Meeting post TB

July 26th, 2023

Preliminary Report of the July 2022 Beam Test: LGADs

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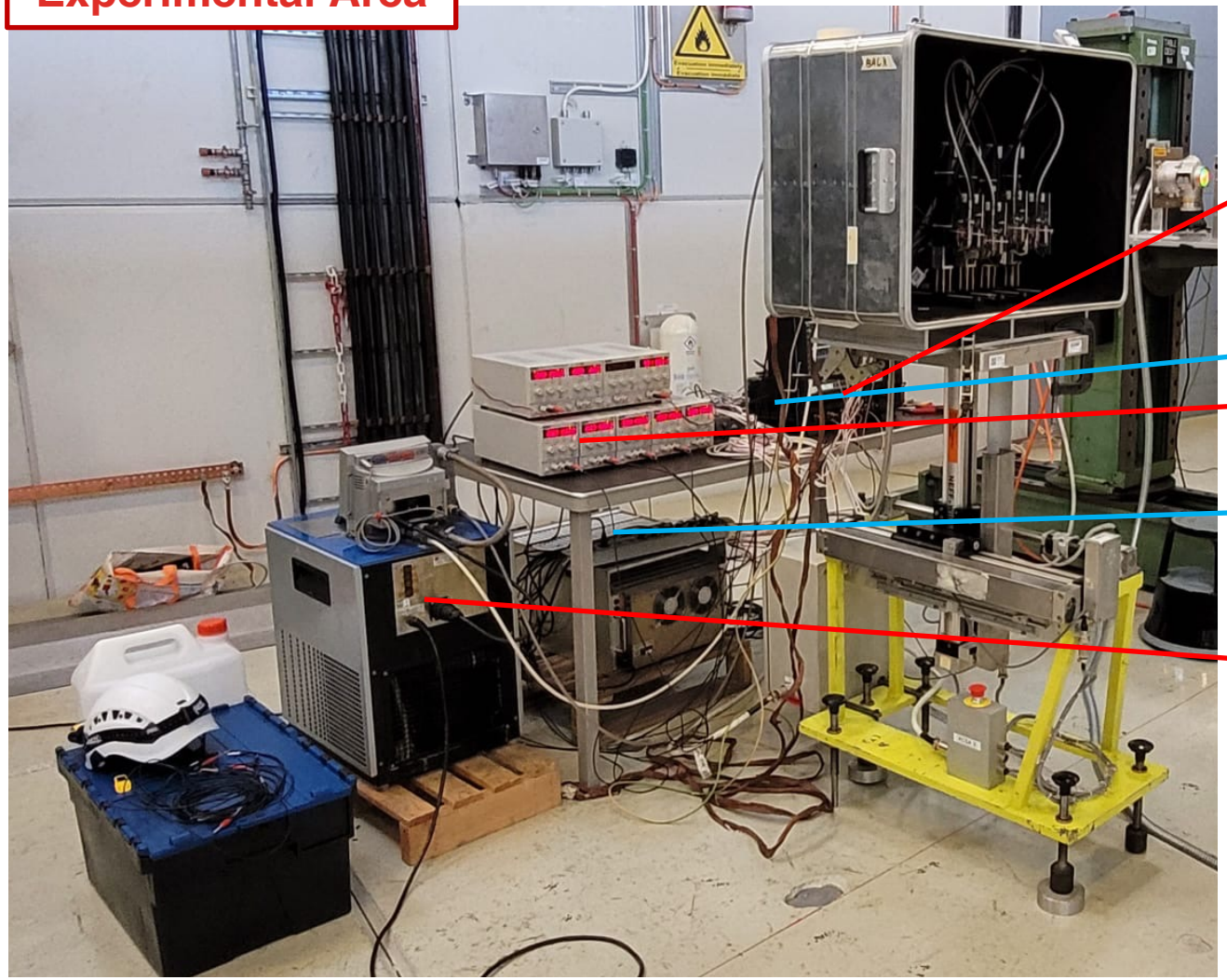
TEST BEAM SETUP

*Hadron beam: p ~ **10 GeV/c**;*
- *max intensity ~10 ^{6} particles/spill*
- *Low intensity for 1 night and the last 2 days*

Experimental Area



LeCroy WaveRunner
9404M-MS (4 GHz)
Sampling rate: 20 GS/s
Time discretization: 50 ps

Arduino

Z100 & TTIPL power supply for the low voltage

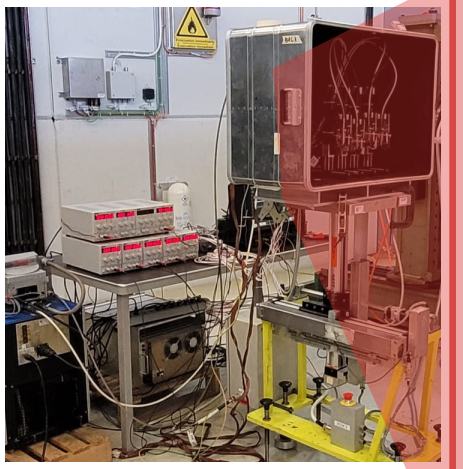
CAEN power supply for the LGADs

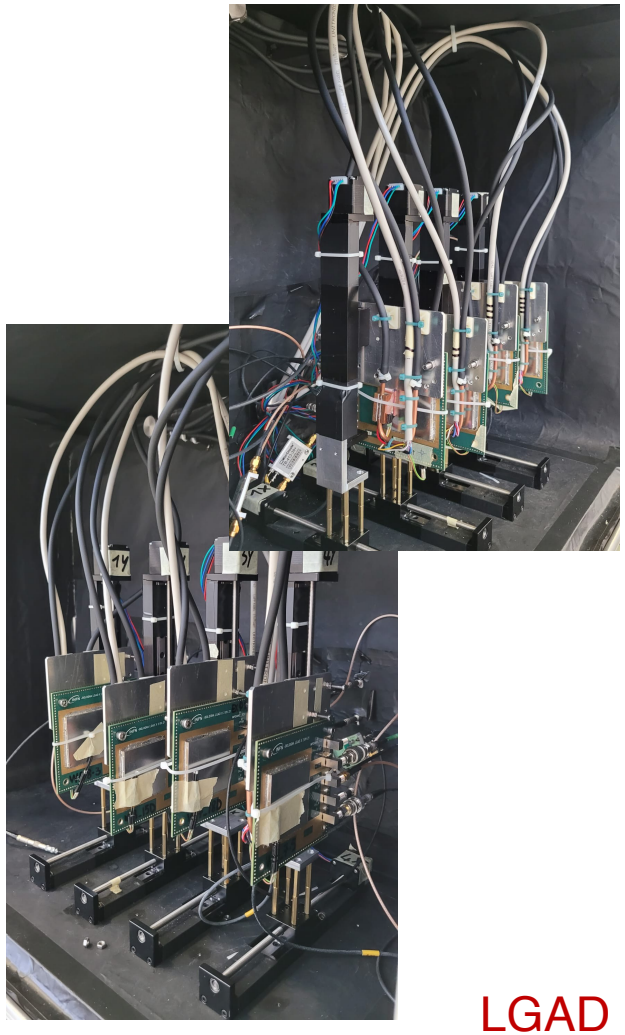
Cooling system

📍 CERN PS East Hall
(beam facility T10)

