



Analysis Report



Y. Kato

The University of Tokyo



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katou@icepp.s.u-tokyo.ac.jp

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Trigger Adjustment (@ Kyushu)

- Threshold scan is performed for estimation of S/N_{Trig} and trigger adjustment. (previous TB: 11.6)
- Test pulse of {4.2, 8.4} fC is injected.
 - 4.2 fC: 1 MIP for 320 μm
- S-curve is fitted by Err-function.

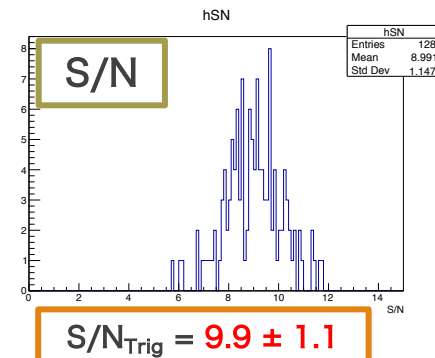
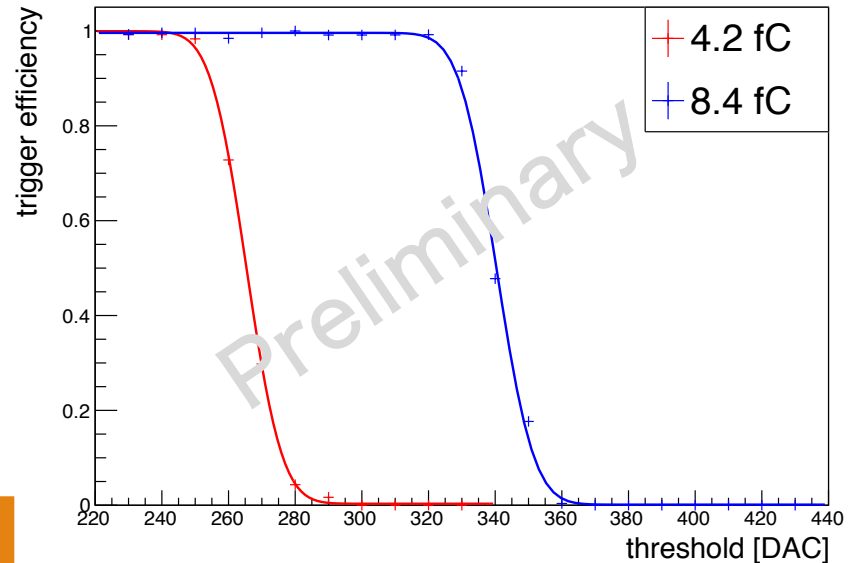
$$S/N_{Trig} \equiv \frac{\mu_{2MIP} - \mu_{1MIP}}{\sigma_{1MIP}}$$

$$f(x) = A \times \text{Erfc}\left(\frac{x - \mu}{\sqrt{2}\sigma}\right) + \text{const.}$$

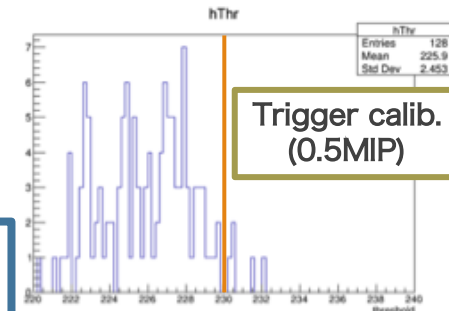
Injection [fC]	4.2	8.4
mean [DAC]	265.4	340.4
sigma [DAC]	12.0 \rightarrow 8.5	12.5 \rightarrow 8.8
	mistake!	
S/N_{Trig}	6.4 \pm 0.8 \rightarrow 9.9 \pm 1.1	

- Trigger is set as 0.5 MIP of 320 μm slab: \sim 230 DAC.

slabP1 chip12 ch58



P1, all chips, ch 58-63



S/N_{Trig} is worse because of noisy pedestals at Kyushu. But it should probably have stabilized in BT.

