
News on Moulds & Structures



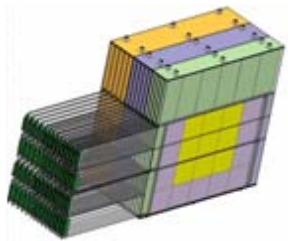
MAR

ECAL SiW meeting

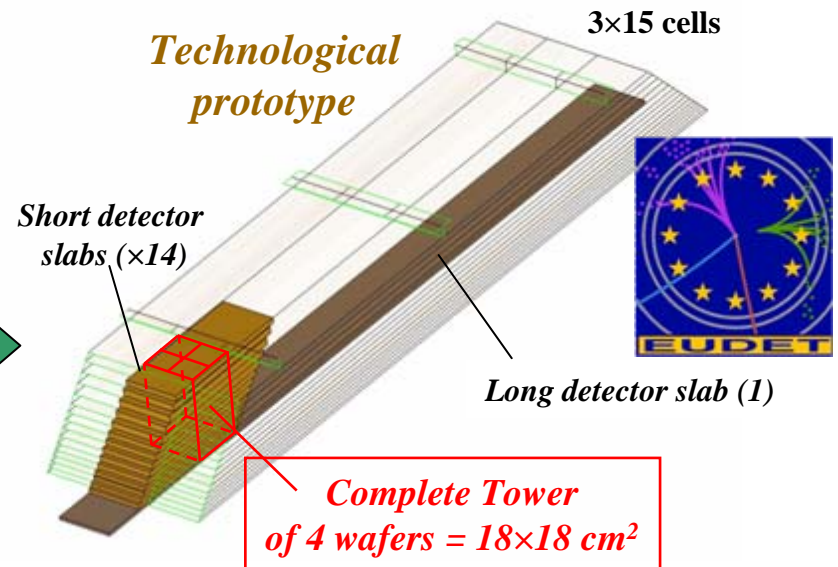
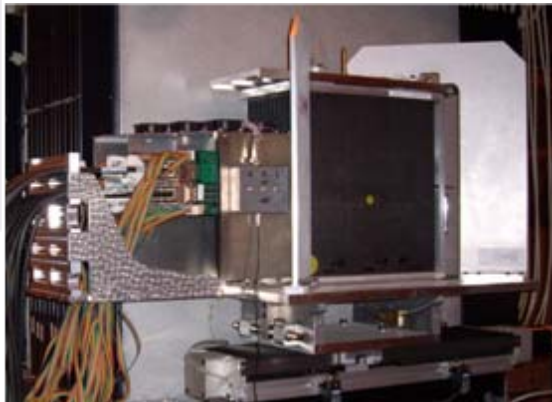


