
News on moulds and structures

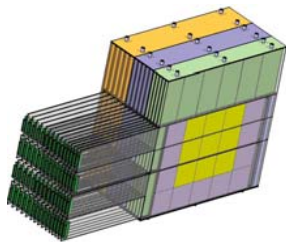


CALICE meeting - Manchester

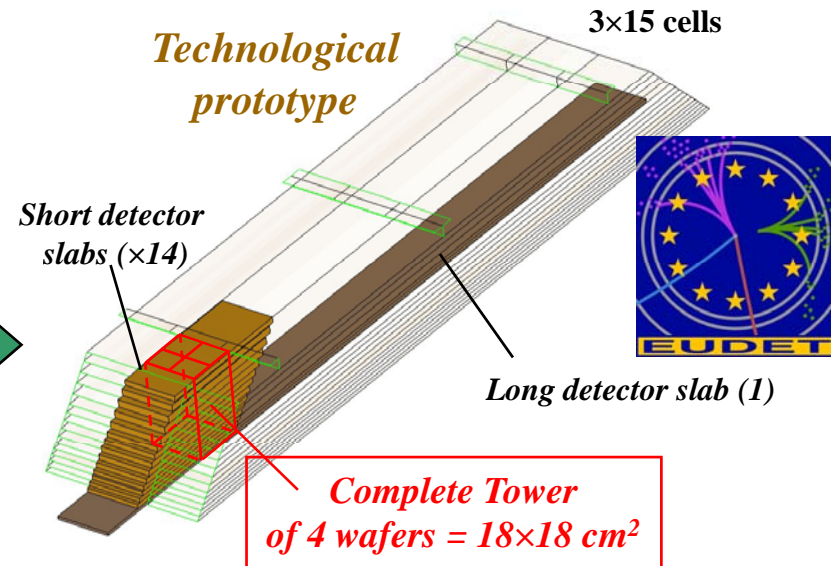
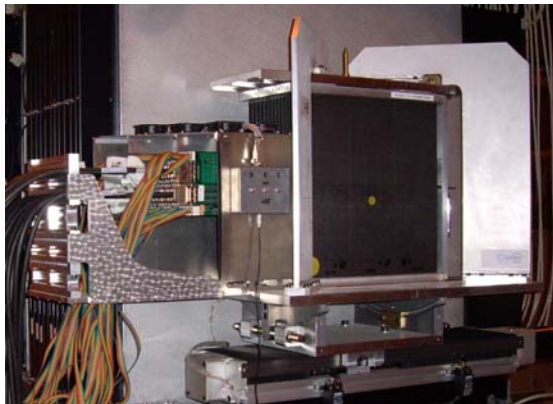


Technological prototype : EUDET module

- Logical continuation to the physics prototype study which validated the main concepts : alveolar structure , slabs, gluing of wafers, integration
- Techno. Proto : study and validation of most of technological solutions wich could be used for the final detector (moulding process, cooling system, sizes of structures,...)
- Taking into account industrialization aspect of process
- Finest cost estimation of one module



