INFN LNF

# STATUS OF 3D CAD MODEL OF THE IR

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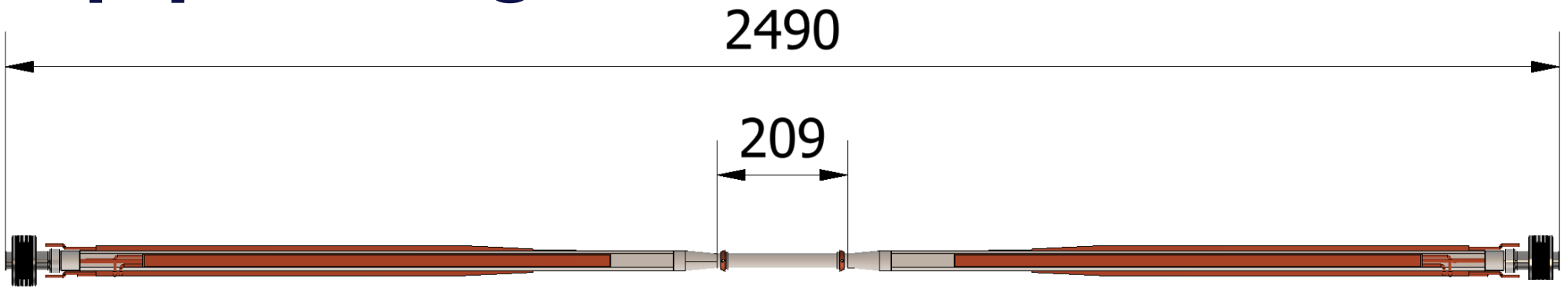
# Outline

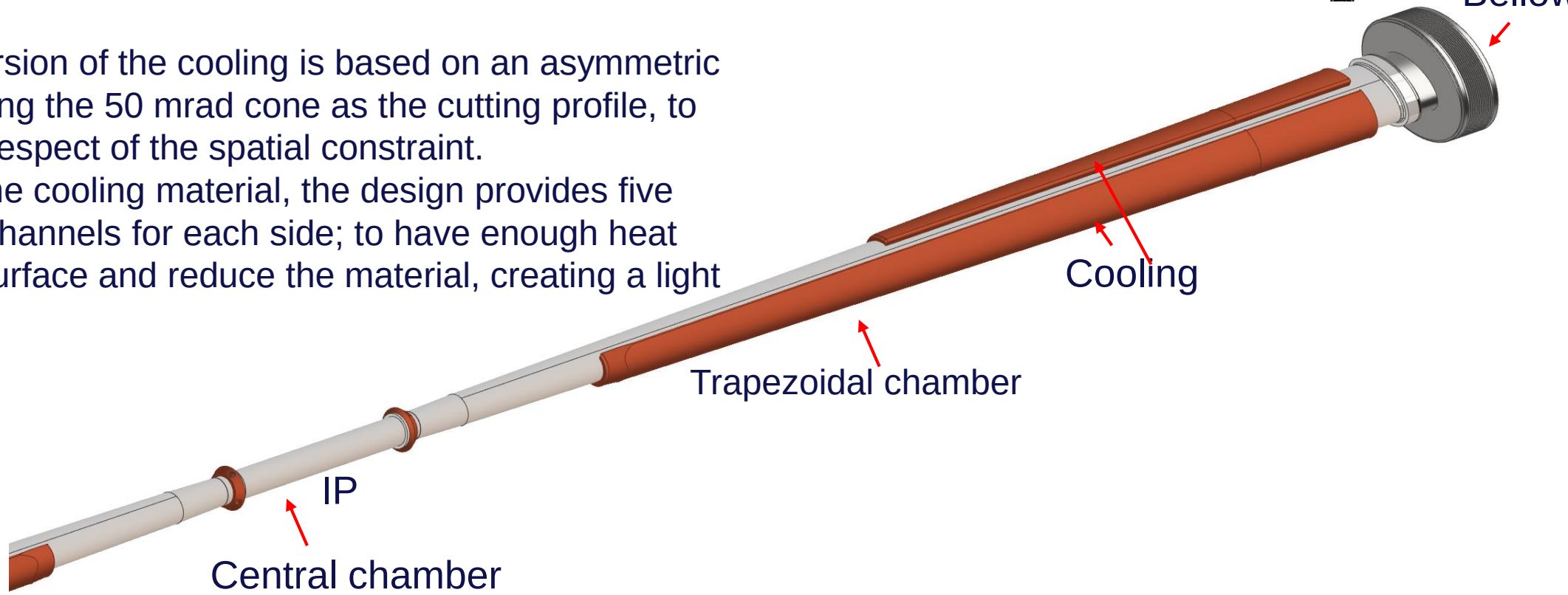
The presentation concerns:

