Mainlines for 2009

- 2009 should be the analysis year!!!
  - Finalizing existing analyses
  - Large bulk of 2007 data still poorly analysed – Scope/Aim of analyses?
    Analysis has started at LLR and LPC.
  - Hadrons in the Ecal – Exploration of high granularity
  - Tighten the interplay with full detector studies
  - Detector LOI's in 2009 – Impact of Calice results?

  - Revision of current Ecal software and improvement of e.g. digitisation?

- Testbeam at FNAL with DHCAL towards end of 2009 !?
  - Completion of first round of CALICE Program

- Construction of EUDET Module
  - Demonstrator Tests in Spring 2009
  - Preparing the assembly of the full Module for easter 2010 (latest)
  - First half of the year mainly hardware (-> EUDET deliverables)
  - Needs to be accompanied by software/analysis effort by late summer '09
    Responsibles for task?

- Preparation of next round of test beams
  - Definition of Programs
  - Preparing the requests of beam times

  (I)LC Testbeam meeting at LAL Orsay – First week of november 09

SiW Ecal EUDET Module

From the TDR to the Demonstrator

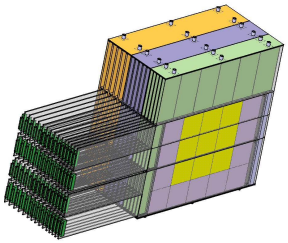
Roman Pöschl
LAL Orsay

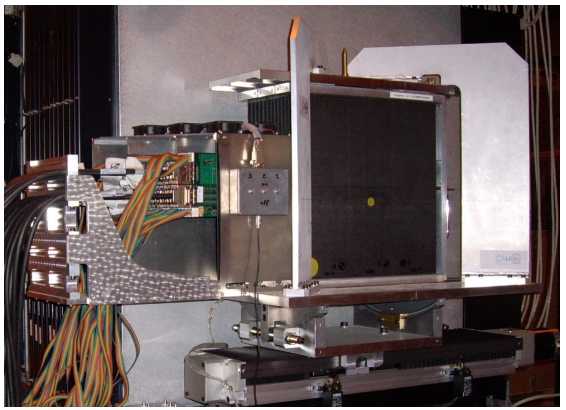
To learn more ....

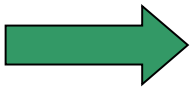
http://flc.web.lal.in2p3.fr/poeschl/siwecal.html

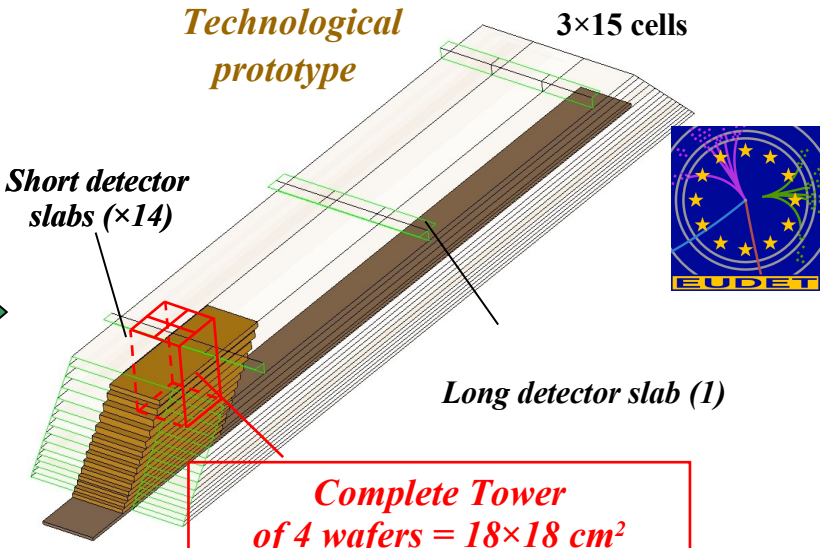
EUDET Prototype

- Logical continuation to the physical 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, wide size structures,…)
- Taking into account industrialization aspect of process
- First cost estimation of one module









- **3 structures : 24 X_0 (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**

boration

- **1 structure : ~ 23 X_0 (20×2,1mm + 9×4,2mm)**
- **sizes : 1560×545×186 mm3**
- **Thickness of slabs : 6 mm (W=2,1mm)**
- **VFE inside detector**
- **Number of channels : 45360 (5×5 mm²)**
- **Weight : ~ 700 Kg**

The groups working on the EUDET Electromagnetic Calorimeter

- What we call “EUDET Module” is in fact the next SiW Ecal CALICE Prototype

- Financial support by EU but largest fraction of funding still from “Calice” ressources!!!!

Time Scale of Project

~Today | Spring 2009 2009 | 1/7/09 | Summer/Autmun 2009 | 2010

← Studies on mechanical Integration and DAQ -> | Tests avec ASU1 | Tests avec ASU2

