



# Report from the Technical Board



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## From FNAL to UTA

Developments since CALICE TB Review Meeting at FNAL

CALICE Collaboration Meeting Arlington/TX March 2010

# The Corner Stones

- Concluding the “Physics Prototype Phase” - Phase CALICE I - with completion of the US-DHCAL and combined test beam at FNAL with the SiW Ecal and TCMT

## **Roadmap issue of TB Review meeting**

NEW: Physics Prototype of W-HCAL

- Preparing/Realising the “Technological prototype phase” - Phase CALICE II

Several prototypes moving towards construction phase

- SiW Ecal  
New: Common effort with ScintEcal
  - SDHCAL-GRPC
  - SDHCAL with Micromegas
  - AHCAL
- Generic R&D on DECAL/MAPS

## Towards the US-DHCAL

- US-DHCAL needs to construct 1 m<sup>2</sup> layers with new components and newly developed manufacturing techniques
- Large GRPC including resistive painting  
Reliable painting still seems to be an issue!
- New Chip DCAL III – Mass test successful all Chips at Hand
- New FE Boards adapted to needs of 1m<sup>2</sup> layers  
In Test phase before mass production, 120 FE needed
- Mastering the manufacturing process (Building of frames, Gluing of different components  
Good Progress: infrastructure settled for RPC assembly, trained staff  
Cassette integrated into Calice stack at FNAL
- Integration of DAQ and s/w into existing calice scheme  
Intensively discussed – Modifs to trigger and timing module to handle event busy flag from CALICE DAQ
  
- First layer not yet realised but gets in sight
  
- TB asked for a time plan on the mass production of 120 Chambers to make up the 40 Layers needed  
Current goal is to have 40 layers by end of April. Challenging!!!!
  
- TB strongly recommended a 1<sup>st</sup> Layer integration  
Test will be done after April 1 . Requires Paul, DESY colleagues and maybe R.P. an site at FNAL
  
- Integration of the GEM structures fell a bit out of focus

## Combined test beam – Detector Status and Constraints

### - SiW Ecal

Investigation of reason for dead areas during summer09 on LLR test bench.

Dead zones not reproducible)

**SiW Ecal is ready at any time to be put back into the test beam**

N.B.: In order to save travel money test beam have to be conducted with minimal man power on site

Shifts via remote control room -> to be established in France

**Definition of beam test program would however need input from SiWEcal <-> AHCAL combined tests**

### - TCMT

- Currently no funding for TCMT available

- Detector would be run by DESY colleagues with local support by NIU

**TCMT is however operational**

### - Beamline/Trigger

- Commissioning by DESY with support from other testbeam participants

### - Two important issues to be mentioned

1) The stage at FNAL is unused since June 2009

2) Due to customs regulations the stage has to be transported back to Europe by **April 2011**

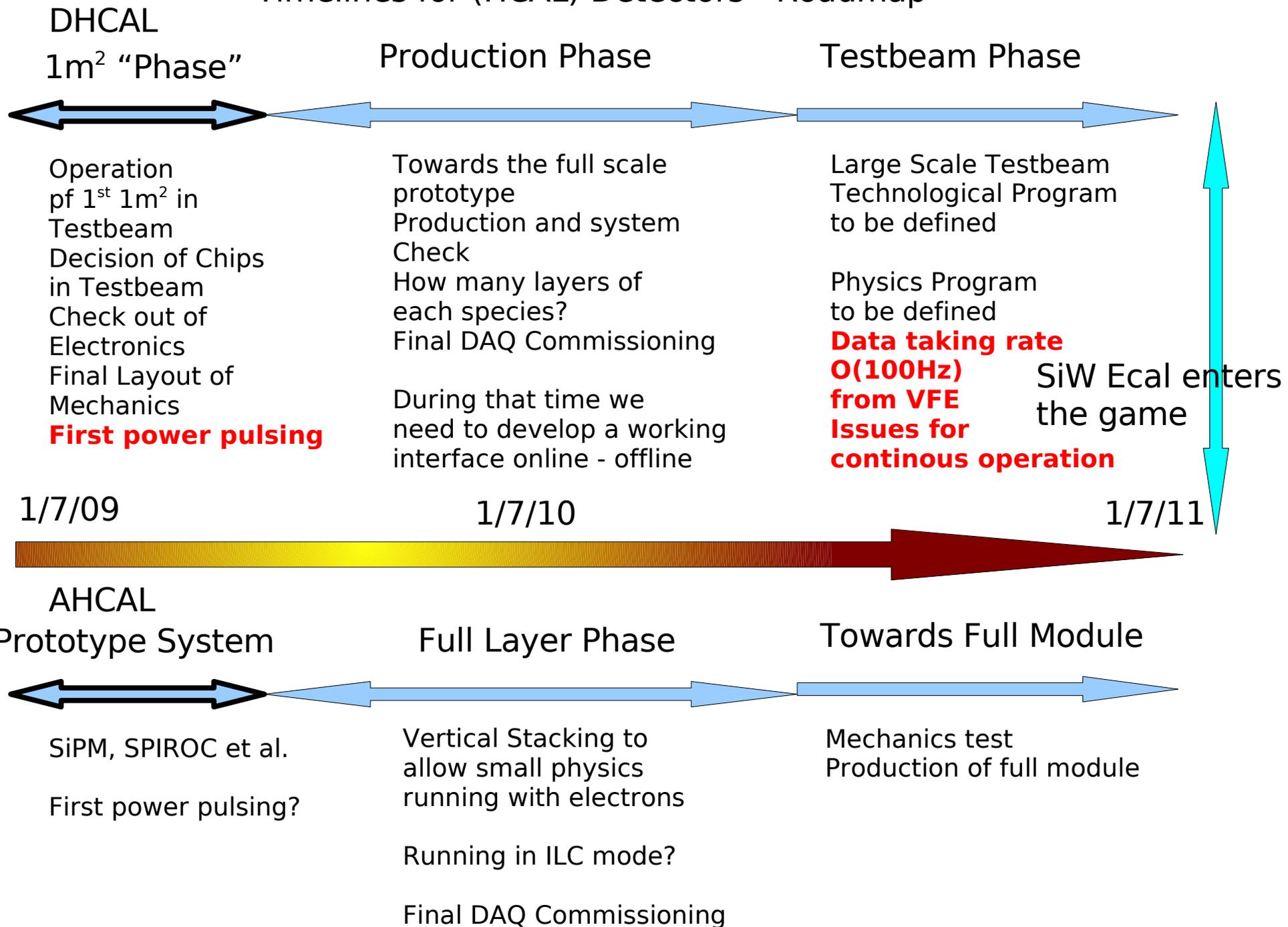
# First Steps on the Roadmap – Towards the Technological Prototypes

