

HalfRing loading and e-connecting

OEC Integration Workshop in Frascati

31Jan - 2 Feb 2024 , Salvini Room (LNF)

R. Assiro, G. Chiodini, M.R. Coluccia, P. Creti, S. Maggiore, A. Miccoli, A. Pellegrino and
G. Rizzo

INFN LECCE

A. Palazzo, C. Pinto and S. Spagnolo

INFN LECCE - Unisalento

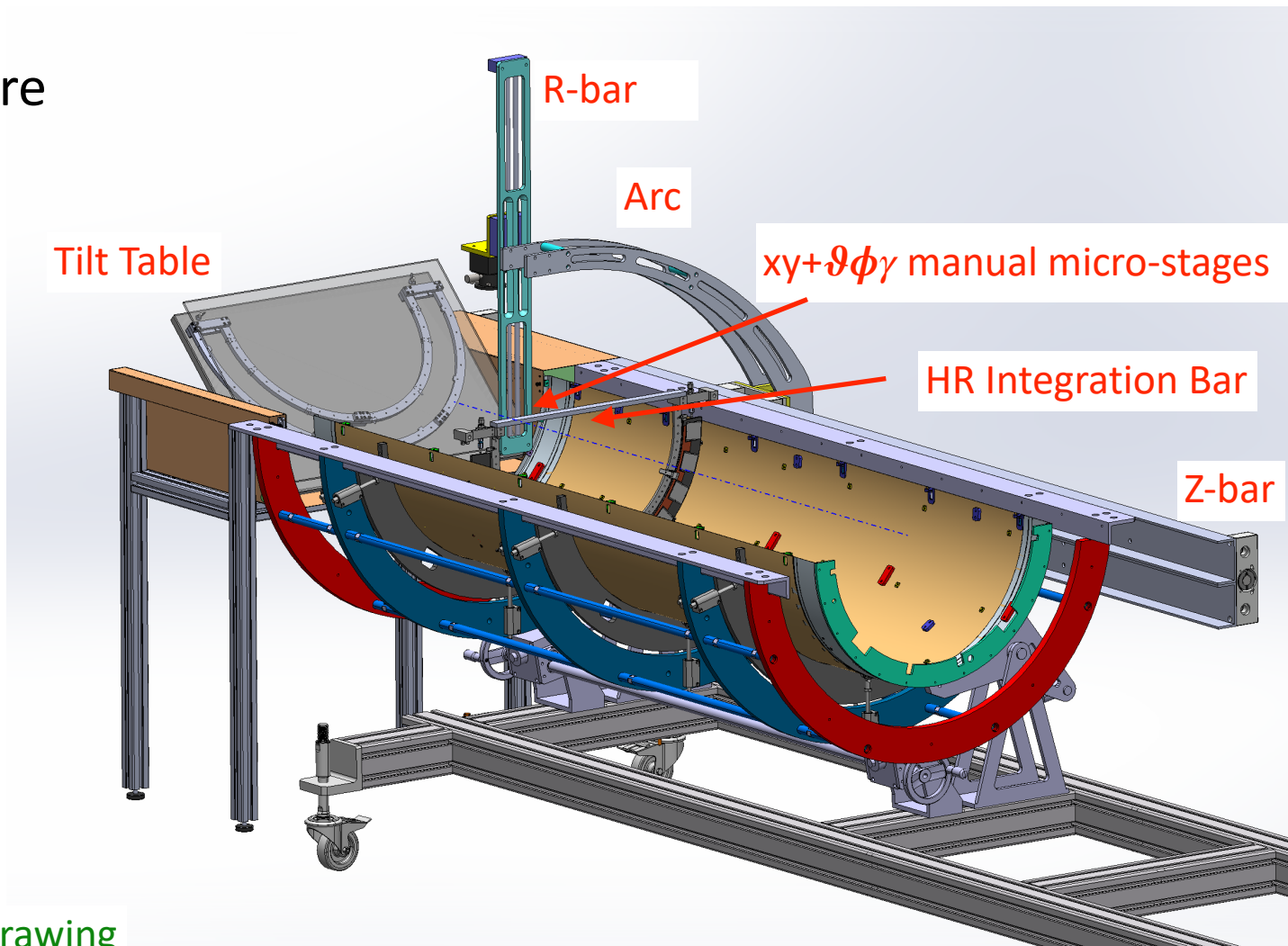


Overview

- HR integration at LNF
- Tilted table for integration tool
- HR preparation steps before integration
- Loaded HR WB protection and PP0s support
- E-connectors insertion

HR integration tool

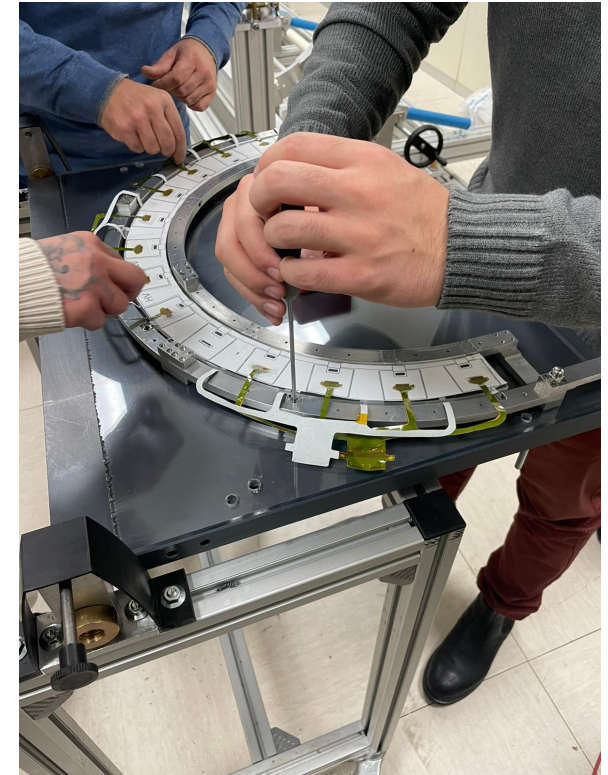
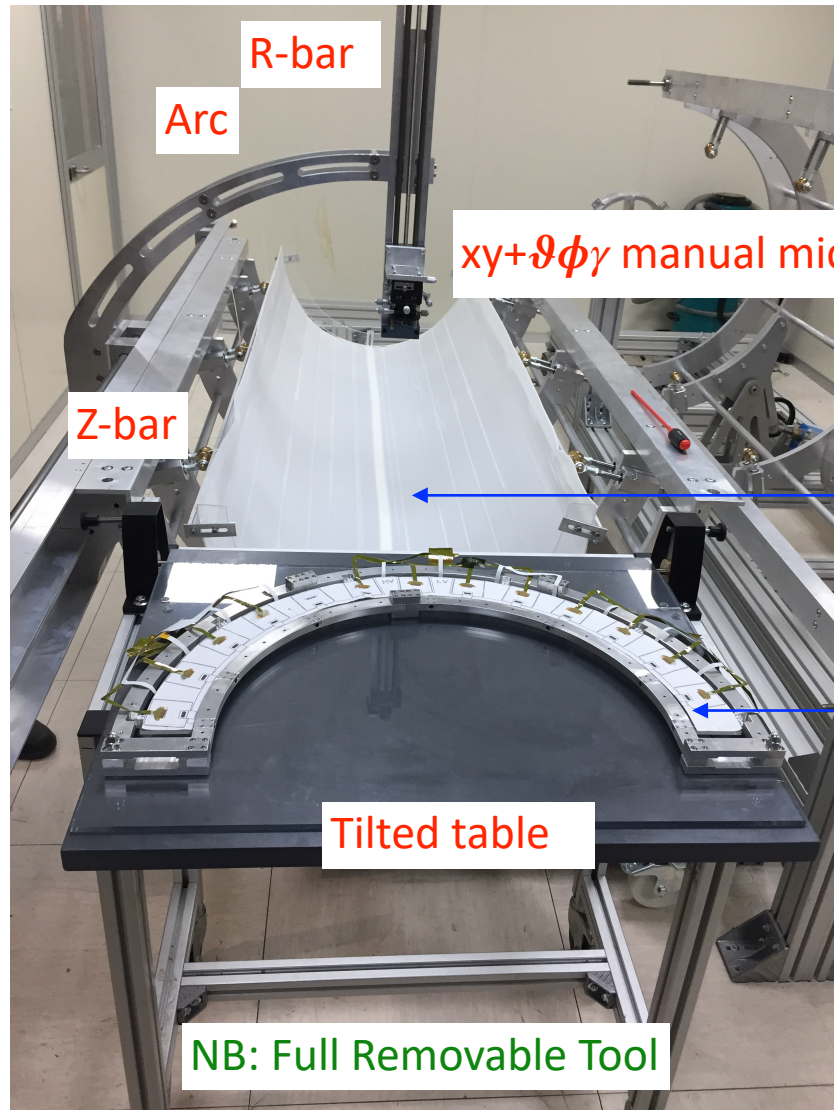
A. Miccoli
S. Maggiore
G. Rizzo



