

## 12GeV Trigger meeting notes:

20-Jan-2012: C. Cuevas, W. Gu. B. Moffit, Ed Jastrzembki, A. Somov, Beni Z., J. Wilson, N. Nganga,

13-Jan-2012: C. Cuevas, W. Gu. B. Moffit, N. Nganga, J. Wilson, S. Kaneta, Ed Jastrzembki, A. Somov

9-Dec-2011: C. Cuevas, W. Gu. B. Raydo, B. Moffit, N. Nganga, J. Wilson, S. Kaneta

2-Dec-2011: C. Cuevas, W. Gu. A. Somov, B. Raydo, B. Moffit, N. Nganga

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### 0. Trigger/Clock/Sync – TI/TD

#### 20Jan2012

→TS 1<sup>st</sup> article is planned for delivery the week of 23-January. Initial testing will occupy at least a few weeks.

→TI –TD specification is complete and is going to be circulated for final signatures. Final quantities have been decided and the total production order is for 185 units.

Front panel and other peripheral hardware for the production TI-TD lot has been submitted to the procurement department.

→The TS rear transition board design is complete. William will wait for TS initial testing, then TS\_Rear Transition board will be sent for manufacturing and assembly.

#### 13Jan2012

-->TS 1<sup>st</sup> article board will be assembled and delivered in a few weeks. Acceptance test firmware in development.

-->TI-TD procurement has started and is approved. Accessory orders have been placed, and production quotes have not been received or evaluated yet. Accessory items are front panels, F/O Transceivers, and alignment pins.

Last week a discussion of consolidating the global crate to include SSP, GTP, SD, TD and TS was held and several issues have been identified. I believe there is an issue with the serial transmission of the trig1 and trig 2 signals from the TS to the SD, but other than that, this configuration should work.

#### 9-Dec-2011

-->Specification and BOM in progress for the production order.

TS Trigger holdoff/pulse width settings, etc. How does this need to be specified and handled in the full system. A few timing diagrams may help define this. Minimum trigger pulse separation is 60ns.(FADC250 )

→TS 1<sup>st</sup> article board has been ordered. Two parts: PCB and assembly. Delivery by Feb.

#### 2-Dec-2011

→TS 1<sup>st</sup> article PR has been submitted and is in process for ordering. This will be a consignment order, because we have the components for a single TS board.

→List results from TI clock meeting held on Wed 30 Nov.,,,,

### 1. SUB-SYSTEM PROCESSOR (SSP)

#### 20-Jan-2012

SSP is effectively ready for production, so we can verify quantities and start the procurement (Hall D and B?). Ben's schedule shows other projects with higher priority, and the ECO list for the initial SSP is minor. Target June 1, 2012 as the procurement start date for the Hall D and B quantities.

### **13Jan2012**

SSP “pre-production” could be advanced and initiated by summer if folks have a need for a few boards for evaluation/testing. There are a few groups that would like to use a SSP so maybe this makes sense. Minor circuit ECO will be completed before this pre-production run.

Final production order will be placed in August -2012 and will coincide with installation of crates and other infrastructure that will be needed before pre-commissioning can begin in the halls.

Development activity for the HPS test run in March-2012 will include firmware for the SSP, and a requirements document is in place for the new firmware required for the FADC250. This is a very aggressive schedule for the March run, but a goal has been set.

## **2. CUSTOMERS**

### **20 Jan 2012**

→Jeff briefly reports on the visit to ACIDI. May receive 1<sup>st</sup> article production boards by end of February! Good news overall.

→The HPS spring run is a high priority given the 6GeV beam will turn off in May. New firmware for the FADC250, CTP and SSP are in progress. The HPS spring run will require at least two VXS crates and twenty six FADC250 boards. Hall B presently has 16 FADC250 boards that are connected the original Inner Calorimeter.

→Make a decision/directive to declare the experiment plan(s) for beam testing AND HPS. Repair and gather up FADC250 to meet the HPS and other beam test needs.

### **13Jan2012**

-->The production order for FADC250 has been awarded and the production orders for the SD and TI-TD boards is in procurement waiting for bids. We have started discussions with the Accelerator group and MIS to use a common database tool to manage the volume of different DAq boards that will be used in all of the halls. This tool is a work in progress, but will handle all equipment tracking and repair information.

### **9- Dec-2011**

Online database tool at the conceptual stage. We will have a fairly enormous quantity of boards and different boards to track, so a tool will be needed to handle this problem.

### **18-Nov-2011**

→FADC250 boards, SD boards, TI boards and CTP are used by several ‘customers’.