- Summary of IR design
- Conceptual strategy of IR assembly on IDEA detector
- Open questions
- Conclusions

# Beam pipe design



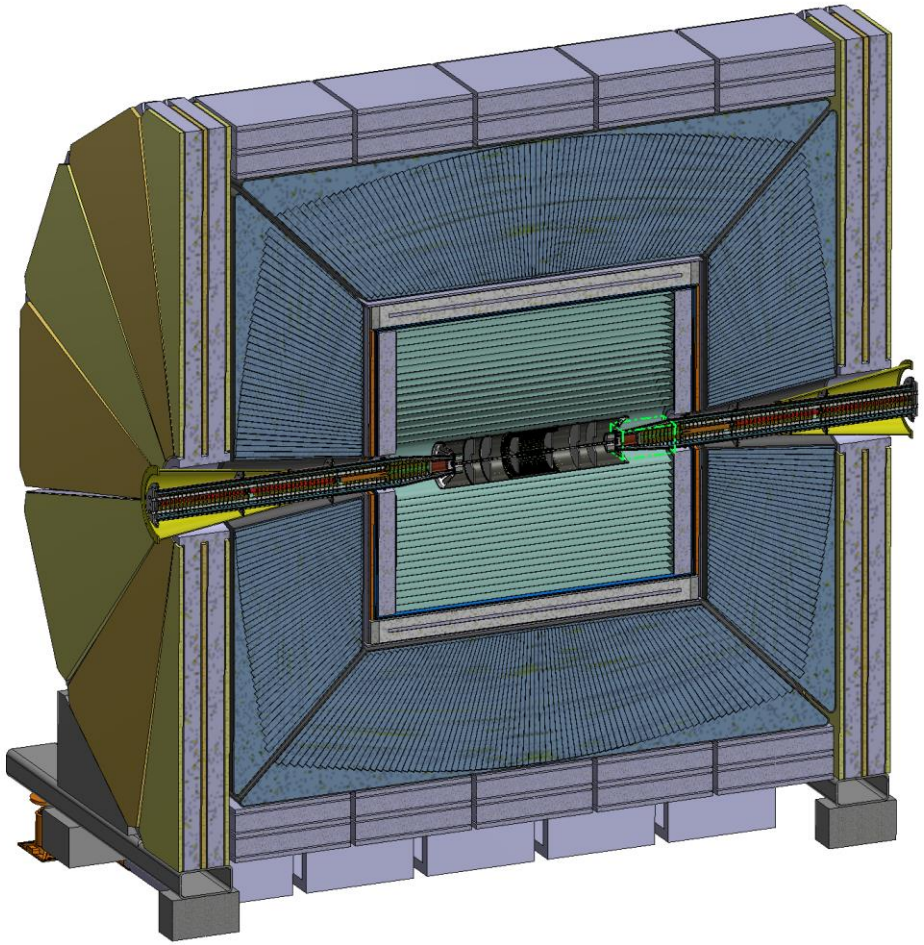

- The new version of the cooling is based on an asymmetric solution, using the 50 mrad cone as the cutting profile, to assure the respect of the spatial constraint.
- To reduce the cooling material, the design provides five couples of channels for each side; to have enough heat exchange surface and reduce the material, creating a light structure.



# IR Design and assembly strategy for IDEA detector

IR design is strictly related to detectors, in particular vertex and tracker detectors

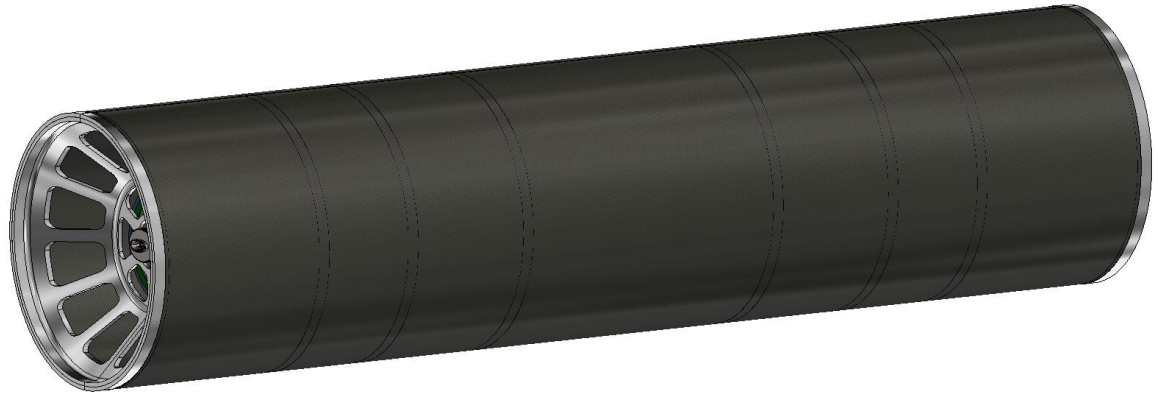
An effective collaboration has been started with INFN-Pisa on tracker and vertex of IDEA detector, in order to integrate 3D parts inside the IR CAD and study the assembly feasibility

