Status in Aachen
+ Measurement Idea

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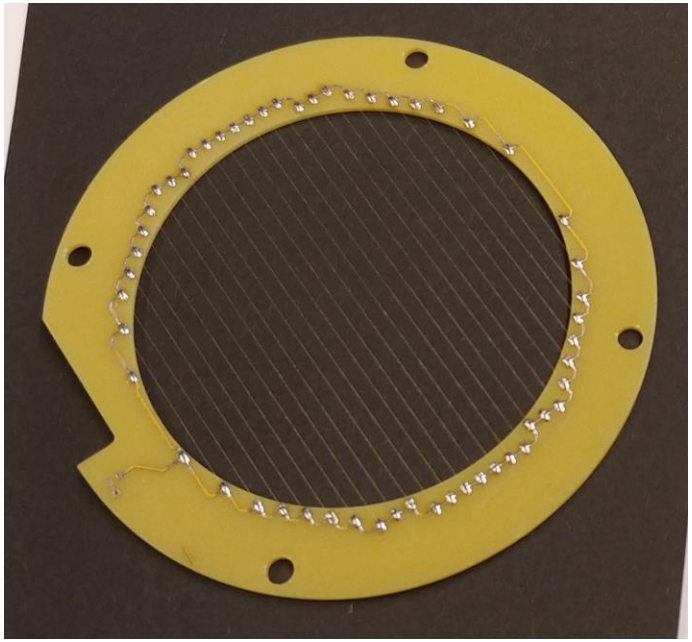
Mini MWPC development

No space for anyROC? Build smaller one with ø~100mm!

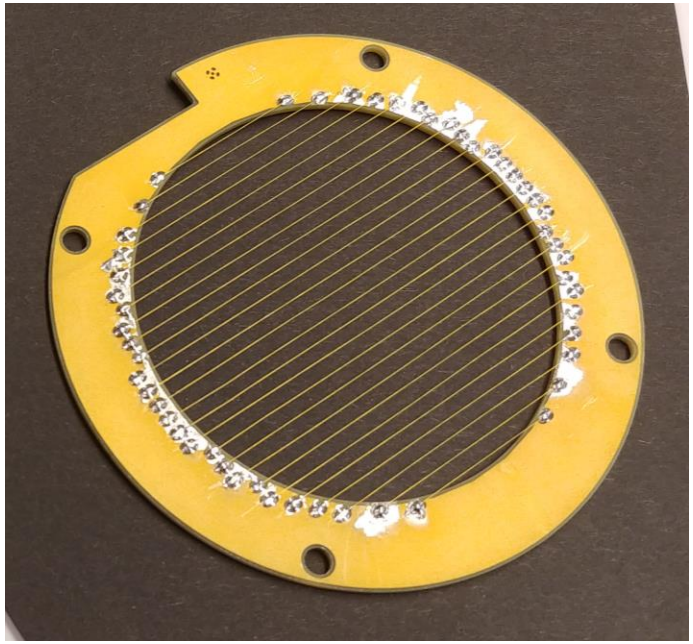
Idea shared with Diego's group, been working in parallel since then.

Design parameters from ALICE:

- Spacing (in-plane/wire-wire, plane-plane) same as ALICEs IROC
- Wire diameters identical (20um and 80um)

