Update on field response check

Xuyang Ning & Wenqiang Gu

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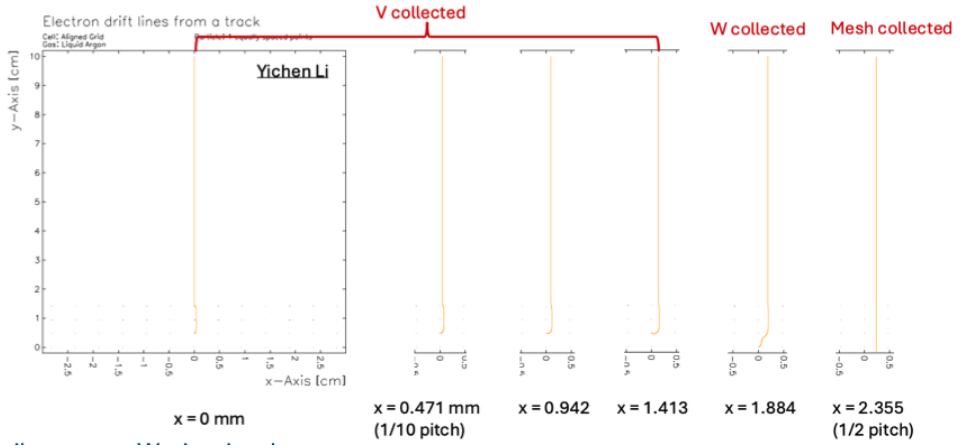
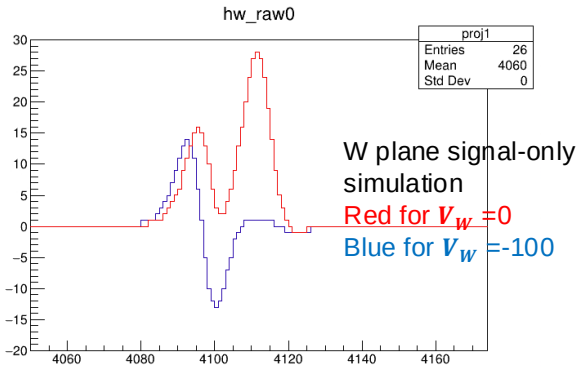
Brookhaven National Laboratory

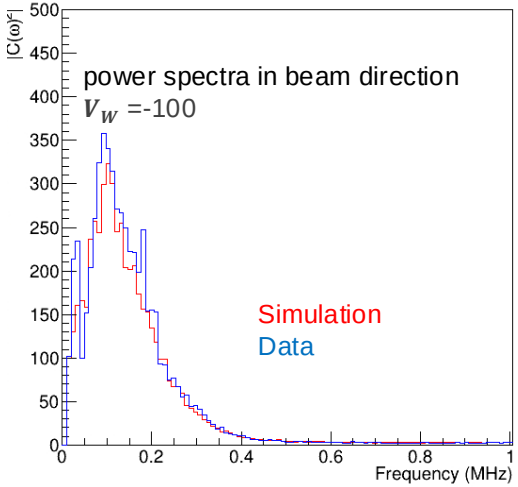
Recap

- APA1 w plane is disconnected.
- 3 kinds of components contribute to w wire signal
  - Collection on v
  - Collection on w
  - Collection on mesh
- First version: V_W = 0 V
  - Problem: too much w collection
- Second version: V_W = -100 V
  - No w collection
  - Shape and power density still different from data
  - The best version up to now. (for decon)

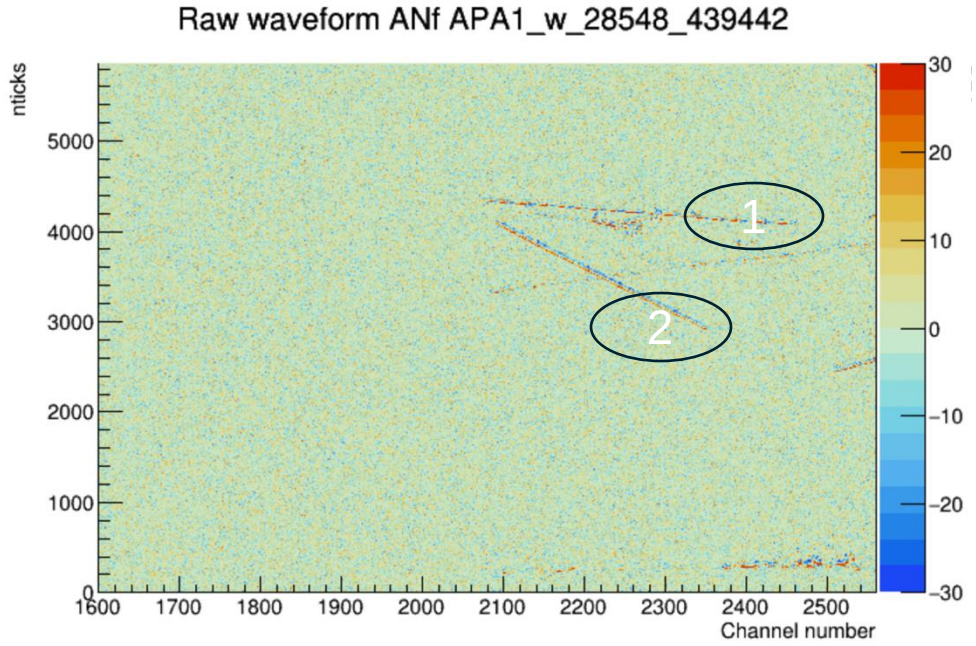
❑ Template fit the shape of the data by renormalize the electron track at 0.4 (w collect) and 0.5 (mesh collect) pitch.

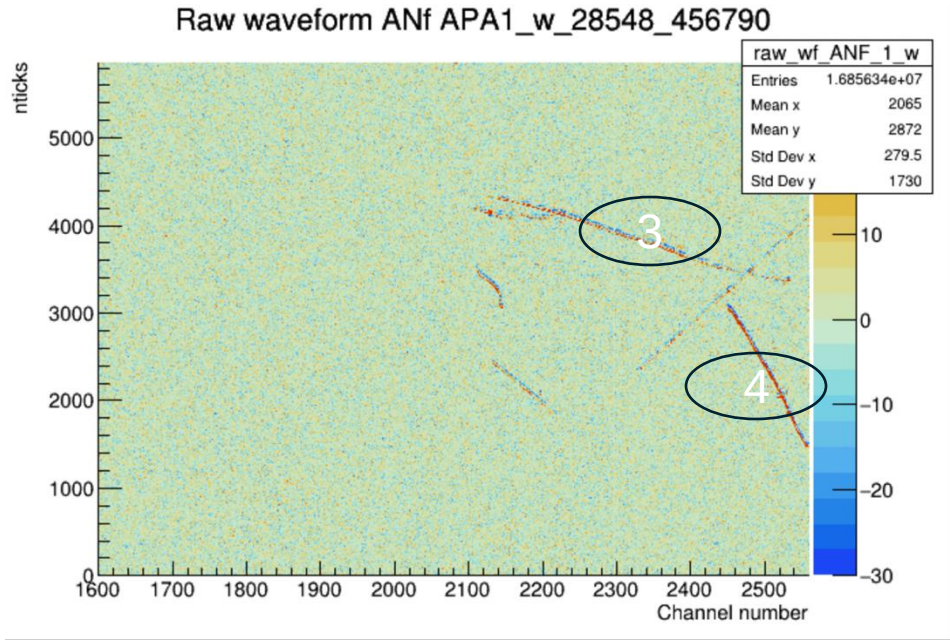


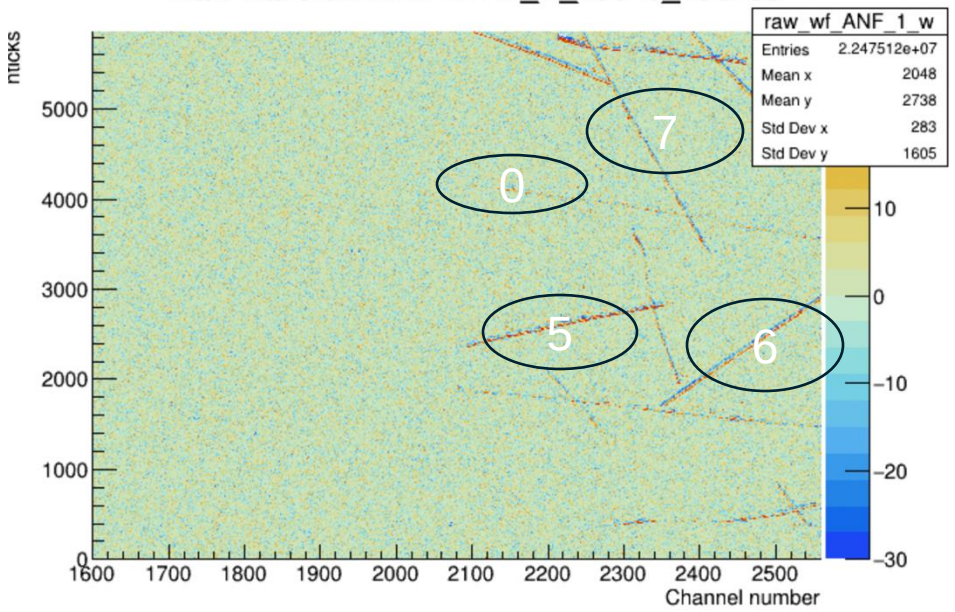




Select more tracks in different direction

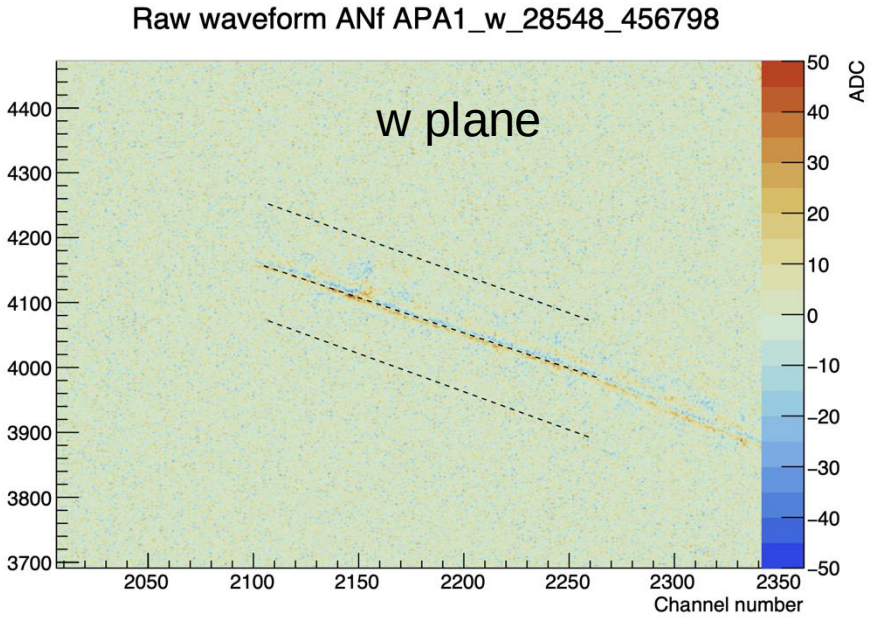


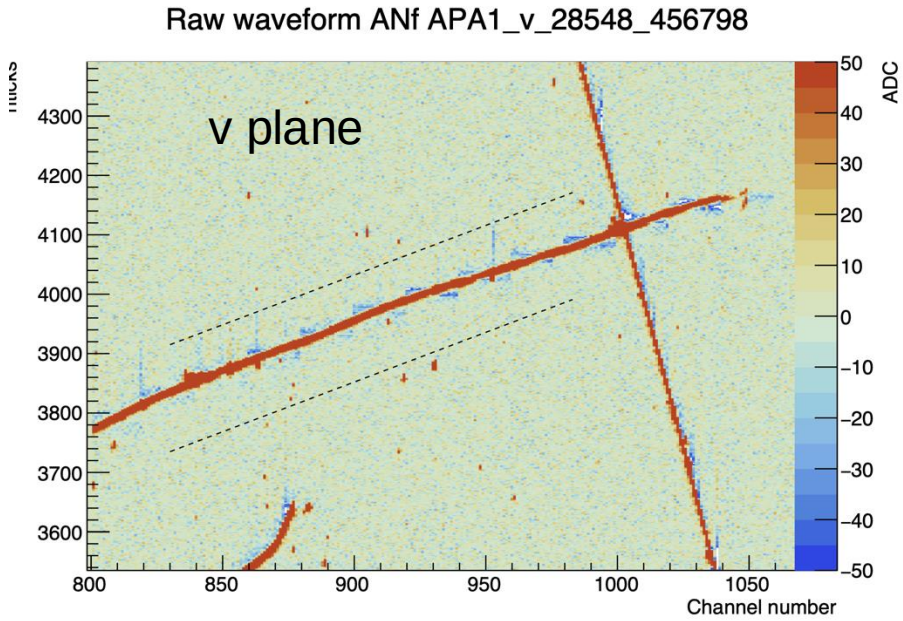




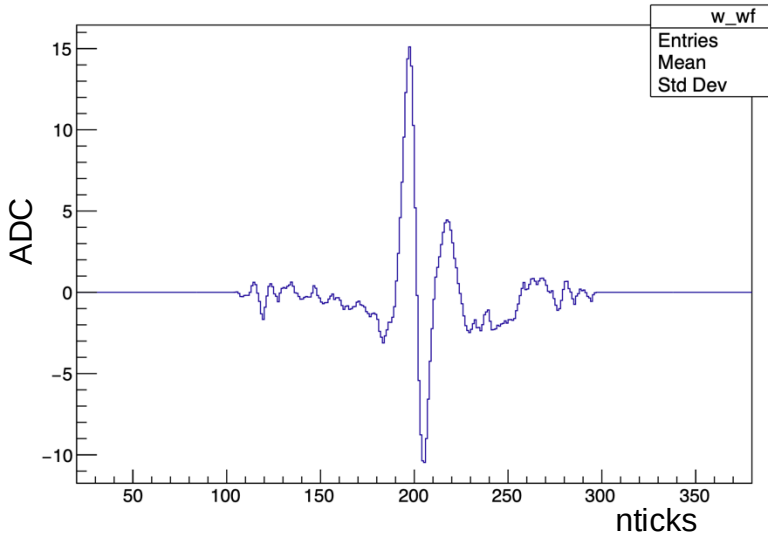
- 8 tracks in different directions are selected
- Only track 0 is beam
- A good field response should satisfy all directions

Align signal from Data

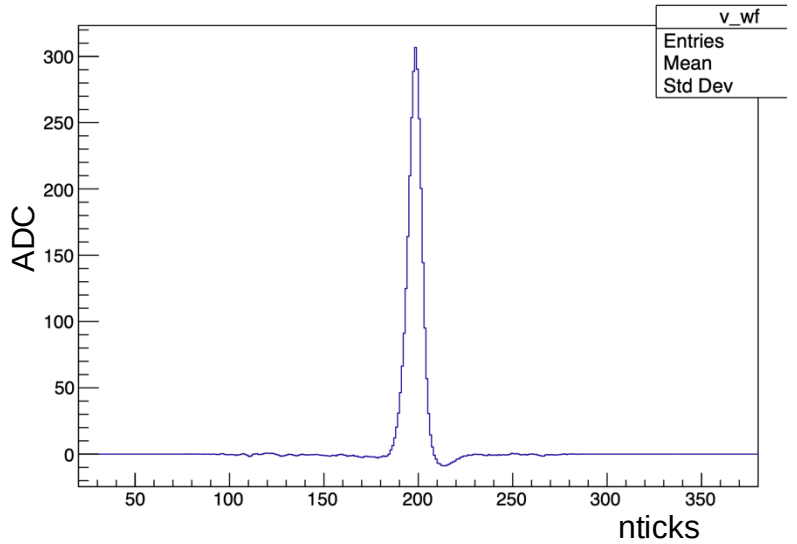




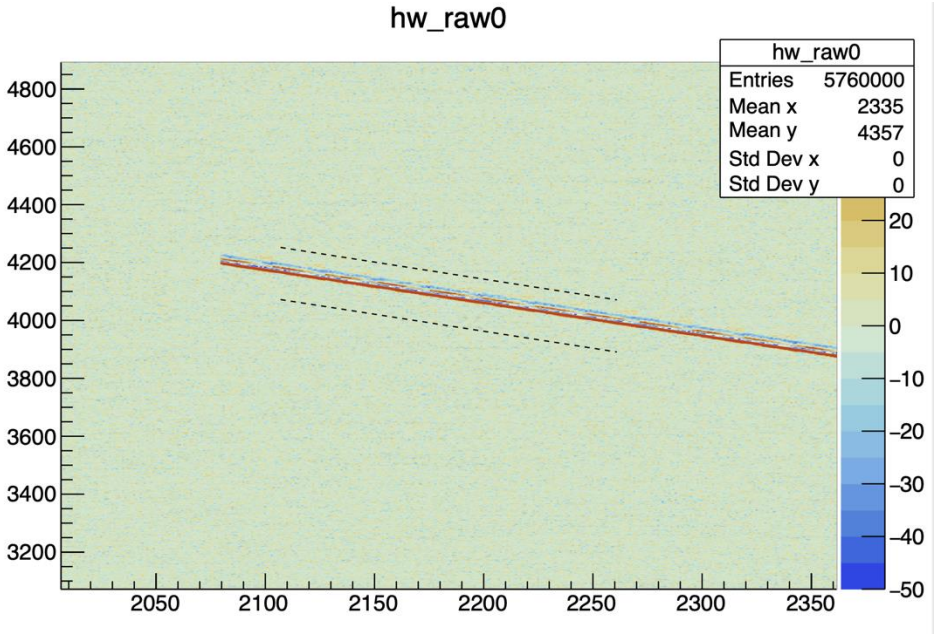
- Align the waveform in each channel along the manually selected line

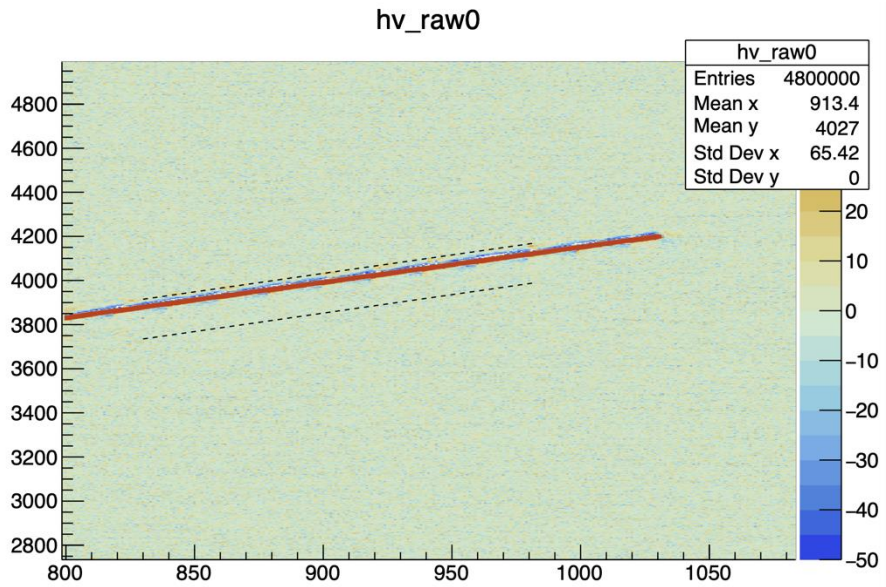


- Align the waveform in each channel according to peak of the signal



Signal in Simulation



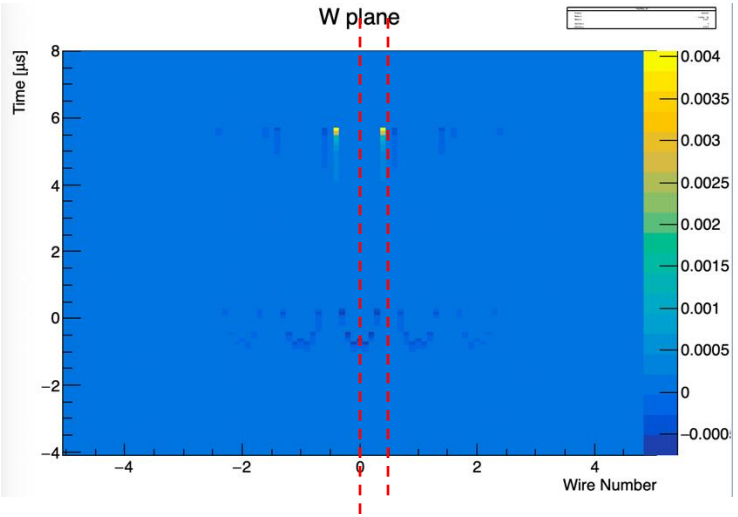


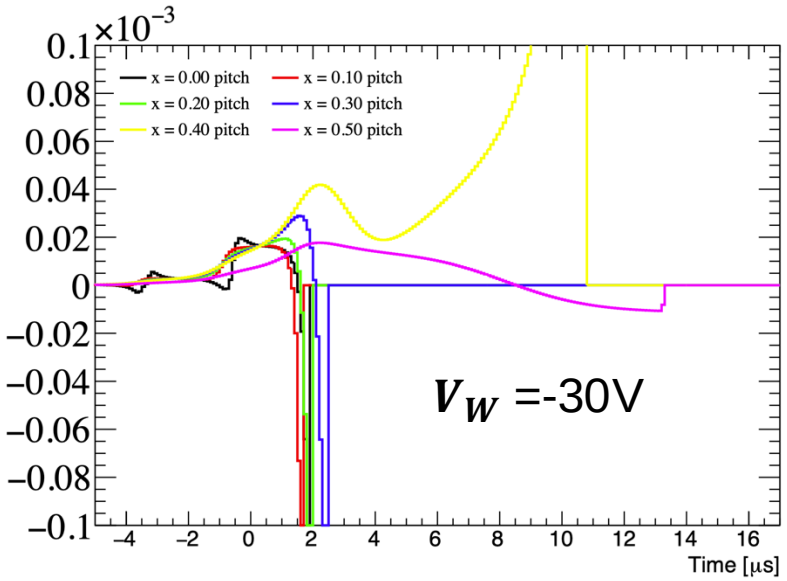
- 3D Direction: derived from wire-cell imaging
  - x-axis might not accurate
  - Tune starting time
- Waveform aligned same as data.
- **We change the field response**

