Do we need the split endcap?

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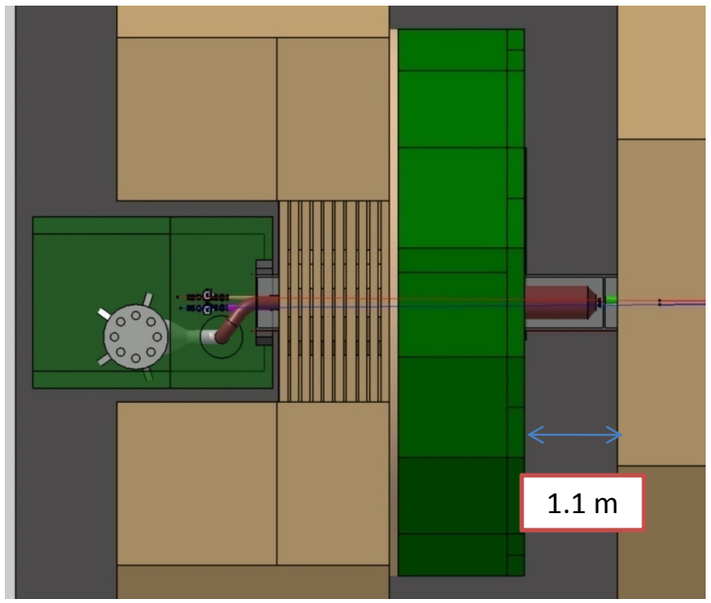
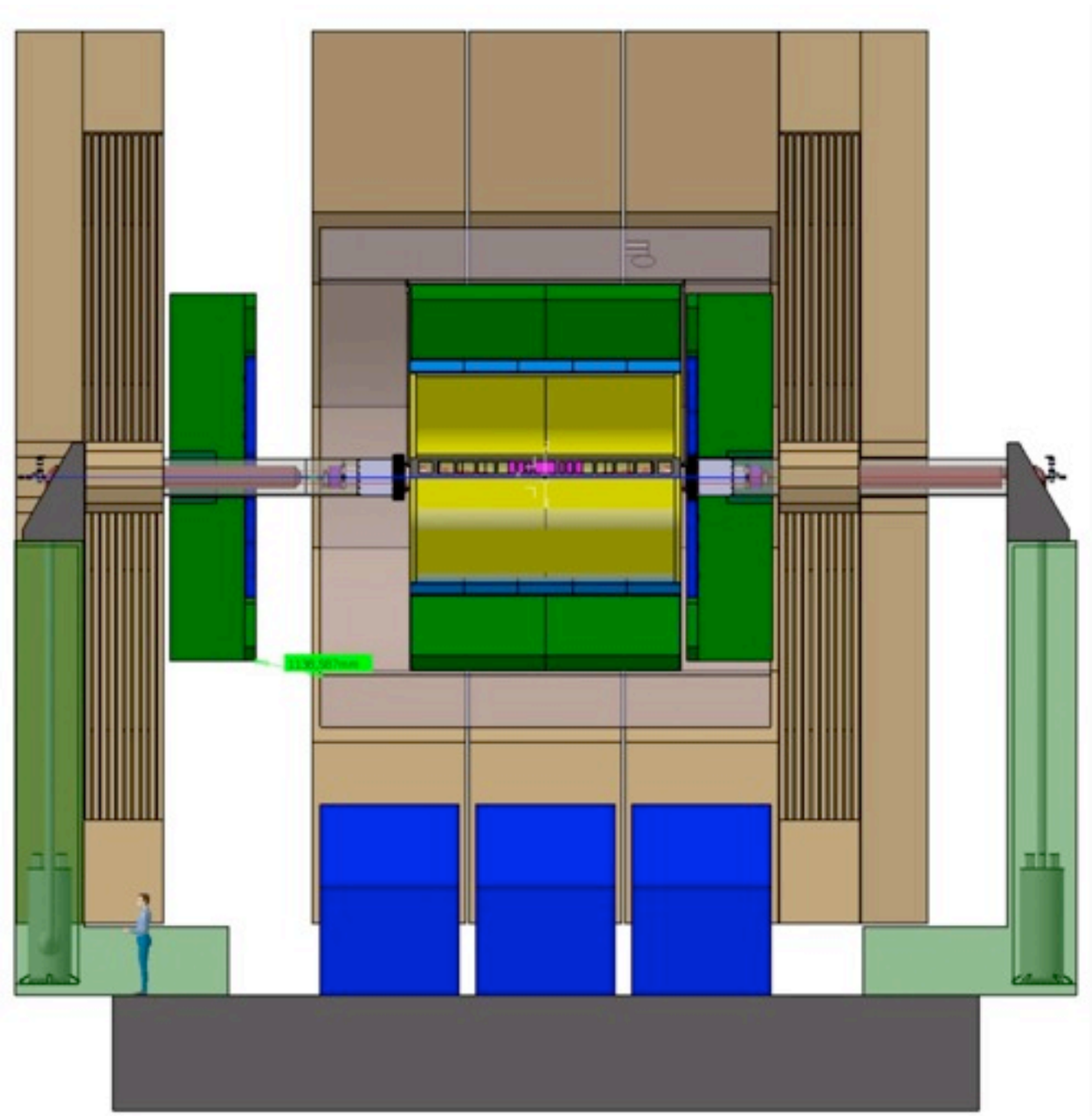
DESY

