List of Homework from SLAC Meeting (01/2015)

Karsten Buesser

ILC Infrastructure Mini-WS
01.09.2015

MDI/CFS Discussions during SiD Workshop

MDI/CFS Meeting

14-15 January 2015
SLAC
US/Pacific timezone

Search

- Overview
- Timetable
- Registration
  - Registration Form
- Participant List

This MDI/CFS meeting takes place right after the SiD workshop at SLAC and will be used mainly for discussions on these topics:

- Status of L* work in BDS, SiD and ILD
- Status of change requests for the Interaction Area
- CFS status of the IR surface areas
- CFS status of the IR underground areas
- Magnetic fringe fields in SiD and ILD
- Manpower and resource requirements
- Seismic studies

These topics will be introduced in an MDI/CFS session that is embedded into the SiD workshop agenda on Tuesday: http://agenda.linearcollider.org/event/6522/other-view?view=standard

The agenda of this expert's meeting on Wendesday (overflow Thursday) will mainly contain discussions without formal presentations.

Timetable

16:00 - 17:30 **Joint Session with MDI/CFS**

Convener: Dr. Thomas Markiewicz (SLAC)

16:00 **4.1/9.1m L* Optics & Performance** *20'*
- Speaker: Dr. Glen White (SLAC)
- Material: **Slides**

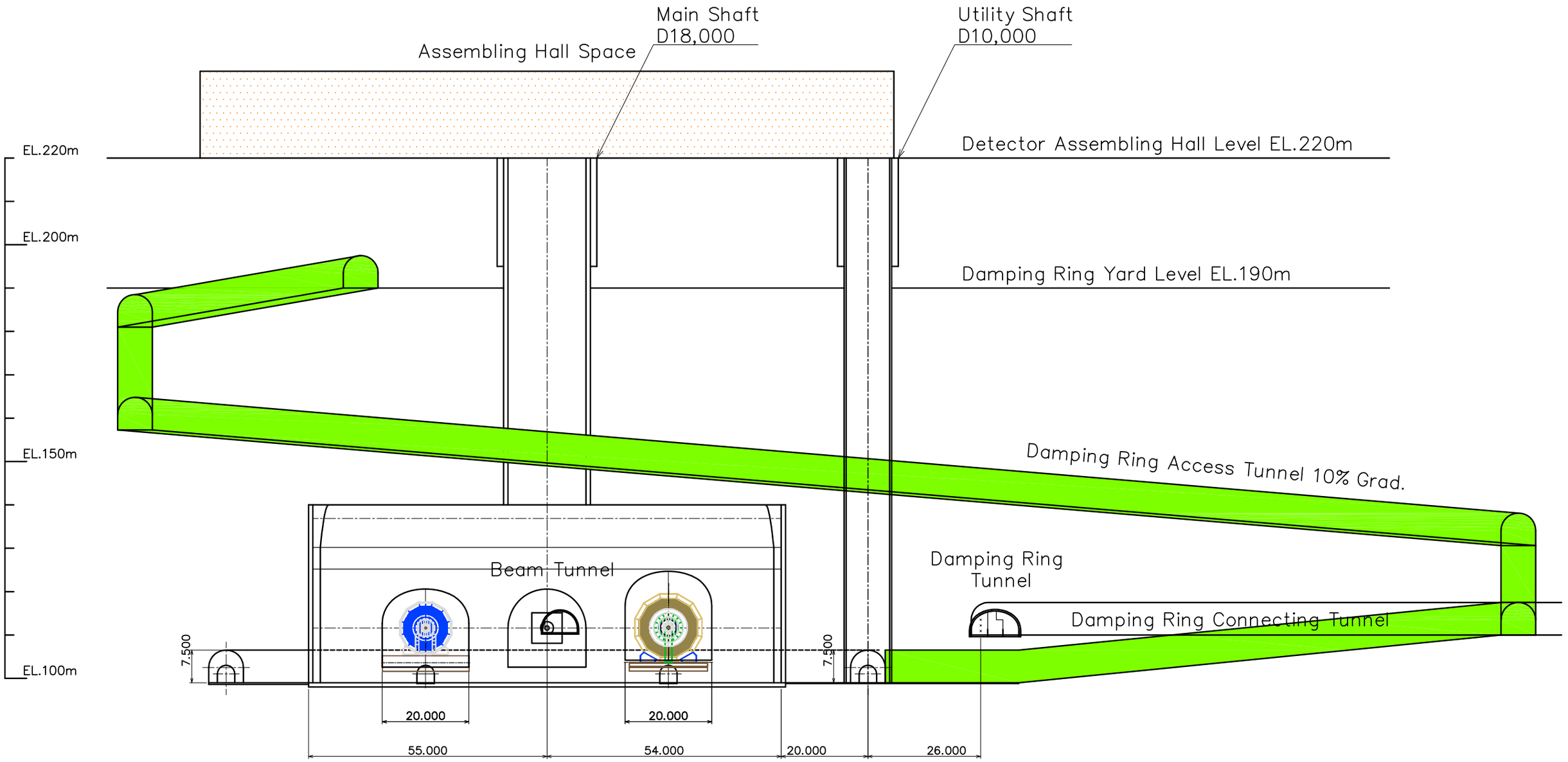
16:20 **ILD L* Studies** *20'*
- Speaker: Dr. Karsten Buesser (DESY)
- Material: **Slides**

16:40 **SiD L* Status** *15'*
- Speaker: Dr. Thomas Markiewicz (SLAC)
- Material: **Slides**

16:55 **Change Request #3 Implementation Plans & Intro to CR#4** *20'*
- Speaker: Mr. Victor Kuchler (Fermilab)
- Material: **Slides**

17:15 **Restatement of SiD Fringe Field & what new requirement would have to be to accommodate current design** *15'*
- Speaker: Marco Oriunno (SLAC National Accelerator Laboratory (US))
- Material: **Slides**

- plus half day of experts discussions

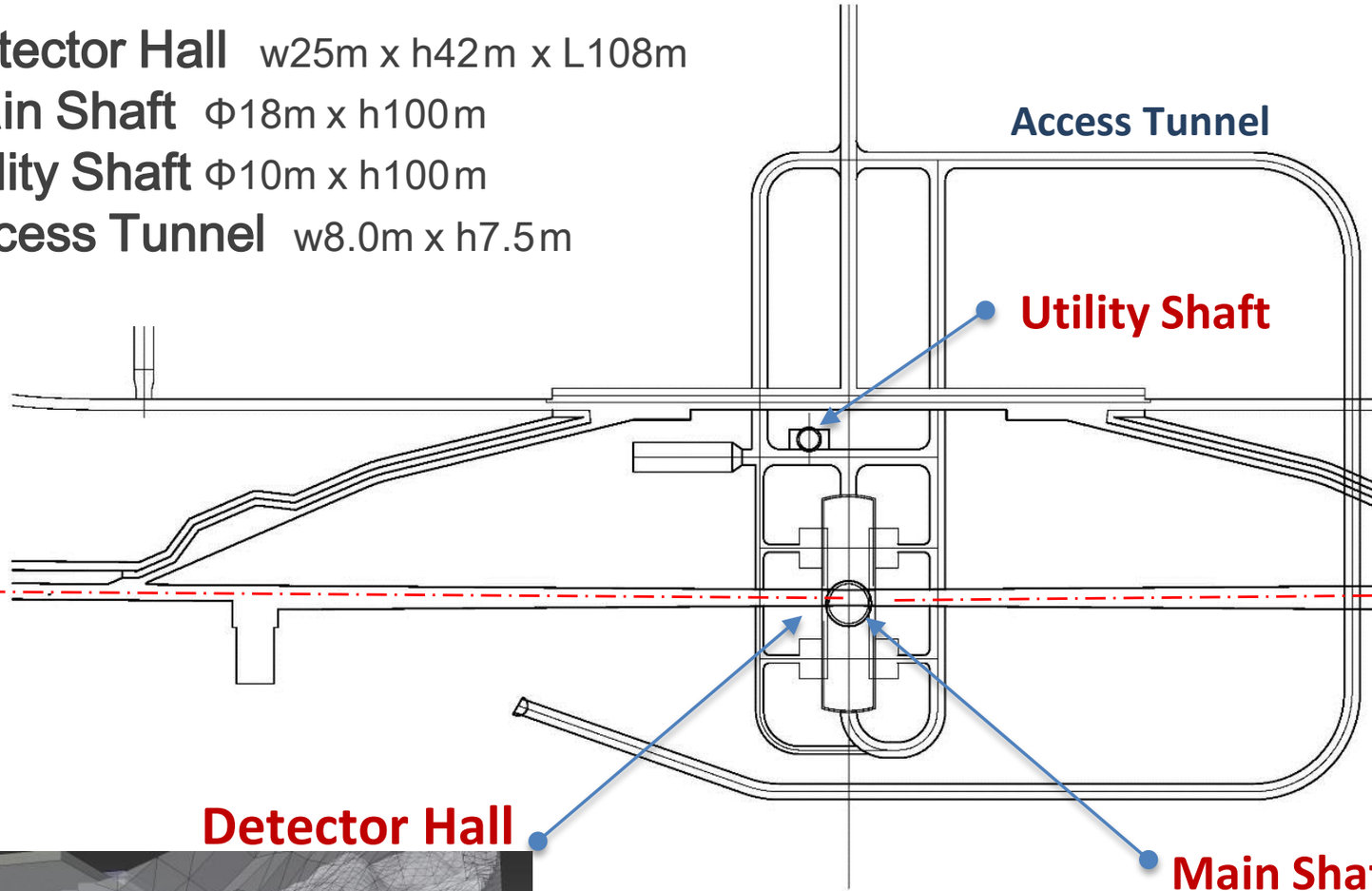

Main Shaft
D18,000
Utility Shaft
D10,000
Assembling Hall Space
EL.220m
Detector Assembling Hall Level EL.220m
EL.200m
Damping Ring Yard Level EL.190m
EL.150m
Damping Ring Access Tunnel 10% Grad.
Damping Ring
Tunnel
Beam Tunnel
Damping Ring Connecting Tunnel
EL.100m
7.500
7.500
20.000
20.000
55.000
54.000
20.000
26.000

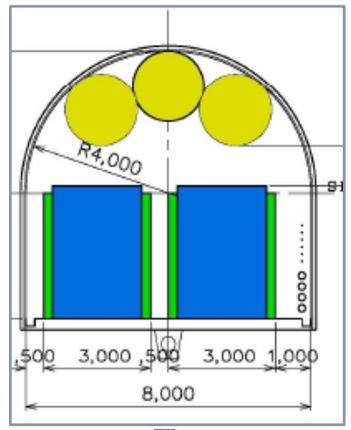
HYBRID - A'

