Current status of discussions with Dieter (assuming he is not here)

- Dieter had requested that I perform my own standalone Lycoris analysis in order to compare with his own.
- In the 33000 events of **Run_20200316_162107.dat** he has found 31000 tracks by selecting only the best.
- Unfortunately all of my analysis was focused on **Run_20200316_172906.dat** which has the entire start up phase stretched by a factor of three.
- This had been shown to drastically improve Noise performance for S43 and have either no impact or minor positive impact on the rest of the sensors.
  - *Plots were shown shown around the 19th of March but I attached them here at the end again.*

- For some reason while Dieters track finding shows excellent results in **Run_20200316_162107.dat** , when trying to use the same analysis code on **Run_20200316_172906.dat** he finds only tracks in 60% of all events.
- I am in a discussion with him about this and slowly sending out all necessary information.

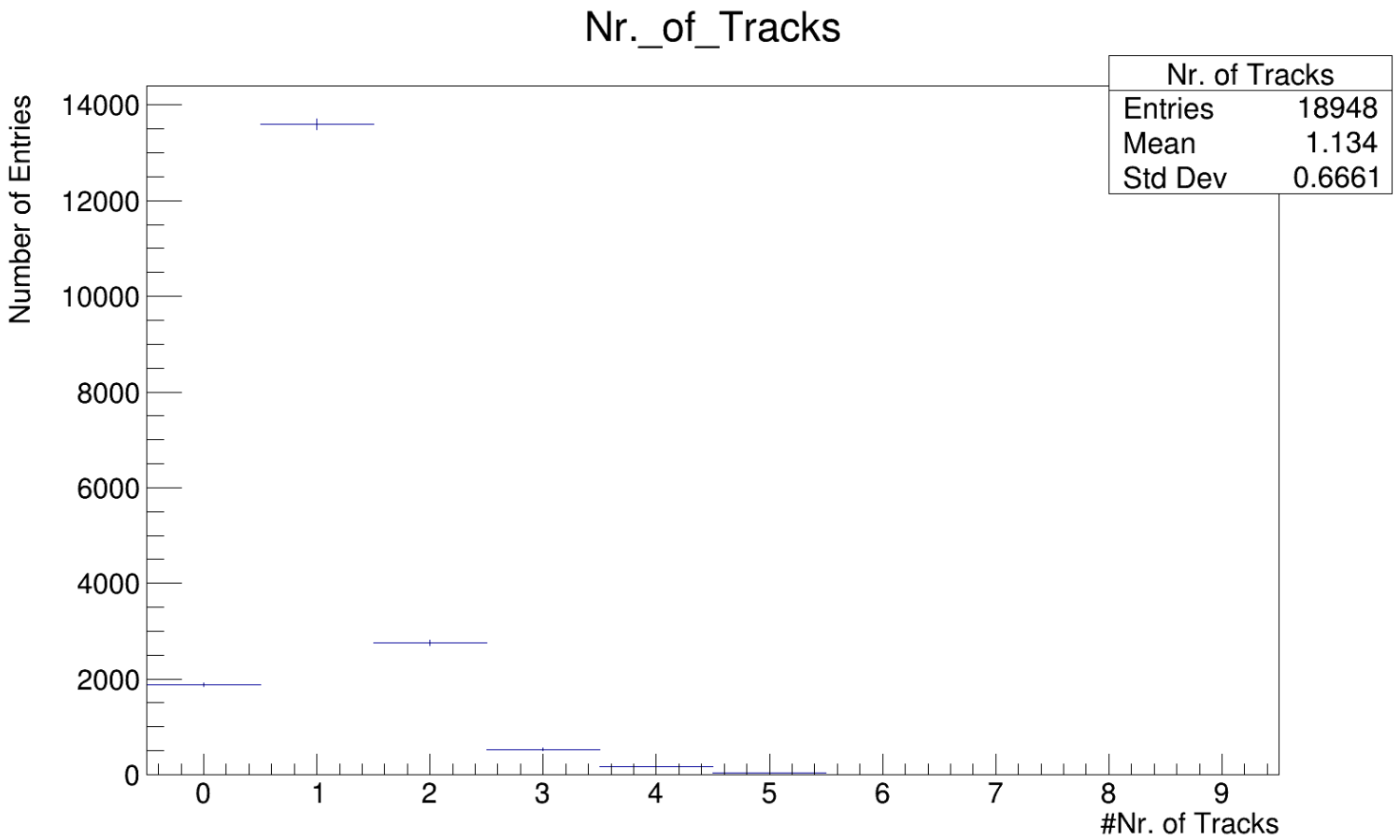
Standalone track finding and fitting with Lycoris

- Our track finding and fitting is based on Claus Kleinworts code using my clustering as input.
- There are two different methods of track finding called
  - Strip Road Search
  - Striplet finder
- The details of which I am currently writing down and will send in a seperate mail as it is probably too detailed to explain in this meeting?
  - I did attach a very rough breakdown of both methods in the backup but please note that I am still working my way through the code so things are subject to change.

