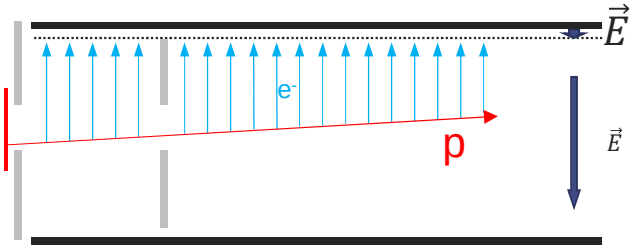
Status SANDA Deliverable 1.1

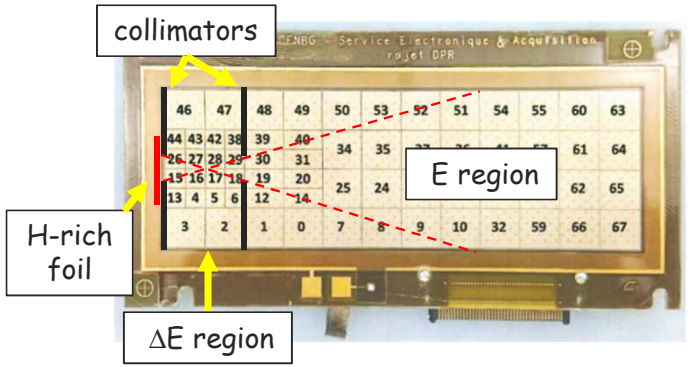
- **WP1:** Developments of new innovative detector devices
  - **Task 1.1:** Innovative devices from fission cross section to fission products decay studies
    -- Subtask 1.1.1: fission cross sections
      - Subtask subdivision: Development of two new detector devices:
        1.1.1_1: LP2i-Bordeaux: Gaseous Proton Recoil Telescope (GPRT)
        1.1.1_2: CEA: Micromegas-based “transparent”detector with XY readout and TOF capable electronics

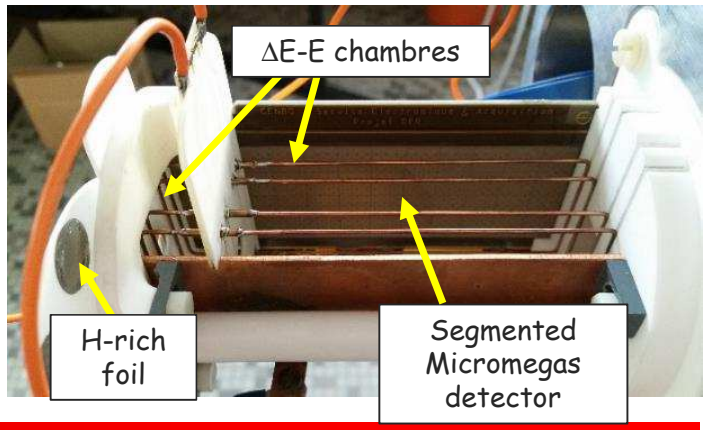
- **D.1.1 (M48+6):** *“Report on the study and construction of new devices for precise fission cross section measurements”*

GPRT detector

- **Goal:** accurate neutron flux measurement, relative to H(n,n)
- **Detector characteristics:**
  - Gas detector: to reduce γ/e sensitivity
  - Two chambers with collimator:
    . to select only forward protons and define precisely the detection efficiency
  - Micromegas detector:
    . combination of ionization chamber (low electric field) and proportional chamber (high electric field)
    . high range in gain, good radiation hardness, good timing
    . for signal amplification
  - Segmented:
    . crude segmentation in 64 pads
    . enables to reconstruct proton track and help background discrimination
  - TPC:
    . drift time measurement
    . enables to reconstruct 3D proton track and infer initial neutron energy







GPRT detector: status

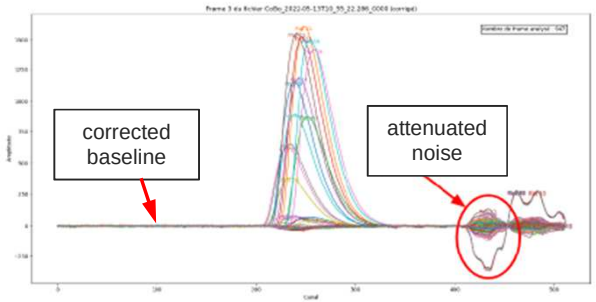
- **Detector performances:**
  - very low sensitivity to γ/e^-
  - 3D track reconstruction
  - good electric behaviour
  - suitable N_2-CO_2 mixture (good gain, good timing)

- **DAQ performances:**
  - an efficiency issue which lasted a very long time
  - problem now identified, due to incorrect signal transmission
  - in “low performance mode”, ε = 100% and dead time manageable

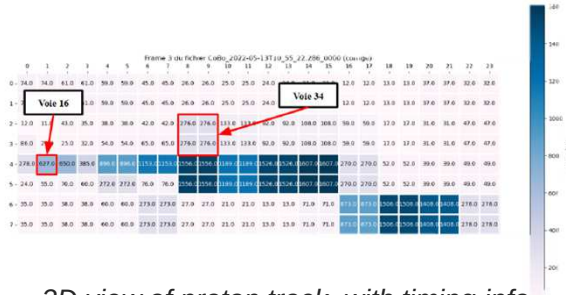
  ⇒ minimal performance requirements met !

