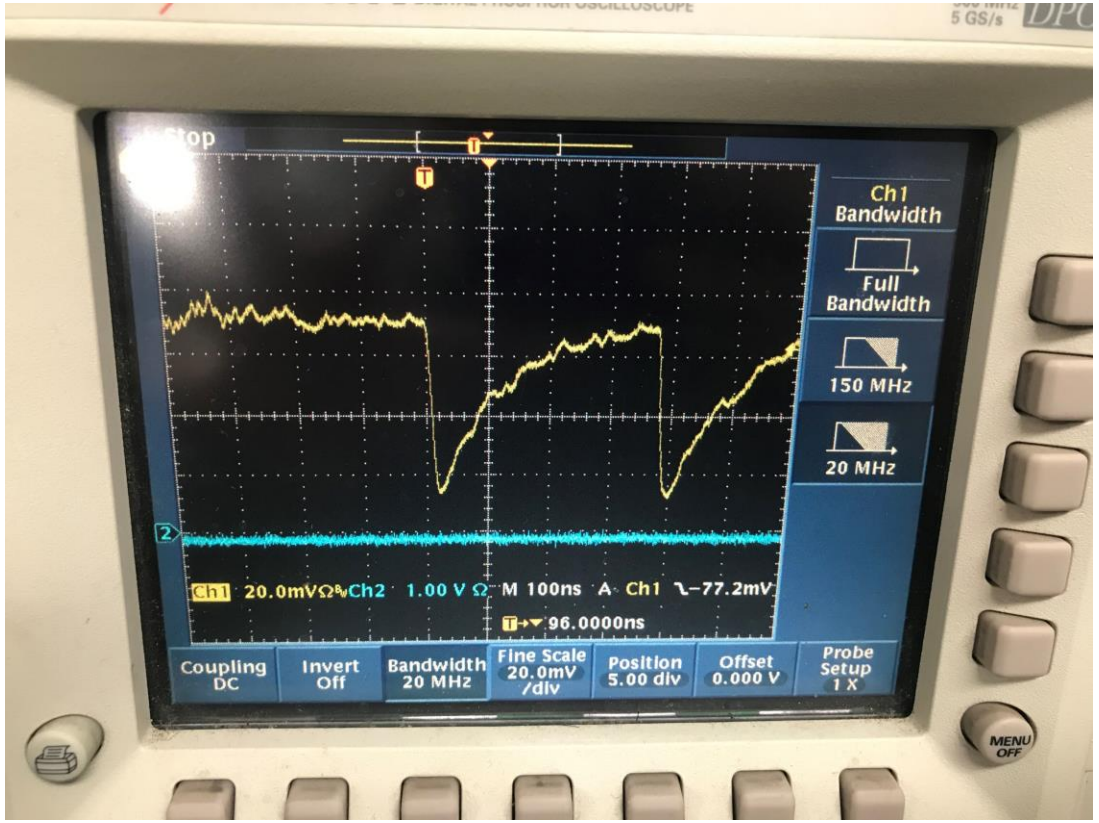
200219

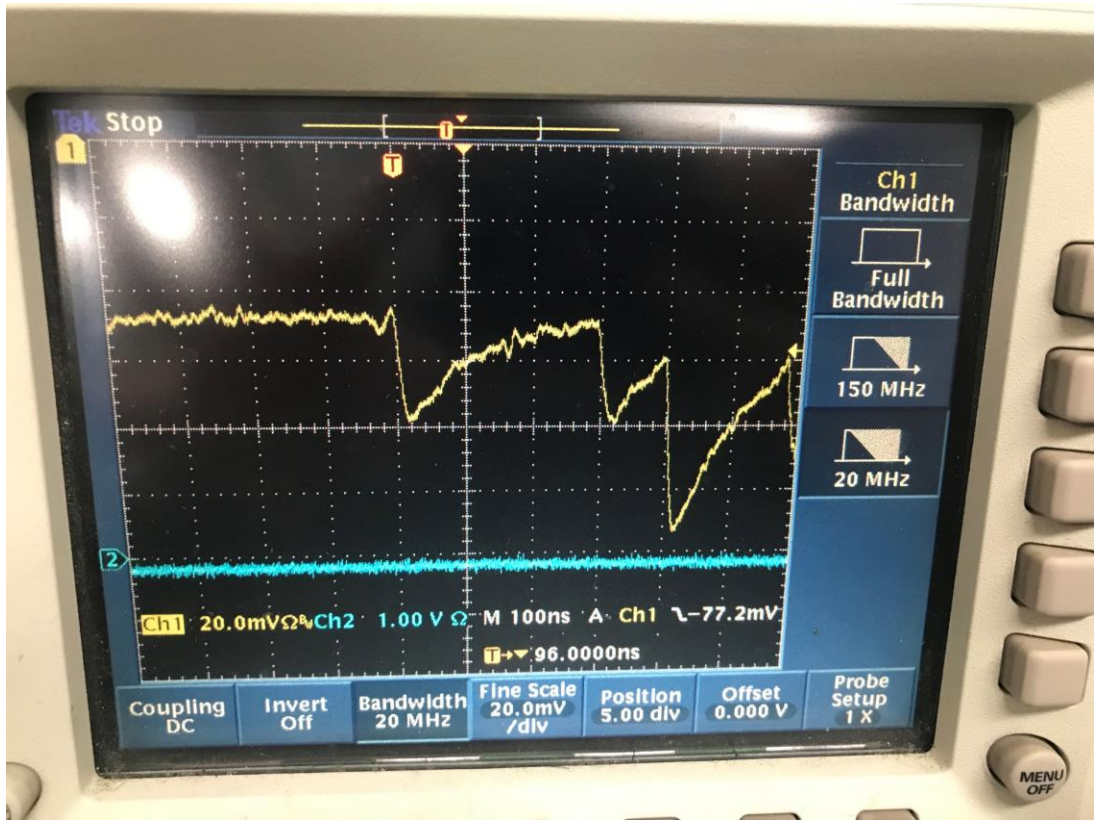
Dark current

Experiment setup

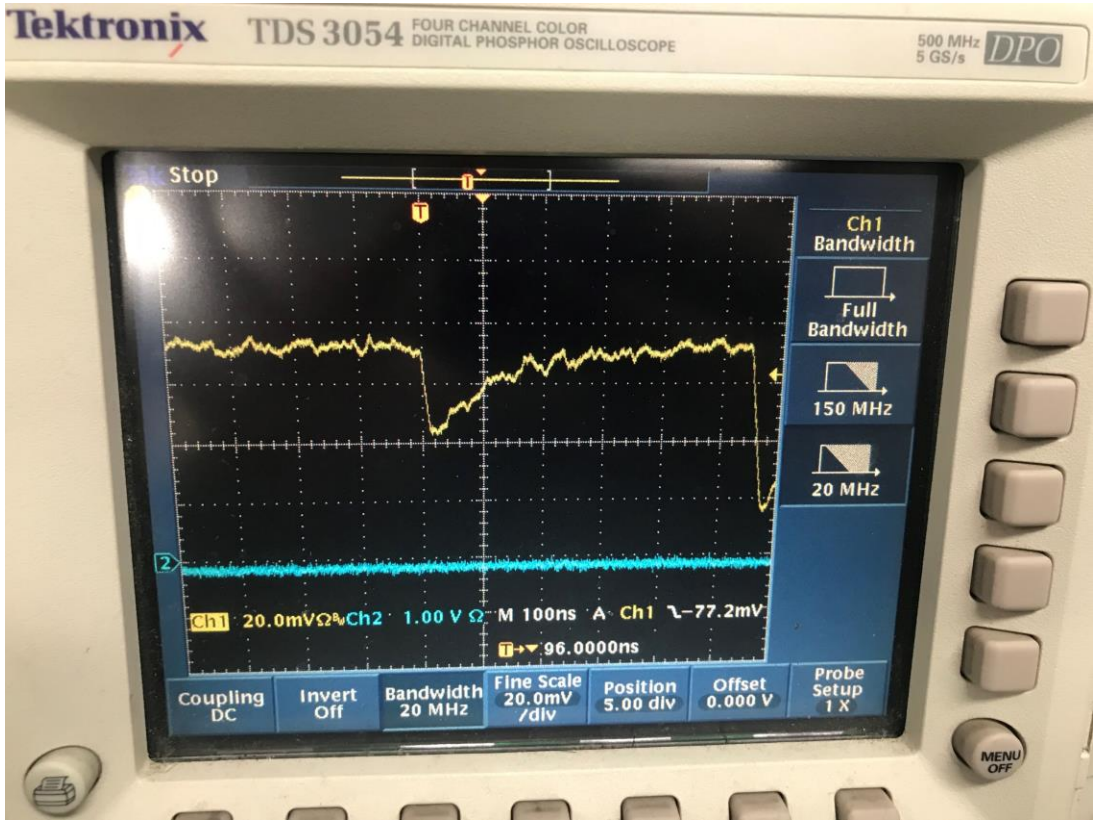
- 58 V를 가한 MPPC의 신호를 100배 증폭 시킨 뒤 discriminator 에 넣는다.
- 이 때 discriminator의 threshold를 변화시키면서 정해둔 시간 0.1 s 동안 들어온 pulse의 수를 확인하여 Hz 단위로 환산한다.
- 해당 결과와 실제 ADC sum 의 누적 그래프를 비교한다.

