Status of TAXS region and TANB

F. Sanchez Galan on behalf of WP8

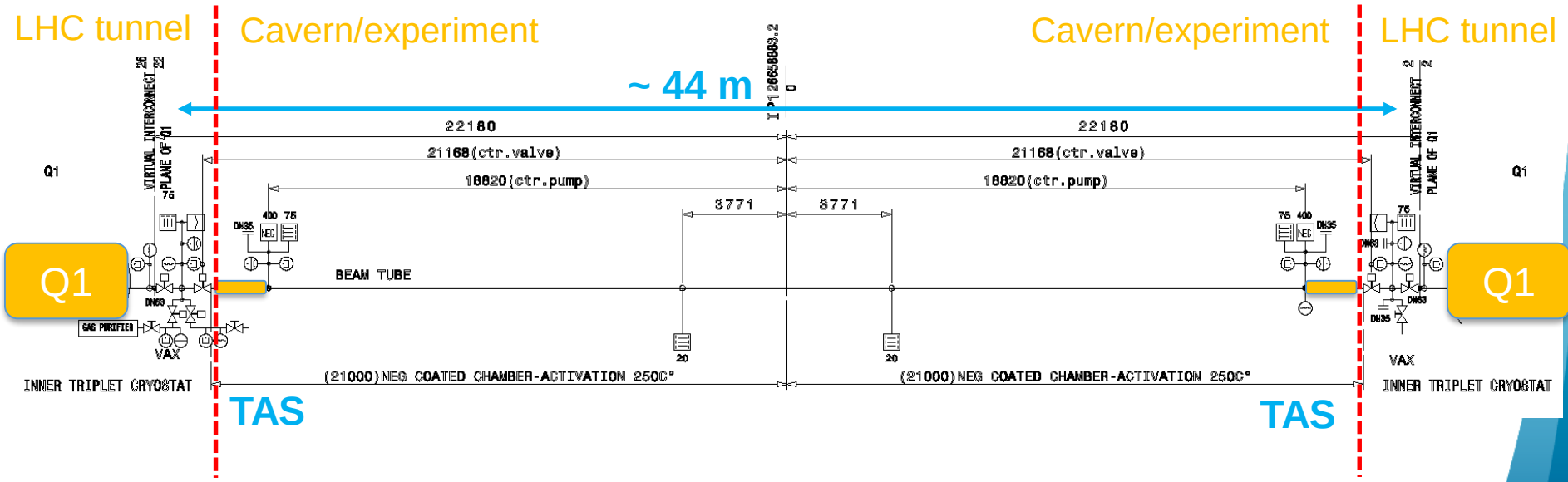
Special acknowledgments: O. Boettcher, J. Sestak, L Krzempek, M. Luque Porras, P. Santos Diaz, A. Gaddi, M. Raymond, J. Hansen, J. Perez Espinos, JL Grenard, A. Bouvard

Outlines

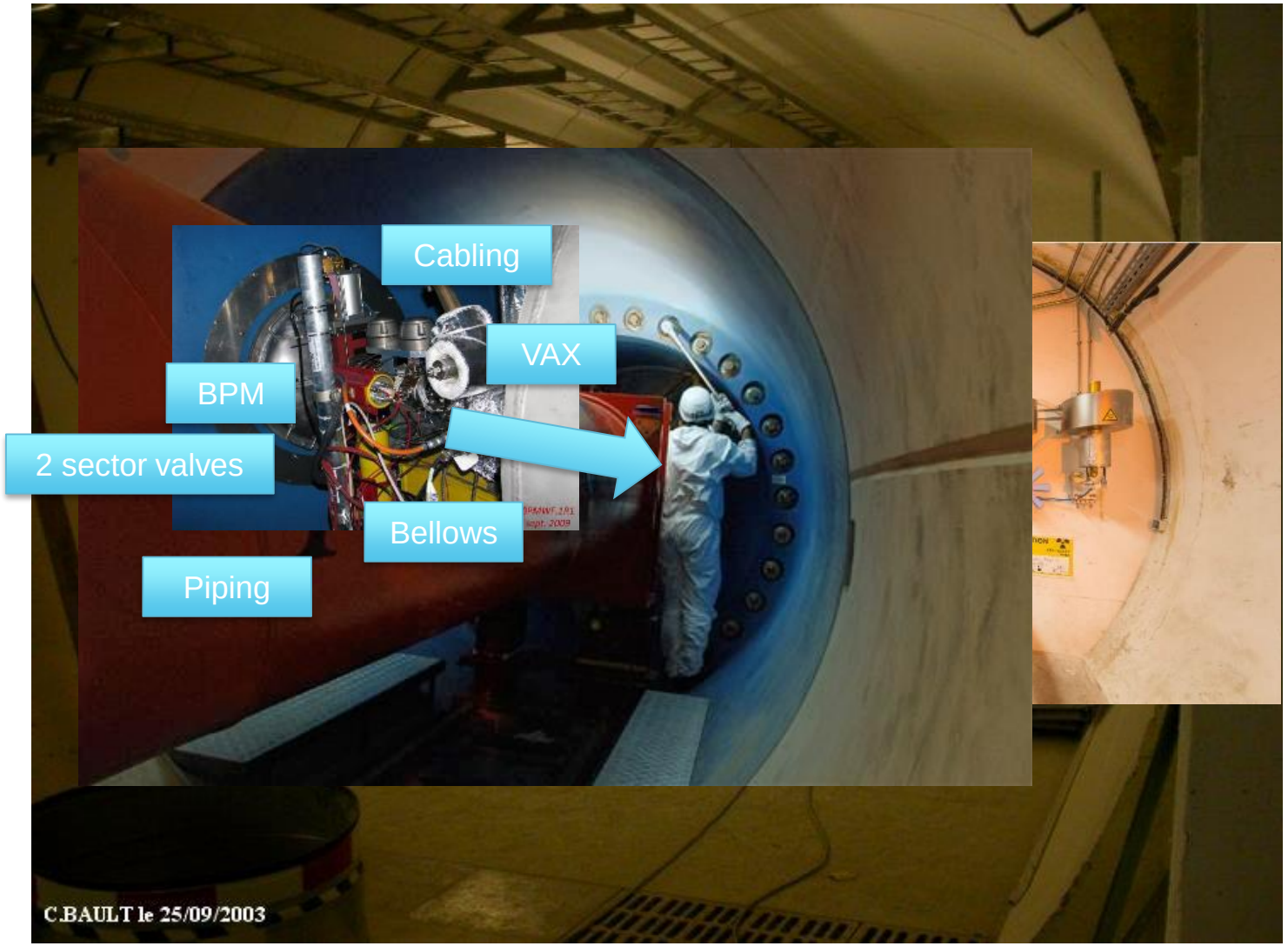
- TAXS region:
  - VAX relocation, status
  - Shielding modifications, status
- TANB in short