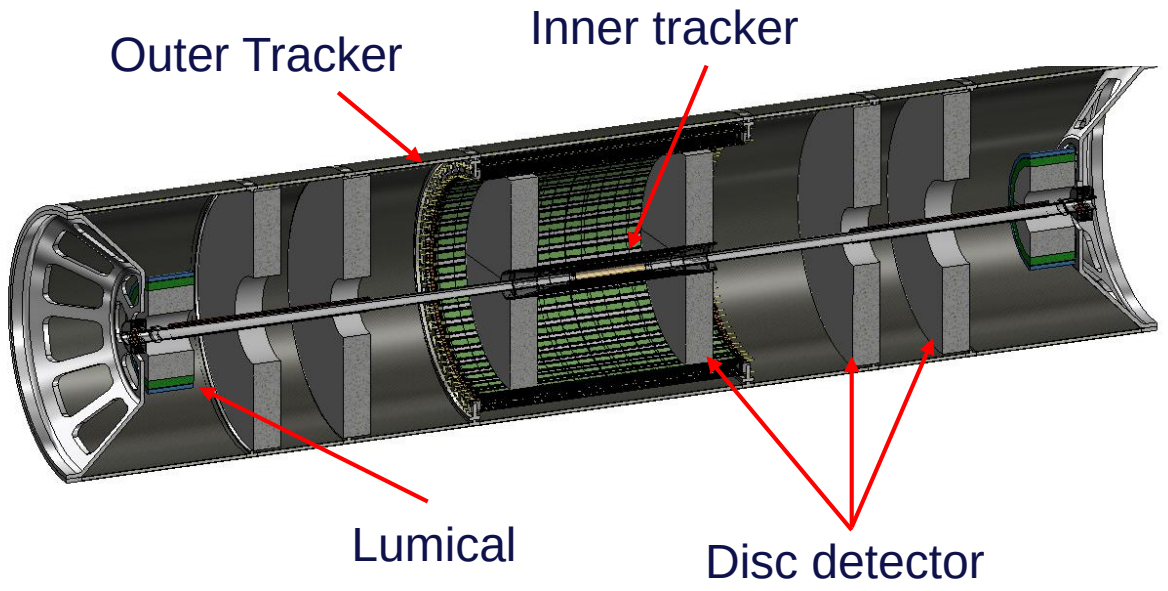


# Carbon fiber supporting tube

Use a lightweight rigid structure:

- Provide a cantilevered support for the pipe
- Avoid loads on thin-walled central chamber during assembly or due to its own weight
- LumiCal support
- Support for outer and disc tracker inside the structure



