Monitoring Program for ECL Trigger System

KU Group Meeting 2017.03.28

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- Consistency of FAM and TMM
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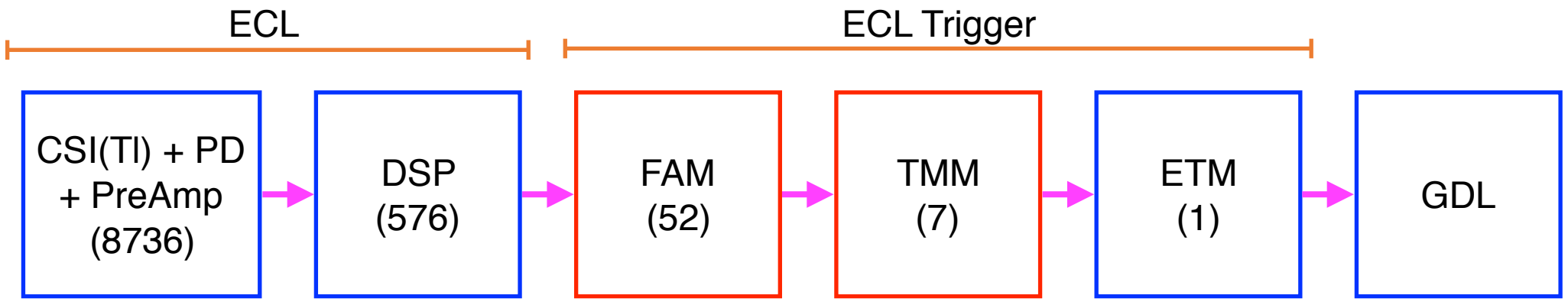
Introduction

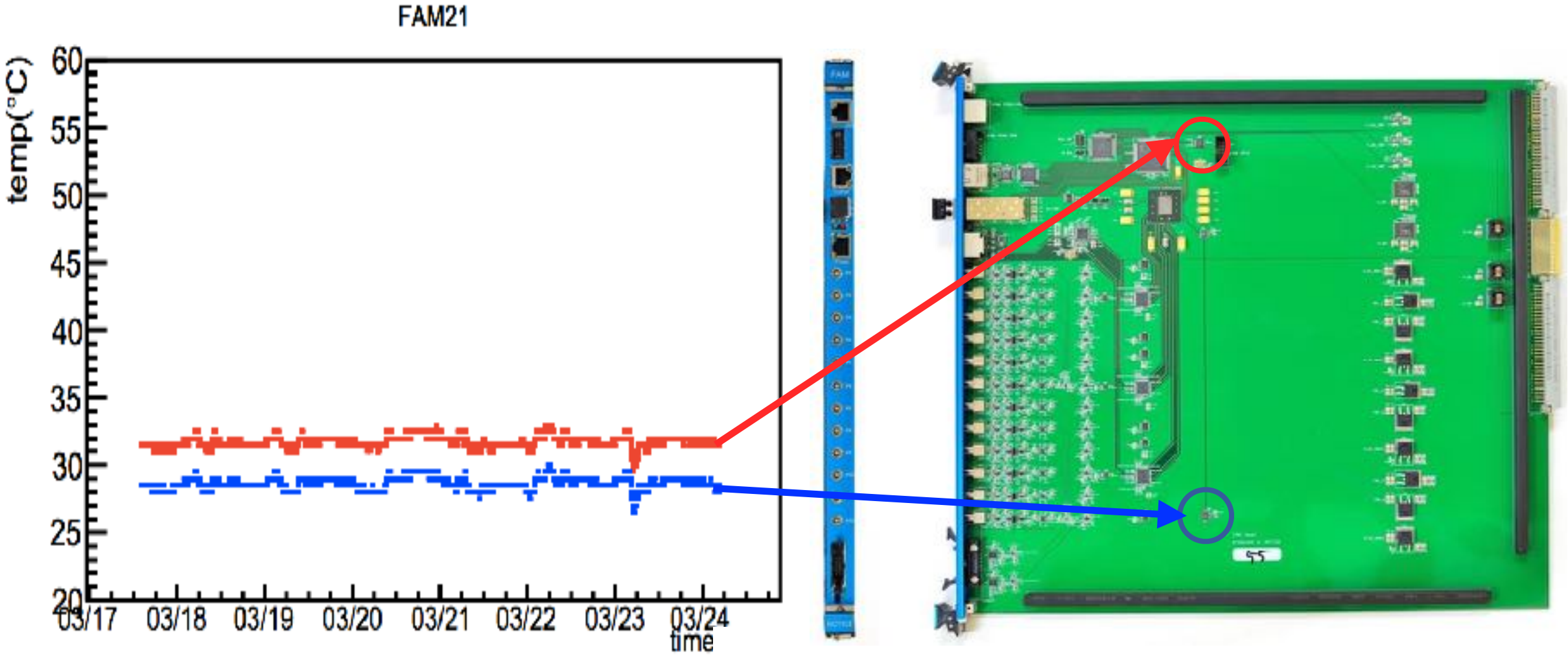


- FAM(FADC Analysis Module) evaluates energy and timing of signal
- TMM(Trigger Merge Module) merges FAM information and sends it to ETM(ECL Trigger Master)
- Monitoring for checking stability of FAM&TMM

