David Bailey, Manchester

CALICE OVERVIEW

Themes

- Hardware
  - MAPS
  - DAQ
  - Glue/Mechanics
- Physics
  - Ongoing studies
  - Eagerly anticipated results and upcoming conferences
- Future
  - DevDet etc.

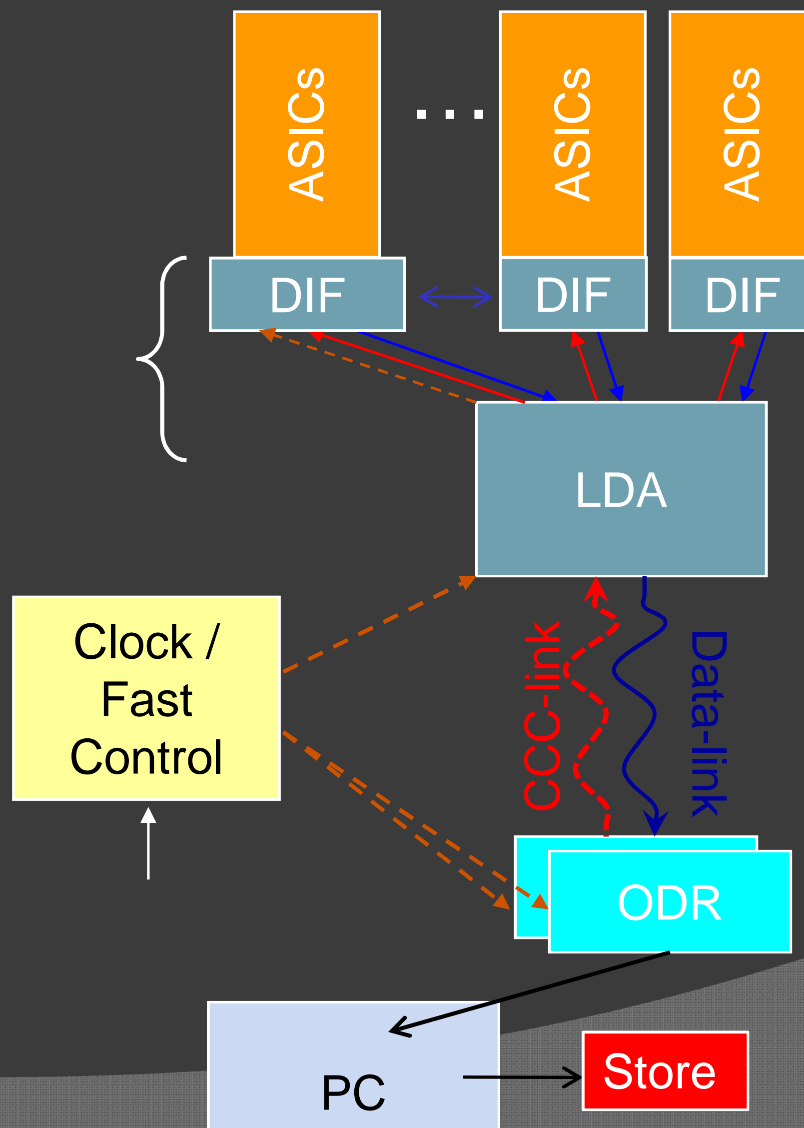
MAPS

- Selected highlights...
