

Photo from I.Nakamura-san

Tomoyuki Konno

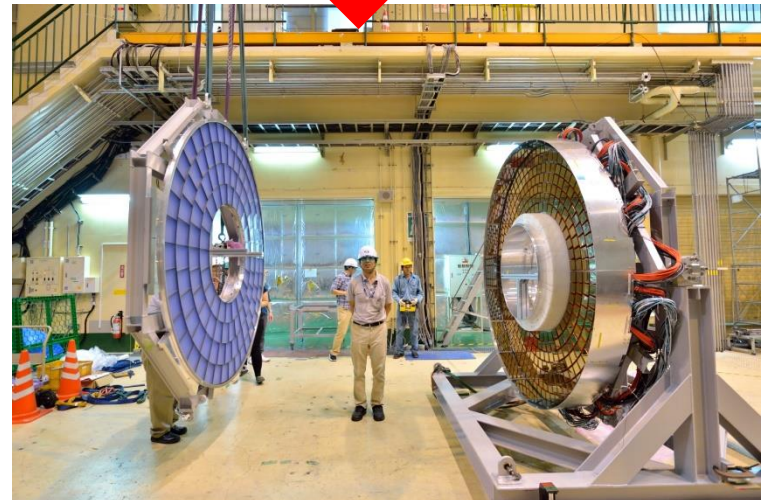
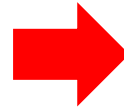
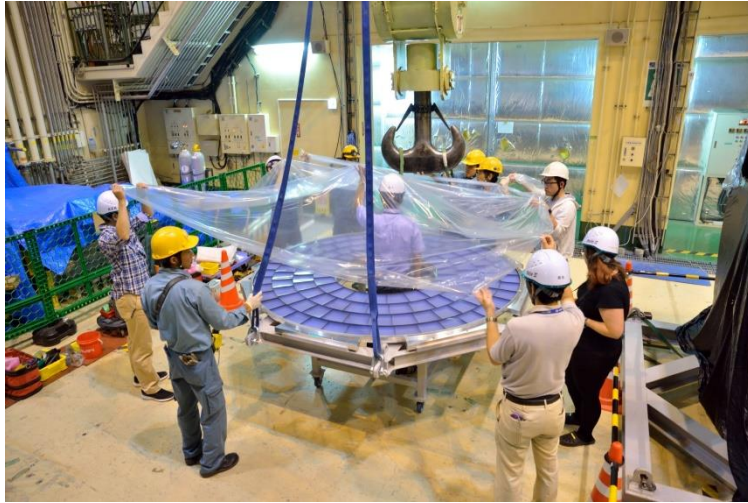
TRG/DAQ workshop

2017/08/24, NTU, Taipei

ARICH Status

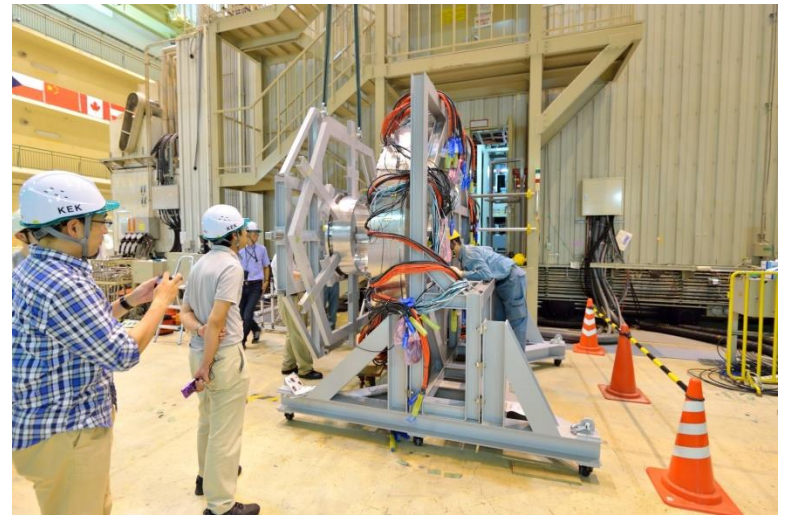
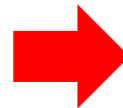
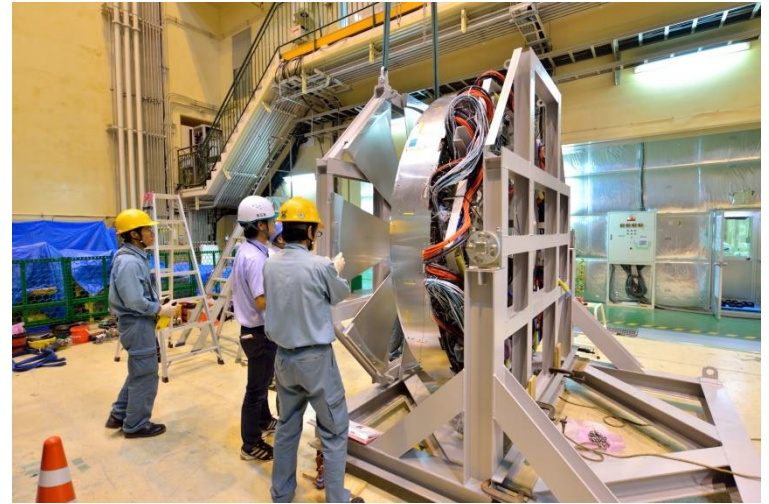
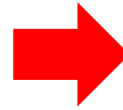
ARICH Construction (9th Aug.)

