

Experimental hall options

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2014/3/13

@MDI WG meeting

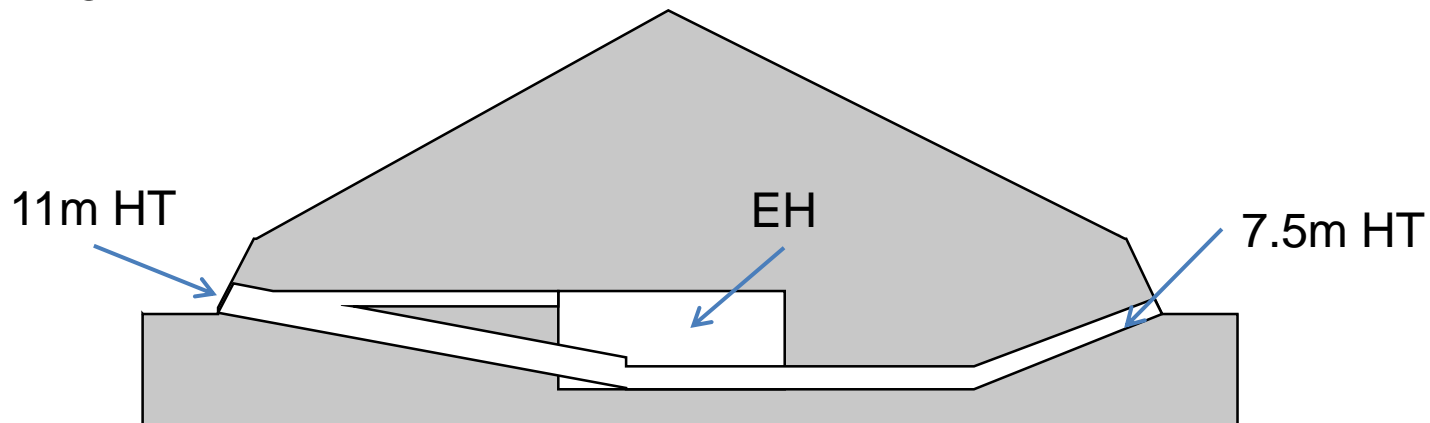
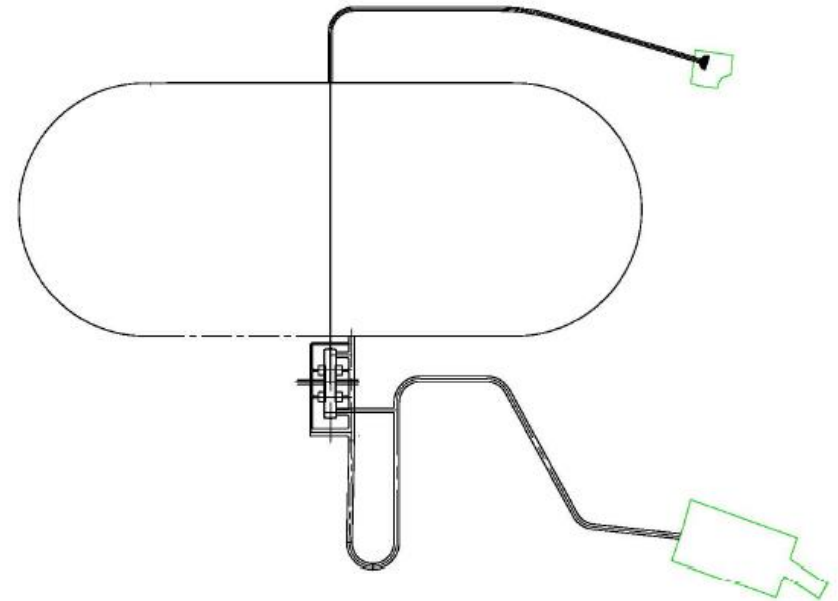
STUDIES SO FAR

Study by KEK CFS group

- Because Kitakami was selected as the candidate site in Japan, the vertical shaft (VS) option has become a possible option
- KEK CFS group has started study of VS options, and proposed “VS option” and “Hybrid option”
- Members of KEK CFS G are from accelerator (A.Enomoto), facility (M.Miyahara), detector (T.Okamura, Y.Sugimoto, T.Tauchi), and consultant companies (J-Power and Nikken-Sekkei)
- Civil engineering study by J-Power
- Mechanical and electrical study by Nikken-Sekkei
- Cost estimate is not complete
 - 4000ton crane cost estimate is tentative, and still under study
 - Cryogenic facility is not included

