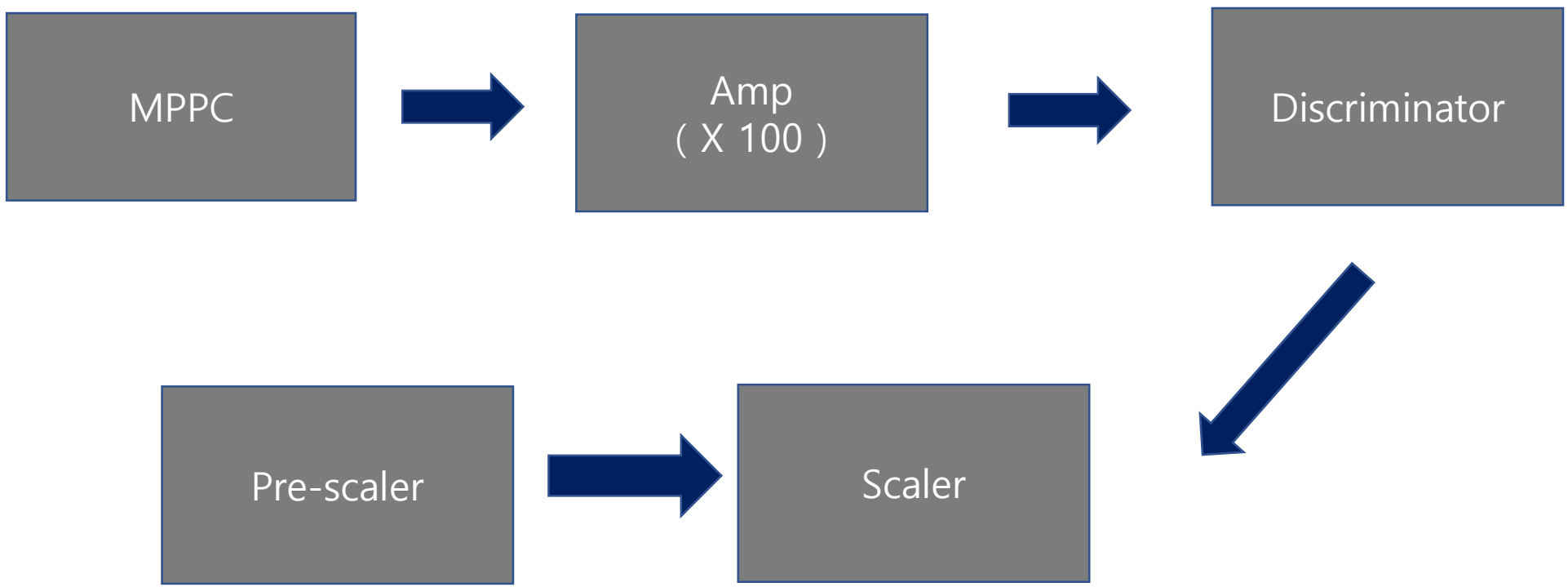
Dark current frequency

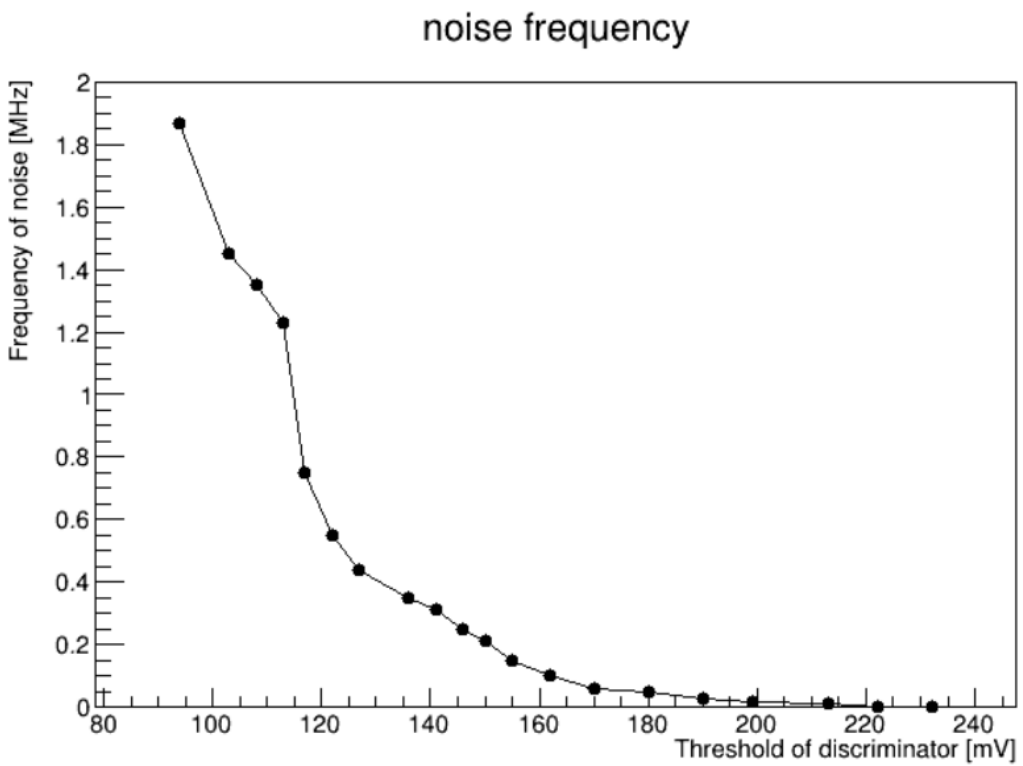
Experiment setup

- 58 V를 가한 MPPC의 신호를 100배 증폭 시킨 뒤 discriminator 에 넣는다.
- 이 때 discriminator의 threshold를 변화시키면서 정해둔 시간 0.1 s 동안 들어온 pulse의 수를 확인하여 Hz 단위로 환산한다.
- 해당 결과와 실제 ADC sum 의 누적 그래프를 비교한다.

