

Oliver Schäfer at the LCTPC Collaboration Meeting, DESY, 2017

ILD TPC Gas System

Discussion for the Interface Control Document

Boundary Conditions

- Physics related requirements
 - Technical
 - Economical
 - Legal
-
- Almost no parallels to LPTPC gas system at the moment
 - We can learn from LEP (esp. Aleph), LHC (standardized), HERA-B, HERMES, T2K.

Basic Parameters

- TPC Volume = 24 ... 39 m³ (ILD small/large)
- ALEPH: 6 Volume changes for flushing sufficient →
Purge Rate = 16 ... 26 m³/h; 9 hours for purging
- Requires many or large diameter tubes for low overpressure in TPC (ALEPH: 75 mm for 8...15 mbar)
- If compression is feasible underground, thinner lines can be used to surface.
- Large volume calls for mixing from components, also more flexible for other systems (Muon chambers, ...)
- System is larger than T2K → new problems

Influences on TPC Physics

- Pressure
- Temperature (Simu by P. Schade, D. Bhattacharya?)
- Composition (Ionization, Attachment, Drift Velocity, Gain, Diffusion)
 - Impurities
 - Aging
- Secondary p, T effects on field cage geometry → electric field
- → What needs to be controlled or measured to what precision to reach physics goals?

Gas Analytics

- Conventional sensors need to sample the gas, partly contaminate it (oxygen electrolytic cell)
- Spectro-photometric sensors can operate very fast and on full tube diameter, but need to be specially developed (Oxygen, Water, other components)
- Gas chromatograph, mass spectrometer desirable to monitor impurities
- Qualitative sensors (monitoring chambers, ...)

Purifying

- Absorbers
 - one way
 - cyclic operation
- Kryo distillation
- Cold traps
- Membrane separation

Exhaust Gas Treatment

- CF_4 can't be released into atmosphere at ILD scales
- Green house gas 7390x CO_2 , no ozone killer
- Usual way is to decompose at high temperature in a furnace and generate CO_2 and HF or CaF_2 or purify and refill into bottles.
- Did RD51 find eco-friendly alternatives?
- Japanese people are very aware of environmental issues because of several industrial pollution scandals (Minamata, Yokkaichi, ...) in the 1960's
- Environmental law is strict and supported by local communities → consider during design

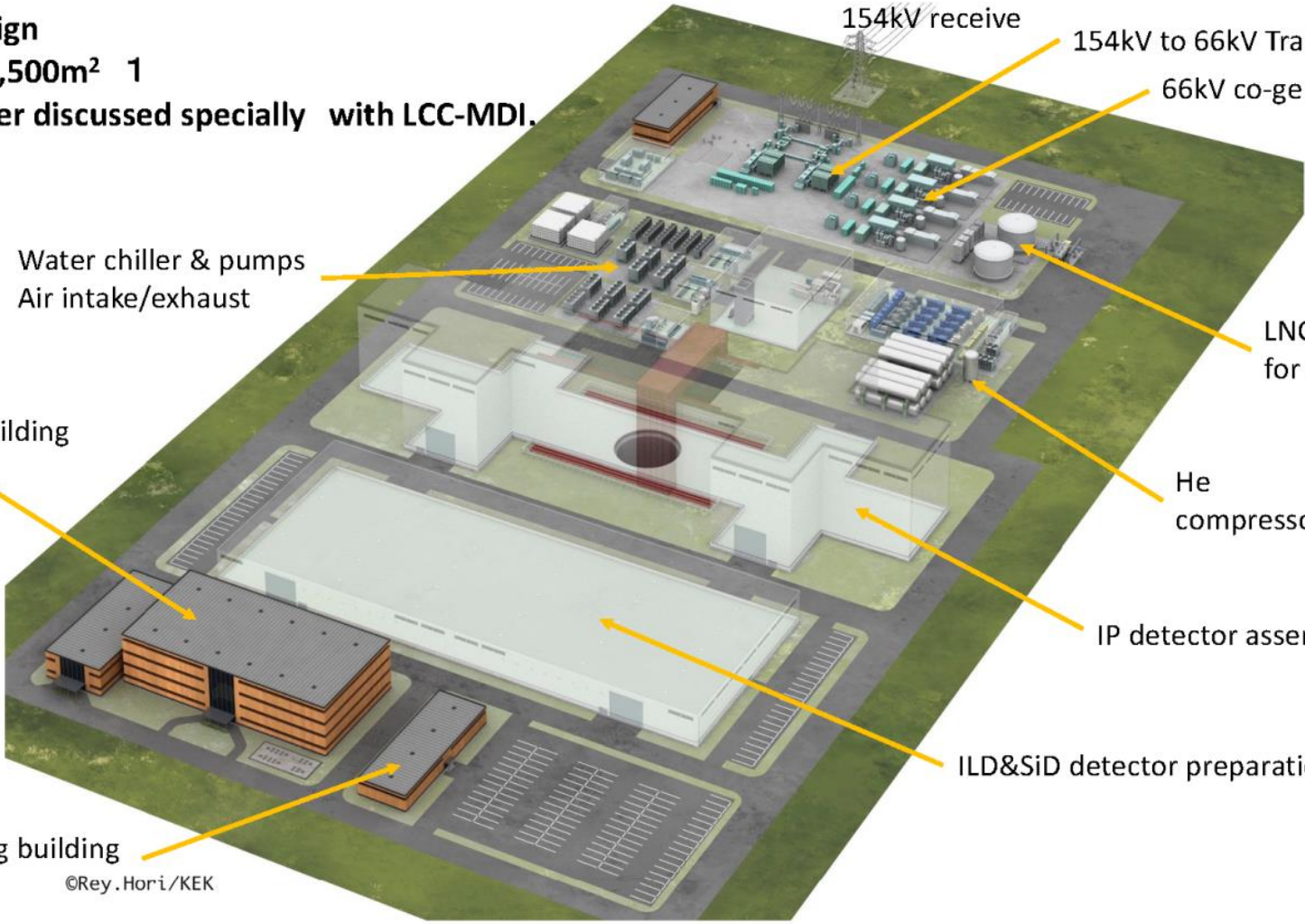
surface design
IP area 78,500m² 1
to be further discussed specially with LCC-MDI.

