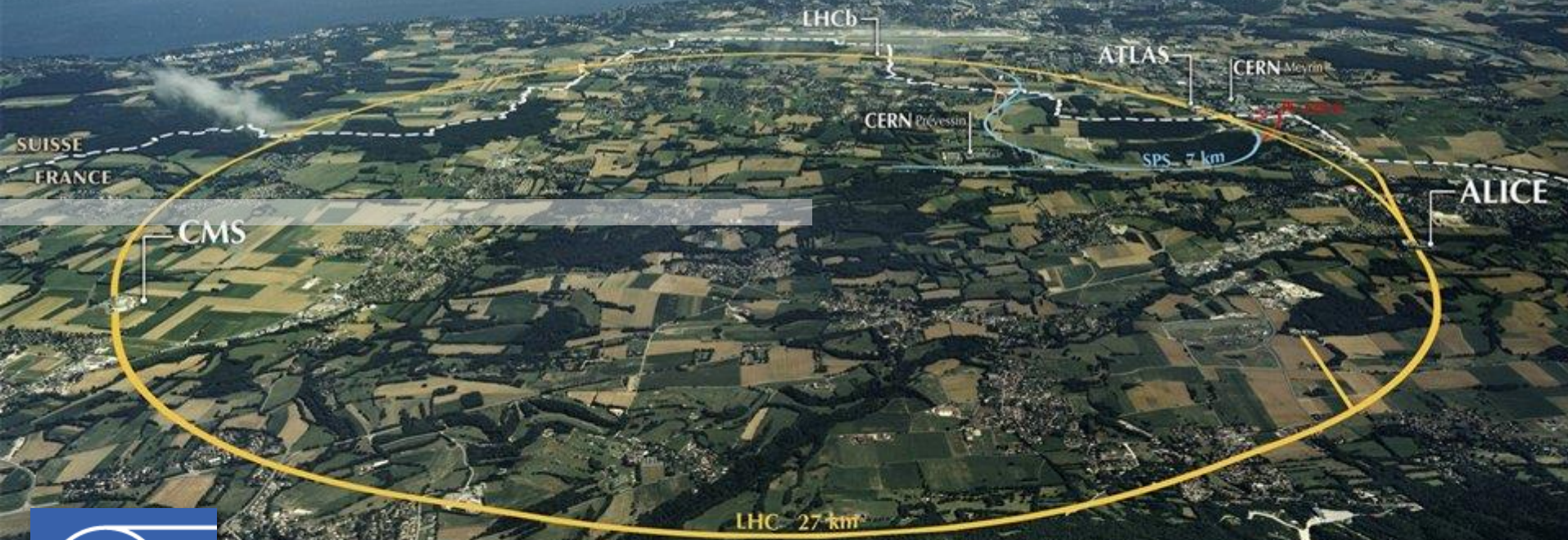


HL-LHC 3D Models



June 11th 2014

Jean-Pierre Corso - CERN

Outline

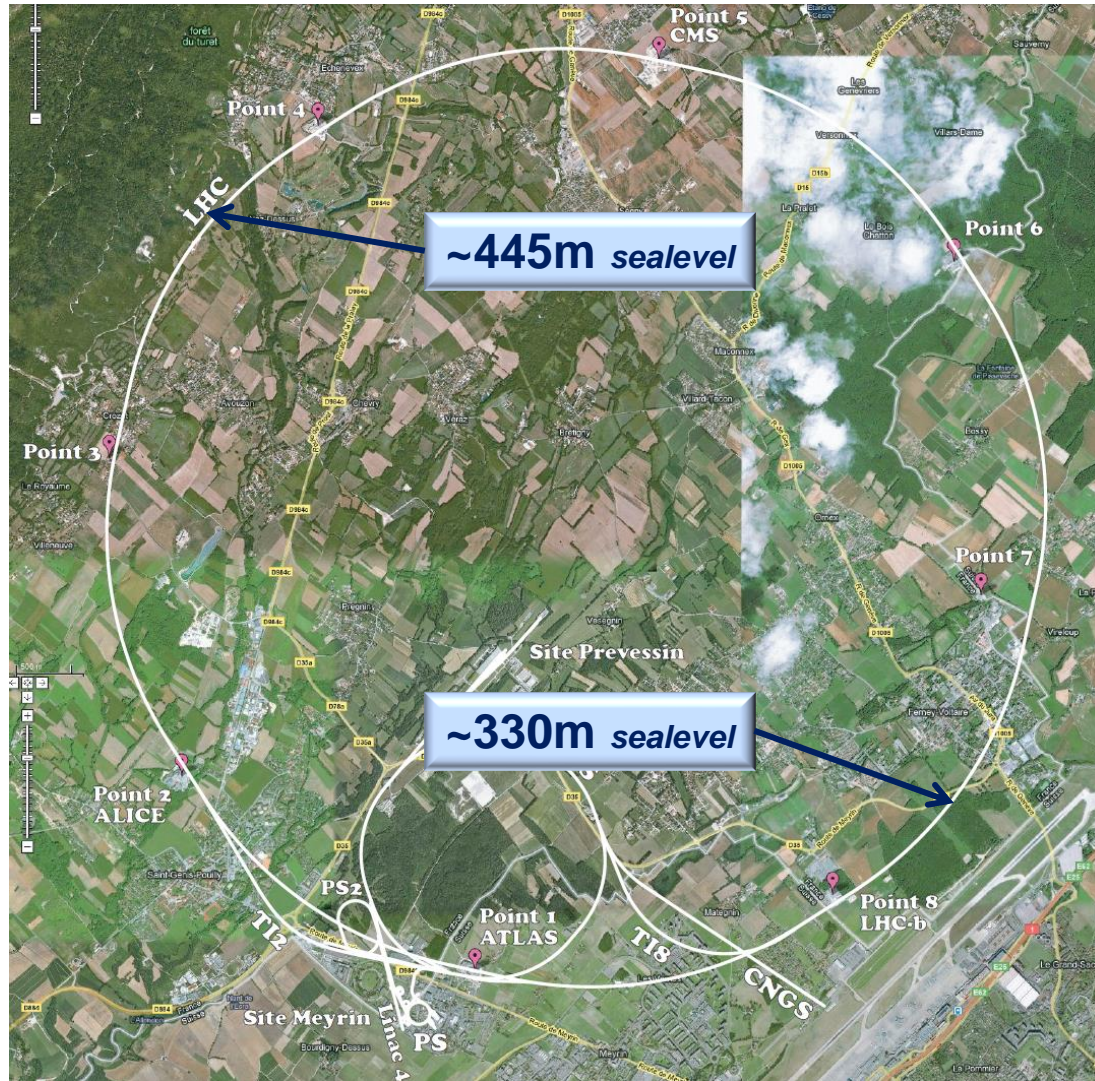
- LHC Tunnel : Slope, Tilt
- Visualization Convention (reference axes)
- 3D model position in space
- DCUM
- Typical Sections
- Models CAD formats

LHC Tunnel : Slope, Tilt...

- ✓ The LHC is using the tunnel excavated for the LEP in 1985.
- ✓ This tunnel is NOT horizontal !
- ✓ The machine is like a circle turned by 1,4%



