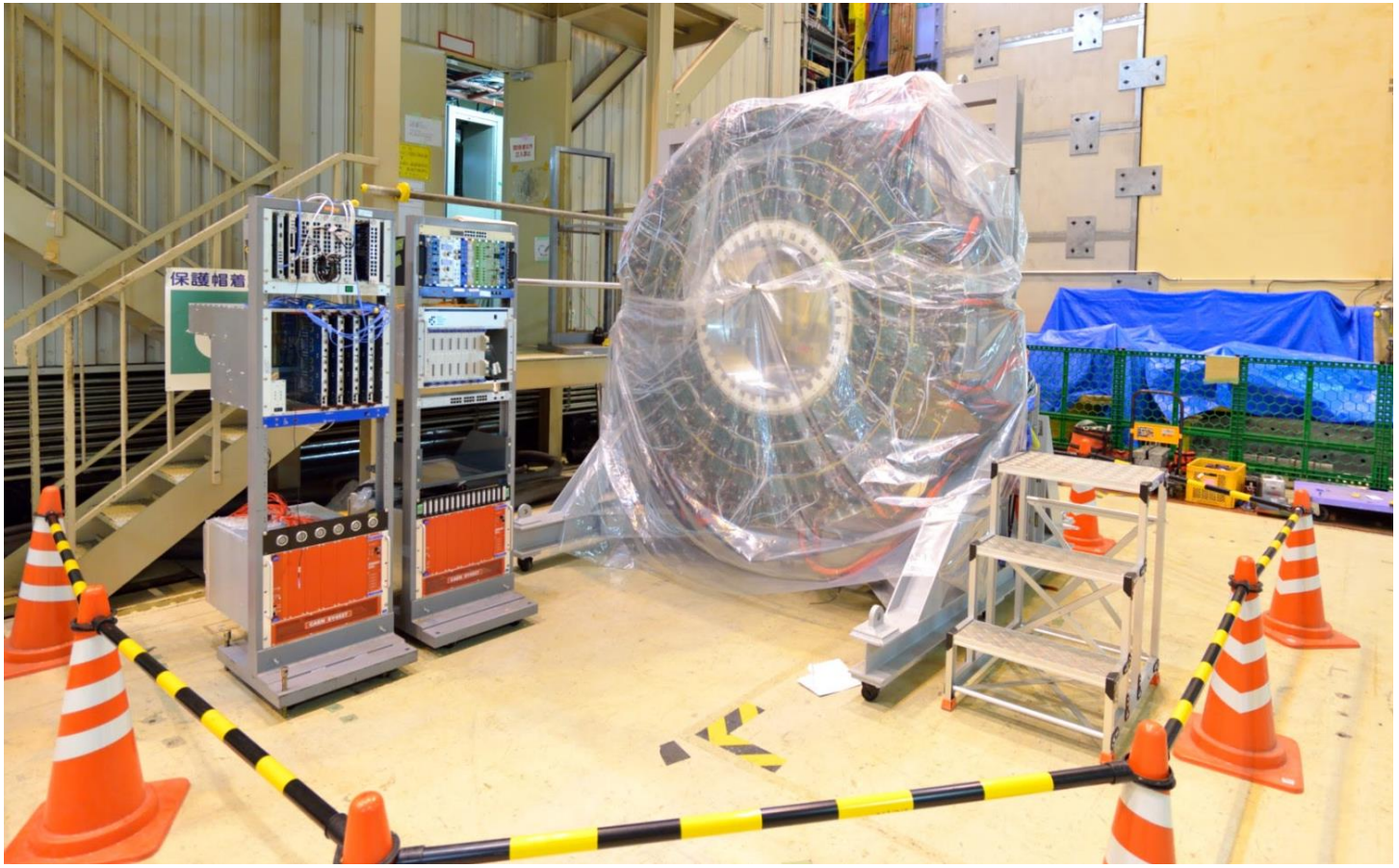


Photo from I.Nakamura-san

ARICH Status

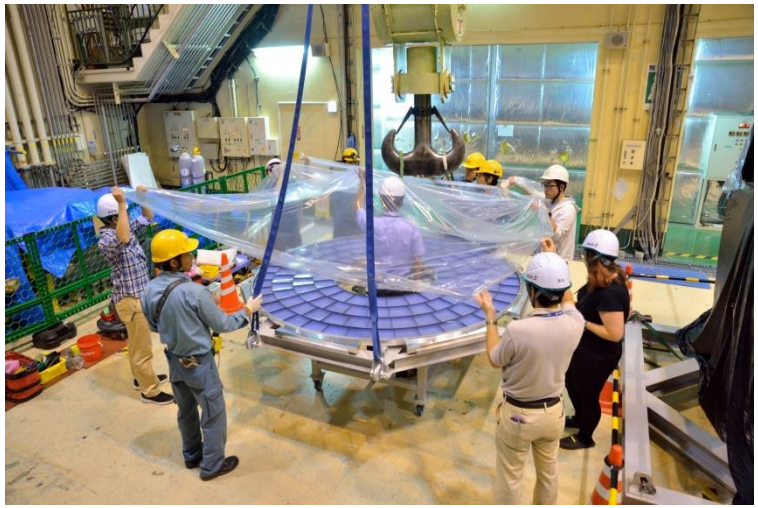
Tomoyuki Konno

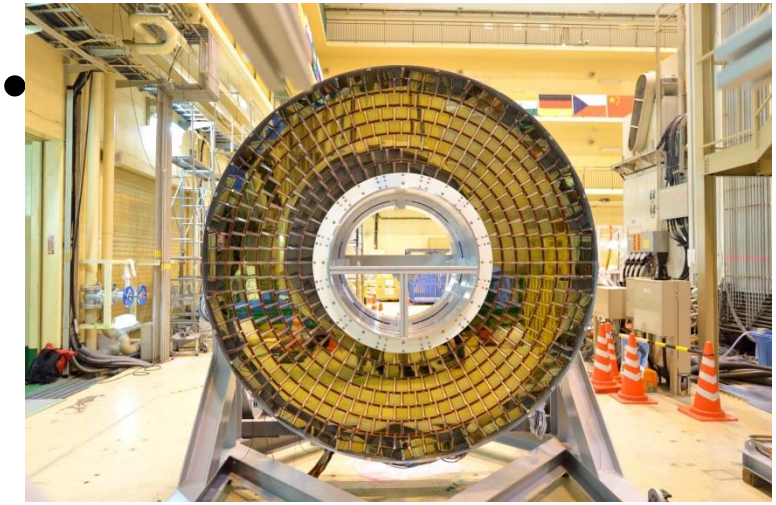
TRG/DAQ workshop

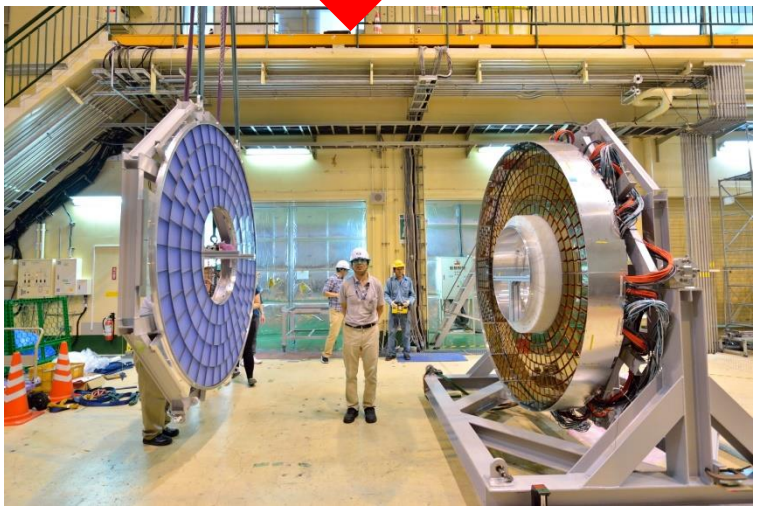
