Update on CLIC cavern and detector

ILD Workshop, Fukuoka, May 21-25, 2012

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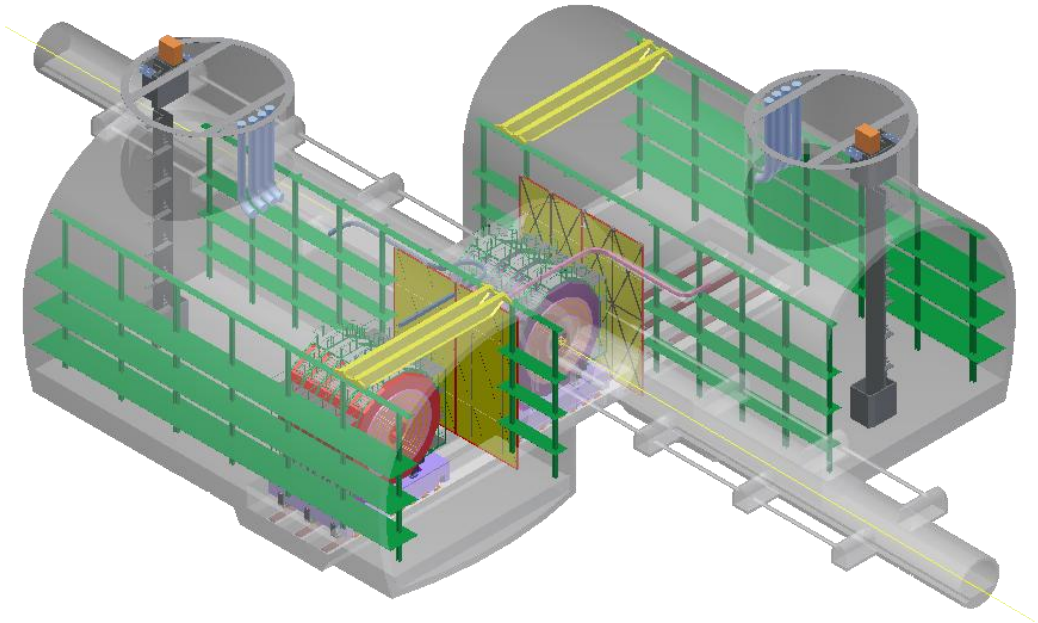
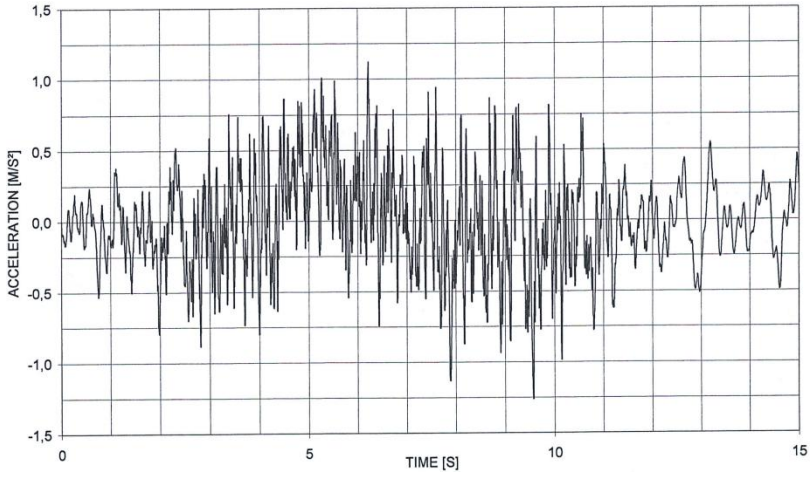
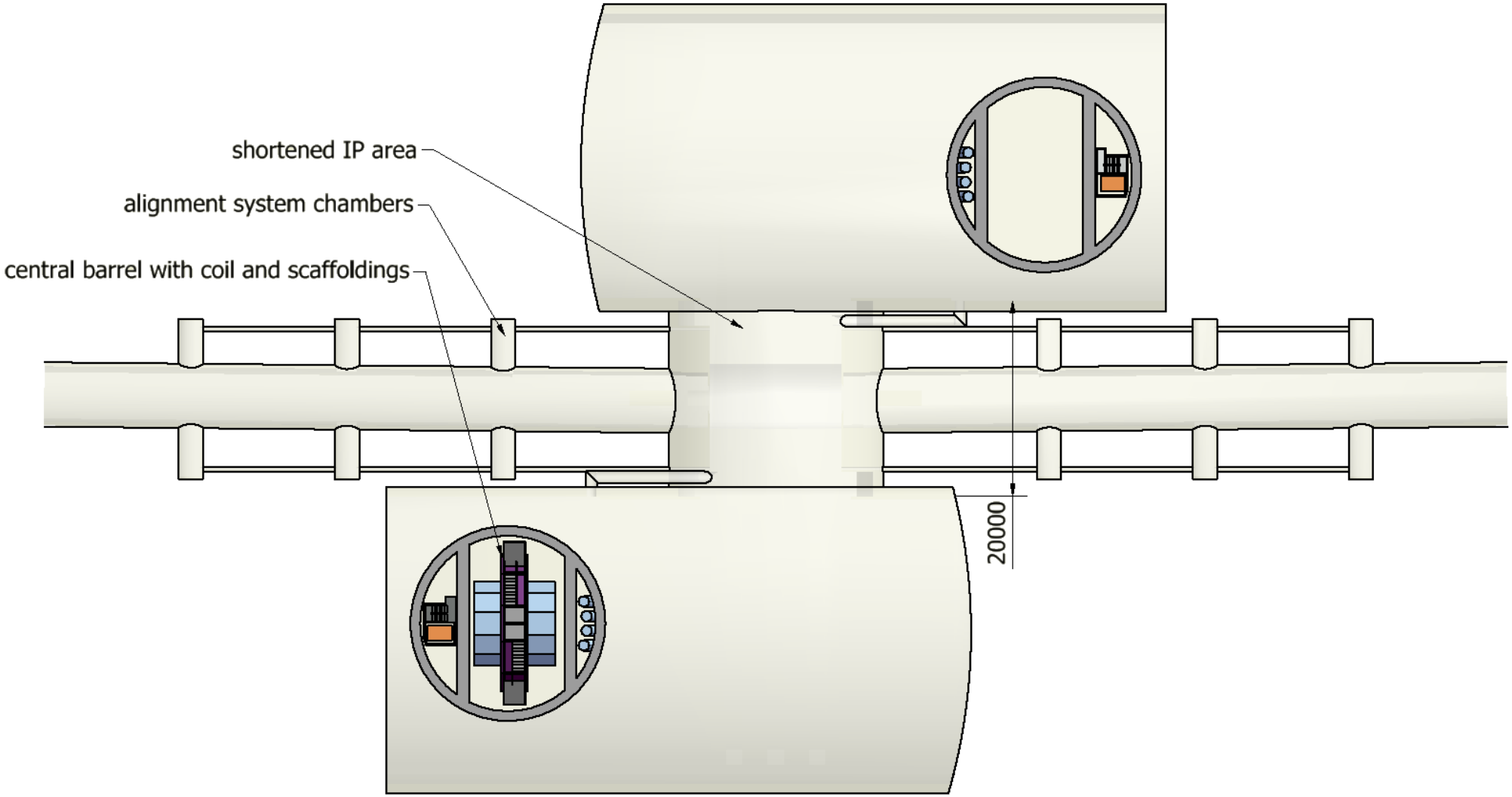
Outline

- Overview
- Platform updates
- Pit and plug consideration
- Seismic issues



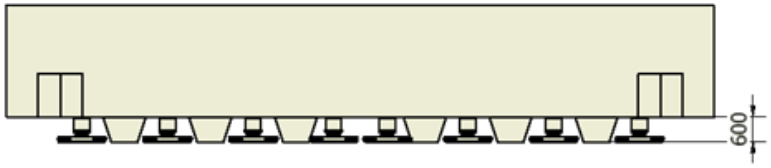


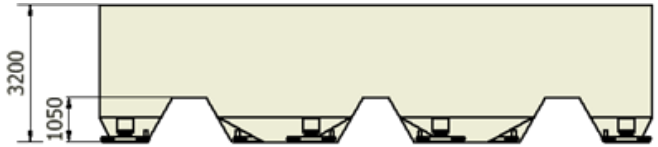
Top view

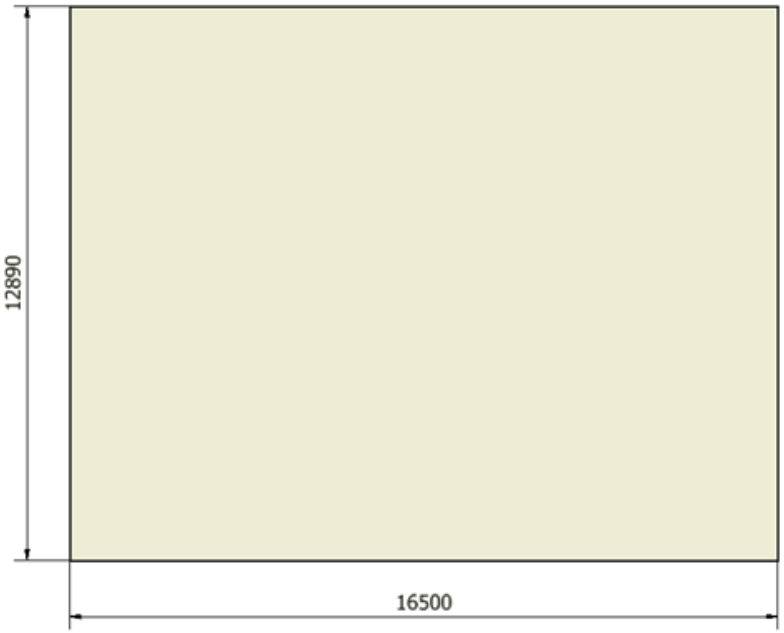

shortened IP area
alignment system chambers
central barrel with coil and scaffoldings
20000

