

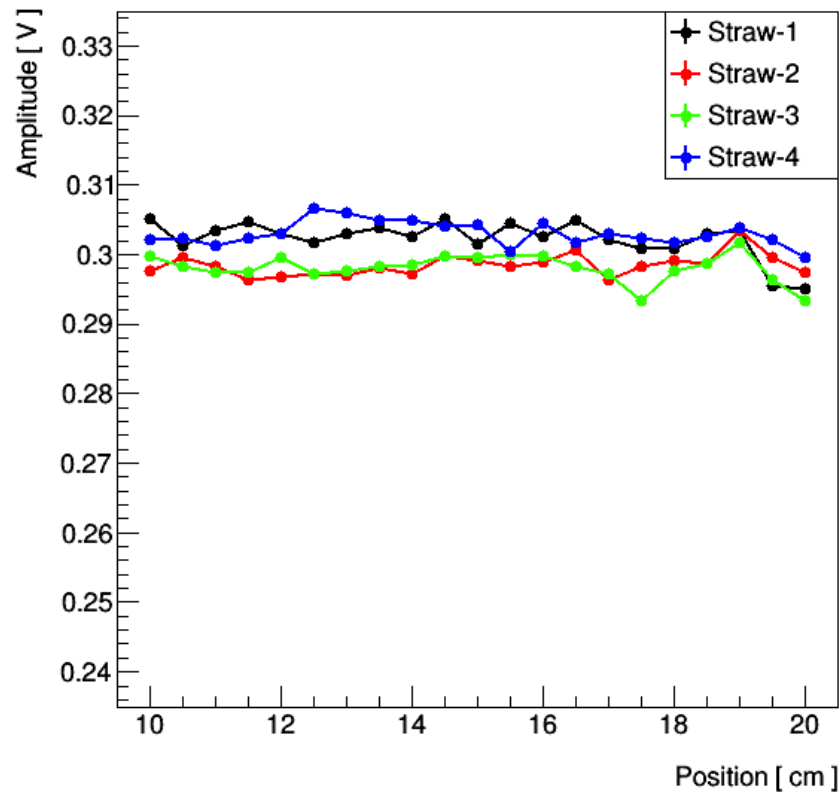
Forward Tracker status

Jerzy Smyrski, Jagiellonian University in Krakow

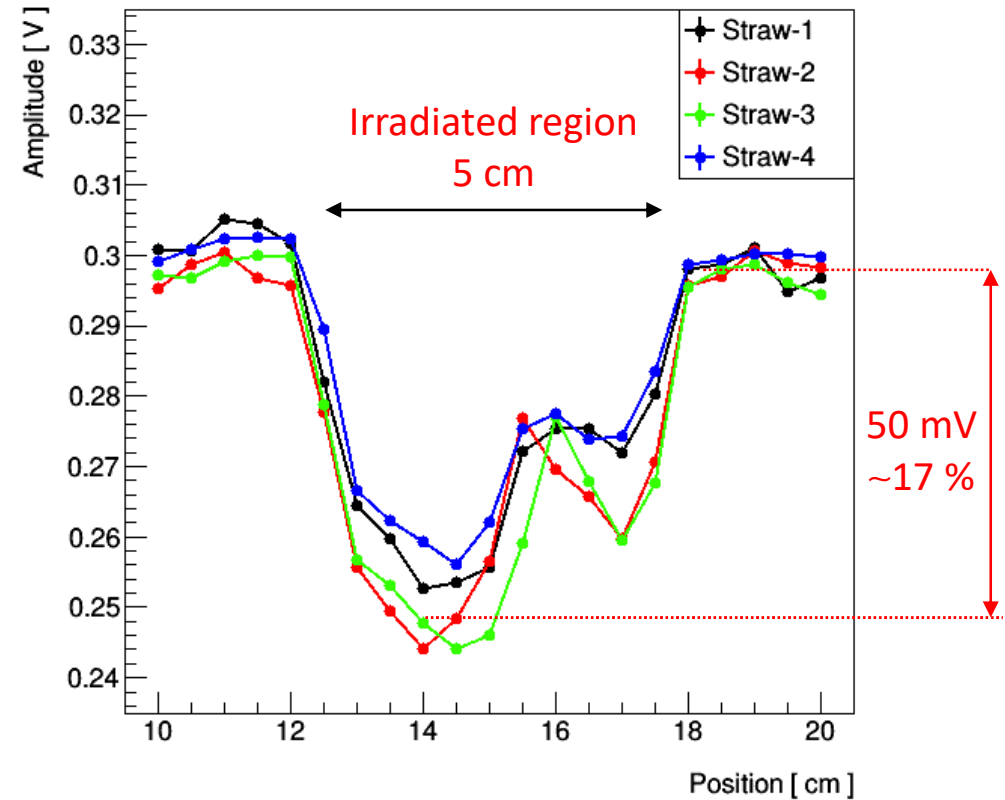
- Results on recent straw aging measurement
 - Update of FT1, 2 design
 - Status of the FT contract
-

Amplitude vs. position along straw (test in 2019)

New ($Q/I = 0 \text{ C/cm}$)

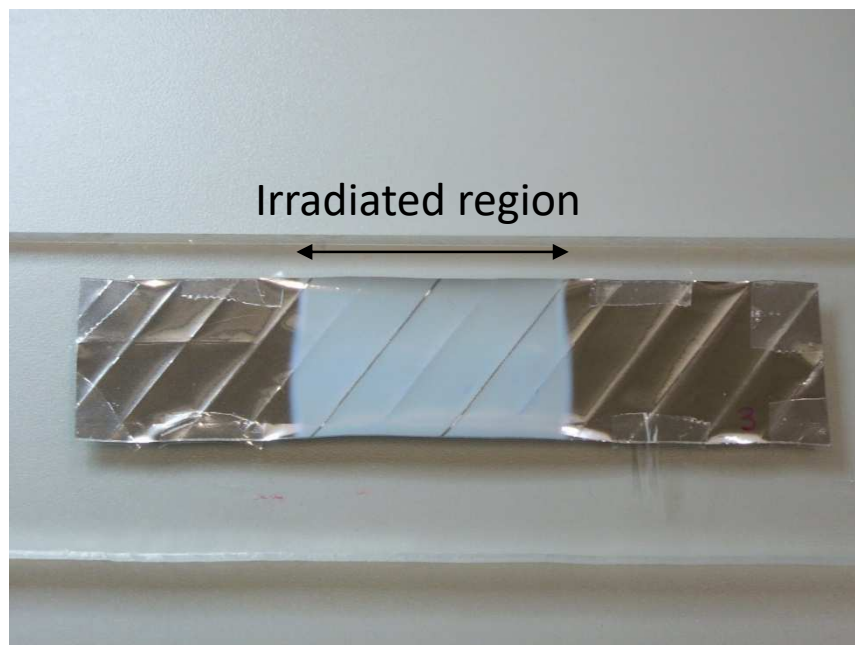


Irradiated ($Q/I = 0.36 \text{ C/cm}$)

