

# Sheffield SF6 measurements with MWPC readout.

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# Experimental setup

96L vacuum vessel containing the detector,  
CR-111 pre-amplifier and CR-200 shaper.

Oscilloscope

RGA

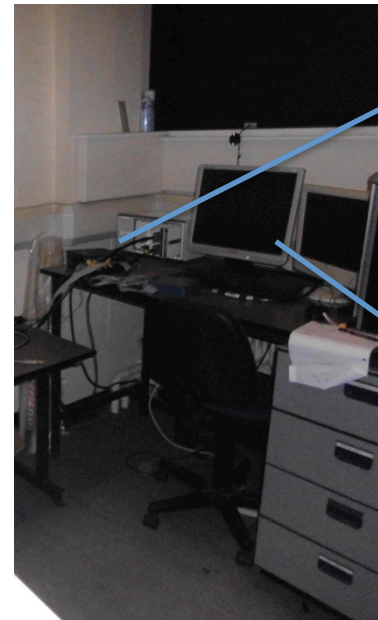
Pump

HV power supplies for cathode,  
grid wires and readout field ring

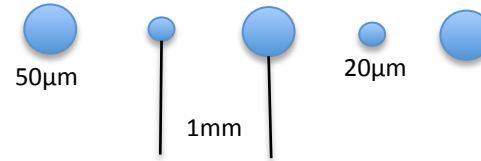
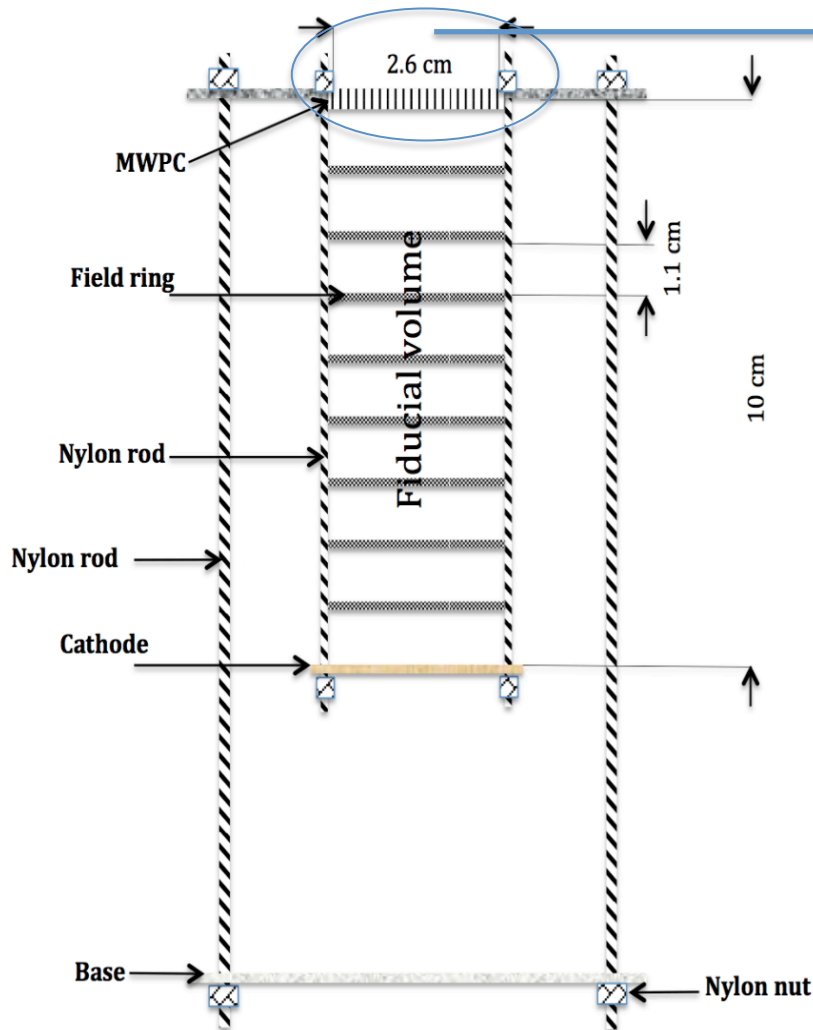
Pressure gauge