Old drawing

HR integration tests at LNF

HS Integration tool positioned for the HR integration at LNF with HR insertion tool



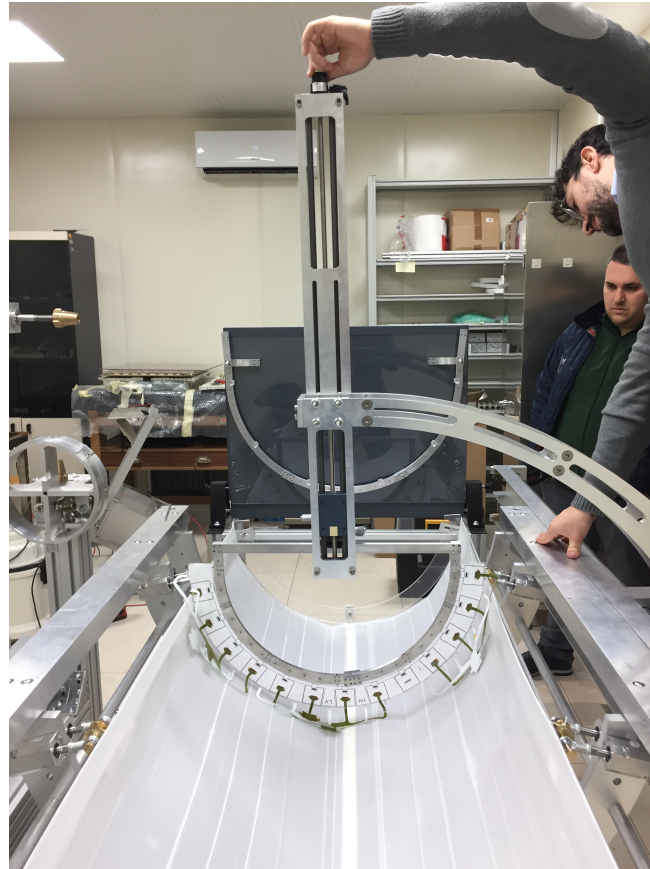
Preliminary integration tests done with realistic dummy HR

What we learned

Tilted table to be fixed to the Z-axis to improve overall oscillations



PP0s dangling around very dangerous for alignment and WB integrity



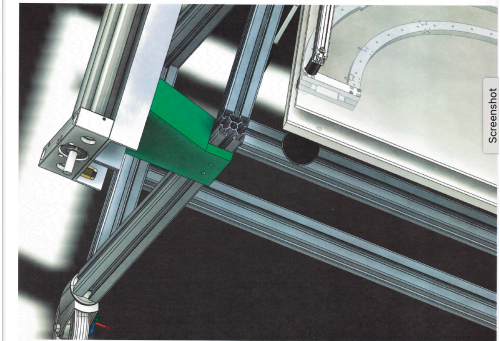
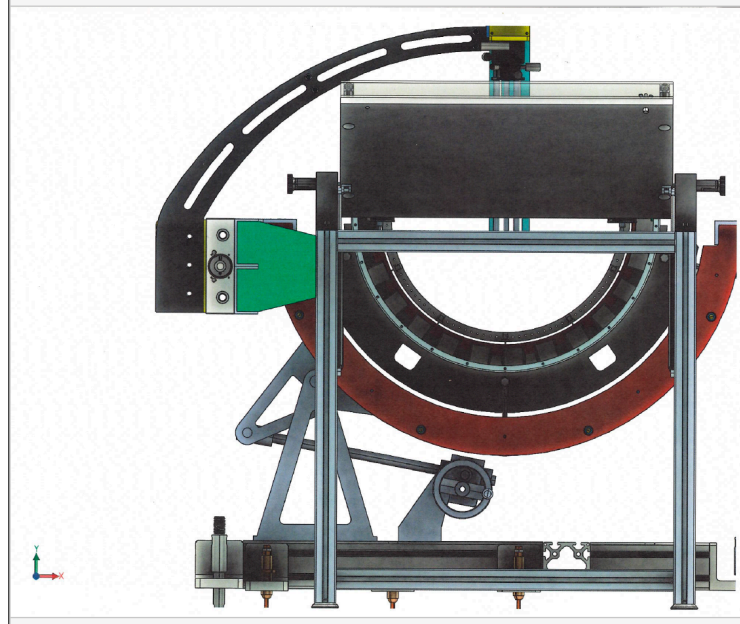
Clearance between HR for e-connections not that bad



Tilt table for HR preparation

Tilt table revised

Fixing piece to anchor tilt table to Z axis designed and under construction.

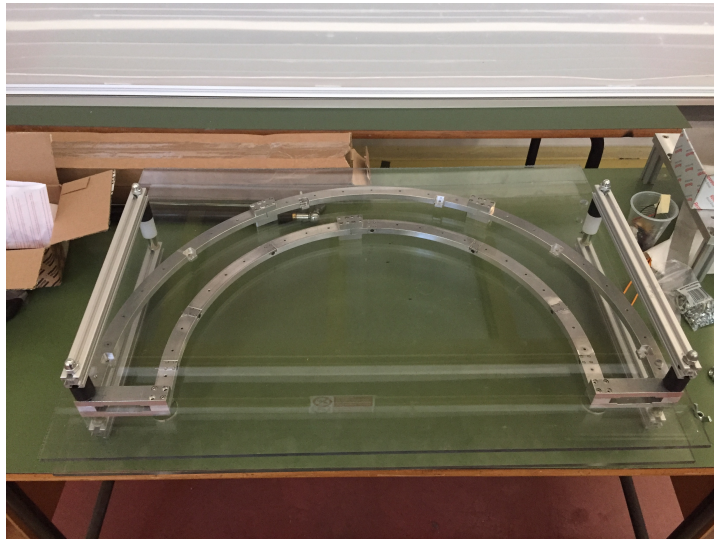


How loaded HR are handled in UK?
Anyway, easy to adapt.

HR preparation steps for integration on HS

HR positioned on tilted table (tilted table should be attached to the HR Integration tool)

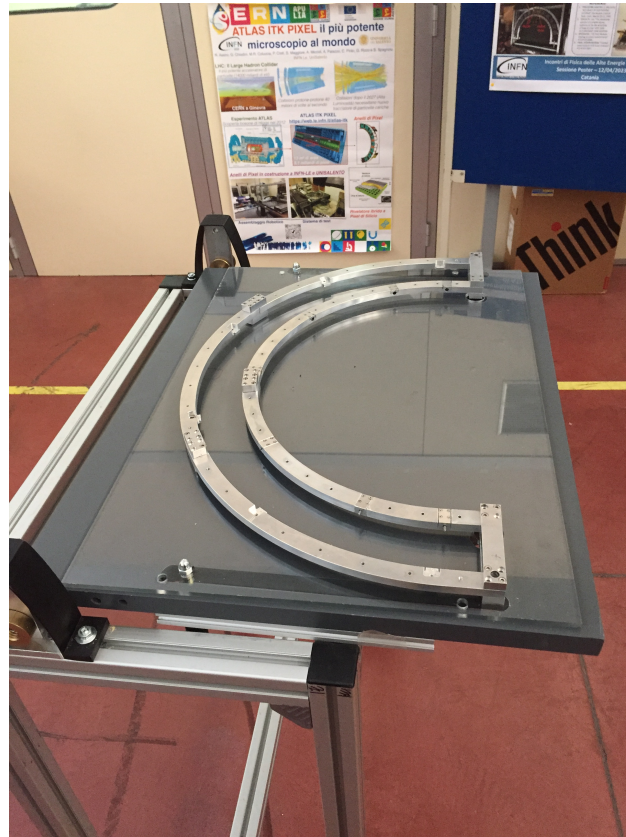
HR after reception test
(HR+PPOs here missing)



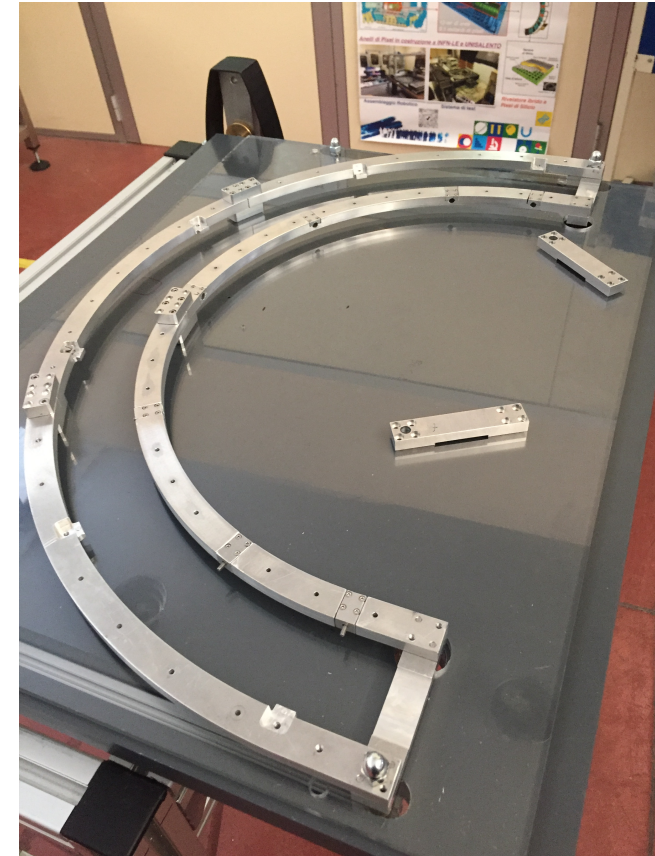
NB) All operations shown are not more difficult when tilted table fixed to HR integration tool