Water chiller & pumps
Air intake/exhaust

research building

computing building

©Rey.Hori/KEK



154kV receive

154kV to 66kV Trans

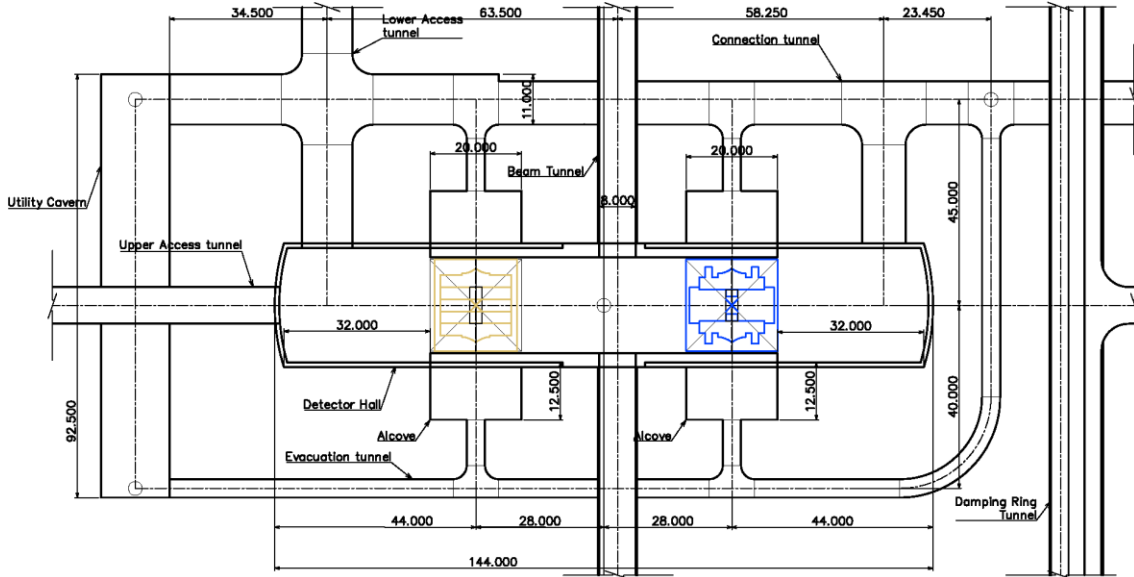
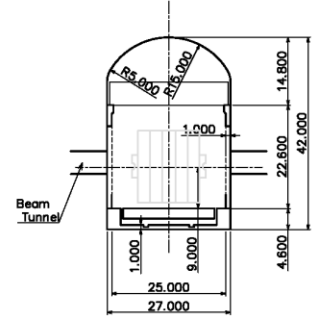
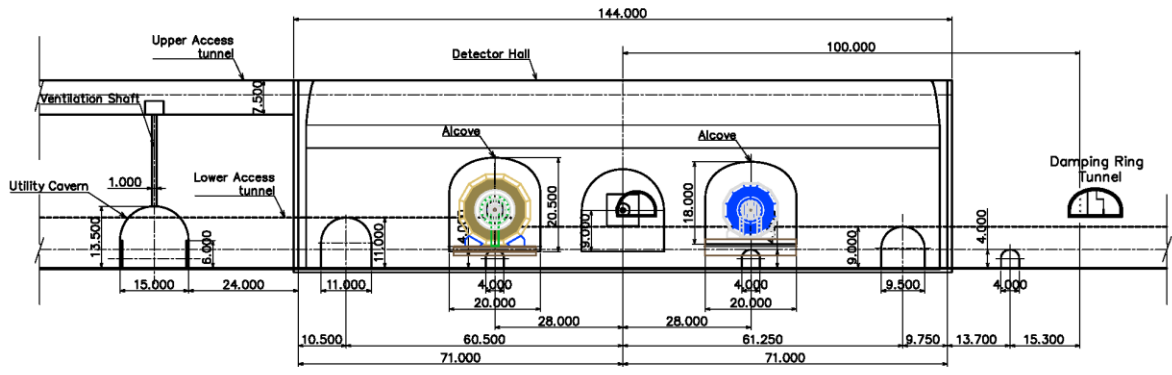
66kV co-generation

