Transport and installation of DFX in the LHC underground areas

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Detailed Design Review of the DFX, CERN 20 June 2019

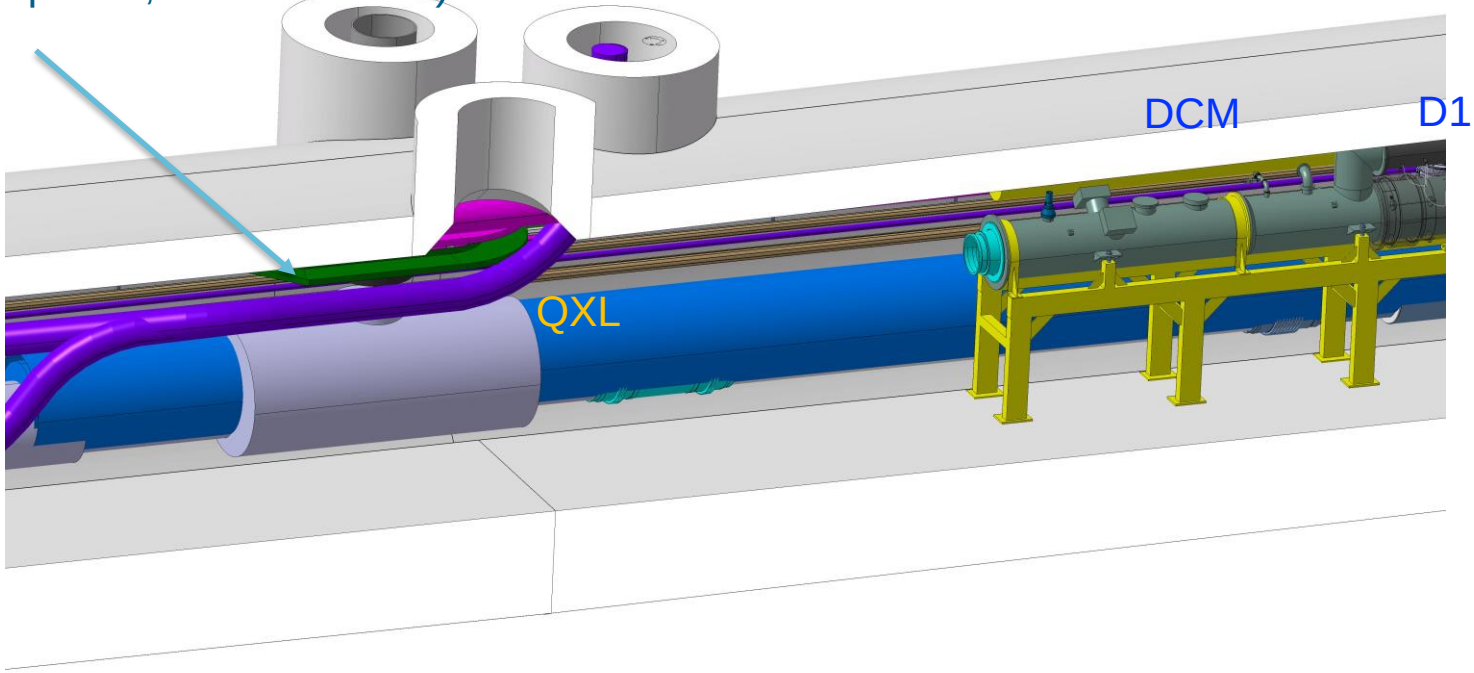
Preamble

- The following slides show the main steps of the assembly of the DFX according to the design by SOTON, but projected into the tunnel environment according to the study by the integration team under WP15. It does not include tools for transport, handling, positioning, nor the special tools for welding, leak detection and other QC means. This work will be done by CERN in the next future and the first assembly need will be for installation in SM18 (for the system test and for the String) which will provide an opportunity for validating procedures, tools and QC.

- The intention of these slides is to illustrate the environment and space limitations in the LHC tunnel in IR5L.

