



FERS-DT5202 tests

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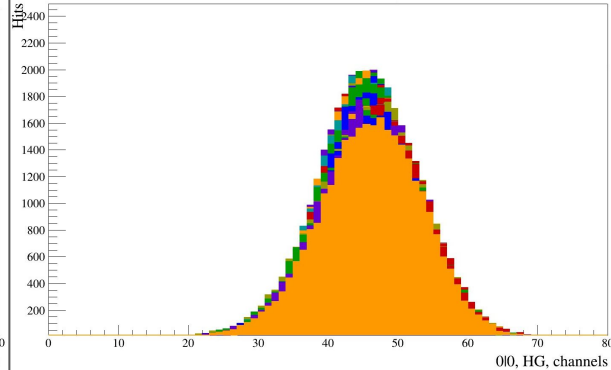
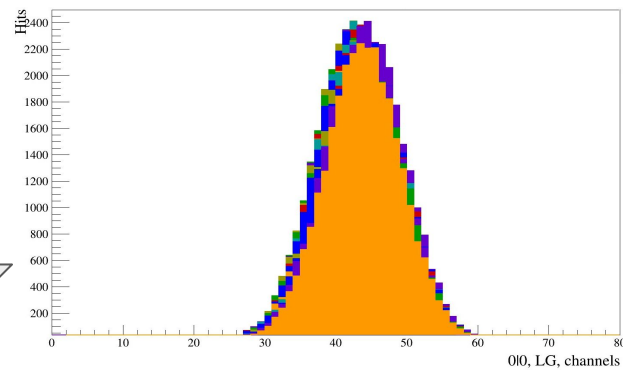
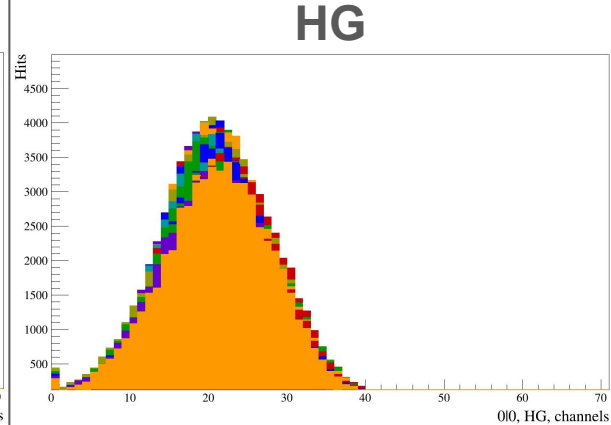
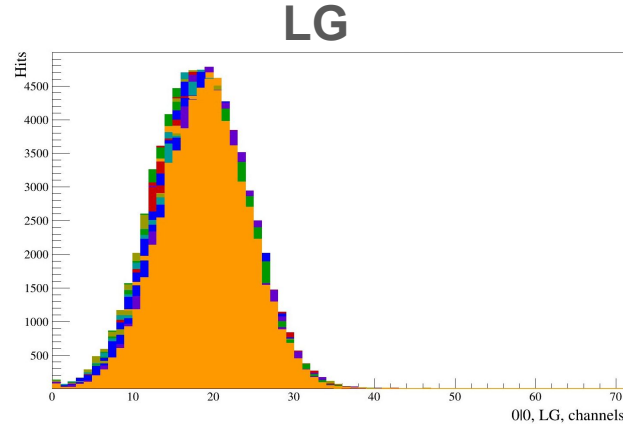
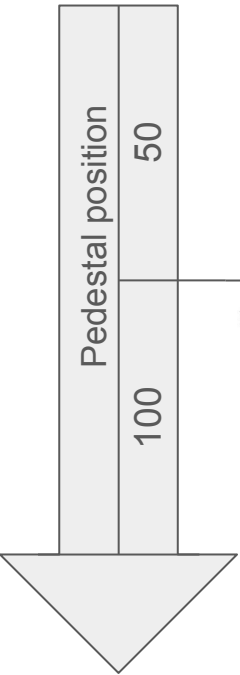
Objective:

To determine the most probable number of photons in MIPs.

Tasks:

- 1) Determining the position of the pedestal.
- 2) Obtaining conversion graphs for LG, HG, TOT, and TOA.
- 3) Determining the offset voltage and threshold for minimum noise.
- 4) Collecting statistics on cosmic radiation and processing data.

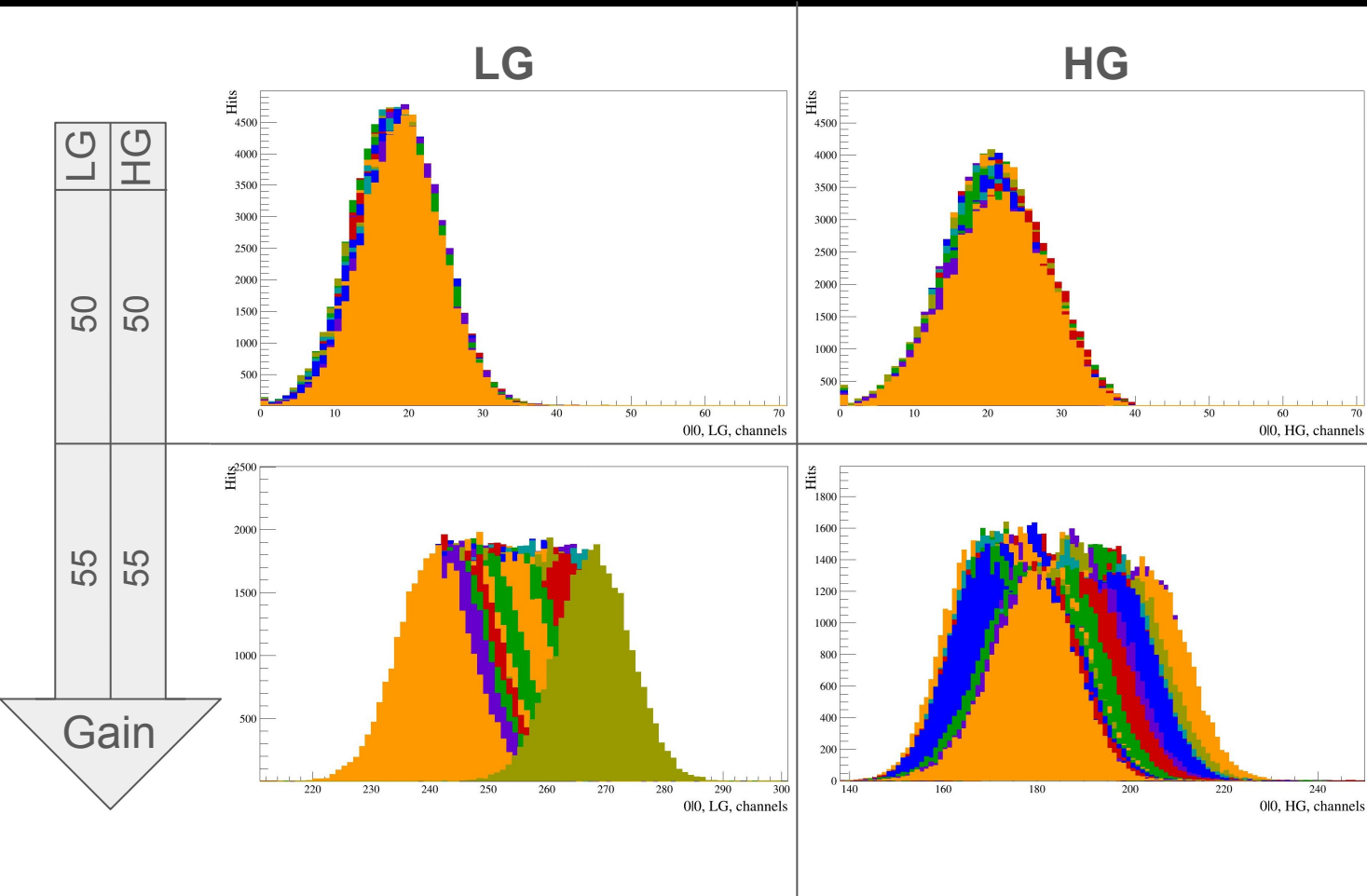
Test for the position of the peak depending on the "Pedestal position"



The test was conducted from "Test Pulse Source", with an HG and LG gain of 50 each.

The position of the peaks was found to change depending on the "Pedestal Position" parameter.

