Hot/Cold/Dead Channel Classifier

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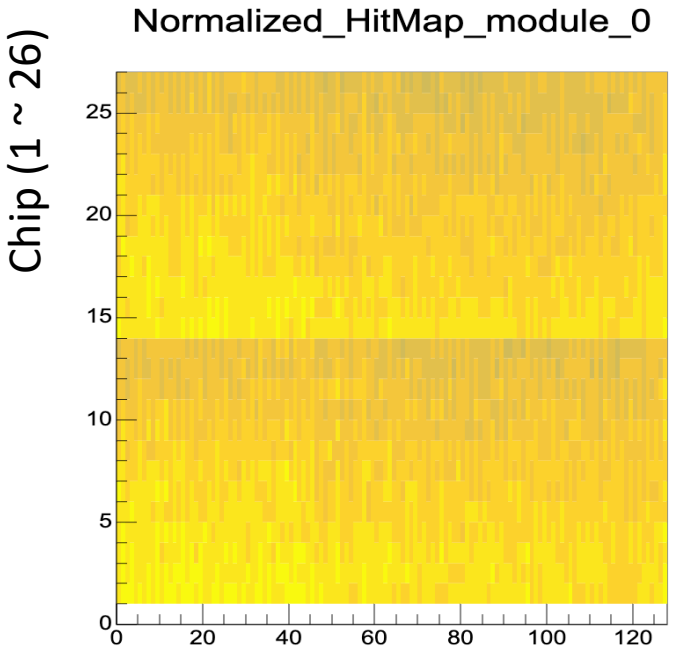
Hot Channel algorithm

Reminder : Procedure of hot channel classifier

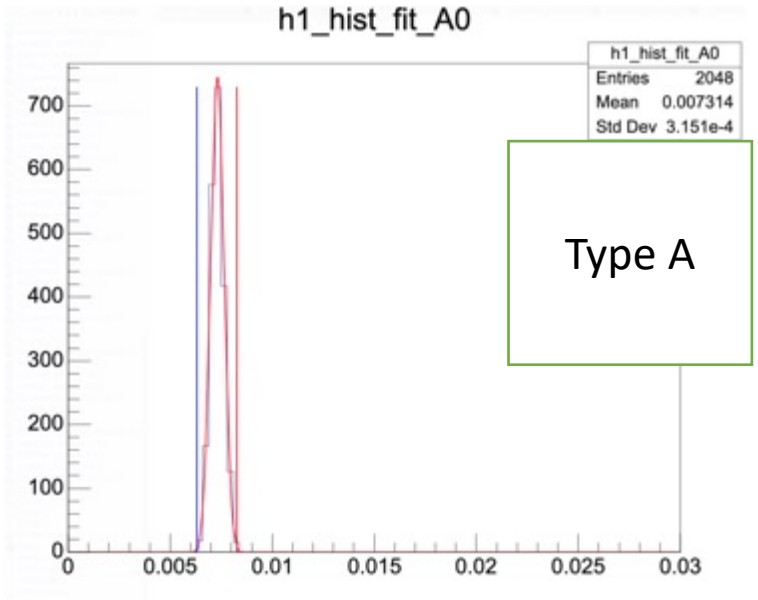
1. Make a normalized hit map distribution
normalized by :
- number of event
- Acceptance difference depending on the chip type
(Type A and Type B) and layer (inner and outer)