TEST BEAM SETUP

Experimental Area





LGAD

TEST BEAM SETUP

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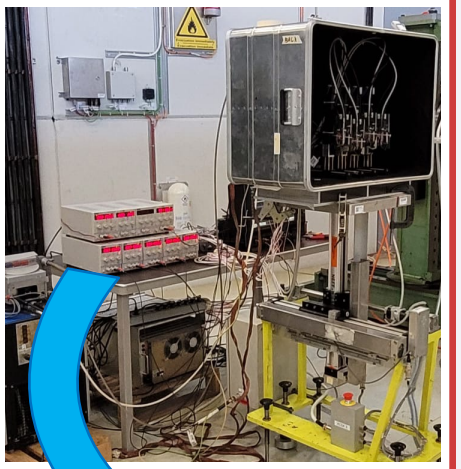


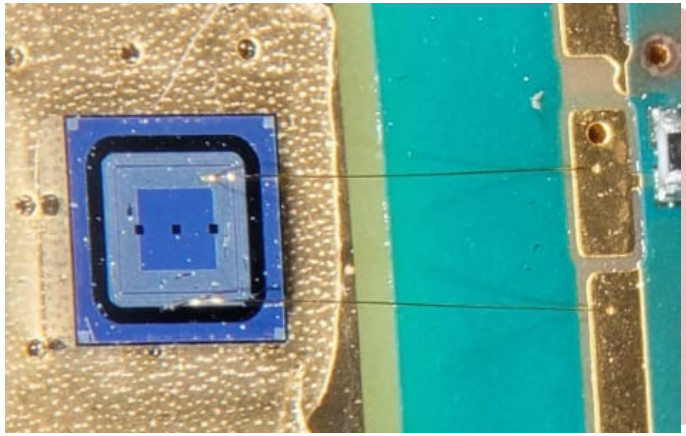
Control Room

All the **instruments were remotely controlled** from a Windows PC, connected through ethernet cables

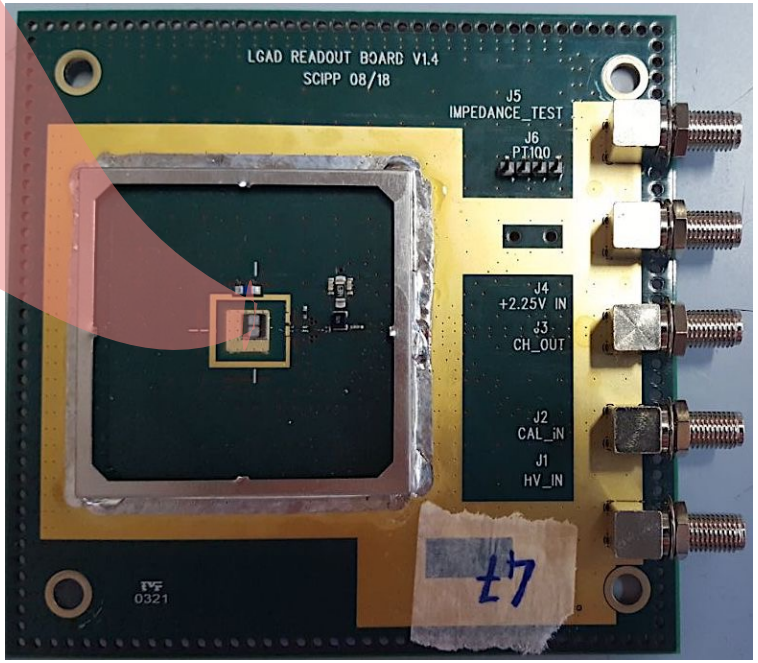
- Remote connection to the oscilloscope:
  - → The whole signal waveforms were acquired
  - → Digitalization at the analysis level

- **LabVIEW applications:**
  - Data transfer and storage
  - Setting up and monitoring of V_{bias} and currents
  - **Monitoring of the temperature**
  - Control **micro-positioners** (indipendent for each sensor)
  - Night scheduler

TESTED LGADs & ELECTRONICS



SantaCruz single-channel LGAD read-out board *V1.4 SCIPP 08/18* ($G_{amplifier}$ ~ **6**)



Very thin LGAD prototypes produced by FBK (Exflu1)

15 µm (W18) & **20 µm** (W17) thick FBK single channel

Area = **1.3x1.3 mm²**

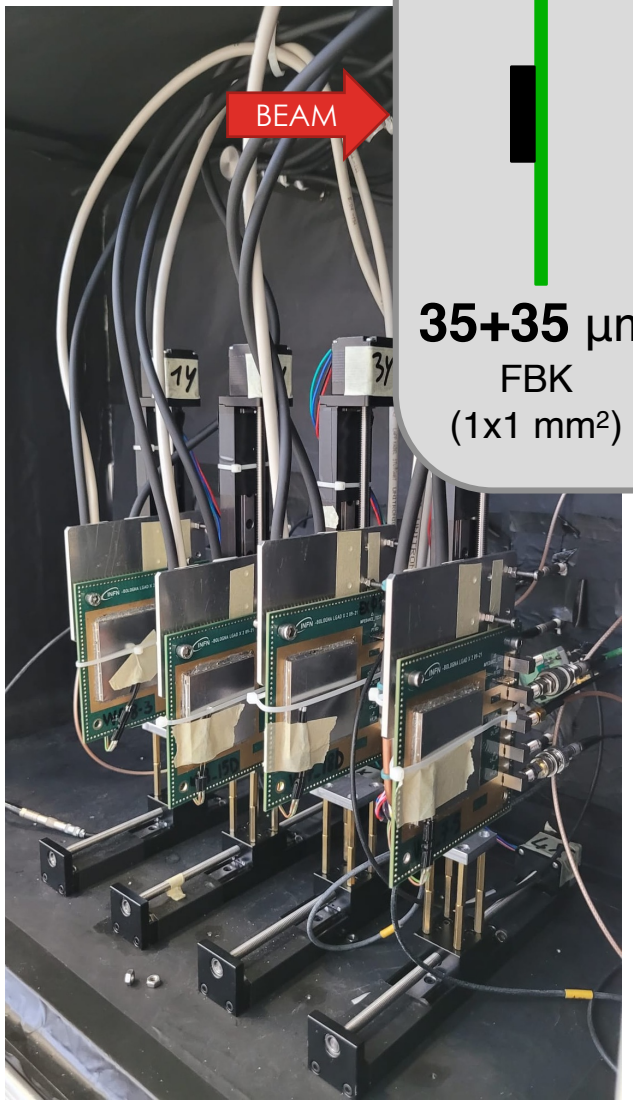
+ Second stage external amplifier ($G_{amplifier}$ ~ **11-13**)