National  
Instrument

DAQ

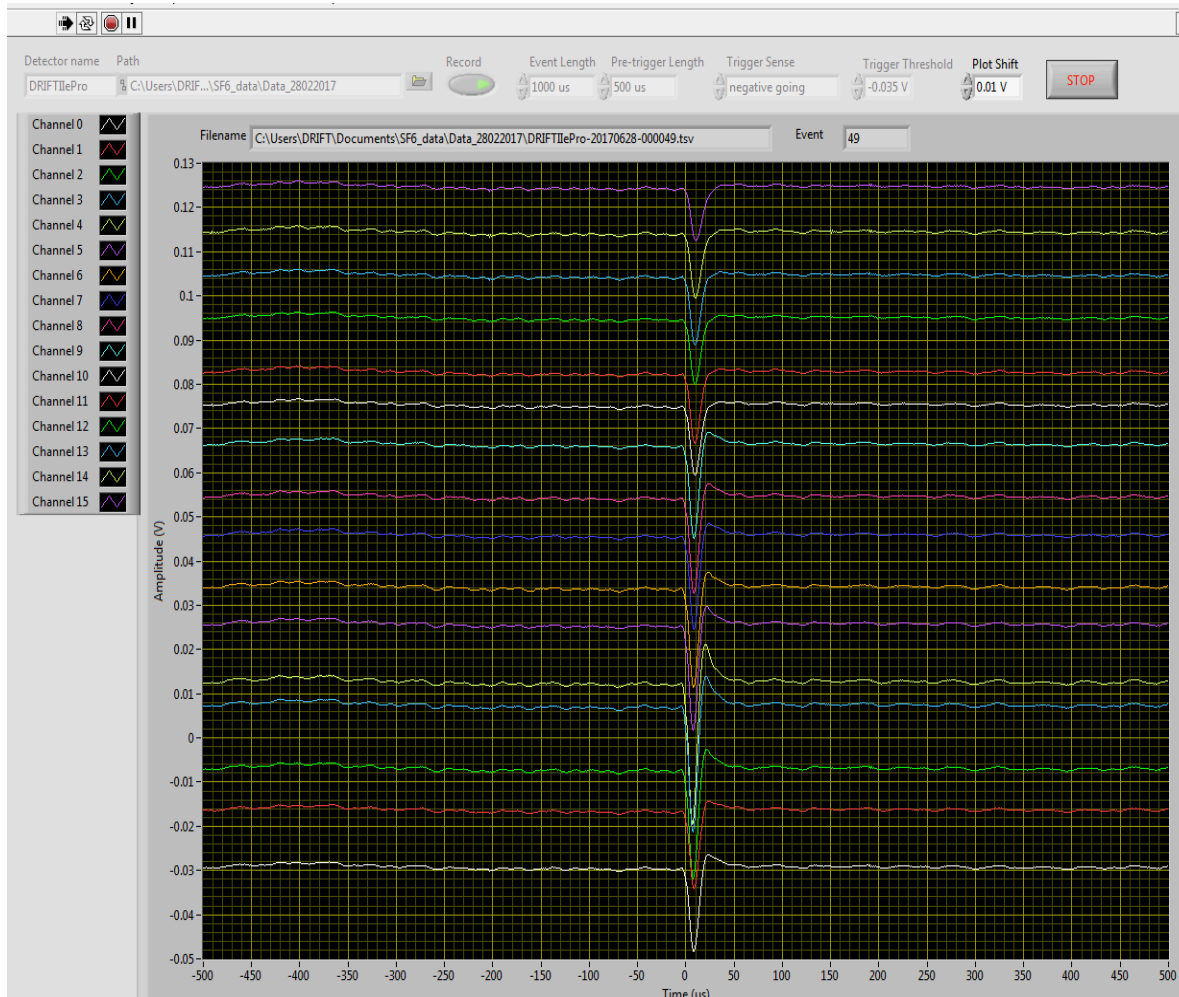


# Detector design



- MWPC wires -> grid-anode-grid with grids at around -600V to -900V and anodes at 0V. Avalanche field between grid and anode wires of 7000V/cm at -700V on the grids.
- 20 channels from 10 anode and 10 grid wires, the 11<sup>th</sup> grid wire is not instrumented.
- Drift region of 10cm, with cathode set between -2000V and -3200V. At -2500V this gives a drift field of 250V/cm.
- Field rings step down the voltage uniformly between the cathode and readout plane.
- Readout field ring around the MWPC is set to -700V to ensure signal capture close to the wires.