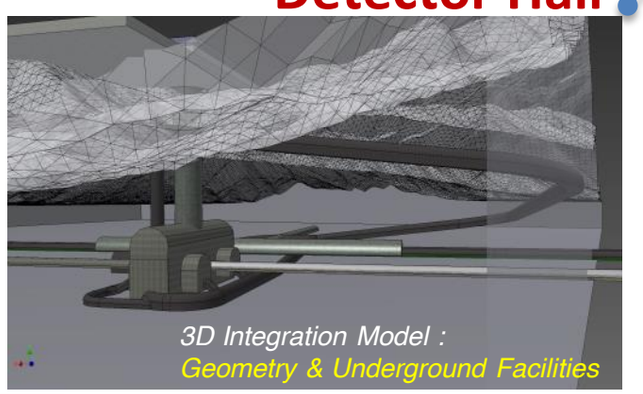
Overview of the DH scheme change

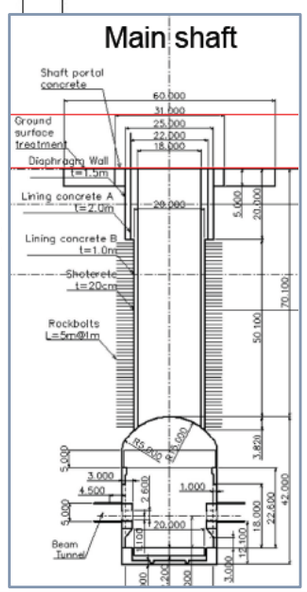
Underground Facilities

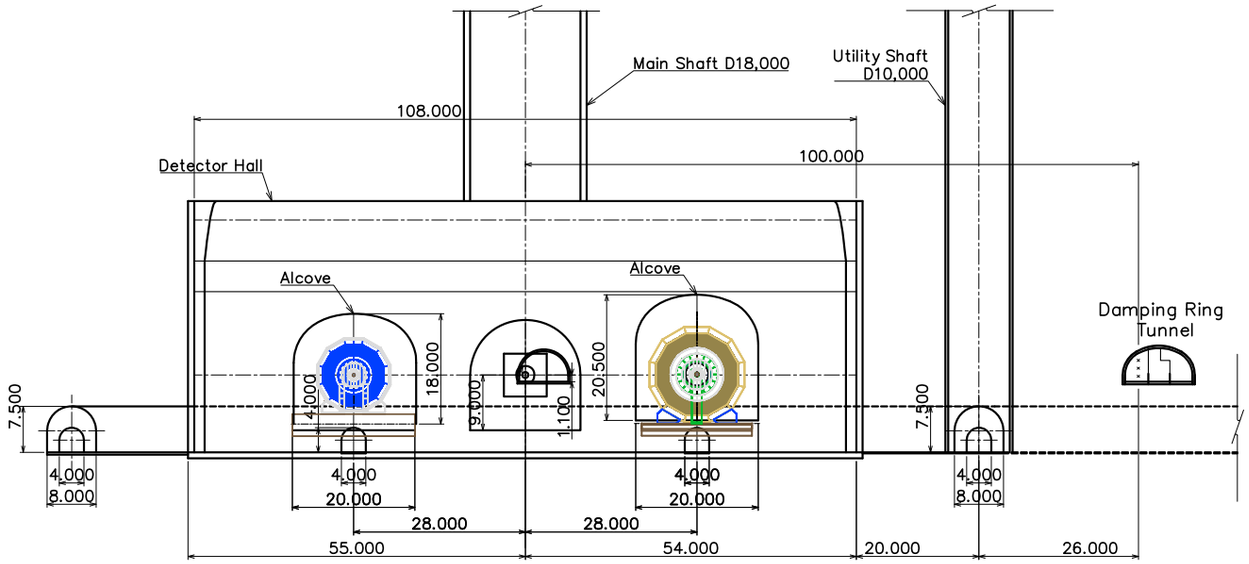
- **Detector Hall** w25m x h42m x L108m
- **Main Shaft** Φ18m x h100m
- **Utility Shaft** Φ10m x h100m
- **Access Tunnel** w8.0m x h7.5m

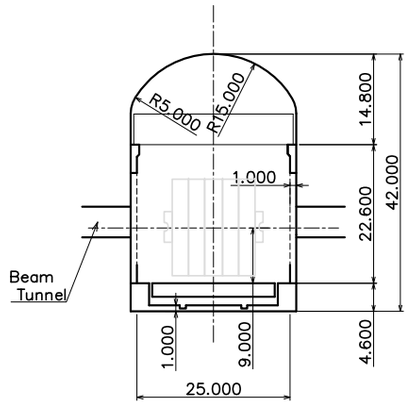


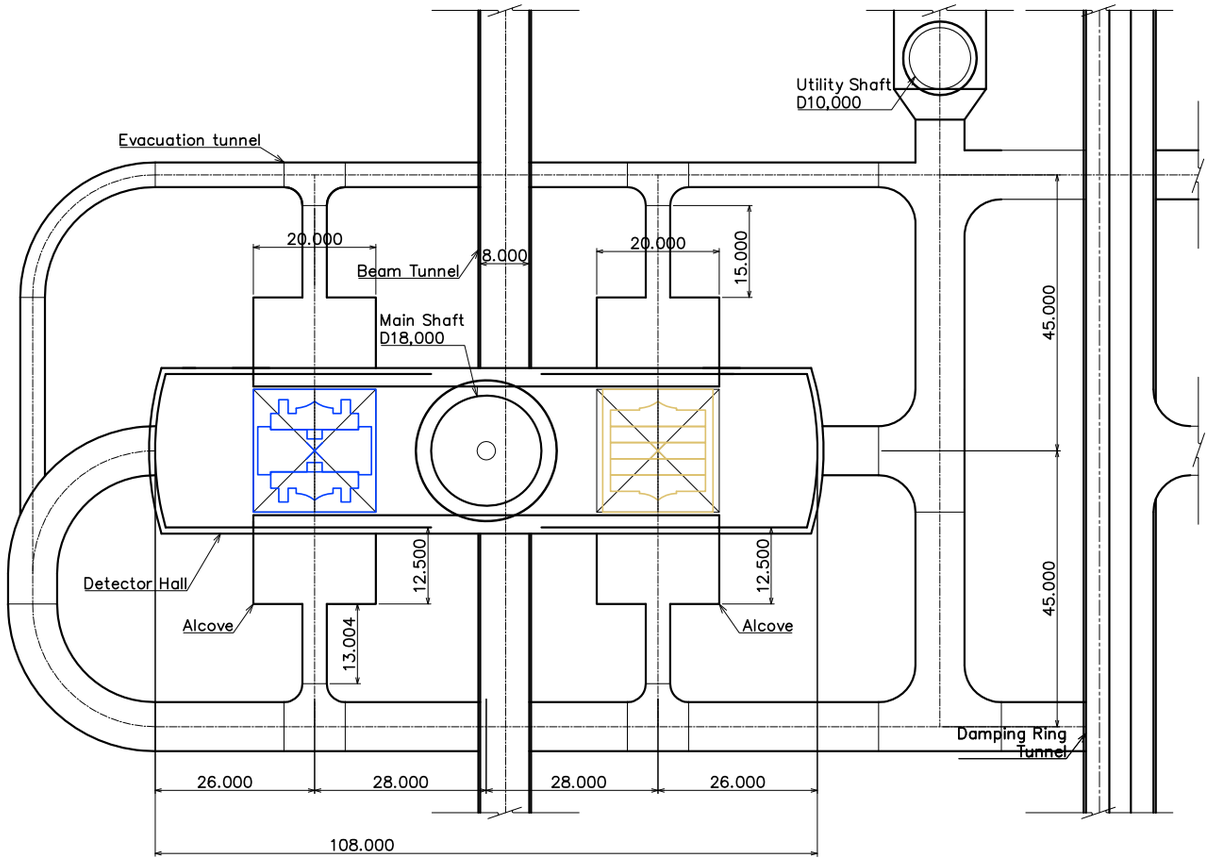












HYBRID-A'

0 50m

Liniar Colider Collaboration **ASIA REGION**	**CFS Detector Hall Access Study** **Hybrid Option**	KEK	**DRAWING NO.**	**REVISION**
			SCALE shown on drawing	**DATE 4 Sep 2014**

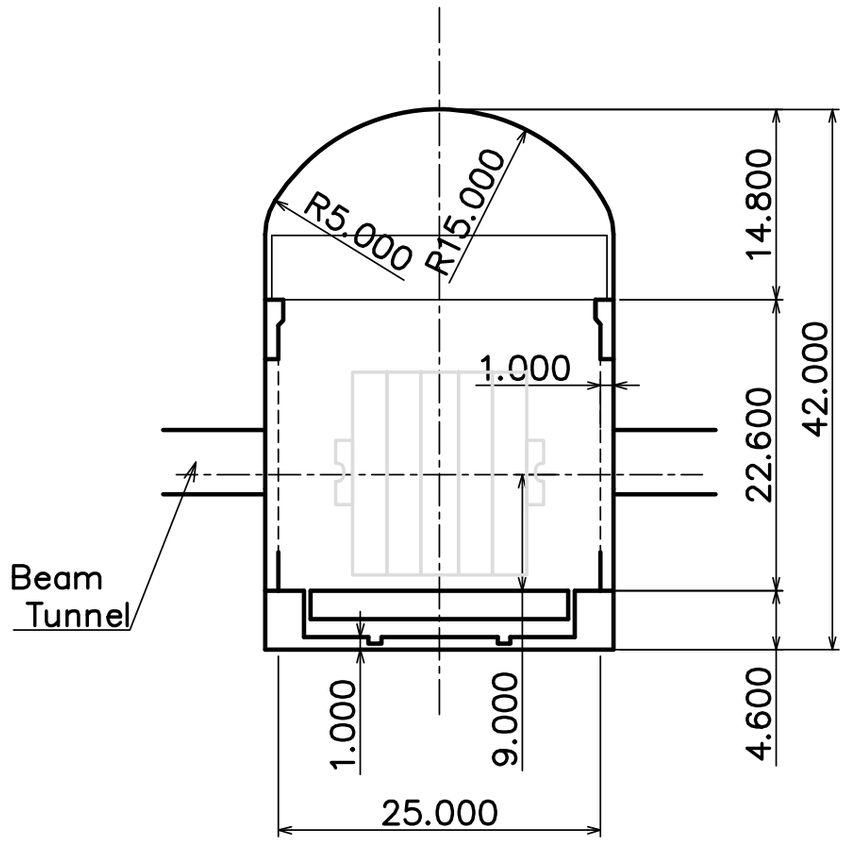
List of Homework

- Assembled list of open questions to be worked on:
  - Verify optimal height of underground hall (now 42m)
  - Verify height of crane bridge over beamline (50G at 18m criterium)
    - -> next presentation
  - Conceptual design of accelerator tunnel/detector hall interface:
    - support of QF1, design of pacman
    - Are 40t cranes adequate for pacman installation?
    - Review possibility of running services in 18m shaft
    - Requirement of #people/time going up/down elevator
    - Workshops on surface and possible need for a second elevator shaft
    - Specify truck routes into assembly hall
    - Connection of on-site office space and location of the central campus

Height of Underground Detector Hall

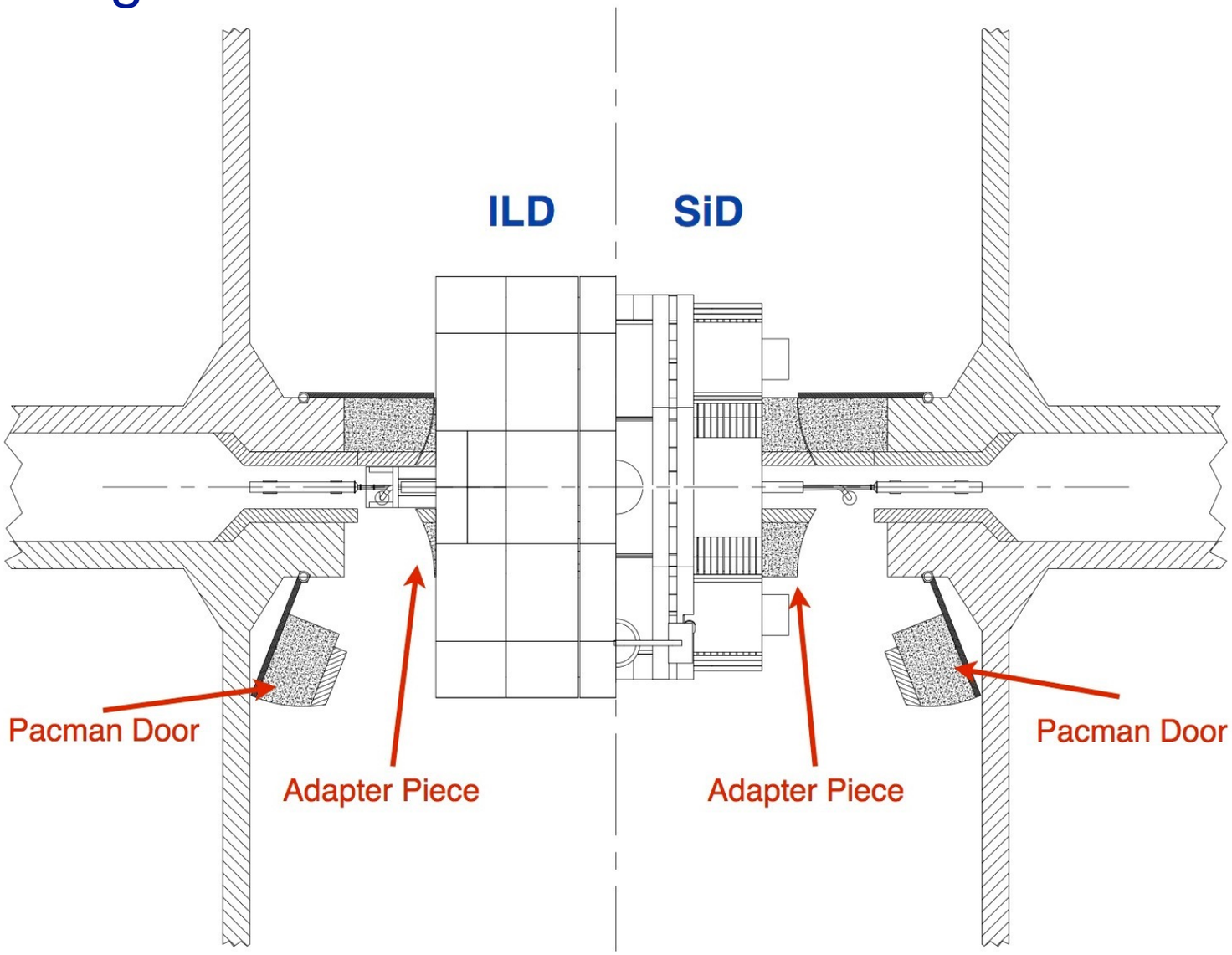
Verify optimal height of underground hall (now 42m)