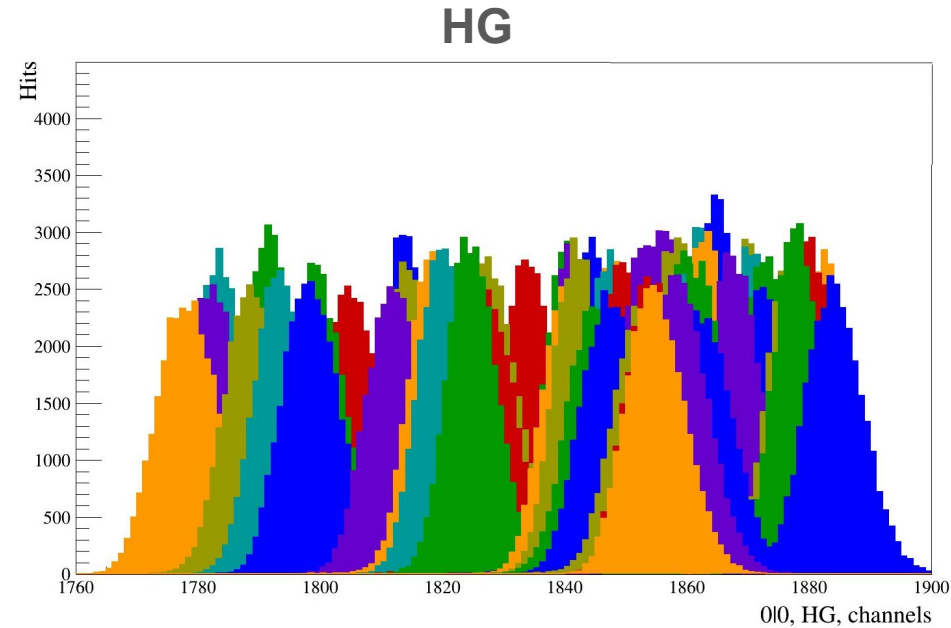
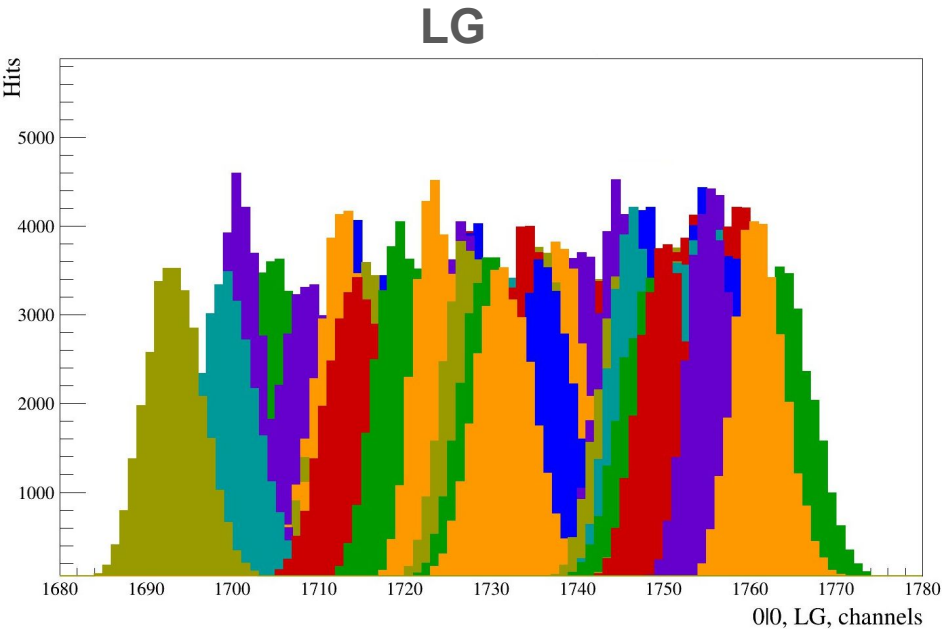
Test for the position of the peak depending on the parameters "HG Gain" and "LG Gain"



The test was conducted from "Test Pulse Source", with a pedestal position of 50.

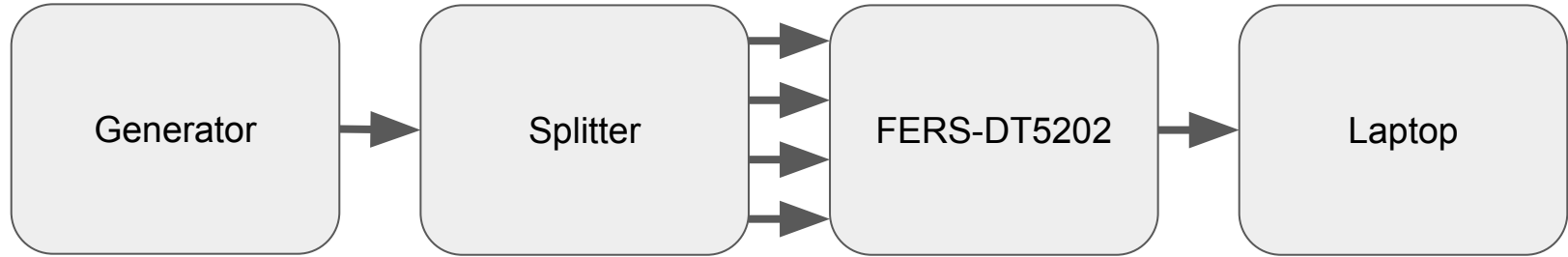
The calibration is broken! The calibration depends on the configuration parameters at the time of calibration.

Test for pedestal position depending on the "Pedestal Position" parameter



Pedestal position: 5000.
During the test, the inputs and the internal generator are disabled. Pedestals have been detected.

Tests from the generator through the splitter



Generator Parameters:

frequency: 100 Hz

Voltage range: 0.06 - 1.25V

DT5202 Parameters:

Bunch Trigger Source: T0-IN

TD Coarse Threshold: 220

HG Gain: 50

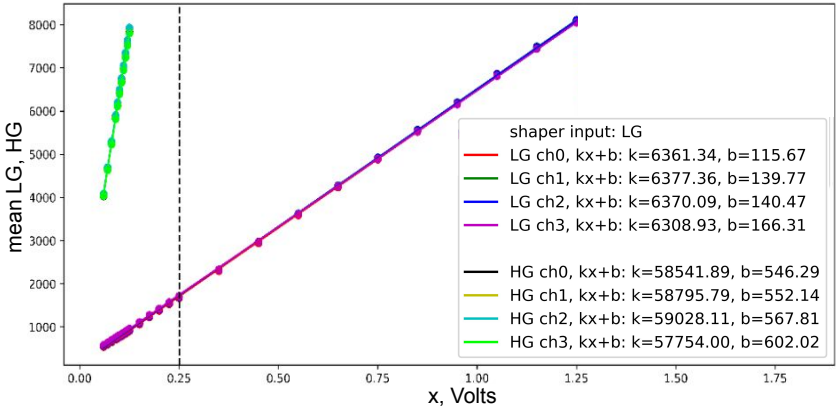
LG Gain: 50

Pedestal: 1800

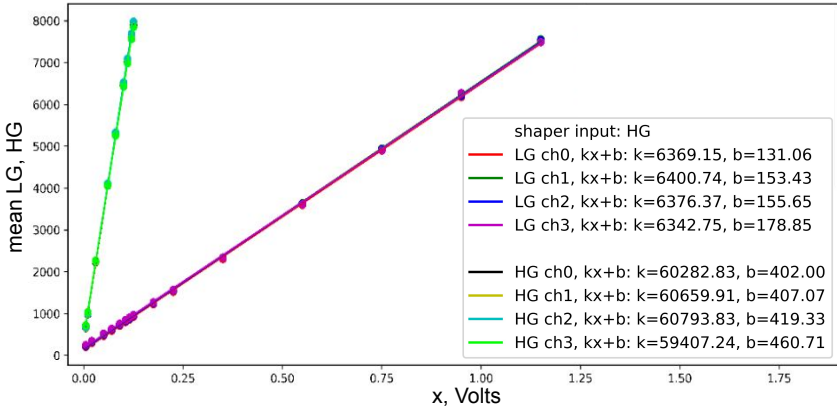
Parameter recalculation schedules

LG shaper input

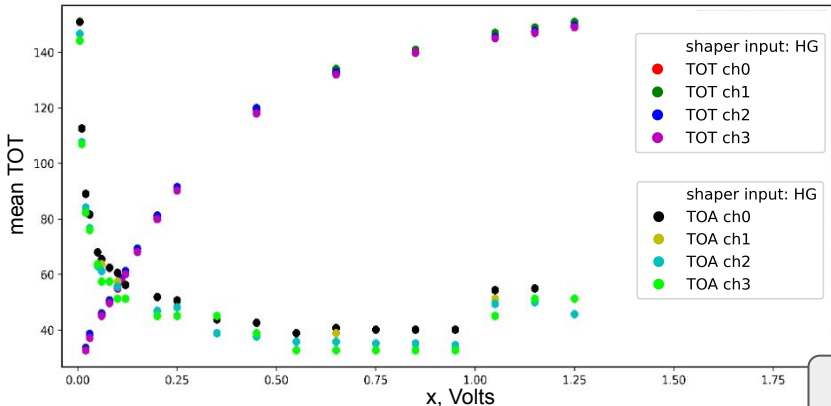
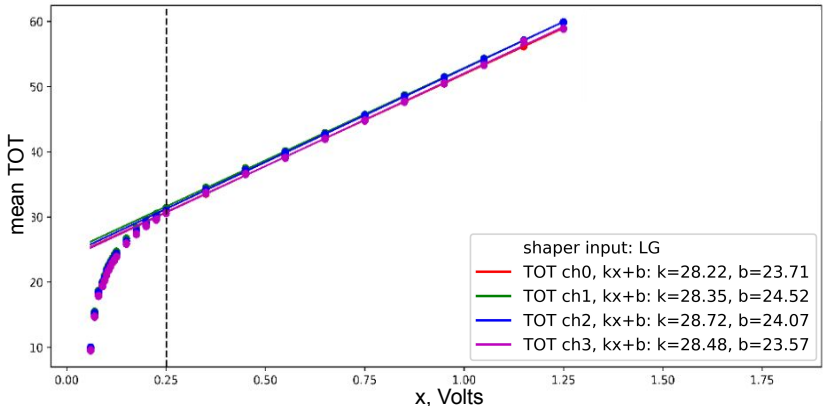
LG, HG