**The aim is to build and operate prototypes as close as possible to what we would like to have for the ILC**

- How well do the ongoing projects meet this requirement?
  - What steps are needed to complete the prototypes
  - Where can we act as a collaboration?
- 
- Roadmap for technological prototype as issue of FNAL meeting
  - Agreed by Steering Board at Collaboration Meeting at Lyon  
TB Review Document can found under

<http://flc.web.lal.in2p3.fr/poeschl/tb-review.doc>

# Timelines for (HCAL) Detectors - Roadmap



# SDHCAL GRPC and Micromegas – Towards a 1m<sup>3</sup> prototype

## GRPC

- successful tests with 1m<sup>2</sup> prototypes in 2009  
Tests with HRI, HRII
- Chamber construction under control
- Very interesting results with semi conductive glass  
-> High Rates ~100kHz/cm<sup>2</sup>
- 2010 continuation of 1m<sup>2</sup> tests  
Power pulsing on the agenda
- Step from USB based DAQ to “EUDET DAQ”

## Micromegas

- Less successful year 2009 in terms of beam tests  
DAQ Problems, Spark problems
- Beam tests for 2010 with 1m<sup>2</sup> planned  
- DIRAC or HARDROC?
- Mechanics for Chamber construction under control
- Flexibility for installation in existing or new Calice stack

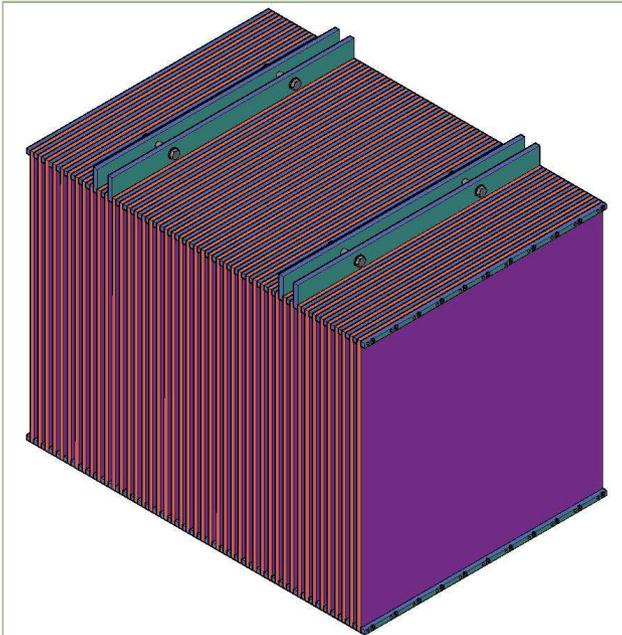
Close collaboration at DAQ Level – DIF and beyond

Number of layers to be produced in 2010 for each variant of sensitive material left to committees organised in France

(Distribution of existing funding for french contribution to SDHCAL)  
Consultance by Technical Board if desired

