Status Report #3

2019.11.1 Fri

B4 Fujiwara Tomomasa

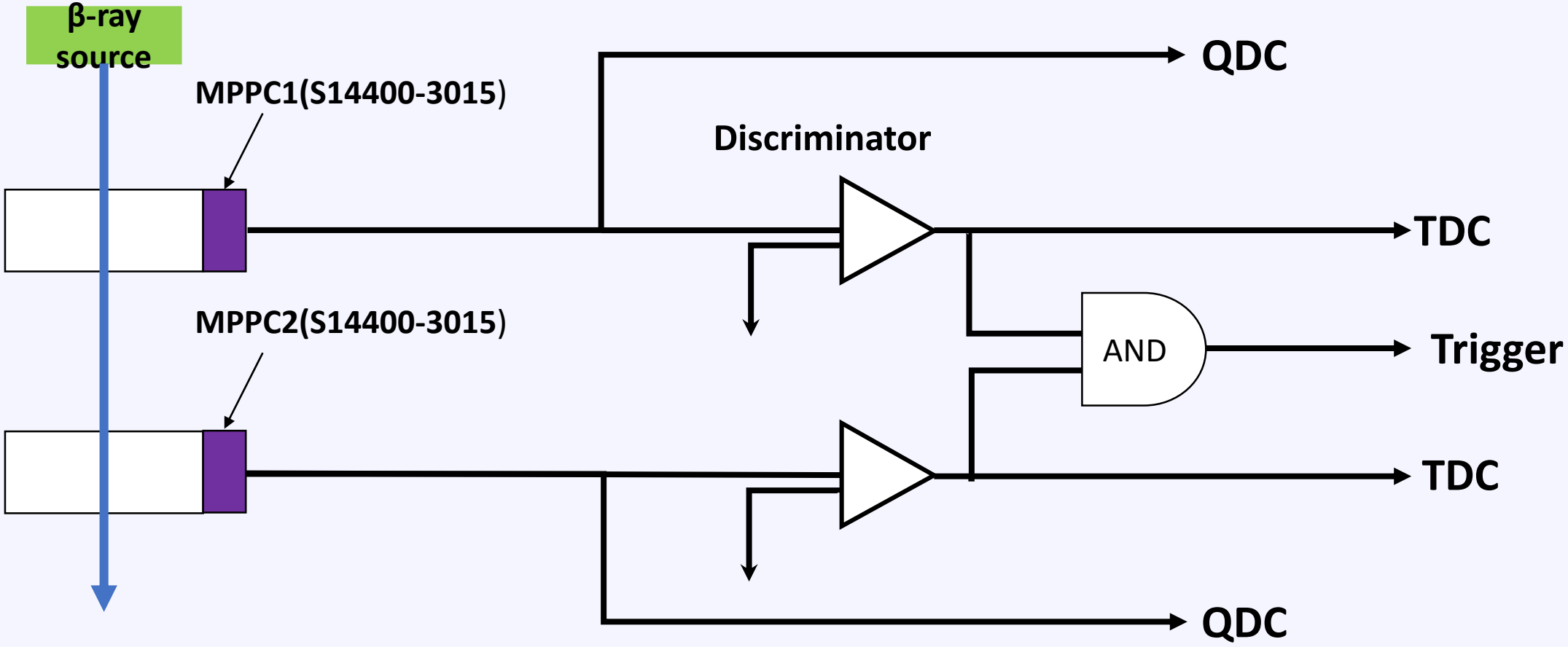
What I have done

- Entry for Scholarship
- ROOT study

ROOT

- Leaning analysis procedure using ROOT
- Goal: Evaluate time resolution of MPPC S14400-3015

〈Setup of measurement〉



ROOT

- Calculate TOF from MPPC1.TDC & MPPC2.TDC:

  TOF = MPPC1.TDC – MPPC2.TDC

- $\sigma_{\mathrm{T}} = \sqrt{\sigma_1^2 + \sigma_2^2}$

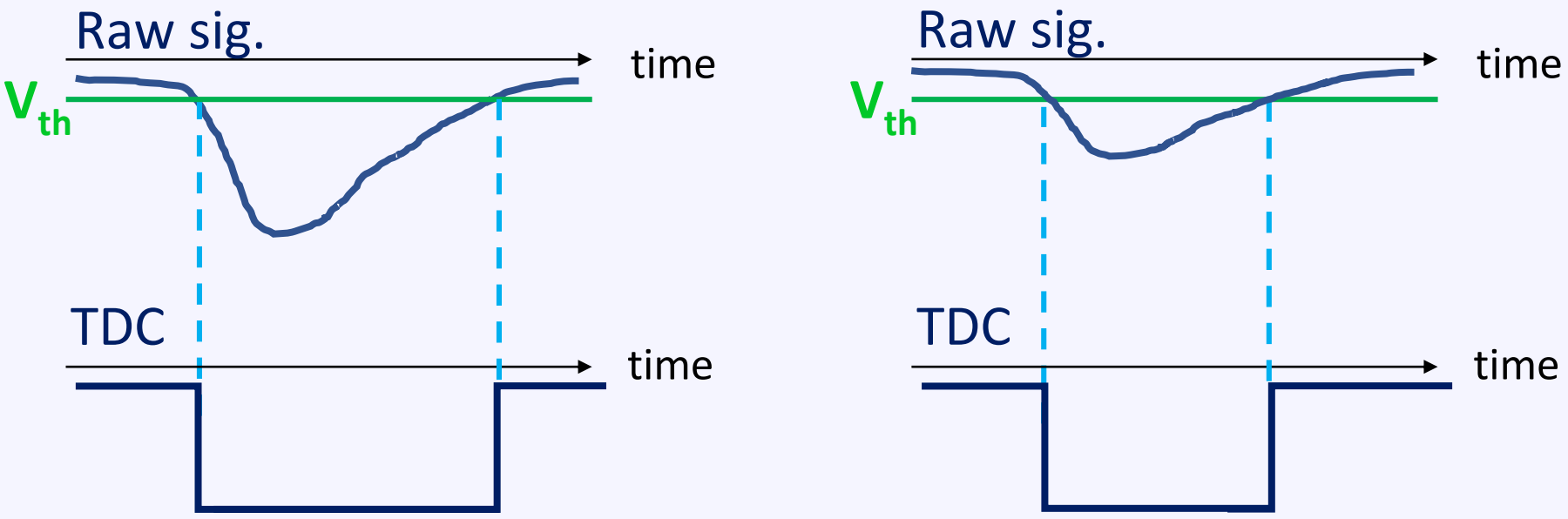
  σ_{T}: Time resolution of TOF, $\sigma_{1,2}$: Time resolution of MPPC1 & 2