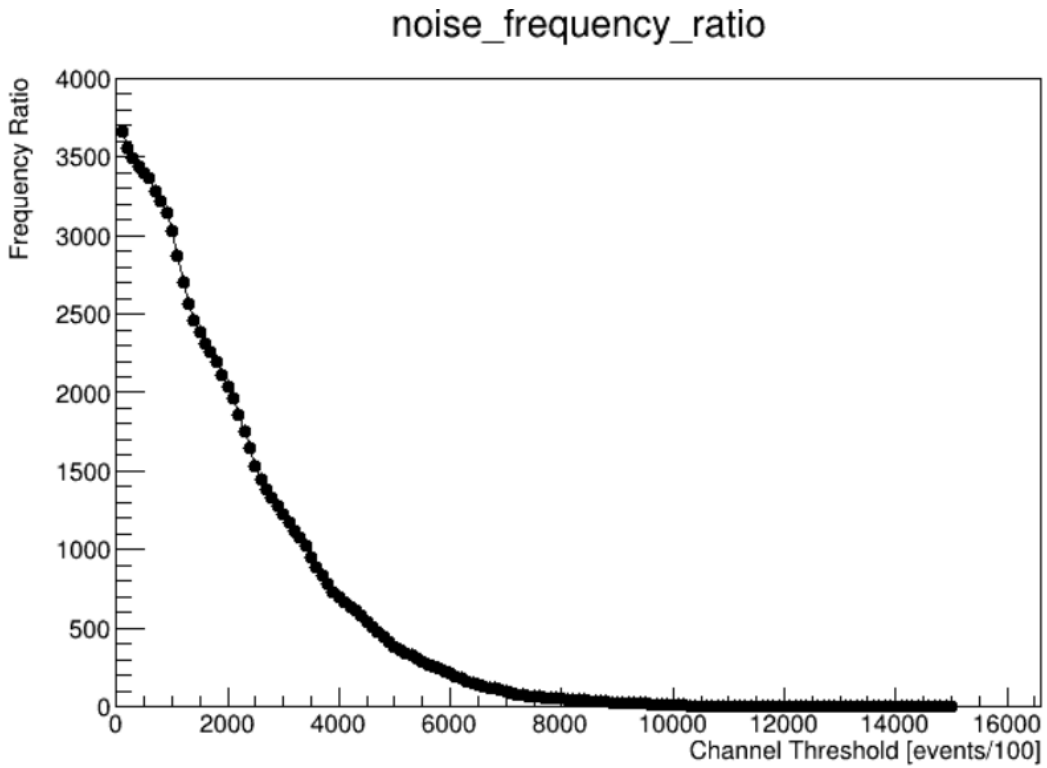
DAQ



Result



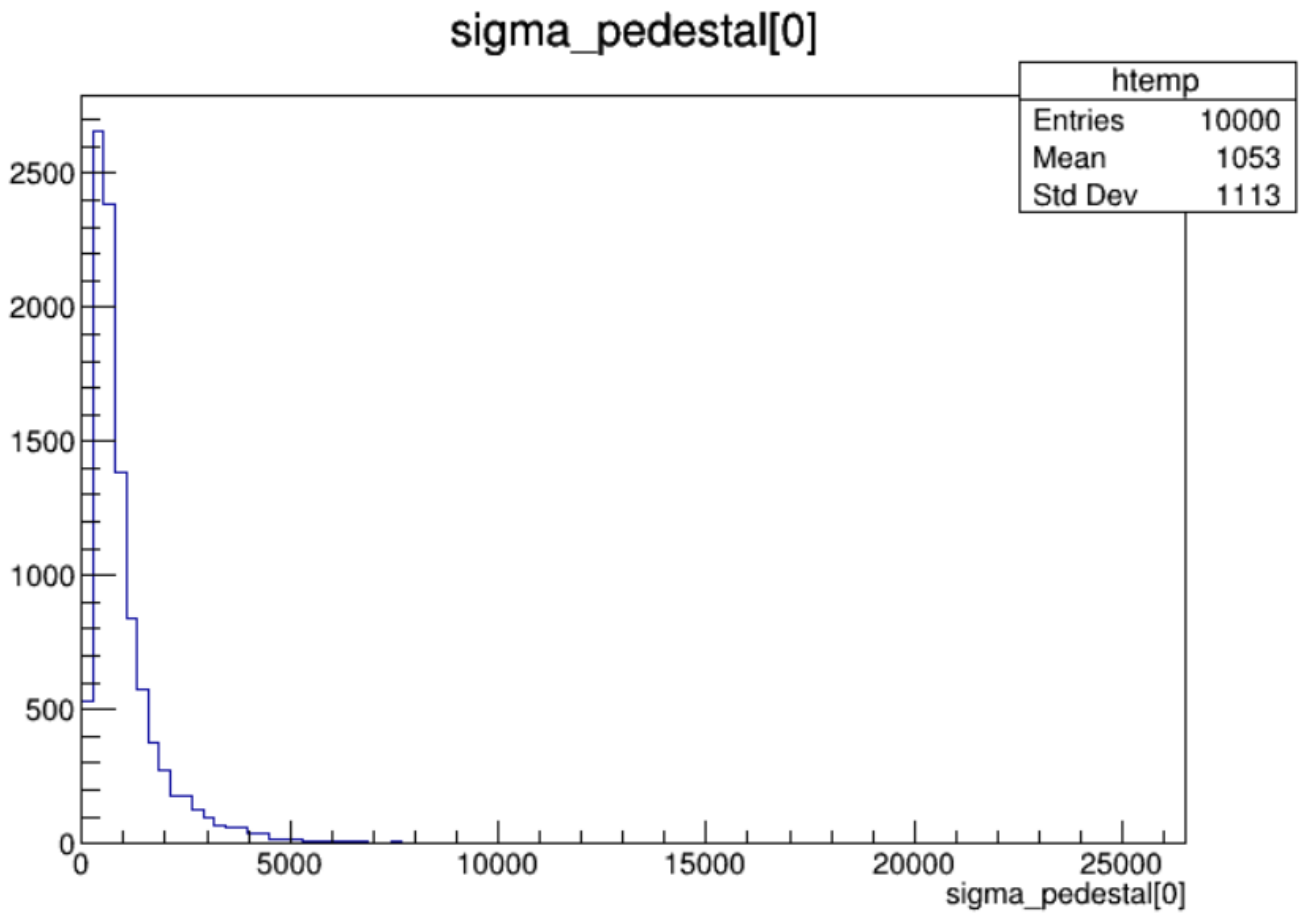
Result from scaler



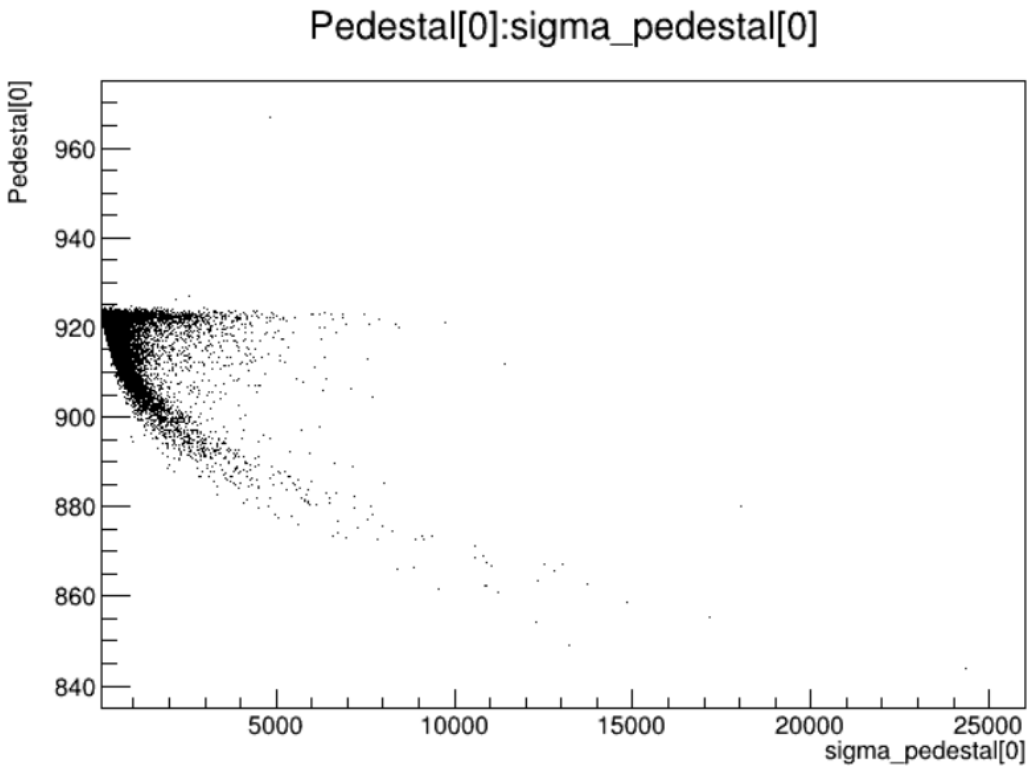
Result from FADC

