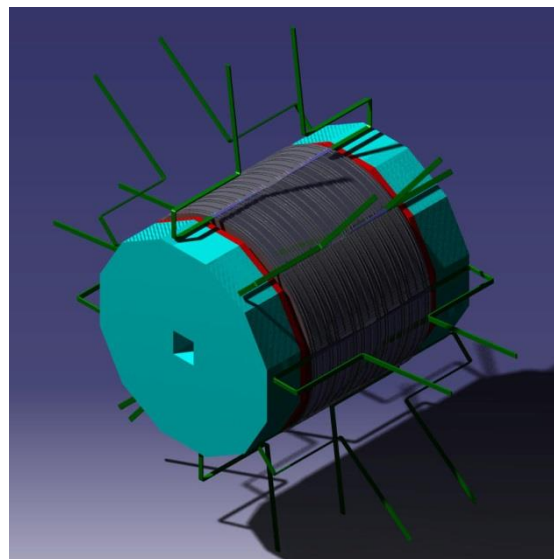




# ILD technical meeting

## *DHCAL*

Services studies



**J.C Ianigro**  
- IPN Lyon -



## ■ GRPC needs

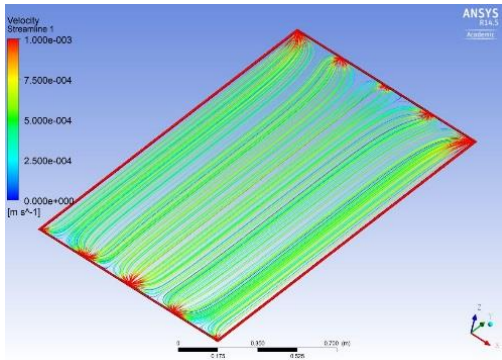
- ❑ Datas : 2 cables
- ❑ H.T (7,5 KV) : 1 cable
- ❑ L.T : 1 cable
- ❑ Gaz :