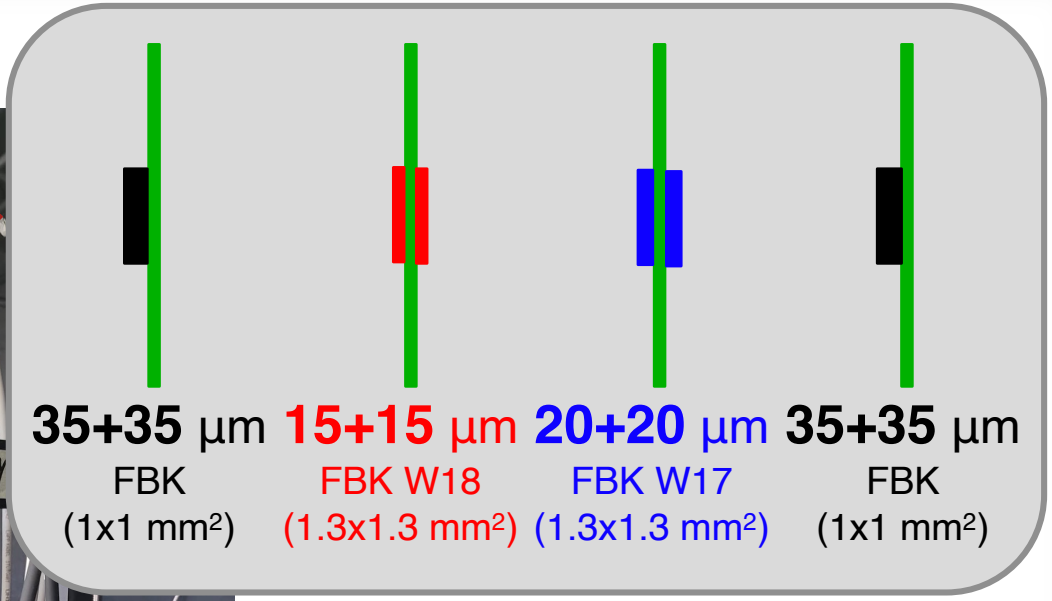
15 µm (W18) thick LGAD:

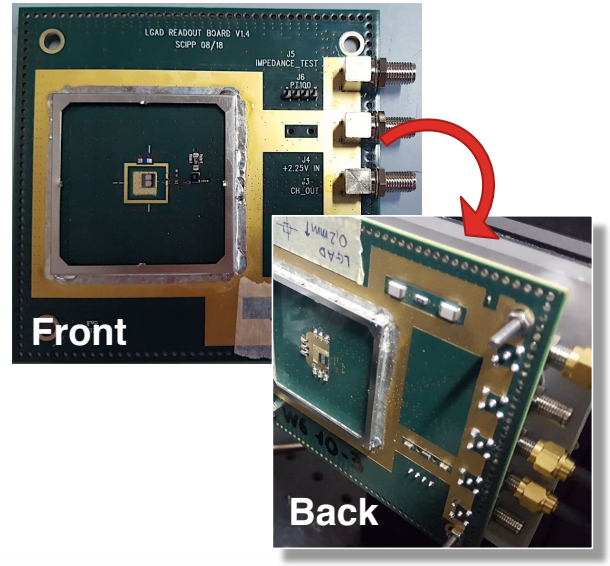
- Double
  - ✓ Front
  - ✓ Back
- Double
  - ✓ Back

20 µm (W17) thick LGAD:

- Double
  - ✓ Front
  - ✓ Back

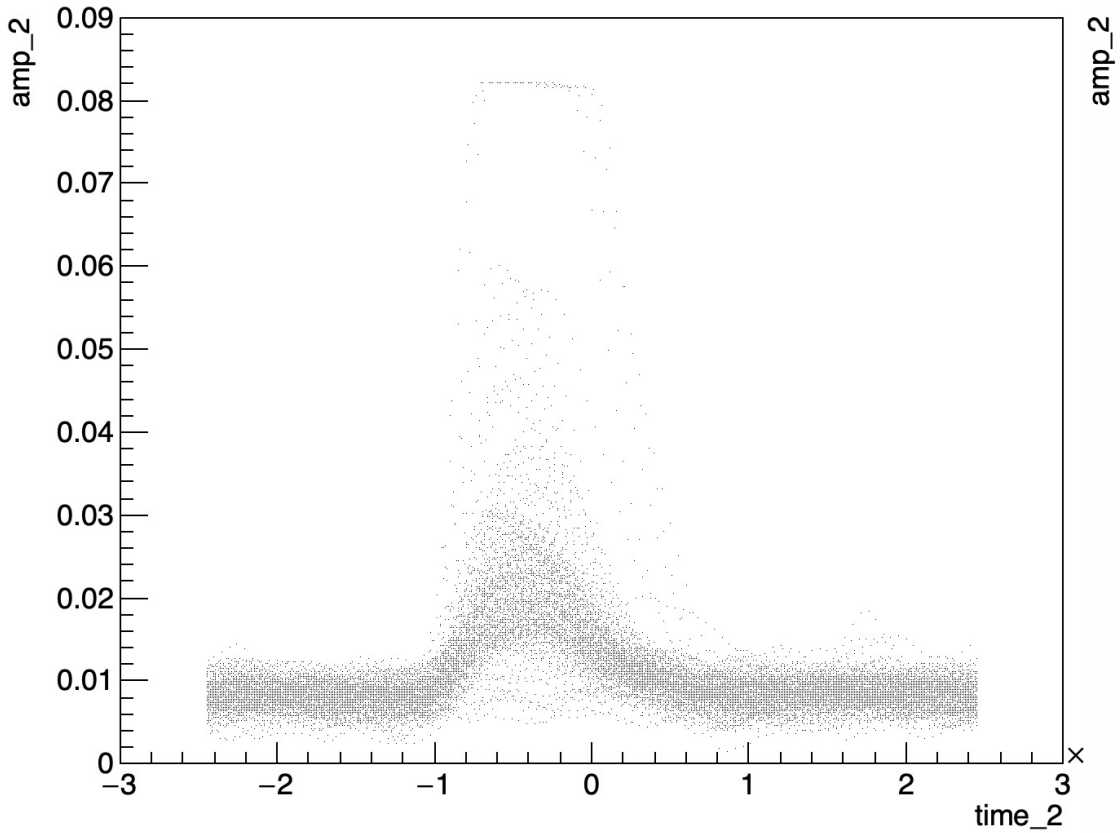






SIGNALS

15 µm (W18) Single



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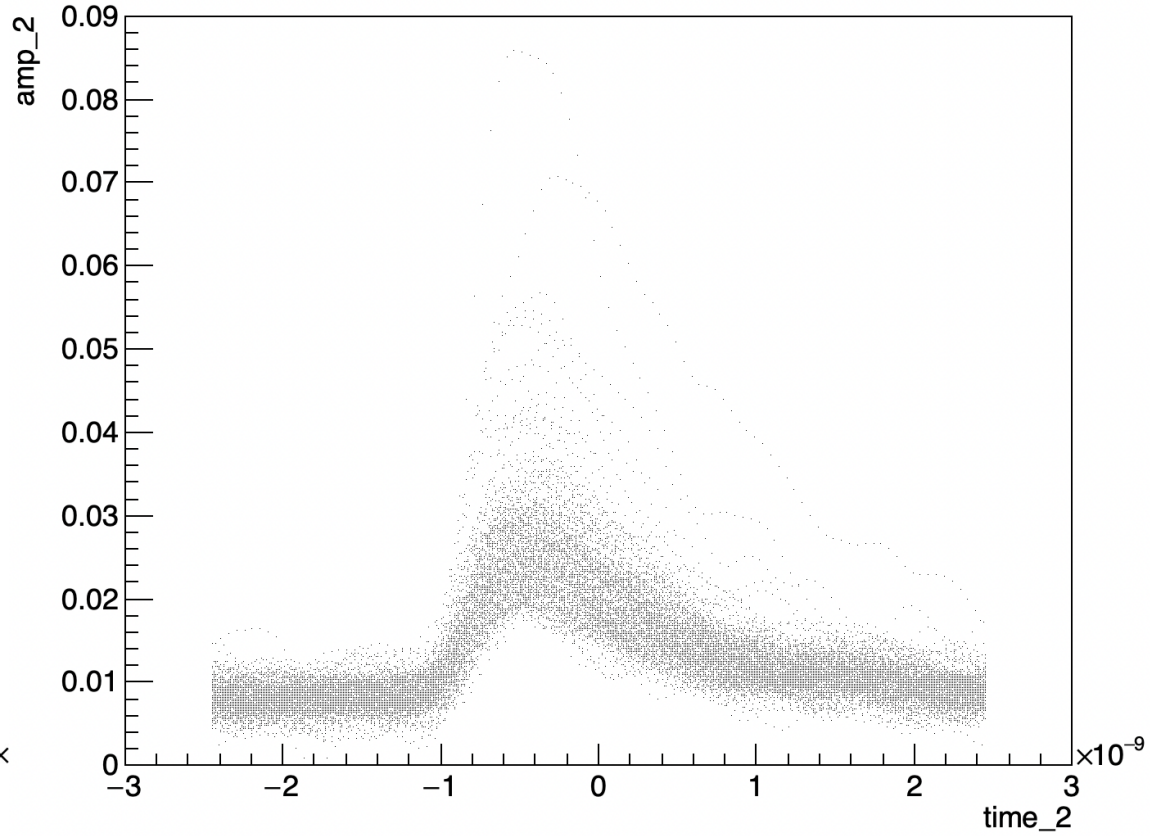
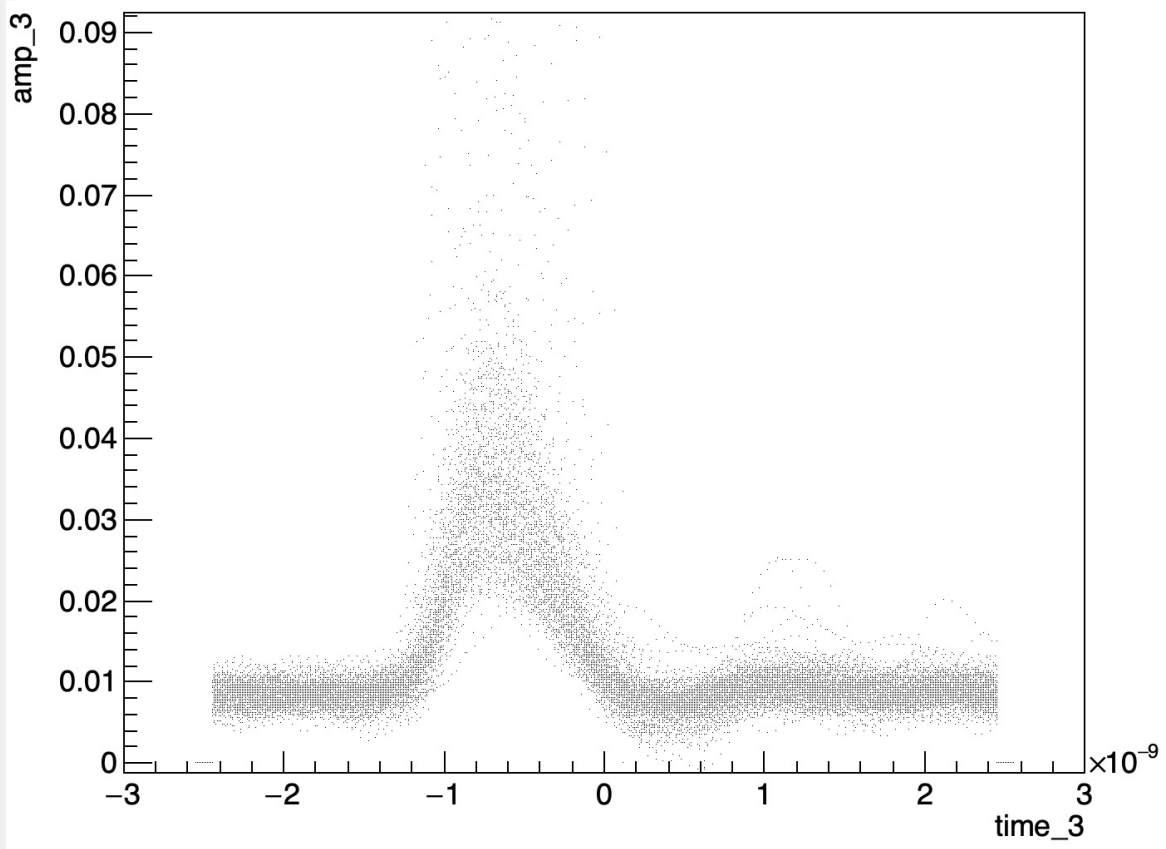