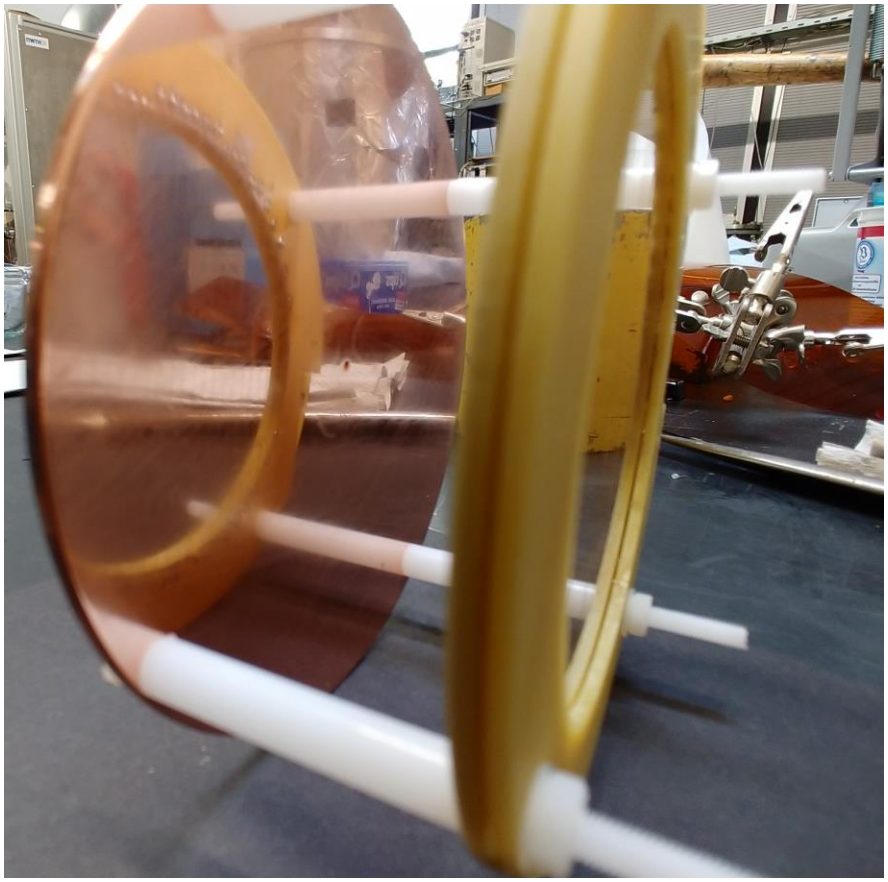


anode



cathode

The Finished Product



3cm drift space with MWPC cathode + anode as readout = mini-TPC

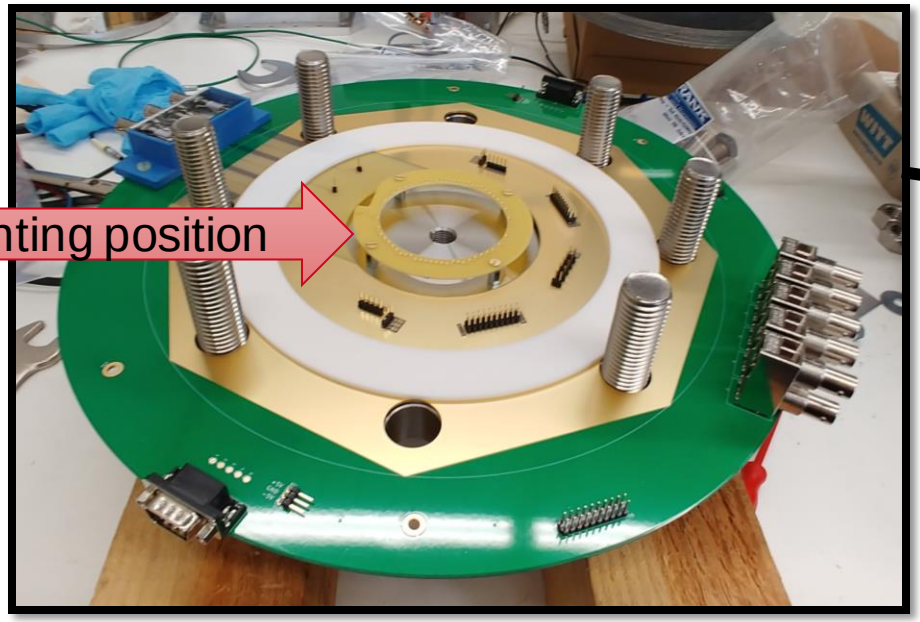
Cathode has a 1mm hole

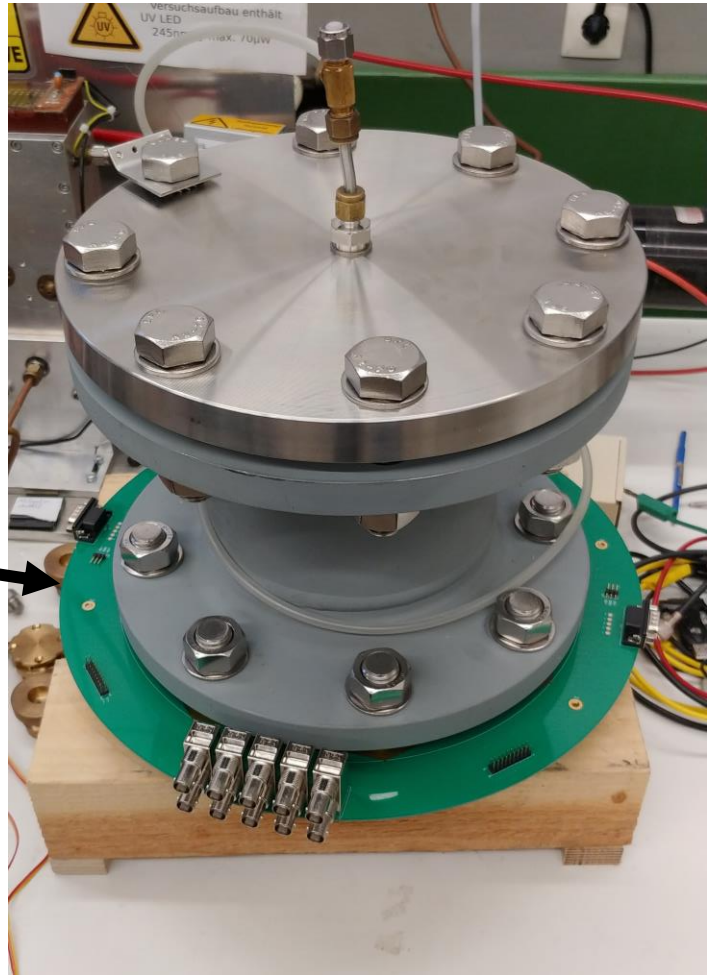
Construction just finished - want to place in gas and under a Fe55 source this week