Photos from I.Nakamura-san



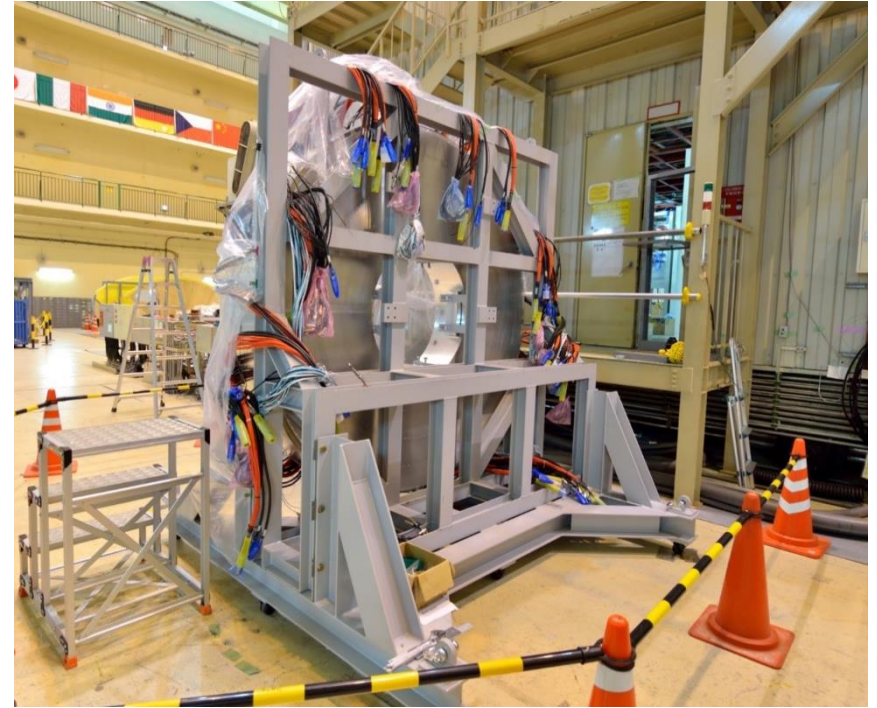
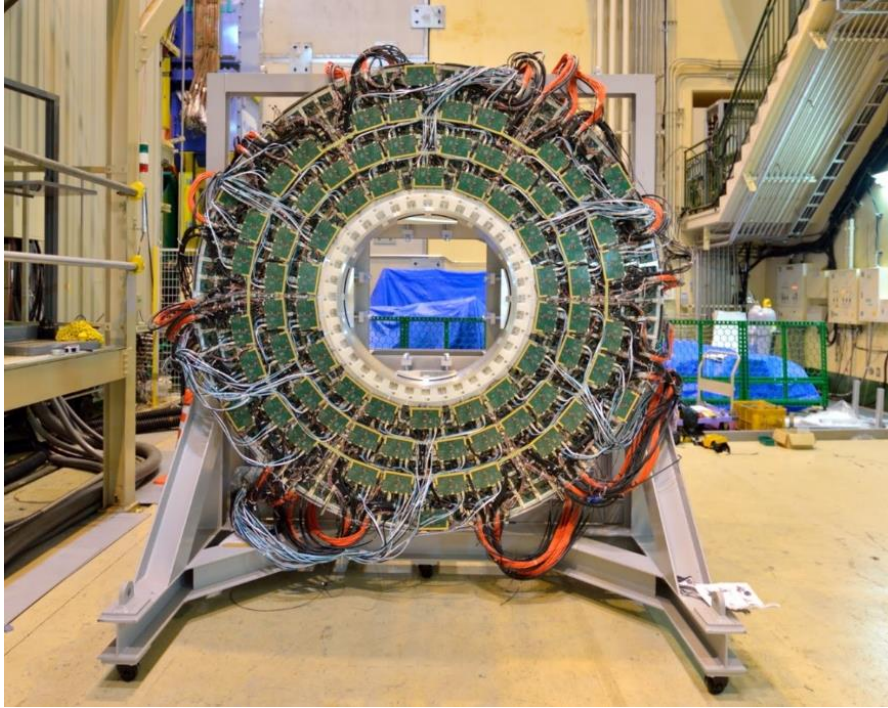
ARICH Construction (9th Aug.)

