



# **WP13 HL-LHC**

## **New BSRTM tank integration and installation**

SY/BI

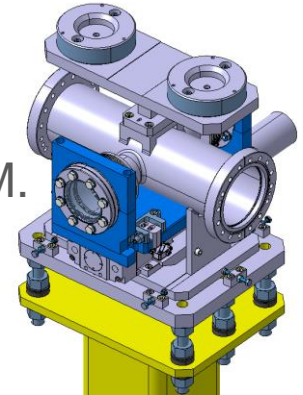
01 June 2021

# Introduction

- New instruments based on synchrotron radiation observation are being developed for the HL-LHC project
- For improved performance, the mirror must be as close as possible to the circulating beam, which may induce heating on the mirror and other components.
- This has caused issues with the existing BSR; the new system has a different design, building and improving on the previous version.
- Impedance simulations have been carried out, nonetheless the uncertainty in the results is high.
- Bench measurements and tests with beam in real operational conditions are required.
- Proposal is to install one BSRTM device in B1, downstream of the D4 separation magnet during the maintenance period 2021-2022.

# Overview

- The main aim is to verify that the mirror will not experience any sensible heating. For this purpose, we have integrated two temperature probes (thermocouples) one in the mirror itself and one in the metallic support of the mirror.
- In this first phase the BSRTM will not be installed at the nominal location since this would have required a larger change in the vacuum layout.
- Extraction tank and support to be installed alongside 2 transition bellows and the necessary fixed and mobile beam pipe supports.
- Racks are available in UA43 BY05.
- Control system arranged between SY-BI and BE-CEM.
- DIC in preparation for two NE48 cables from UA43 to BSRTM.

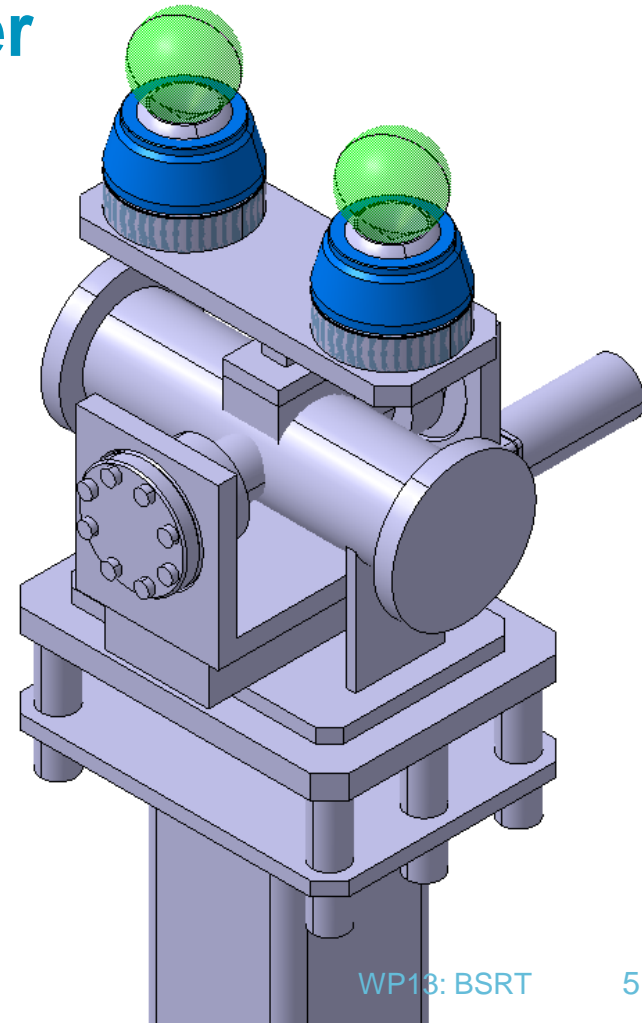


# Timeline and Actions

- ✓ Fabrication of tank to be finished by end June (confirmed with Workshop)
- ✓ Bellows under fabrication, to be delivered by end June.
- ✓ Simplified integration model to be provided by Ana by 28<sup>th</sup> April
- ECR draft ongoing
  - 1<sup>st</sup> approval by HL-LHC, 2<sup>nd</sup> LMC
- ❑ Define and agree (BI, VSC, ACE-INT) on installation position and procedure
- ❑ Integration document to be provided in the coming weeks and information to be included in the ECR

