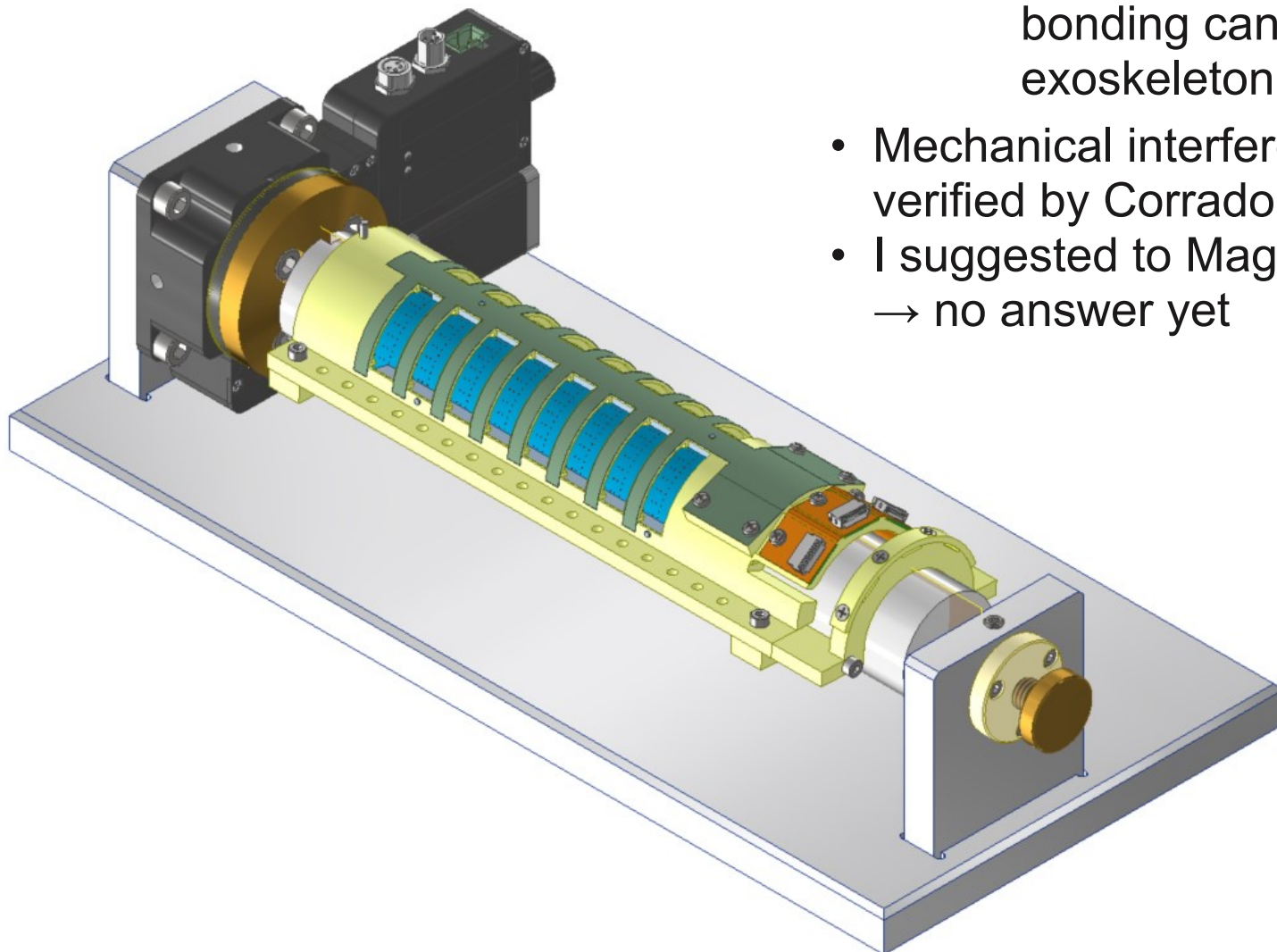




ITS3 activities in Bari

NEWS - 14/05/2021

SUPER-ALPIDE SETUP

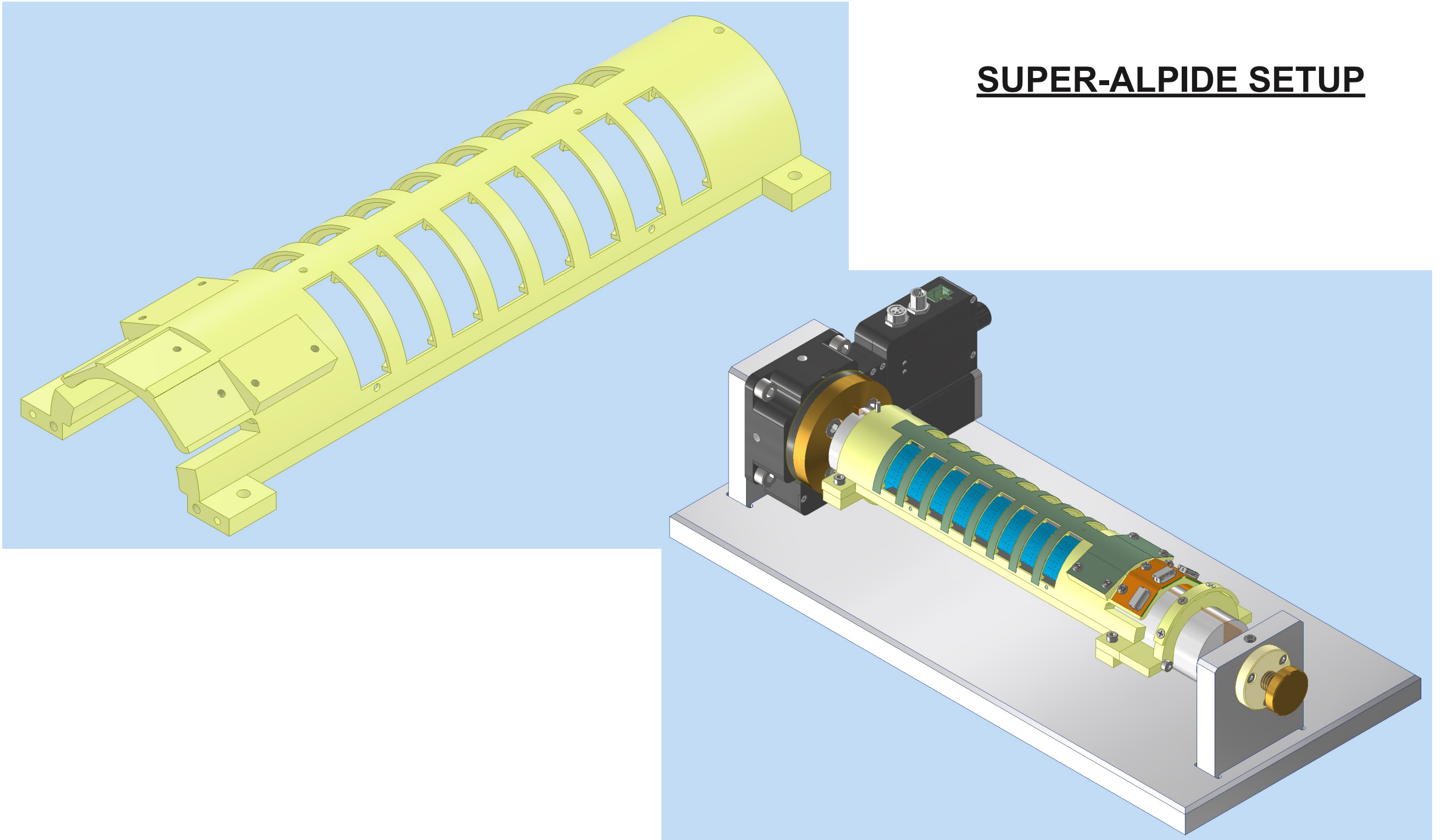


Status

- Cylindrical bonding tools ready
- Setup assembled using single ALPIDE chip on the cylinder and single-ALPIDE-FPC as bonding surface on the exoskeleton
- Bonding test performed by Pasquale using a 1.5 mm thick exoskeleton (still old one, designed by Magnus)
 - Lateral bars create mechanical interference with the bonding head → must be removed
 - With such an distance between the two soldering points, bonding can be performed but we are at the limit → reduce exoskeleton thickness to 1 mm
- Mechanical interference with bending tool are expected to be verified by Corrado team at CERN → No reply after two weeks
- I suggested to Magnus to proceed with exoskeleton production → no answer yet
- Dummy-super-ALPIDE production launched
 - ordine spedito 23/04
 - tempo consegna: 15 giorni
 - conferma ordine 6/05
- Edge-FPC offer search launched