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

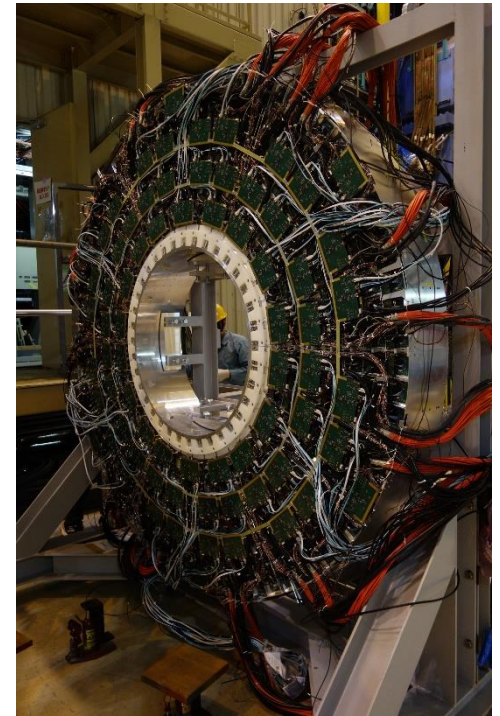
- Cables are prepared to connect to patch panel
 - HV for HAPDs and LV for readout electronics
 - LAN and optical for Belle2Link and b2tt
- Cooling pipes are constructed after combination
- 420 Frontend and 72 Merger boards in the counter

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

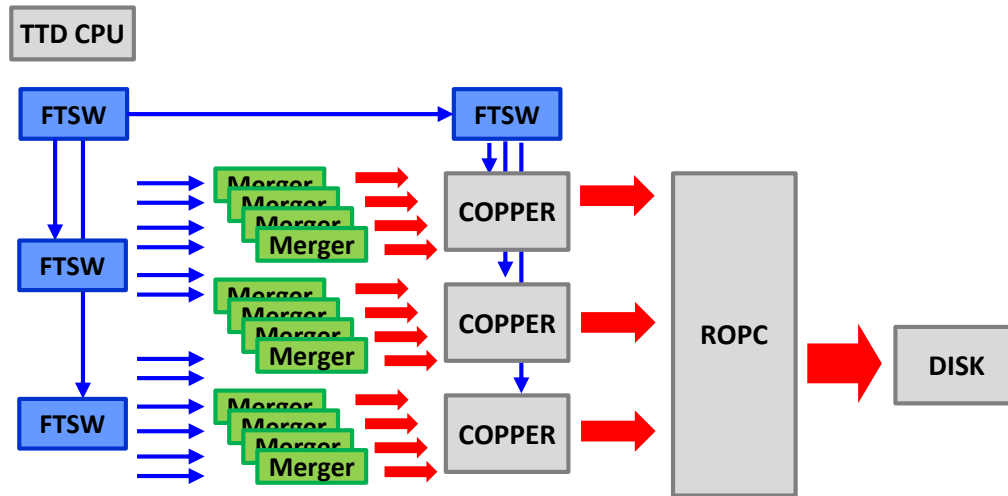
=> 70 HAPDs/Frontend and 12 Mergers per sector

- Channel mapping survey for HV
 - 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



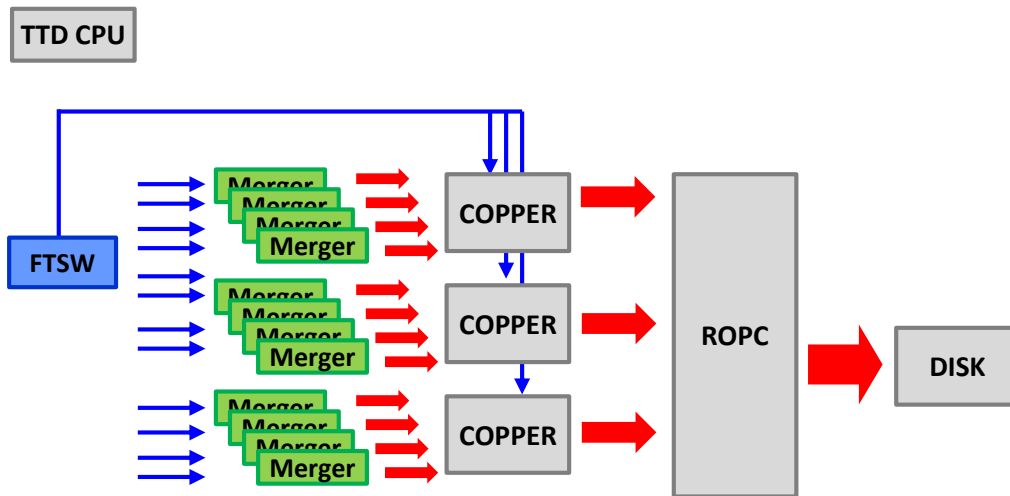
Test with a copy of the global DAQ

- 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

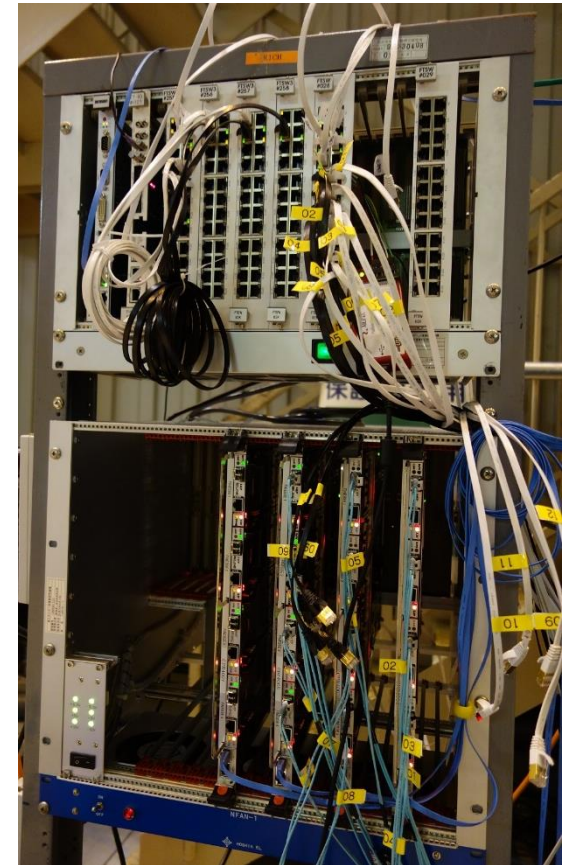
- DAQ will stop after several ten events due to **BUSY** from Mergers
 - It will happen even if only single merger-copper with 1Hz pulse
- Miner issue : jtagft does not program Merger due to different VME CPU