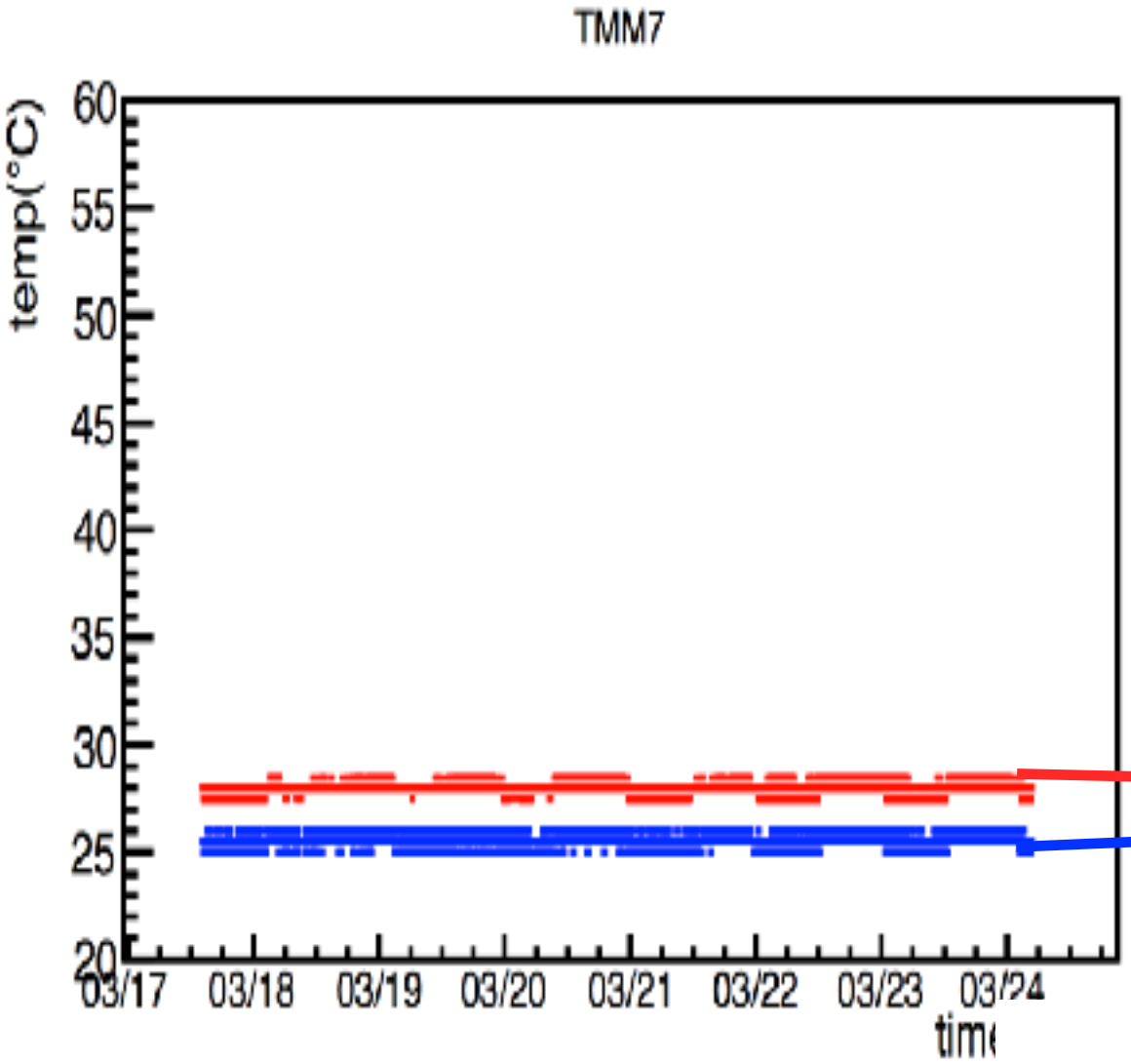
Monitoring Contents

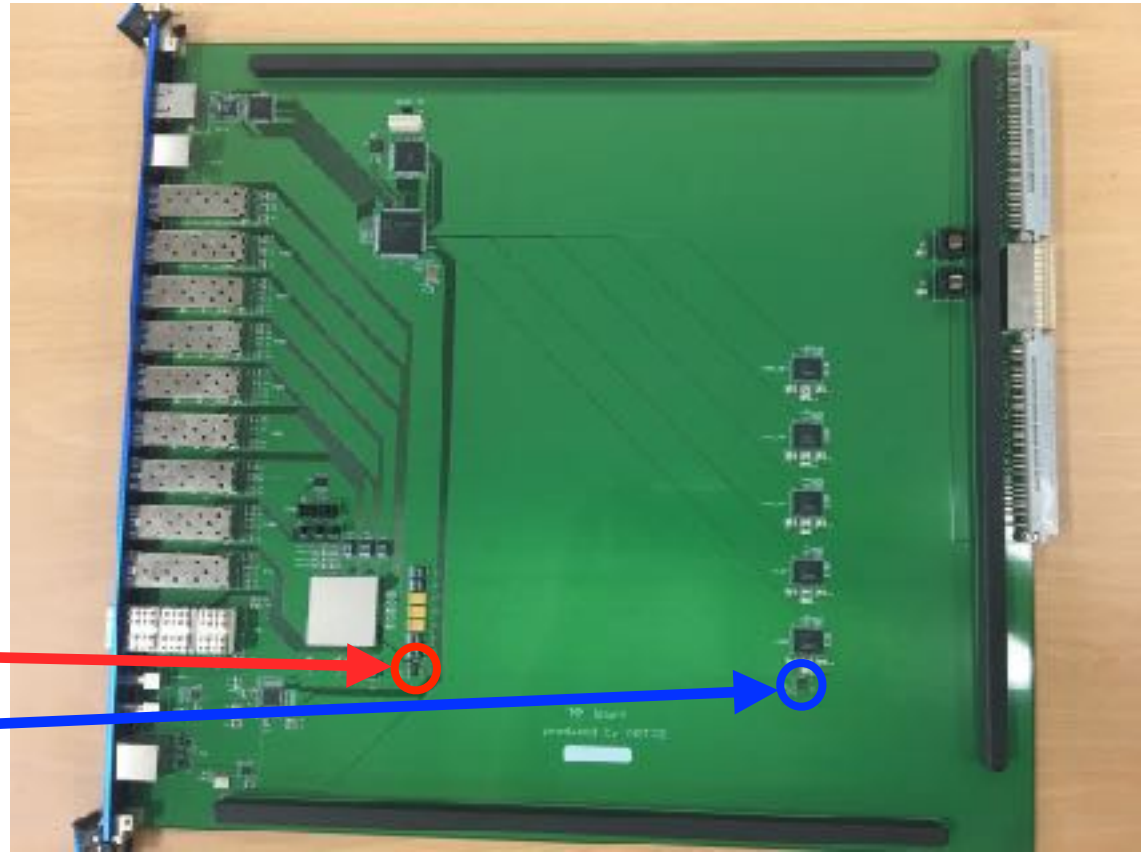
- FAM monitoring
  - Recording noise, pedestal, temperature and hit rate with time at every specific period
- TMM monitoring
  - Recording temperature and hit rate with time at every specific period
- Saving the data in text file classified by each day
- The monitoring program runs continuously

Temperature (FAM)

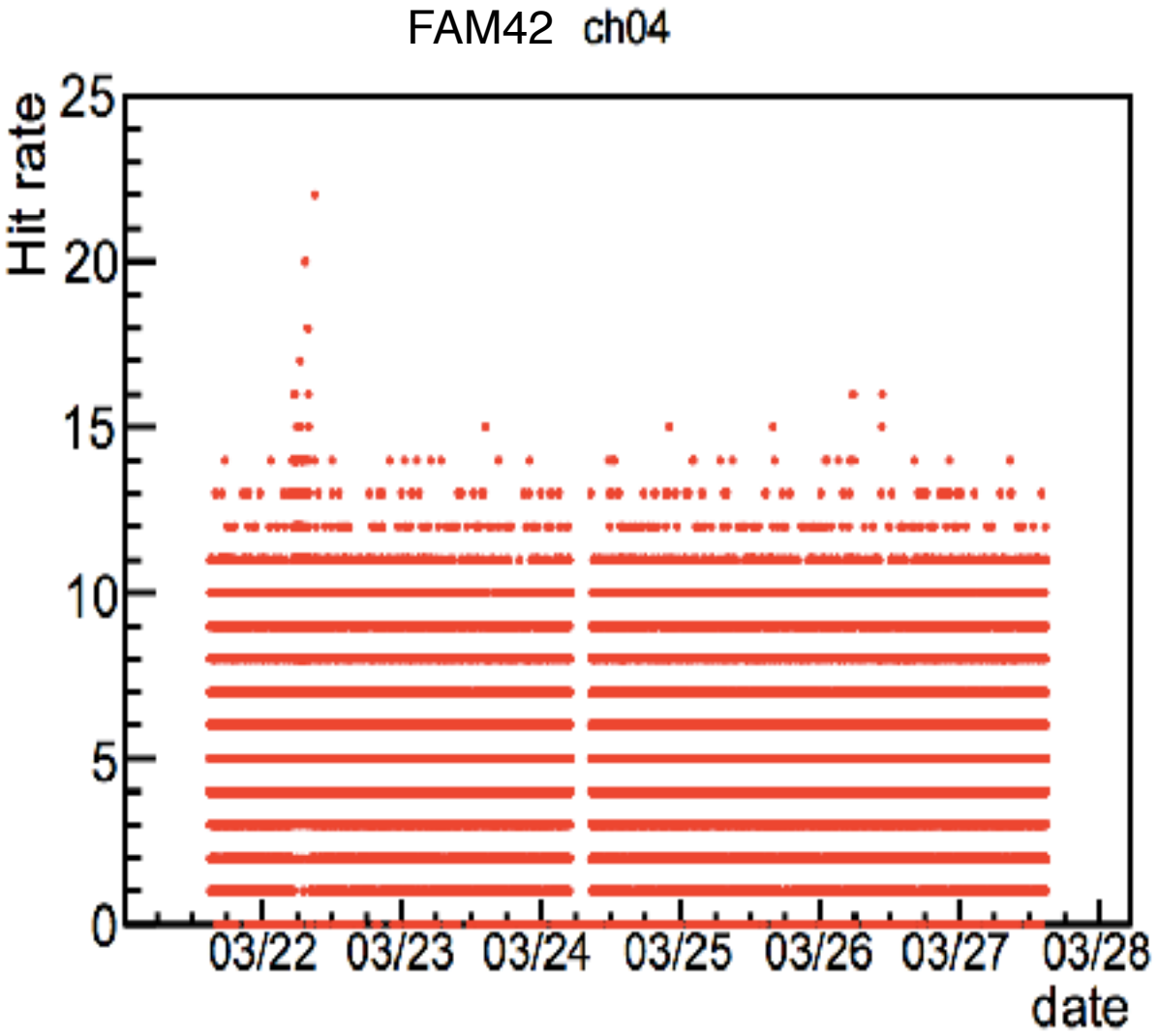


Temperature (TMM)