NEWS - 14/05/2021

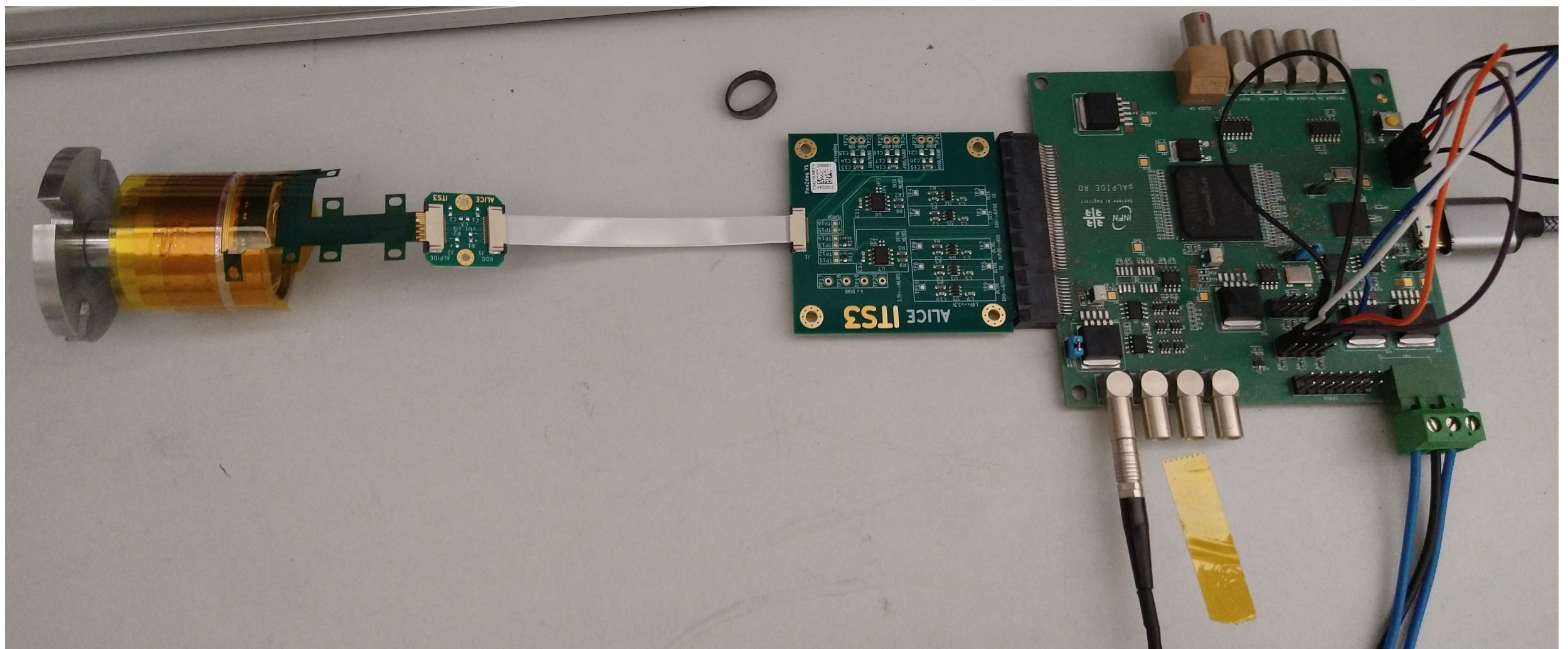
SUPER-ALPIDE SETUP



NEWS - 14/05/2021

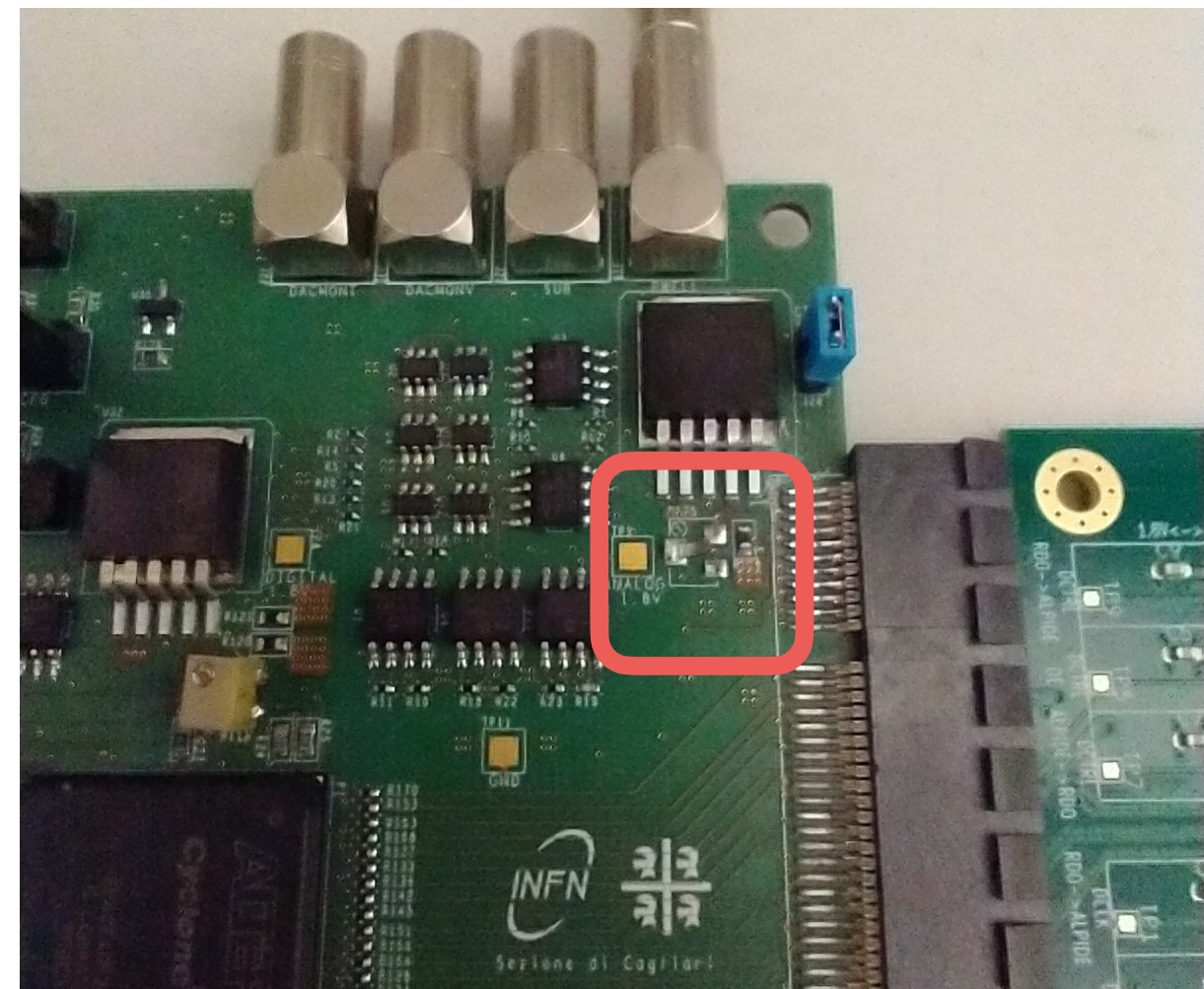
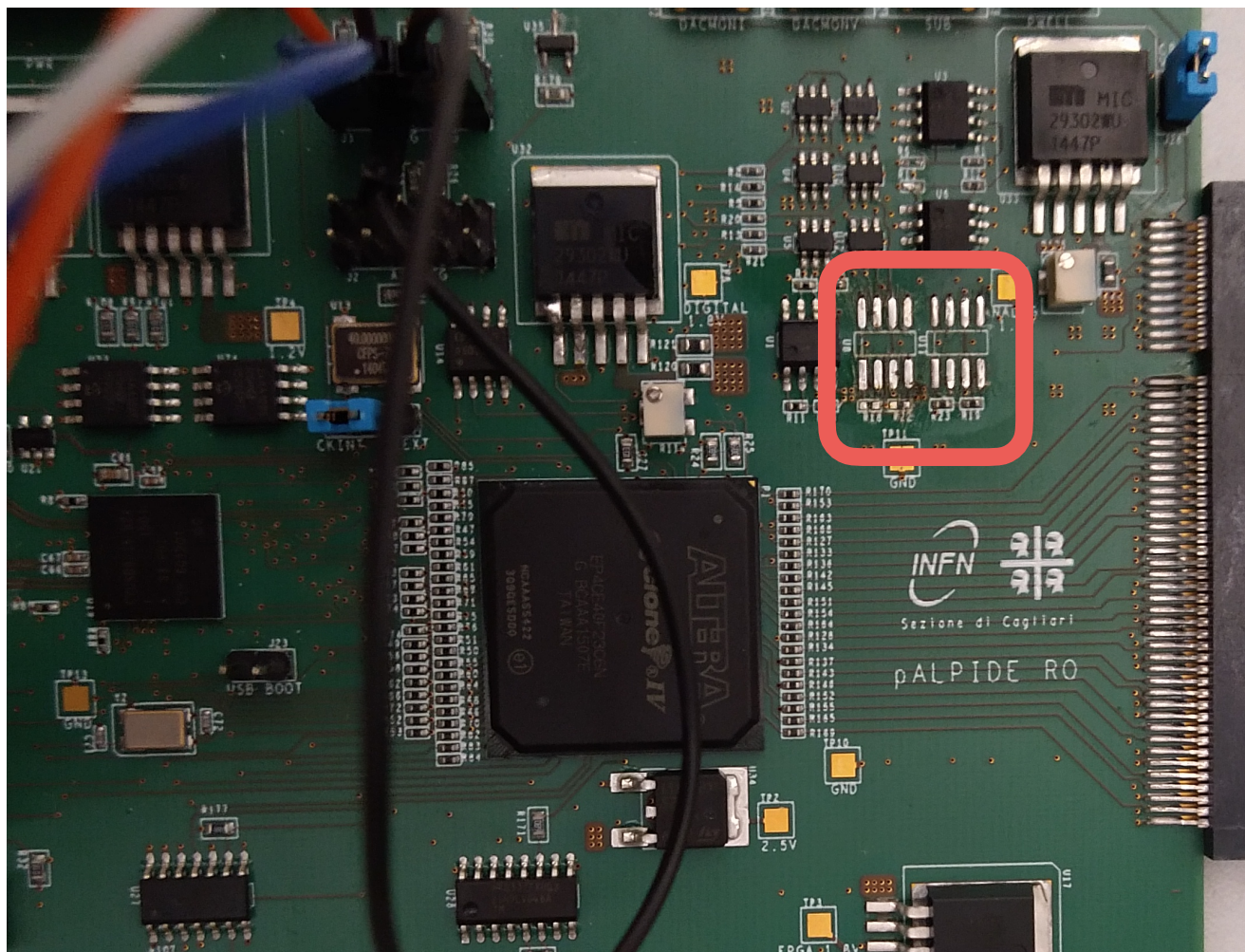
SINGLE ALPIDE SETUP

- Assembly with working chip by Cosimo and Vincenzo
- Bonding done by Pasquale
- First powering test on Friday 7/5
 - Board requires new fixing



NEWS - 14/05/2021

- 5 problematic DAQ boards shipped to Bari for reparation (by Michele)
 - Intervention successful for two boards (remaining cannot be fixed)
 - FW can be loaded in these two boards but other components are missing
 - New intervention on Monday





**NEXT SLIDES ARE
FROM PREVIOUS MEETINGS**

NEWS - 23/04/2021

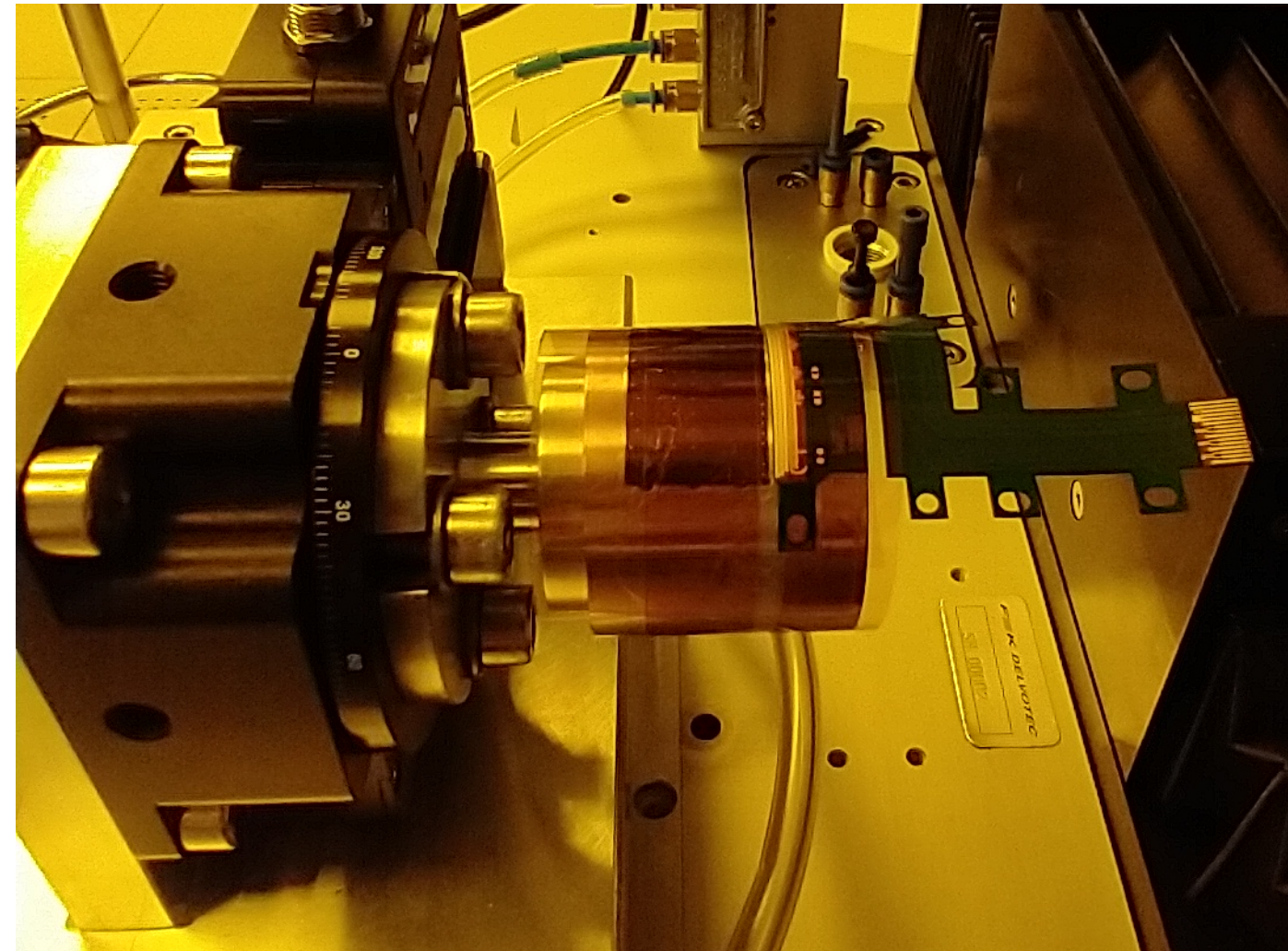
SINGLE ALPIDE SETUP

Status

- Chips available
 - First assembly using NOT working chip done [Cosimo, Vincenzo]
 - Bonding test next week [Pasquale]
- DAQ system
 - Available board not compatible with FW
 - 5 boards in Bari for reparation [Michele]
 - we will keep one
 - Other cables and boards available

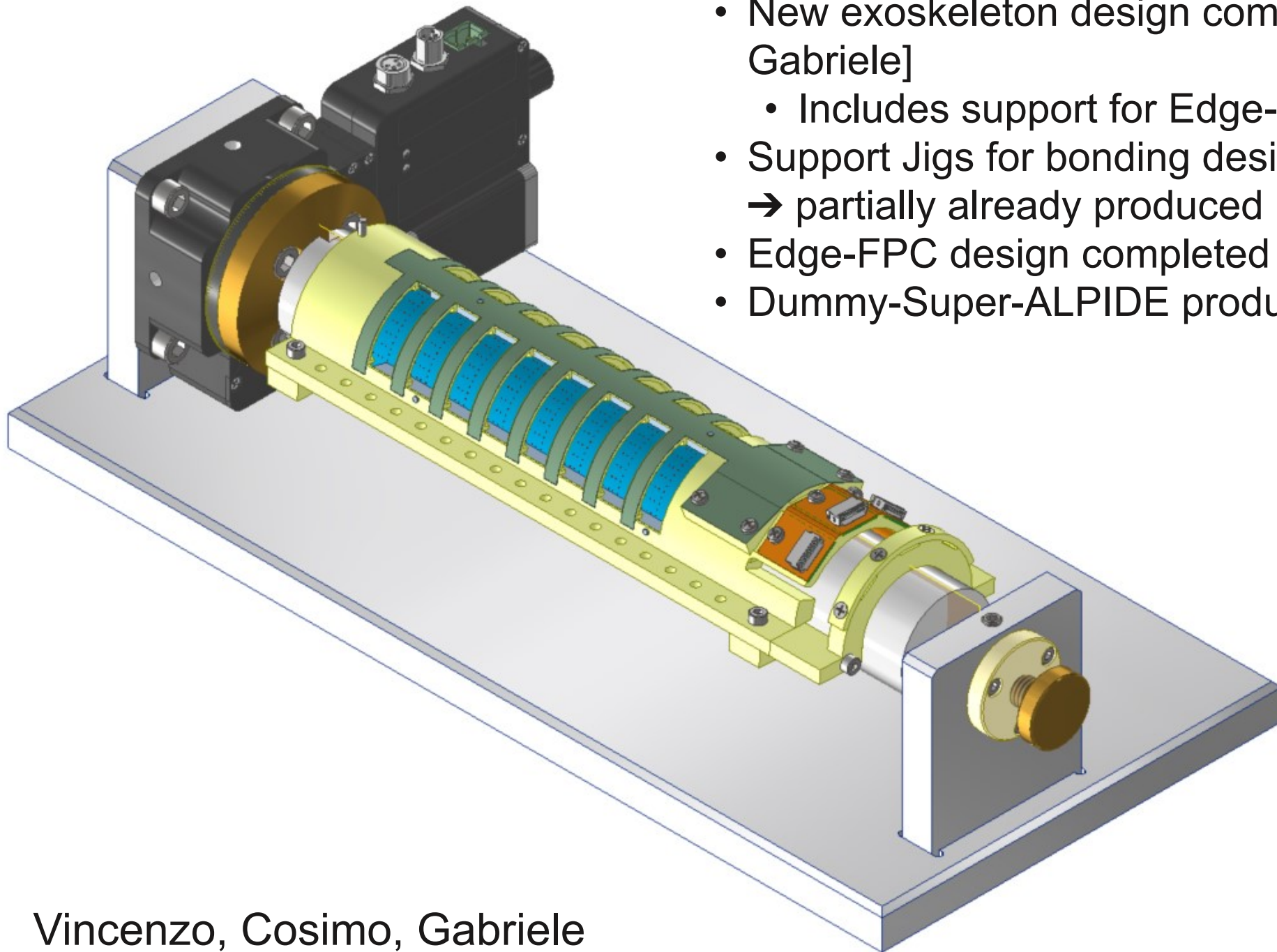
Next steps

- Push for DAQ board reparation
- Assembly of working chip setup
- Start with measurements...



