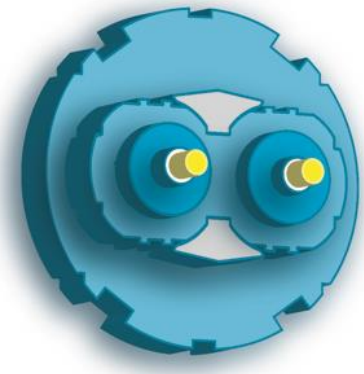


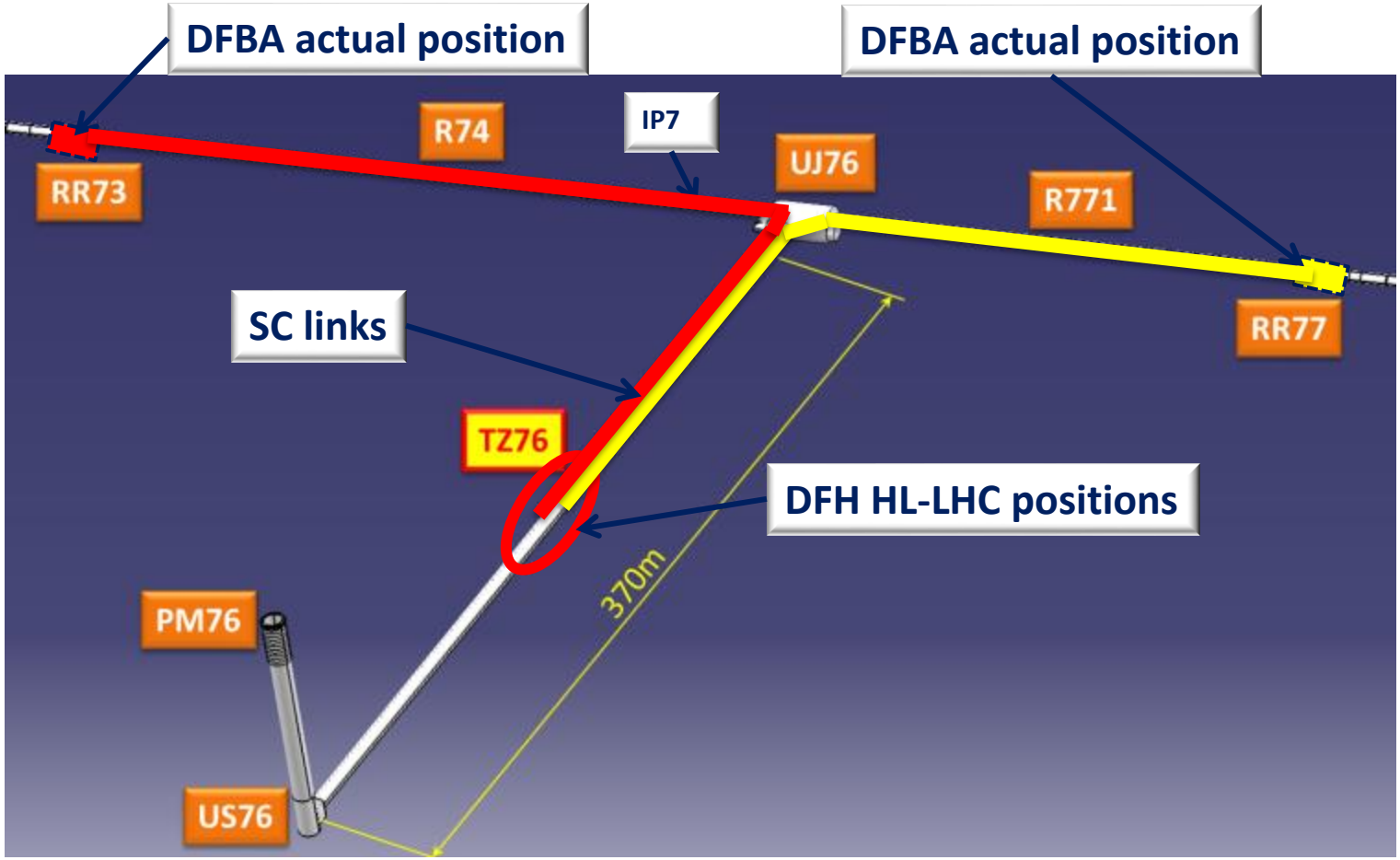
High Luminosity LHC

# SC Links Point 7 Installation Challenges

## Integration drawings by J. P. Corso

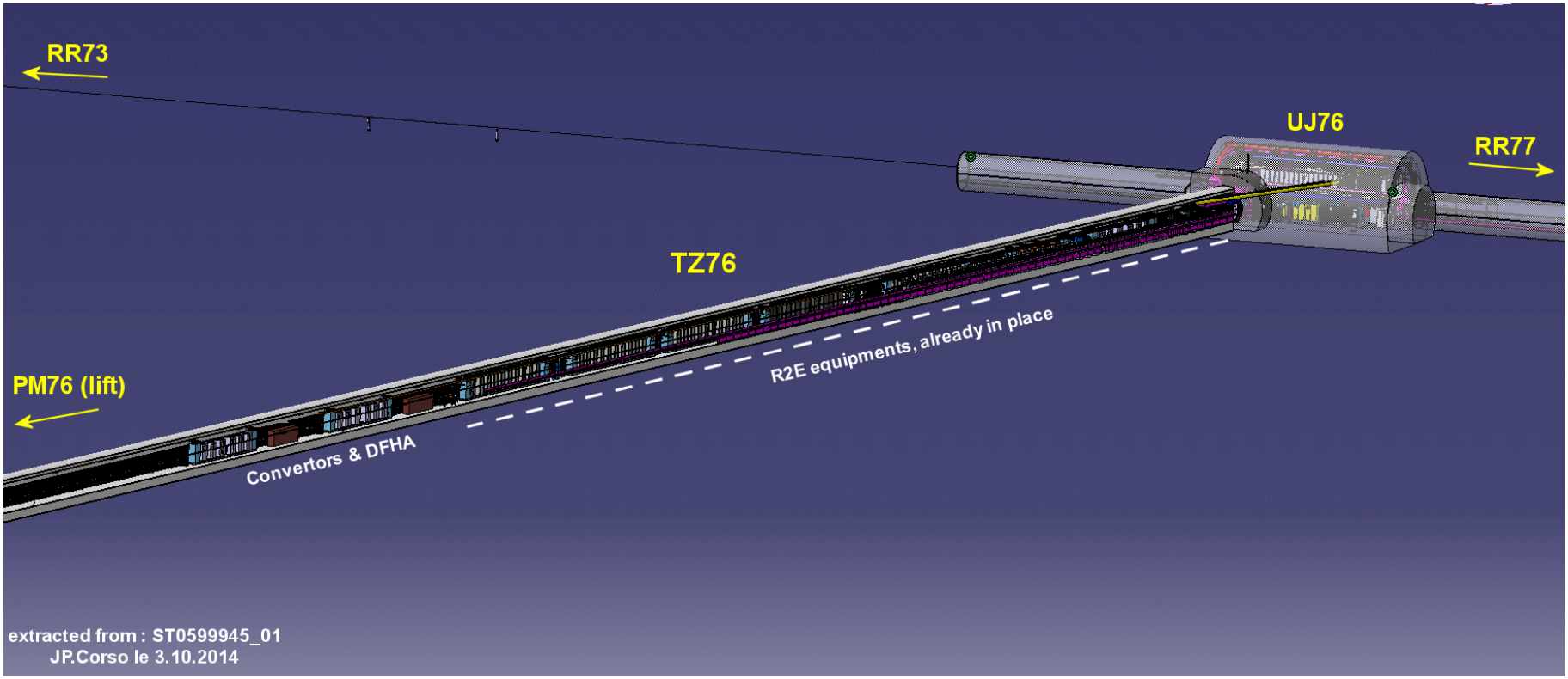
The HiLumi LHC Design Study is included in the High Luminosity LHC project and is partly funded by the European Commission within the Framework Programme 7 Capacities Specific Programme, Grant Agreement 284404.