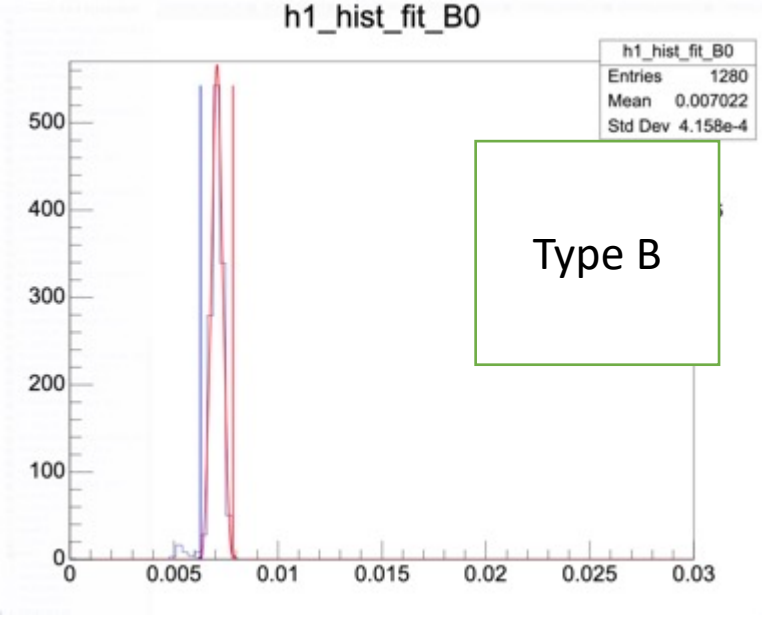


2. Draw Hit rate distribution for every half ladders.
Each half ladder have two hit rate distributions, one is distribution of Type A, the other is for Type B.

