

# Minutes of ATLAS Level-1 Calorimeter Trigger Phone Conference – 8<sup>th</sup> March 2007

**Birmingham:** Dave Charlton\*, Gilles Mahout, Richard Staley, Pete Watkins

**Heidelberg:** Paul Hanke, Eike-Erik Kluge, Karlheinz Meier

**Mainz:** Uli Schäfer

**QMUL:** Eric Eisenhandler\*\*

**RAL:** Ian Brawn, Norman Gee, Tony Gillman\*

**Stockholm:** Sten Hellman, Attila Hidvégi, Sam Silverstein

\* at CERN    \*\*at RAL

## 1. Birmingham

- A further four production CPMs have been successfully tested, and all work correctly. The total number of fully-working modules (production and pre-production) is now 50.
- The re-designed CMM RTM has arrived safely in Birmingham, primarily to be used as a space model for designing its crate mounting mechanics. Unfortunately, it is currently impossible to test it electrically as the Processor Crate Backplane in the working crate has been removed to be X-rayed.
- Richard has built an ESD unit to discharge any possible static charge build-up on the LVDS cables installed in USA15, in order to prevent damage to modules during connection. A dummy CPM/JEM is also required to be used briefly before inserting modules into CP/JEP crates for the first time, and as the parts for this are already available it can be assembled quite quickly.

## 2. Heidelberg

- Assembly of all of the production PPMs is now complete, and 160 modules are at KIP. 70 of these modules have been visually inspected, and a few require some minor re-soldering around the MCM connectors. Of these 70 modules, 25 have been thoroughly tested on the test stand, using analogue signals from the video DAC system, and problems have been observed with only two modules, which have been put aside for later study.

The current status is therefore that 23 production PPMs are now fully tested and working, making a total of 43 available modules including the 20 pre-series PPMs.

There is now an urgent need for a TCM-64 to operate a full crate of 16 PPMs together.

This is a very impressive achievement, and it is encouraging that the high yield of working modules established with the pre-series run is being sustained.

## 3. Mainz

- All 43 of the production JEMs have been boundary-scanned in Mainz, and only two show any connectivity faults, generally of a minor nature.
- Eight production JEMs were taken to CERN last week for tests in USA15, together with three of the pre-production modules.

Good progress was made with these tests: FIO timing was checked, LVDS signals sent over eight cables from a PPM to one JEM, readout to DAQ operated, *etc.*

No oscillations of the crate PSU, using remote sensing, were observed during these tests, with a total of eleven JEMs in a single crate. This was possibly due to the shorter power cable looms in USA15, compared to the crate PSU setup in Mainz.

*N.B. The full-crate CPM tests carried out recently in USA15 did exhibit some evidence of large-amplitude bursts of high-frequency noise on the PSU supply lines, which requires further study.*

The Processor Crate Backplane was subsequently removed and shipped to RAL for X-ray tests.

- A further 16 production JEMs have been successfully tested in Mainz, and are ready to ship to CERN.
- The Processor Crate Backplane in use in Mainz has been checked for correct connectivity across all slots using a full set of modules, and shows no errors (although damaged ground pins would not be revealed in this way).

#### 4. *RAL*

- The status of the CPM production is that the assembly company has been requested to scrap seven modules showing persistent connectivity faults associated with large BGAs, and to manufacture completely new modules.
- From the second batch of four pre-production RODs, one PCB has also been scrapped after PCB QA problems.
- The three pre-production CMMs have all been tested successfully at RAL and are working, although currently lacking extraction handles, more of which have been ordered.

Two of the CMMs will be sent to Birmingham for in-crate system tests, before shipping them to CERN.

A problem has been discovered with the CMM design, where the incorrect type of crystal oscillator has been specified (a 3.3V part, which is not 5V-tolerant, so representing a potential problem of long-term unreliability), so the third CMM will be retained at RAL to try to find a post-production solution. There are two possibilities: the addition of a single wire, or the addition of a small solder-attached PCB to generate 3.3V from the 5V supply.

