Temperature analysis

Amux cards calibration and first glance at CFD simulations

Nuetrino Oscillations group’s meeting
18/10/2018

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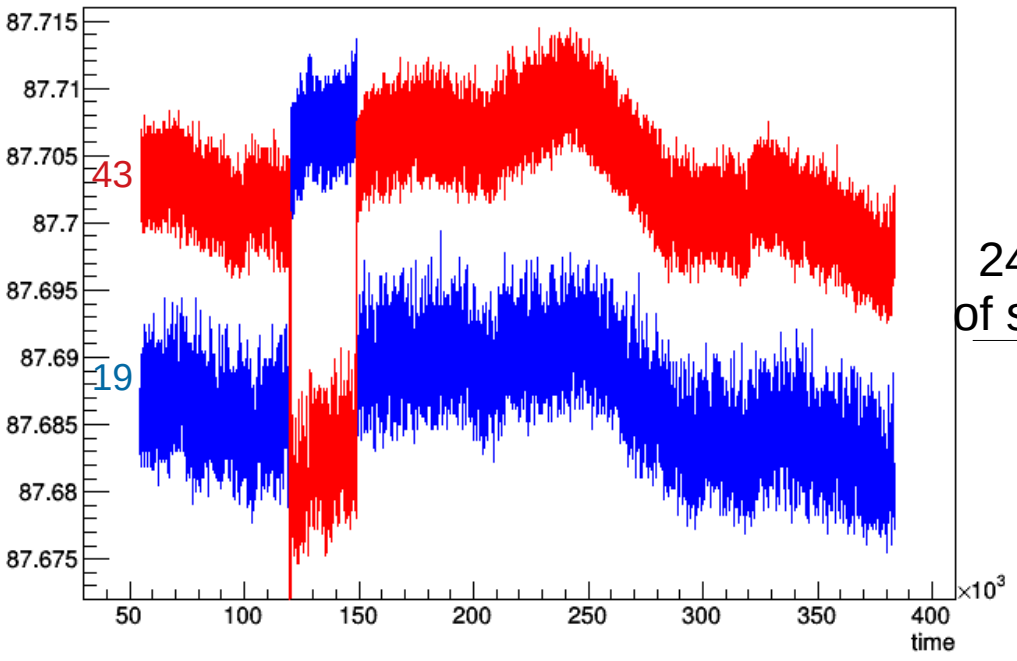
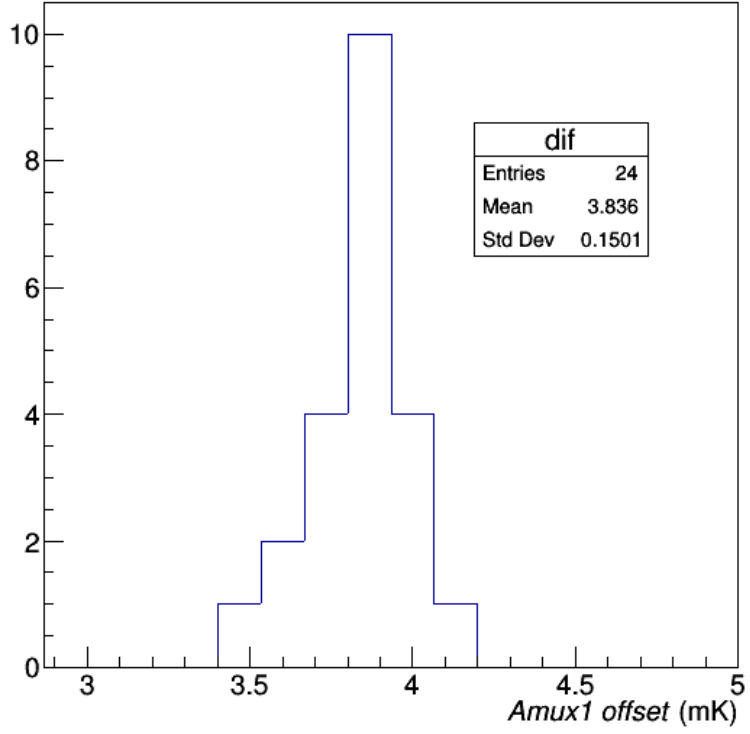
Amux cards offset

After last week's amux exchange we observed an electronic offset between both amux cards.