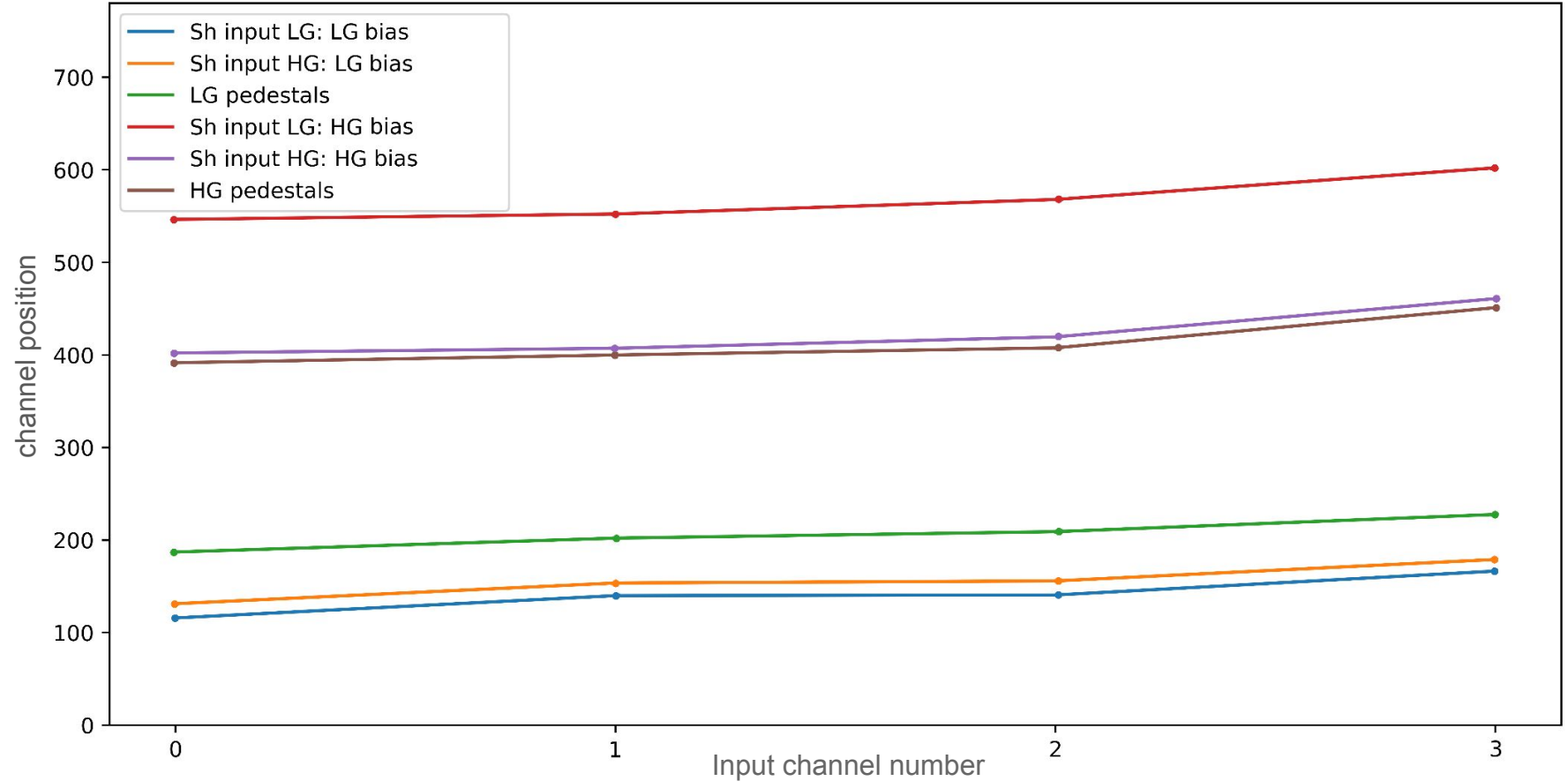
HG shaper input



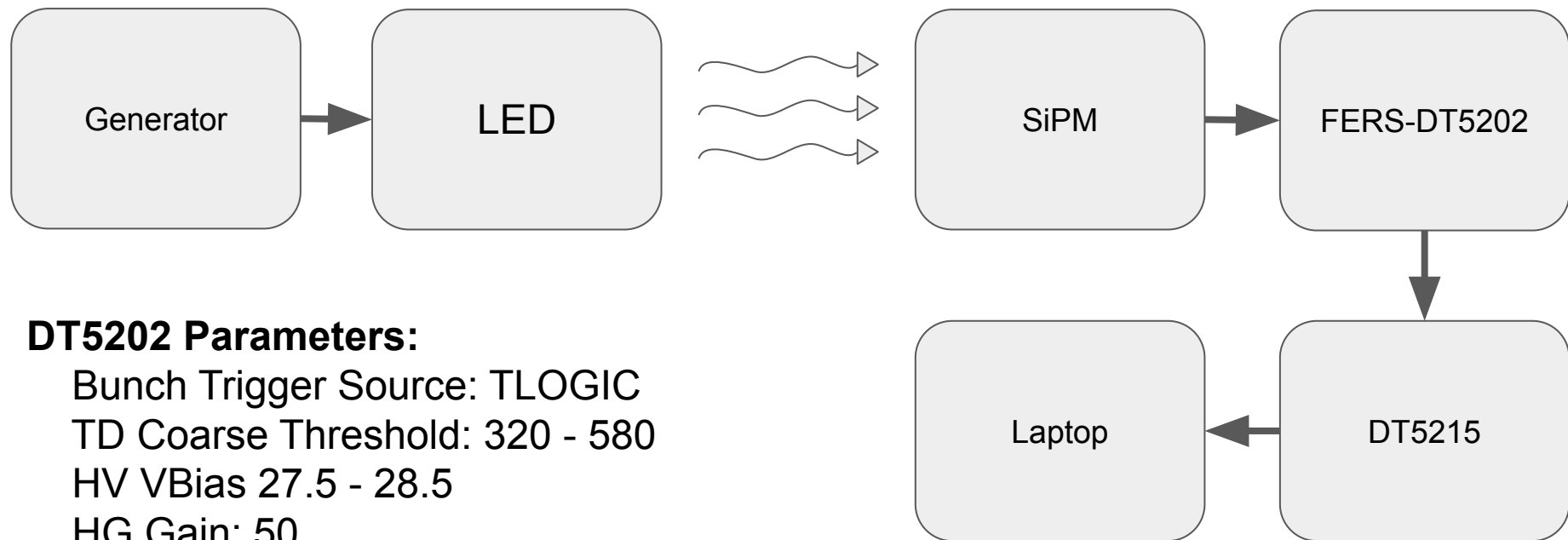
TOA, TOT



Two versions of the pedestal



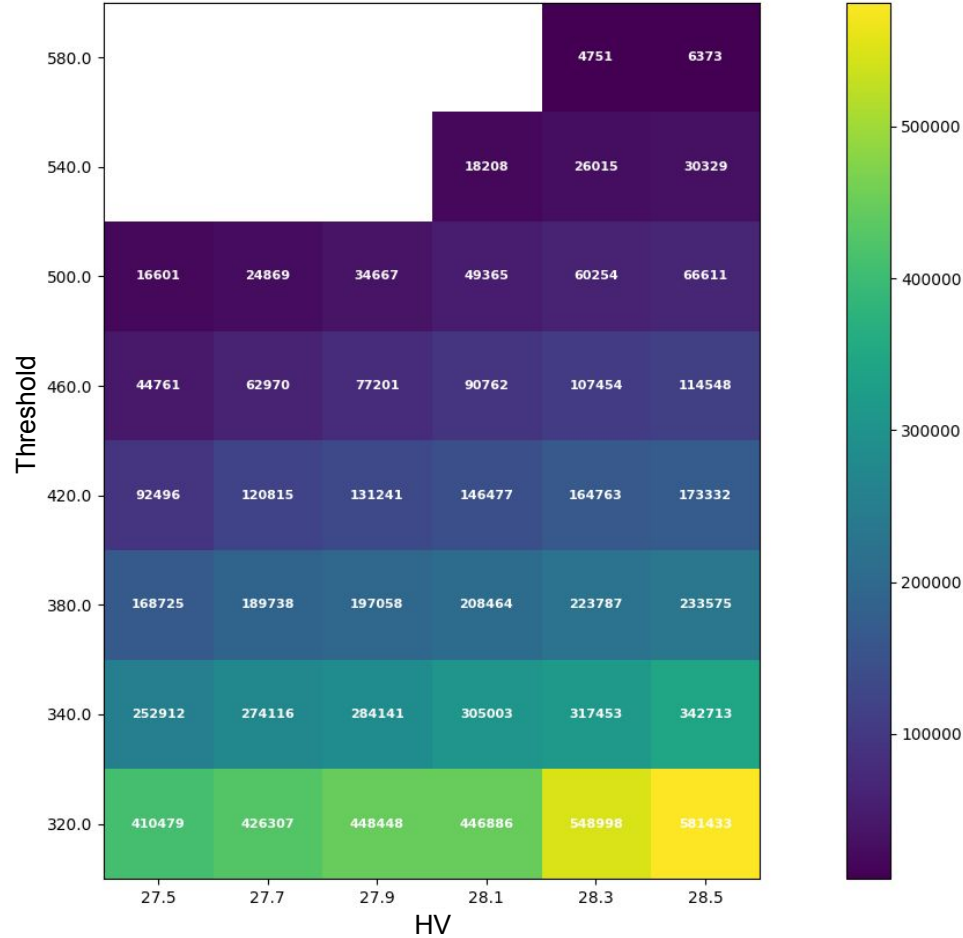
Tests from a generator with SiPM



DT5202 Parameters:

Bunch Trigger Source: TLOGIC
TD Coarse Threshold: 320 - 580
HV VBias 27.5 - 28.5
HG Gain: 50
LG Gain: 50