Technological prototype : EUDET module

- 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



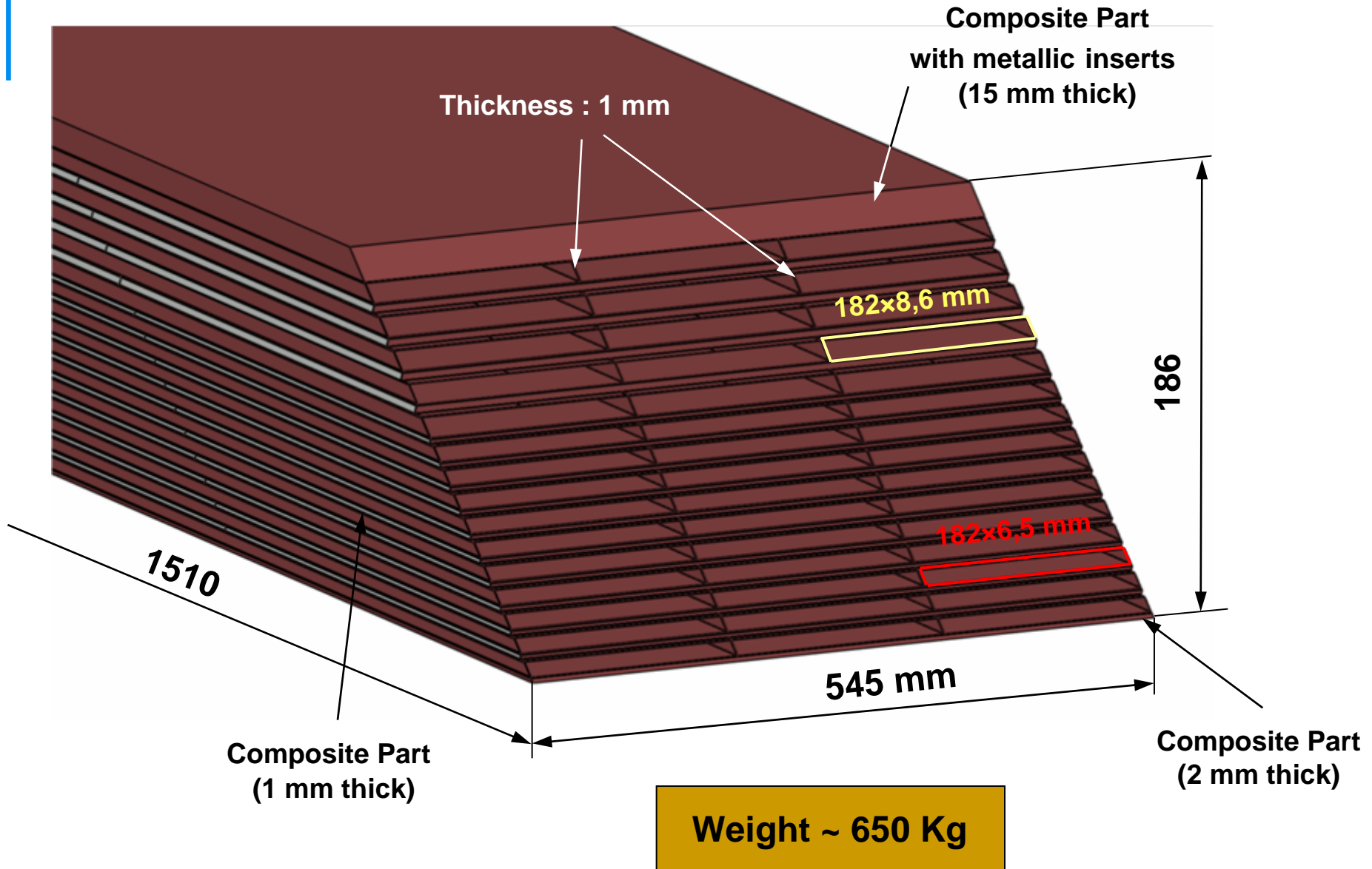
Physical prototype



- 3 structures : **24 X_0**
(10x1,4mm + 10x2,8mm + 10x4,2mm)
- sizes : **380x380x200 mm³**
- Thickness of slabs : **8.3 mm** (W=1,4mm)
- VFE **outside** detector
- Number of channels : **9720** (10x10 mm²)
- Weight : **~ 200 Kg**

- 1 structure : **~ 23 X_0**
(20x2,1mm + 9x4,2mm)
- sizes : **1560x545x186 mm³**
- Thickness of slabs : **6 mm** (W=2,1mm)
- VFE **inside** detector
- Number of chan. : **~37890** (5.5x5.5 mm²)
- Weight : **~ 700 Kg**