Motivation for VAX Relocation @ P1 & P5

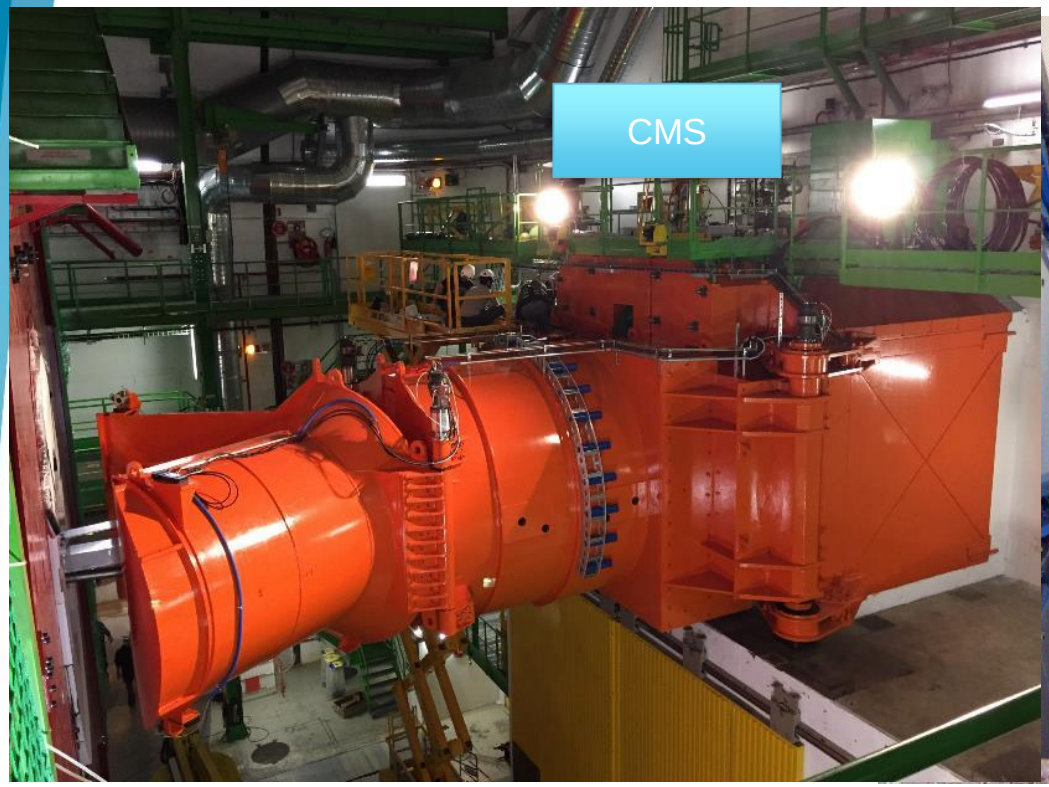
- To increase the aperture for the beam, **TAS will be replaced for TAXS (ID34 to 60mm)**.
- VAX equipment is situated at the most difficult access region in LHC. Allocated space can not be modified.
- **Radiation levels and proximity to equipment make routine operations difficult and costly in terms of radiation dose. TAXS Region needs to** be compatible with HL operation, following the **ALARA** principle.