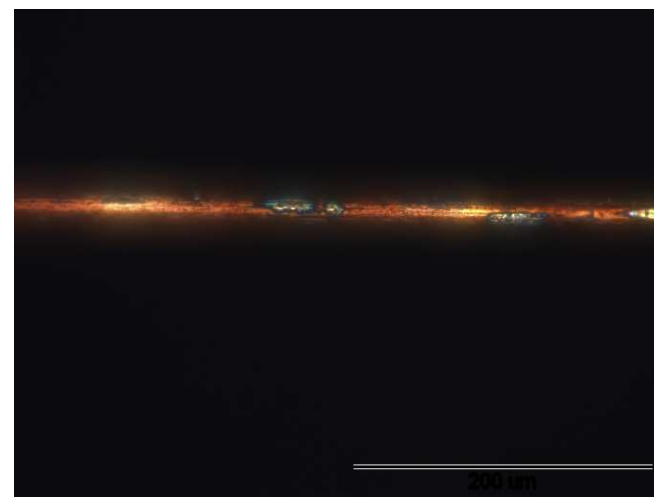


Deposits on straw and on anode wire

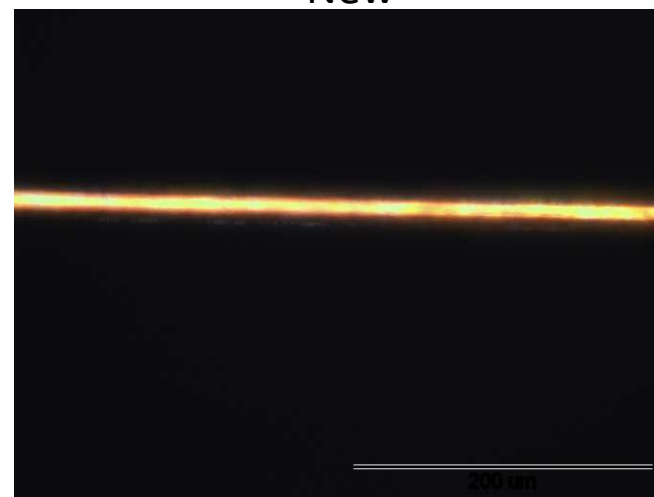
Irradiated **straw material**



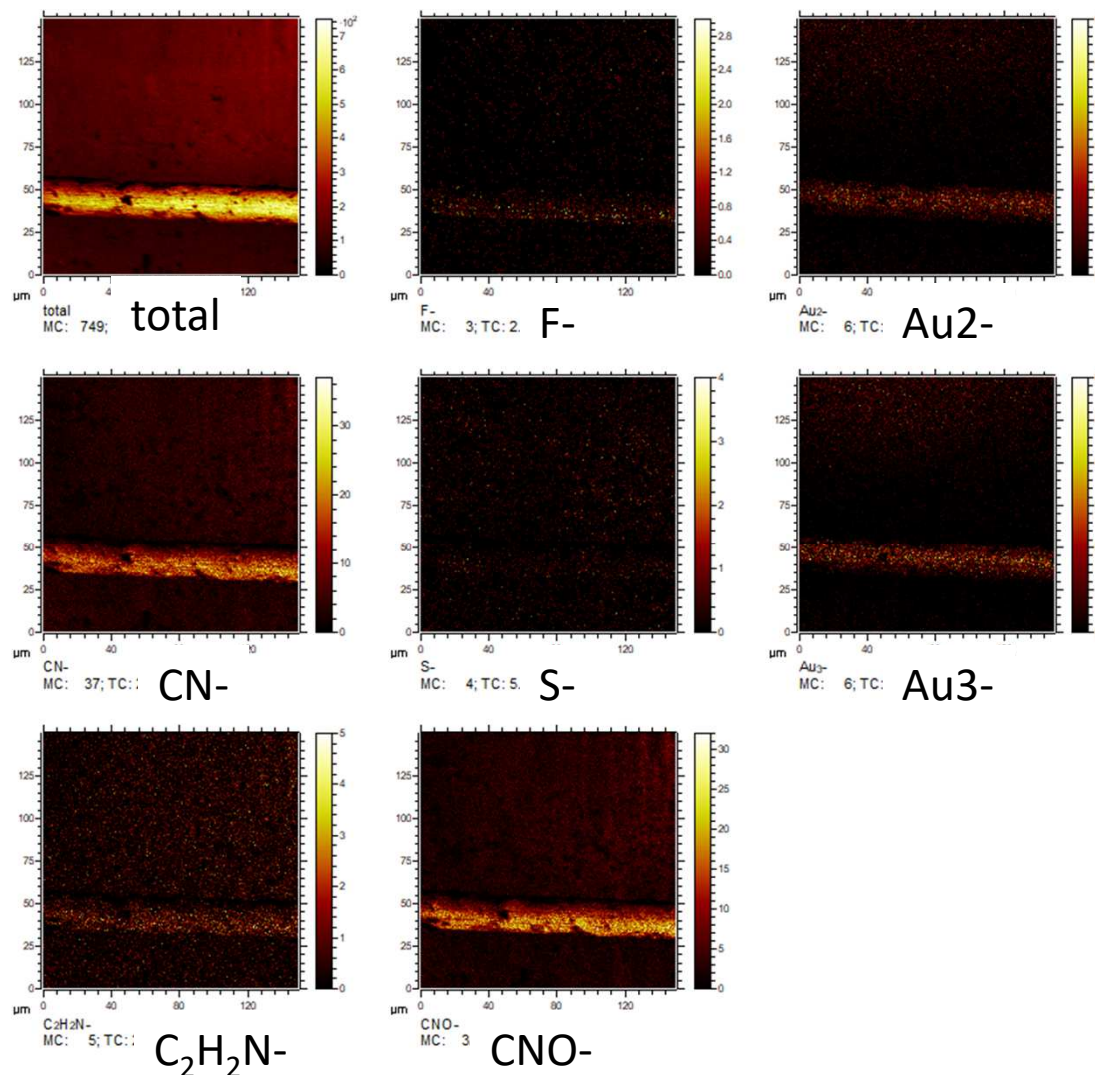
Irradiated **anode wire**



New

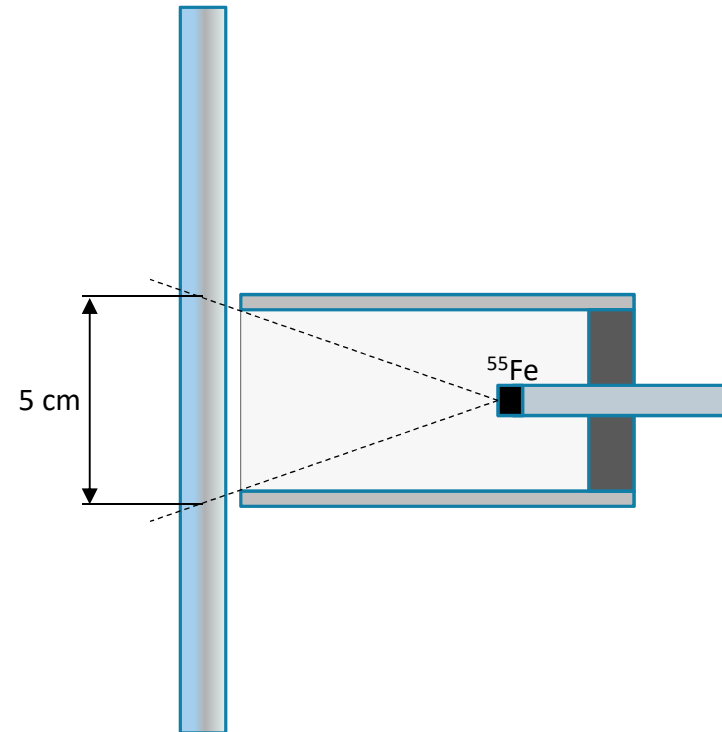
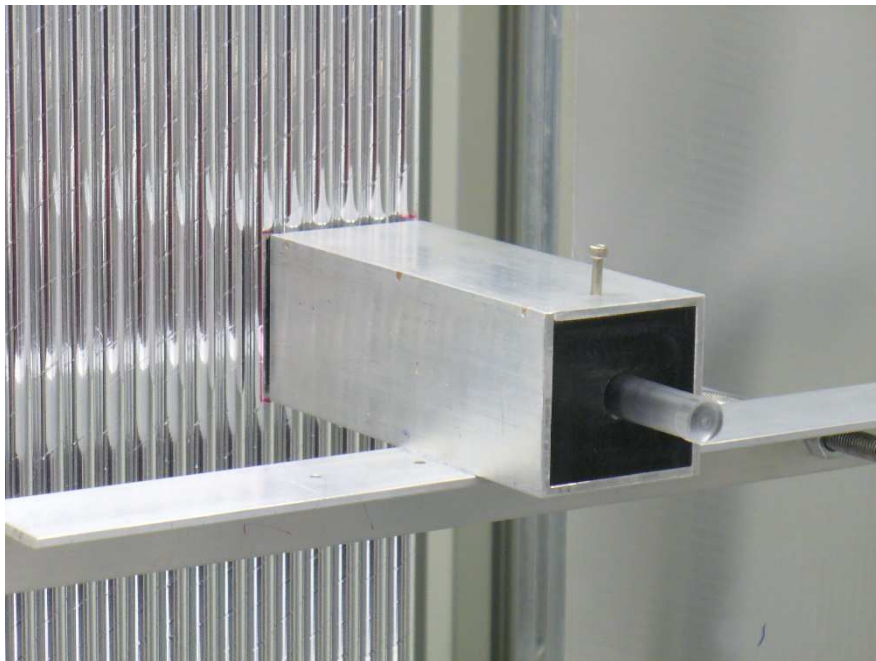


Analysis of deposits on wires using TOF-SIMS (Time Of Flight - Secondary Ion Mass Spectrometry).



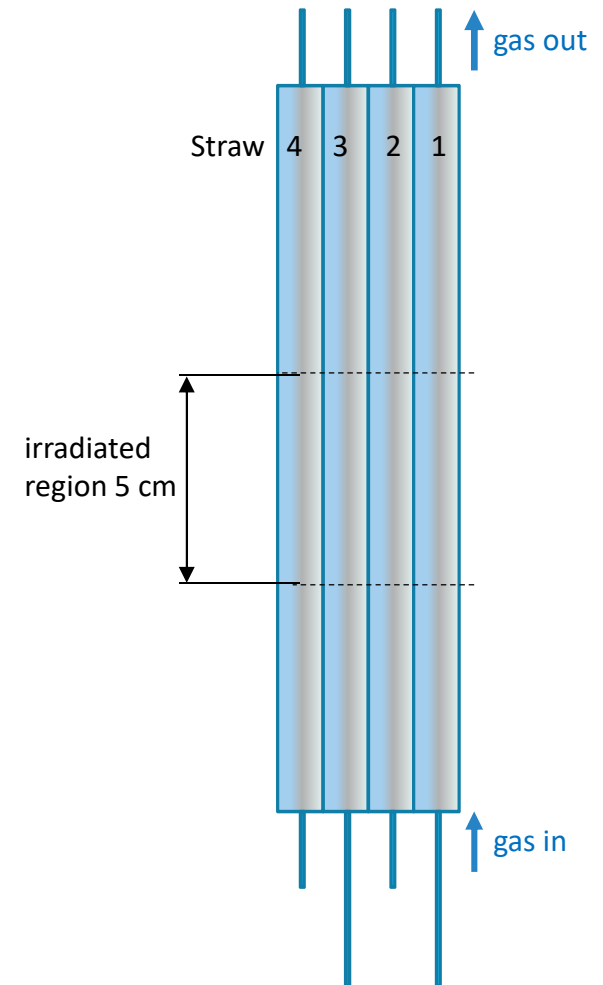
Collimator of ^{55}Fe source

- 4 straws irradiated, each on a length of 5 cm



Arrangement of straws in the new test

- straw 1 and 2 glued with **UHU Endfest 300** (*used so far*)
- straw 3 and 4 glued with **Araldit AY103 + hardener 991** (*low outgassing epoxy adhesive suggested for gas detectors by the CERN PH-DT-DI Gas Project*)
- in straw 1 and 3, length of PVC pipes at the gas inlet is 22 cm while in straw 2 and 4 – 10 cm.