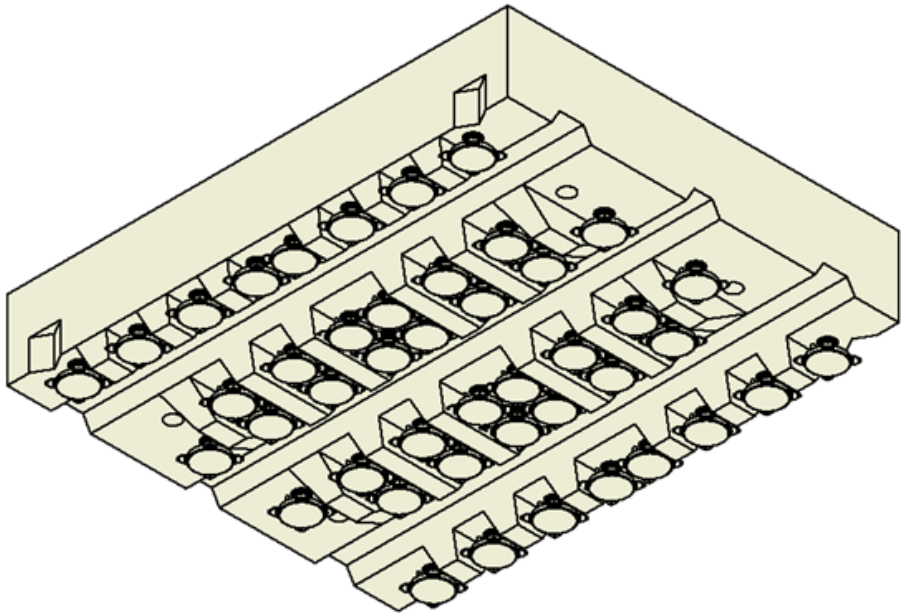
Latest platform issues

- Following comments from ARUP :
  - Thickness of the platform was increased
  - Relocation of supporting feet and change in the airpads layout