2017/08/24, NTU, Taipei

ARICH Construction (9th Aug.)

Photos from I.Nakamura-san

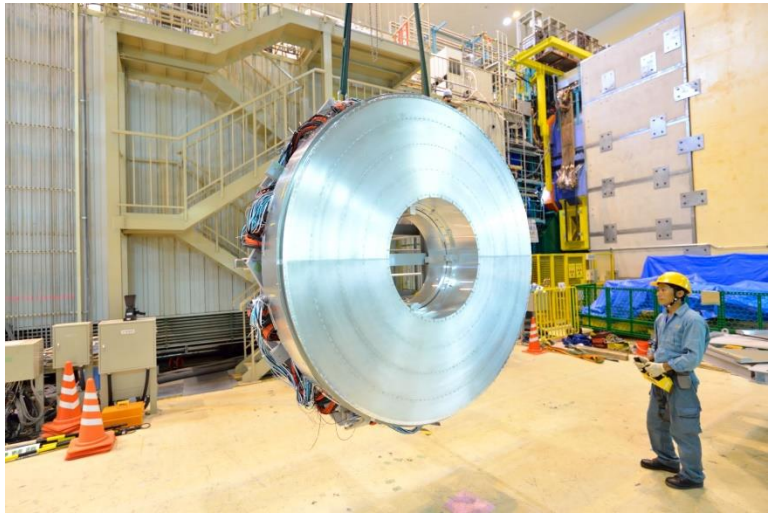


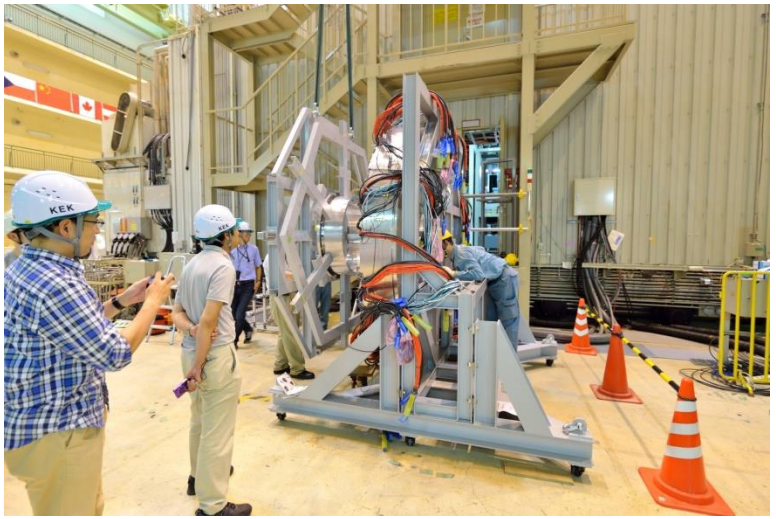




ARICH Construction (9th Aug.)

