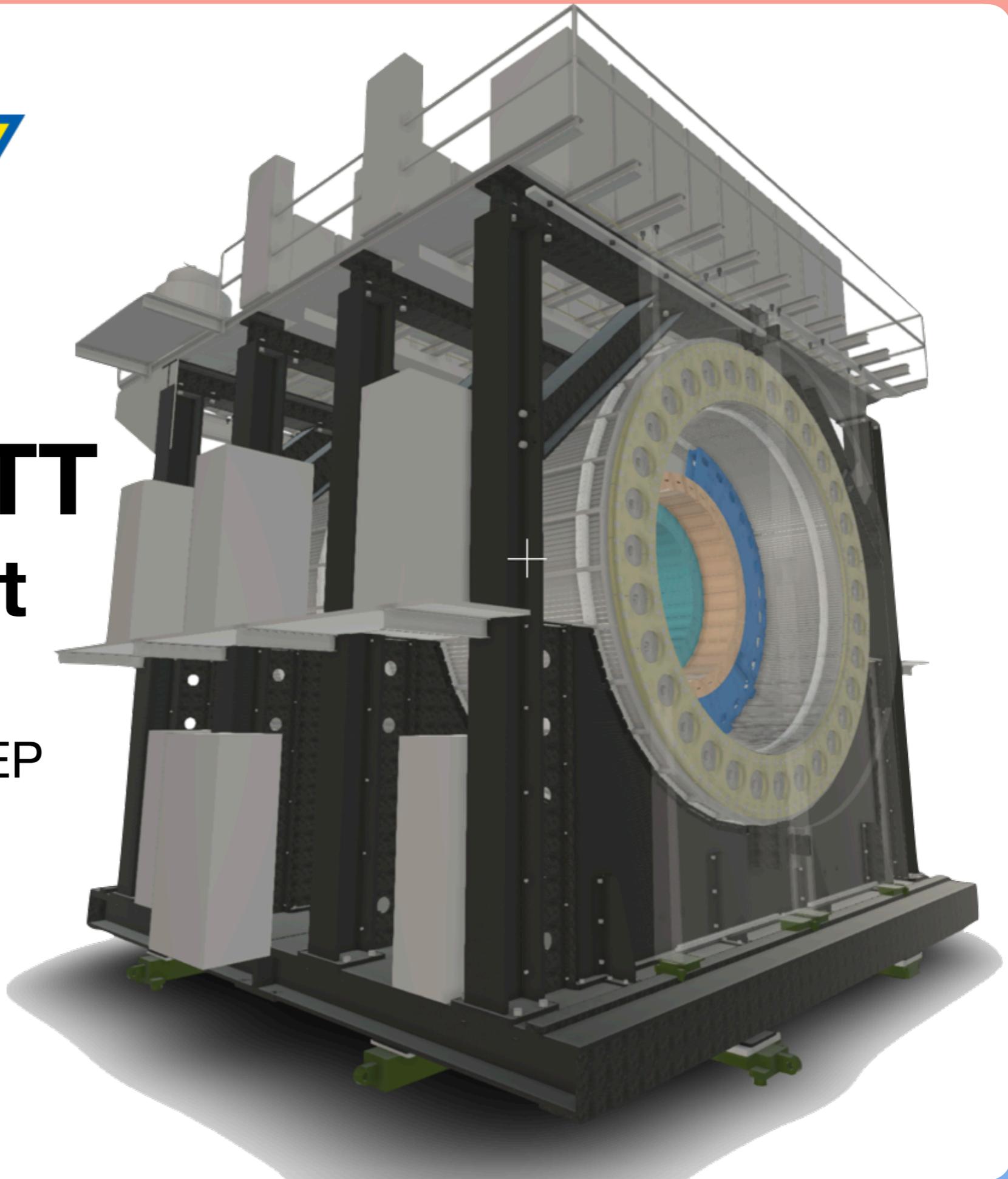# sPHENIX INTT - Weekly Report
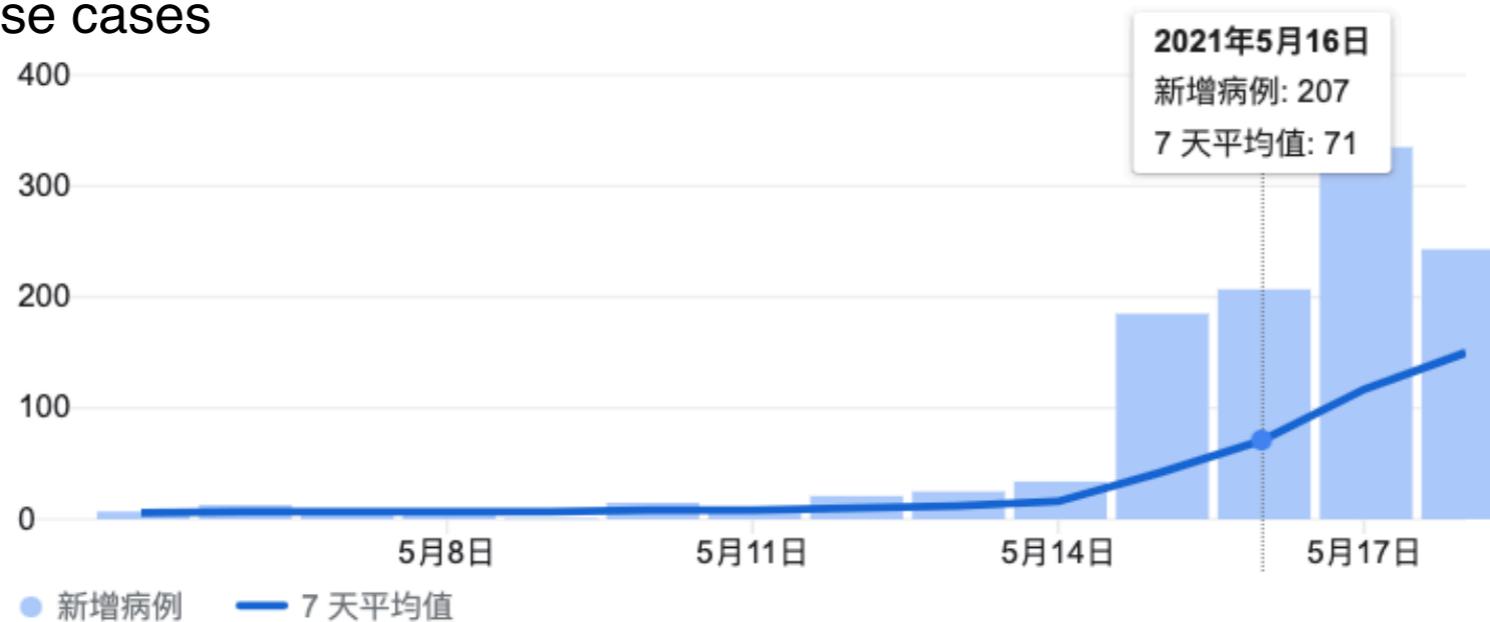
Cheng-Wei Shih, NCUHEP

