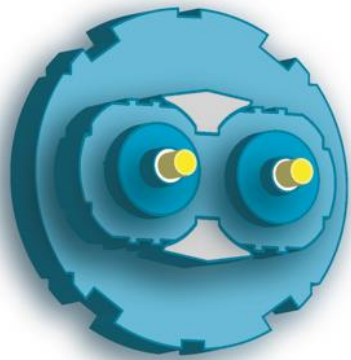


*4th Joint HiLumi LHC-LARP Annual Meeting
November 17-21, 2014*

KEK



**High
Luminosity
LHC**

**SC Links
Point 7**

Status Integration 7.10.2014

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EDMS ; No. 1419773



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.



Outline

- Remind of requirements
- Overview of Point 7 ; Remind
- Routings
 - TZ76 → UJ76 → R771 → RR77
- Tricky Points
- Open Points

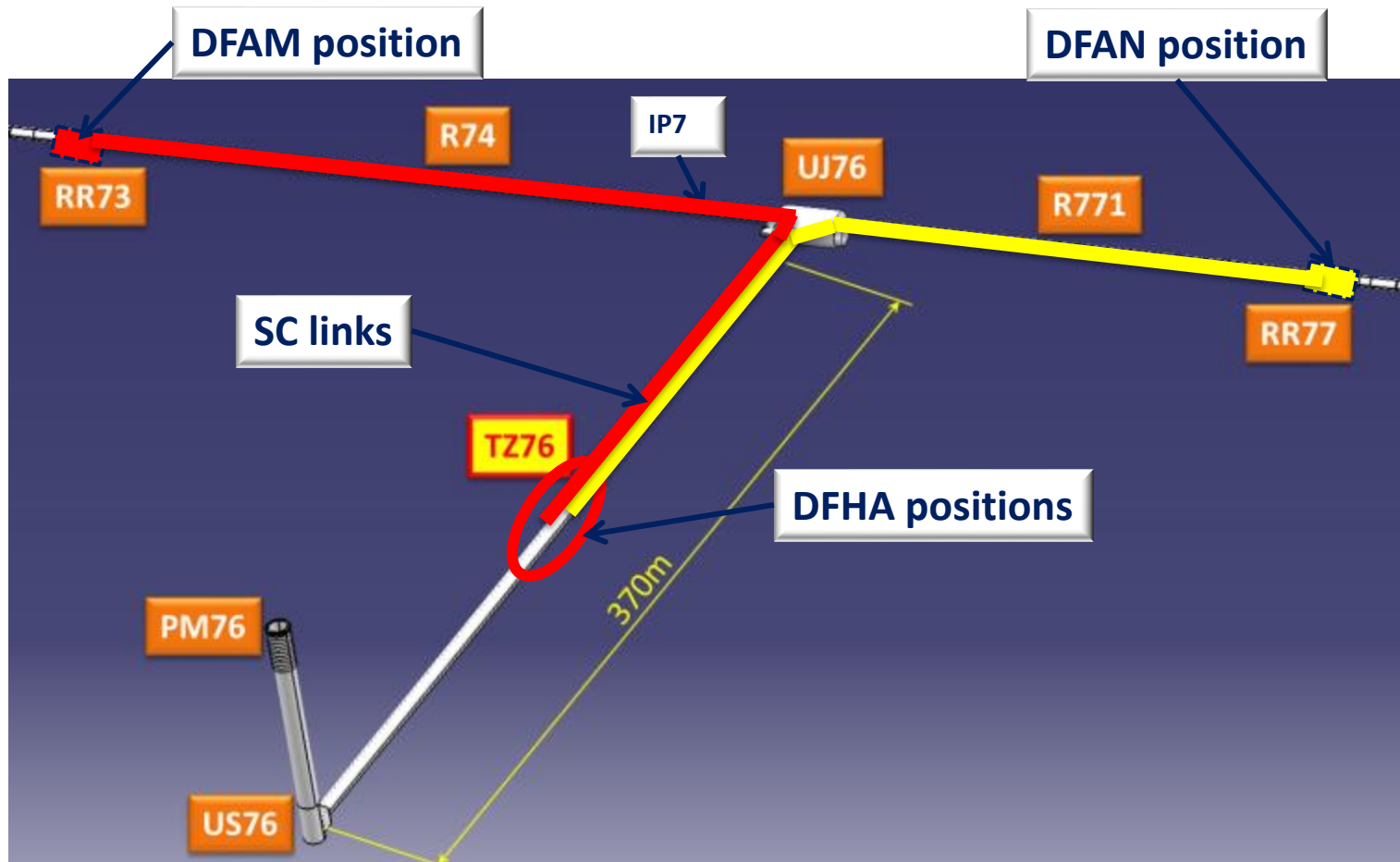
Remind of requirements

- Relocate **DFBA** (80% of powering) and their power convertors from RR73 & RR77 inside the TZ76 gallery
- Replace **DFBA** by a **DFA** with same bulkiness, keeping current leads for Quench protection

Remind of requirements

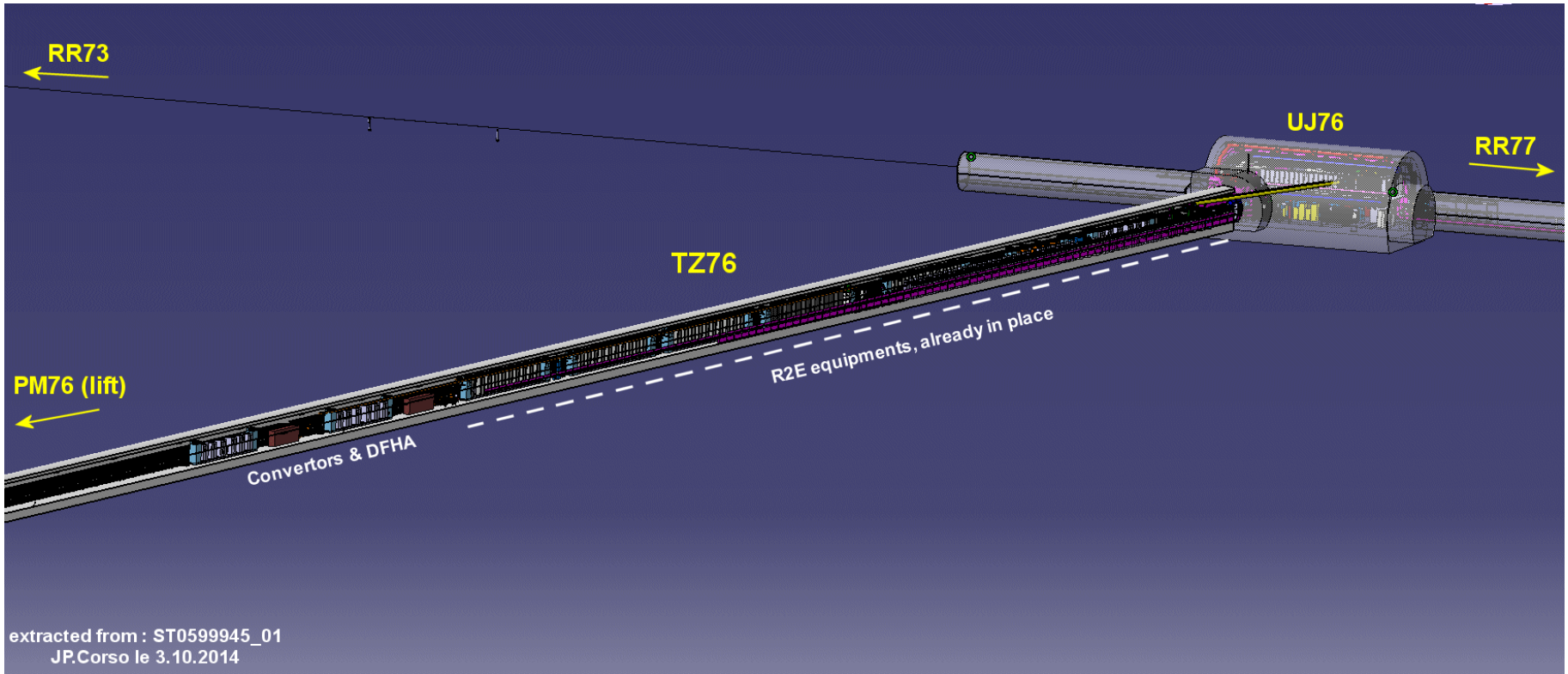
- Connect **DFA** in RR73 & RR77 to two **DFHA** inside the TZ76 gallery via LSS7 & UJ76 by the mean of a $\varnothing 200\text{mm}$ semi-rigid pipe (supra link)
- Connect **DFM** to **DFA** (size to be defined)
- Connect **DFA** to the **DFHA** with a DN80 rigid warm pipe (Helium)

Overview of Point 7 : Remind



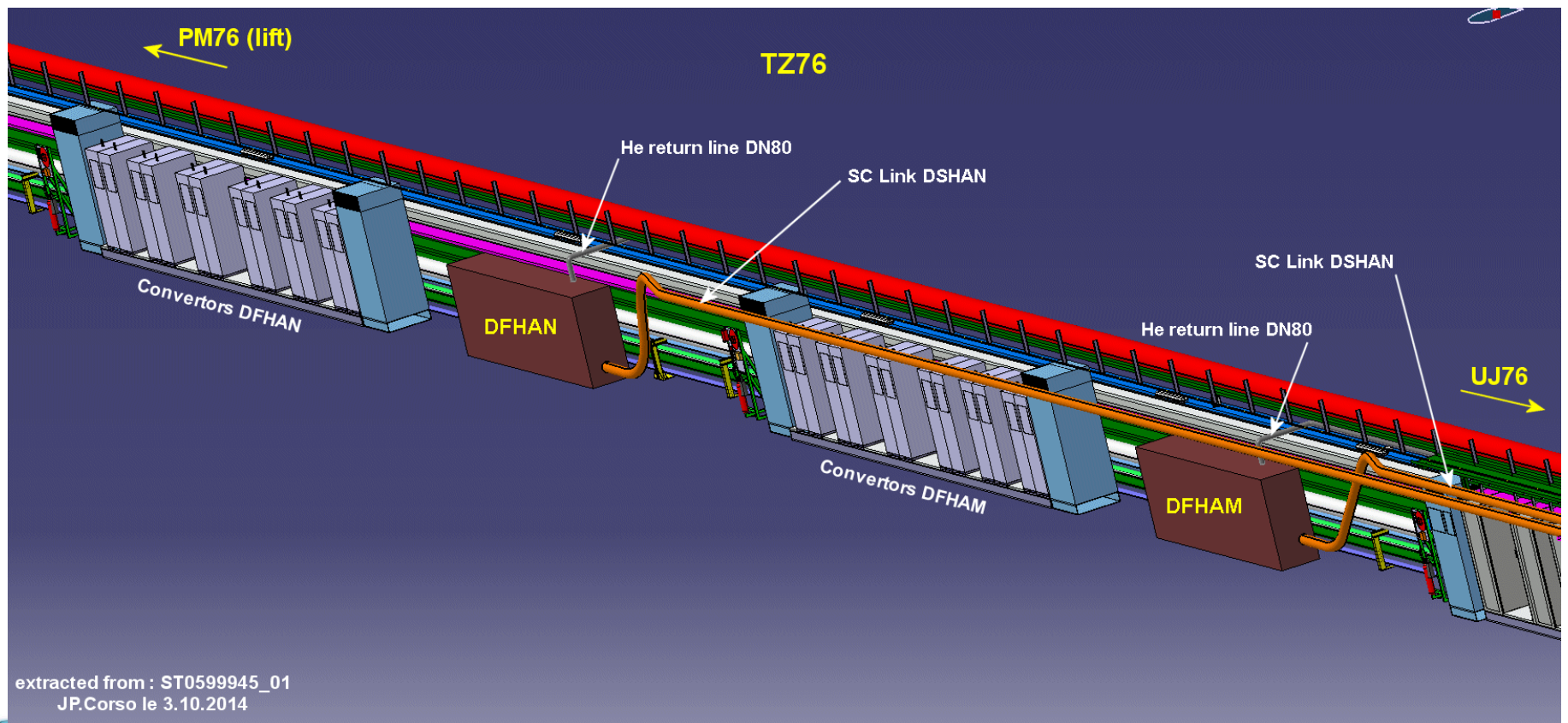
Routing along TZ76

- Position of DFHAN & DFHAM into the TZ76



Routing along TZ76

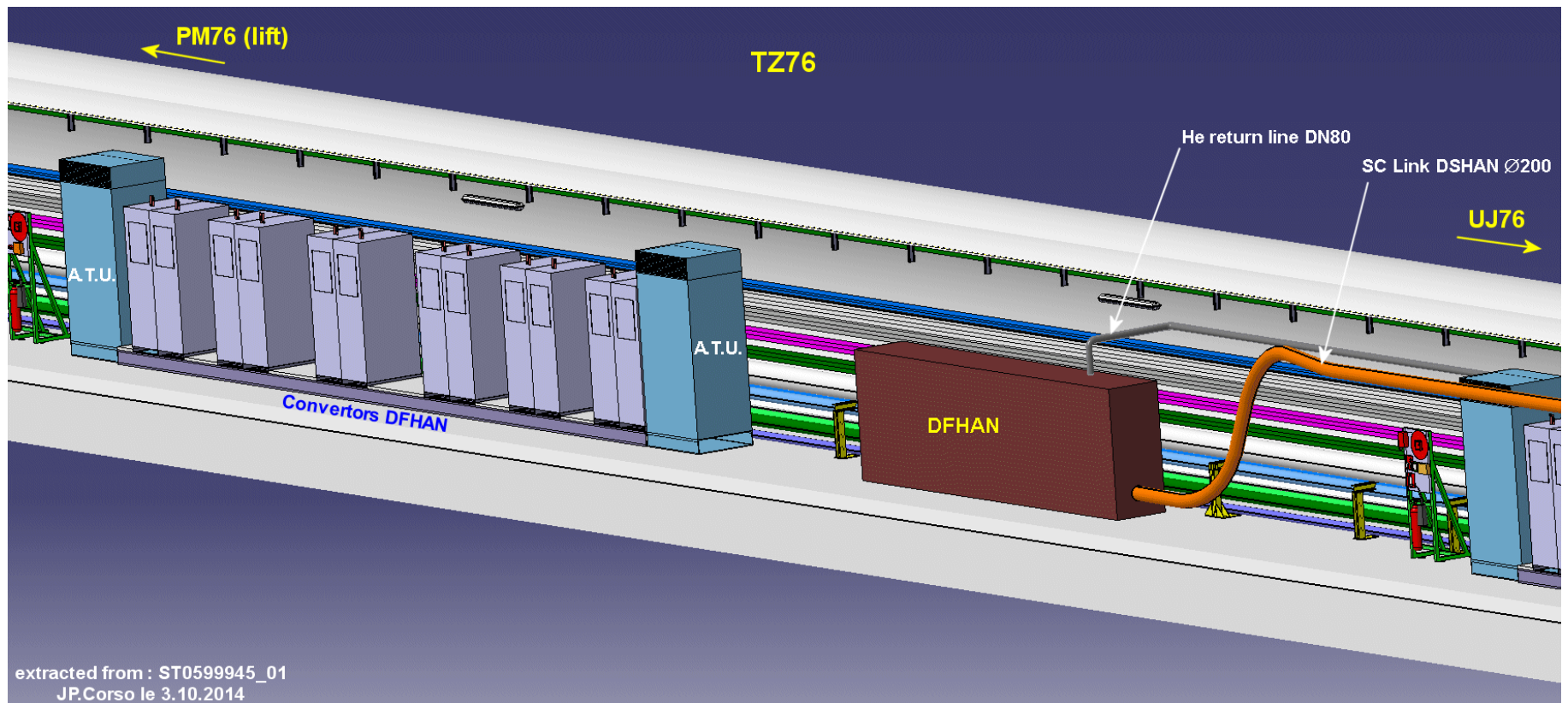
- Connection to the DFHA's grouped with their corresponding power converters