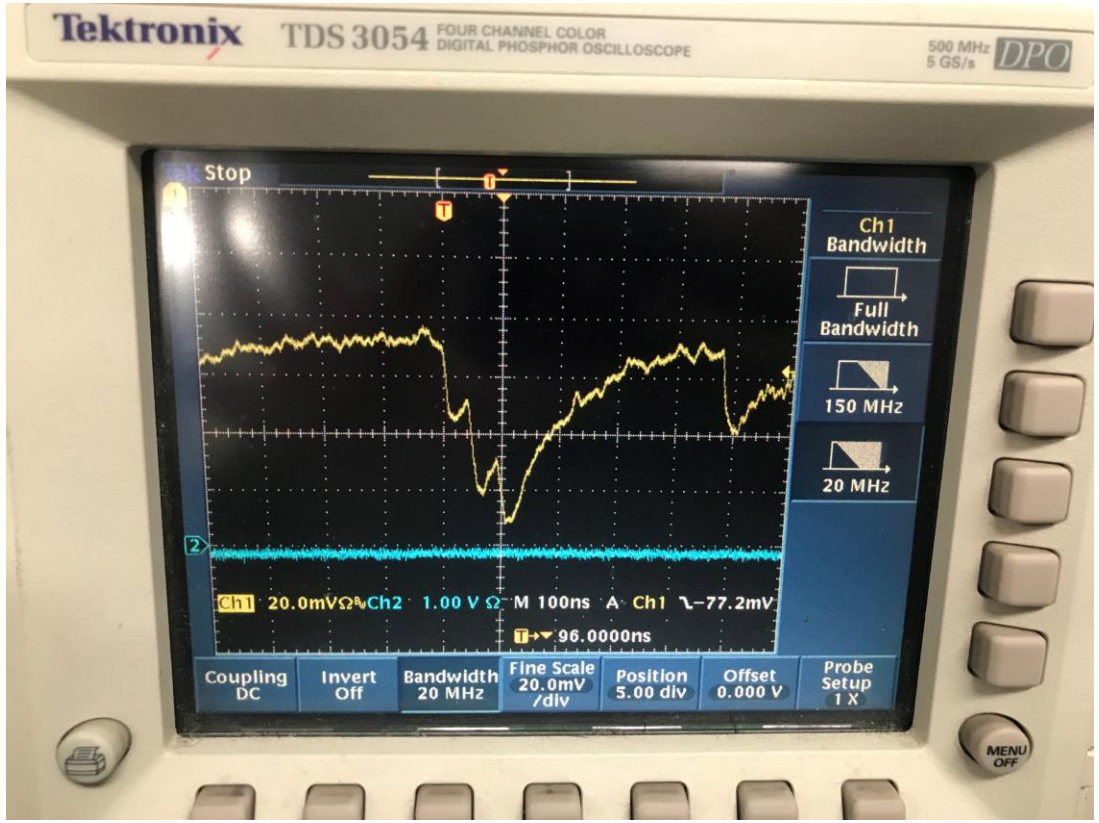
The number of signal per window



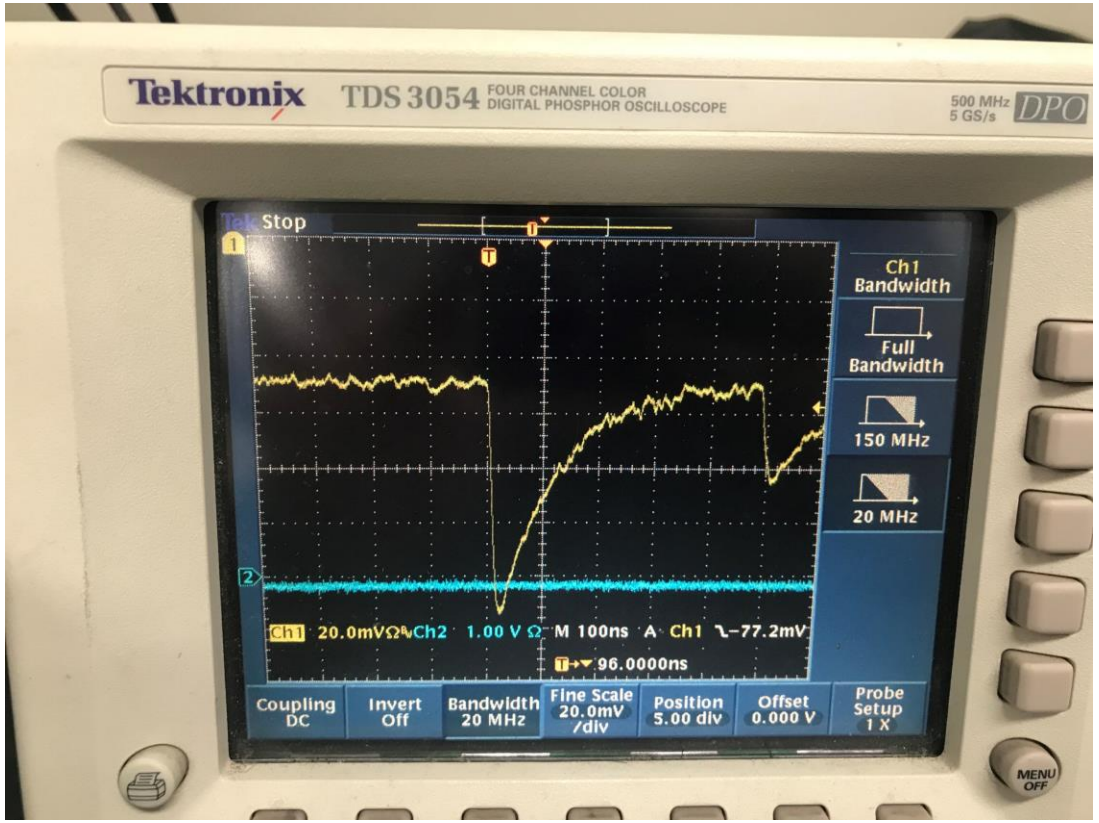


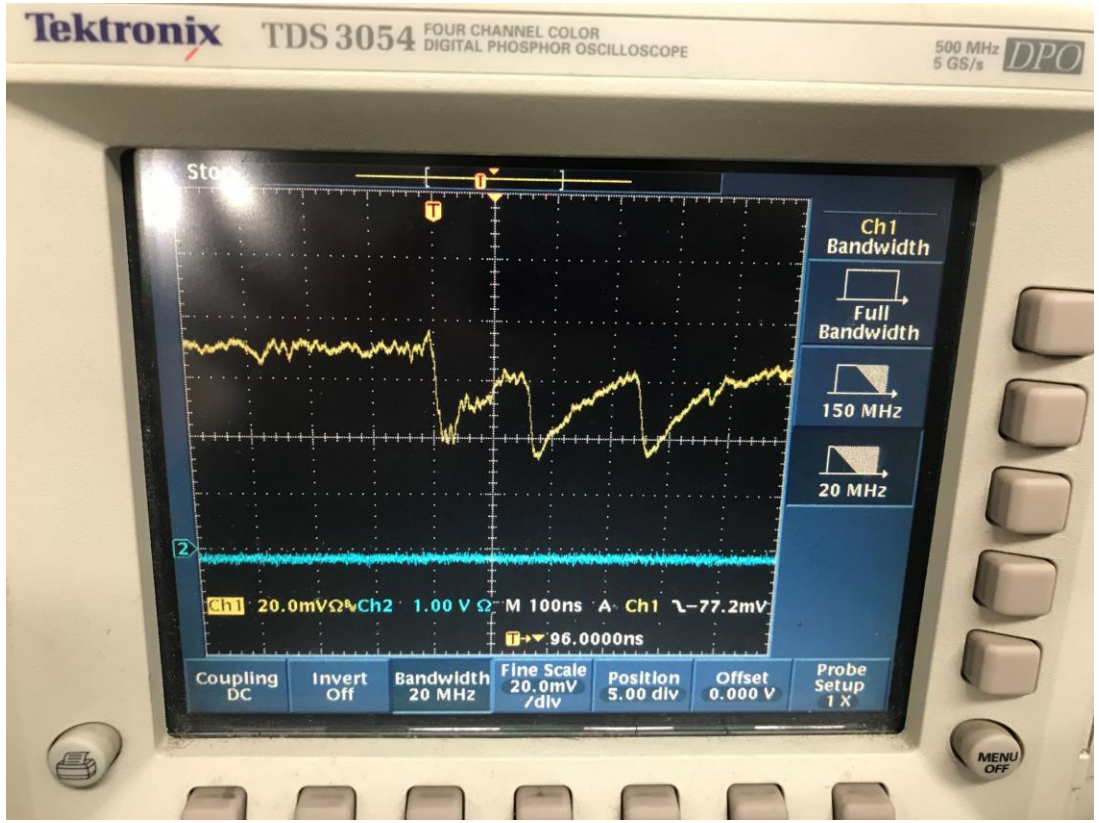
The number of signal per window



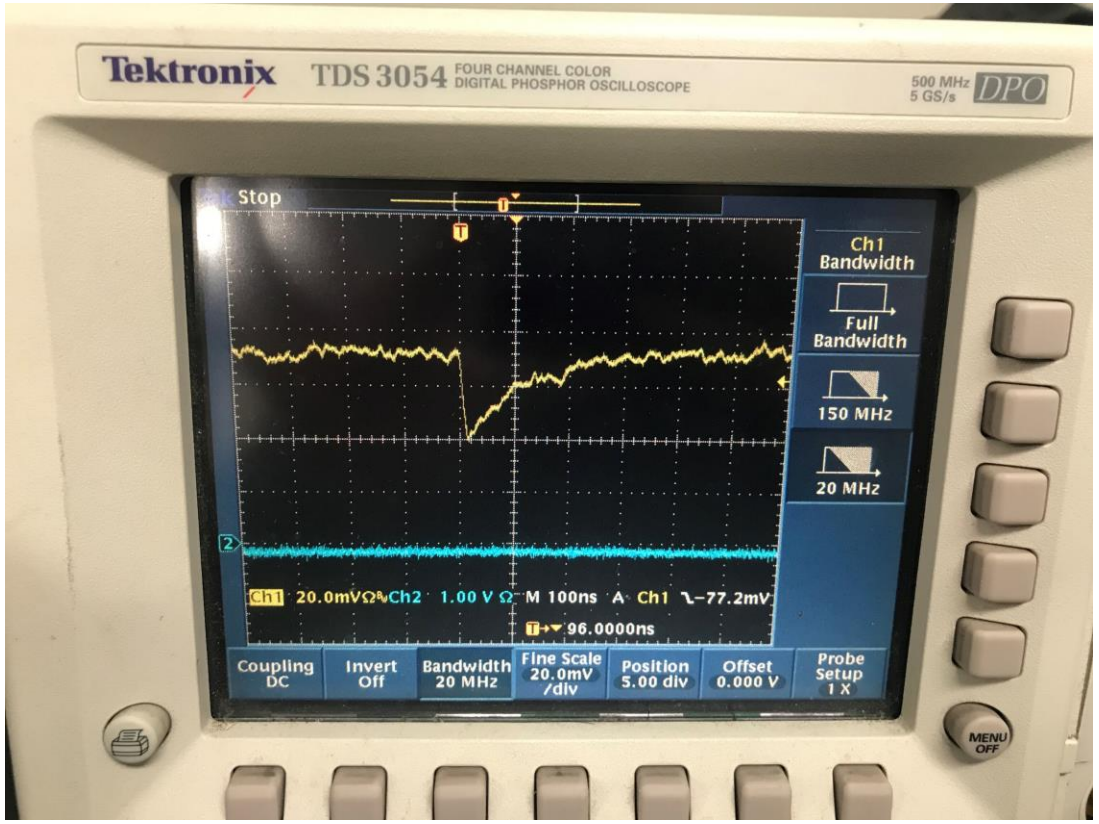


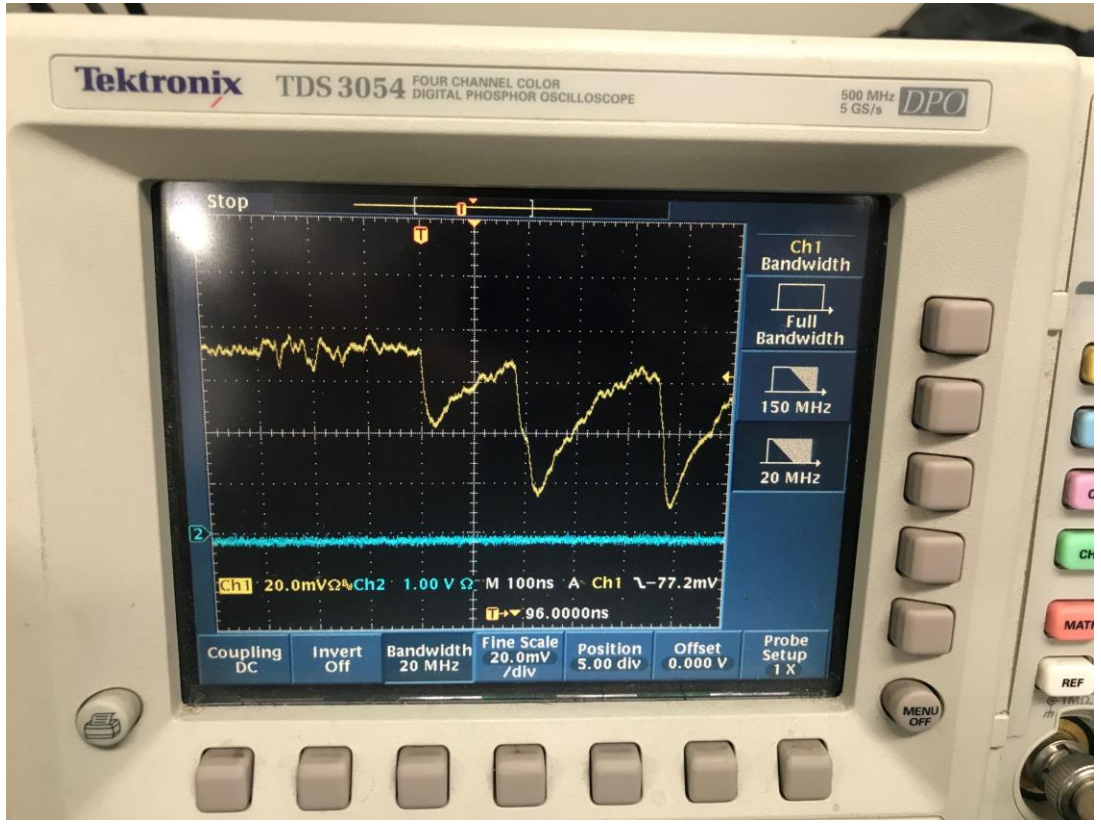
The number of signal per window



