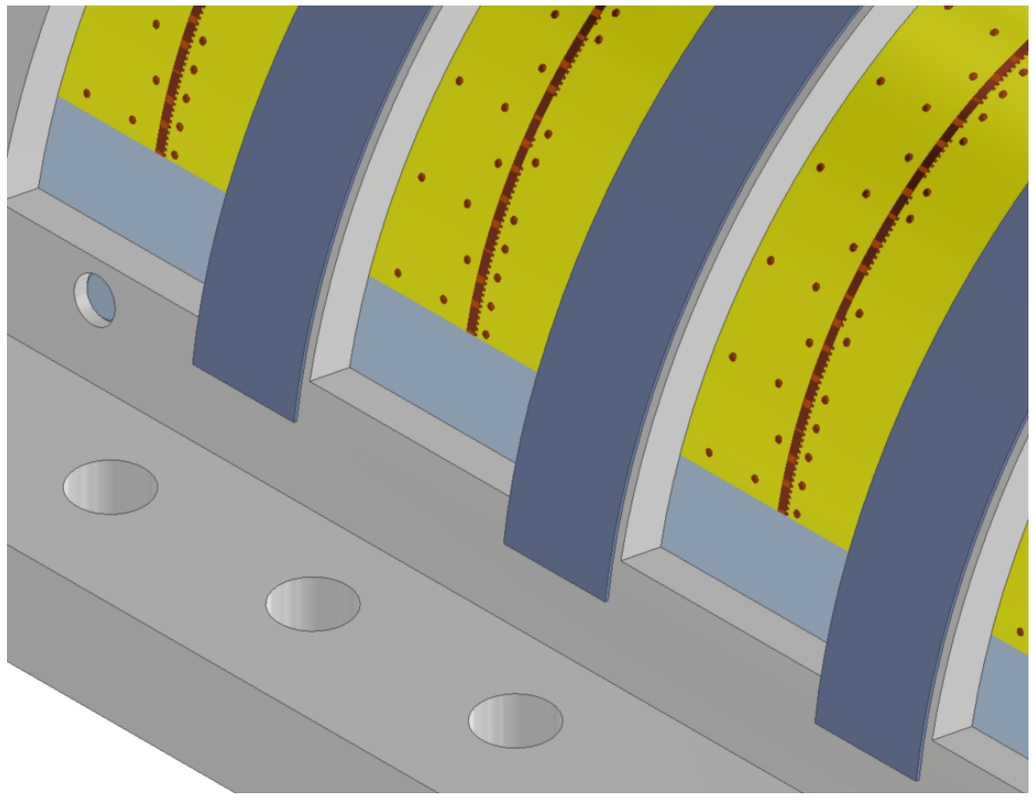
Very last details under completion by today