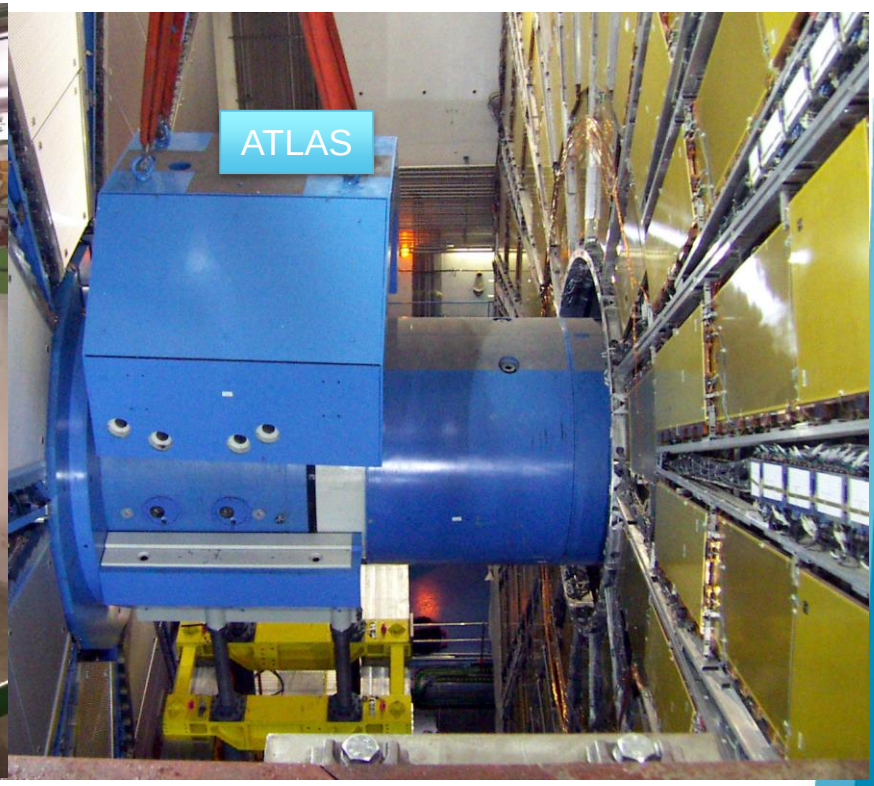


The VAX Region in LHC



Access to TAS from the Experimental caverns



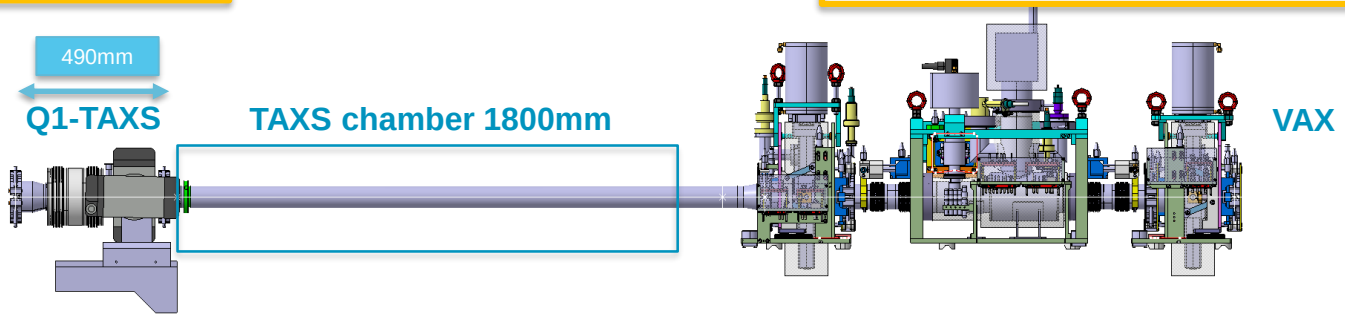


TAS surrounded by huge shielding structures

HL-LHC Layout

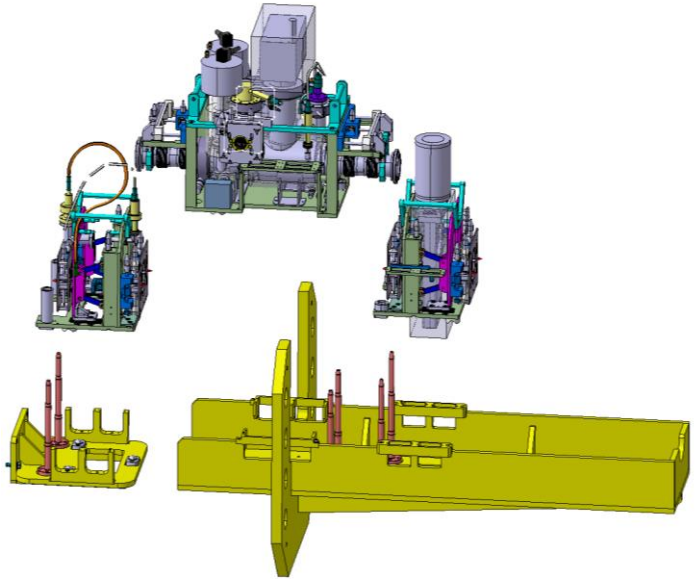
LHC TUNNEL

EXPERIMENTAL CAVERN



Integrate the BPM in Q1 and relocate the VAX equipment from the tunnel to the experiment side.

New support structure to host 3 independent frames with VAX, sector valves and bellows remote handling based on quick connector plugins.

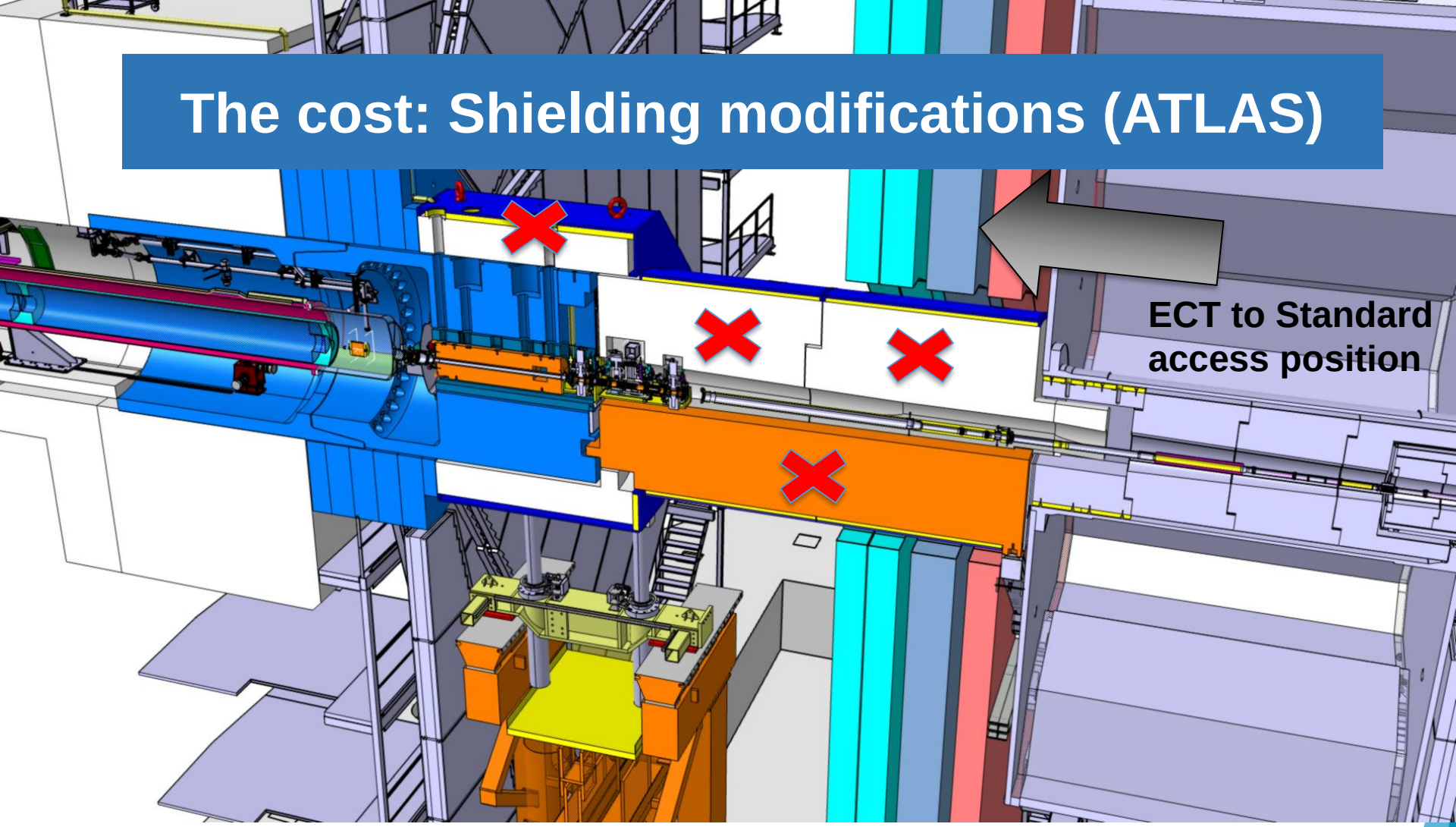


Status: VAX Modules Testing

Multiple tests already performed with crane, slings and small hooks validated the handling principle with quick connections.

Fully remote approach

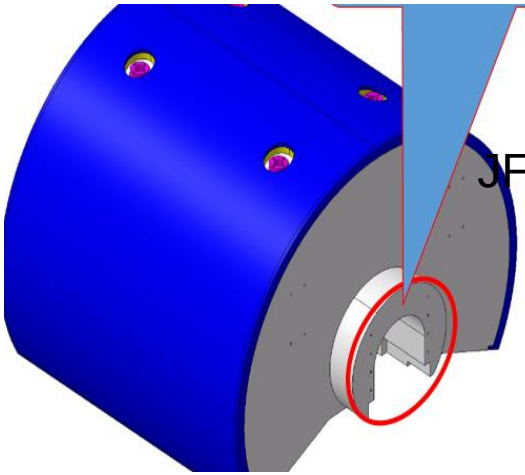
The cost: Shielding modifications (ATLAS)



IMPACT on the VT supports

For a standard access configuration. ECT must accommodate VAX in existing JTT plug 1 area.

