

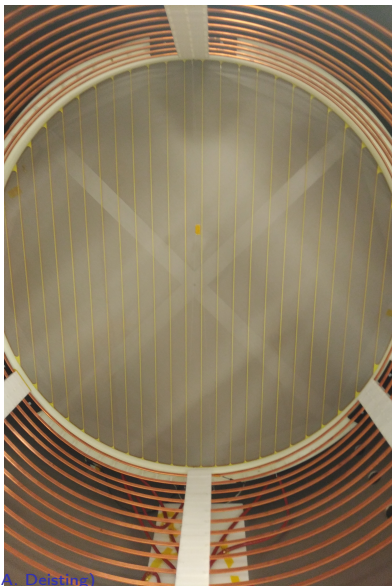
Week 30 – Hardware report

Alexander Deisting

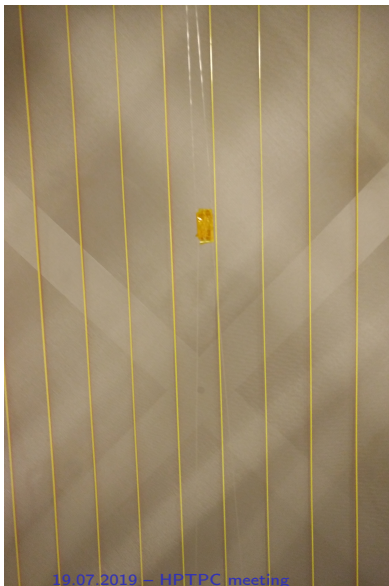


25th of July, 2019

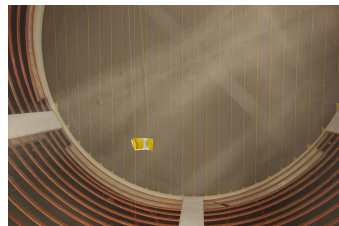
Last Firday's hardware intervention



(A. Daisting)