# Alpha track in SF6

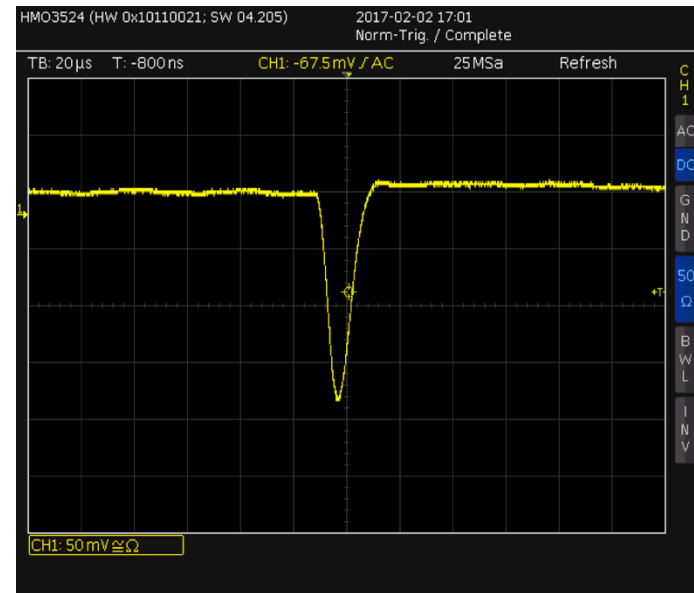


- Alpha Source tilted 45° upwards from the cathode plane.
- SF6 at 20 Torr.
- Cathode: -2500V, Grids: -700V
- Signal shown over 16 channels.
- Grid channel polarity is reversed.
- High trigger threshold of 35mV due to software noise.
- Signal between 100mV and 200mV.
- No delay between signals observed.

# Further results

Pressure (Torr)	Cathode (V)	Grids (V)	Max Alpha signal (mV)
20	-2000	-750	370
30	-2000	-750	100
40	-2000	-750	70
80	-3000	-770	No signal

80 Torr contains the alpha track within the fiducial volume (from SRIM)



Typical Single anode wire signal of 180mV, taken with cathode at -2500V, anode at -800V and 20 Torr SF6.