The assembly company has requested a “scout” PCB to check that the required 5% impedance tolerance for the CMM has been achieved.

- Three CMM RTMs have been delivered to RAL, of which one has already been sent to Birmingham. (The fourth module was sent in error by the assembly company to UCL in London instead of to Birmingham!)
- The four TCM-64 modules should be delivered to RAL today, and the first two will be tested by Adam as quickly as possible – hopefully this week – and then shipped to Heidelberg for use with the PPM testing.
- The nine TCM-CP/JEPs are scheduled for delivery to RAL next week. As the CMM tests at RAL are now complete, the prototype TCM-CP/JEP has now become available and will be shipped to CERN.
- Some minor mechanical problems have been discovered with the pre-production VMMs, but to avoid changing the design files for the production modules the necessary corrections can easily be made post-production. However, it has not yet been completely confirmed that the solution to the fault seen with the prototype VMM (periodic resetting of the crate processor because of excessive IR-drop on the 5V supply PCB trace) works correctly.
- Of the seven S-link RTMs for RODs now at RAL, it was agreed that two should be shipped to CERN and one to Birmingham, with the remainder being stored at RAL.
- Bruce asked whether we should consider producing more CPMs to increase our level of spare modules, in light of the persistent problems seen with their production to date. We should decide quite soon, as the assembly company is about to order a batch of PCBs to replace the scrapped ones.

#### 5. *Stockholm*

- There was some discussion of the current Processor Crate Backplane problem. In summary, connectivity faults are seen on several backplanes, one of which has been removed from its crate and X-rayed. Where shorts to ground had been observed, the X-ray and *Ersascope* images clearly show pins that have bent over before entering their backplane holes, and that have sometimes broken up.

*At a subsequent discussion after the phone conference it was agreed to request a quotation from the company which carried out the X-ray procedure (local to RAL) to X-ray all eleven of the backplanes, to provide an accurate assessment of which pins/connectors need to be replaced. This company, which has carried out a great deal of PCB assembly work for RAL, also has the capability to replace damaged 2mm connectors, so it was proposed that they be asked to make repairs to one backplane to allow us to assess the quality of the work. In parallel, Sam will continue to discuss similar possibilities with the company in Germany that originally assembled the backplanes. We must then formulate a viable plan for checking and repairing all eleven backplanes as soon as possible, without producing too much disruption to the installation programme in USA15.*

## **6. CERN**

- The LVDS cabling installation has gone very well so far this week. The installation rate is about four hours per half-crate (CP/JEP), and the A-side installation is now almost complete. With ~four people under-floor and two above-floor, the process is very efficient. The estimate is that a maximum of only two further cabling weeks will be required to complete the full installation, although more time (<two weeks?) will be needed to connect all of the cables to their respective crate slots at both ends – ~4000 connectors. This latter process must also incorporate a systematic cable-discharge procedure, which will take a little extra time.
- Only two crates have the final set of mechanical additions (LVDS cable strain relief, bus-bar extensions, safety covers, etc), which means that these crates must be moved between racks as the LVDS cabling proceeds, which is a time-consuming and hazardous procedure. We expect that the remaining sets of crate mechanics will be finished in the Birmingham workshops before the end of March, which will ease this situation.
- Manufacture of the prototype CMM RTM mechanics will begin as soon as the Birmingham workshops have completed the current work.
- Chris Curtis installed the latest PVSS updates successfully. The fan-trays in the USA15 racks can now be accessed correctly.
- Vasile returned to Romania today, after a successful two months work to assemble and label all of the LVDS cables, ready for installation in USA15.
- There is some concern about maintaining the cleanliness of the LVDS connectors in the USA15 cable plant, before they are plugged on to the backplanes. As the racks are not yet sealed, there is probably considerable dirt being blown around by the cooling fans, so the connectors must all be covered with protective bags, and it may be helpful to use air-jet cleaning on them before finally connecting them to the backplanes.

**Next Phone Conference – Thursday 22<sup>nd</sup> March 2007 at 11:00 (10:00 in UK)**

***Tony Gillman***