SIGNALS

20 µm (W18) Single



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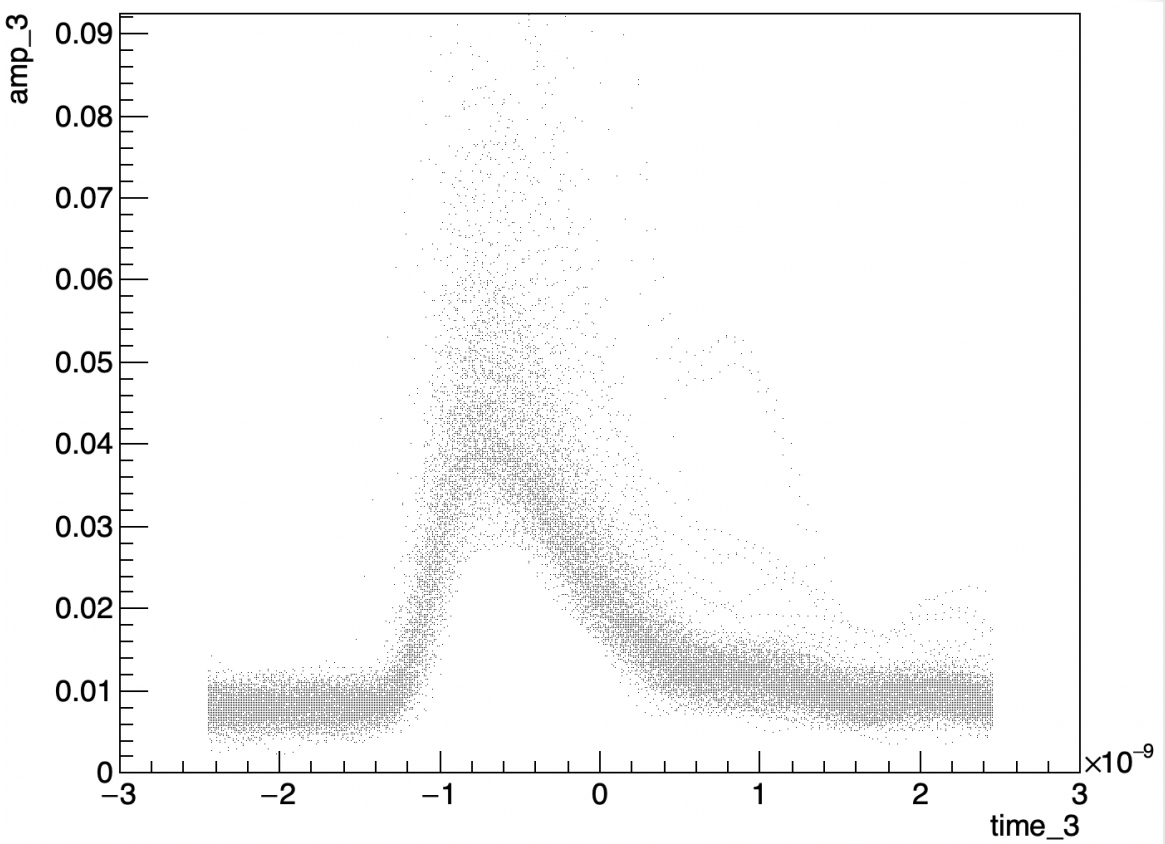
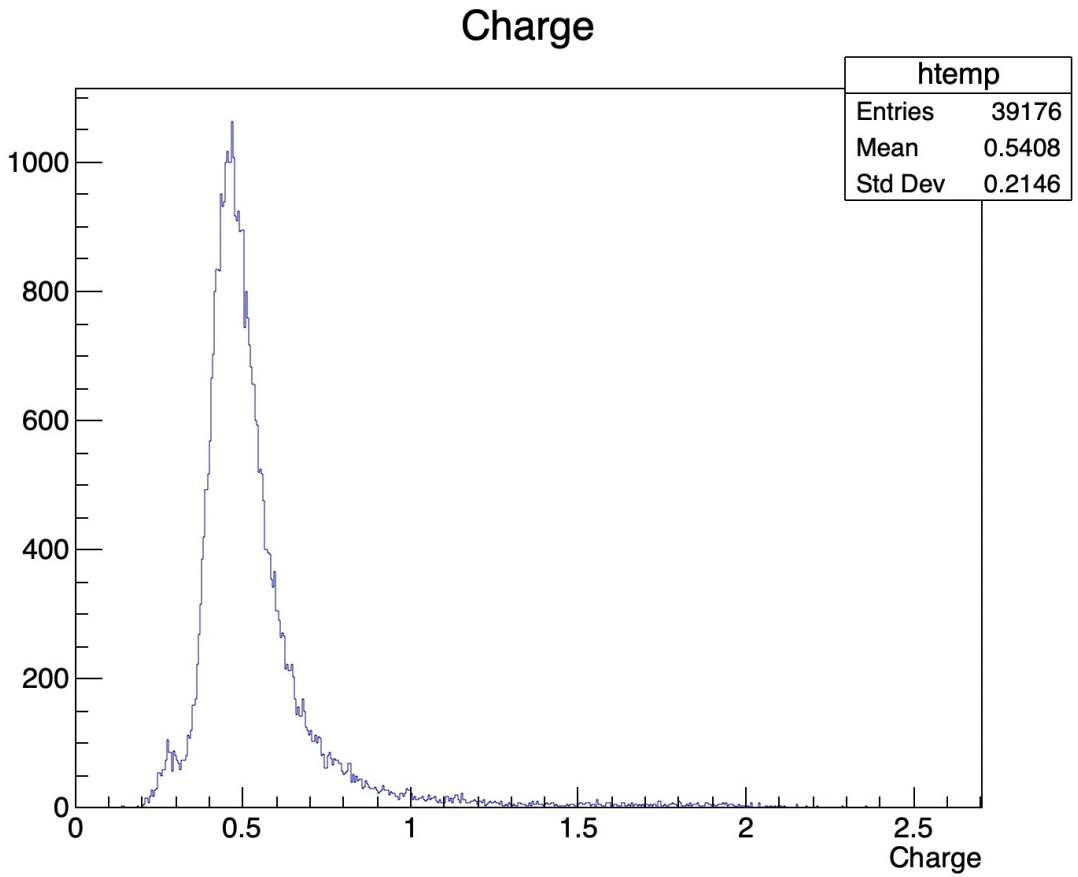