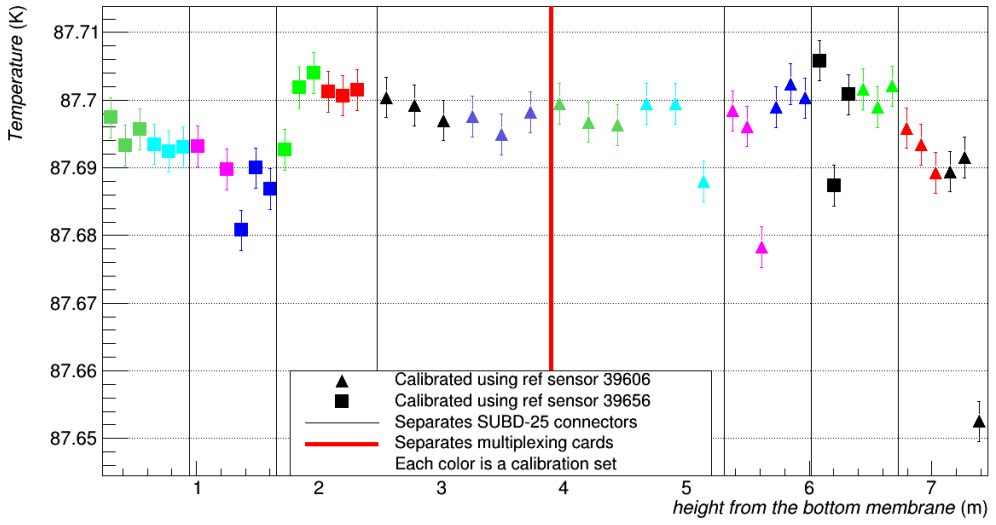
Xavier repeated the exchange on Friday and this offset was spotted again.



