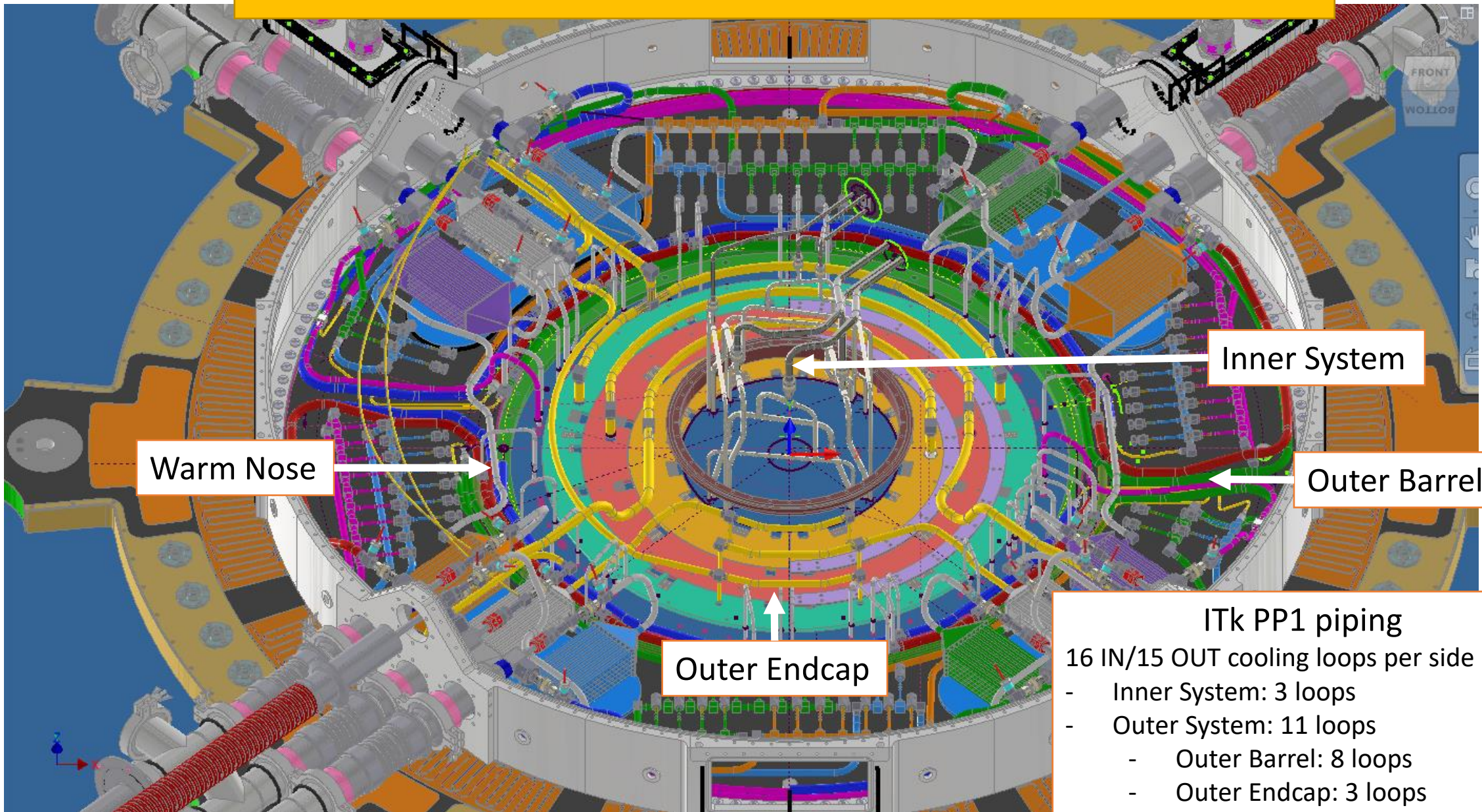


Design cooling PP1 and cooling pipe integration in SR1

Emiliano Dané

LNf - 20240201

ITk PP1 PIPING A-side



Warm Nose

Inner System

Outer Barrel

Outer Endcap

- ITk PP1 piping
- 16 IN/15 OUT cooling loops per side
 - Inner System: 3 loops
 - Outer System: 11 loops
 - Outer Barrel: 8 loops
 - Outer Endcap: 3 loops
 - Warm Nose: 2->1 loop

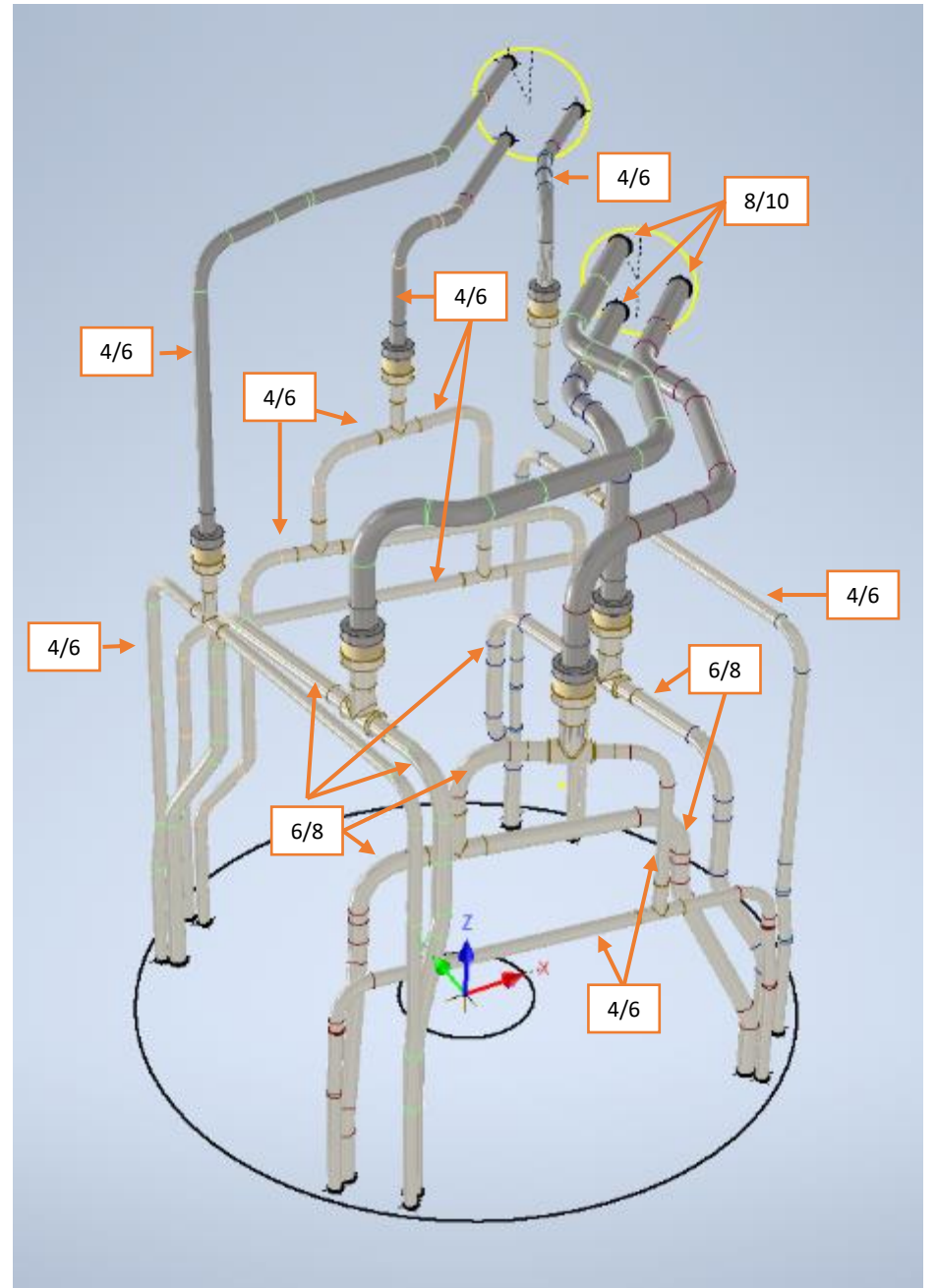
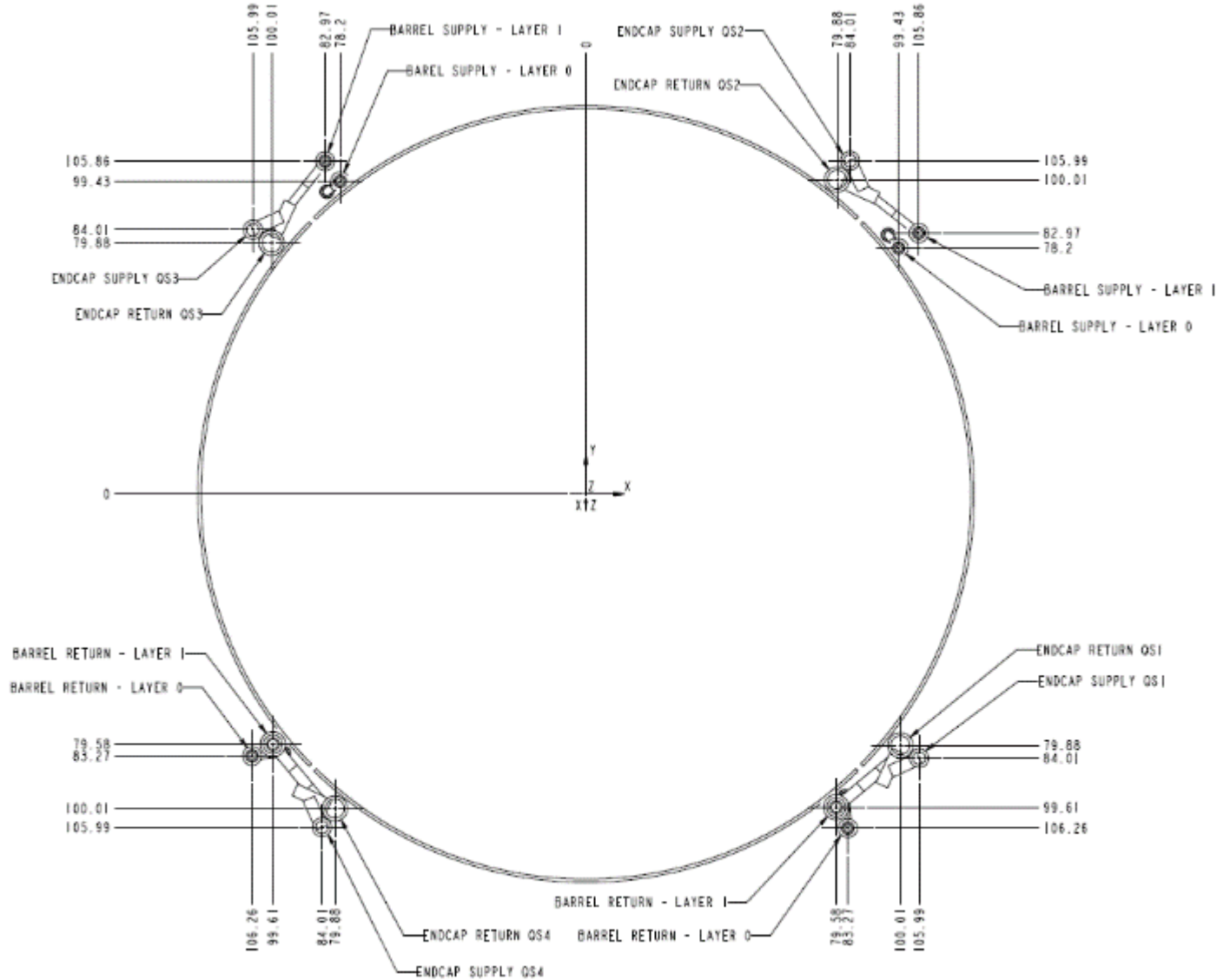
Update on piping in PP1

- Flex Lines
 - New design of the Flex Lines, overall regarding the connection to the Outer PP1 wall
- Temp 4w
 - No more Temperature sensors in contact with the fluid, but only on the surface
- Foot prints
 - Aluminum plates are positioned to the BH in order to fix structure for handling the Electrical breakers
- Bulkheads bolts inside the envelope
- Electrical Breakers
 - Big problem in obtaining the quotation
- Prototype
 - Also for the prototype, the company is getting a lot of time to deliver the bent pipes

