Status of Ecal(s) for ILD

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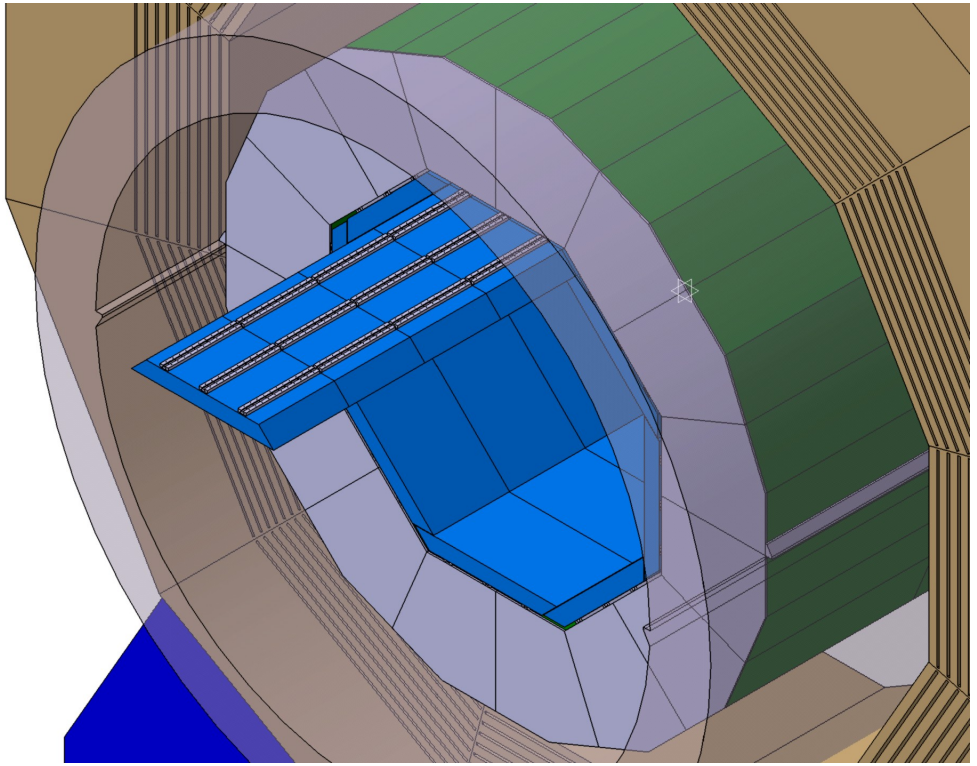
ILD Meeting at LCWS11 at Granada Sept. 2011

Subdetector components IV - Electromagnetic calorimeter

The SiW Ecal in the ILD Detector



Basic Requirements

- Extreme high granularity

- Compact and hermetic

Basic Choices

- Tungsten as absorber material
  - X0=3.5mm, RM=9mm. λI=96mm
  - Narrow showers
  - Assures compact design
- Silicon as active material

or

- Scintillator as active material

Ecal designed as Particle Flow Calorimeter
R&D within CALICE Collaboration

Detector Optimisation – Number of Layers/Sensitive Material

Models under study:

1) A pure SiW Ecal Calorimeter with 20 < N < 30 Layers

2) A pure Scintillator Ecal

3) A hybrid solution
   e.g. first 20 layers Si with rear part of calorimeter equipped with Scintillator

