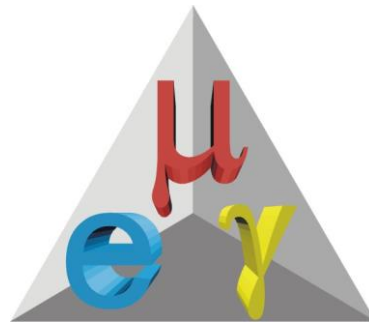


# CDCH Status



Marco Chiappini  
INFN Pisa  
MEG meeting  
Tokyo, April 5, 2018

# Outline

## 1. Preparation to CDCH sealing

- Wire-PCBs and outer ring mounting, short circuits removal, geometry measurements

## 2. CDCH sealing

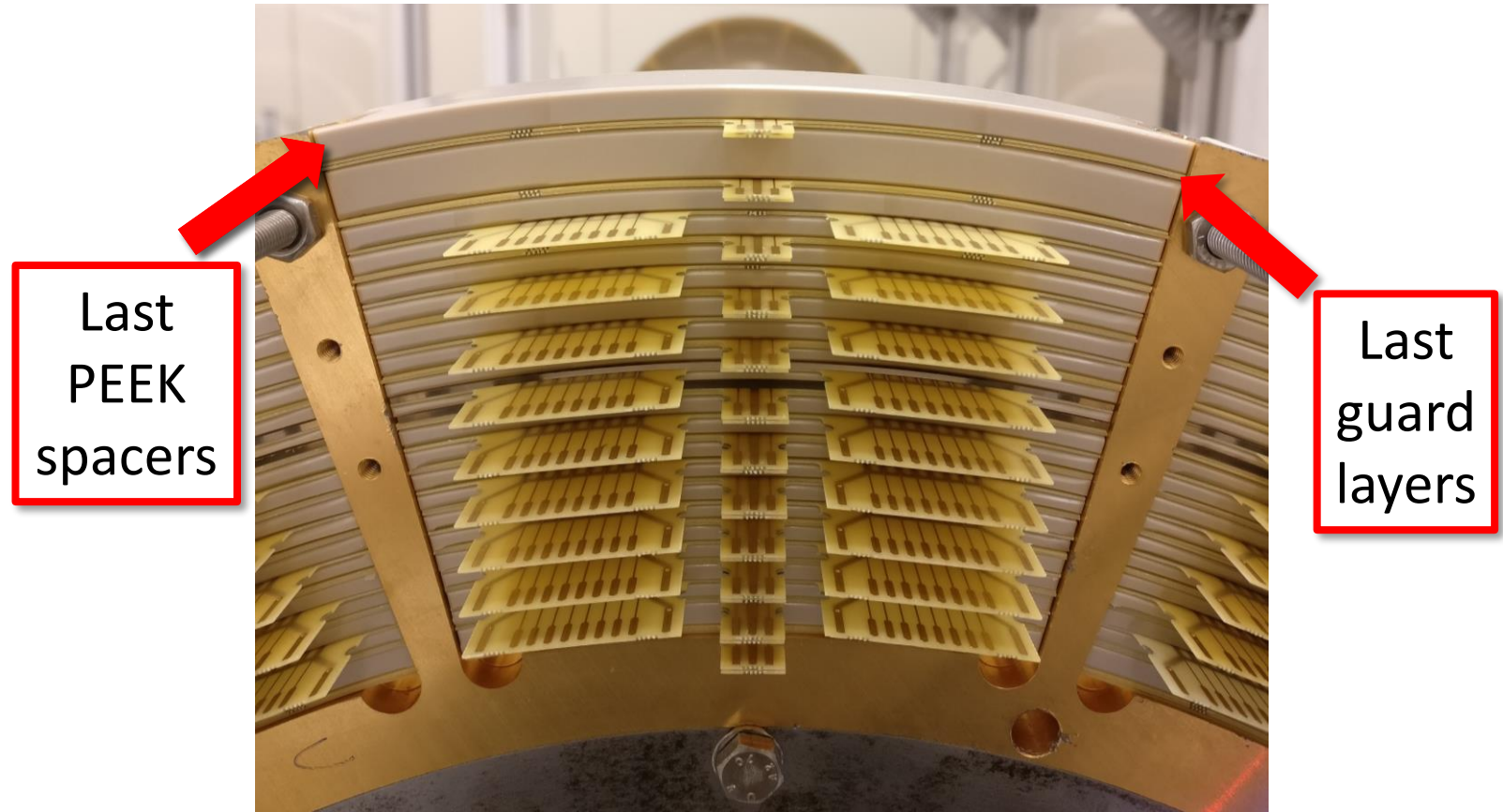
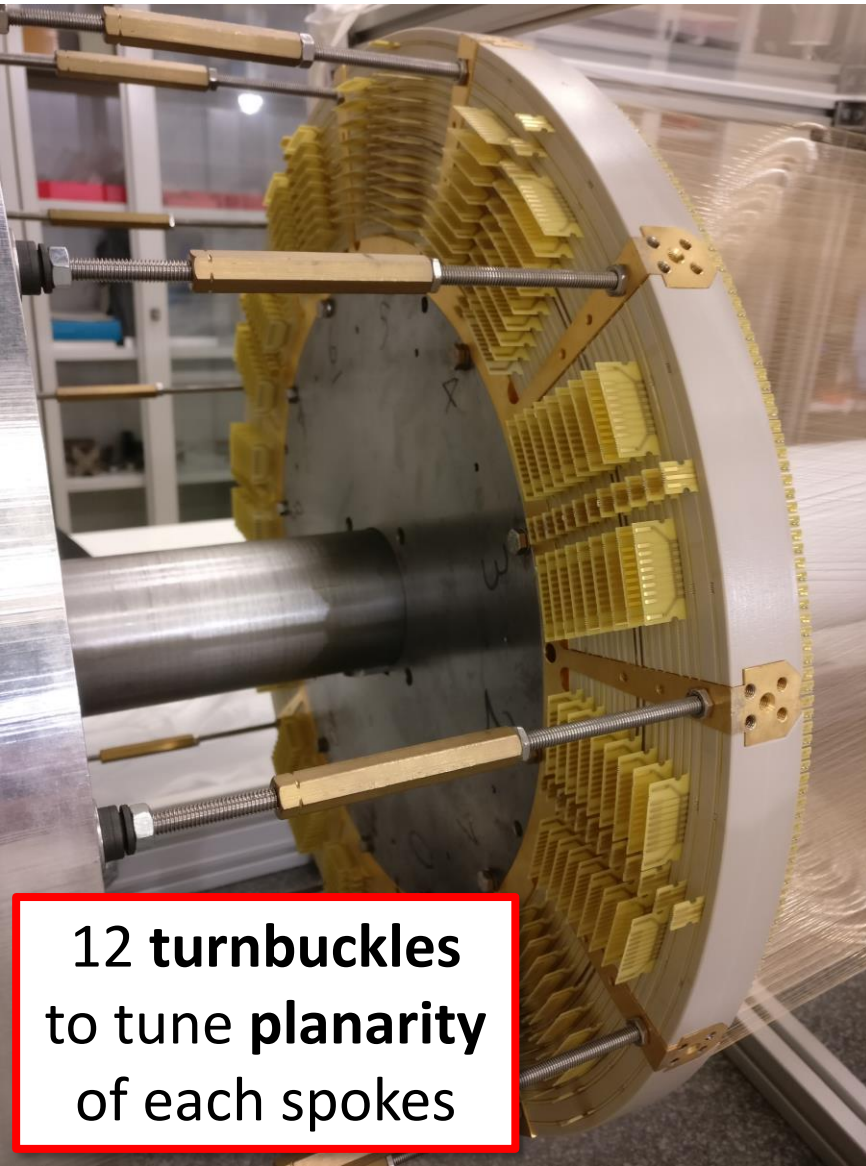
- Carbon fiber mounting, shaft extraction, mylar foil insertion, endplates sealing

## 3. Next operations in Pisa

## 4. Conclusions and schedule

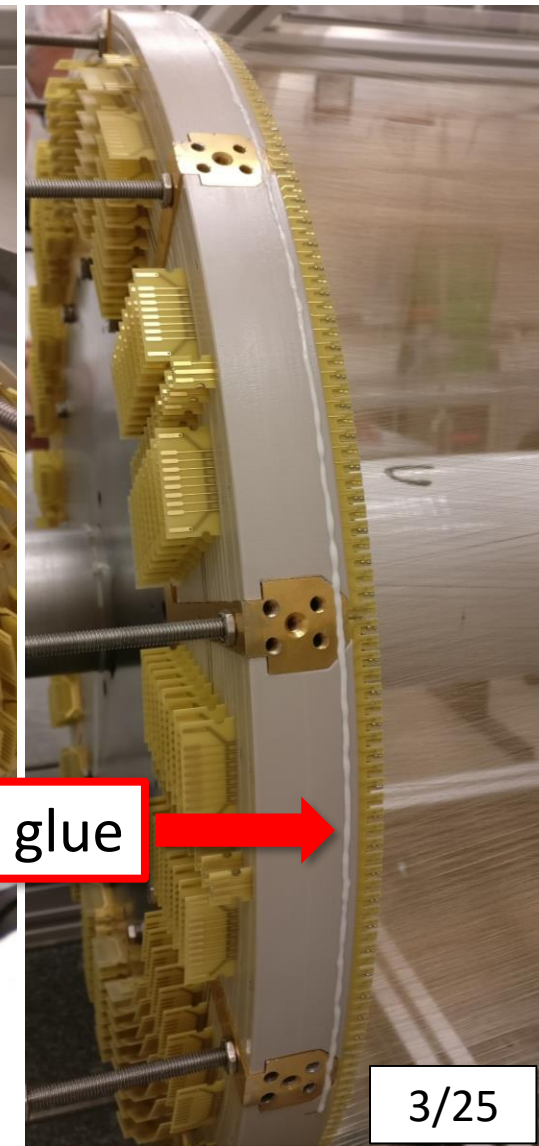
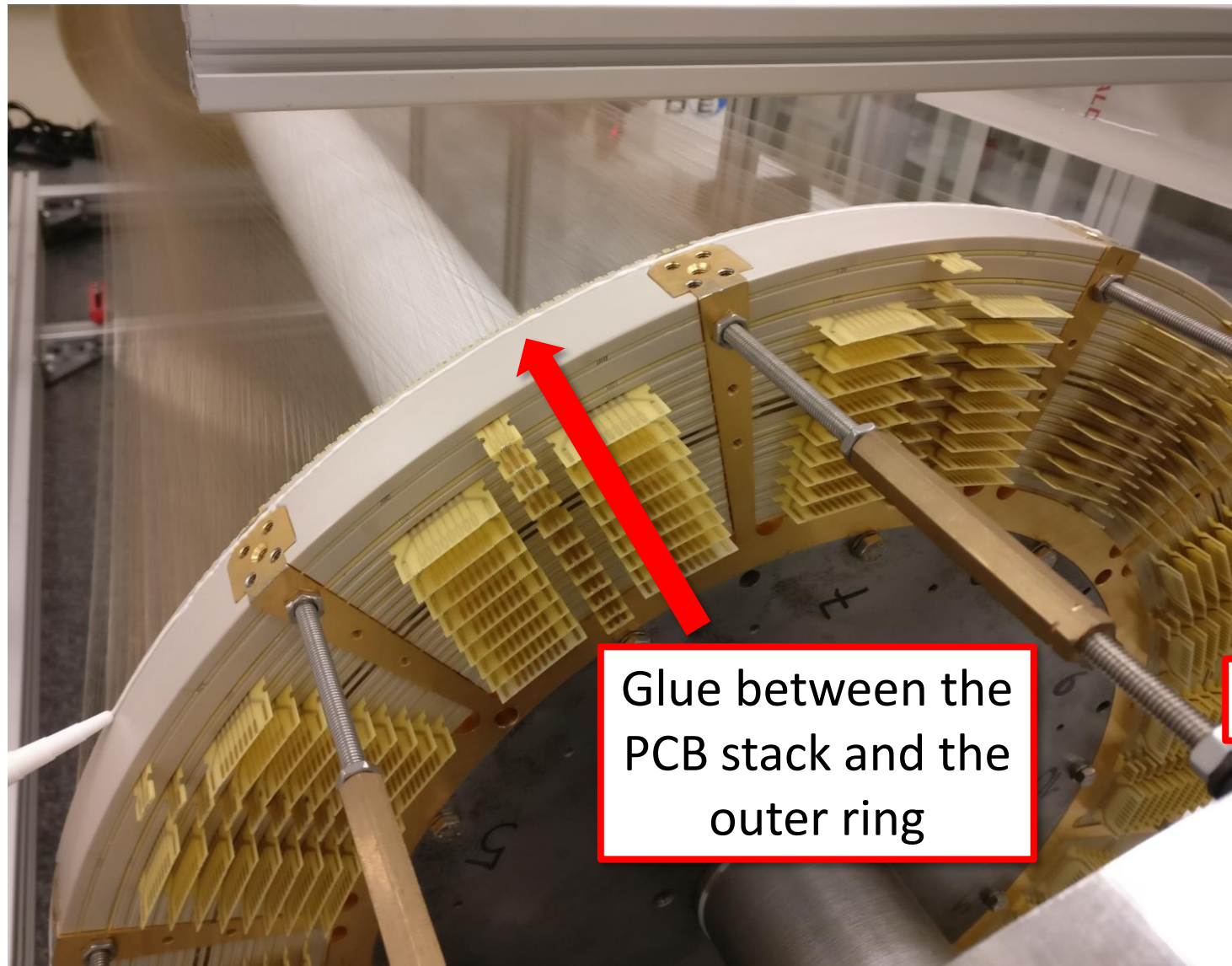
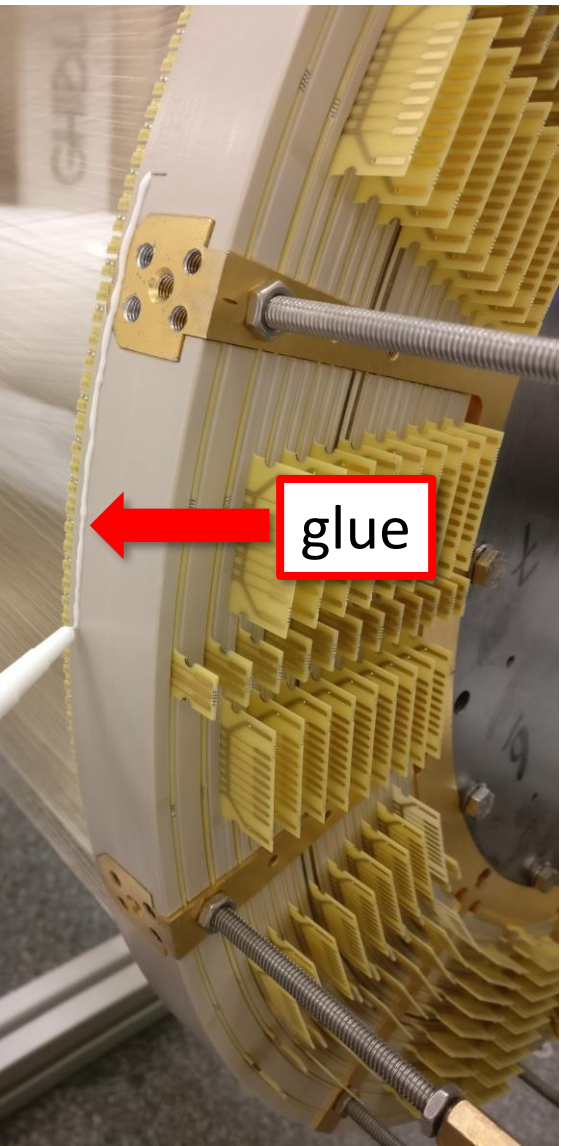
# 1. Preparation to CDCH sealing

