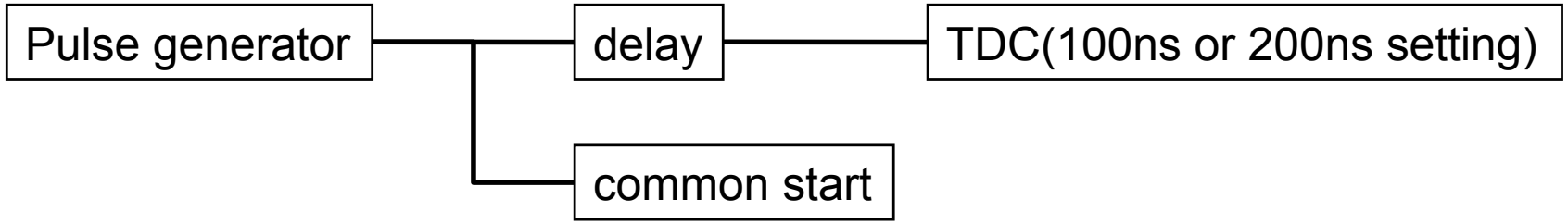
CDH time resolution

M.Tokuda

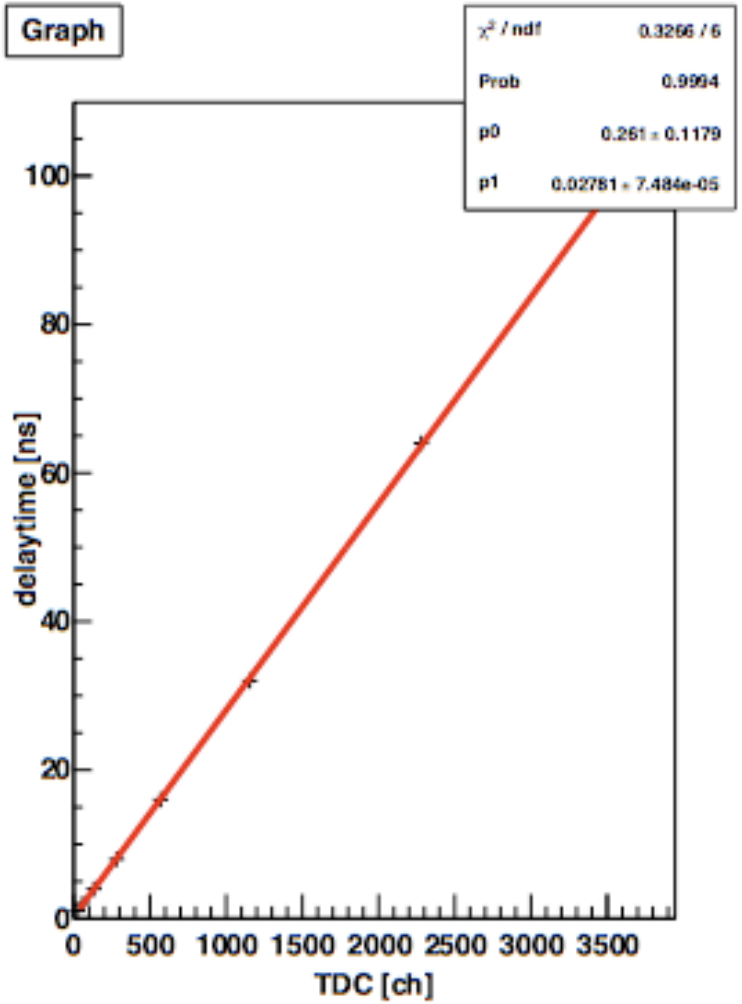
目的:CDHの基本性能である時間分解能を調べる

・まずTDC-calibrationを行った。
次の回路によりチャンネルあたりの時間([s]/[ch])を測定した。



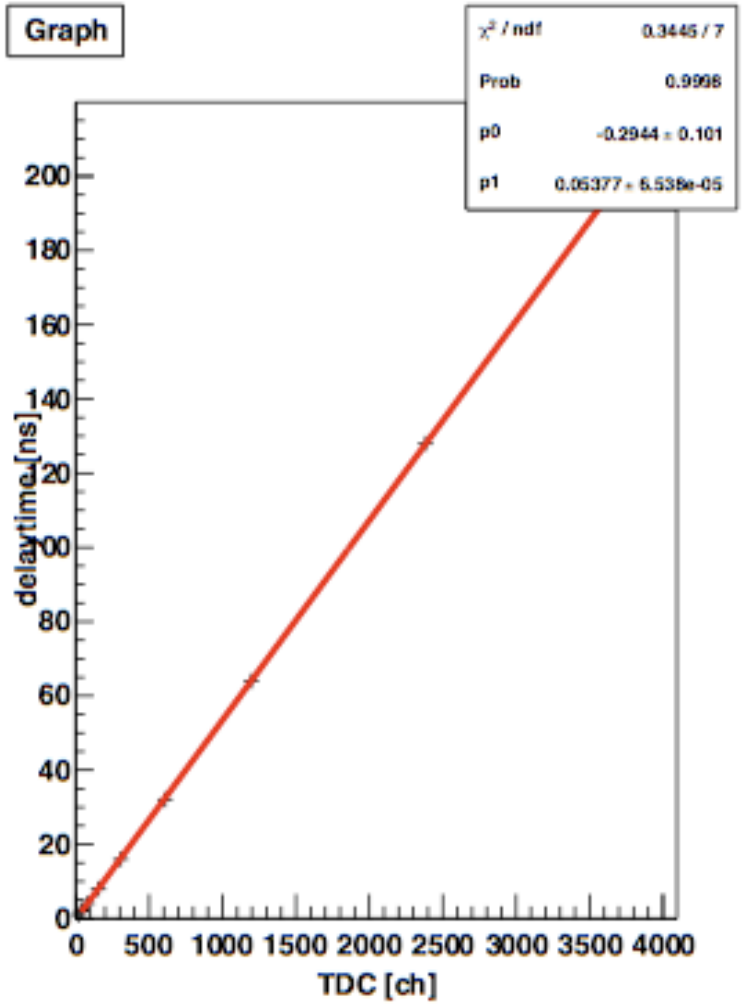
TDC-calibration

100ns設定(最大118ns)
8点→1,2,4,8,16,32,64,100ns



TDC-118[ns]/4096[ch]
仕様値:25[ps/ch]
測定値:27.51[ps/ch]

200ns設定(最大238ns)
9点→1,2,4,8,16,32,64,128,200ns



TDC-238[ns]/4096[ch]
仕様値:50[ps/ch]
測定値:53.77[ps/ch]

・CDH time resolution

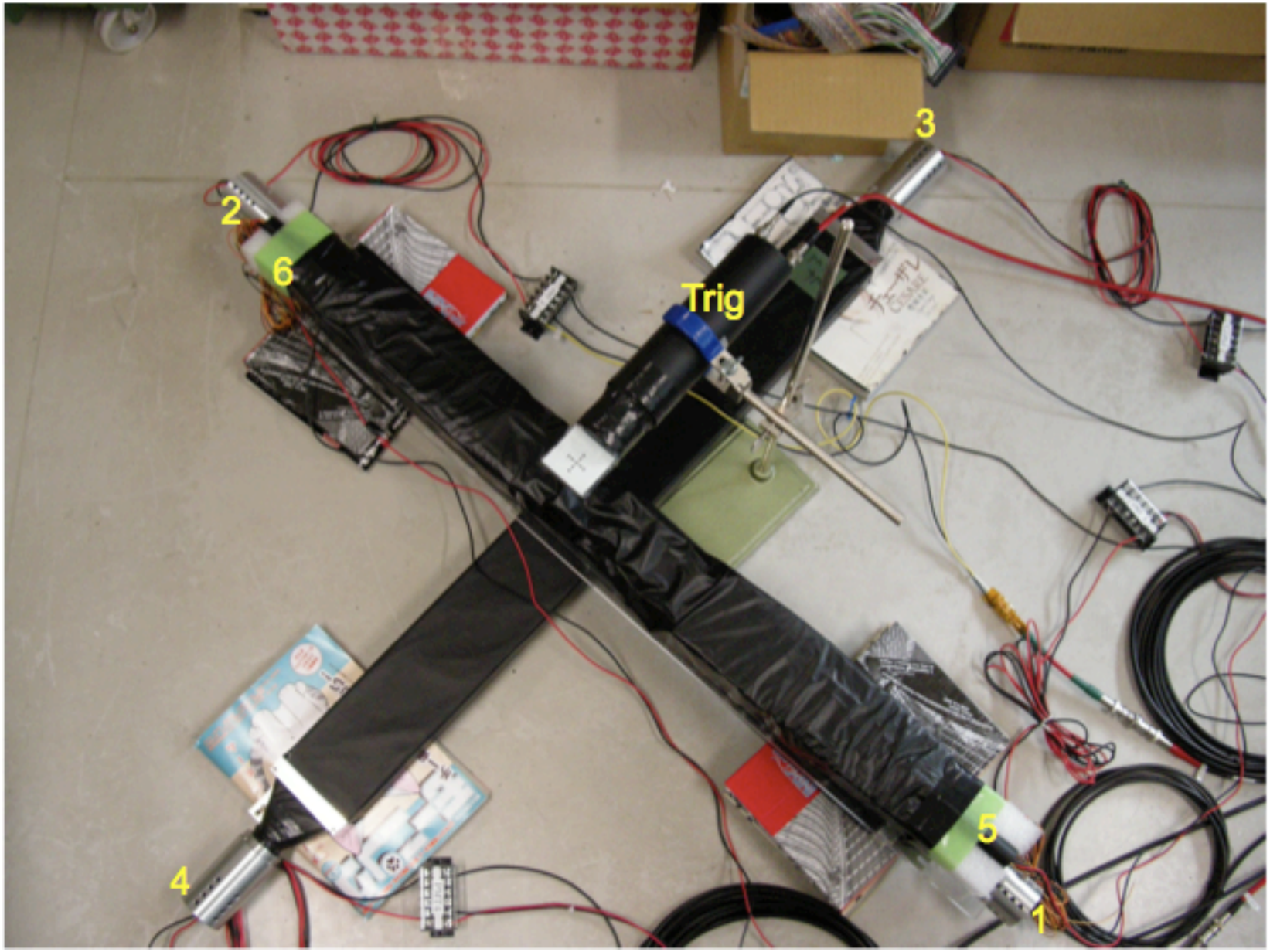
CDH2本でのσ_{TOF}を
次の3つの条件で測定した。

1. CDHの中央で交差させ（図は5ページ）、PMTのgain calibrationでgainが一定になるHV(ADC1000ch)設定にして測定。
2. CDHの交差する位置をずらして測定（図は13ページ）。
3. PMTのgainが2倍になるHV(ADC2000ch)設定にして測定。