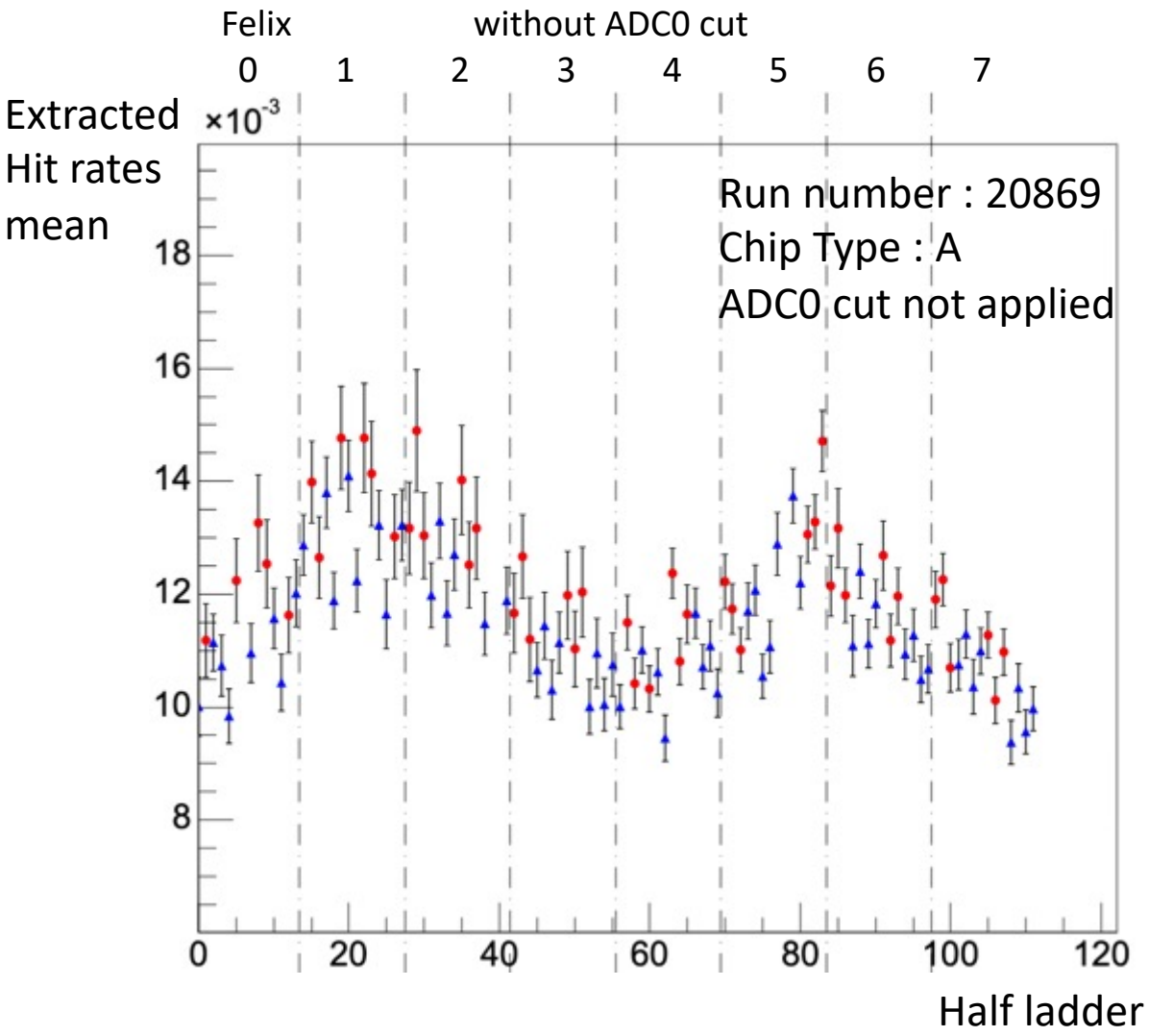
3. Definition of channel

Hot Channel : mean + 3sigma
Cold Channel : mean – 3sigma
Dead Channel : 0 hit





Extracted Mean & Sigma from Gaussian



Extracted Mean & Sigma from Gaussian

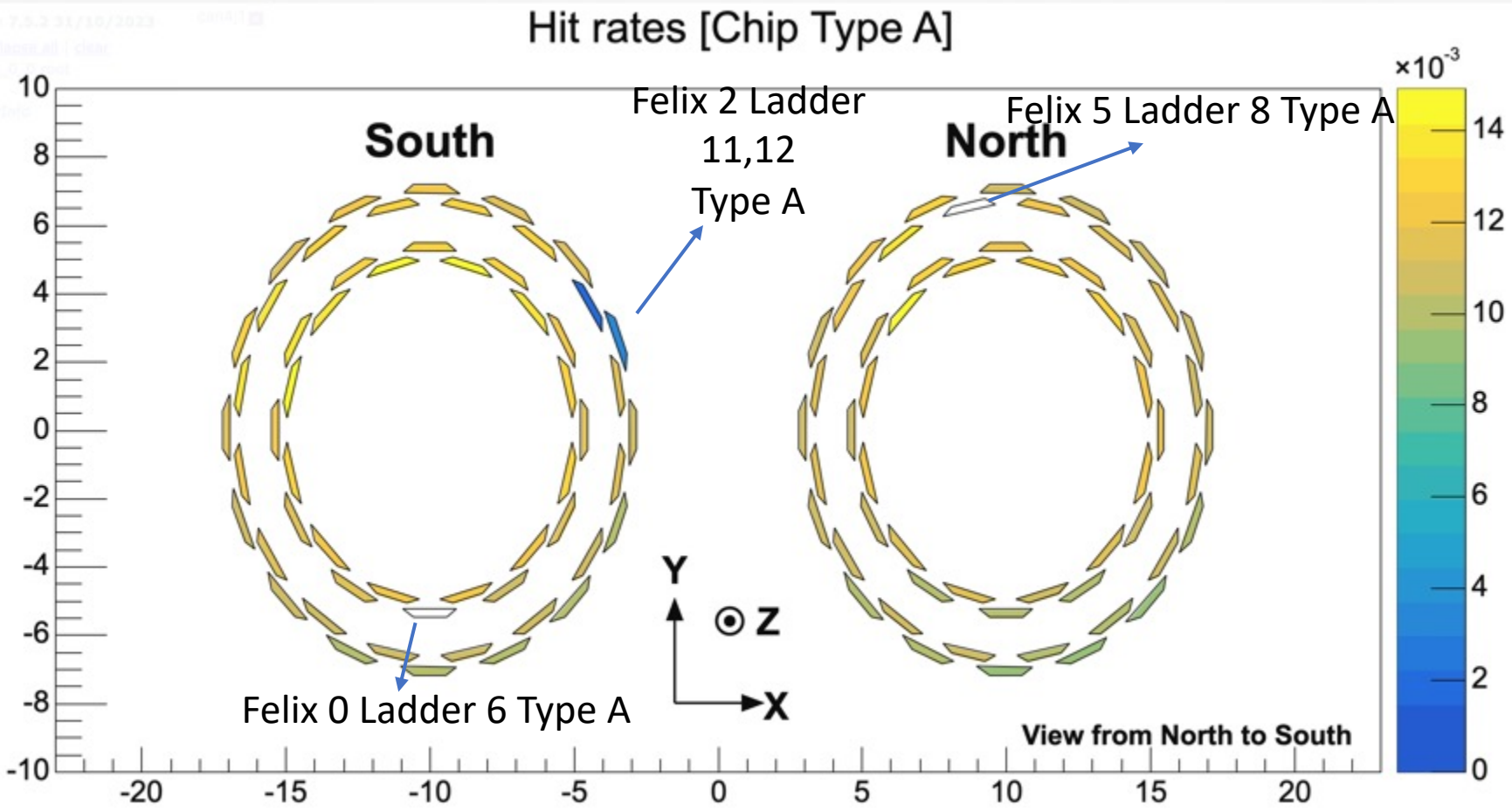
X axis : Half ladder (0~127)
Y axis : mean of Gaus
Error bar : sigma of Gaus

Red dot : Inner barrel
Bule dot : Outer barrel

After consideration of normalization for barrels(inner and outer),
we can have similar trend & hit rates.

