First EUDET Prototype – The Demonstrator

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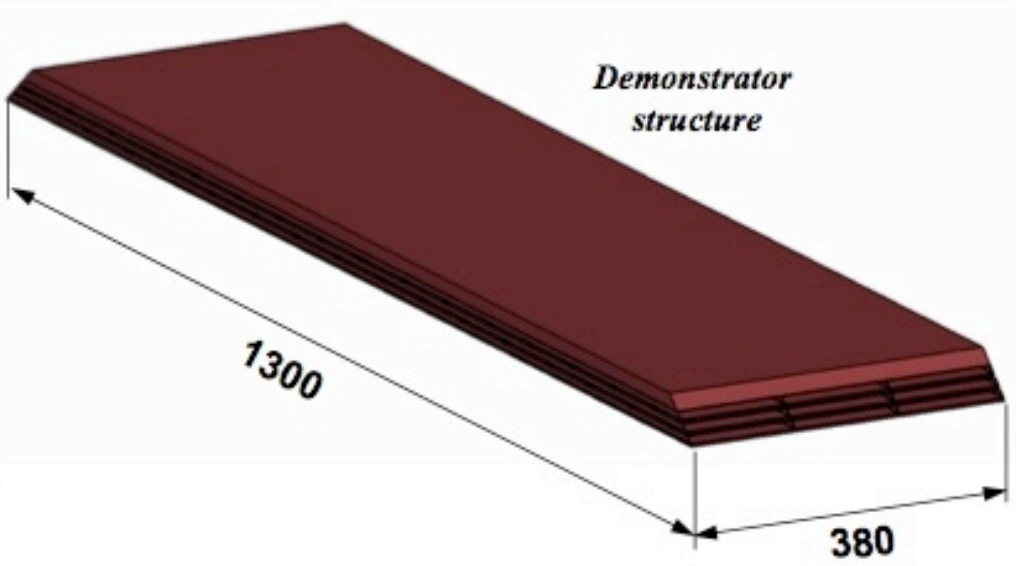
Demonstrator design

- We plan to build a first small demonstrator to validate all process before the EUDET module
- Dimensions based on physic prototype (cells width : 124 mm)

  ➡ need to validate all Eudet dimensions !!!
- Could be used for thermal studies and analysis : design of a thermal PCB and cooling system.

- 3 alveolar layers + 2 W layers
- 3 columns of cells : representative cells in the middle of the structure
- Thermal studies support
- Width of cells : 124 mm
- Identical global length : 1.3m and shape (trapezoidal)
- Fastening system ECAL/HCAL

