

EUDET R&D



CALICE meeting - Lyon

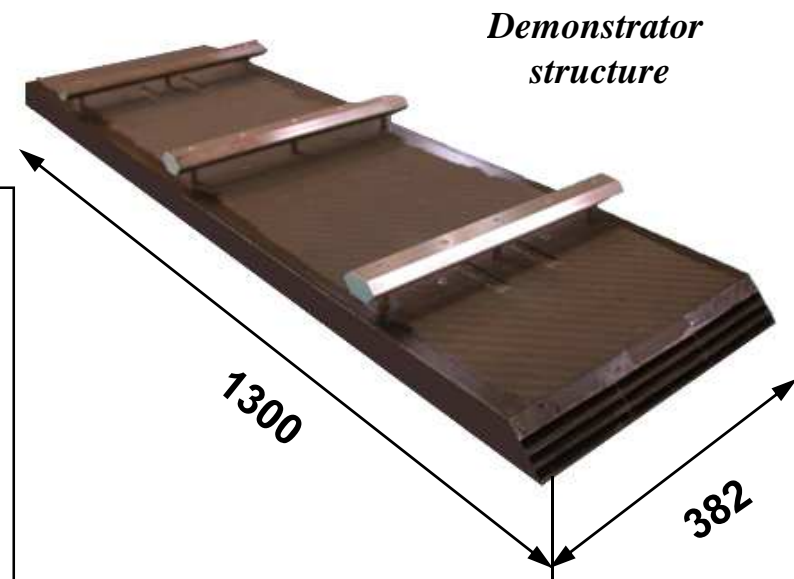


A handwritten signature in red ink, likely belonging to Mickael Frodin.

Mickael Frodin– 17/09/2009

Demonstrator design

- Built a first demonstrator to understand all composite process
- Width is based on physic prototype (124 mm)
- Good precision (width, dead zone, cells thickness) is due to the grinding of CORES (global tolerance +/- 0.01mm).
- Used for thermal PCB studies and cooling system analysis
- Used for the First test of slab integration (gluing, interconnection ...)

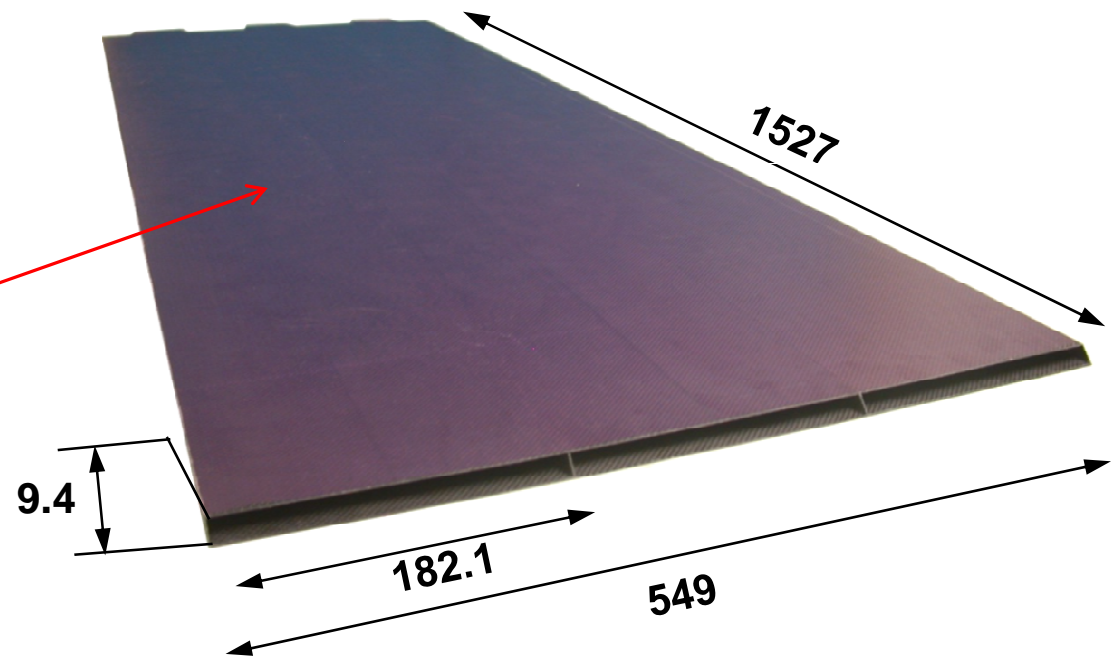


- It's consisted of
 - 3 alveolar layers + 2 Tungsten layers
 - 3 columns of cells : representative cells in the middle of the structure
- Used for **Thermal studies** support
- Width of cells : **126 mm**
- Identical global length : **1.3m** and shape (trapezoidal)
- Fastening system ECAL/HCAL
- weight : ~ **60 Kg**

EUDET design

- New built layer for the EUDET Module
- Cells width is based on 182.1 mm
- Used for BEAMTESTS.