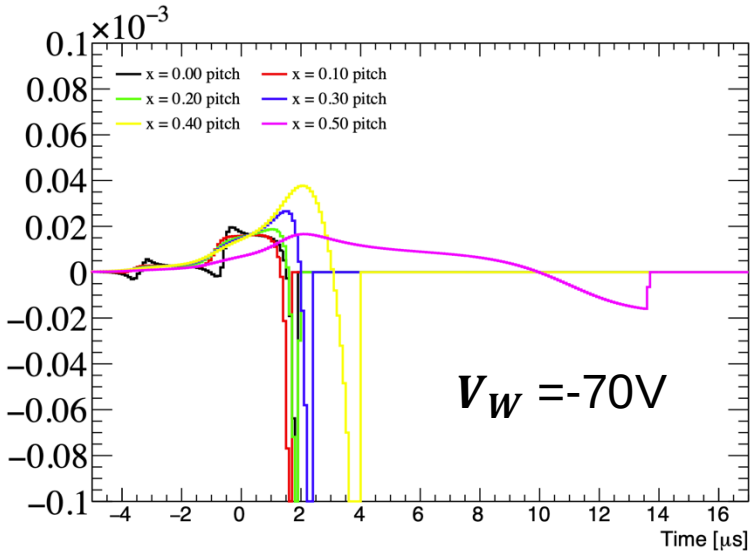
Thanks Jay and Chao

Field response in Garfield Simulation

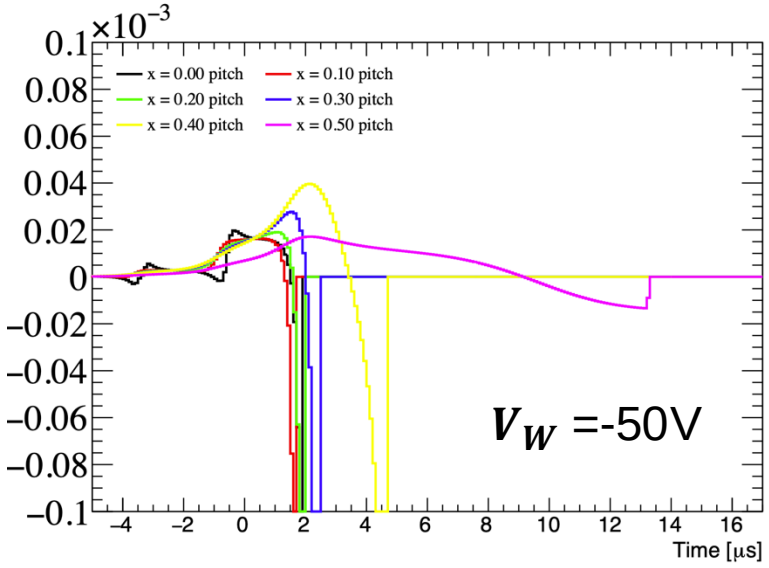
Draw projection of field response along 0-0.5 wire

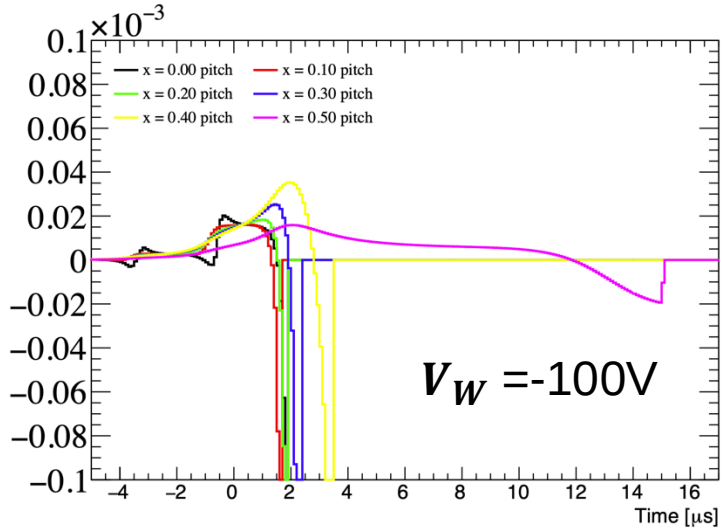






- Only have 6 electron tracks can be used.
- For different w voltage, 0.4 and 0.5 pitch vary a lot, others are similar.
  - 0.4 pitch: w collected or not
  - 0.5 pitch: mesh collected
- We try to “create” the shape by renormalize the electron track at 0.4 and 0.5 pitch.





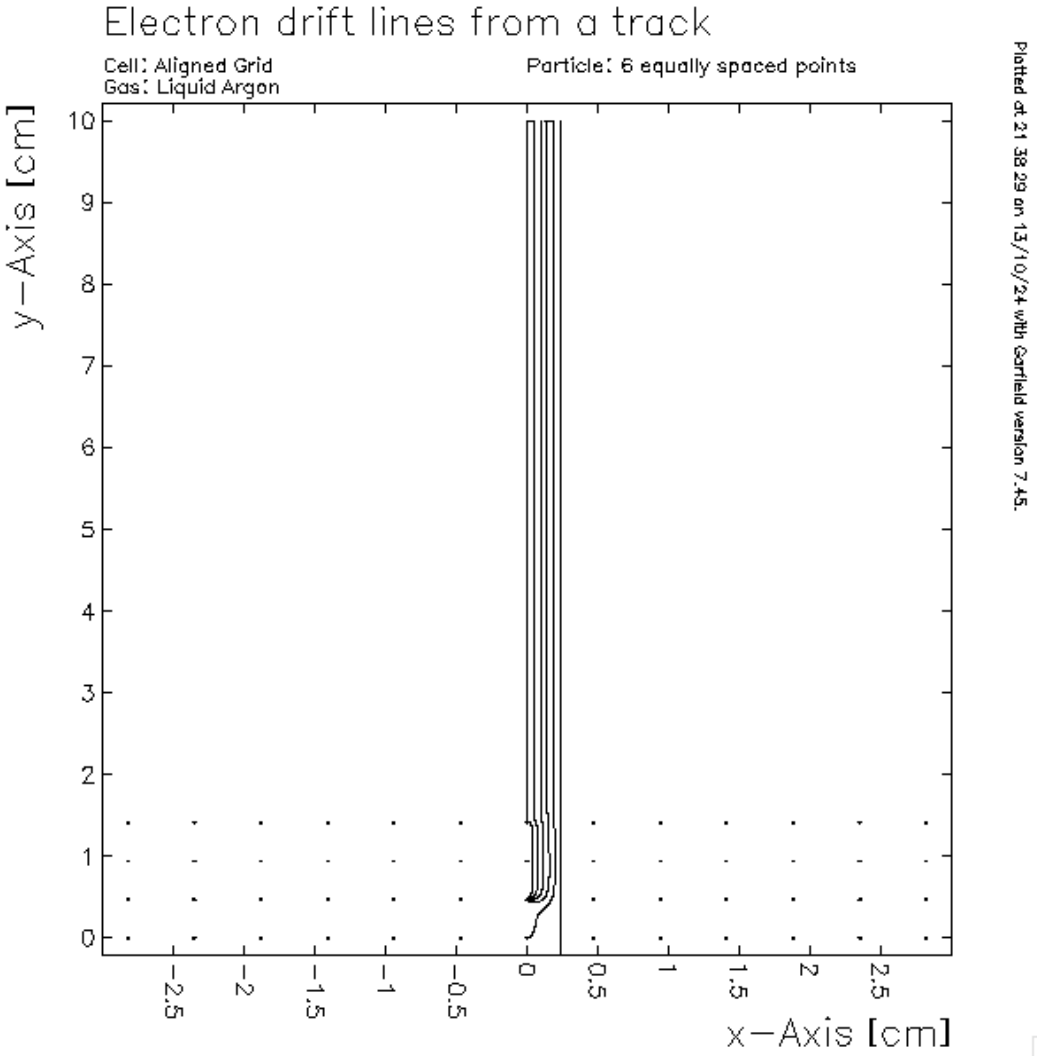
Create field response

- Start with Garfield simulation $\boldsymbol{V_W}$ = 0 V
  - 0.4 pitch: w collected
  - 0.5 pitch: mesh collected

- Apply different renormalize factor to 0.4 pitch ($\boldsymbol{f_5}$) and 0.5 pitch ($\boldsymbol{f_6}$)
- Grid scan with range (0-3).

- Do same things to v and w, v can be used to normalize the amplitude.
- Amplitude is normalized as “1 electron collected on v”

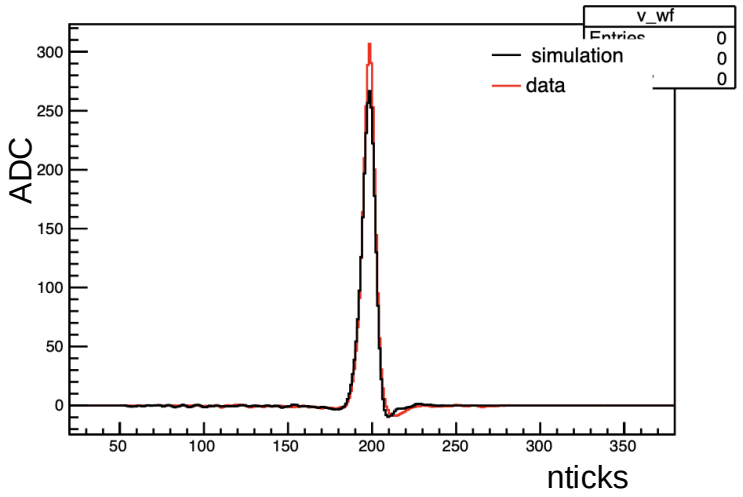
- Compare waveform and power spectra.

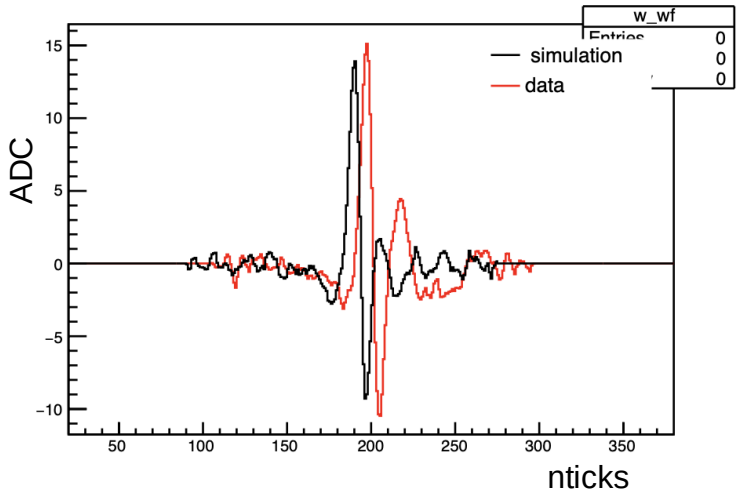


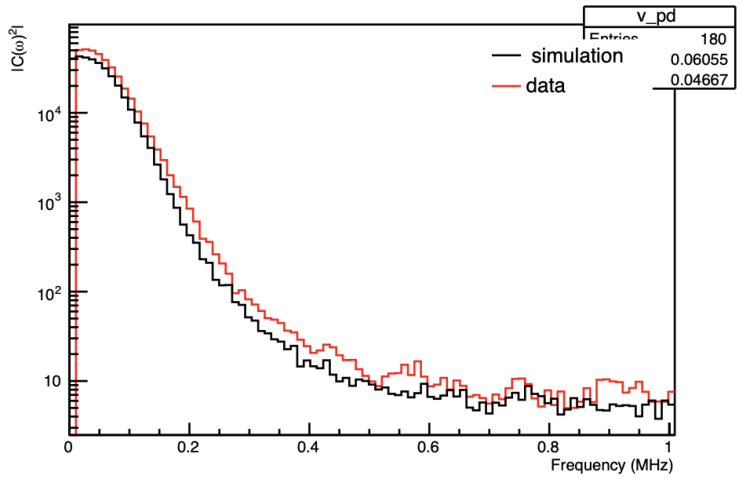
A good result

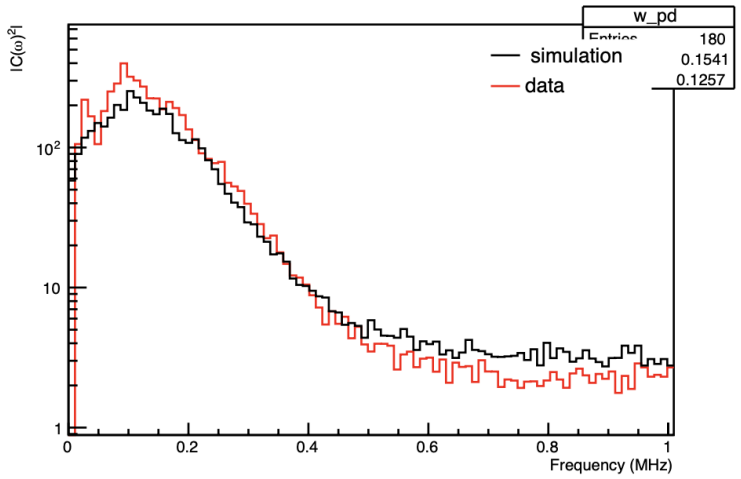
- Amplitude is still a little different
  - ➢ Rescale for each track according to v plane
- W plane signal is not well aligned between simulation and data
  - ➢ Further align according to peak
- Simulation is narrower than the data.
  - ➢ Add parameters of time stretch

Track0; beam



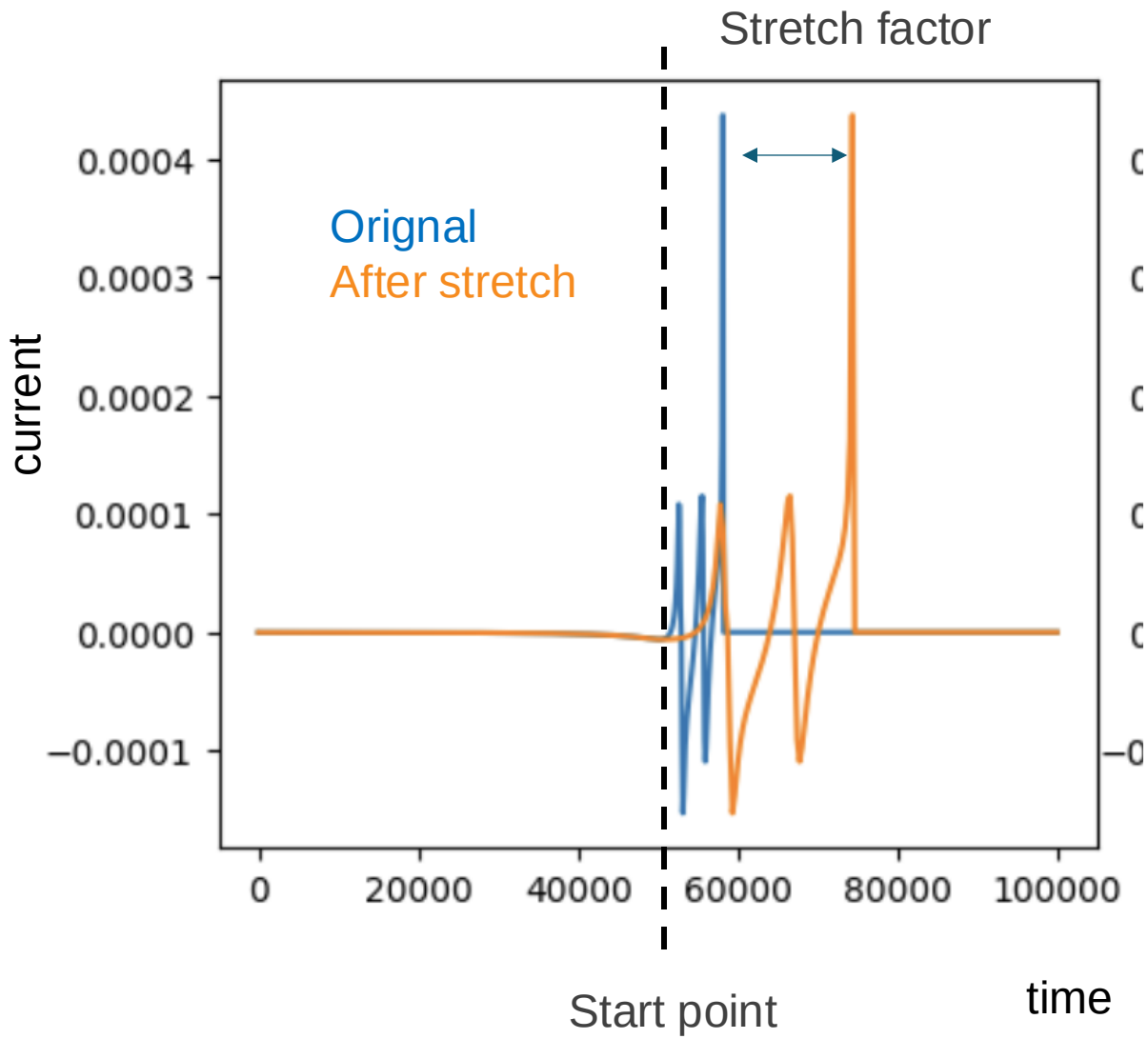






Time stretch

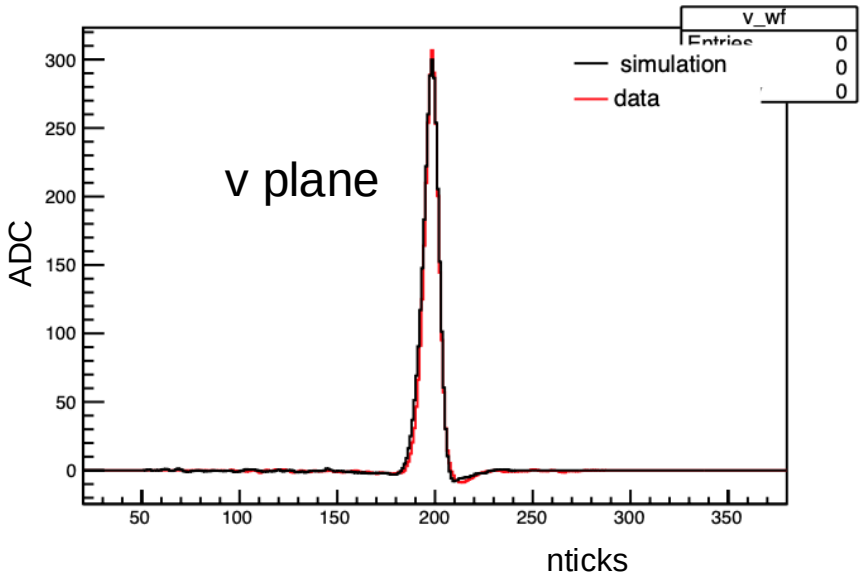
- 2 more factors added for each electron path:
  - Start point;
  - stretch factor

