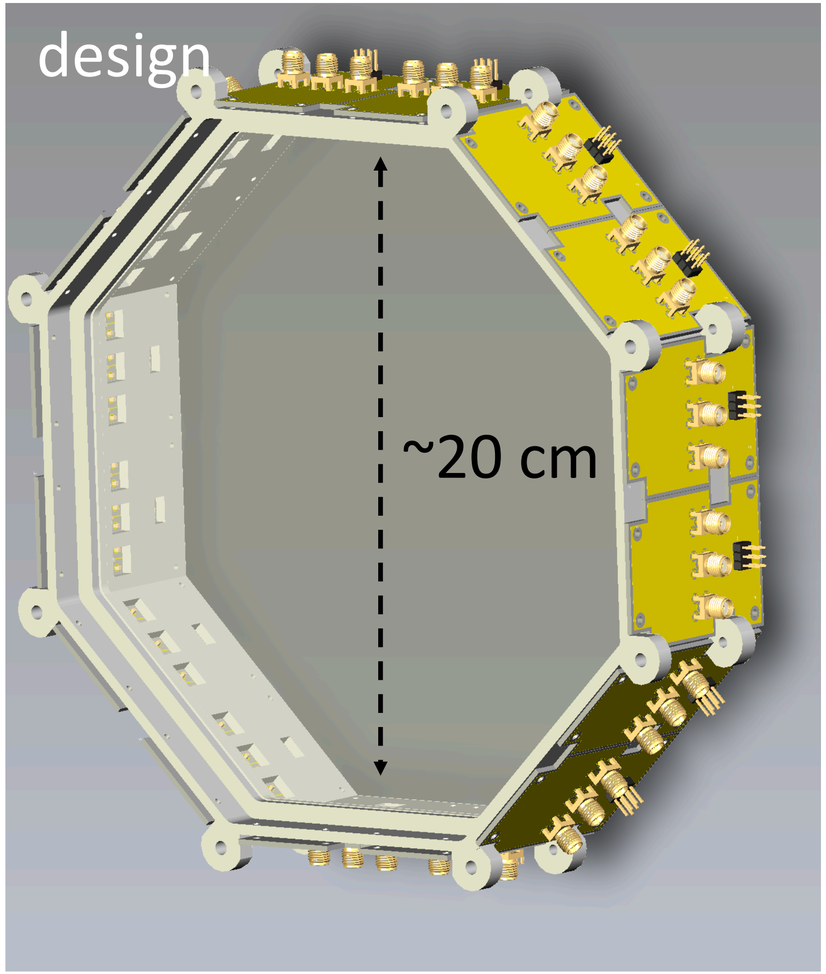
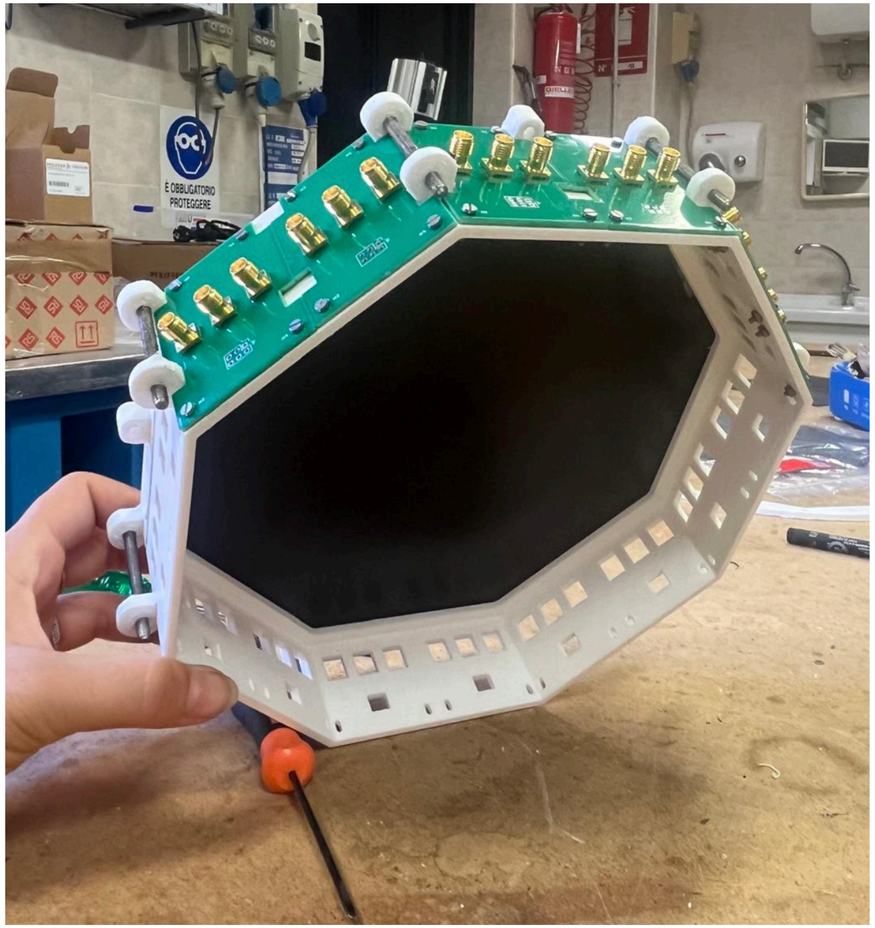
Tofprad update