# SDHCAL - Self-Supporting Structure

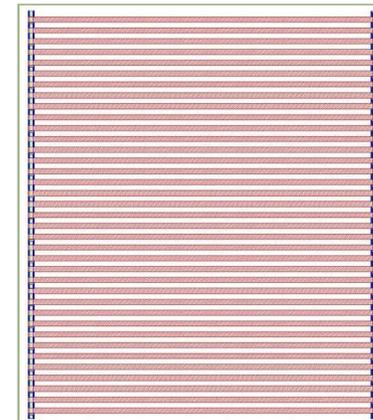
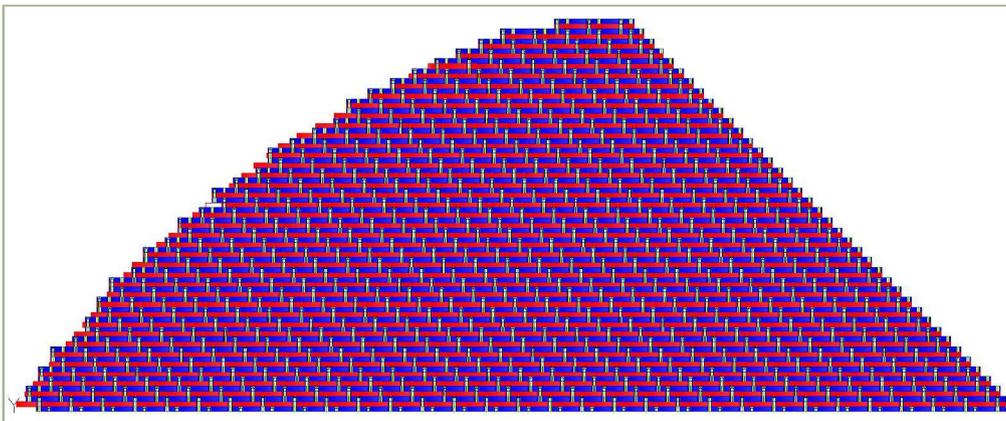
In agreement with recommendation of TB Review Document



## Mechanical structure, parameters:

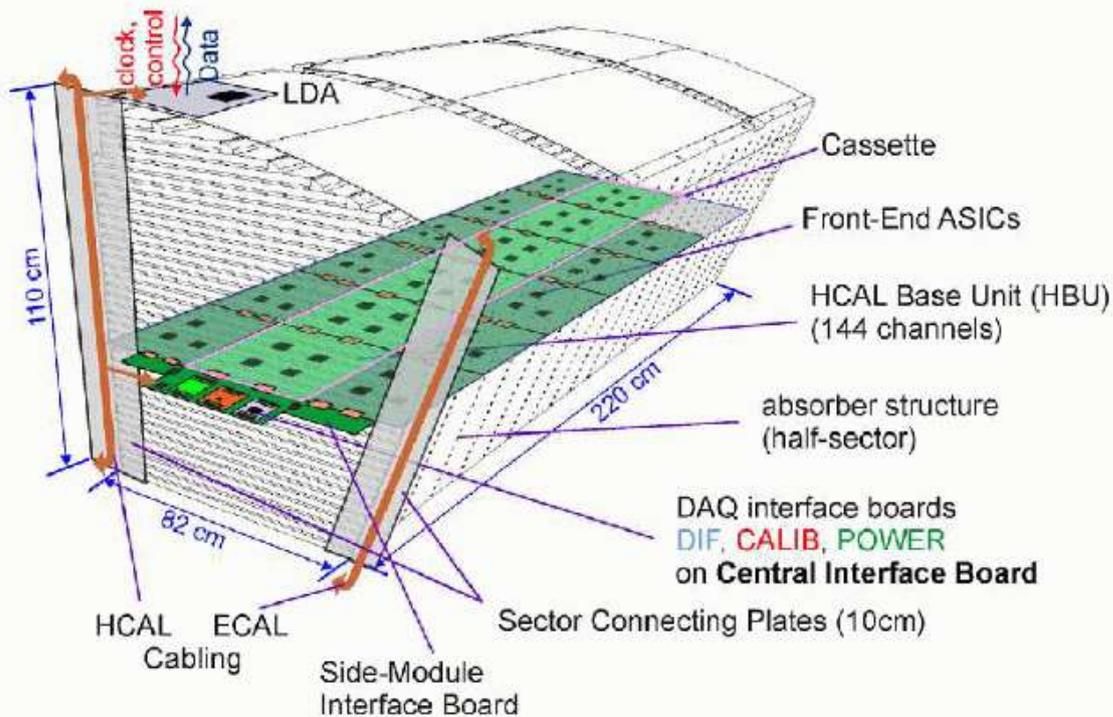
- 44 slots to can implement 44 MICROMEAS or GRPCs.
- Structure compose of only 2 different kinds of pieces. Attached between by M8 screws, 11+11 bolts by layer.
- plus base support pieces and the manipulation fixations (By 2 bolts of M20), only can be fixed elements to the bar pieces.