Alveolar structure – current design

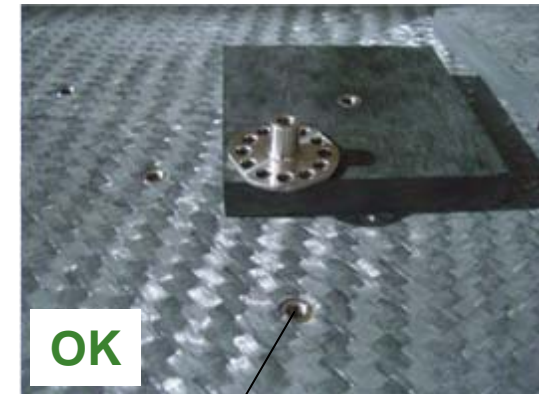
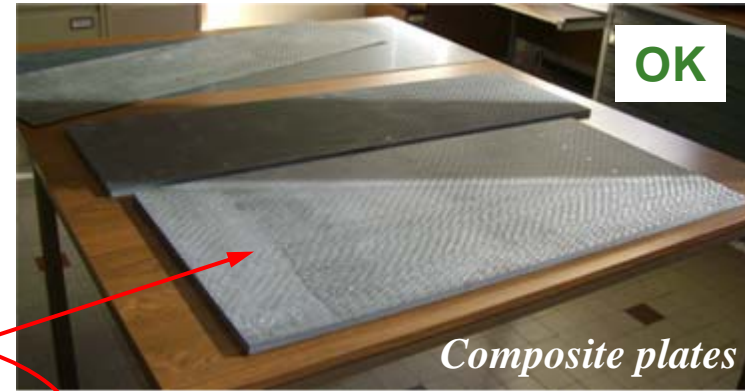
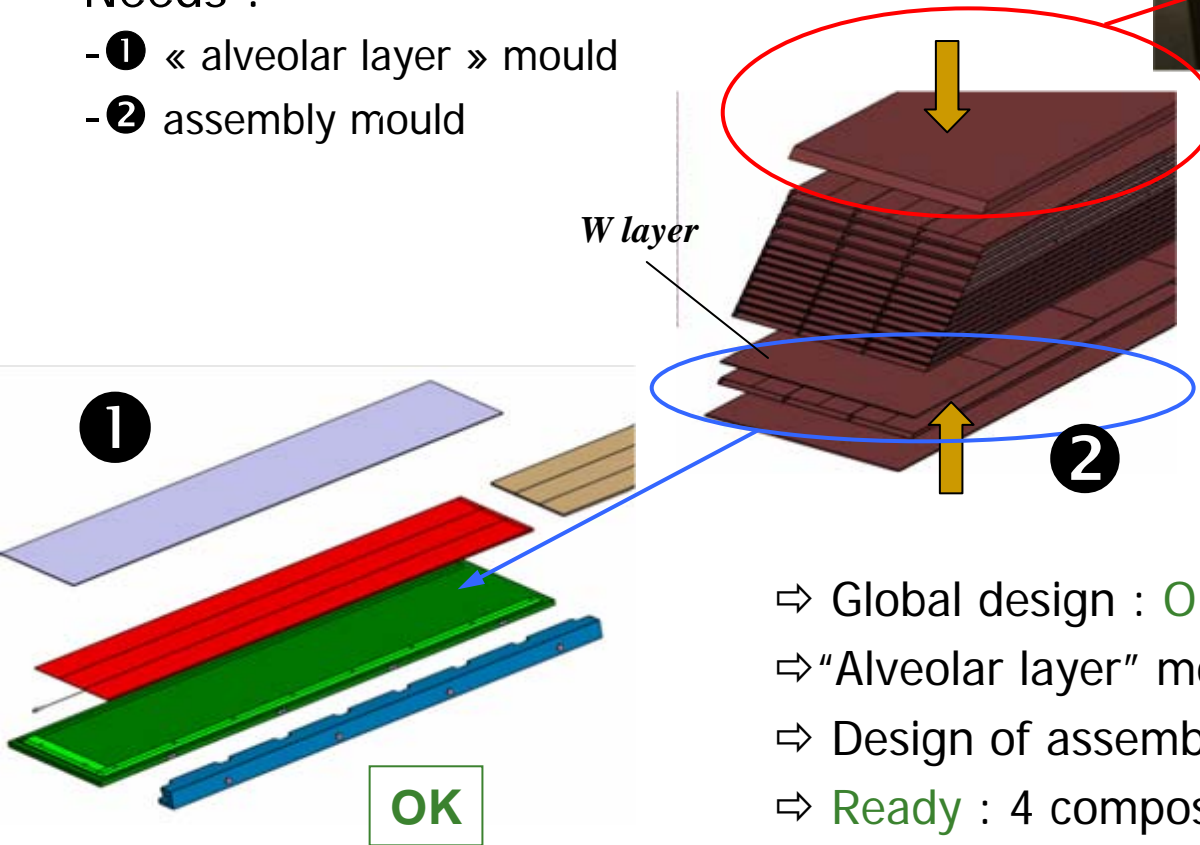


Alveolar structure - Construction

Assembled structure : Each alveolar layer are done independently, cut to the right length (with 45°) and assembled alternatively with W plates in a second curing step

Needs :