Different Pressure Vessel

mini-MWPC setup in test chamber

- Rated up to 10 bar pressure
- Run detector in series with HPGMC
- Electrical feedthroughs by a gasket-shaped PCB





Advanced Measurement Idea

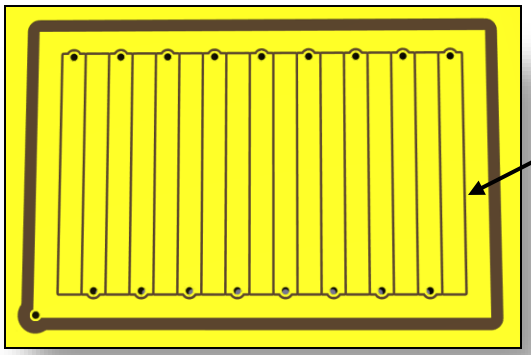
Isotope with EC followed by gamma and xray emission

"Infinite" number of interaction depths

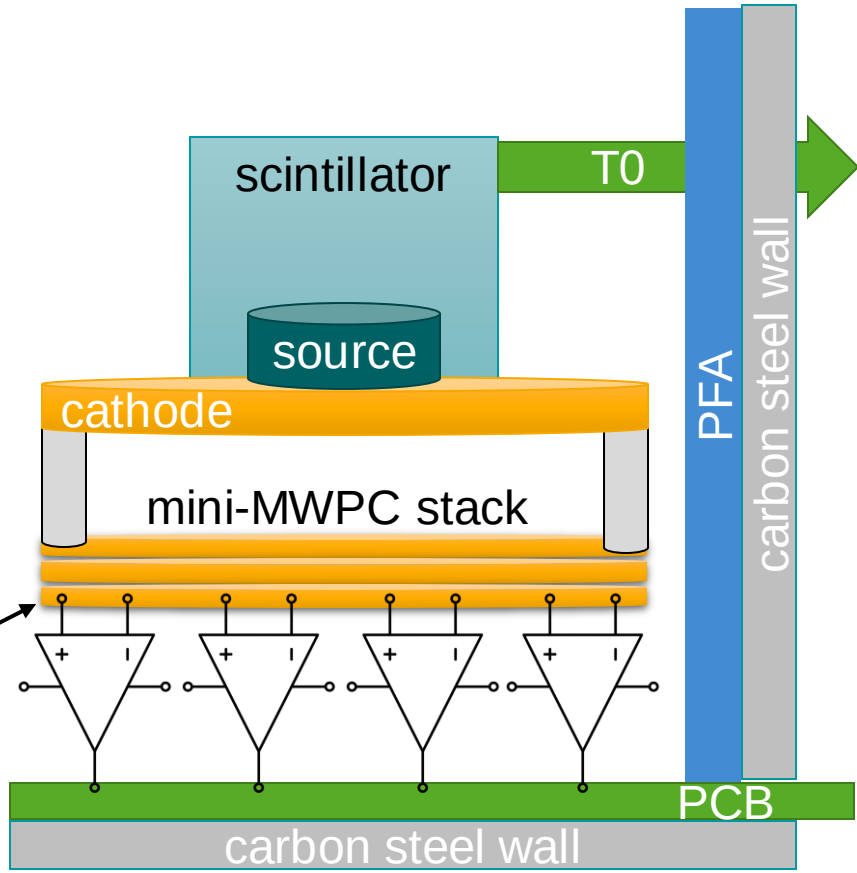
- T0 from gamma
- Depth of gas-interaction:
  - d = vd * (arrival time – T0) = vd * drift time

- Create width²:distance plots -> dt
- Longitudinal diffusion
- Or reco. dt from measured source profile

- Mono-energetic energy deposition
- (Attachment?)