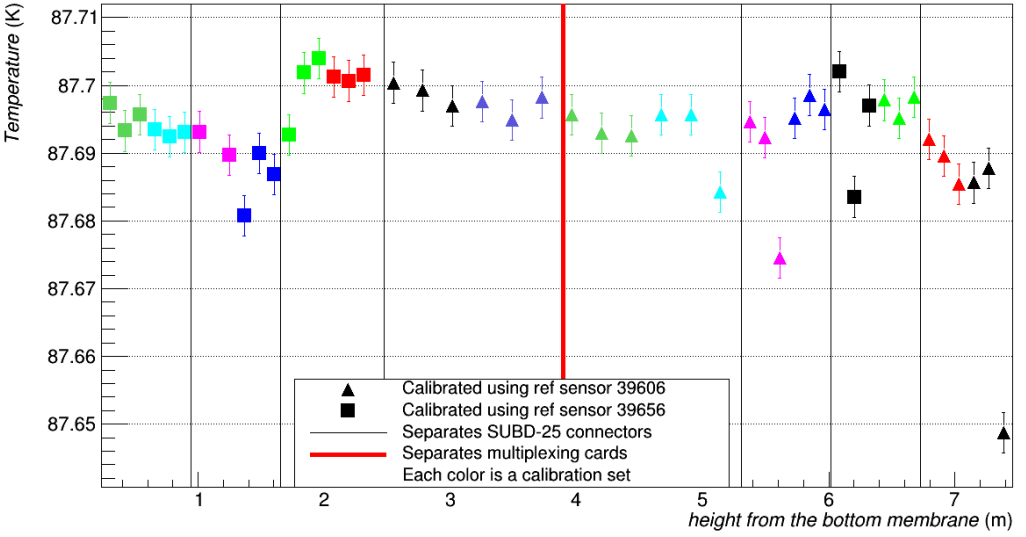
24 pairs of sensors



Amux cards offset



w/o offset

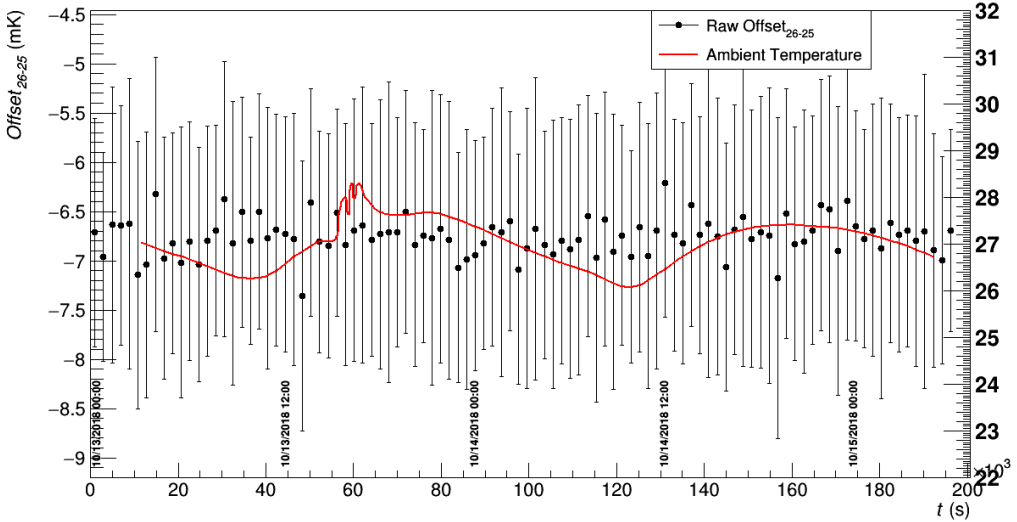


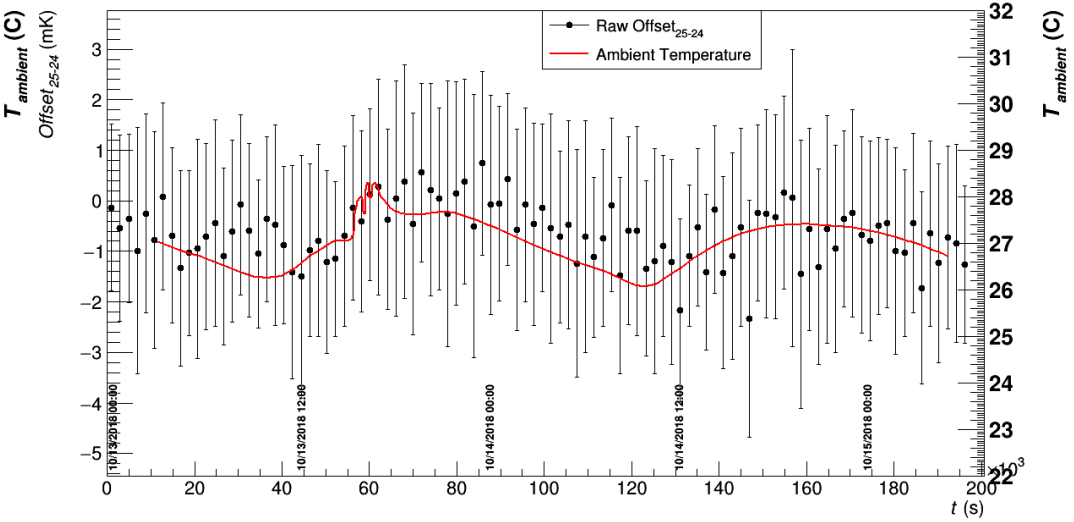
with offset

It is not a bigg difference but trying to measure very low temperature gradient it is important.

However, an offset of 4 mK implies a very good calibration between amux cards.

As this offset seems to having appeared all of a sudden we should check it regularly.