Extracted Mean & Sigma from Gaussian

Geometry dependence of hit rates (Type A)



The ladders near bottom show relatively low rate.

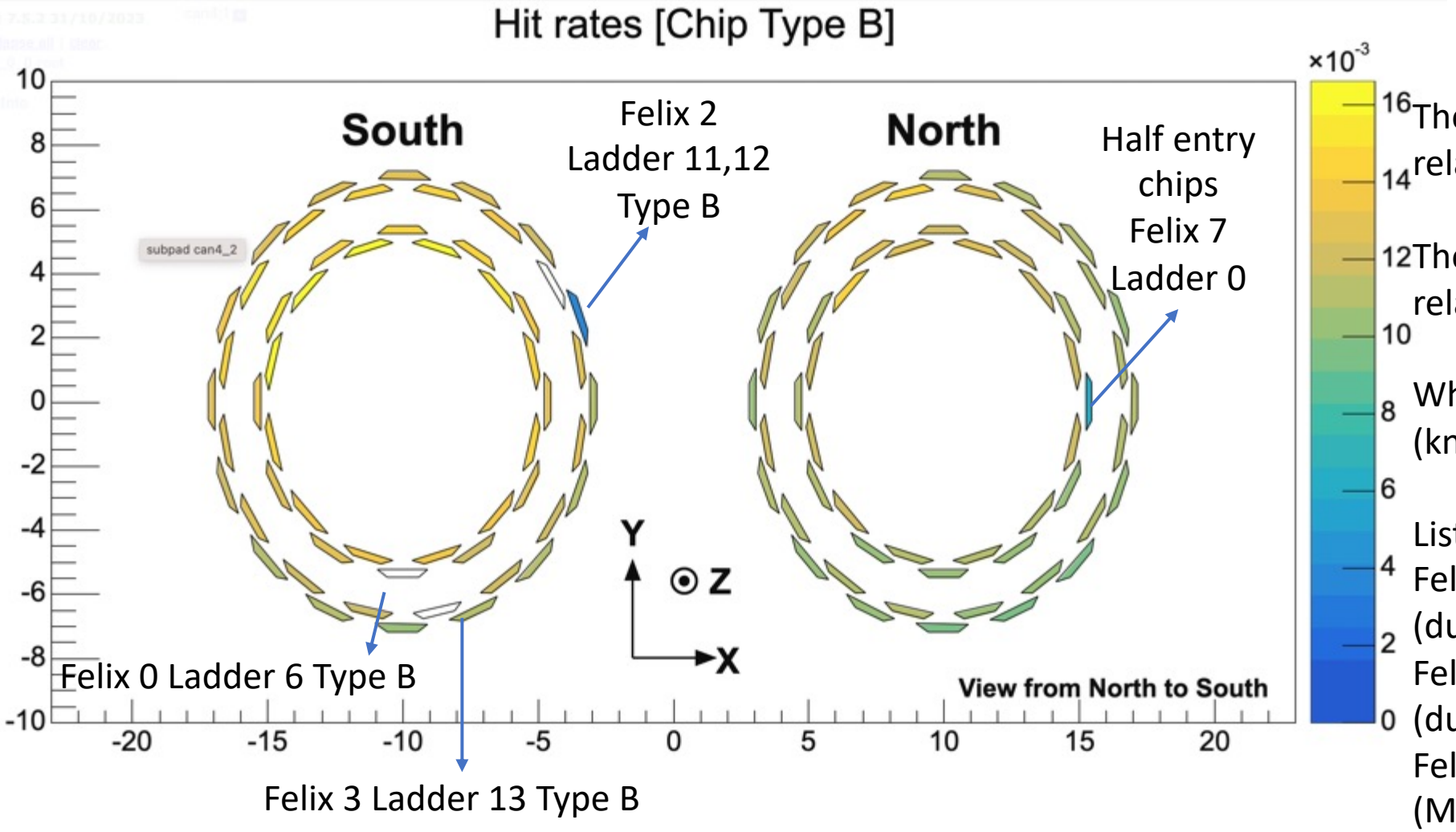
The hit rates on South ladders are relatively higher than that on North.