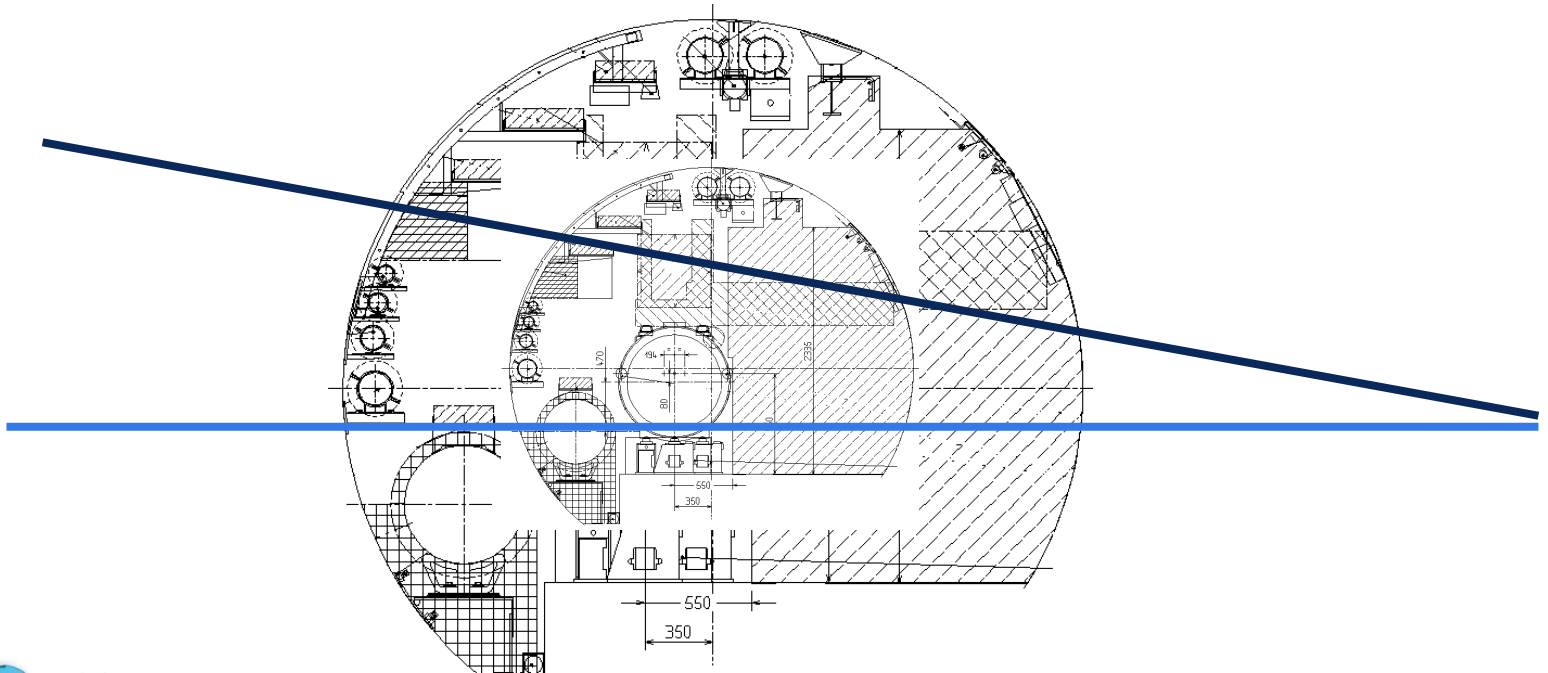
The LHC from the space



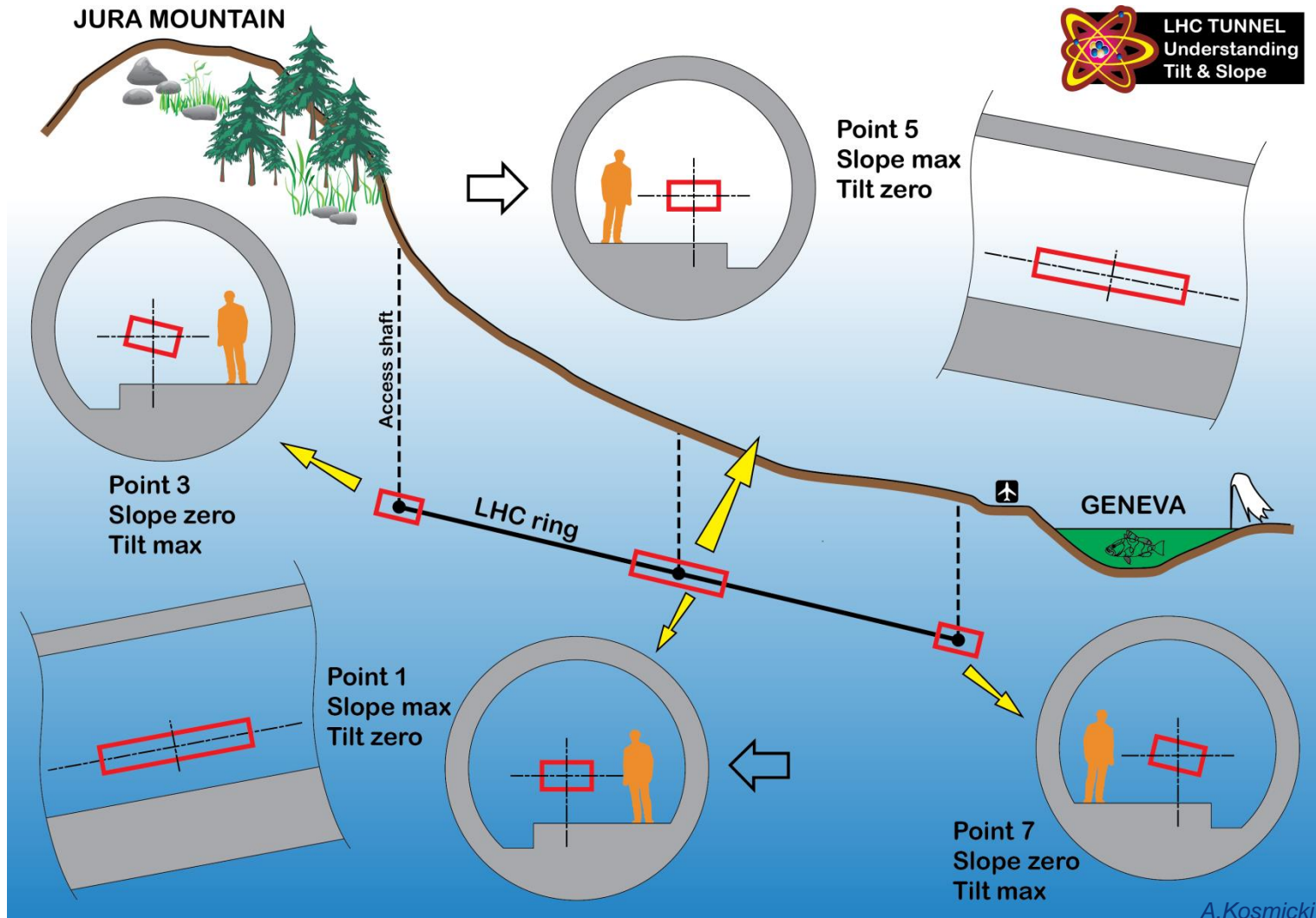
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LHC Tunnel : Slope, Tilt...