Pedestal: 1800
Fast Shaper Input: LG-PA

Grid of data set parameters



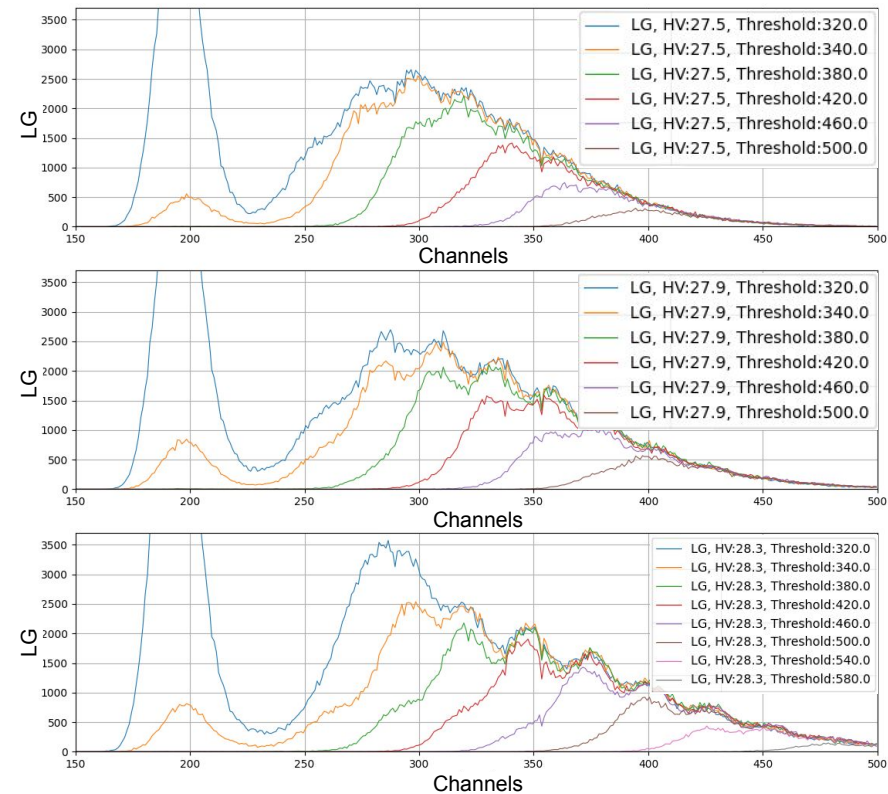
The generator operated at a frequency of 1 kHz for 5 minutes.

The data was collected using two variables: Voltage (HV) and threshold.

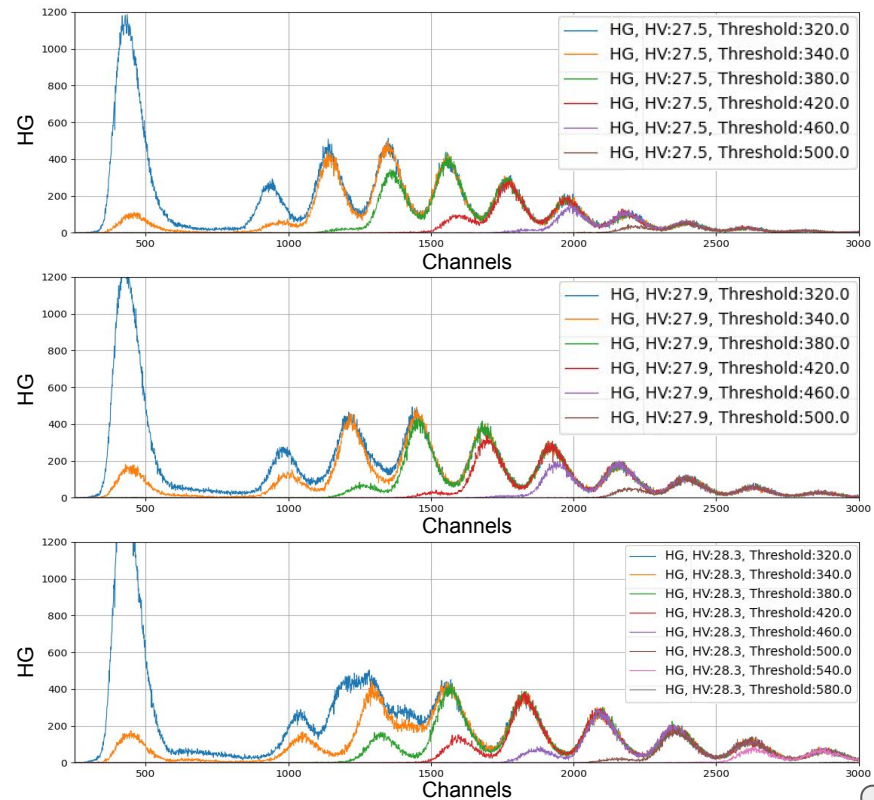
The data in the empty cells is missing due to the low statistics.

