UK DAQ and Mechanical Work and Opportunities for ILD Involvement

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Summary of Current Activities

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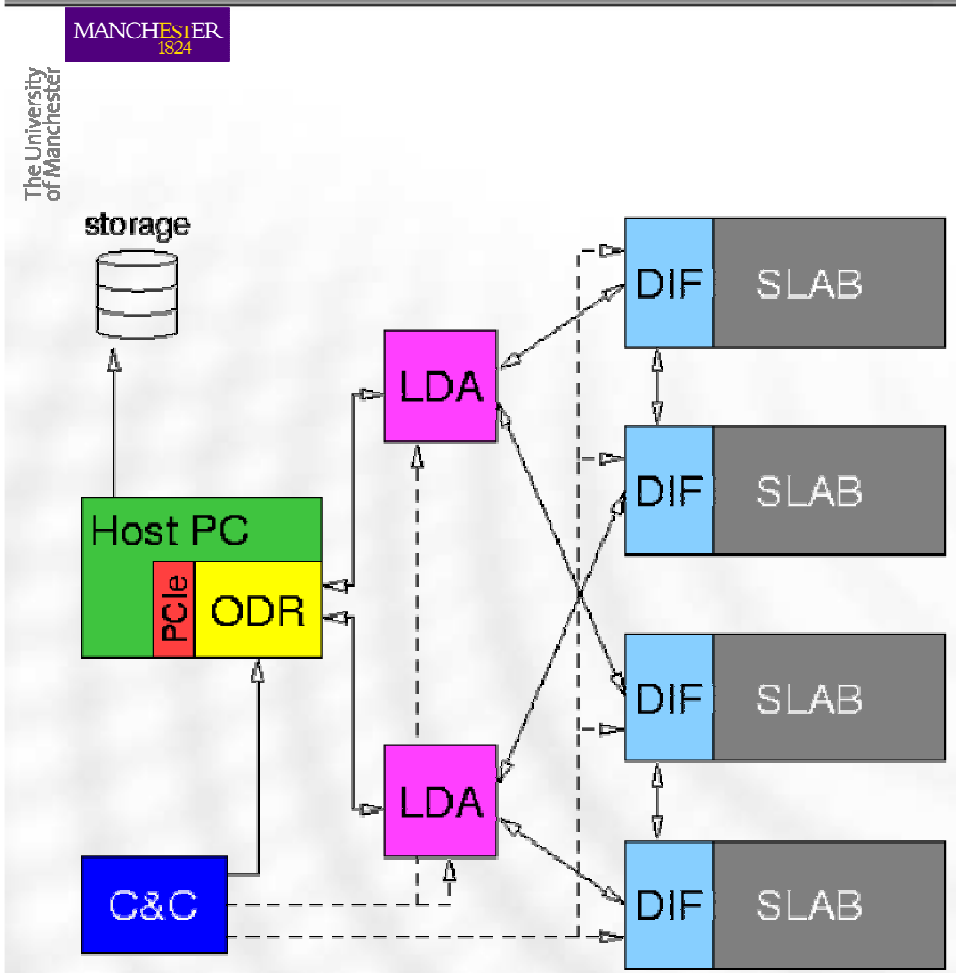
- UK Involvement
  - DAQ for SiW ECAL (and beyond)
    - “Generic” solution using fast serial links
    - STFC (CALICE-UK) and EUDET workpackages
  - Mechanical Design and Integration
    - Targeting EUDET Module
    - Small but significant effort based in Manchester
    - CALICE-UK workpackage
- I will talk about this from the CALICE-UK point of view

ILC DAQ

- Triggerless DAQ system
  - All data from a bunch train must be read off the detector
  - Use beam structure to our advantage
    - 1ms bunch train
    - 200ms of inter-train gap to read out detector
- Particulary relevant for calorimeter is power consumption of very-front-end
  - DAQ system will also control power cycling of readout ASICs

