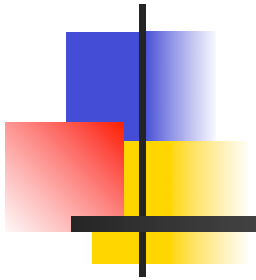
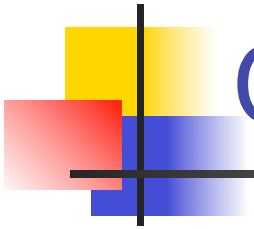


ILD Platform Based Push-Pull Detector Movement

Uwe Schneekloth
DESY

19.10.2010
IWLC 2010, Genève



Outline

- Detector Assembly
- Detector Opening
- Push-Pull using Platform
- Push-Pull without Platform
- Conclusion

K. Buesser[1], C. Clerc[2], M. Joré[4], B. Krause[1], A. Petrov[1], U.Schneekloth[1],

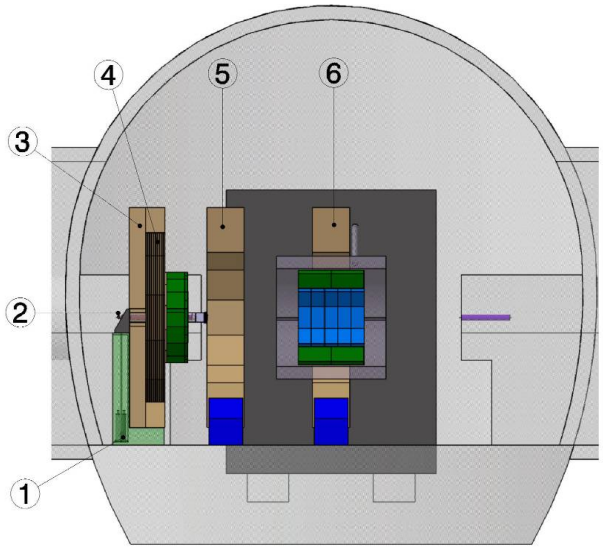
K. Sinram[1], R. Stromhagen[1], A. Petrov[1], Y. Sugimoto[5], T. Tauchi[5]

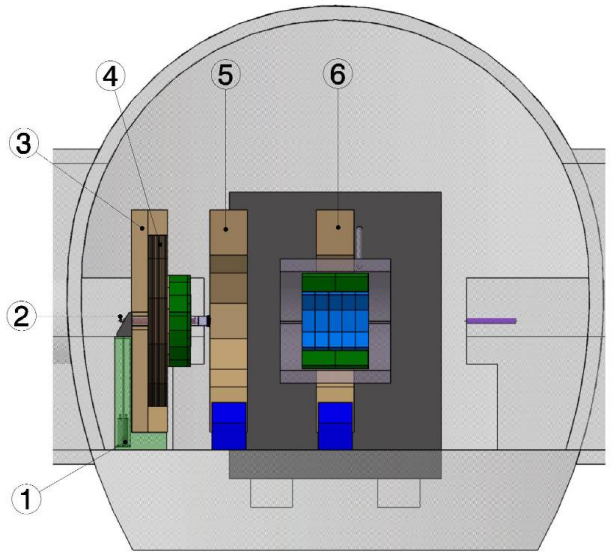
[1]DESY, [2]LLR, [4]LAL, [5]KEK

Detector Assembly

Detector assembly similar to CMS

- Detector pre-assembled on surface
- Large independent sub-assemblies lowered into experimental hall
- Barrel consisting out of three ring barrel wheels
- Each end-cap consisting out of two (or three) parts