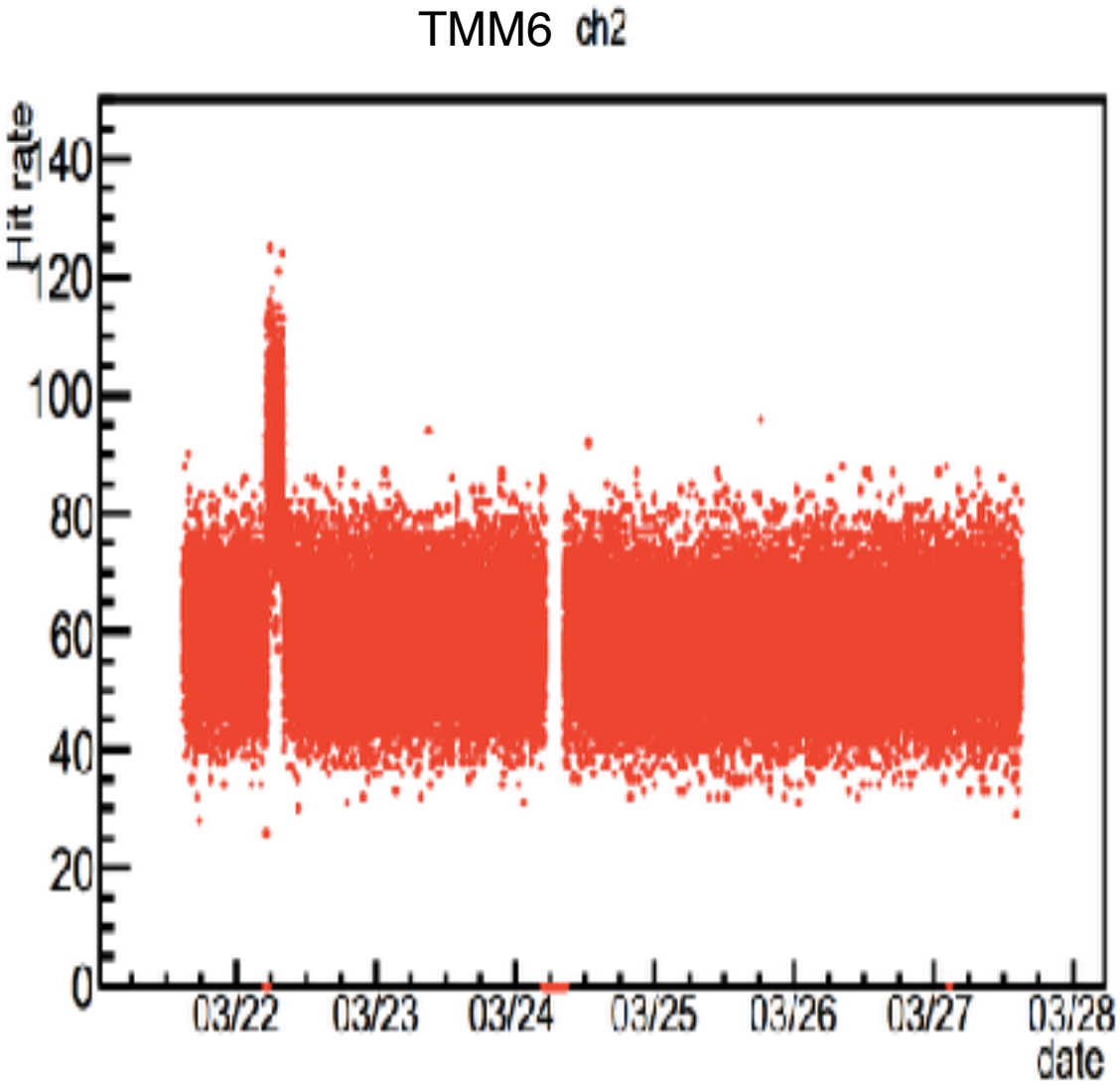


Hit rate (FAM)



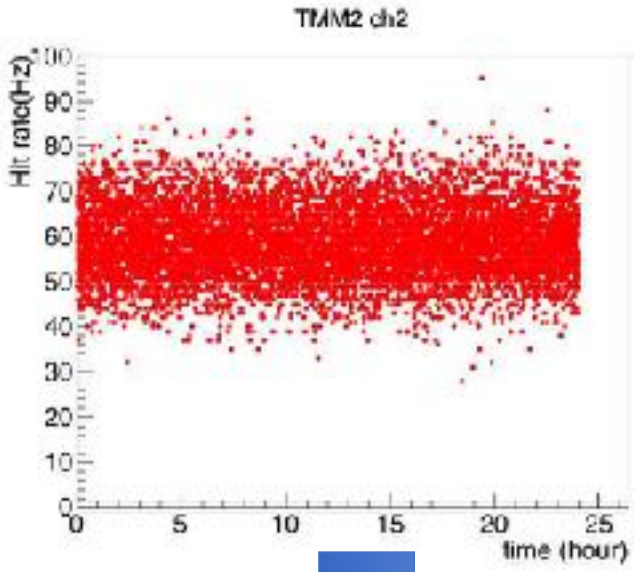
- Hit rate is average over 1second
- Time interval between each data point is 10 seconds
- Hit rate can increase when someone change threshold level

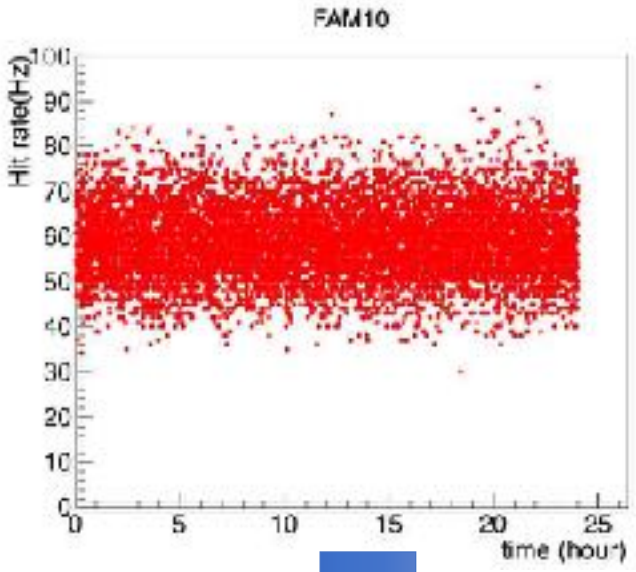
Hit rate (TMM)