# CDCH mounting completed

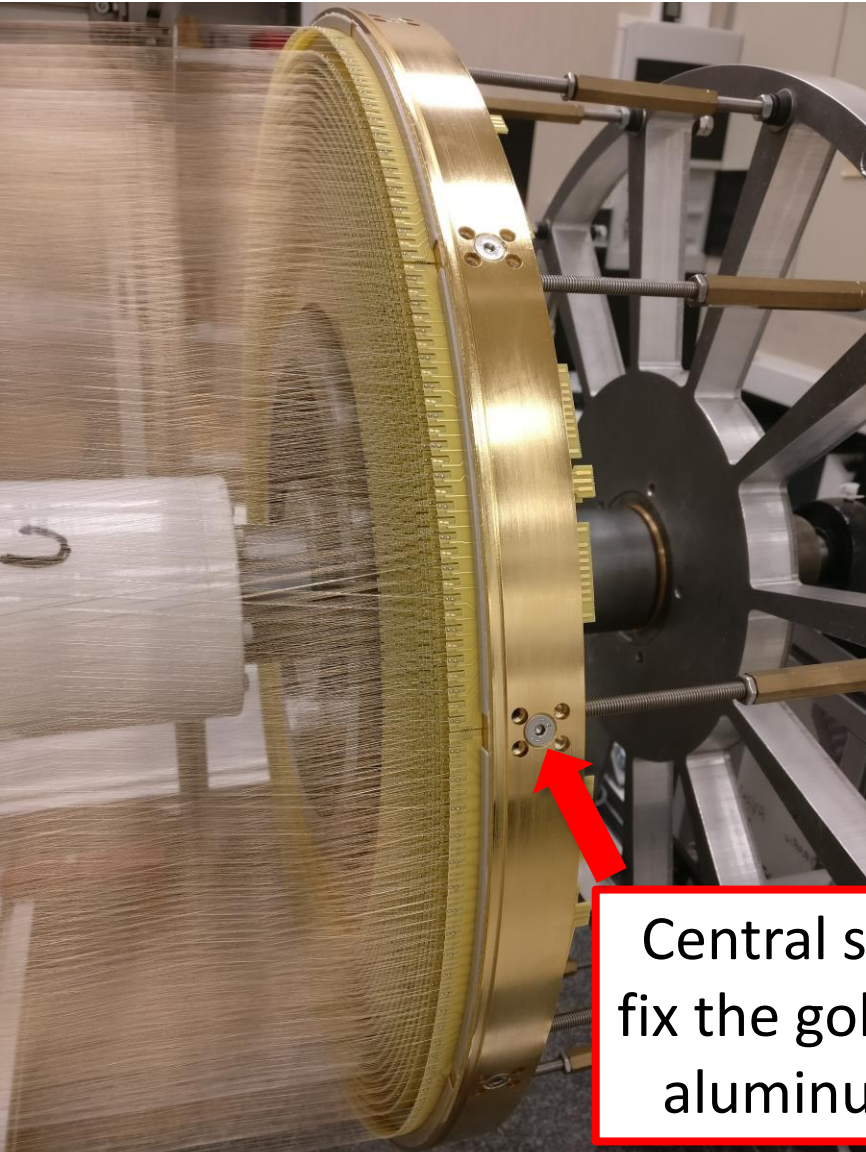


- Recovery from 21/12/2017 accident completed on 02/02/2018
- Last PEEK spacers mounted on 15/02/2018

# PCB stack ThreeBond sealing



# Outer ring mounting completed



Central screw to fix the gold plated aluminum ring



The other 4 screws will be used to fix the carbon fiber structures

# Carbon fiber structures



2 half cylinders screwed on top of the spokes and along the lateral junctions to keep in position CDCH endplates when the central shaft will be extracted



Carbon fiber extensions



50  $\mu\text{m}$ -thick aluminum inner face with quartz windows

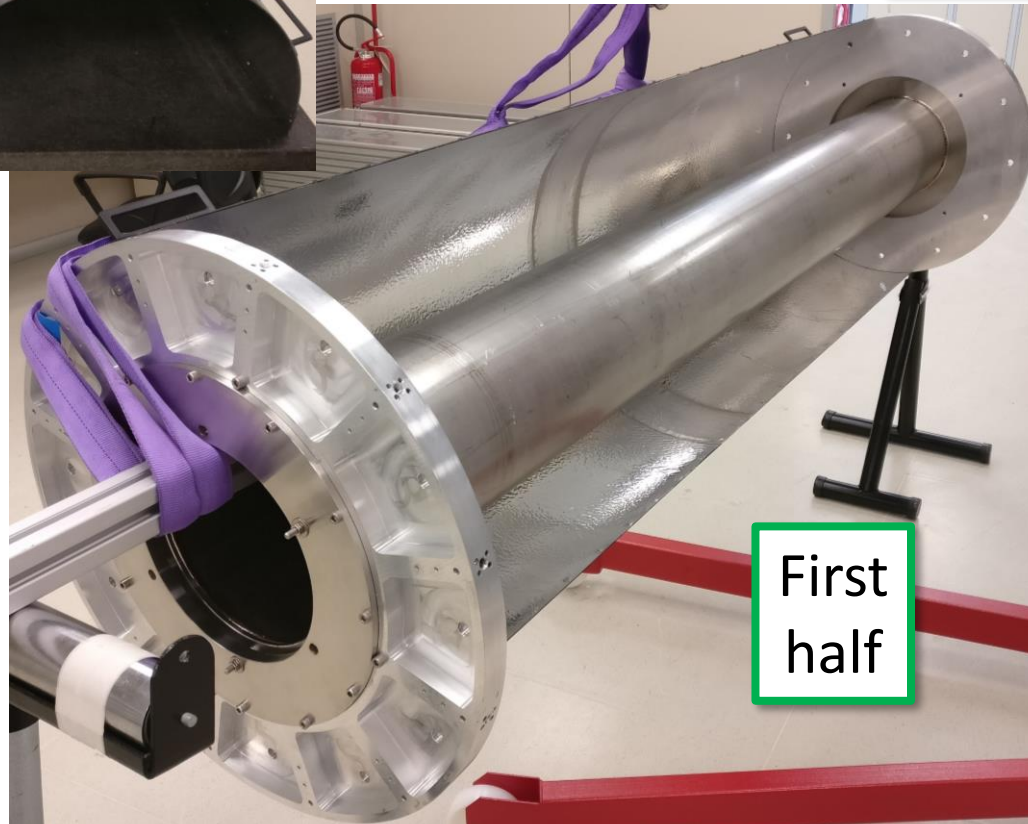
# Carbon fiber mounting test



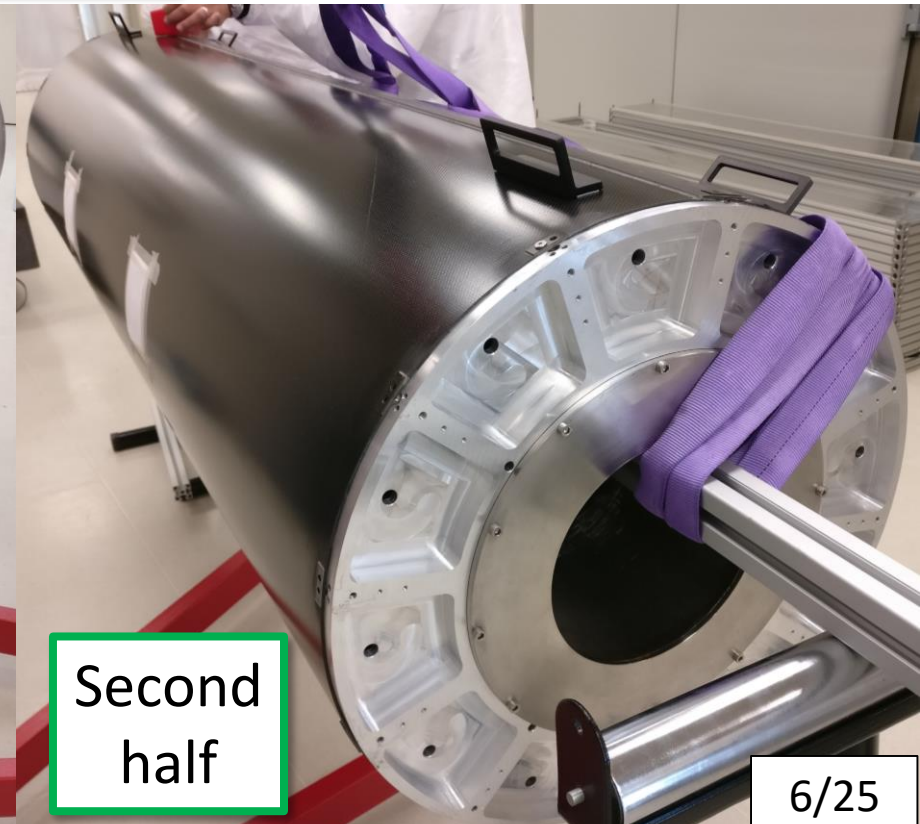
4 handles glued in each half-cylinder to move structures