2021/5/20

COVID-19 status in Taiwan

- ~ 250 new COVID-19 cases each day.
  - Most of the cases are from Taipei.
- CDC raised epidemic warning to level 3 nationwide.
  - Indoor gathering < 5 people.
  - We stop to go to NTU for 1 week so far.

Half-ladder assembly status

Half-ladder assembly

	Total	Good	Not yet bonded & tested	Bad
Chip to HDI	11	1	0	10
Sensor to HDI	4	2	1	1
Encapsulation	3	3	0	0
Thermal cycle	34	30	0	4

One in NWU

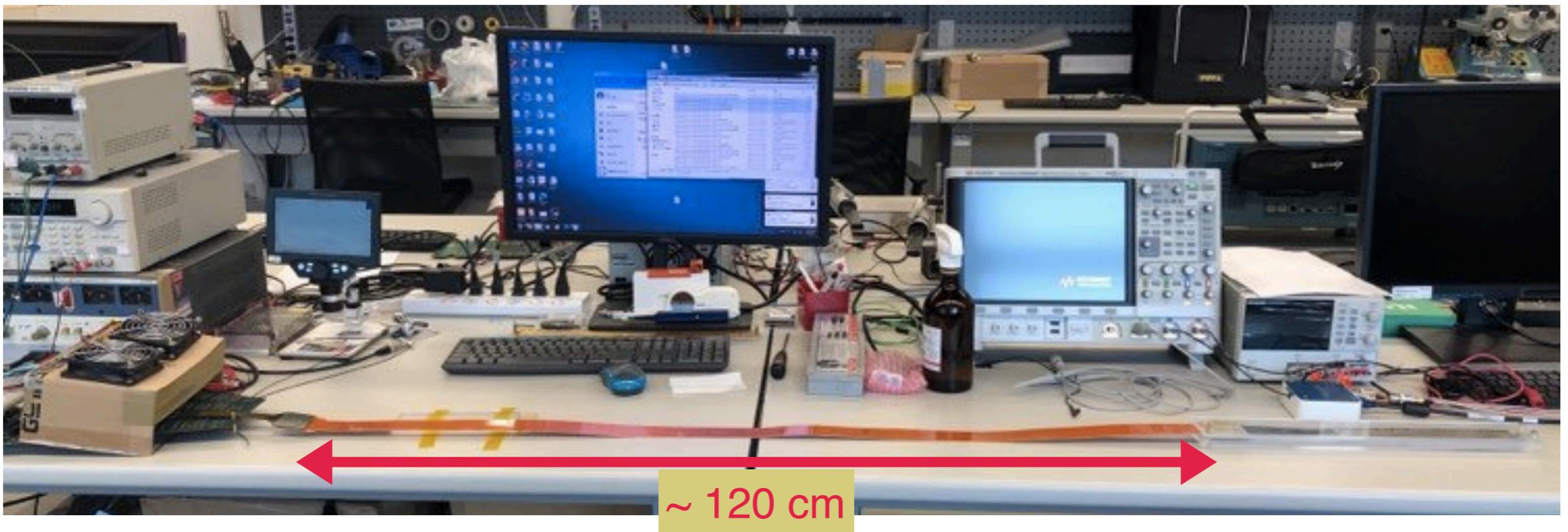| all bonded	29
1 ~ 6 un-bonded	7
7 ~ 25 un-bonded	0
> 25 un-bonded	3

Bonding performance (chip to sensor)

