

## Activités 2016 et demande de budget 2017

Projet de R&D : -> calorimétrie EM Si/W

### Équipe (2017)

Physiciens : 1

J-Y. Hostachy (DR 70%)

Ingénieurs de Recherche : 1

D. Grondin (IR 25%)

Ingénieurs (autres que IR) et techniciens :

J. Giraud (IE 20%) + L. Vivargent (AI 50%), atelier (15%)

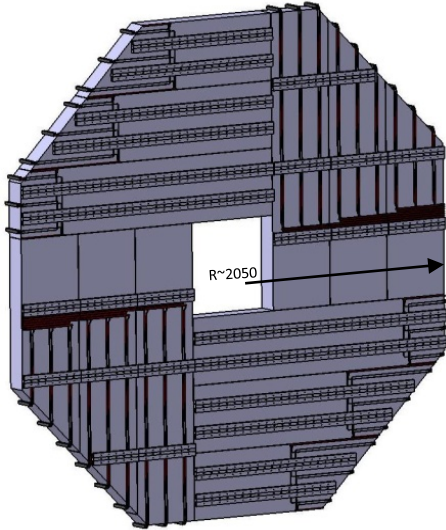
**Soit au TOTAL : 1,8**

### R&D mécanique :

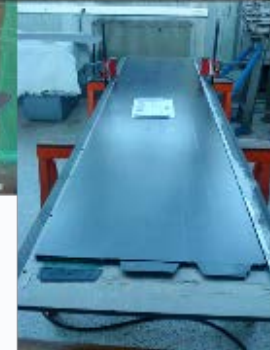
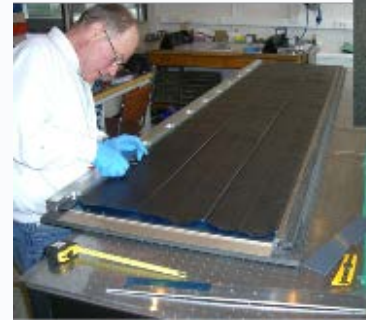
- Structure Alvéolaire des bouchons EM
- Système de refroidissement (thermalisation) de l'ensemble du calorimètre

# Conception des bouchons EM

End-Caps: modular alveolar structure - composite W / Carbone HR



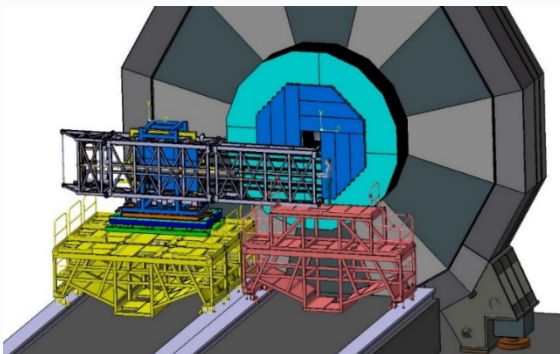
End-Cap thick composite plate 13mm+ inserts for double row rails



25,5 t / EC  
4 quadrants of 3 modules  
2 x 12 modules  
2 x 540 alveoli



Module handling and integrating tool for modules (on going)



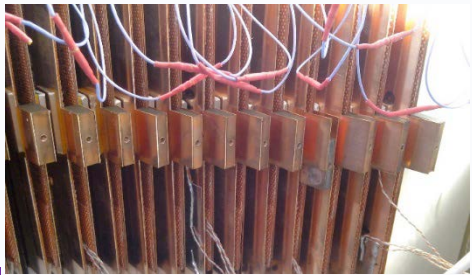
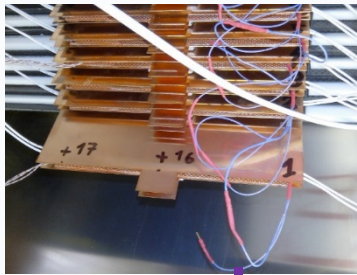
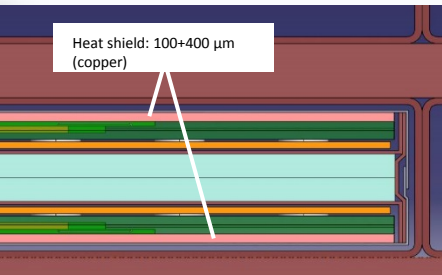
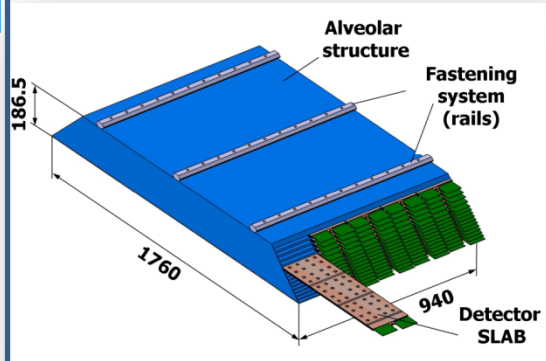
Integration of ECAL quarter on Quarter insertion tool on site

