MultiMesh-Thick-GEM: preliminary negative ion data

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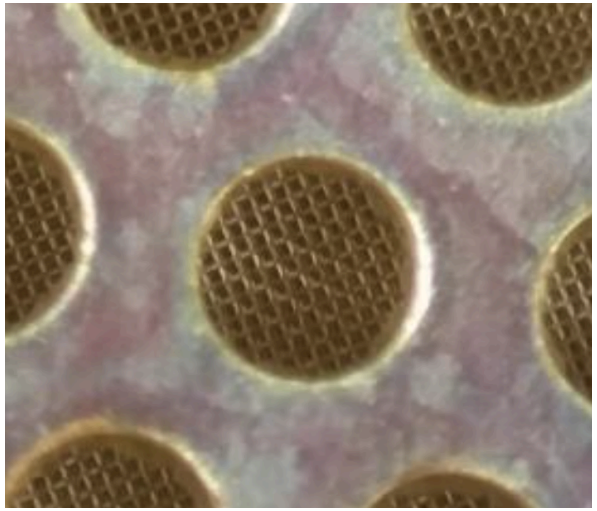
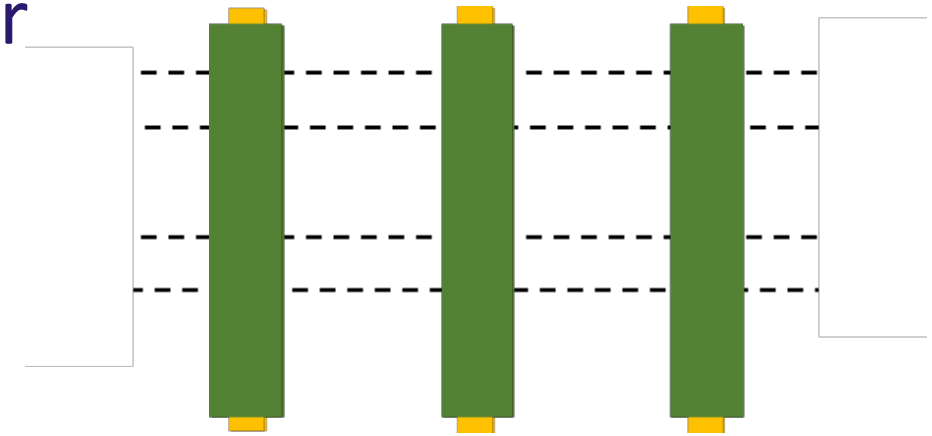
ThGEM

+ Large gain
+ self-supporting structure over large area
- Performance is very sensitive to defects
- Prone to damage from discharges while operating

MM-ThGEM

+ Large gain from multiple stages->up to as many as 10 meshes
+ self-supporting structure over large area
- Sensitive to dust
- More manufacturing steps