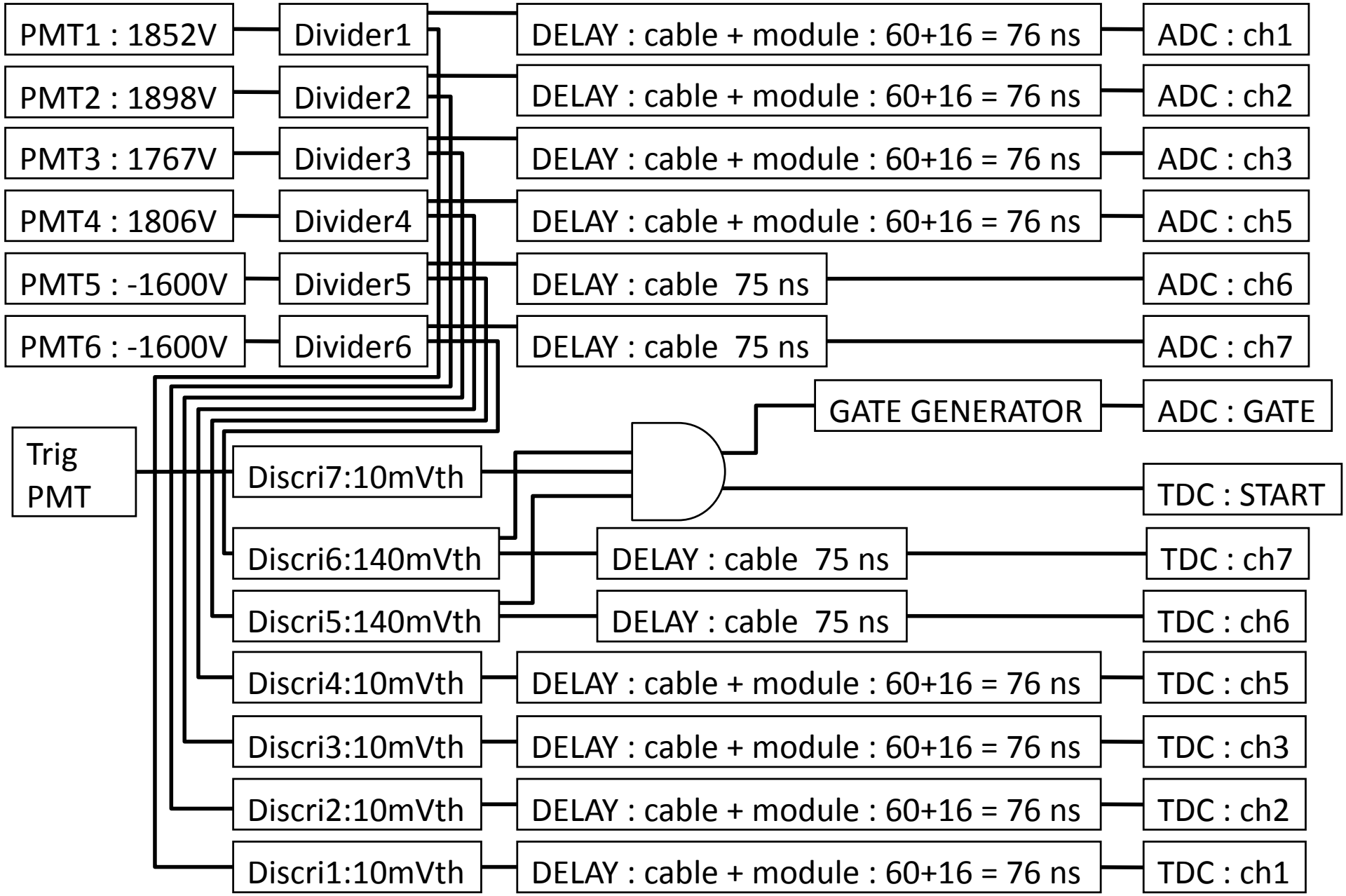
TDCは100ns設定を使用した

CDH-time-resolution system setting

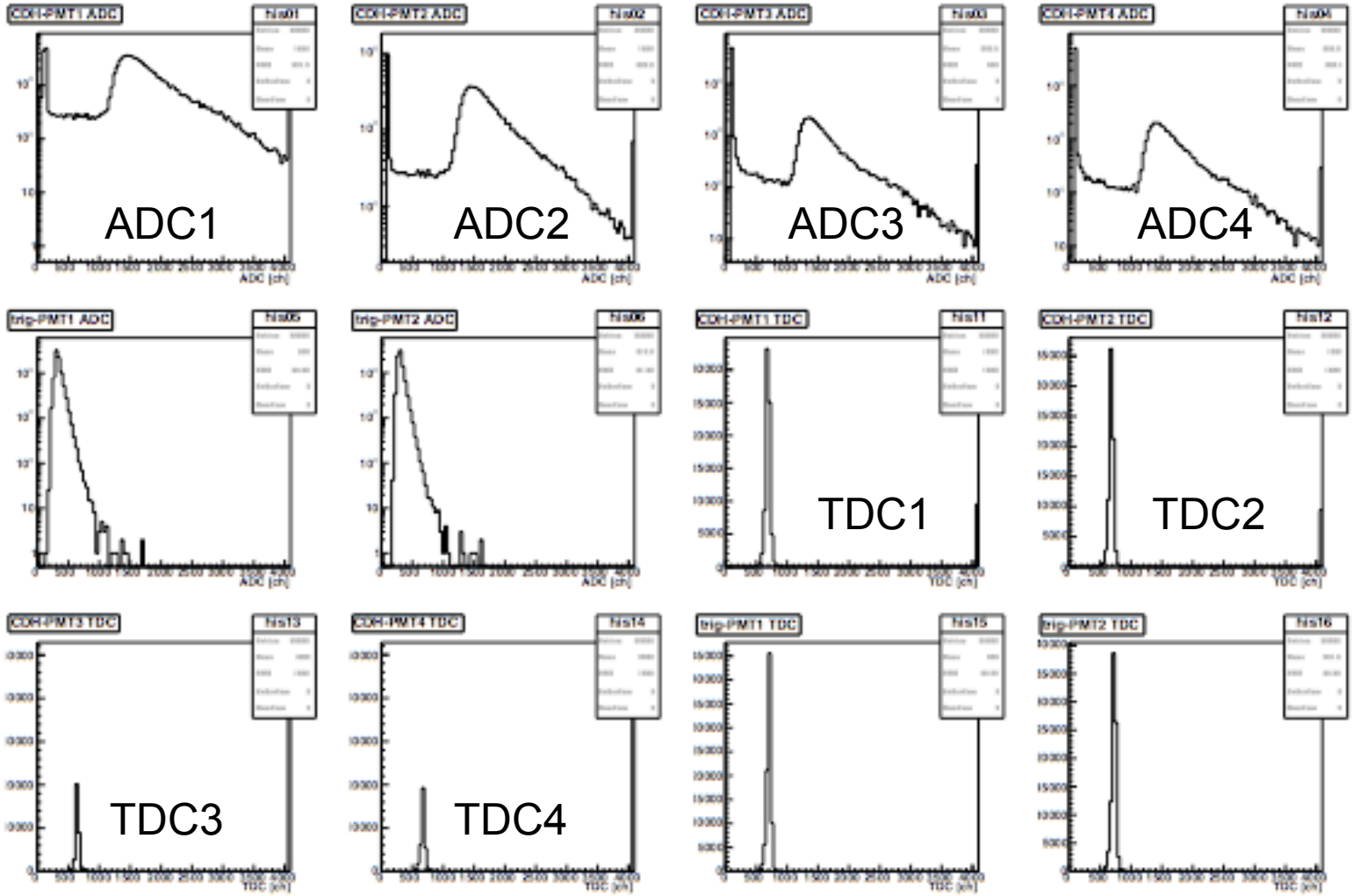
Trig:H6410
CDH:H8409



CDH-time-resolution ADC1000ch setting circuit



CDH-time-resolution
Data1: ADC1000ch setting
raw data

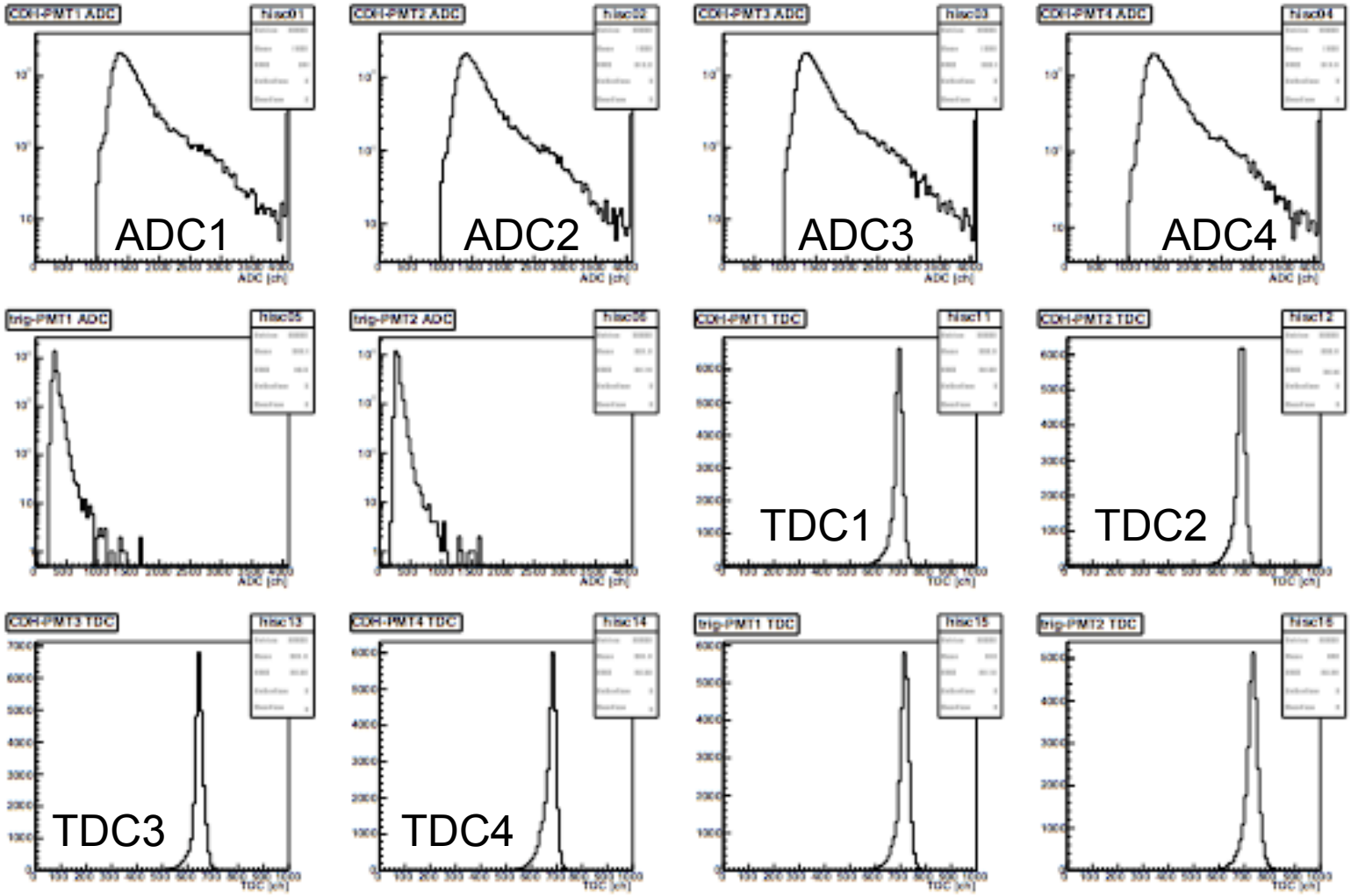


CDH-time-resolution

Data1: ADC1000ch setting

available data

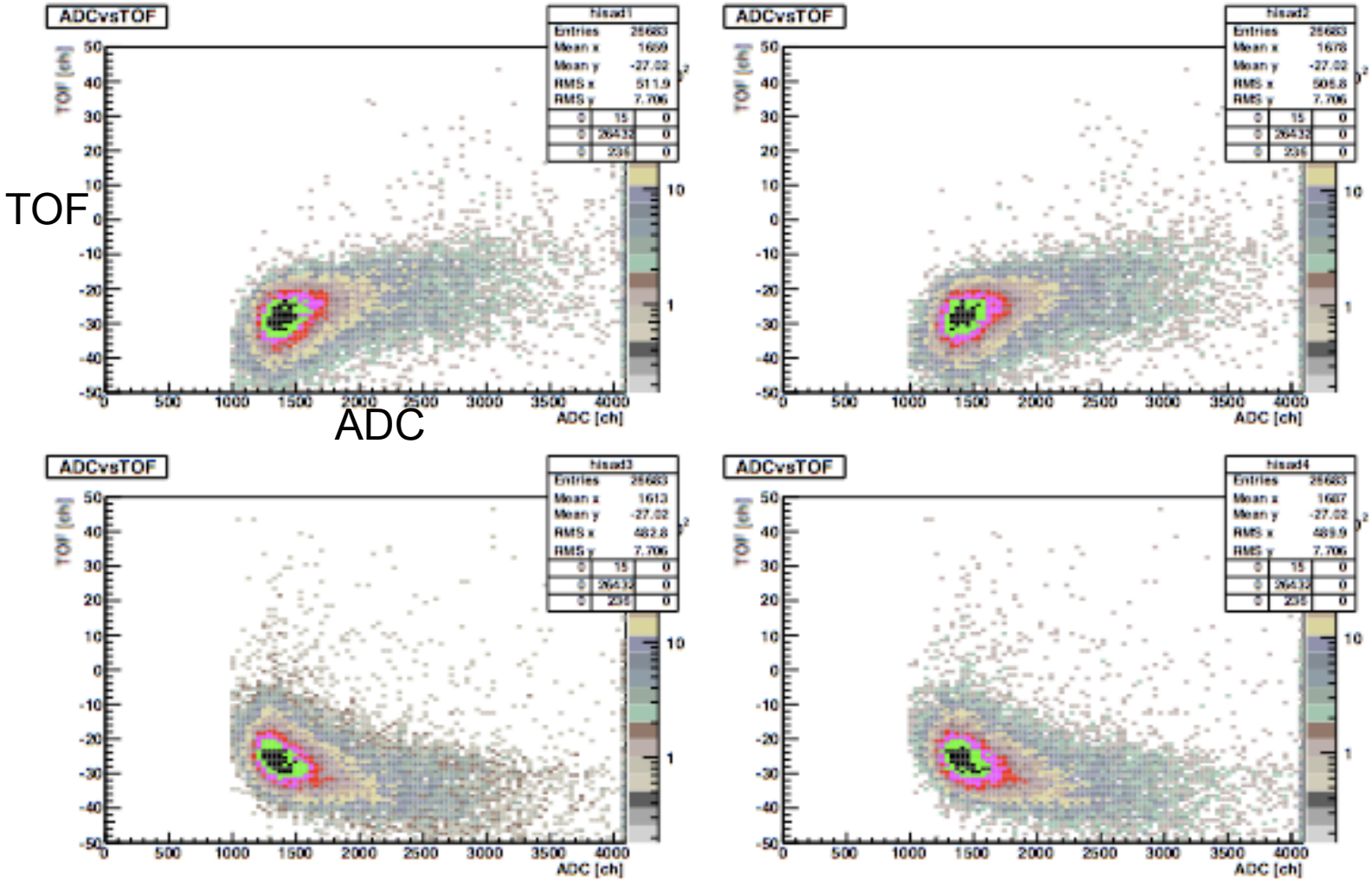
condition ADC1~4 >1000ch & TDC1~4 counts exist