Giacomo Traini

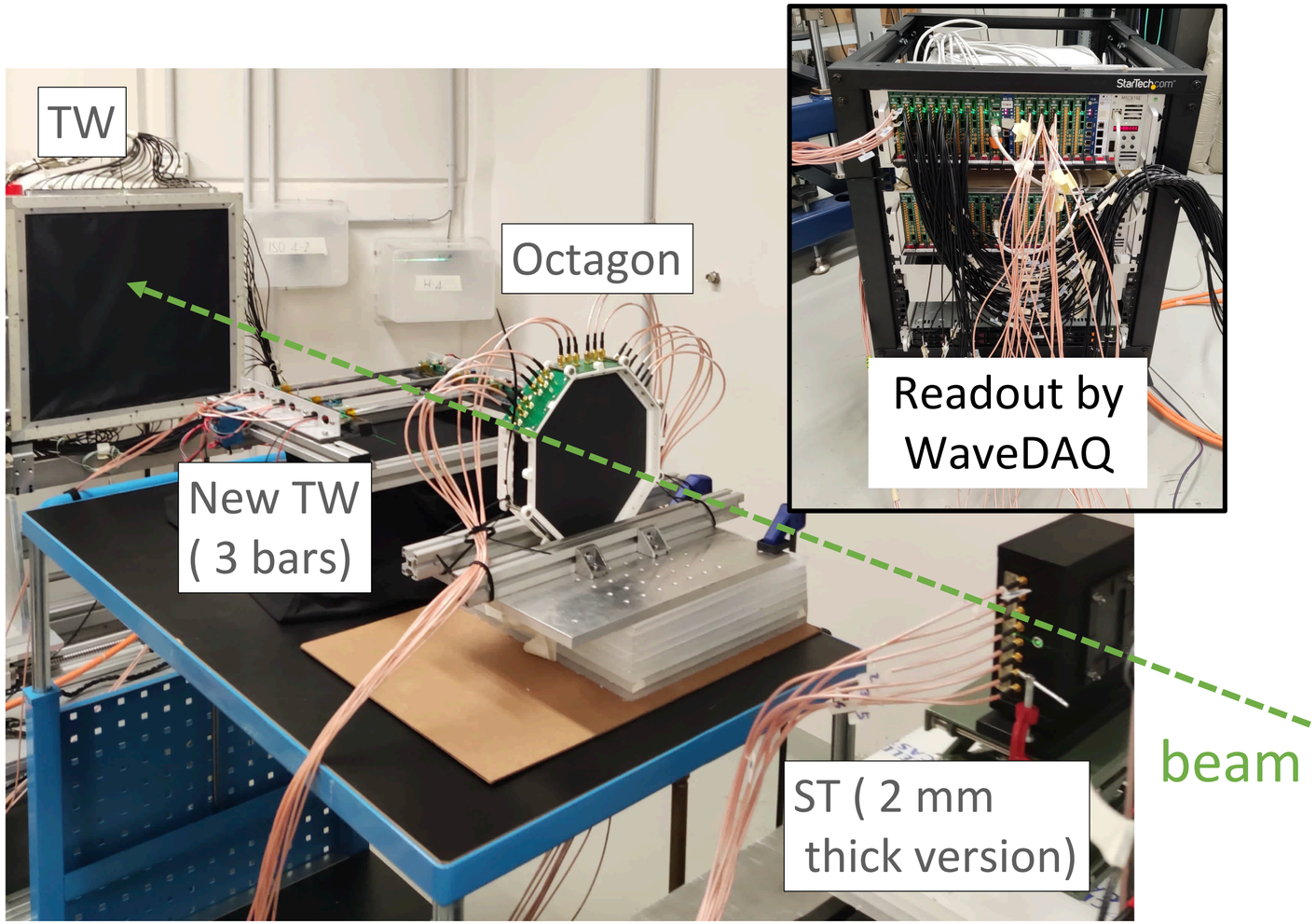
Start detector





- Currently adopting 1 mm thick EJ-212 cut by Marco Magi (final scintillator 6 mm, cut and polished by ELJEN)
- SiPM glued by INFN-Pi
- Just **3 sides** instrumented at today (second delivery of SiPM expected in September)