Stave quality test

- Tube clamp + torque screwdriver from BNL is arrived.
- We have DP460NS on hand now
- We haven't used it yet, we need instructions from BNL.
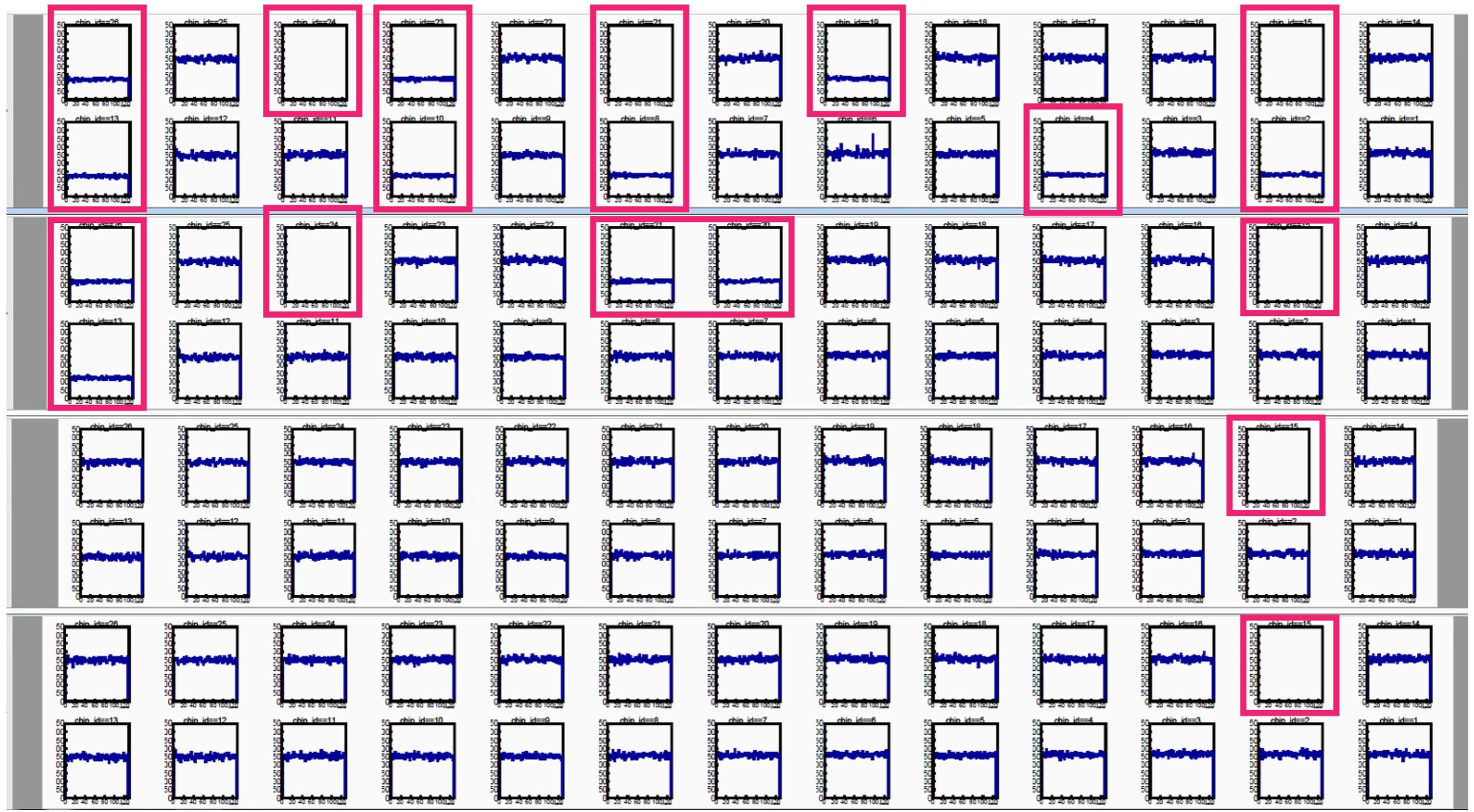
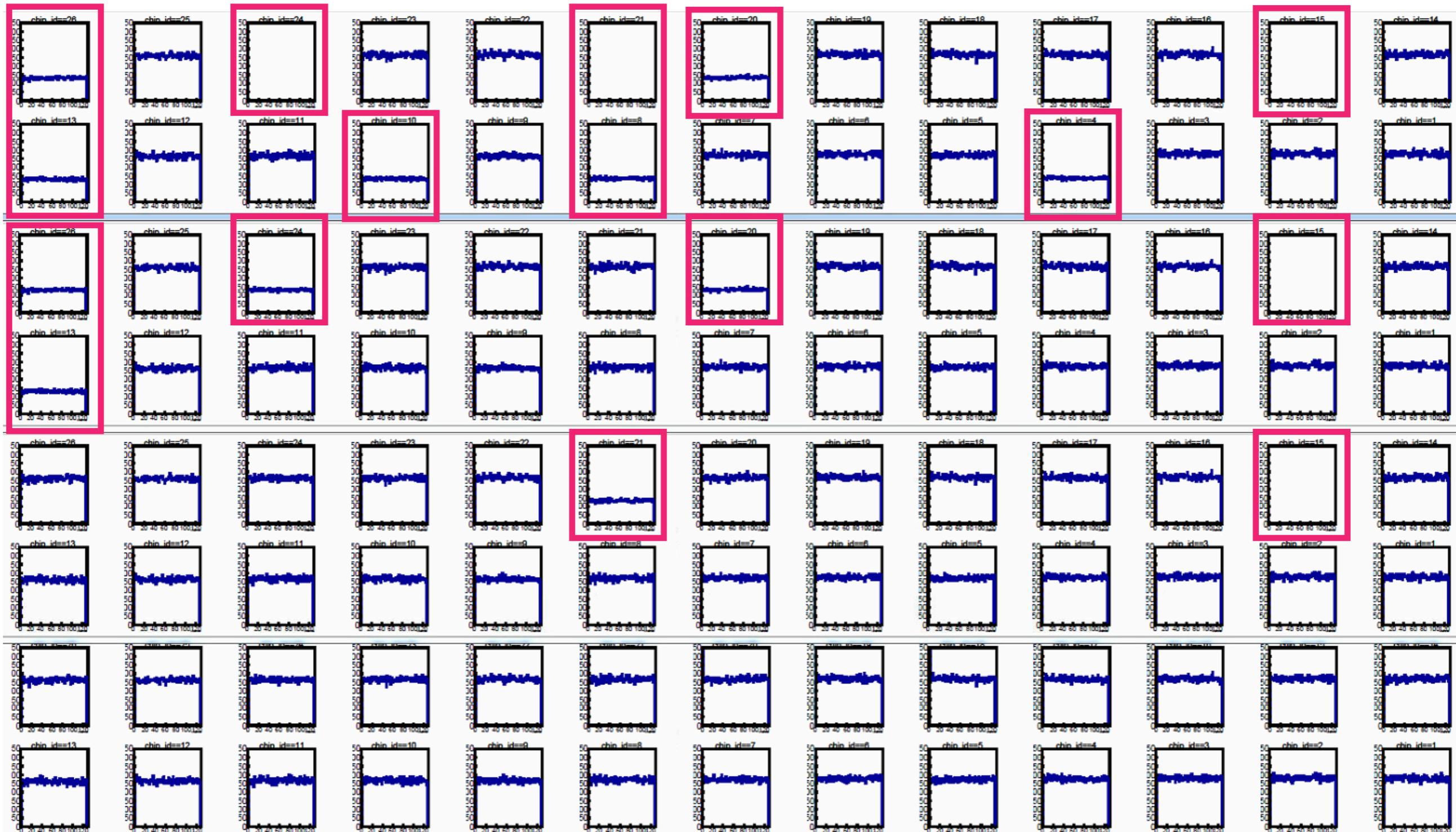- 2 Bus Extender Cables from NWU were arrived.