CDH-time-resolution

Data1: ADC1000ch setting

ADC vs TOF

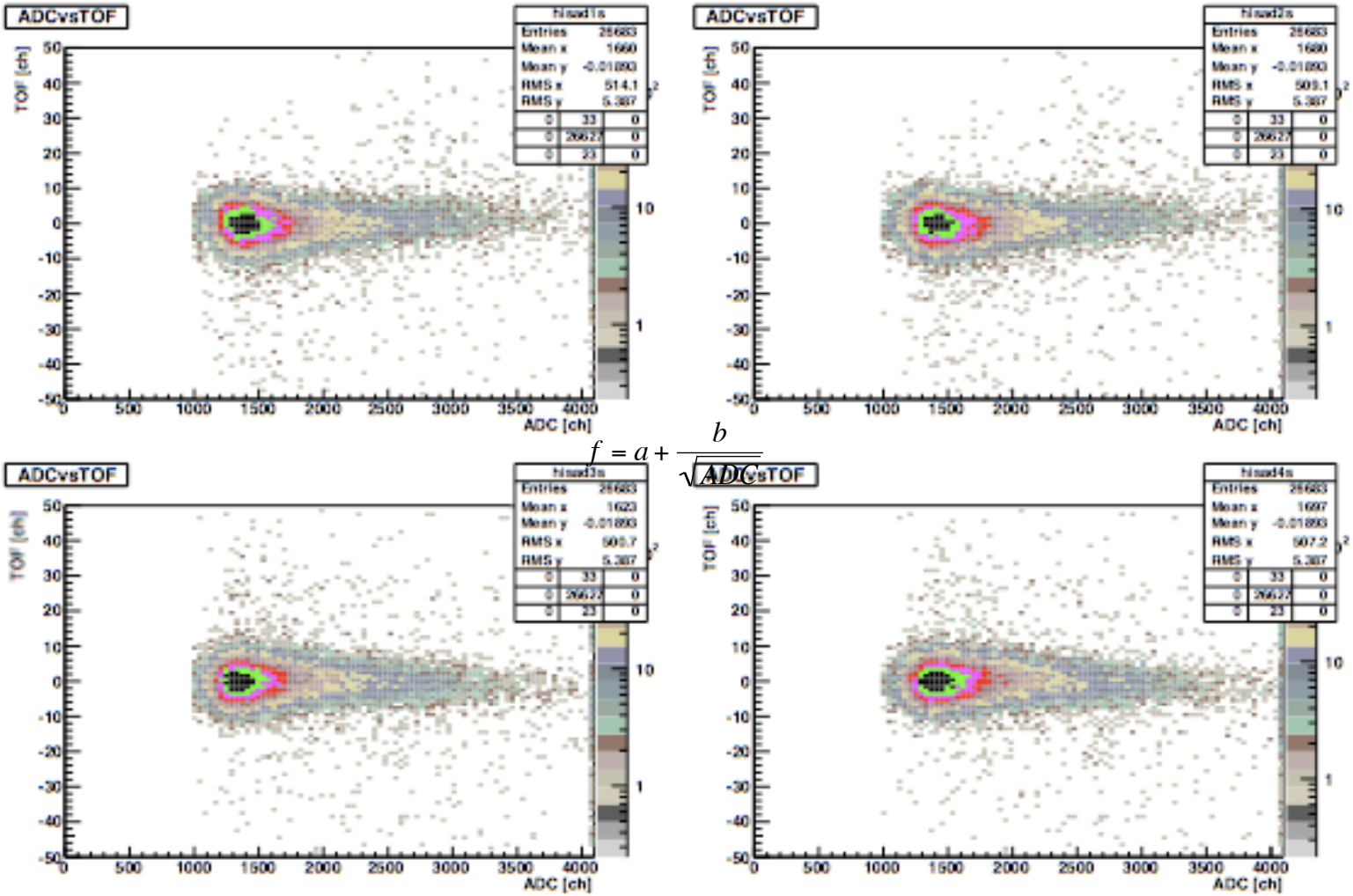


CDH-time-resolution

Data1: ADC1000ch setting

ADC vs TOF after slewing collection

$$f = a + \frac{b}{\sqrt{ADC}}$$

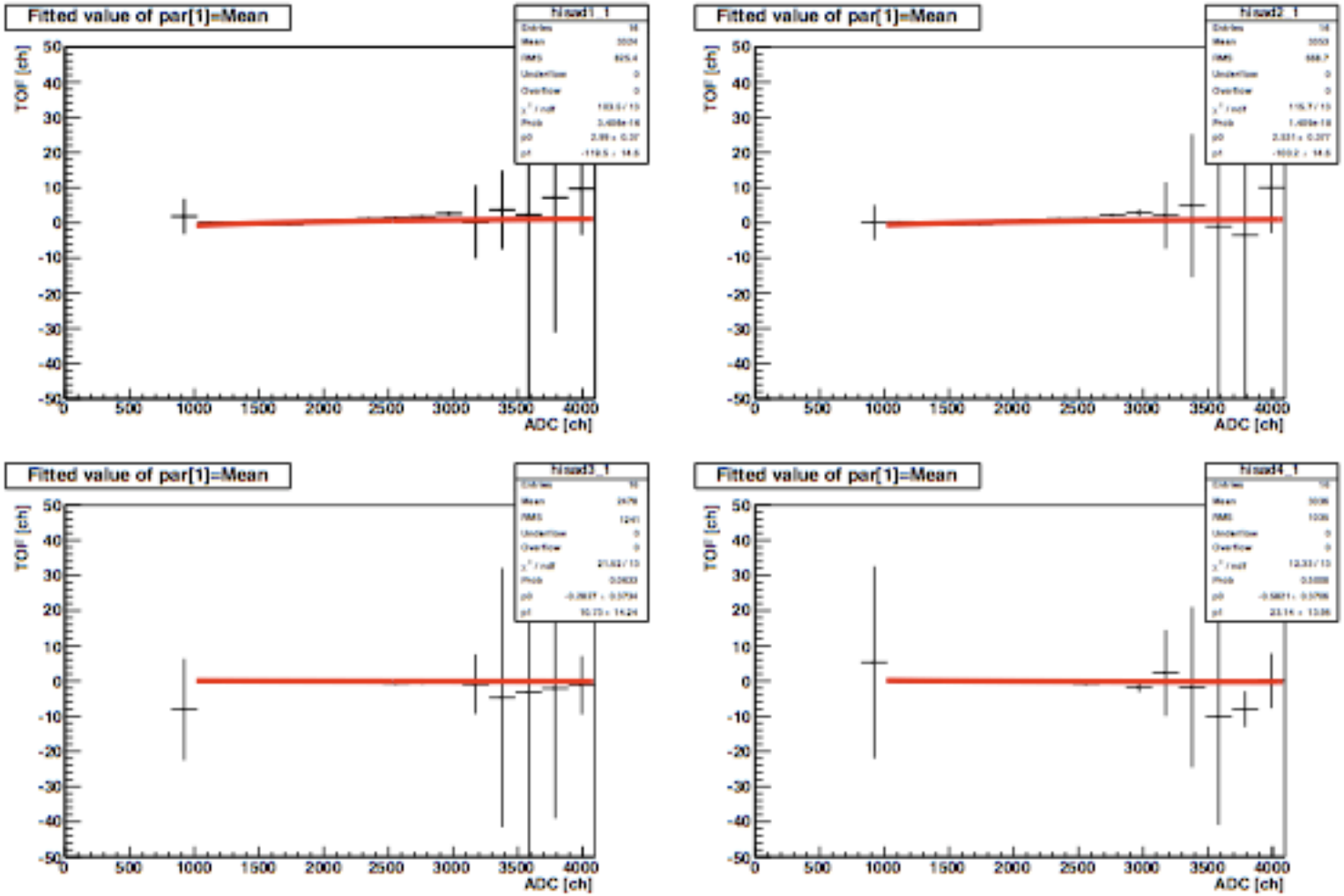


$$f = a + \frac{b}{\sqrt{ADC}}$$

CDH-time-resolution

Data1: ADC1000ch setting

ADC vs TOF Fitting after slewing collection

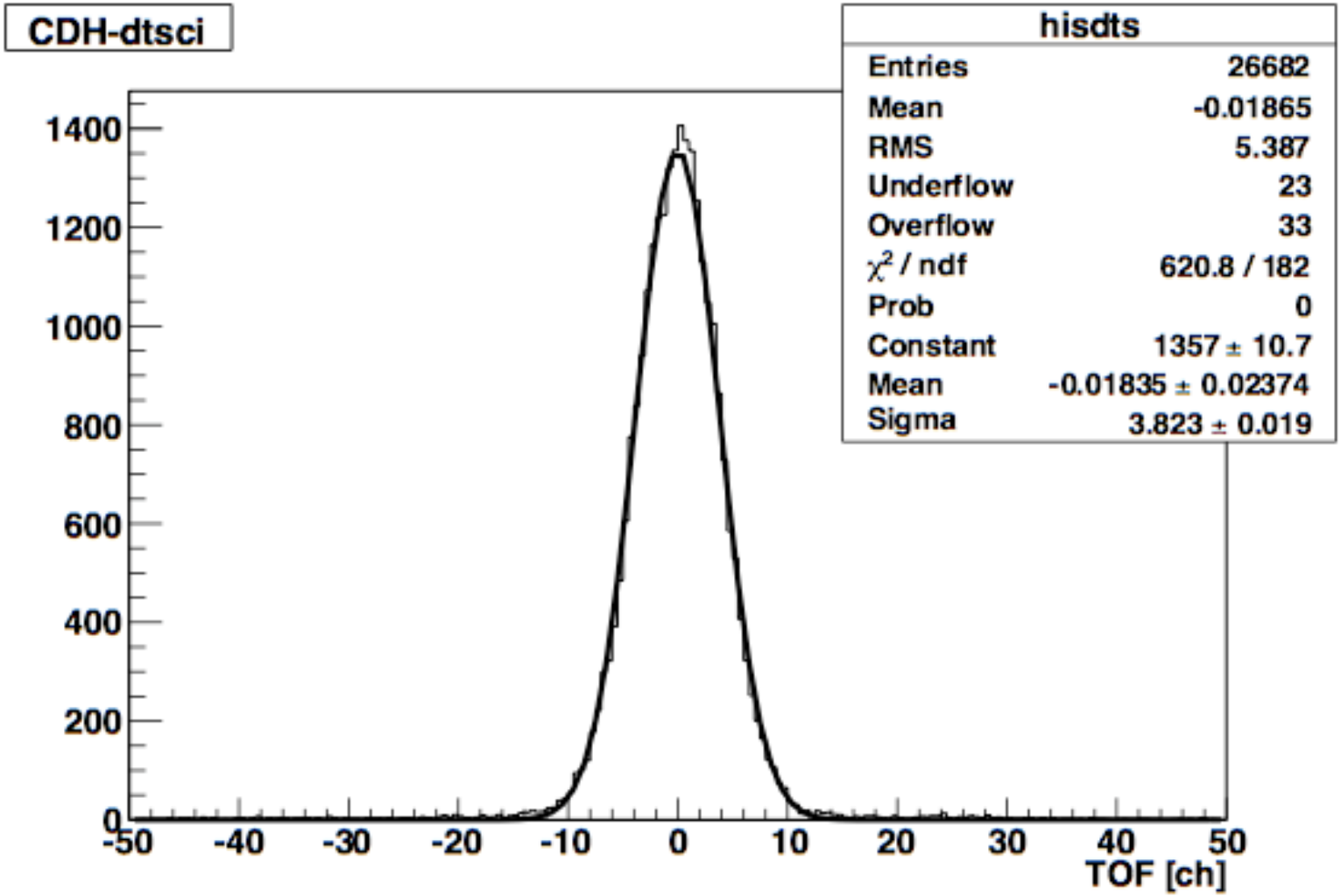


CDH-time-resolution