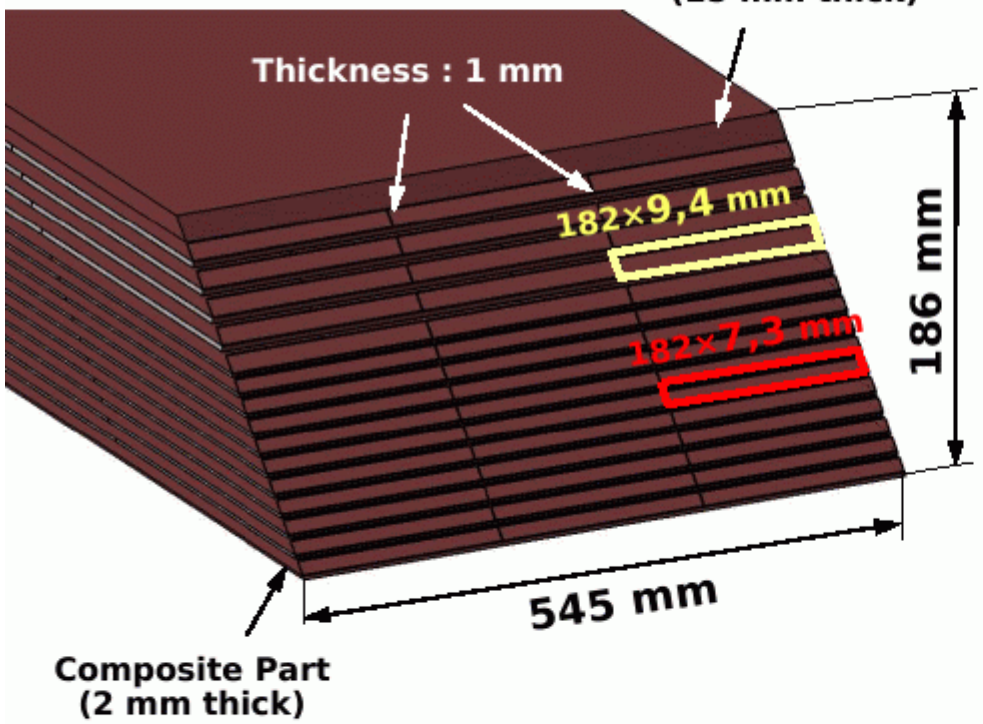
PFA studies for hybrid calorimeter ongoing

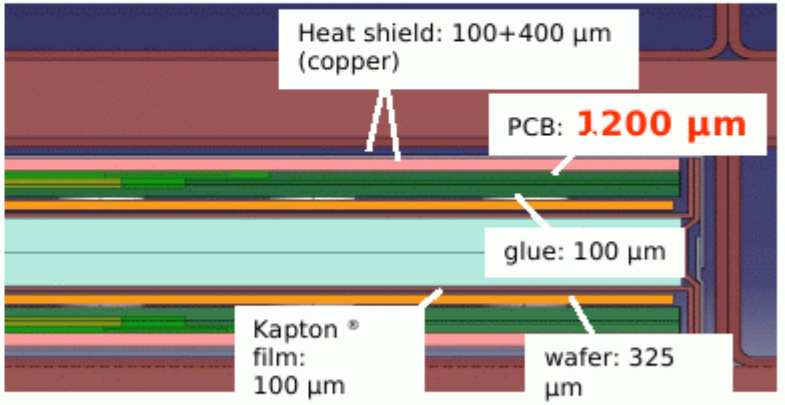
Both options are implemented into Mokka since long

- PFA with silicon well tested already for LOI
- PFA with scintillator is well advancing