~ 120 cm

BEC test, BEC#1

Half-ladder performance : all chips are good without BEC
LVDS current : 1mA -> 2mA -> 4mA -> 8mA
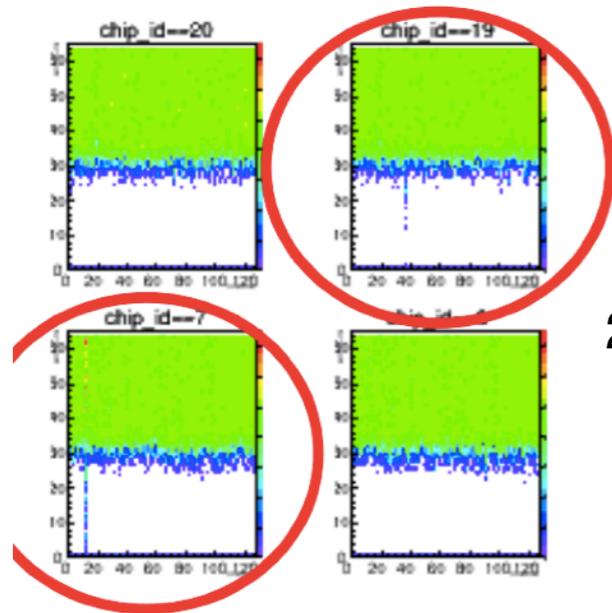
BEC test, BEC#4

Half-ladder performance : all chips are good without BEC
LVDS current : 1mA -> 2mA -> 4mA -> 8mA
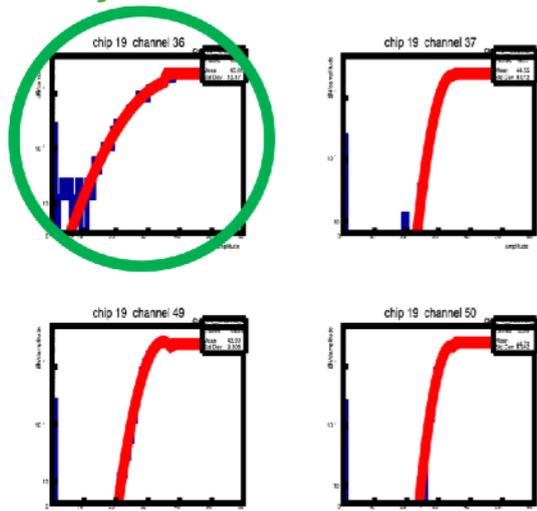
Channel classification : BNL

- Goal : try to classify good channel & bad channel.
- 2 algorithms so far, Taiwan & BNL.

We use the same data
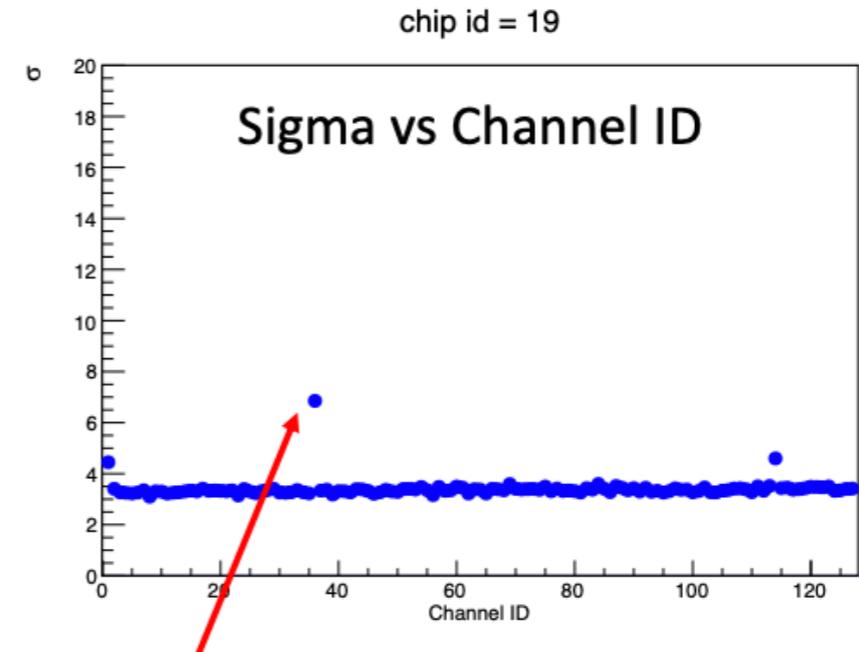
2 noisy channel in this case

Noisy channel

Sigma vs Channel ID

chip id = 19

Noisy channel

Every channel is fitted with gaussian
X axis : ampl
Y axis : entries

Fit function:

$$f(x) = \begin{cases} Gaus(x, mean, sigma), x < a \\ const, x \geq a \end{cases}$$