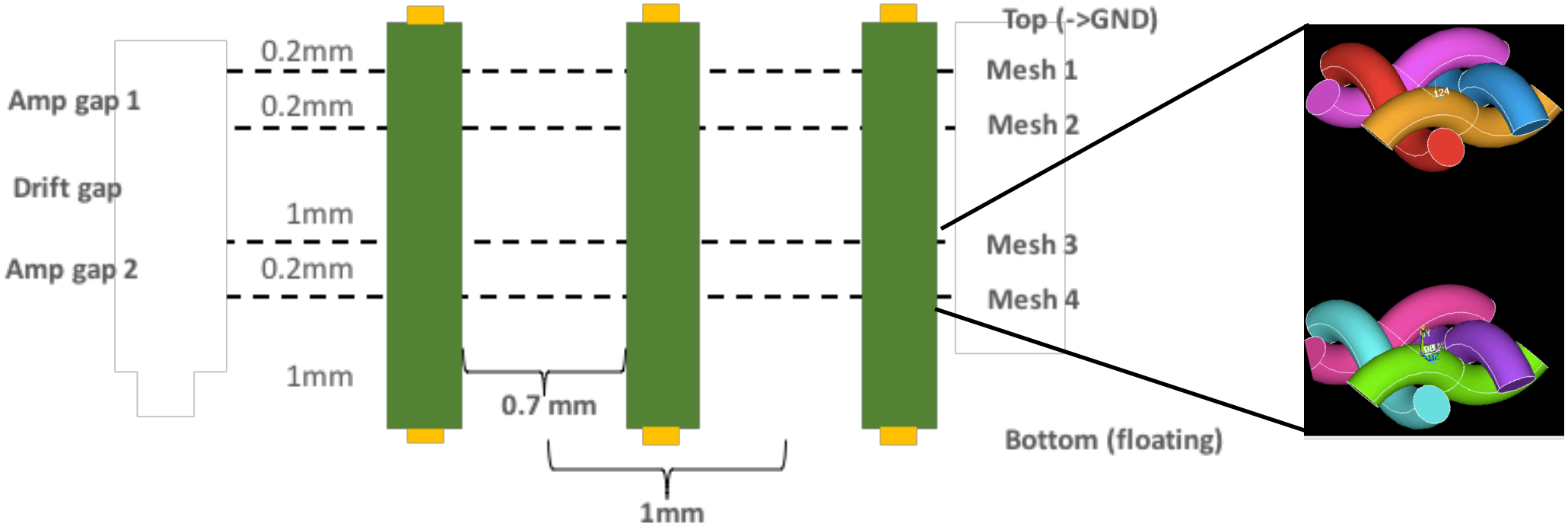




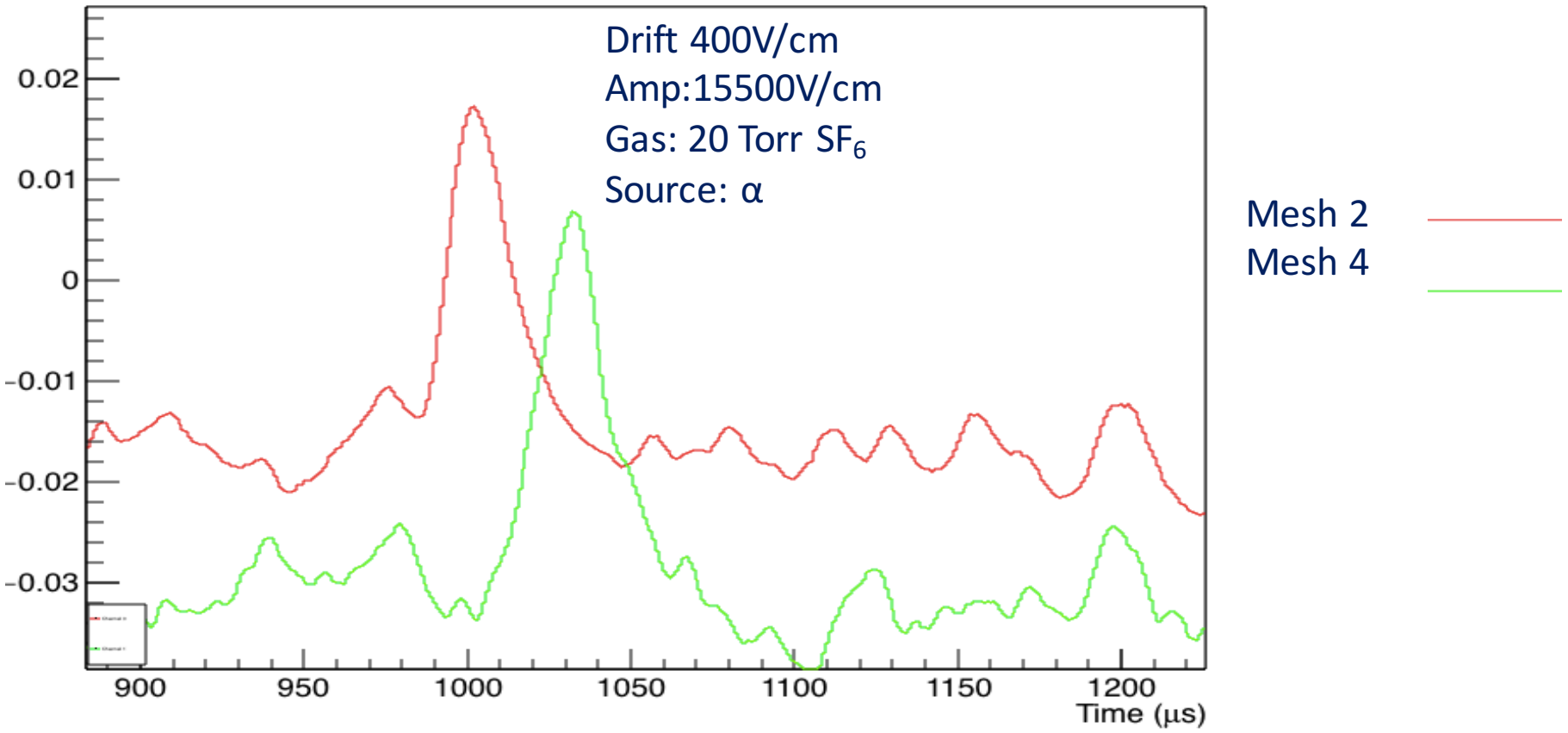
https://arxiv.org/abs/1804.04643

MM-ThGEM: dimensions

Wire thickness is 50um->needs to be considered for drift/amplification

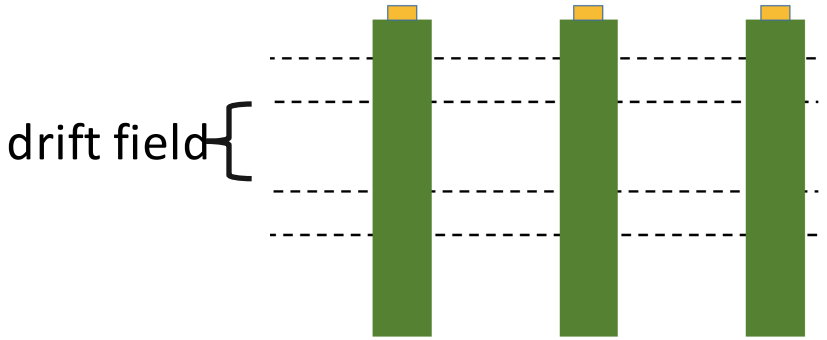


Alpha runs