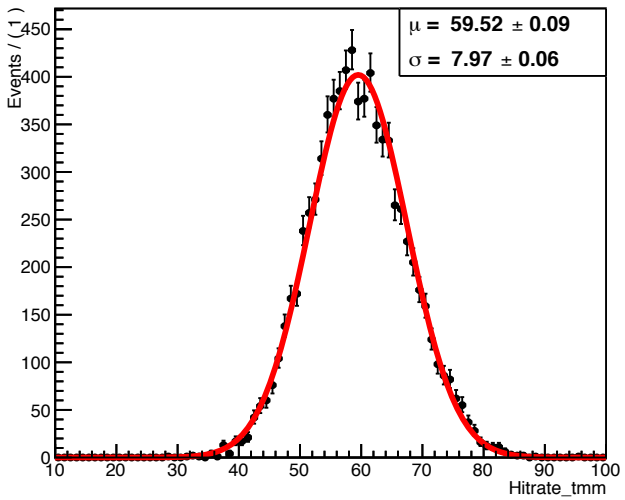


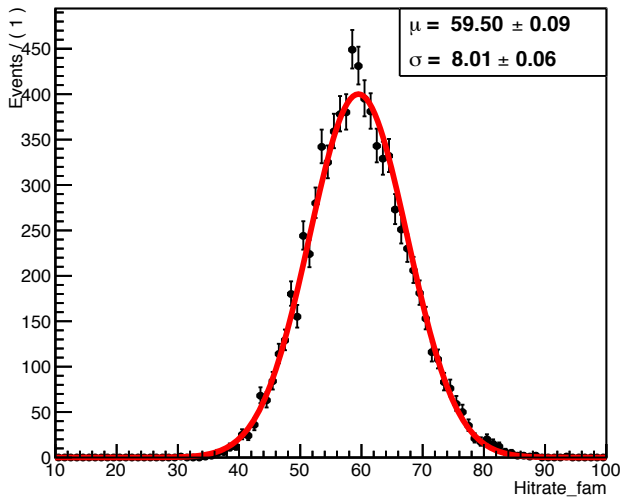
- Recording condition is same as FAM
- Each channel of TMM corresponds to sum of all channels of one FAM
- TMM information should be consistent with information from FAM

Consistency







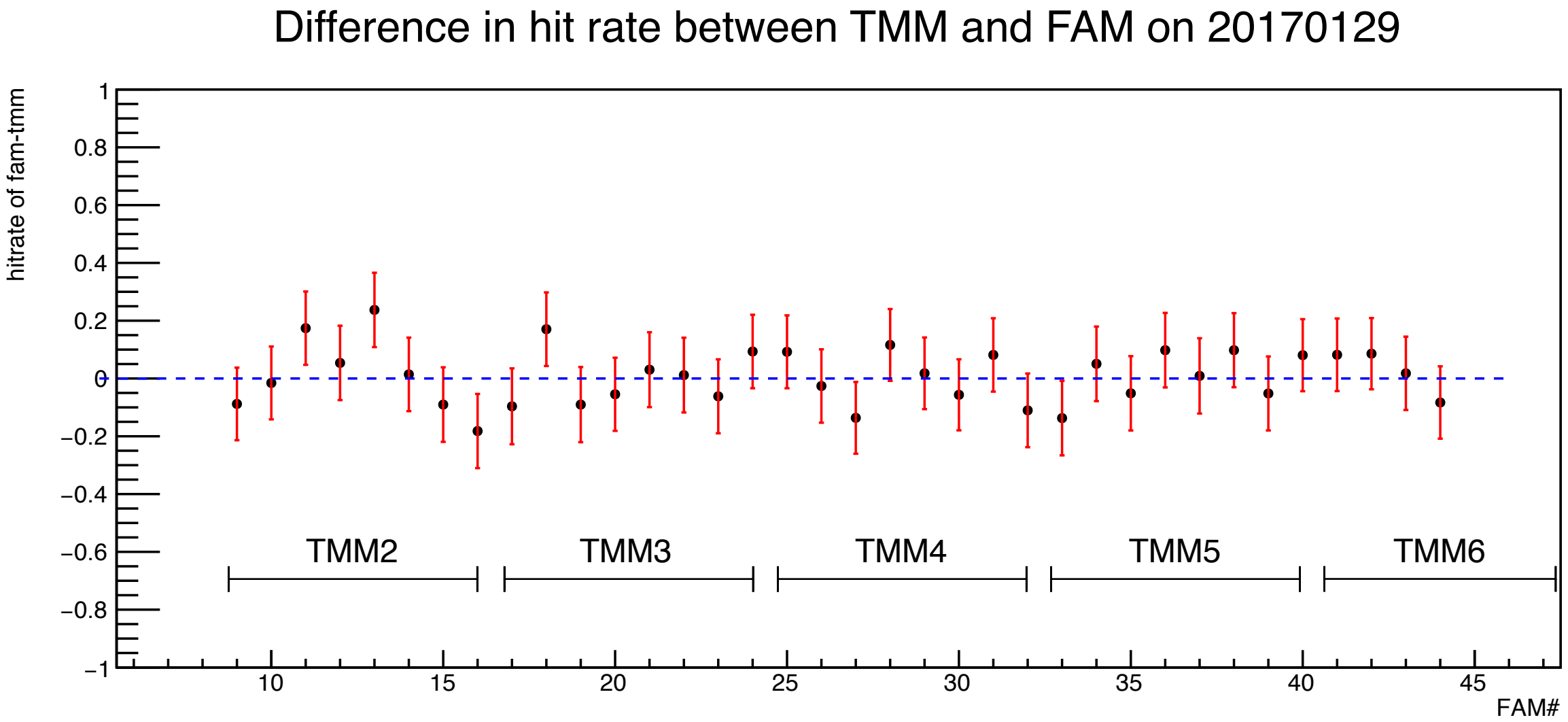


- We have to check consistency of data from TMM and FAM

Comparison TMM with FAM on 20170129

- FAM10 corresponds to TMM2 ch2
- Project above two graphs to y-axis then we get below histogram.
- Fit to Gaussian P.D.F.
- Compare two results

