MDI Summary

of the MDI-CFS meeting on ILC Interaction Region Issues, 4-6 September, 2014

Change Request of IR access, i.e. Hybrid A'

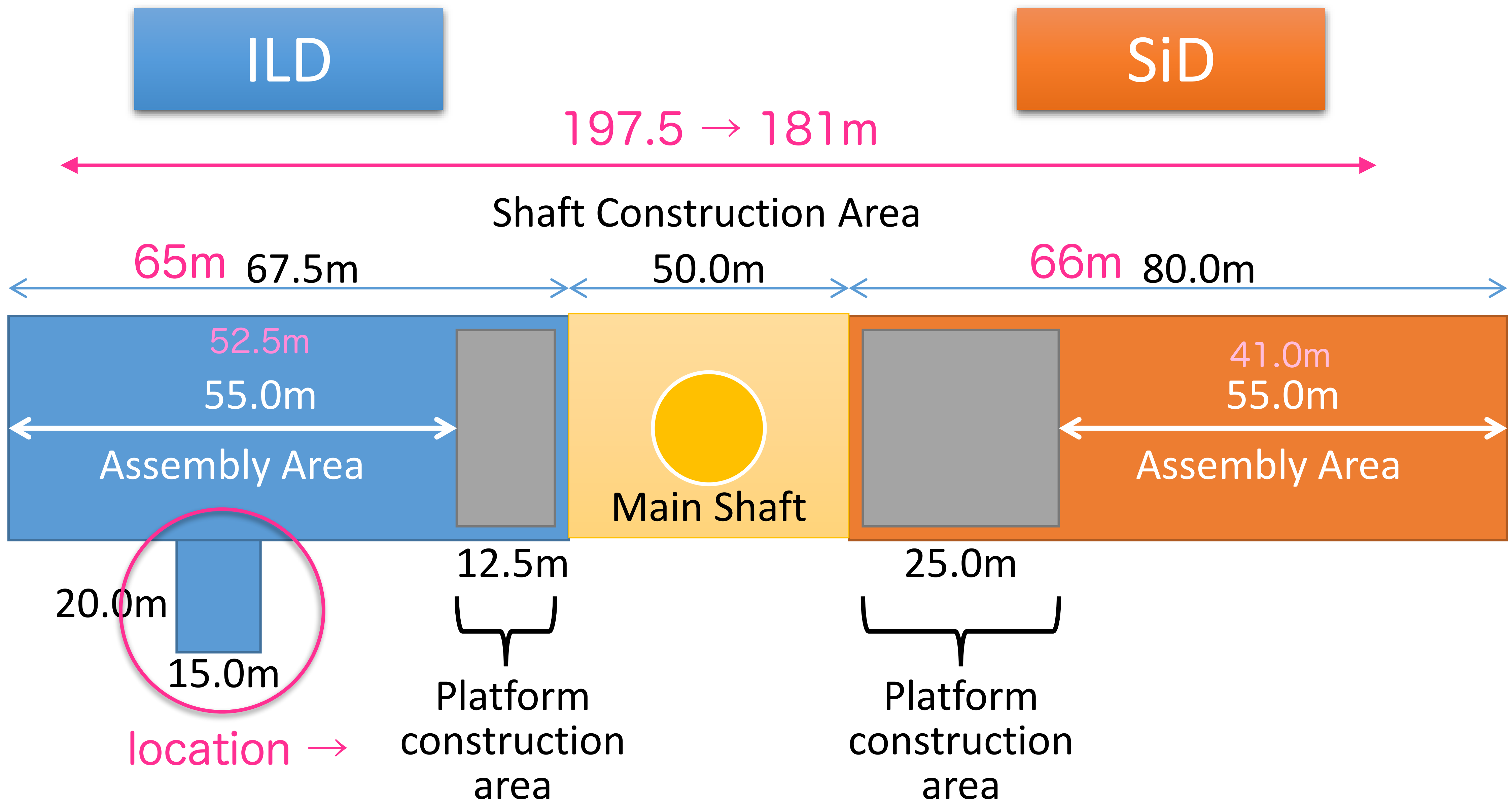
Assembly/Detector Halls and Transportation,

Shorter L* Change Request

Toshiaki Tauchi, 27th LC Project Committee,
KEK, 16 September, 2014

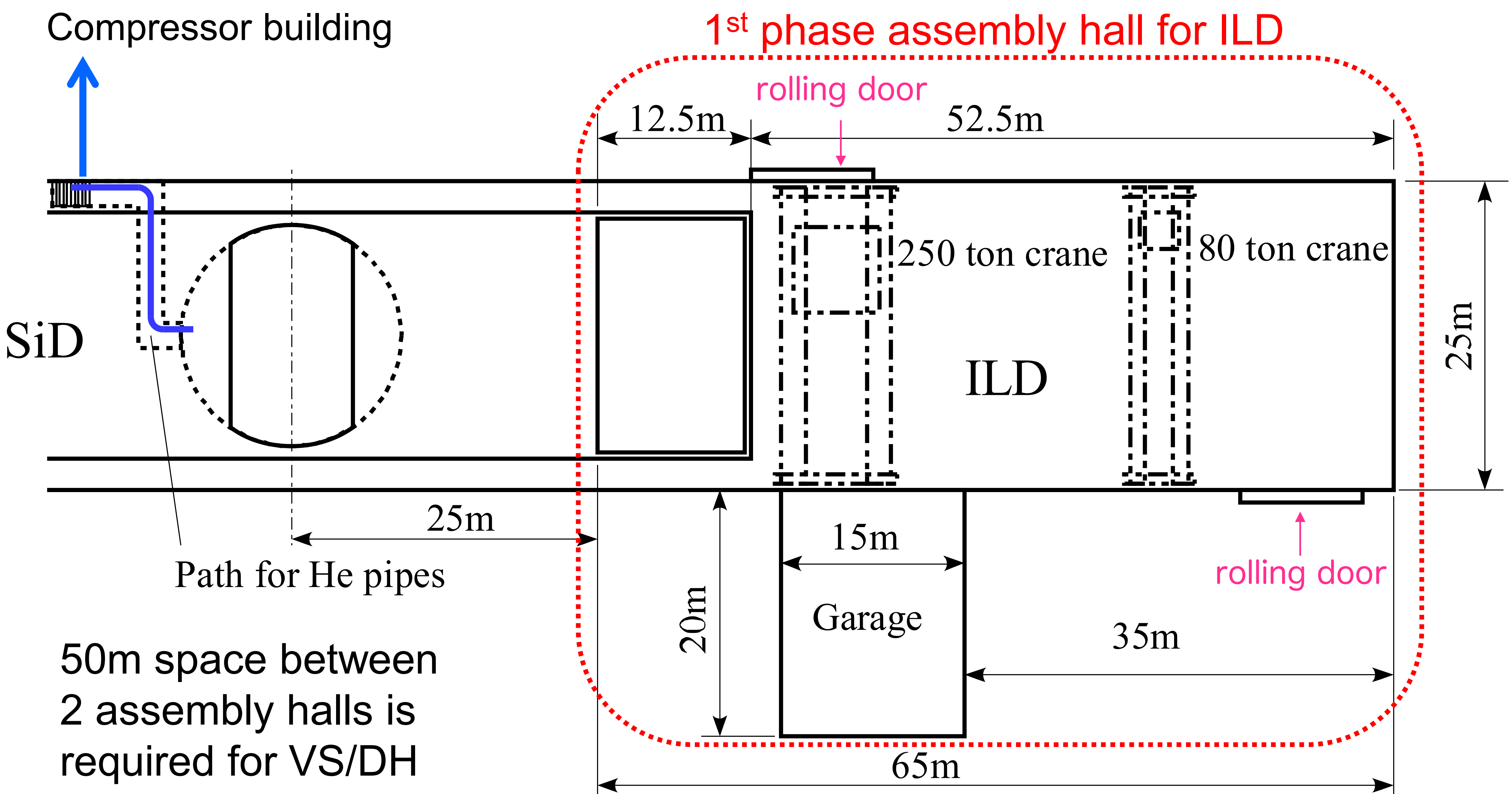
Assembly Hall Layout with Platform Construction Area

Entrance for trailers ?