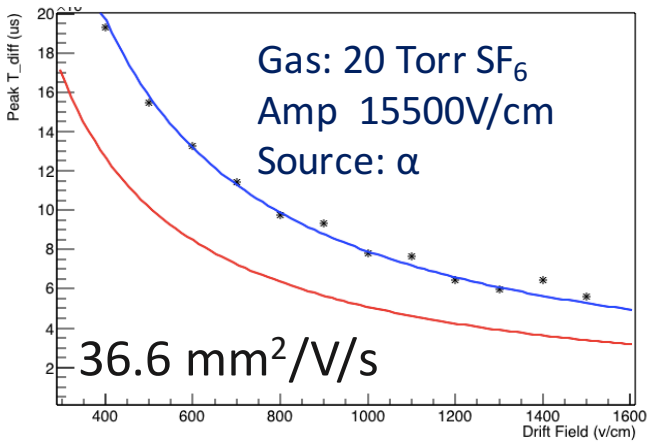


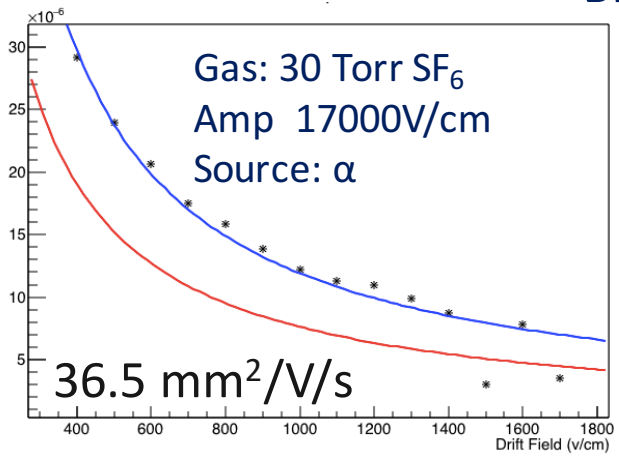
Drift field

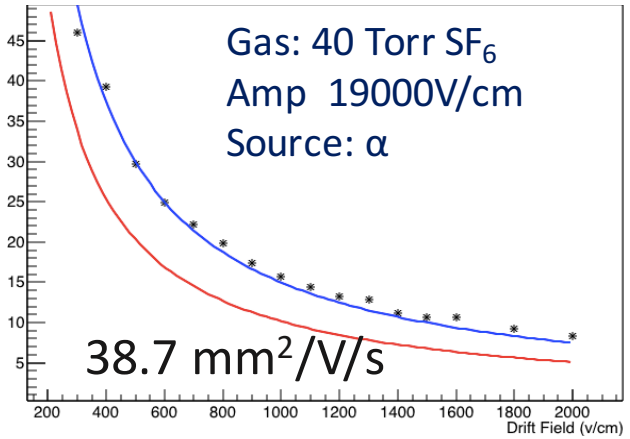
- Drift in gap is slower than expected
- Amplification time? – should be nanoseconds
- Not fully understanding detatchment?



