



DFX conceptual integration in the LHC tunnel: Status and view ahead

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Work in strict collaboration with

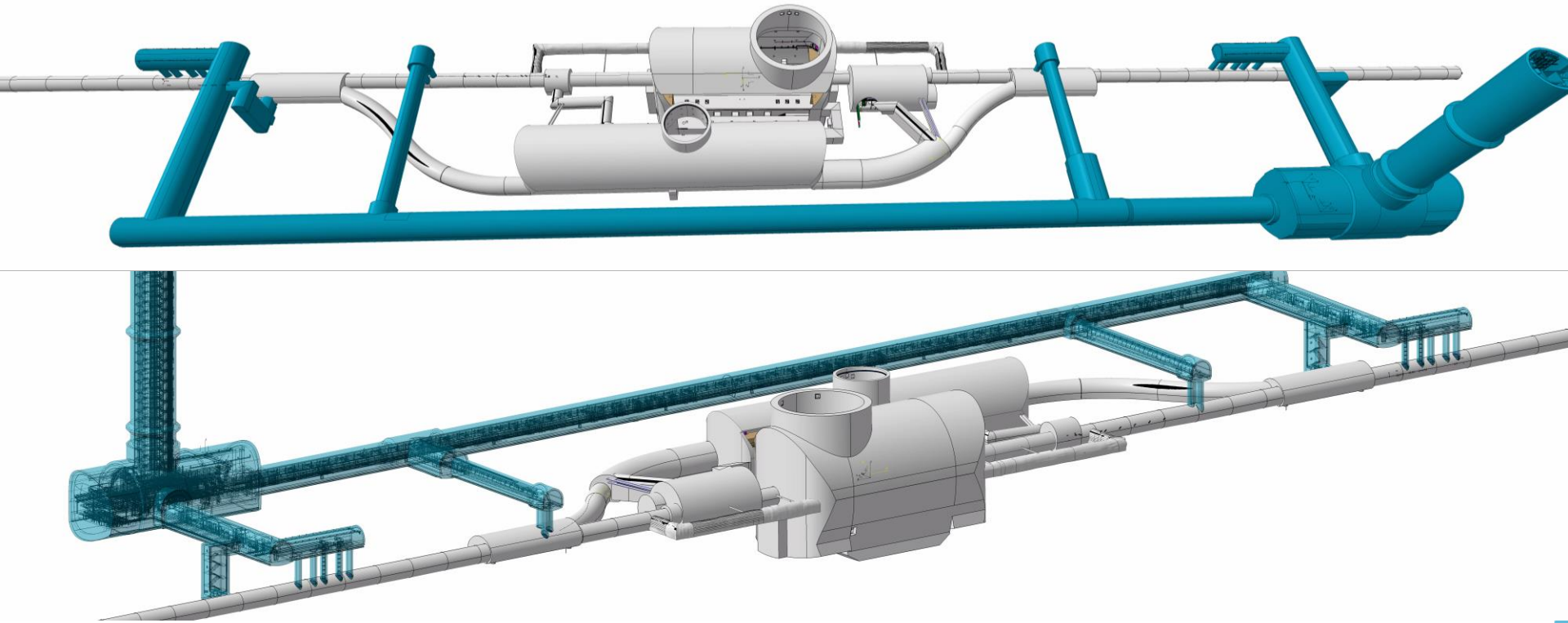
R. Betemps, Y. Leclercq, J. Metselaar, M. Sisti.



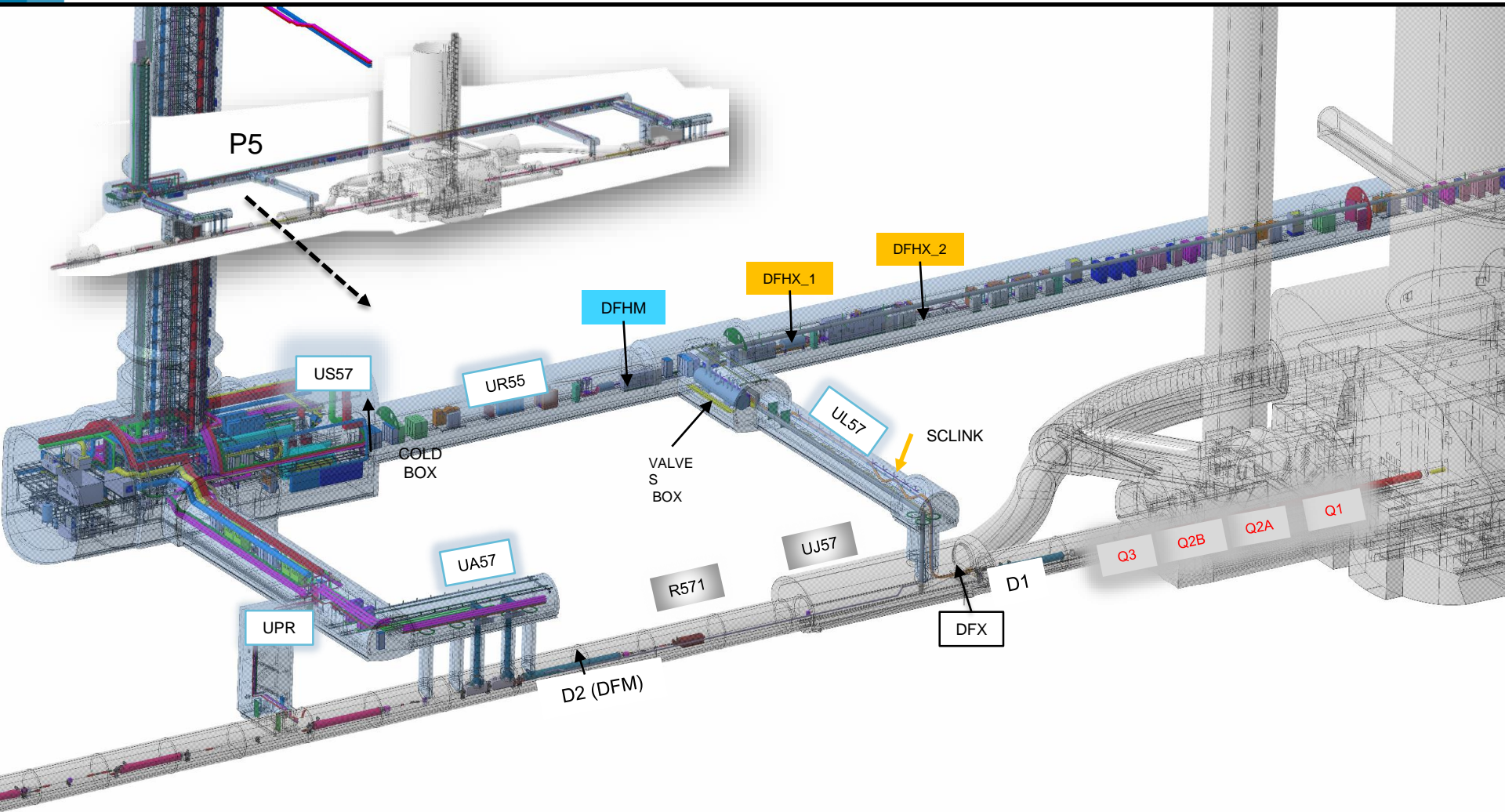
Summary

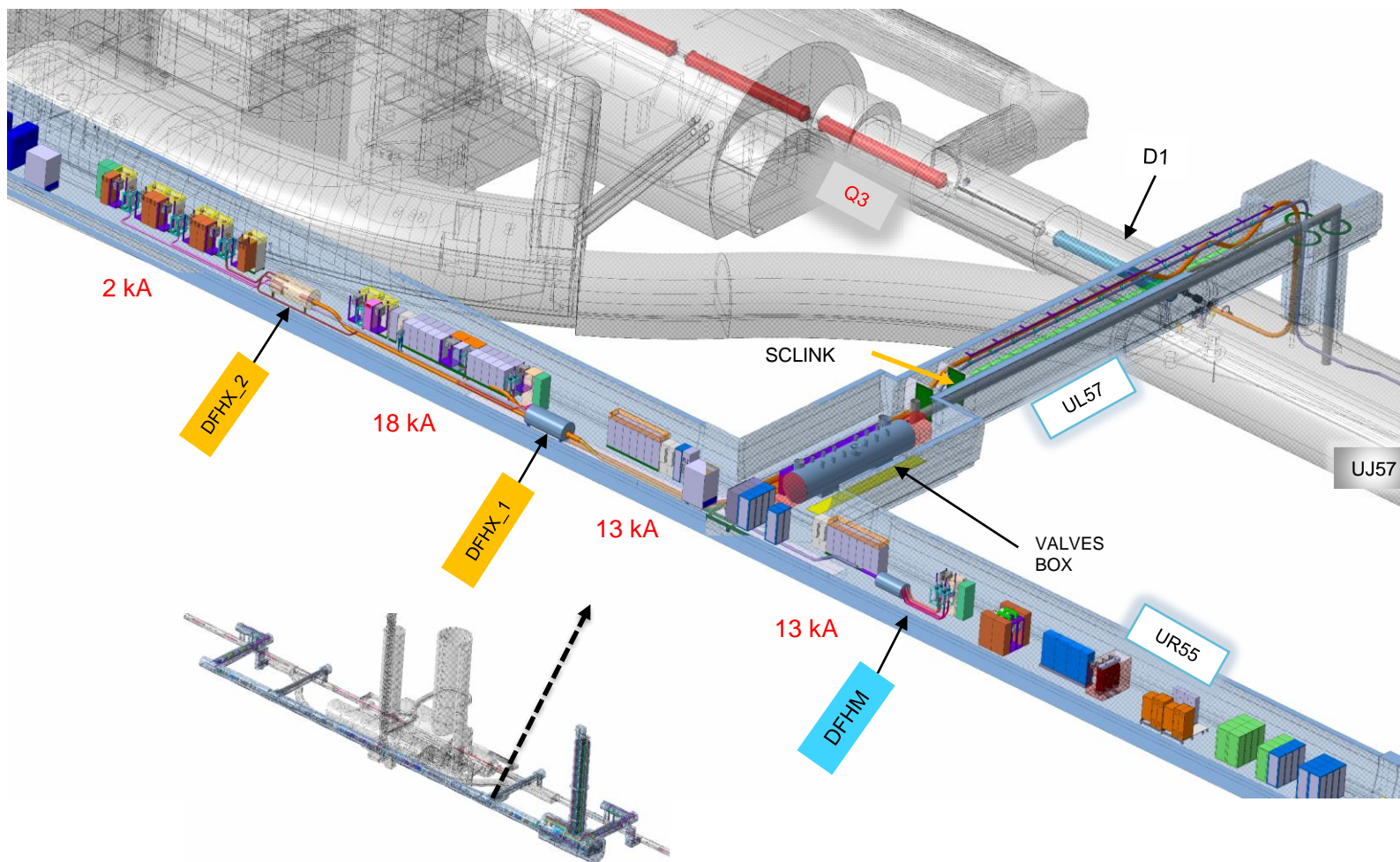
- Topological recall: the HL-LHC and the powering
- A bit of DFX integration history
- The 5L and 5R
- Hint on point 1
- Conclusions