## Extrapolation of the $m^3$ module philosophy for the ILD (One Proposal!!!)

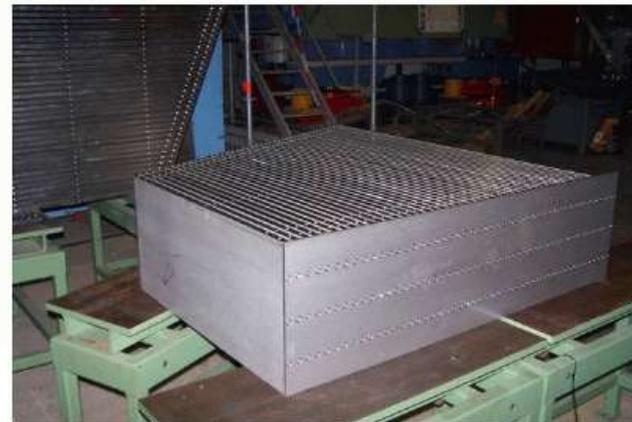


# AHCAL – Towards a Technological Prototype

Mech.  
structures



horizontal



vertical

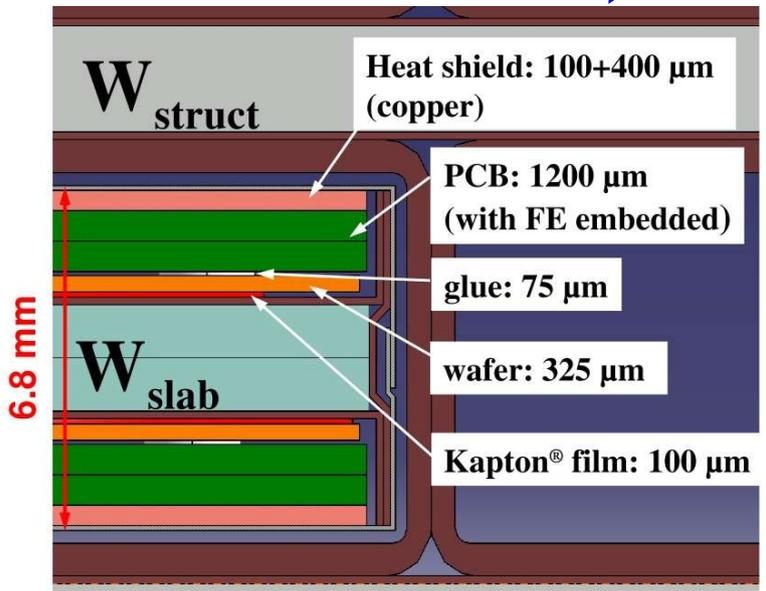
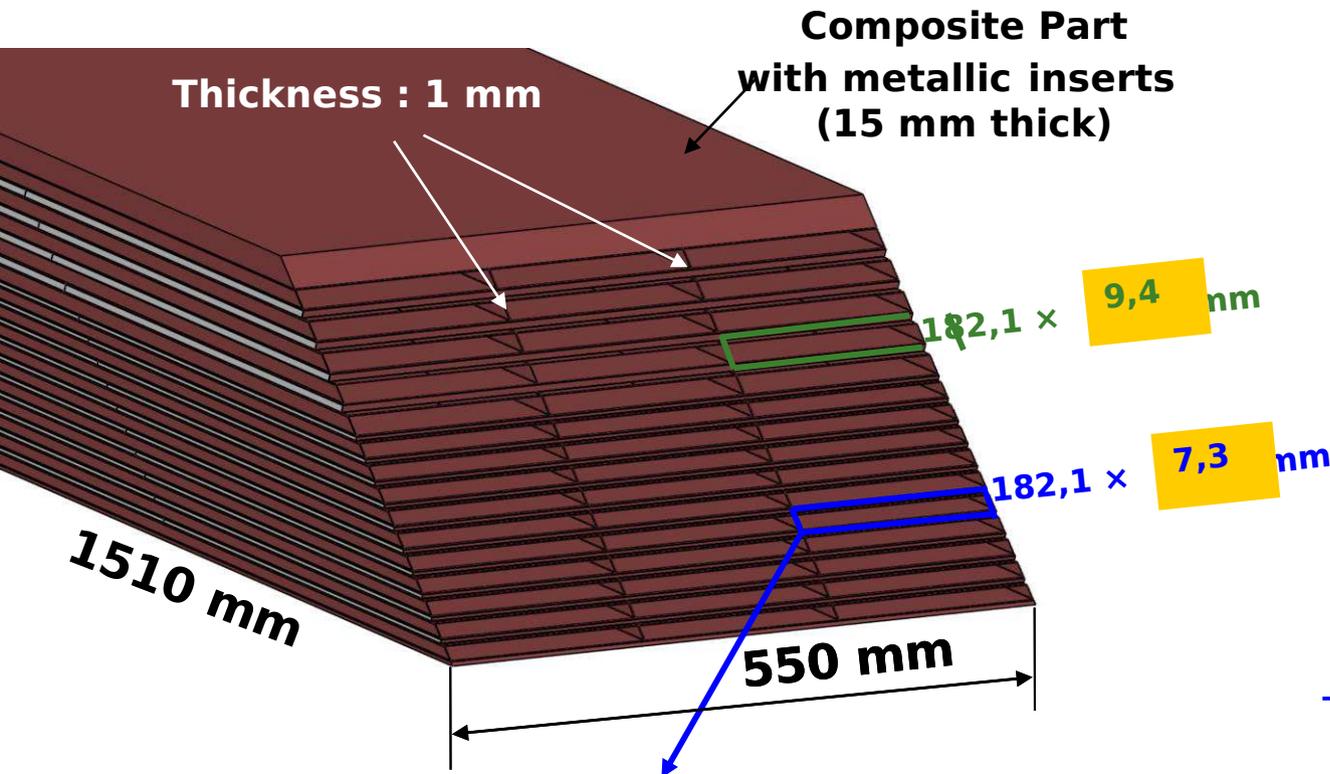
## Status and Planning:

- First HCAL HBU in DESY Testbeam
- Full slab end of 2010
- “Vertical Test” in 2011
  - Stack will be equipped vertically for tests with electrons (DESY?)

