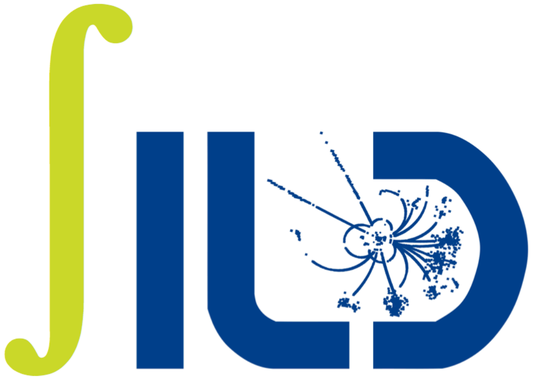
Report from Technical Coordination

Karsten Buesser

ILD Phone Meeting
09.05.2018

ILD Integration

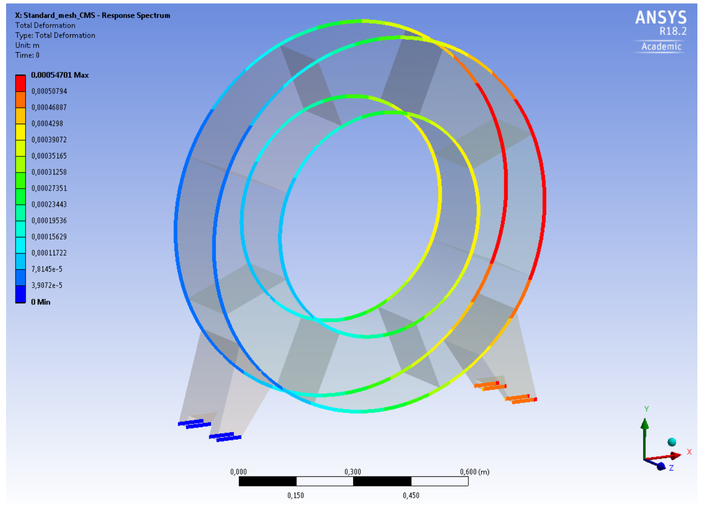
- Update fully integrated ILD model
- ILD Integration Task Force (Kick-off meeting in February at LAL)
- Bottom-up process based on information from sub-detectors:
  - Interface Control Documents
- Input from dedicated task forces
  - Central Design and Integration Group
  - ad-hoc technical groups
    - mechanical simulations (seismic events)
    - cables and services
- Cooperation with global efforts
  - ILC infrastructure groups (dedicated workshops)
  - SiD
  - ILC machine groups

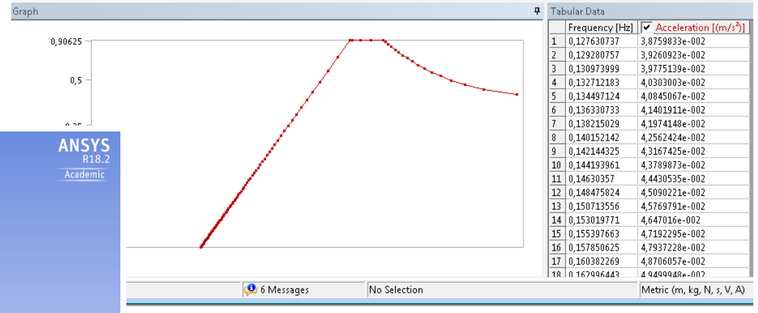


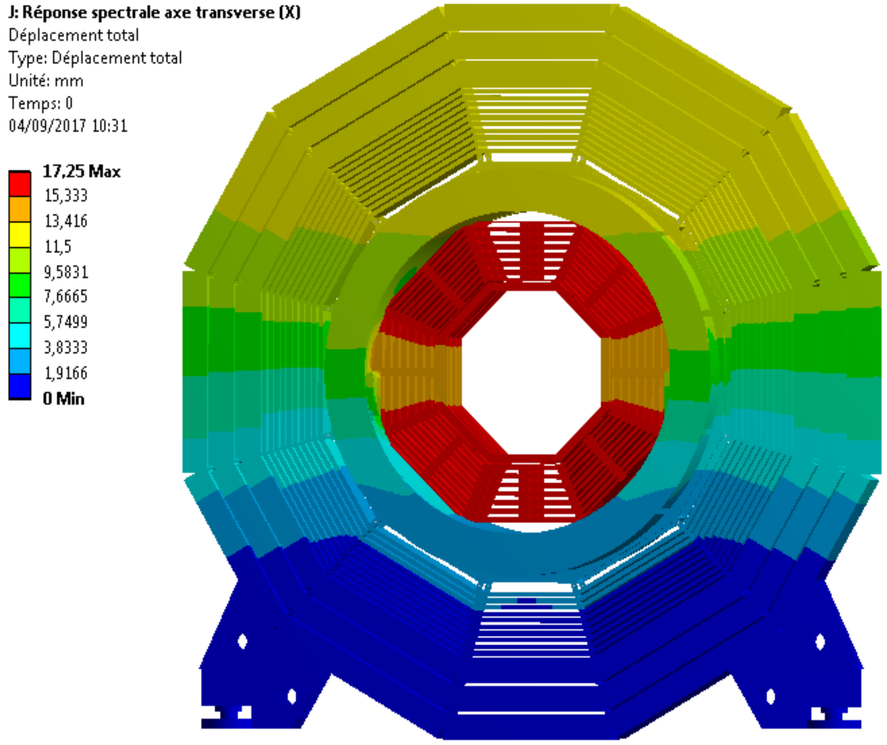
Subdetector	
VTX	in progress
SIT/FTD/ETD	in progress
TPC	draft on EDMS
Si-ECAL	draft on EDMS
Sc-ECAL	draft on EDMS
A-HCAL	discussions have started
SD-HCAL	in progress
FCAL	draft on EDMS
Yoke/Muon	???
ILD Conventions/Rules	draft on EDMS