HL-LHC topology



- HL-LHC civil engineering is under construction. Present topology and volumes, that were agreed with all WPs, have to be considered today as fixed boundary conditions
- Any equipment design modification that brings changes to other equipment or infrastructures will need to be listed and detailed in an ECR. Therefore the ECR (detailing the design modification) is under the responsibility of the requiring WP it shall contain all related impacts





A bit of history and the related documentation

- Till May 2018 the HL integration model featured, for the DFX, a place holder volume
- Previously indetermination of the DFX design had pushed to take margin moving the UL positions towards the arc in order to increase the distance between the D1 extremity and the inlet of the SC link into the LHC tunnel
- From May 2018 till September 2018 we worked with some preliminary model of an “horizontal DFX”
- From September 2018 we are working on the vertical model
- First integration of vertical DFX discussed at the integration meeting of the 12/10/2018
- New version received in November 2018
- Last model shown here received on the 22/01/2019
- We periodically publish new versions of the HL-LHC Equipment Integration Note:
 - *VOLUME AVAILABLE FOR DFX INTEGRATION IN THE LHC MACHINE (POINT 1 AND 5). EDMS nr 1991506 . Presently we have just uploaded on EDMS the 2.0 based on the model received 9 days ago. Approval procedure starting next week*
 - *Previous versions:*
 - V 0.1 15/06/2018
 - V 0.2 18/07/2018
 - V 1.0 26/07/2018
 - V 1.1 22/08/2018

LHC tunnel – L5

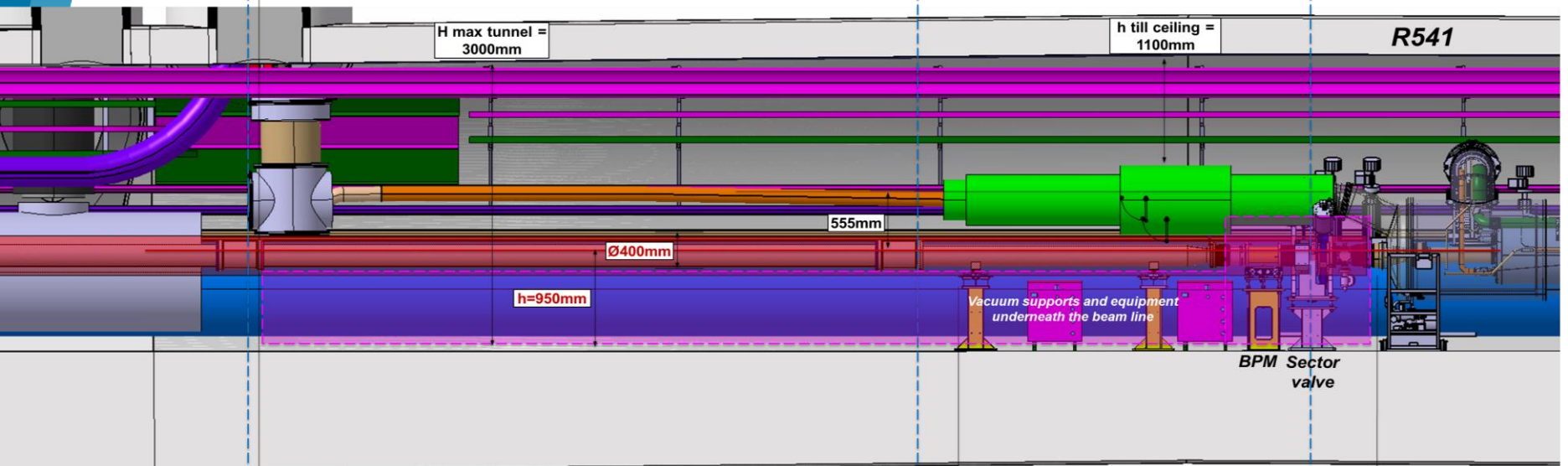
Volume reserved (5L)

-93.257m / IP

Cross Section CC'

Cross Section AA'

Cross Section BB'

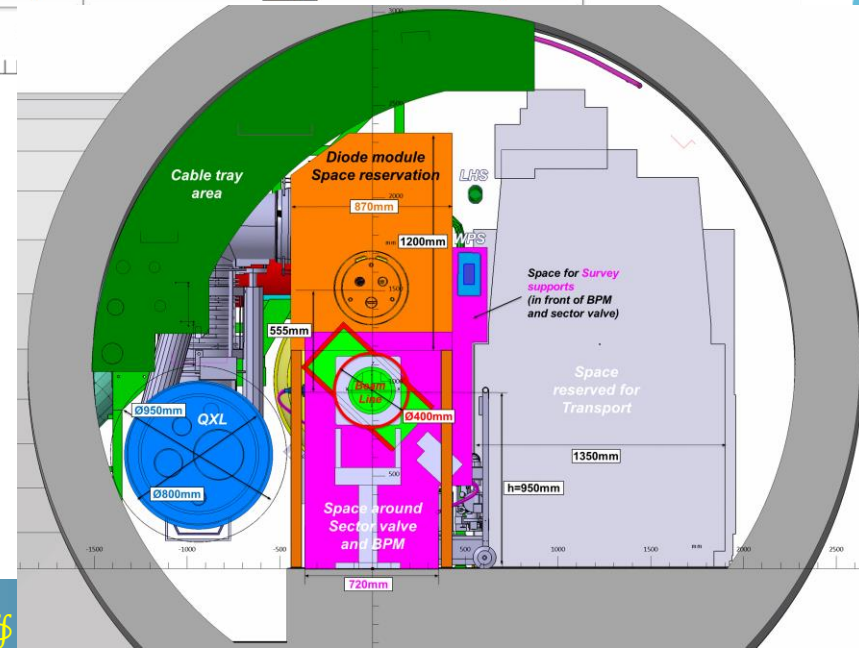
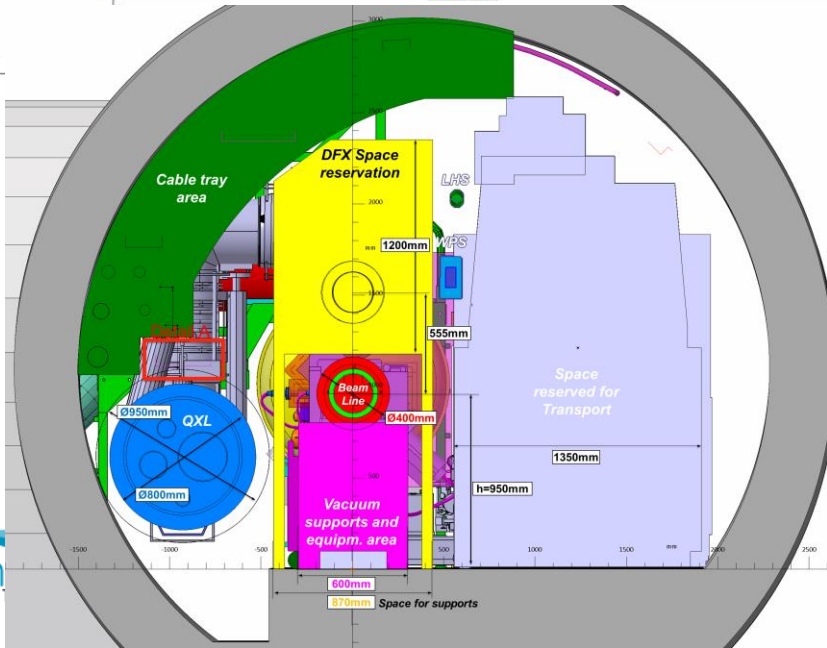


