

# Conventional Facility for TPC

Space  
Power

Utility Space

Platform

Service Gallery

U/S Cavern

Surface

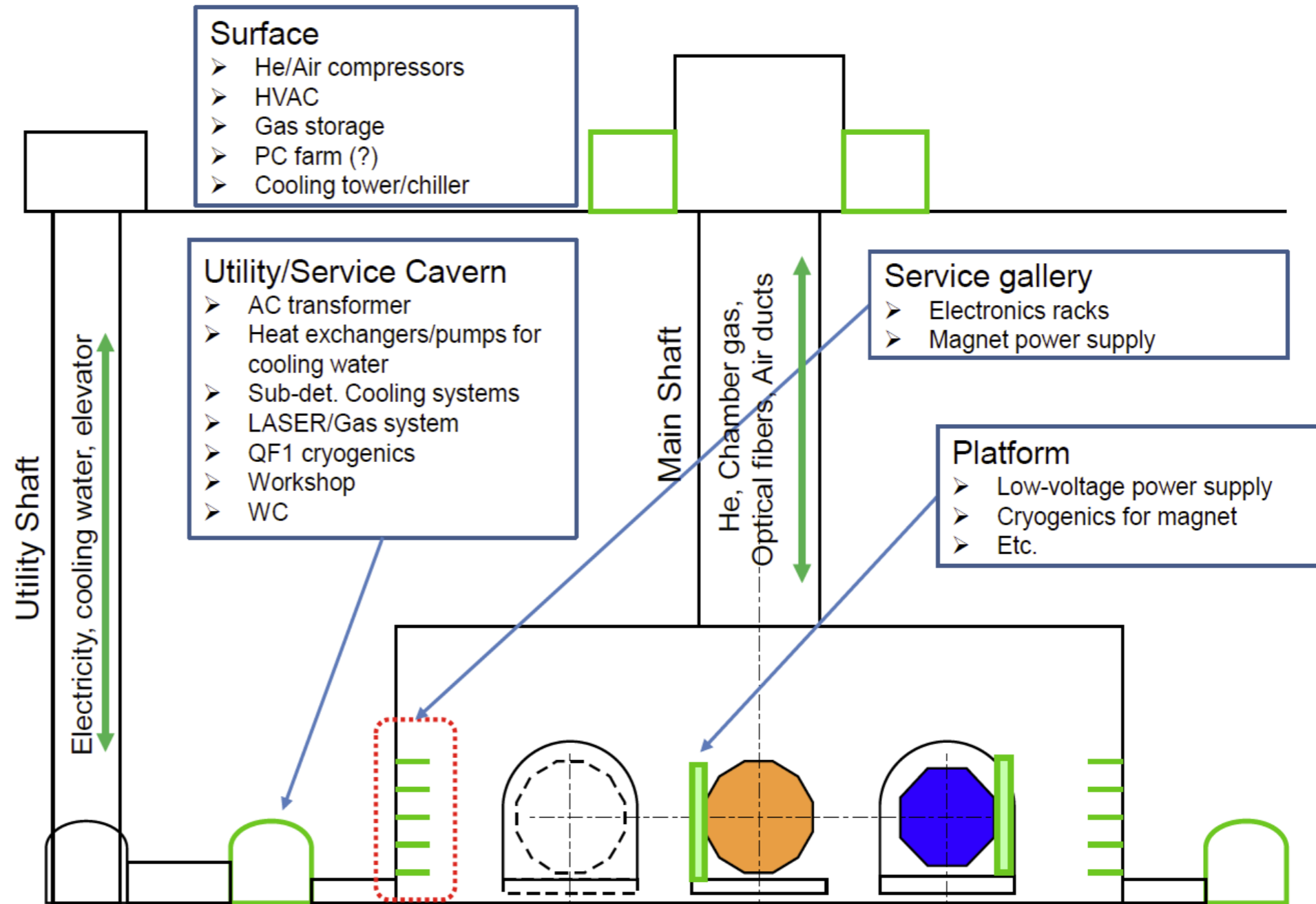
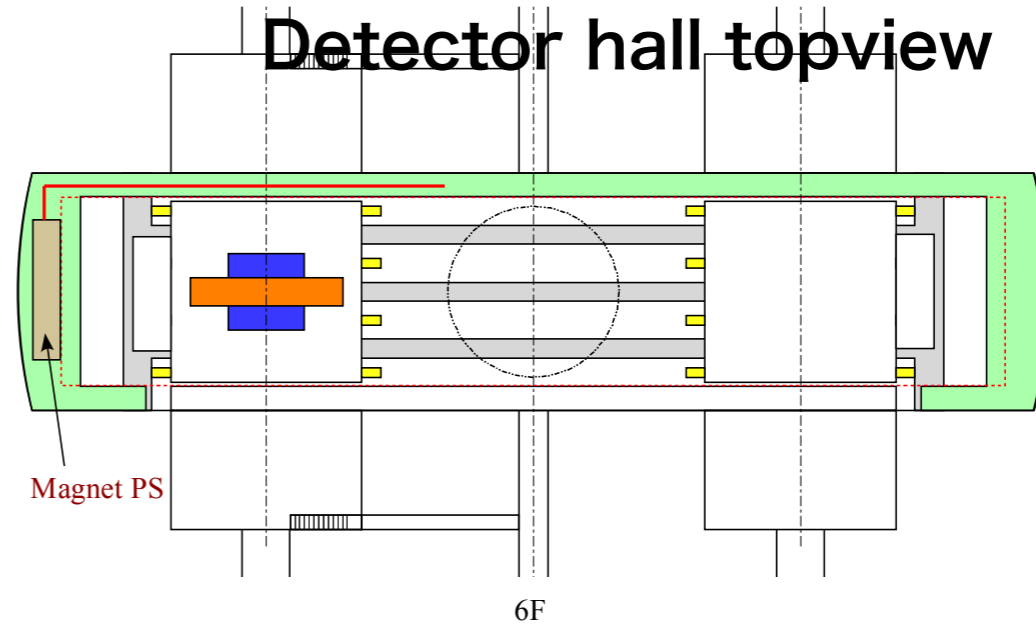
~20-30 m

