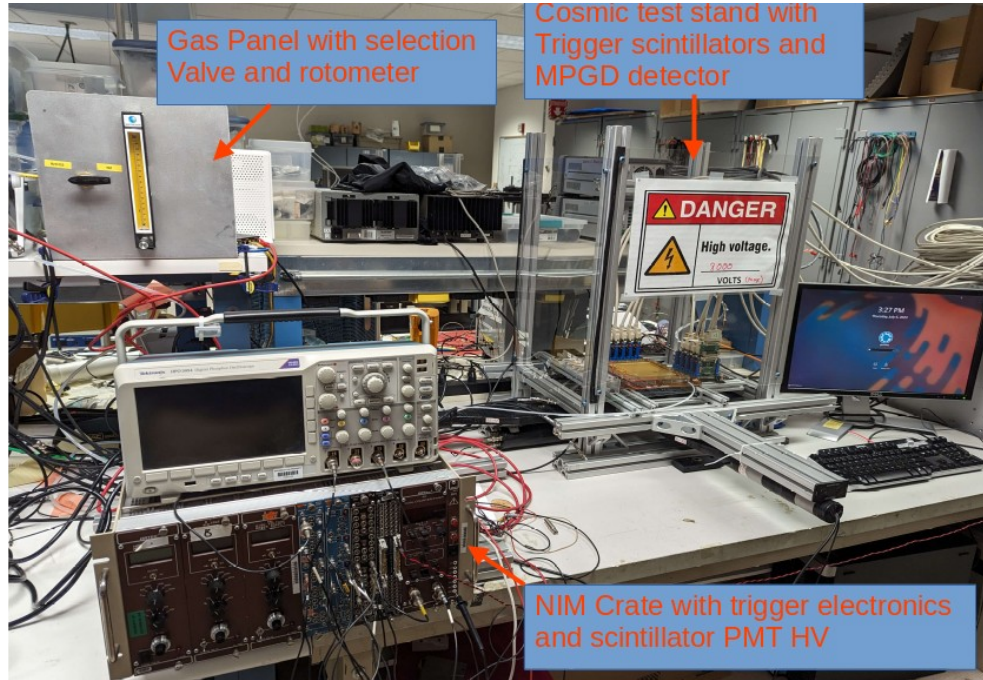
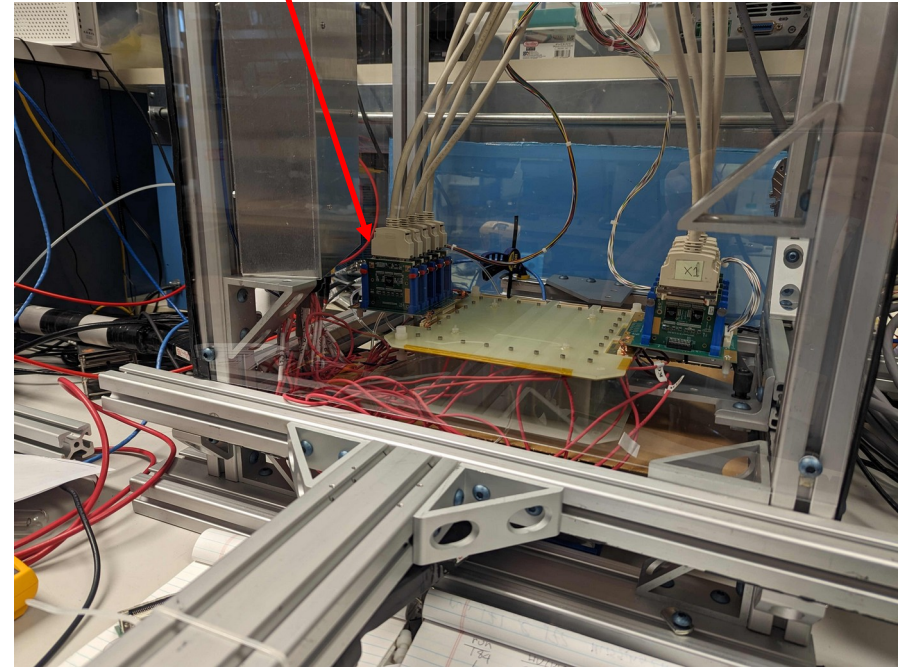