- Assuming $\sigma_1 = \sigma_2 = \sigma_{\mathrm{MPPC}}$,

$$\sigma_{\mathrm{MPPC}} = \frac{1}{\sqrt{2}}\sigma_{\mathrm{T}}$$

ROOT

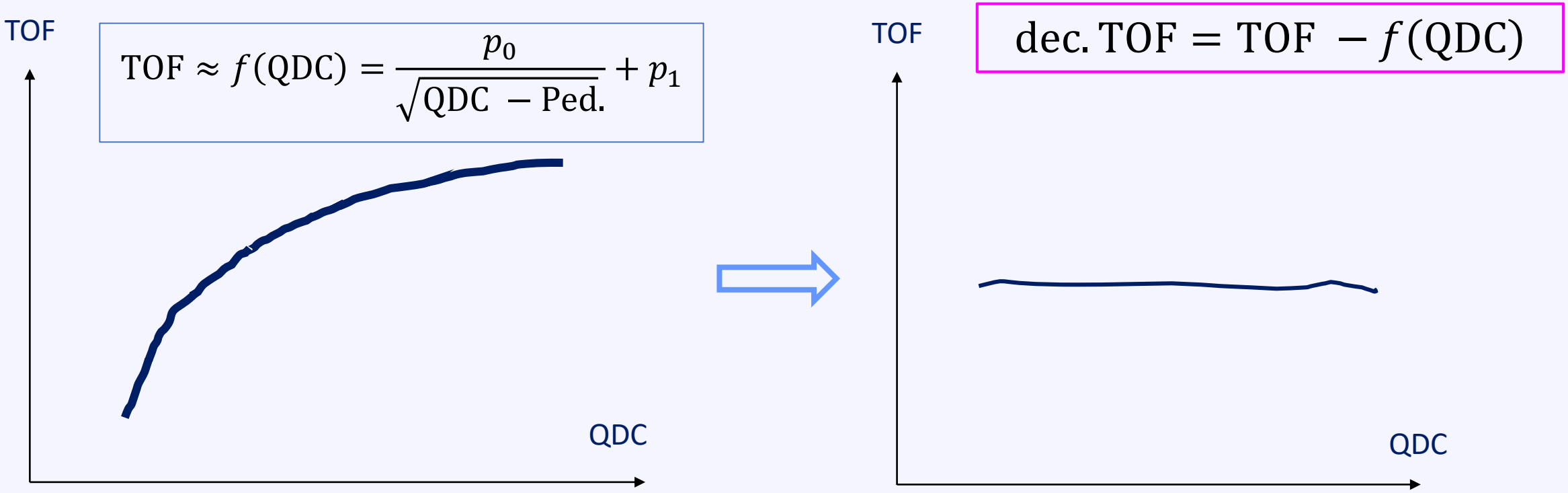
- TDC: output only when $V_{\mathrm{sig}} > V_{\mathrm{th}} = 25\mathrm{mV}$



