# DAQ system hardware status

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for DAQ groups: Cambridge, Manchester, RHUL and UCL

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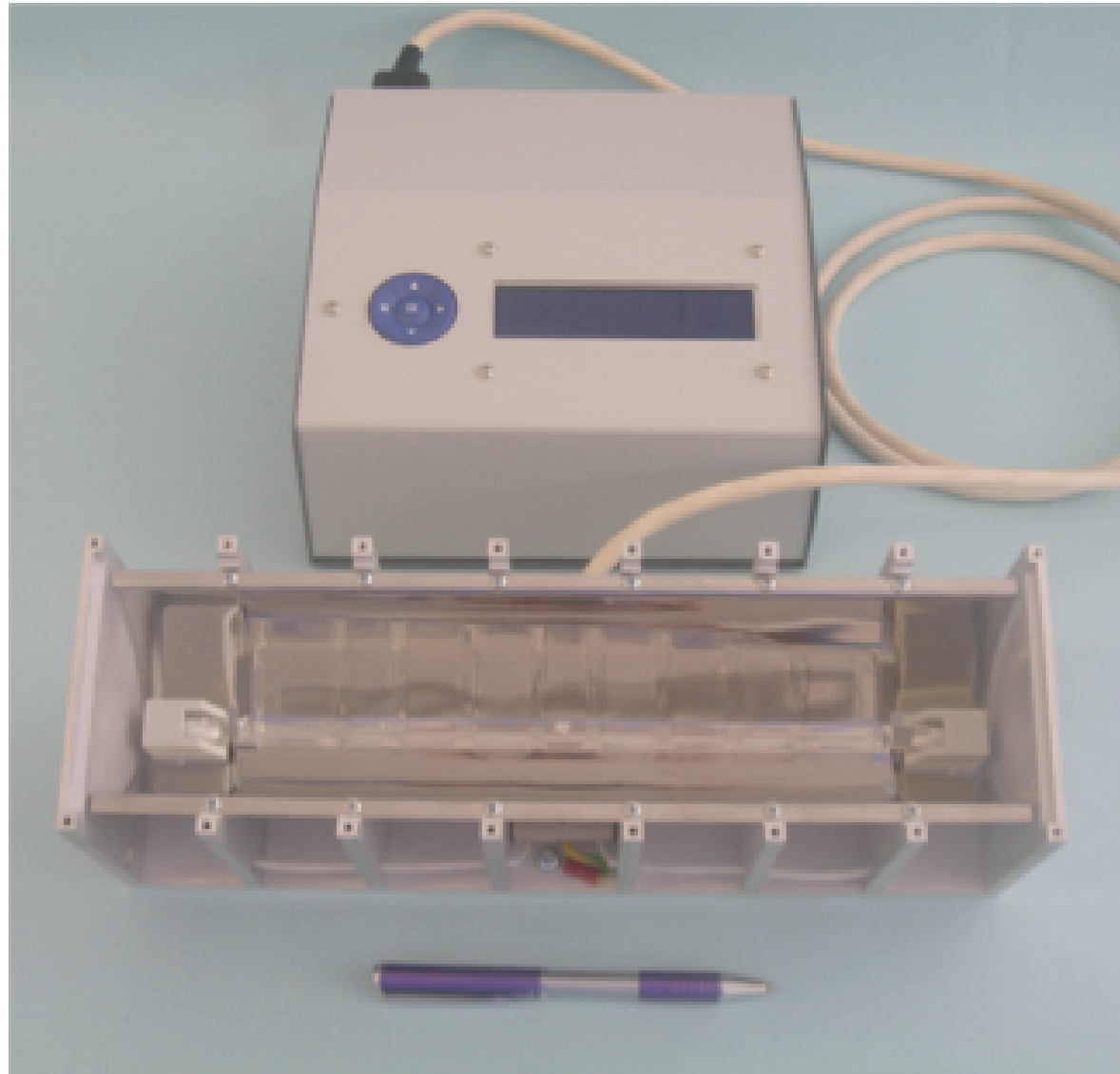