Retriggers

- What is retriggerers?
 - consecutive BCID
 - many dummy hits

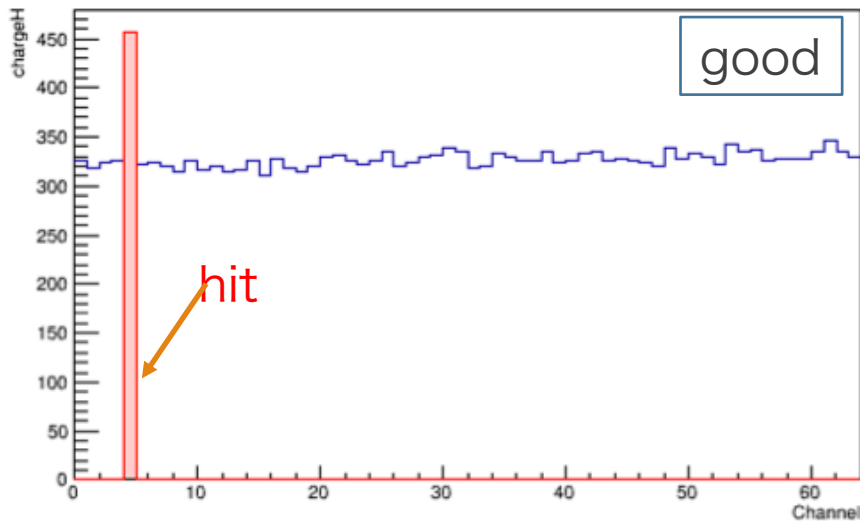
run32012 (beam off) FEV13-K2

```
~/SIW-ECAL/tmp -- bash ... -- katou@bepp02 -- ssh - ssh bepp -- yu@cw14:~/work/JER_v02-0
*****
==> 60 selected entries
(Long64_t) 60
root [27] fev10->Scan("event:acqNumber:chipid:nColumns:bcid:nhits","bcid!=-999&&chipid==8&&nColumns==15")
*****
* Row * Instance * event * acqNumber * chipid * nColumns * bcid * nhits *
*****
* 18 * 120 * 19 * 116368 * 8 * 15 * 3381 * 1 *
* 18 * 121 * 19 * 116368 * 8 * 15 * 3385 * 8 *
* 18 * 122 * 19 * 116368 * 8 * 15 * 3386 * 48 *
* 18 * 123 * 19 * 116368 * 8 * 15 * 3387 * 4 *
* 18 * 124 * 19 * 116368 * 8 * 15 * 3388 * 1 *
* 18 * 125 * 19 * 116368 * 8 * 15 * 3389 * 2 *
* 18 * 126 * 19 * 116368 * 8 * 15 * 3392 * 37 *
* 18 * 127 * 19 * 116368 * 8 * 15 * 3393 * 21 *
* 18 * 128 * 19 * 116368 * 8 * 15 * 3395 * 3 *
* 18 * 129 * 19 * 116368 * 8 * 15 * 3396 * 1 *
* 18 * 130 * 19 * 116368 * 8 * 15 * 3397 * 2 *
* 18 * 131 * 19 * 116368 * 8 * 15 * 3399 * 26 *
* 18 * 132 * 19 * 116368 * 8 * 15 * 3400 * 28 *
* 18 * 133 * 19 * 116368 * 8 * 15 * 3401 * 3 *
* 18 * 134 * 19 * 116368 * 8 * 15 * 3403 * 2 *
Type <CR> to continue or q to quit ==>
* 71 * 120 * 72 * 117199 * 8 * 15 * 2006 * 1 *
* 71 * 121 * 72 * 117199 * 8 * 15 * 2010 * 8 *
* 71 * 122 * 72 * 117199 * 8 * 15 * 2011 * 47 *
* 71 * 123 * 72 * 117199 * 8 * 15 * 2012 * 4 *
* 71 * 124 * 72 * 117199 * 8 * 15 * 2013 * 2 *
* 71 * 125 * 72 * 117199 * 8 * 15 * 2014 * 1 *
* 71 * 126 * 72 * 117199 * 8 * 15 * 2017 * 39 *
* 71 * 127 * 72 * 117199 * 8 * 15 * 2018 * 18 *
* 71 * 128 * 72 * 117199 * 8 * 15 * 2020 * 3 *
* 71 * 129 * 72 * 117199 * 8 * 15 * 2021 * 1 *
* 71 * 130 * 72 * 117199 * 8 * 15 * 2022 * 2 *
* 71 * 131 * 72 * 117199 * 8 * 15 * 2024 * 27 *
* 71 * 132 * 72 * 117199 * 8 * 15 * 2025 * 25 *
* 71 * 133 * 72 * 117199 * 8 * 15 * 2026 * 2 *
* 71 * 134 * 72 * 117199 * 8 * 15 * 2028 * 3 *
```

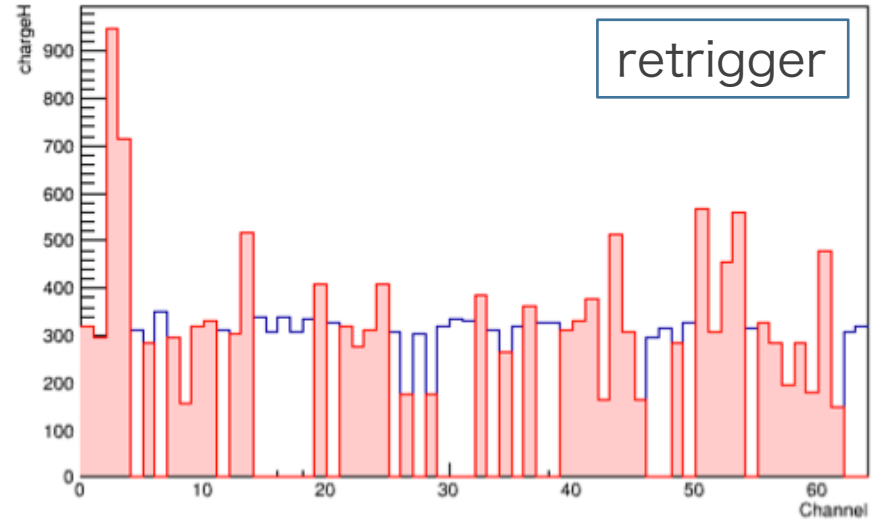
Retriggers

- trigger vs charge
 - Which shaper has problems that cause retriggers?
 - The charges and hits are compared between good/retrigger events.
 - Even the channel which charge is lower than pedestal is triggered.
- Fast shaper has some problems in retrigger?