ILD Regional Integration Workshop
LAL Orsay
19. April 2011

Opening on the Beam (- or not)?

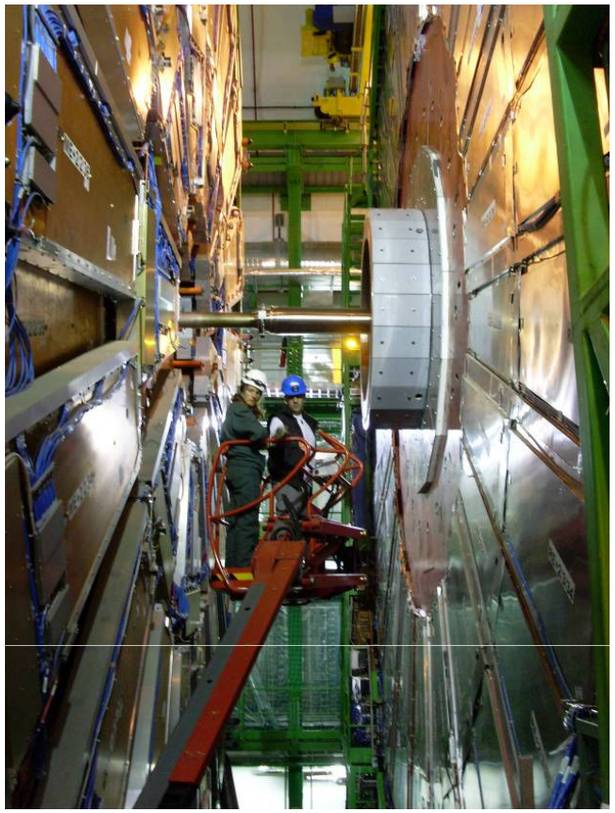
- Present design foresees opening of the detector on the beam:
  - Partially split endcap yoke allows ~1m wide access space between coil and endcap calorimeters
  - Allows for limited maintenance in the beam position(?)
  - Every major work would be done in the parking position - push pull!
- But:
  - A real engineering challenge which puts hard boundary conditions on many other things





Tools for Access

CMS Experience: it is not trivial to access a 1m wide space several meters above the floor (beam height is at 9m).



➢Small size cradle elevator (used for small interventions) :

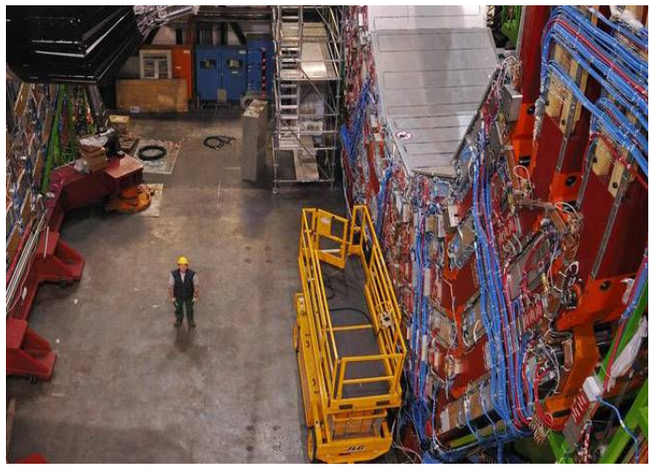
Needed place between endcap and barrel : 1.6 m

