INTT Commissioning Plan

4/30 ~ 5/6 without beam

RIKEN/RBRC

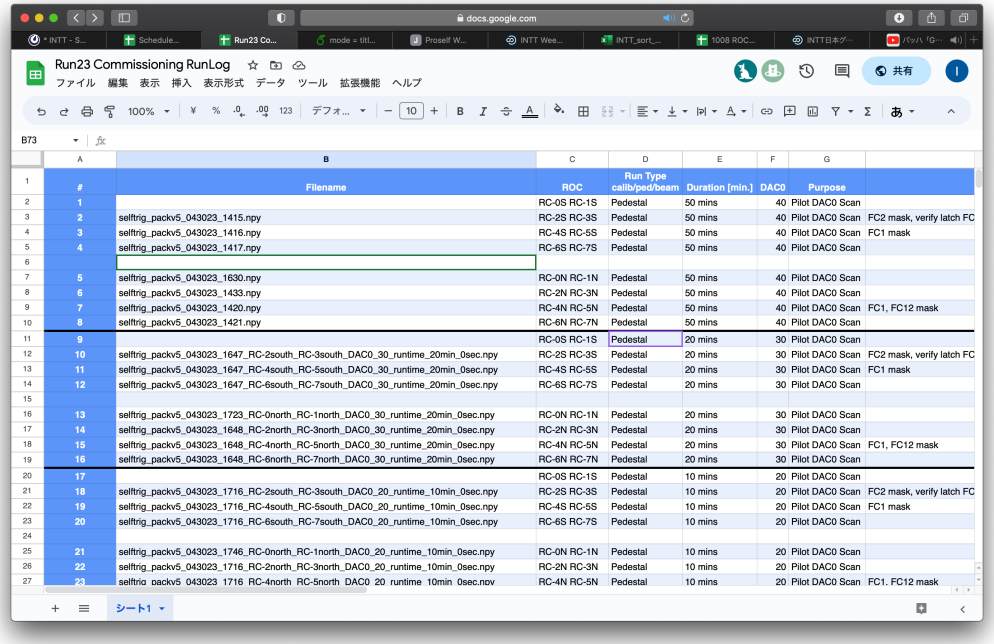
Itaru Nakagawa

Data Taking Plan (Week of April 30)

- Establish (semi-)automated hot channel list and mask before the data taking.
  - Take calibration -> mask hot channels -> hot-channel sweeper by Cheng-Wei ✓
  - Take pedestal -> list additional hot channels and mask off ✓
  - Take ~500 counts/strip noise data for all ROCs. ✓
- Noise data for all S+N ROCs by self-trigger for environment dependence study
  - Noise study with light off (3+3 hours) -> Rates analysis by Jaein
  - Noise study with light on/off for a few ROCs. DAC0=15. (1hour)
  - Noise study with magnet door open (3+3 hours) -> This Friday?
- DAC0 scan for noise rate study for threshold optimization practice (3hours) ✓
- DAC scan (First attempt to observe MIP in IR) with self-trigger mode. (>10hours) -> Analysis by Yuka? and Cheng-Wei
  - Planning to to execute pilot run for 2 to 3 settings early this week for software tuning
- Setup Run List spreadsheets to be used until rcdaq->RunLog becomes ready. ✓

Run Log

- Automated run log is the one of the feature of rcdaq though, we need temporary version especially for the commissioning.
- The Run Log as we used for the past beam test is launched.
- Somewhat automation of filename, essential parameters are to be implemented later.