- ❶ « alveolar layer » mould
- ❷ assembly mould

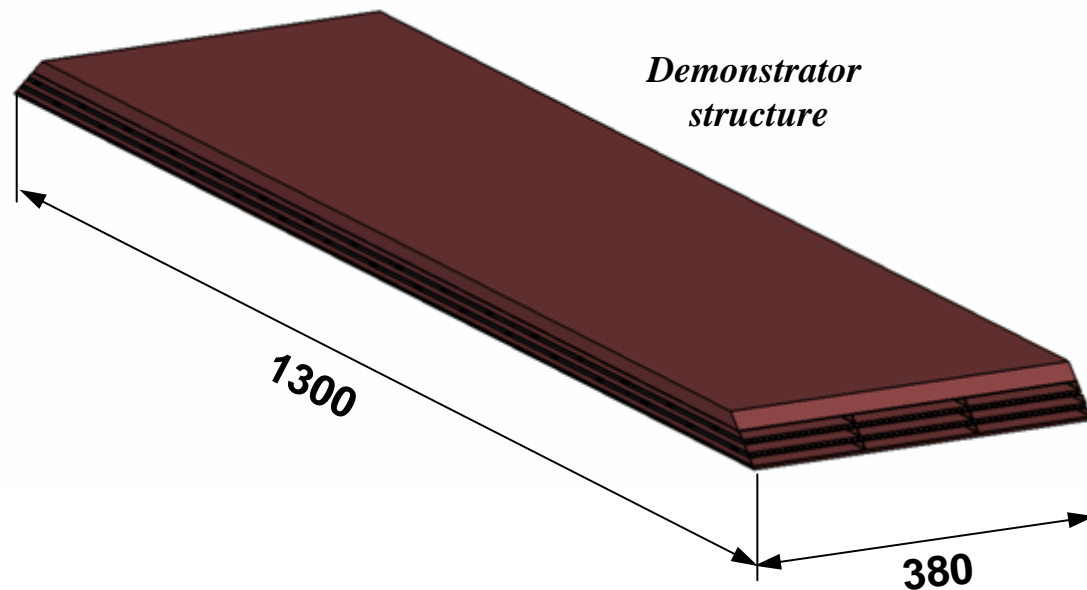


- ⇒ Global design : OK
- ⇒ "Alveolar layer" mould machining : OK (first test)
- ⇒ Design of assembly mould : ongoing
- ⇒ Ready : 4 composite plates (15mm and 2 mm)

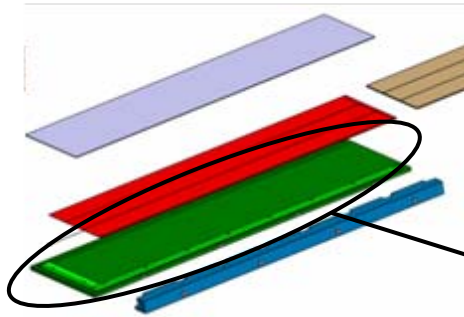
Demonstrator design

- 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 !!! (see Aboud's talk)
- 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**



« Alveolar layer » mould



Indian company:
Machining problems
(parameters, vibrations,
thermal problems ...) dues
to the **no-experience** in the
composite material used for
this mould (Hextool)

→ delayed of **8 months** !!!

French solution found :
Experience with Hextool
Complete dimensional
inspection and re-machining
all pieces of the mould

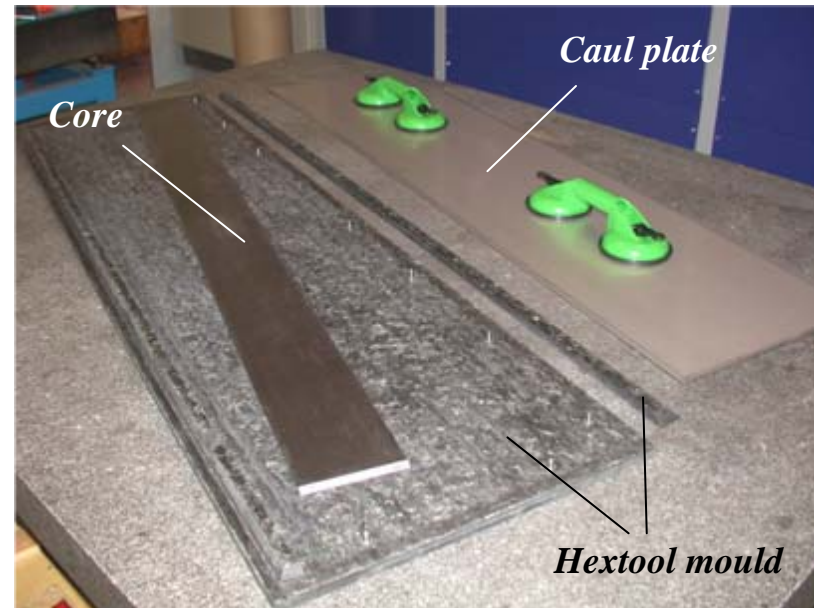
Dimensional inspection



Re-machining



The result →



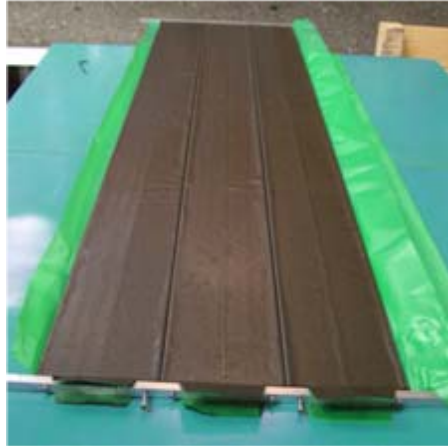
First long structure test (1/2)