ILD A possible design of AH

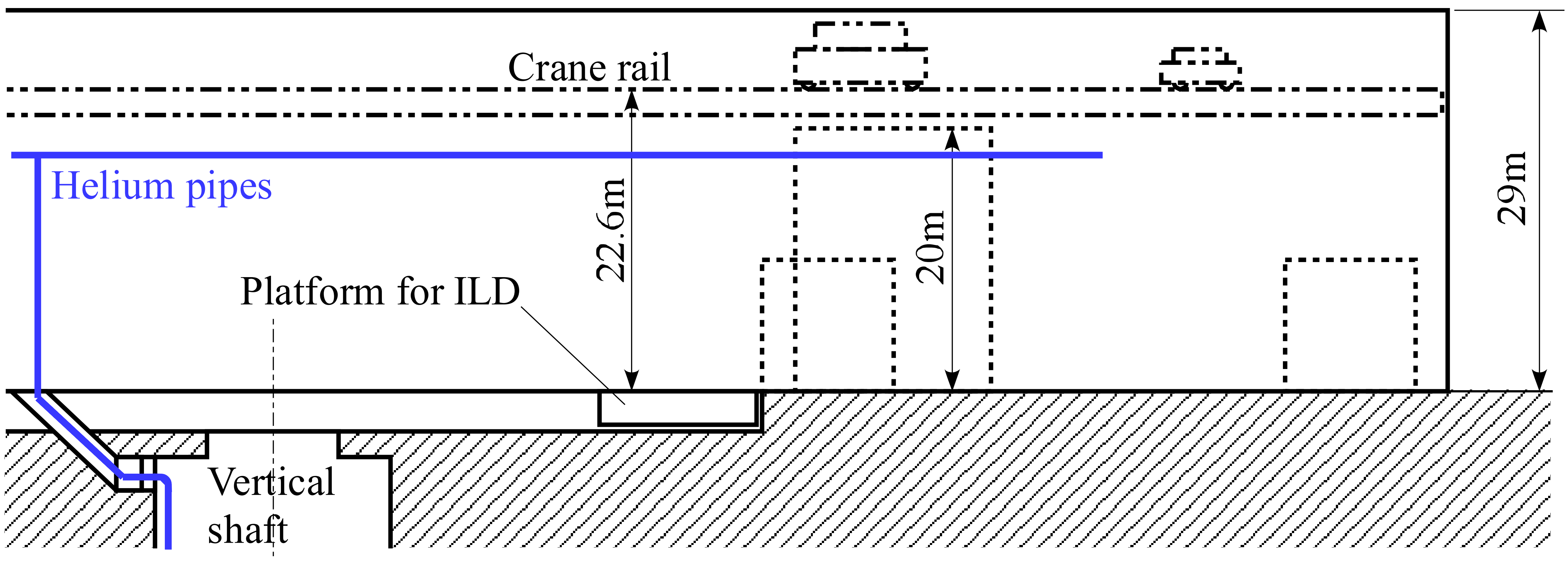
- Plan view



50m space between 2 assembly halls is required for VS/DH construction

ILD A possible design of AH

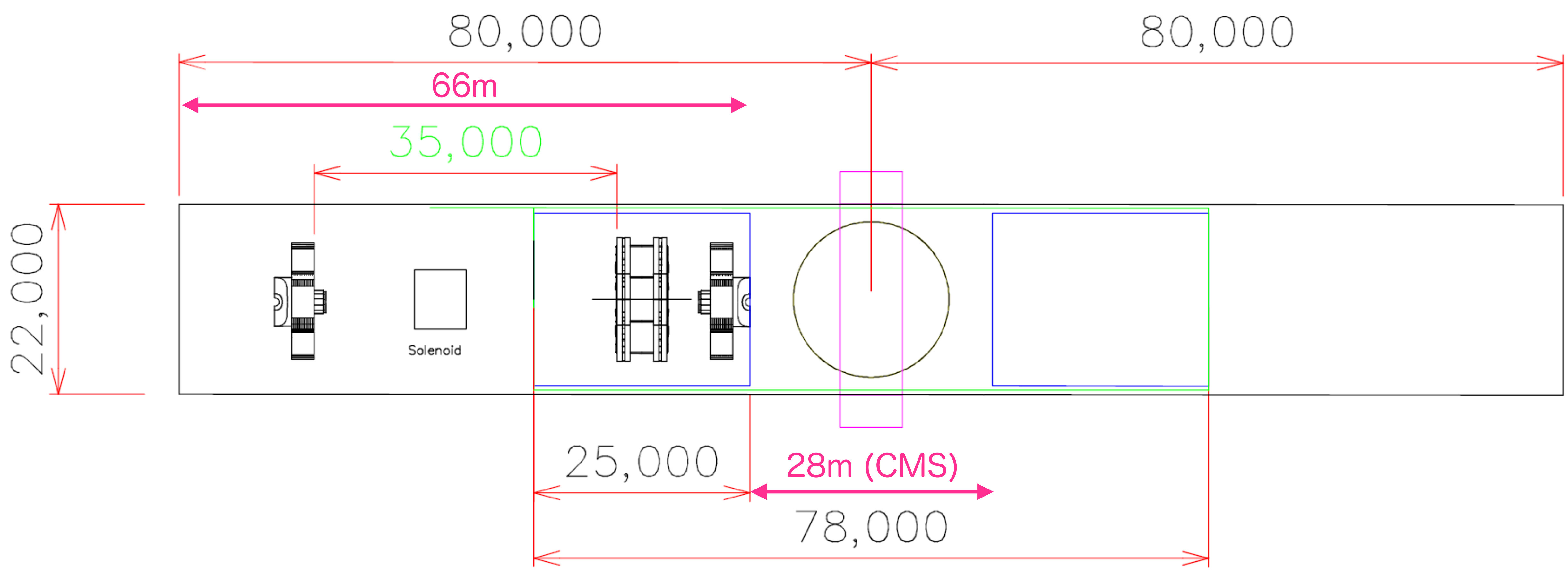
- Side view



ILC Assembly Hall - Proposal

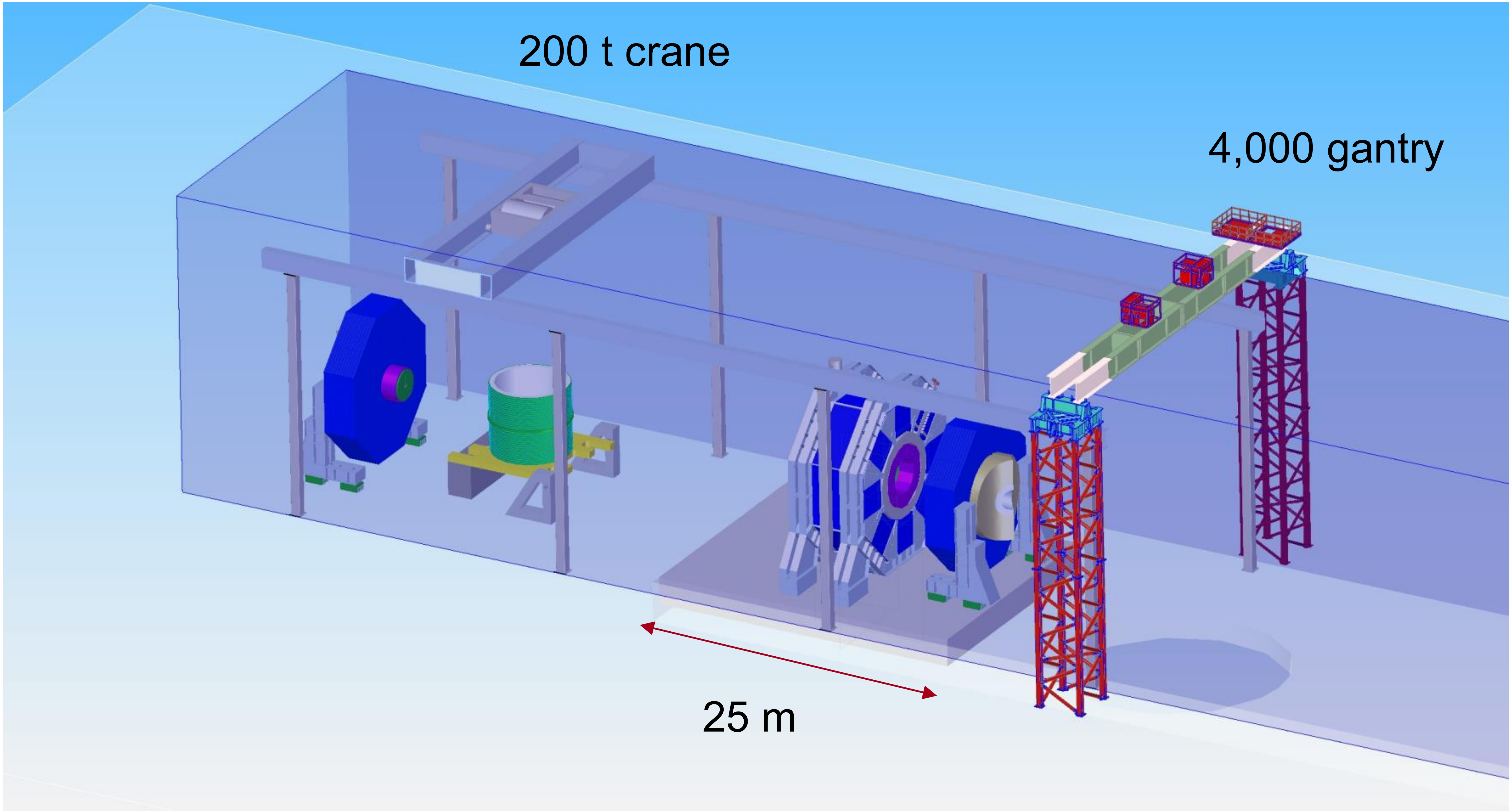
SiD

SLAC

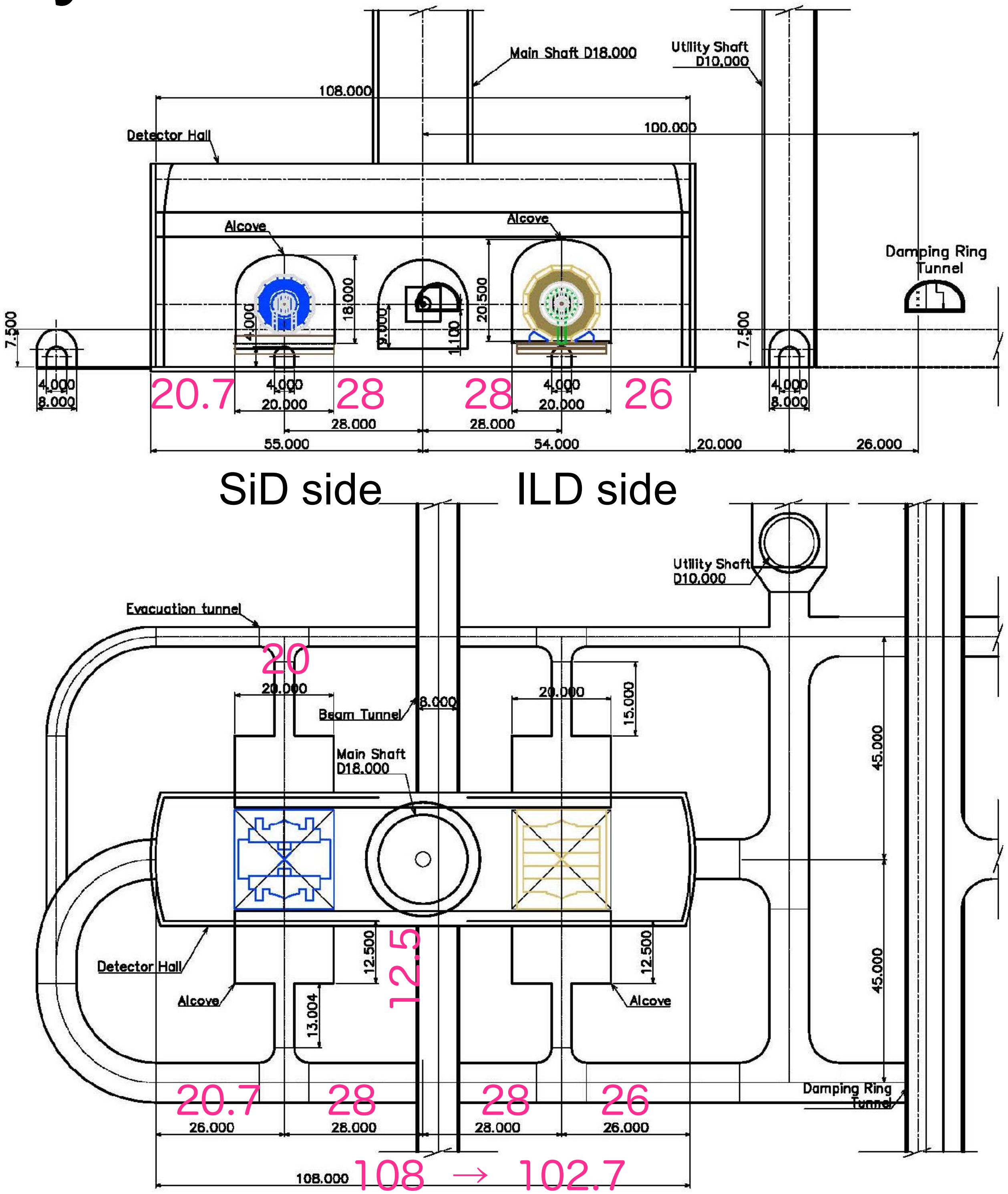


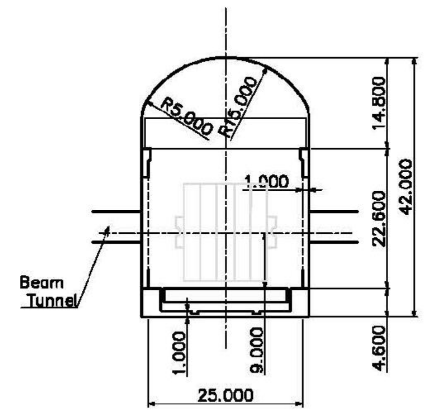
platform : 25m x 20m, 50m motion range

SID Assembly Hall



Hybrid A' Detector hall





- Connecting points of access tunnel are located at both end of Detector hall