  - Anne-Marie

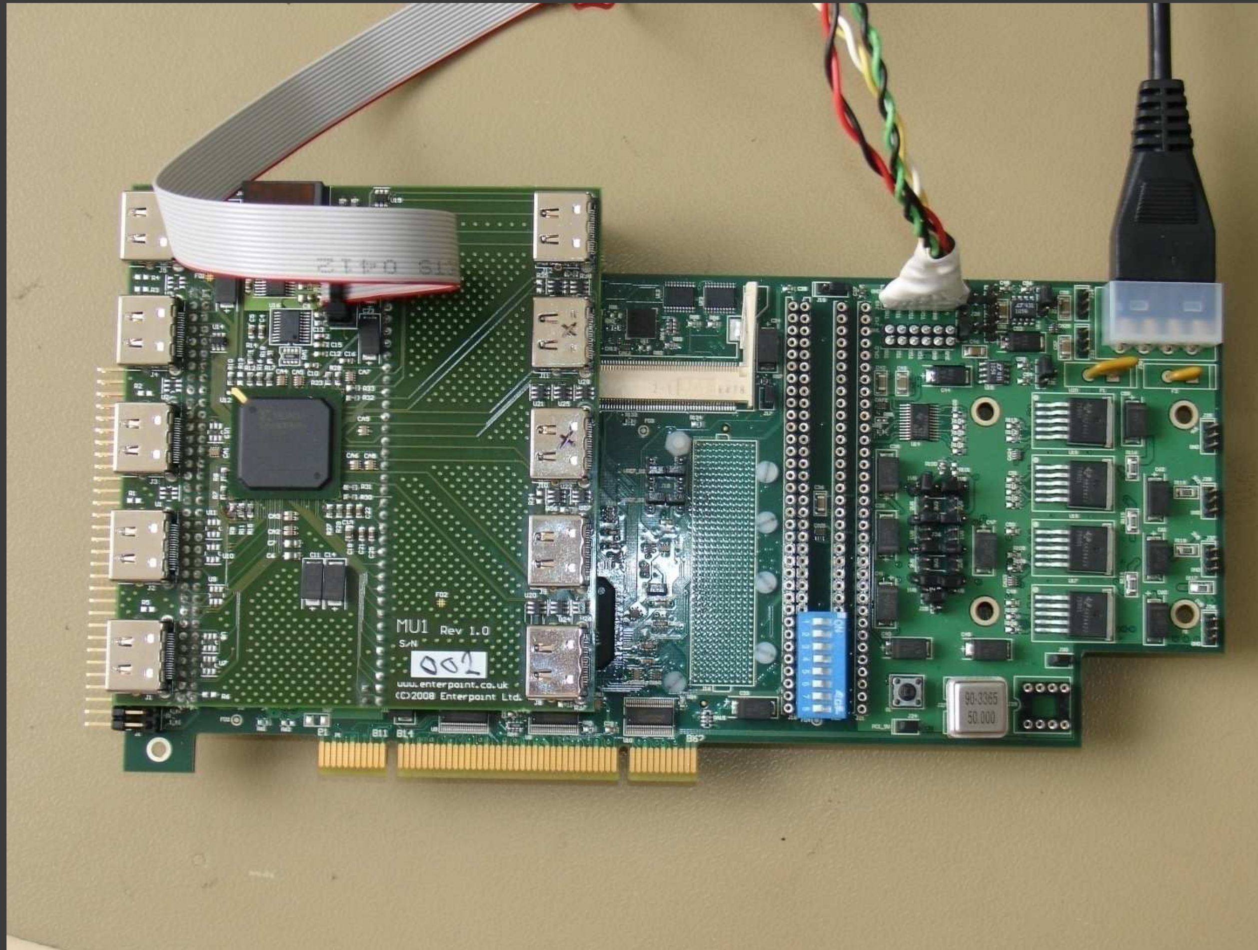
DAQ

- Hardware
  - Marc
  - Maurice/Bart
- Software
  - Valeria & Tau

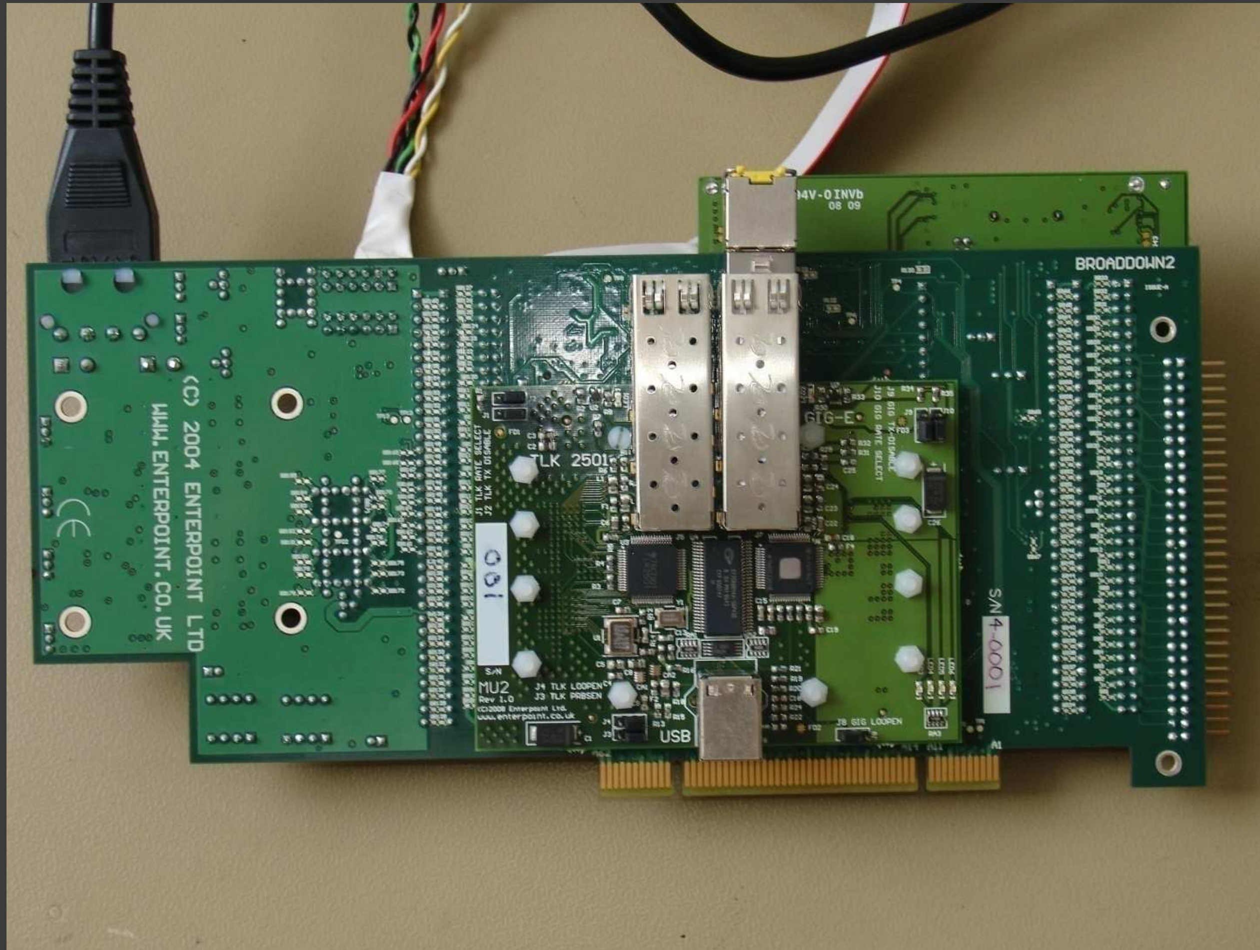
DAQ Architecture



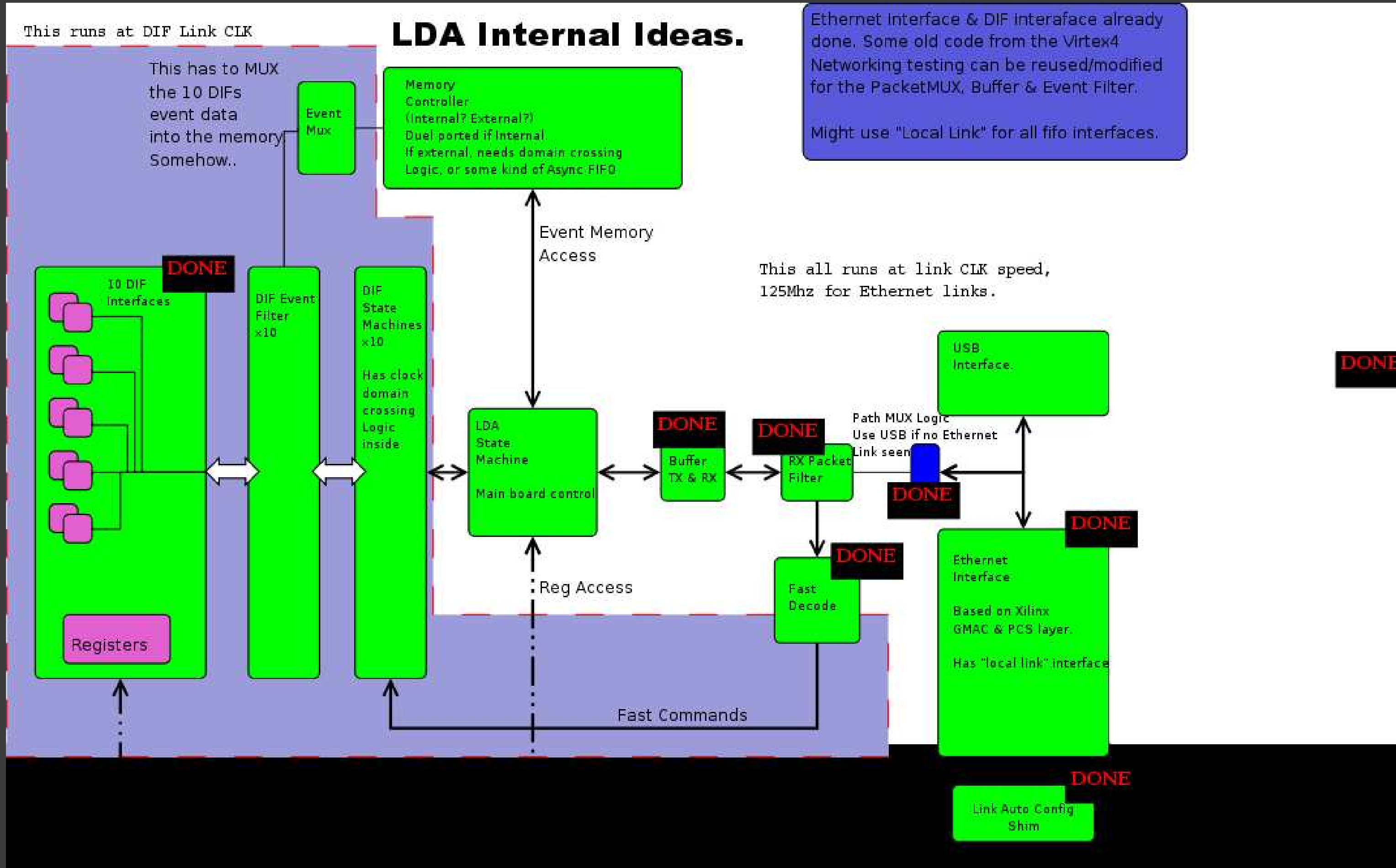
LDA Hardware Delivered

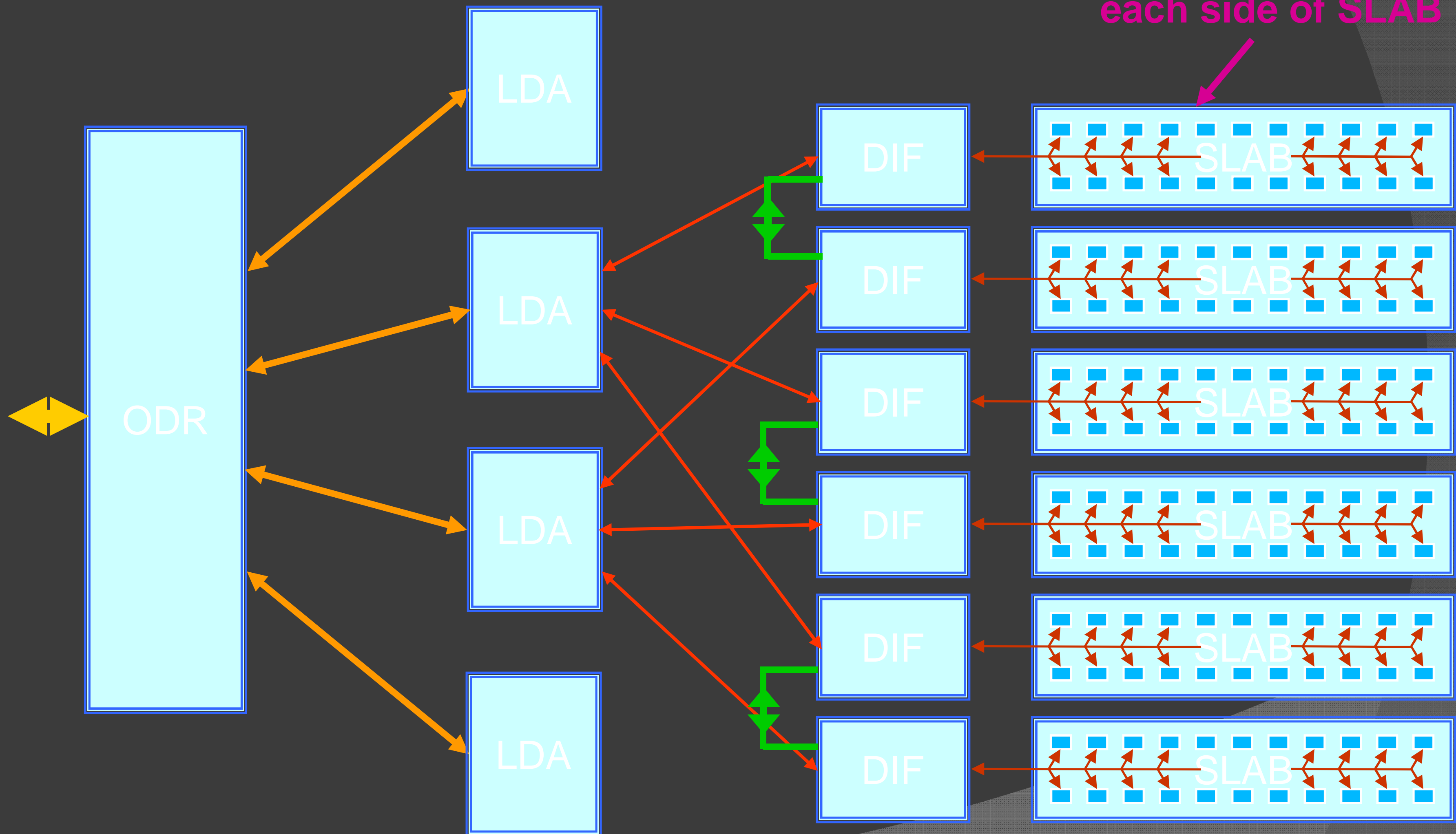