2 ways in, 1 out

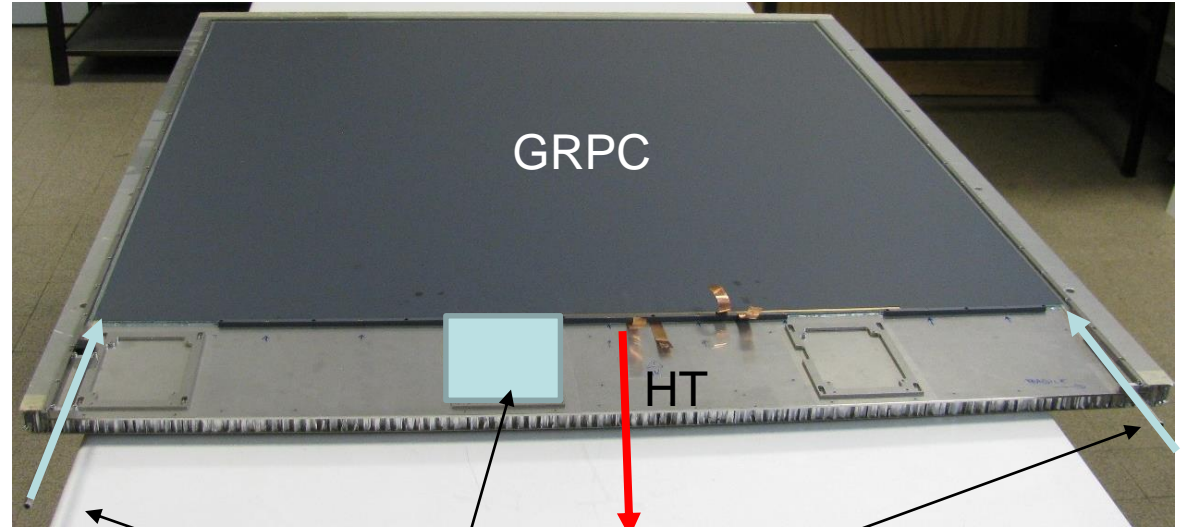
Ø 1,5 mm tube

1 liter/hour

Volume : 1 liter/m<sup>2</sup>



Gaz simulation

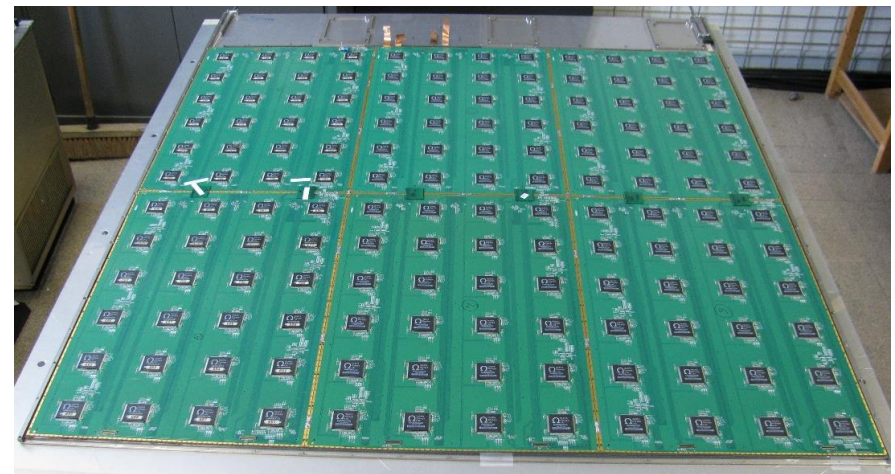


1 x Dif

Gaz



Recycling machine



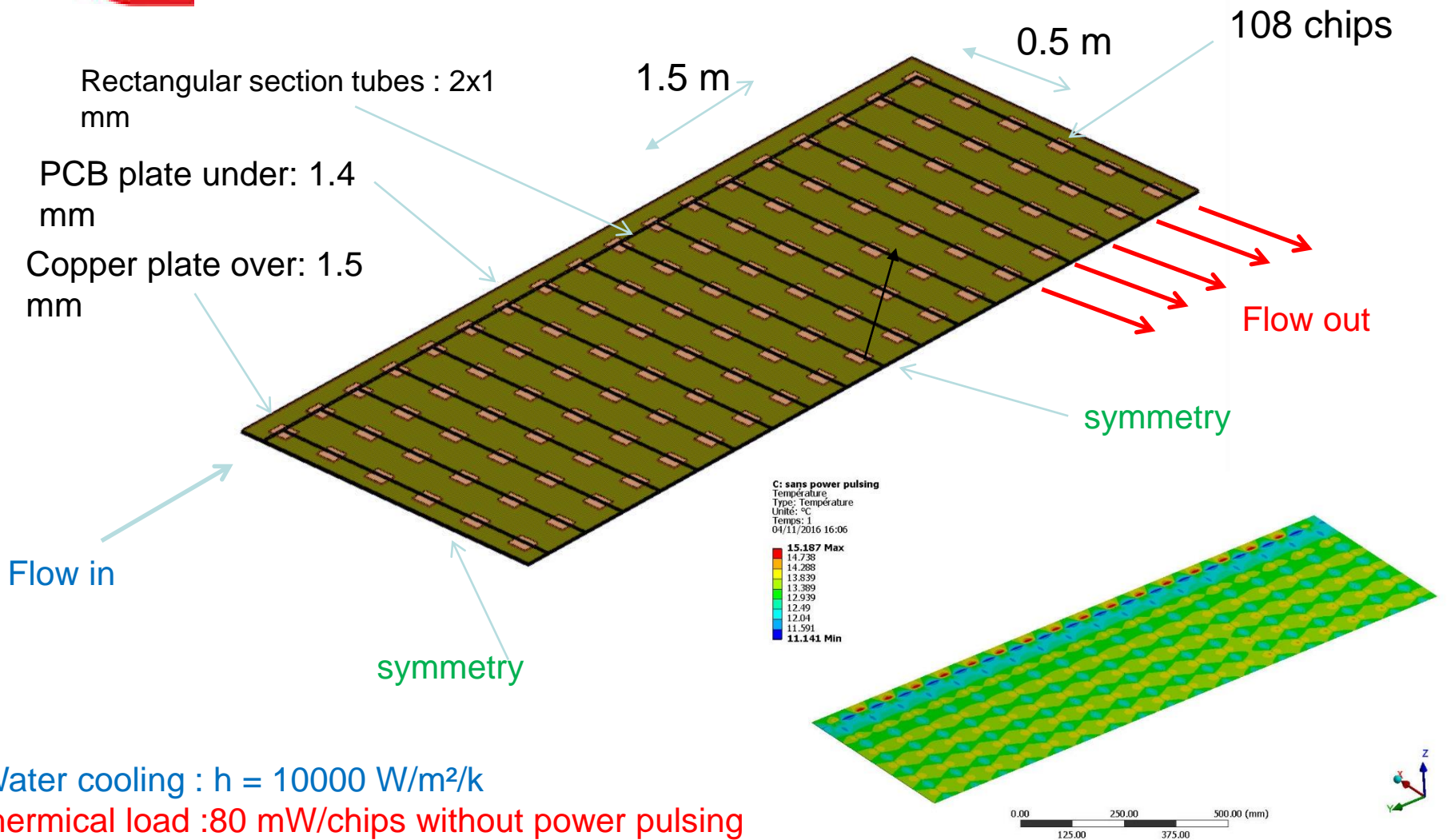


## ■ Cooling Options –

Low heat to extract –  $3 \text{ W/m}^2$  for GRPC

Big exchange surface – material with good conductivity

- **water cooling** : good exchange coefficient, need perfect connections
- **Bi-phasic gas** like  $\text{CO}_2$  : High Pressure (100 bars), expensive connexions (no leak), small diameter tubes, important exchange coefficient