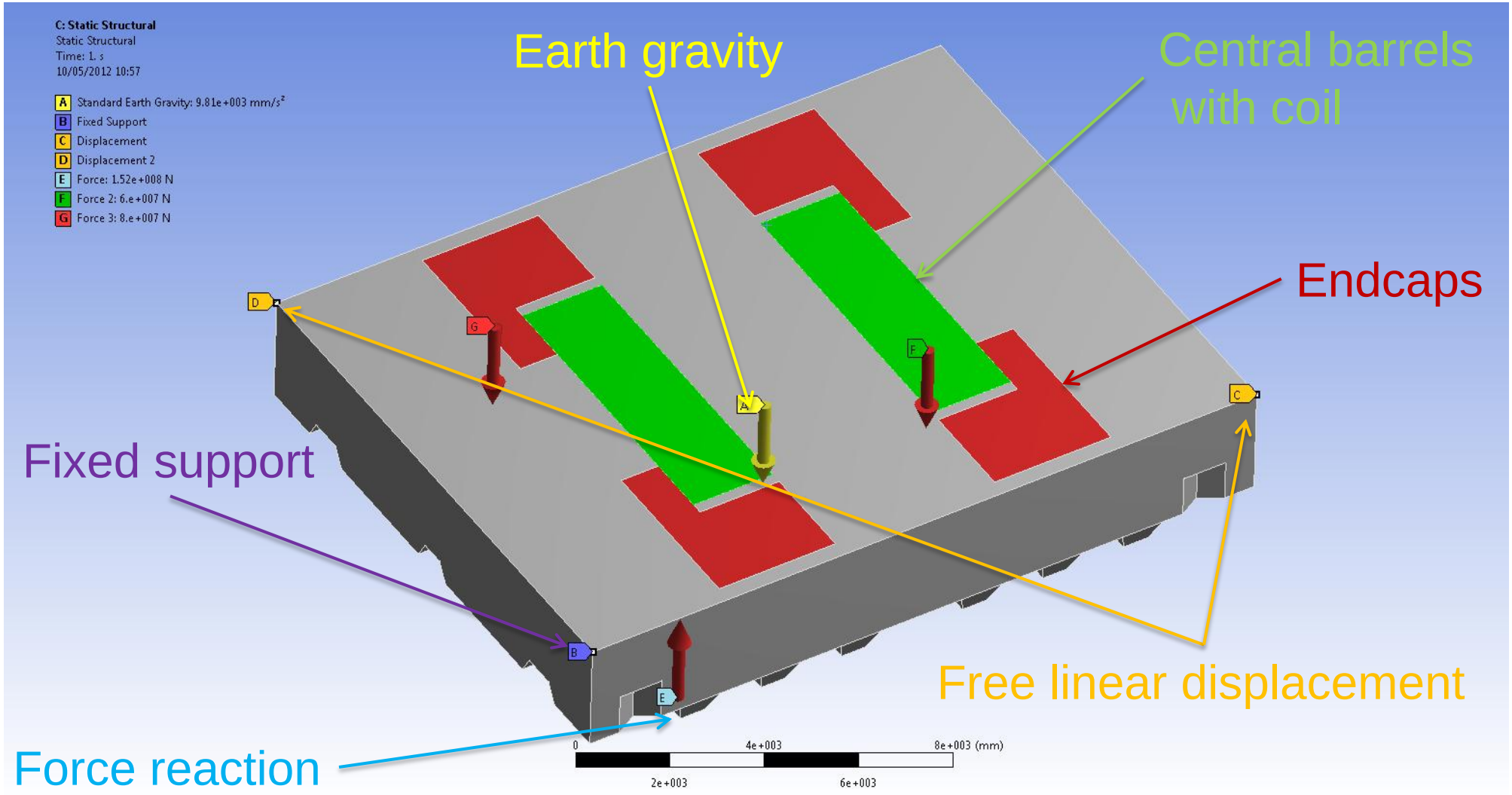




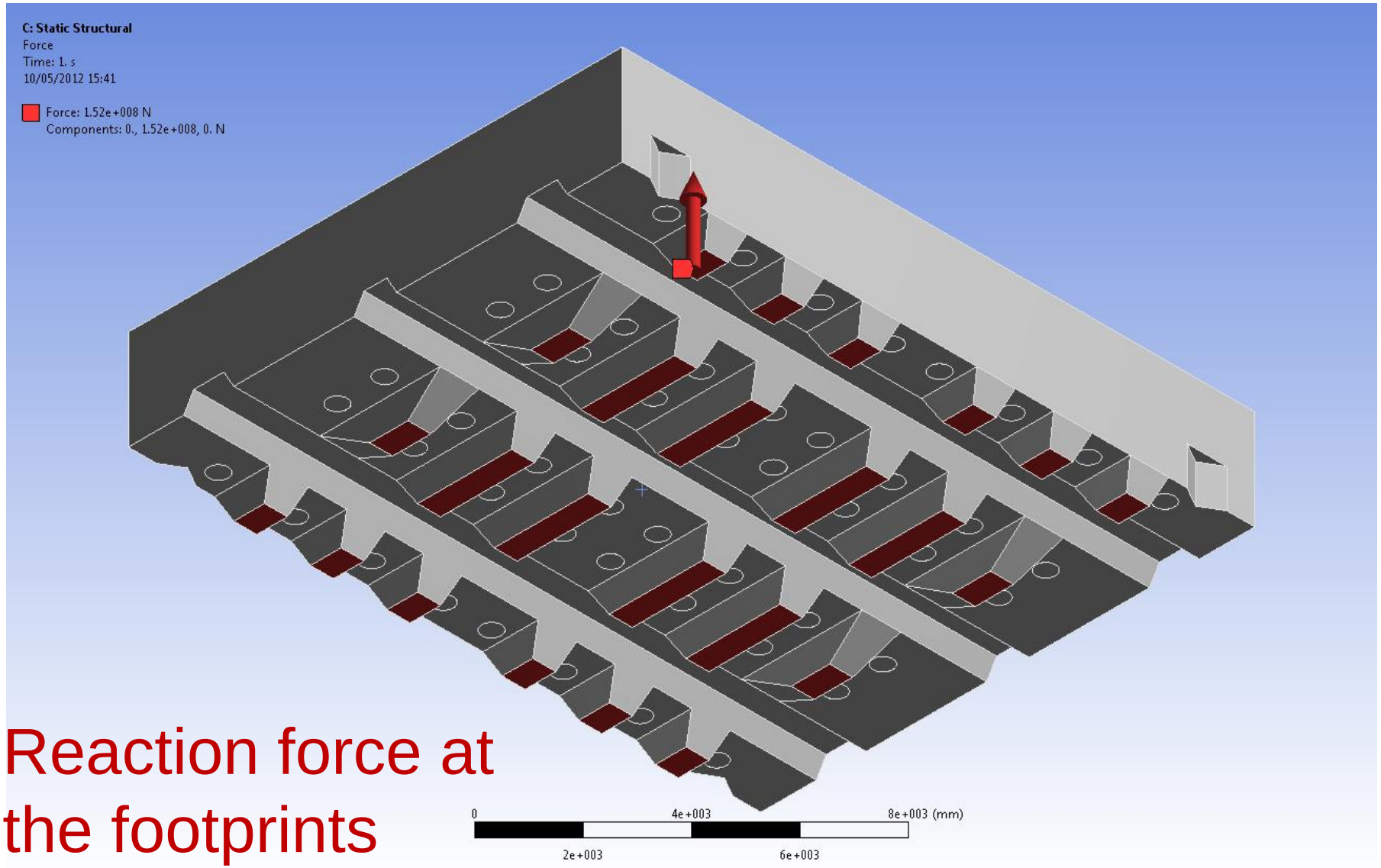




Loads applied to the platform

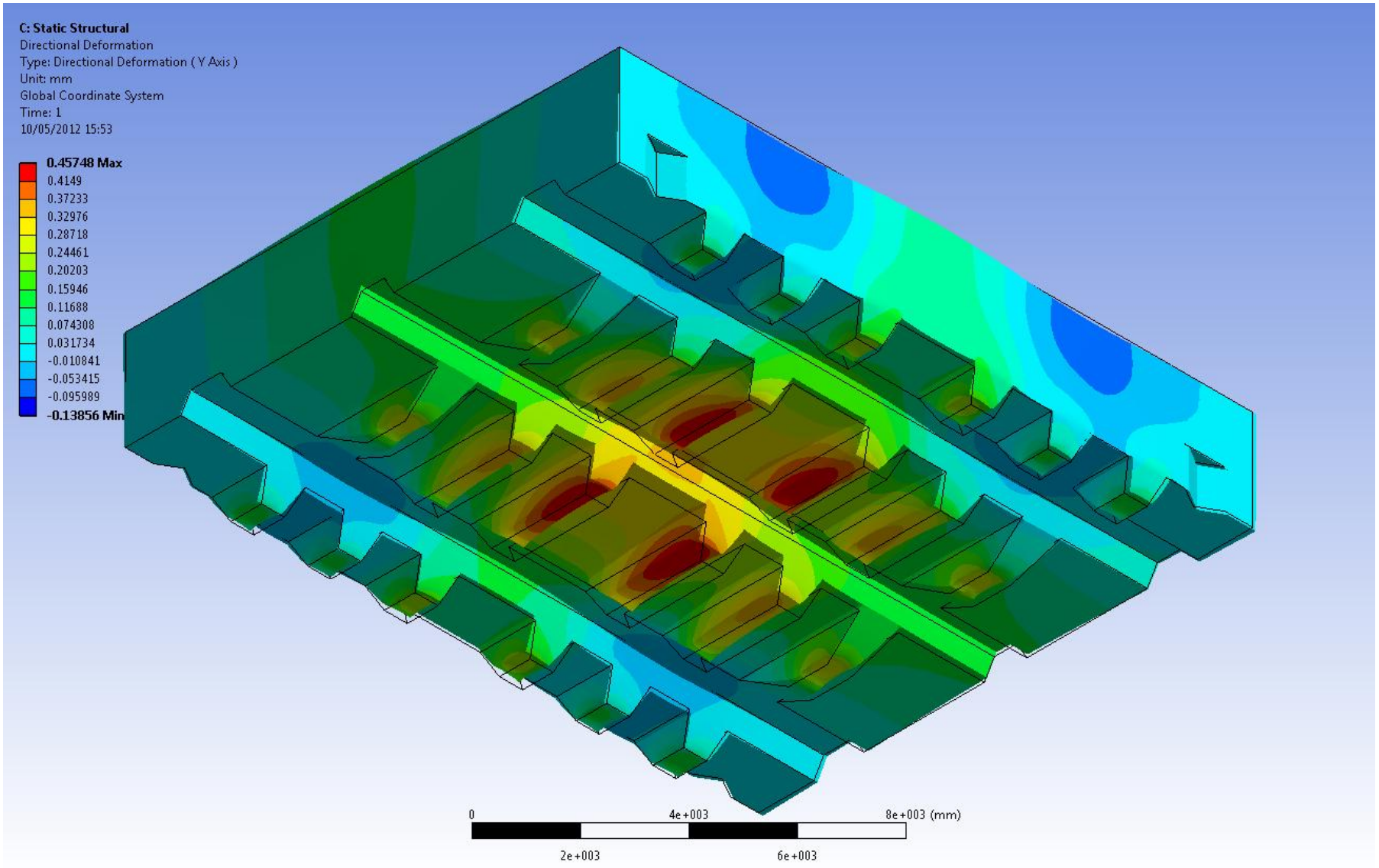


First case – platform on own feet

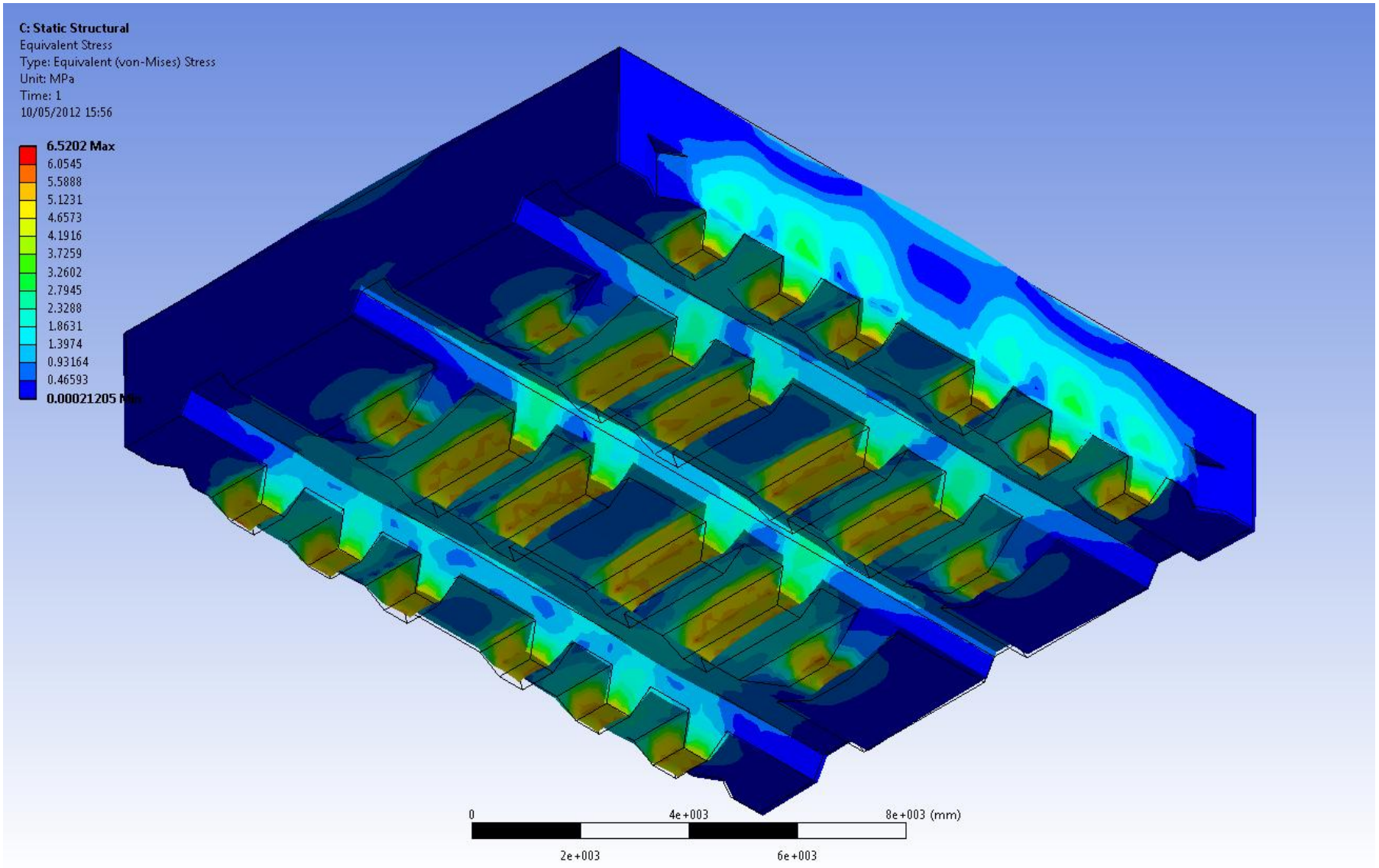


Reaction force at the footprints

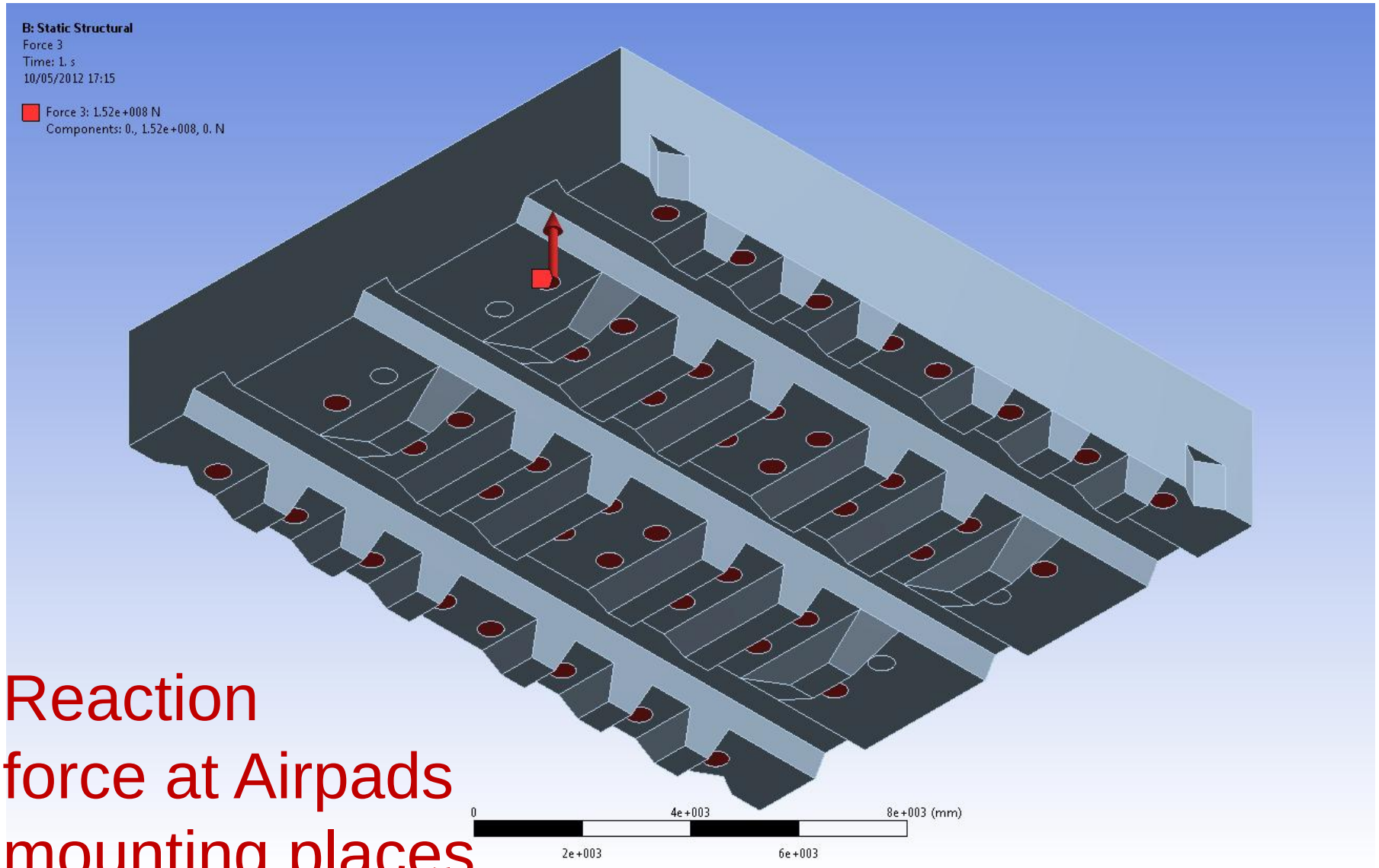
Deformation – maximum value 0.46[mm]



Equivalent stress – max 6.52 [MPa]