LDA Hardware



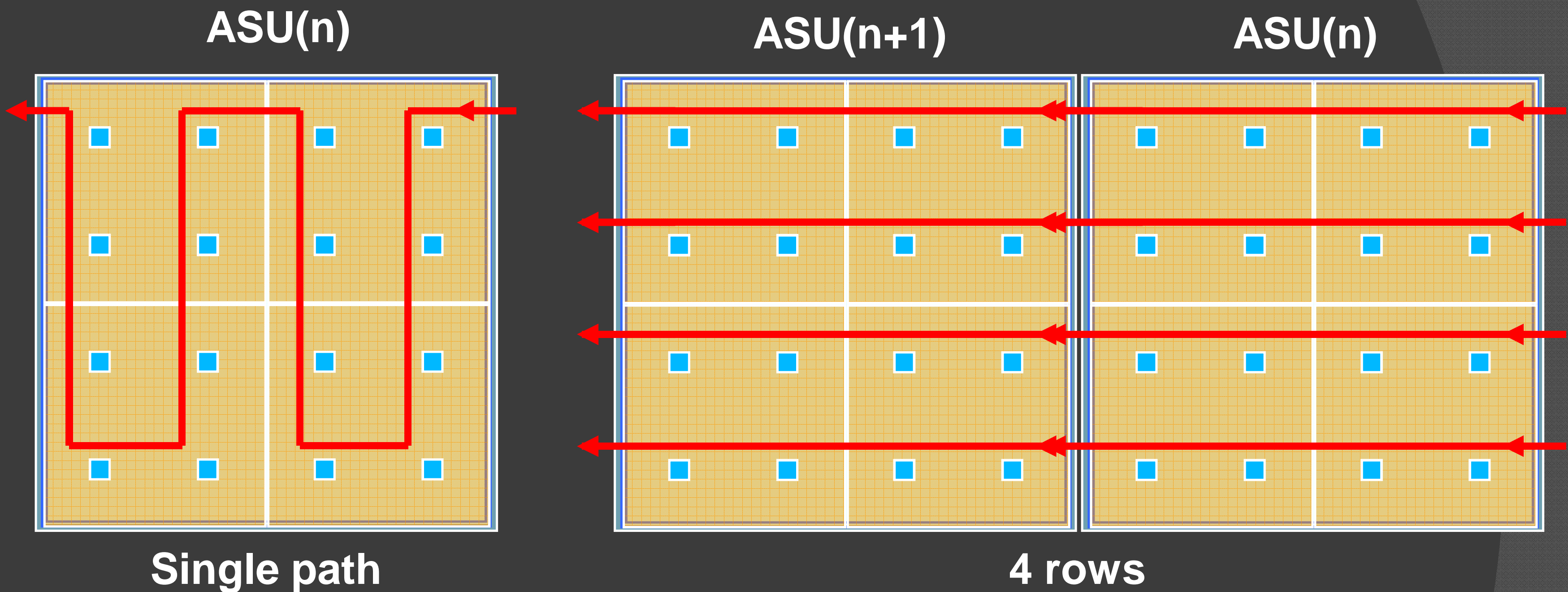
Firmware




ECAL SLAB Interconnect
DAQ Architecture - Overall view
~150 VFE ASICs on each side of SLAB
ODR
LDA
LDA
LDA
LDA
DIF
DIF
DIF
DIF
DIF
DIF
SLAB
SLAB
SLAB
SLAB
SLAB
SLAB

ECAL SLAB Interconnect – Why Multi-Rows?