Consistency



Back up

Noise Monitoring

1. FADC sampling

2. Gaussian fit

3. Recording the result

4. Recording sampling data
if noise level is high or low

Noise Monitoring

64MHz, 20480 datapoint / sampling

FADC Sampling

↓

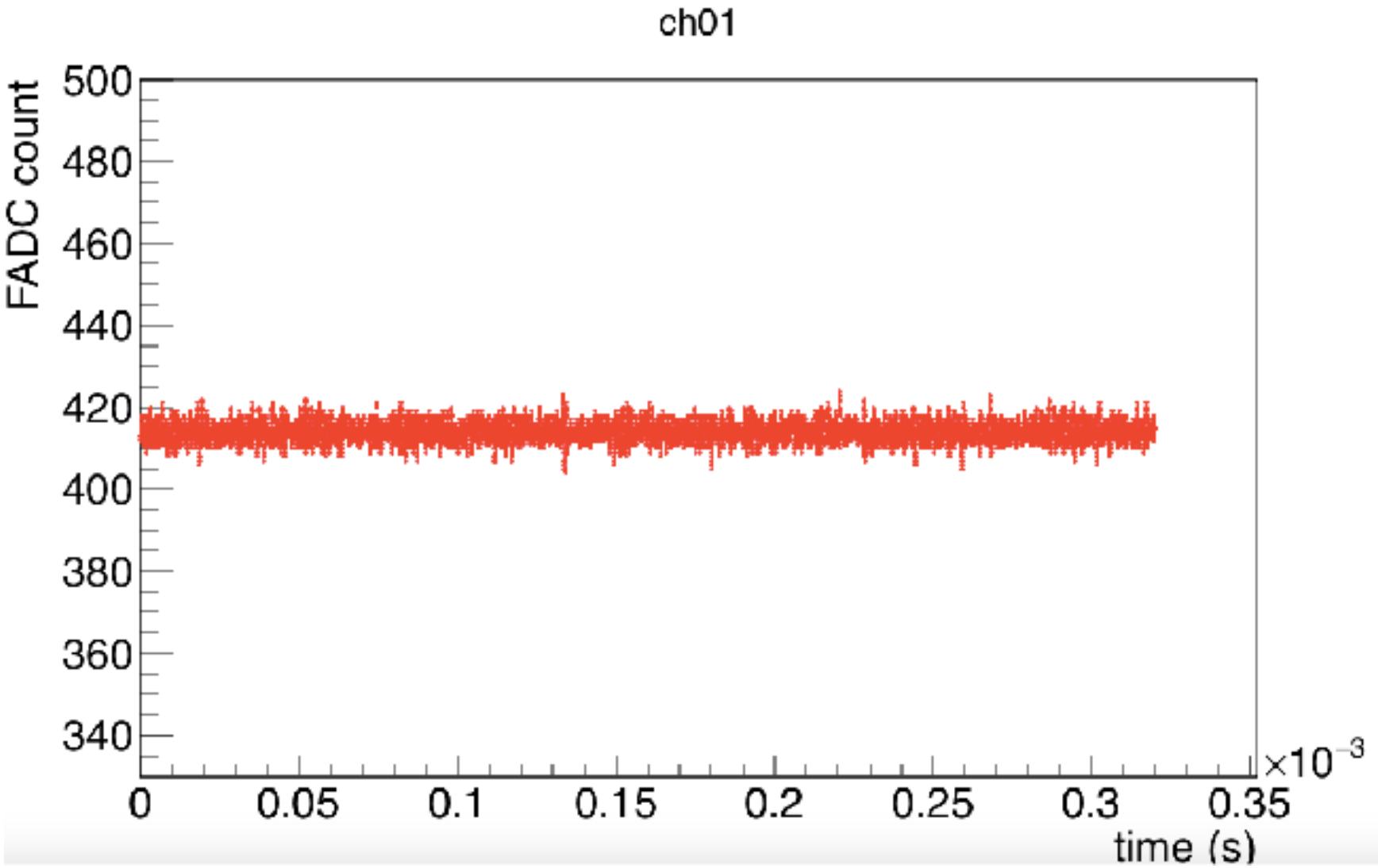
Gaussian Fitting

↓

Recording the result

↓

Recording Sampling data



Noise Monitoring

FADC Sampling

↓

