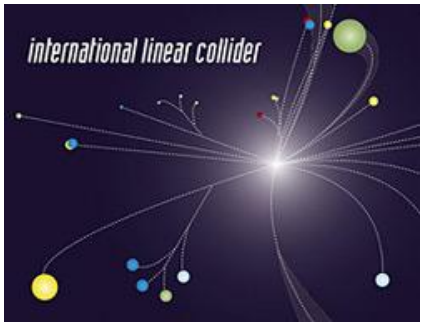


ILD Mechanical structure

DHCAL Barrel and Endcaps

DHCAL Assembly, Tooling, Cooling

J.C Ianigro

- IPN Lyon -

Contents

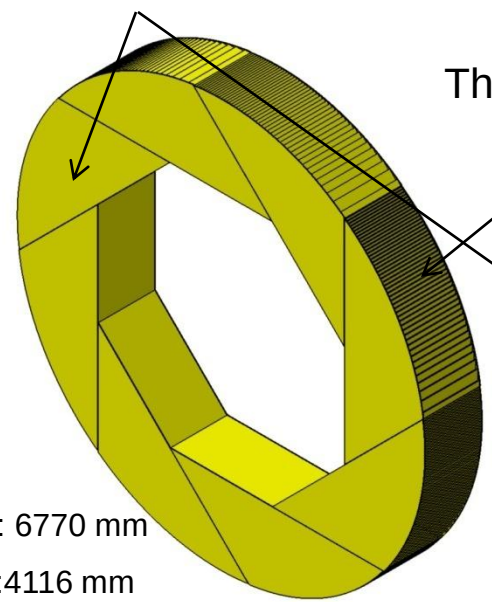
- Barrel Assembly
- Tooling
- Cooling
- Perspectives

