



# Design criteria and present design status of the BGC v4.2 for the LHC

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# Content

- Review of the fundamental design parameters for v4.2
- Present Design Status of the BGC
- Next Steps
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- Summary

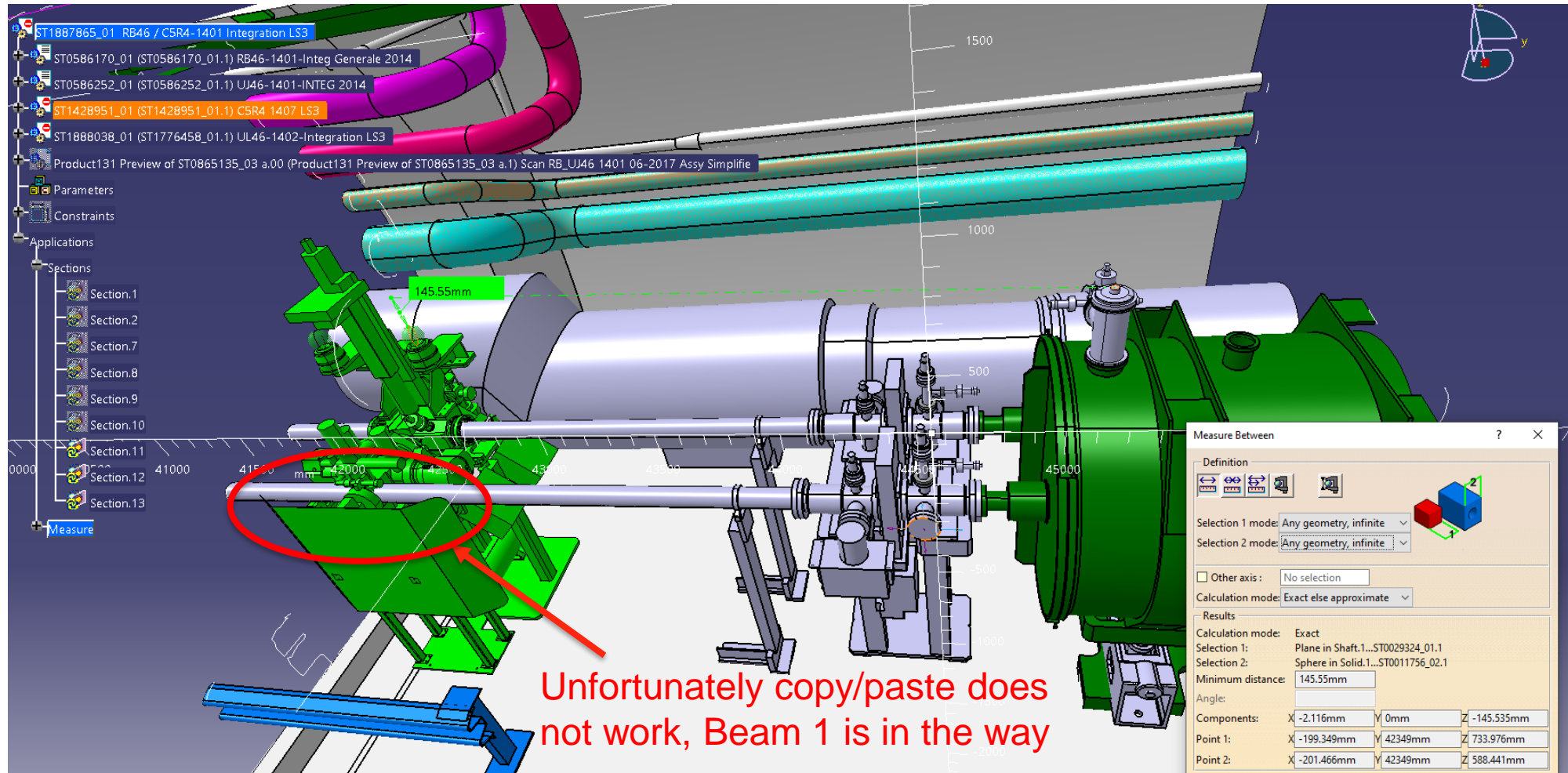
# Fundamental Design Parameters for v4.2 (1/2)

- No design for the Hollow Electron Lens, but optimised for cost, construction time and function as beam instrumentation e.g. profile measurement device and halo monitoring for protons and ions.
- Location: Beam 2 LHC Point 4, symmetric around IP4 with some margin to adopt for best position due to the cryogenic distribution line.
- Gas curtain angle  $90^\circ$  to beam (maybe?)

# Design Parameters for v4.2 (2/2)

- Same curtain gasses as present, Neon and/or Nitrogen
- Camera ideally away from beam axis to reduce noise
- Mirror for light extraction accepted
- All gas injection infrastructure to be copied for right side