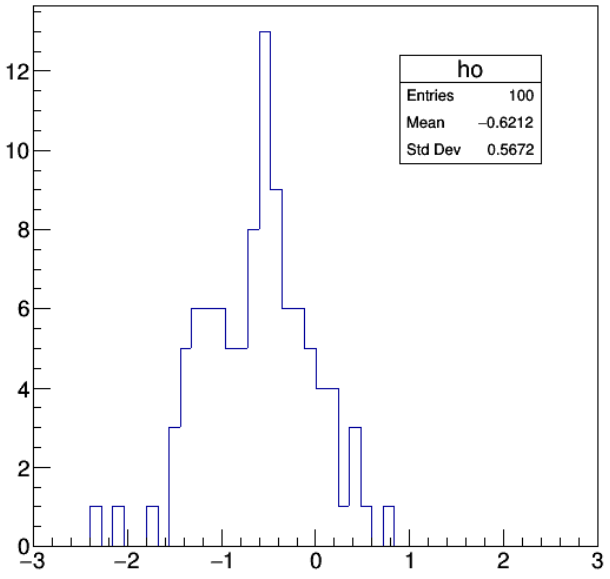




It seems that offset betweend amux cards is related with ambient temperature.

This variation has an RMS of 0.6 mK, which is very good.

In other words, electronics seems to be working perfectly.

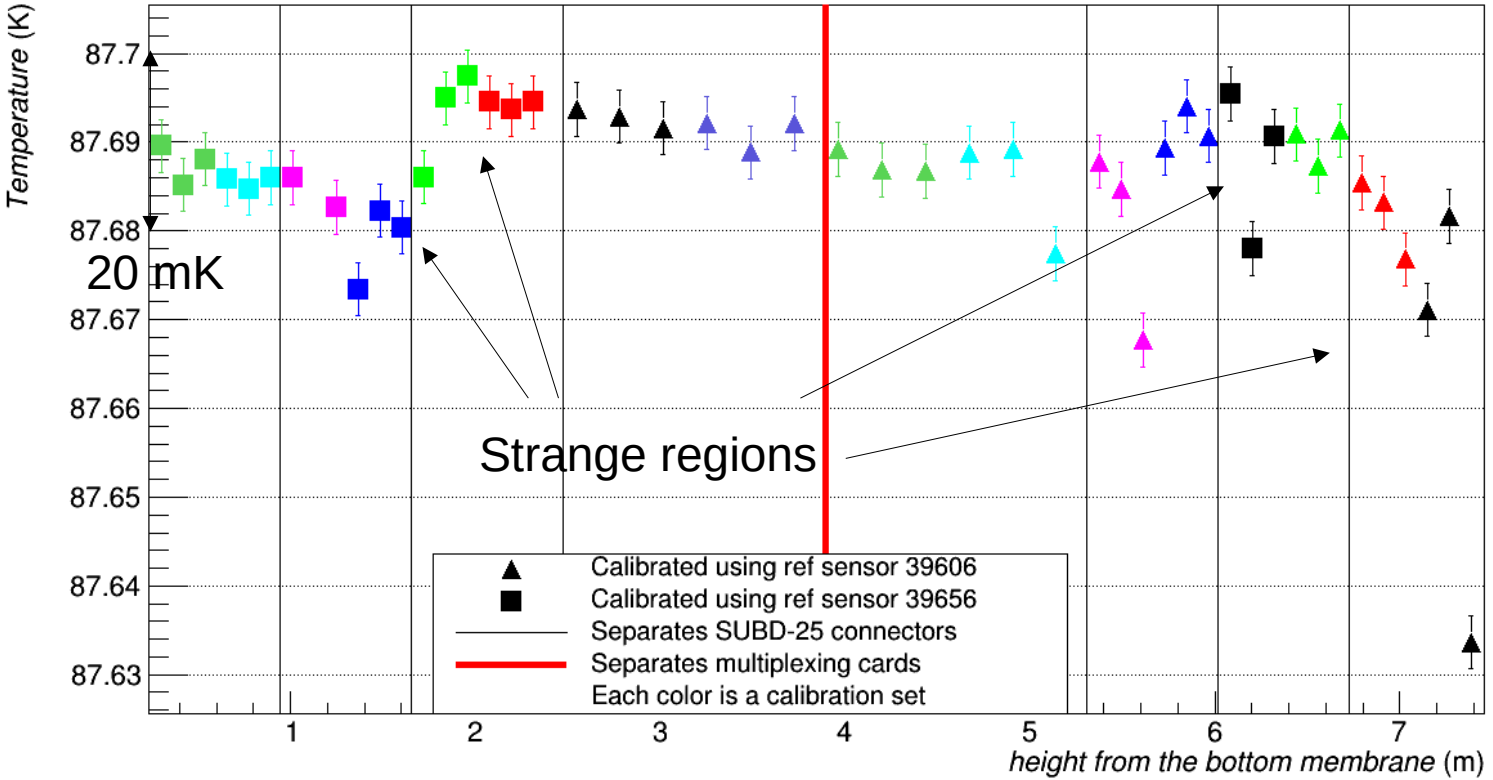


projection

CFD comparison: Valencia actual profile

Dakota folks have provided us the first data concerning Valencia sensors' planes.

