Status of the System Test in Aachen I

and

Plans for a Petal Cooling Test

Katja Klein

Physikalisches Institut Ib

RWTH Aachen

18th February, TEC Meeting Brussels
System Test - why (in Aachen) ?

- Learn about the noise behaviour of the modules on the ICB/petal
- "Qualify" the ICB: last chance to find problems
- Check for crosstalk between modules
- For system test centers: learn to operate the hard- and software
  (hard- and software should be as final as possible)

Original idea was to have two complete TEC system tests: in Aachen I & Lyon
But: not enough modules / analog opt. hybrids to fully equip two petals!
=> hope to test at least group II (rings 3, 4, 6)
System Test Setup

LV-supply for ICB (HP E3631A)

LV-supply (Kniel 1.25V, 2.5V)

HV-supply (ISEG SHQ222M, 2 channels)

ICB

VME-crate with O-FED

industrial PC with 12 PCI slots: FED, FEC, TSC

fibers of AOHs

fiber ribbon with patch panel
The ICB for Rings 4 & 6

- Ring 4
- Ring 6
- CCU
- AOH
- HV connectors
- LV connectors
- Power (2.5V) for the ICB
- Connection to the FEC

Katja Klein
Brussels, 18th February 2003
Optical Readout

Keep fibers / ribbon in original boxes to avoid a complete mess

Frequent (un)plugging of optical connector necessary -> no negative effect on optical performance observed

The OFED card - plug & play, but very sensitive to noise!

E.g. oscilloscope in vicinity can screw up the signal completely
• Use the "StandAlone" DAQ (debugging program for xdaq, same hardware access and configuration)
  - Steering with two xml files:
    fec & fed settings
  - Only one GUI
  - Basic functionality:
    pedestal & calibration runs

• Present readout config.:
  simultaneous readout of two modules works
Raw Data

E.g. module 30200020000643 (expressline II, ring 6)

Data taken in peak mode, inverter on U=120V

Large offset in FED due to OEC Logical 0 at ~170 ADC counts

AOH settings: gain=3 bias=22
Pedestal Run

E.g. for module 30200020000643:

- Raw data (ordered)
- Raw noise
- Corrected noise

Four pinholes are clearly visible.
Timing

TuneFed: fed delay = 6, clock delay = 4
Timing run: PLL fine delay = 8
Calibration Run

E.g. module ...643
Peak mode, inverter on, Ical=40

Good strip
(typically -40 to -50 ADC counts)

Strip with pinhole
(typically -10 ADC counts)
All remaining 5 expressline II modules were measured:

<table>
<thead>
<tr>
<th>Module #</th>
<th>Bad strip #</th>
</tr>
</thead>
<tbody>
<tr>
<td>...503</td>
<td>-</td>
</tr>
<tr>
<td>...642</td>
<td>183, 512</td>
</tr>
<tr>
<td>...643</td>
<td>2, 3, 65, 292</td>
</tr>
<tr>
<td>...644</td>
<td>155</td>
</tr>
<tr>
<td>...645</td>
<td>-</td>
</tr>
</tbody>
</table>

=> 100% consistent with ARCS measurement
I²C Communication

E.g. opto-hybrid: address = 96
write 22 to bias register 96
(register numbers: bias=96,97,98, gain=99)

I²C communication with all chips (apart from DCU) tested -> working well
But: for more than 1 module very unstable I²C communication (seems to depend on position of the modules on the ICB)
Next step - the petal!