- The tunnel Section stays strictly horizontal everywhere along the 27km,
- and magnets are positioned in the plane created by the circle, each element of the machine will have at a certain point its own slope and its own tilt...



LHC Tunnel : Slope, Tilt...



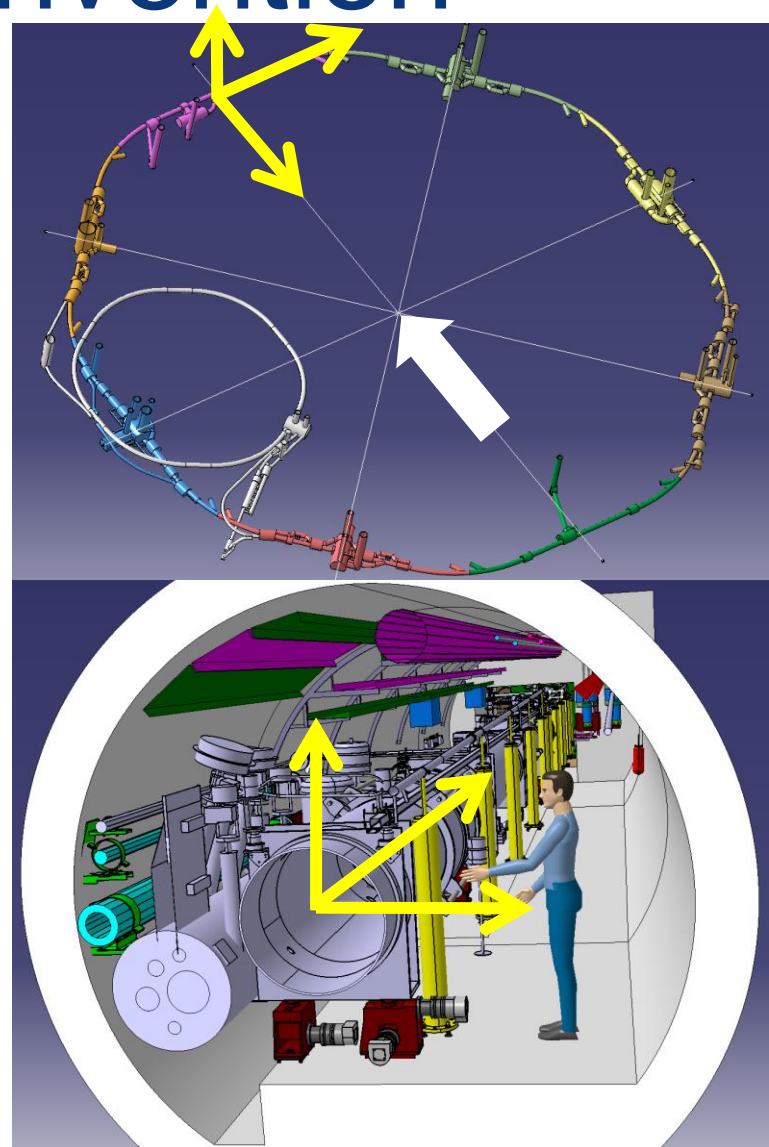
Visualization Convention

Everywhere along the 27km, if you look at the LHC machine, you might consider following postulates:

- ✓ You look
 - from Ring Center
 - Above the machine
- ✓ The reference is the medium beam axis
 - X_{axis} towards Ring Center
 - Y_{axis} towards Beam downstream(*)
 - Z_{axis} upward