JLab RDIG MPGD Cosmic Test Stand

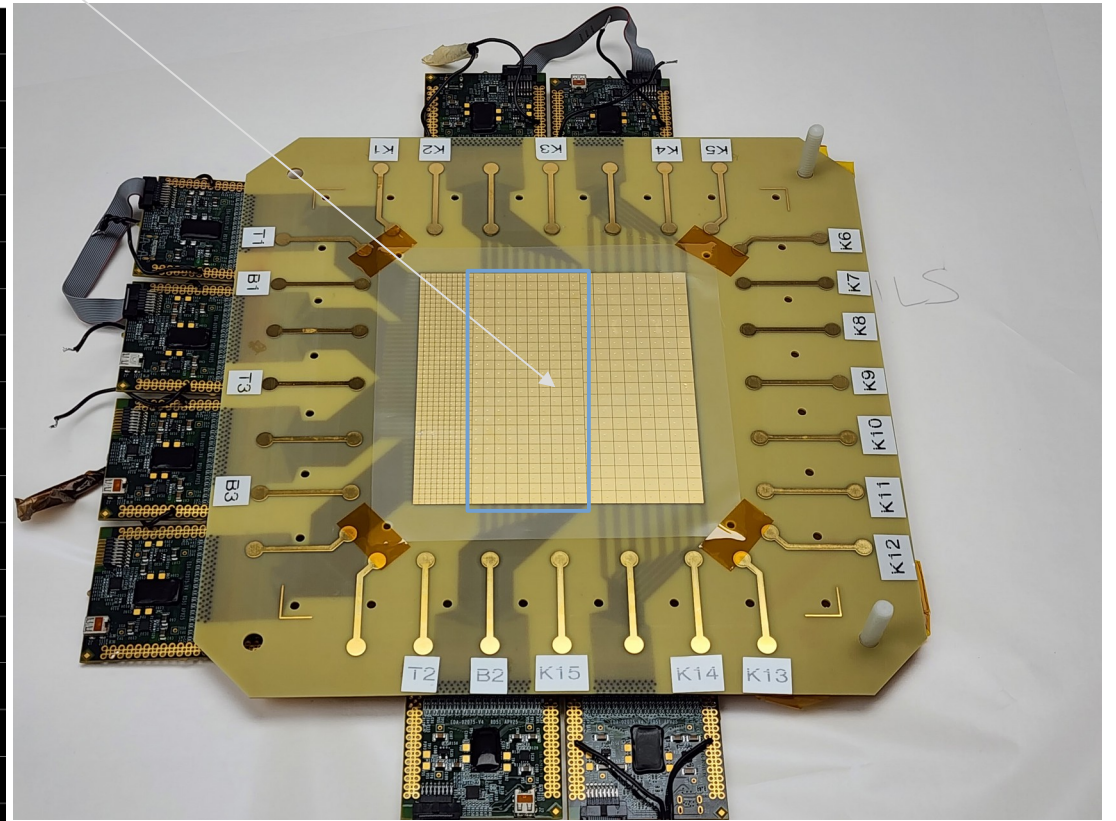
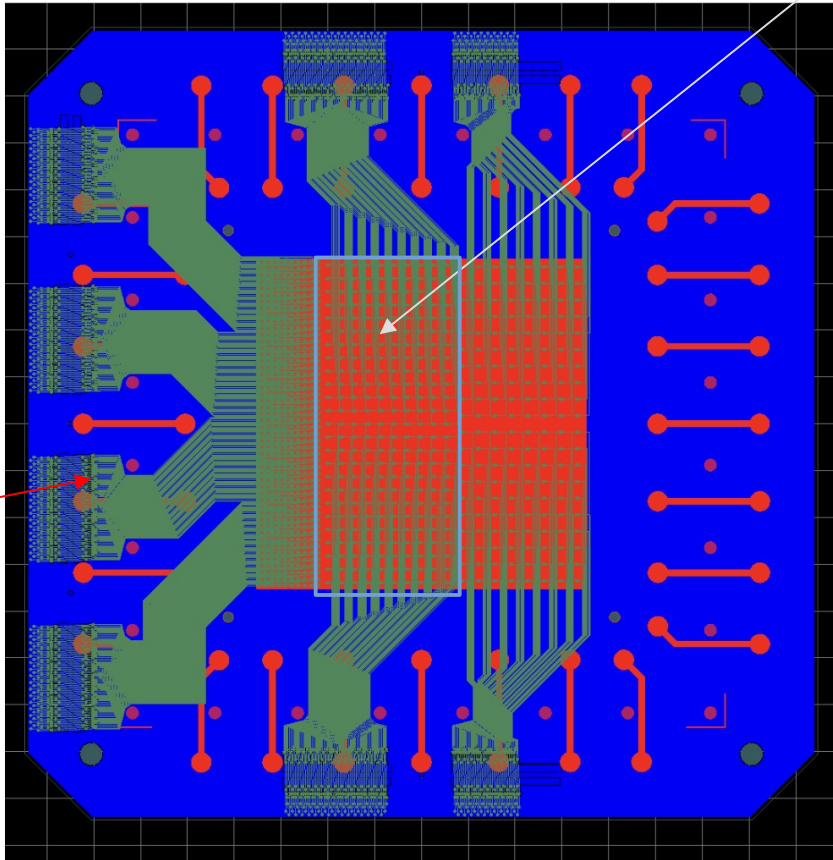


