Report on GEM signal

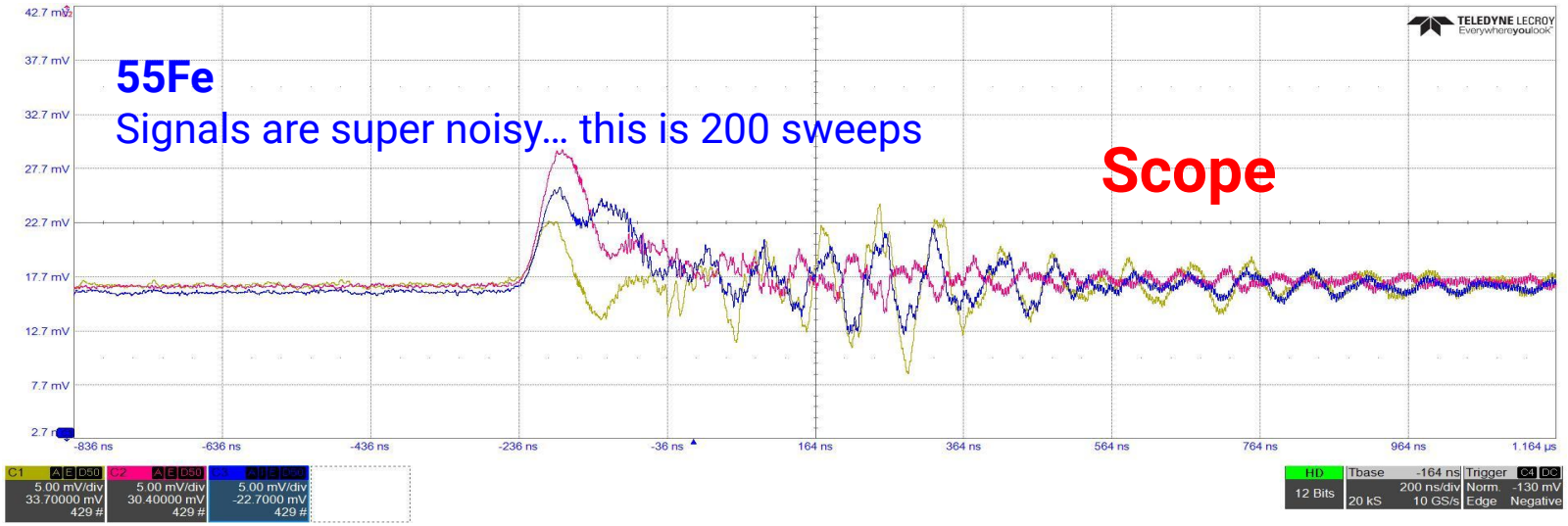
19/09/2024

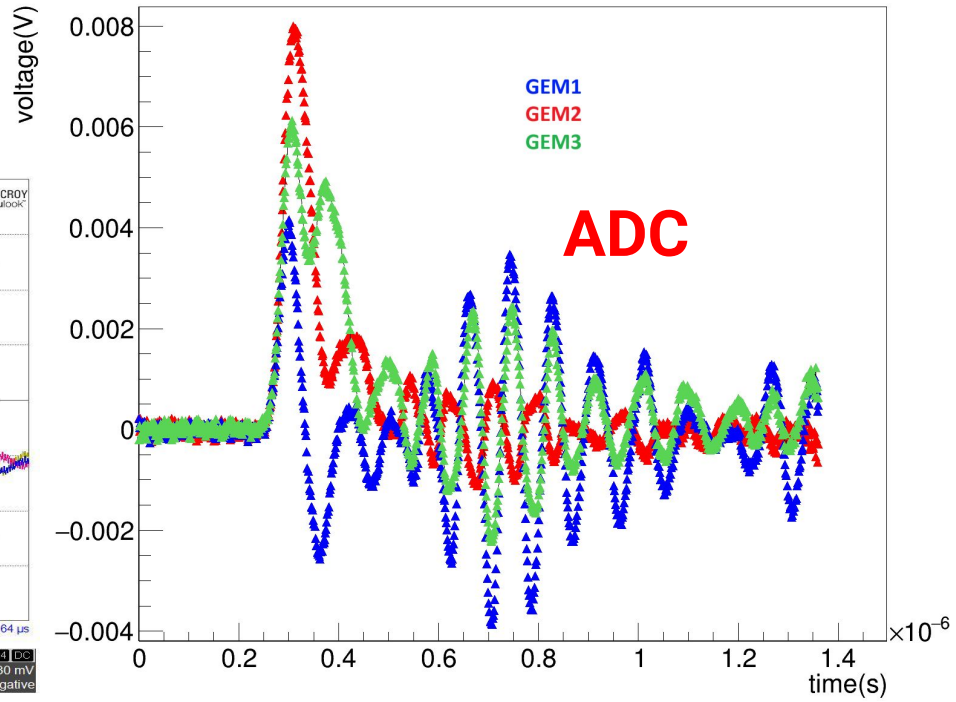
GEM signals

- Calibration run with 55Fe
- I'm reading the GEM signal
  - Matching the ADC impedance (we're reading half of the V)