How to read them out – **single path** or in **4 rows?**



Single path	4 rows
Per ASU: L ~ 720mm, C ~ 72pF	Per ASU: L ~ 180mm, C ~ 18pF
Per Slab of 9 ASUs: L ~ 6.5m, C ~ 650pF	Per Slab of 9 ASUs: L ~ 1.6m, C ~ 160pF

Do these look **BIG ??**

ECAL SLAB Interconnect

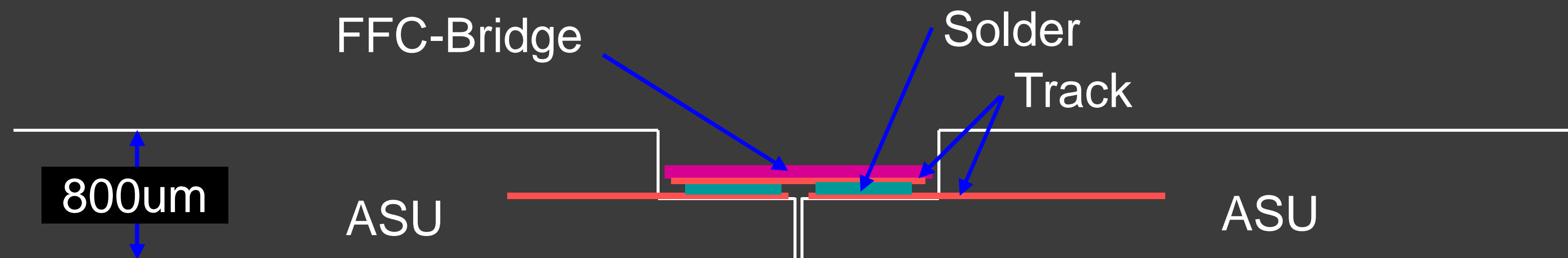
We have been looking at using “Bridges” to jumper multiple connections between adjacent ASUs

The Bridge would be soldered onto pads on the ASU (or DIF) PCB

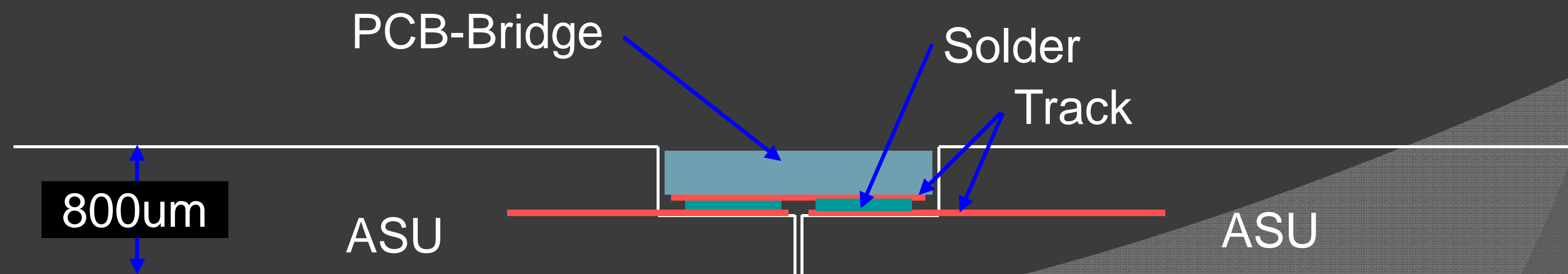
Each Bridge would provide 30-40 connections
Up to 4 Bridges fit in the width of an ASU
… 1 per path would be an ideal solution J J

ECAL SLAB Interconnect

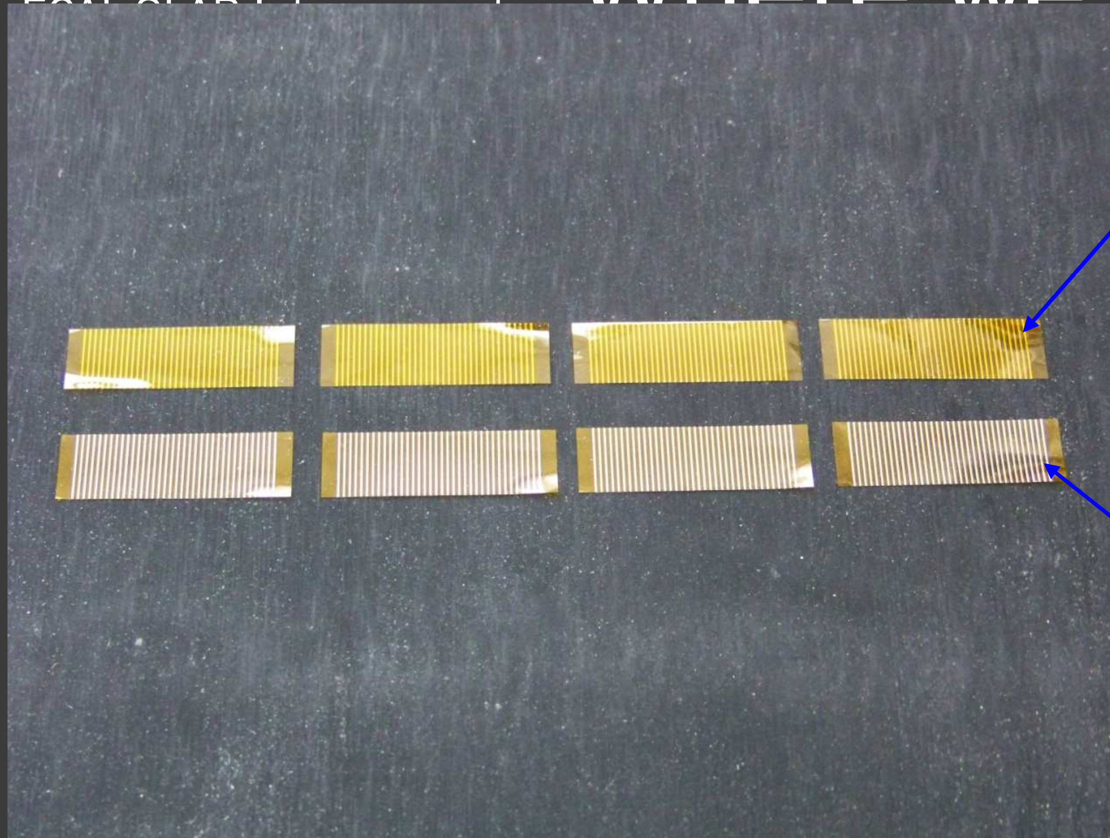
Short FFC (Flat,Flexible-Cable) Bridges make connections on a 1mm pitch – OK for at least 120 connections



Alternatively the Bridges can be thin PCBs, also with 1mm pitch connections. This gives a mechanical as well as electrical joint



Where we



Top View

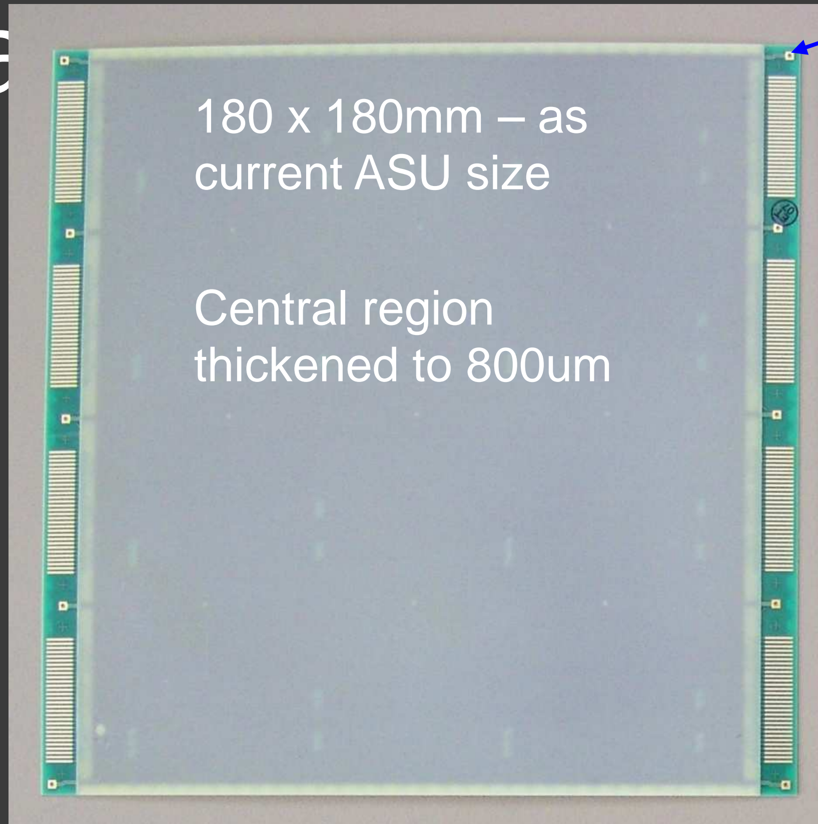
Thin traces on
Kapton backing

Under View

FFC-Bridges: we have 250 cut, 250 on roll

ECAL SLAB Interconnect – Where we a

Top View



180 x 180mm – as current ASU size

Central region thickened to 800um

Interconnect region 400um

4 identical rows of differential tracks connecting 36 way interconnect pads on left and right