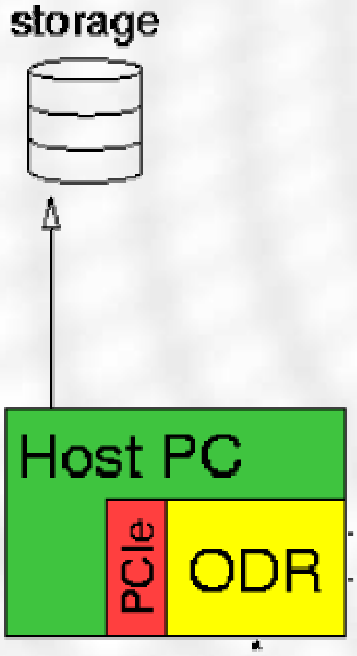
CALICE/EUDET DAQ Architecture

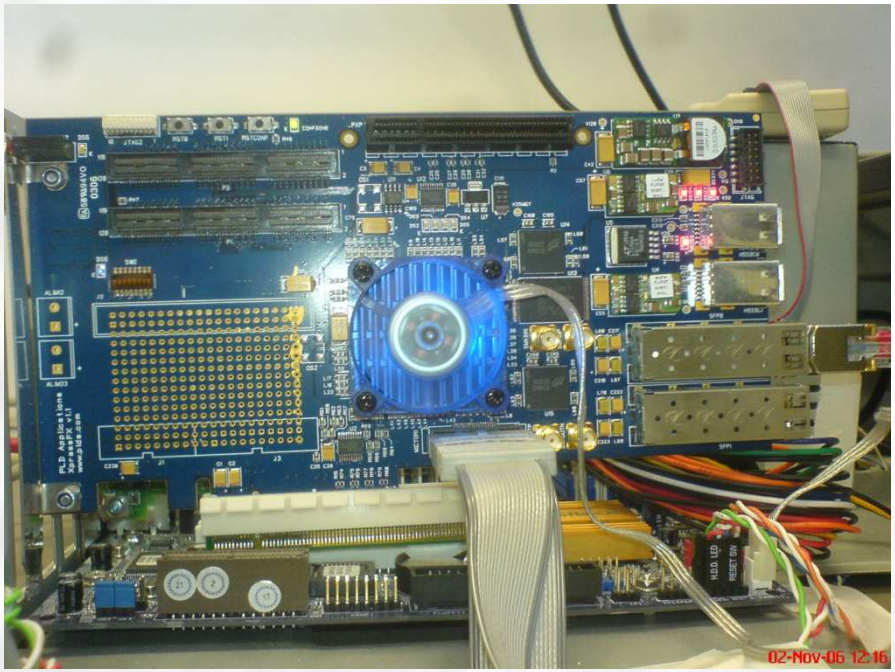


- UK is world leader in the DAQ effort
  - Logically the DAQ is a funnel, concentrating the data in stages before sending to storage
  - Aim to use as much “off the shelf” technology as possible to minimise costs and development cycles.

Off-Detector Receiver

- ODR is a commercial FPGA development board with PCI express interface – gets the data into a PC for processing
  - Virtex4, PCIe 8x
  - This is our first implementation – other technologies will certainly have to be considered in the near-term