Data1: ADC1000ch setting

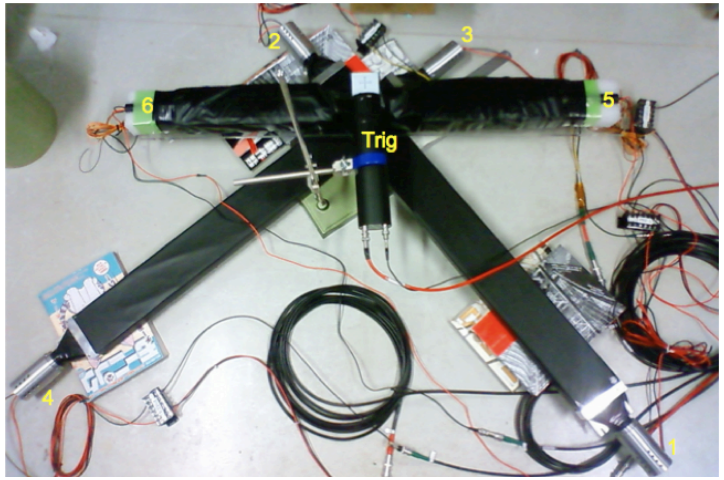
$$\sigma_{TOF} = 3.823[ch]* 27.51[ps/ch]=105ps$$

$$\sigma_{int} = 74ps$$



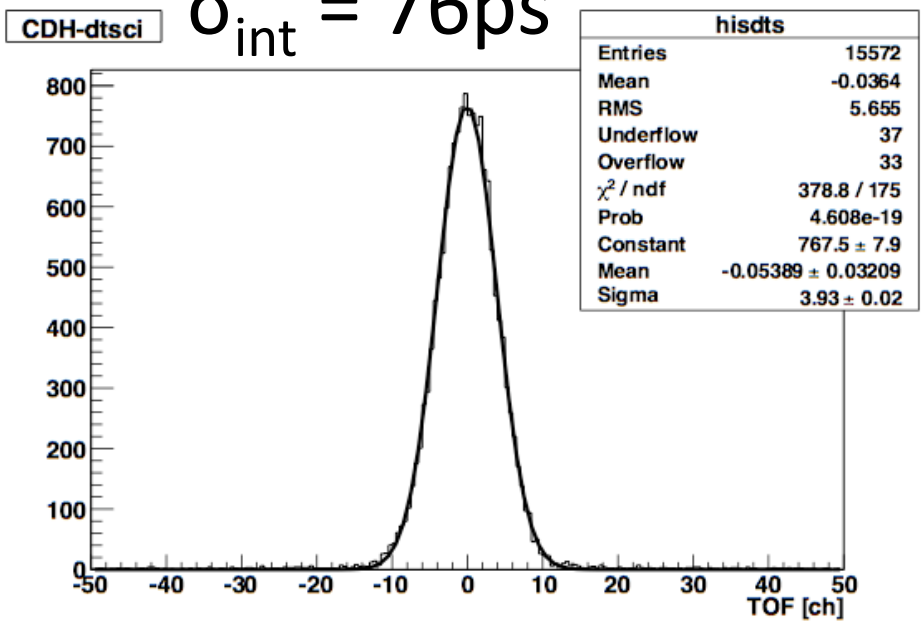
CDH-time-resolution

Data2: Another system setting



σ_{TOF} = 108ps

σ_{int} = 76ps

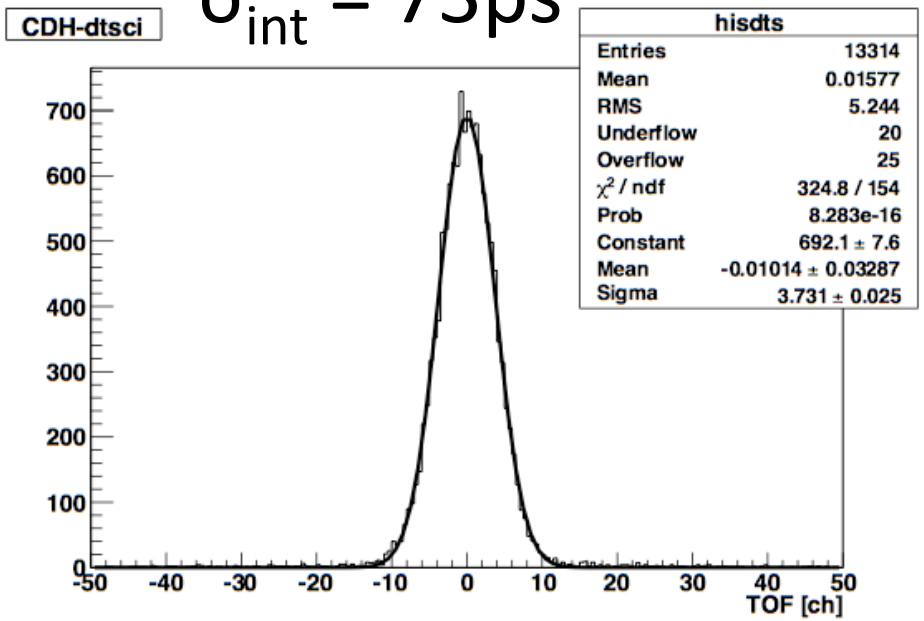


Data3: ADC2000ch setting

ADC1000ch	ADC2000ch
PMT1 : 1852V	PMT1 : 2007V
PMT2 : 1898V	PMT2 : 2054V
PMT3 : 1767V	PMT3 : 1915V
PMT4 : 1806V	PMT4 : 1957V