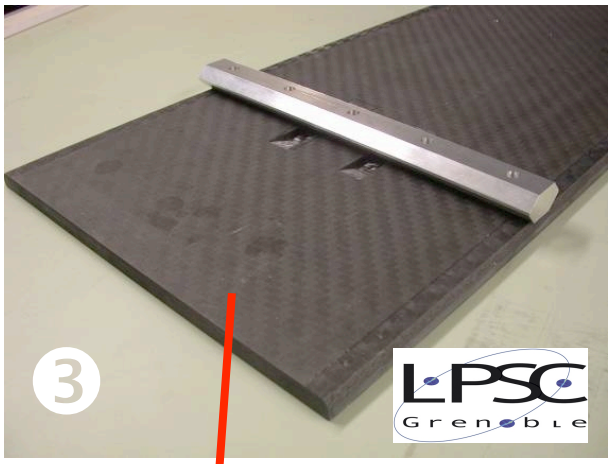


M.Anduze, LLR

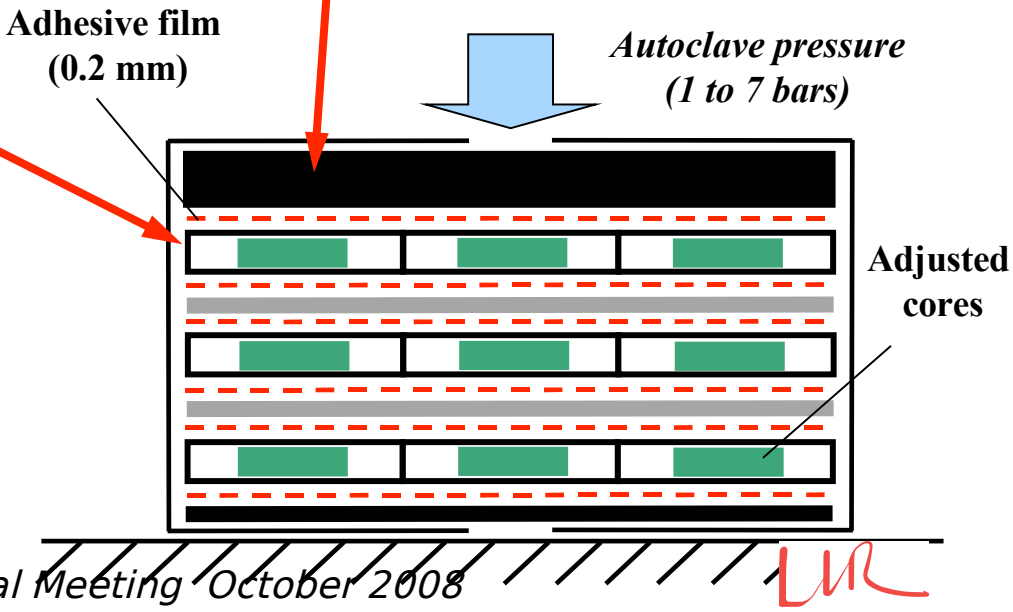
Demonstrator – Alveolar structure

Assembled structure : Each alveolar layer ❶ are done independently , cut to the right length and angle (❷) and bonded alternatively with W plates in a second curing step. The assembling is closed by 2 composite plates ❸ of 15 mm and 2 mm thick (from LPSC)

first test of alveolar layer



top composite plate (15mm)



⇨ Global design : ***OK***

⇨"Alveolar layer" first test ❶ : ***OK***

⇨ Cutting test ❷ : ***OK***

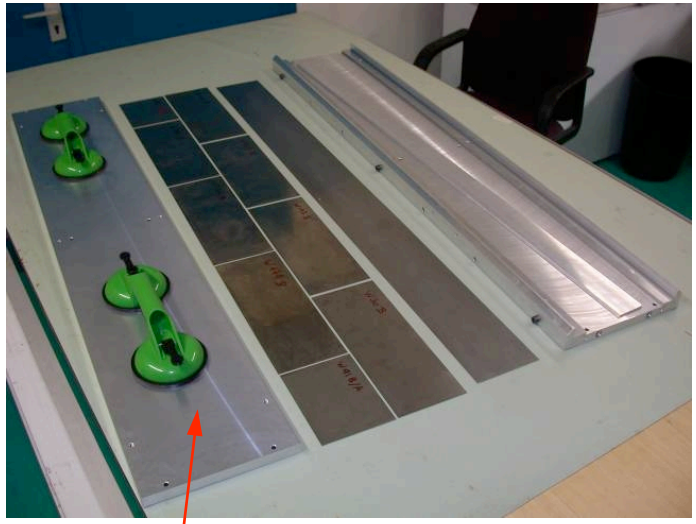
⇨ Composite plates ❸ (15mm and 2 mm) : ***OK***