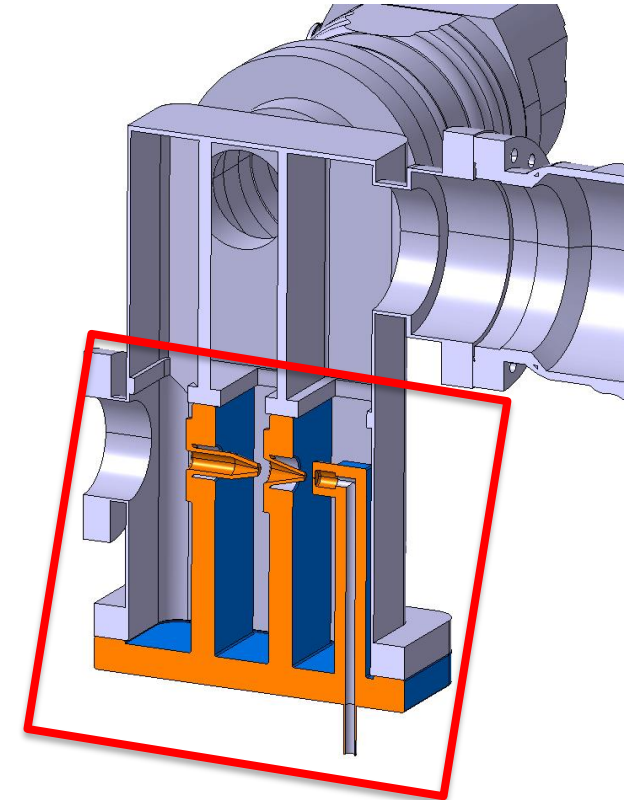
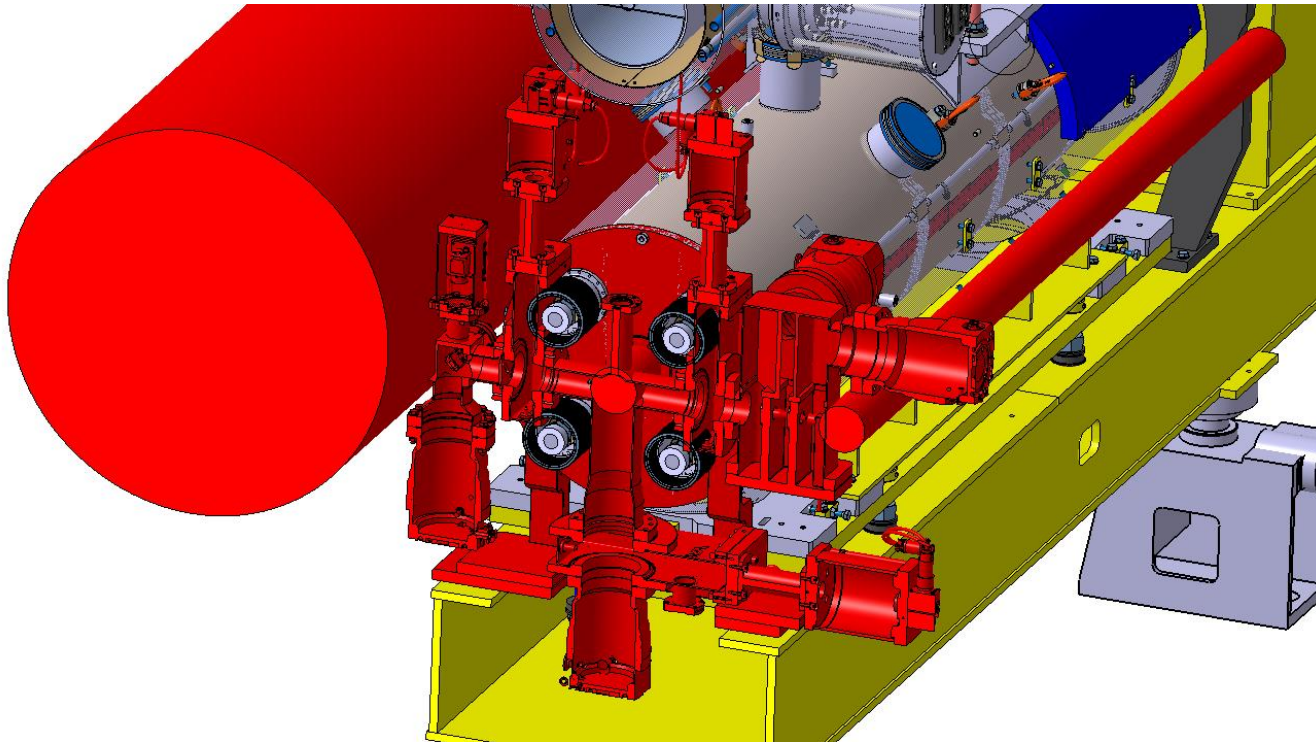
# Design- BGC v3 moved to right side



“Krystians’ design” for space optimised BGC seen next slide far off from being engineered to its end



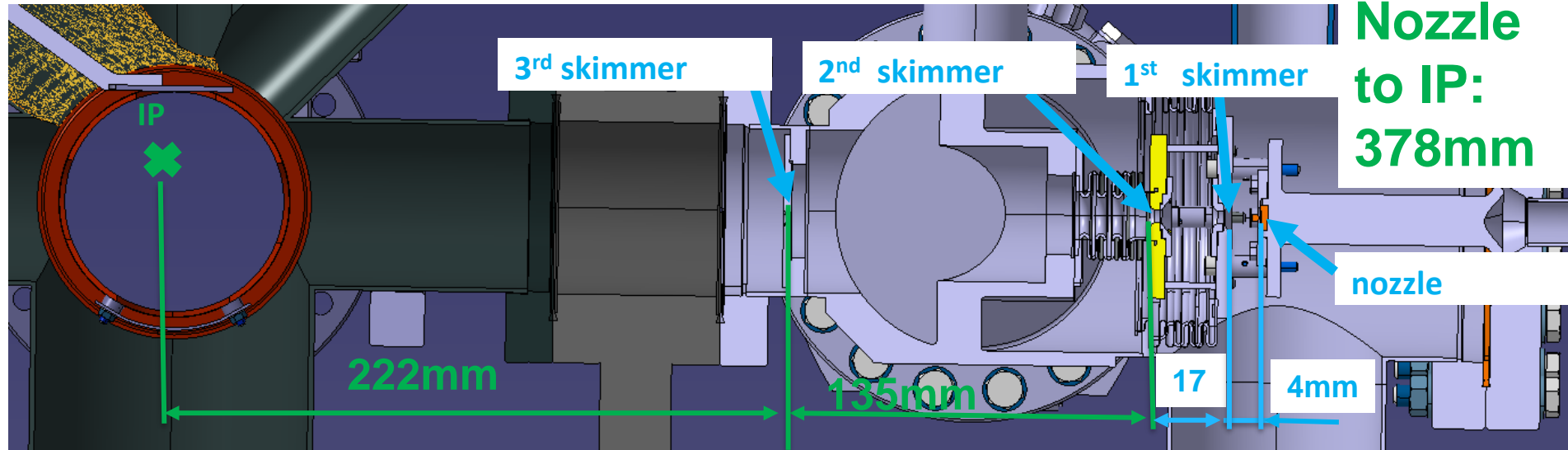
# Krystians' Design for HEL as a reminder