Detector's manifolding preparation for the SR1 Assembly

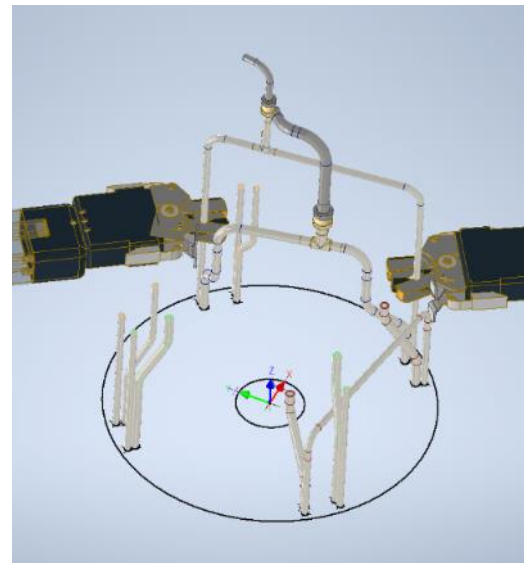
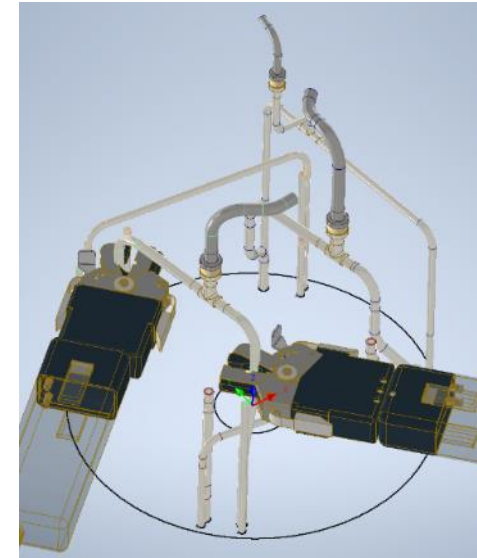
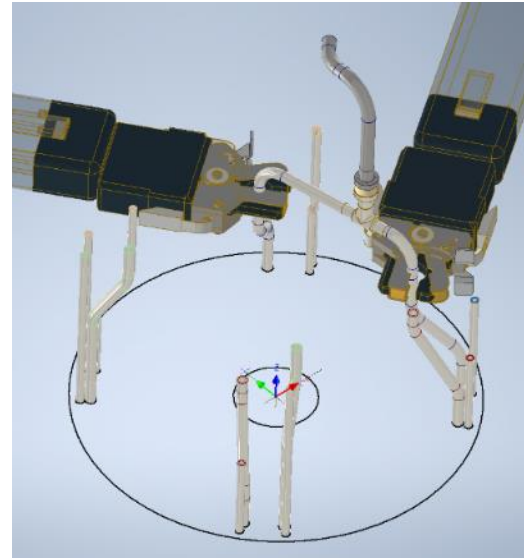
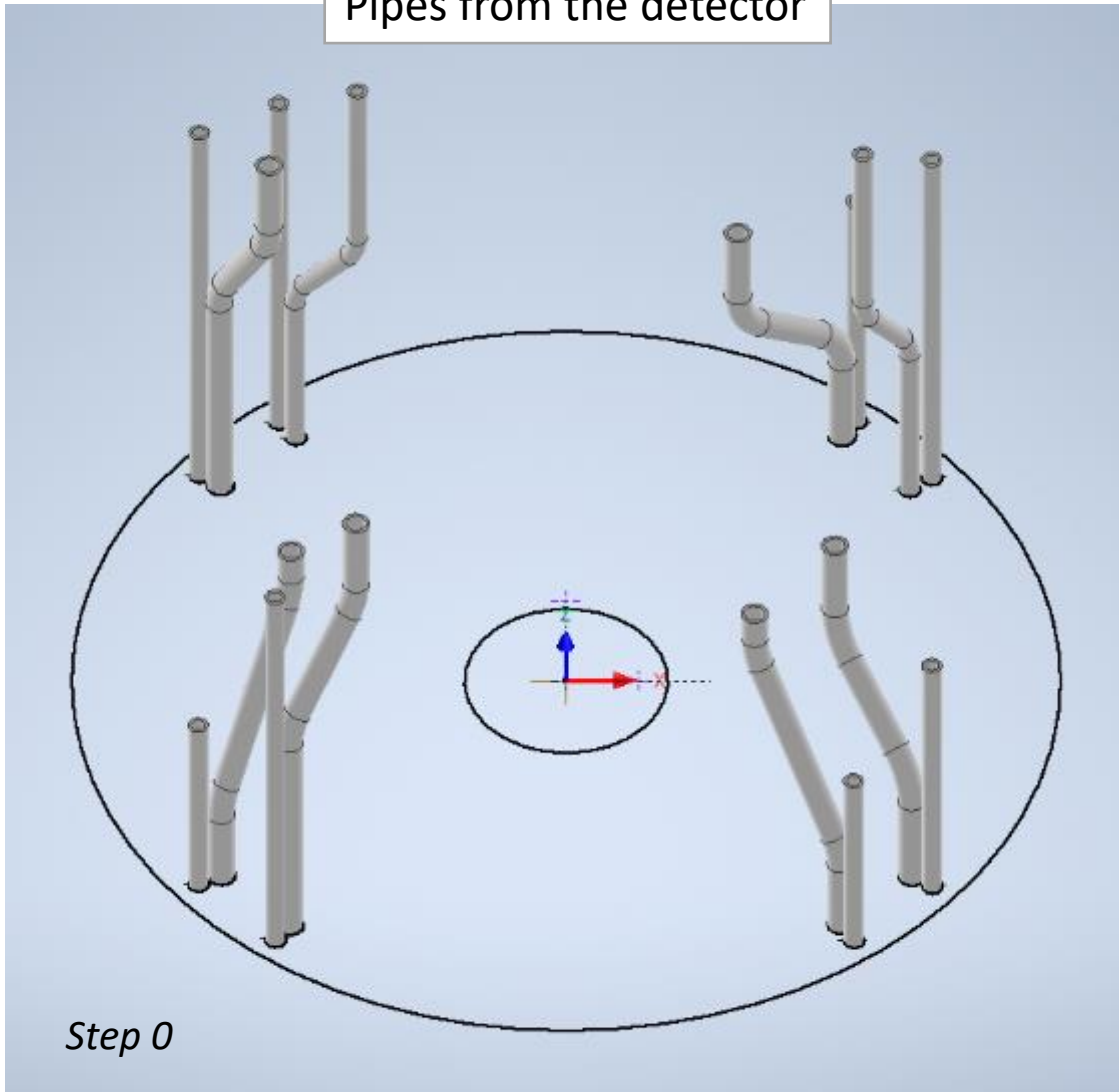
Inner System

IS MANIFOLD (side A)



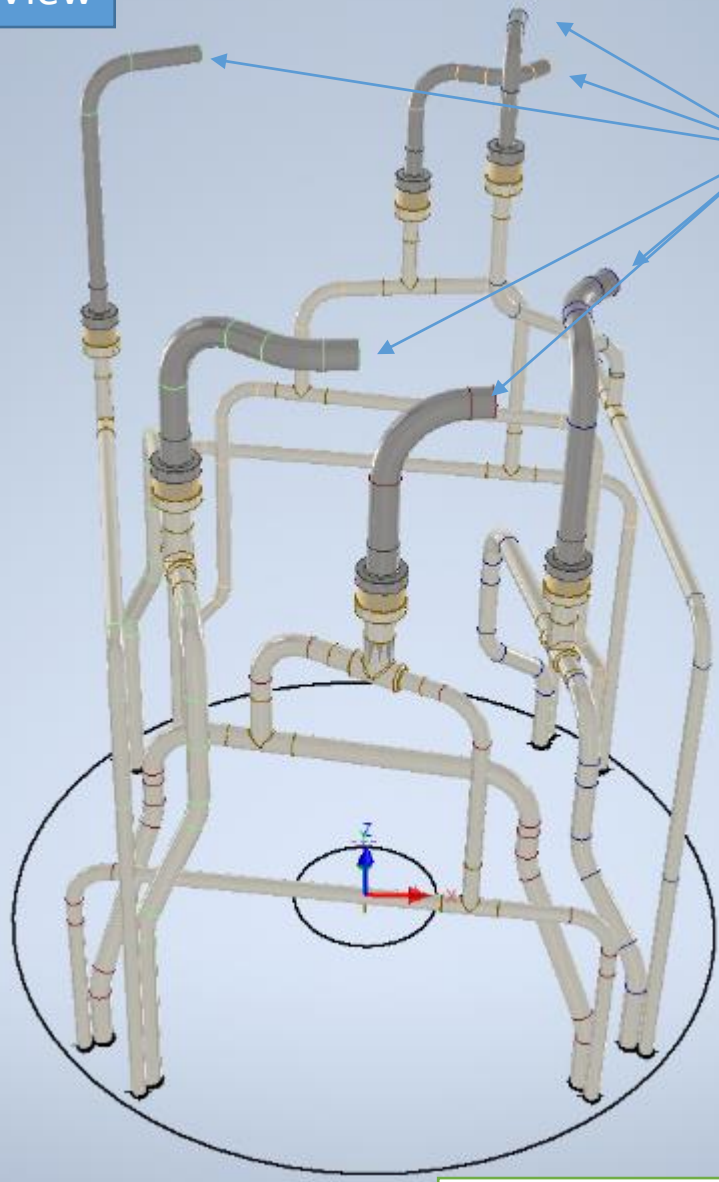
PP1 Manifold Assembly Procedure

Pipes from the detector



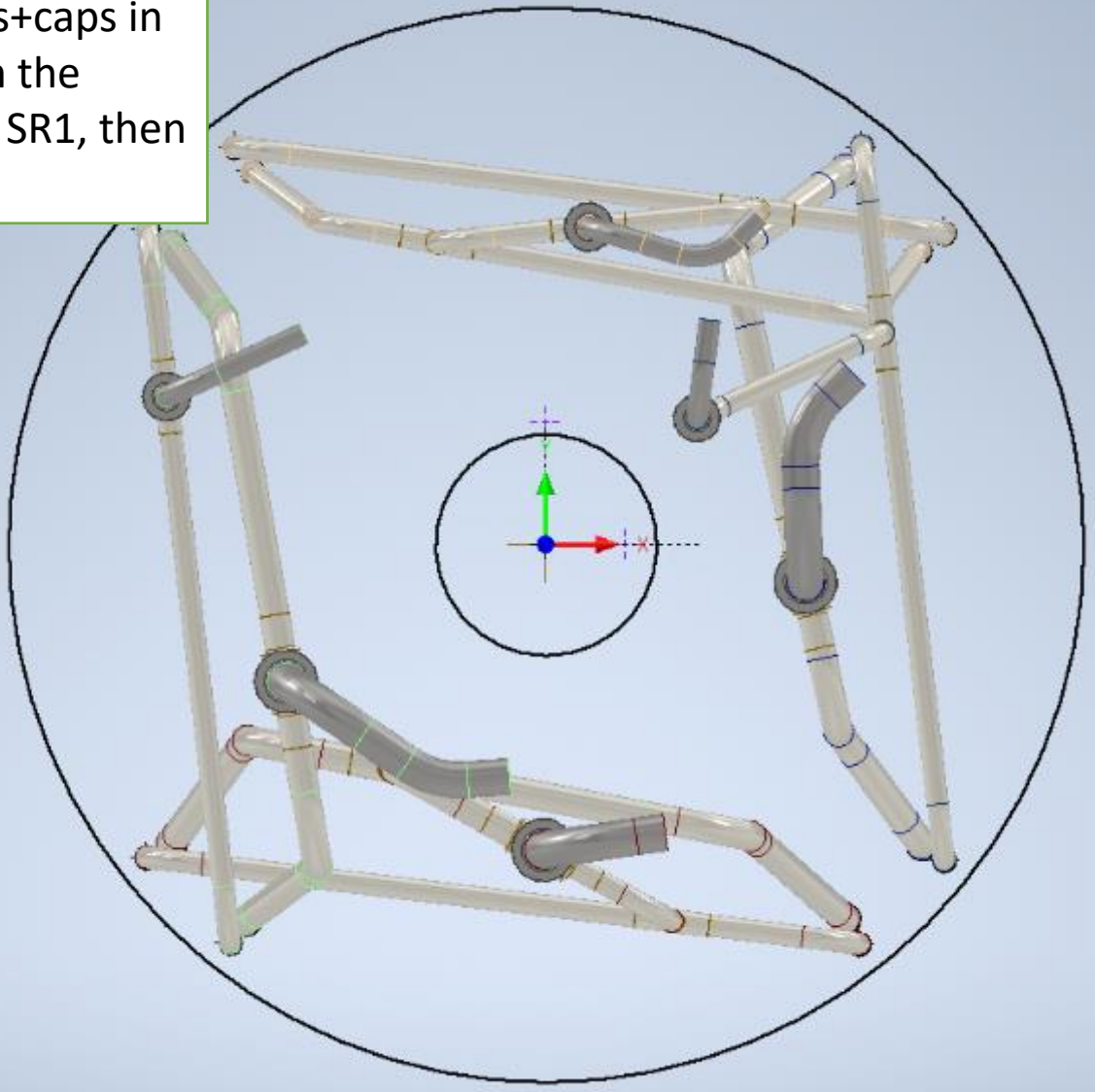
Not clear to me if will be assembled in SR1 or in USA

Final View



Closed by fittings+caps in order to perform the pressure tests in SR1, then removed.

