



# Preliminary Y-chamber specifications – First draft

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# OUTLINE

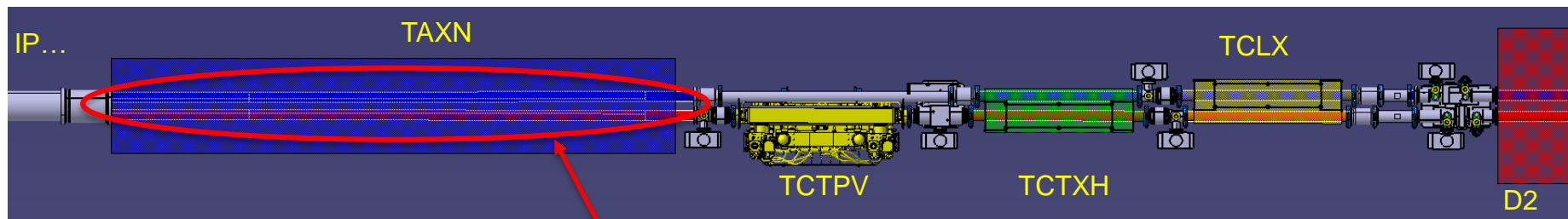
1. Introduction.
2. Functional specifications.
3. First draft.

# 1. Introduction



# HL-LHC TAXN area

- The HL-LHC Y-chamber is planned to be installed inside TAXN in point 1&5.
- LHC Y-chamber currently installed in point 1&5 will be use as a reference.

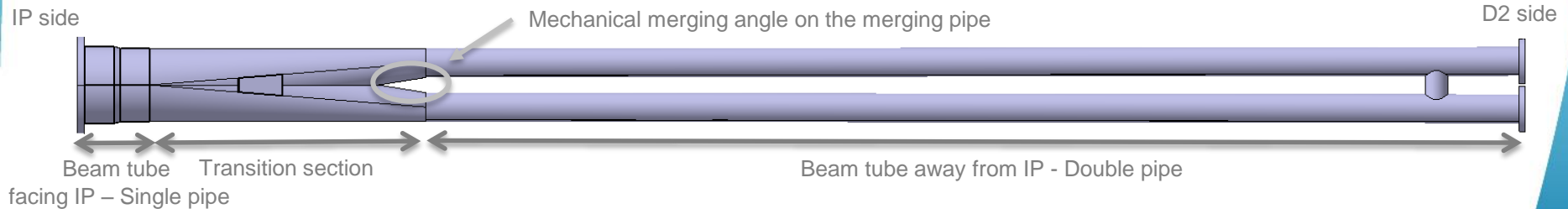


**Planned Y-chamber location.**

## 2. Specifications

# Specifications [I]

- **Vacuum specifications:**
  - On IP side:
    - ID equals to 250 mm.
    - Flange DN273.
  - On D2 side:
    - ID equals to 91 mm.
    - Flange DN100.
  - Length transition section equals to 935 mm due to its merging angle is  $9^\circ$  (as it is in LHC Y-chamber 1&5).
  - Leak tight rate less than  $10^{-11}$  Pa m<sup>3</sup> s<sup>-1</sup>.
- **Beam impedance specifications:**
  - Max mechanical merging pipe  $15^\circ$ .
- Space between the tubes of the double pipe is reserved for possible installation of luminosity detectors.

