MASK integration in LSS L8 - layout proposal

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OUTLINE

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3. Proposed layout.
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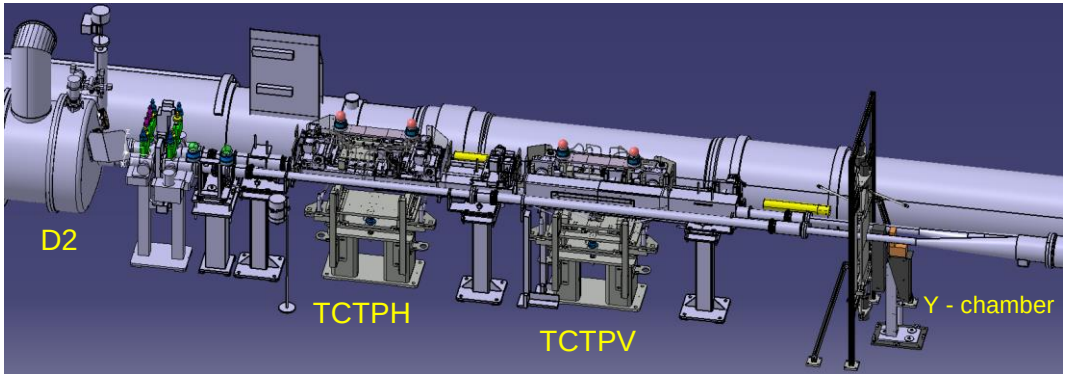
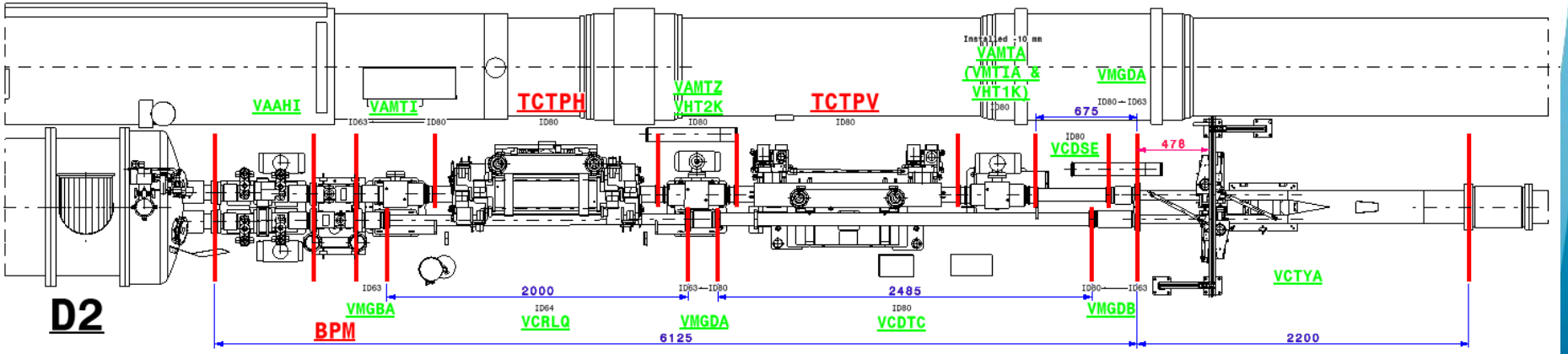
1. Introduction

LHC current layout between D2 and Y chamber

- 3D and drawings are not up to date.
- Complex integration.
- Non-conform bakeout system.



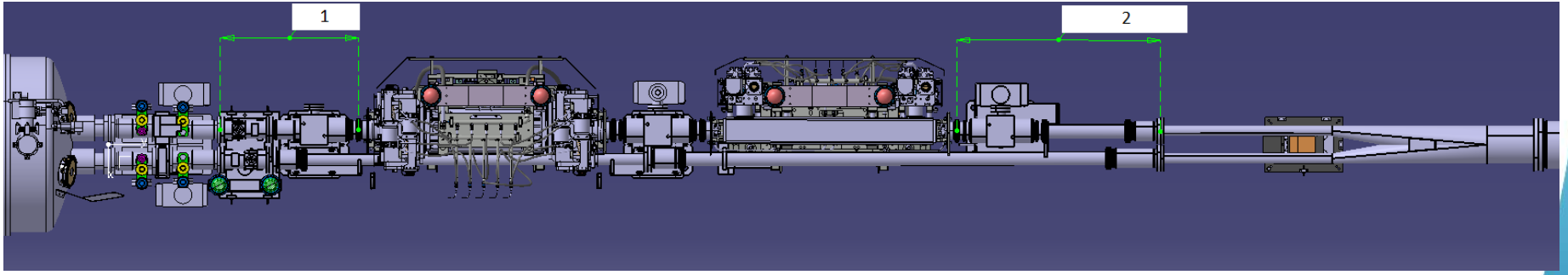


2. Inspection summary

Measurements in LSS8L : 14/9/2016

Measurement in-situ of the:

- space available measured between VAB and TCTPH (1) = 805 mm.
- distance between TCTPV and Y-chamber (2) = 1177 mm.



- Cross check value on the right side

Observations

- Due to the distance measured (~ 1mm) between the TCTPH and the vacuum chamber next to it and due to the beam merging angle, it is not possible to displace TCTPV and TCTPH towards IP without reducing further the available space between the two components unless they are modified!

  → not enough space to install quick connectors between the mask and the vacuum modules.

- A new bakeout configuration is required for TCTPH and its closest vacuum chamber. The present baseline is to bake separately the TCTPH and its closest vacuum chamber. Due to the 1 mm distance between them there is not enough space to install the bakeout jackets of both components. To improve the present configuration, an insulation cover is installed during bakeout.

Baseline bakeout configuration

TCTPH
TCTPH bakeout jacket (25 mm thickness)
Vacuum chamber (VC)
Vacuum chamber bakeout jacket (25 mm thickness)

Non Conform Present bakeout configuration

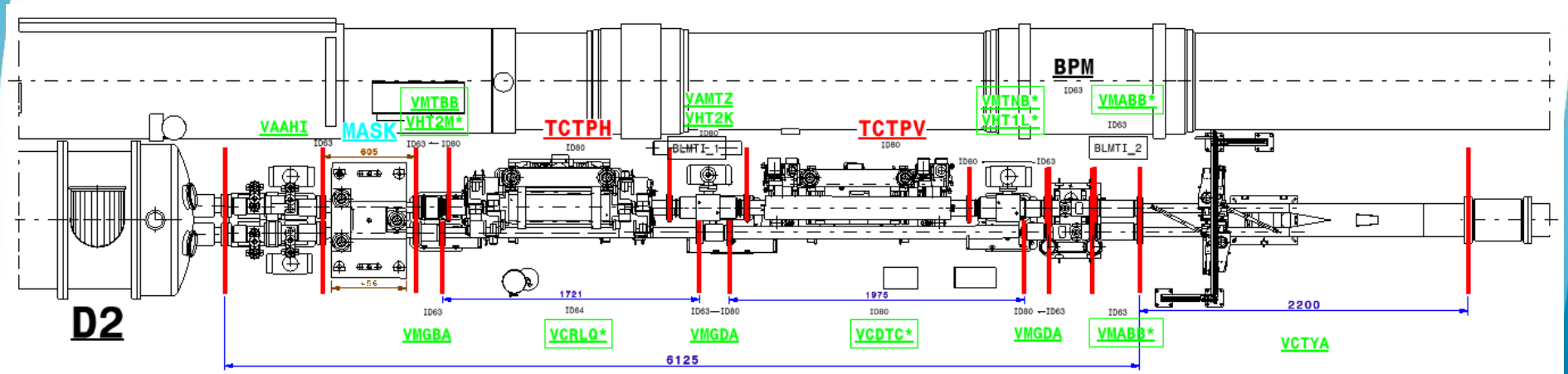
Only installed when bakeout is carry out

TCTPH
TCTPH bakeout jacket (25 mm thickness)
Vacuum chamber (VC)
Polyamide system (4 mm thickness)
Occasional insulation

3. Proposed layout

Proposed layout (collimators position fixed)