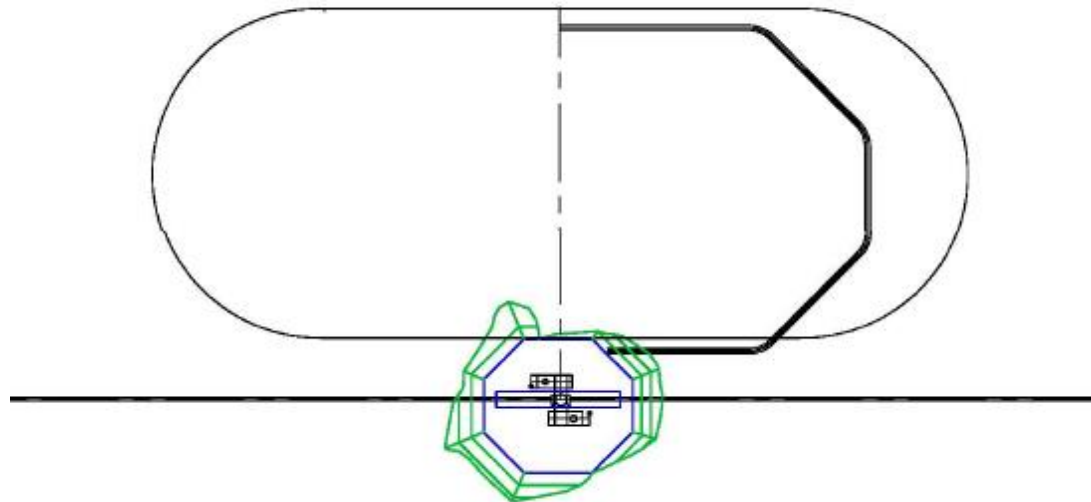
HT (TDR) option

- Experimental hall (EH) below peak of a mountain ($d > 200\text{m}$)
- Detector transportation through ($h =$) 11m (slope $\sim 7\%$) horizontal tunnel (HT)
- Accelerator components transportation through 7.5m (slope $\sim 10\%$) HT
- Services/utilities through 7.5m tunnel



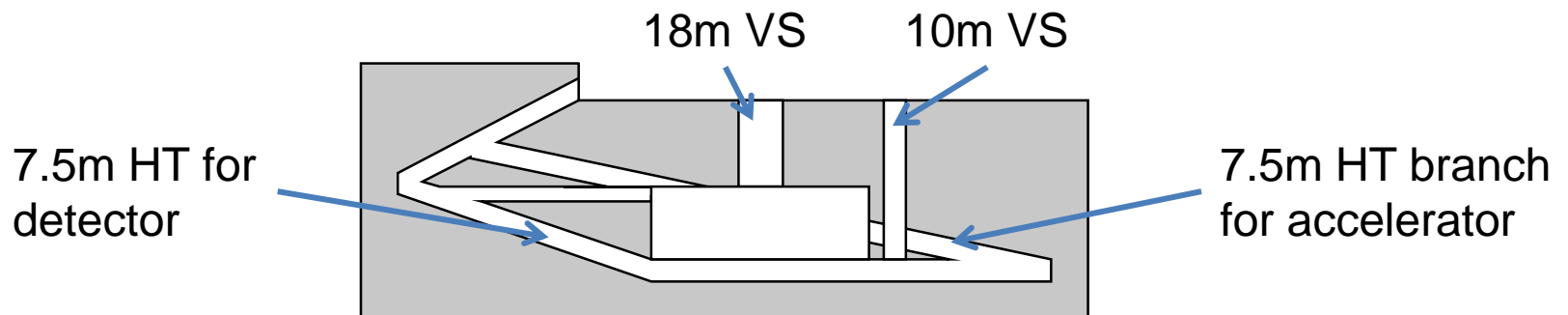
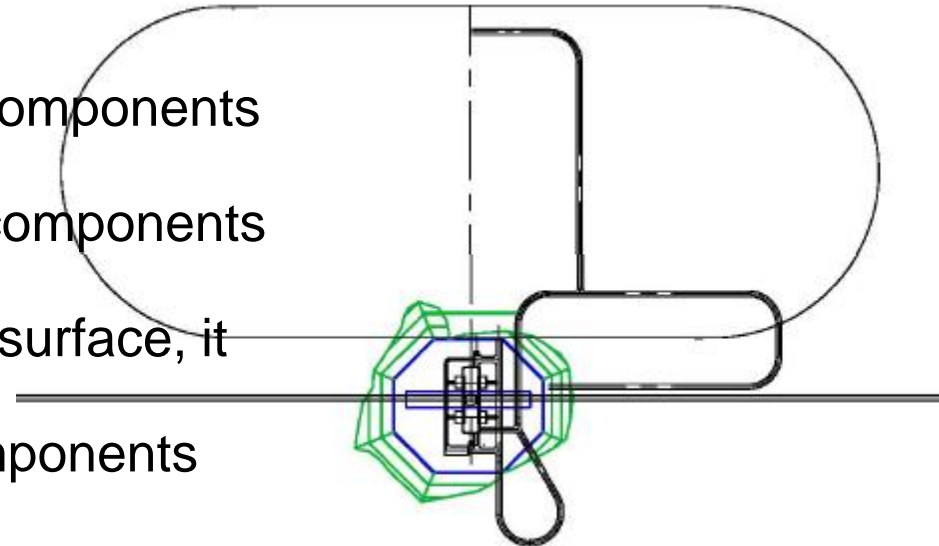
VS option