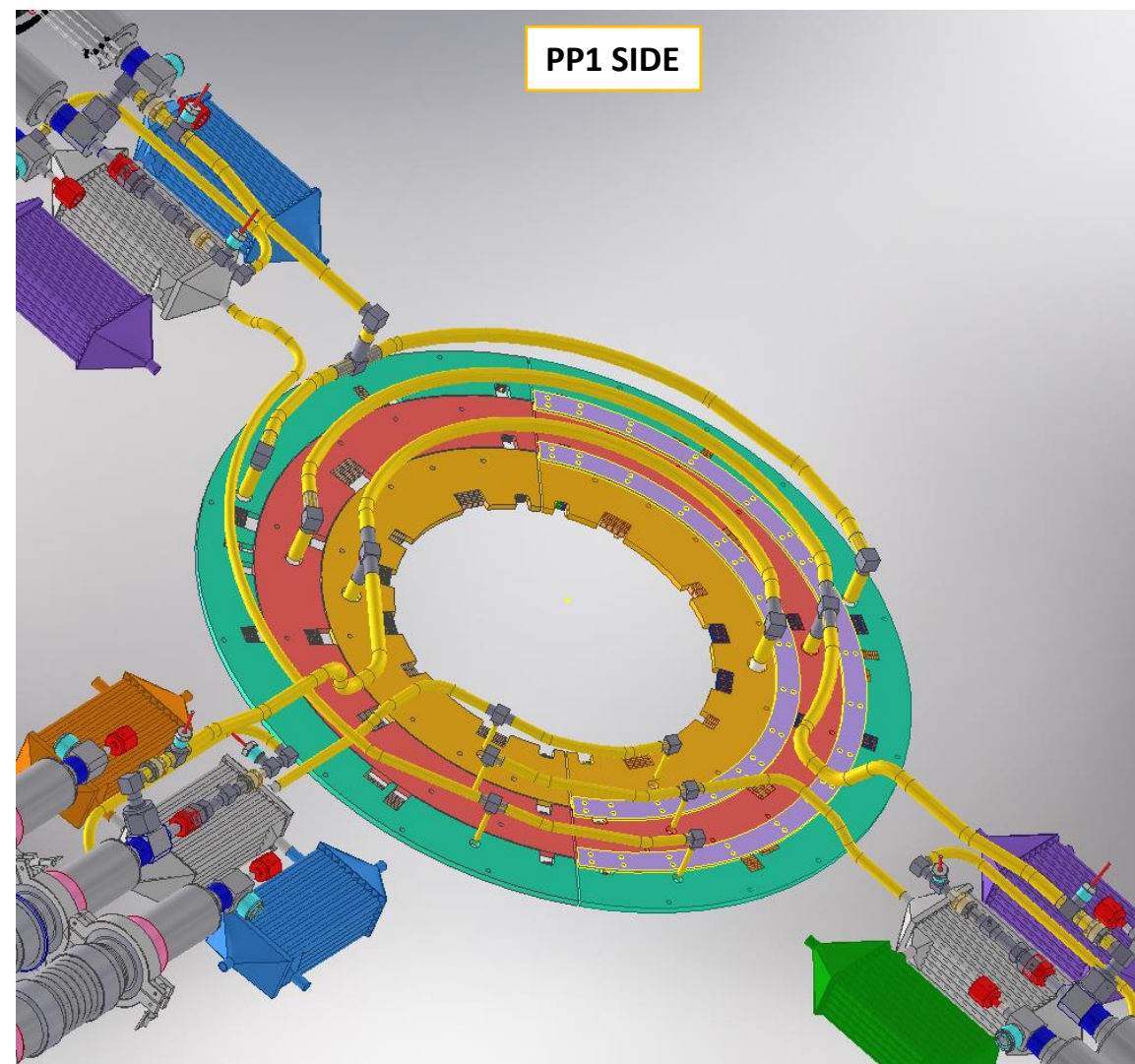
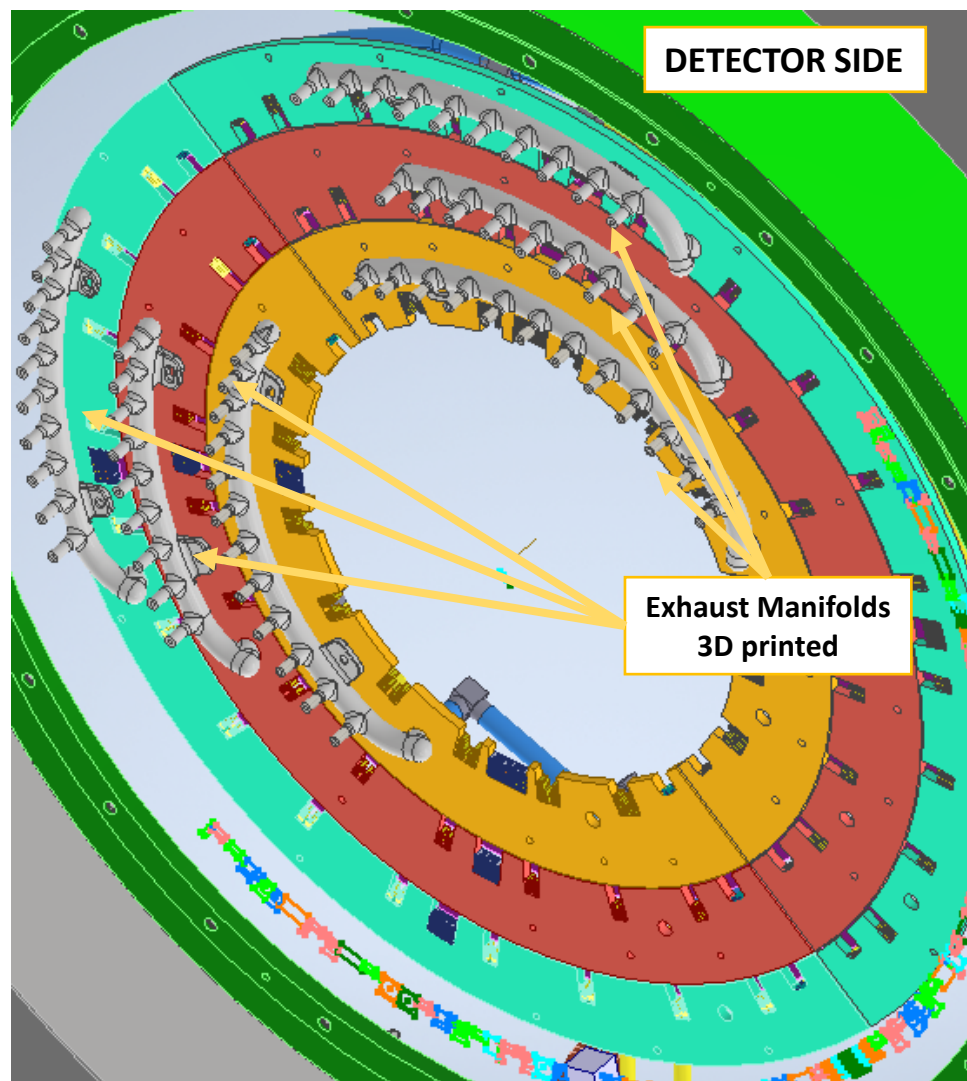
Top View



The use of sleeves is foreseen in order to have 3 shots in case of problems during the assembly in the PIT

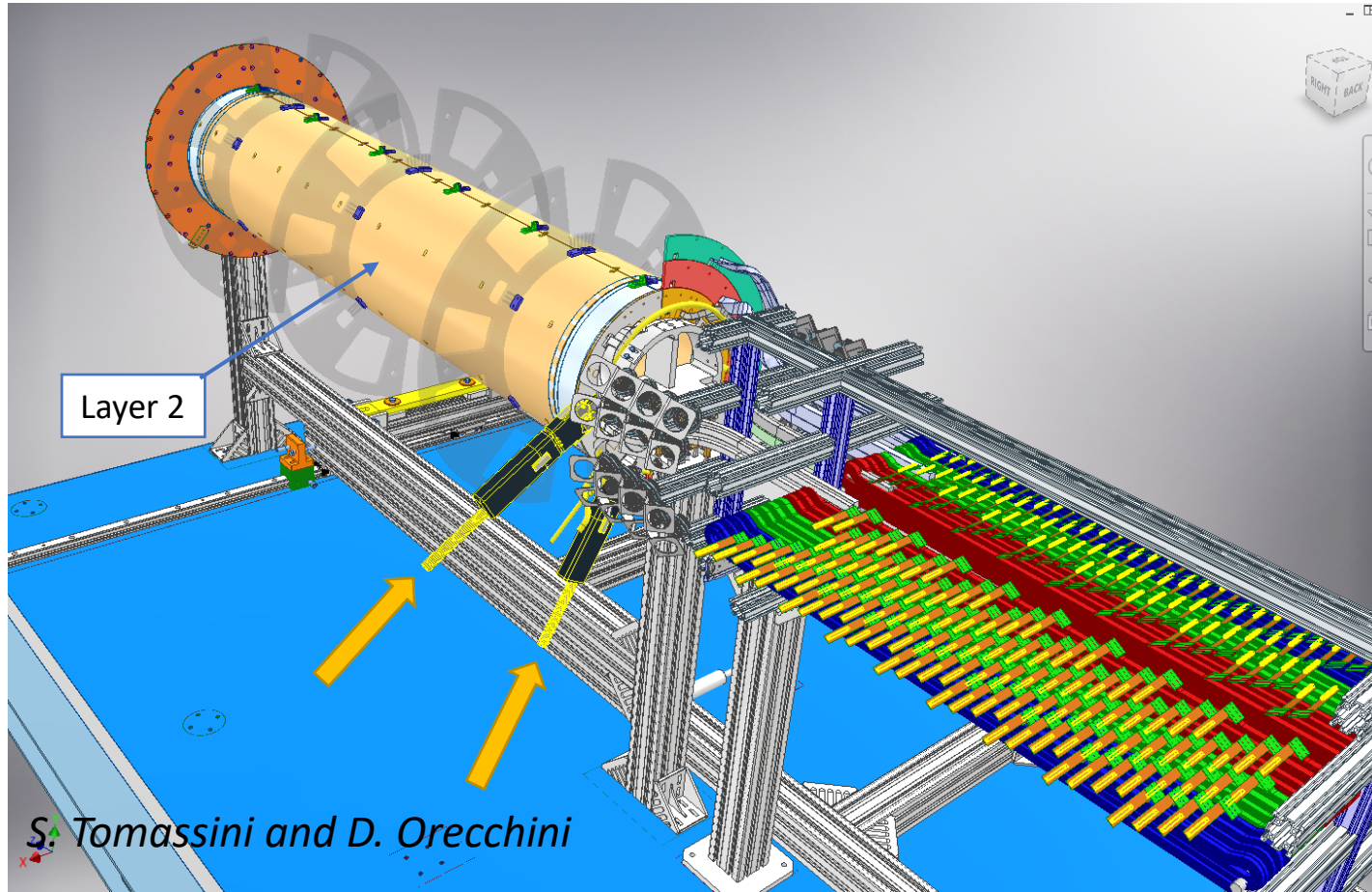
EC Piping Assembly in Production Sites

EC PP1 MANIFOLD

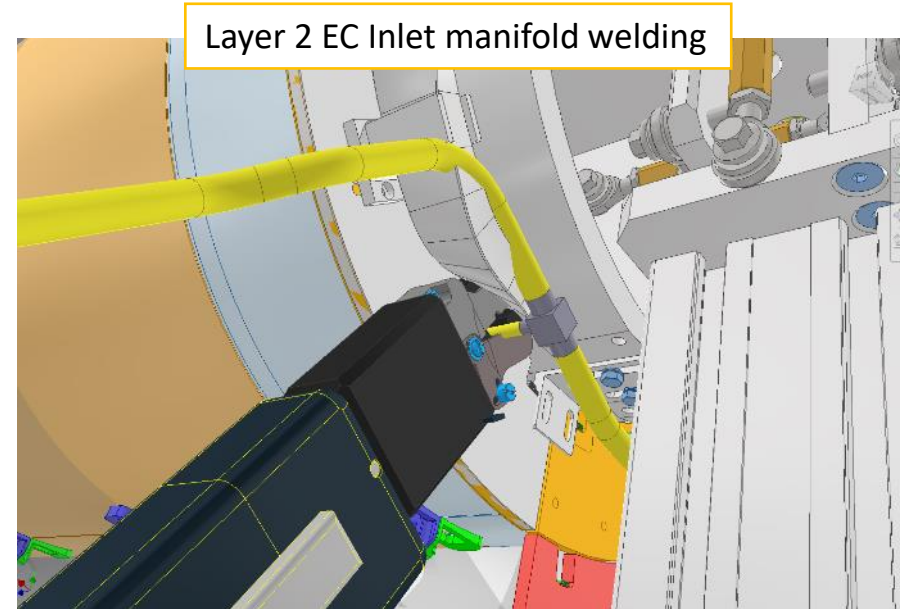


The plan is to weld the Inlets and Exhausts manifold just after mating each layer in order to perform the test by CO2 cooling plant and also because would be impossible to weld it after having completed the detector.