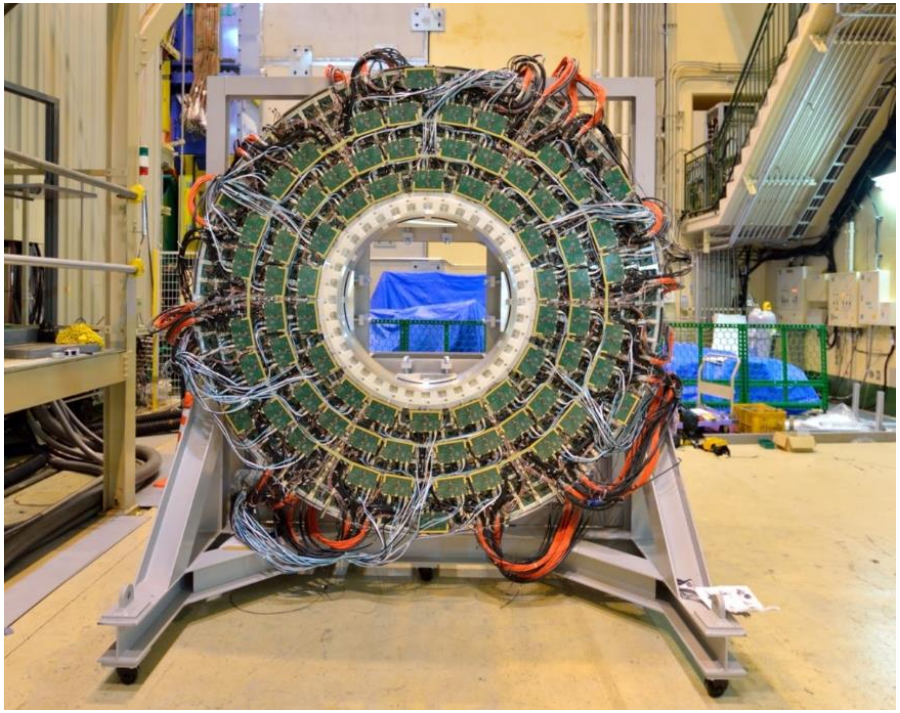
Photos from I.Nakamura-san

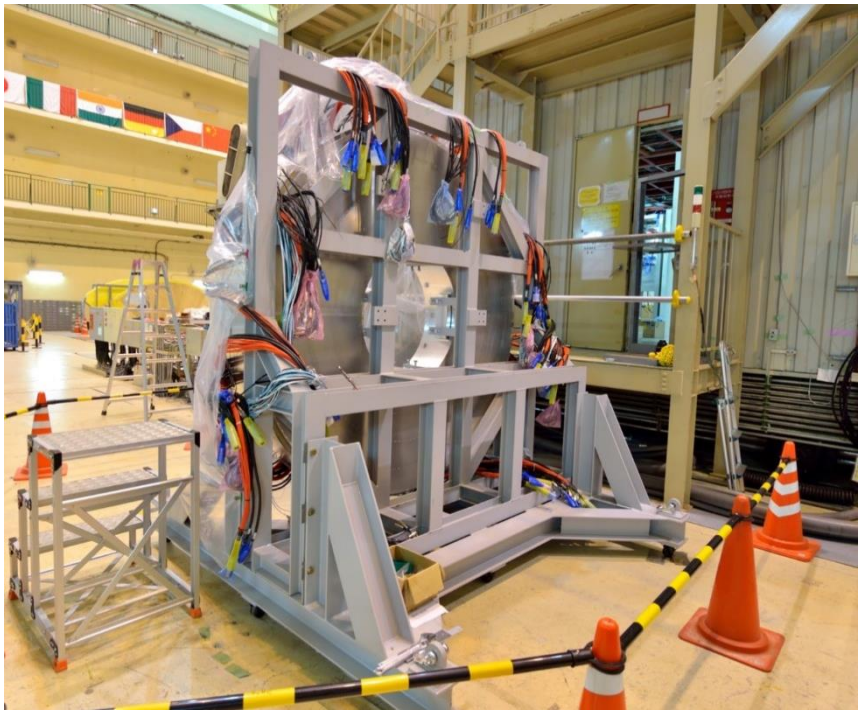




ARICH Construction : Completed!

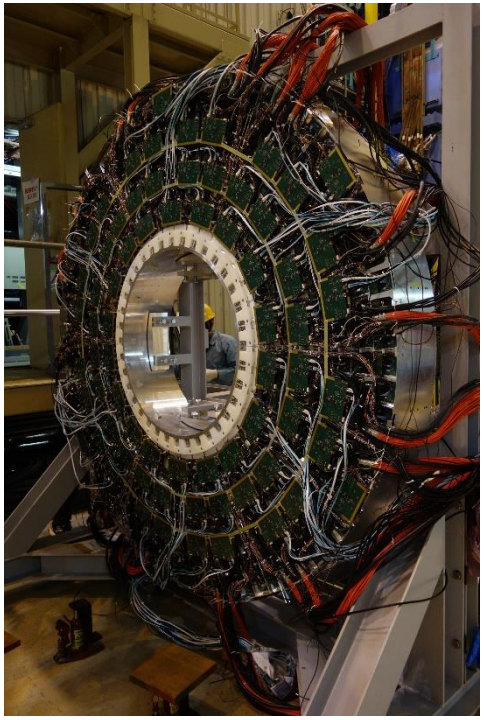
Photos from I.Nakamura-san





- Located in front of Ehut
  - Cables from detector is ready to patch panel
- Detector-DAQ test is the task in Aug.-Sep.

ARICH counter status



ARICH counter is constructed now

- Cables are prepared to connect to patch panel
  - HV for HAPDs and LV for readout electronics
  - LAN and optical for Belle2Link and b2tt
- Cooling pipes are constructed after combination
- 420 Frontend and 72 Merger boards in the counter

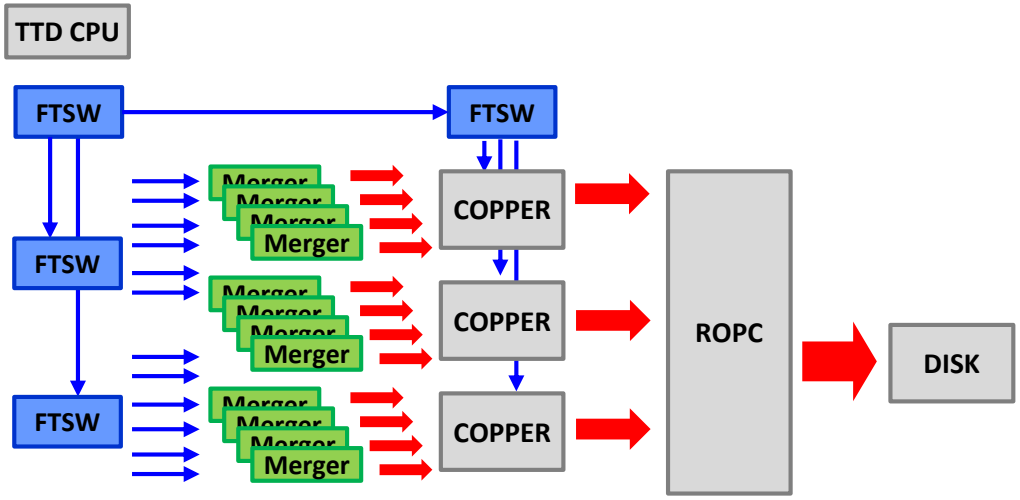
1/6 scale test is now in progress from last week

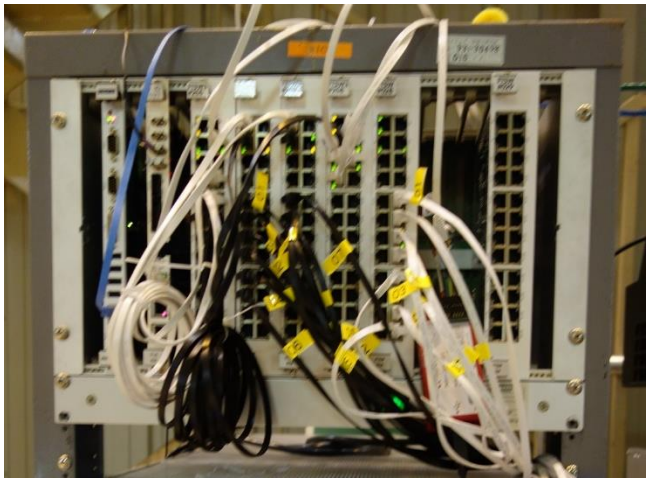
=> 70 HAPDs/Frontend and 12 Mergers per sector

- Channel mapping survey for HV
- 12 Mergers connected to 3 COPPERs
  - Survey of unplugged channels
  - Measurement of signal offset in frontend
  - Photon signal observation using LED system