Design of Prototype concluded

Assembly and studies with Demonstrateur

'ASU 1': SPIROC2/SKIROC with FEV7

EUDET: Deadline, Alveolar Structures and ASU 1

ASU2: SPIROC2 with FEV8

EUDET-Memo-2008-07

ECAL Si/W – Design and Fabrication of moulds for the EUDET Module

M.Anduze, R. Poeschl

July 01, 2008

Covering apects of the alveolar structures

TDR of SiW EUDET Module

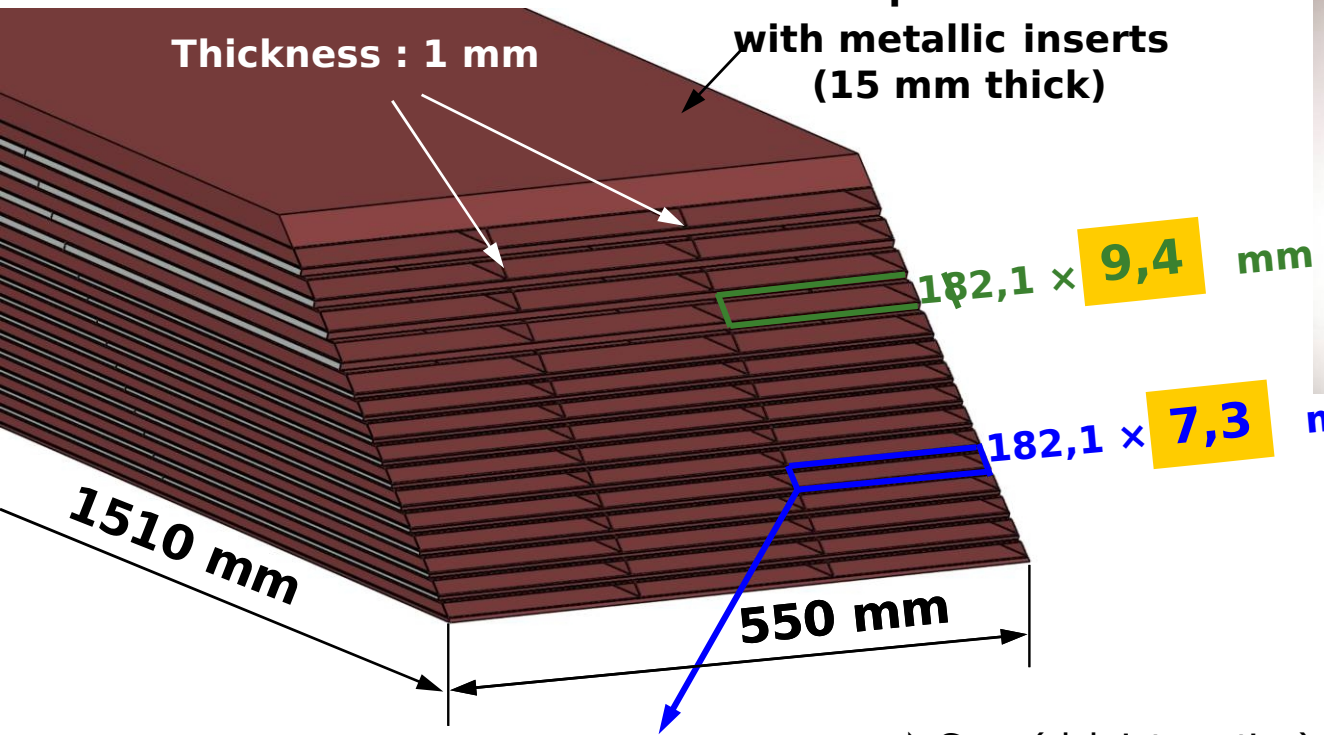
EUDET Memo 2008-11

JRA3 Electromagnetic Calorimeter Technical Design Report

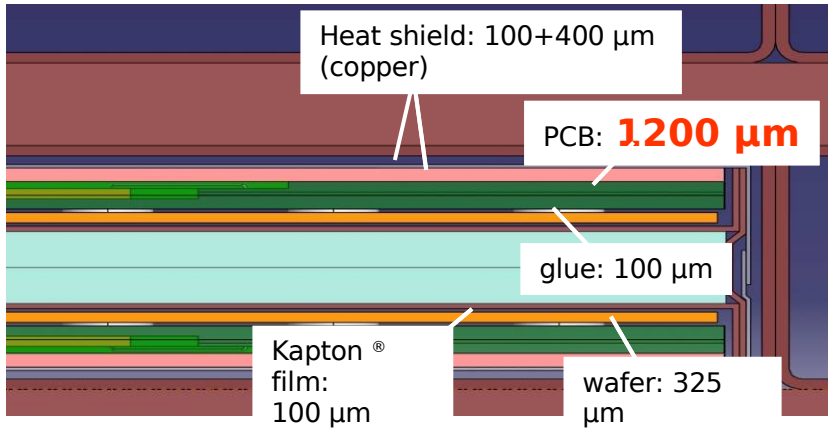
M. Anduze[1], D. Bailey[2], R. Cornat[1], P. Cornebise[3], A. Falou[3], J. Fleury[3], J. Giraud[5], M. Goodrick[4], D. Grondin[5], B. Hommels[4], R. Poeschl[3], R. Thompson[2]

Detailed Technical Design of EUDET Module

Module EUDET – Current Design (final)



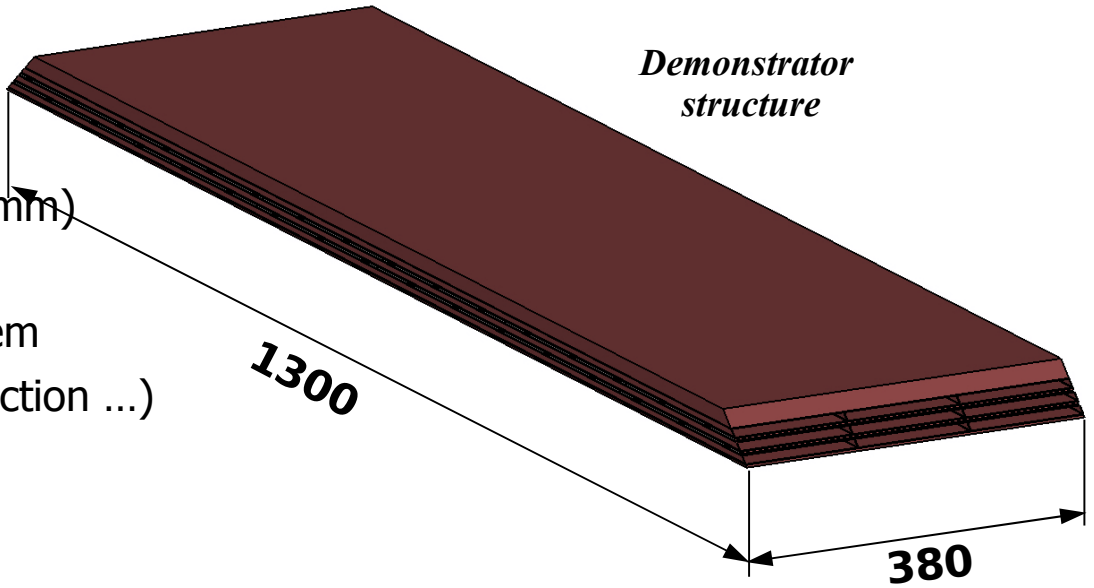
Thickness :
FEV5-1 : 1.17mm (+-0.04)
FEV5-2 : 1.19mm (+-0.04)
FEV5-3 : 1.20mm (+-0.02)



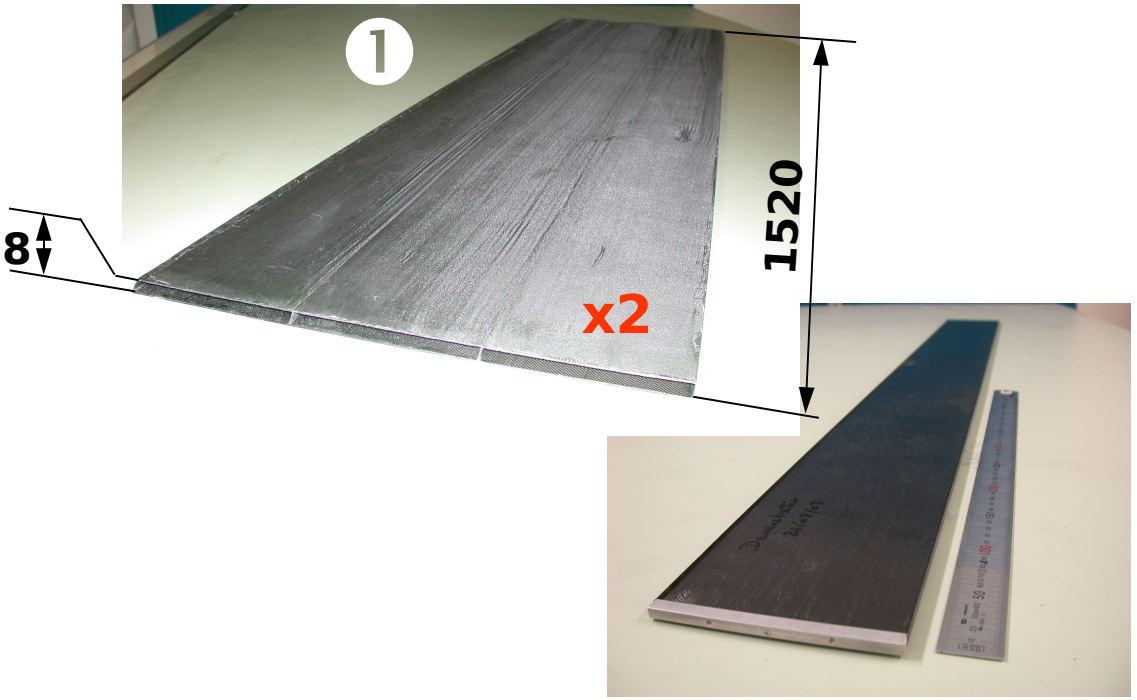
- ⇨ Gaps (slab integration) : 500 µm
- ⇨ Heat Shield: **400 µm ?** Validation with the demonstrateur
- ⇨ PCB : ~~800 µm~~ **~1200 µm**
- ⇨ Thickness of Glue : 100 µm
- ⇨ Thickness of SiWafer : 325 µm
- ⇨ Kapton® film HV : **100 µm ?**
- ⇨ Thickness of W : 2100/4200 µm (± 80 µm)