Main process steps :

mould release preparation



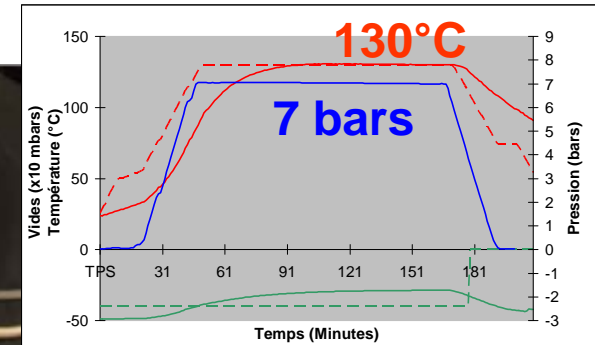
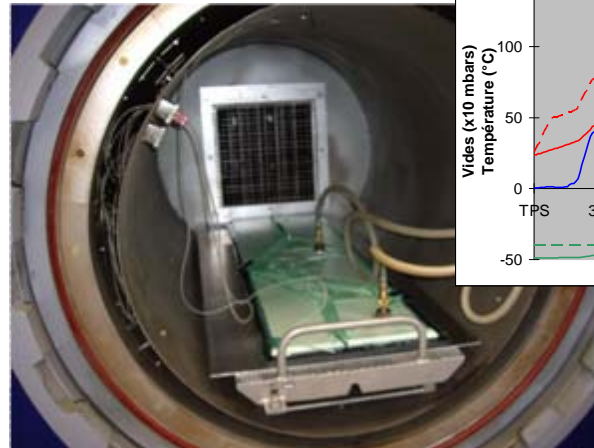
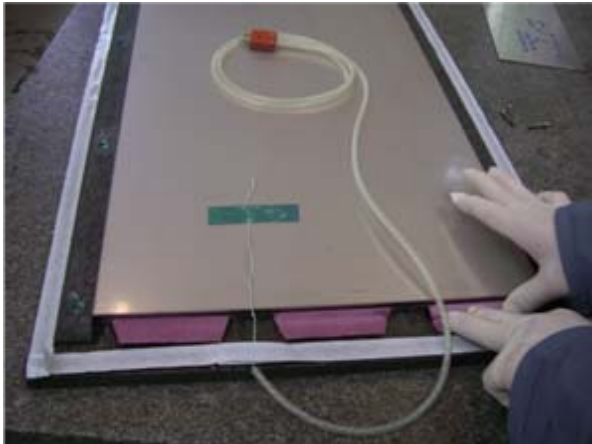
Cores wrapped with prepreg