Test OK on CDCH jig

The 8 handles will be removed



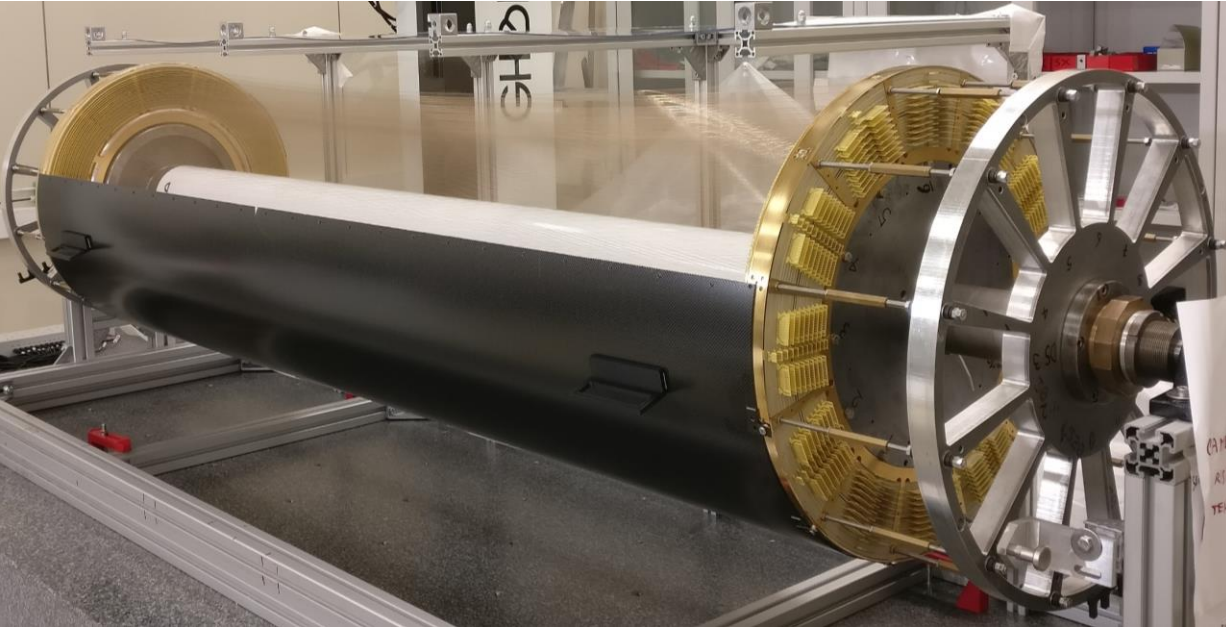
First half



Second half



# Carbon fiber mounting test



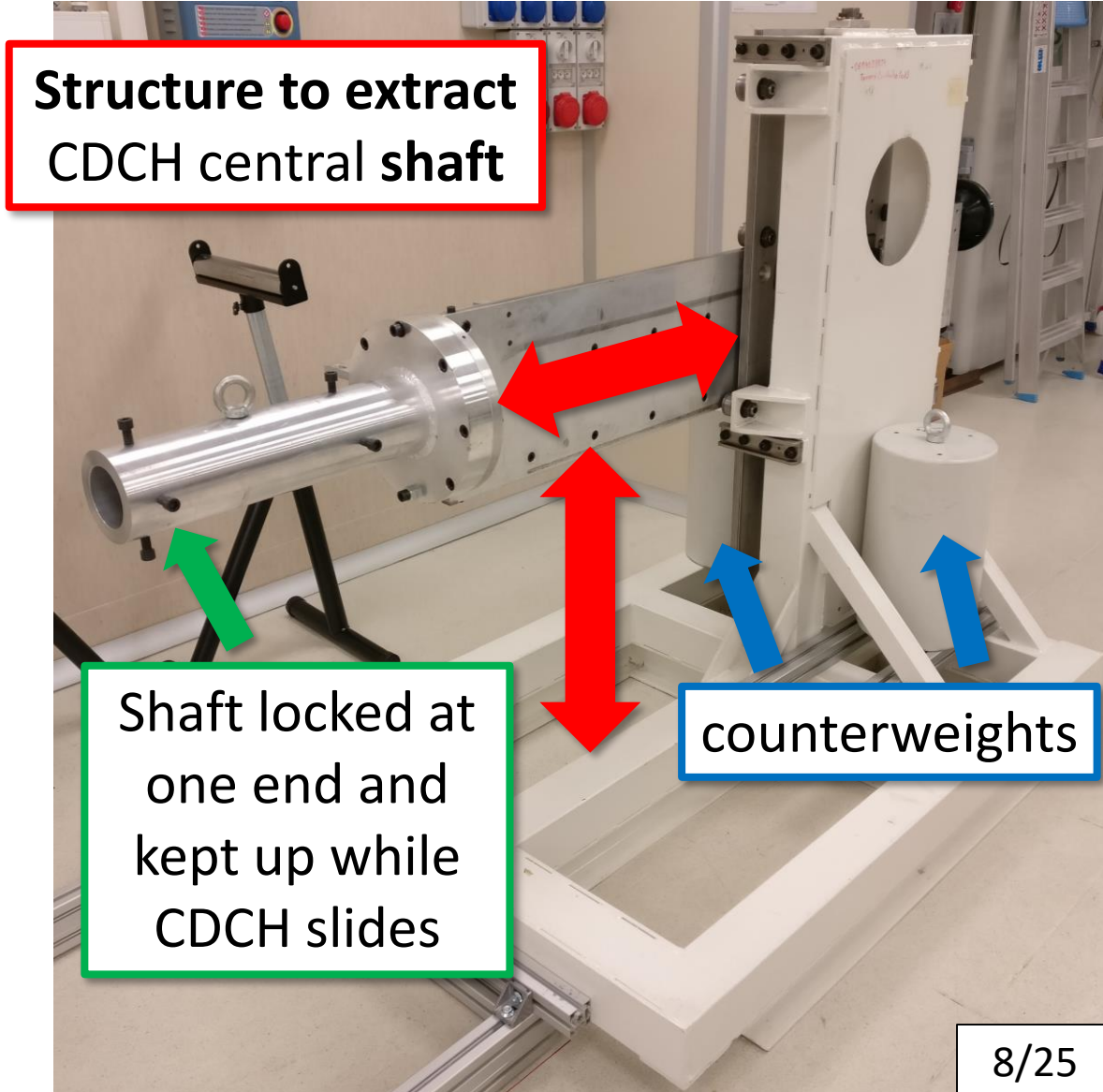
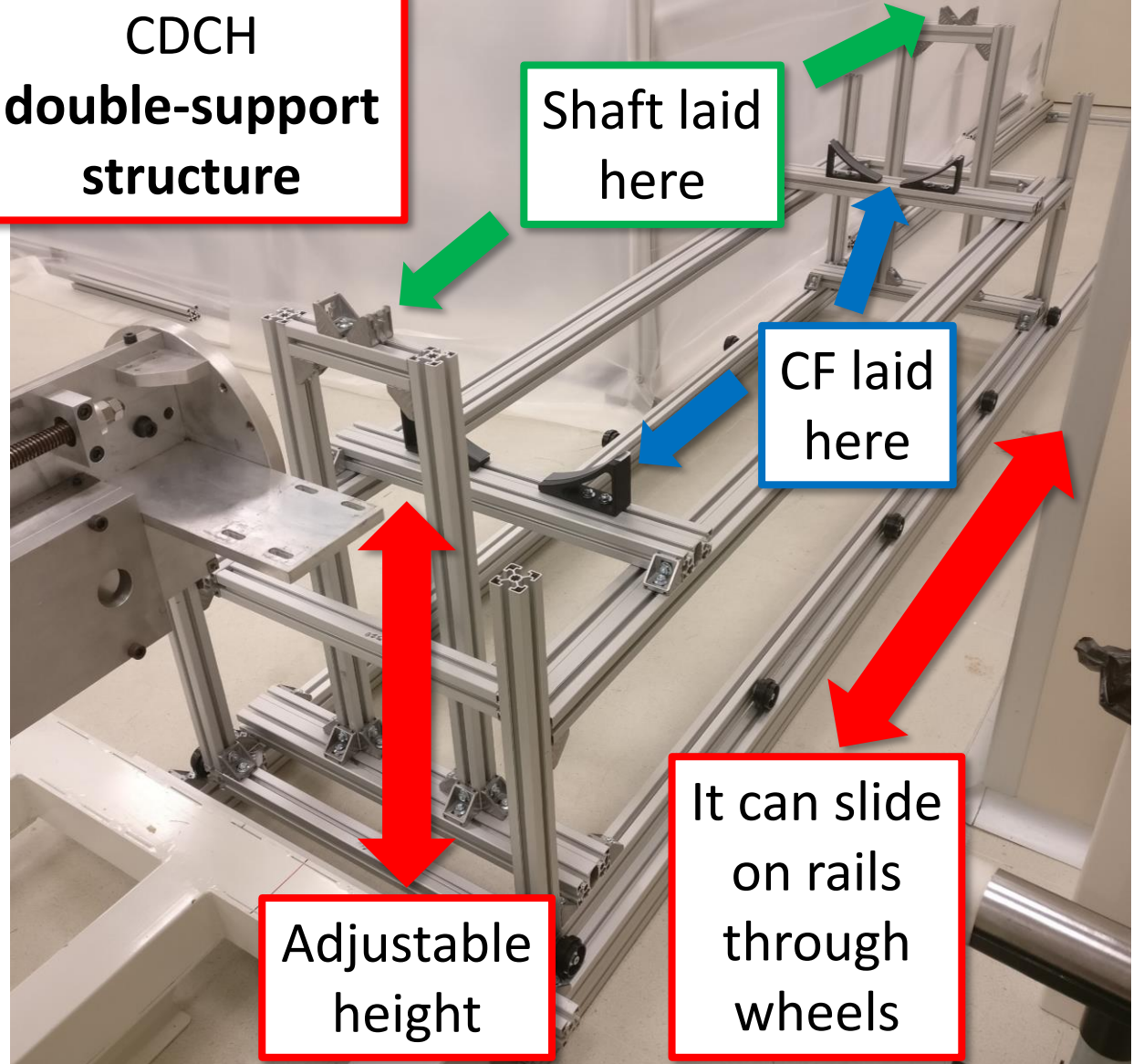
Test OK on  
CDCH