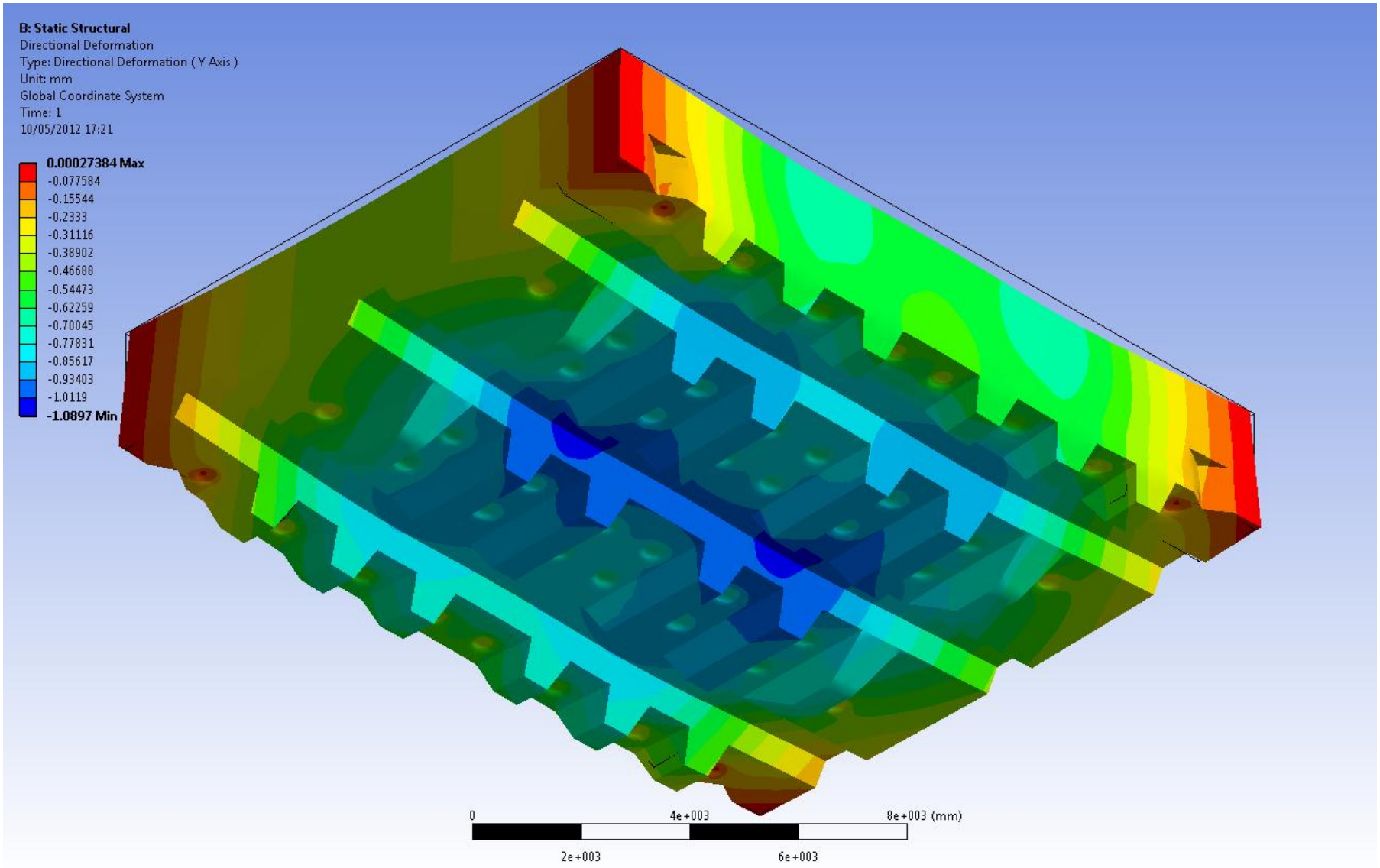


Second case – platform on Airpads

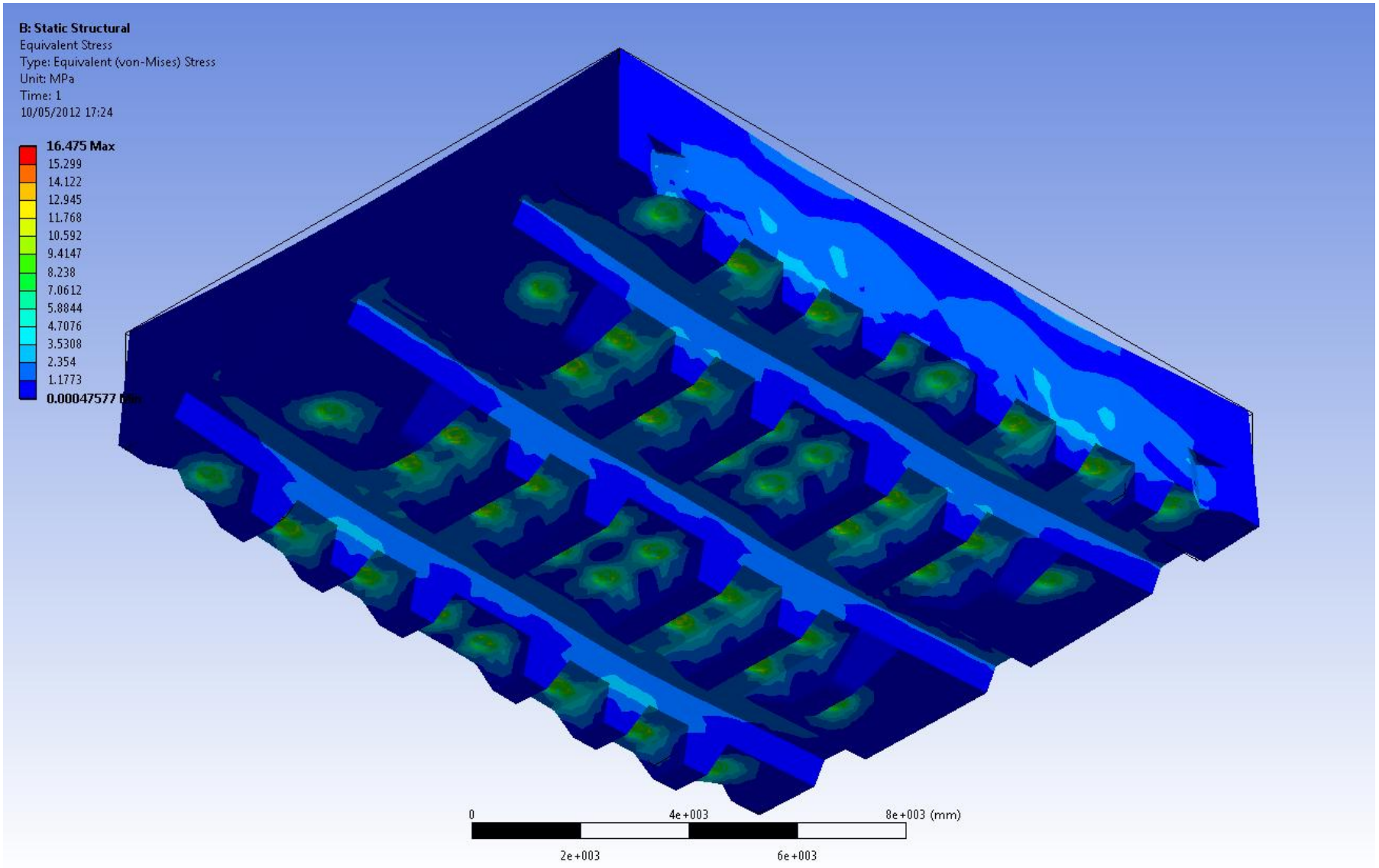


Reaction force at Airpads mounting places

Deformation max -1.09[mm]

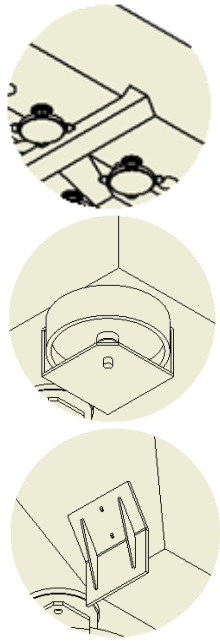


Equivalent stress – max 16.48[MPa]

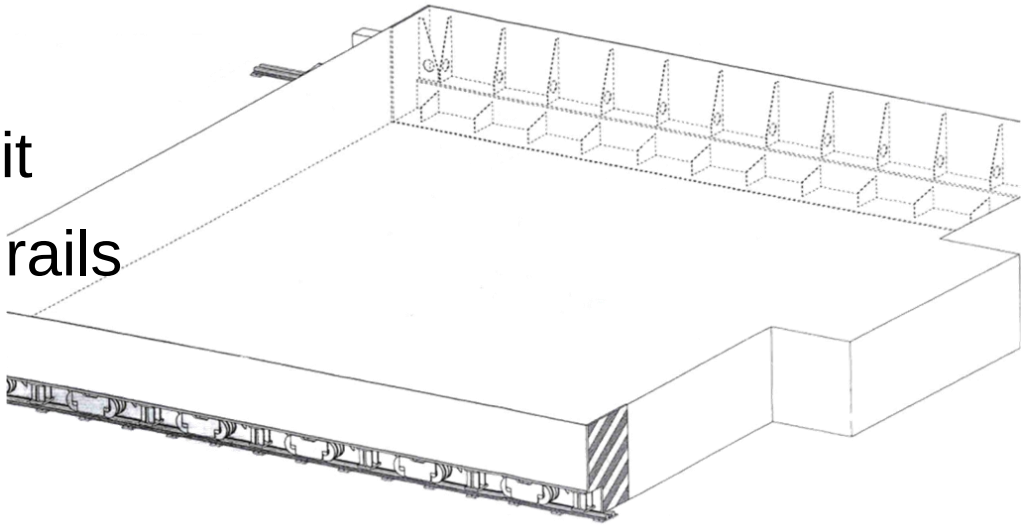


Platform - summary

- The deformation is smaller than allowed in requirements 2[mm]
- New layout corresponds better with load of the detector
- All functionality preserved
  - Cuts in the bottom of the platform to make the service space above cable chains higher
  - Space in corners for horizontal wheels preventing hitting the wall in case of tilt
  - Plates on sides of the platform legs for guiding during push-pull move