Tunnel configuration at DFX installation

SC link for DFM/D2
(space occupation, size is smaller)

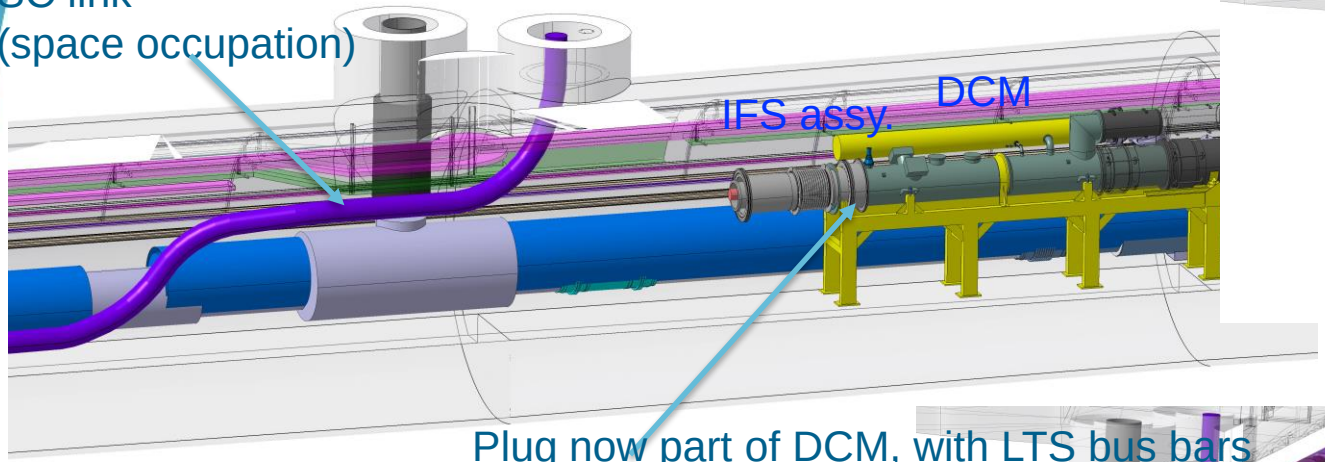


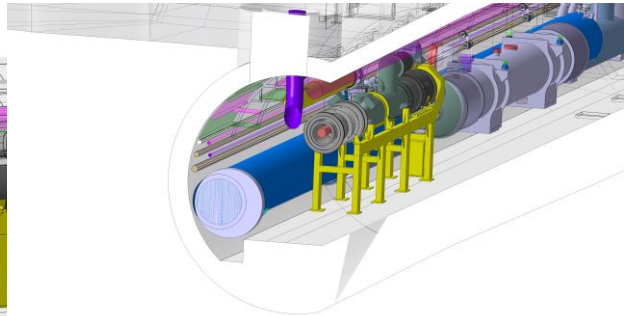
DFX machine assembly

SC link
(space occupation)

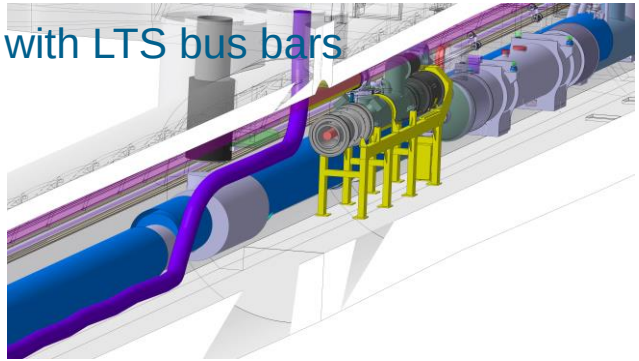
IFS assy.