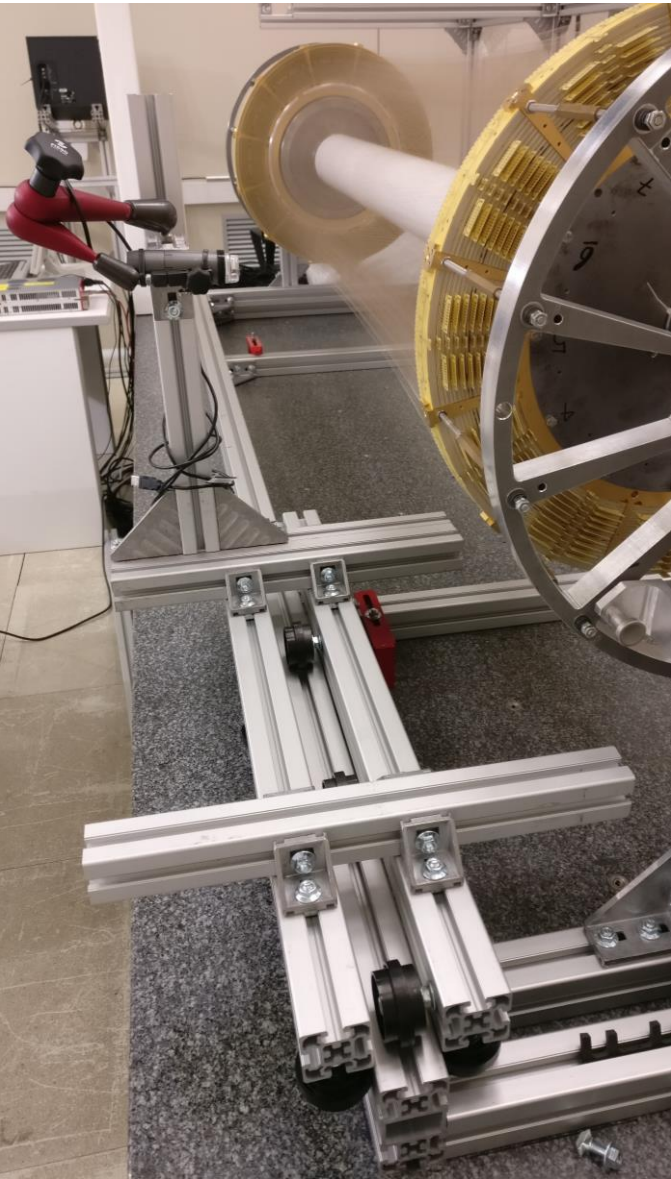
Hyperbolic  
wires envelope



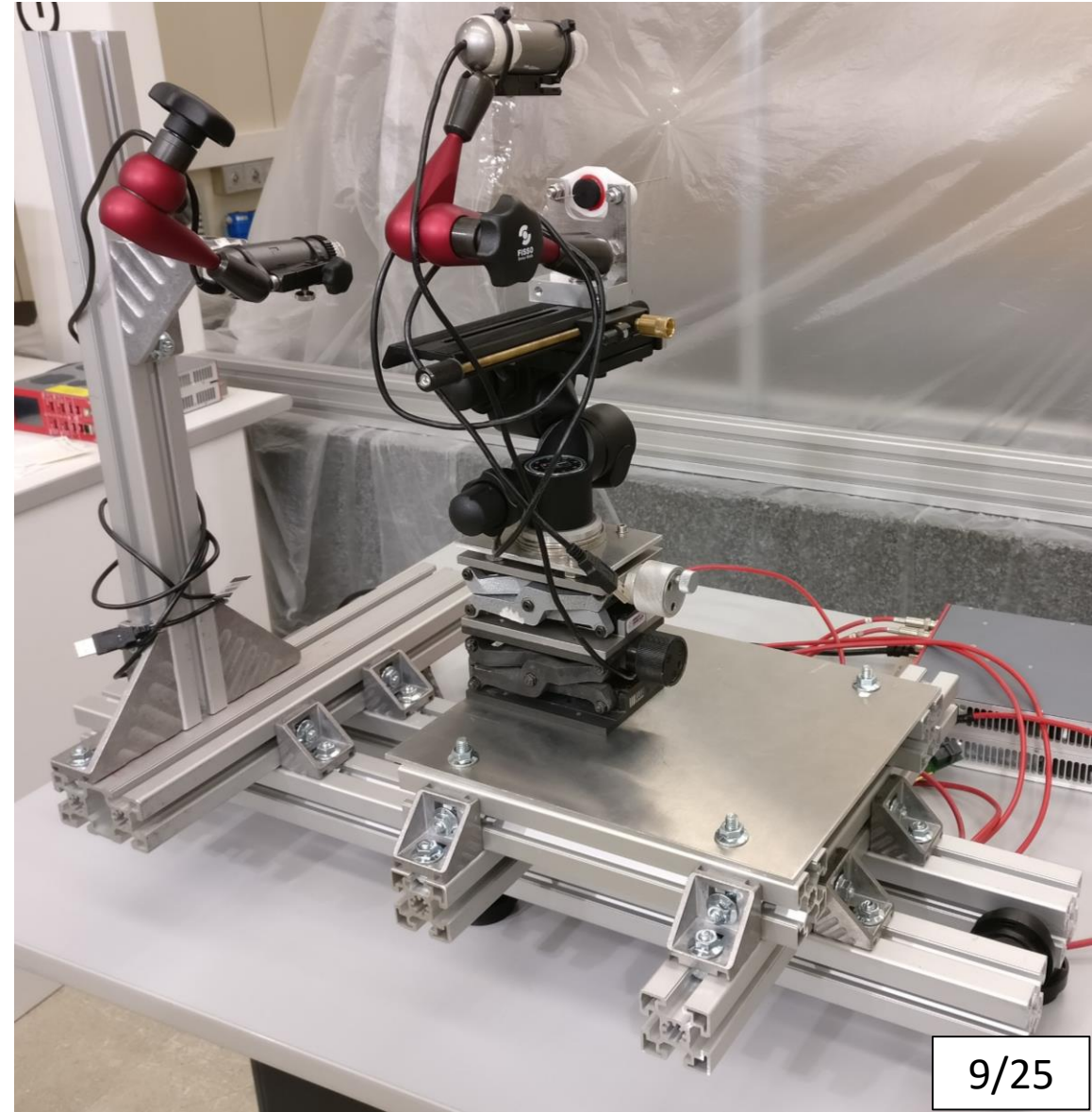
# Auxiliary structures preparation



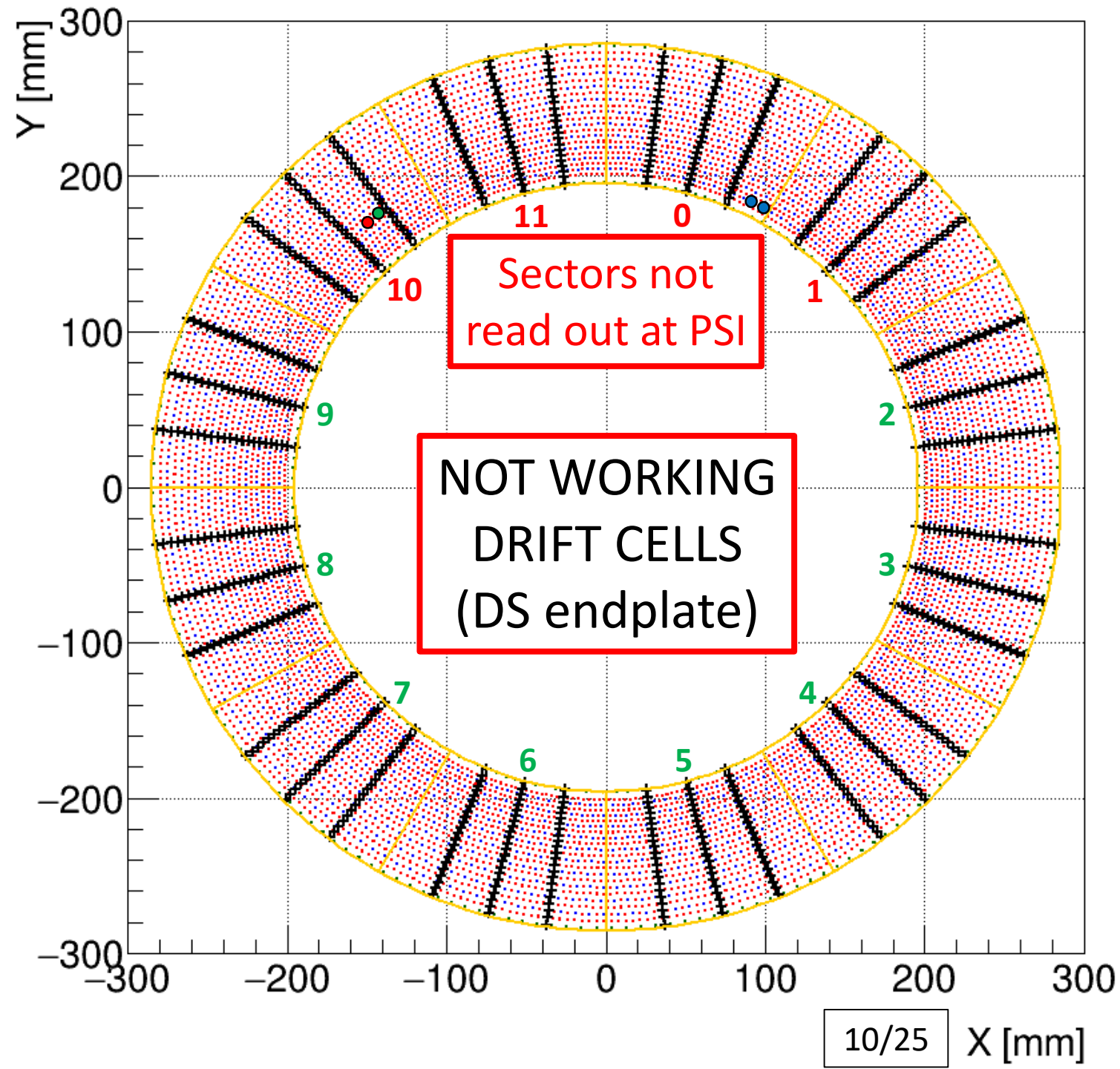
# Short circuits investigations



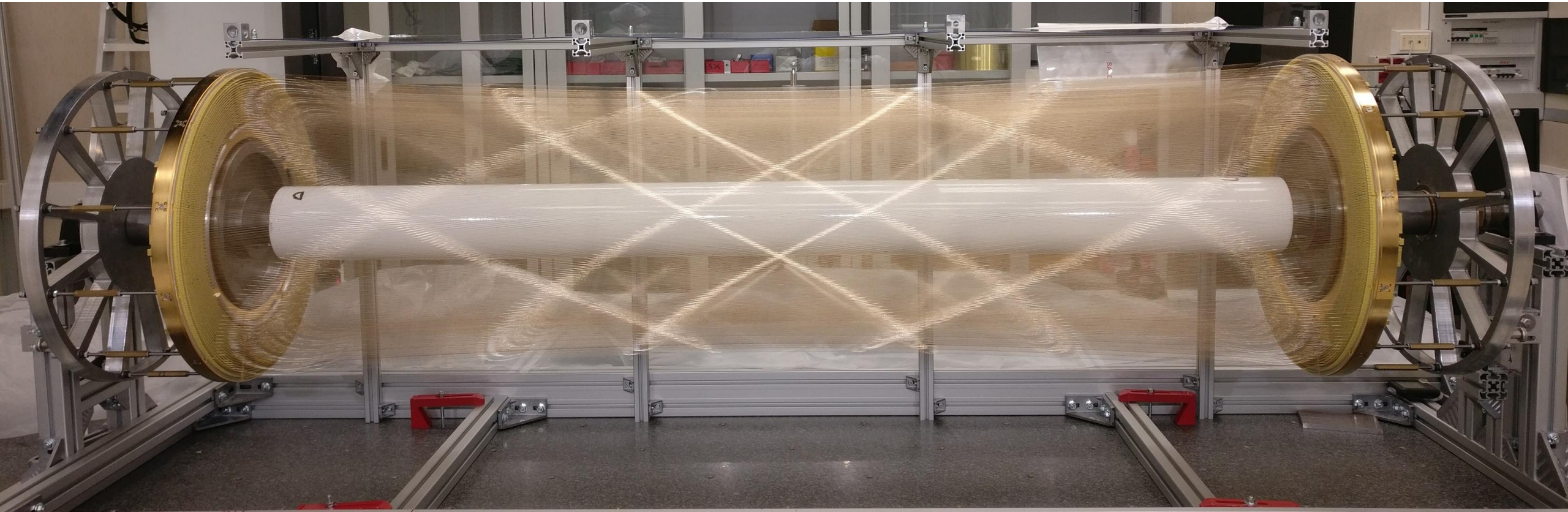
- Built a cart with wheels able to manually slide on CDCH support structure rail
- **Longitudinal** (cart) and **vertical** (precision mount) movements
- Used to **follow the wires** and **remove fibers**



- **Only 1 short circuit remained** (27 shorts at January 2018 PSI collaboration meeting)
- We confirm this is due to an anode and a cathode which remain attached
- At the end **4 not working drift cells**:
  - **1 broken anode**
  - **2 unusable drift cells** due to the breaking of a 50  $\mu\text{m}$ -cathode between the anodes
  - **1 short**



# Ready for sealing

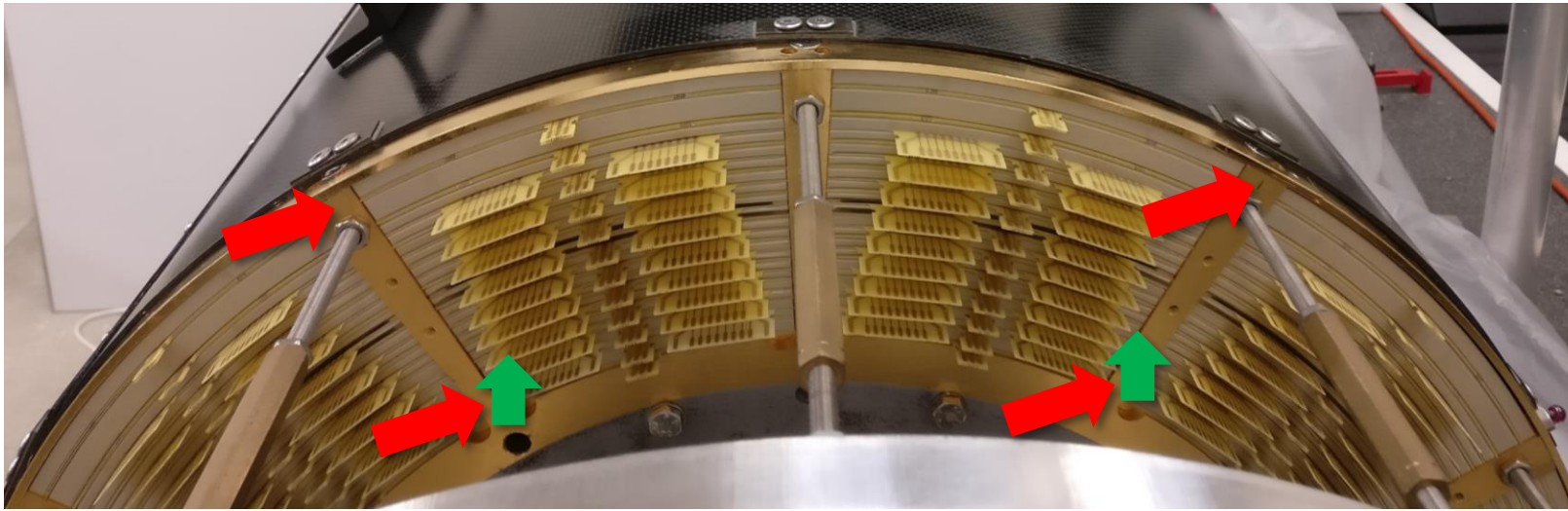


**Final CDCH length set to +4.2 mm with respect to zero tension position**

# CDCH geometry

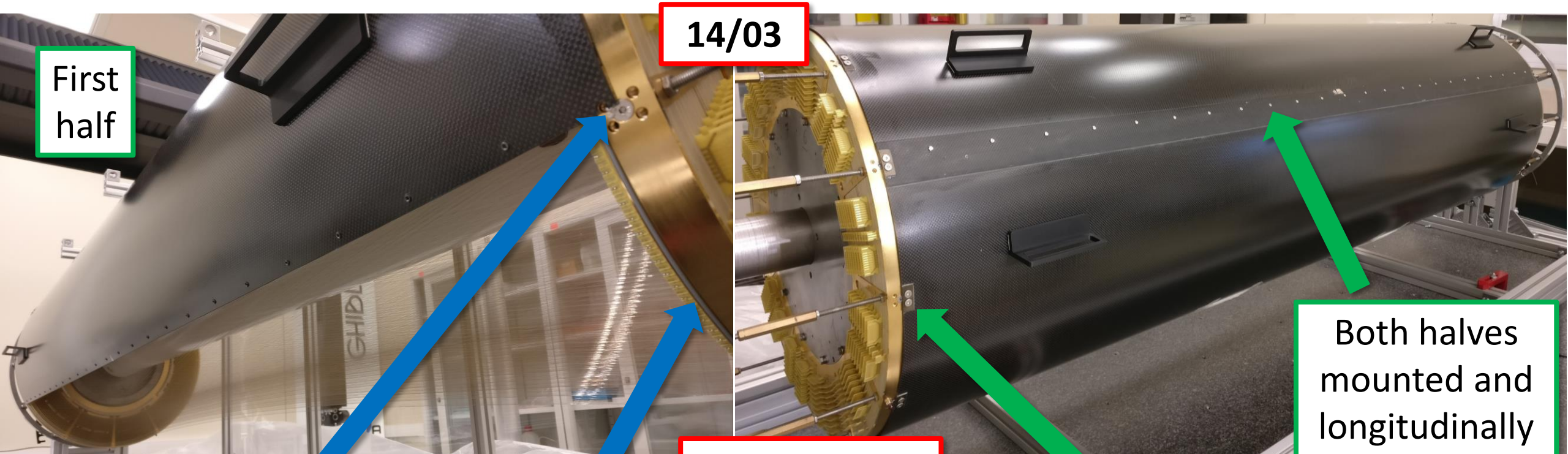
**Geometric features measured with the touching probe of the Coordinate Measuring Machine (CMM)**

- **Distance** between the average endplate planes: **1992.203 mm (+4.203 mm)**
- Endplates **planarity**: **35  $\mu\text{m}$  (US), 20  $\mu\text{m}$  (DS)**
- **Parallelism** between the average endplate planes: **40  $\mu\text{m}$**
- Relative **azimuthal tilt** of endplates: **0.001 $^\circ$**
- **Radial deformation** of endplates: **45  $\mu\text{m}$  (US), 35  $\mu\text{m}$  (DS)**



## 2. CDCH sealing

# CF mounting on CDCH



First half

14/03

Silver epoxy drop at each spoke to connect the CF Al foil with the endplates

Soft O-ring to seal the gap between the ring and CF

Turnbuckles still in position

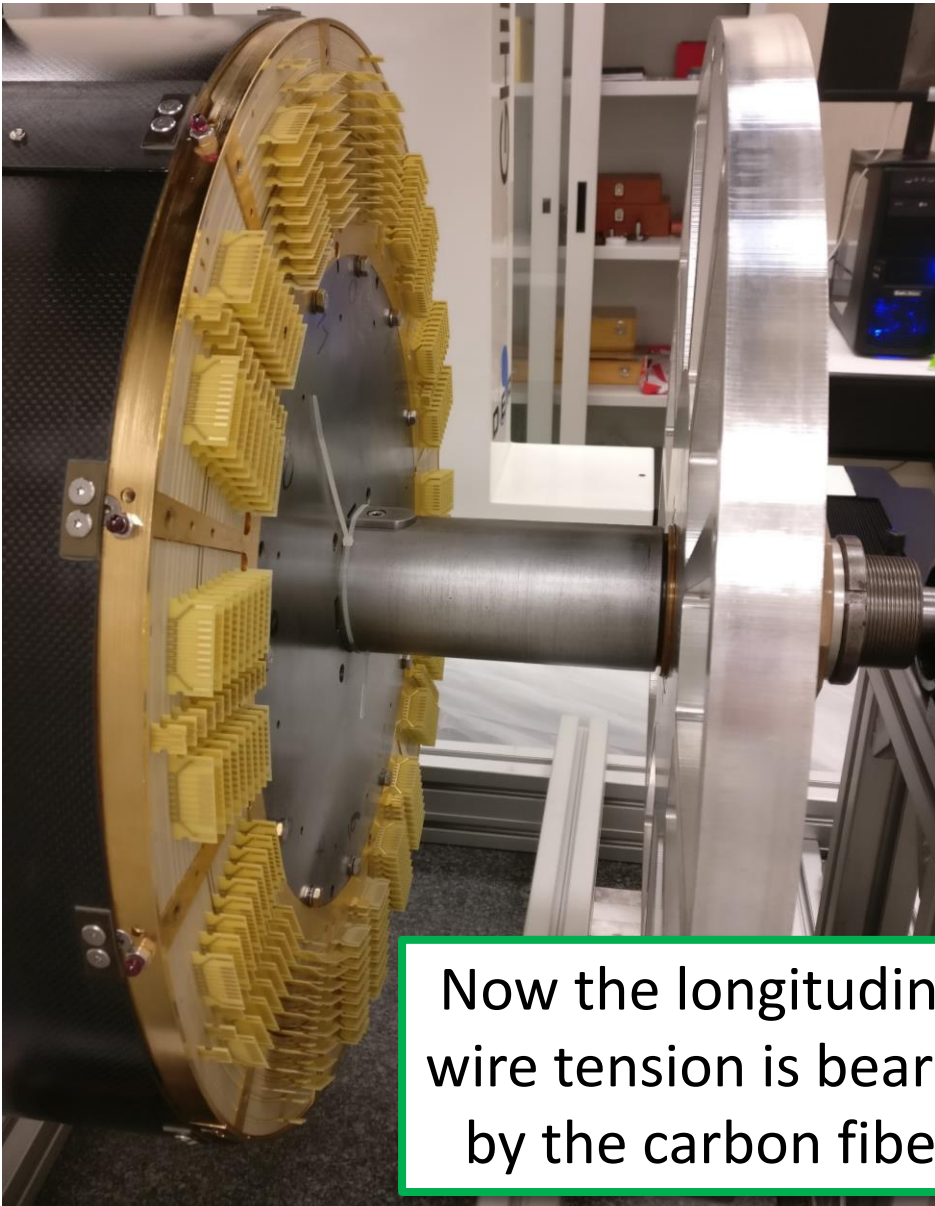
CF fixed over each spoke

Torque wrench used

Both halves mounted and longitudinally screwed in the overlapping junction



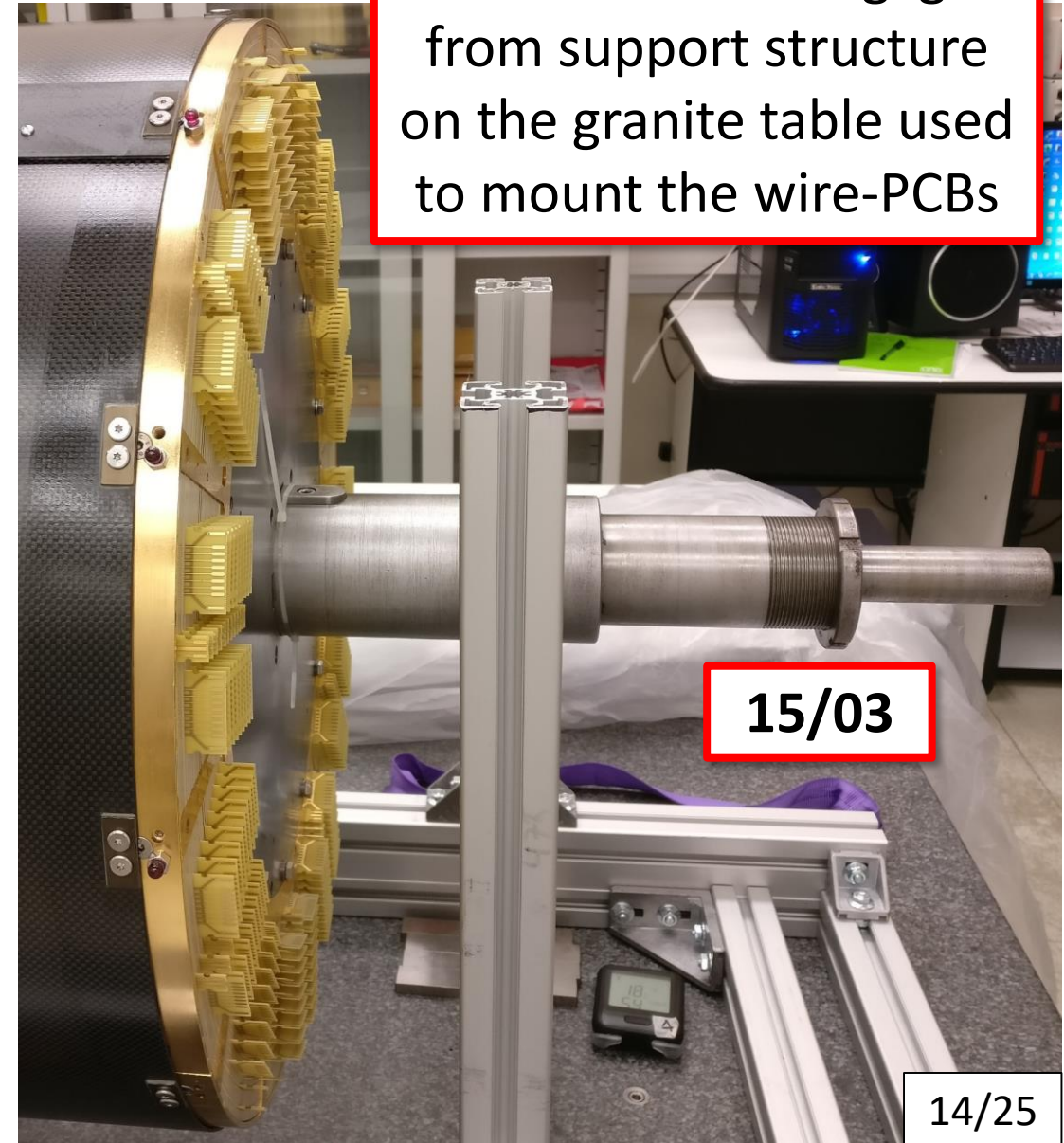
# Turnbuckles removal



Now the longitudinal wire tension is beared by the carbon fiber

Changes in geometric features (CMM)