Test @ CNAO

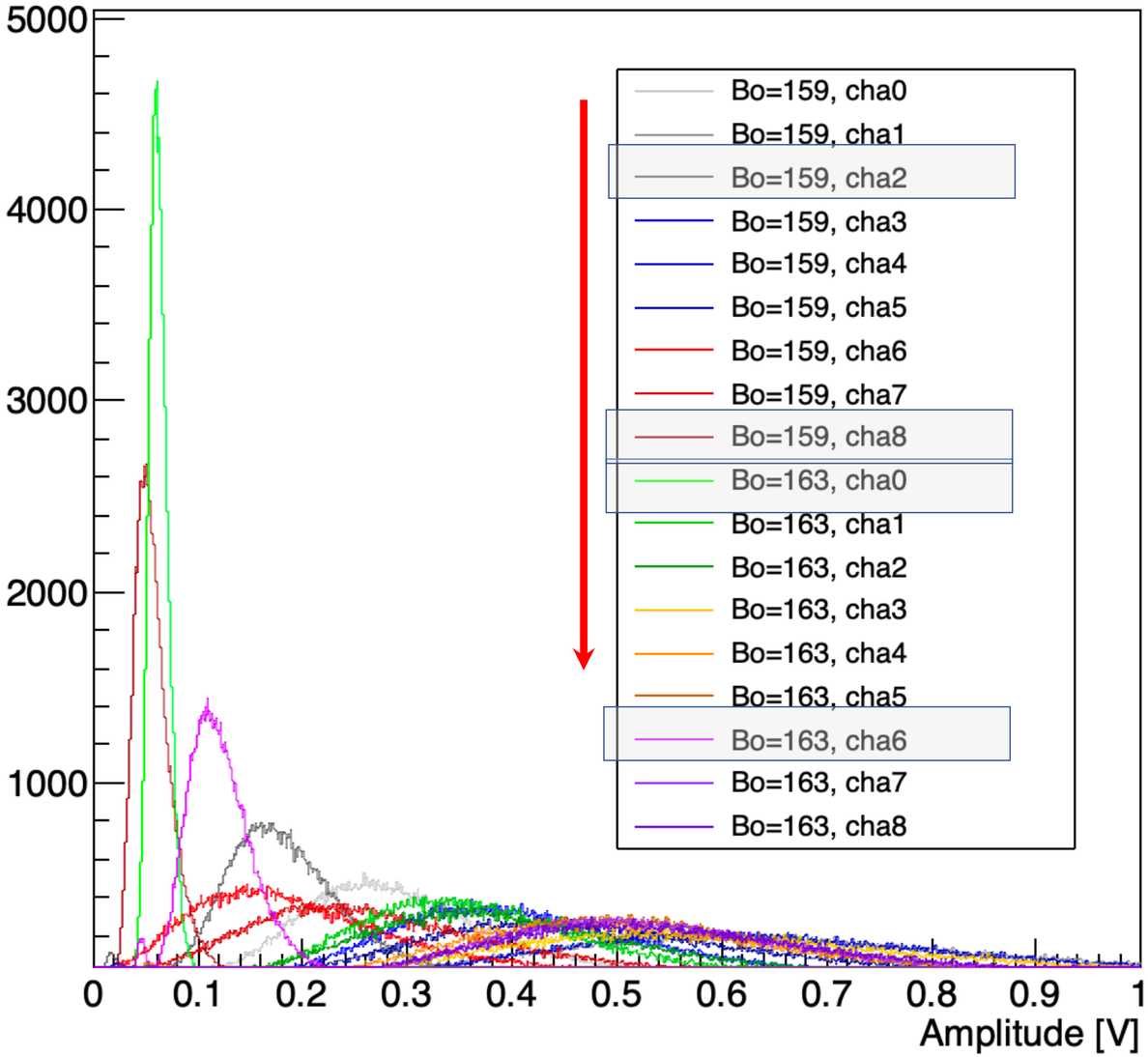


- It has been scheduled 7 months ago in view of the expected project deadline… which has been postponed to 28th Feb 2026

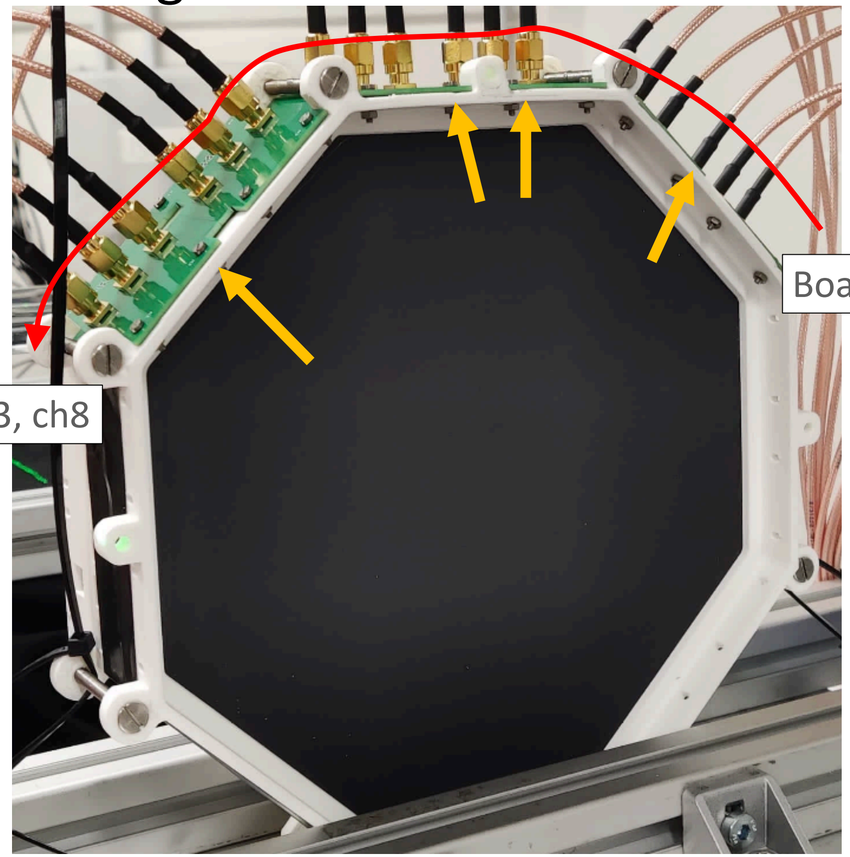
- We test the response of our prototype with p beams

  - Signal characterisation vs HV, pol0

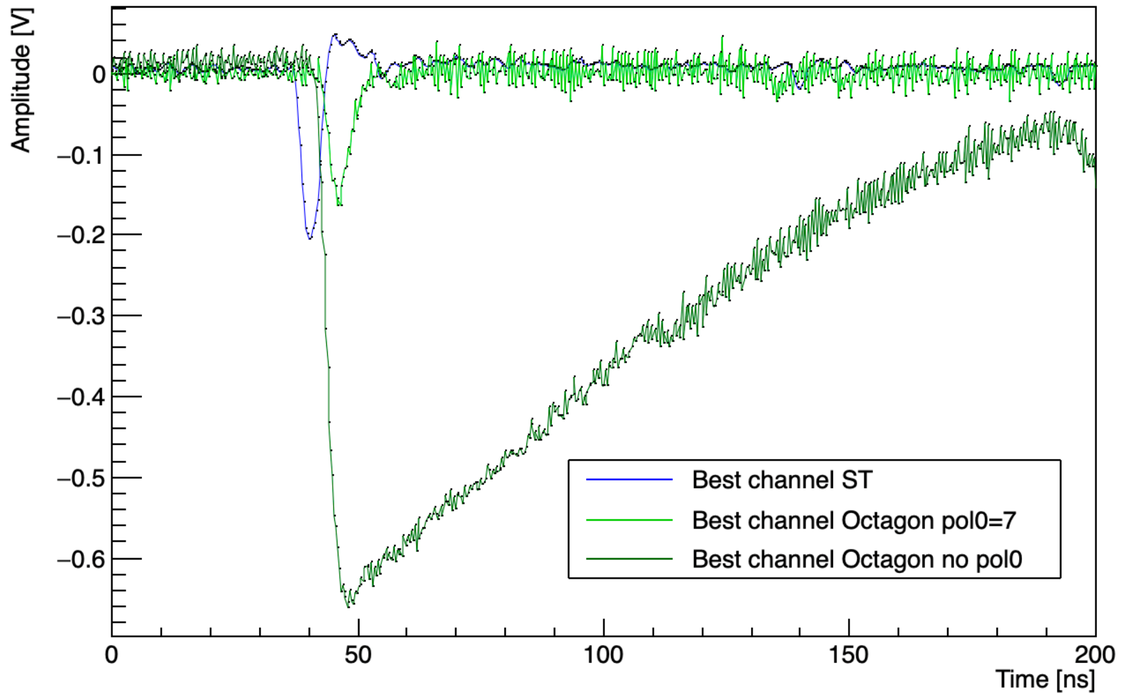
Octagon response



- Significant non-uniformity against different channels. Likely due to not optimized polishing…