- Because securing the separation distance from alcoves in the point of cavern stability.

Handling equipment CFS

Permanent crane

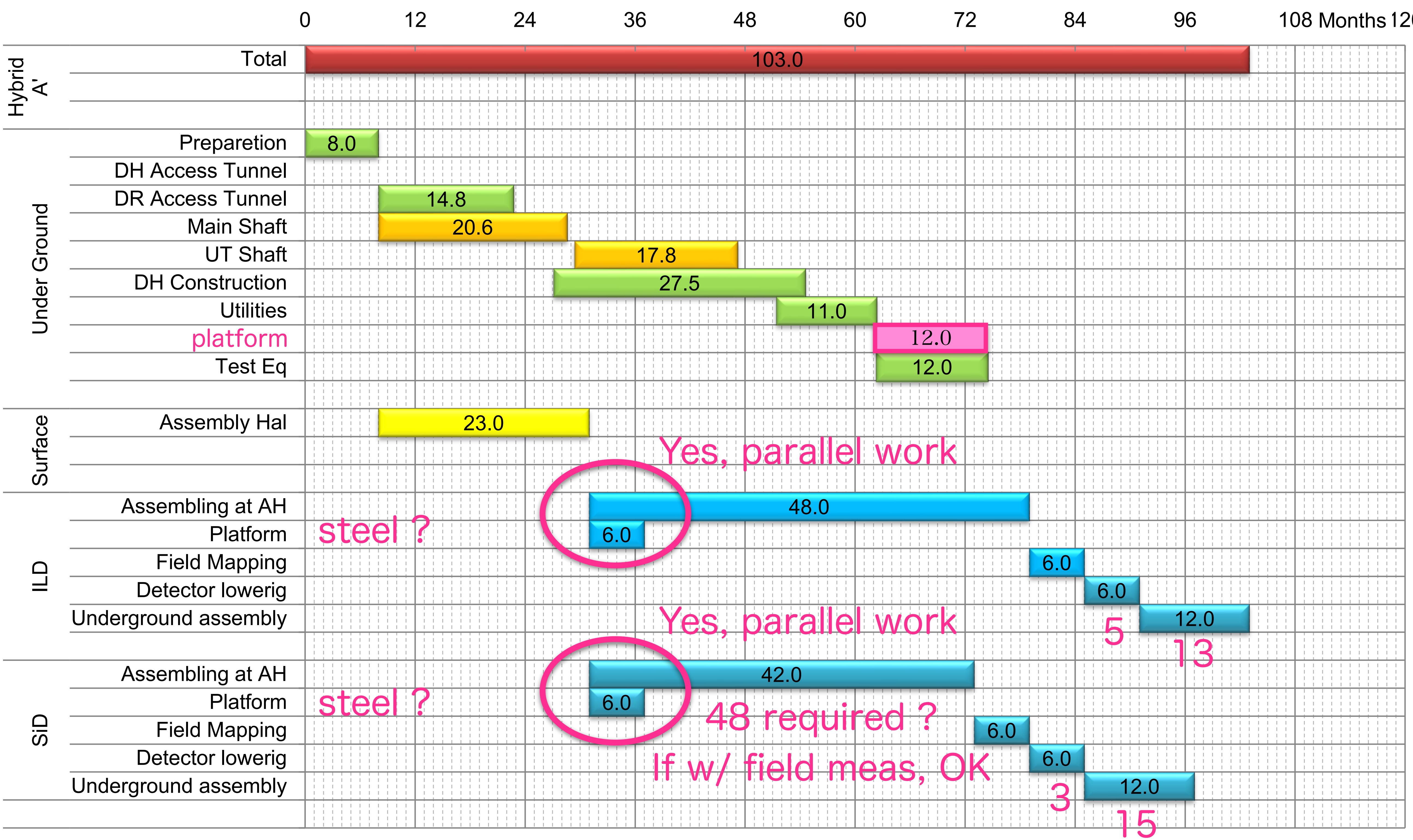
Items	Specifications	Unit	Baseline	Hybrid-A'
DH Main/H Crane	250t S25m h35m	pcs	2	
	80t S25m h35m	pcs	2	
	40t S25m h35m	pcs		2
DH Alcove Hoist Crane	2.5t S25m h25m	pcs	4	4
Assembly Hall	250t S25m h35m	pcs	2	
	250t S25m h130m	pcs		2
	80t S25m h35m	pcs	2	2

Heavy equipment transportation

Items	Specifications	Unit	Baseline	Hybrid-A'
Tunnel heavy transporter	220 t carrier	times	Many 12?	
Shaft Lowering system	4100t h130m gantry crane	pcs		1

