# The Latest Development of Readout Board with MPPC

2011/12/19th

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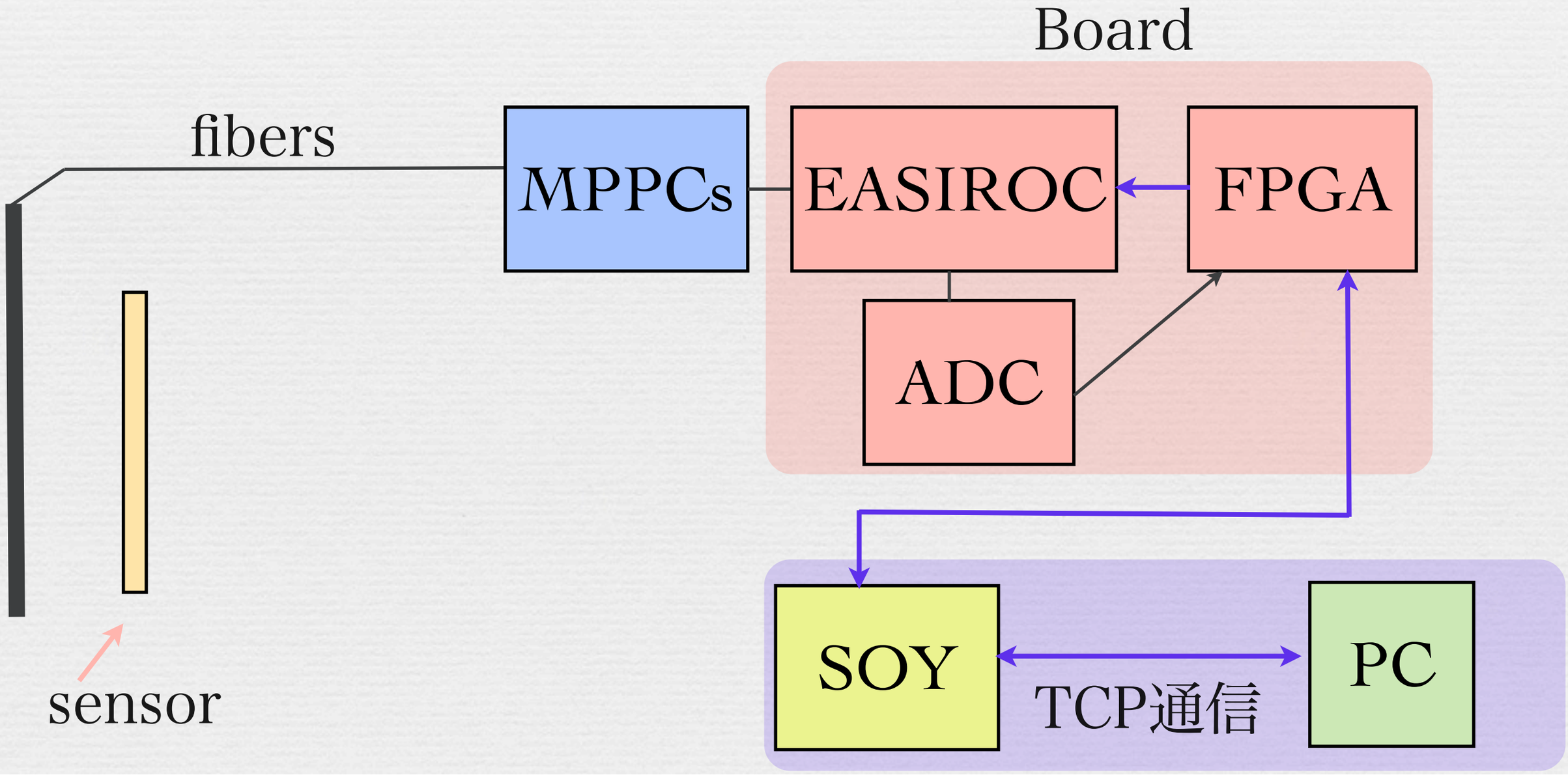
# 発表の流れ

- 研究目的
- Readout Boardの概要(EASIROC Board)
- 現状について
- まとめ
- To Do

# 研究目的

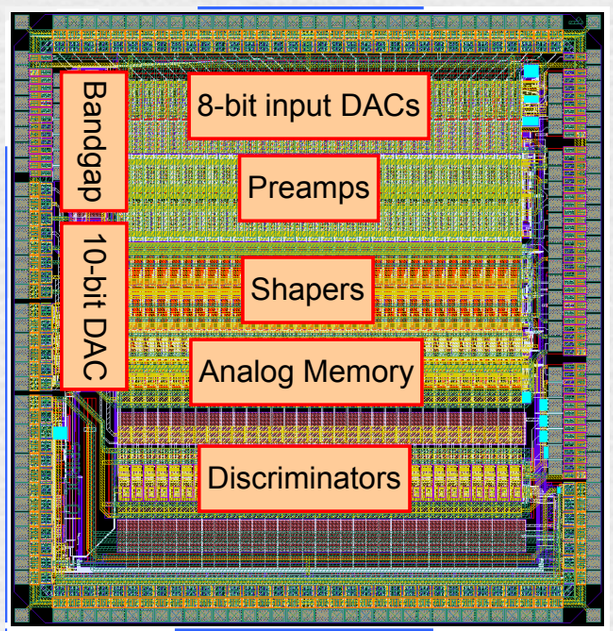
- 来秋(冬)に行われるビームテストにおけるプロファイル・モニタ

- 他モジュールへのトリガ



# EASIROC Boardの概要①(EASIROC Chip)

- 32ch読み出し
- 8bit DACにてMPPCへのH.V.を個別に調整可能
- gain調整可能なPreamp. & 時定数調整可能なShaper
- Triggerの生成

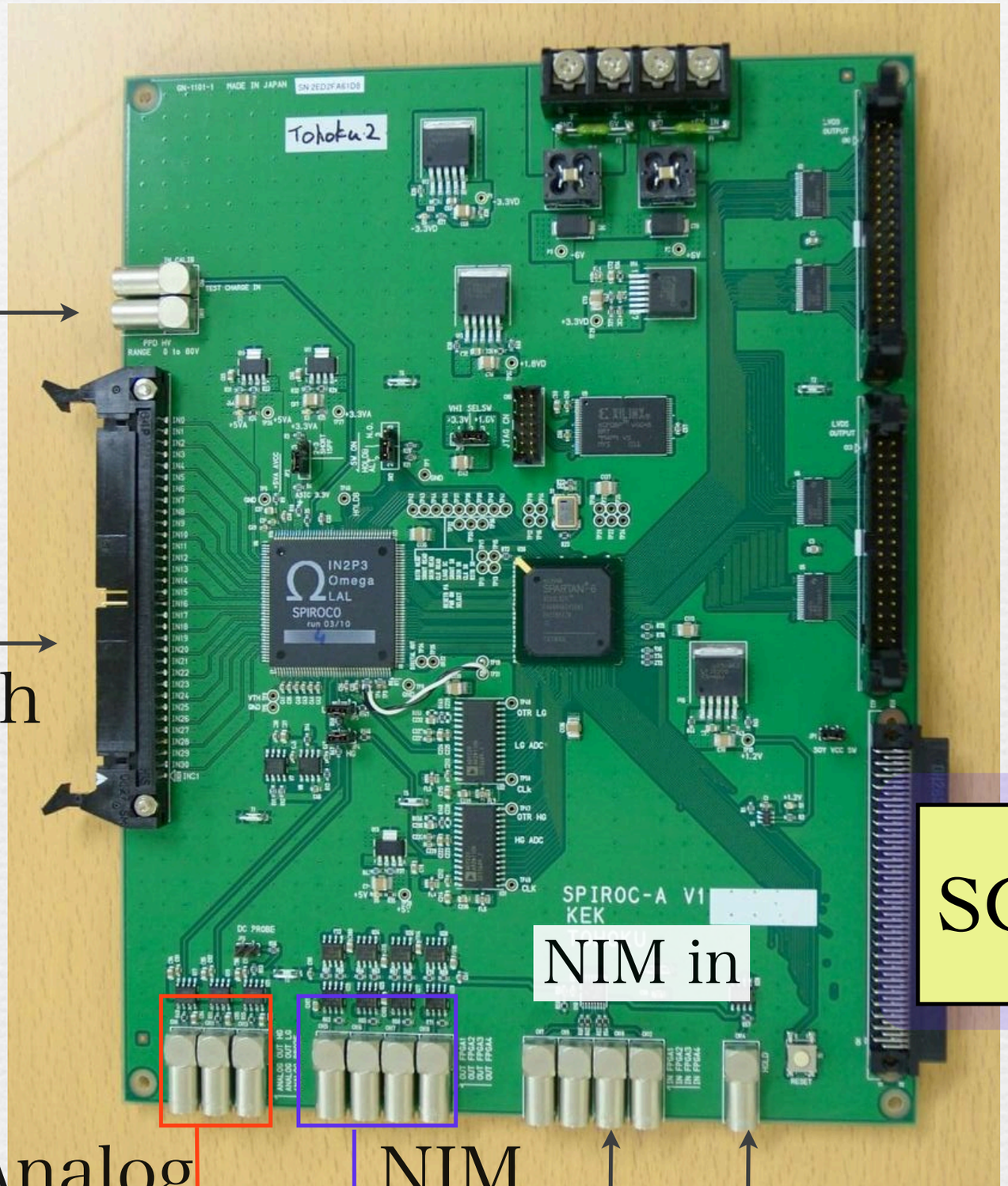


# EASIROC Boardの概要①

H.V.