LNG
for co-generation

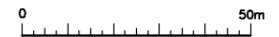
He
compressor & tanks

IP detector assembly building

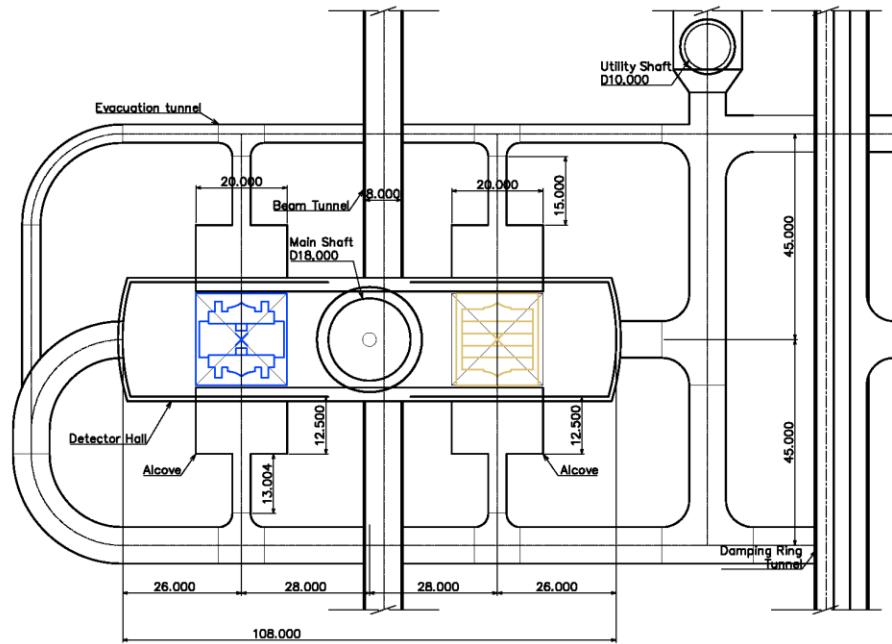
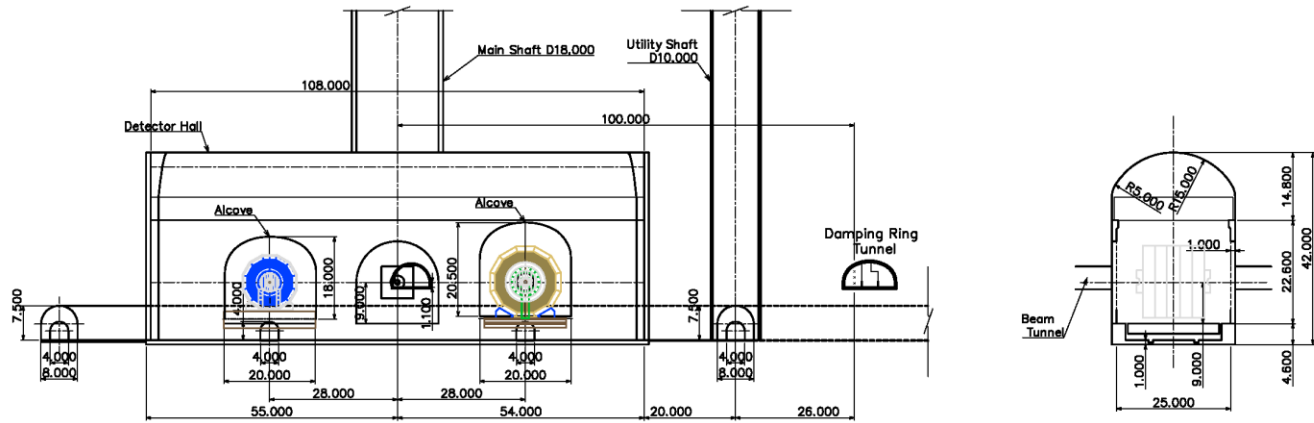
ILD&SiD detector preparation building