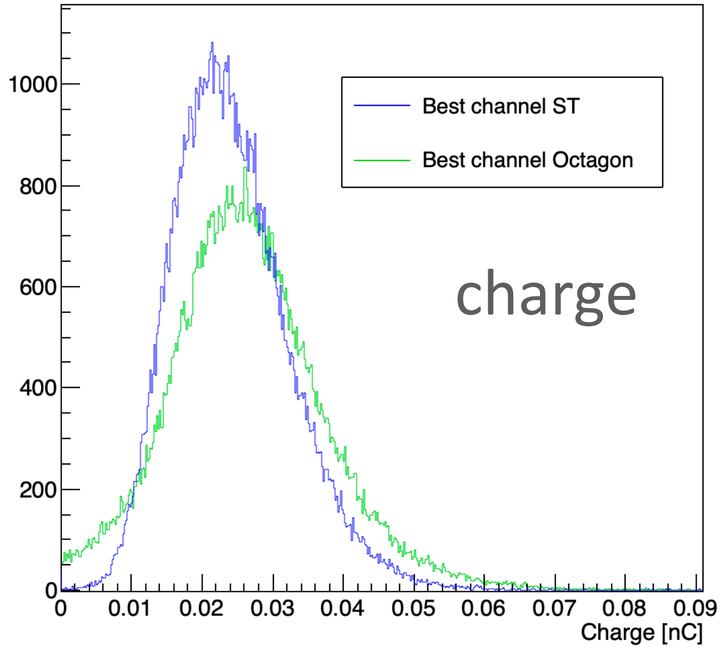


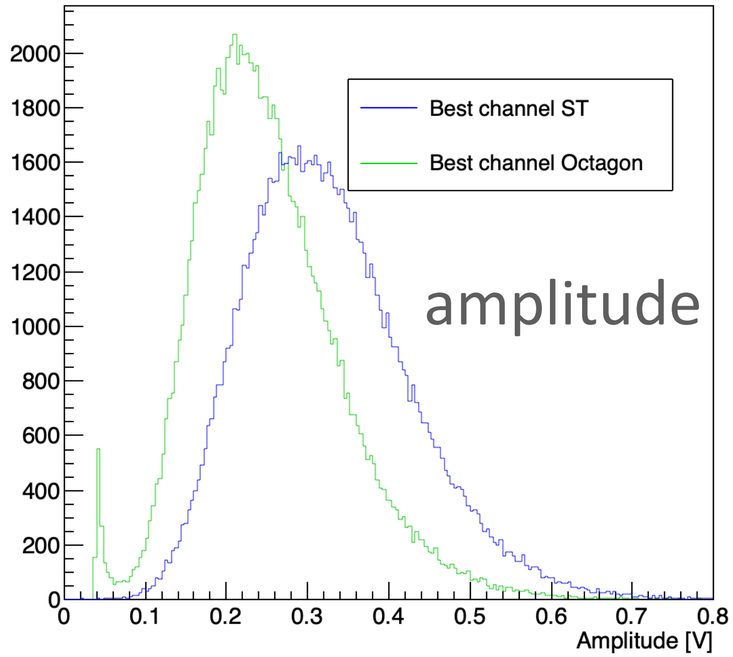
A comparison with the ST (II)



	Wdaq Gain	Pol0 level	SiPM gain	PDE @ max λ	Active area
ST	50	7	~3e6	45%	6x3mm^2
Octagon	25	7	~8e6	63%	2x6mm^2

A comparison with the ST (I)





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Octagon signal expected 20% higher

Time Resolution

$$\sigma^2_{\Delta t(ST-TW)} = \sigma^2_{TW} + \sigma^2_{ST}$$

$$\sigma^2_{\Delta t(TAMB-TW)} = \sigma^2_{TW} + \sigma^2_{TAMB}$$

$$\sigma^2_{\Delta t(TAMB-ST)} = \sigma^2_{ST} + \sigma^2_{TAMB}$$

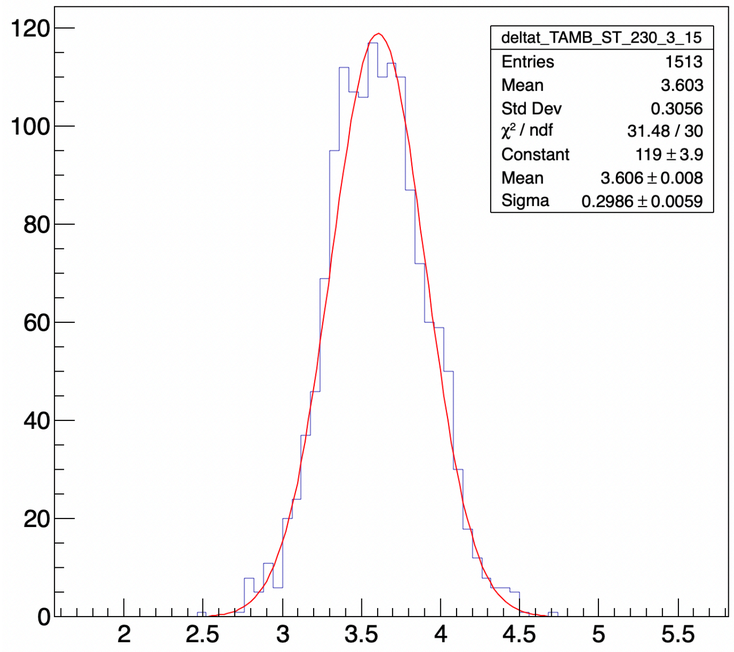
3 equation for 3 variables

- Selections:
  - TW bar=31 (out of the toffetto's bars)
  - Hit Rear Bar == 9 (try to be in the center…)
  - Amplitude of toffetto's bars < 50 mV
  - Amplitude of ST > 100 mV