The overall size on floor of engine is 1.3 m

➢Crane truck (allowing heavier operation up to ≈full height) :

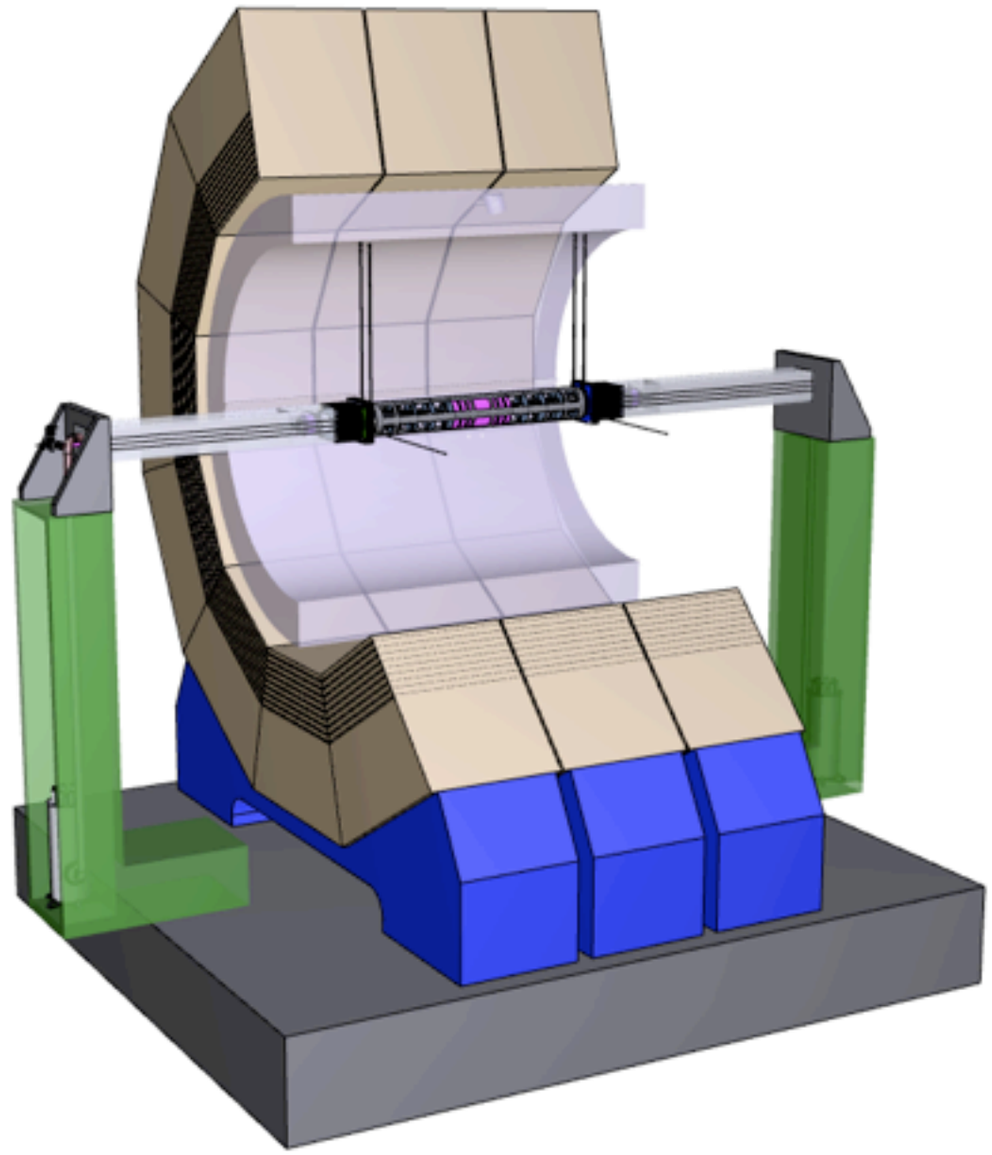
1.5 m on floor, 2 m needed for motion

+ On surface :
Scaffolding
Fixed and moveable



QD0 Support

- Movable yoke endcap makes QD0 support complicated
- QD0 supported by pillar outside of the detector and suspended on tie rods from the cryostat
- Monitored by interferometer, placed on actuators for alignment
- Vibration issues are under study
- Alternative QD0 support ideas are appealing



MONALISA Integration

- MONALISA requires vacuum pipes for laser beams attached to QD0
- Need to be disconnected remotely controlled when the endcap is opened
- Needs a lot of engineering work