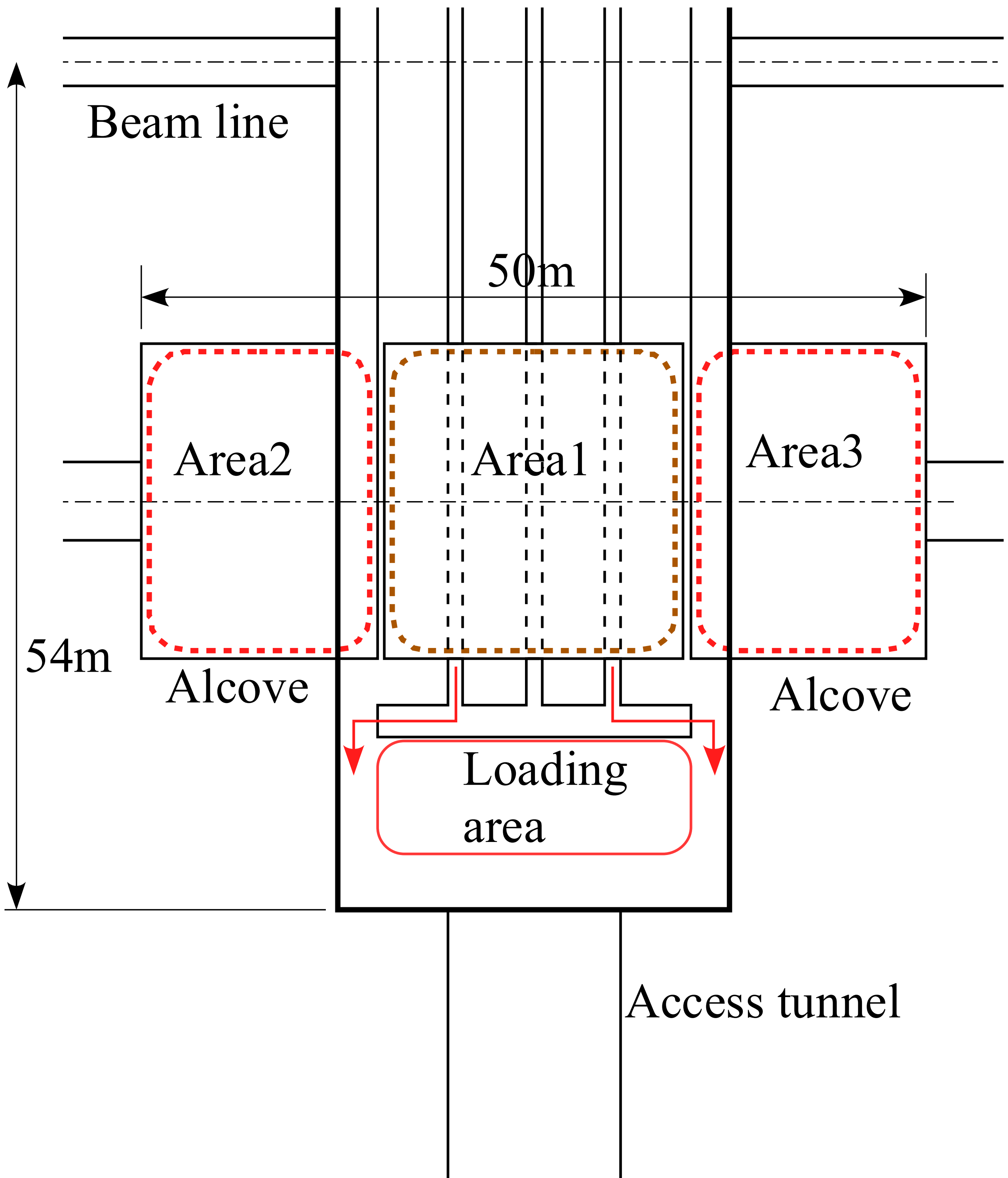
CFS

Const. Schedule for the Hybrid A’ Design

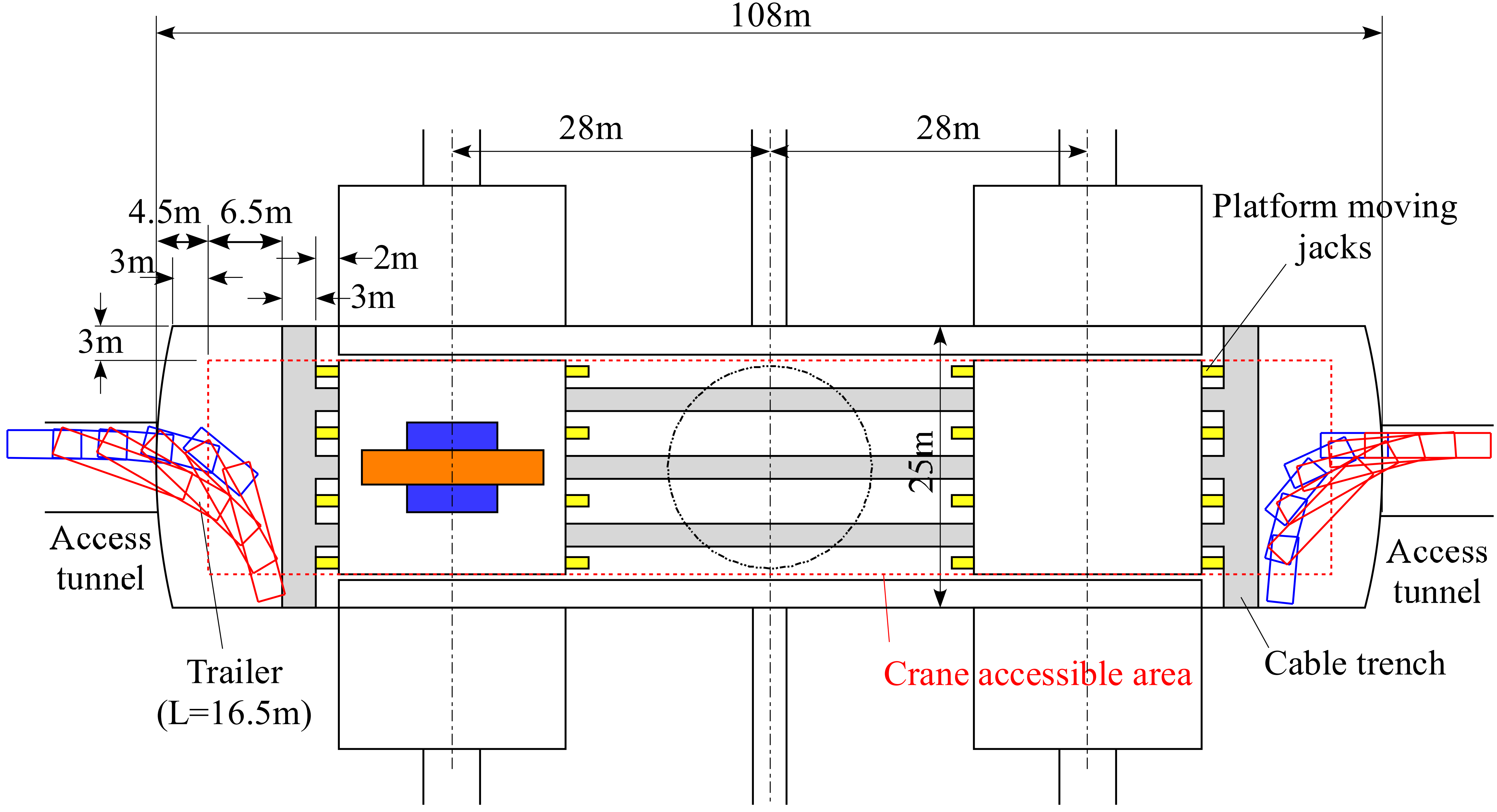


ILD DH assembly area in Hybrid-A' option

- Area 1: Platform
  - Landing of lowered detector rings
  - Barrel trackers installation/cabling
- Area 2/3: Alcoves
  - QD0 support tube assembly
  - FCAL install/cabling



ILD DH size



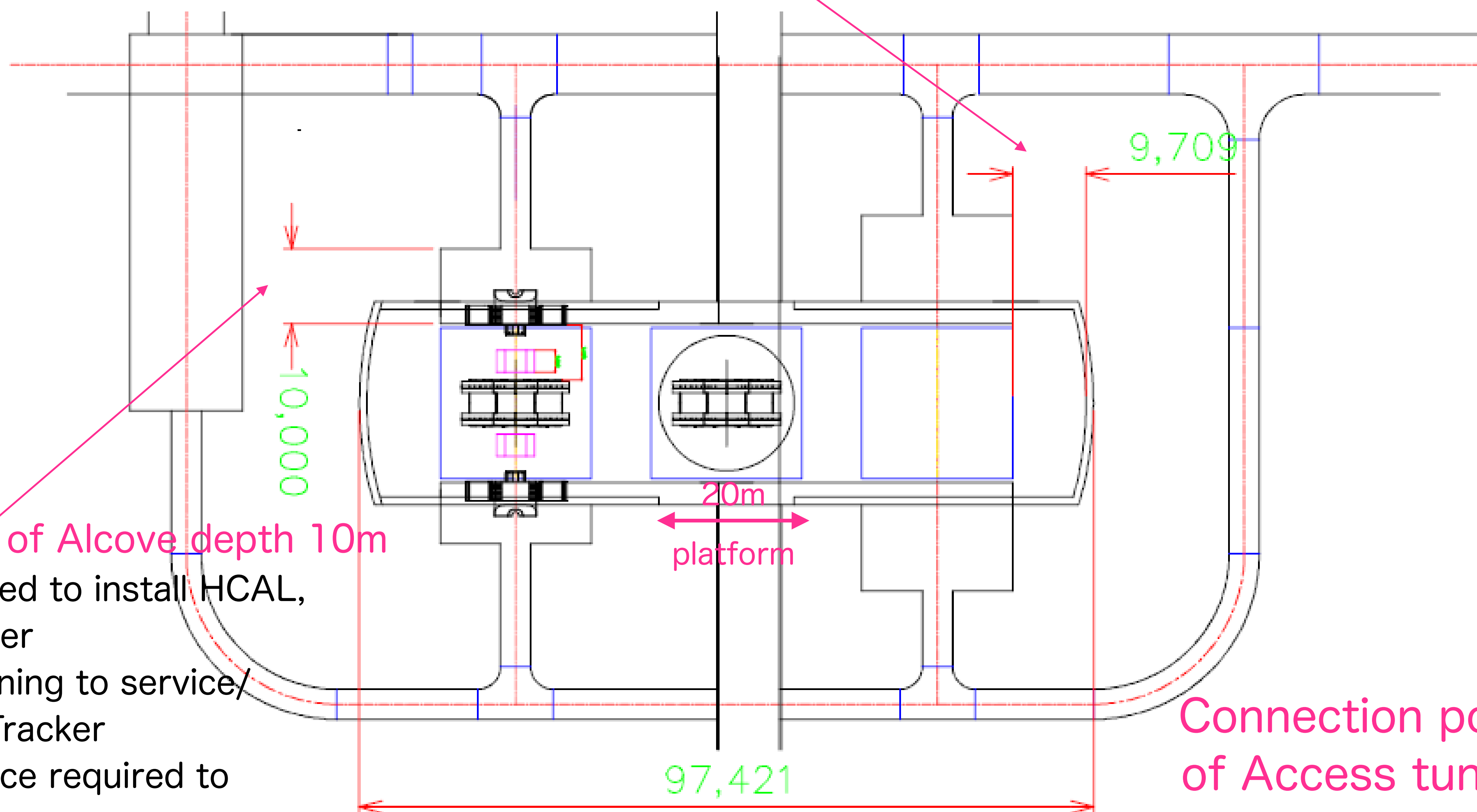
108m
28m
28m
4.5m
6.5m
3m
2m
3m
3m
Platform moving jacks
25m
Access tunnel
Access tunnel
Trailer (L=16.5m)
Crane accessible area
Cable trench

Cavern length ~ 98 m

SiD

Cavern length set by :

1. Minimum distance for Push-Pull ~25 m
2. Space required at the end of the DH to service the motion system under the platforms ~10 m