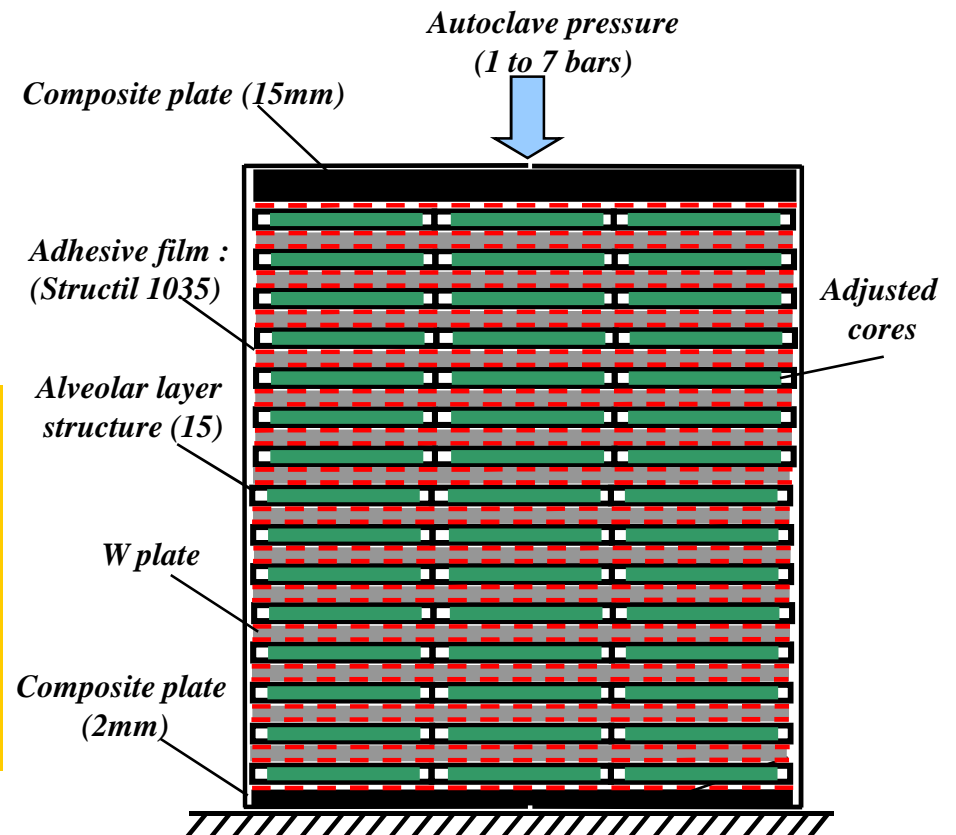
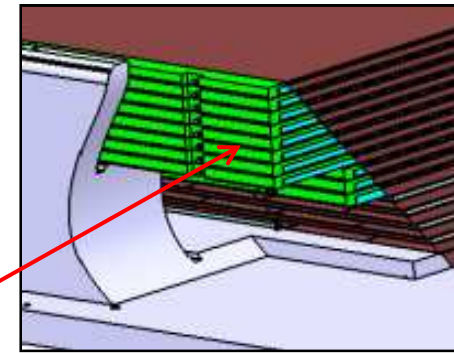
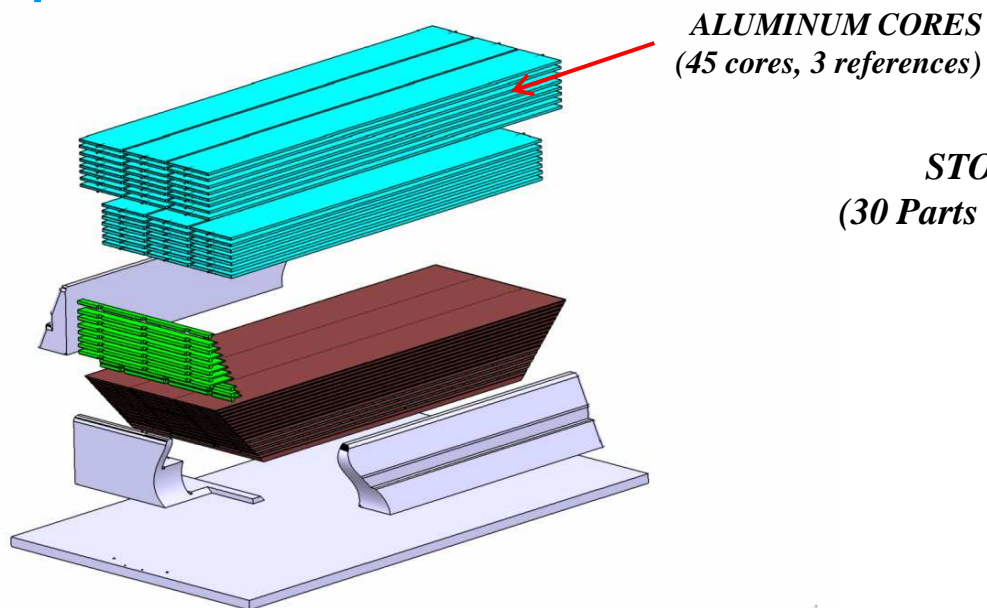
First EUDET layer alveolar structure