ANALYSIS

15 µm (W18) Single



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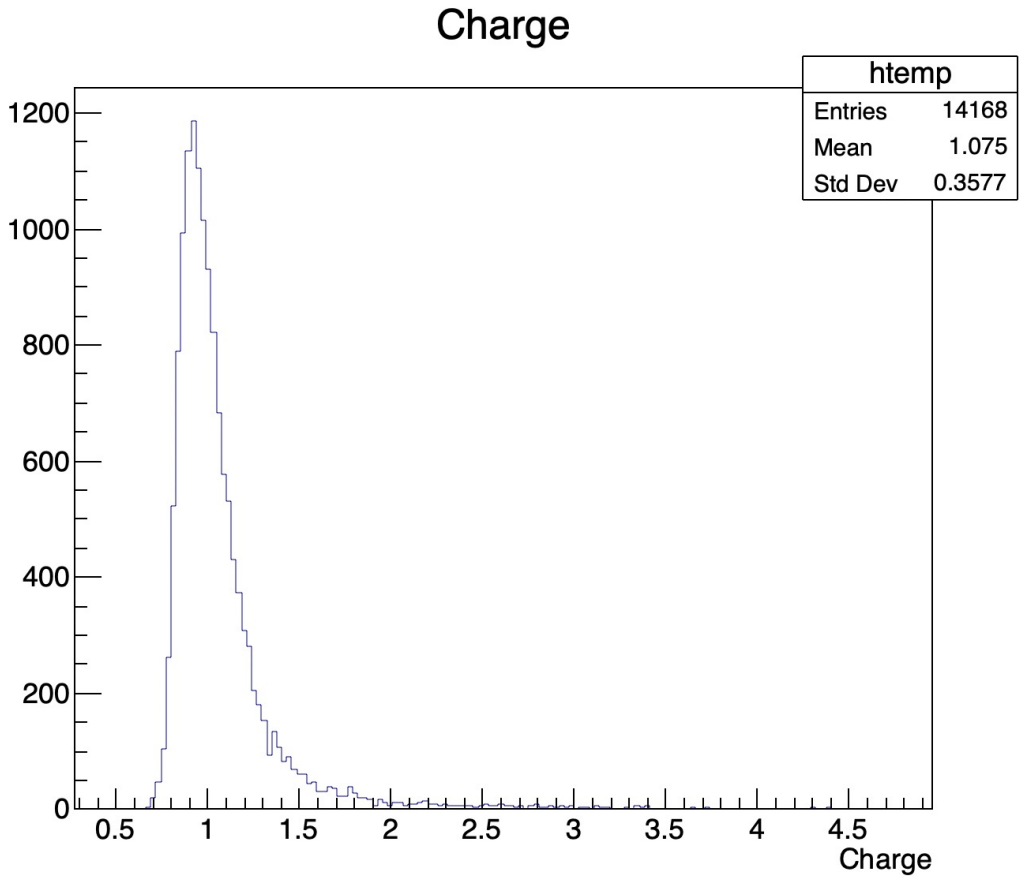

Just to control that everything is ok

→ cuts, normalization and consideration of the amplification gains to be done

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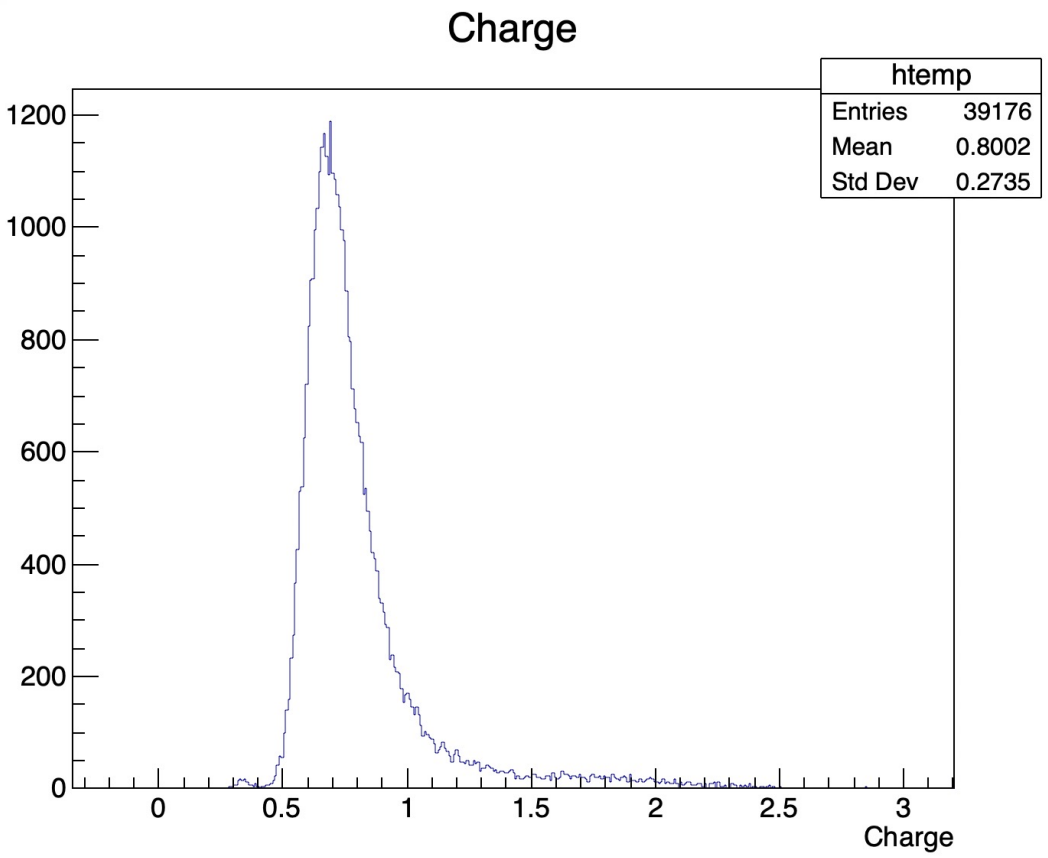