chip_id=19

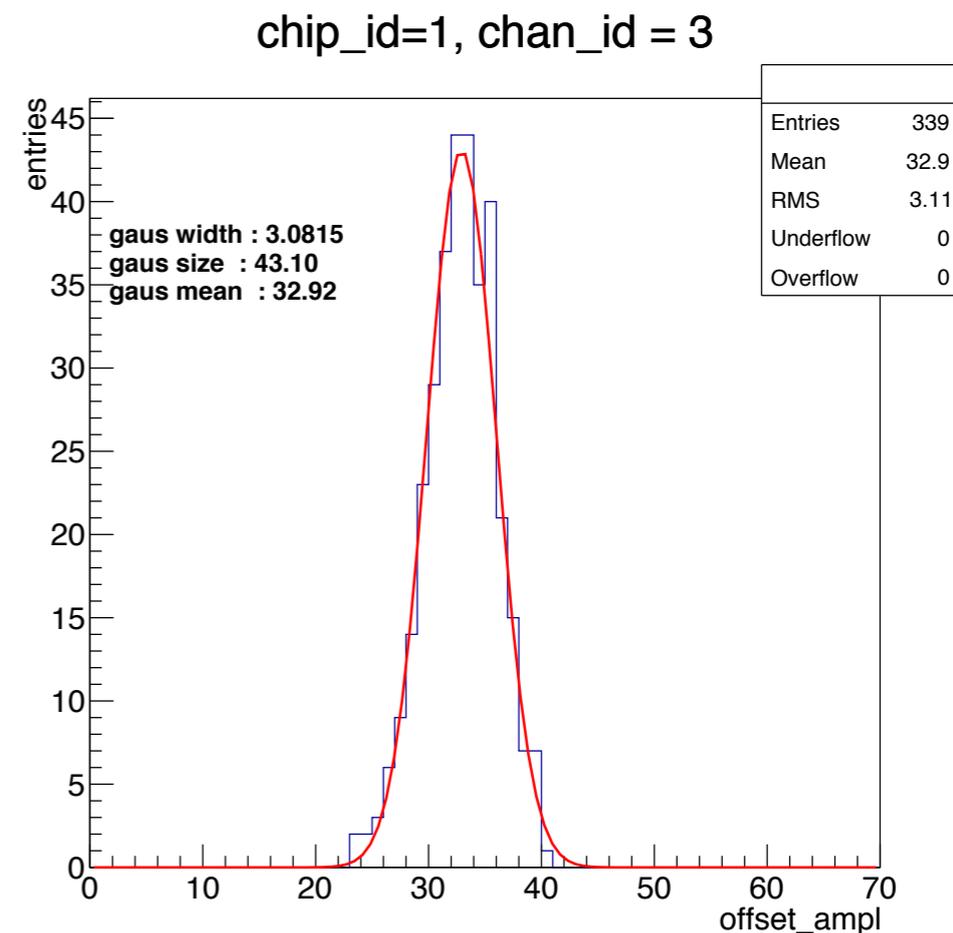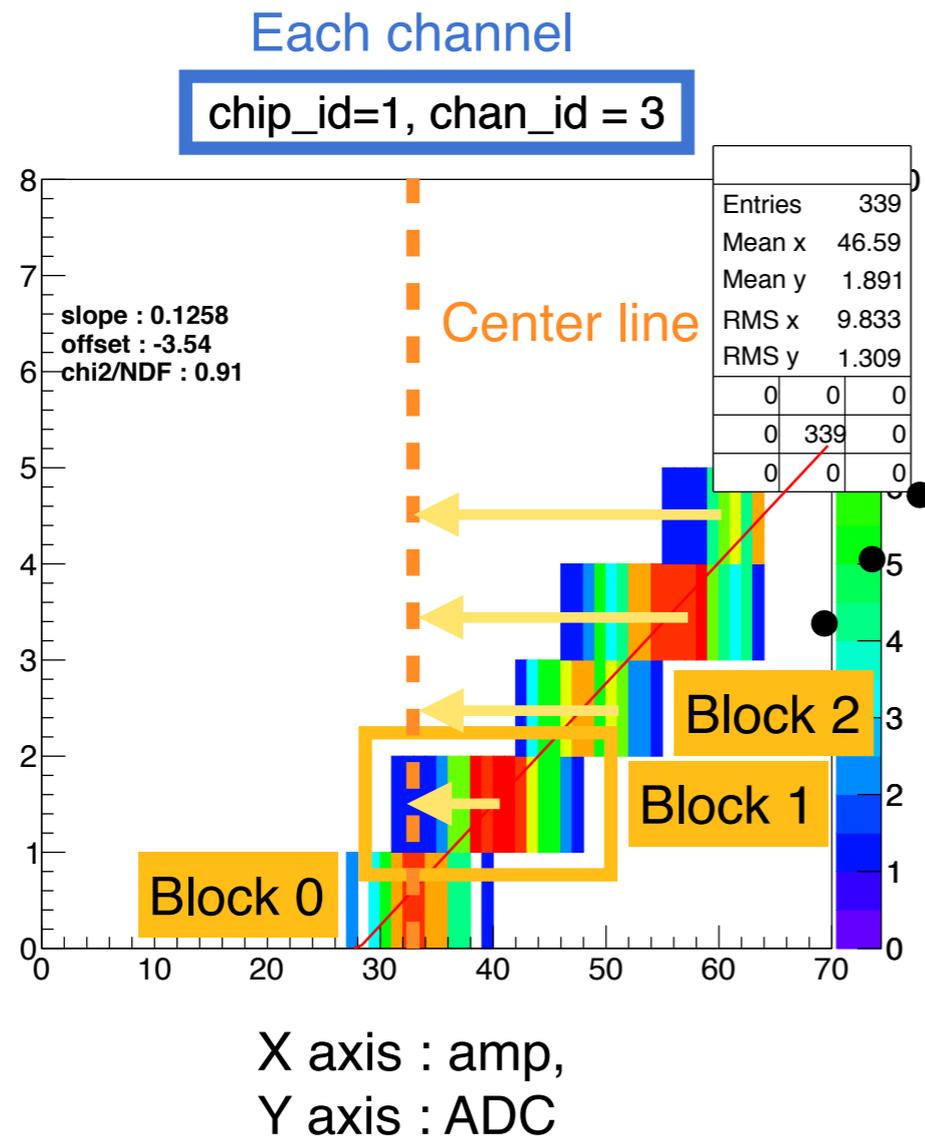| Chip_id = 18	
Entries	127
Mean	3.397
Std Dev	0.3515

Noisy channel

Require 20 runs of calibration test

- For each channel of each chip :
  - Center line : mean of events in "Block 0" (ADC==0)
  - Center of the rest blocks are panned to center line.
    - Amount of movement : Mean of each block - center line
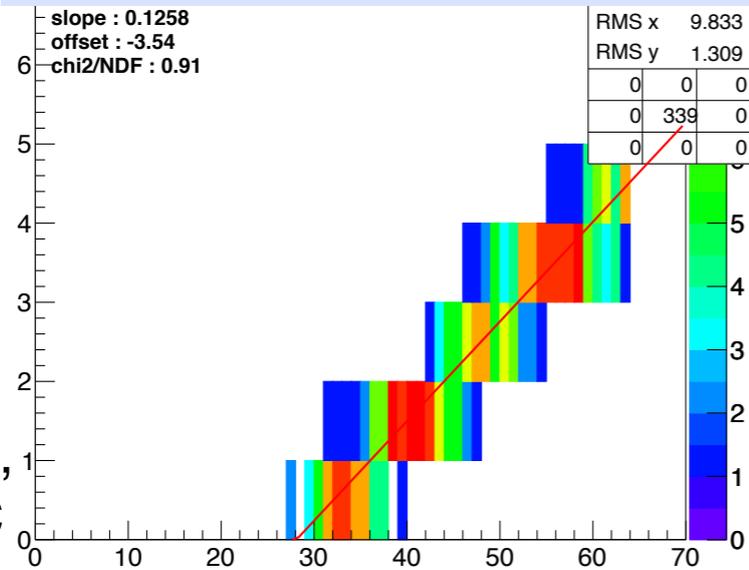 - Each event is filled in TH1F, and fit with gaussian.