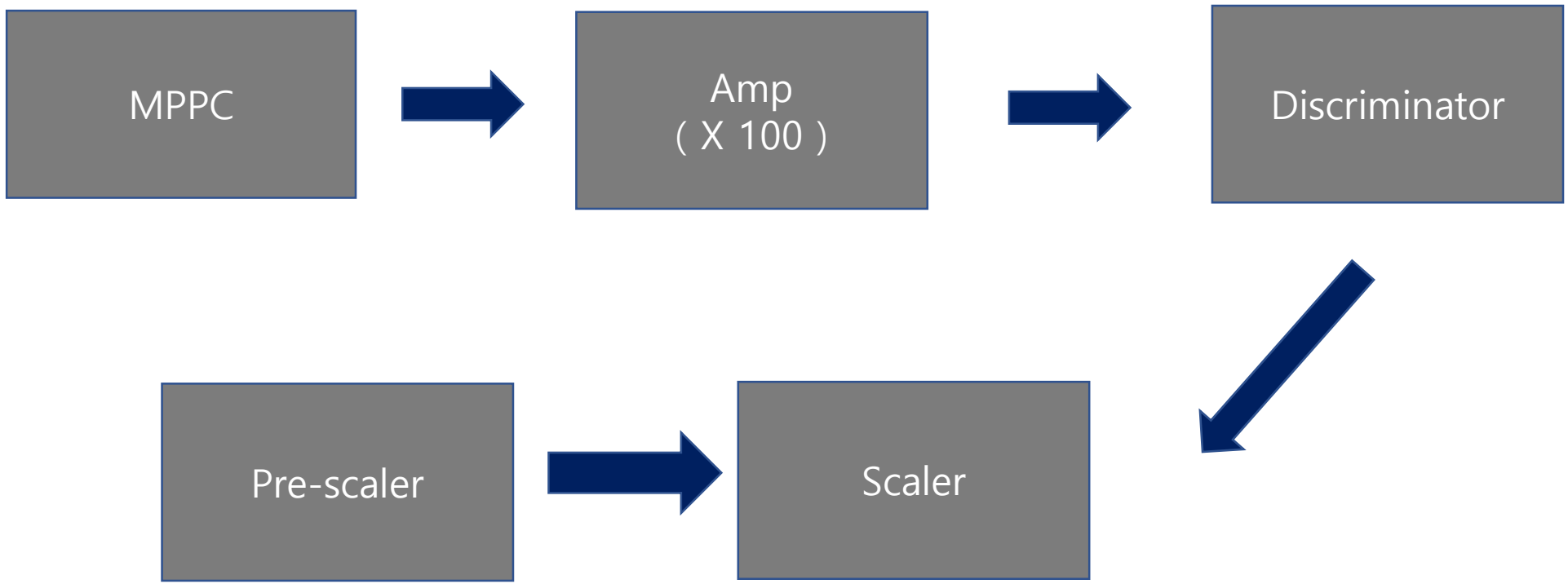


The number of signal per window

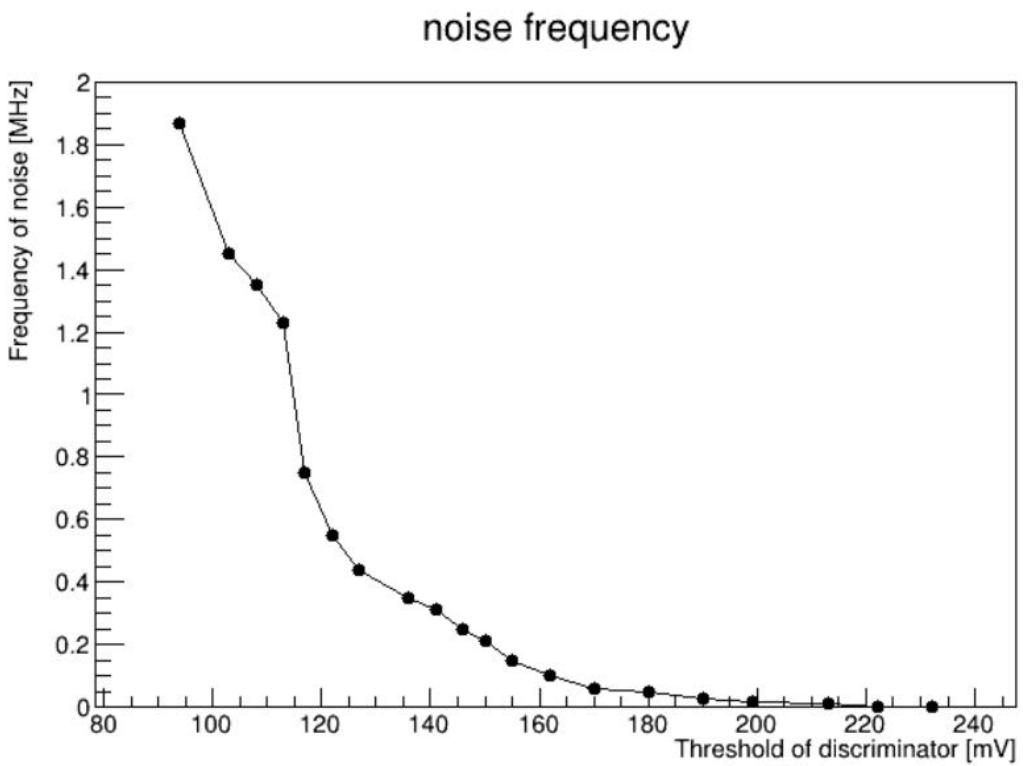




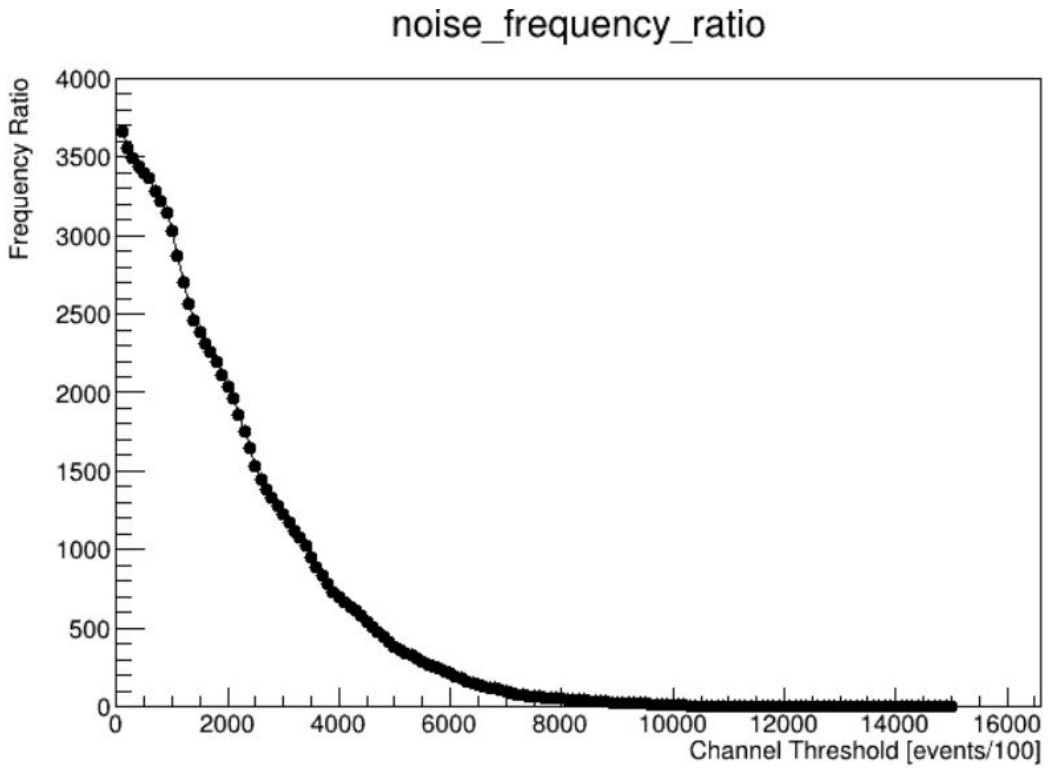
DAQ



Result



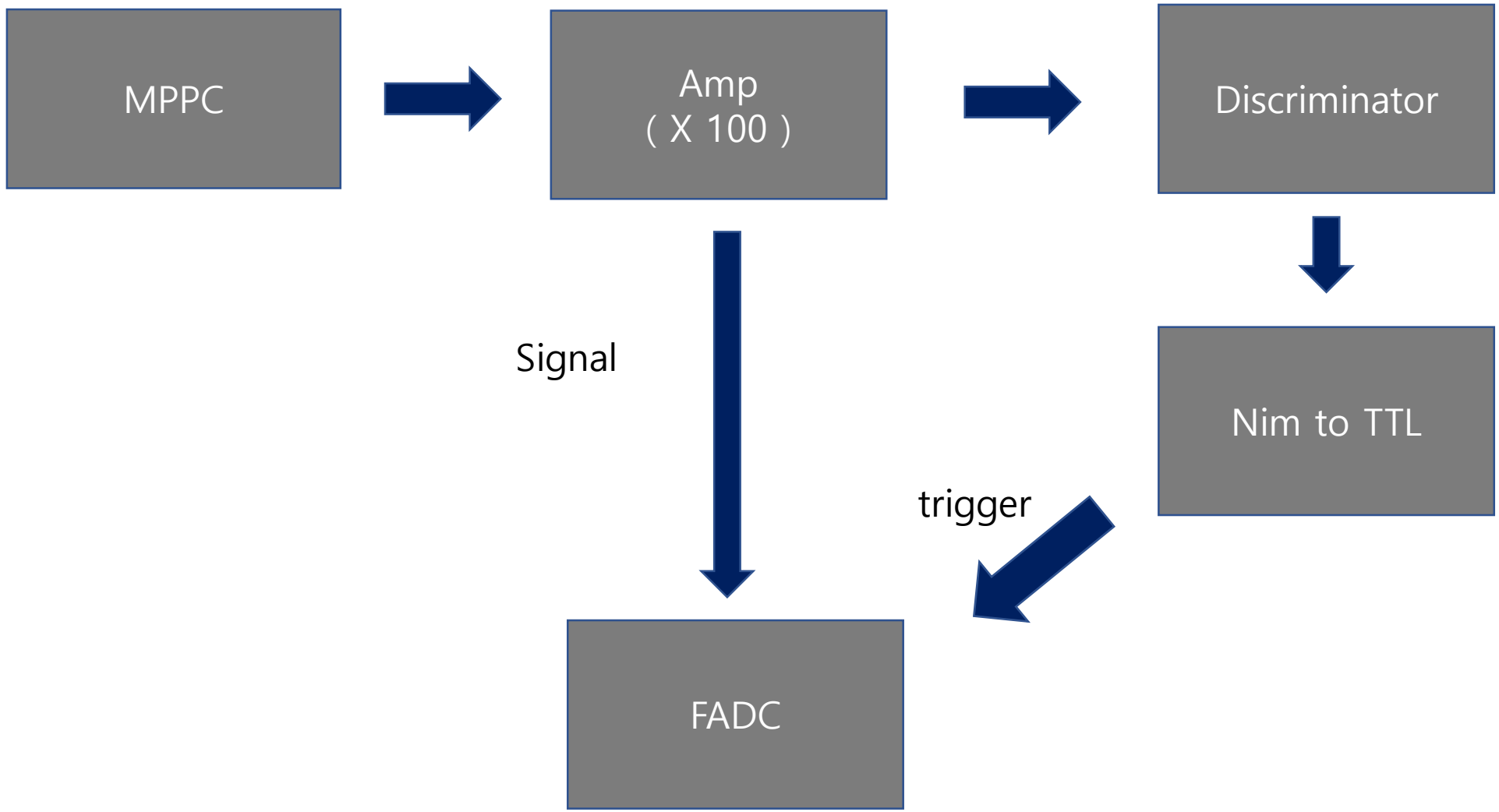
Result from scaler



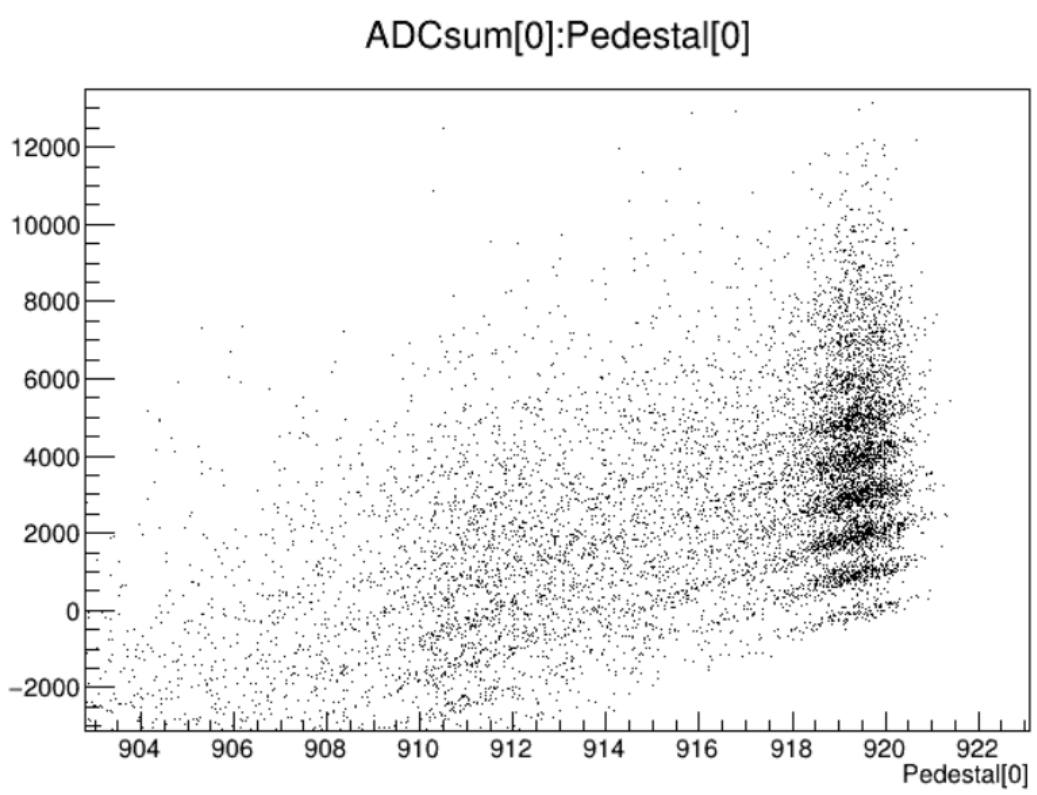
Result from FADC