extracted from : ST0599945_01
JP.Corso le 3.10.2014

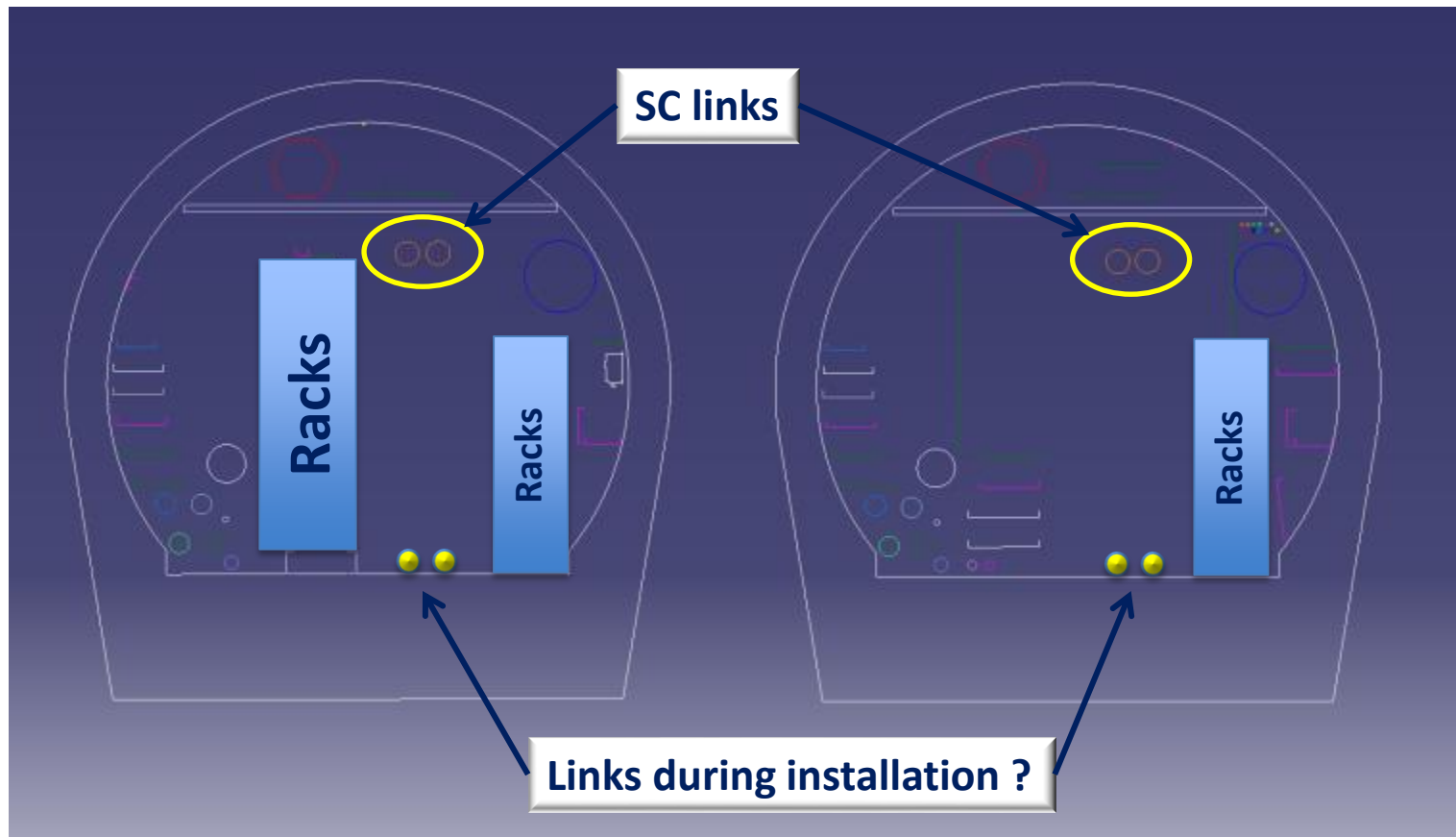
Routing along TZ76

- Detailed view on the DFHAN and its converters



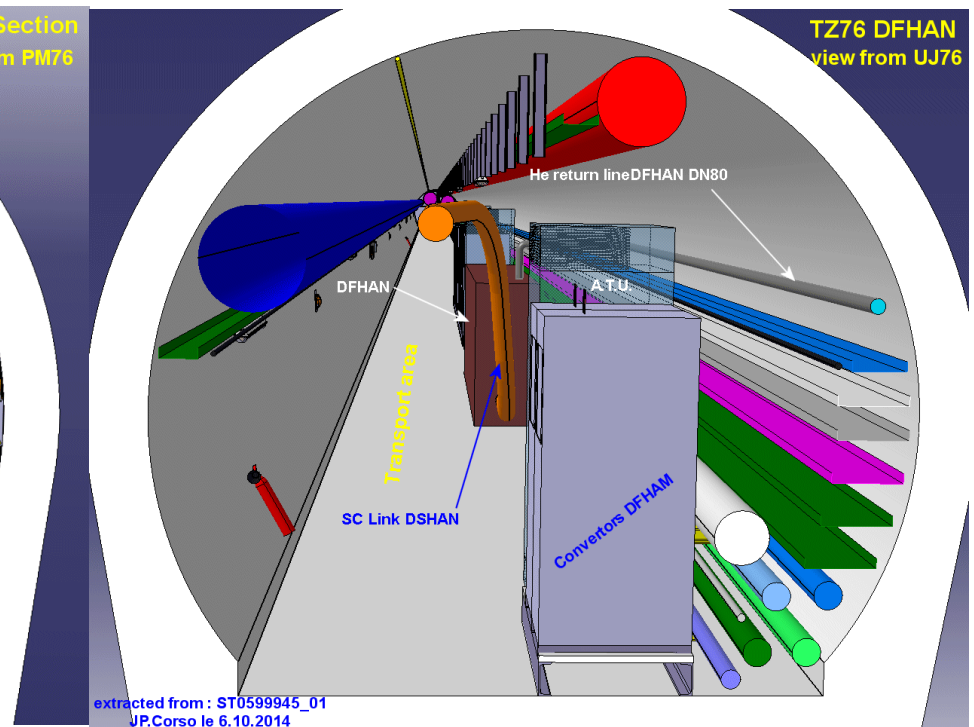
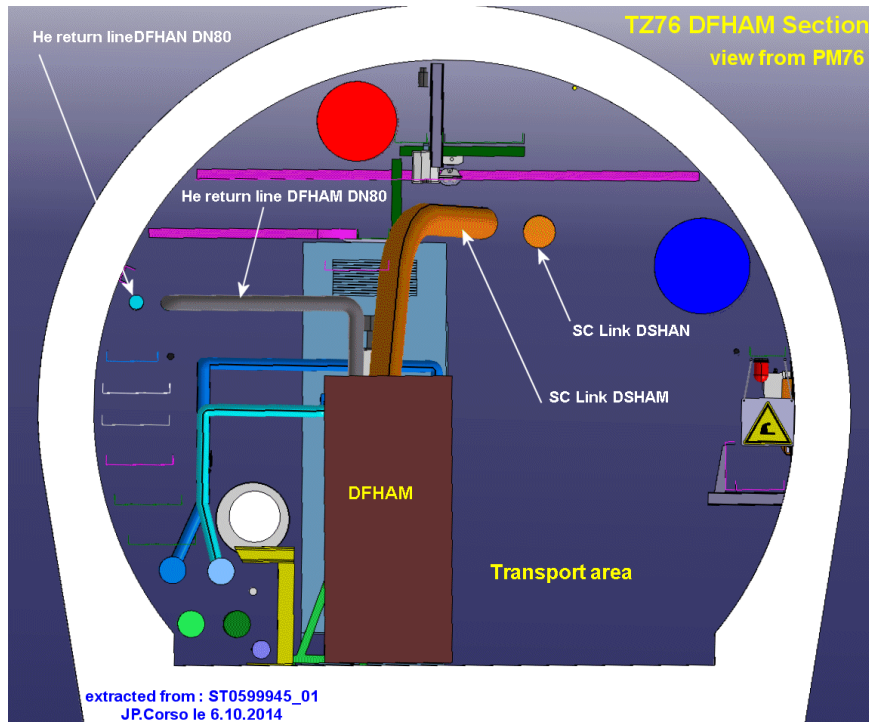
Routing along TZ76