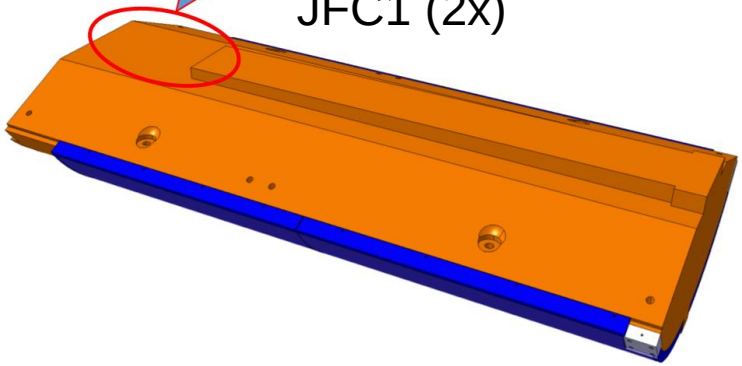
Modifications on JFC1,2,3



JFC2 (2x)

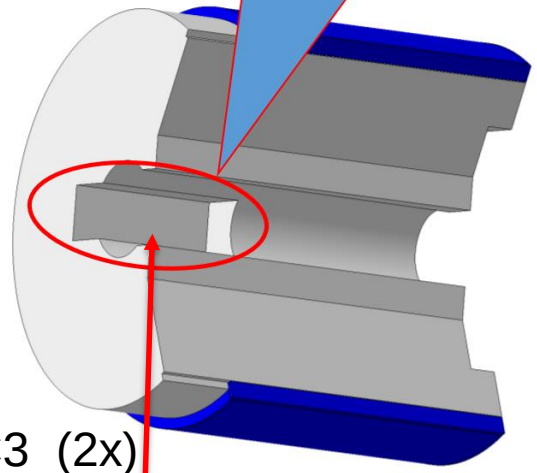
1.25m x 0.52m x 0.09m = 0.0585m³
→ 421kg to machining

JFC1 (2x)



1.15m x 0.41m x 0.38m = 0.179m³
→ 1290kg to machining

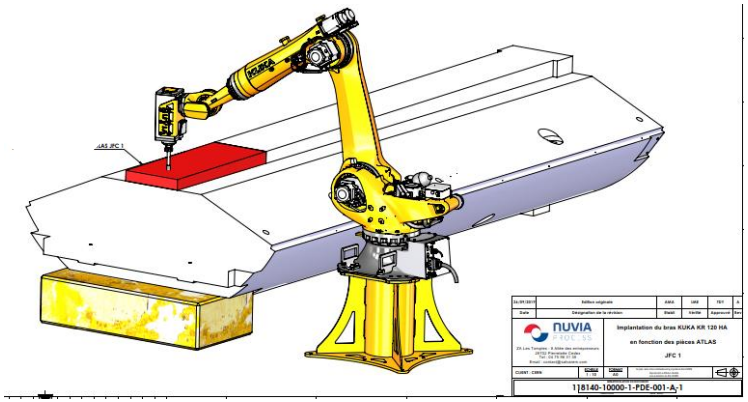
JFC3 (2x)

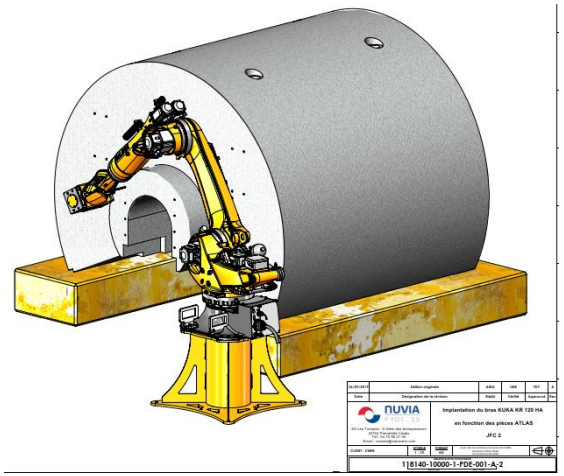


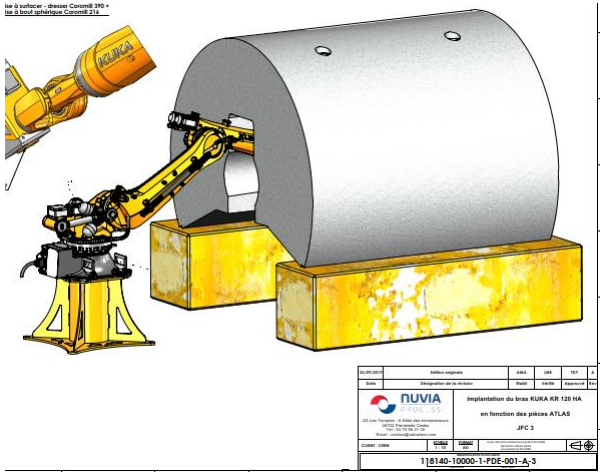
In addition:
3x 6 holes to machining

In total machining concerns:
1) milling off 4.3 tons from 4 units JFC1+3 and
2) drilling and thread machining of 52 holes into 4 units JFC2+3