+ 50 m

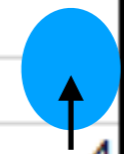
+ 30 m

+100 m

Detector hall topview



Sub-detector name		TPC	
Number of 19-inch electronics racks	Platform		
	Service gallery		
	Utility/Service Cavern (USC)		4
Sub-detector cooling system	Floor in USC	Don't mind	
	WxDxH	12x(0.8x0.7x1.5)	m <sup>3</sup>
Gas system	Space on surface (WxD)	8x4	m <sup>2</sup>
	Space in USC (WxD)		m <sup>2</sup>
	Space on service gallery (WxD)		m <sup>2</sup>
	Space on platform (WxD)	2x2	m <sup>2</sup>
Laser system	Space in USC (WxD)	1x0.6	m <sup>2</sup>
Other requirements			
Comment by Y.Sugimoto	Laser system has to be placed in an isolated room in USC for safety reason.		



for LV supply  
for HV(+VHV) supply

Big tank

gas circulation  
purification/removal O<sub>2</sub>,H<sub>2</sub>O  
gain monitor

Do we need any other space?

monitor(temperature, , )

control, interlock,,, somewhere near detector

	Sub-detector name	TPC
P_FE	Power consumption of Front-end Electronics	12 kW
Q_PC	Heat loss in Power Cables	kW
e	Efficiency of low voltage power supply	80%
P_BE	AC Power input to Back-end Electronics	kW
P_CS	Electric power to drive Cooling System	1.2 kW
	Type of cooling water for cooling system	Normal temperature
P_LV	AC Power input to Low Voltage power supply	15 kW
Q_LV	Heat loss in Low Voltage power supply	3 kW
Q_BE	Heat loss in Back-end Electronics	0 kW
Q_CS	Heat to be extracted from cooling system	13.2 kW