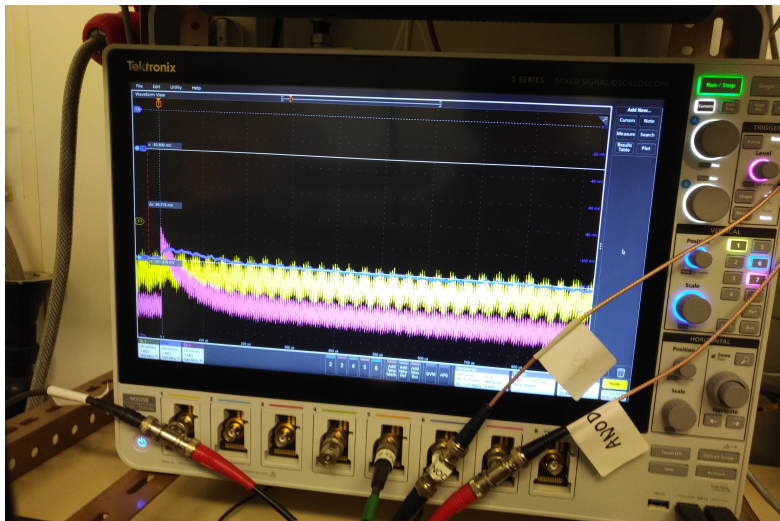


19.07.2019 – HPTPC meeting

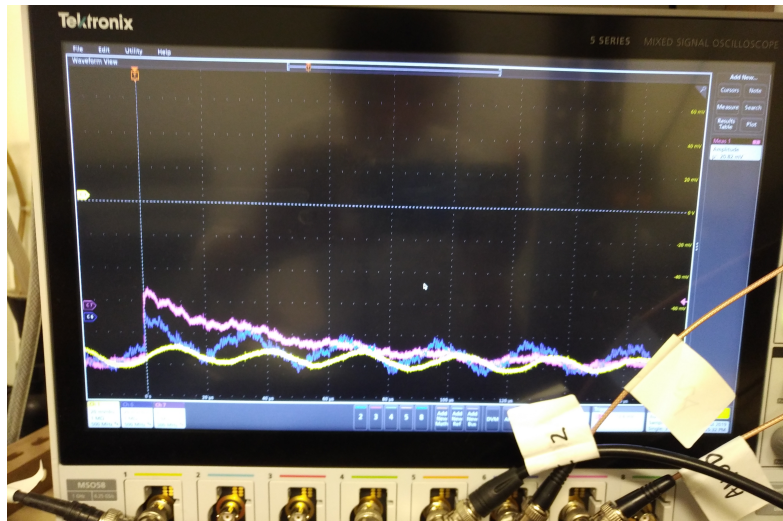


- ▶ At up to two days a week we have currently (wo)man power from Imperial at RHUL to help with detector works
- ▶ Progress since the last meeting
 - ▶ Test the effect of the CAEN cathode power supply vs the Spellman (→ They behave the same)
 - ▶ Place the ^{55}Fe in the centre of the drift region (*cf.* previous slide)
 - ▶ Attach an aluminiumised mylar dot on the cathode (for laser tests, *cf.* previous slide)
 - ▶ Successful noise fighting session: We managed to shield the detector against all the high frequency noise and reduce the amplitude of the 50 kHz noise
- ▶ This week Ar-CO₂ data taking continued, still aiming for an ^{55}Fe peak
- ▶ Analysis of the data taken in Ar-CO₂ @ 1.1 barA is under-way
 - ▶ Thanks to the improved noise, this data will be probably treated with a `sin` fit and correction

A word on high frequency noise – before



A word on high frequency noise – after



- ▶ All shortening cards which we could put, are in place
- ▶ The OROC is back in its box and awaits testing
- ▶ We have the aircon again running in the MWPC and MPGD lab
- ▶ Copper shims should arrive tomorrow or next week
- ▶ A slightly reduced list of the usual OROC ToDo's still applies:
 - Put cooper shims
 - Do the HV distribution network
 - HV tests in air
 - Pulser test in air
 - Construction of the field line termination plane

Backup

Hardware todo's:

- open, hang JESD noise
- put mylar on cathode
- put shielding cards
- OROC back on the door
- OROC tests →
- Create field line termination tool
- test hitting mylar with the laser
- build and test HV distribution boxes
- Test O-sub at high pressure
- Test charge spectrum for the modified preamp
 - drive the modified preamp and the actual one into saturation
- PS test: CAEM vs Spectram
- low frequency noise

most power (rate test)

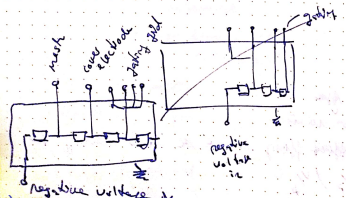
Noise:

- external source: power filter
O Tom

- PS test: CAEM vs Spectram
- Filter on preamp level

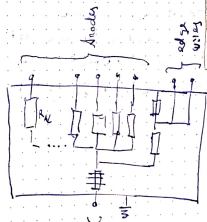
- Wire 1 ? Missing Anode Data Wires first anode
- Wire 2 ? Look more like Anode
- Wire 3 ? Like Anode
- 4 Anode
- 5 Green — } Grids, larger half
- Red — } Gating Grid for Cathode
- Yellow — } ~~gating grid~~ gating grid larger half
- White } gating, smaller half
- 6 Anode
- 7 Anode
- 8 Car Electrode ✓
- 9 Anode
- 10 Data Wires "first" anode

Top side wire: cathode



8 Tur, 293 k 2.92
 2.06 x $\frac{293.18}{293} = 1.515$ 2.06
 65% 275.15
 1017 km

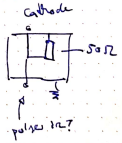
gating grid, small part
 gating grid, larger part
 ???



- ToDo
- check PS current resolution
 - check GG - cover distance
 - get boxes
 - Anodes: calibration pulses
 - check cap. values / R of all feed through
 - P-d plane window: pole char. resistance?
 - R_{tot}: close after checking PS current resolution

using hard pulses in the cathode for the OBOC

cathode is GG: 3 mm
 O - F₅ - 0.3
 also cover electrode 2mm on top of the GG?



Hardware report week 29

HPTPC news and not really news:

- ▶ Data taking with Ar (100 %) at 1 barA to the end of seeing a decent rate of the 100 kHz ^{55}Fe source
 - ▶ We do not see a large rate of signals / significant rate increase for higher voltages
 - ▶ The sparking behaviour was reasonable \rightarrow *i.e.* correlated with the voltage difference between anodes.
- ▶ On Thursday we switched to \sim Ar-CO₂ (90-10) (about 1.2 barA) and went to high voltages
- ▶ Friday:
 - ✓ Test the noise performance: cathode-supply from the Spellman vs the last channel of the CAEN module
 - ✓ More experiments with the gas mixture in the TPC
 - ✓ Opening the vessel
 - ✓ Hanging the ^{55}Fe
 - ✓ Placing an aluminiumised mylar dot on the cathode (for laser tests)