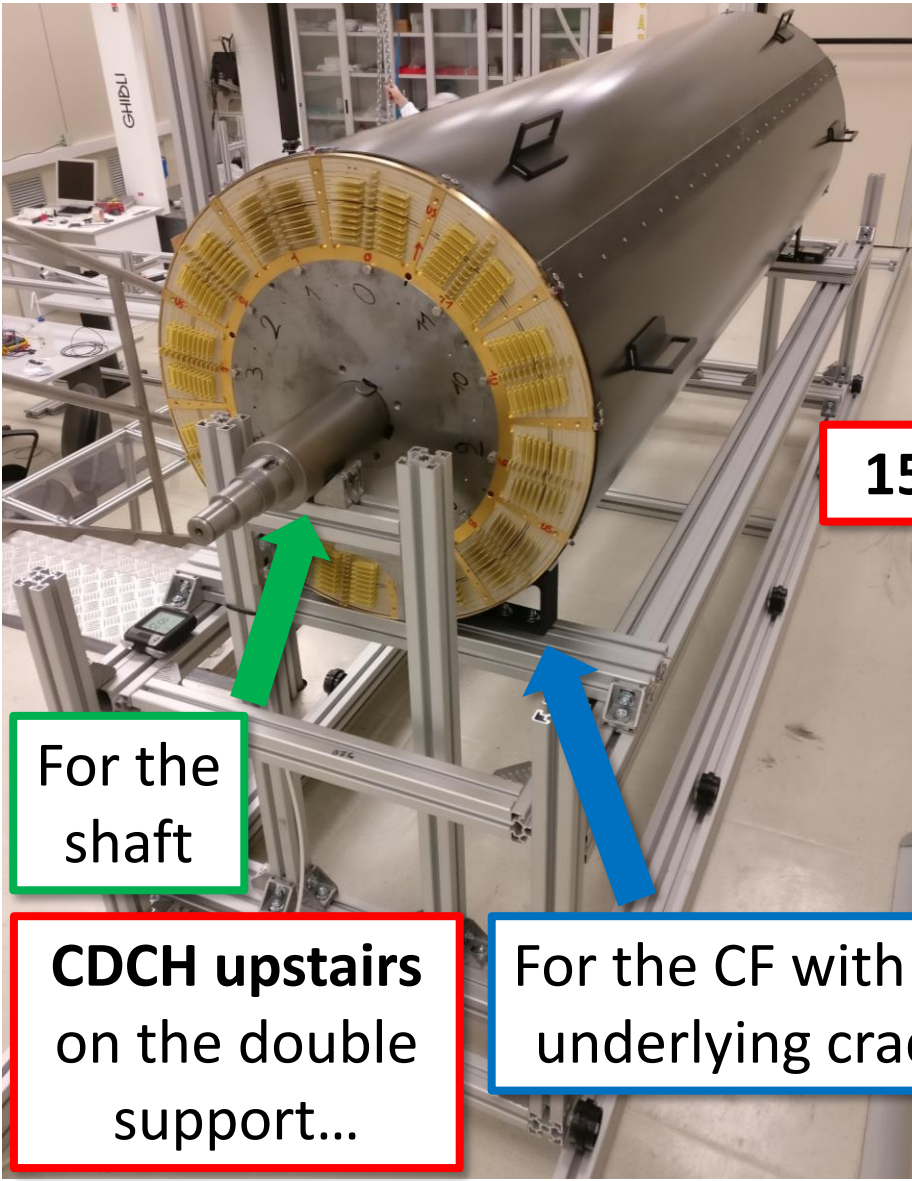
- CDCH shortening of  $20\ \mu\text{m}$
- Radial deformation of endplates:  $60\ \mu\text{m}$  (US),  $55\ \mu\text{m}$  (DS)



End-flanges removal: now CDCH is disengaged from support structure on the granite table used to mount the wire-PCBs

15/03

# Preparation to shaft extraction

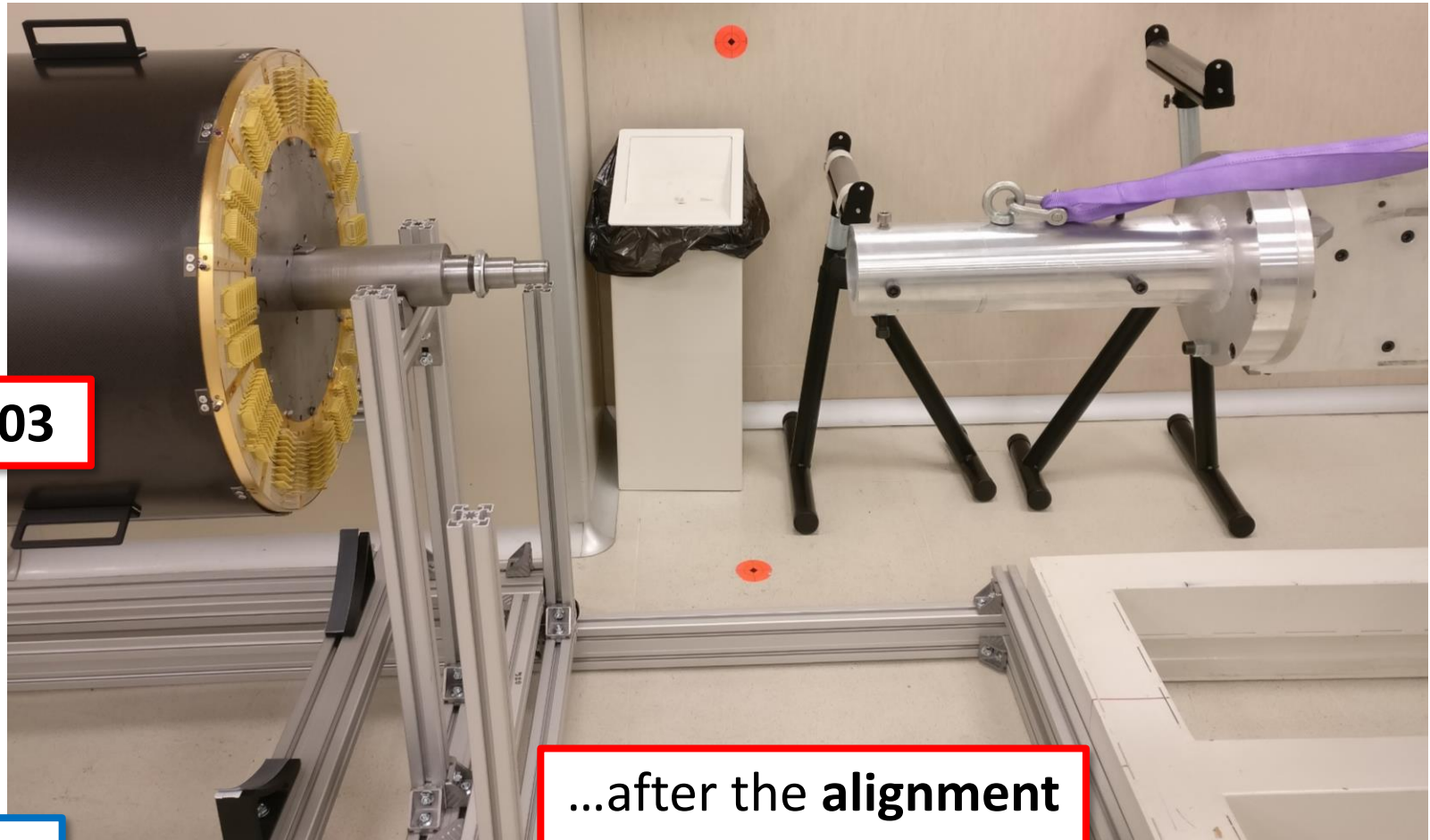


15/03

For the shaft

CDCH upstairs on the double support...

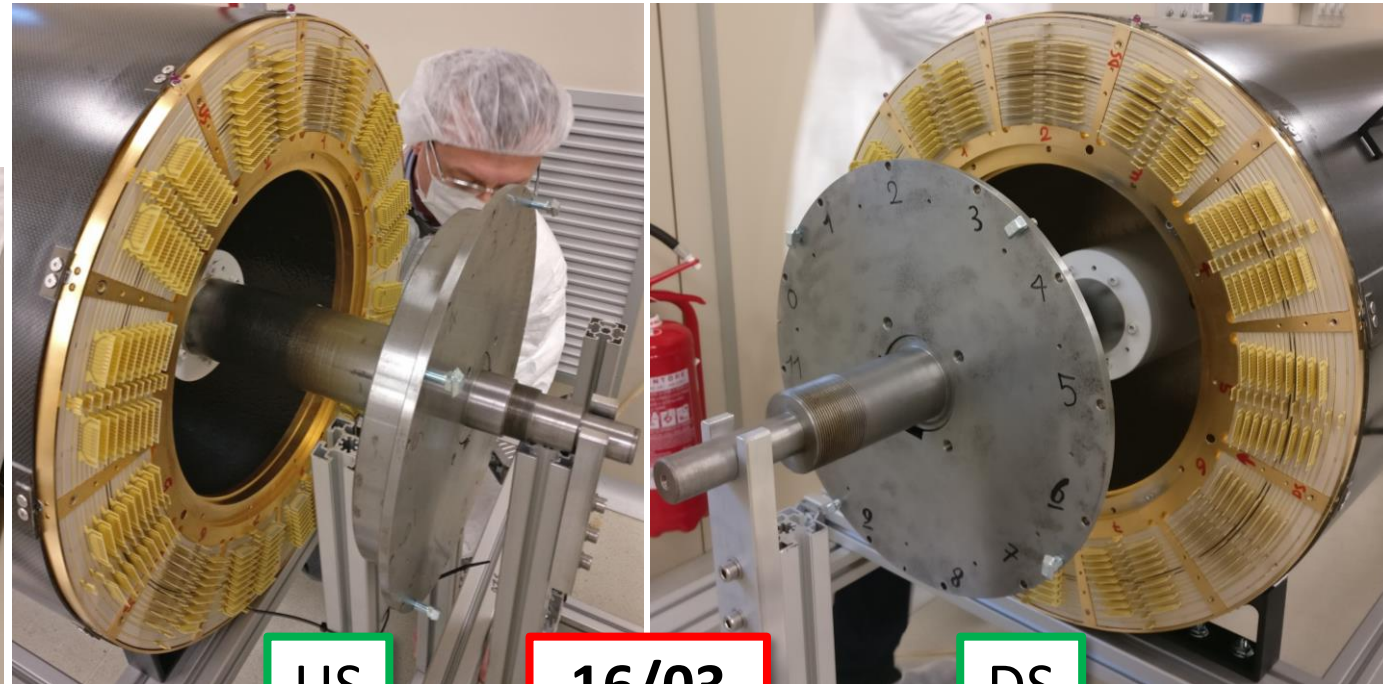
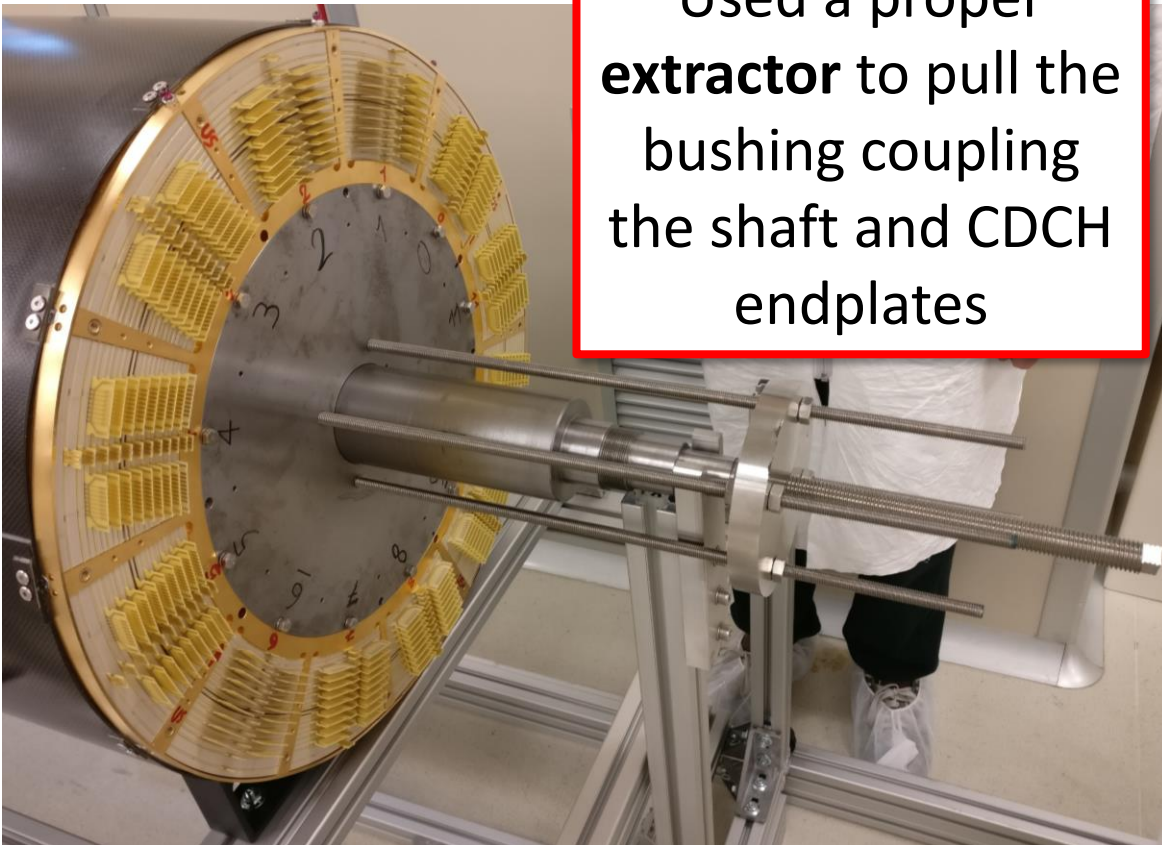
For the CF with the underlying cradle



...after the alignment of the shaft with the coupling bushing of the extraction tool