- **Mono-phasic gas** like  $\text{C}_6\text{F}_{14}$

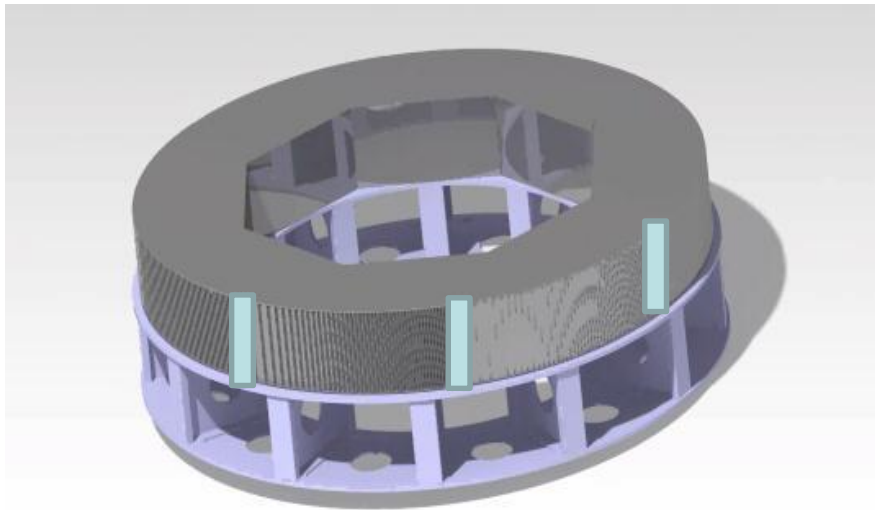


## Simulation 1/4 structure

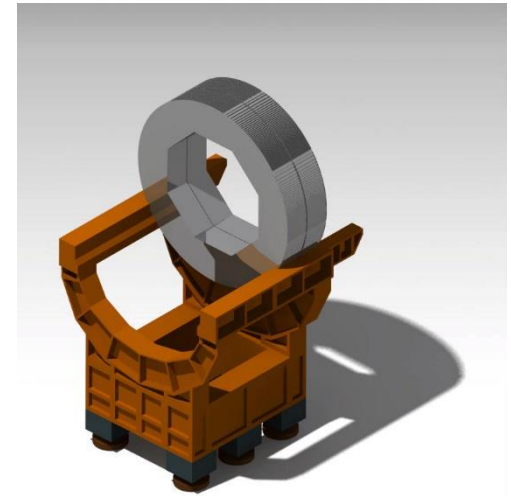


## ■ GRPC Detectors insertion & connections

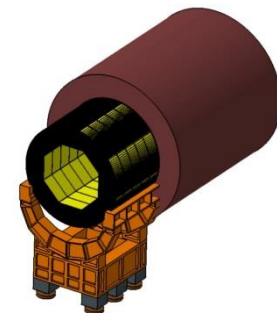
- Wheels built in Assembly hall & 368 GRPC inserted
- **368** GRPC connected to services
- 8 quick connections zone



*After GRPC insertion :  
services connections and installation in the 8 top modules  
zone*