# Things to consider

- Tank length: 371.4 mm
- Linear table motor protrudes a significant amount
  - This is OK as it is under the drift chamber, but can clash with drift chamber support (further discussed later)
- Mirror can move 15 mm inwards and 15 mm outwards w.r.t neutral position (position shown in 3D)
  - Thickness of bake-out jacket & spacing between the flange and the drift chamber to be considered



# Position Options

VACSEC.E5L4.B 36.4830 m

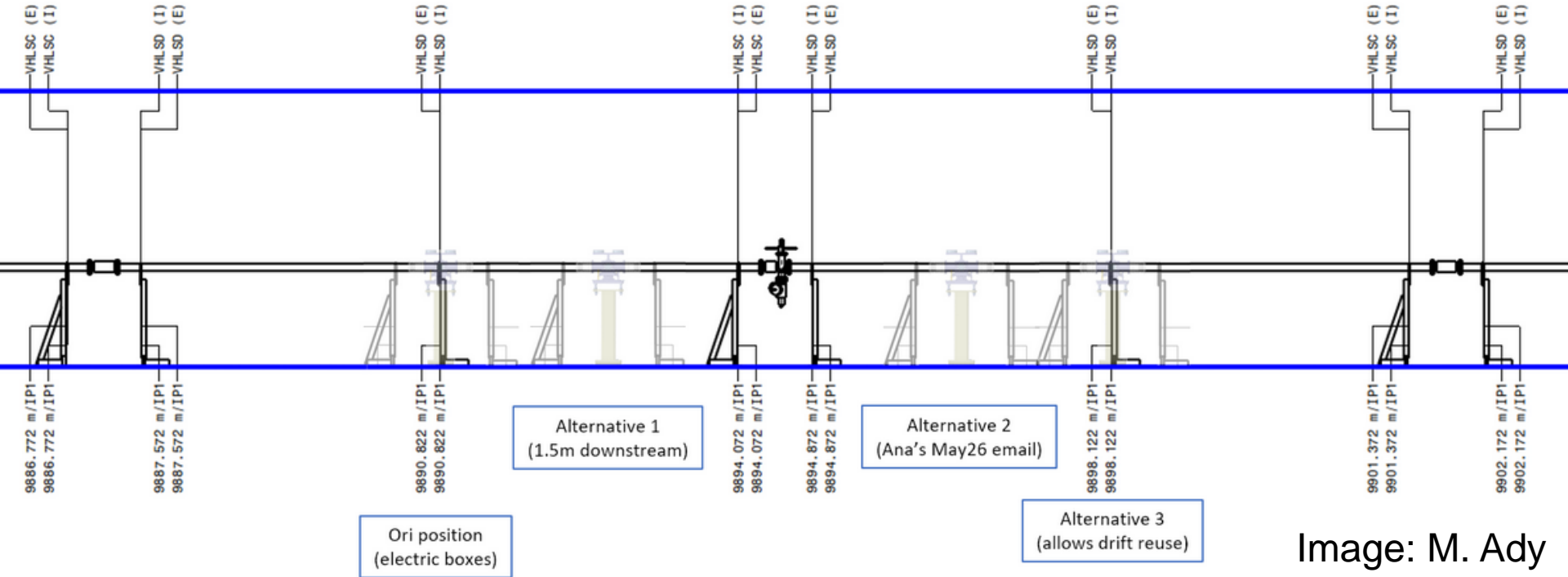
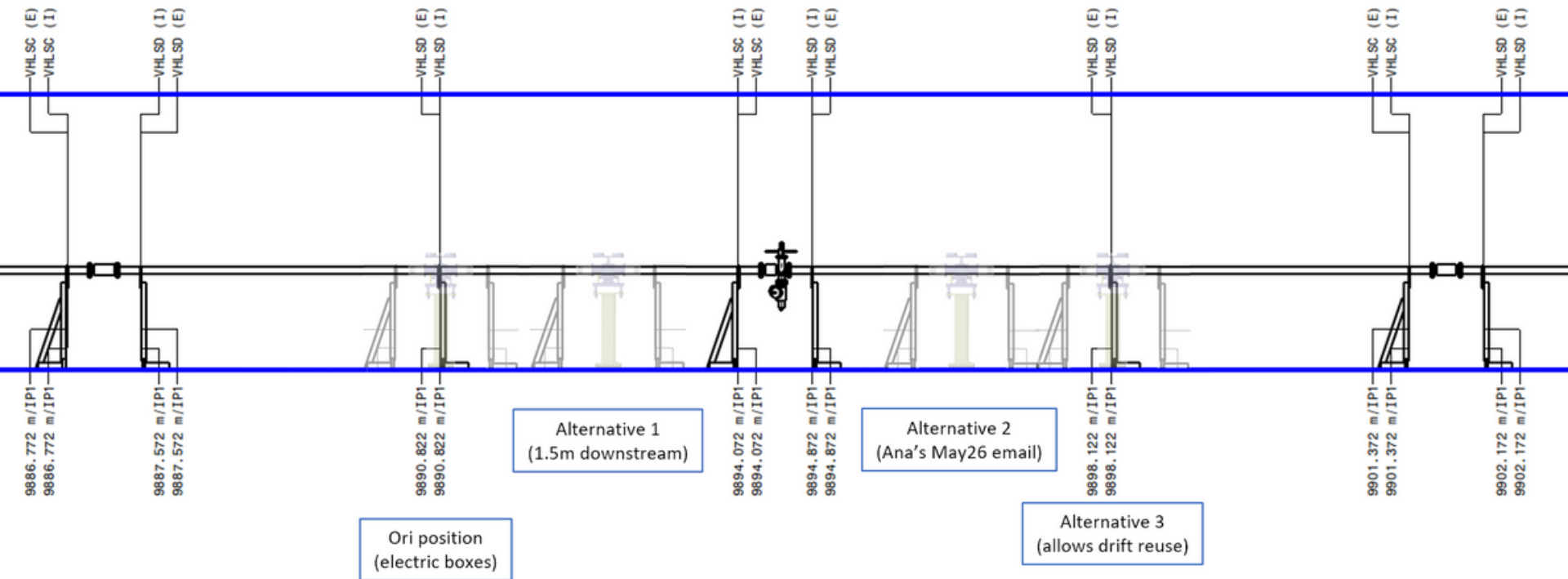