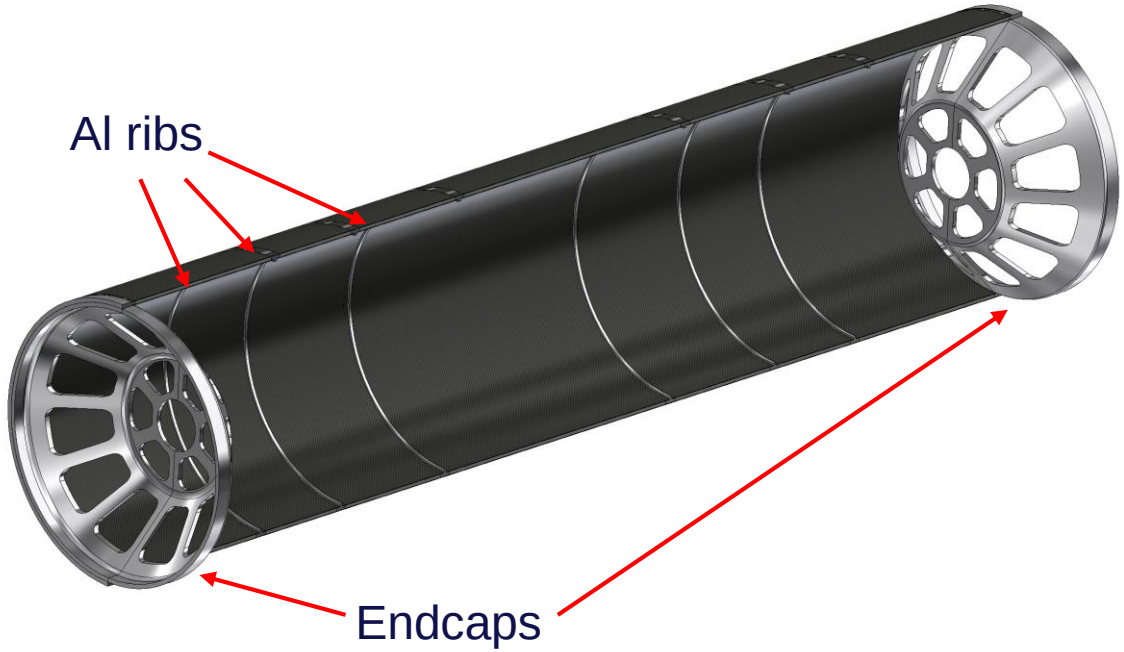


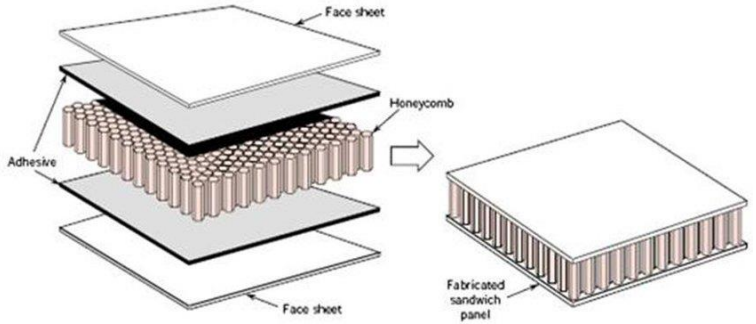
# Cylinder material and structure

Sandwich structure:

- Carbon fiber 1mm
- Honeycomb or rigid foam structure (Rohacell) 8mm
- Carbon fiber 1mm

Cylinder splitted in two halves
Alumin ribs to fix detector
Endcaps for supporting Lumical and beampipe

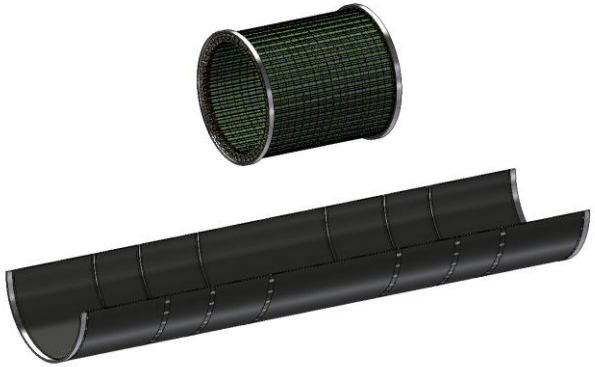


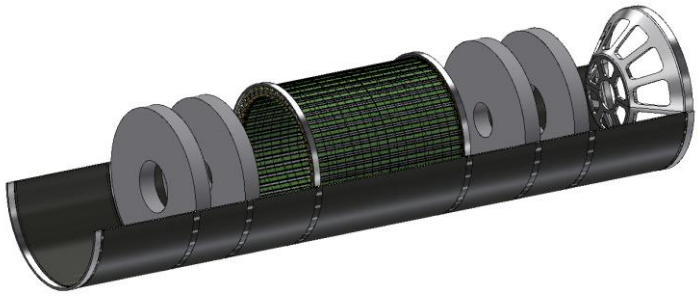

Honeycomb (fiberglass, aluminum, nomex/Kevlar)

Rohacell ( polymethacrylimide)