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# Outline

- System overview and recent progress
- Individual (hardware) component status
- System tests
- Numbers of each component and availability
- Summary and issues
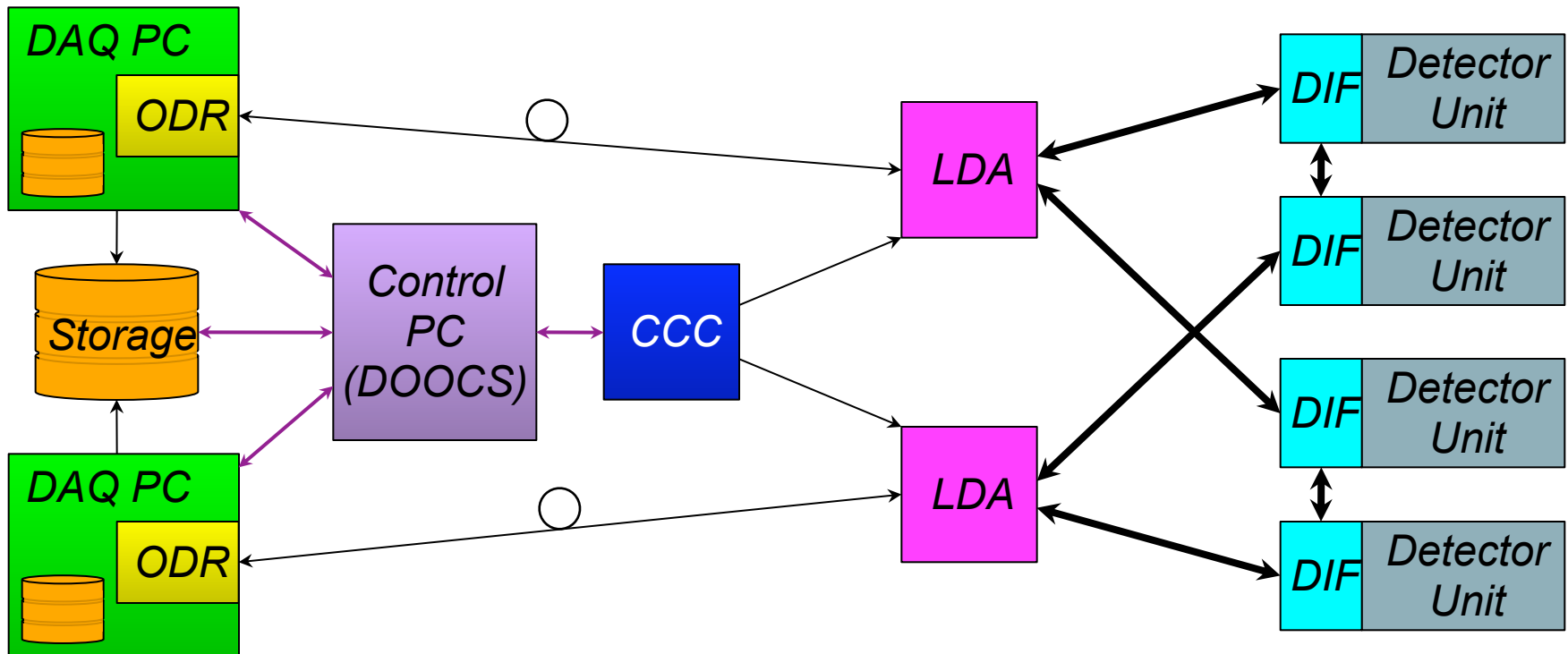
# DAQ system overview

(**Detector Unit**: ASICs)
**DIF**: Detector InterFace connects generic DAQ and services
**LDA**: Link/Data Aggregator fansout/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

# Overall status—progress since UCL meeting

Have been concentrating on :

• firmware improvements and finalisation;

• final hardware tweaks and production versions of relevant components;

• hardware orders to have enough systems available for lab and beam tests;

• system tests getting DAQ chain running ongoing.

# ECAL DIF

• The ECAL DIF is being developed by the Cambridge group; HCAL DIFs developed by other groups, but all within the DIF task force.

• Produced a prototype board which worked well, in use at LLR.  Have reduced number of components, whilst maintaining functionality (e.g. FPGA).

• Two DIFs have been produced and being used in system tests.  Can then produce full run of 40 ECAL DIFs—all PCBs and components in-house.