- the assembly consisted of
 - 15 alveolar layers + 14 Tungsten layers
 - 3 columns of cells : representative cells in the middle of the structure
- Width of cells : 182.1 mm
- 2 Thickness cells (7.3 mm and 9.4 mm)
- Identical global length : 1.495m
- Fastening system ECAL/HCAL
- Total weight : ~ 800 Kg

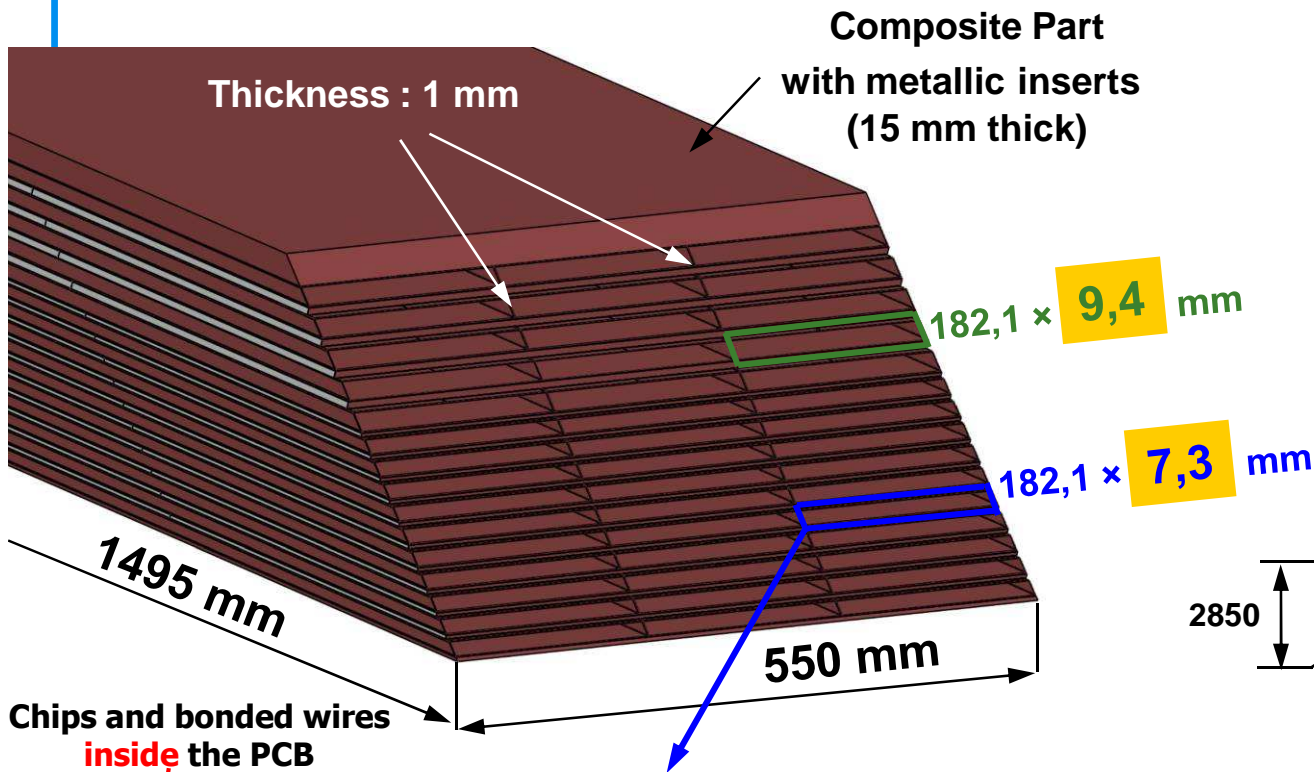
EUDET- Assembly Mould

Now, here is the EUDET assembly mould :