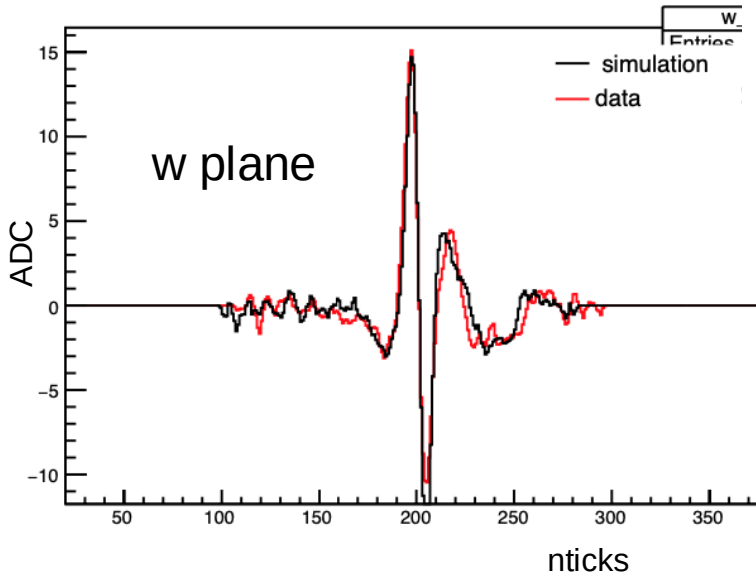


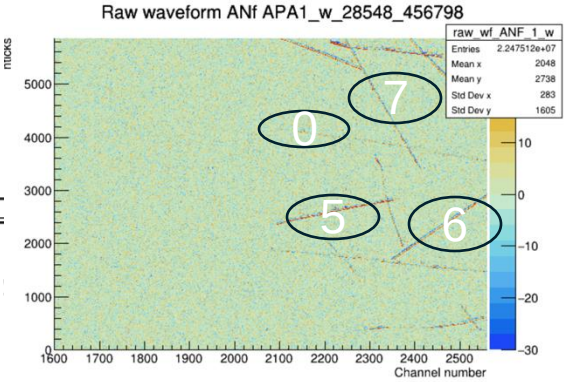
Best one I got

Track0; beam

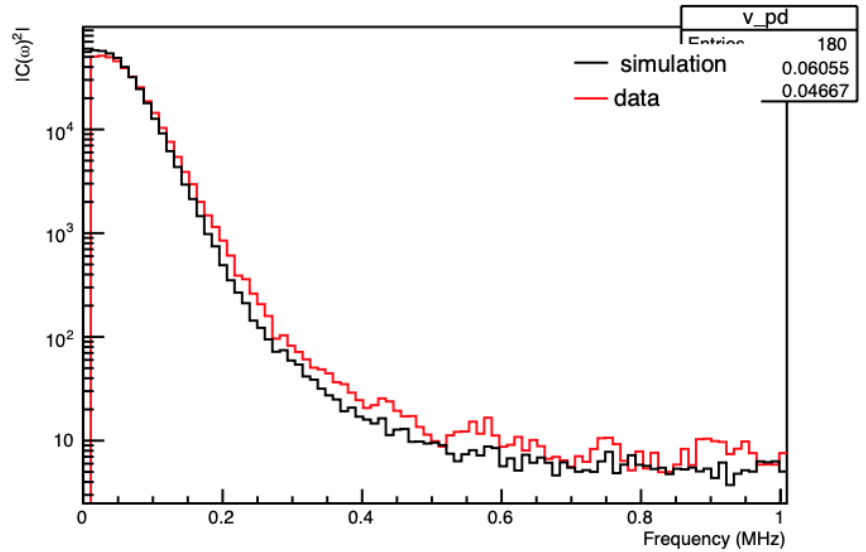
waveform

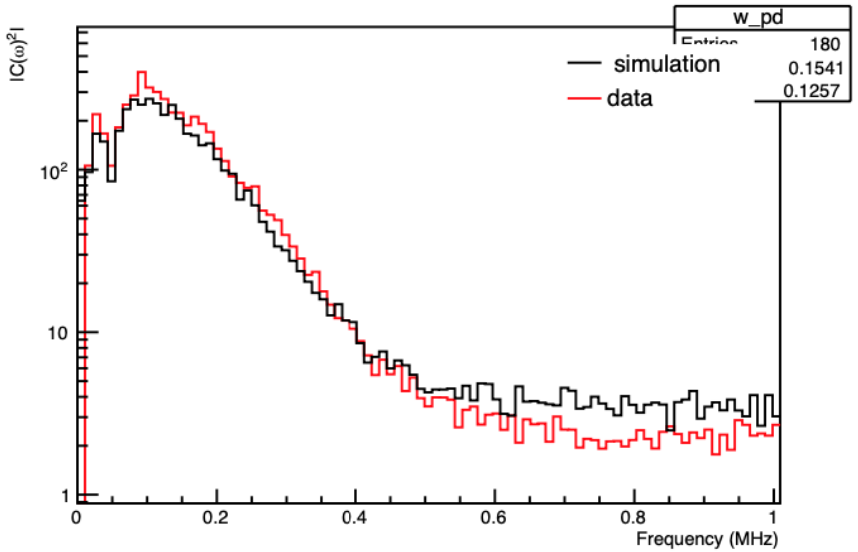






Power spectra





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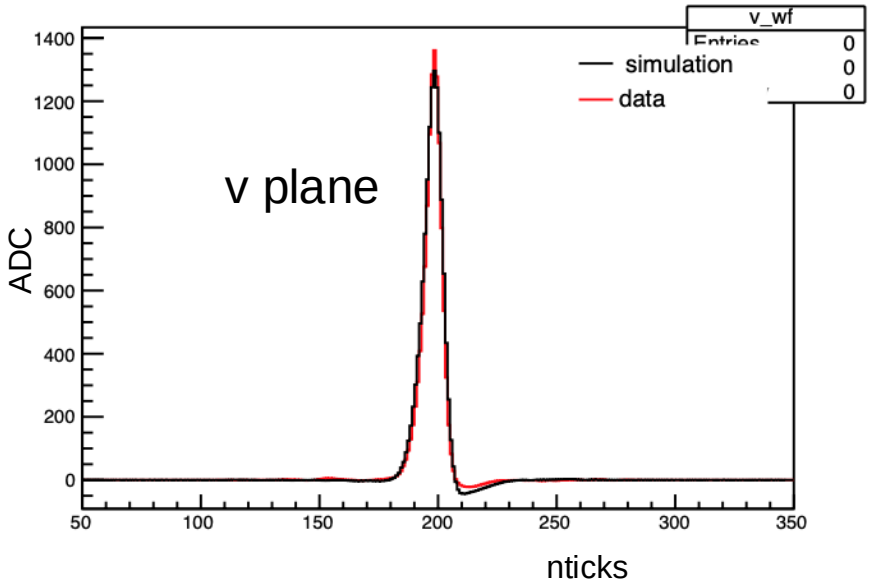
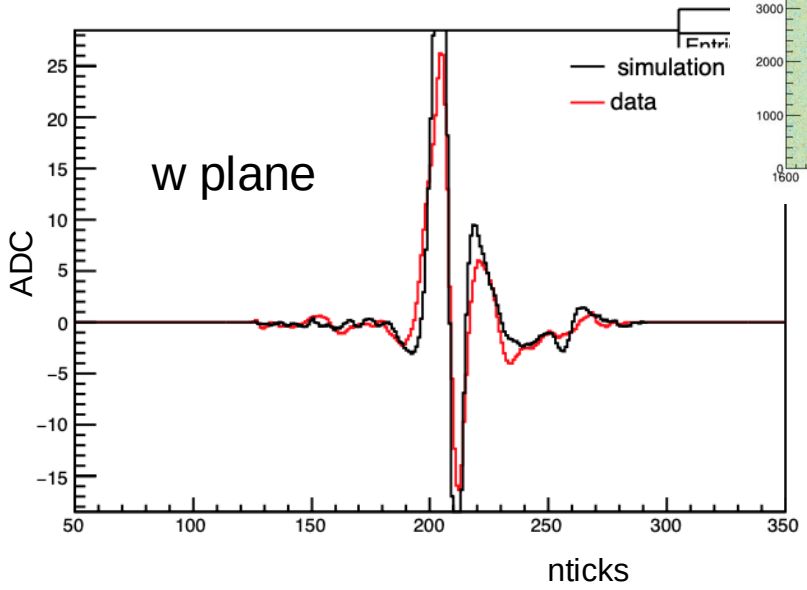
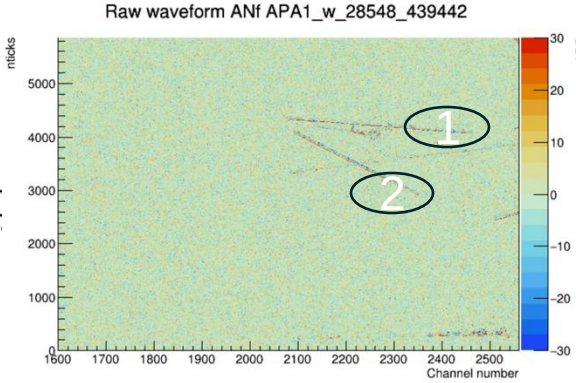
Best one I got

