

Notes of ATLAS Level-1 Calorimeter Trigger Phone Conference – 16th September 2004

Birmingham: Steve Hillier*, Gilles Mahout*, Richard Staley, Jürgen Thomas

Heidelberg: Ralf Achenbach, Paul Hanke, Victor Lendermann, Kambiz Mahboubi*, Karlheinz Meier, Frederik Rühr, Klaus Schmitt, Hans-Christian Schultz-Coulon

Mainz: Gernot Weber*, Uli Schäfer*

QMUL: Eric Eisenhandler

RAL: Bruce Barnett, Ian Brawn, Norman Gee, Tony Gillman, Dave Sankey

Stockholm: Attila Hidvégi, Sam Silverstein

* at CERN (ATLAS test-beam)

1. Birmingham

- Richard reported that the designs for the new CPM (CPM1.9) and the LVDS Source Module (LSM) are now with the Drawing Office for layout. Some minor points still need resolving – e.g. should the CPM (and all other final-design modules) use fixed optical transceiver modules, or move to Small Form Factor Pluggable (SFP) devices, which are easily replaceable. According to the Agilent data sheets, the reliability figures for the optical transmitter run at 30 degrees Celsius suggest a typical MTBF of 288 years, suggesting a low overall system failure rate.

2. Heidelberg

- The first batch of 61 MCMs using FR4 substrate material, with much better bond pad surface finish and bond strength, have been tested. Only 7 devices have faults (89% yield):
 - 4 MCMs show a fault on a single FADC die, which may simply represent the yield of full-specification dies operating at 40 MHz, which the manufacturer has only tested at low speeds. This would suggest a full-specification FADC die yield of 98%.
 - 2 MCMs have a faulty PHOS4 die.
 - 1 MCM has a faulty PPrASIC, which was possibly damaged during assembly.

Re-working will allow all the faulty dies to be replaced on the MCMs.

- Of the 54 working MCMs, 27 have been gel-filled and re-tested with no further failures. They have now been sent to CERN to replace the original MCMs in the PPM(s) in the test-beam. The remaining 27 MCMs, which are currently being gel-filled, will be returned to KIP next week.
- Heated to 80 degrees Celsius, the differential thermal expansion of the gel inside the MCM cavity causes slight leakage via the filling hole, suggesting over-filling, so some adjustment will be needed.

Bruce asked if this differential thermal movement produced any mechanical stresses on the bond wires, but there has been no evidence of such an effect after a couple of cooling and heating temperature ramping cycles.

The gel-filling is important for two reasons: it provides a gas-tight interface to the bond wire surfaces to remove any oxygen which could cause corrosion, and its viscosity tends to stabilise the fragile bond wires against mechanical shock. A dry nitrogen filling would not provide the second function.

- These results suggest that the MCM production process is now fully under control, and the 89% yield is excellent.
- One observation from the test-beam work is that there is a problem to configure the PHOS4 chips, when the MCMs are mounted on a PPM. This is not seen when operating the MCMs on the test-bench, and so needs further study of the relevant firmware.

- The 3.5 wafers from the first engineering run of the latest PPrASIC design have produced 380 good dies after testing, which is a yield of 54%. The wafers have now been sent to a company in Finland for dicing, following which they will be assembled on to the new MCM substrates.
- The second LVDS Cable Driver (LCD) card, assembled by Klaus, has been tested successfully and sent to CERN for use in the test-beam system. A second PPM has also been sent to CERN, together with the original (“golden”) PPM, so there will be a total of three PPMs available.

3. *Mainz*

- Uli reported that a second JEM1.0 module has been assembled in Mainz, and once it has its front-panel it will be sent to CERN for use in the test-beam system.

4. *QMUL*

- Eric reported that his trigger algorithm note has been published as an ATLAS Note (ATL-DAQ-2004-011), and can be found at:

<http://cdsweb.cern.ch/search.py?p=ATL-DAQ-2004-011&f=wrn>

5. *RAL*

- The two updated TCM designs (for the VME64x(P) and VME-- crates) are at present undergoing placement and routing in the Drawing Office, and are about 90% complete..
- Layout of the updated VMM design is also nearing completion.
- A further four optical G-link receiver cards have been ordered for the 6U RODs and DSS modules, to enable all G-links to be operated optically.
- The VME64x crate, believed shipped from CERN over two weeks ago, has not yet arrived at RAL. Eric will chase this up.
- The 9U ROD module successfully passed its JTAG tests, and detailed testing will start once a suitable crate becomes available.
- The interface to Xilinx System ACE for FPGA configuration will be set up as soon as a crate is available.

6. *Stockholm*

- The two Wiener crates allegedly shipped from CERN a few weeks ago have not yet arrived in Stockholm – Eric will chase this up with Paul Harwood at CERN.
- Sam reported that the production of the extra mechanical hardware for the Processor crates is in progress. Support ribs and power bus bars for all 11 crates are now being made, and should be ready in about one month.
- The Gerber files giving all the details of the CMM Rear Transition Modules (RTMs) were received from RAL, and a design for a cable support system has been made.
- A number of problems have been identified and fixed with the CMM firmware. The crate level merger code looks fine, but the resources used for the system level merger code look suspiciously small.

7. *Test-Beam*

- Norman summarised the last two weeks work at the ATLAS test-beam:
 - Most of the cabling was installed during the pilot visit at the beginning of August

- An extra tower builder has been installed to ensure that the appropriate LAr calorimeter cells seen by the beam are instrumented for the 25 nsec run.
- Several problems with the PreProcessor have been successfully solved – one important firmware area that still needs to be fixed is the readback from PPrASIC to the ReMFPGA.
- A production VME64xP Wiener crate has been sent from KIP to CERN to replace the one borrowed last week for the PPM from Philippe Farthouat.
- Uli proposed and implemented a simple solution to the G-link “ Δf ” locking problem, so we can now read out the CMMs and CPMs without any firmware or hardware changes.
- We will test the CMM \rightarrow CTP interfacing on Tuesday 21st September, after the CMM review.
- The CTP core module has had problems caused by an engineering sample of a Xilinx FPGA being supplied.
- The RoIB is currently installed at the test-beam, and we should test our system with it within the next two weeks.
- Uli and Gernot have started to study the DCS/CANbus system in the JEM, the voltages and temperatures of which can now read out correctly. There may still be problems when operating several modules in the same crate.

Next Phone Conference – Thursday 30th September 2004 at 10:00 (UK), 11:00 (Germany, Sweden)

Tony Gillman