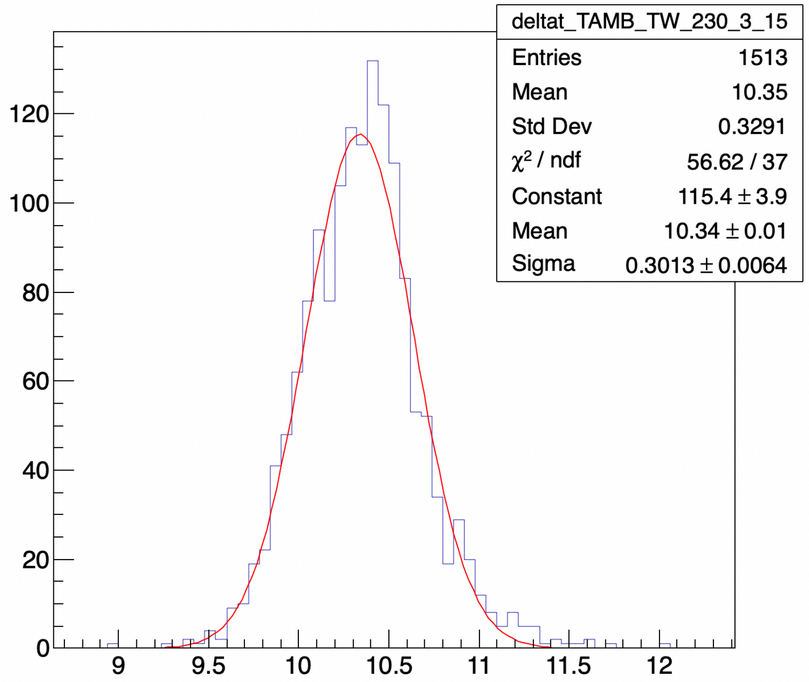
ST and TAMB signals are summed up

Time resolution (II)