run_32010_dif_1_1_1 event0 chip12 sca0 bcid224 nhits1



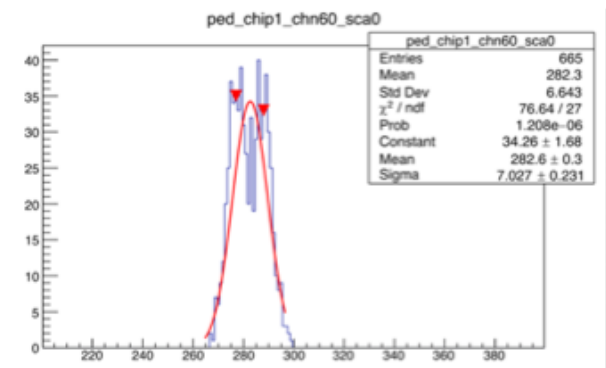
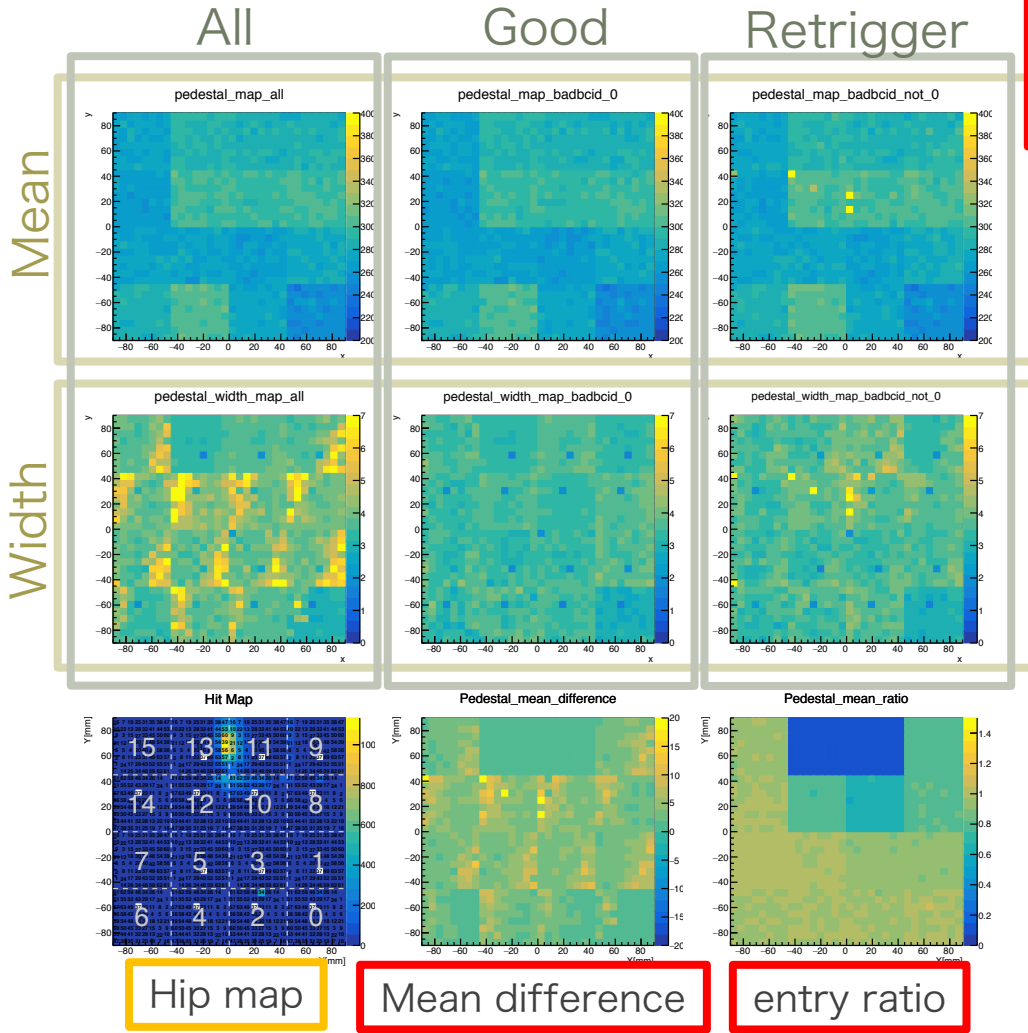
run_32010_dif_1_1_1 event0 chip12 sca2 bcid229 nhits40



Retriggers

- pedestal map (run 32015, FEV13-P1)

I showed this map in previous talk, but I have to comment that **this run is operated with TDC mode and its SCA is 0.**