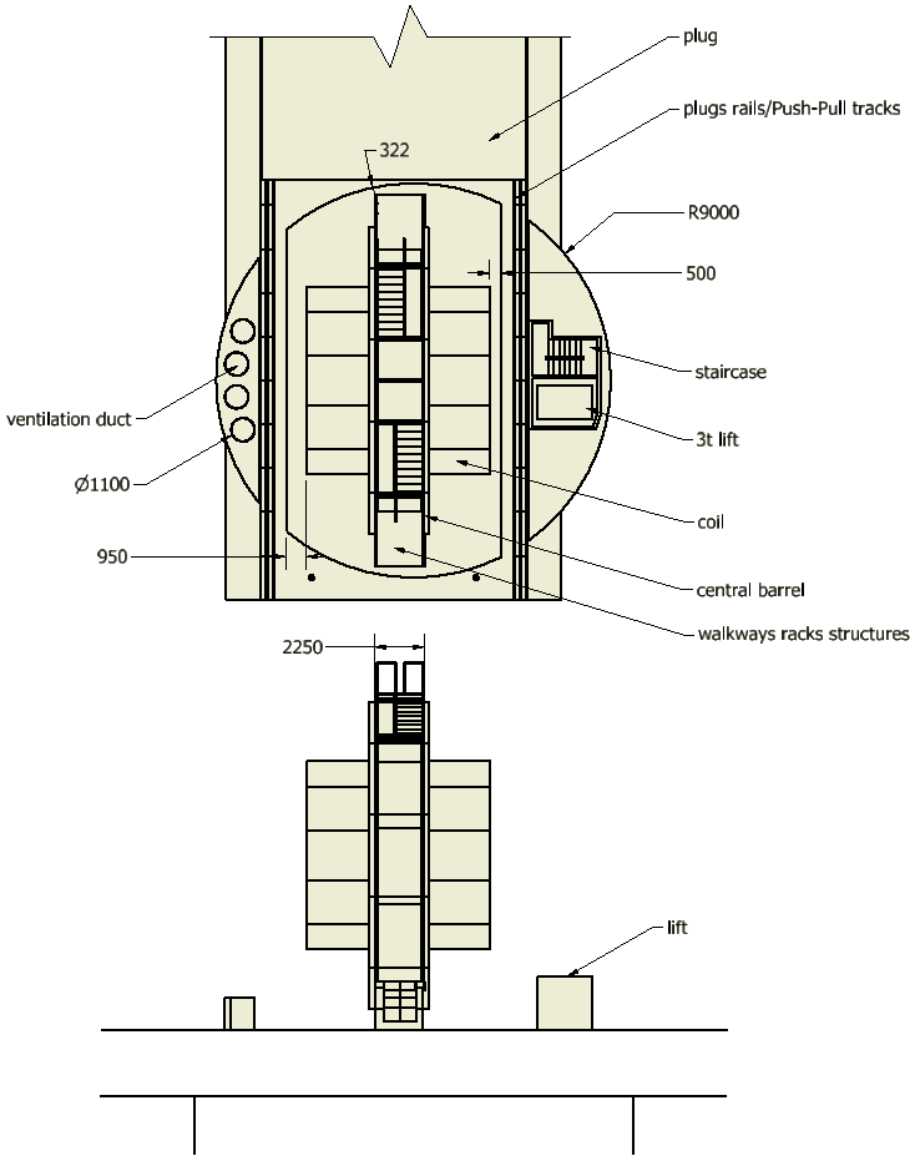


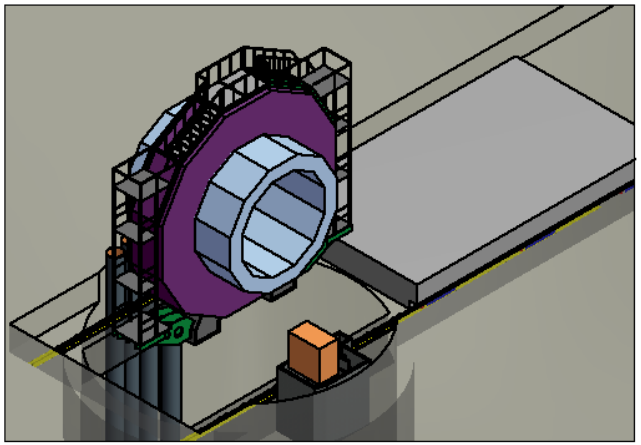
Plug consideration

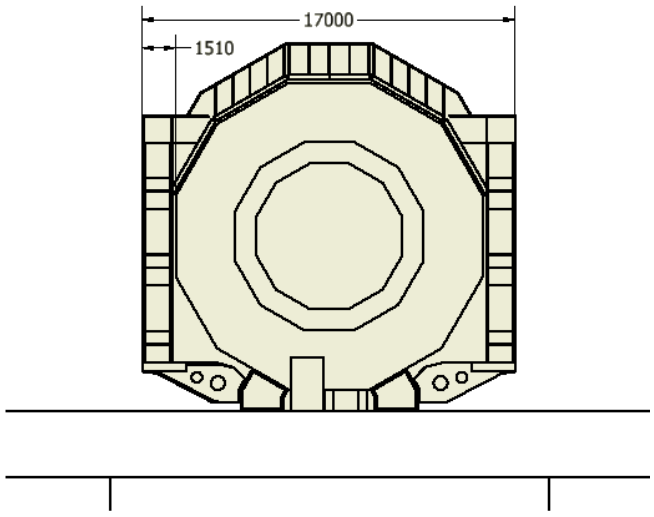


- A plug of CMS type over each pit
- Trolleys and supporting legs on rails
- Each pit divided into sections:
  - Ventilation,
  - Staircase with lift,
  - Heavy loads lowering section
    - Biggest unit – ILD central barrel with coil and scaffoldings fits the gap with enough space to lower it safely