MPPCs

32ch




SOY

PC

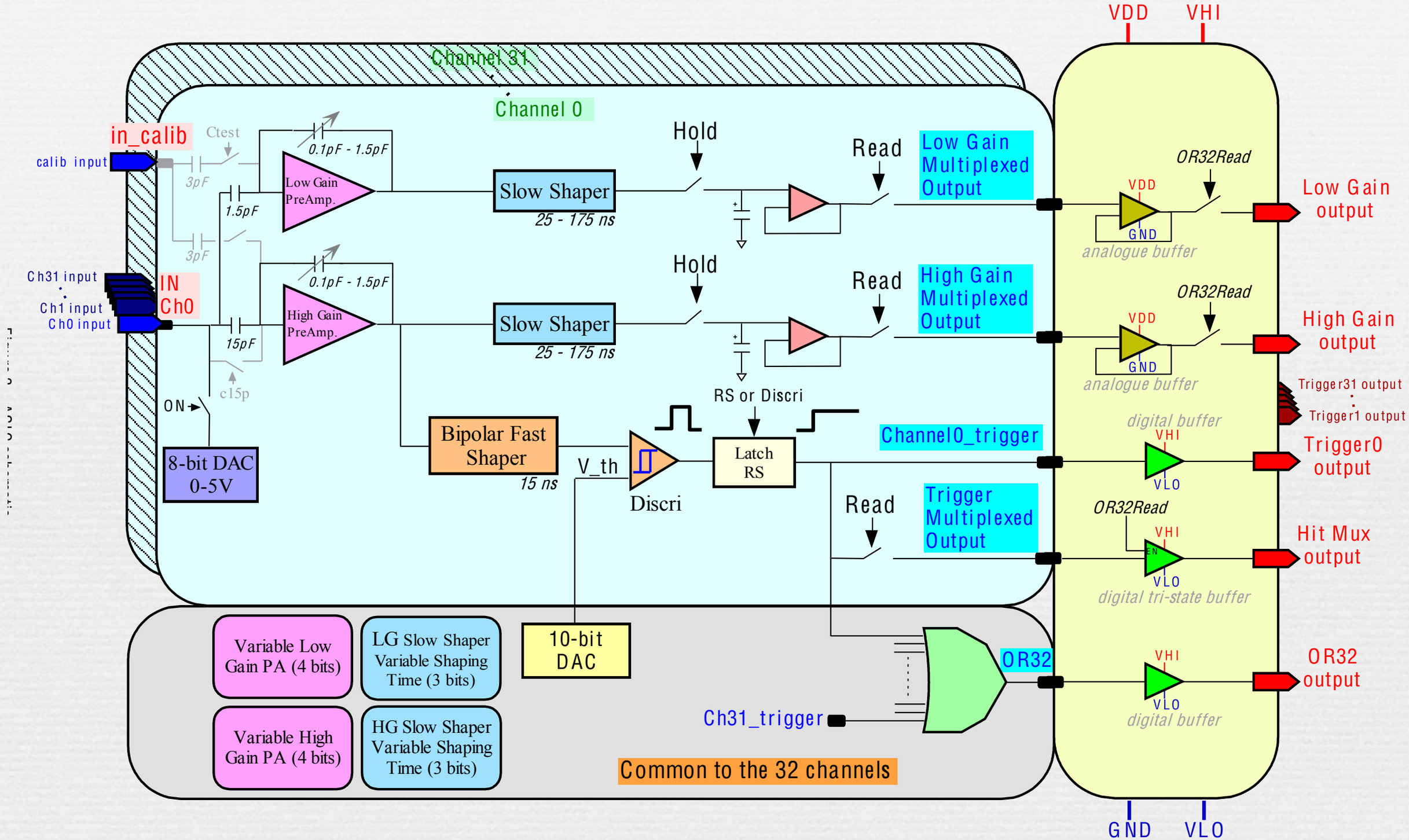
NIM in

Analog out

NIM out

Trigger

# EASIROC Boardの概要②(EASIROC Chip)



# EASIROC Boardの概要③

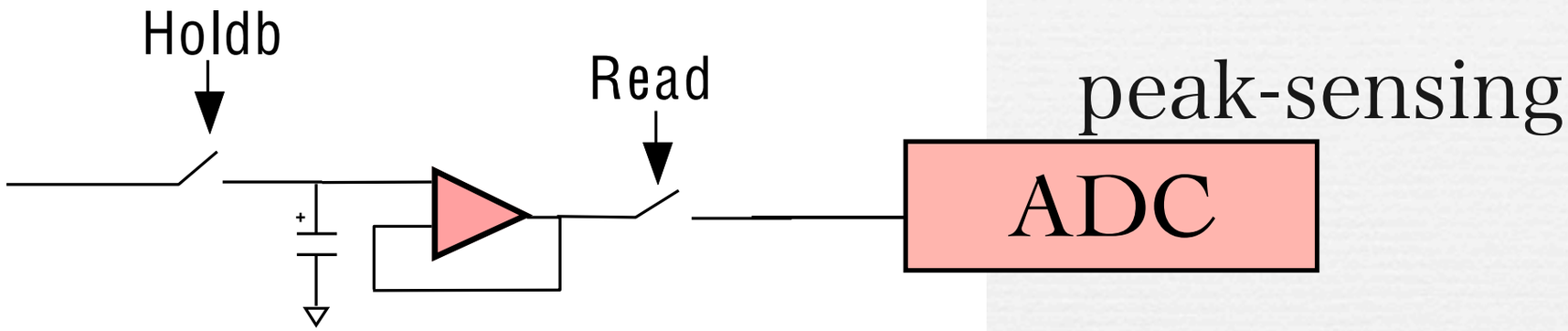
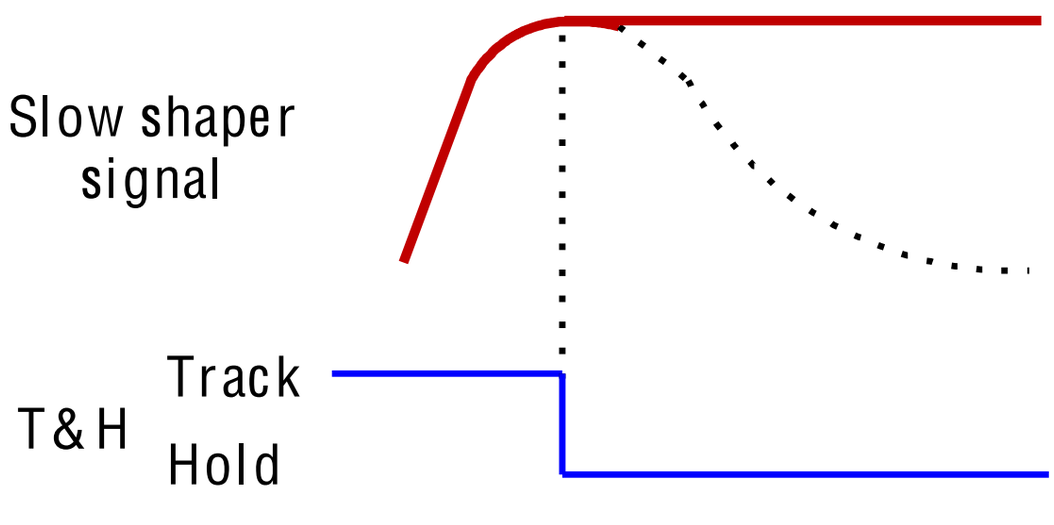