- EH ~100m below surface (IP is shifted along the beam direction)
- 5 VSs: 18m, 10m, 8m, 2x7.5m
- Transportation of large detector components through 18m VS
- Transportation of small detector components through 10m (ILD) and 8m (SiD) VSs
- Detector services through 10m (ILD) and 8m (SiD) VSs
- Two 7.5m VSs for elevators
- Transportation of accelerator components through 7.5m HT
- Services/utilities for accelerator through 7.5m HT



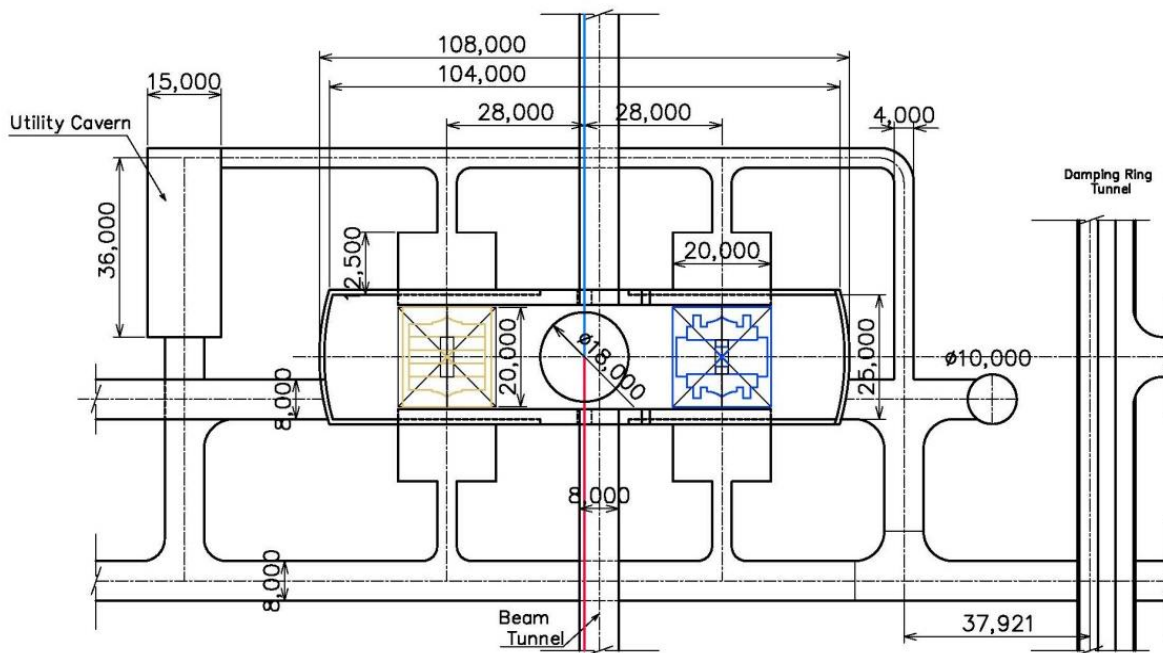
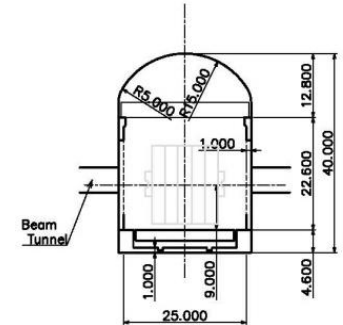
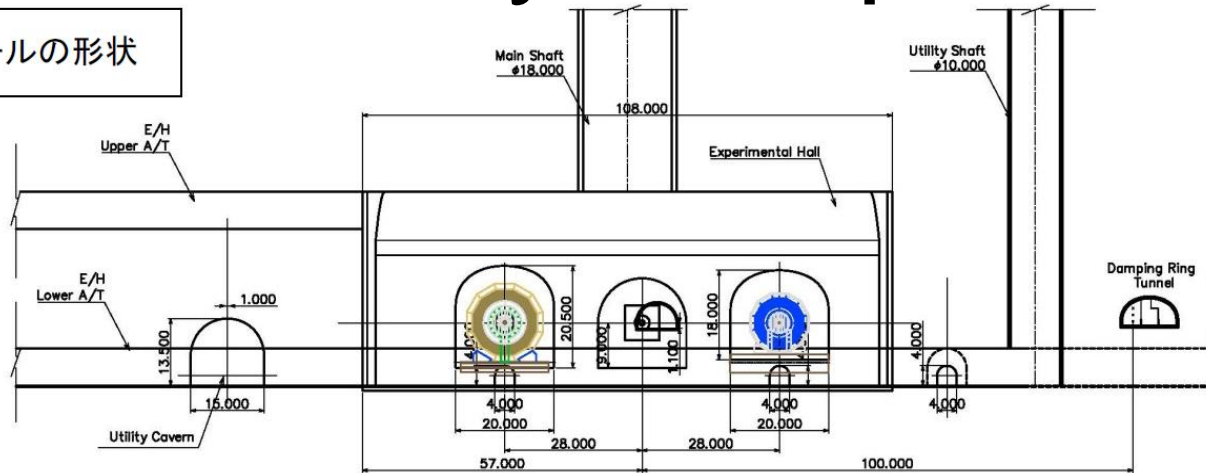
Hybrid option

- EH ~100m below surface
- Two VSs (18m and 10m) plus HT
- Transportation of large detector components through 18m VS
- Transportation of small detector components through 7.5m HT (slope~10%)
- If solenoid has to be taken out to surface, it will go through 18m VS
- Transportation of accelerator components through a branch of 7.5m HT
- Services/utilities/elevator through 10m VS



Hybrid option

実験ホールの形状



ALT 4



Discussion at CFS meetings

- These 3 options were shown and discussed at the CFS webex meetings on Feb.25 and Mar.4
- VS option has been dropped because of the environmental impact and the cost
- An opinion that Hybrid option should have only 1 VS
- SiD showed preference of horizontal access of heavy components even for hybrid option



- Study of HT option and Hybrid option should be continued
- Modified designs are necessary for hybrid option

