

CALICE-ASIA 2020.1.22

- Topic

- Retriggers in SiW-ECAL
 - 判明していること
 - 要確認事項
 - Omega(Stephane)への質問事項(案)

Retriggers

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

run32012 (beam off) FEV13-K2

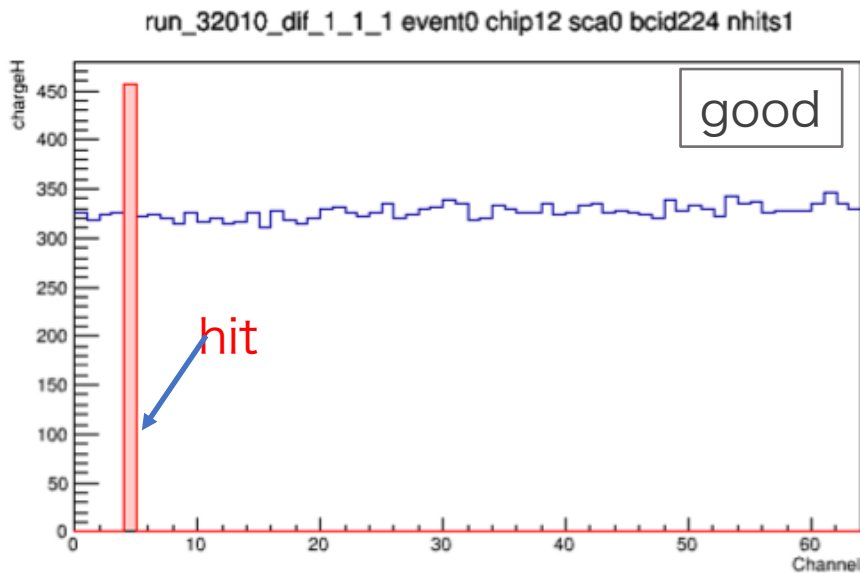
```
~/SIW-ECAL/tmp -- bash ... -- katou@bepp02 -- ssh - ssh bepp -- yu@cw14:~/work/JER_v02-0
*****
==> 60 selected entries
(Long64_t) 60
root [27] fev10->Scan("event:acqNumber:chipid:nColumns:bcid:nhits","bcid!=999&&chipid==8&&nColumns==15")
*****
* Row * Instance * event * acqNumber * chipid * nColumns * 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 *
```

判明していること

- retrigger時、chargeが明らかにthrより低いものもhit判定されている
- きっかけとなる正常(らしき)hitからbcidが3~5後に連続かつ多数hitが発生している
- ひとまとまりのretriggerで重複なくすべてのchannelが1回ずつhit判定されている
 - ただし、maskしたものを除く
 - まれに1つ2つ鳴らないchannelもある
- beam onのときのほうが明らかに発生頻度が高くなる
 - 特にbeamが当たっているchipでは顕著
 - beamが当たっているchipでのretrigger rateは~40%
- TDC modeではpedestalの広がり大きい

Retriggers: trigger vs charge

- 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?