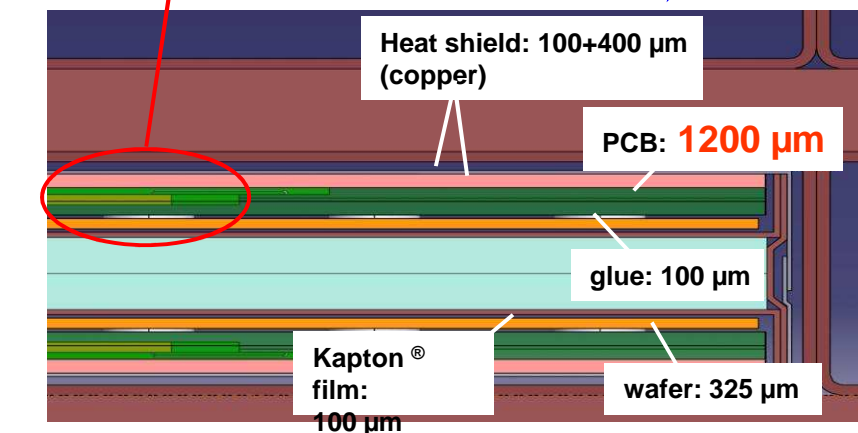
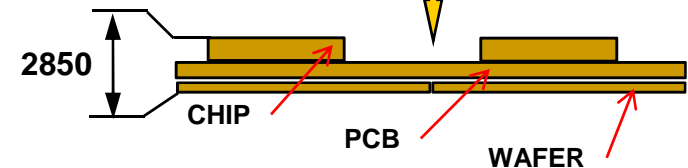
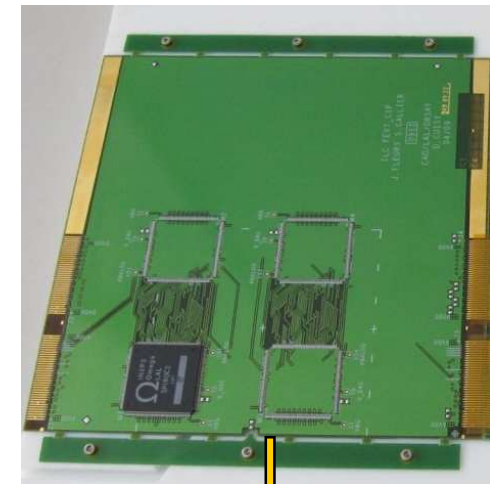


- ⇒ Global design : **OK**
- ⇒ W and Carbon Needs : **OK**
- ⇒ Detailed design description : **ON going**
- ⇒ Technical drawing : **October 09**
- ⇒ Ordered : **November 09**

EUDET design



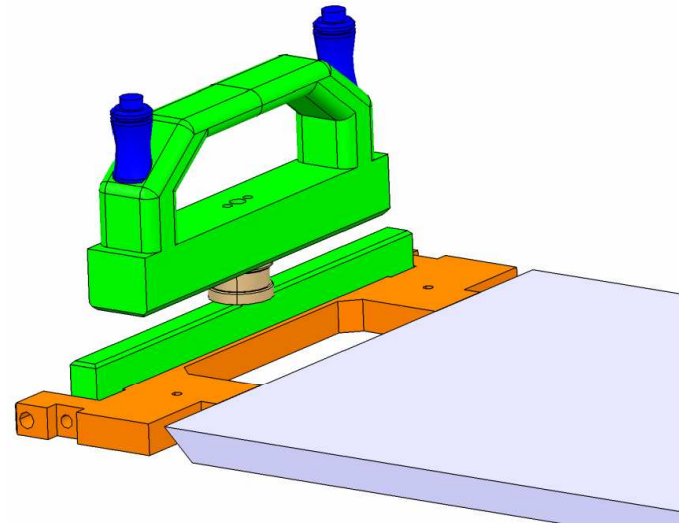
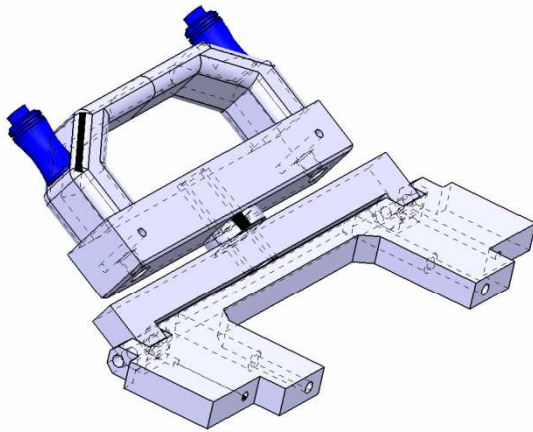
FEV7 CIP at the present time