- Crane hook height: 22.6m above platform
  - ILD height: 17m plus ~2m free space, SiD less
  - crane hook height is ok, could even be less
- Space for crane rails and beam
  - still designed for 250t crane
  - now 2x40t cranes - so could be less
- Space for arched roof above crane
  - depends on geology at site
  - studies planned
- Space for platform mechanics
  - need better understanding of platform support
    - rails, air pads, seismic isolation, trenches
- Maybe the underground volume could be reduced? Cost issue!



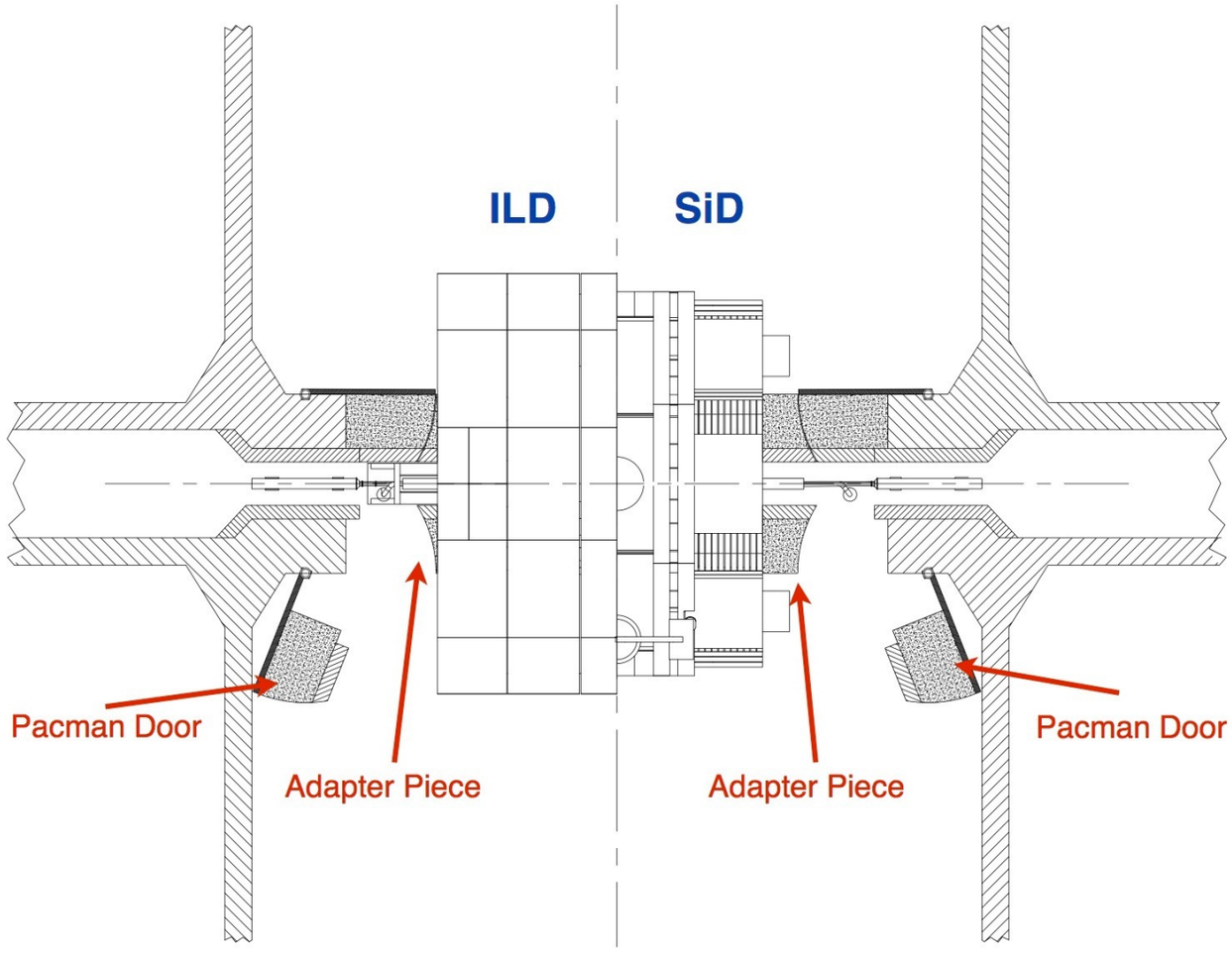
Pacman

- Conceptual design of accelerator tunnel/detector hall interface:
  - support of QF1, design of pacman
- Are 40t cranes adequate for pacman installation?
- Preliminary design in RDR/TDR:



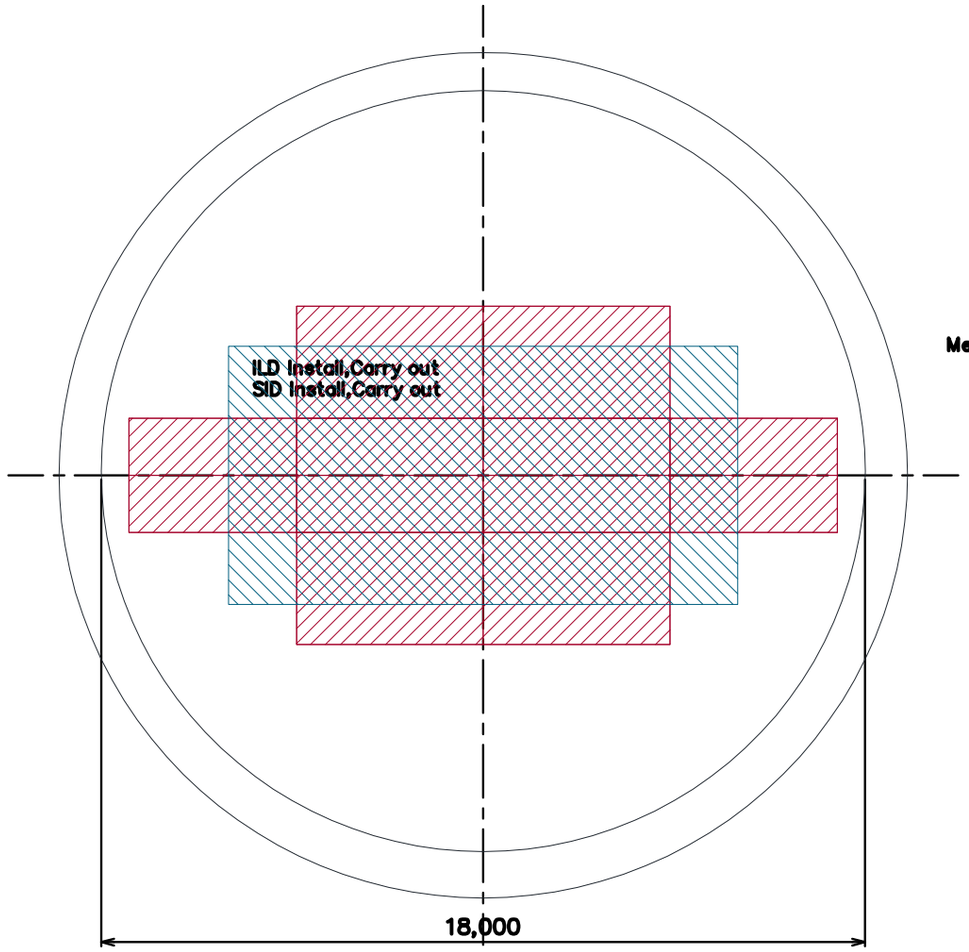
Pacman

- Need engineering design for pacman:
  - radiation shielding properties
  - support and movement
  - installation
  - adapter pieces to ILD/SiD
- Interface between accelerator tunnel and DH
- Support of QF1 for updated FF design (common L*)
- Conceptual installation plan for FF infrastructure and pacman



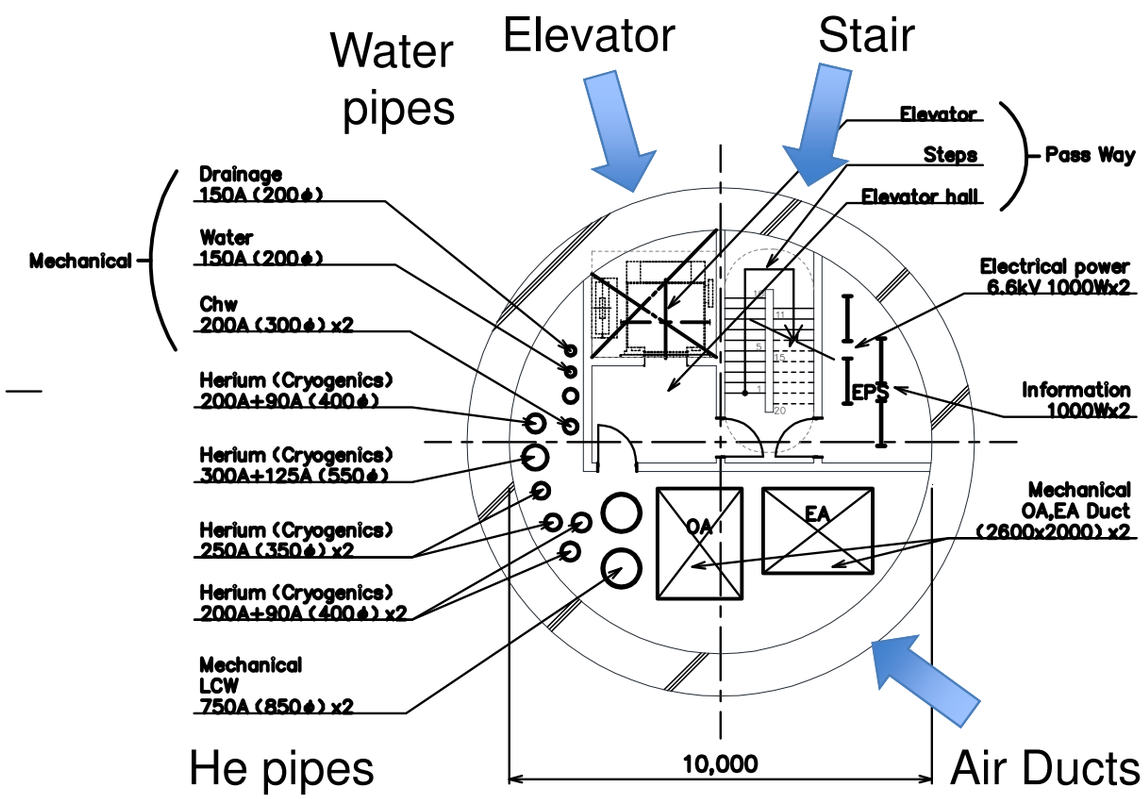
Services in Large Shaft

- Review possibility of running services in 18m shaft
- Three access paths into detector hall:
  - main shaft (18m) mainly for detector installation
    - ends above the IR, so could not be used when a detector is on the beam
  - utility shaft (10m) for elevator and services
    - one elevator, space for infrastructure (cables, cooling, venting)
    - access tunnel to damping rings
      - ~10% slope access by trucks into DH possible
- Discussions on whether one elevator is enough for routine access
- Maybe open space in main shaft could be used for services that are currently foreseen to run through utility shaft
  - no access to hall floor underneath the main shaft (IR), but service lines could be routed along ceiling and walls?
- Could add another elevator in utility shaft