Machining setup



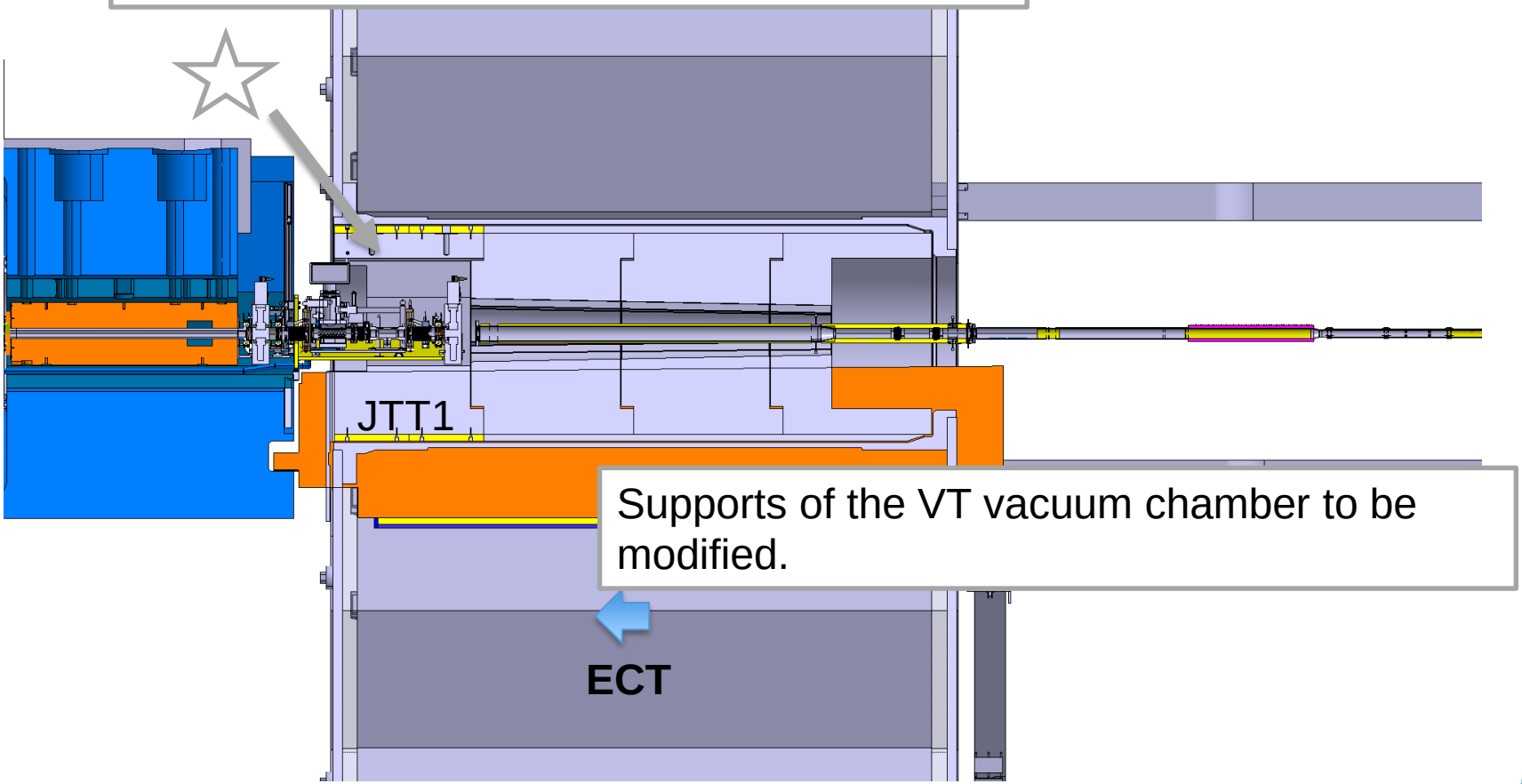




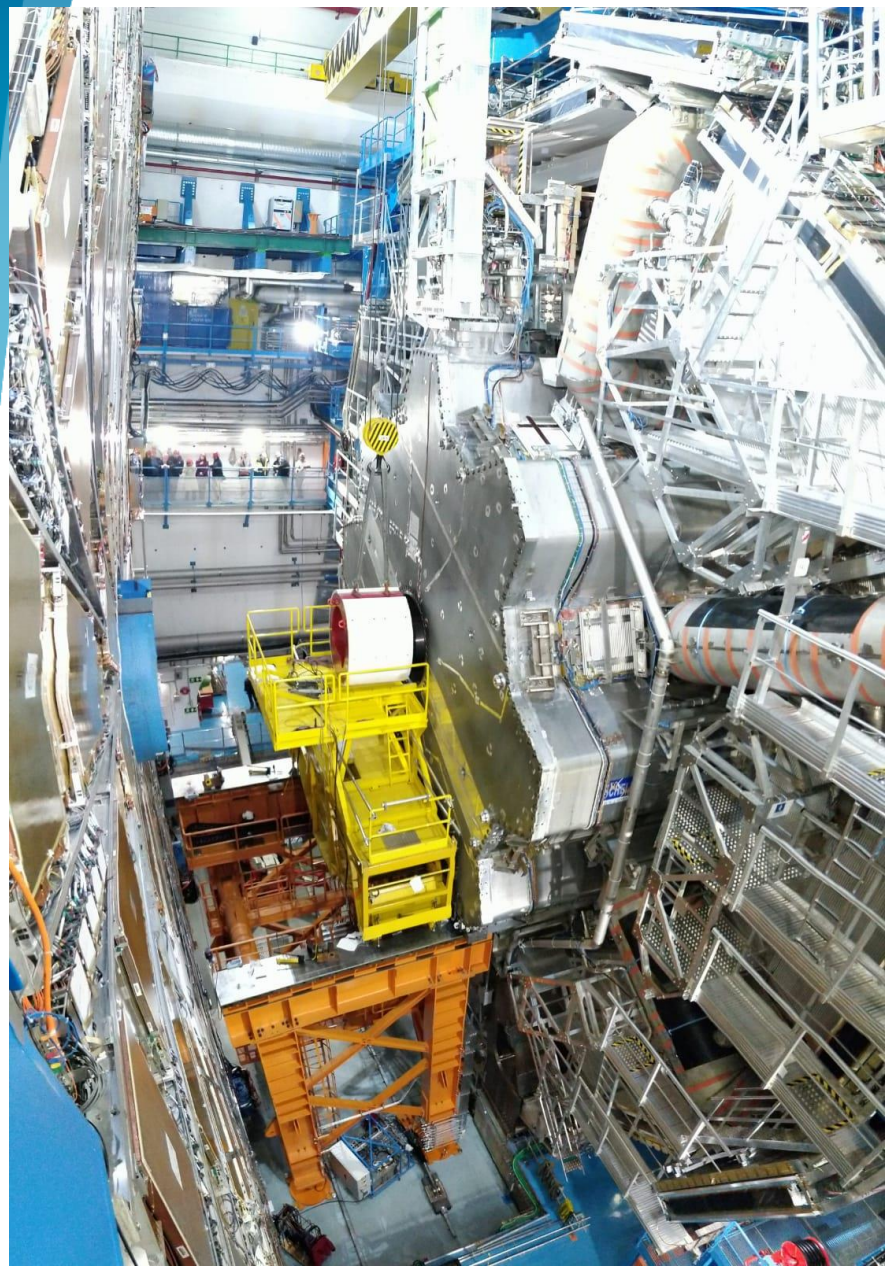
The contractor specified the positions for machining the JFCs using the Kuka 120 HA robot that CERN will own after the project.