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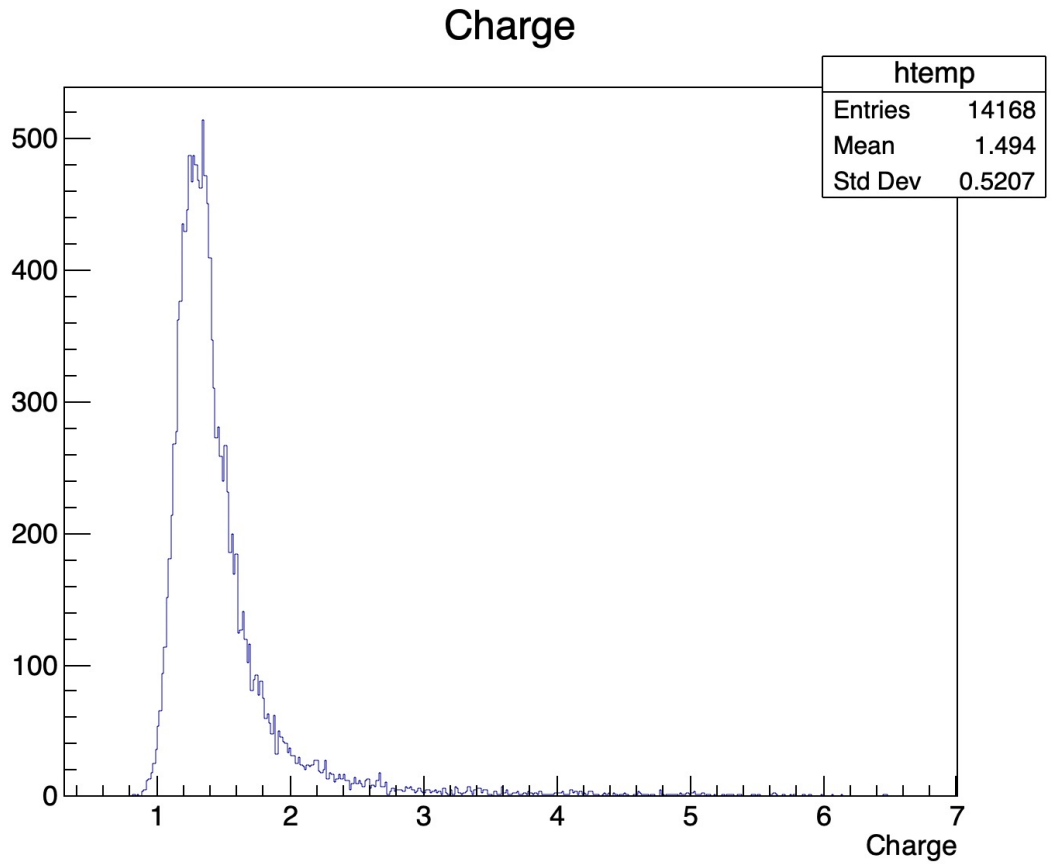

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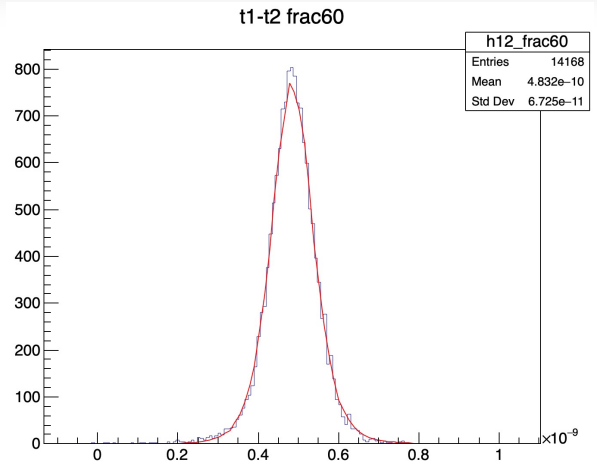
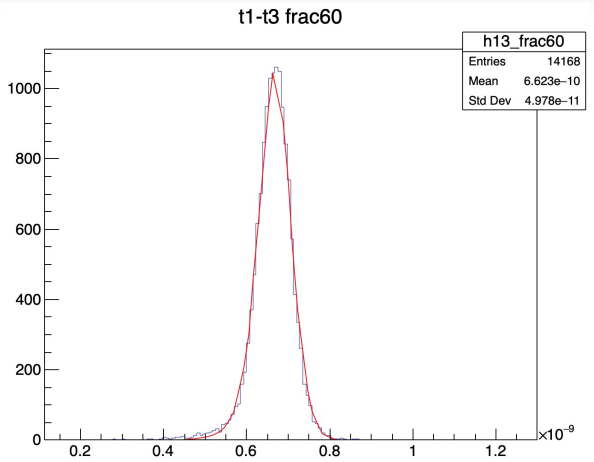
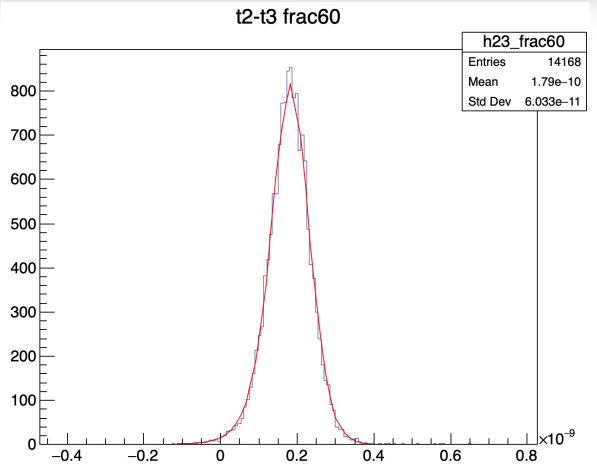
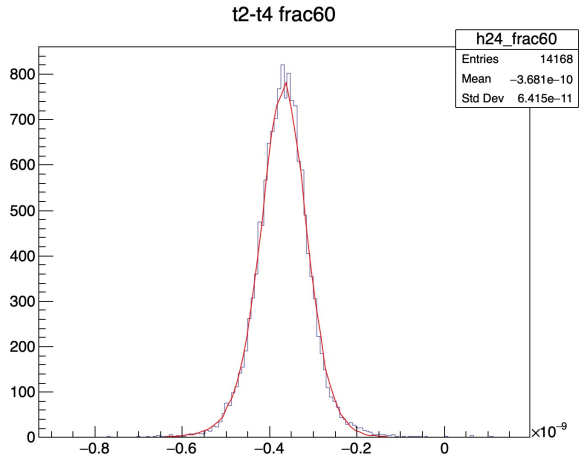
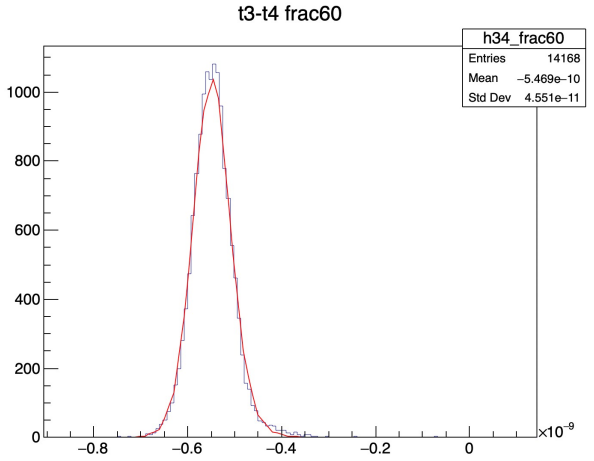
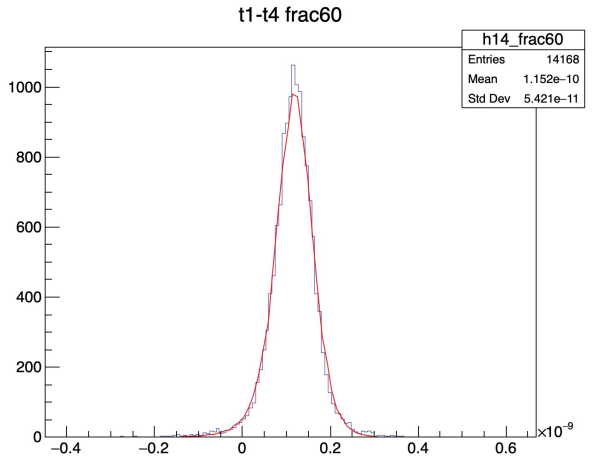