Each channel

chip_id=1, chan_id = 3

slope : 0.1258
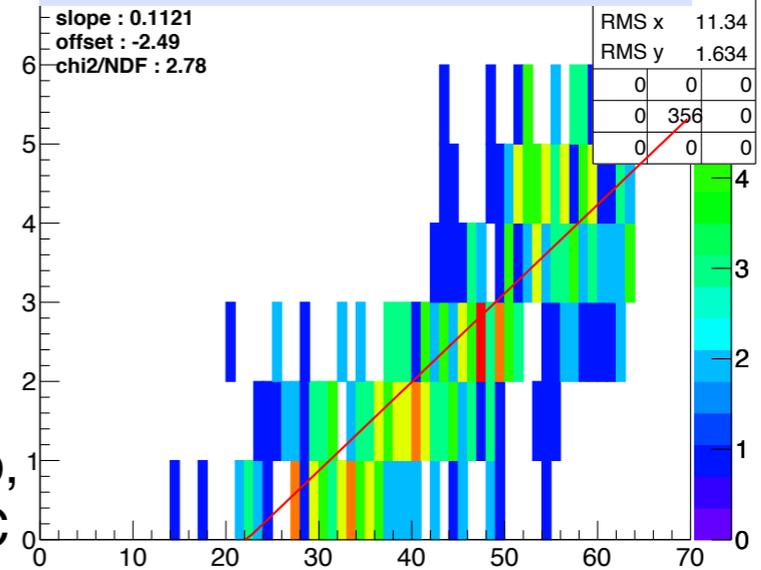offset : -3.54
chi2/NDF : 0.91