Demonstrator design

- We have constructed a demonstrator
  validate the assembly process
  before the actual EUDET Module
- Width the same as for physics prototype (124 mm)
- Thermal Studies:
  Equiped with thermal PCBs and a cooling system
- First test of slab integration (gluing, interconnection …)



first test of alveolar layer



- **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**

Parties Involved

6 Laboratories are sharing out tasks in according to preferences and localization:

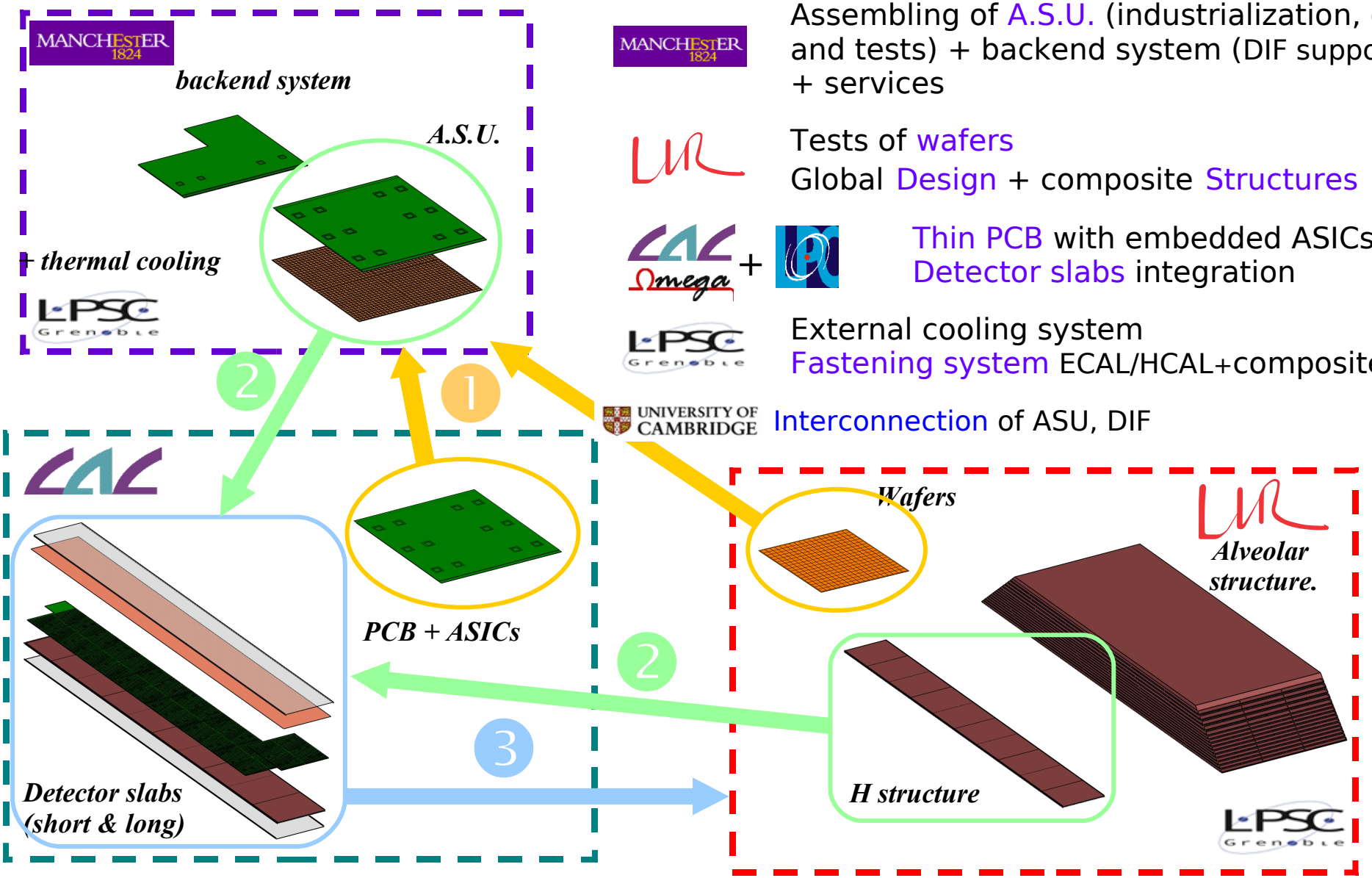
Assembling of A.S.U. (industrialization, gluing and tests) + backend system (DIF support) + services