Image: M. Ady

# Originally proposed

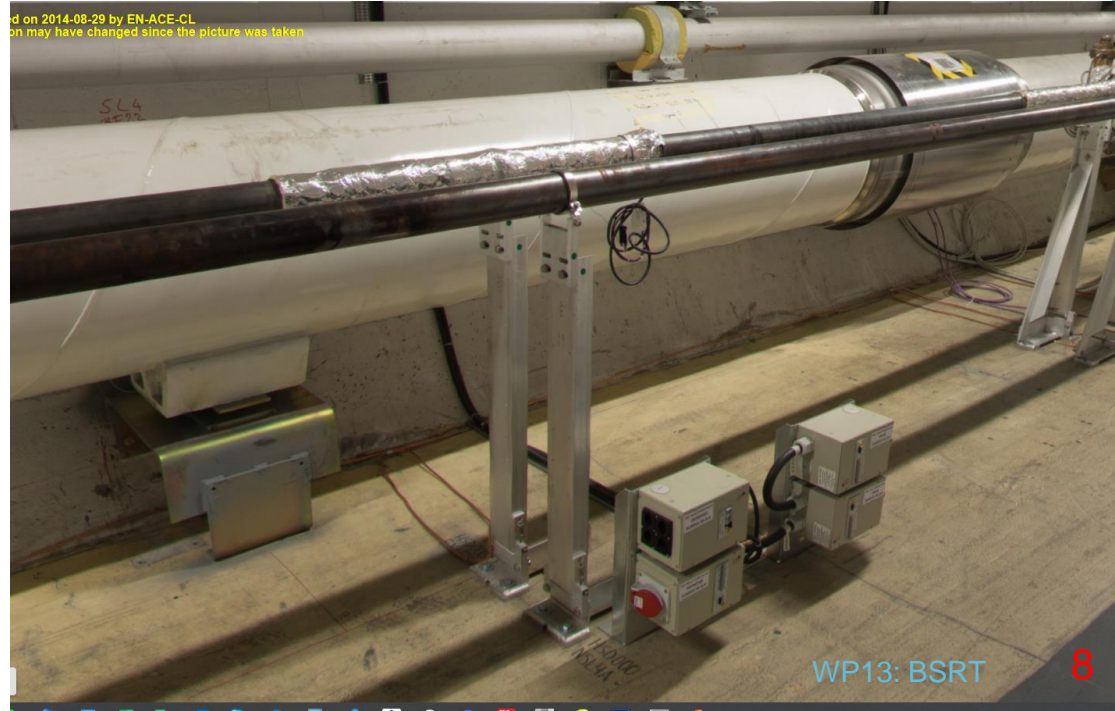


VACSEC.E5L4.B 36.4830 m



# Originally proposed

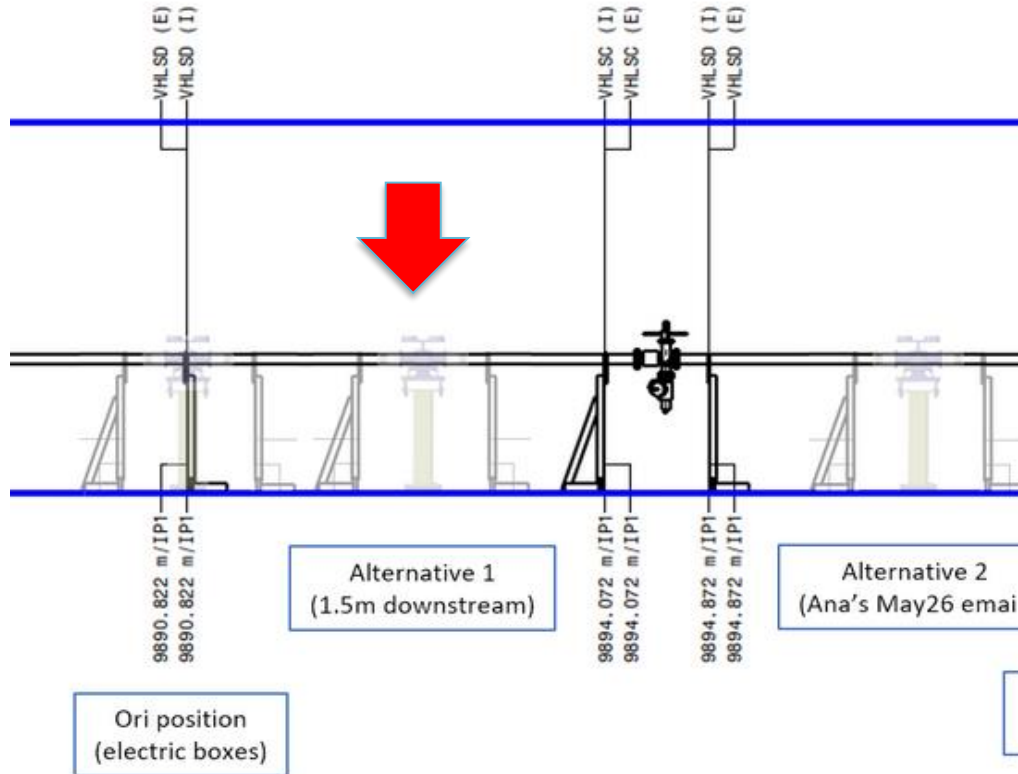
- DCUM ~9890
- Electrical boxes and cable obstructing the area





# Alternative 1

VACS



Alternative 1  
(1.5m downstream)

Alternative 2  
(Ana's May26 emai)

Ori position  
(electric boxes)

# Alternative 1

- Avoids the cable and boxes but limited amount of space between the existing supports.
- + No support foot on second beam (gives us more space)
- Drift chambers to be modified, not standard size

## Position information (left-most flange)

Distance cumulated: 9892.5482 m.

Distance from IP4: -104.5330 m.

Upstream of 5L4 (RA43/C-05L4): 9861.2842 m.

Downstream of 5L4 (RA43/C-05L4): 9997.0812 m.

Length of 5L4 (RA43/C-05L4): 135.7970 m.

Distance from upstream of 5L4 (RA43/C-05L4): 31.2640 m.