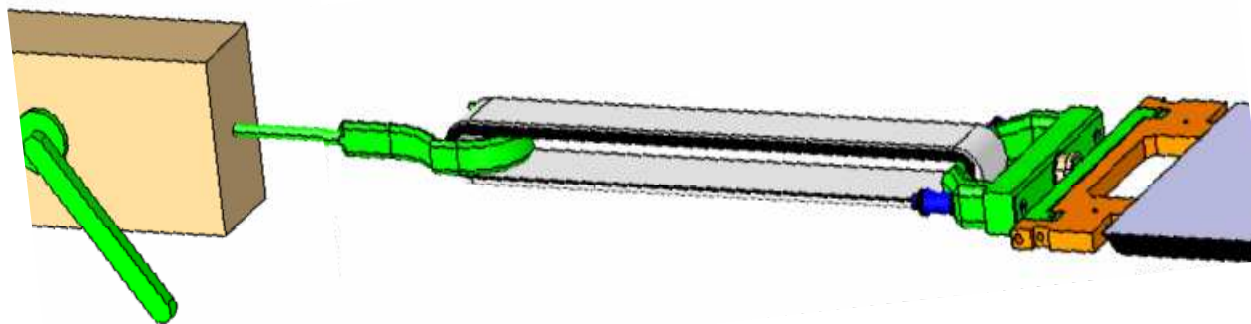
- ⇒ Clearance (slab integration) : 500 μm
- ⇒ Heat shield : 500 μm → Thermal demonstrator
- ⇒ PCB : 1200 μm → but 1100 μm used
- ⇒ Thickness of glue : 100 μm
- ⇒ Thickness of wafer : 325 μm
- ⇒ Kapton[®] film HV : 100 μm ? → tests
- ⇒ Thickness of W : 2100/4200 μm (\pm 80 μm)

EUDET TOOLS : Study and design

- EUDET handle core
 - Safety Transport
 - Facilitate the wrapping core



- Winch extraction core
 - Control the traction force (max 6000 N) and the speed extraction (0,5 m/min)



EUDET – First layer (1/2)

Main process steps :