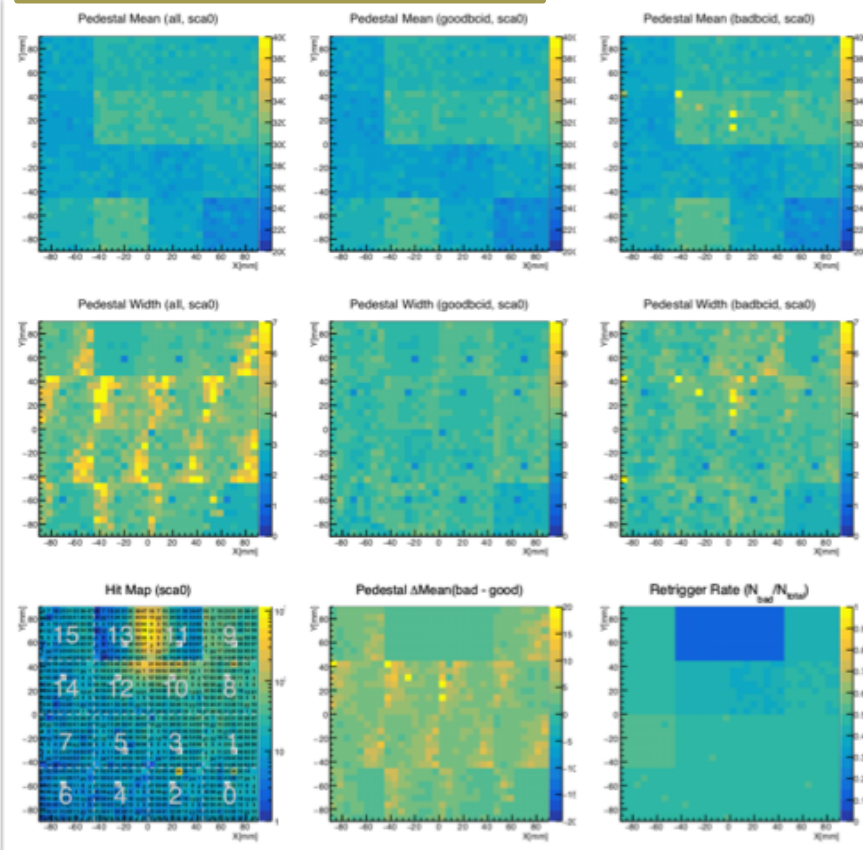


Double pedestal by retrigger

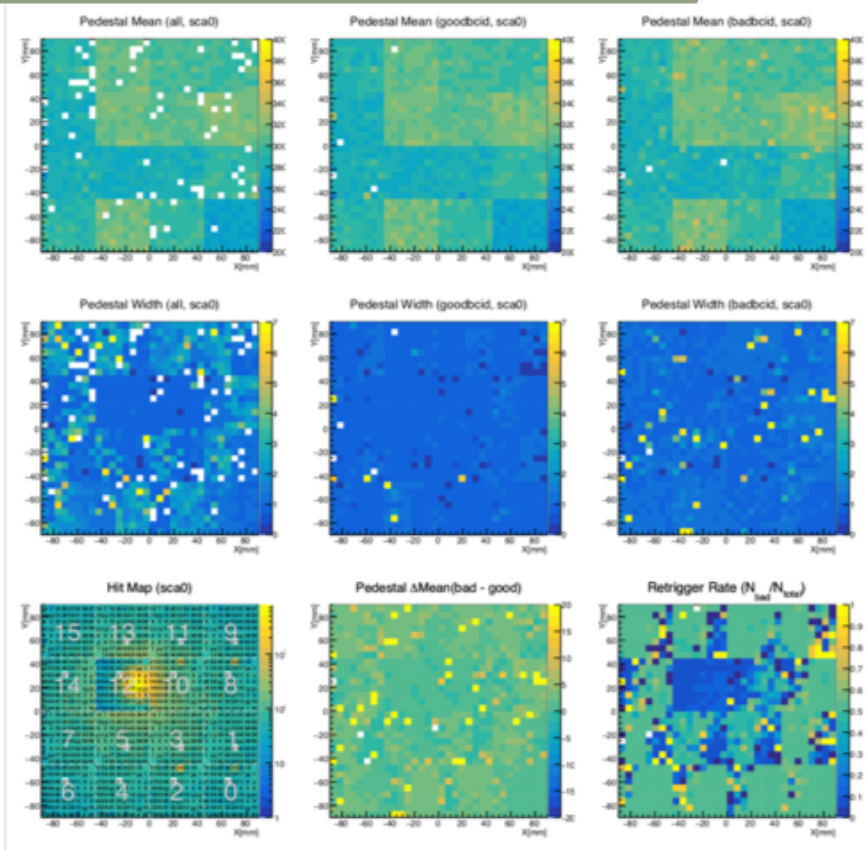
Retriggers

- In ADC mode, the strange structure of pedestal width disappeared.

TDC mode (run32015)



ADC mode (run32004-32010)



Retriggers

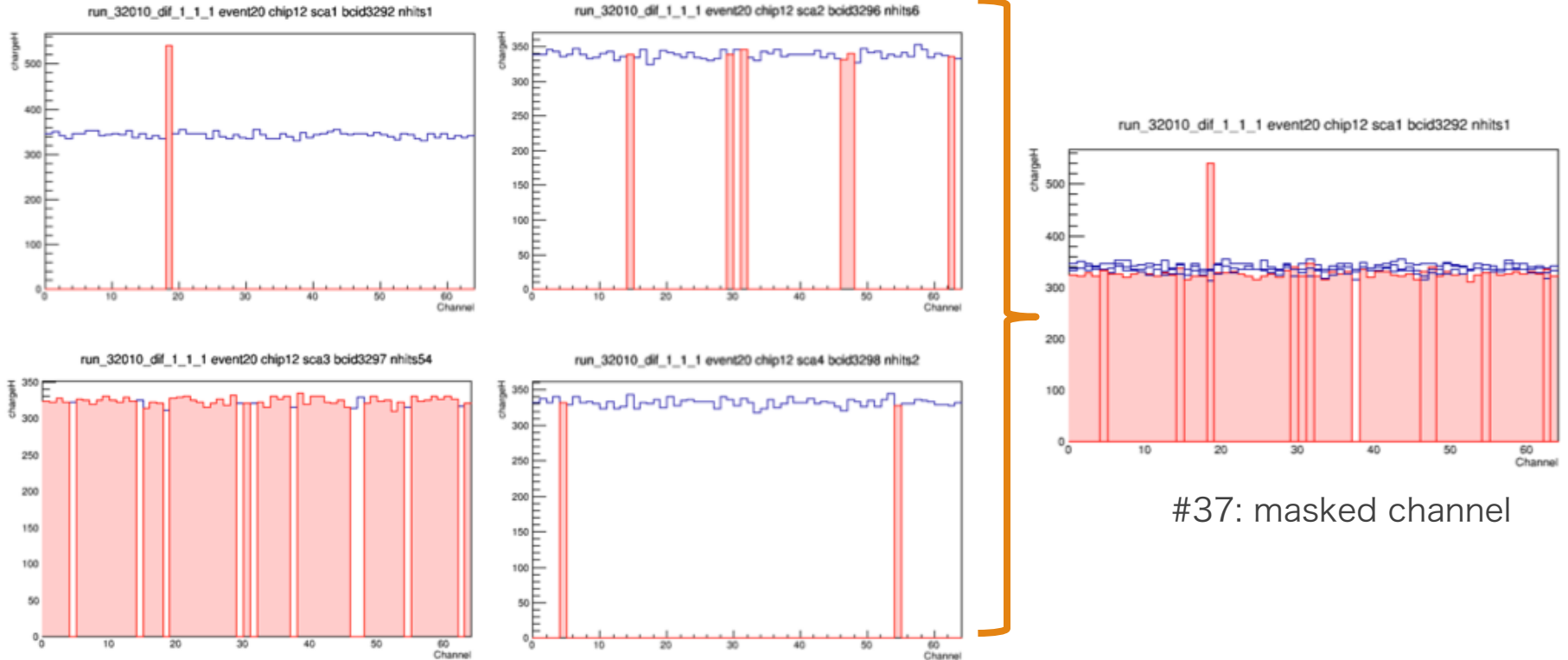
- channel combination
 - Almost all the channel is triggered in single retrigger unit.
 - It's difficult to distinguish some retriggers to divide into unit.

```
root [6] fev10->Scan("event:acqNumber:chipid:nColumns:bcid:badbcid:nhits","bcid!=-999&&chipid==12&&event==21")
*****
*      Row * Instance *      event * acqNumber *      chipid * nColumns *      bcid * badbcid *      nhits *
*****
*      20 *   180 *      21 *   86878 *      12 *   15 *   2955 *    0 *    1 *
*      20 *   181 *      21 *   86878 *      12 *   15 *   3292 *    3 *    1 *
*      20 *   182 *      21 *   86878 *      12 *   15 *   3296 *    3 *    6 *
*      20 *   183 *      21 *   86878 *      12 *   15 *   3297 *    3 *   54 *
*      20 *   184 *      21 *   86878 *      12 *   15 *   3298 *    3 *    2 *
*      20 *   185 *      21 *   86878 *      12 *   15 *   3380 *    0 *    1 *
*      20 *   186 *      21 *   86878 *      12 *   15 *   3463 *    0 *    1 *
*      20 *   187 *      21 *   86878 *      12 *   15 *   3859 *    3 *    2 *
*      20 *   188 *      21 *   86878 *      12 *   15 *   3863 *    3 *    4 *
*      20 *   189 *      21 *   86878 *      12 *   15 *   3864 *    3 *   38 *
*      20 *   190 *      21 *   86878 *      12 *   15 *   3865 *    3 *   18 *
*      20 *   191 *      21 *   86878 *      12 *   15 *   3866 *    3 *    2 *
*      20 *   192 *      21 *   86878 *      12 *   15 *   3868 *    3 *    1 *
*      20 *   193 *      21 *   86878 *      12 *   15 *   3869 *    3 *    5 *
*      20 *   194 *      21 *   86878 *      12 *   15 *   3870 *    3 *   24 *
*****
```