Retriggers

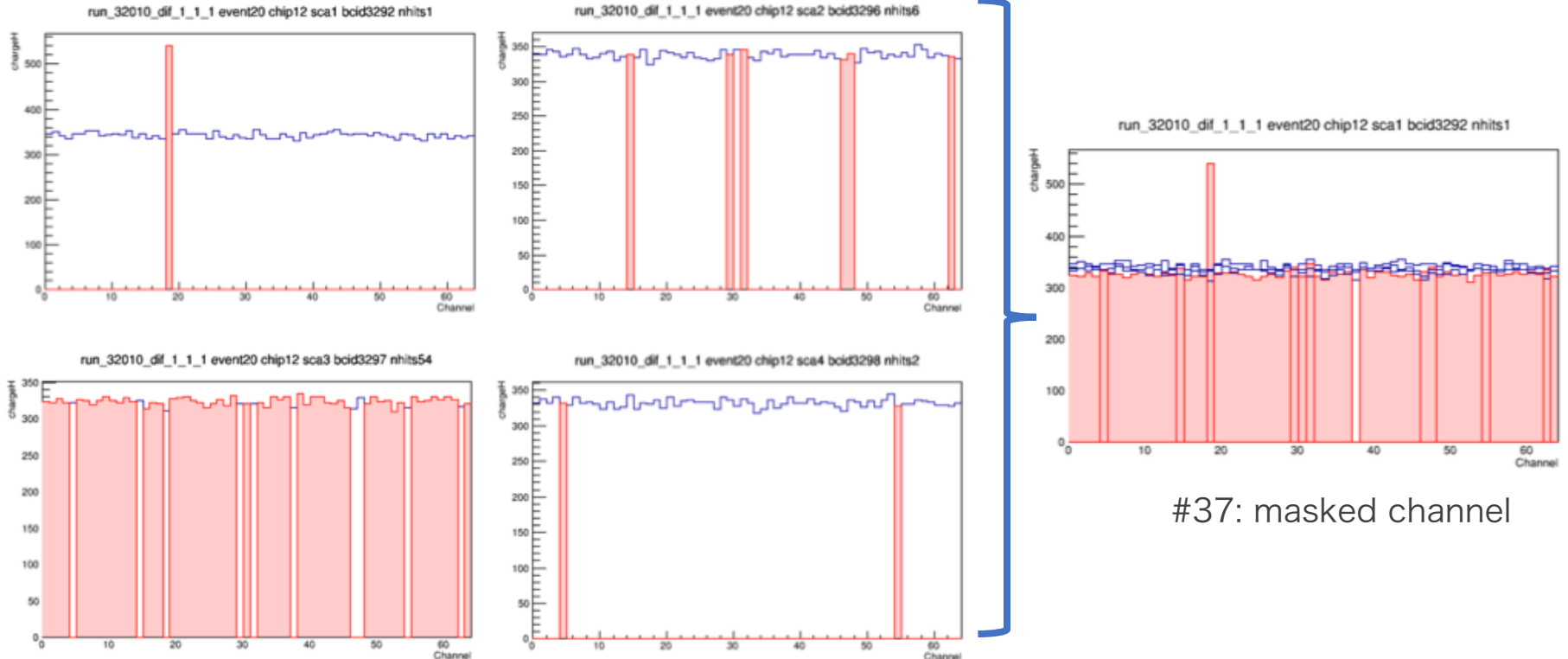
- channel combination
 - Almost all the channel is triggered in single retrigger unit.
 - It's difficult to distinguish some retriggers to divide into unit.