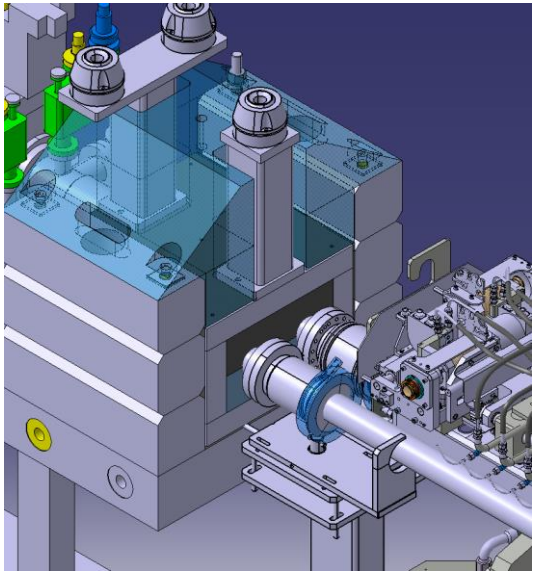
- New mask with 456* mm shielding longitudinal length → tbc with STI.
- VAB,TCTPV, TCTPH and Y chamber positions are fixed.
- BPM displaced close to the Y-chamber.
- No chain clamps installed in both side of the mask → to be agreed with RP.
- On the internal beam line the vacuum chambers (VCRLQ and VCDTC) have to be shorten to adjust them to the new external beam line configuration.
- Bakeout system in TCTPH and VCRLQ* has to be improved.

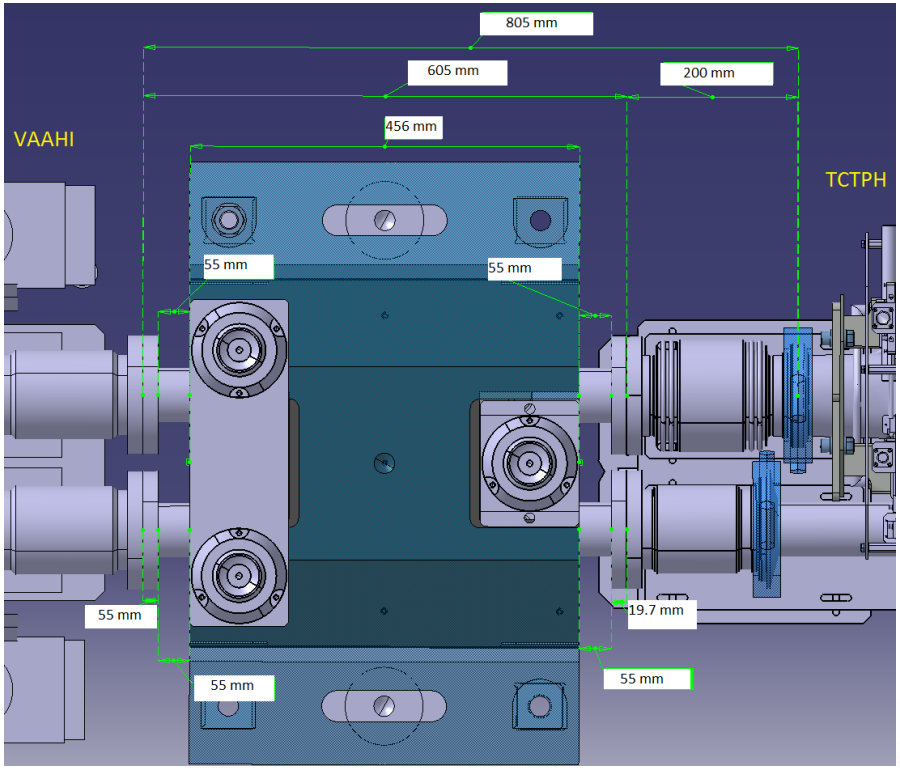


*See proposed configuration (next slide).

Proposed mask configuration

- TOTAL MASK LENGTH 456 mm.
- Bakeout system to be defined/integrated.