Track1

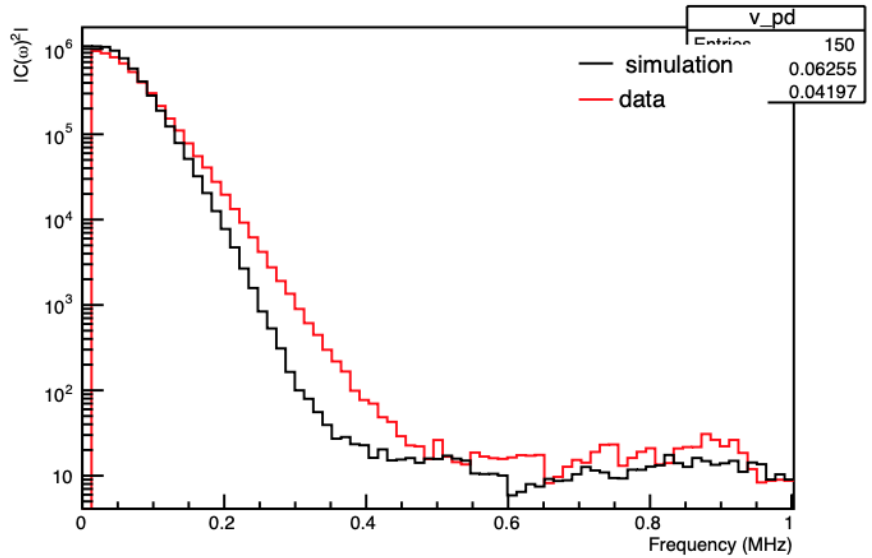
waveform

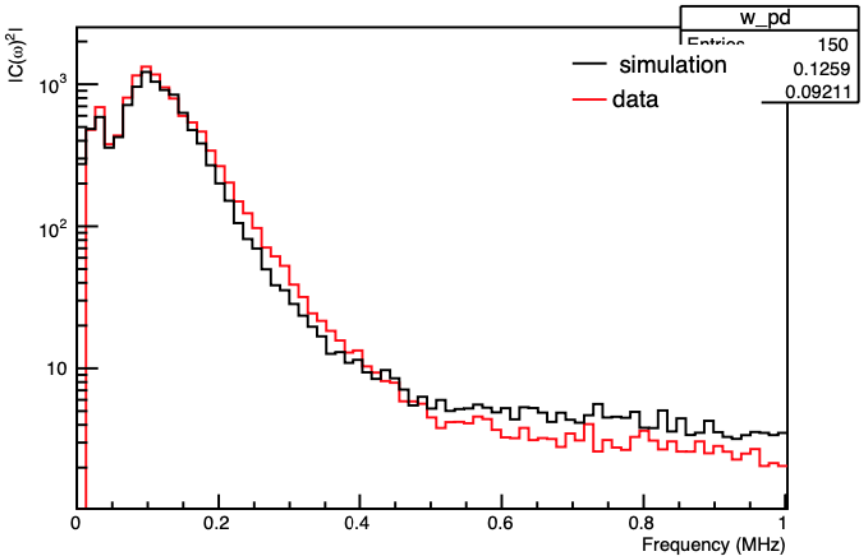






Power spectra

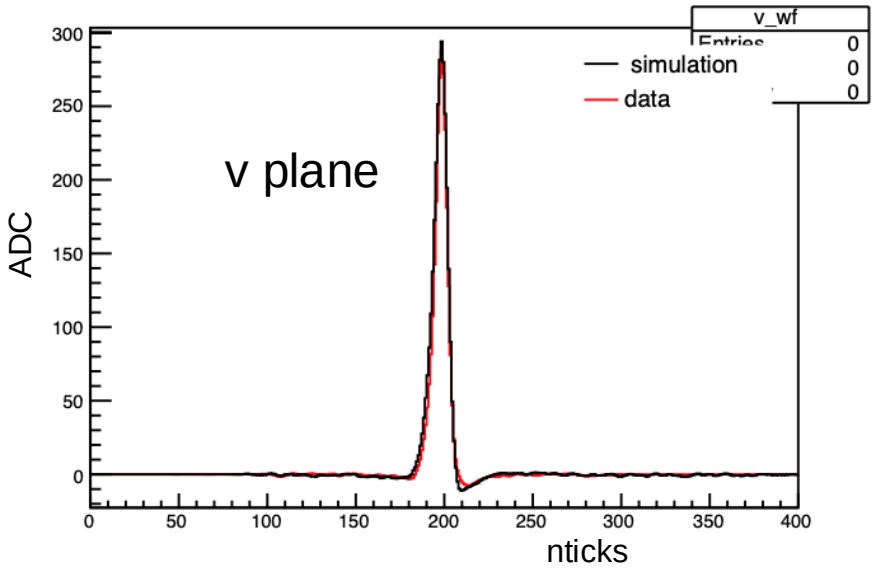


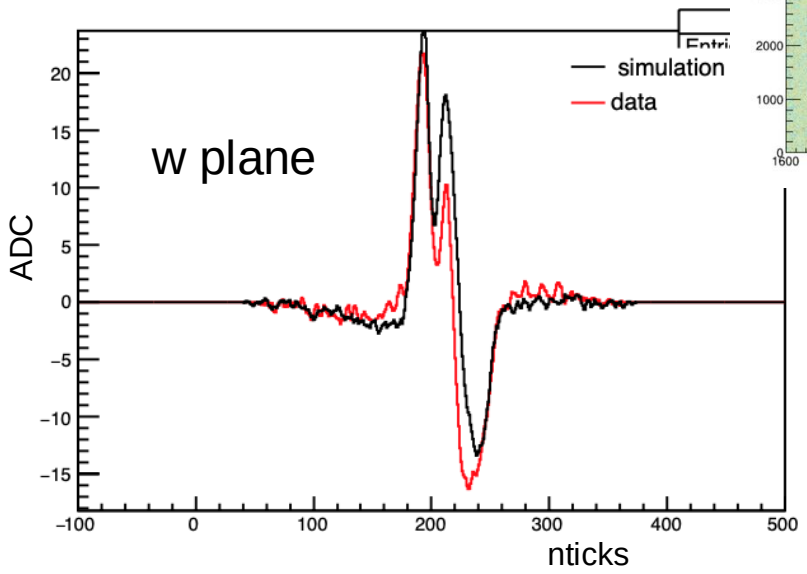


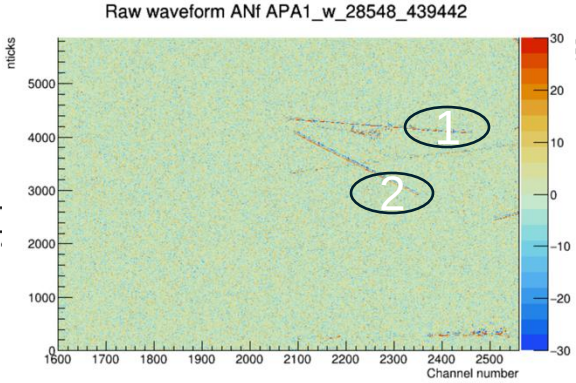
Best one I got

Track2

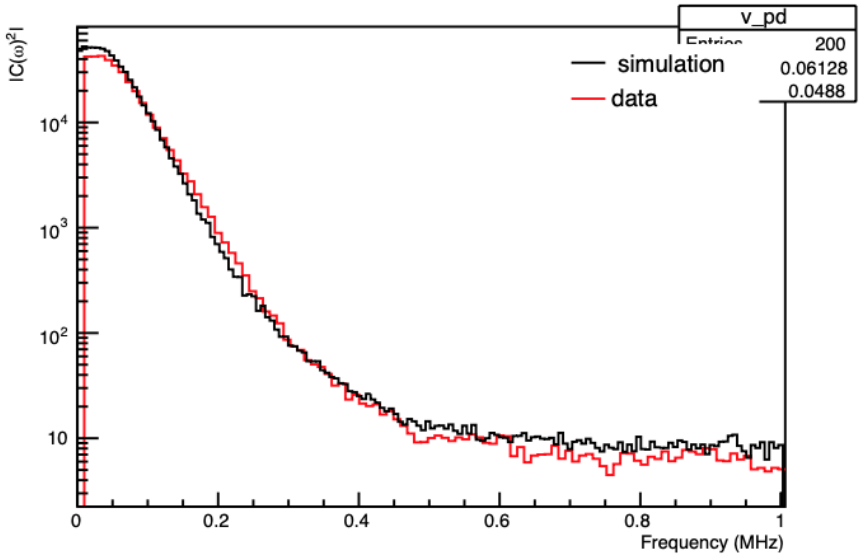
waveform

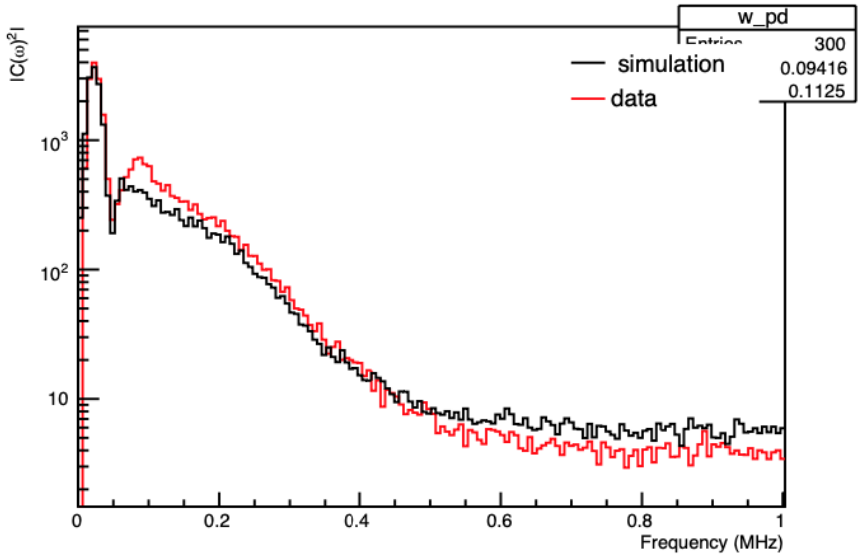






Power spectra

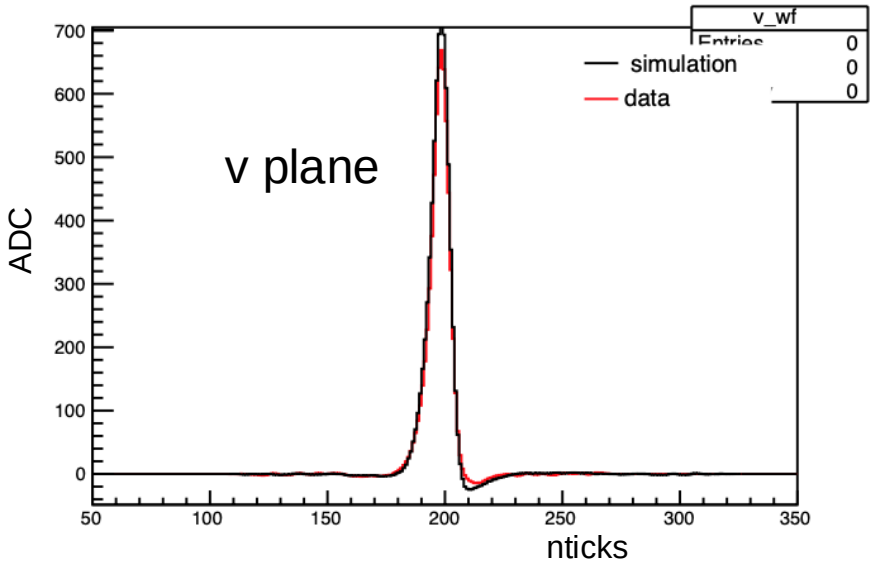


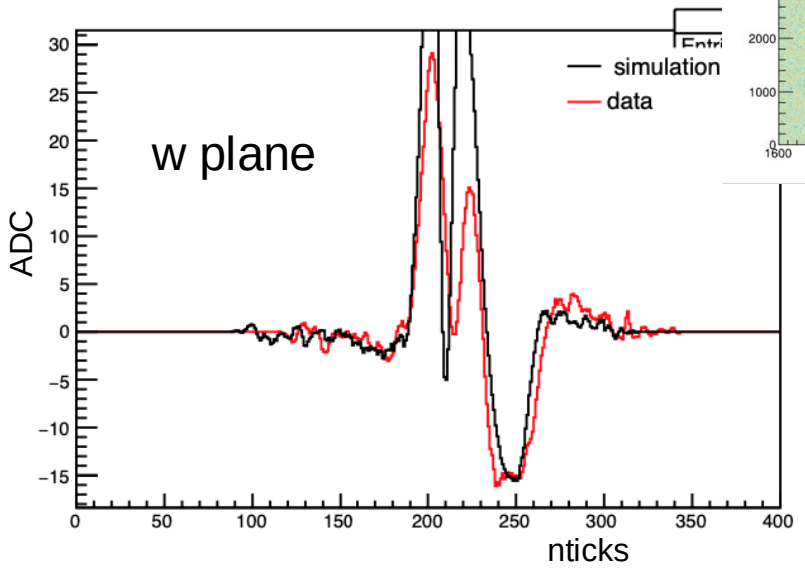


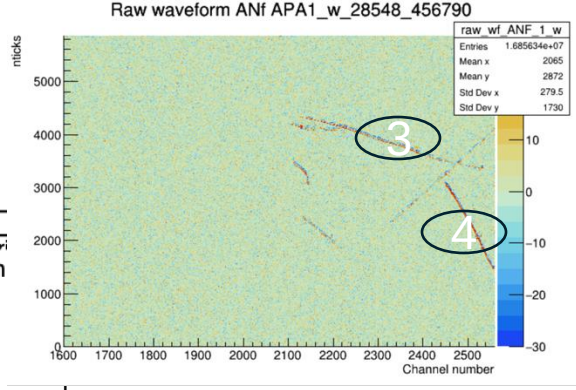
Best one I got

Track3

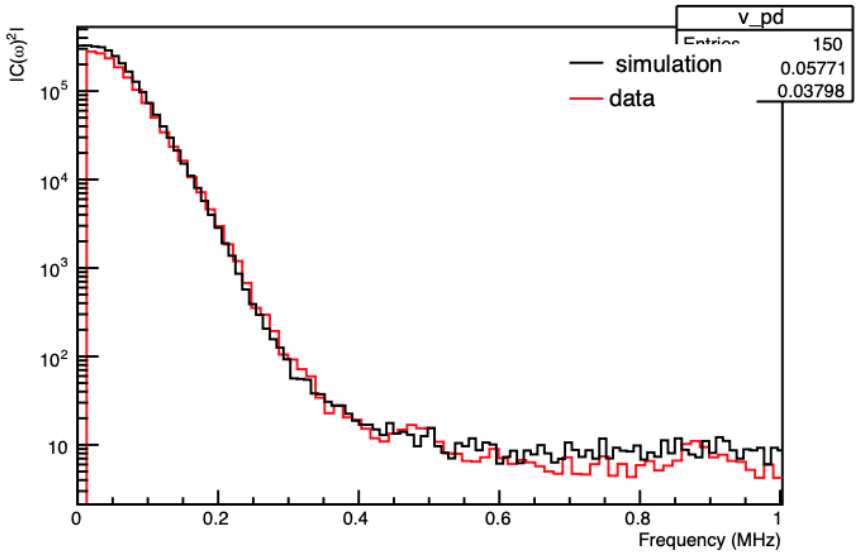
waveform

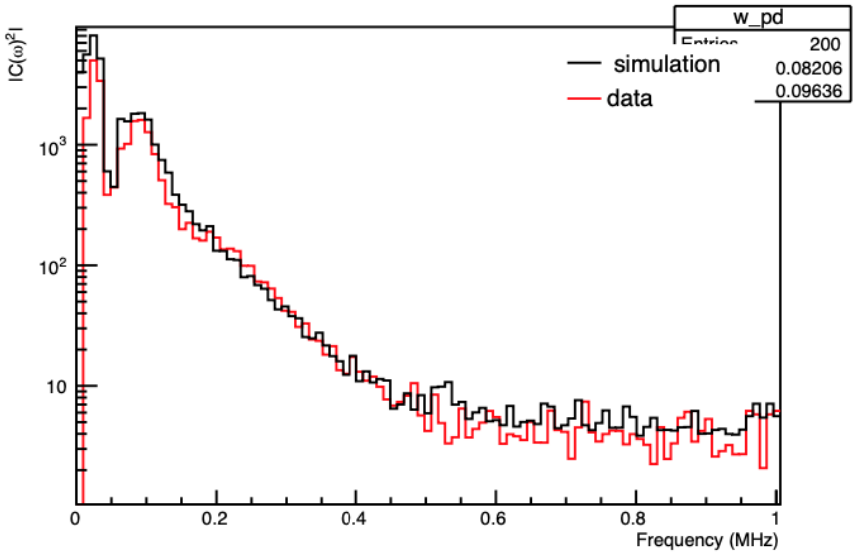






Power spectra

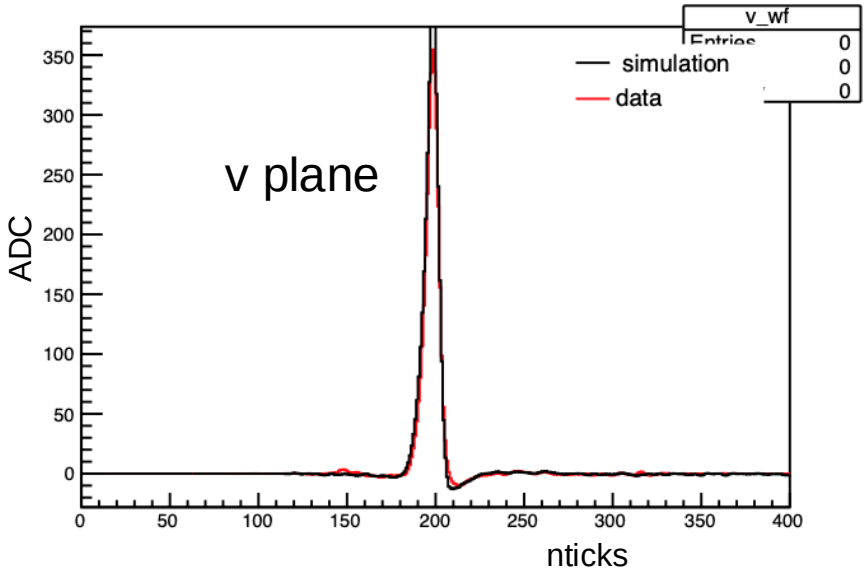


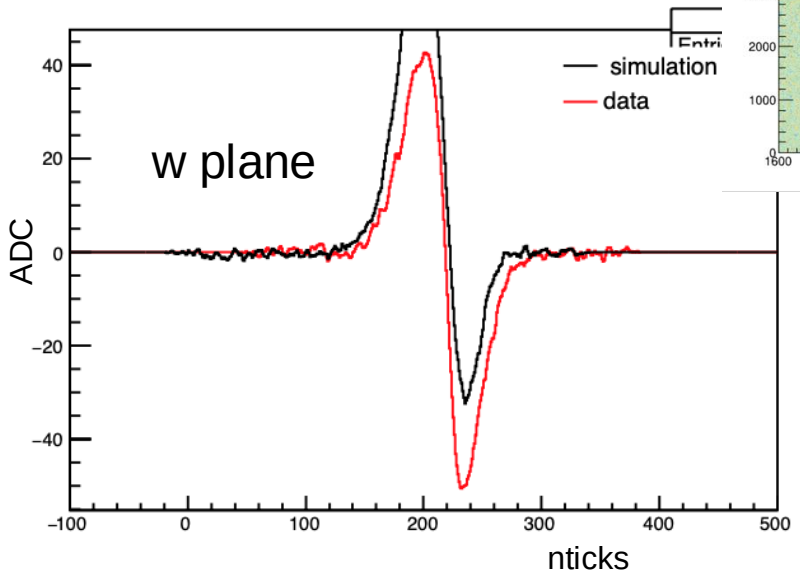


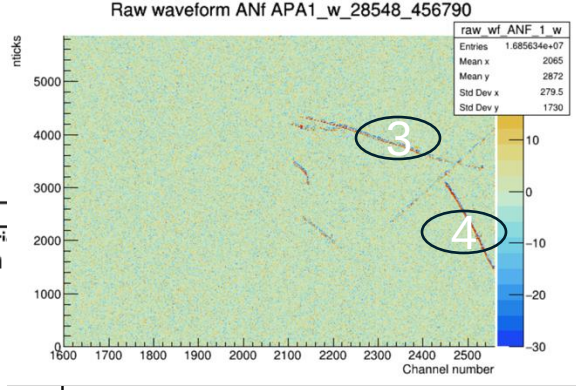
Best one I got

Track4

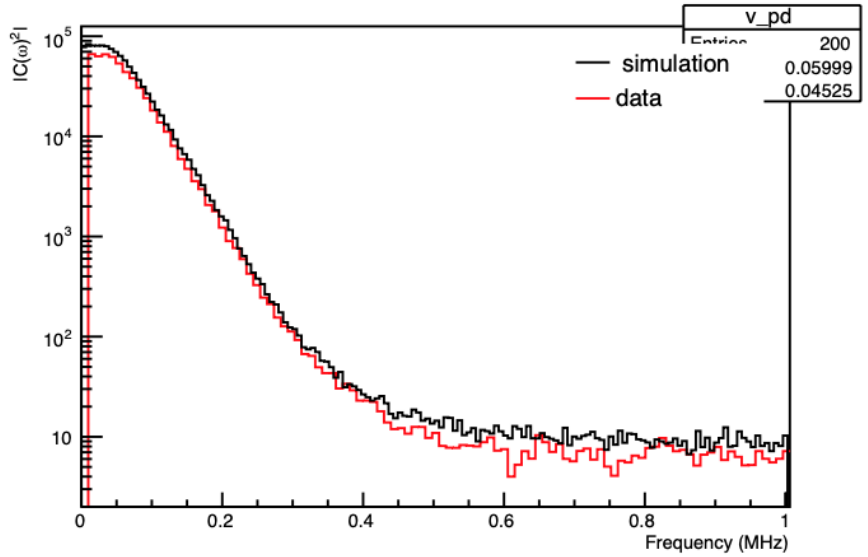
waveform

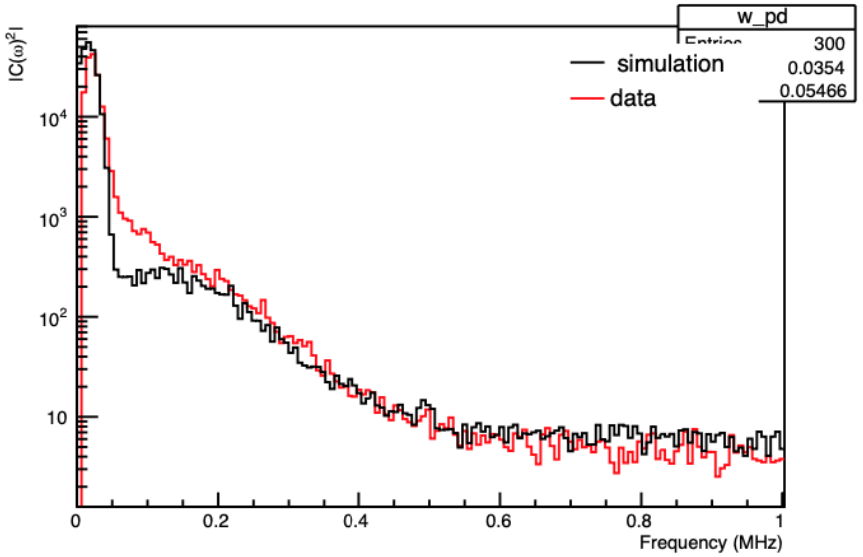






Power spectra

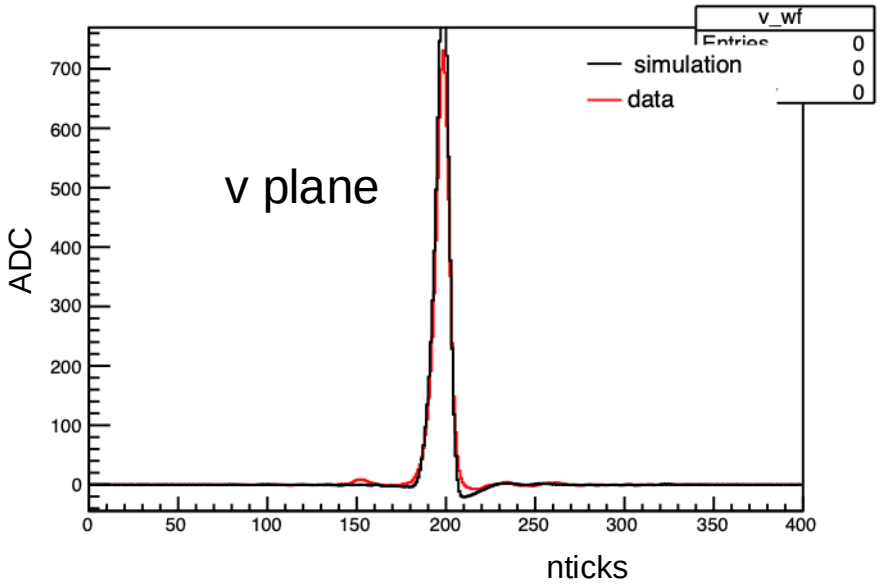


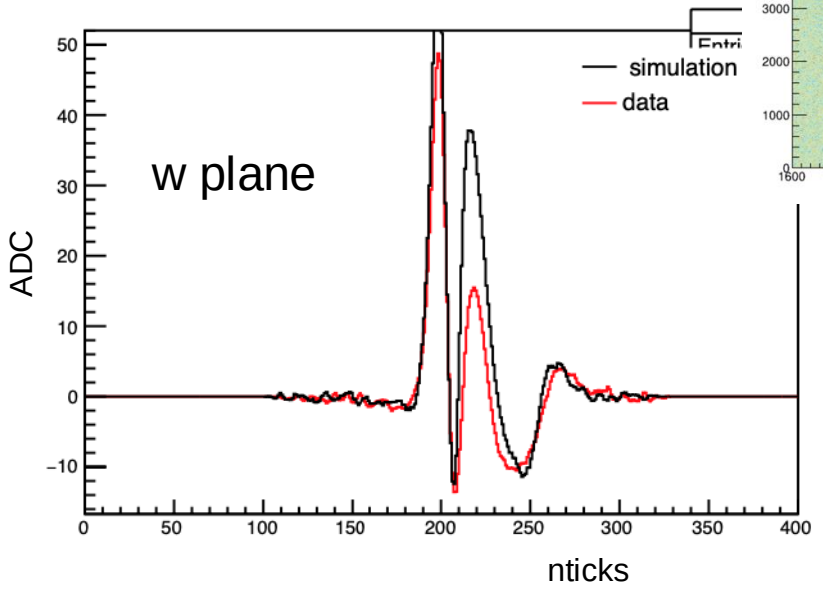


