Minutes of ATLAS Level-1 Calorimeter Trigger Phone Conference – 2nd February 2006

Birmingham: **Dave Charlton, Chris Curtis, Simon Pyatt*, Richard Staley, Peter Watkins**

Heidelberg: **Ralf Achenbach, Florian Föhlisch*, Paul Hanke, Eike-Erik Kluge, Karlheinz Meier, Hans-Christian Schultz-Coulon, Pavel Weber**

Mainz: **Uli Schäfer**

QMUL: **Murrough Landon*,**

RAL: **Bruce Barnett, Ian Brawn, Norman Gee, Tony Gillman, Viraj Perera, Weiming Qian**

Stockholm: **Attila Hidvégi, Sam Silverstein**

*at CERN

1. Birmingham

- Having installed thicker cables to the CP crate power supplies, it was possible to operate eight CPMs in the crate without any problems. All CPMs underwent TTC scans with playback memory data, showing the parity-flagged error-free timing windows to be ~2ns before any optimisation.

- The next stage is to drive real-time data into the CPMs via LVDS cables from LSMs. A total of 14 CPMs are now available and will be installed into the CP crate for the full-crate tests recommended by the CPM FDR. It is still unclear whether the CP crate +5V power supply will have sufficient current capacity.

- Chris Curtis has run PVSS to control and monitor a Wiener crate using an OPC server. With Adam's help, the next step will be to repeat this for a TCM.

- Also with Adam's help, the causes of the low-level CAN problems seen on the CP crate in Birmingham have been understood, and most (if not all) of the non-working CPM CAN circuits are now working.

- There were some minor problems with the CAN hardware helping to produce these faults, primarily relating to the transceiver between the backplane bus and the on-board micro-controller, which has a 'trinary' control pin placing it into one of three modes: STANDBY, SLEW-RATE CONTROLLED and FAST.

  o Unfortunately, a design error with the common CAN interface circuit can sometimes put the transceiver into standby mode and block transmission onto the backplane bus when this pin is unconnected. Some CPMs (but not all) had already been modified at RAL to ground this pin, but all future production modules will require this small modification. Viraj will check whether other modules (CMM, ROD, etc) exhibit similar problems.

  o The transceiver logic 1 level is outside specification, and so backplane CAN signals are not correctly received by the CPM CAN micro-controller. Adding a pull-up resistor to the transceiver output corrected this effect.

  o The spurious 8MHz oscillation observed on the CANbus signal driven from the TCM transceiver must be removed. It disappears when both of the following conditions are true:

    ▪ The CANbus must be terminated at both extreme ends, not just at the backplane connectors.

    ▪ The transceiver must be put into FAST mode by grounding the trinary control pin.

  o A wiring error on the TCM CAN transceiver circuitry prevents the variable resistor on the trinary control pin being adjusted to put the transceiver into FAST mode. Any unmodified prototype TCM may therefore display this oscillation. (N.B. It is possible that the CAN transceiver may be from a faulty batch of devices, as the Fujitsu CAN evaluation board uses the same part with the same micro-controller.)

- o The MAXIM MAX3057 is a pin-compatible transceiver which would be better for driving the CAN micro-controller and is hopefully less prone to instability. Richard has ordered samples to evaluate on a prototype TCM and a production CPM as soon as they arrive.

2. *Heidelberg*

- Production of MCMs is continuing, with a further 1500 glob-topped devices at Hasec awaiting lid attachment. Full details of the production status and numbers of completed MCMs can be found at:

  http://www.kip.uni-heidelberg.de/atlas/db/DbPPr/welcome.html

  The overall yield continues to be excellent.

- The layout work is continuing for the PPM. All of the traces required by the new pre-compensation circuitry for the LCD cards have been routed, and work is now under way to complete the remaining digital routing.

- The AnIn daughter-card design data has been submitted for manufacture, and the first 16 boards are scheduled to be delivered to KIP ~9th February for assembly by hand, prior to full production.

- There will be a new Diploma student joining the project, who will work for three months with Frederik at CERN, starting in March.

3. *Mainz*

- The JEM tests at RAL last week demonstrated that the new Input FPGA firmware with reduced latency worked well. It is not yet in its final version as there are still modifications needed to accommodate the Jet algorithm.

- Input FPGA configuration works correctly *via* System ACE, but there were problems at RAL when configuring *via* VME (as needed for lab testing), which however are not seen in Mainz.

- Rohde & Schwarz are satisfied with the design files for the pre-production JEM, and the four modules are scheduled for delivery to Mainz in early March.

4. *RAL*

- The VMM design files were submitted for board manufacture and assembly last week, with the first two pre-production modules being due for delivery in the first week of March.

- The two pre-production CMMs have successfully passed their JTAG tests and are ready for functional testing.

- The two new prototype ROD modules have also been successfully JTAG tested and are ready for functional tests.