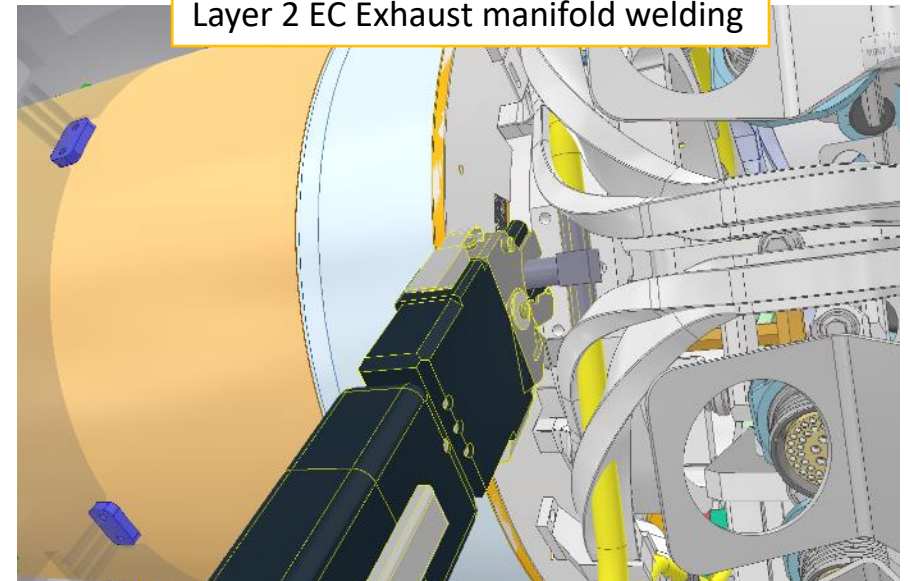
In the 3D model I used the Swagelok Orbital Welding. Not yet defined the Welding Machine will be used in Frascati.



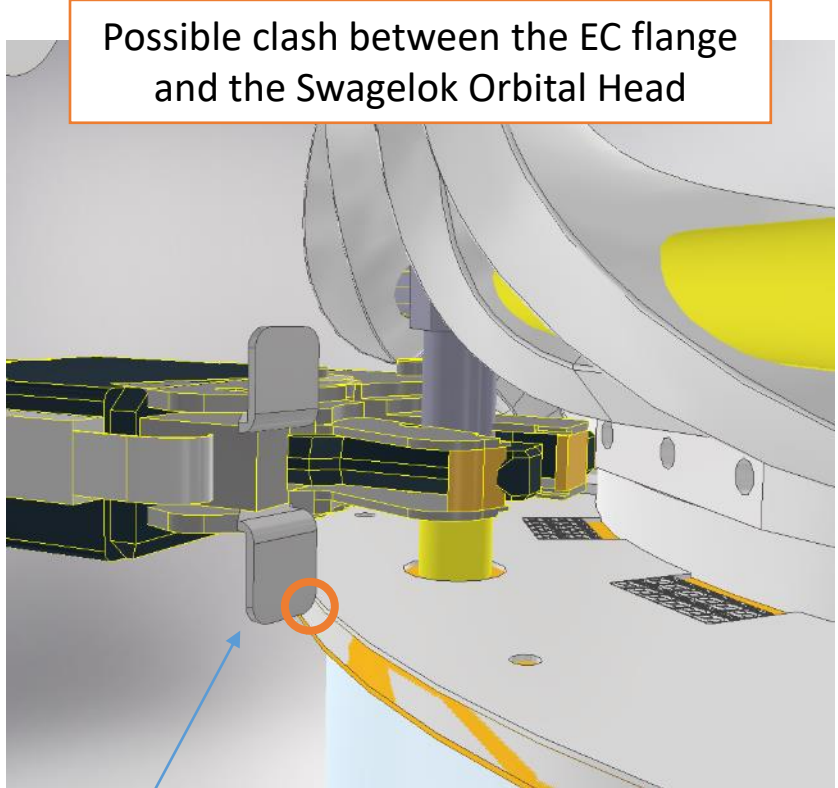
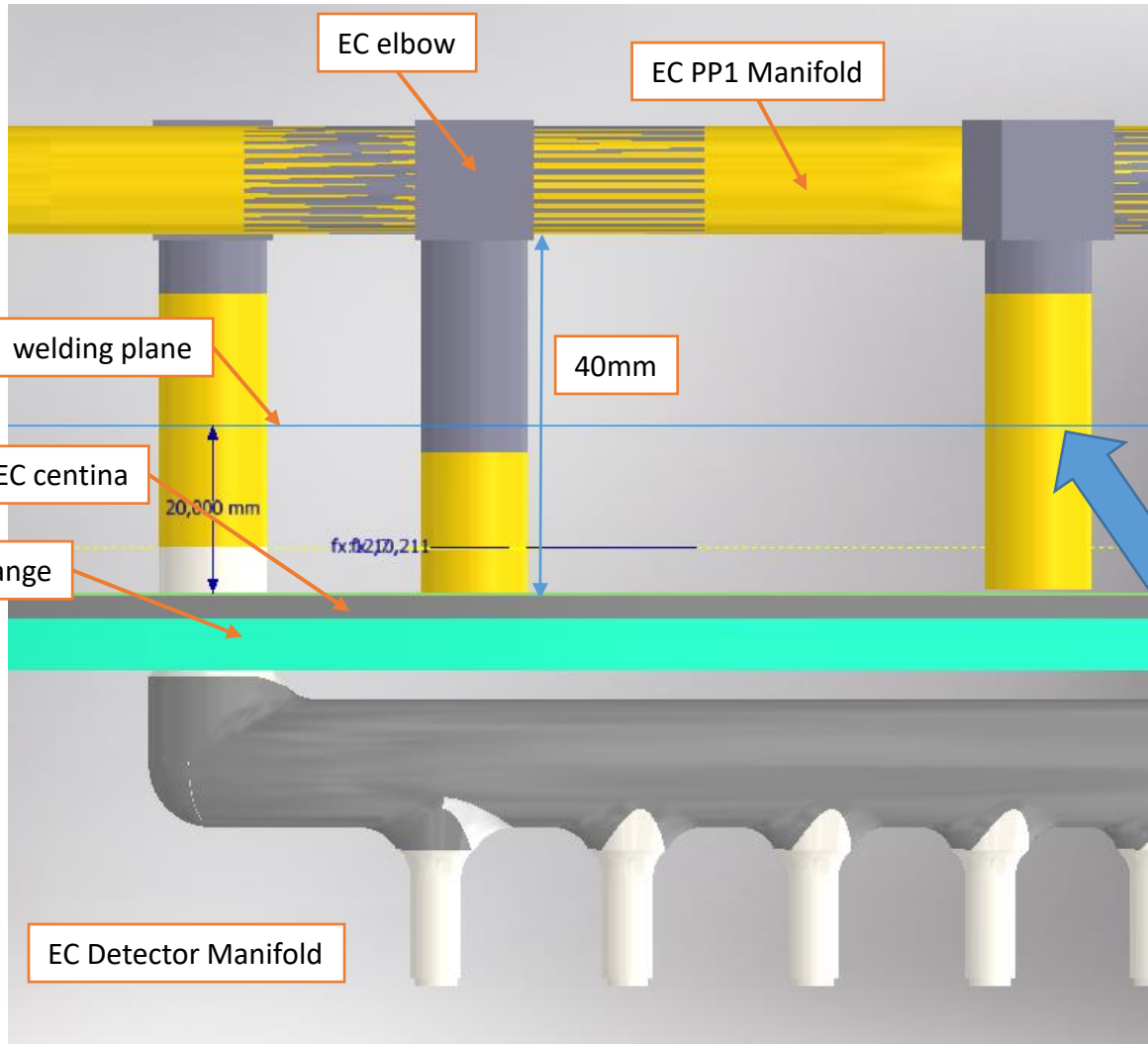
S. Tomassini and D. Orecchini