=> 1-2 days per sector for these tests

1/6 sector operation with global DAQ





Test with a copy of the global DAQ

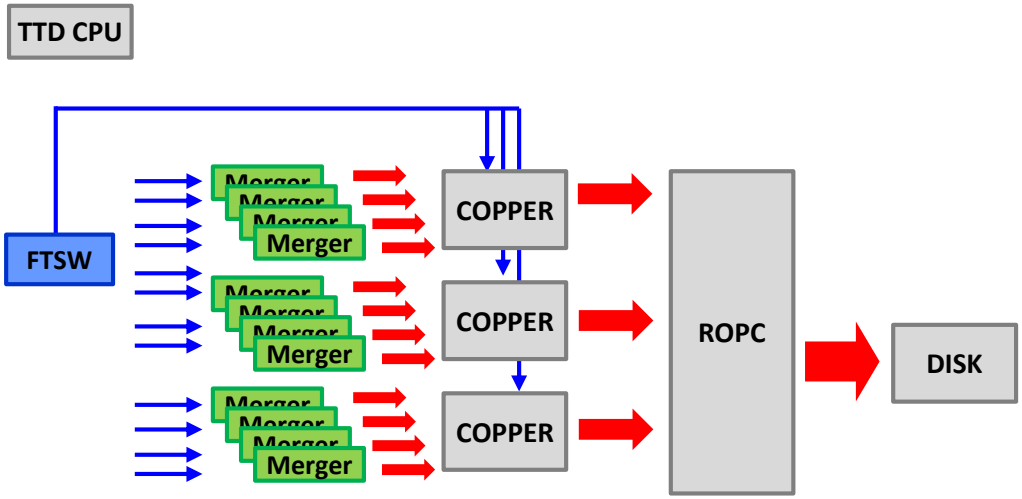
- 70 HAPDs to 12 Merger boards to 3 COPPERs
- 1 Master FTSW to 3 daughter FTSWs: ft3p055 / ft3d046 / ft3x035

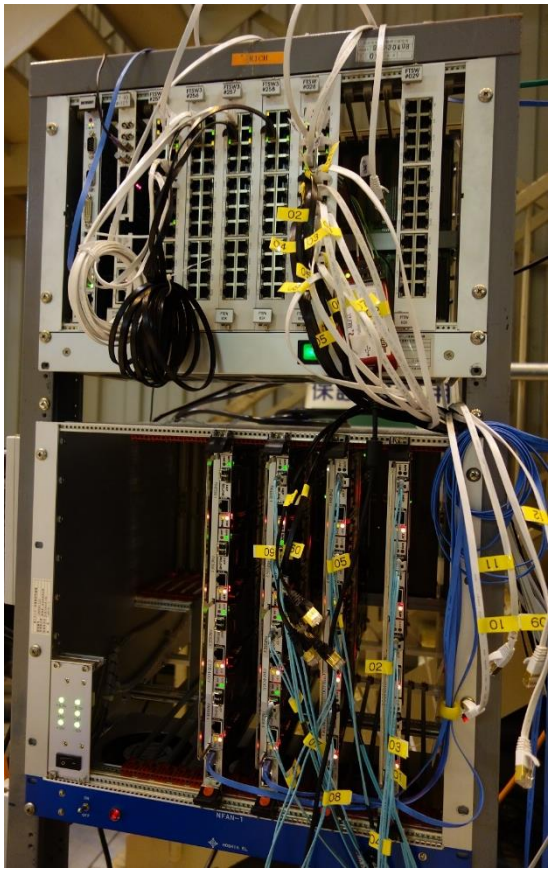
Mergers seems not working with global FTSWs

- DAQ will stop after several ten events due to **BUSY** from Mergers
  - It will happen even if only single merger-copper with 1Hz pulse

Miner issue : jtagft does not program Merger due to different VME CPU

1/6 sector operation with pocket DAQ



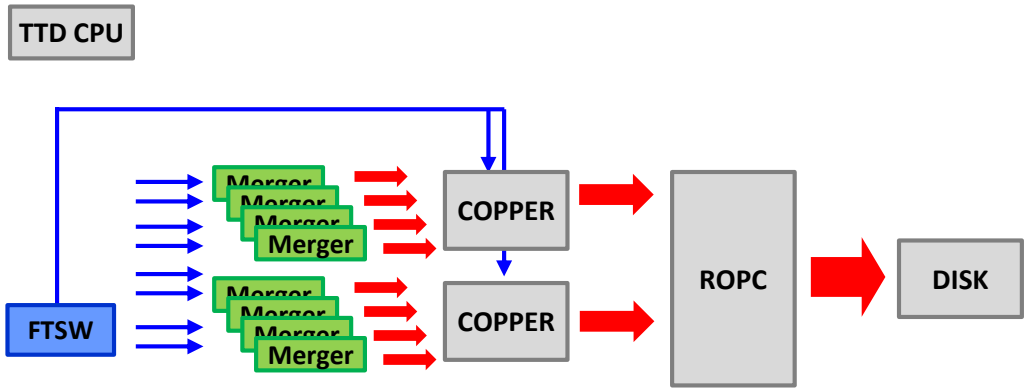


Test with a pocket DAQ as a temporal solution

- 70 HAPDs to 12 Merger cannot be handled at once
  - 8 / 4 Mergers are switched per a run
- FTSW with latest b2tt/b2l firmware (ft3u087)

  => **Mergers seems not working with global FTSWs**
  - DAQ will stop after several ten events same as global DAQ case
- Detector test is ongoing with **old FTSW firmware** (ft3u080)
  - 8 Merger can be readout with no error/busy

Performance with multiple mergers



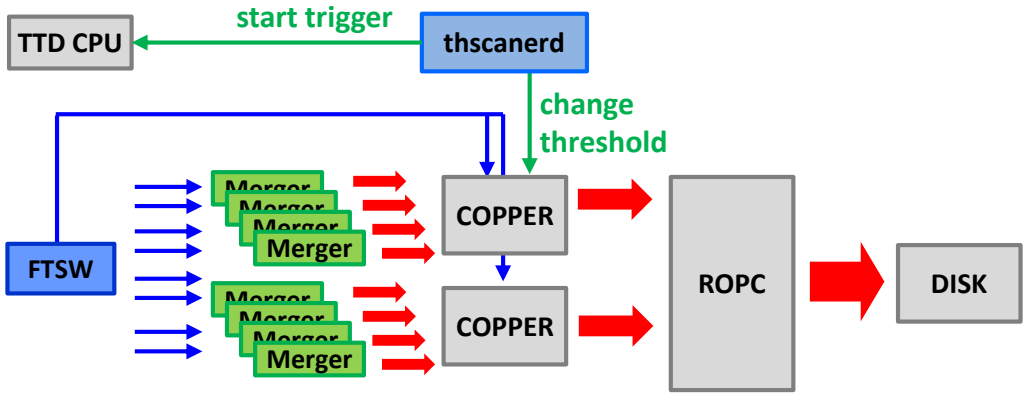
First performance test with multiple mergers