# Overview of Point 7



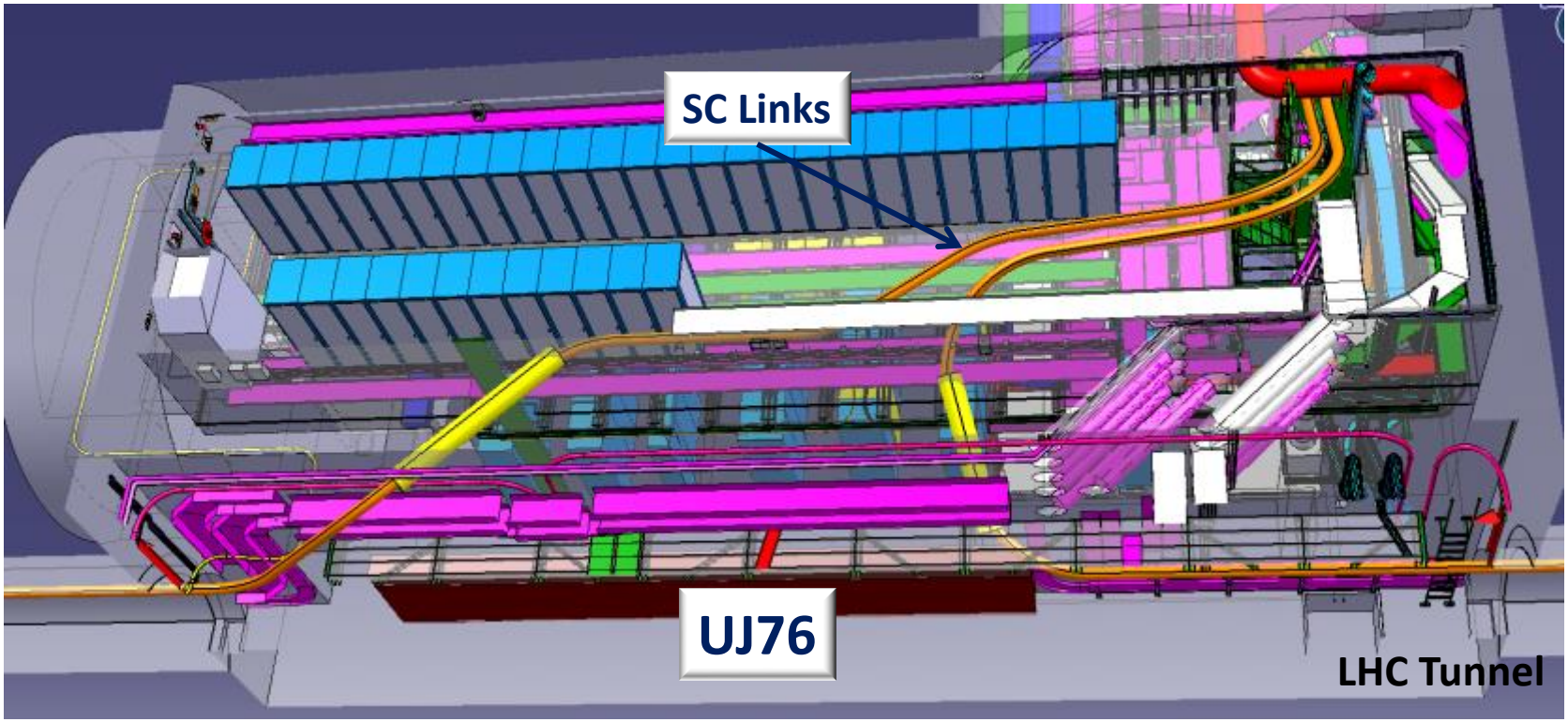

**~250 m in LHC tunnel and > 200m in TZ gallery ➔ ~500m total for each link**

# Routing in TZ76



