MSD Analysis Status

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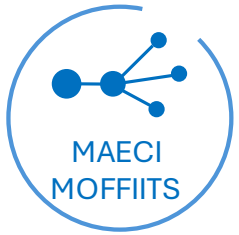


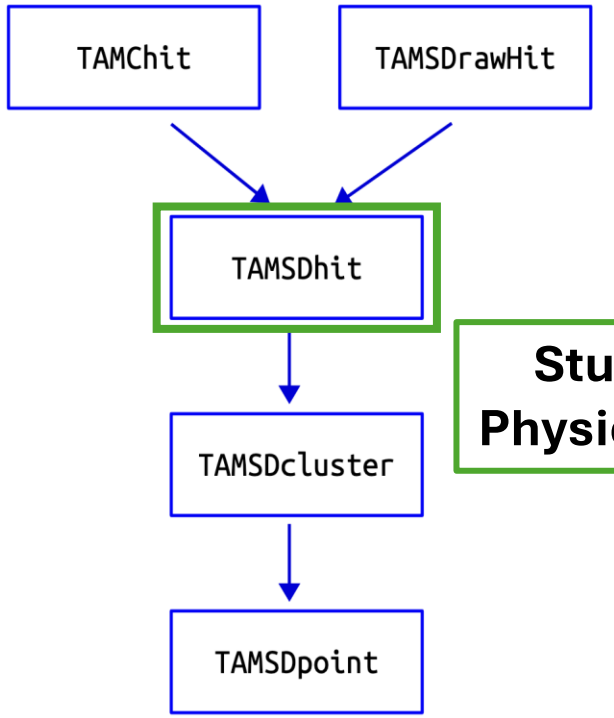
MSD Status

From R. Zarrella slides of FOOT XVI General Meeting

The MSD workflow

Step-by-step review of the MSD data processing!

- **RawHit → Hit**
  - → VA gain correction added ✓
  - → Correct flagging of noisy/dead strips ✓
- **Hit → Cluster**
  - → Clustering algorithm re-checked and updated
  - → η-correction
- **MChit → Hit → Cluster**
  - → Updated to match new containers



Studying Physics Runs

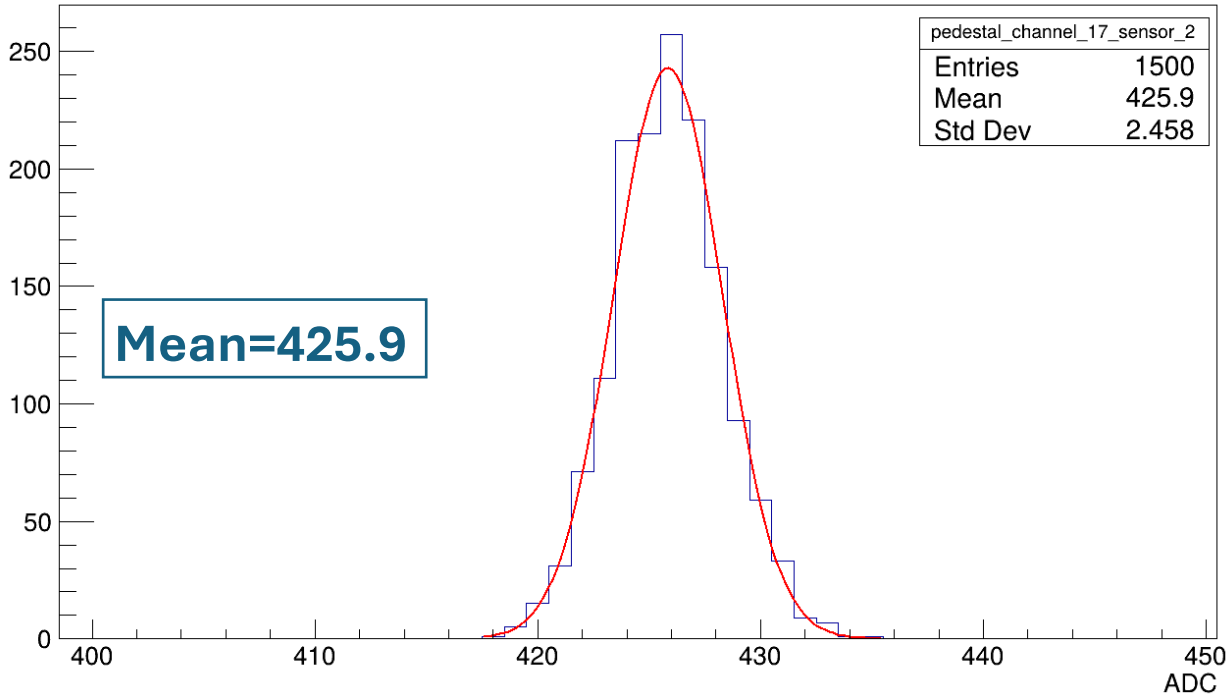
24-26/06/2024 R. Zarrella FOOT XVI General Meeting 2