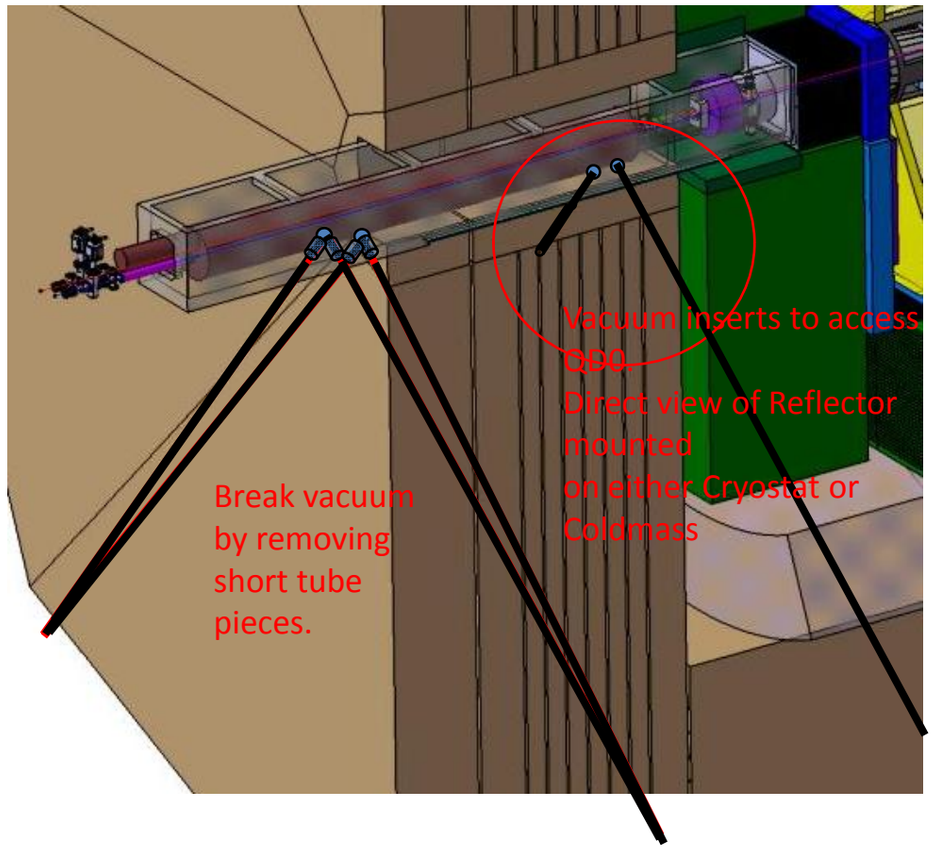
Case of Monalisa :

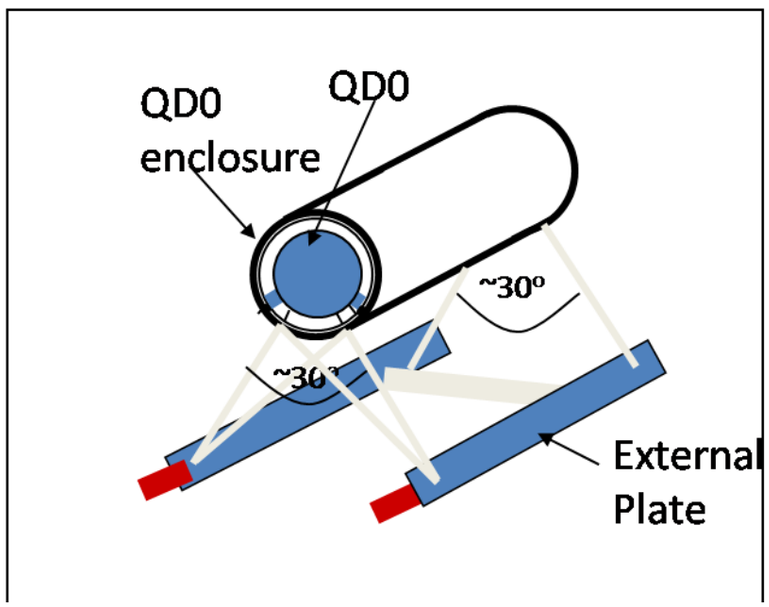
Final Doublet Stability and in-detector Interferometry