- In both cases after the track finding we refit the tracks using General Broken Lines (GBL) which is a tool to take into account multiple scattering as the test beam particles used have only an energy of 4.4 GeV

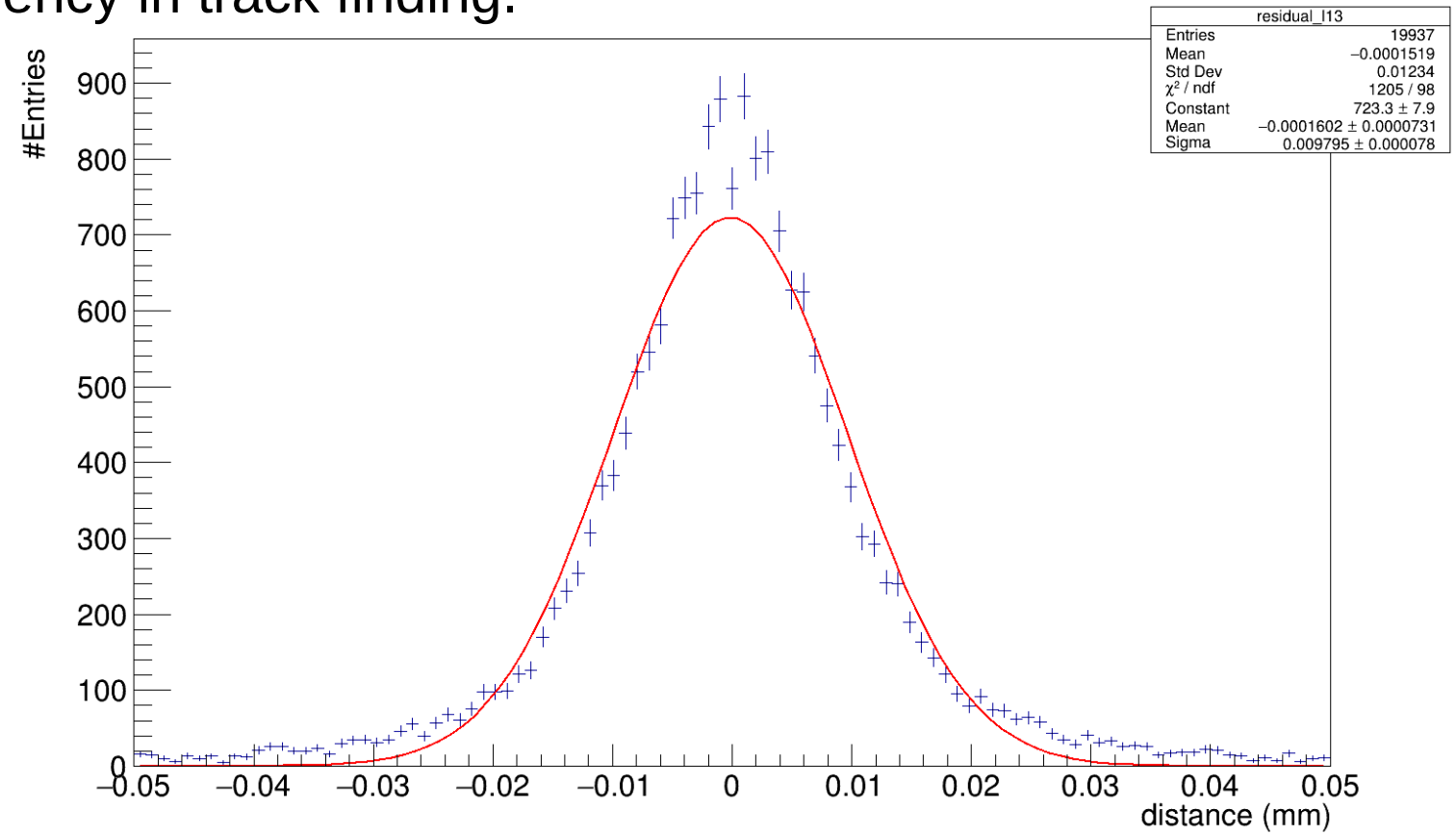
Some more results from the standalone track finding and fitting

- All results I had shown in the last two weeks stem from this standalone code
- In **Run_20200316_172906.dat** with the standalone track finding and fitting I find ~21000 tracks in 18948 events.
- This in parts because I can have multiple tracks within an event. When selecting only the best track I get ~17000 tracks or an efficiency of 90%. Similar to what Dieter had in the other run



Some more results from the standalone track finding and fitting

- Current results without GBL give me a single point resolution of 9.8 um which is similar to what Dieter has shown though there is a caveat.
- Unfortunately I bias myself to my test layers (axial layers) which are basically the only ones I can use to check for the resolution because of how the code currently works.
- The standalone code is not intended to determine the resolution of its own layers but to have high efficiency in track finding.



Backup

Strip road finder rough breakdown

- We seperate the 6 layers into its 4 stereo layers and 2 axial layers
- We use the 4 stereo layers as seed layers to build the track and the 2 axial layers as test layers to rid ourselves of invalid combinations
- If only 3 stereo layers are valid (noisy stereo layer or no hits on stereo layer) we take one of the axial layers as seed layer
- Only tracks with a minimum of 5 hits are considered valid
- All possible combinations of seed hits are taken into account
- We project the position of the track candidate generated by the seed layer to the axial layers and search for hits within a distance of $d < 200$ um
- We then select the single best track, based on both number of hits and chi2/ndf and put all other hits back into the pile