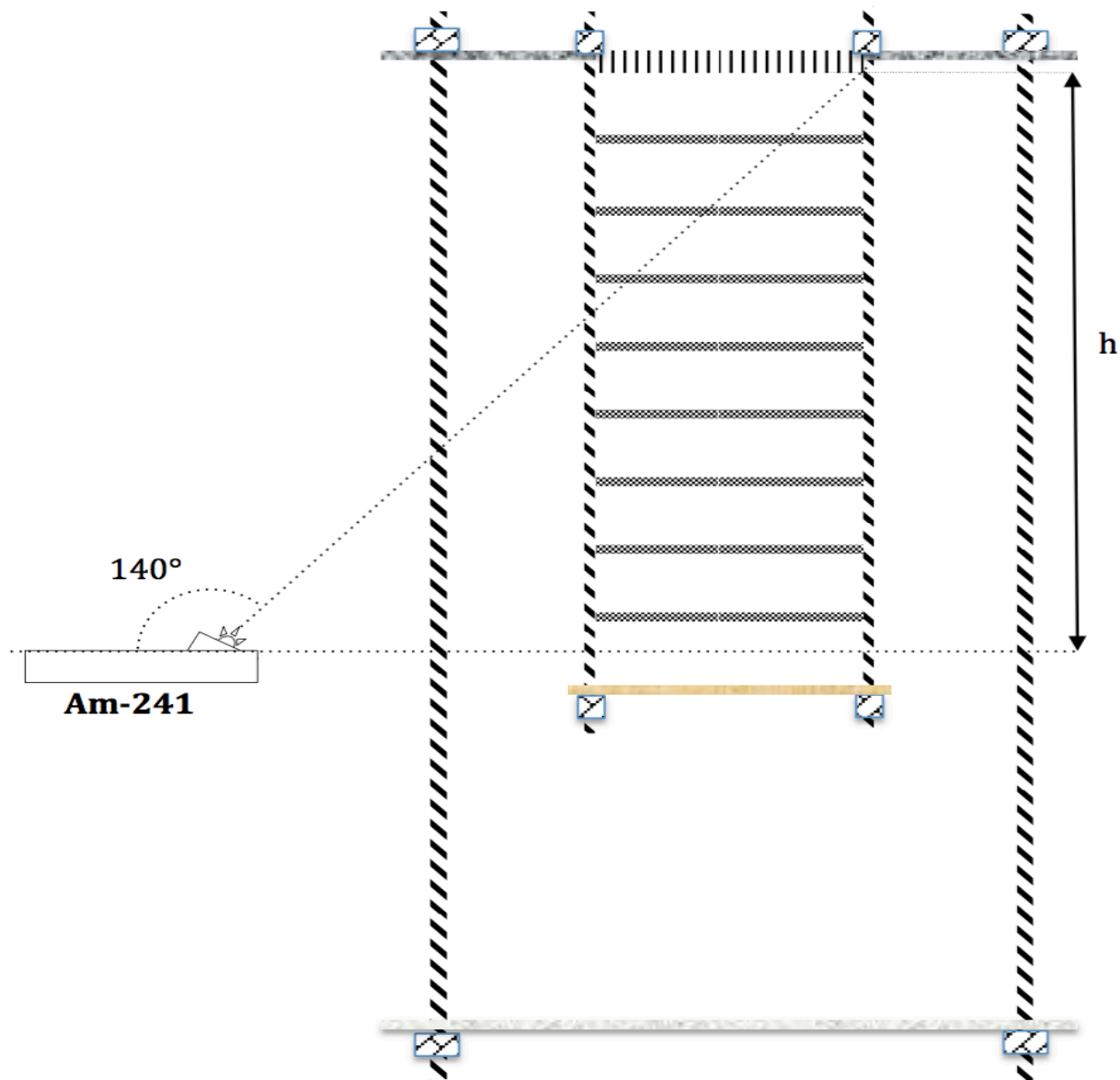
# What Next?

- Investigate why no wire-to-wire delay was observed
- Reduce the DAQ noise so that we can reduce the trigger threshold to improve the rate.
- Perform gas gain measurements.
- Try different gas mixtures (including Oxygen) and look for minority peaks.
- Gas degradation and recirculation tests with the RGA