run32010(beam on) FEV13-P1

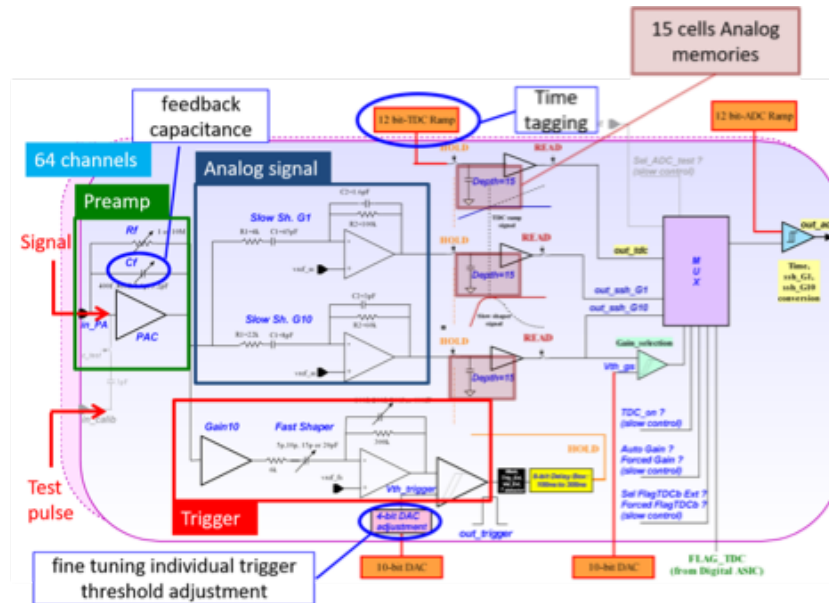
Retriggers

- channel combination
 - Almost all the channel is triggered in single retrigger unit.
 - It's difficult to distinguish some retriggers to divide into unit.
- In single retrigger unit, all the channel without masked is triggered.



Retriggers

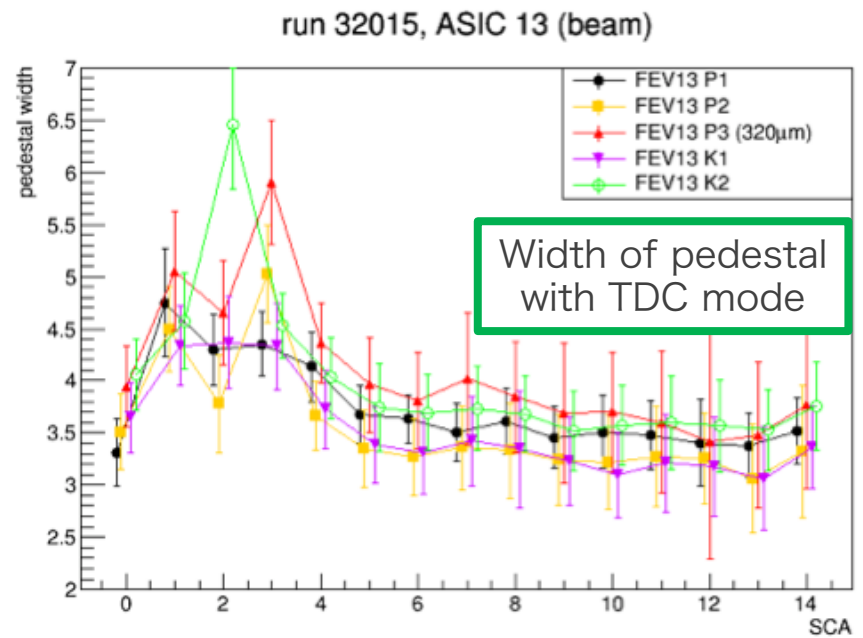
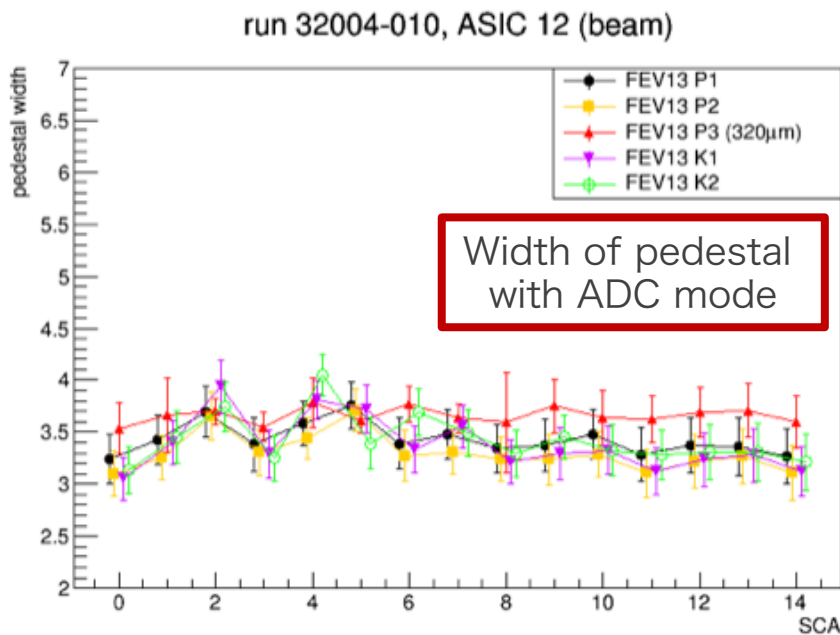
- Summary
 - Fast shaper has some problems in retrigger?
 - Structure of double pedestal appear only in TDC mode.
 - In single retrigger unit, all the channel without masked is triggered.
- Questions
 - I suspect the stability of the reference voltage especially on fast shaper.