Available space for DFX design + Support

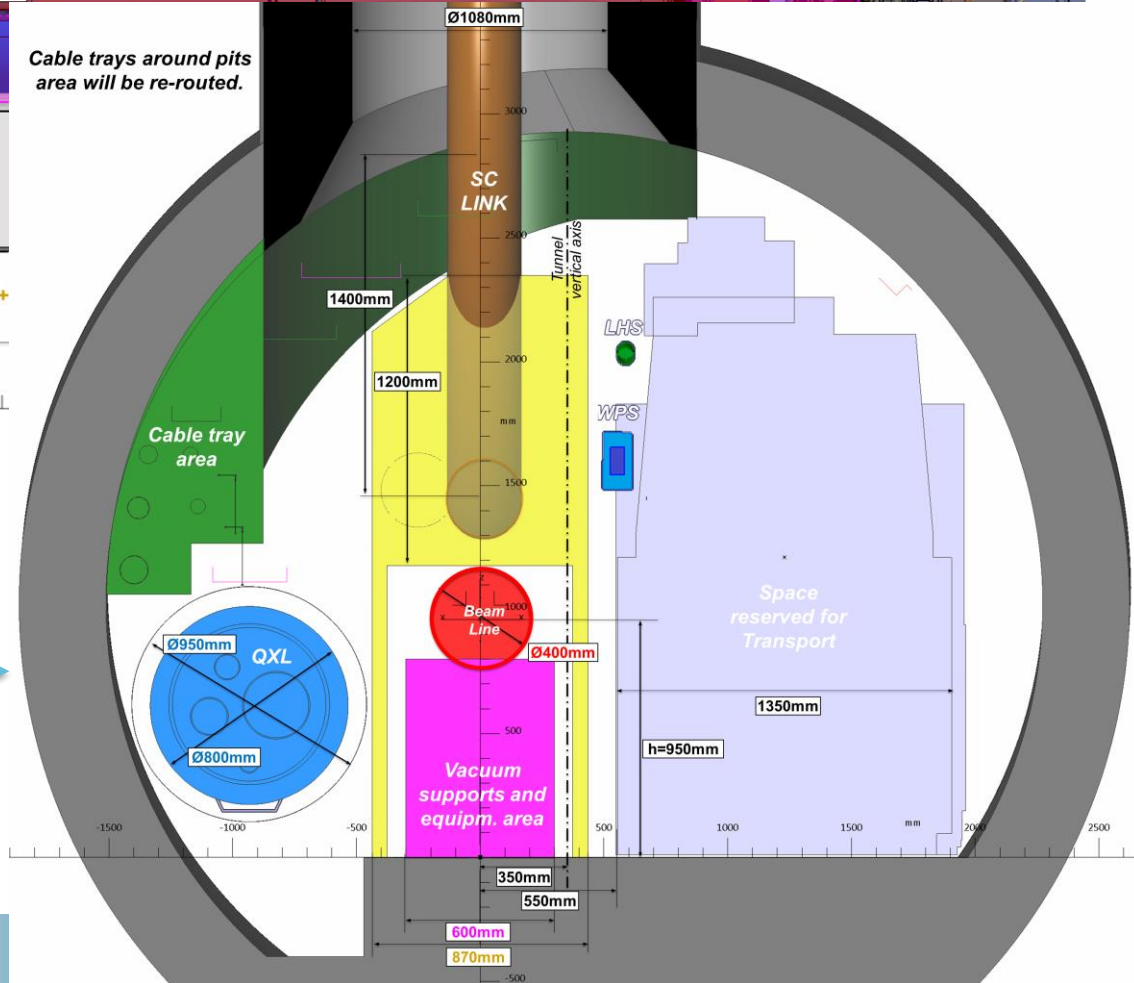
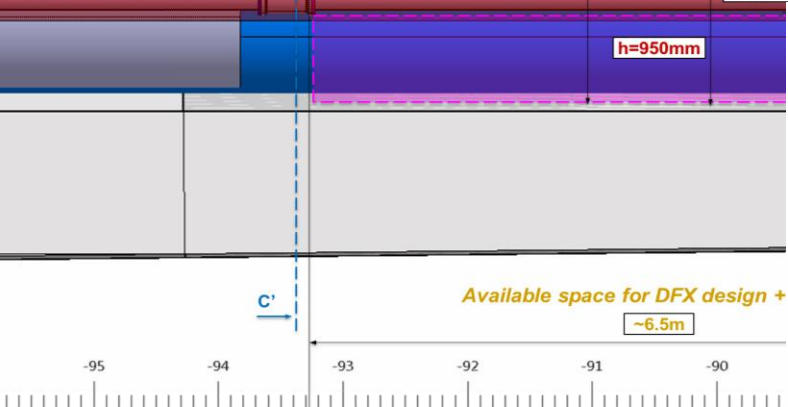
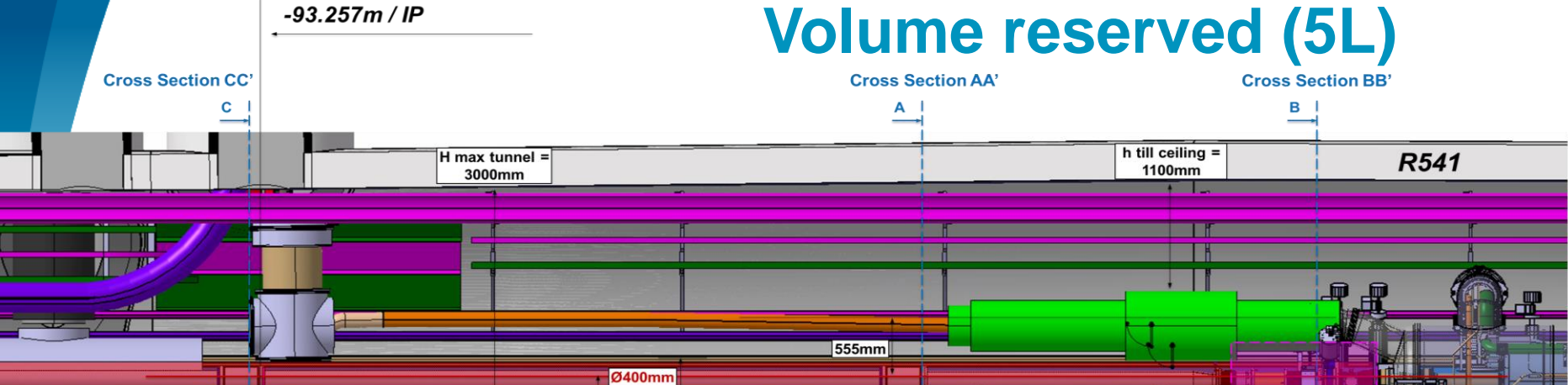
~6.5m

Cold diodes module

~4m

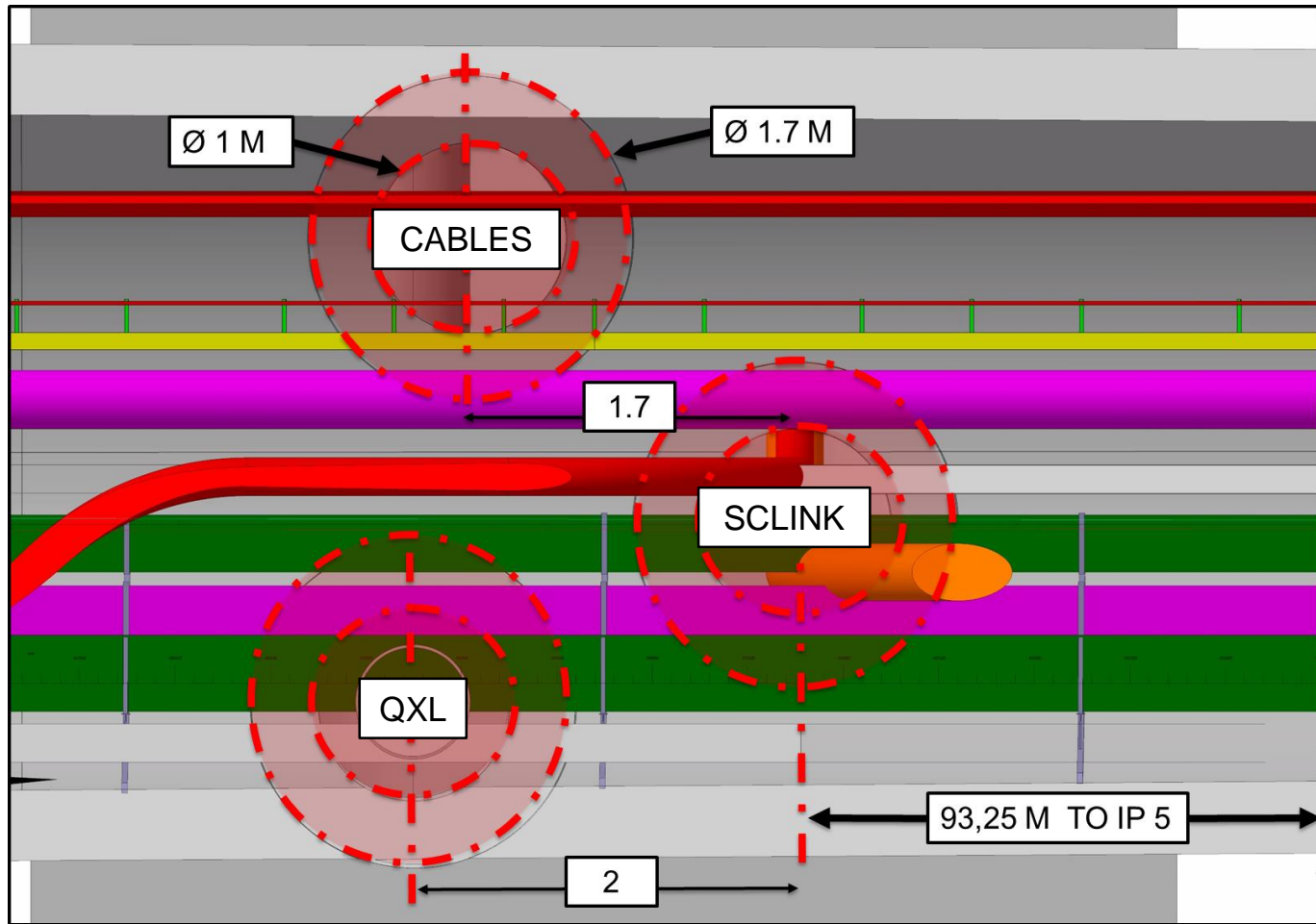


Volume reserved (5L)