# Conceptual assembly strategy

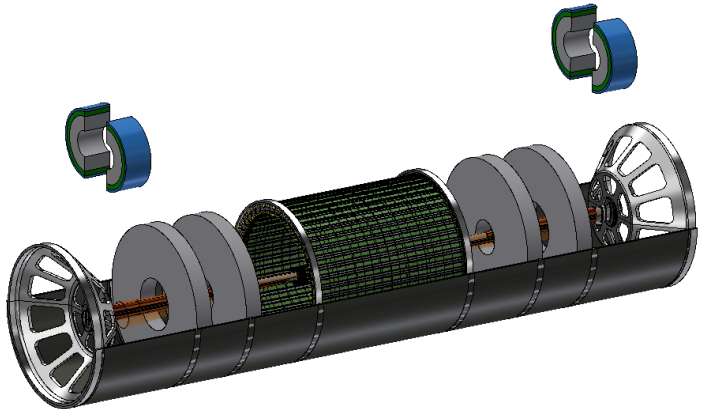


1) Outer tracker is assembled and laid down and fixed on half cylinder

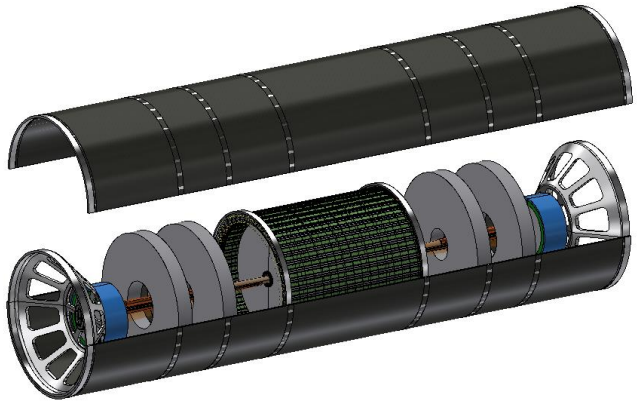


2) Detector disc and one endcap fixed to the half cylinder

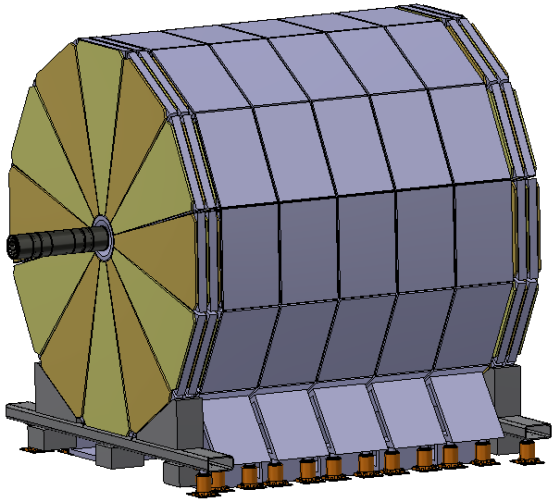
3) Beam pipe with vertex detector is inserted with a dedicated tool inside discs and outer tracker, then fixed to both endcaps