Measurements

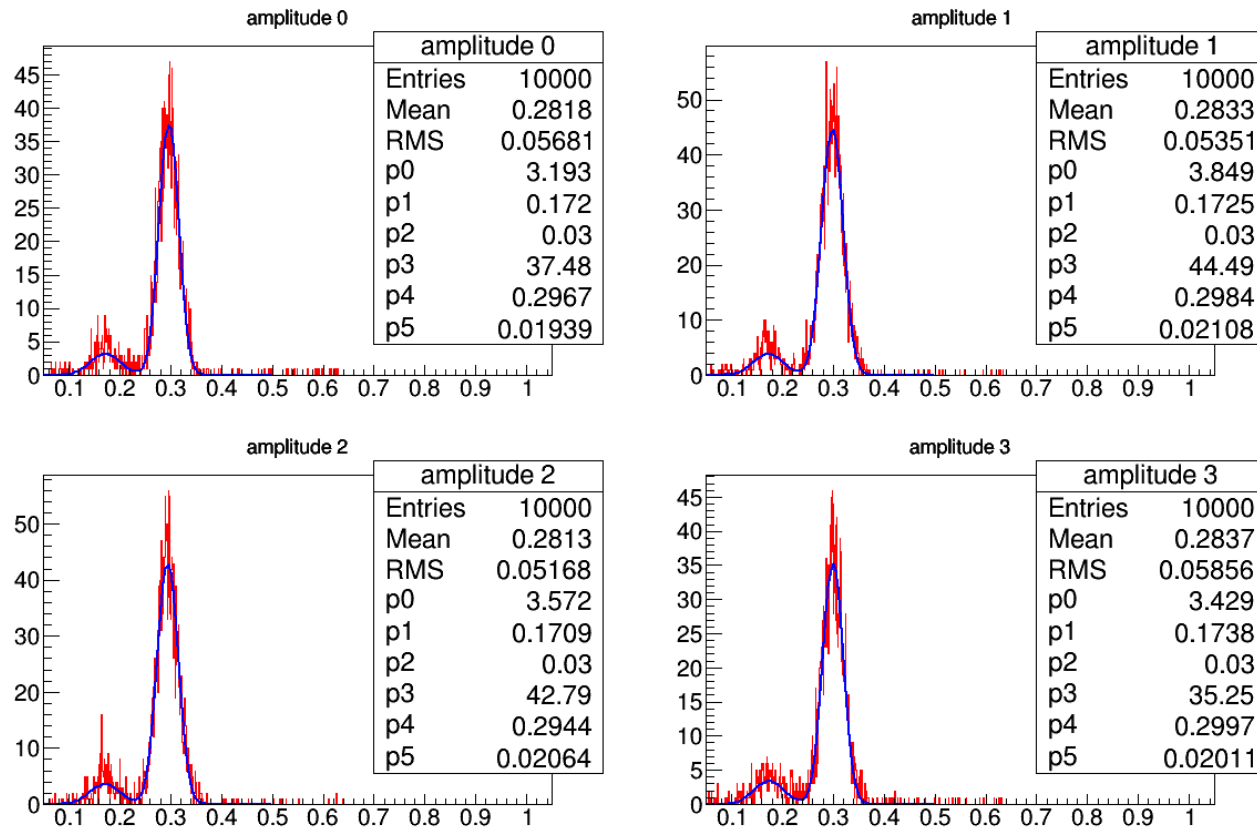
Operating conditions:

- Gas mixture: Ar+CO₂ (90:10) at 2 bar
- Gas exchange rate: ~ 1 volume/h
- HV: 1850 V, gas gain: $\sim 5 \times 10^4$

Monitored/measured:

- Rate: ~ 250 kHz/straw (~ 60 kHz/cm) registered with the TRB
- Current: ~ 650 nA/straw
- Amplitude of pulses: monitored with a scope
- Amplitude of pulses as a function the position along the straw was measured for a few accumulated charges up to 0.73 C/cm