Calibration: Pedestals

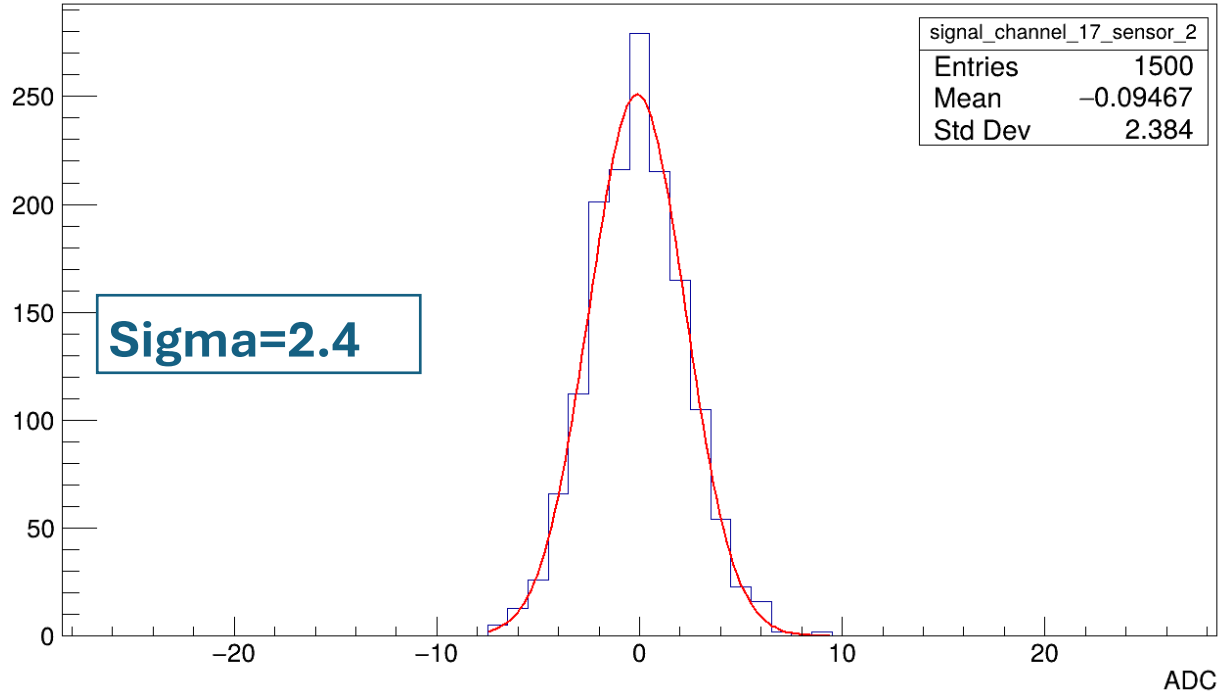
CNAO2024 run 7073
-Calib- **(10k events)**

Sensor 2
Strip 17

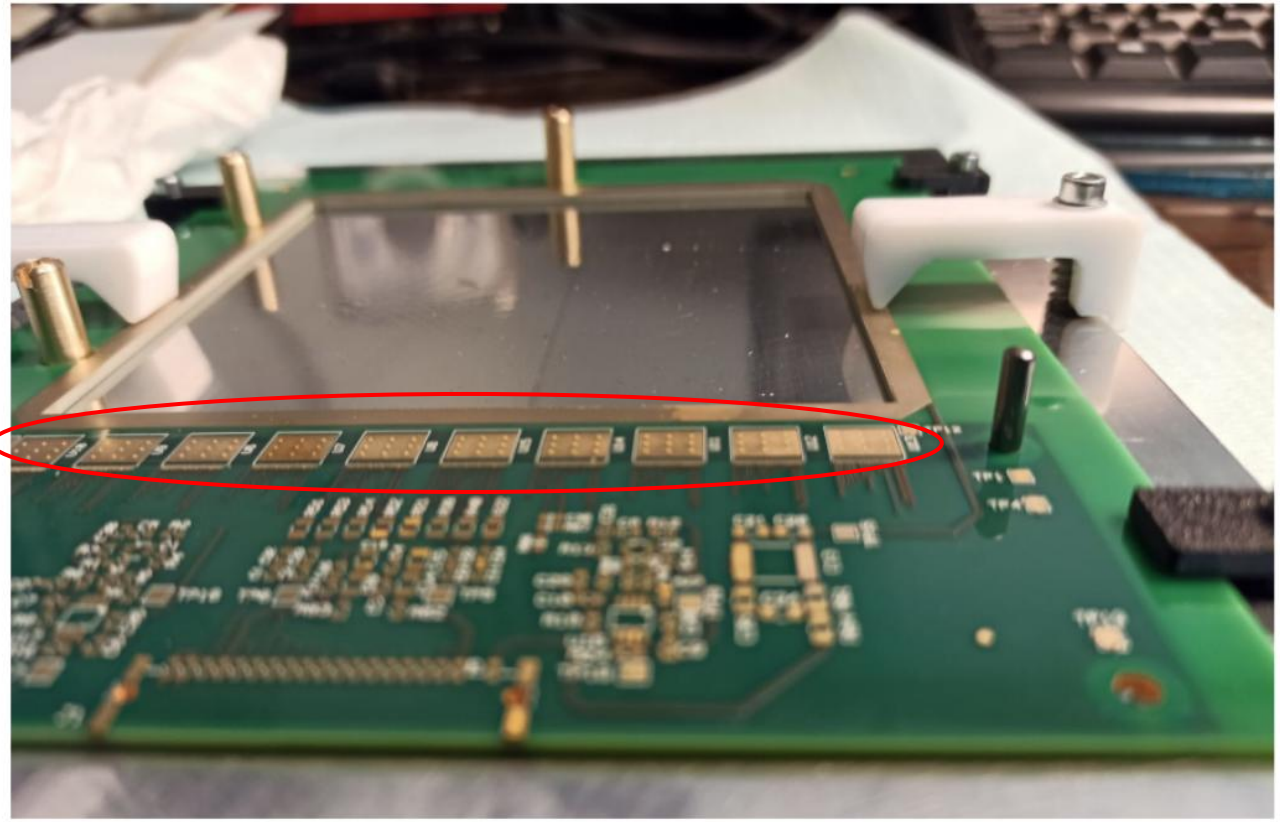
Pedestal



Signal - Pedestal



Common Noise Calculation



- 10 Chips
- Each Chip reads 64 strips of a sensor

The *Common mode Noise* (CN) is the average deviation, event by event, of a collective signal variation due to external electromagnetic noise felt from all the strips read by a single ASIC (= a single Chip).