- TDC: depend on shape pulse → necessary of correction: Time walk correction

ROOT

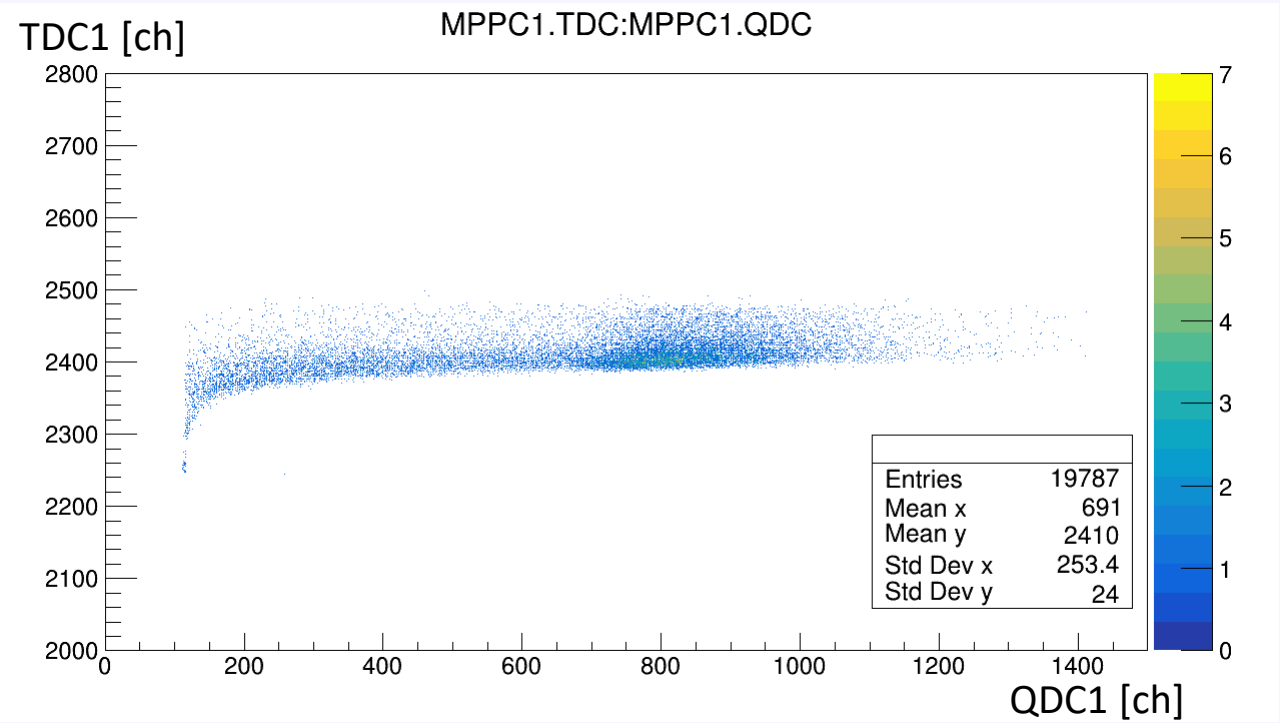
- Time walk correction

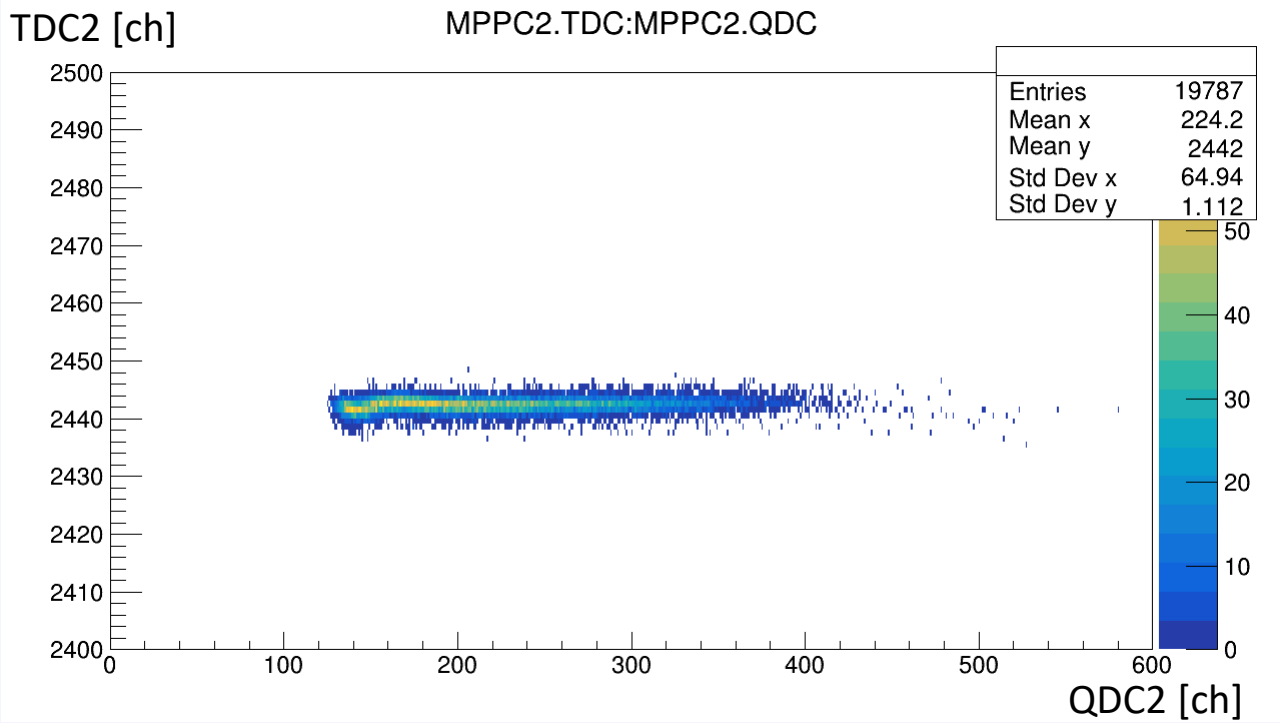