⇨ Design assembling mould : **on going**

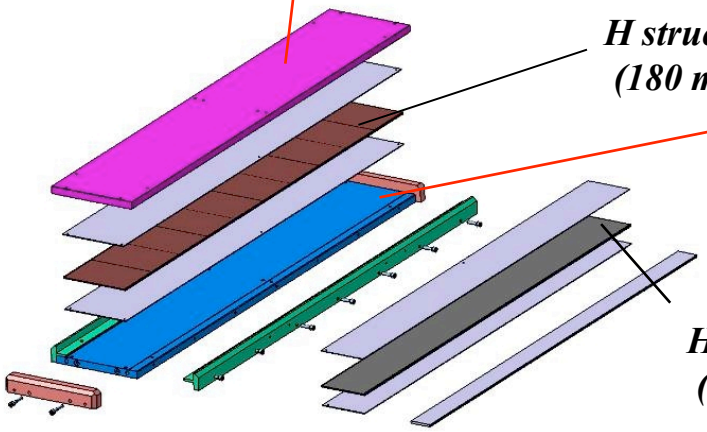
Demonstrator - H structure

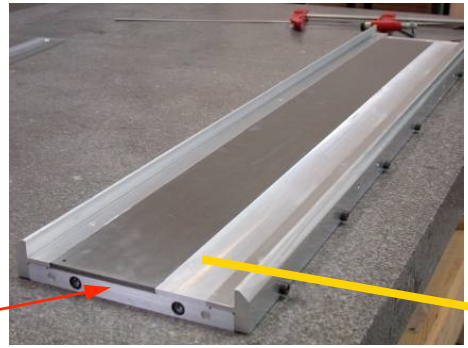
Study of one mould for whole structures:

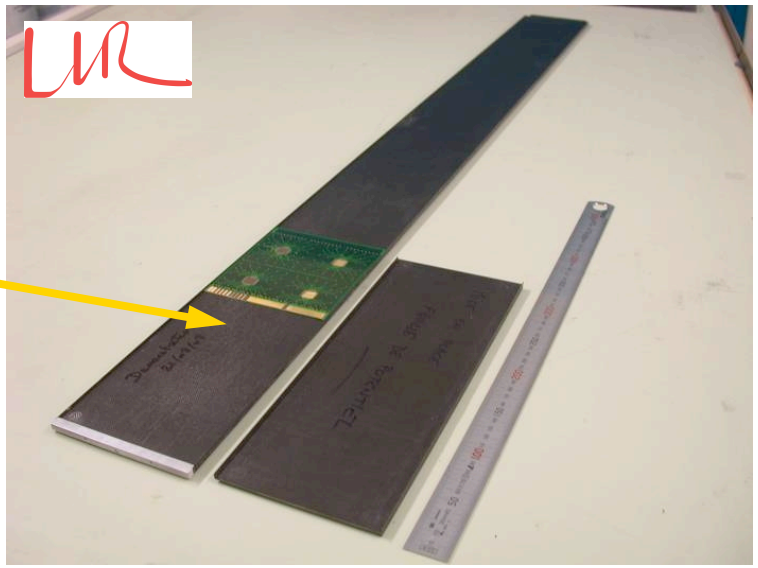
- Same principle than the mould used to do H physical prototype structures but using the autoclave)
- One long mould for both long and short H structures and 2 width (124 and 180 mm)



⇨ Design : ***OK***
⇨ machining : ***OK***
⇨ first H structure (1300×124): ***OK***

