

ILD in Mountain Site Hall

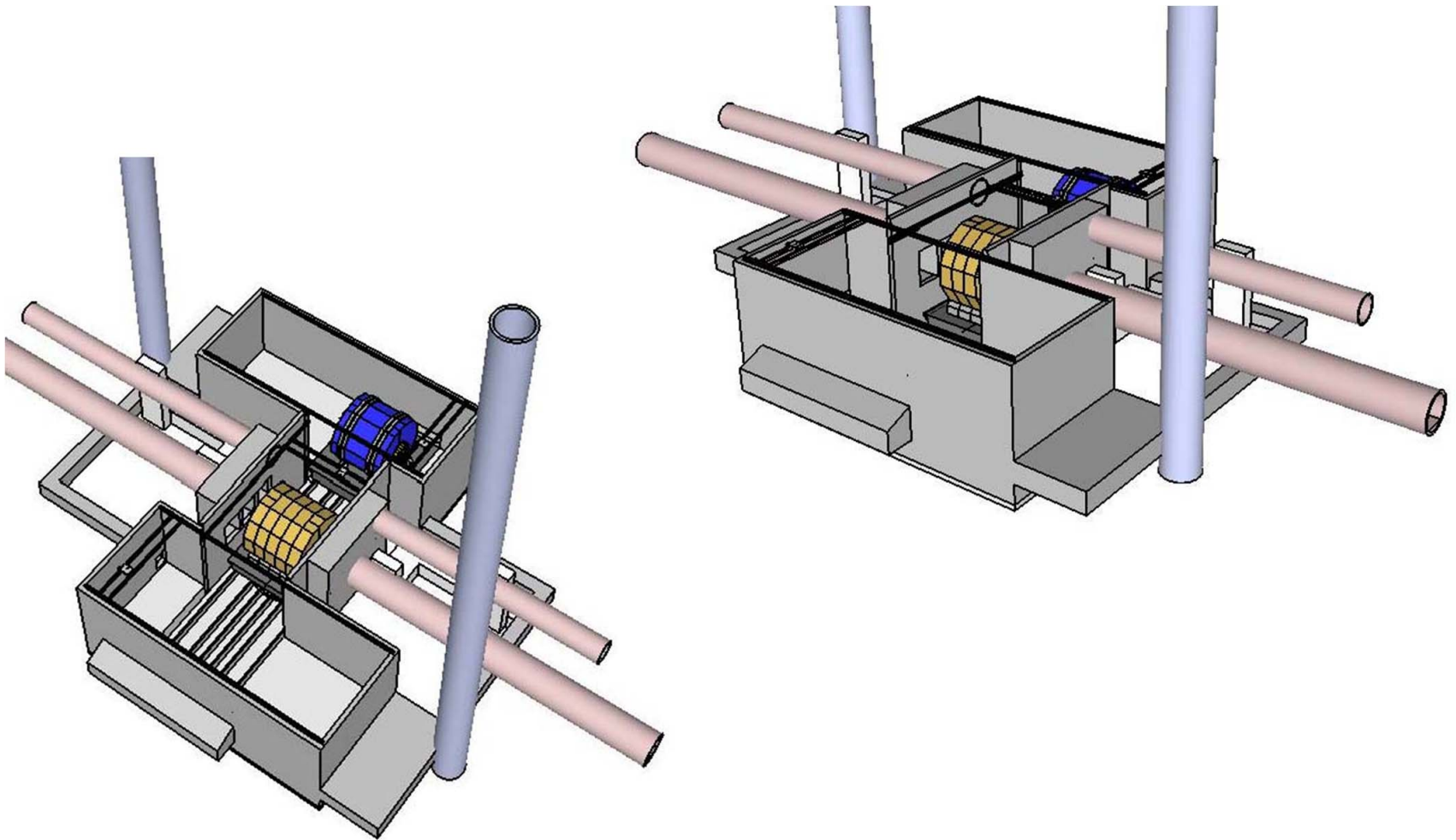
Karsten Buesser

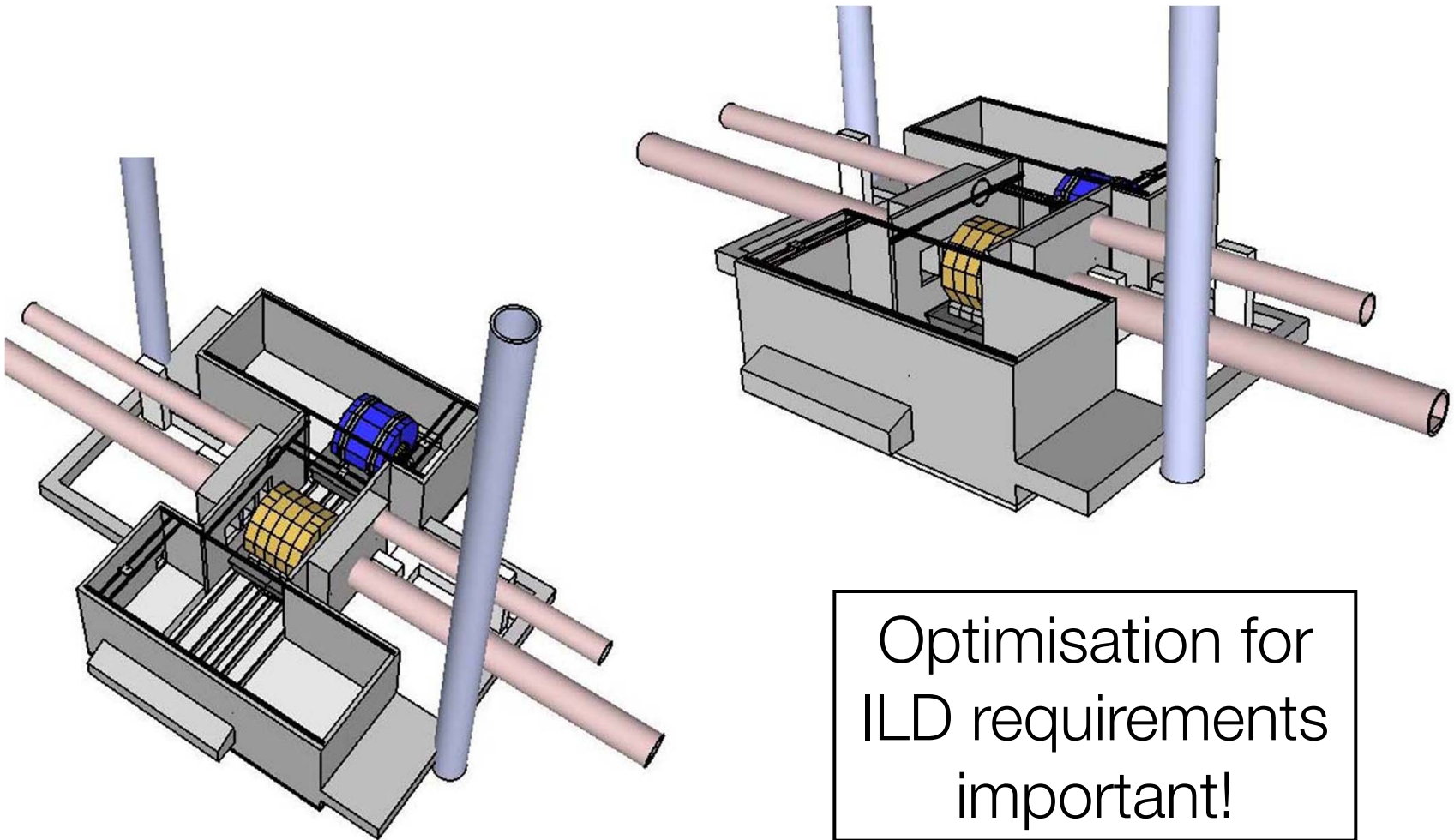
02.03.2012

ILD Integration Webex

Overview

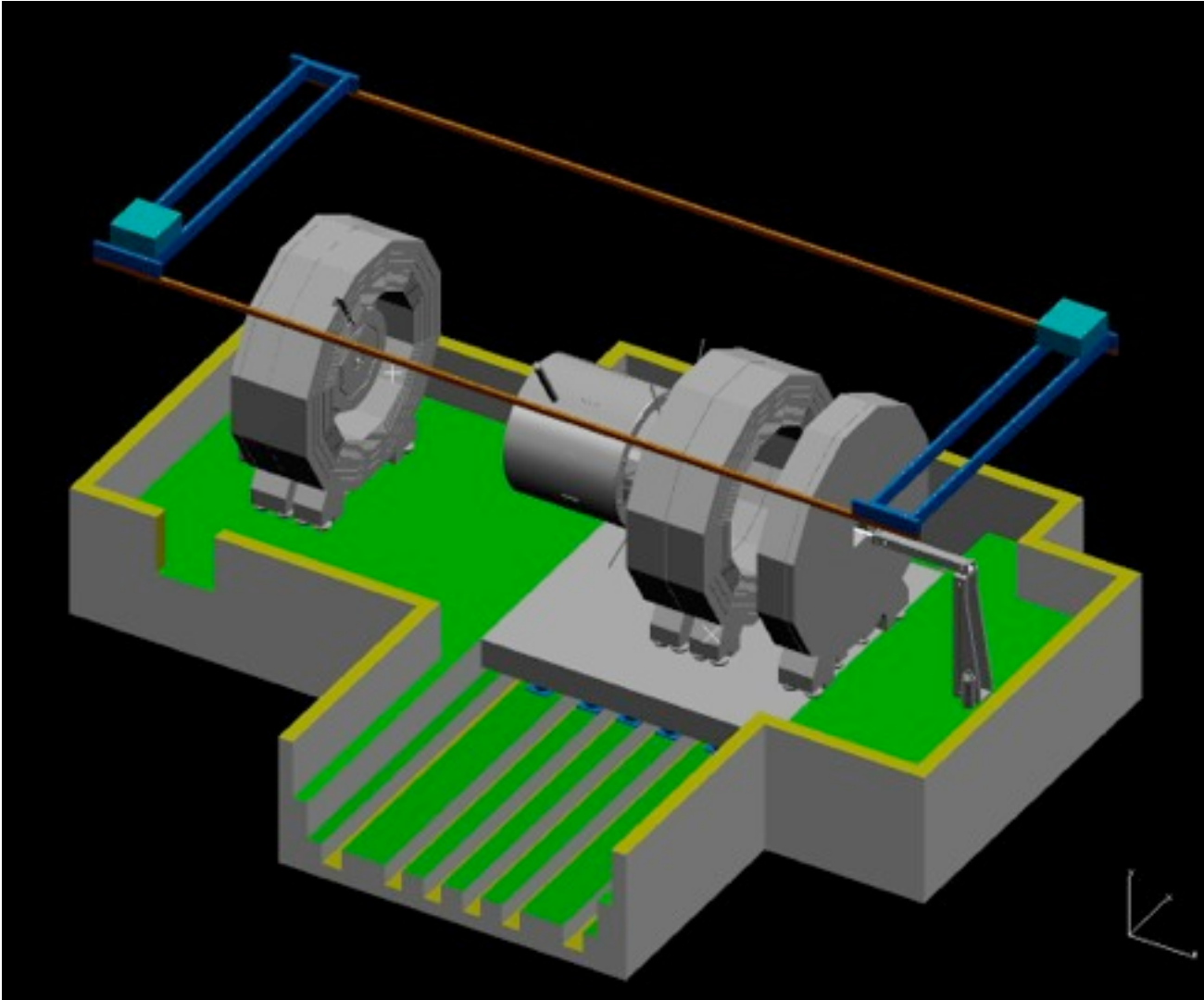
- Machine group is finalising the design of the civil facilities for the TDR/DBD
- This is in the focus of the ILC management: cost drivers!
- Discussions between detector concepts (SiD/ILD) and ILC CFS group have been intensified since Granada
- Dedicated meeting in December at SLAC: final input from detector groups
- Started with the „non-mountain“ sites - hall design finalised
- Japanese site requirements are different