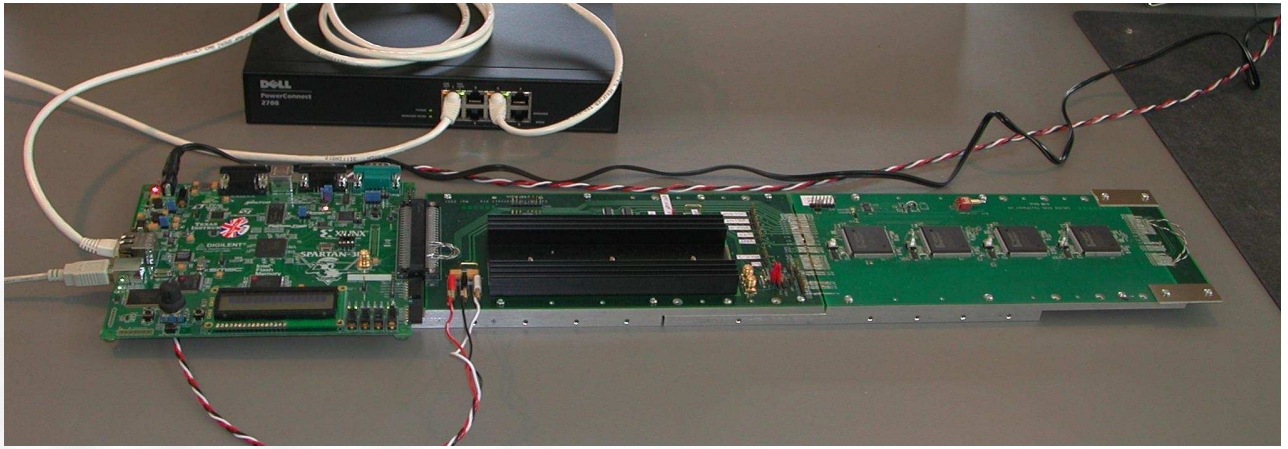




LDA

- Prototype LDA
  - Again, using developmet boards
    - From Enterpoint in the UK this time
  - Will have daughter cards manufactured to carry serial data to the front end and to the off-detector infrastructure
    - Ethernet, USB, GLINK

DIF and Signal Tests Along ECAL Slab



- Proto-slab:
  - FPGA for VFEs
  - provisional ‘DIF’ for ECAL
- Tests of signal distribution along long PCB lines: signal deterioration, termination options, speed, etc.
- Identification of possible issues with many (pseudo) VFE chips on long transmission paths
- Familiarise ourselves with VFE readout architecture

DAQ Software

- Starting to think about the necessary software to actually make this work
  - Very early stages
  - Still need to identify suitable frameworks
  - Really need more people to get involved

Mechanical Work

- All mechanical effort currently in Manchester
  - Aimed at the EUDET prototype
- Tasks
  - Long term aging studies of conductive glue
  - Thermal simulation of calorimeter modules
  - Assembly
  - Integration