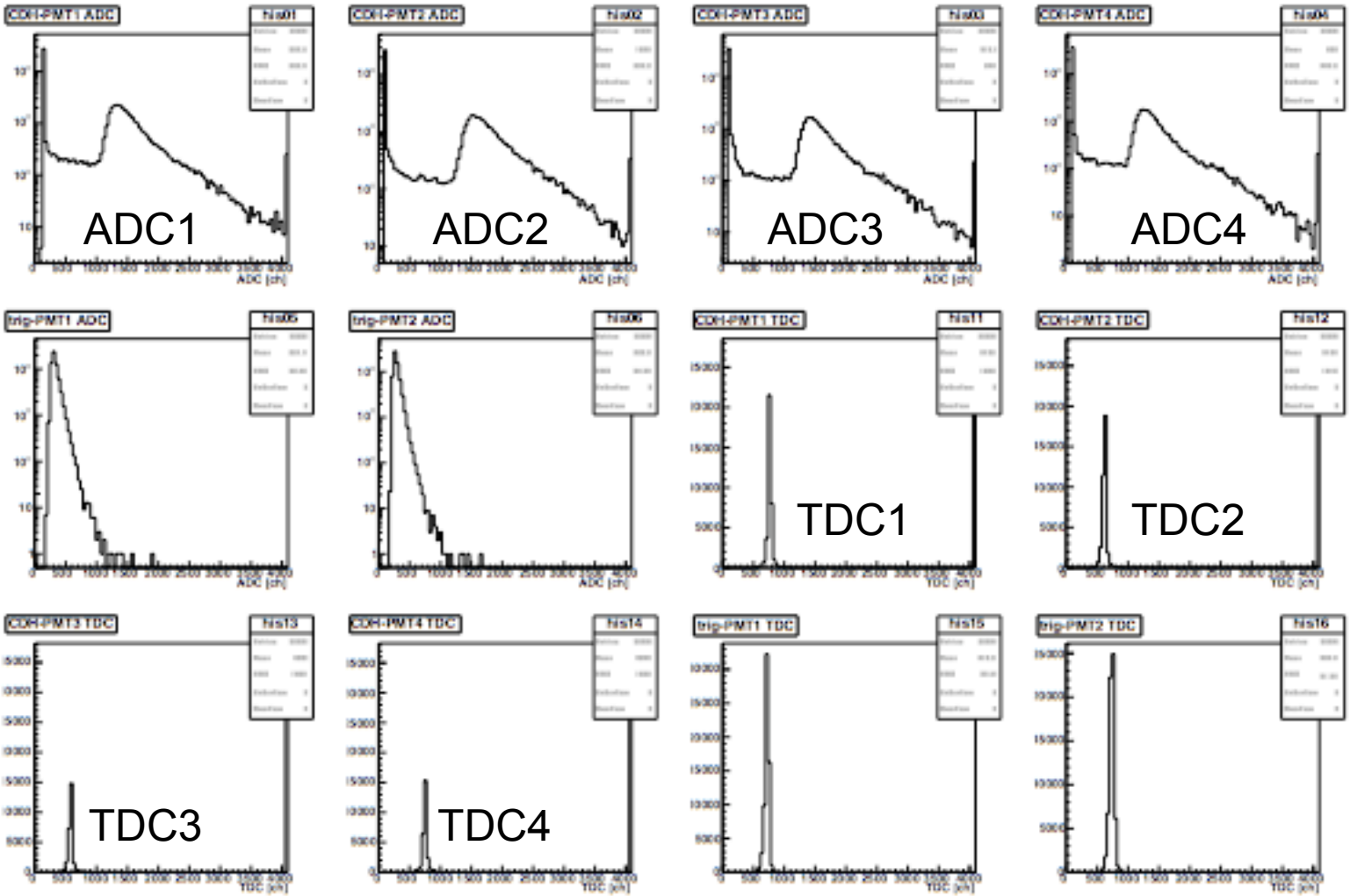
σ_{TOF} = 103ps

σ_{int} = 73ps



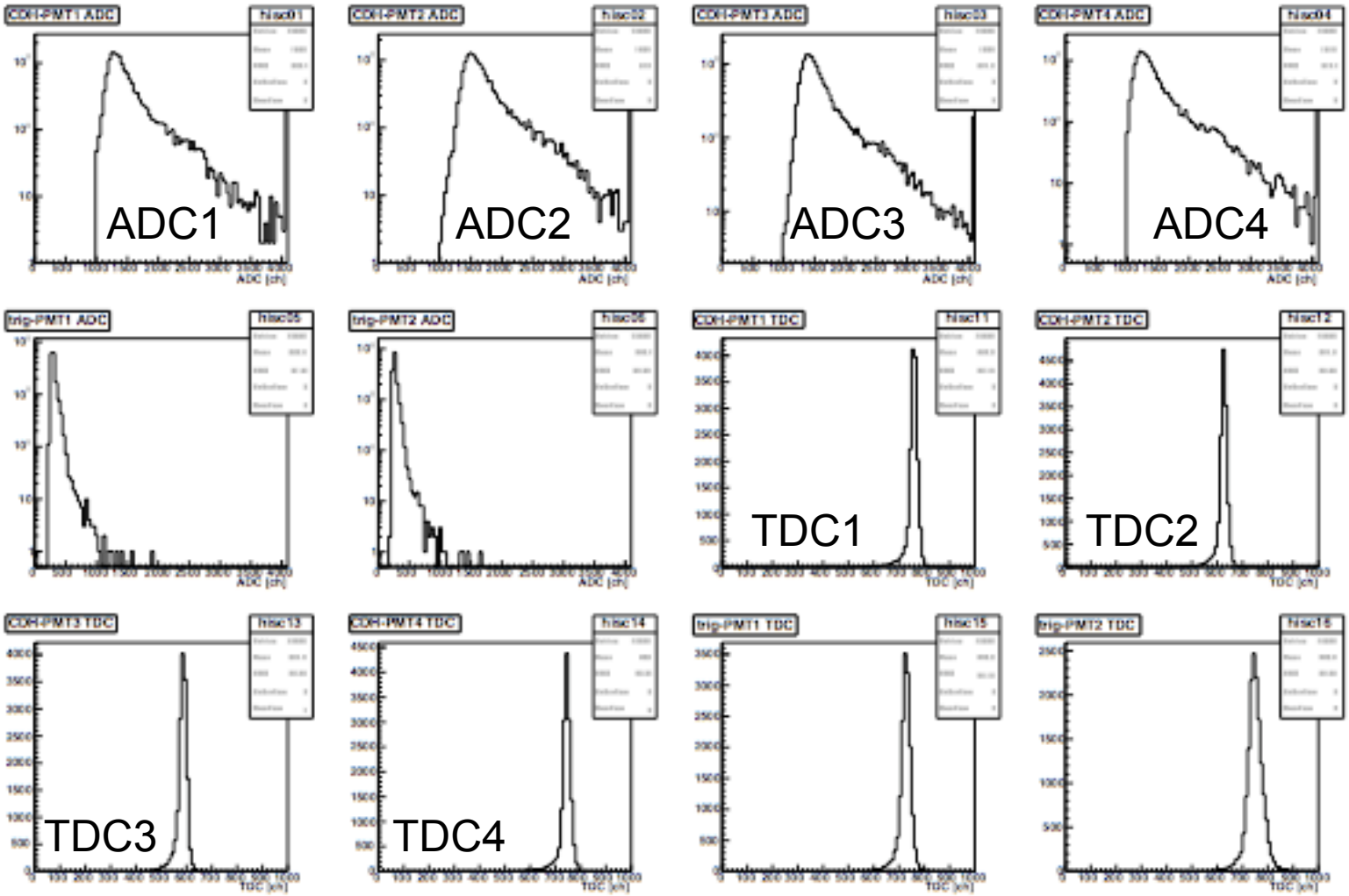
Back up

Data2: ADC1000ch setting
raw data



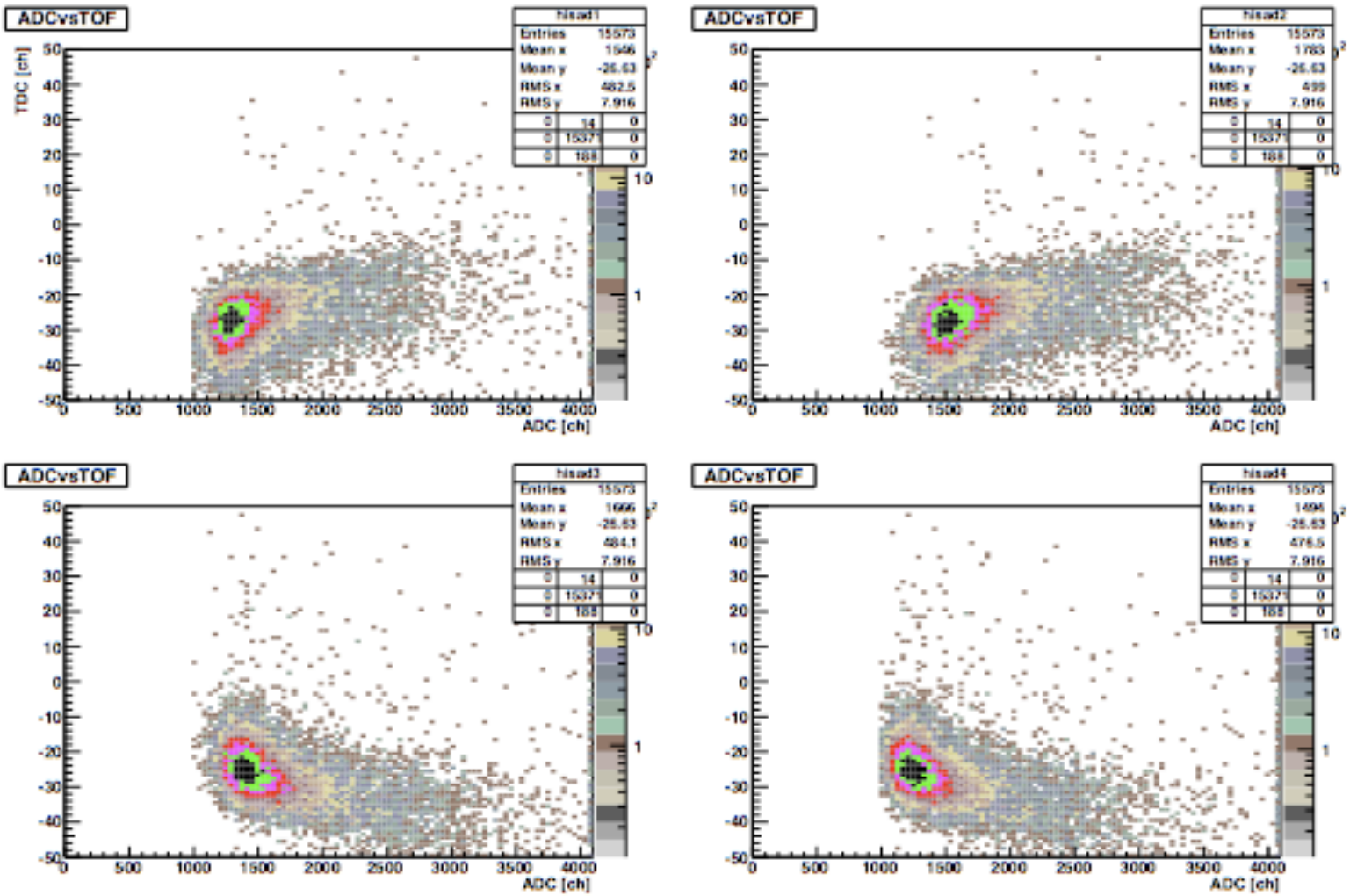
Data2: ADC1000ch setting
available data

condition ADC1~4 >1000ch & TDC1~4 counts exist



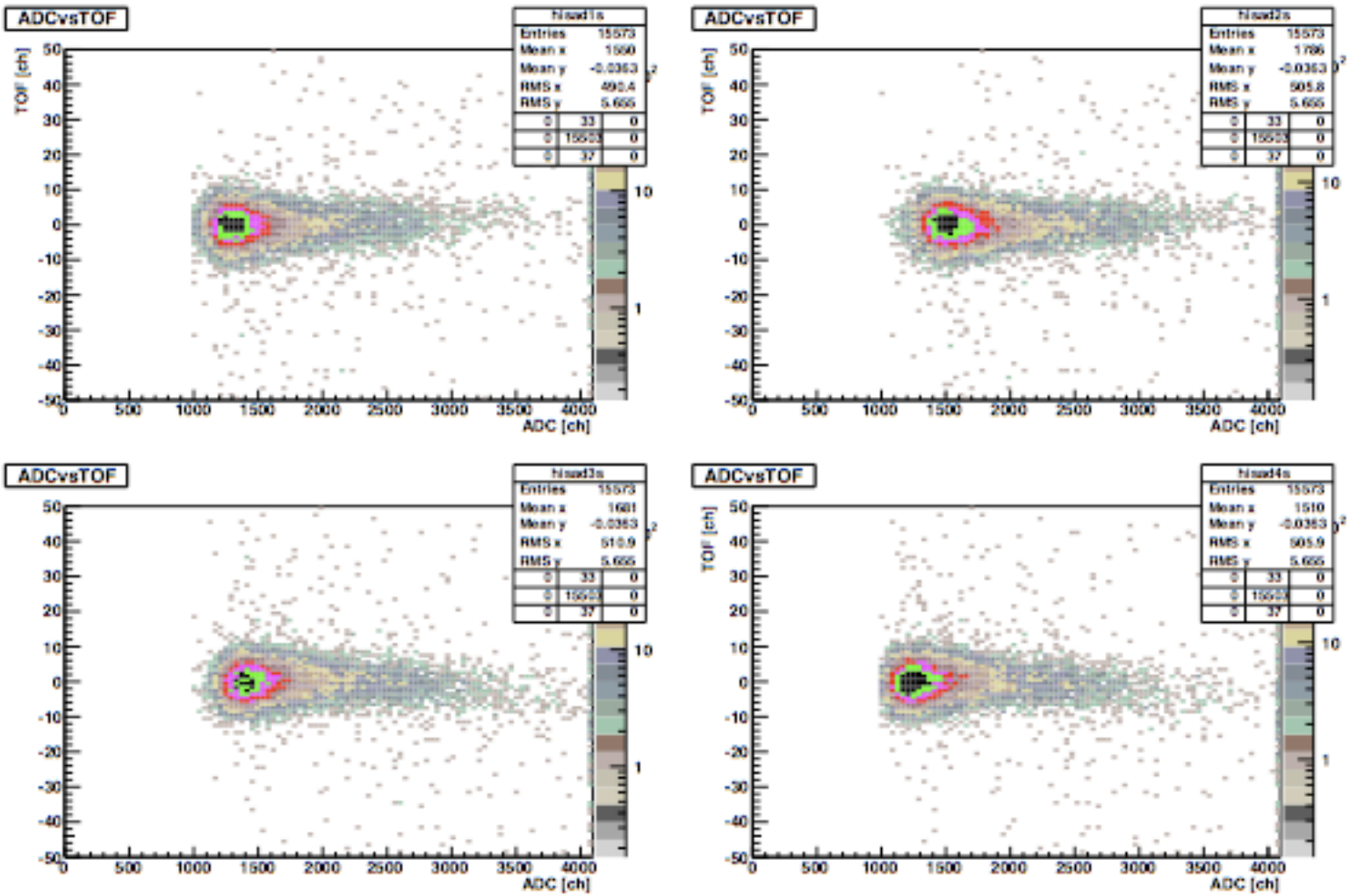
Data2: ADC1000ch setting