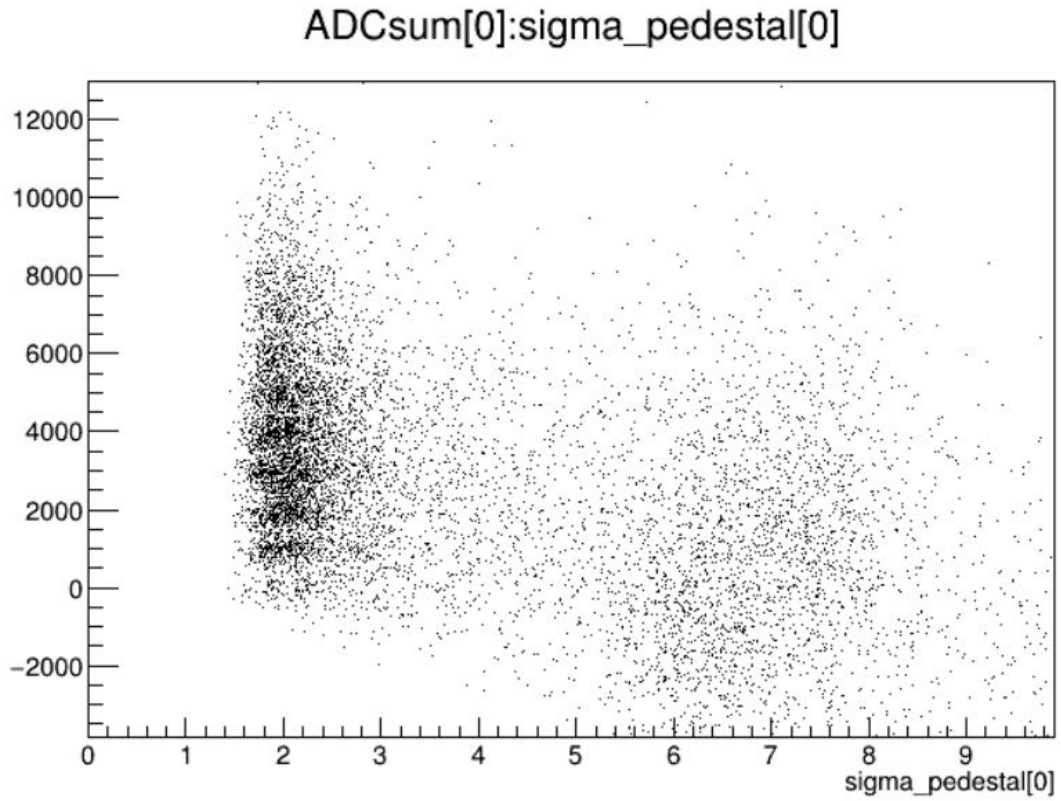
Gain of MPPC

DAQ

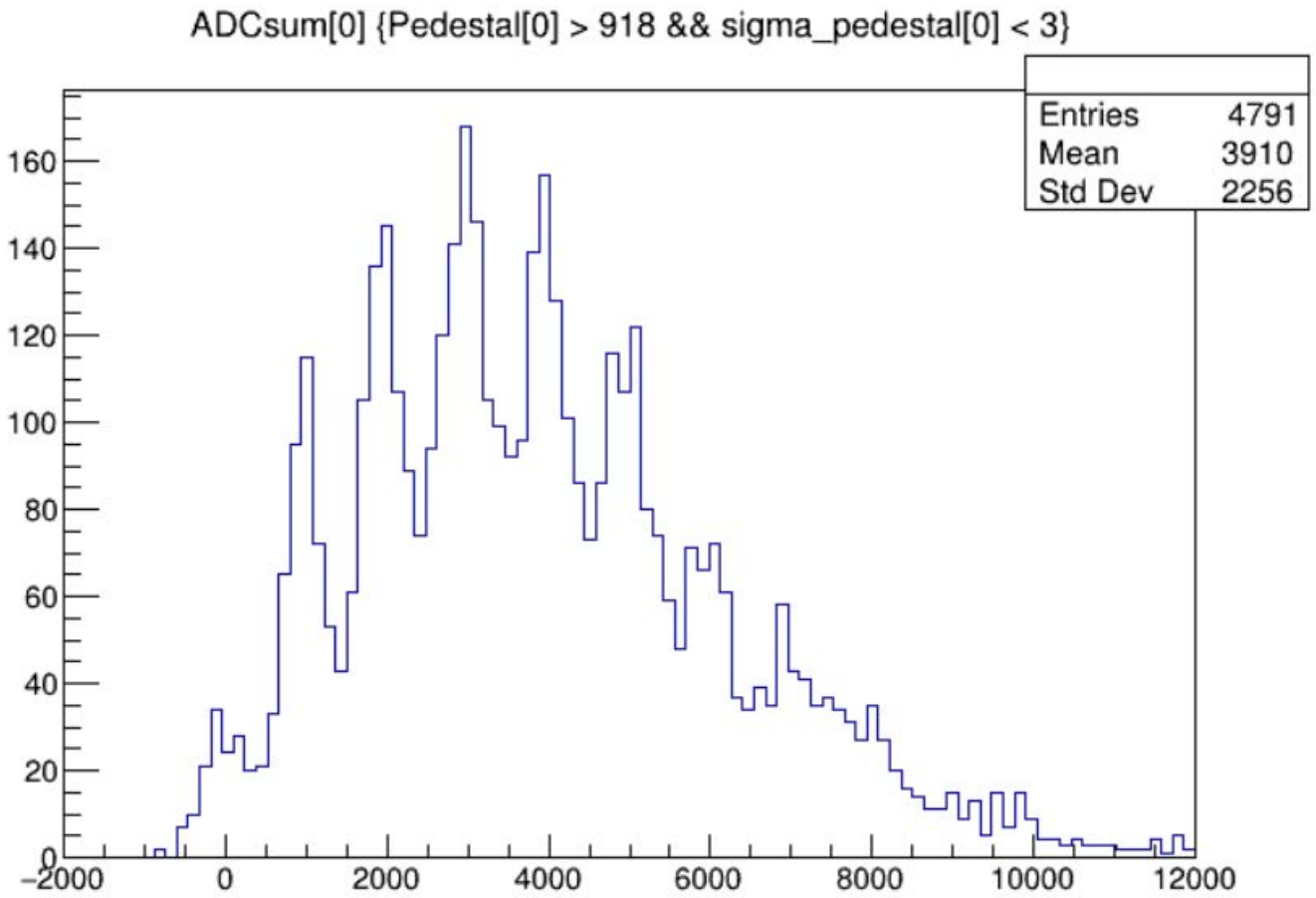


ADC sum with other parameters





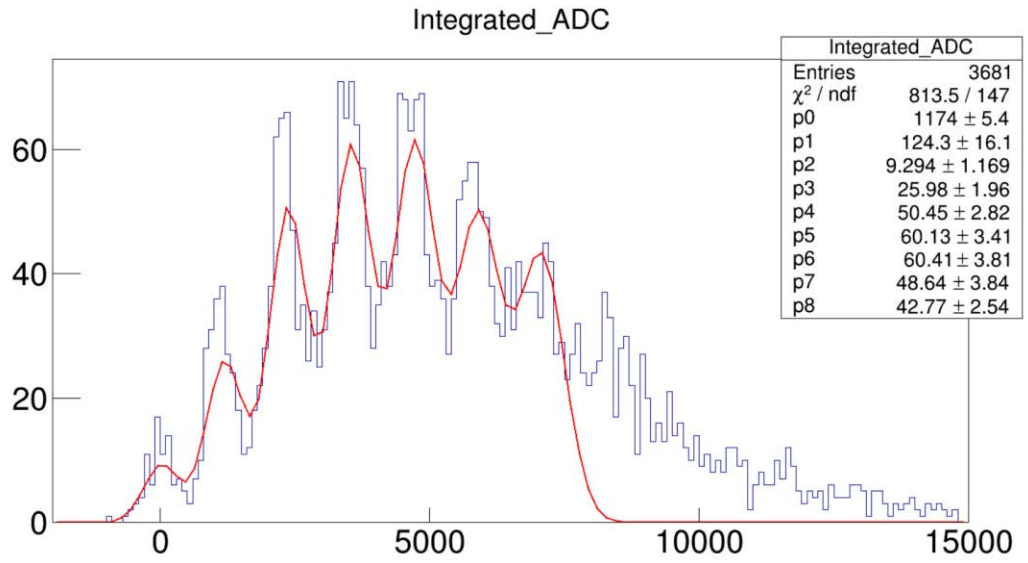
ADC sum with cut condition



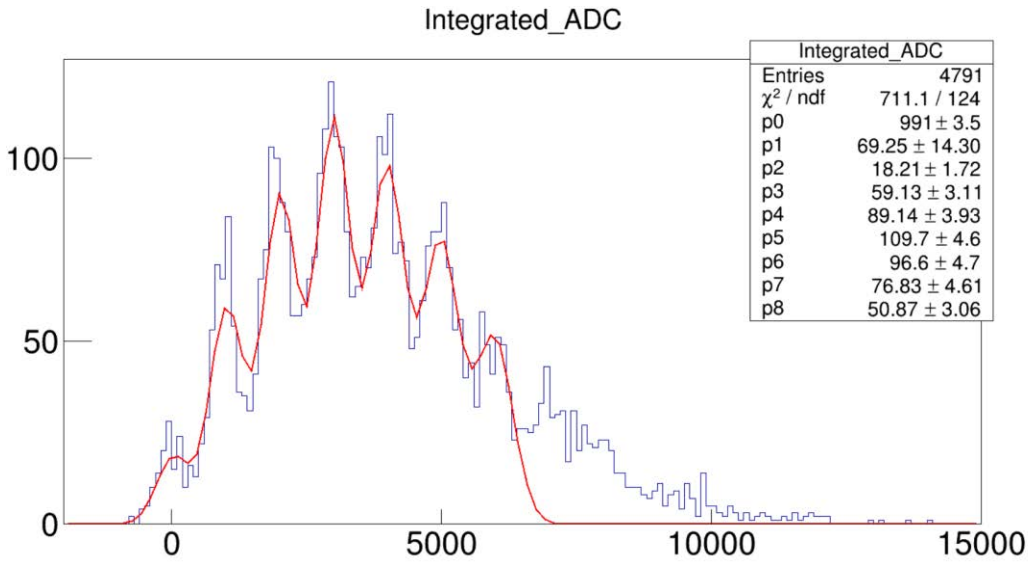
Fitting Function

```
double finger_ft(double *x, double *par)