LHC tunnel – L5

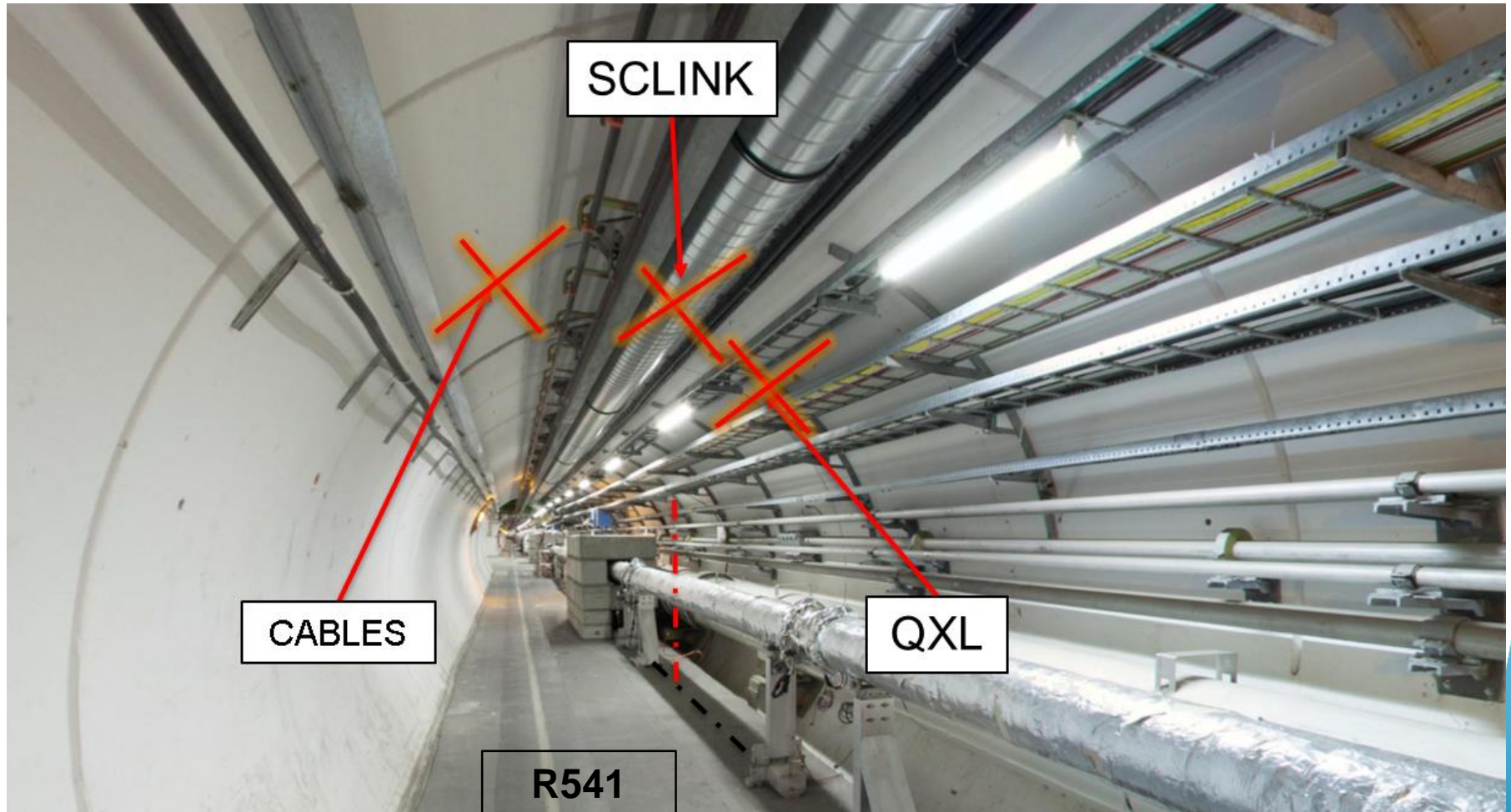
Bottom view



S.Maridor

LHC tunnel – L5

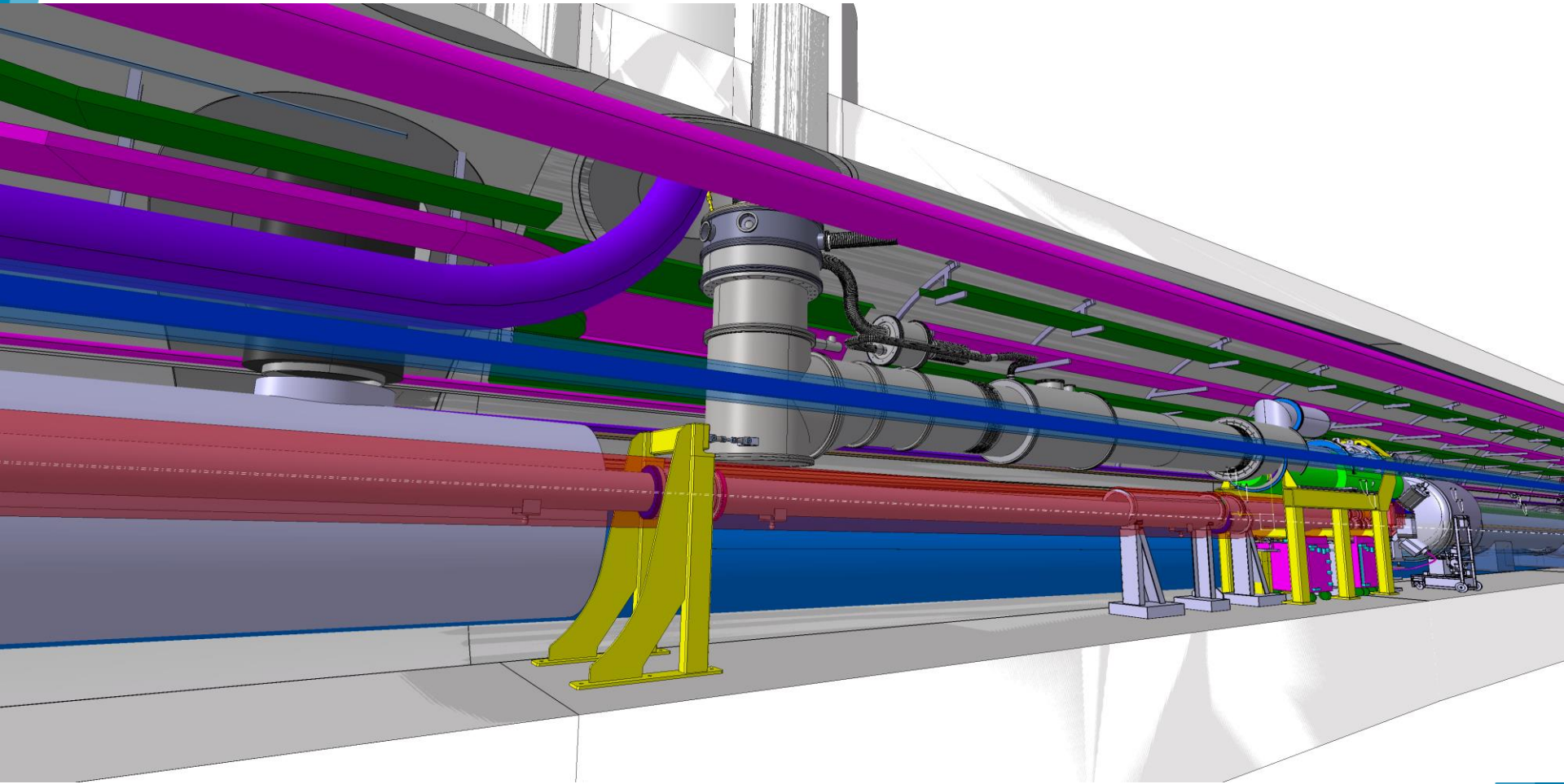
GIS portal



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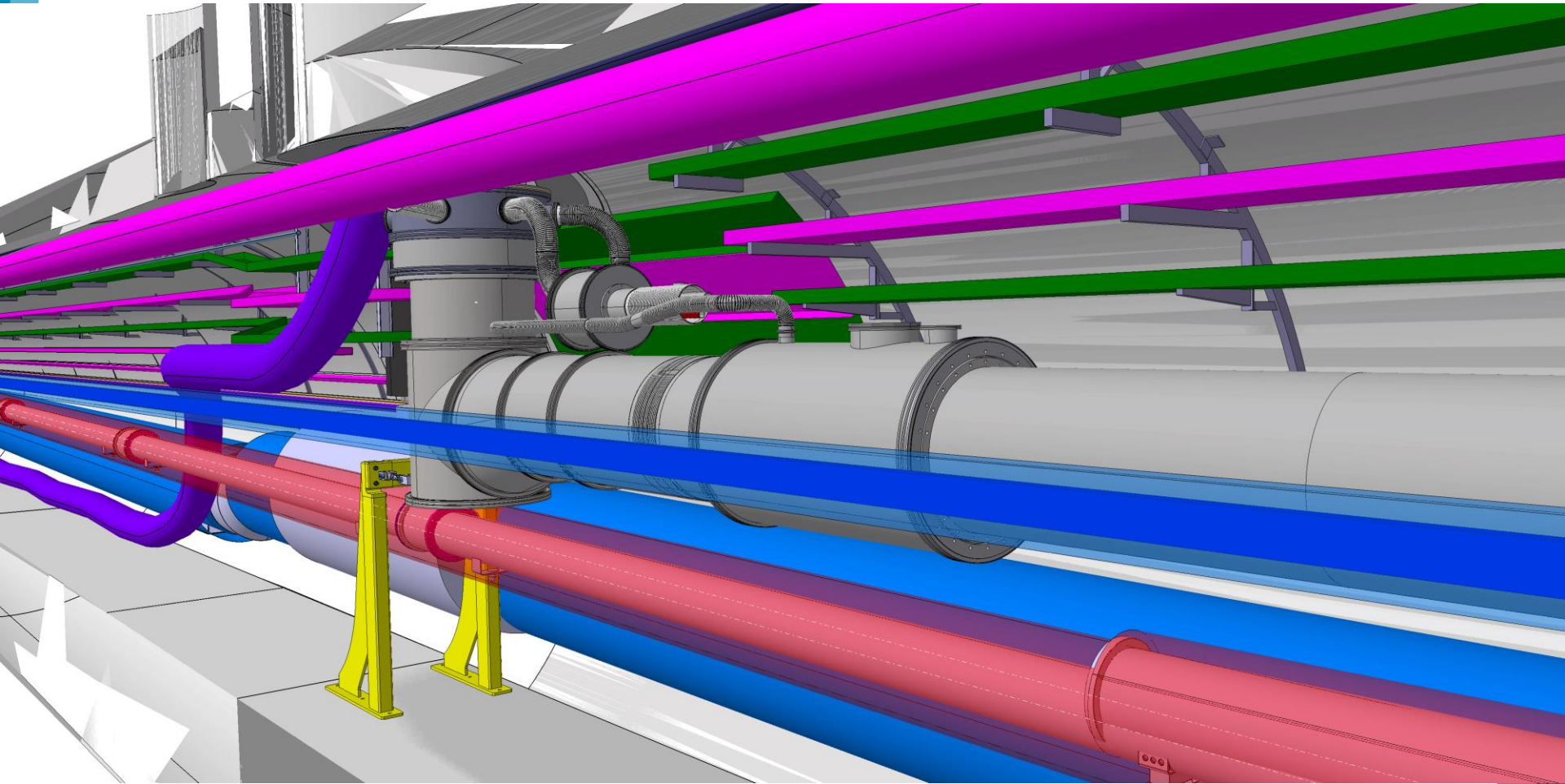
LHC tunnel – L5