ADC vs TOF



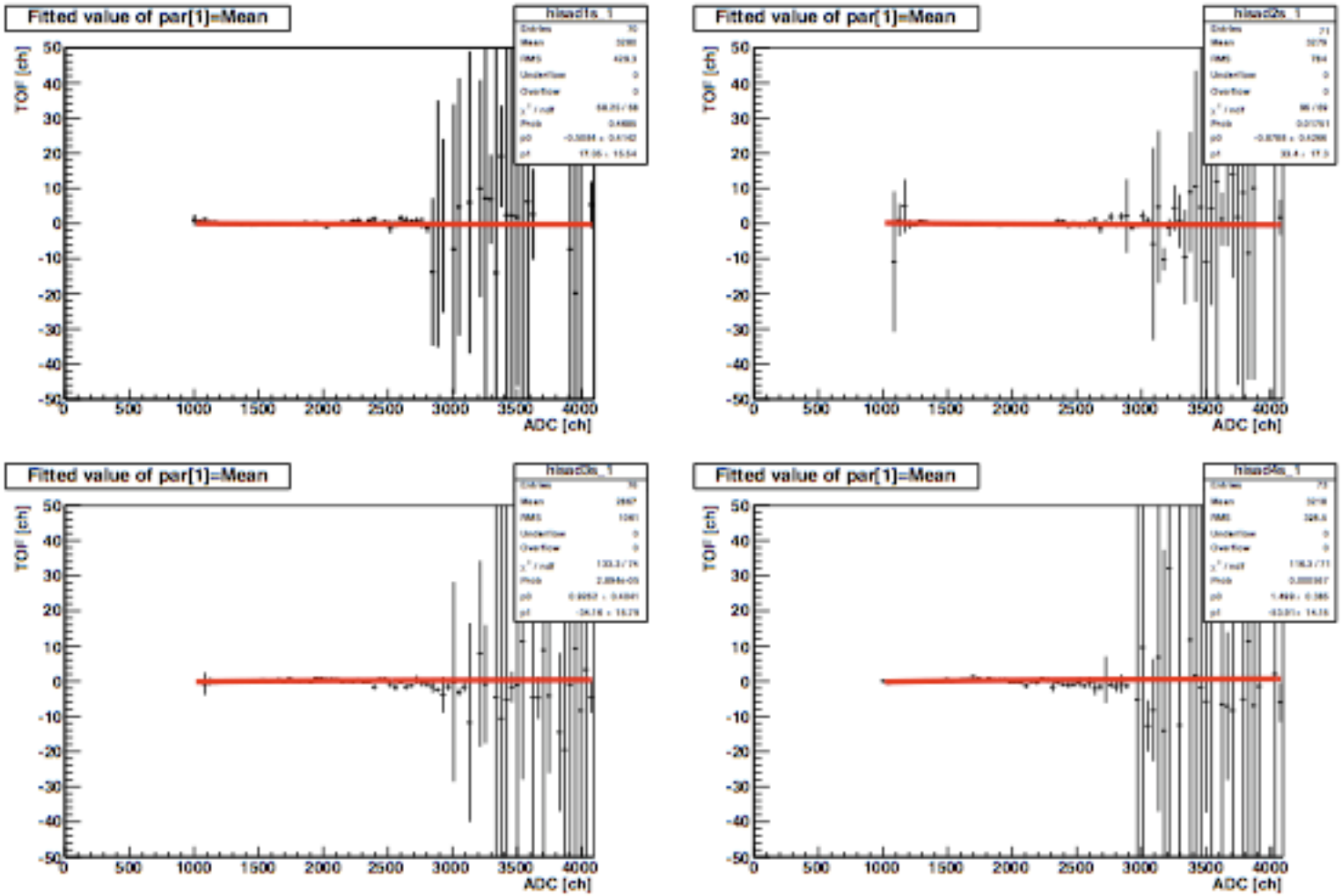
Data2: ADC1000ch setting

ADC vs TOF after slewing collection



Data2: ADC1000ch setting

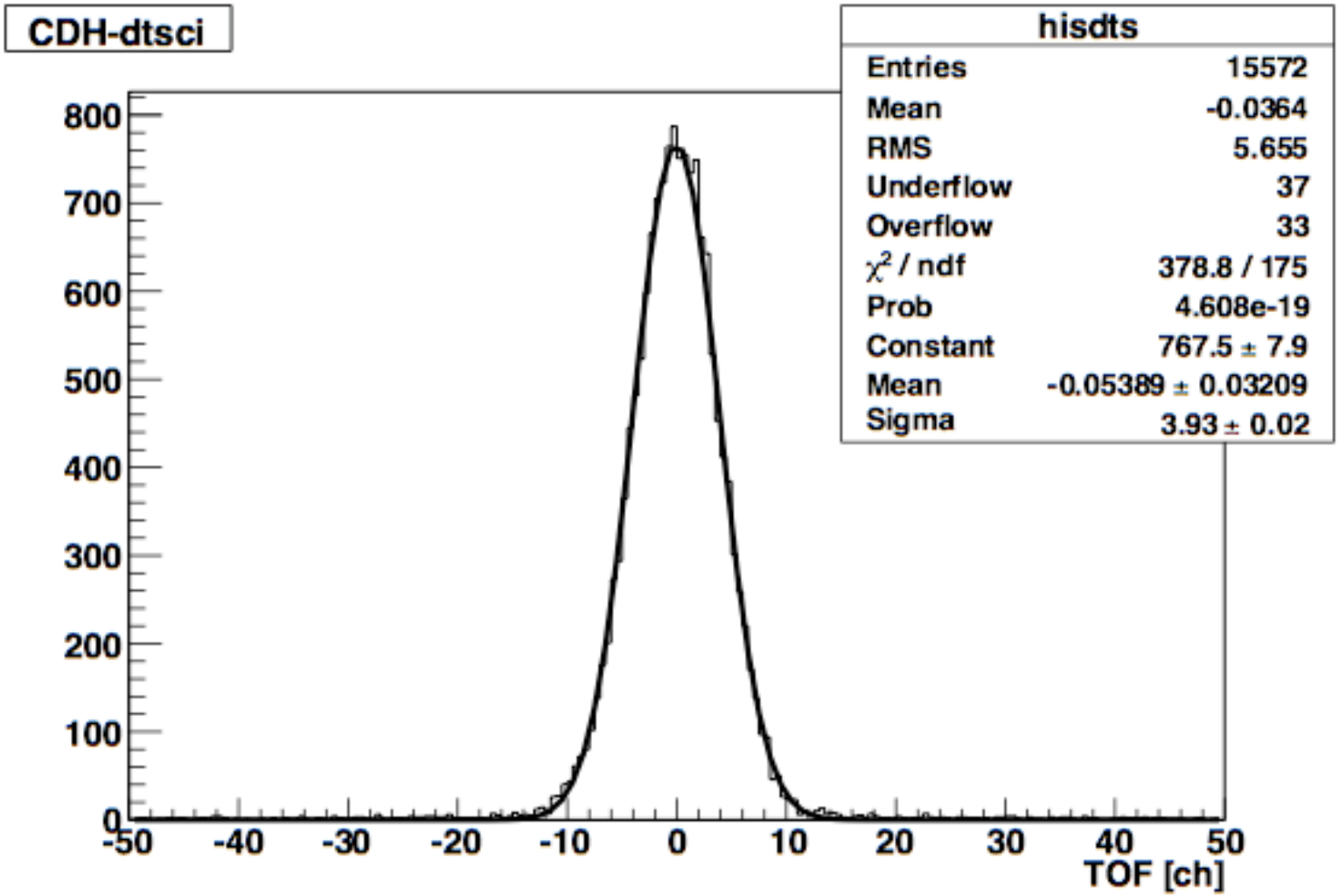
ADC vs TOF after slewing collection



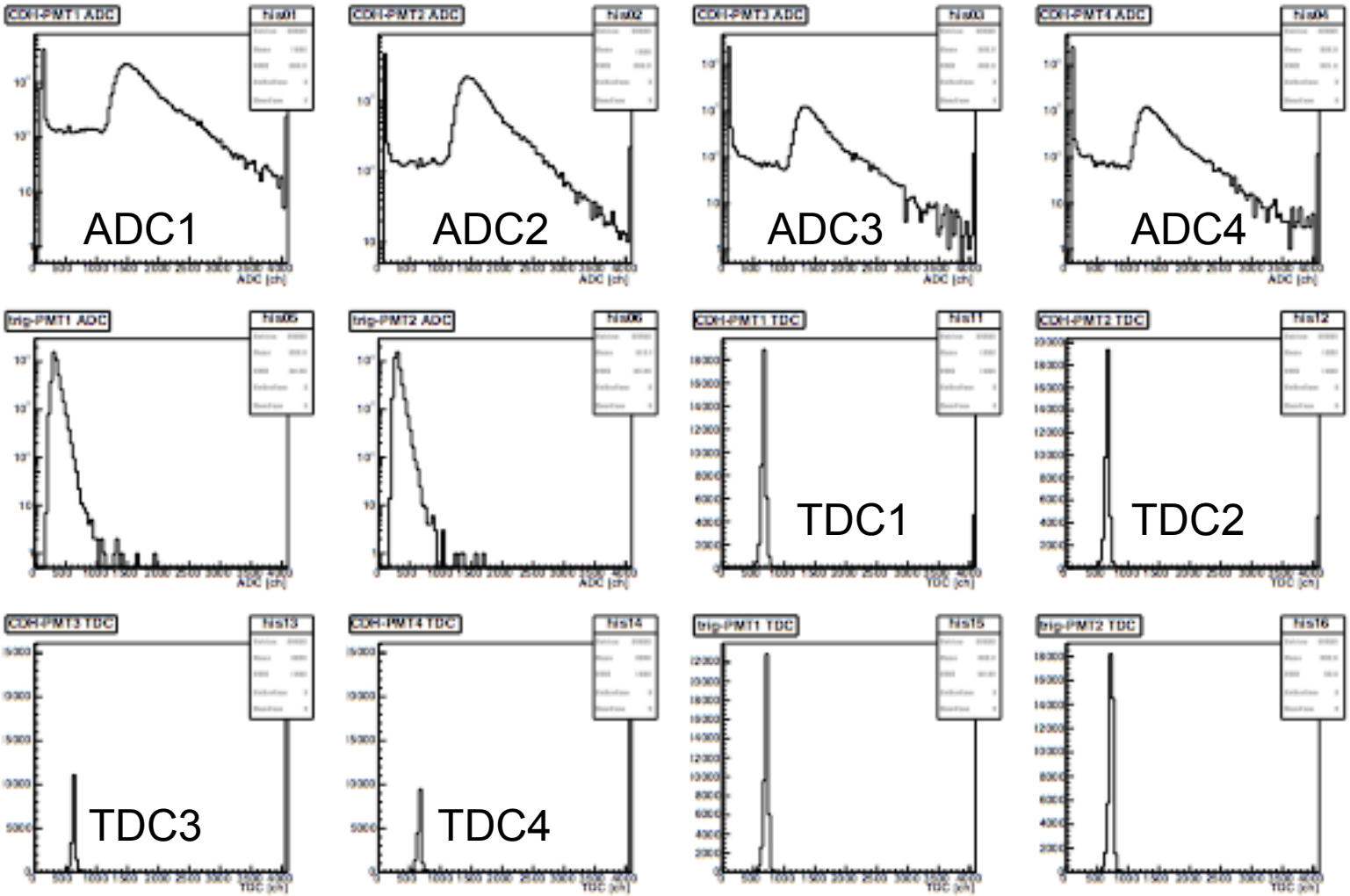
Data2: ADC1000ch setting

σ_{TOF} = 3.930[ch]* 27.51[ps/ch]=108ps

σ_{int} = 76ps