- This procedure is then reiterated until no valid tracks can be build

Striplet finder rough breakdown

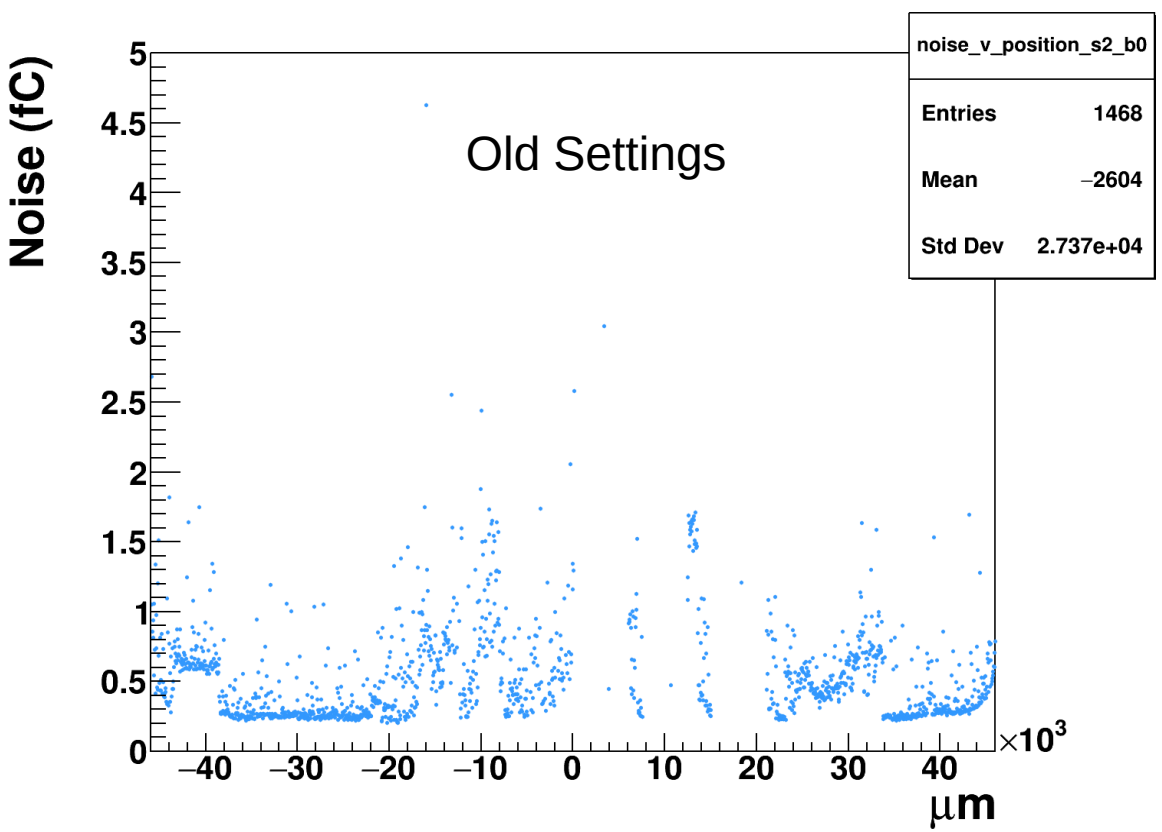
- We try to build strip triplets (striplets) in each cassette that we later combine with each other.
- In order to do so we first assume that the initial track angles are 0
- We then use the two stereo layers to determine the tracks x and y position
- From there we take the axial layer to search for a valid hit and then correct the angle along y using this hit
- This is done seperately for all hits in each cassette
- We then take all striplets from the cassettes and try to combine them by projecting them to the center between the cassettes.
- Only if the distance of the projected striplet position is below 200 um in y do we consider this to be a valid striplet track.