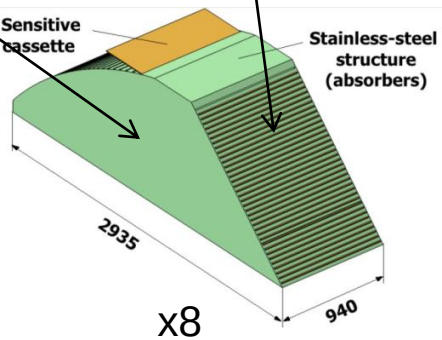
Barrel design

Ext. Diameter	6770 mm
Int. Diameter	4116 mm
Lenght	4700 mm

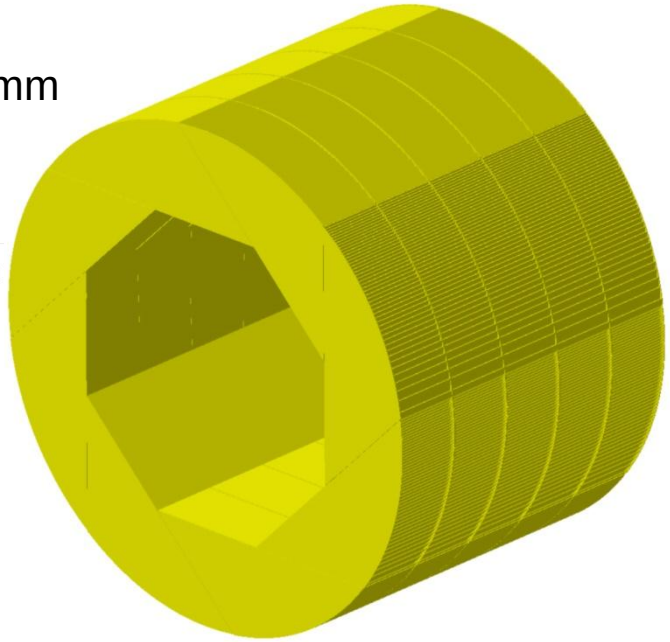
Thickness wheel face = 10 mm

Thickness absorbers= 15 mm





x8



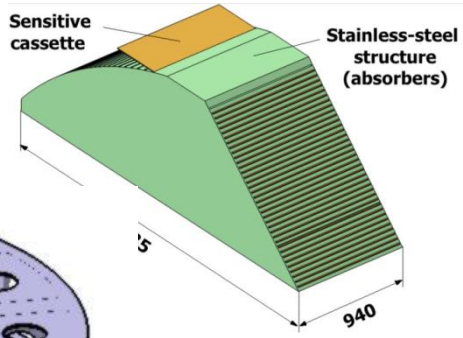
Ext. Diameter : 6770 mm

Int. Diameter :4116 mm

Lenght : 940 mm

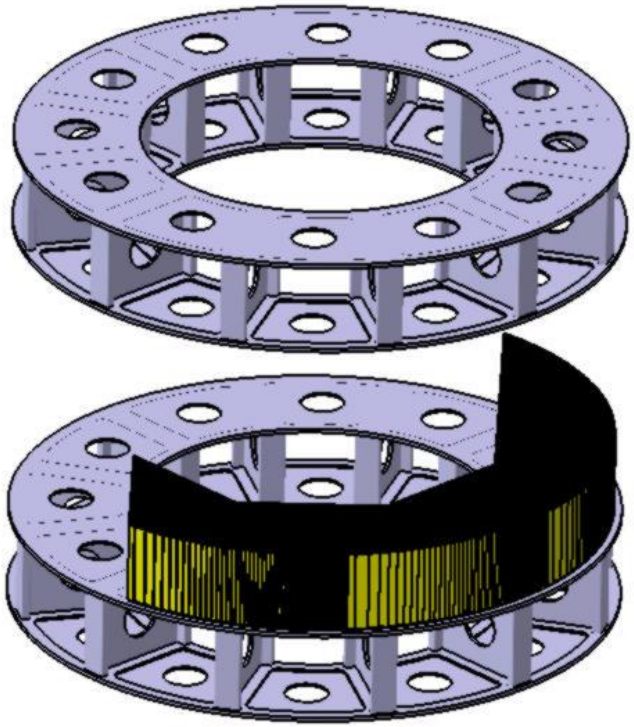
Stainless steel	1 wheel (8 mod.)	5 wheels
Weight (t):	88 t	440 t
Detectors W. (t):	36.8 t	184 t
Total Weight (t) :	124.8 t	**624 t**

Barrel Building & GRPC Detectors insertion



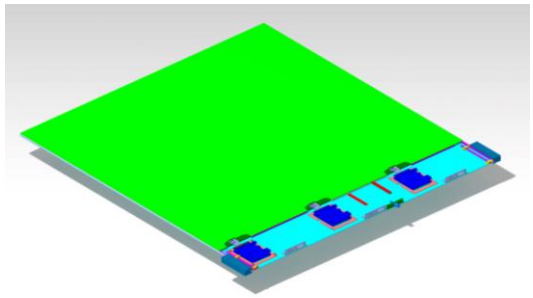
Welding Method

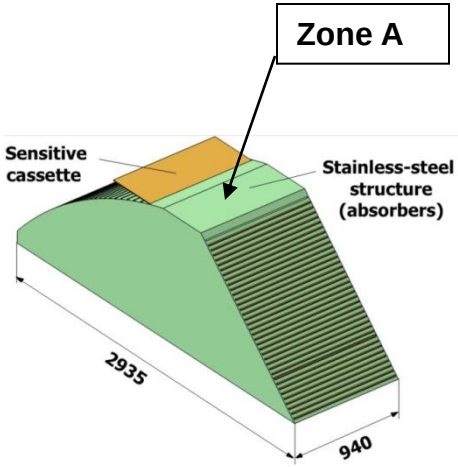
- 8 Modules assembling for making a wheel on specific structure
- 180° rotation to weld both faces, 2 support structure
- Probably electron beam welding will be used
- 5 wheels assembled in industry



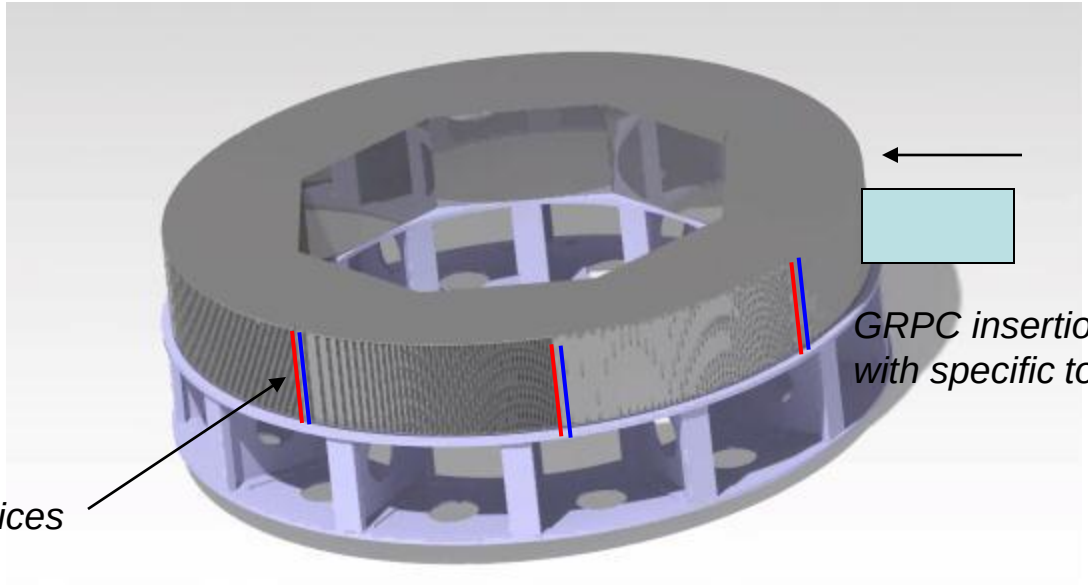
Barrel design : wheel assembly & detectors integration