Center line

Entries	339
Mean x	46.59
Mean y	1.891
RMS x	9.833
RMS y	1.309

0	0	0
0	339	0
0	0	0

Block 2

Block 1

Block 0

X axis : amp,
Y axis : ADC

chip_id=1, chan_id = 3

gaus width : 3.0815
gaus size : 43.10
gaus mean : 32.92

Entries	339
Mean	32.9
RMS	3.11
Underflow	0
Overflow	0

entries

offset_ampl

Channel classification : Taiwan

chip_id=1, chan_id = 3

Example for functional channel

slope : 0.1258
offset : -3.54
chi2/NDF : 0.91

RMS x   9.833
RMS y   1.309

X axis : amp,
Y axis : ADC

chip_id=7, chan_id = 12

Example for noisy channel

slope : 0.1121
offset : -2.49
chi2/NDF : 2.78

RMS x   11.34
RMS y   1.634

X axis : amp,
Y axis : ADC

chip_id=1, chan_id = 3

entries

gaus width : 3.0815
gaus size : 43.10
gaus mean : 32.92

Entries   339
Mean   32.9
RMS   3.11
Underflow   0
Overflow   0

offset_ampl
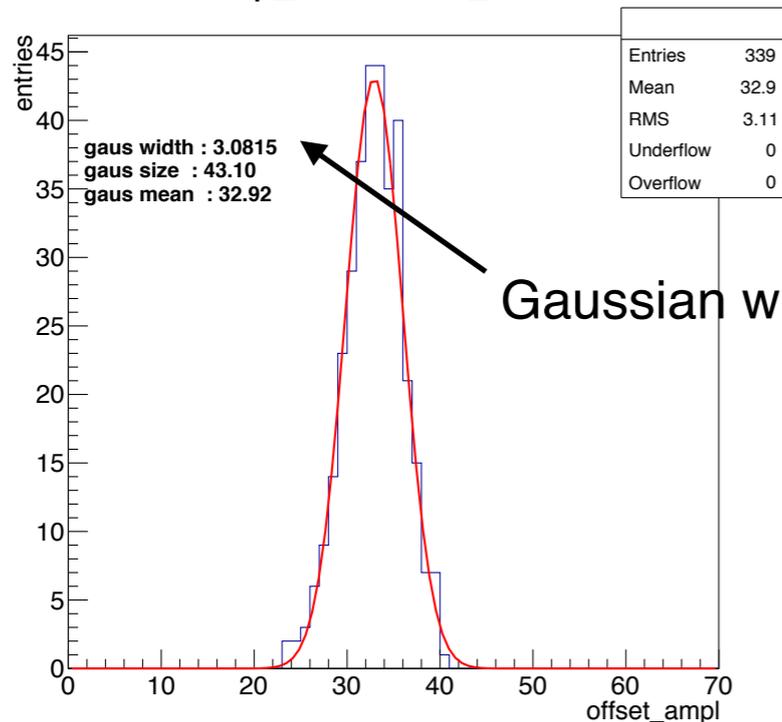
Gaussian width mostly < 4

chip_id=7, chan_id = 12

entries

gaus width : 6.1024
gaus size : 21.00
gaus mean : 32.87

Entries   356
Mean   32.79
RMS   6.815
Underflow   0
Overflow   0

offset_ampl

Gaussian width mostly > 4

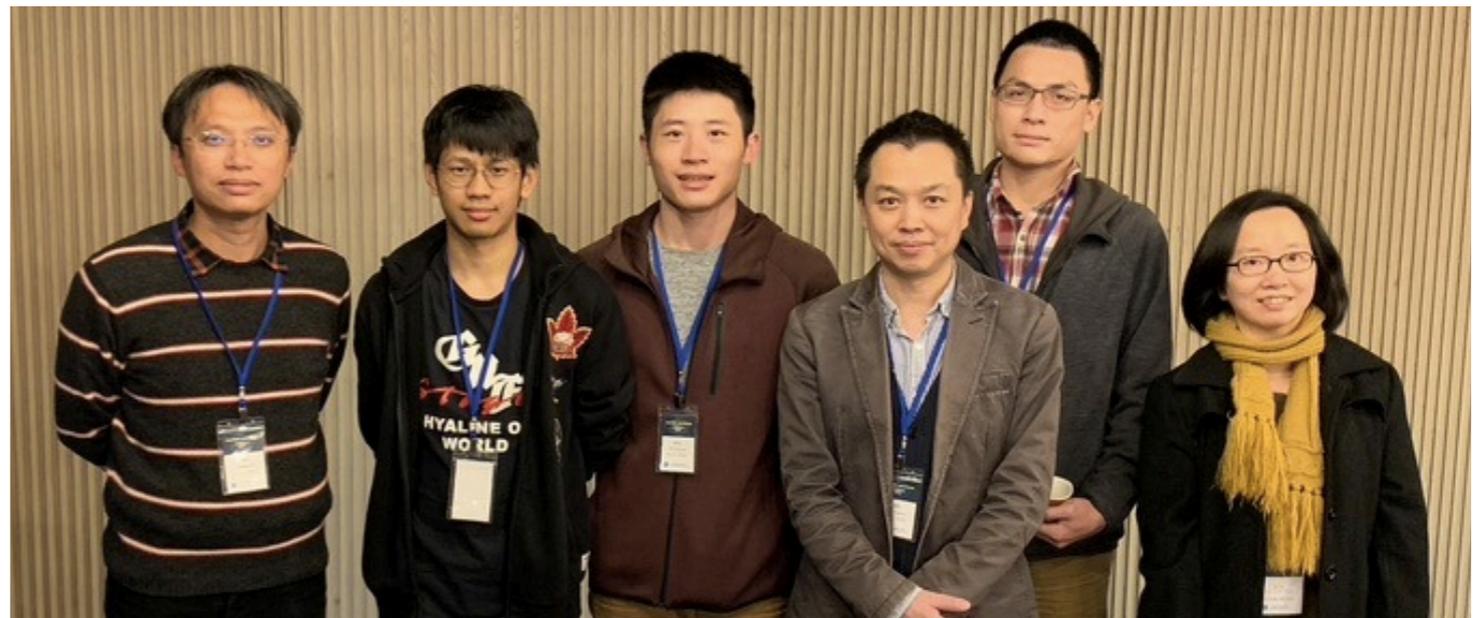Faster and with better separation power

Back up

Taiwan INTT team

Ou-Wei Cheng
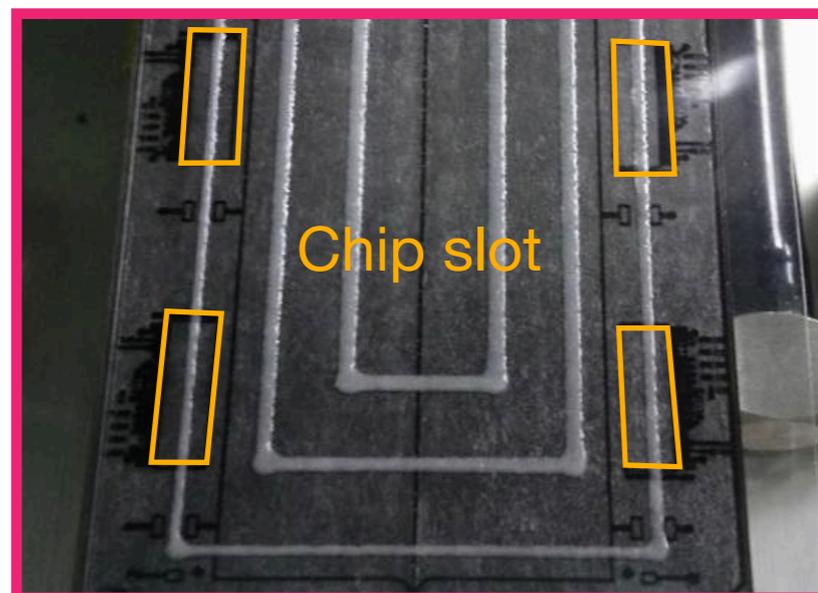

Kai-Yu Cheng
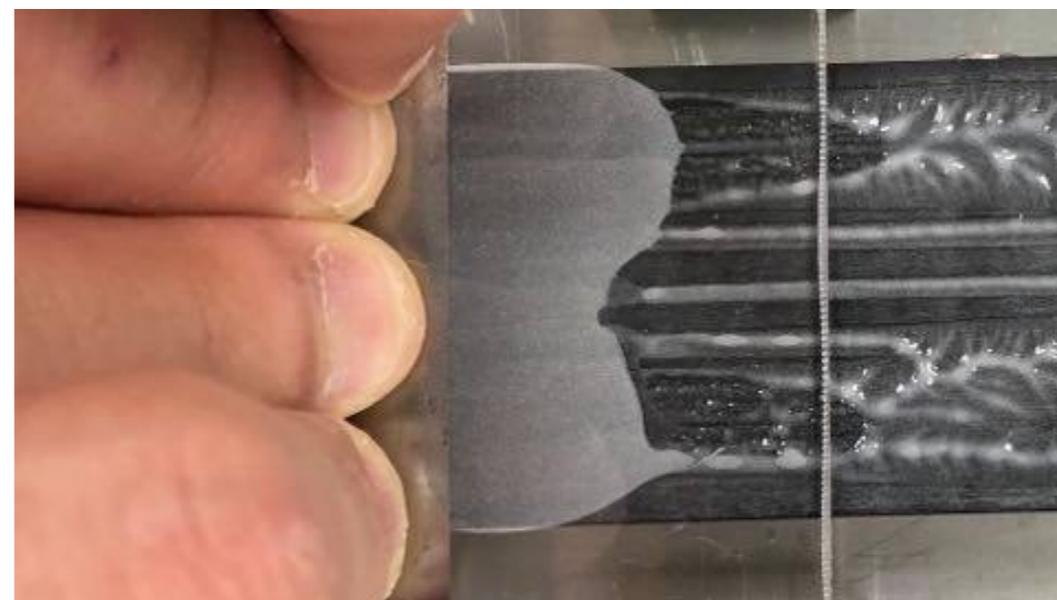

Chia-Ming Kuo   Cheng-Wei Shih   Lian-Sheng Tsai
Wei-Che Tang   Rong-Shyang Lu   Janny Huang