Requirements of Alcove depth 10m

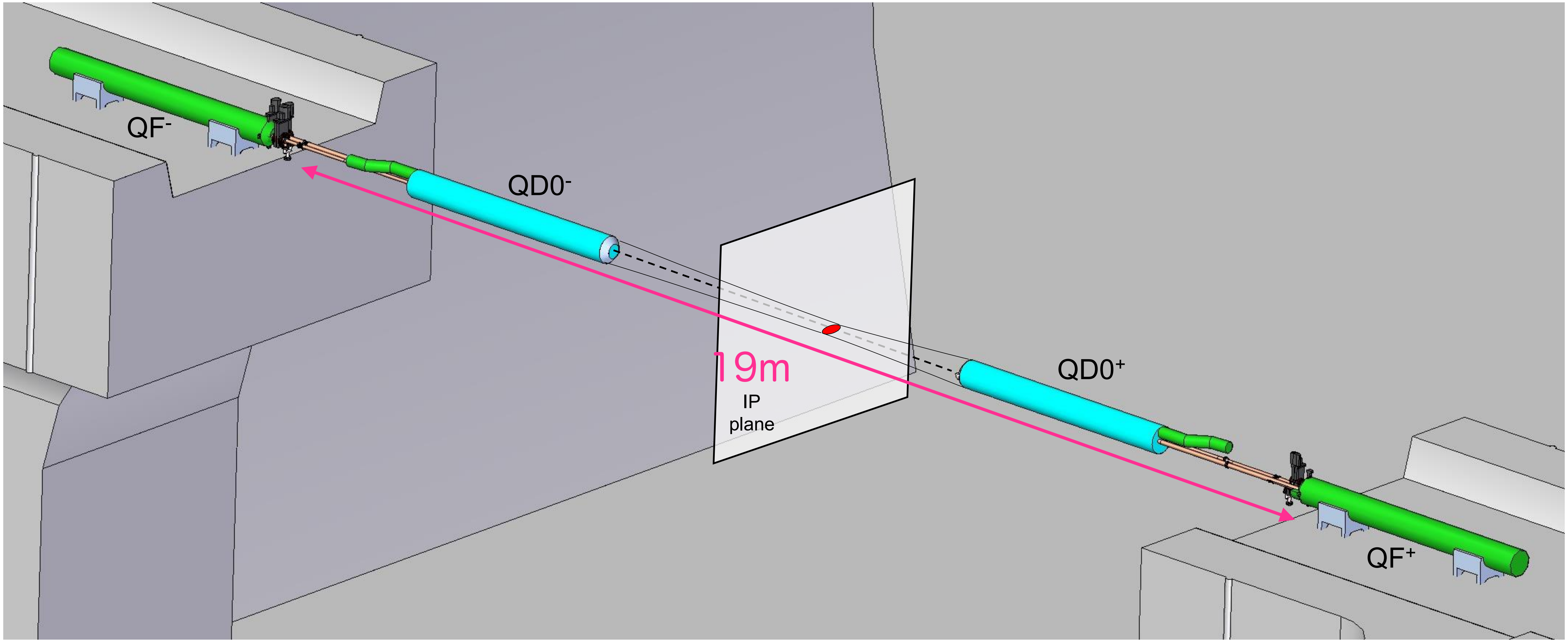
1. Space required to install HCAL, EMcal, Tracker
2. 6m door opening to service/ replace the Tracker
3. minimum space required to service QD0
4. He Cryogenics hardware

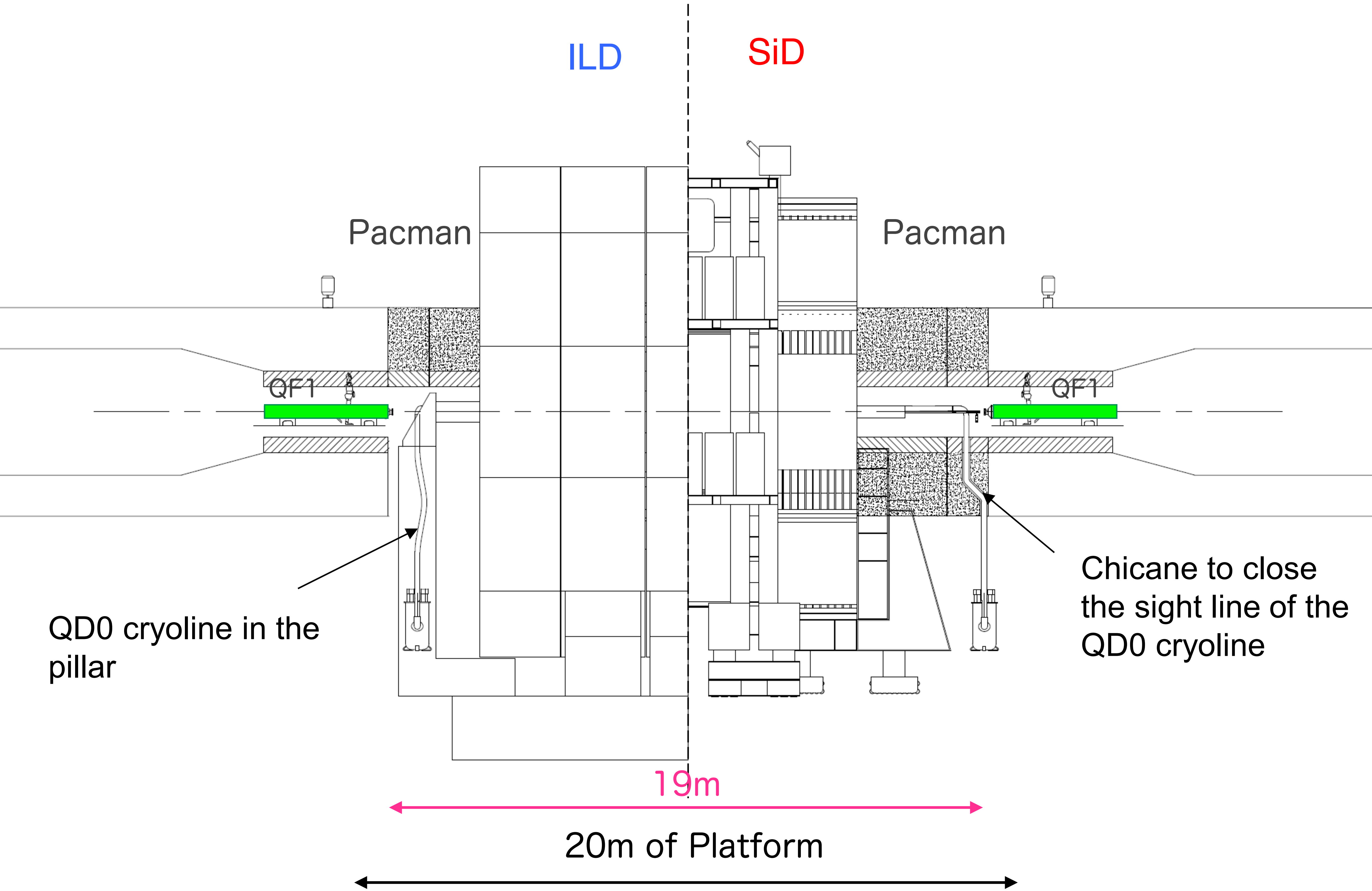
Connection points of Access tunnels differ from the CFS design.

Cavern Width, Pier-to-Pier = 19 m

SiD

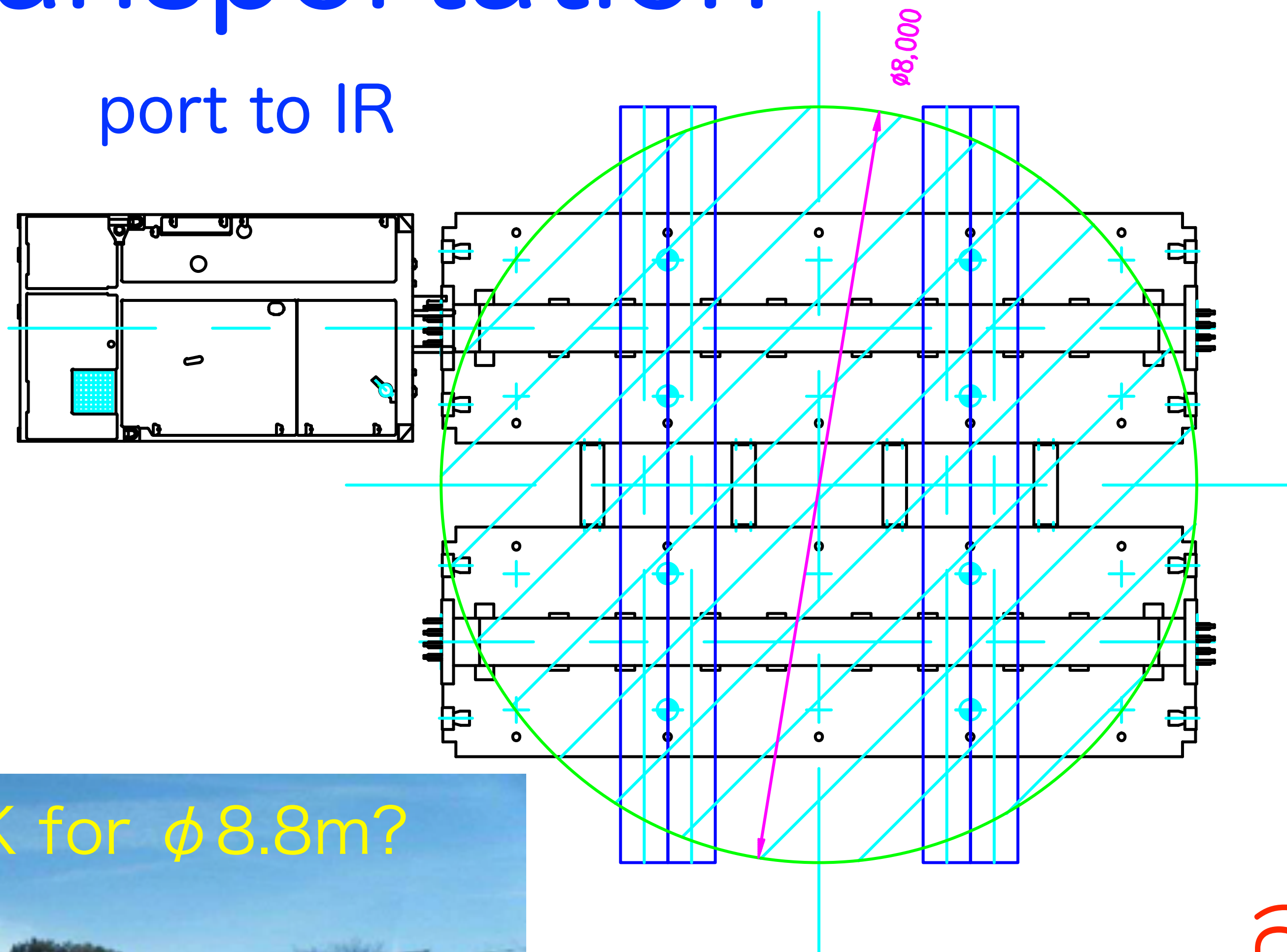
SLAC




ILD
SiD
Pacman
Pacman
QF1
QF1
QD0 cryoline in the pillar
Chicane to close the sight line of the QD0 cryoline
19m
20m of Platform