# Preparation to shaft extraction

Used a proper **extractor** to pull the bushing coupling the shaft and CDCH endplates



US

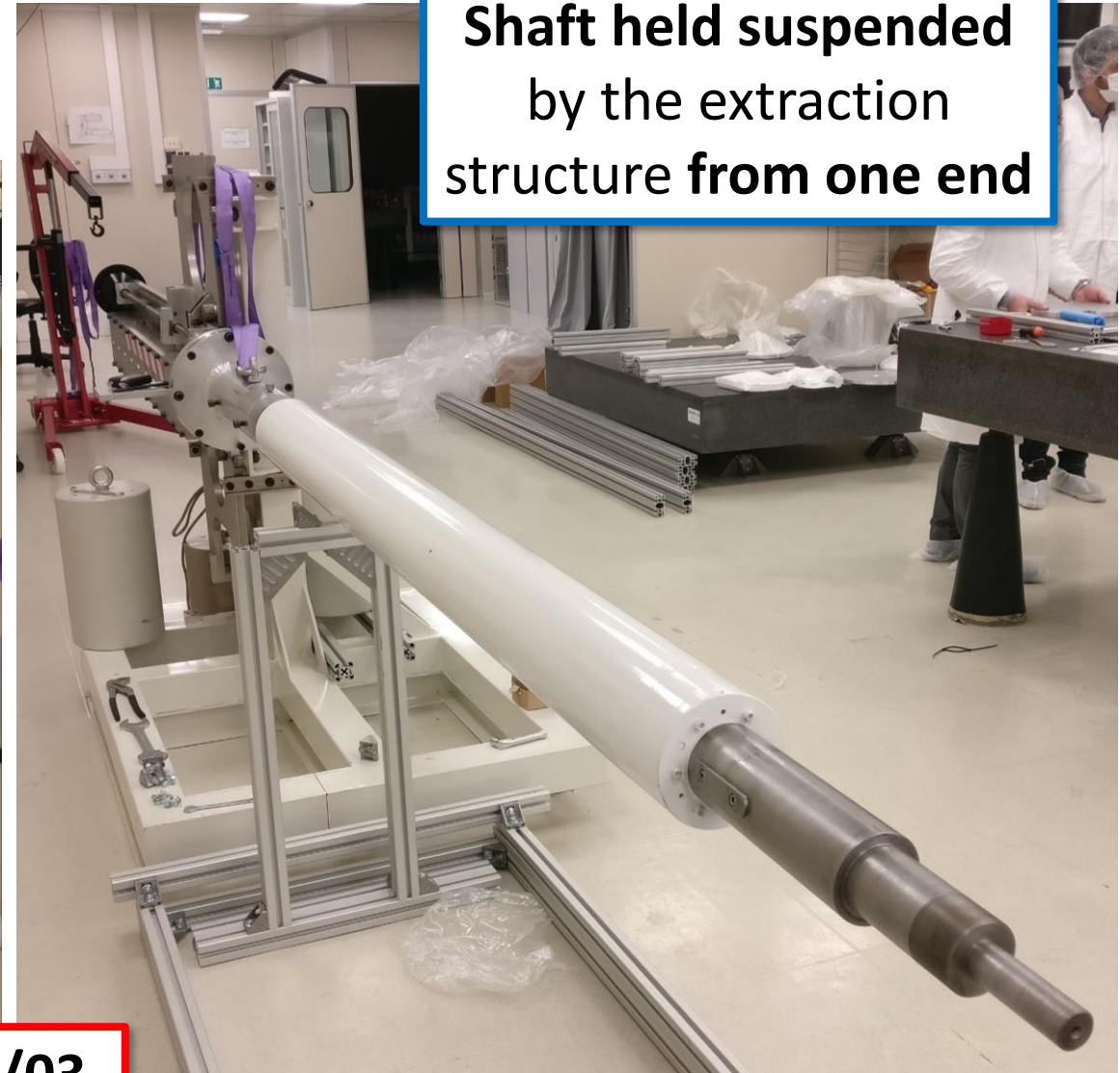
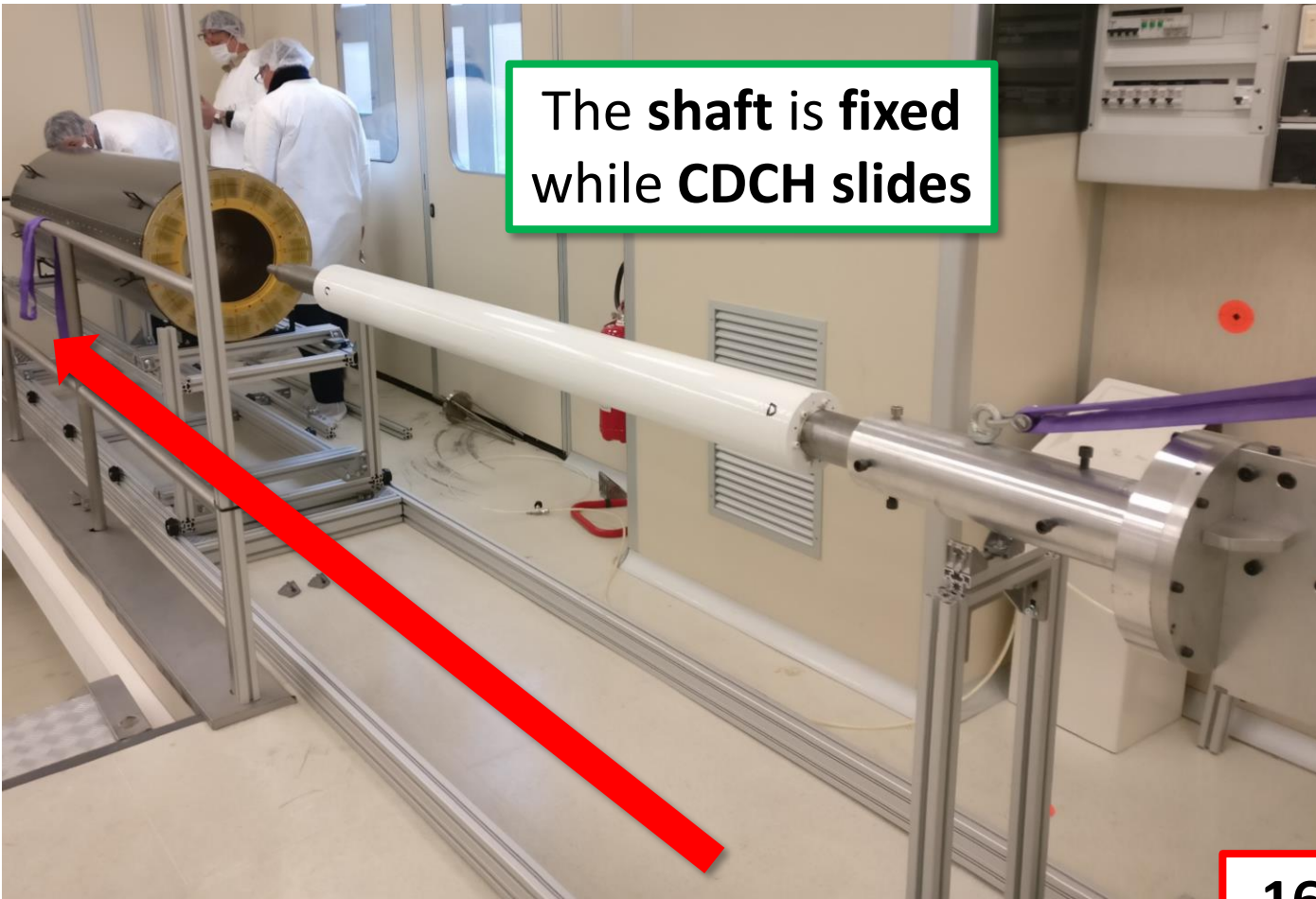
16/03

DS

- Now **CDCH is independent from the shaft**
- Ready for extraction

[Link to videoclip](#)