4) Lumicals are coupled to endcaps

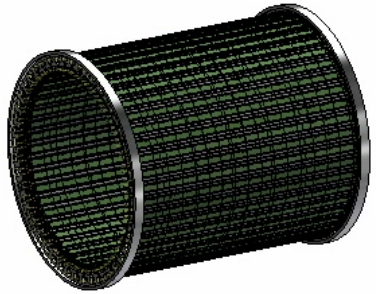


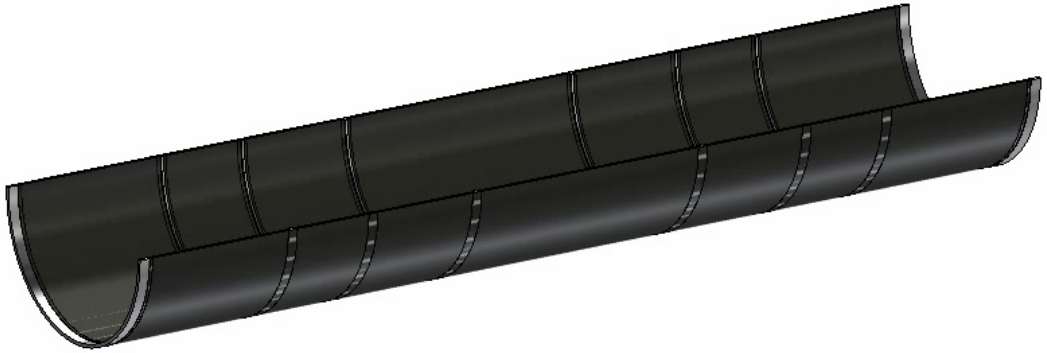
5) The whole cylinder can be composed



6) Cylinder can be inserted inside the detector using a rail system

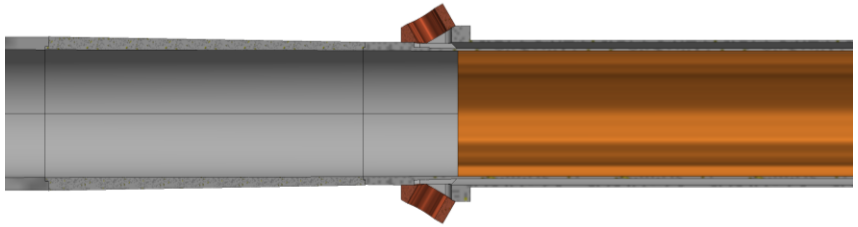
# Conceptual assembly strategy



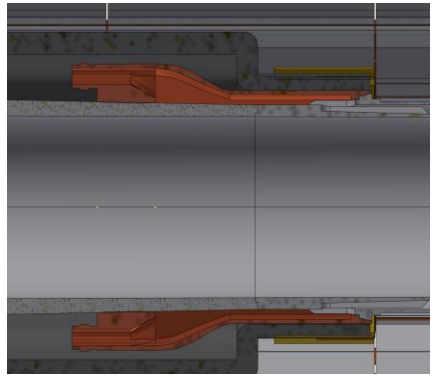


# Open questions – Detector integration

- The IR design is strictly related to detector design, we started an effective collaboration with INFN-PISA on vertex and tracker detector but we have no info on other detector proposal (CLD)

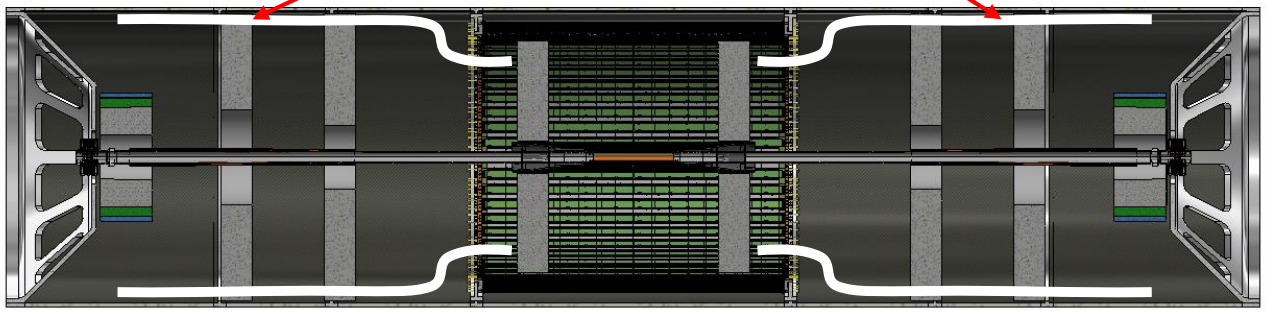


Original design



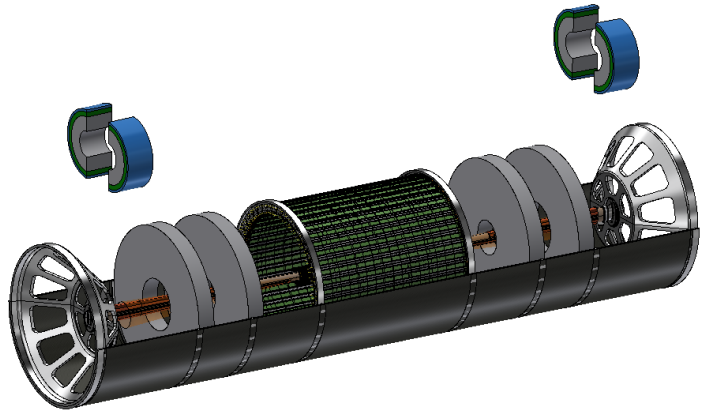
Modified design to accommodate 1st Layer of IDEA vxd

- Services (cables and cooling) should be carefully taken into account
- Detector design is still preliminary and some parts are represented only by an envelope, we will integrate further details when-available
- How and where cylinder is supported inside the main detector it's not defined

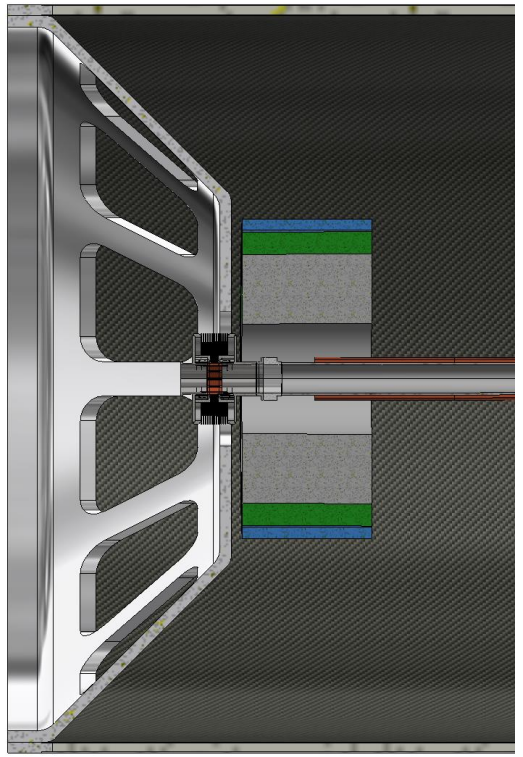


# Open questions - Lumical

- Lumicals should be split in two halves in order to be assembled
- To be checked if feasible