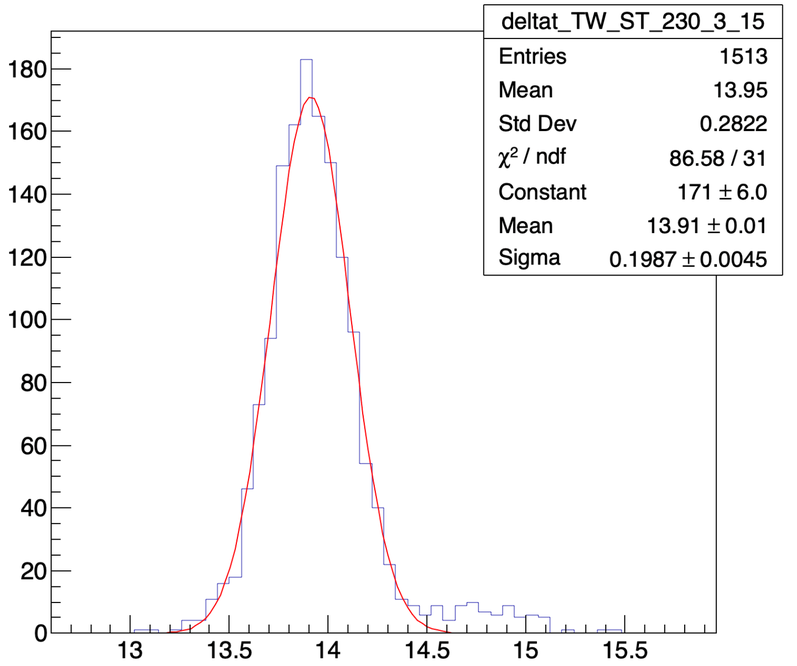
Protons @ 230 MeV



$\Delta t(TAMB - ST)[ns]$

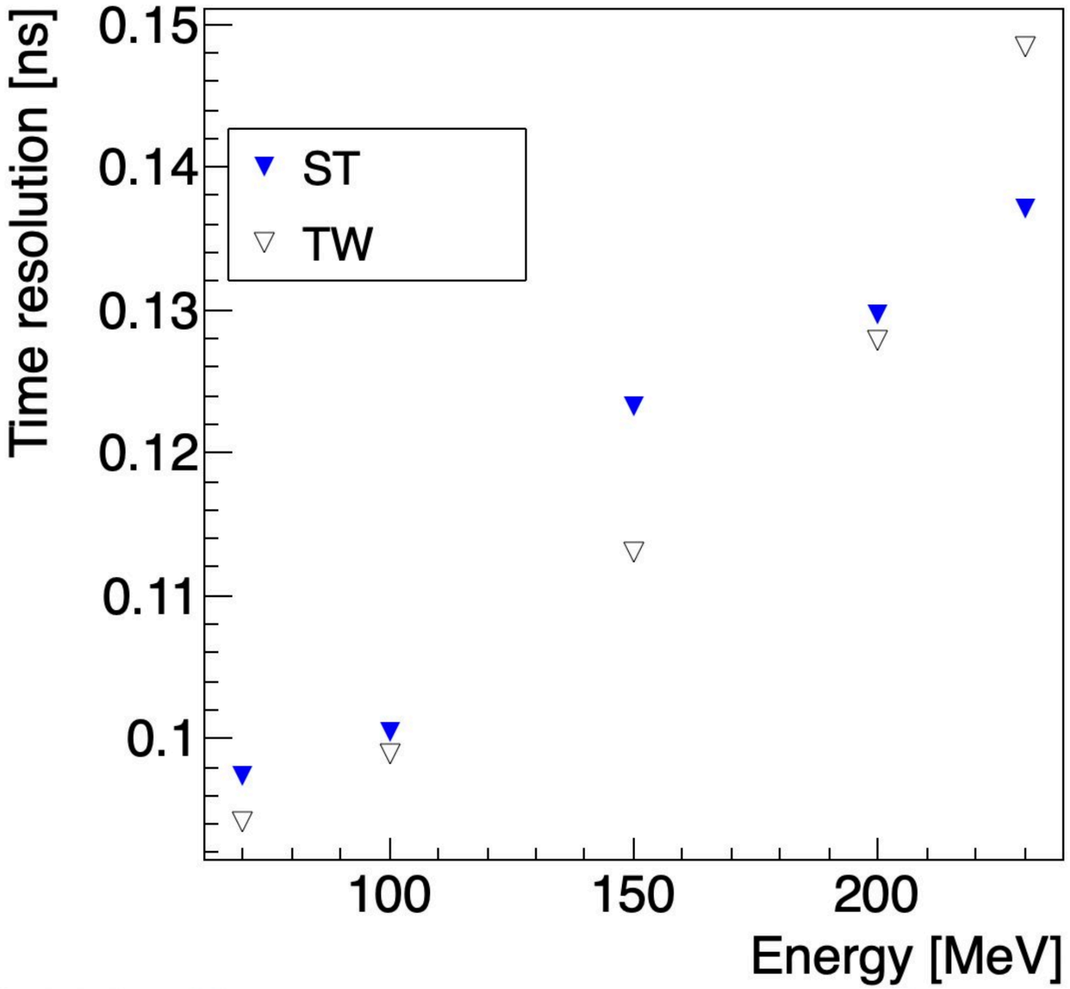


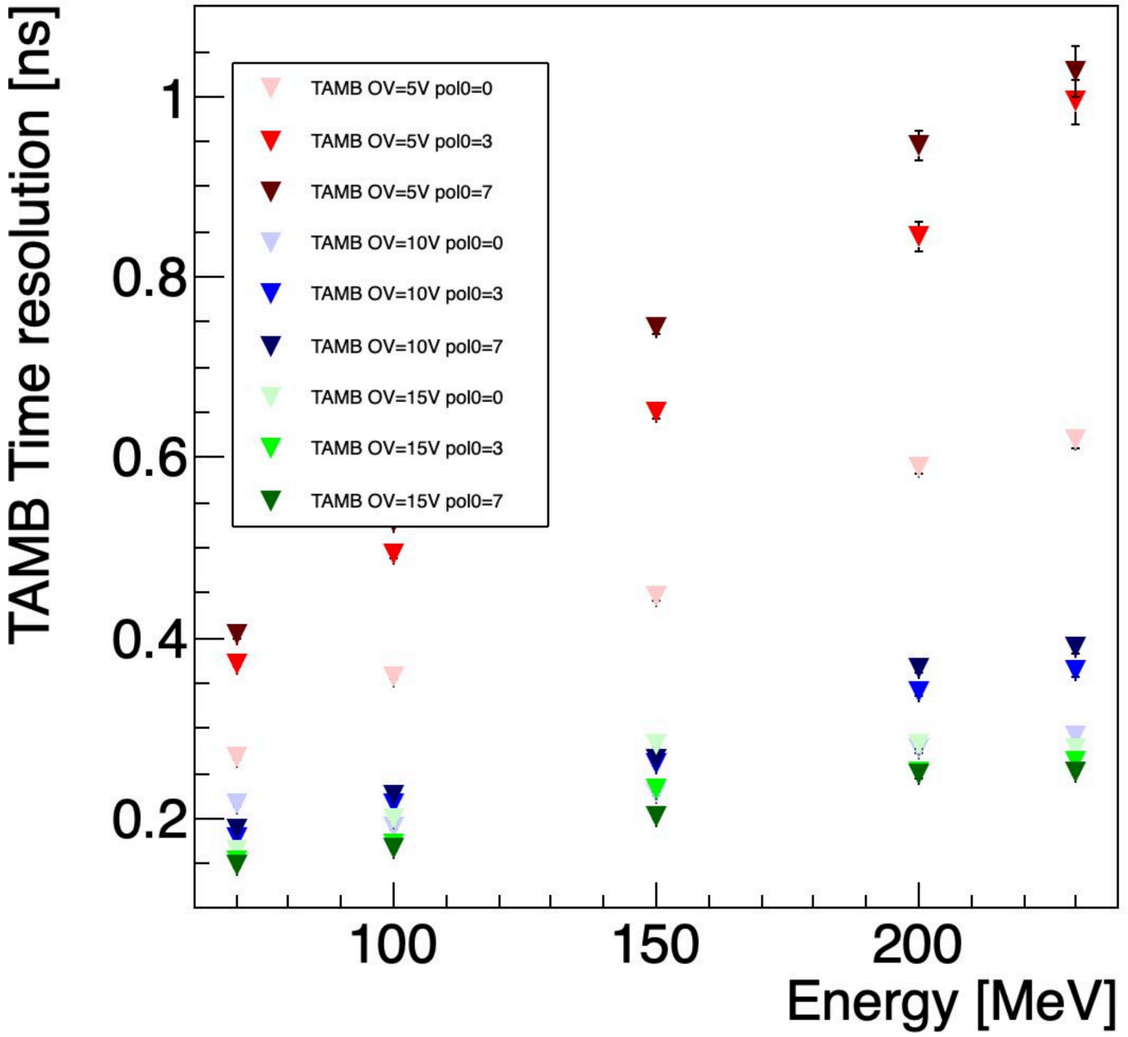
$\Delta t(TAMB - TW)[ns]$



$\Delta t(ST - TW)[ns]$

Time resolution (III)

