

Notes from readout testing plan meeting, Jul 2, 2020

Slides for discussion by TS on <https://indico.bnl.gov/event/8866/>

- Purpose of the meeting is to plan testing until the installation ready (Oct 2021)
  - Slide 3 had error on the number of DAM produced so far (10 were produced). It is now corrected and uploaded.
  - The number of 48-fiber trunk cables necessary for one sector is now 4 instead of 2 in the previous case. This is because QSFP+ is employed for new FEE: slow control (1 Rx), Data (2 Tx), JTAG (1 Tx and 1 Rx), clock distribution (1 Rx). The 48-fibers are debundled in the sort-out box.
  - We need one DAM and one clock-distribution boards, and one JTAG control board as backend now. We need to decide if we produce clock-distribution board and/or JTAG control board soon. Whether or not the clock is distributed to FEE with a separate fiber will affect to FPGA firmware.
  - Connection between DAM and the clock-distribution board is with optical fiber, not PCI.
  - We should hold a separate meeting to discuss about clock-distribution board.
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- After showing Slide 5, we discussed the logistics and testing plan until Oct 2021.
- 1, There is a time gap between Oct 2021 and Oct 2022, during which the TPC should mostly sit in SBU, modulo, transportation time from SBU to BNL. Not necessarily the full-TPC test is possible, since full-TPC test requires cooling/power supplies properly stuffed, which is not possible. At SBU, long-term test in the unit of ~3 sectors is possible, and a good goal to set.
  - 2, Padplane connectivity testing will need a small standalone DAQ with ~12 FEEs and 1 DAM. This is to find any disconnect or shortage between pads and/or GND. The test may want to start in Sep, when 32 pre-production board should become available. It should be operated in trigger mode (external trigger)
  - 3, Readout module (GEMs) testing using cosmic ray and/or X-ray should be performed also with FEE and DAMs. It should be operated in continuous mode with zero-suppression.
  - 4, When going to 700 FEE production, we expect ~40 cards or more delivery per week. Testing of the cards will run in parallel to the production. Needs automated testing which students can volunteer. One needs a Pulse injection boards for testing. John Kuczewski has once worked on. It would be nice that John, Tom and TS sit together to modify design as necessary so that the board can also be used for padplane connectivity testing. Follow-up meeting should be held for discussion this. (Slide 8)
  - 5, Evgeny is looking at Test beam data and found some Single-pad clusters. We should hear from him at another meeting.
  6. For outer tracker testing, Aiwu wants to have a couple of FEEs with DAQ system. The module is not obtained from Sacle. TS received inquiry separately from Maxence about the DAQ system. TS will coordinate with two of them.
  - 7, For looking at the laser track in miniTPC in Bob's lab, two FEE cards + DAM + DAQ is necessary. This is relatively urgent project.

- Summarizing test plans above, we need the following DAQ sets.

(i) For SBU small scale test: 12 FEE + 1 DAM + DAQ, with and without trigger

(ii) Laser track test at BNL: 2 FEE + 1 DAM + DAQ, with trigger

(iii) 700 FEE test: X FEE + 1 DAM + DAQ, with and without trigger

(iv) Outer tracker development: 2 FEE + 1 DAM + DAQ

Probably, we need a couple of FPGA firmware versions?

- Radiation hardness testing for Laser and optical fibers should be performed rather soon. FEE radiation test can be performed later.

- SEU testing for FEE at a later time.

- Need another meeting to discuss how to port the necessary stuffs to SBU. For LV power, probably porting one rack with realistic cable length is nicer?

- We have to order a couple more MegaPacs as soon as possible.

- Many items hang on John Kuczewski...

- Next follow-up meeting in a month