1/6 sector operation with pocket DAQ

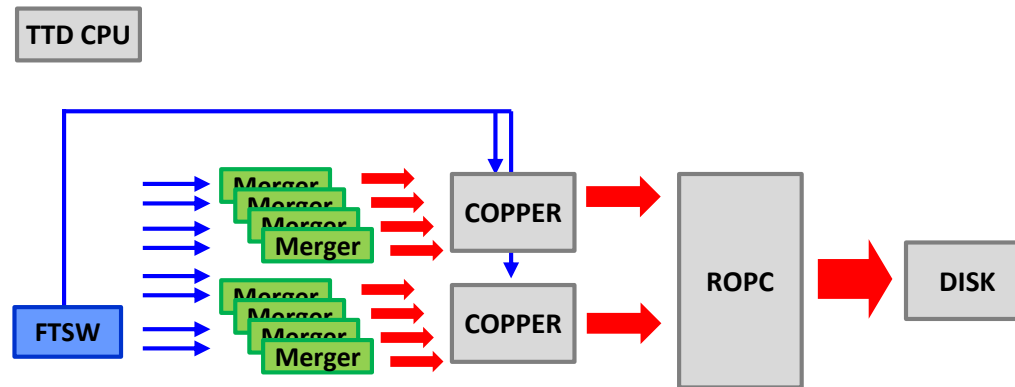


Test with a pocket DAQ as a temporal solution

- 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



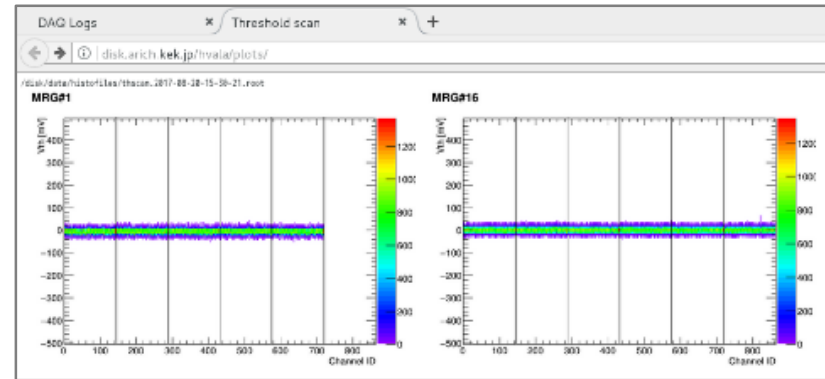
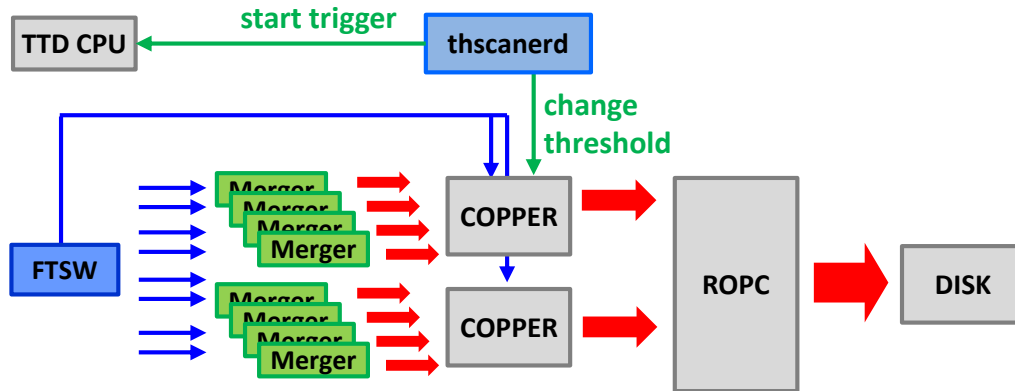
Performance with multiple mergers



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 : $\sim 19.3[\text{kHz}]/25[\text{MB/s}]$
 - 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

The screenshot displays the DAQ Run control GUI with the following sections:

- DAQ:** RUNNING status, HV control panel.
- RC_ARICH:** Exp #: 2, Run #: 3870, Type: RUNNING, HVCONTROL: OFF, ARICH10: RUNNING, DISK: RUNNING, TTARICH: RUNNING.
- TTD:** RUNNING status, FTSW # 29, Trigger type: poisson, TT IO: off, Trigger limit: -1, Dummy rate: 20000 [Hz], Max time: 4 [us], Max trig: 1.
- FTSW Status:** FEE #29 table with columns: ser, link, mask, busy, freee, ttlost, ttldn, b2lost, b2ldn, tage, fifoe, seu, enabled, jtag.
- Belle2Link on COPERs:** Configuration for 4001, 4002, 4003, 4004 with options for enable, empty, full, err, use.
- Program FTBs:** Select firmware panel.
- Threshold scan:** off, READY status, Rate: 10000 [Hz], nth: 0, nevents: 0, dth: 0.010, th0: -0.500.
- COPPER-ROPC:** RUNNING status, ROPC410: RUNNING, Event rates [kHz] for basf2 (19.37, 19.51), COPPER basf2 (19.13, 25.26).
- DISK:** RUNNING status, Event rate [kHz]: 19.13, Flow rate [MB/s]: 25.26, Event counter: 1608560.
- CPR4001, CPR4002, CPR4003:** Control panels for each channel, including BOOT, CONFIGU..., HSLB firmware, and tesths done status.

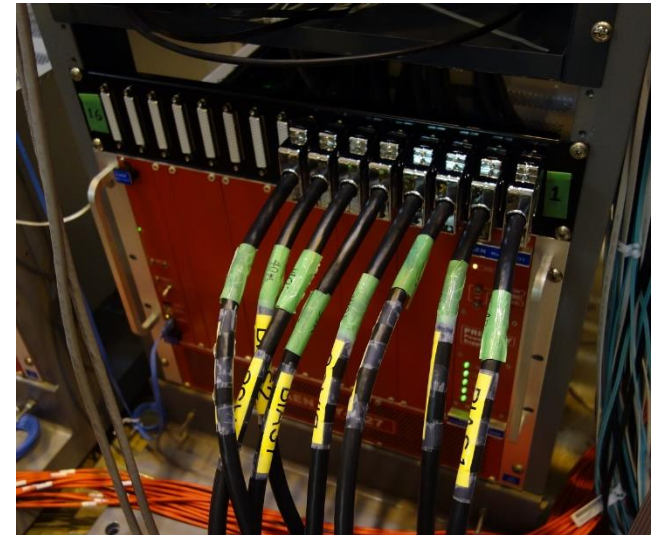
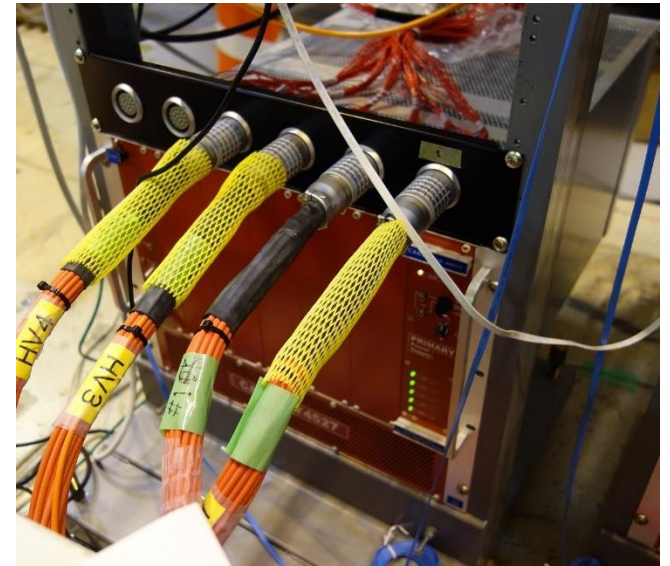
- CSS based control GUI is used since last year
- Configuration for both Frontend and Merger is done by BOOT/LOAD
 - FPGA in Frontend is programmed via Belle2Link
- Both usual run and threshold scan is available from the GUI

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(\sim 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

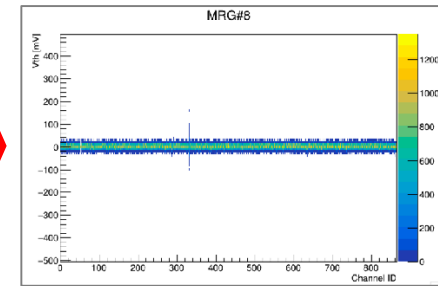
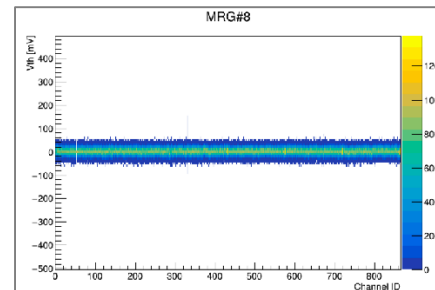
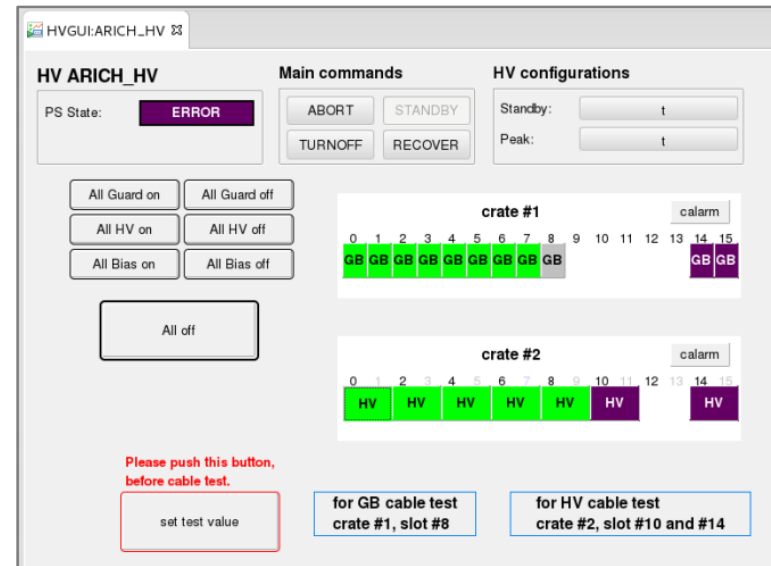