•4 entries on one side,

•2 on the other side,

•Lines going under the detector





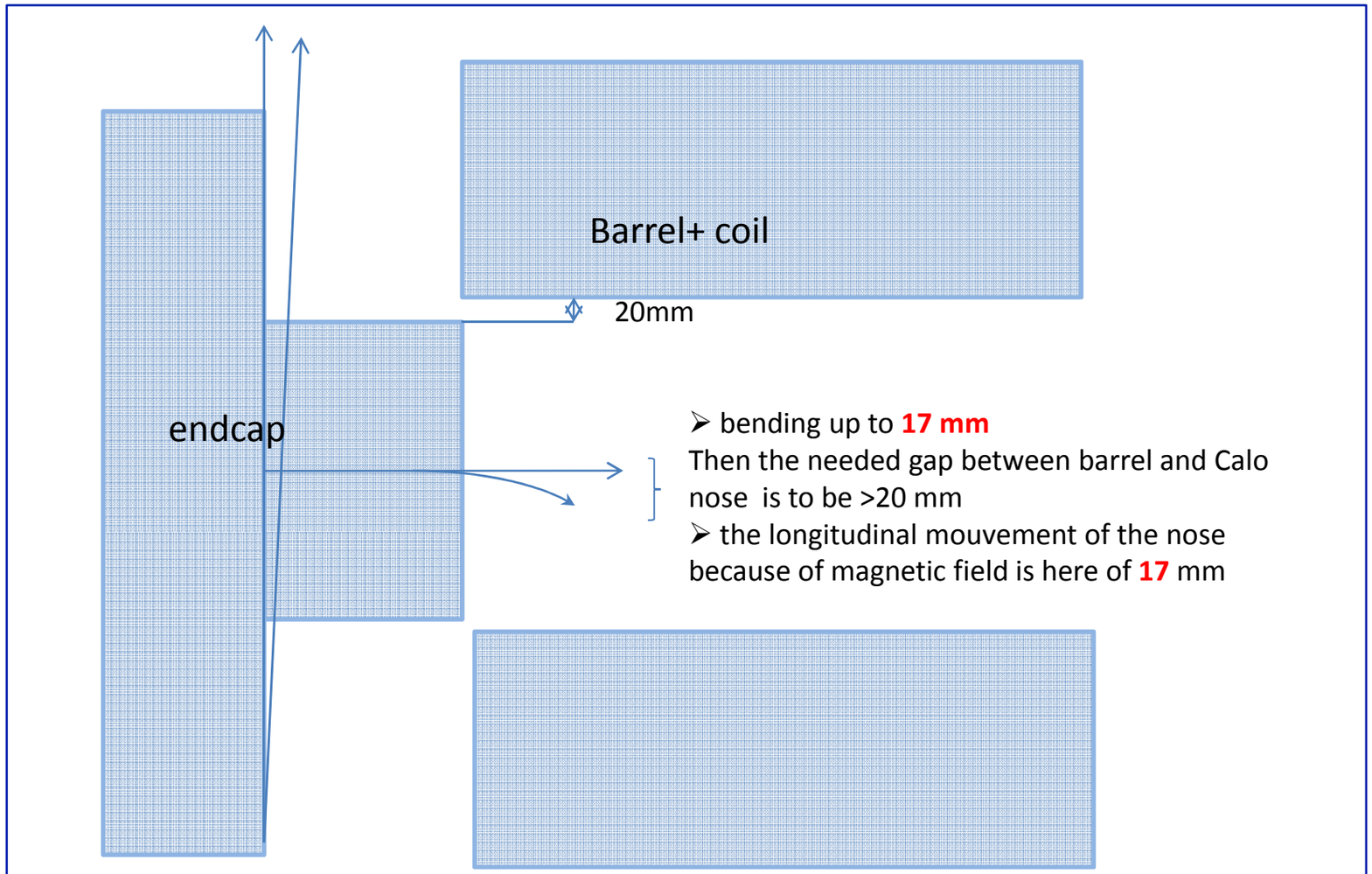
•It is an interferometric metrology system for continuous monitoring of position critical accelerator components

•Consists of a fixed network of evacuated interferometric distance meters with nanometre type resolutions over O(10m)