- After correction, $\mathrm{TOF} = \mathrm{dec.\,TOF}_1 - \mathrm{dec.\,TOF}_2$

In Progress

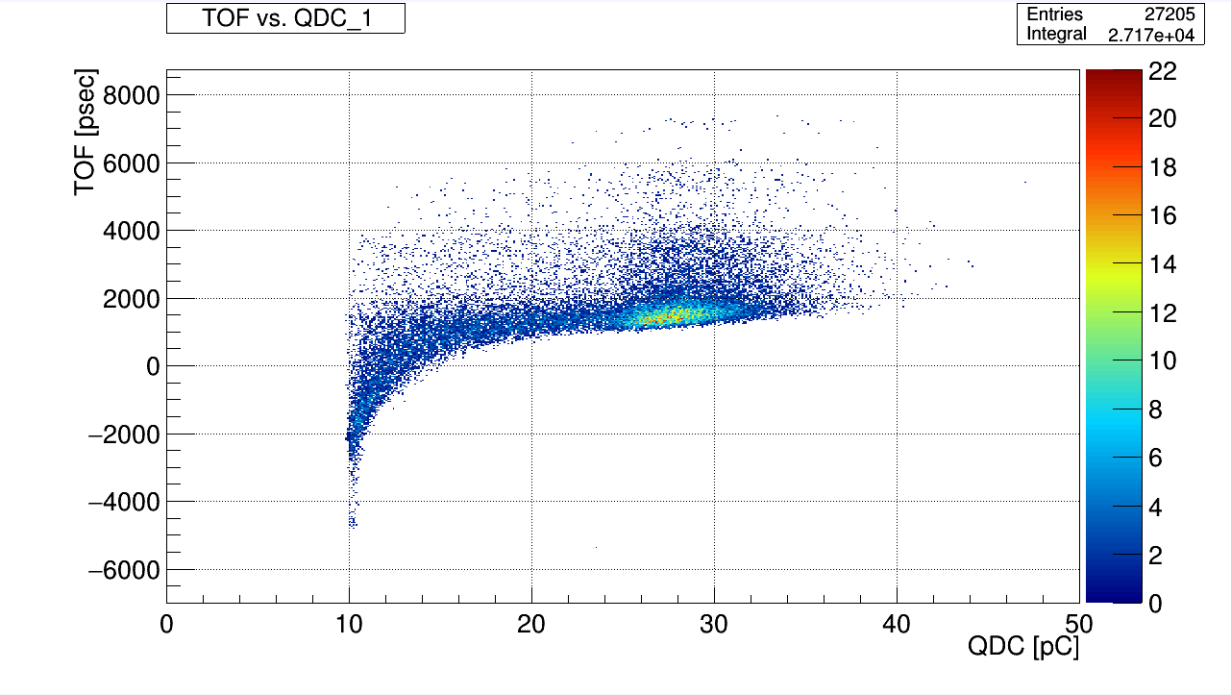
- Before
  - Plot TDC vs. QDC1&QDC2

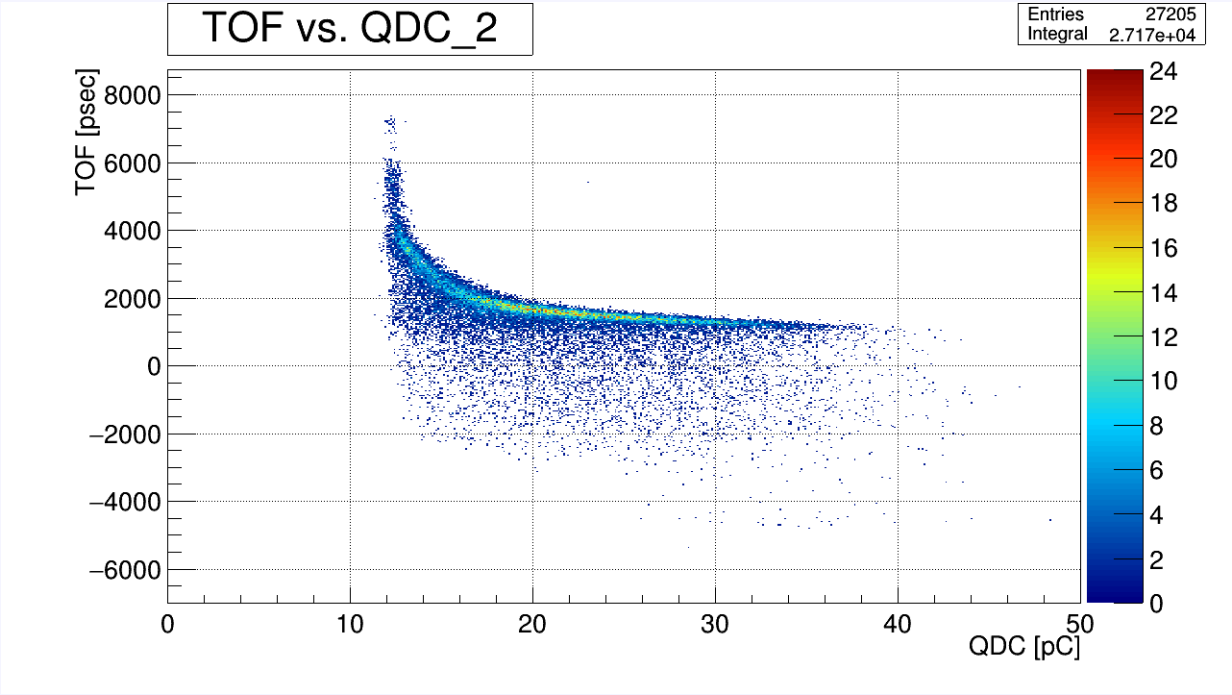




In Progress