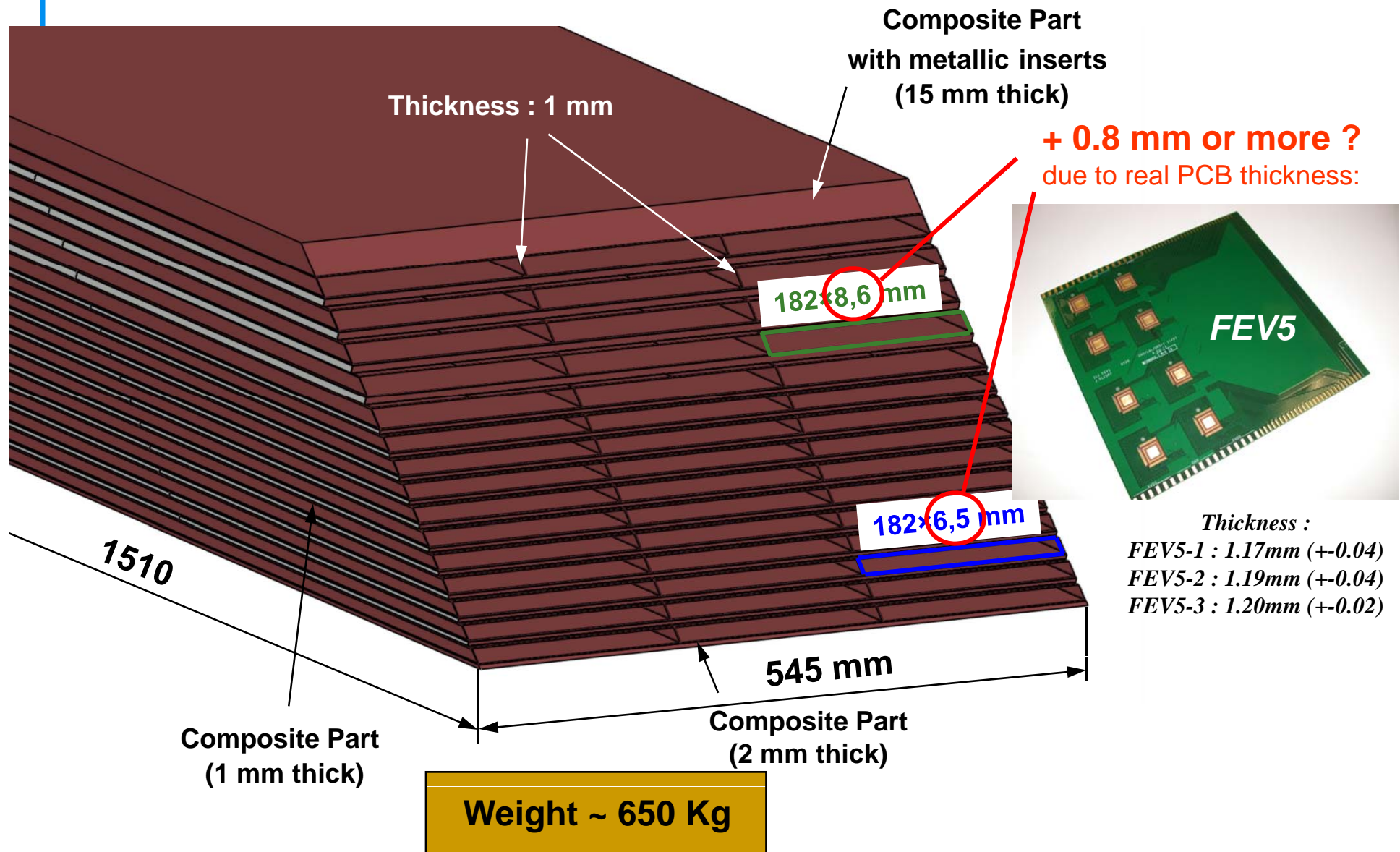
Physical prototype



- 3 structures : **24 X₀**
(10×1,4mm + 10×2,8mm + 10×4,2mm)
- sizes : **380×380×200 mm³**
- Thickness of slabs : **8.3 mm** (W=1,4mm)
- VFE **outside** detector
- Number of channels : **9720** (10×10 mm²)
- Weight : **~ 200 Kg**

- 1 structure : **~ 23 X₀**
(20×2,1mm + 9×4,2mm)
- sizes : **1560×545×186 mm³**
- Thickness of slabs : **6 mm** (W=2,1mm)
- VFE **inside** detector
- Number of chan. : **~37890** (5.5×5.5 mm²)
- Weight : **~ 700 Kg**