Red: ion mobility = 57.0mm²/V/s
Blue: best fit ion mobility

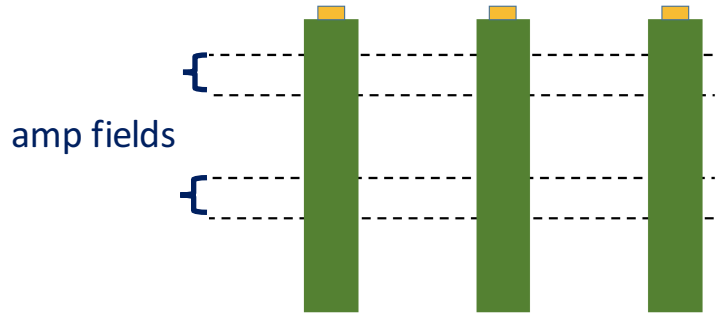


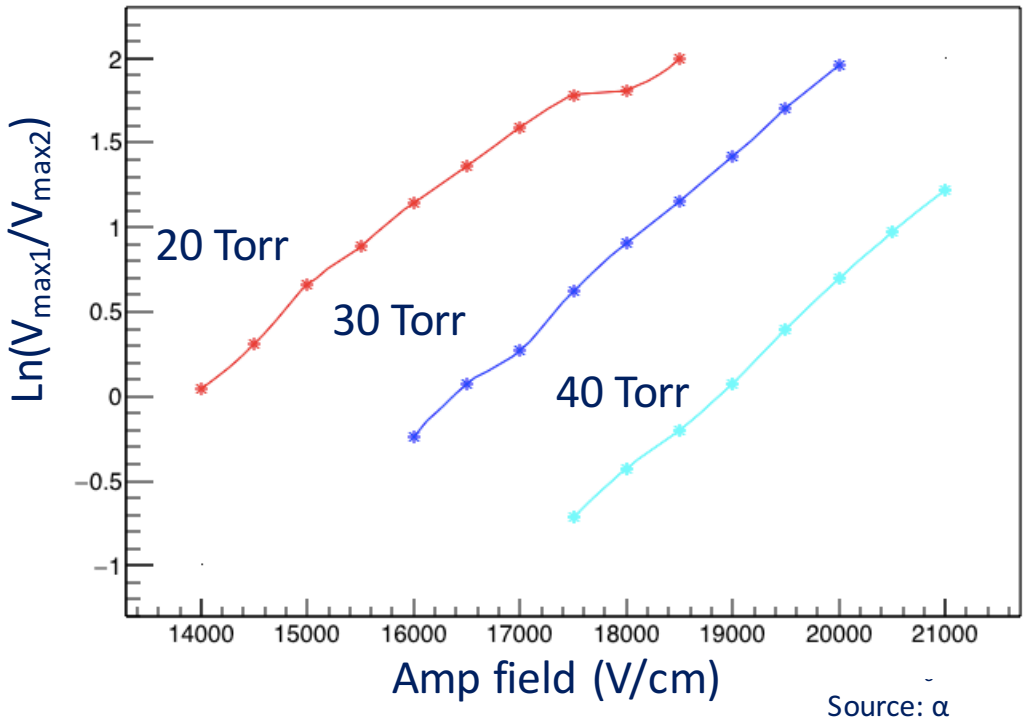




Amplification field

- Approximately log-lin relationship between signal ratio and amplification field
- V_{max1}/V_{max2} should be a proxy for the gain per stage.