## W-HCAL

- Hadronic Calorimeter using Tungsten Absorber  
Driven by High energy needs
- Will use sensitive parts from existing analogue (steel) Hcal and Micromegas
- So far no monitoring in Calice-TB  
Plans only presented at Collaboration Meeting  
Regular reports to calice-tb will start after UTA Meeting
- Plan for considerable testbeam in September 2010 at CERN PS

# SiW Ecal

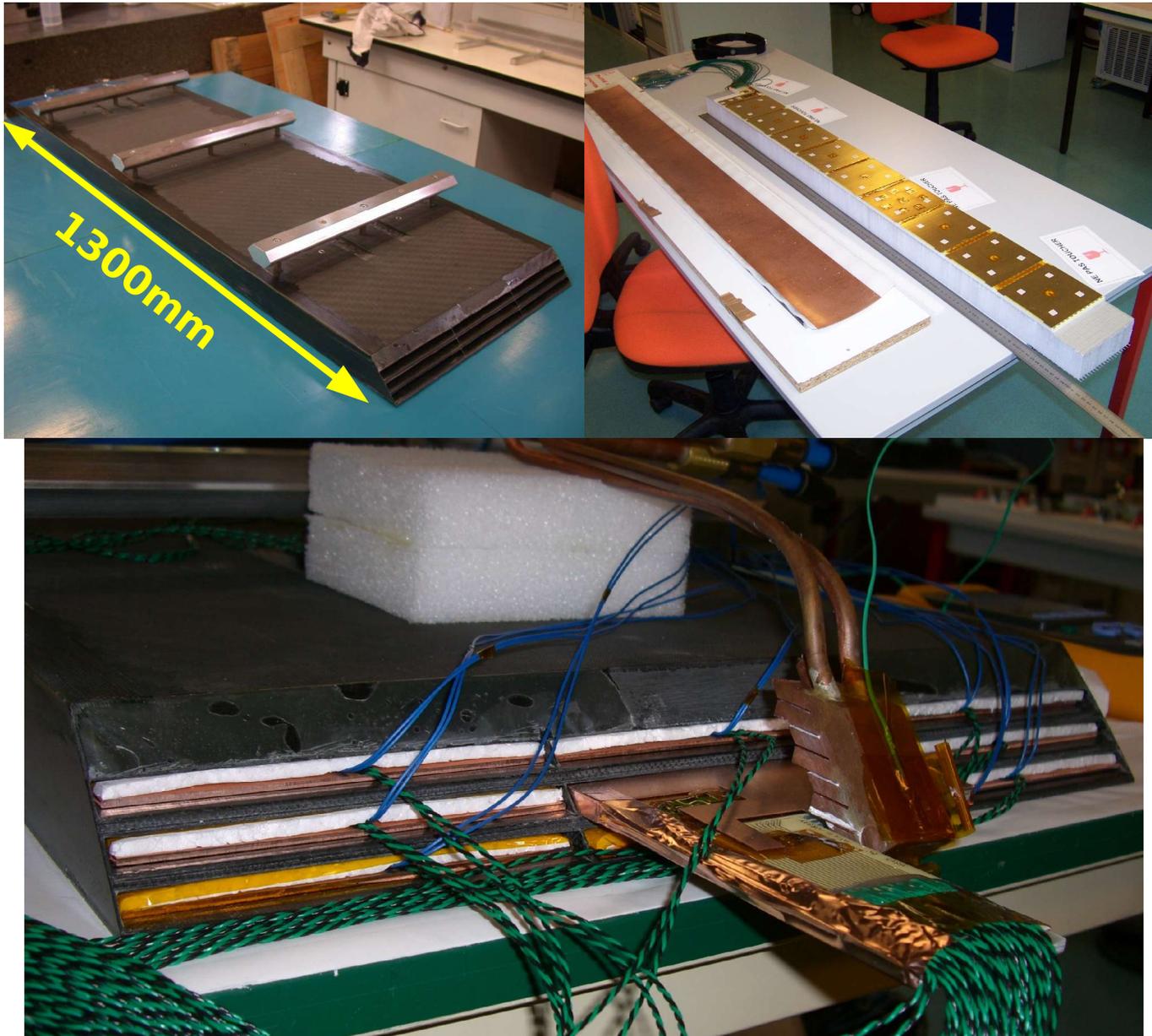


## Prototype of VFE



- Progress in VFE Electronics
- SKIROC Chip sent(?) to foundry
- Corean partners for FEV8 board
- Tests with SPIROC and FEV7 (ASU by end of 2010)
- Progress in DAQ.
- Communication to DIF via LDA
- Next step communication with actual VFE
- SiW Ecal Layers mid 2011?
- Testbeam late 2011 early 2012
- should plan for progressive tests

## Demonstrator 2009



- Detector module realised (from mechanical point of view)
- Demonstrator subject to a thermal test