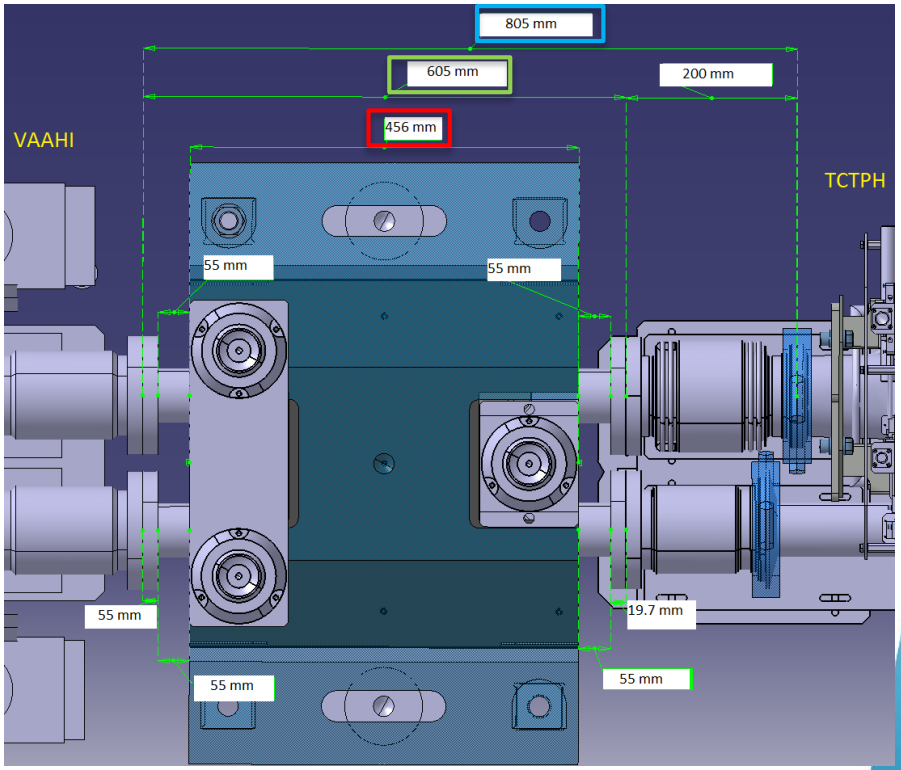
Mask integration

- The space available measured between VAB and TCTPH in the external beam line to install the Mask is: 520 mm (VAMTI length) + 285 mm (BPM length) = 805 mm.

- The space for the Mask assembly is: 805 mm (space available measured) – 200 mm (VTMBB below compressed length) = 605 mm.

- The space for Absorber block is: 605 mm – 19.7 mm*2 (flanges thickness) – 55 mm*2 (space required for screws installation) = 456 mm.

- **TOTAL MASK LENGTH 456 mm.**

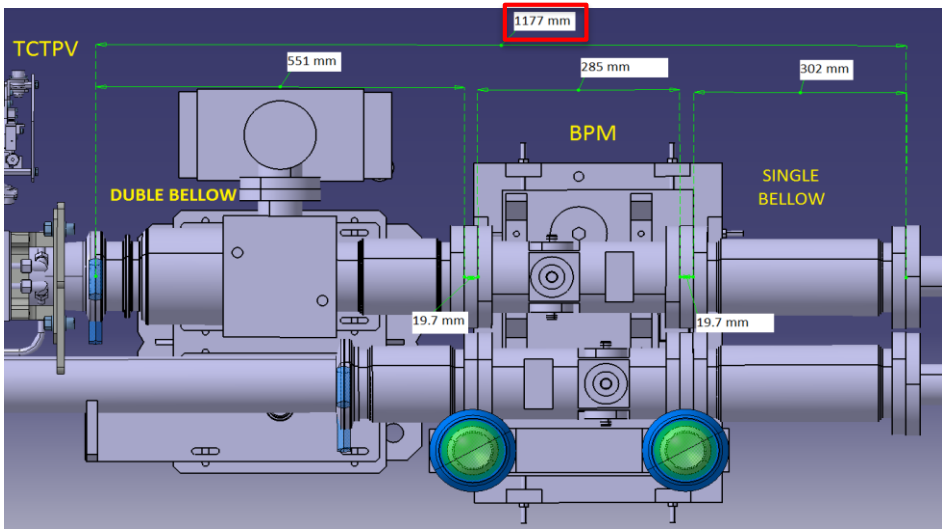


Valid mechanical layout from VSC point of view.

Y-chamber side integration

- The distance between TCTPV and Y-chamber measured in the external beam line is: 520 mm (VAMTA length) + 487 mm (VCDSE length) + 170 mm (VMGDA length) = 1177 mm.