1mm pitch



Choosing the right Source

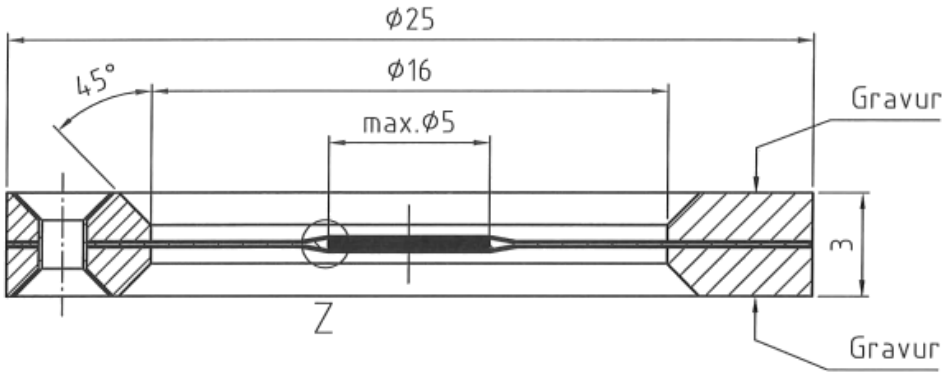
$^{54}_{25}$Mn	0.855 y	EC	0.835 100% Cr K x rays 26%
$^{55}_{26}$Fe	2.73 y	EC	Mn K x rays: 0.00590 24.4% 0.00649 2.86%
$^{57}_{27}$Co	0.744 y	EC	0.014 9% 0.122 86% 0.136 11% Fe K x rays 58%

Mn54:
- High energy gammas
- 5.4 keV xray

Co57:
- Lower energy gammas
- 6.4 keV xray

After absorption and geometric efficiencies (w/o holder):
Mn54 3% : 6% Co57

Ultra thin conversion-electron source holder adds almost no shielding:

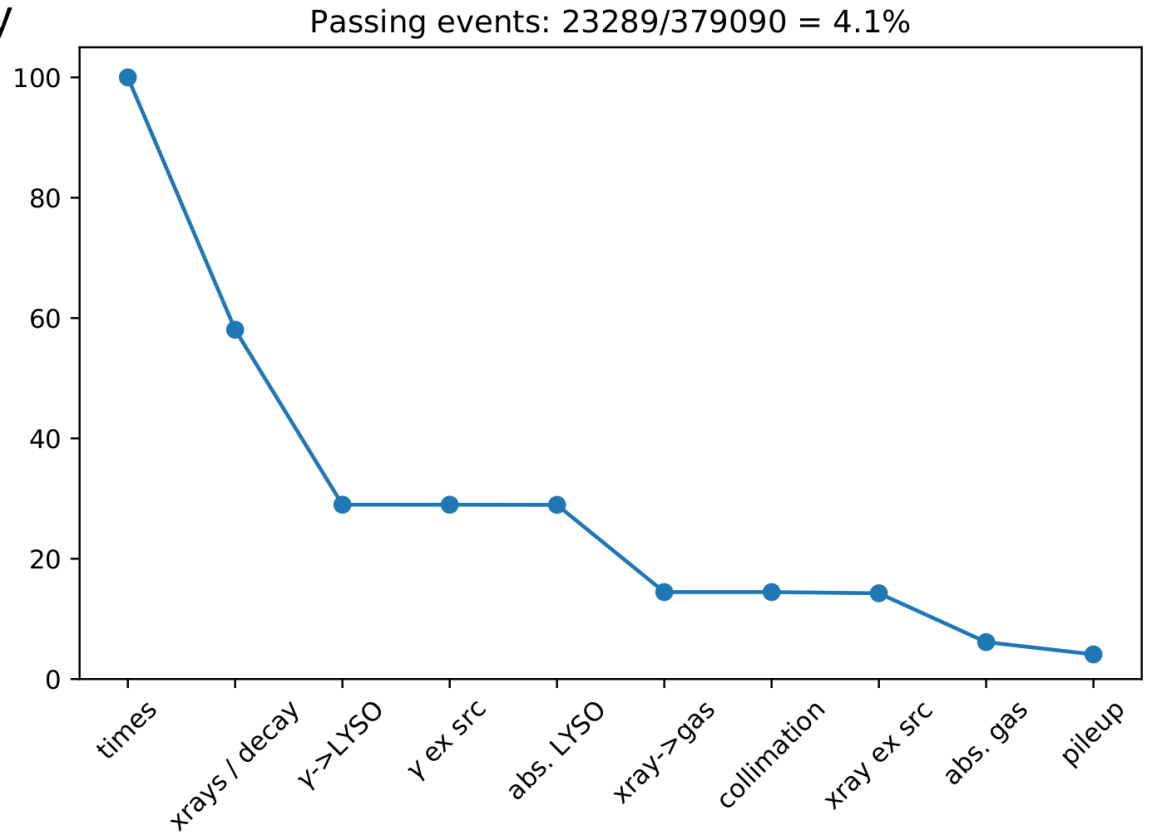


Expected Performance

Toysim only

Largest reductions:

- 50% each for gamma and xray direction
- 58% from source xray production



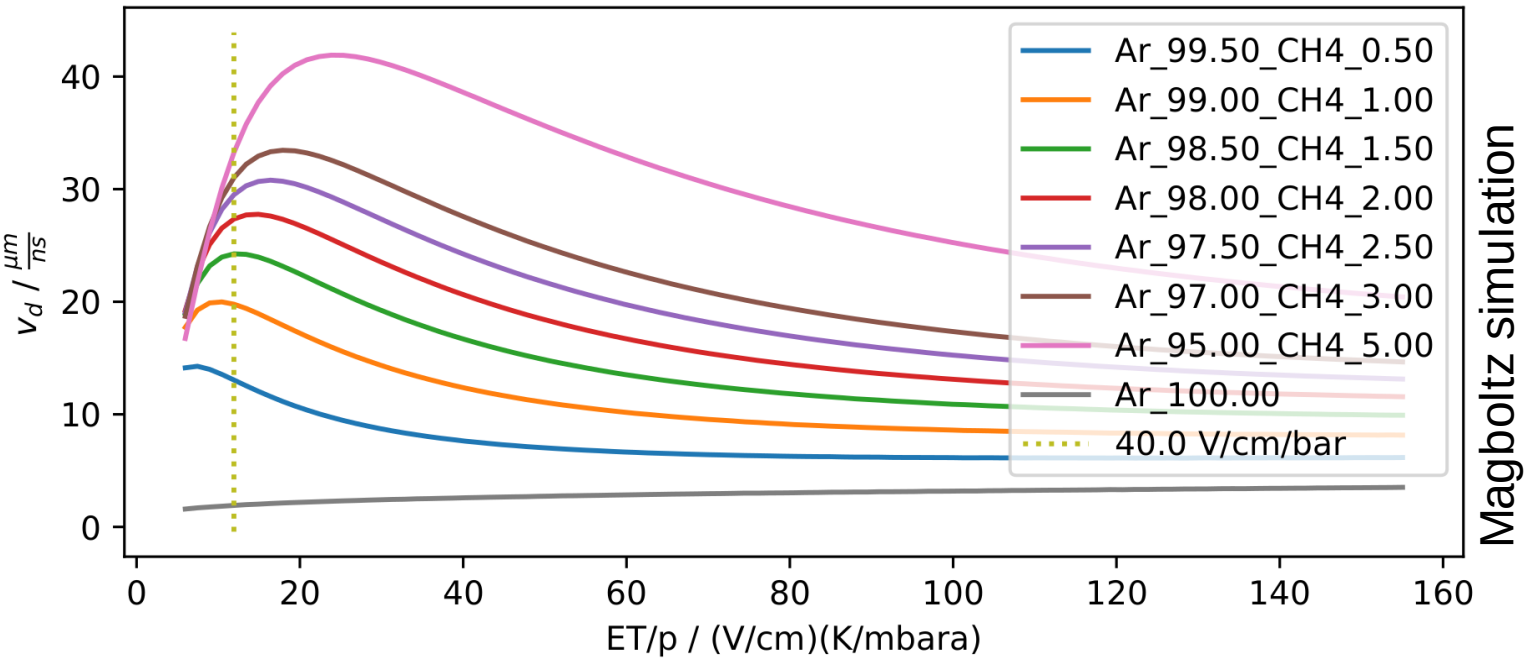
Lessons learned:

- Certain source holders are impossible (xrays)
- Pileup in gas an issue
  - Few us needed between interactions for clean signals

Measurement Plans: Gas

Both low quencher and high quencher scenarios of interest

At which quencher fraction is the drift velocity maximum of Ar:CH4 at 40 V/cm/bar?



Measurements of swarm parameters in P2, P5, P10, (P50), (P100) from 1 bar to 10 bar

Conclusion, Outlook, AOB, ...

Build two mini-MWPC planes and attached them to a drift space.
Very first tests with Fe55 hopefully this week (first at atmospheric pressure).

