PMT analysis – Update

Cygno reco and analysis meeting - 5/05/2022

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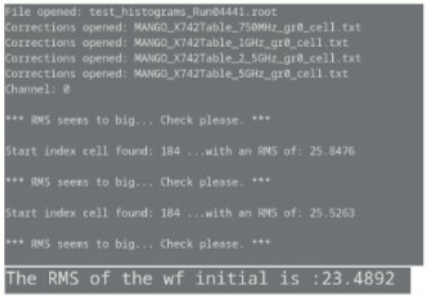
PMT analysis - ...previously...

Outcome:

1. Ok, it works.

Next step:

2. Let's apply this to LIME data.



Tested all the *frequencies*, *"channels"*, *"groups"*, and all the ***capacitors***.

–> Always find **higher RMS** that the original one == **corrections not working.**

What could be the issue?

1. Maybe digitizers were **swapped** (LNGS <-> Frascati)
   a. So I don't have the *correct* correction tables
   b. It's not so easy to get them now because they are performing software upgrades and not all the libraries are properly working.
2. But now all the digitizers are working properly, why not during last summer?
   a. Maybe there was some miscalibration.
   b. It could mean the data might never be correctable…

What now?

- ➔ **Carry on the analysis** nonetheless. Maybe it's better to prepare the analysis for when better data arrives.
- ➔ If the data seems too much broken, try to manually fix it:
  - ◆ With a man-made correction table (?)
  - ◆ Bringing back the initial study with the moving average (?)

PMT analysis - ...previously...

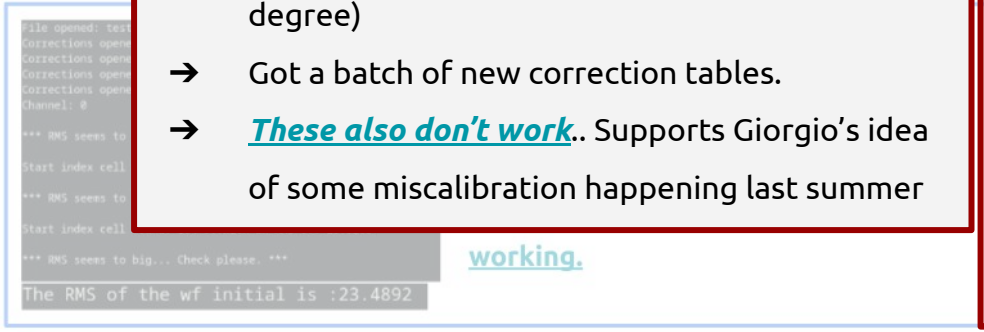
Outcome:

1. Ok, it works.

Next step:

2. L

- ➔ They fixed unground library issues (to some degree)
- ➔ Got a batch of new correction tables.
- ➔ ***These also don't work***.. Supports Giorgio's idea of some miscalibration happening last summer



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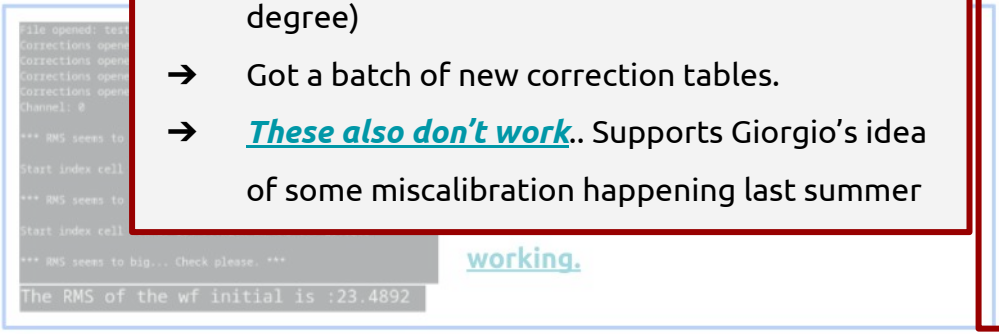

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Followed this idea and created a ***self-correcting script***

PMT analysis - Correction script - Rational

1. Find ~20 empty waveforms for each channel
2. Read and save them into vector.
3. Input given ***to be corrected waveform***.
4. Test all the 20 empty waveforms into this ***to be corrected waveform***.
    a. This means find the *start_index_cell (SIC)* and respective RMS got after correcting
5. Choose the best waveforms (meaning the ones which output an RMS lower than X).
6. With these, create an average correction waveform
    a. Why not just use the best of the 20 empty waveforms?
        i. To avoid the creation of artifacts in the data, since the correction is just a point-by-point subtraction.
7. Correct the ***to be corrected waveform***.
8. Write the new waveform into a root file, following the same scheme as the normal data.
9. Repeat for all the waveforms.