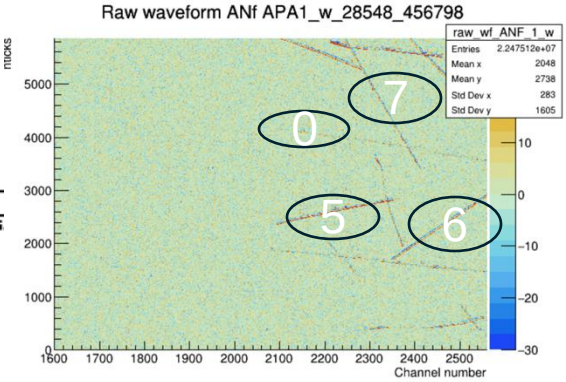
Best one I got

Track5

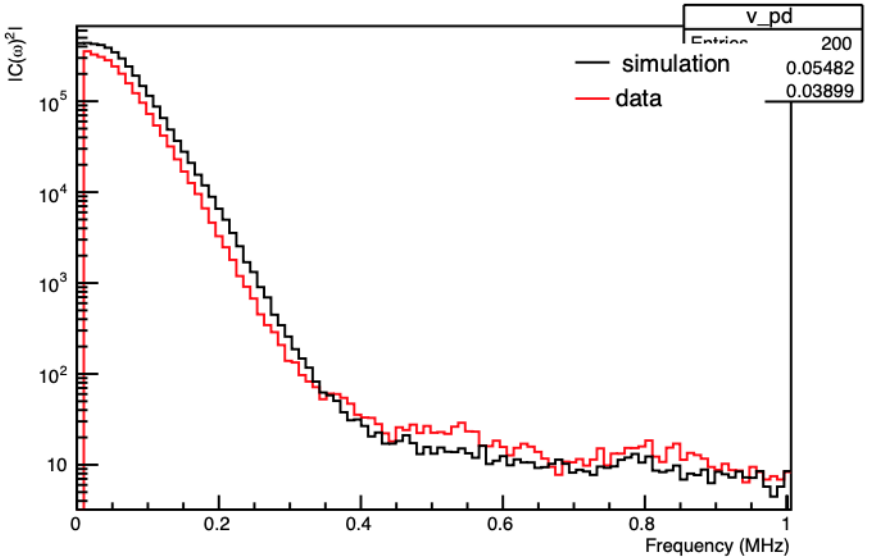
waveform

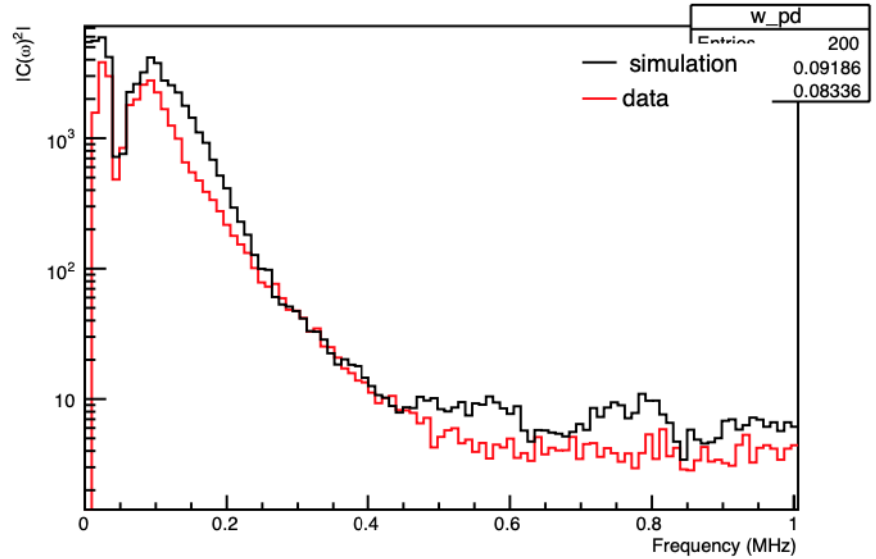






Power spectra

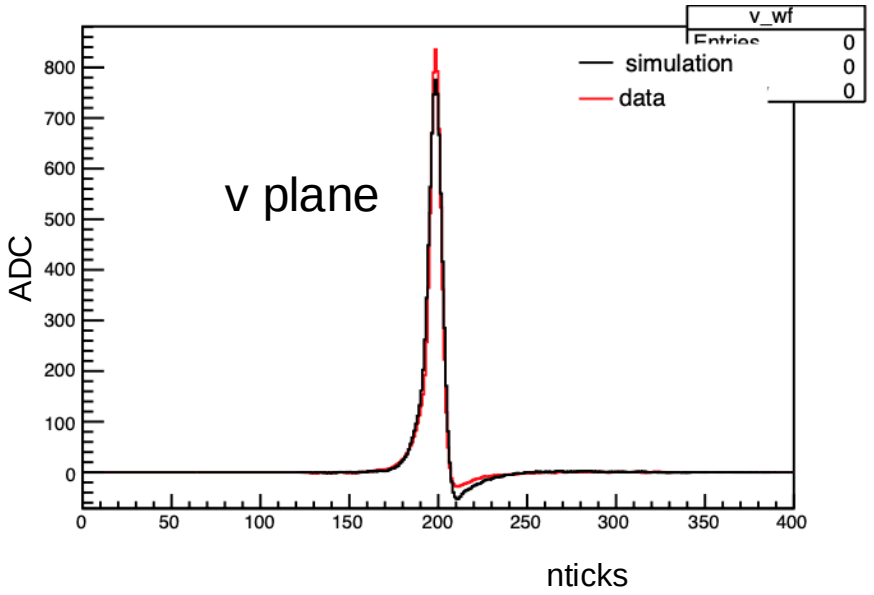


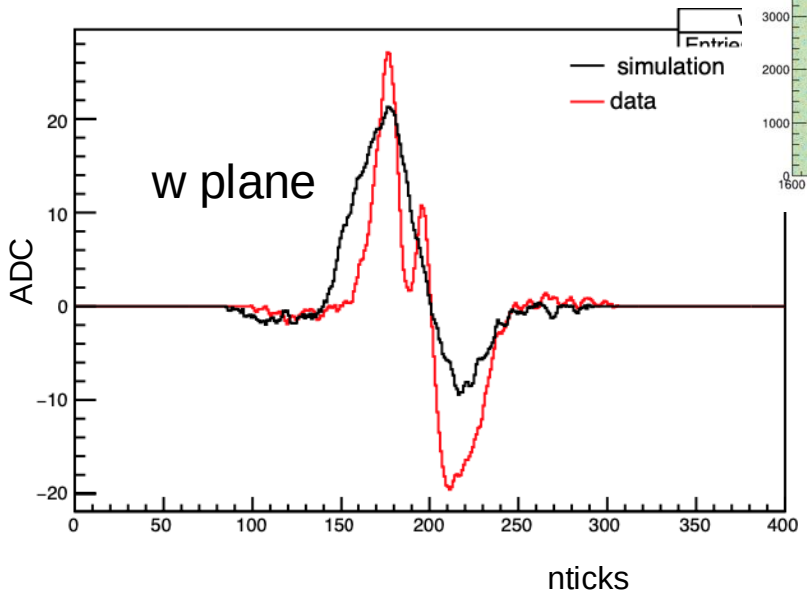


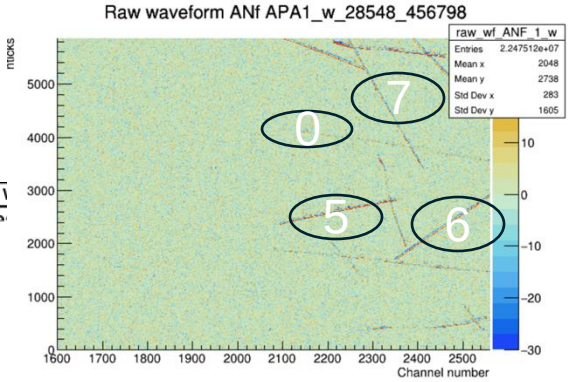
Best one I got

Track6

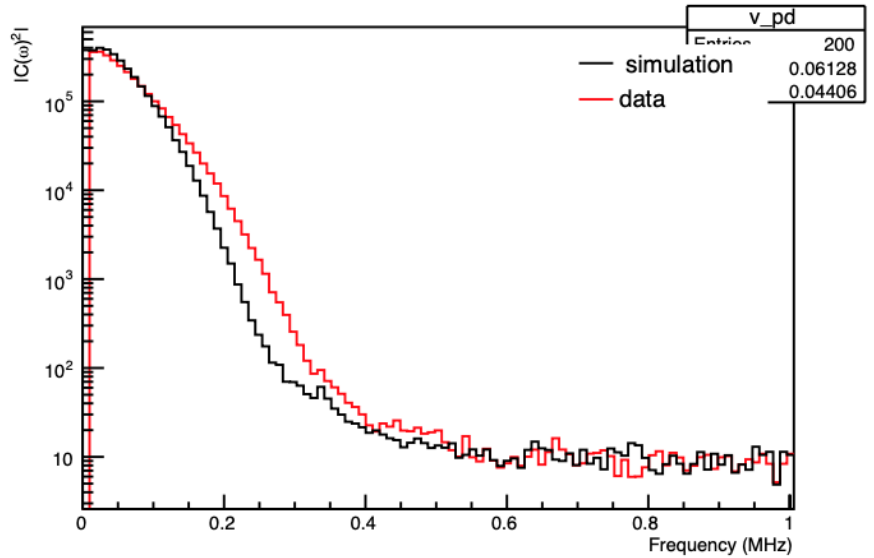
waveform

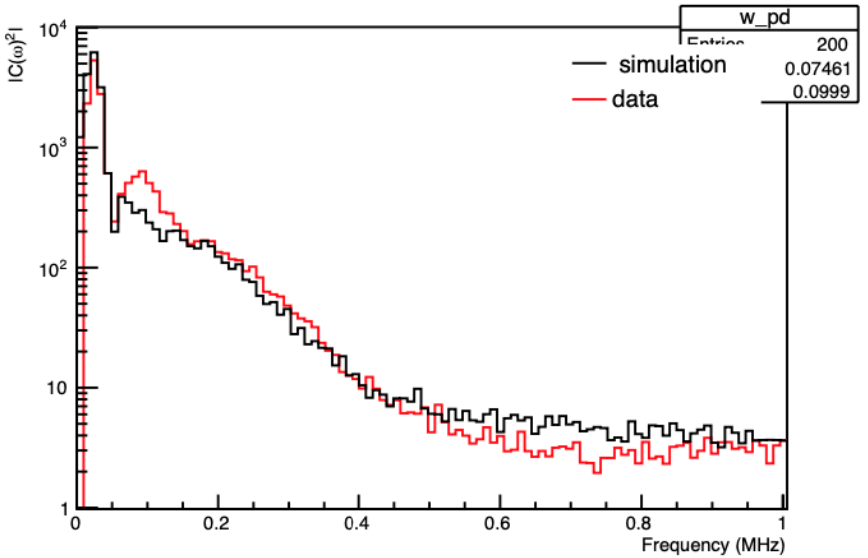






Power spectra

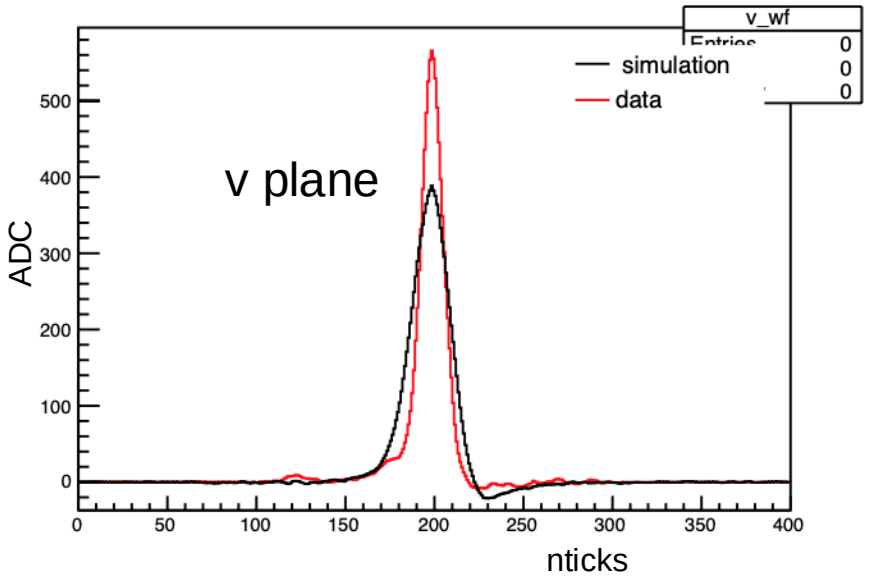


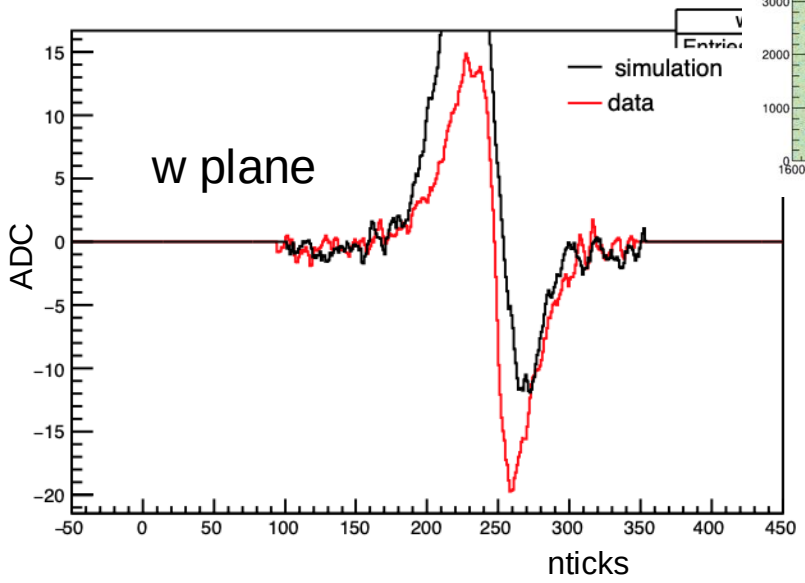


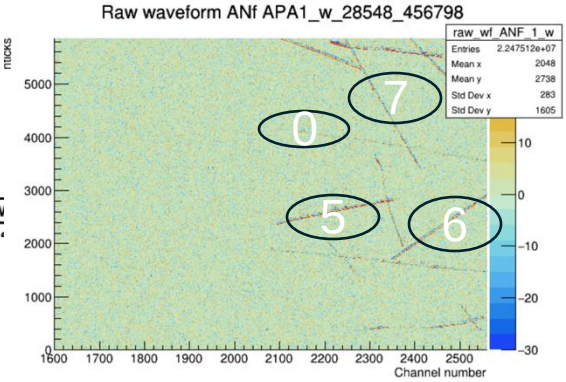
Best one I got

Track7

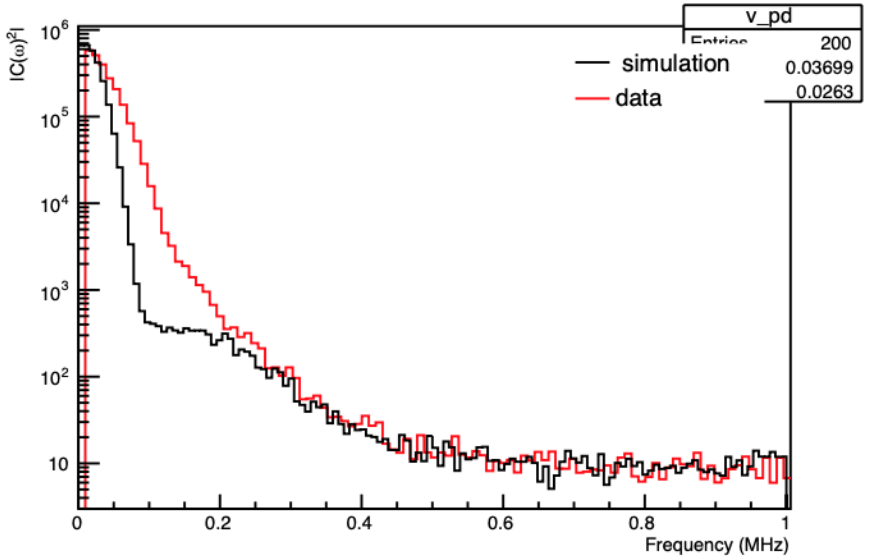
waveform

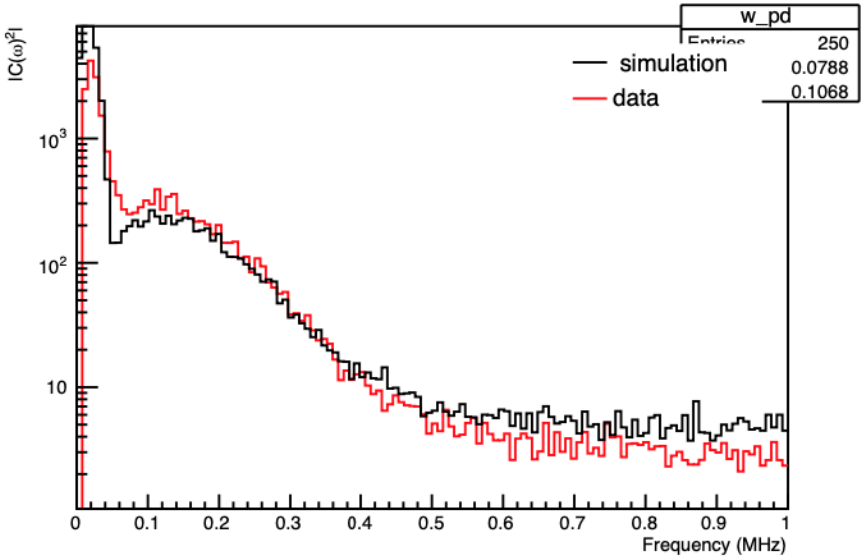






Power spectra





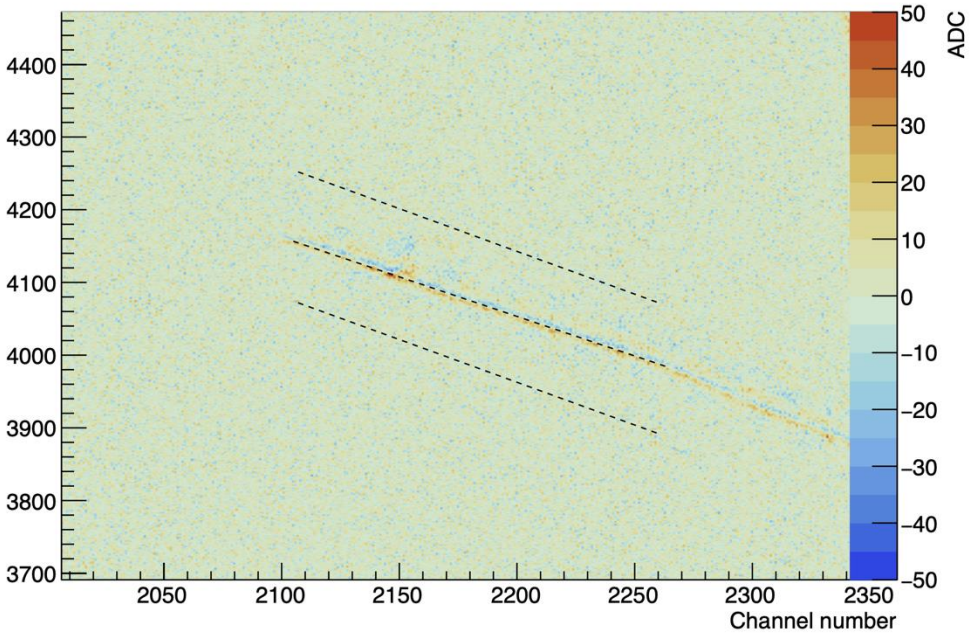
Problems

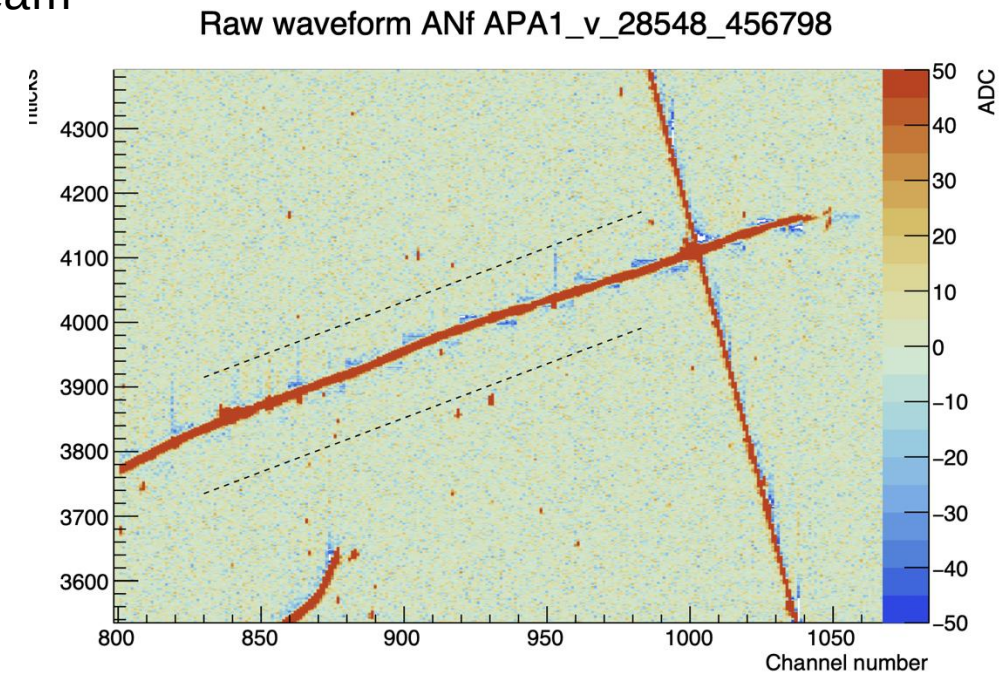
- Although it seems good, the deconvolution result shows nothing.
  - Even won't work in simulated MIP track
- Still keep working on it.
- Now we provide field response with $\boldsymbol{V_W}$ = -100 V as the current version.