backup

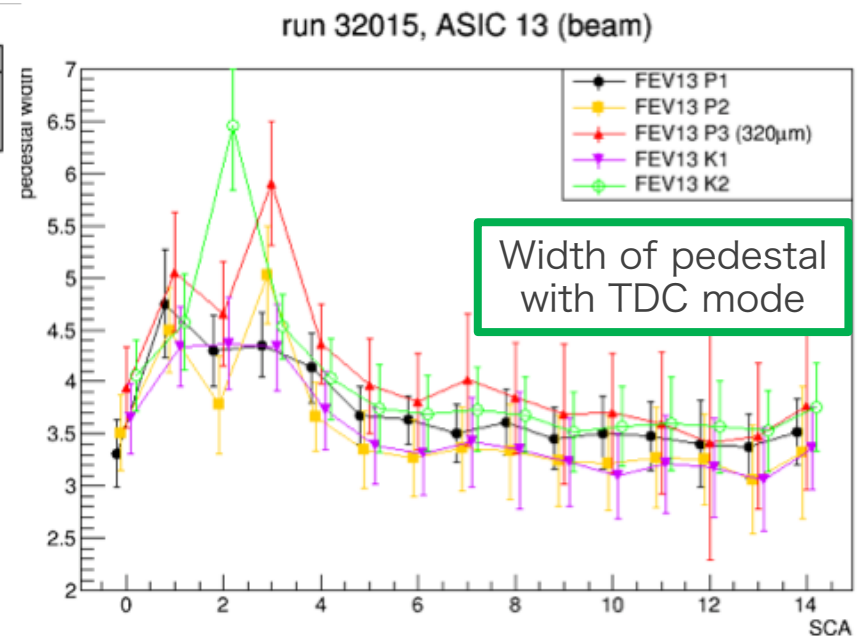
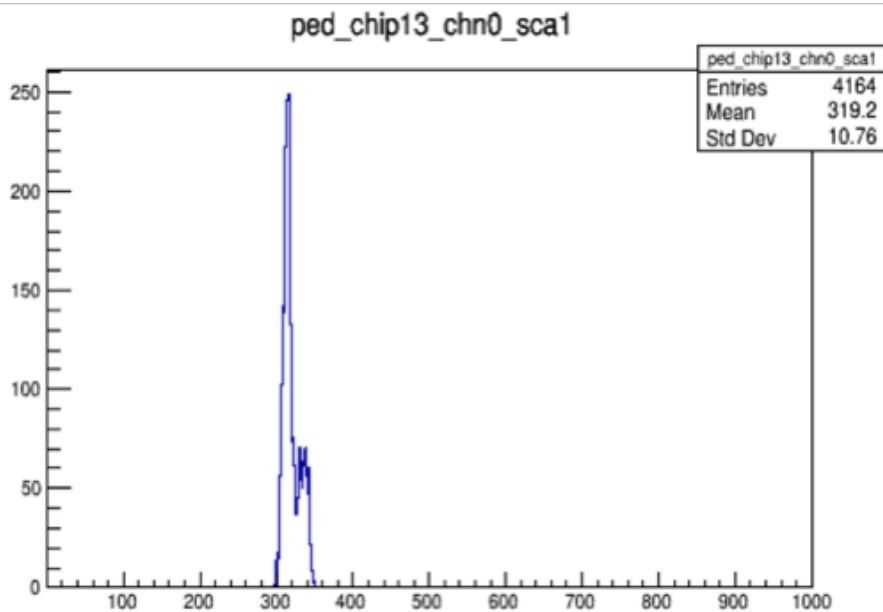
Pedestal difference between ADC/TDC mode

- We found the difference of pedestals between ADC/TDC mode.
- Memory-cell dependence is not same.
- In TDC mode, SCA~2 is worse.