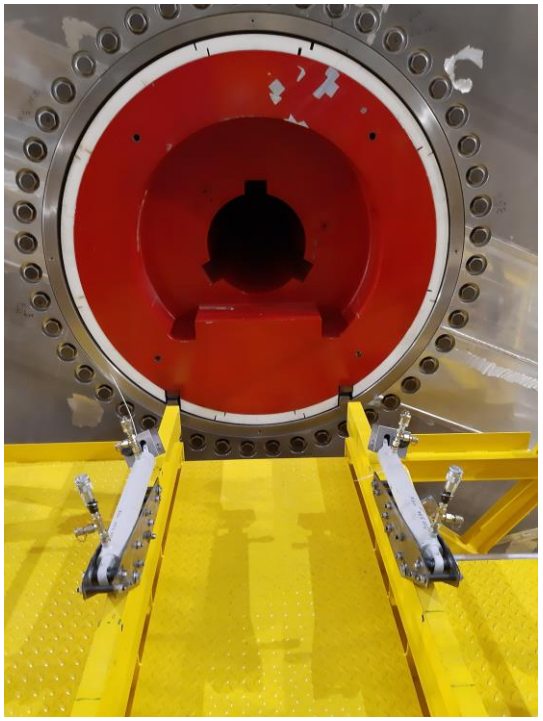
During Shutdown period: Toroid moved towards the TAS

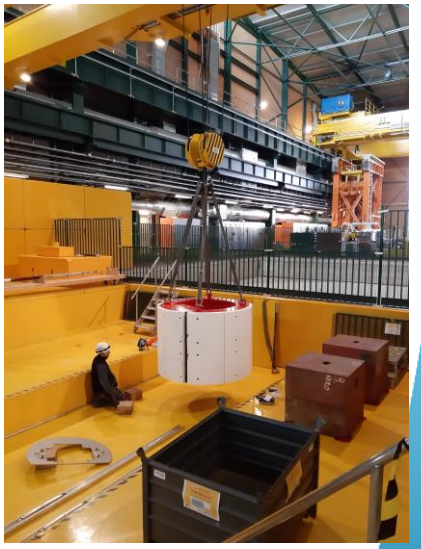
To avoid clash with new HL vacuum configuration, the JTT 1 has to be modified.



JTT Removal







JTT manufactured [PAEC]

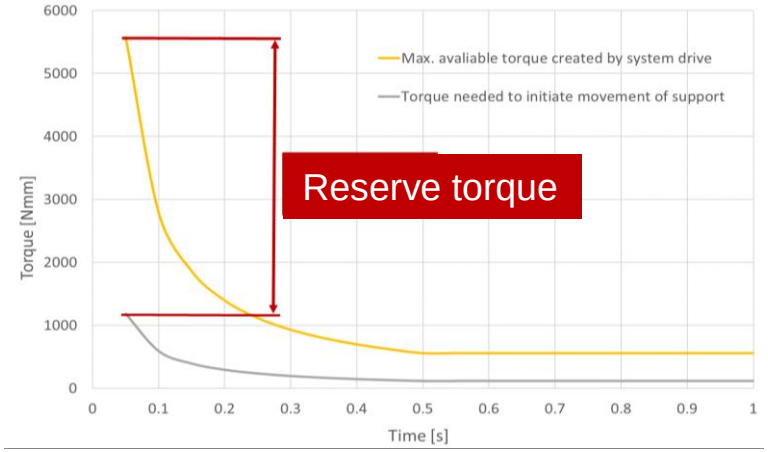
Modification of the VT retractable support system

VT support prototype – full scale mechanism

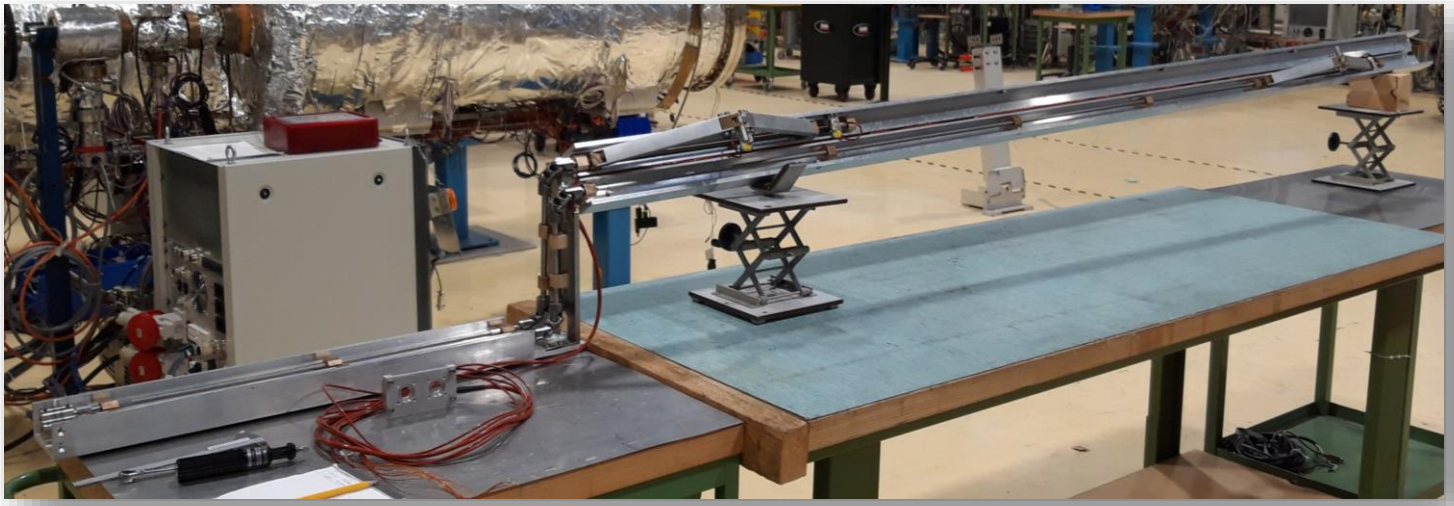
Motor torque = 5.6 Nm (100%)

VT mechanism torque = 0.8 Nm (14%)

Reserve torque = 4.8 Nm (86%)