Baseline



Linier Colider Collaboration ASIA REGION	CFS Detector Hall Access Study Baseline		DRAWING NO.	REVISION
			SCALE shown on drawing	DATE 12 Jun 2014



HYBRID-A'



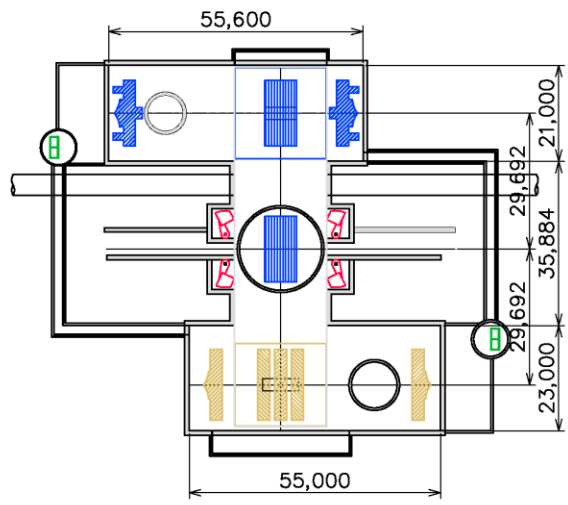
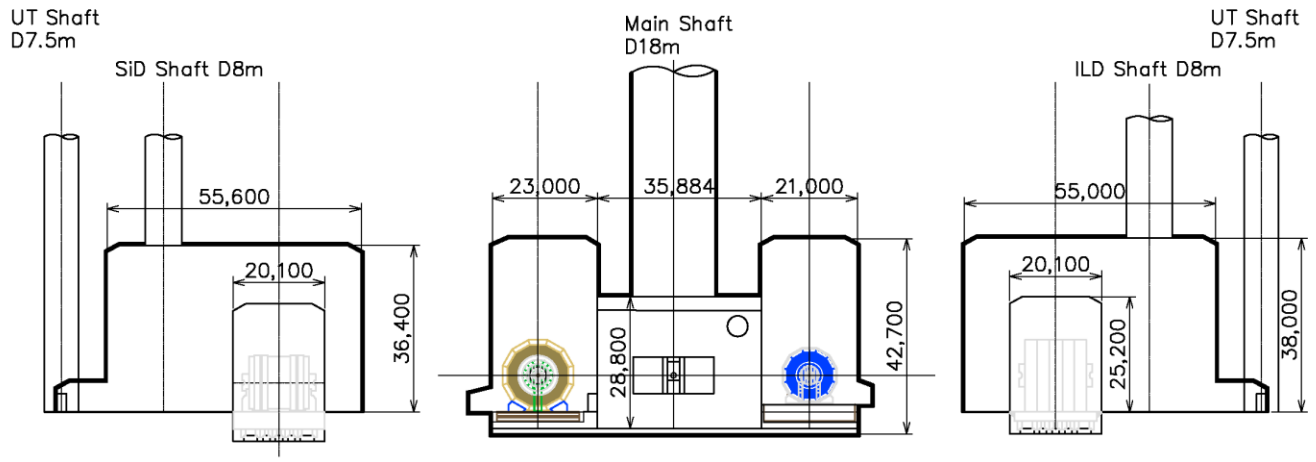
Linier Colider Collaboration
ASIA REGION