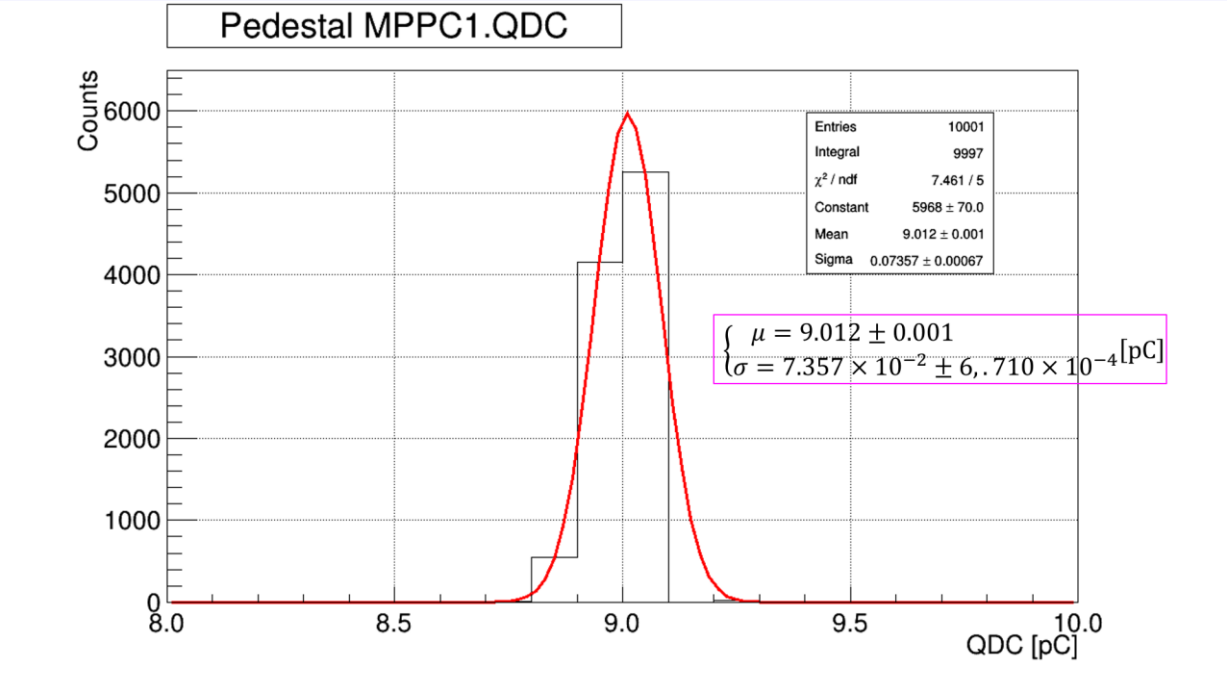
- Plot TOF vs. QDC1, QDC2

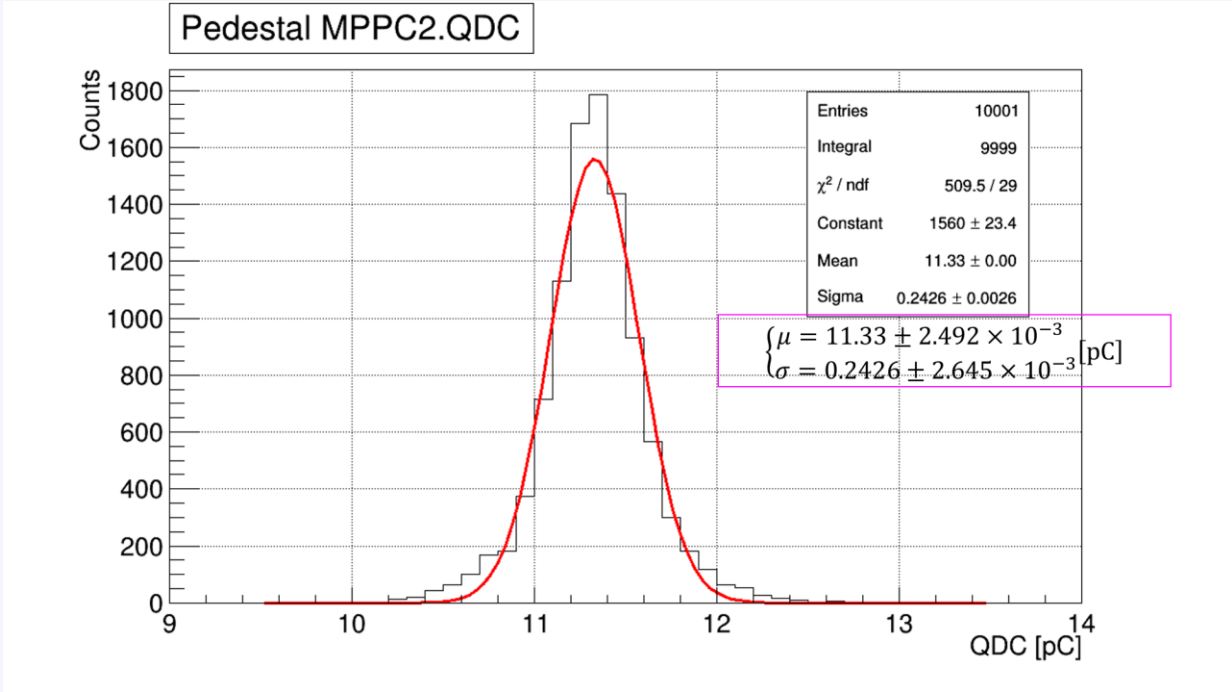




In Progress

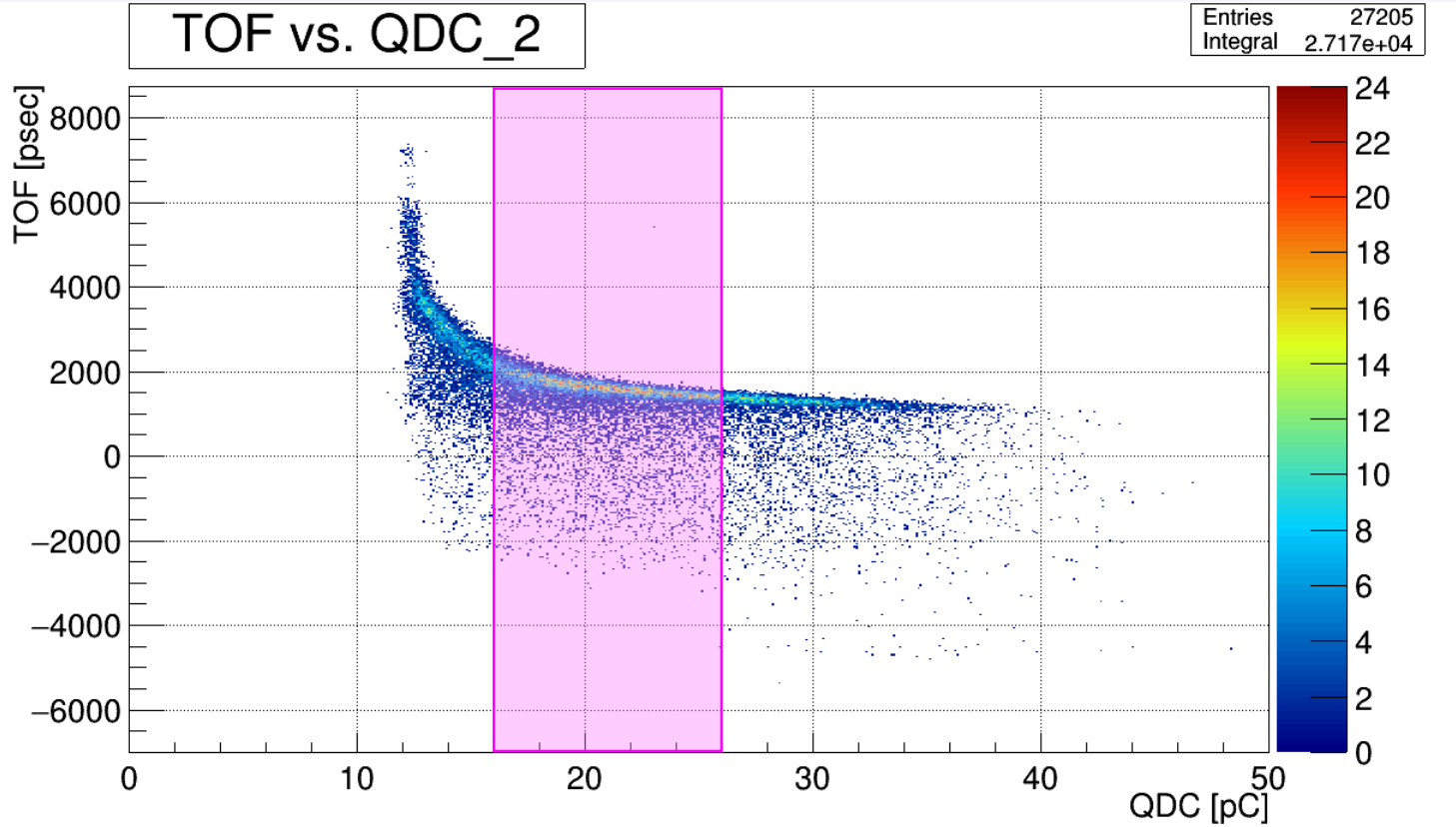
- Pedestal(run No.0047)
  - Fit using gassian