Two calculations of Common Noise:

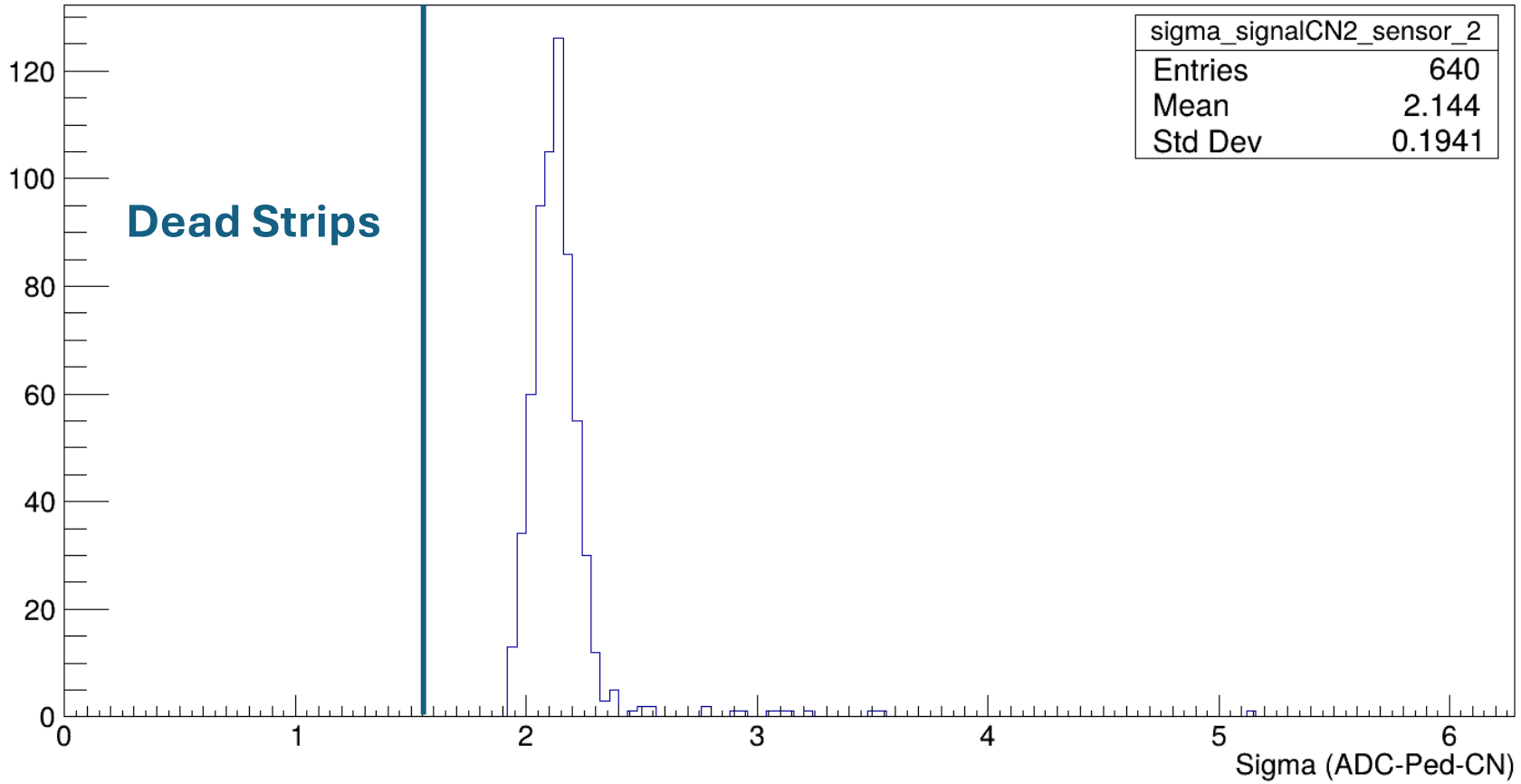
1. the first to identify Dead and Noisy strips;
2. the second without using them.

Dead Strips

CNAO2024 run 7073
-Calib- (10k events)

Sensor 2

Sigma(Signal – Ped – CN1)



Dead if:

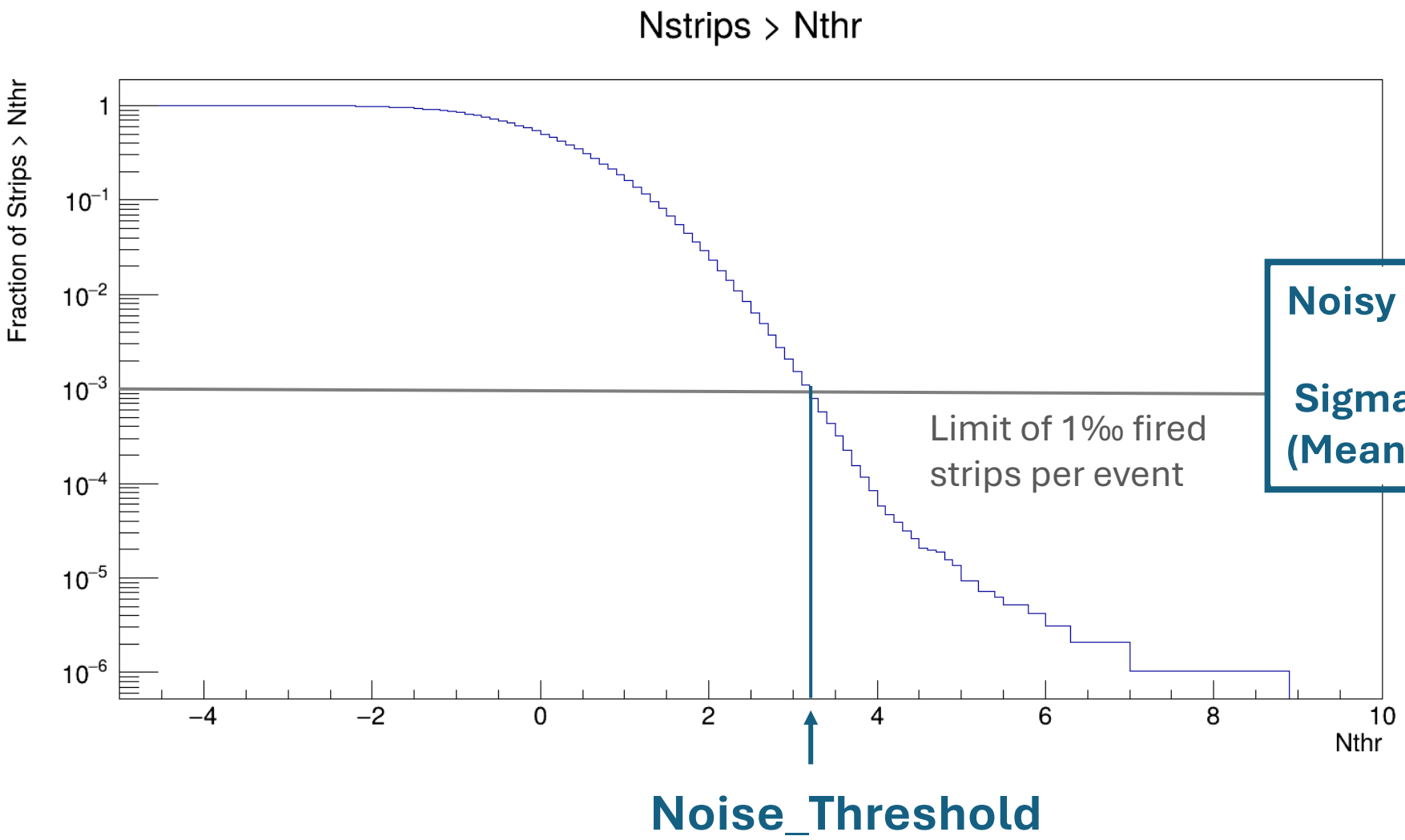
Sigma(ADC-Ped-CN1) < Mean – 3 Std Dev

Strips probably not connected to the read out.

Noisy Strips

Sensor 2

CNAO2024 run 7073
-Calib- **(10k events)**



$$\frac{\text{ADC-Ped-CN1}}{\text{sigma(ADC-Ped-CN1)}} > \text{Nthr}$$

Noisy if :

Sigma(ADC-Ped-CN1) > (Mean+ Noise_Threshold x Std Dev)

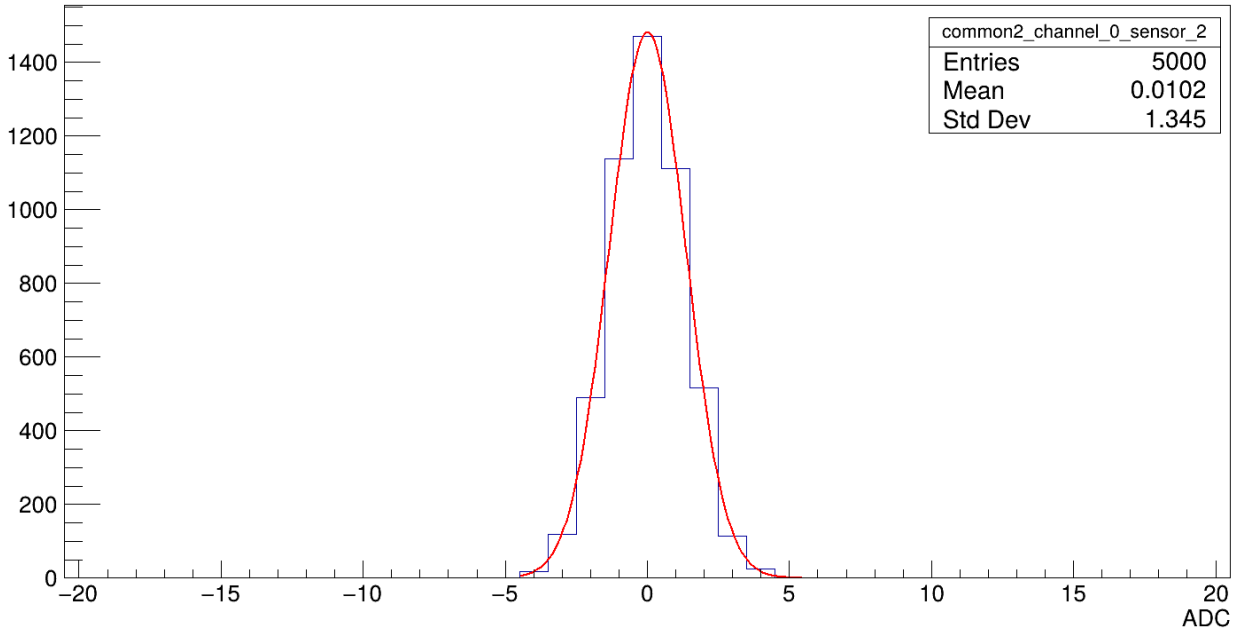
Common Noise 2
(without dead and noisy strips)