Tests of wafers
Global Design + composite Structures

Thin PCB with embedded ASICs
Detector slabs integration

External cooling system
Fastening system ECAL/HCAL+composite plates

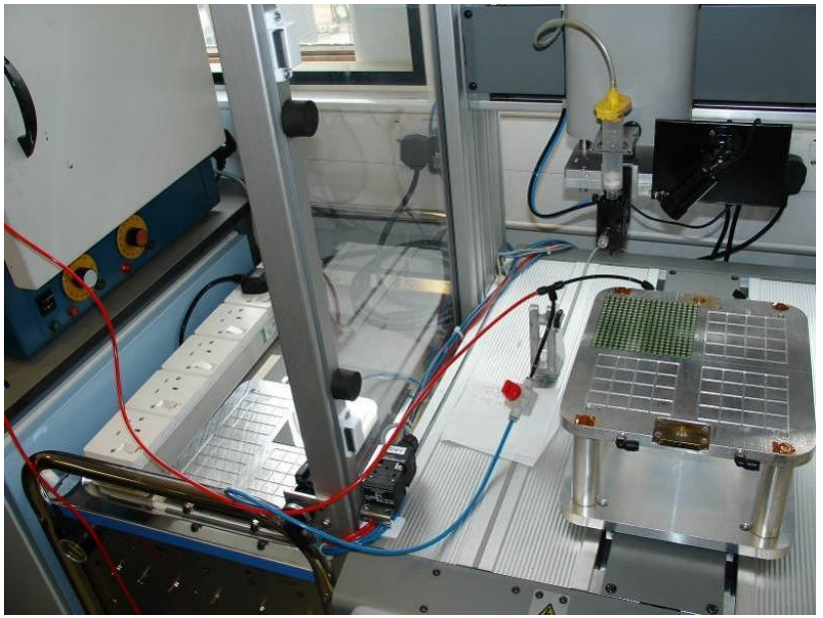
Interconnection of ASU, DIF



Gluing of ASUS

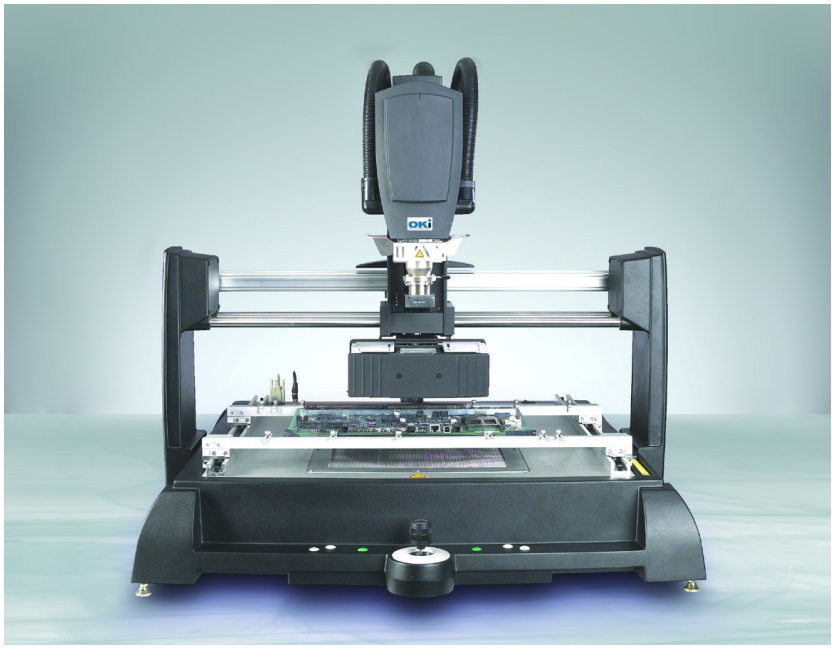
- Controlled glue dot deposition on the PCB
- The (four) Si Wafers are picked up, aligned and placed on the PCB
- Accurate thickness and planarity control via vacuum jigs
- The assembled ASU is allowed to cure

Test board with Dispenser Robot



“Gluing” rate 0.4 Hz

BGA Workstation for Wafer Placement



Precise Wafer Placement
by Split Field Optics

ASUs for four thermal layers glued at Uni Manchester

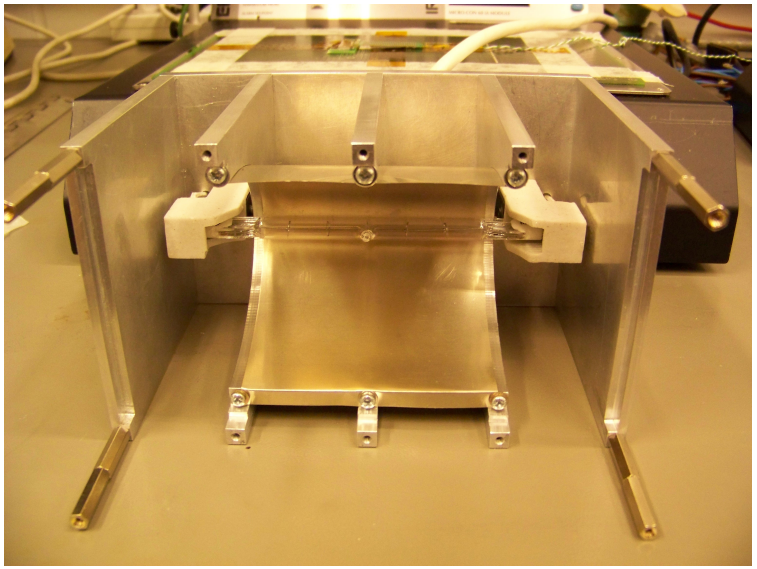
The crew (mainly) working on the Ecal EUDET Module

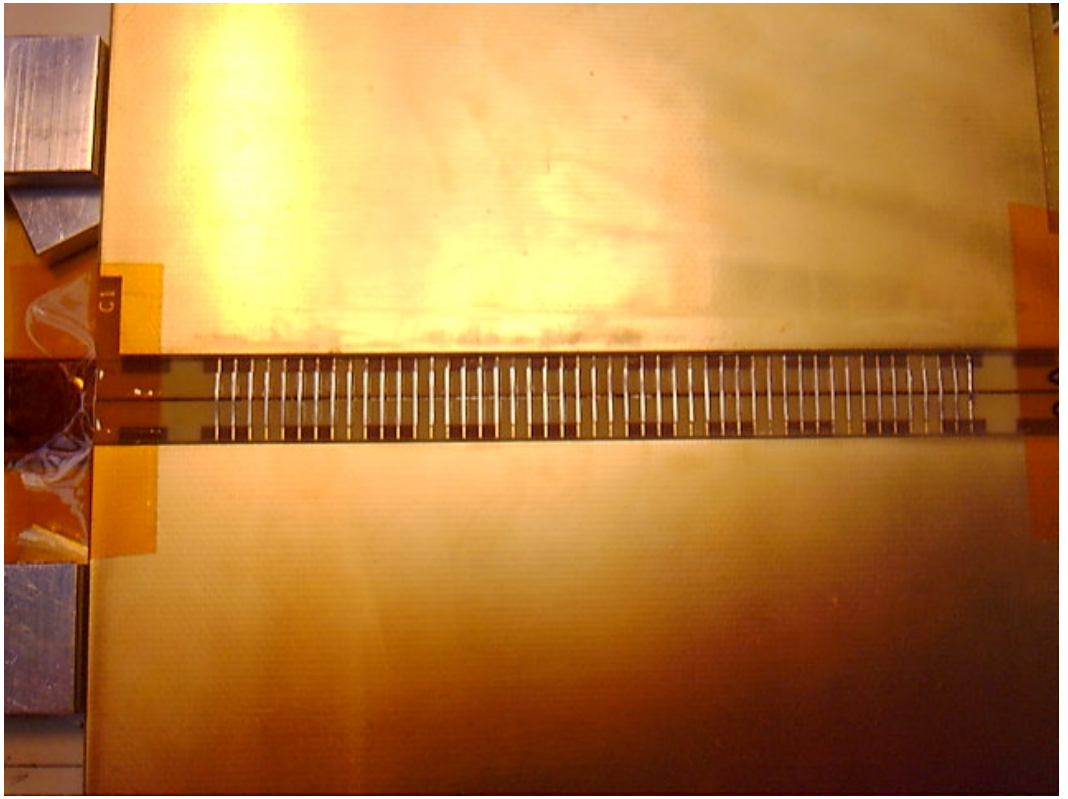
Missing: D. Bailey and R. Thompson

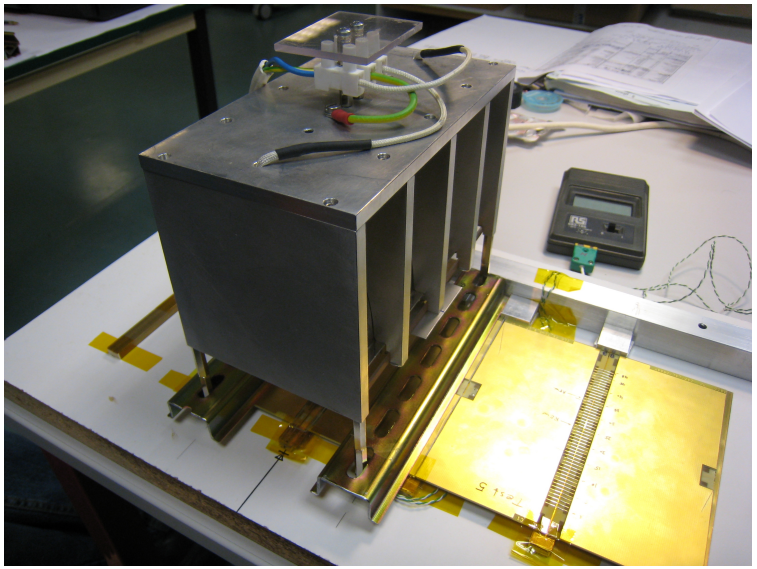
Photo shot during interconnection tests/studies at LAL Orsay
12/1/09 - 16/1/09