- Hall B – Inner Calorimeter – Full crate, SD, CTP and TI
- Hall B – Hall D FCAL test – FADC250, SD, TI
- Injector Group: FADC250

→A fairly large batch of VME FADC250 fan-out modules have been ordered and are in the assembly process. Should be able to release a few boards to Alex, and Sergey by 5-Dec.

## **3. “B” Switch - Signal Distribution Module (SD)**

### **20-JAN-2012**

→Nick has completed the purchase requisition, specification and all account managers have approved and signed the requisition. The total production order is 124 SD units. The orders for the peripheral hardware (front panel, alignment keys, other?) will need to be submitted soon using the same account allocations.

→Update the ETC schedule for production boards.

### **13-JAN 2012**

→Signature approvals for the production order is 50%.

PRs for accessory items needs to be submitted. Accessory items are front panel, and alignment keys. This PR can use the same account codes and quantity breakdown.

→Nick has created a test plan document, and will need to modify and update this test procedure in preparation for the 1st article production test acceptance and production unit testing.

### **9-Dec-2011**

→PR for the SD is in progress.

Specification is complete

BOM complete

Manufacturing files complete

Will need specification signatures and account number approvals before sending to procurement.

### **2 Dec 2011**

No report but the PR will be signed and submitted by the time Nick

### **18 Nov 2011**

→Production order specification and BOM files are a work in progress. Goal is to have a PR created in the system to begin the contract by the time Nick goes on vacation.

## **4. System Diagrams/Fiber Optics**

### **13JAN2012**

Peripheral components can be purchased now for the trigger fiber optic system. For example, the patch panels and patch cords can be purchased. The trunk fiber cable will not be purchased until the cable trays and platforms are in place, so that an accurate length can be given to the selected vendor. Looking at the schedule, these length values for the trunk cables will be ready by summer 2012.

### **December 2011**

No update to draft specification status. Procurement is not critical until first quarter of FY12. System level drawings have been updated for both Hall D and Hall B to reflect the latest requirements for the parallel fiber optics that will be used for the trigger hardware.

## **5. Two Crate DAq test configuration**

### **20-JAN-2012**

→We had a discussion on testing the production front end “payload” boards in a full DAq crate with all the trigger boards. Clear agreement that this testing will be essential before delivering a full crate to the Hall location.

→A few bullet points on the procedure to test a full crate of “payload” boards. (FADC250)

#### **Prerequisites**

- Each board will have passed individual acceptance testing
  - FADC250, SD, CTP, TI as examples all have individual acceptance test procedures.
- Final firmware revision will be loaded into payload modules
- VXS crate will be load tested and prepared for new modules
- Single board computer (ROC) will be configured with proper OS and pre-tested
- Required function generator, oscilloscope, and test cables will be available.
- Tests:
  - Deterministic timing alignment: Synchronous “Playback” mode.
  - Asynchronous “Playback” mode with Trig\_2 generated with random pulser.

- Inject pulse signal to 16 input channels and verify trigger generation and readout of input signals. 16 of 256 channels is 6.25% occupancy. Low, but probably useful. Could ramp up the pulse rate to test trigger rate.

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### **13-Jan-2012**

-->Chris will draft a "Full DAQ Crate Test Procedure" document. The idea is that all boards in a single crate will have passed individual acceptance testing and these boards will need to be operated in concert with CODA and together in a VXS backplane to verify full readout and synchronization testing. This will eliminate full crate troubleshooting in the halls.

-->Random pulse generator testing with playback data needs to be documented.

-->Need to get started with configuration and test goals for the global trigger crate testing. We will have ALL custom trigger boards in either production or 1st article format by March, and can begin testing the SSP, GTP, SD, TD and TS in a full crate. Needless to say, significant CODA driver library development activities will increase.

### **9-Dec-2011**

→Discussion on global trigger hardware testing

BER test? Need to do.

Test in lab using a random pulse generator to start the playback data. Perform the same testing as before and measure trigger rate vs. CPU transfer rate.

### **2-Dec-2011**

→Production testing – Full crate with CODA – Make a goal of Feb-2012 to have a prototype setup of this test station in place.

### **18 Nov 2011**

→Bryan has been testing hardware with the EEL109 crates using the remaining modules that have not been deployed to "Customers". A new bug has been identified with the TI at high input trigger rates.

→Set up a test for BER would be a very good measurement to record, and this would need at least a few days of dedicated running to establish a realistic test. Need to discuss further.