1 - mould release preparation



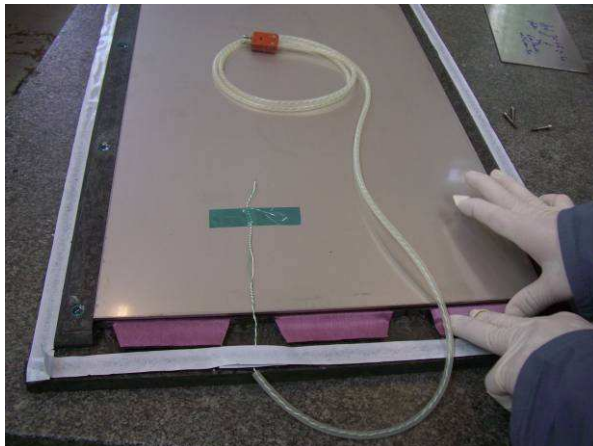
2 - Cores wrapped with prepreg



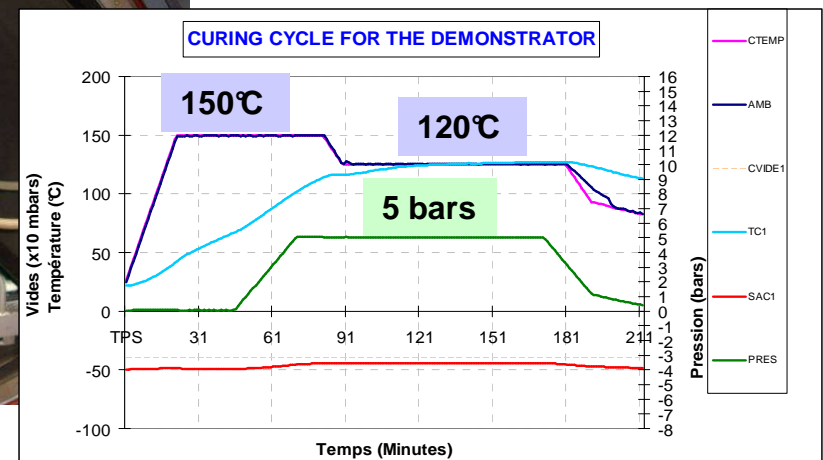
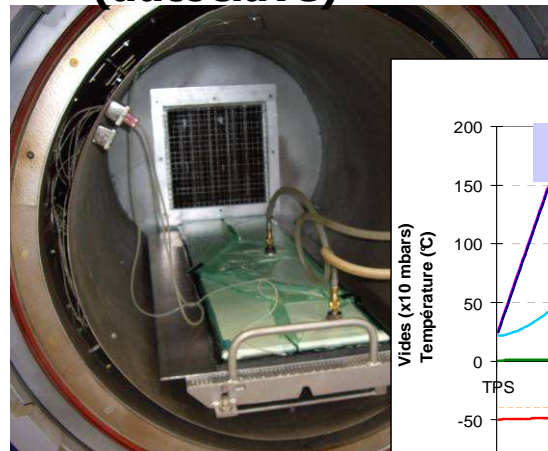
3 – Compression step



4 – Thermal sensor equipment



5 – Curing operation (autoclave)

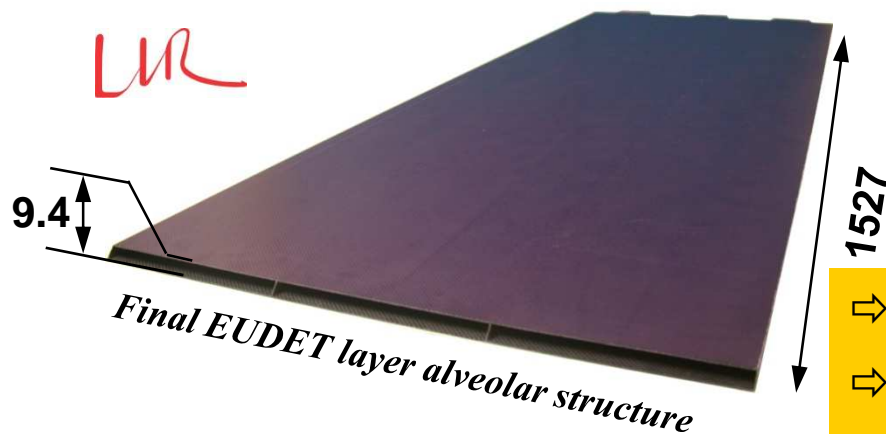
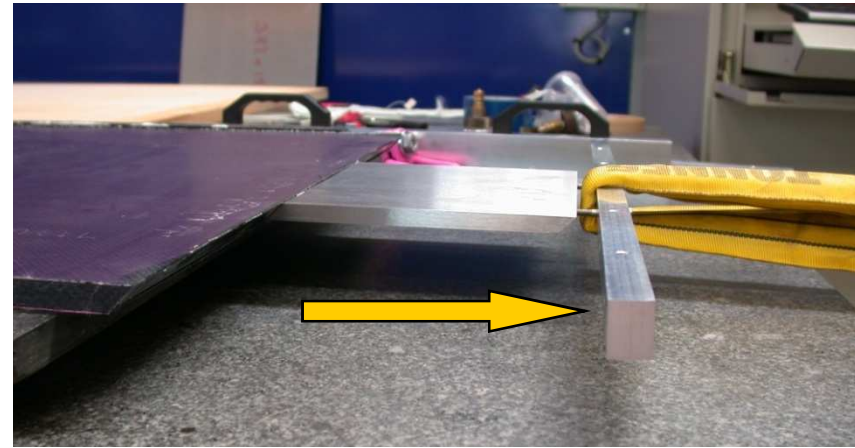


EUDET – First layer (2/2)