Bonus:

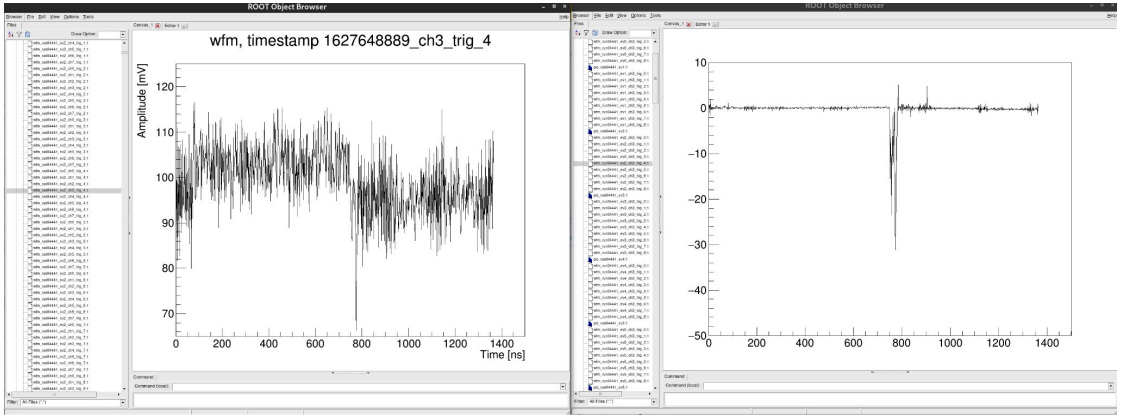
– Empty waveforms can be used between different runs (the capacitors are always the same)

– Automatically removes trigger 9, for which all the graphs were empty. (and the weird folders)

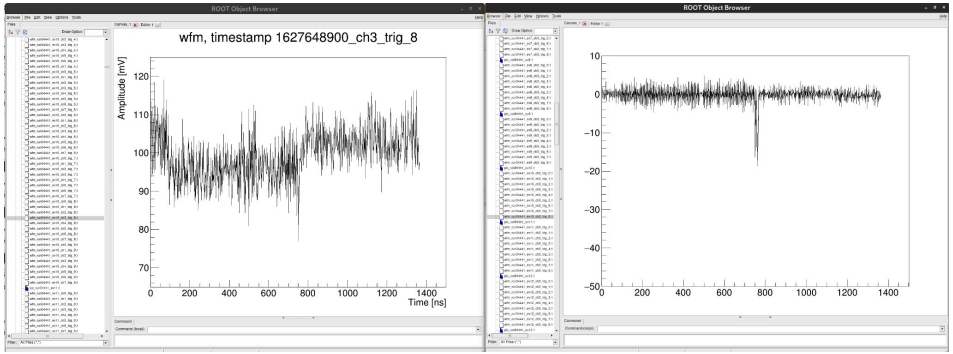
★ To do:

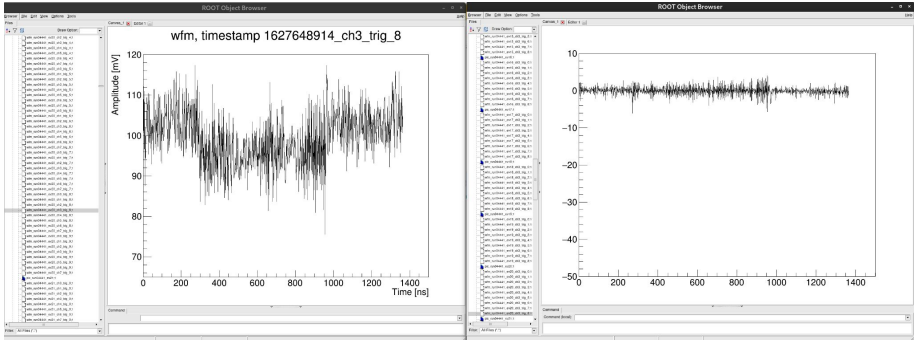
- Find some empty waveforms -> The more the better -> Finalise code to correct all channels

PMT analysis - Correction script - Examples



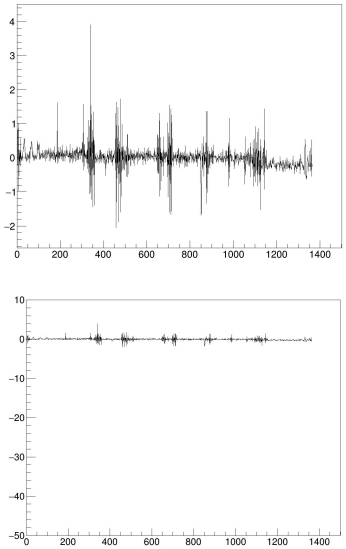
1. Noting the different RMSs, you can see that sometimes works better than others..
2. Good enough (?)!





PMT analysis - Correction script - Examples

- Sometimes there are weird features..
- Irrelevant once a threshold is given (~10 mV)



- Hard to identify signals become evident