Compression step



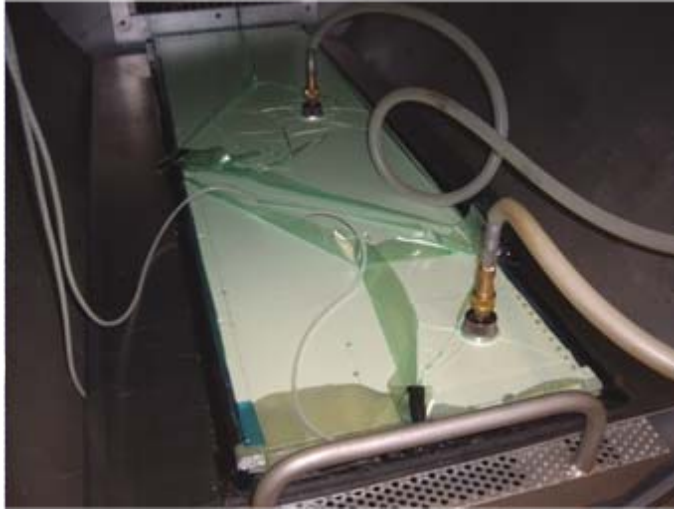
Thermal sensor equipment



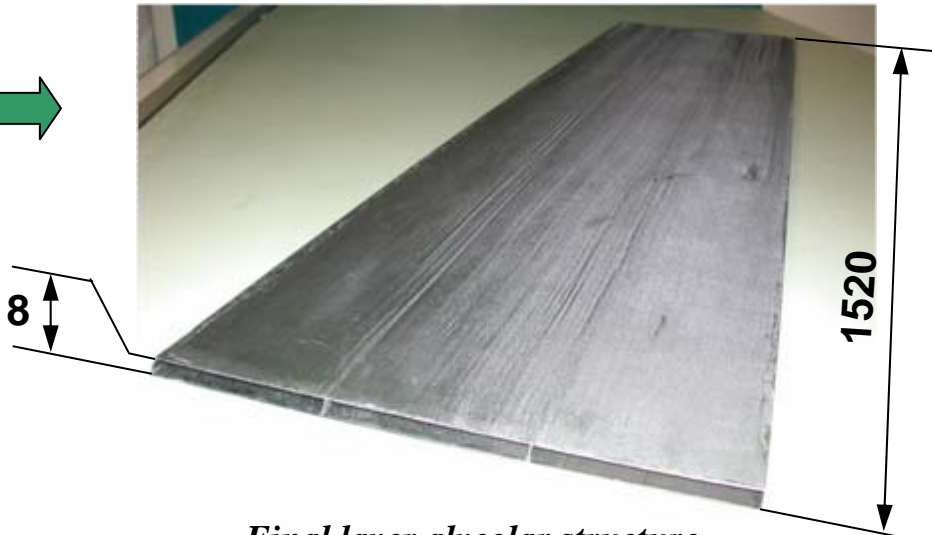
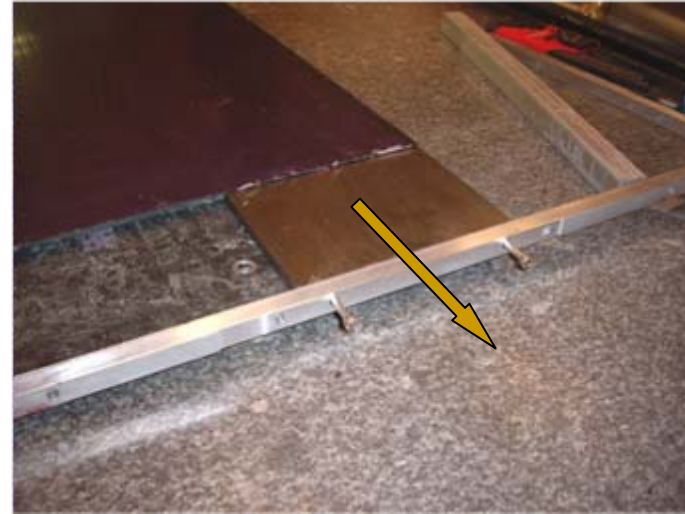
Curing operation (autoclave)

First long structure test (2/2)

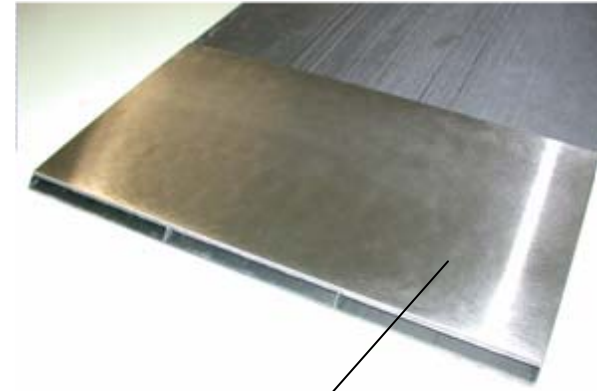
After curing step



Main issue : cores extraction – OK !!!