NEWS - 23/04/2021

SUPER-ALPIDE SETUP

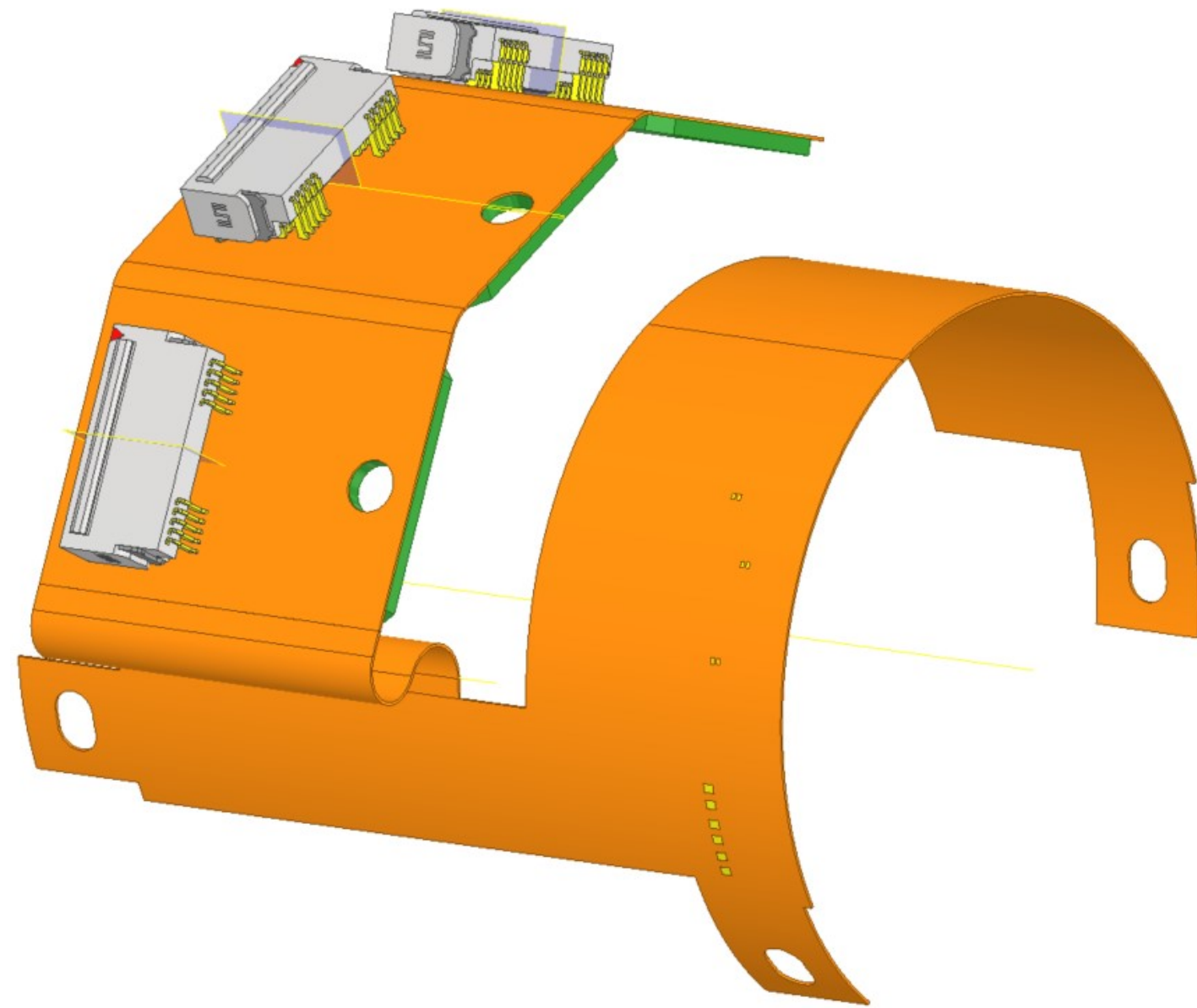


Status

- Exo-FPC and exoskeleton received
 - Dimensional inspection [Pasquale]
- New exoskeleton design completed [Cosimo, Vincenzo, Gabriele]
 - Includes support for Edge-FPC
- Support Jigs for bonding design completed [Vincenzo]
→ partially already produced [Cosimo, Michele F.]
- Edge-FPC design completed [Matteo, Giuseppe]
- Dummy-Super-ALPIDE production launched

Vincenzo, Cosimo, Gabriele
Matteo, Giuseppe

NEWS - 23/04/2021



Matteo, Giuseppe

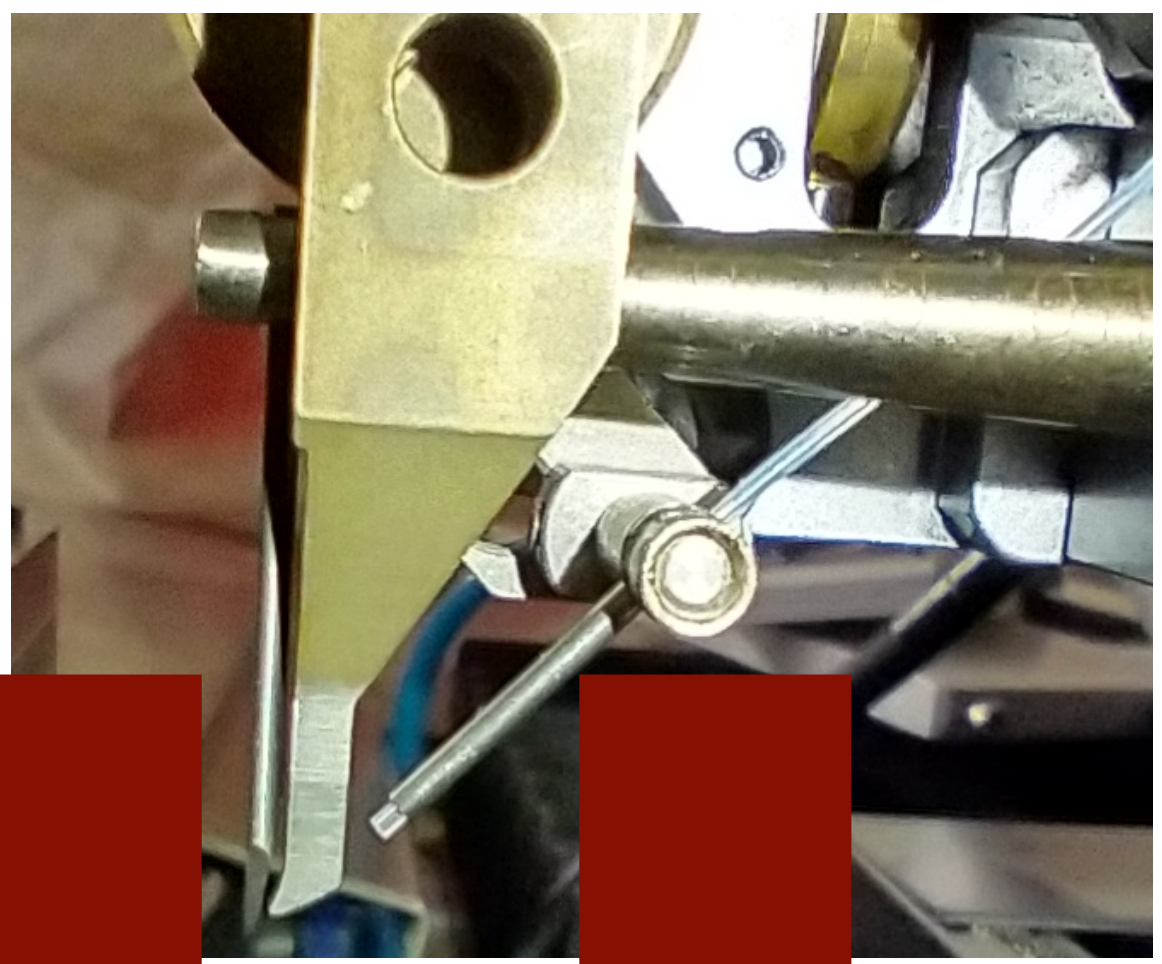
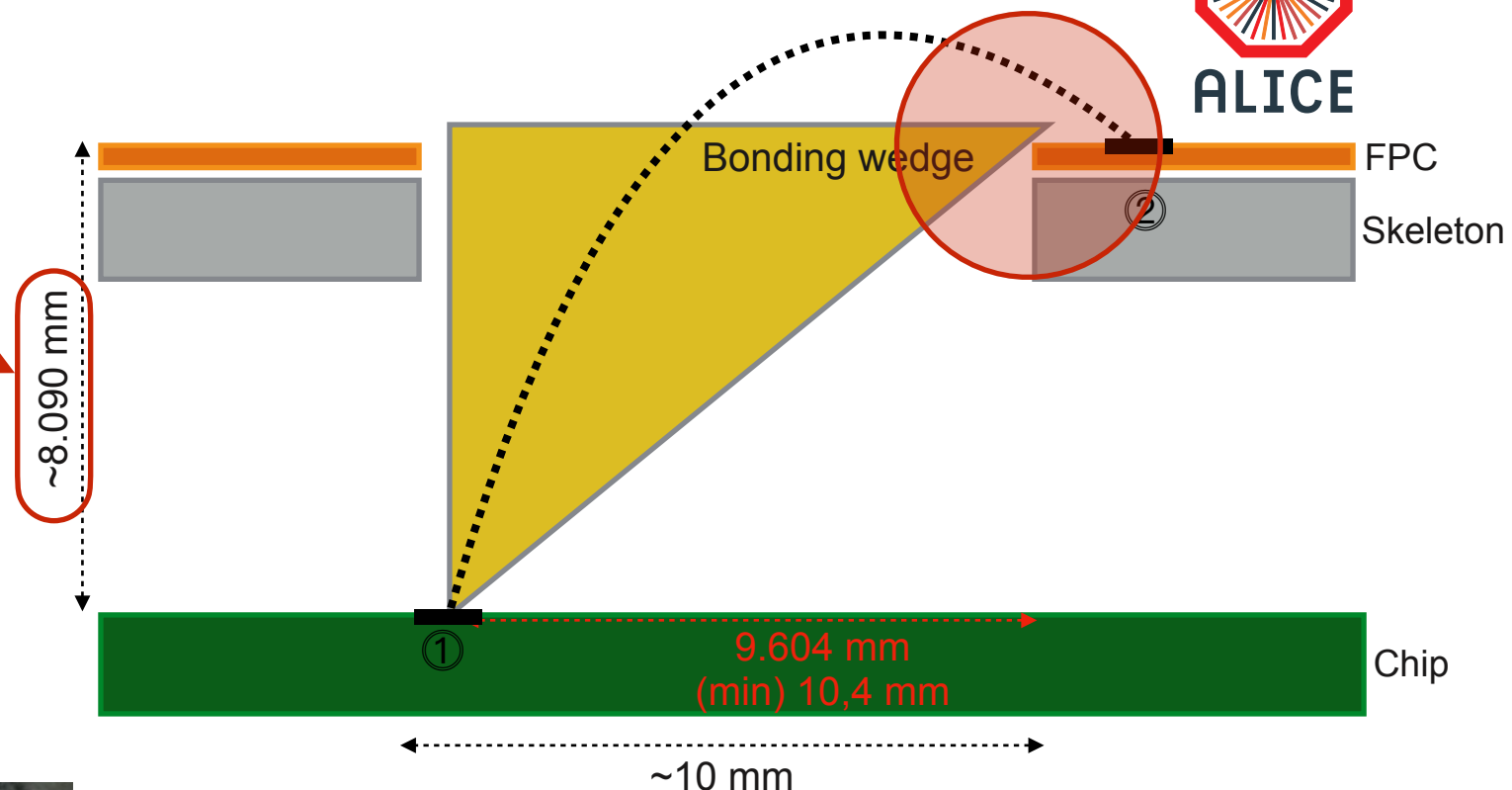
NEWS - 23/04/2021