```
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

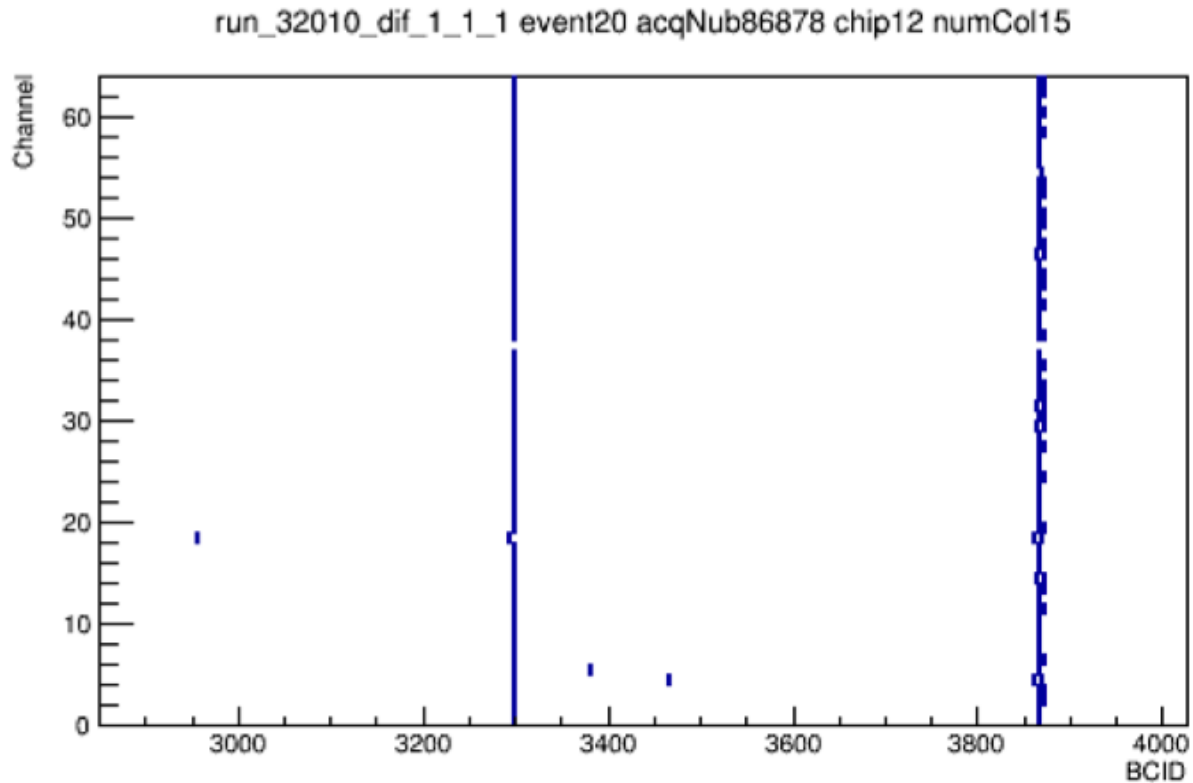
Retriggers

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