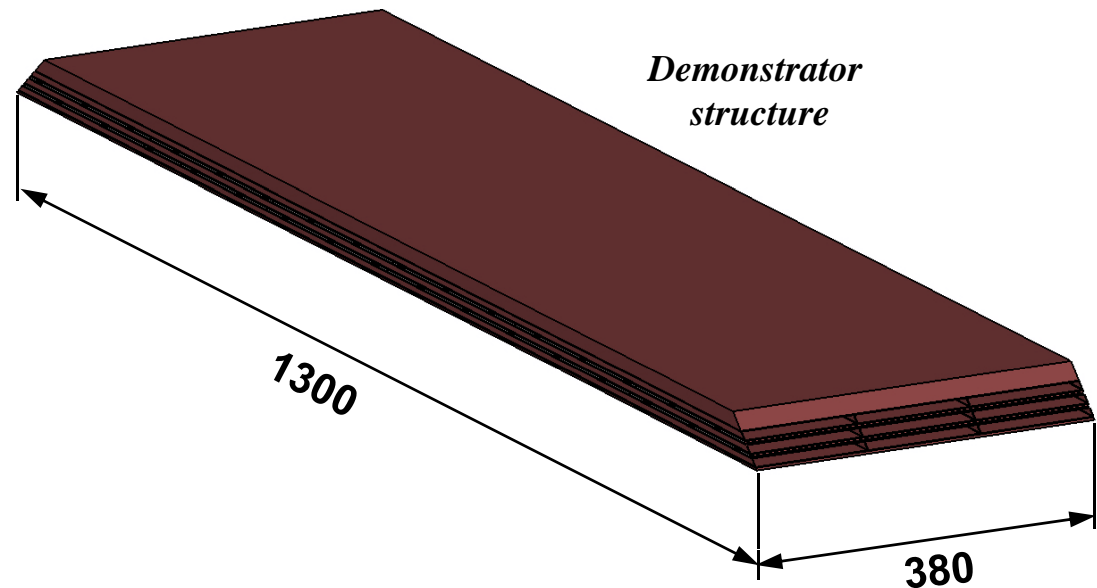
Alveolar structure – current design



Demonstrator design

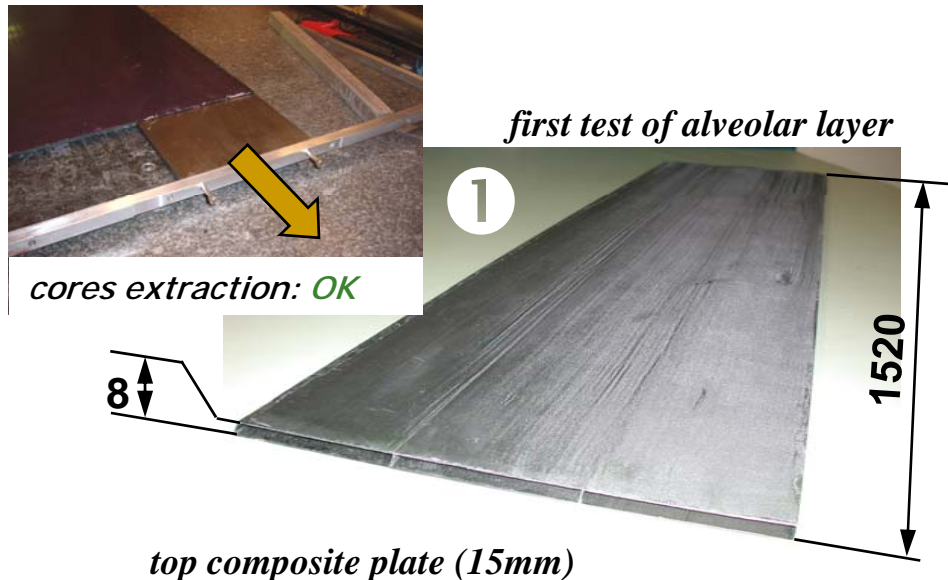
- We plan to build a first **small demonstrator** to validate all composite process before the EUDET module
- Width based on physic prototype (124 mm)
➡ still need to validate all Eudet dimensions !!!
- Could be used for **thermal studies** and analysis : design of a thermal PCB and cooling system.
- First test of **slab integration** (gluing, interconnection ...)

- **3 alveolar layers + 2 W layers**
- **3 columns of cells : representative cells in the middle of the structure**
- **Thermal studies support**
- **Width of cells : 126 mm**
- **Identical global length : 1.3m and shape (trapezoidal)**
- **Fastening system ECAL/HCAL**



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)



- ⇒ Global design : *OK*
- ⇒ "Alveolar layer" first test ❶ : *OK*
- ⇒ Cutting test ❷ : *OK*
- ⇒ Composite plates ❸ (15mm and 2 mm) : *OK*