Can be sliced into 4 sections, so provides for many trials

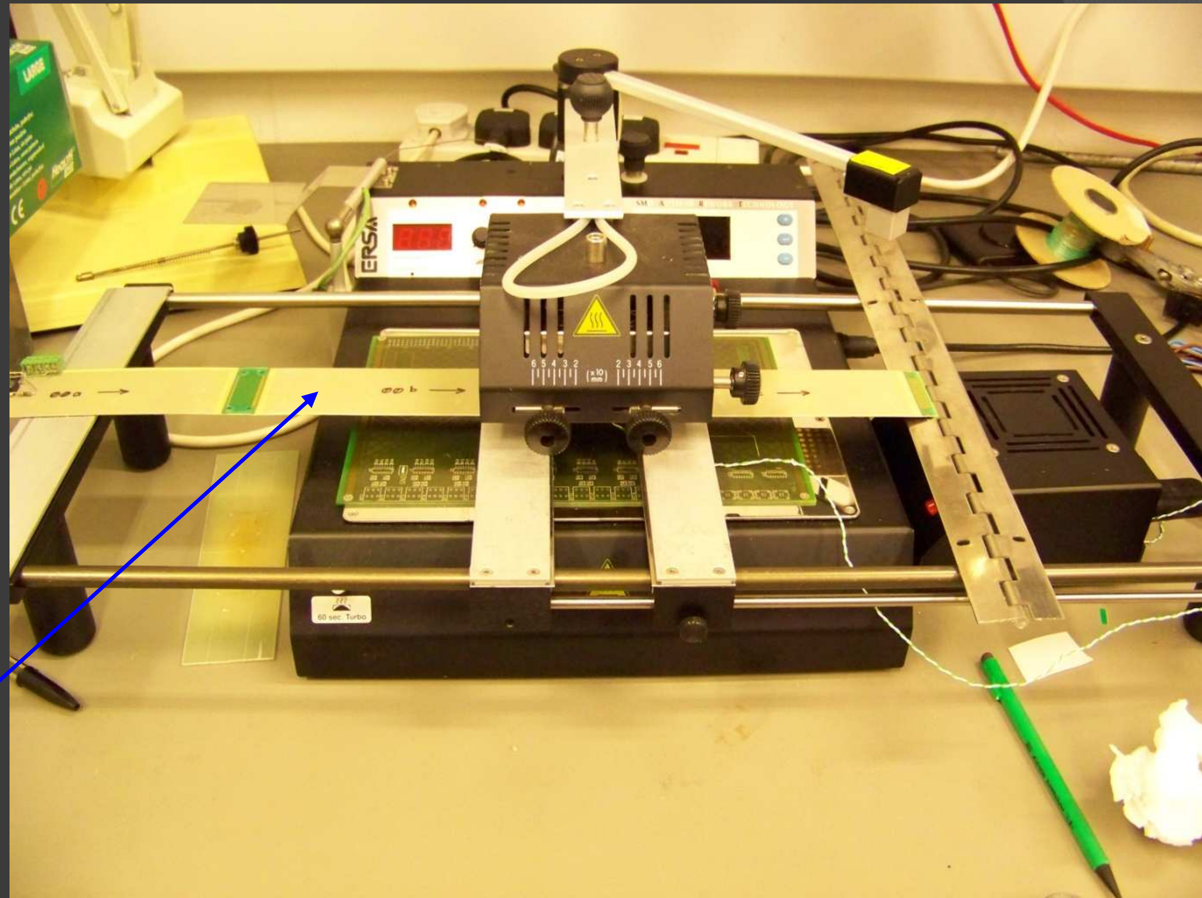
Differential tracks have a range of spacings & other charcteristics to test signal propagation and cross-talk

ASU-Test PCB: we have 15

ECAL SLAB

Interconnect –

Where we are



3 bits of ASU-Test being joined: reflow of 2nd and 3rd

Using the IR Re-work station

ECAL SLAB Interconnect:

Conclusions

There are major advantages in using Bridges:

- Removes major bottleneck in number of connections
- Promises greater reliability
- Rework likely to be easier

There's a lot to be done:

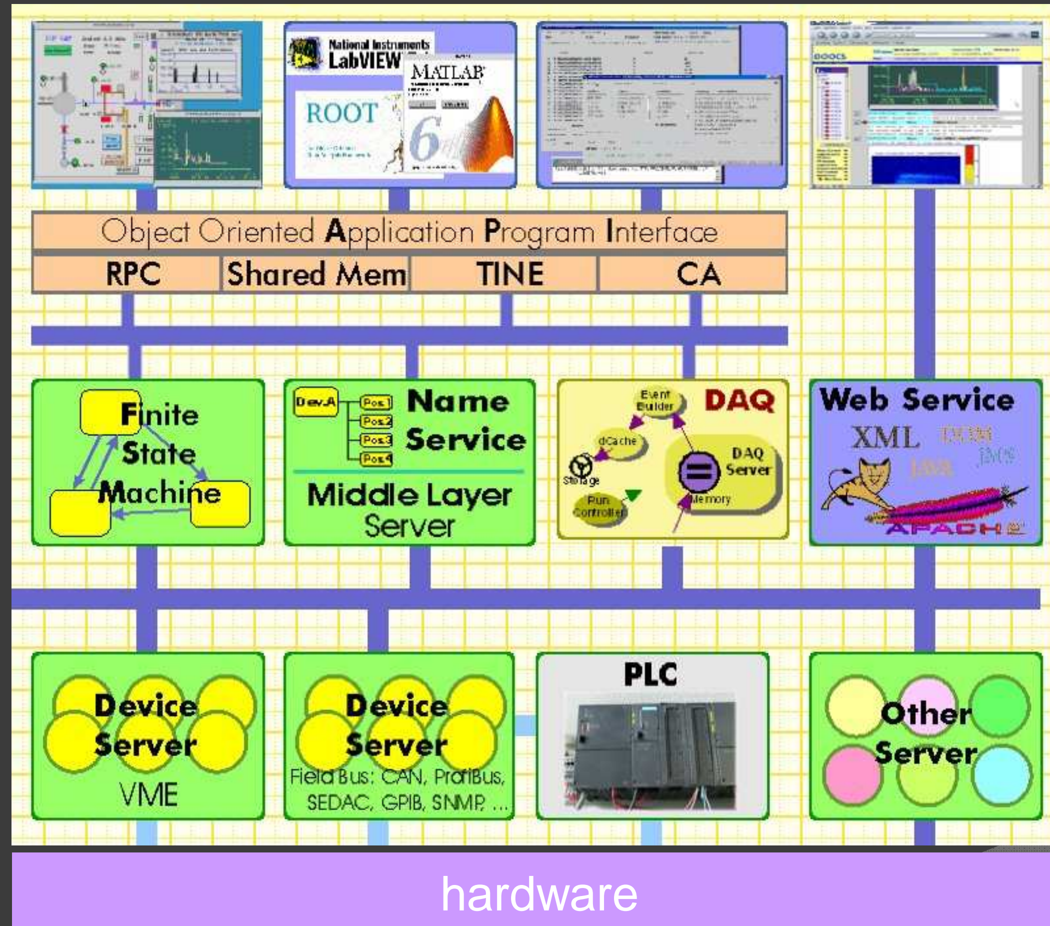
- We are trying out many things
- LAL Mechanical Prototype will also test PCB-Bridge mechanics