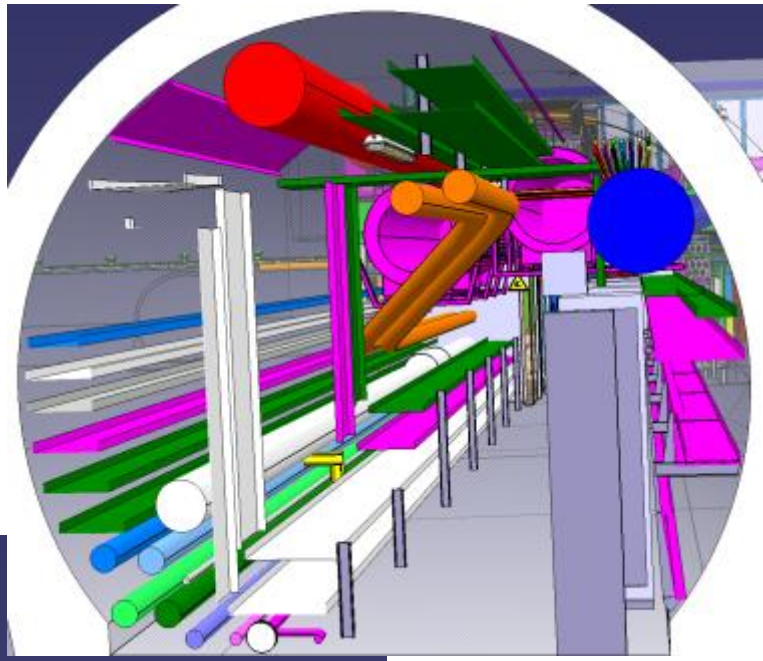
# Routing UJ76 – Option 1 (Minimal CE)

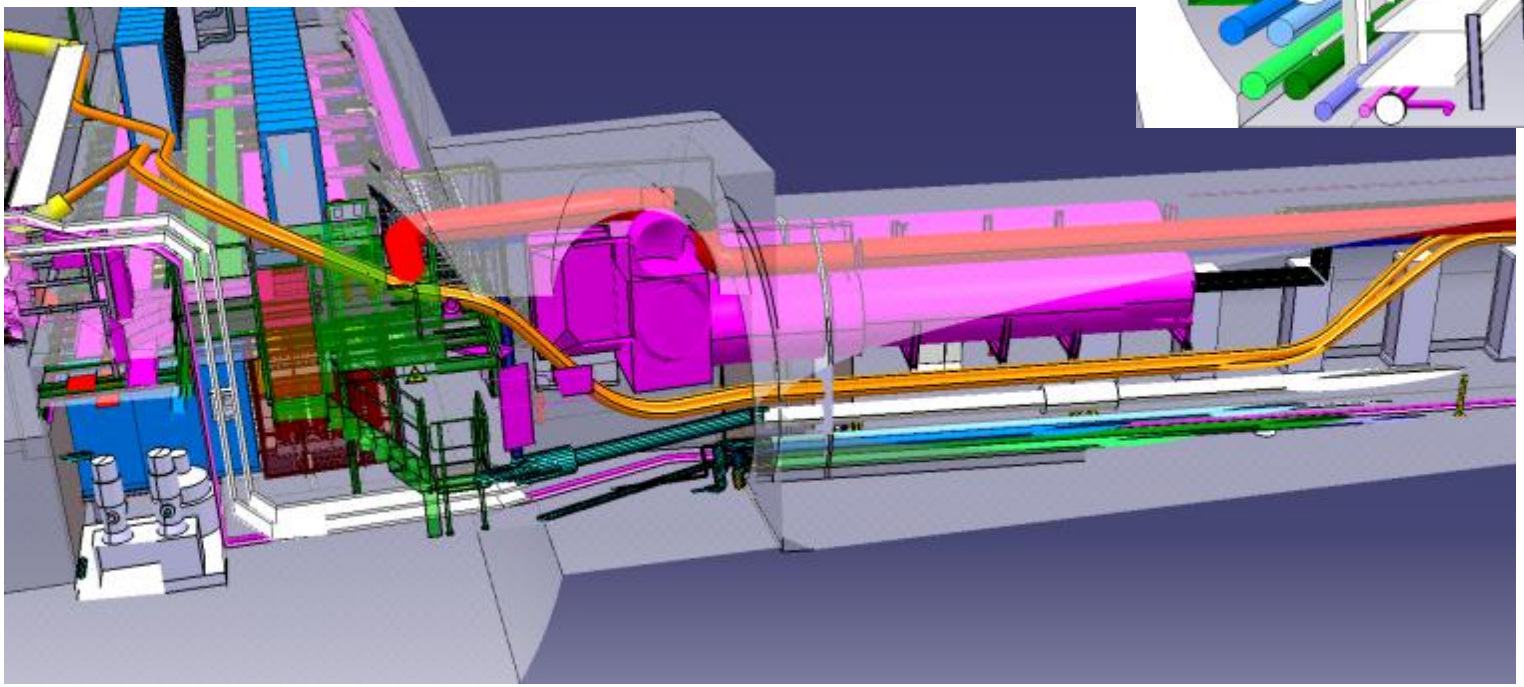
- 2 shorts ducts from LHC tunnel to service area
- NO new long ducts