Layer 2 EC Inlet manifold welding



Layer 2 EC Exhaust manifold welding

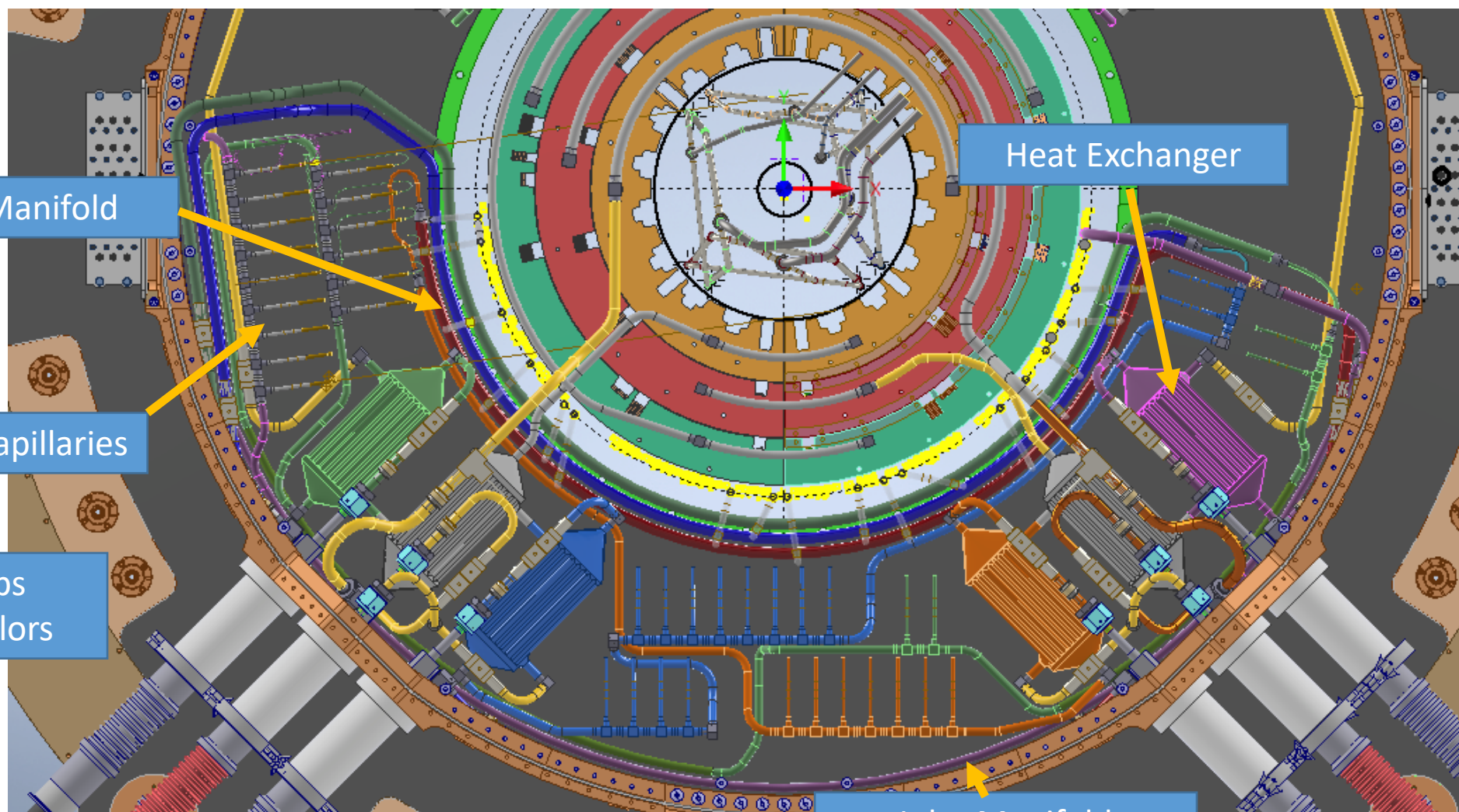


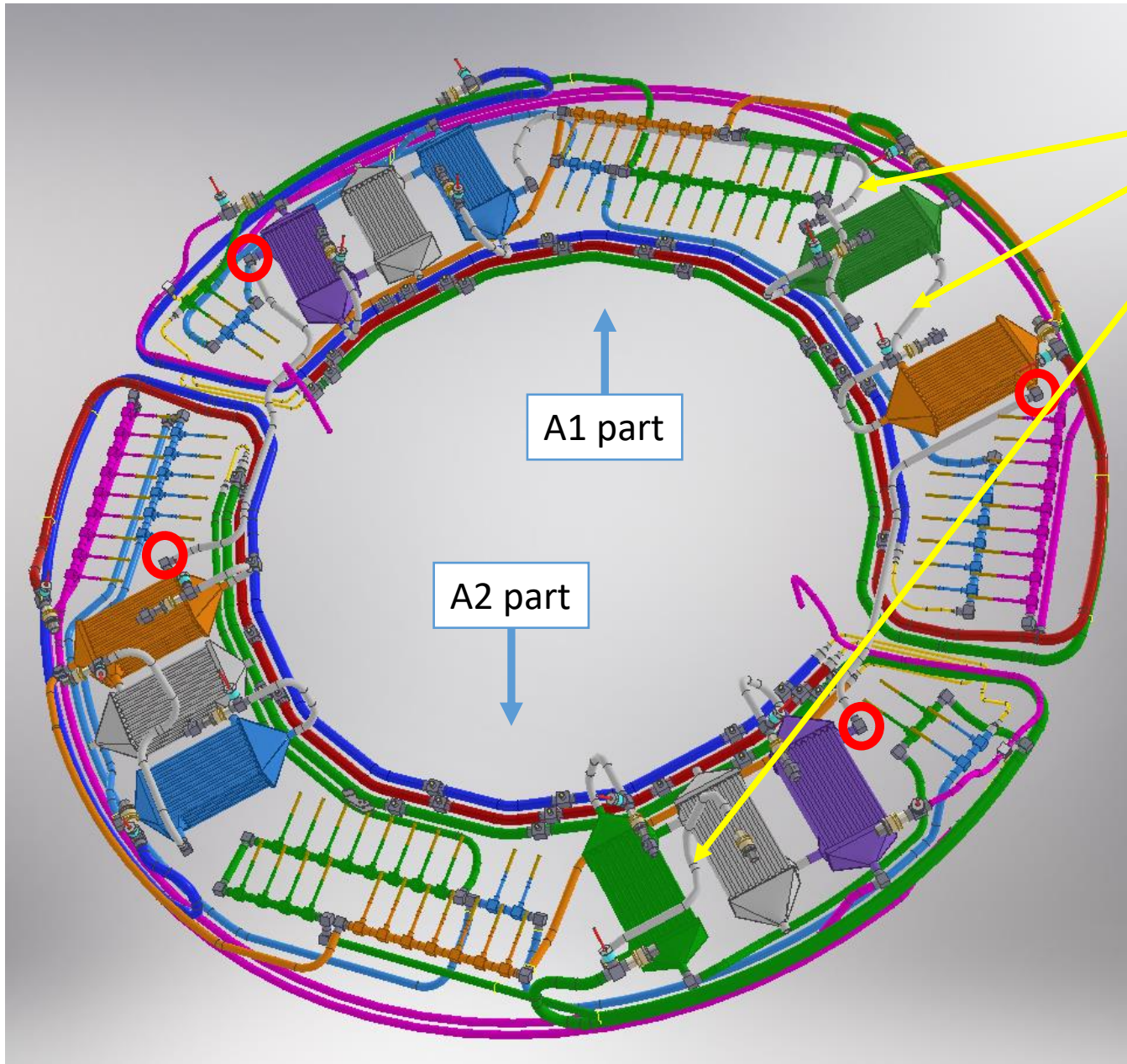
For the Polysude is better having the welding plane @20mm while for the Swagelok due to the "wings" should be better a little bit higher

What about welding back solution: pocket welding is a possibility?

Outer PP1 piping Barrel Status

OB MANIFOLD





Warm Nose in place and welded

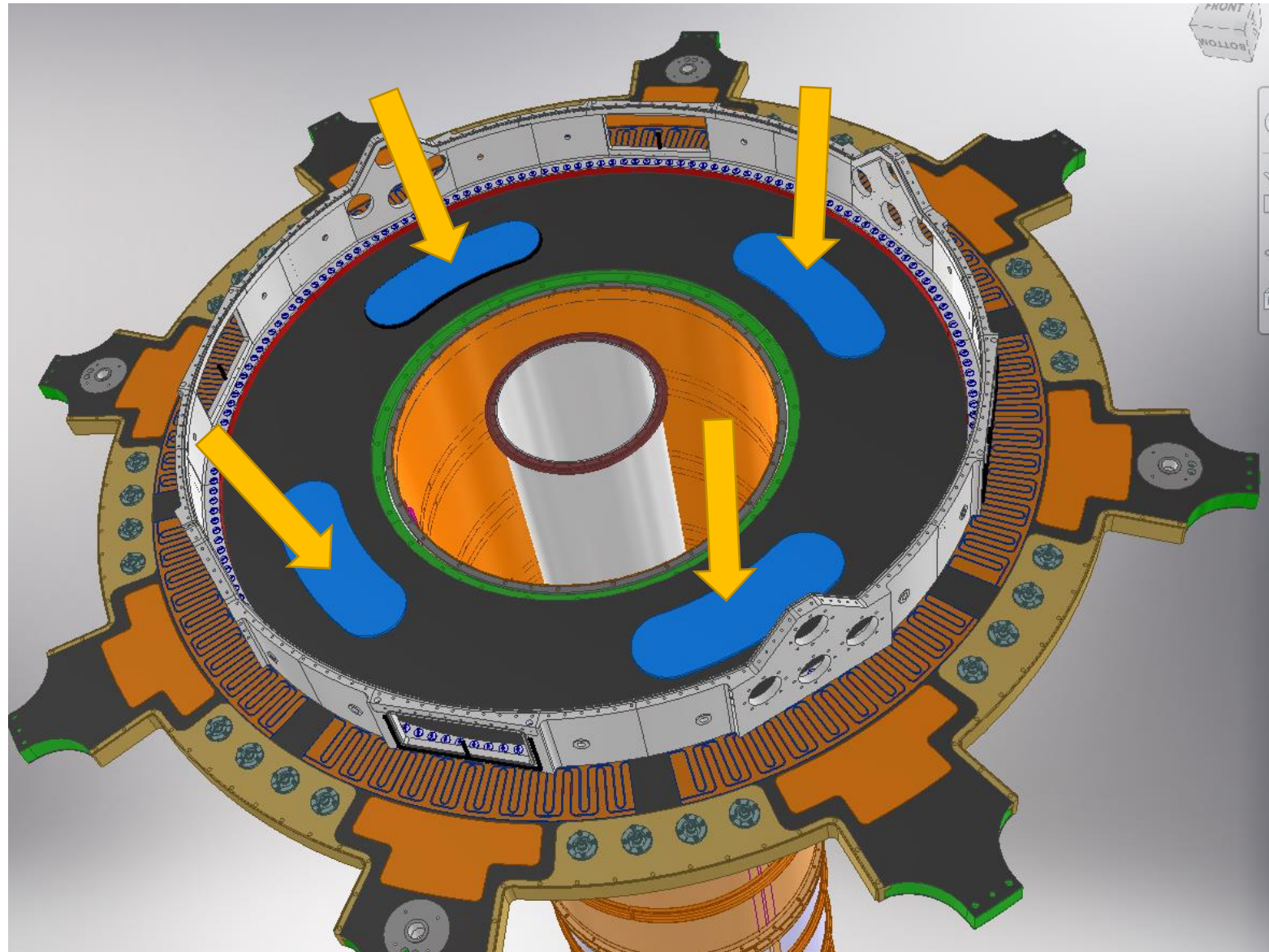
In order to get the minimum number of weldings in SR1, the target is build all the pipes in the workshop, including some parts of the warm nose line.

Red circles are the warm nose joints connecting the two halves (A1 and A2 OB parts). We are thinking to put the whole manifoldings.

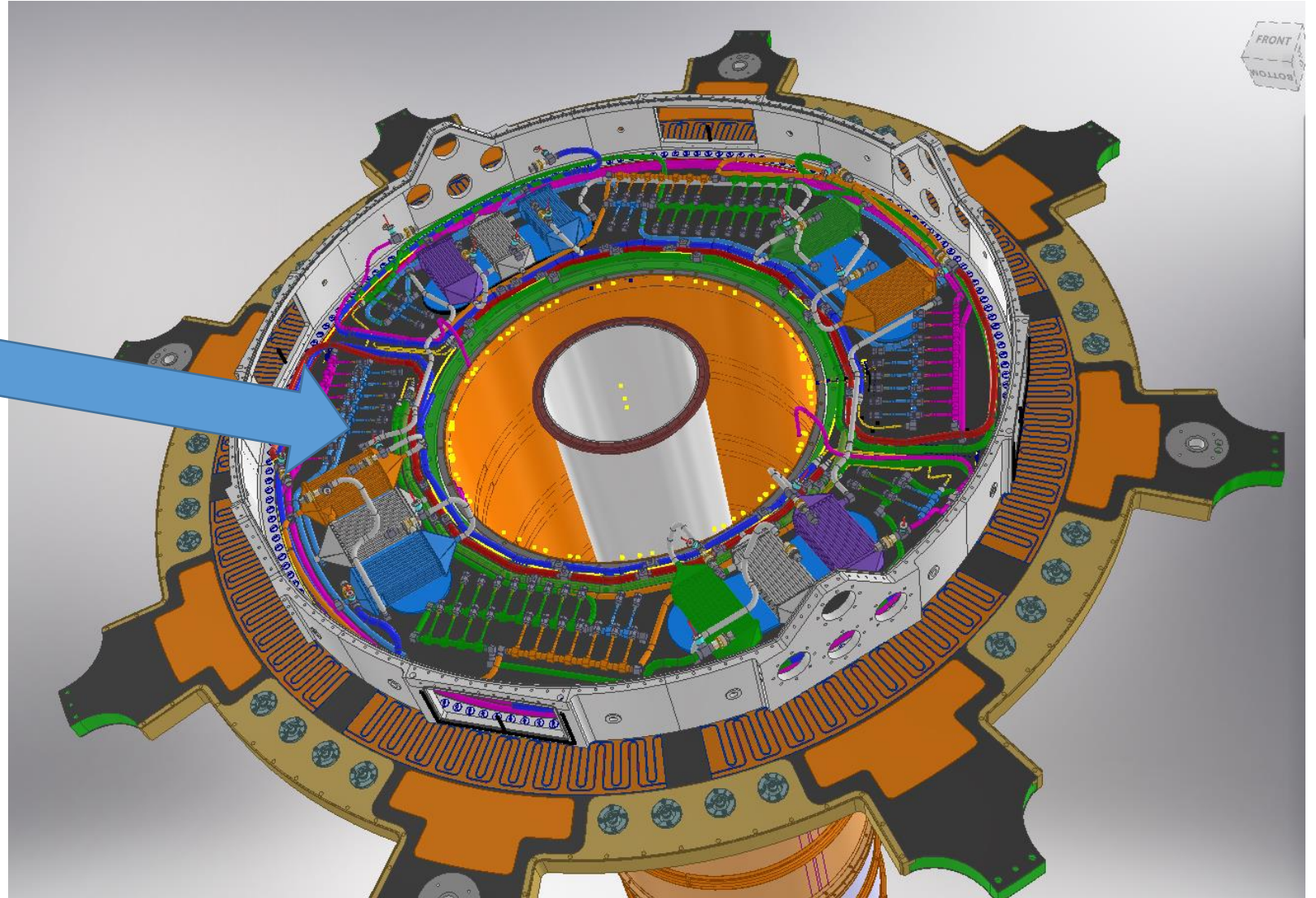
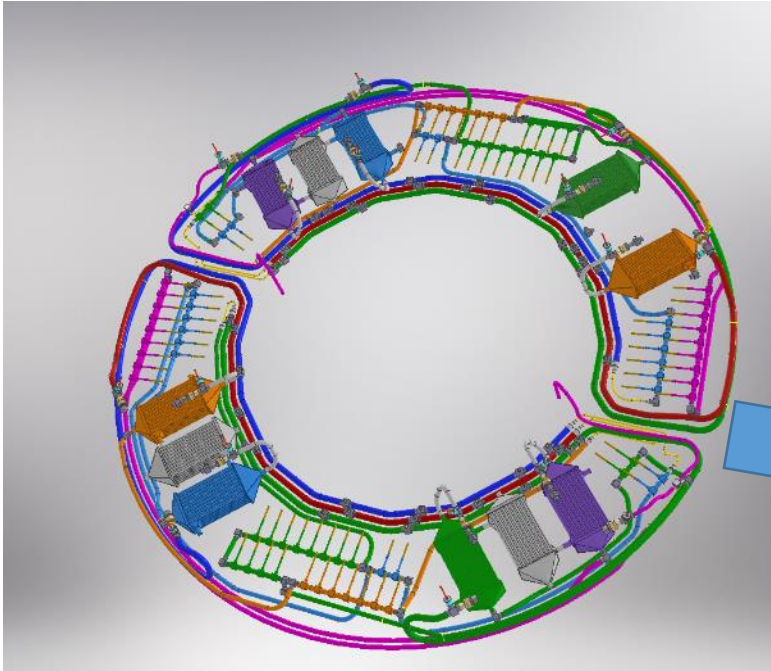
All capillaries will be closed by caps (removable without cutting)