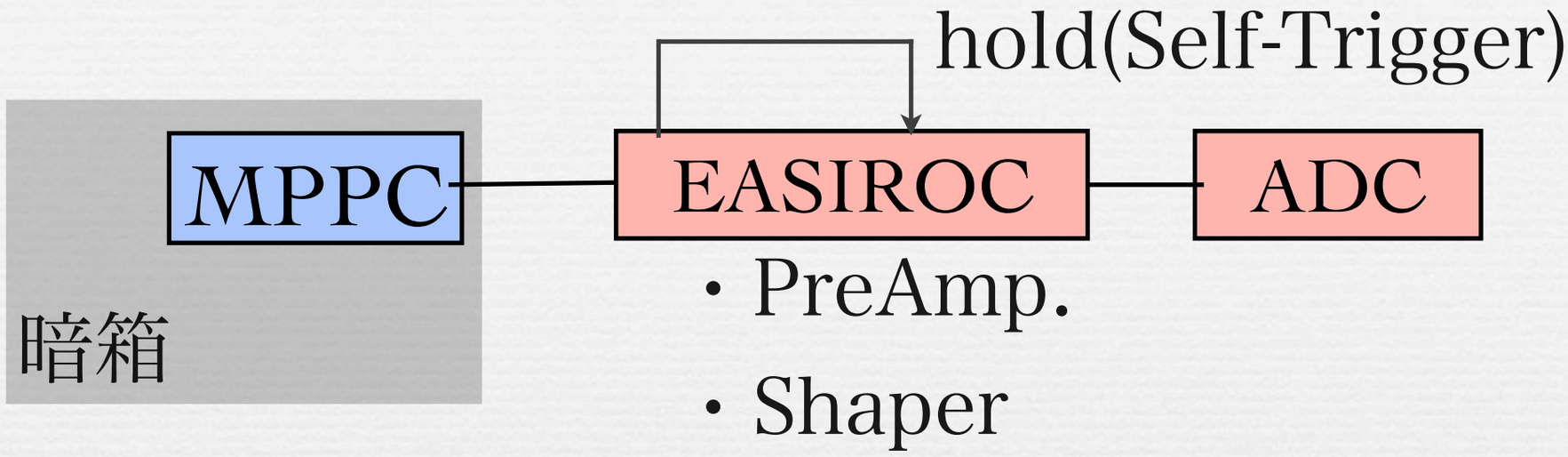

Figure 8 – Schematic of track and hold cell




holdのタイミングは、外部で調整する。

## 現状について①

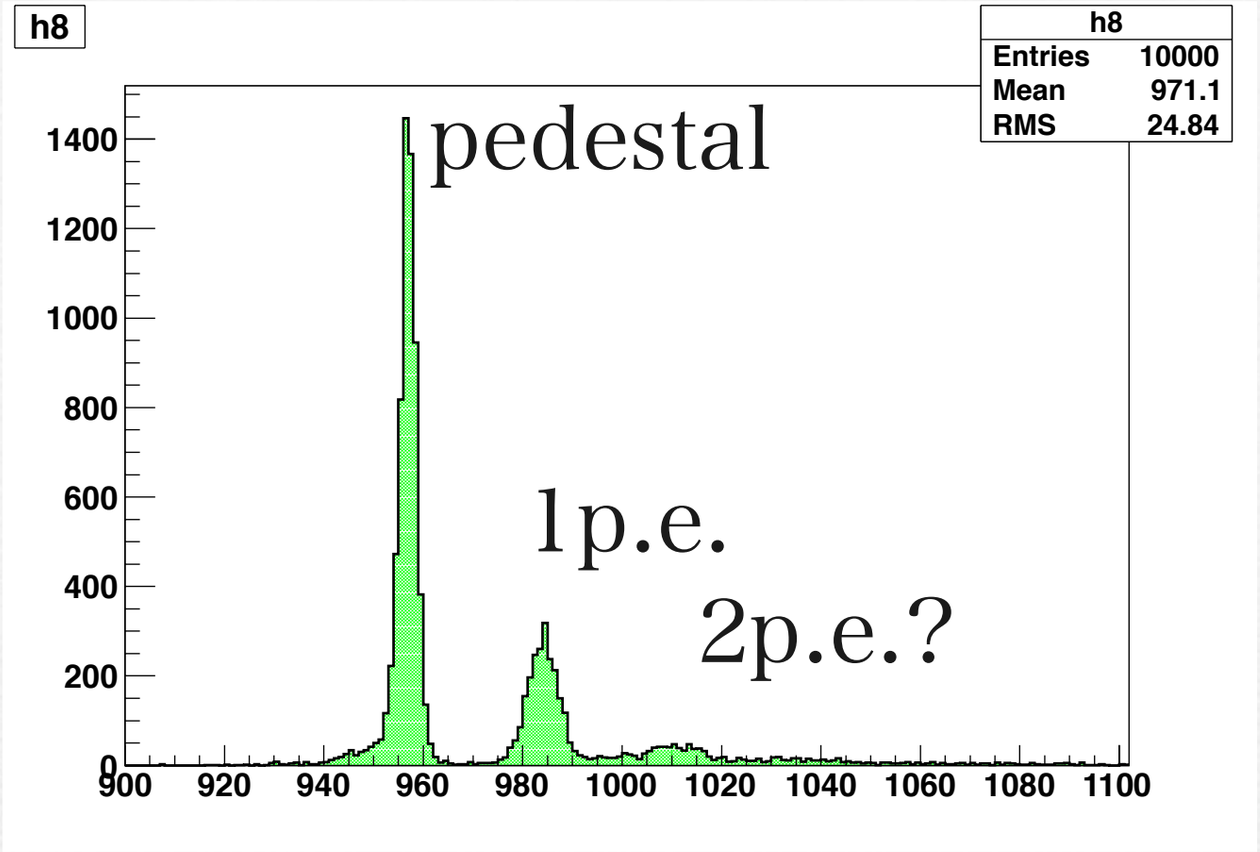
# 1chのみでのDark Currentの測定




H.V.　：76.00~74.00V(ソースメータ表示)
PreAmp. Gain　：75
Time Const.　：75ns

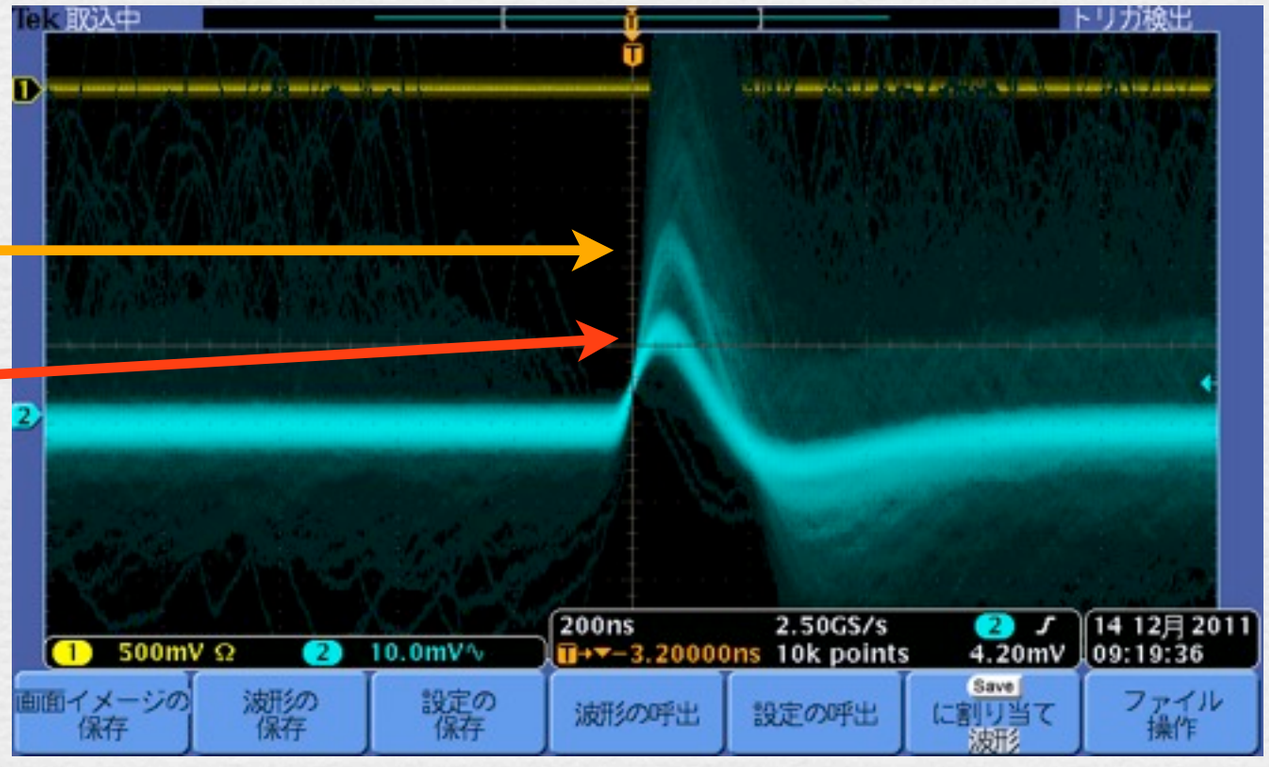
例えば、76.0Vをかけてみると…

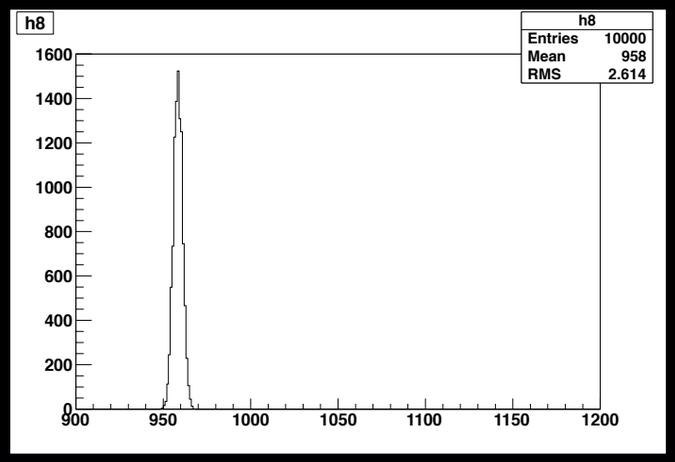
# H.V.　76.0V

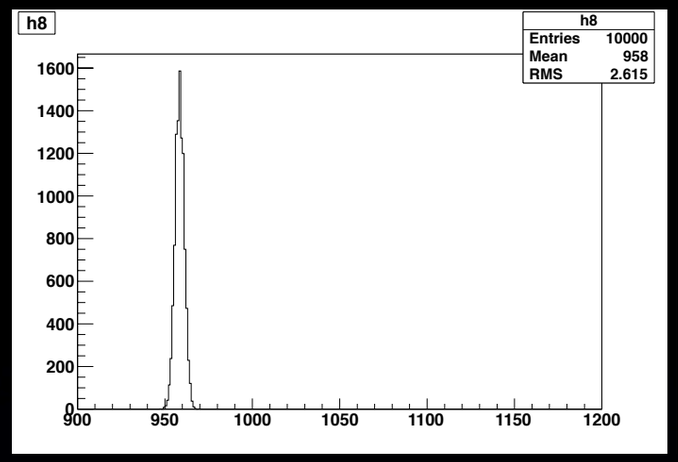


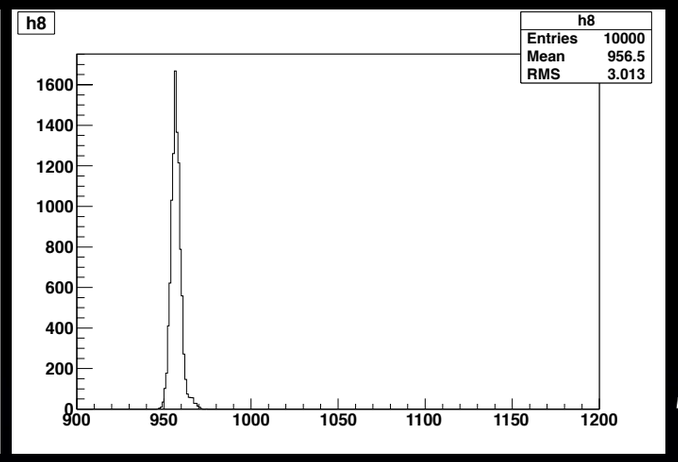

2p.e.