We are finding answers:

- 1mm pitch connections with continuity and no shorts
- IR re-flow looking very good:
  - ERSA Re-work station OK
  - Home-brew Imaging IR source may fit well into large-scale assembly procedures: full width re-flow, multiple heads,…

DOOCS overview

- 3 layers
- common APIs
- modular design
- multi protocol (RPC, TINE, EPICS, shared memory)
- device level (~200 server types)
- middle layer (FSM, FB, DAQ)



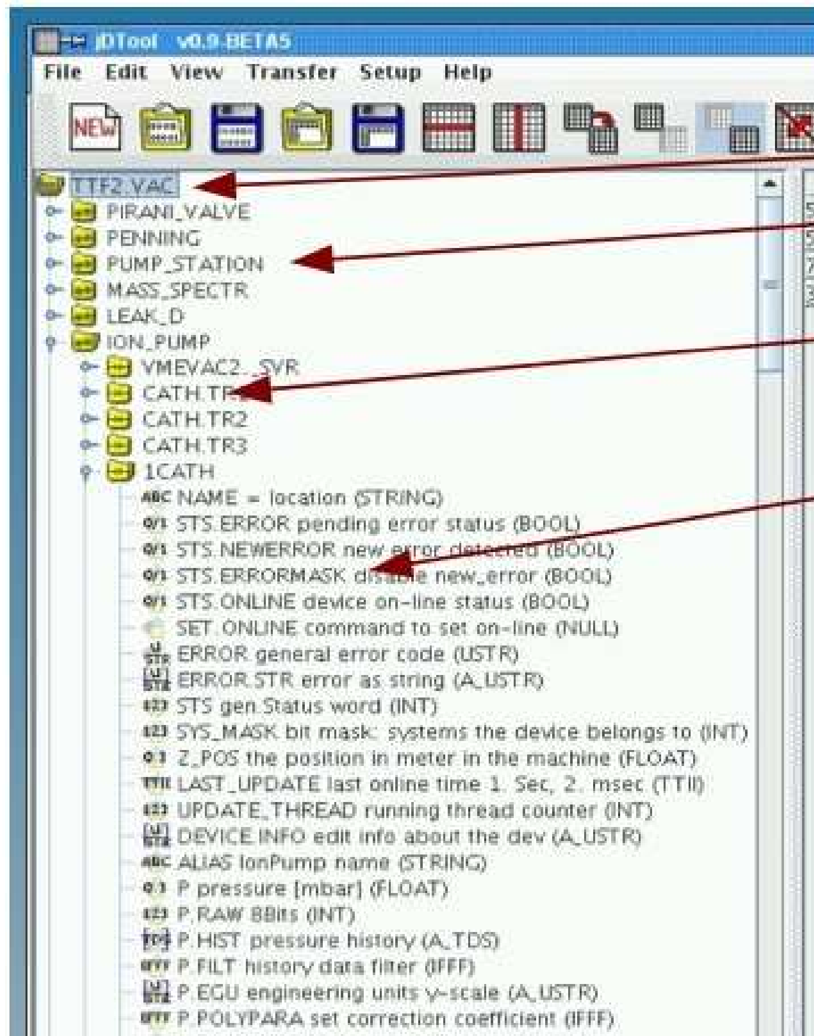
User Interface

Program Interface

Middle Layer

Hardware interface

ENS naming service



FACILITY == Accelerator

DEVICE == Type of a device

LOCATION == position inside the accelerator

PROPERTY == list of properties

Example:
CALICE.ECAL/ODR/ODR1/STATUS

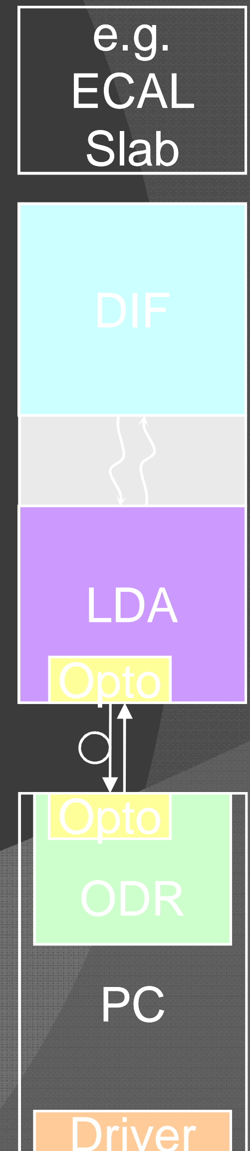
ENS naming service: hierachical DAQ system

- send data to DIF by wrapper through ODR and LDA (have switch to configure debugging modes which go directly to the LDA or DIF)
- ENS naming service can signal connections by additional properties, e.g. for device DIF:

CALICE.ECAL/DIF/DIF1/ODR_CON

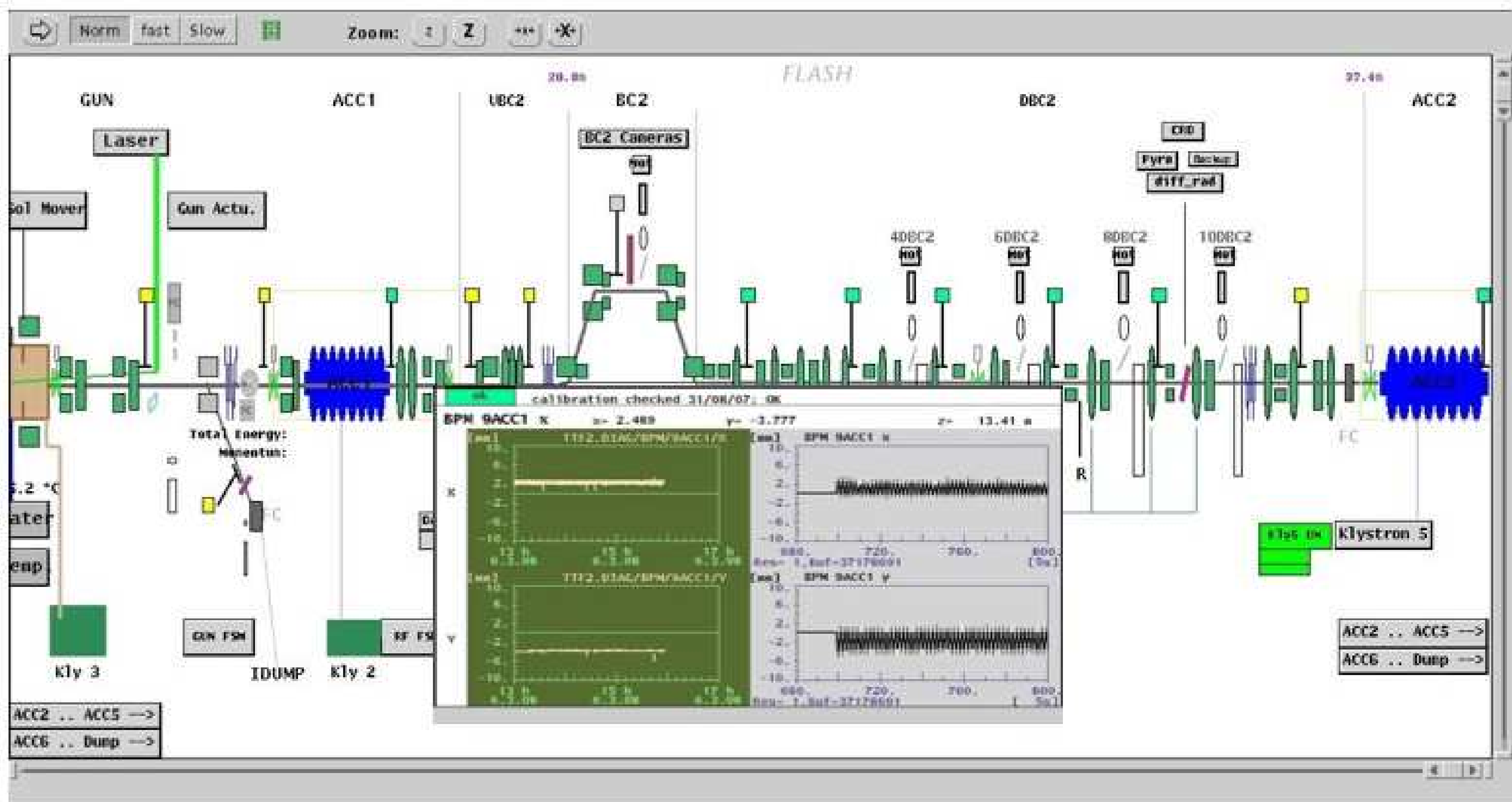
CALICE.ECAL/DIF/DIF1/LDA_CON

CALICE.ECAL/DIF/DIF1/DEBUG_MODE



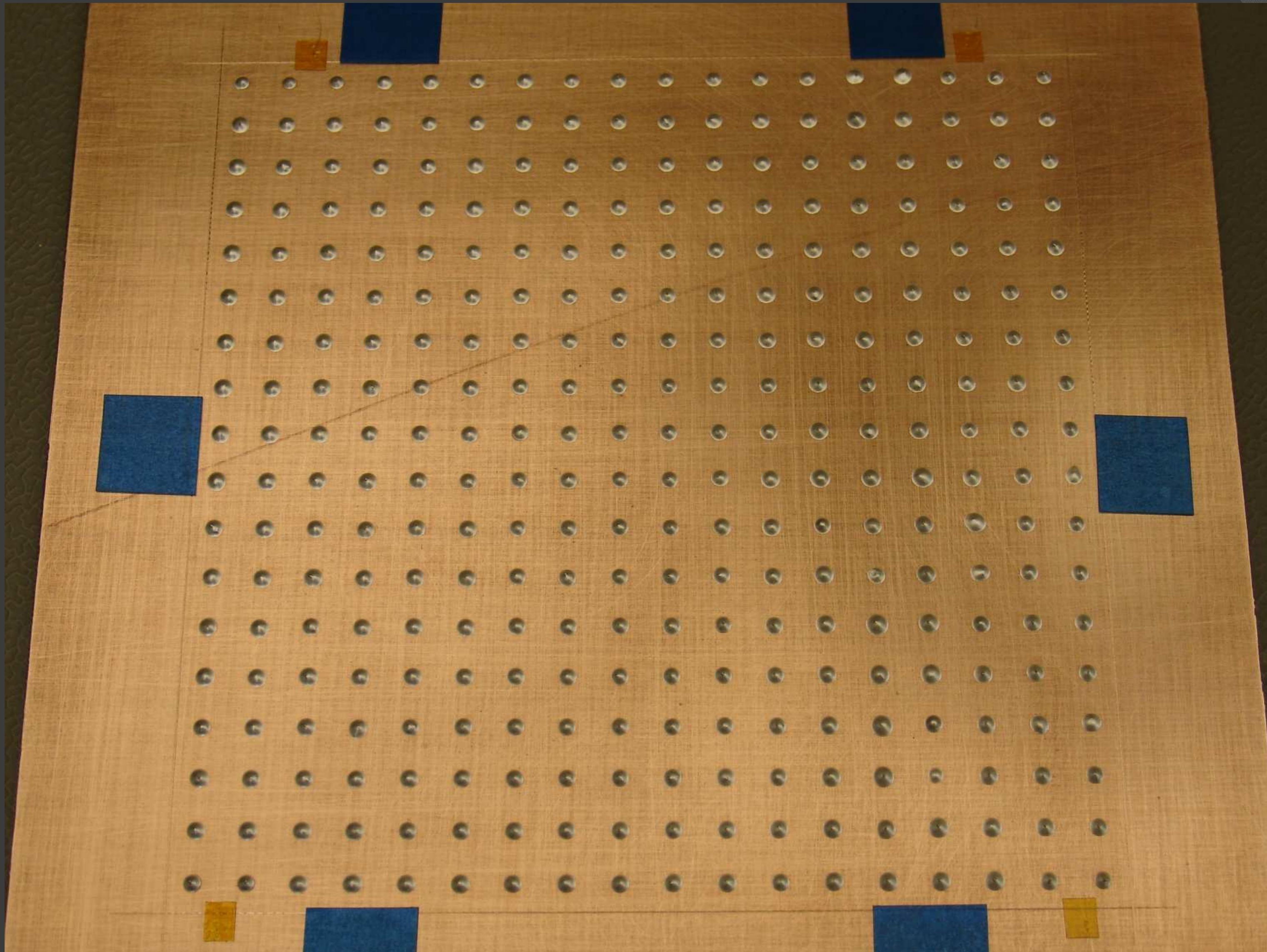
Example of monitoring GUI

DOOCS Data Display (DDD)