Install the Gas Injection System from the bottom

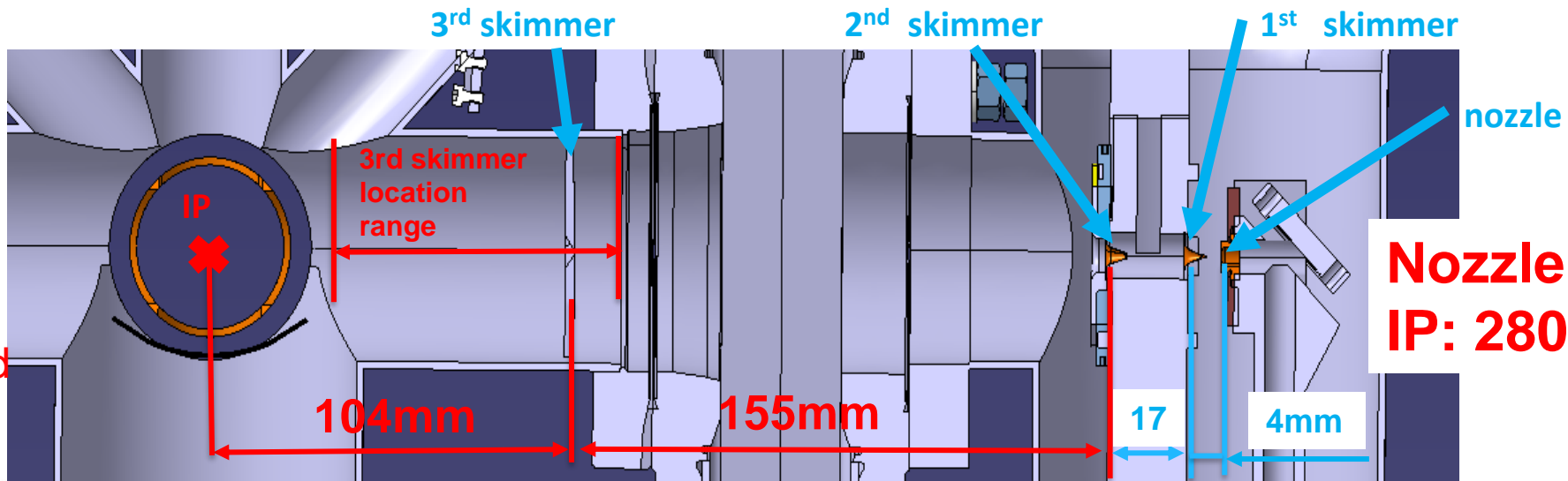
To make the “bottom installation” V4 design work would need major vacuum and mechanical engineering resources, which we do not have