1p.e.

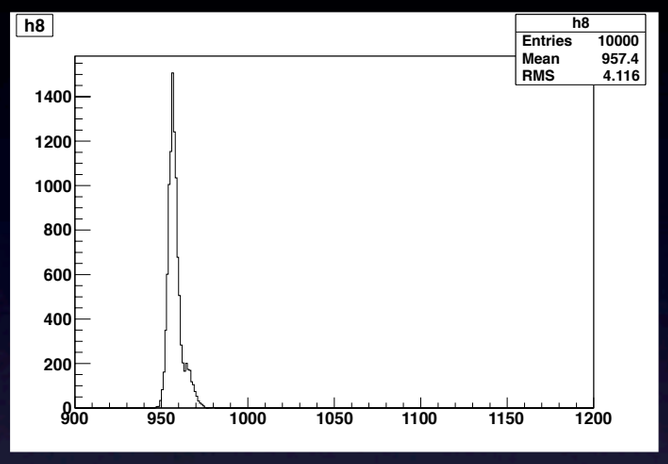


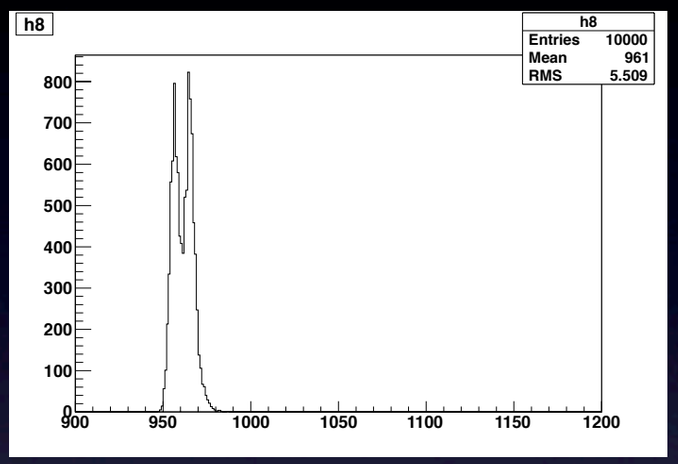


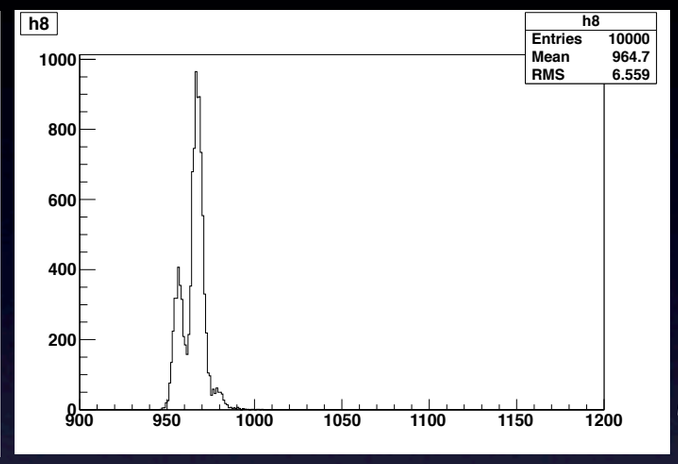



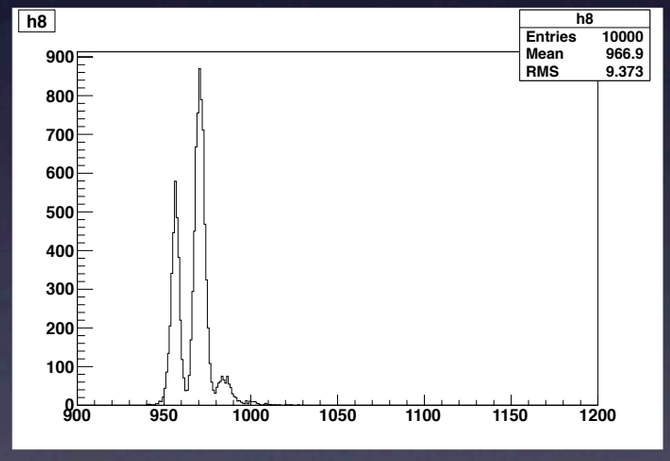

74.0V, 74.2V, 74.4V

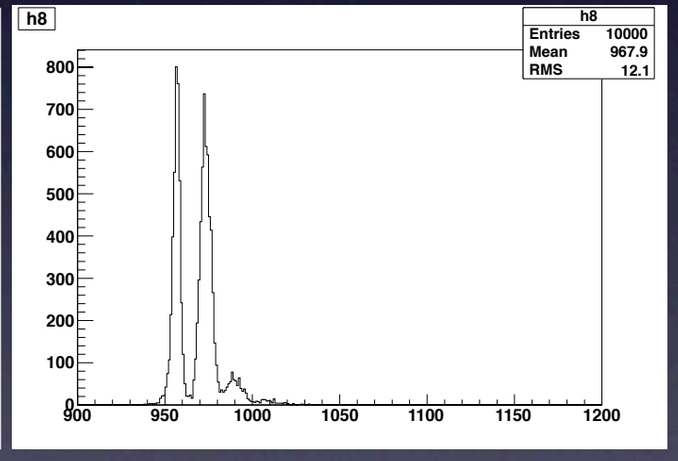


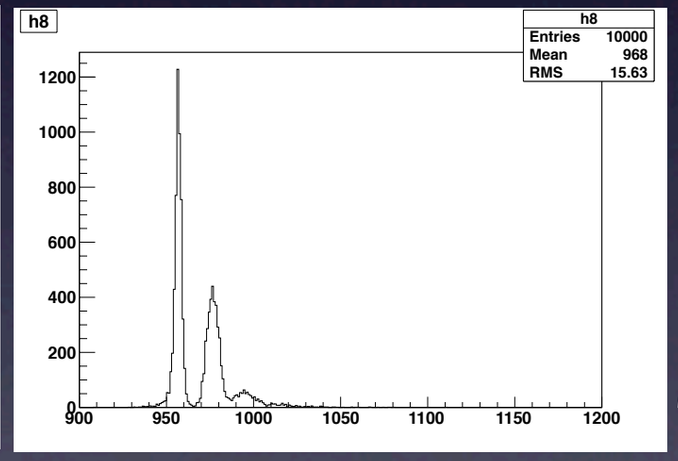



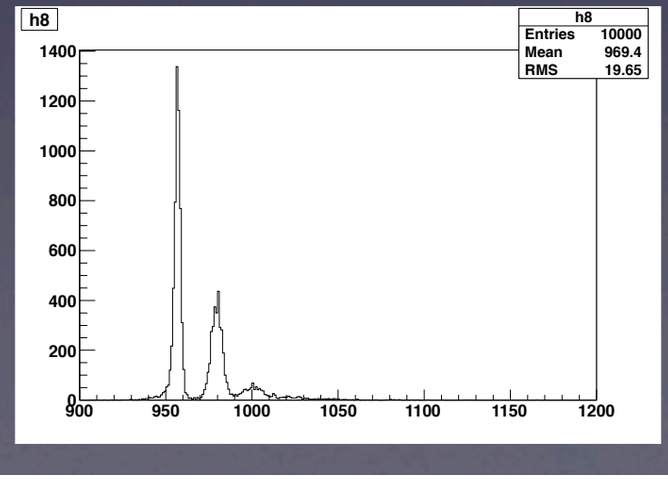