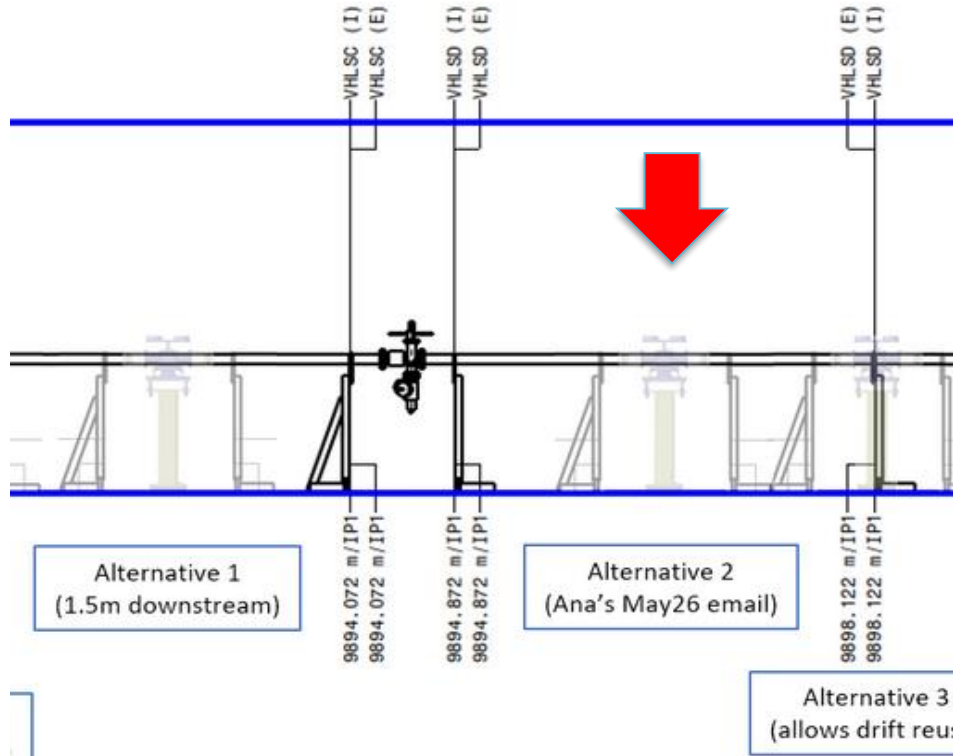
Distance to downstream of 5L4 (RA43/C-05L4): 104.5330 m.

Beam Separation: 0.2551 m.



# Alternative 2

VACSEC.E5L4.B 36.4830

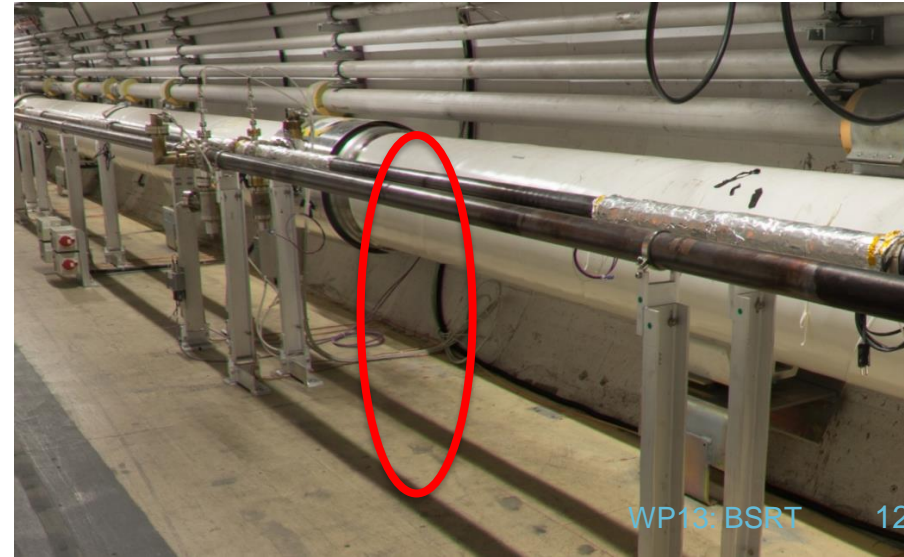


## Alternative 2

- + No support foot on second beam (gives us more space)
- + Further downstream, closer to final HL-LHC position
- Drift chambers to be modified, not standard size

