

Minutes of ATLAS Level-1 Calorimeter Trigger Phone Conference – 12th April 2007

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Heidelberg: Paul Hanke, Eike-Erik Kluge

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* at CERN **at RAL

1. Birmingham

- Tests have been carried out with one of the new pre-production CMMs fed from three CPMs. No parity errors were seen on the HIT input data transmitted *via* the PB in a five-minute run. However, the readout is not yet working, as it is at present using an old firmware version; Ian will supply the most recent version. The I/O cable links have also not yet been tested.
- There are four new CPMs ready to be tested.
- Simon has completed the modifications to the prototype RTM support structure, which he will take to CERN next week.
- There are six sets of support structures for the LVDS cable strain relief system now at CERN, enough for all of the Processor crates in USA15.

2. Heidelberg

- 100 of the production PPMs have now been carefully inspected visually, of which ten may have minor soldering faults on one of the MCM connectors; *Ersascope* inspection is required for final verification. The overall manufacturing yield is therefore ~90%.
- Of these 100 modules, Victor has fully-tested 38, of which two exhibit problems with firmware loading and have been put aside for later study.
- 36 PPMs are therefore fully-working, which is a sufficient number to fully populate two PPr crates.
- Real-time LVDS data tests had shown some non-zero bit-error rate, which was traced to a faulty LVDS cable with high signal attenuation (possibly a casualty of test-beam work?).
- Another cause of non-zero bit error rates ($\sim 10^{-5}$) was impedance mis-matching in the test system receiver multiplexing board; a new board design/layout is required.
- The final two PPr crates will be taken to CERN next week for installation in USA15.
- The PrePreProcessor Module (PPPM) will also be taken to CERN next week. This module consists of an old (non-working) PPM with an LCD card modified with bleed resistors to discharge any possible static charge buildup on the installed LVDS cables (Cable Discharge Events – CDE). The PPPM will be inserted briefly into each PPr crate slot before installing final PPMs.

3. Mainz

- JEM tests in USA15 will be carried out remotely from Mainz next week.
- Improvements to the simulation software are currently being made.
- Two of the production JEMs with minor connector assembly faults have been repaired and re-tested. One module is now working, but the other still has a G-link fault.
- One full crate of 16 JEMS is already installed in USA15, and a further 16 JEMs, sufficient to populate the second crate, is ready to be sent to CERN.

4. RAL

- Of the 53 production CPMs:

40 modules have passed all tests and are fully-working

Three modules have been re-worked at the assembly company and await JTAG testing at RAL

Three modules await BGA re-work at the assembly company

Seven modules cannot be re-worked at the assembly company, but may be re-workable at a specialist company – a trial batch of three of the seven is being prepared. If this test is unsatisfactory, all seven modules will be scrapped and new boards made

- One of the three new pre-production RODs was delivered to RAL on 4th April, and successfully passed its JTAG tests. Unfortunately, optical transmitter parts were fitted instead of optical receivers, so the module has been returned to the assembly company to be re-worked.

Assembly of the remaining two new pre-production RODs is almost complete, and they are expected to be delivered to RAL within the next few days.

- Tests on a pre-production VMM at Birmingham have confirmed that the full-load voltage drop on the 5V supply line is acceptable, so full module production can now go ahead.
- Two of the nine TCM-CP/JEP modules had minor assembly problems relating to connectors, but seven were successfully tested at RAL. One of these modules will be sent to Birmingham for system tests, and the remaining six will be shipped to CERN. The first four pre-production TCM-CP/JEPs should then be returned from CERN to RAL for the necessary updates to be made.
- The two TCM-64 modules in Heidelberg appear to be working correctly, although CAN operation has not been tested. Once this functionality has been checked, and if no problems have been observed with operation in the ROD crate at CERN, then full production can soon begin. (*Note – the ZDC group will require ~two TCM-64 modules, so their precise needs must be determined in order to define the total number of modules to order.*)
- At present, only three (pre-production) CMMs exist, and approval for full production awaits the current design and implementation to be finally signed off. As the production run will be with a new company, it will be necessary to order a four-module pre-production run to check the build.

5. Stockholm

- A viable solution is now beginning to emerge for the Processor Backplane (PB) problem. All eleven PBs will be sent to RAL for detailed evaluation to detect missing connector pins, using a combination of automatic scanning with the *Smartscope* metrology system and careful microscopic inspection. Agreement has been reached with *Rubicon* in Stockholm that *Erni* in Germany will repair all of the faulty PBs and return them to CERN. The company has been requested to supply high-resolution photographs of the faulty PB regions, both before and after the repairs. The timescale for the repairs is at present unknown.

To date, five PBs have been sent to RAL, and work to evaluate them is well advanced:

One PB (P5M2) has been found to be fault-free and has been sent to CERN for re-installation in a USA15 crate.

A second PB (P2M2) requires three connectors to be replaced, and will be sent to *Erni* for repair later today.

The evaluation of two further PBs (P3M2 and P4M2) is almost complete. Connector faults have already been identified on both, so they will be sent to *Erni* as soon as possible. In addition to these faults, P4M2 is lacking all 63 of the power pins, which are currently in Stockholm.

Scanning and inspection of the fifth PB (P1M0) is expected to be completed next week.

- Sam will visit CERN next week to re-install P5M2 in a USA15 crate, and remove three other PBs from their crates for shipping back to RAL, where they will be evaluated for connector faults. For the re-installation procedure he will need a CPM or a JEM – preferably non-working.

- Sam has been working again on the Jet CMM firmware. The VHDL code has been cleaned up in places and the timing in the synthesis and place-and-route has been improved, so that all four FPGA designs compile with comfortable timing margins and no meaningful warnings.

Test bench code to simulate the crate and system level real-time data paths in ModelSim is now being written, using Ian's CP test benches as a starting point, but because the Jet CMM functionality is a superset of the CMM functionality, adapting the CP code is non-trivial. The crate-level test bench is complete and looks OK, but the system level is harder because the lookup tables for Jet E_t need to be filled with some reasonable, non-zero contents for that part of the system to be checked.

For the Jet E_t LUT simulation, the LUTs in the actual CMM code will be instantiated with pre-defined contents that can be easily calculated in the test bench. This will have the side benefit of providing a default Jet E_t functionality that is available in the CMM directly after turn-on.

6. *CERN*

- The JEM tests that took place during the week before Easter were very successful.
- The installation and commissioning schedule for the next two weeks can be found on the L1Calo Twiki page – <https://twiki.cern.ch/twiki/bin/view/Atlas/LevelOneCaloInstallationSchedule>. It was noted that next week's schedule appears very crowded – tests with Tile Calorimeter signals may be possible towards the end of the week.
- The M3 combined run, which had been scheduled for April, has been delayed until June, so we may now be presented with an opportunity to join in.

Next Phone Conference – Thursday 3rd May 2007 at 11:00 (10:00 in UK)

Tony Gillman