Pit sections

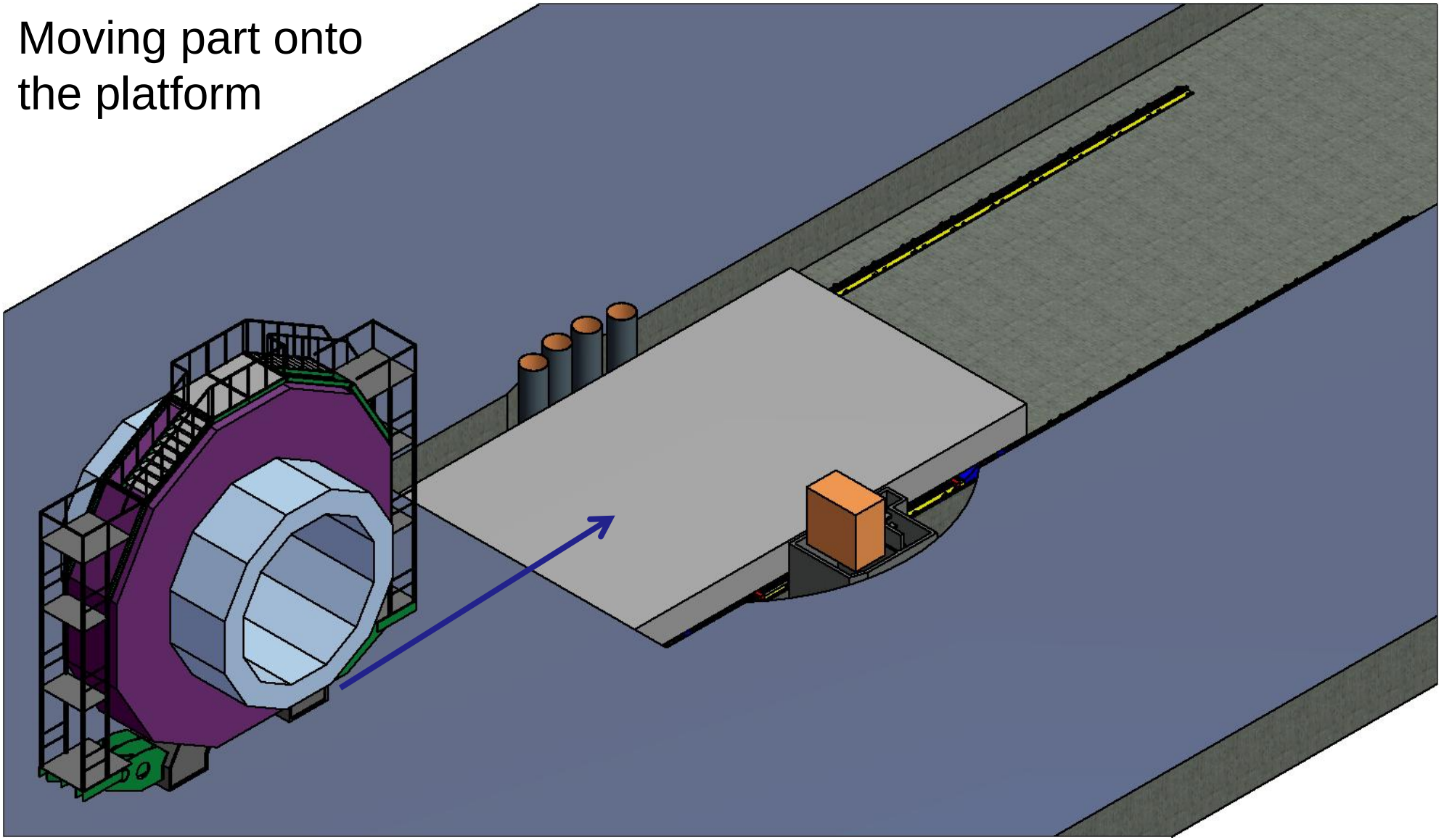






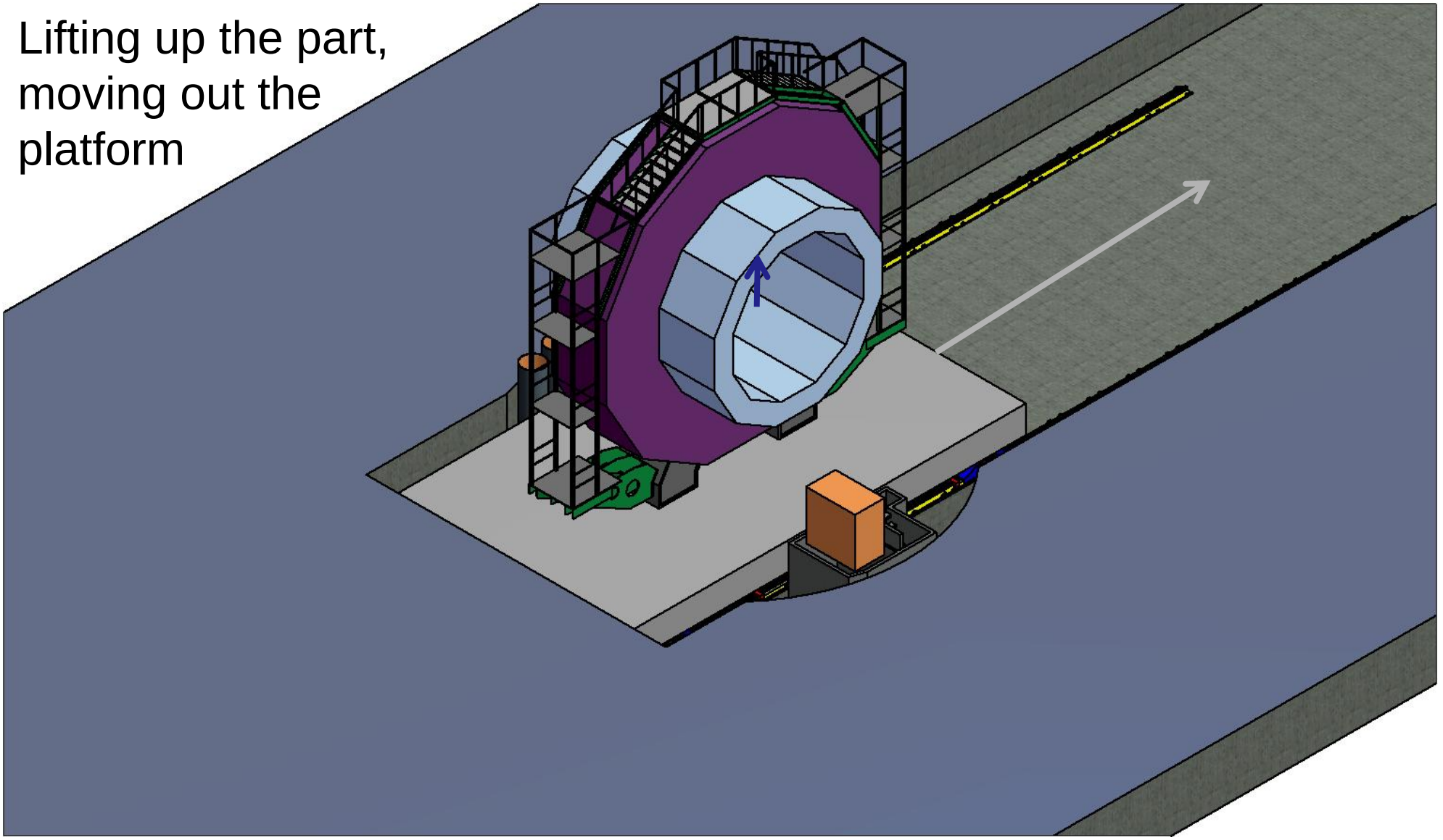
Heavy loads lowering

Moving part onto the platform



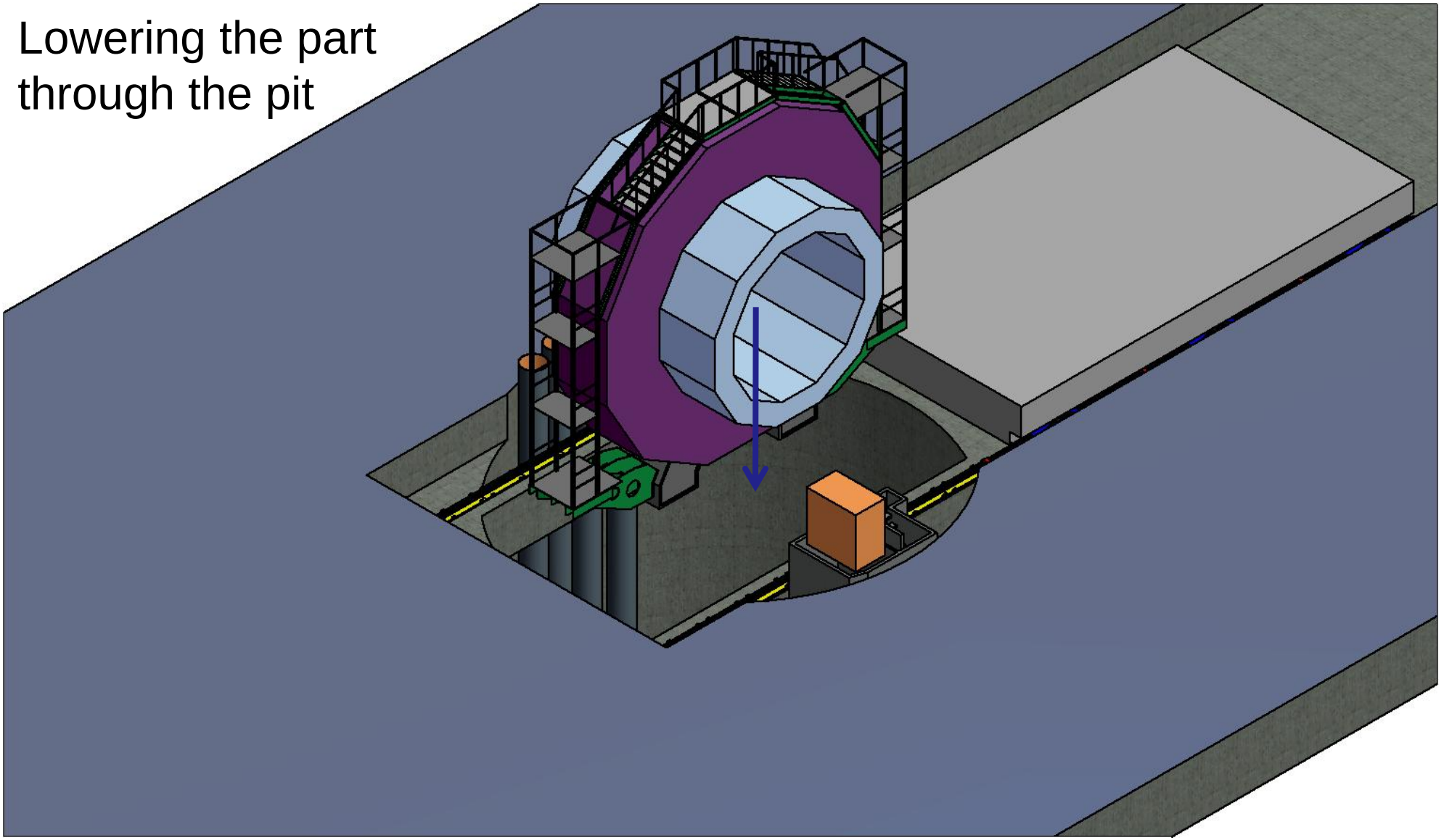
Heavy loads lowering

Lifting up the part, moving out the platform



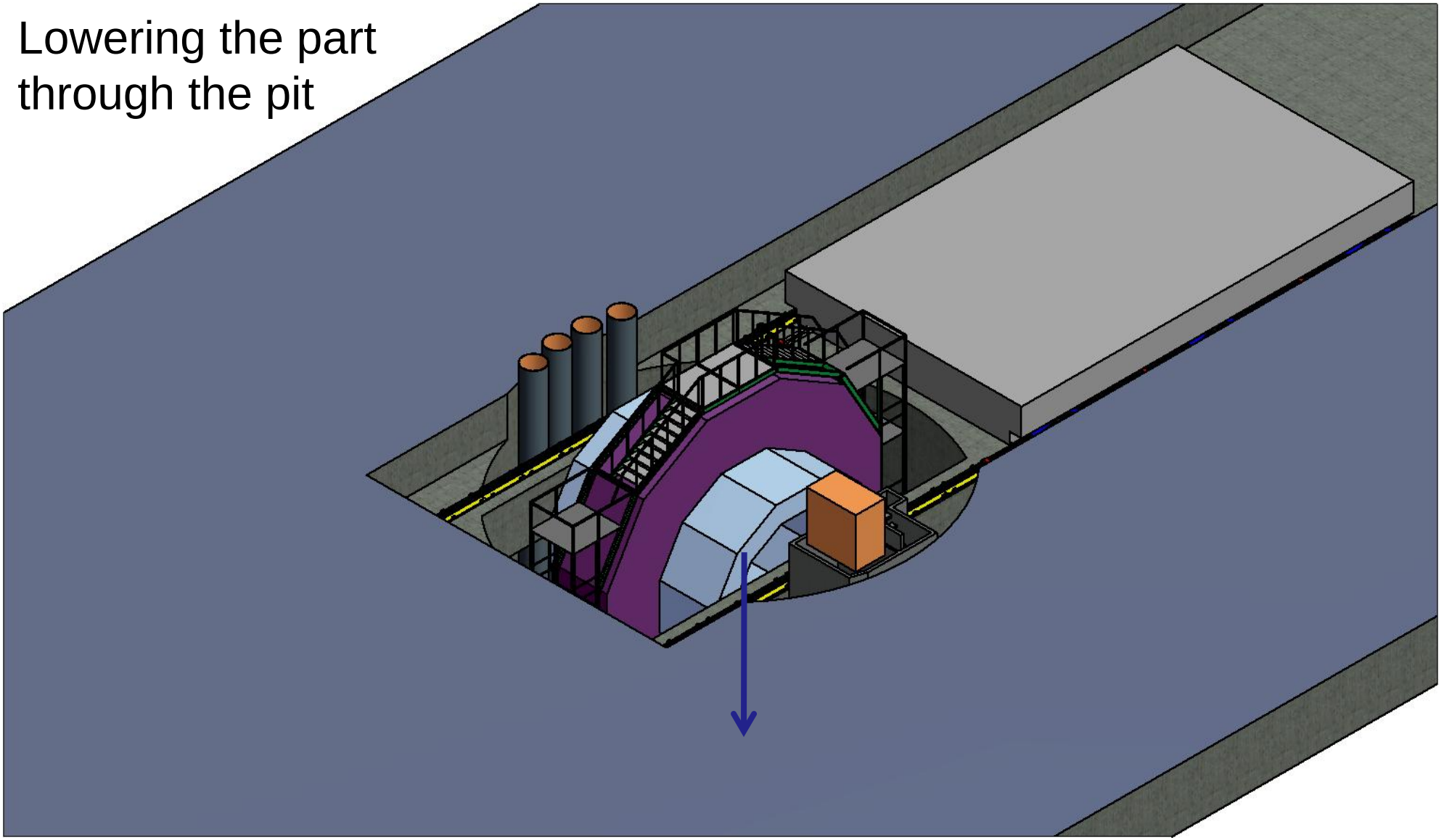
Heavy loads lowering

Lowering the part through the pit



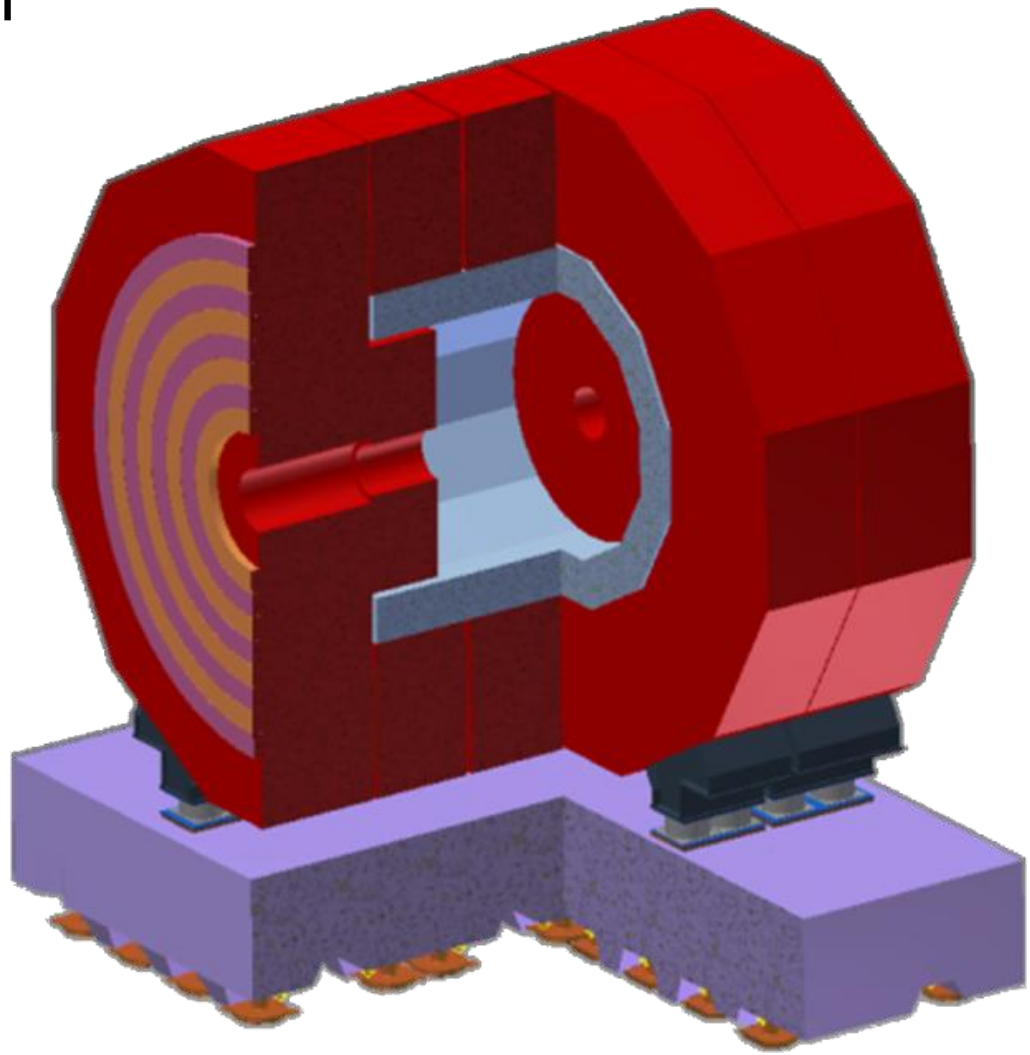
Heavy loads lowering

Lowering the part through the pit



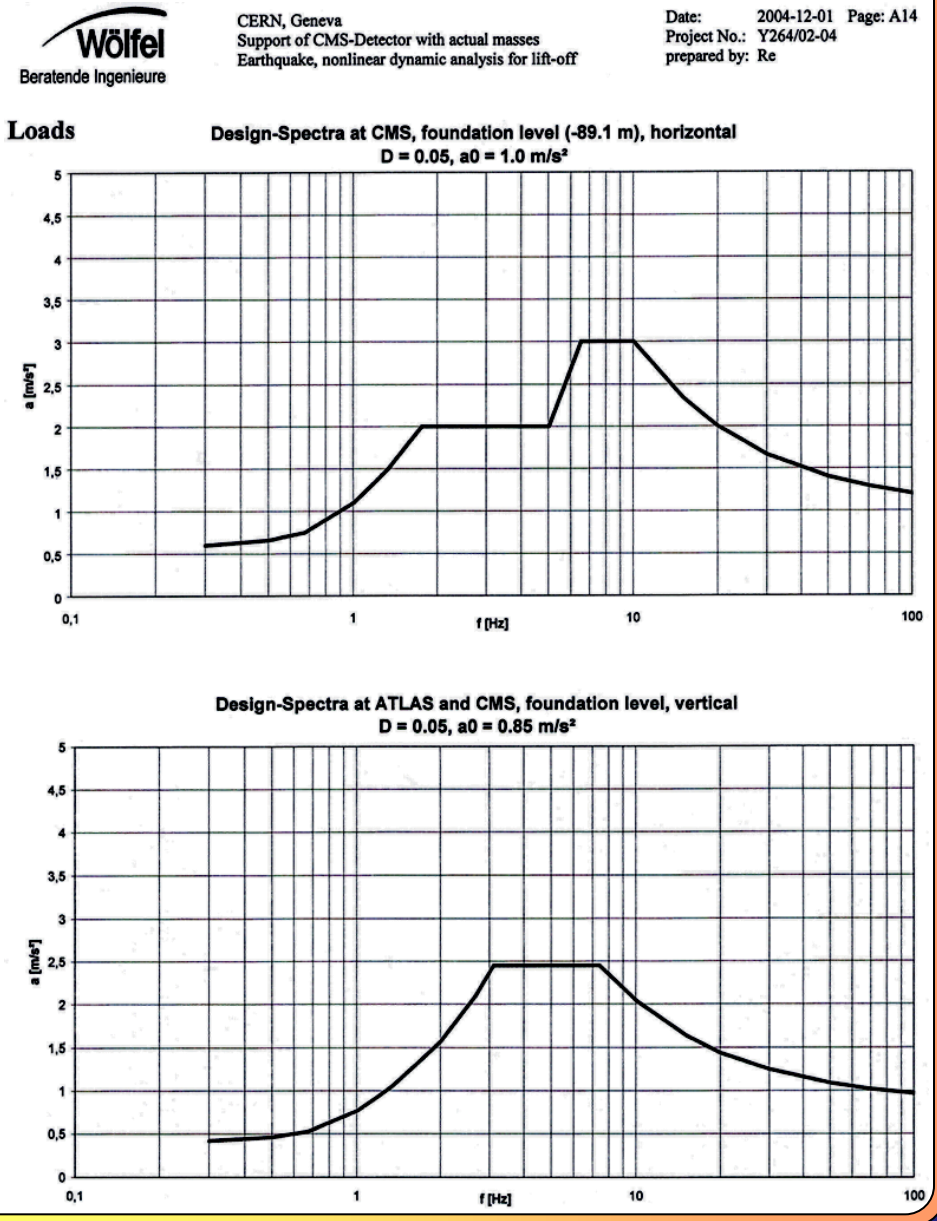
Seismic issues – overview & constraints

- Chosen solution for French side of CERN region