Gaussian Fitting

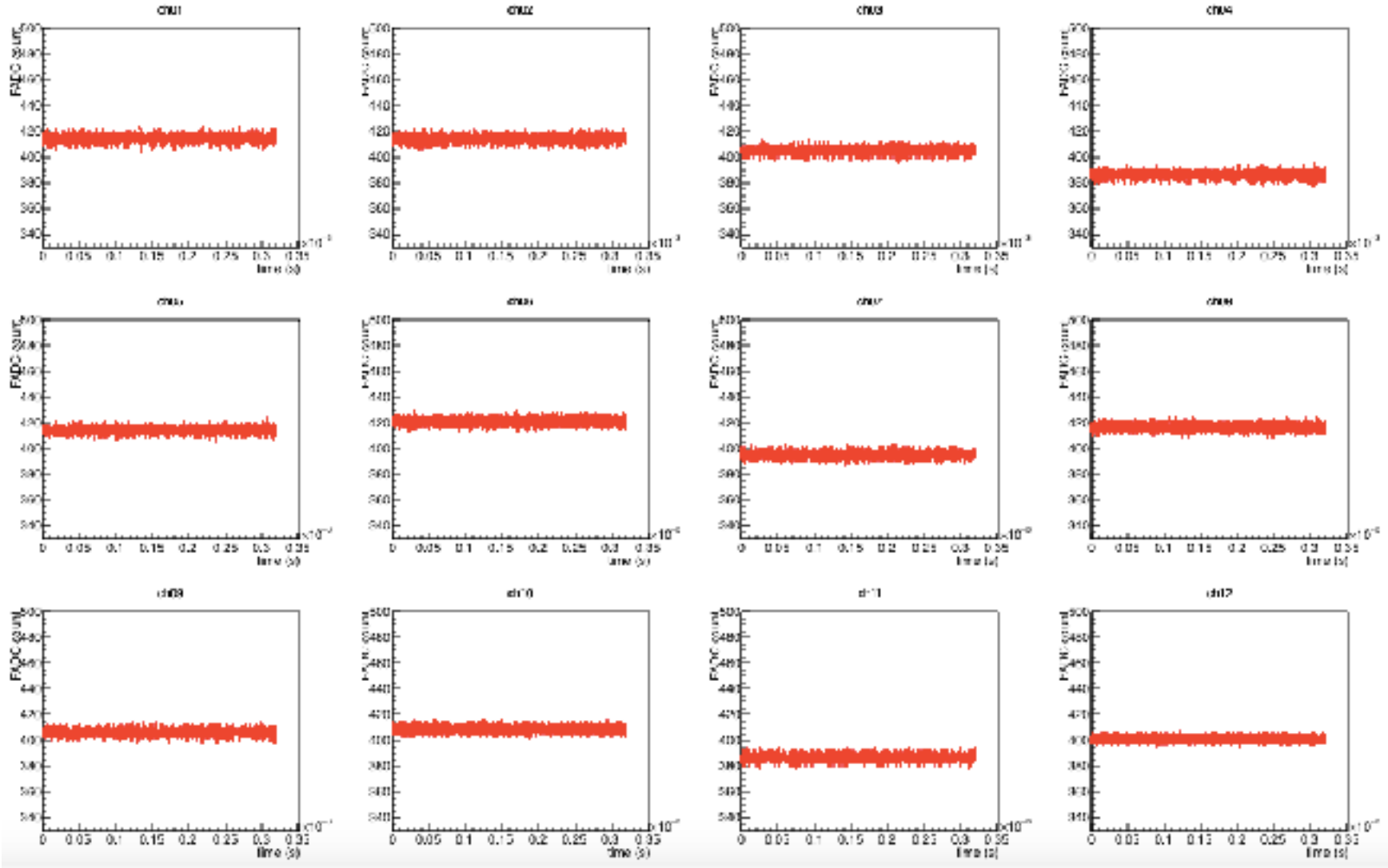
↓

Recording the result

↓

Recording Sampling data

One FAM has 12 channels



Noise Monitoring

FADC Sampling

↓

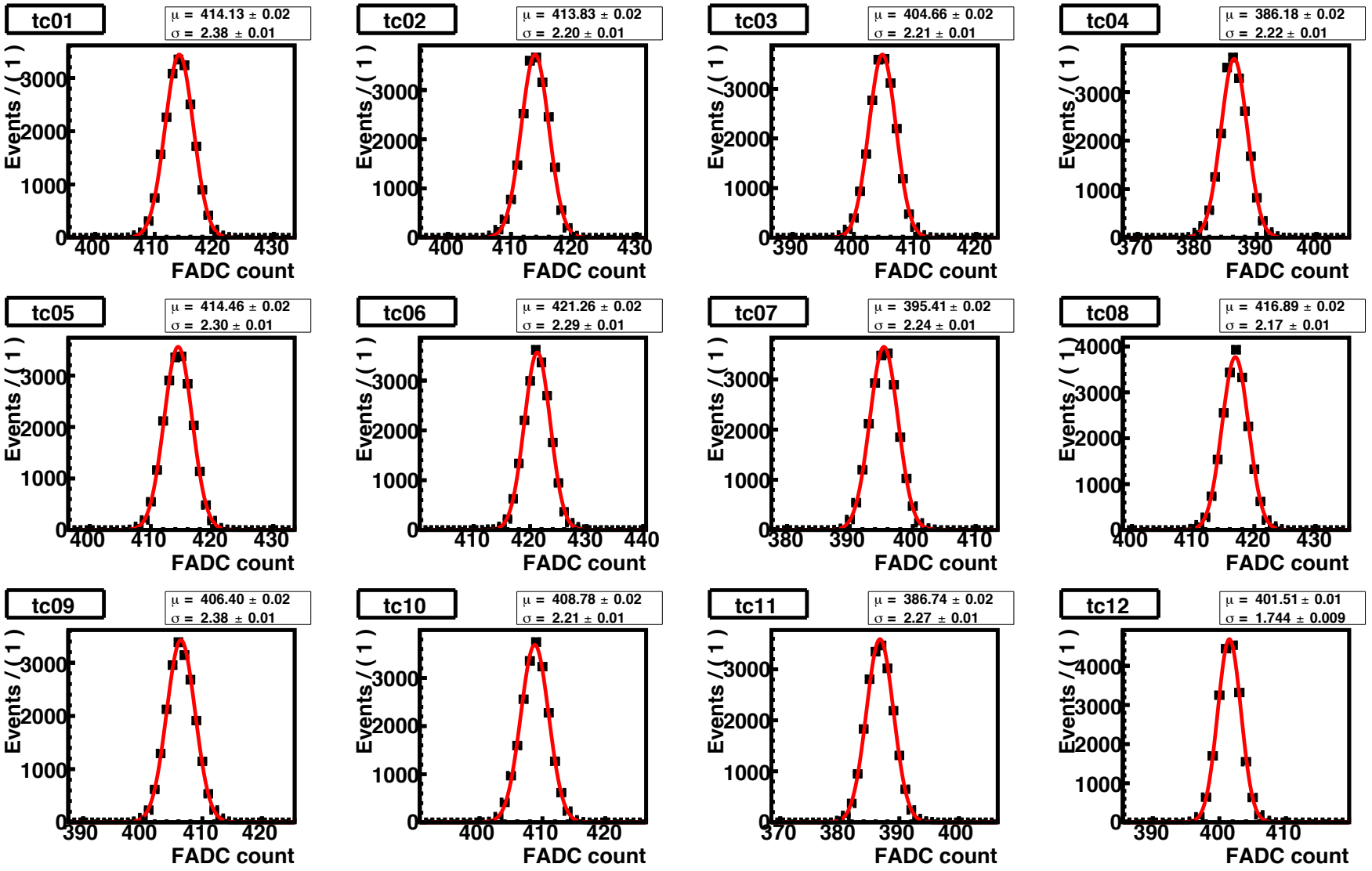
Gaussian Fitting

↓

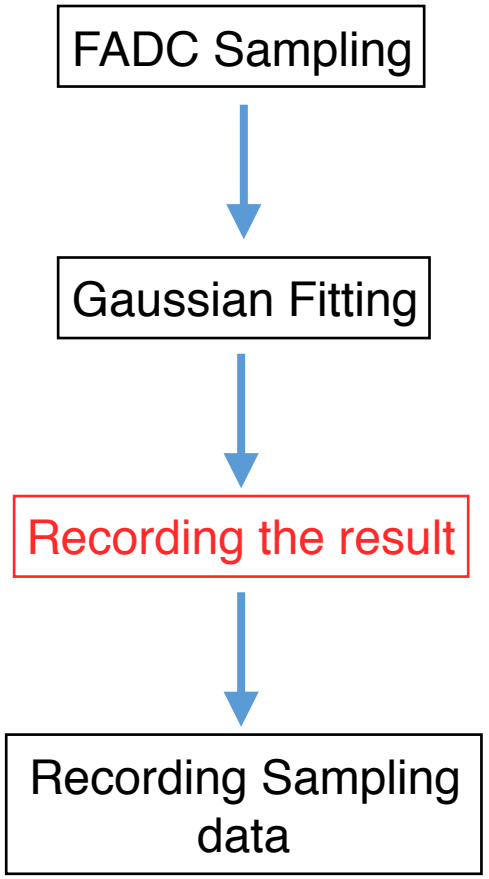
Recording the result

↓

Recording Sampling data



Noise Monitoring



Record following contents :