3D view



LHC tunnel – L5

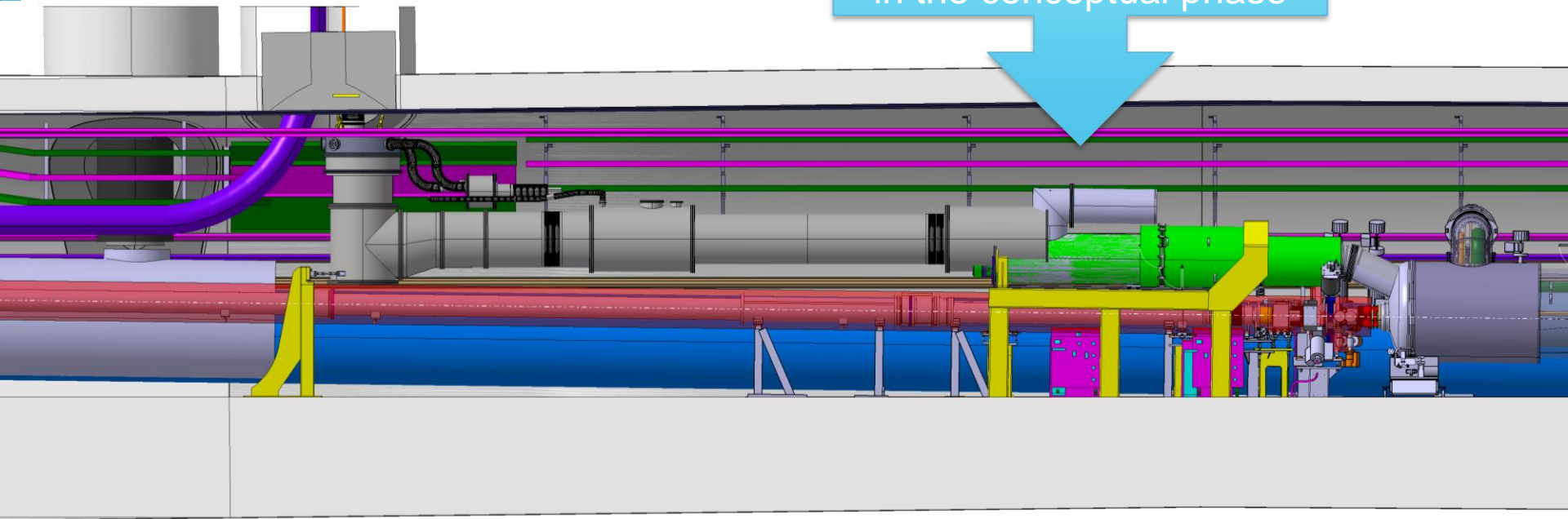
3D view



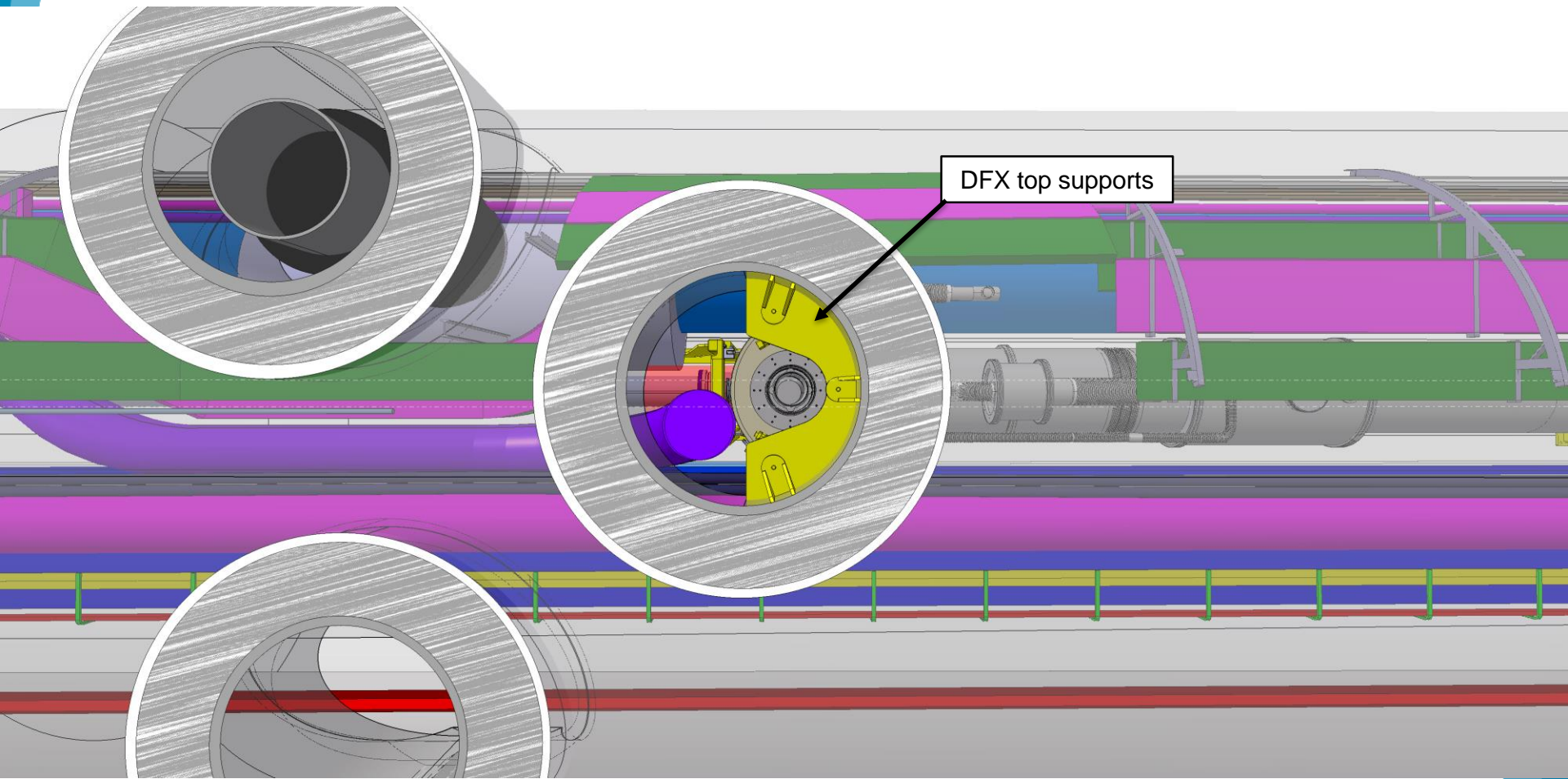
LHC tunnel – L5

Bottom view

Superposition with possible volume reservation for the diode box. Not an issue as all is in the conceptual phase