HR preparation steps for integration on HS

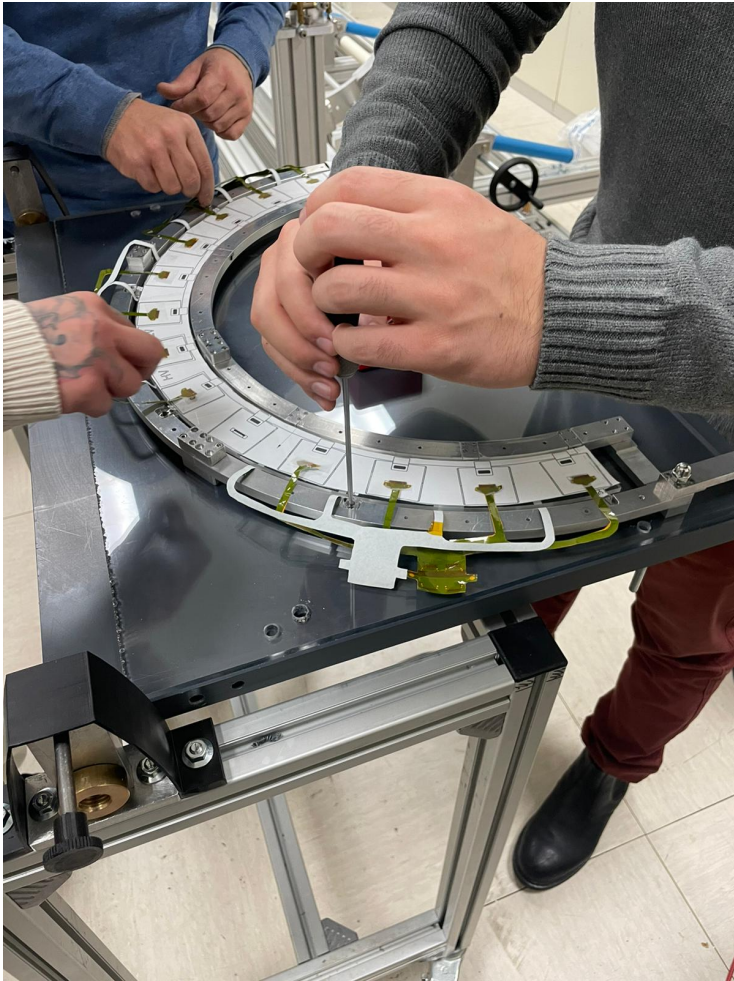
Remove upper handles and perplex plate



Remove upper HR End Pieces and fix HF outer arcs using its two M8 holes



HR preparation steps for integration on HS



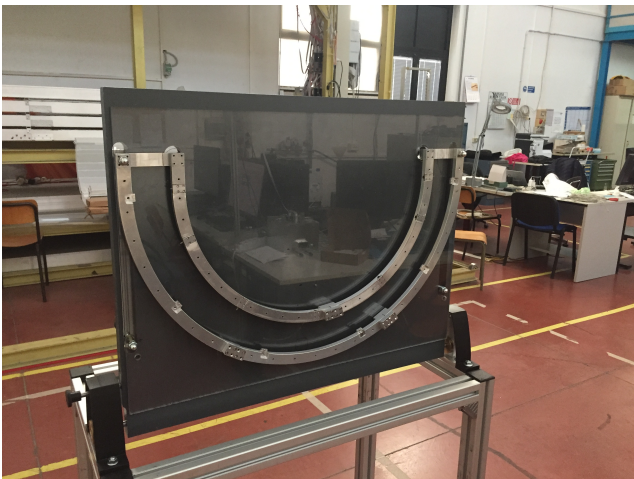
Remove lug clumps from HF outer arcs and free HR from HF outer arcs.

NB:

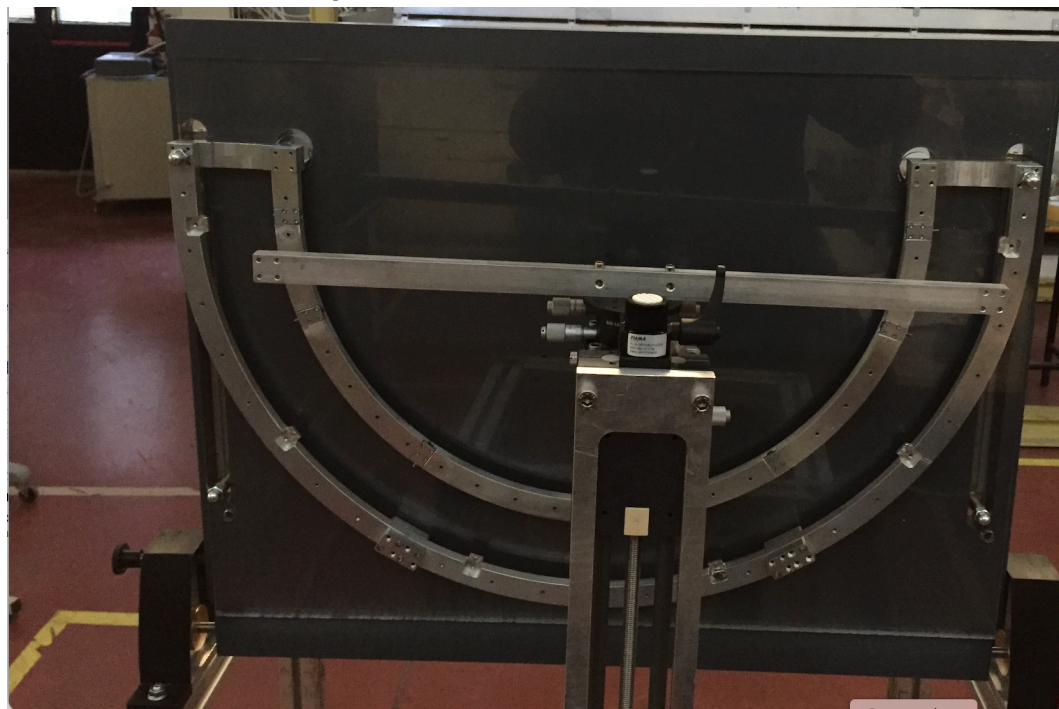
- HF inner arcs attached only by HF lower End Pieces to HF outer arcs
- HR attached to HF inner arcs only by captive screws
- PPOs support (see next slides) likely still attached to HR outer arcs