Pasquale

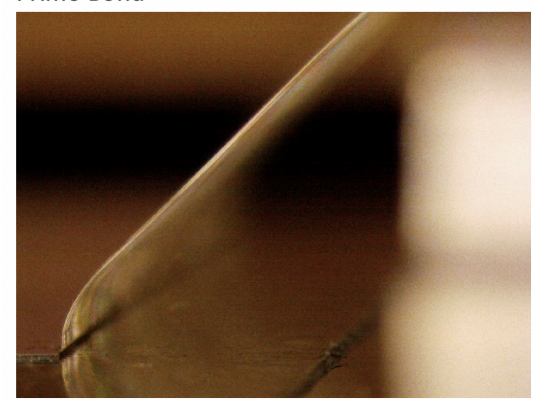


ALICE

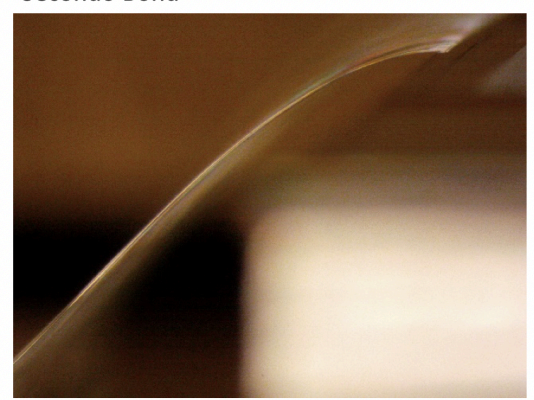
Moving to the target height



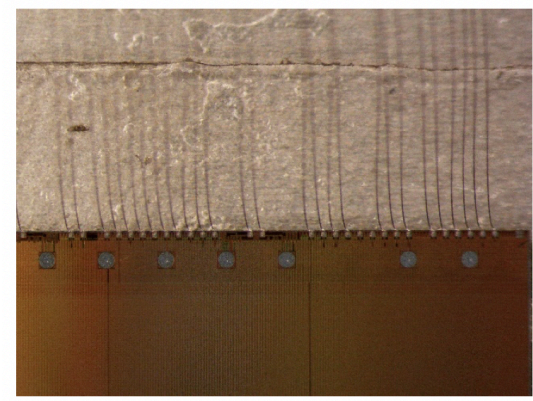
Primo Bond



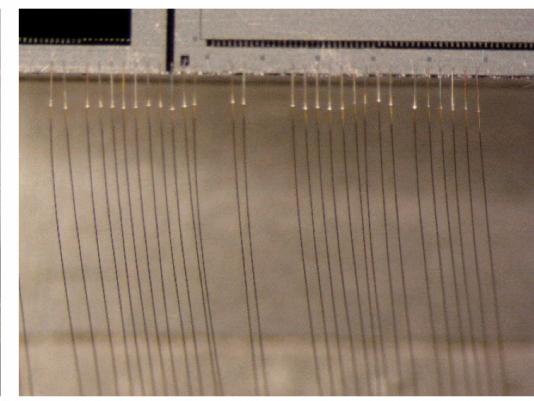
Secondo Bond



Primo Bond



Secondo Bond



NEWS - 23/04/2021

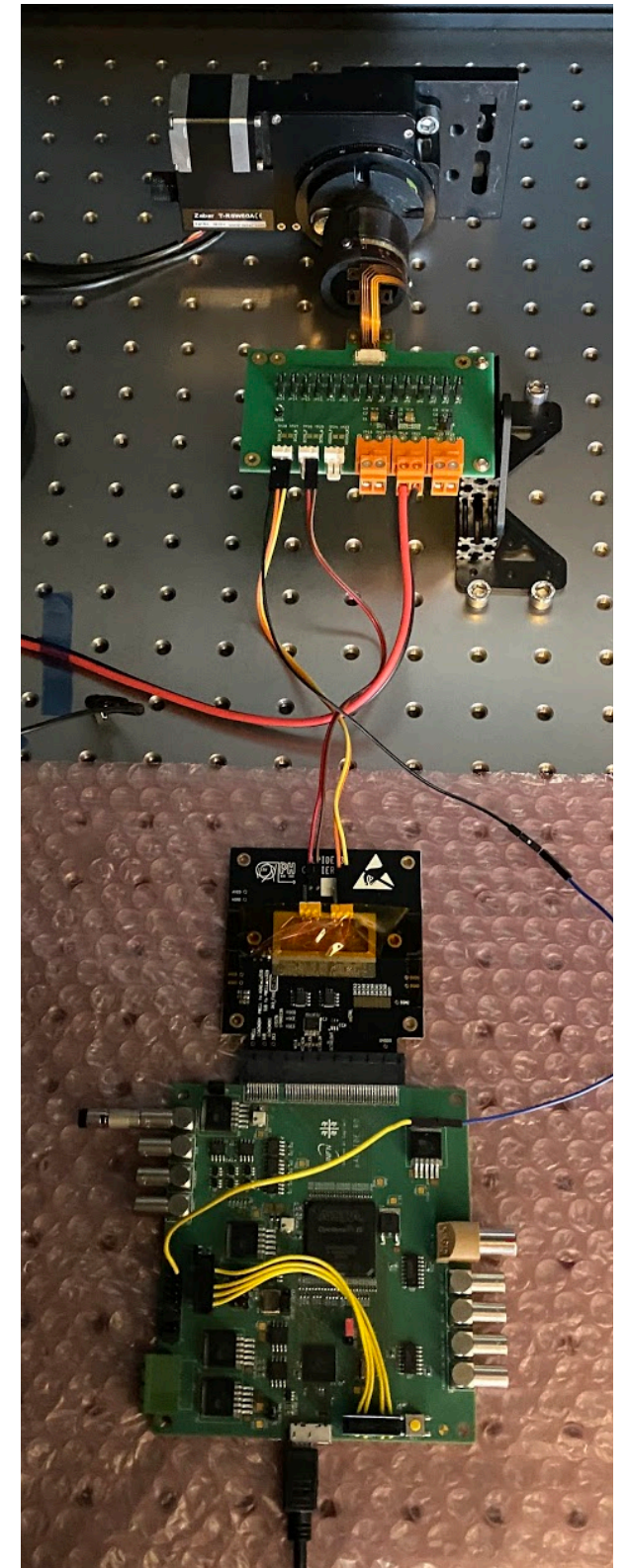
Next steps

- Assembly the super-ALPIDE bonding jigs and try bonding with present exoskeleton version
- Proceed with new exoskeleton version production
- Proceed with Edge-FPC production

NEWS - 12/03/2021

SINGLE CHIP TEST

1. ALPIDE 50 um received
2. FPC single chip production request submitted
 - Order submitted on March 1
 - Delivery time 10 working days
 - Expected March 15
3. Rotary motor adapter under design (Vincenzo)
 - Connect the rotary motor to the cylinder hosting the bended chip
 - Needed to perform the bonding over bent chip
4. Bending procedure
 - Simplify as much as possible → No tool development
 - Use Mylar foil sandwich to keep side-by-side chip and FPC
5. DAQ board
 - Connector fixed
 - Instructions for FW loading available
6. FPC to DAQ connection
 - Flex2DAQ connector in production (two weeks more for delivery)
→ One could be sent to Bari
 - Alternatively, adaptor+carrier board → To be requested at CERN



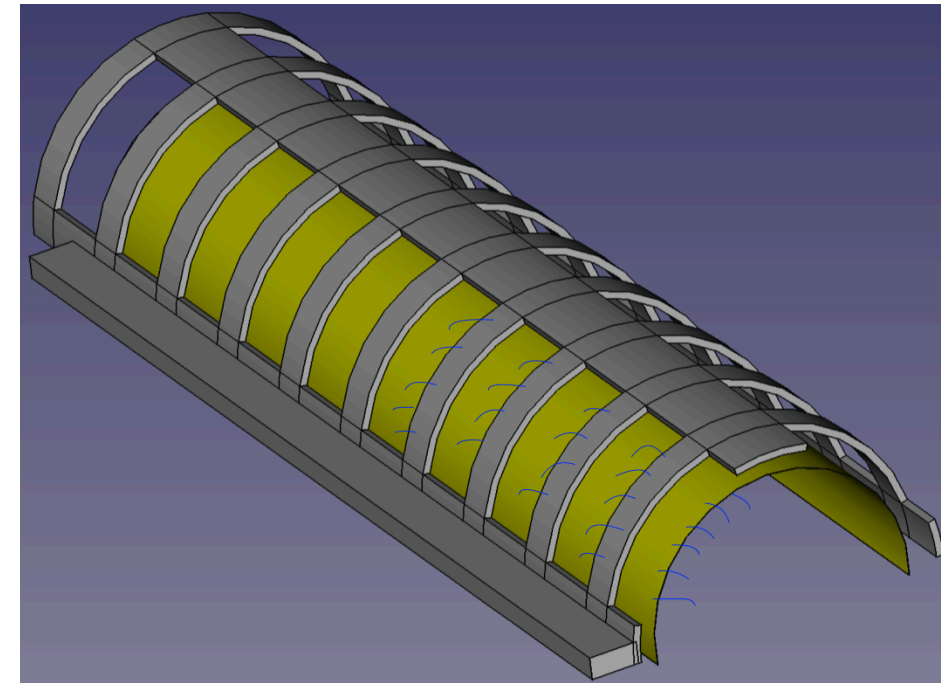


NEWS - 12/03/2021

SUPER-CHIP

1. Skeleton FPC

- Skeleton
 - Scalable design by Magnus
 - Good material for the production to be identified
- Wire-bonding
 - First tests performed by Pasquale (next slide)
 - More tests during next week
- FPC
 - designed by Magnus, under G. De Robertis revision



2. Edge FPC

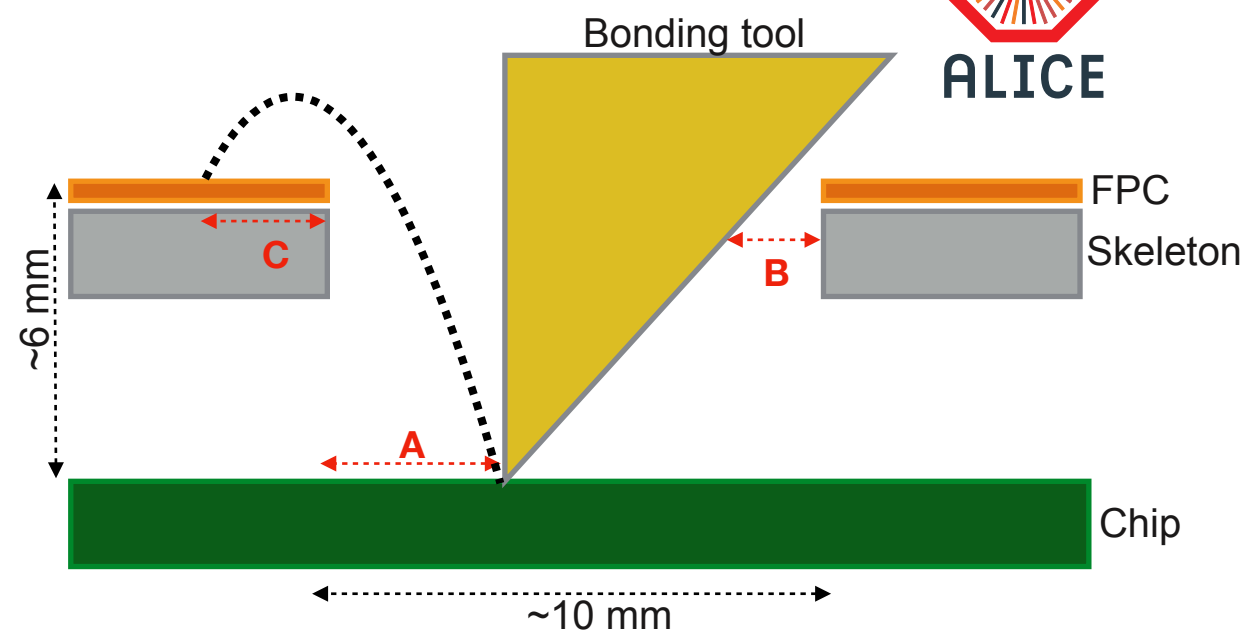
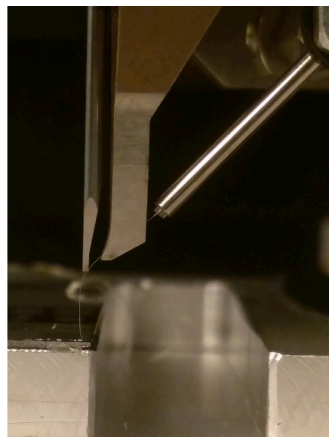
- FPC design requires minimal geometrical limitations from mechanical support → Vincenzo and G. De Robertis
- Mechanical support design requires actual dimensions of the full detector mechanical support → Gabriele and Vincenzo
- Mechanical support design also requires to take into account the full object assembly sequence → Gabriele and Vincenzo

3. General observation

- Magnus agreed that a mockup of the chip bending tool is needed in Bari to exercise the bonding and actually study the mechanics for the edge FPC support → Gabriele, Vincenzo and Cosimo