Barrel Building & GRPC Detectors insertion



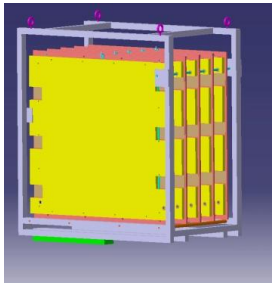


- transport of GRPC with specific structure to surface building point
- 368 GRPC insertion around the wheel
- connection of gaz, HT, datas and cooling for each GRPC
- Services installation on each 8 spaces in zone A, ready to be connected



GRPC insertion with specific tool

Common services

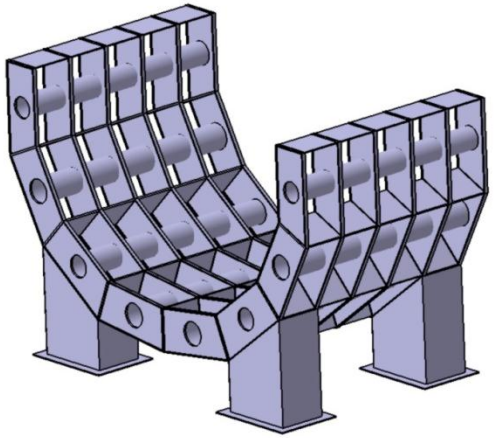


Damper transport structure

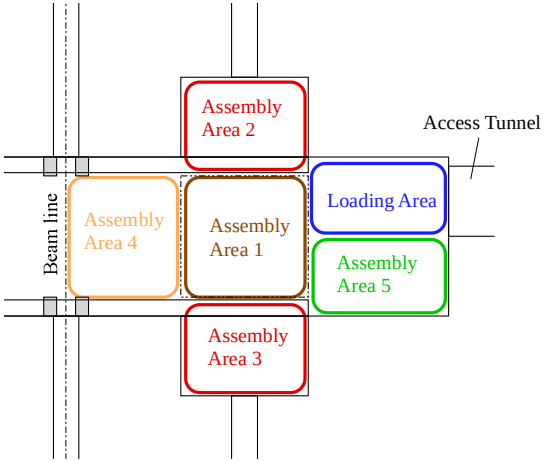
Barrel design : wheel assembly & detectors integration

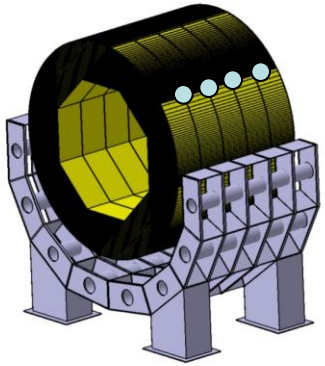
Barrel Building & services connecting

- transport and down drafting of barrel insertion structure alone
- 5 wheels going down separatly on specific structure
- 5 wheels linked together on the barrel insertion structure
- connection of services between the wheels
- Services issues on both sides of the barrel



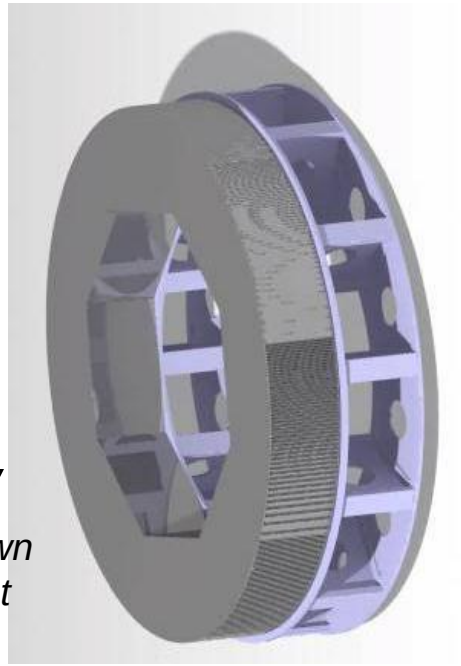
1 – Barrel insertion structure coud be divided in 5 parts