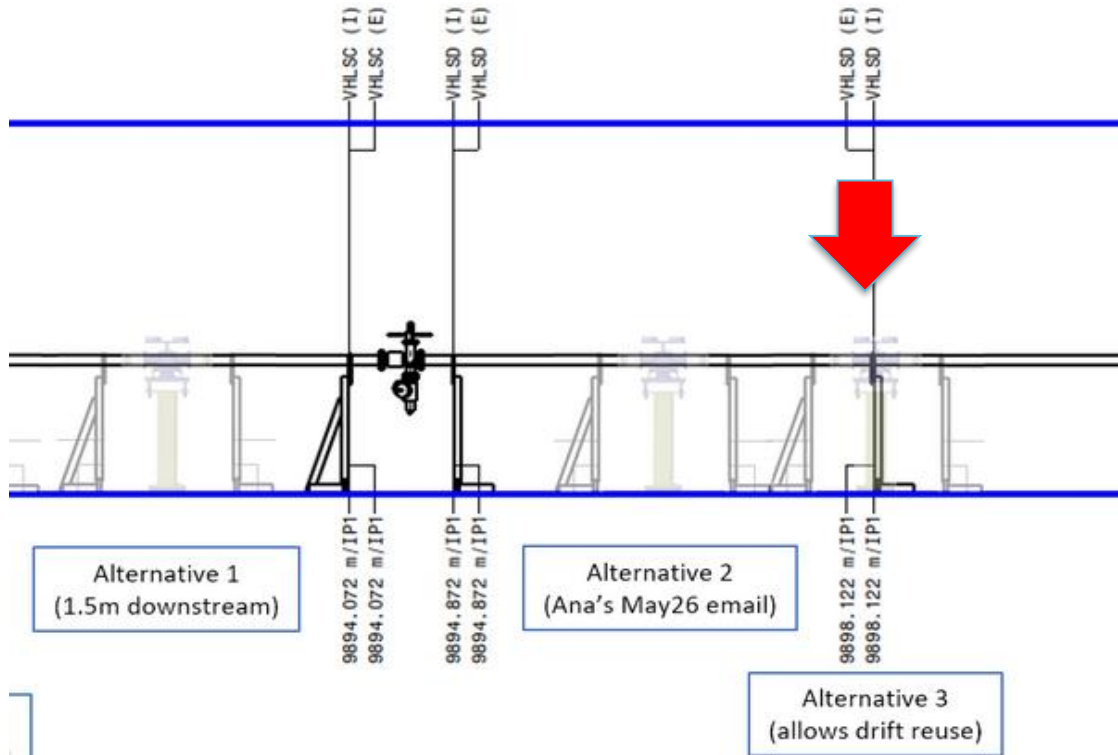
### Approximate Position (left-most flange)

Distance cumulated: 9896.0750 m.  
Distance from IP4: -101.0062 m.  
Upstream of 5L4 (RA43/C-05L4): 9861.2842 m.  
Downstream of 5L4 (RA43/C-05L4): 9997.0812 m.  
Length of 5L4 (RA43/C-05L4): 135.7970 m.  
Distance from upstream of 5L4 (RA43/C-05L4): 34.7908 m.  
Distance to downstream of 5L4 (RA43/C-05L4): 101.0062 m.  
Beam Separation: 0.2662 m.



# Alternative 3

VACSEC.E5L4.B 36.4830 m



# Alternative 3

- + Drift chambers available and ready
- + Further downstream, closer to final HL-LHC position
- Support for second drift chamber clashes with BSR motor IF tank is centred
  - Solution: off-centre tank or move drift chamber support if possible

## Position (left-most flange)

Distance cumulated: 9897.9363 m.

Distance from IP4: -99.1449 m.

Upstream of 5L4 (RA43/C-05L4): 9861.2842 m.

Downstream of 5L4 (RA43/C-05L4): 9997.0812 m.

Length of 5L4 (RA43/C-05L4): 135.7970 m.