DCM



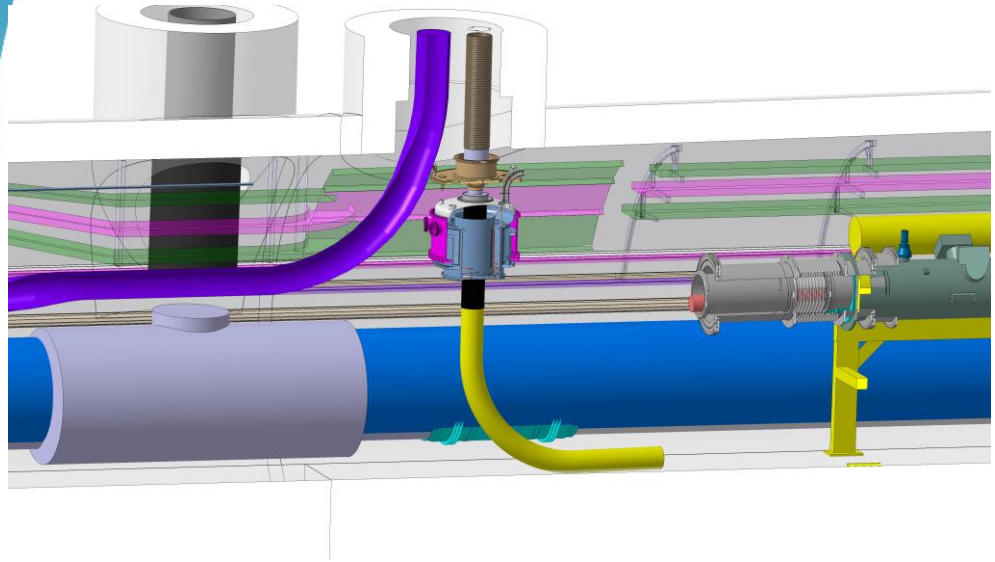


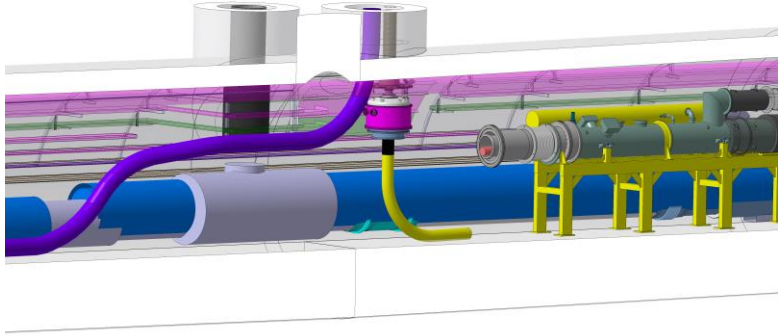
Plug now part of DCM, with LTS bus bars



- Assembly of IFS assy. to DCM

DFX machine assembly

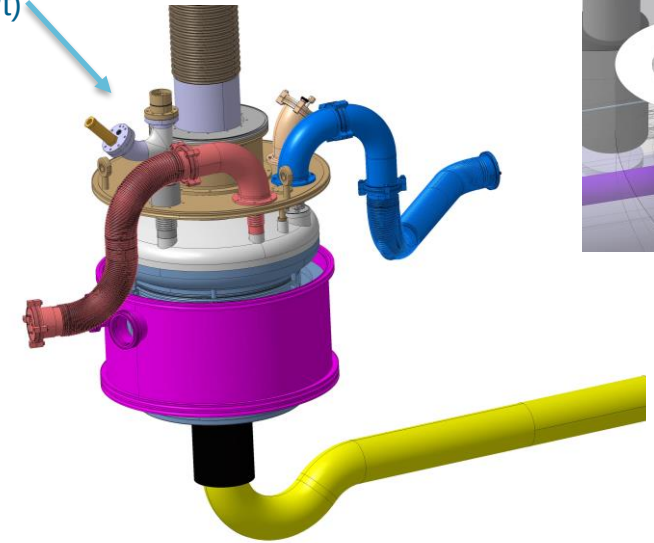


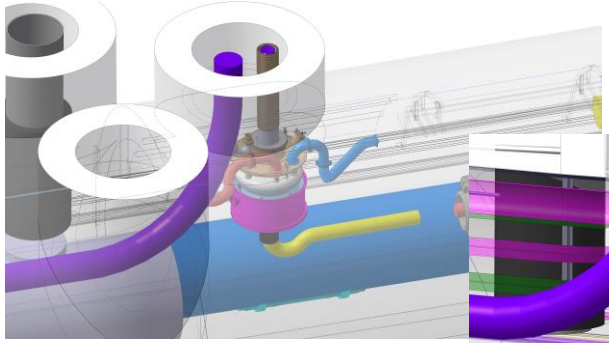


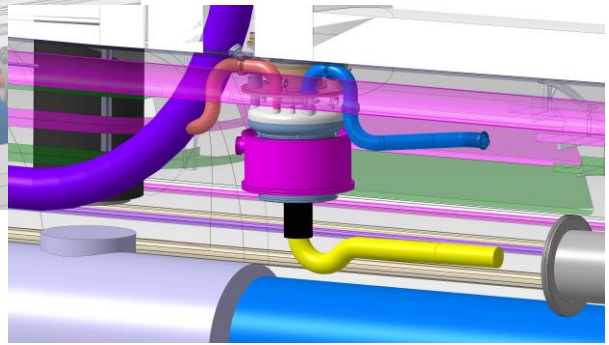
- 1. Top Flange and DFX tank in prepared position
- 2. Link Down +100 mm with LTS