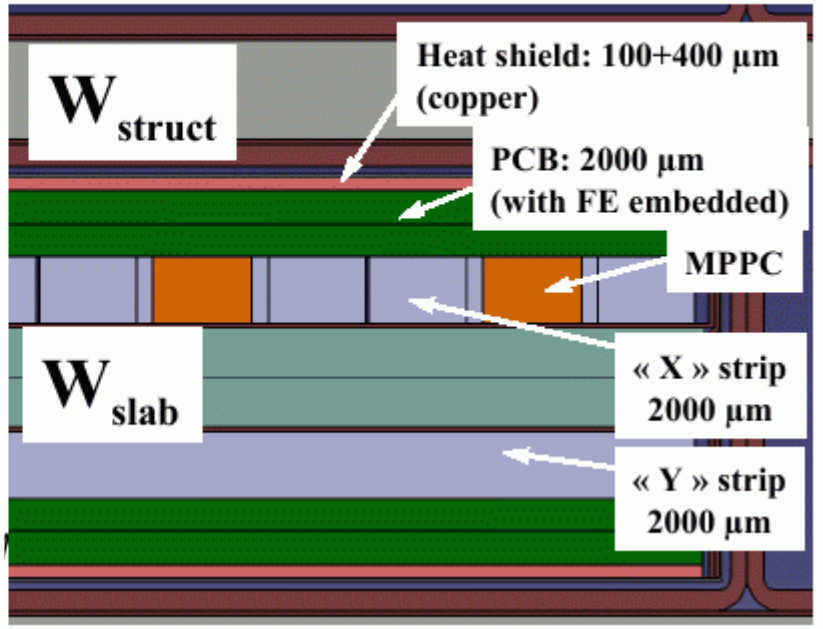
Technological prototypes

ECAL W/Si





ECAL W/Scin



Technological prototype to address engineering challenges of detector Construction

Collaboration between alternative technologies where possible

R&D for Technological Readiness – Detectors

Scint Ecal

SiW Ecal

- Proof of principle with physics prototypes
  Solid backup of full detector simulation by beam test data
- Robustness of calibration over 6 years (at least proven for SiW Ecal)

- Alveolar structures for barrel and end caps

First ASUs expected 2011/12

First ASUs since 2009

First tests in 2011!!!
Progress slowed down
By non-availability of
DAQ2 ←. drop our of
British groups

- Tests of electronics
- Test of power pulsing
  in magnetic field
- Interconnection and
  cooling

