

LDC Detector Assembly Issues

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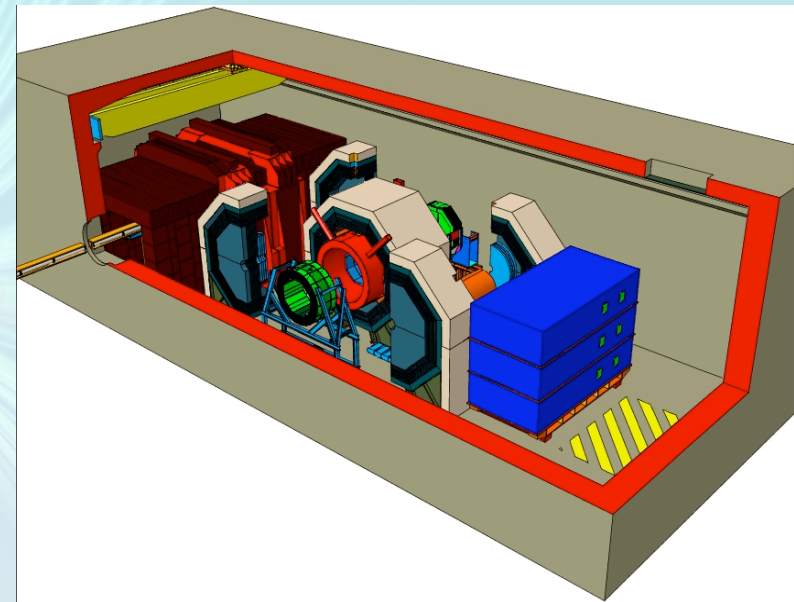
MDI Panel Phone Meeting
15. August 2006

Introductory Remarks

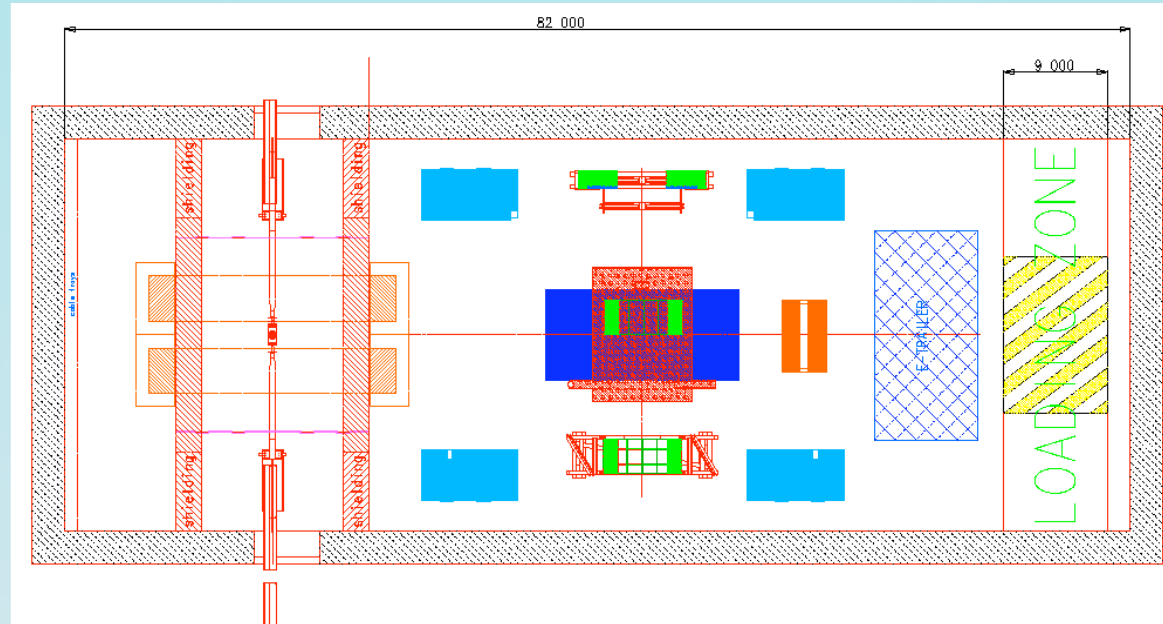
- August is not a particular convenient month in Europe to discuss technical issues
 - Everyone's on the beach
- I tried to discuss the thoughts presented here in this talk with some LDC people and some DESY people who were involved in the detector integration issues for TESLA
- No conclusive discussion has been done within the LDC community
- **Basically all I will present is therefore my personal opinion**