Super-ALPIDE FPCs support mechanics integration



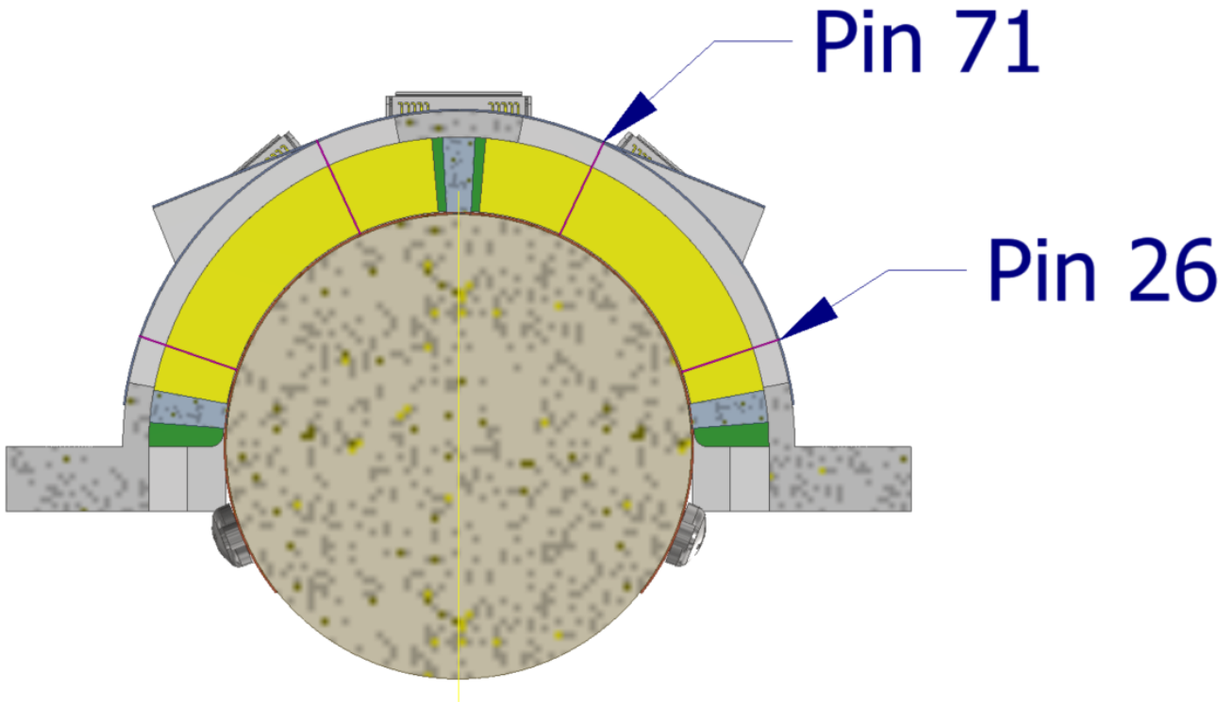


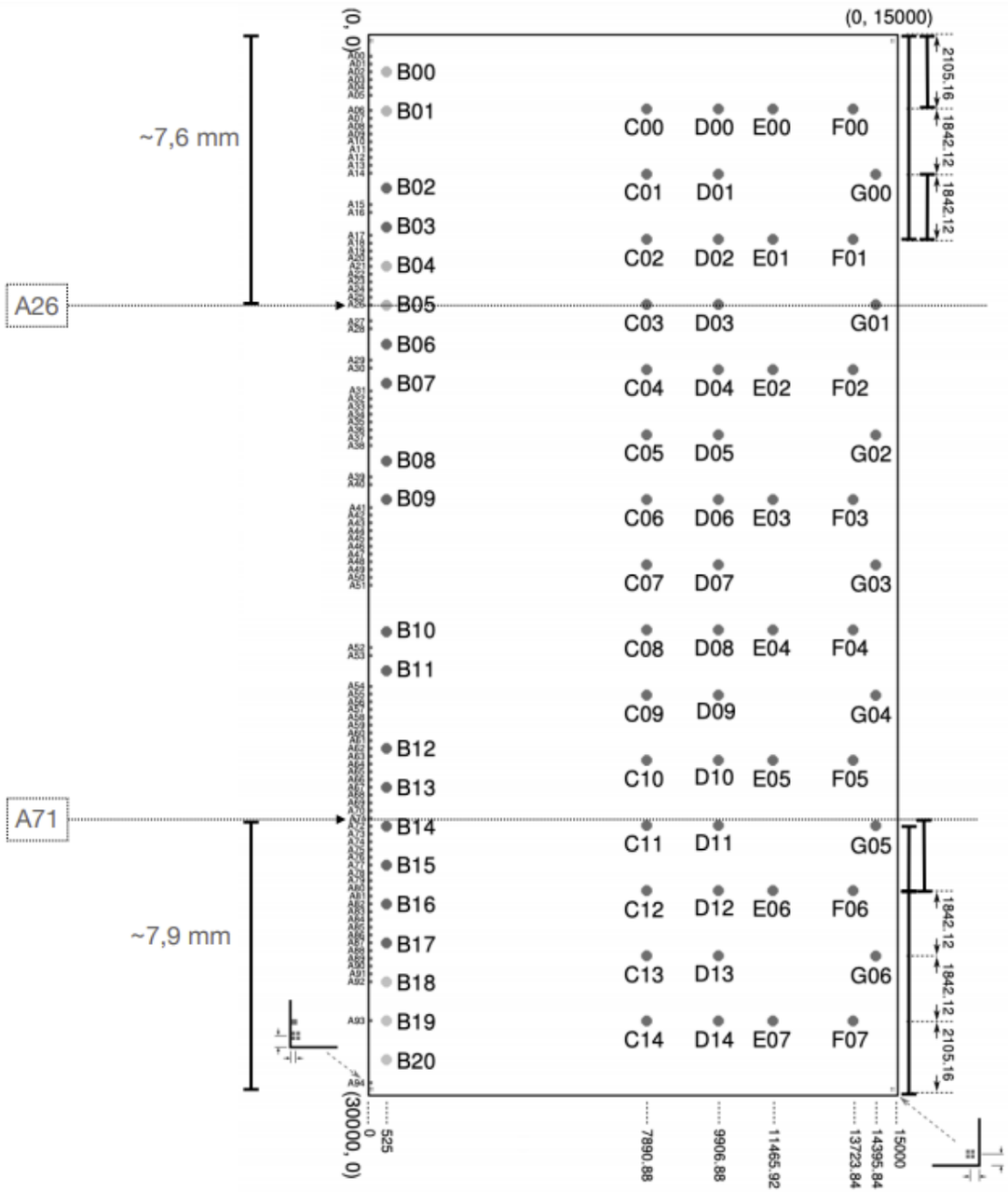


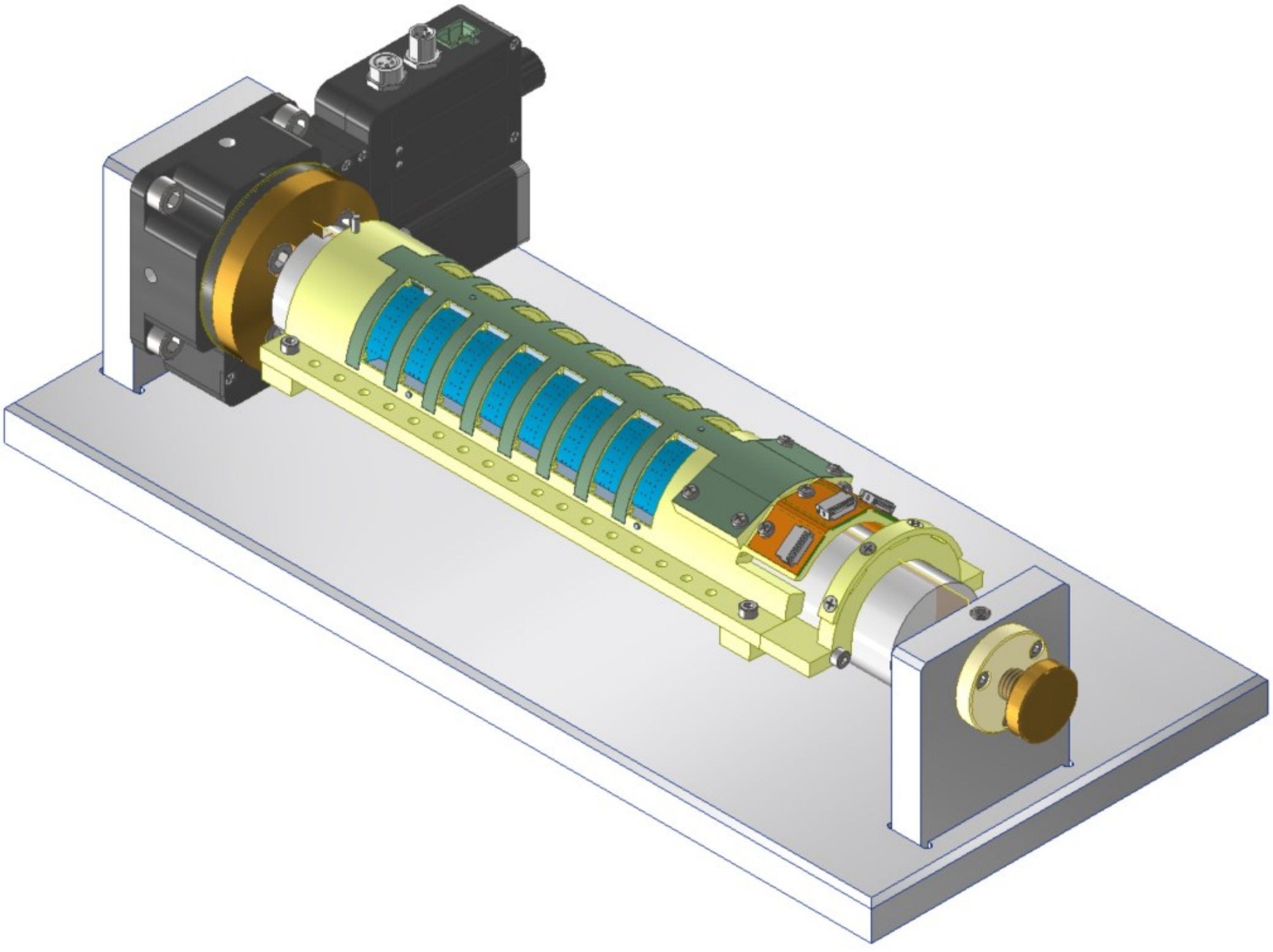
To be understood

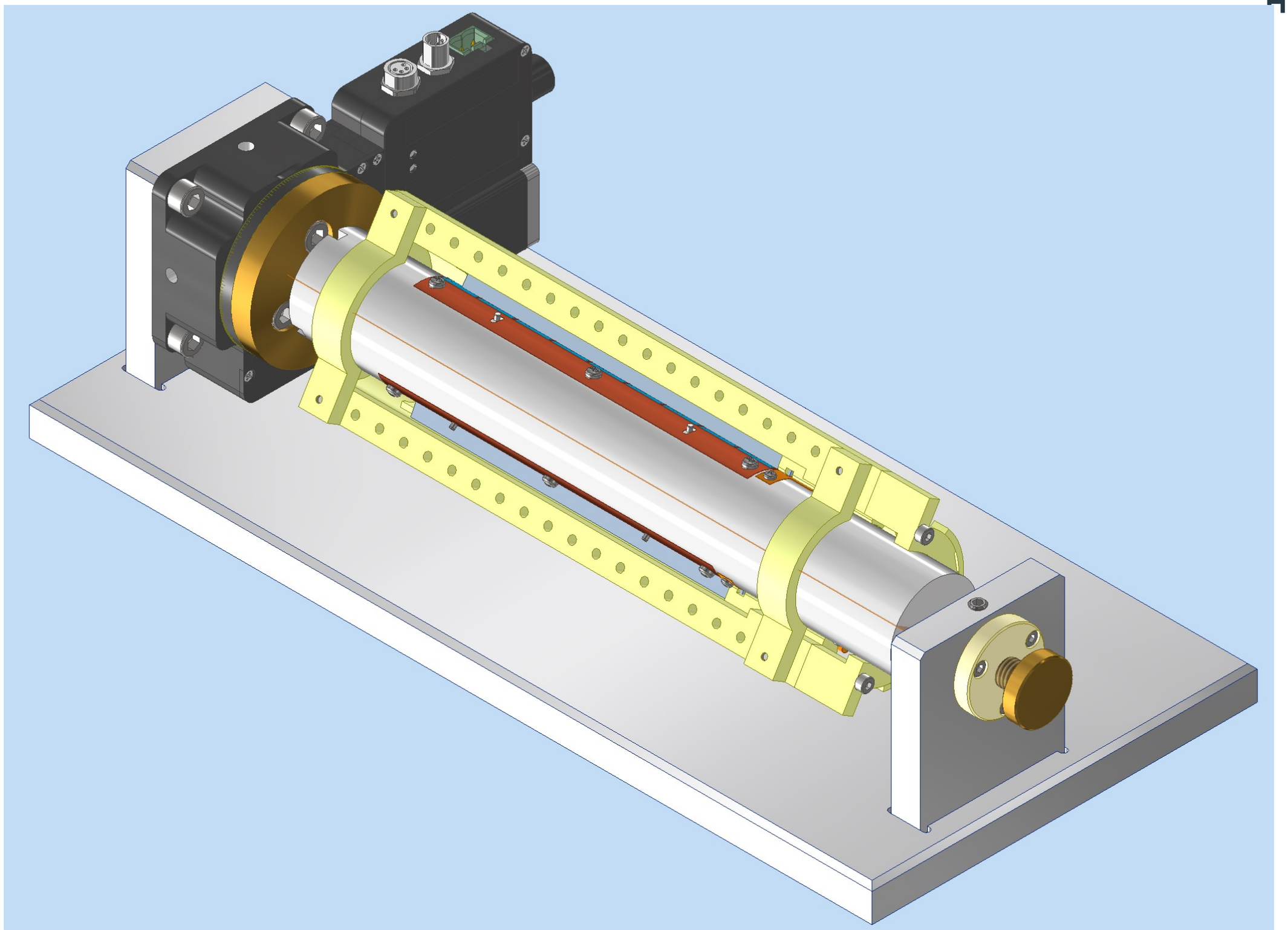
- One source: having used the 1mm thick exoskeleton (reduced radius) for an FPC designed for a 2 mm thick one