See David Urner's talk at LCSW08

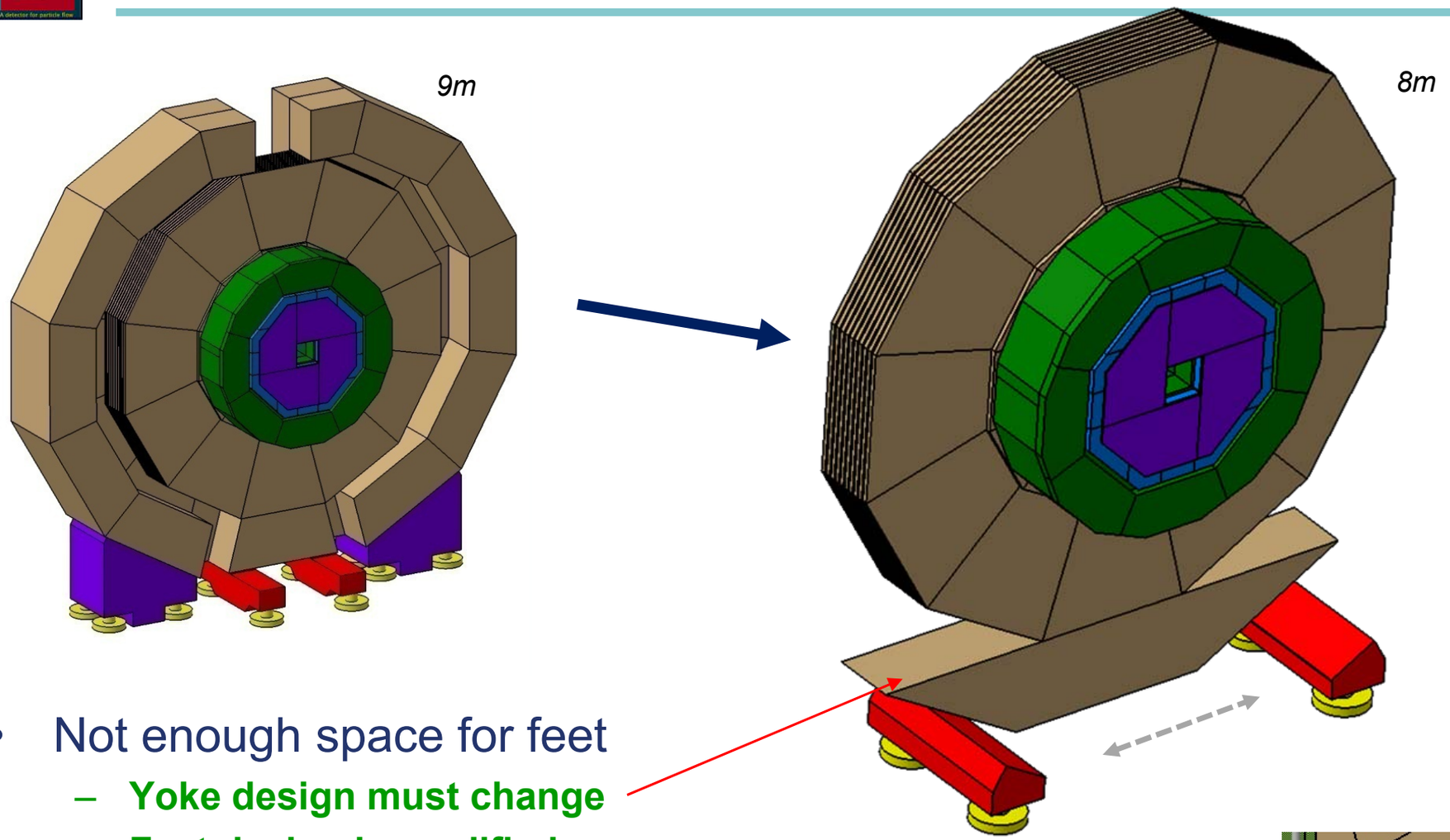
More CMS Experience

- Endcap deformations are in the order of 15mm
  - Will be better at ILD
- Ground deformations during movements can reach 5mm at a scale of 2m.
- Time for closing of the endcap is in the order of 1.5 days (sic!)
  - Has not been done very often so far. Learning-curve effects are expected
- Moving 3000t pieces in a delicate environment (beam pipe is 1mm) is not trivial and needs throrough engineering