HR preparation steps for integration on HS

Position HF vertically



Fix HR inner arcs on integration tool by the horizontal bar



Air bellows to be mounted

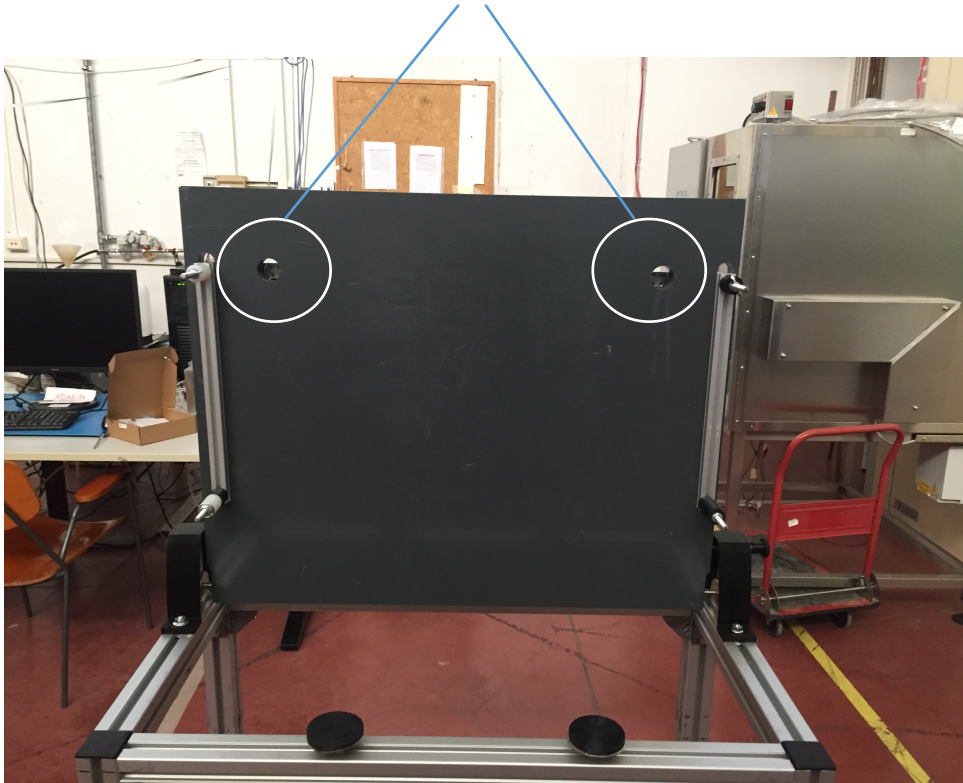


Mechanical Stops with handle and spring

At this stage Fix HR inner arcs on integration tool by the horizontal bar

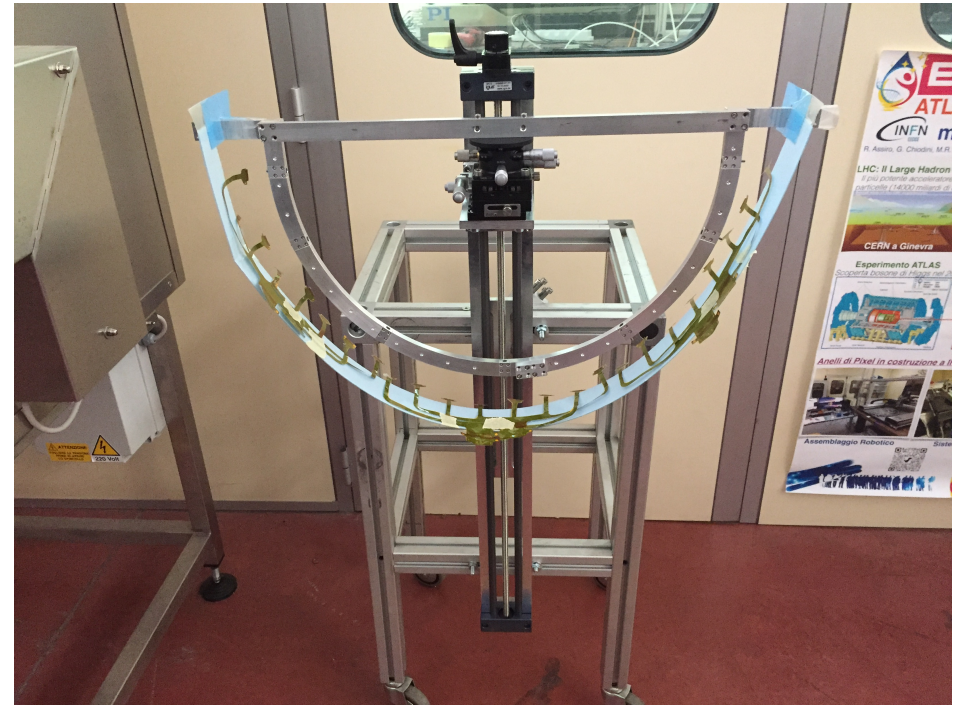
HR preparation steps for integration on HS

Free HR inner arcs from lower HR End Pieces from the back



Needed corresponding holes also in the lower perplex plane of HR support with closing corks.

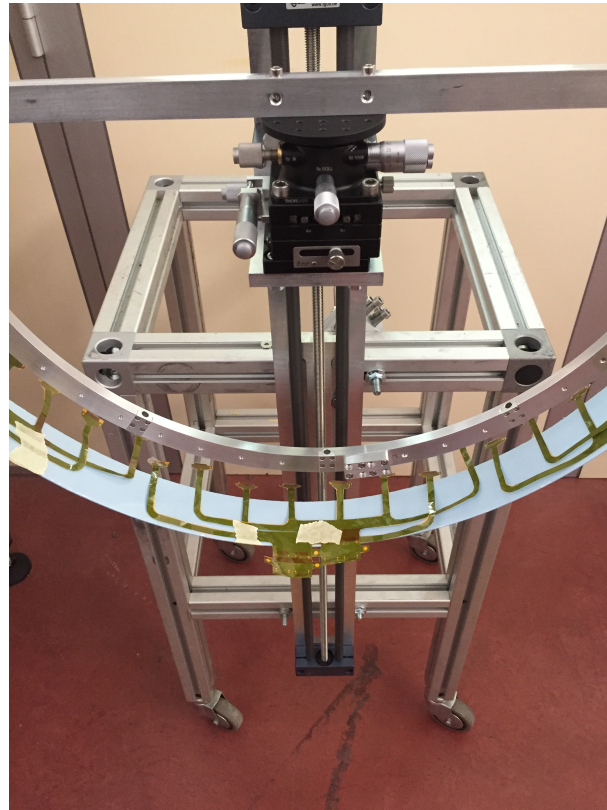
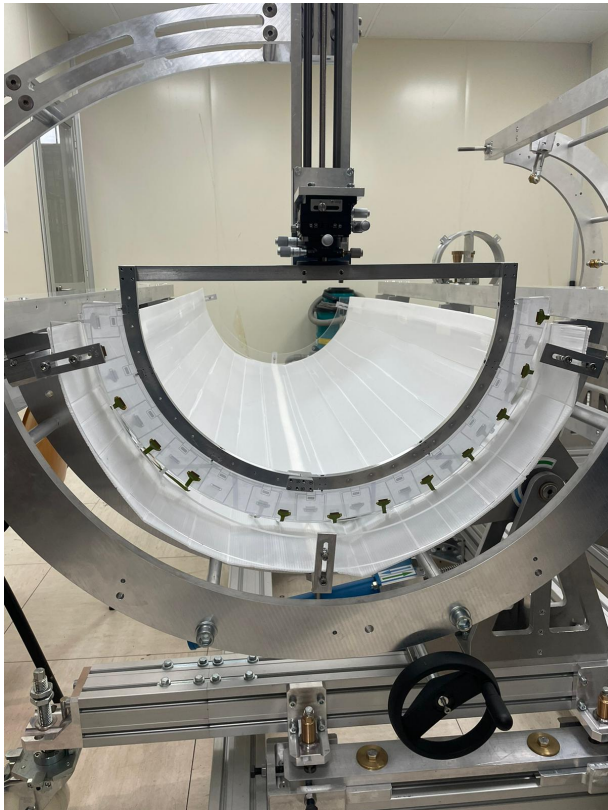
HR inner arcs on integration tool with dummy PPOs and dummy PPOs support (not discussed and showed up to now)



PPOs support must mimic the shell for safety

HR preparation steps for integration on HS

$xy+\partial\phi\gamma$ manual micro-stages flipped up: It is the correct working position and more intuitive movements.



Addition frame needed to position the horizontal bar 10 cm below the micro-stages to avoid clashing with tilted table during HR pick-up.