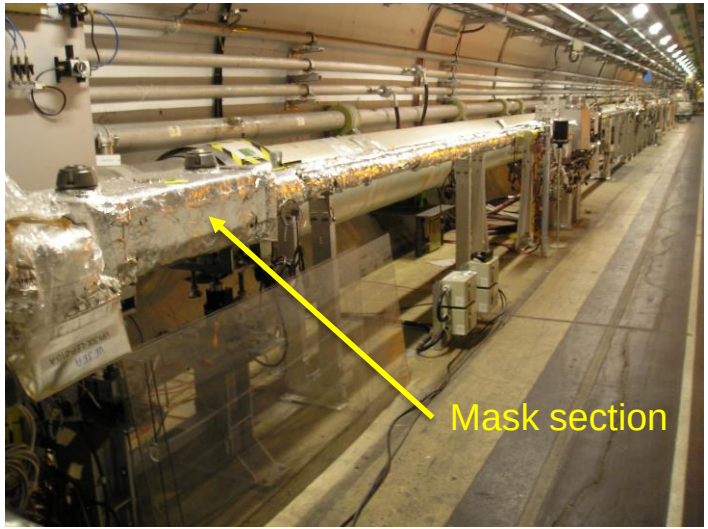
- 72 mm GAP to fill with the layout proposed → to be compensated with two double flanges (19.7 mm thickness) and the extension of the bellows.



Valid mechanical layout from VSC point of view.

Proposed mask bakeout system

- Standard bakeout is required.
- There are two TCLIM in LHC located in 6R2 and in 6L8 with standard bakeout system.
- TCLIM bakeout system could be take into account and integrated in the new design of the mask → tbd with WP8.



Mask section

Bakeout tape (4 mm thickness)
Insulation 1 (8 mm thickness)
Insulation 2 (8 mm thickness)

2 tapes of 7 meters x 1500 W
Cu mask (tbc)
Mass ≈ 550 kg
50 deg/h

4. Conclusions

Conclusions

- A layout which integrates a new mask in front of D2 is proposed with:
  - No quick connectors around the mask → tbd with RP.
  - VAB, TCTPH, TCTPV and Y-chamber remaining at current positions.
  - A mask length of 456 mm → tbc with STI.
  - A bakeout system for the new mask which might be similar to the present TCLIM → tbd with WP8.

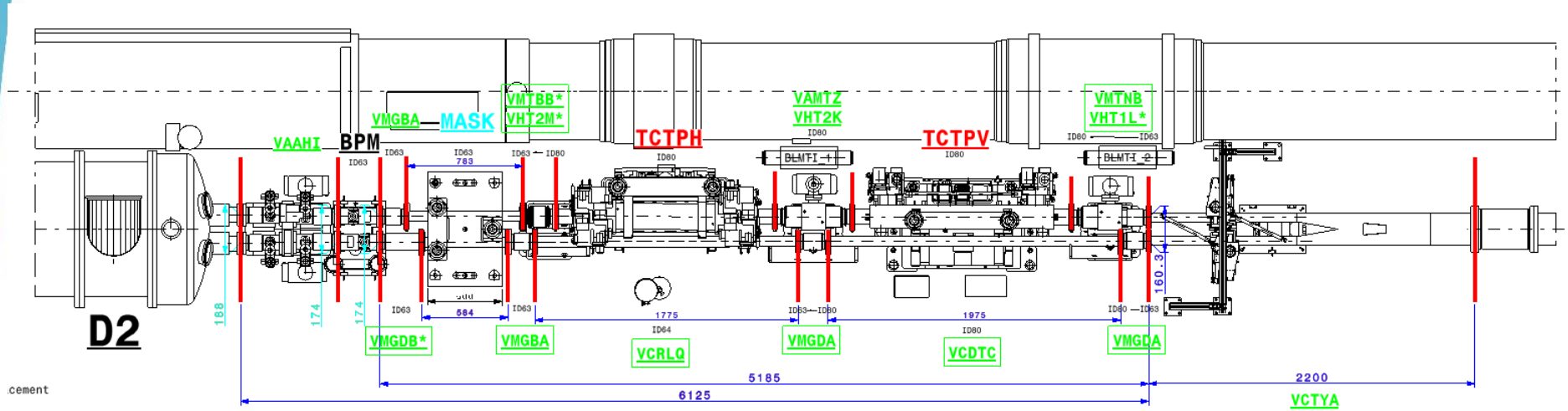
- A new bakeout configuration is required for TCTPH and the vacuum chamber next to it.

THANK YOU FOR YOUR ATTENTION!!!

SPARE SLIDES

Layout option with BPM displaced

- Install a new mask with 500 mm shielding longitudinal length.
- VAB and Y chamber fixed.
- BPM displaced next to the Y-chamber.
- Collimators displaced 101 mm towards IP.
- Approaching 0.101 x 3 mm/m = 0.3 mm.
- Chain clamps installed in both side of the mask.