75.5V, 75.6V, 75.8V

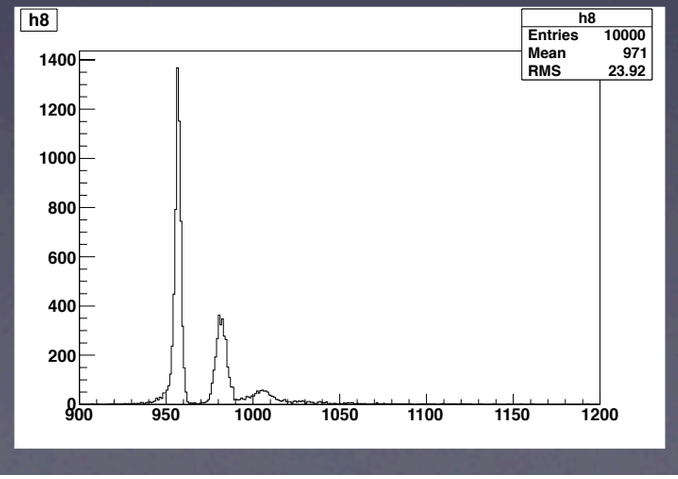


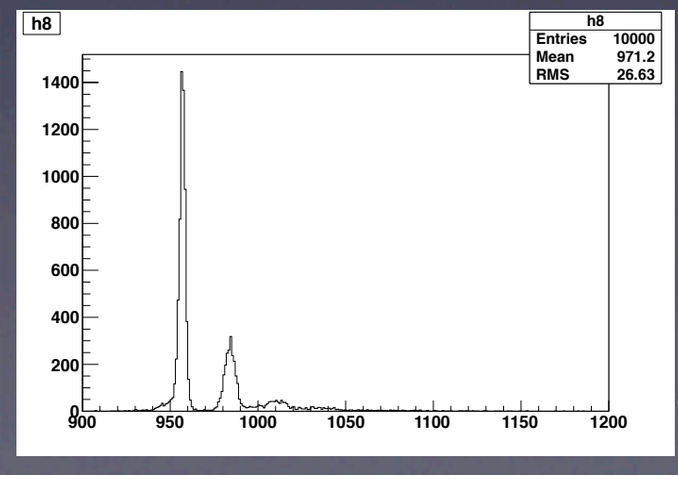




75.0V, 75.2V, 75.4V



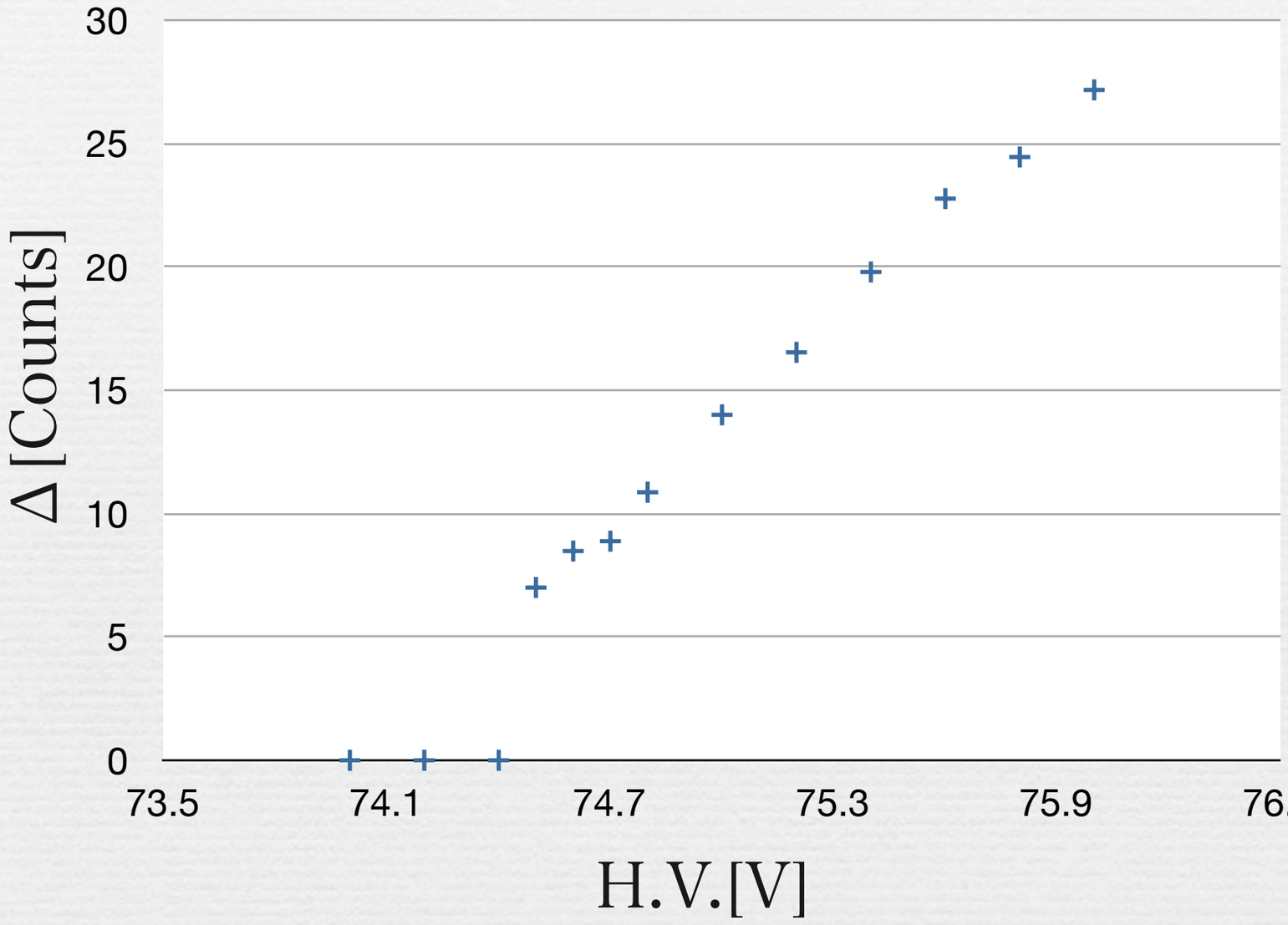




75.6V, 75.8V, 76.0V

# H.V.とΔ(pdstl - 1p.e.)の関係






$\Delta \propto e \times G \times G'$

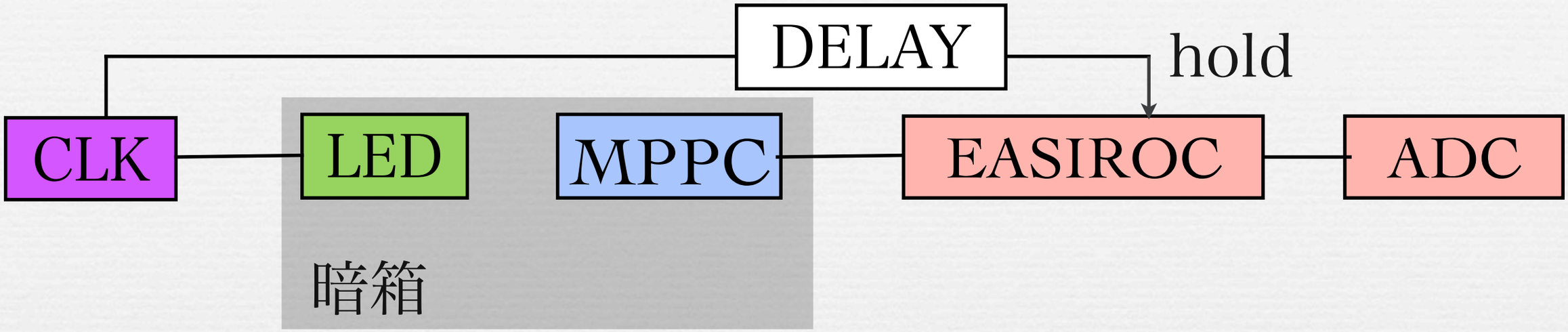
G: Gain(MPPC)

G': Gain(PreAmp.)