### **11 Nov 2011**

-->Hai and Bryan have successfully tested a full crate using playback mode. The summing information from each FADC250 payload board has been aligned properly in the CTP to create the crate sum.

→The GOALS of the two crate test station have been successfully achieved and the amount of work is commendable.

→The number of available FADC250 boards is diminishing, but we should set up the two crate EEL109 test station for a long term BER test using as many boards as possible.

→Creating a draft procedure for a full crate test using playback mode and CODA would be brilliant and would allow other personnel to perform full crate acceptance testing. Typical questions, Who, When, What priority?

### **3 June 2011**

**→Successful testing with the two crates each with a single FADC250-V2, CTP, TI, SD and one SSP!!**

**16 July 2010 (Keep this note because it needs to be implemented and tested at some point) See older note dates for the list of items.**

## 6. *Crate Trigger Processor (CTP)*

### 20-Jan-2012

→No report from Hai, BUT, Scott is presently working on custom firmware for the HPS cluster finding trigger algorithm. The calorimeter mapping and other information is starting to take shape, and Scott could implement the firmware in both a CTP (Xilinx) or GTP (Altera). The HPS beam test configuration will require two VXS crates to fully instrument their calorimeter and the new cluster finding trigger algorithm will be implemented and tested.

Due March 1.

→Lets not forget that the CTP production order will need to be started this summer. As described last week, the Hall D units in principle could be ordered by the summer. Will require time to modify existing circuit board design for final production version.

### 13-Jan-2012

Discussion about how to proceed with the FY12 order of production boards for Hall D. Existing version meets(exceeds?) requirement for energy summing and other parameters. Goal is to order production units by 1-Aug-2012.

Will continue to work with the CLAS12 folks for a written requirement document to justify a new design for the CTP. The new requirements for the CTP may in fact affect the design of the SSP, so this will have to be discussed in detail. Schedule impact will be a significant issue to consider.

### 9-Dec-2011

→Conversion of CTP-2009 (PCAD) to Altium 2012 will happen today!

### 2-Dec-2011

→Conversion of the PCAD CTP database to Altium will be complete by 5-Dec-2011. Review required ECO and other circuit additions. Goal to fabricate production boards by Q4-FY12.

## 7. *GTP and Global Crate Developments*

### 20-Jan-2012

→Scott has taken on the activity to develop the HPS cluster finding trigger using the CTP and possibly the GTP to process the modified serial streams from each of the sixteen FADC250 payload boards that will be connected to the Hall B Inner Calorimeter(IC). LOTS of development and testing in a short time, but this will take a priority over some of the other activities needed for the GTP.

→Need to shift the production order for the GTP to the latter part of FY12 because it makes sense and there are several essential and critical tests that need to be completed with the global trigger boards (SSP, TS, TD) before ordering the production boards for ALL halls. The quantities for the TS and GTP are low (<10) and there is time before pre-commissioning begins in the halls.

### 13-Jan-2012

-->Scott continues to make progress on the Ethernet development, and will complete testing of the FO transceiver soon. Some work activity will be completed by Scott for the upcoming HPS run and we also discussed activities to verify the limits of the FADC250 to CTP Gigabit serial speed. (Works at 2.5Gb/s but hardware limits need to be tested @5Gb/s). Scott can use a FADC250 and the GTP to document results of the higher speed transfer.

### 9-Dec-2011

→Ethernet development in progress.

### **18-Nov-2011**

→Need to review the requirements/specification document for the GTP and focus on the primary functions. The Ethernet interface will need to be completely defined soon so that any software development tools/licenses can be accounted and purchased this year.

→Not too early to begin creation of a Global Trigger Test document that will include SSP, TS and SD.

→Trigger equations: What other required features for the GTP are needed?

- Minimum Bias Trigger
- Cosmic Ray Trigger(s)
- Diagnostic Trigger(s)

### **11 Nov 2011**

-->Testing continues: DDR memory, power, and several other hardware functions have been tested.

→Ethernet development has started, but details need to be defined.

→Investigate how to make the GTP appear as a ROC; (Cmsg). Investigate does not mean implement, but Scott needs to know the requirements for the Ethernet interface.

→Physics equation was loaded into the GTP Altera FPGA and Scott presented the latest results for the latency through the part.

- Altera design approach used 46 clock cycles (184ns) to perform the final GTP equation that was initially tested with the Xilinx FPGA.

→Prepare a test plan for the global trigger crate. (SSP, GTP, SD, TI, TS?)

**ACTION ITEMS:Next meeting -Friday 27 JAN@ 10AM in F226**