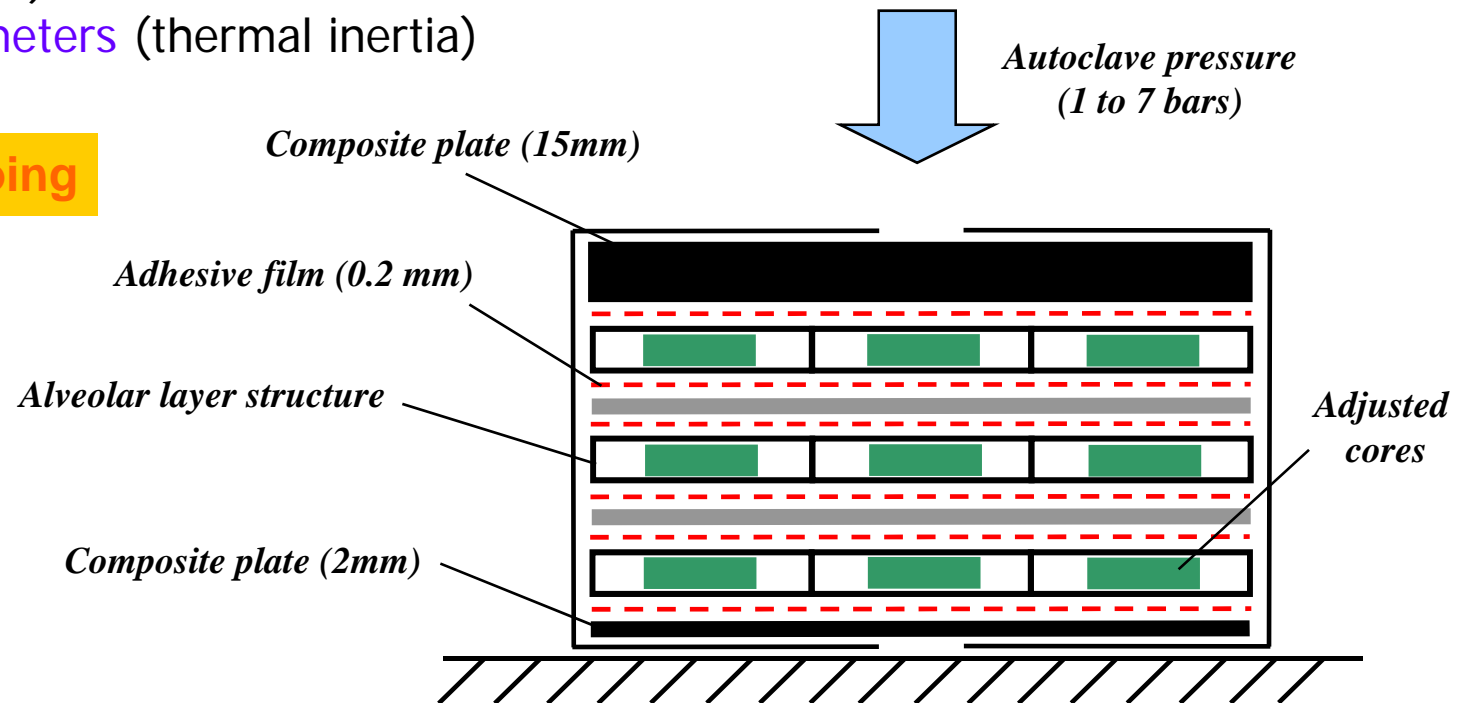
Demonstrator – Assembling mould

The design of the assembling mould has started :

Several issues have to be studied yet:

- The definition of the **compacting pressure**, according to the mechanical behaviour of the inter alveolar wall (destructive tests)
- The study of **core system**, keeping each alveoli against W plates to obtain a correct assembly during the curing : Use of **adjusted metallic cores** (thickness)
- **Curing parameters** (thermal inertia)