- **Analysis tools:**
  - goal: automatic data sorting, background correction, parasite correction...
  - implemented features:
    - . navigation through data
    - . data plotting (spectra and 2D)
    - . parasitic correction

- **Contribution to the D1.1 report: still planed by end of February**



signal correction

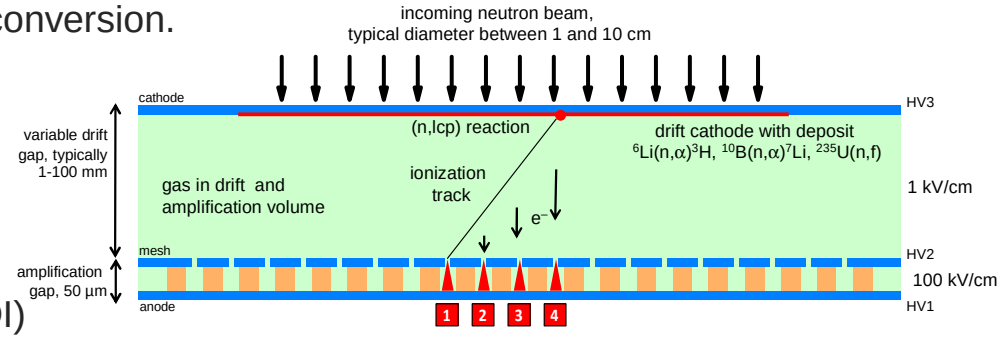


2D view of proton track, with timing info

XyMegas detector

- **Goal:** develop a Micromegas microbulk neutron detector which combines:
  - neutron beam imaging and neutron flux measurements
  - neutron-induced (n,f) and (n,lcp) reaction cross sections
  - angular distributions of neutron-induced reactions

- **Micromegas detectors:**
  - Gaseous parallel plate detectors for charged particles and X-ray and UV photons,
  - Neutron detection possible via neutron to charged-particle conversion.
  - type bulk (PCB integrated)
  - type microbulk (double sided copper-coated Kapton foil)



- **Technical implementation:**
  - Micromegas low-mass microbulk detector (transparency) with X- and Y-strips produced with Laser Direct Imaging (LDI)
  - New data acquisition system based on dedicated **VMM3** chip for neutron time-of-flight environment

- **SANDA** funding completed with French **ANR** project **XyMegas**, in partnership with JRC-Geel

XyMegas detector: status

- **Prototype** (manufactured at CERN)**:**
  - 50 µm thick detector “transparent” microbulk detector
  - 128x128 strips
  - geometrical quantification done
  - mounted in detector chamber

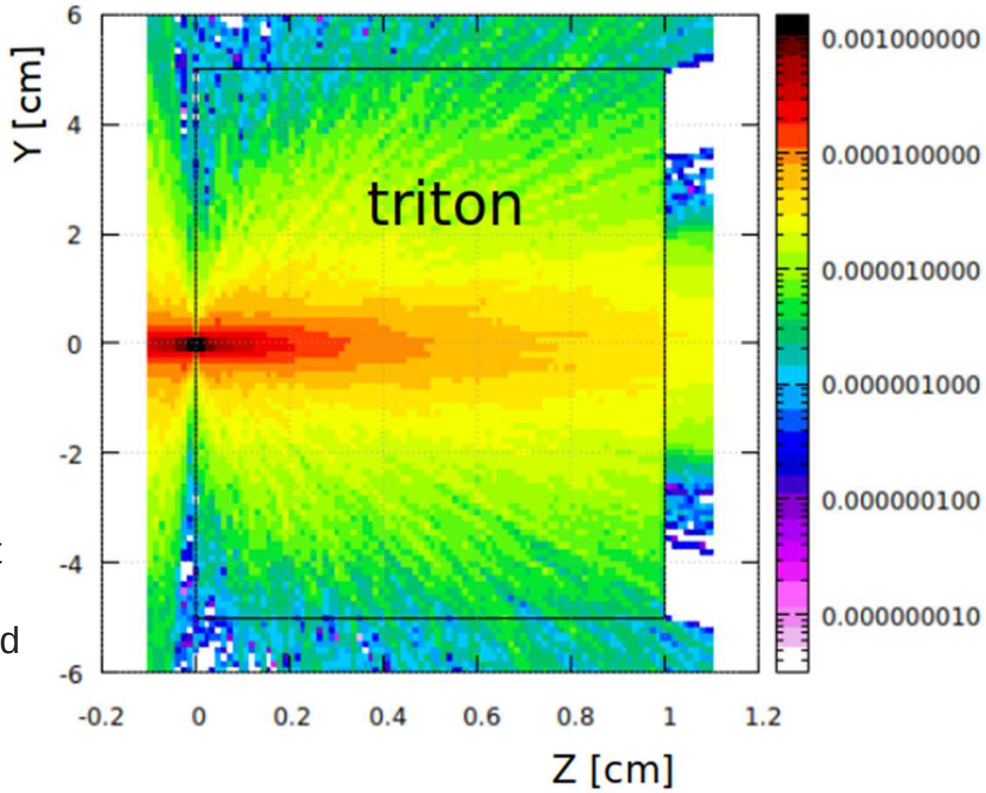
- **DAQ:**
  - VMM3 development board received.
  - PCB boards designed and produced to interface VMM3 electronics and HV distribution

- **Tests:** in lab environment using a ^{55}Fe X-ray source

- **Postdoc recruitment:**
  - a first postdoc could be recruited only early 2022 and has left by the end of 2022 because of family reasons
  - a second postdoc was recruited early 2023 and has advanced on the simulations part using FLUKA, Garfield++, and GEANT4.

- **Contribution to the D1.1 report:**
  - with a focus on the simulations
  - **is still expected by end of February**.

The full D.1.1 report still needs merging and final review



Example of a ^{6}Li(n,a) particle range inside the detector