(*) or following DCUM increase, i.e. on the right

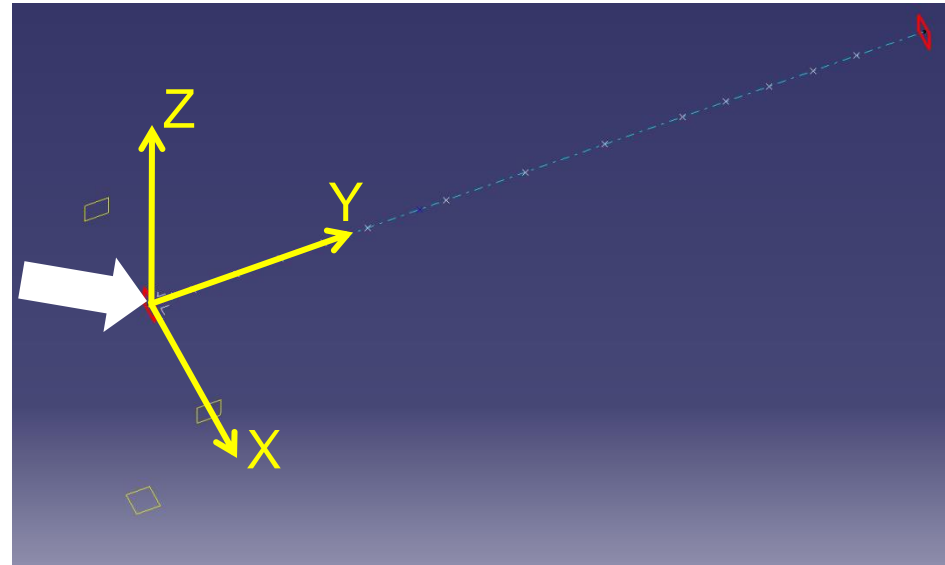
- ✓ A section of the tunnel is always shown “from left” looking downstream



3D model position in space

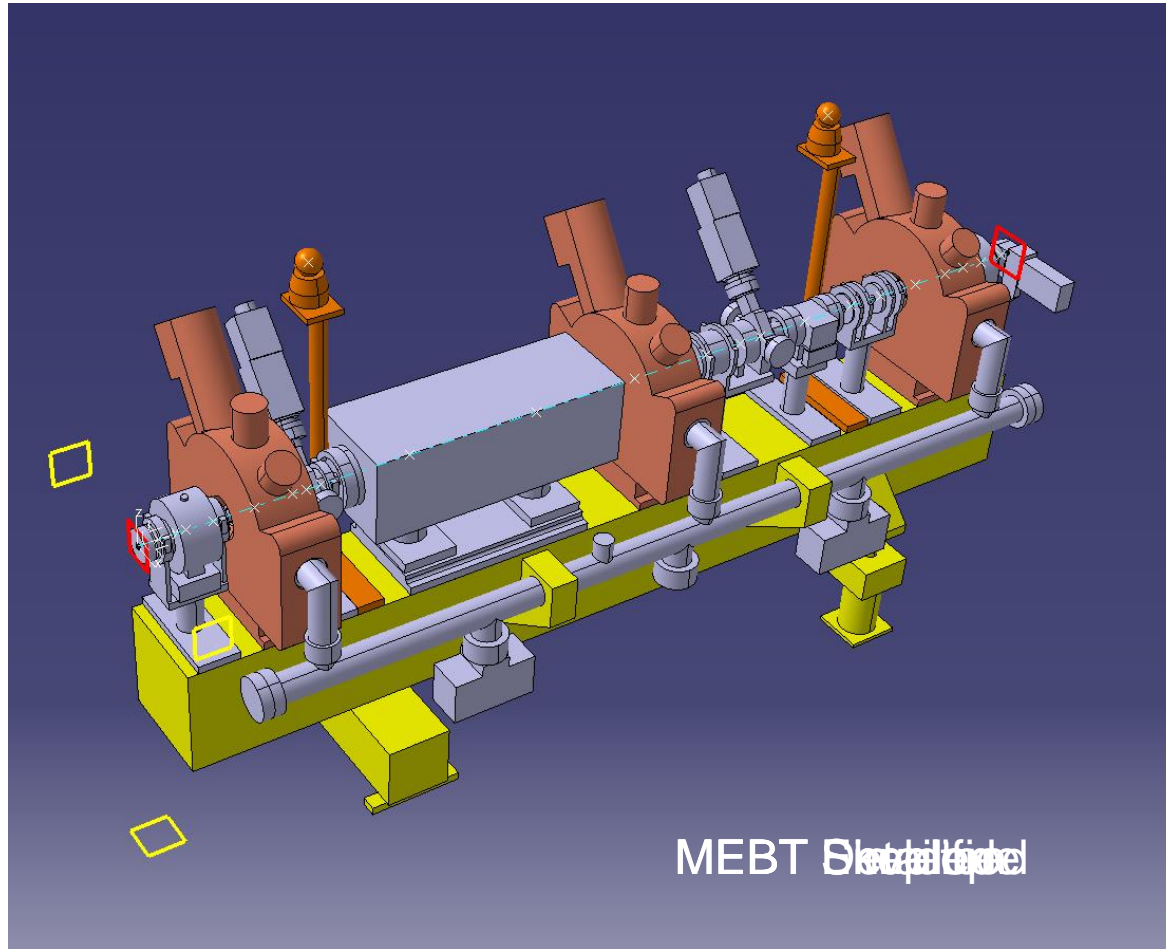
To be integrated properly, every element must be provided to our designers positioned within this rule:

- ✓ The reference of the model(0,0,0) located on the Beam Axis, start plane upstream
- ✓ The referential axis like this:
 - X_{axis} towards you
 - Y_{axis} towards Beam downstream
 - Z_{axis} upward
- ✓ Like this, each model can be handled by all technical offices with the same referential.

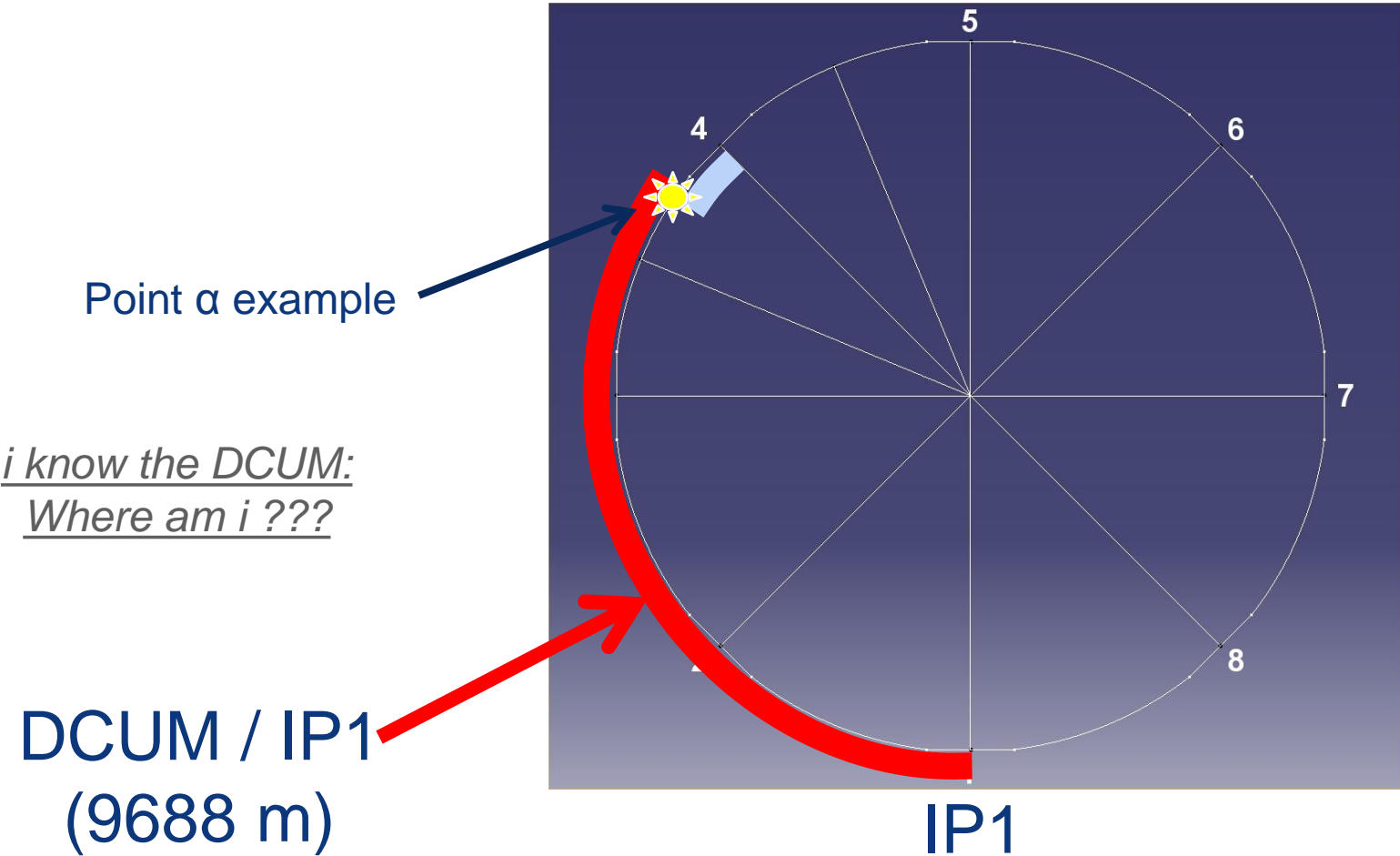


3D model position in space

Example of the Chopper line assembly of the Linac4 :



About DCUM...