6 – After curing step



7 – Main issue : 3000 Newtons of cores traction



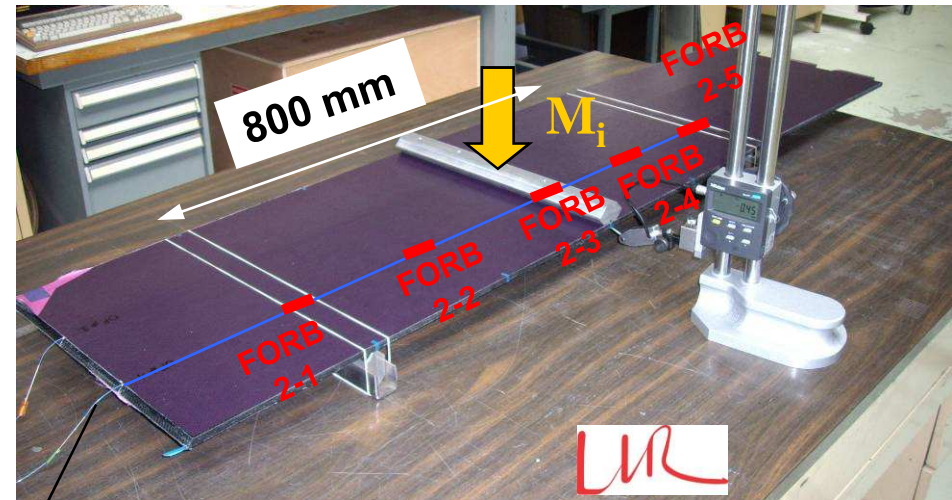
- ⇒ Global design : **OK**
- ⇒ 1/15 "Alveolar EUDET layer" structure : **OK**
- ⇒ Cutting Layer operation: **OK**
- ⇒ The supplier for cutting layer : **ON going**

Mechanical tests – bragg grating

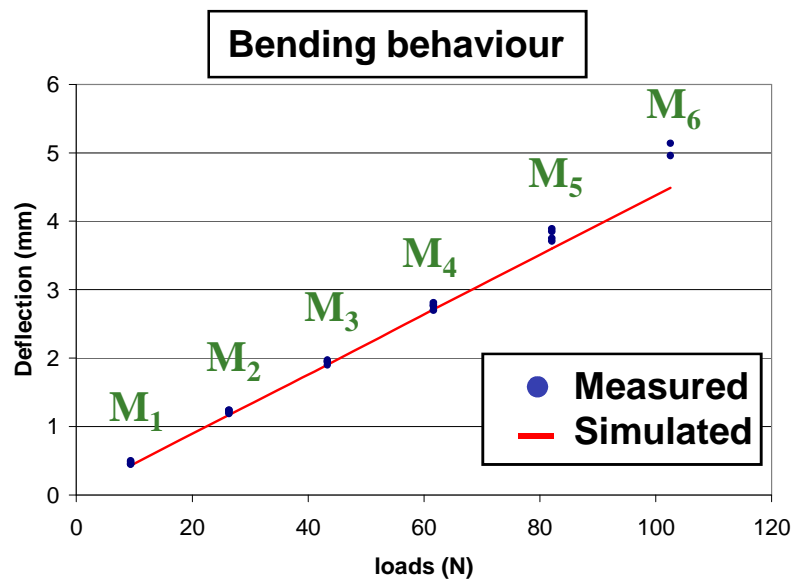
Embedded sensor:

Improve the simulation about the mechanical behaviour

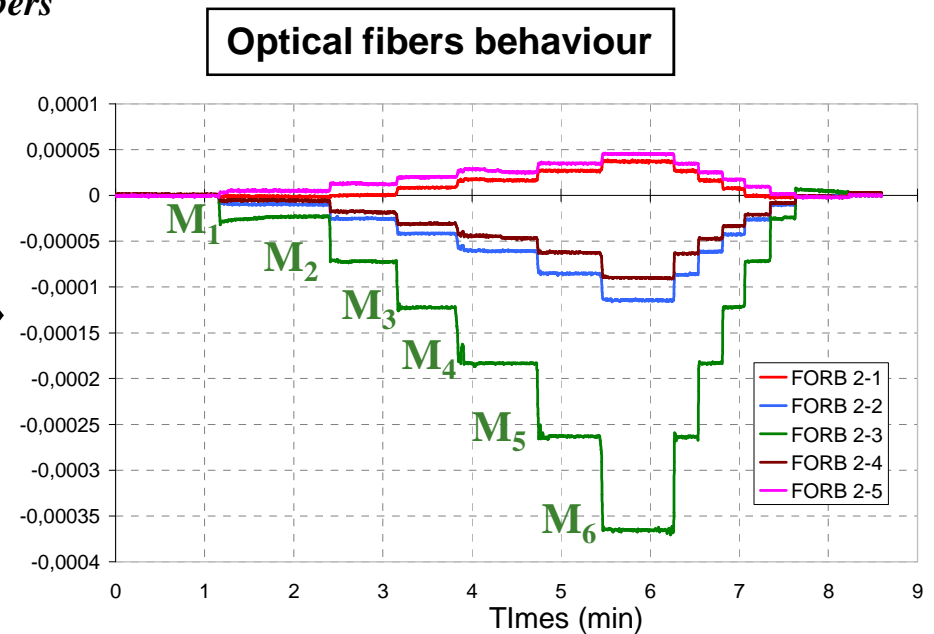
- Non-Destructive tests using optical fibers with 5 bragg gratings along the alveolar structure layer
- Bending tests (3 pts):
6 different cases (M_i) compared with SAMCEF simulations