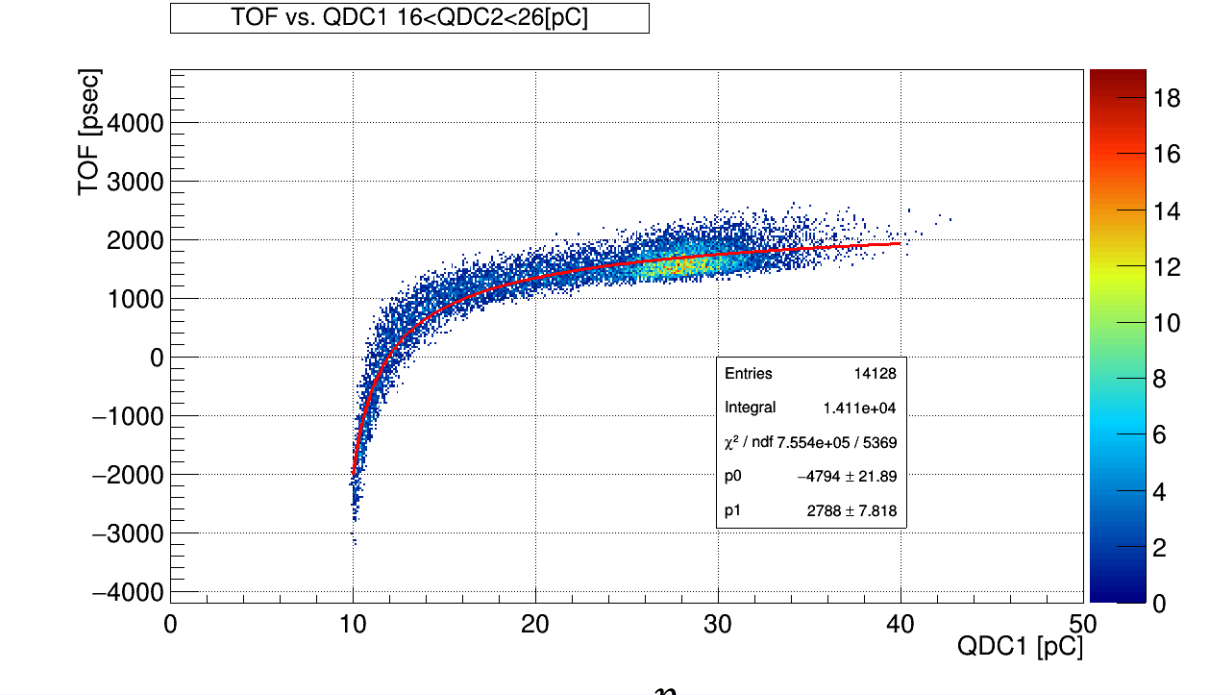
In Progress

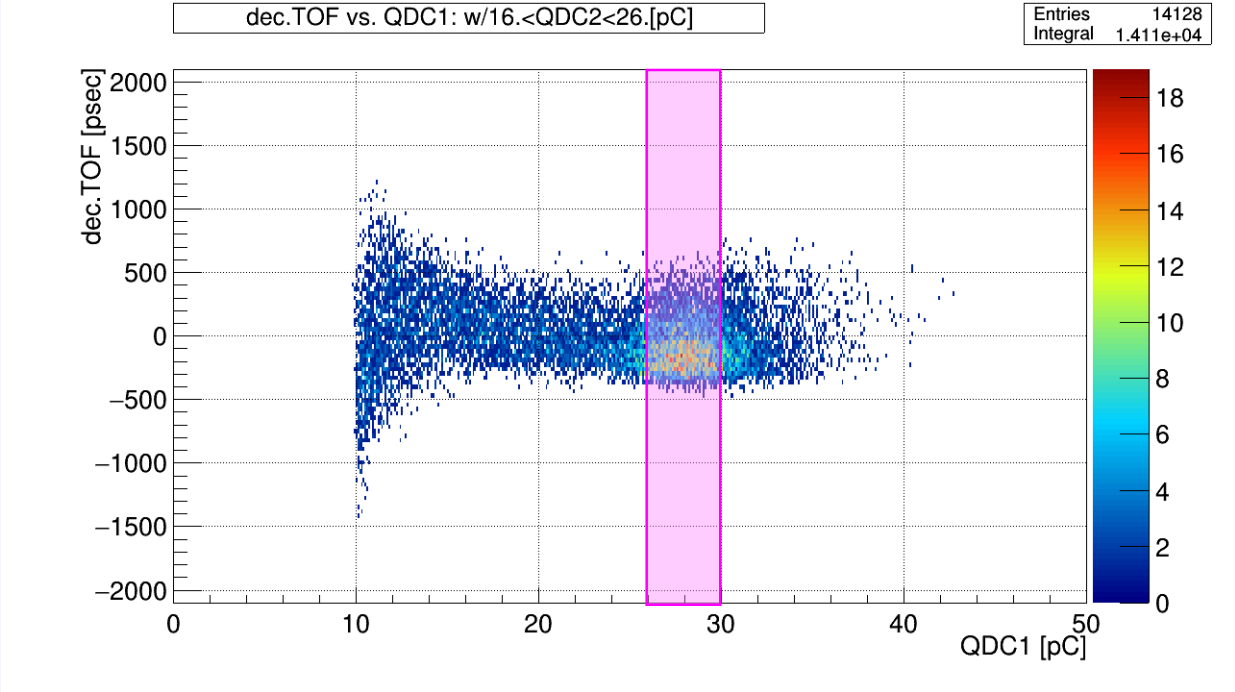
- For time walk correction, focus on TOF vs QDC1 & 2 dist.



- Pick up bins with large entry
  16<QDC2<26 [pC]
- Under this condition,
  Calibrate TOF vs. QDC1

In Progress





$$f(\mathrm{QDC}_1) = \frac{p_0}{\sqrt{\mathrm{QDC}_1 - 9.01}} + p_1 \quad [\mathrm{psec}]$$

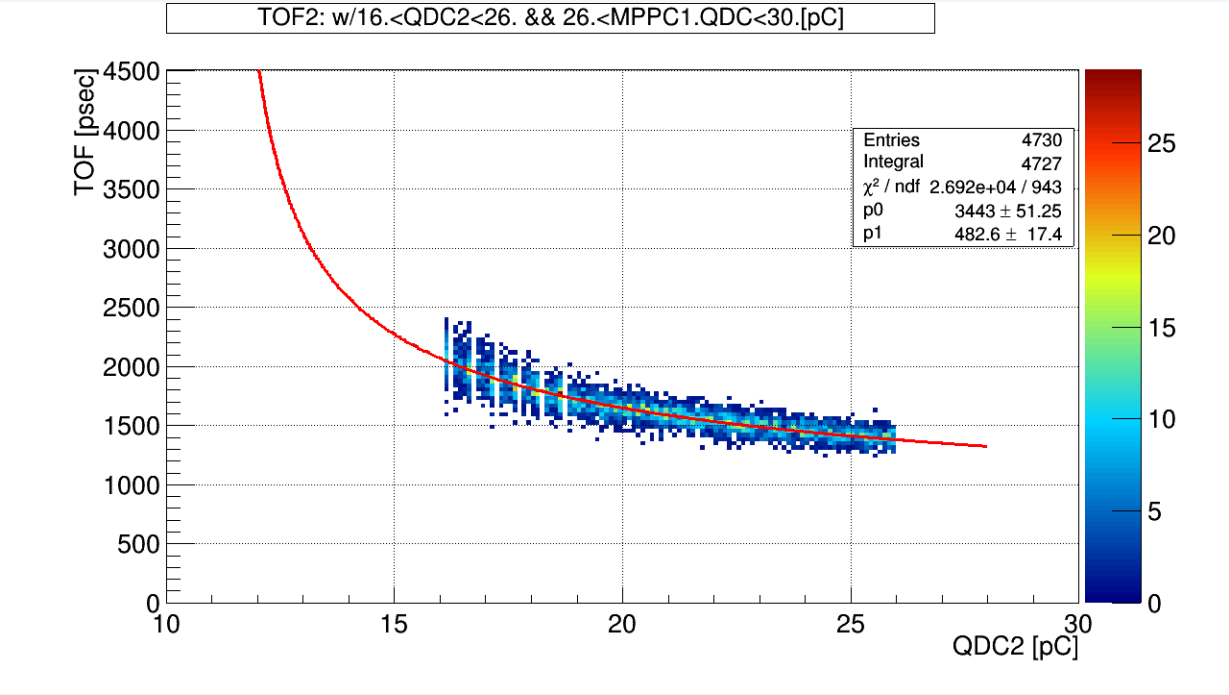
$$\begin{cases} p_0 = -4793.85 \pm 21.8909 \ [\mathrm{psec} \cdot (\mathrm{pC})^{\frac{1}{2}}] \\ p_1 = 2788.21 \pm 7.81754 \qquad [\mathrm{psec}] \end{cases}$$