White Ladders Problematic ladders (known issue)

List of problematic ladders
Felix 0 Ladder 6 Type A
(due to the no-timed in)
Felix 2 Ladder 11,12 Type A
(due to the weird BCO distribution)
Felix 5 Ladder 8 Type A
(Masked due to no bias)

Extracted Mean & Sigma from Gaussian

Geometry dependence of hit rates (Type B)



The ladders near bottom show relatively low rate.

The hit rates on South ladders are relatively higher than that on North.

White Ladders Problematic ladders (known issue)

List of problematic ladders
Felix 0 Ladder 6 Type B
(due to the no-timed in)
Felix 2 Ladder 11,12 Type B
(due to the weird BCO distribution)
Felix 3 Ladder 13 Type B
(Masked due to no bias)

Number of hot/Dead/Cold channels (Run 20869)

Mismatched ratio

$$\frac{(Yuka \cup Jaein) - (Yuka \cap Jaein)}{(Yuka \cup Jaein)}$$

Cross check study between Jaein & Yuka
12/7 last Thursday

```
all Felix
 hot channel by Yuka: 21
 hot channel by Jaein: 122
 hot channel by both: 933
 mismatched ratio: 0.1329
```

Cross check study between Jaein & Yuka
12/13 just today

```
all Felix
 hot channel by Yuka: 1
 hot channel by Jaein: 0
 hot channel by both: 1028
 mismatched ratio: 0.000971817
```

```
Total # of channels ( 56 ladders : 56 x 2 x 26 x 128 ) : 372736
# of hot channels : 1028
# of cold channels : 19698
# of dead channels : 5073
 % of hot/cold/dead channels : 6.92152%
```

Status of the Hot channel analysis

Yuka's and Jaein's codes are consistent with each other!

Location of the hot channels for run 20869 (temporary)