Pedestal difference between ADC/TDC mode

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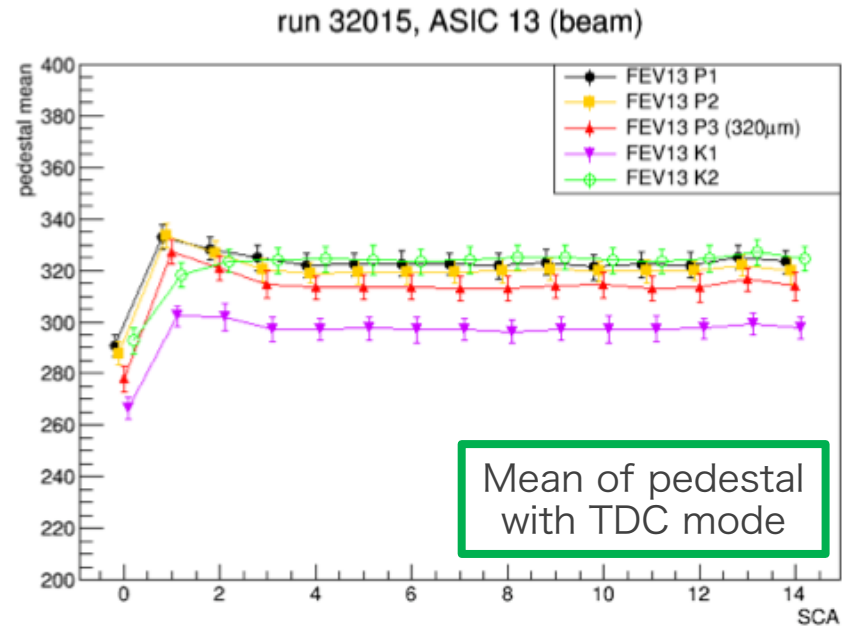
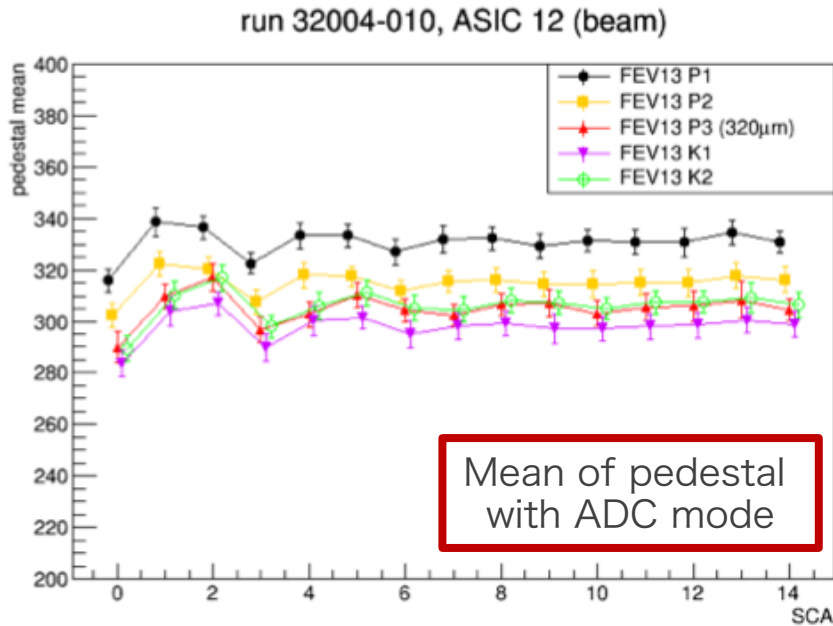


- There are double pedestal even after bcid selection in TDC mode.
- The criteria for identification of double pedestal is not optimized.

Work in progress.

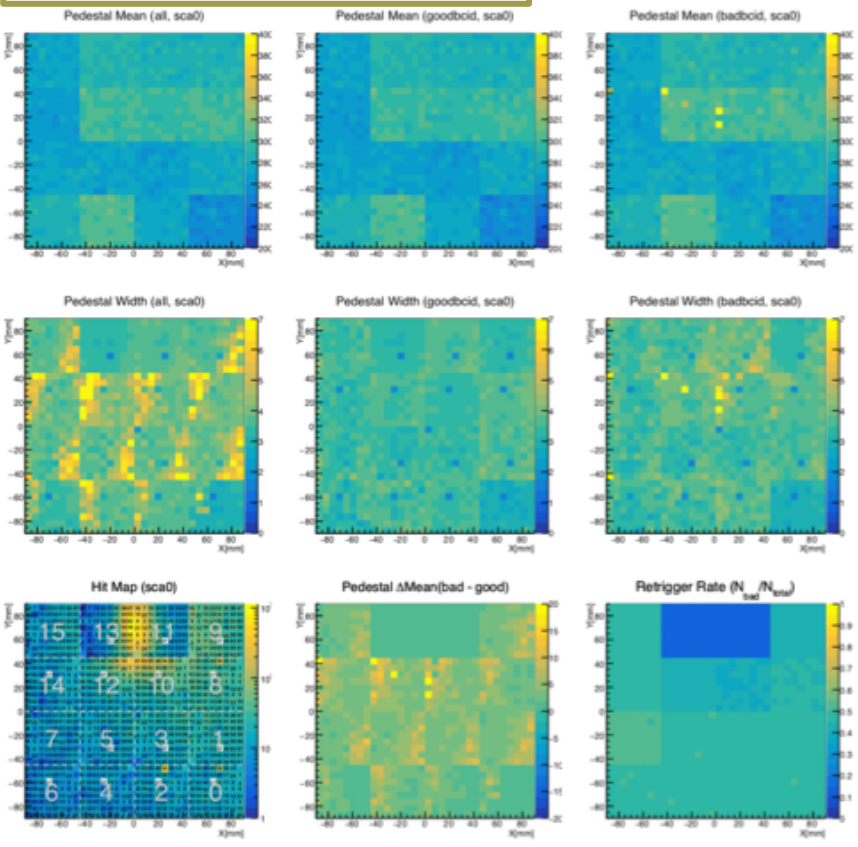
Pedestal difference between ADC/TDC mode

- We found the difference of pedestals between ADC/TDC mode.
- Memory-cell dependence is not same.
- In the first memory cell, the difference of typical Ped_mean is ~ 15 .