- Only one practical solution: under existing cable trays



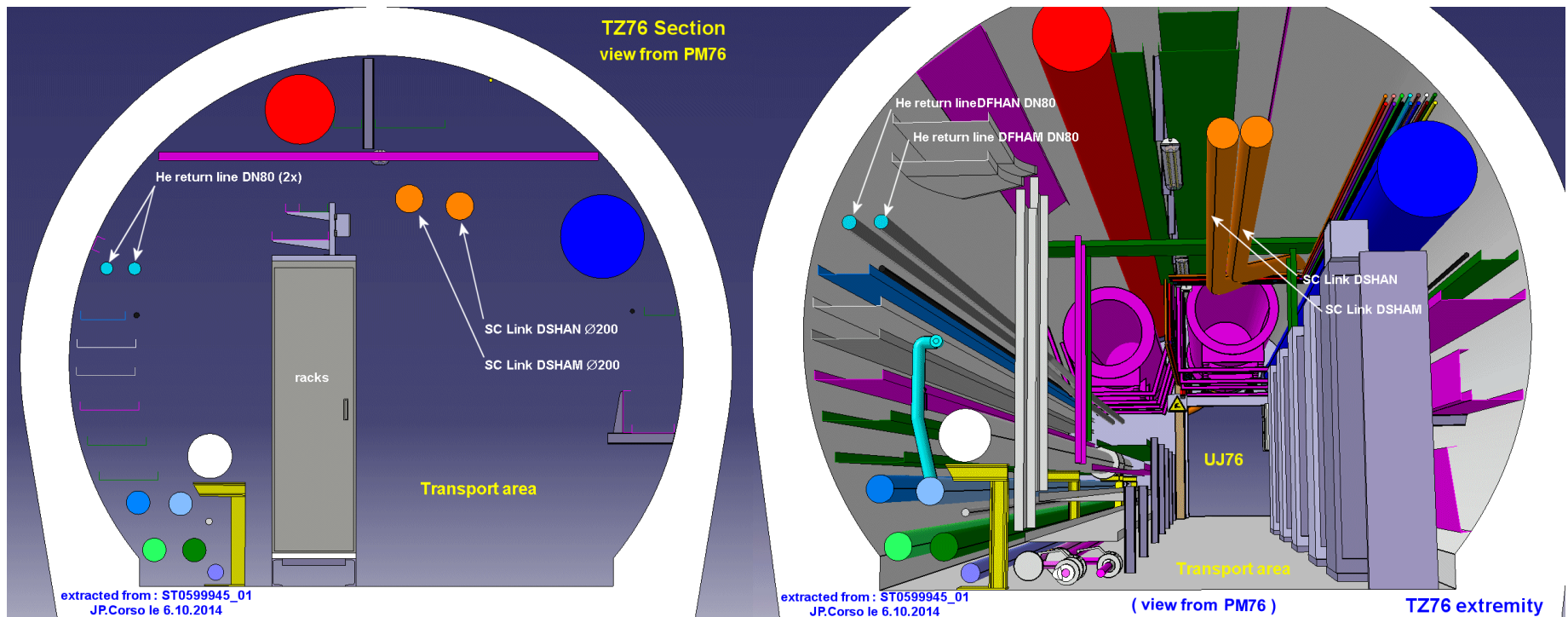
Routing along TZ76

- Detailed view and Section on the DFHAM



Routing along TZ76

- Section along TZ76 and detailed view of the exit UJ76

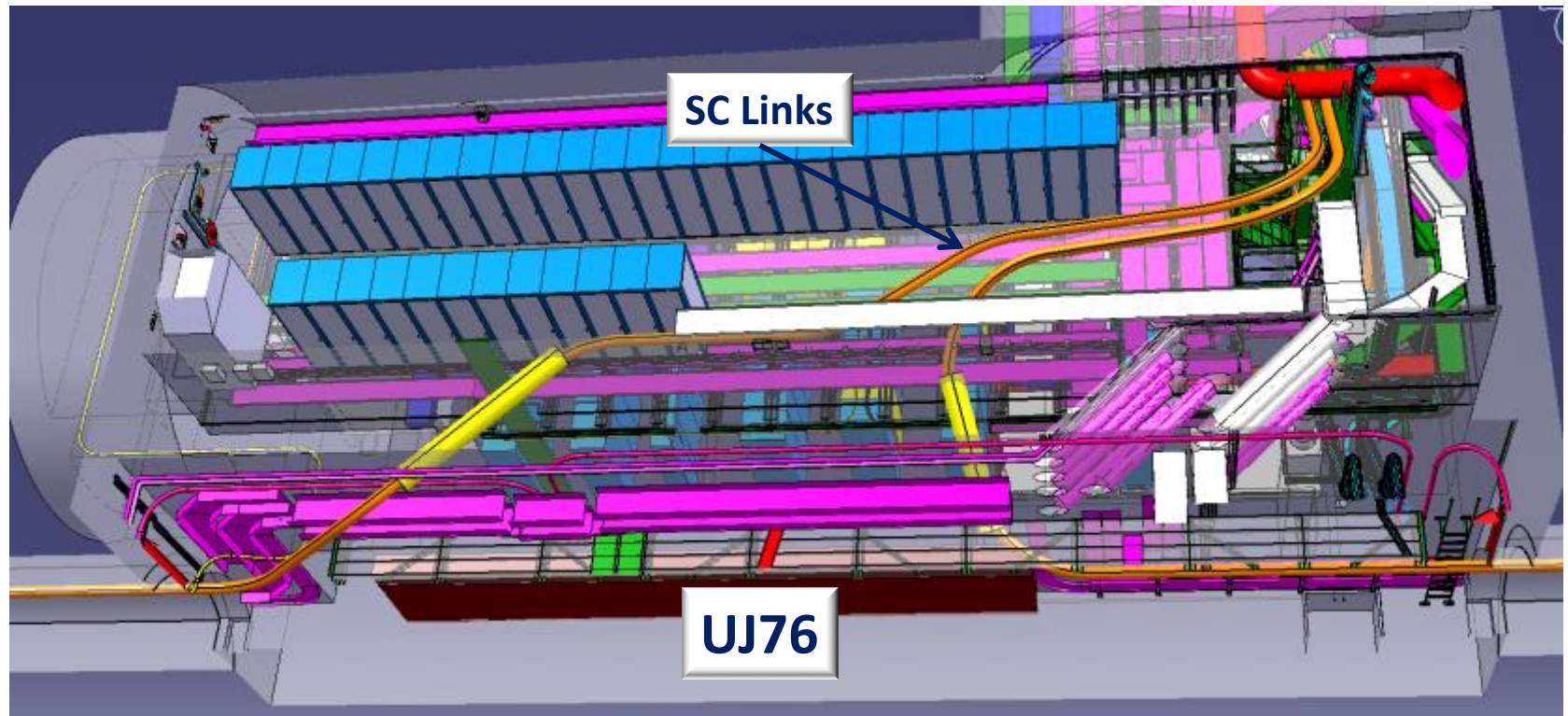


Routing UJ76 junction - Options

- Tunnel to UJ76 service area: existing ducts are full!
 - 2 “small” ducts \varnothing 400mm must be drilled
 - Between 2m & 3m long, depends on the angle...
- UJ76 to TZ76 gallery: 2 main options
 - without long ducts, along UJ76 bottleneck...
 - with 2 new long ducts (~19m each)

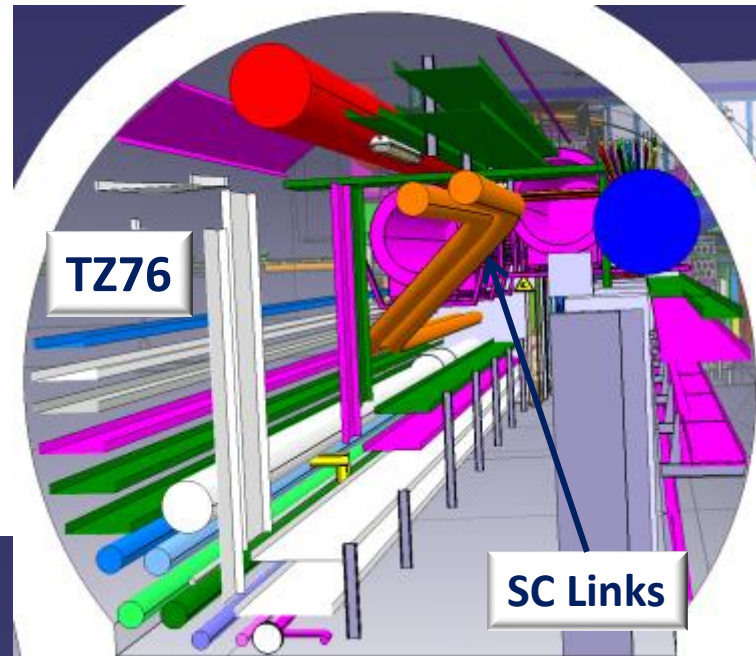
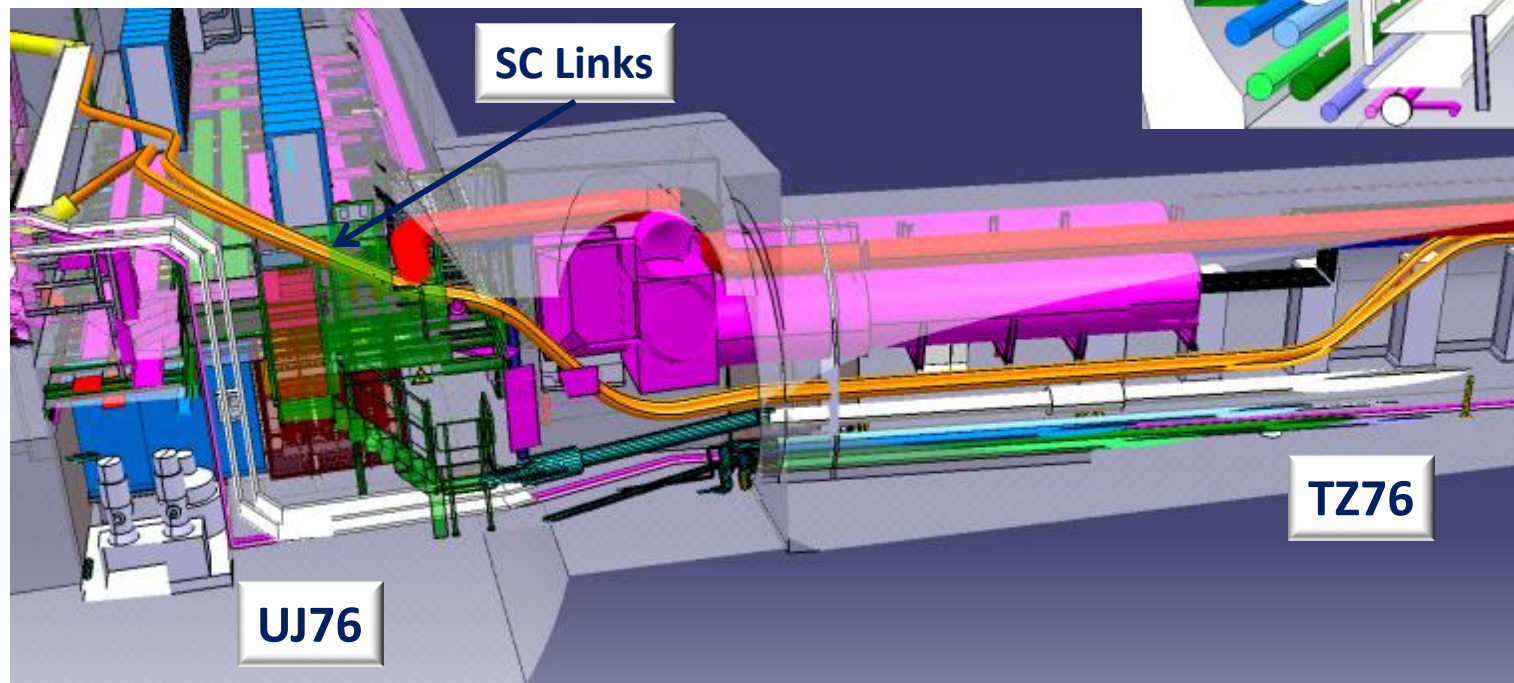
Routing UJ76 – Option 1