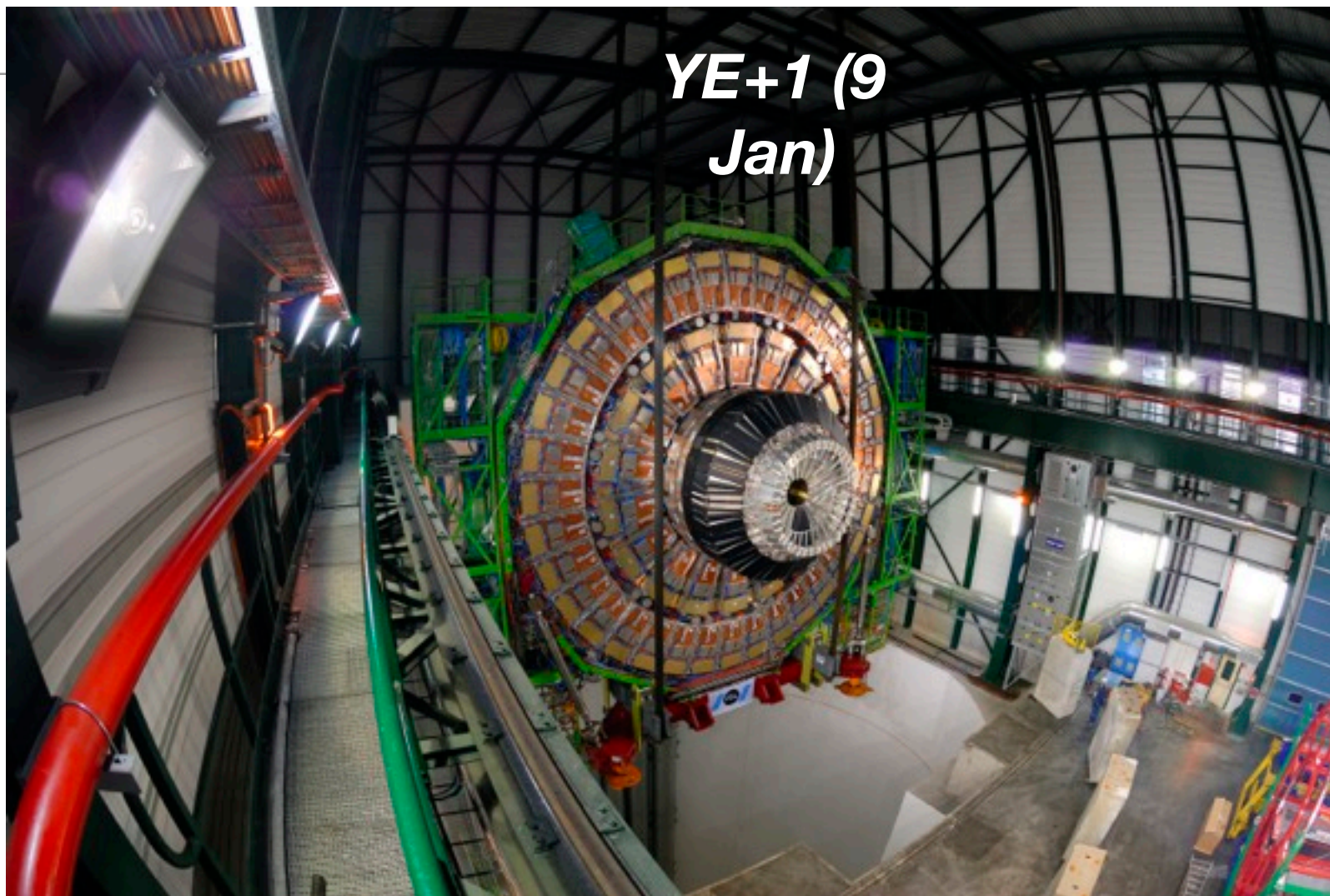


Optimisation for
ILD requirements
important!

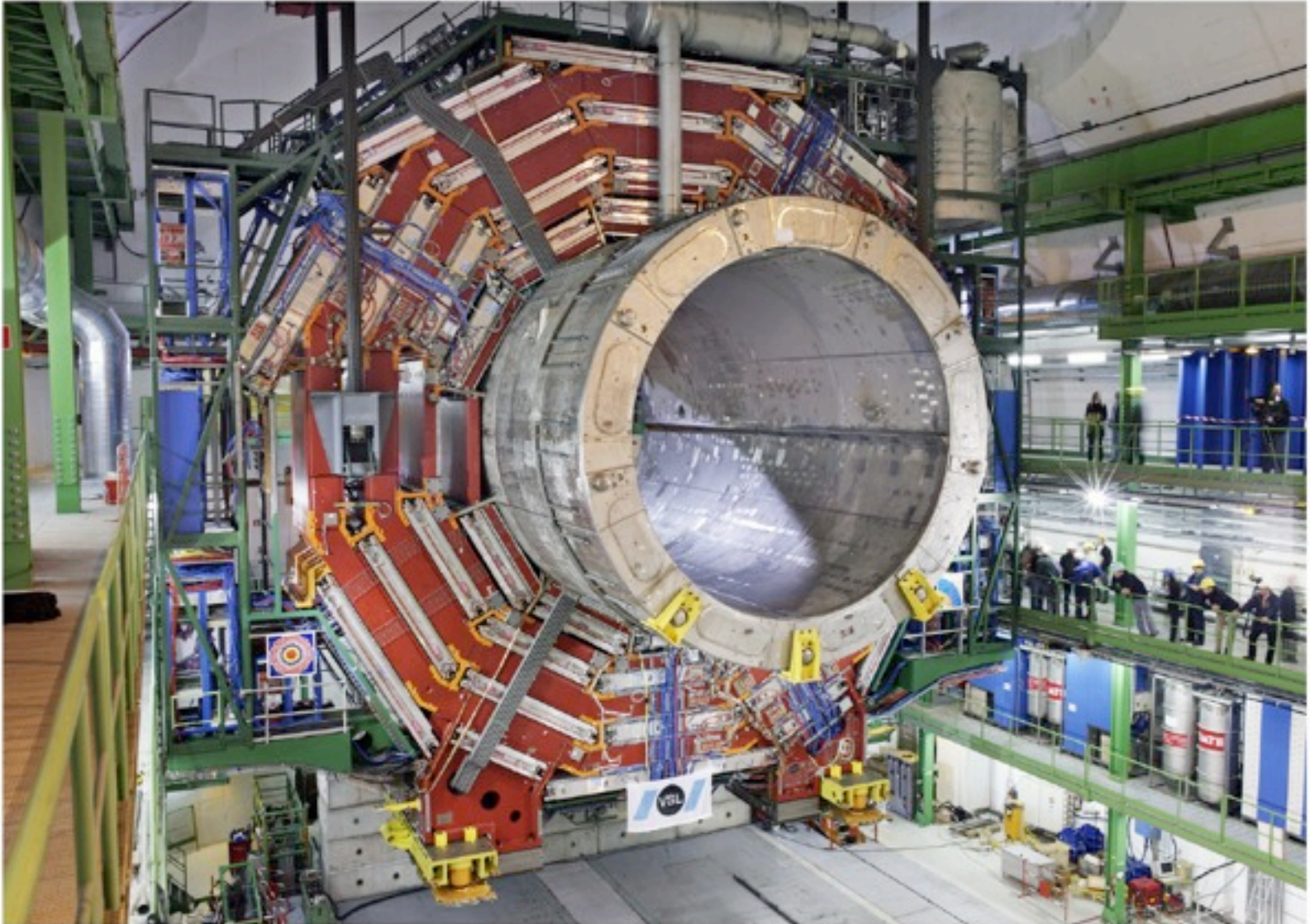
ILD in Maintenance Region (non-mountain site)



CMS Assembly



CMS Assembly



A. Hervé

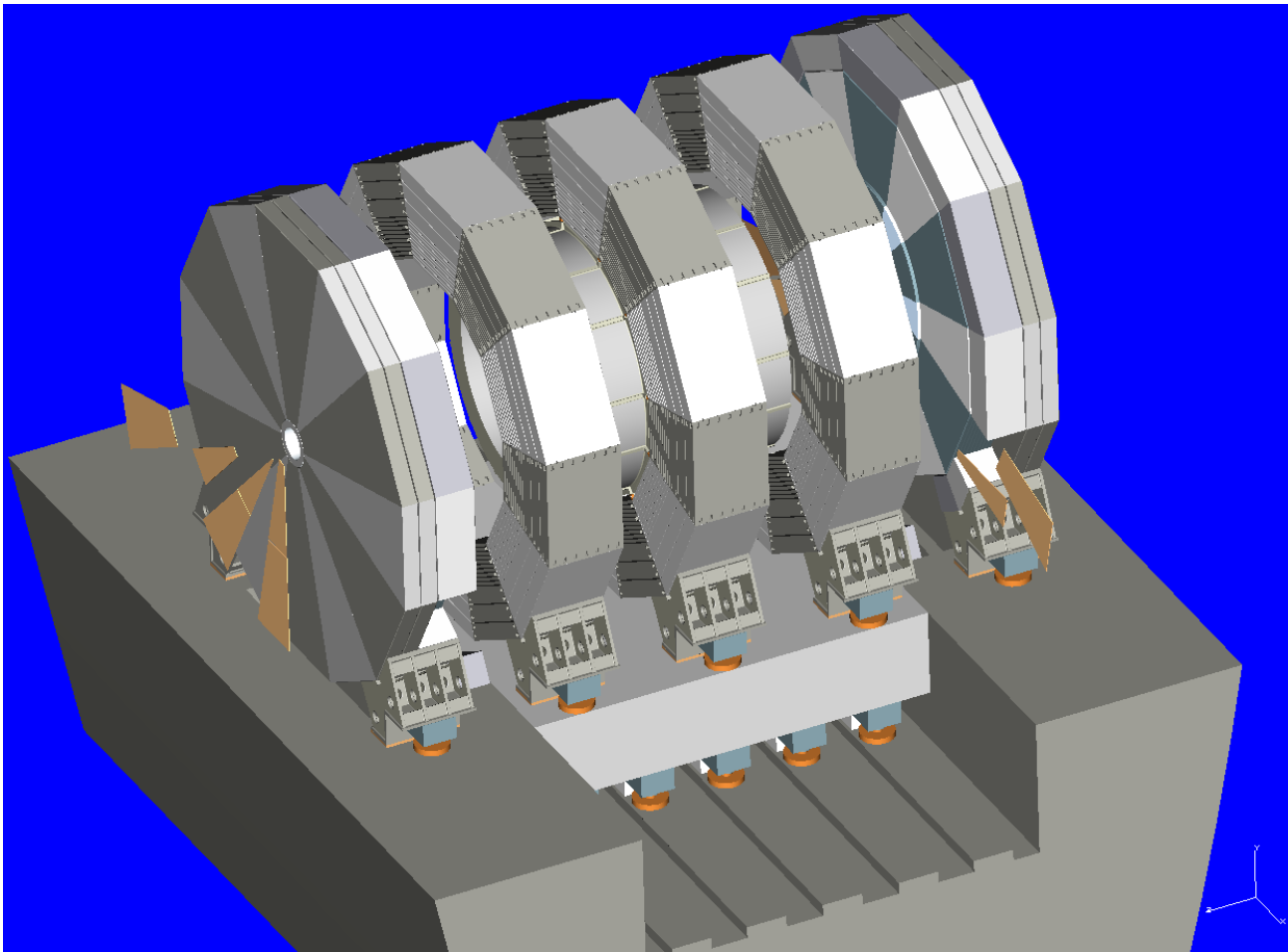
YB0 landing in the CMS experiment hall

ILD Assembly

- CMS-type assembly for non-mountain sites:
 - Pre-assemble and test ILD components on surface as far as possible
 - Lower five yoke rings with pre-installed detector components
 - About one year of assembly underground
- Non-CMS-type assembly for mountain sites:
 - Part sizes are limited by access tunnel
 - Yoke rings need to be built underground
 - Sub-detectors mostly installed underground
 - Need more time (~3y) and more underground space