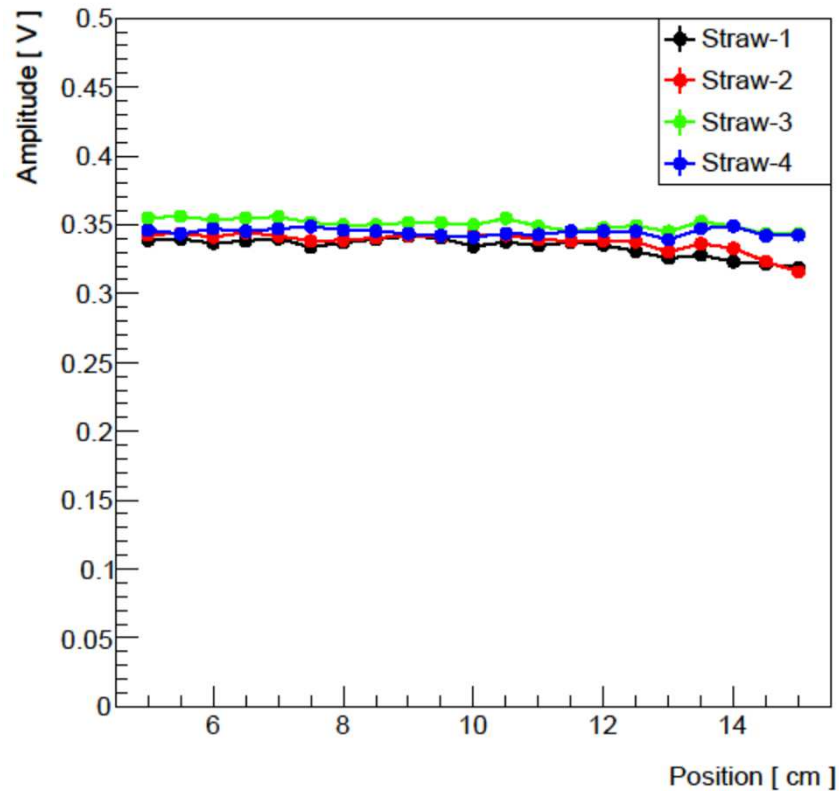
Amplitude spectra with ^{55}Fe



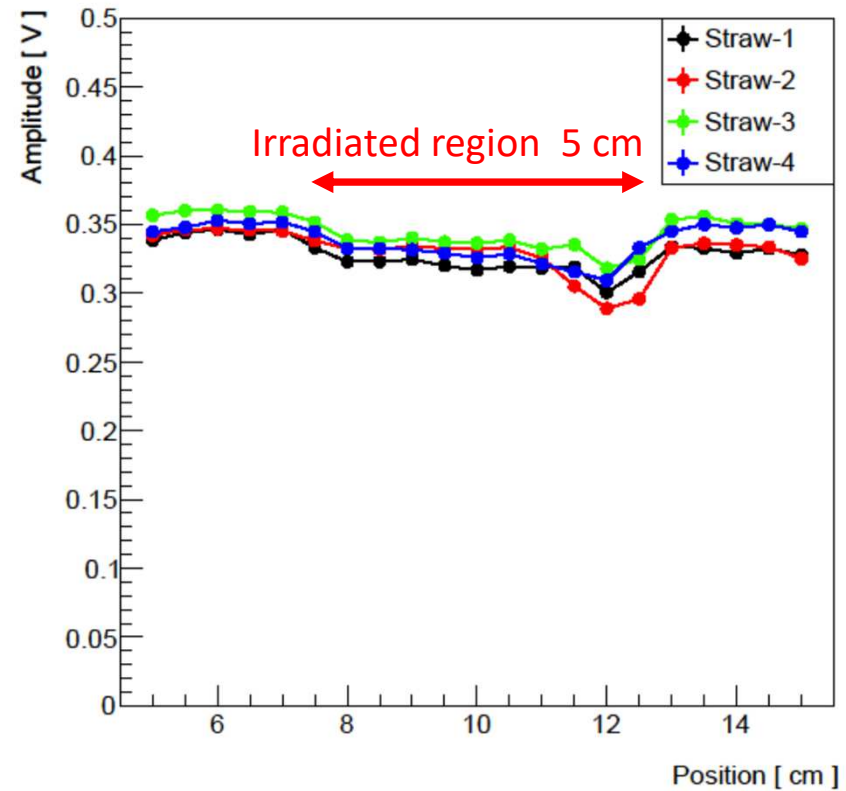
- Gaussian curves fitted to 2.9 and 5.9 keV peak.
- Central amplitude for the 5.9 keV peak taken for further analysis

Amplitude vs. position along straw

New, Febr. 26. ($Q/I = 0 \text{ C/cm}$)

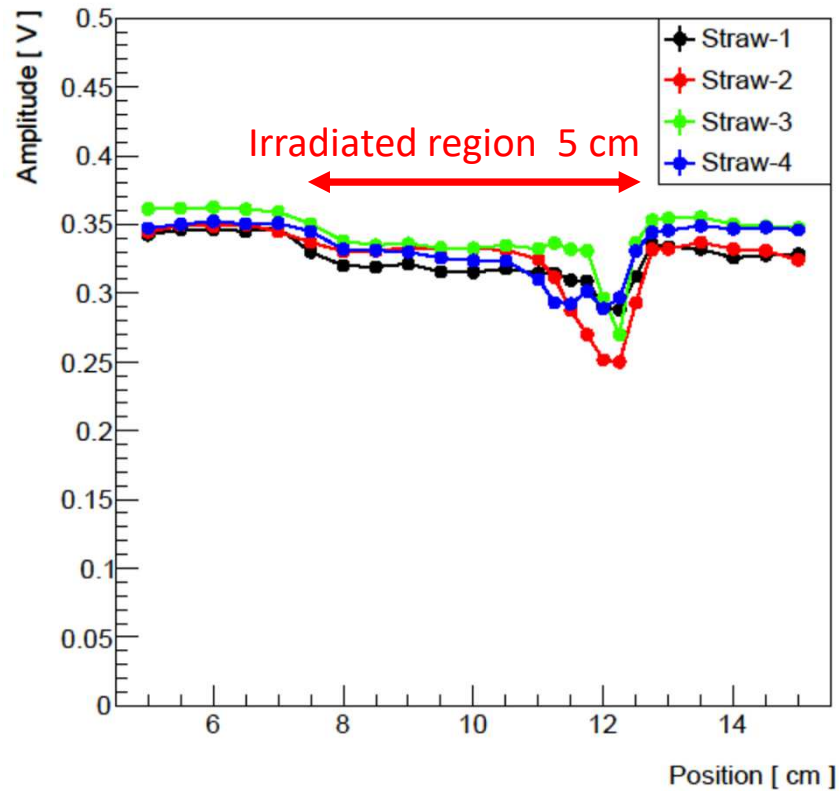


Irradiated, April 26. ($Q/I = 0.46 \text{ C/cm}$)

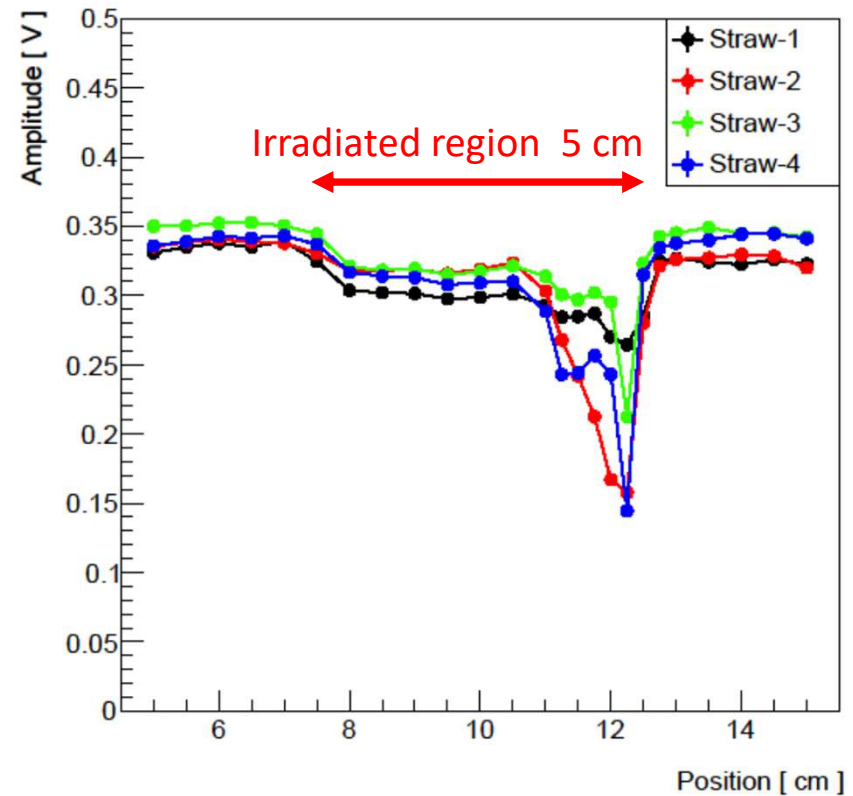


Amplitude vs. position along straw

New, May 3. ($Q/I = 0.51 \text{ C/cm}$)