Hybrid (HT–VS) –Main Shaft
Real Circle

Main shaft D=18m
Center of DH
Detectors Installation



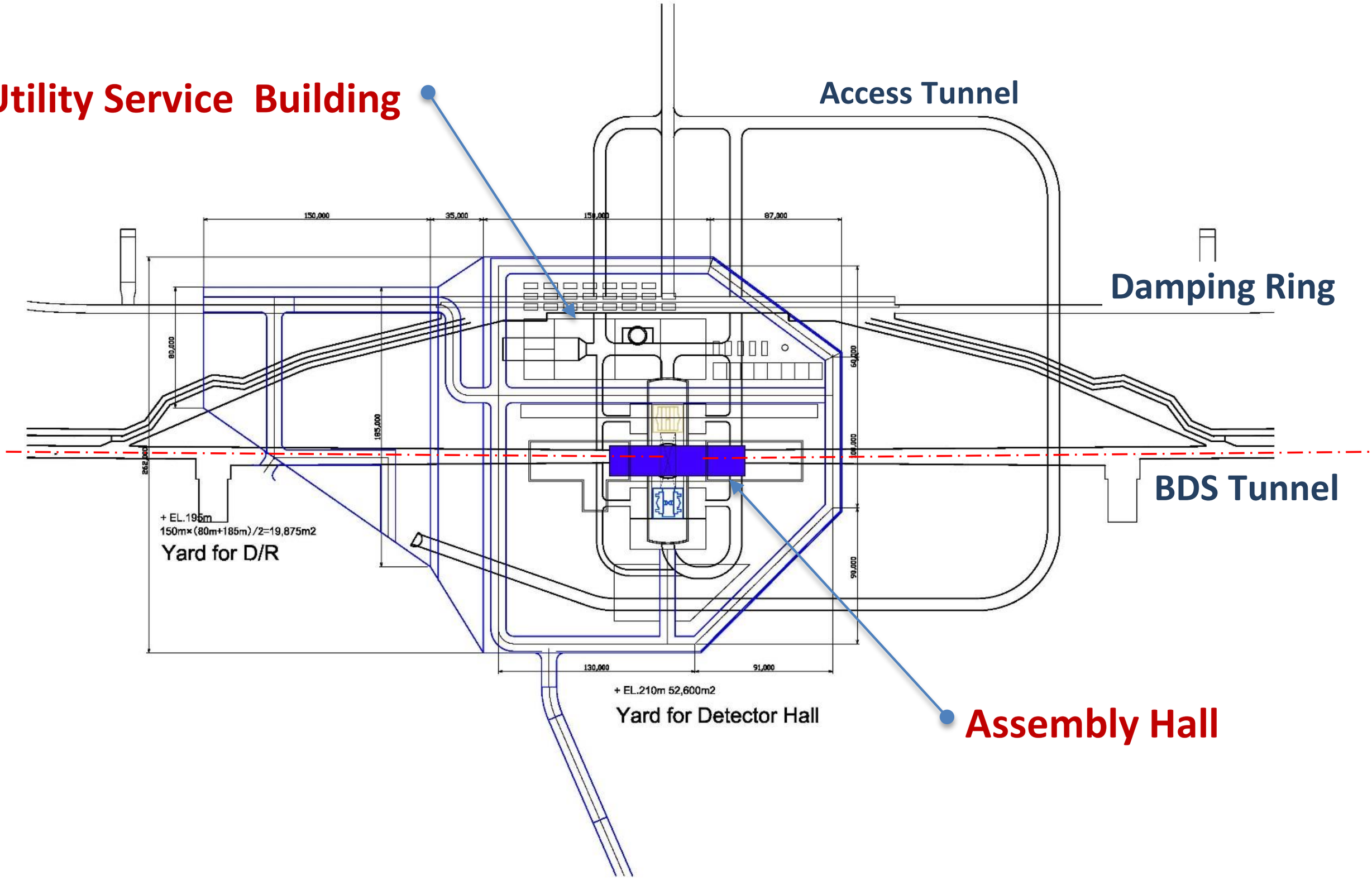
Utility shaft D=10m
Utility lines
 Pipes, ducts, cables
Personnel access to D/H
 Elevator and stair

Y. Nishimoto

Service Elevator

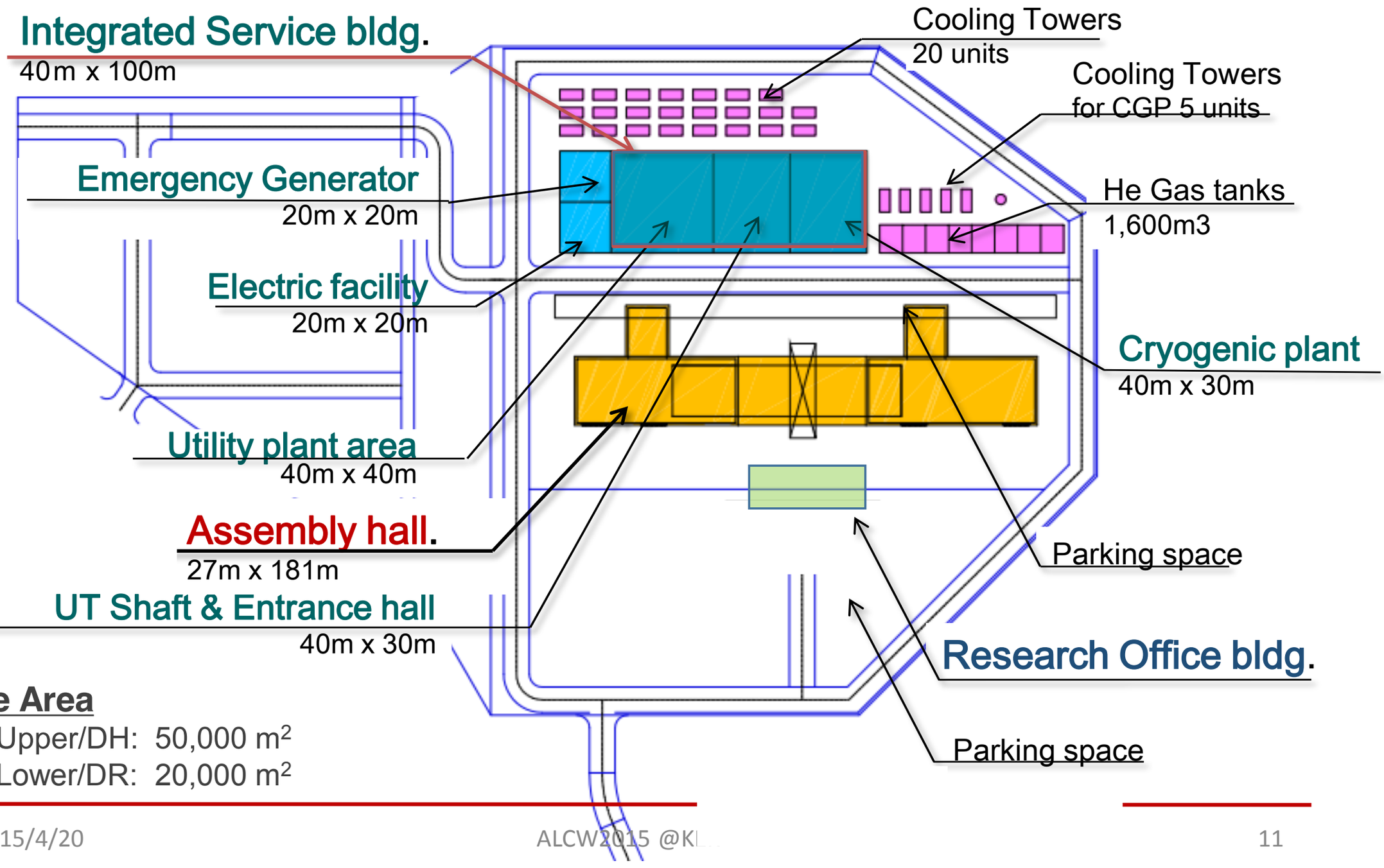
- Requirement of #people/time going up/down elevator
- Workshops on surface and possible need for a second elevator shaft
- During normal operations, the service elevator would be the main access into the hall. How many people and how much material needs to get down and up? What is the required capacity for the elevator?
- How far is the elevator on surface away from the detector infrastructure buildings (labs, workshops)?

- Need to understand workflows and paths of people and material
  - during installation
  - during operations


Utility Service Building
Access Tunnel
Damping Ring
BDS Tunnel
Assembly Hall
150,000
35,000
150,000
87,000
80,000
185,000
262,000
60,000
104,000
90,000
130,000
91,000
+ EL.195m
150m×(80m+185m)/2=19,875m2
Yard for D/R
+ EL.210m 52,600m2
Yard for Detector Hall

M. Miyahara

Facility Arrangement on the above ground
in Operation Phase



Site Area

- Upper/DH: 50,000 m²
- Lower/DR: 20,000 m²

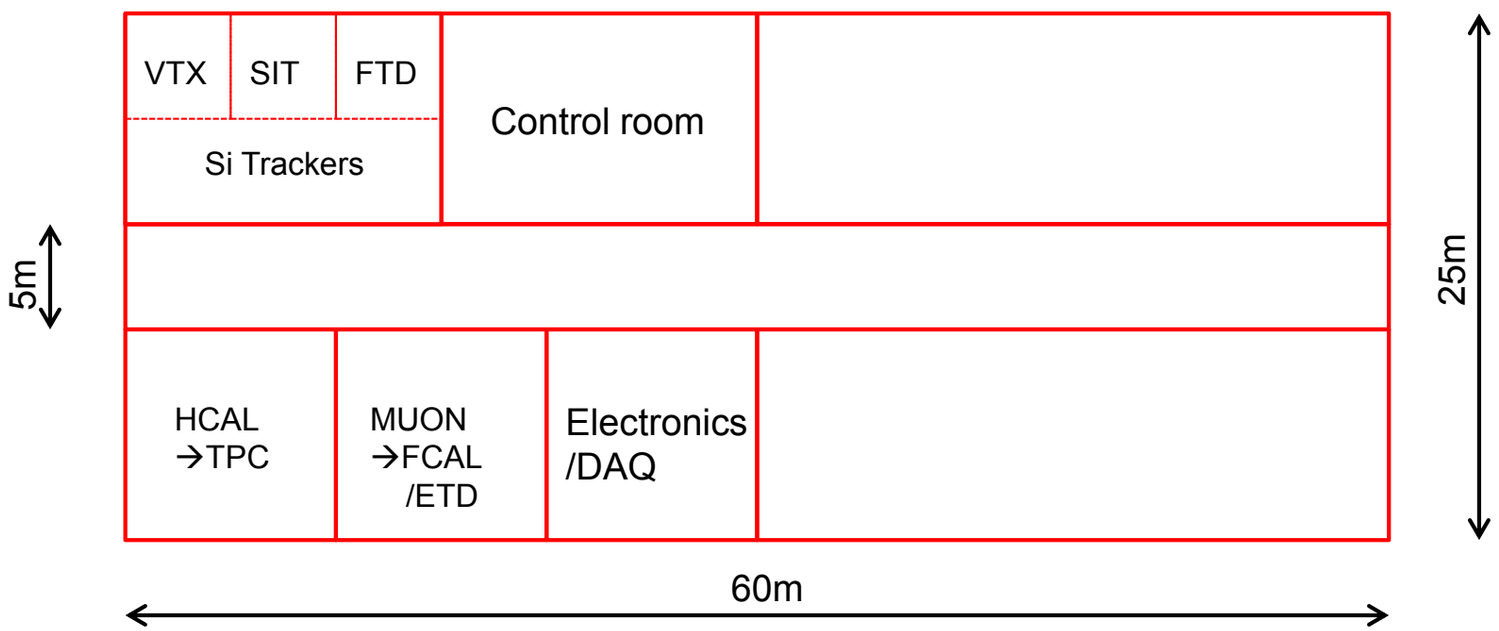
M. Miyahara

Lab/Workshop Space for ILD in Research Building

- Very first estimates for ILD (Y. Sugimoto):