Final layer alveolar structure



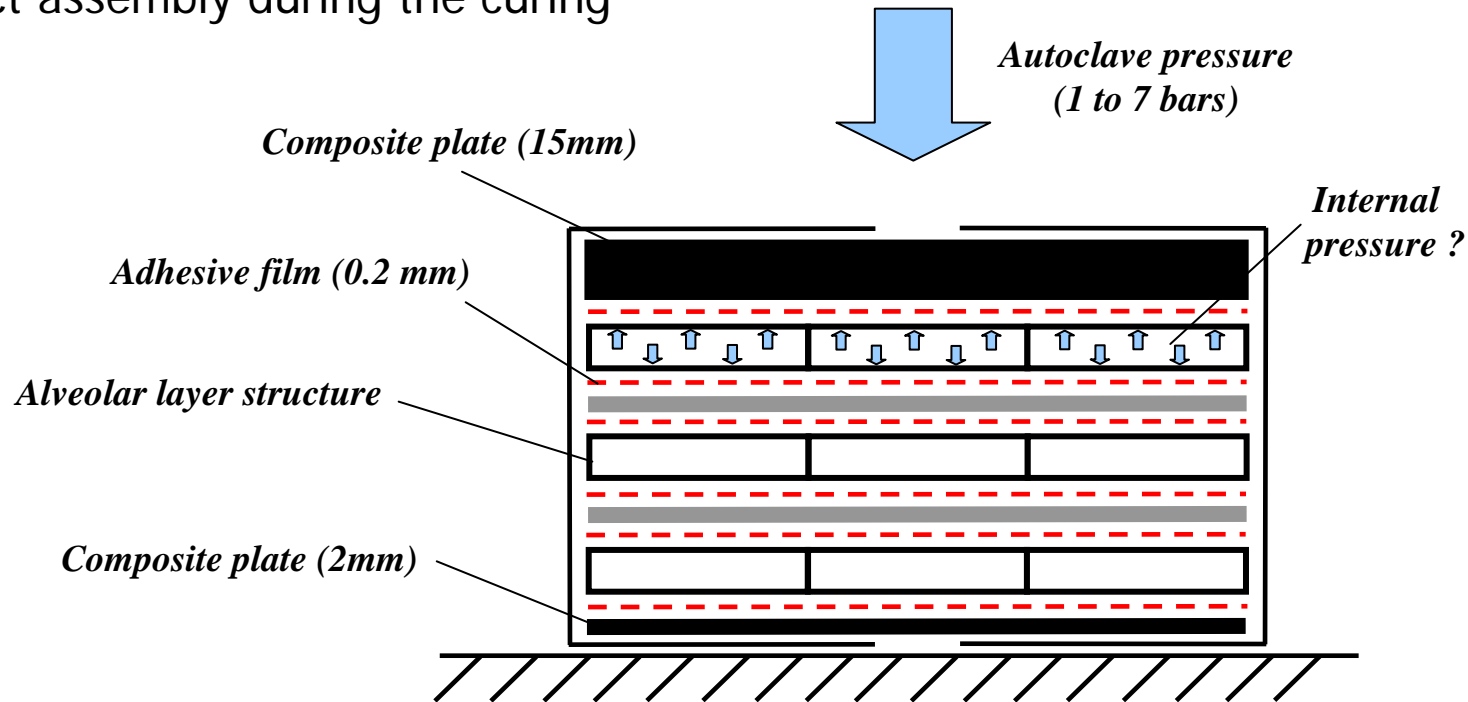
W plate (2.1 mm thick)

Assembly mould

The **design** has started but depends on the first result for the alveolar layer :

Several issues have to be studied yet:

- The definition of the **compacting pressure**, according to the mechanical behaviour of the inter alveolar wall
- The study of **core system**, keeping each alveoli against W plates to obtain a correct assembly during the curing



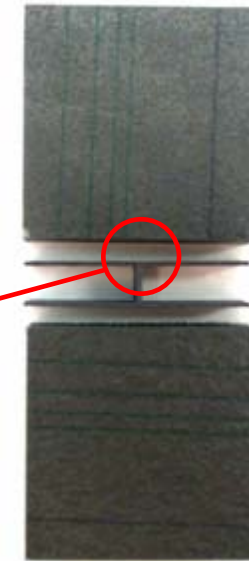
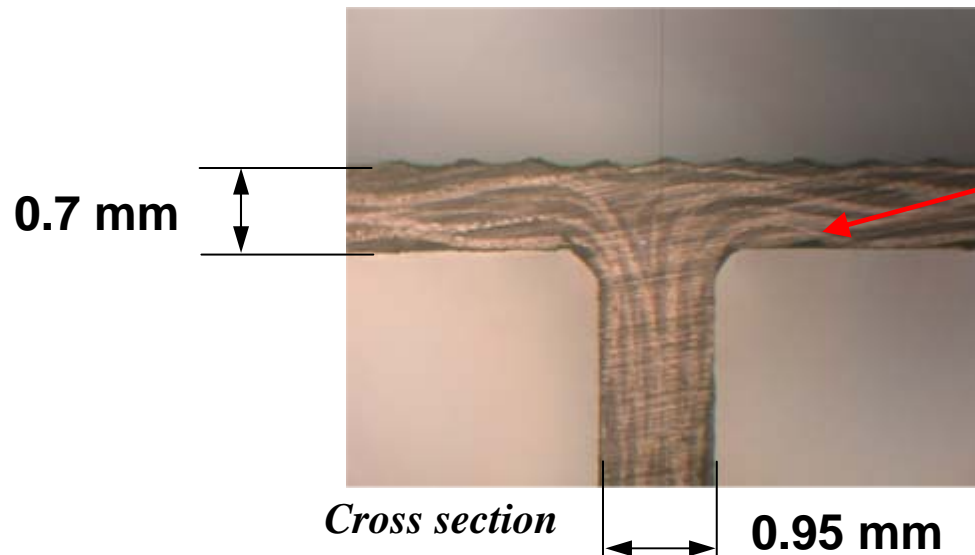
Destructive tests

Mechanical tests :

- Destructive tests of inter alveolar walls until breaking of interface in order to evaluate constraints and elongations under different loading cases:
 - Tensile (5 samples)
 - Compression (5 samples)
- Study and fabrication of test samples including composite cutting tests : OK