Mechanical Simulations

- At least two groups have started to look into impact of seismic events on ILD subdetectors







- Cross-check of simulations by exchange of models still pending
- Standard description for earthquake spectra is now on EDMS

Maximum displacement:
17,3 mm
Smallest gap between ECAL rings along z:
0,98 mm
Smallest gap between ECAL module along phi: **1,89mm**

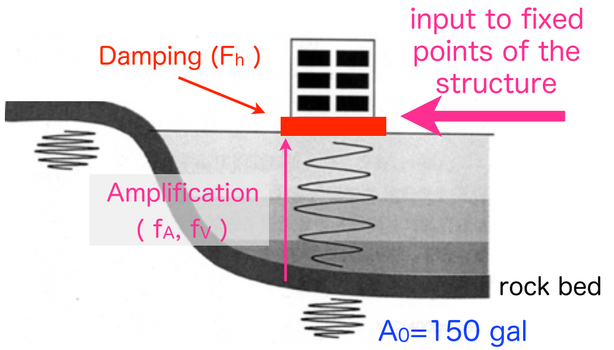
Standard Earthquake Spectra in Kitakami

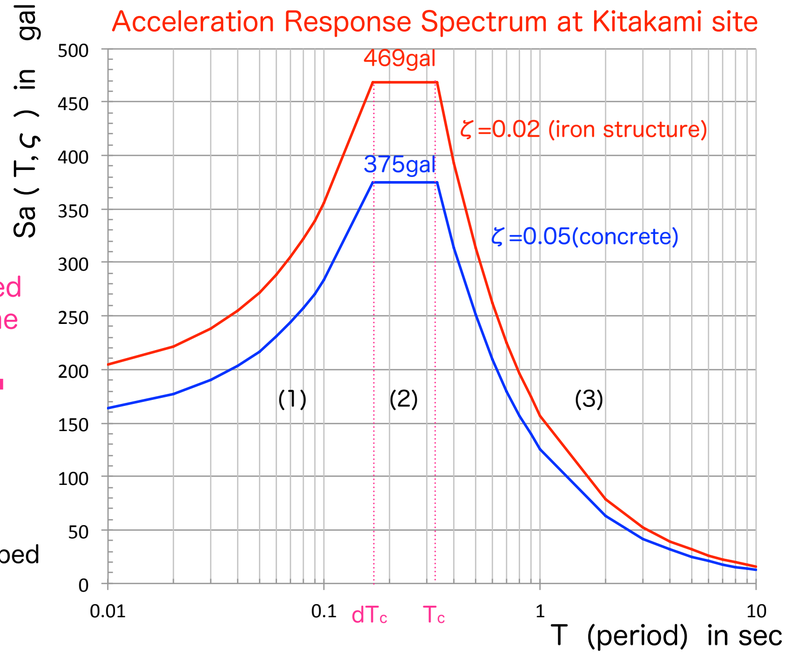
- Assembled by T. Tauchi
- Details on EDMS:
  - D*1164345
  - or follow WBS tree on edmsdirect.desy.de

Seismic Analysis with the class-1 geology (hard soil)

following the guideline of construction loads by Architectural Institute of Japan, also ISO3010

Kitakami is a site with hard soil.





Site-dependent parameters in seismic analysis for hard soil

A_0 (150 at Kitakami site): Basic maximum acceleration of ground motion
V_0 (A_0/15 hard) : Basic maximum velocity of ground motion
R_A (1.0 hard): conversion coefficient of recurrence intervals (std:100y) of the maximum acceleration
R_v (1.0 hard) : conversion coefficient of recurrence intervals (std:100y) of the maximum velocity
G_A (1.0 hard): site-dependent (ground type) correction factor of the maximum acceleration
G_v (1.0 hard): site-dependent (ground type) correction factor of the maximum velocity
F_h (1.25/1.0 hard): Correction factor by damping, $1.5/(1+10\zeta)$ with ζ =0.02/0.05 for steel/concrete
f_A (2.5 hard): ratio of $G_AR_AA_0$ of $S_a(T,\zeta)$ in $dT_c<T<T_c$, amplification factor
f_v (2.0 hard): ratio of $G_vR_vV_0$ of the velocity spectrum $S_v(T,\zeta)= S_a(T,\zeta)T/2\pi$ in $T_c<T$, amplification factor
d (0.5 hard): dT_c/T_c, ratio of lower bound of period (dT_c) relative to the upper one (T_c=0.33sec hard) in the constant $S_a(T,\zeta)$