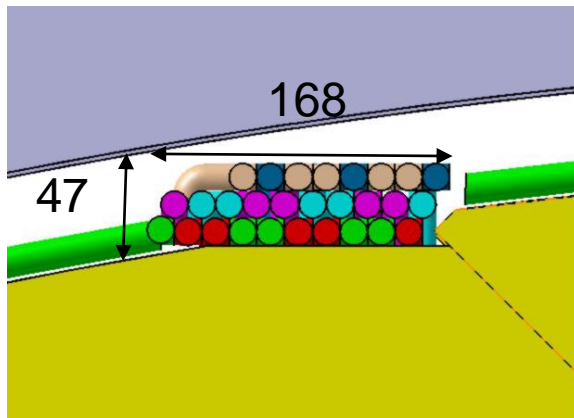
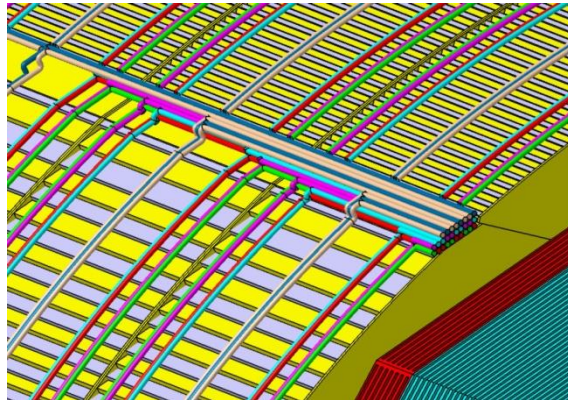
*Wheels connections on structure*



*5 Wheels connected before insertion  
in cryostat*



## ■ Services : Barrel 3/2 wheels



### Module details :

average length for cable : 1,5 m

### •Cooling for GRPC : Blue / Red

2 loops by module : 14 m tubing  
Ø 14 mm for principal  
Ø 2 mm for distribution alternative

### • Gaz For GRPC : green / pink

2 loops by module : 14 m tubing  
Ø 14 mm for principal  
Ø 1,5 mm for distribution alternative

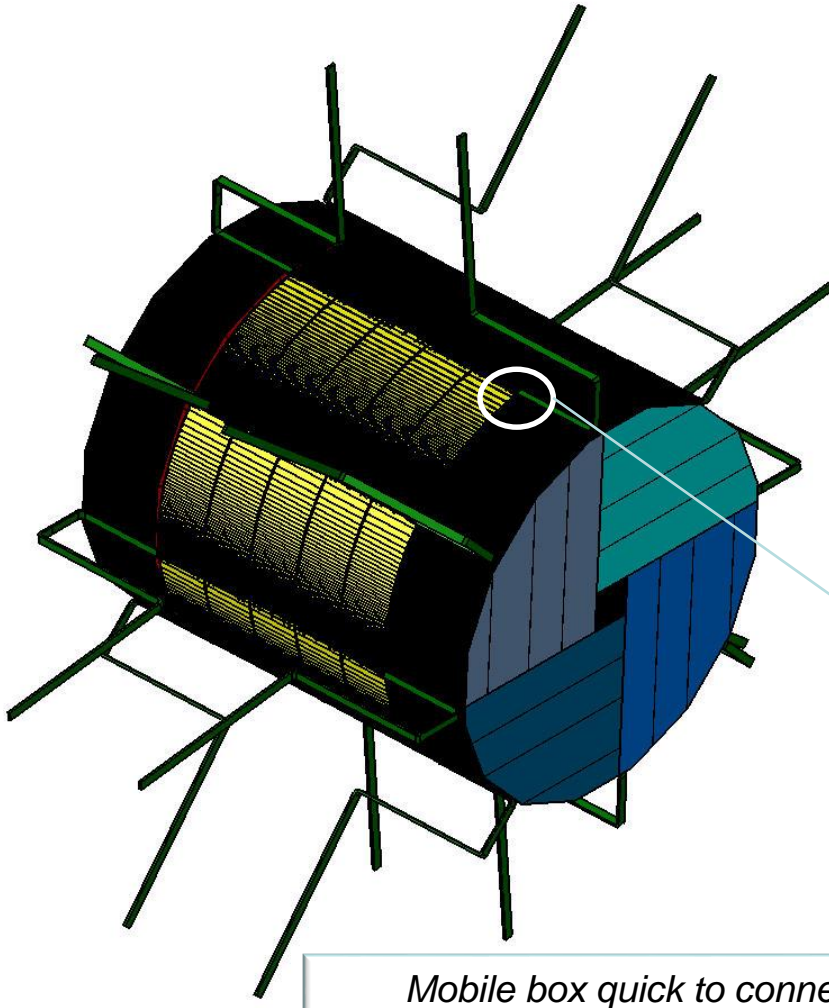
### • High Tension/ Low tension : Brown cable Ø 5 mm : 72x2 = 144 m