3 - Wheels linked and services connection in 32 zones

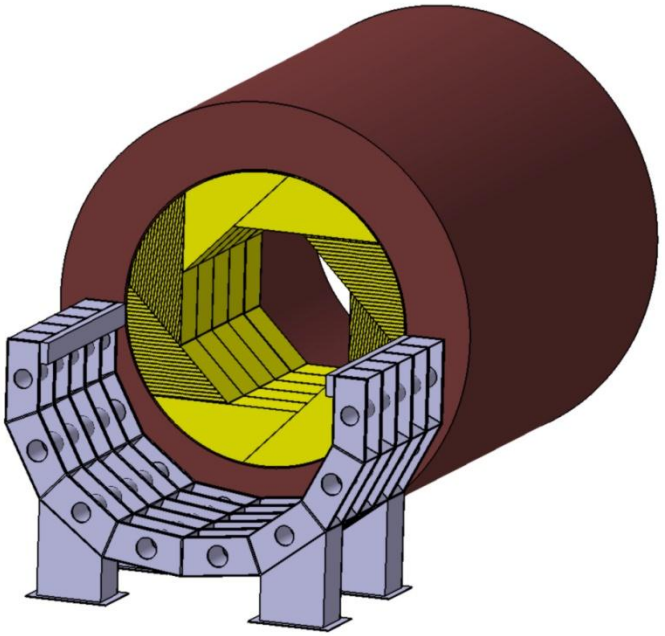
5x



2 - Wheels down drafted P=200 t

Barrel Building & services connecting

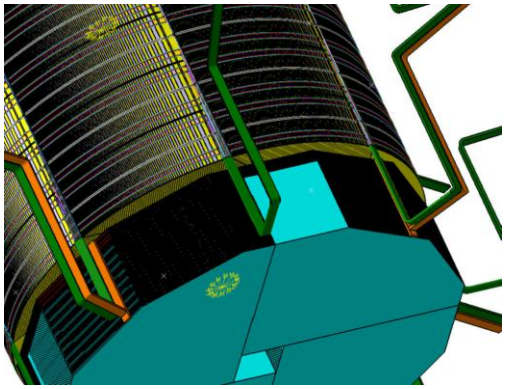
Barrel insertion



- Barrel with 5 linked wheels inserted
- rails inside the yoke
- fixation inside the yoke on both sides
- services installation along the yoke to patch pannels

CMS « enfourneur »

Services issues to patch pannels



Barrel Building & services connecting : Time estimation

- On surface :

  5 wheels construction : 3 month

  368 GRPC production : 1,5 year

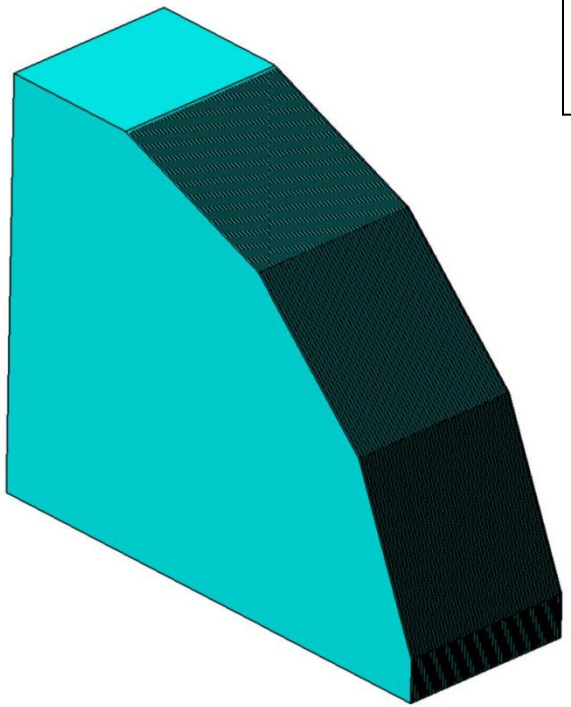
  368 Grpc Insertion & testing : 6 month

- In the tunnel :