NEWS - 12/03/2021



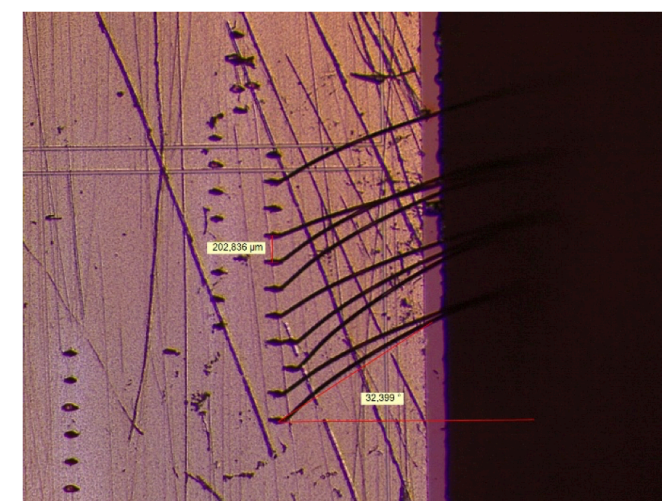
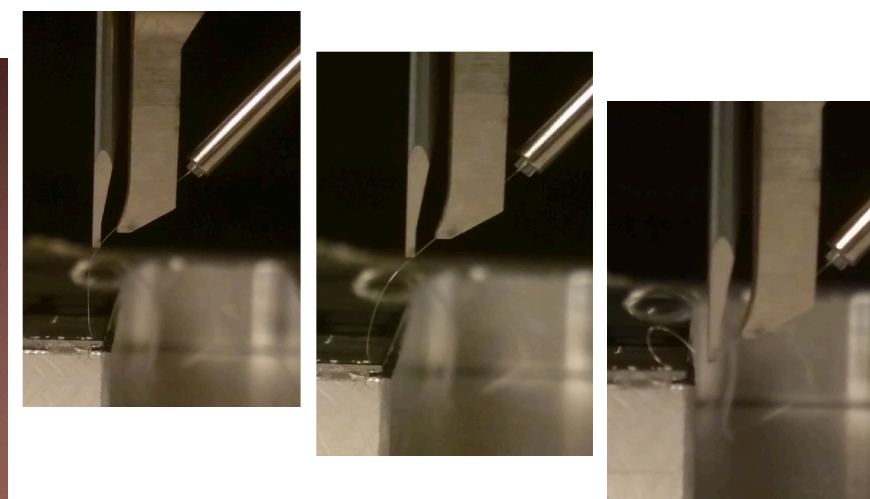
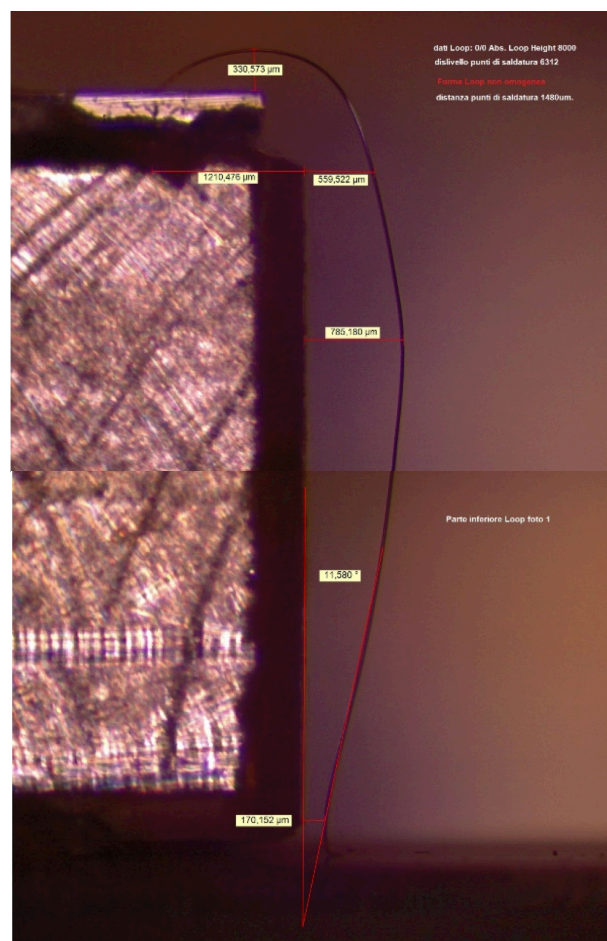
Two configurations explored

1. FIRST CONFIGURATION

- $h = \sim 6,3$ mm and $C+A = \sim 2.5$ mm
- bonding from top to bottom
- Results
 - Very low pull-force: 3,5 grams
 - Deviation angle ~ 32 degrees
 - High wires touching probability
 - Not homogenous loop shape

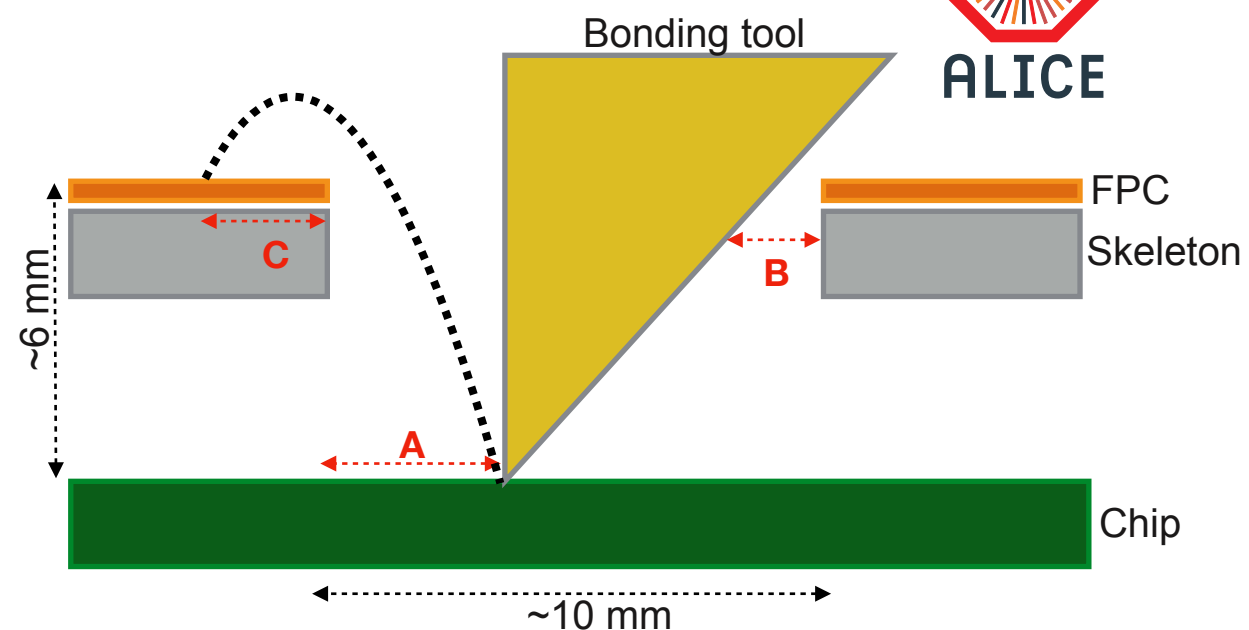
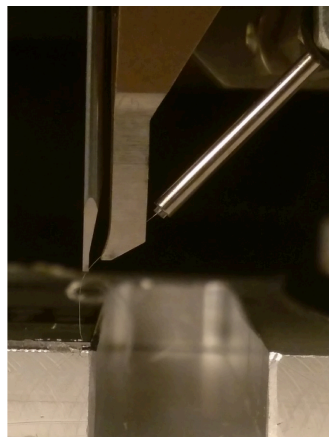
2. SECOND CONFIGURATION

- $h = \sim 6,6$ mm and $C+A = \sim 4.6$ mm
- bonding from top to bottom
- Results
 - Decent pull-force: 8,55 grams
 - Deviation angle ~ 2 degrees
 - Reduced wires touching probability
 - Loop shape improved





NEWS - 12/03/2021



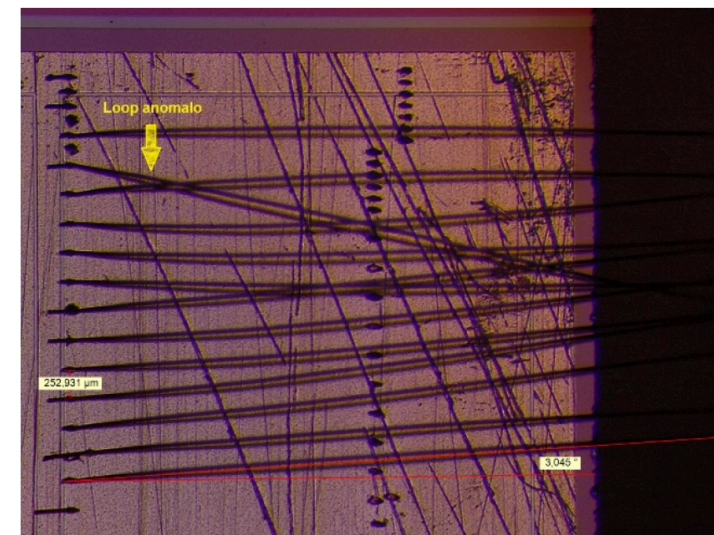
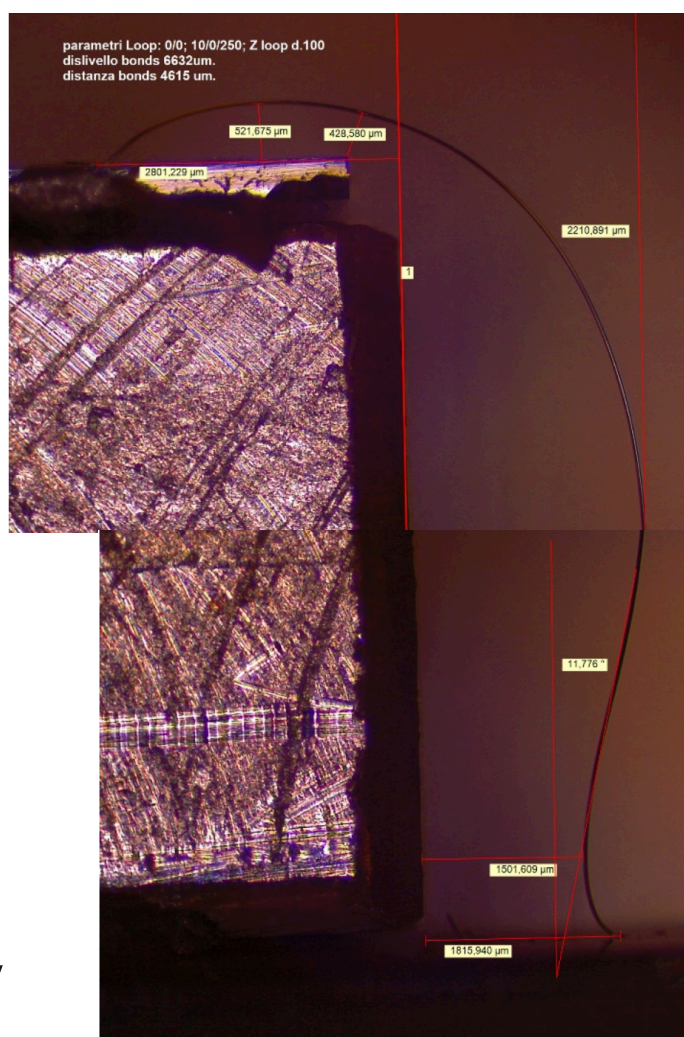
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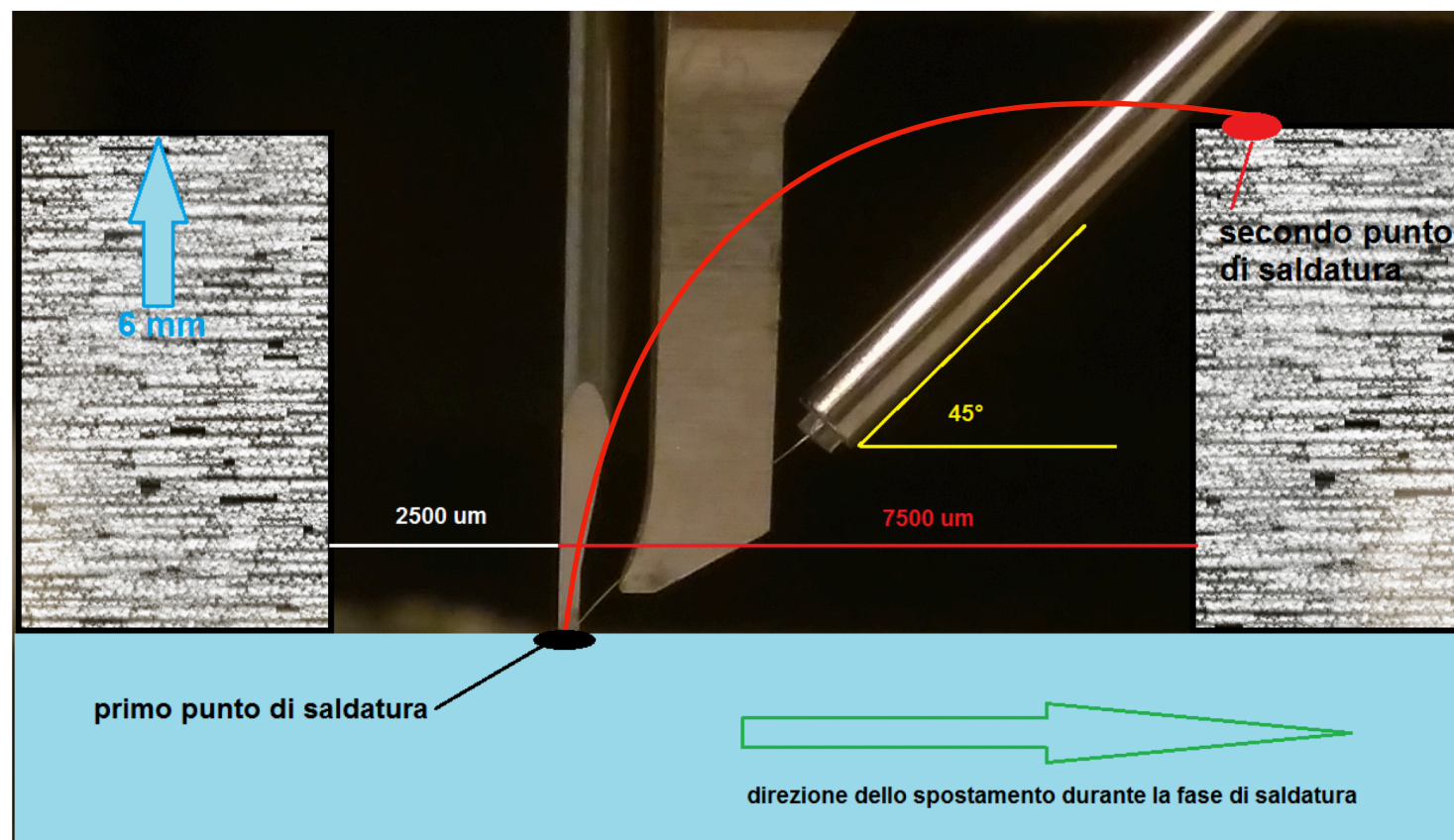
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- bonding from top to bottom
- Results
 - Decent pull-force: 8,55 grams
 - Deviation angle ~ 2 degrees
 - Reduced wires touching probability
 - Loop shape improved