Version 3



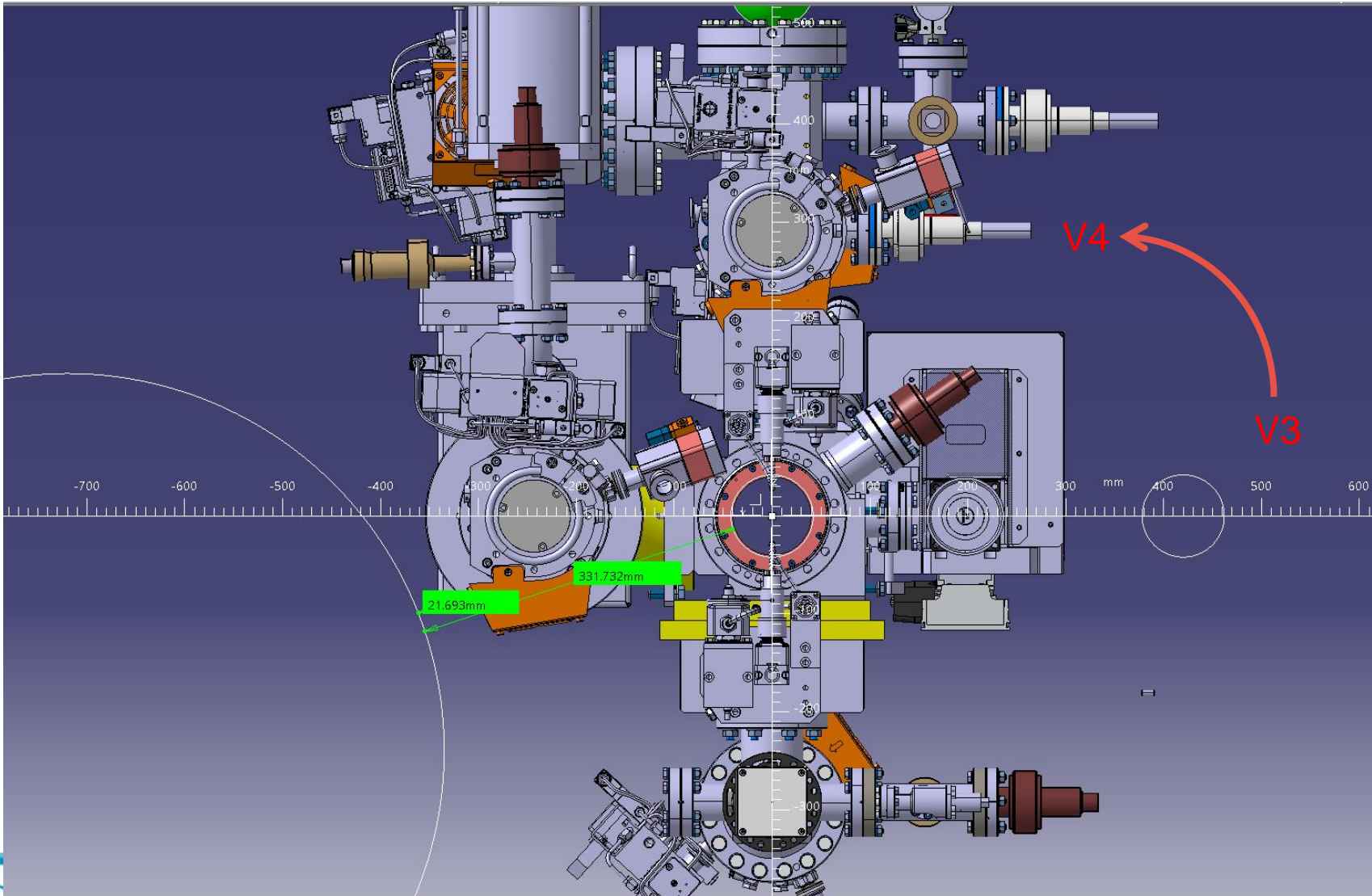
Nozzle to IP: 378mm

Version 4  
Bottom load  
Concept  
→ Not followed



Nozzle to IP: 280mm

# BGC v4.2 draft design

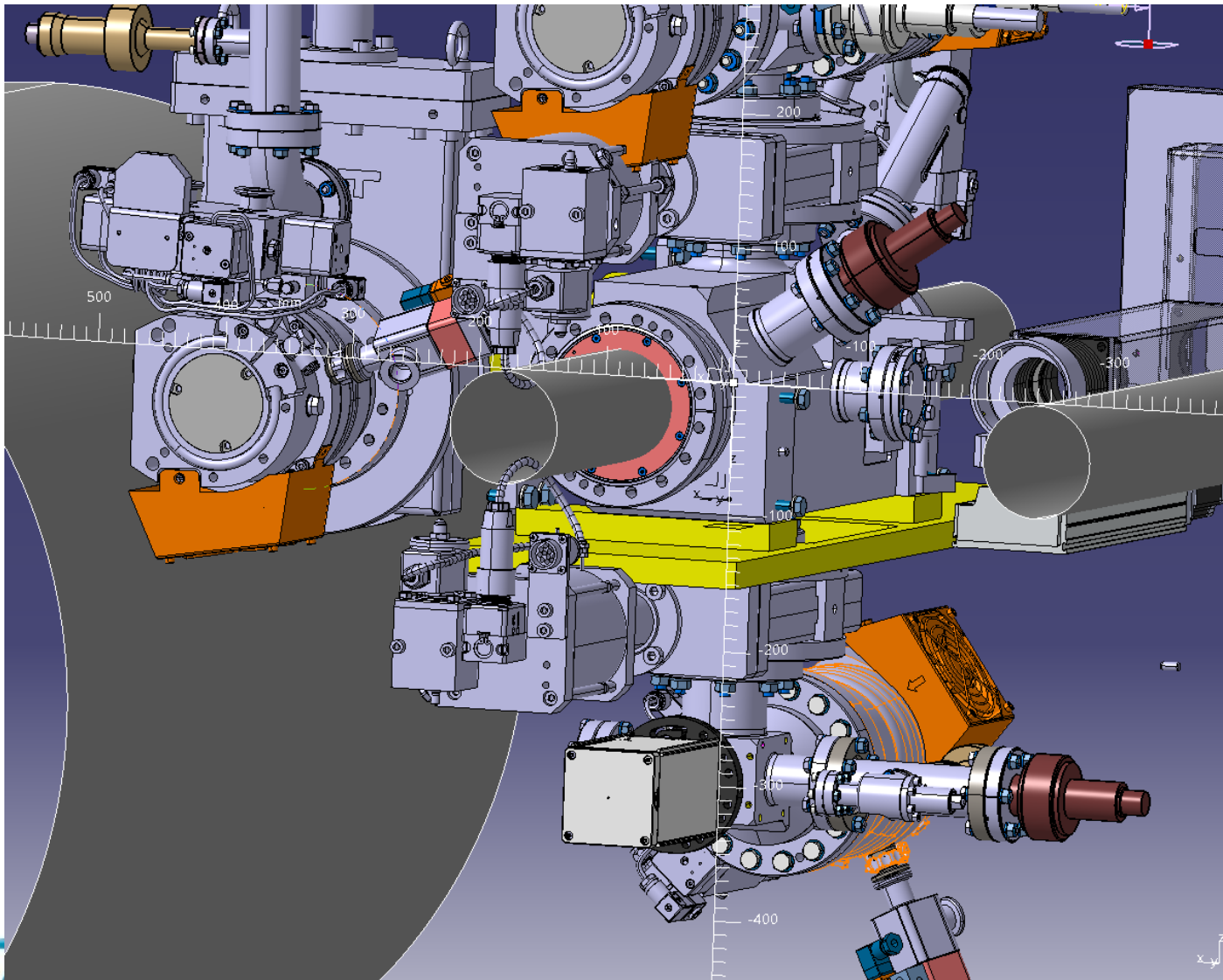


Base Parameter:

Turn V3 90° to have the Gas Injection Top-Down



# BGC v4.2 draft design – Next steps



- Remove Interaction Chamber TPM
- Add Ion Pumps on beam axis left and right of BGC 400 l/s or 1000 l/s, ideally re-cycled
- Find not-in-axis camera location
- Add BGC support
- Define exact location and in-axis length of BGC
- Some additional design support soon

# Summary

- BGC v4.2 preparation ongoing to become a HL-LHC baseline beam instrument for profile and/or halo measurements.
- Design of v4.2 is based on v3 with top-down gas injection.
- No HEL design, but cost and time optimised.
- Design needs in 2025 a real push in order to start manufacture in 2026.
- Paper work as Engineering Change Request, space reservation required in order to prepare for the adjacent beam pipes.
- Phased approach as for the v3.

# Sum of Deliveries

Central Beam pipe including liner, plate and calibration including cleaning and leak checks