⇒ Design : **on going**

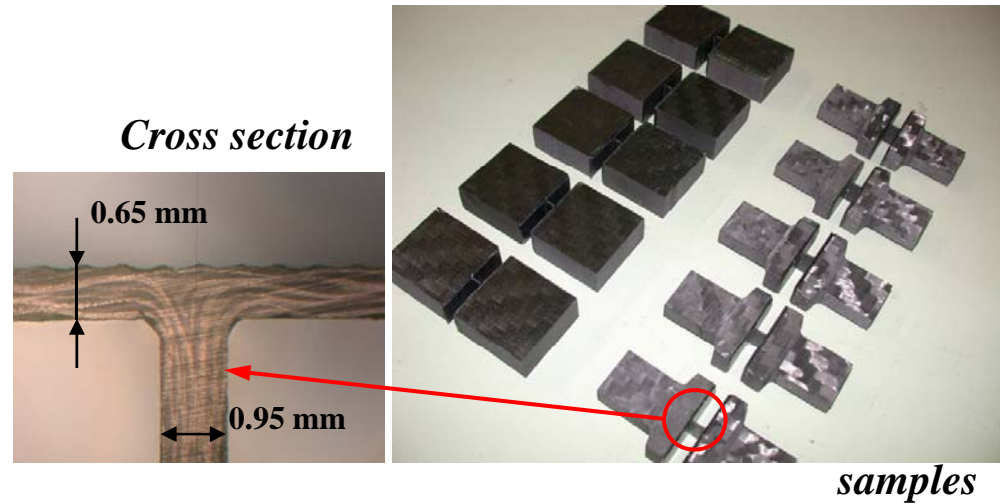


Destructive tests – first results

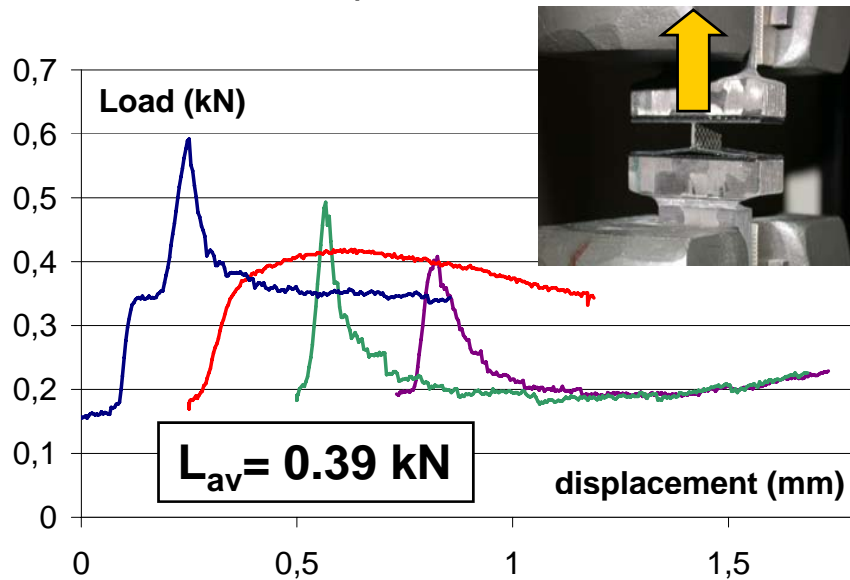
Mechanical tests :

Destructive tests of inter alveolar walls until breaking of interface in order to evaluate loads and elongations under different loading cases:

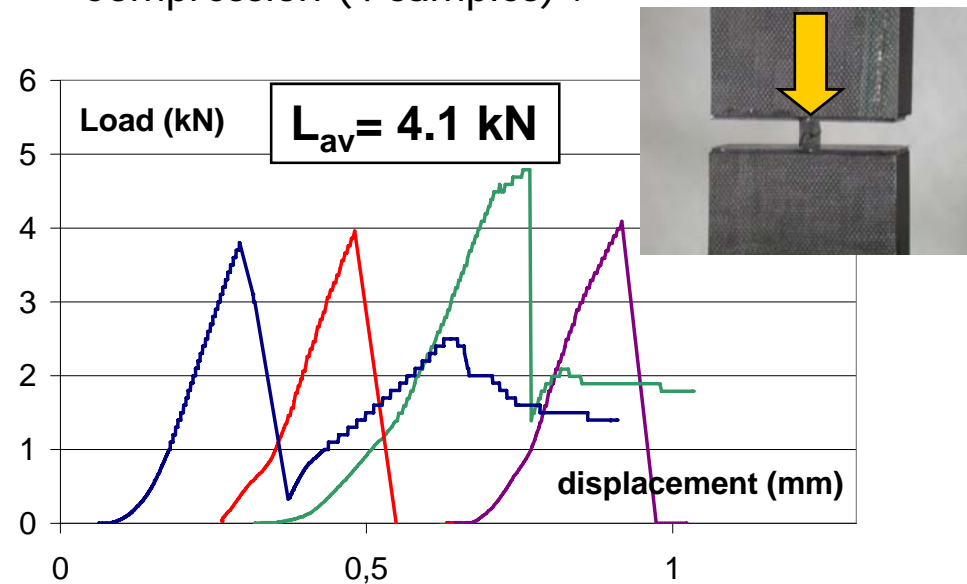
sample section : $0.95 \times 15 \text{ mm}^2$



- Tensile (4 samples) :