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



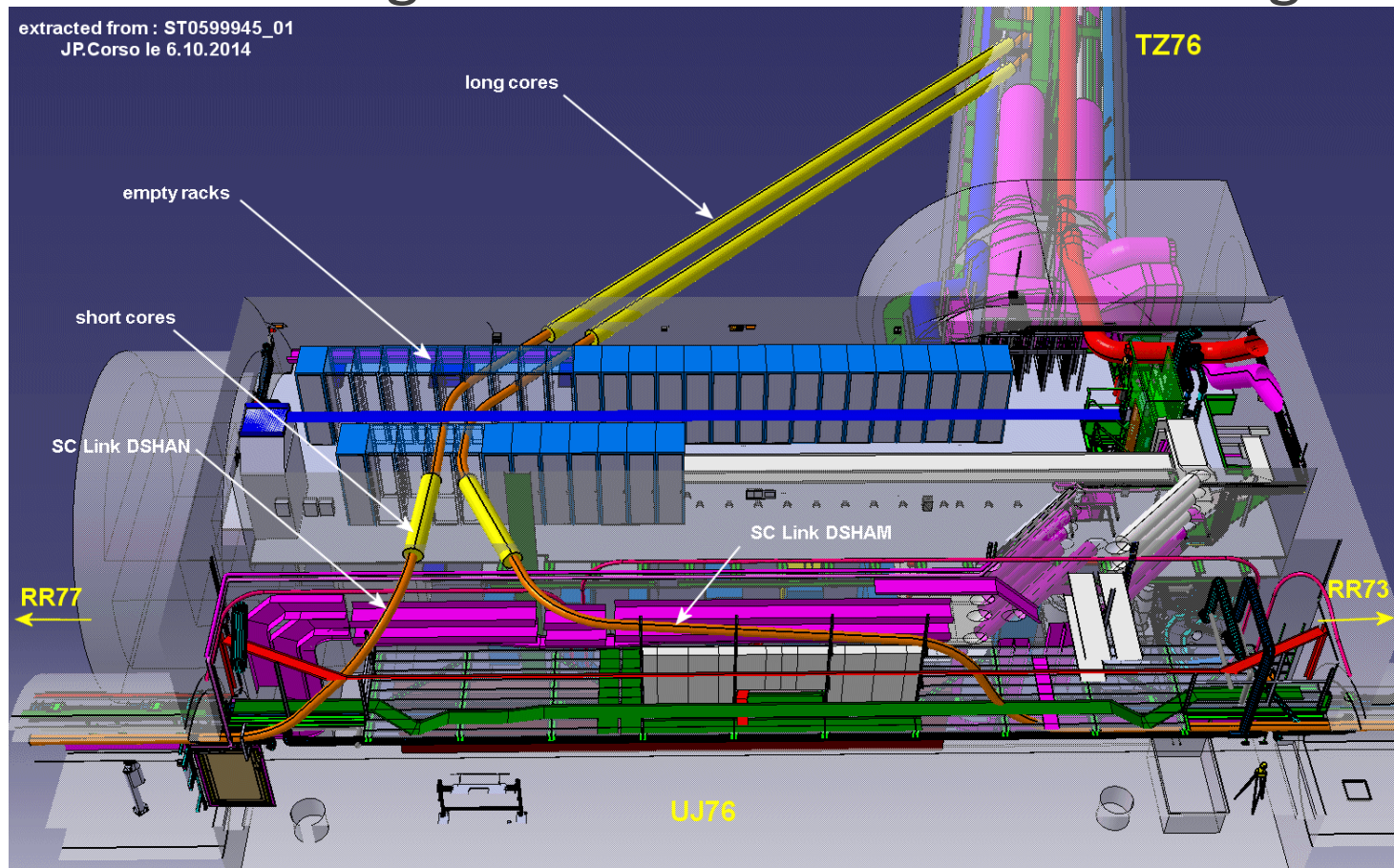
Routing UJ76 – Option 1

- Along UJ76 bottleneck



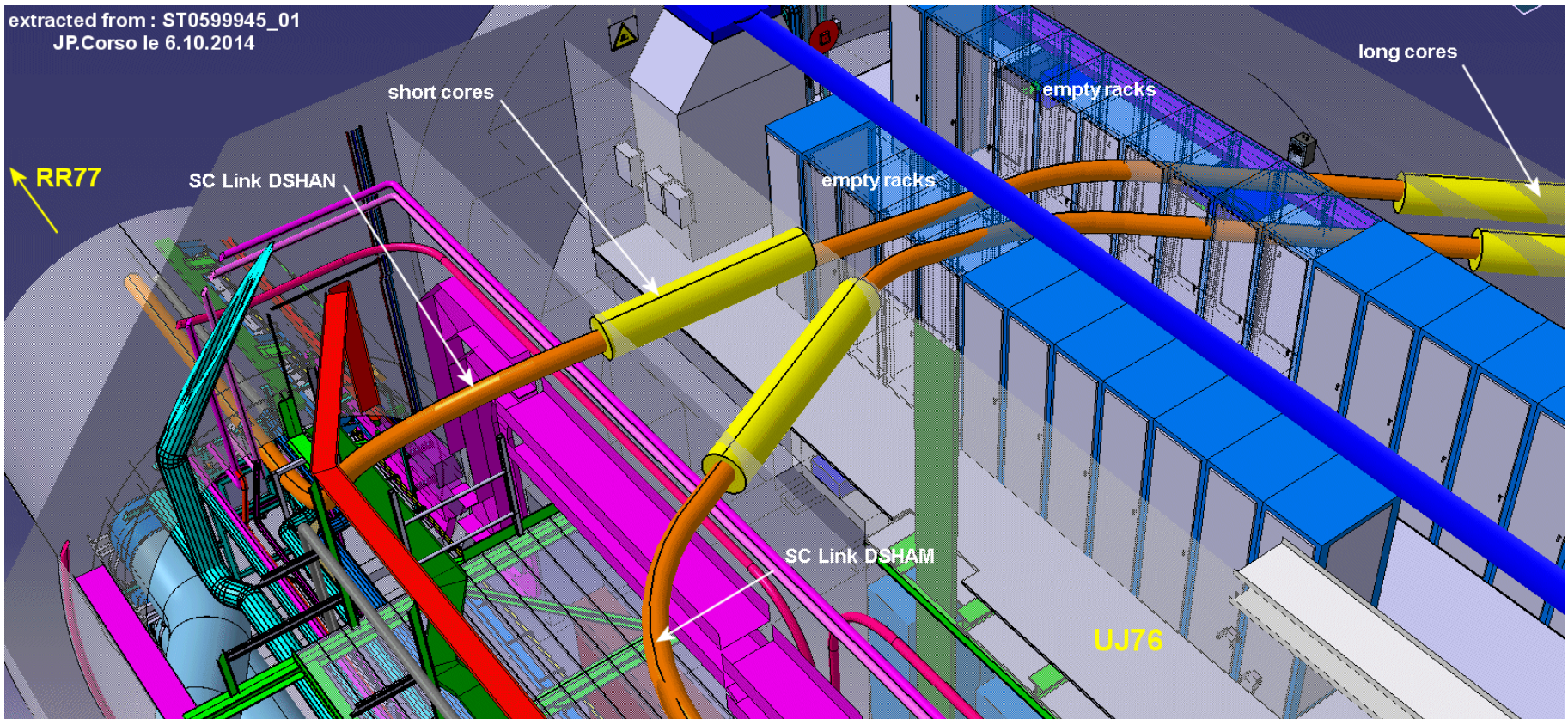
Routing UJ76 – Option 2

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



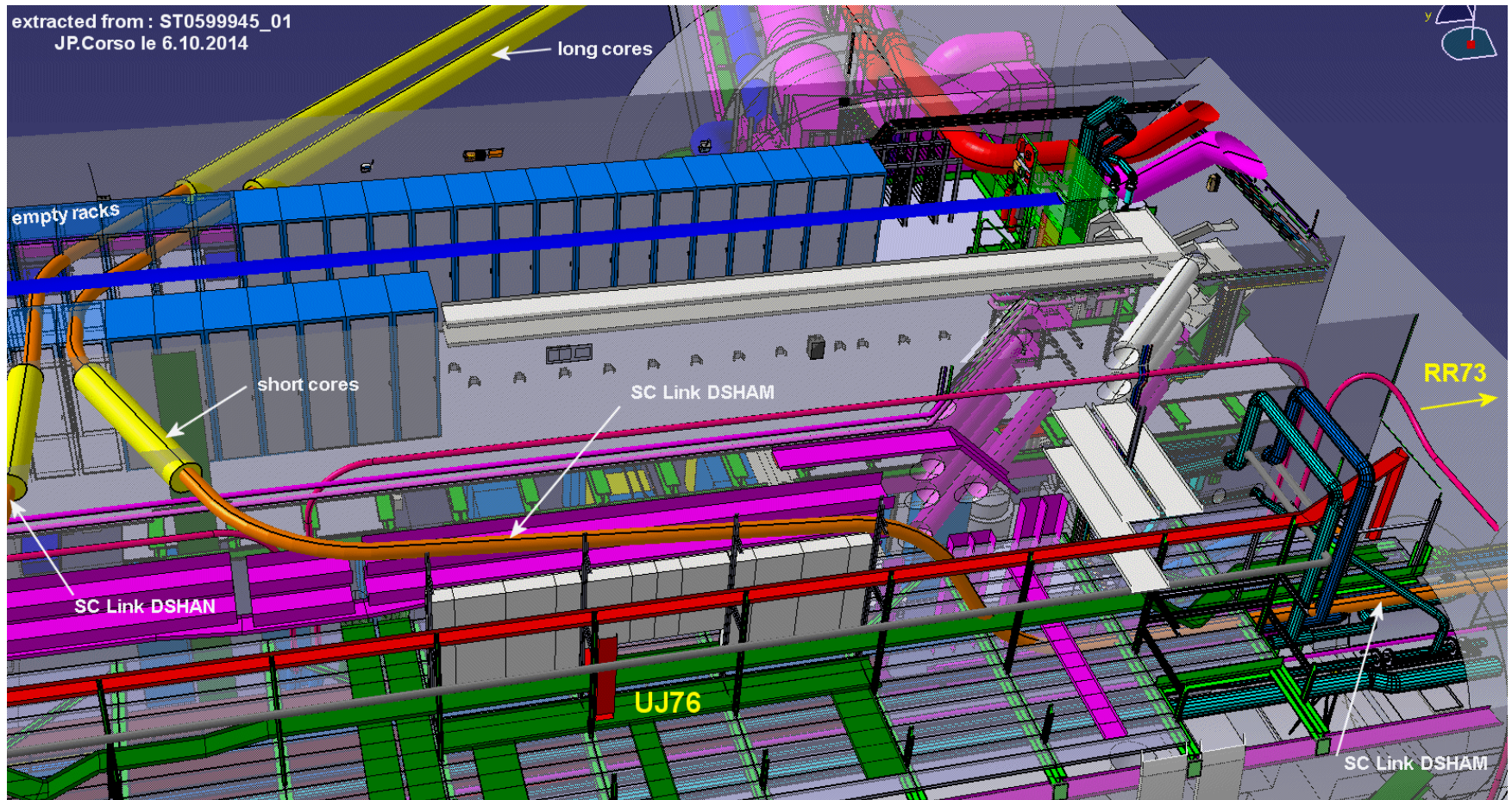
Routing UJ76 – Option 2

- Detailed view on DSHAN link (R7)



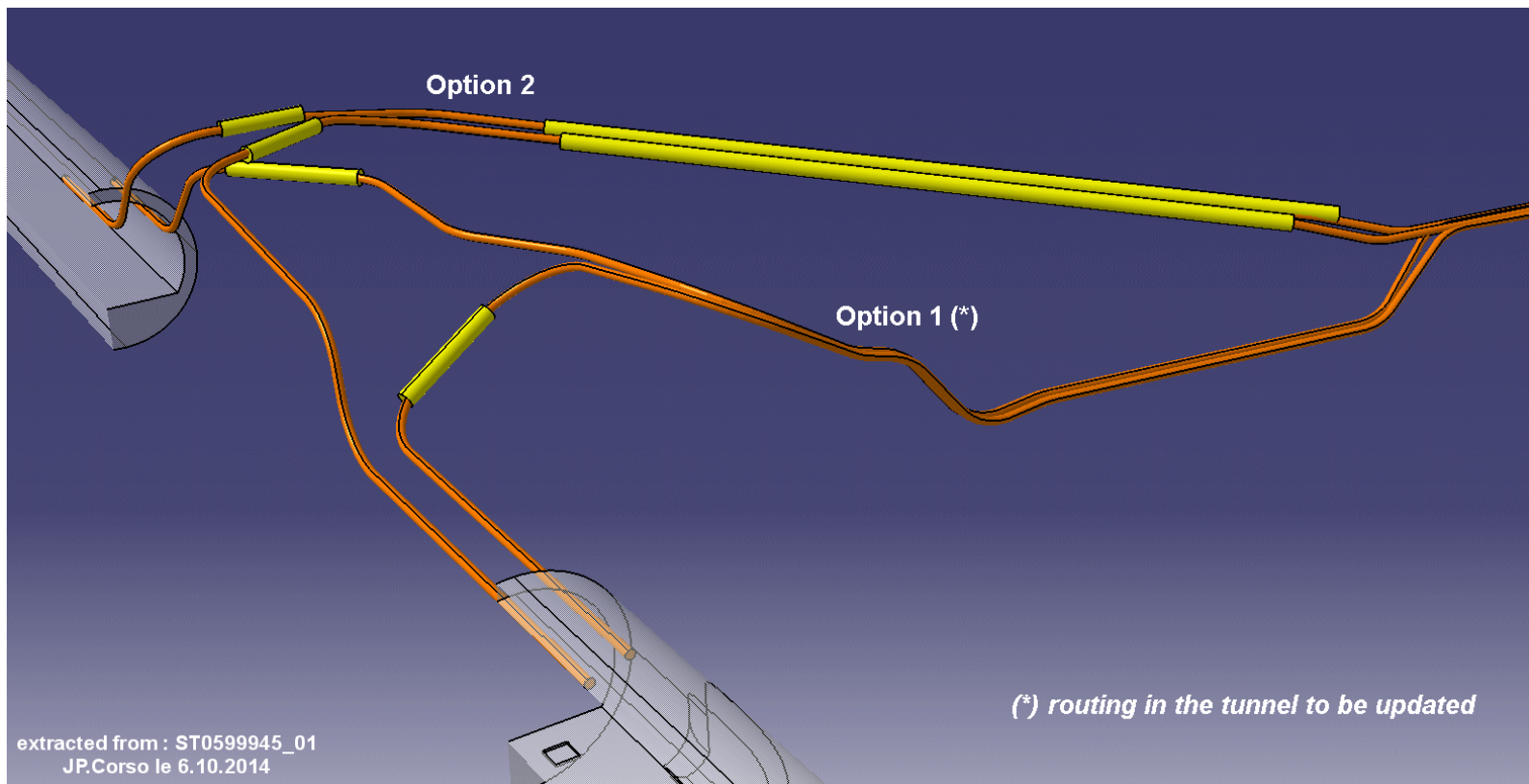
Routing UJ76 – Option 2

- Detailed view on DSHAM link (L7)