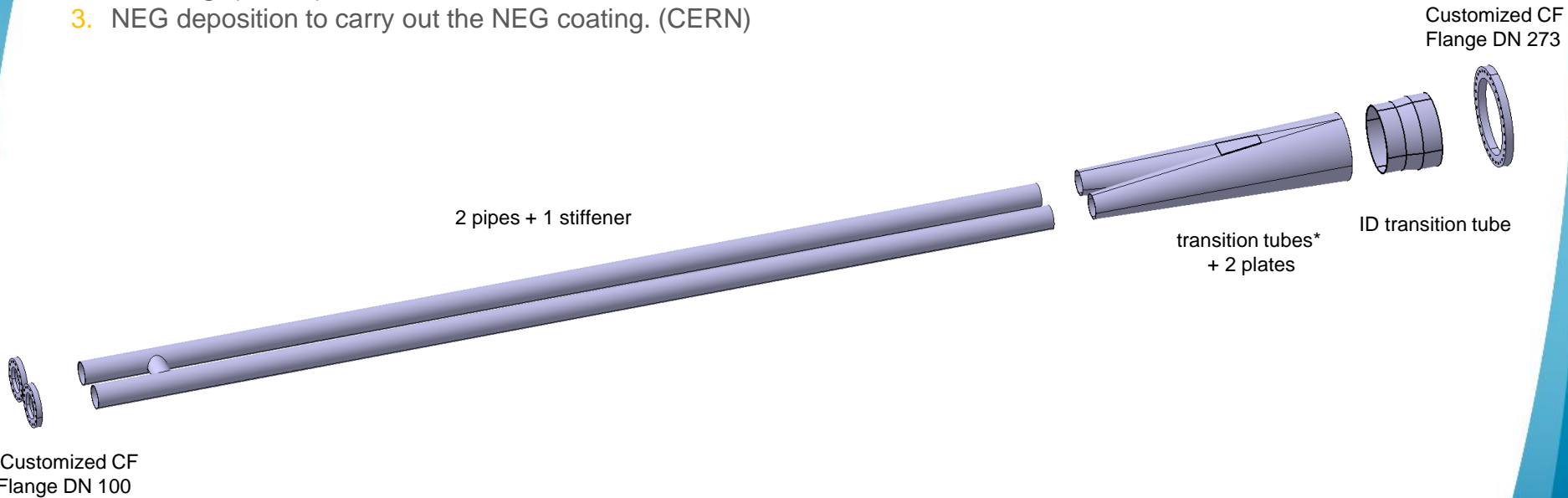


# Specifications [II]

- **Material:** Cooper OFS (Stainless Steel 316L as a second option).
- **Bakeout specifications:** in situ bakeout temperature is 250°C with 50°C/h rate.
- **Coating:**
  - Copper coating (in case it is built in Stainless Steel 316L)
  - NEG coating.
- **Transport:** construction phase will be carry out in BINP installations and then will be cleaned and NEG coated at CERN\*.
- **Tooling:** to be defined and included in the delivery.
- **Mechanical tolerances.** The following data contains the very worst case concerning mechanical tolerances WP8 can accept.
  - Beam tube facing IP (two beams in one tube)
    - Inner radius: 125.0 mm.
    - Mechanical tolerance (radius):  $\pm 2.1$  mm
  - Transition section
    - Inner radii: 125.0 to 42.5 mm.
    - Mechanical tolerance (radius) [e/m/e]:  $\pm 1.9 / \pm 4.9 / \pm 1.4$  mm.
  - Beam tube away from IP (two beams in two different tubes)
    - Inner radius: 42.5.0 mm.
    - Mechanical tolerance (radius):  $\pm 1.0$  mm.
- **Alignment tolerances.**
  - Vacuum chamber to alignment fiducial tolerance (radius):  $\pm 0.6$  mm.

# Manufacturing strategy proposal

1. To build the Y-chamber the different parts would be welded by electron beam welding in order to achieve a leak tight rate less than  $10^{-11}$  Pa m<sup>3</sup> s<sup>-1</sup>. (BINP)
2. Cleaning. (CERN)
3. NEG deposition to carry out the NEG coating. (CERN)

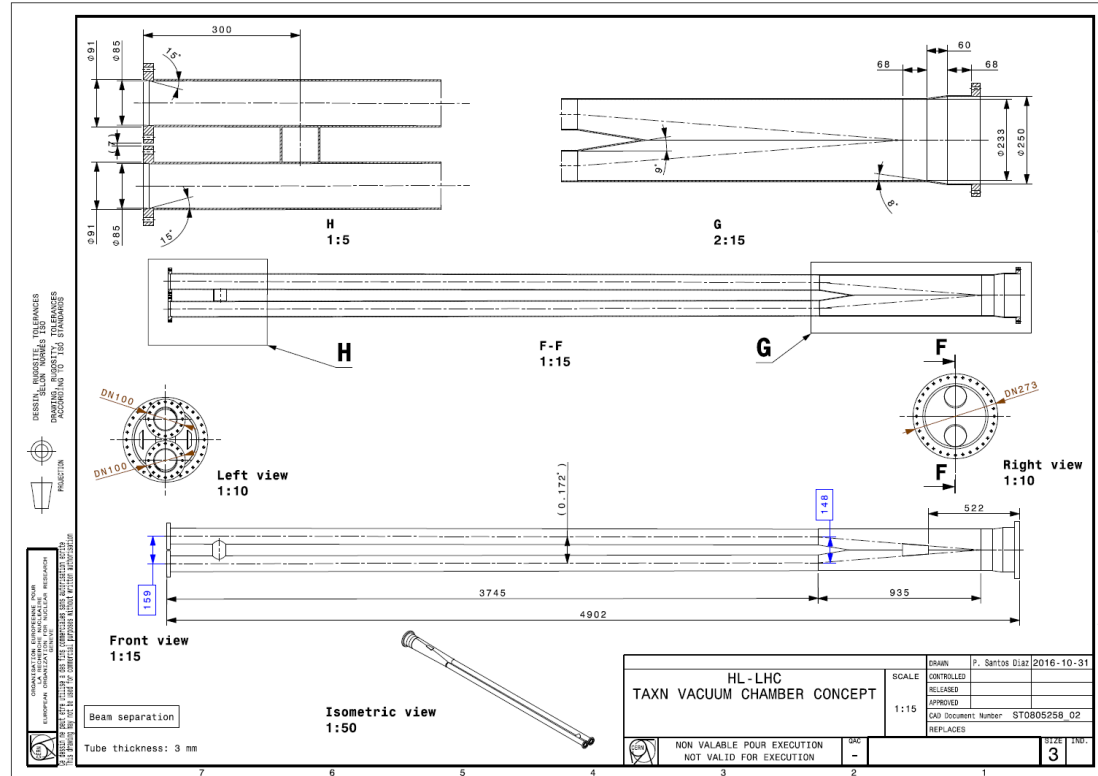
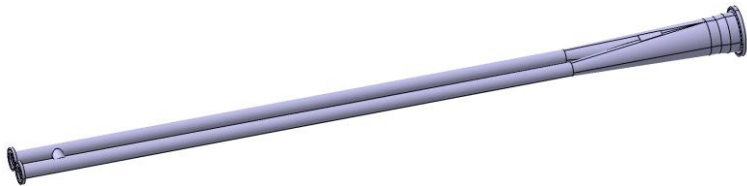