Common Noise

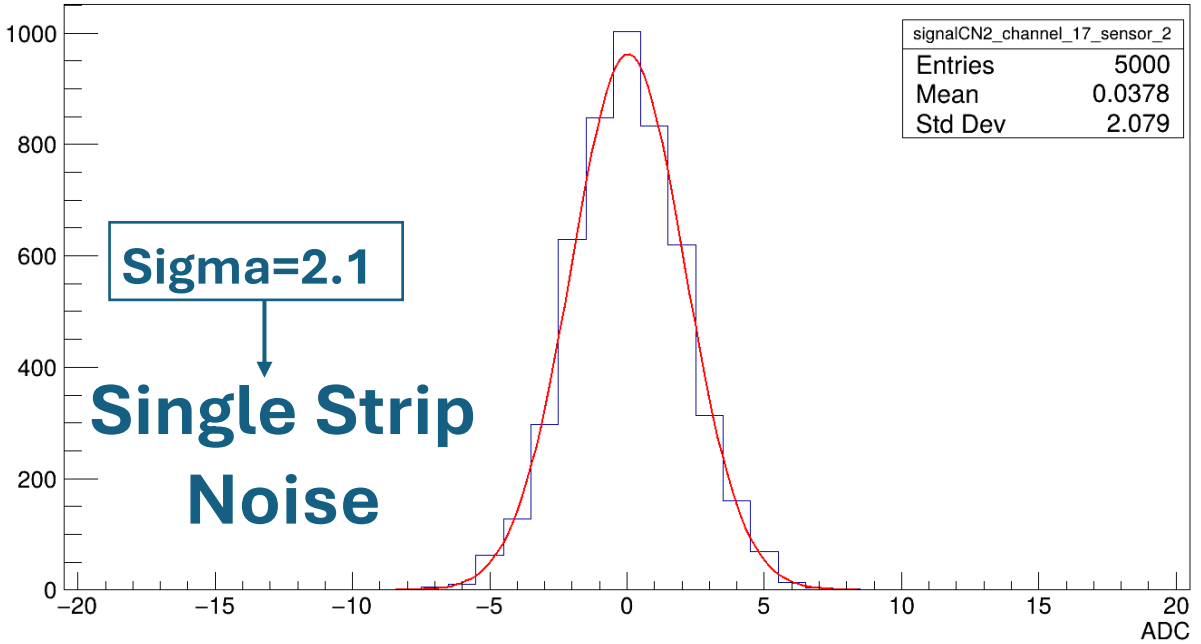
Sensor 2
Chip 0: strips (0-63)
Strip 17

CNAO2024 run 7073
-Calib- (10k events)

Common Noise



Signal – Pedestal – CN



Stability of Pedestals

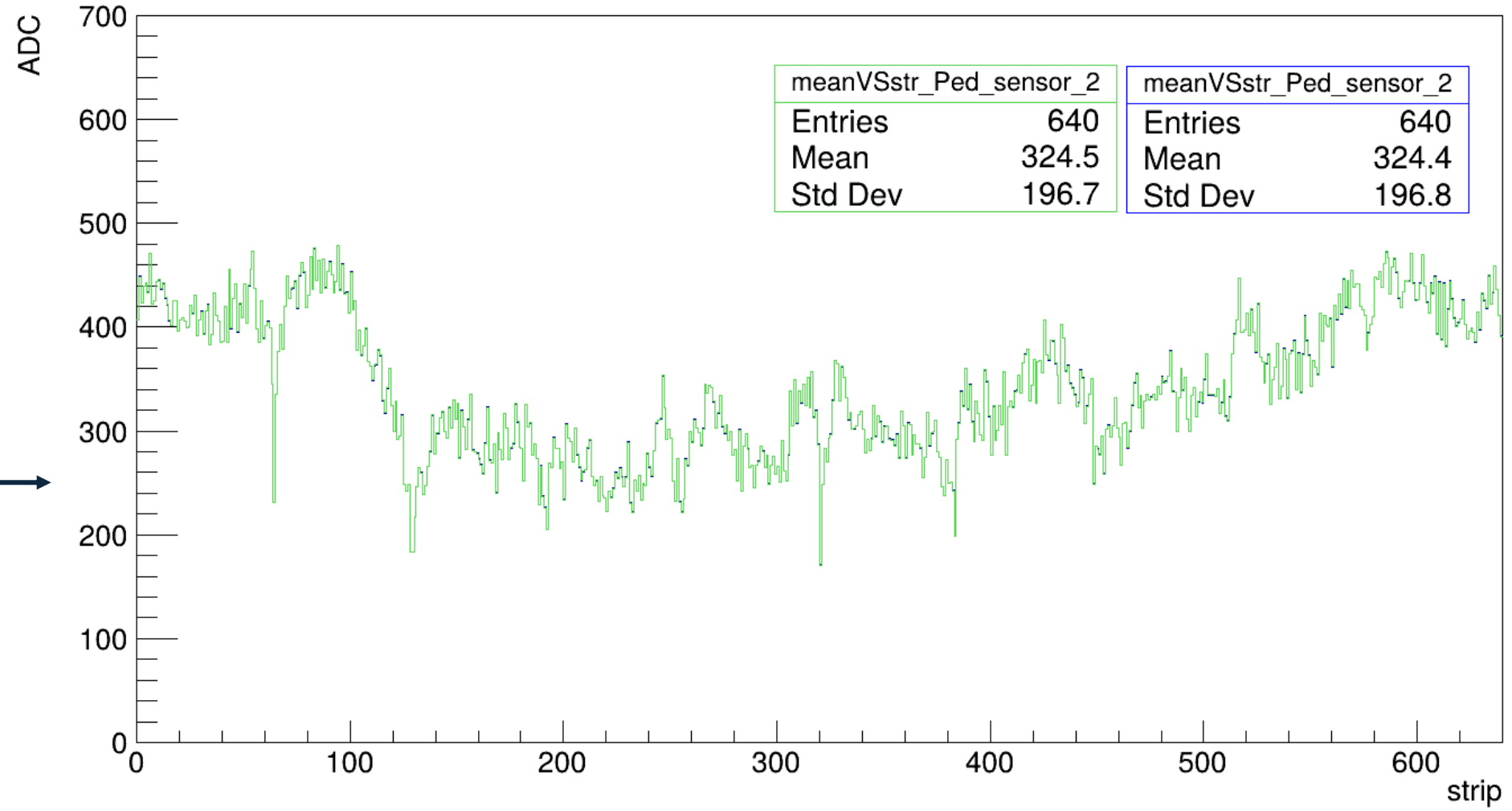
CNAO2024 run 7028
-Calib- **(10k events)**