Workshop with H and Thermal Boards

The joint between two boards





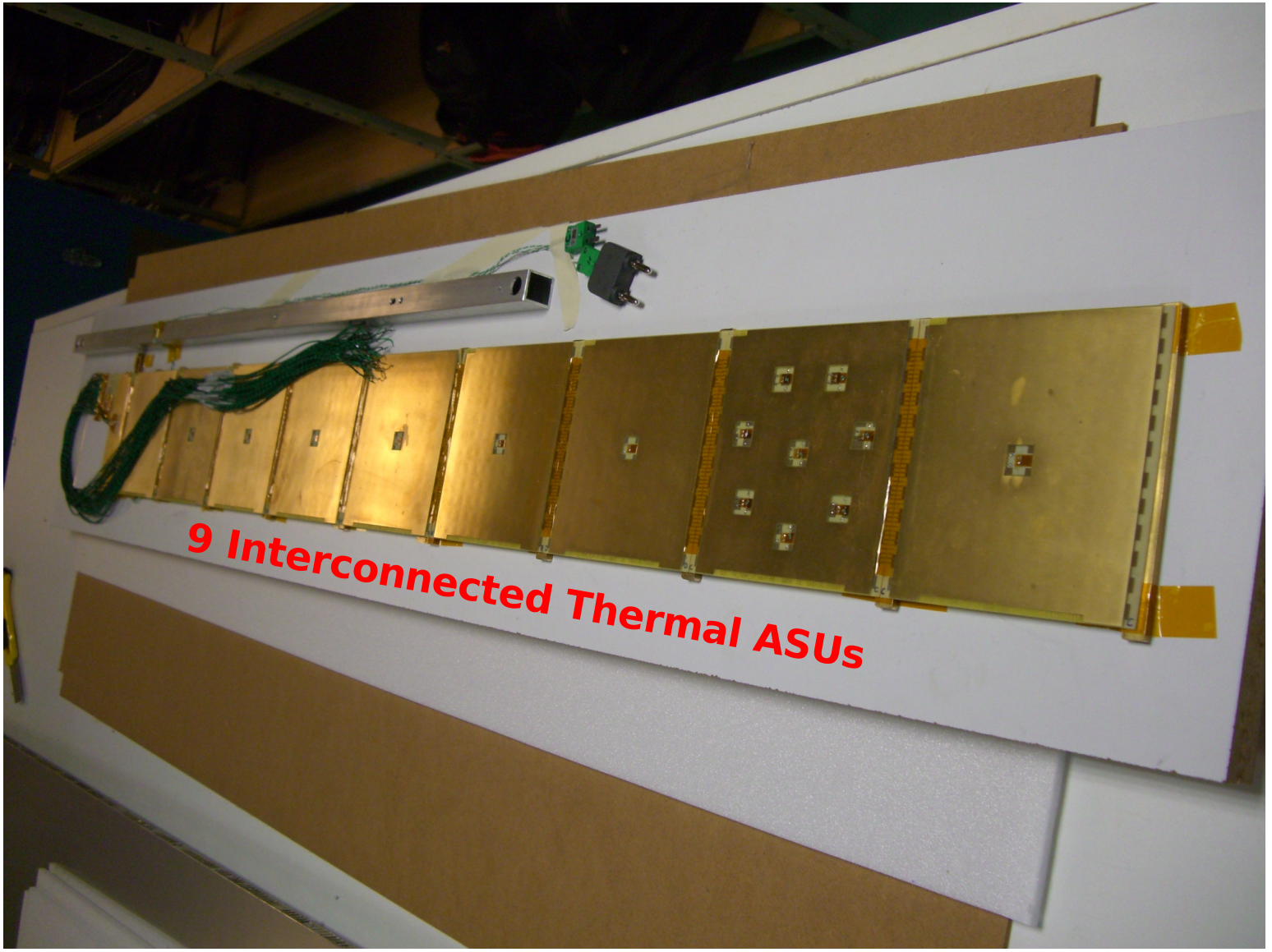


- Joint by halogen lamp heating up tin-bismuth soldering paste
  (Method developed by U. Cambridge)

- Heating Temperature ~200° C

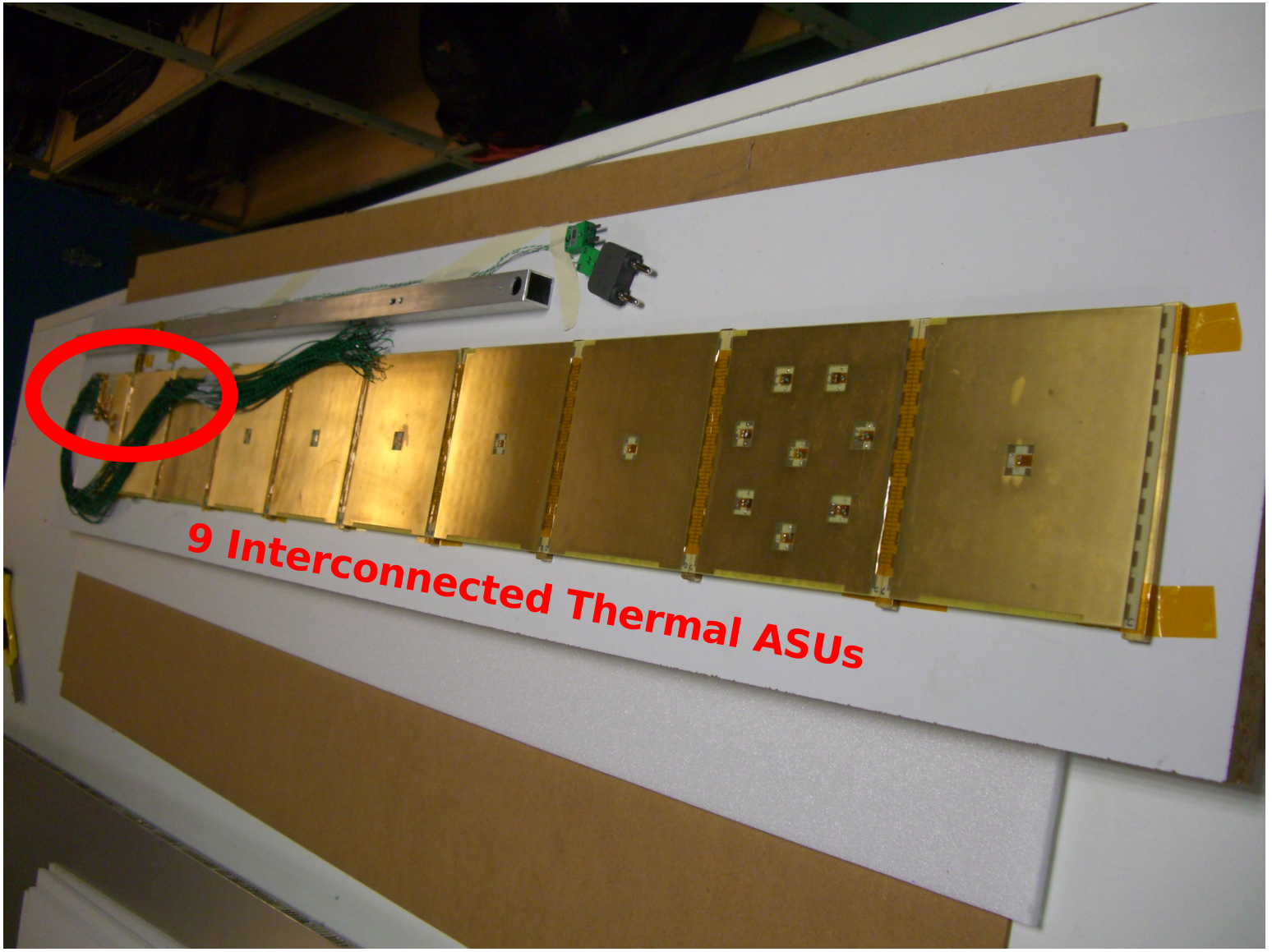
Delicate Process for Demonstrator – Easier for EUDET Module