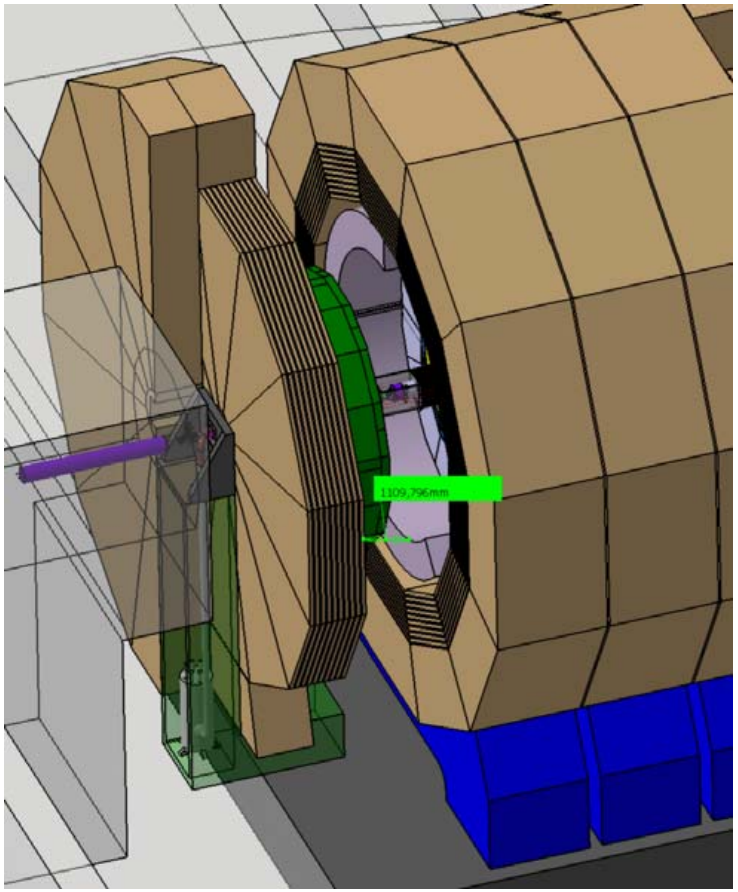




Detector Opening

Detector opening foreseen in parking and in beam position

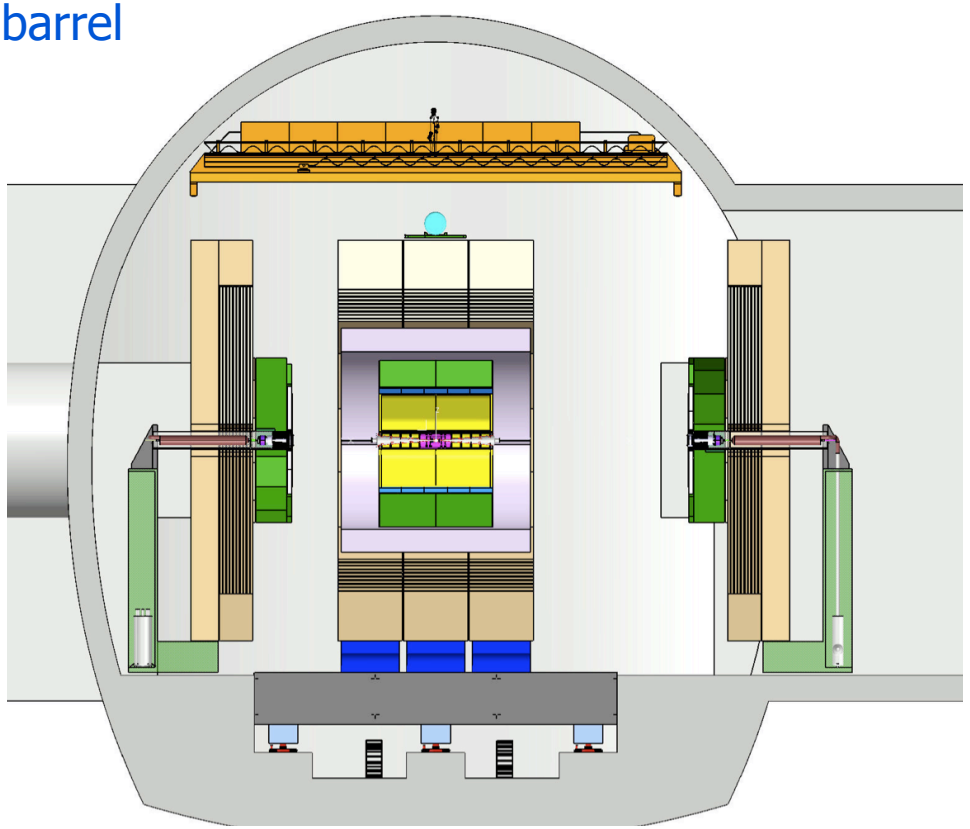
- Beam position
  - End-caps can be opened Limited access to EC and barrel and some inner sub-detectors



Detector Opening

Detector opening foreseen in parking and in beam position

- Parking position
  - End-caps and all three barrel wheels can be opened
  - Access to all detector components possible



Push-Pull Concept

- ILC Detectors and in particular final beam line elements have to be positioned and aligned very precisely
- Ideally, the detectors should not be moved, at least not frequently, out of or into the beam position
- Push-pull concept was introduced due to financial reasons not to improve the setup
- Frequent push-pull requires detector moving mechanism to be optimized for fast moving in and out
- Detector moving to be designed to be fast and not complicated

Push-Pull using Platform

- Reduce vibrations during movement
  - Initial concern was vibrations on cold mass during movement while solenoid cold
- Keeping inter-alignment of detector parts
  - Barrel wheels and end-cap parts can be aligned on platform in parking position
  - Time for alignment in beam position is reduced
  - Calibration requirements are reduced
- Movement directions are decoupled
  - Push-pull movement (transverse) is done by platform
  - Detector opening is done by longitudinal movement of end-caps or barrel wheels
  - One dimensional movement systems easier, can be optimized
- Floor behavior is decoupled from detector mounting
- Platform separates push-pull moving system from detector
- Damping or earth quake damping systems could be implement underneath platform
- Best compatibility with ILD assembly and opening procedures

Push-Pull without Platform

Present design of ILD

- Common (push-pull) movement of barrel wheels not possible
  - Solenoid extends over all three barrel wheels
  - Would need rigid connection between barrel wheels
- Common (push-pull) movement of barrel and end-caps not possible
  - Would need rigid connection between barrel and end-caps

Push-Pull without Platform

Common rigid frame for barrel wheels, barrel end-caps and inner outer end-caps connection

- Fixed frame should severely limit access when detector is open
  - Access between barrel and end-cap, access between barrel wheels ("cherry picker", scaffolding or crane access like at CMS)
- Mounting/dismounting removable frame would be too time consuming for fast push-pull operation
- Outer frame would add added magnetic material and weight
  - Adding iron would modify the magnetic stray field and forces (CMS experience)
- Outer frame may lead to re-design of the assembly procedure
- Distribution of outer forces during movement much more complicated with outer frame. Frame coupled to barrel wheels and end-caps
  - Sheering force may result into misalignment of detector parts

Conclusion

- Push-pull is a delicate operation, which has to be performed reliably, fast and without complications, e.g. mis-alignment of detector parts during movement
- Adequate moving system is essential, which fulfills these requirements
- Present design of ILD, relying on concrete platform for the moving system, fulfills the requirements
- Connecting barrel wheels, barrel end-caps and end-caps part using an outer frame has severe disadvantages