Machine for destructive tests

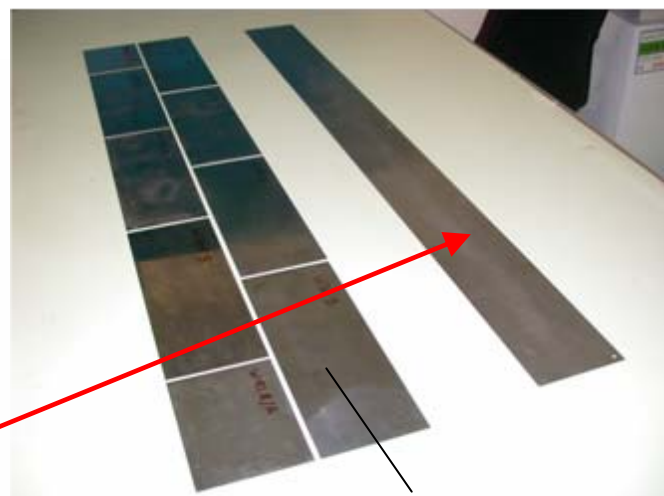
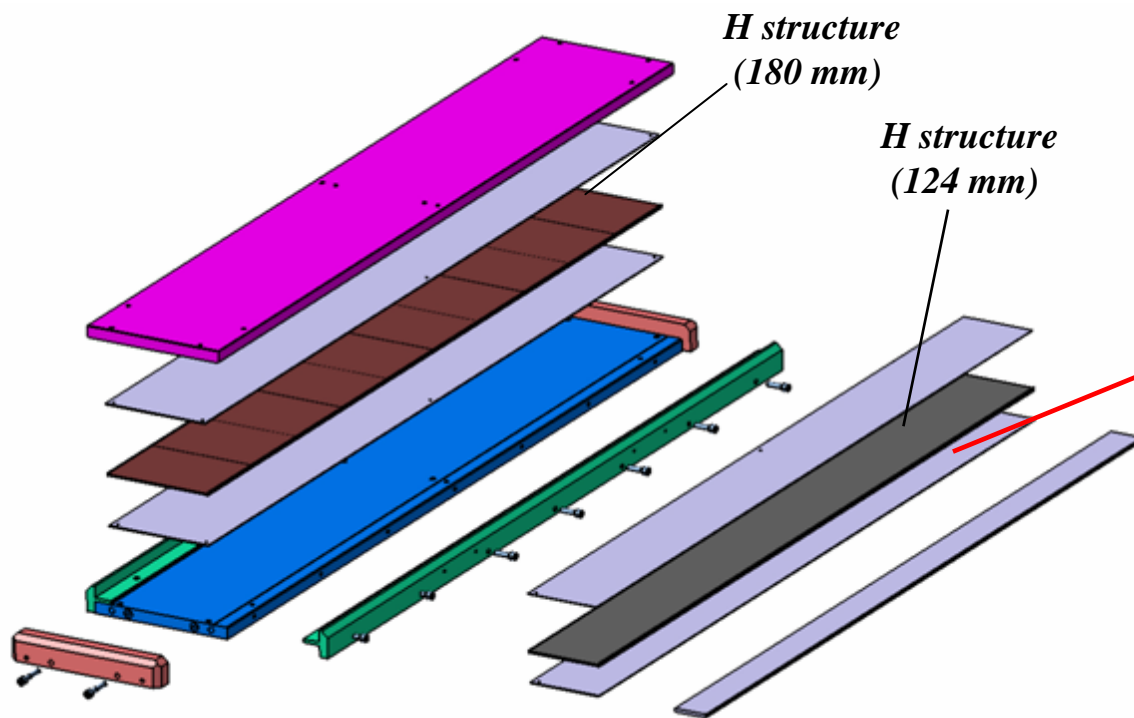


Test sample

H structure mould

Study of one mould for whole structures:

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



W plates (1.4 mm thick)

- ⇒ Design : OK
- ⇒ machining : ongoing
- ⇒ Ready (W + C) to mould first H structure (1300×124)



Composite **Structures** part :

- “alveolar layer” mould + first long structure **May 08** ⇒ OK !
- Destructive tests and analysis **June 08**
- H Mould available + first H structure (126 mm) **June 08**
- Assembly mould design and fabrication **Oct 08**
- **Demonstrator** (3 layers – 126mm) **Oct 08**
- Final moulds design
(dimensions adjustment: 126 → 182 mm) **Jan 09**
- EUDET layer structures production + H (long & short) **Feb 09**
- **EUDET structure** assembly **Jun 09**