This is a very first step in which we want to compare generally and try to set the simulation conditions.



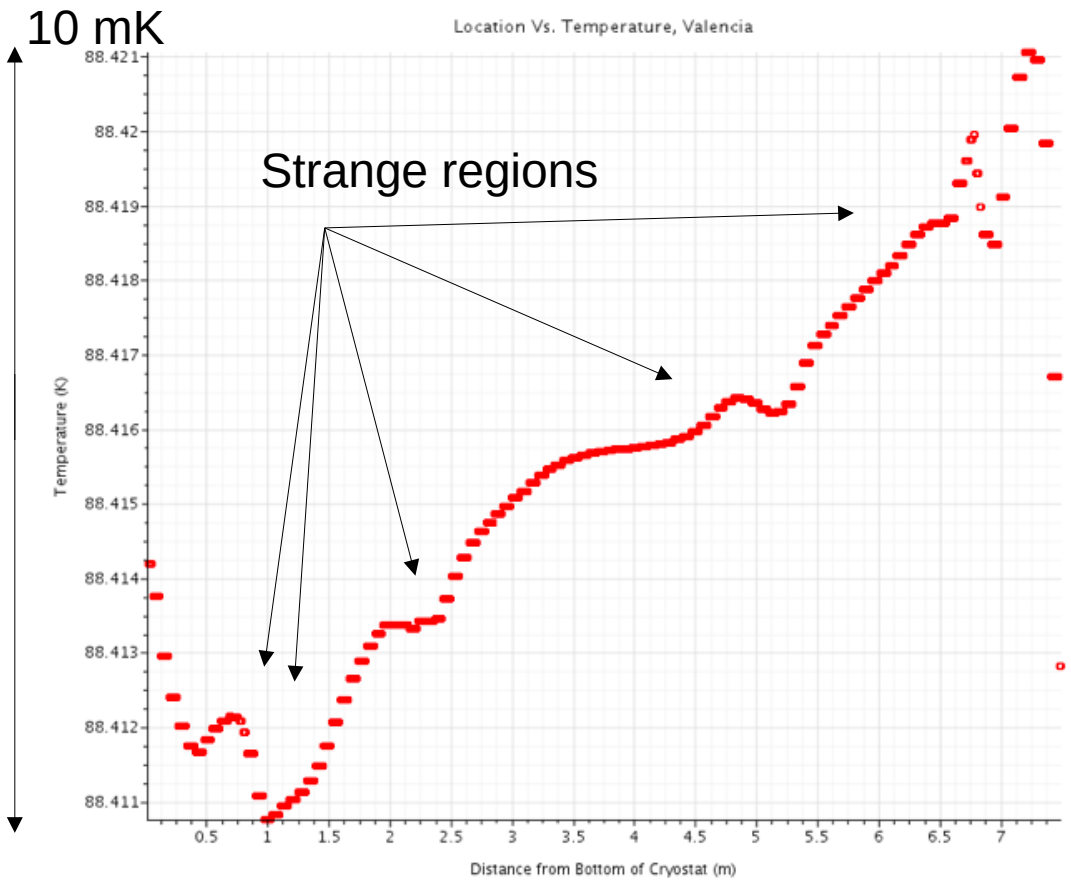
It is around 87.7 K.

It shows that temperature is within 20 mK.

It actually shows a non-intuitive shape:

- It does not grow or decrease continiusly.
- It shows jumps.