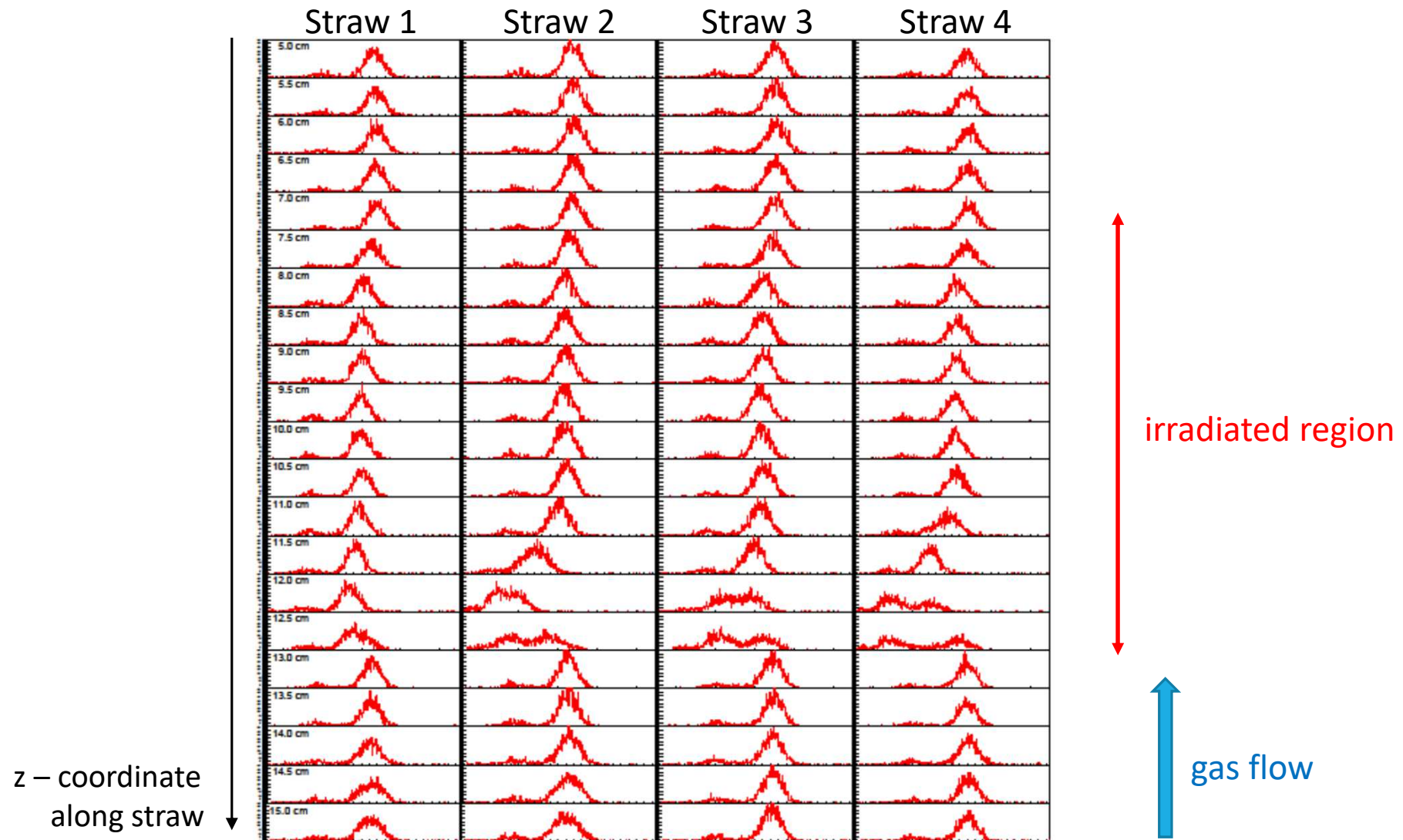


Irradiated, May 19. ($Q/I = 0.63 \text{ C/cm}$)

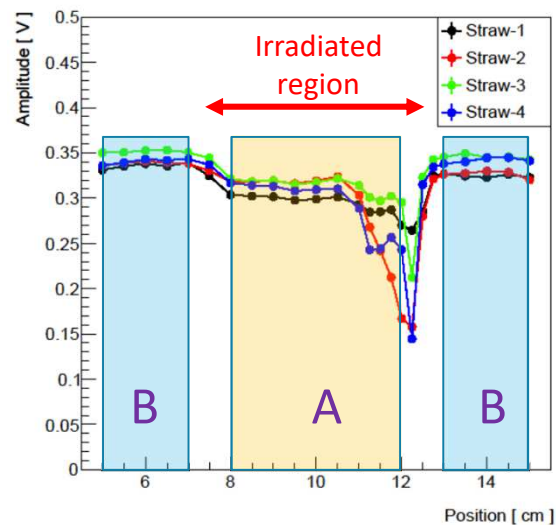


gas flow
←

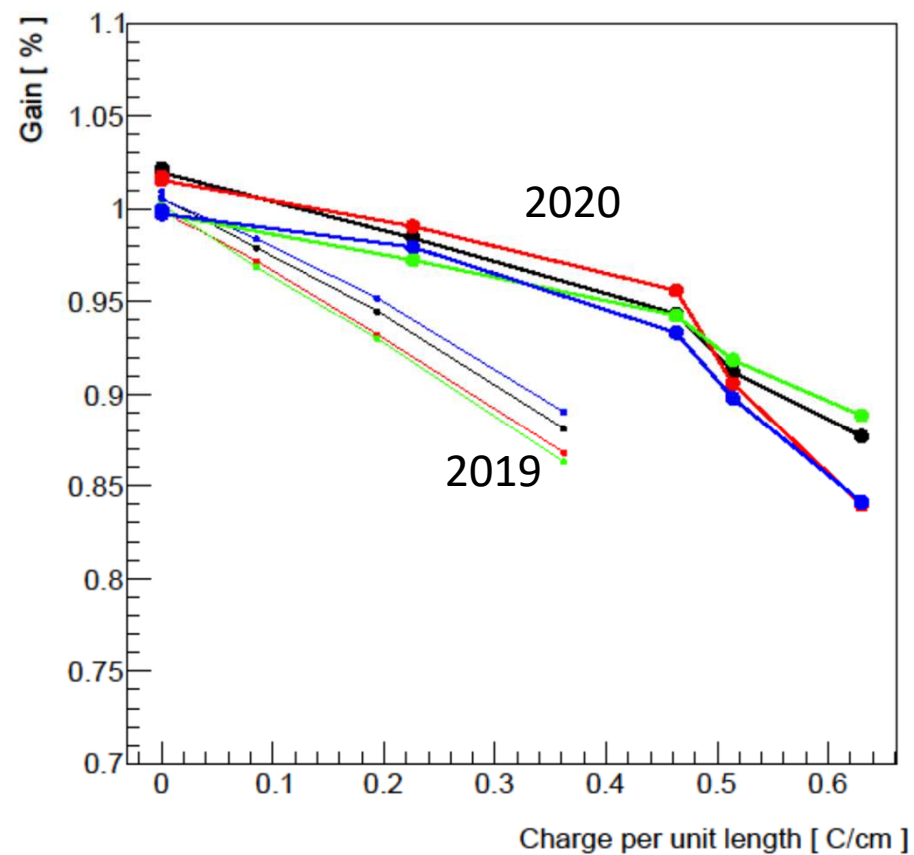
Amplitude spectra for $Q/I = 0.63 \text{ C/cm}$ (2 months+1 week of irradiation)