$$(1)\ 0 \le T \le dT_c \quad : \quad S_a = \left(1 + \frac{f_A - 1}{d}\frac{T}{T_c}\right) F_h G_A R_A A_0$$

$$(2)\ dT_c \le T \le T_c \quad : \quad S_a = f_A F_h G_A R_A A_0$$

$$(3)\ T_c \le T \quad : \quad S_a = \frac{2\pi f_V F_h G_V R_V V_0}{T}$$

(constant velocity spectrum)

$$T_c = \frac{2\pi f_V G_V R_V V_0}{f_A G_A R_A A_0} = 0.33\text{sec}$$

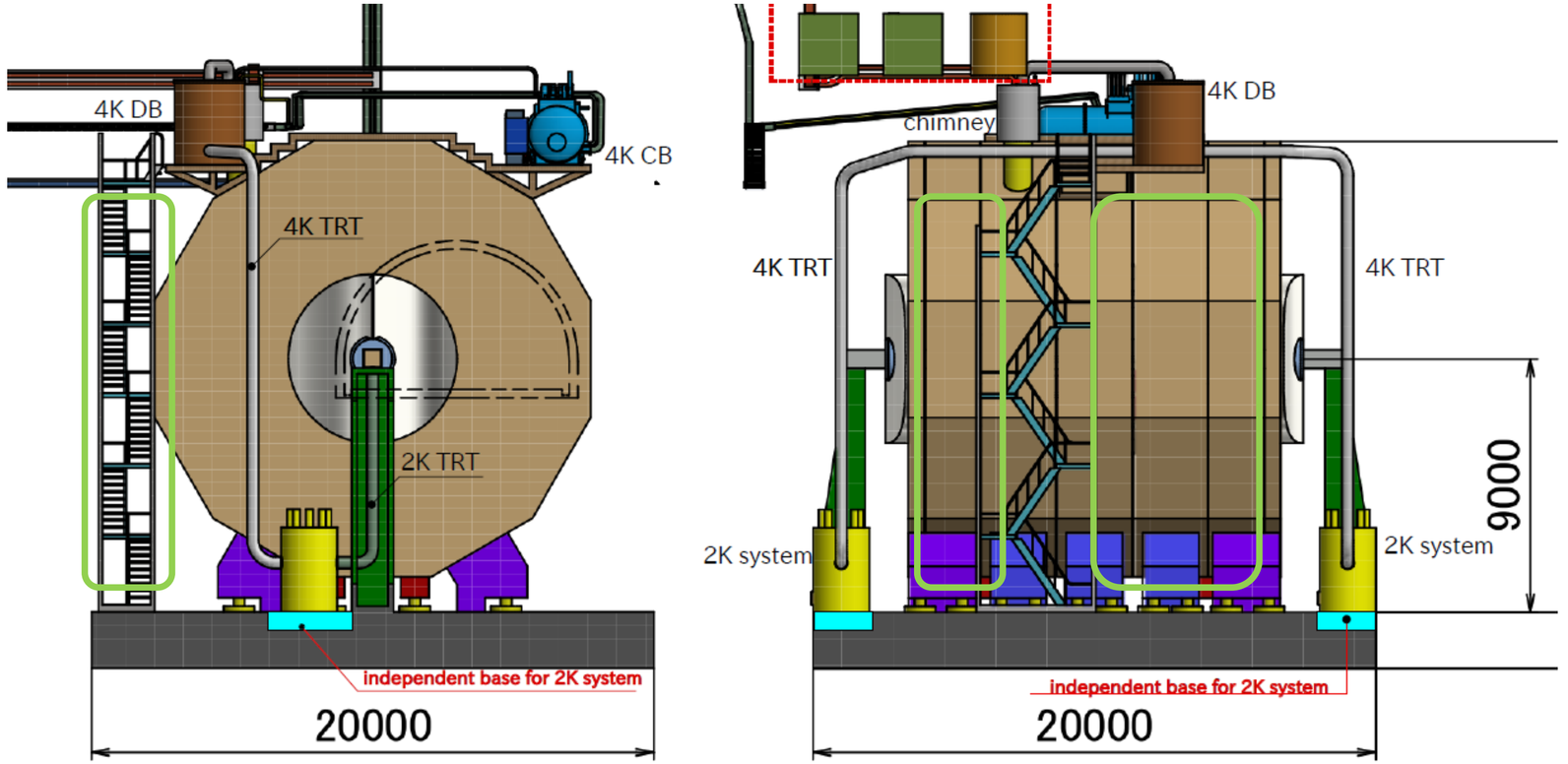
$$dT_c = 0.17\text{sec for } d = 0.5$$

$$\text{Frequency:} f = \frac{1}{T} \quad \text{Displacement:} x(f,\zeta) = \frac{S_a(T,\zeta)}{(2\pi f)^2}$$