HV control

Control software is updated

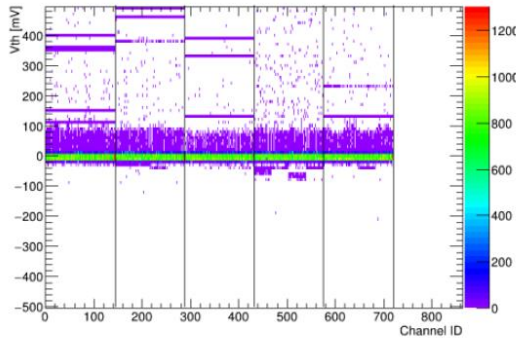
- Type (Guard/HV/Bias) is newly assigned for each channel
 - New buttons to turn on/off All Guard/HV/Bias channels
- Extended the system
 - 2 crate with 17 modules
 - 640 output channels
 - => 3.5 times larger scale than before
- CSS control GUI has problem
 - Access to too many channels causes very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

Bias voltage is successfully applied

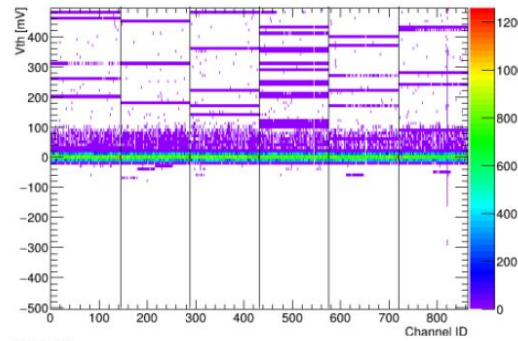


Threshold scan with HV ON

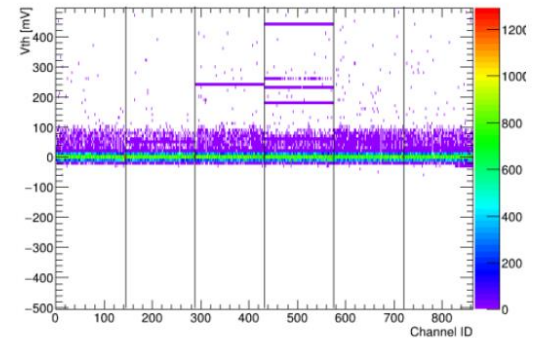
MRG#1



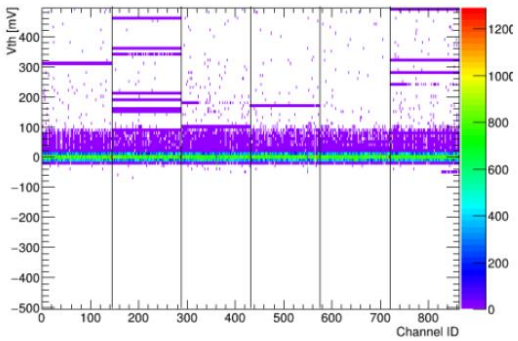
MRG#16



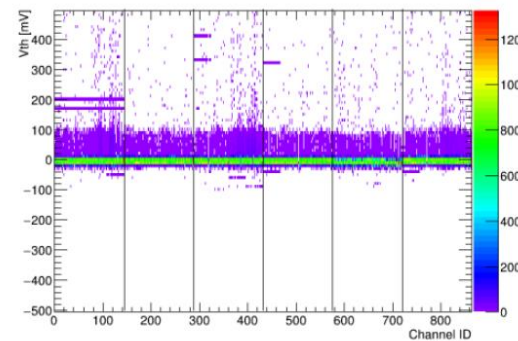
MRG#17



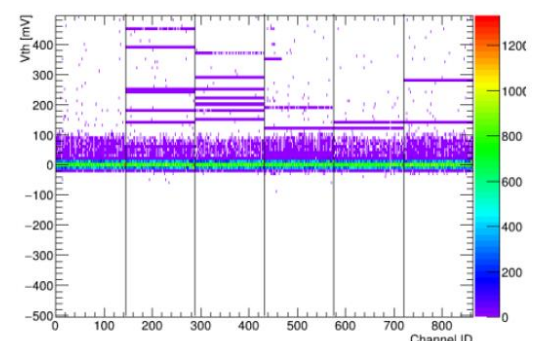
MRG#25



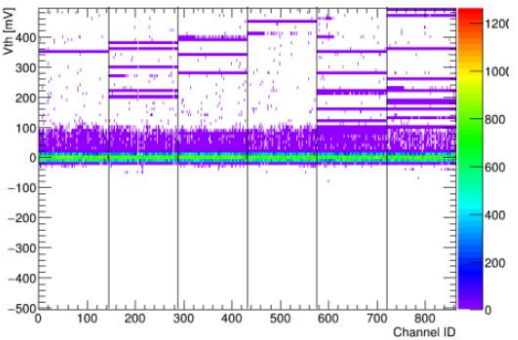
MRG#48



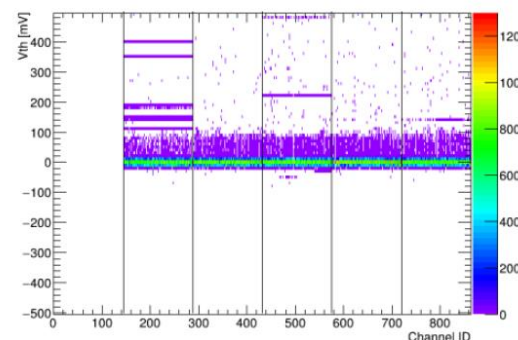
MRG#51



MRG#54



MRG#61



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



iseg Control Version 1.1.7.0

File System Module Channel Help

7 Modules found. Connected to MPV8008 sn. 3787026 at Slot 1

Slot	Channel	Vset (V)	Vmeasure (V)	Vnominal (V)	Iset (mA)	Imeasure (mA)	Inominal (mA)	Status	CV
Slot 0 3787015	Channel 0	1.90	1.90	8.00	T 5,000.000	2,814.209 mA	5,000.000		
Slot 1 3787026	Channel 1	4.10	4.10	8.00	T 5,000.000	4,887.646 mA	5,000.000		
Slot 2 3787018	Channel 2	2.40	2.40	8.00	T 5,000.000	2,451.125 mA	5,000.000		
Slot 3 3787024	Channel 4	1.90	1.90	8.00	T 5,000.000	1,798.828 mA	5,000.000		
Slot 4 3787020	Channel 5	4.10	4.10	8.00	T 5,000.000	3,758.778 mA	5,000.000		
Slot 5 3787019	Channel 6	2.40	2.40	8.00	T 5,000.000	2,511.238 mA	5,000.000		
Slot 6 3787017	Channel 7	2.40	2.40	8.00	T 5,000.000	3,275.146 mA	5,000.000		

Module Information

Serial Number: 3787026
Firmware Name: MPV8008
Firmware Release: n/a
Channel Number: 8
Device Class: -1