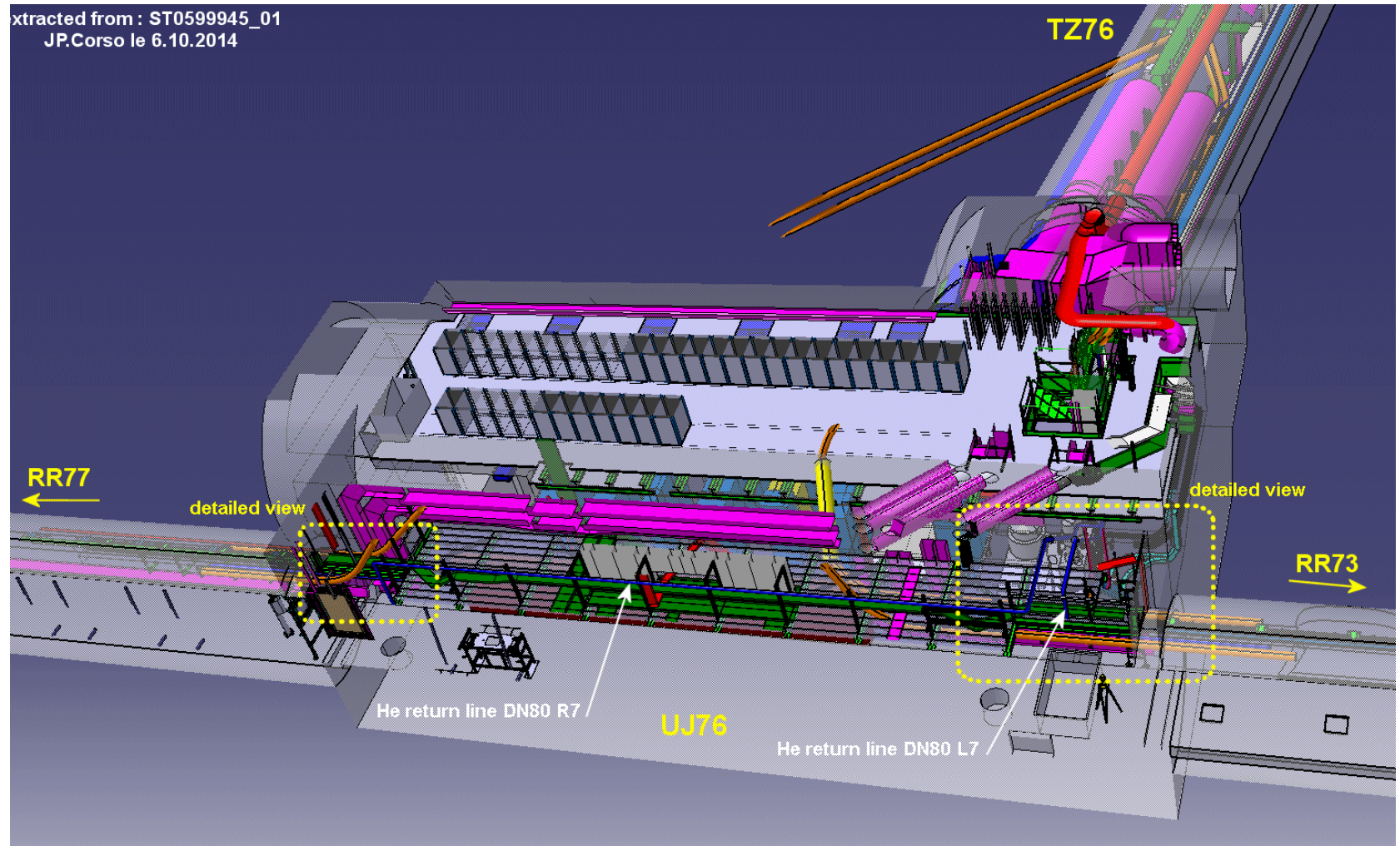
Routing Options – UJ76

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



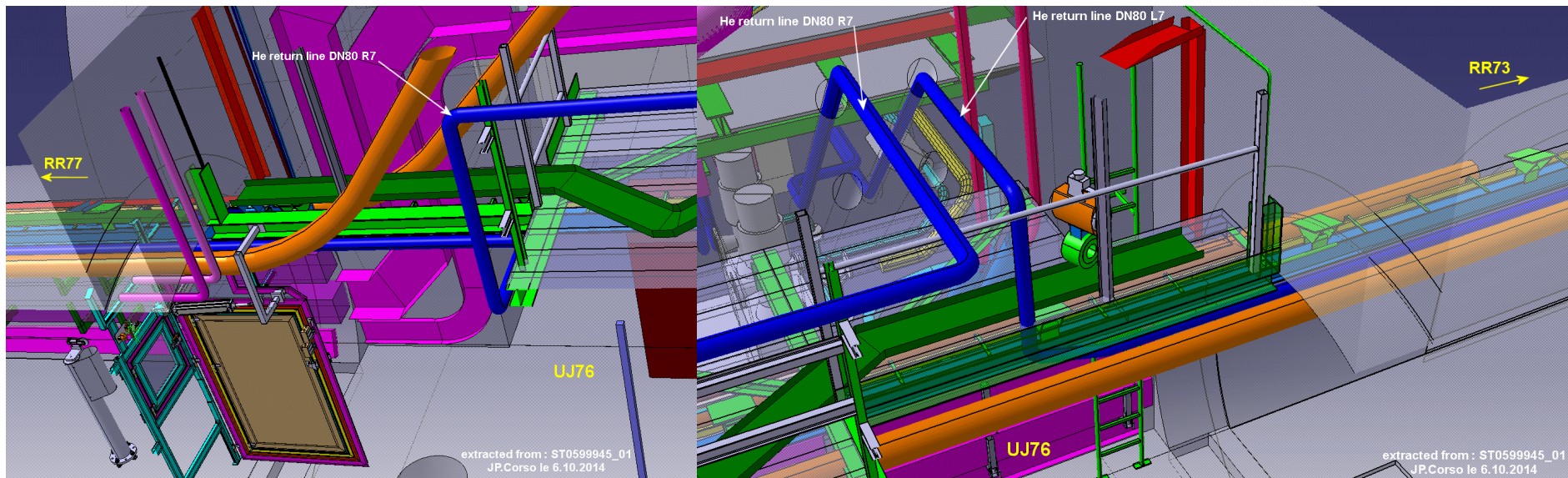
Routing He.Re pipes DN80 into UJ76

Extracted from : ST0599945_01
JP.Corso le 6.10.2014



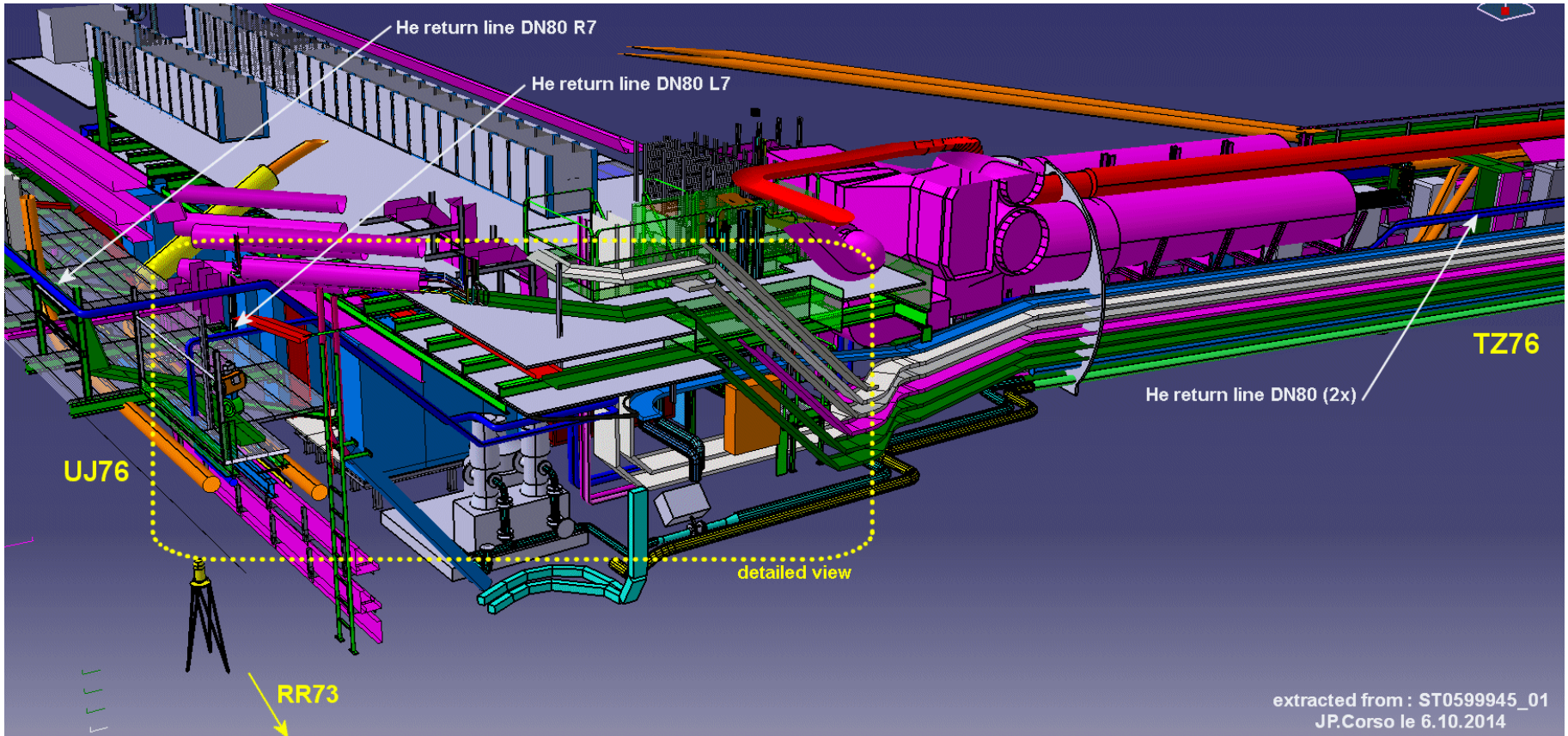
Routing He.Re pipes DN80 into UJ76

- Detailed views right and left side



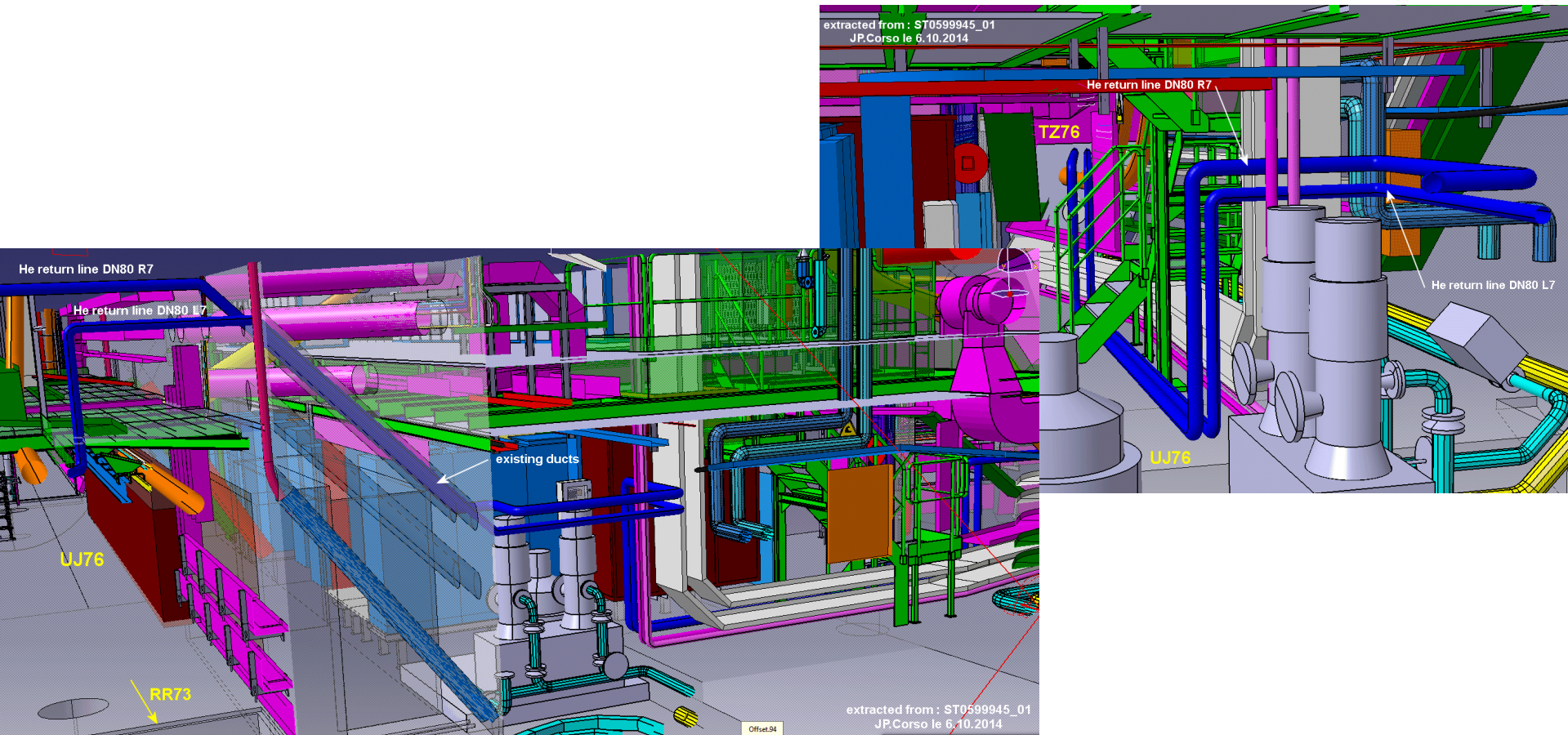
Routing He.Re pipes DN80 into UJ76

- View from L7 side

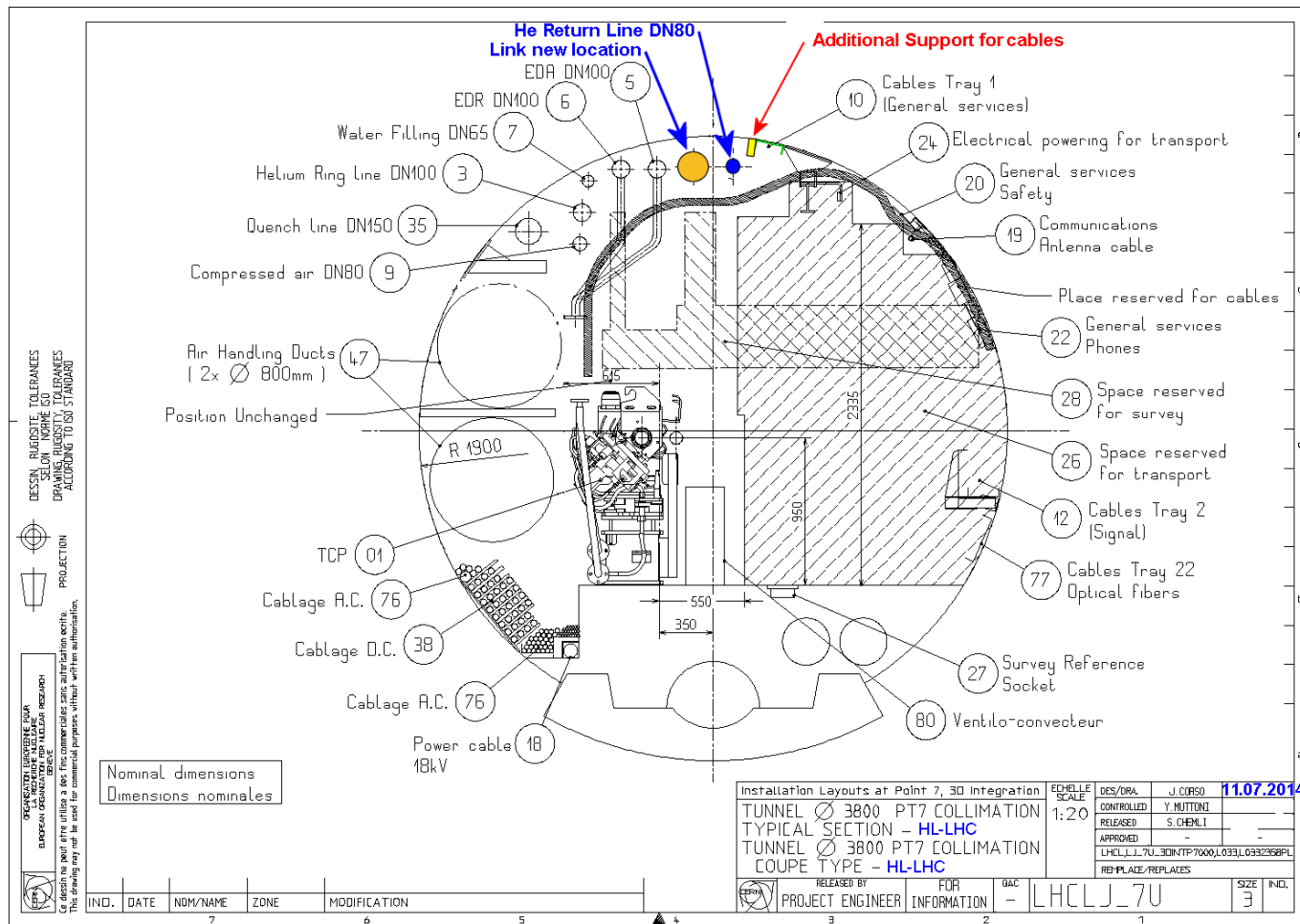