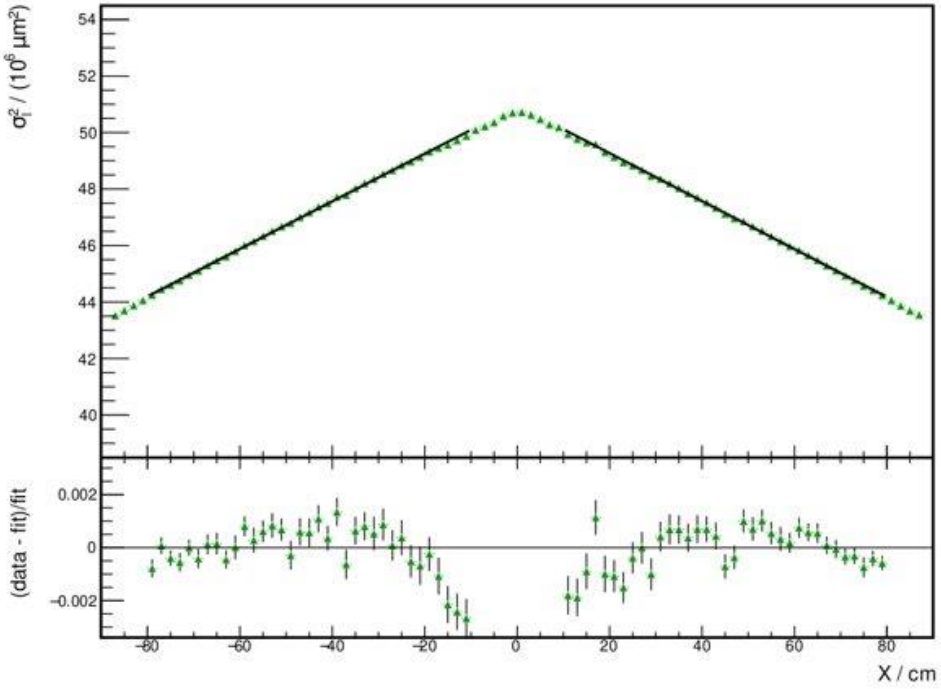
Plan to run with very low quencher and high quencher fractions in Ar:CH4.
P10 and P50 were already delivered today, also have P100 on stock.

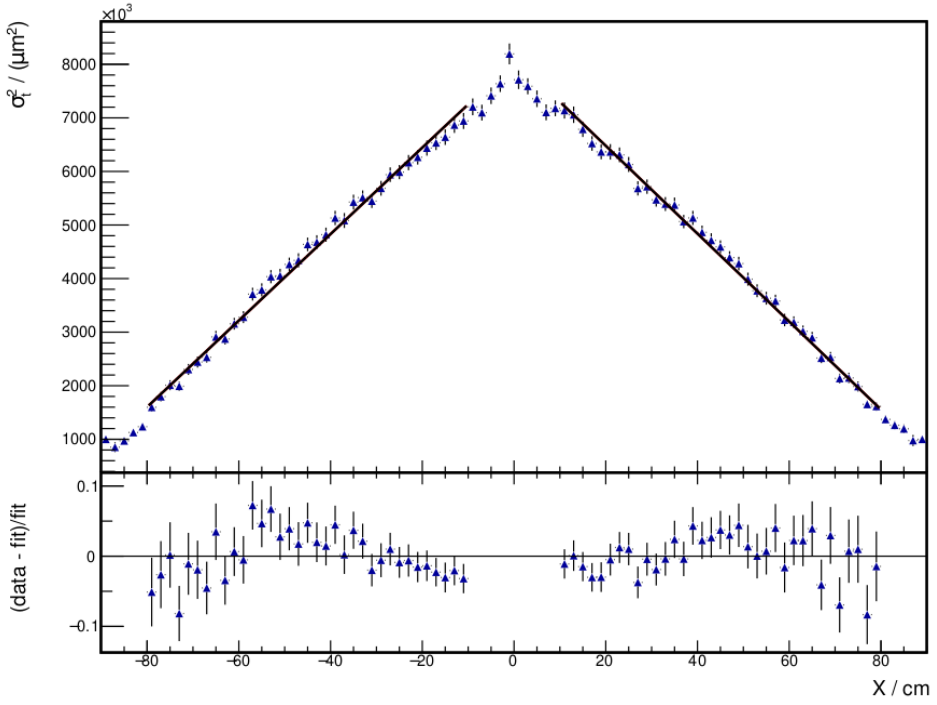
Final goal is to measure vd, dl and dt for Ar:CH4 mixtures.

Thank you!