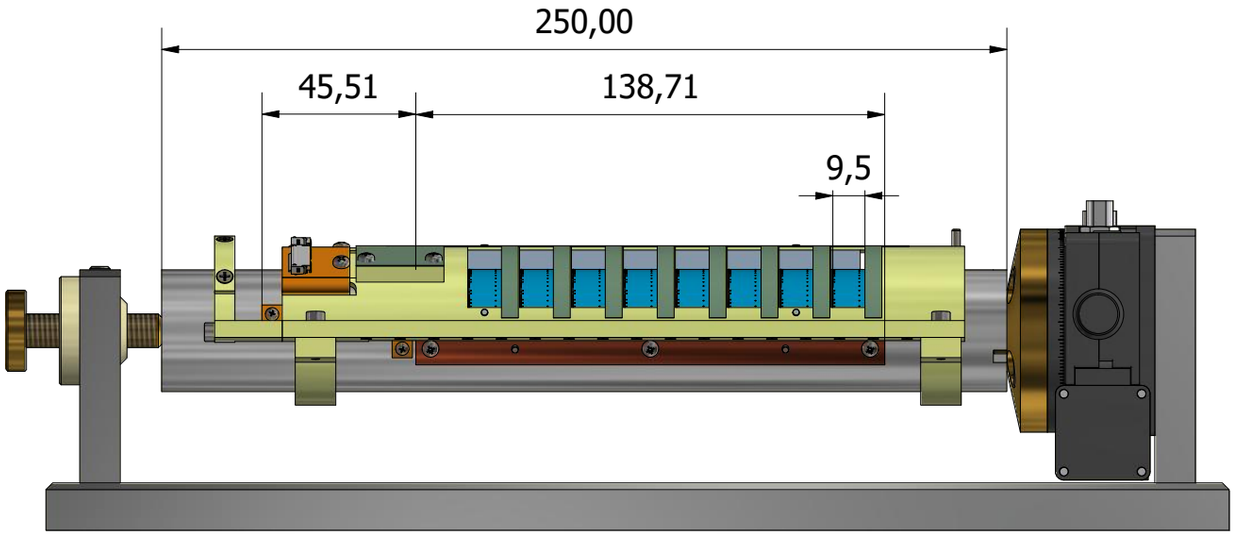
Super-ALPIDE FPCs support mechanics integration