Routing He.Re pipes DN80 into UJ76

- Detailed views

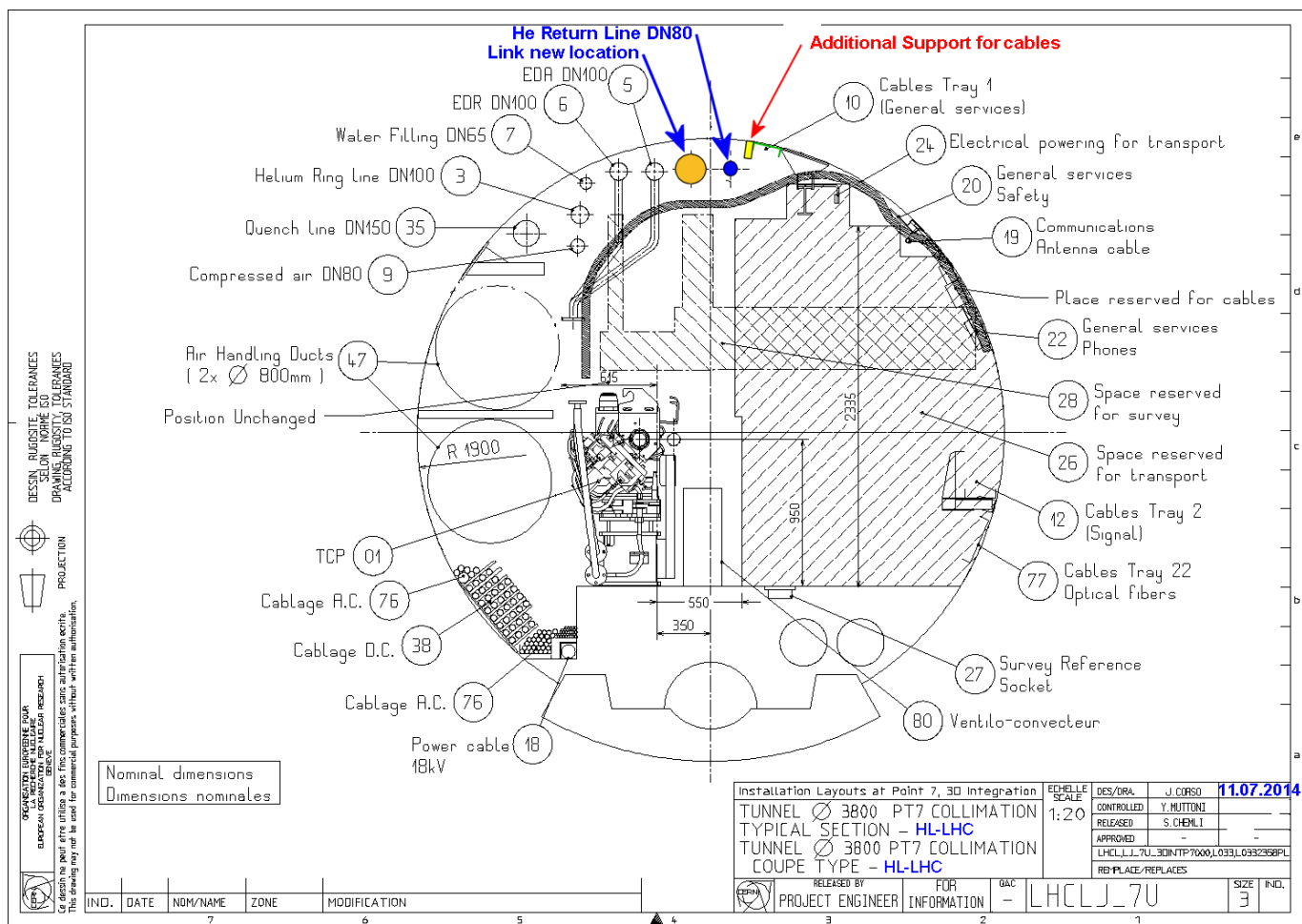


Routing R771 – Typical Section



Routing R771 towards RR77

- Principle is similar for R74 and RR73

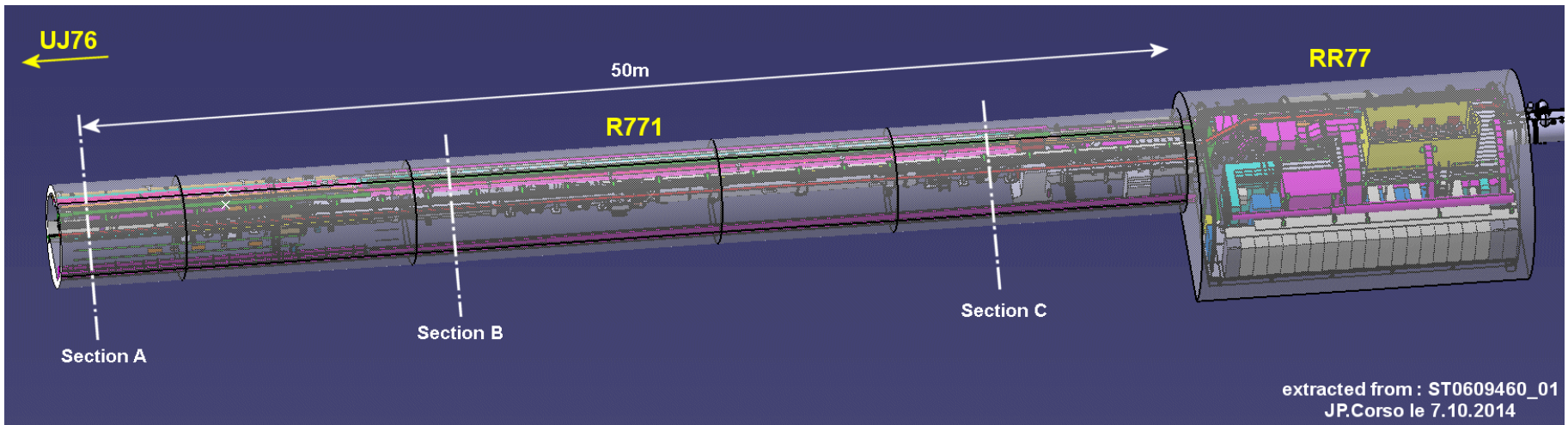


Pt7 Links Integration Status 2014 - JPC

7/10/2014 EDMS:1419773

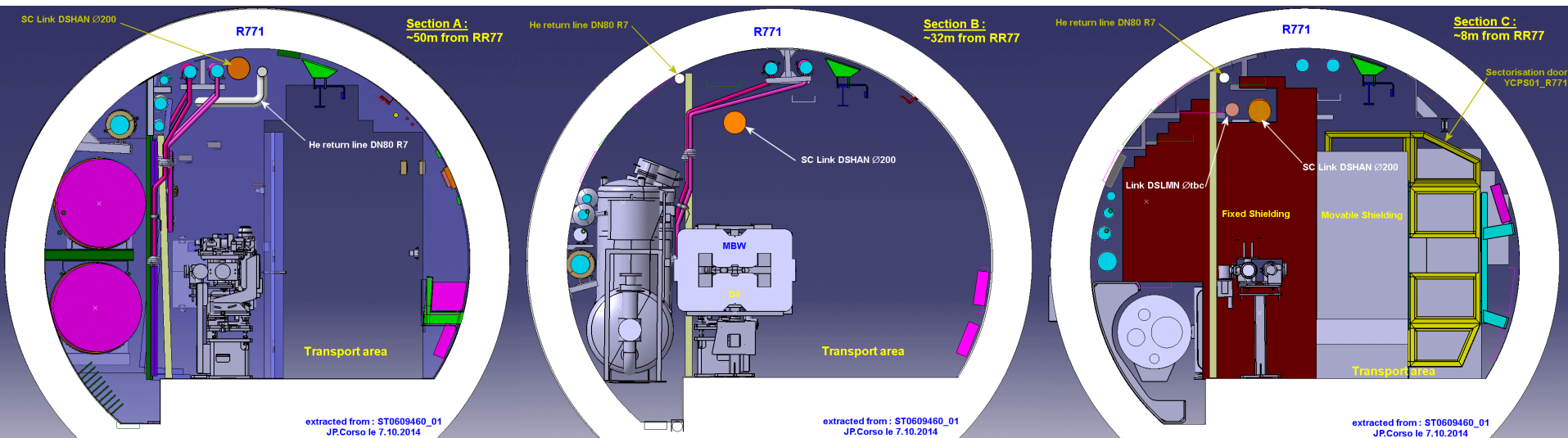
Routing R771 towards RR77

- design of DFAN module in stand-by
- Characteristics of DSLMN to be defined
- General view of the area : *Sections next slide*