## Ongoing developments 2016 Stop in 2017

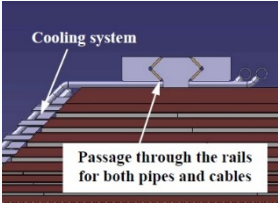
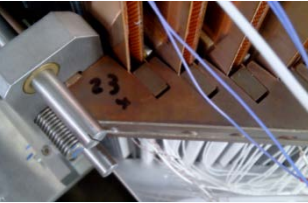
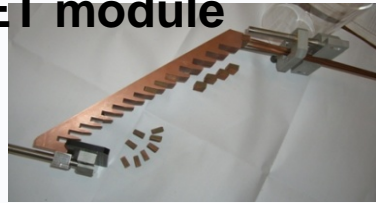
- Moulding of a layer of 3 alveoli - 2,5m End-Cap (complex CC202+ET445)
- Towards an End-Cap assembly mould for 1 module
- Evolution of diameter ? -> redesign of all modules / parts
- Integration of heavy handling tool

# Thermalisation : boucle sous-atmosphérique

Study from the power source to the global cooling

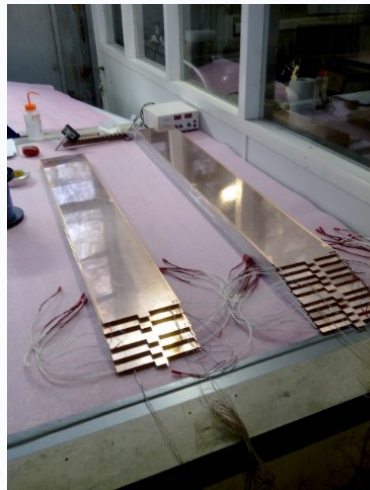


## Specification and test of local Cooling System on EUDET module

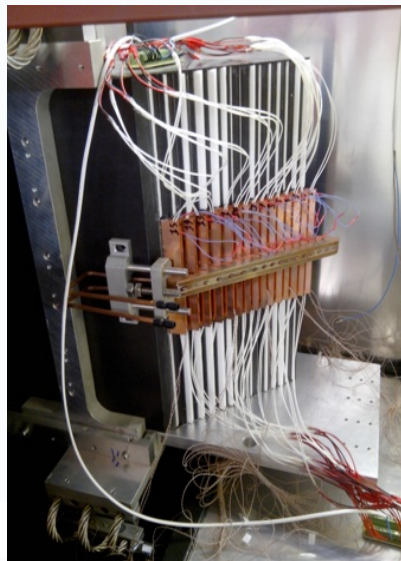


Active cooling technology, using fluid circulation

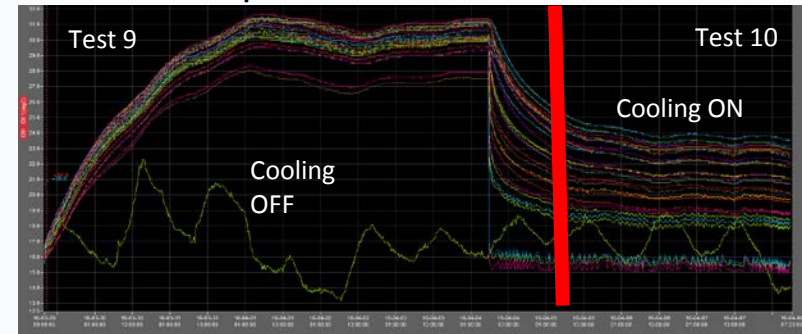
Design and construction of the heat exchanger



Thermal tests on EUDET / fall 2015



Demonstration and performance of Thermal model



First tests results in line with simulations

Ongoing developments 2016-2017

-Thermal tests & simulations / power variations (limit of pulsing)