{
    double ped = 22.78;
    double sigma_noise = 325.5;

  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] + sigma_noise * sigma_noise)));
  double y2 = exp(-(xx - 2 * par[0] - ped)*(xx - 2 * par[0] - ped) / (2.* (1. * par[1] * par[1] + sigma_noise * sigma_noise)));
  double y3 = exp(-(xx - 3 * par[0] - ped)*(xx - 3 * par[0] - ped) / (2.* (2. * par[1] * par[1] + sigma_noise * sigma_noise)));
  double y4 = exp(-(xx - 4 * par[0] - ped)*(xx - 4 * par[0] - ped) / (2.* (3. * par[1] * par[1] + sigma_noise * sigma_noise)));
  double y5 = exp(-(xx - 5 * par[0] - ped)*(xx - 5 * par[0] - ped) / (2.* (4. * par[1] * par[1] + sigma_noise * sigma_noise)));
  double y6 = exp(-(xx - 6 * par[0] - ped)*(xx - 6 * par[0] - ped) / (2.* (5. * par[1] * par[1] + sigma_noise * sigma_noise)));
  double fitval = (par[2] * y0 + par[3] * y1 + par[4] * y2 + par[5] * y3 + par[6] * y4 + par[7] * y5 + par[8] * y6);

  return fitval;
}
```