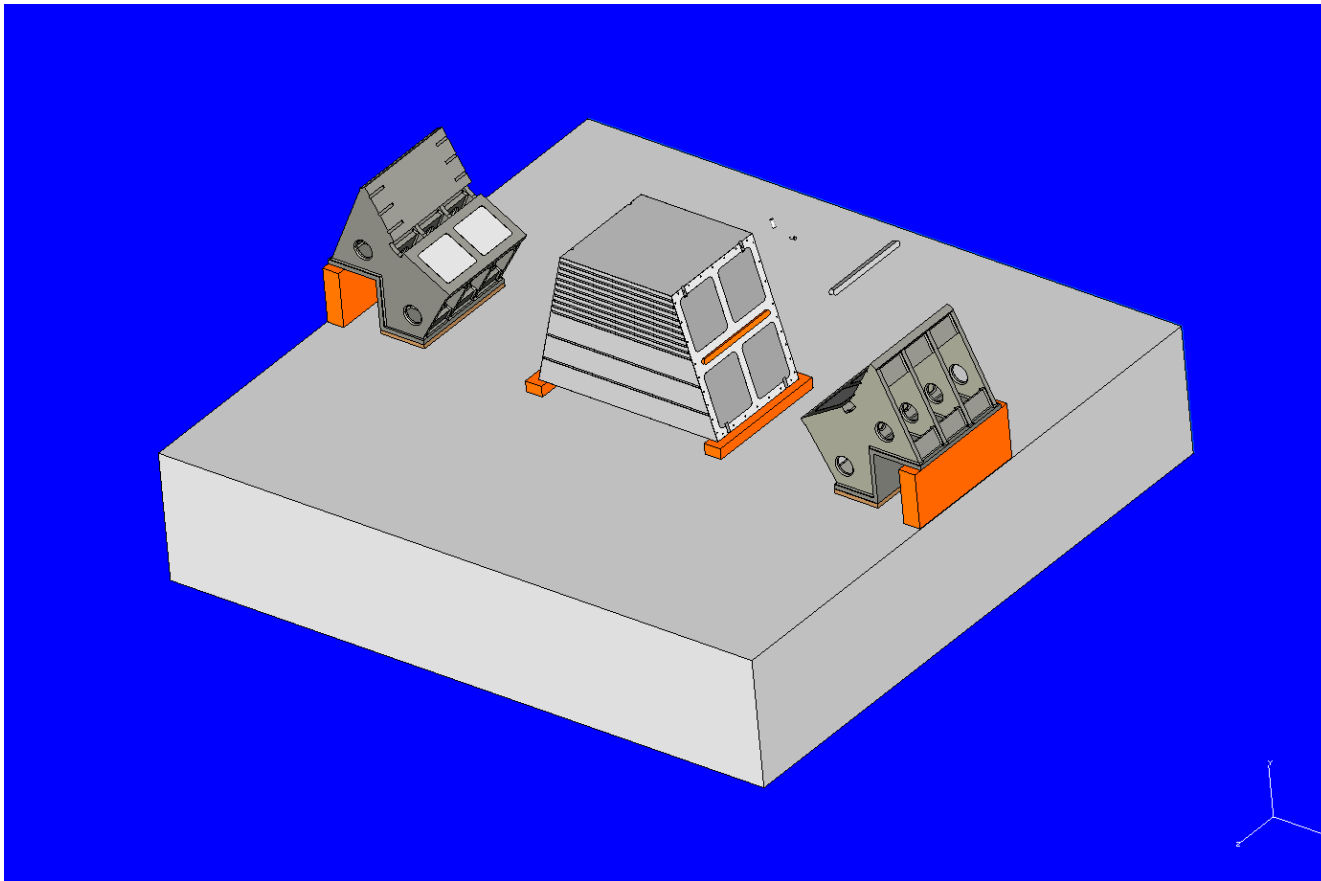
ILD Design

- Assumption: basic detector model will not change for mountain sites



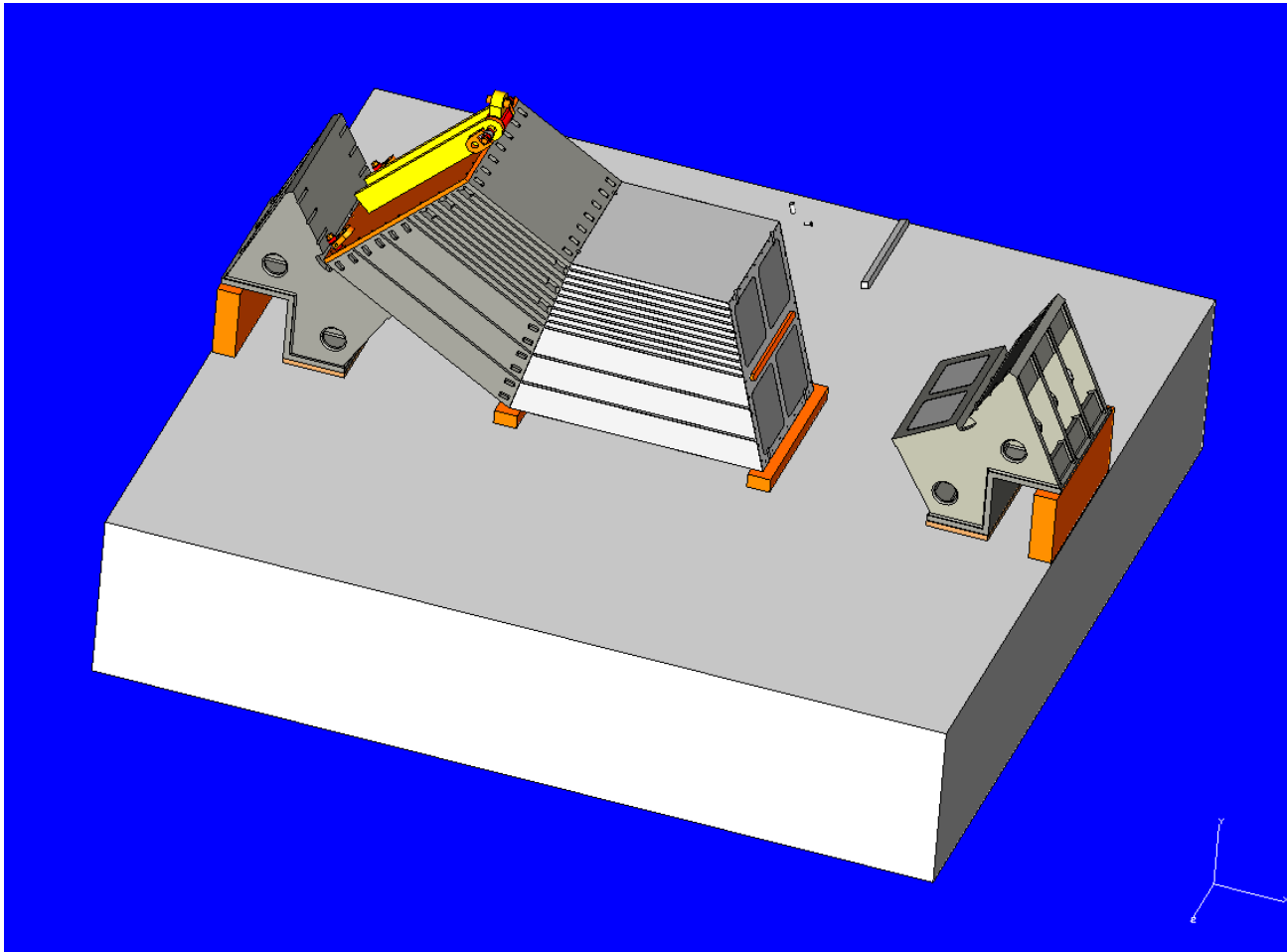
Yoke Assembly

- Start with central ring on platform
- Space needed for: tools, scaffolding, surveying equipment