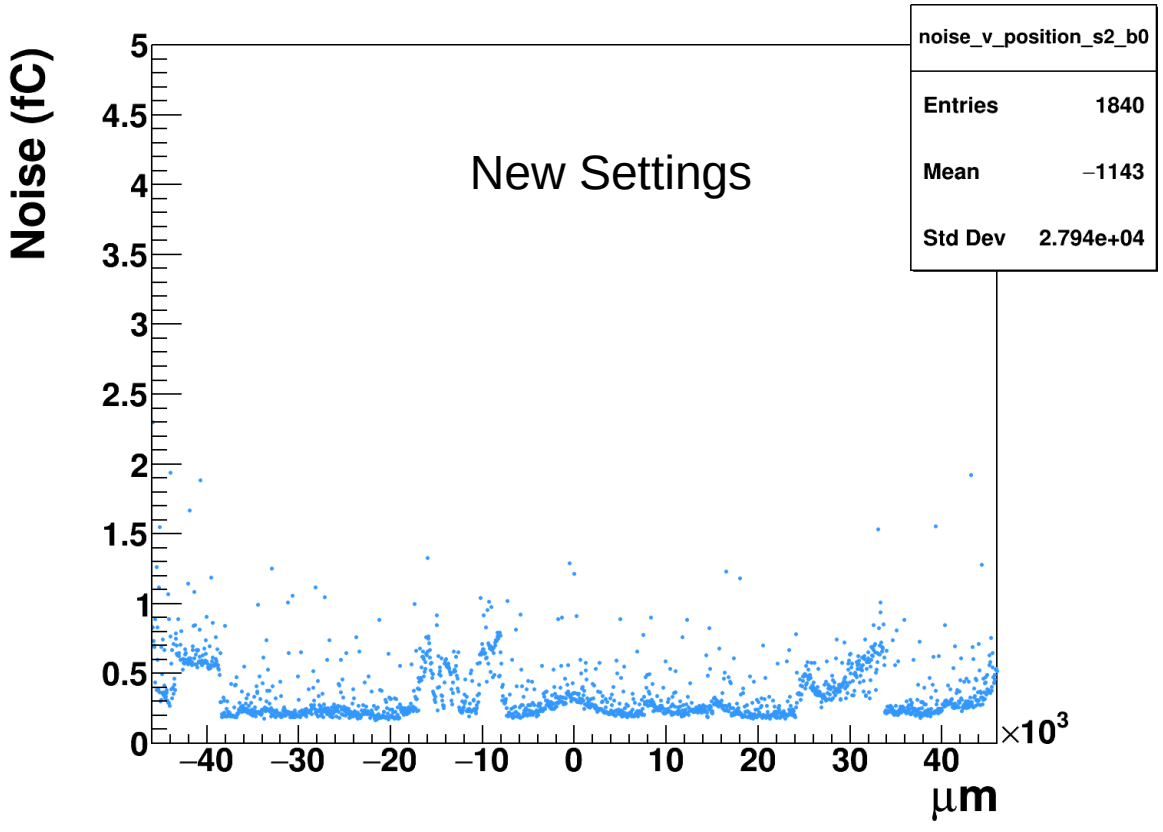
Testbeam, what has changed

- All cassette boards used had both dampened clock and trigger lines
- All sensors were glued into frames instead of held via rubber bands
- Two cassettes were placed within Azalea instead of one
- Performed measurements at different settings based on results gotten in the E-Lab
- Exchanged positions of some sensors. S43 (the worst) is now S2 whereas it was previously S1

Impact of the different settings (S2)

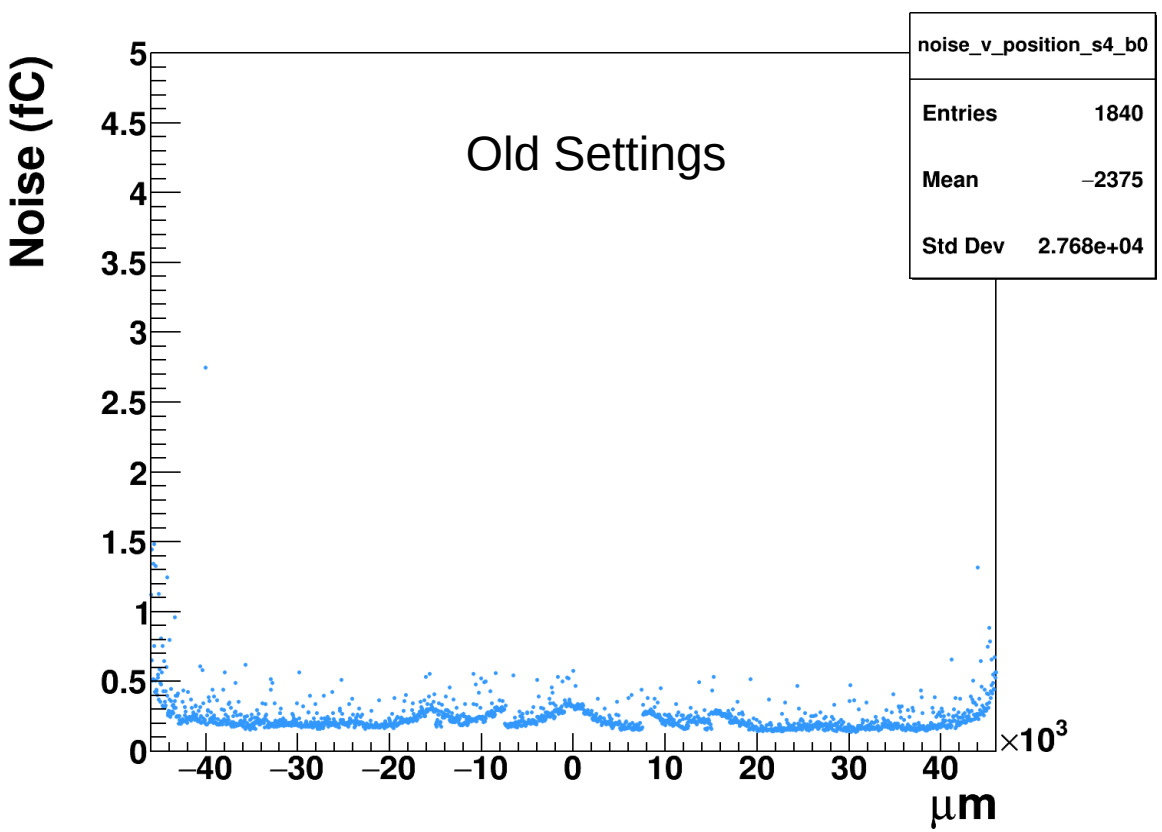
- They produce massive differences for one sensor in particular
- Below is a noise distribution over the whole sensor for S43. The sensor which I previously called the worst sensor is still the worst can now also be used in the other sensor half