*CALICE Collaboration Meeting March 2010*

# Collaboration SiW-Scint Ecal Initiated by TB-Review Meeting

**Composite Part  
with metallic inserts  
(15 mm thick)**

Thickness : 1 mm

182x9,4 mm

182x7,3 mm

186 mm

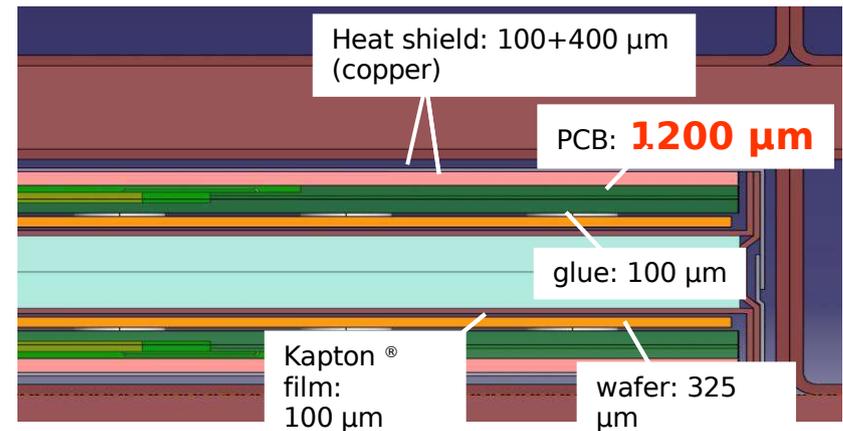
545 mm

**Composite Part  
(2 mm thick)**

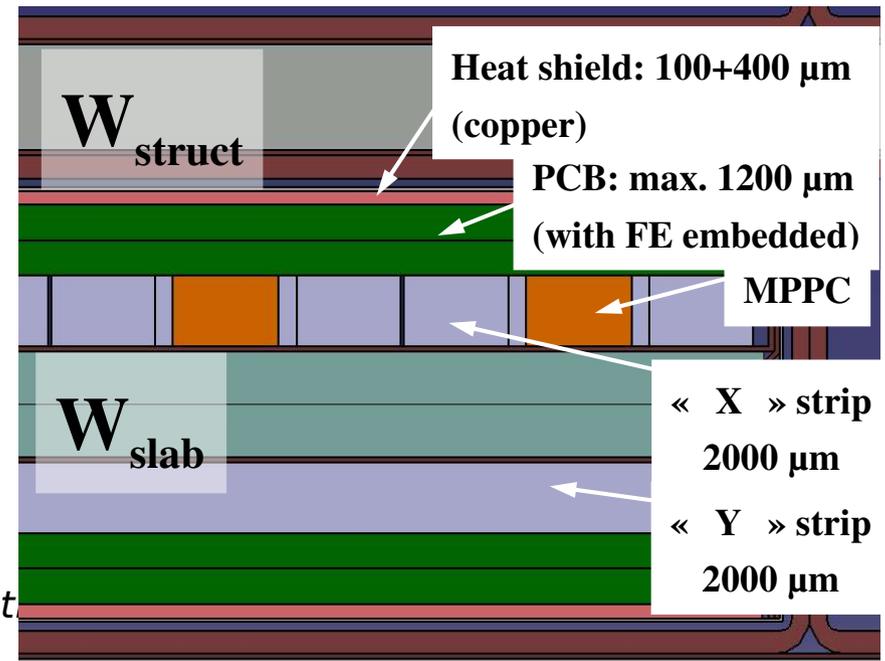
- Alveolar structure applicable for both Ecal proposals
- Details on integration are currently worked out.

Communication SiW Ecal-ScintEcal-DESY

- Schedule to be precised in coming months



## ECAL W/Scin



## Reducing the Cost of the (ILC) Ecal

The CALICE TB endorses to use the years 2010 and 2011 for the R&D of wafers at lower prices and extensive studies of the Si market. This is also vital for the realisation of a SiW calorimeter for an ILC detector.

- Hybrid Ecal might be one solution to master cost of Ecal w/o performance penalty
- Still silicon cost need to be controlled
  - Forging closer contacts with industry  
LETI France  
Hamamatsu **Japan**