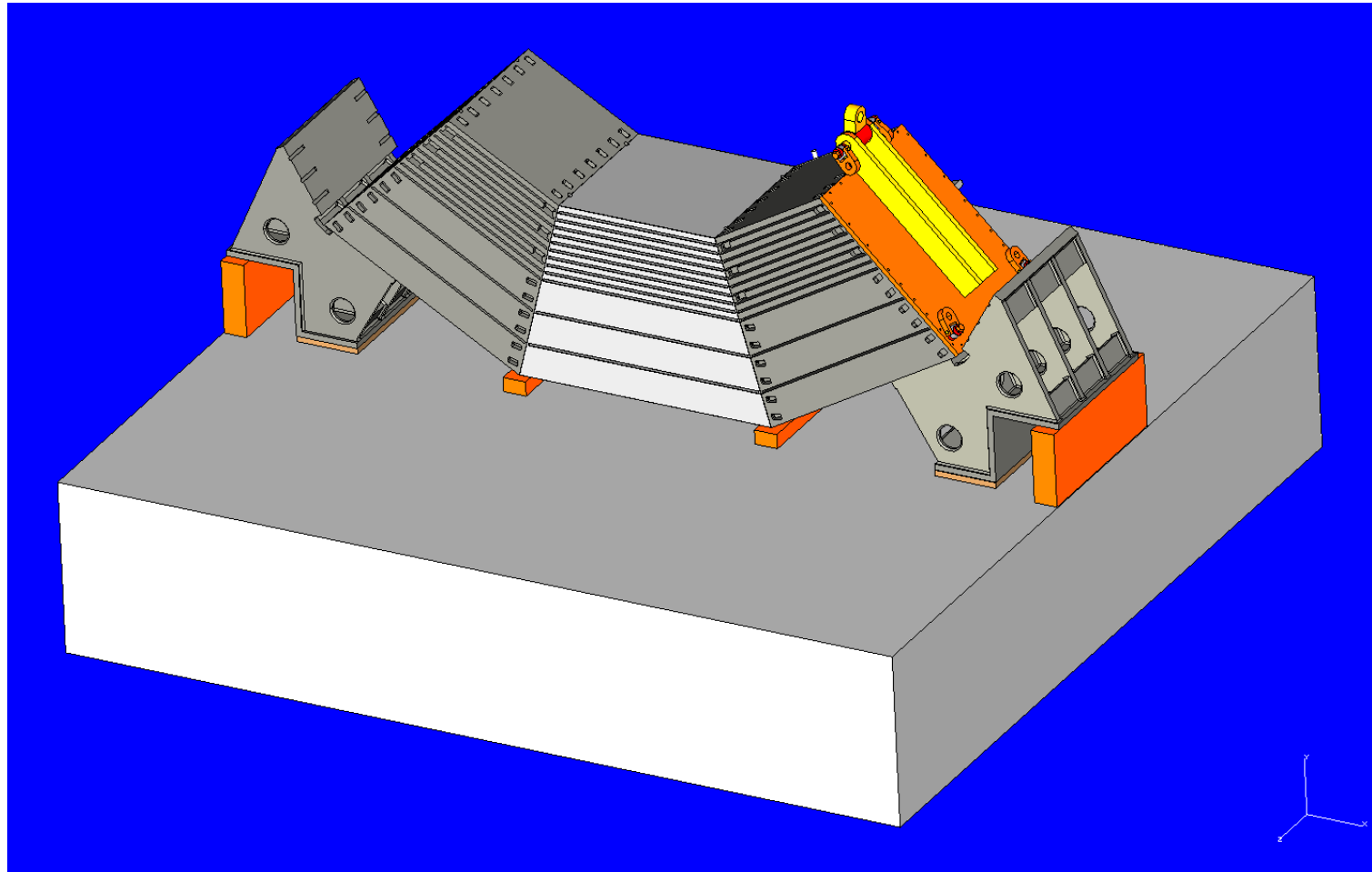


Yoke Assembly

- 200t crane coverage needed

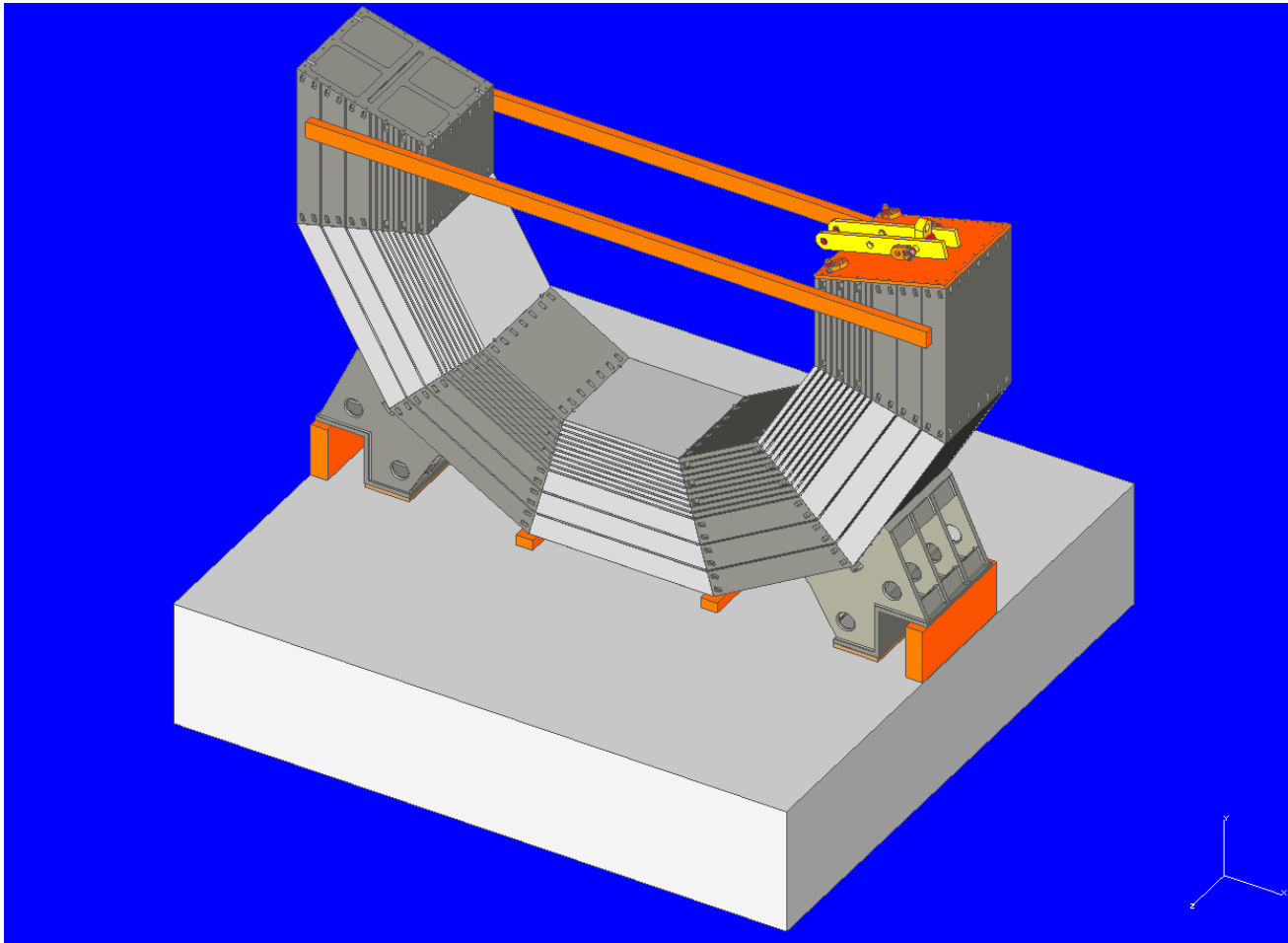


Yoke Assembly

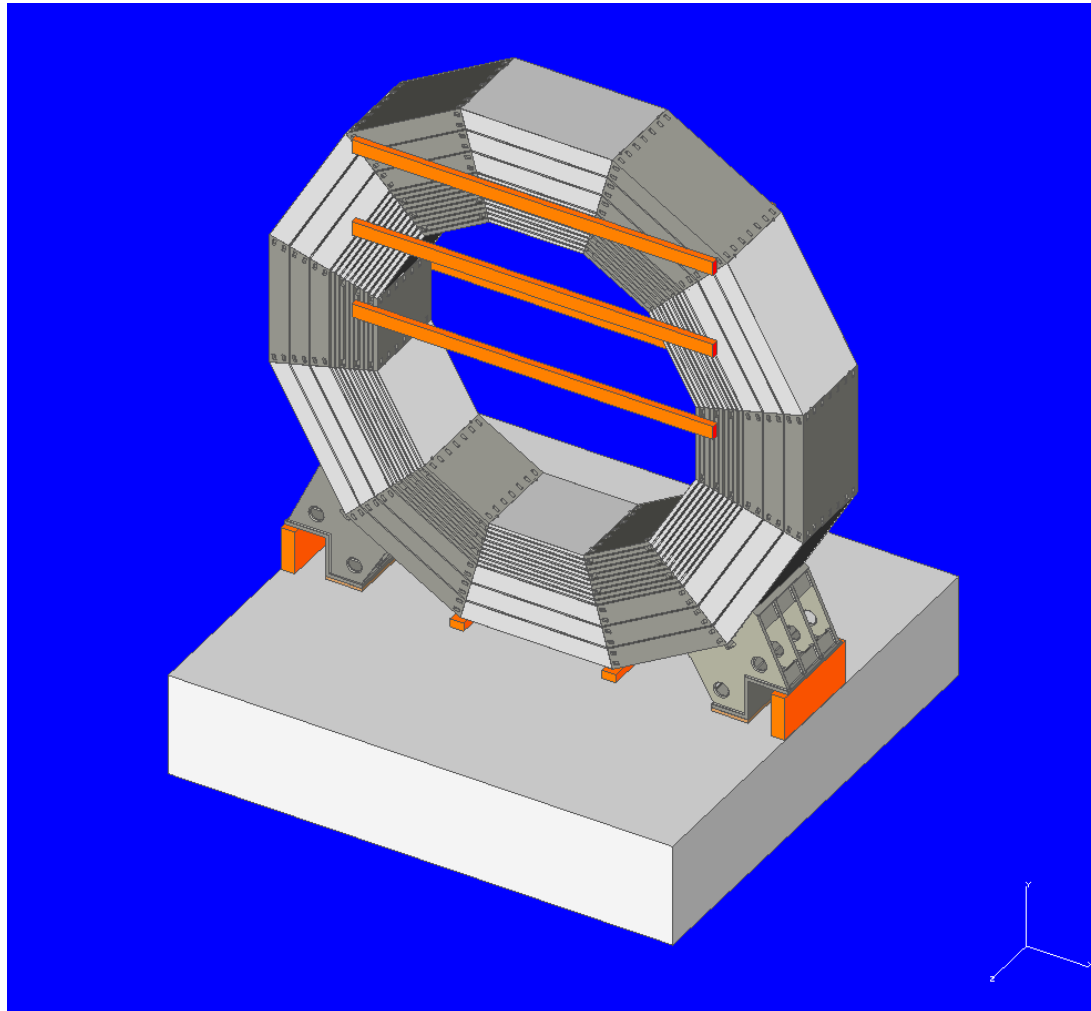


Yoke Assembly

- Tooling needs still under study

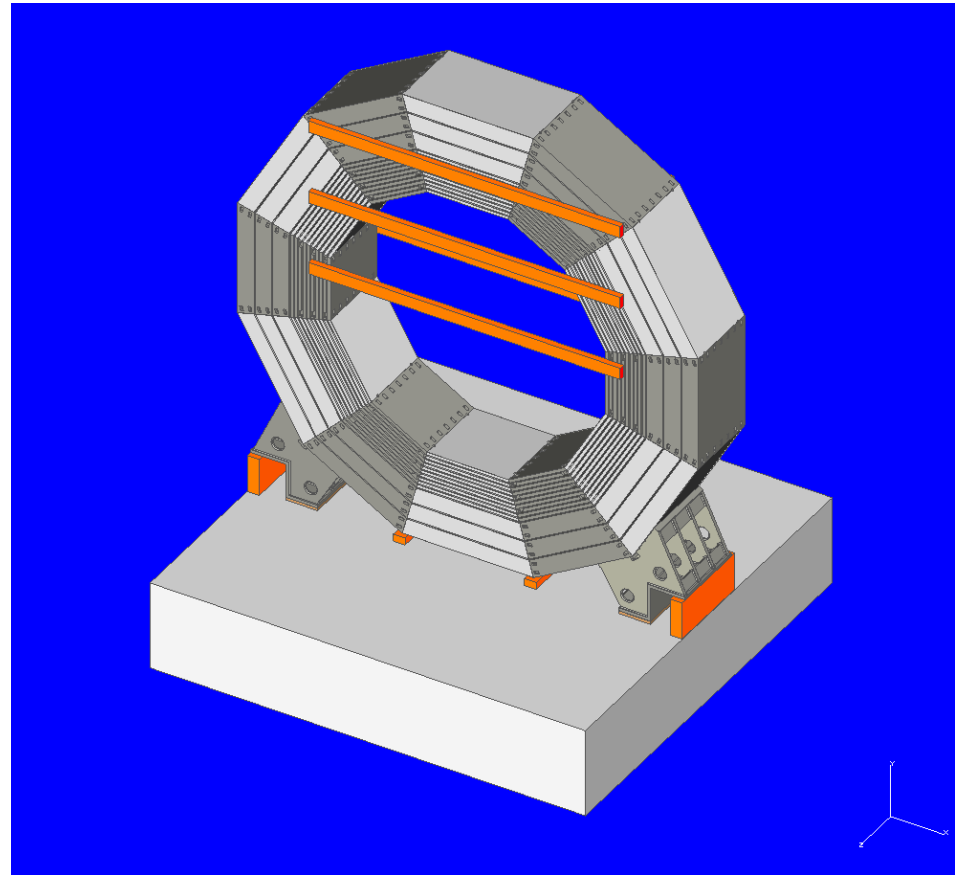


Yoke Assembly



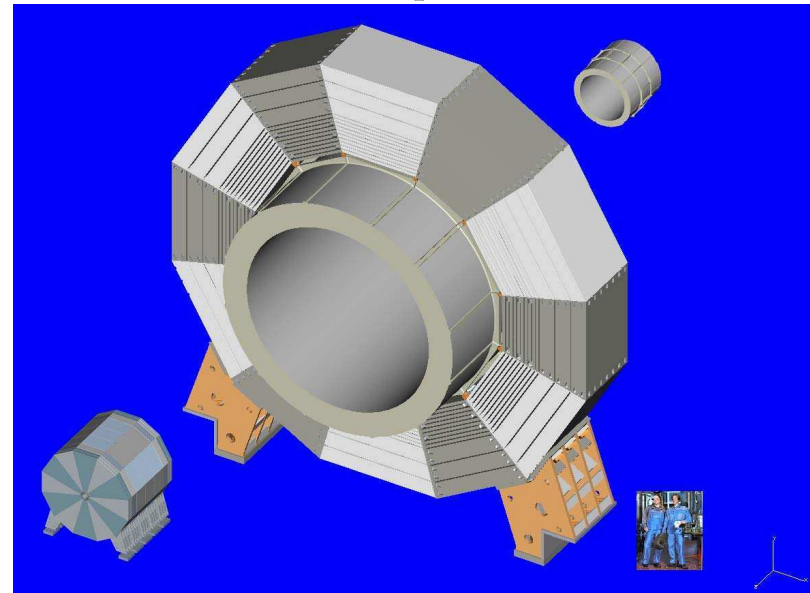
Yoke Assembly

- Tolerances of the ring segments need to be better than 1 mm
- Laser surveying needed during full assembly
- Tools needed
 - 200t crane
 - chain hoists
 - tailored tools: beams etc.
 - hydraulics
 - surveyors
- Time estimate: 60 working days per ring



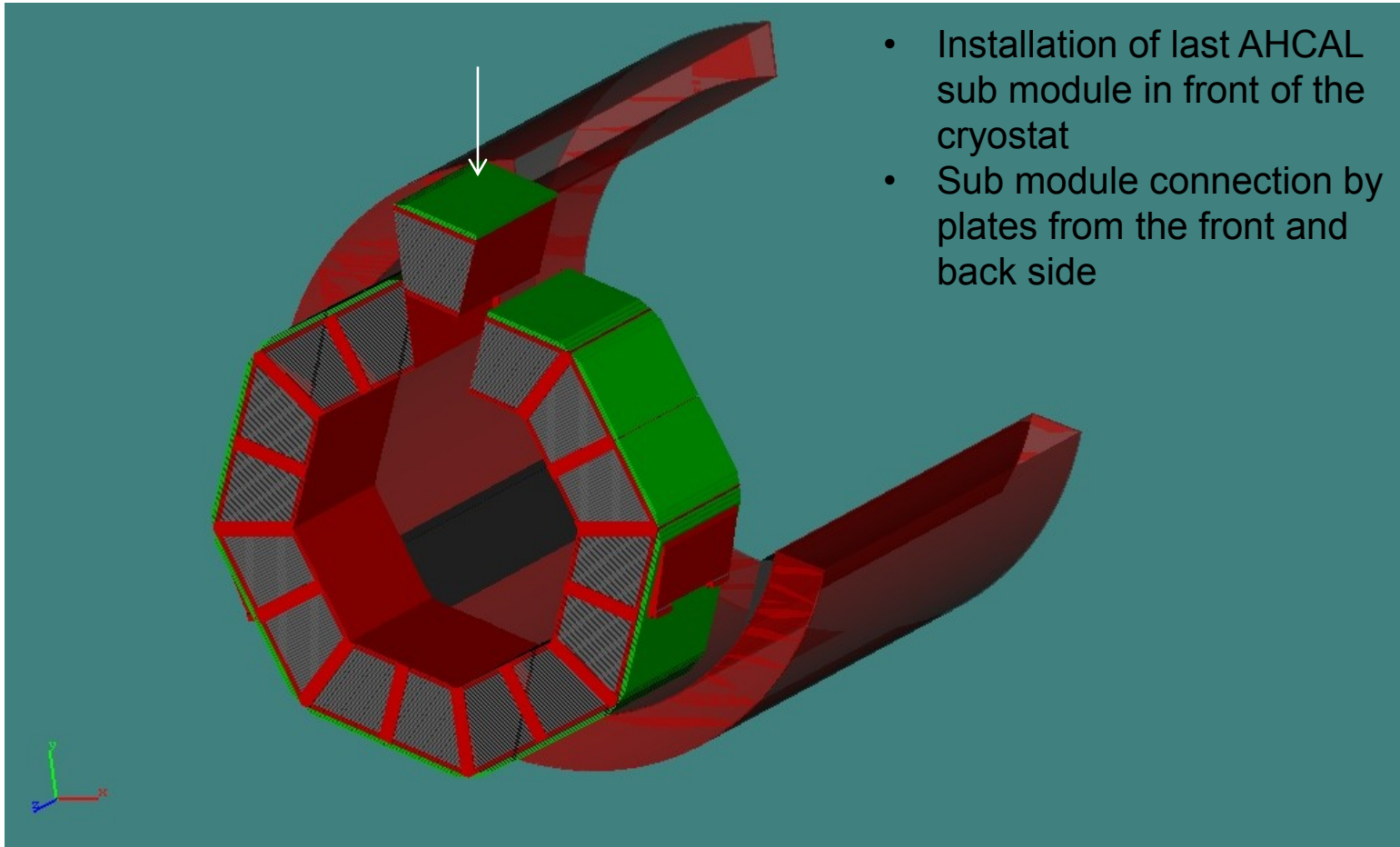
Coil Installation

- Coil can only be transported without its ancillaries (cold box, chimney)
- Functional test needs to be done underground after installation into central barrel yoke ring
 - very low fields, yoke will not be ready by then
 - Takes ~3 months (incl. cool-down and warm-up)