Module Supplies and Temperature

+ 5 Volt (V): 0.0
+ 24 Volt (V): 0.0
- 24 Volt (V): n/a
Temperature (* C): 0.0

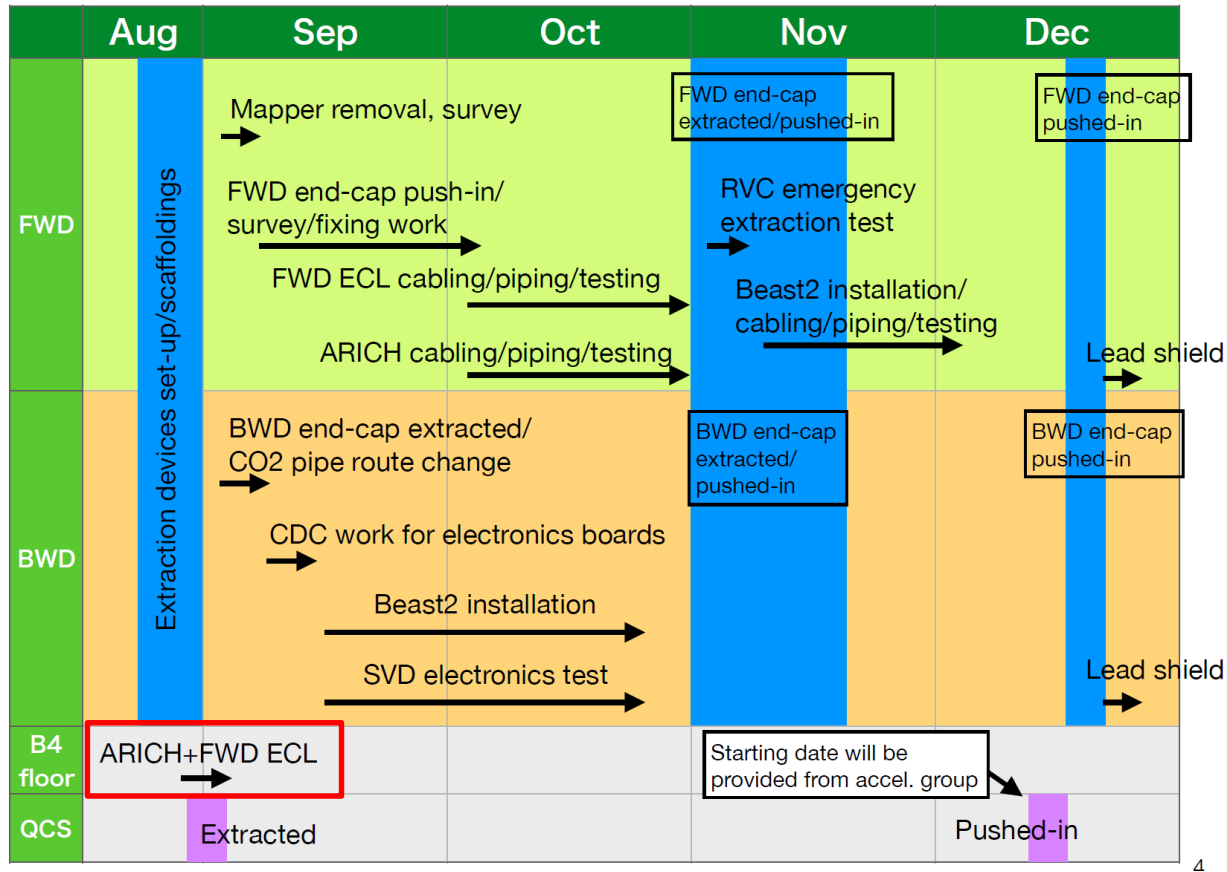
Module Settings

Voltage Limit (%): 0
Current Limit (%): 0
Voltage Ramp Speed (%): 0
Current Ramp Speed (%): 0

Module Summary | Module Control | Module Status | Module Event Mask | Channel Control | Channel Status | Channel |<>