Laboratory space

- Because of difference in installation schedule, the same space can be used by different sub-detectors;
  - HCAL → TPC
  - ECAL → Si trackers
  - MUON → FCAL, ETD

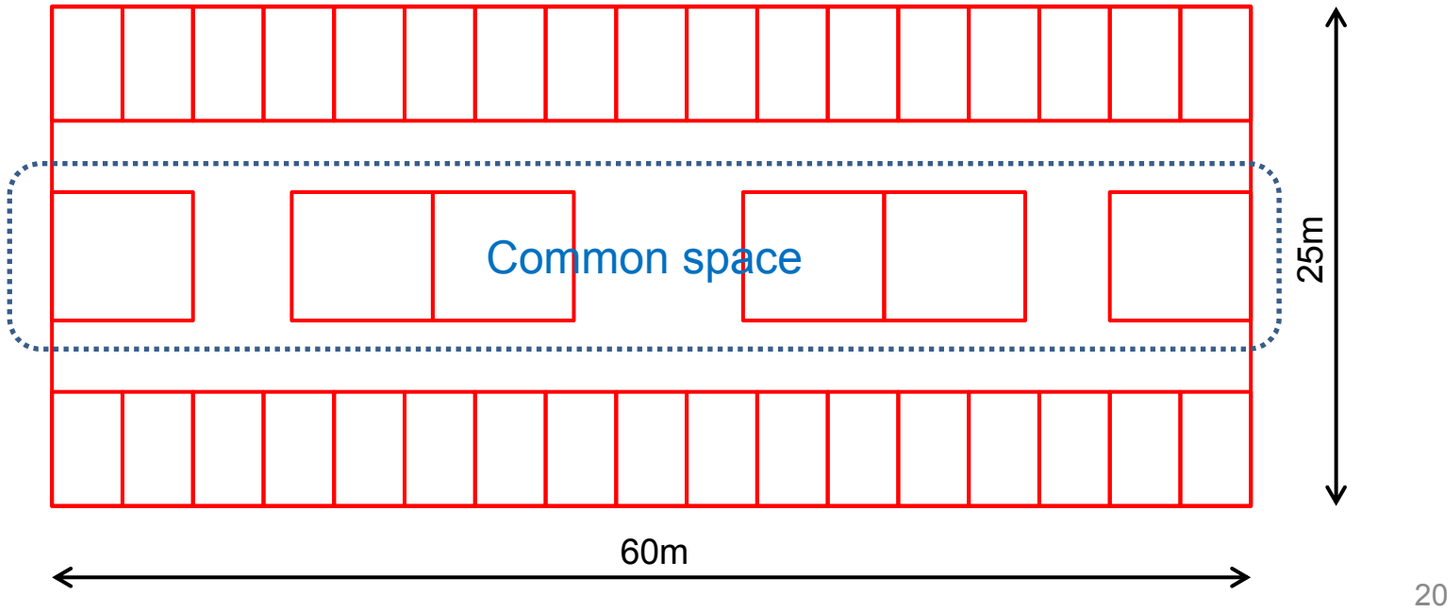


Y. Sugimoto

Office Space in Research Building

- It seems ~34 office rooms can be put in a floor with meeting rooms, rest rooms, elevators in common space

Y. Sugimoto



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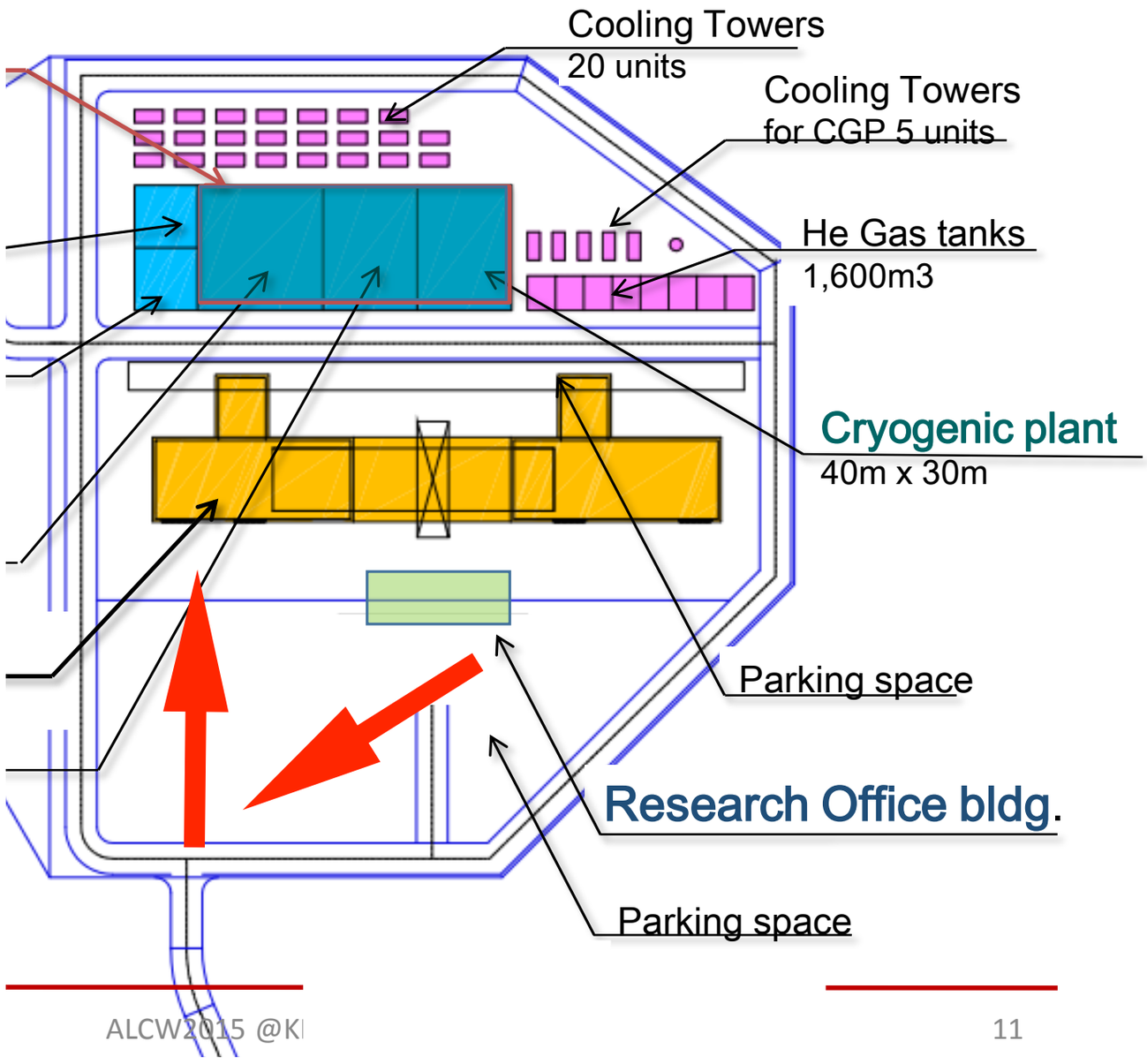
- Only first estimates have been done for requirements of IR site research building
- Need better understanding of assembly, maintenance and operation scenarios for both detectors, ILD and SiD!

Truck Routes

- Specify truck routes into assembly hall
- Need to drive through?
- Space for turn arounds?

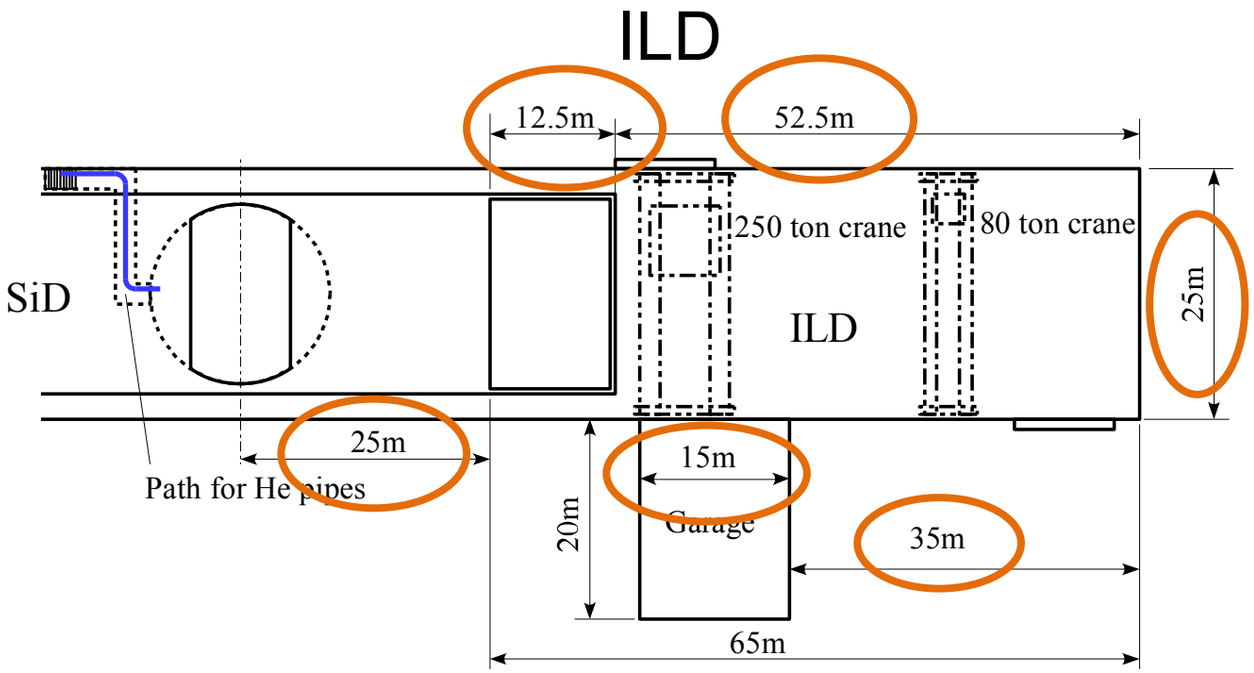
- Connected to assembly plan within surface hall