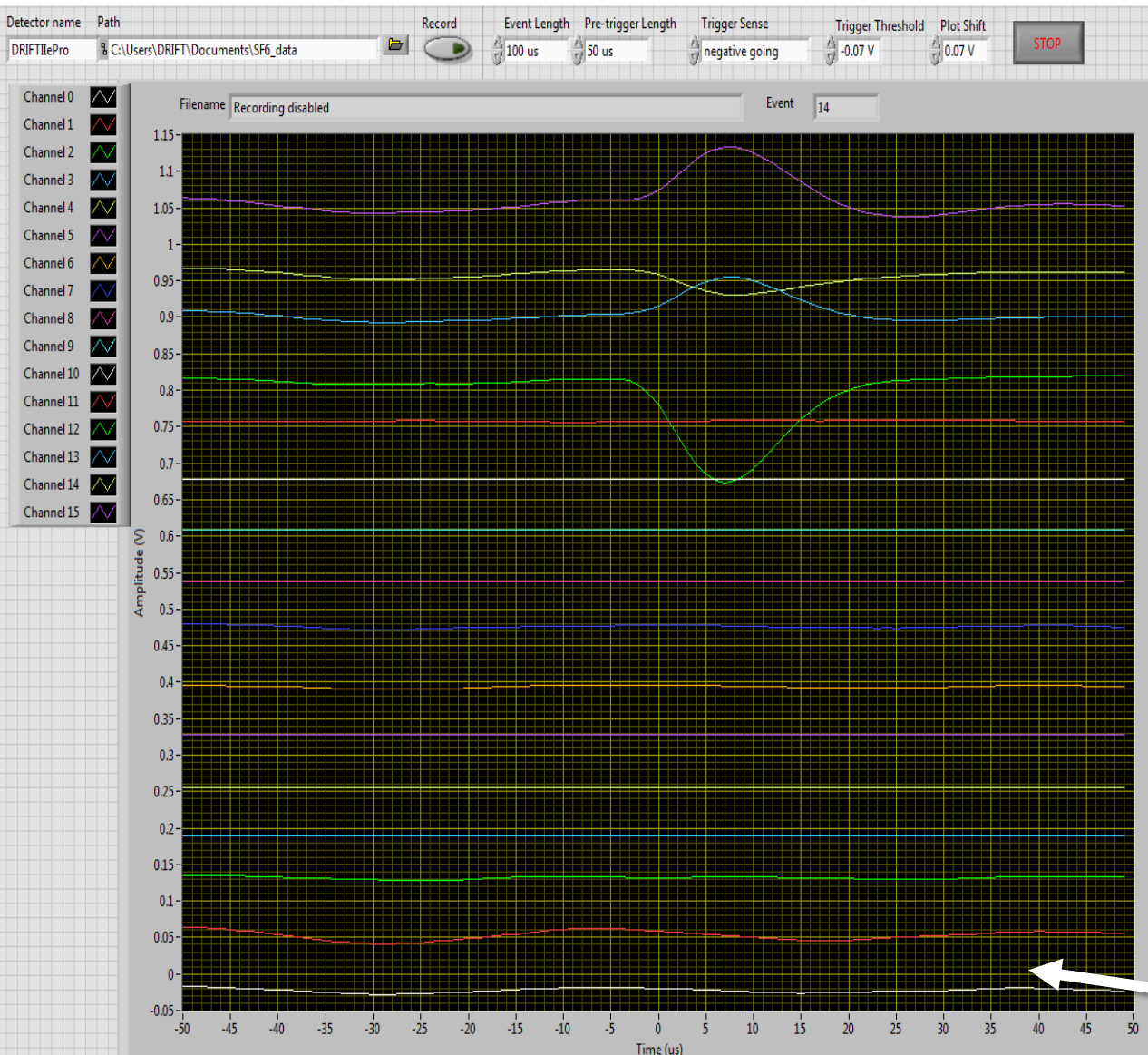
# Changes made

- ❑ Found a bug in the DAQ trigger
  - This has been corrected (thanks to Matt)
- ❑ Disabled pulse polarity switches (grids: +ve, anodes: -ve)