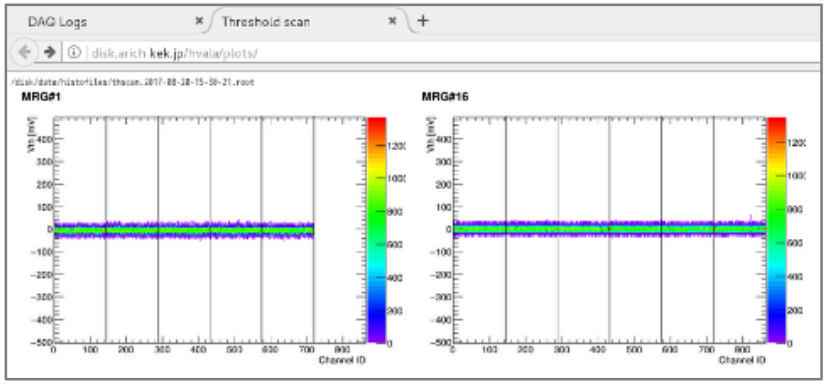
- 8 Mergers with 2 COPPERs are tested
- Single merger worked up to 30kHz pulse and poisson with 12 trigger in 100 us
- **8 Mergers works up to 20kHz pulse and poisson**
  - Stably running for more than 10hours : output : ~19.3[kHz]/25[MB/s]
  - More higher rate causes fifo error in Merger boards
  - 4 us trigger veto is necessary otherwise DAQ crashes due to fifo error

  => **Busy hand shake in Merger seems not working correctly**

=> Investigation / update of Merger firmware is now ongoing

Threshold scan





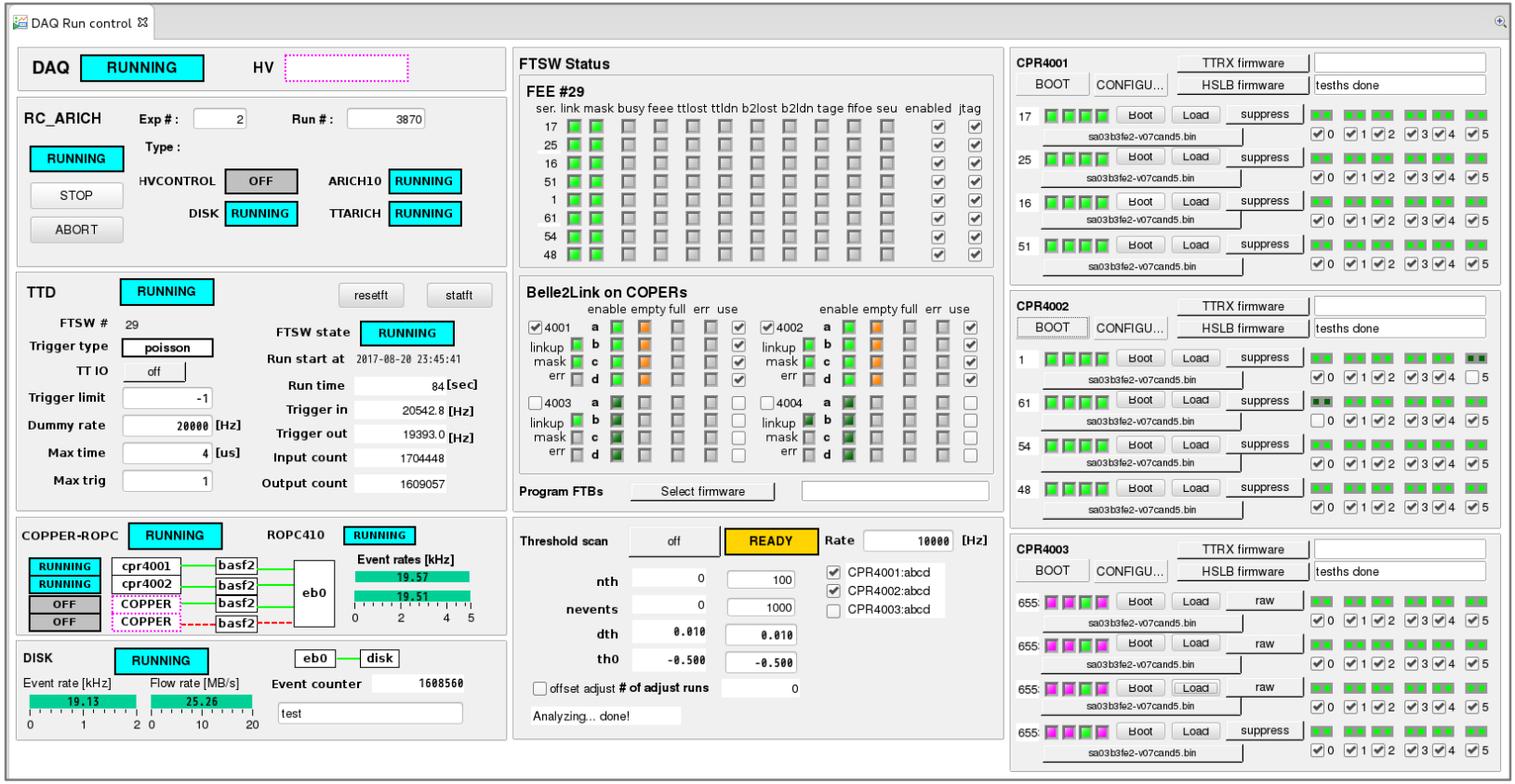
Noise level Measurement for each readout channel

- Repeat of data taking with various threshold setting
  - Control by a slow control process : thscanerd
- 100 runs per scan : 1 min for initialization + 1-2 mins for data taking

Long data taking for adjustment of signal offset

- 31 scans with 400 runs each per adjustment : ~3 hours in total
  - 2 times per sector due to limitation of PocketDAQ FTSW ports
- A basf2 modules extracts offset parameters and upload to DAQ database

Control GUI



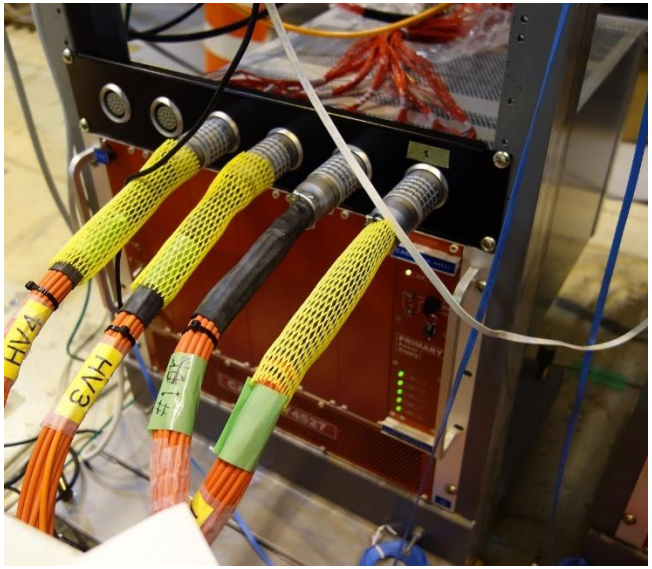
- CSS based control GUI is used since last year
- Configuration for both Frontend and Merger is done by BOOT/LOAD
  - FPGA in Frontend is programed via Belle2Link
- Both usual run and threshold scan is available from the GUI