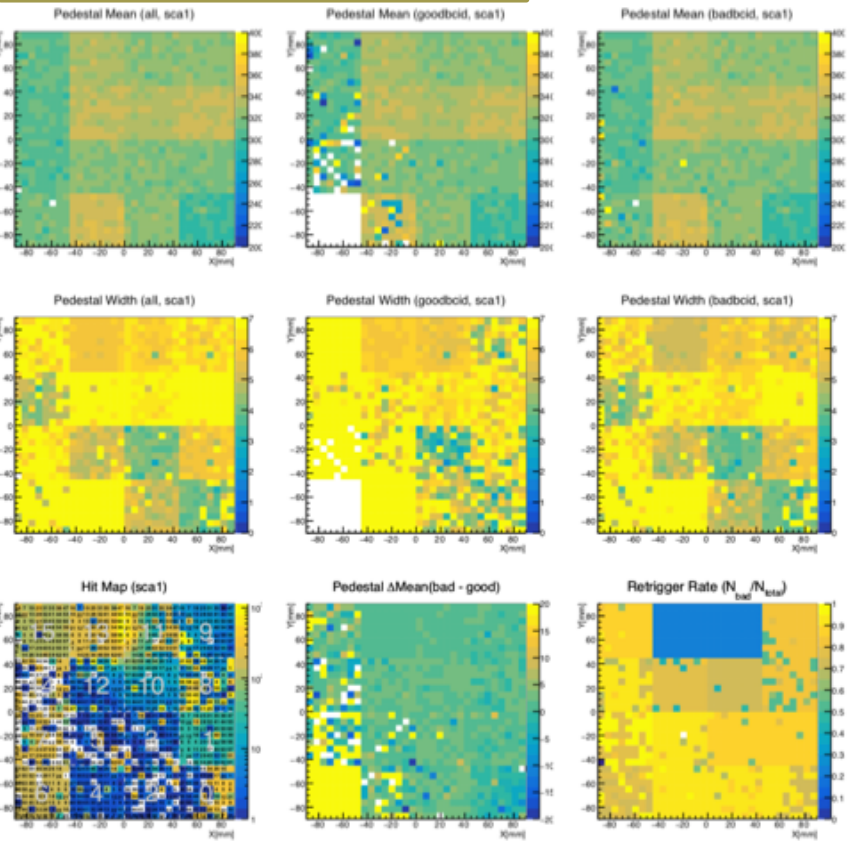


Retriggers

SCA 0
TDC mode (run32015)



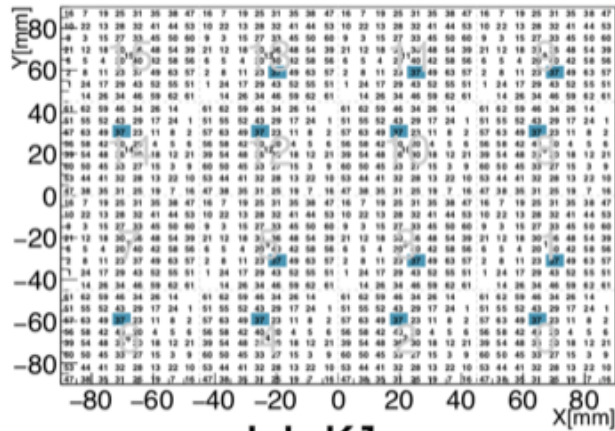
SCA 1
TDC mode (run32015)



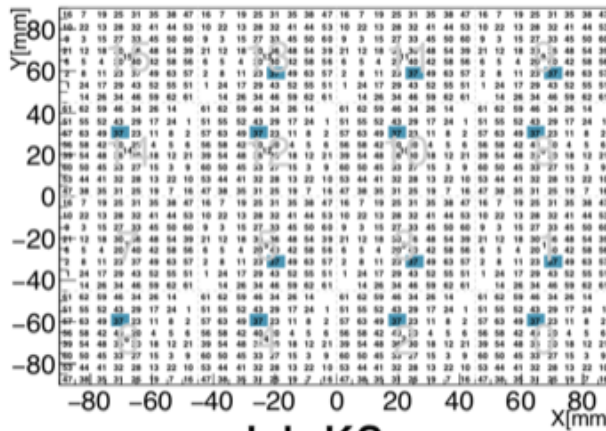
Masking of Noisy channels

- A few channels are noisy after trigger adjustment and masked: 1 - 2 %.
- Individual threshold control was not used because it wasn't ready. → Next TB

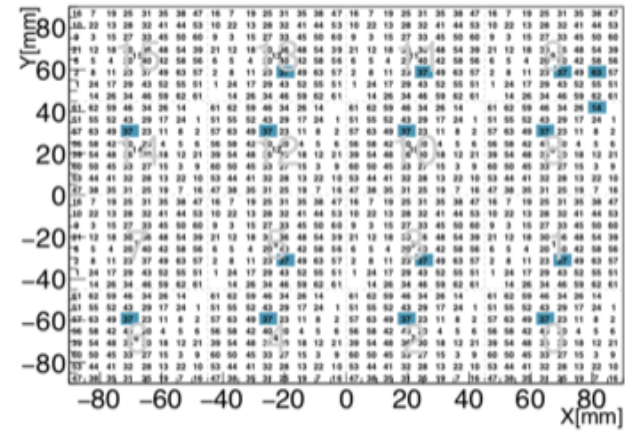
slab P1



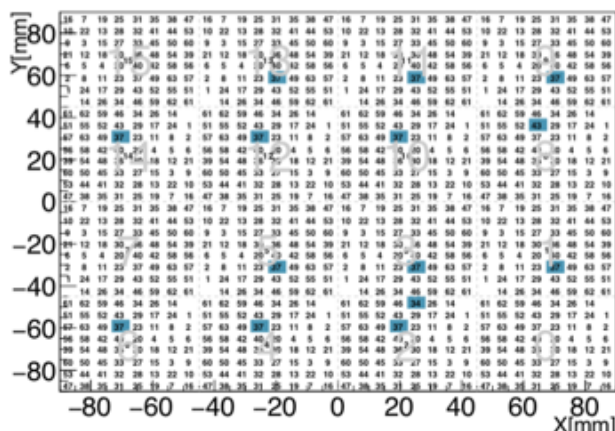
slab P2



slab P3



slab K1



slab K2