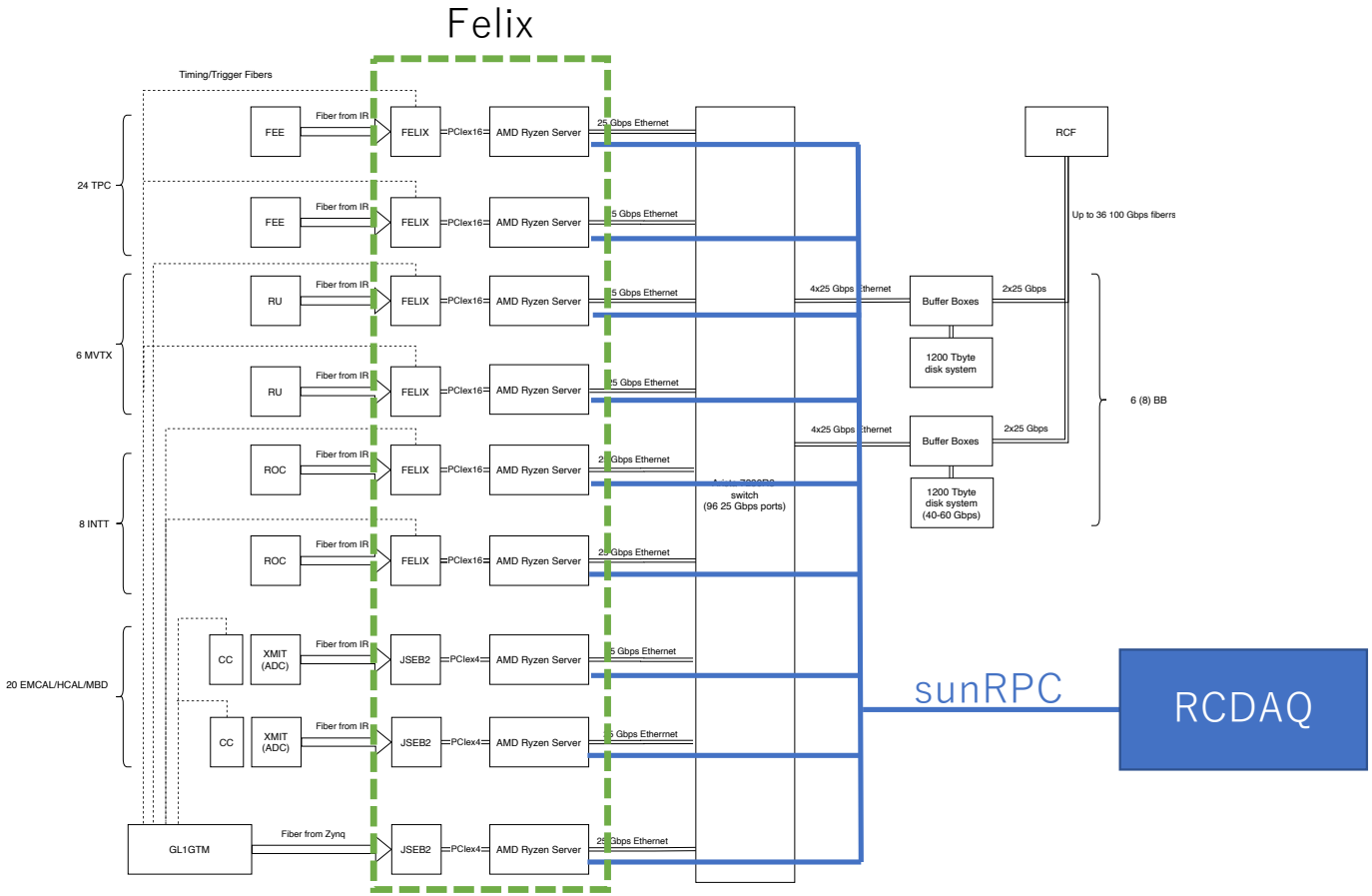
Run23 Commissioning RunLog

#	Filename	ROC	Run Type calib/ped/beam	Duration [min.]	DAC0	Purpose	
1		RC-0S RC-1S	Pedestal	50 mins	40	Pilot DAC0 Scan	
2	selftrig_packv5_043023_1415.npy	RC-2S RC-3S	Pedestal	50 mins	40	Pilot DAC0 Scan	FC2 mask, verify latch FC
3	selftrig_packv5_043023_1416.npy	RC-4S RC-5S	Pedestal	50 mins	40	Pilot DAC0 Scan	FC1 mask
4	selftrig_packv5_043023_1417.npy	RC-6S RC-7S	Pedestal	50 mins	40	Pilot DAC0 Scan	
5	selftrig_packv5_043023_1630.npy	RC-0N RC-1N	Pedestal	50 mins	40	Pilot DAC0 Scan	
6	selftrig_packv5_043023_1433.npy	RC-2N RC-3N	Pedestal	50 mins	40	Pilot DAC0 Scan	
7	selftrig_packv5_043023_1420.npy	RC-4N RC-5N	Pedestal	50 mins	40	Pilot DAC0 Scan	FC1, FC12 mask
8	selftrig_packv5_043023_1421.npy	RC-6N RC-7N	Pedestal	50 mins	40	Pilot DAC0 Scan	
9		RC-0S RC-1S	Pedestal	20 mins	30	Pilot DAC0 Scan	
10	selftrig_packv5_043023_1647_RC-2south_RC-3south_DAC0_30_runtime_20min_0sec.npy	RC-2S RC-3S	Pedestal	20 mins	30	Pilot DAC0 Scan	FC2 mask, verify latch FC
11	selftrig_packv5_043023_1647_RC-4south_RC-5south_DAC0_30_runtime_20min_0sec.npy	RC-4S RC-5S	Pedestal	20 mins	30	Pilot DAC0 Scan	FC1 mask
12	selftrig_packv5_043023_1647_RC-6south_RC-7south_DAC0_30_runtime_20min_0sec.npy	RC-6S RC-7S	Pedestal	20 mins	30	Pilot DAC0 Scan	
13	selftrig_packv5_043023_1723_RC-0north_RC-1north_DAC0_30_runtime_20min_0sec.npy	RC-0N RC-1N	Pedestal	20 mins	30	Pilot DAC0 Scan	
14	selftrig_packv5_043023_1648_RC-2north_RC-3north_DAC0_30_runtime_20min_0sec.npy	RC-2N RC-3N	Pedestal	20 mins	30	Pilot DAC0 Scan	
15	selftrig_packv5_043023_1648_RC-4north_RC-5north_DAC0_30_runtime_20min_0sec.npy	RC-4N RC-5N	Pedestal	20 mins	30	Pilot DAC0 Scan	FC1, FC12 mask
16	selftrig_packv5_043023_1648_RC-6north_RC-7north_DAC0_30_runtime_20min_0sec.npy	RC-6N RC-7N	Pedestal	20 mins	30	Pilot DAC0 Scan	
17		RC-0S RC-1S	Pedestal	10 mins	20	Pilot DAC0 Scan	
18	selftrig_packv5_043023_1716_RC-2south_RC-3south_DAC0_20_runtime_10min_0sec.npy	RC-2S RC-3S	Pedestal	10 mins	20	Pilot DAC0 Scan	FC2 mask, verify latch FC
19	selftrig_packv5_043023_1716_RC-4south_RC-5south_DAC0_20_runtime_10min_0sec.npy	RC-4S RC-5S	Pedestal	10 mins	20	Pilot DAC0 Scan	FC1 mask
20	selftrig_packv5_043023_1716_RC-6south_RC-7south_DAC0_20_runtime_10min_0sec.npy	RC-6S RC-7S	Pedestal	10 mins	20	Pilot DAC0 Scan	
21	selftrig_packv5_043023_1746_RC-0north_RC-1north_DAC0_20_runtime_10min_0sec.npy	RC-0N RC-1N	Pedestal	10 mins	20	Pilot DAC0 Scan	
22	selftrig_packv5_043023_1716_RC-2north_RC-3north_DAC0_20_runtime_10min_0sec.npy	RC-2N RC-3N	Pedestal	10 mins	20	Pilot DAC0 Scan	
23	selftrig_packv5_043023_1716_RC-4north_RC-5north_DAC0_20_runtime_10min_0sec.npy	RC-4N RC-5N	Pedestal	10 mins	20	Pilot DAC0 Scan	FC1, FC12 mask