# Shaft extraction

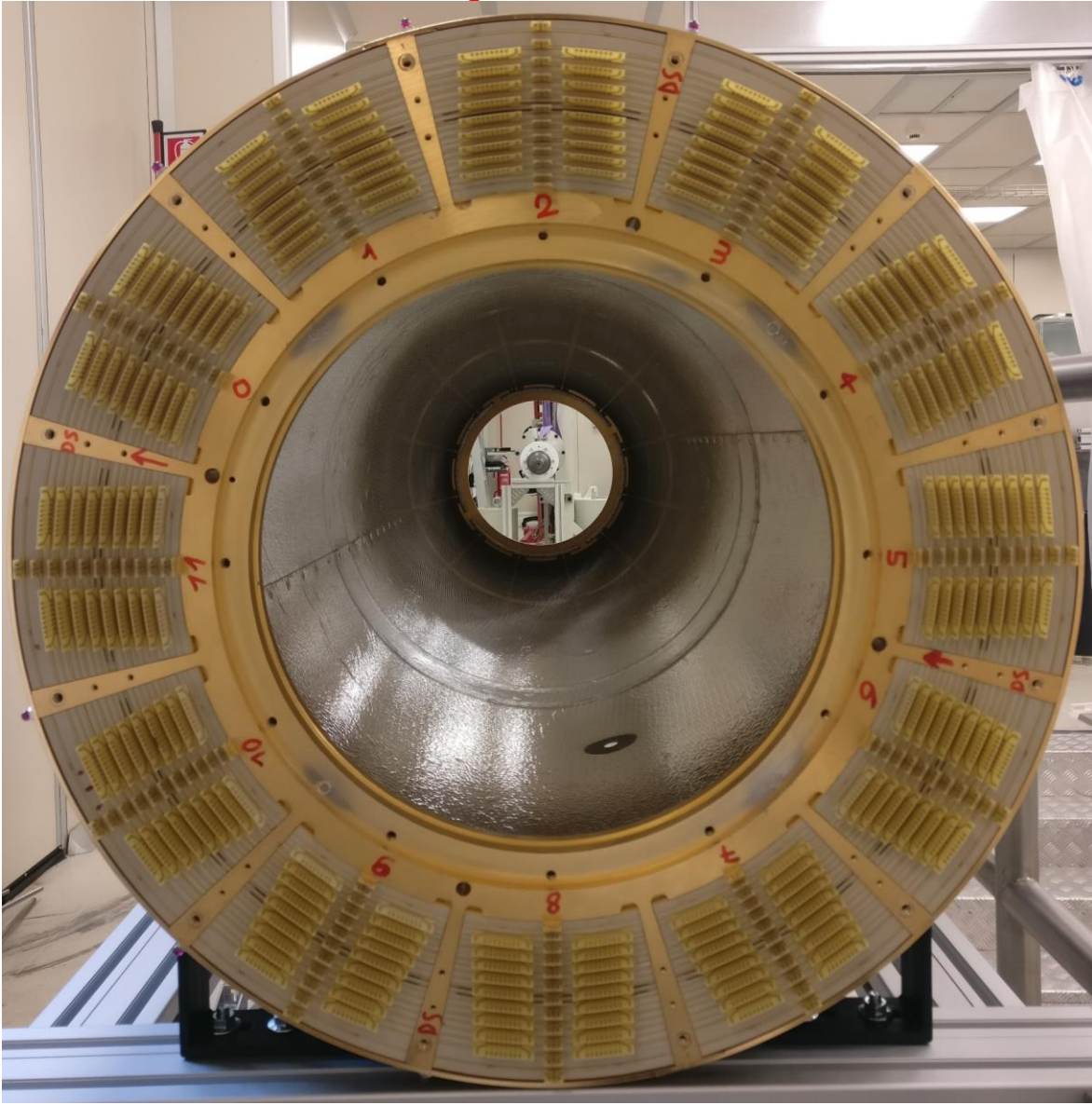


16/03

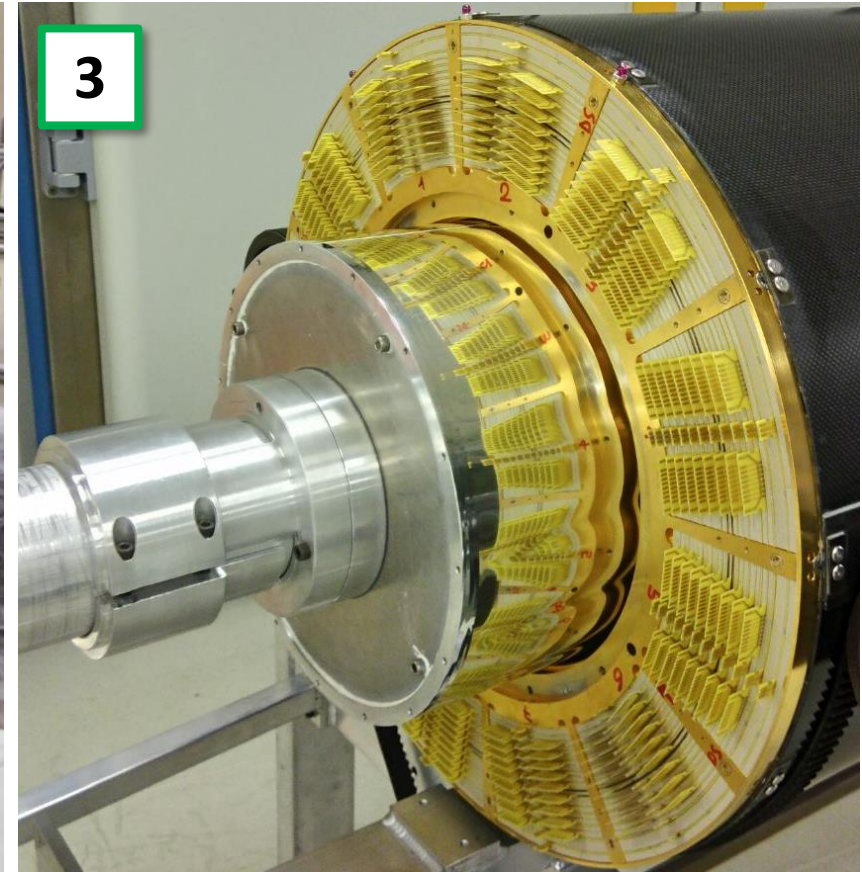
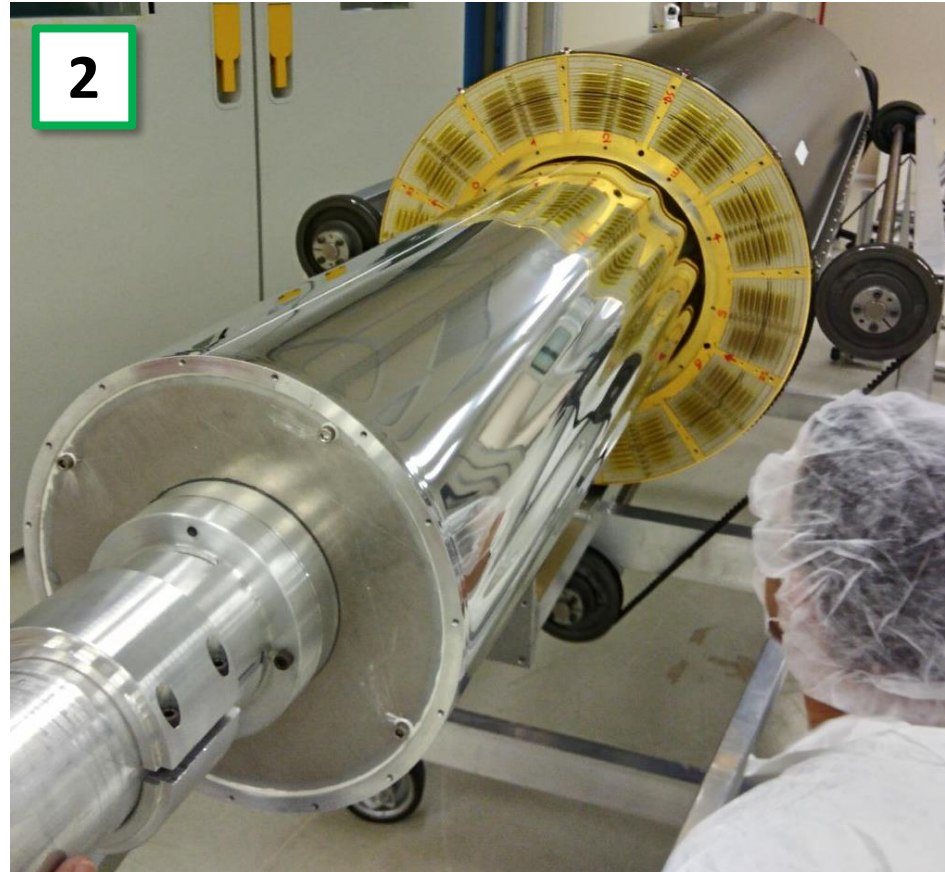
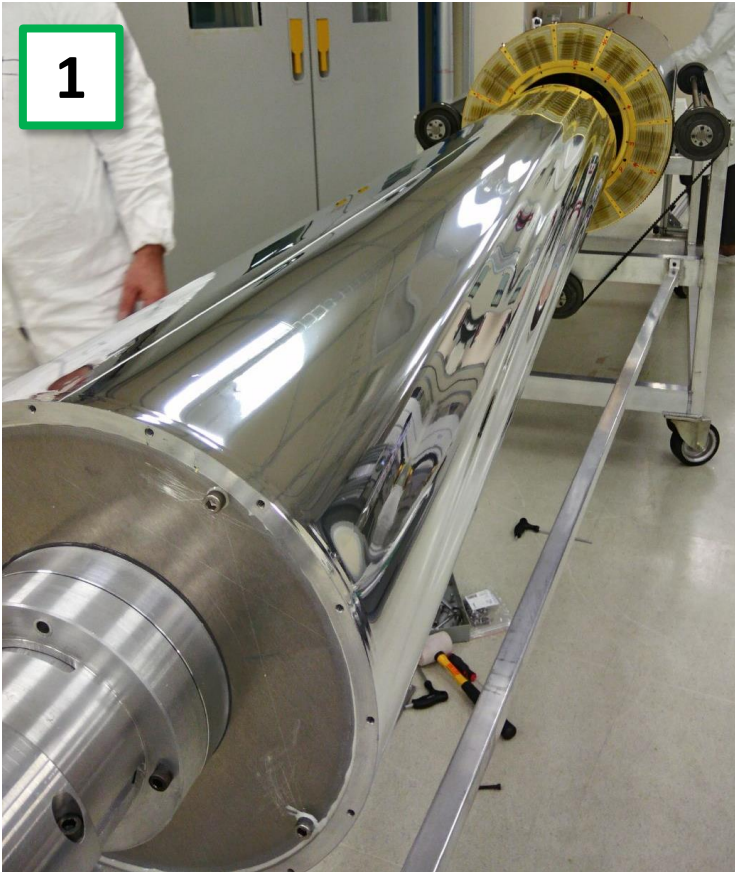
[Link to videoclip](#)

17/25

# Some pics from the central hole

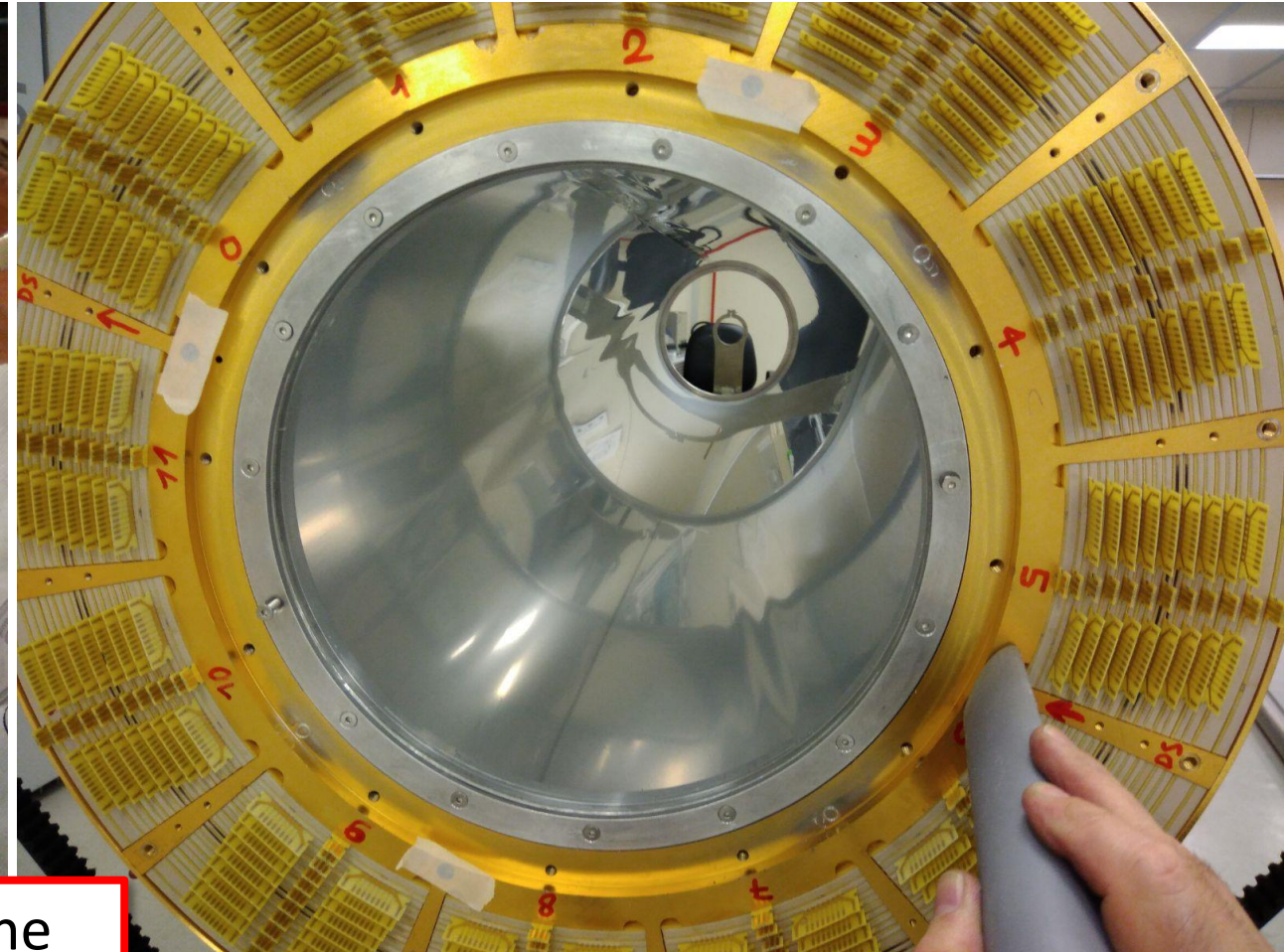


# Mylar inner foil insertion



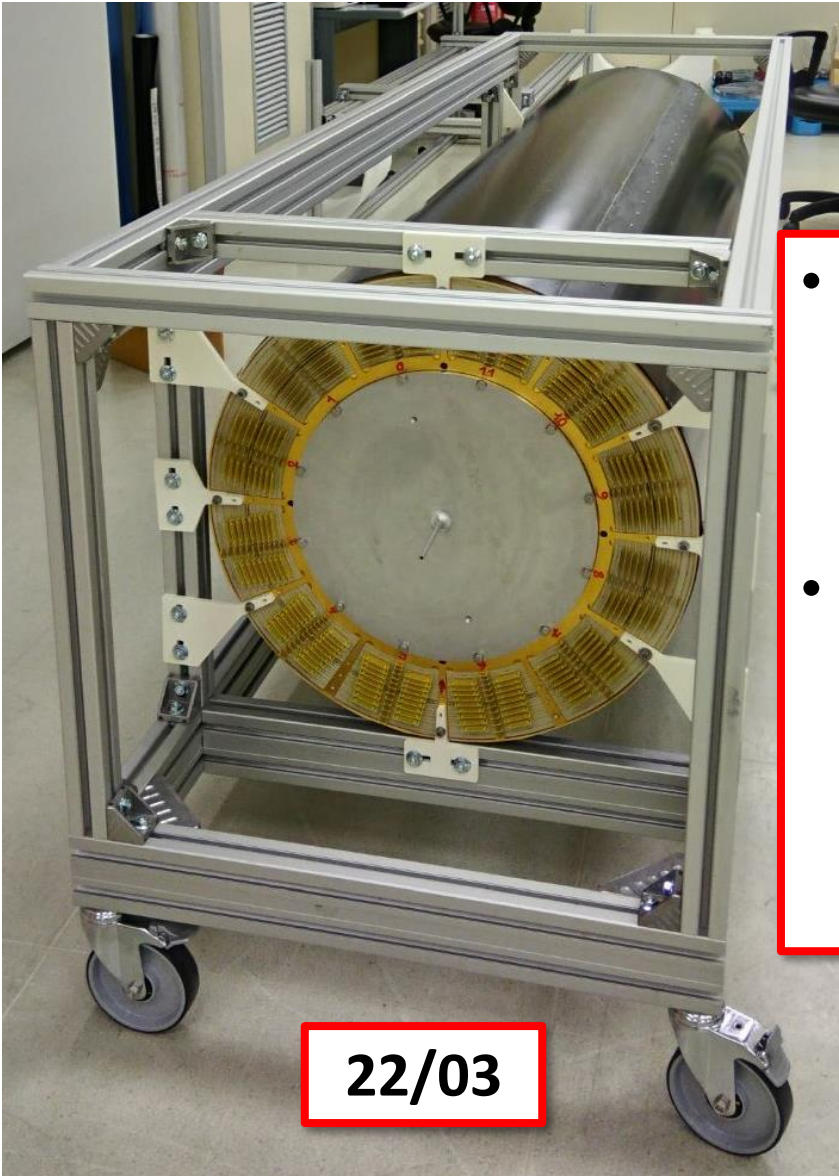
**20-21/03:** Andy and Dieter from PSI were in Pisa for this operation

# Mylar inner foil insertion



- **Mylar cylinder locked** at the endplates with proper **flanges**
- Gaps sealed with **ThreeBond**

# CDCH in the handling cage



- Used a proper cork to close the central hole
- **Inner CDCH volume continuously fluxed with dry air**

22/03



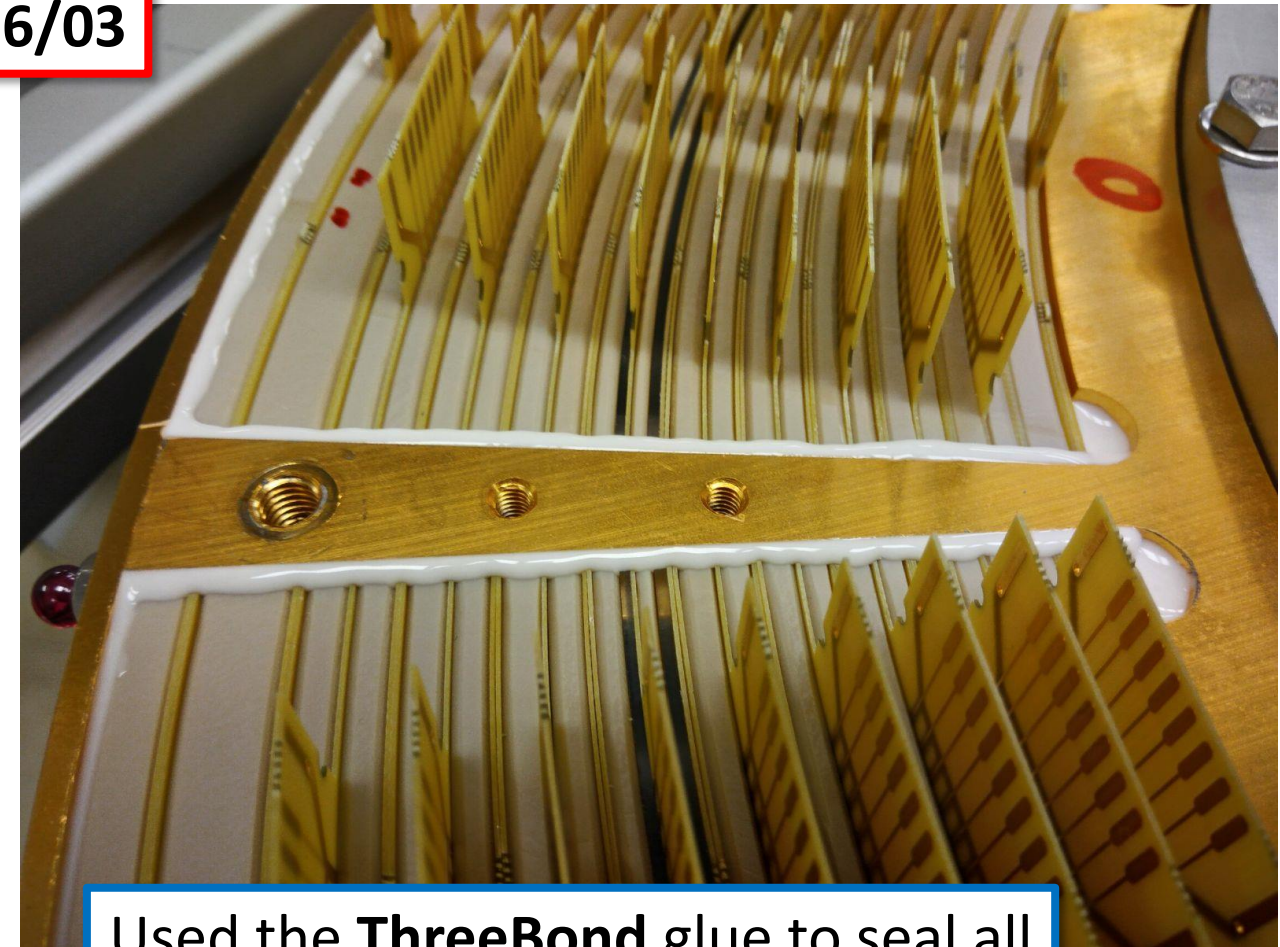
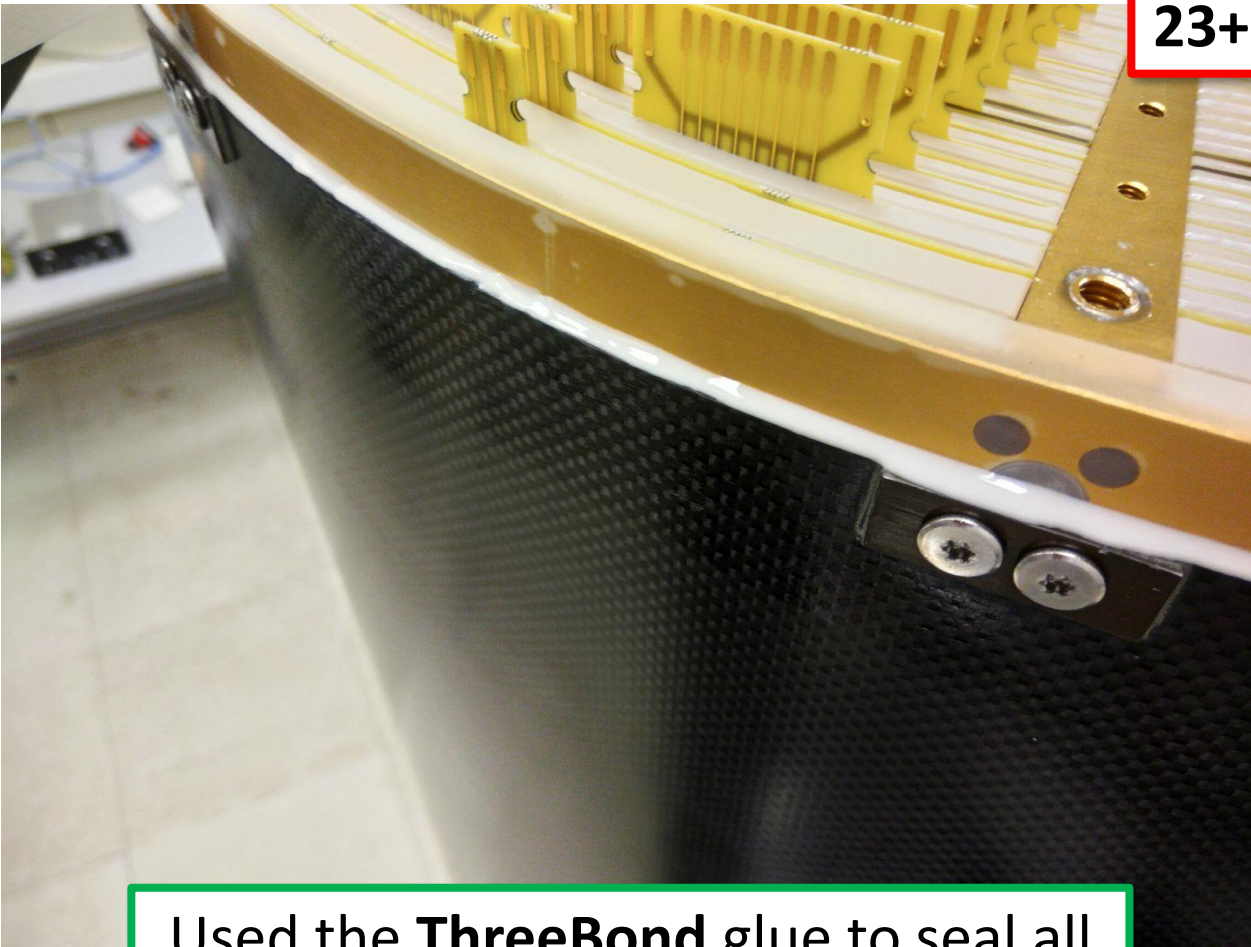
Now CDCH is in **vertical position** in view of the following **endplates sealing**