LHC tunnel – L5

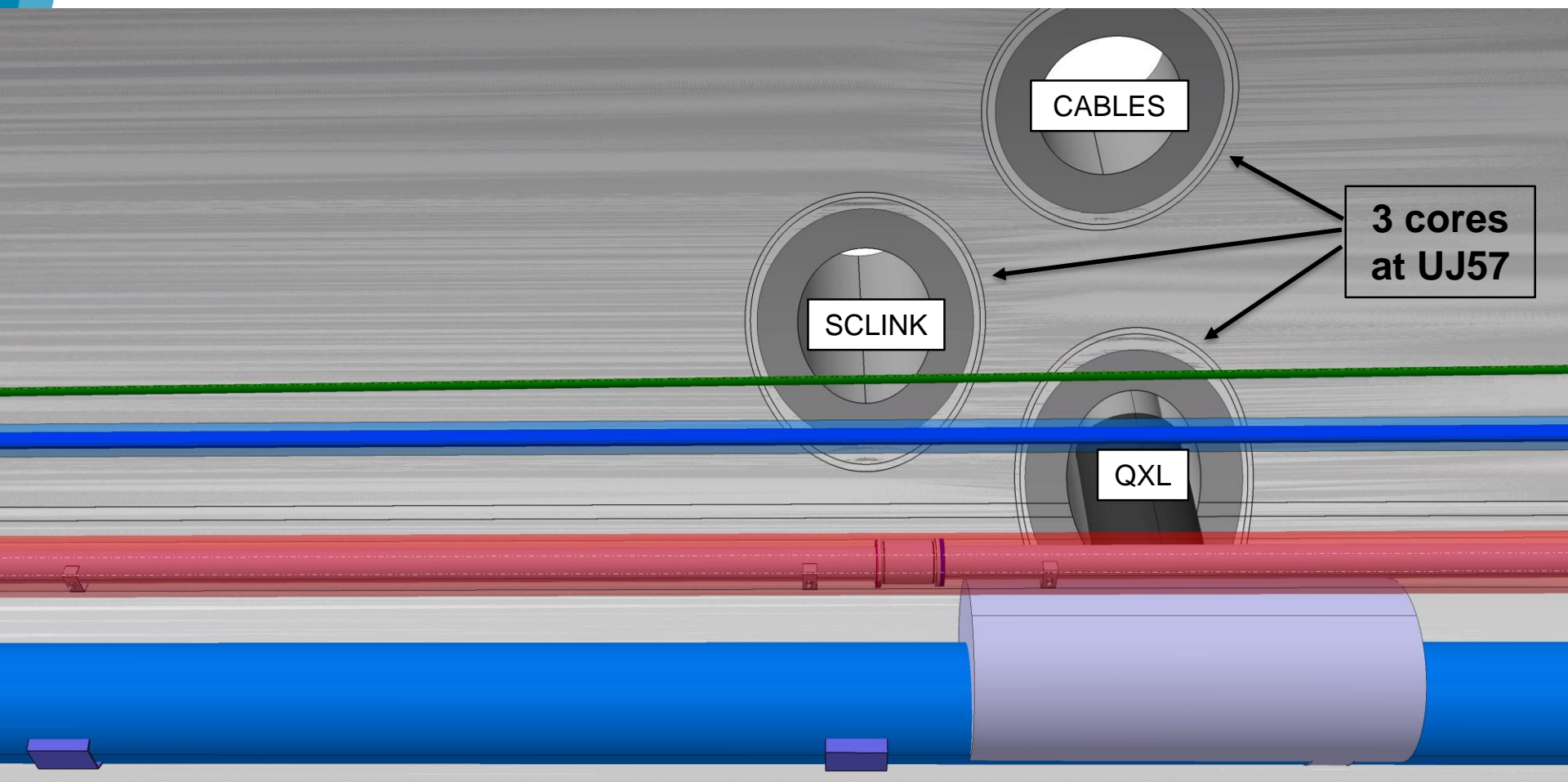


DFX top supports

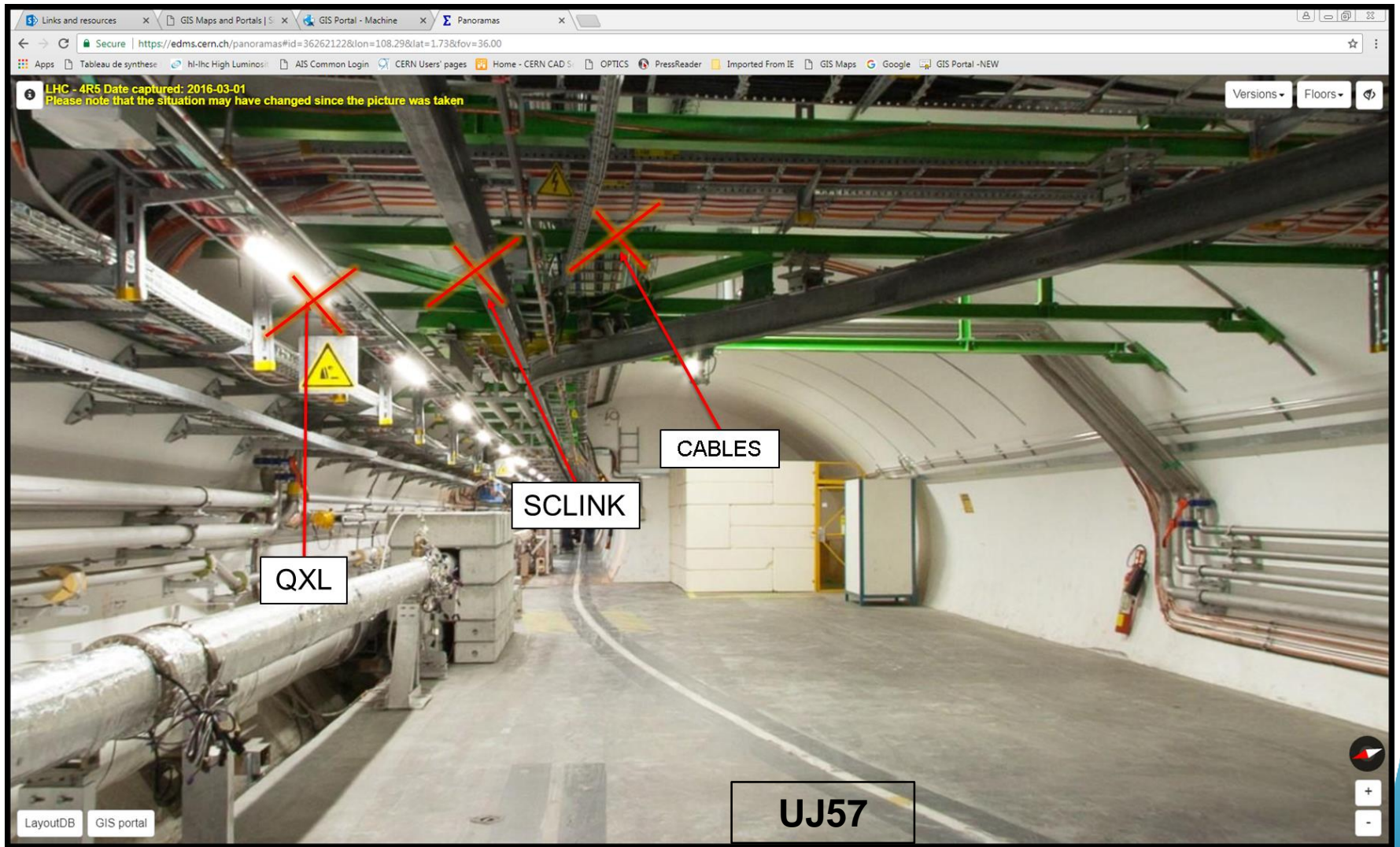
LHC tunnel – R5

LHC tunnel – R5

3D view



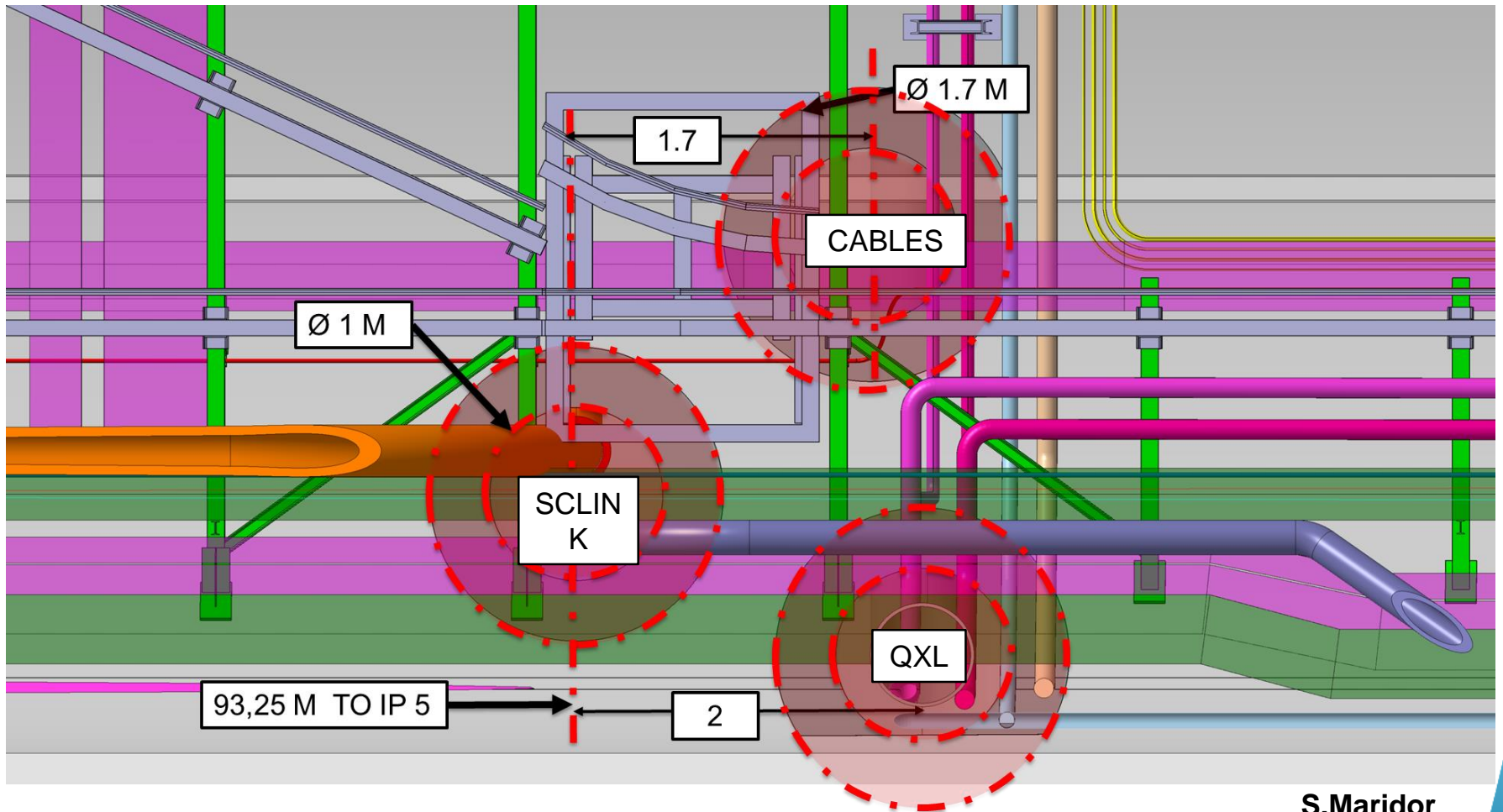
LHC tunnel – R5