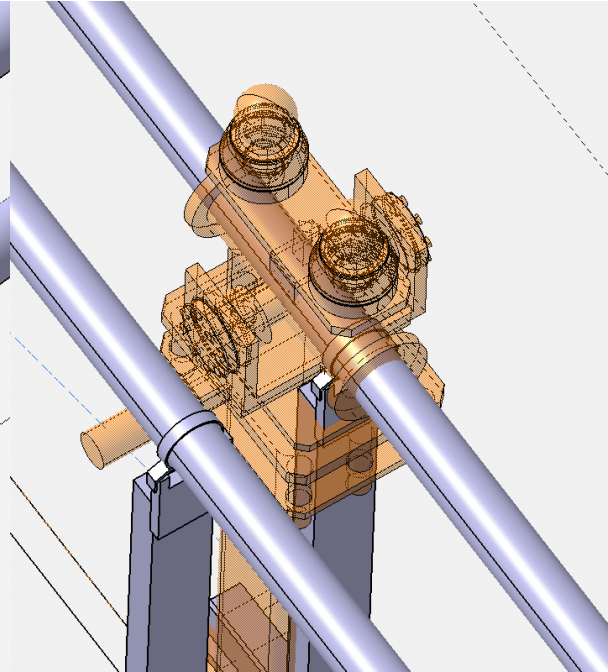
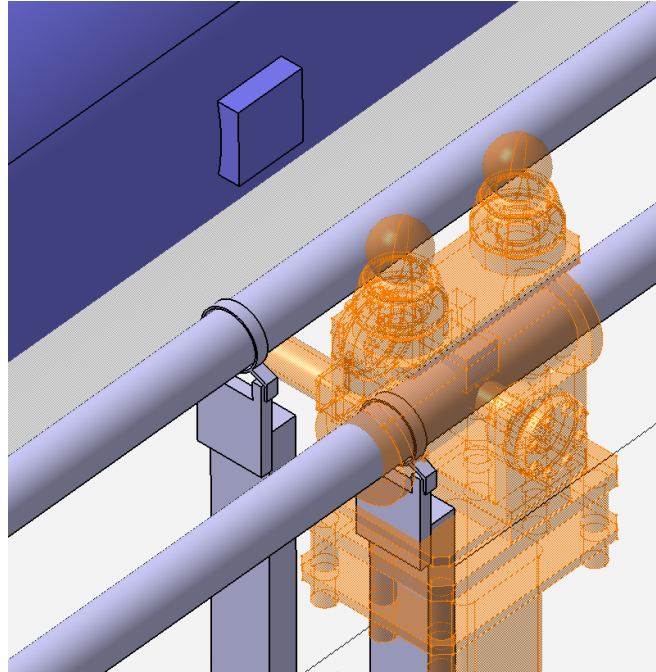
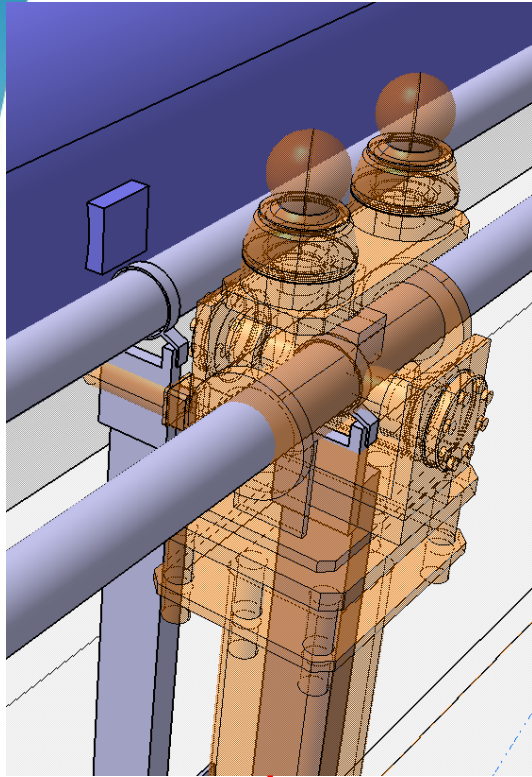
Distance from upstream of 5L4 (RA43/C-05L4): 36.6521 m.

Distance to downstream of 5L4 (RA43/C-05L4): 99.1449 m.

Beam Separation: 0.272 m.



# Alternative 3



Shift upstream or downstream  
by 10 to 20 cm

# Summary and Conclusion

- All positions/alternatives have some pros and some cons.
- Position should be fixed as soon as possible
  - Integration report to be incorporated to ECR and draft ECR to be circulated ASAP (almost ready to send now)
- Manufacturing of parts going ahead and tank will be finished by mid-June.