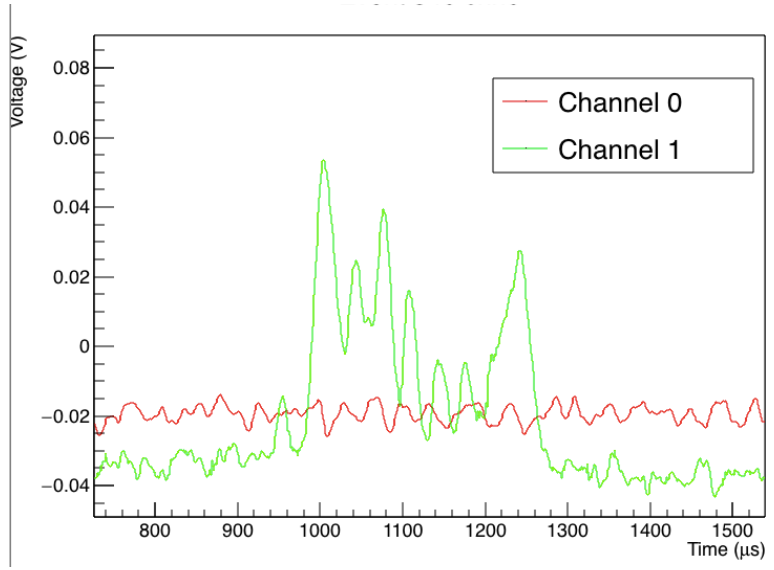


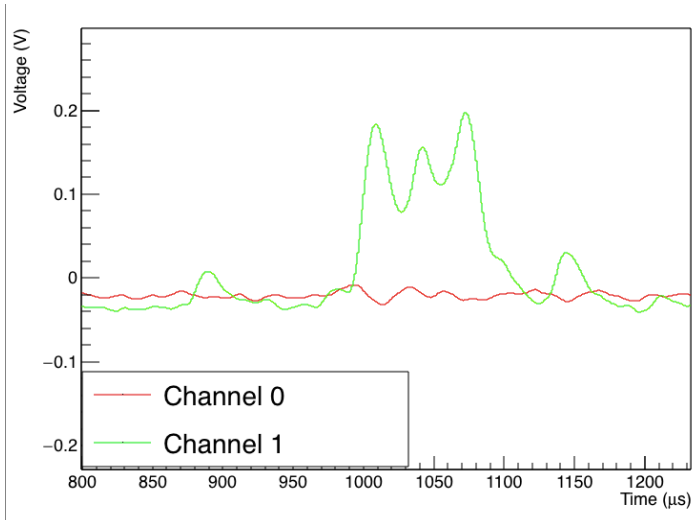


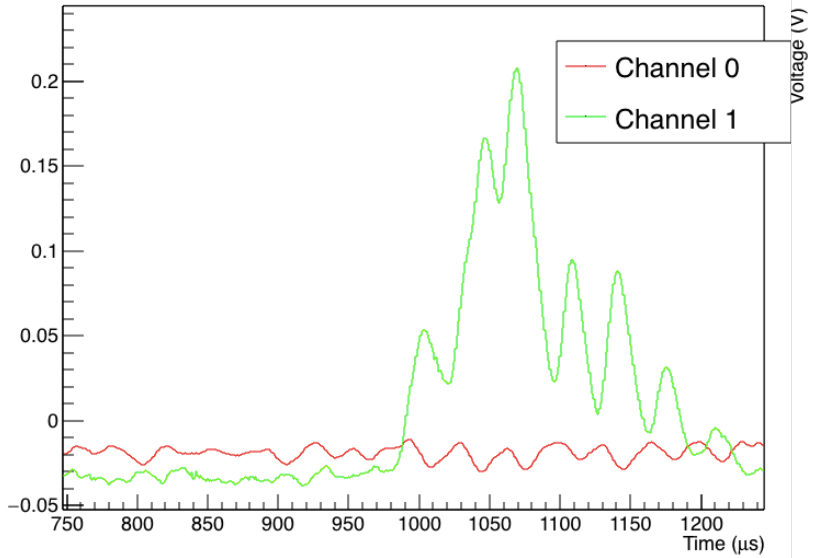
Source: α

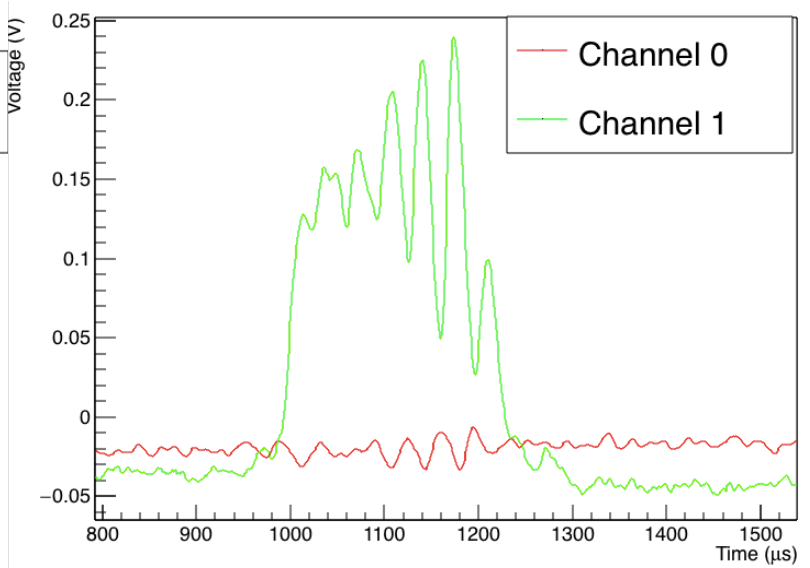
Fe^{55} waveforms

- At low drift fields we see a lot of peaks in the waveforms
- Seems to be related to drift field between meshes 2 and 3