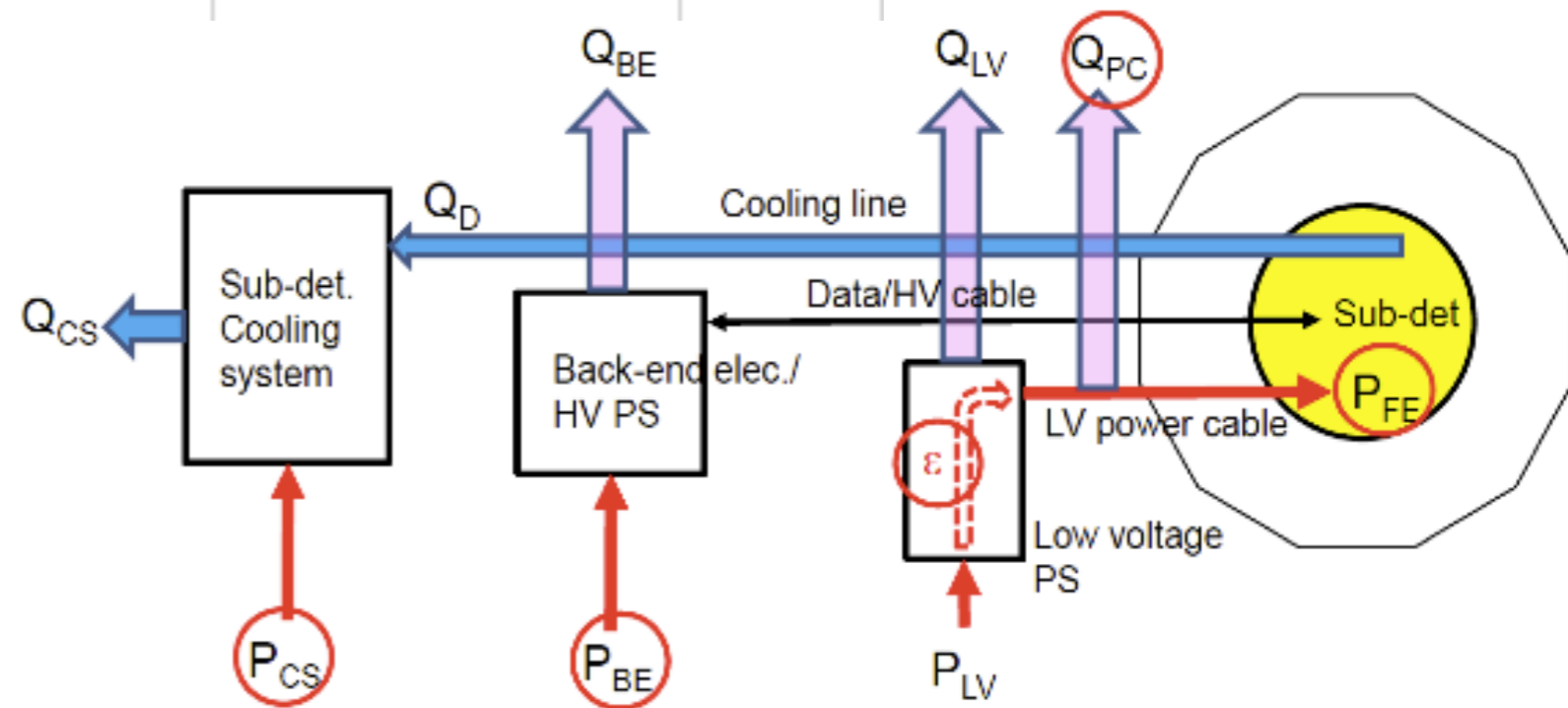
### Assumption

1.5M channel/EP

PConsumption 4mW/ch

=> 12 kW

HV Power consumption  
~5W from LP1 extrapolat



- $P_{FE}$  : Power consumption of sub-detector Front-end Electronics
- $Q_D$  : Heat loss in sub-det. (=  $P_{FE}$ )
- $Q_{PC}$  : Heat loss in power cables
- $P_{LV}$  : AC power input to LV PS
- $\varepsilon$  : Efficiency of LV PS ( $P_{LV} \cdot \varepsilon = P_{FE} + Q_{PC}$ )
- $Q_{LV}$  : Heat loss in the LV PS ( $= (1 - \varepsilon) \cdot P_{LV}$ )
- $P_{BE}$  : AC power input to back-end elec./HV power supply
- $Q_{BE}$  : Heat loss in the BE/HV PS ( $= P_{BE}$ )
- $P_{CS}$  : Electric power to drive the cooling system
- $Q_{CS}$  : Heat to be extracted from cooling system ( $= Q_D + P_{CS}$ )

LV power is distributed using  $6\text{mm}^2$  Cu cable  
**10 bundle** of Cu cables supplied from 6 direction/EP