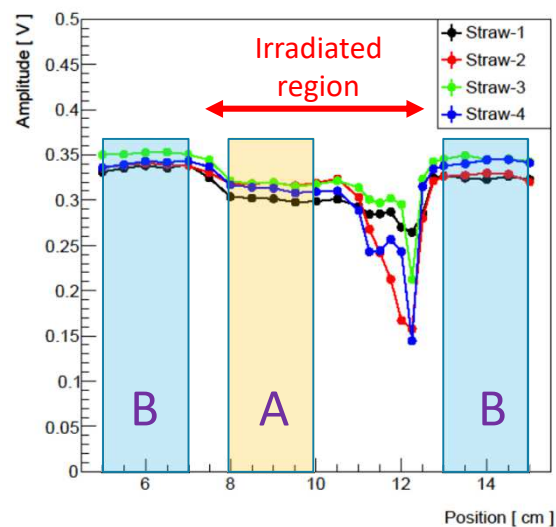
Gas gain drop



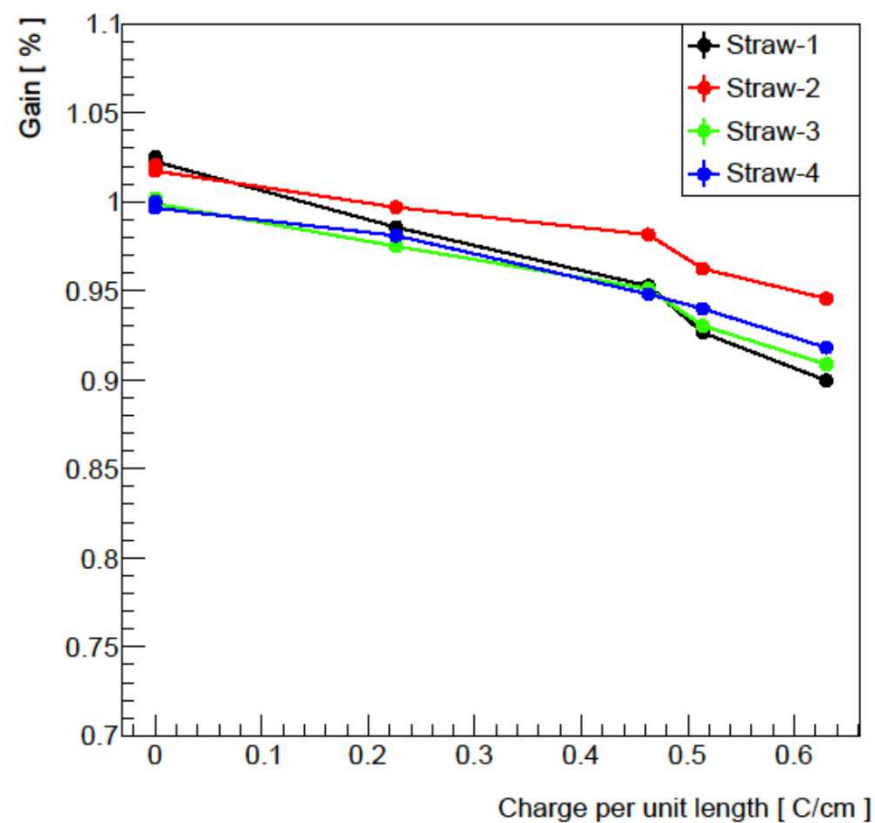
$$\text{gain drop} = \frac{\text{amplitude (A)}}{\text{amplitude (B)}}$$



Gas gain drop

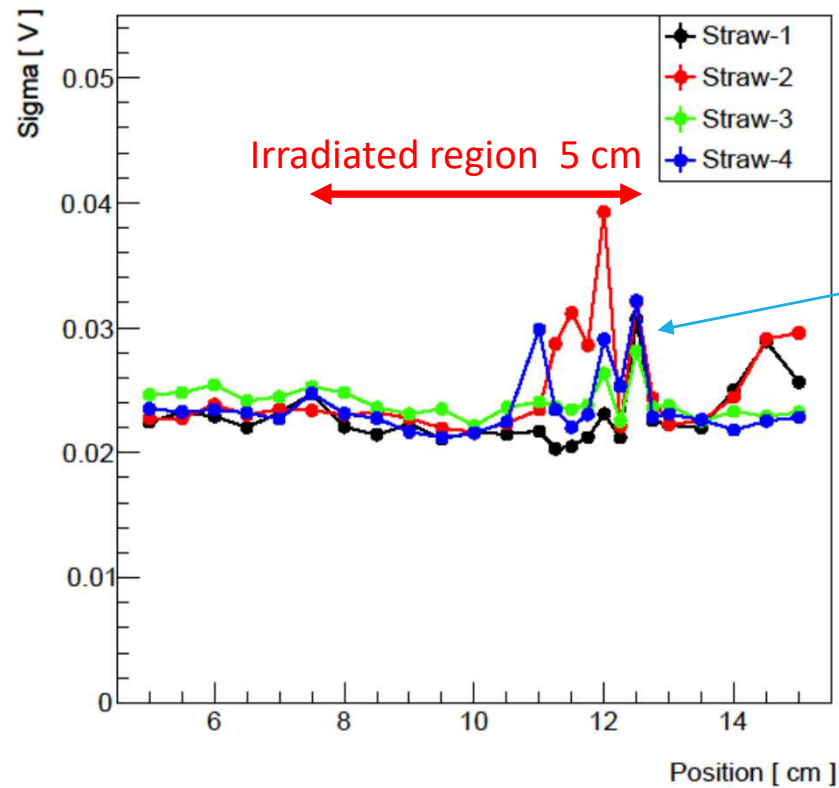


$$\text{gain drop} = \frac{\text{amplitude (A)}}{\text{amplitude (B)}}$$



Energy resolution

Irradiated, May 19. ($Q/I = 0.63 \text{ C/cm}$)



Non uniformity of deposits
on the wire (?)