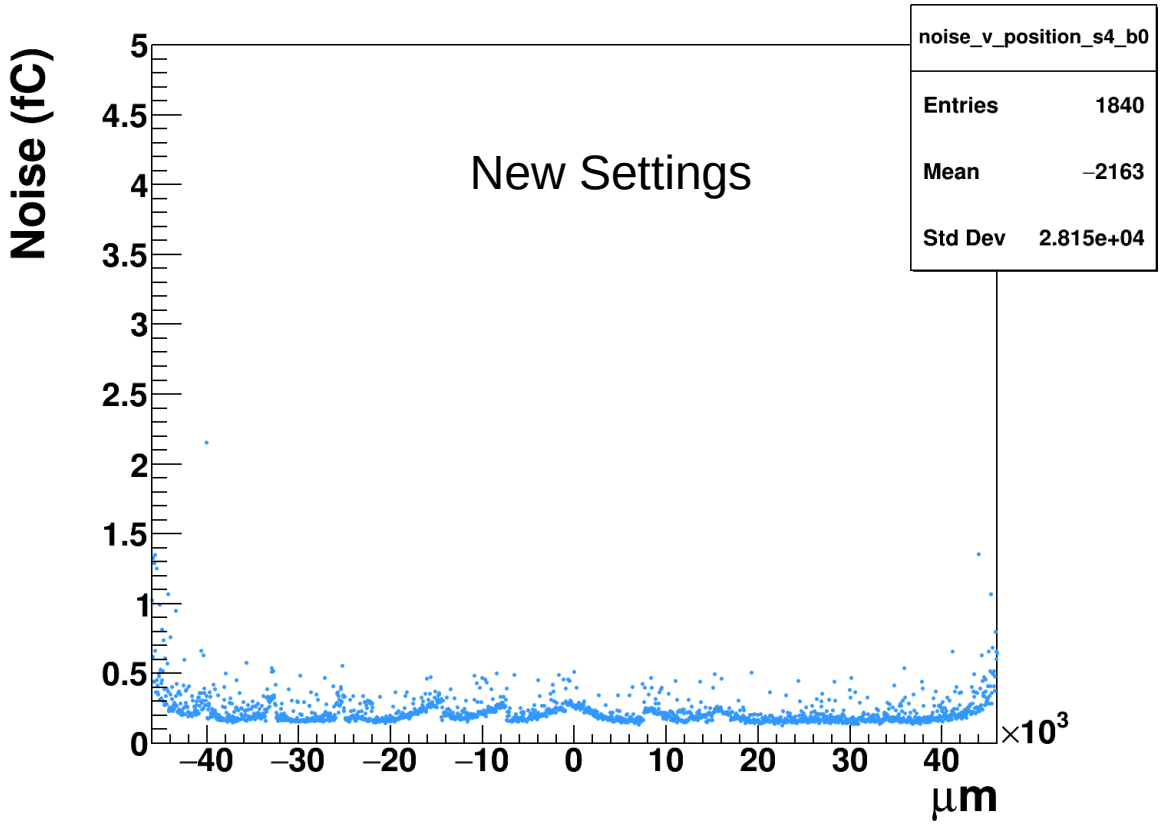




Impact of the different settings (S4)

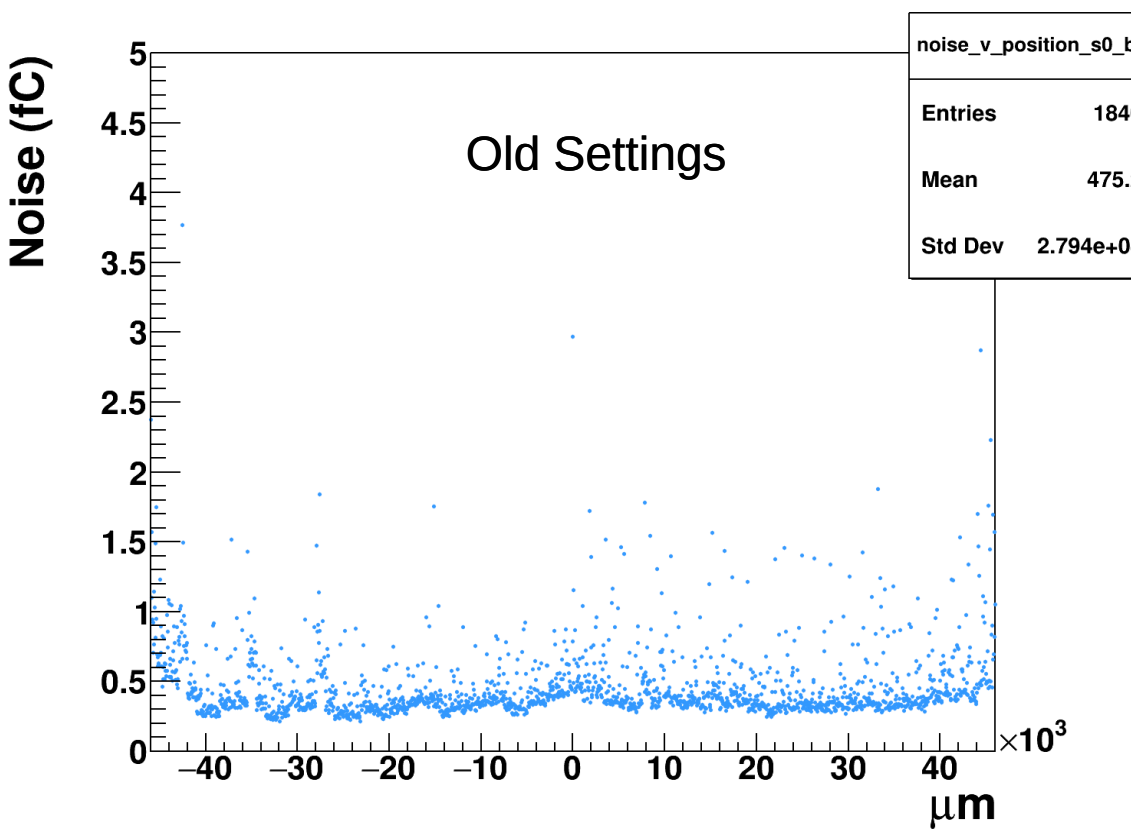
- For other sensors the impact is minimal