- Separation between beams showed is this drawing is mechanical aperture → to be crosscheck with VAC layout aperture

Comparison between the two options

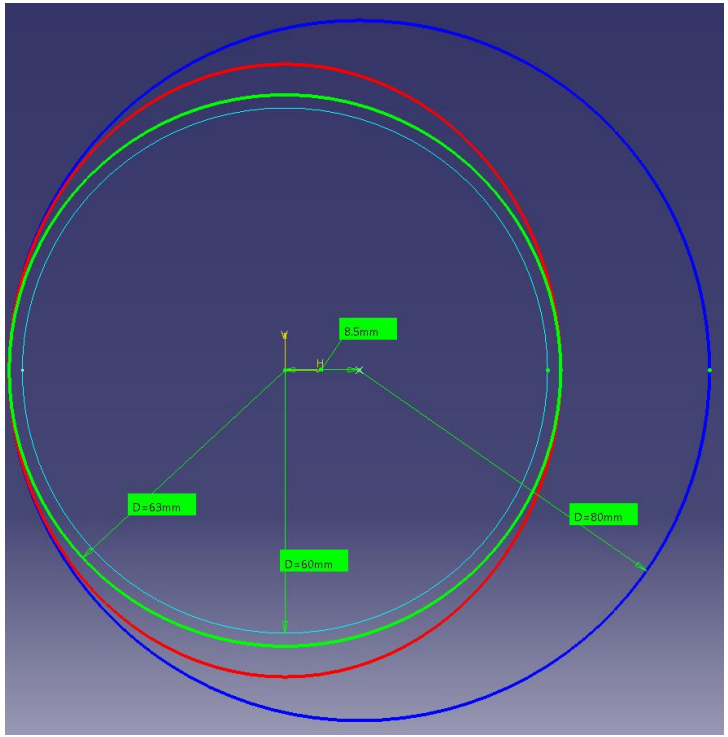
	ACTIONS	ISSUES	ADVANTAGES
Option 1 (moved BPM)	-Produce new VM* for new VAB. -Produce VMTBB*. -Produce VMGBA*. -Modify VHT2M support. -Cut VCRLQ and VCDTC. -Produce new VTMNB. -Modify VHT1L support. -Produce 2x VMABB. -Modify BPM beam separation.	-Merging angle: distance reduced between collimators and vacuum chambers. -TCTPH and VCRLQ bakeout non-conformity**. -Asymmetric VAB and asymmetric left and right layout.	
Option 2 (moved BPM + fixed collimators)	-Produce VMTBB*. -Modify VHT2M support. -Cut VCRLQ and VCDTC. -Produce VTMNB. -Modify VHT1L support. -Produce 2x VMABB. -Produce 3x DN100 flange with 63 ID*. -Modify BPM beam separation.	-TCTPH and VCRLQ bakeout non-conformity**.	-Less components to be produced. -Less components displaced. -Less intervention time. -Less VSC components storage. -Less expensive.

*new design

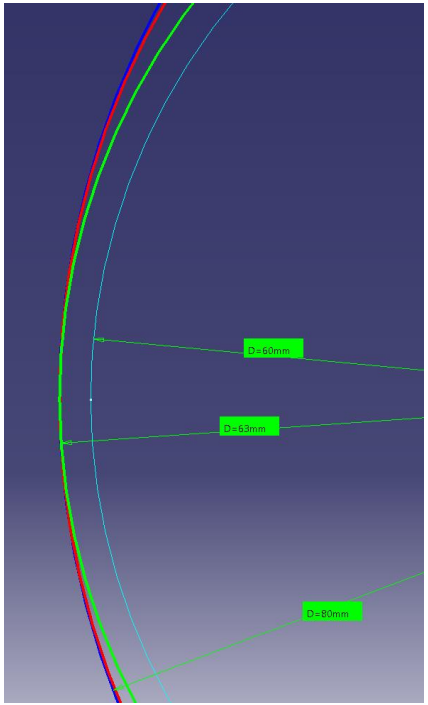
**solution to be studied

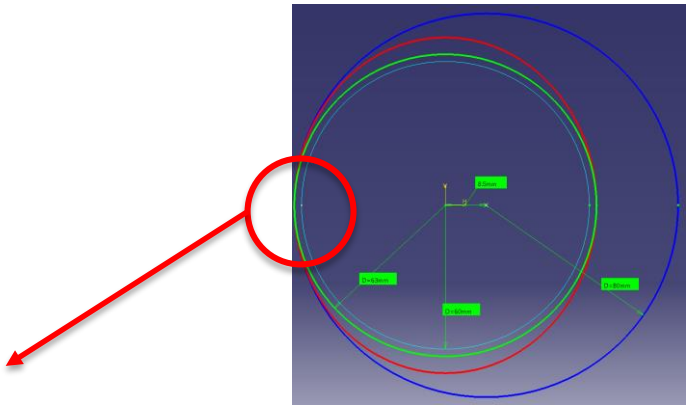
Circular vacuum chamber vs elliptical vacuum chamber