pedestal (μ), noise (σ) , incoh. noise and noise ratio with time

Noise Monitoring

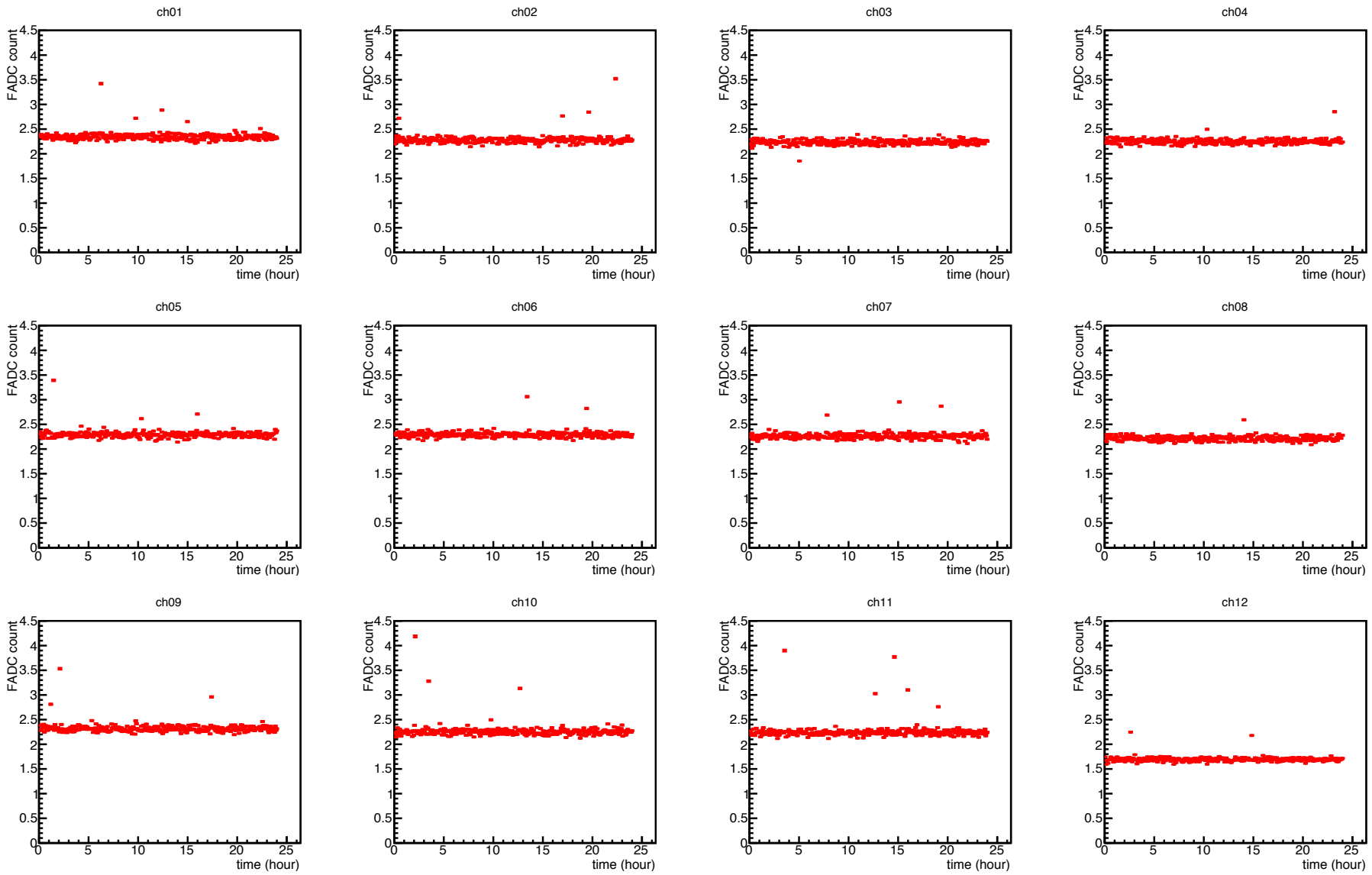
FADC Sampling

Gaussian Fitting

Recording the result

Recording Sampling data

FAM #10 on 04. Sep. 2016



Noise Monitoring

FADC Sampling

↓

Gaussian Fitting

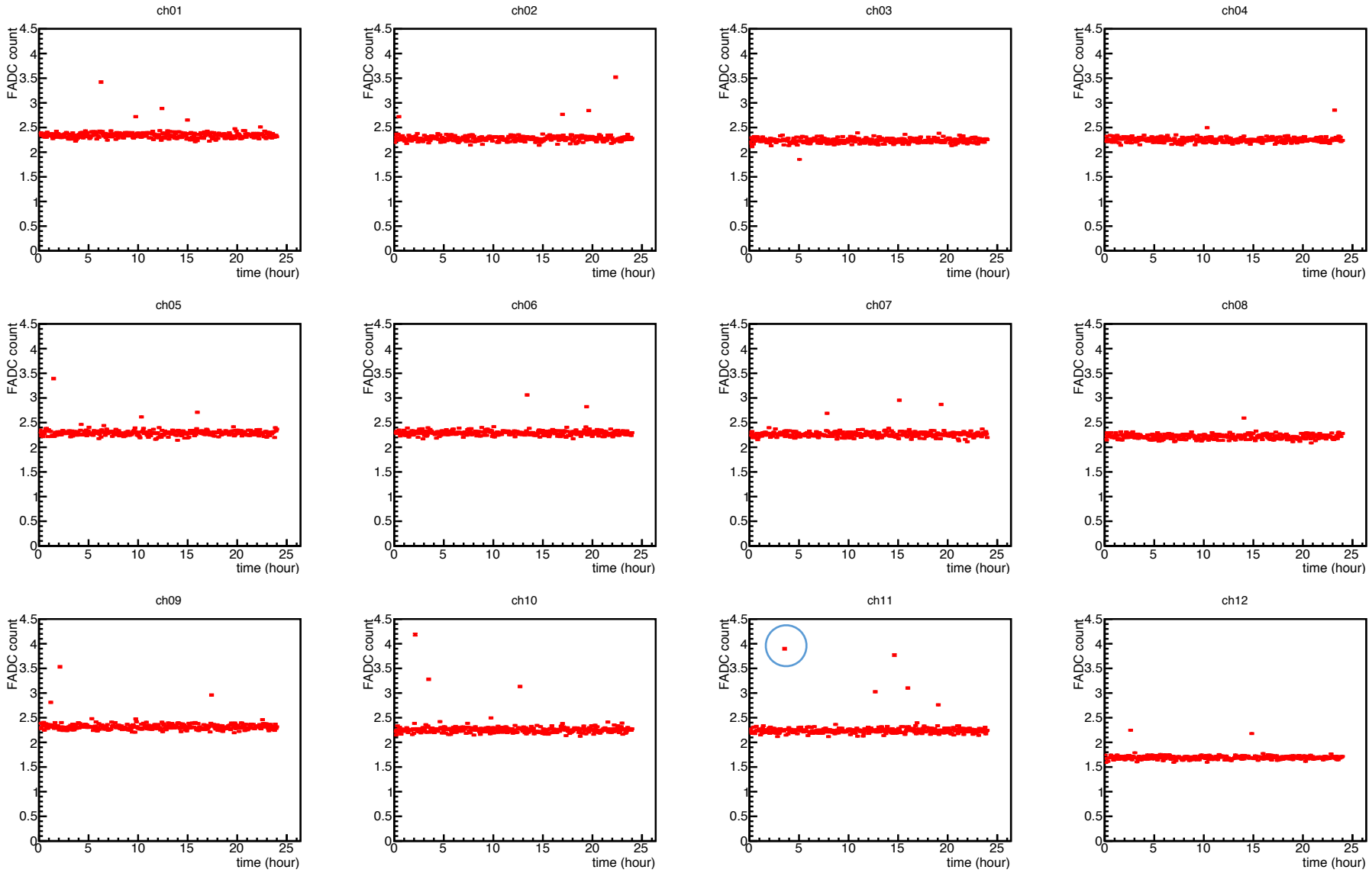
↓

Recording the result

↓

Recording Sampling data

FAM #10 on 04. Sep. 2016



Noise Monitoring

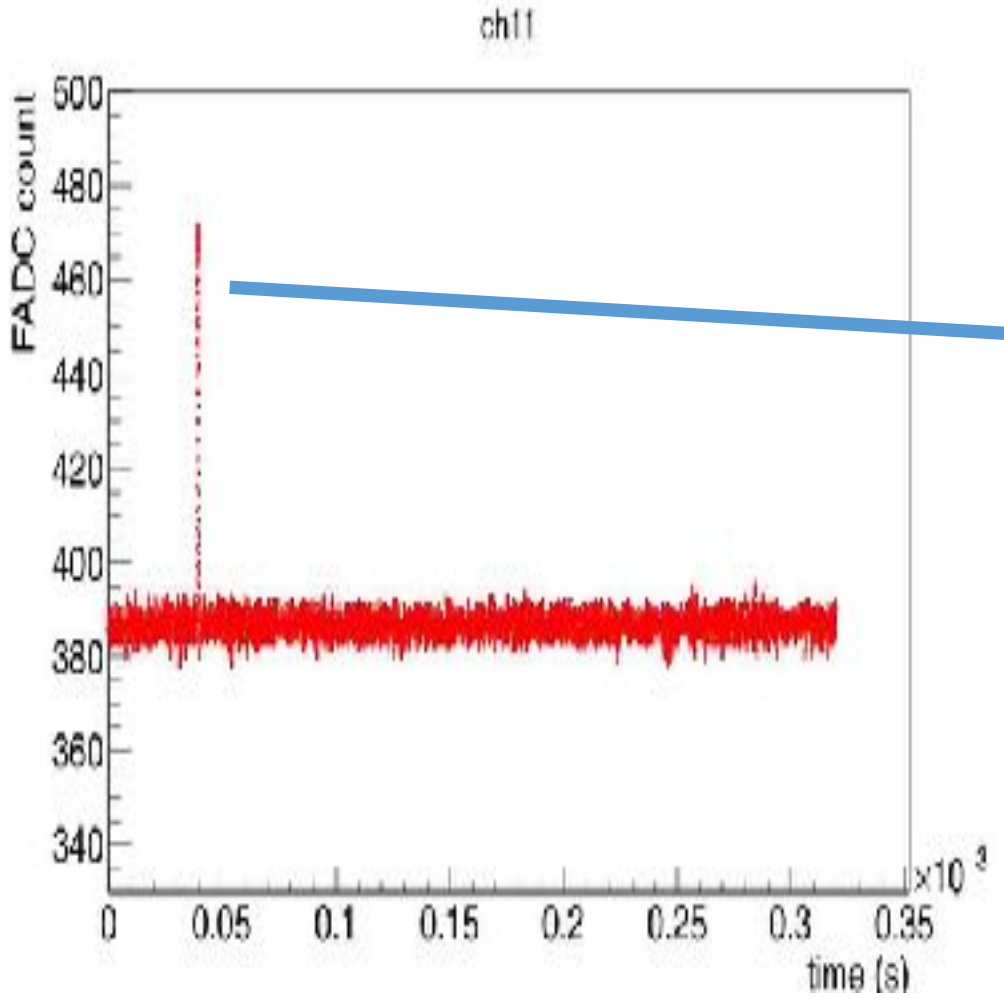
FADC Sampling

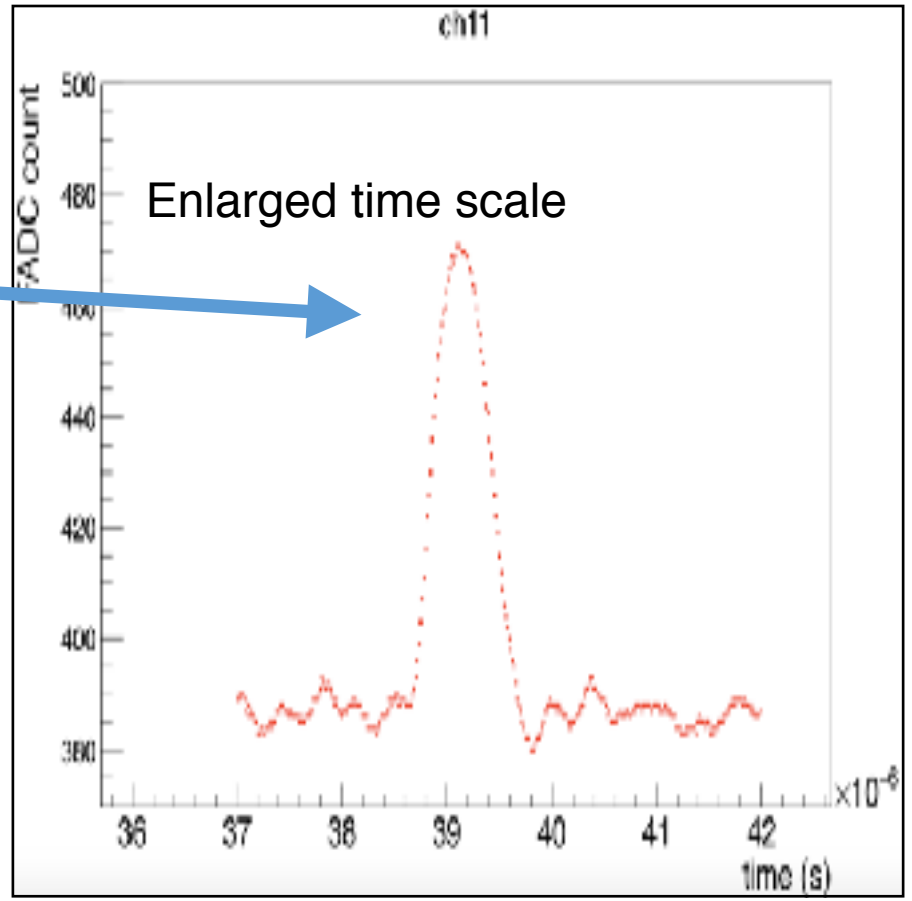
Gaussian Fitting

Recording the result