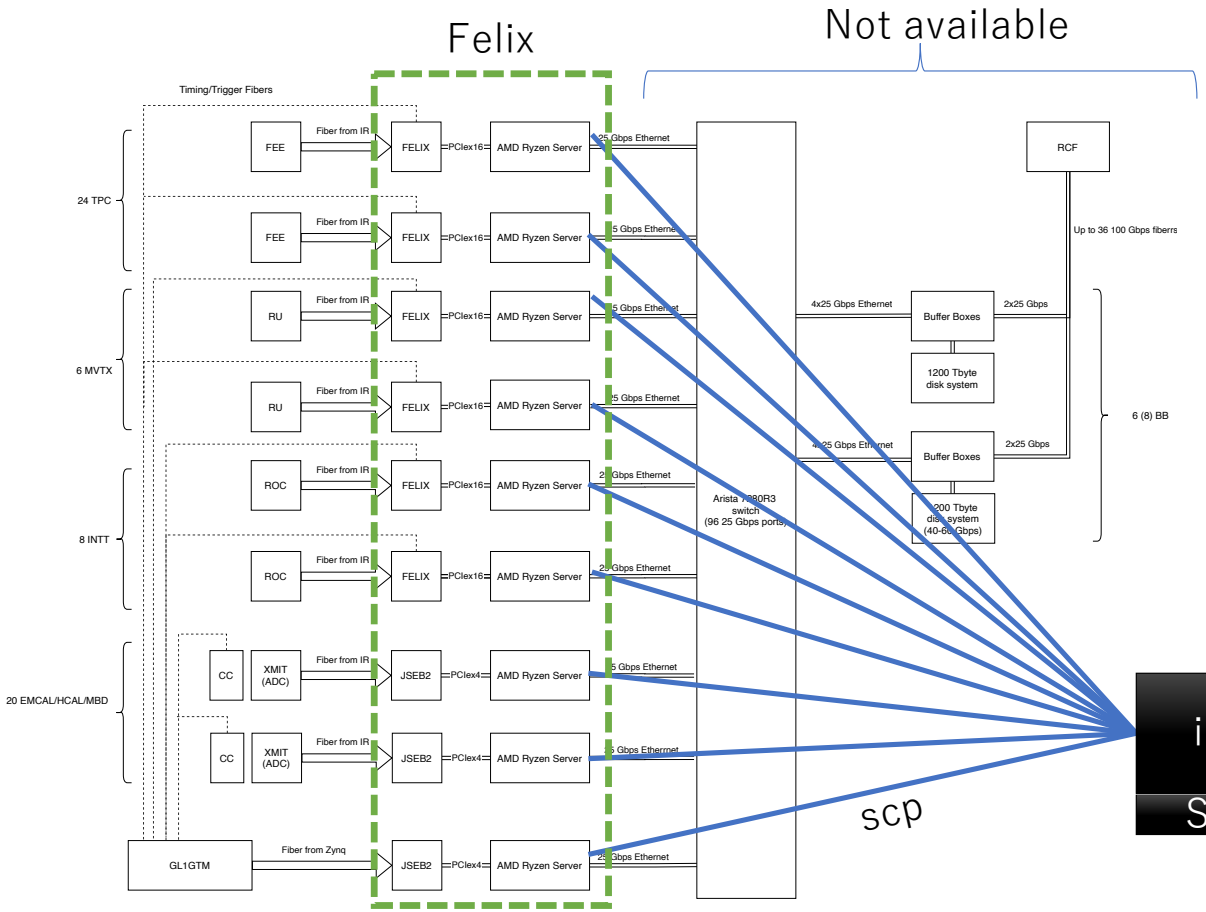
https://docs.google.com/spreadsheets/d/1dkvDEc5iUQd_xskGzAvR5JQ_HzxxxeJfPXEdy0TMKas/edit#gid=0

Current Data location: `/home/inttdev/data/IR_DAQ_server`

RCDAQ Final Configuration



RCDAQ Final Configuration (Transition Period 4/26~?)



- Mounting inttX server discs to inttdaq was dismissed by Martin
- Scp data to inttdaq is quick and dirty solution

- 300MB/16 ROCs of data
- 1TB local disc space approaching full
- Back up in Genki's 2TB hard disk in progress.
- We may be able to survive like this until beam data taking.

For Future

- Existing data (500GB) in inttdaq are to be backed up in SDCC via the bufferbox hopefully soon.
- We'll announce if data becomes available in SDCC for easier access from offsite crews.
- For the time being, we have to ask offline crews to access inttdaq and get data from there.

How to access Inttdaq

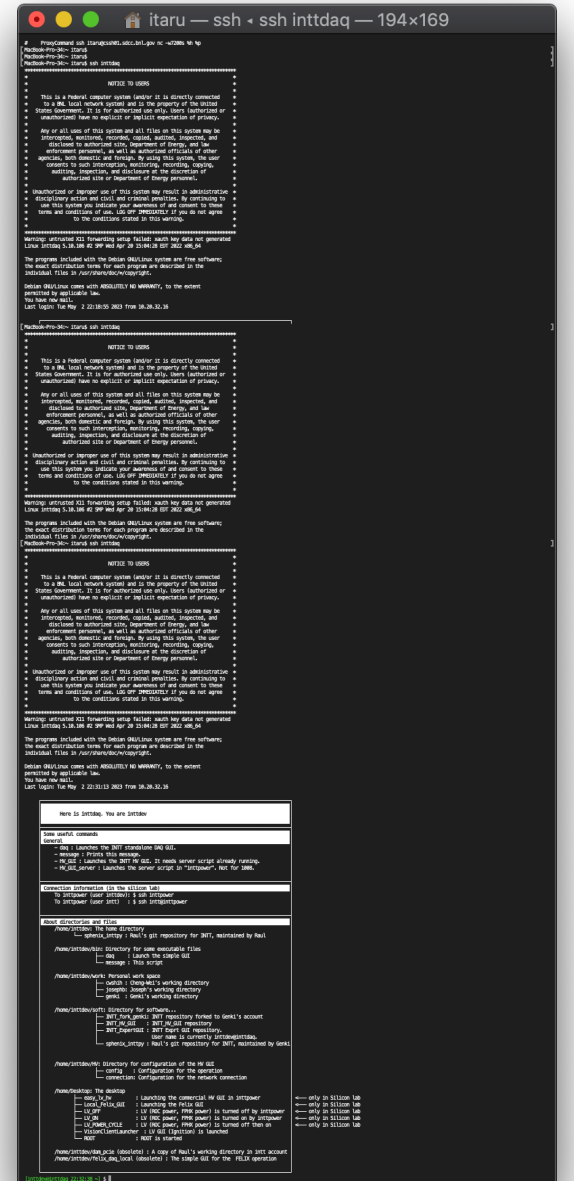
* Useful reference:
  http://www.phenix.bnl.gov/~purschke/ssh_tutorial.pdf