Examples of data for 27.5, 27.9, and 28.3 volts

LG

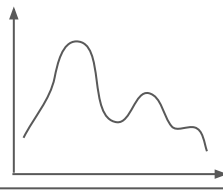


HG

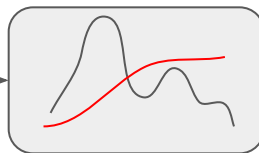


Threshold transfer characteristic

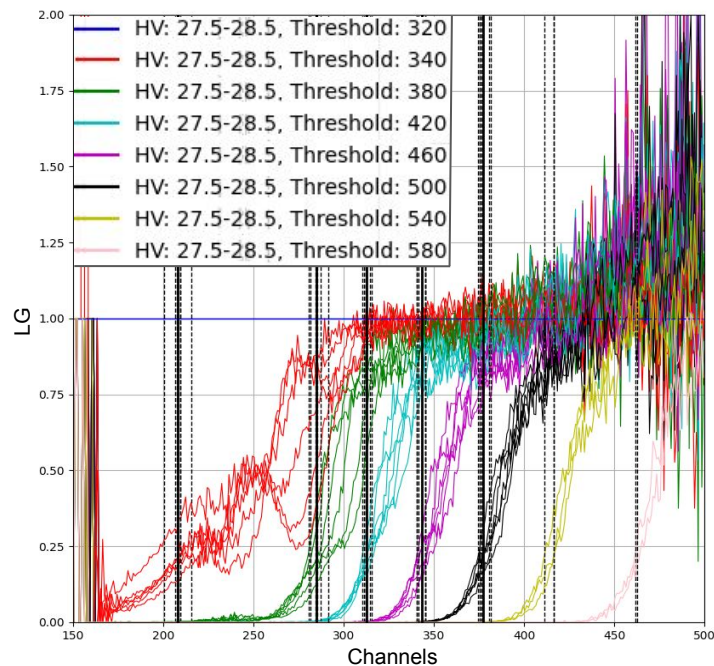
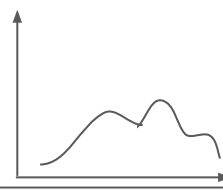
Input: X



Transfer characteristics: H

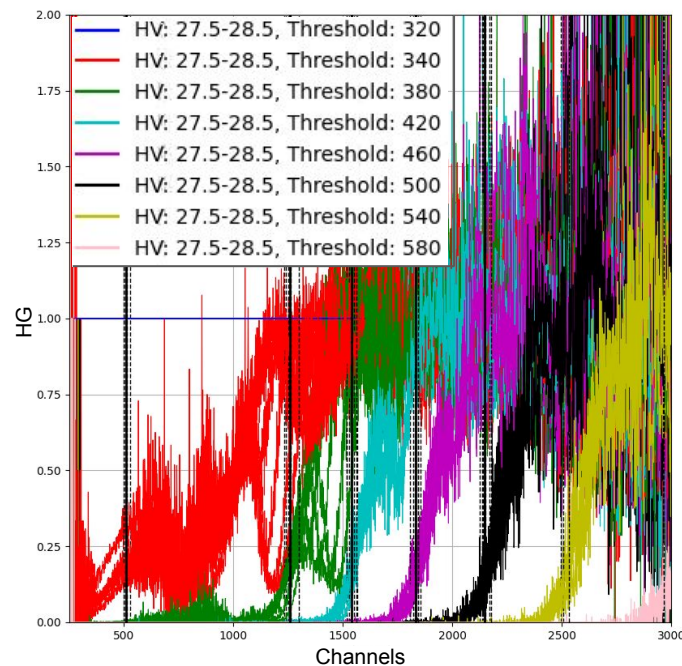


Output: Y

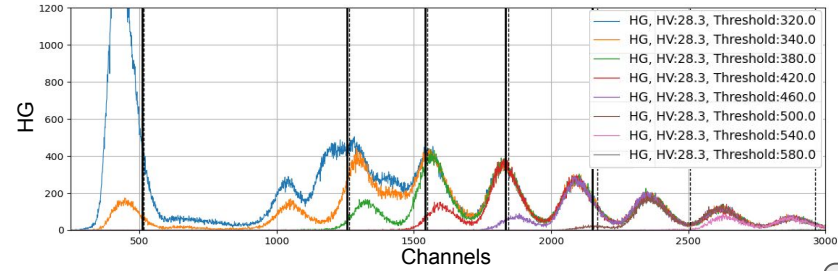
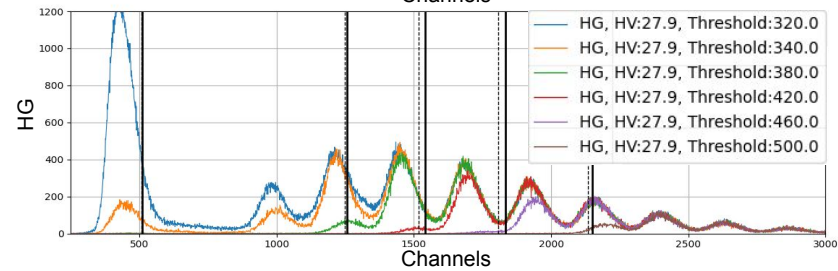
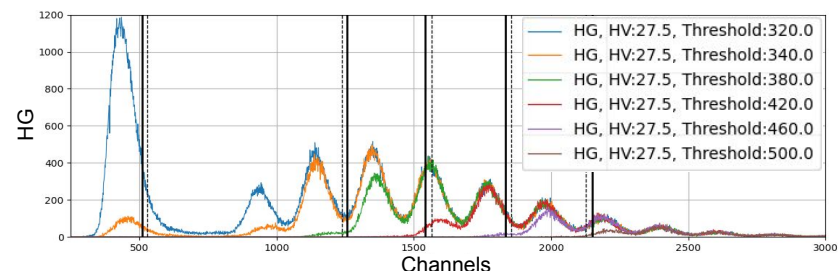
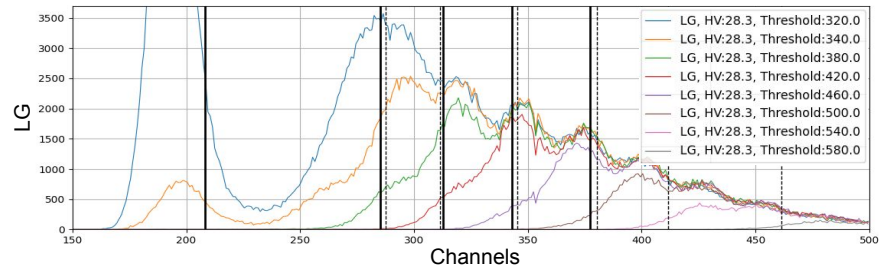
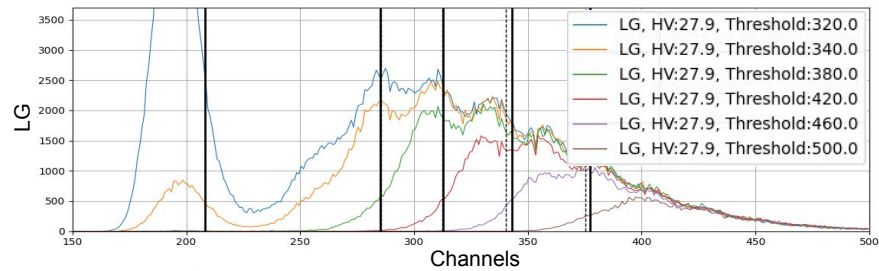
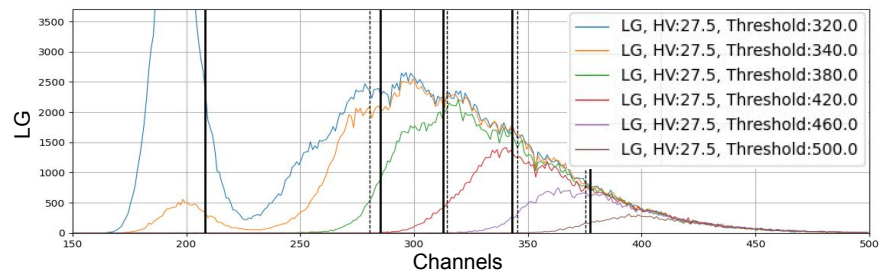