# Test for delays



# What did we find?



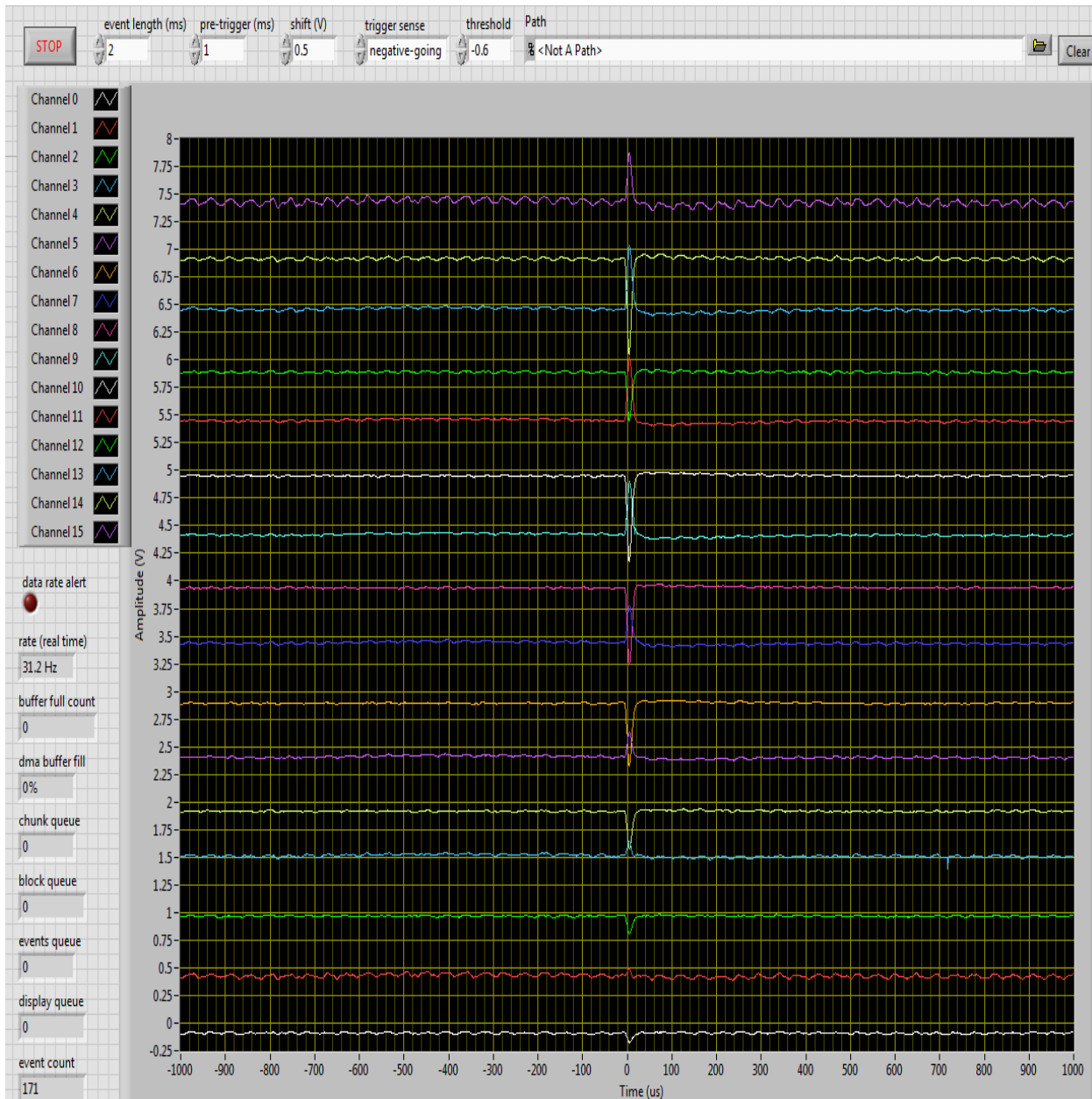
**Gas:** 30 Torr, SF<sub>6</sub>

**Drift field:** 350 V/cm

**Avalanche field:** 7kV/cm

Channels closer to the source

# Detector works with CF4



**Gas:** 150 Torr, CF4

**Drift field:** 350 V/cm

**Avalanche field:** 7kV/cm

Source positioned as in  
the SF6 test

# What next?

- ❑ The current field cage was not designed for  $>350$  V/cm operations.
- ❑ So we are currently building a more robust field cage to be used for SF6 measurements at  $>1000$  V/cm drift fields.
- ❑ Also, we are modifying the readout to include a ThGEM for MWPC+ThGEM hybrid operations.