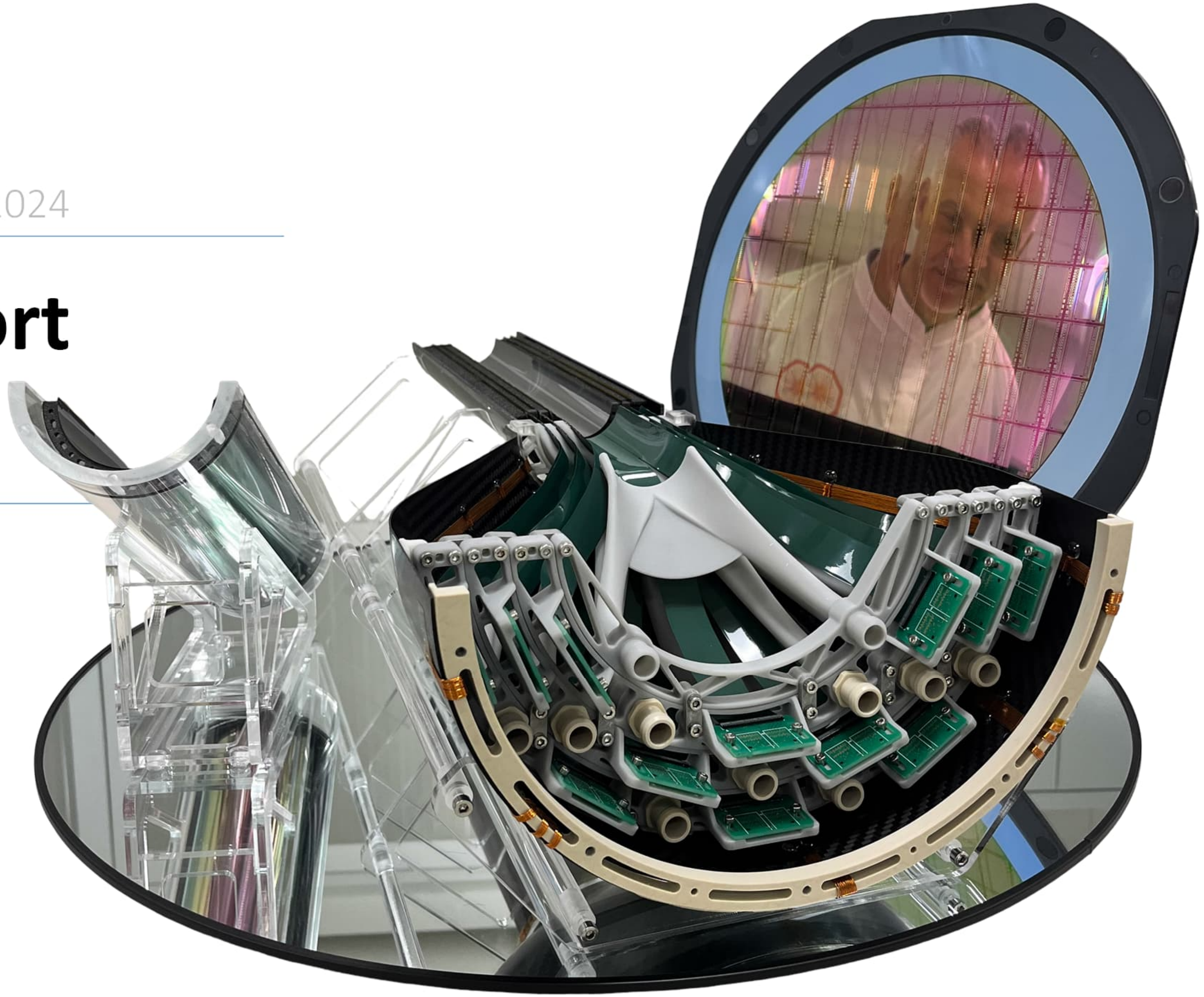
ITS3 Tuesday 29th October 2024

WP5 progress report



M. Angeletti
On behalf of WP5 CERN group

CERN: P. J. Bouvier, C. Gargiulo, P. Ijzermans, A. Junique, E. Laudi, G. Ledey, S. Liaqat, J. M. Mourot, K. Ozen, F. Pellegrino, V. Samsonov, P.J. Secouet, J. Van Beelen…

Utrecht: R. Barthel, J. Deen and Y. Zubaroglu…

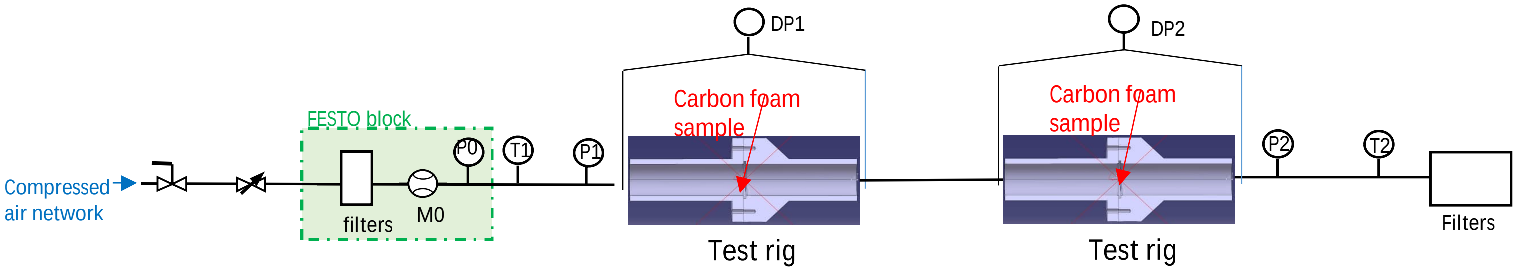
Outline

- Tests:
  - Particle realise test
  - Wind-tunnel upgrade
- Prototypes (Engineering Models)
- FPC updates

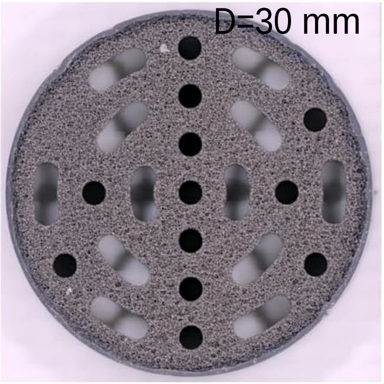
Tests: Particles realise tests

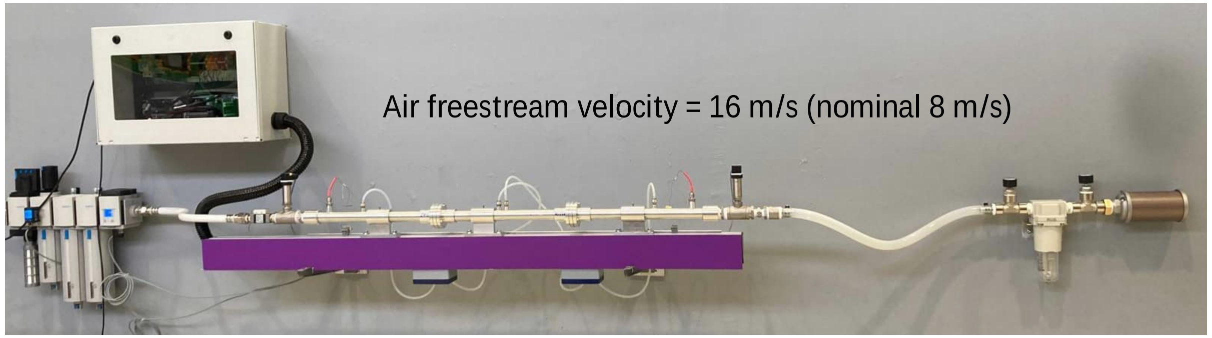
- Investigate potential particle realise and potential degradation of the holes/slots of the carbon foam
  - Tests (1 month time) ➔ inspection (visual, check of possible particle inside the vortex filter) ➔ repeat test
  - 2 samples : ERG and Allcomp

@P. Bouvier, P. Ijzermans, J. Mourot, F. Pellegrino

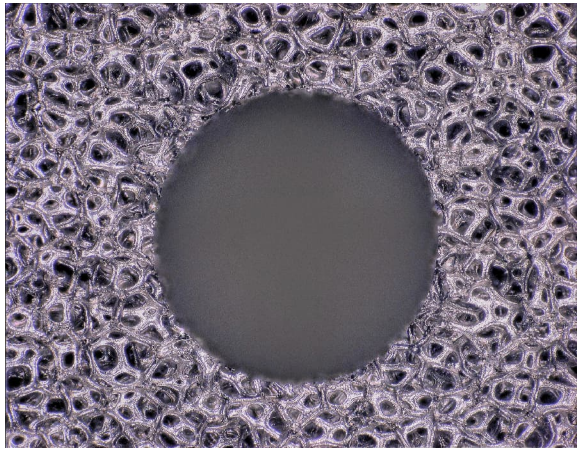


Visual inspection





- .....
- Allcomp, 1 month, 10-11 m/s (done)
- ERG, 1 month, 10-11 m/s (done)
- Allcomp, 1 month, 16 m/s (done)
- ERG, 1 month, 16 m/s (done)
- Allcomp+ERG, 1 month, 16 m/s (on-going)
- Allcomp+ERG, 3 months, 16 m/s



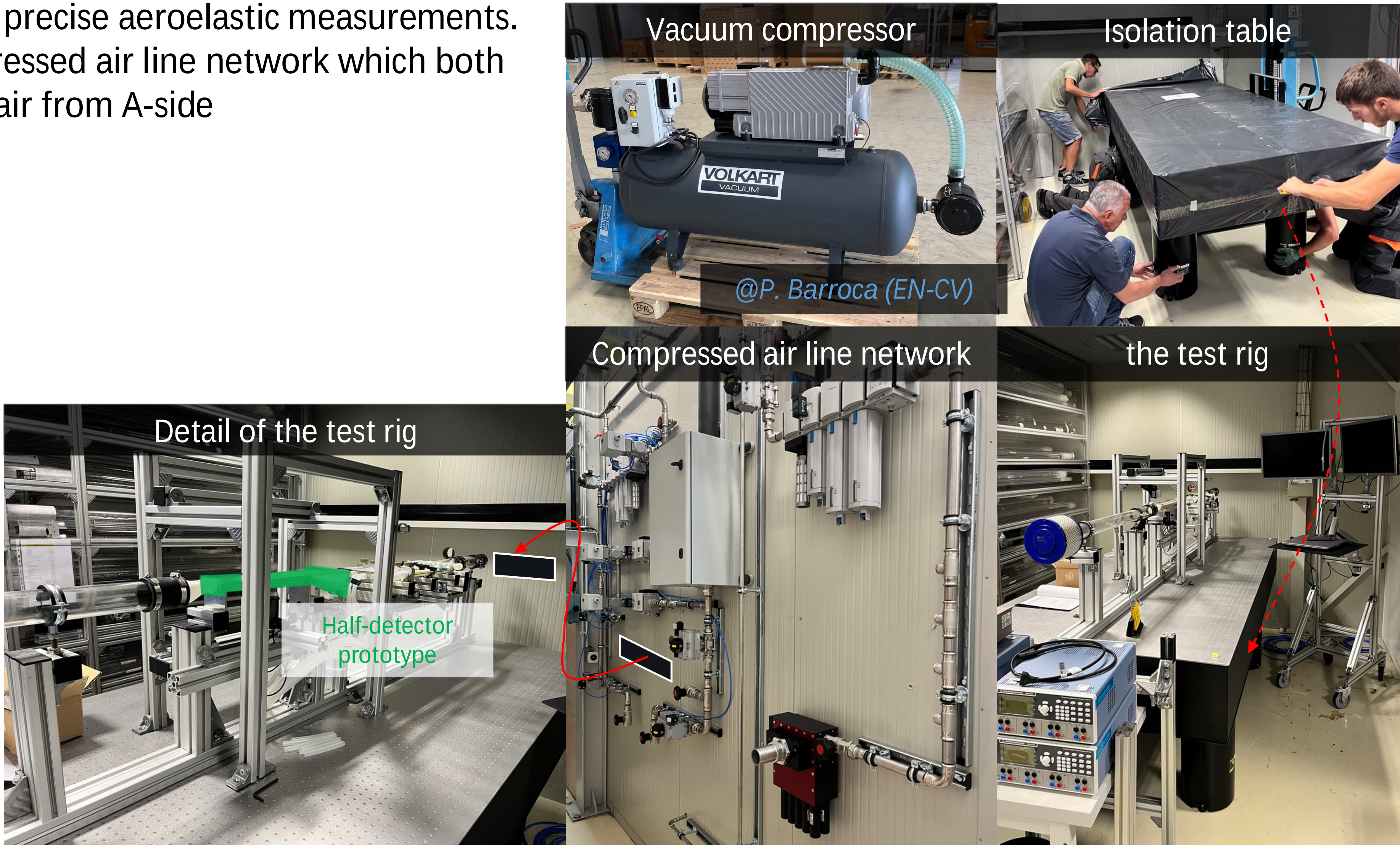
- Release of particles due to the machining (approximately within the first hour of testing).
- No release of particles or potential degradation within 5 months of testing