Routing R771 towards RR77

- 3 Sections with various positions of the link & pipe



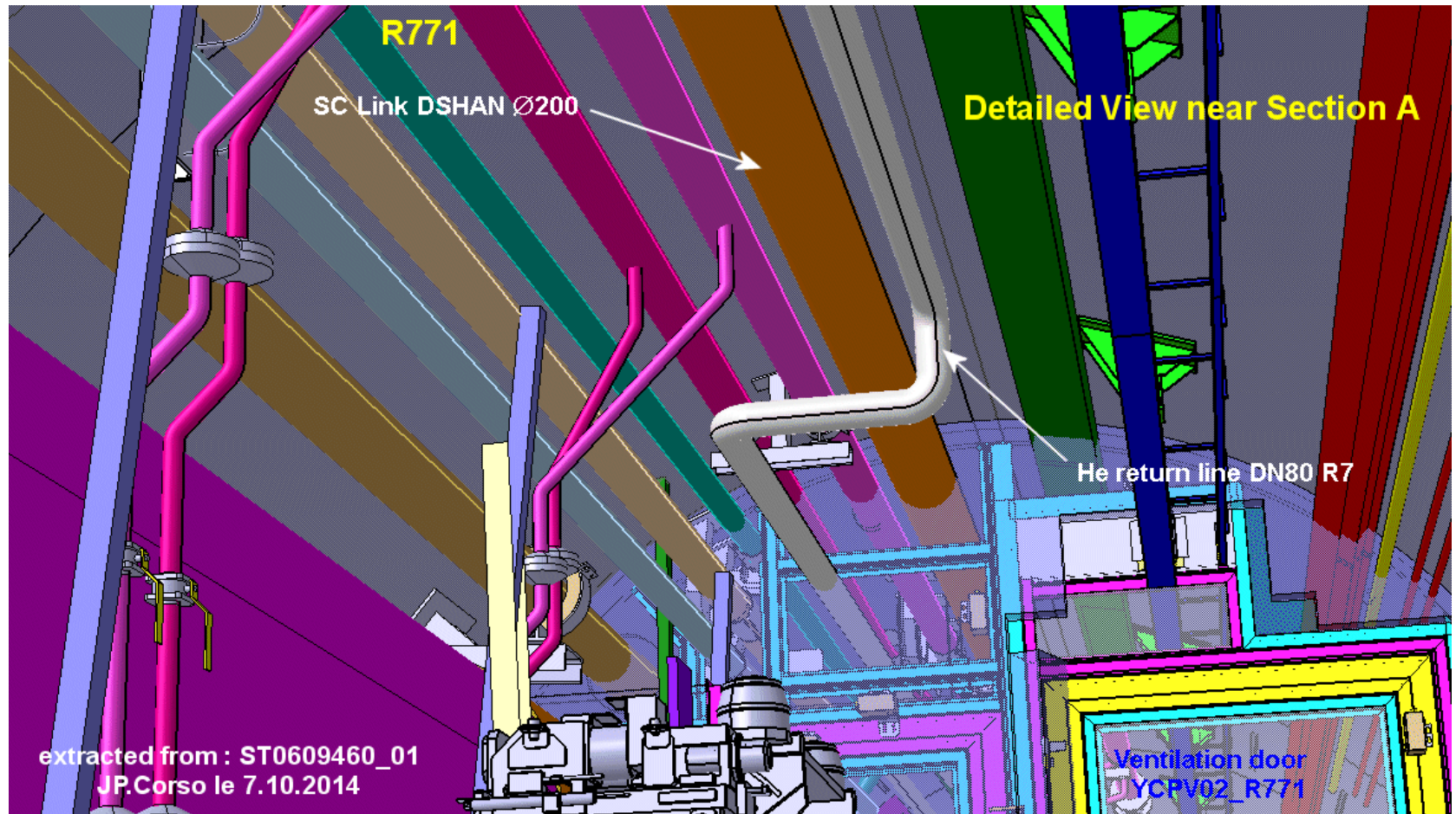
LHC Ring - 6R7 - 08 - Date: 2014-07-31



Click on the image and click on C4R7 on ICL website

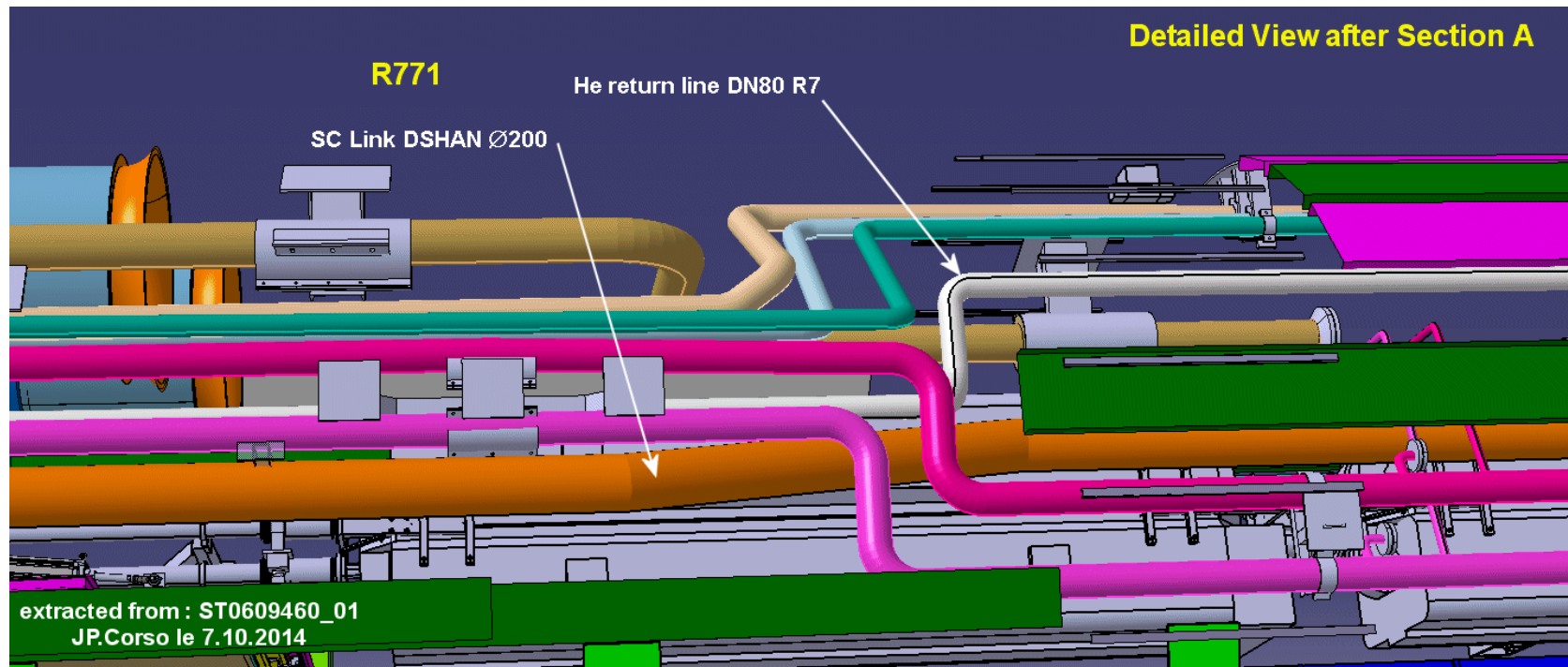
Routing R771 towards RR77

- First change of disposition to cross ventilation door



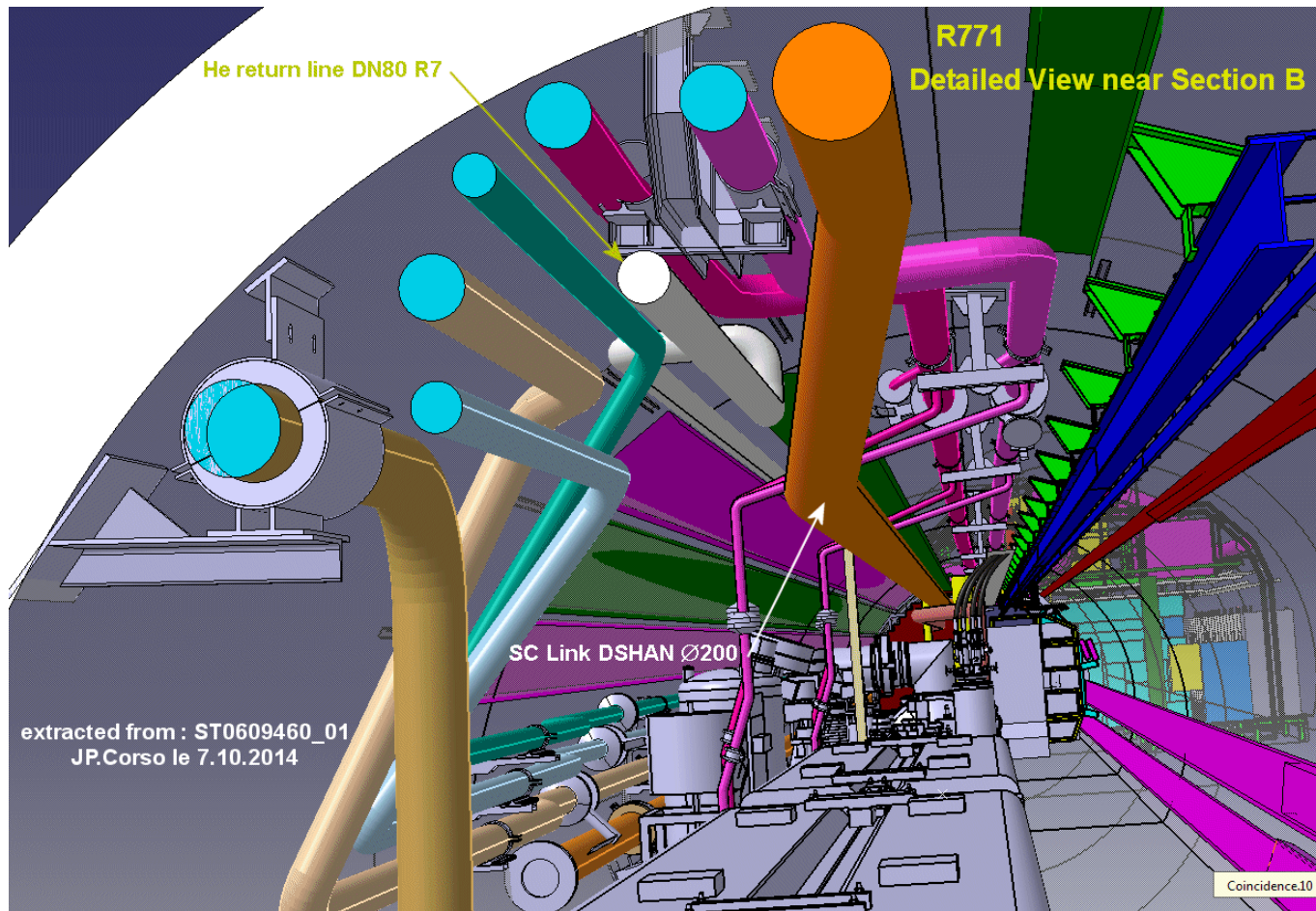
Routing R771 towards RR77

- Second change of disposition after ventilation door, to fit with pipes' change of position ; top view