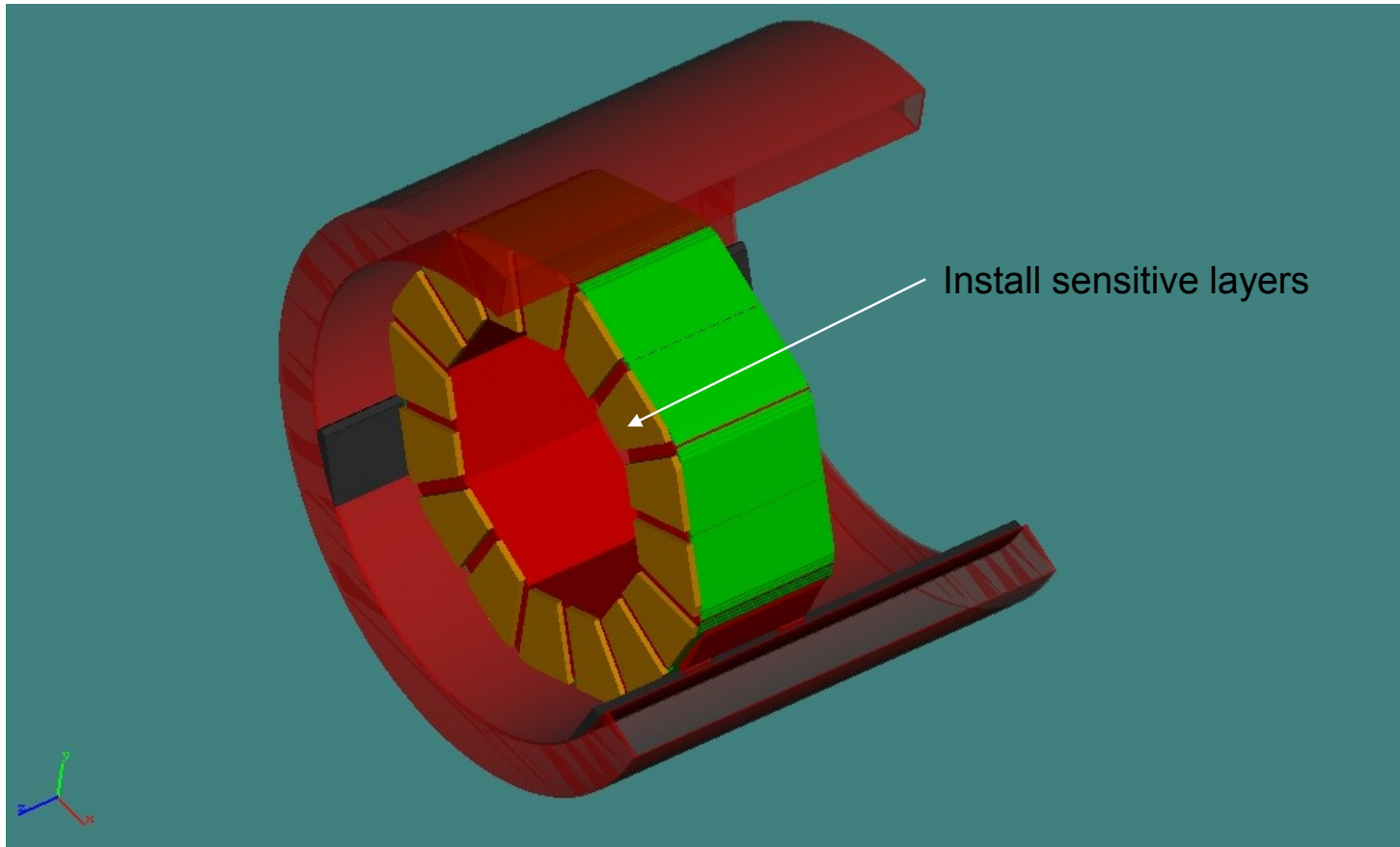


R. Stromhagen

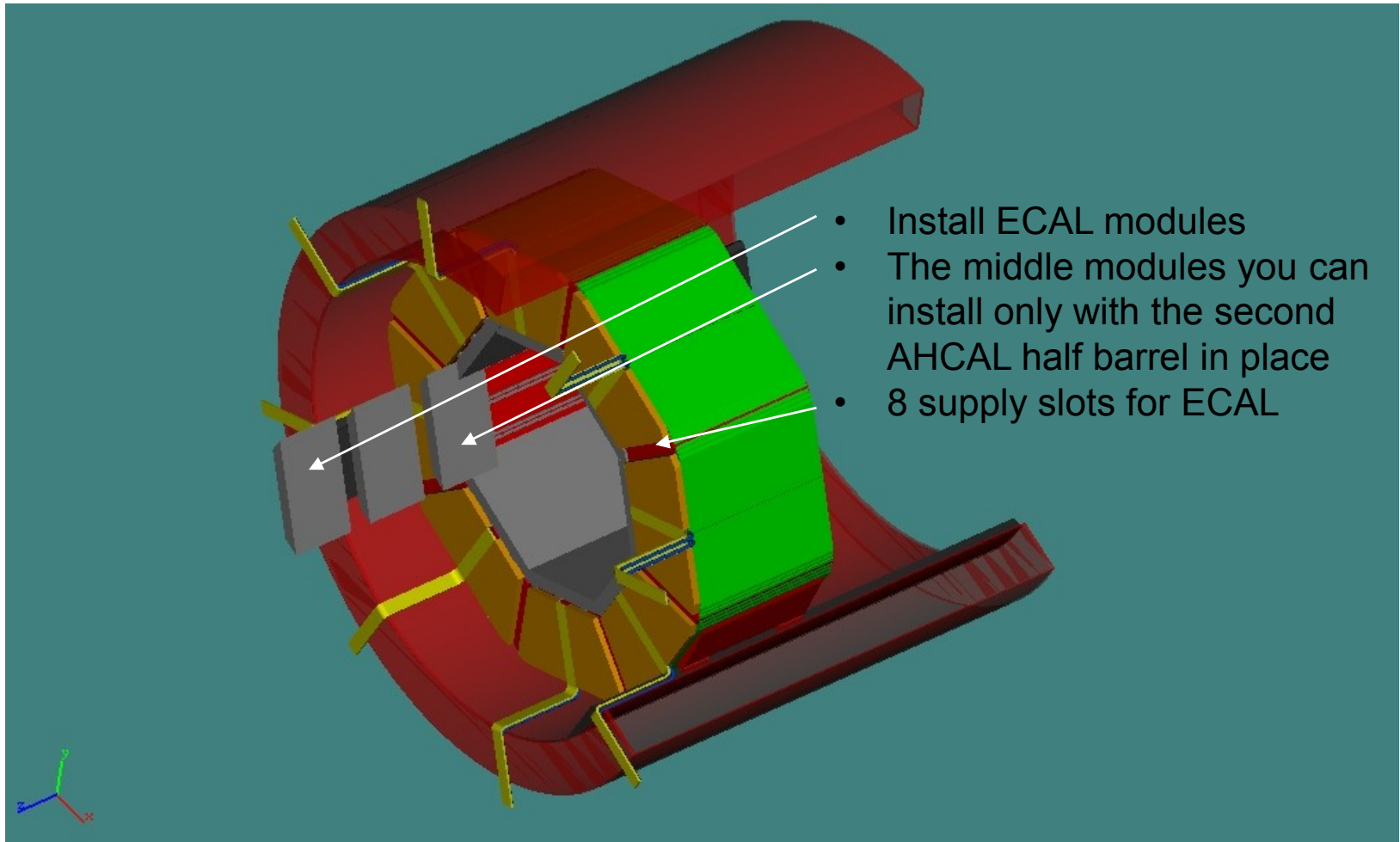
AHCAL Installation



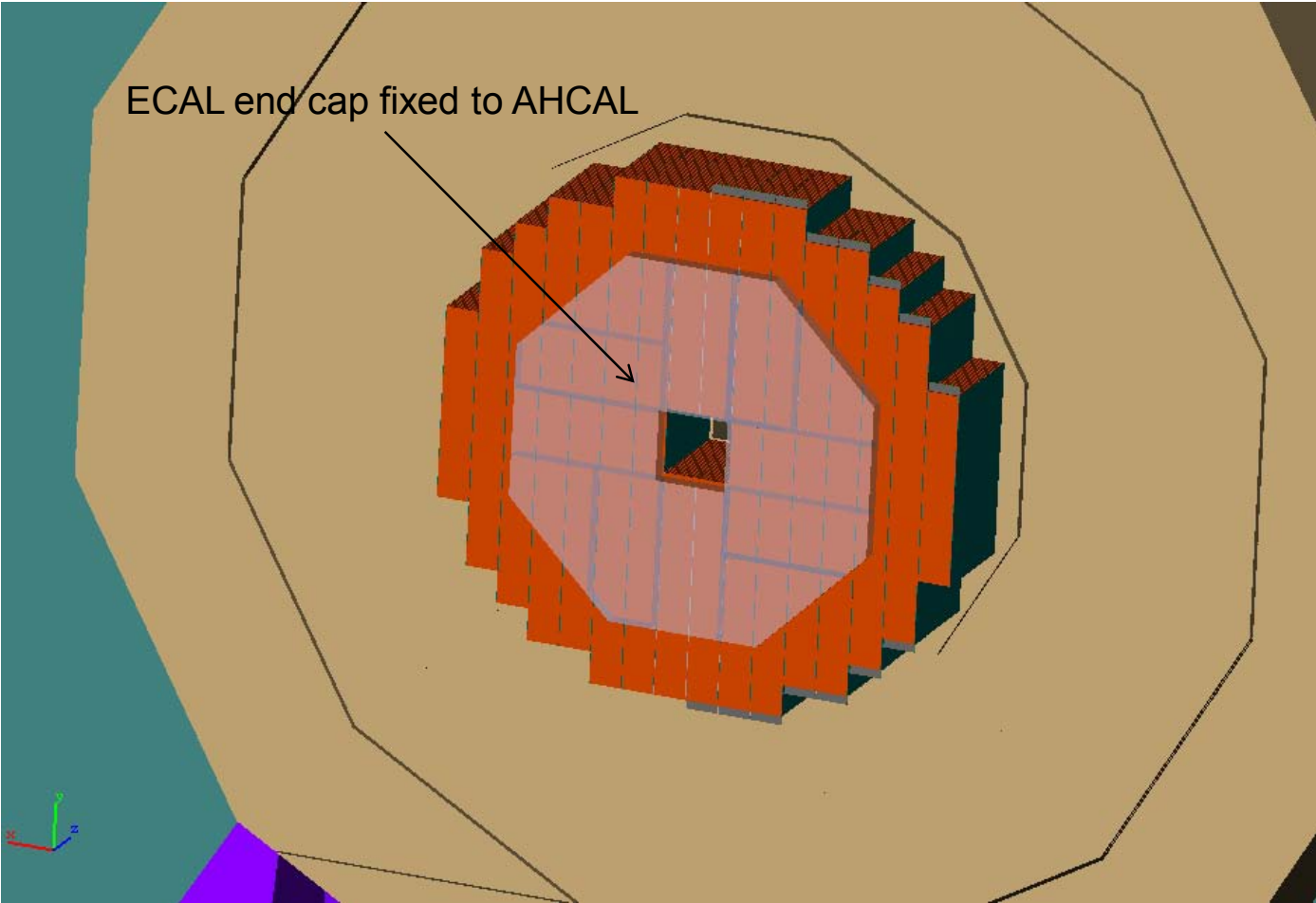
AHCAL Installation



AHCAL/ECAL Installation

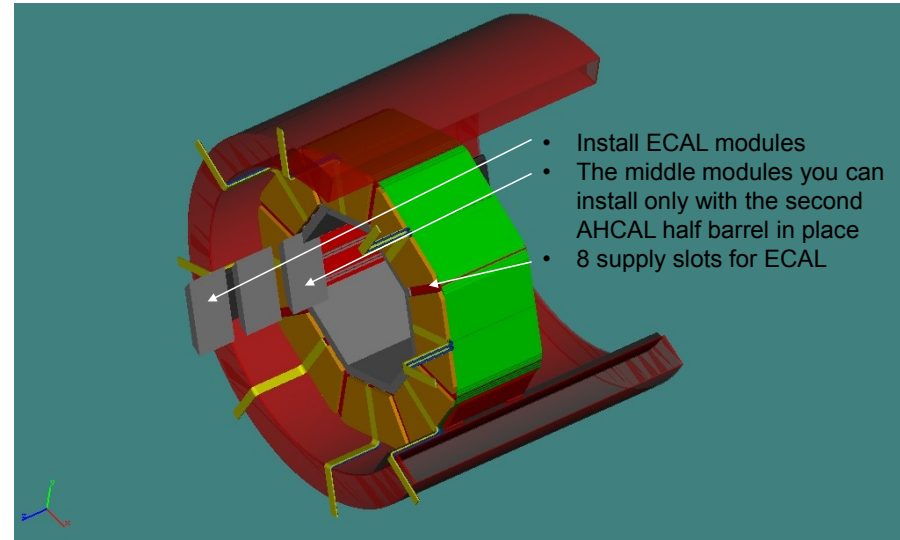


Endcap Calorimeter Installation

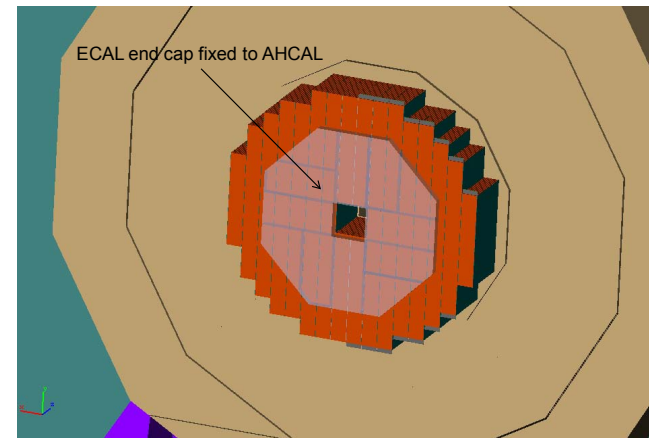


Calorimeter Installation

- Special tooling needed:
support cradle, directly mounted to the coil
- Crane coverage
- Surveying equipment
- Time estimate for AHCAL barrel:
 - 180 working days
- ECAL barrel:
 - probably less
- Endcaps: ?