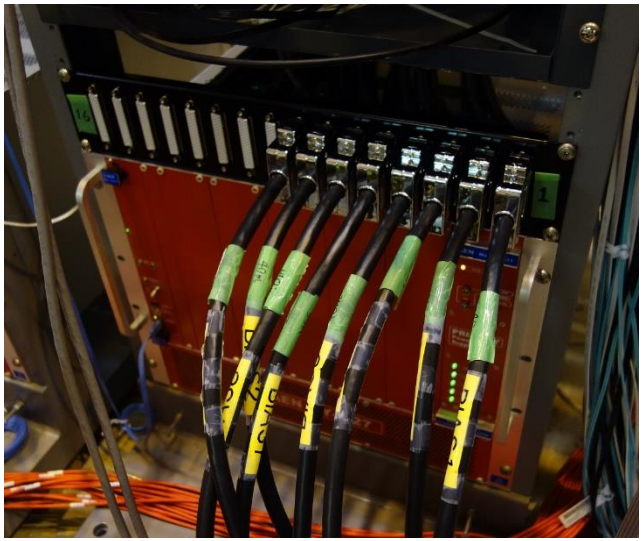
HV system

HV system for 1/6 sector is ready

- 2 crates for HV and Guard/Bias
  - 12 modules per sector
  - HV(-9 kV) : 70 ch
  - Guard (175 V) : 70 ch
  - Bias(~350 V) : 280 ch
- Cable connected to patch panel
  - 1.5 sector per panel for HV
    - 4 channels in 2 modules cause trip
  - 2 sector per panel for Guard-Bias
    - 2 channels cause leakage current

  => No critical issue for the sector test
- Channel mapping of the first sector is confirmed
  - Updated database table



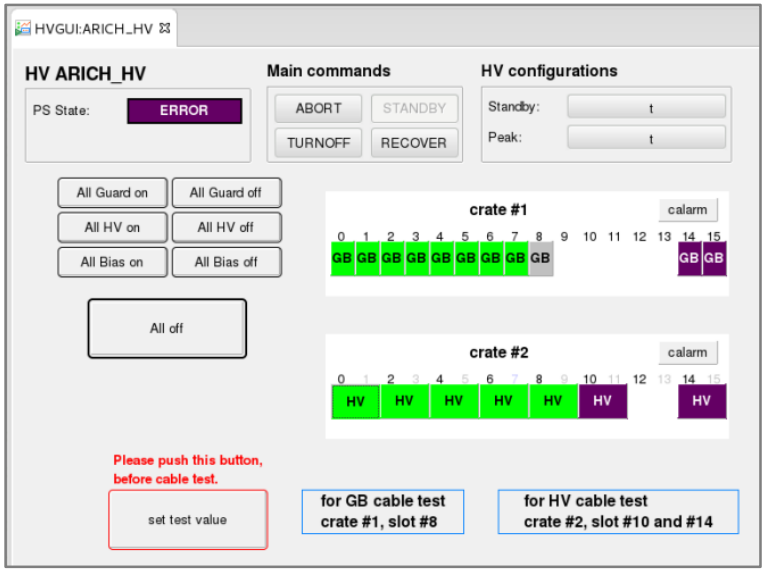


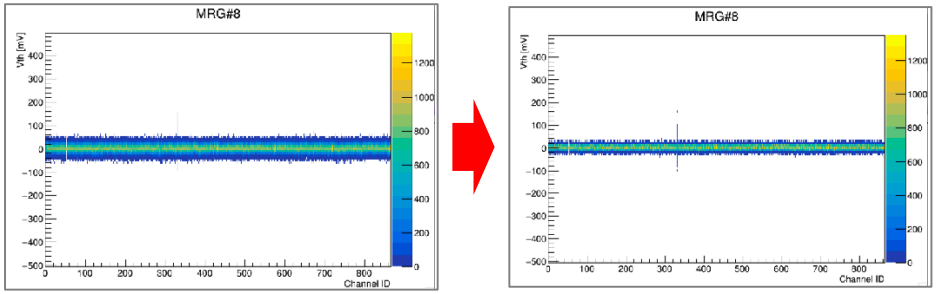
HV control

Control software is updated

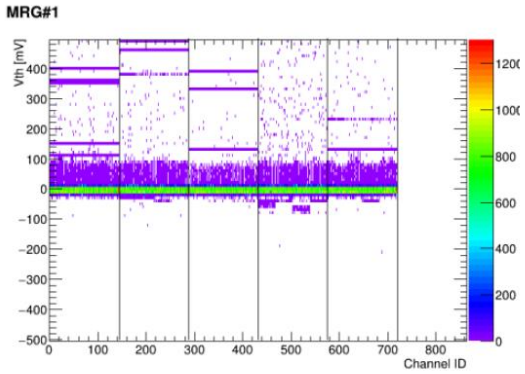
- Type (Guard/HV/Bias) is newly assigned for each channel
  - New buttons to turn on/off All Guard/HV/Bias channels
- Extended the system
  - 2 crate with 17 modules
  - 640 output channels
  - => 3.5 times larger scale than before
- CSS control GUI has problem
  - Access to too many channels causes very slow response
  - DAQ issue (so I'm working)