- 3. Weld of the flange, weld inspections and leak checks

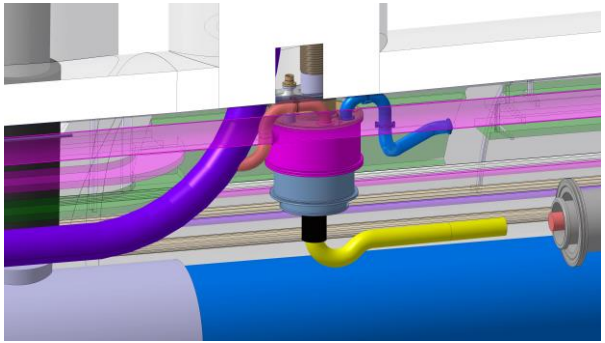
DFX machine assembly

(Burst disk mounted only after Pt)



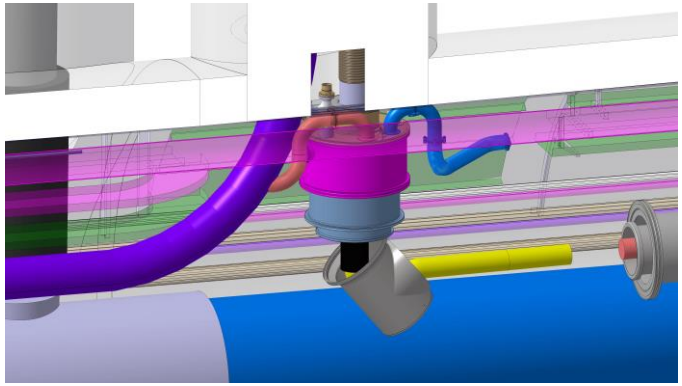


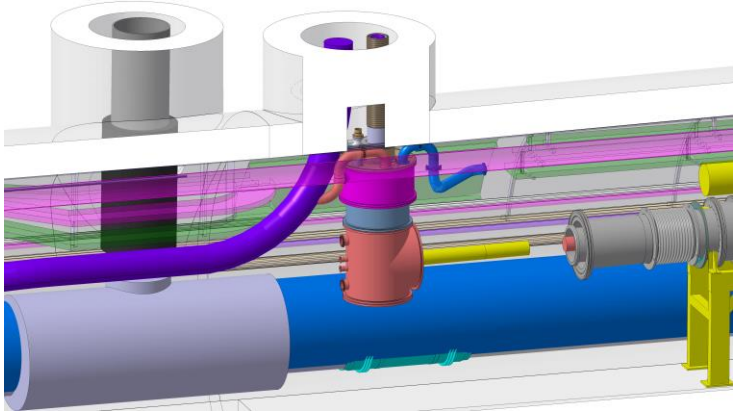




- Move the He tank and link 100 mm up
- Equipment of the top flange
- LTS extension shaped for threading of horizontal segments