- Copy and paste your public key `:~/.ssh/id_rsa.pub` to `phnxrc@opc0:~/.ssh/authorized_keys`

In your local host: ~/.ssh/config

```
Host inttdaq
     HostName inttdaq.sphenix.bnl.gov
     User inttdev
     ForwardAgent yes
     IdentityFile ~/.ssh/id_rsa
     ForwardX11 yes
     ProxyJump
         [username]@cssh01.sdcc.bnl.gov,phnxrc@opc0.sphenix.bnl.gov
```

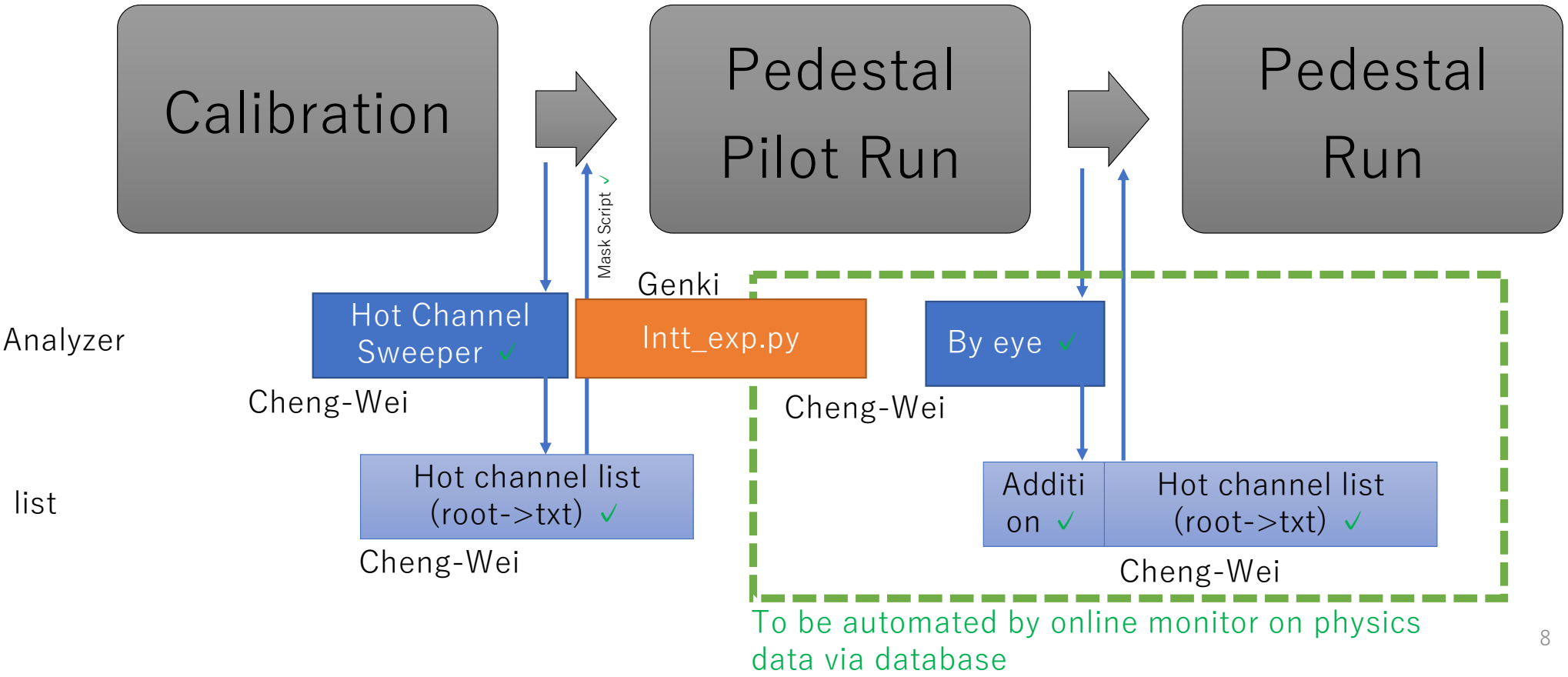
MacBook-Pro-34:~ itaru$ ssh inttdaq



Inttdaq login screenshot→

Channels Masking Routine

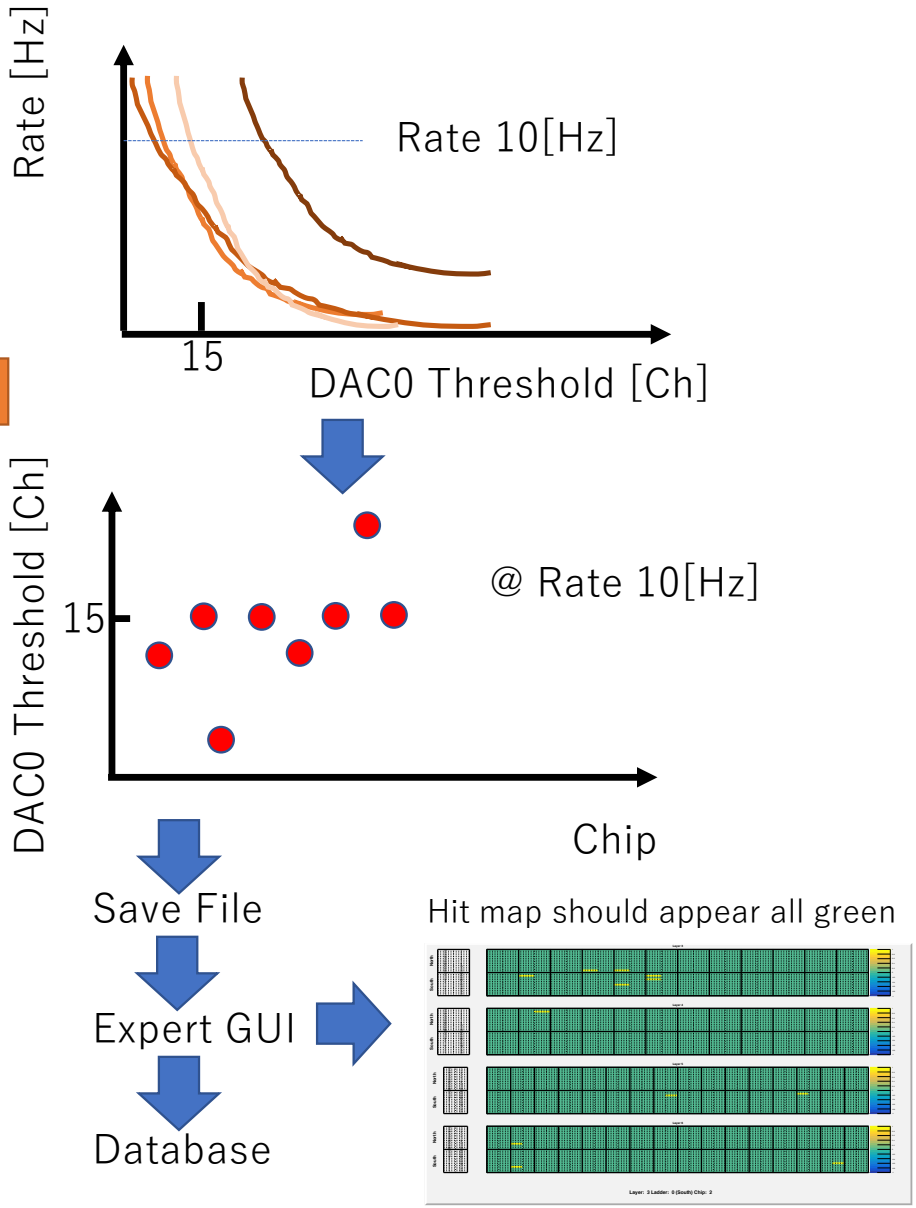
Status : 94 half ladders are done. 4/30
18 more half ladders to go (to be resolved ladder issue first)