Thermal Layer assembled and ready for Thermal Tests



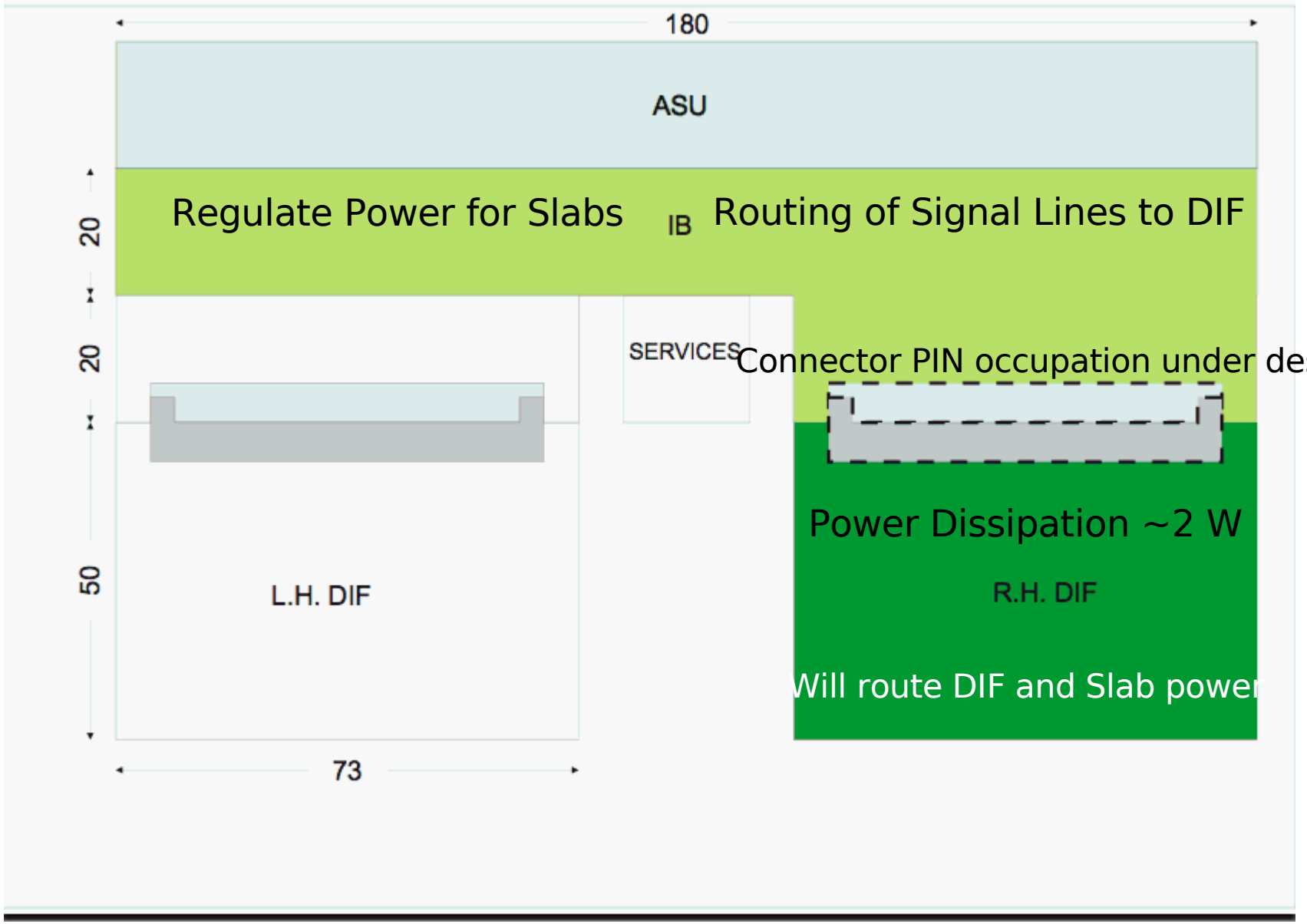
- w/o Photo: Copper Shielding and CuCe Electrical Protection manufactured at CERN in Collaboration with CALICE

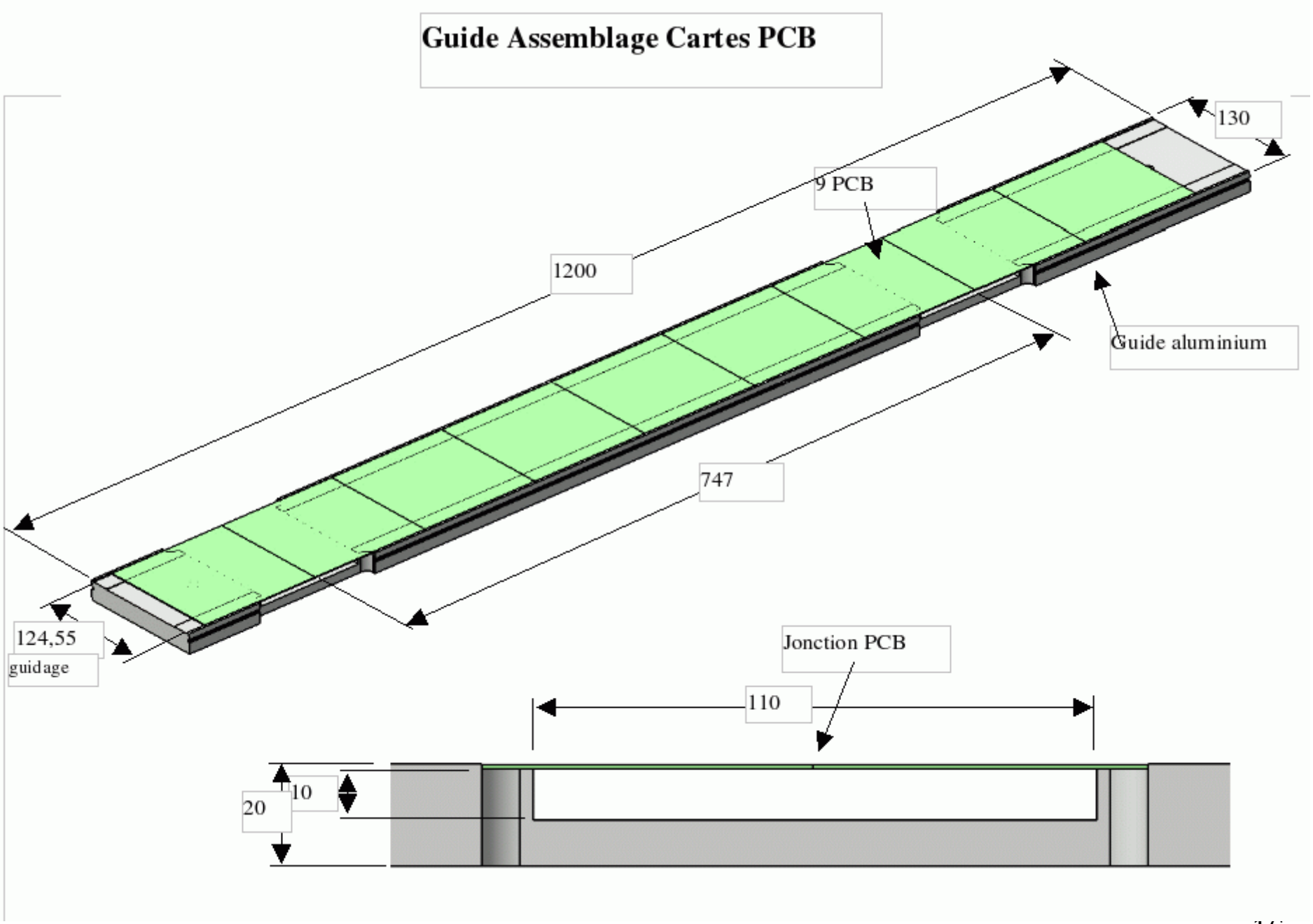
Thermal Layer assembled and ready for Thermal Tests