K. Gadov

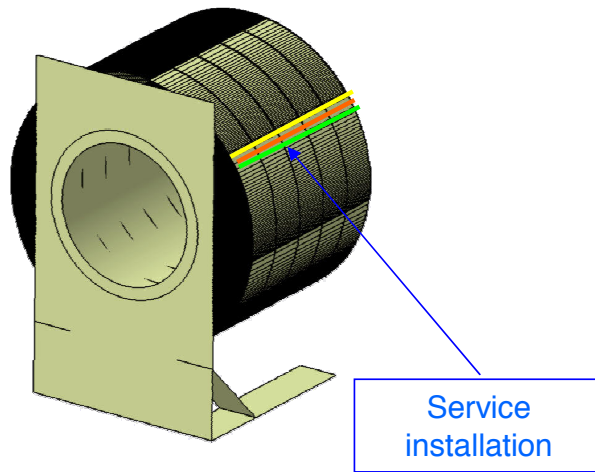


SDHCAL Installation

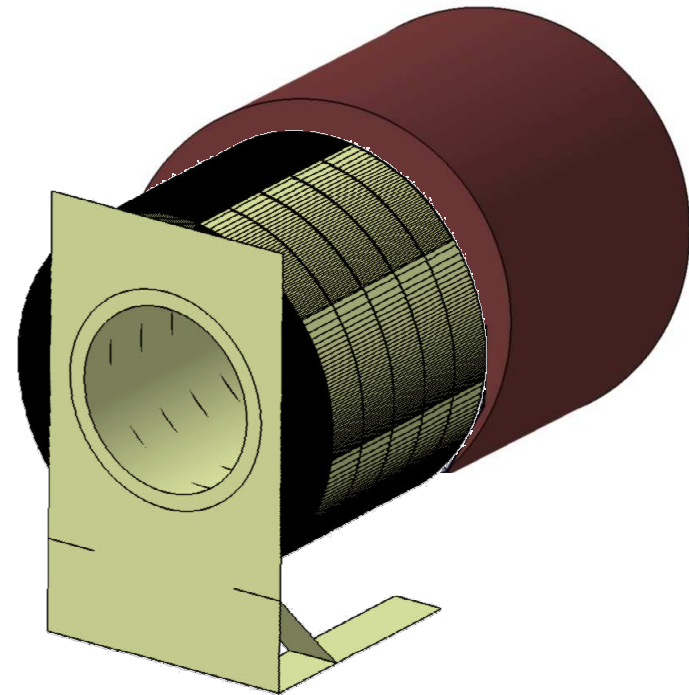


Barrel design : ILD integration

- Barrel with 5 wheels into the ILD

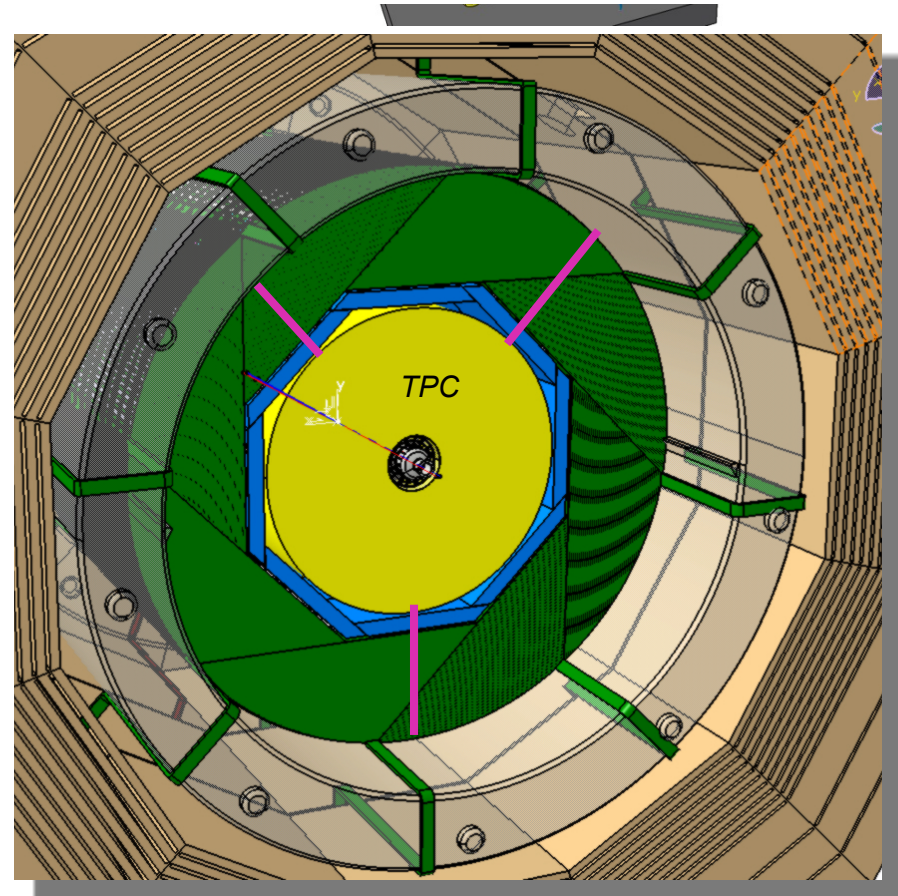
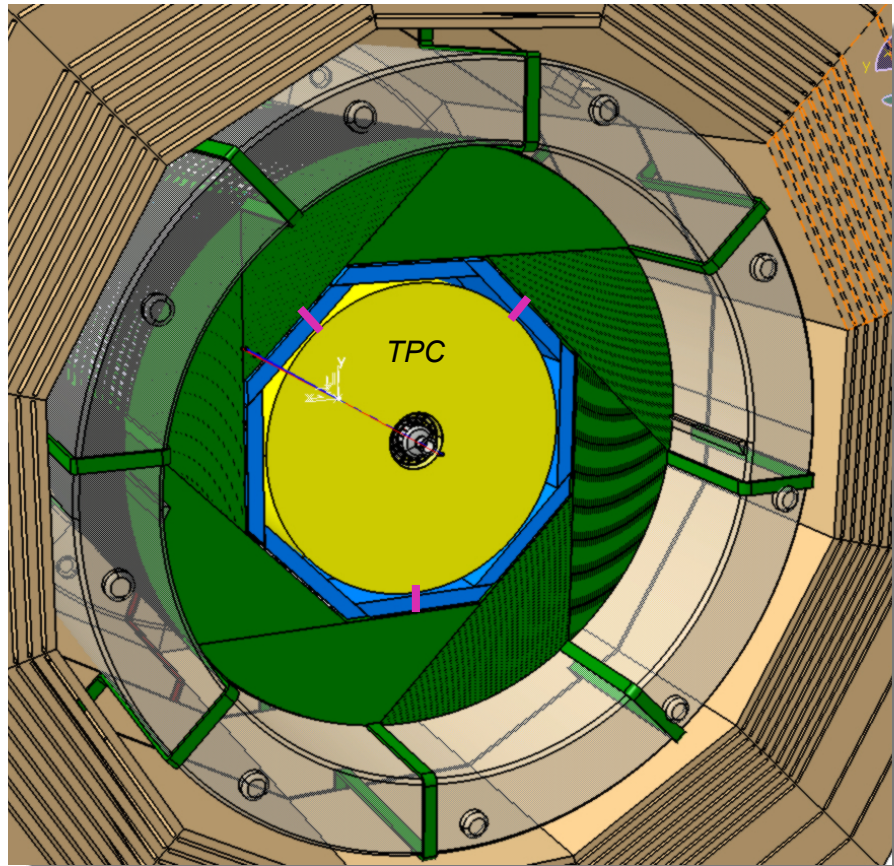


- Wheels are linked together
- Services installed then and connected between wheels



- Barrel ready to be connected put in front of the coil
- Insertion on the rails with tool

TPC Installation

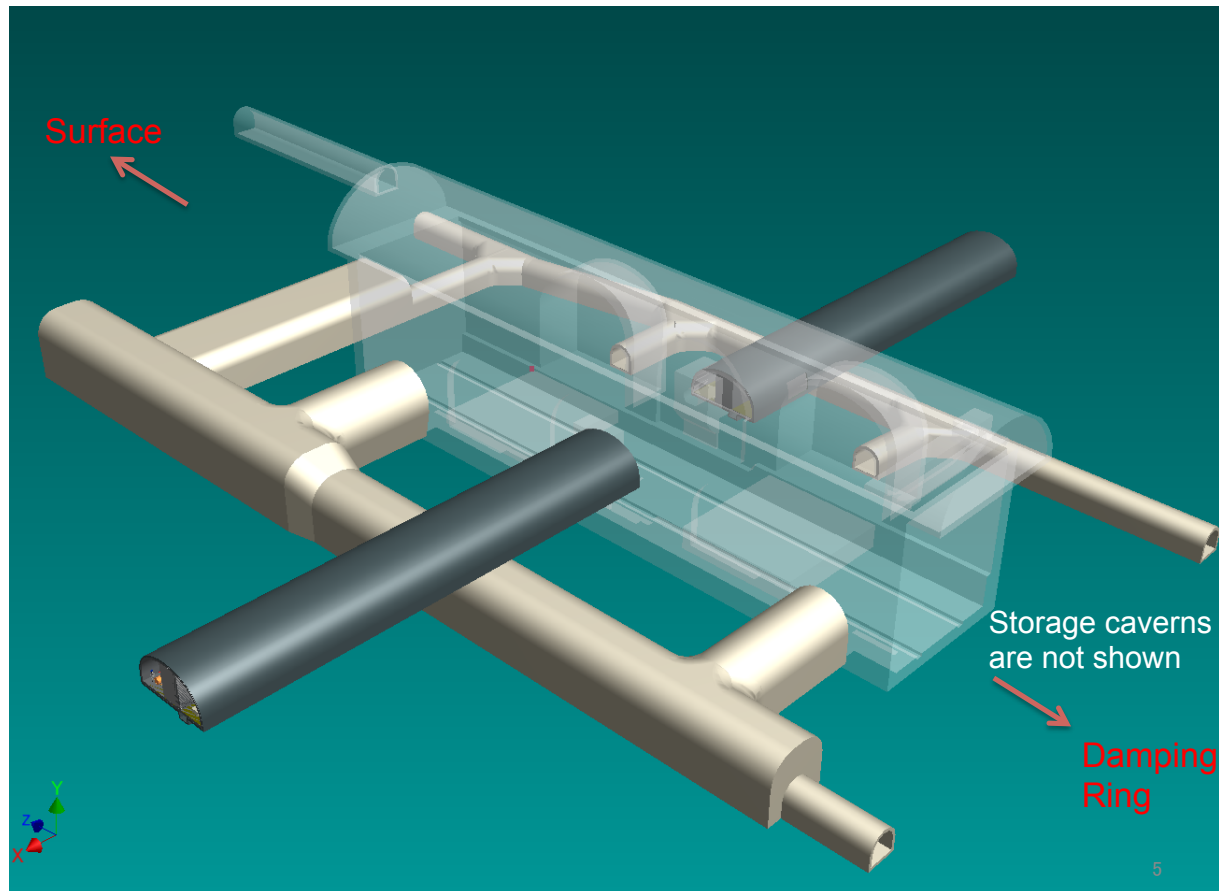


ID	Task Name	Duration	Year 1				Year 2				Year 3				Year 4				Year 5				
			Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	
32	Move YBs	10 days																					
33	Move YEs	10 days																					
34	Move/install QD0 pillar	10 days																					
35	Magnet commissioning	100 days																					
36	Cool down	20 days																					
37	High field tests	20 days																					
38	Field mapping	20 days																					
39	QD0 testing	20 days																					
40	Warm up	20 days																					
41	Detector commissioning	120 days																					
42	Detector commissioning and testing	120 days																					

- Critical path is defined by central detector construction:
 - central yoke ring, coil, barrel calorimeter, TPC, inner detector
- Will have three coexistent major „construction sites“ at the same time in the underground hall:
 - barrel part, both endcaps
 - consecutively: two other barrel yoke rings, QD0 pillar, forward calorimeter
- Time estimate: 3.25 years
- But: need sufficient underground space!