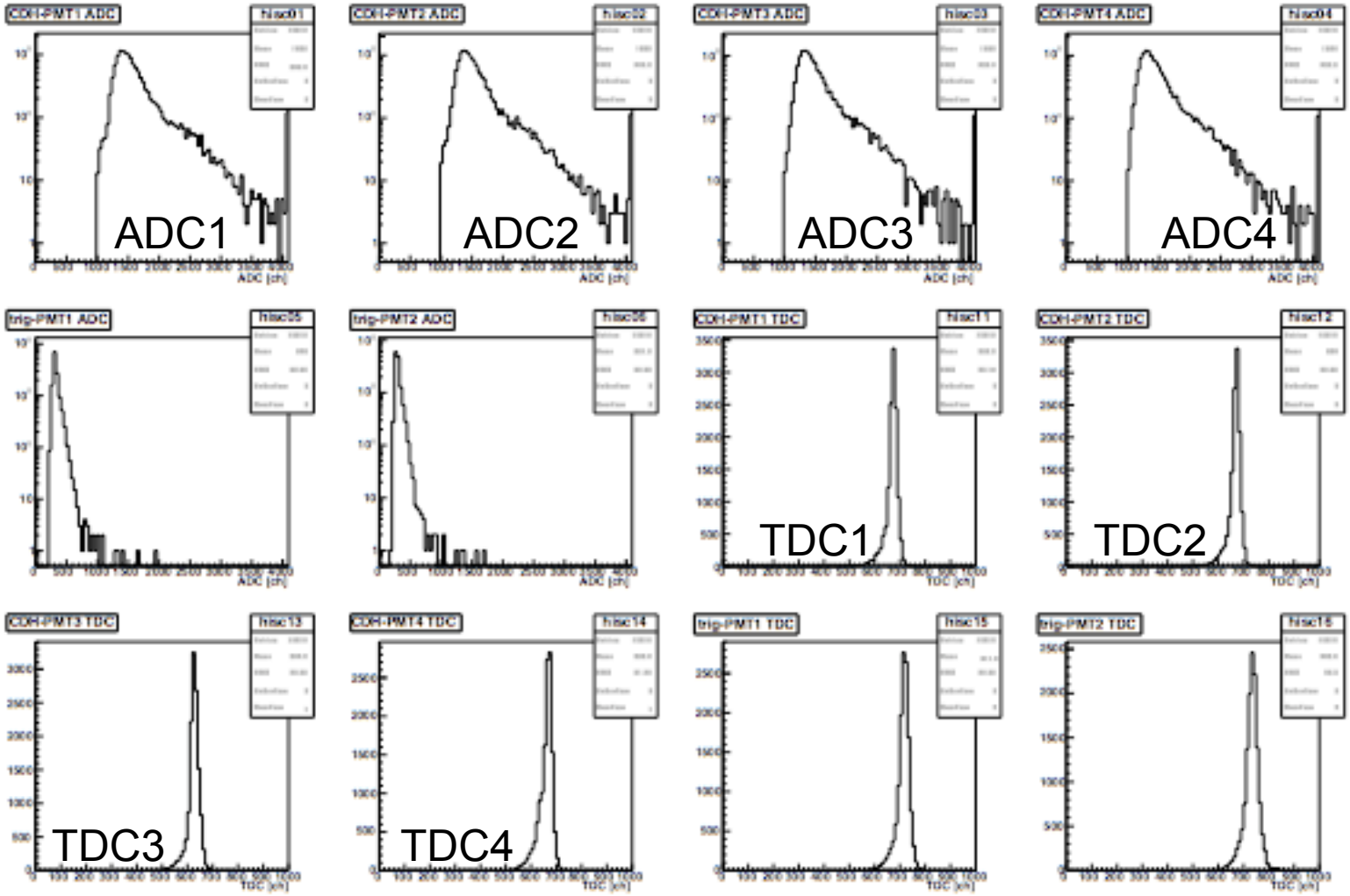


Data3: ADC2000ch setting (w/ attenuator 6dB)
raw data

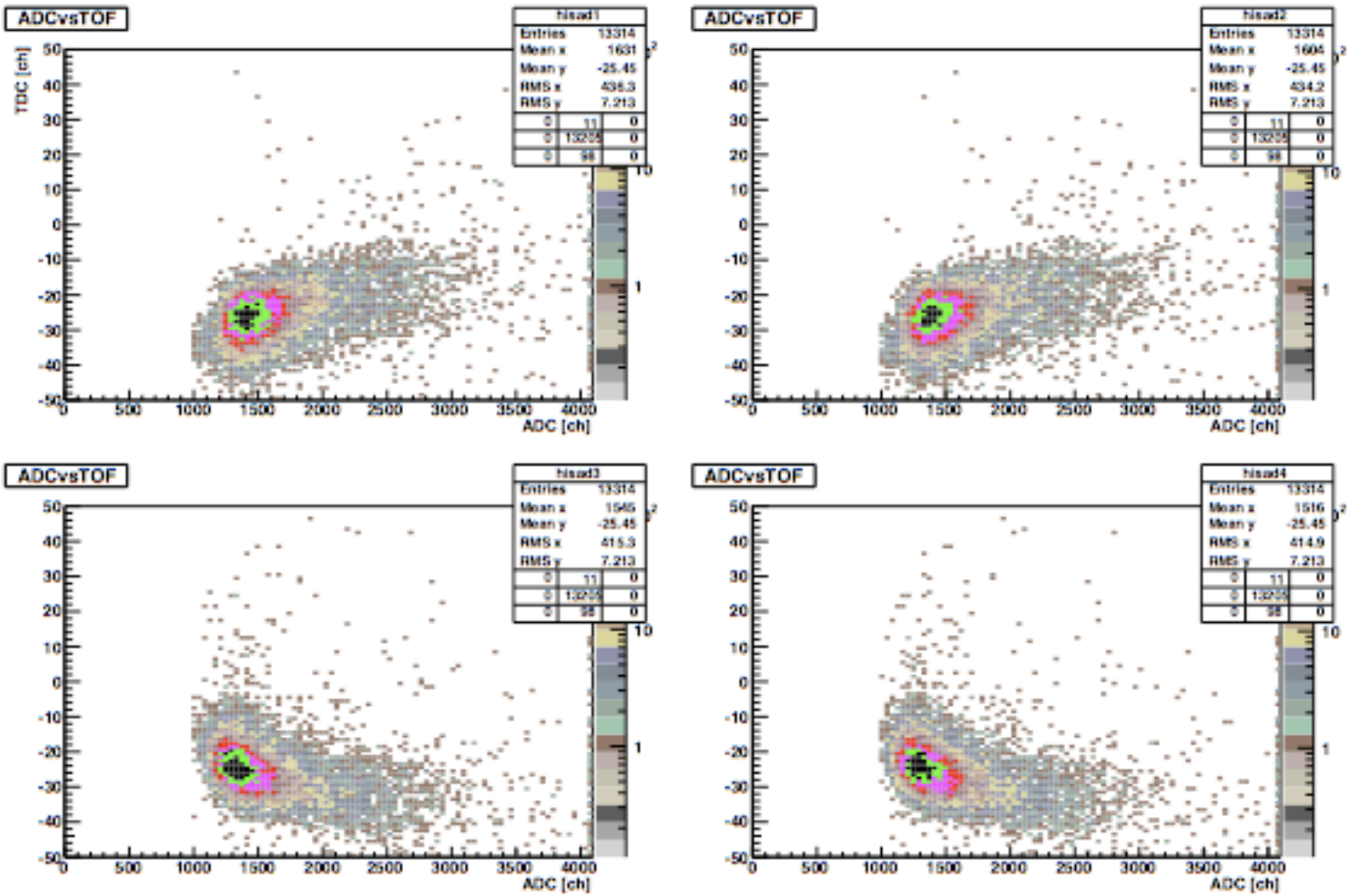


Data3: ADC2000ch setting (w/ attenuator 6dB)
available data

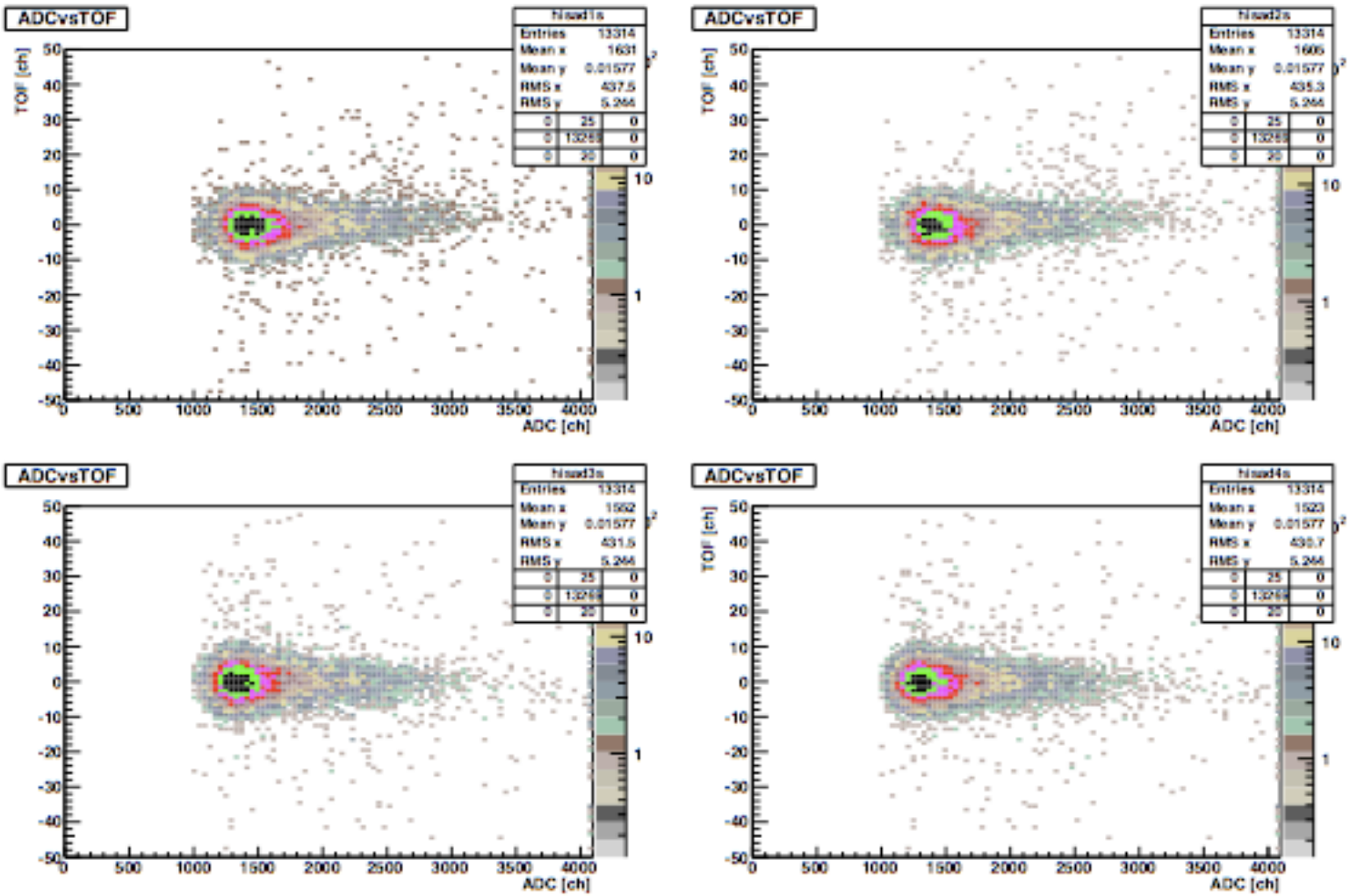
condition ADC1~4 >1000ch & TDC1~4 counts exist



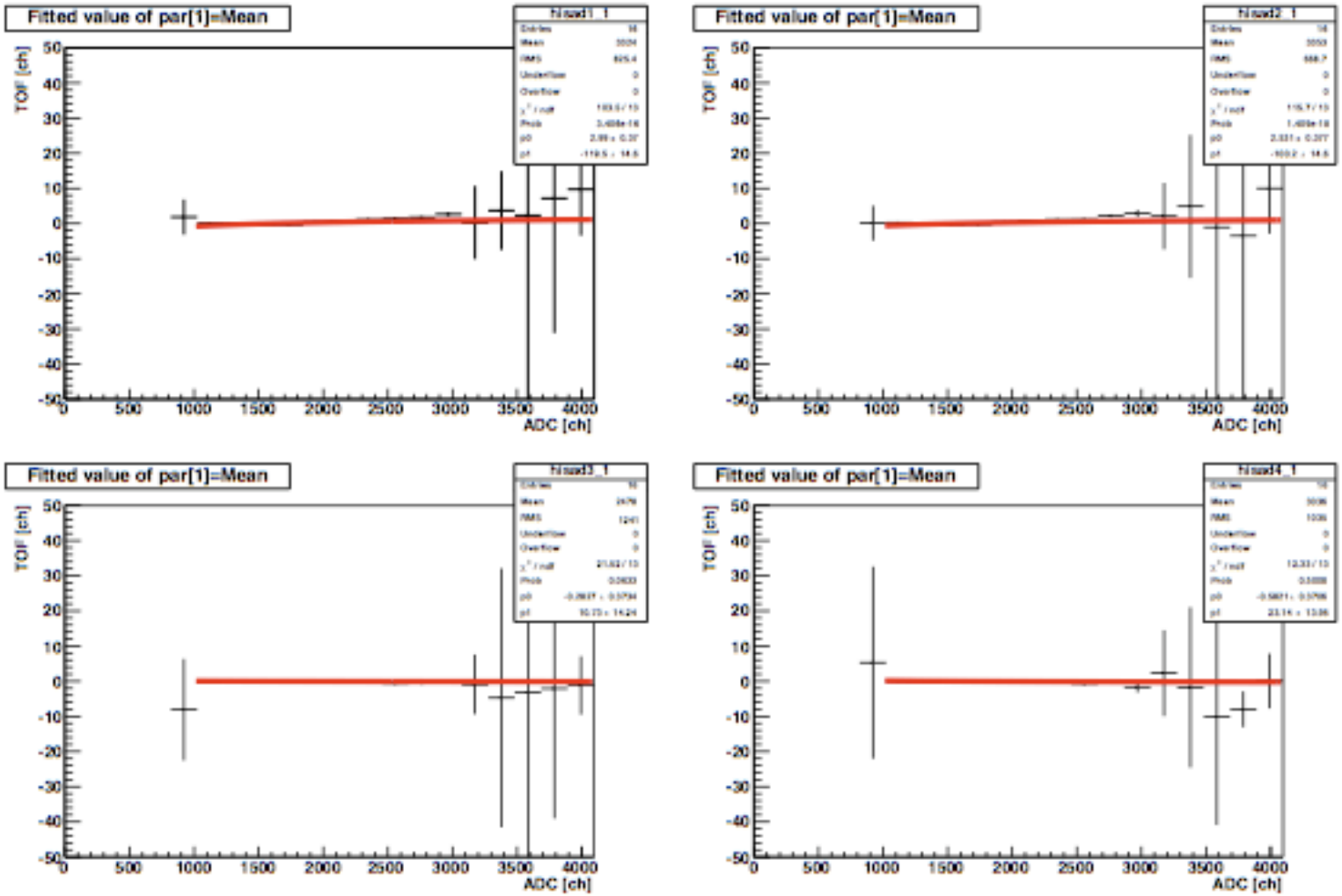
Data3: ADC2000ch setting (w/ attenuator 6dB)