Sigma of Pedestal – self trigger

Sigma of Pedestal

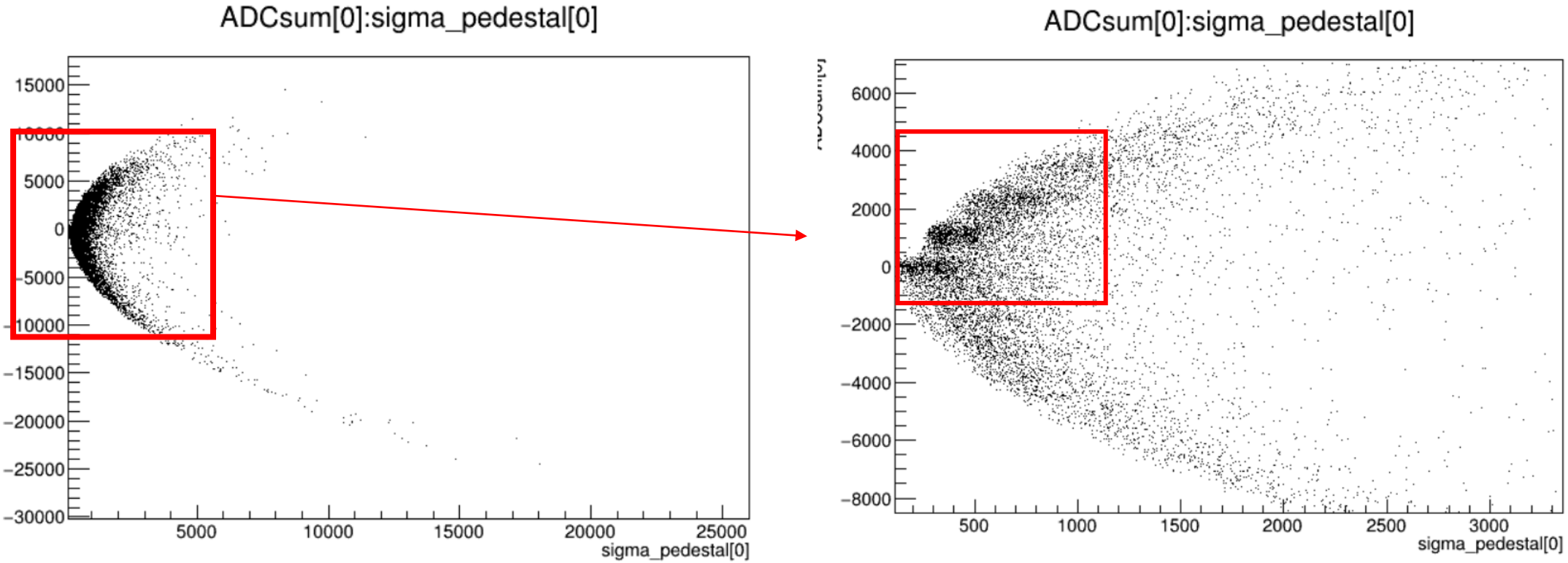


Pedestal – Sigma of Pedestal

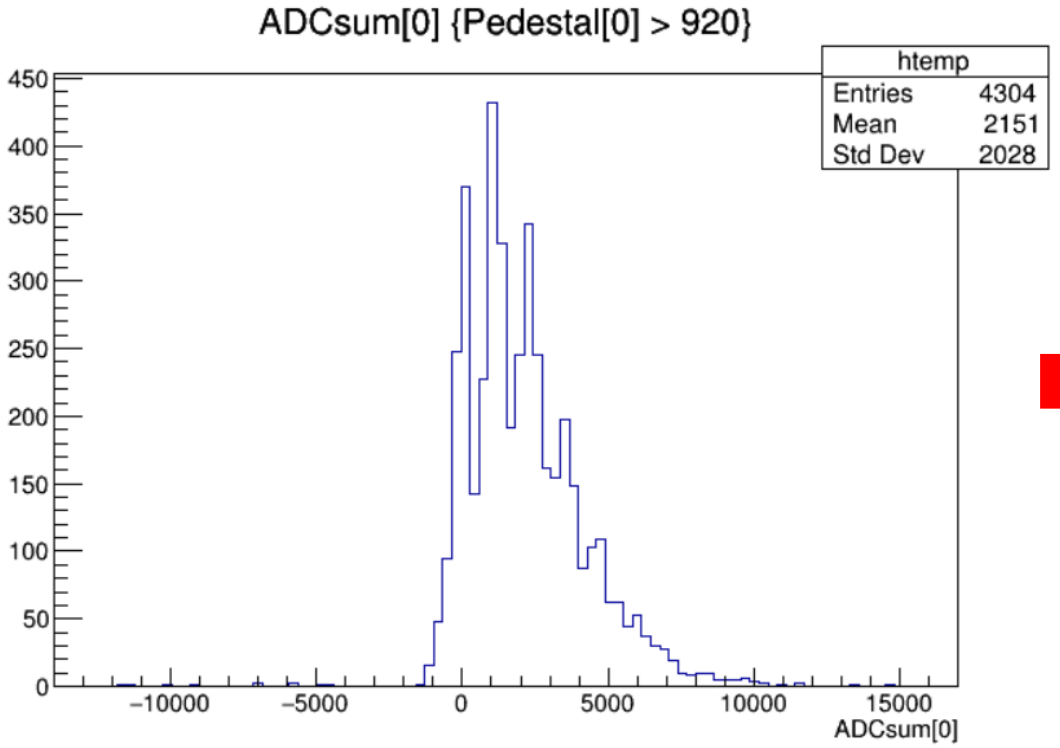


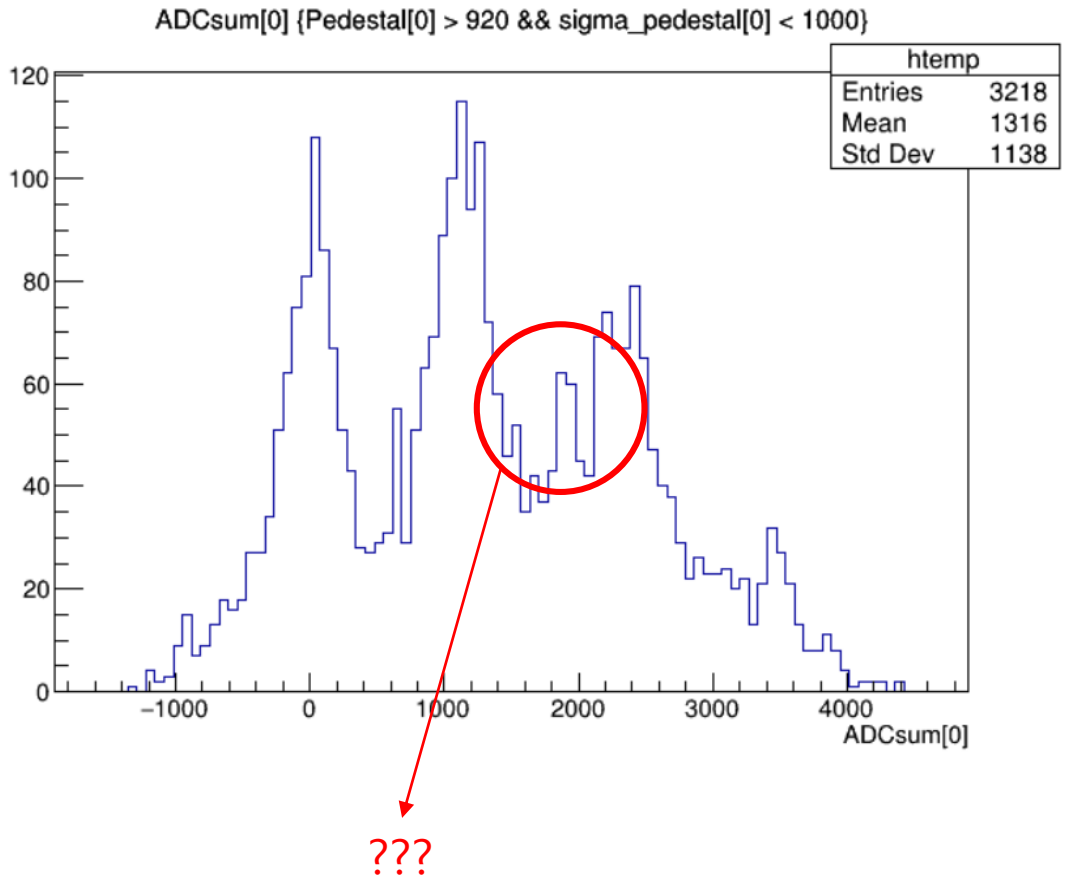
- Pedestal이 증가하거나 감소할 때, 반드시 pedestal의 표준편차도 증가한다. 그리고 이러한 비율은 pedestal 값 920으로부터 떨어진 거리의 제곱에 비례한다.
- Pedestal이 변할 때, pedestal의 표준편차가 특정한 함수에 따라변한다는 것은, pedestal의 증가에 관여하는 특정한 신호/파형이 있다는 것을 의미한다.