Diffusion in the T2K TPCs

Track / Waveform Width Distribution in ND280's TPCs

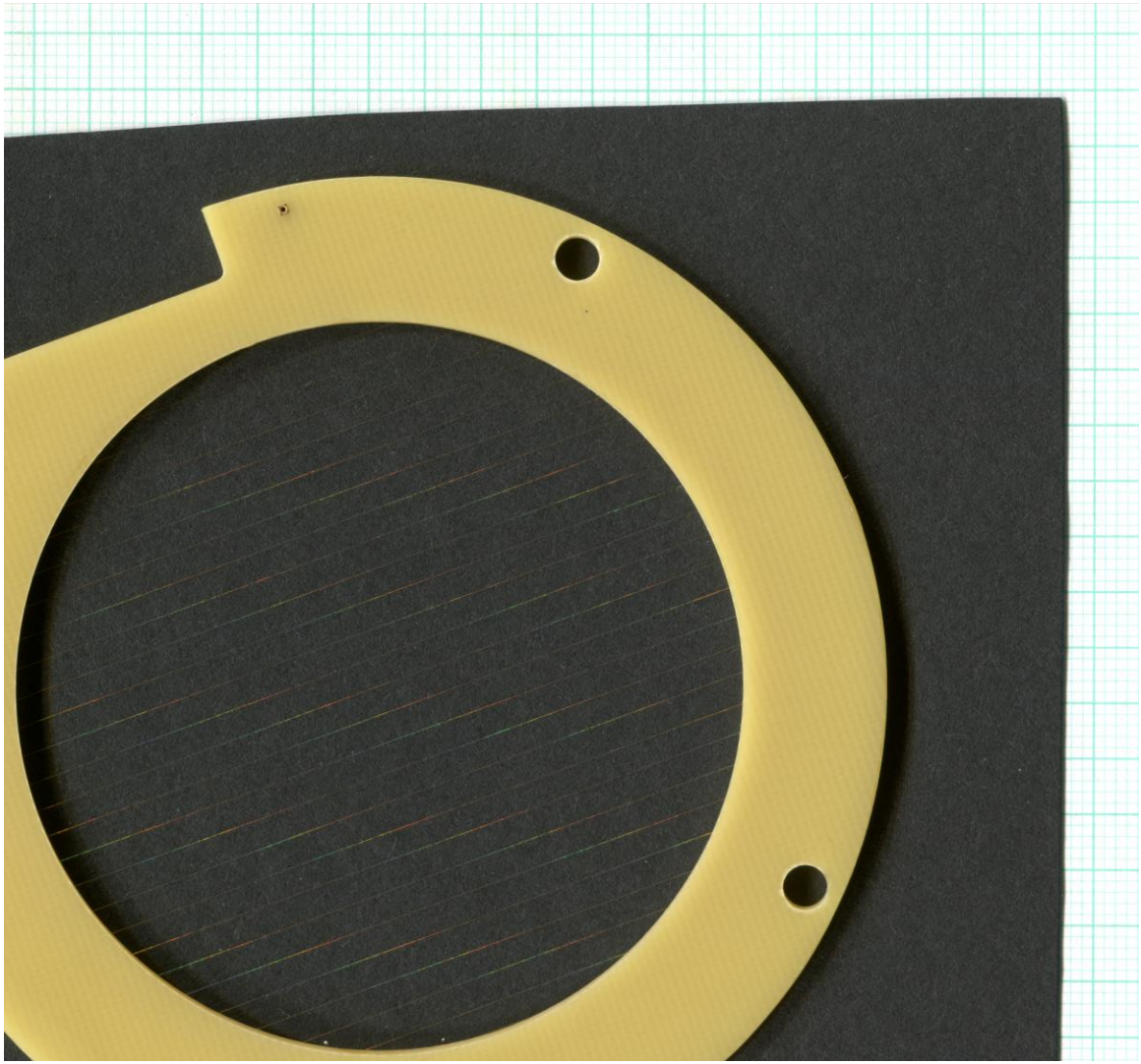




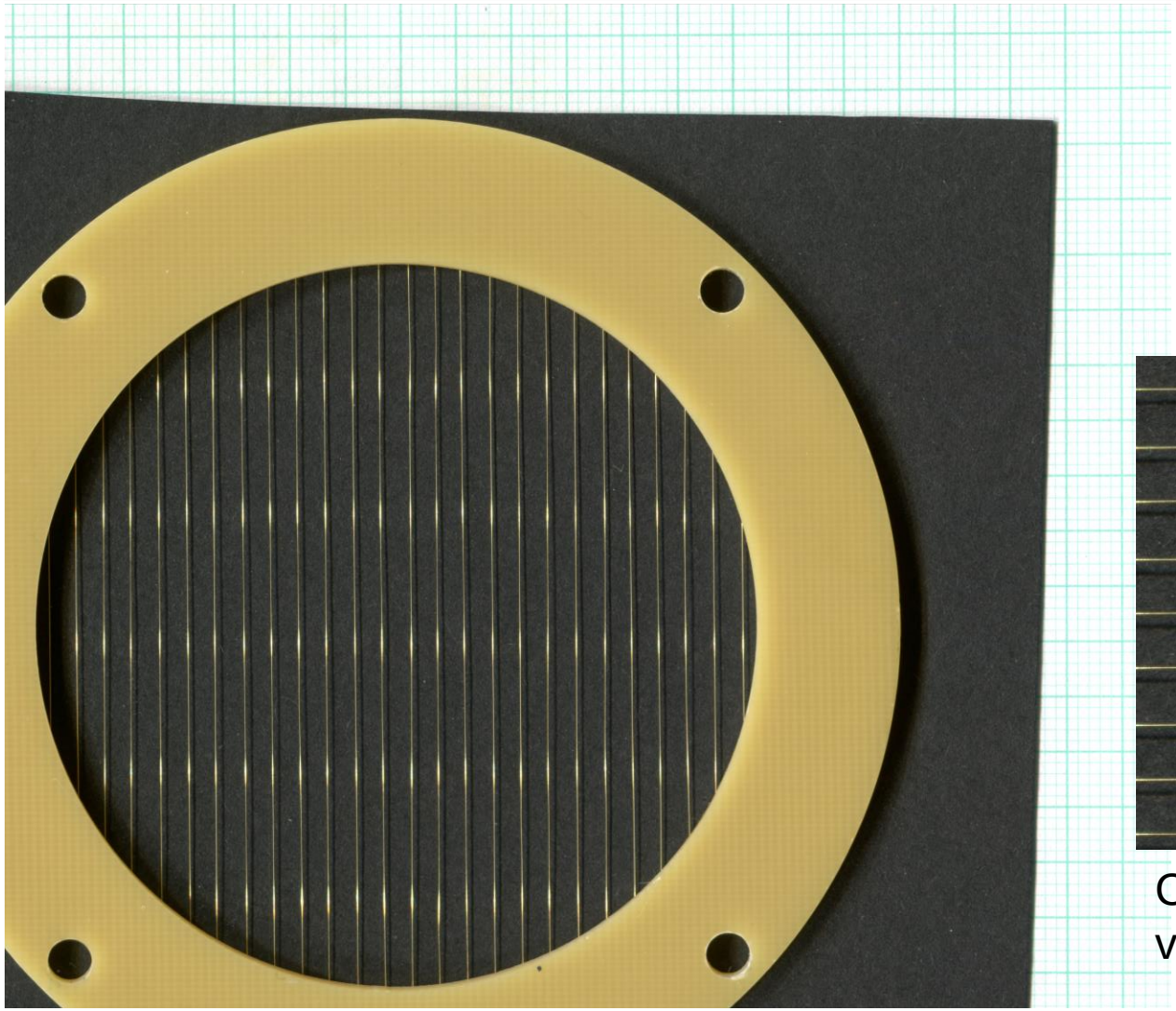