Comparison of 2 options

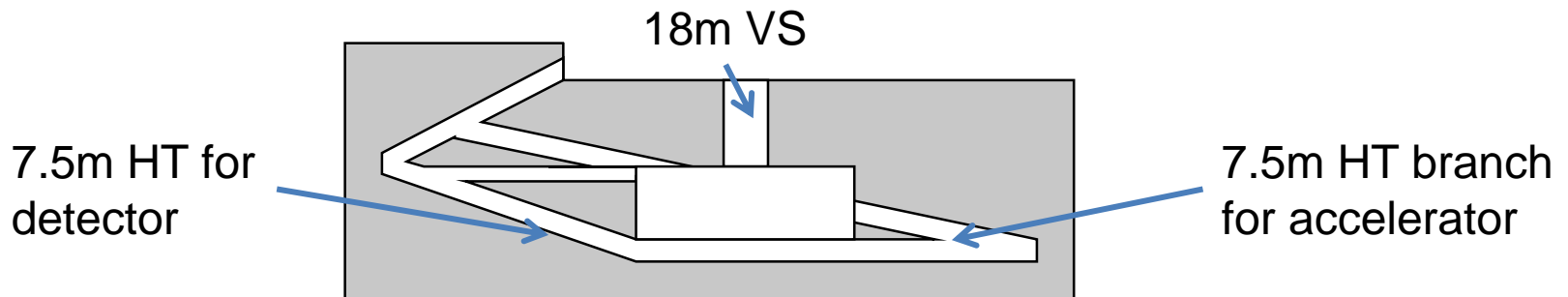
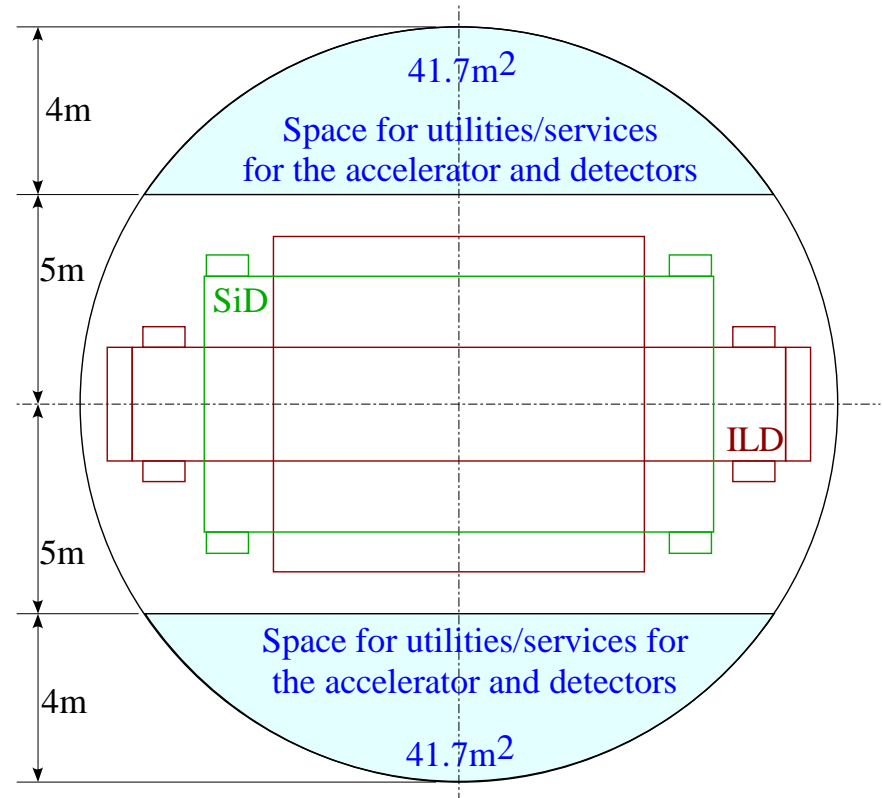
	HT	Hybrid	Comment
Excavation period	45.7 mo	42.3 mo	
Experimental hall	Large (L=142m)	Small (L=108m)	
Vertical shaft	None	18m, 10m	
Access tunnel	Large (H=11m)	Small (H=7.5m)	
Services	Long (~1 km)	Short (~100m)	$\Delta=10 - 20 \text{ M\*
Access	Car or foot	Elevator	
Cranes in EH	250t x2, 80t x2	40t x2	
Cranes on surface	250t x2, 80t x2	← + 4000t	
Critical path	EH excavation	Sub-detector construction	