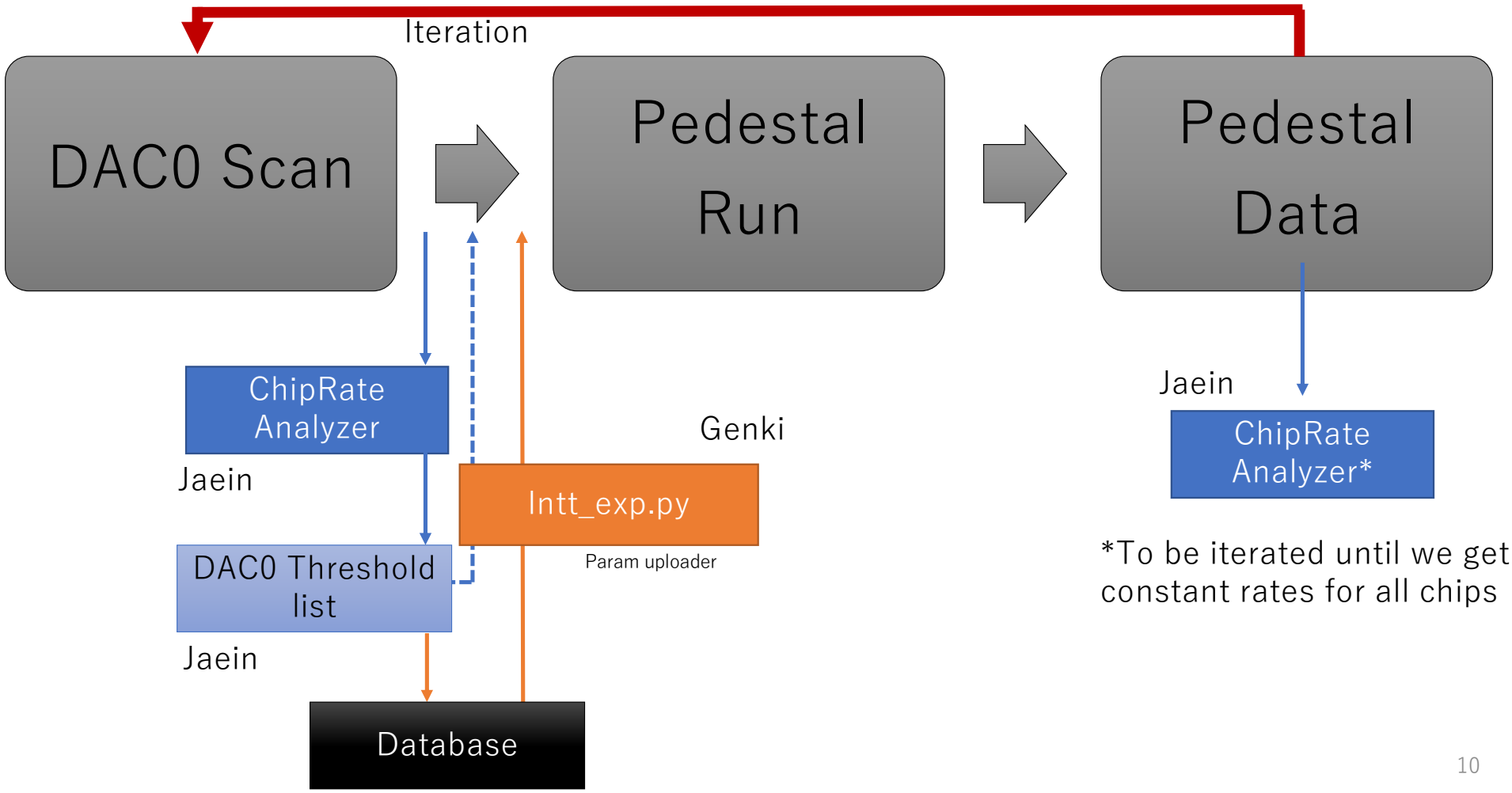
DAC0 Scan

- Scan DAC0 value one-by-one [20, 19, 18, 17, …] w/ self-trigger.
- Need develop analysis software to evaluate rates/chip. Jaein
- Optimize the DAC0 threshold for each Chip to give the same given rate. Save threshold values (52 x 56) in file loadable to Expert GUI.
- Customize DAC0 threshold setting chip-by-chip (Expert-GUI)
- This is the practice for the DAC0 threshold scan with the beam during commissioning. (S/N is also considered w/ beam)

~~Joseph develops data converter to feed non-prdf data to the online monitor~~



DAC0 Threshold Feedback System



DAC0 Scan

DAC0 condition list

Scan#	1	2	3	4	5	6	7	8*	9*	10*	11*
minutes	**5**	**5**	**5**	**5**	**10**	**20**	**60**				
DAC0	**15**	**16**	**17**	**18**	**20**	**30**	**40**	**14**	**13**	**12**	**11**
DAC1	44	44	44	44	44	44	44	44	44	44	44
DAC2	48	48	48	48	48	48	48	48	48	48	48