PP1 Assembly in SR1

Step 0: Aluminum plates in order to support EB holders



Step 1: OB piping and manifolds insertion



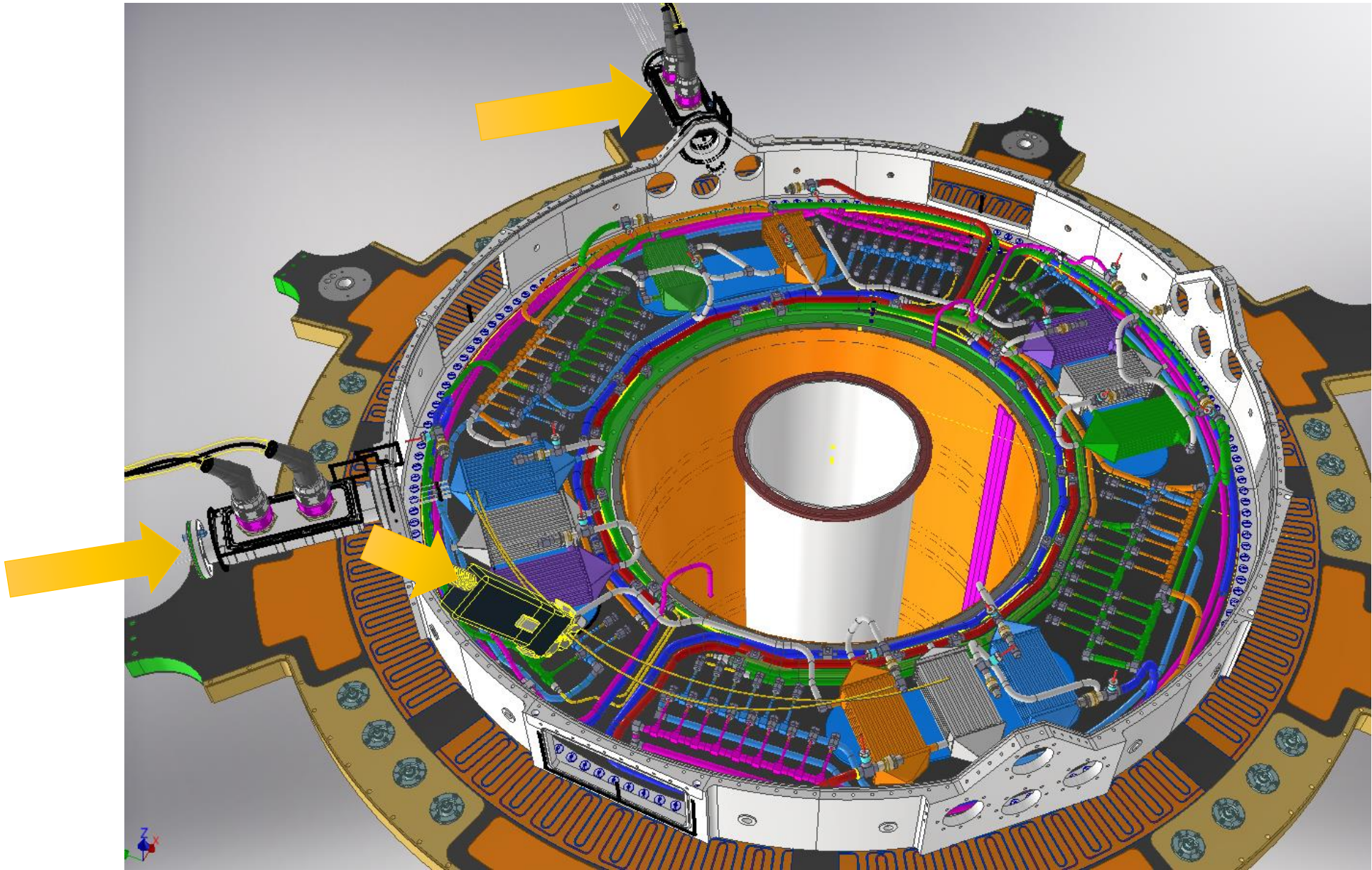
Step 1.1 Insertion of the Upper part

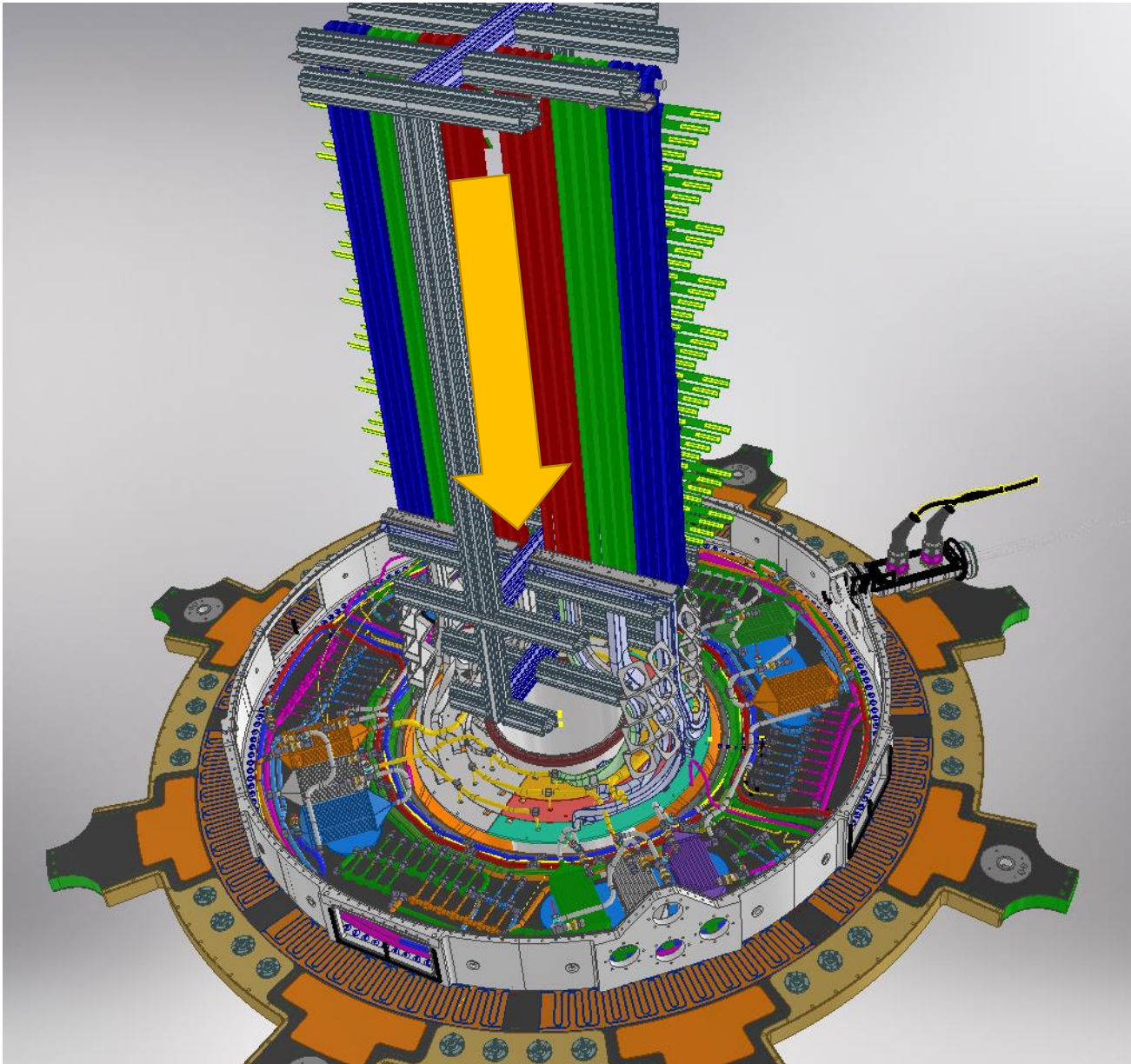
Step 1.2 Insertion of the bottom part

Step 1.3 Weld the 4 joints of the Warm nose line (slide ...)

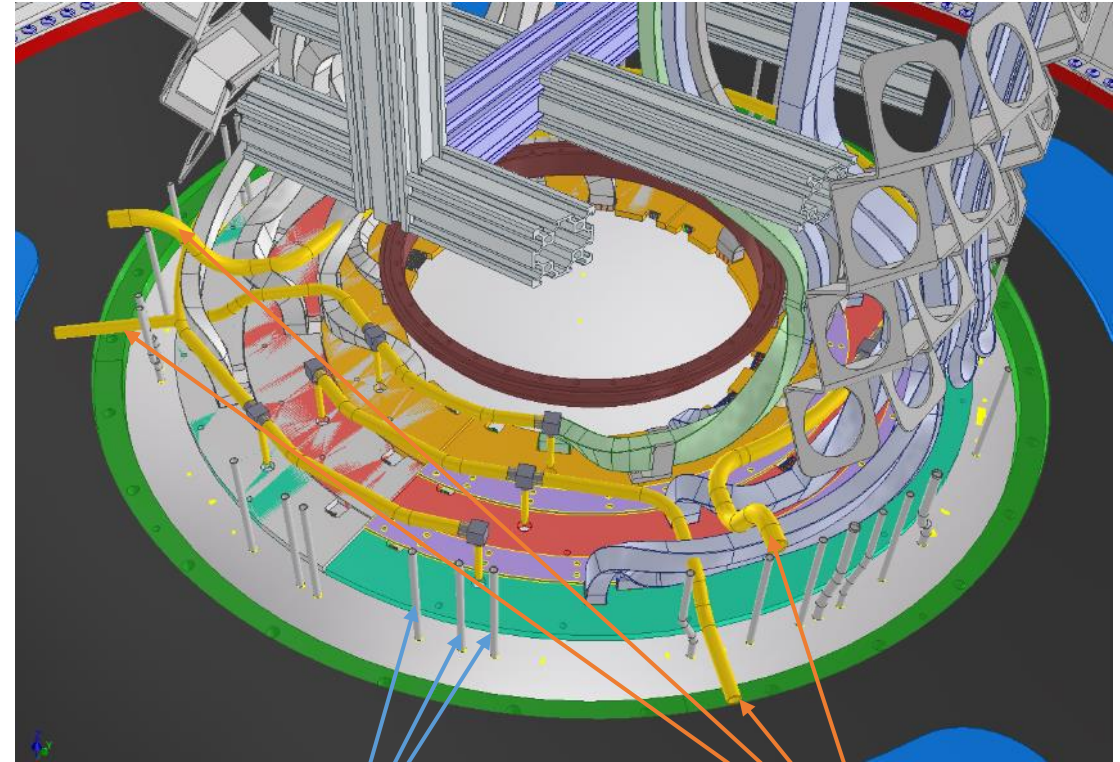
OR Insertion of the whole OB+WN piping and also parts of the endcap.

Step 2: Insertion of the DP boxes and DP capillaries welding





Step 3: OE and OB detectors insertion. Services on the trolley.