- Easiest way to mount four ring 6 modules is on the petal
- Prototype (used by Louvain for cooling tests) can in principle be used
- Old cooling pipe design
- Problem with precision inserts: wrong height (too short!), non-centered holes, ...
- Metal pieces to screw on inserts are produced

-> mount ICB, modules and AOHs as soon as possible
-> learn about module mounting, fiber routing etc.
Slow Control Plans

- **HV:**
  - implement control of ISEG SHQ222M power supply via RS232 interface
    - monitoring of power & current
    - ramping -> IV-curves
    - control (switch off in case of high currents)

- **Temperature:**
  - read thermistors of the modules (6 for group II) via ICB and digital multimeter Prema DMM 5017 (RS232)
    - 80 channels (40 thermistors readable)
    - 7 1/2 bit resolution
    - galvanically isolated (opto couplers)

- **Use the DCU**
Summary of Short Term Plans

- Use xdaq for readout
- Slow control: - implementation of thermistor readout via the ICB with the digital multimeter
  - monitoring and control of the ISEG HV power supply via the RS232 interface
- Mounting of the modules / FE-hybrids (plus AOHs) on the petal
- Implement the digital optical link with the Vienna card (ordered)
- Do the measurements!
2 FEDs
2 FECs
1 TSC (plus 1 ordered)
1 OFED
4 ring 6 modules
7 Dorazil hybrids: 5 with 4 APVs, 2 with 6 APVs
9 AOHs: 8 with 2 lasers, 1 with 3 lasers
MUX ordered
2 CCUMs
1 DOH, Vienna card is ordered
What's Missing

- With present hardware: can read out only 8 modules / hybrids
  => not even group II!

- Missing for group II test:
  - modules!!
  - 2 more AOHs (get partially working ones from Lyon?)
  - another FED (or MUX)

- Not really clear how (if at all) to proceed for other groups
  - no further AOHs for system test available
    (next batch of 165 for final assembly end of March)
  - maybe an option to borrow hardware from Lyon once
    they are "finished" with their system test?
    Or test group after group?
Plans for a Petal Cooling Test

(Benedikt Hegner, Jan Olzem, Oliver Pooth, K.K.)

Basic idea of cooling test setup:
★ Test the cooling properties of a real petal
★ Cool it with Louvain cooling plant (first one is expected to arrive this week)
★ Mount petal on the mock-up
★ Put dummy modules with temperature sensors on every position on the petal
★ Use resistors to produce heat on dummy sensors / FE-hybrids / AOHs
★ At a later stage: mount the four ring 6 modules on the petal and read them out during cooling
Passive cooling box: wood, aluminum plate for electrical shielding, styrofoam and metallized foil for thermal isolation

Two slits for cooling tubes and cables (corresponding to two service channels)

wheels for easy transport

can be opened from top and side
The Mock-up

- The mock-up consists of two disk segments -> mount two front and two back petals
- Use one real front petal (risky - ring 6 faces the disk)
- Three dummy petals = aluminum plates with cooling pipes will be used to simulate influence of other petals on cooling
Have all ingredients to built 28 dummy modules:
- capton for all rings (wavy or otherwise bad)
- frames for all rings (e.g. with unprecise precision holes)
- all jigs are available
- use silicon or aluminum plates to simulate sensors

Precision is not crucial => dummy modules can be glued by an unexperienced person
Heating:
- use resistors to provide the heat
- place resistor on dummy wafer (0.5W/wafer)
- for FE-Hybrid and AOH: place resistors on little FR4 boards (0.5W/laser, 2.8W for 6 APVs, 1.9W for 4 APVs)

Temperature sensors:
- use thermistors of the capton, readout via extra cables or via ICB (later, only 12 per petal)
- in addition use Dallas sensors DS1820:
  64 bit address -> can put all sensors on one bus
  9 bit resolution = 0.5°C precision
- have readout card already in hands (AMS)
System Test:

- Readout chain is fully operational
- "StandAlone" DAQ (xdaq-like hardware access & configuration) is running
- Next steps are: - monitoring / slow control
  - xdaq readout
  - measurements on all ring 6 modules
- Still a lot to do...

Cooling test:

- In collaboration with institute Aachen IIIb: test petal cooling performance under realistic conditions
- Real petal & cooling plant / realistic heat load & geometry
- Preparations have started, first results in a few month