NEWS - 12/03/2021

Next tests

1. Try bonding from bottom to top with large distance from skeleton edge
 - the 45 degrees wire dispenser tool allow a minimal distance from the skeleton edge of $\sim 7,5$ mm
 - here the wire is released while the head is moving reducing uncertainty on the wire positioning and reducing the stress on the bonding feet
 - limitation from the maximal wire extension of 10 mm (is this still true??)
2. Procure a 60 degrees wire dispenser tool
 - would allow to reduce the minimal distance from the edge
3. Try to increase the height to ~ 8 mm
 - Magnus desire to stay as close as possible to the real detector mechanical support dimensions



NEWS - 25/02/2021

SINGLE CHIP TEST

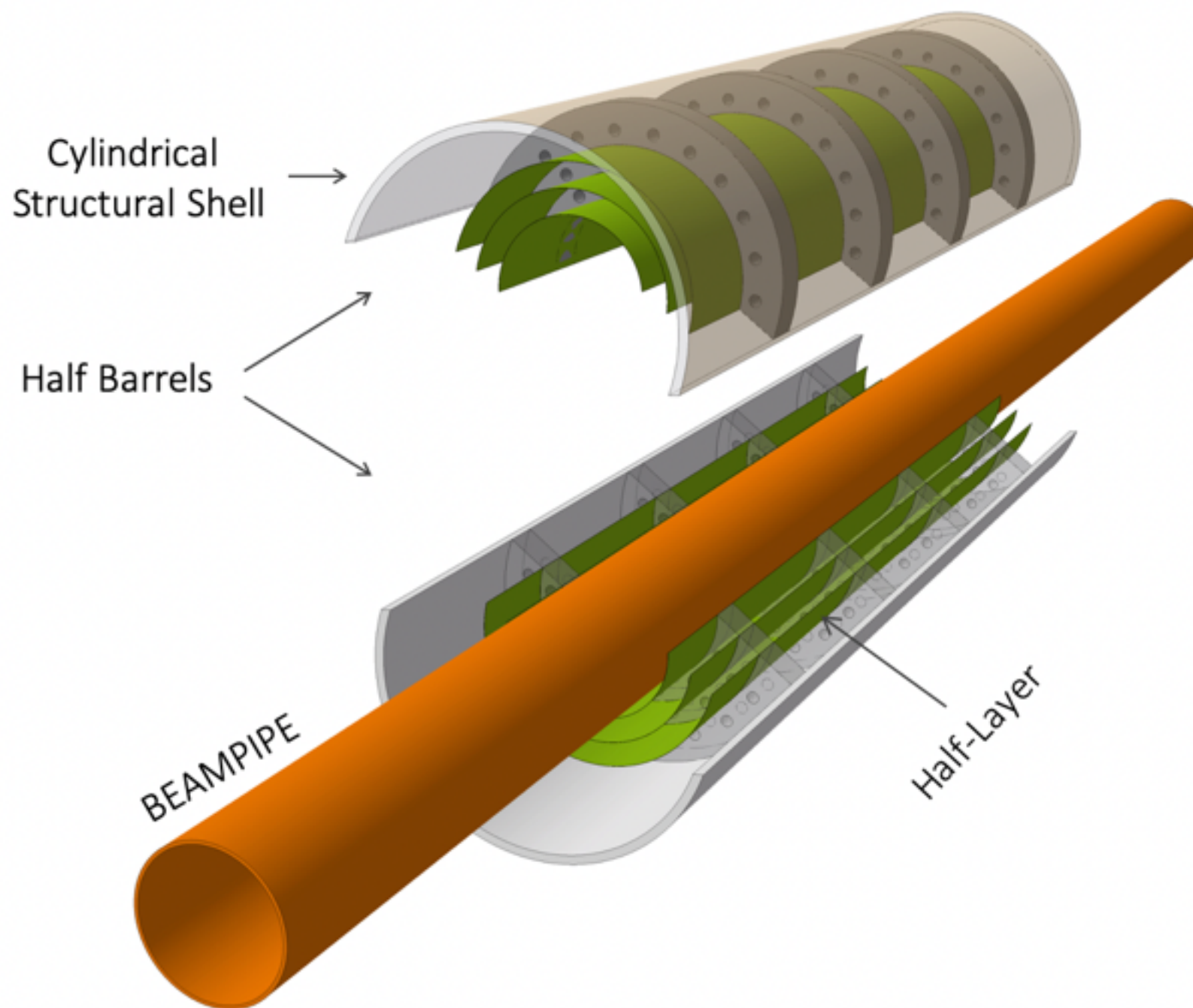
1. ALPIDE 50 um received
2. FPC single chip production request submitted
3. Cylinder for bending under design (Vincenzo)
4. No specify tool for bending, but Mylar foil as done in Strasbourg
5. DAQ board connector purchase submitted

SUPER-CHIP FPCs

7. First internal meeting on Friday
8. New bonding test from Monday (Pasquale)
9. Skeleton FPC
 - A. Large pads usage preferable
 - B. Doubts reported to Magnus → No reply
10. Focus more on the edge FPC



NEWS - 16/02/2021



NEWS - 16/02/2021

1. WP3

- August 2020 Test beams data analysis
- Single chip (ALPIDE 50 um) verification

2. WP4

- Single chip bendable FPC
- Pull-force study for wire-bonding
- Super-chip (ALPIDE) mechanics/FPC design
- Final chip mechanics/FPC design

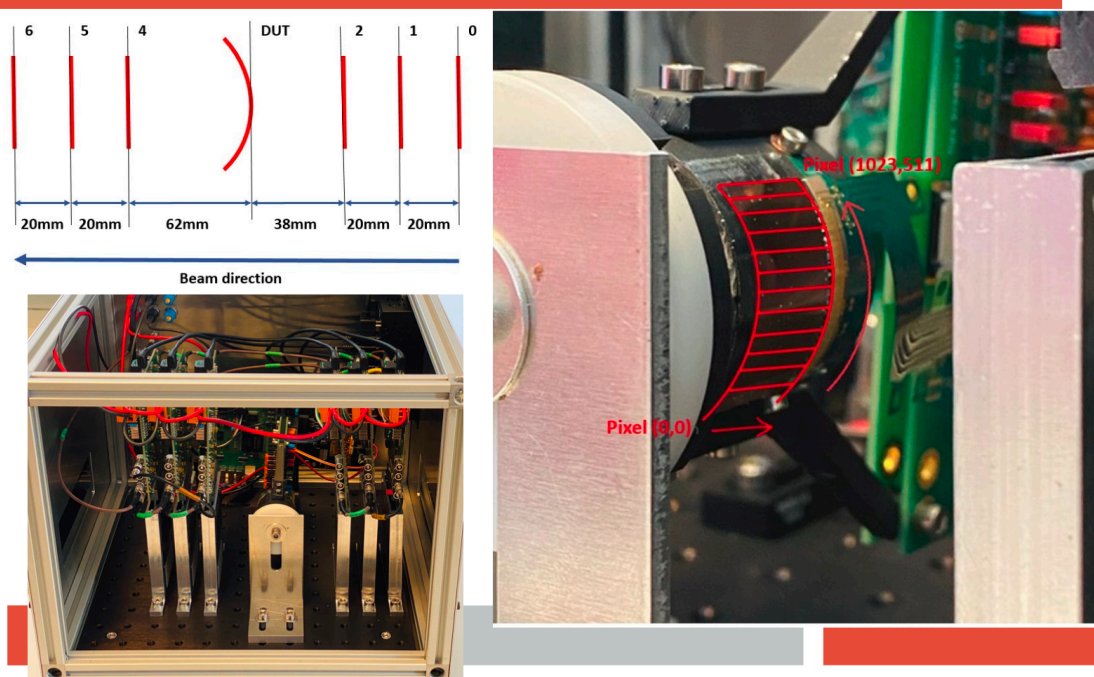
NEWS - 16/02/2021

WP3 - Test beams analysis

Presentation by Arianna at WP3 meeting on 12/01/2021:

https://indico.cern.ch/event/991234/contributions/4175356/attachments/2169191/3662129/preliminary_analysis_v3.pdf

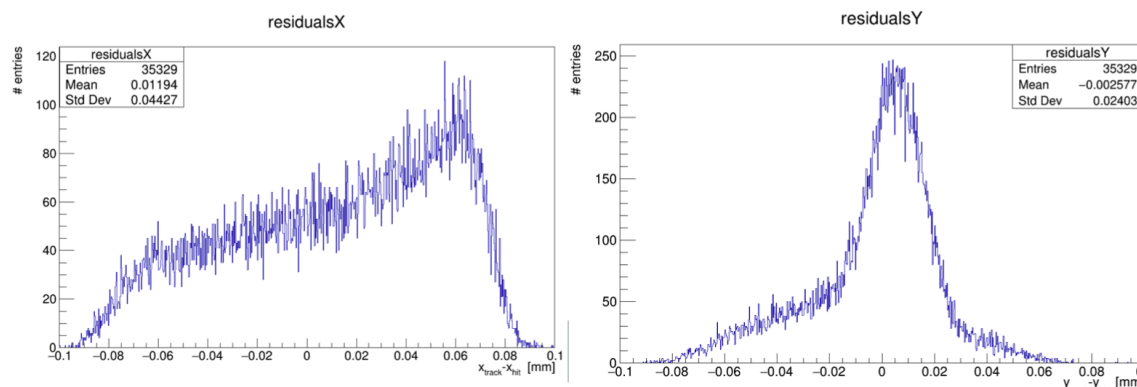
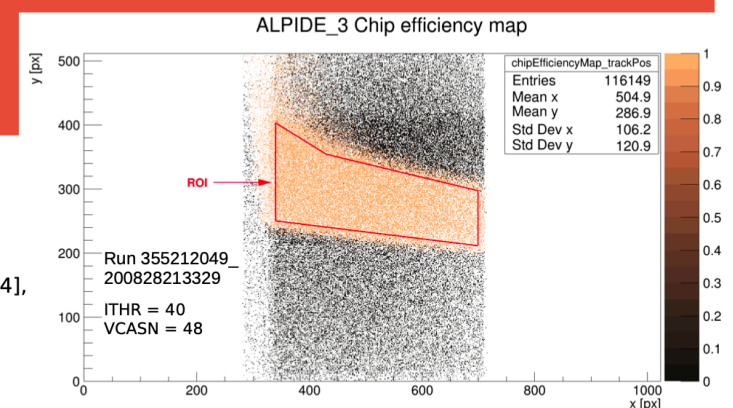
Setup and DUT orientation



Region of Interest

- Polynomial R.O.I.

3REF-C7-3REF.conf
[ALPIDE_3]
roi = [340, 250], [340, 403], [430, 354],
[699, 297], [699, 211]



Conclusions:

- geometry/alignment description not enough good
- software (Corryvreckan) needs modification in the management of the geometry (bent chip)
- CERN/Bologna/GSI team will take care of this

<https://twiki.cern.ch/twiki/bin/view/ALICE/ITS3WP3>

NEWS - 16/02/2021

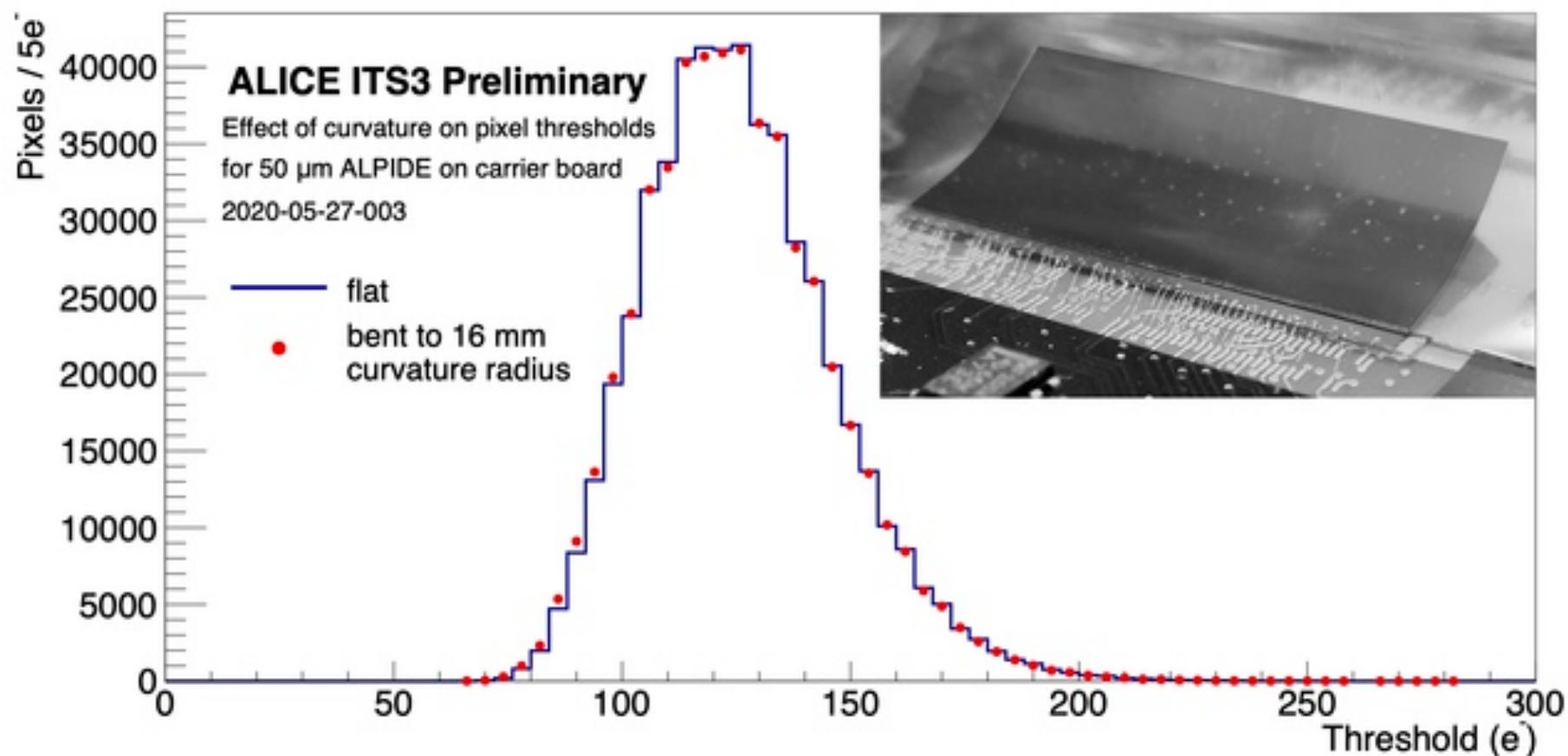
WP3 - Single bent ALPIDE characterisation