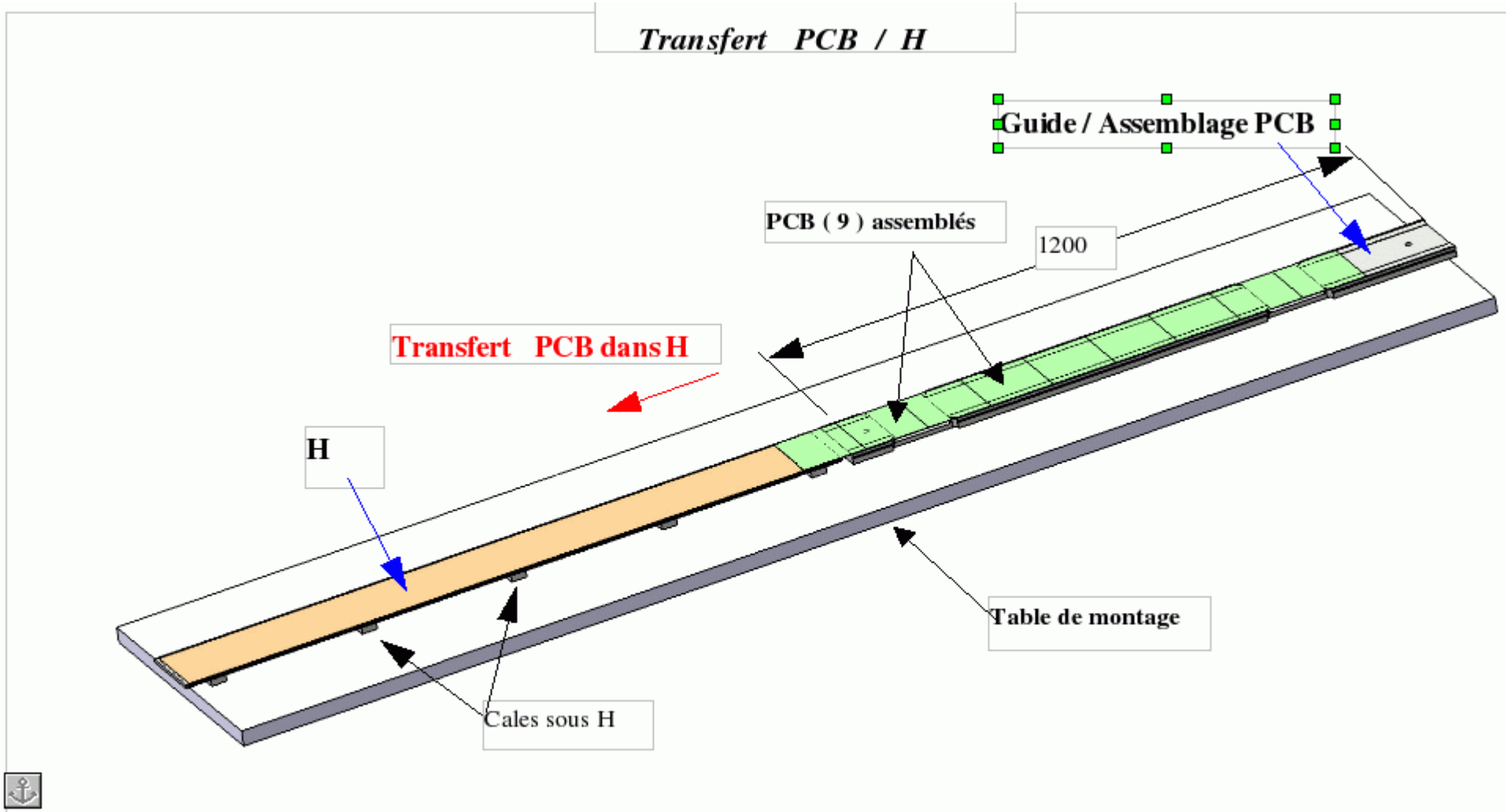


- w/o Photo: Copper Shielding and CuCe Electrical Protection manufactured at CERN in Collaboration with CALICE

Agreed Dimensions DIF/IB Region




Guide Assemblage Cartes PCB
130
9 PCB
1200
Guide aluminium
747
124,55
guidage
Jonction PCB
110
10
20

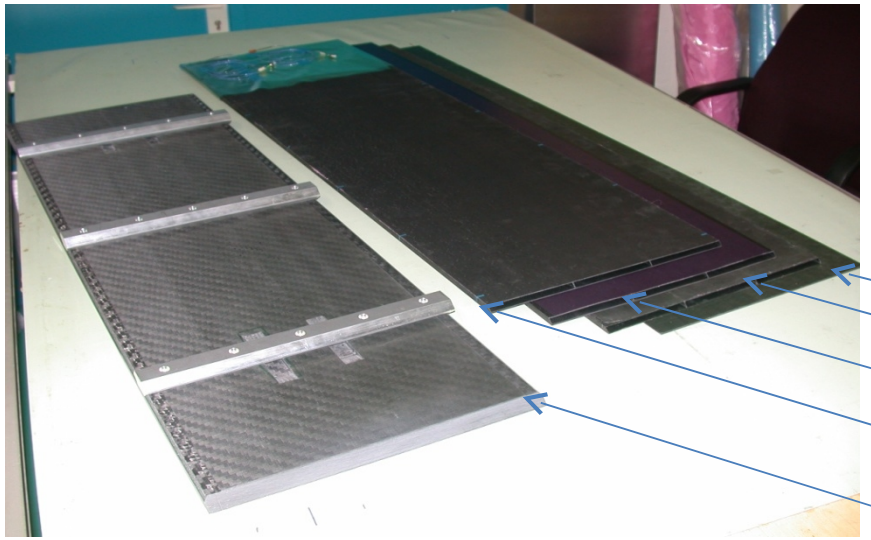


- Integration Cradle gets ready as we speak
- Will be used for second thermal layer