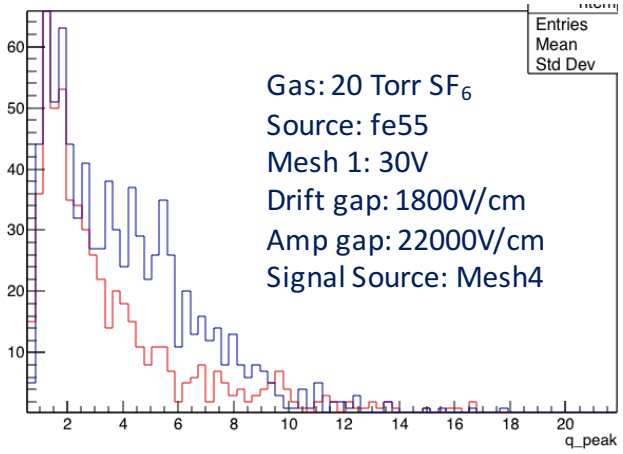




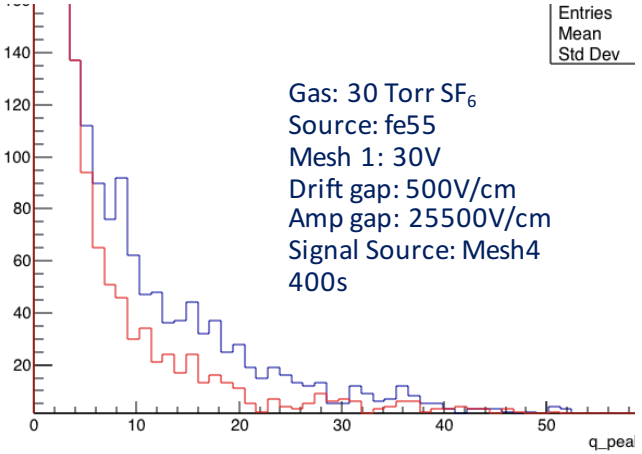


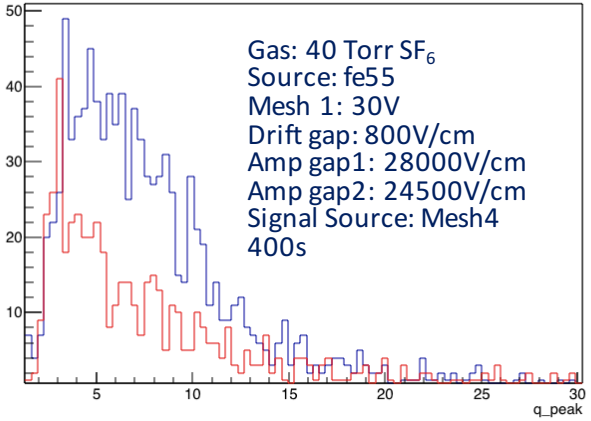
Fe^{55} runs

RED: background
Blue: Fe55



Gain ~2300

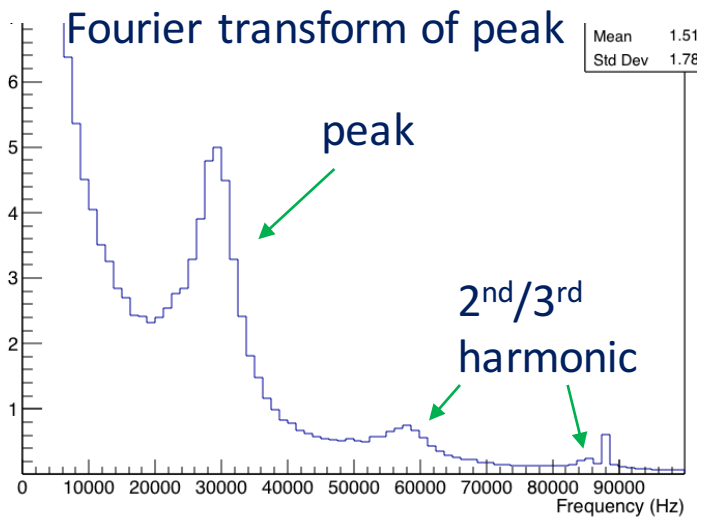


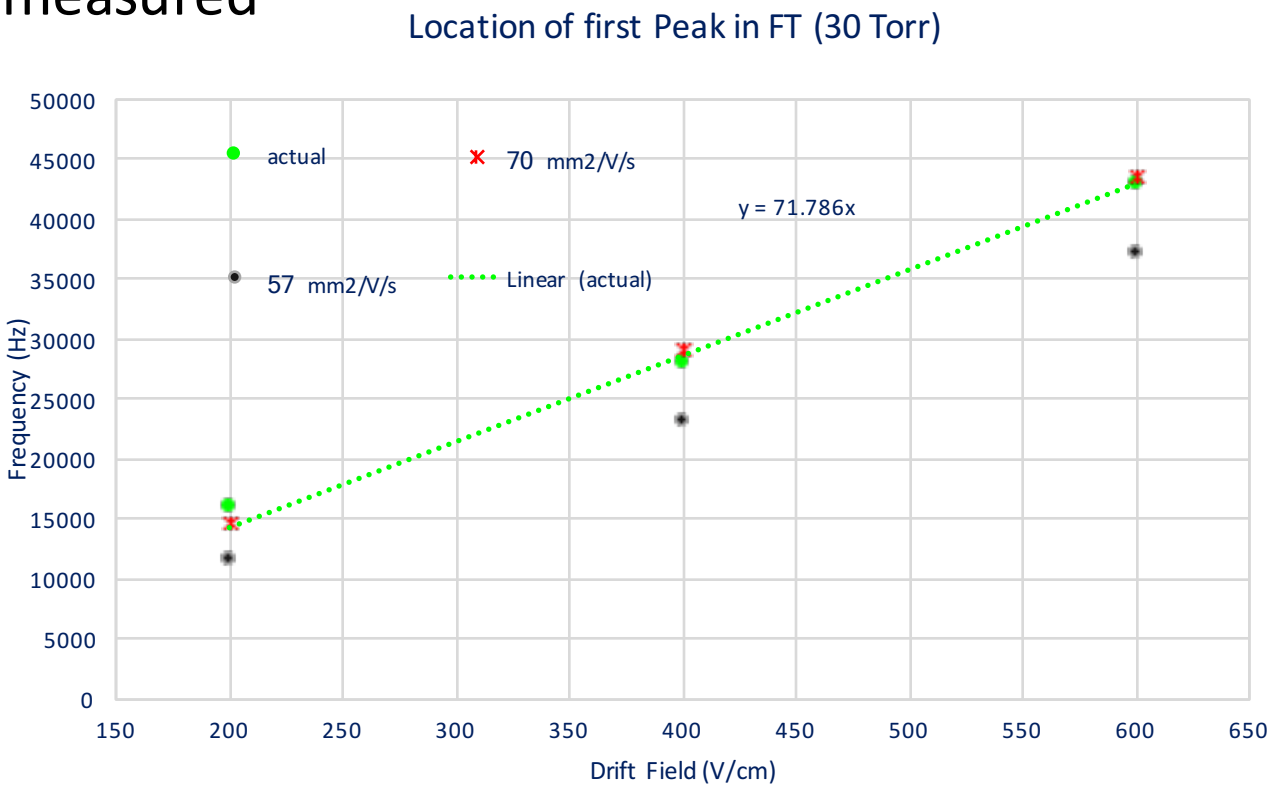


Gain ~3000

Fe^{55} waveforms

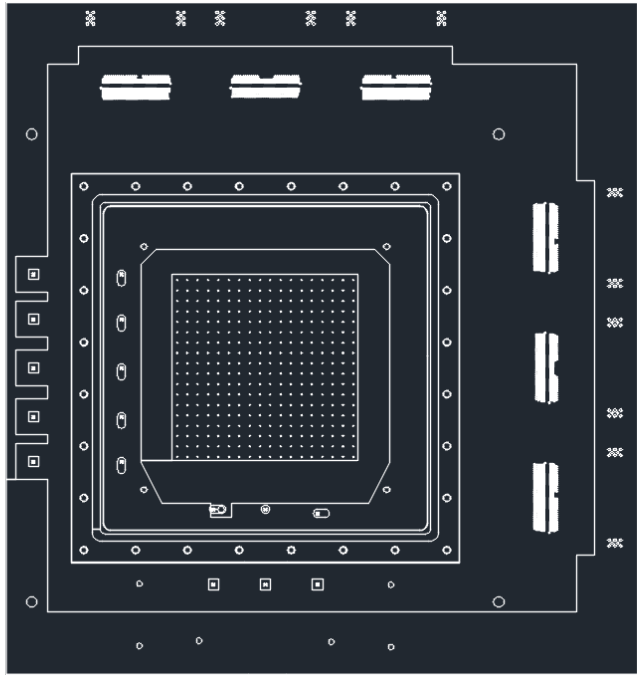
- Oscillation frequency is linear with drift field
- Ion backflow model suggests frequency would corresponds to ~4 times drift time
- Best fit seems to correspond to 2 times measured drift time…?