  - removing the amplification (G=10)
  - sampling 4ns
- Code: [fiorotto8/GEMsignals_LIME (github.com)]

Observation:

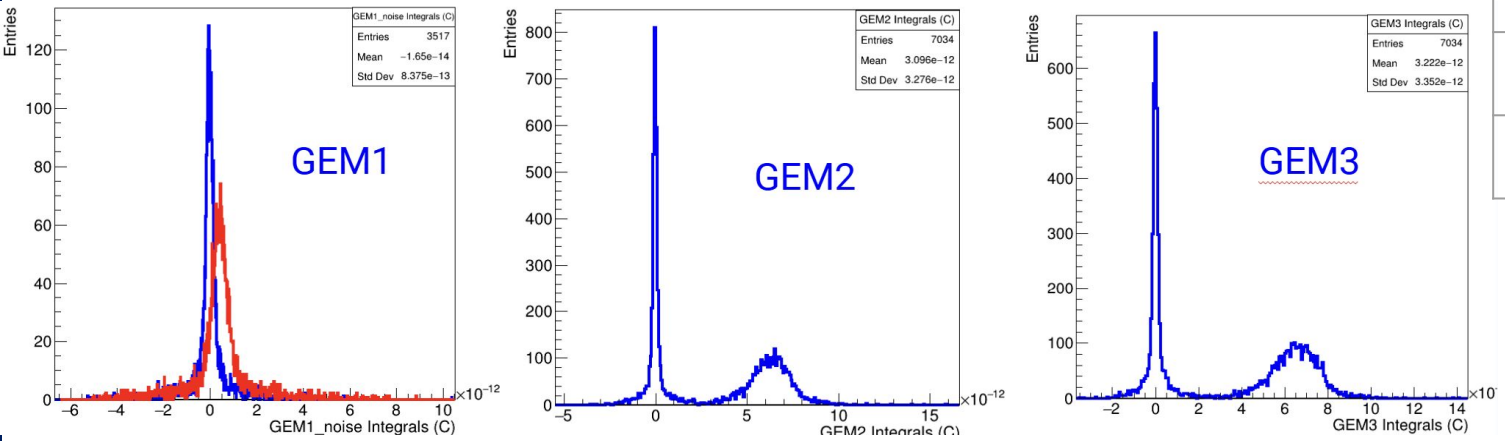
- Signals are super noisy
- There are reflections (no impedance matched)
- Post signal noise (crosstalk/ringing?)