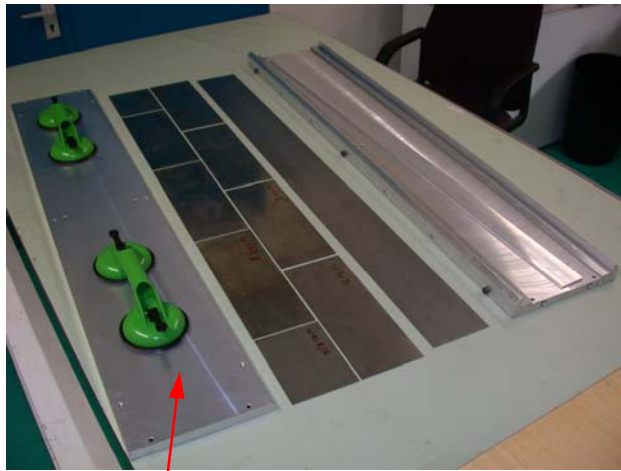
- Compression (4 samples) :



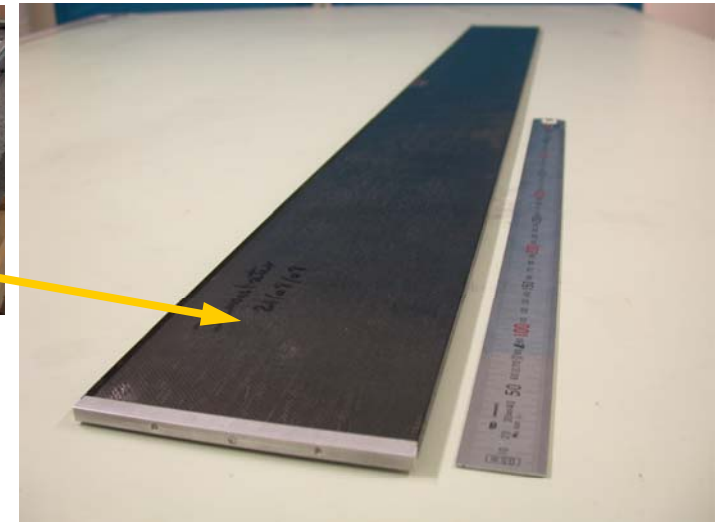
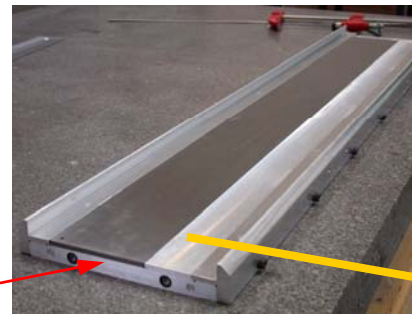
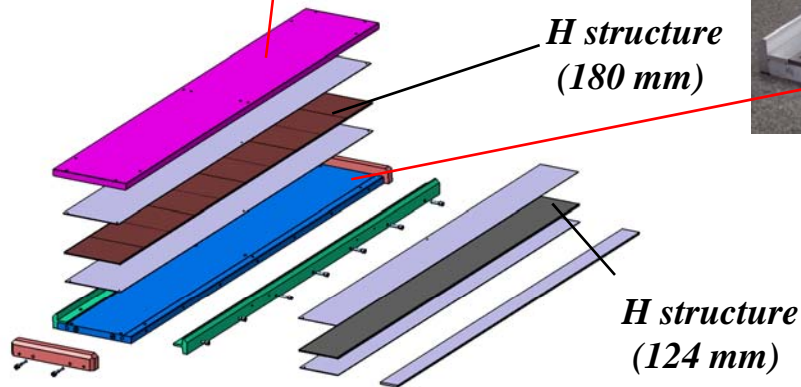
Demonstrator - H structure

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*



Conclusion : schedule



Composite **Structures** part :

- “alveolar layer” mould + **first long structure**
(*demonstrator*) **May 08** ⇒ OK
- First **destructive tests** **Jun 08** ⇒ OK
- H Mould available + **first H structure** (126 mm)
(*demonstrator*) **Aug 08** ⇒ OK
- Assembling mould design and fabrication **Nov 08**
- **Demonstrator** (3 layers – 126 mm) **Dec 08**
- EUDET **Final** moulds design and order
(**Design needs to be fixed now!!!**) **Nov 08**
- EUDET layer structures production + H (long & short) **Feb 09**
- **EUDET structure** assembly **Jun 09**