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LHC tunnel – R5

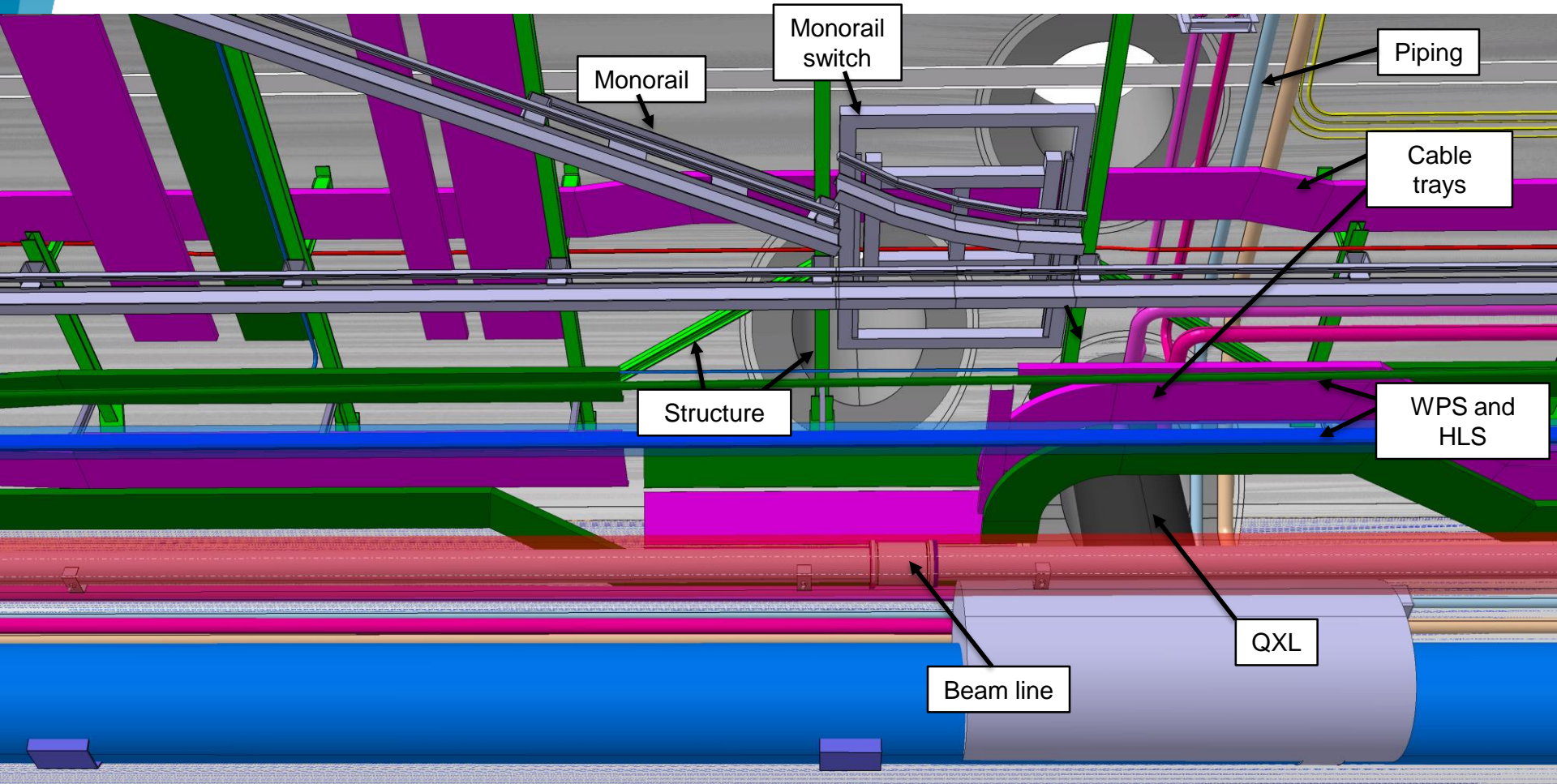
Bottom view



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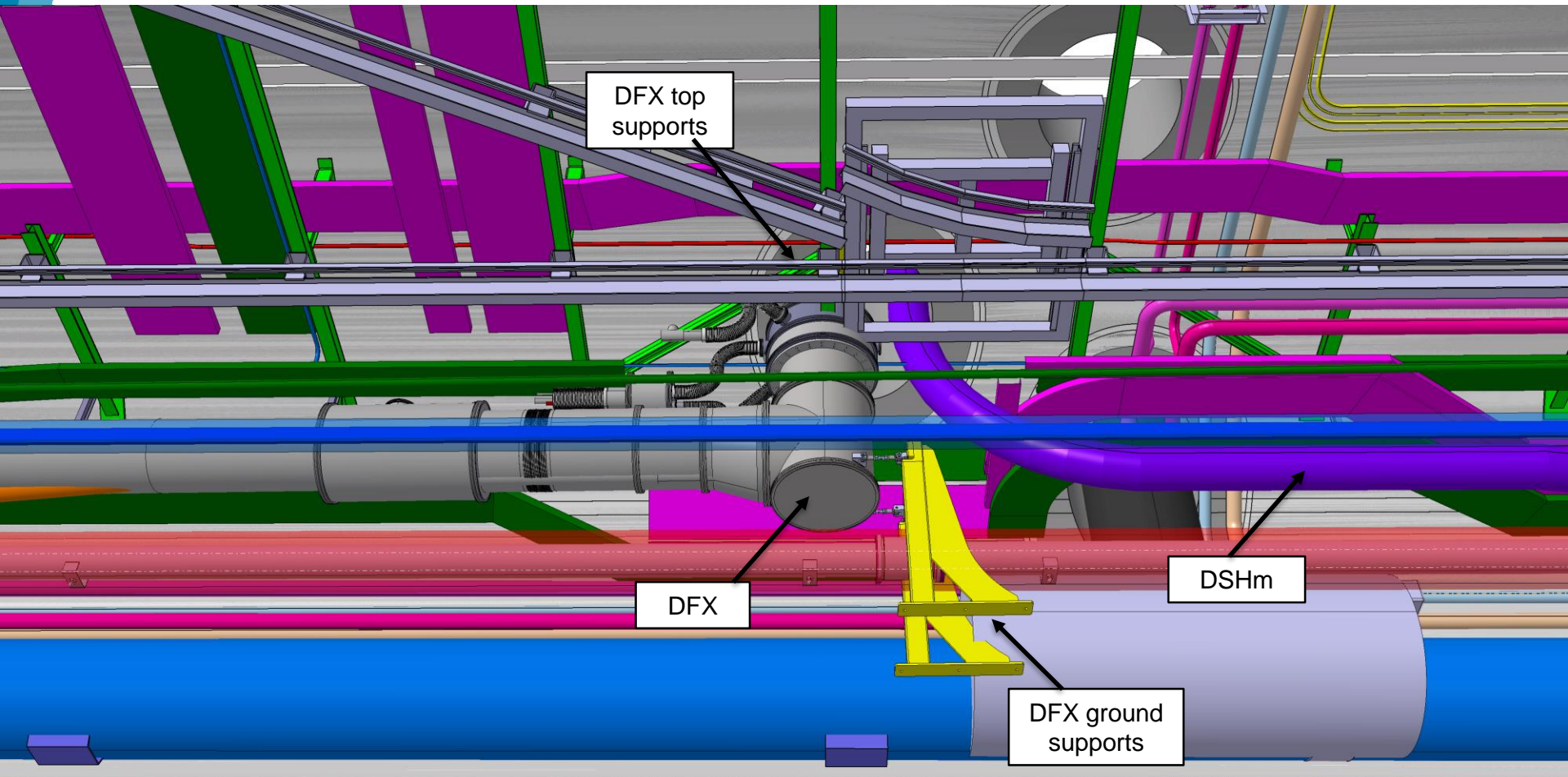
LHC tunnel – R5