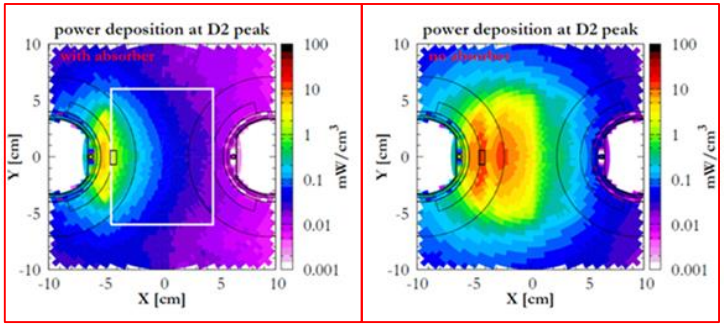


Cycling test – 50 cycles performed → 5 years of operation

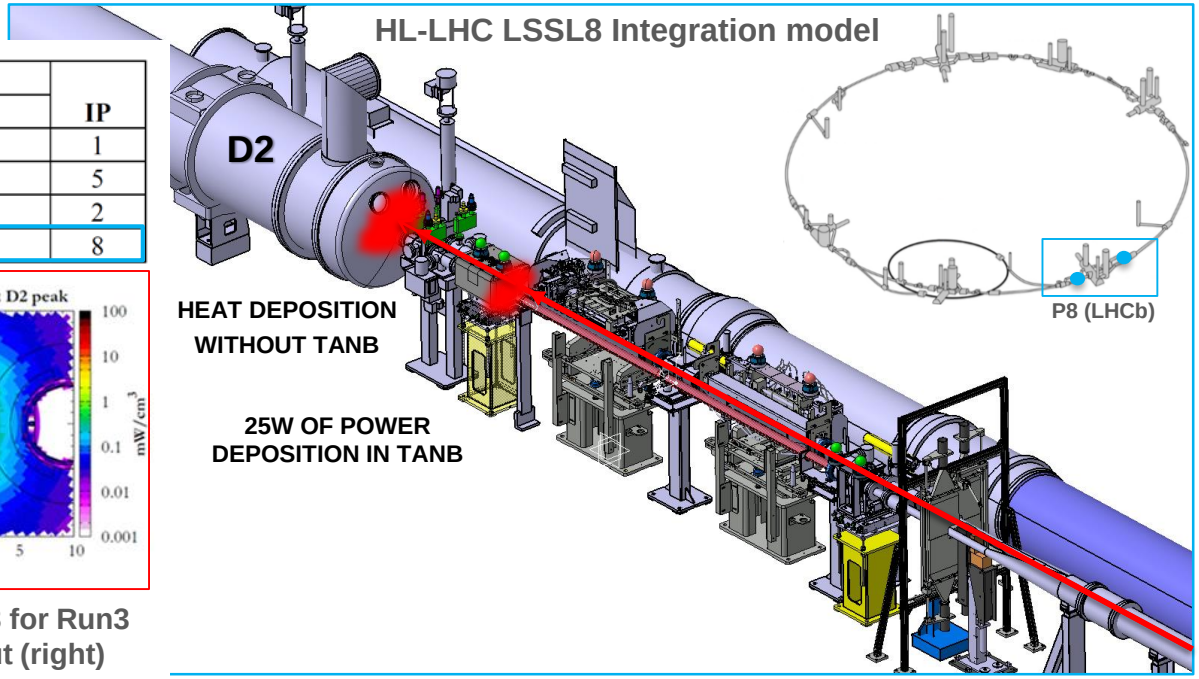


First “TAXN” :TANB Neutral Absorber

Experiment	Peak Luminosity [cm^{-2} s^{-1}]		IP
	HL-LHC	LHC	
ATLAS	5×10^{34}	2×10^{34}	1
CMS	5×10^{34}	2×10^{34}	5
ALICE	1×10^{31}	1×10^{31}	2
LHCb	2×10^{33}	4×10^{32}	8



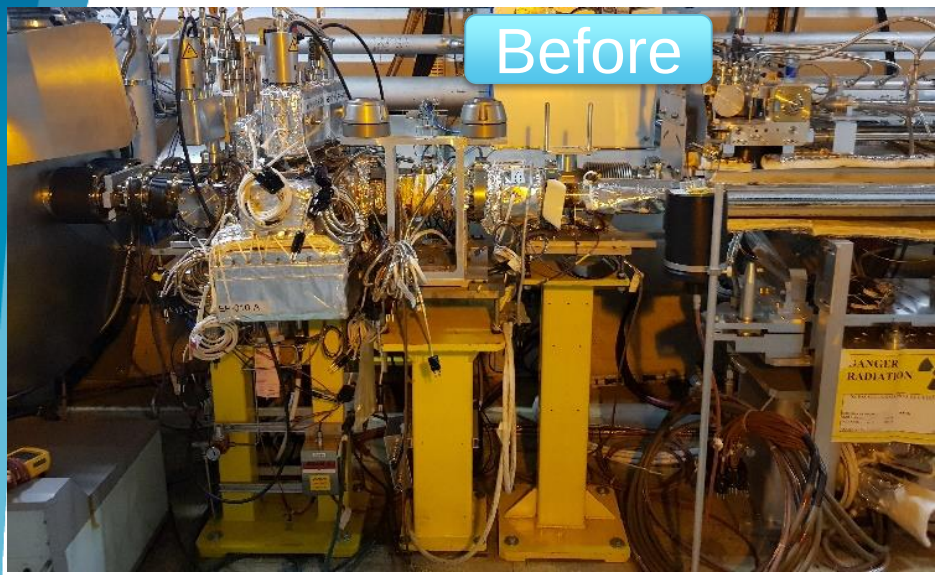
Power deposition plots at D2 in Point 8 for Run3 conditions, with absorber and without (right)