TDIS Prototype TPC installed

Preamp cards with shaper
24 channels per card / 5 cards per baseboard



Instrumented pads

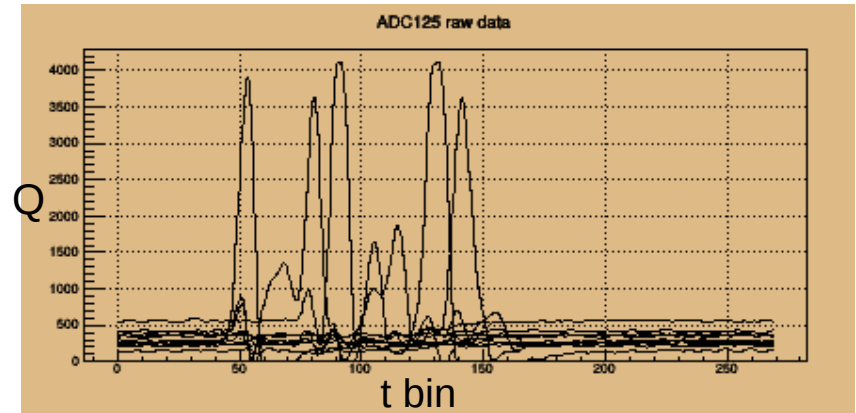
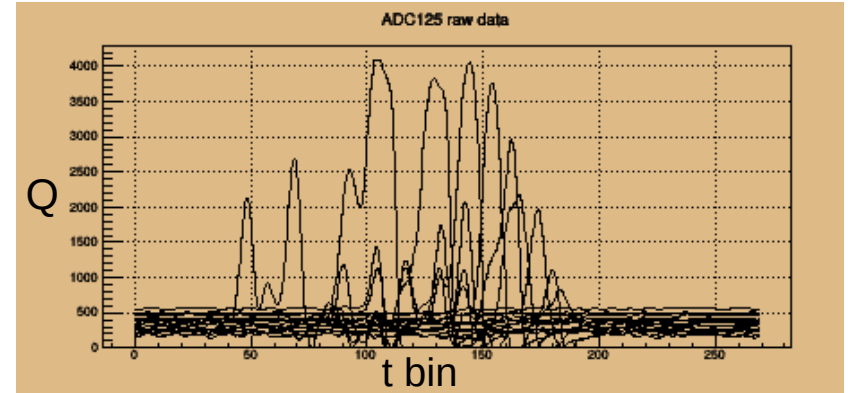


Status

- Started with Ar/CO₂ 75/25, but moved to 90/10 for faster v_d
- Prototype powered to 8 kV / 3.2 kV (Cathode / GEMs)
- Time window on FA125 set to ~1.7 μ s width.
- Rough adjustment of FA125 baselines performed
 - => observed saturation of some large signals so turned down the GEM HV.
- Event observed with expected multiple signals throughout maximum drift time.
 - => measuring drift velocity from the time distribution width.