G'は固定。

## 現状について②

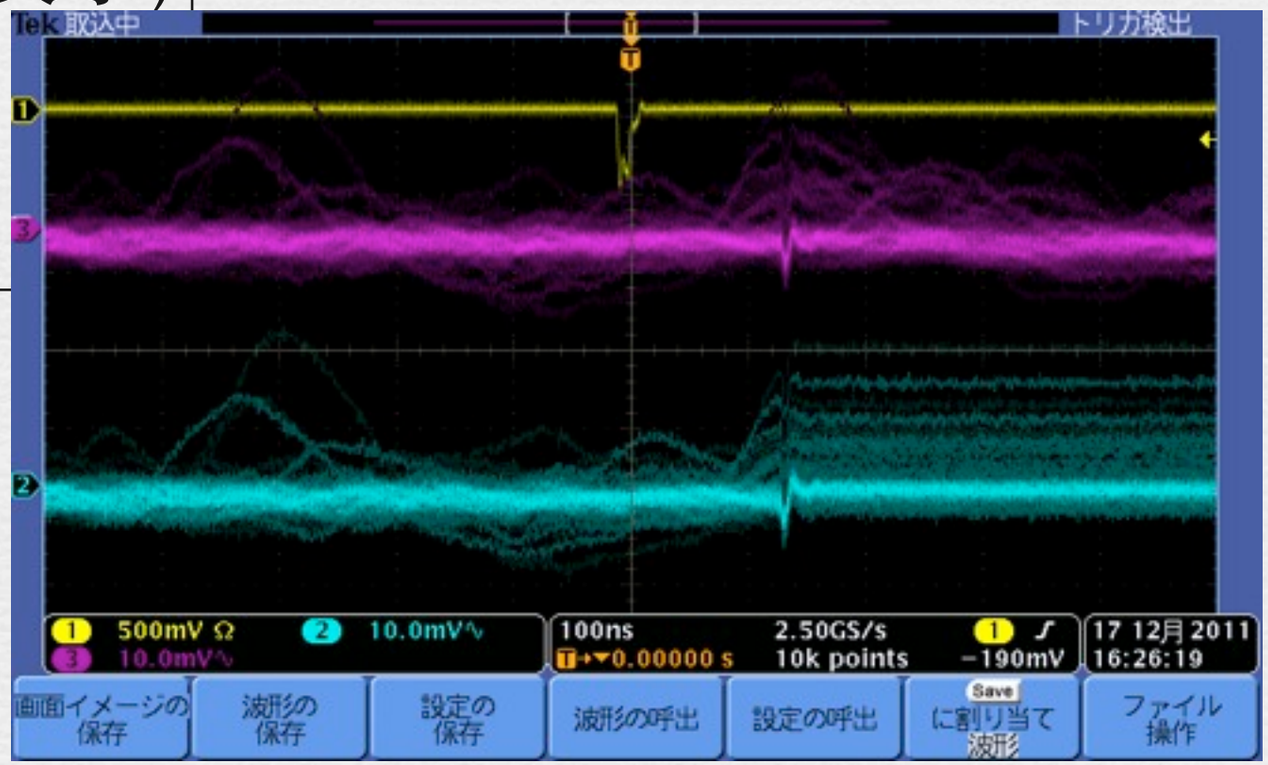
## LEDを光らせて、ADC分布をとる



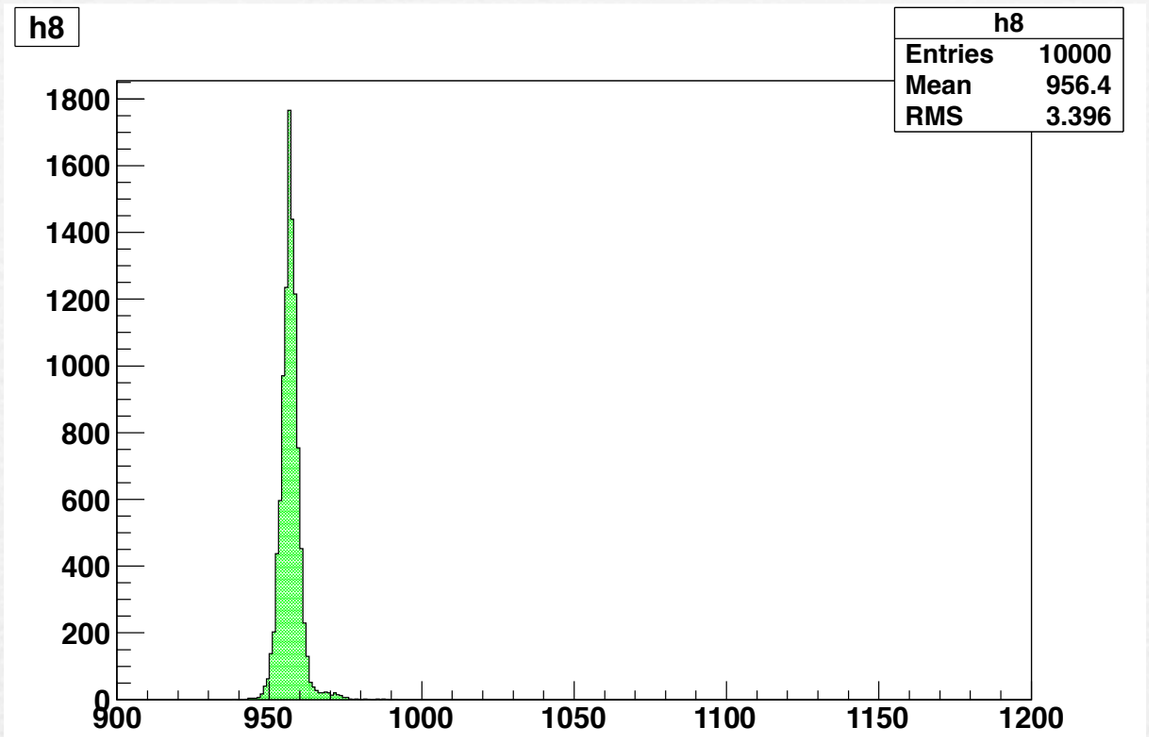

H.V.　：75.00V(ソースメータ表示)

PreAmp. Gain　：75

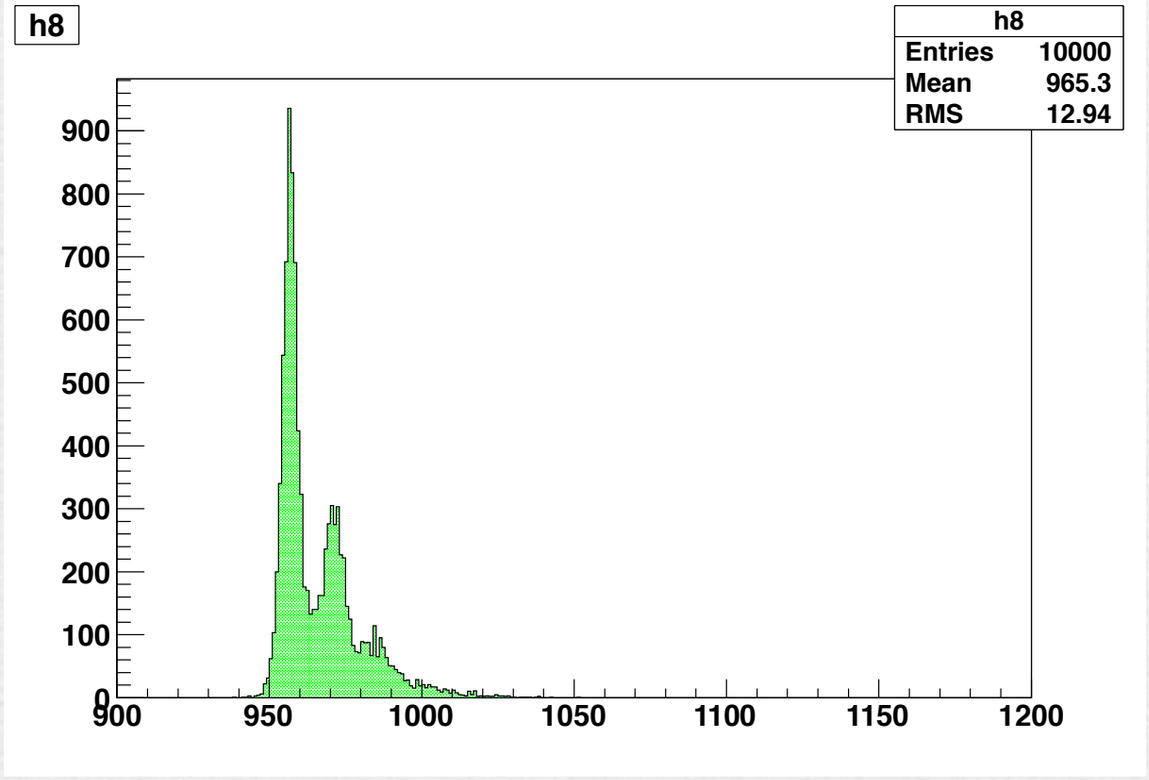
Time Const.　：75ns



# 現状について②




No LED




LED

dark currentでの測定とpeakの位置は、同じようになった。

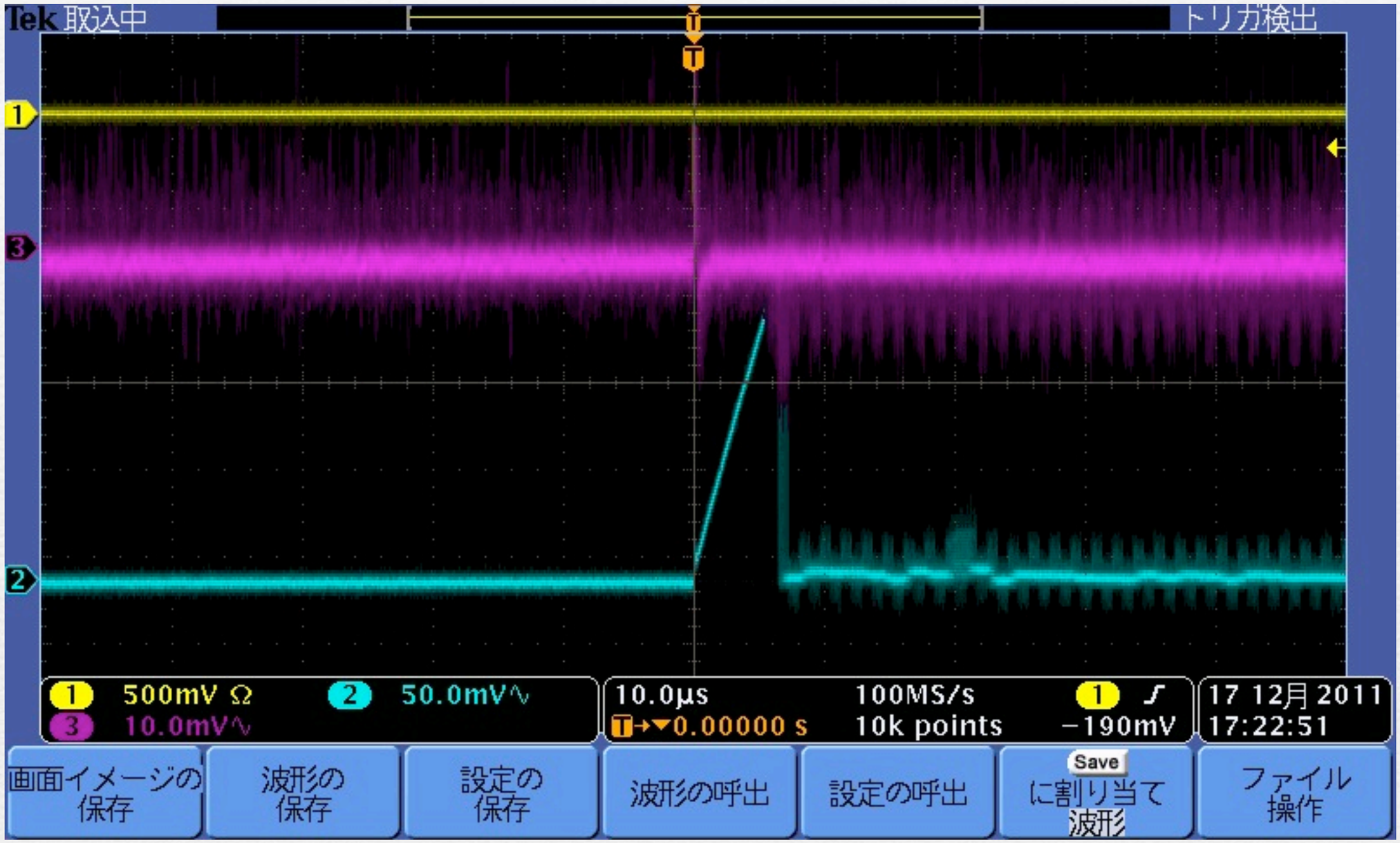
# まとめ

- 読み出しボードEASIROC Boardを用いて、ビームプロファイルモニタの設計をしていく
- Dark Currentでの1p.e.、2p.e.の検出が出来た
- LED光での1p.e.、2p.e.の検出が出来た