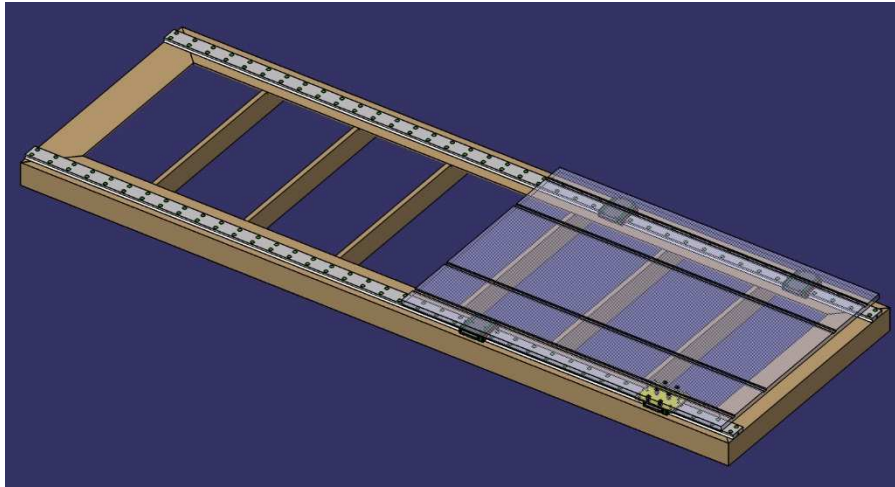
gas flow

Conclusions and plans

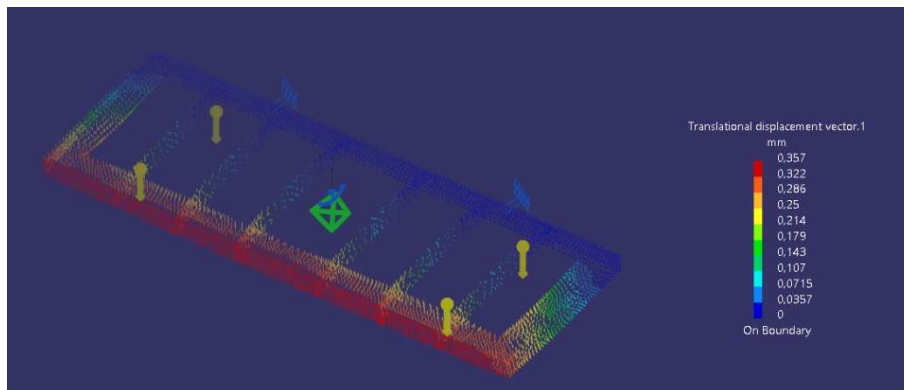
- Gain drop in tests from 2019 about 3 Times higher than from 2020 (possible cause: expired adhesive in straws from 2019).
- In tests from 2020, there are no visible differences between straws glued with **UHU Endfest 300** (used also in 2019) and **Araldit AY103 + hardener 991**.
- We observe a strong aging effect in the place where gas enters the irradiation area (contaminants flowing into the straw from the gas system side?).
- New tests are in preparation to investigate the influence of the PVC gas pipes on the aging.

Update of FT1, 2 design

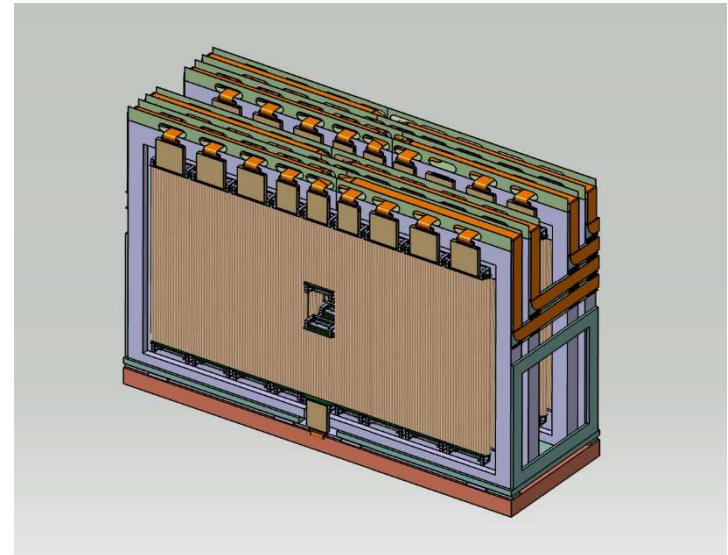
Base frame with movable tables



Deformation <0.36 mm under total load of 200 kg



Work is underway on the design of the frames for modules and the details of routing the supply lines

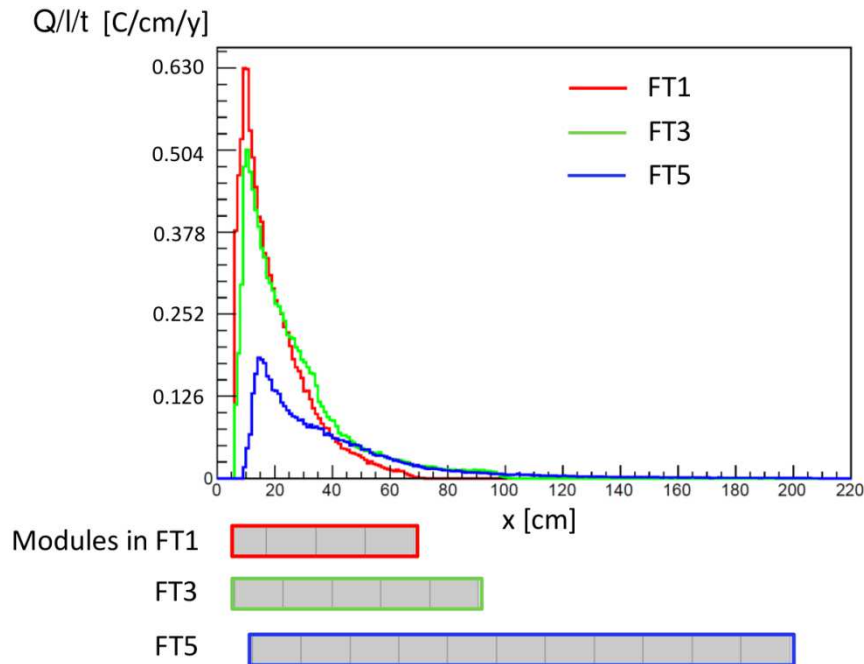


FT contract

- We just received a quote for straw material from Lamina
- Text of the contract is ready
- Let's hope it will be signed soon

BACKUP SLIDES

Accumulated charges in the FT straws



Simulations with DPM:

- pbar momentum: 15 GeV/c
- interaction rate: 2×10^7 1/s

Straw operating conditions

- gas mixture: Ar:CO₂ (90:10)
- gas gain: 5×10^4

In 10 years of data taking in the high luminosity mode at 15 GeV/c, $Q/l < 1$ C/cm for $x > 40$ cm