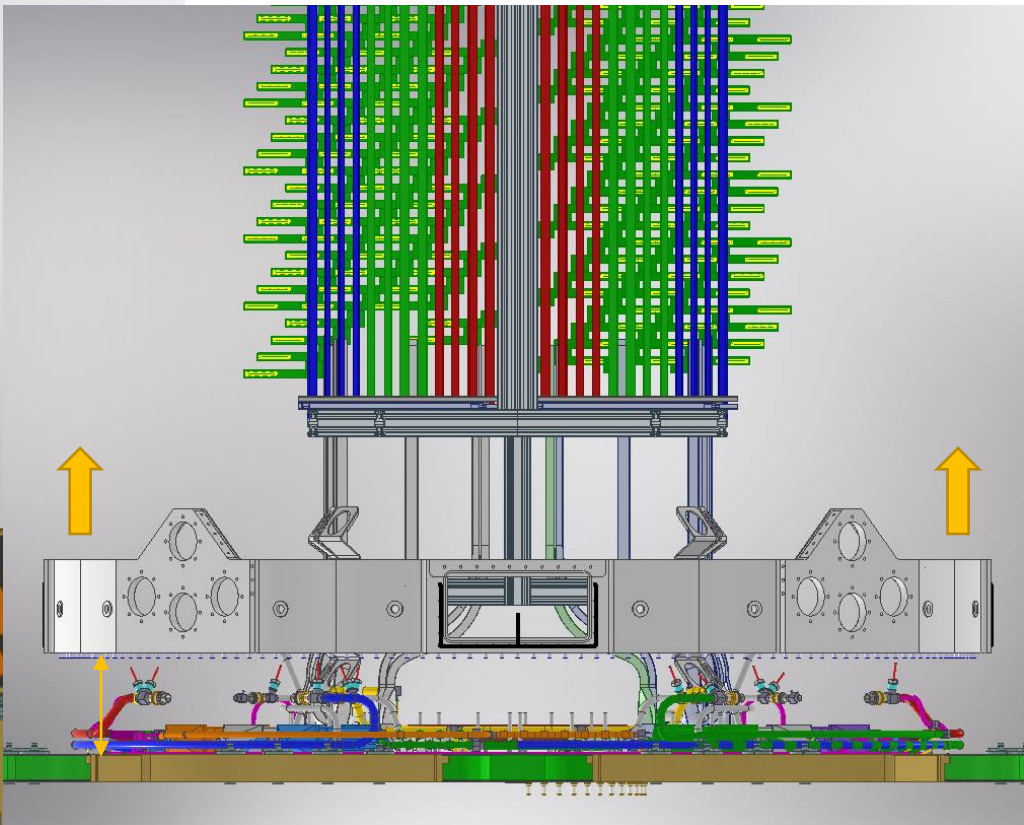
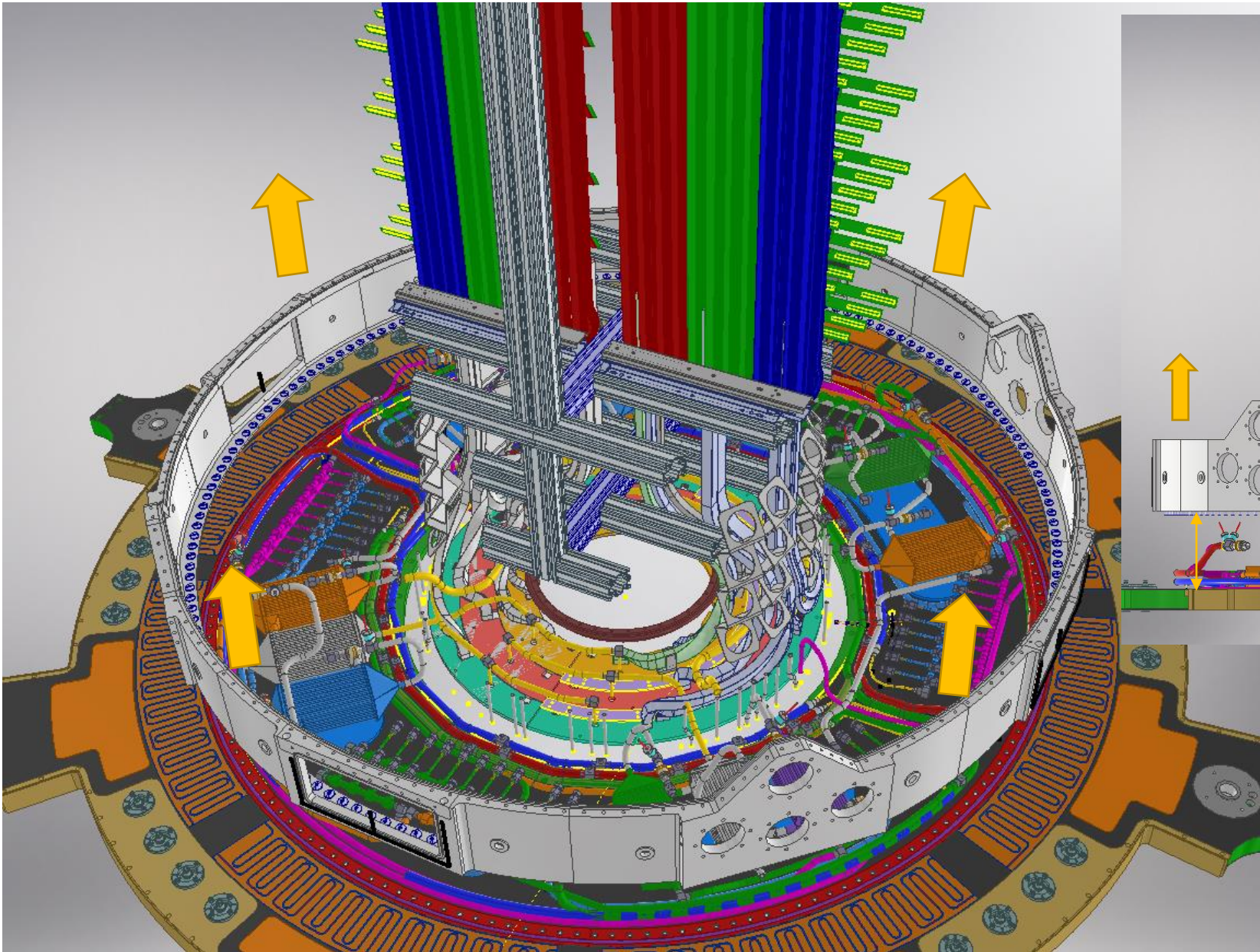


Outer Barrel exhaust pipes

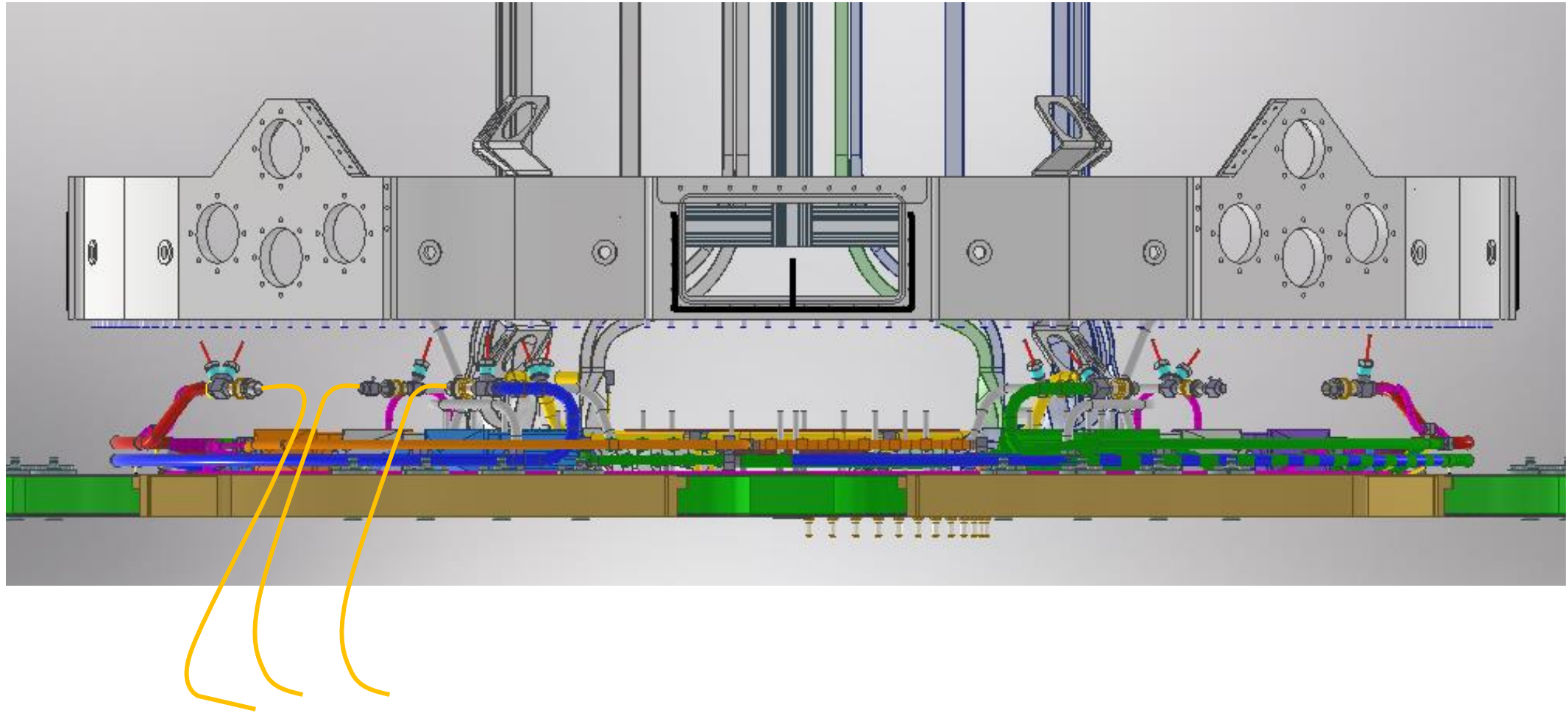
Endcap cooling pipes

All these pipes arrive closed in order to perform the pressure test

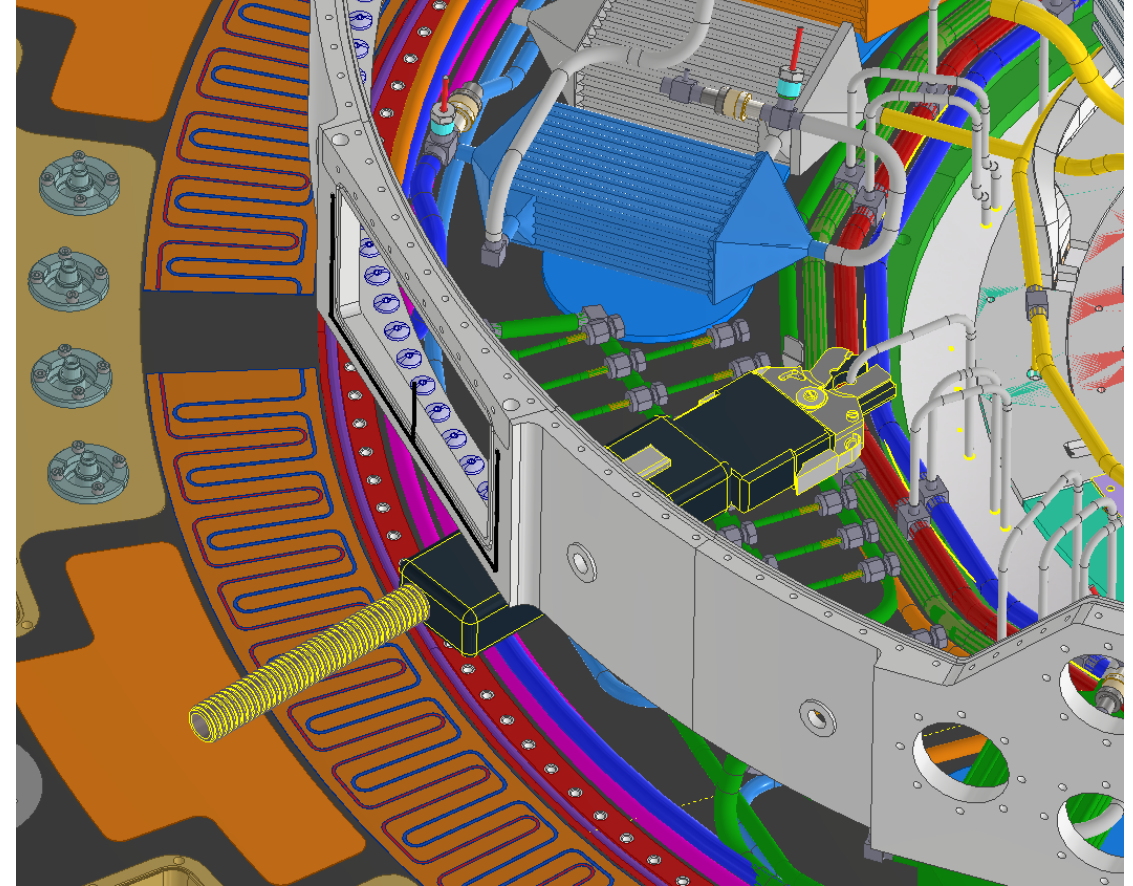
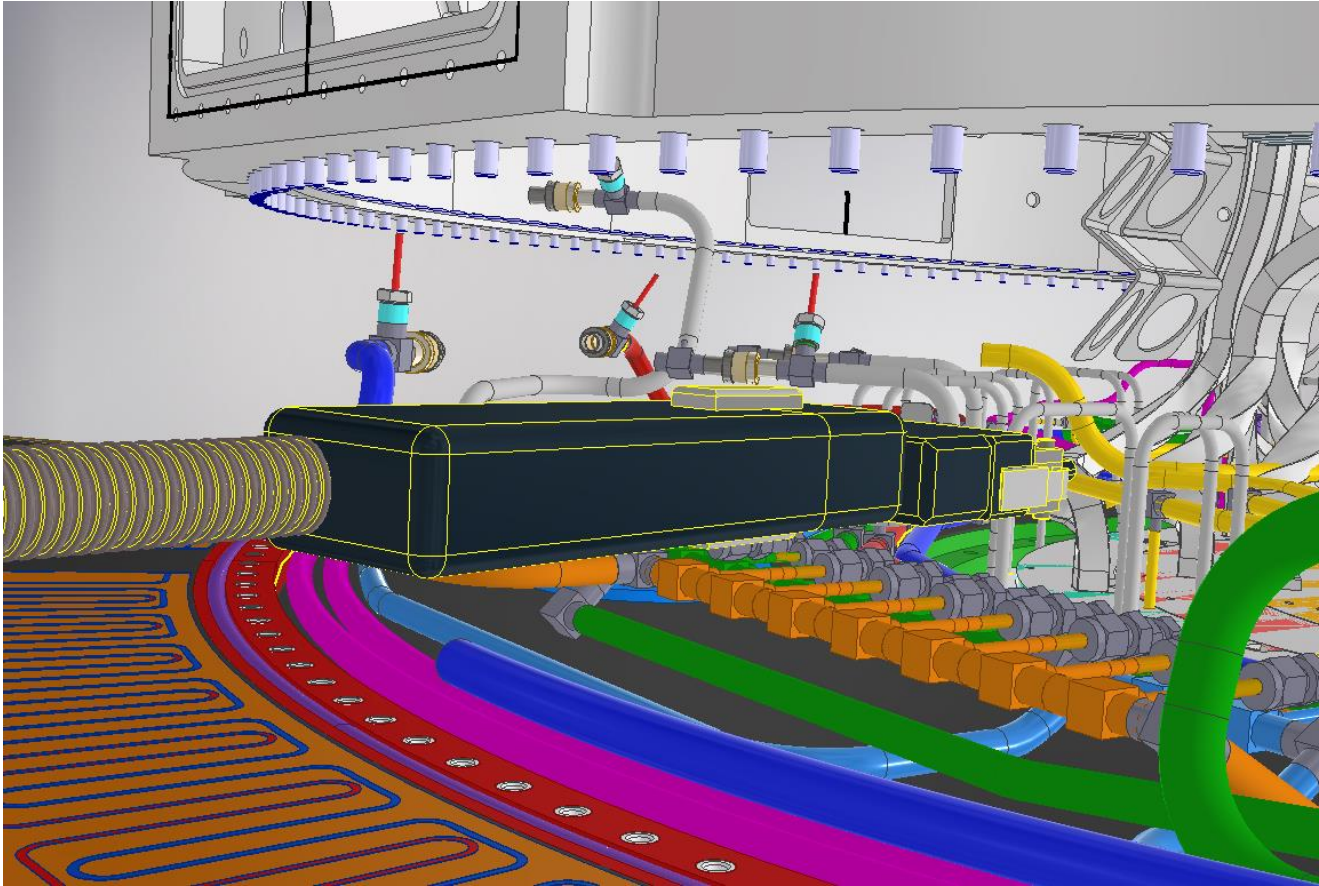
Step 4: PP1 Outer Wall shifting of 150mm in order to weld the OB U-pipes