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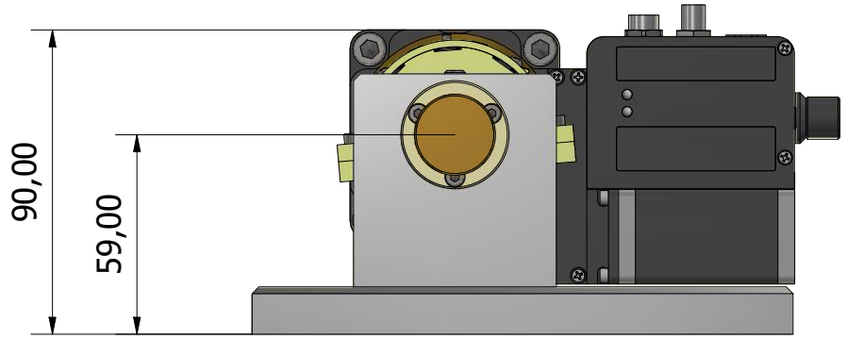
138,71
9,5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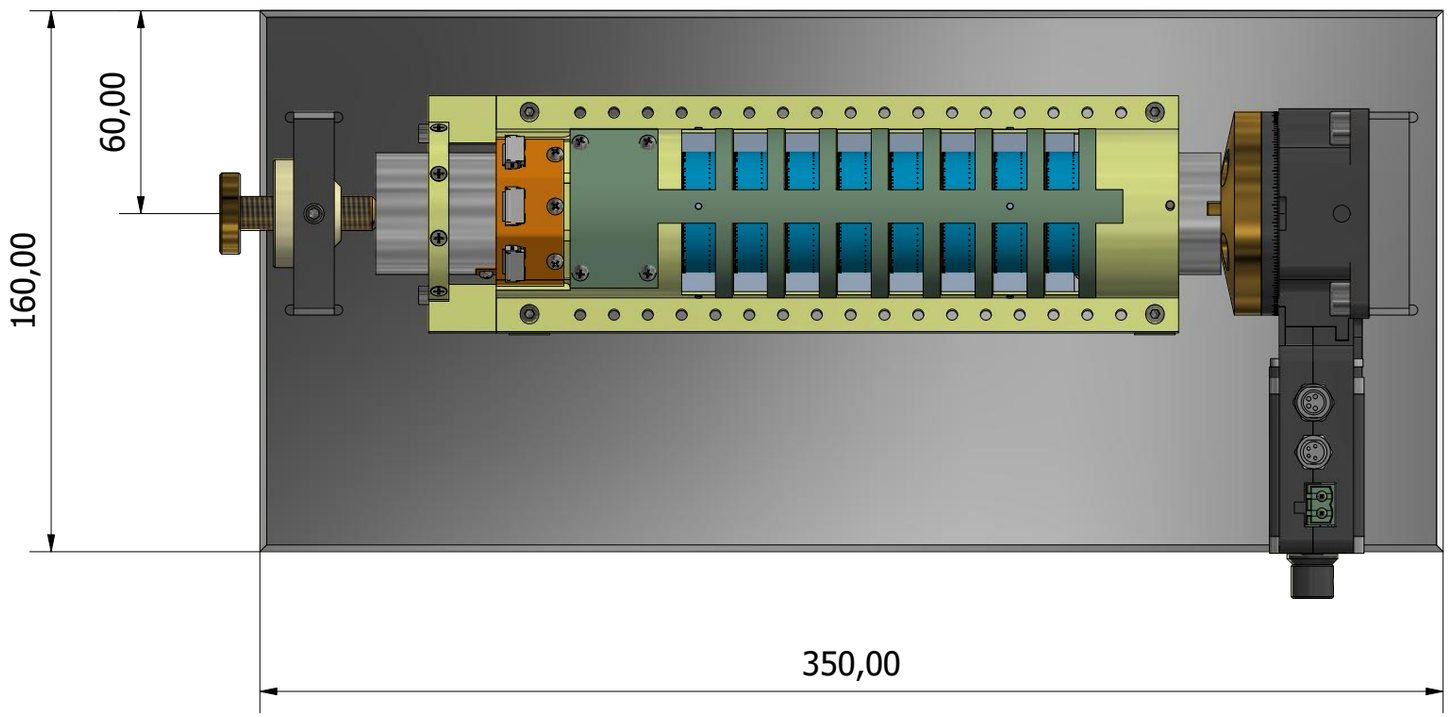
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60,00
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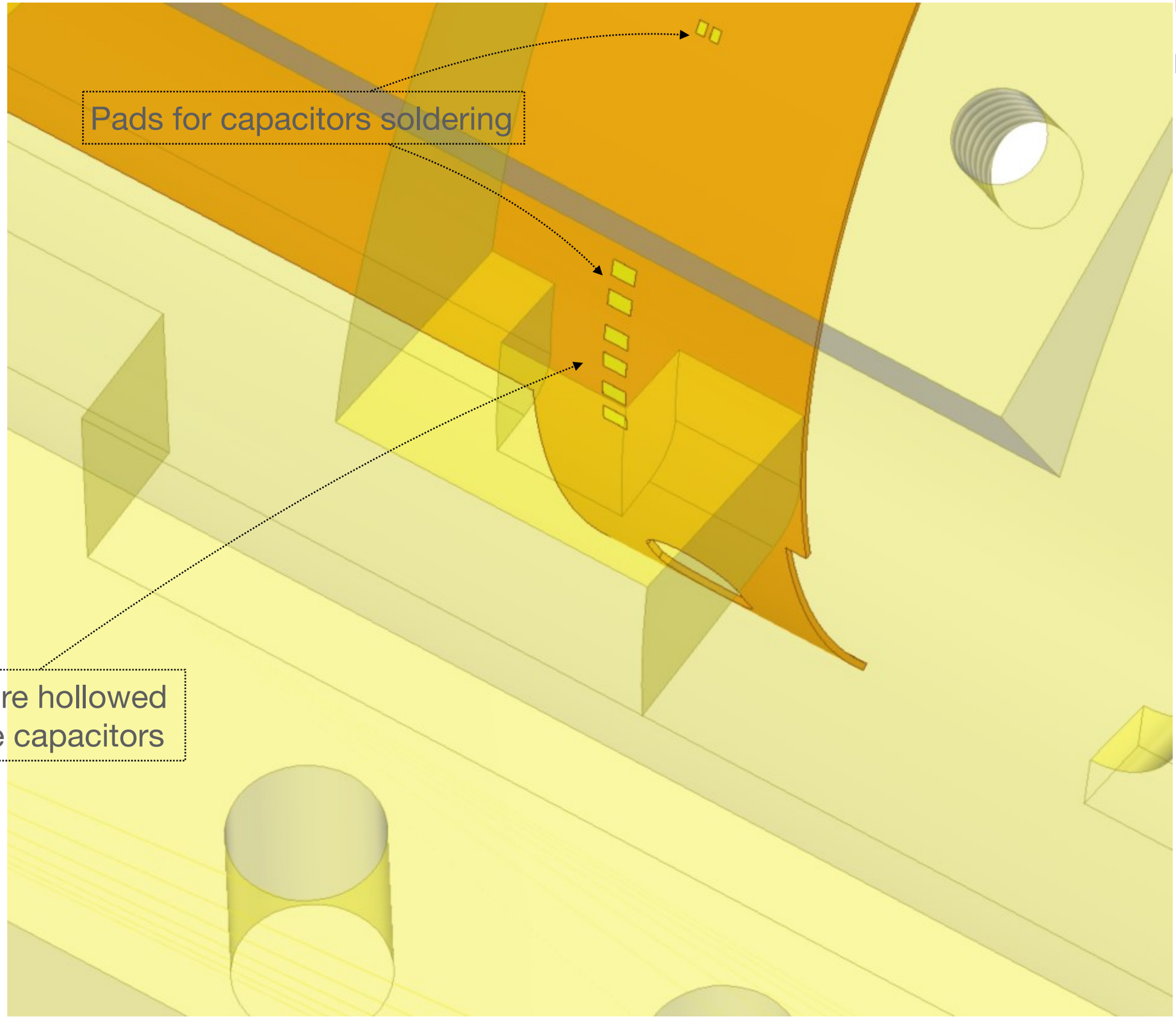
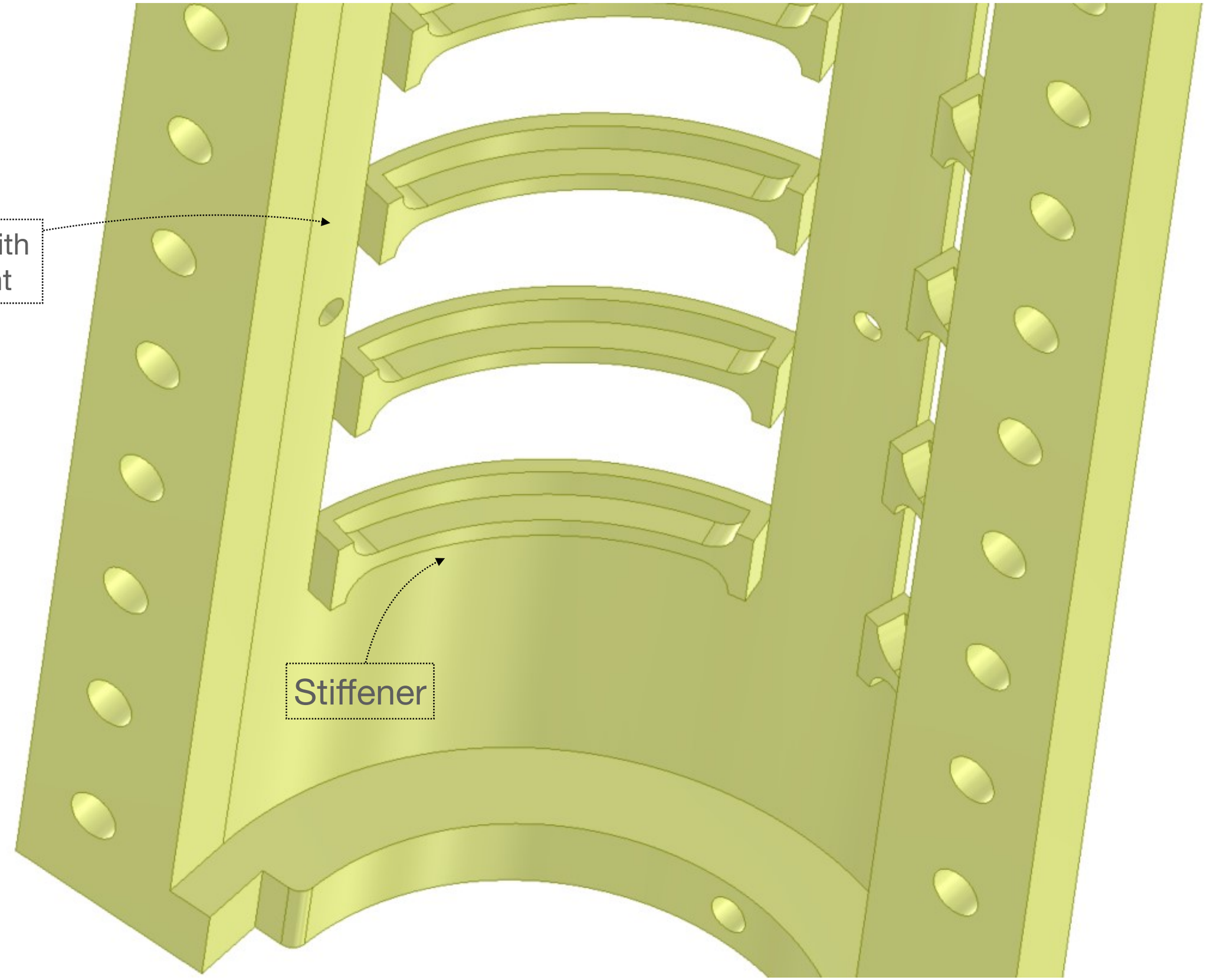
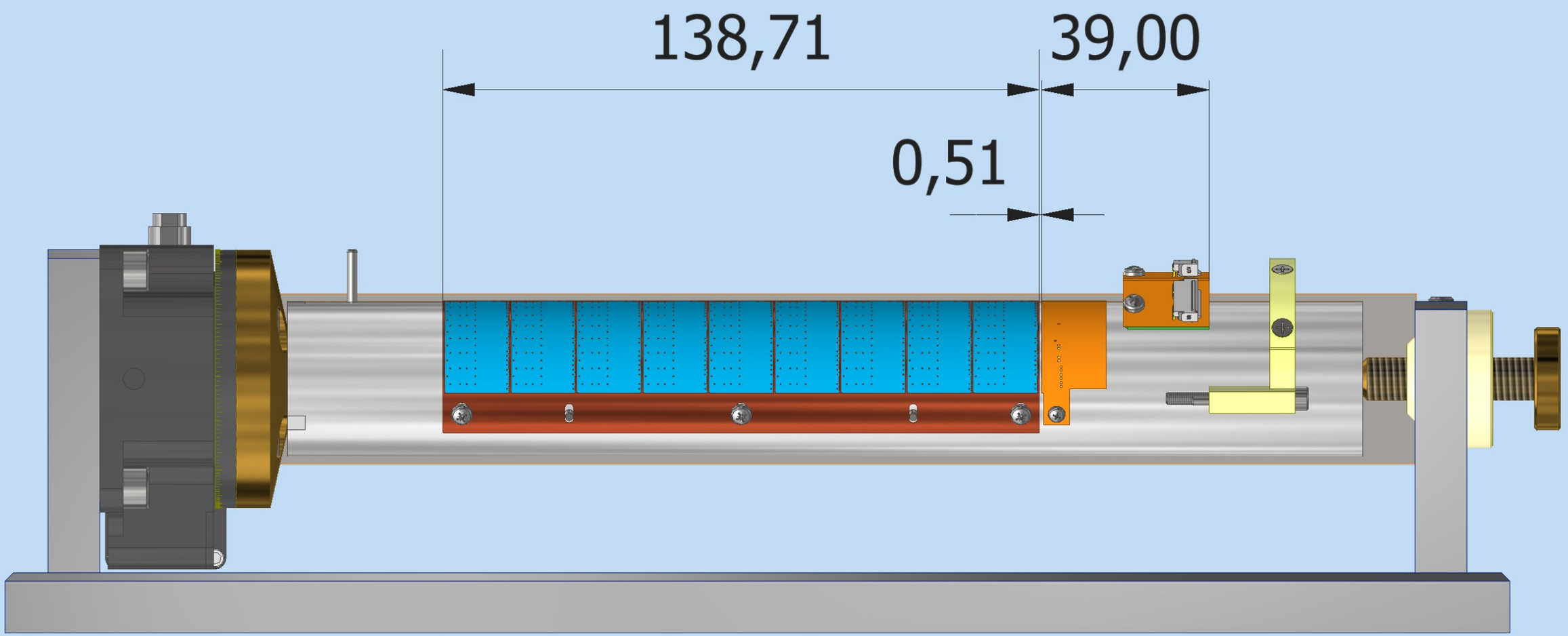
SAMTEC cables support and holder


Pads for capacitors soldering
Support structure hollowed
to not touch the capacitors