EUDET Module

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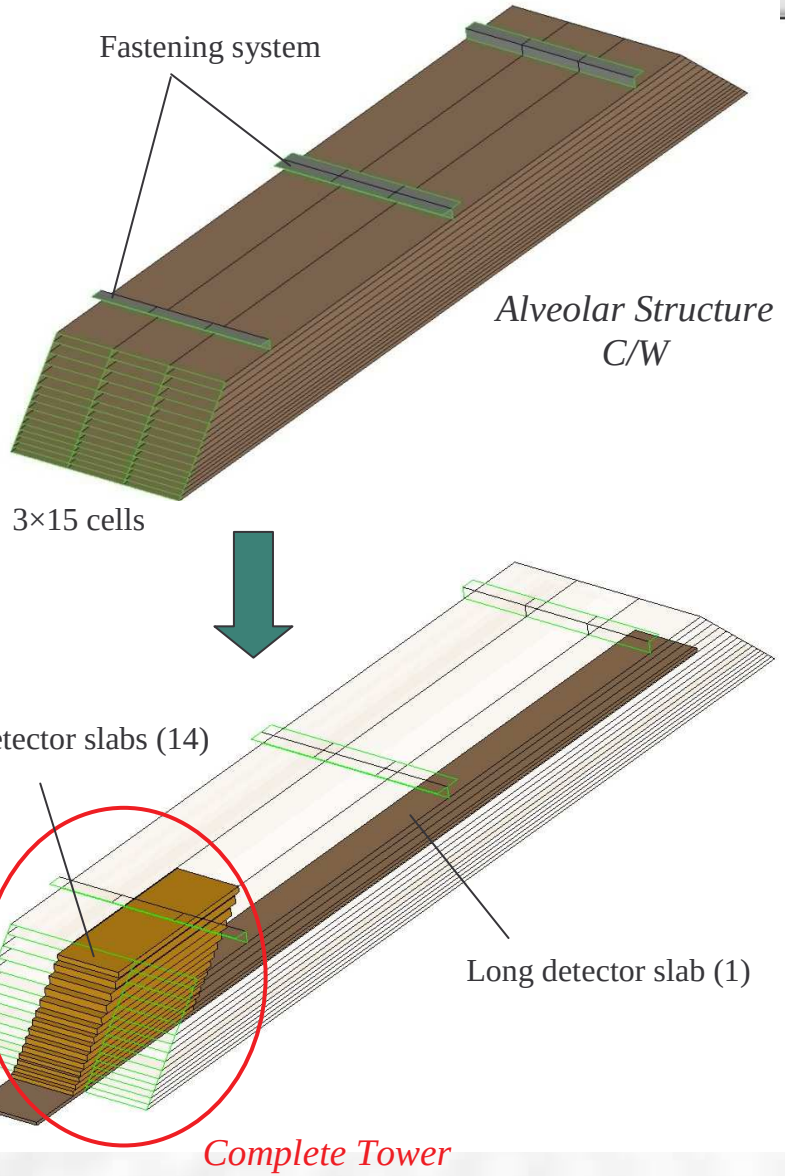
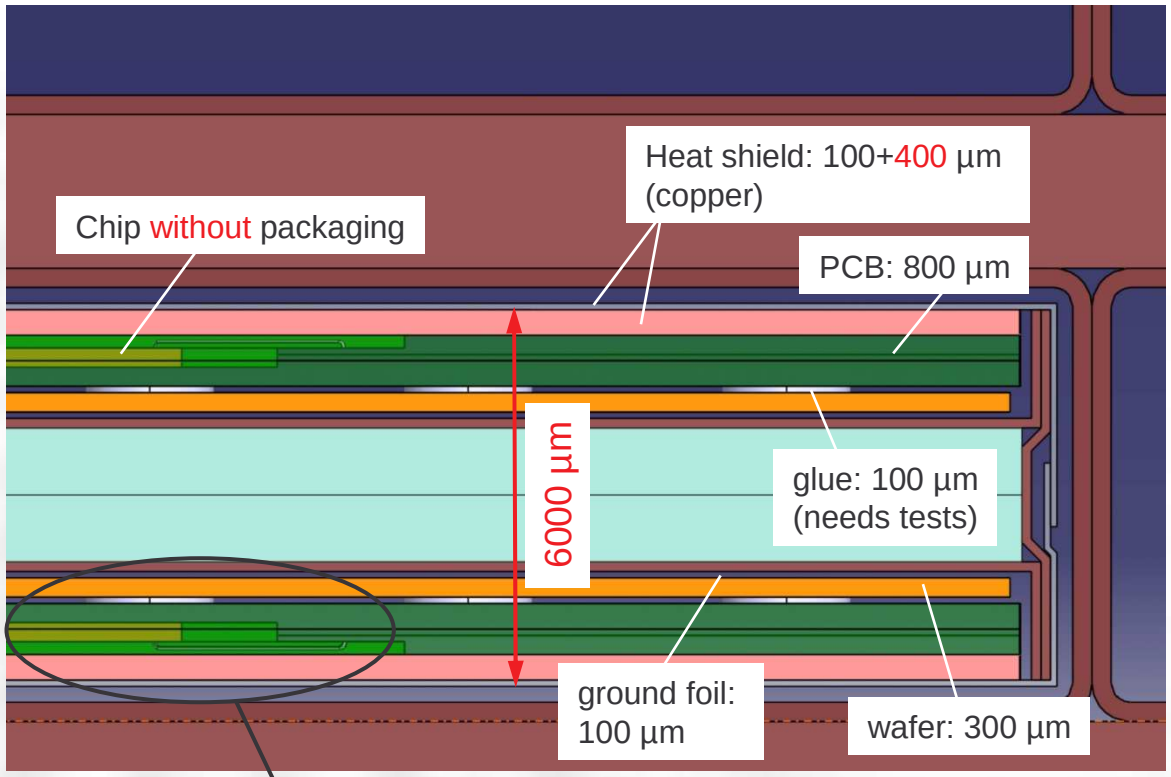
- n alveolar composite/tungsten structure with:
  - same W sampling
  - 3 columns of cells to have representative cells in the middle of the structure (with thin composite sheets)
  - Identical global dimensions (1.5m long) and shape (trapezoidal)
  - Fastening system ECAL/HCAL (include in the design of composite structure)
- 5 Detector slabs with FE chips integrated
  - 1 long and complete slab (L=1.3m)
  - 15 short slabs to obtain a complete tower of detection (typ. L=40 cm)