Retriggers

- channel combination



Retrigger rate

beam on

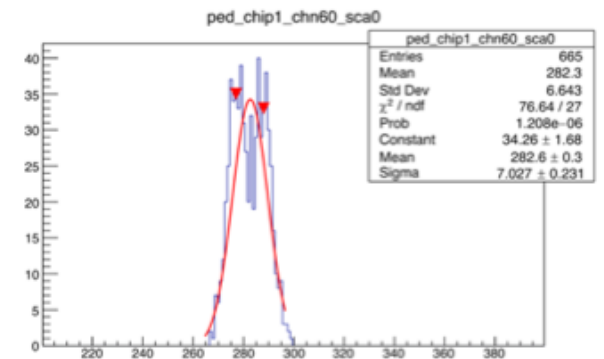
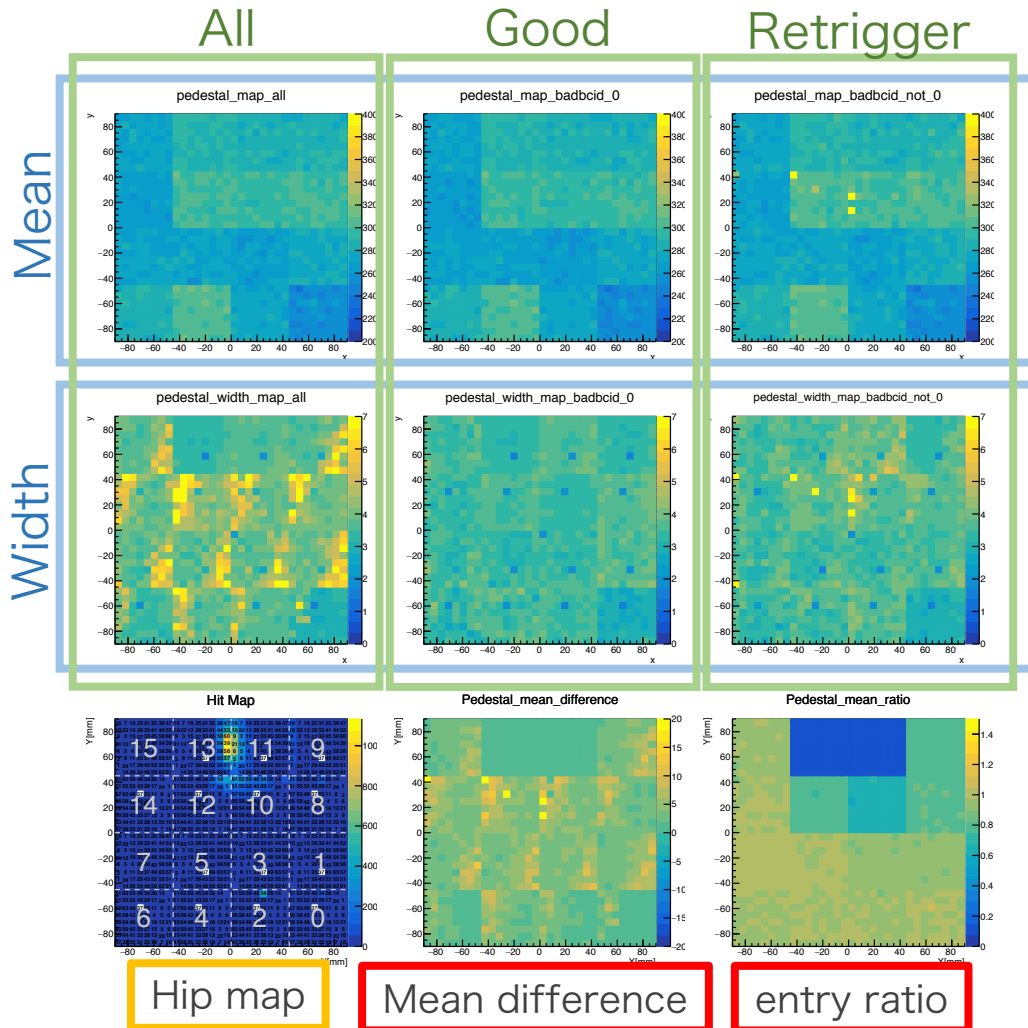
```
Processing test.C(32010,1)...  
  