Wire bonding protection on loaded HR

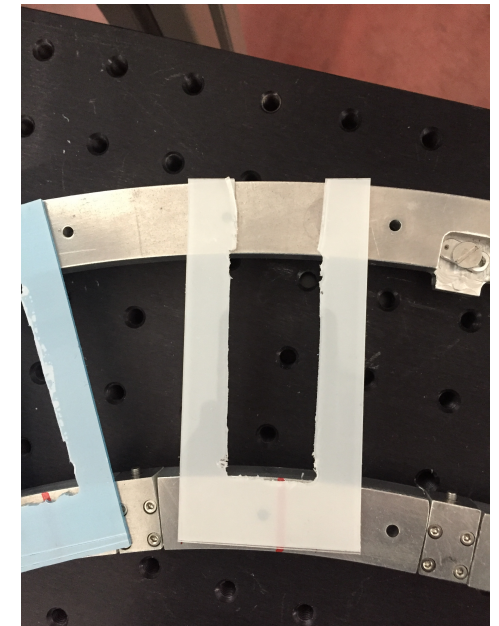
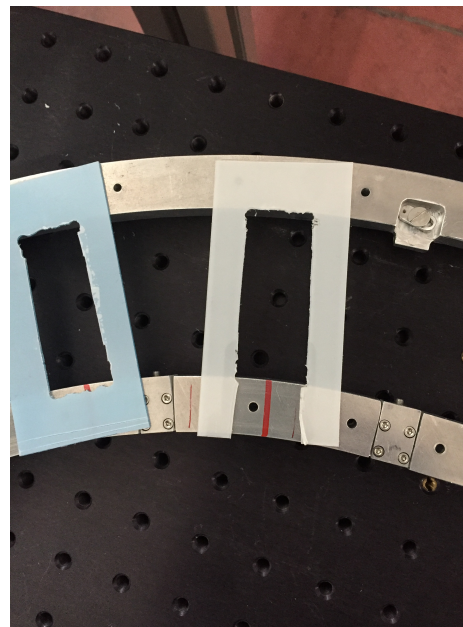
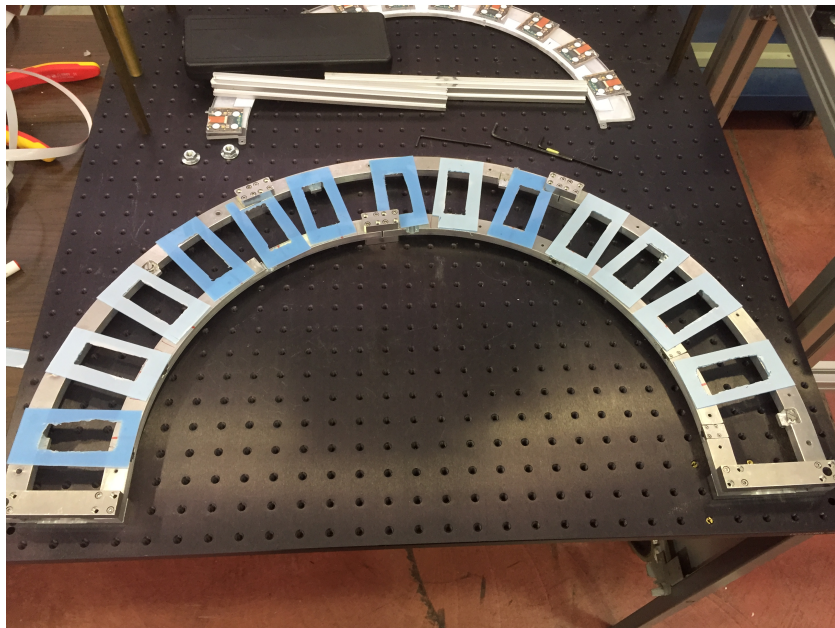
When a quad module is loaded on the HR a Wire Bonding protection frame (WBPF) is screwed on HF.

Three types of WBPF could be designed:

- O-shape
- U-shape up or down

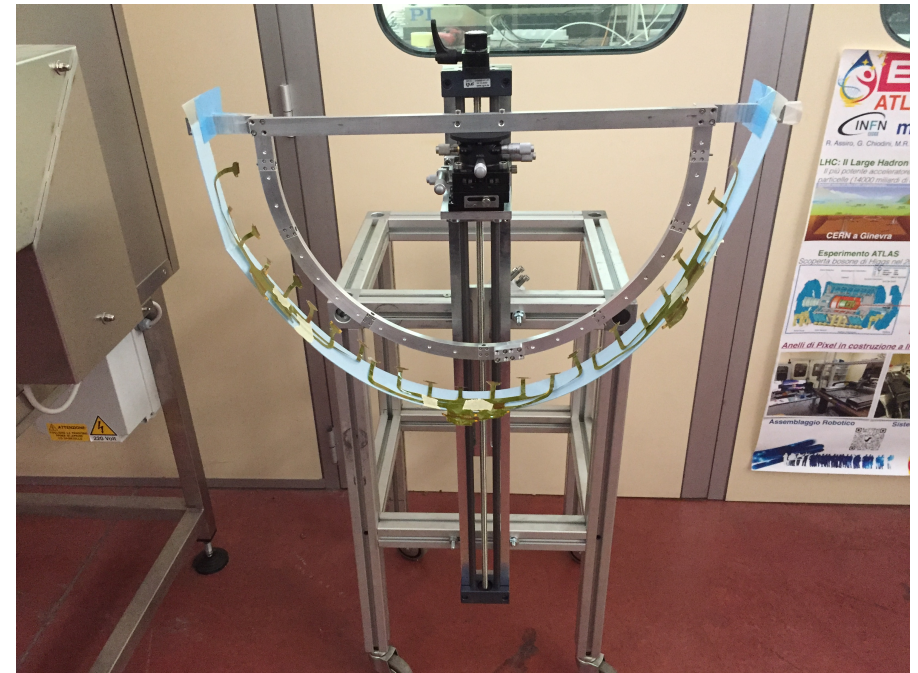
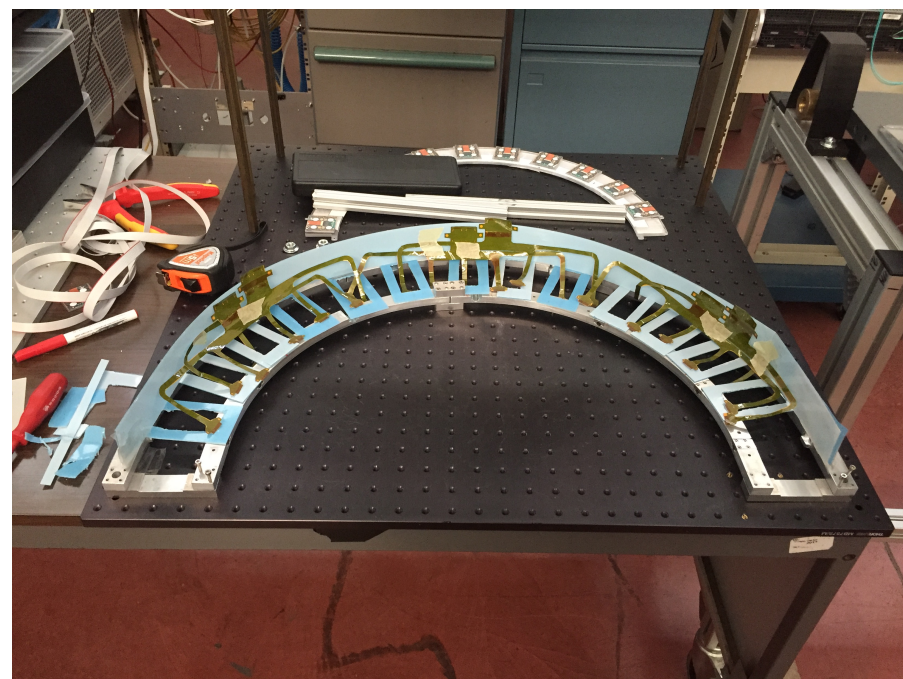
With the following requirements:

- Compatible with power pig tail soldering
- To be removable after PPOs dressing



PP0s support on loaded HR

PP0s support must mimic the shell for safety



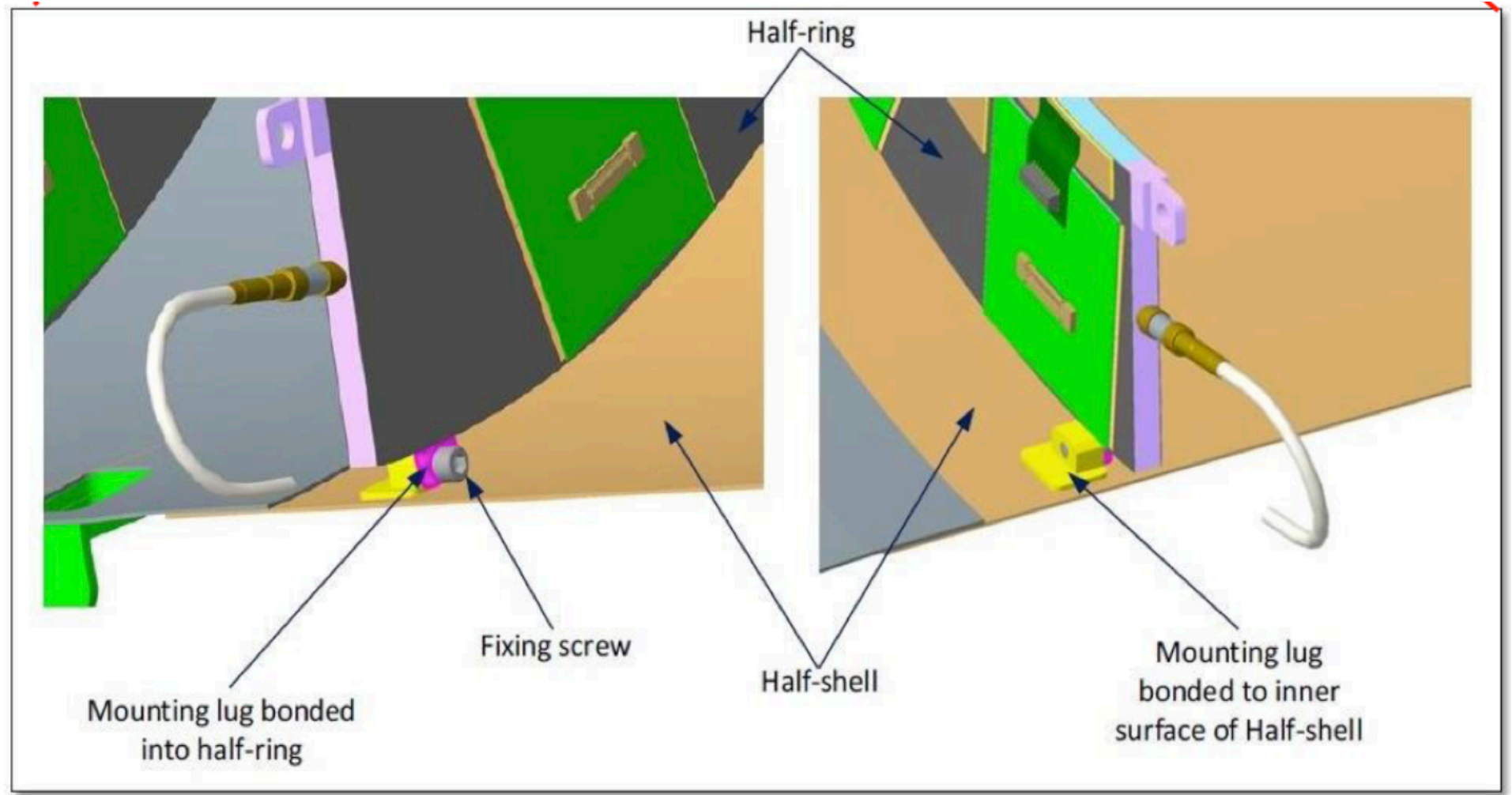
Should follow the loaded HR for testing, transport and insertion in the HS