Starting Point

- Starting point is the engineering design which has been developed for the TESLA detector
- LC-DET-2001-045
- Assumptions:
 - Need a detector hall large enough to allow for a parking position for the detector which allows for independent beam operations during detector assembly and maintenance
 - Underground assembly of the detector



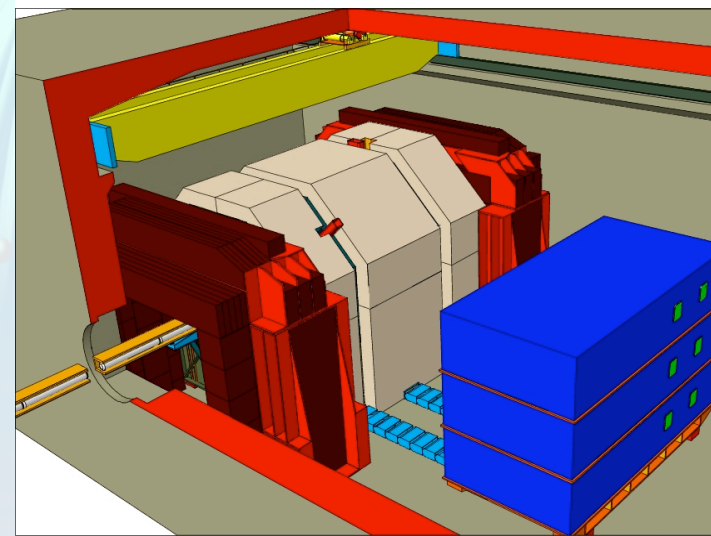
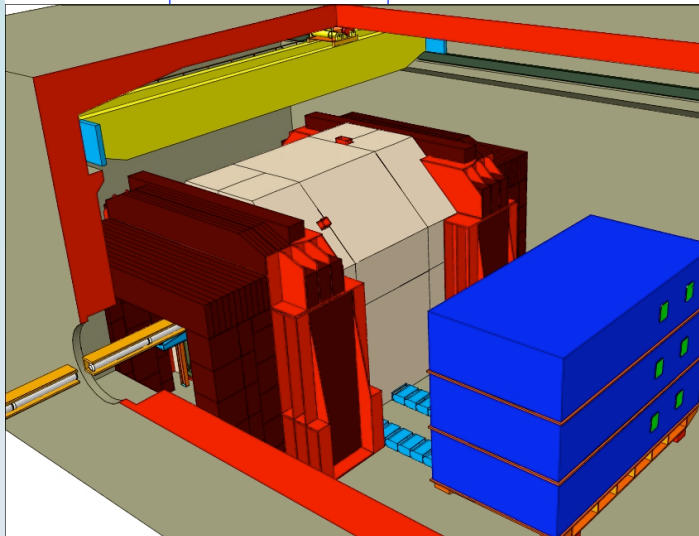
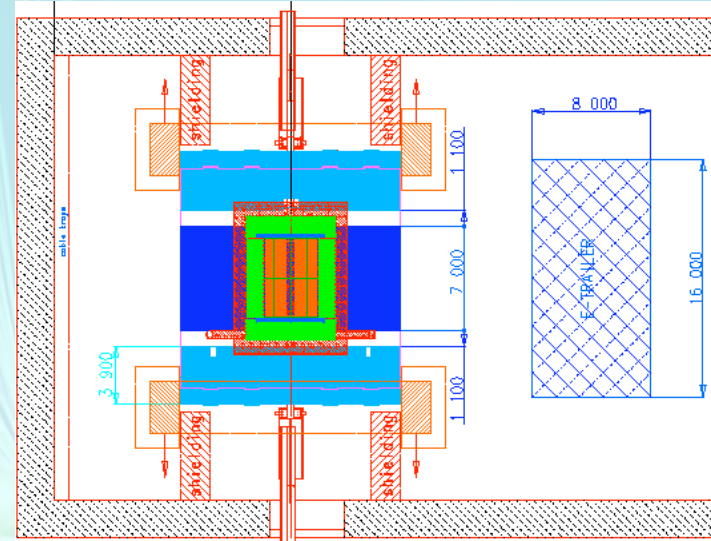
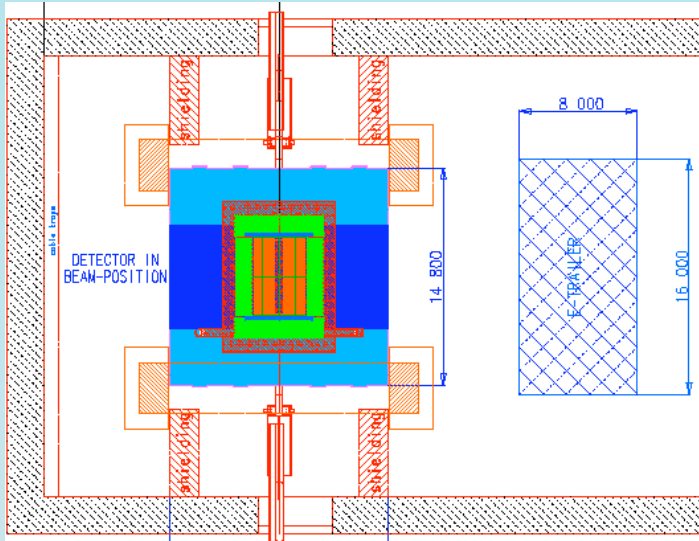
TESLA Detector Hall