Support and installation

Vacuum gauges, racks, cables controlers, gas injection valves tunnel side

Vacuum pumps turbo and primary

Vacuum gate valves

Vacuum Sectorisation

Tunnel cables

Injection chamber including bellows and nozzels

Dump chamber including skimmer, mirror and camera

Gas Rack, valves and line

Camera system

Ion pumps including supports, warm modules, controller and cabling

Testing, various, tools

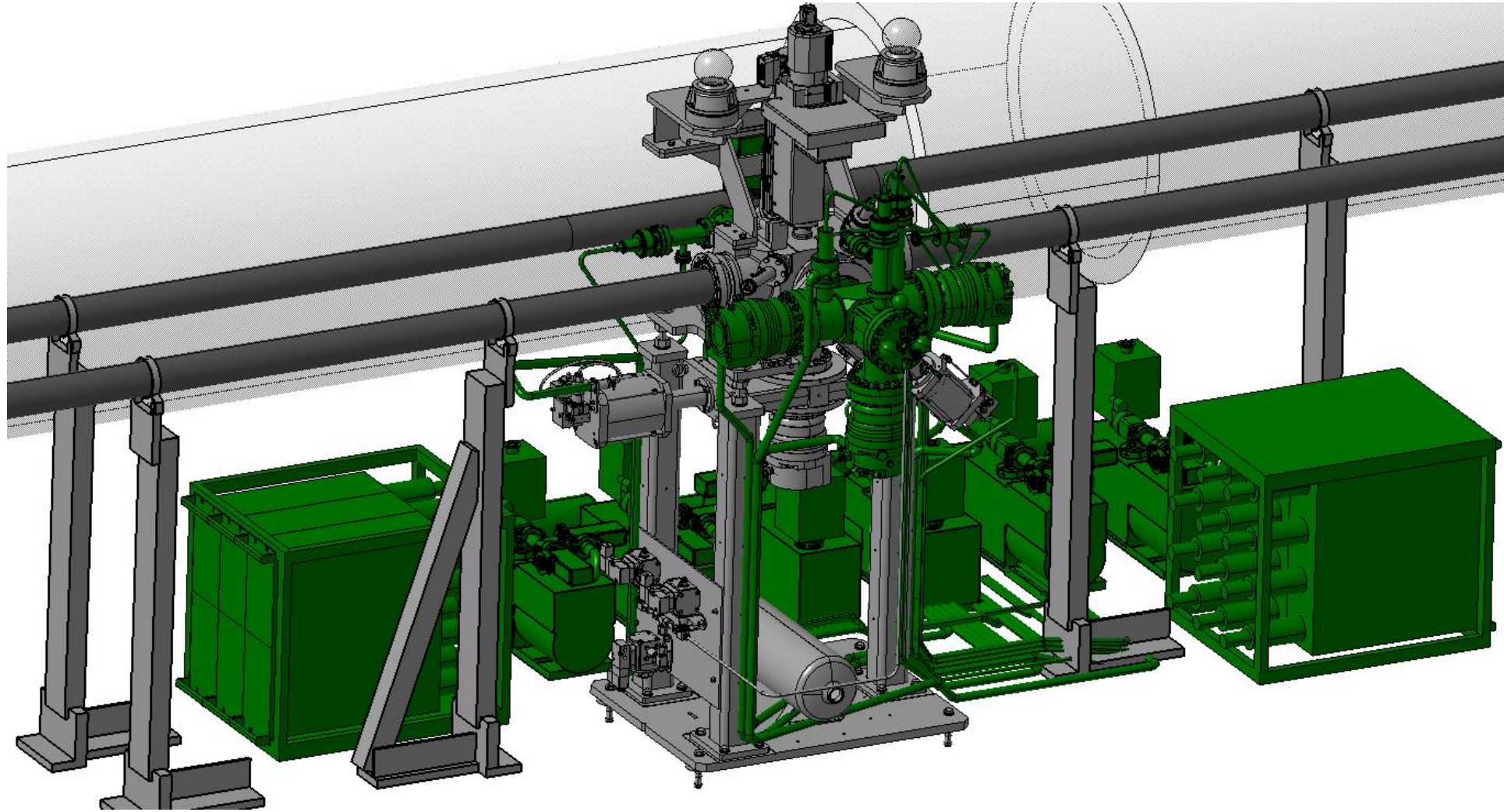


***Questions?***





# BGC V3 in the HEL



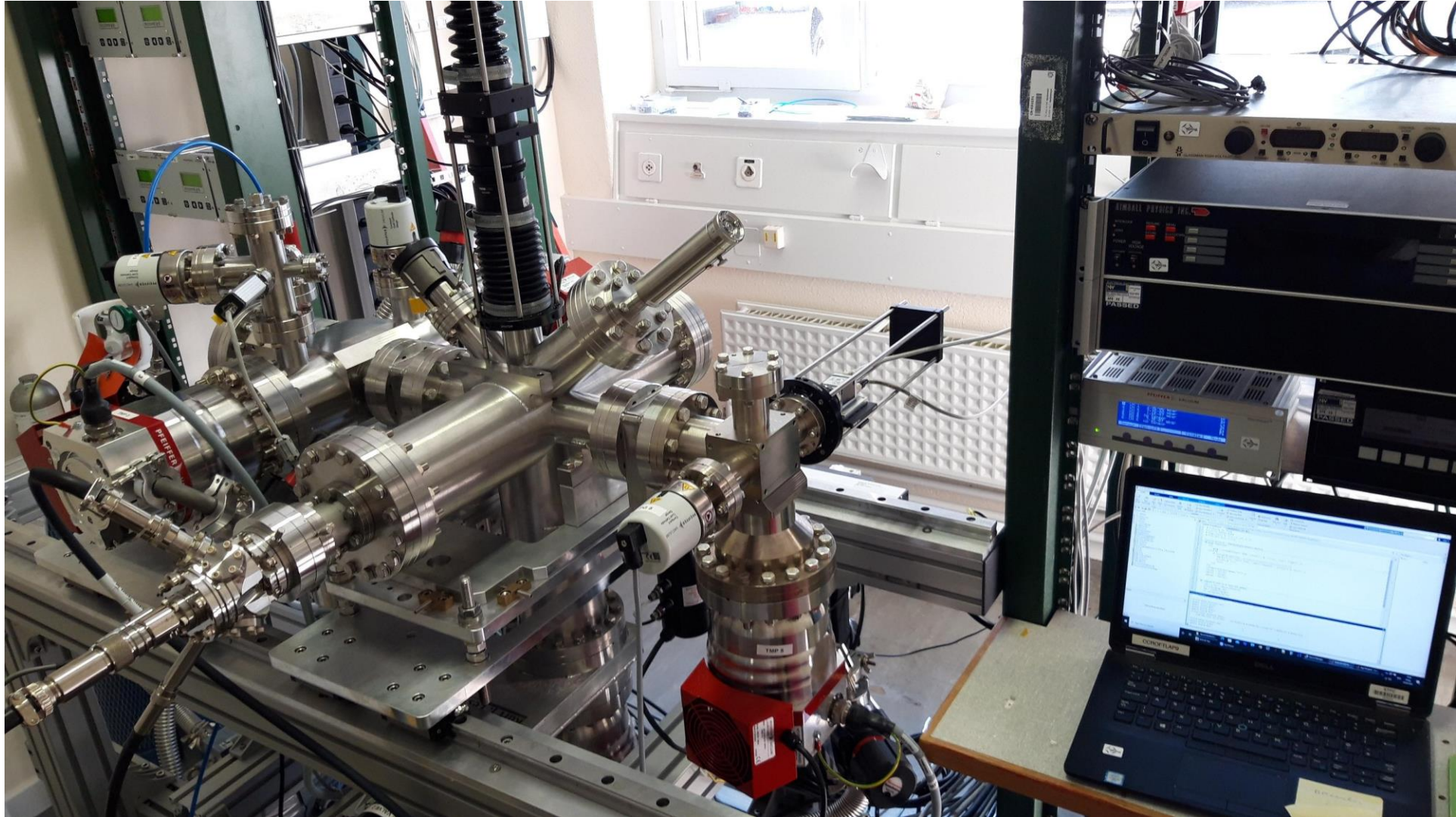