Transportation

port to IR



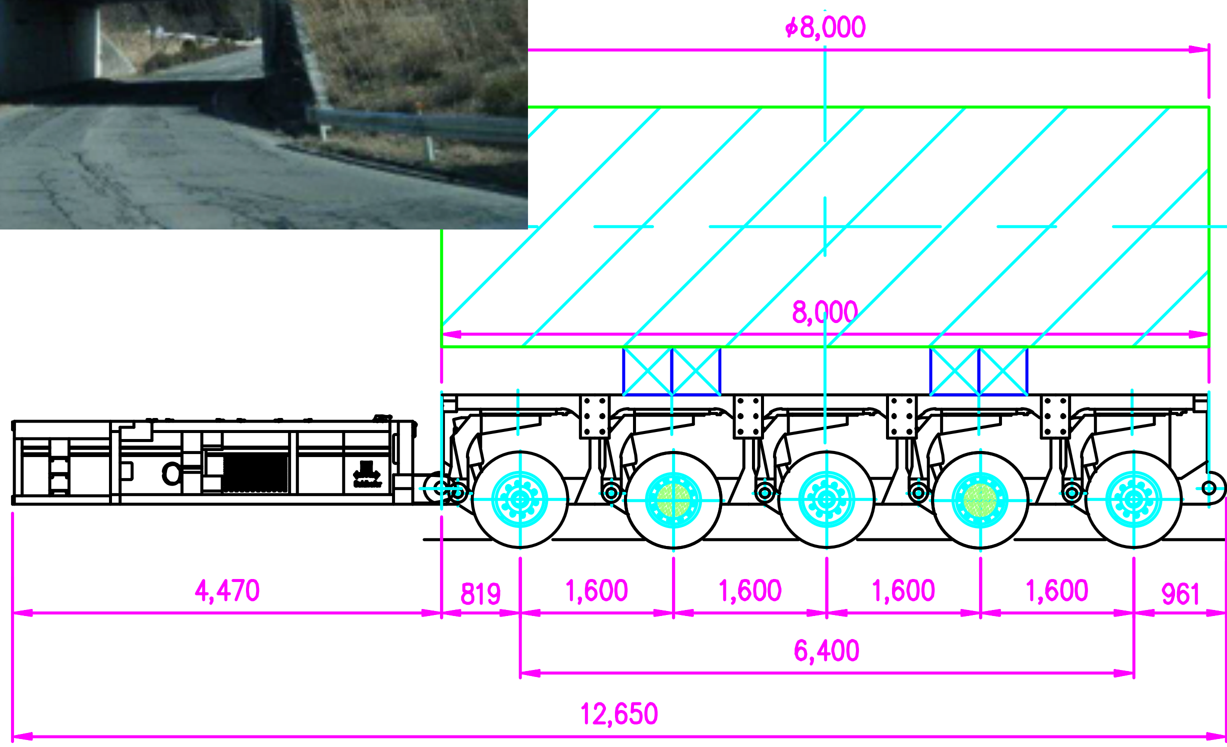
Largest Components

ILD Solenoid

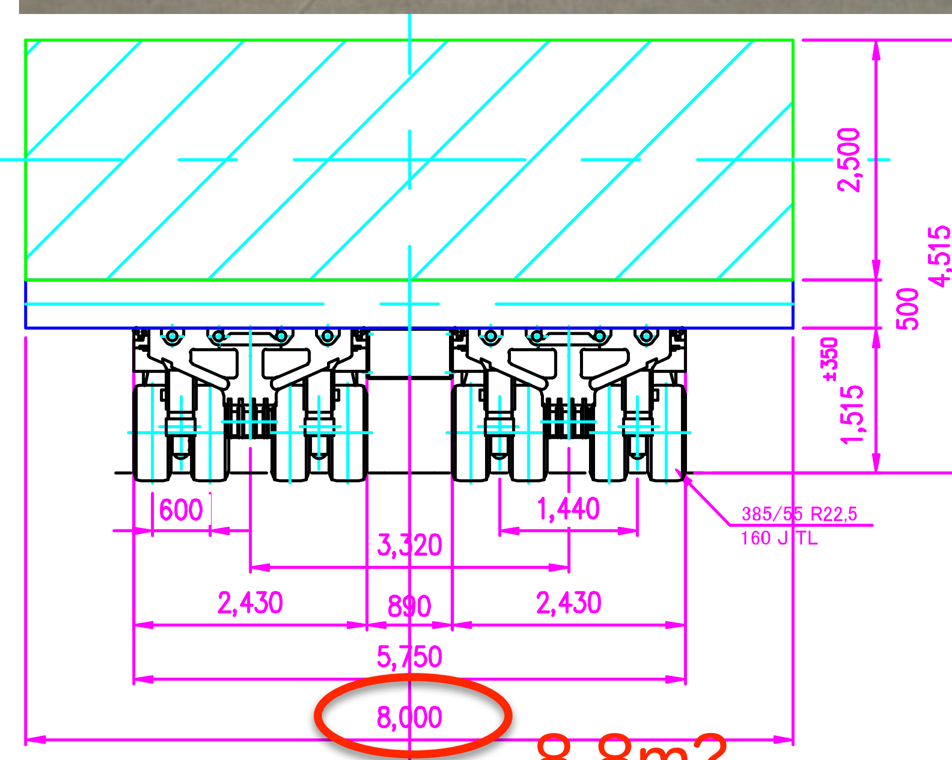
1/3

Φ8.8m (w/ DID)? , 60t

Φ8m, H2.5m, 50t



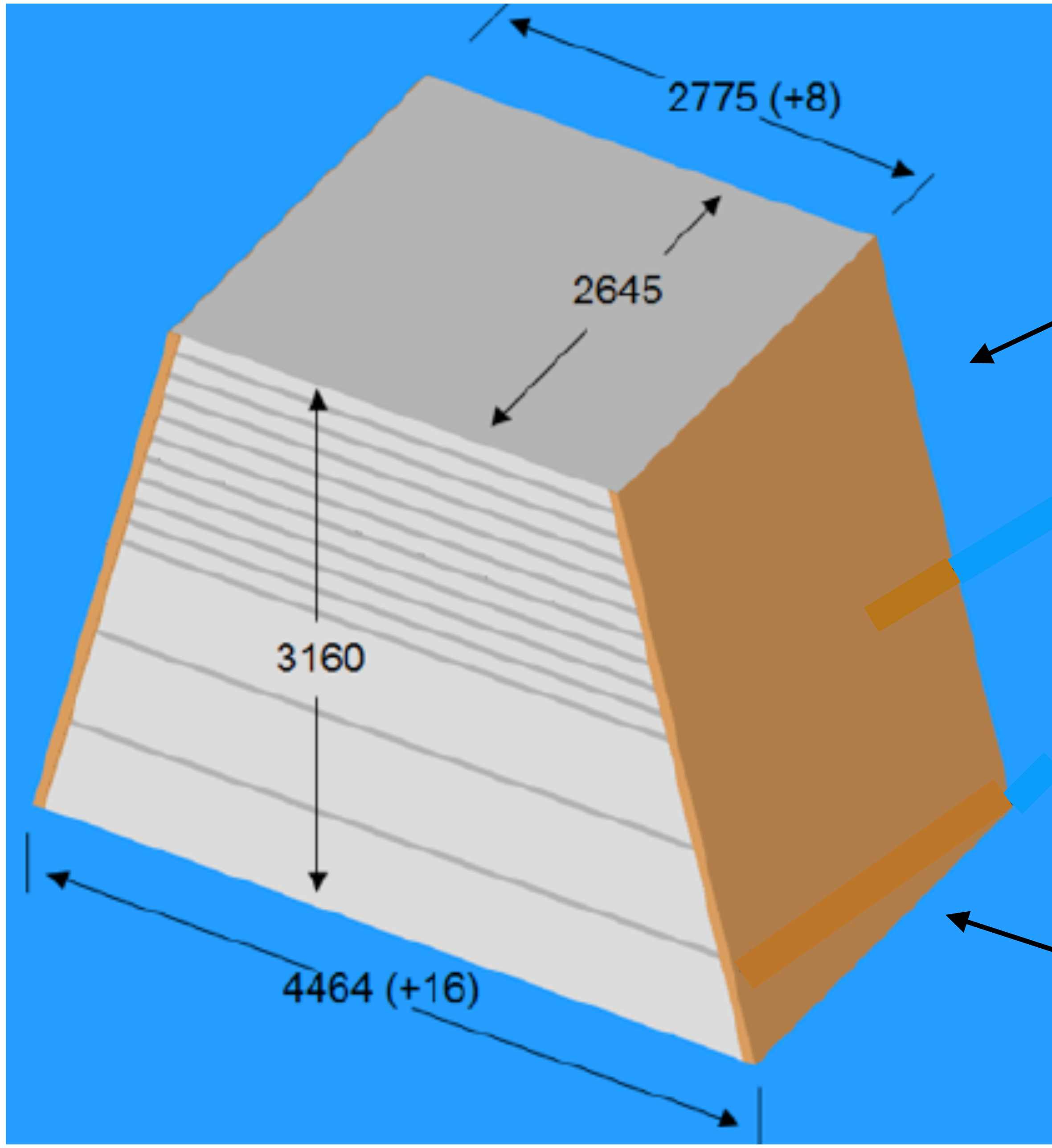
4.2m(ILD), 4.5m(SiD)



8.8m?