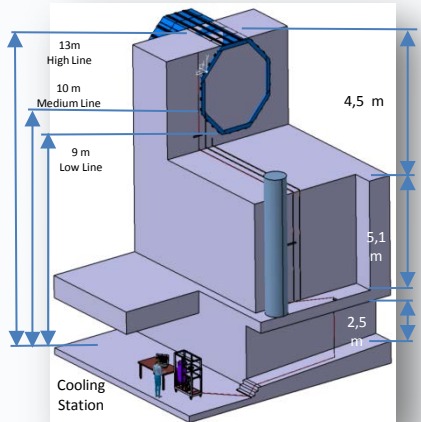
# Thermalisation : boucle sous-atmosphérique

## Global cooling: towards a True scale leak less loop

- demonstration and performance of a large leak-less cooling-loop on 3 levels (13m-10m- 9m) / 2017

### Rough estimate on fluid circulation:

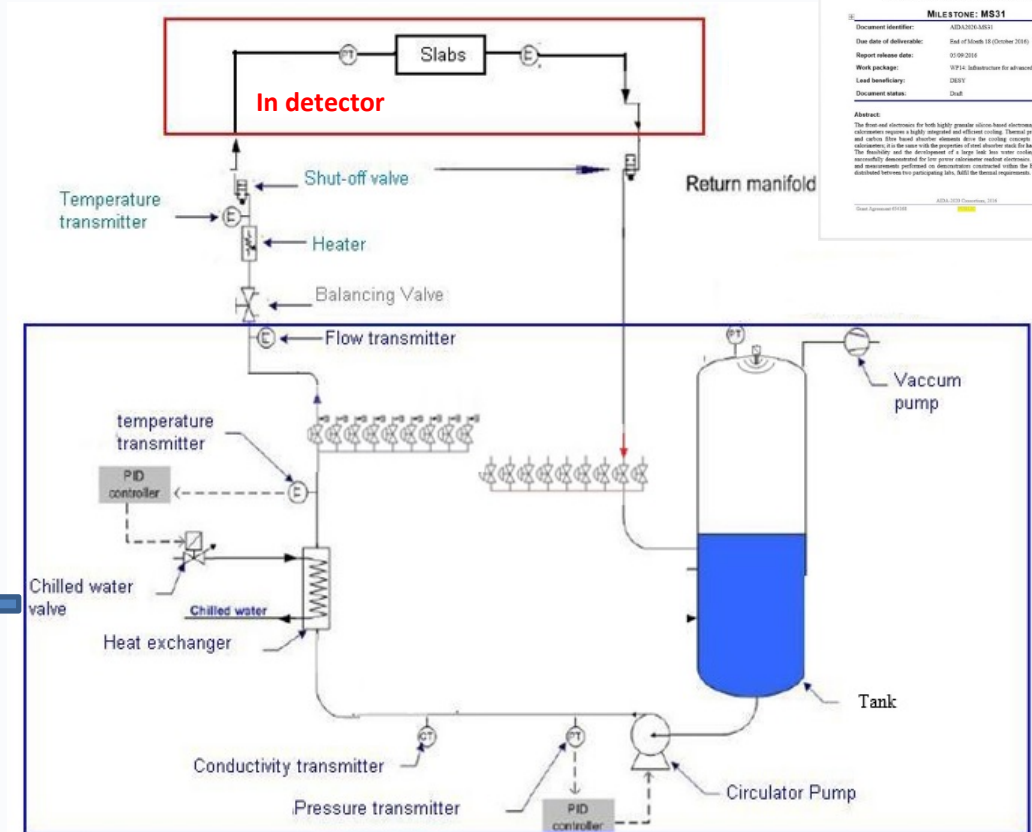
Global flow rate : 250 l/min  
 Variation of fluid temperature : in-out => 5°C  
 Fluid speed < 2 m/s  
 Maximal pressure drop : 1.2 bar  
 Total heat to be removed : 4.6 kW  
 Total Volume of water in installation ≈ 200L



LSPC cooling test area with a drop of 13 m



Cooling station on going



Design of one leakless loop for next tests in 2017

AIDA  
Grant Agreement No. 65163  
**AIDA-2020**  
Advanced Equipment Infrastructure for Calorimeters at Accelerators  
Horizon 2020 Research Infrastructure project AIDA-2020