ADCsum - Pedestal

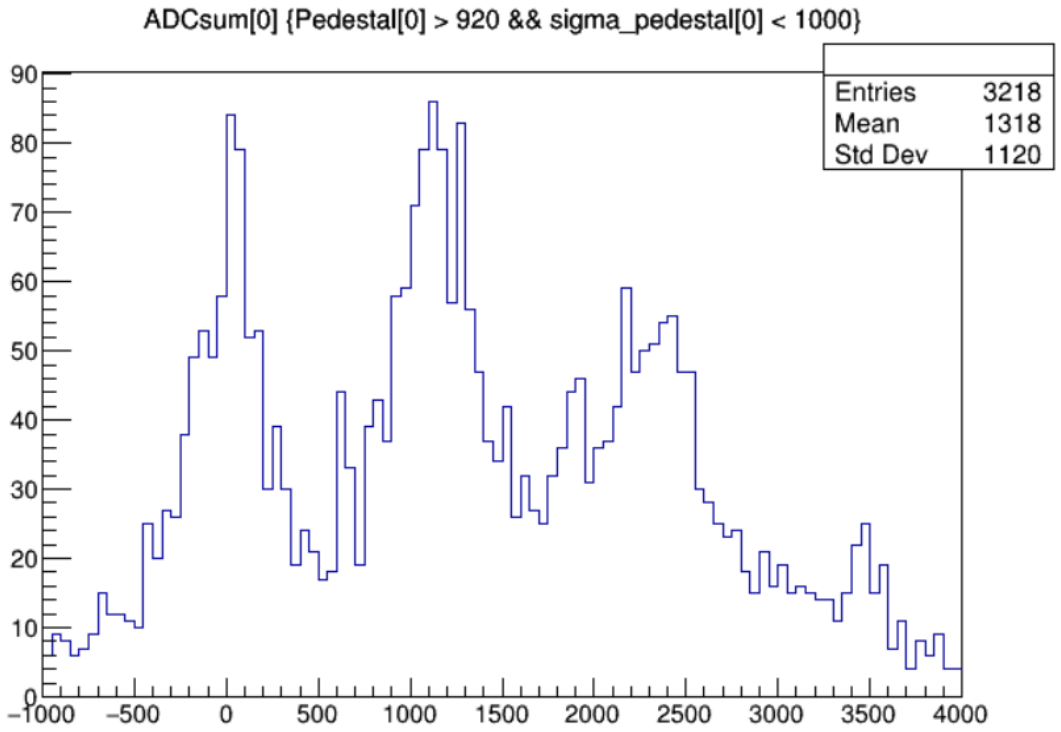


Cut condition

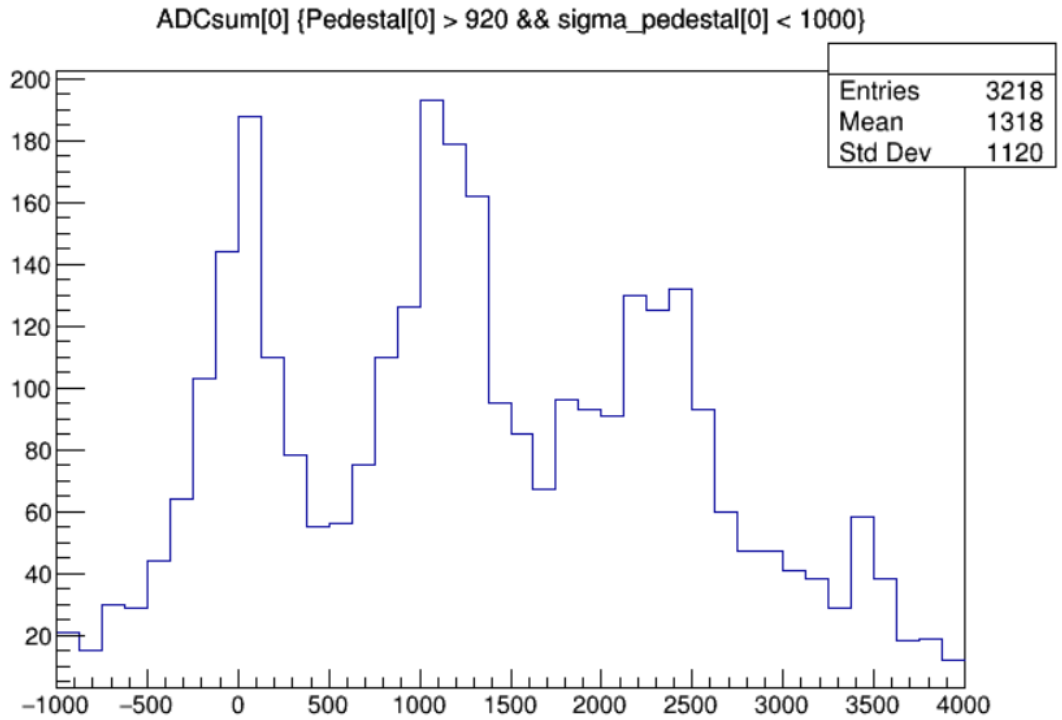




Binning?