Tests: Wind-tunnel upgrade

@P. Bouvier, J. Mourot, F. Pellegrino,

Upgrades to the wind tunnel are being undertaken, which mainly consist of:

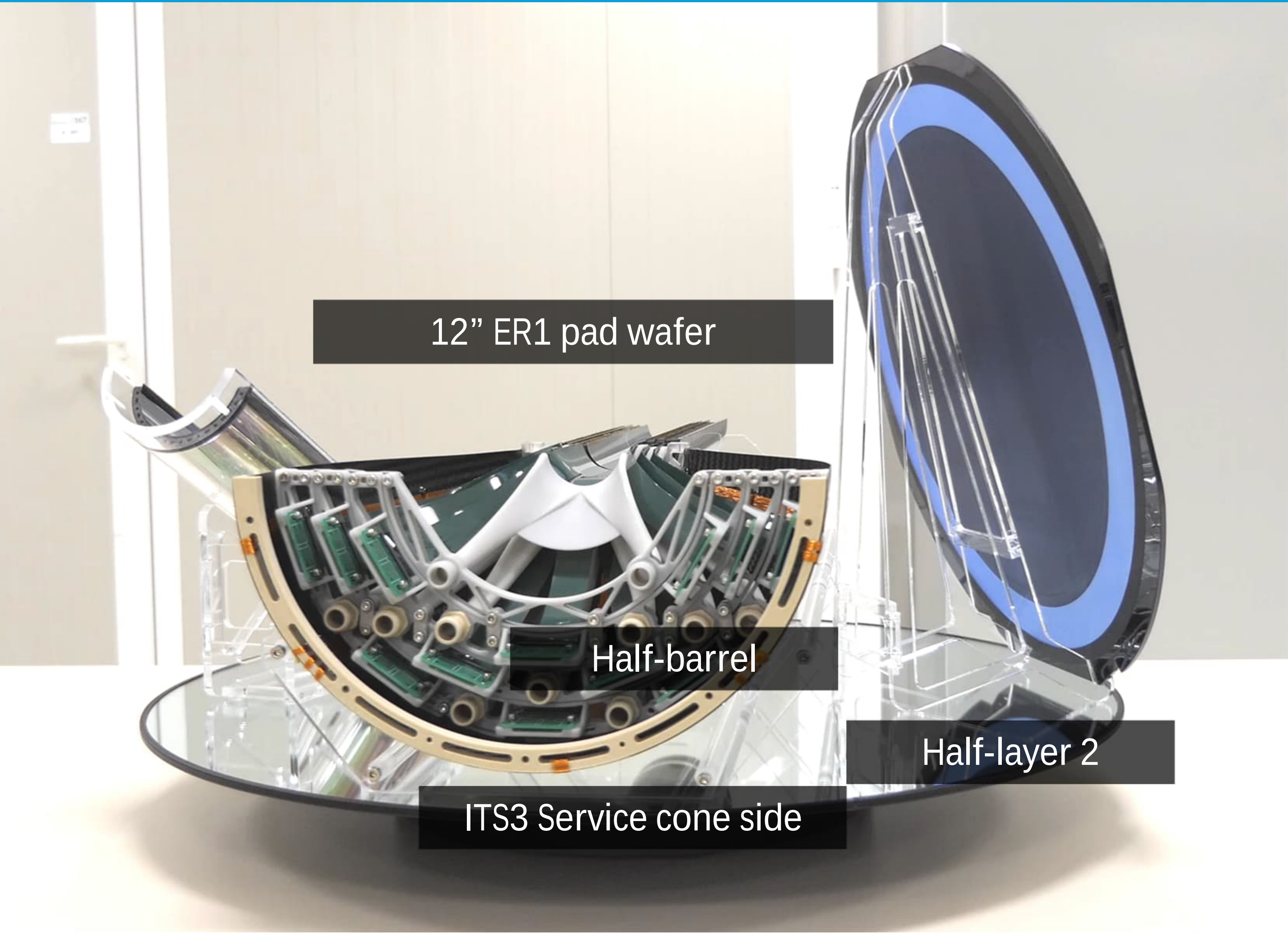
- A new isolation table for more precise aeroelastic measurements.
- New compressors and a compressed air line network which both allows extracting and blowing air from A-side

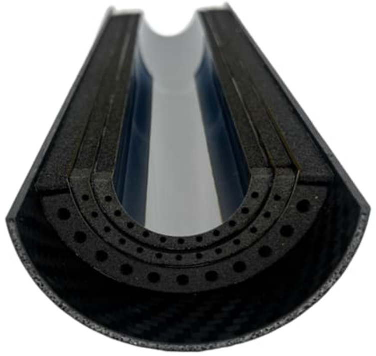


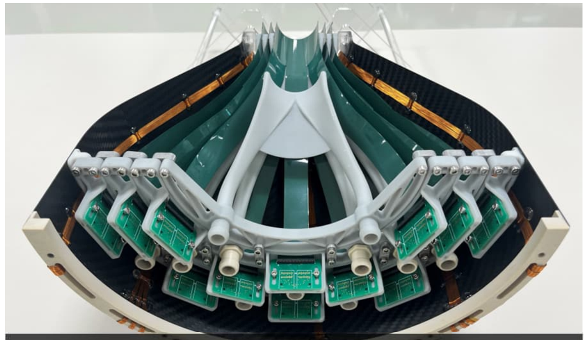
Prototypes: CERN70, 1st October exhibition

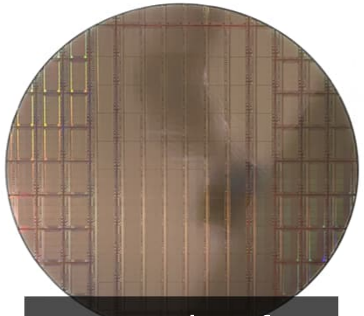
- On October 1st, an event was held for CERN's 70th anniversary. A small exhibition was prepared, featuring objects representing CERN’s activities. One component from each of the four LHC experiments, one from the LHC, and one from IT were included. For ALICE, an ITS3 mockup was displayed.

ALICE ITS3 prototype





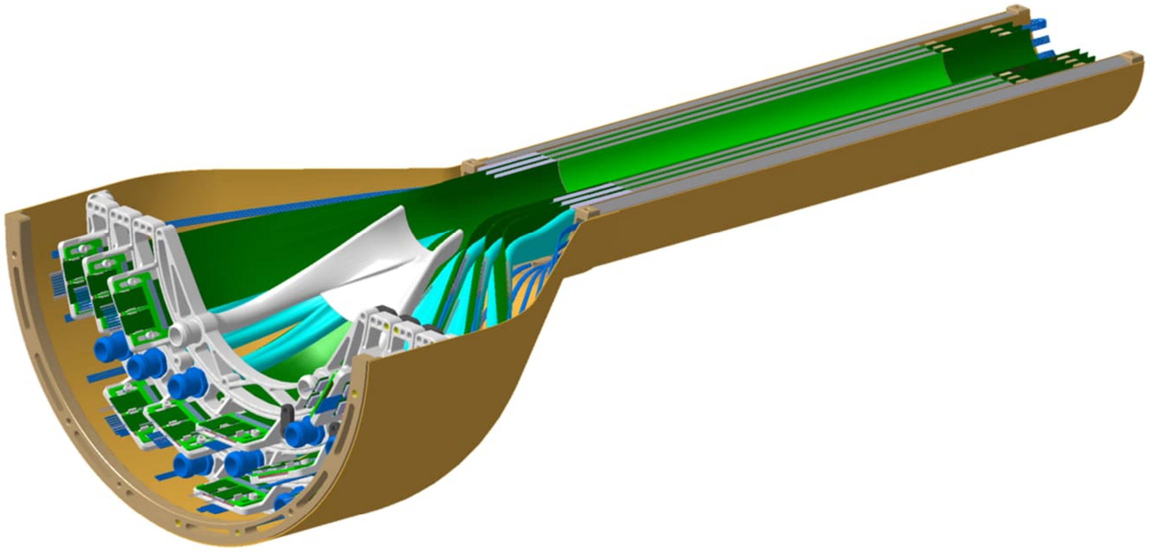


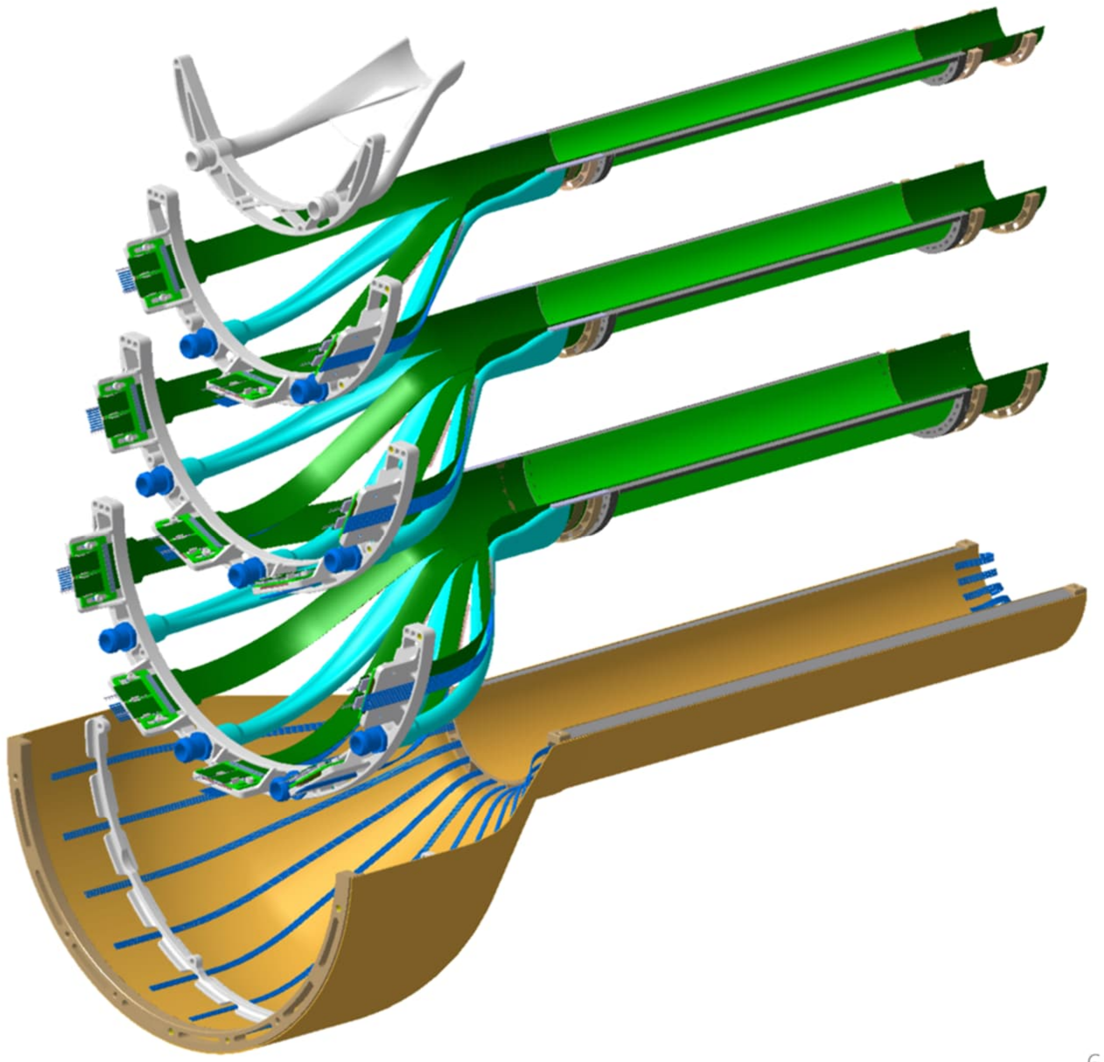


Prototypes: Engineering models

Before the Qualification Models (QMs), minimum three additional Engineering Models (EMs) will be constructed, aimed at validating:

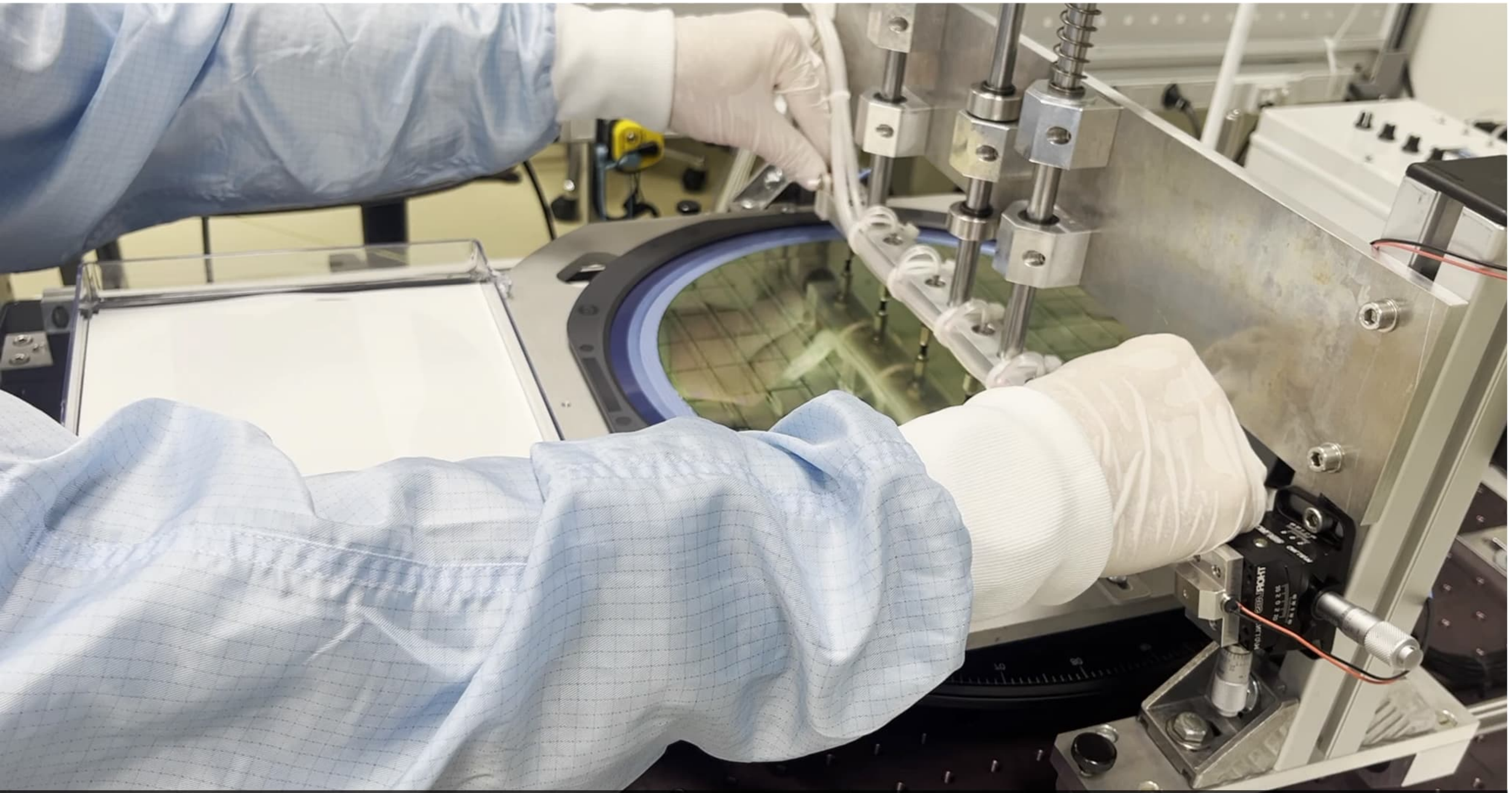
- The layout, including the electronics connections and the service interface
- The final assembly jigs and the assembly procedure
- The installation minimum clearances



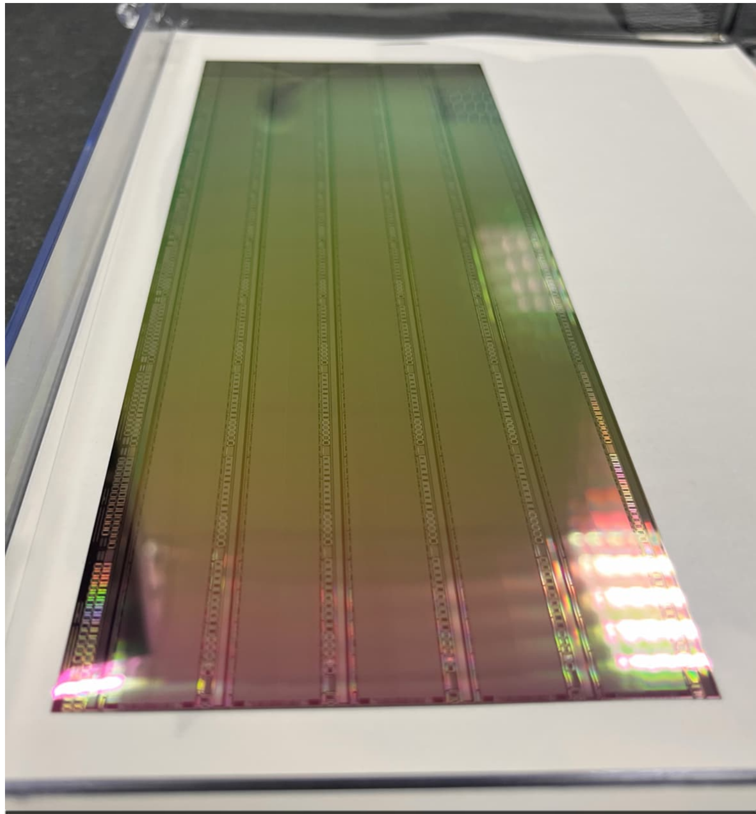


Prototypes: EM3

- EM3 was intended to be displayed at the small-exposition for the CERN70th anniversary (Ex ~~EXPO~~ prototype)
- This prototype is intended to assess the new assembly jigs, identify potential additional modifications, and evaluate the overall sensor integration, including services and their routing.
- It integrates half-layer sensors from the ER1 pad wafers, though they do not have the nominal dimensions of the MOSAIX.