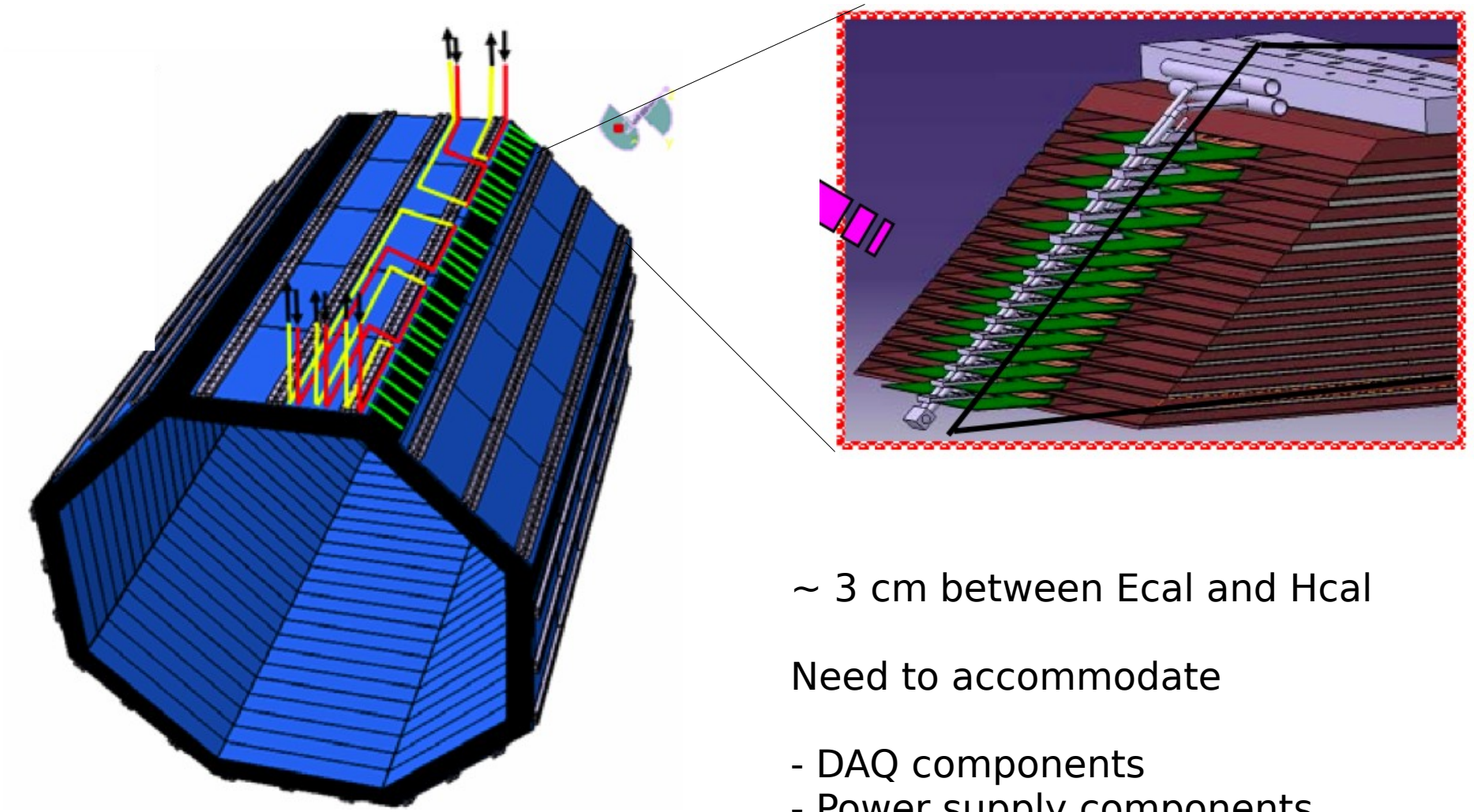
→ planned until summer 2012

- Scintillator strips
  seems to be available

- Advanced Wafers
  Technology in principle
  at hand but still
  matter of R&D
- Advanced PCBs
  Ultra thin and Ultra flat

Not clear what can be achieved until time of DBD
All is very much funding driven
Main sources are French in2p3/ANR and new Japanese ILC funding

R&D for Technological Readiness – Peripherals



~ 3 cm between Ecal and Hcal

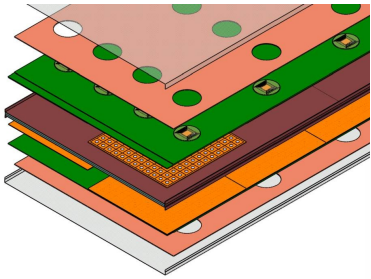
Need to accommodate

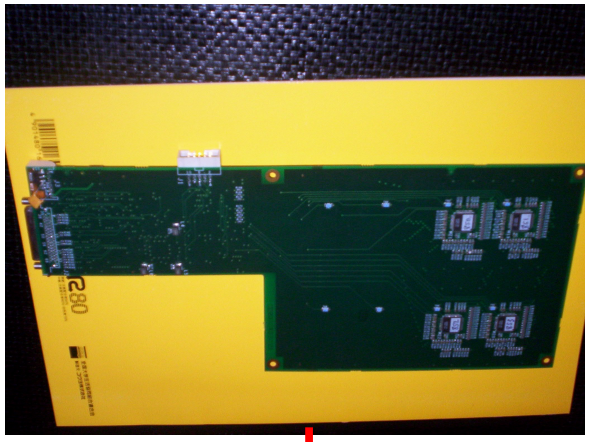
- DAQ components
- Power supply components
- Cooling

Issues are addressed and at least we will come up with a list of open issues and proposals how to address these