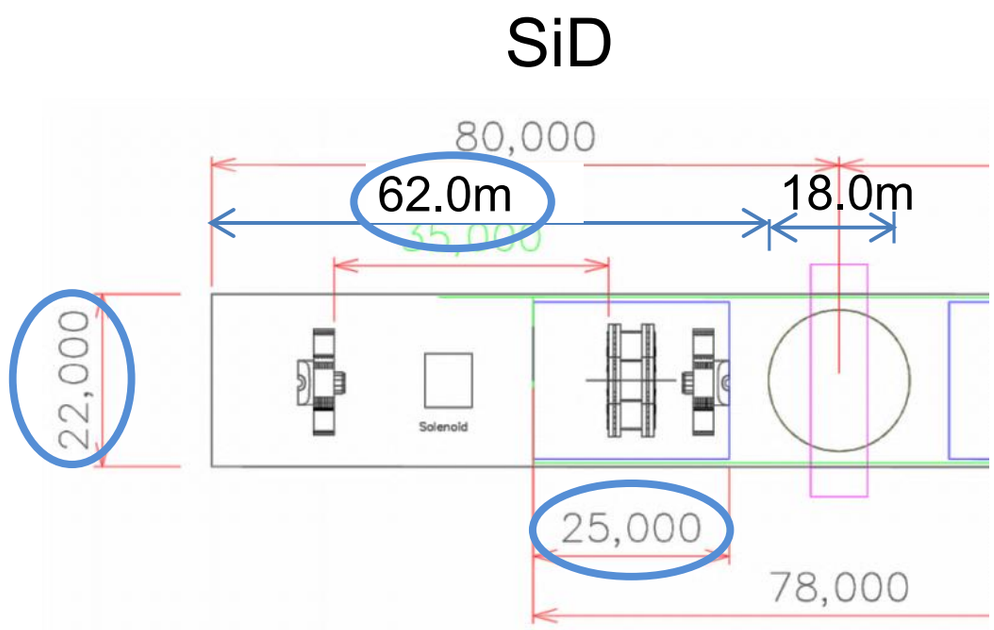
- Y. Nishimoto has shown that access with biggest parts (solenoid) is possible but not easy
- need to understand require-ments for all transports (machine and detector)

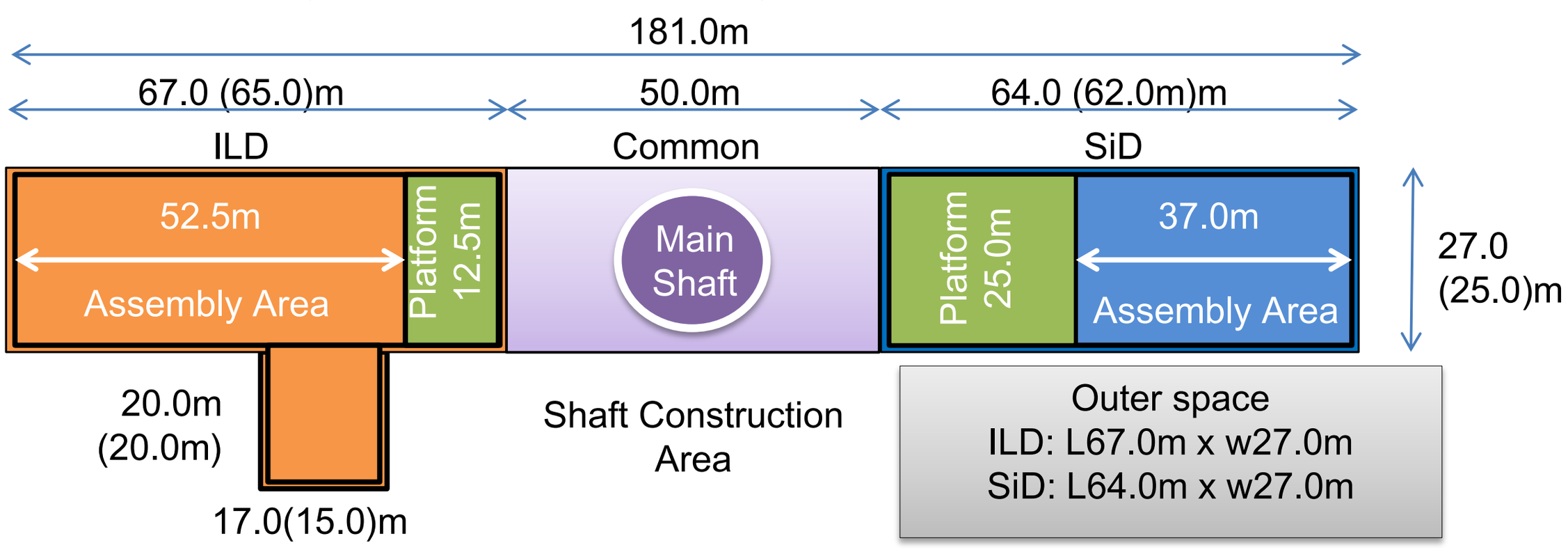


M. Miyahara

Required Space of Assembly Hall

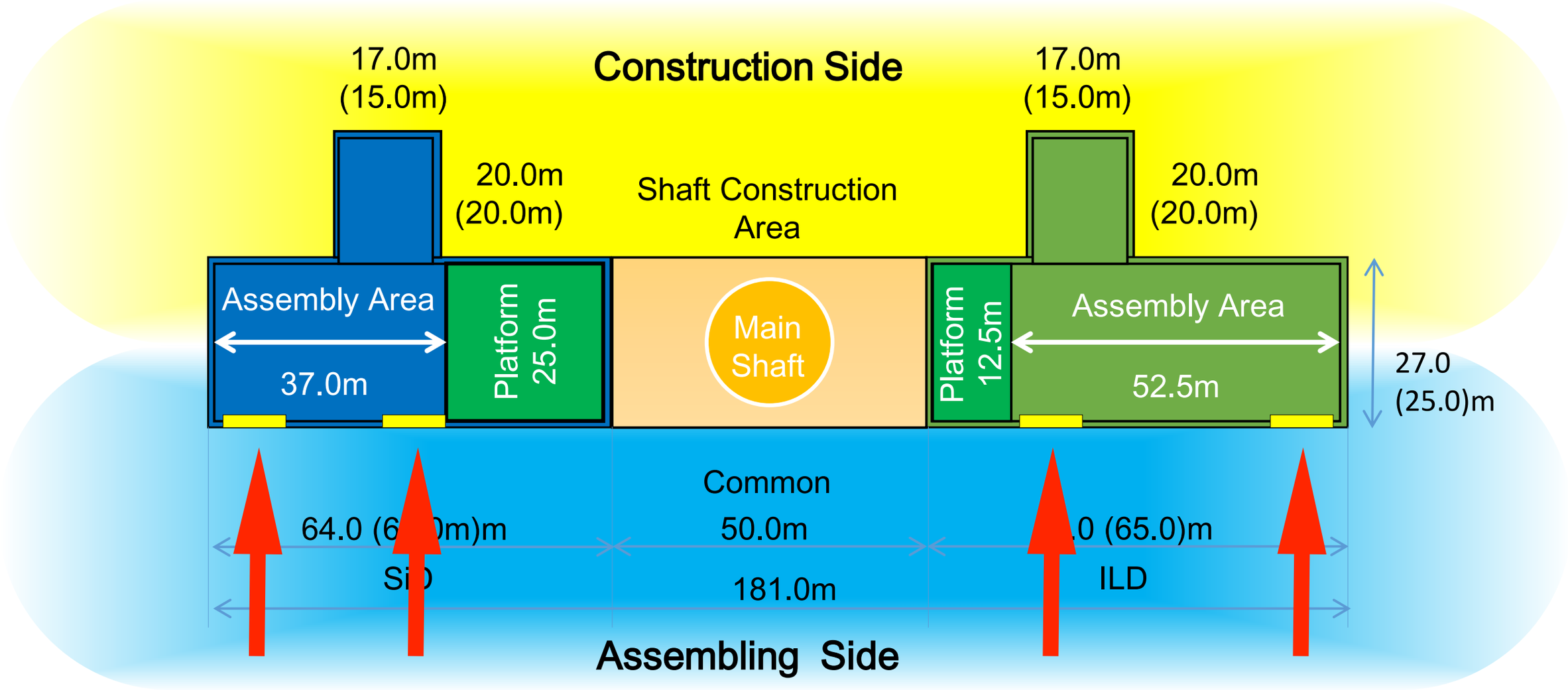






M. Miyahara

Revised design of Assembly Hall



Two Garages for each Detecotor
Two Large Entrances for SiD
Two Large Entrances for ILD
All Large Entrances are at the same side

Outer space
ILD: L67.0m x w27.0m
SiD: L64.0m x w27.0m

M. Miyahara

IP Campus and Central Campus

- Connection of on-site office space and location of the central campus
- The amount of on-site office space depends on how far the central campus is away…
- This is also true for the requirements for other facilities: workshops, labs, clean rooms, etc.

- What we really need is a complete detector installation and operation scenario:
  - how are the detector components transported to Kitakami
  - how much sub-detector assembly and testing is planned on-site
    - started discussion within ILD at ALCW15