More details by JCB

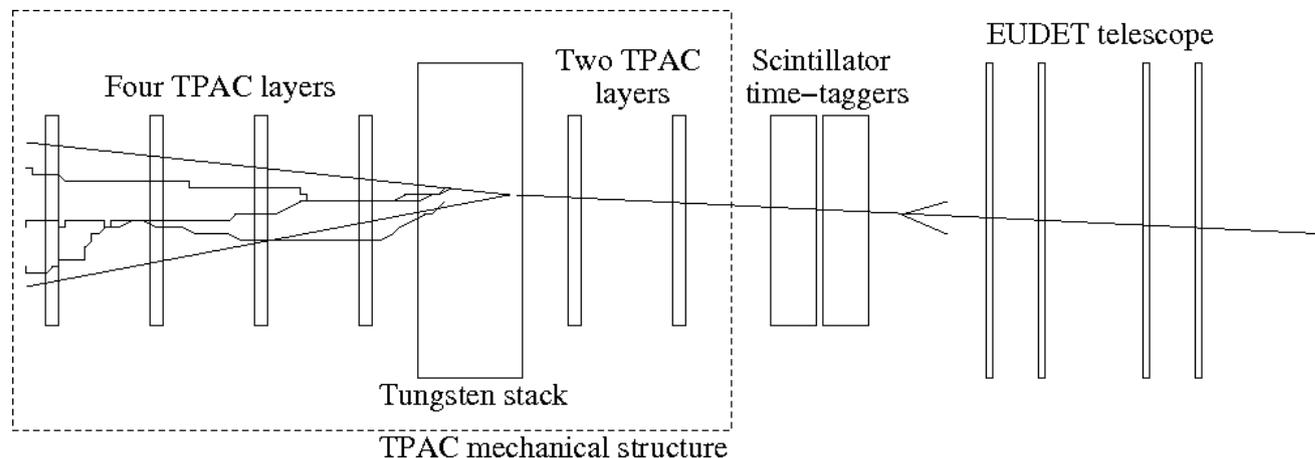
# MAPS – DECAL - Spider

Since TB Review DECAL is regularly on the agenda of CALICE TB

## SPIDER

- Silicon Pixel Detector R&D
- Remnants of CALICE-UK DECAL group and LCFI
- “Generic” pixel detectors for future colliders
- Struggle a lot with disastrous funding situation in UK

## DESY Testbeam March 2010



- Efficiency for different sensor variants
- Shower densities in electromagnetic showers
- Program after April 2010 entirely uncertain

# DAQ system overview

**(Detector Unit : ASICs)**

**DIF** : Detector InterFace connects generic DAQ and services

**LDA** : Link/Data Aggregator fans out/in DIFs and drives links to ODR

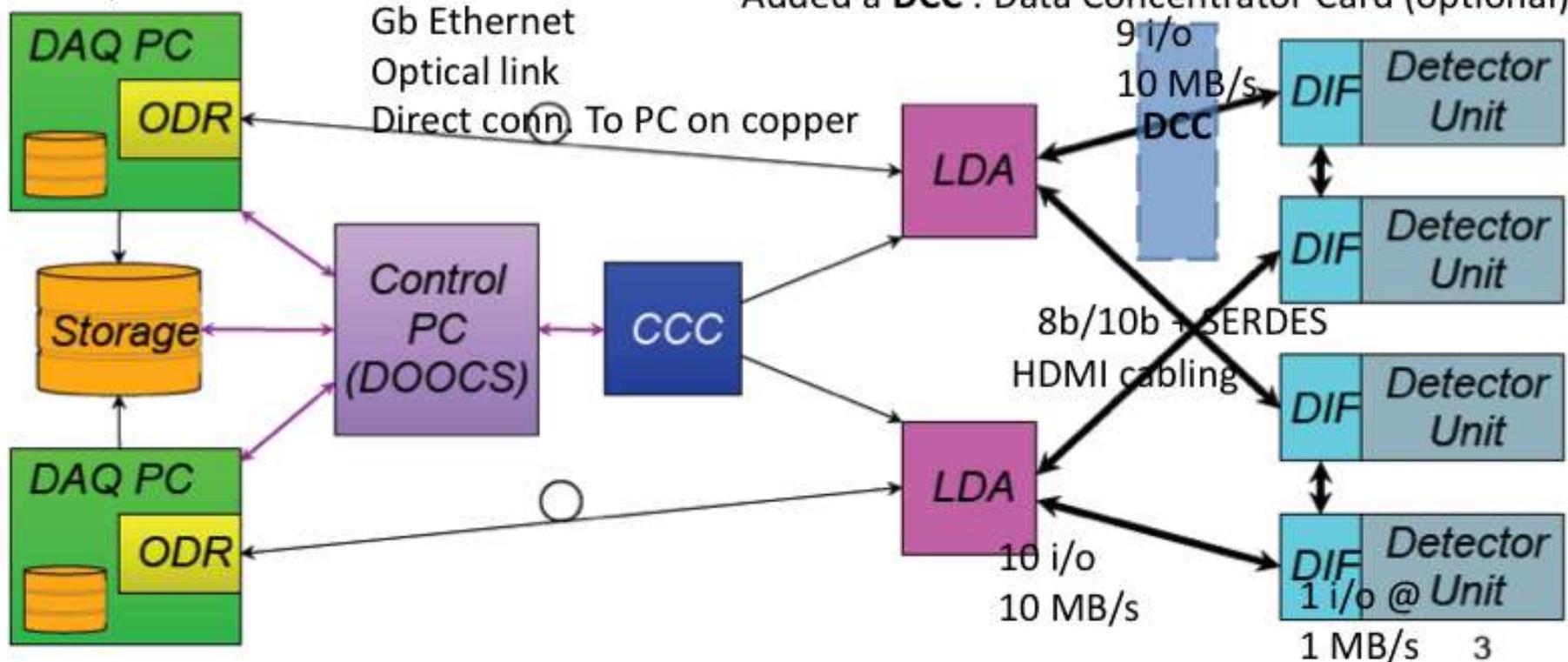
**ODR** : Off-Detector Receiver is PC interface

**CCC** : Clock and Control Card fans out to ODRs (or LDAs)

**Control PC** : Using DOOCS

200 MB/s on disk

Added a **DCC** : Data Concentrator Card (optional)



## Status of DAQ for Technological Prototypes

- Hardware provided by UK groups – Now start of operation

So far it looks alright, but devil is in the details

Drop out of UK groups essentially caught by french groups

Transfer of information works smoothly (still clearly deplorable situation)

Remarkable effort of UK groups to remain in business

- SDHCAL DAQ: first working chain running in may/early summer of 2010

Stress tests during summer early autumn 2010.