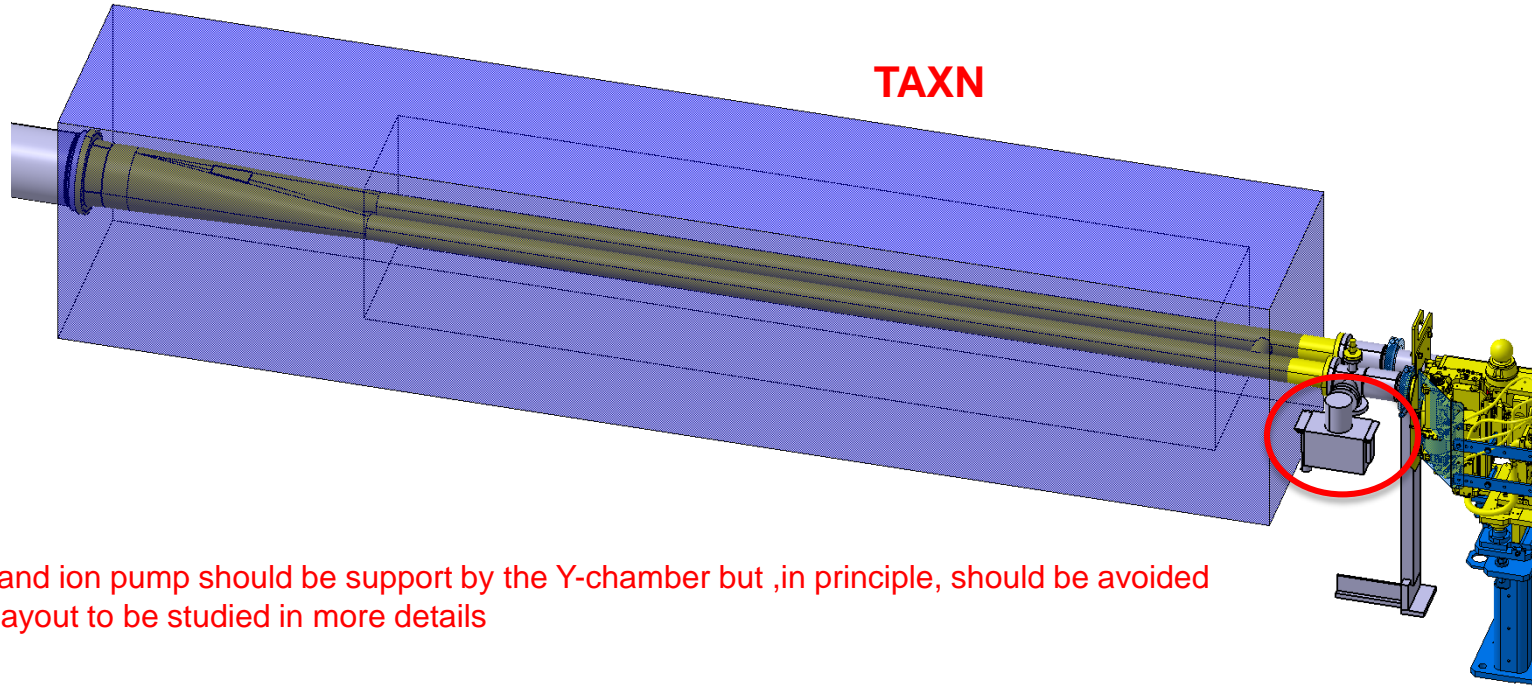
# 3. First draft

# 3D model and features

- On IP side:
  - ID: 250 mm.
  - Transition to ID 233 mm.
  - Flange DN273 CF.
- On D2 side:
  - ID: 85 mm.
  - At the end of both tubes of the double pipe there is an ID transition from 85 mm to 91 mm.
  - Flange DN100 CF.
- Thickness 3 mm → tbc by a stress analysis.
- The tubes of the double pipe has an angle, it means that both pipes are parallel to its respective beams.

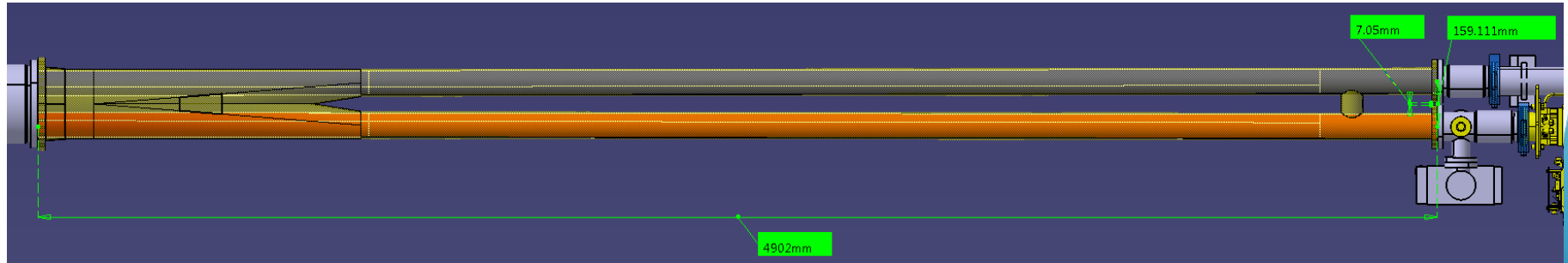
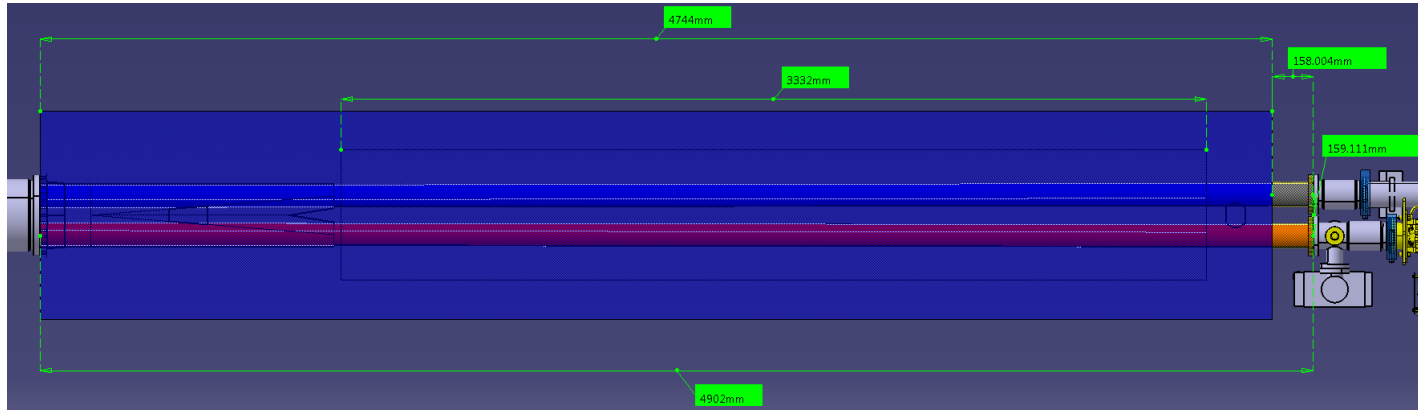


# LSS R5 layout [I]



VM and ion pump should be support by the Y-chamber but ,in principle, should be avoided  
→ Layout to be studied in more details

# LSS R5 layout [II]



# Conclusions

- A preliminary Y-chamber for HL-LHC LSS 1&5 draft is proposed following the present specifications shown. The specifications and the Y-chamber geometry would change during the project course.
- A manufacturing strategy is proposed.

## Next steps

- Y-chamber functional specifications document.
- Perform a structural and thermal analysis to confirm the Y-chamber thickness.



***THANK YOU FOR YOUR  
ATTENTION!!!***