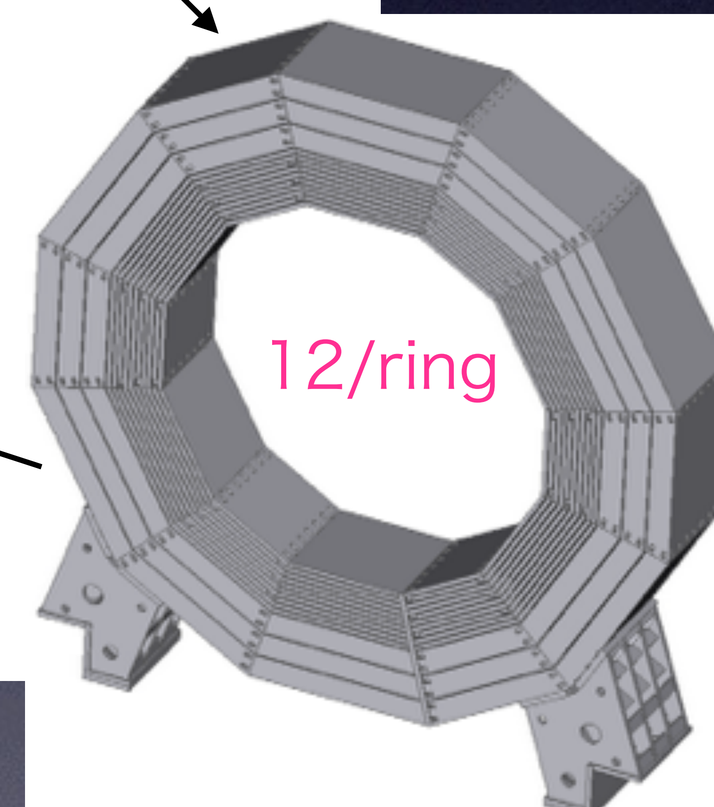
Heaviest Components

ILD Barrel Yoke Segment



ILD

Weight ~210t
18 pieces
18=6x3ring
Plus 18 slightly smaller pieces weight ~170t

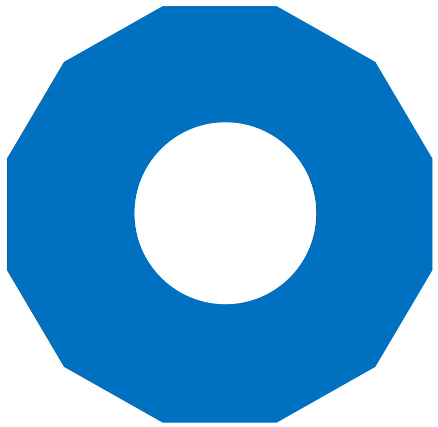


Magnet Design – Segmentation Options

SiD

Σ weight   12x Σ weight

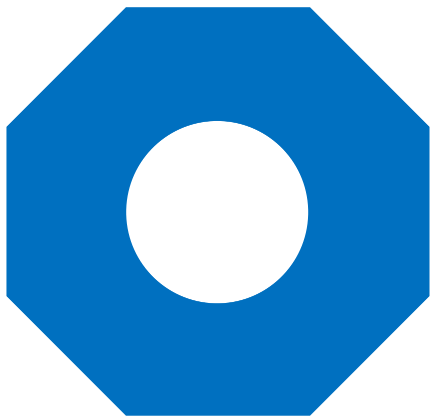
				R (m)	Width (mm)	Weight (tons)	Accrued Sector Weight	Accrued Barrel Weight
L	5900		Plate 1	3454	1851	17	17	204
Thickness	200		Plate 2	3694	1980	18	35	423
Gap	40		Plate 3	3934	2108	19	55	656
			Plate 4	4174	2237	21	75	903
			Plate 5	4414	2365	22	97	1164
			Plate 6	4654	2494	23	120	1440
			Plate 7	4894	2623	24	144	1729
			Plate 8	5134	2751	25	169	2033
			Plate 9	5374	2880	27	196	2351
			Plate 10	5614	3009	28	224	2684
			Plate 11	5854	3137	29	253	3030



12 edges

Σ weight   8x Σ weight

				R (m)	Width (mm)	Weight (tons)	Accrued Sector Weight	Accrued Barrel Weight
L	5900		Plate 1	3454	2861	26	26	211
Thickness	200		Plate 2	3694	3060	28	55	436
Gap	40		Plate 3	3934	3259	30	84	676
			Plate 4	4174	3458	32	116	931
			Plate 5	4414	3657	34	150	1200
			Plate 6	4654	3855	35	185	1484
			Plate 7	4894	4054	37	223	1782
			Plate 8	5134	4253	39	262	2095
			Plate 9	5374	4452	41	303	2423
			Plate 10	5614	4651	43	346	2766
			Plate 11	5854	4850	45	390	3123



8 edges

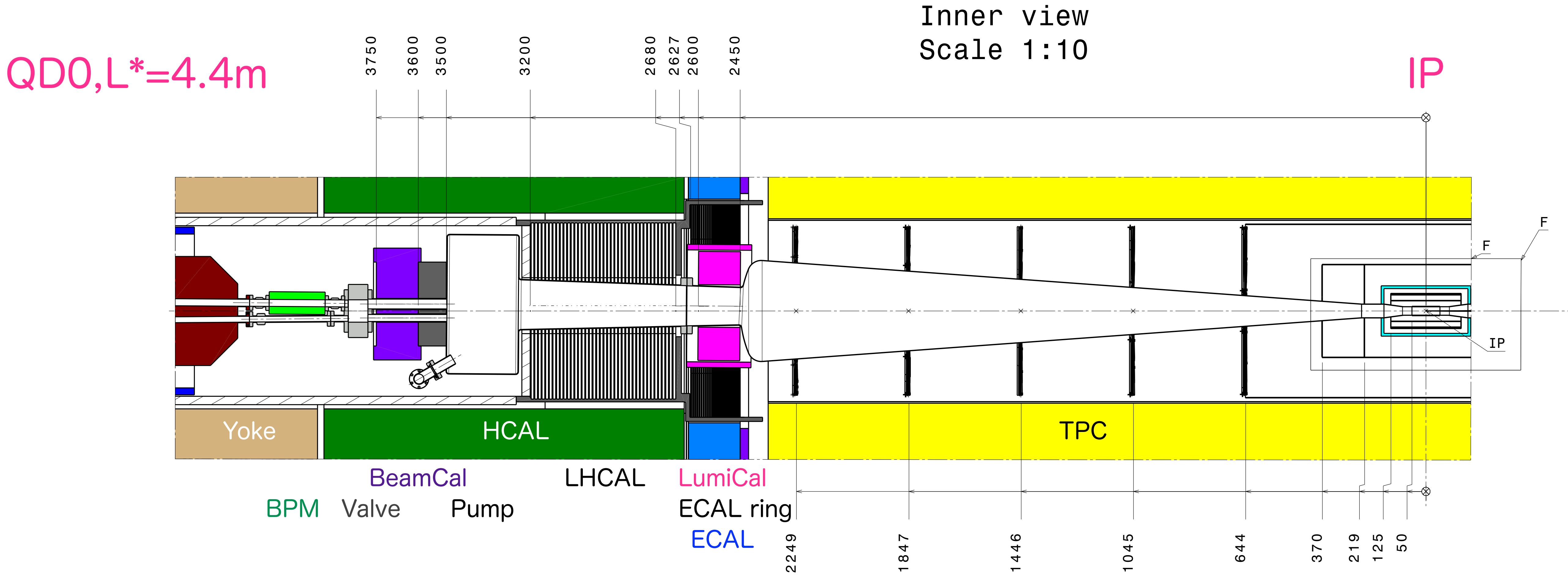
Boundary conditions

- If we will transport only a few heavy packages, 70 ton is a realistic number.

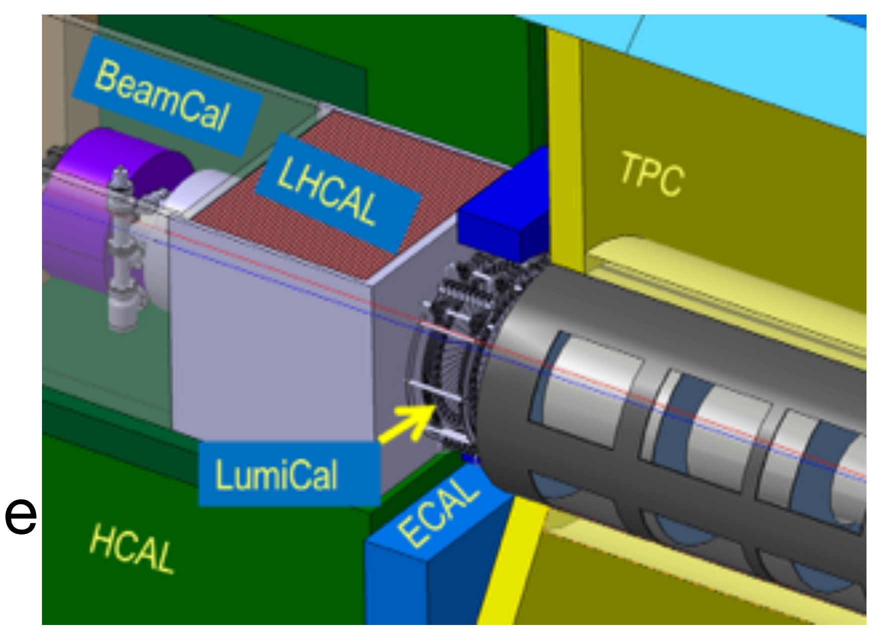
- We have to transport MANY heavy packages.
- ~50 ton would be a good number

- WG/TF in Tohoku will study transportation in more detail.