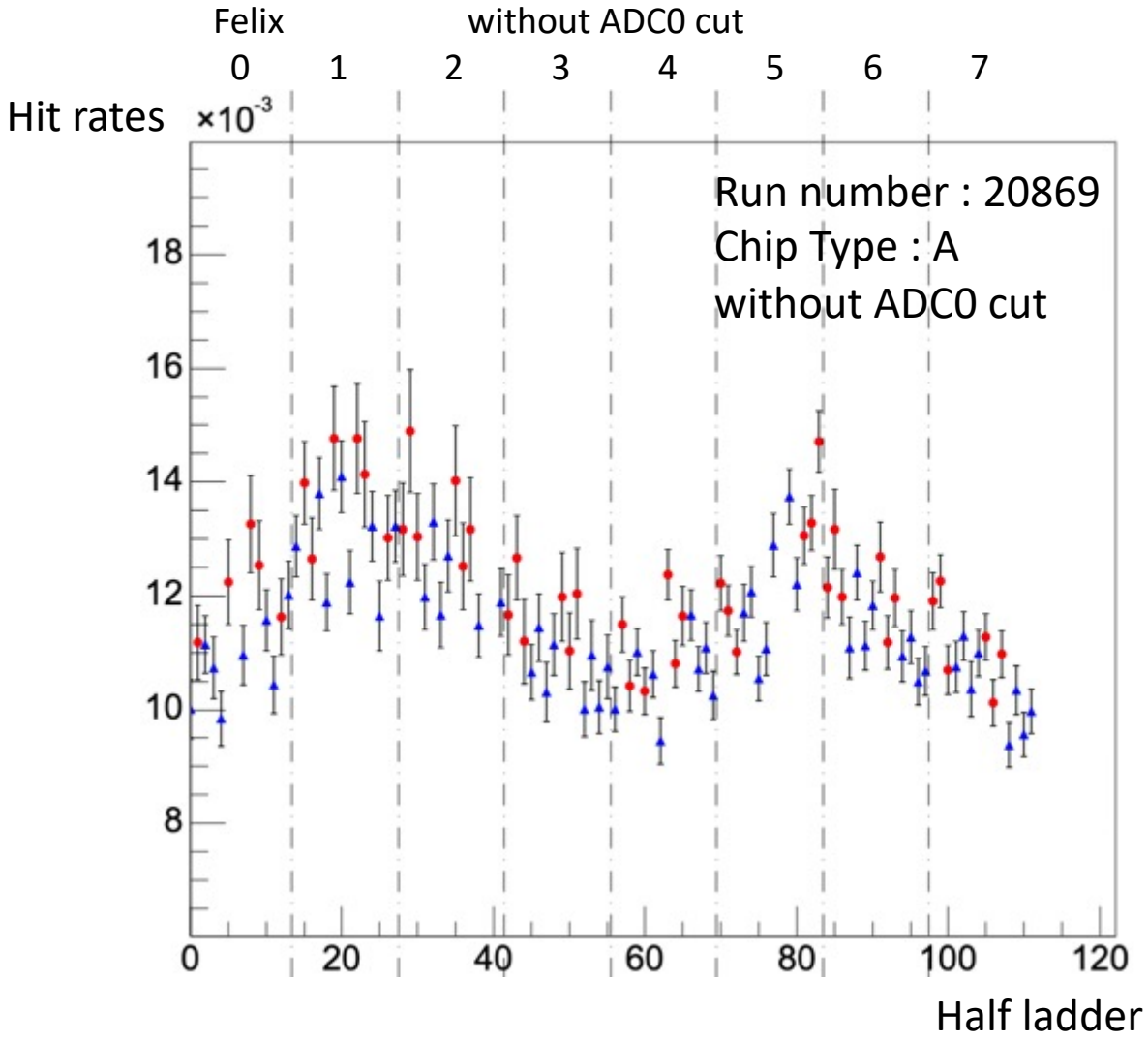
/sphenix/tg/tg01/commissioning/INTT/QA/hotdeadchannel/temp/20869/
20869_{felixnumber}_hotlist_clone_0_itr_0.root