Die ejector

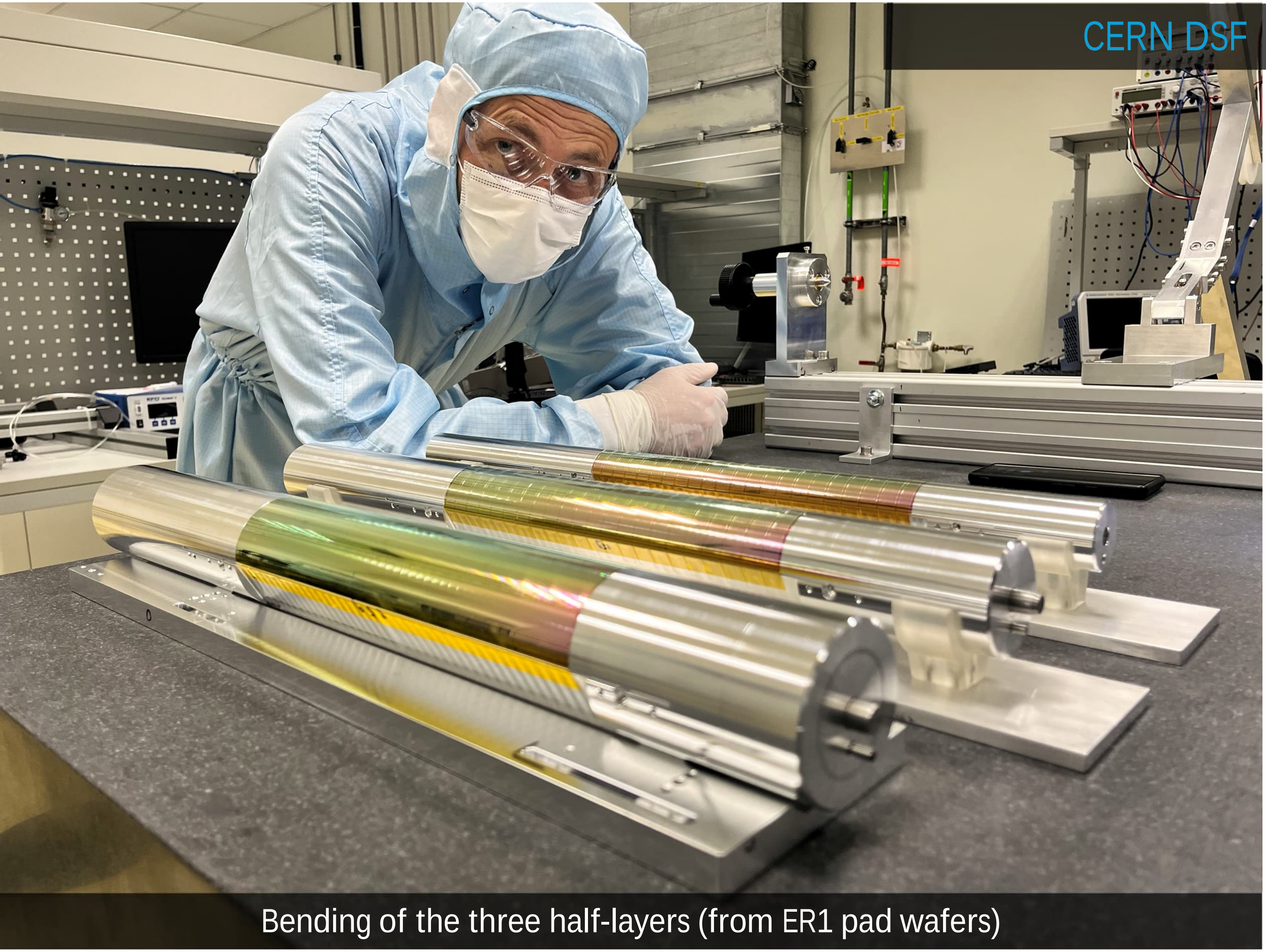


Half-layer 2 size

Prototypes: EM3

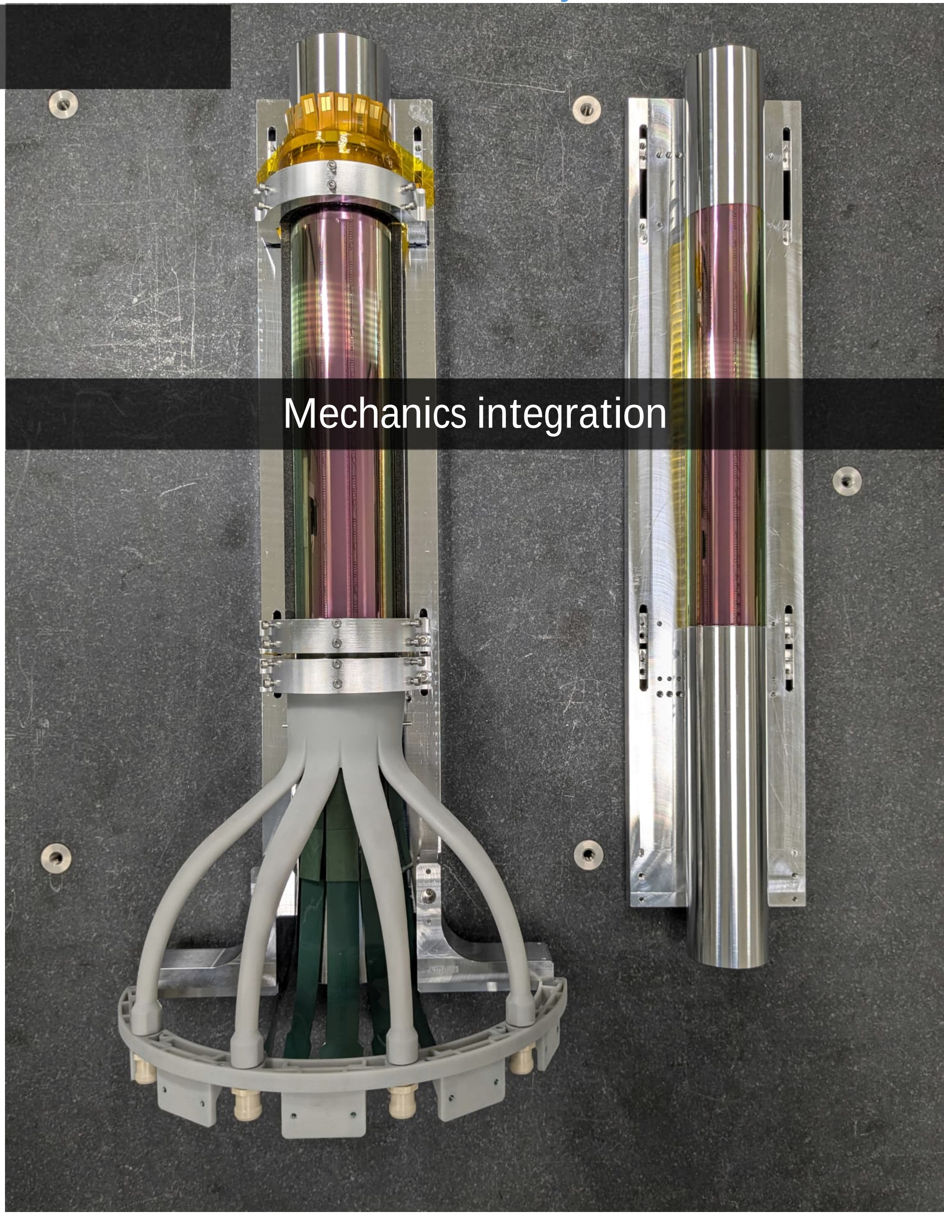
ALICE ITS3 WP5

@P. Ijzermans



CERN DSF

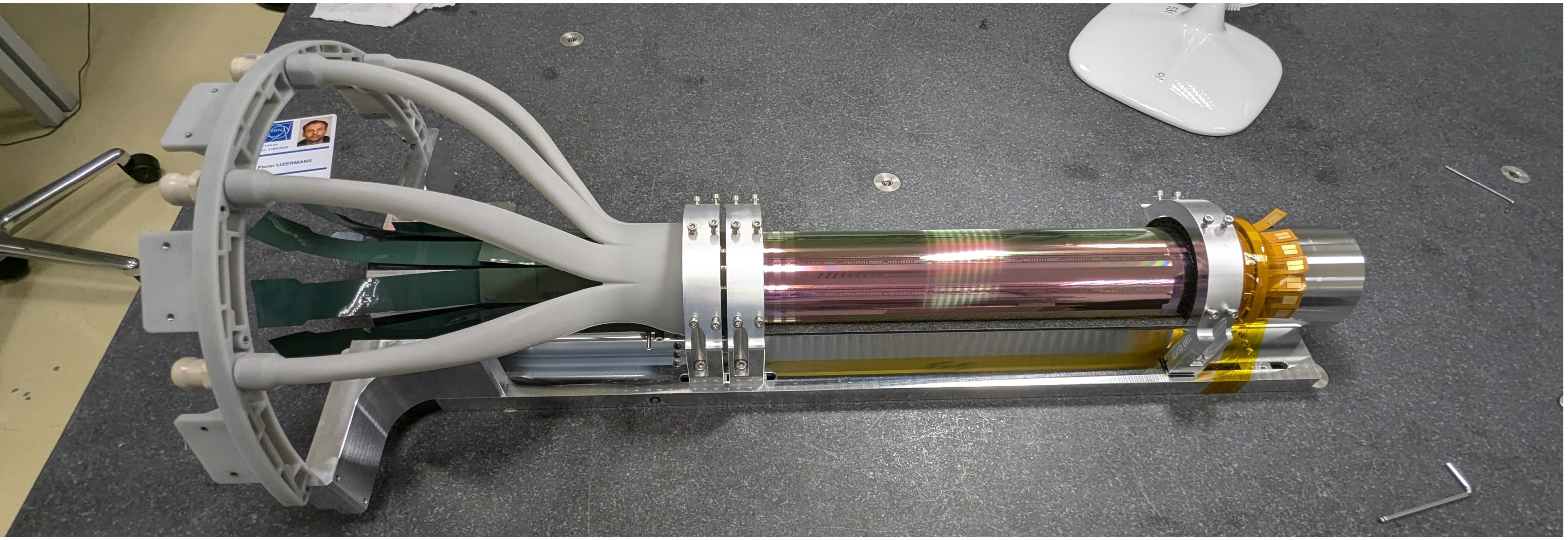
Bending of the three half-layers (from ER1 pad wafers)