DAC3	52	52	52	52	52	52	52	52	52	52	52
DAC4	56	56	56	56	56	56	56	56	56	56	56
DAC5	60	60	60	60	60	60	60	60	60	60	60
DAC6	64	64	64	64	64	64	64	64	64	64	64
DAC7	68	68	68	68	68	68	68	68	68	68	68

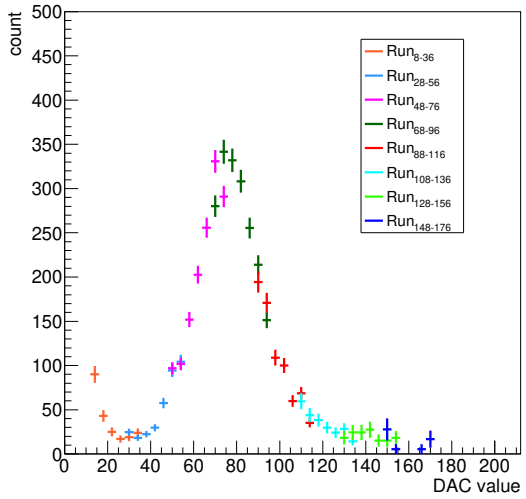
*We'll explore DAC0<15 threshold in the 2nd round for the chips

DAC Scan

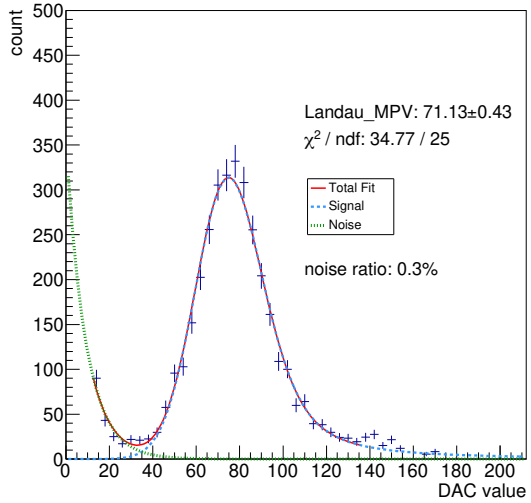
w/ Cosmic Ray
w/ self-trigger

Scan#	1	2	3	4	5	6	7	8
DAC0	8	28	48	68	88	108	128	148
1	12	32	52	72	92	112	132	152
2	16	36	56	76	96	116	136	156
3	20	40	60	80	100	120	140	160
4	24	44	64	84	104	124	144	164
5	28	48	68	88	108	128	148	168
6	32	52	72	92	112	132	152	172
7	36	56	76	96	116	136	156	176

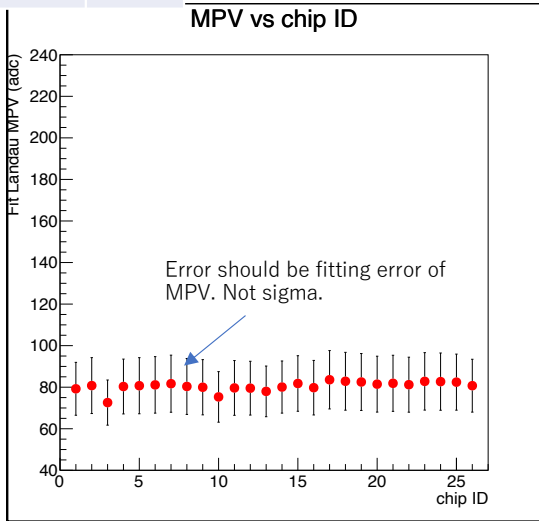
Cheng-Wei and Yuka?



- Chip-by-Chip Base
- Clustering (Optimize offset value)
- Normalization btwn adjacent runs
- Concatenate all runs



- Fitting with Landau+Gaussian convolution function.