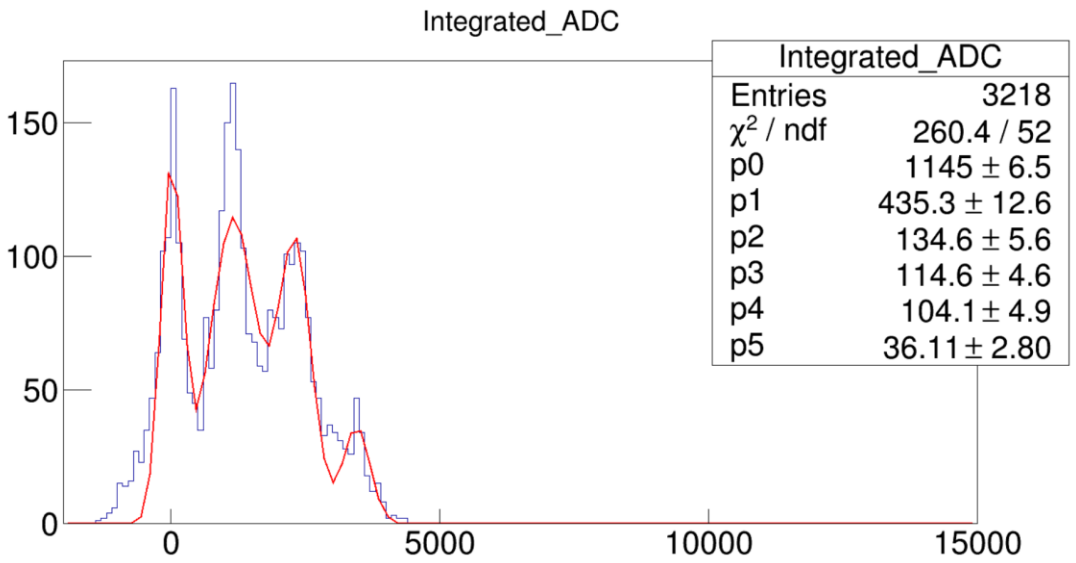


Binning = 100



Binning = 40

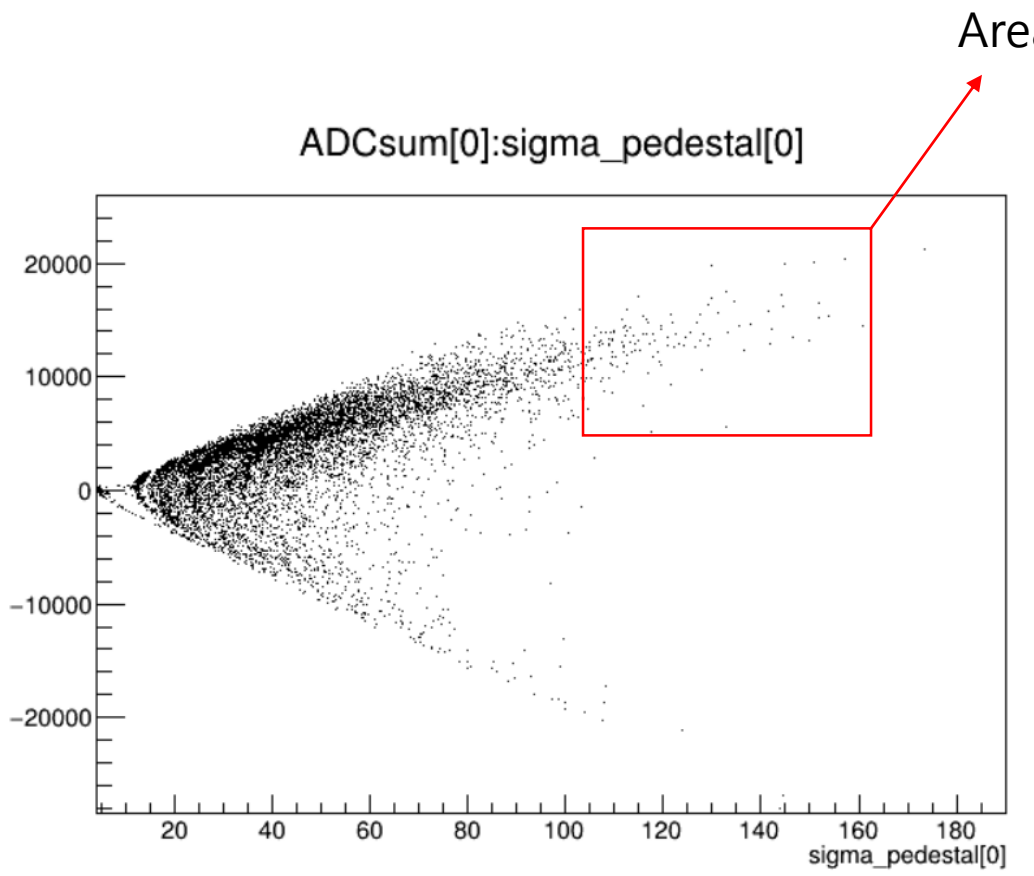
Fitting result

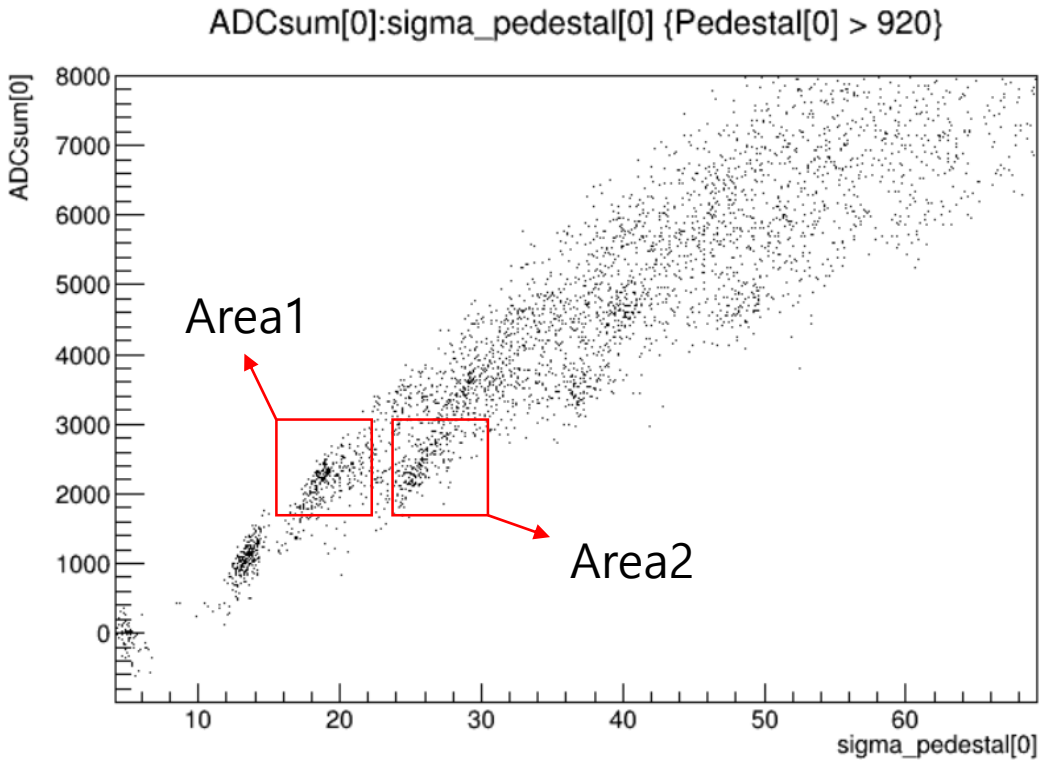



```
double finger_ft(double *x, double *par)
{
//  double ped = 168.5;
    double ped = 15.5;
//  double sigma_noise = 410.5;
    double sigma_noise = 200.5;

  double xx = x[0];
  double y=0;
  double y0 = exp(-(xx - ped)*(xx - ped) / (2 * sigma_noise*sigma_noise));
  double y1 = exp(-(xx - par[0] - ped)*(xx - par[0] - ped) / (2.* par[1] * par[1]));
  double y2 = exp(-(xx - 2 * par[0] - ped)*(xx - 2 * par[0] - ped) / (2.* par[1] * par[1] / 2.));
  double y3 = exp(-(xx - 3 * par[0] - ped)*(xx - 3 * par[0] - ped) / (2.* par[1] * par[1] / 3.));
  double y4 = exp(-(xx - 4 * par[0] - ped)*(xx - 4 * par[0] - ped) / (2.* par[1] * par[1] / 4.));
  double y5 = exp(-(xx - 5 * par[0] - ped)*(xx - 5 * par[0] - ped) / (2.* par[1] * par[1] / 5.));
  double y6 = exp(-(xx - 6 * par[0] - ped)*(xx - 6 * par[0] - ped) / (2.* par[1] * par[1] / 6.));
//  double fitval = (par[2] * y0 + par[3] * y1 + par[4] * y2 + par[5] * y3 + par[6] * y4 + par[7]
  double fitval = (par[2] * y0 + par[3] * y1 + par[4] * y2 + par[5] * y3 + par[6] );

  return fitval;
}
```