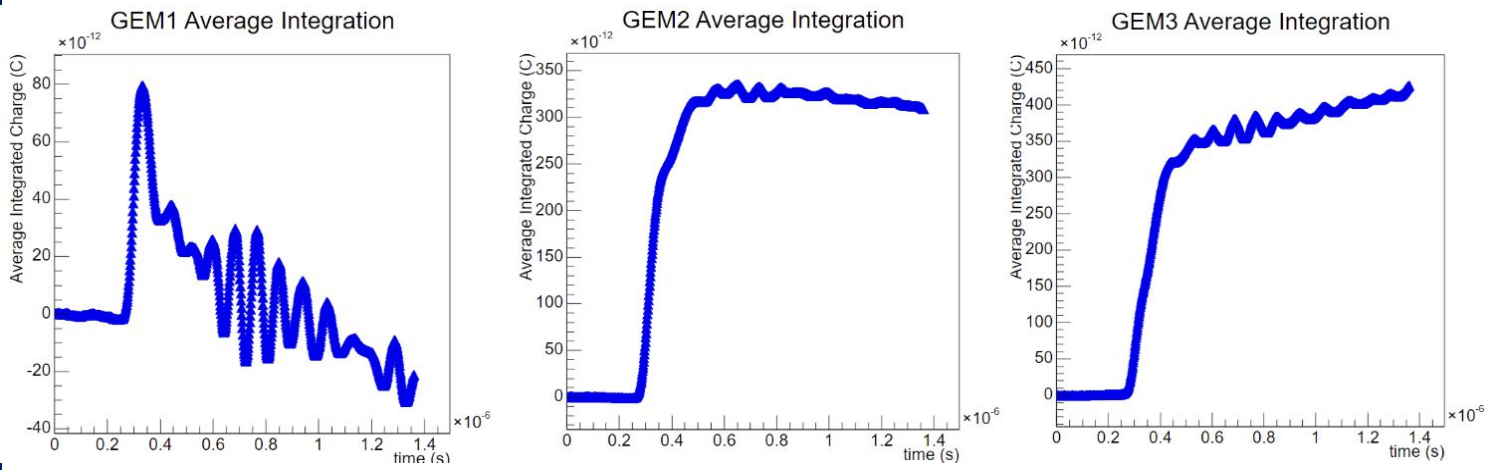




Gain Estimation

Try to estimate the Gain with *software*
integral of the signal and **signal integration**





	integral of signal Effective gain (n0=150)	Signal integration Effective gain (n0=150)
GEM1	1.8E4	3.3E4
GEM2	1.3E5	1.3E5
GEM3	1.37E5	1.4E5

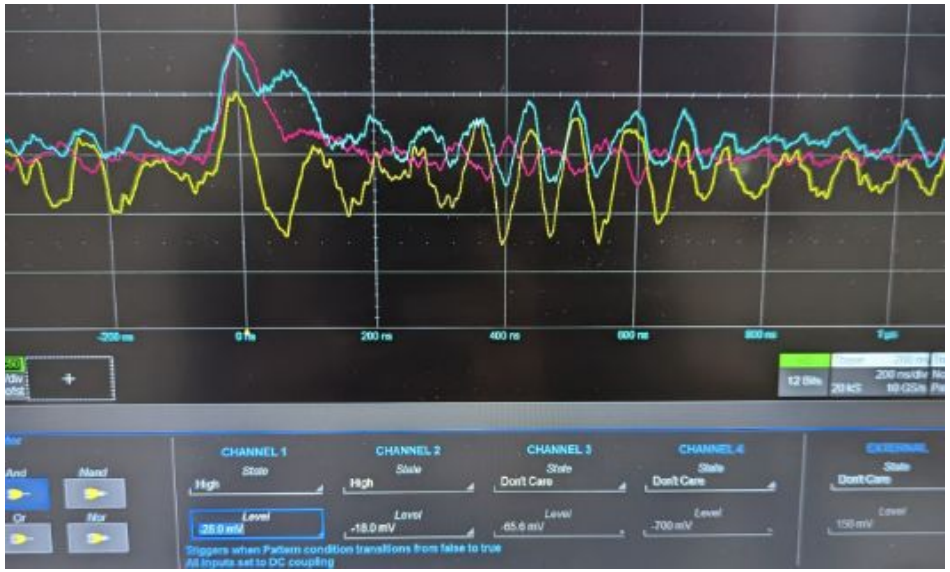
- Numbers are almost compatible
- However they do not make a lot of sense…
- So what to do?

Test with Scope

Find a way to trigger signals without GEM3:

- AND trigger on GEM1 and GEM2

These are the signals... now, what do you expect to happen if I switch OFF GEM3?



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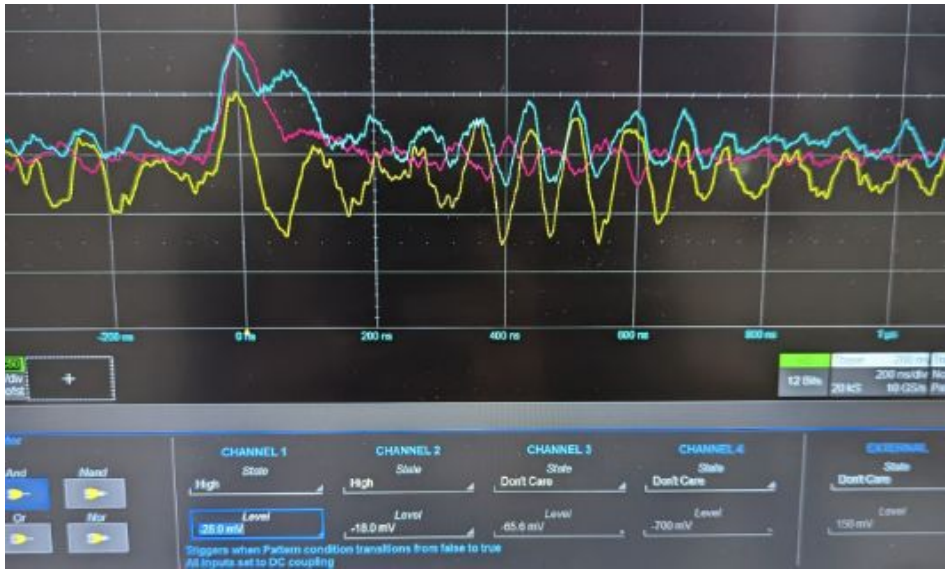

FLATLINE

no signals at all

i.e. all the signals we see are the GEM3 signals coupled to the other electrodes….