Do not interfere with wedges placement
Stiffener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39,00
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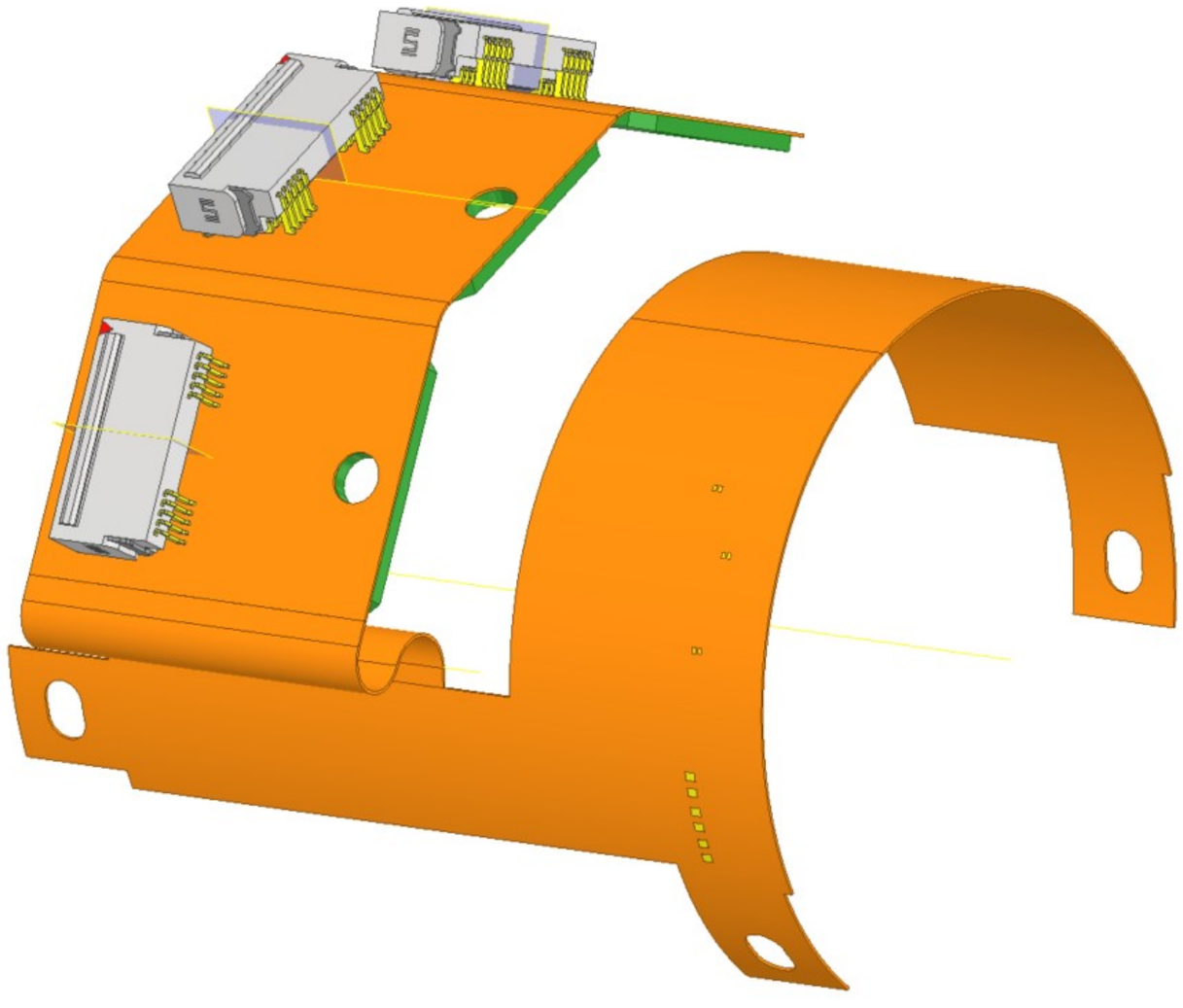