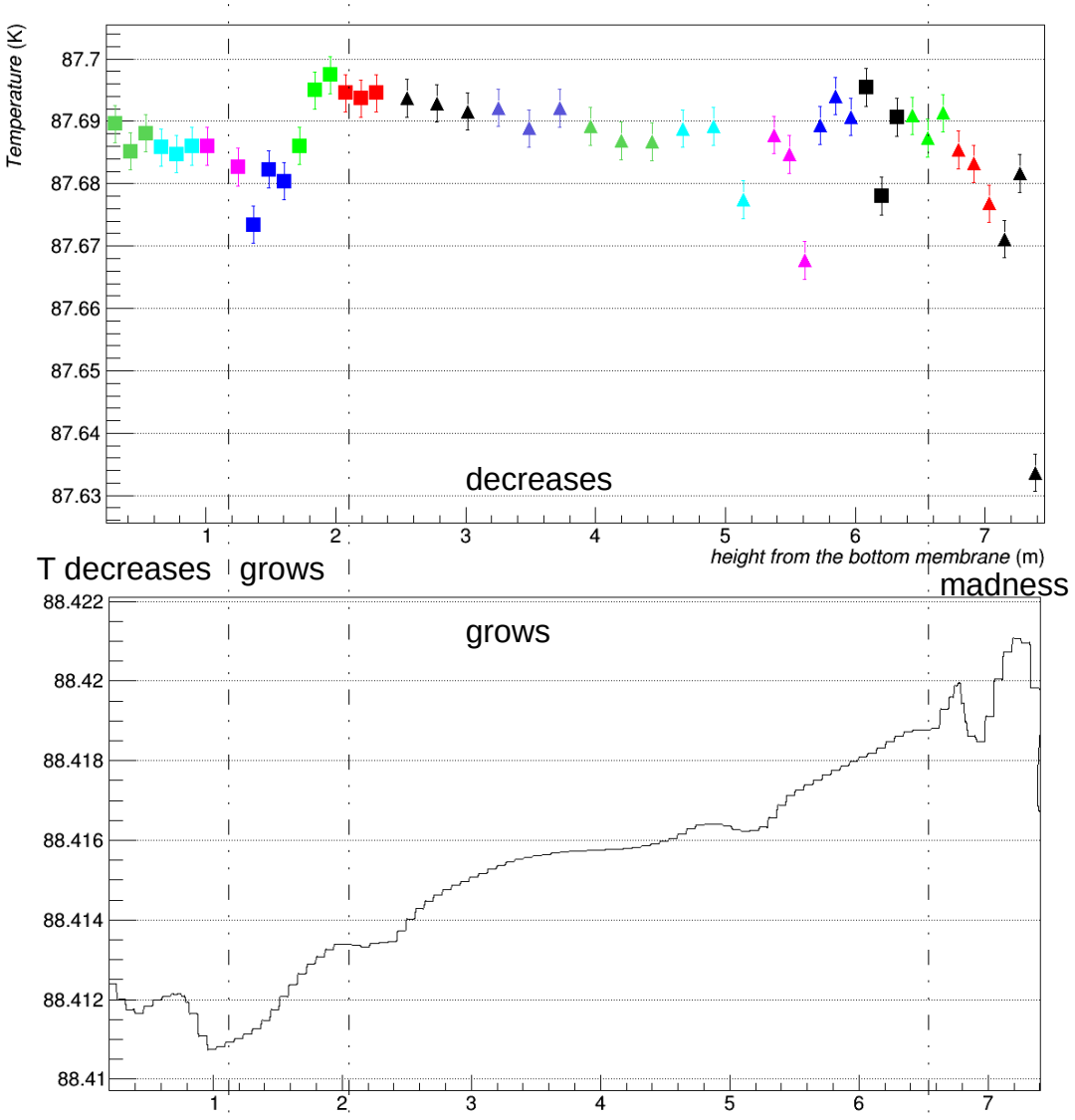
CFD comparison: first CFD results



It is around 88.4 mK. Boundary conditions should be correctly fixed.

It shows that temperature is within 10 mK.