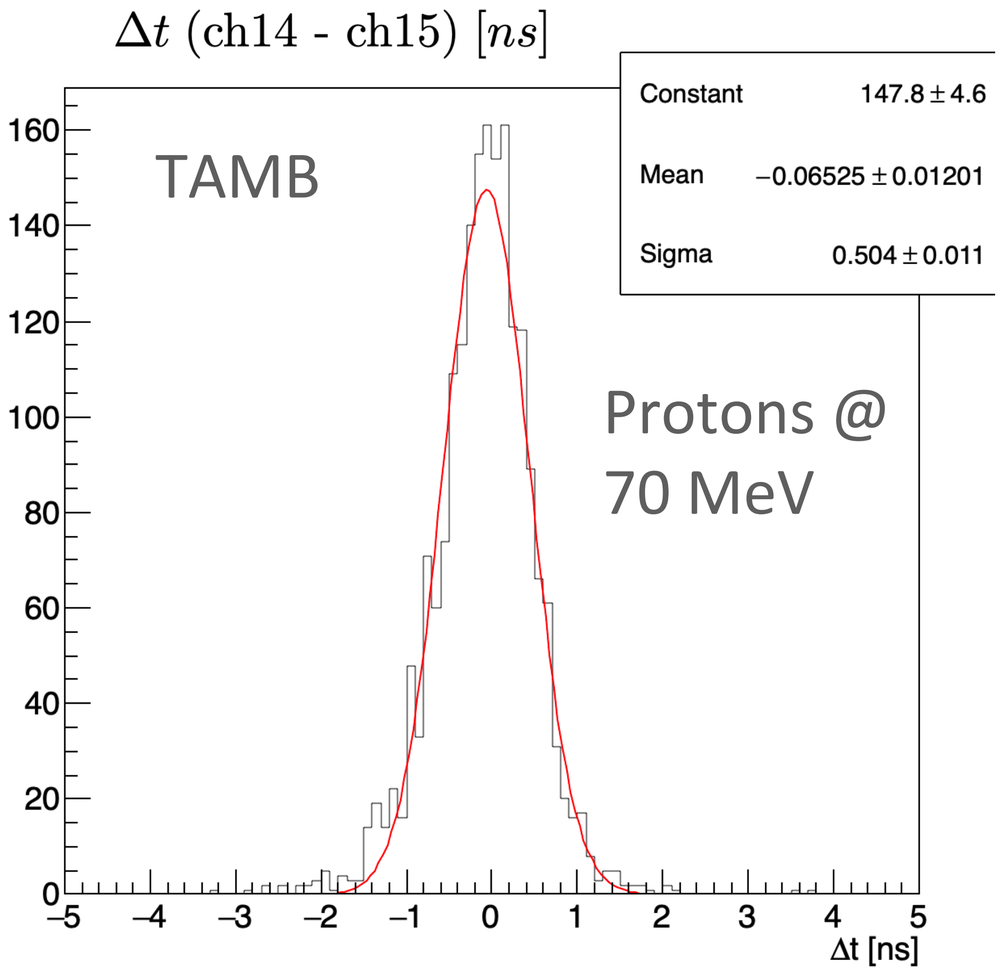




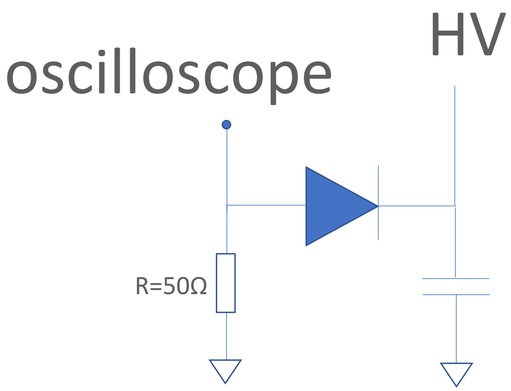
Scaling laws…

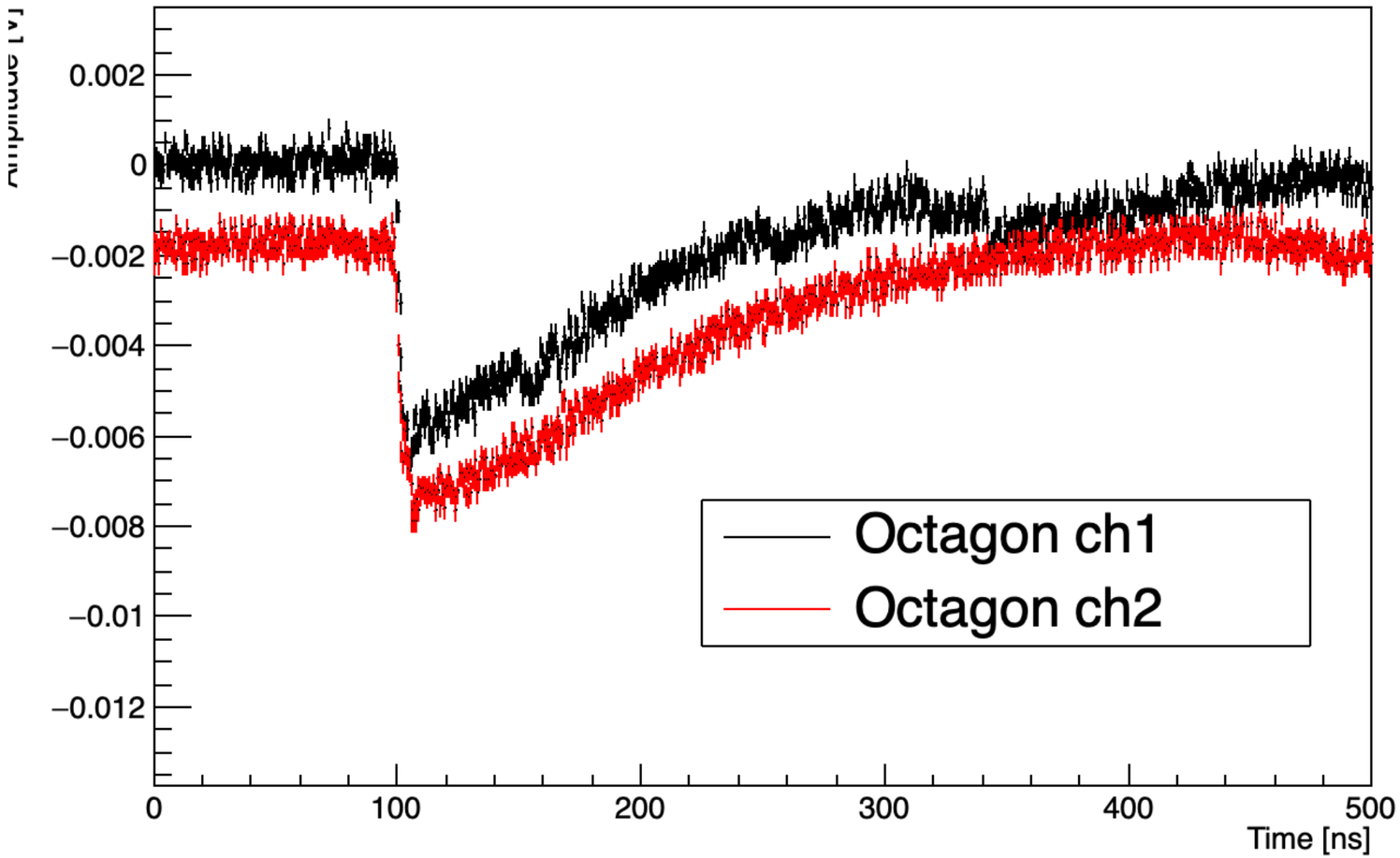
- 500ps/sqrt(2) = 360 ps per channel
- 48 channels → 70 ps
- 1mm->6mm → 30 ps (ma chi ci crede)