* For water pipes, He pipes, and air ducts

POSSIBLE MODIFICATIONS

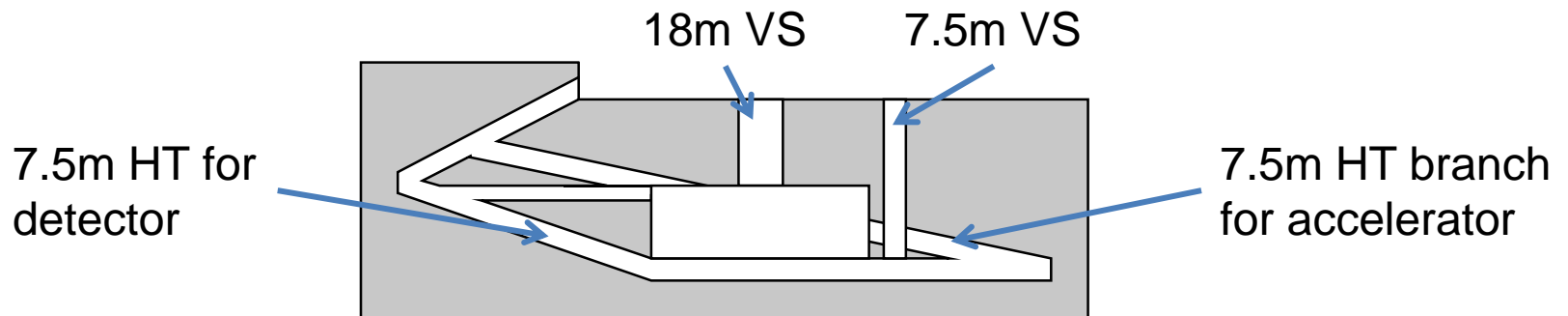
Hybrid option (1 shaft)

- At CFS webex meeting, there was a strong opinion that Hybrid option should have only one VS
- Services/utilities can go through 18m VS
- No elevator



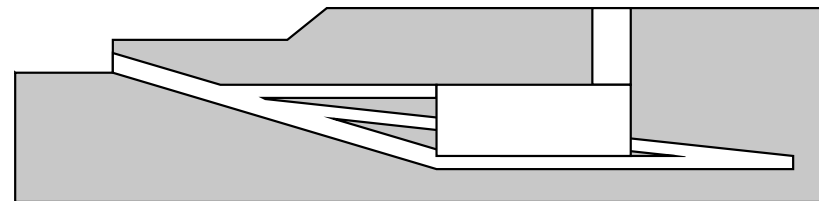
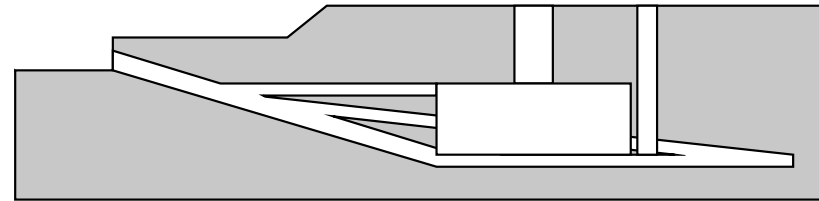
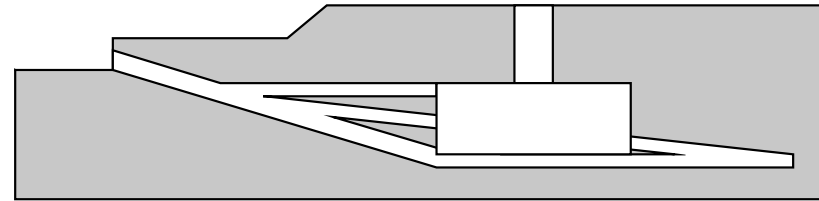
Hybrid option (smaller 2nd shaft)

- Services/utilities through 18m VS
- Elevator in 7.5m VS
- If there is a strong request for an elevator from detector groups, it can be an option



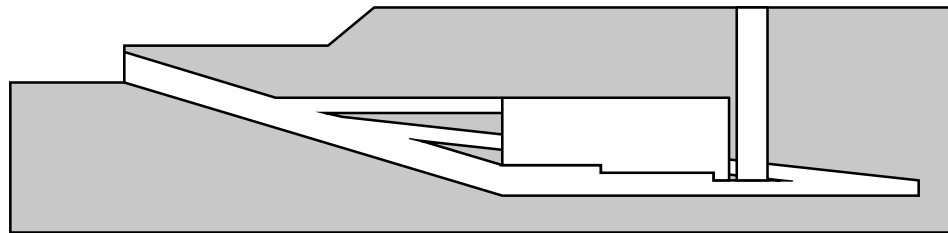
Hybrid option 2

- Transportation of SiD detector components through 9(?)m HT (slope~7(?)%)
- Transportation of large ILD components through 18m VS
- Transportation of small ILD components through HT
- Assembly halls (AH) on surface at separate location
- Several options for VS
 - 18m VS for ILD and services
 - 18m VS for ILD/services and 7.5m VS for elevator/services
 - 18m VS above loading area for ILD and services/elevator