• Firmware being debugged in DAQ  system tests.
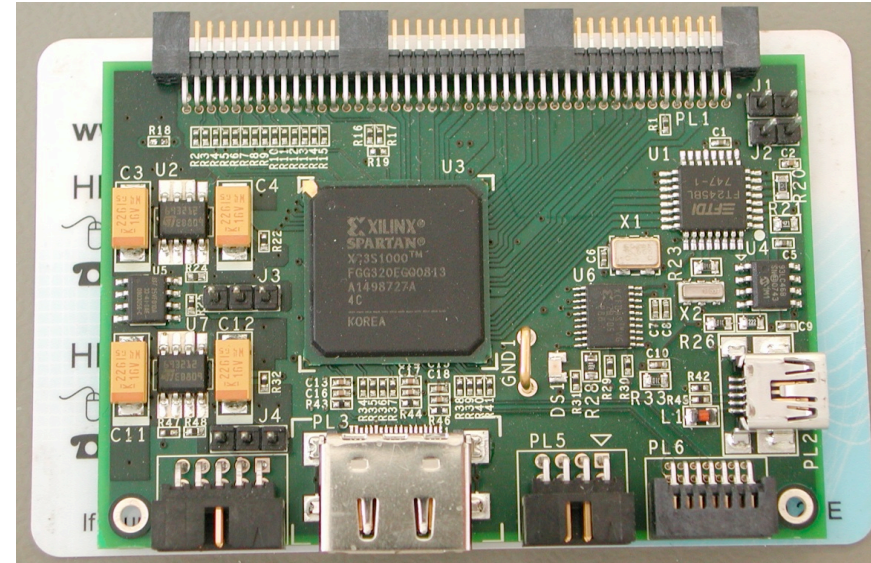


# CCC

• Full complement of 10 boards with power supplies tested (one of which in LLR).

• CCC link to LDA still needs to be done.
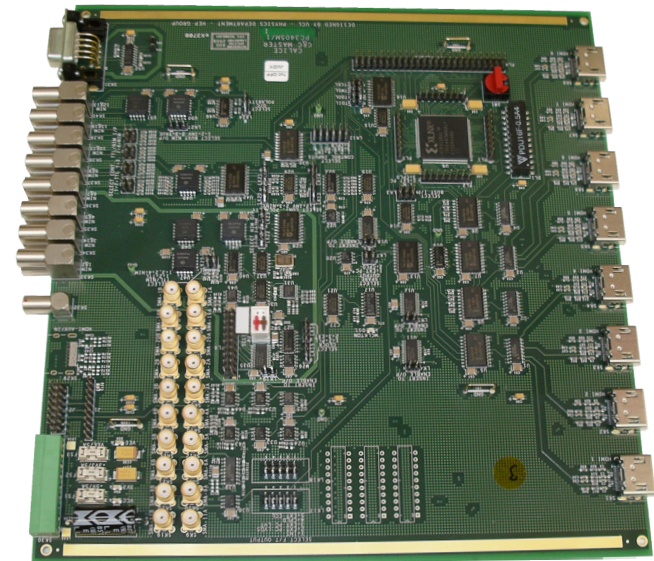
# LDA

• The LDA (from Enterpoint) consists of :  a Mulldonoch2 baseboard; an add-on HDMI board to connect to 10 DIFs; and an add-on ethernet board to connect to an ODR.

• Have 20 baseboards in-house;

• Have 5 ethernet boards in-house, 20 being manufactured;

• Have 5 HDMI boards in-house, 20 being manufactured.

• Firmware development ongoing :
  • get DIF <=> LDA link running
  • general improvements (different compilers)
  • new code to be posted soon
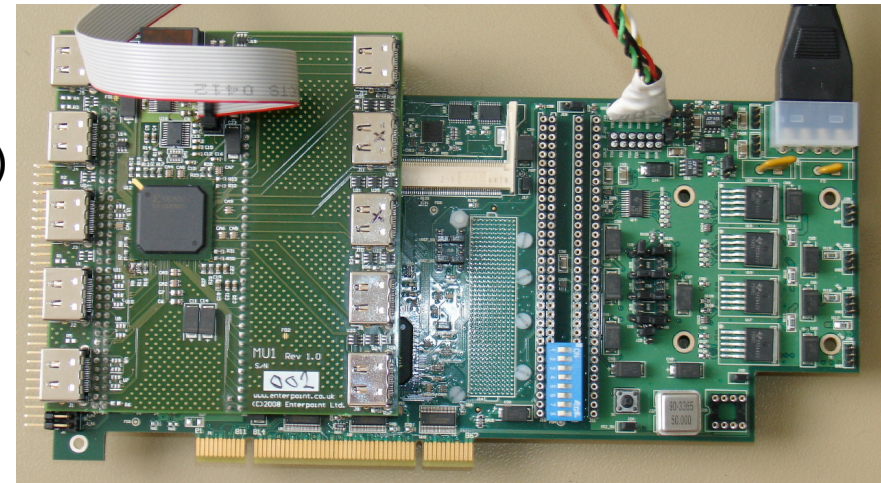
# LDA (+ system test)

Doing full-system tests highlights problems !