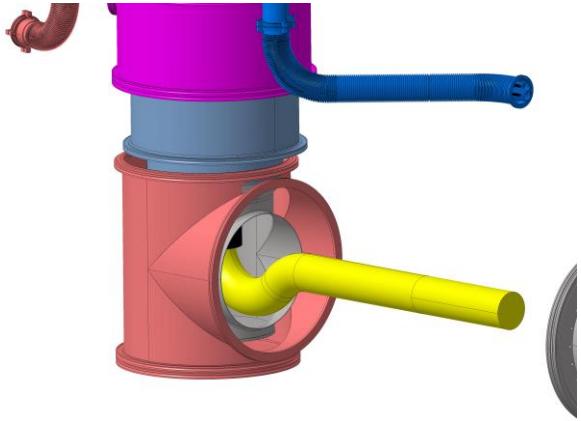
DFX machine assembly

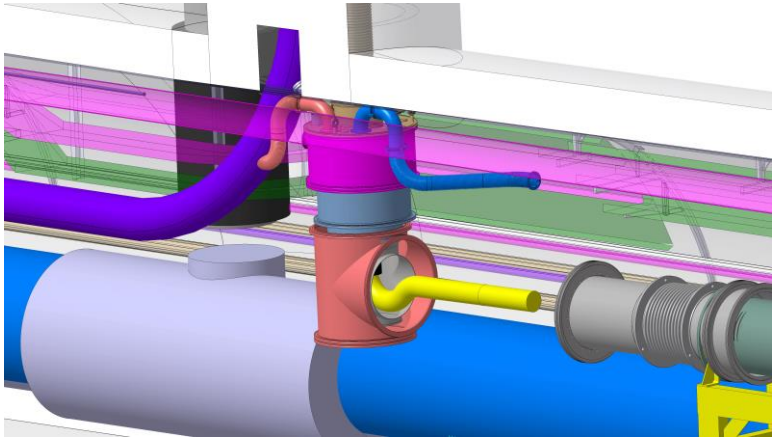




- Threading of helium & vacuum chamber in place (will be helped with a side bend of the LTS cable)
- Welding, weld inspections and leak checks