The integration cradle in the Mechanical Workshop

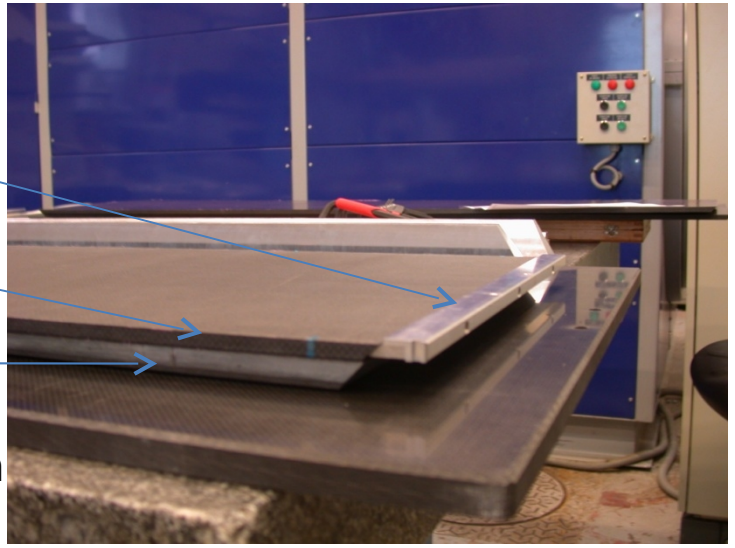
First Assembly of the Alveolar Structure for the Demonstrator

Mechanical Structure only slightly smaller than for EUDET Module



All pieces for mechanical housing of “Demonstrator” Slabs available

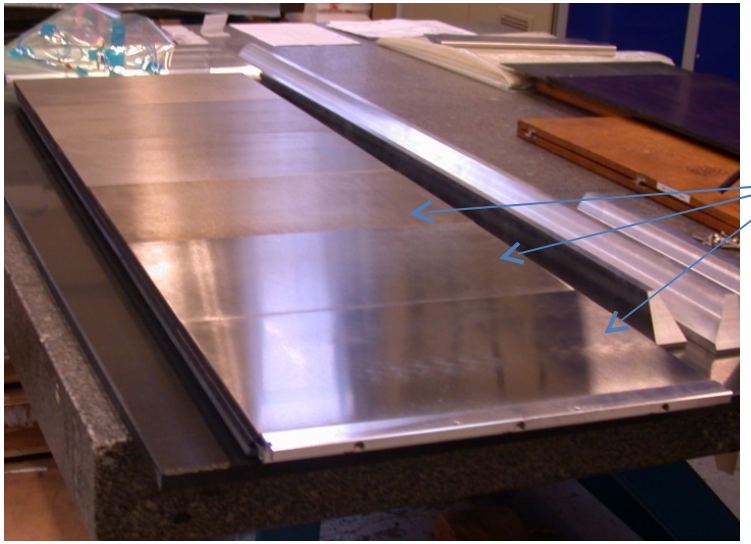
Full Assembly



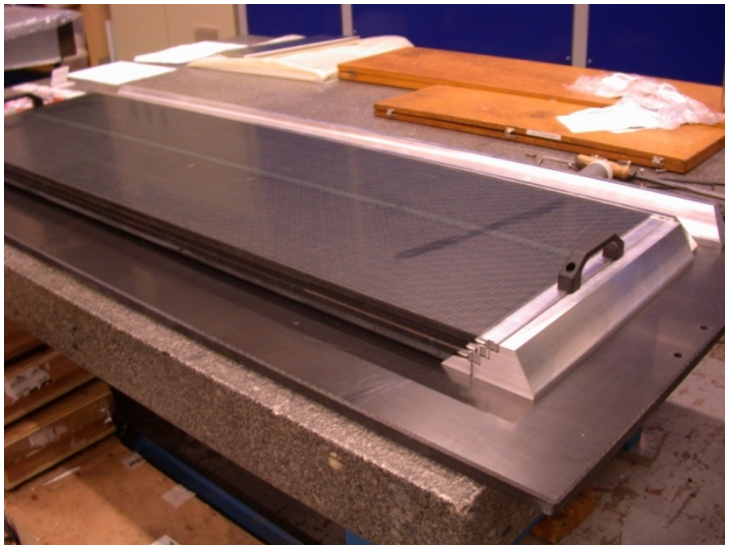
Adjusted cores

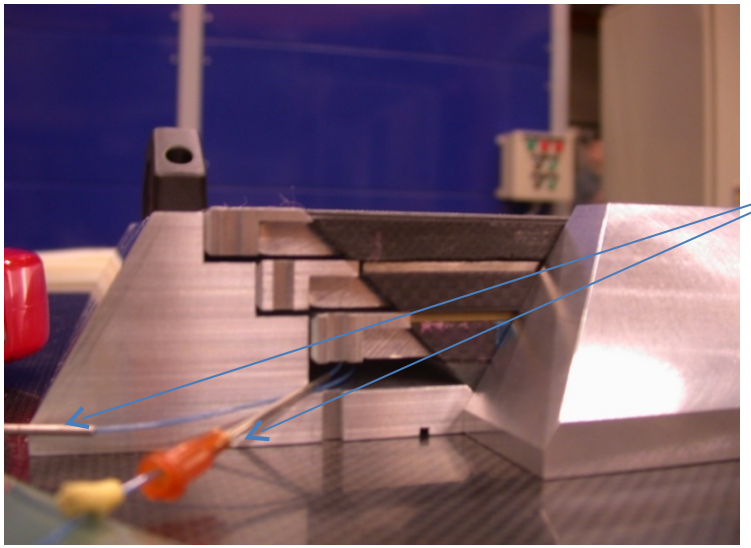
Carbon Cell

Big Carbon plate



Tungsten plate





Optical Fiber to monitor stress

...including Aluminum Cores and Assembly Mould

-> Ready for Curing

Conclusion and Outlook

- Technical Design finished in Oct. 2008
  Preparation of Demonstrator Tests since then

- In the middle of the studies with the demonstrator
  - First measurement for thermal analysis
  - Assembly of alveolar structure nealry finished
  - Integration cradle for long slan nearly read

Demonstrator studies finished by March 2009
Will cover most if not all aspects described in EUDET proposal
The collaboration is a real pleasure, thanks to everbody involved!!!

Conclusion and Outlook cont'd

- Towards the EUDET Module

  - Moulds for H Structures and alveolar layers ordered
    Fabrication of full blown alveolar stucture is EUDET deliverable
    Expected beginning of June

  - Assembly Hall for EUDET at LAL in preparation

  - “Wrapping” of Slab and Integration Cradle for 'real' slab
    - needs further study
    - needs special tools which are very expensive!!!!

- Focus of getting the VFE accomplished in early 2010
  - Meeting EUDET Timeline with “intermediate” solution for VFE
    SPIROC in SKIROC on a FEV7, let's look for a few cosmics
  - Special (expensive) equipment and manufacturing procedures needed for mass production of chips and boards (See talk by Stephane)
  - Michele at LAL to strengthen communication between engeneering and physics

- “Shipping” signals out
  Interface to the DAQ and beyond will be addressed -> Daniel