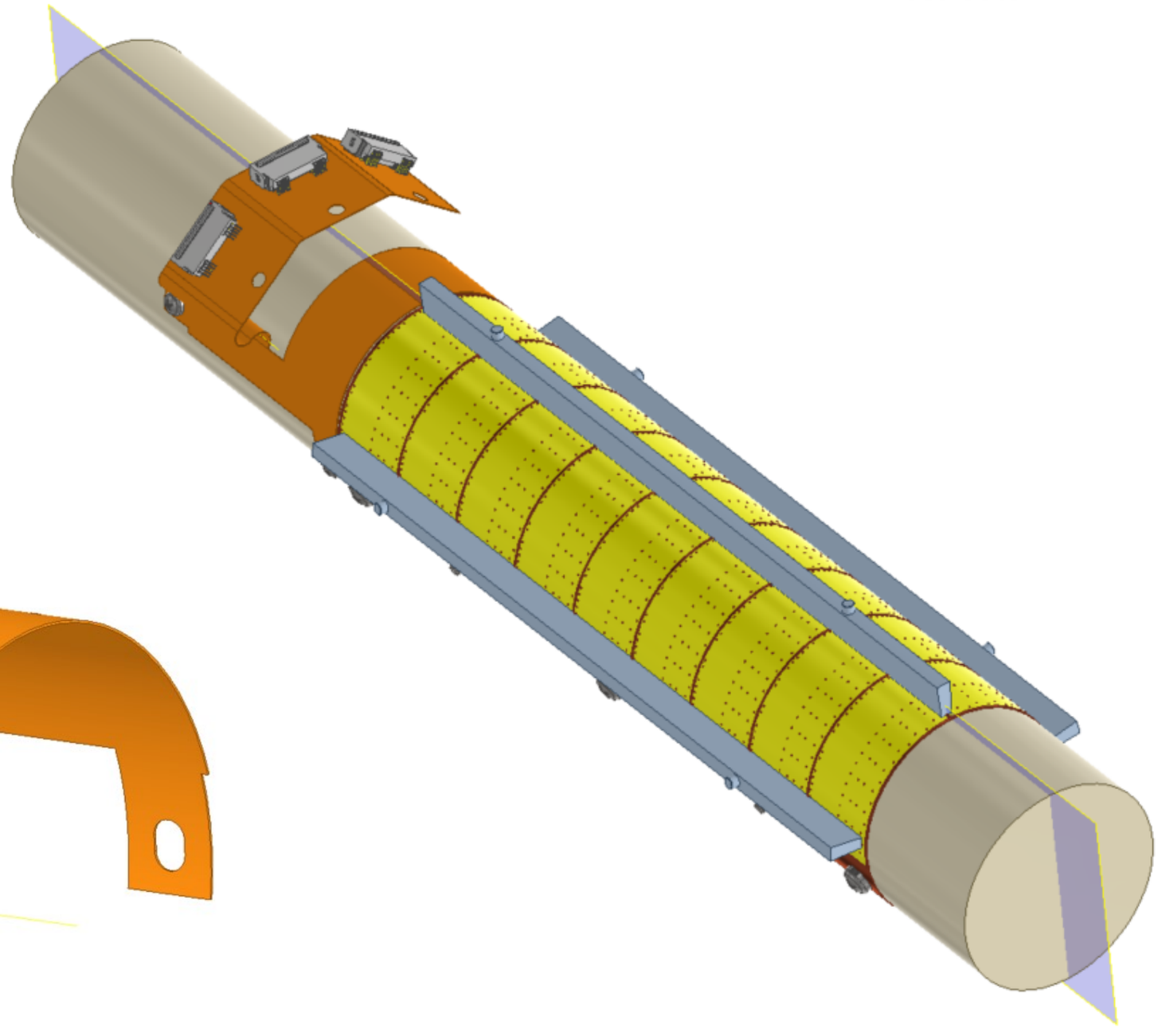
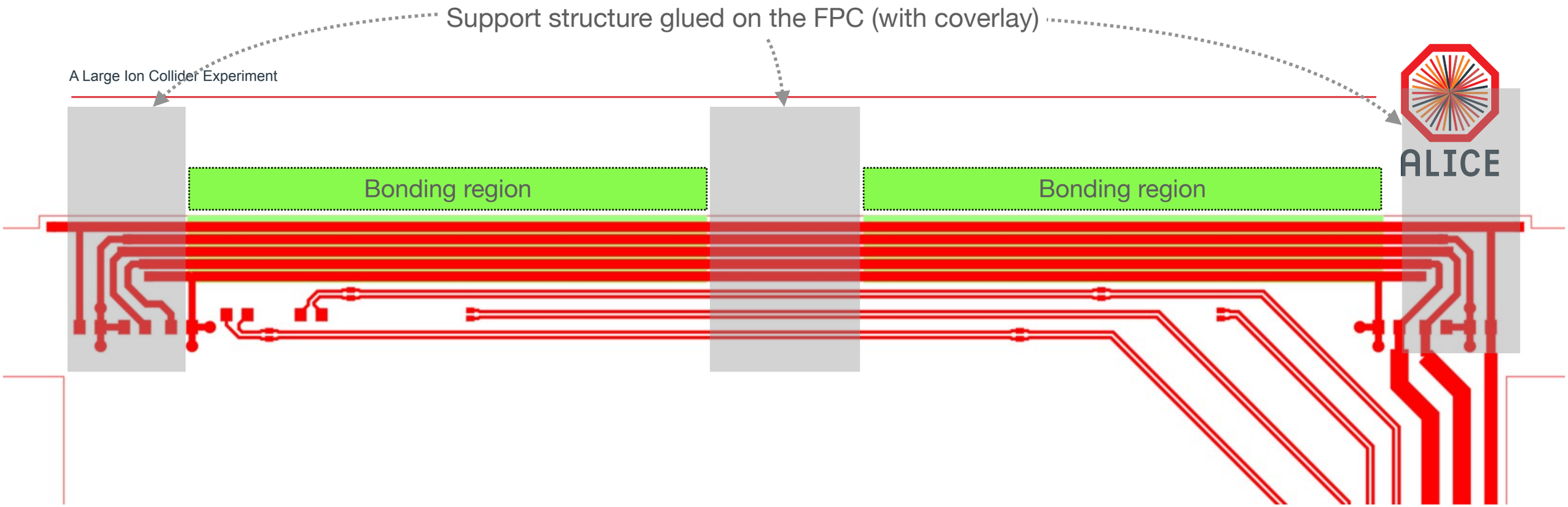
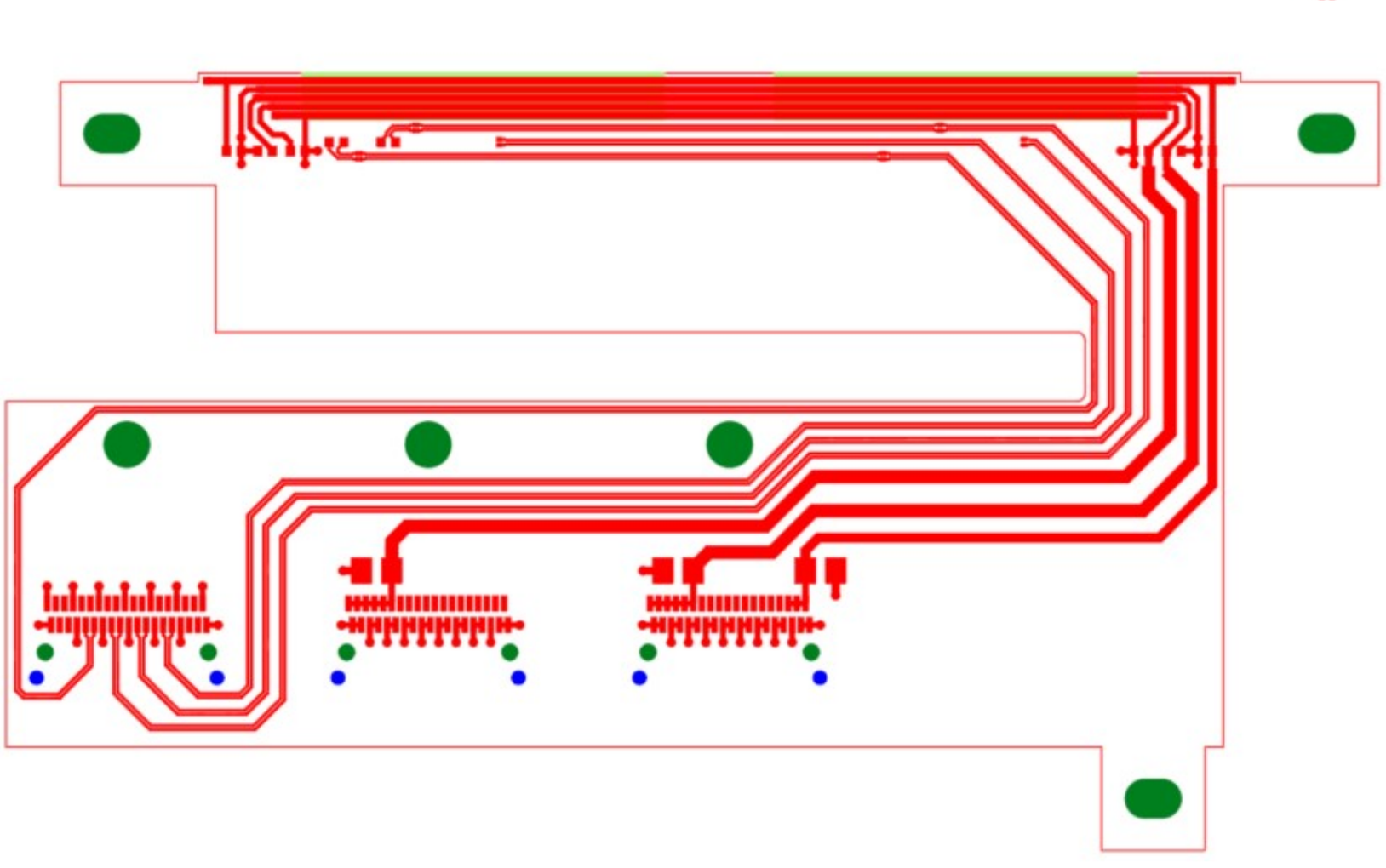
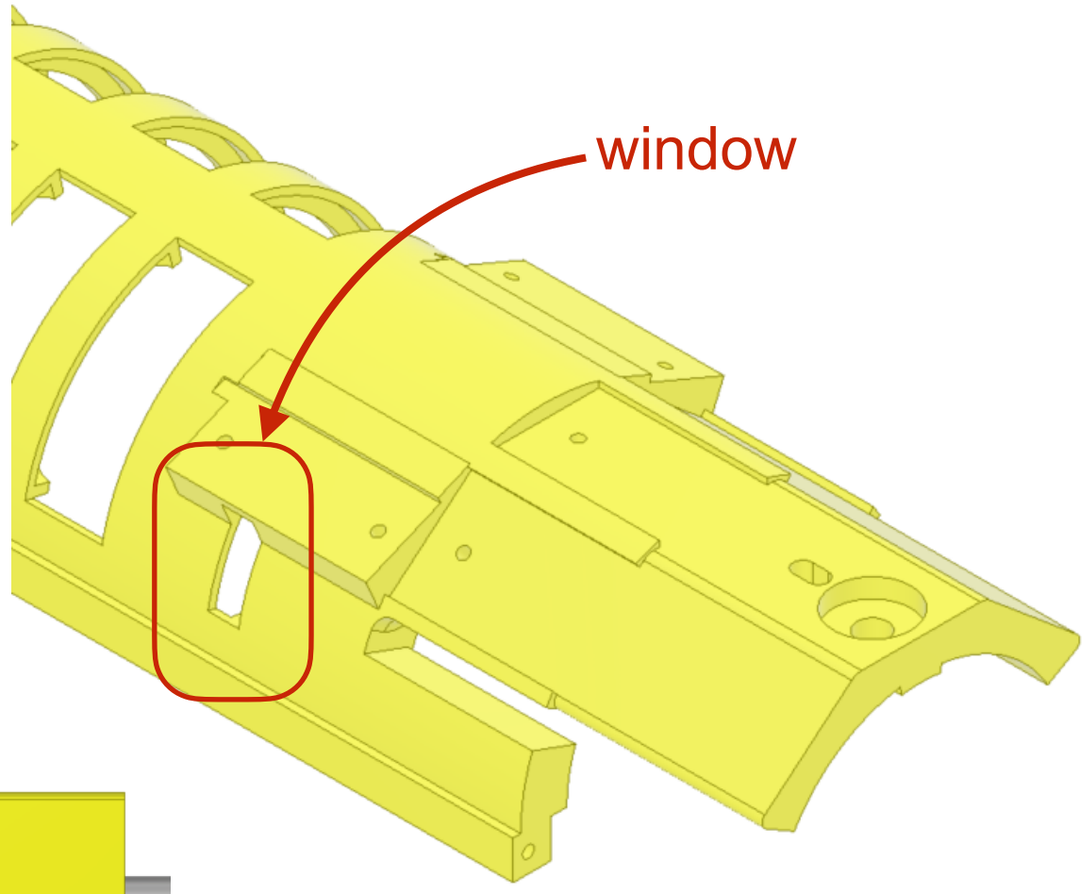