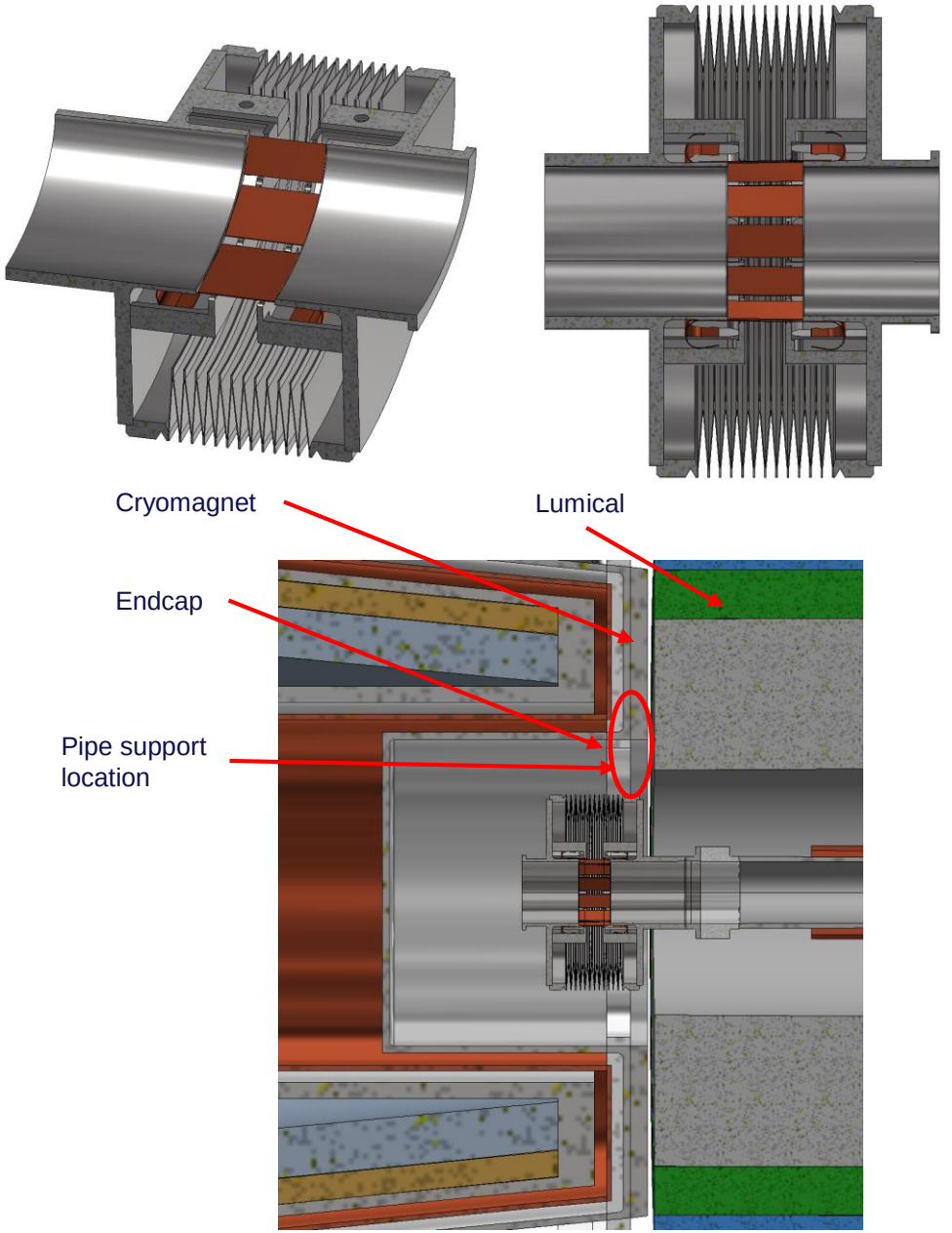


- Lumicals would need an active alignment and positioning system
- Designing supports, alignment and/or positioning system require some progress on LumiCal engineering design