Detector Utilities and Services

- ILD technical description gets more realistic
- Input from realistic sub-system prototypes
- Planning for ILD environments (halls, infrastructure) advances

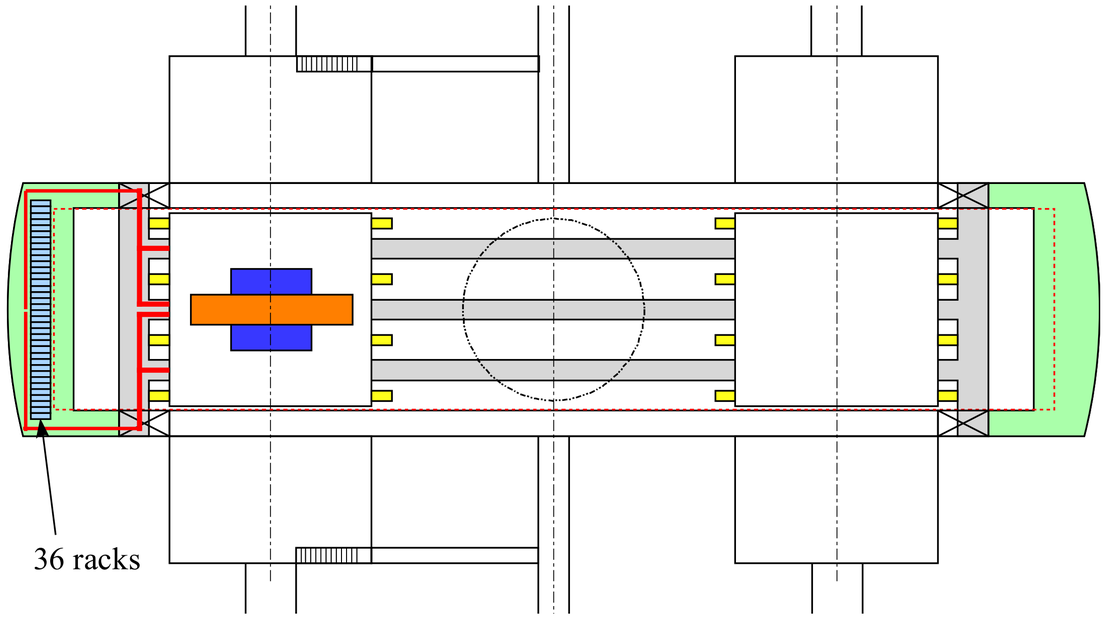
- Need to close the loop urgently!