### • Data acquisition , 2 cables : Beige cable Ø 5 mm : 72x2 = 144 m

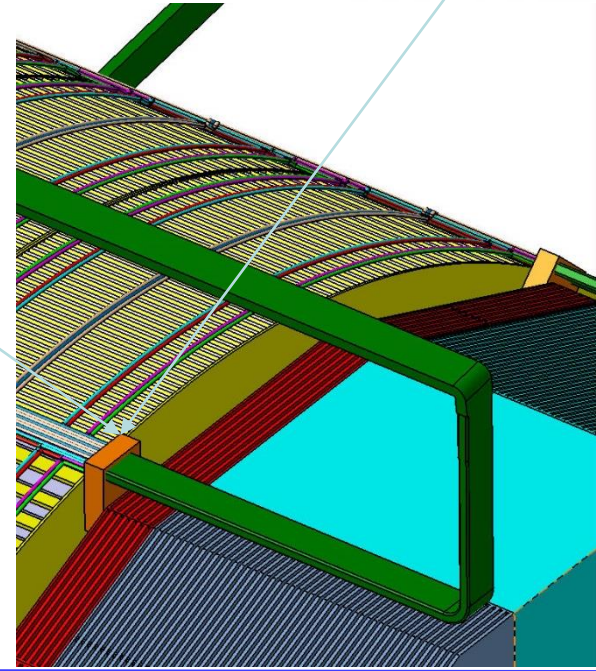
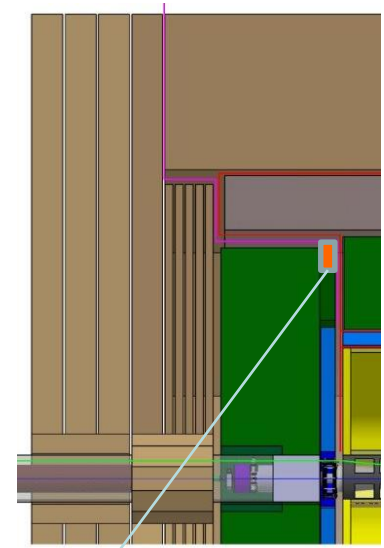
**Issues : 8 zones 168 x 47 mm<sup>2</sup>**



- Services : Barrel patch pannels

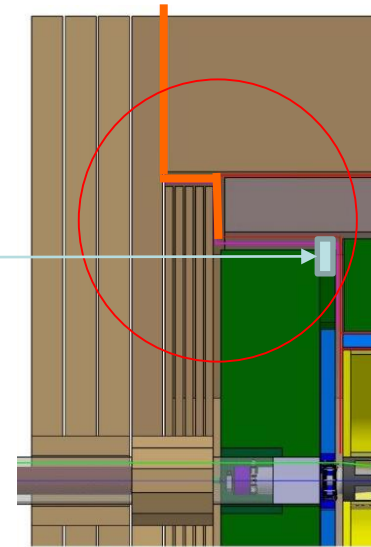
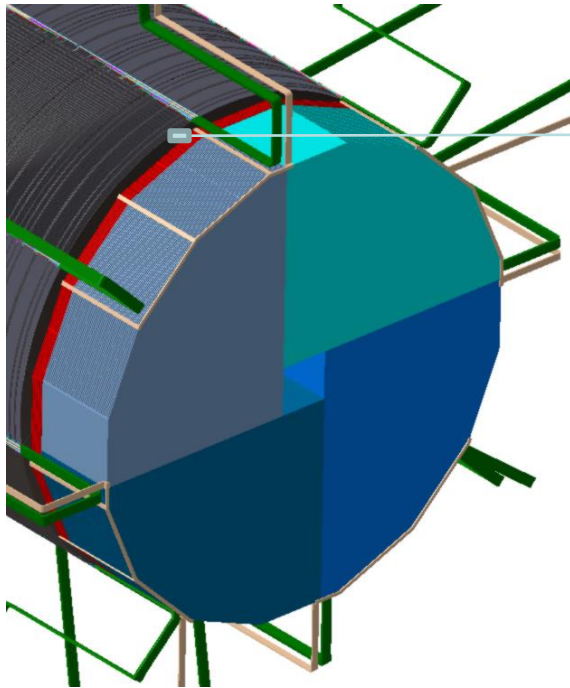


*Mobile box quick to connect*





## Services : Endcap+ring



Issues : 8 tubes outing

*Same services details as barrel*