**MILESTONE REPORT**  
DESIGN OF COOLING SYSTEMS  
FOR TUNGSTEN / CARBON FIBRE  
AND FOR HADRON  
CALORIMETER STRUCTURES

**MILESTONE: MSS1**

Document identifier:	AIDA-2020-0001
Due date of deliverable:	End of Month 18 (October 2018)
Report release date:	01/09/2018
Work package:	WP14: Substructure for advanced calorimeters
Lead beneficiary:	DESY
Document status:	Draft

**Abstract:**  
 The final deliverable for this project is a highly integrated and efficient cooling system for hadron calorimeters. This system requires a highly integrated and efficient cooling system. Thermal properties of tungsten and carbon fibre based calorimeter elements, their cooling concept of electromagnetic calorimeters, as well as the design of the calorimeter structure for hadron calorimeters. The feasibility and the development of a large leak less water cooling system has been successfully demonstrated for the proton calorimeter model calorimeter. Thermal modeling and measurements performed on microsystems connected online for the AIDA-2020 project and distributed between the participating ILC, DESY for technical requirements.

AIDA-2020 Deliverable 014  
Task Agreement 01008  
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## Ongoing developments 2017

- Full scale leakless loop Integration
- Cooling station integration+ network

# Budget mécanique 2016

Allocation LPSC: totale 2016: 3 k€ (-5% missions: 2,85 k€ / Méca: 0 k€)  
 3 k€ (-5%: R&D / Méca: 2,85 k€)  
 Demande mécanique 2016: 10,5 k€ (10,5k€-5%)

S-total

Allocation 2016: 2,85K€

Objectif réalisé

... ou non

## COOLING

- **Boucle de test sub-atmosphérique** (suite montage)
- **Mise à jour prototype d'échangeur thermique EUDET / géométrie BGA**
- **Tests thermiques /simulations de variations de puissance (limites/pulsing)**

1.0 K€

0 K€

1 K€

1 K€

0.35

k€

0

1 k€

OUI(en cours)

NON

OUI

## COMPOSITE

- **Moulage grand layer 2,5 m de 3alvéoles composite (182,3mm)**

- Adaptation du moule actuel
- Usinage reprise du moule
- Fabrication de 3 noyaux rectifiés
- Complexe composite CC202-ET445 pour 3 alvéoles (20m<sup>2</sup>)
- Cuisson + transport (nouveau prestataire / grandes dimensions)

9.5 K€

1.7 K€

2.0 K€

3.0 K€

1.3 K€

1.5 K€

0

0

0

0

1.5k€

NON

NON

NON

NON

OUI

## GUIDAGE / SUPPORTAGE

- **Rails double rangée**
- **Suite construction outillage manutention modules**

0.0 K€

0.0 K€

0.0 K€

0

0

NON

OUI(en cours)

# Demande de Budget 2017

## 1 – COOLING

Fin de la construction d'une boucle test de circulation vraie grandeur pour valider le fonctionnement sous-atmosphérique. Tests d'un échangeur dédié en faisceau.

### 1.1. : Boucle leakless complète et fabrication

- Poursuite du montage de la boucle sous-atmosphérique : **1,0 k€**
- Tests thermiques /simulations de variations de puissance (limites/pulsing) **1,0 k€**

### 1.2. Fabrication et test échangeur thermique EUDET / géométrie BGA:

- Fabrication et brasage échangeur thermique sur géométrie BGA: 0,9 k€
- TOTAL COOLING: 2,9 k€

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2- COMPOSITE: Réalisation d'un grand layer sur la nouvelle géométrie « Kephren » ou « Mykhérinos » pour un futur démonstrateur de module complet End-Cap et finalisation process fabrication grands layer End-Cap

- Stand-by / réductions budgétaires

TOTAL COMPOSITE: 0 k€

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## 3- GUIDAGE / SUPPORTAGE

Poursuite de la réalisation de l'équipement pour les tests de manutention (contraintes/structures composites) et d'installation des fluides sur tous les types de modules : sur budget 2015 et AIDA.

- Peinture + transport outillage lourd manutention modules : 1,3 k€
- 2 Rails double rangée 0,7 k€
- Solde outillage lourd support modules 0,5 k€

TOTAL OUTILLAGE: 2,5 k€

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## 4- MISSIONS:

Conférences internationales, réunions CALICE, IN2P3, JCL et les déplacements techniques (LLR, CERN pôle composite, etc.)

TOTAL MISSIONS: **5 k€**

**TOTAL BUDGET 2017 : 10,4 k€**