

# FOOT meeting

## TOF-wall: test with cosmic rays



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1.2. Data acquisition

## 2. Data analysis

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# TOF-wall detector

- TW used to measure the energy loss  $\Delta E$  of the passing particles and to provide their arrival time.
- Made of 40 bars of EJ-200 plastic scintillator arranged in two orthogonal layers of 20 each.
- At each end of each bar, the two series of two SiPMs were connected in parallel.

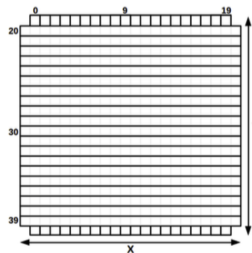


Figure: Scheme of TOF-Wall bar numbering

# Experimental setup

- The light produced in the bars is collected at each end.
- Each group of four SiPMs provides a single summed analogical signal.
- The output signal of each side of each bar was input to a waveform digitizer board hosted in the WaveDAQ integrated trigger and data acquisition system.

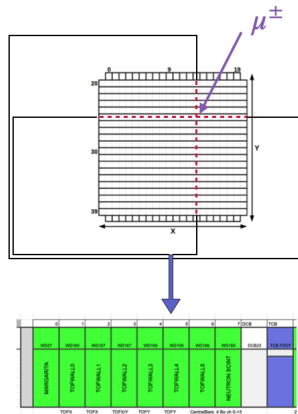


Figure: Thanks M. Morrocchi for the cabling!

# Experimental setup

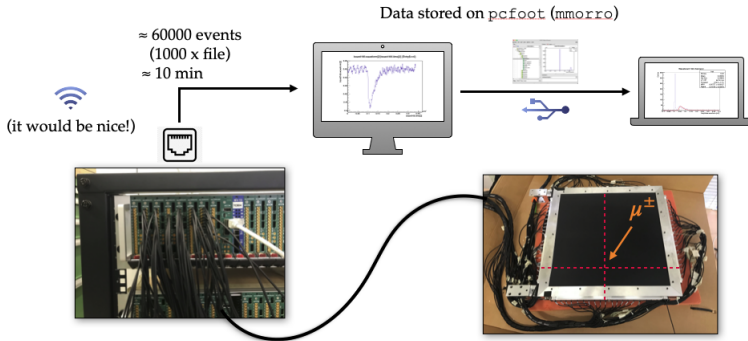
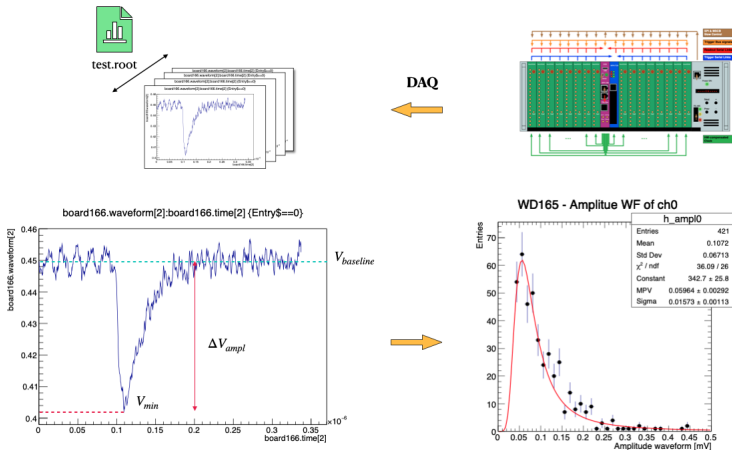
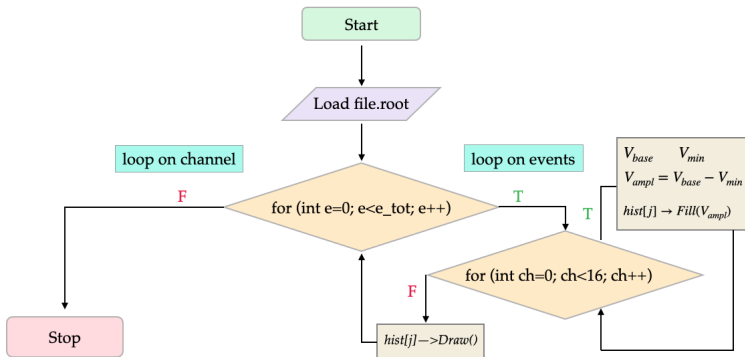


Figure: Schematic representation of the setup

# Data acquisition



# Flowchart



Algorithm applied on all the waveDREAMs of the TOF wall.

# WaveDREAM board 165 - Amplitude histograms

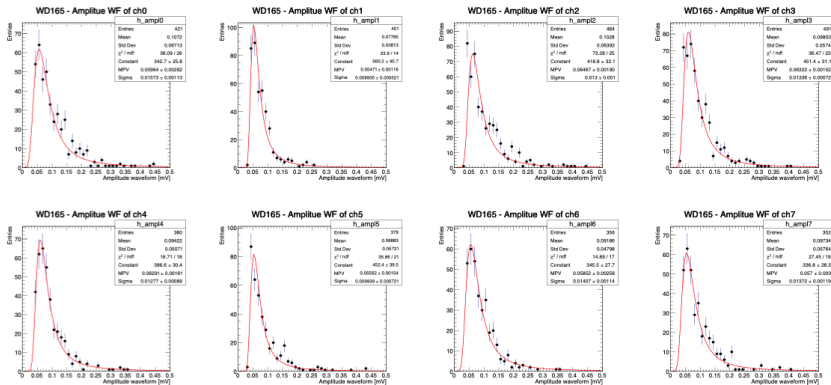


Figure: Channels from 0 to 7.