Conclusions

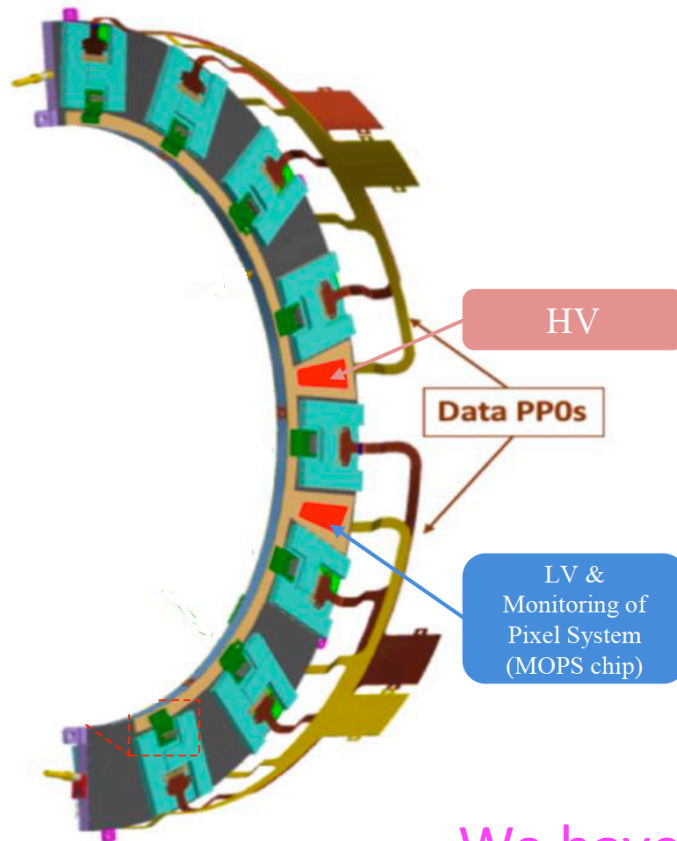
1. A complete Half Ring installation sequence is defined.
2. The HR integration tool prototype is almost finalised.
3. Tilt table prototype basically finished
4. Still to be defined how to realise the PPOs support and its fixing on HF and Horizontal bar (**work in progress**)

Back-up

HR mechanical fixing



HR Data PP0, SP, HV and MOPS connections



The PP0 flex is installed on the HR before integration and it is secured to the handling frame outer arc.

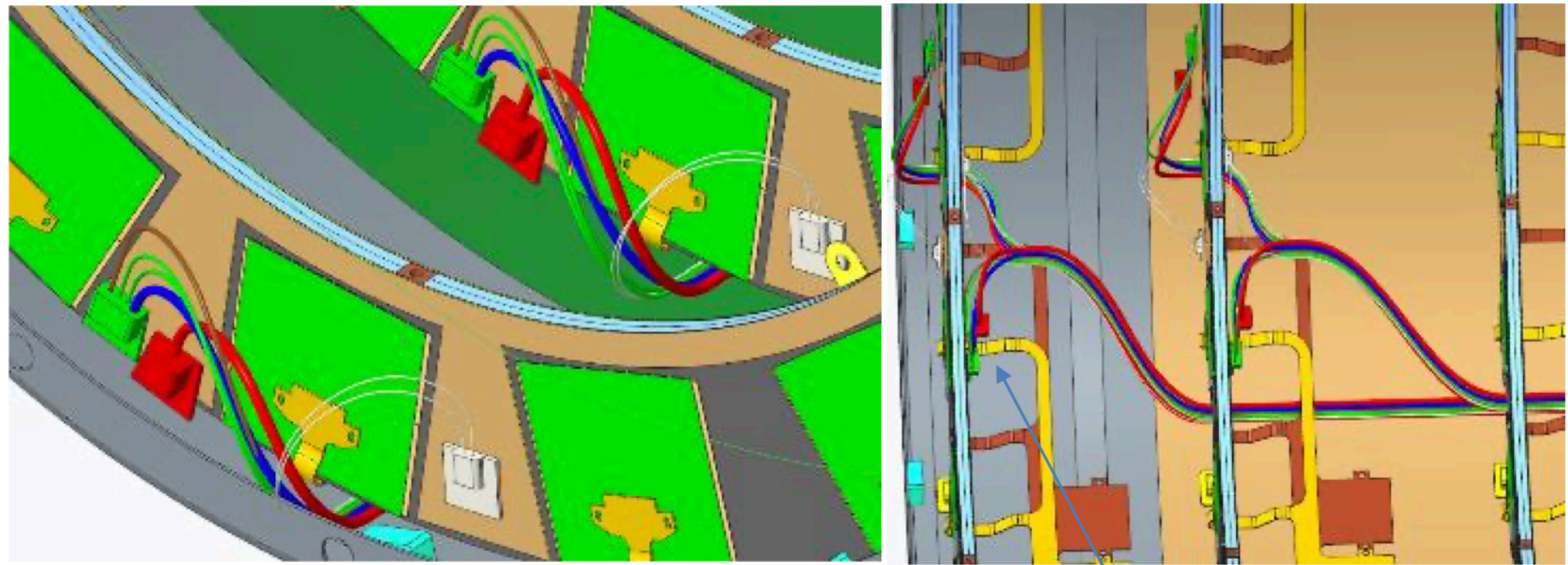
The PP0 flex is secured to the Integration Bar during integration (if needed).

The PP0 flex in the half shell is secured to the carbon support ring and the data cables (Firefly) are connected.

We have to establish how easy it is to plug in PP0
See back-up slide 24

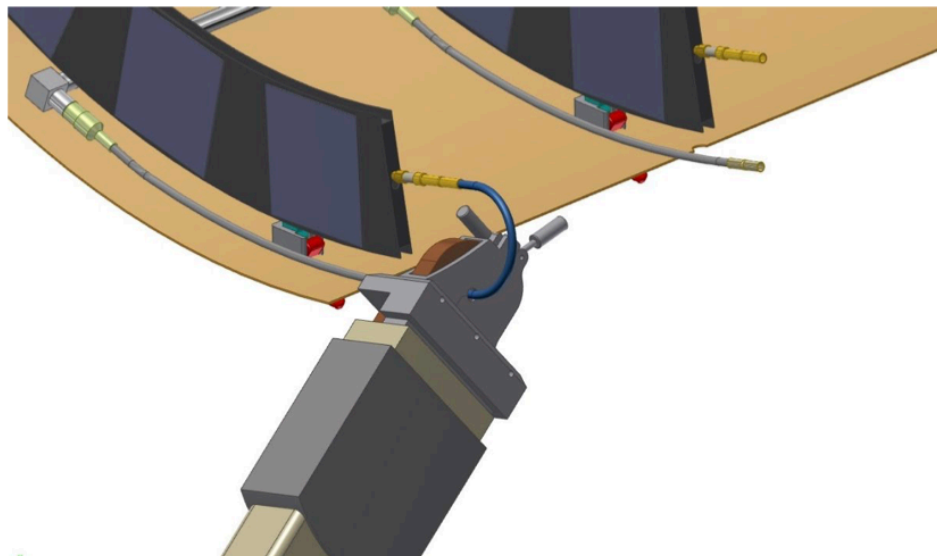
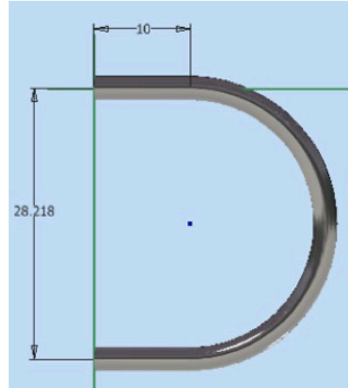
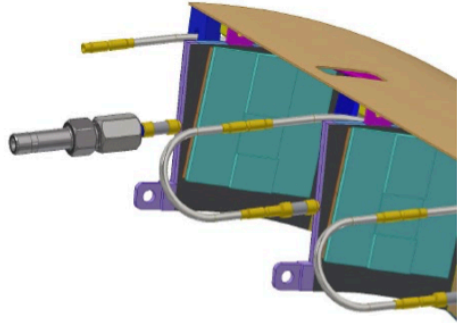
HR SP, HV and MOPS connections

The SP, HV and MOPS cable connectors are connected to the EoS cards.
How difficult it is to connect the electrical services for the low Z side?
How to protect wire-bonds of near-by modules?