Issues :

• Need AC coupling on HDMI boards.

• HDMI pins are wrongly ordered, 1 is 19, etc. Botched some cables together; Enterpoint to provide adaptors.

• Power being drawn leading to high currents and needed to cut some of the pins.

• Improvements on DIF <=> LDA link firmware

Hardware problems have been / are being fixed by Enterpoint  and new HDMI boards should be delivered in four weeks.

So this is an example of commercially-available, off-the-shelf equipment ... all of which needed some corrections/additions/modifications from ourselves...
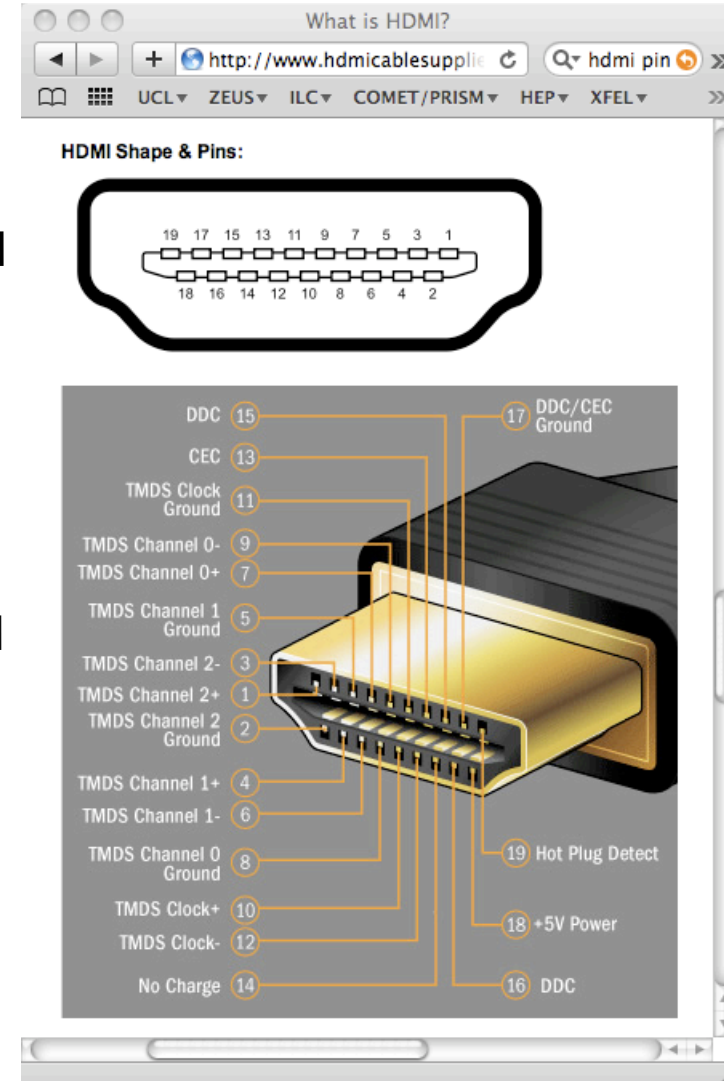
# ODR and DAQ PC

- System has generally been stable for a while :  firmware written, linked to LDAem, etc..
- Have 8 ODRs in house along with 6 DAQ PCs, one of each is at LLR.

# DAQ software

- Started development using DOOCS software mainly by V. Bartsch and T. Wu.
- They have both left and David Decotigny (LLR) has taken over.
- We will be able to provide some additional effort for next ~6 months to help.