1m<sup>2</sup> prototypes of the SDHCAL are read out by USB based DAQs

need to complete step towards Ethernet/HDMI DAQ

- New Groups for DAQ Tasks?

Though impressive progress, SiW Ecal is at risk (depends on one person)

Slow control for Ecal (and other prototypes)?

- Which s/w frame for DAQ piloting to choose?

DOOCS. XDAQ, Tango?

Decisions to be taken until Easter!!!!

## Status of FEE

- Production Run March 2010
- Reticle : 22 x 18 mm<sup>2</sup>, 50 reticles per wafer
- 25 wafers produced,



- SKIROC for Ecal is integrated

=> Back in phase with other chips <-> Compliant with TB Review  
More details in Electronics Session

# CALICE Software

- **New Software Coordinator [Angela Lucaci-Timoce](#)**

Proven already to be very competent

- **Contacts for subdetectors (CALICE I):**

SiW Ecal: K. Krastev, R.Poeschl

ScintEcal: Coteria (?)

AHCAL: Angela herself

(S)DHCALS: ??? (Fate of task force initiated by Niels)

TCMT: K.Francis?

Tracking: P. Dauncey, D. Jeans (?)

Simulation/Mokka: G. Musat

- **Data Processing: Support by A. Kaplan, N.Feege, L. Weuste and S. Lu**

Lack of man power for mass production

Data processing on request

- **CALICE s/w needs to be put on broader basis**

Efficient s/w group is essential for publishing physics results



# Testbeam planning for 2010

## CALICE Requests for 2010 to FNAL

No dedicated request or MOU so far

Further steps depend largely on readiness of DHCAL Phys. Prototype

## CALICE Requests for 2010 to CERN

<b>GRPC</b>	SPS 2 weeks July and November PS 2 weeks May	Test of 1m <sup>2</sup> Chambers	H2(Magnet)/H4/H6 T9 beamline
<b>Mmegas</b>	2 weeks June/July	Test of 1m <sup>2</sup> Chambers	H2/H4 beamline
<b>W-Hcal</b>	PS 2 weeks 4 <sup>th</sup> quarter 2010	Hadron Calo 1m <sup>3</sup> , 1 ton??	T9 beamline
<b>(Spider</b>	June/July (preferred)	Pixel Ecal Calo 30x30x30cm <sup>3</sup>	H6B (EUDET Tel.!!)

- Not entirely happy with preliminary CERN response

CERN beamlines are very crowded!!!

- 2 main issues

- Solve situation for 2010 quickly

- Prepare planning for 2011 and beyond now!!!

Tight communication with CERN on CALICE/LC needs to/about to be established

Topic at today's TB Meeting

# Testbeam Planning beyond 2010

Table published in DESY-PRC Report (also arXiv: 1003.1394 phys.ins-det, hep-ex)

Project	2010/1	2010/2	2011/1	2011/2	2012/1	2012/2
Phys. Prot. Si-W ECAL/DCHAL/TCMT	xx	xx	xx	-	-	-
Phys. Prot. W ECAL / W HCAL / TCMT		x	x	xx	xx	-
Tech. Prot. DHCAL	x	x	xx	xx	xx	xx
Tech. Prot. AHCAL	x	x	x	x	xx	xx
Tech. Prot. Si-W ECAL	-	x	x	xx	xx	xx
Phys. Prot. DECAL	x	x	x	x	x	x
Tech. Prot. Sc-W ECAL	-	-	-	-	-	x

- No Activity
- x Small Activity
- xx Large Scale Testbeam

## - Large Scale 2011/1 – 2012/2, SDHCAL/AHCAL+ECAL at CERN (most likely)

Needs several weeks/months steady occupation of beam line  
Table does not take W-HCAL into account (also large scale TB)

## - Other LC Detector Components

TPC do also plan large hadron testbeams, preferably also at CERN

## - Need good coordination among ourselves, with other LC projects and facility managers (not only CERN).

## - Key issue in LCTW09 document and at today's TB Board

## Summary and Conclusion

- CALICE continues to have a rich R&D program and enters a phase in challenging technologies for (I)LC faces their realisation  
It is explicitly in the interest of CALICE to investigate several detector technologies
- Landscape is very heterogeneous  
8 different Technologies (Absorber or Sensitive Medium)  
Up to six large scale prototypes which will be employed  
Yet, nice examples for collaboration in R&D beyond “boundaries”  
However, also counter examples
- Many items addressed at the TB Review meeting are transformed into action
- TB will continue to monitor all efforts and streamline activities
- TB will be in first line to realise longer term planning
  - Availability of Testbeam lines
  - **All** beam test efforts should be launched via TB (or at least TB needs to be informed)
- TB will support steps towards DBD
  - Priority list
  - Prepare judgement on maturity of detector technology  
Need charge by steering board on exact measures

It should be CALICE who decides which technology is mature and which is not