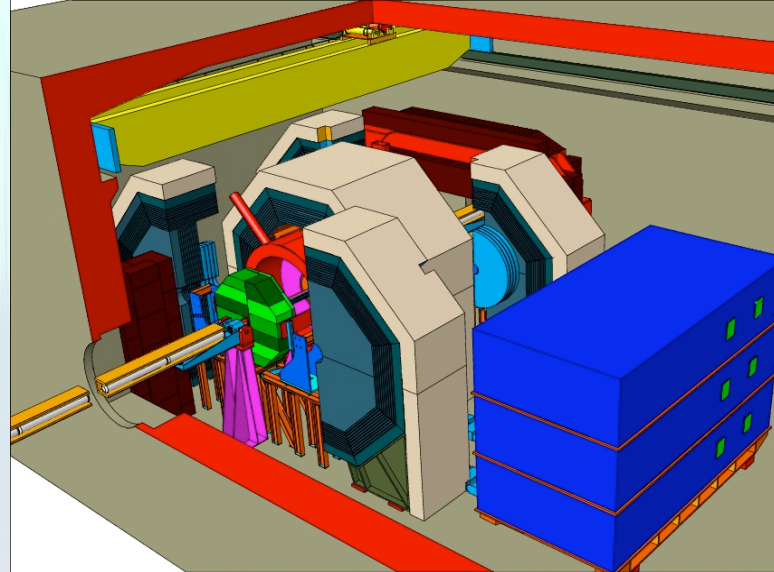
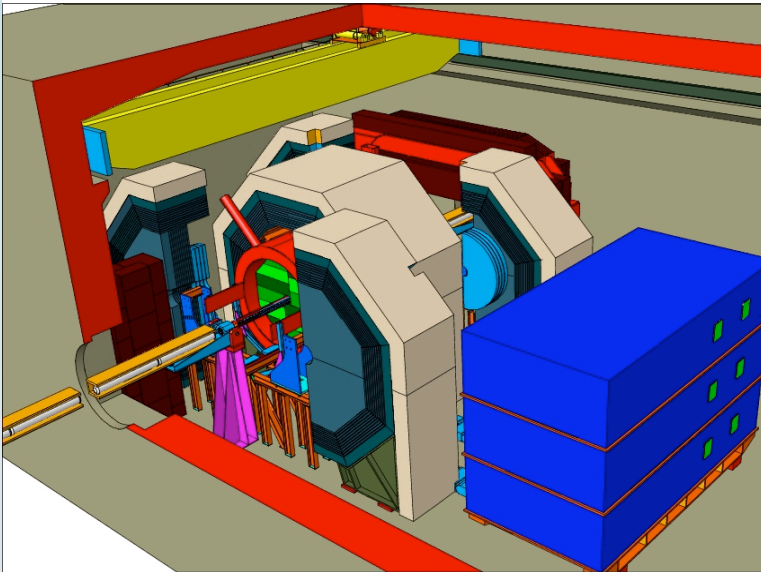
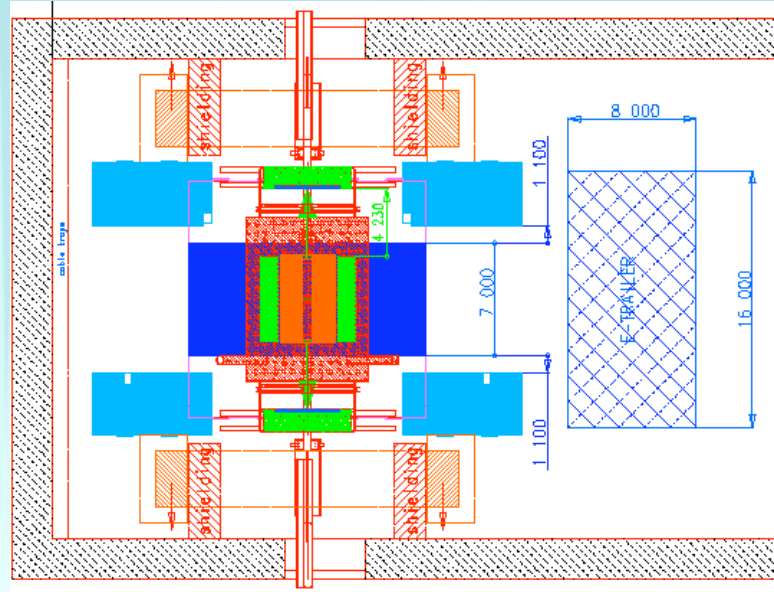
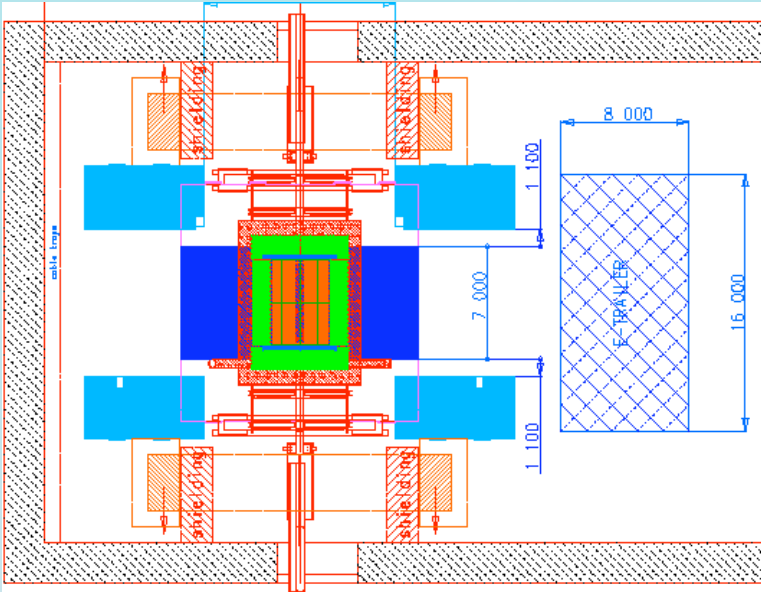
- Hall size: 82m x 30m
- Beam position: 16/66m away from left/right wall
- Beam height: 8m above floor
- Crane hook: 19m above floor
- Access shaft: 9m x 16m
- Cranes: 2 x 80t