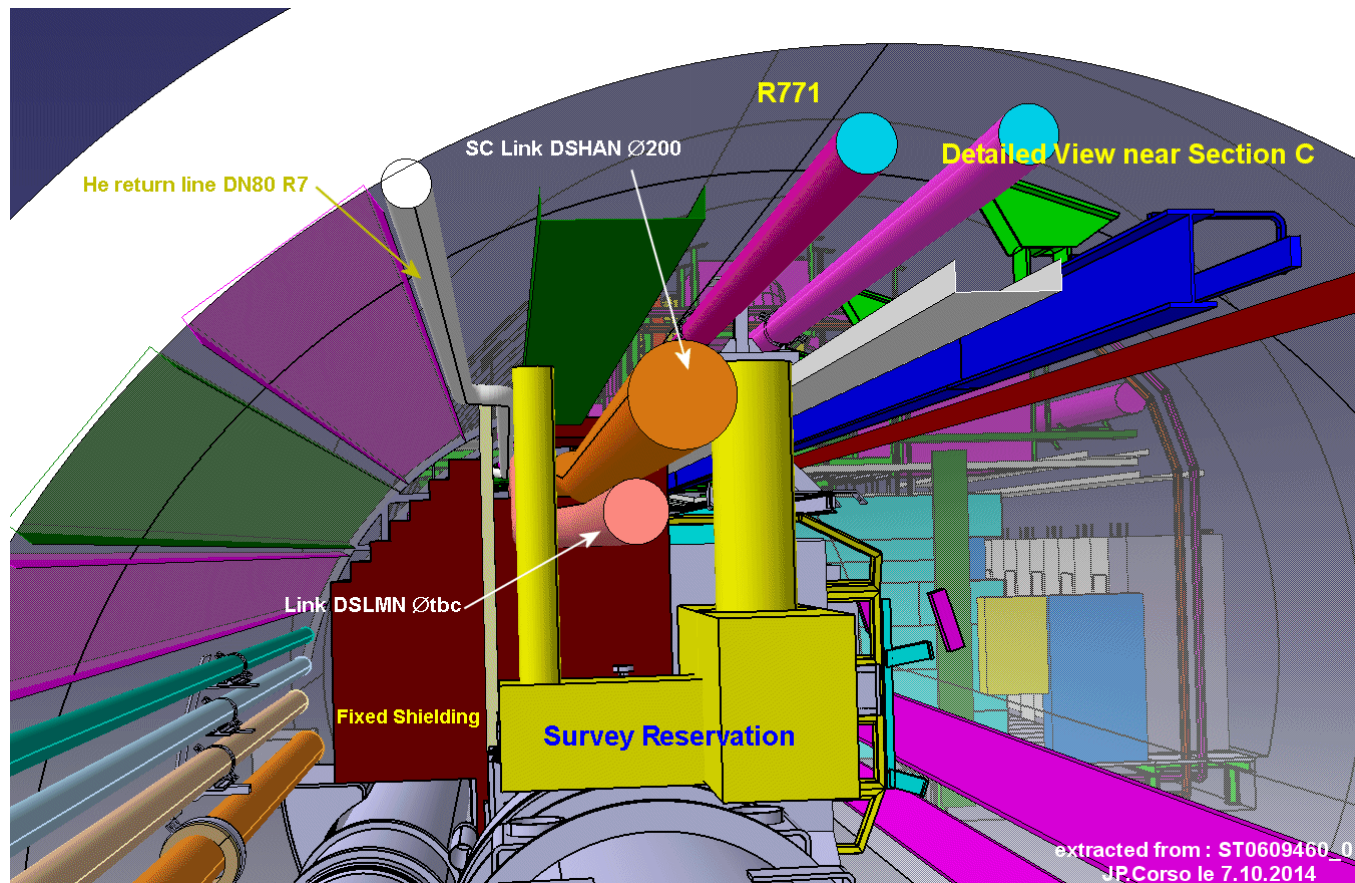
Routing R771 towards RR77

- Second change of disposition after ventilation door ; left view



Routing R771 towards RR77

- Third change of disposition to cross shielding



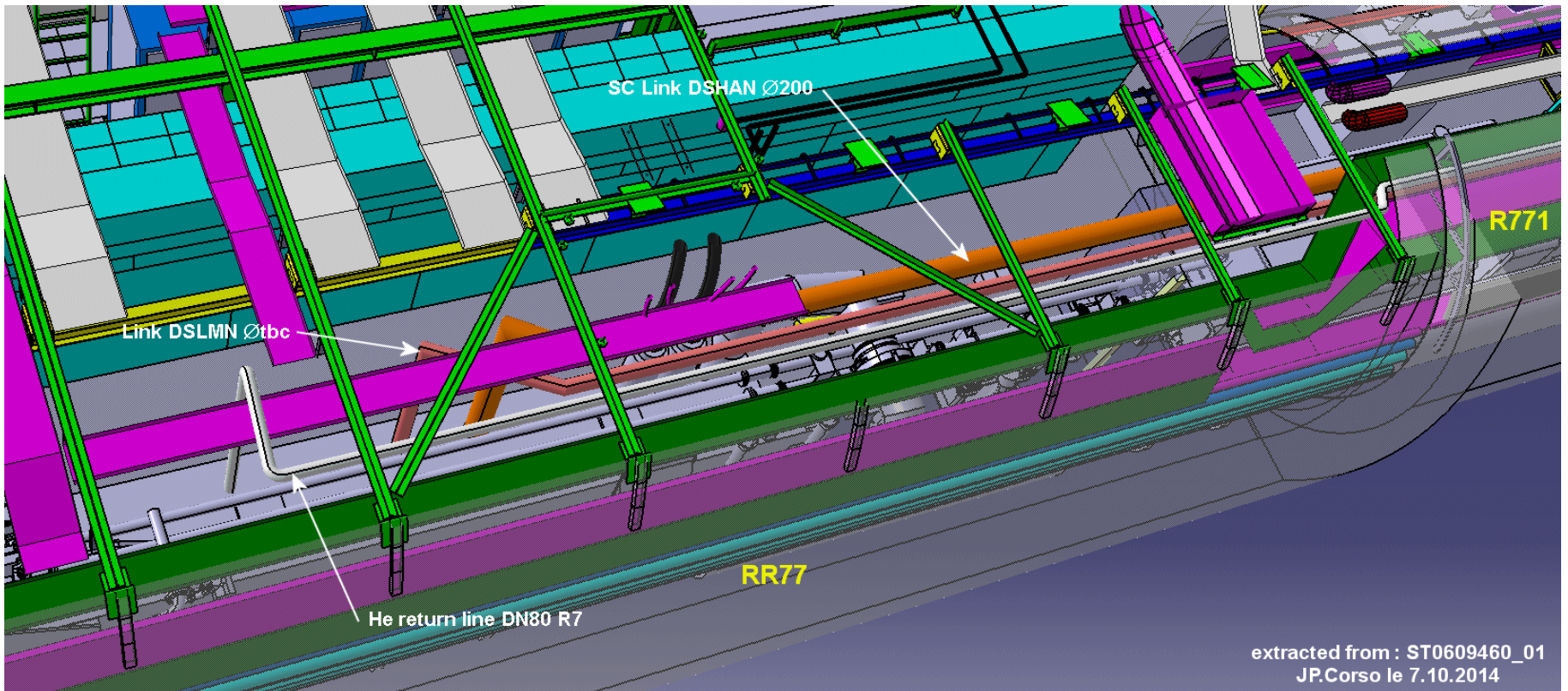
LHC Ring - 7R7 - 01 - Date: 2014-07-31



Click on the image and click on C7R7 on ICL website

Routing inside RR77

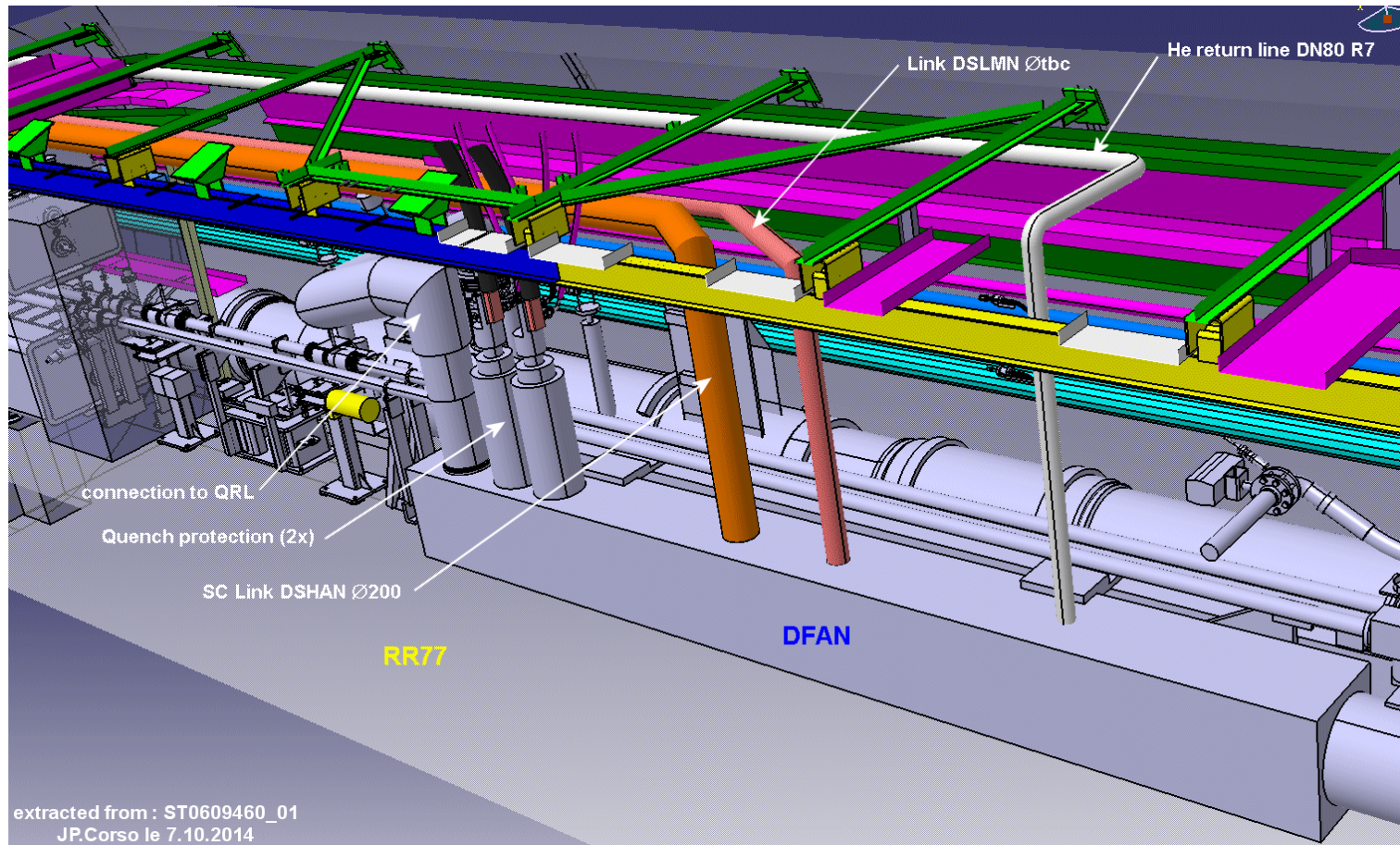
- General view



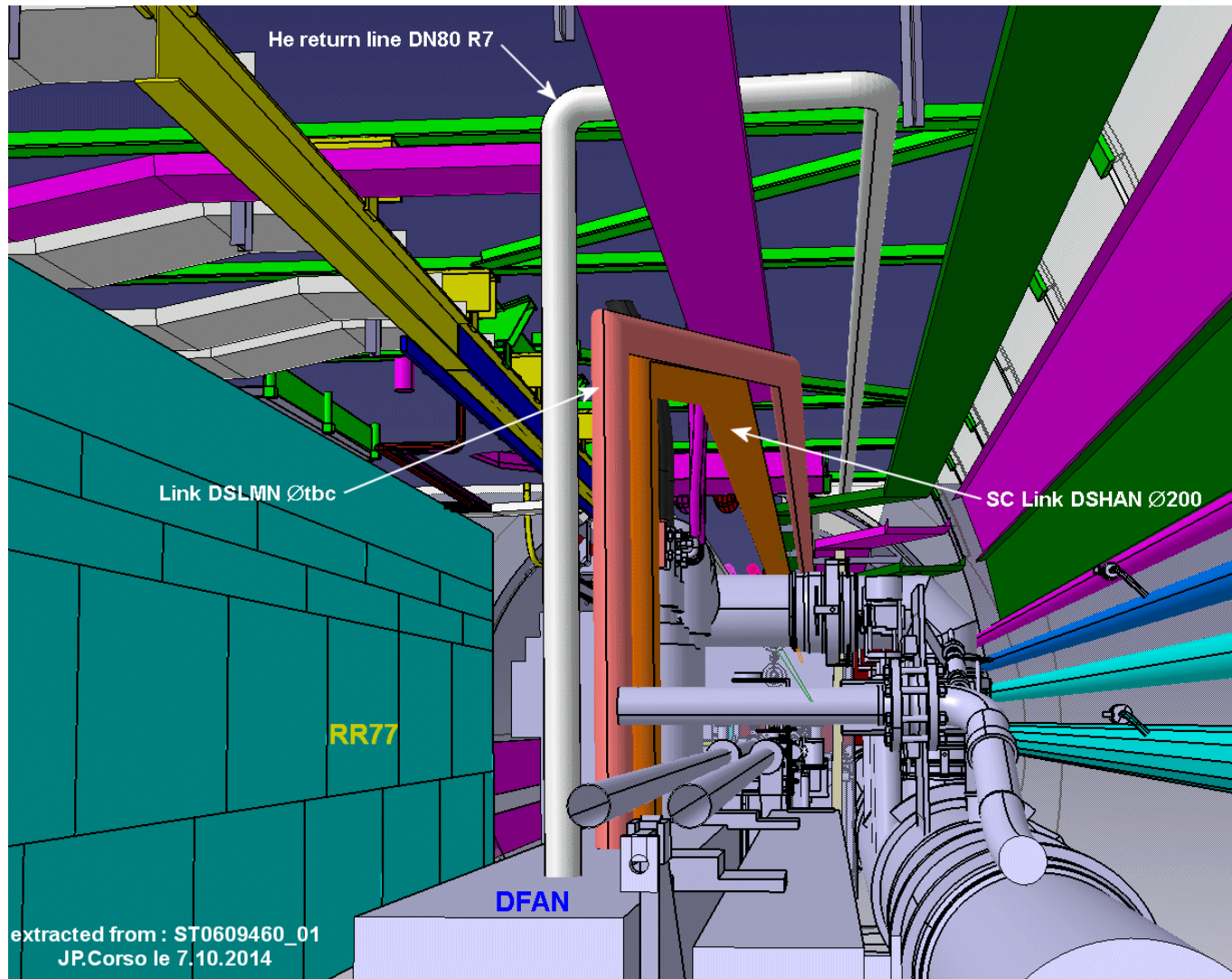
extracted from : ST0609460_01
JP.Corso le 7.10.2014

Routing inside RR77

- View from passage



Routing inside RR77 ; lateral view



Pt7 Links Integration Status 2014 - JPC
7/10/2014 EDMS:1419773

Routing R74 → RR73

- Remind: the principle for routing of all the links and pipes shown in the previous slides is similar for R74 and RR73 as for R771 and RR77 !

Tricky Points

- RR73/77 to LHC tunnel:
 - Many constraints due to shieldings, metallic structures and supports to avoid and cross
- UJ76 crossing: many bends in multiple directions

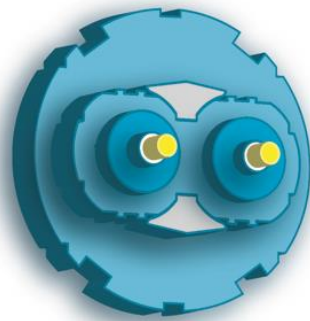
Open Points

- How to connect the link to the service module ?
 - Vertically ? Horizontally ?
- Constraints on the SC link ?
 - Supporting? Fixed points? Limited space for that

Open Points

- “Accessories” on the link inside the tunnel:
 - Instrumentation?
 - Services (controls, etc...)?
- RR devices to be relocated in TZ76 ?
 - Inventory under progress (converters, lead control, etc...)
- Size of DFH elements to be transported? Space required for assembly and maintenance?

Thanks for your attention



High Luminosity LHC

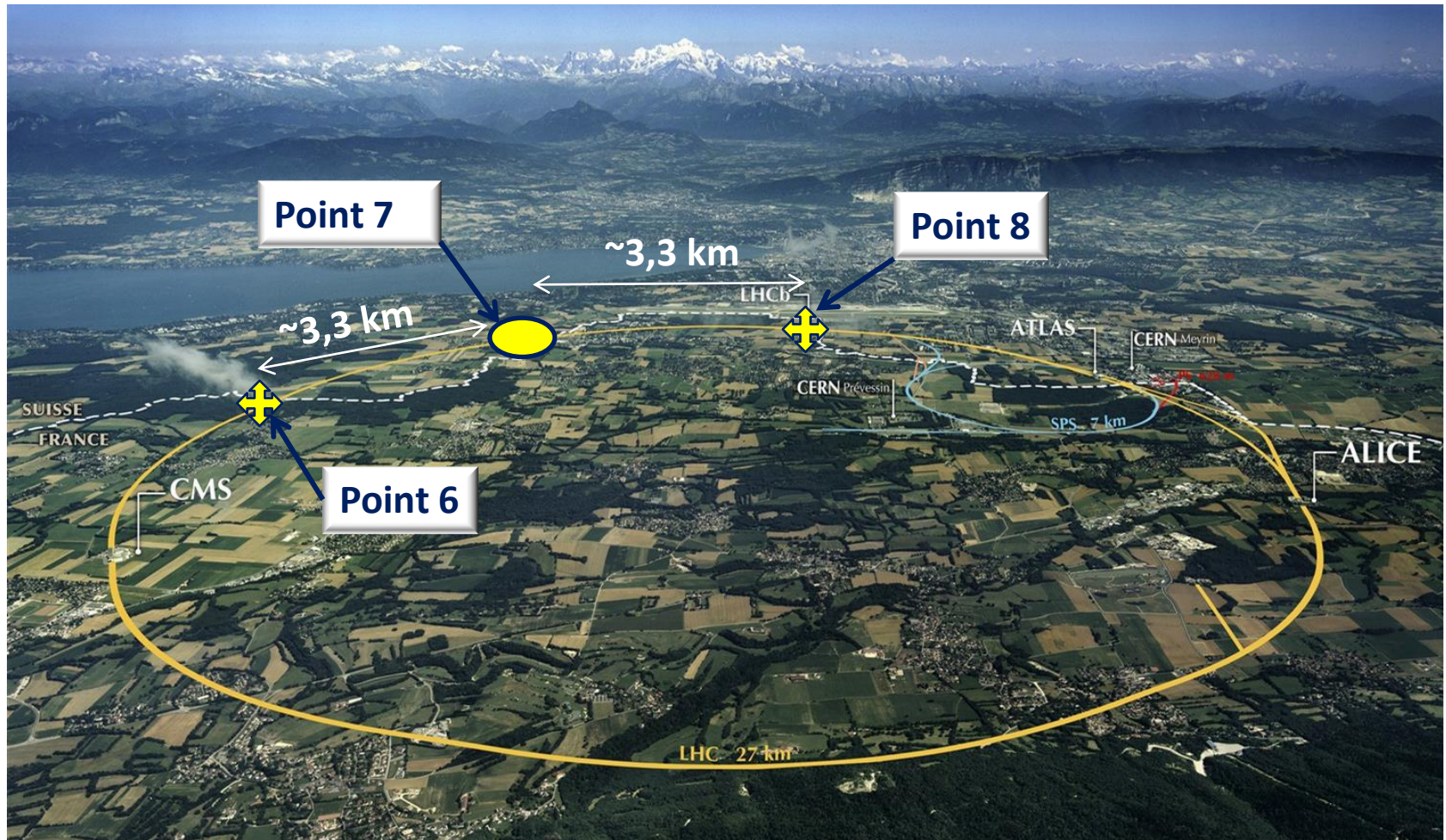


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Annex

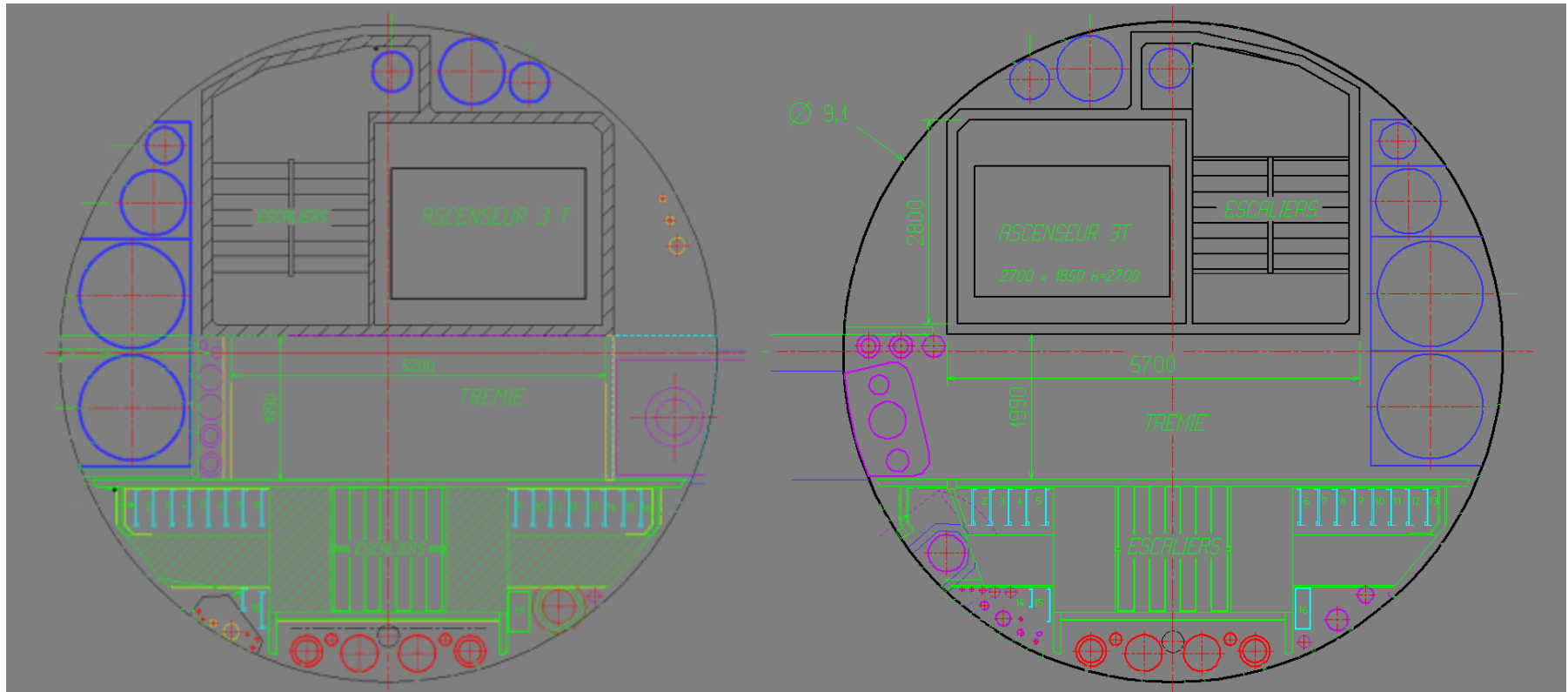
Access to Point 7 for SC links



Access to Point 7 for SC links

Access Pit PM 65

Access Pit PM 85



Access to Point 7 for SC links

500m link ready for handling

Surface Building
SD8

Space inside PM 85

1,8

5,5