- The design changes recommended by the TCM FDR are still being implemented.

- A ~£200K order has been placed for 432 XCV1000E FPGAs for the production CPMs. 225 of these are available ex stock, and the remainder in 15 weeks.

- Viraj has located a smaller version of the 95-pin 2mm backplane connector which may be useful for the Auxiliary/Supplementary backplanes on the VME64x(P) crates. With only 55 pins, the insertion force should be almost halved, although it may still be advisable to remove any unwanted pins (if possible – to be confirmed). Some samples have been requested.

- A new design of Rear Transition Module is needed for the production CMMs. Detailed design work can begin as soon as the exact specifications are available.

- Ian is continuing to work on the ROD firmware. Some of the bugs observed during the testing programme have been fixed, but others require further study.

- The CMM Test Plan requires some special diagnostic firmware which has not yet been written, but Ian hopes to make this available within a few days. A prototype CP crate will be needed in the Test Lab to carry out the first CMM functional tests.

- It was noted that none of the daughter-cards had VME-readable IDs, so it will be essential to maintain a careful record of serial numbers when replacing faulty daughter-cards. It is therefore especially important that all daughter-cards include machine-readable bar-codes, although this is probably not possible for the PPr MCMs.

5. *Stockholm*

- The CMM Jet firmware was tested last week at RAL. For the real-time data path the crate-level firmware was shown to work correctly, but problems were observed with the system-level firmware when data appeared to be blocked somewhere. The effect is not seen in simulation and inspection of the VHDL code reveals no problems.

- Production of the first ~four Processor Backplane PCBs is expected to be completed in the next few days, and Sam will probably visit the PCB manufacturing company to inspect them before they are shipped to Erni in Germany for connector assembly and testing.

- The first Wiener CP/JEP crates required will be the variants with air-cooled PSUs for use in Test Rigs, and the necessary mechanics for these will be prepared in advance of the completed Backplanes becoming available.

- The issue of strain relief for the incoming LVDS cables in the CP/JEP crates was discussed. It was felt that it was difficult to design anything at this stage without making some trials on a space model.

- It was emphasised that all exposed power bus-bars and connections on the CP/JEP crates and PSUs must be protected by insulation to prevent accidental electrical shorts.

- Sam had written a draft proposal for module keying, which required some further editing before public release. This should then be checked and approved by the module designers before ordering the appropriate keys, which would be required by mid-February for pre-installation into the Wiener CP/JEP crates.

6. *CERN*

- Length measurements of the 96 direct cables between the upper two sets (EM and Hadronic Barrel) of A side Receiver and PPM crates were completed, and the cables were cut accordingly.

- Before removing the cables, a check was made that the upper PSU in the Receiver crates could be removed without uncabling. With the extra 20cm standoffs installed in the cable stocks this can be achieved after first removing the red PSU handle at the front. These standoffs also provide larger bend radii for the cables into the tray so they are less stressed mechanically. Also, TC have apparently agreed that the turbines at the tops of the racks could be modified to be removed from the back, so the upper cabling scheme is probably now optimal.

- These 96 cables are now boxed up for Cegelec to put connectors on the other ends. A further 48 off-cuts need two connectors added by Cegelec for the C side cabling, following the proposed plan for optimising the cutting of the 21m cables.

- The next cabling trip will be the week beginning 13th February, probably to prepare the under-floor direct cabling between the A side End-cap Receiver and PPr crates, which will involve lifting floor tiles, *etc*.

- At last week's TileCal commissioning meeting, a few names were suggested of people who should help us with the cable tests, and in future prearranged time slots for them should be available.

- The TileCal group have made good progress with their PSU problems but still suspect that the failures may have damaged some of their electronics (and were possibly the cause of the broken

Receiver Rear Transition Module, the first electronics stage after the passive TCPPs to see Tile signals).

- Simon is again at CERN this week to inspect the initial connector assembly work from Cegelec; the indications are that it is of good quality.

- The portable loaned Tektronix scope shipped from RAL has arrived at CERN and will be very useful in USA15 for TileCal trigger signal commissioning tests.

- A total of 67 TCPPs were shipped from RAL to CERN this week, which, together with the three modules already in USA15, will provide 64 plus six spare TCPPs. They are all currently lacking the screwlocks for the D-sub connectors, which will be sent directly to CERN once they are delivered to RAL at the beginning of next week. It will take a day or two to fit all of them (1260!) and then install the modules in the four TCPP crates.

- Tony will complete the material database spreadsheet to allow ATLAS labels to be generated for the TCPPs.

- The first 1.2km of Nexans cable is now available, and has apparently passed the necessary acceptance tests at the company. Two sample pieces of 100m will be sent immediately to RAL for measurements of differential skew.

Next Phone Conference – Thursday 16th February 2006 at 11:00 *(UK)*, **12:00** *(Germany, Sweden)*

Tony Gillman