Opening Sequence

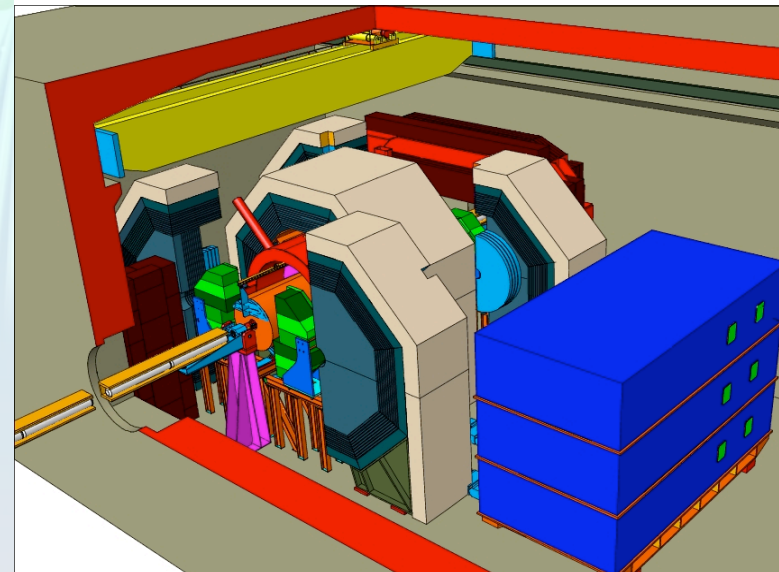
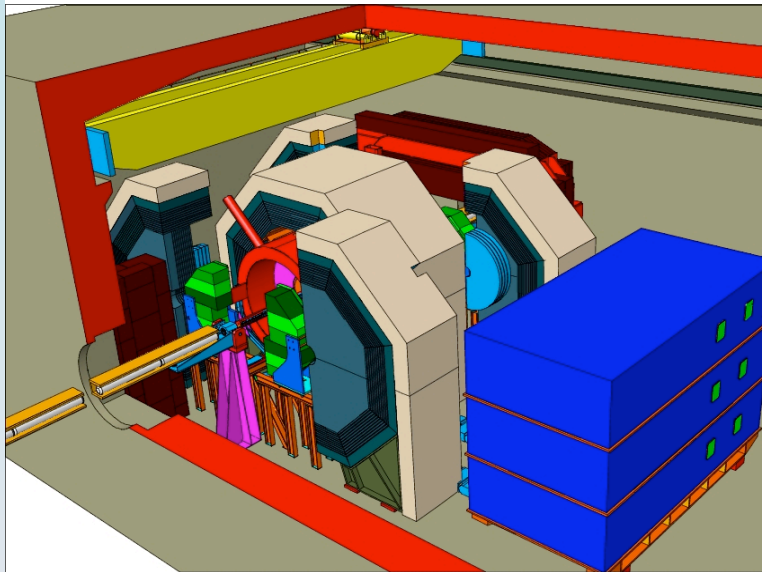
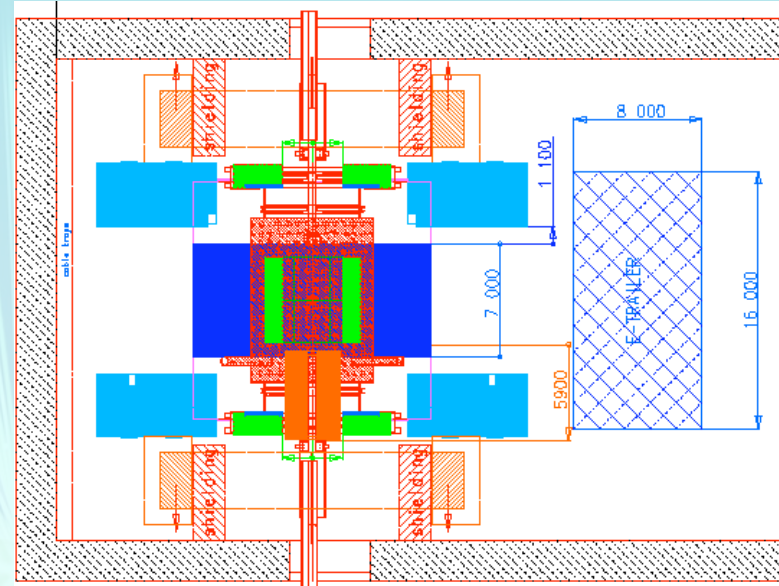
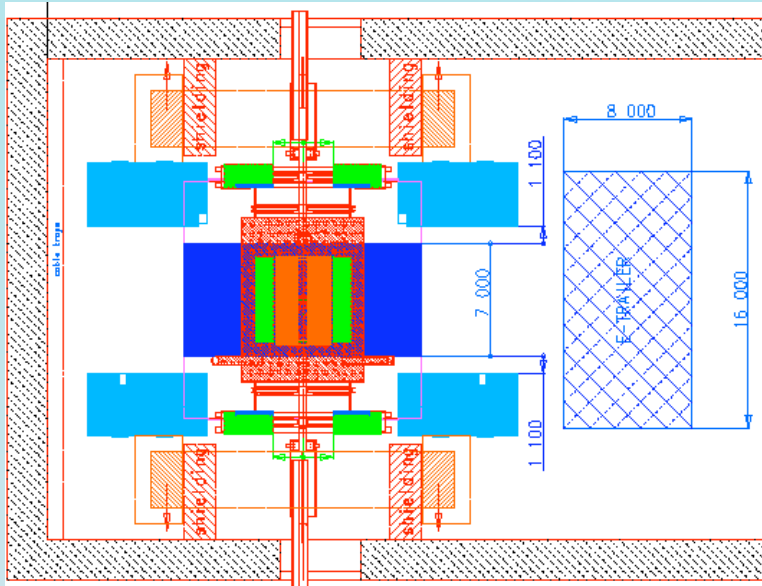
- Opening the detector for maintenance at the beam position:



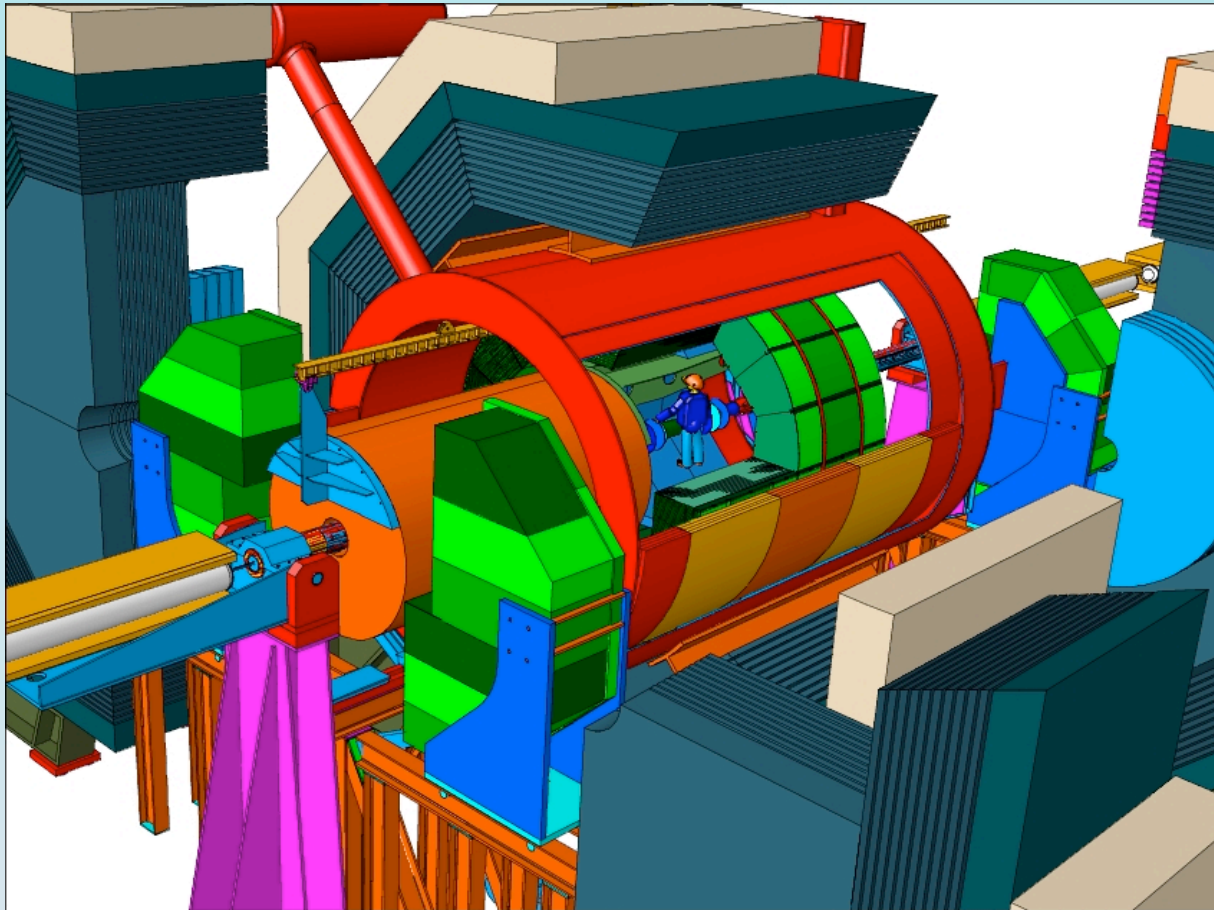
Opening Sequence II



Opening Sequence III



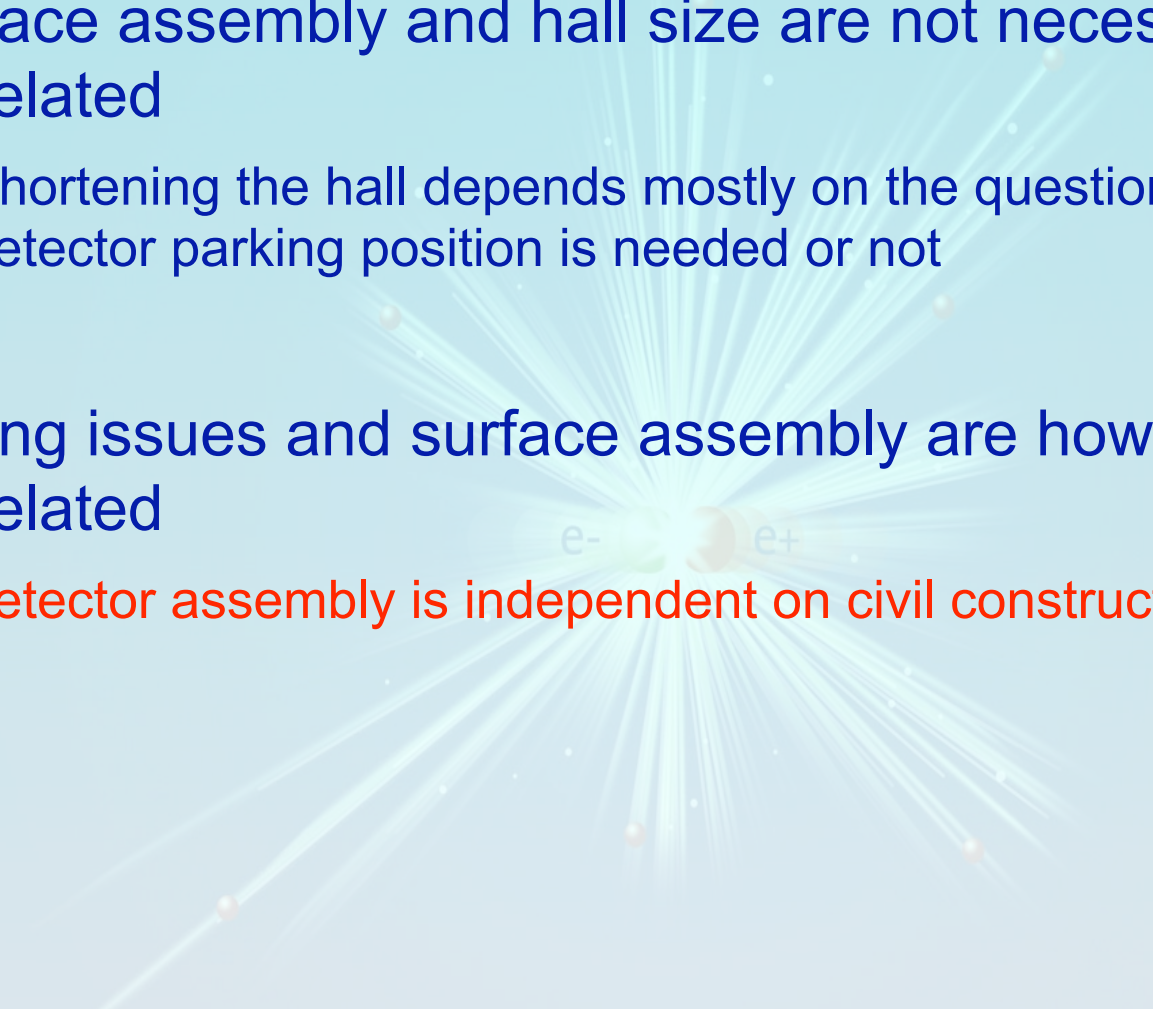
Maintenance Position ,on the beam‘



- Maintenance position allows access to the inner tracking system

Surface Assembly Issues

- Surface assembly and hall size are not necessarily correlated
 - Shortening the hall depends mostly on the question whether a detector parking position is needed or not
- Timing issues and surface assembly are however correlated
 - **detector assembly is independent on civil construction!**



- CMS experience:
 - Detector commissioning cannot be done completely on the surface
 - Need for doubling of resources like cables, gas systems, cooling, etc
 - Commissioning takes place on surface as far as possible, break for lowering of the detector of several months, commence commissioning underground
 - ATLAS: started cosmic runs some time ago, gradually increases complexity by installing detector components