CFS Detector Hall Access Study
Hybrid Option



DRAWING NO.
SCALE shown on drawing

REVISION
DATE 4 Sep 2014

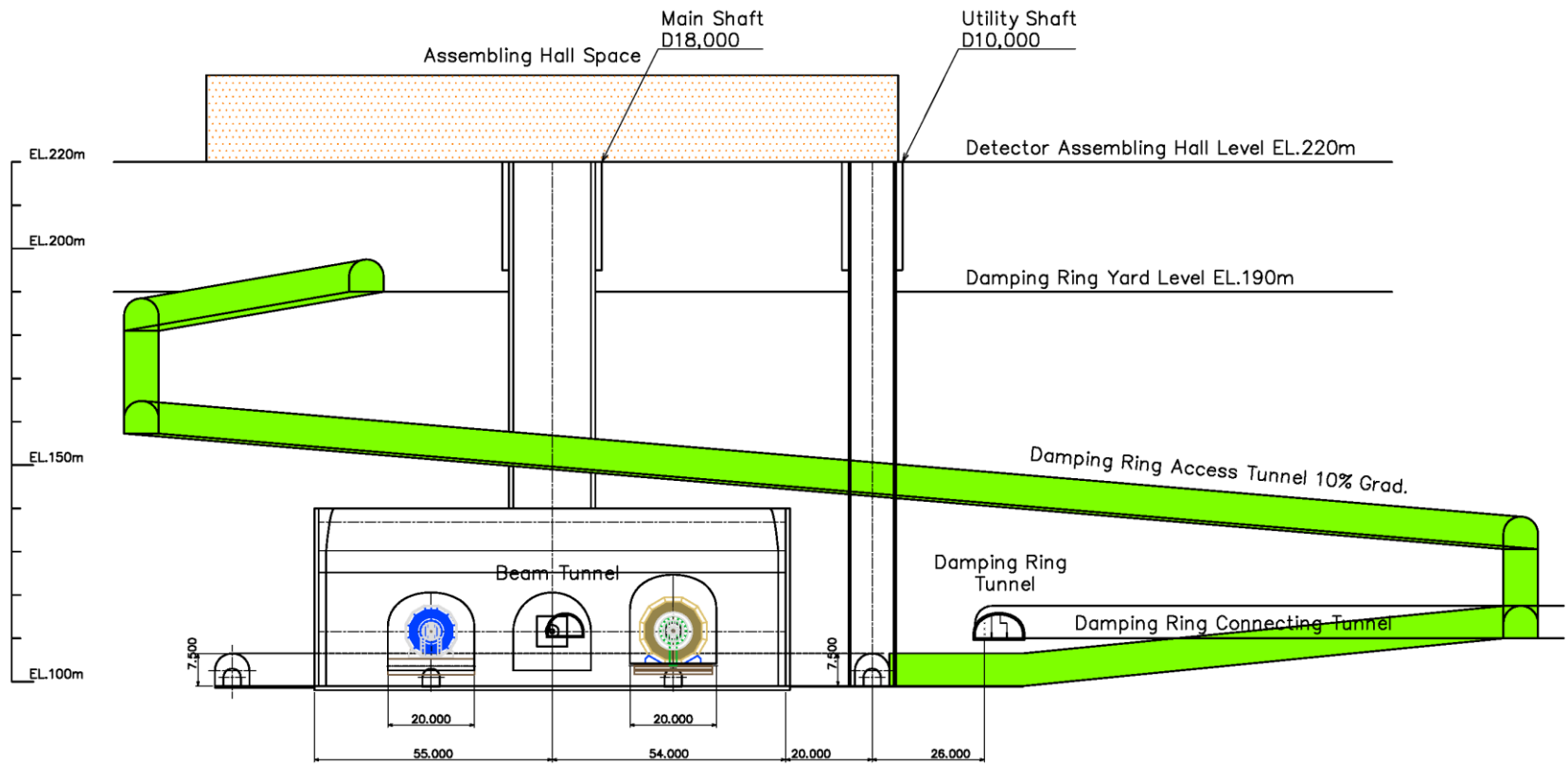


TDR AMERICAS



Linier Colider Collaboration ASIA REGION	ASIAN ILC BASIS OF COST DETECTOR HALL - PLAN & SECTIONS		DRAWING NO. U - 41	REVISION
			SCALE 1/1000	DATE 30 Nov. 2012

EDMS Nr.: D0000001093215 Rev. A Ver. 3 Status: Released - for internal reference Dat.: 7. Jan 2015



HYBRID - A'

Thoughts?