# Routing UJ76 – Option 1

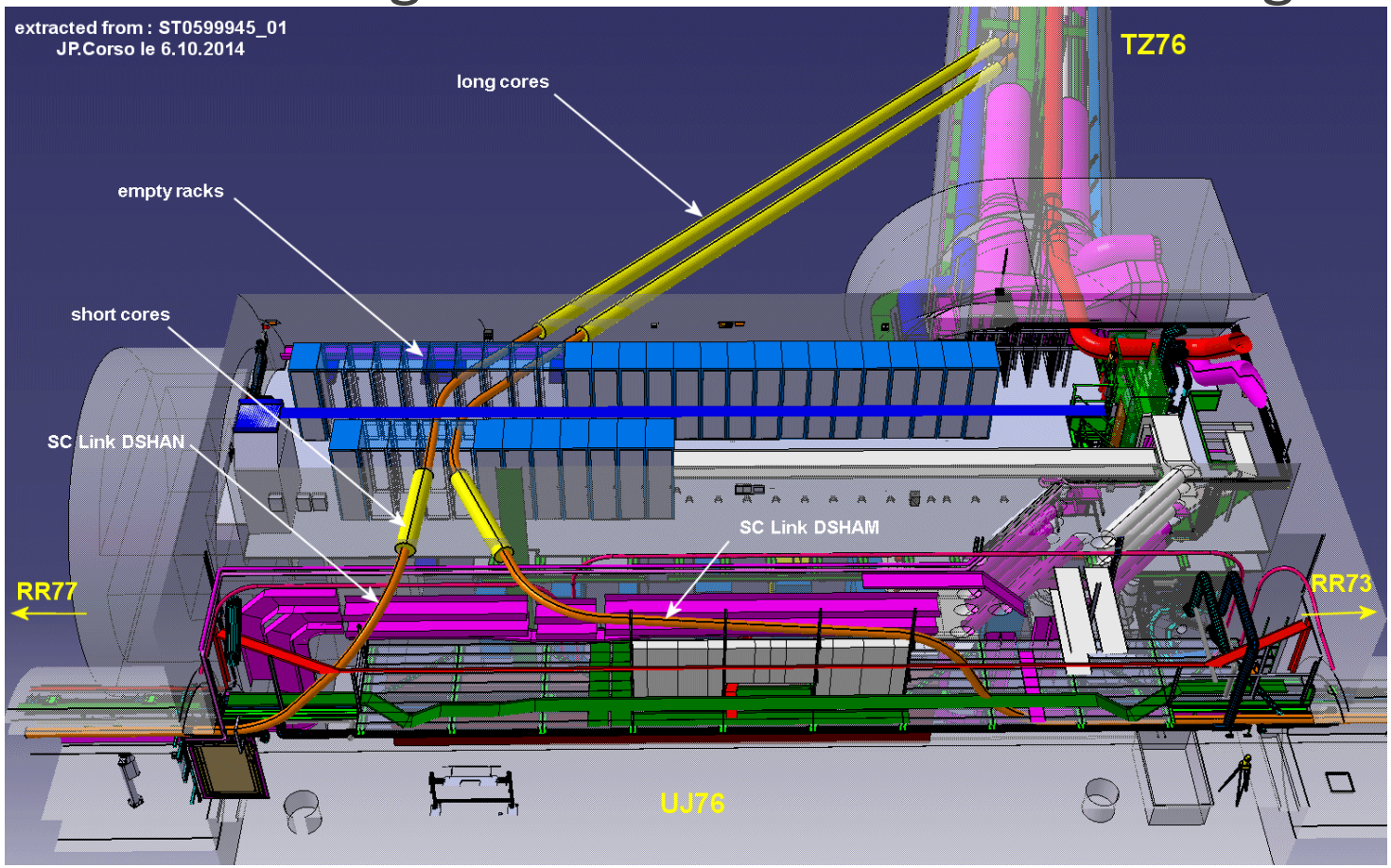
- Along UJ76 bottleneck





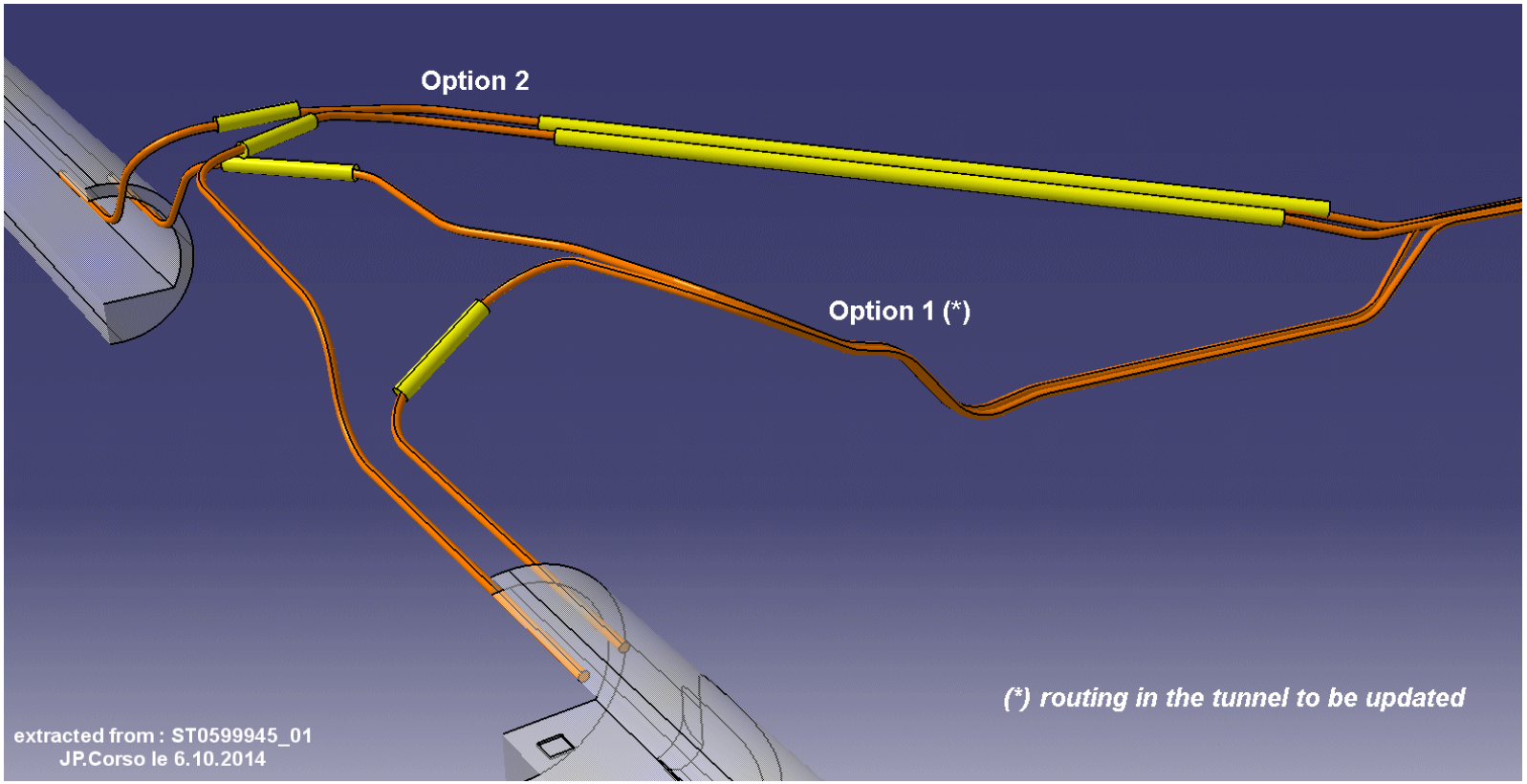
# Routing UJ76 – Option 2

- 2 shorts ducts from LHC tunnel to service area
- 2 additional long ducts from UJ76 to the TZ76 gallery



# Routing Options – UJ76

- Overview of the two options: 1st option (no long ducts) requires more bends and smaller bending radius



# Installation Challenges

- Install each SC link as one single element:
  - No splices on the MgB2 cable
  - Possibility to test SC link before installation
  - Fast installation in LHC tunnel (ALARA)
- Need to bring the SC link at Point 7
- Need to pull >200 m of SC link through ducts and complex paths in UJ76