 - If interference between detector and machine construction is expected, a parking position underground might be needed also in case of surface assembly
 - Otherwise there must be a period (some months before the start) when the detector gets full control of the underground facility

- Assemble and commission detector parts as far as possible on surface
- Central yoke ring (shortened to ~2.7m) and coil probably have to be lowered together
 - depends on crane capacity underground
- Barrel calorimeter will probably also be installed before lowering
- Weight of this largest component: ~2000t
- Size: 13 x 7m

9.1 Weight of Detector Components

Component	Weight per Module	Number of Modules	Total Weight
Central Yoke Ring	-	1	~4000t
Cold Mass (Coil with Vacuum Tank and Cryostat)	-	1	~200t
HCAL Barrel	15.3t	2 x 16	~490t
HCAL End Caps	49t	2 x 4	~392t
ECAL Barrel	~2.83t	8 x 5	~113t
ECAL End Caps	5.18t	2 x 4	~42t
TPC and FCH	~5t	1	~5t
Sum Central Part			~5240t
Corner Half Shells	~1600t	4	~6400t

TESLA Numbers!

Minimal Requirements for Surface Assembly

- Assuming surface detector assembly and no need for independent detector parking position:
 - Hall size: 30 x 45m
 - Distance between beam and wall: 12.25m (14m - half concrete wall) is somewhat tight
 - Yoke corners are 6m wide, have to slide back by ~6m to allow for the extraction of the calorimeter endcaps and the TPC
 - Concrete shielding outside of the yoke (additional 1m) can be made thinner on that side?
 - Biggest part: shortened barrel yoke ring mounted with coil and barrel calorimeter
 - Shaft size: 14 x 8m
 - Temporary crane: 2000t
 - Permanent crane (surface - bottom): 120t (calorimeter endcap)
 - Hall crane (bottom): 80t

Summary

- There is at first glance no show-stopper to prepare LDC for surface assembly
- Detector maintenance can be done with the detector in the beam position
- Detector hall size is a question of the need for a parking position
- Timing issues favour surface assembly
- Detailed engineering design for LDC needs to be done!
- Surprises might come!
- Discussion with LDC community is still ongoing