Japanese Hall Design

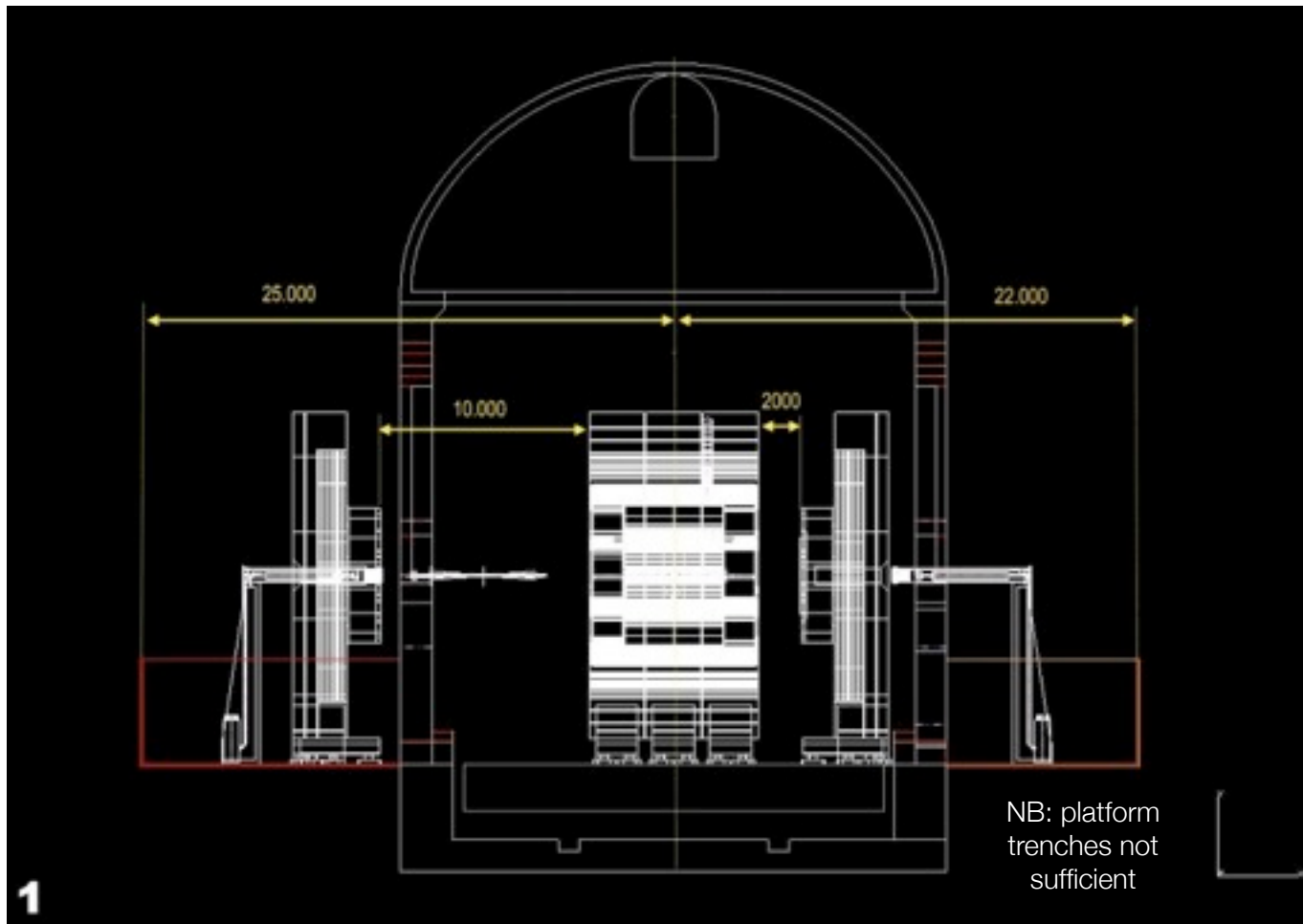
Y. Sugimoto



- Probably not enough space for detector assembly and regular maintenance

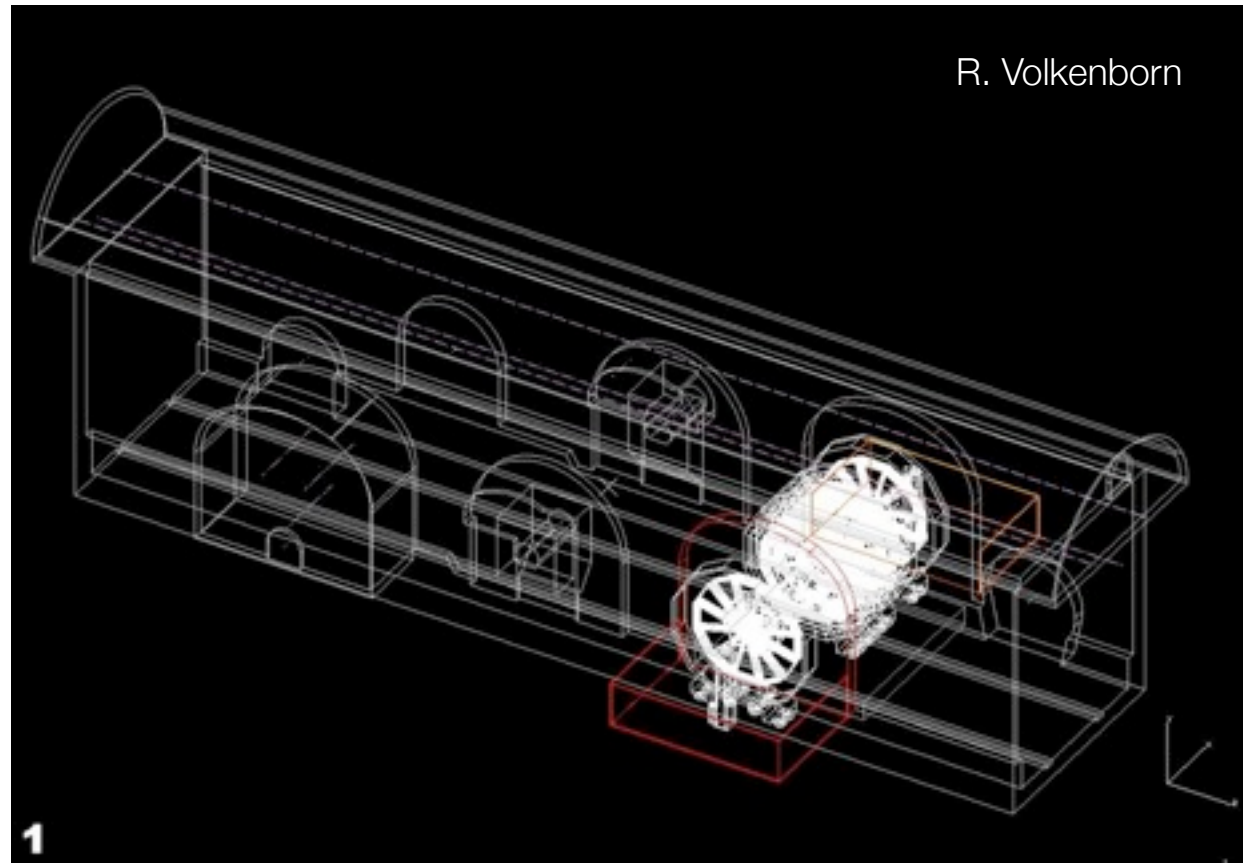
Maintenance Position

- Changed hall model to enlarge alcoves in parking position (47m lateral space)



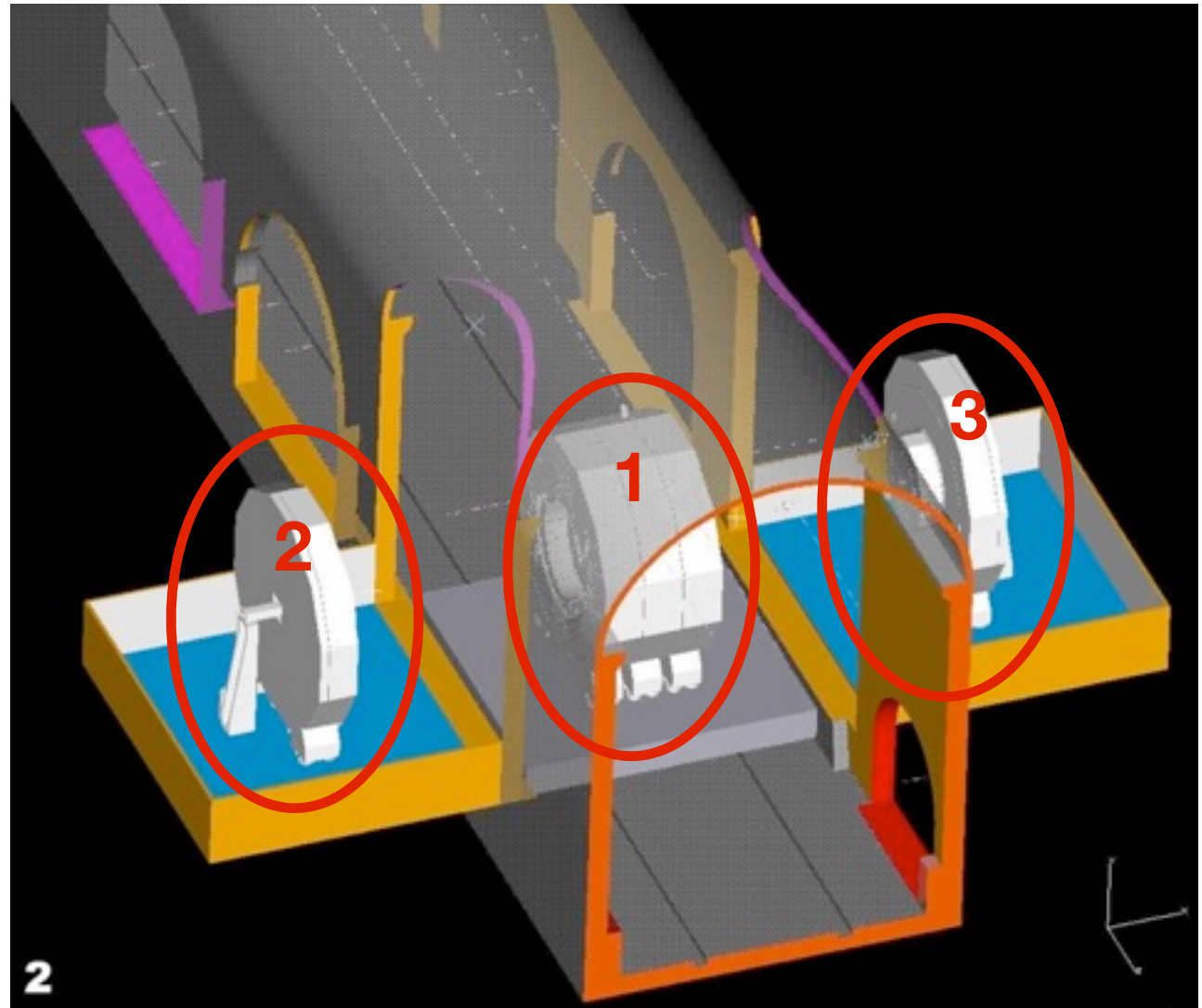
Larger Parking Position

- Lateral space is needed to open the detector, remove QD0 magnets, inner detector, TPC
- Alternative: rotate the detector by 90 deg before opening
 - Almost impossible
 - need to disconnect cable chains and possibly cryo lines
 - warm-up the coil



Underground Construction Space

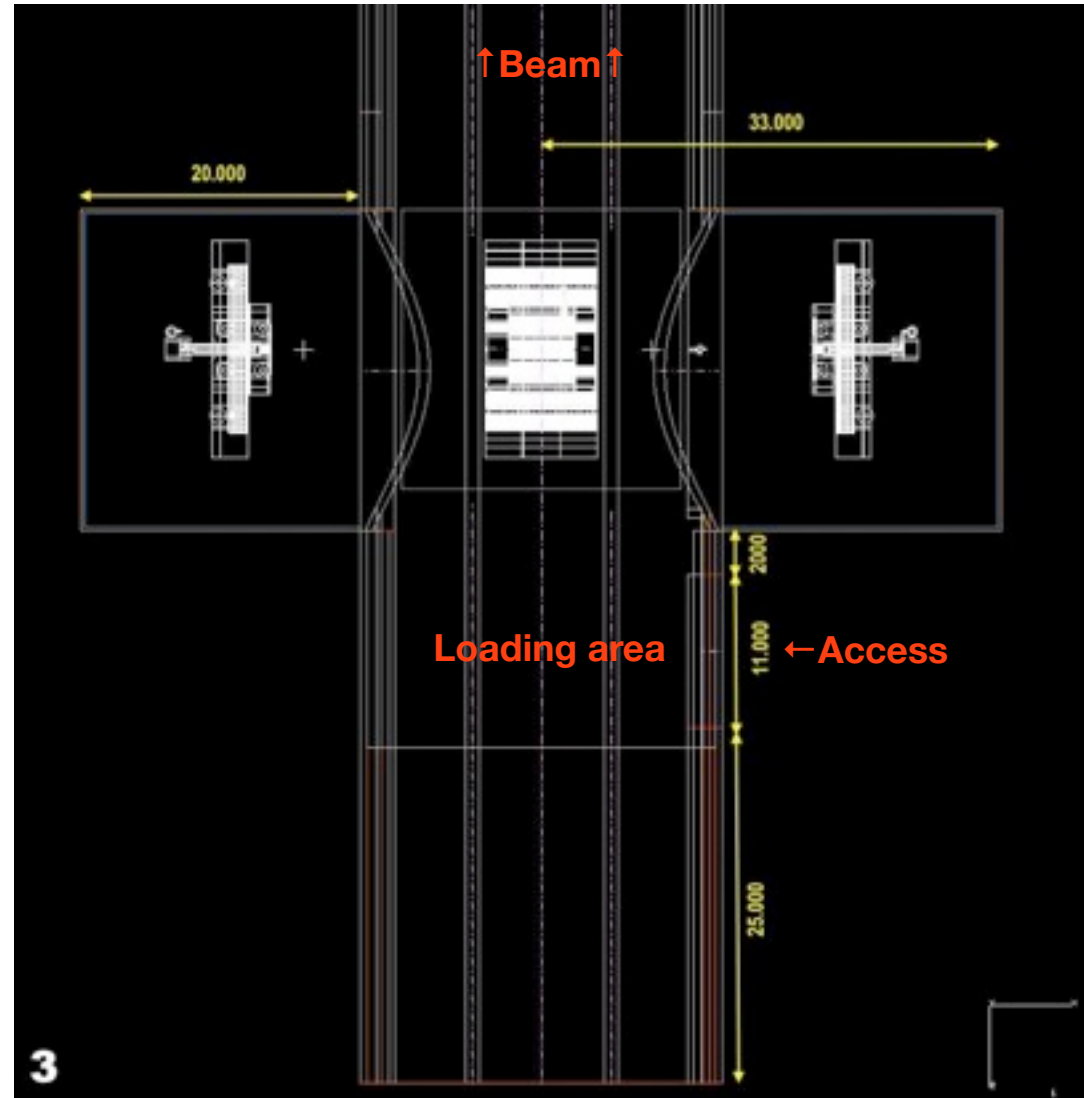
- Three „construction sites“
- Platform (1): central yoke ring, coil, barrel detector
- Alcoves (2,3): endcaps: yoke, calorimeter
- Crane coverage:
 - 200t in main hall
 - 100t in alcoves