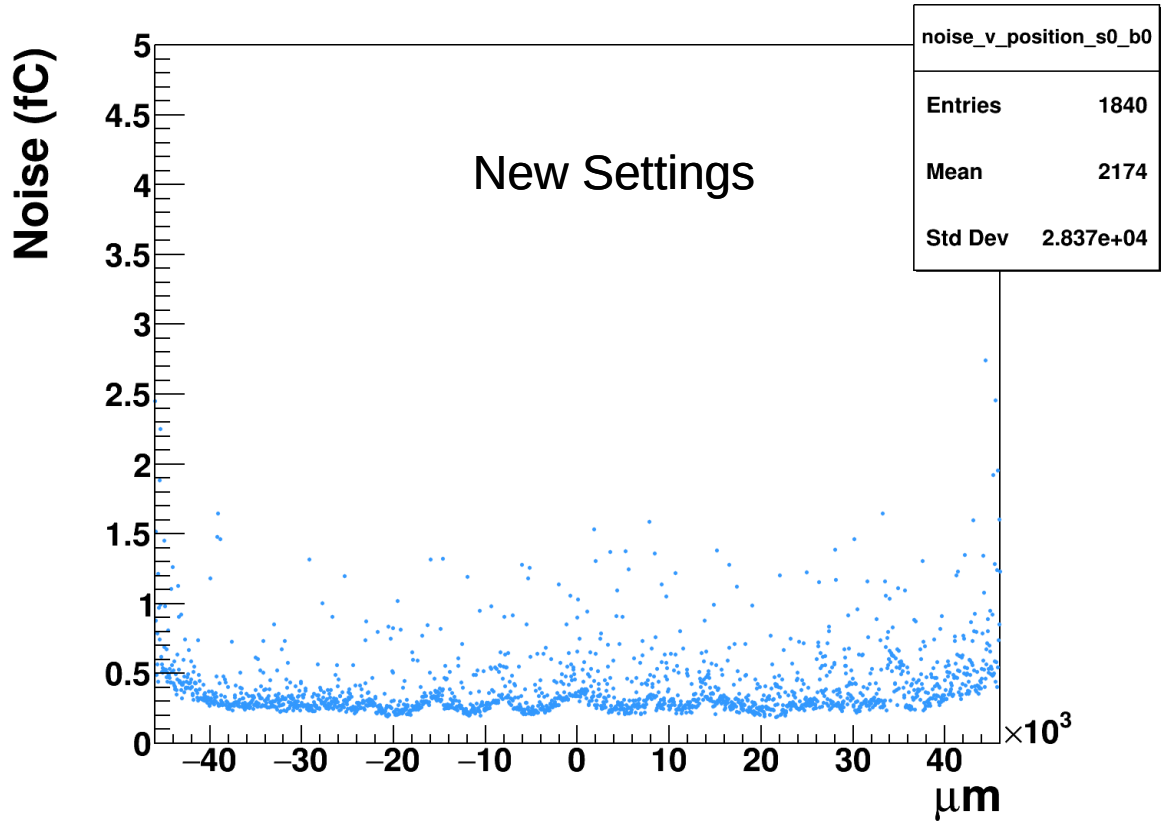




Impact of the different settings (S0)

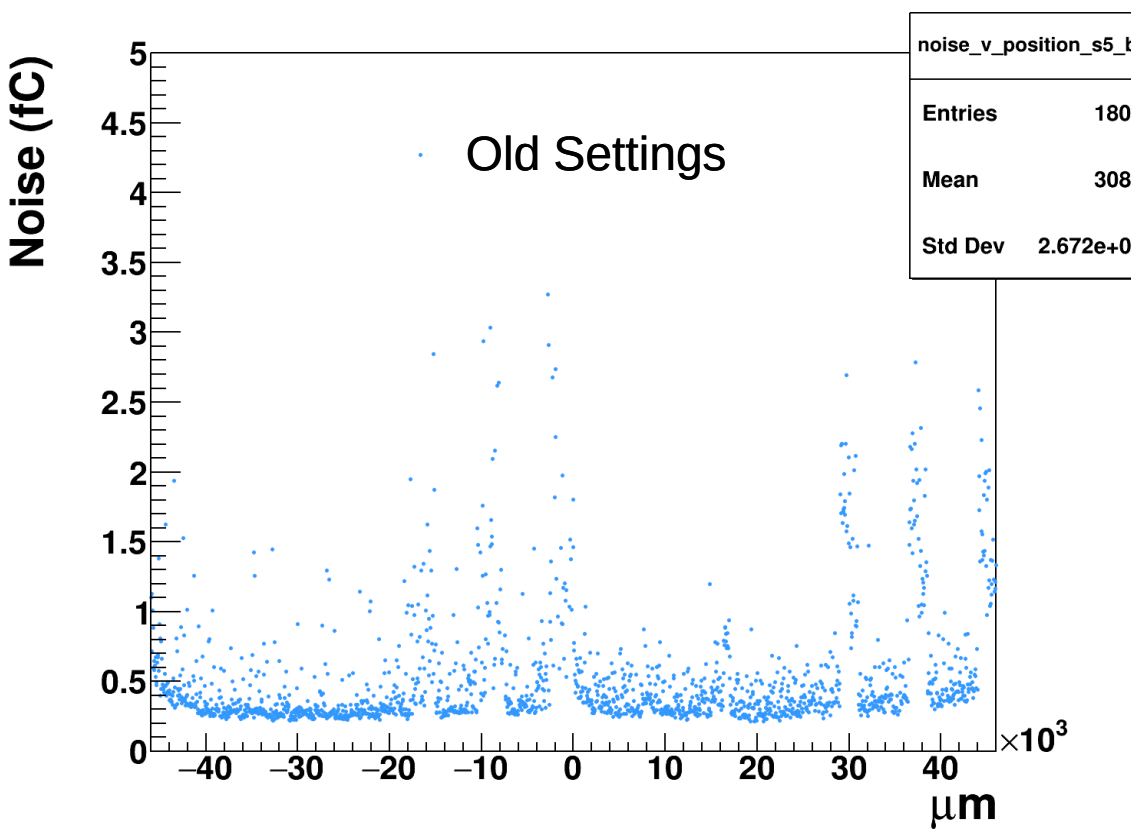
- For other sensors the impact is minimal