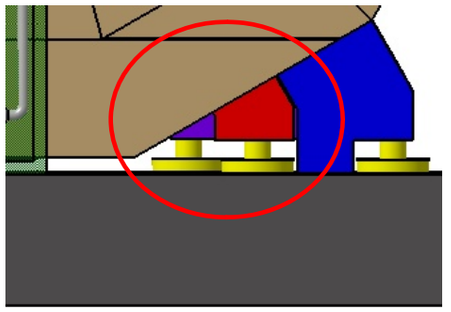


Reduced Beam Height - More Problems

First endcap ring

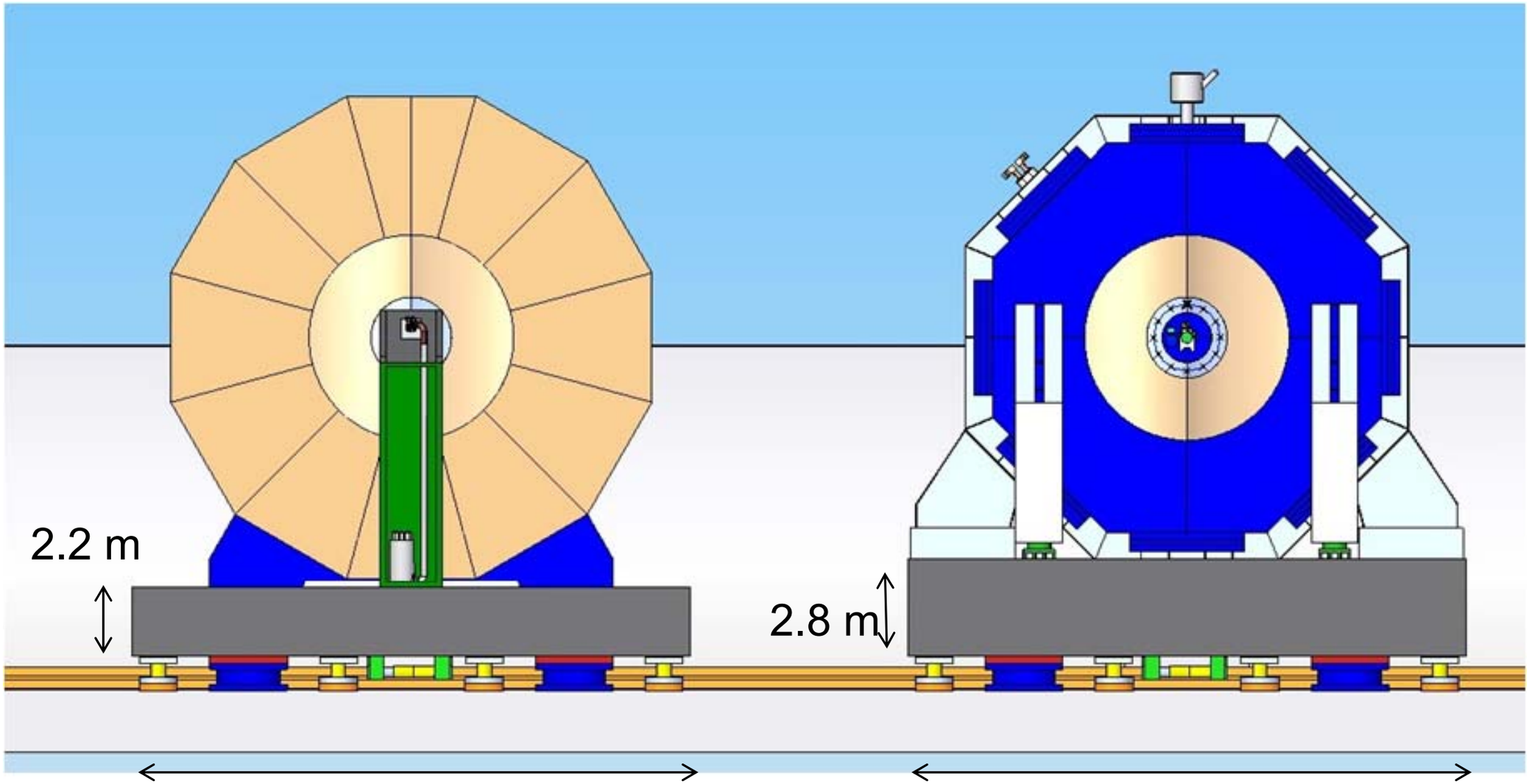


- Not enough space for feet
  - **Yoke design must change**
  - **Feet design is modified**
  - **Distance between feet is increased**
  - **Muons chamber must then be inserted horizontally**