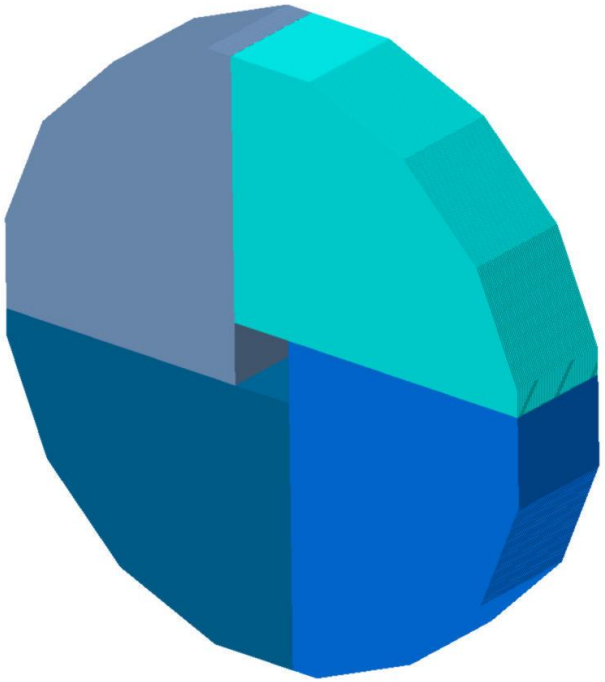
  barrel building, connected & tested, insertion: 2 month

  Services installation from the barrel : 1 month

- Endcap



Approximately the same scenario



One module

Module Weight : 50 t

Detectors weight : 22.5 t

Total weight : 72.5 t

One endcap made of 4 modules

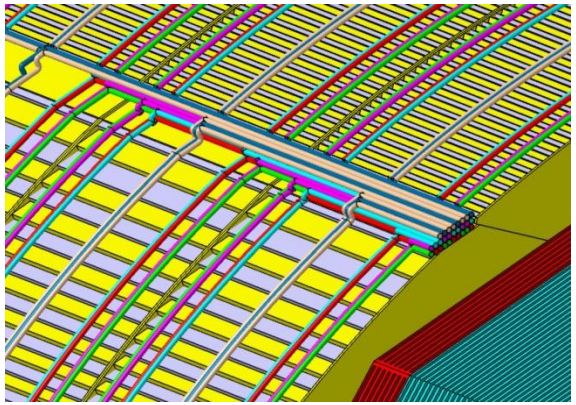
Endcap Weight : 200 t

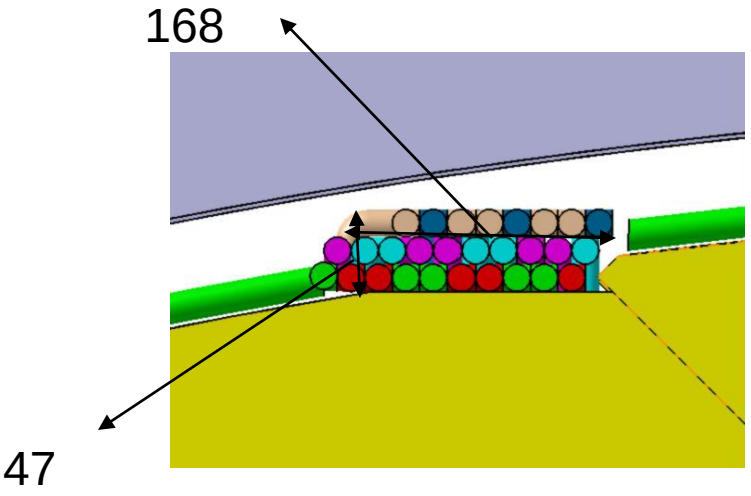
Detectors weight : 90 t

Total weight : 290 t

Barrel Services

- Services : Barrel





Gaz For GRPC : green / pink

2 loops by module:

Ø14 for principal
Ø4 for distribution alternative

• High Tension : Brown

Ø14 for supply

• Data acquisition : Beige

Ø14 for collecting

Issues : 8 zones 168 x 47

Barrel Services

- Cooling Options –

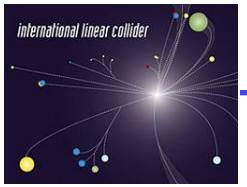
  Low heat to extract – 3 W/m² for GRPC

  Big exchange surface – material with good conductivity

  - **Leak-less water cooling** : no risk for electronic and other detectors, pressure between 0,8 and 1bar (cavitation), balanced network, pneumatic activators needed

  - **Bi-phasic gas** like CO2 : High Pressure (100 bars), expensive connexions (no leak), small diameter tubes, important exchange coefficient

  - **Mono-phasic gas** like C6F14



ILD mechanical structure. Perspectives

- Simulations have to be done in this configuration
  - Thermal studies : cooling implantation
  - Seismic studies
  - Barrel insertion
- Design evolution
  - Services optimization and integration
  - Interfaces, support