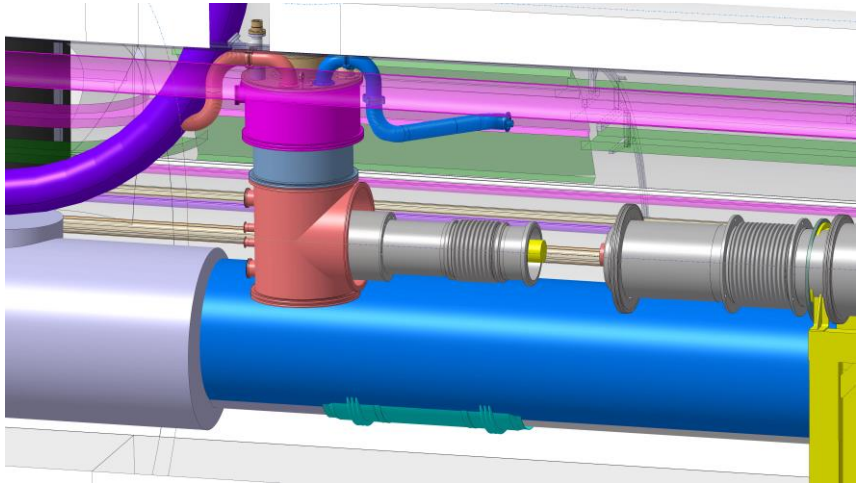
DFX machine assembly

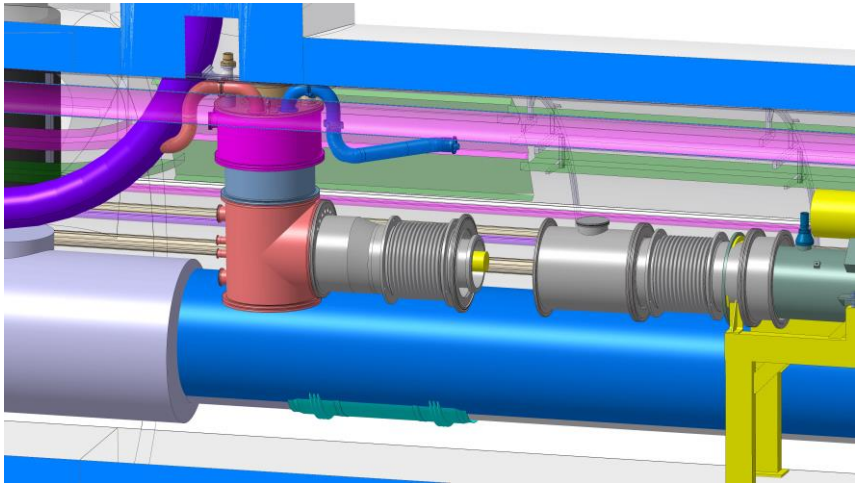




- Vacuum chamber move to allow the weld with the horizontal section

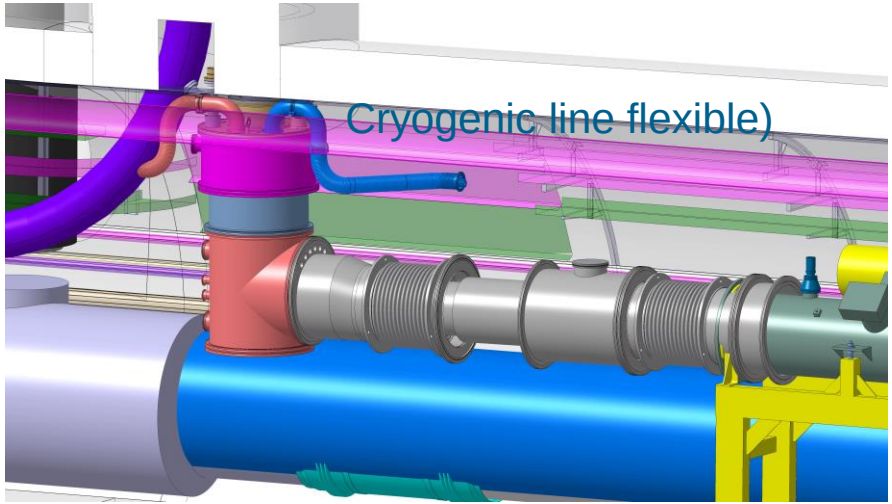
DFX machine assembly

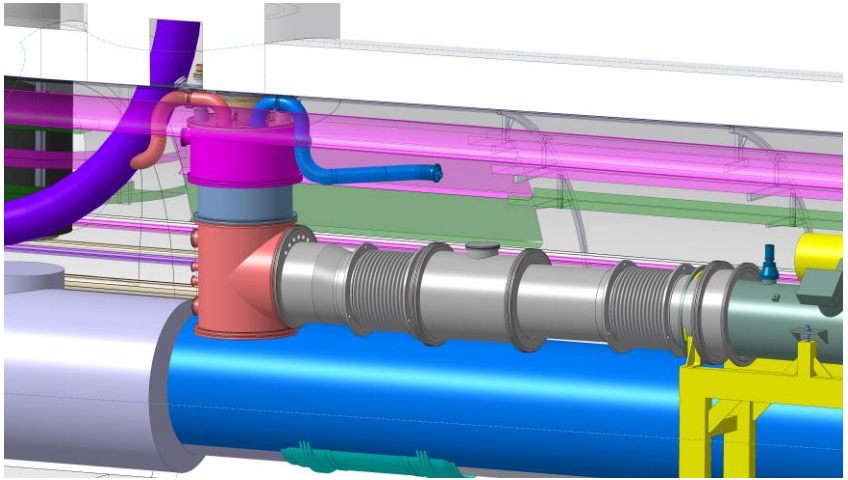




- Helium & vacuum vessel segments
- Welding, weld inspections and leak checks

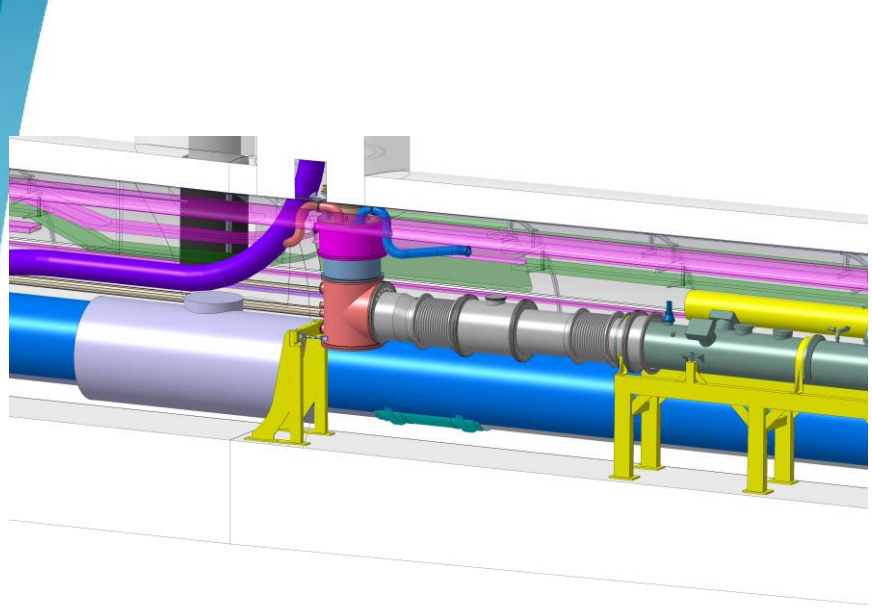
DFX machine assembly

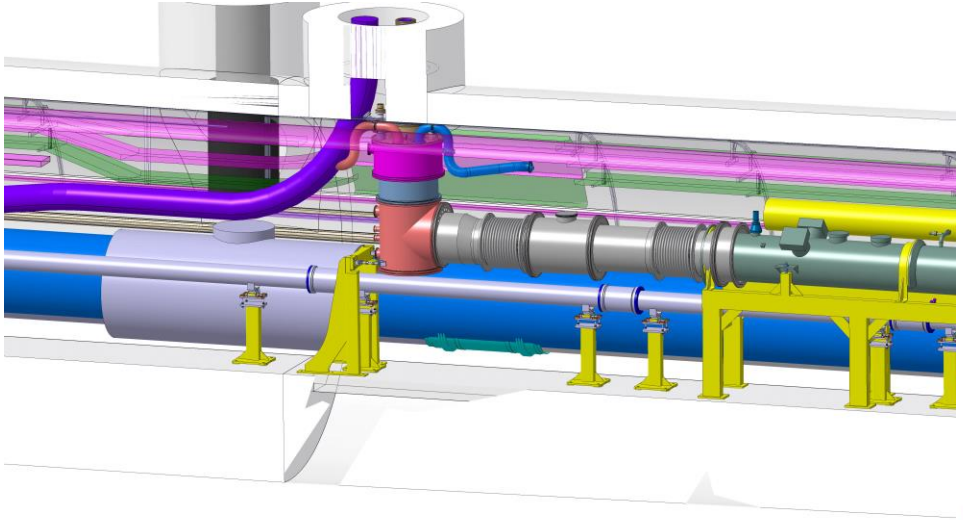




- Splices, instrumentation wires connections, electrical checks
- Final welding helium chamber (+checks)
- Close the vacuum chamber
- Connection of cryogenic lines flexible to QXL (not shown)

DFX machine assembly





- Add the DFX longitudinal force frame
- Ins. vacuum pumping and global leak check possible
- …

Summary

- From this preliminary study we learn about the space limitations for the DFX assembly in the tunnel providing the play ground for developing handling, positioning and assembly tooling
- Once the 3D models are finalized, a structured assembly study work should be carried out to define assembly procedures, and QC checks
- This study is planned to be closely followed in WP15

Thank you for your attention

Q&A?