# System tests

Have a system set-up in UCL :  DAQ PC with ODR <=> LDA <=> DIF :

• using network analyser and 'scope to check signals;

• using both prototype and production DIF;

• have successfully sent data all the way up to the DIF;

• link DIF => LDA has not yet been established—firmware being updated and debugged.
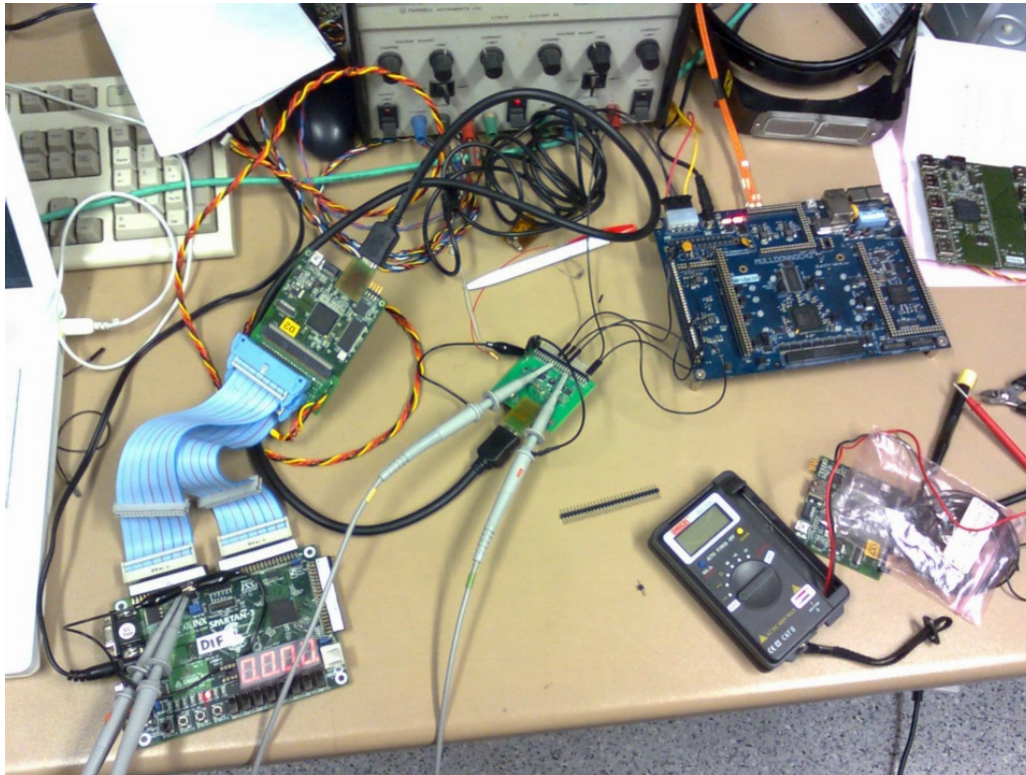
# Hardware numbers needed

Detectors' requirements :

- ECAL :  30 layers ⇒ 30 DIFs, 3 LDAs, 1 ODR and DAQ PC, 1 CCC
- AHCAL :  48 layers ⇒ (48 DIFs), 5 LDAs, 2 ODRs and 1 DAQ PC, 1 CCC
- DHCAL :  40 layers ⇒ (120 DIFs, 14 DCCs), 2 LDAs, 1 ODR and DAQ PC, 1 CCC

In general DAQ groups have to provide :

- 30 ECAL DIFs, 10 LDAs, 4 ODRs, 3 DAQ PCs, 3 CCCs;
- sufficient spares for test-beam running;
- additional systems for tests in labs.

Our procurement schedule is :
- 40 ECAL DIFs (have 2, components for 40)
- 20 LDAs (different parts at different stages, all delivered in ~1 month)
- 8 ODRs and 8 DAQ PCs (have 8+6)
- 10 CCCs (have 10)

# Summary and issues

• Progress made (firmware, purchasing, developing) for all components and system as a whole.

• We are gradually building up a stock of components which should be sufficient for lab and beam tests.  Complete very soon.

• As stated before CALICE-UK no longer exists and we continue our work using EUDET money and our spare time.

  • We do not have any (UK) continued funding for DAQ work.

  • V. Bartsch and T. Wu have left and D. Decotigny has taken over the software, although we can still provide some effort on a 6-month timescale.

  • By the end of the year, all of our effort will decrease rapidly.  M. Kelly will leave Manchester end of Sept.

• We will / need to have a debugged full system 0, assuming no show-stoppers, very soon which the detector groups become familiar with very soon.  And we need to provide sufficient spares for future use.  All of our work is and will be thoroughly documented on the CALICE wiki.