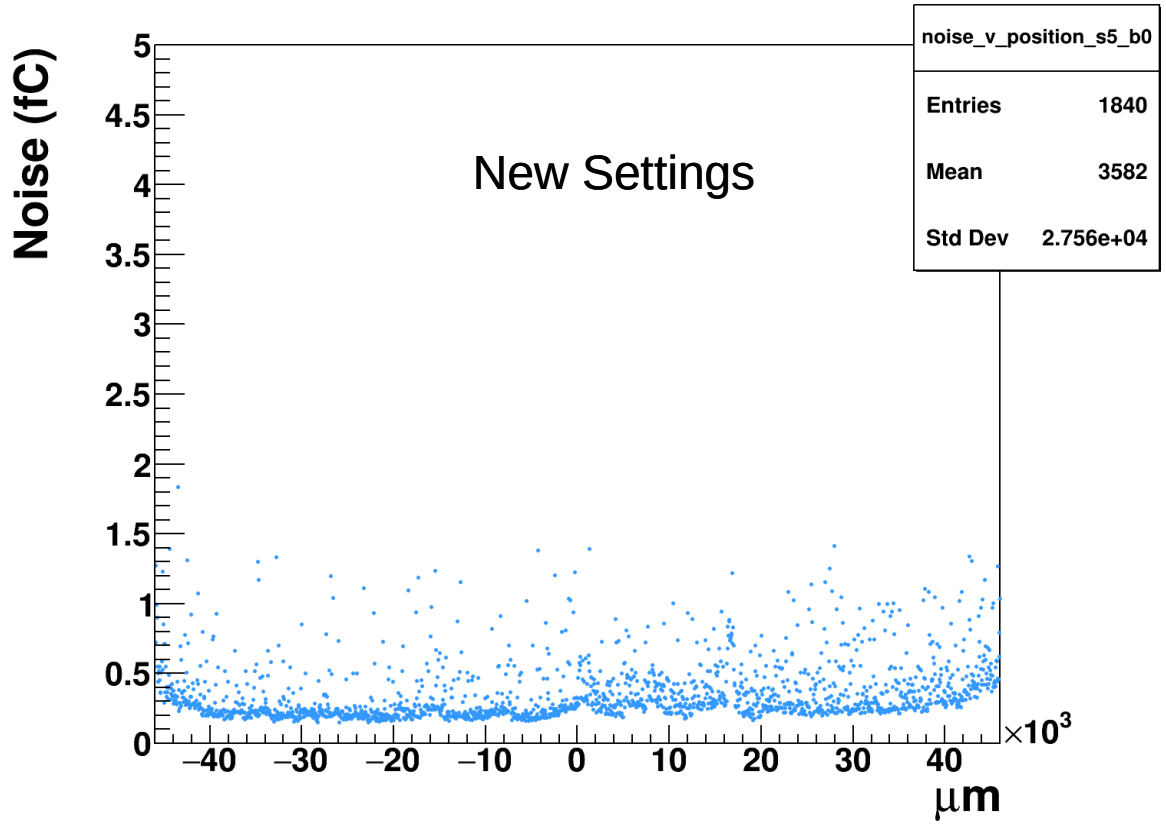




Impact of the different settings (S5)