ILD Example: DHCAL

Barrel integration : scenario 1

- Wheel Building in Industry / Campus : 8 modules => 5 wheels

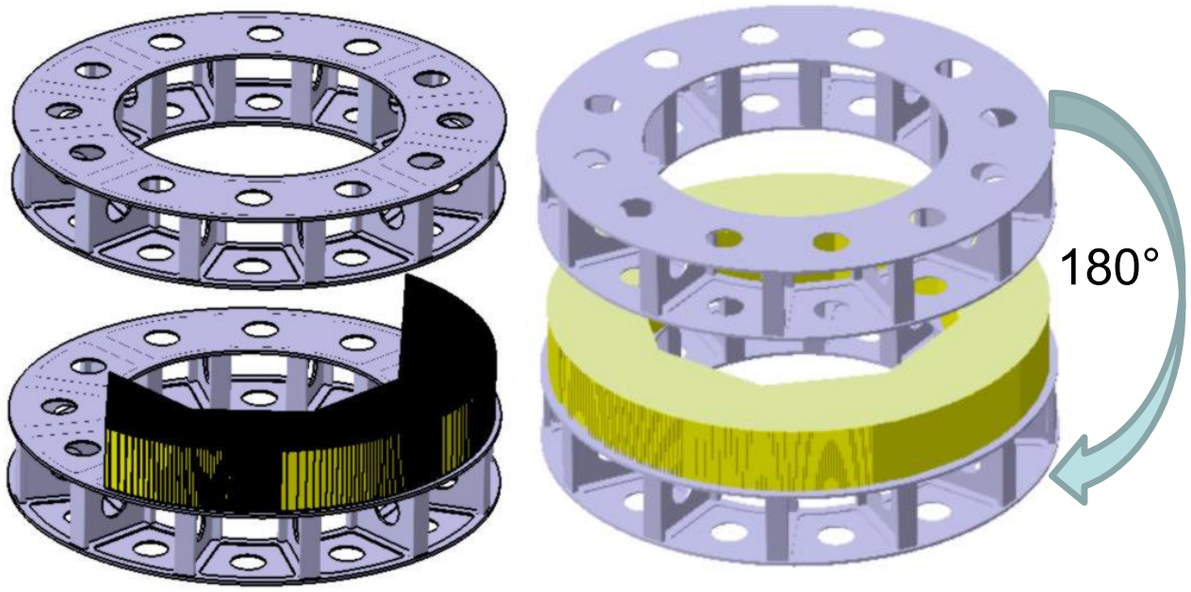
Building Method

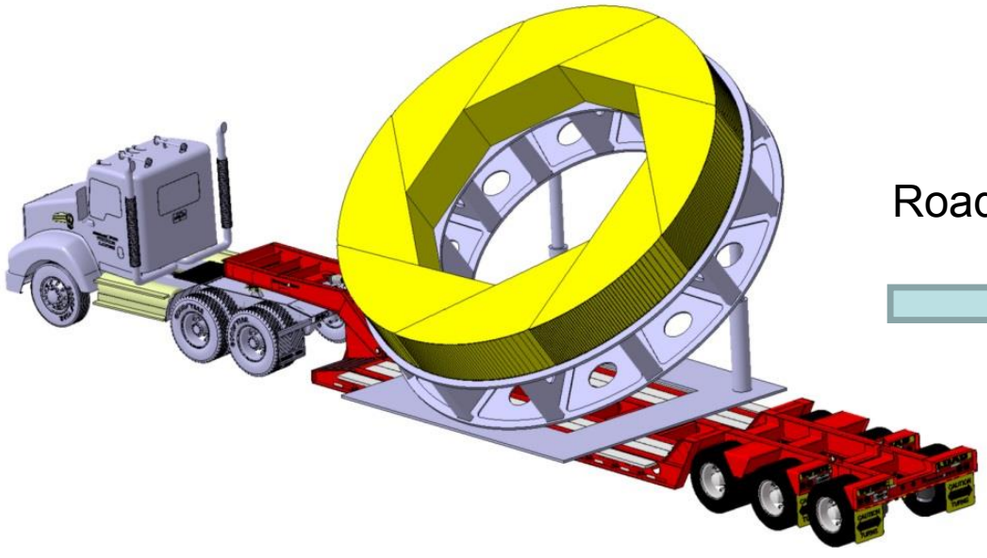
•Step 1 : Modules assembly to wheel

- 8 modules in position on specific tool
- welding / screwing and rotation

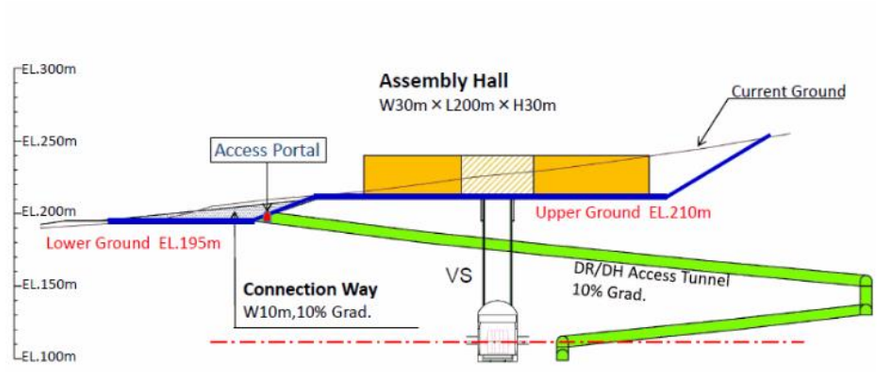
• **Step 2 :** Wheel on specific tool

• **Step 3** : Special convoy to Assembly Hall





Road to



Longitudinal section

Wheel weight = 88 t

I. Laktineh

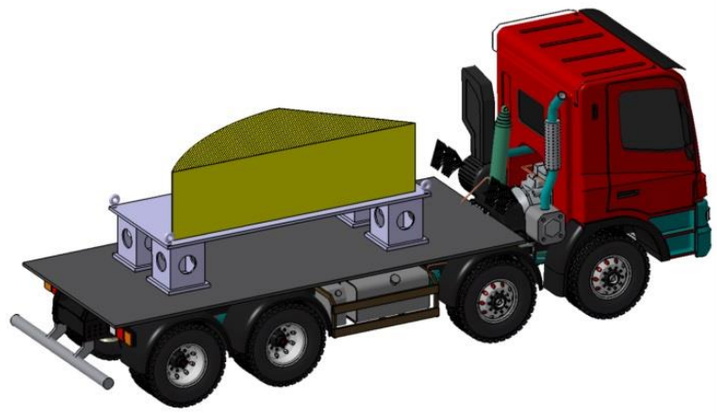
ILD Example: DHCAL

Barrel integration : scenario 2

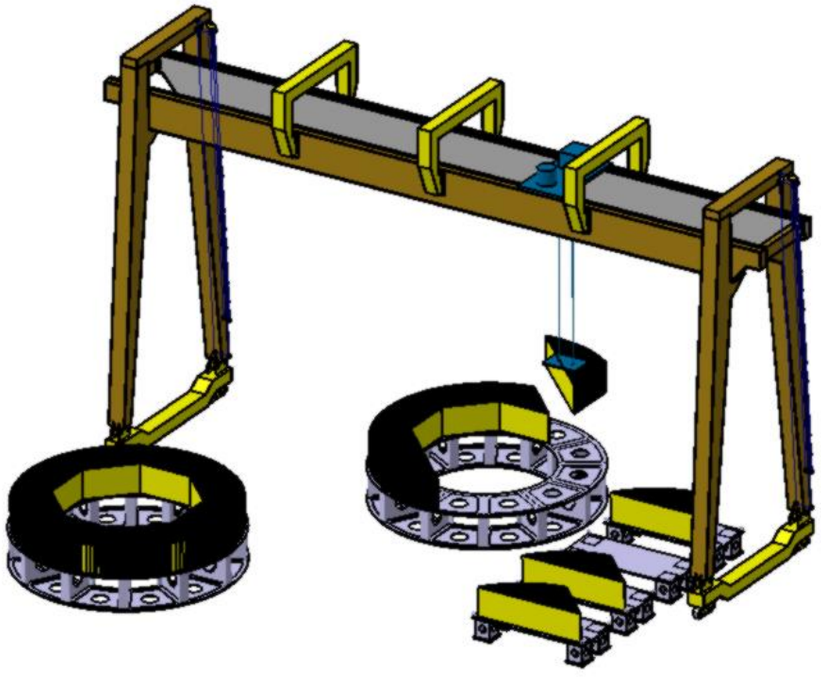
- Wheel Building in Assembly Hall : 8 modules x 5

Building Method

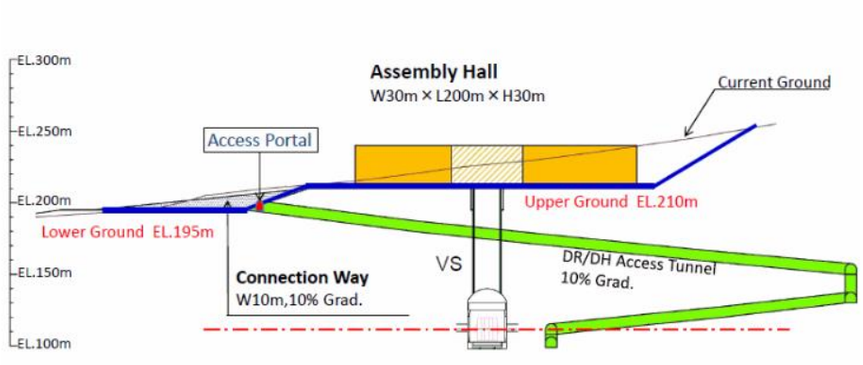
- **Step 1** : Modules transport by normal truck to Assembly Hall
- **Step 2 :** Wheel structure transport
- **Step 3 :** Modules assembly on the wheel
  - 8 modules in position on specific tool & screwing



Module weight = 11 t



Road to



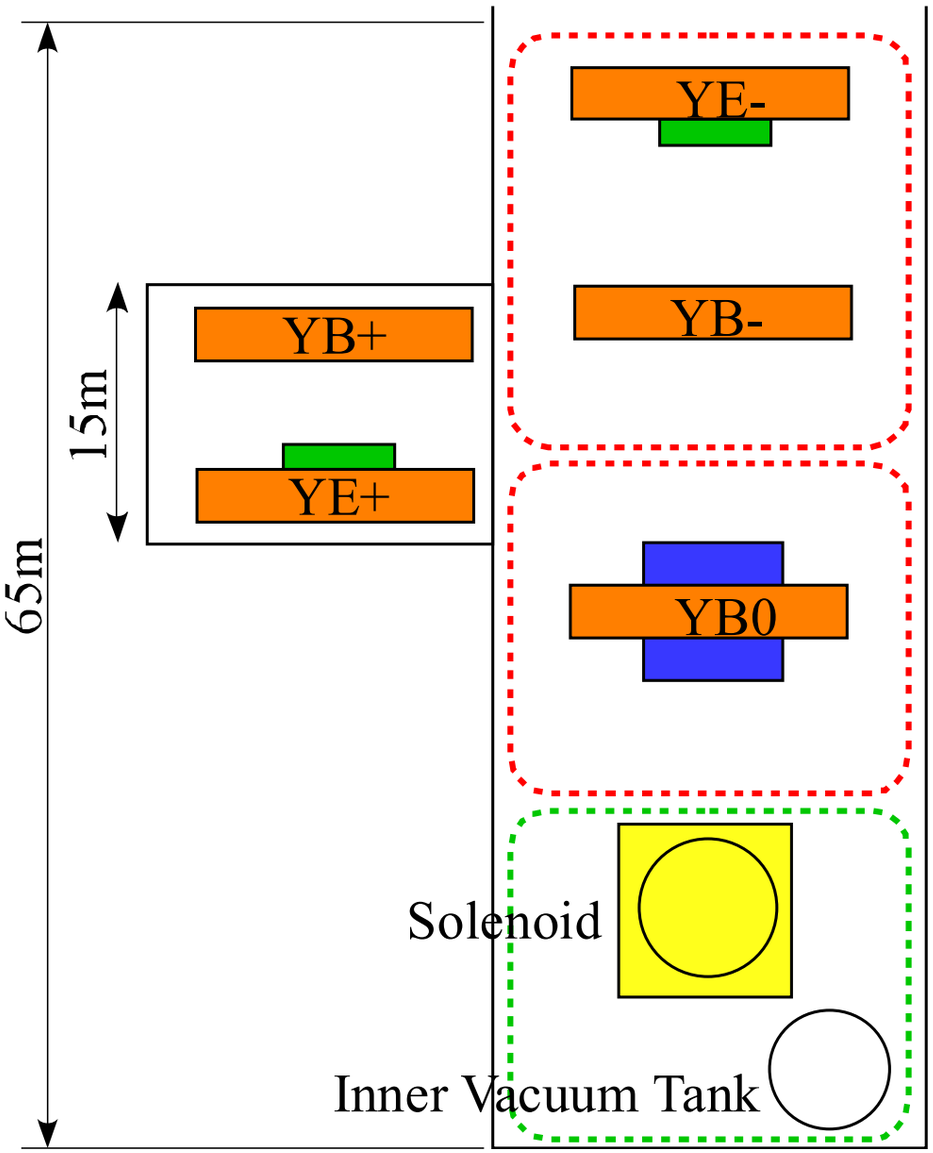
Longitudinal section

I. Laktineh

ILD Assembly

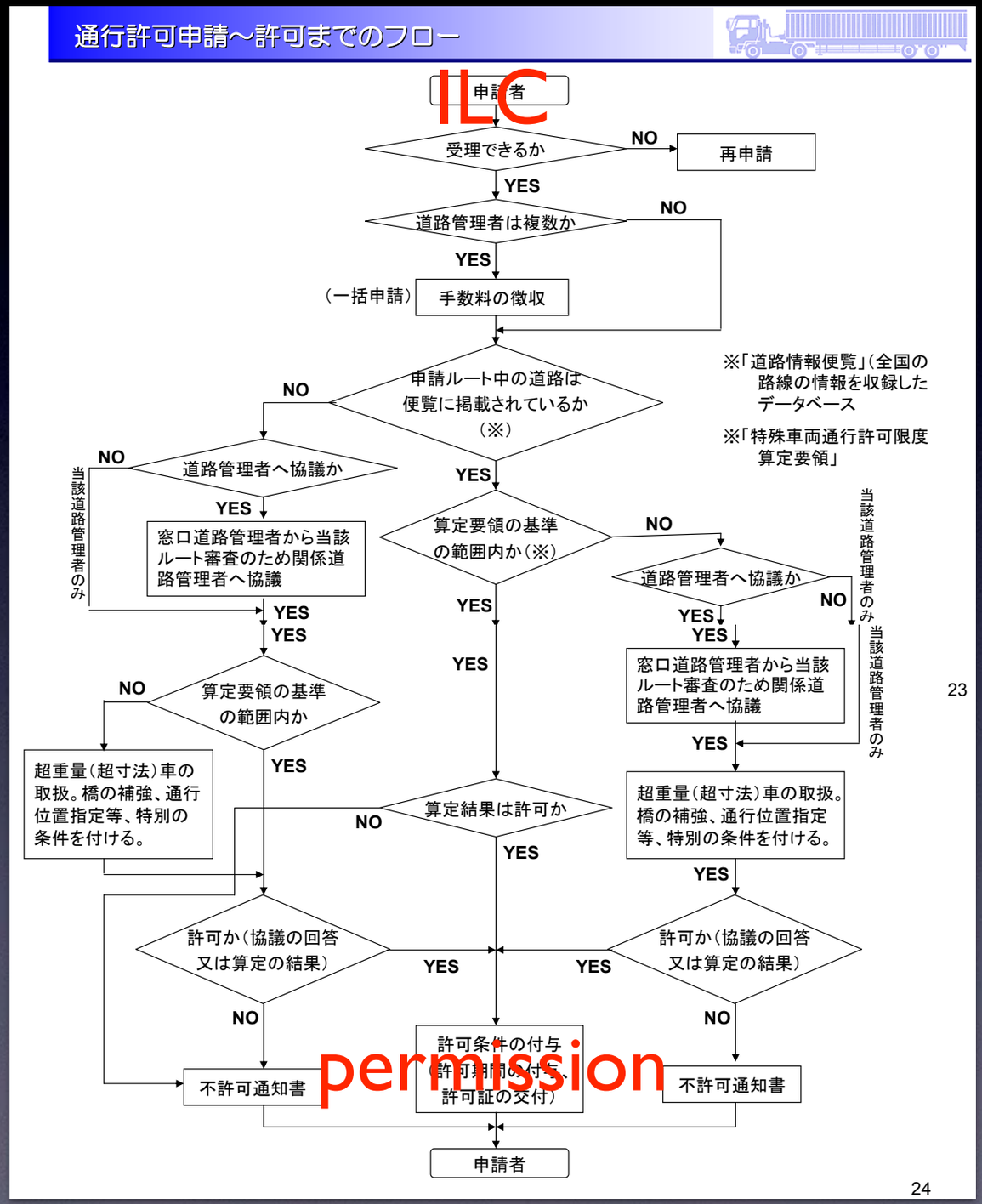
- For ILD, assembly hall is used for
  - Iron yoke assembly
  - Solenoid assembly and installation
  - Installation of HCAL, ECAL, and Muon detector
  - Field mapping