# BGC V3 in the lab





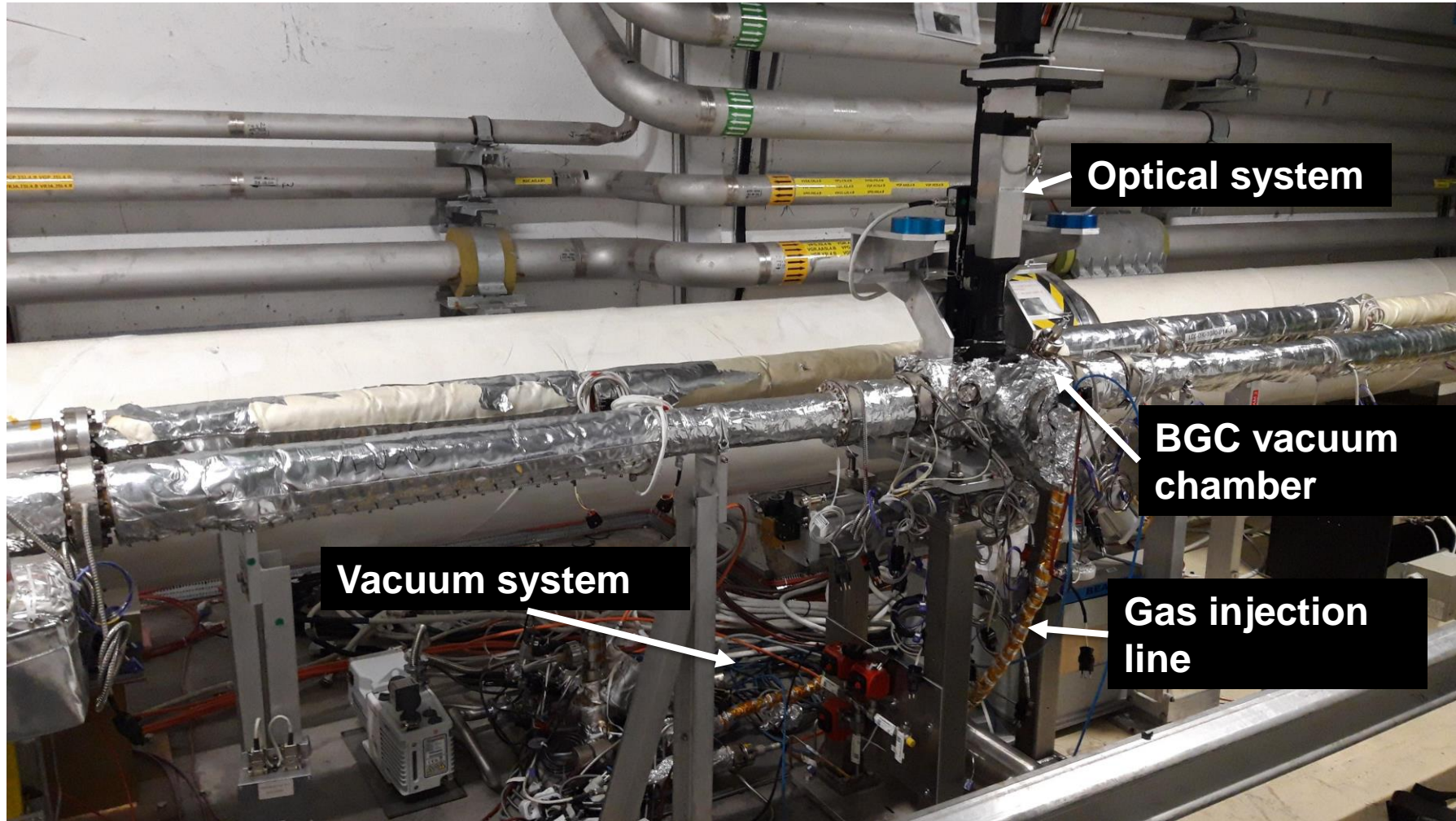
# BGC V3 in the lab



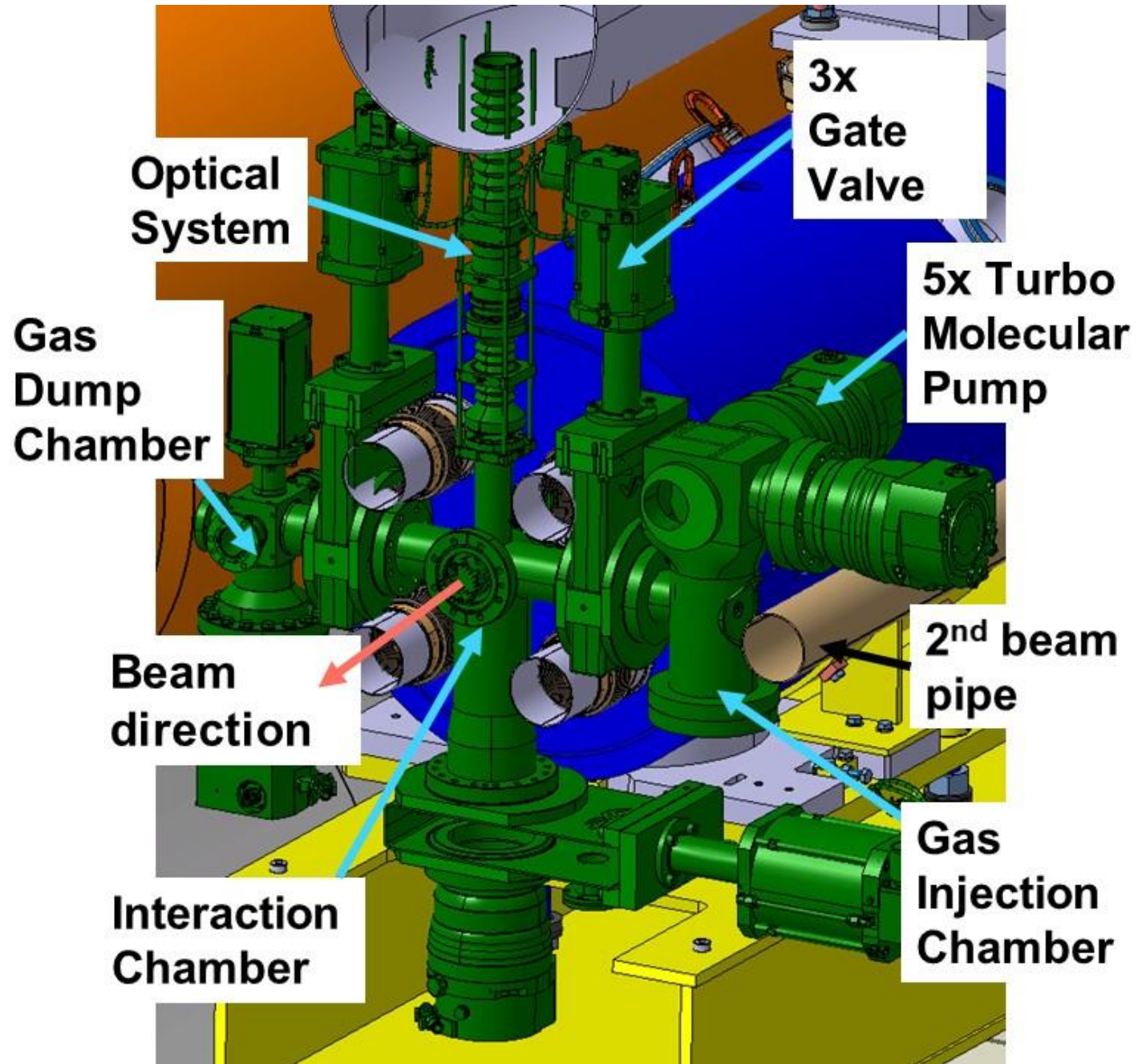


# BGC in LHC tunnel 2022

## Distributed neon Gas operation

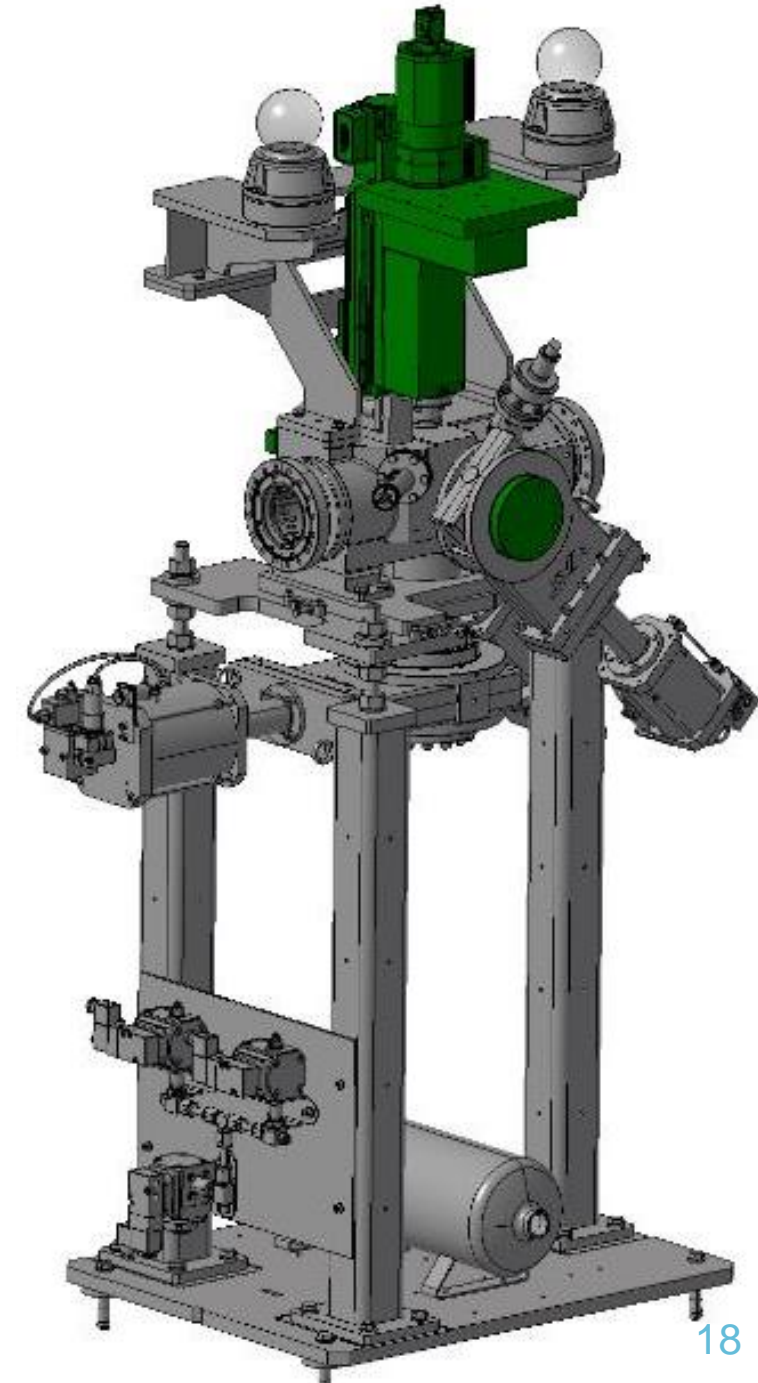