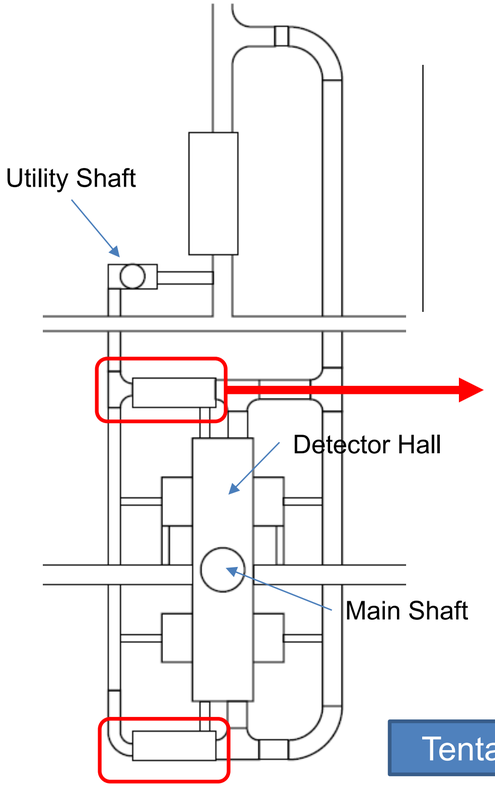
Detector Utilities in Underground Areas

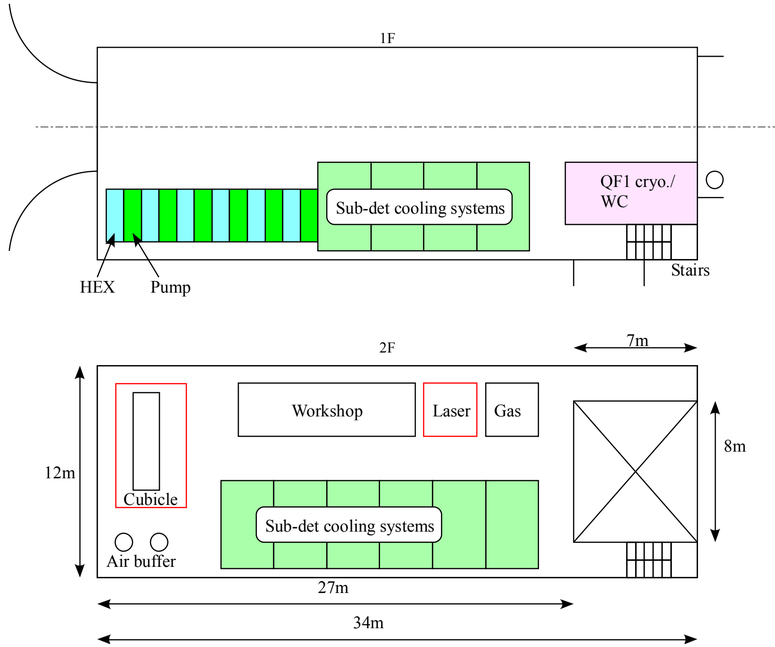
Service gallery

- 3F-5F



Utility/service cavern





Tentative design

Y. Sugimoto

Survey for Sub-Detectors (Y. Sugimoto)

Items to be clarified

- Electronics (19 inch) racks
  - Number and location (platform, service gallery, or somewhere else)
  - AC power (Quite large power consumption (>1 MW) for CMS o ATLAS. What about in the ILD case?)
  - Heat loss (= AC power-DC power to the detector)
- Sub-detector cooling system
  - Location (Utility/Service Cavern?) and space requirement
  - Request for the cooling water (LCW, chilled, or normal?, how much power?) for the 2nd loop of the cooling system
- Gas system
  - Location and space requirement
- Laser system
  - Location (Utility/Service Cavern?) and area
- PC farm for data processing (data reduction, event build, etc.)
  - Location (Underground or surface?) and area
  - AC power consumption

Items to be clarified

- An excel file for survey is under construction

			VTX	SIT	FTD	TPC	ECAL	AHCAL	SDHCAL	Muon	FCAL	PC farm	Off-line	Solenoid	QF1
Electronics Racks	Platform	Number													
		AC power (kW)													
		Heat loss (kW)													
	Service gallery	Number													
		AC power (kW)													
		Heat loss (kW)													
	U/S cavern	Number													
		AC power (kW)													
		Heat loss (kW)													
	Surface	Number													
		AC power (kW)													
		Heat loss (kW)													
Sub-detector cooling system	Space requirement	Location													
		WxDxH (m^3)													
		AC power (kW)													
	Cooling water	Type													
		Heat bad (kW)													
Gas system	Platform	WxD (m^2)													
	Service gallery	WxD (m^2)													
	U/S cavern	WxD (m^2)													
	Surface	WxD (m^2)													
Laser system	Space requirement	Location													
		WxD (m^2)													
Magnet ancillaries	DC power supply	AC power (kW)													
	Cooling water for power supply	Type													
		Heat bad (kW)													
	Cryogenics	AC power (kW)													
	Space requirement	Location													
		WxDxH (m^3)													
	Cooling water for cryogenics	Type													
		Heat bad (kW)													
	Cooling water for dump resister	Type													
		Heat bad (kW)													

Y. Sugimoto

Survey for Sub-Detectors (Y. Sugimoto)

Items to be clarified

- Electronics (19 inch) racks
  - Number and location (platform, service gallery, or somewhere else)
  - AC p… (Quite large power consumption (>1 MW) for CMS e… ATL…
  - Hea…
- Sub-de…
  - Loca…
  - Request for the cooling water (LCW, chilled, or normal?, how much power?) for the 2nd loop of the cooling system
- Gas system
  - Location and space requirement
- Laser system
  - Location (Utility/Service Cavern?) and area
- PC farm for data processing (data reduction, event build, etc.)
  - Location (Underground or surface?) and area
  - AC power consumption

Input required before Fukuoka Workshop
- that is in 19 days -

Items to be clarified

r construction

			L	Muon	FCAL	PC farm	Off-line	Solenoid	QF1
Sub-detector cooling system	Space requirement	Location							
		WxDxH (m^3)							
		AC power (kW)							
	Cooling water	Type							
		Heat bad (kW)							
Gas system	Platform	WxD (m^2)							
	Service gallery	WxD (m^2)							
	U/S cavern	WxD (m^2)							
	Surface	WxD (m^2)							
Laser system	Space requirement	Location							
		WxD (m^2)							
Magnet ancillaries	DC power supply	AC power (kW)							
	Cooling water for power supply	Type							
		Heat bad (kW)							
	Cryogenics	AC power (kW)							
	Space requirement	Location							
		WxDxH (m^3)							
	Cooling water for cryogenics	Type							
		Heat bad (kW)							
	Cooling water for dump resister	Type							
		Heat bad (kW)							