$$Y=HX$$

$$H = \frac{Y}{X}$$

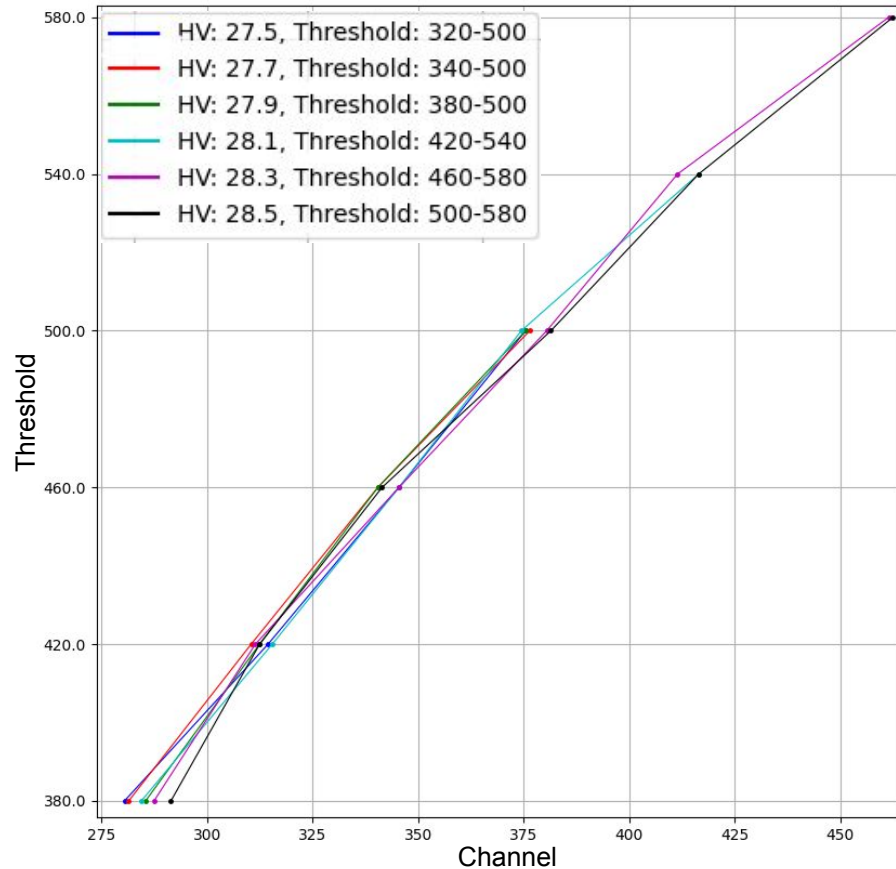


Examples of data for 27.5, 27.9, and 28.3 volts with threshold

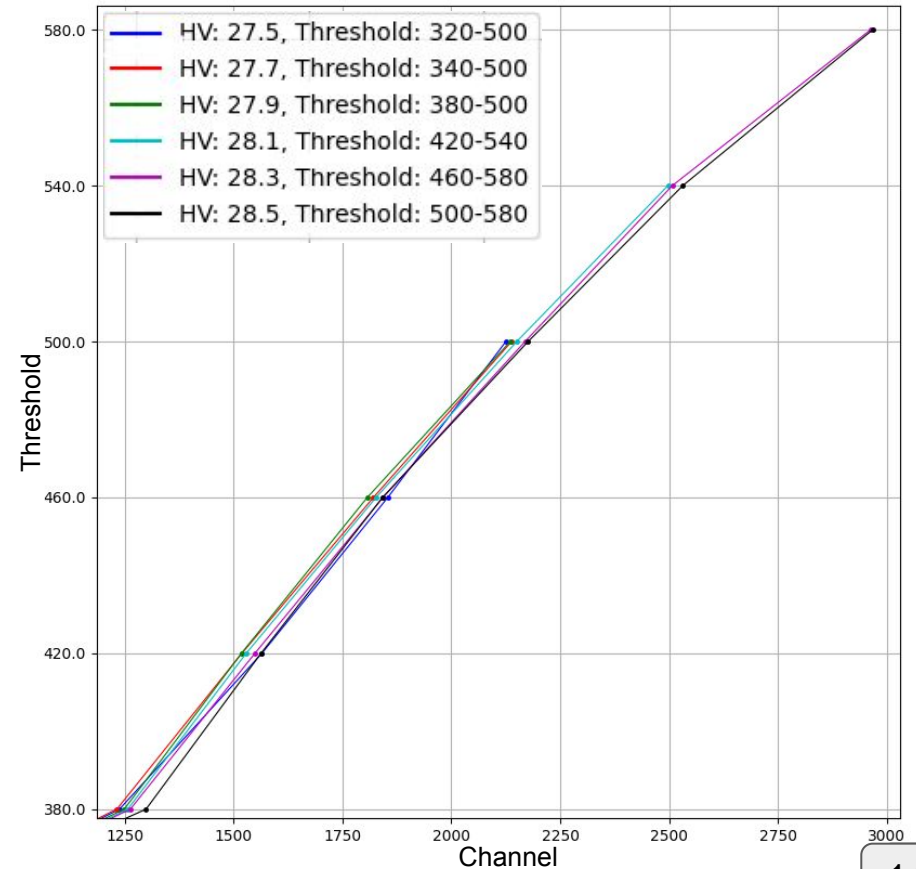


The schedule for converting the threshold into channels

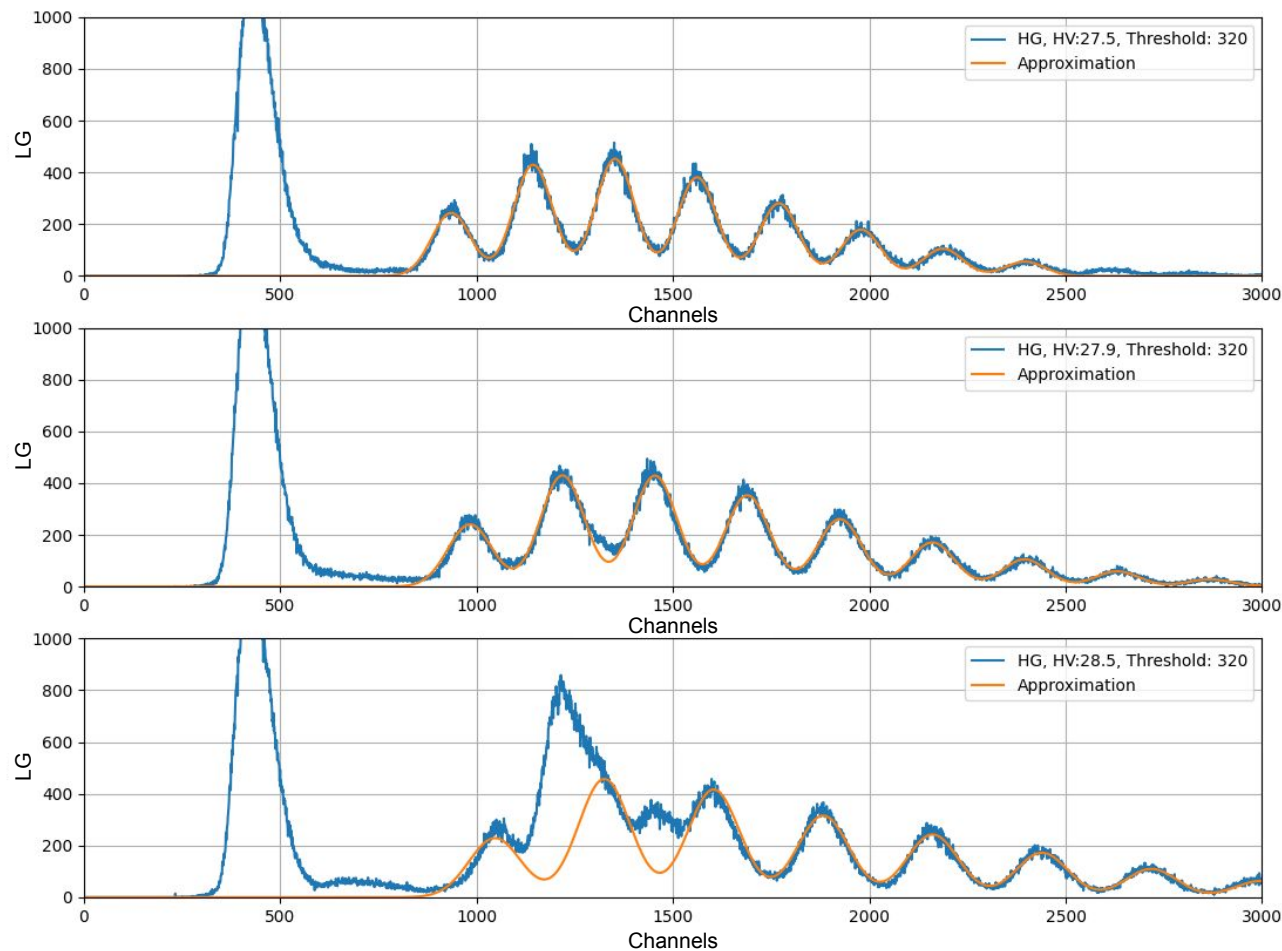
LG



HG



Pixel approximation

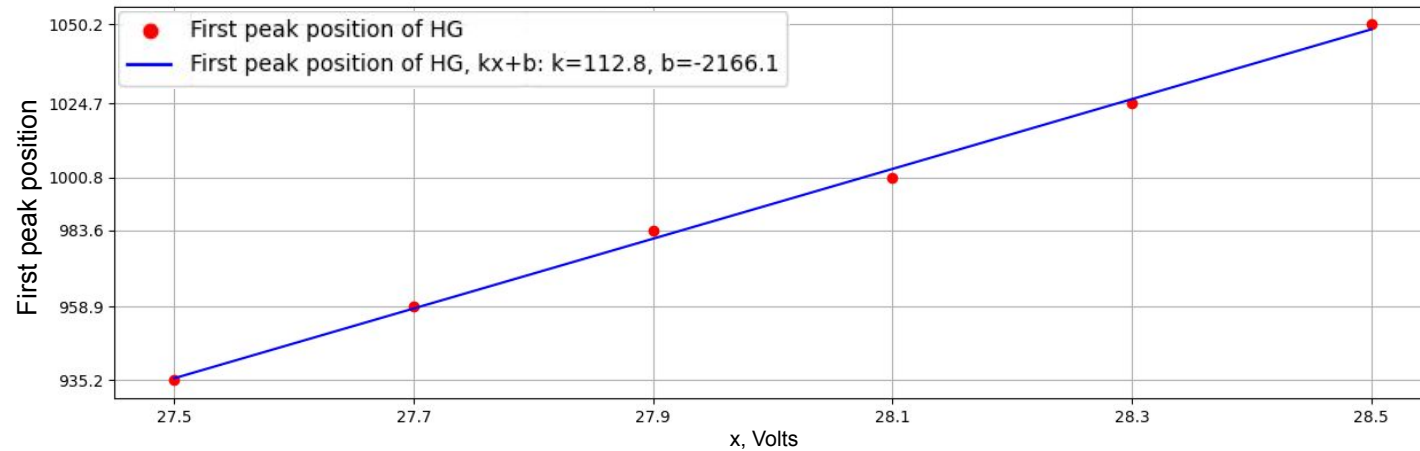
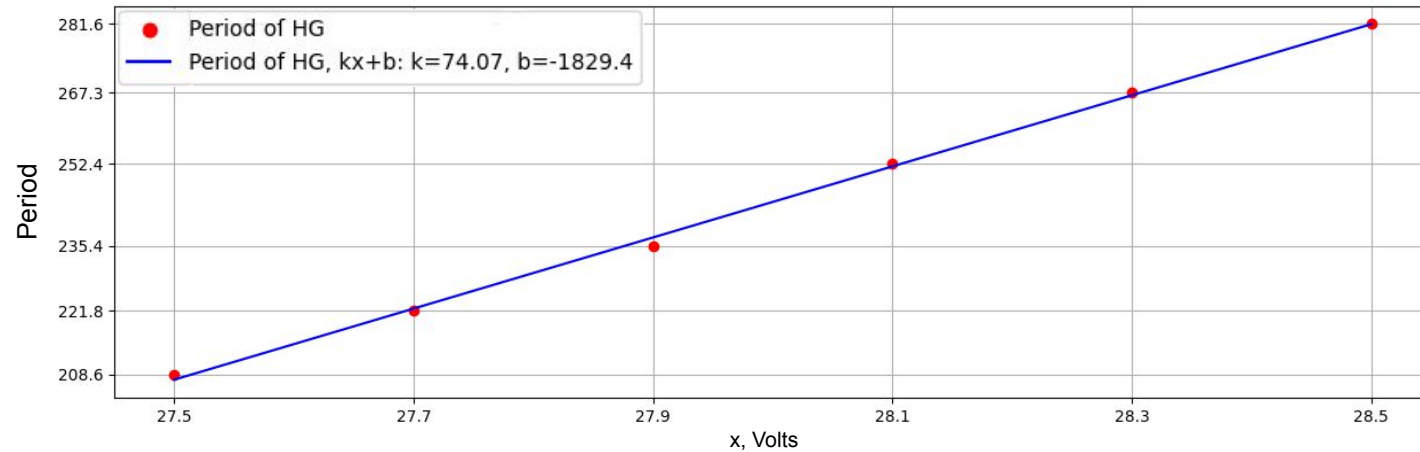


We assume that the minopixel signal is periodic.

To describe the position of all pixels, we need to know the position of the first pixel and the period.

We approximate the data with a sum of Gaussian functions with a periodic offset.