We have to establish how the real cable-connectors look like.
See back-up slide 25

HR CO2 connections and tests

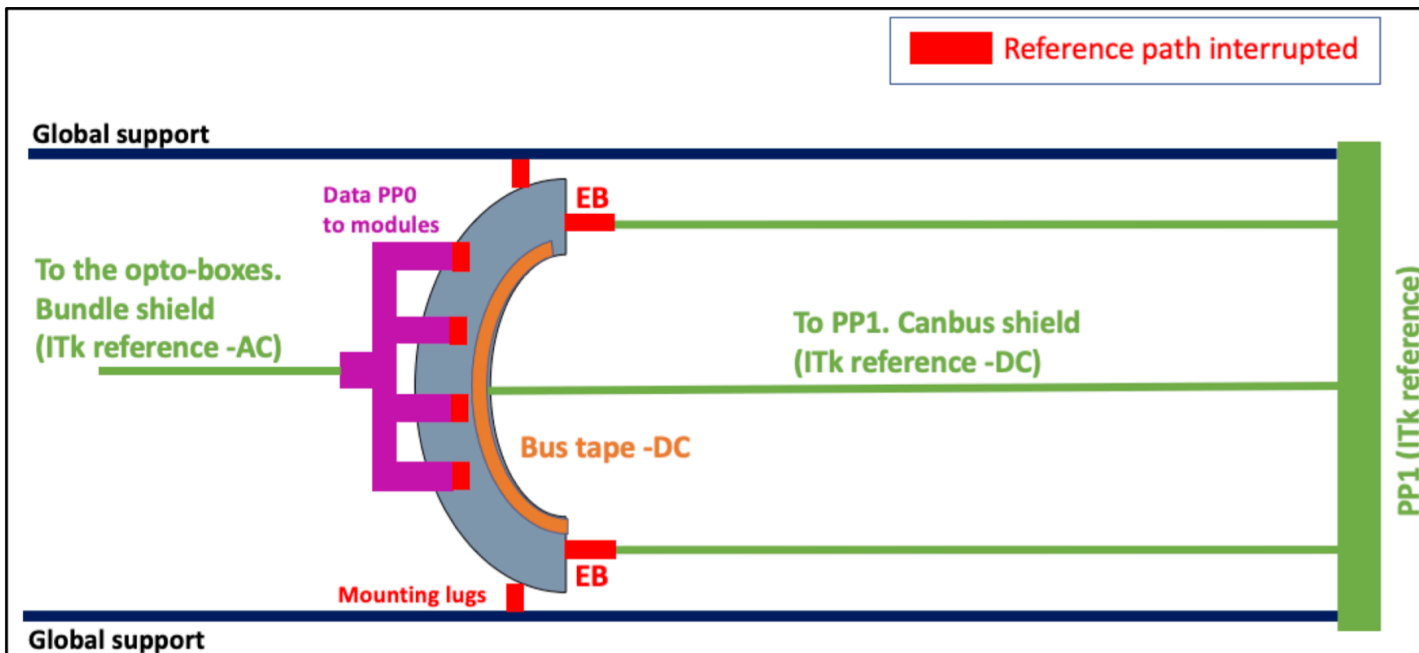


The cooling U-bends can be welded.
Now or after installation of all half-rings?

- Insertion of Half-ring and welding – 4-5 welds per HR
- Leak test
- Pressure test 162 bar
 - Compressed Dry Air or freon (TBC)
- Leak test
- **HR connectivity test after each welding with low power mode again**

HR grounding test after cooling pipe welding

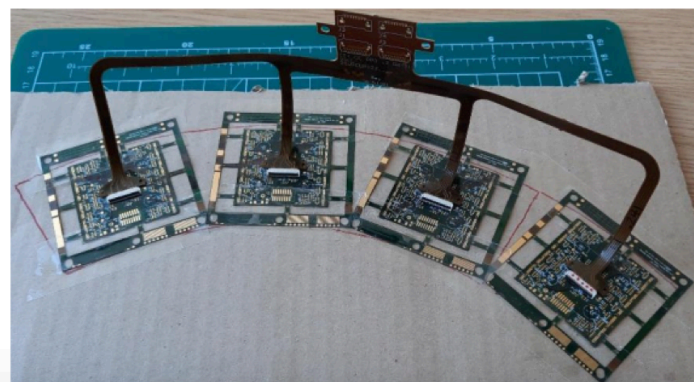
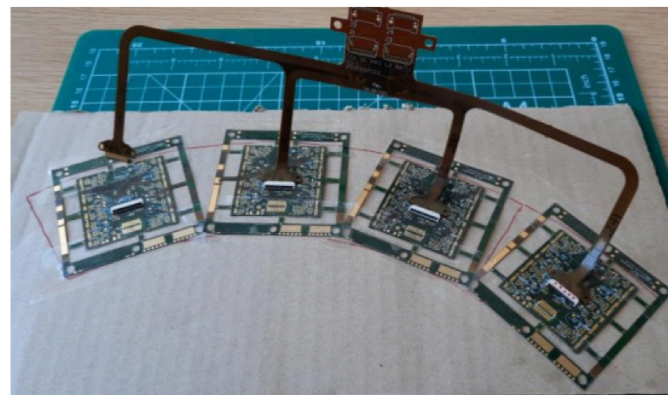
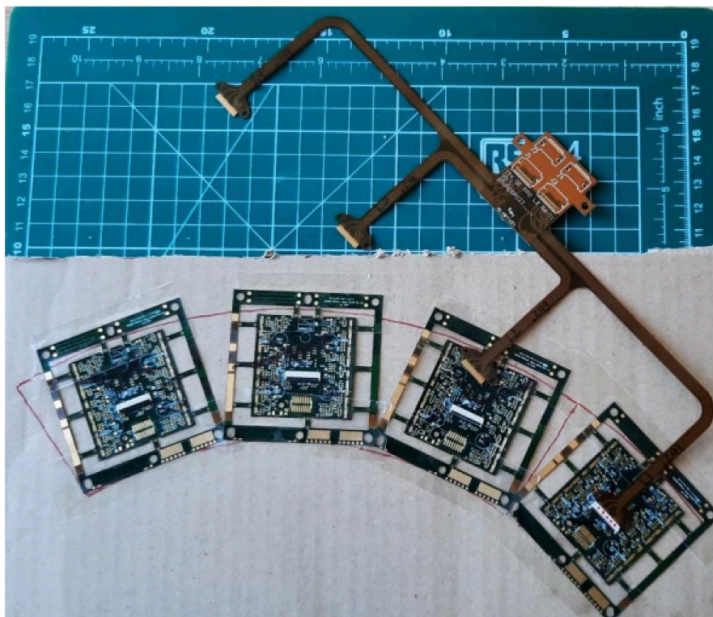
The isolation resistance between a designated point on the half-ring to the Type-1 cooling manifolds and the half-cylinder will be recorded. Half-rings will be tested in low power mode.