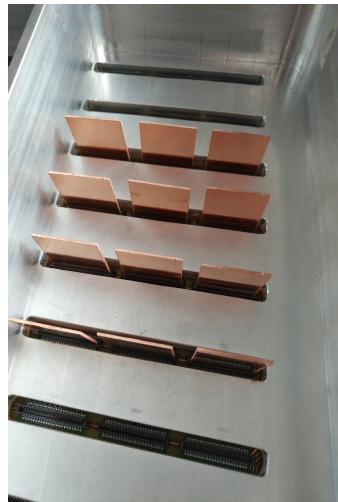
ToDo's

Hardware report week 29

A word on high frequency noise

- ▶ There is 1.35 MHz noise in the data
- ▶ However: It turns out that is only there at certain instances and permanently, uncorrelated with changes to the HPTPC → Possibly something else in the building is responsible
- ▶ In other news: The signal from the preamp at anode 2 looks different, because the evaluation board there has a different capacitor
- ▶ Hence:
 - Test the response of the modified preamp to test pulses on the test input
 - Do the same, but with pulses coupled into the real input using a capacitor
 - Drive the preamps into saturation (check first on the old scope as a safety measure)
 - Do the same test with a non modified preamp)

- ▶ The first samples for the copper shims arrived, they fit and the rest is ordered
- ▶ Annora measured dust counts and I did a clean of the floor in T111 – We will see whether this helped
- ▶ The next OROC step:
 - Put shortening cards (cooper shims)
 - Mount the OROC back to the lid of the test box (copper shims can also be placed after this)
 - Do the HV distribution network
 - HV tests in air
 - Pulser test in air
 - Construction of the field line termination plane



ToDo's

MPD meeting week 29

- ▶ The *get-the-OROC-out-of-box* tool arrived and after one round of re-working we can use it now to get the chamber out of the box
- ▶ The chamber looks fine, there are no broken wires visible

ToDoS (OROC @ air)

- Check the supply cables and their matching to the wire planes
- Order copper shims
- Remove the OROC from the lid
- Place shortening cards and copper shims
- Built a HV distribution network
- HV test at air

ToDo's

Hardware report week 26

- ▶ Jocelyn fixed the burst disk:
 - ▶ We discovered where was a puncture in the burst disk
 - ▶ It was replaced with a 5 barG burst disk
- ▶ ^{55}Fe is in the vessel now → We will explore with one fill if we can see a peak related to this source
- Filling the vessel again
- Decision on a gas mixture / pressure for a diffusion measurement will be made when we have first insights from the light gain analysis
- Talk to FIKE what they think is the best solution for our use case (possibly another pressure relive valve)

- ▶ The *get-the-OROC-out-of-box* tool arrived and after one round of re-working we can use it now to get the chamber out of the box
- ▶ We opened the box and had a look at the chamber – the wire protection cover fits
- ▶ Currently the chamber is back in the box

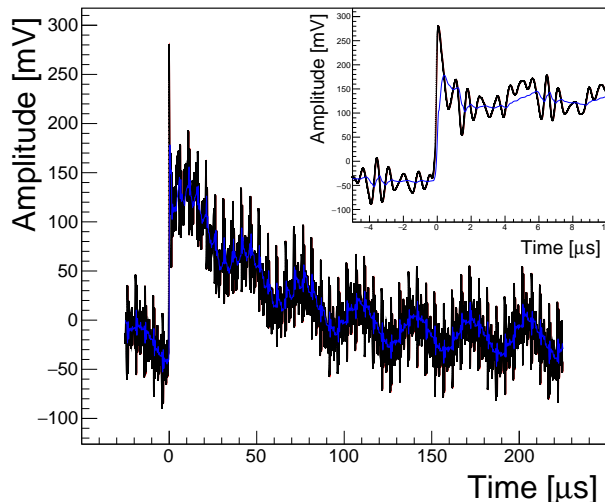
ToDos (OROC @ air)

- Check the supply cables and their matching to the wire planes
- Get handles made (to remove the OROC from the lid of the box)
- Get copper shims
- Remove the OROC from the lid
- Place shortening cards
- Built a HV distribution network
- HV test

ToDo's

Waveform report week 25

Updates on the waveform analysis code in rapTorr



- ▶ There are about 30 k (red) int points below the about 120 k (black) double points → There is no real gain in having all samples with full precision
- Reduce the samples in waveforms while reading in dmtpc files
- ▶ Exponential smoothing has been added and it performs well (*i.e.* orders of magnitude faster than Gaußian smoothing. We are currently checking amplitude spectra with and without
- Look at waveforms with and without

Update on the toy Monte-Carlo to model the energy deposited in the detector

- ▶ Using the known decay energies the ^{241}Am sources (α , γ) and the ^{137}Cs (β , γ) decay energy spectra are modelled
 - ▶ ^{137}Cs β -spectrum: Based on interpolated IAEA data
 - ▶ γ - and α -spectra: Approximated using Gaußians with an arbitrary width
- ▶ The γ absorption as well as charged particle ranges are extracted from ESTAR, PSTAR and XCOM
- ▶ γ s and α s are assumed to deposit their full energy in the detector
- Currently cosmic μ are added
- Garfield/heed will be used for the energy deposit of charged particles
- Furthermore the detector geometry is being put in
- ^{55}Fe is added