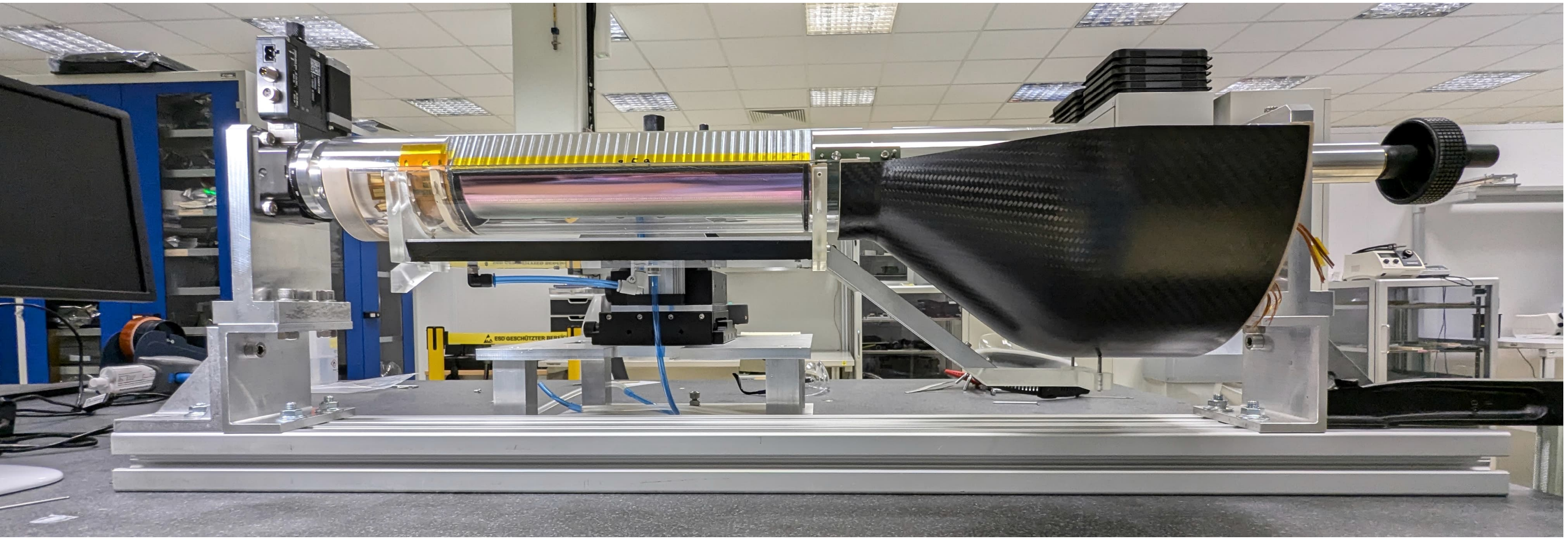


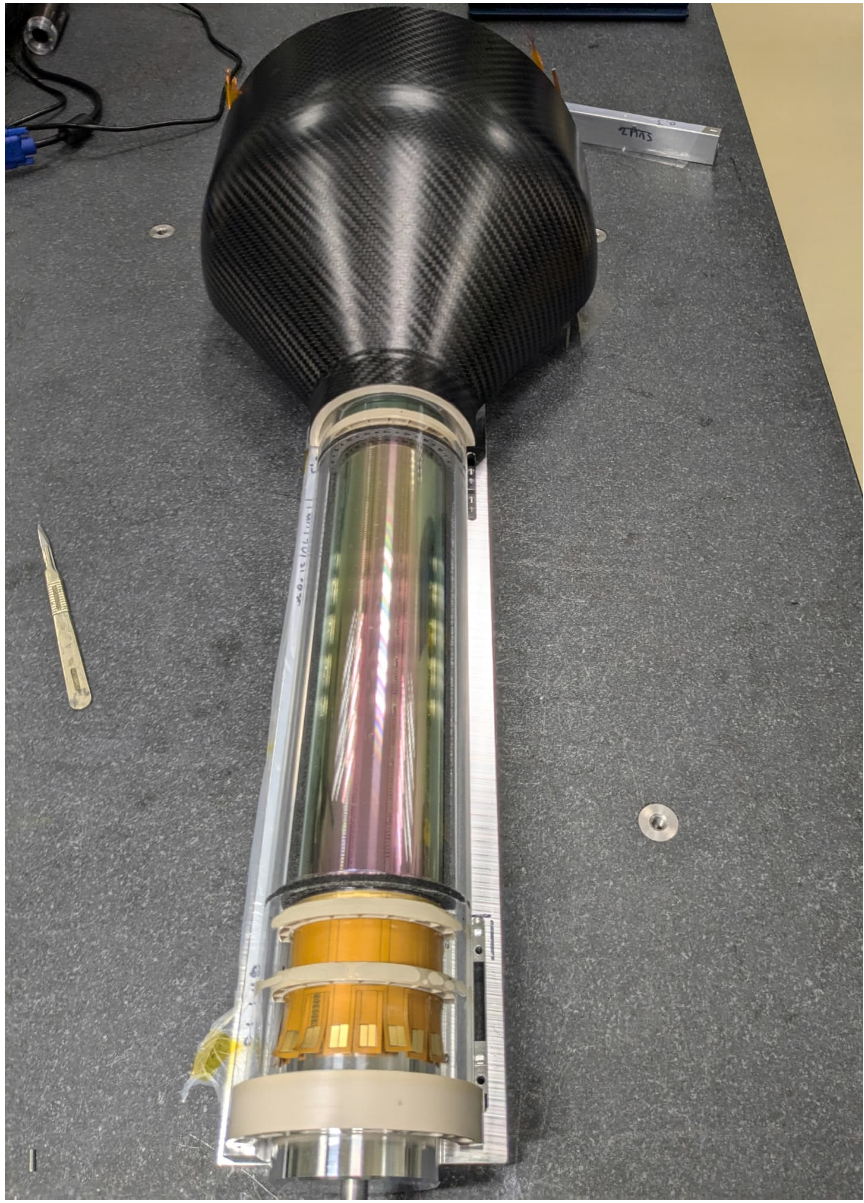
Mechanics integration

Prototypes: EM3, L2 integration

@P. Ijzermans

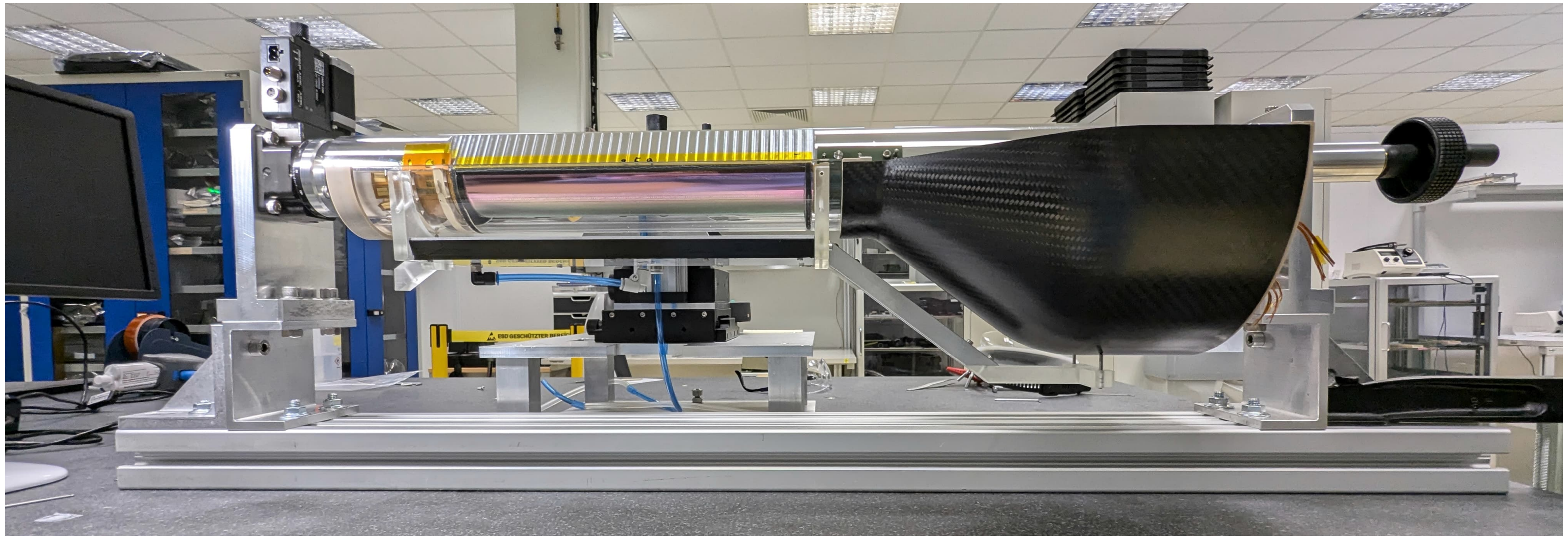






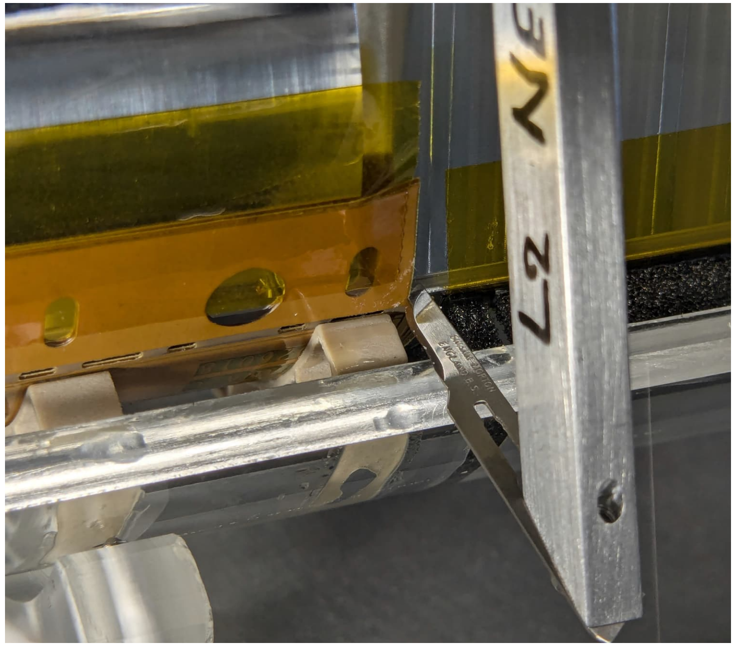
Prototypes: EM3, L2 integration

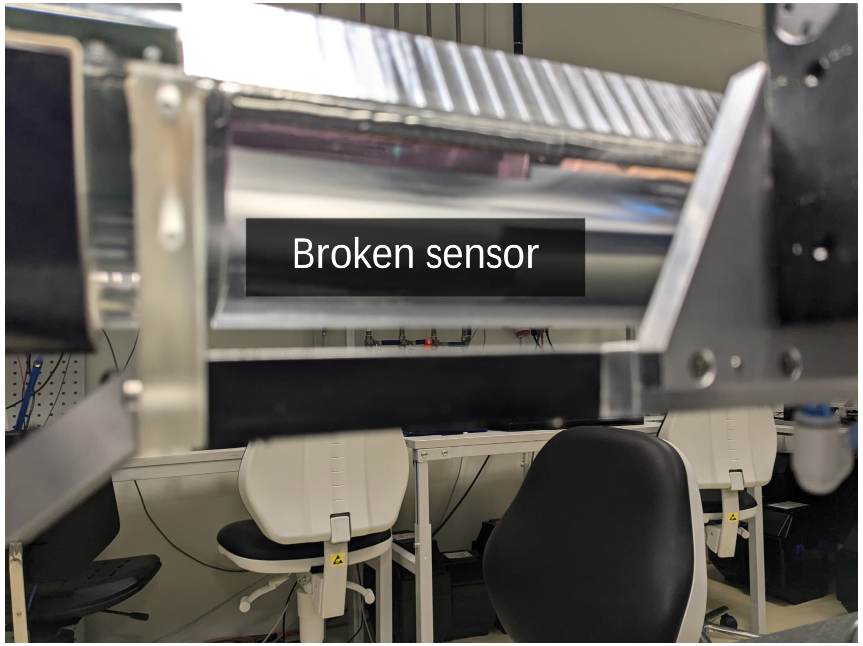
@P. Ijzermans



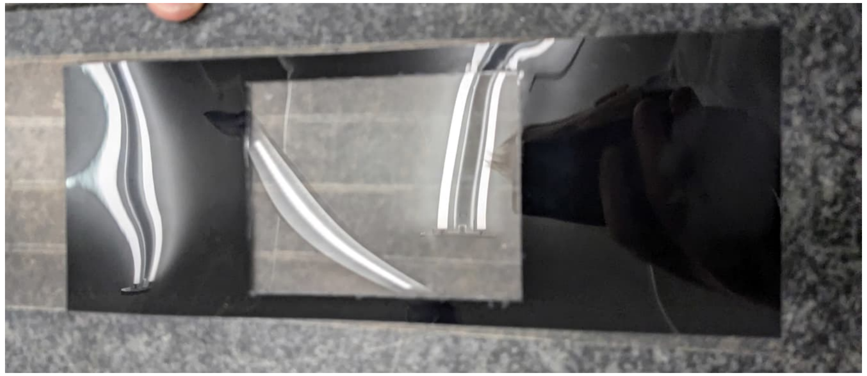
The half-layer 2 sensor broke during the final step of L2 integration into the CYSS, specifically when removing the chip from the mandrel (after cutting the Kapton tape). The failure was due to the sensor's smaller width (approximately 1 mm less) compared to the nominal size. This size difference caused part of the Kapton tape to remain stuck to the mandrel, which constrained the chip along its long edge during removal.

The assembly proceeded with a mylar-based dummy sensor.