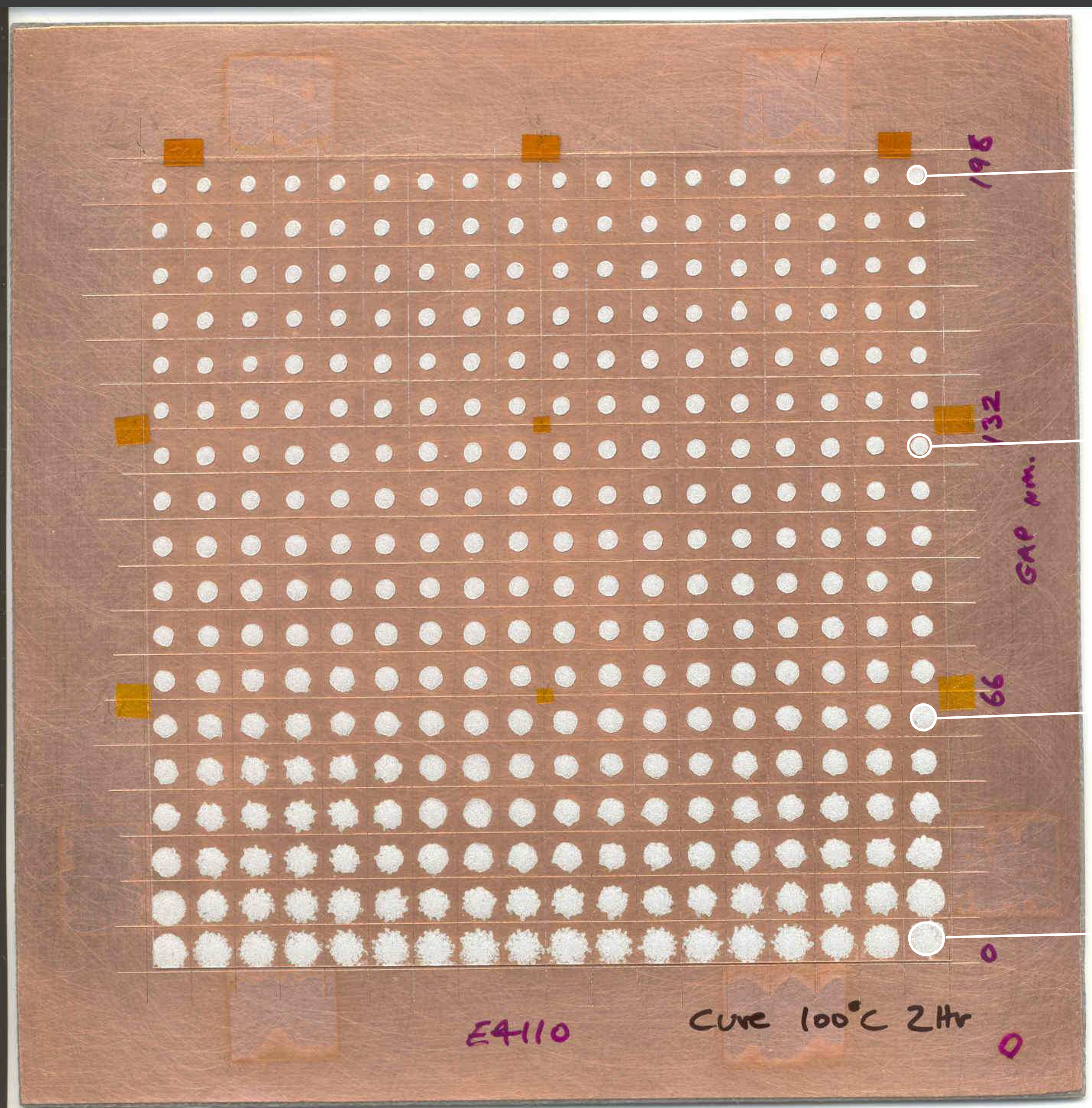


Glue/Mechanics

- Sticky stuff



The baseboard before overlaying glass plate



Ø1.6mm

Ø2.0mm

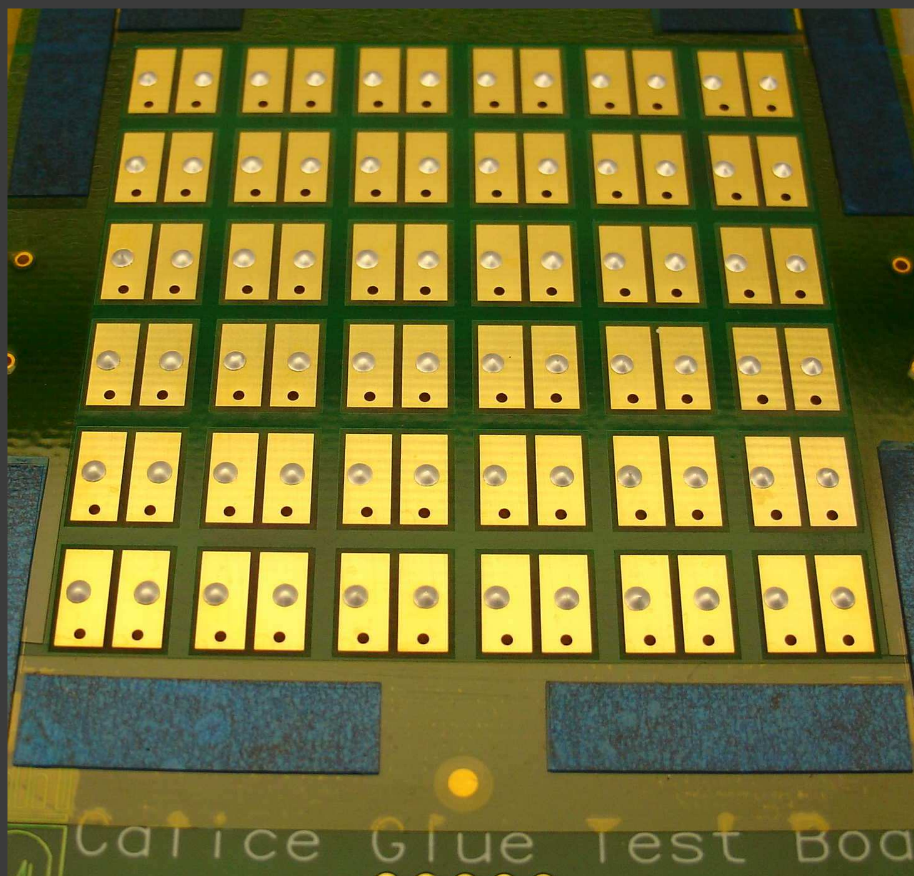
Ø2.5mm

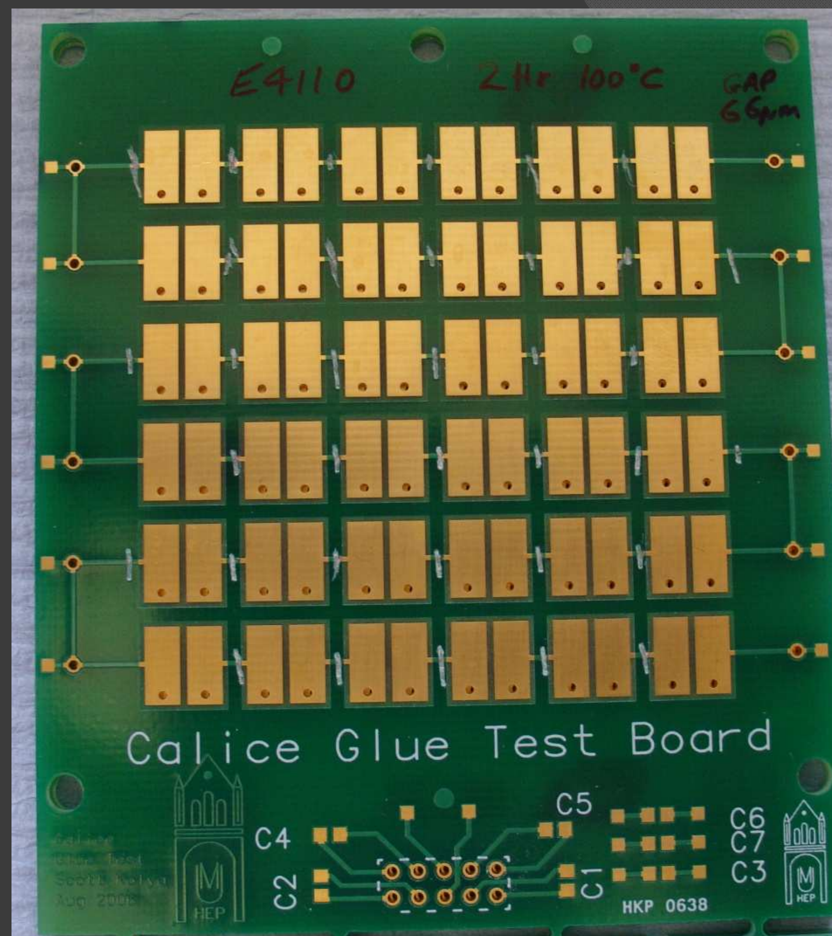
Ø3.6mm

Glass Plate #2

0.2 sec per dot

Mid spacers under plate





12 x 6 dots @0.2 sec on CALICE test board

Two boards sandwiched together, 66μm gap

Interpad links cut on top board

Resistances between overlapping pads measured –

<0.005Ω per pad

Physics

- Neural Networks
- G4 physics lists and data

Upcoming Conferences and Plans

- Upcoming Conferences
  - CALOR'08 (Pavia, 26-30 May)
  - ECFA ILC Workshop (Warsaw, 9-12 June)
  - NDIP 2008 (Aix les Bains, 15-20 June)
  - ICHEP'08 (Philadelphia, 29 July-5 August)
  - PSD8 (Glasgow, 1-5 September)
  - IEEE (Dresden, 19-25 October)
  - IPRD08 (Siena, 1-4 October)
- 16 Abstracts submitted to CALOR'08; 4 to ICHEP.
- Papers/Analysis notes
  - ECAL Commissioning paper (Anne-Marie)
  - ECAL electron response paper (Cristina)
  - Three AHCAL notes planned
  - "Final" ScEcal note on 2007 data

Future

- DevDet
  - UK involved in ECAL and DAQ workpackages
    - Low level participation to keep our fingers in the pie...
- STFC SOIs
  - Due in May
  - MAPS and DAQ under consideration