Backup

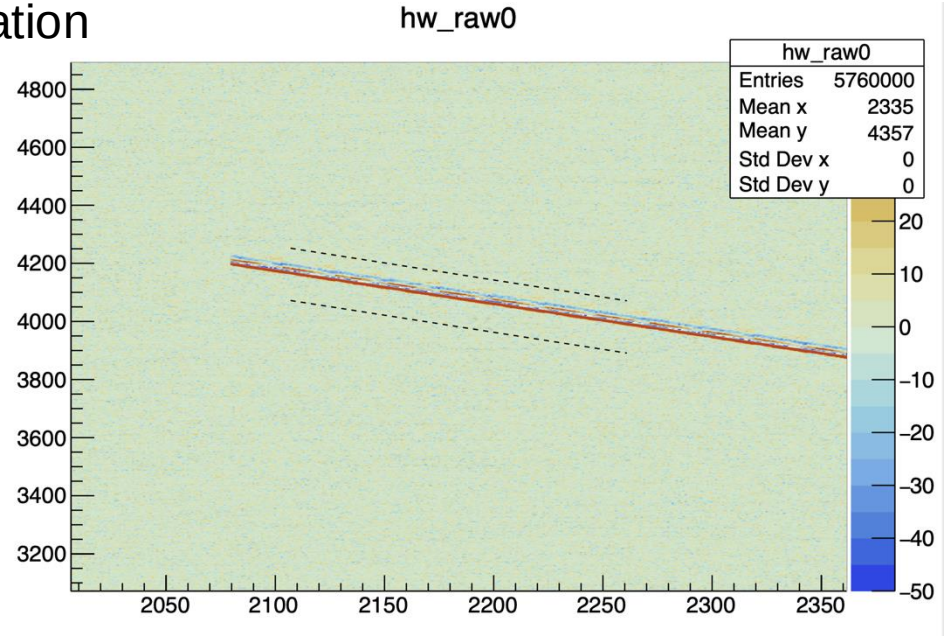
Track0; beam

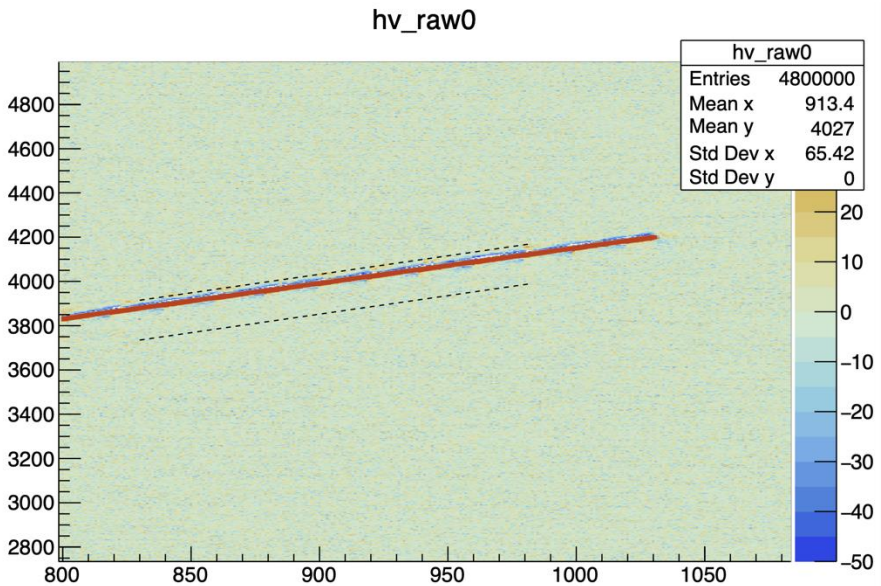
data





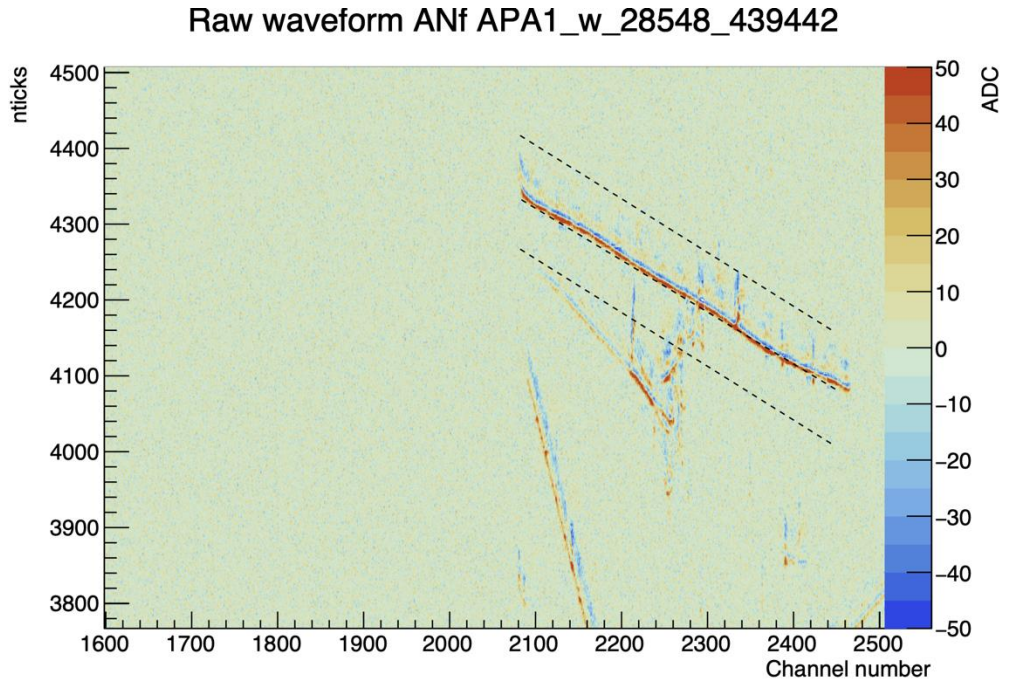
simulation

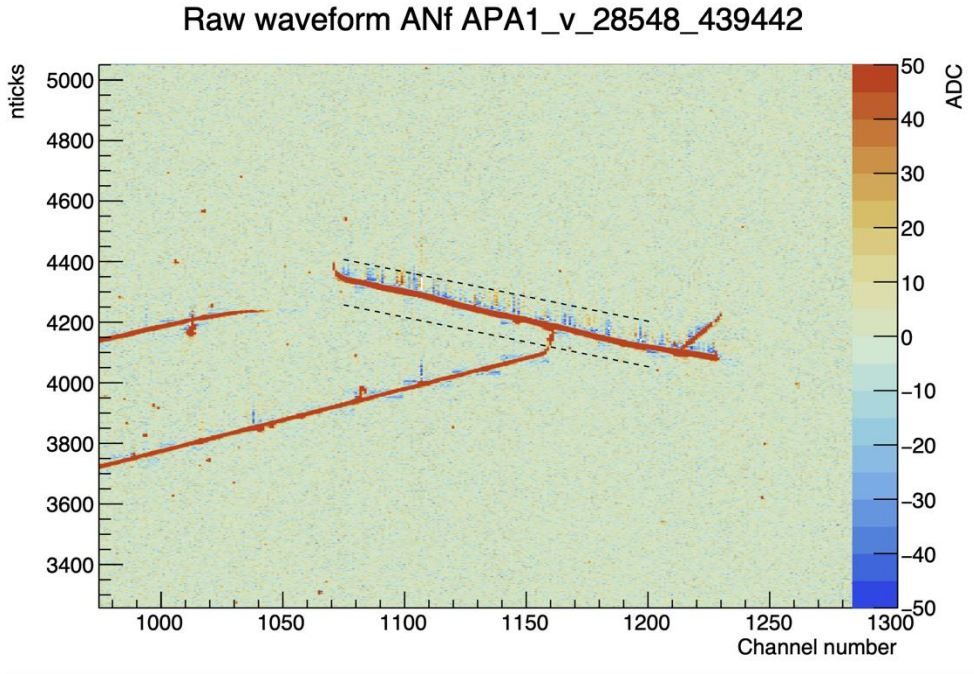




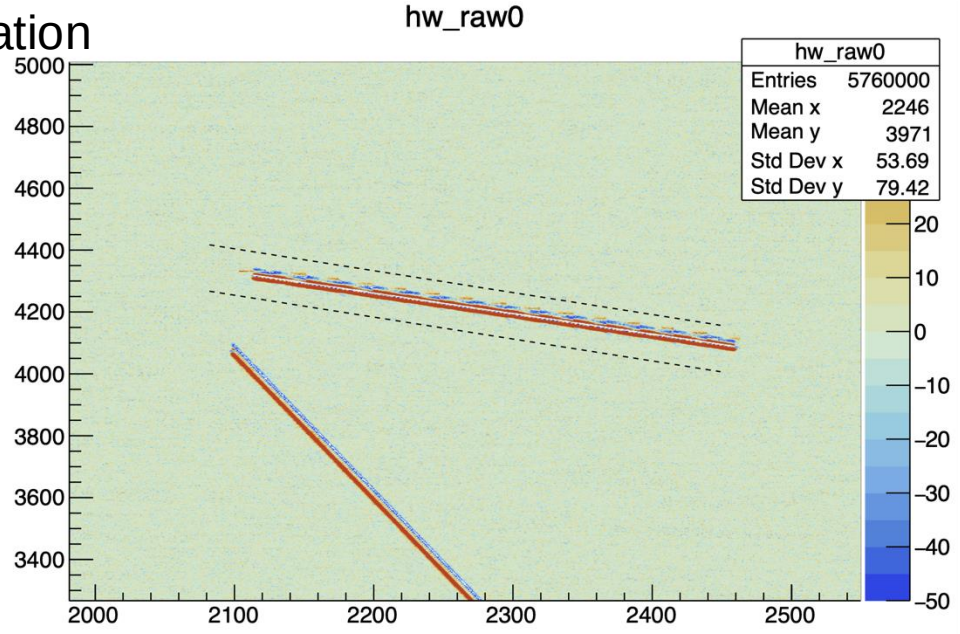
Track1

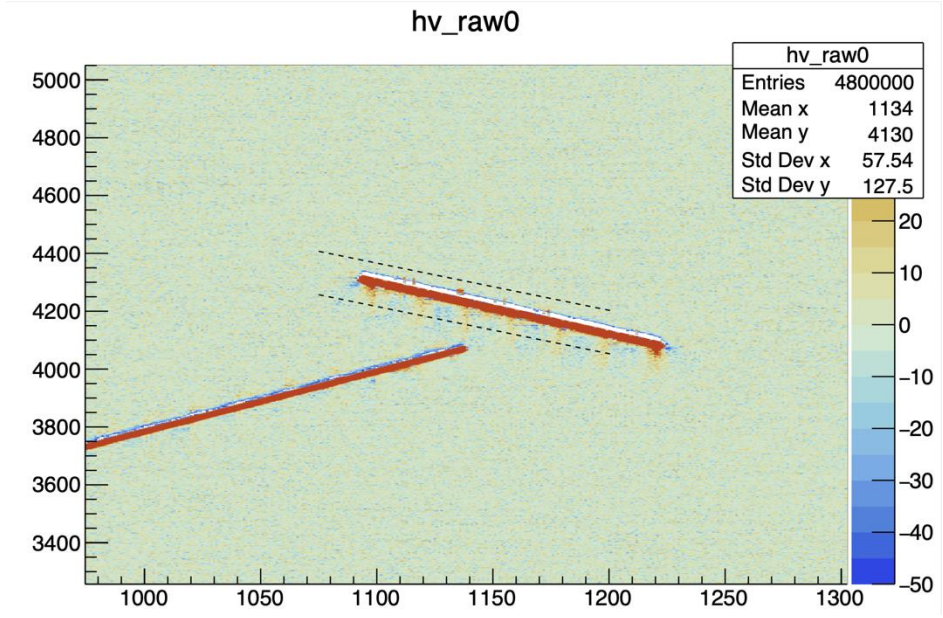
data





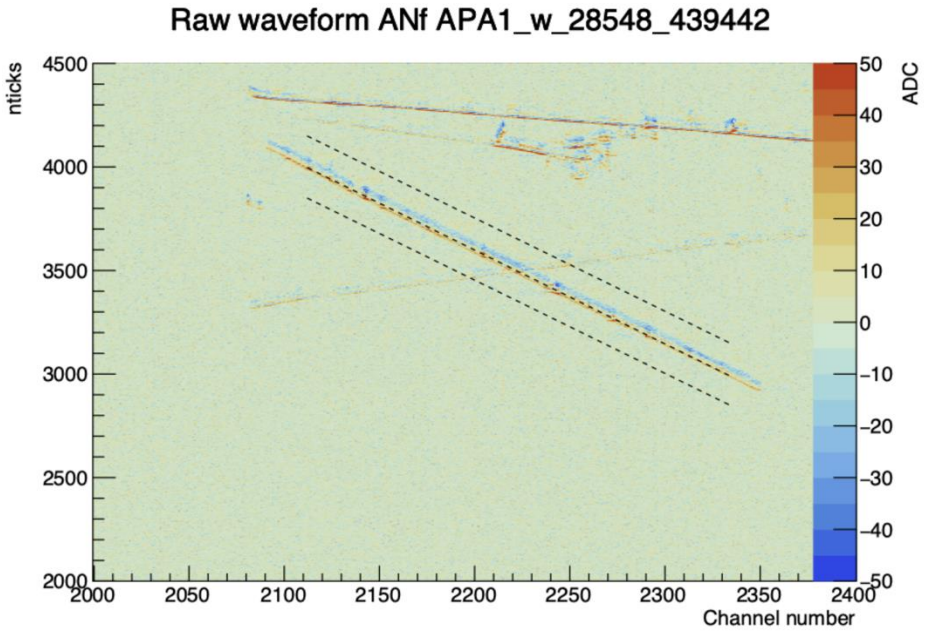
simulation

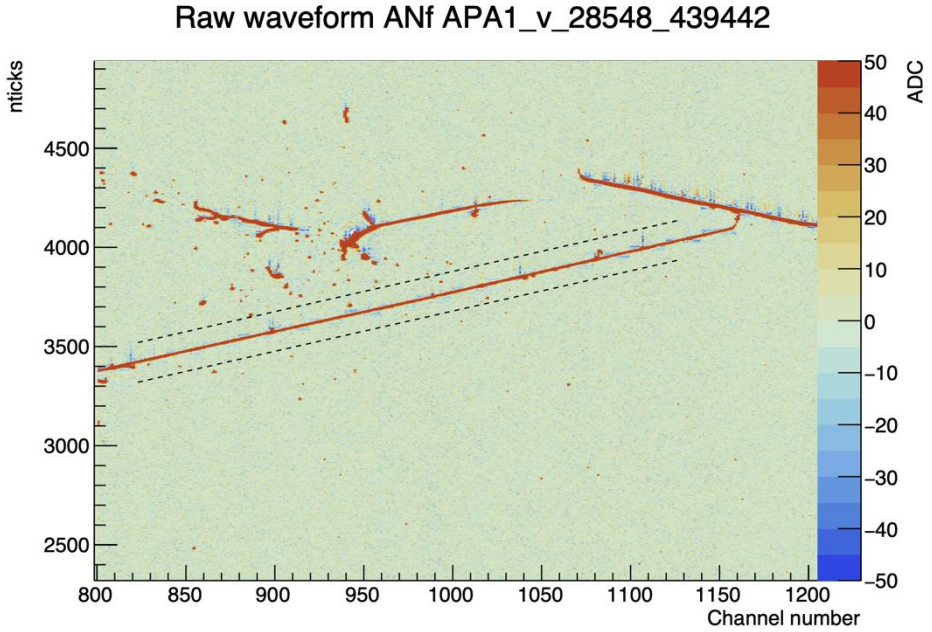




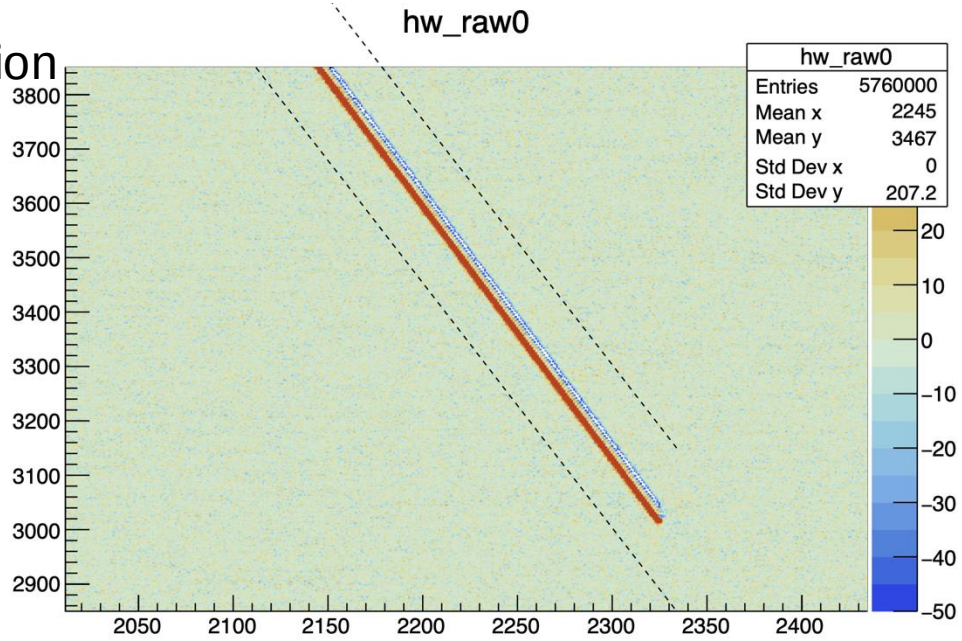
Track2

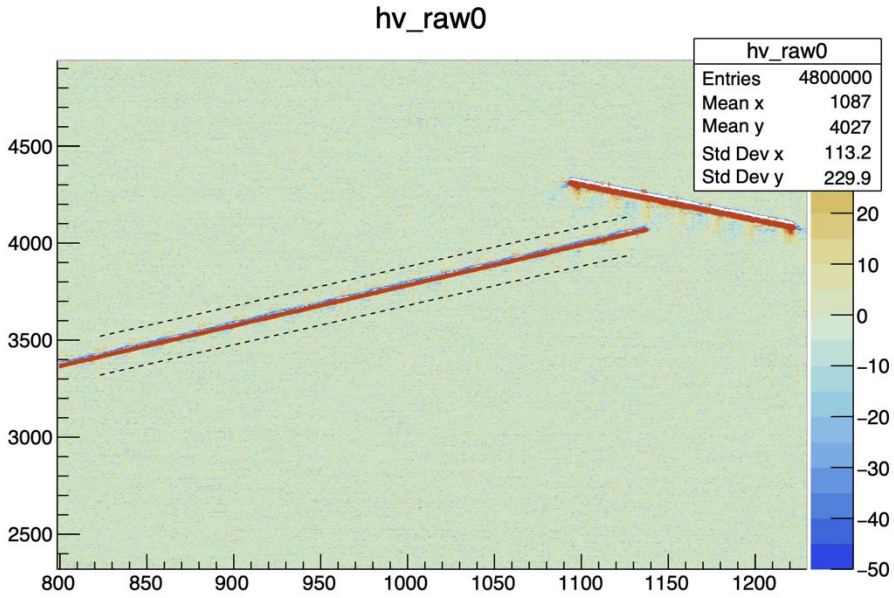
data





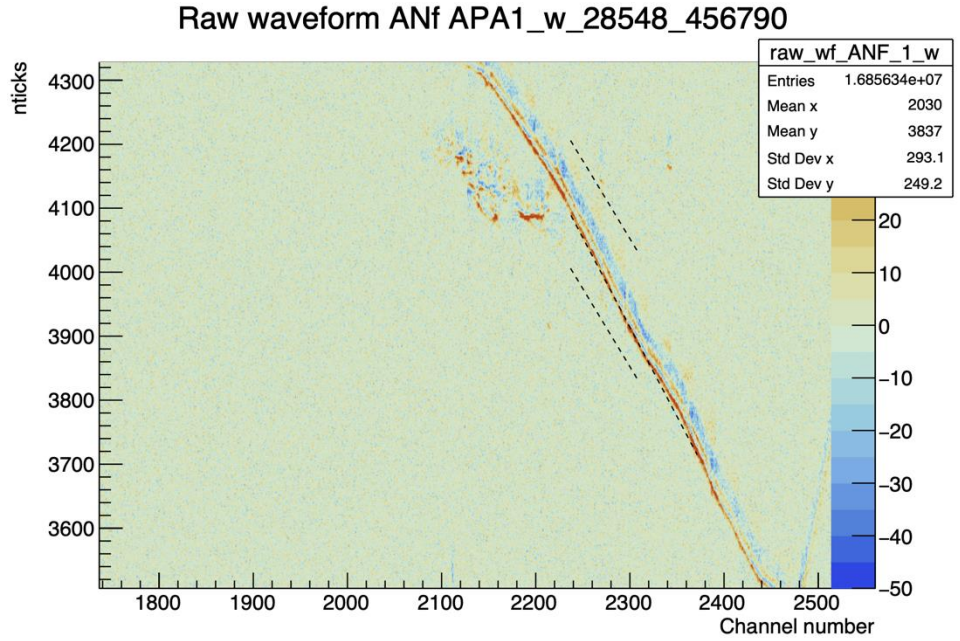
simulation