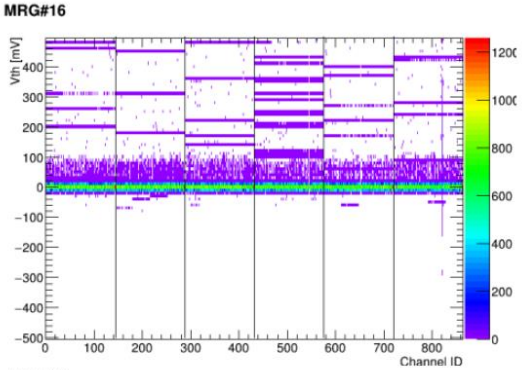
Bias voltage is successfully applied

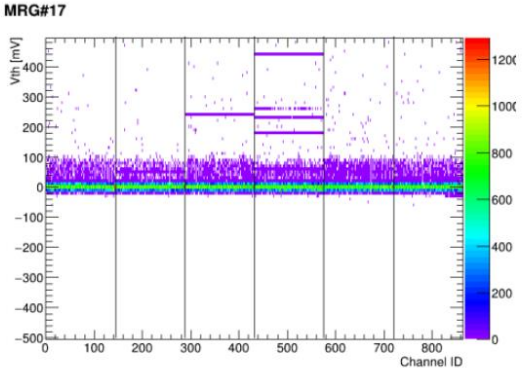


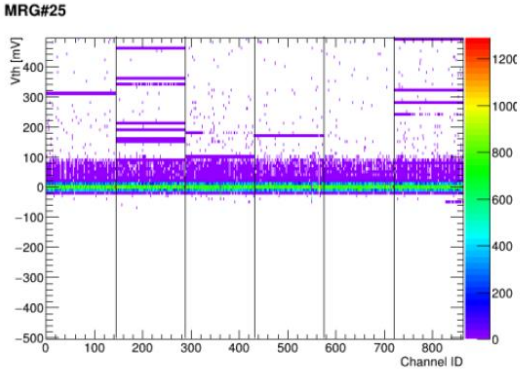


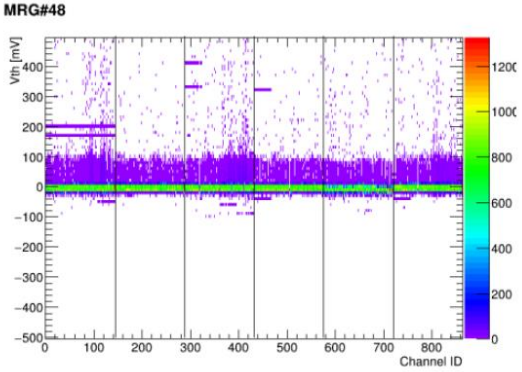
Threshold scan with HV ON

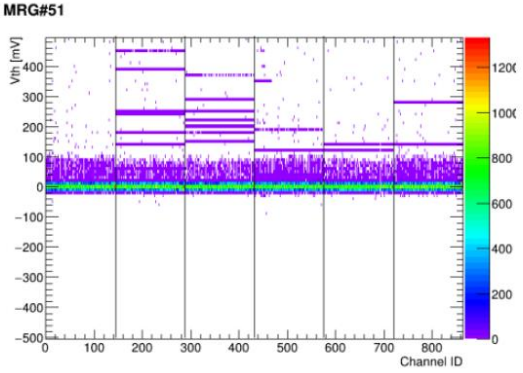


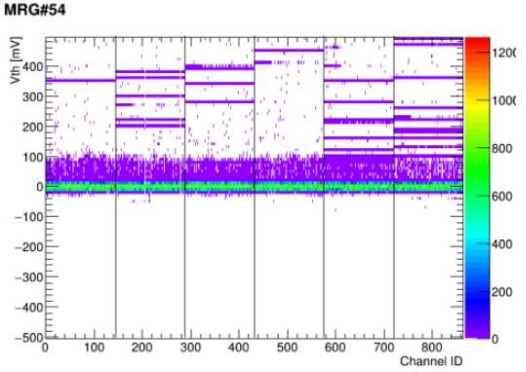


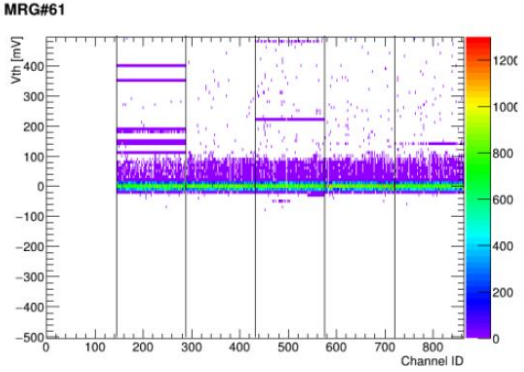












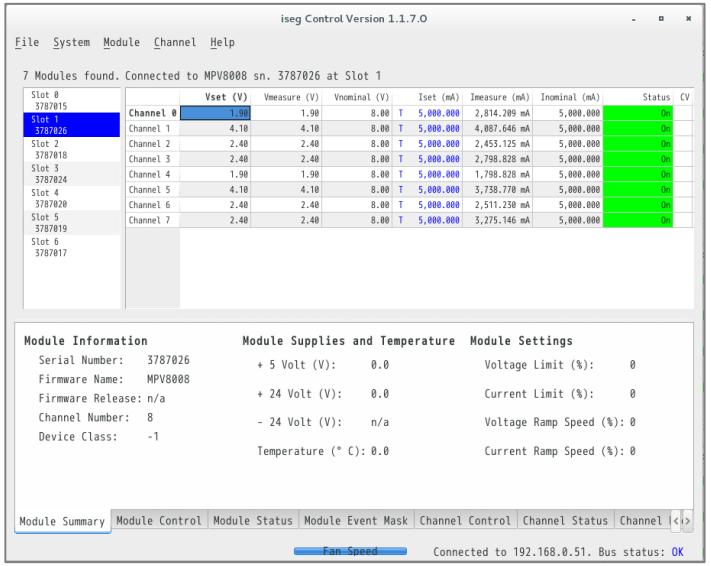
Successfully applied HV !

