

FCS Electronics & DAQ

at the Forward Upgrade Face-to-face Meeting

Feb 28, 2020

Tonko Ljubicic/BNL
(for Bob, John, Mike & Tim)

Deliverables

- DEP/ADC digitizer boards (with FEE controls)
 - 74 required
 - with Trenz TE0712 FPGA modules & SFP fiber modules
- DEP/IO triggering boards (for Stage 2 & 3 trigger algorithms)
 - 3 required
 - with Trenz TE0712 FPGA modules & SFP fiber modules
- DEP/patch boards (for trigger data interconnect management)
 - 4 required
- DEP crates
 - 5 required custom crates and backplanes with power supplies and fan units
- DAQ PCs
 - 10 required
- DAQ Receiver Boards
 - 4 fiber channels each using Trenz TEF1001 PCIe cards, TEF1008 fiber cages & SFP modules
 - 20 required (2 per PC)
- fibers, patch boxes, power control, trigger data cables, etc

DAQ Room: DAQ PCs, Receiver Boards, network

- 11 DAQ PCs arrived (10 required, 1 hot spare)
 - will be named “fcs01”..”fcs11”
- in the process of installation into rack DA14
 - rack cleaned from various odd crates
 - ⇒ waiting for Rahul et al to install some mechanical mounting rails
 - power distribution on hand
 - ethernet discussed with Jeff and scheme decided
- once the Receiver Boards arrive (Mar 15) we need to assemble them in the lab
 - connect the FMC fiber cage to the PCIe card, insert SFP (fiber) modules
 - provide special power cables (on order)
 - program firmware
- ... and install into the DAQ PCs → 2 in each
- test all PCs → boot, check Receiver Boards, support software, etc
- we also need to install the fiber patch boxes (“MIC”) and connect short fiber patch cables from the MIC to the Receiver Boards
 - on order
- ⇒ Expect to complete the DAQ Room by Apr 1st

Platform: racks, crates

- 5 (+2 spares) DEP crates are in hand and assembled
 - mechanical components, power supplies, custom backplanes, fan units ⇒ done
- rack drawing → Tim's talk
- order NPS power control for the 5 crates
 - still deliberating between 208V vs 110V
- TCD unit (for the Clock & Trigger distribution) already installed and tested
 - but we need to provide 5 multidrop cables to each DEP crate (June)
- DSM cable from the Stage 3 DEP board to STAR Trigger installed
 - we can use up to 16 bits into the TCU
- MIC box and fiber patch cables on order
- ⇒ Start rack setup process once the run ends (~June 15)

Digitizers: DEP/ADC

- 74 boards required
 - 98 PCBs ordered, 88 will be assembled
- waiting for PCBs from China
 - delayed due to virus, expected Feb 28th **but I expect more delays**
- all assembly & parts quotes sent to Texas A&M
 - **I hope this is done soon so the parts procurement can start!**
- firmware now supports all FEE flavors (E/HCAL & FPOST)
 - we can get rid of the TUFF boxes
- firmware continues to be developed and tested in the lab
- once boards arrive they will be configured & tested in the lab
- **⇒ expect/hope to be ready by Jun 15**

Triggering: DEP/IO, DEP/patch

- 3 DEP/IO boards required (2x Stage-2, 1x Stage-3)
 - 5 assembled
- 4 DEP/patch boards required
 - 5 assembled
 - a board which fans-in individual trigger datapath cables from 16 DEP/ADC Stage 1 sources into 1 high-density cable connected to a DEP/IO (2 per DEP/IO board == 32 channels)
- But problems with DEP/IO
 - the 1st problem with fast serial links resolved
 - incorrect cut/paste for a regulator → trivial fix (remove 1 wrong capacitor)
 - a large number (~30%) of serial link channels look like disconnects
 - Bad assembly? Still early to tell (looked at 1 board only). Working on it.
 - and also problems with a number of channels at highest rates
 - ⇒ We should assume 64bits per xing for trigger algorithms as we originally planned (at least for now)
 - ⇒ fortunately we only need 2x Stage-2 boards with 32 input channels so we expect to be able to fix every channel “by hand” if necessary
- ⇒ expected to be ready by Apr 1st
- note: trigger algorithms for Stage 2 and Stage 3 really don't exist
 - I expect problems in this area so we shouldn't expect to have any high-quality algorithm running in FY21

Schedule

- MILESTONE: ready for FEE commissioning by Sep 1st 2020
 - see details in the FCS Electronics Schedule .pdf in Indico
- ...and ready for data-taking for the FY21 run
 - with all the DAQ software etc
- but any sophisticated trigger algorithms problematic for FY21
 - do we need them?

And a note:

- We don't have resources to fully support the currently installed DEP boards in STAR in FY20
 - the new FEEs are delayed and a window of opportunity for us has passed
 - I will maintain ADC readout, FEE controls and STAR-DAQ to some level (but only once/if needed for FEE tests) but **no triggering capability for FY20**