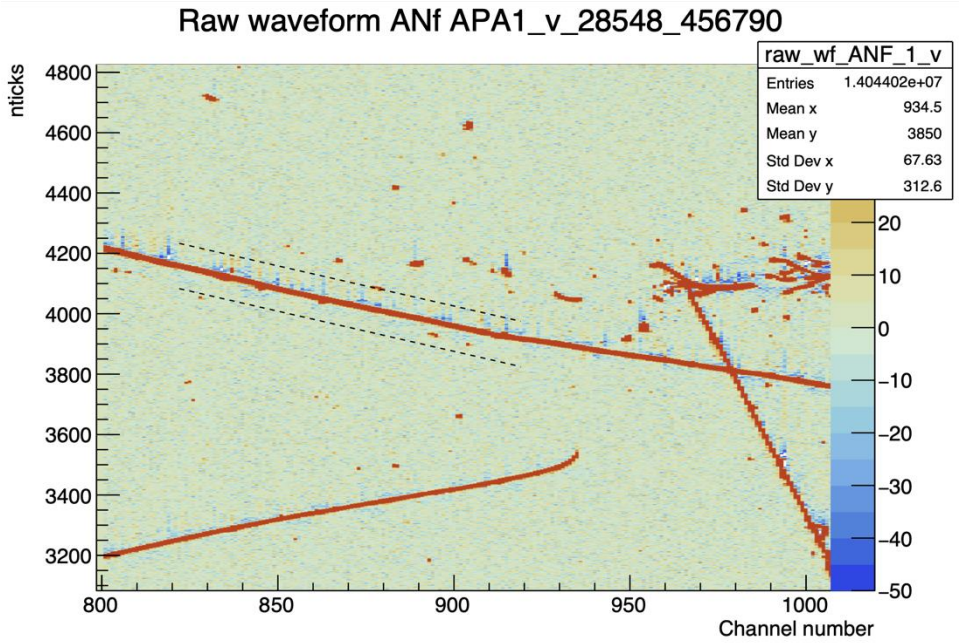




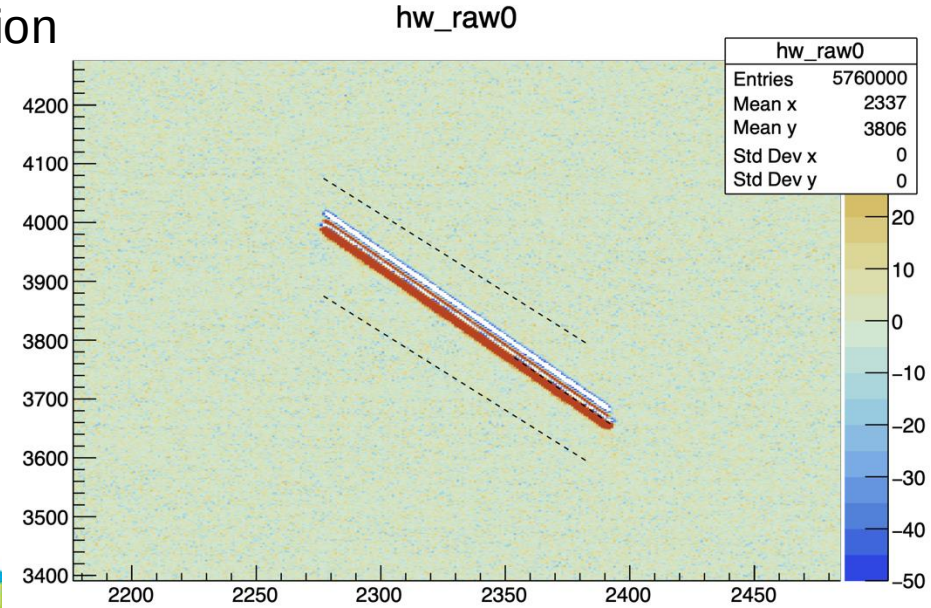
Track3

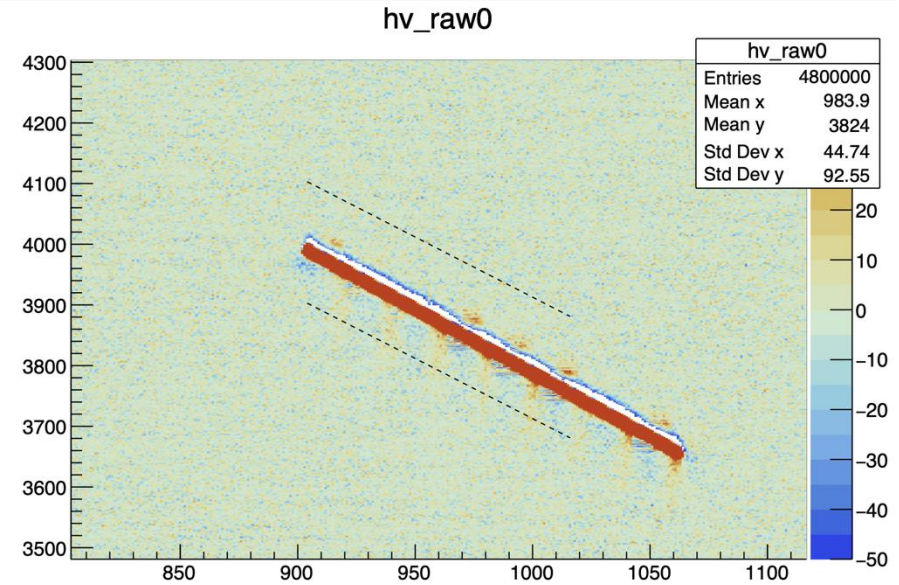
data





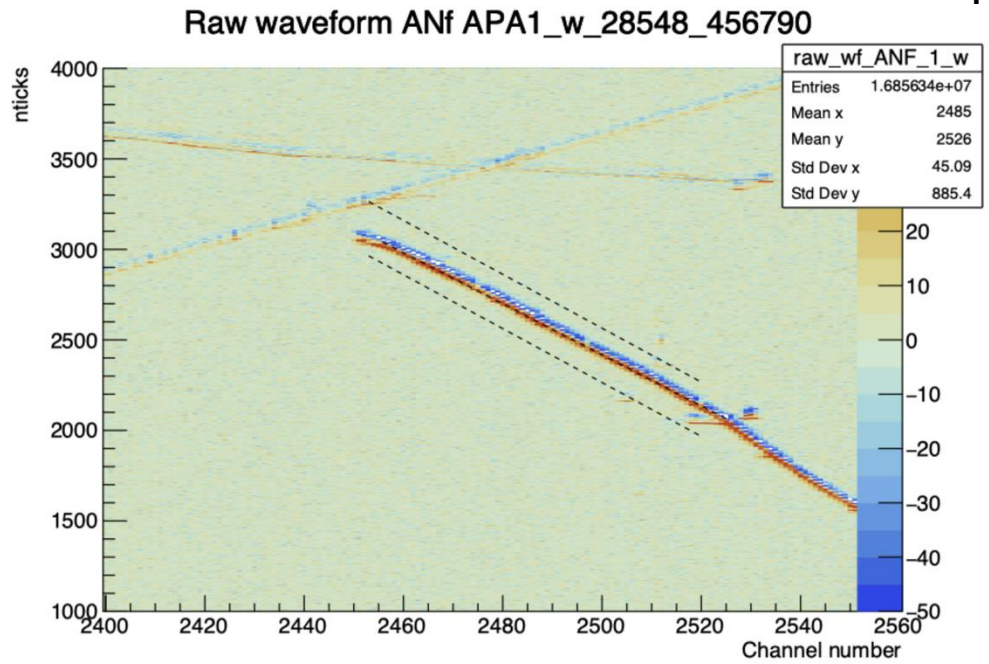
simulation

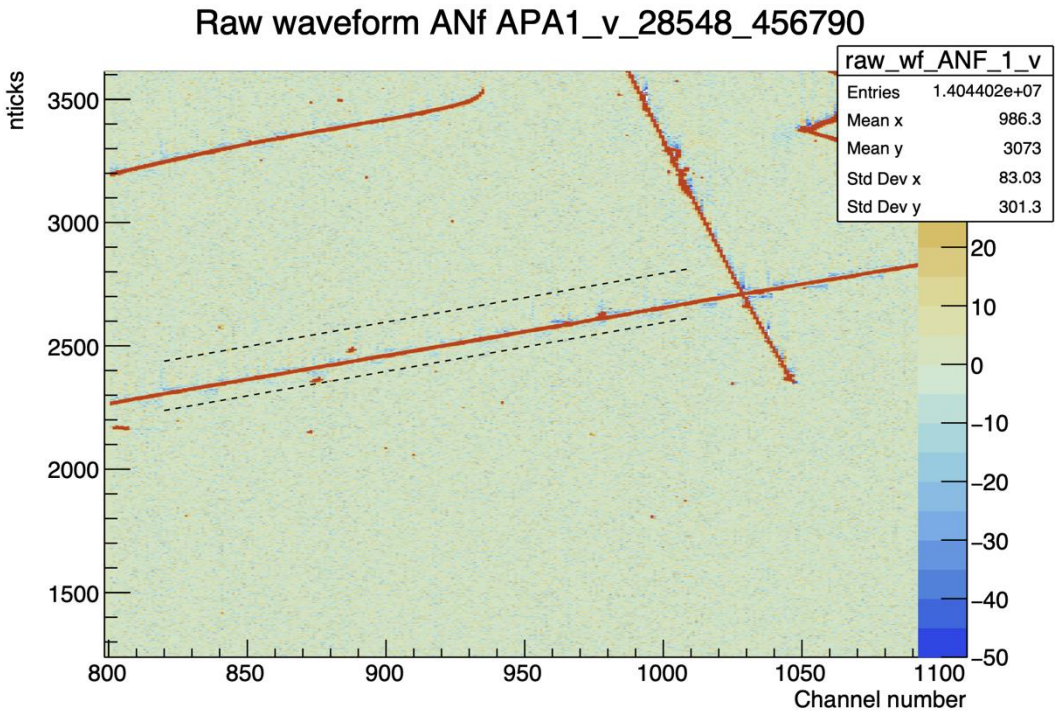




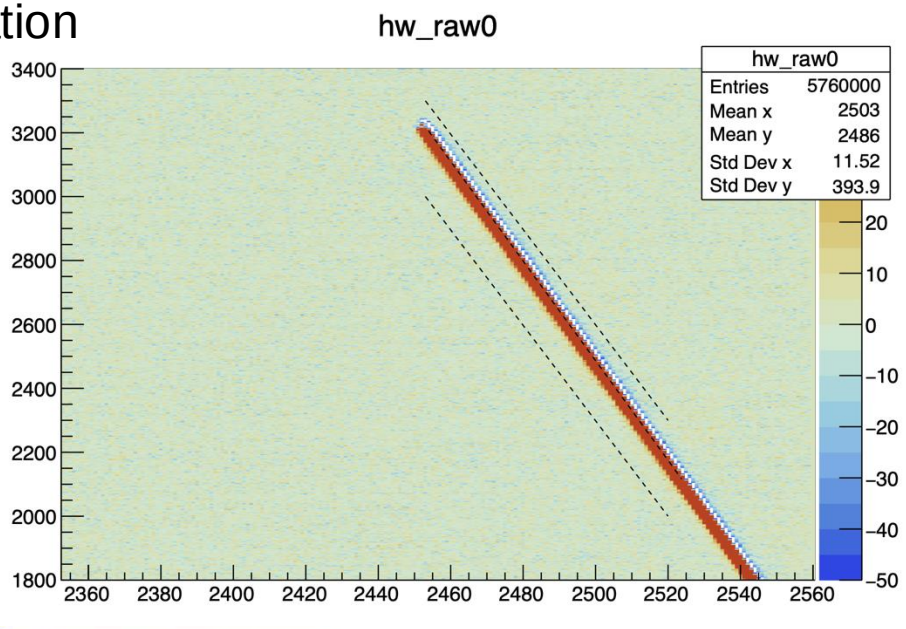
Track4

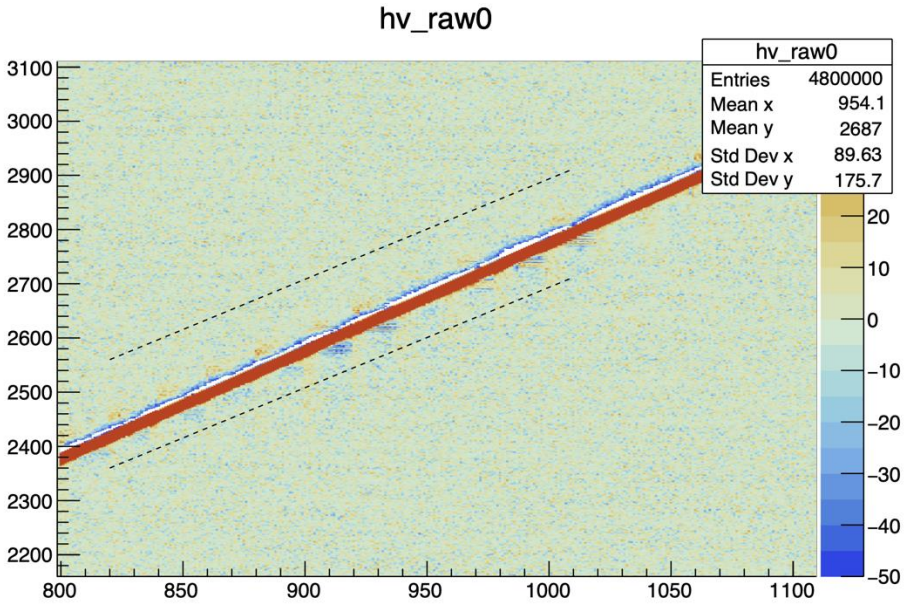
data





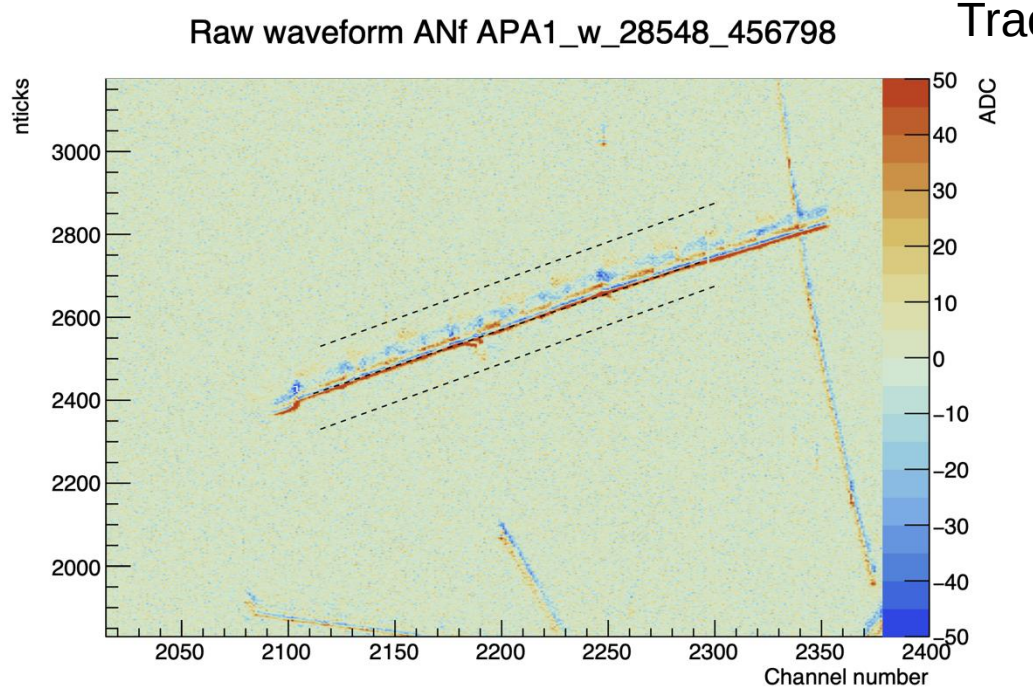
simulation

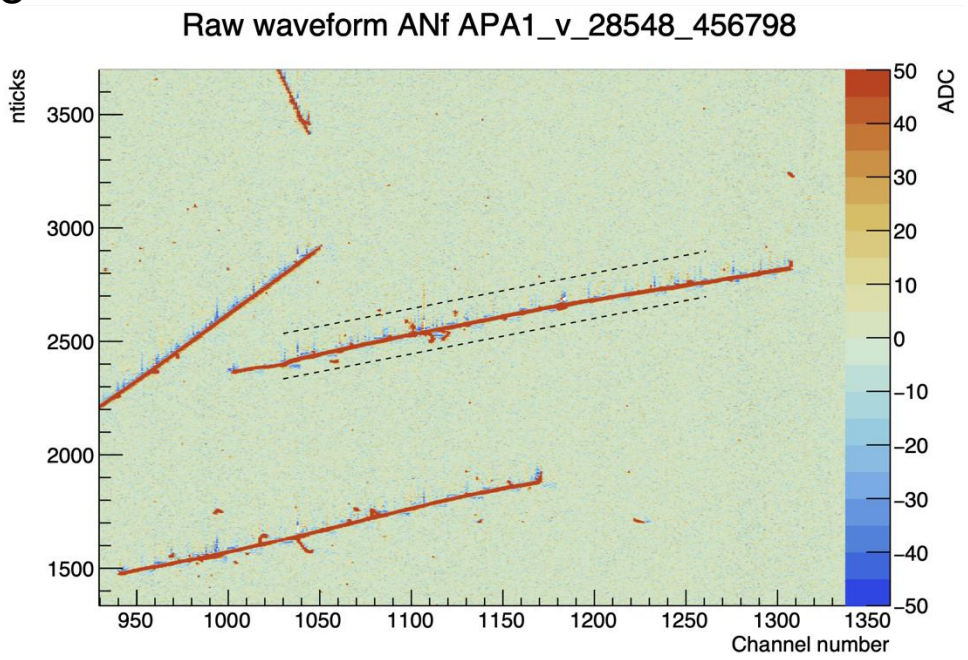




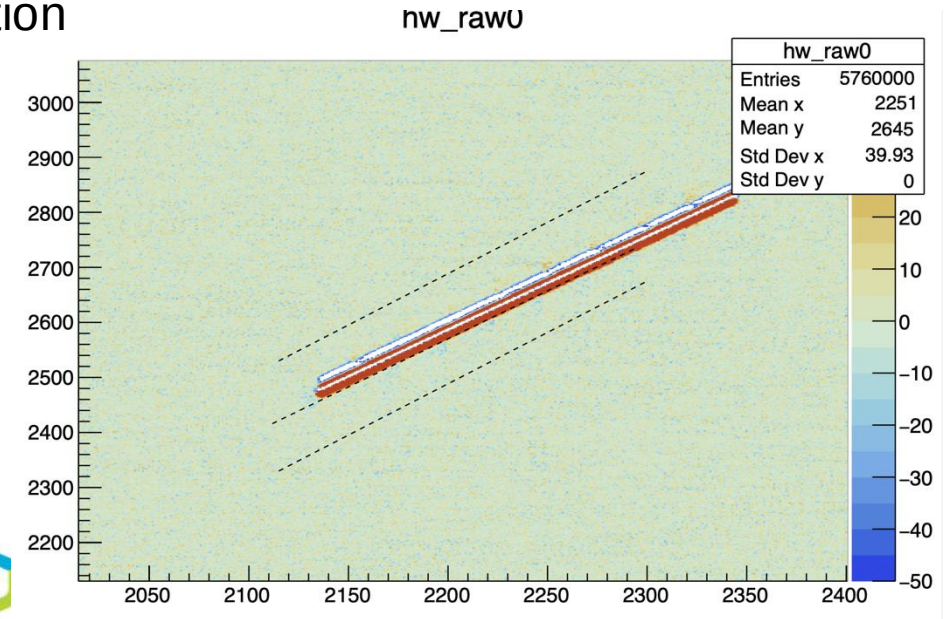
Track5

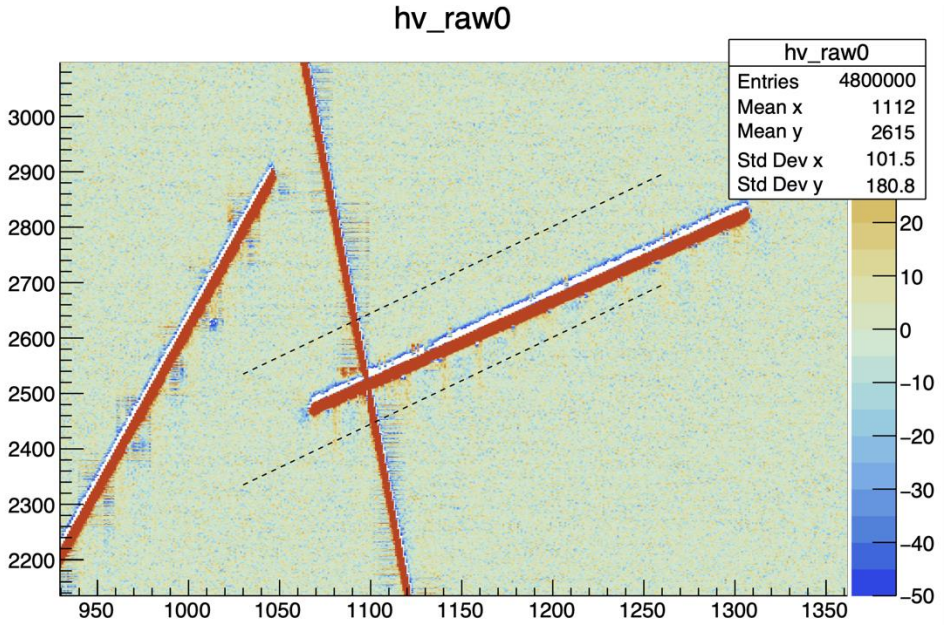
data