RESULT  
Spills: 201, Entries: 100  
Chip, Triggered, Retriggers, Empty, Rate(retrg/trg)  
0 61 57 2 0.934  
1 47 40 2 0.851  
2 80 70 4 0.875  
3 63 54 2 0.857  
4 30 28 1 0.933  
5 58 47 0 0.810  
6 36 31 0 0.861  
7 19 18 0 0.947  
8 60 53 3 0.883  
9 33 30 0 0.909  
10 176 148 9 0.841  
11 43 36 1 0.837  
12 898 337 43 0.375  
13 60 49 2 0.817  
14 47 40 5 0.851  
15 47 41 1 0.872
```

beam off

```
Processing test.C(32012,1)...  
  
RESULT  
Spills: 7126, Entries: 100  
Chip, Triggered, Retriggers, Empty, Rate(retrg/trg)  
0 75 75 0 1.000  
1 76 75 1 0.987  
2 162 160 0 0.988  
3 141 141 3 1.000  
4 60 60 0 1.000  
5 120 120 1 1.000  
6 75 73 3 0.973  
7 72 71 0 0.986  
8 270 249 9 0.922  
9 75 75 2 1.000  
10 180 178 8 0.989  
11 45 45 0 1.000  
12 45 45 1 1.000  
13 90 88 3 0.978  
14 30 30 2 1.000  
15 76 73 2 0.961
```


Retriggers