CNAO2024 run 7073
-Calib- **(10k events)**

Mean Pedestals

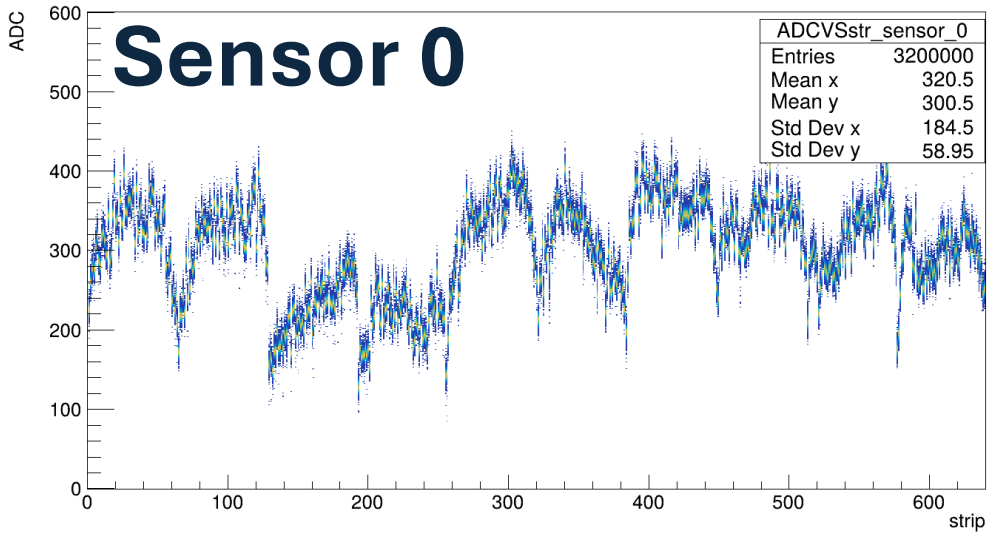
1) **Verification of stability for different number of events.**

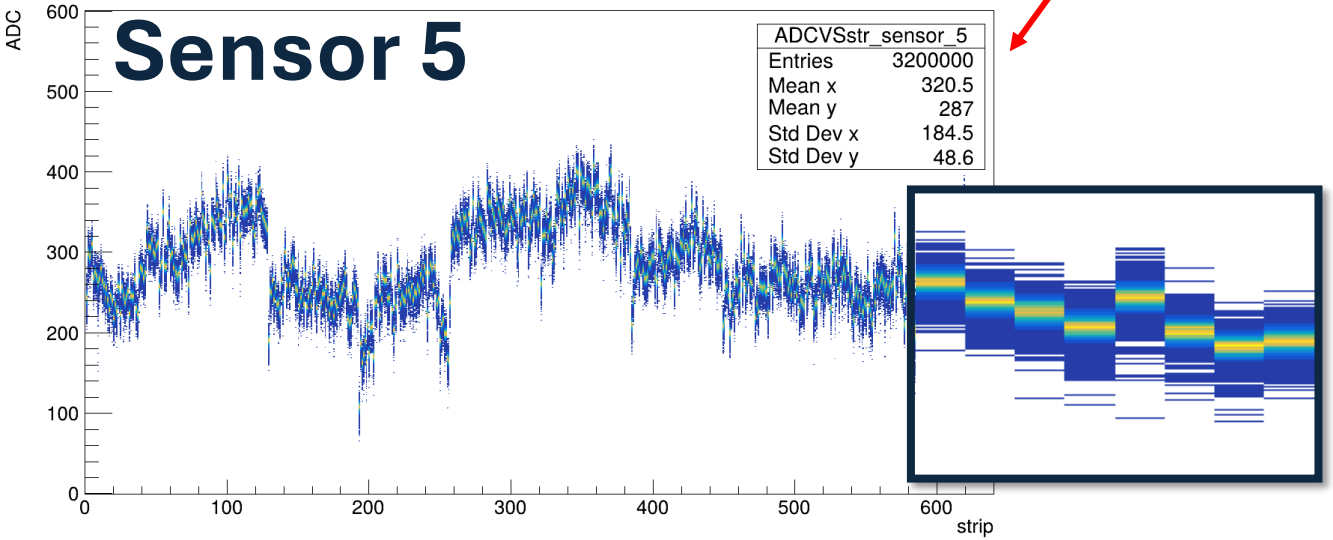
2) **Verification of stability through each campaign.**



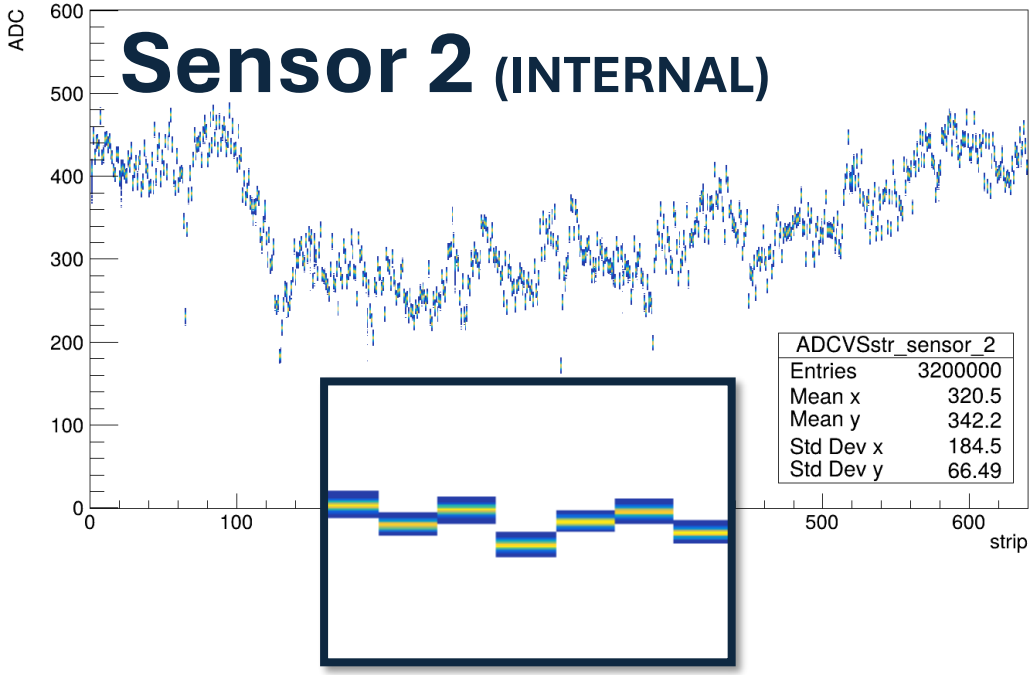
External Sensors

CNAO2024 run 7073
-Calib- (10k events)