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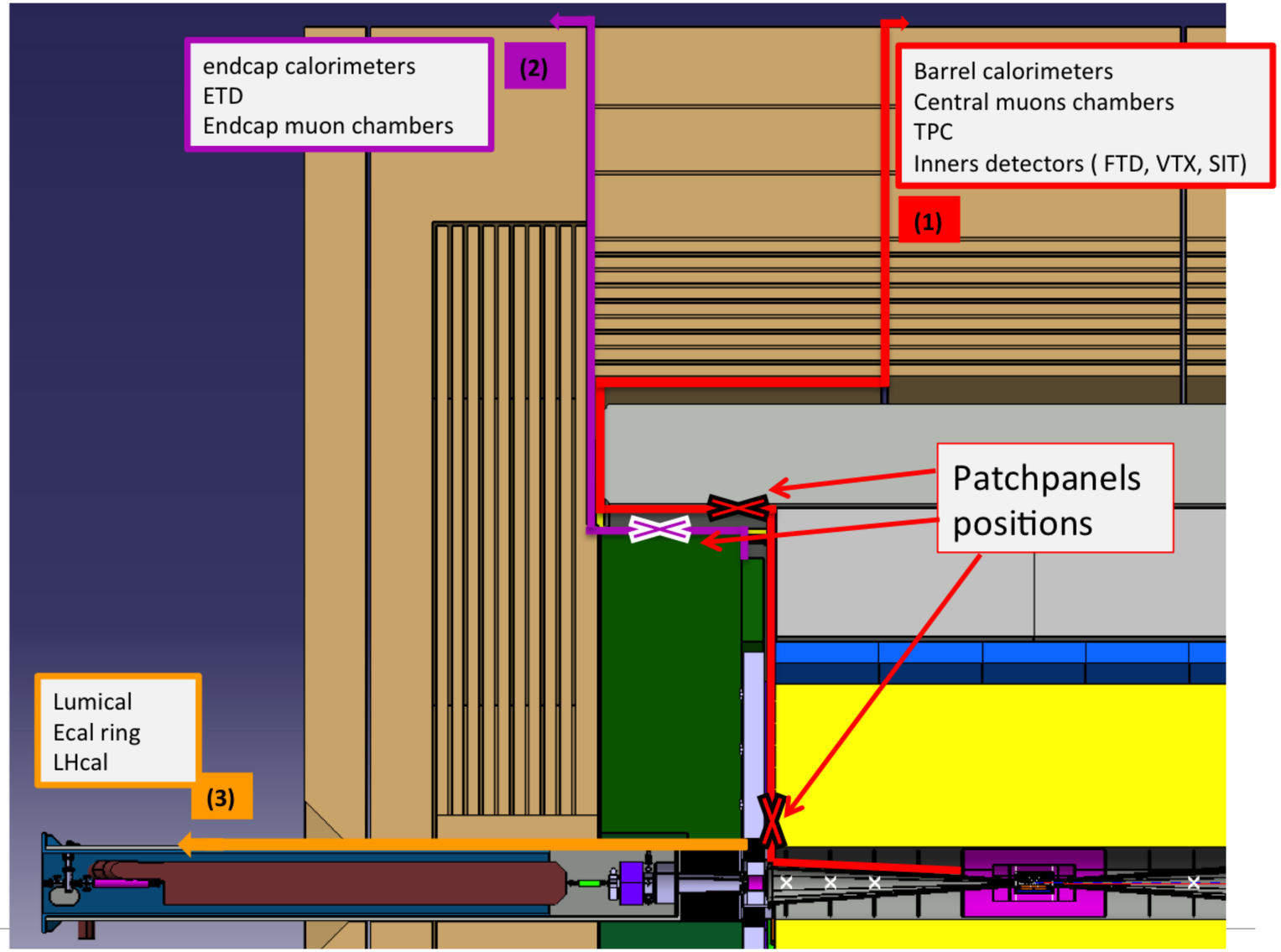
Y. Sugimoto

Cable Paths

- Need to review the ILD cable and utility paths
  - better understanding of sub-detector connections
- Roman has kindly agreed to coordinate this effort:
  - review subdetector assumptions
    - ICD documents provide input
  - look into possible positions for patch panels
  - understand additional utilities
    - cooling, gas, etc.



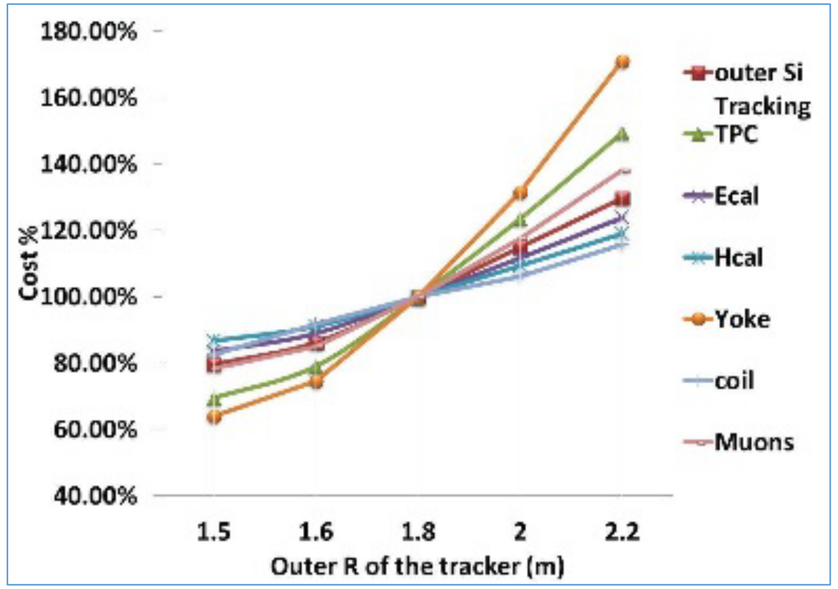
ILD Costing Group

- Costing Group set up in Ichinoseki
- Chair: Henri Videau
- Work on Cost Work Breakdown Sheets
- Form a basis for better understanding of cost derivatives