  - Rigid platform standing in a trench with narrow gap between
  - Seismic isolation of the detector
  - Flexible fluids, data and power connections with cable chains



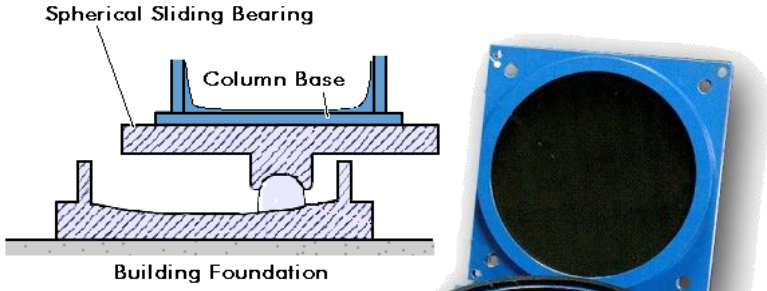
Seismic issues – overview & constraints

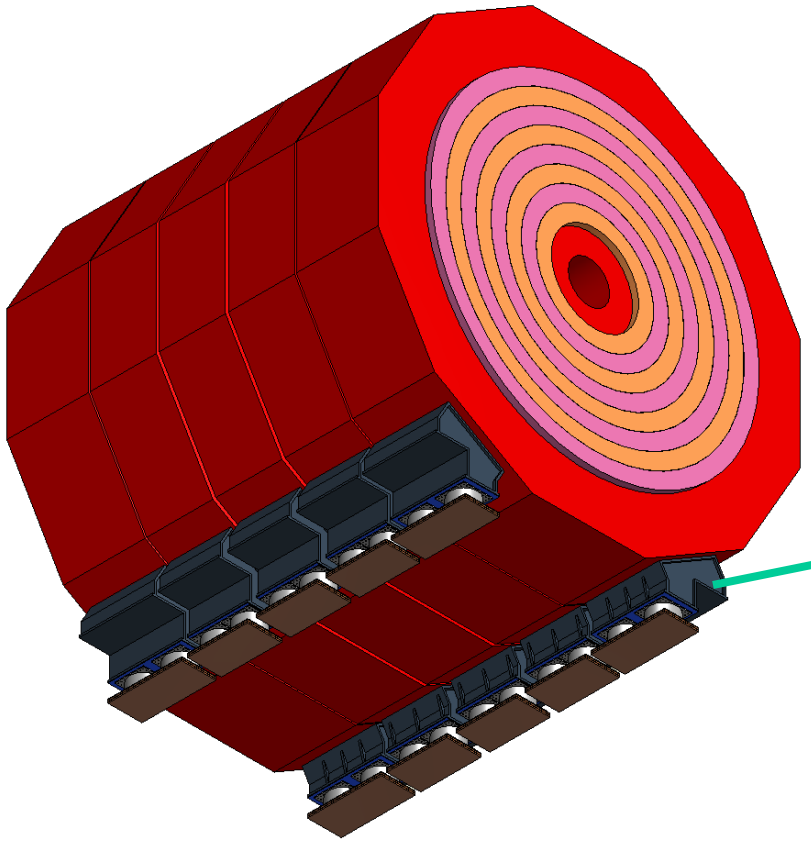
- Moderate risk and small magnitude
  - Seismic design at CERN regulated by Technical Inspection And Safety Commission (TIS) - all structures and equipment should follow rules of Eurocode 8
  - In 2004 expertise was done for CMS and ATLAS experiments, from this analysis horizontal acceleration on experiment foundation level : $a_{max} = 0.3g$