- Sector # 5
- HV : -6000 V
- With LED
- Small light leakage

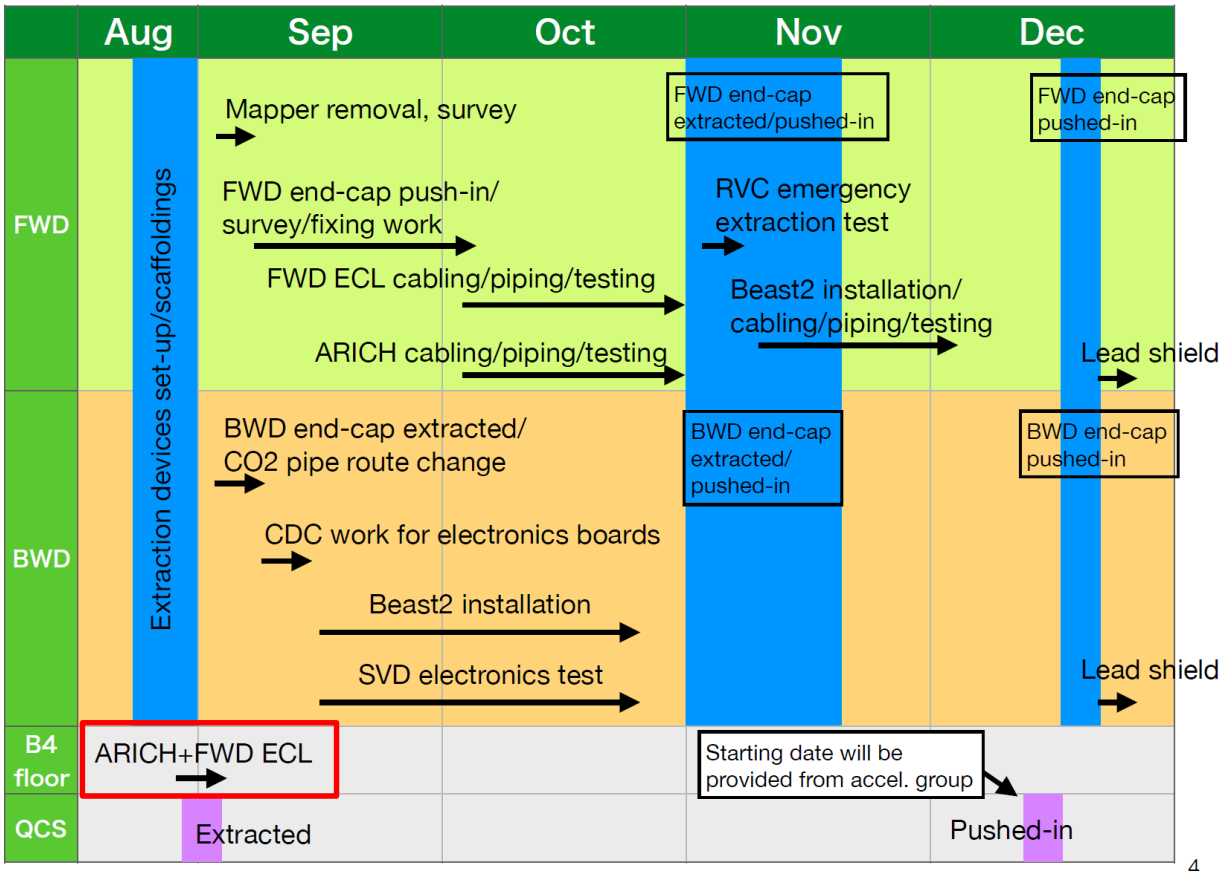
LV system

ISEG supply is adapted for LV control

- WieNer crate : MPOD Crate
  - 2 Modules per sector : OMPV 8008
    - 2 crates in total
  - 4 channels divided in the detector
    - for 2 Merger and 12 Frontends
- Control via SNMP protocol
  - A product program in control PC
  - NSM version of control program is under preparation => coming very soon
    - Same functions with HV control



Schedule



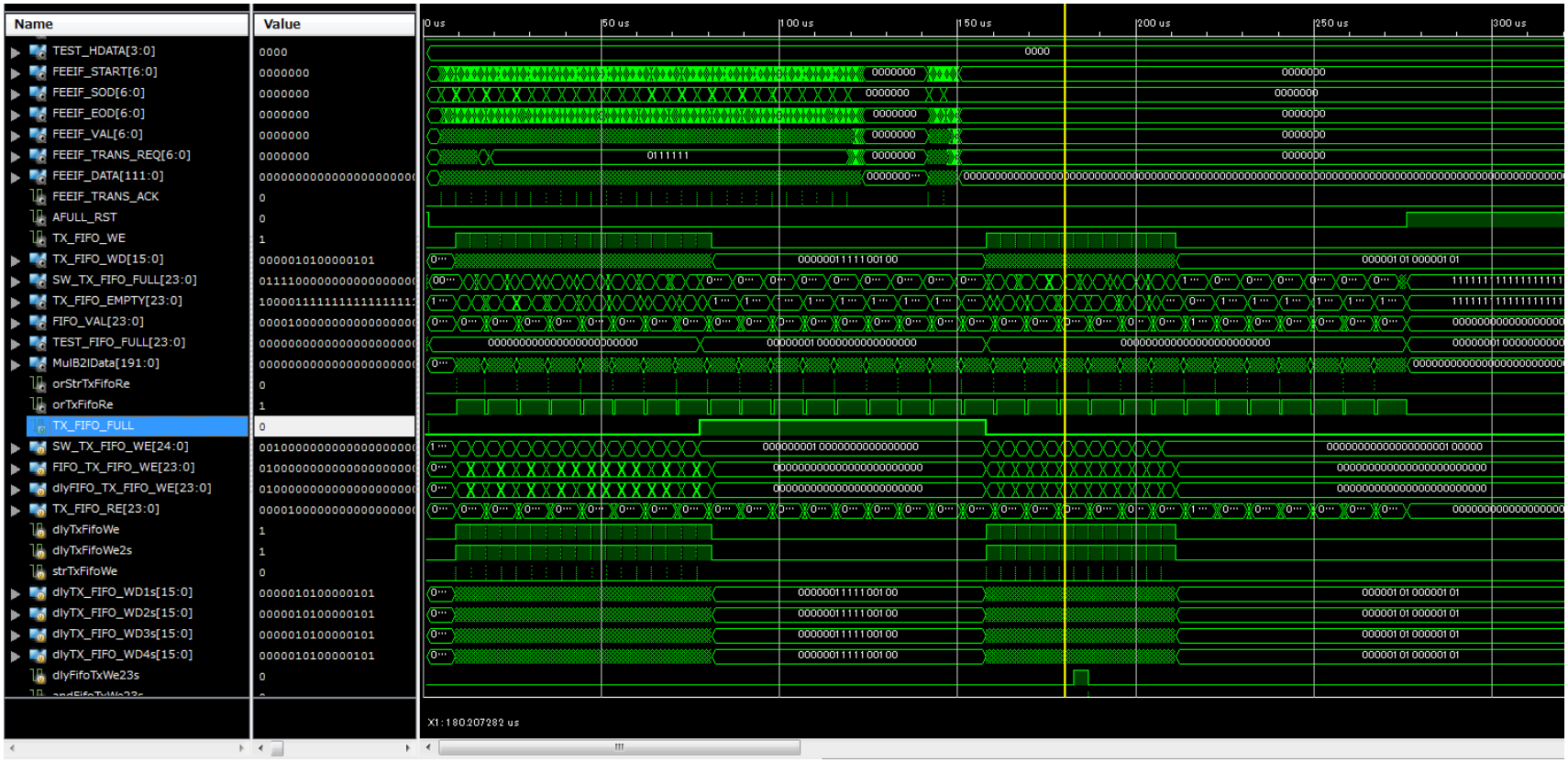
- ARICH will be combined to F-ECL in 4th Sep
  - 1-2 days per sector for cable survey
- DAQ must be ready in next month : HV/LV will be moved to E-hut
  - Merger/Frontend firmware should be ready in 1 month

Summary

- ARICH is now fully constructed! => Combined HAPD and Aerogel planes
  - Located in front of the E-hut (but not connected to E-hut)
- Dedicated DAQ system is setup for 1/6 sector operation
  - 70 HAPDs/Frontends and 12 Mergers per sector
  - Survey of cables for mappings and unplugged channels
  - Photon signal observation using LED system
- Survey of the first sector was done in a week
  - We learned and accelerate the survey in next sectors : 1-2 days
  - Confirmed LV and HV worked as expected
- Merger firmware still has problems with the latest b2tt/b2l
  - Busy hand shake seems not working correctly
  - Investigation toward global DAQ is ongoing while detector test is carried out with older with pocket DAQ
- We must be ready in the next month : No time to waste!

Issues in Merger firmware

Simulation results for merger firmware



- TX_FIFO_FULL is connected to BUSY