Goal

- repeat threshold flat/bent chip characterisation
 - useful for Arianna thesis
 - useful for larger chip characterisation

Material

- 50 μm ALPIDE chips → **Requested**
- Bendable FPC → **Not available** (To be produced, next slide)
- DAQ board (or MOSAIC) → **Partially available**
- Cables and adaptors → **Requested**
- Tool for bending + cylinder to hold bent chip → **Production in Bari under investigation**



NEWS - 16/02/2021

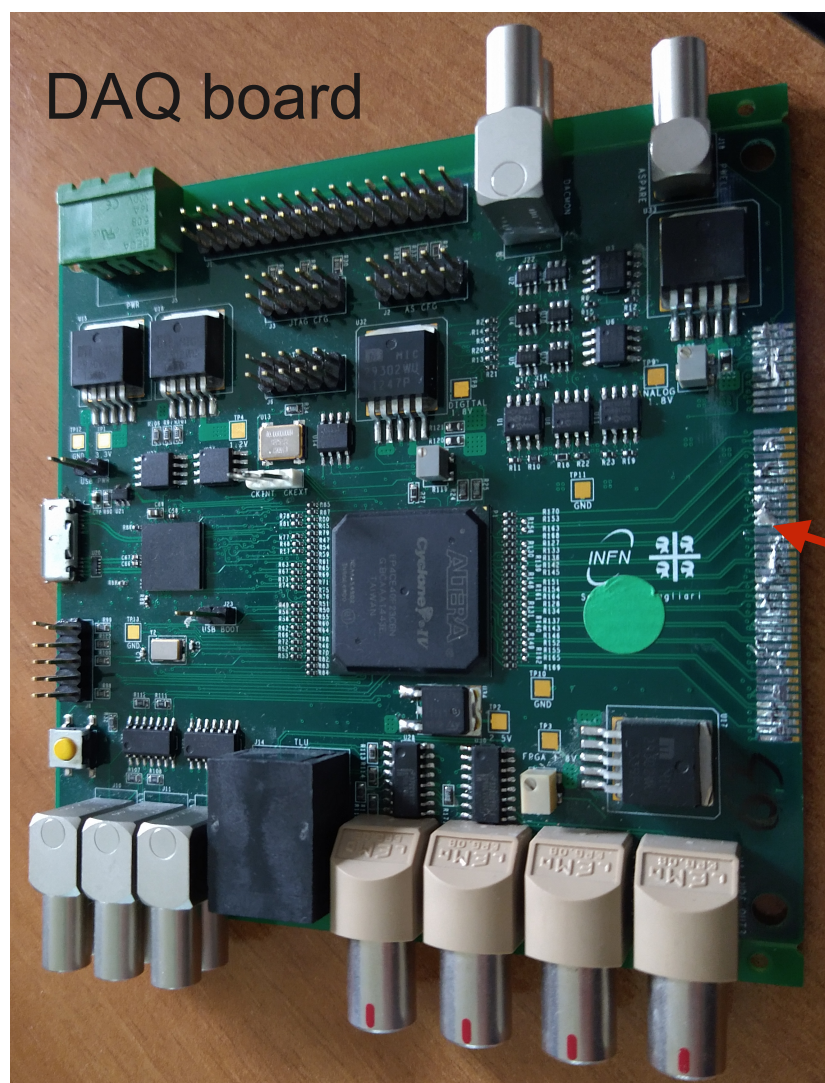
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- Tool for bending + cylinder to hold bent chip → Production in Bari under investigation



DAQ board

DAQ board:

- Missing connector → G. Usai contacted
 - Firmware/Software to be installed
- (Alternatively) MOSAIC board:
- Used for single chip usage (Fabio)
 - Connectors to be adapted (?)

NEWS - 16/02/2021

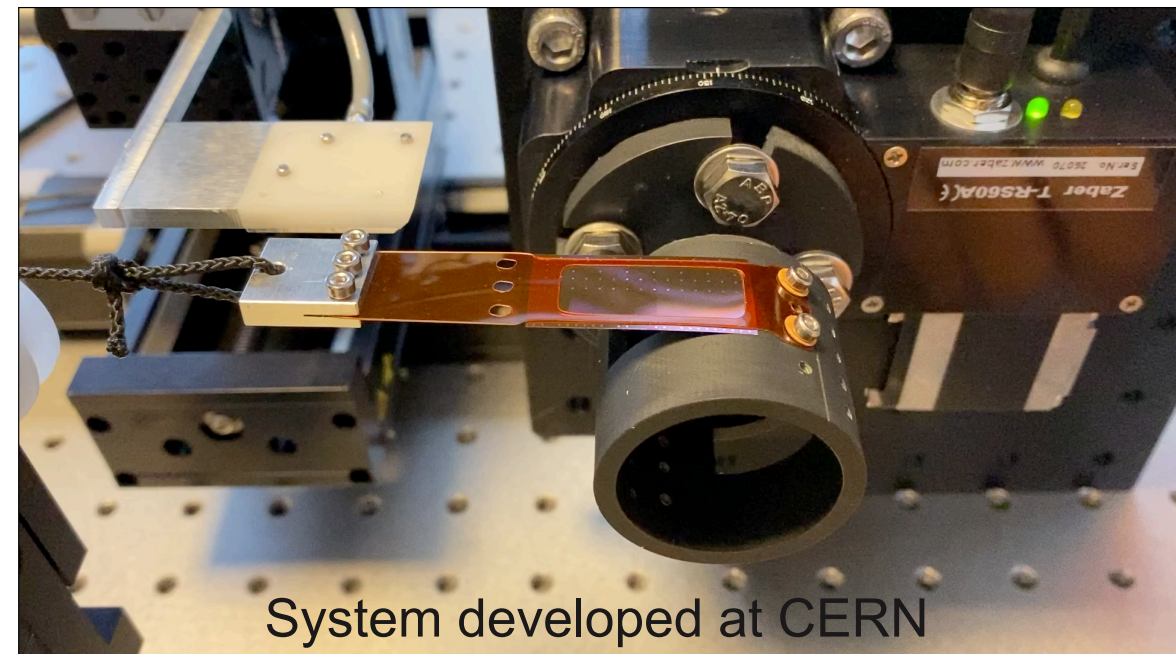
WP4 - Pull force measurement campaign

Goal

1. Systematic study of the wire bonding through pull-force and failure mechanism measurement campaign
 - ▶ Bonding after bending
 - ▶ Bending after bonding
 - ▶ After multiple bending

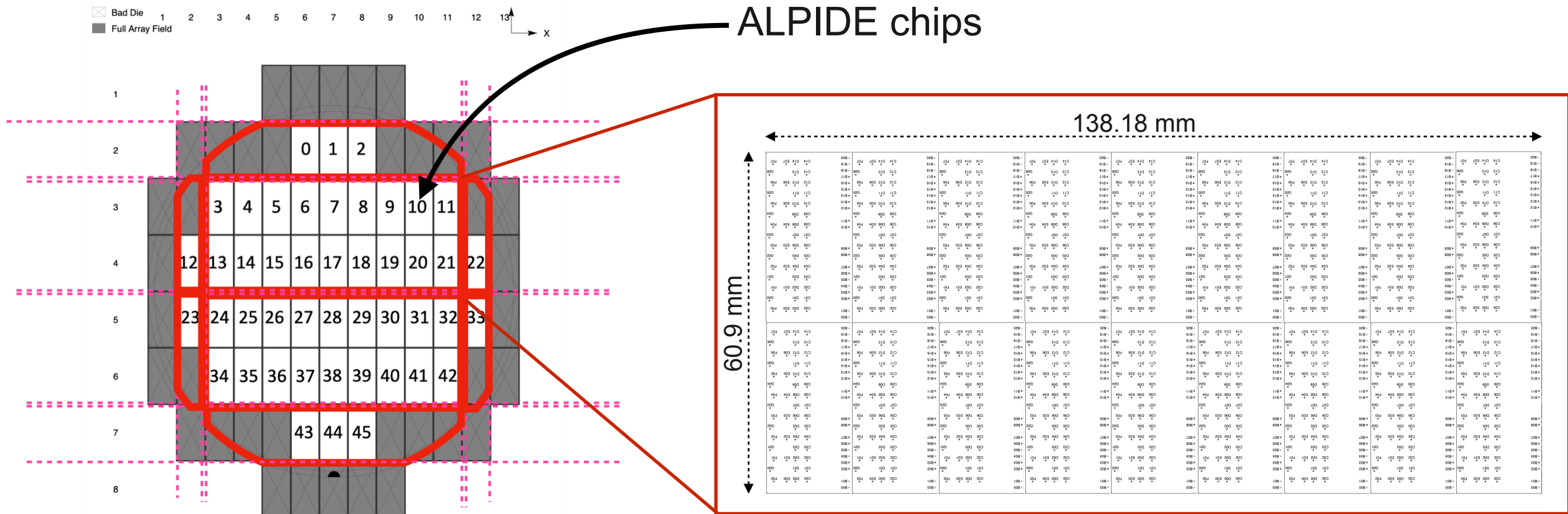
Tools

1. Bonding machine → **Available**
2. Supporting tool for bonding that allow to → **Under study**
 - ▶ bend after bonding
 - ▶ bond after bending
 - ▶ bend multiple times
3. Pull-test machine → **Available**
4. Chips (50 μm) [NOT working and working] → **Requested**
5. FPC → **Not available** (To be produced, next slide)



NEWS - 16/02/2021

WP4 - Super-chip mechanics/FPC design and production

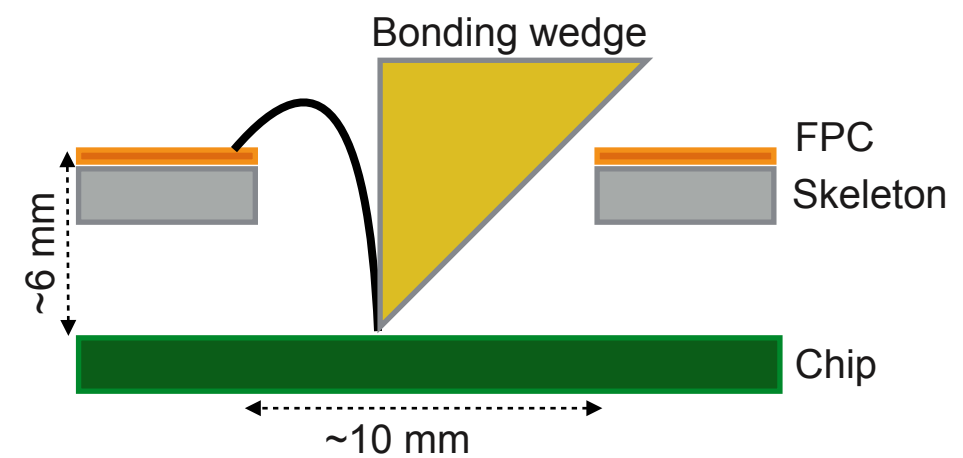
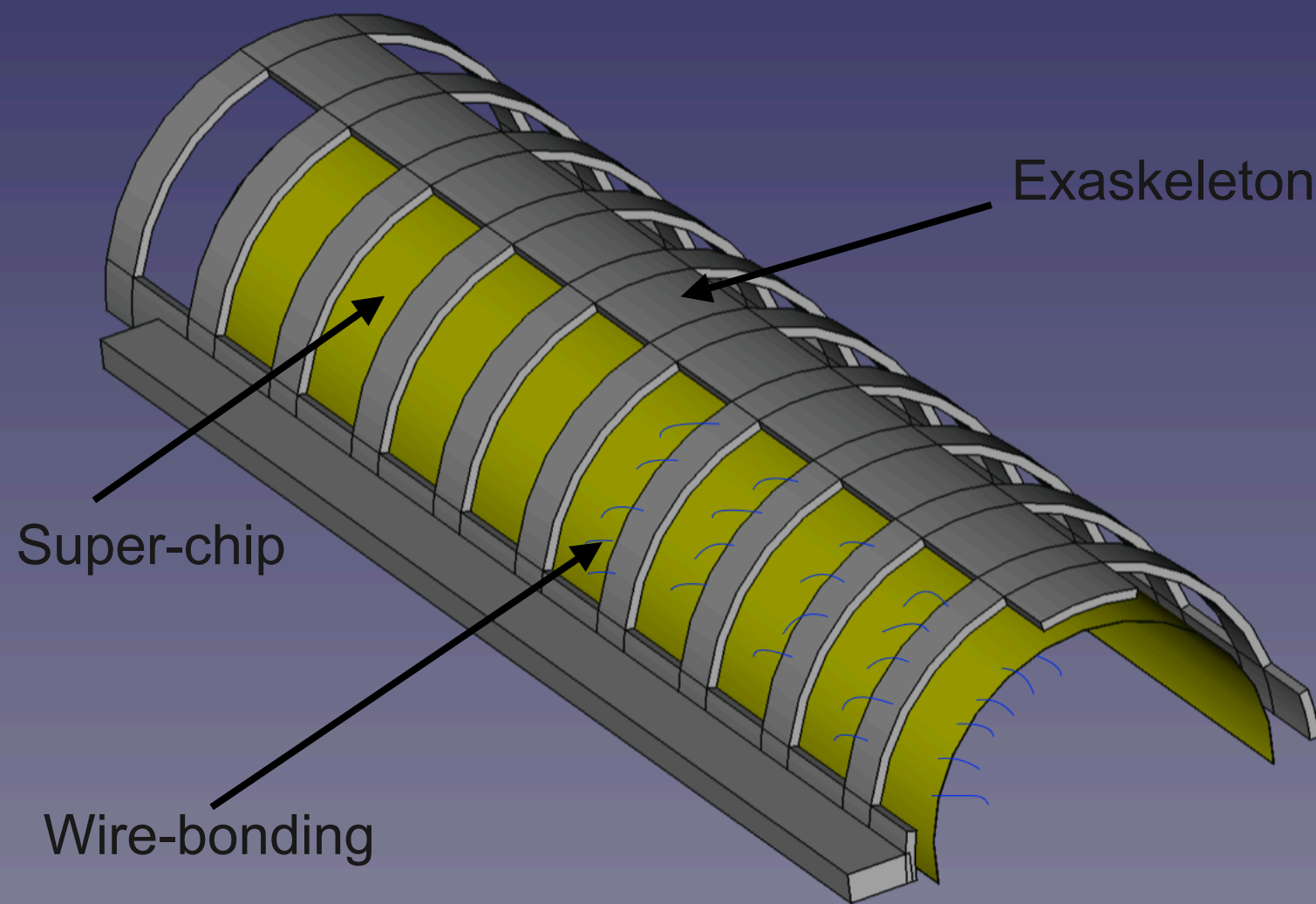