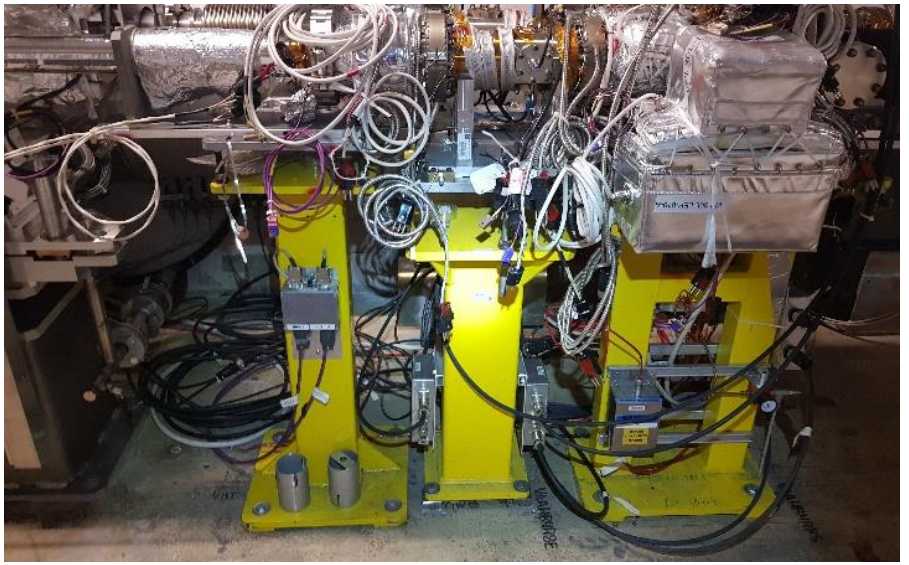


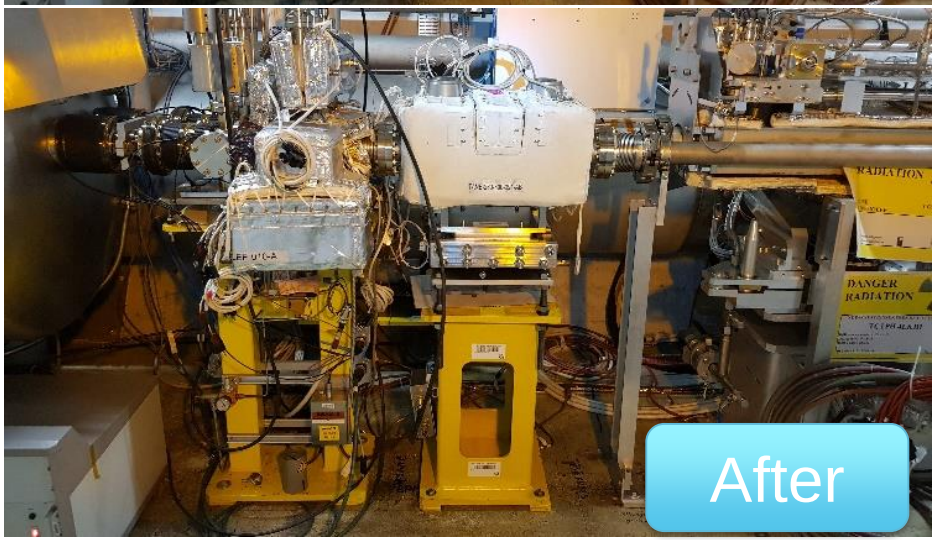
P8 TANB Left section configuration [installed in 2019]

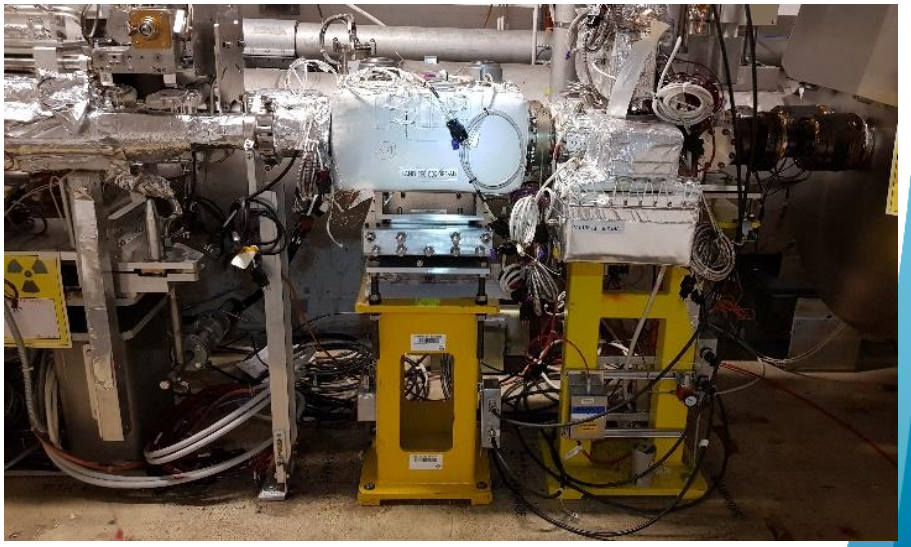
Run2 configuration

Installation









End of installation

Installing high luminosity in the tunnel

The first definitive component of the High-Luminosity LHC, an absorber designed to protect the machine, has been installed in the LHC

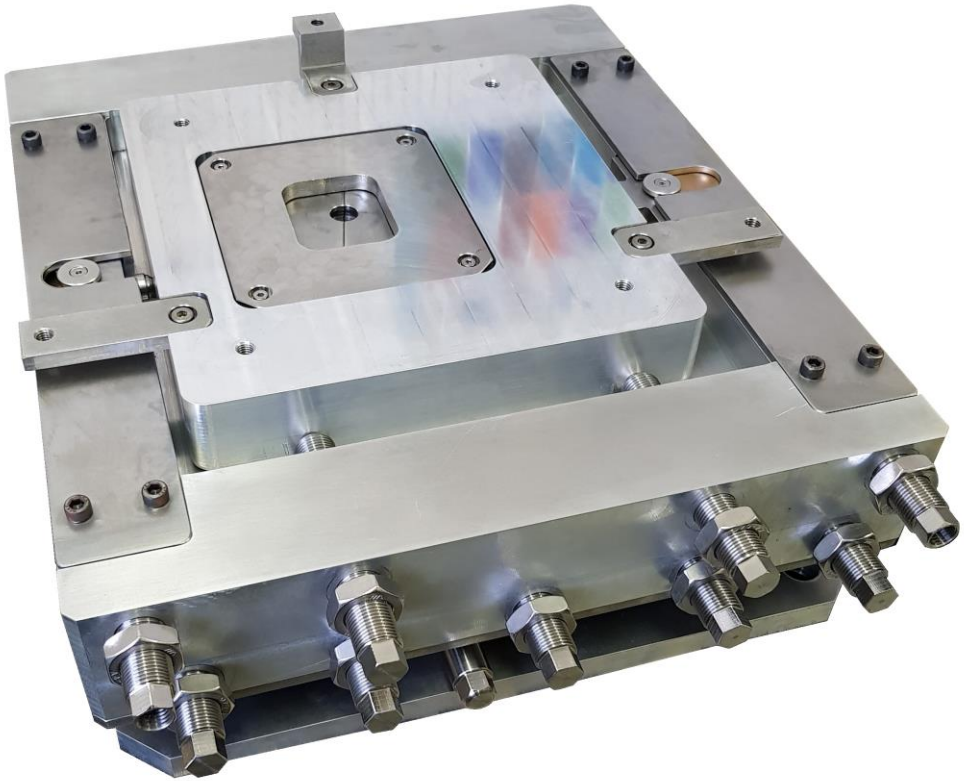
News | Accelerators | 04 September, 2019

Conclusions

- VAX layout frozen, approved by ATLAS & CMS
- Extensive testing campaign ongoing, handling principle validated. Remote operation with robots started
- Most of the shielding modifications advanced to LS2, started in January
- Installation of the first absorber (2x TANB) completed. Manual alignment plate with all actuators in front available.

Thank you for your attention!

WEPLATE (WP8)



Overview

- 6DOF manually operated
- Full locking
- Independent axis movements
- Displacement range:
  - Beam (X) : +/-10mm, 0.4mm p/turn
  - Radial (Z) : +/-25mm, 1.5mm p/turn
  - Vertical (Y) : +/-6mm, 0.28mm, p/turn
  - Roll, Pitch and Yaw: : >>14mrad
- Repeatability ≤0.2mm
- Service load 750kg (designed for TANB)
- Radiation compliant (no lubrication, mainly aluminum construction)
- Standardized bolts heads
- User interface instructions on the platform

WEPLATE WP8 6DOF ALIGNMENT PLATFORM

CERN-ACC-NOTE-2019-0035 http://cds.cern.ch/record/2687639