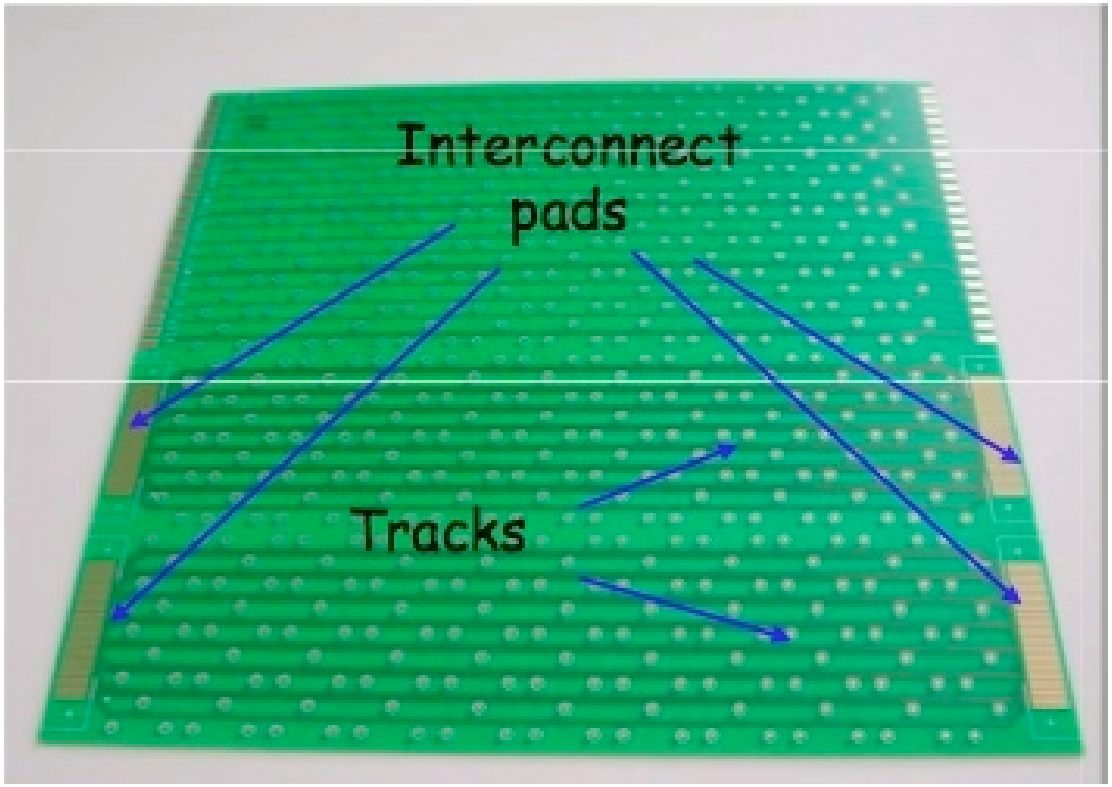






PCB/”ASU” for Demonstrator

FEV6



- Simple PCB allowing for

Studying mechanical rigidity

Gluing onto glass plates

Interconnection of ASU

Heat Dissipation

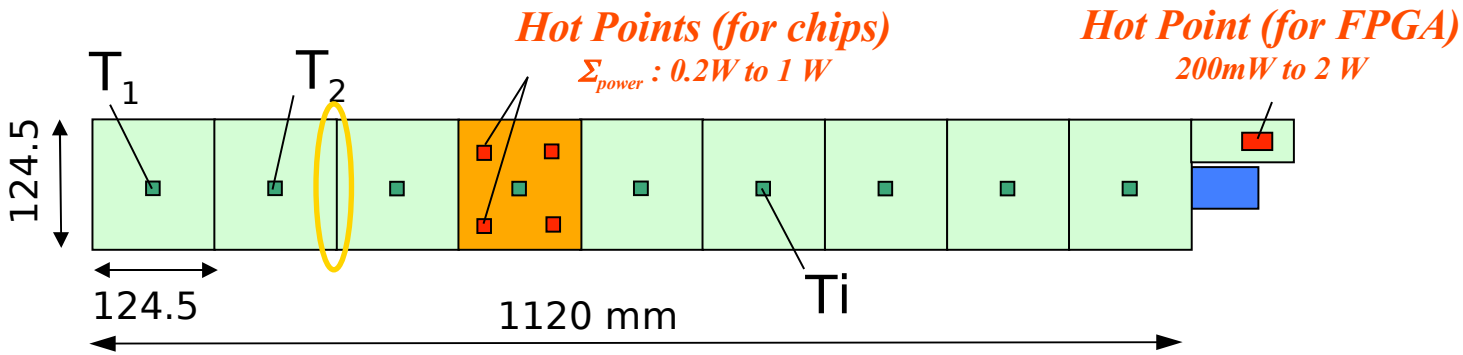
Mastering all the construction steps decribed previously