1

<sup>1</sup>Data in GoogleDrive/FOOT/Cosmici/3GSample-oct23



# WaveDREAM board 165 - Amplitude histograms

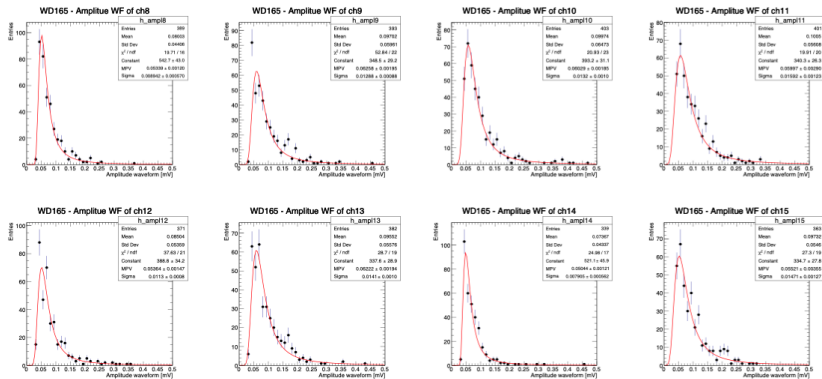
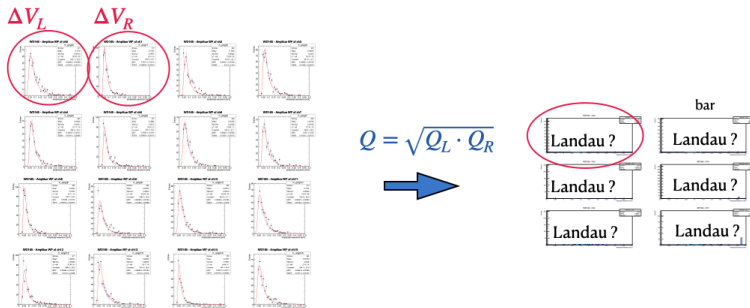


Figure: Channels from 8 to 15.

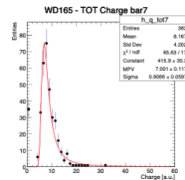
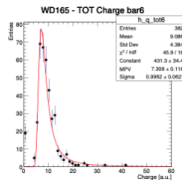
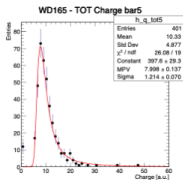
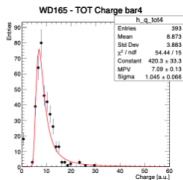
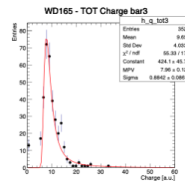
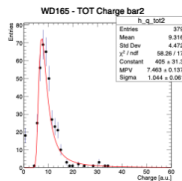
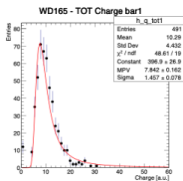
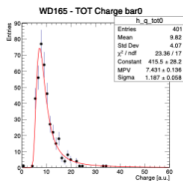
2

# Charge



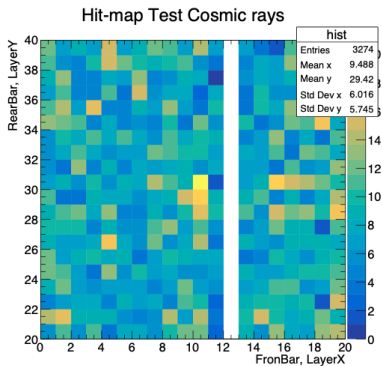
- Compute charge  $Q$  through the integral of the waveform (for each individual event).
- For each event,  $Q_{tot}$  evaluated from the collected charge on each side of the bar .

# Charge

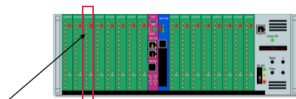


Good agreement with the expected Landau distribution.

# Hit-Map TOFWall



Board 157, channel 2 and 3 disabled



Maybe a problem with the connector?

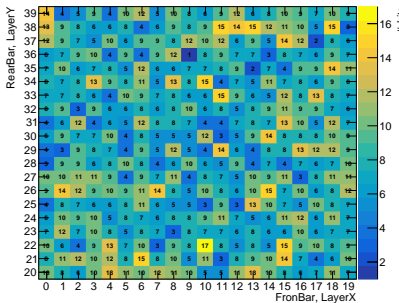
BAR 12 X-View



Distribution of hits on the TOF-wall bars is uniform for both layers .

# Hit-Map TOFWall

Hit-map Test Cosmic rays



- Waiting for the CNAO, we replaced the **WD 157 with the 170**.
- Thanks to: L. Galli, M. Morrocchi and M. Francesconi.
- **Next task**  $\implies$  time resolution of TOFWall.



Tesi di Laurea, Roberto Zarrella 2018-19



Tesi di Laurea, Marco Montefiori 2019-20