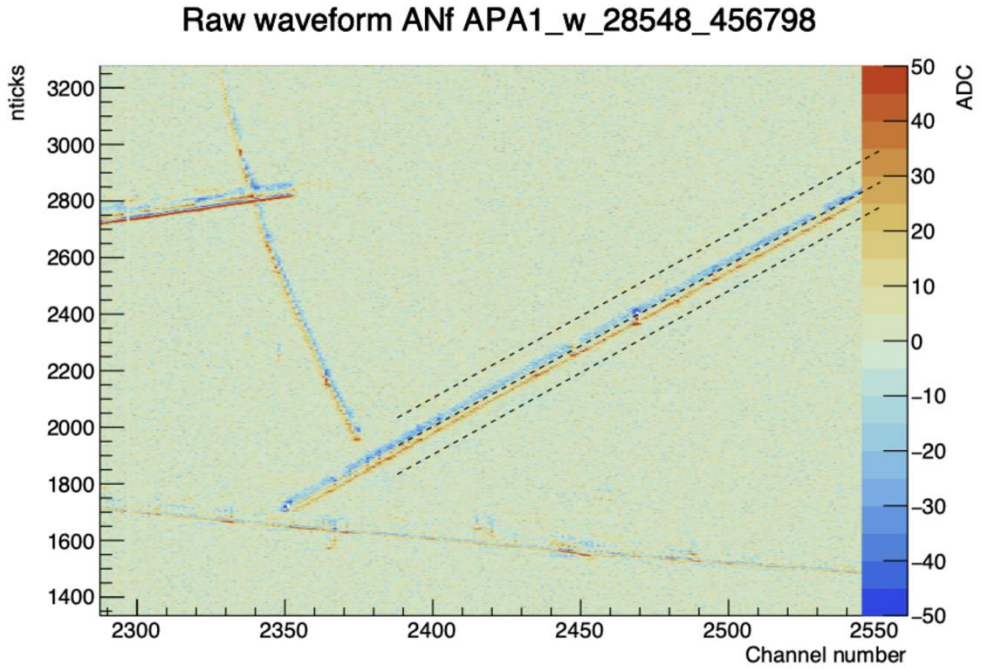
simulation

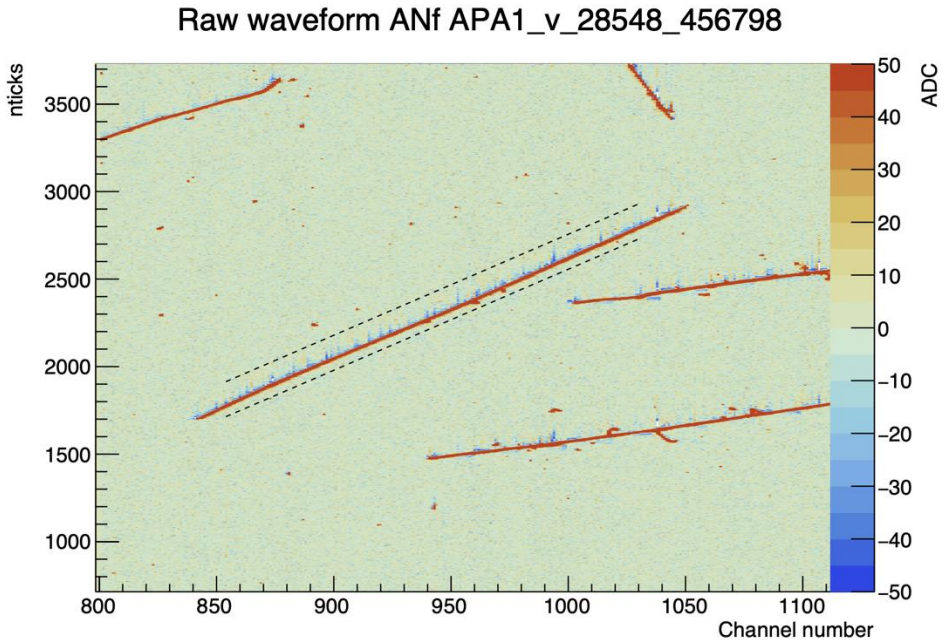




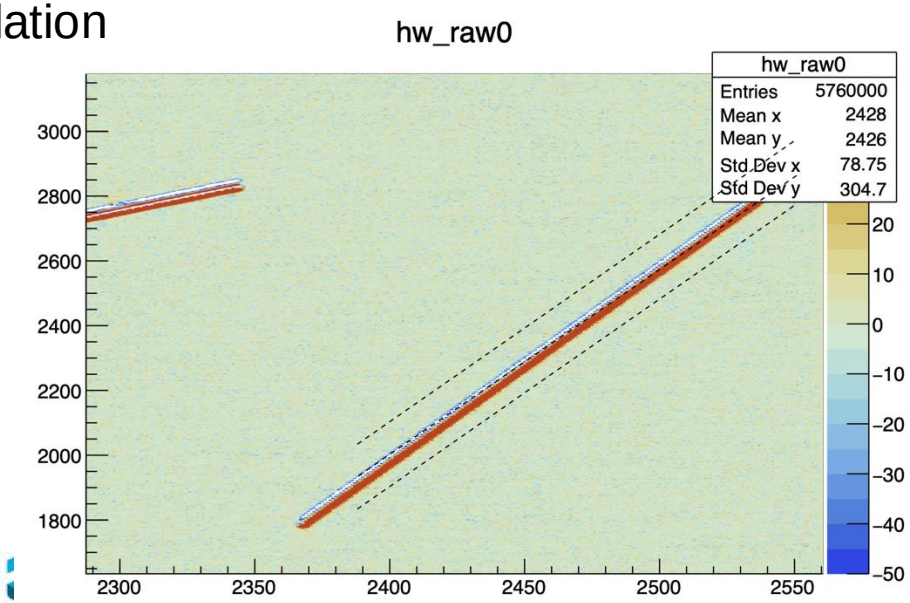
Track6

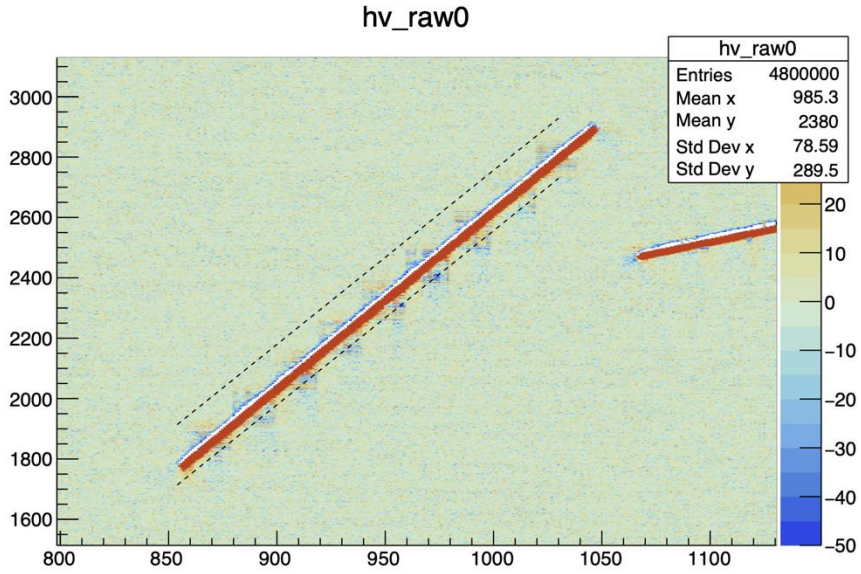
data





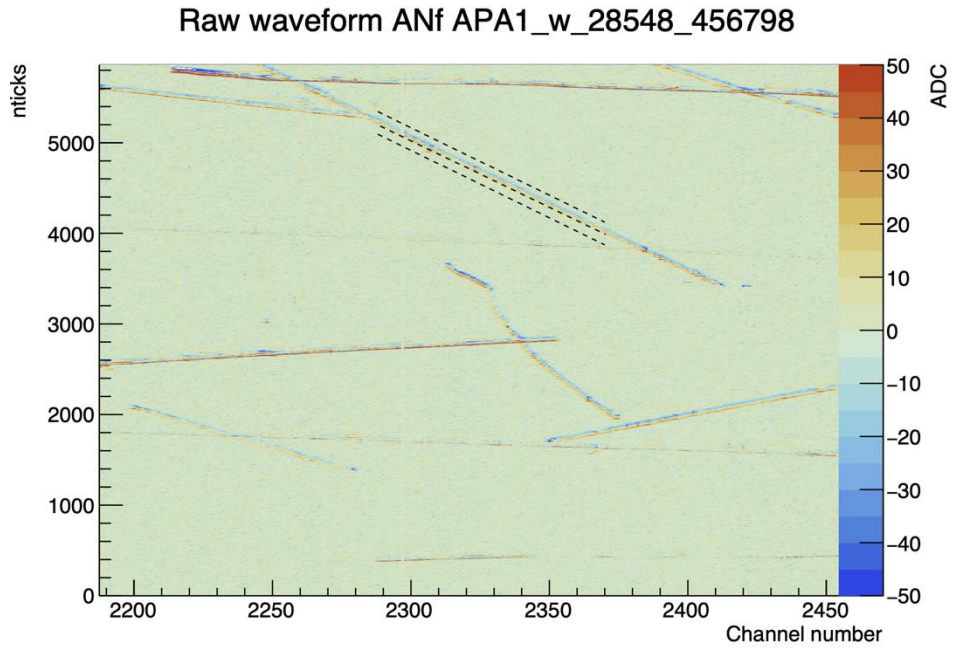
simulation

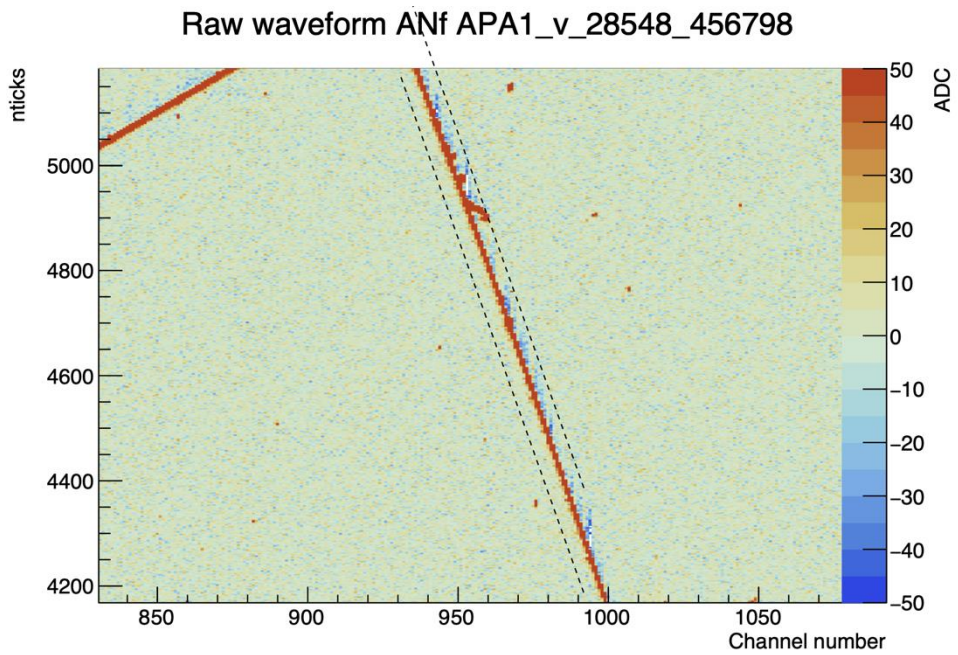




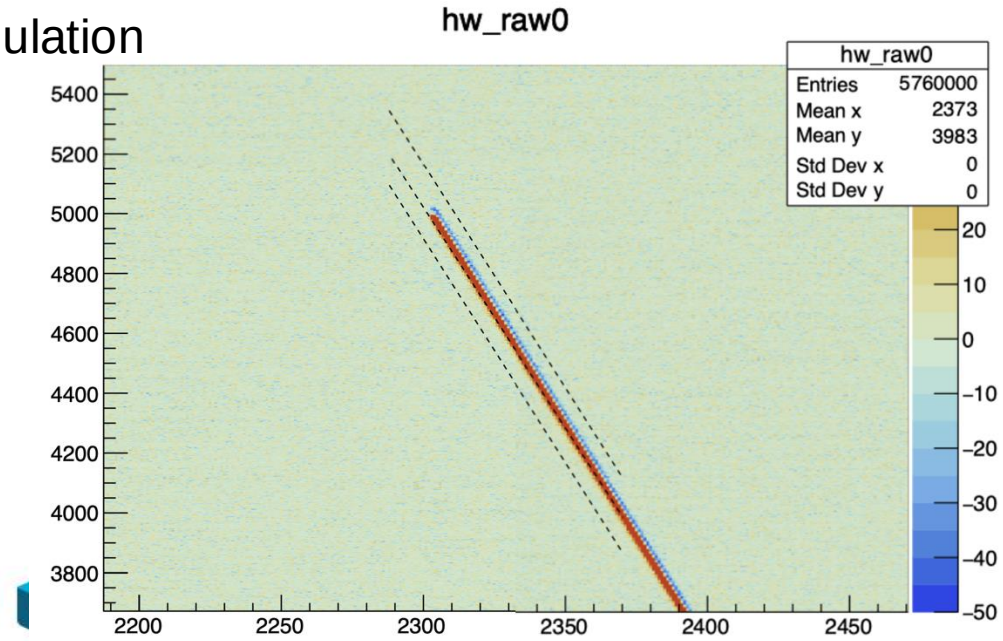
Track7

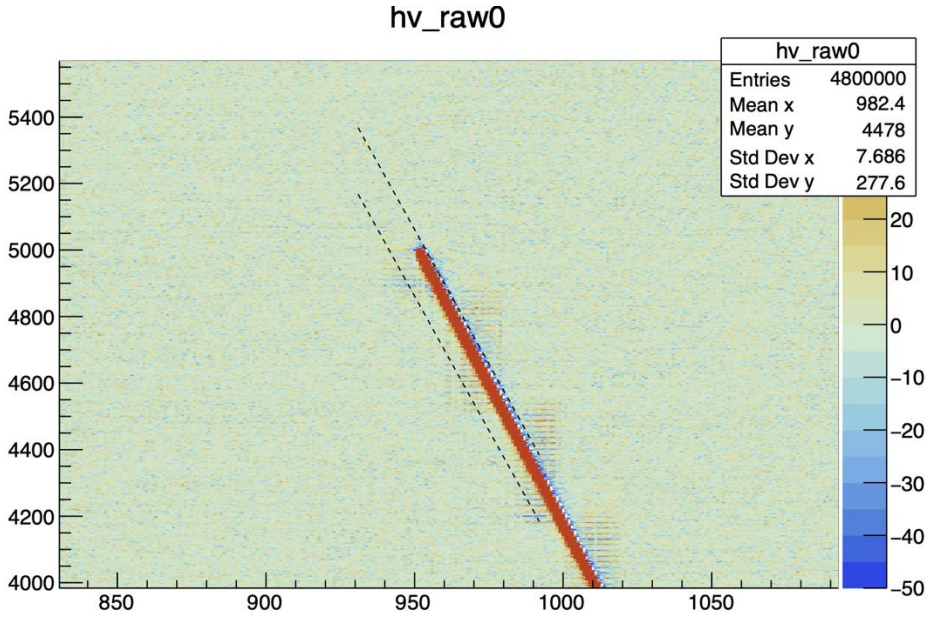
data

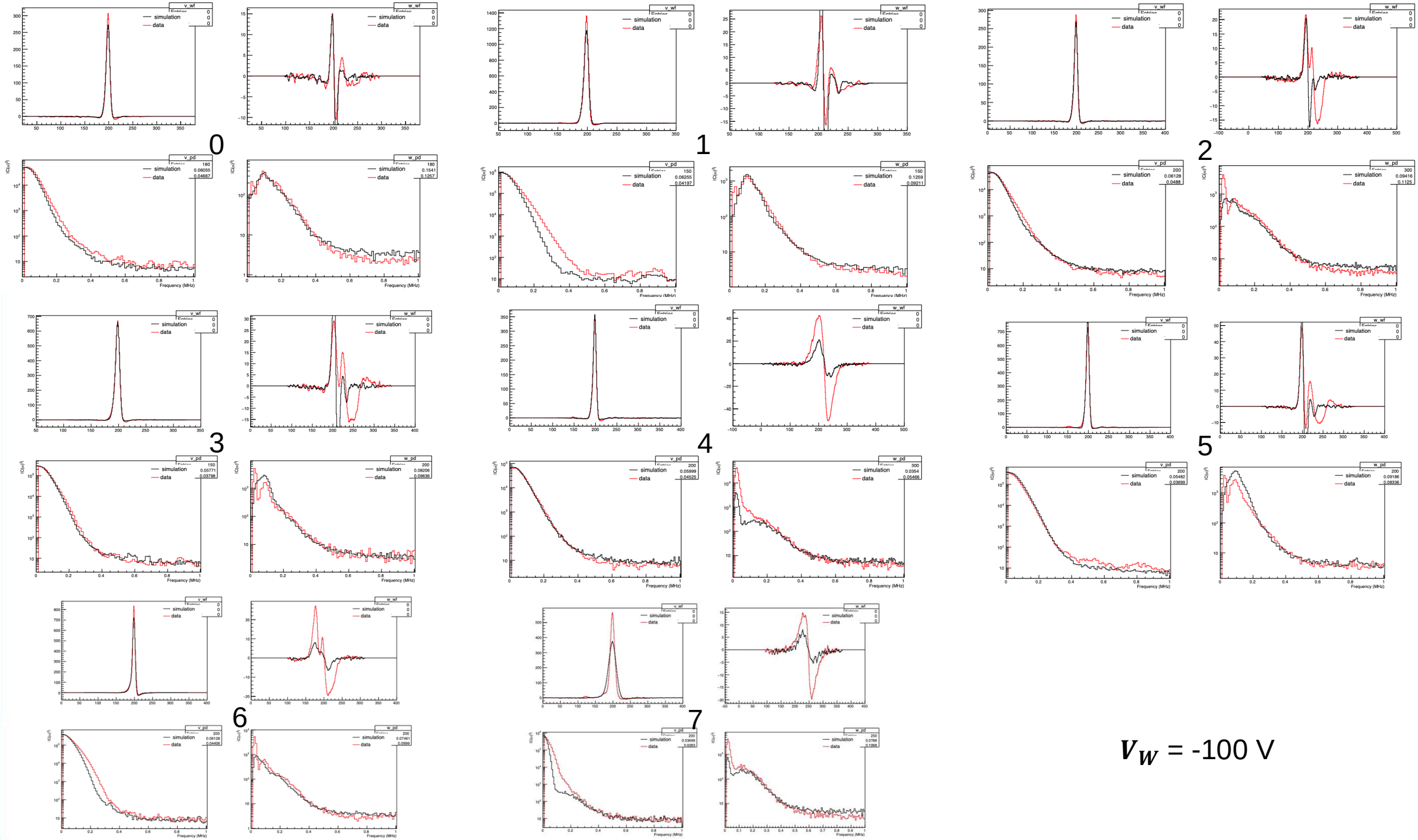




simulation

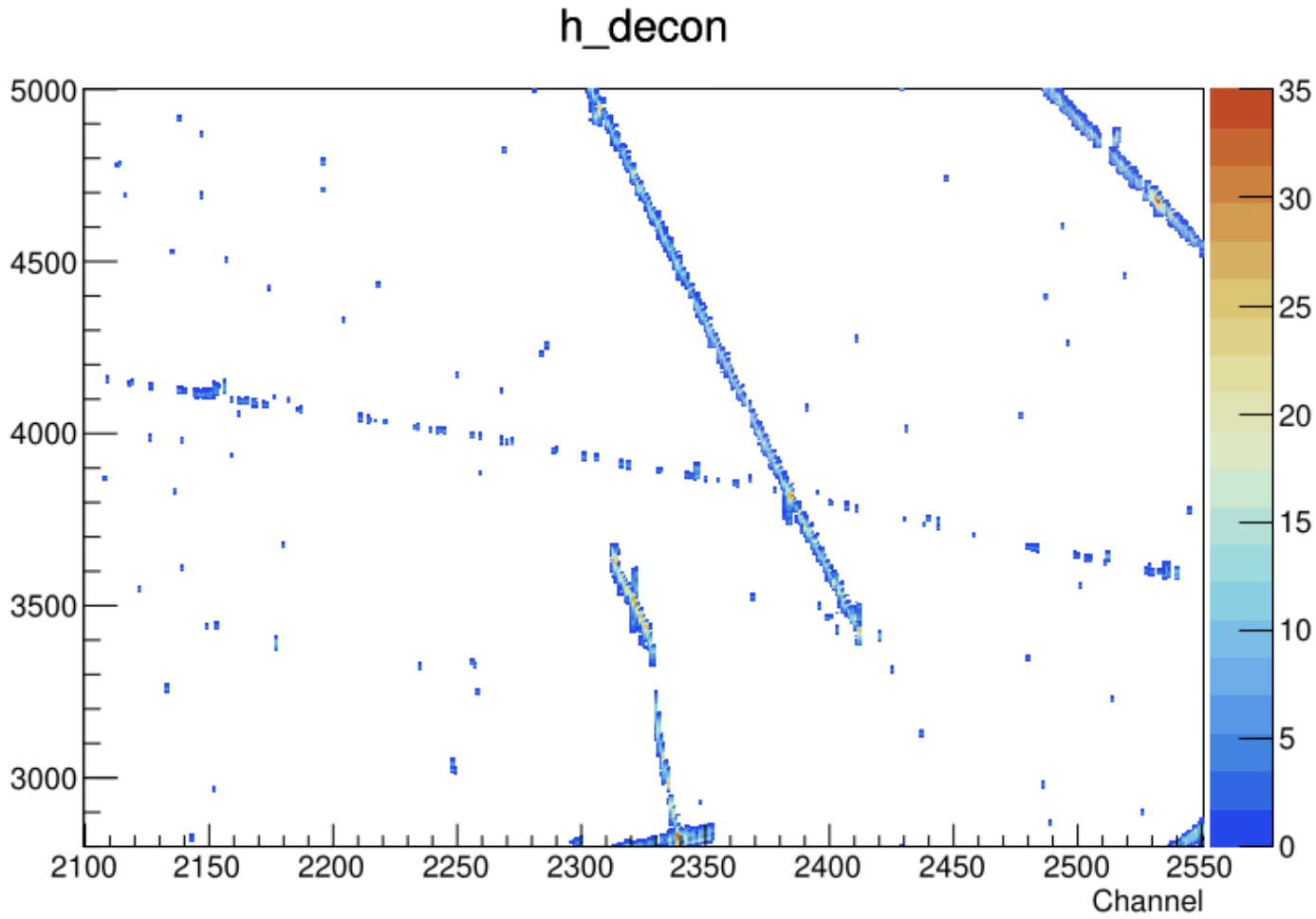






V_W = -100 V

V_W = -100 V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