The first pixel position and period

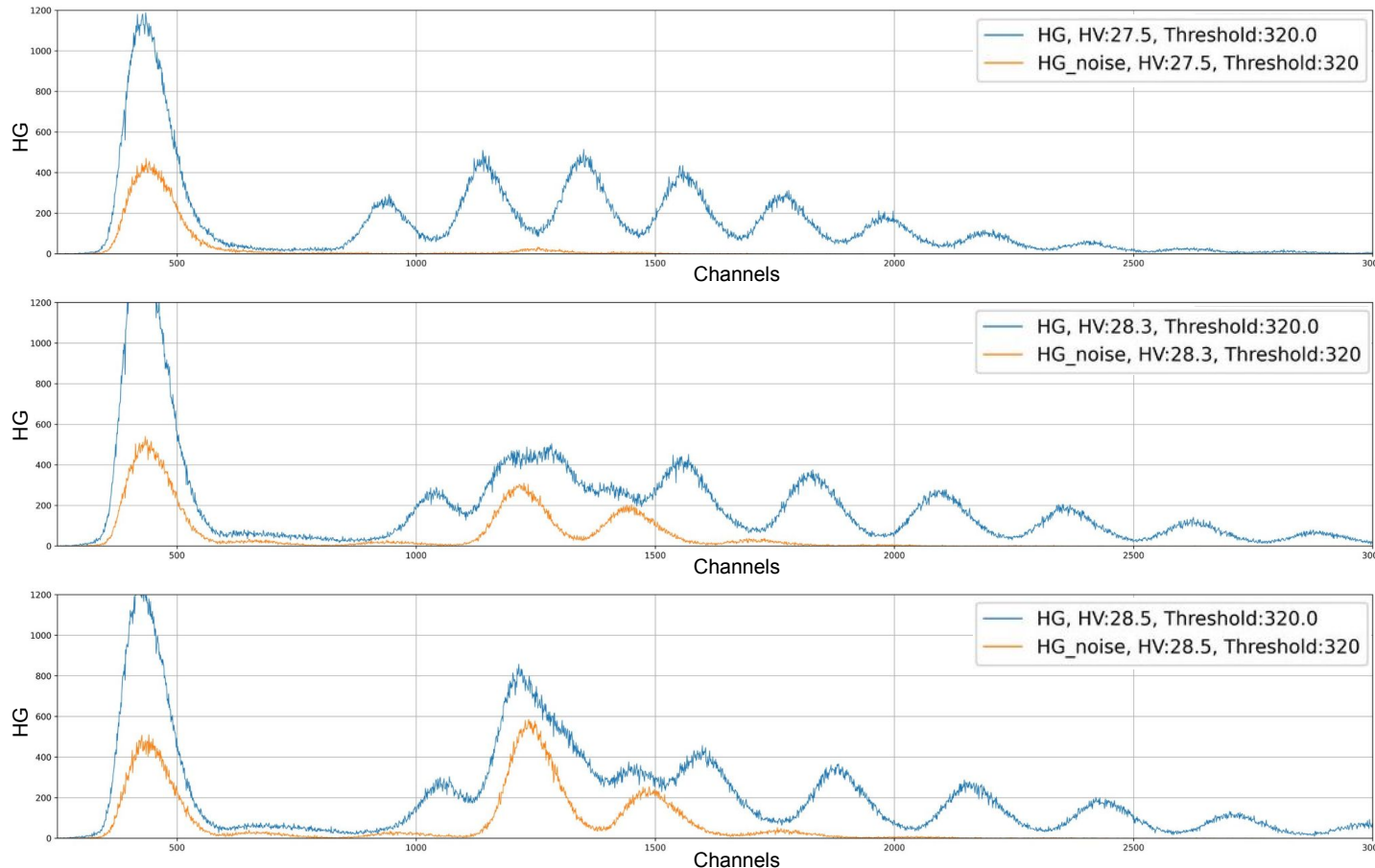


Exposure to noise

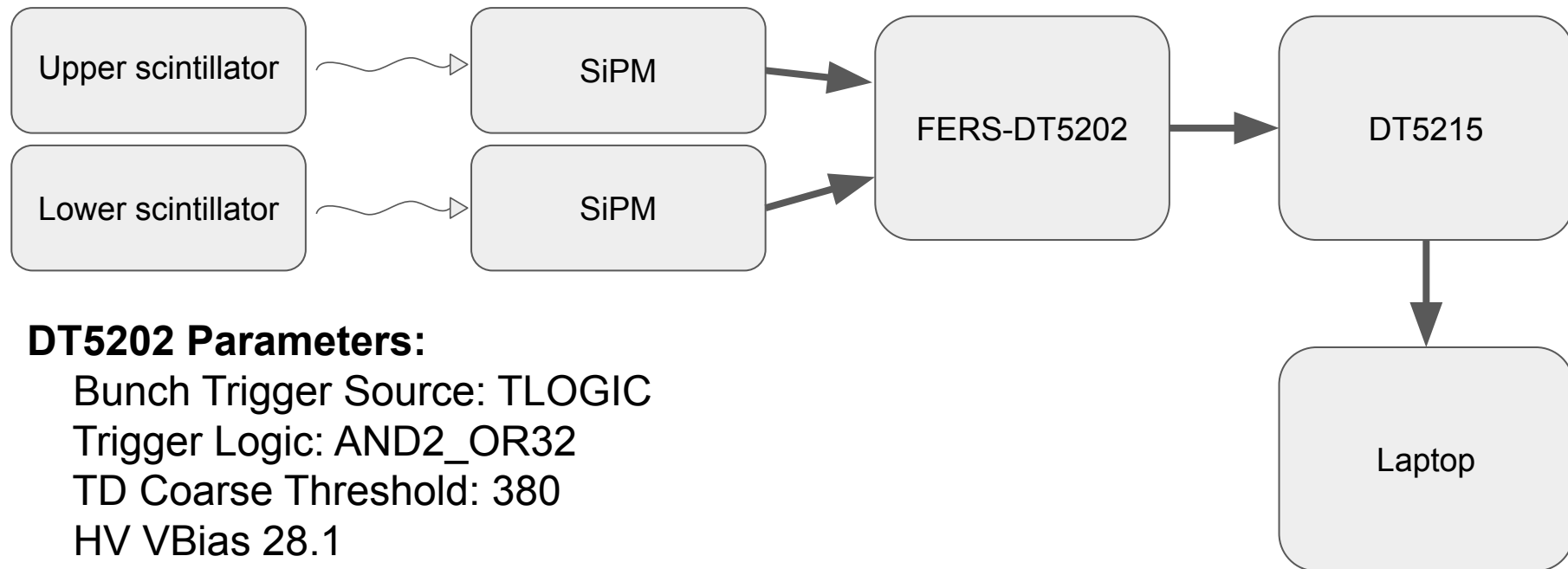
Additionally, data was collected without the generator turned on.

The noise data is displayed in orange, and the generator data is displayed in blue.

The noise appears between the first and second pixels and between the second and third pixels.



Cosmic radiation tests



DT5202 Parameters:

Bunch Trigger Source: TLOGIC

Trigger Logic: AND2_OR32

TD Coarse Threshold: 380

HV VBias 28.1

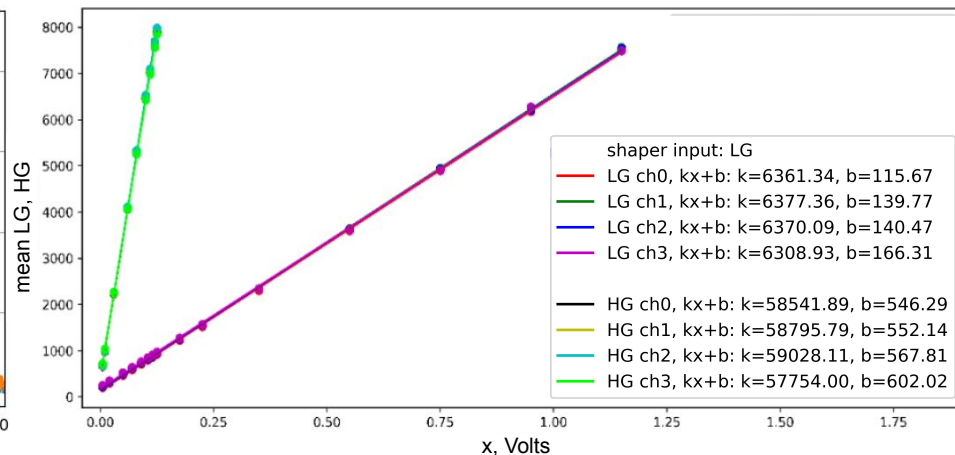
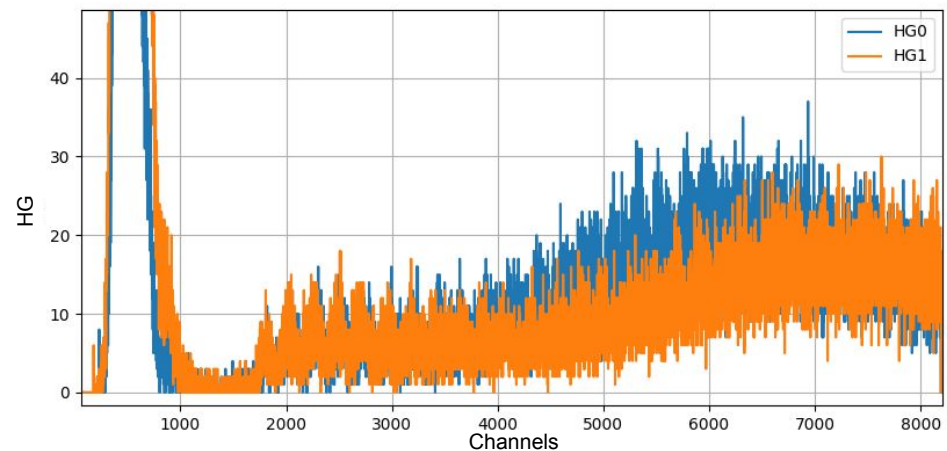
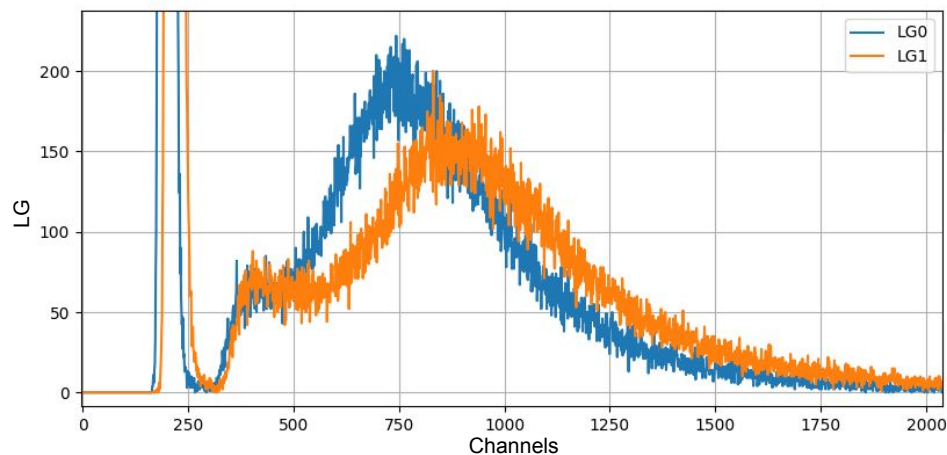
HG Gain: 50

LG Gain: 50

Pedestal: 1800

Fast Shaper Input: HG-PA

Cosmic radiation tests



x , Volts

$k_{LG} = 6354.4$, $k_{HG} = 58529.9$, $b_{LG} = 140.5$, $b_{HG} = 567.0$ - average approximation coefficients

$C_{max0} = 750$, $C_{max1} = 875$ - position of the maximum of channels 0 and 1 in LG

$P_{HG0} = 1812$, $P_{HG1} = 1819$ - position of the first pixels for HG

$$P_{LG} = \frac{k_{LG}}{k_{HG}} (P_{HG} - b_{HG}) + b_{LG}$$

$P_{LG0} = 275.7$, $P_{LG1} = 276.4$ - position of the first pixels for HG

$T_{HG0} = 227$, $T_{HG1} = 231$ - periods for HG 0 and 1 channel.

$$\Delta T_{LG} = \frac{k_{LG}}{k_{HG}} \Delta T_{HG}$$

$$T_{LG0} \approx 24.6, T_{LG1} \approx 25.0$$

$$M = \frac{(C_{max} - P_{LG})}{T_{LG}}$$

$$M_0 \approx 20, M_1 \approx 23$$

It was completed:

1. The position of the pedestal was determined
2. conversion charts for LG, HG, TOT, and TOA were obtained
3. offset voltage and threshold for minimum noise were determined
4. The number of photons in MIPS was determined to be 20 and 23 for tile 0 and 1, respectively

To do list:

1. Refinement and approximation of the threshold conversion graph into channels
2. Determine the cause of the noise offset relative to the pixel signal
3. Defining parameters for other SiPMs

Thanks for your attention!

Backup