Example cosmic events

- GEM HV @ ~3100 V
- Waveforms (Q vs time bin) for events
- 8 ns / bin, 12 bit ADC - 4096 max bin in Q
- multiple channels (pads) contributing
- Some channels saturating – lower GEM HV?



Notes

- Some issues with small increases in current draw which produce ringing in FA125s and can kill the DAQ.
 - => Need to move Cathode / FC electrodes as far from GEM and ground as possible to reach highest HV required.
- Very inconvenient to have Panasonic connectors on bottom of Readout board, as the preamp cards then hang upside down.
- We are designing a frame to be able to mount the prototype at a 30 degree tilt (often only a few pads are seeing signals from vertical tracks).

Drift velocity measurements

Expect hits along tracks to be uniformly populated in position and, therefore, in drift time.

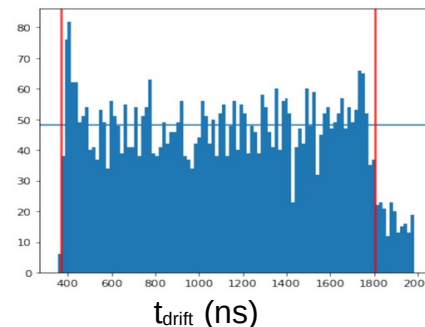
=> Range of drift time distribution $dt = t_{\max} - t_{\min}$ corresponds to time for full 5 cm drift and removes amplification and signal propagation time.

$$v_{\text{drift}} = 5 \text{ cm} / dt$$

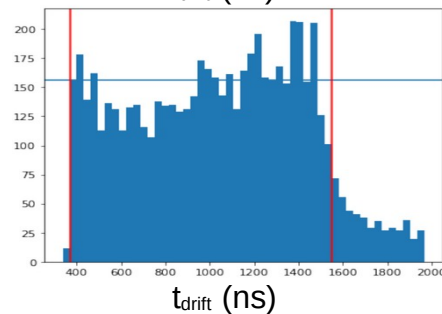
The measured v_{drift} are *close* to those expected (~10-15%).

Note: the gas percentage uncertainty is +/- 2%.

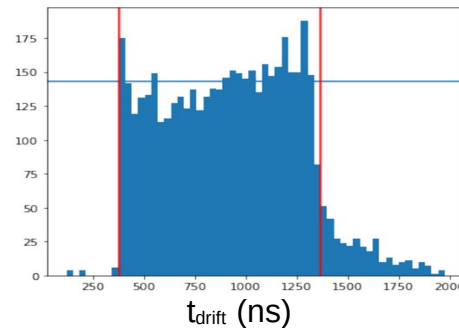
Runs with range of E_{drift} for Ar/CO2 90/10



Run: 254
 E_{drift} : 0.50 V/cm
 $t_{\max} - t_{\min}$: 1440 ns
 $v_{\text{drift}} = 3.47 \text{ cm}/\mu\text{s}$



Run: 257
 E_{drift} : 0.58 V/cm
 $t_{\max} - t_{\min}$: 1184 ns
 $v_{\text{drift}} = 4.22 \text{ cm}/\mu\text{s}$



Run: 259
 E_{drift} : 0.69 V/cm
 $t_{\max} - t_{\min}$: 992 ns
 $v_{\text{drift}} = 5.04 \text{ cm}/\mu\text{s}$

Status and plans

→ Waveforms and measured drift velocity look reasonable.

=> Detector generally operating nominally (sans discharge events previously noted)

→ cosmic tracks with GEM HV @ 3100 V are close to saturating on some channels

=> lower GEM HV for future tests.

→ Working on channel → pad map.

=> Hope to have 3-D hit plots in 1-2 weeks.