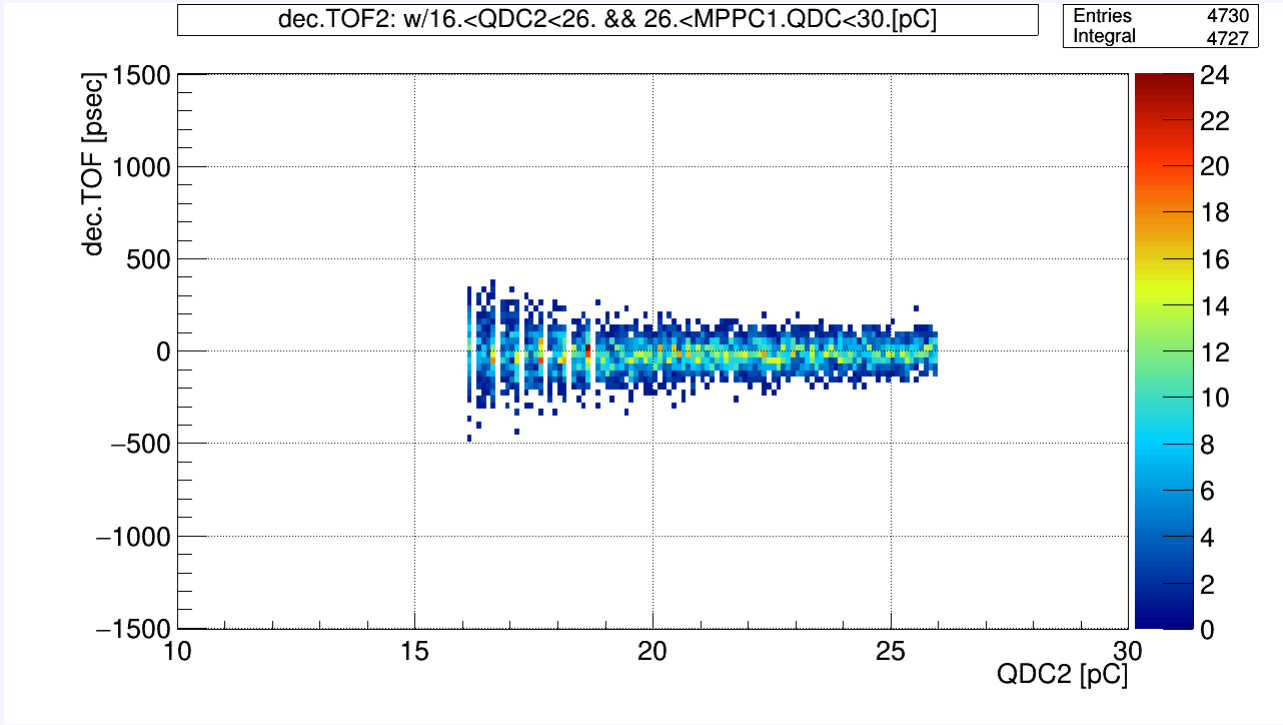
$$\uparrow \mathrm{dec.TOF} = \ \mathrm{TOF} \ - f(\mathrm{QDC1})$$

- Additional condition, 26<QDC1<30 [pC]