3D view



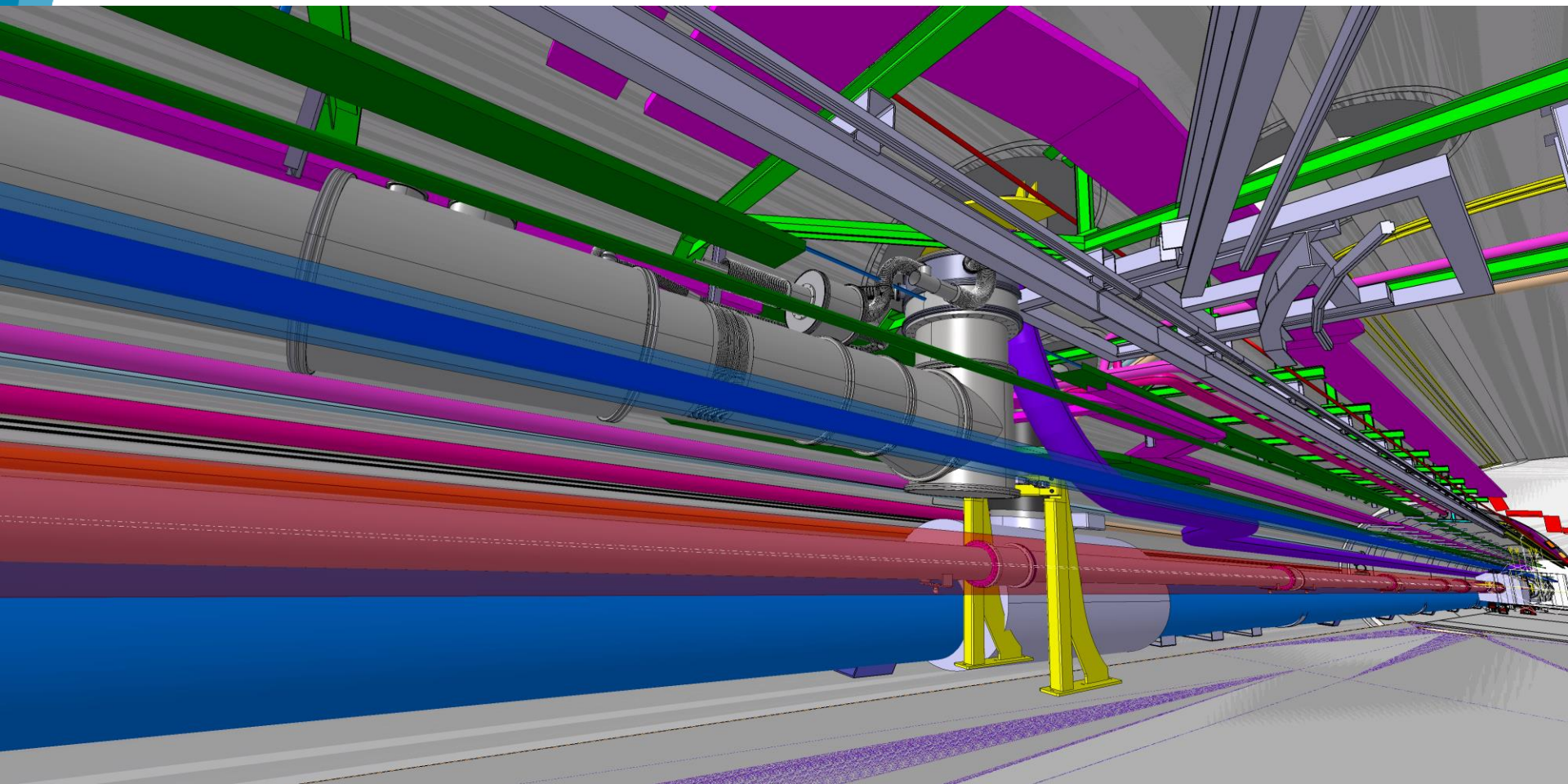
LHC tunnel – R5

3D view



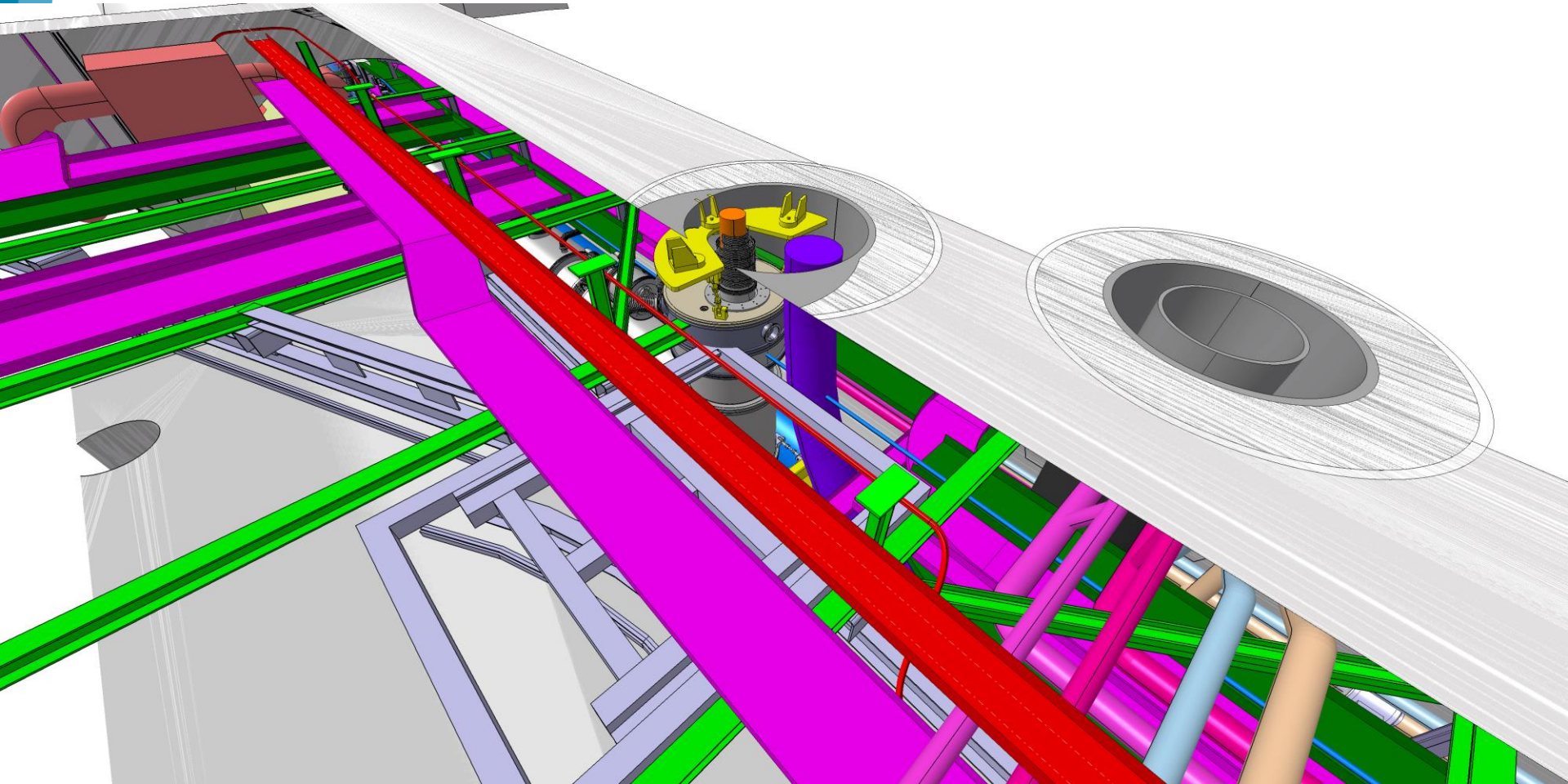
LHC tunnel – R5

3D view

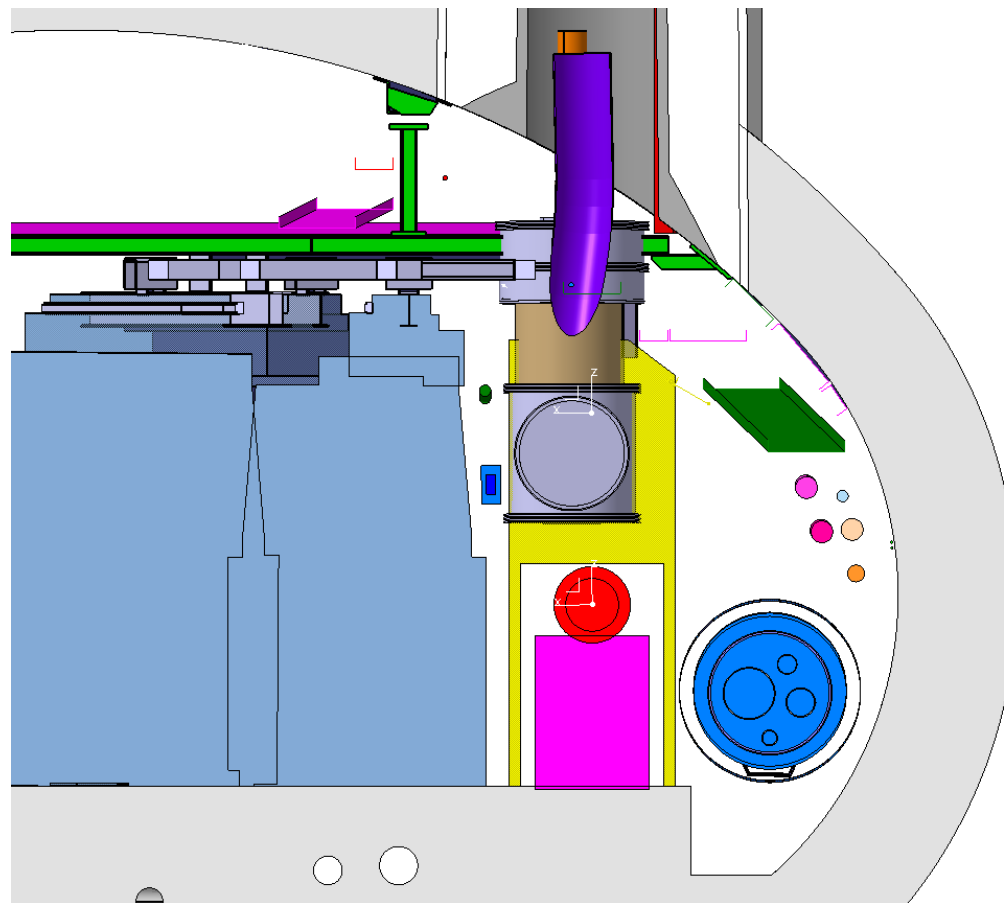


LHC tunnel – R5

3D view



LHC tunnel – R5

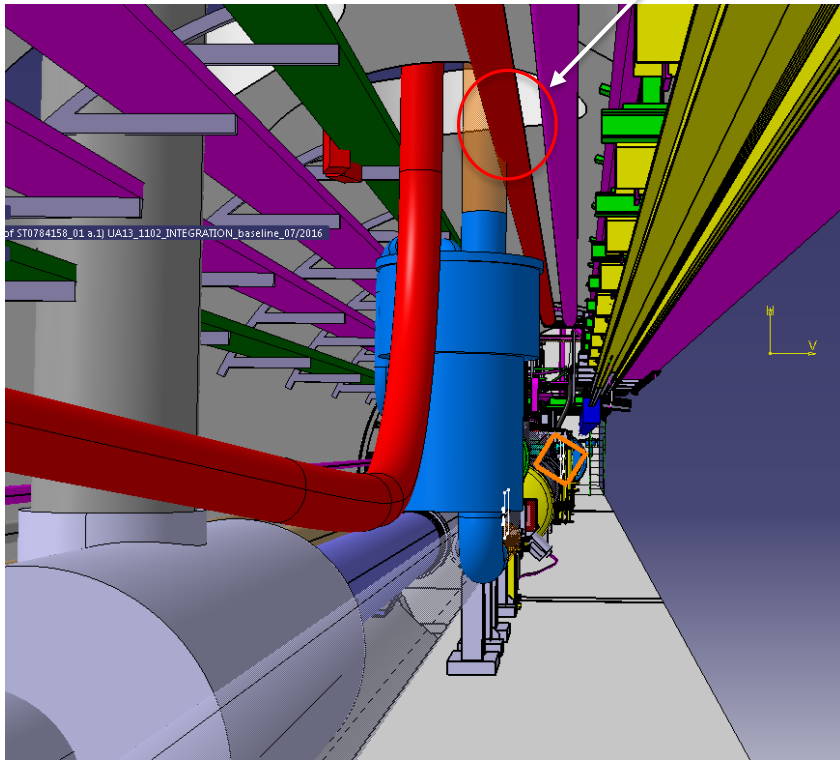


First integration of new DFX concept (1L & 1R)

First integration of the vertical DFX in the tunnel environment:

1L (RI132)

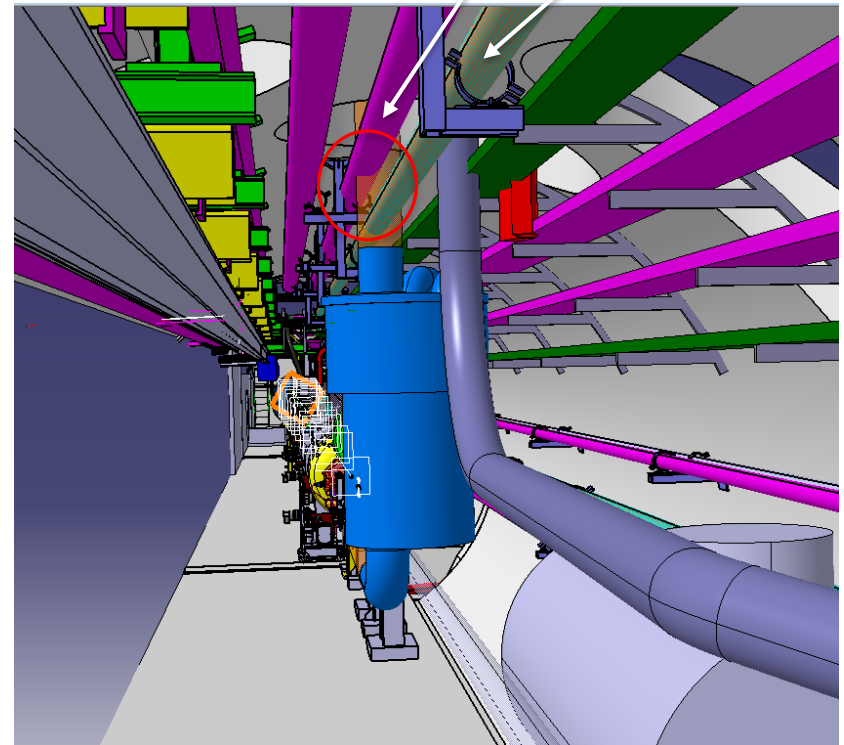
Water pipes



1R (RI171)

Water pipes

Additional pipe



What is new for the new concept and it should be kept in mind

- The proximity with the tunnel vault and the possible interfaces with the tunnel itself (for example supports if any).
- The design of the supporting system to the floor to allow full access to the beam line
- The presence of a large vertical element in the proximity of the T junction module for the QXL (no interference for the moment following analysis by WP9)
- The larger interference with the mono-rail requiring larger modification and therefore related increase of costs

Integration conclusion

- From the Conceptual point of view the integration of the present DFX design is feasible
- Equipment Integration Note “*VOLUME AVAILABLE FOR DFX INTEGRATION IN THE LHC MACHINE (POINT 1 AND 5). EDMS nr 1991506*” is the unique reference for the volume reservation and it is prepared and discussed in the Friday HL-integration meeting (presently we are at the meeting nr. 120)

But

- Normally we never found problems in the integration during the conceptual phases. The major problems are in a more advanced stage. In the specific case of the DFX it is important to understand where are and where are going
 - the cables terminals and the cables
 - the cryogenic connections
 - the safety devices
 - the vacuum equipment
 - In general all ancillaries for which for the moment there is no volume requested / reserved

Typically these elements were not in the initial model provided in September (and this is logic) and they start to appear now, but it is where the main problems will raise

- The accessibility is key issue
 - Accessibility to the DFX itself: it is needed to define the access space for **routine maintenance** and for **extraordinary maintenance**. Remark: intervention in the TS should be considered exceptional. Maintenance should be performed in the YETS not TS. The area is complex with many equipment and actors and we should avoid interventions performed in 3-4 days span We need to guarantee access to other equipment on the back of the DFX as the cryogenic equipment
 - We need to guarantee maintainability of all the systems installed on the beam line
 - Accessibility to new equipment that are in the HL and that were not present in the LHC as the WPS and the HLS. The space is reserved in the 3D section and it shall be respected