# To Do

- MPPCに実際にかかっているH.V.を正しく理解する
- ノイズの特定

# Backup




# DAQ中のshaper後の波形

| Feedback Capacitance | Low gain value | High gain value |
|---|---|---|
| 1.5 pF | 1 | 10 |
| 1.4 pF | 1.07 | 10.7 |
| 1.3 pF | 1.15 | 11.5 |
| 1.2 pF | 1.25 | 12.5 |
| 1.1 pF | 1.36 | 13.6 |
| 1.0 pF | 1.5 | 15 |
| 900 fF | 1.66 | 16.6 |
| 800 fF | 1.875 | 18.75 |
| 700 fF | 2.14 | 21.4 |
| 600 fF | 2.5 | 25 |
| 500 fF | 3.0 | 30 |
| 400 fF | 3.75 | 37.5 |
| 300 fF | 5.0 | 50 |
| 200 fF | 7.5 | 75 |
| 100 fF | 15 | 150 |

Table 1 – Theoretical preamplifiers gain value vs feedback capacitance

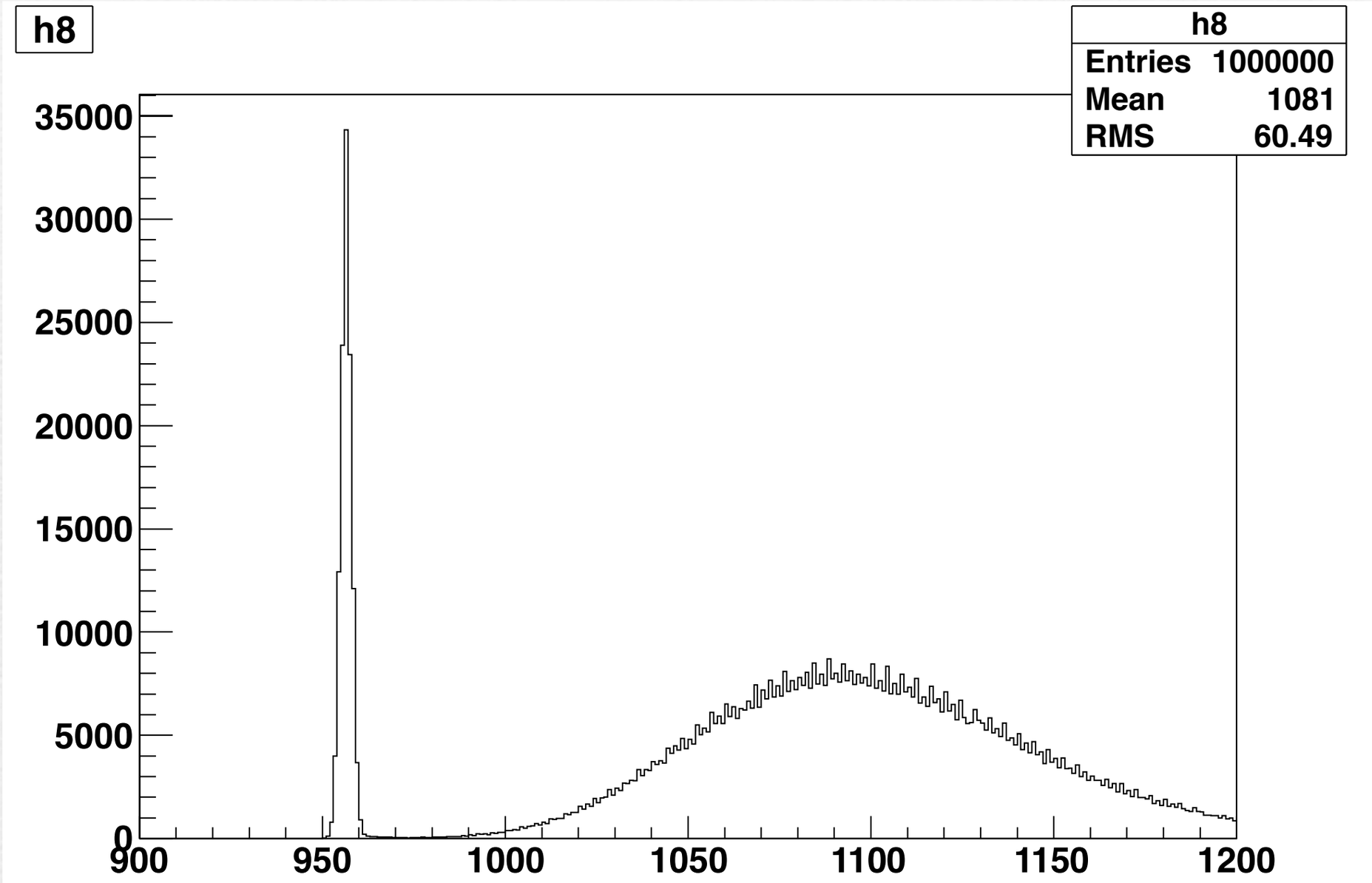
PreAmp. Gain

| Slow control value | Peaking time value |
|---|---|
| 1 (001) | 25 ns |
| 2 (010) | 50 ns |
| 3 (011) | 75 ns |
| 4 (100) | 100 ns |
| 5 (101) | 125 ns |
| 6 (110) | 150 ns |
| 7 (111) | 175 ns |

Table 2 – Slow shaper peaking time value vs slow control parameters

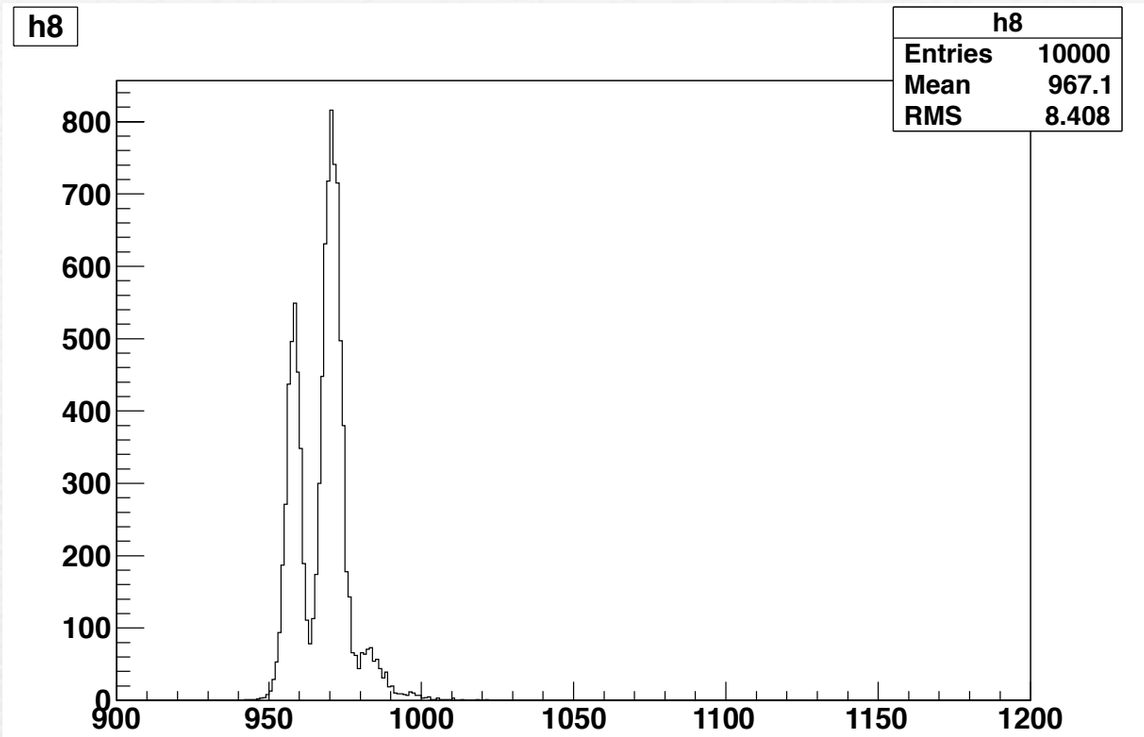
Time Const.