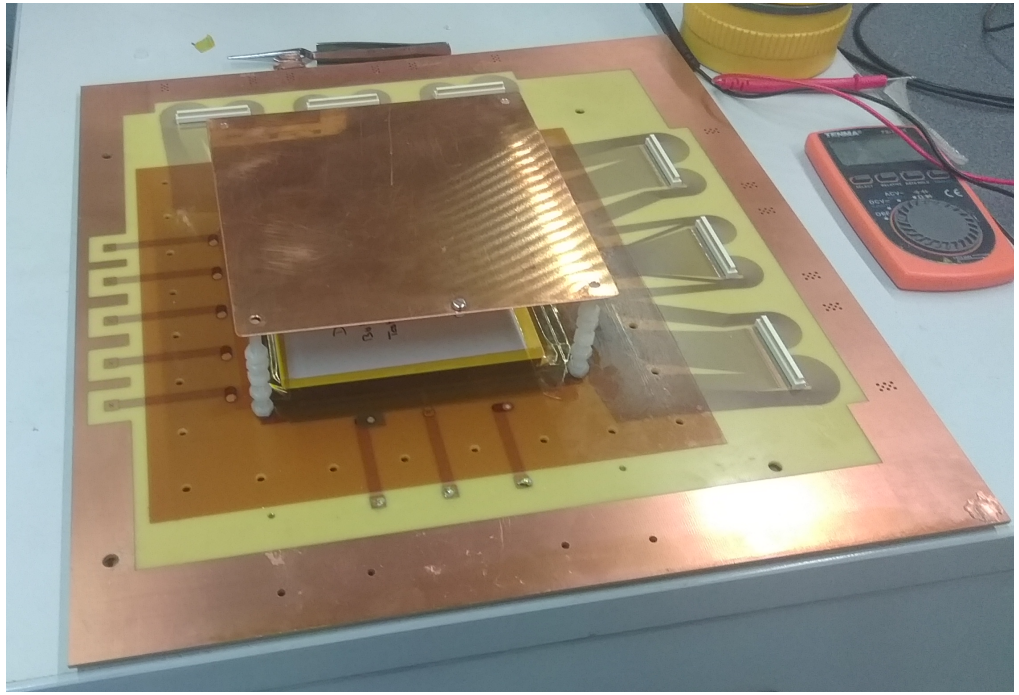




Micromegas

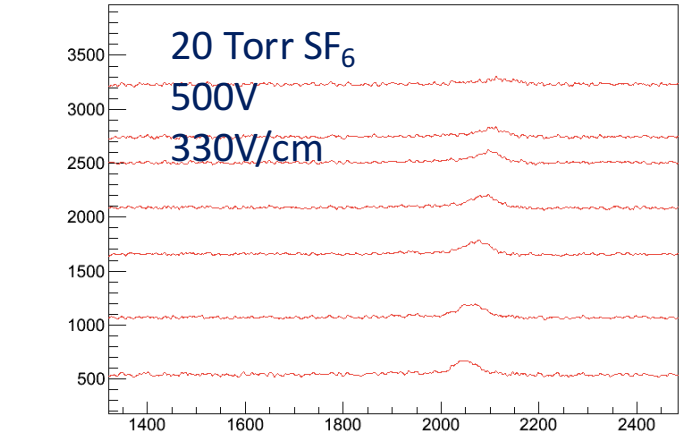
- Use as a gain stage for strip readout to get XYZ of recoils with high gain
- 256um gap micromegas for this purpose
- 250um pitch
- Want to use MM-ThGEM as gain stage

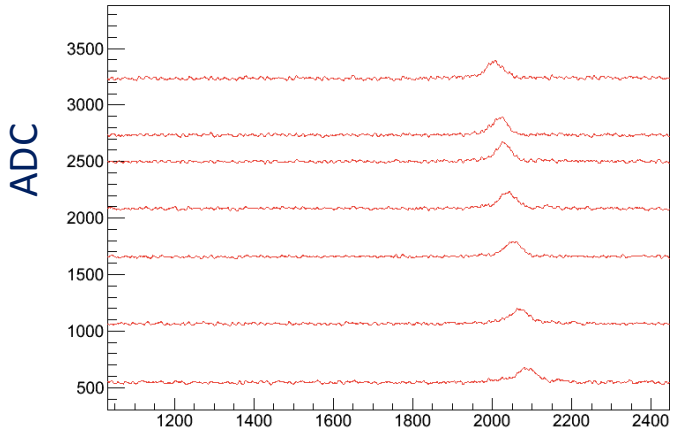




Micromegas runs at Kobe

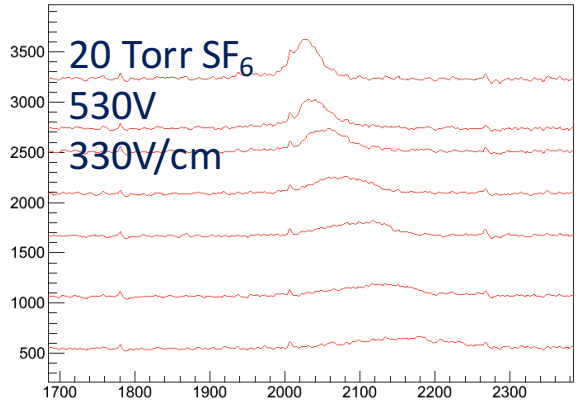
- First runs had only x strips of bare micromegas