Height Difference SiD/ILD Will Stay

New ILD and SiD on a platform

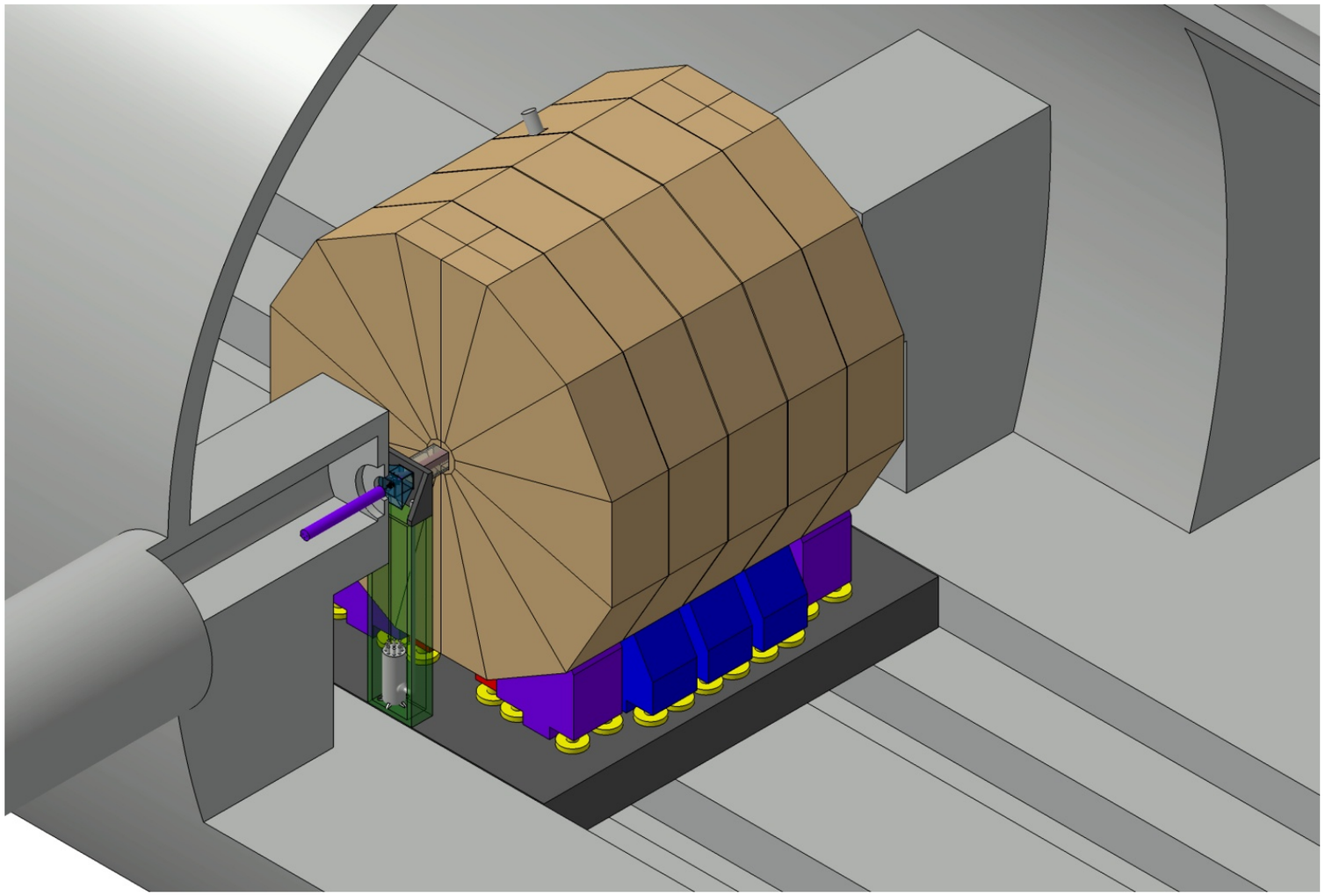


Floor height is different in parking positions, and cannot fit both at beam position

Boundary Condition for Platform

First consequence

- For opening on beam, the platform must take all the width of the cavern (18m)



To Open or Not to Open (on the beam)

- From the engineering point of view it would be much simpler to do maintenance on the detector only in the parking position
  - Push-pull will bring the detector to the parking position in one day
- Do we need the split-endcap even if we do not want to open on the beam?
- If we want to abandon the possibility to open on the beam, then we should apply formally to the ILD-JSB (or EB?)
  - Short document...