EUDET ECAL Slab



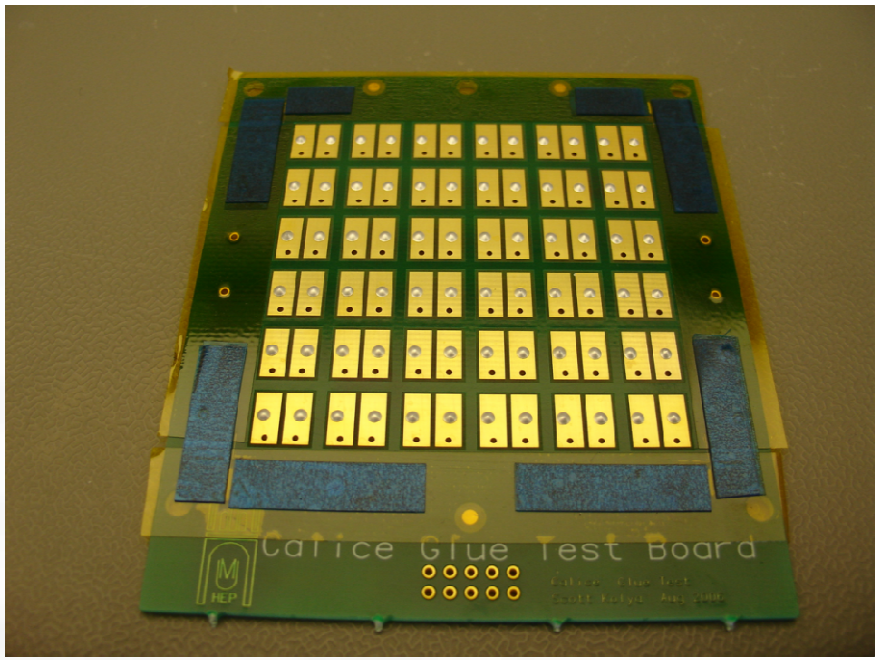
Design EUDET Slab

The alveolar thickness is defined by :

- Gaps (slab integration) : 500 µm - OK
- Heat shield : 400 µm ?
  but real thermal dissipation (active cooling ?)
- PCB : 800 µm with interconnection ?
- Thickness of glue : 100 µm ?
  size of dots ?
- Thickness of wafer : 300 µm ?
- Ground or isolate foil : 100 µm ?
  AC vs DC ?
- Thickness of W : 2100 µm - OK
  and 4200 µm - OK

Glue Tests

- Sensors attached to PCBs with conductive glue
  - There will be about 100,000 glue joints
  - They (all) have to work in a reasonably high radiation environment and stay stuck for 10 years
- Have been doing long-term tests of conductive glues



Upcoming Mechanicals

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- Assembly and Integration Studies just getting underway
  - Sensor attachment to PCBs and associated testing
  - Integration of cooling and services on the EUDET module
- Lots of scope to expand this role, but no manpower to do it at present...

Wrap-Up

- The UK is leading the global ILC effort in DAQ
  - But there are plenty of areas where we need more people
  - We should be looking to write (at least a major part of) the DAQ section of the EDR
- Mechanical work is in its infancy
  - We have a foot in the door...
  - But we need to move forward and start doing some serious engineering if we want to bid to build a large chunk of detector in the future
    - EDRs are looming and we need to be ready...