120 cables share 12kW

100W/cable

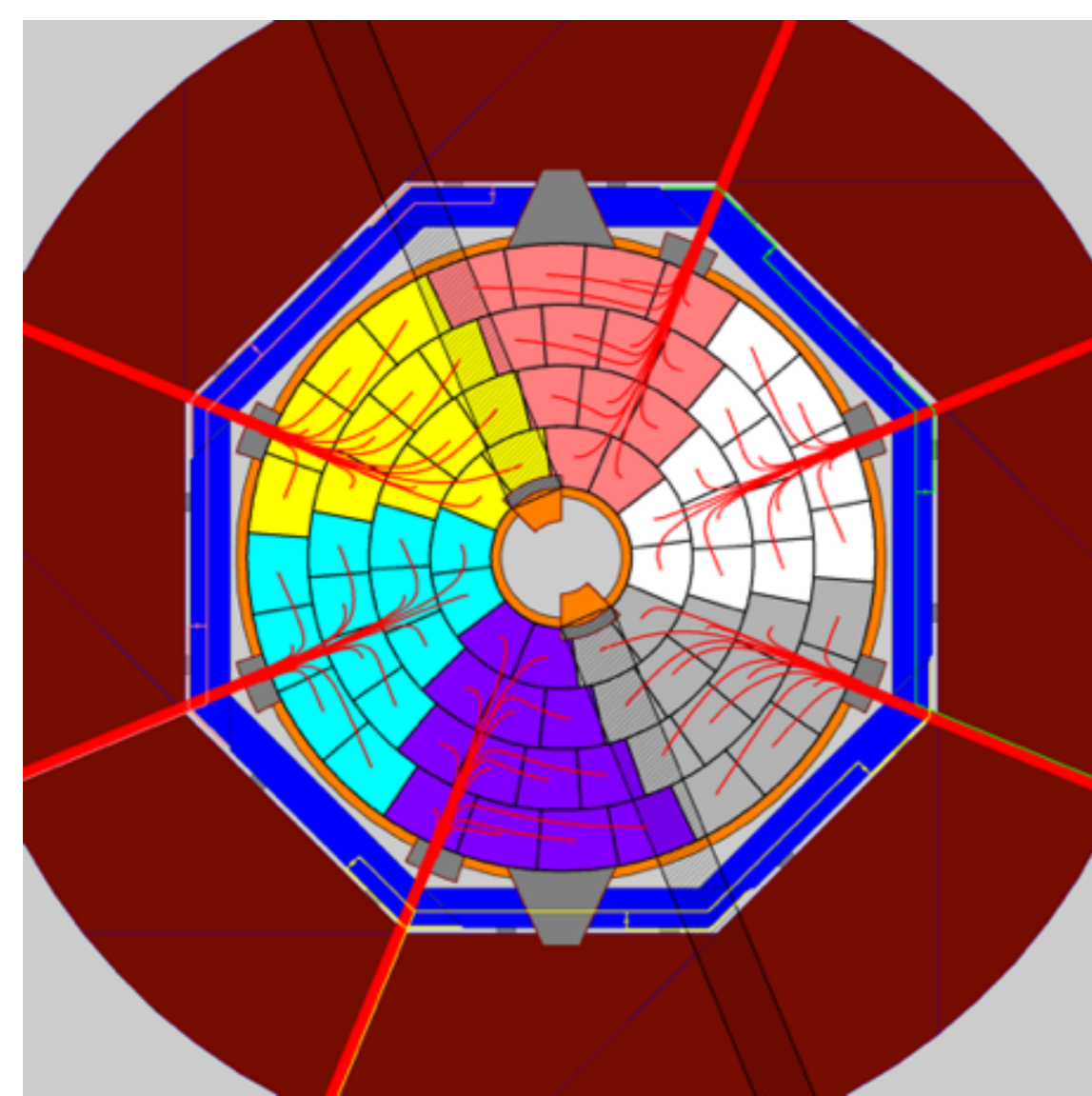
Cu cable carry 32A  $R[\text{Ohm/m}] = 0.003$

Assume 20m cable length  $\Rightarrow R = 0.06\text{Ohm}$

Loss from cable  $I^2R = 32^2 * 0.06 = 60\text{W} ???$   
to meet 80% current must be  $1/2 \rightarrow 15\text{W}$

$\Rightarrow$  **20 bundle** space would be twice

or DC-DC converter



2018/2/23			VTX	SIT	FTD	TPC
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)				
Cables	Detector Hall	Heat loss (kW)				
Sub-detector cooling system	USC	Floor				Either
		WxDxH (m <sup>3</sup> )	5x3x2			12x (0.8x0.7x1.5)
		AC power (kW)				1.2 kW
	Cooling water	Type	Chilled			
Heat load (kW)		1				
Gas system	Platform	WxD (m <sup>2</sup> )				2x2
	Service gallery	WxD (m <sup>2</sup> )				
	U/S cavern	WxD (m <sup>2</sup> )				
	Surface	WxD (m <sup>2</sup> )				8x4
Laser system	Space requirement	Location				detector platform
		WxD (m <sup>2</sup> )				1mx0.6m

We have to fill this out

**What else we have to request ?**

**we know**

**Pixel option is not considered yet  
should it included ? or too early**