- pedestal map (run 32015, FEV13-P1, TDC mode, SCA=0)

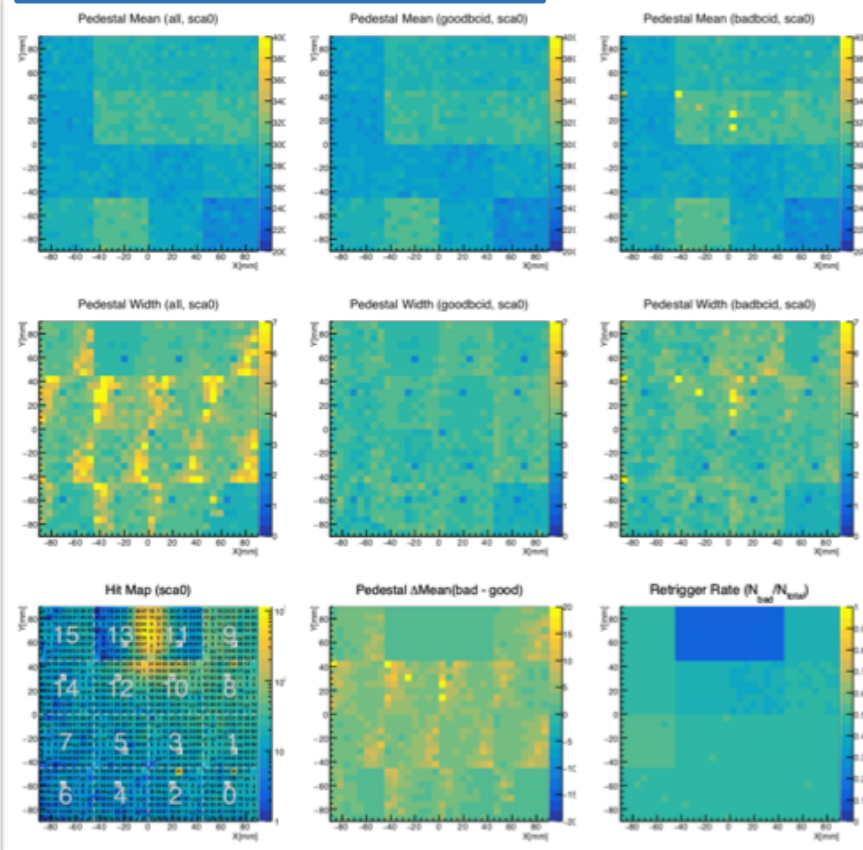


Double pedestal by retrigger

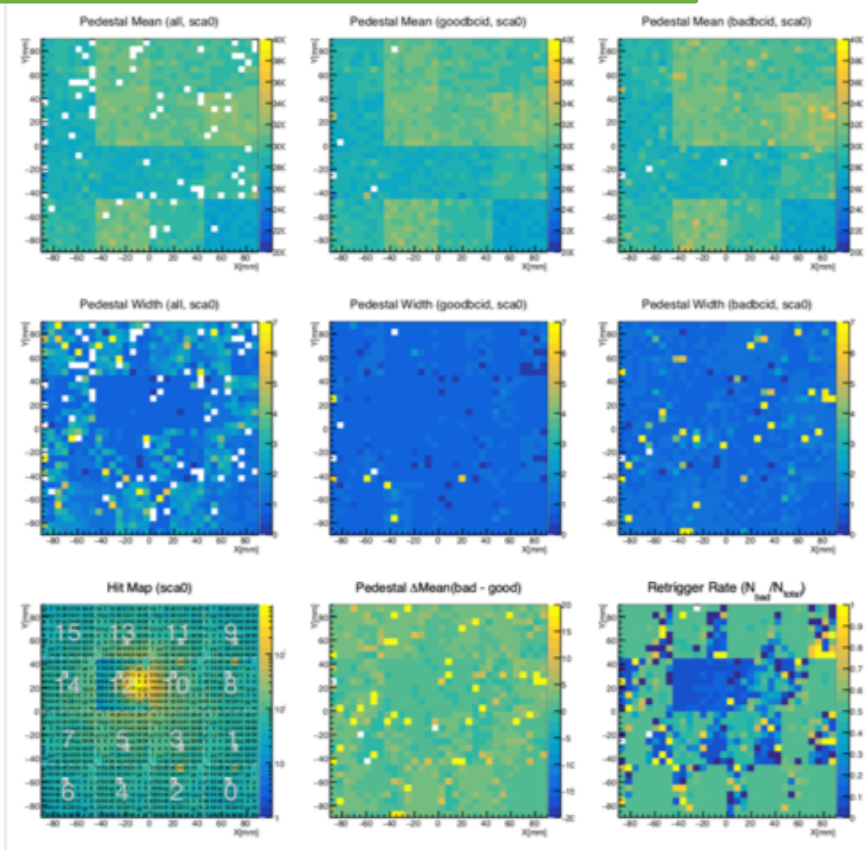
Retriggers

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

TDC mode (run32015)

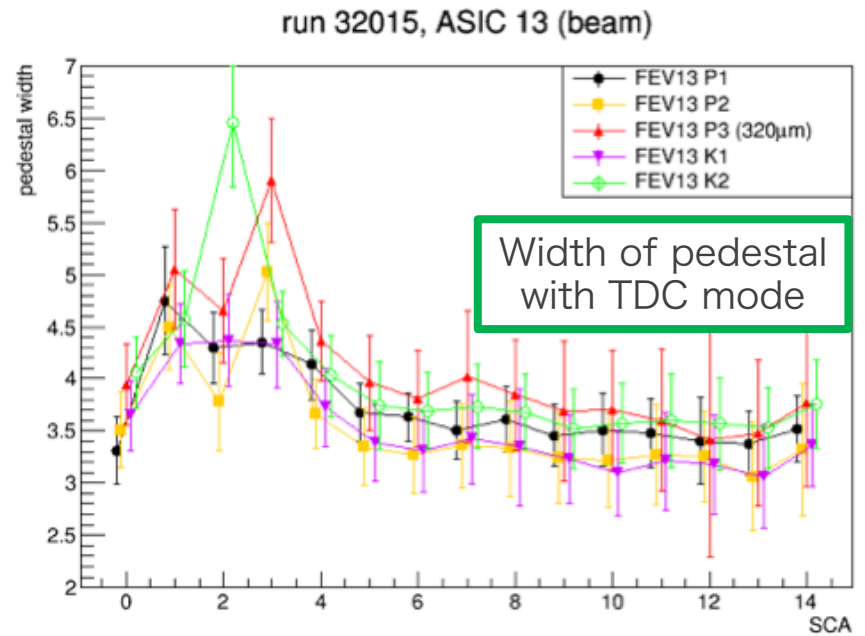
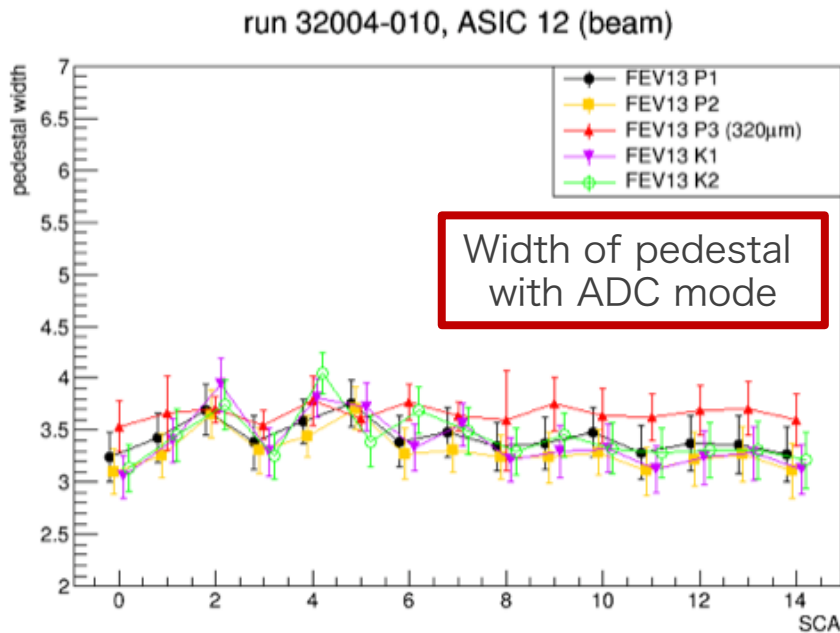


ADC mode (run32004-32010)



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.



要確認事項

- retrigger時にchargeがばらつくときとばらつかないときの差
- retrigger時のpedestalの上昇具合
- TDC modeにおける状況
 - pedestalの広がりか double pedestal によるものなのか
- ChipSat信号の影響
 - メモリセルが満たされたときに発生する信号
 - LALからの報告あり

Omega(Stephane)への質問事項(案)

- bclidをどのように保存しているのか
- 連続した信号とメモリセルの切り替え時間との関係
- メモリセル毎のpedestal差はあえてやっているのか
- channel間のhit判定の共有の詳細(digital part)

今後の予定

- CHEF proceedings執筆
- CALICE Colab. meeting 3/4 - 6
- JPS @ 名古屋大
- TB @ DESY 3/23 - 27

backup

2020/1/22

Yu Kato

SKIROC-2A Analogue part