Isolation resistance measured between GND pad on EOS card and Half Shell

Insertion Procedure

- Tool will likely be the same regardless of whether we choose option 2 or 3
- In order to allow the bend in phi, so all the legs can be inserted, the flex must be placed in close-to-final position (i.e. 90° bend)
 - Not possible to insert multiple legs with flat PPO flex
- Unsure how to constrain the loose tips so they don't dangle around, but can still be picked up by the tool and inserted



Screenshot

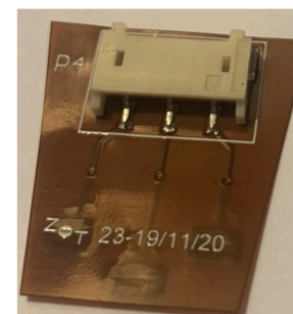
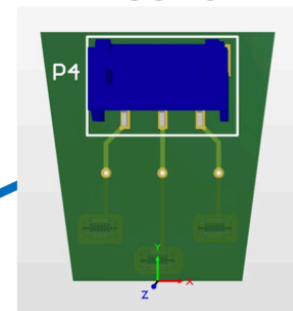
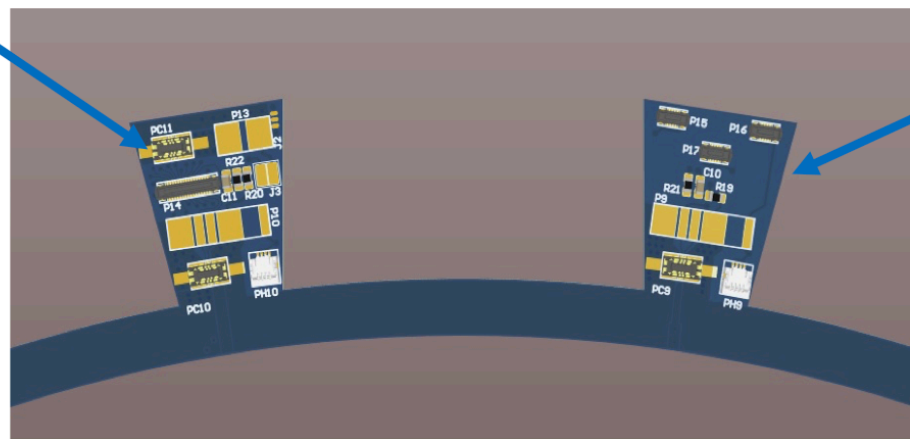
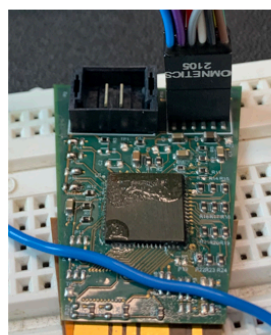
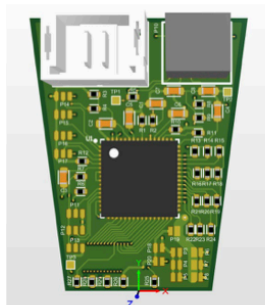
https://indico.cern.ch/event/1207012/contributions/5076887/attachments/2524769/4342106/OEC_Type0_Readiness_20221010.pdf

EoS Prototypes: Overview

LV card

Tests done with Tape V5 and LV/HV EoS cards plugged in.

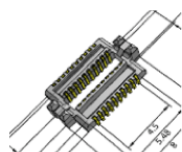
HV card



Manufactured 10 LV EOS and 10 HV cards.

- Populated 5 LV cards with just the connectors.
- Fully populated 2 LV cards with MOPS chip.
- In the process of populating another LV EOS cards with MOPS.

Pre-production FlexTapeV7 (L2/L3/L4) will have EOS CanBus/NTC_lock/LPE Connector: TLH-010-0.50-G-D:



19

https://indico.cern.ch/event/1207012/contributions/5076887/attachments/2524769/4342106/OEC_Type0_Readiness_20221010.pdf

HR Reception Tests

Half Ring in Test Box in Lecce with top shell removed (to be reproduced at LNF)

Half Ring support frame and Transport/Test Box

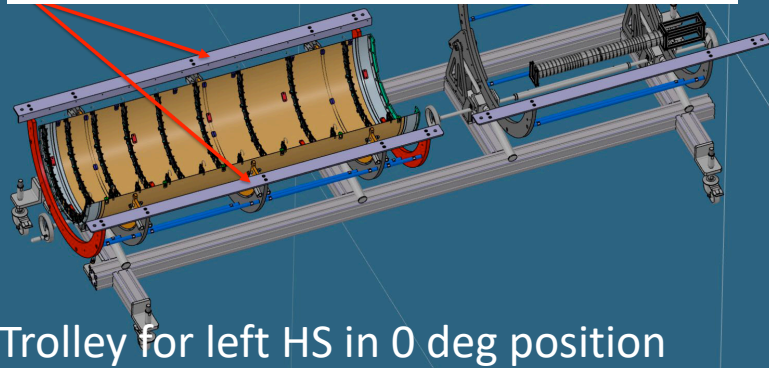


Half Ring with support frame removed from the Test Box after reception test and moved to integration table

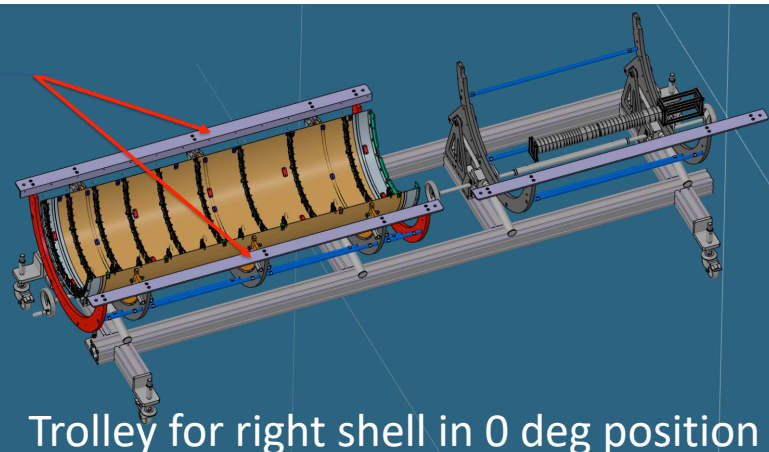
Half shell integration

3 X integration two half shells

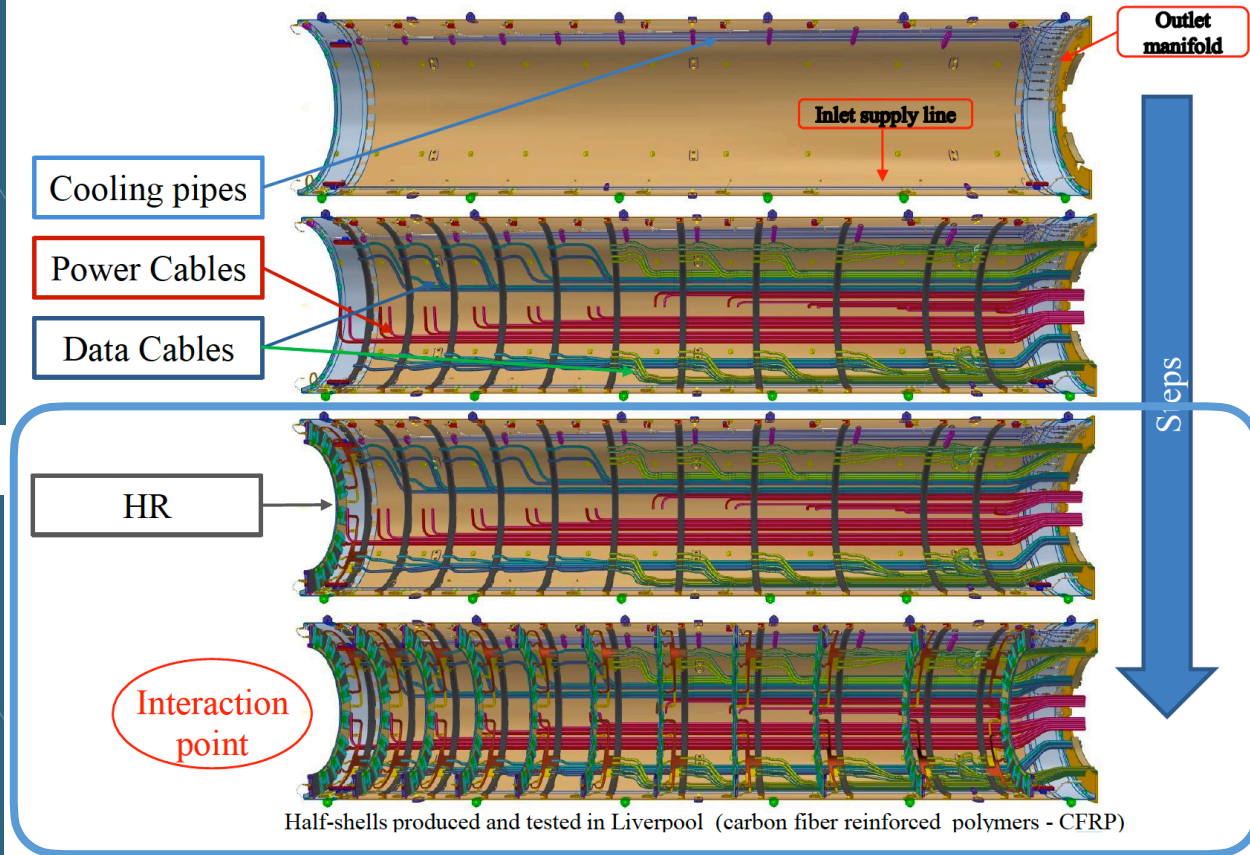
Rails for services and HR installation



Trolley for left HS in 0 deg position



Trolley for right shell in 0 deg position



This Talk: HR insertion on the half shell