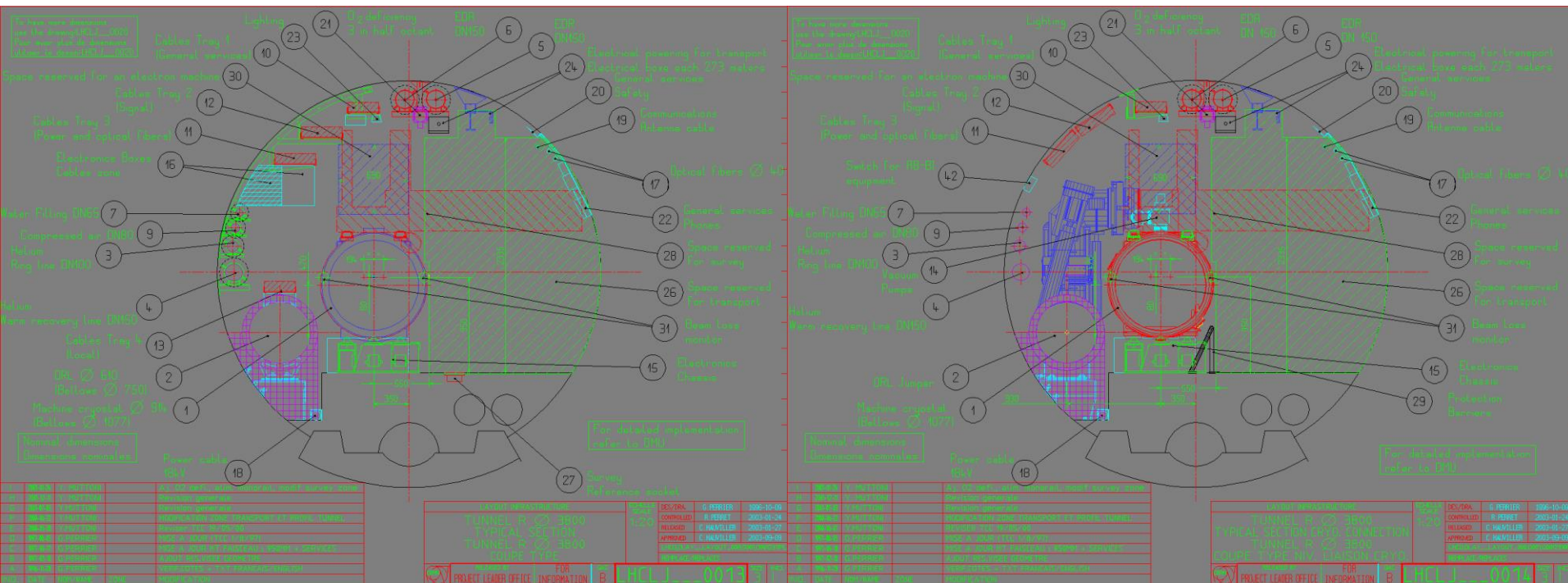


Typical Sections

- The LHC is composed of 2 main type of tunnels :
 - ✓ Long Straight Sections [LSS] (~4km)
 - ✓ Arcs (~23km)