Step 4: OB U pipe Welding and Pressure Testing by using temporary pressure lines, with sacrificial VCR

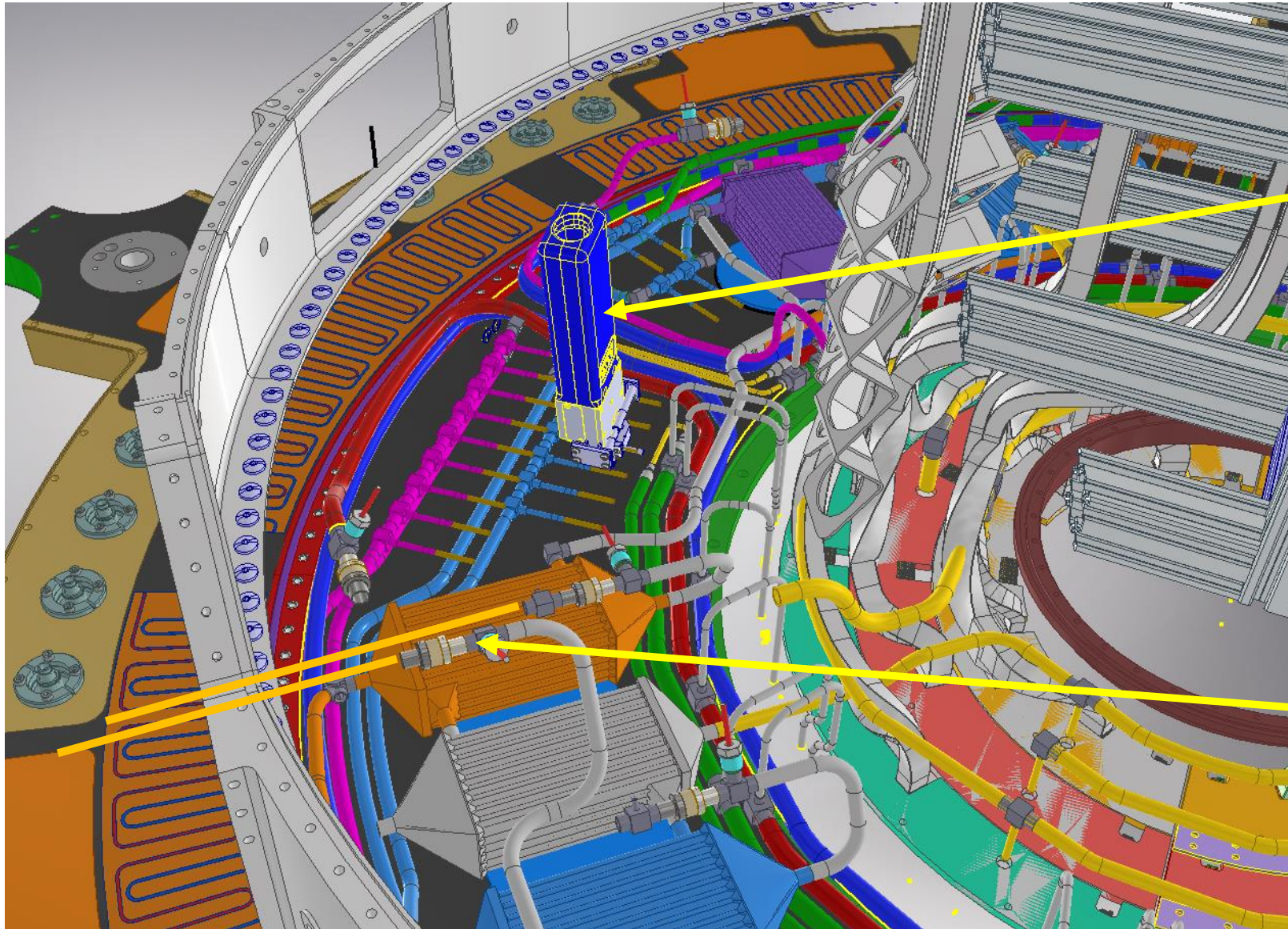


Step 5: OB U pipe Welding and Testing



The back solution is foreseen done by using the sleeves

Step 5: OB Welding of the capillaries



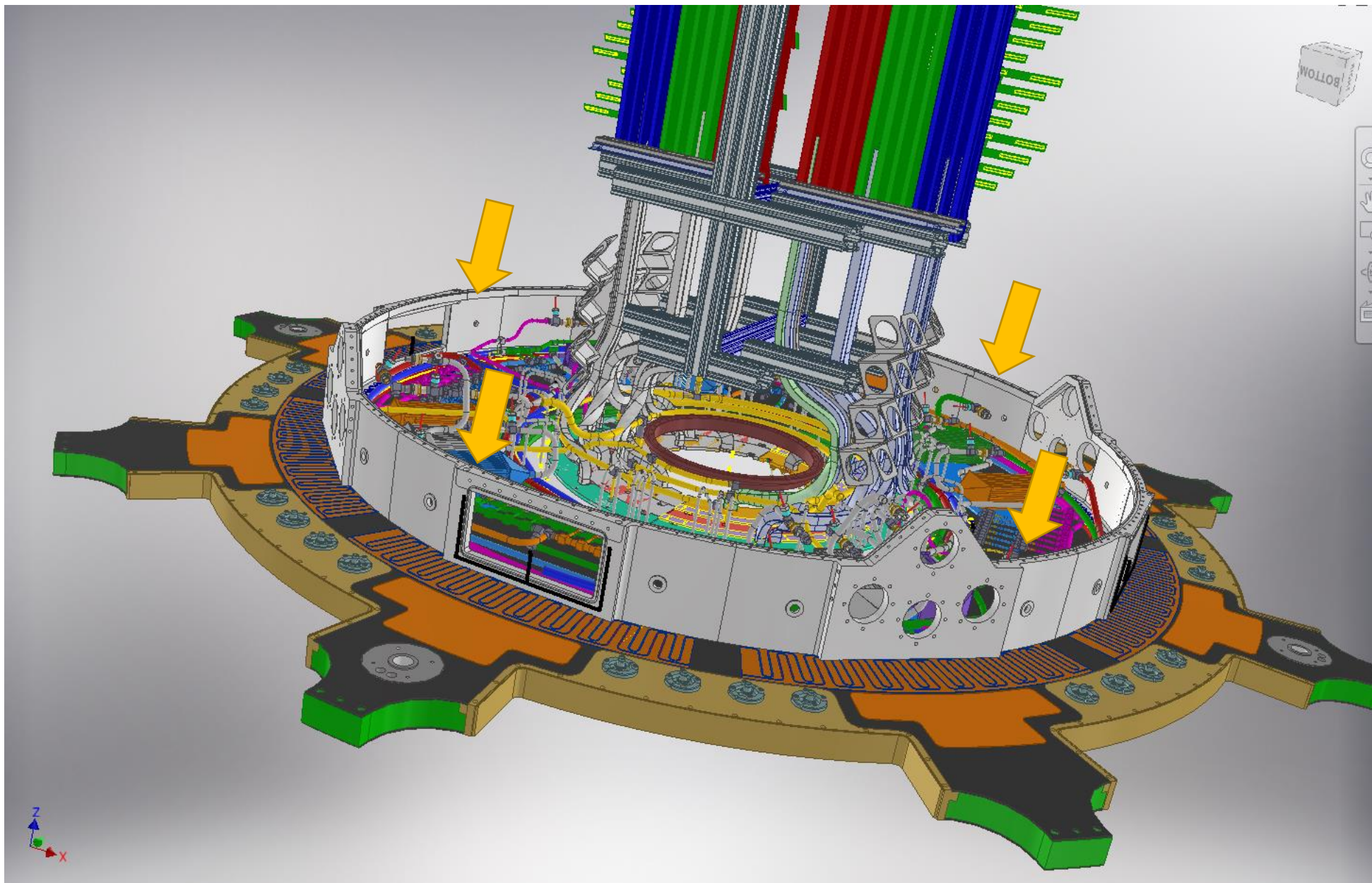
AMI Welding Head

Capillary weldings:

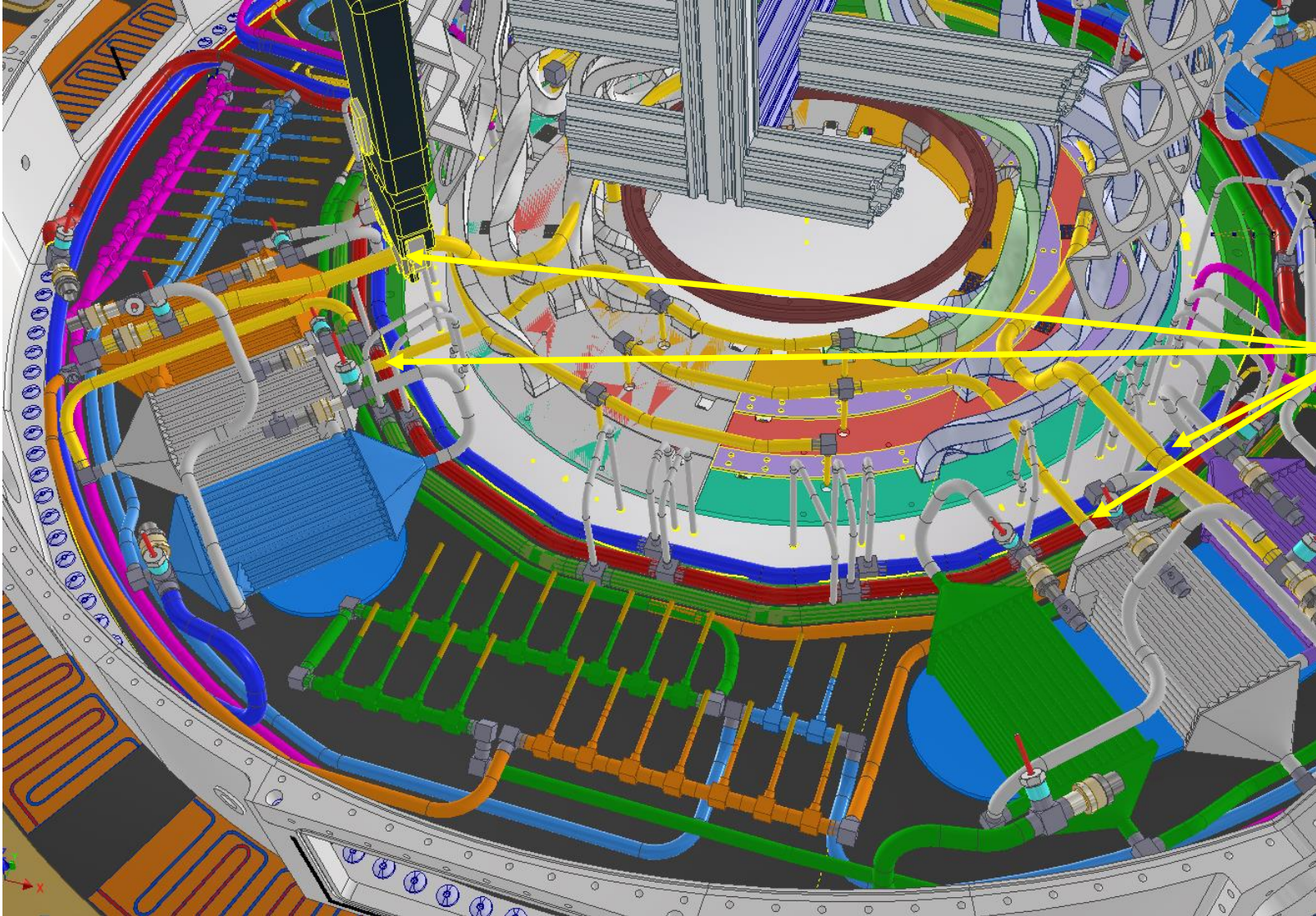
- 79 in total per side
- 39 A1 part (upper)
- 40 A2 part (bottom)

Pressure Tests performed by temporary pressure lines

Step 6: Outer Wall flange back in position



Step 6: EC pipe welding and test



6 weldings (2 per layer) in order to connect the EC to the VCR

BACKUP