Fan Speed Connected to 192.168.0.51. Bus status: OK

Schedule



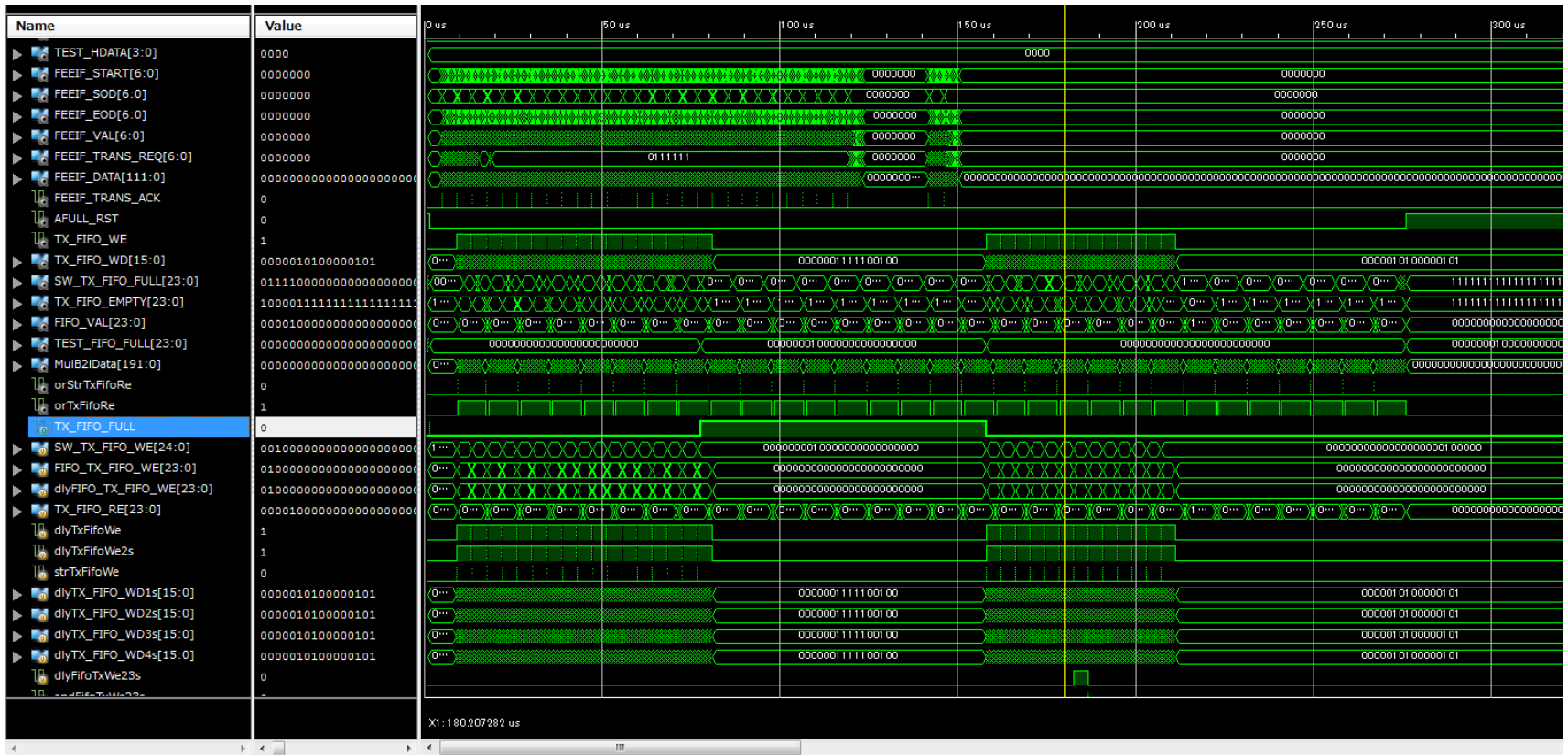
- ARICH will be combined to F-ECL in **4th Sep**
 - 1-2 days per sector for cable survey
- DAQ must be ready in next month : HV/LV will be moved to E-hut
 - Merger/Frontend firmware should be ready in 1 month

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