Half ladder by half ladder

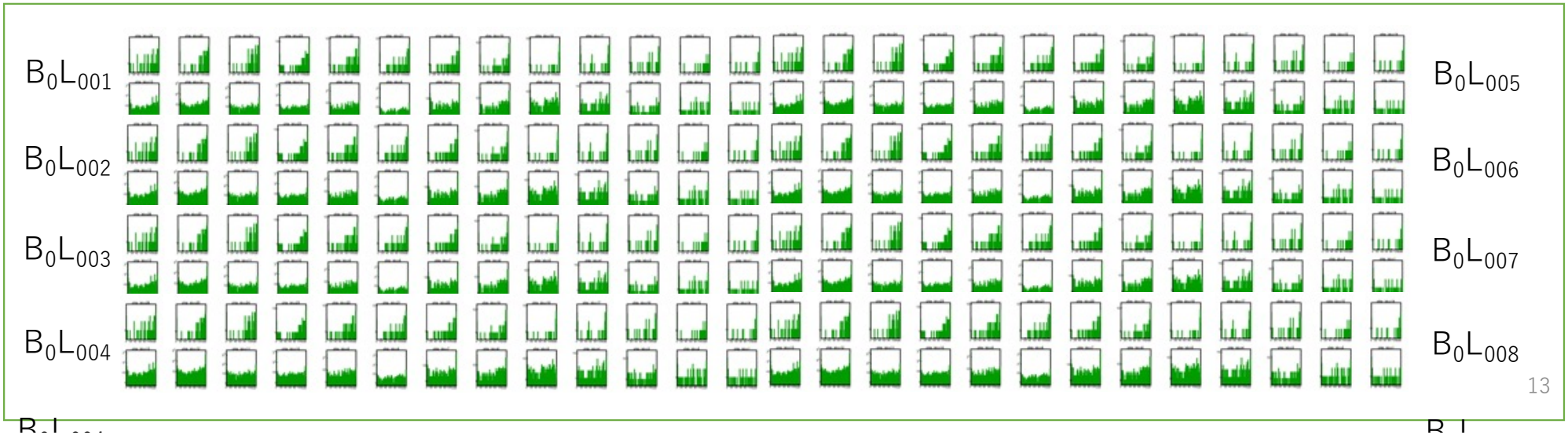
All ladders
Save all fitting parameters:
MPV, Width, …

From ELPH annual report and Cheng-Wei's slide 2022/4/15

FelixQuickViewer

Misaki

- Extend calibration display software to display self-trigger (pedestal) runs as well. Rename it to be FelixQuickViewer.
- Exclude any plots associate with amplitudes for self-trigger run display.
- Calibration/Self-Trigger modes can be distinguished by the file name “calib” or “selftrig” in the macro.



Cheng-Wei?

LVDS Current Scan

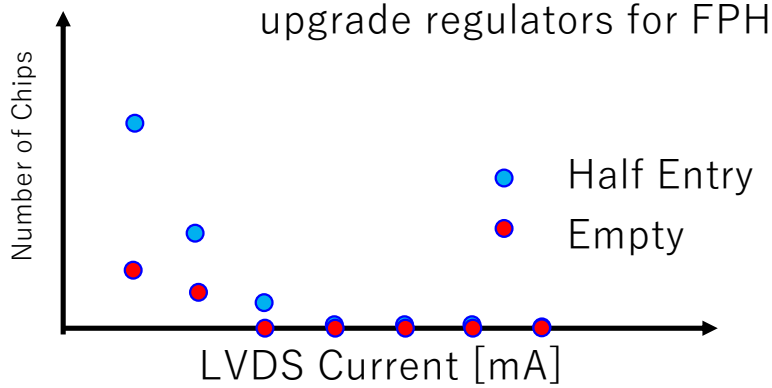
- Purpose: to learn the lowest limit of LVDS current below 6mA for the safe operation.
- How: Run calibration for each LVDS current setting and counts # of chips which falls into ”half entry”/”empty” symptoms. (Calibration Result Analyzer)
- Plot # of ”half entry” and ”empty” chips as a function of LVDS current.

210324_LVDS_Scan.xlsx

LVDS Current [mA]	LVDS Current GUI Setting	Calibration Results	Data
8mA	255	1 2 3 4 5 6 7 8 9 10 11 12 13 / 14 15 16 17 18 19 20 21 22 23 24 25 26	1738
7mA	127	1 2 3 4 5 6 7 8 9 10 11 12 13 / 14 15 16 17 18 19 20 21 22 23 24 25 26	1751
6mA	63	1 2 3 4 5 6 7 8 9 10 11 12 13 / 14 15 16 17 18 19 20 21 22 23 24 25 26	1755
5mA	31	1 2 3 4 5 6 7 8 9 10 11 12 13 / 14 15 16 17 18 19 20 21 22 23 24 25 26	1800
4mA	15	1 2 3 4 5 6 7 8 9 10 11 12 13 / 14 15 16 17 18 19 20 21 22 23 24 25 26	1807
3mA	7	1 2 3 4 5 6 7 8 9 10 11 12 13 / 14 15 16 17 18 19 20 21 22 23 24 25 26	1813
2mA	3	1 2 3 4 5 6 7 8 9 10 11 12 13 / 14 15 16 17 18 19 20 21 22 23 24 25 26	1818
1mA	1	1 2 3 4 5 6 7 8 9 10 11 12 13 / 14 15 16 17 18 19 20 21 22 23 24 25 26	1824
1mA	1	1 2 3 4 5 6 7 8 9 10 11 12 13 / 14 15 16 17 18 19 20 21 22 23 24 25 26	1829

Good Half Entry Empty

This measurement was done in NWU before we upgrade regulators for FPHX power on ROCs.