# Specifications of Nexans Cryostat

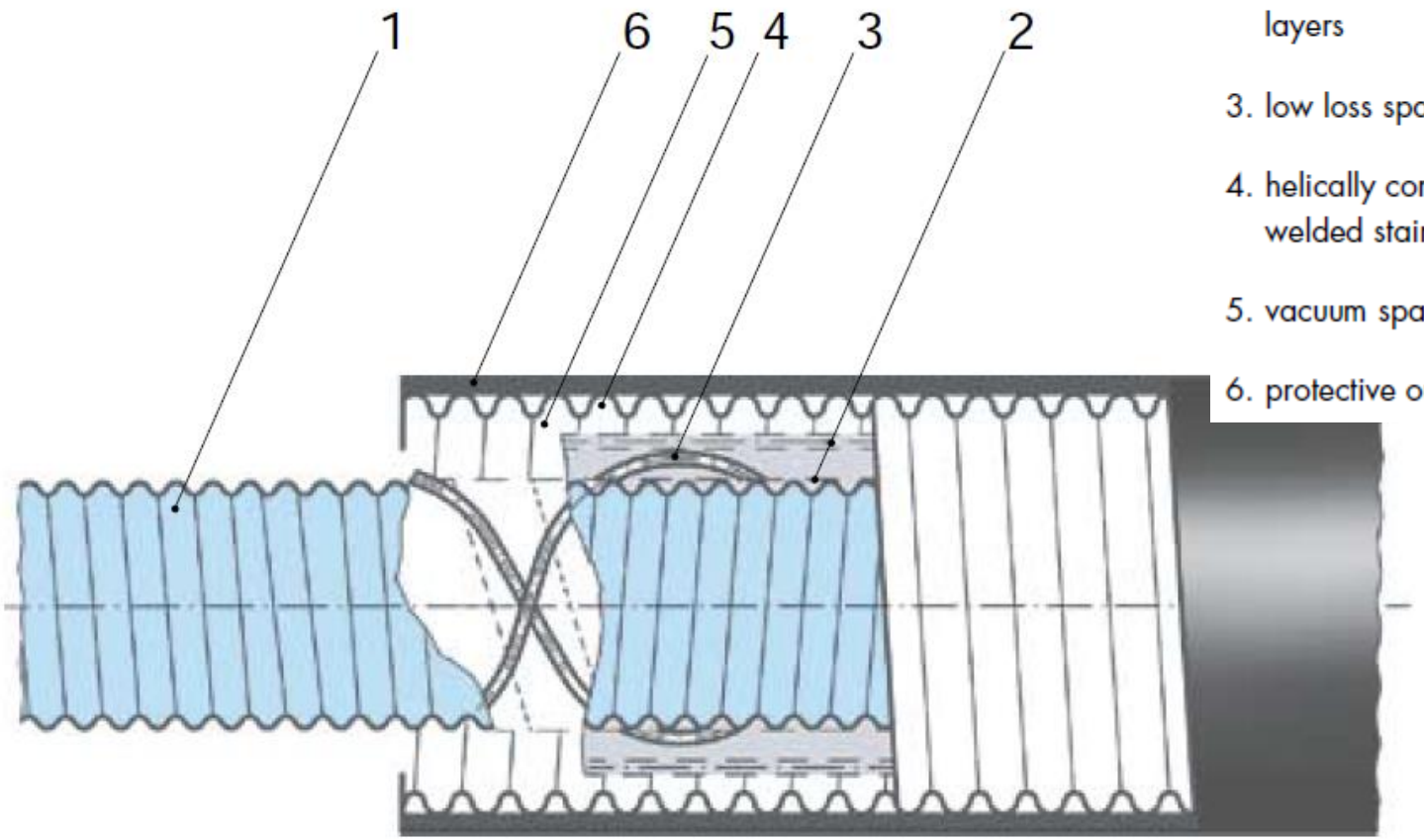
| Transfer Line Type: | 14/34 | 21/44 | 30/58 | 39/66 | 60/110 | 75/125 | 84/143 | 100/163 |
|---|---|---|---|---|---|---|---|---|
| *Inner tube Nominal diameter in mm* (inner-/outer-Ø) | 14/18 | 21/25 | 30/34 | 39/44 | 60/66 | 75/85 | 84/92 | 100/110 |
| *Outer tube Nominal diameter in mm* (inner-/outer-Ø) | 30/34 | 39/44 | 51/58 | 60/66 | 100/110 | 115/125 | 130/143 | 147/163 |
| *Bending radius - mm:* | | | | | | | | |
| Several bends | 600 | 700 | 900 | 1100 | 2000 | 2200 | 2500 | 3000 |
| Single bend | 300 | 350 | 450 | 550 | 1000 | 1100 | 1250 | 1500 |
| *Heat inleak - watt/m* | 0.4 | 0.6 | 0.8 | 1.0 | 1.2 | 1.5 | 2 | 2 |
| *Weight - kg/m* | 0.5 | 0.8 | 1.3 | 1.7 | 4 | 5 | 6 | 9 |

!

Total weight is about 6 tons (with MgB2 cables) per link, and it is very stiff …

We anyway need more specifications relevant to our project.

# Structure of Nexans cryostat




1. helically corrugated and longitudinally welded stainless steel inner tube
2. n layers of superinsulation (both sides of the PET-foil are AL-coated) with PP spacer fleece between the layers
3. low loss spacer
4. helically corrugated, longitudinally welded stainless steel outer tube
5. vacuum space
6. protective outer PE-jacket

# Some questions for today:

- Can we use cable pulling techniques to install the SC links?
- What type of pulling equipment is available?
- What is the experience relevant to this project?
- What type of information do we need from Nexans?
- Or what properties should we specify to potential suppliers of such semi-flexible cryostat?