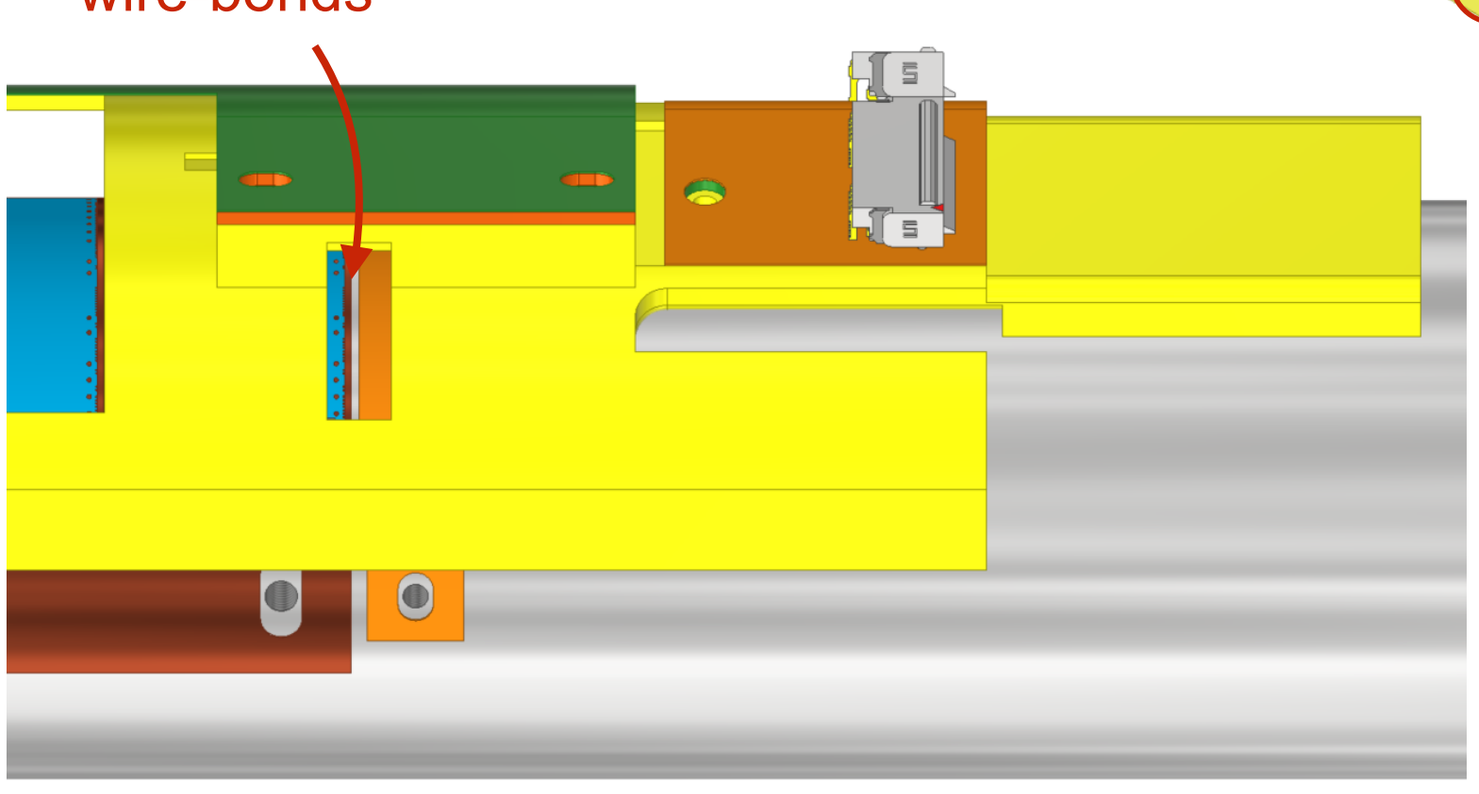



Support structure glued on the FPC (with coverlay)
A Large Ion Collider Experiment
ALICE
Bonding region
Bonding region

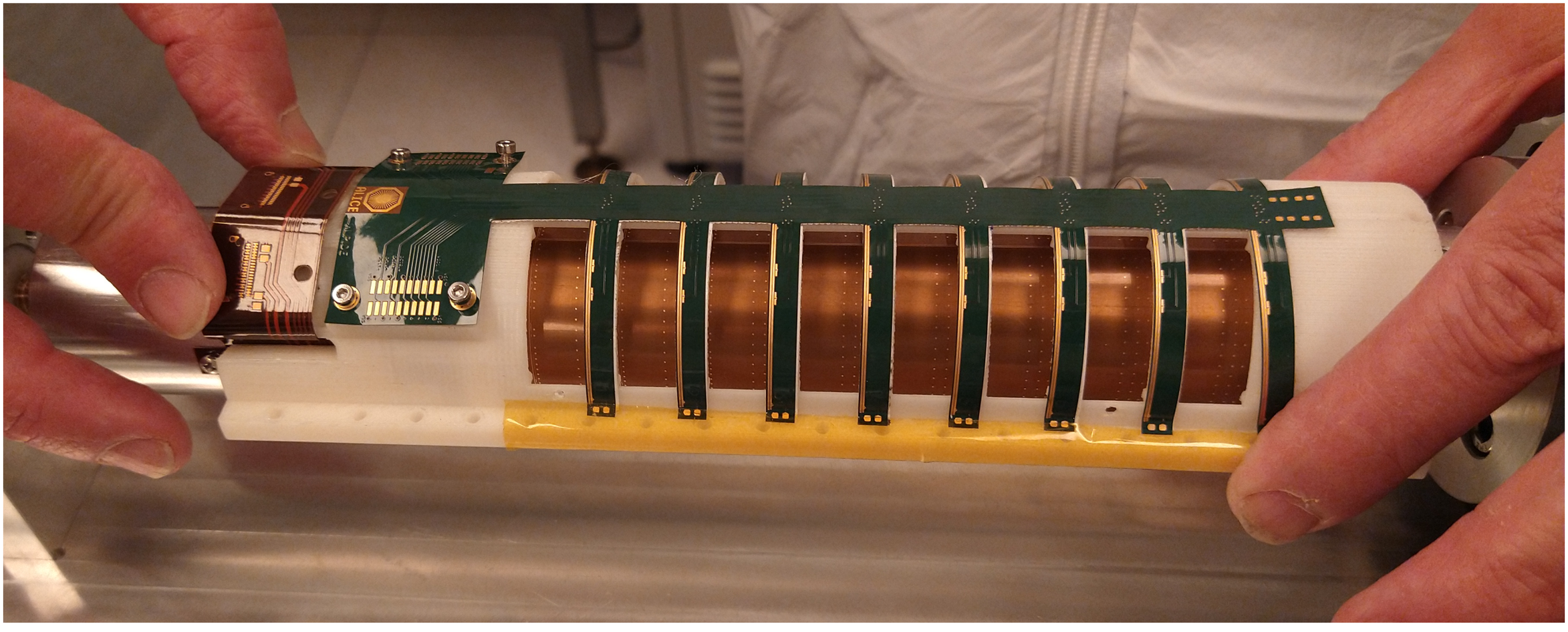


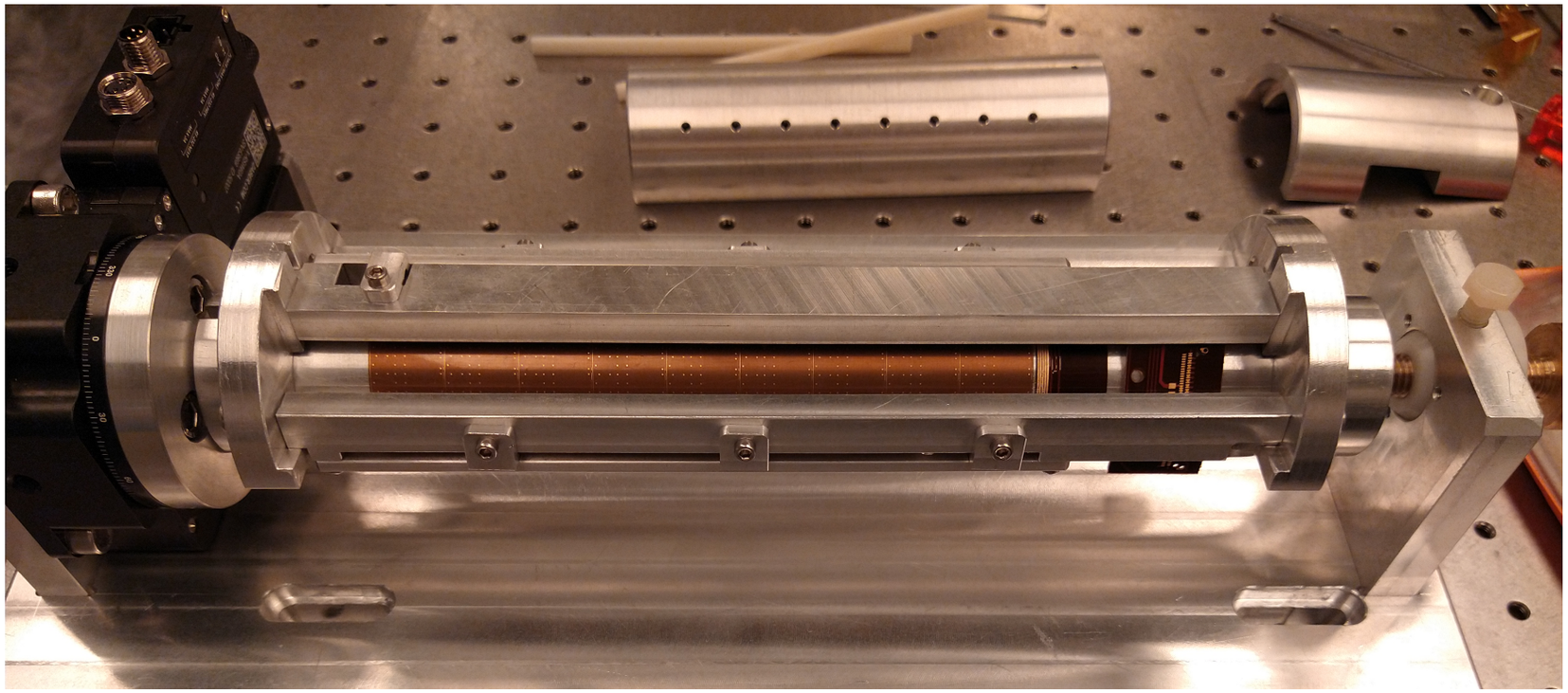
exoskeleton modification
look at the bonds