21/25



# CDCH endplates sealing

23+26/03



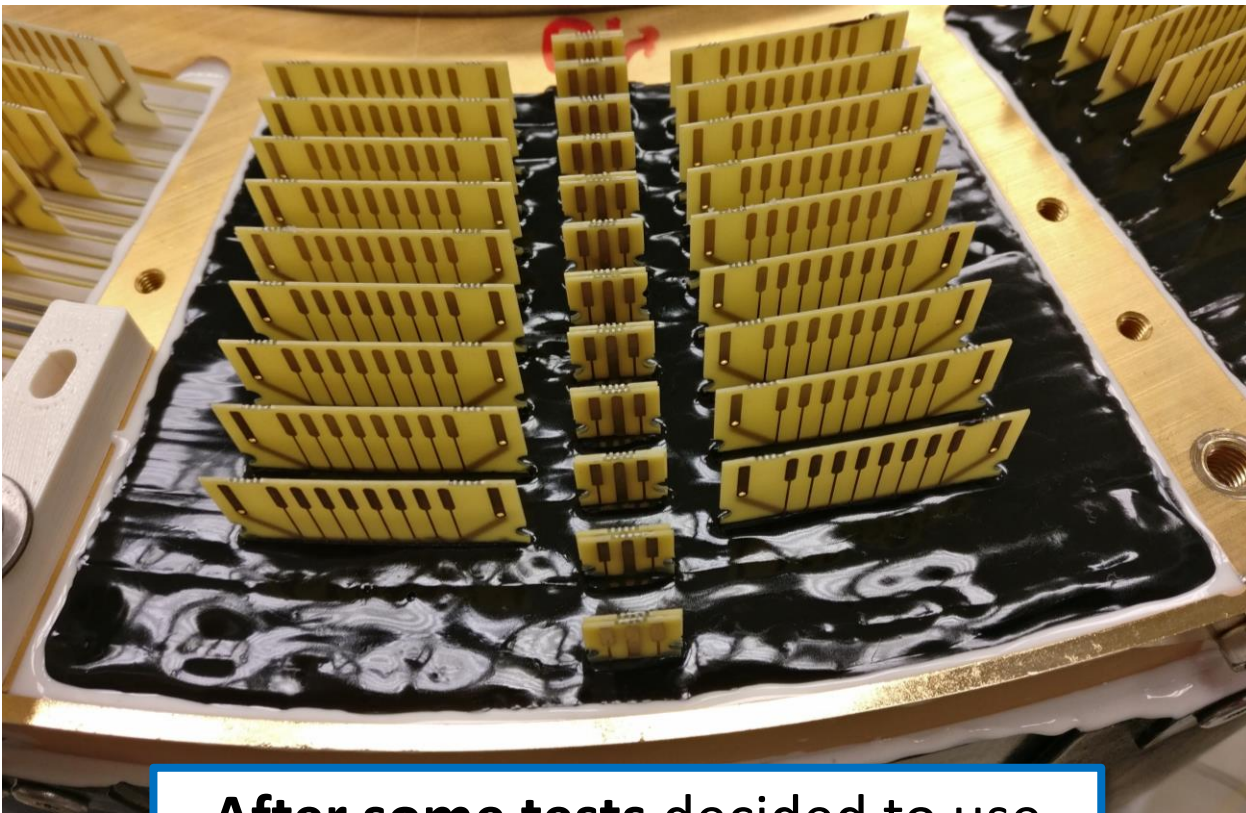
Used the **ThreeBond** glue to seal all around the gap between the CF and the outer ring of both endplates

Used the **ThreeBond** glue to seal all around the edges of each CDCH sectors of both endplates

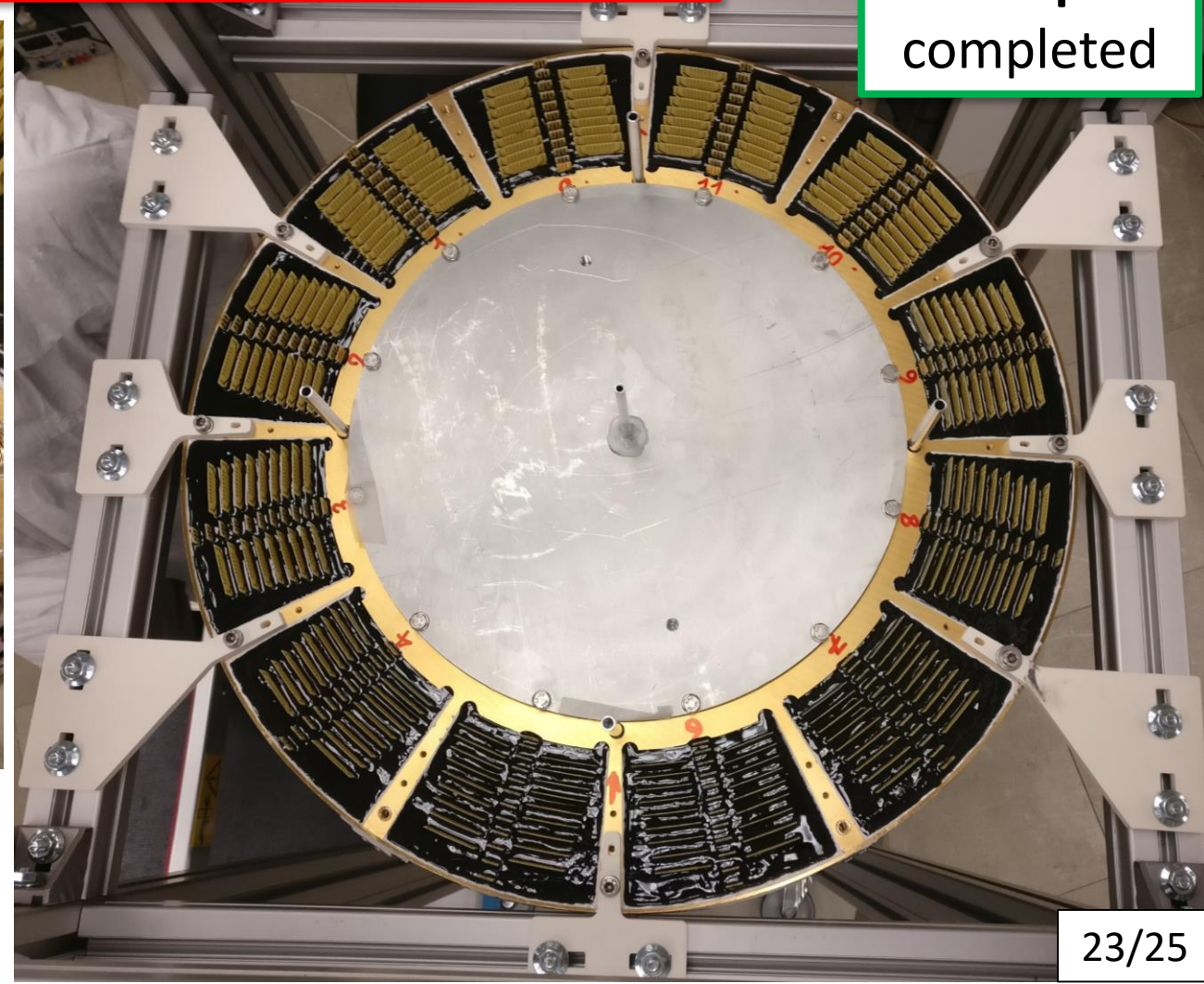
# CDCH endplates sealing

27-29/03 endplate US – endplate DS within this week

US endplate  
completed



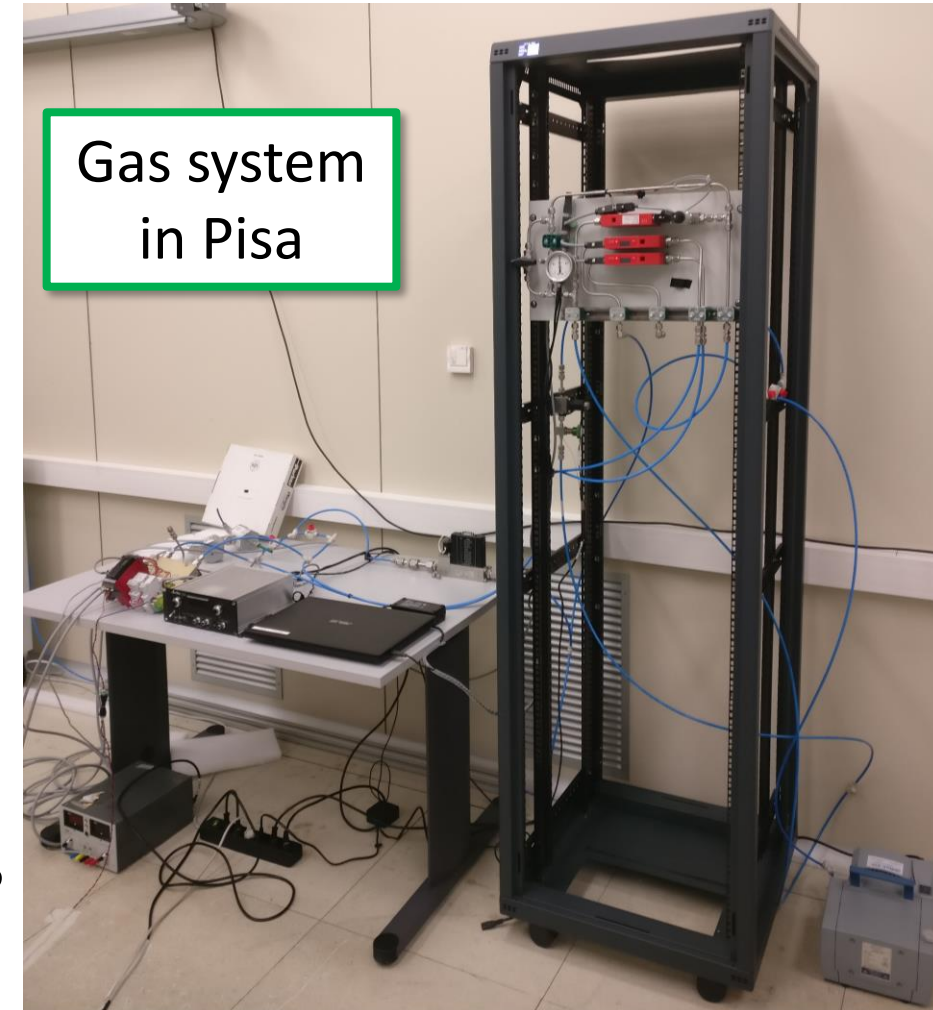
After some tests decided to use the **Stycats 2850** glue to seal the back side of the wire-PCBs stack



# Next operations in Pisa

**After CDCH sealing and before the shipping to PSI we plan to perform**

- 1. Leakage test with He (sniffer)**
  - The gas system is ready (Francesco, Gianluigi)
- 2. HV test to check the drift cells stability**
  - Boards ready in the first half of April
- 3. Common ground connections in wire-PCBs**
- 4. Extensions mounting**



# Conclusions and schedule

- **Completed operations**
  - Wire-PCBs and Carbon Fiber mounting, Central shaft extraction, Mylar inner foil insertion
- **Ongoing operations**
  - CDCH sealing (US endplate completed, DS in this week)
- **To date in schedule to deliver CDCH to PSI in the first two weeks of May**
- **When at PSI we plan to acquire cosmic tracks outside PiE5 area (LXe tent)**
  - We need **13 WaveDREAM boards for about 2 months** for CDCH channels and trigger scintillators PMTs
  - We already have a **trigger board** able to work in **stand-alone configuration** (Luca, MarcoF)
  - We already have **cables** and **Differential/Single-Ended signal converters** (MarcoP)

**THANKS FOR  
YOUR ATTENTION**