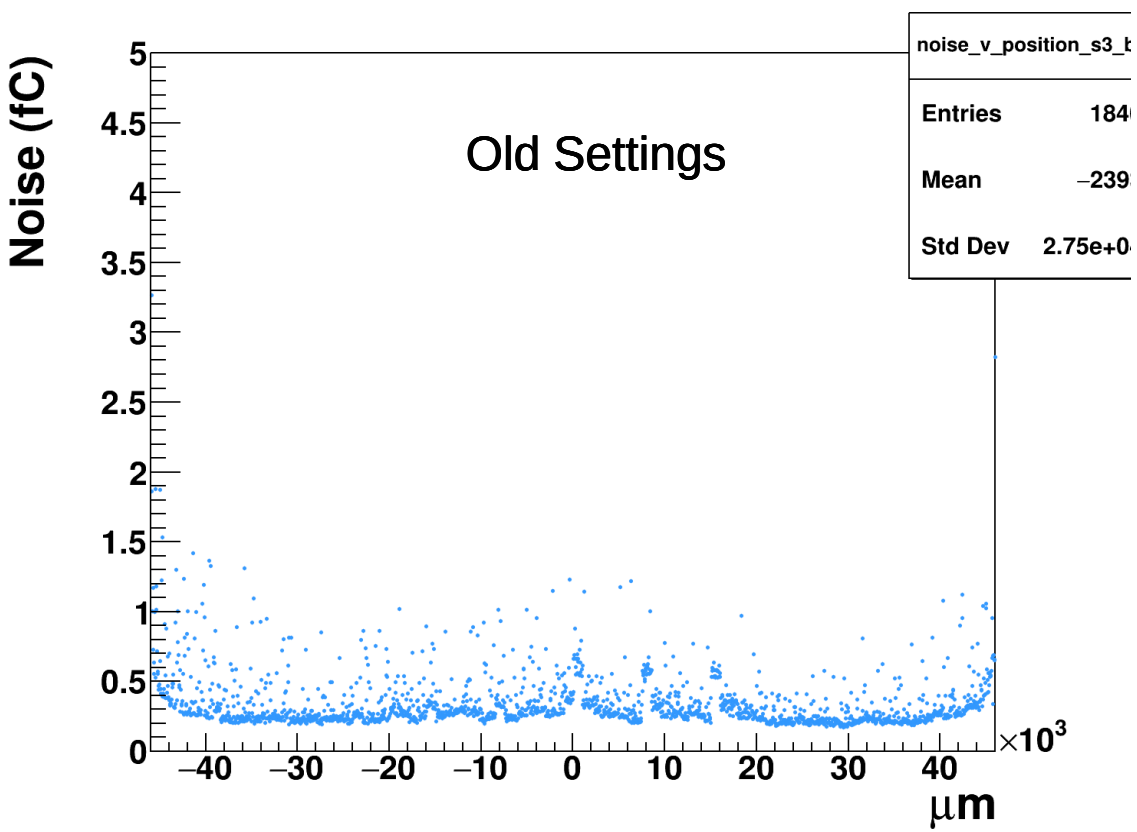
- For other sensors the impact is minimal
- Or also positive

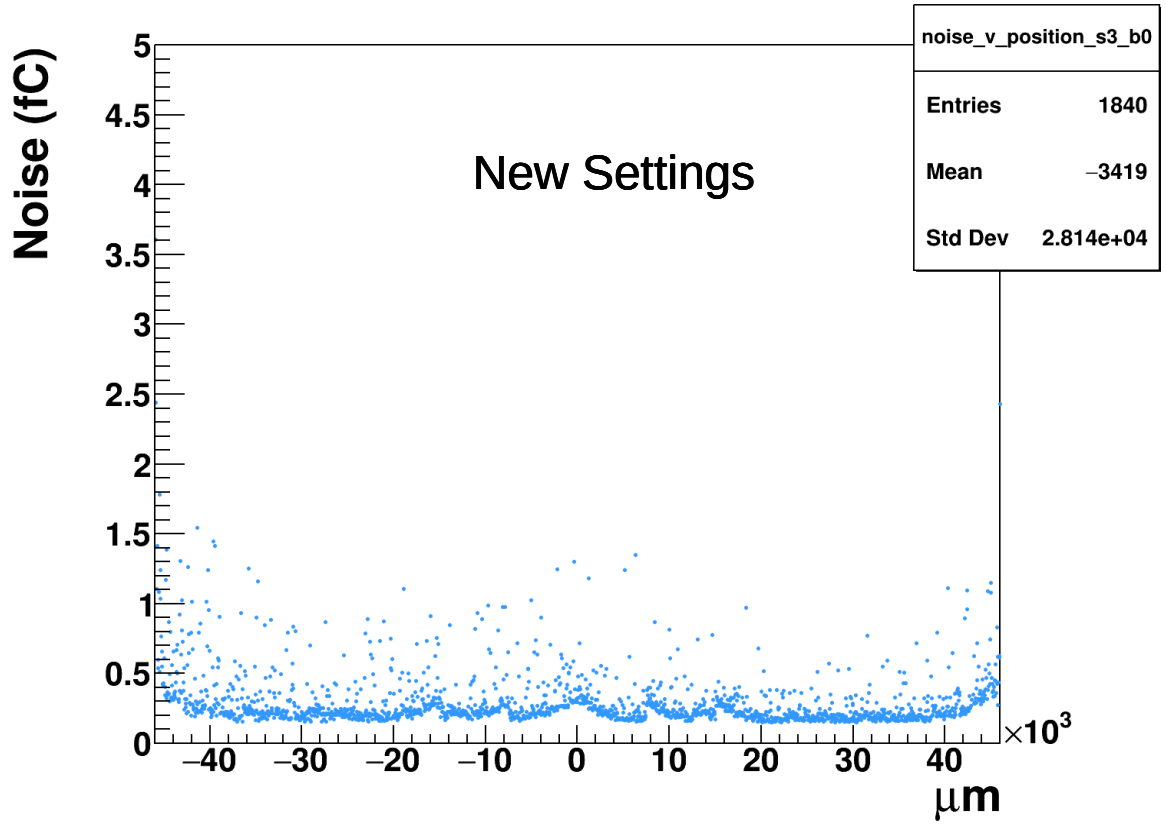




Impact of the different settings (S3)

- For other sensors the impact is minimal
- Or also positive





Impact of the different settings (S1)

- For other sensors the impact is minimal
- Or also positive