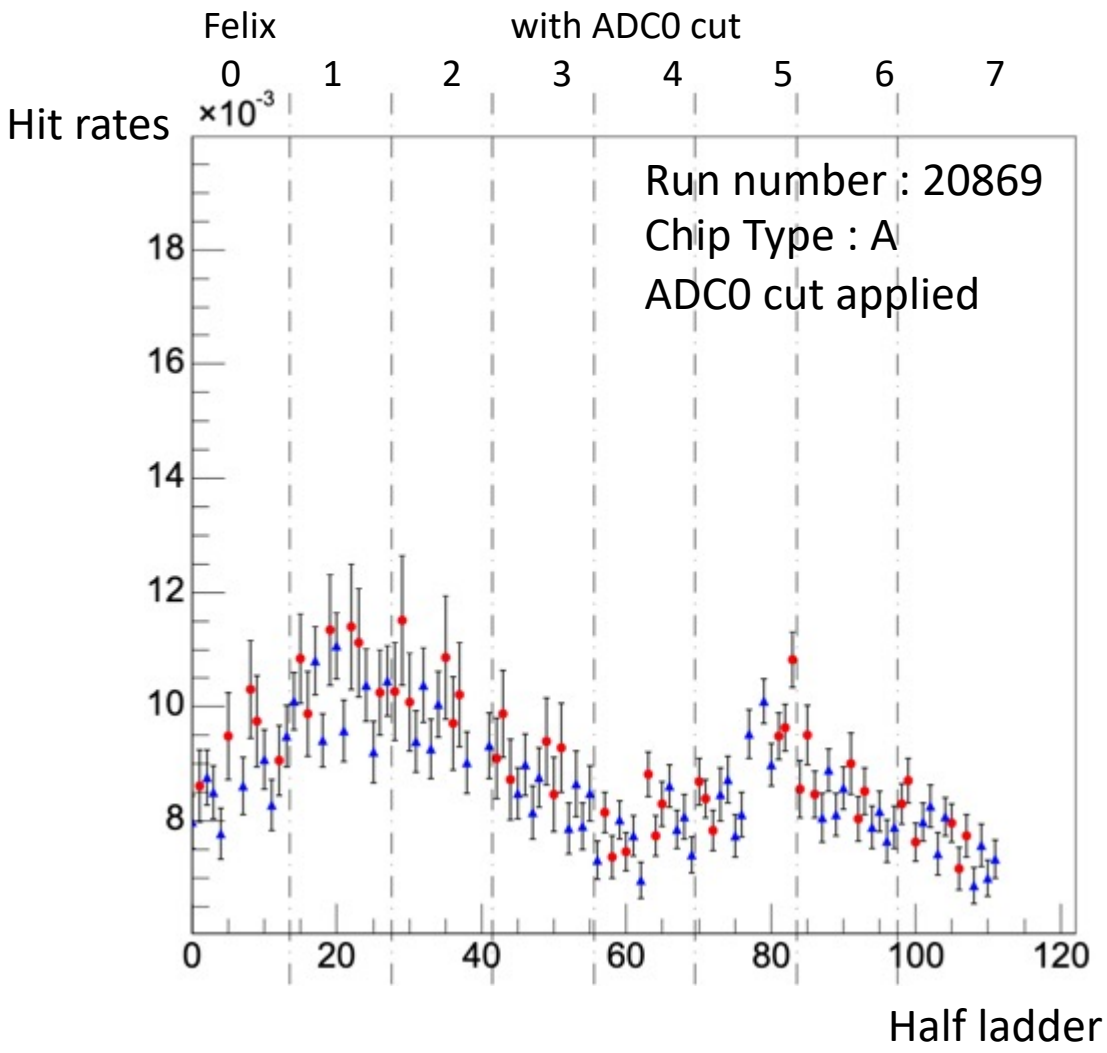
```
Attaching file 20869_0_hotlist_clone_0_itr_0.root as _file0...
.(TFile *) 0x2f6c440
root [1] .ls
TFile**         20869_0_hotlist_clone_0_itr_0.root
 TFile*         20869_0_hotlist_clone_0_itr_0.root
  KEY: TH2D     Normalized_HitMap_module_0;1    Normalized_HitMap_module_0
  KEY: TH2D     DeadMap_module_0;1      DeadMap_module_0
  KEY: TH2D     ColdMap_module_0;1      ColdMap_module_0
  KEY: TH2D     HotMap_module_0;1       HotMap_module_0
  KEY: TH2D     CloneHitMap_module_0;1  CloneHitMap_module_0
  KEY: TH1D     h1_hist_fit_A0;1        h1_hist_fit_A0
  KEY: TH1D     h1_hist_fit_B0;1        h1_hist_fit_B0
  KEY: TH2D     Normalized_HitMap_module_1;1    Normalized_HitMap_module_1
  KEY: TH2D     DeadMap_module_1;1      DeadMap_module_1
  KEY: TH2D     ColdMap_module_1;1      ColdMap_module_1
  KEY: TH2D     HotMap_module_1;1       HotMap_module_1
```

To do
- Comparison with Joseph's hot/cold/dead channel list
- Change code to fit Fun4All framework
- Minimum # of events to apply the algorithm (probably ~ 10k)
- Stability of hot channel lists
- Effect of ADC0/multiplicity etc..