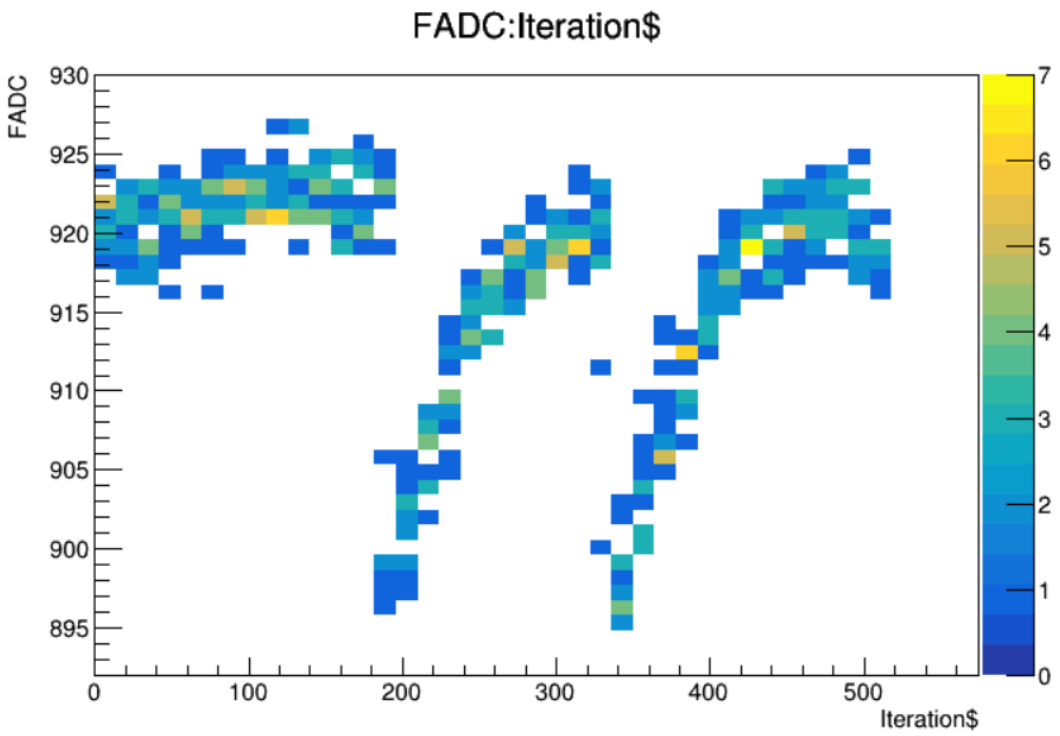
Sigma of Pedestal
– LED trigger

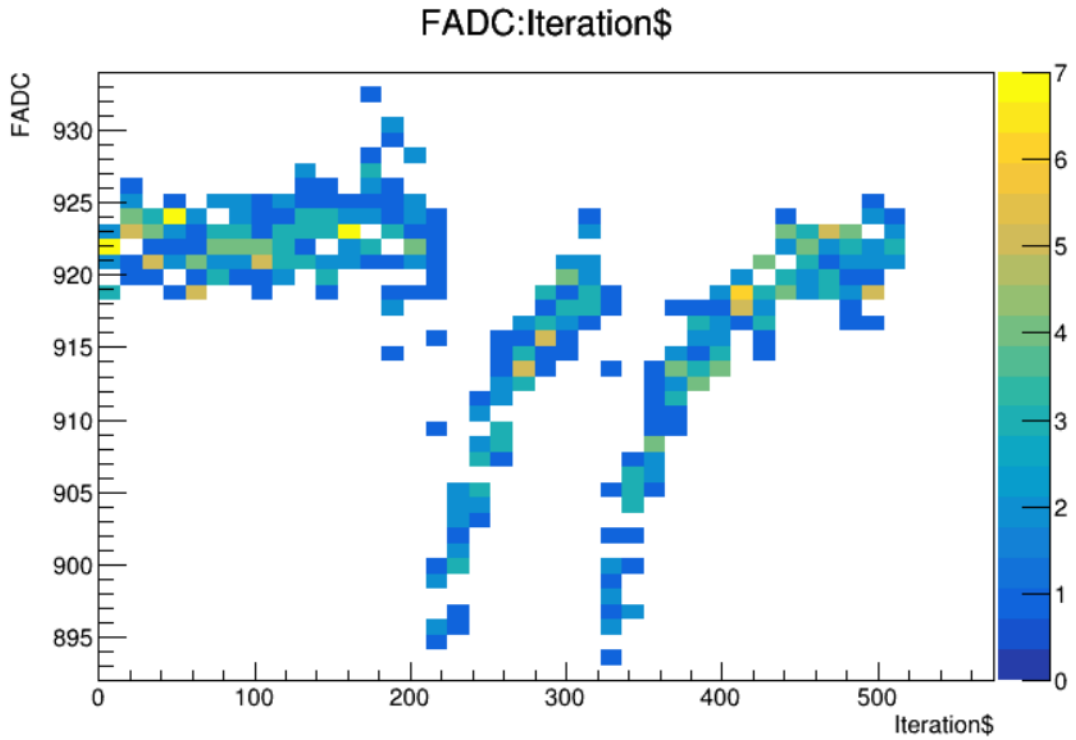
ADC


Area3
ADCsum[0]:sigma_pedestal[0]
20000
10000
0
−10000
−20000
20
40
60
80
100
120
140
160
180
sigma_pedestal[0]


ADCsum[0]:sigma_pedestal[0] {Pedestal[0] > 920}
ADCsum[0]
8000
7000
6000
5000
4000
3000
2000
1000
0
Area1
Area2
10
20
30
40
50
60
sigma_pedestal[0]