Members

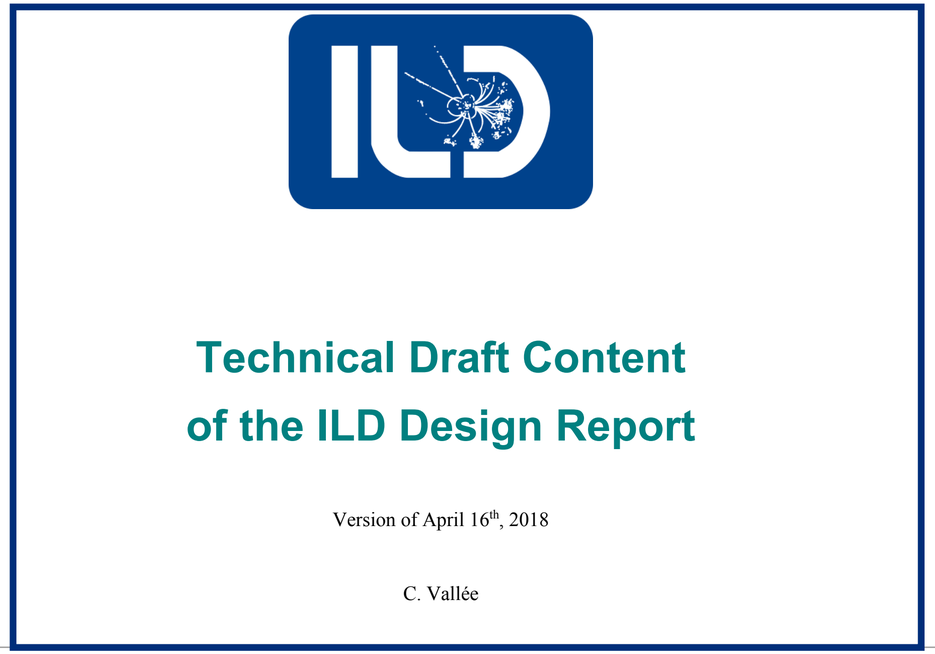
- Chair: H. Videau
- Deputy: K. Buesser
- Technical Support: S. Pavy
- VTX/CMOS, SIT: A. Besson
- VTX/DEPFET, FTD: M. Vos
- TPC: P. Colas
- Si-ECAL: H. Videau
- Sc-ECAL: T. Takeshita
- A-HCAL: F. Sefkow
- SD-HCAL: I. Laktineh
- VFS: Y. Benhammou
- Muon: V. Saveliev
- Coil/Yoke: U. Schneekloth

	Steps/Needs	Quantities	Unit	Tools	Place	Unit cost/time	Cost in k€	M.Y
2.	**Electromagnetic calorimeter**						**158159.14**	**115.8**
2.1	**Barrel**	**1**					**105552.807**	**77.1**
2.1.1	**Module structure construction**	**40**					**14461.54**	**51.1**
2.1.1.1	**Material procurements and operations**						**12209.04**	**5**
	Tungsten plates (thickness tolerance +- 40 µm) Thickness : 1.05 – 2.1 – 4.2 mm	90.3	ton		Industry Several suppliers	120	10838	
	Dimensional inspection of W plates	24000	plates	3D measurement system	HOMEI ndustry			5
	Carbon fibres prepreg 2K for H structure	6000	m^2		Industry	0.09	540	
	Carbon fibres prepreg 3K for alveolar structure	13000	m^2		Industry	0.05	650	
	Thin carbon plate (2mm) with 12K fibres	40	plates		Industry	1	40	
	Thick carbon plate (15mm) with 12K fibres	40	plates		Industry	2	80	
	Rails fabrication (male + female pairs)	80	rails		Industry	0.5	40	
	Metal inserts	950	inserts		Industry	0.024	23.04	
2.1.1.2	**Monolayer alveolar structure**	**600**					**1812**	**15**
	Tools procurements						**342**	**0**
	Hexcel moulds	6	moulds		Industry	50	300	
	Steel ground cores	30	cores		Industry	1	30	
	Storage boxes	40	boxes	Specific boxes	Industry	0.300	12	
	Operations						**1470**	**15**
	Dimensional inspections (cores & moules)	all		3D measurement system	Industry			



ILD Technical Deliverables

- Draft of technical content for the IDR assembled by Claude and sent to the ET and the technical conveners
- Contains a lot of plots (most of them to be updated) and a skeleton layout
- Should be a good starting point for the editorial team of the IDR (tbn)