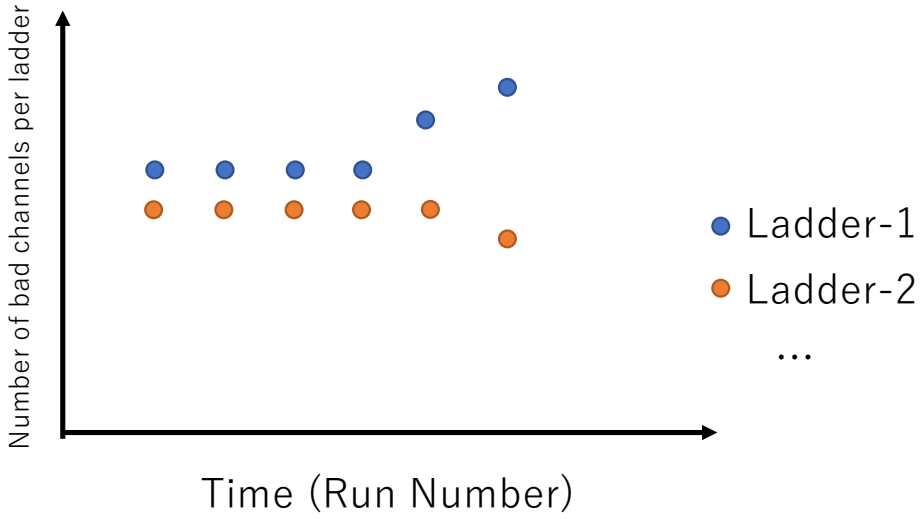
Stability Monitor

Wei-Che

The purpose of the stability monitor is to visualize something changed and tell when it happened by a glance.

- Texturized summary of calibration results are saved in the calibration database.
- The StabilityMonitor extracts the data from the database and display the history of each key performances per chip.
  - # of bad channels per half ladders, etc
- The monitor should be designed to run in two modes.
  1. Calibration mode
  2. Physics data mode (Plot average hit rates/half ladder, etc in physics data mode)

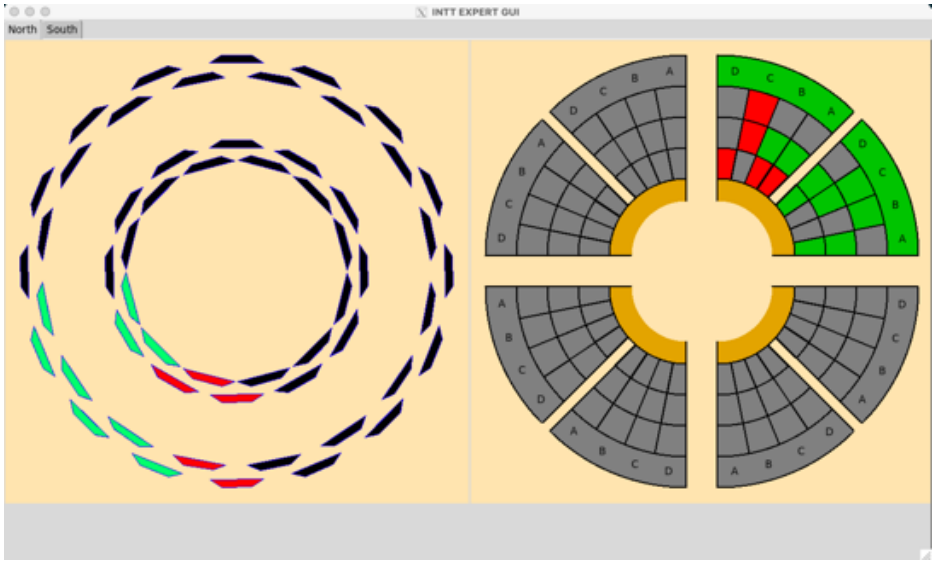
- Extract data from database
- Option to select the term (from run# - to run#)
- Make plot
- Automated update of plots

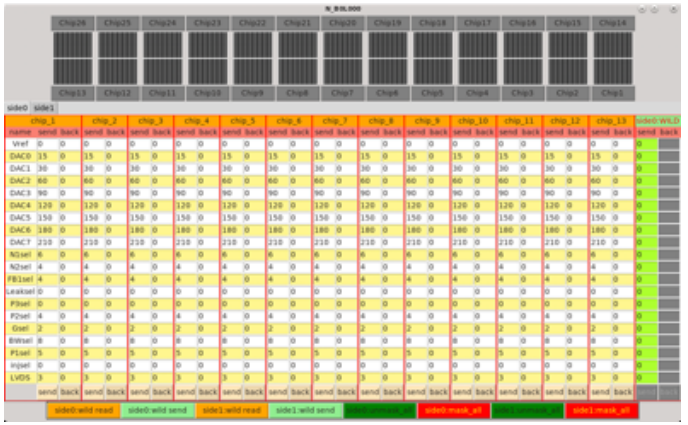


Expert GUI Development

RIKEN

- Test RPC function ✓
- Establish RPC functions to all inttX servers
- Test individual DAC0 threshold control works.
- Implement loading DAC0 thresholds from a list file. (Cheng-Wei) ✓
- Automate DAC0 setting to all ladders/chips.





- Update verify latch function with the latest

Commissioning without beam Status

1. Apply 100V bias (HV GUI). Diagnose any over current channels. ✓
2. Power on a ladder by ladder (LV GUIs) and apply 100V bias. Run the calibration. Make sure the results appears in the expected ladder map in the Calibration Display/Analyzer/Monitor. (Misaki/Cheng-Wei) ✓
3. Diagnose missing channels and try to recover. ✓
4. Tune the alert range of LV/HV voltage/current control panels (alert features of LV/HV GUI). (Maya/Mai, still need fine tuning) ✓
5. Random trigger noise run (random external trigger). Debug any large noise half ladder or channels (online monitor). (Joseph, ongoing)
6. Save dead/hot channels in the database. (Expert GUI) (Hikaru, Itaru, ongoing)
7. Cosmic ray trajectory observation by the event display with the INTT self-trigger and standalone DAQ. If the big-partition and calorimeter trigger are available, we try to take data with the calorimeter external trigger.

Necessary Software tools To be implemented by Raul/Martin