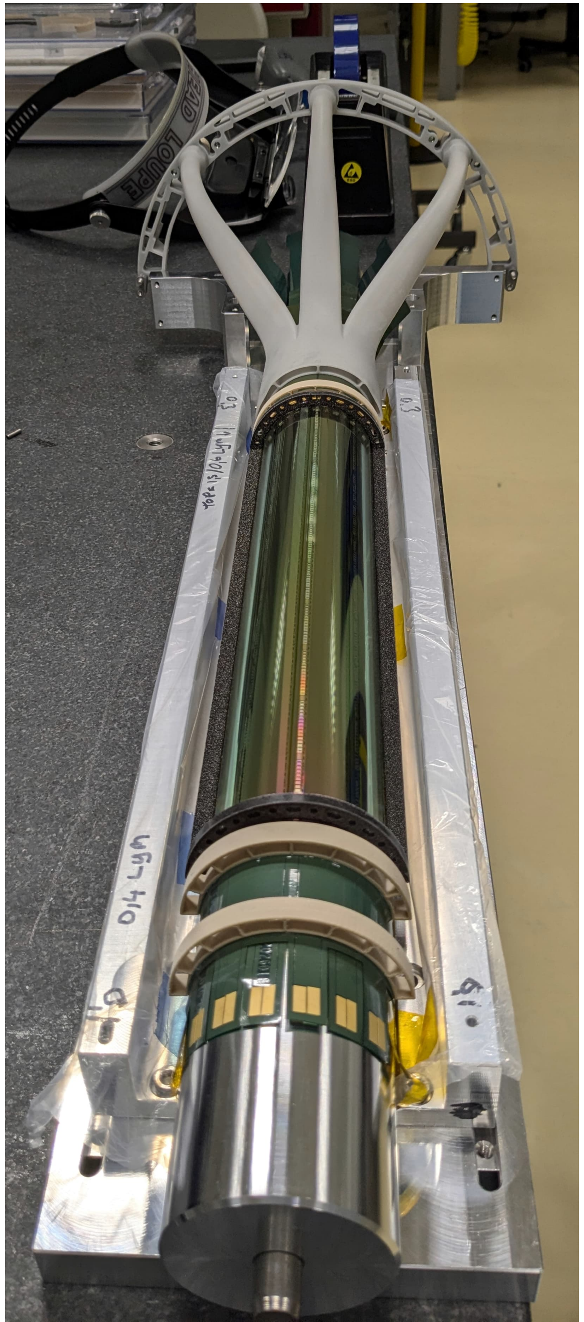
Dummy half-layer 2

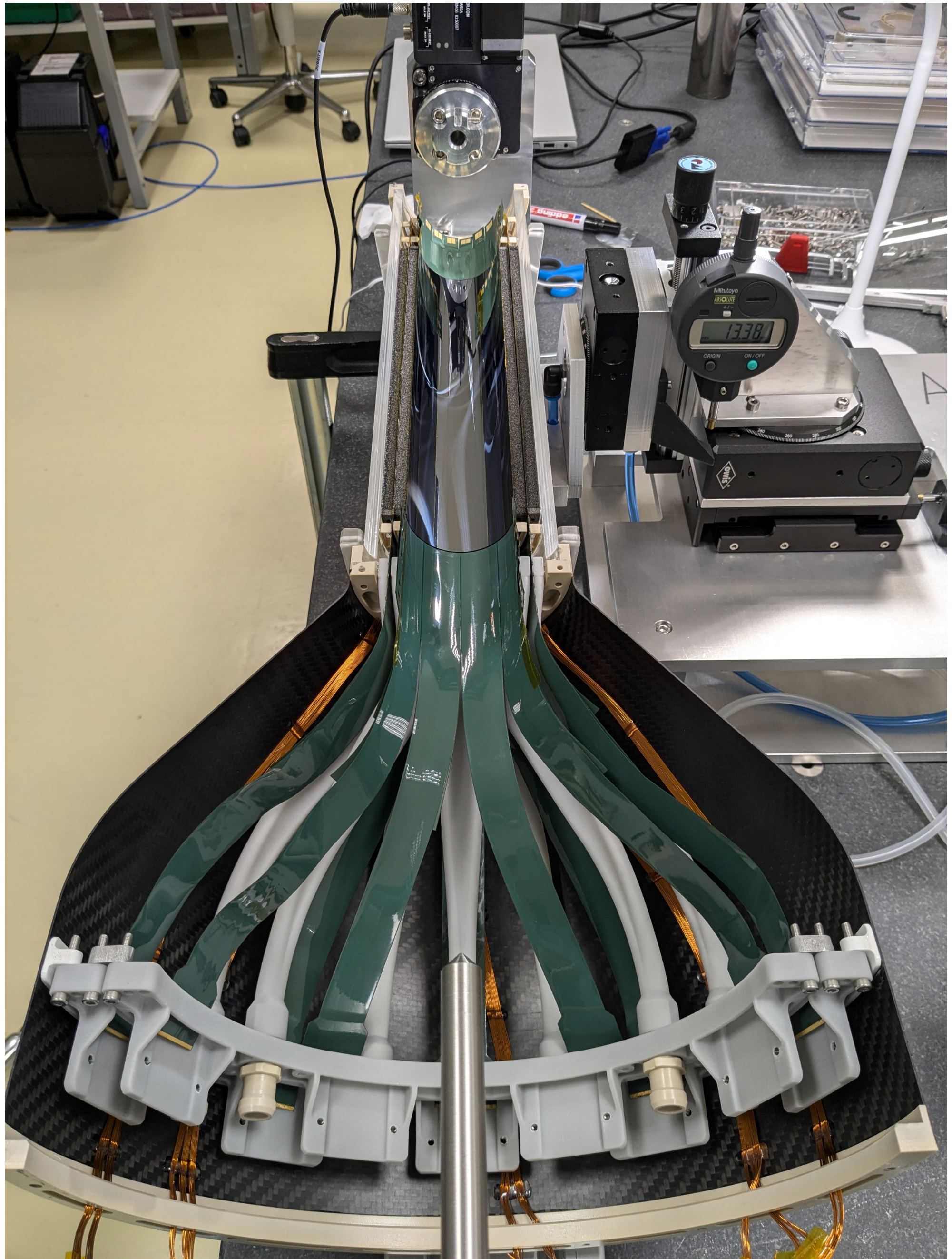


Mylar transparent foil + black thermochromic foil

Status of the new prototype: EM3, L1 integration

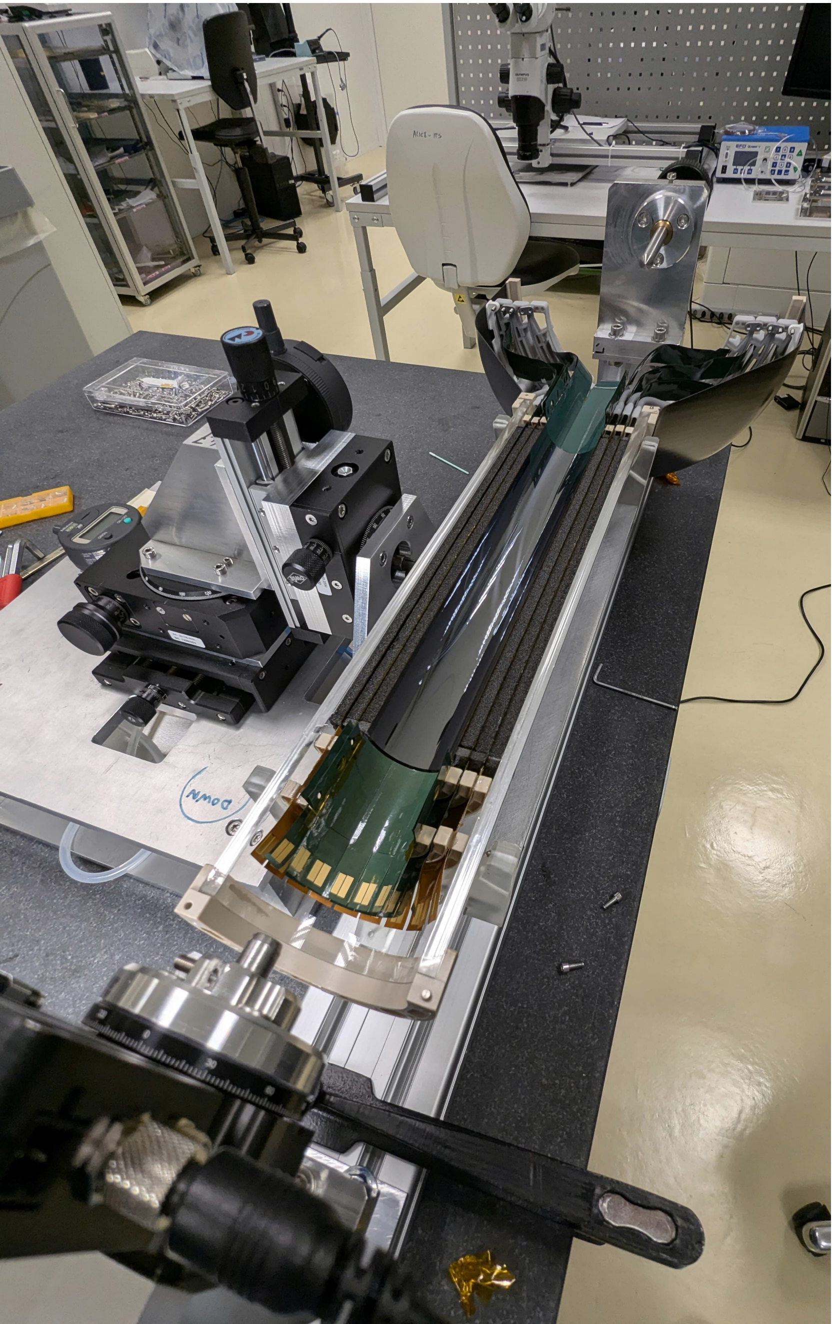
@P. Ijzermans

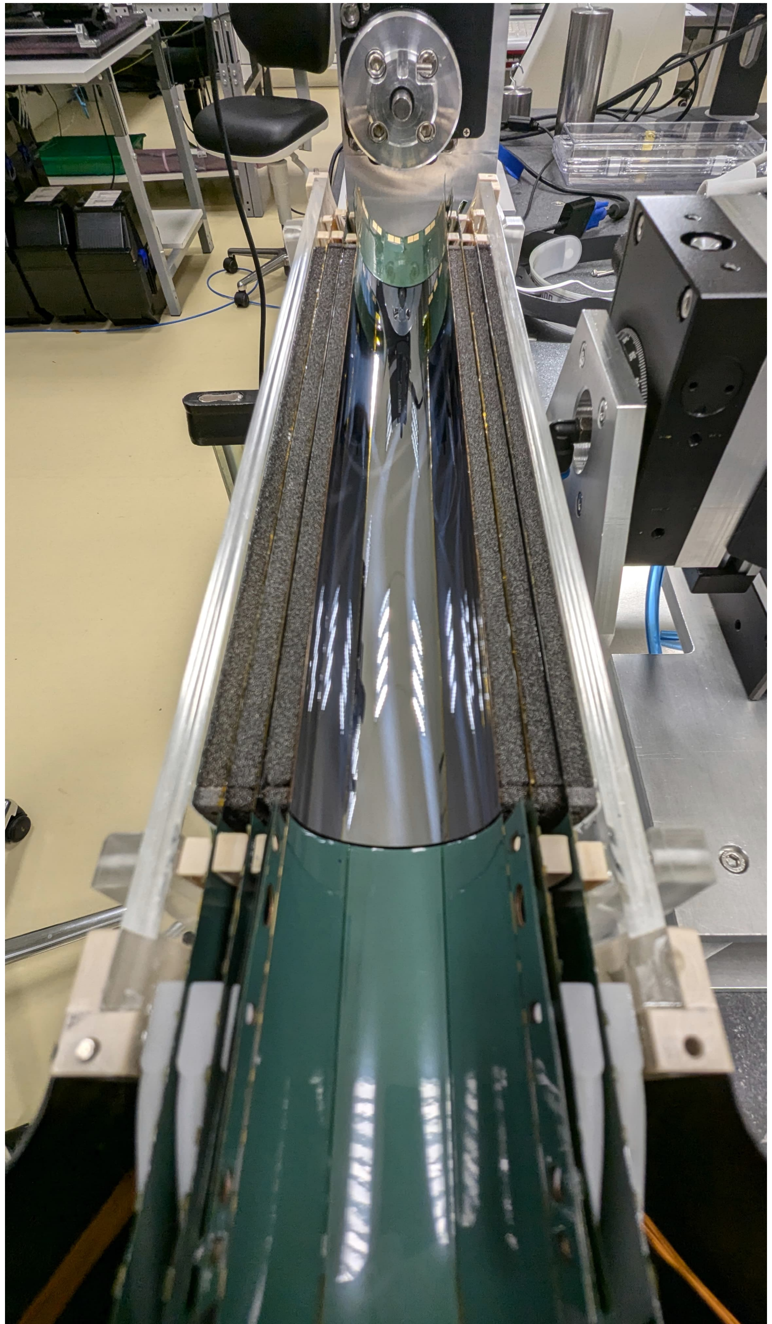




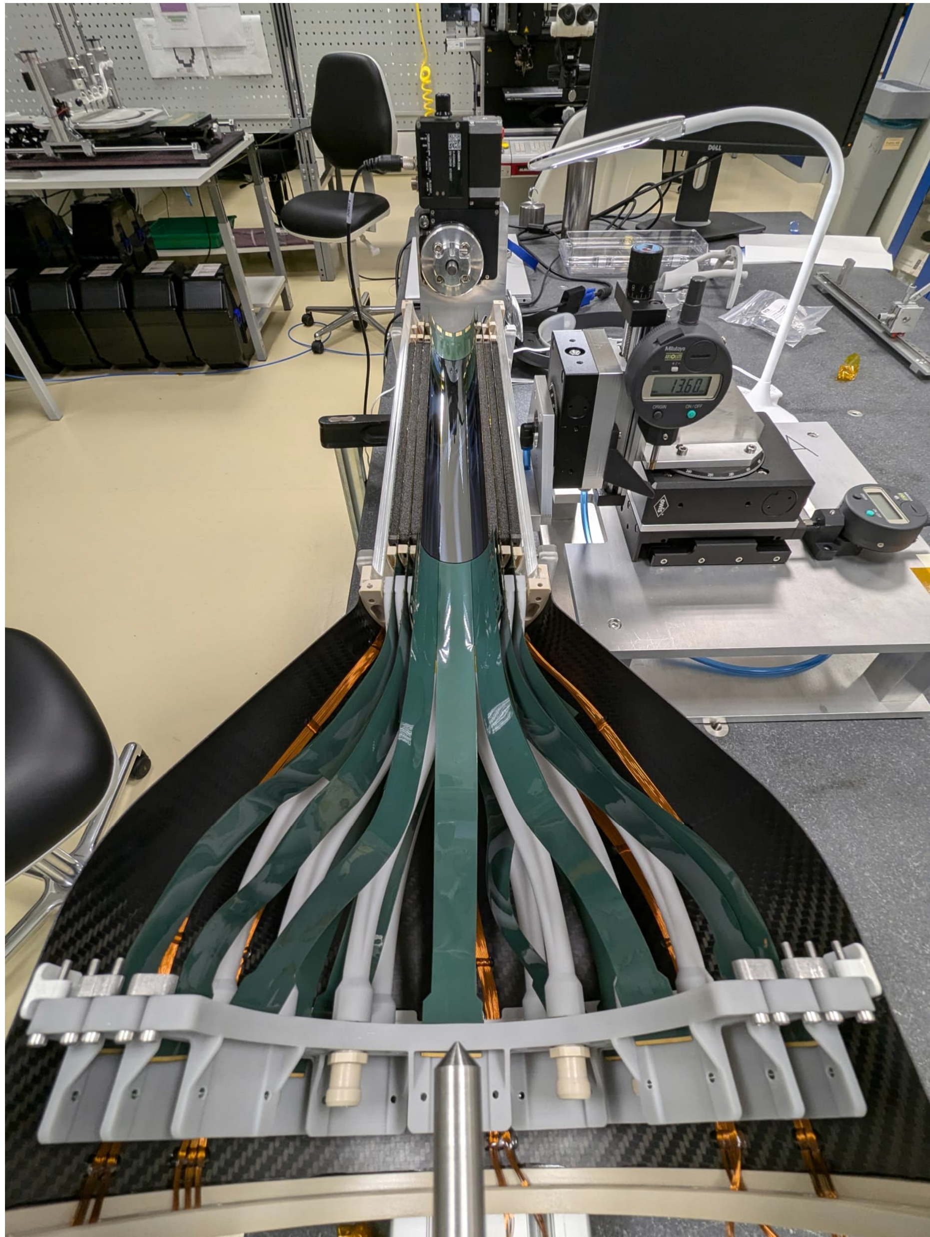
Status of the new prototype: EM3, L0 integration