backup

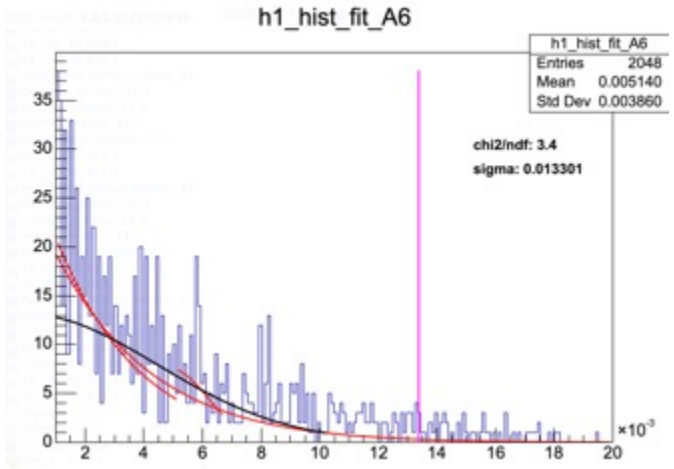
Effect of ADC0 cut

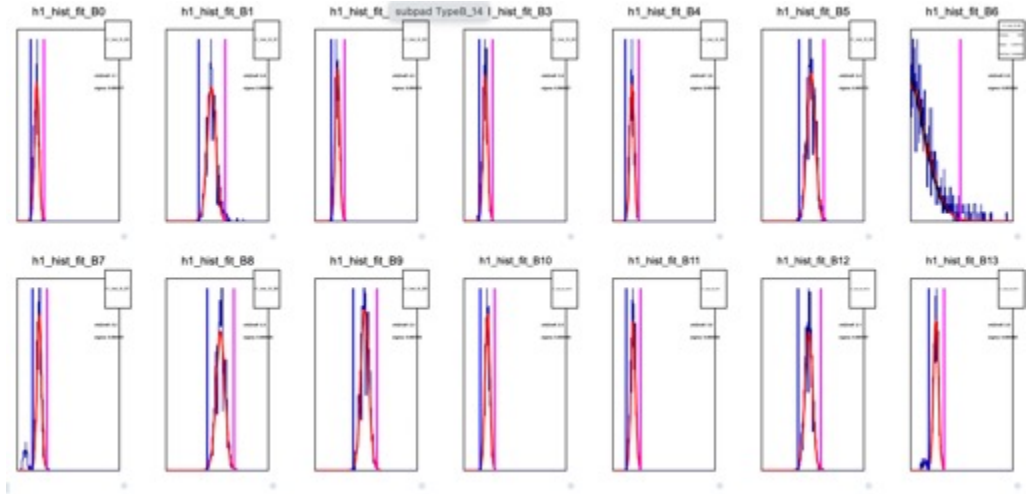


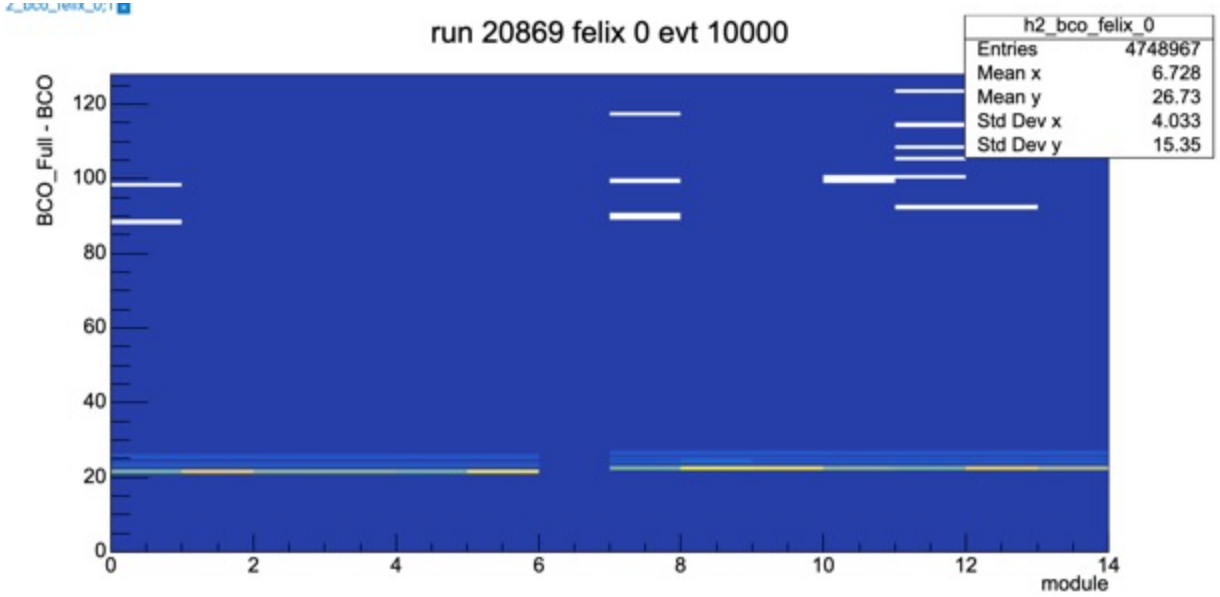


Problematic ladders(Felix 0 module 6)

Hit rate distribution before BCO cut – No clear time peak in BCO distribution







Problematic ladders(Felix 2 module 11,12)

Hit rate distribution before BCO cut – Weird shape of BCO distribution