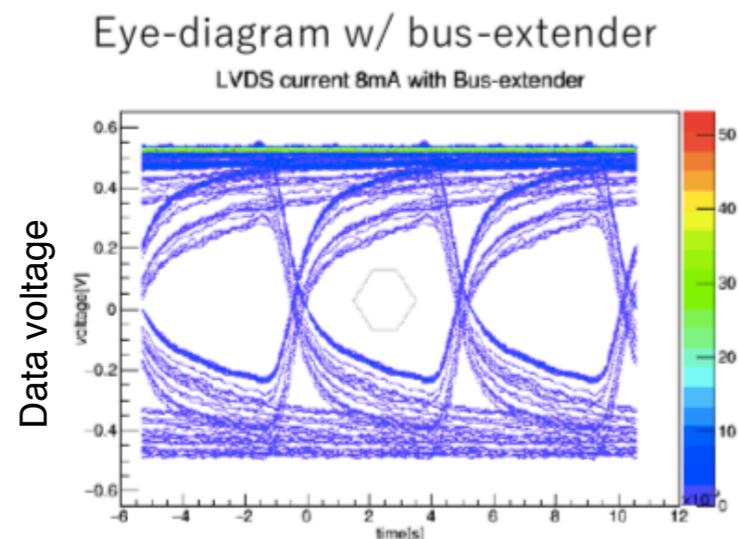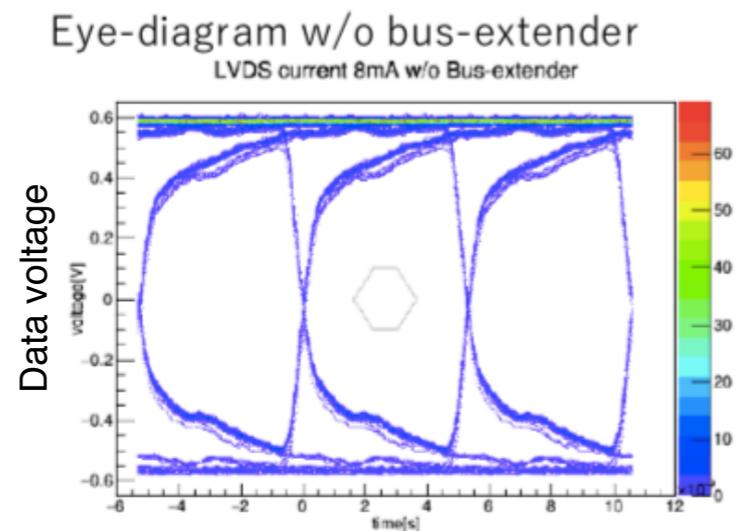Two glue lines under chip

Chip slot

INTT DAQ problem

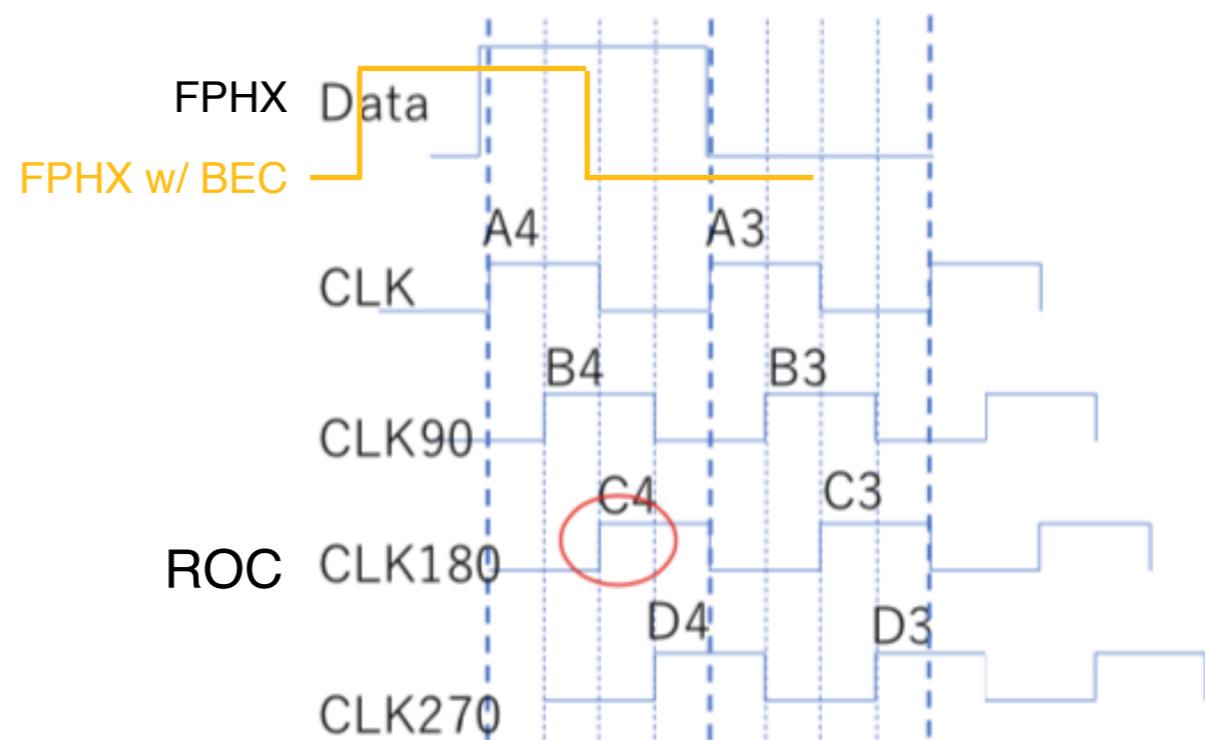- General chip : output signal & clock. Example : CMS Pixel
  - Clock : to synchronize with following electronics
- INTT FPHX : output signal only

Eye-diagram w/o bus-extender

Eye-diagram w/ bus-extender

slow voltage rising rate

FPHX - ROC synchronize method :
fix the phase at 180^0

FPHX

FPHX w/ BEC

ROC

works in FVTX (short transmission cable)

Goal : try to change the phase

Twist test status

- We first focused on barrel-1
- 23 barrel-1 staves in total (Batch-1 : 13, Batch-2 : 10)
    - 2 staves → failed in leakage test
    - 2 stave → ladder assembly.
    - 6 staves → twist test practice (all are bad in flatness)
- Remaining : 13 staves
    - 13 trials -> 13 failed
- We recorded the twist test for all staves and took photos after twist, photos and videos are in the link.

- Leakage & submersion test for 8 batch-2 barrel-1 staves were performed after twist test → 1 passed
    - link of submersion test