Fitting result



58 V

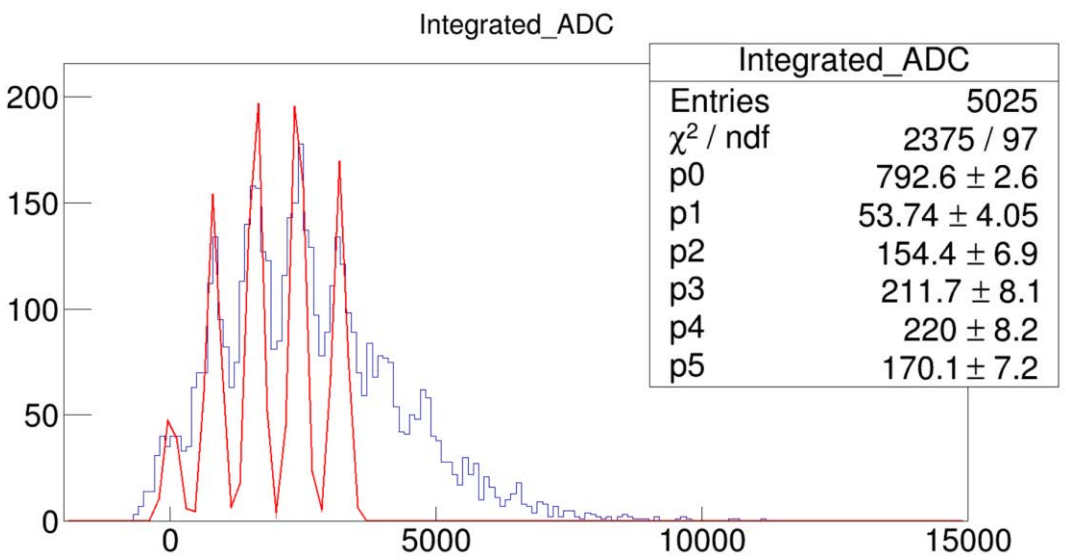


57 V

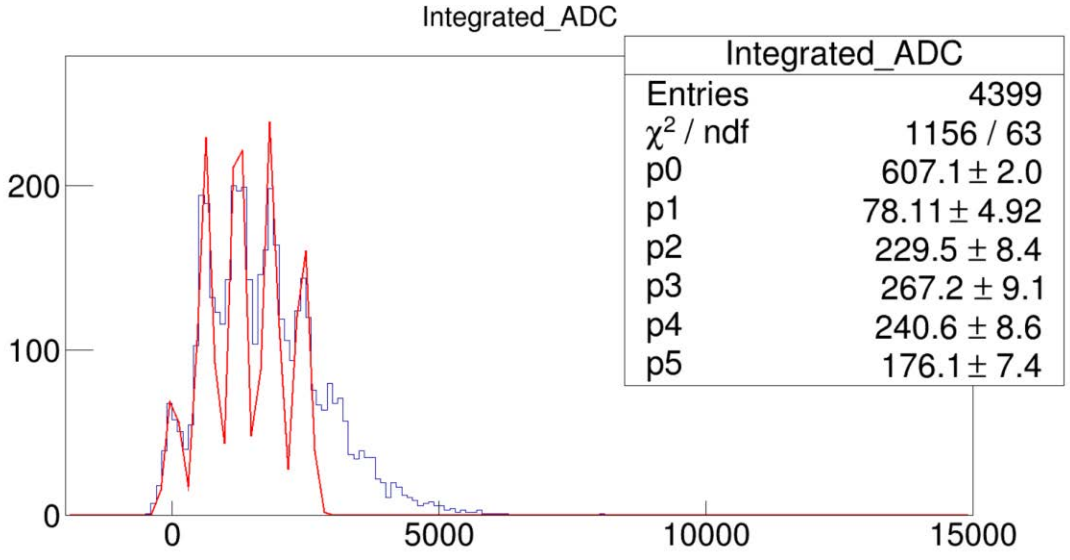
Fitting Function

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

Fitting result

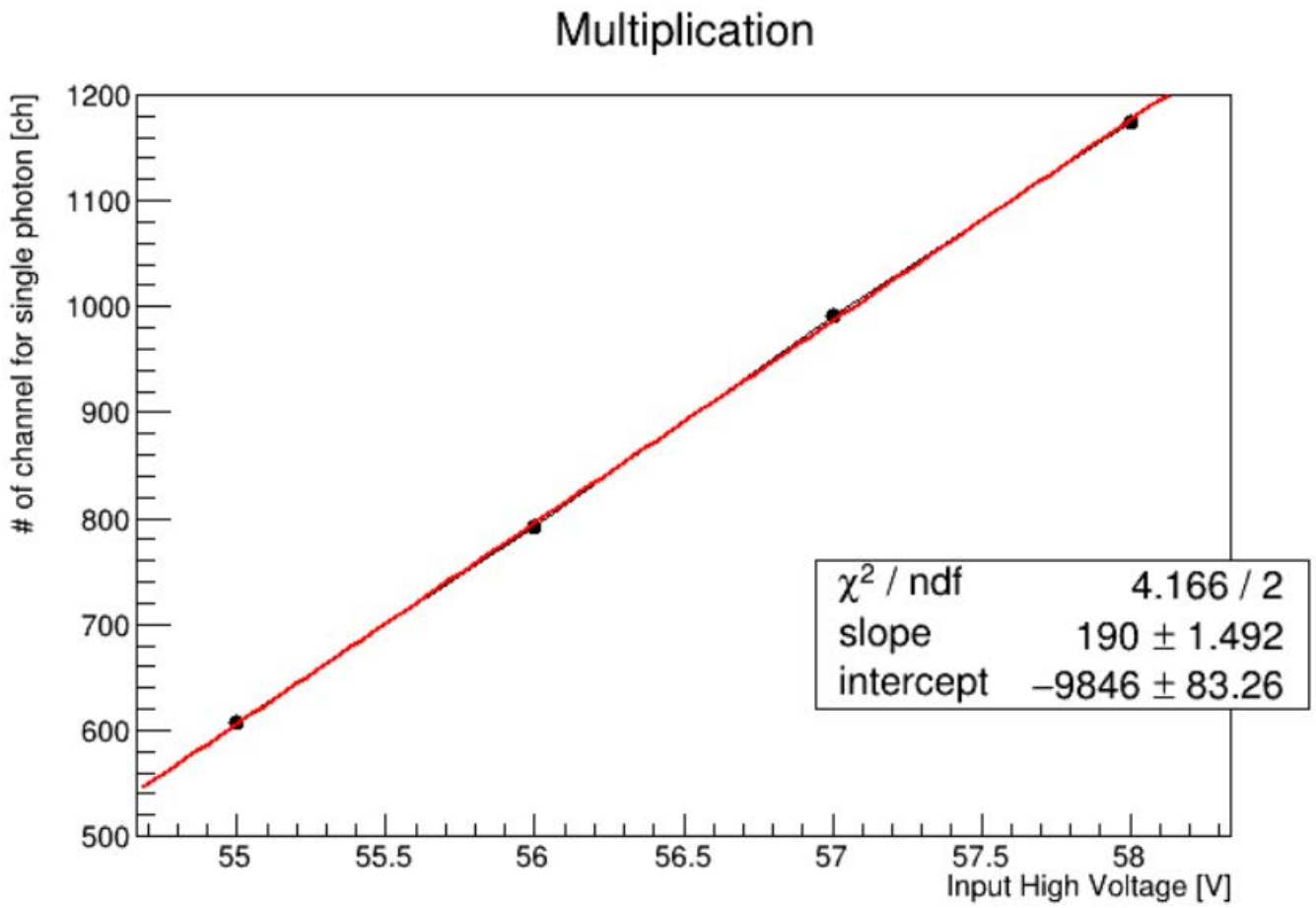


56 V



55 V

Gain


Multiplication
# of channel for single photon [ch]
1200
1100
1000
900
800
700
600
500
55
55.5
56
56.5
57
57.5
58
Input High Voltage [V]
χ² / ndf 4.166 / 2
slope 190 ± 1.492
intercept −9846 ± 83.26