18 ALPIDE chips, as in 2 Inner Barrel ITS2 staves,
but different chip orientation

NEWS - 16/02/2021

WP4 - Super-chip mechanics/FPC design and production

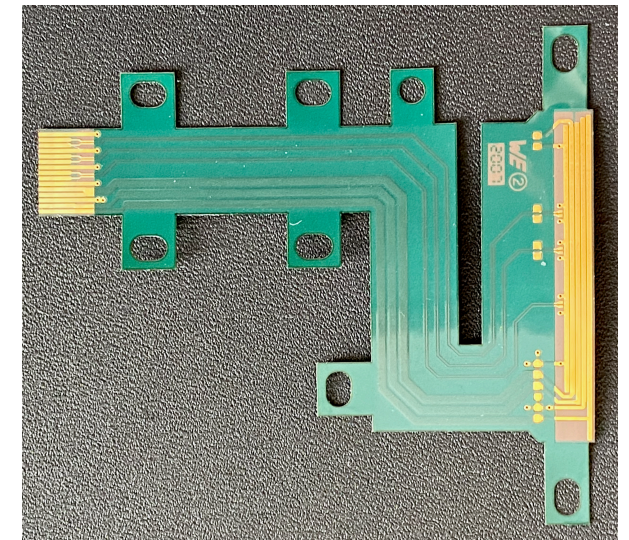
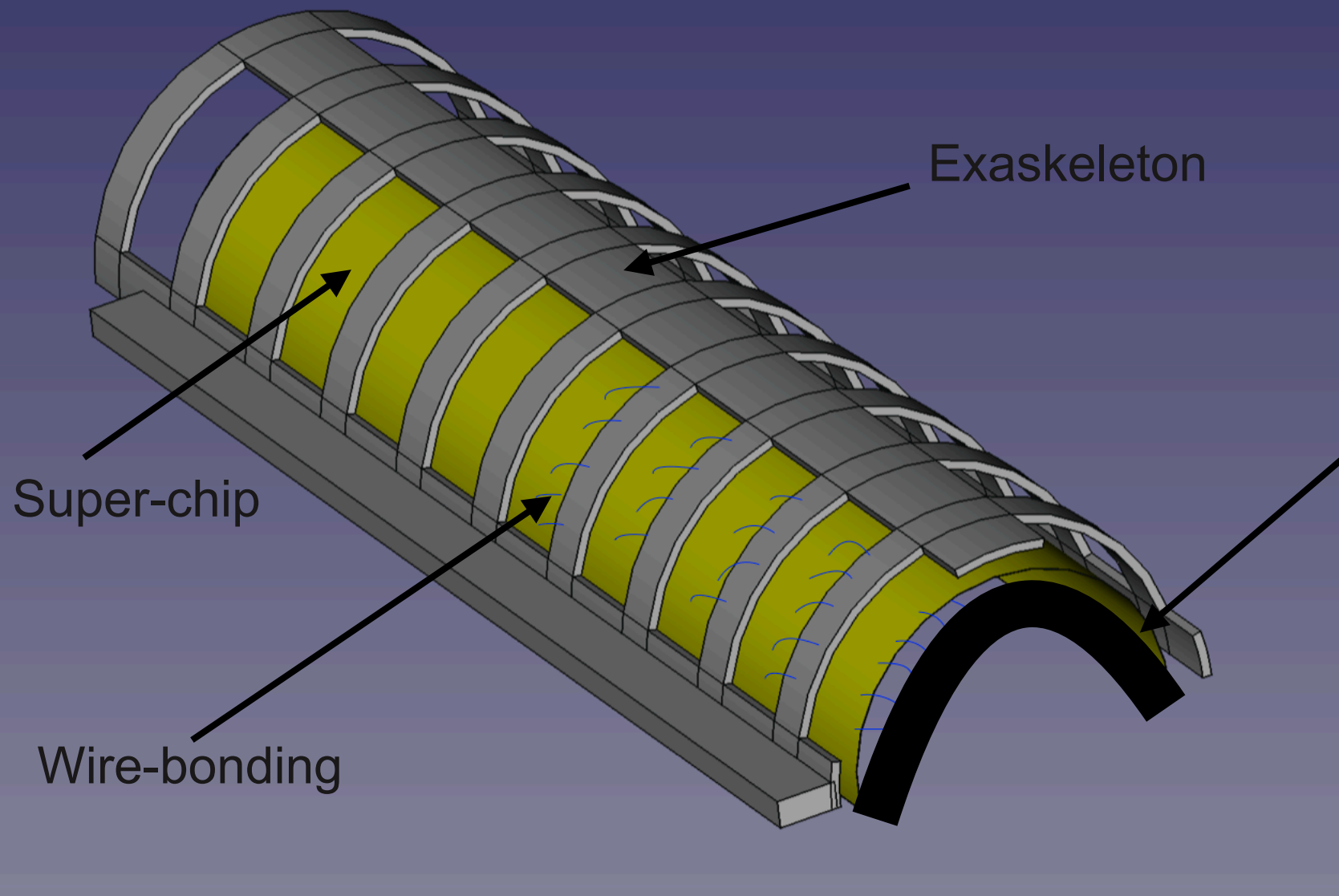
Sketched by Magnus



NEWS - 16/02/2021

WP4 - Final-chip mechanics/FPC design and production

Sketched by Magnus

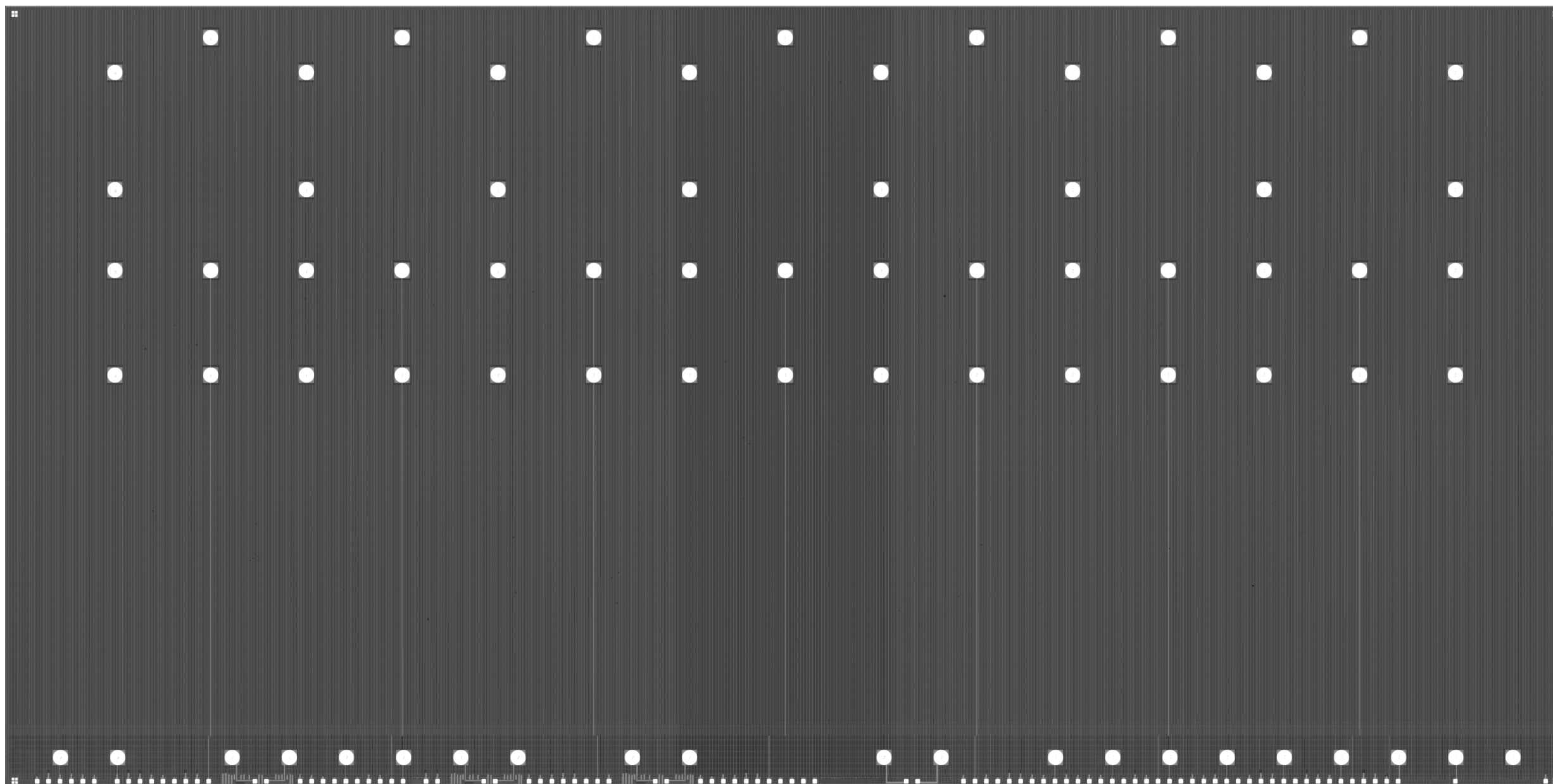


Edge FPC/mechanics

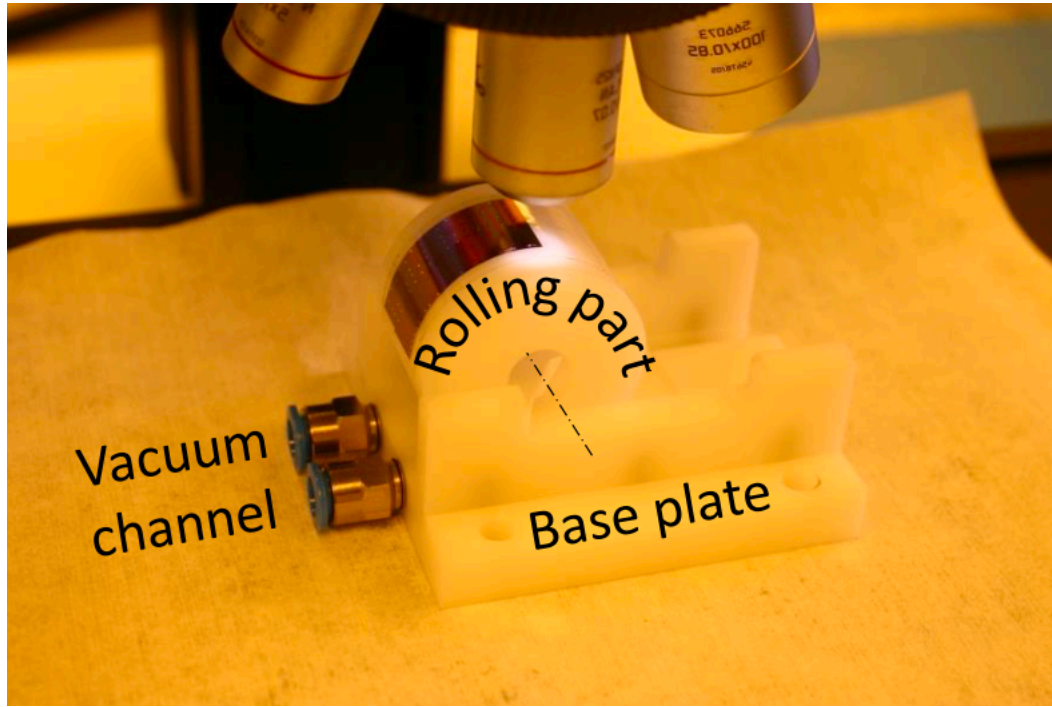
- For the last two chips of the super-chip
- Toward the final chip configuration (only end-of-chip connection)
- Support mechanics design
- Starting design, single-chip FPC

BACKUP





~95 mini-pads



The production of the new chip bending tool is ongoing