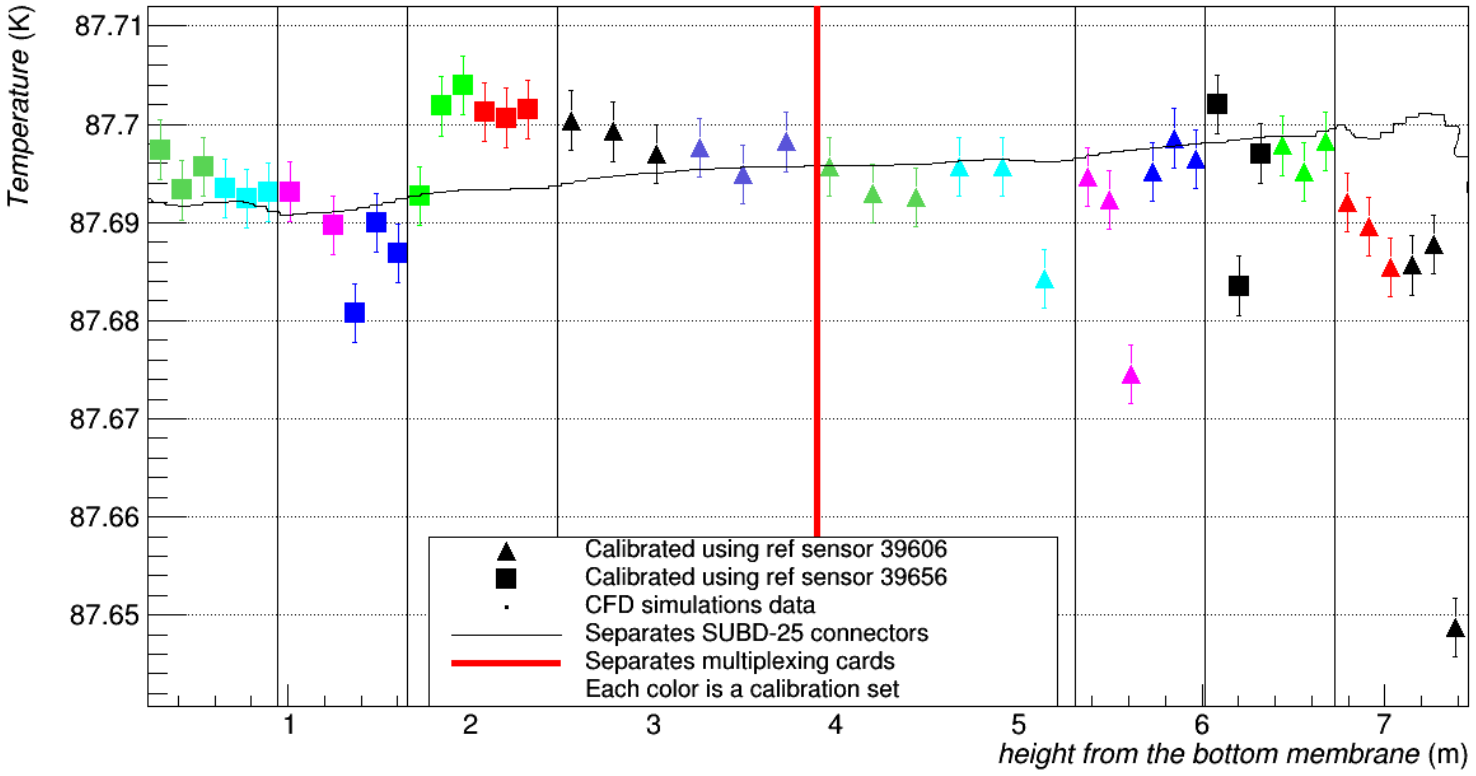
Ignoring some bumps, the profile basically decreases from 0 to 1 m and after that grows.



Although it is still very soon to compare and try to get important conclusions, it is worth to notice that some behaviors on the lower part of the cryostat are similar in real data and simulations except for a scale factor.