There are events in which the entire EXTERNAL SENSORS fluctuate: LIGHT ON SENSORS

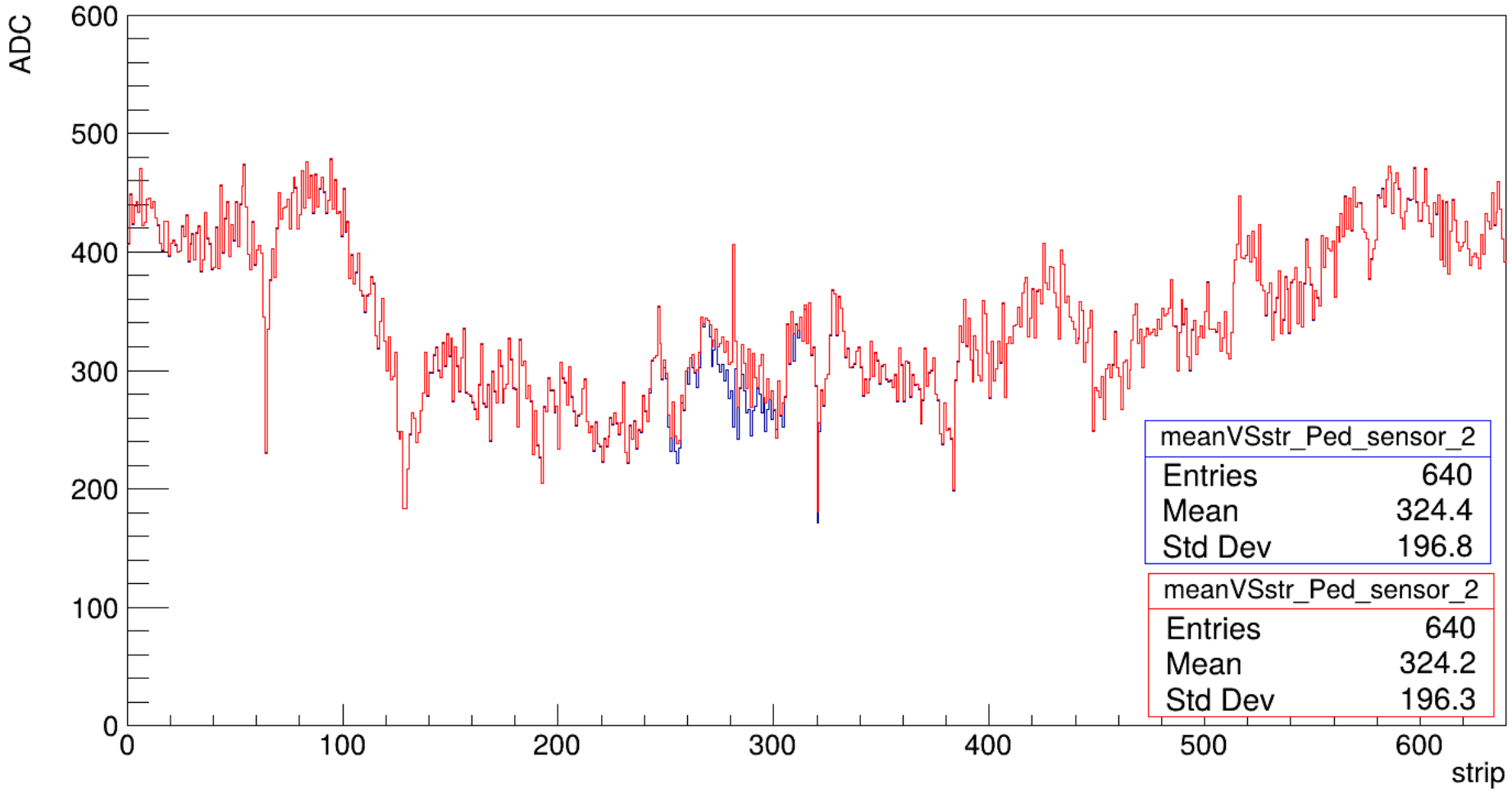


Physics Runs - Pedestals

CNAO2024 run 7073
-Calib- **(10k events)**

CNAO2024 run 7076
-Physics- **(200k events)**
C@200 MeV/u on C target
yes B

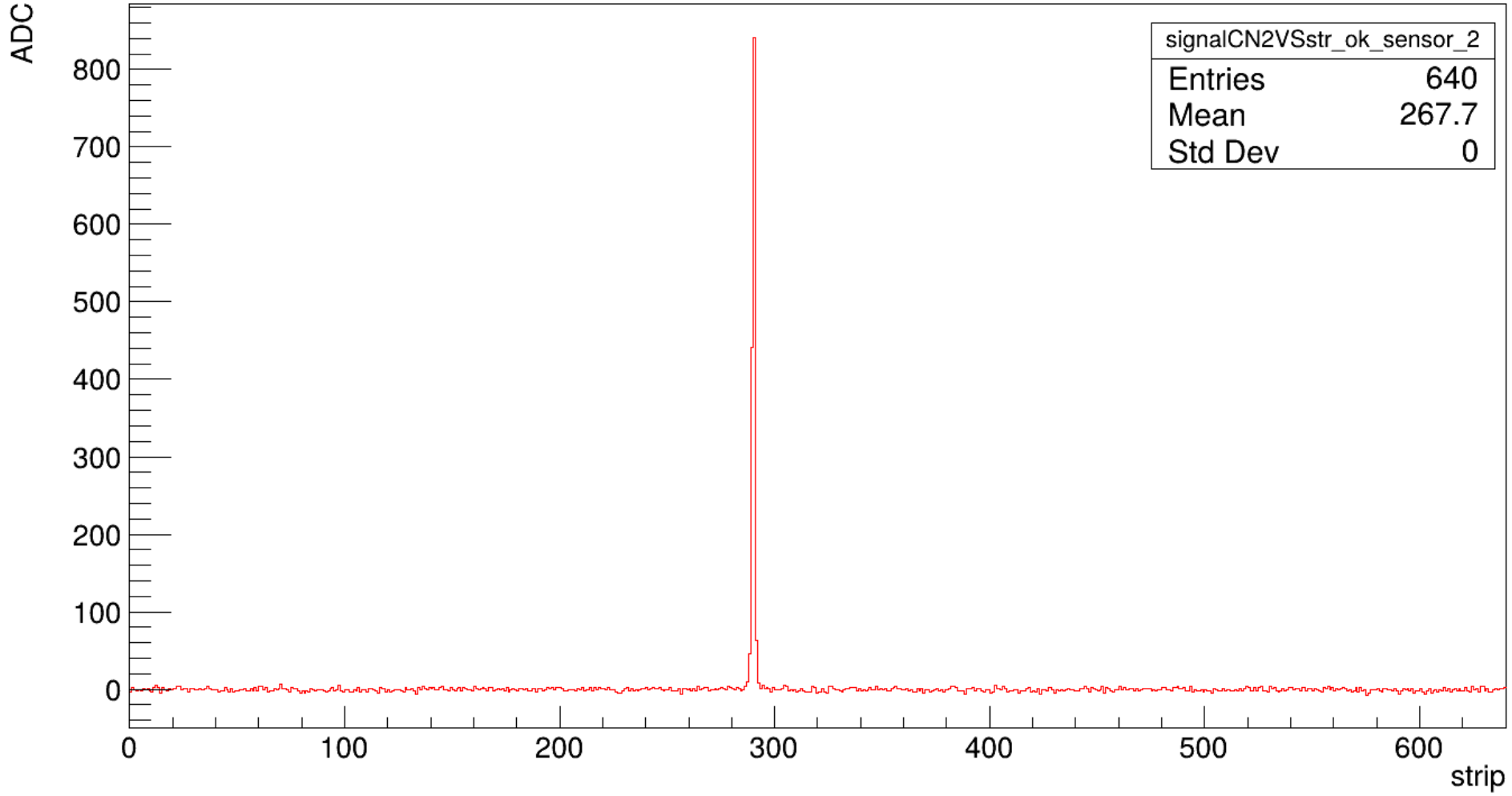
Mean Pedestals (sensor 2)



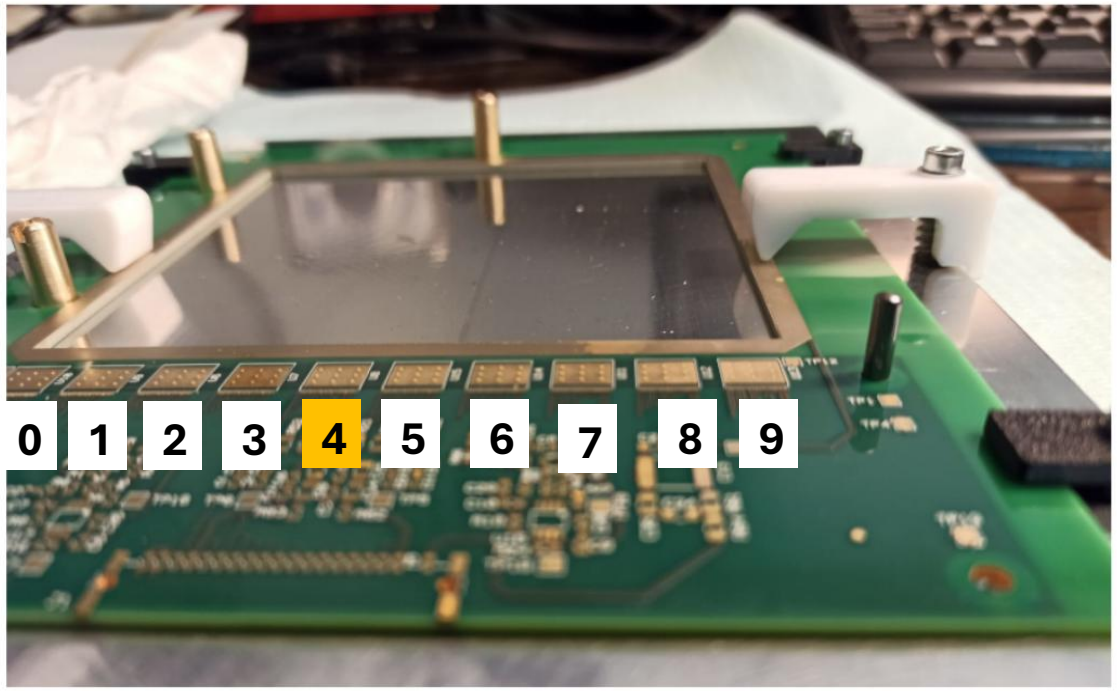
We see the particle!

CNAO2024 run 7076
-Physics- (200k events)
C@200 MeV/u on C target
yes B

Signal – Ped - CN (sensor 2)



Physics Runs-Common Noise



- CN has to be calculated event by event during the physics run.
- The chips connected to strips that see a particle cannot be used for the calculation.
- Possible solution: to use the CN of external chips.

↓

CORRECTION FACTORS BETWEEN CHIPS

↓

Calculated during the calibration runs.

Reference chips: internal ones (4-5)

Conclusion

- **ComputeMsdPed.C is an efficient not hardcoded macro usable for both Calibration Runs and Physics Runs**
- **Pedestals are stable during each data taking campaign**
- **New implementation of Common Noise calculation in Physics Runs**

NEXT WORK:

- **Definition of Seed and Fired Thresholds for the clustering**

Thank you for the attention!