Underground Construction Space

- Three underground „construction sites“ are minimum
 - Alcoves need to be enlarged (53m lateral space)
- Fourth might be needed for YB+/- barrel yoke rings, QD0 pillars, etc.
- For comparison: CMS surface assembly hall : ~25m x ~90m
 - we need about the same - underground

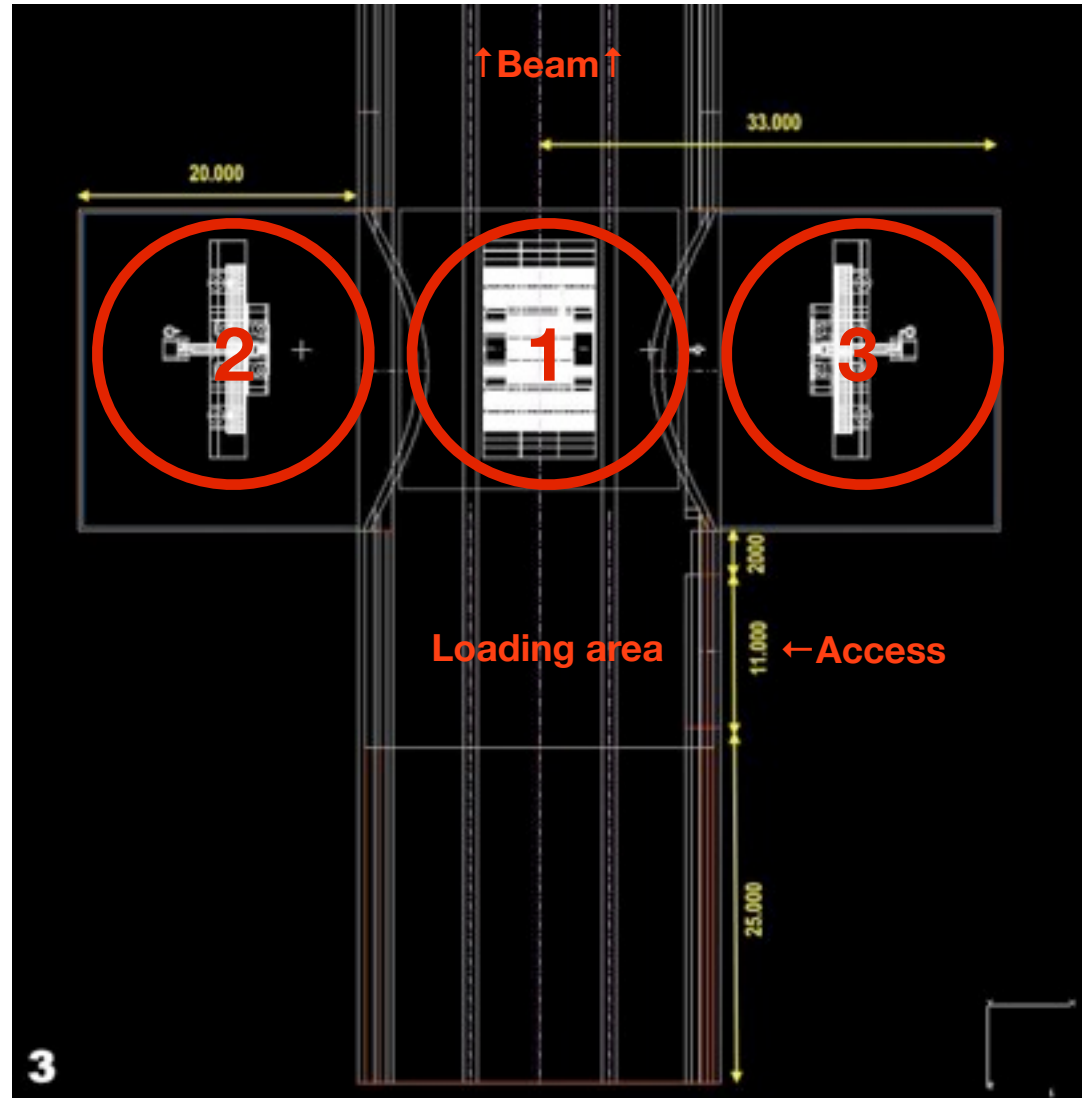
R. Volkenborn



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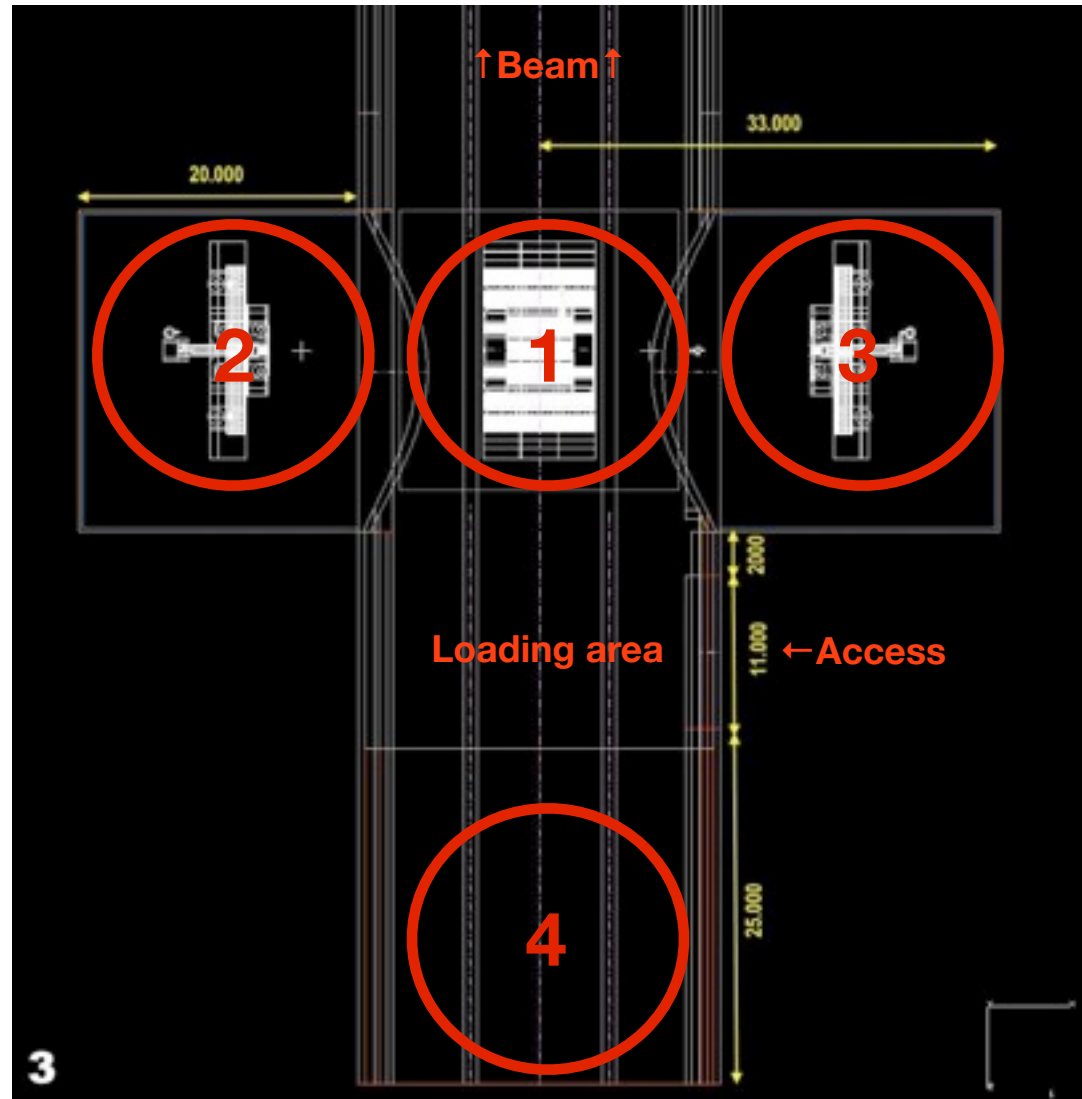
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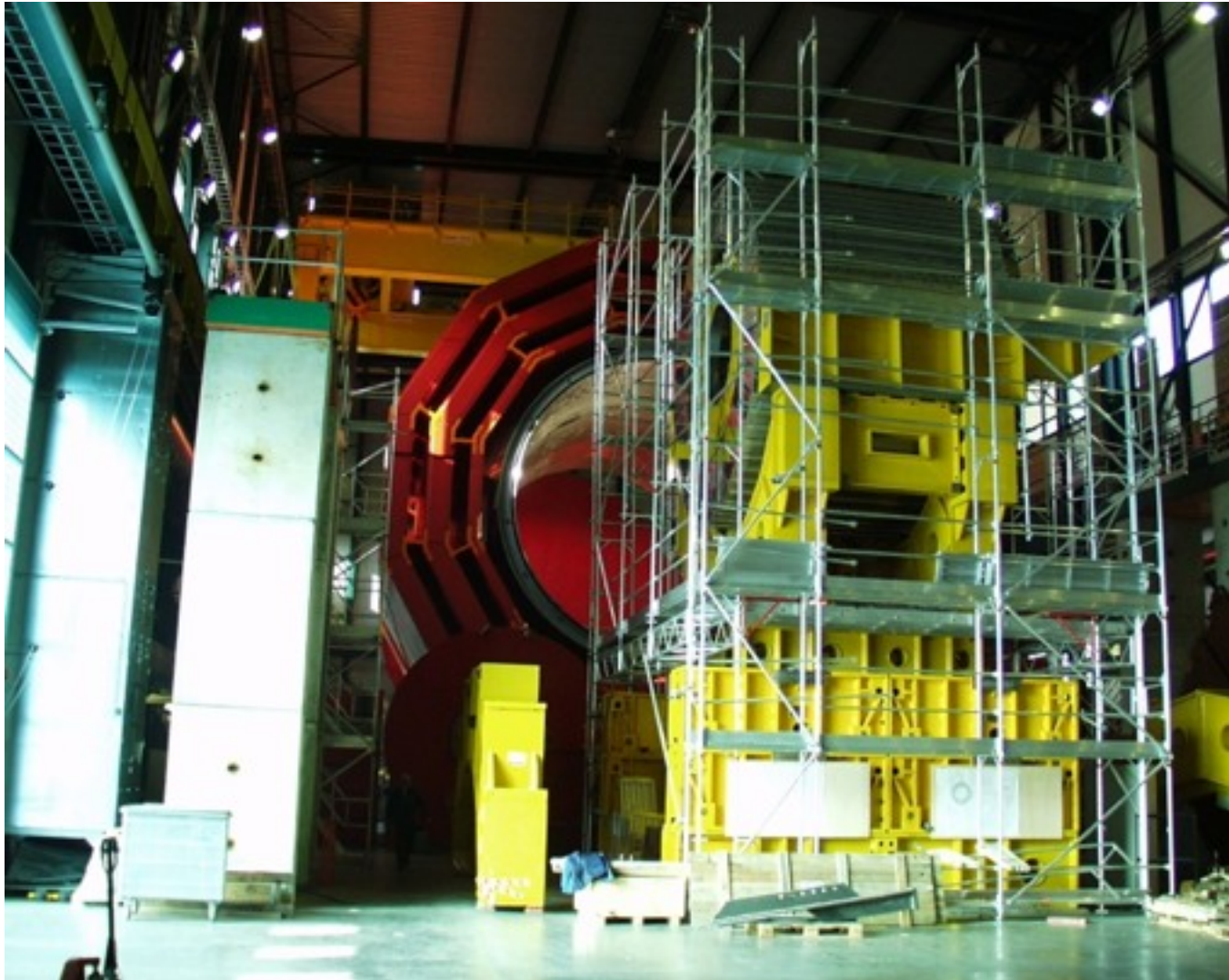
R. Volkenborn



CMS Surface Assembly Hall



CMS Surface Assembly Hall



CMS Surface Assembly Hall



Conclusion

- First attempt to define an assembly sequence for ILD in the mountain sites
- 3y+ underground assembly time seems feasible
 - Requires optimised underground conditions
- Current hall design probably too small for regular detector maintenance
- Current hall design probably too small for underground detector assembly

- Need to optimise the whole system detector/machine/hall w.r.t. assembly time schedule and cost!
- Need to understand trade-offs: space vs time