HT option 2

- 11m HT for transportation of detector components
- 7.5m HT branch for accelerator components
- 10m VS for services and elevator
- Cost could be similar to the original HT option



Summary of possible options

	HT	VS	Elevator	ILD	SiD
HT	11m	None	0	Non-CMS	Non-CMS
Hybrid-1a	7.5m	18m, 10m	1	CMS	CMS
Hybrid-1b	7.5m	18m, 7.5m	1	CMS	CMS
Hybrid-1c	7.5m	18m	0	CMS	CMS
Hybrid-2a	9(?)m	18m	0	CMS	Non-CMS
Hybrid-2b	9(?)m	18m, 7.5m	1	CMS	Non-CMS
Hybrid-2c	9(?)m	18m (shifted)	1	CMS	Non-CMS
HT-2	11m	7.5m	1	Non-CMS	Non-CMS

- Study of 3 options (bf) would be enough
- Cost and construction period for other options can be calculated from these 3 cases

NEXT STEP

Tasks for KEK CFS Group

- Continue study of HT option and Hybrid option-1
 - Cost of cranes
 - Cost of Helium piping
 - Rearrangement of services (pipes, air ducts, etc.)
 - Impact of small (7.5m or 10m) VS
- Study of Hybrid option-2
 - Possibility of two separated campus with different elevation
 - Estimation of cost and construction period
- Study of impact of Hybrid option to other parts of ILC
 - Surface facilities including assembly hall(s)
 - Reconsideration of access tunnels for the accelerator (main linac) and the cost impact (Access points could change if IP is shifted)

Tasks for detector groups

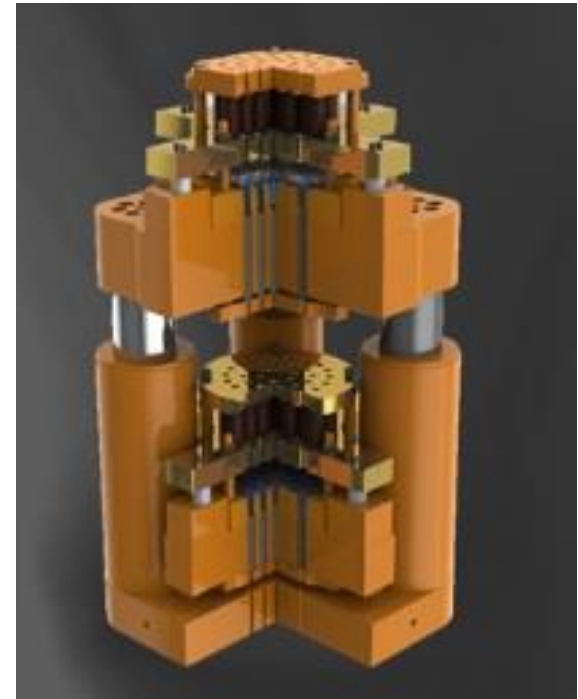
- CFS group needs the following information from detector groups (MDI WG) to carry out the tasks
 - HT height and slope for Hybrid-2 option (SiD)
 - SiD detector assembly space in EH for Hybrid-2 option
 - Position of 18m VS for Hybrid-2 option (ILD)
 - Necessity of an elevator
 - Crane capacity
 - Size, weight, and number of hooking points of large detector components to be lowered by 4000 ton crane

	HT		Hybrid-1		Hybrid-2	
EH	Main cavern	250t x2	Main cavern	40t x2	Main cavern	250t (?)
		80t x2				40t (?)
	Alcove	2.5t x4	Alcove	2.5t x4	Alcove	2.5t x4 (?)
AH (No description on cranes in TDR)	Mail hall	250t x2	18m VS	4000t	18m VS	4000t (?)
		80t x2	Main hall	250t x2	Main hall 1	250t (?)
		80t x2		80t (?)		
					Main hall 2	250t (?)
						80t (?)

Present assumption of crane capacity by KEK CFS group

4000 ton crane

- 4000 ton crane consists of several strand jacks (580ton x4 for CMS)
- 600 ton strand jacks are available from a Japanese company → 8 jacks are necessary to lift 4000 ton object



Summary

- KEK CFS group will continue study of experimental hall for several options
- More precise estimate of cost and construction period will be made
- In order to do these tasks, information from detector groups is indispensable