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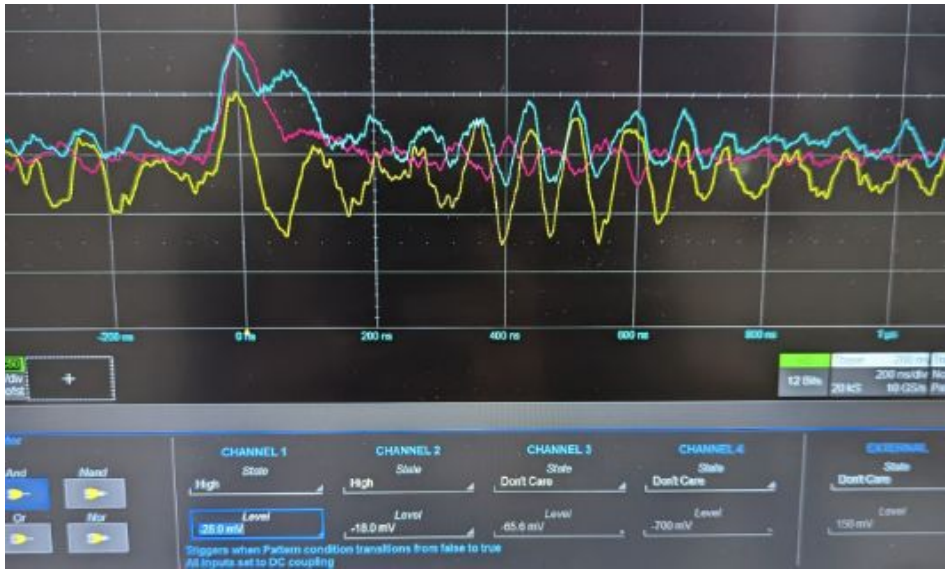

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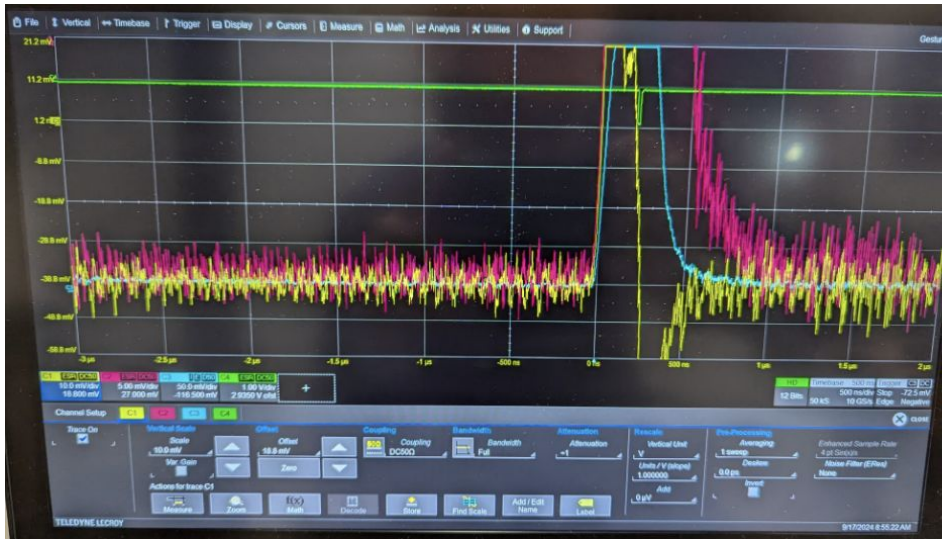
Also checking on huge signals, no sign of GEM1 or GEM2….



Conclusion

We Know:

Lack of information about GEM coupling and routing:

- Impedance Mismatch
- noise
- Possible signal filtering
- Unable to quantify data from GEM readout

It is clear that what we observe is just due to GEM3 amplification.

We don't know if:

- It is not possible to get single GEM signal
- We are just too coupled to GEM3

However, if we decide to take this path also for CYGNO04, we should not repeat the same errors we did in LIME