Technical Draft Content
of the ILD Design Report

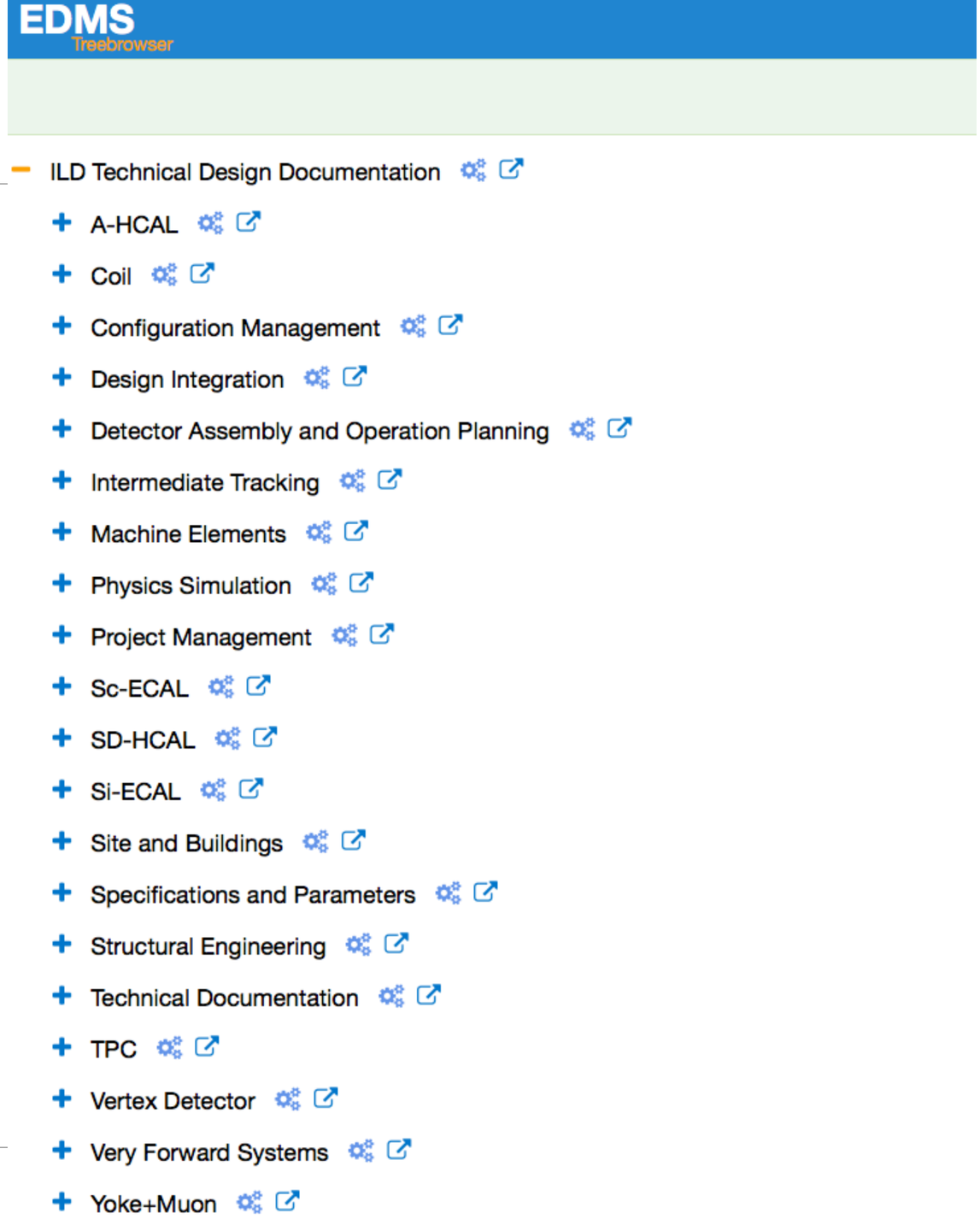
Version of April 16th, 2018

C. Vallée

Content

Documentation

- Plan: Assemble complete ILD technical documentation on ILC EDMS…
- Everyone can use EDMS now!
- Go to: edmsdirect.desy.de -> „ILD TDR“
  - linked from ILD Confluence
- Access ILD Work Breakdown Structure Tree
- Just view and/or download all public ILD documents in WBS
- Some documents are restricted, need EDMS account to access those
  - for experts
  - if you feel like an expert, just contact me for an EDMS account



Plans for Fukuoka Workshop

- Technical talks from subdetectors take place in the technical workshop sessions
  - no dedicated technical agenda with ILD label
- Will use Saturday morning sessions (ILD parallel) for possible discussion on ILD technical deliverable document
  - Discussion in next technical convener meeting on May 14th

- Advertisement:
  - Talk in summary session on Friday by Claude: „Highlights and Visions of LC Detectors“

Latest News from AHCAL

- Large AHCAL prototype is in CERN testbeam
- First muons seen yesterday, first hadrons expected for later today
- Congratulations!