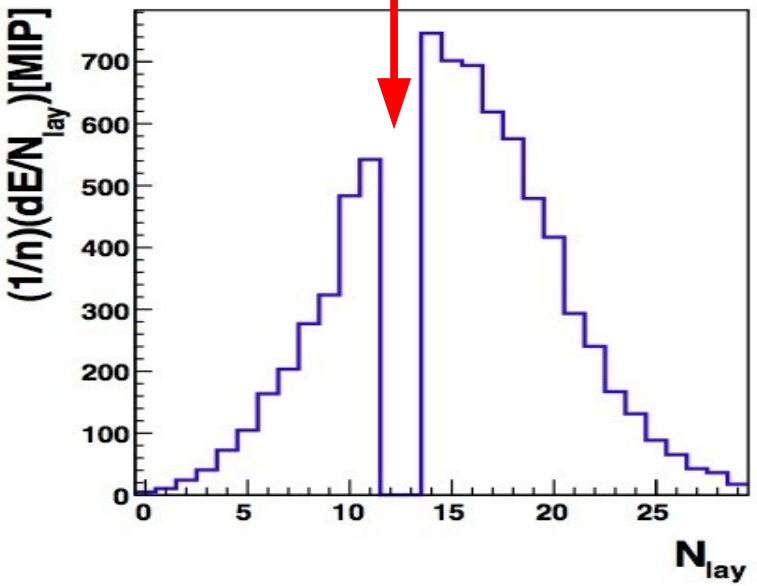
Embedded electronics - Parasitic effects?

Exposure of front end electronics to electromagnetic showers

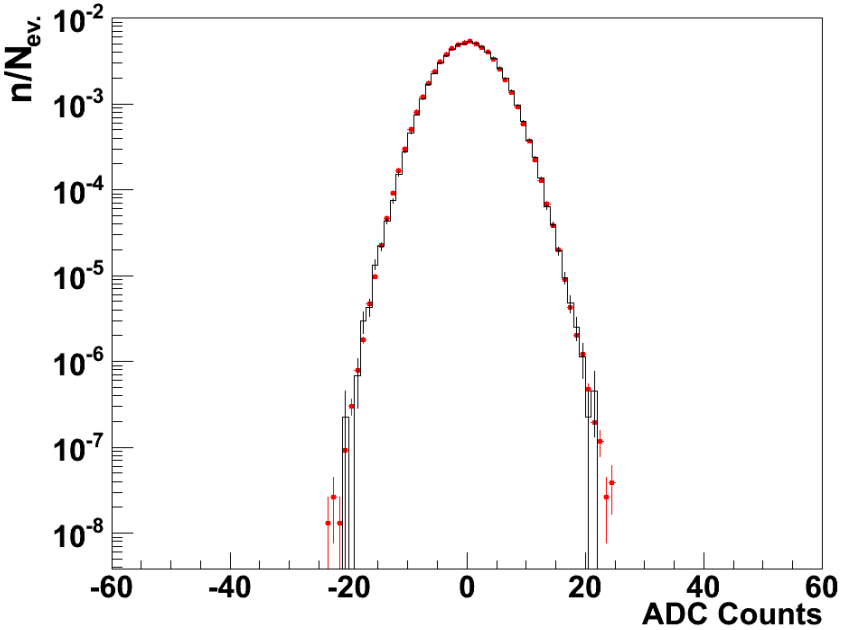




Chips placed in shower maximum
of 70-90 GeV elm. showers



Comparison: Beam events
(Interleaved) Pedestal events



- No sizable influence on noise spectra by beam exposure
  ΔMean < 0.01% of MIP ΔRMS < 0.01% of MIP
- No hit above 1 MIP observed
  => Upper Limit on rate of faked MIPs: ~7×10^{-7}

Possible Effects: Transient effects
Single event upsets

Summary of Ecals

- Ecals in s/w baseline
  Both Ecals are well implemented in Mokka
  Solid backup by beam test analyses

- Input for technology part of DBD

All relevant questions are addressed
However, anwers driven by available funding and manpower

- Some points are already achieved:
  - Stable calibration (at least demonstrated for SiW Ecal)
  - No negative impact by embedded electronics
    (goes beyond Ecal matters)
  - Large alveaolar structures are about to be constructed

Backup