Rather an imitation than a real PCB

Demonstrator – Thermal studies

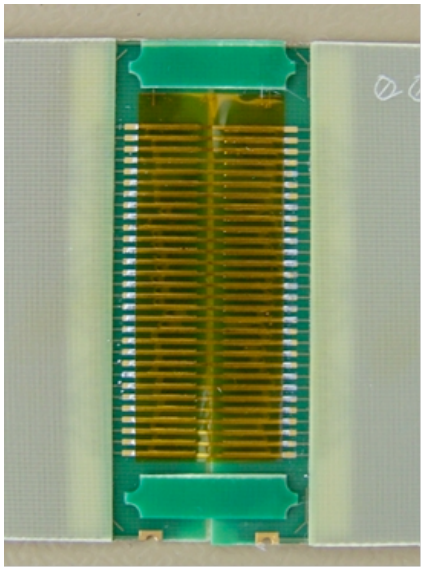
Slab cooling tests (1 Hot ASU + 8 thermal ASU):

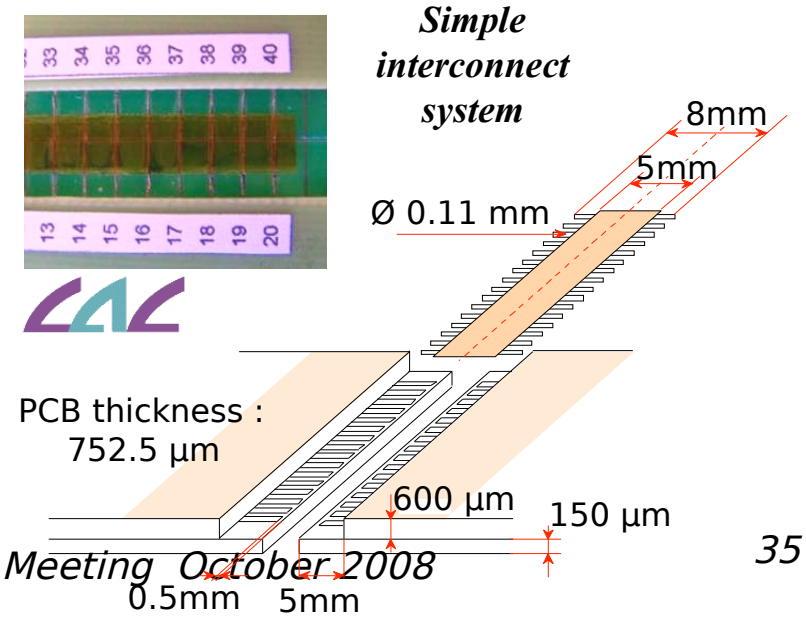
- Check a thermal dissipation behaviour close to EUDET design



Interconnections

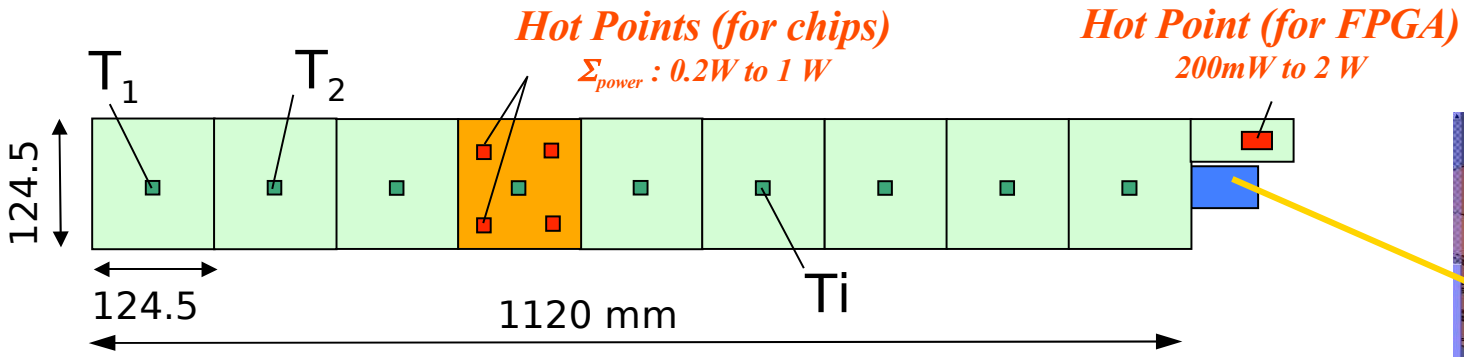
FFC (see above)