ALICE ITS3 WP5





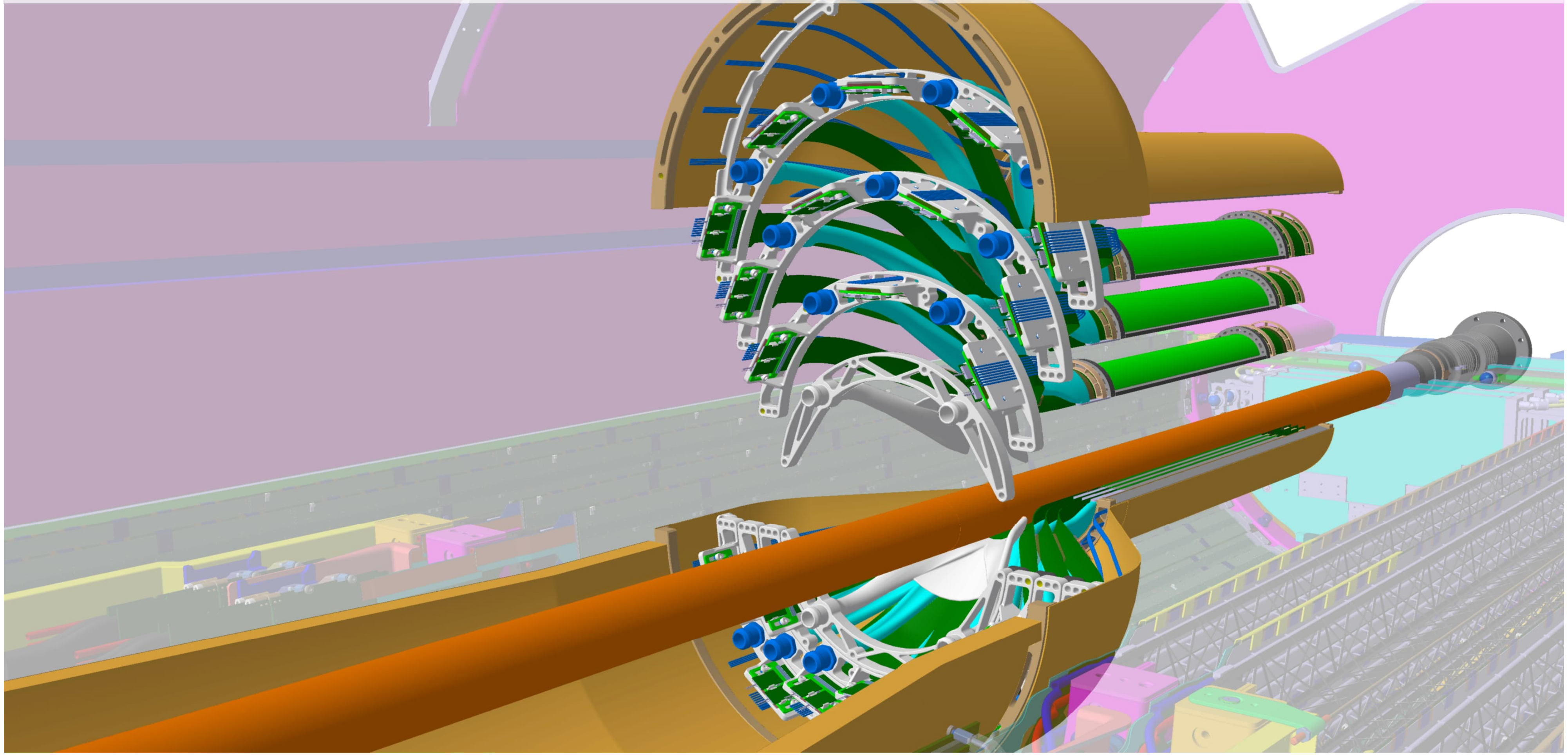
@P. Ijzermans



Prototypes: EM4 and EM5

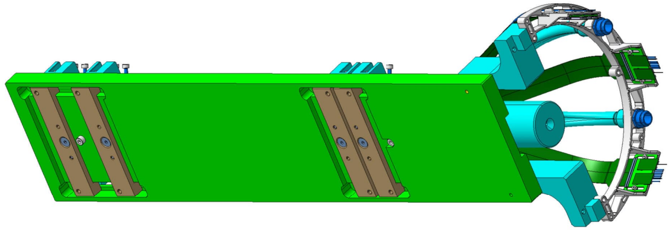
- They will validate the overall assembly procedure, including the wire-bonding step. In addition, they will be used to preliminary assess the installation procedure.
- Depending on which sensors are available at the time of assembly, these prototypes will integrate either dummy MOSAIX (from ER2 pad wafers) or dummy chips from blank wafers with Cr/Al metal deposition for wire-bonding purposes.

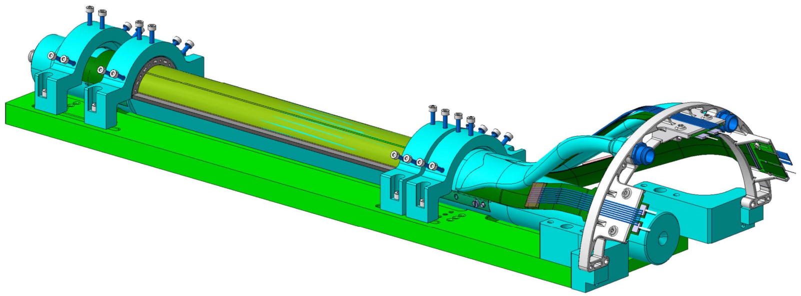
Exploded view of ITS3 around the beampipe

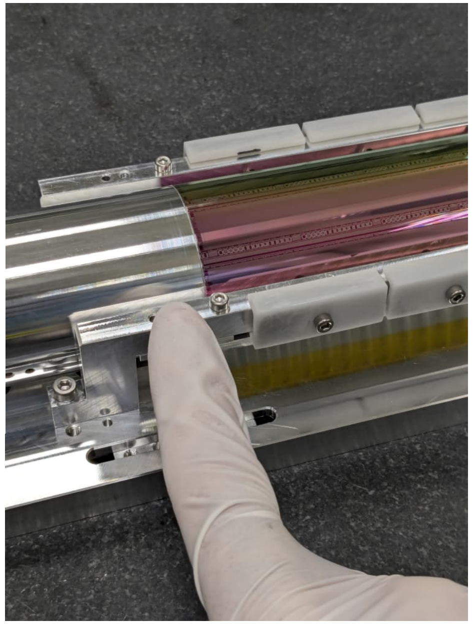


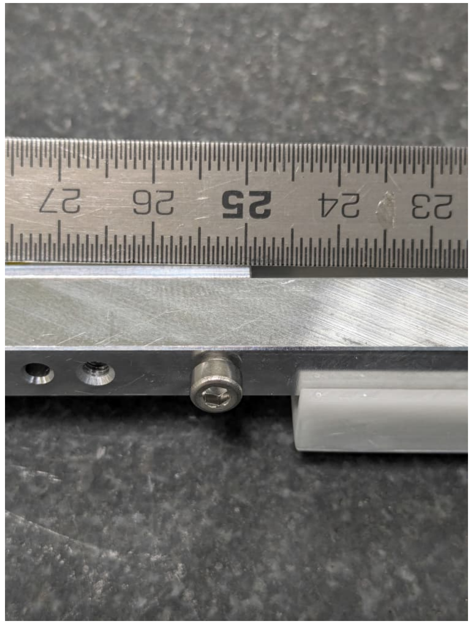
Prototypes: EM4 and EM5, assembly jigs

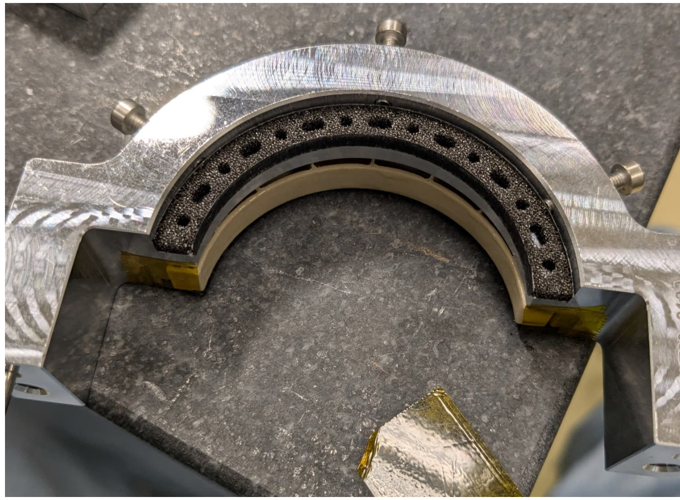
The present assembly jigs were designed to accommodate h-rings of different thicknesses (6 and 3.5 mm) and varying longeron lengths.

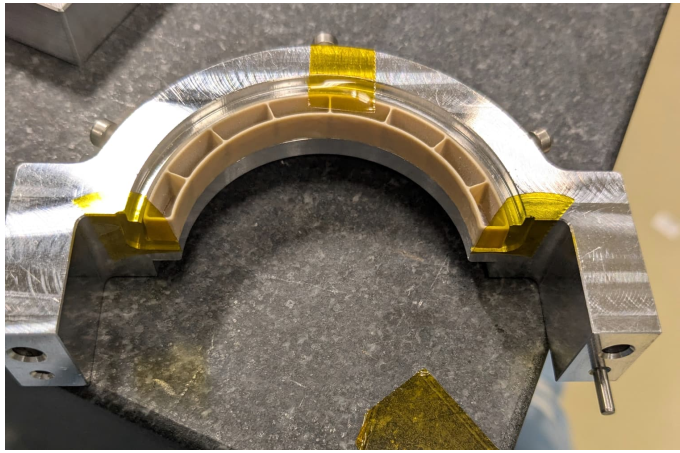












- During the assembly of the EM3, valuable experience was gained. This experience highlighted several suggestions for improving the assembly jigs, particularly regarding alignment.