- **To allow 60 mm of beam aperture the most optimized geometry is a cylindrical vacuum chamber instead of elliptical vacuum chamber.**
  - **Beam aperture.**
  - **Cylindrical vacuum chamber, ID63.**
  - **Elliptical vacuum chamber, 63/70**
  - **ID80 cylindrical vacuum chamber with 8.5 mm offset.**



Circular vacuum chamber
vs
elliptical vacuum chamber

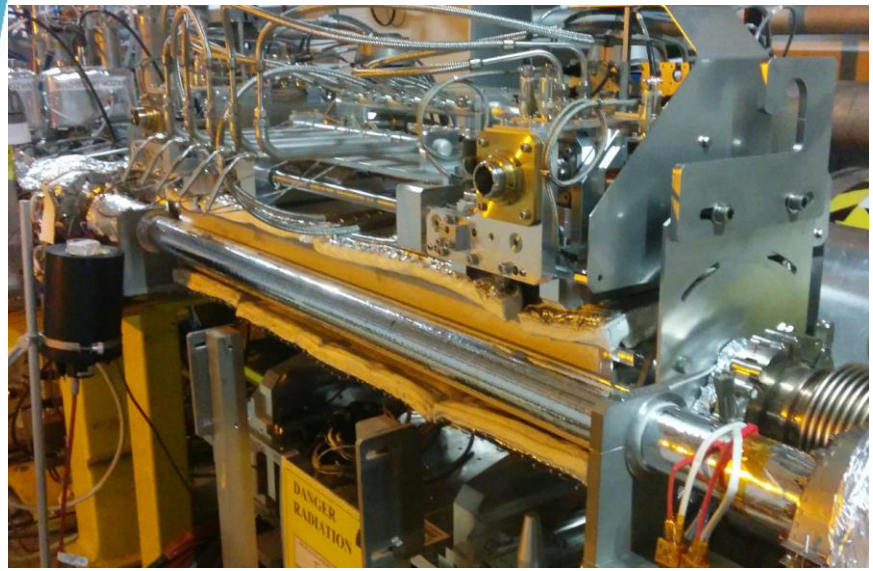




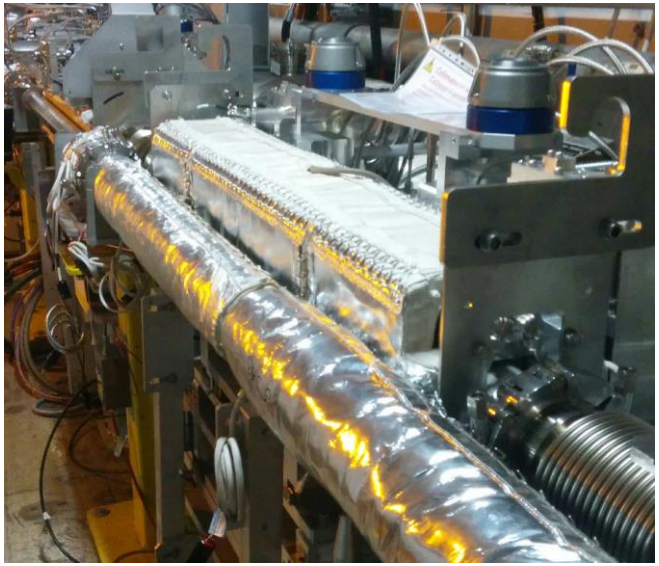
- **Beam aperture.**
- **Cylindrical vacuum chamber, ID63.**
- **Elliptical vacuum chamber, 63/70**
- **ID80 cylindrical vacuum chamber with 8.5 mm offset.**

Current TCTPH and TCPV configuration

TCTPH



TCTPV



Courtesy of Francisco Sanchez Galan