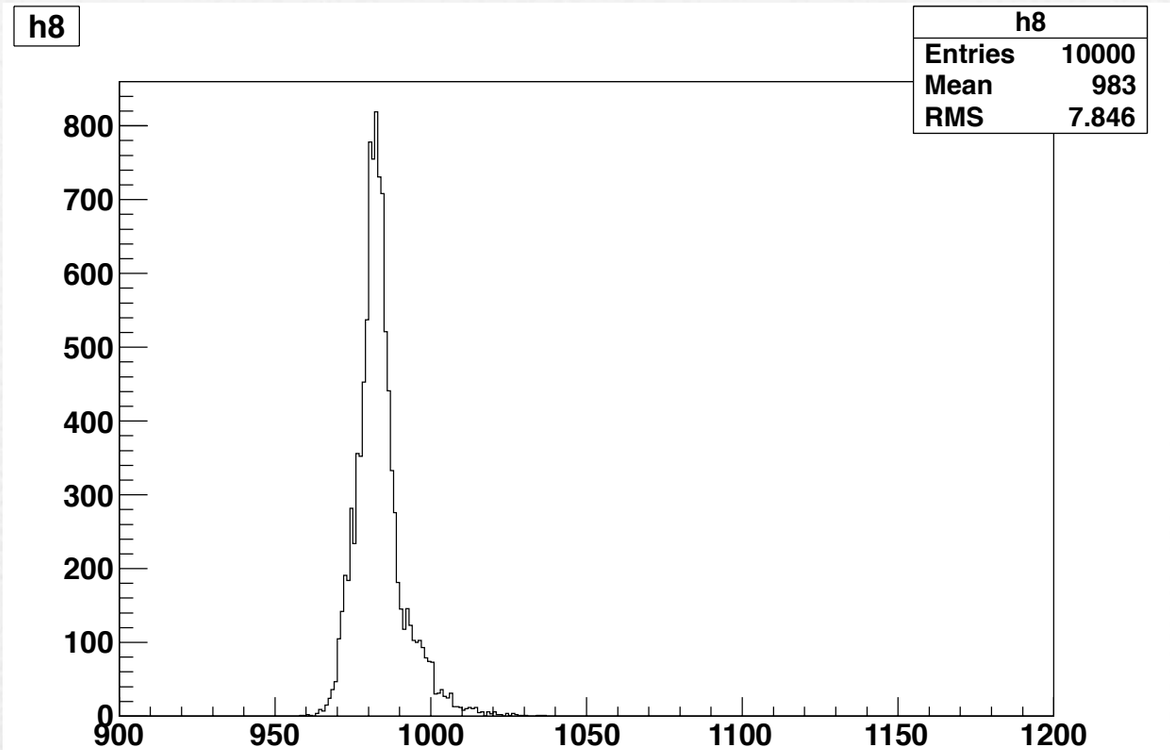
| | | |
|---|---|---|
| 76.00V | | |
| pedestal | 1p.e. | 2p.e. |
| 956.9 | 984.072 | 1010.2 |
| | | |
| 75.80V | | |
| 956.768 | 981.22 | 1005.58 |
| | | |
| 75.60V | | |
| 956.827 | 979.593 | 1000.53 |
| | | |
| 75.40V | | |
| 956.840 | 976.632 | 994.535 |
| | | |
| 75.20V | | |
| 956.730 | 973.265 | 989.351 |
| | | |
| 75.00V | | |
| 956.605 | 970.608 | 984.312 |
| | | |
| 74.80V | | |
| 956.510 | 967.375 | 978.333 |
| | | |
| 74.75V | | |
| 956.692 | 966.330 | |
| | | |
| 74.70V | | |
| 956.802 | 965.683 | |
| | | |
| 74.65V | | |
| 956.752 | 965.291 | |
| | | |
| 74.60V | | |
| 956.641 | 965.122 | |
| | | |
| 74.55V | | |
| 956.694 | 964.856 | |
| | | |
| 74.50V | | |
| 956.595 | 963.597 | <-心眼 |
| | | |
| 74.45V | | |
| 956.609 | | |
| | | |
| 74.40V | | |
| 956.940 | | |
| | | |
| 74.20V | | |
| 958.460 | | |
| | | |
| 74.00V | | |

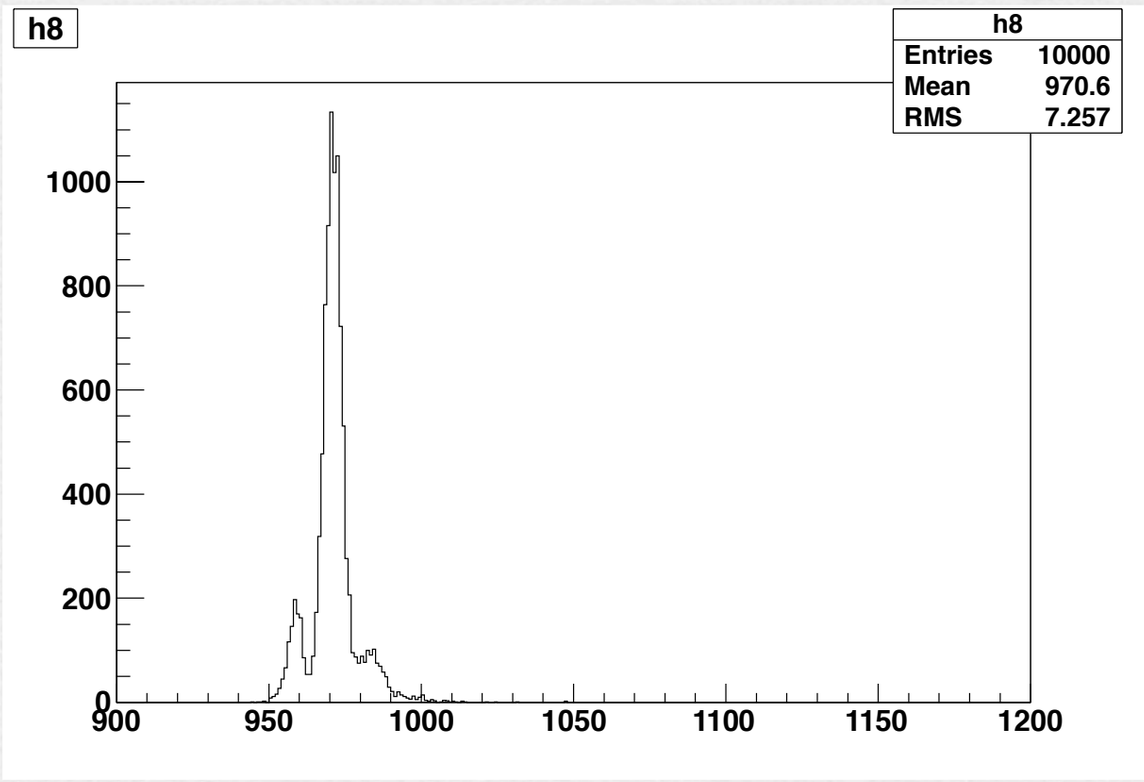



Gainは固定。

clk for ledの幅を20ns->40ns



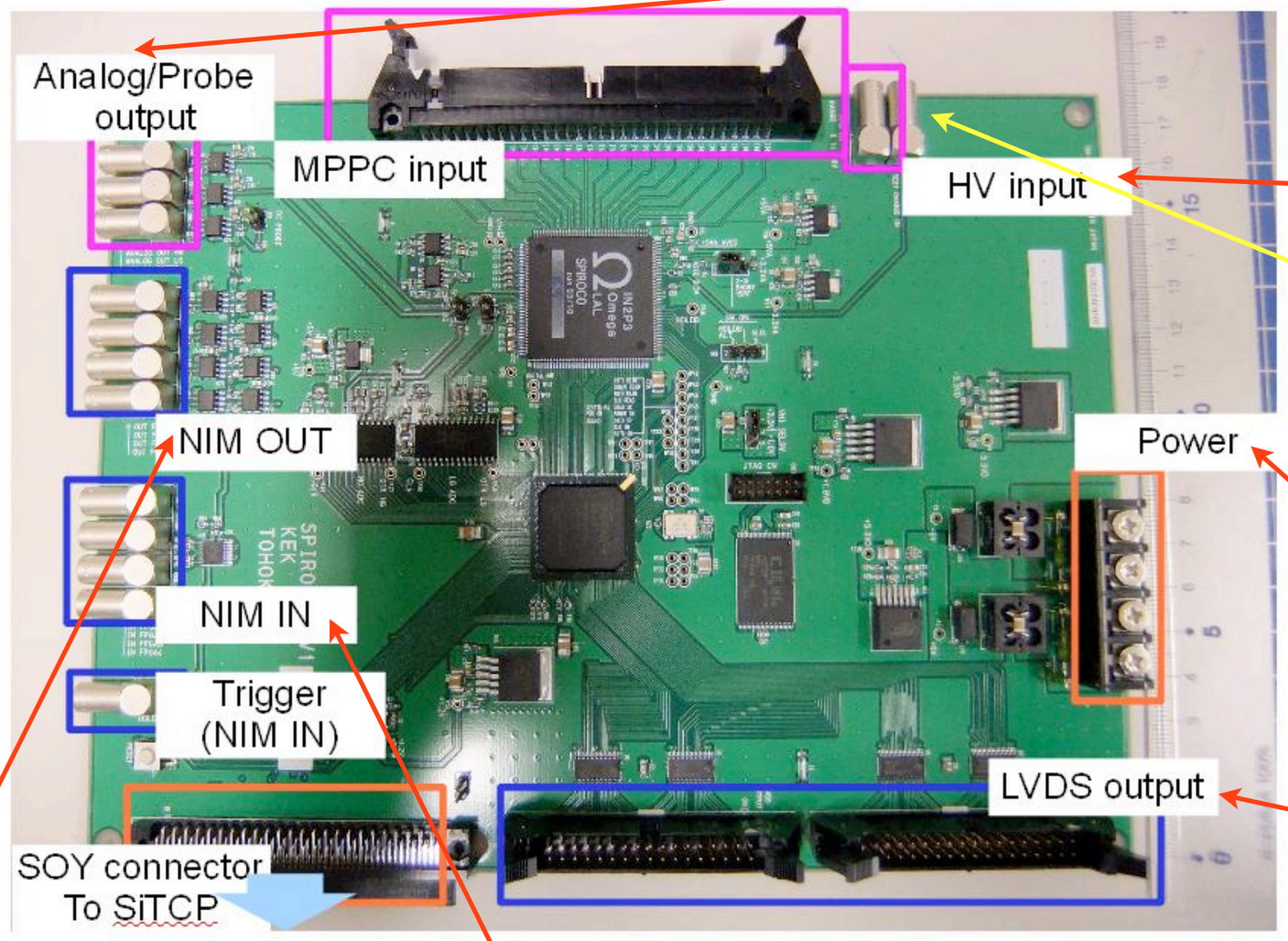




Thresh. value 860 840

850

# About EASIROC Board




From EASIROC shaper (Only 1 ch)

0~80V

CALIB. Pulse

±6V

From EASIROC Discri.

NIM OUT(digital)

NIM IN(digital)