- New jigs (new collars for the h-rings, baseplate for alignment), which will be used for the upcoming engineering models, are currently in the design phase (*@G. Ledey)*

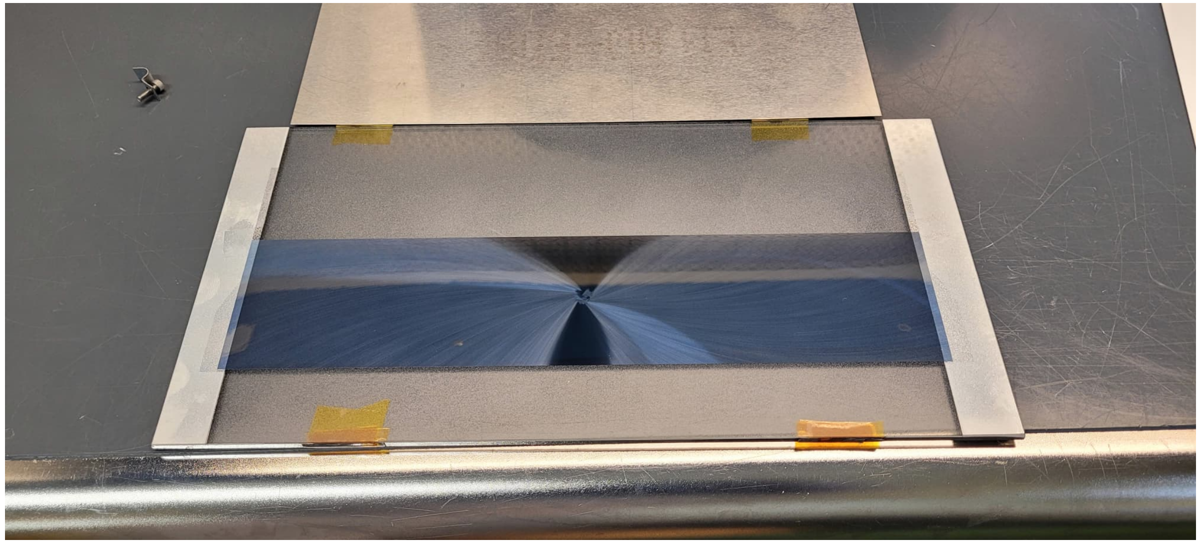
Prototypes: EM4 and EM5, dummy sensors

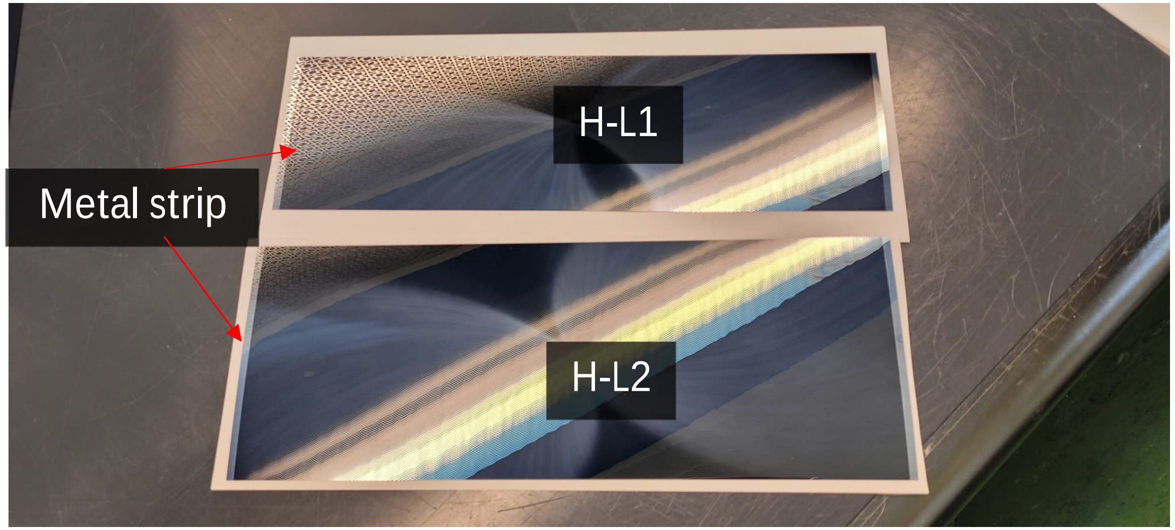
- Dummy chips from blank wafers with Cr/Al metal deposition for wire-bonding purposes.

@J. B. Van Beelen, EP-DT-TFG

EP-DT-TFG, Physical Vapour Deposition (PVD)

Done:
2x half-layer 2
2x half-layer 1
On-going
2xhalf-layer 0





FPC updates: Design

- Stack-up of the FPCs as of today

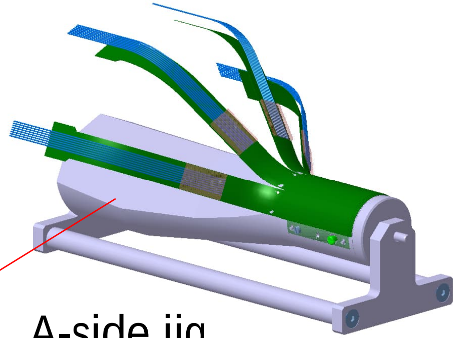
@A.Junique

- The new FPC stack-up is thicker and more rigid compared to what was initially proposed in the TDR.
- A new gluing method was necessary due to the specific rigidity of the FPC-Data.
- For the C-side FPCs, the three sub-FPCs will be glued together using an adhesive film that requires high temperature, vacuum, and pressure during the bonding process.
- Similar procedure will be followed for the A-side FPCs
- This gluing process necessitates the use of an autoclave *(@EP-DT Composite lab)*.
- For this purpose, new gluing jig mandrels were produced (@L.Mcalpine).
- PEEK H-rings (mechanics support of the FPCs) will be adapted according to FPC thicknesses *(@G. Ledey)*

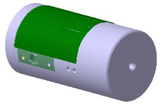
FPC updates: assembly jigs

- New jigs for FPC production for gluing/curing in autoclave.

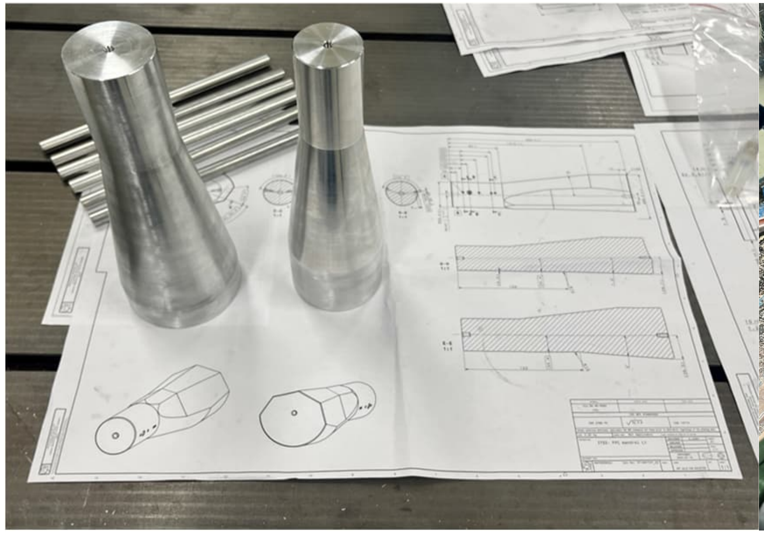
@G. Ledey, L. Mcalpine

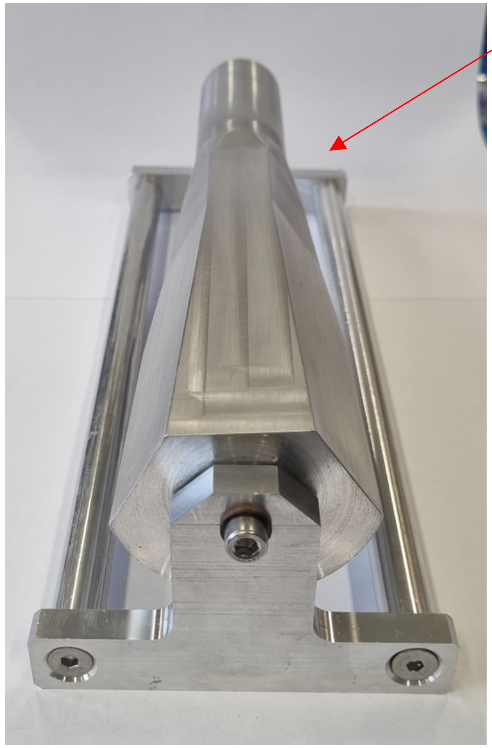


A-side jig



C-side jig





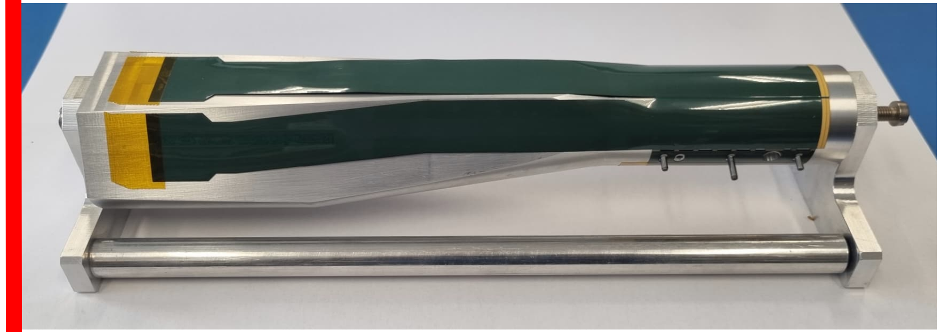
- A set of gluing jig mandrels for the assembly of the A-side FPCS was produced.
- Next: production of a set of gluing jigs for the assembly of C-side FPCs

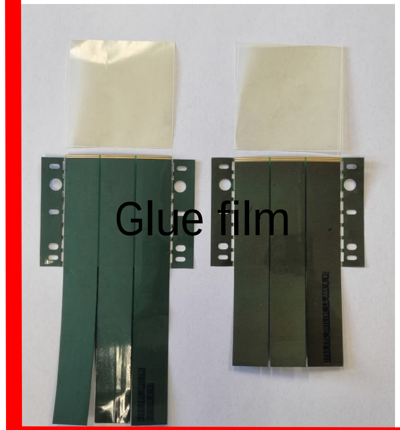
FPC updates: Assembly

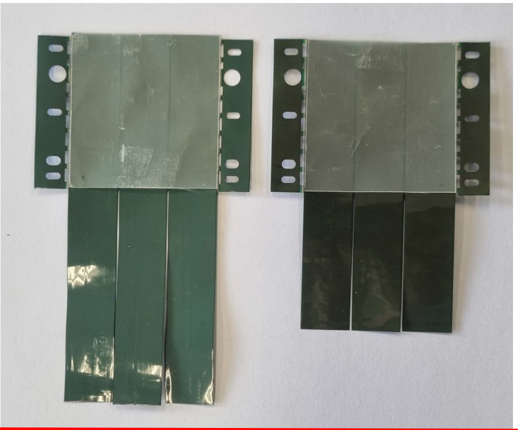
- Curing in autoclave: Validated assembly of the FPCs

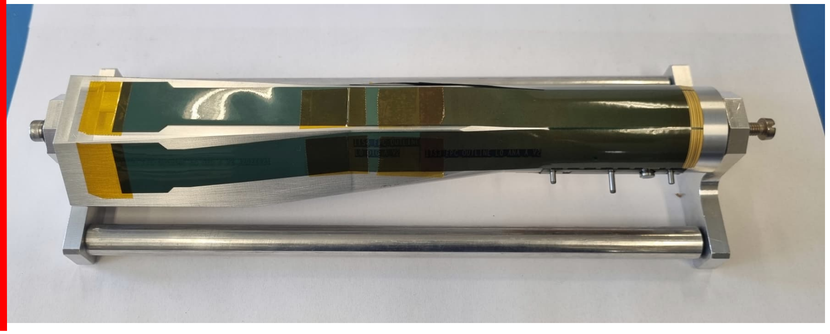
The photos below show the assembly of a Dummy C-side FPC

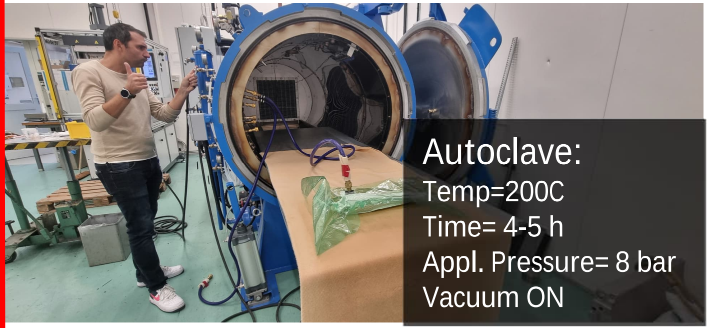
@A.Junique, EP-DT Composite Lab











FPC updates: Assembly

- C-Side FPC (L0) with nominal stack-up (total thickness 790 um) was produced.

@A.Junique, EP-DT Composite Lab

Next: Production of a C-Side FPC (L2) with nominal stack-up.