Recording Sampling data

FAM #10 at 03:24 on 04. Sep. 2016





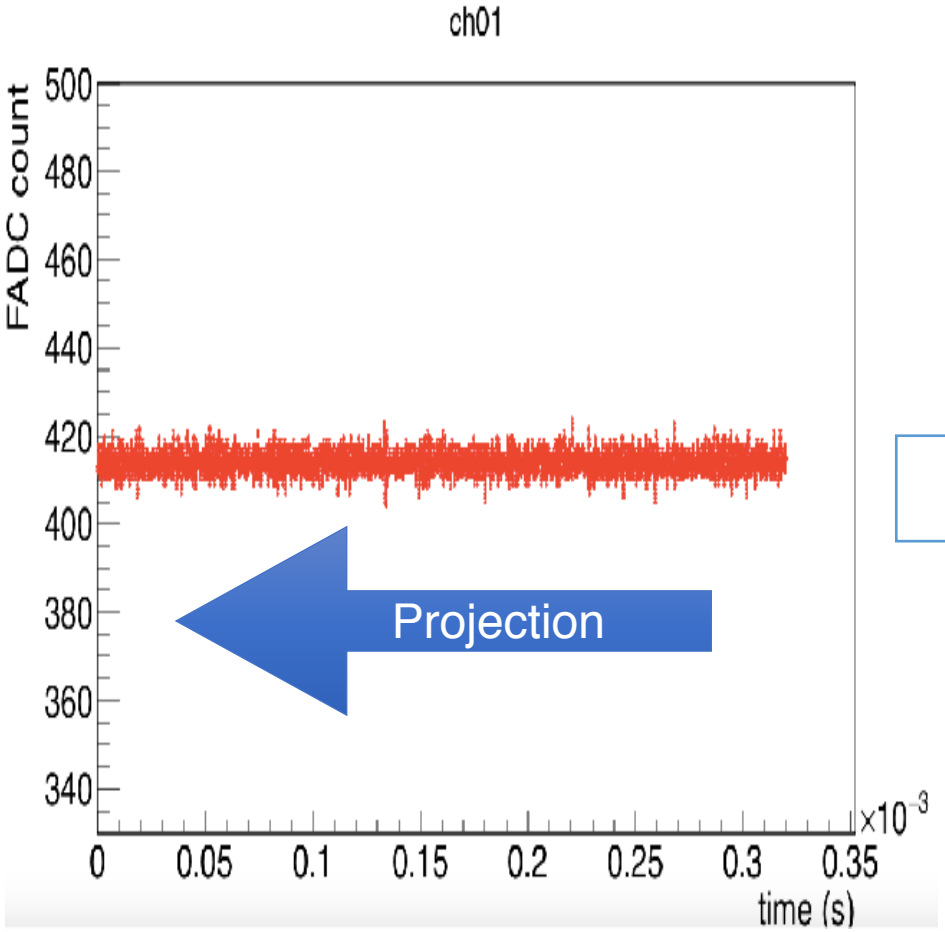
Projection & Gaussian Fitting

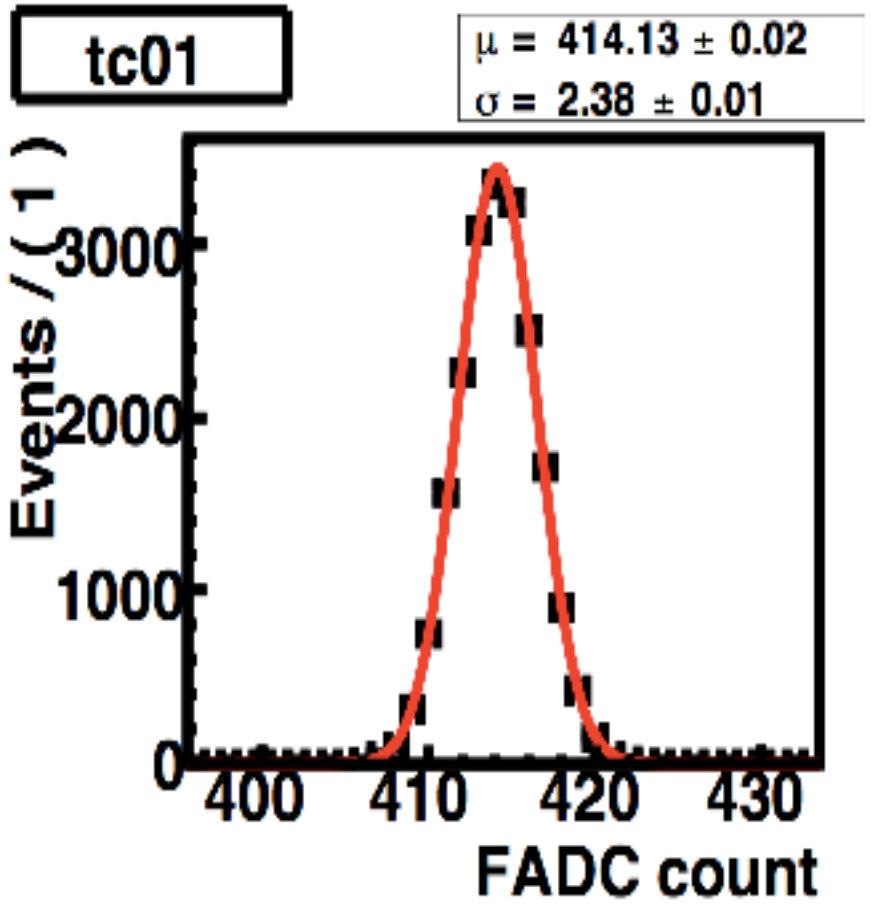
FADC Sampling

Gaussian Fitting

Recording the result

Recording Sampling data





Electronic noise

$$\sigma_{\text{1Channel}} = \sqrt{\sigma^2_{\text{incoherent}} + \sigma^2_{\text{coherent}}}$$

$$\sigma_{\text{nChannel}} = \sqrt{n\sigma^2_{\text{incoherent}} + n^2\sigma^2_{\text{coherent}}}$$

$$\sigma_{\text{coherent}} = \sqrt{\frac{\sigma^2_{\text{nChannel}} - n\sigma^2_{\text{1Channel}}}{n(n-1)}}$$