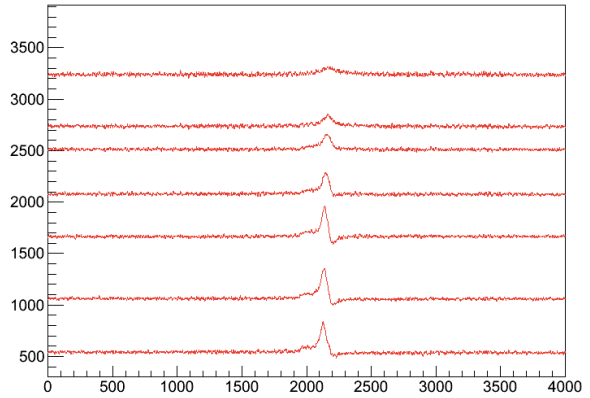


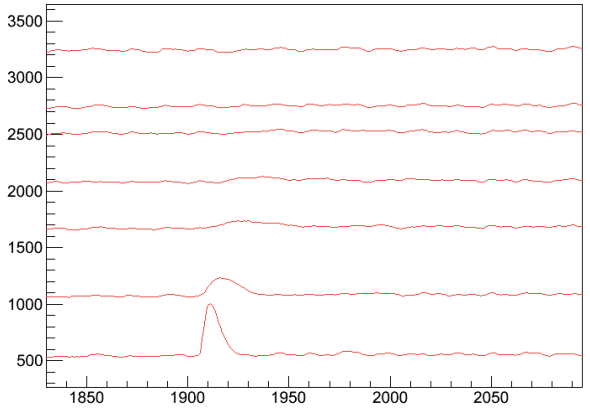


ADC

Trigger time (us)



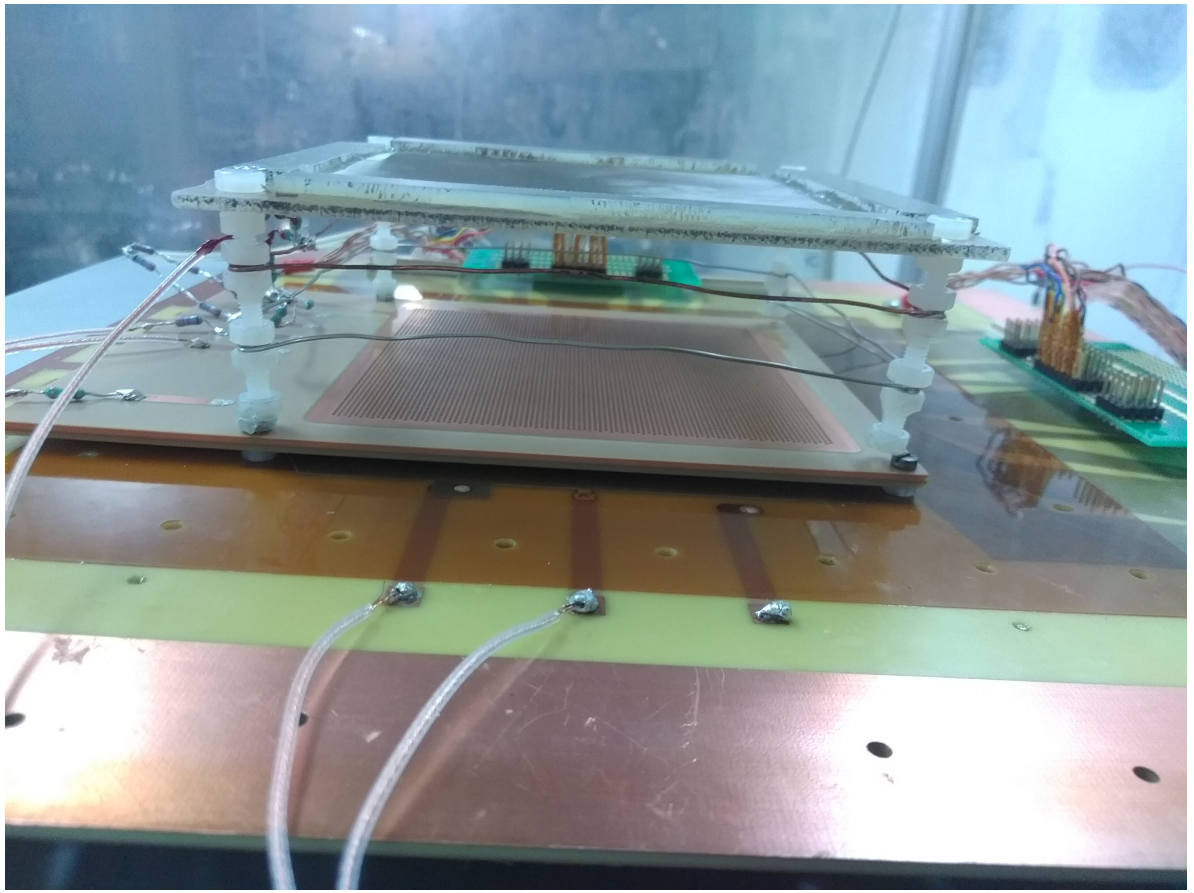




Micromegas + MMThGEM

- Had issues with biasing so many channels without any noise

➢No data yet!



Thank you!