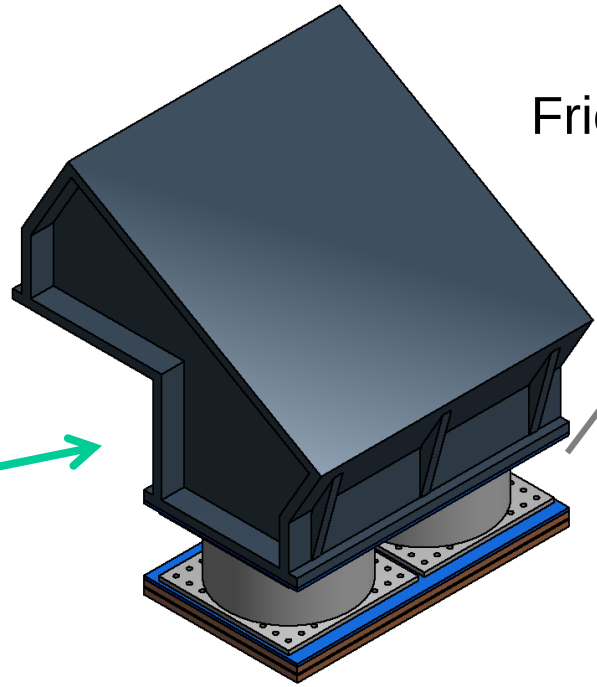


Detector with seismic isolated feet

Each barrel stands on feet that are isolated
In this solution separated parts are still protected during maintenance when detector is opened



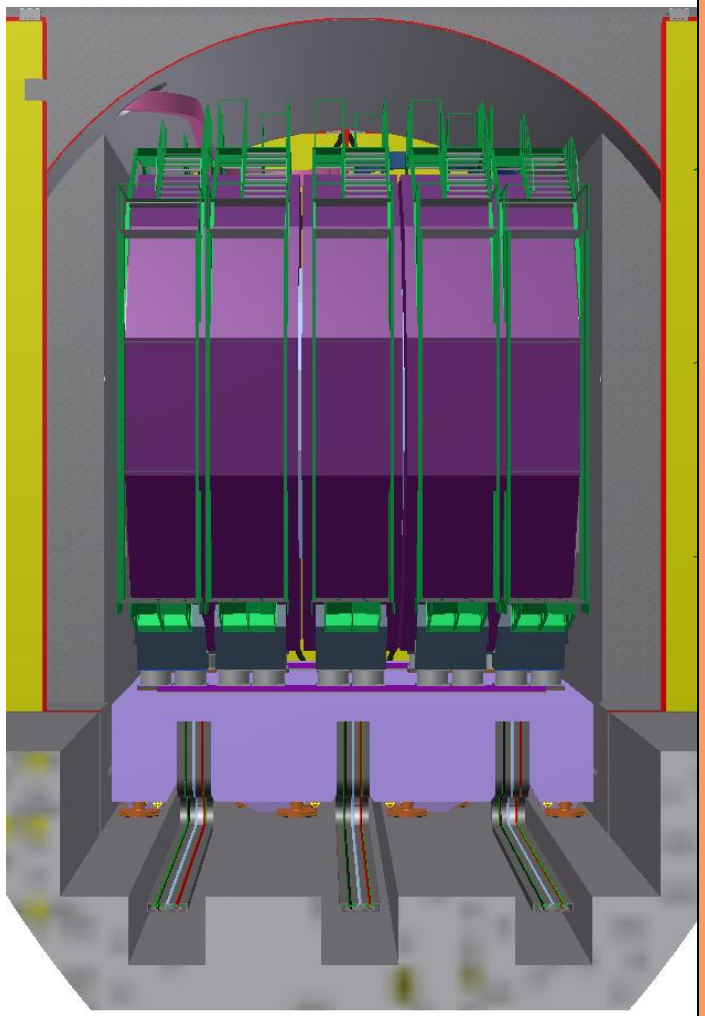




Friction pendulum bearings

Possible solution for the IP area

- When the detector is in the cavern it can swing on pendulums, either if it is closed, or each part separately when it is opened
- When detector is “on beam” the detectors chicane is closing the gap between the endcap and the wall



Two scenarios are possible

- Rigid

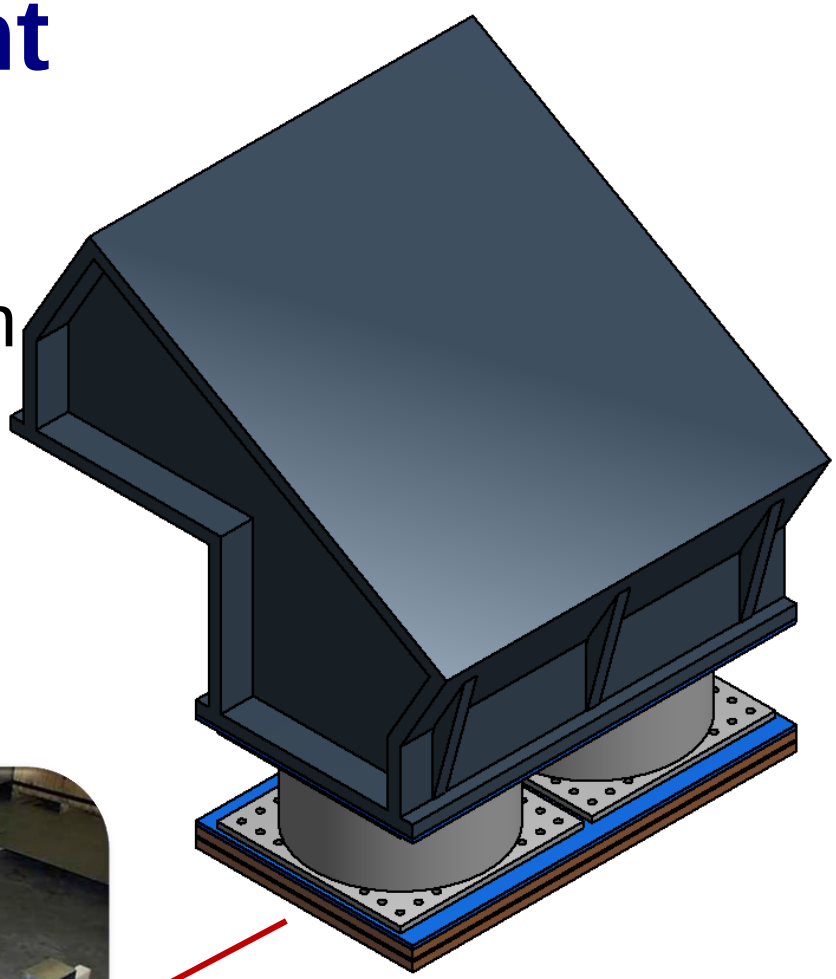
Making the detector rigid enough so it does not get damaged during probable ground shakes

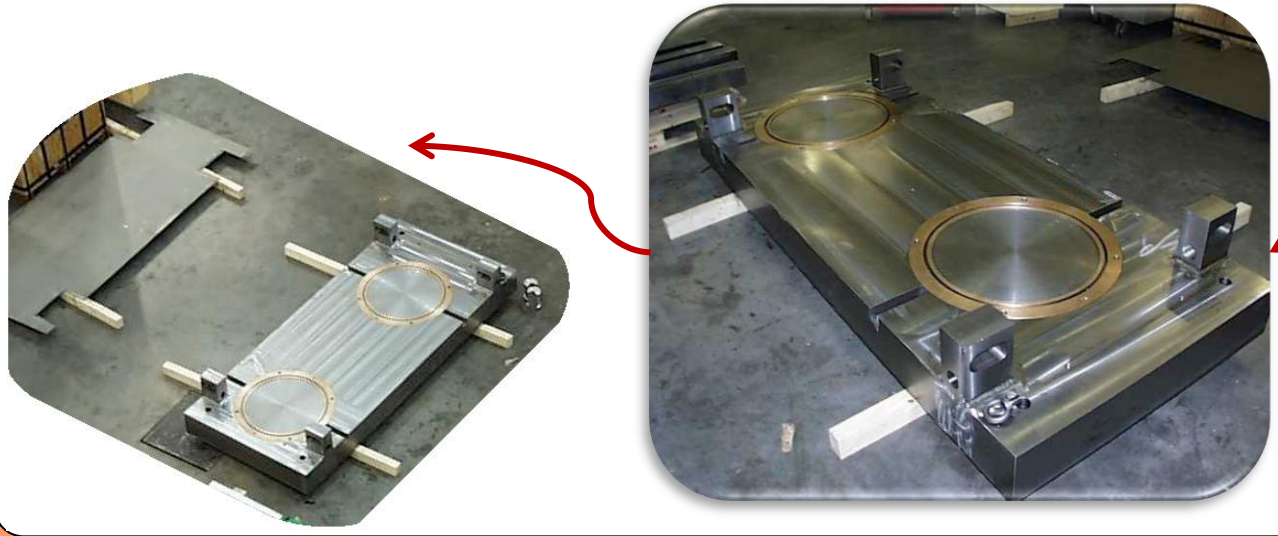
- Soft

Construction of the IP area would include suspended walls that would work as bumpers

Final precise adjustment

- The grease pads are needed to allow a final precise adjustment of the main components of each detector. The grease will lower the friction between the sliding components and therefore less force is needed.





Summary

- The new layout of platform meets all needs and corresponds better with load cases
- 18[m] shaft fulfils requirements of space divided into sections of heavy parts lowering, staircase/lift and ventilation
- A plug of CMS type may be applied for both pits
- Seismic isolation between the platform and the detector assures all detector parts even when the detector is opened

Thank you

And special thanks to

H. Gerwig, N. Siegrist