Current Lower Constraints on L* ILD



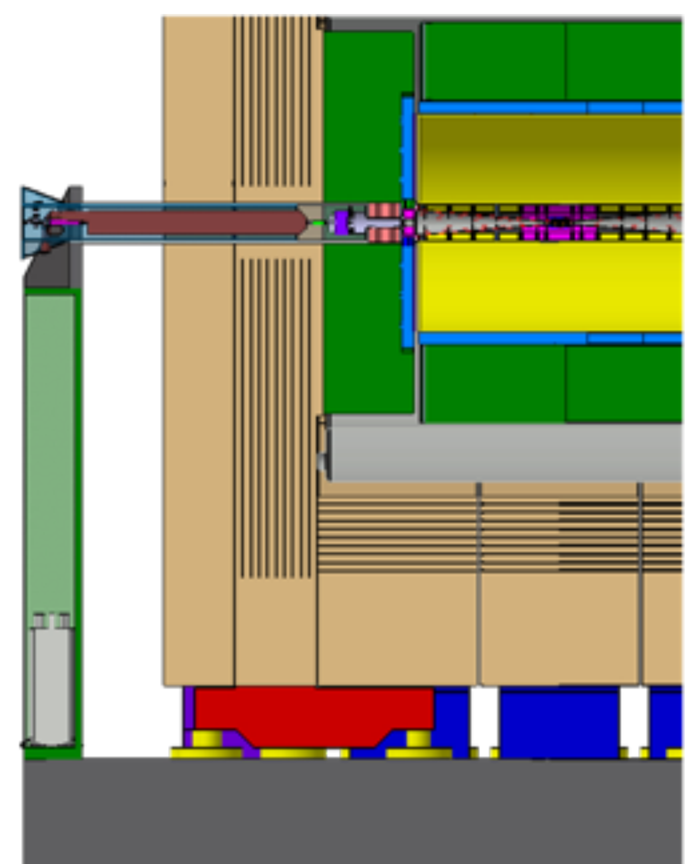
- Detailed design of forward region:
  - LumiCal, LHCAL, BeamCal
  - Beam Pipe, Bellows, Flanges, Vacuum Pumps
  - Optimised (many FTEs in the last ~10y) for
    - operations: no FCAL or masks inside the tracking volume
    - assembly and maintenance
    - physics: VTX (occupancies and layer radii), FCAL performance, hermeticity



Summary

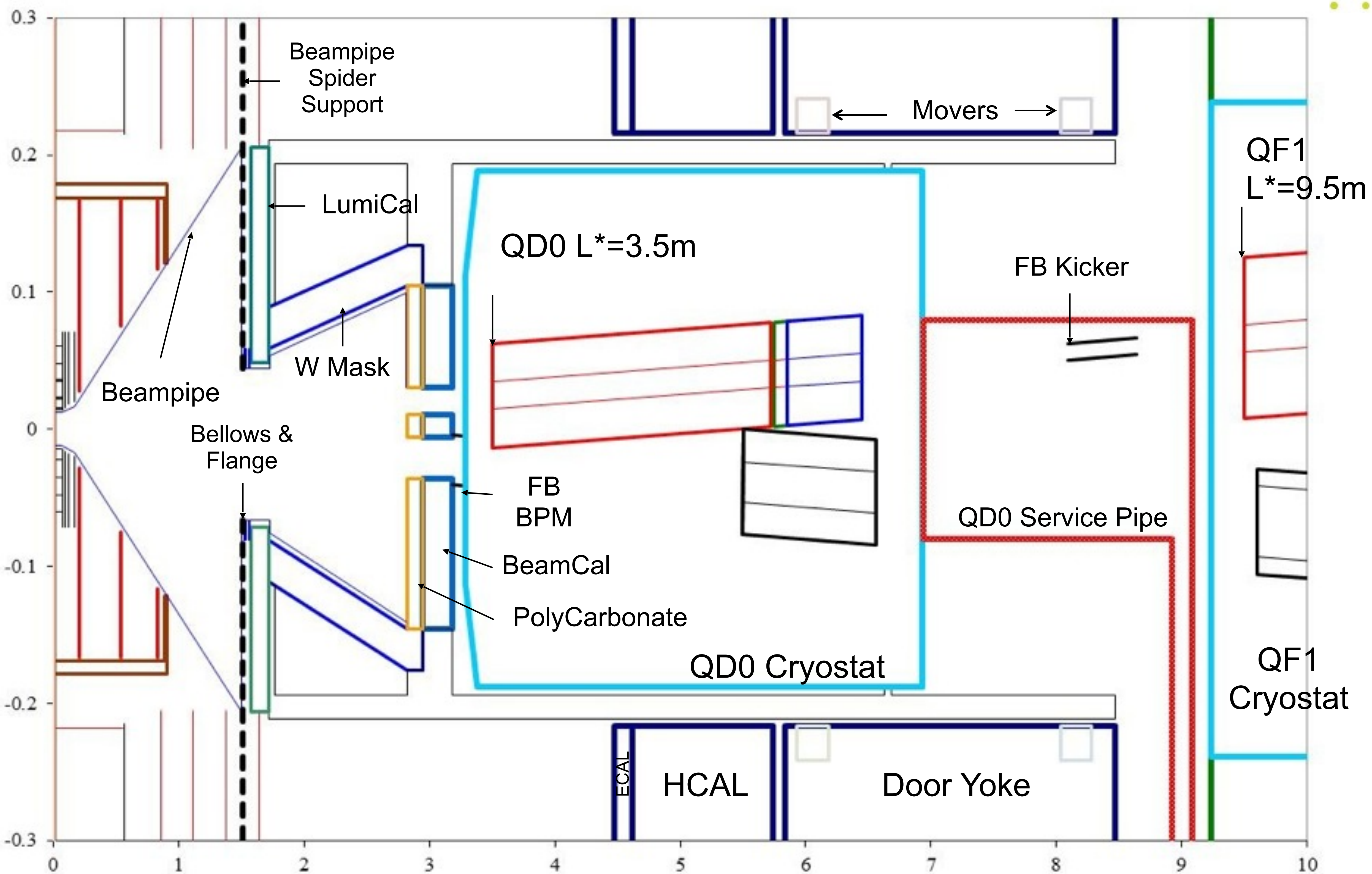
ILD

- Current ILD design relies on L*=4.4 m
- Making L* smaller is possible but not easy:
  - re-design of forward region might reduce L* by O(0.3)m
  - go back to TESLA-like solution with FCAL inside the tracking volume
  - make ILD smaller
- A larger L* makes only sense if it is big enough to keep QD0 stationary during push-pull
  - in current ILD design >7.0m
  - might shrink if ILD should shrink…



SiD Schematic

(Door Open 2.8m)

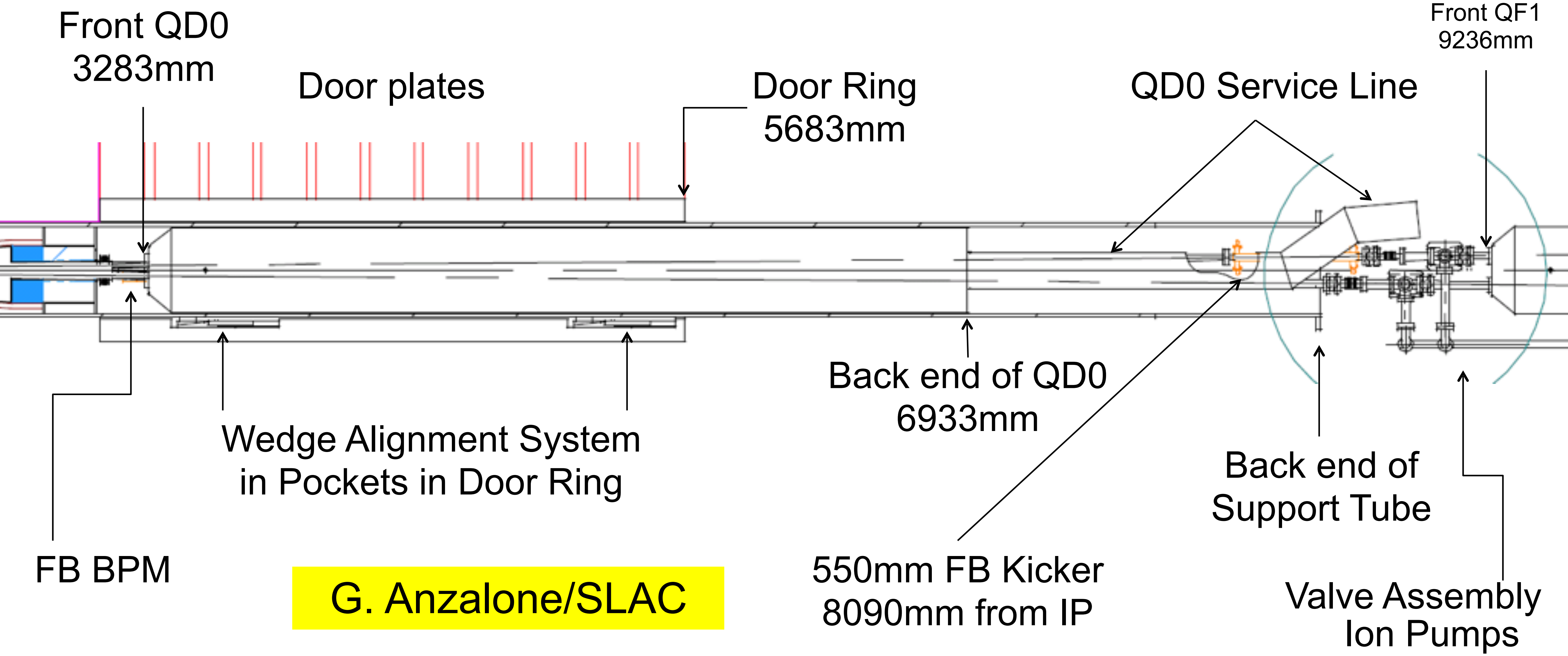


T. Markiewicz/SLAC

Evolution of QD0-QF1 region

SiD

- Valve/Pump Out/RGA assemblies near QF1 end
- QD0 Service Line to 2K chiller extended maximally to rear
- Support tube behind QD0 extends to allow 2.8m door opening transitioning to a half-cylinder for access



G. Anzalone/SLAC

Summary

SiD

- SiD can accommodate a L* between 2.6-4.5m
  - **Minimum L* probably dictated by QD0 technology, not SiD**
- Minimum and maximum L* in SiD are a function of
  - **Z where endcap ECAL begins**
  - **Length of QD0 cryostat**
  - **L* of QF1 (9.5m) and space required for disconnect valves, flanges, pump outs and the feedback kicker**
- More work needed to evaluate engineering stresses and backgrounds if L* changes

Conclusion

1. Interaction Region Design : Change Request (CR)

   We agreed on the CR with Hybrid A' w.r.t.

   Detector assembly in the assembly hall

   the installation/assembly in the detector hall

2. Transportation : the WG/TF active in Tohoku

   a concern of the largest size to be transported

   impact on the detector assembly to be studied

3. Shorter L* : Change Request (CR) by BDS

   ILD : L* > 4.4 - O(0.3) m , (L*>7m for ILD design)

   SID : 2.6m < L* < 4.5 m

   Both need detailed investigations