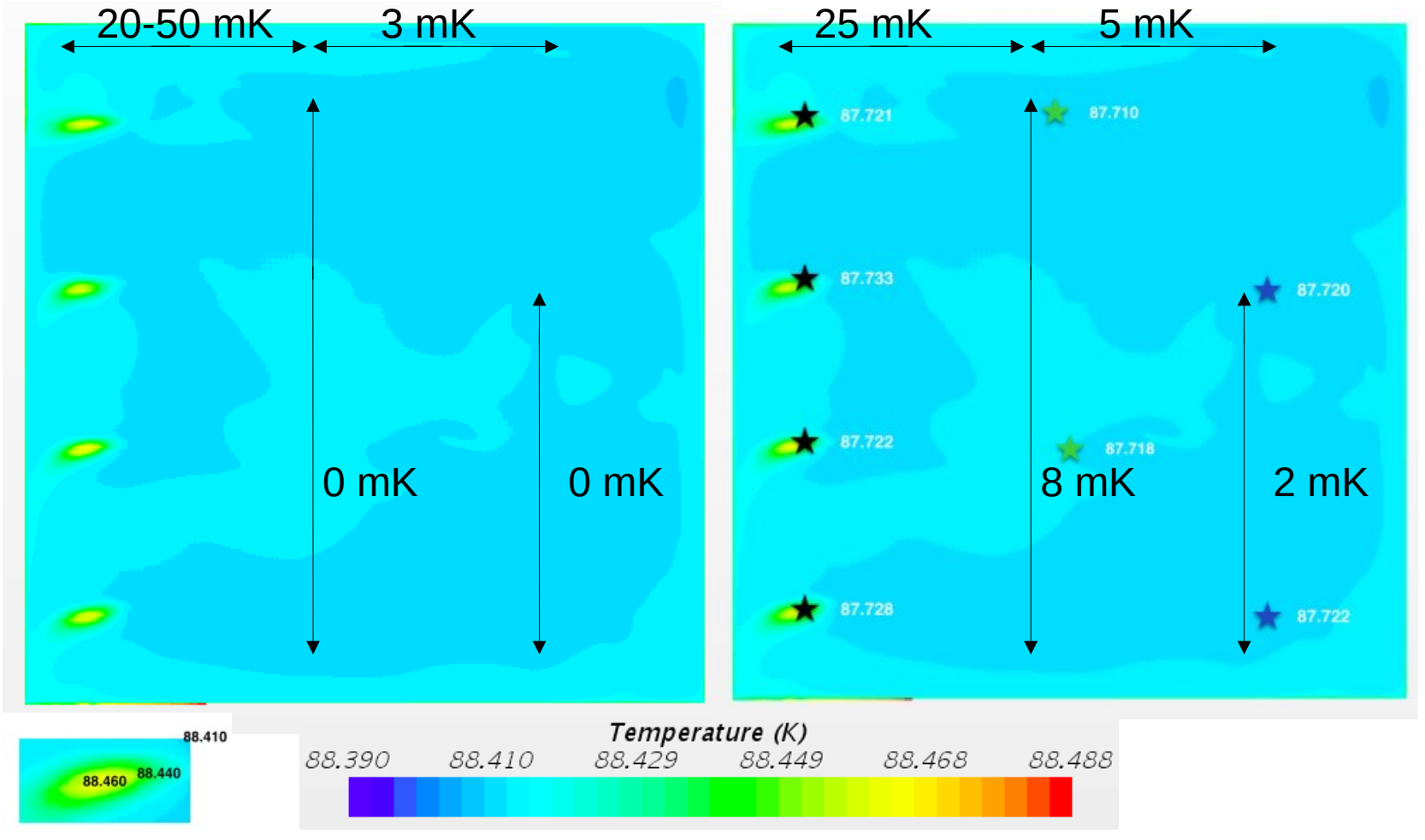
Despite general behavior, real data seems to ‘go downwards’ manwhile simulations seem to ‘go upwards’.

CFD comparison



If both datasets are overlapped we see that they are mostly within 15 mK but their tendences are different

CFD comparison: top pipes sensors



Conclusions

Everything that could be generating the profile’s jump has been studied and nothing seems to point to a sistematic. The only thing that remains without checking is the ‘cold side’ electronics, which can’t be tested → it could really be real.

We have seen on CFD data that temperature profile shows a non-trivial shape but with a scale factor x3 lower.

In general real data and simulated data do not match but we first have to set boundary conditions to perform again simulations closer to protoDUNE-SP reality.

The most important thing is that we have started to speak with Dakota folks and in the next days we expect to keep making some progress.