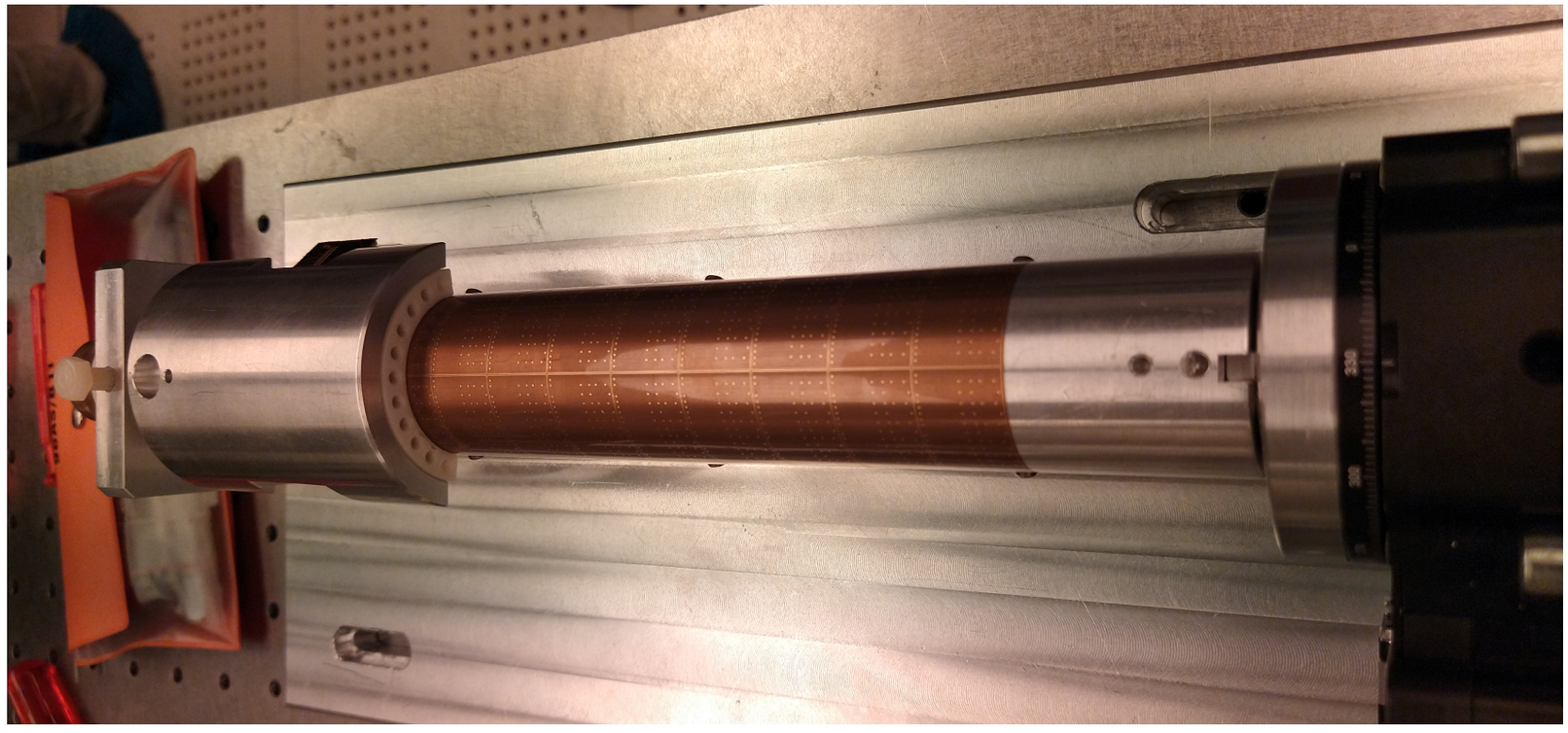
Exoskeleton and Edge-FPC matching (very first mechanical verification)

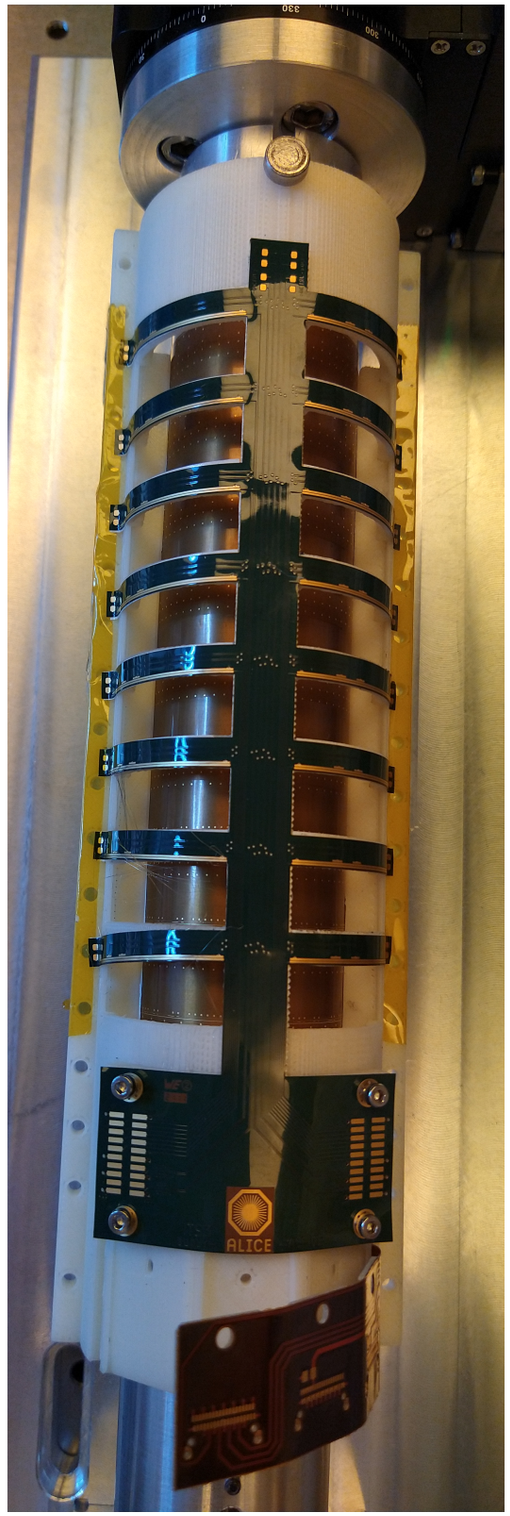
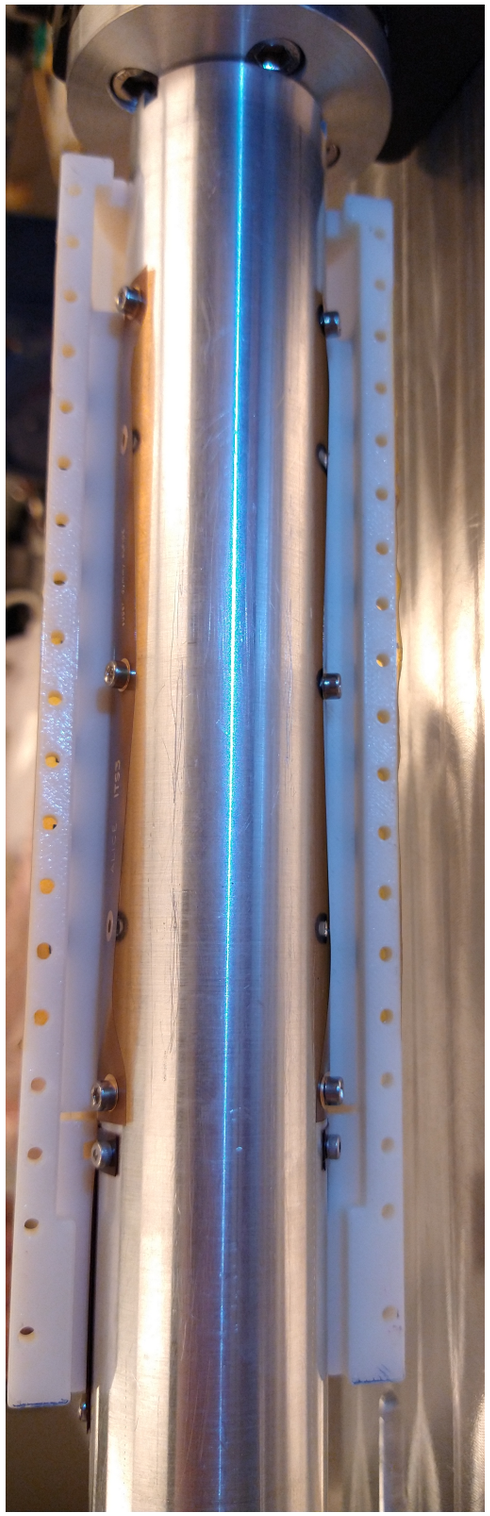




Gluing tool for longerons and wedge

Gluing tool half-ring




ALICE