Well below the tofprad needs…



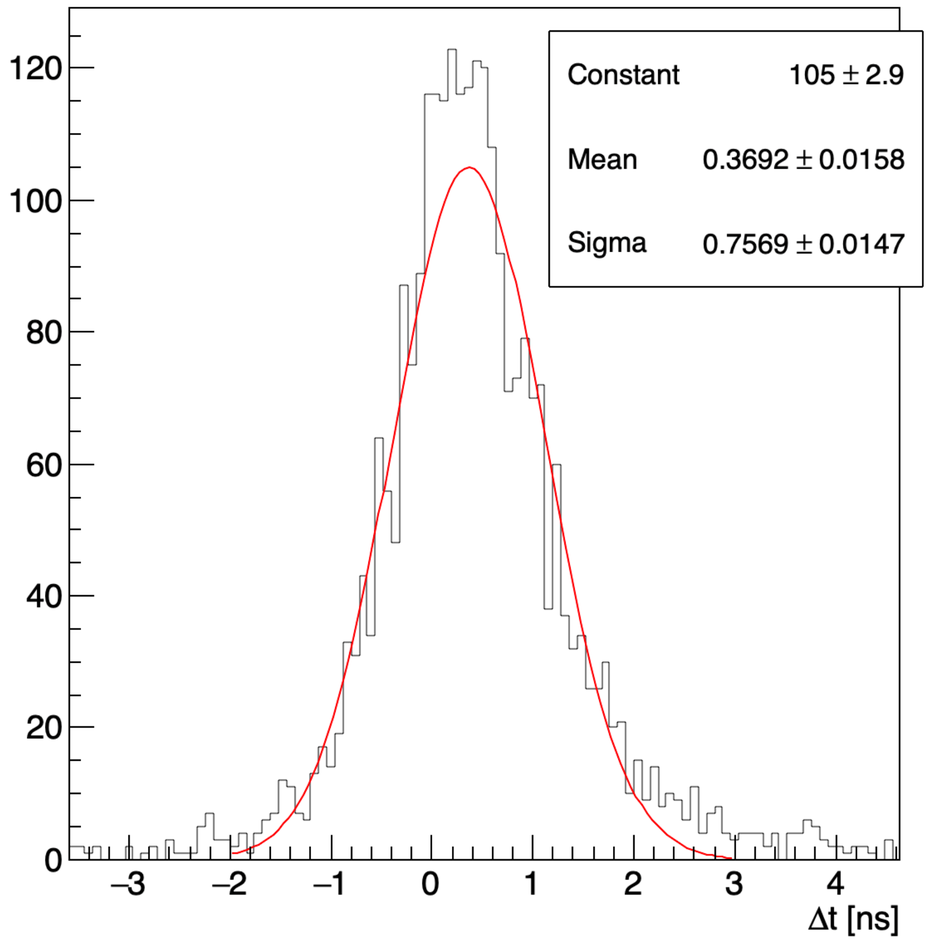
Try to change DAQ…



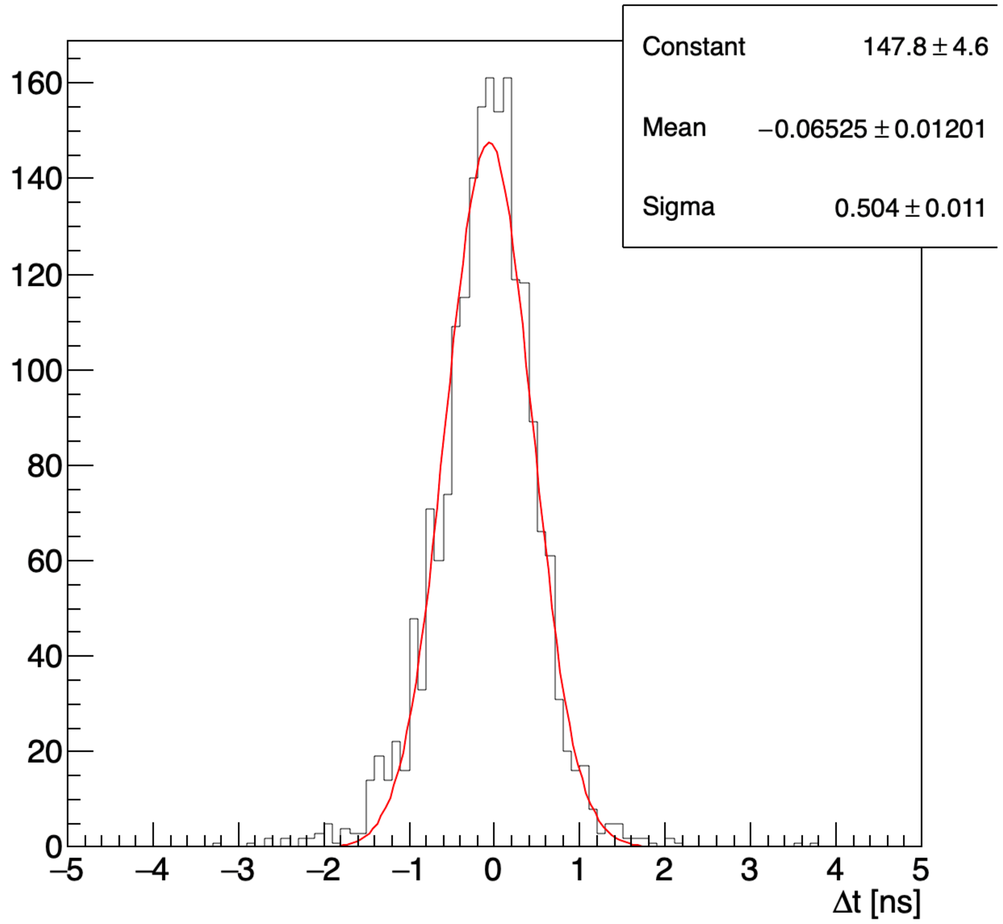


Time resolution

Oscilloscope (gain=1)



WaveDAQ (gain=25)



Next steps

- Bring out the device from CNAO
- Waiting for the SiPM… (expected in august/September)
- Waiting for the thicker scintillator (expected in September)

- Tracker: no updates. We have the fiber planes, we need to arrange the mechanic support design

- Test beam in 2026?