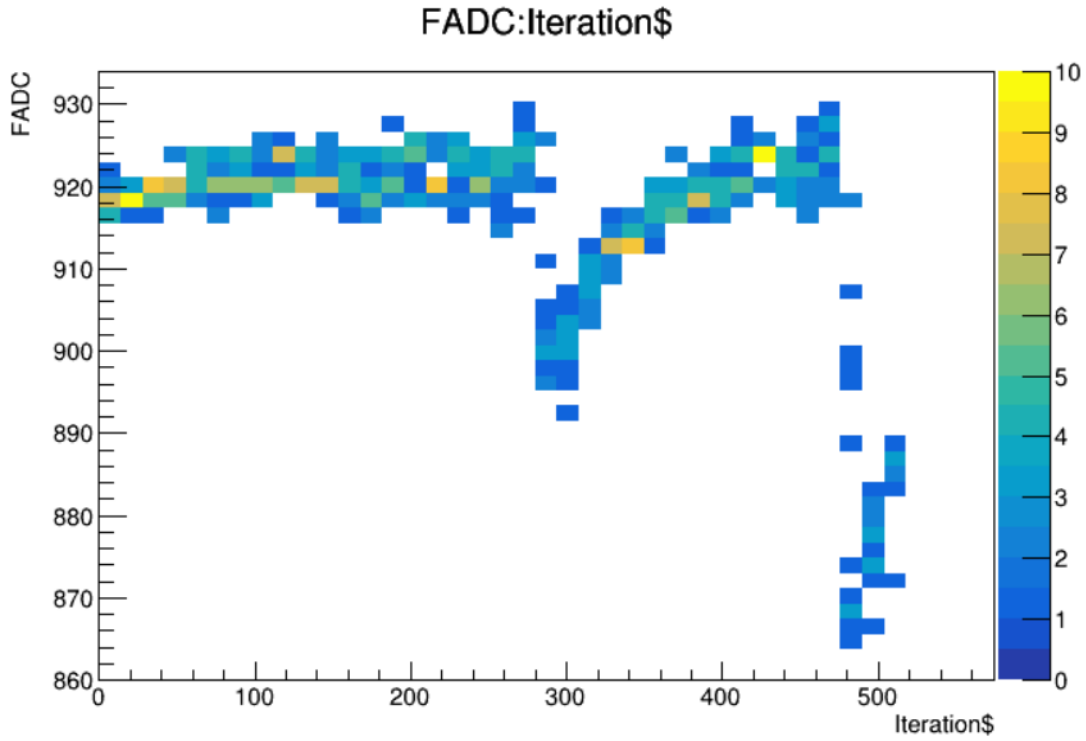
Area1

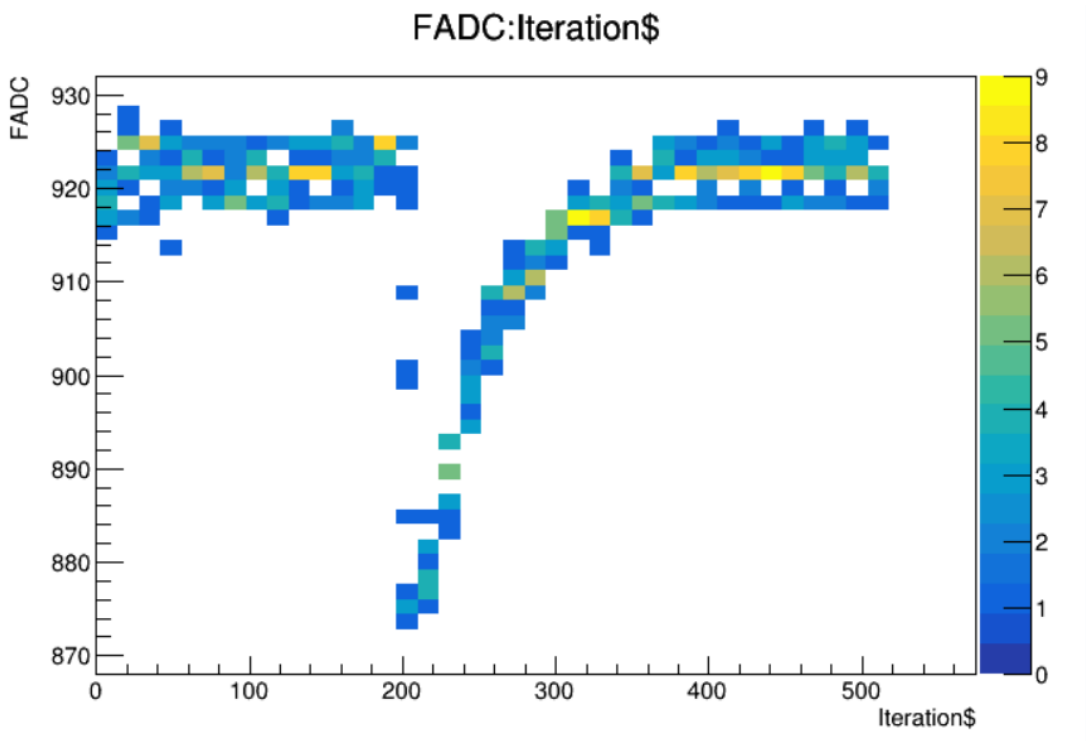




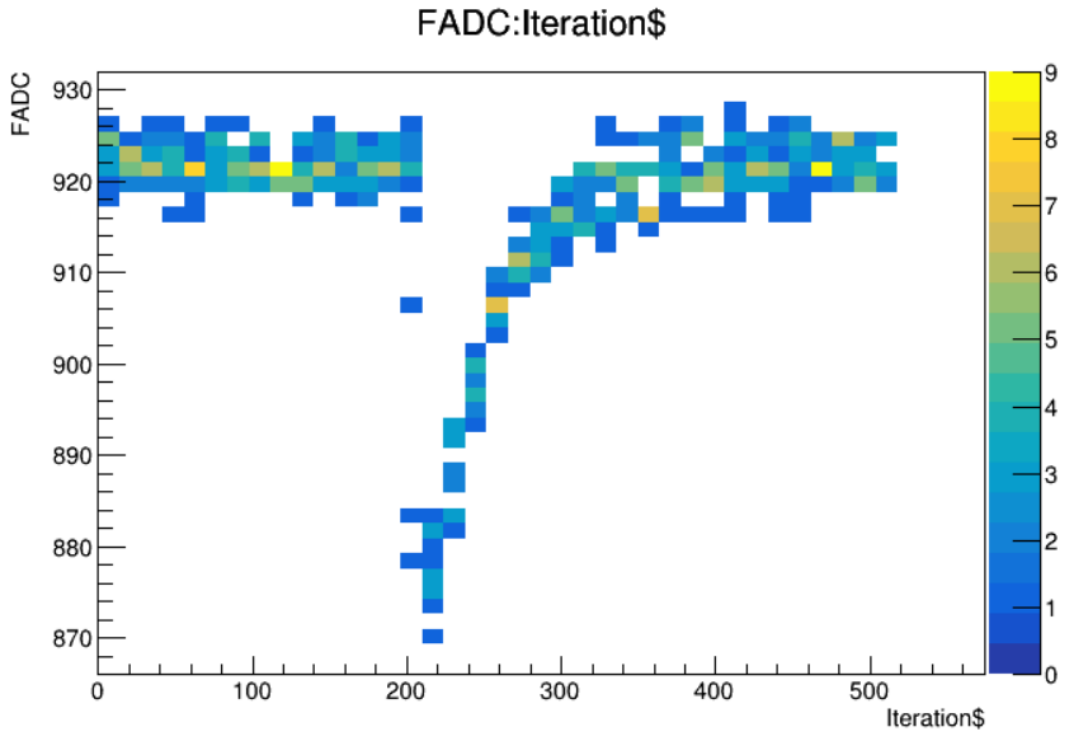
특징 : 전부 2개의 single photon signal이 들어온 경우

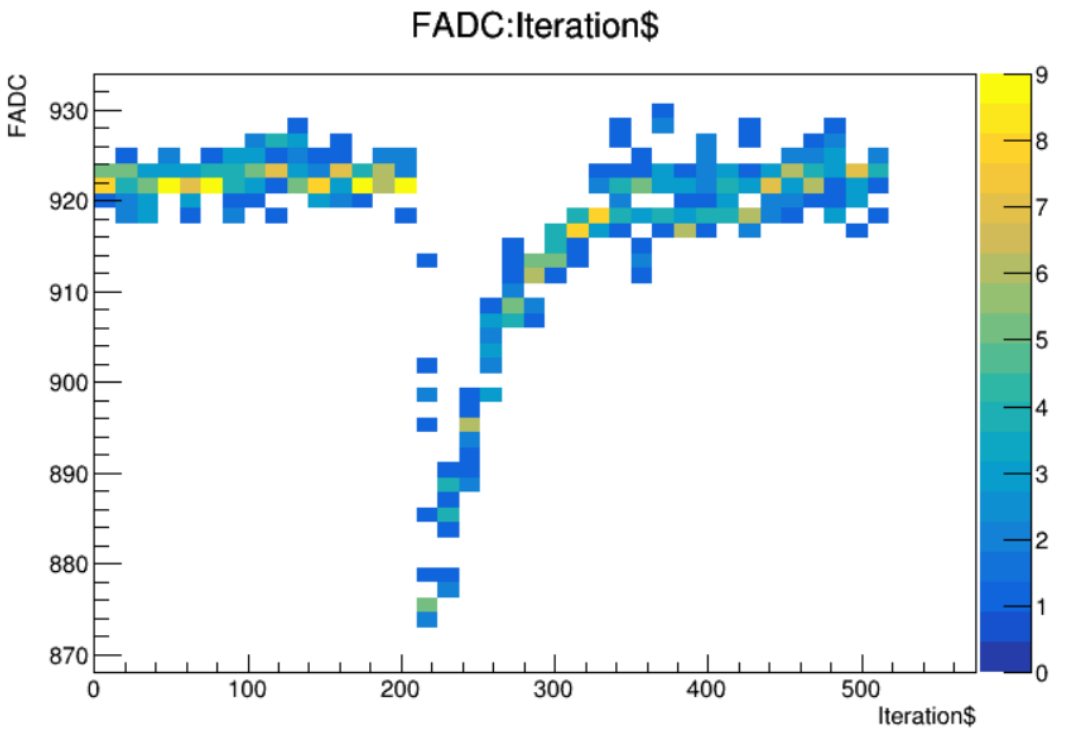
Area2


FADC:Iteration$
FADC
930
920
910
900
890
880
870
860
0
100
200
300
400
500
Iteration$
10
9
8
7
6
5
4
3
2
1
0


FADC:Iteration$
FADC
930
920
910
900
890
880
870
0
100
200
300
400
500
Iteration$
9
8
7
6
5
4
3
2
1
0

Area2


FADC:Iteration$
FADC
930
920
910
900
890
880
870
0
100
200
300
400
500
Iteration$
9
8
7
6
5
4
3
2
1
0


FADC:Iteration$
FADC
930
920
910
900
890
880
870
0
100
200
300
400
500
Iteration$
9
8
7
6
5
4
3
2
1
0

Area3

1st peak