Optical fibers



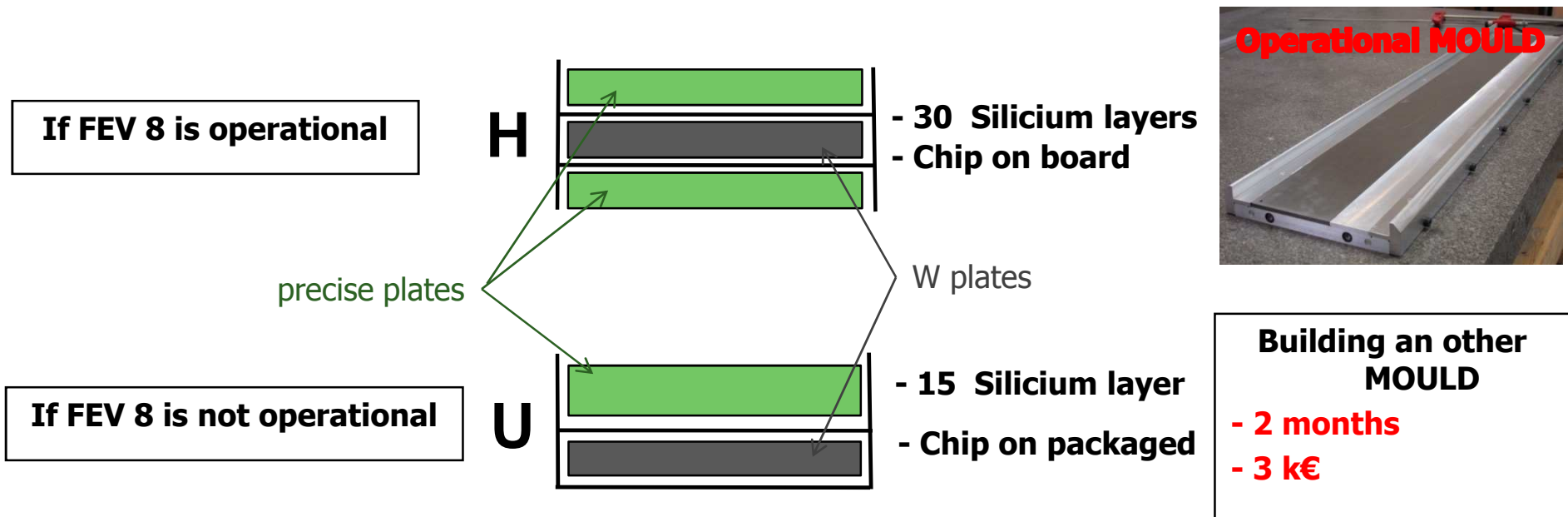
Variation de longueur d'onde de Bragg



EUDET H or U SLAB

Study of one mould for whole slab structures:

- All slabs are made by several short but **precise plates**, assembled in 2 layers, in order to control the thickness and the flatness



- ⇒ Design and Machining: **OK**
- ⇒ first H structure (1300×124): **OK**
- ⇒ EUDET short and long H SLAB: **Decem 09**
- ⇒ EUDET short and long U SLAB: **Fev 10**

Conclusion :

- We have realized a high step :
 - knowledge in the Carbon cells structures building.
 - the demonstrator assembly and mono- EUDET layer.
 - Global dimensions are correct to envisage the ILD assembly as planned.
 - Respect internal dimensions, no problem to insert the slab.
 - Start the Design and studies of the EUDET Assembly Mould.

- The next step :
 - Build 14 mono-EUDET layer.
 - Cutting layer operation.
 - Studies the thermal inerties parameters 1.7 T (W and mould)
 - Insertions slab tests
 - Characterize material Test
 - Continue the mechanical tests (with bragg grating) until destroy ?

Conclusion : schedule

- For Eudet module :
 - Composite reception **realized in april (2008)**
 - "Alveolar layer" mould reception **realized in april (2008)**
 - Building one EUDET alveolar layer in **July (2009)**
 - We will plan:
 - "Assembly mould" design in **October (2009)**
 - 14 alveolar layers in **second half-year (2009)**
 - Eudet structure assembled in the **first half-year (2010)**
 - "14" H or U Short structure in **second half-year (2010)**
 - "1" H or U long structure in **second half-year (2010)**