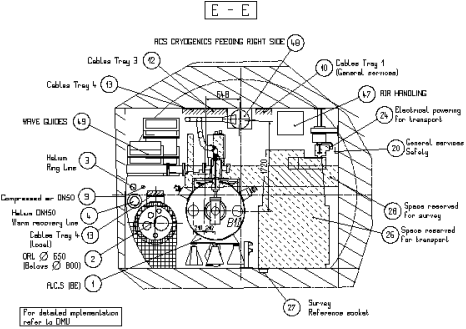
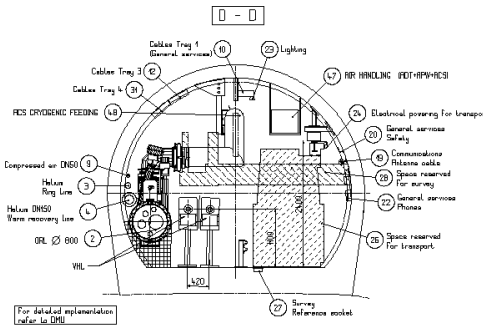
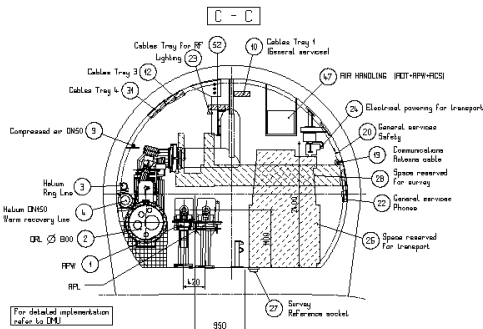
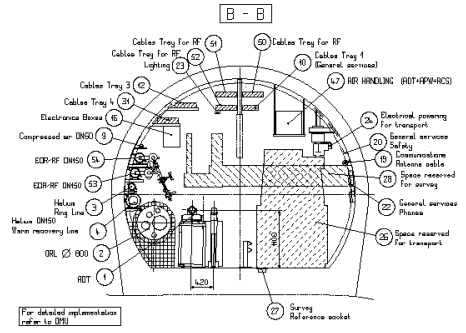
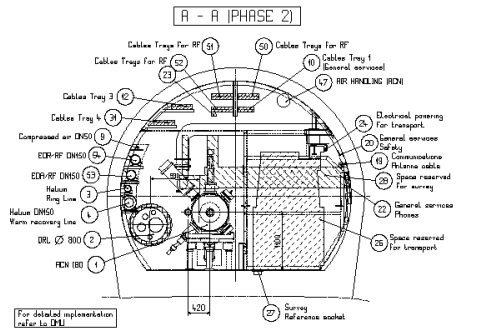
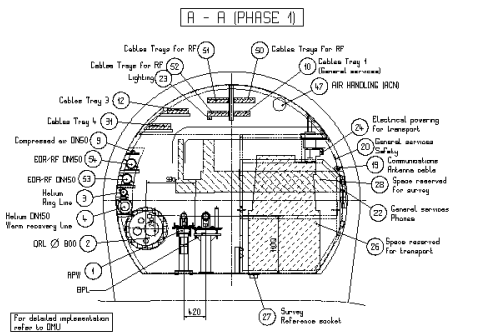
Typical Sections

Arcs can be summarized with ONLY THIS:



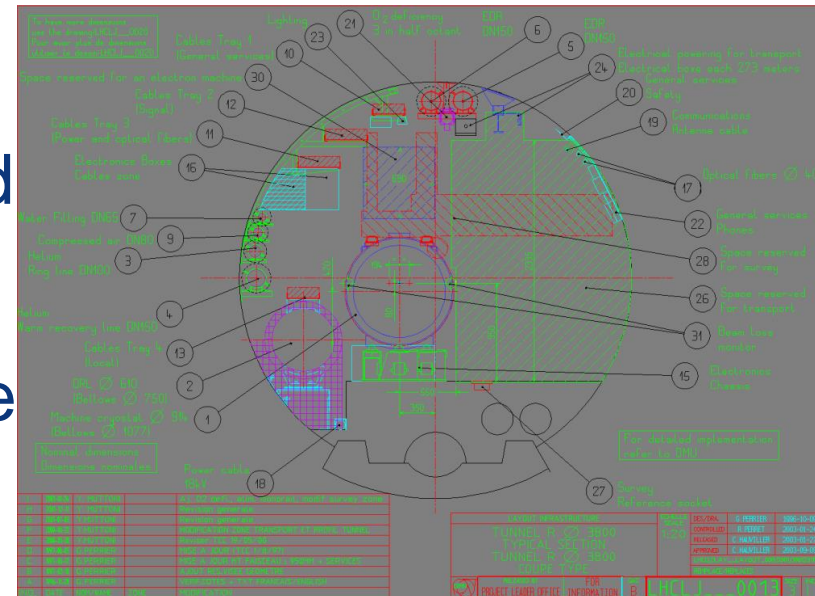
Typical Sections

✓ Long Straight Sections need more particular Sections...and 3D !



Typical Sections

- Some portions of the tunnel are already reserved for dedicated Services, as Transport or Survey
- QRL has its own area behind the machine
- Pipes and cables stand behind the machine, over the QRL
- Safety equipments are on the wall close to passage
- And the concrete is foreseen not to move...



CAD Models Formats

- CERN designers use CATIA V5 (DS)
- STEP files are recommended as alternative
- For others, contact us !

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- Thanks for your attention