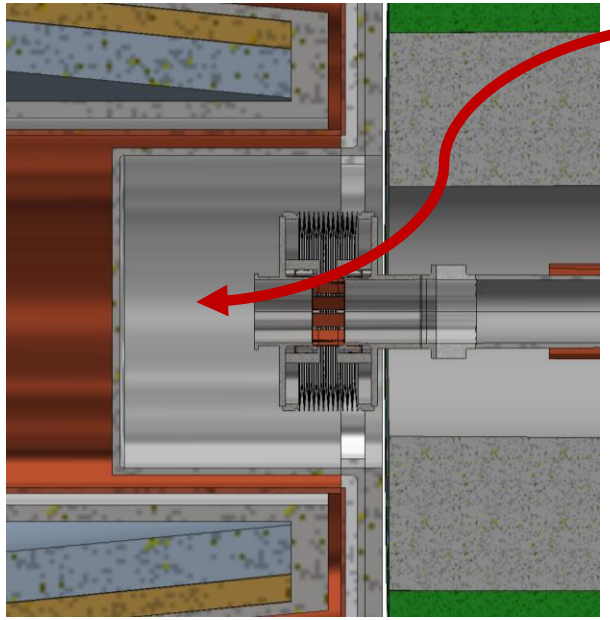
# Open questions - Bellow

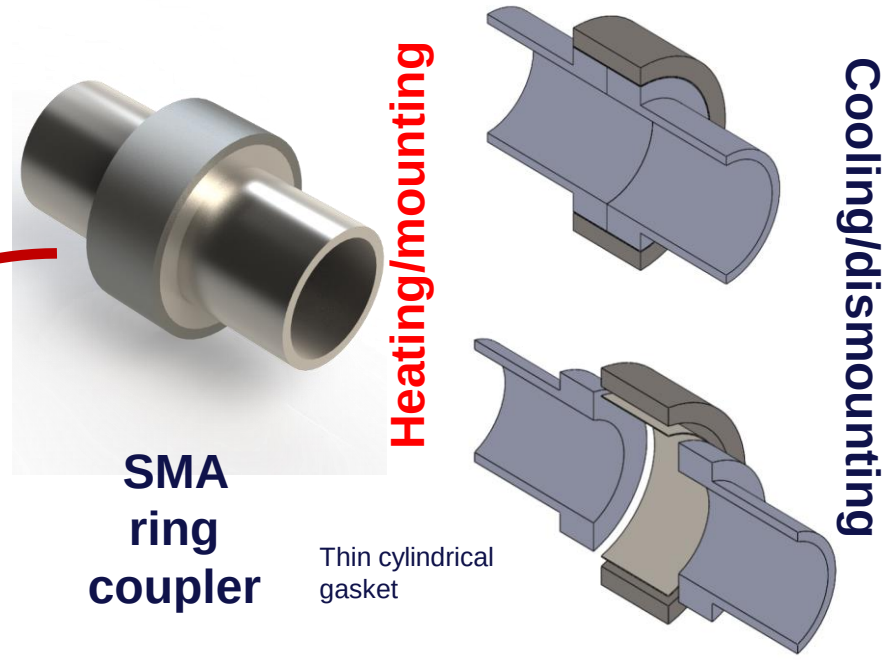
- Internal bellow design is very similar to what has been used in ESRF and is proven to work
- Simulation and collaboration with Alexander Novokhatski is on going and we are waiting for results in order to understand if any modifications are needed.
- Bellow cannot be attached to LumiCal and it will also support the beam pipe.
- Interference with magnet needs to be solved



# Open questions – Remote Vacuum Connection

- Mechanical solution, as used in Super KEKB, require a lot of space
- SMA connection (FCC Week 2022) thanks to the compact dimensions would be the perfect solution to fit inside the available space.
- We may start a collaboration to investigate if the use of this solution is compatible with our design






Soft/hard materials + temperature control

C. Garion FCC Week 1st June 2022

# Conclusions

- What has been showed is  a “conceptual strategy” for assembly but it’s useful to understand how and where things should be designed and also the needed handling tools
- IR strongly depends on detector, an iterative collaboration started only on the IDEA vertex detector but not inputs from other detectors proposal
- There is still a lot to be done and many aspect needs to be implemented/designed/improved and defined but the process can be speeded up if an engineering counterpart is defined. (LumiCal, detectors, alignment specification, etc….)
- Hope to start as soon as possible with prototyping to demonstrate the technical feasibility of proposed solutions

# *THANK YOU FOR YOUR ATTENTION*

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