In Progress

TOF vs. QDC2 under gate conditions



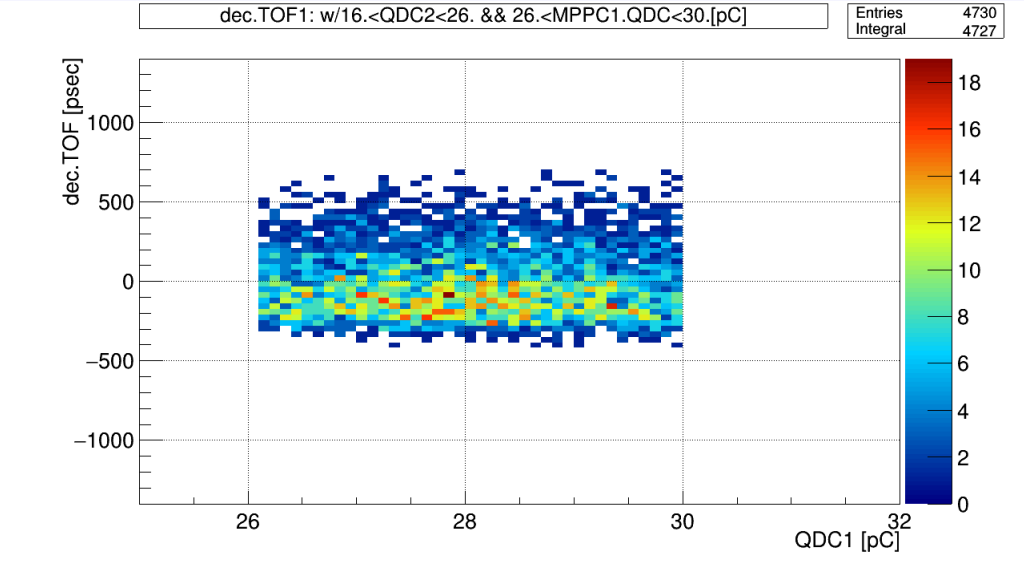


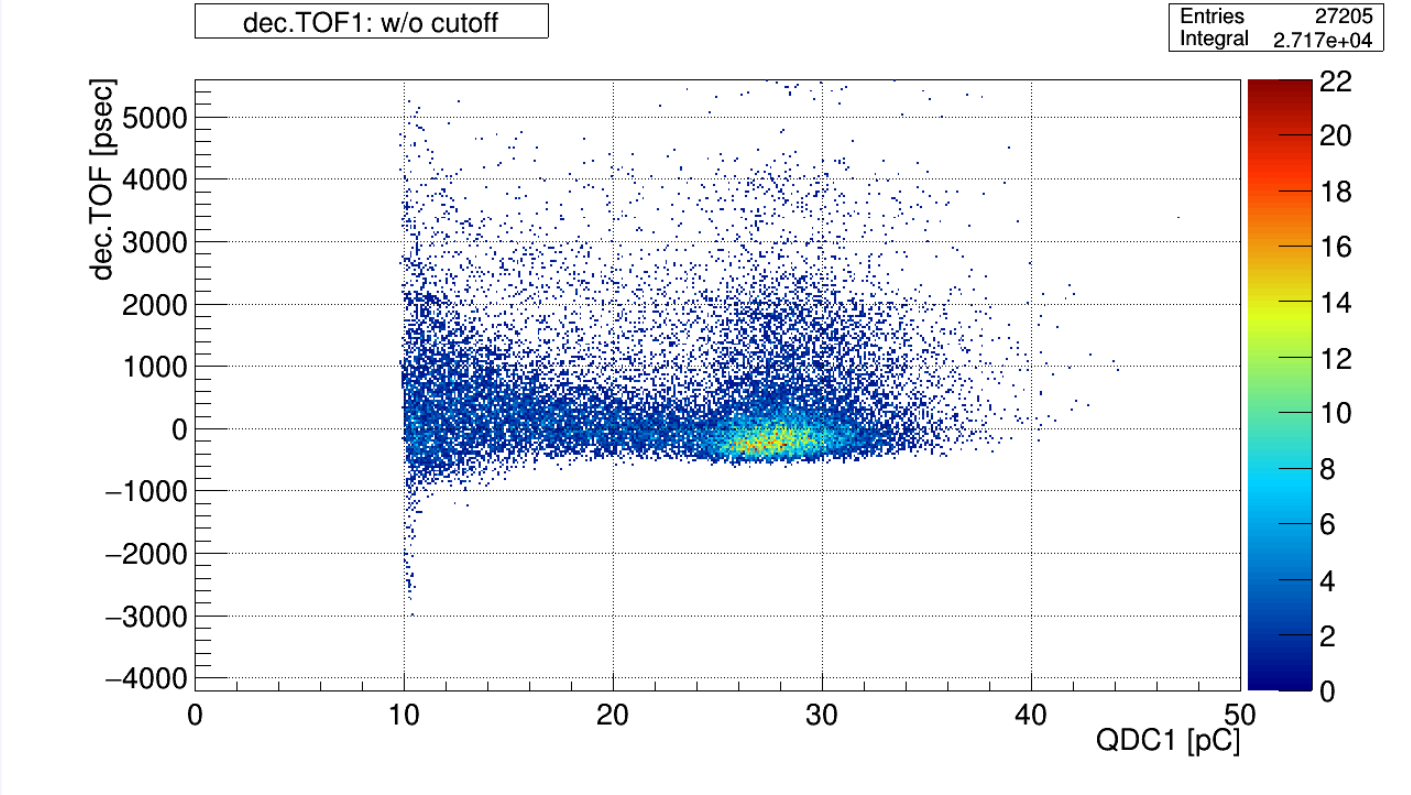
$$f(\mathrm{QDC}_2) = \frac{p_0}{\sqrt{\mathrm{QDC}_2 - 11.3}} + p_1 \quad [\mathrm{psec}]$$

$$\begin{cases} p_0 = 3443.35 \pm 51.2489 \ [\mathrm{psec} \cdot (\mathrm{pC})^{\frac{1}{2}}] \\ p_1 = 482.587 \pm 17.4016 \qquad [\mathrm{psec}] \end{cases}$$

↑dec. TOF = TOF $- f(\mathrm{QDC2})$ vs. QDC2

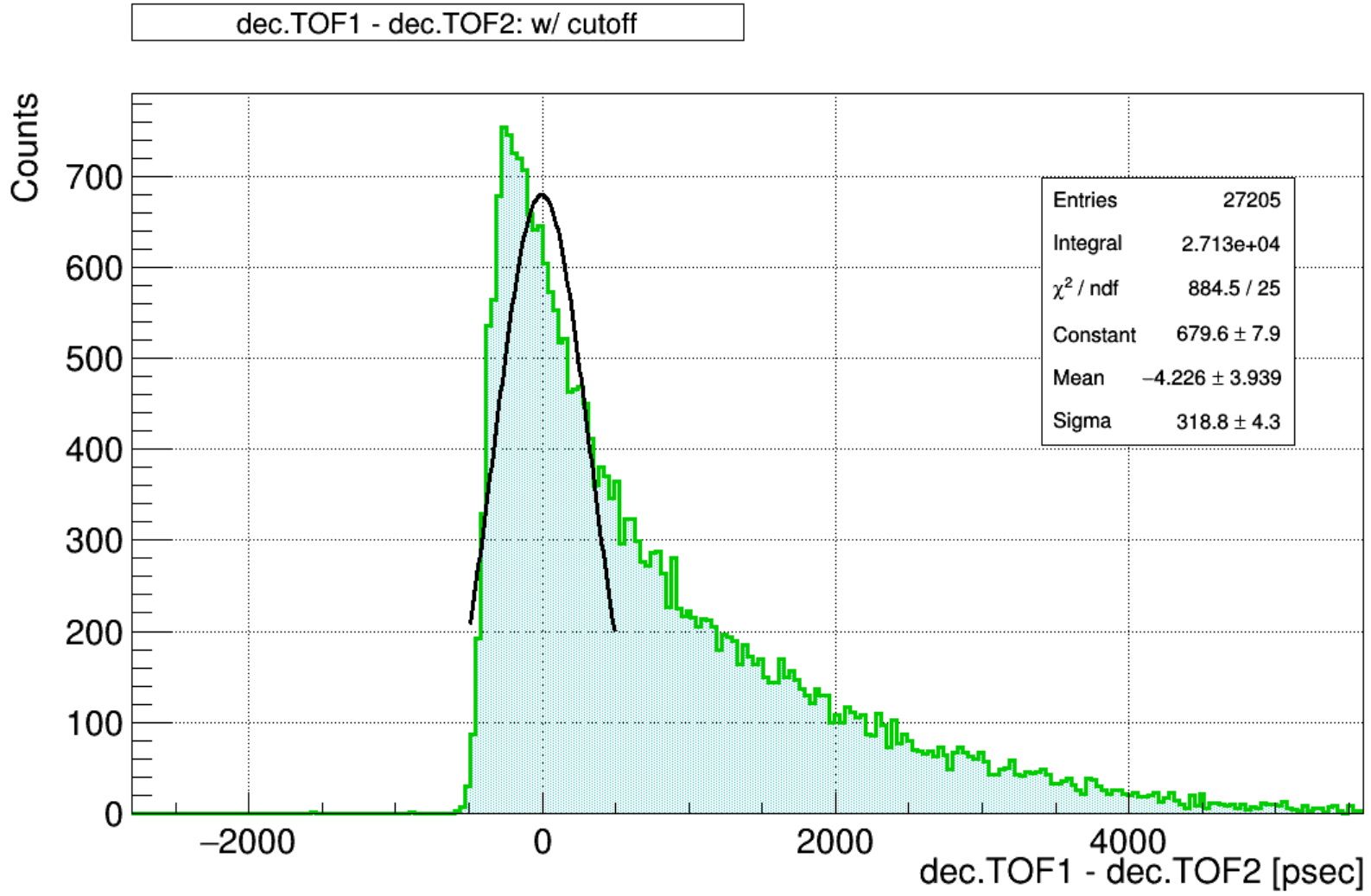
In Progress





↑修正したTOF(dec.TOF)をカットオフを外し、すべてプロット

In Progress



←Dist. TOF = dec.TOF1 - dec.TOF2

- Really, want to make macro file
- I couldn't solve error…

→ to do next!

To do

- Work hard time resolution analyze
  - Learn macro

- FPGA Seminar (11.7～8)