ADC vs TOF



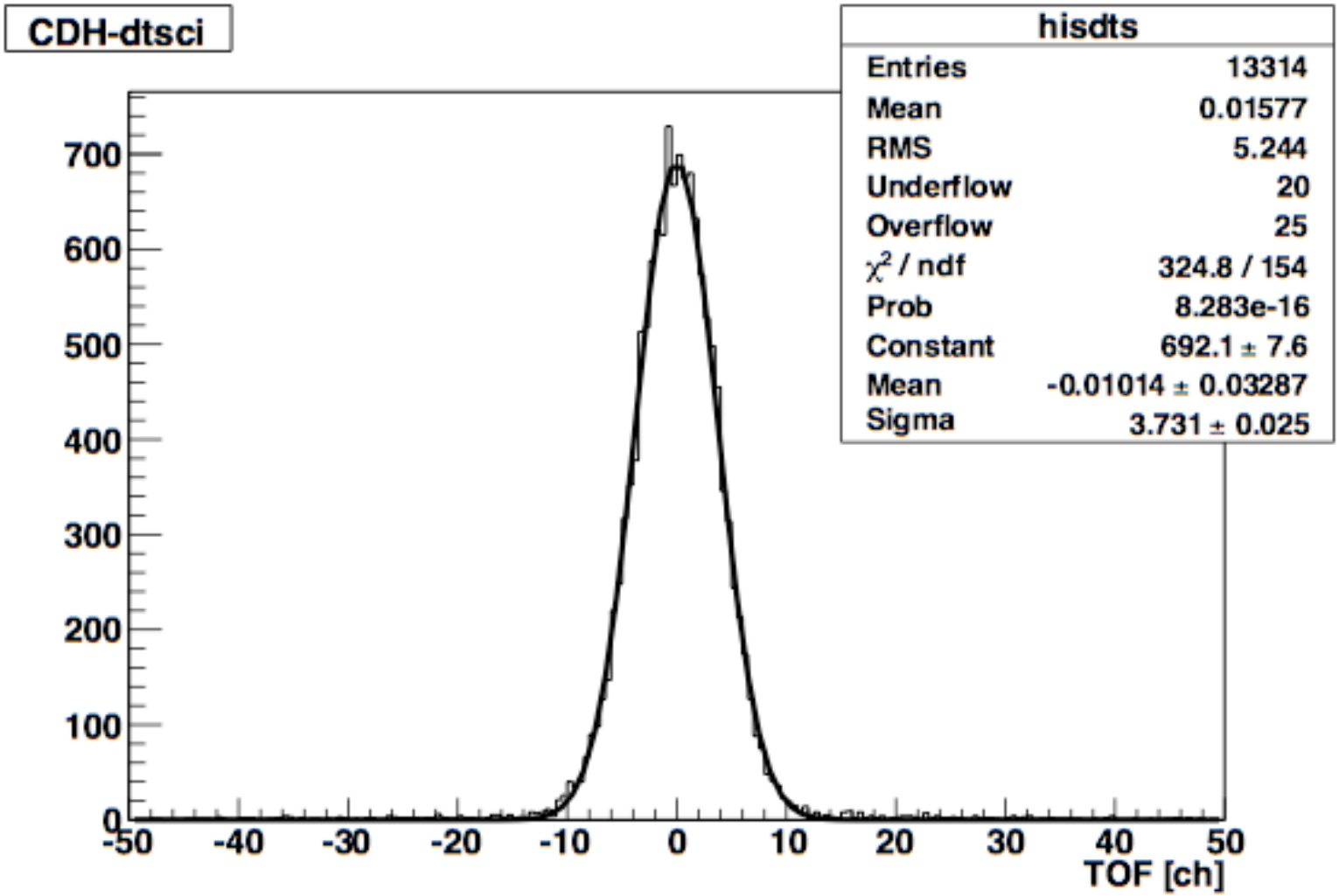
Data3: ADC2000ch setting (w/ attenuator 6dB)
ADC vs TOF after slewing collection



Data3: ADC2000ch setting (w/ attenuator 6dB)
ADC vs TOF Fitting after slewing collection



Data3: ADC2000ch setting (w/ attenuator 6dB)

$$\sigma_{TOF} = 3.731[ch]* 27.51[ps/ch]=103ps$$

$$\sigma_{int} = 73ps$$