$$\sigma_l^2(x) = d_l^2 \cdot x + \sigma_0^2$$

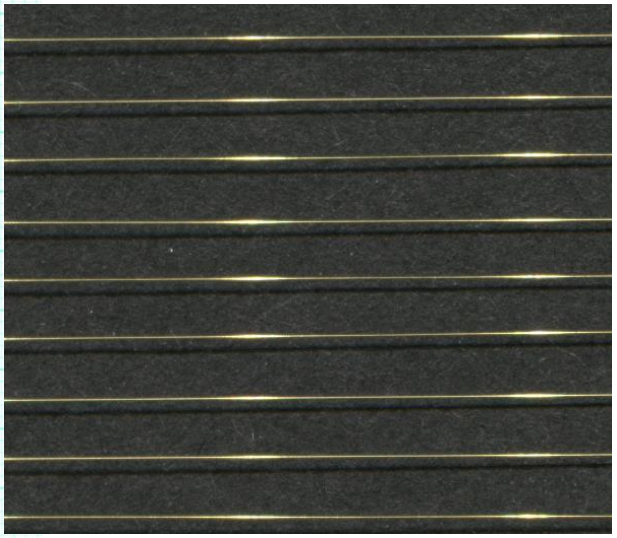
$$\sigma_t^2 = d_t^2 \cdot x + \sigma_0^2$$

Anode



Cathode





Cast shadow should not be visible for parallax-free scan