- Assembly and test of sub-detectors should be done in Central campus or in the research/office building in IP campus



Transportation Issues

We have to get permission from the authorities.

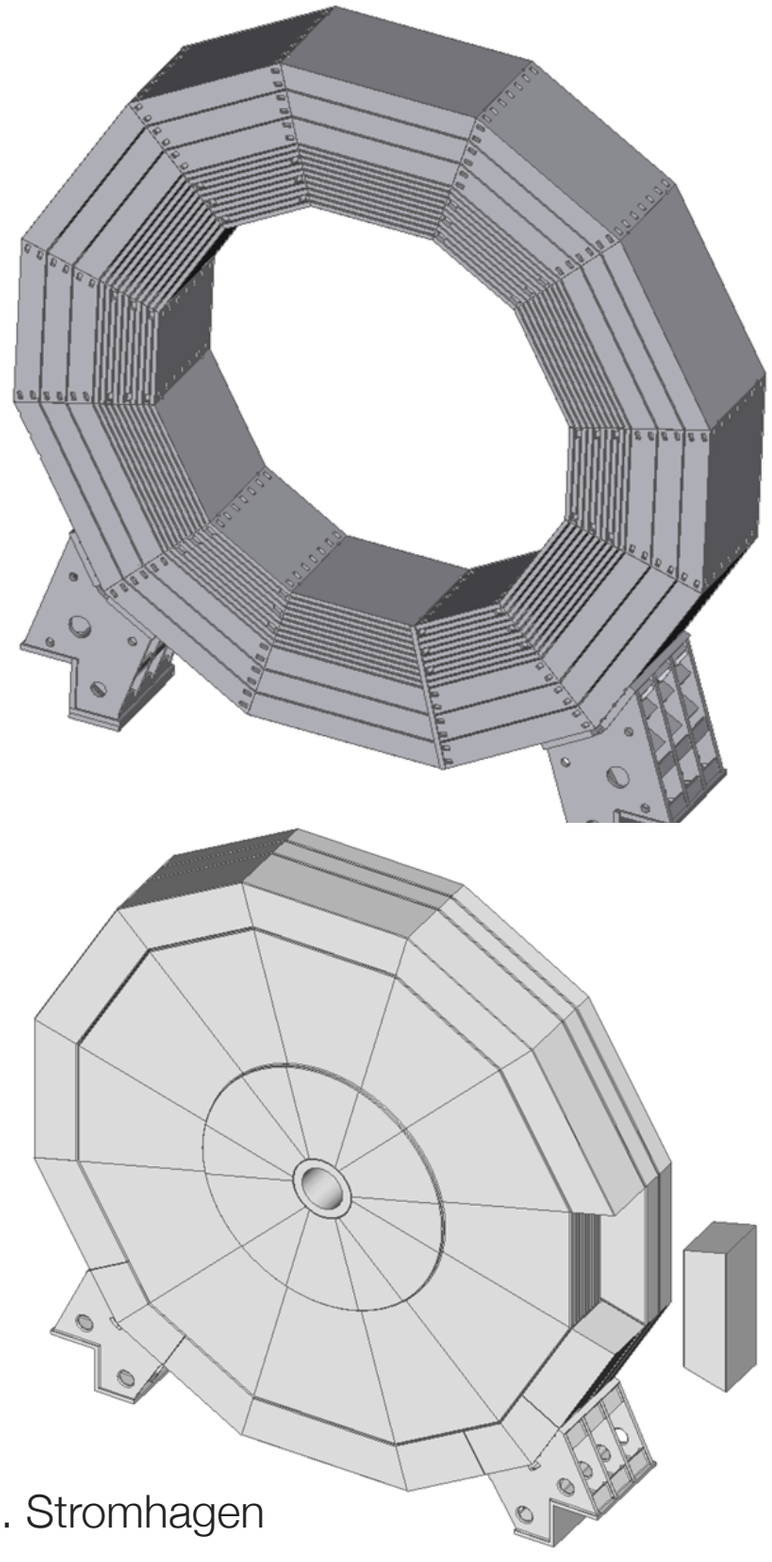


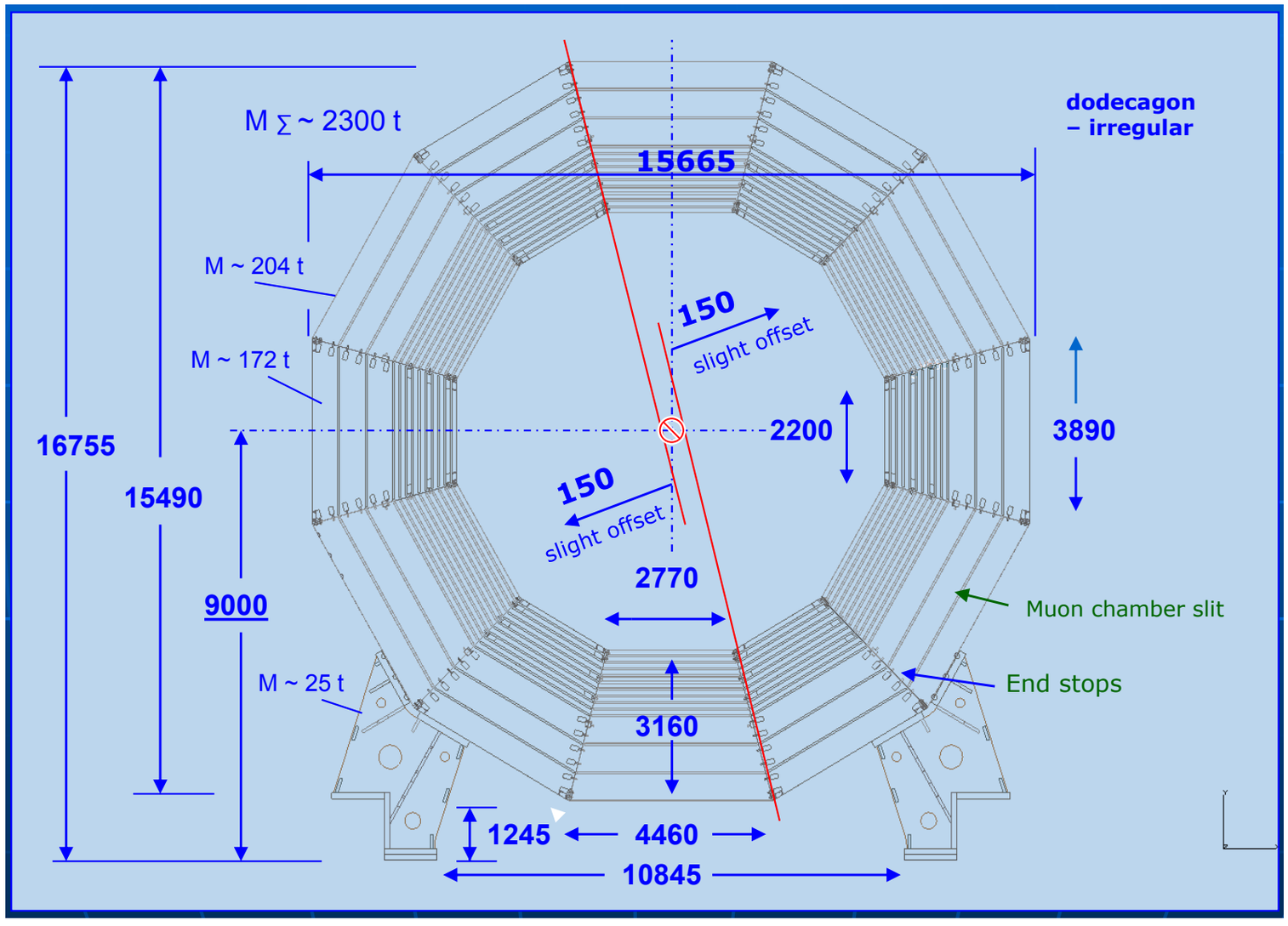
T. Sanuki

Ministry of Land, Infrastructure, Transport and Tourism

- Transportation of heavy parts is limited by road capacities and regulations
- Normal transports of up to ~30t are probably ok, some few transports of up to ~70t seem doable
- Going beyond ~70t seems not to be possible
- This requires heavy parts to be assembled on-site:
  - Iron yokes
  - Coils
- This needs space at the IR campus that is very limited by the given situation of the site
  - environmental impact
  - IR campus area

ILD Yoke




M ∑ ~ 2300 t
dodecagon
– irregular
15665
M ~ 204 t
M ~ 172 t
150
slight offset
16755
15490
2200
3890
150
slight offset
9000
2770
Muon chamber slit
M ~ 25 t
End stops
3160
1245
4460
10845

Heavy Part Assembly

- If the ILC central campus is near to the IR and if there is one re-inforced road between central campus and IR campus, pre-assemblies could be done at central campus
- If the central campus is too far away, then maybe an intermediate assembly space could be organized
  - e.g. a temporary hall close to the IR campus where yoke parts can be assembled
    - this temporary facility would be used only for a few years and can be de-commissioned after that
- Heavy-duty transports beyond 70t would be needed, but only on a dedicated and short part of a road
- …no idea if this is viable in terms of regulations and laws…

List of Homework - Status

- Status of work:
  - Verify optimal height of underground hall (now 42m): needs to be done
  - Verify height of crane bridge over beamline (50G at 15m criterium)
    - -> next presentation: might be ok
  - Conceptual design of accelerator tunnel/detector hall interface:
    - support of QF1, design of pacman: needs to be done
    - Are 40t cranes adequate for pacman installation? needs to be done
    - Review possibility of running services in 18m shaft: seems possible
    - Requirement of #people/time going up/down elevator: needs to be done
    - Workshops on surface and possible need for a second elevator shaft: needs to be done
    - Specify truck routes into assembly hall: work in progress
    - Connection of on-site office space and location of the central campus: needs to be done

Summary

- Some topics are being investigated right now, some need input from detector collaborations
- Biggest task: develop conceptual detector construction and assembly plans for SiD and ILD starting from sub-detector level
  - btw, this is a deliverable for the E-JADE MDI work package…
- This requires a lot of work within the subdetector collaborations and the concepts to decide on assembly strategies
  - which parts are built where
  - which work remains to be done at ILC campus or at IR
    - e.g. fully tested modules delivered on-time vs. subdetector integration and testing work on site
  - most subdetector collaborations are just starting to think about these issues