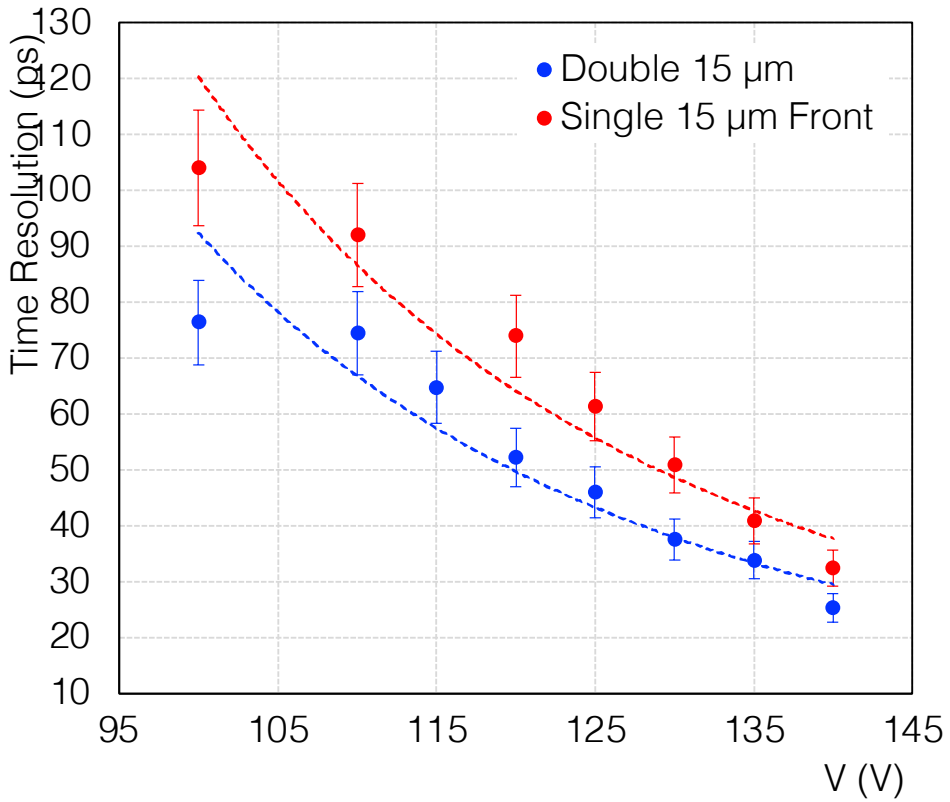


A low number of simultaneous events between the 4 sensors

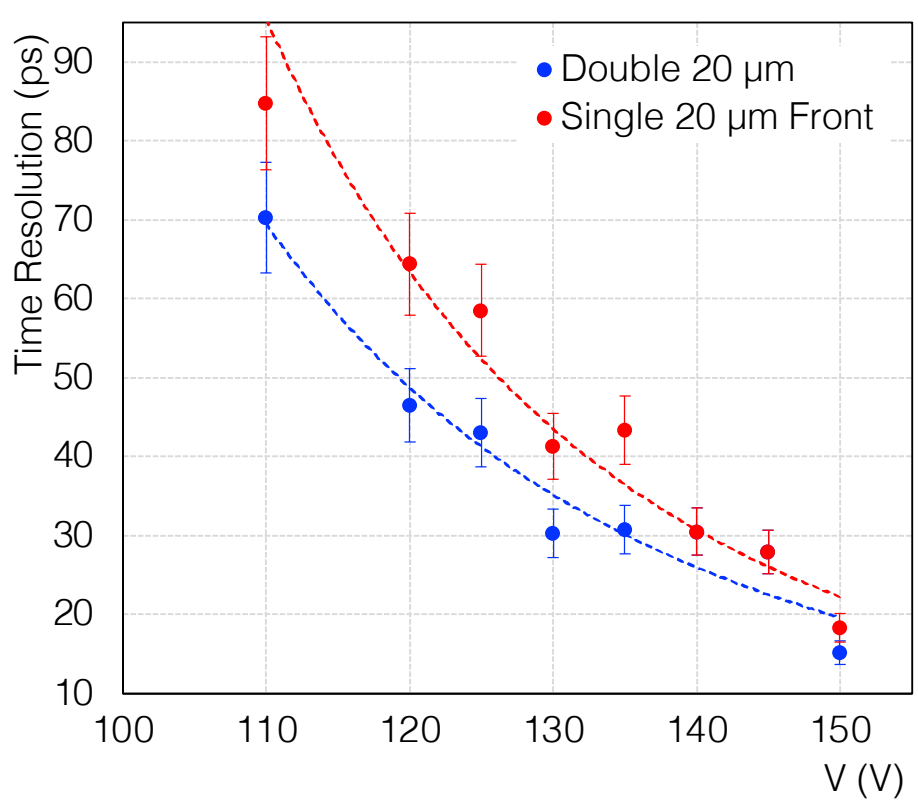
→ trying to use just one system with the references, to extract the resolution of the two under study

SOME VERY PRELIMINARY RESULTS

15 µm (W18)



20 µm (W17)



CONCLUSIONS AND PLANS

- Charges double VS single (Gaussian + Landau distributions)
- Noise
- Gain

- Reconstruction of the Landau of the double and the single in order to see which is the displacement

- Time resolution double VS single
- Time resolution 15,20,25,35,50 μm

- Implementatio of FFT inside the macro to remove noise

BACKUP SLIDES