# BGC V4



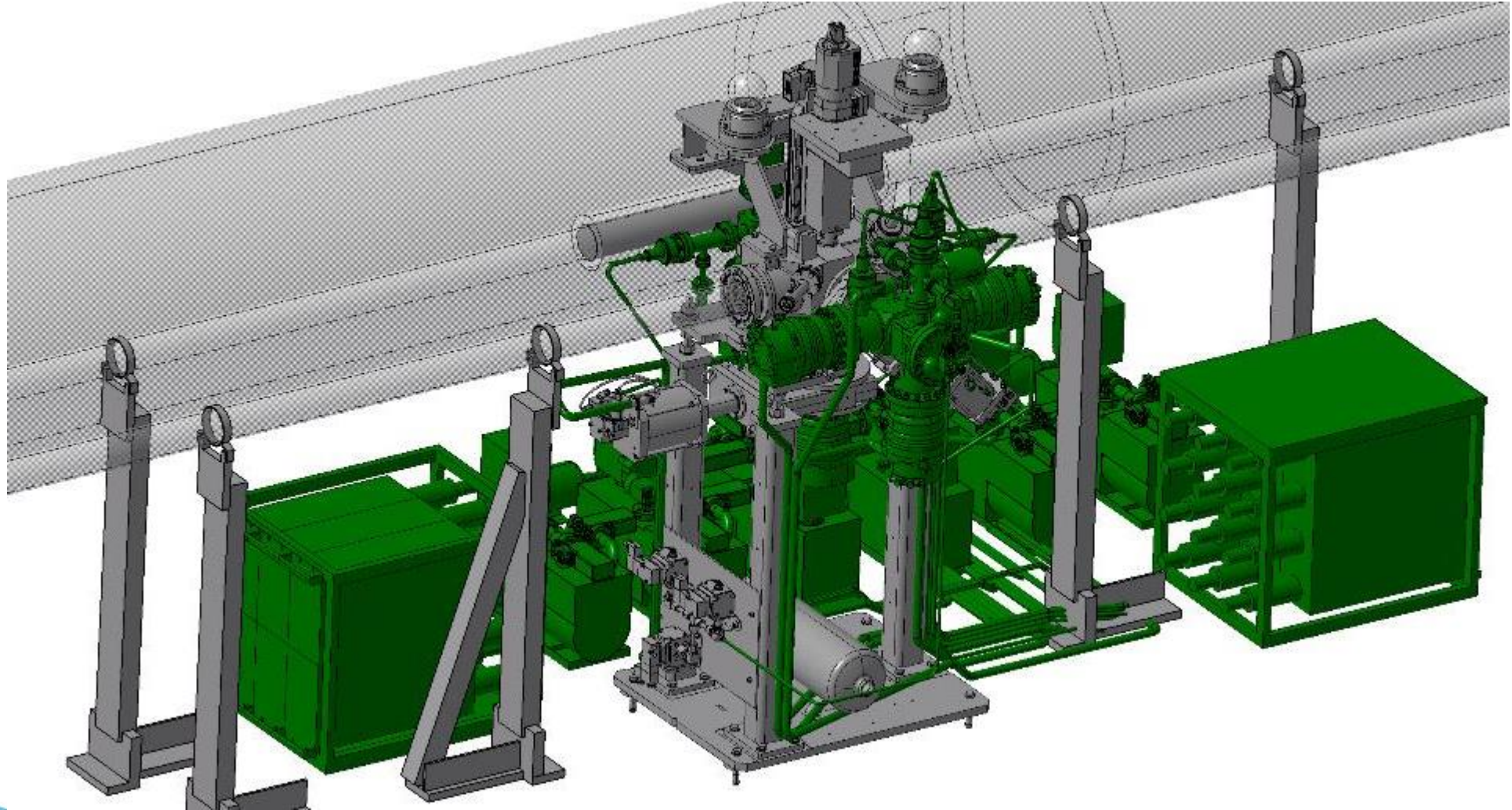


# BGC Phase 1 2021 in YETS

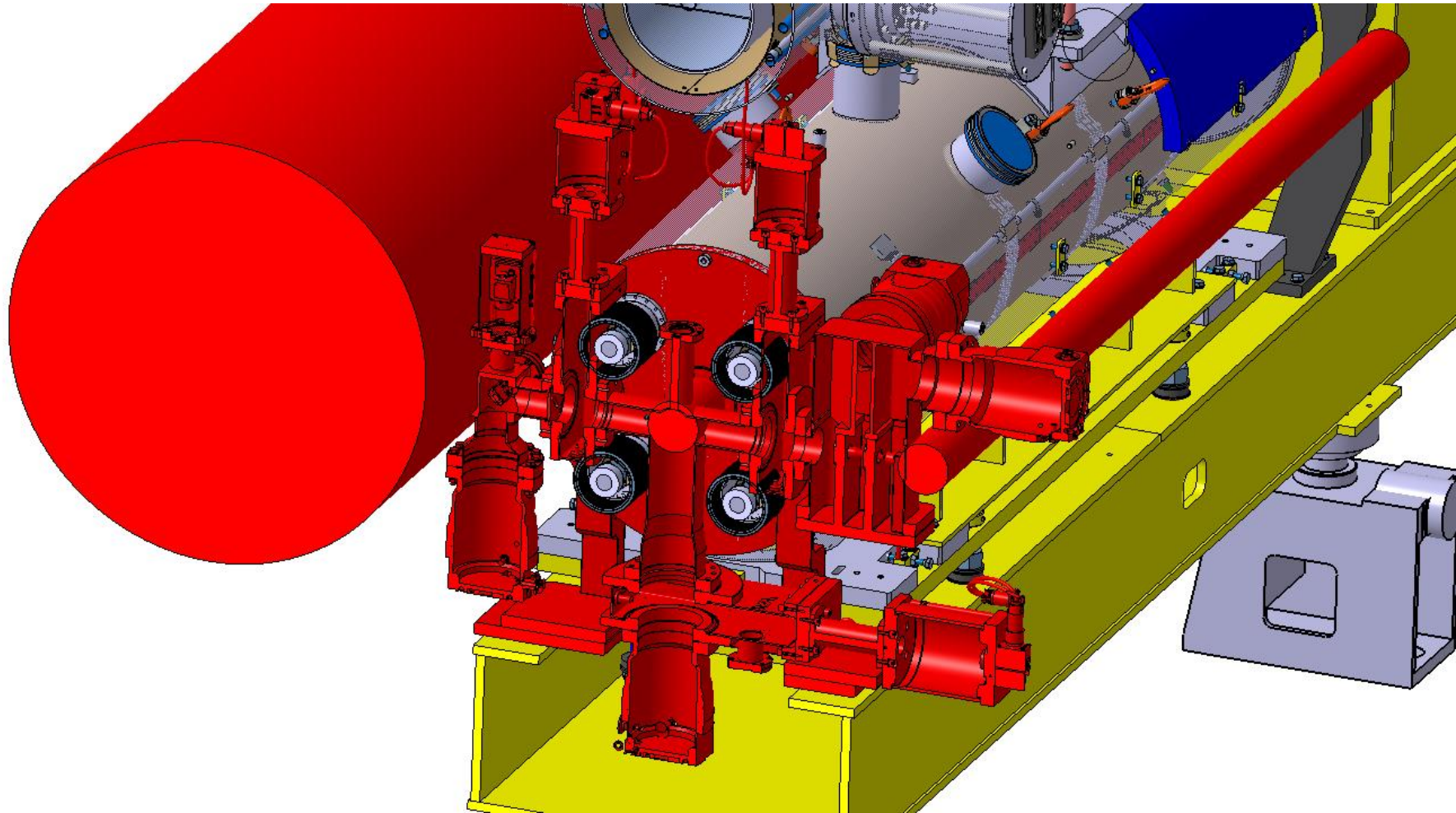




# Phase 2 to be installed



# Final BGC version (V4) in HEL, here 4R





# Design of final instrument (V4) for HEL well in Progress

## Challenge: Space