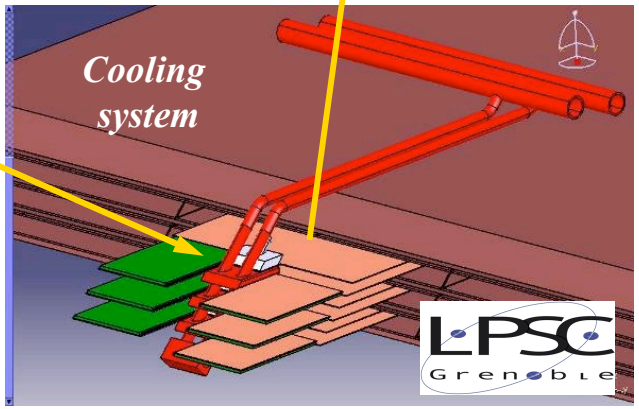


Demonstrator – Thermal studies

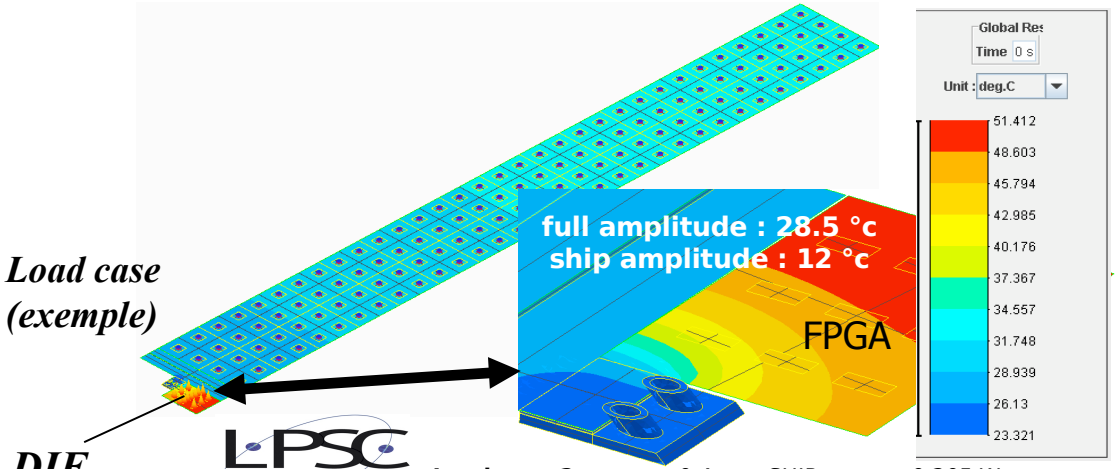
- Correlation with simulations (transfer coefficients, contacts ...)
- Validate the cooling system (400 µm copper plate drain + pipes)



Copper (400 µm)



⇨ Design : ***OK***
⇨ Simulations : ***OK***
⇨ PCB : **on going (ordered)**
⇨ Copper plate : ***OK***
⇨ Interconnect : **on going**
⇨ Exp. setup : **on going**



Load case 2 : copper 0,4mm; SHIP power : 0.205 W;
FPGA power : **2 W distributed : 55 x 77.5 (KAPTON)**

Demonstrator – Integration Process

- Studying handling difficulties caused of extreme fragile slabs

- Simplified Integration Cradle with vacuum pads tooling

- Handling and placing of HV feeding inside H Structure

- Cleaning of copper envelope in ultrasonic bath
  150 l
  Temperature range 30-85° C
  Transducer Power 3600 W
  Frequency 35-150 kHz

- Brazing techniques (Brazing under vacuum)
  low temperature domain (~240°C)
  high temperature (760°C)

Conclusion and Outlook

- Demonstrator consitutes important step towards EUDET Module
  - Allows for studying and validating all mechanical aspects
  - ... by reusing existing material

  Major part of JRA3 EUDET Deliverable

- Most of pieces already manufactured or ordered

- Ideal opportunity to establish production chain
  - All parts of production will be examined

Results expected in January 2009