WP2: Analysis Summary

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Reco code

DONE

- Study of lowgain parameters
- ReRun of Run2 with redpix and PMT
- Adapting recocode for QUEST (almost complete)
- Removing odd rotation and orientation to data saving (ready for Run5)

ONGOING

- Running Run3 PMT data

NEXT

- Update of autoreco to be run not only for LIME, but also for GIN and MANGO
- Running early Run4 PMT data
- Standardise code to read recofiles for analysis
- Correct for lens geometrical distorsion

Odd Rotations

- Too many rotations and transpositions and wrong interpretation of row-column to x-y were present in the reco code.

- Thus:
    - When reading with ROOT the image was flipped top-bottom
    - The images were mirrored left-right
    - The x and y coordinates were saved swapped

- After corrections, all this will be solved, with the 0,0 coordinate being on the top left of the image (for midas files)

Raw

Old


New
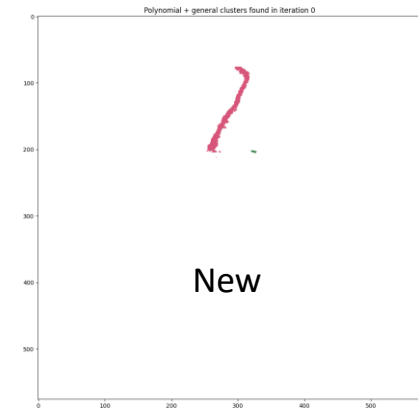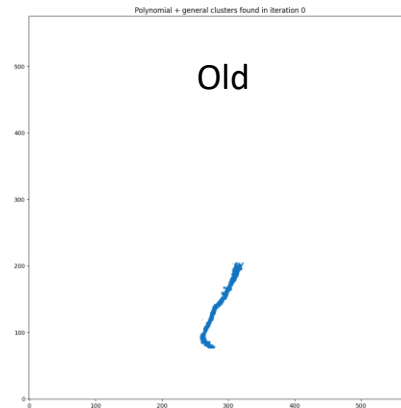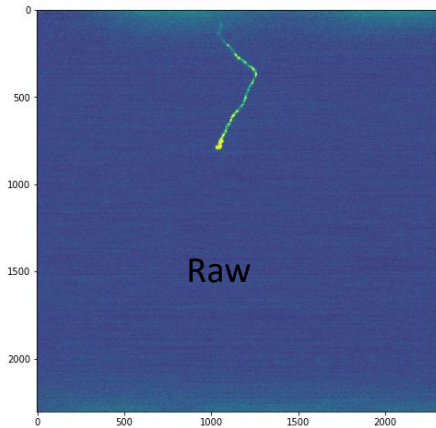
Alpha contamination (D. Pinci)

- Radon contamination characterization with sCMOS images with respect to length, energy and position

- Special interest in:

    - understanding which population comes from cathode/GEM

    - The contribution of Rn to low energy electron recoil band

Length spectrum of alphas in the detector center
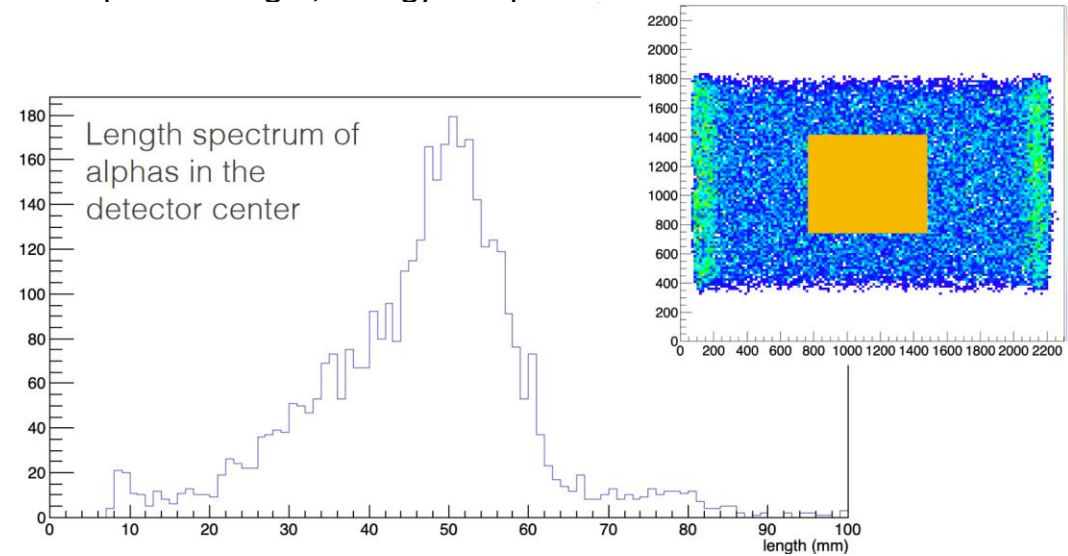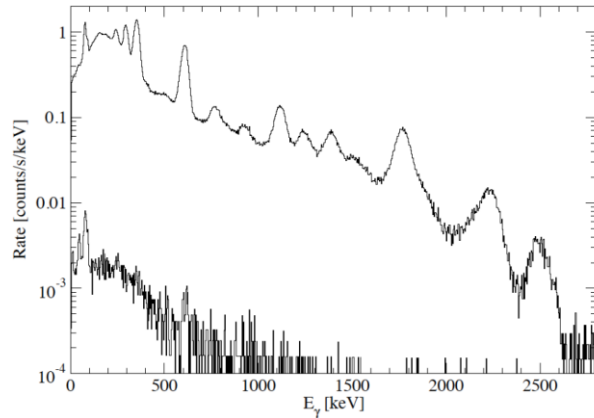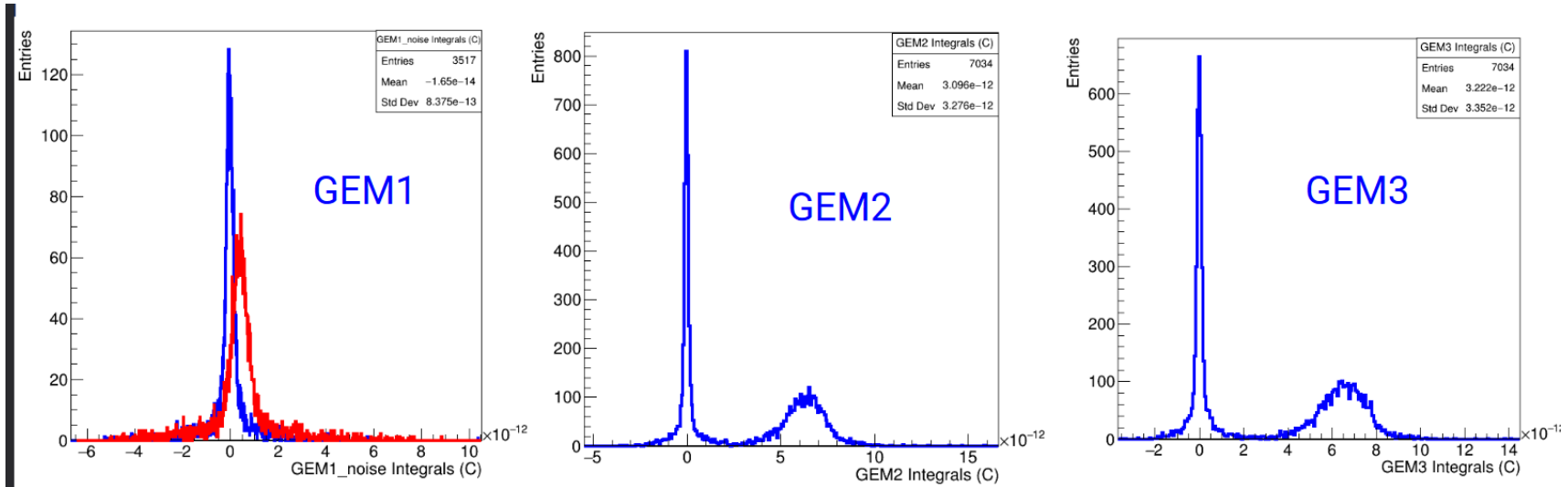
Saturation Studies (D. Fiorina)

- Analysis of the data taken with different drift fields and VGEMs

- Increasing diffusion to have less charge density at GEM level seemed to have the larger effect

- Interplay between attenuation and saturation non trivial

- Best configuration found to run at lower gain: VGEM 420 V, E_drift 0,5 kV/cm
  (now in use for Run5)

- Suggestion for a better way to measure saturation: use low energy sources
  (at least 3 between 1-8 keV)
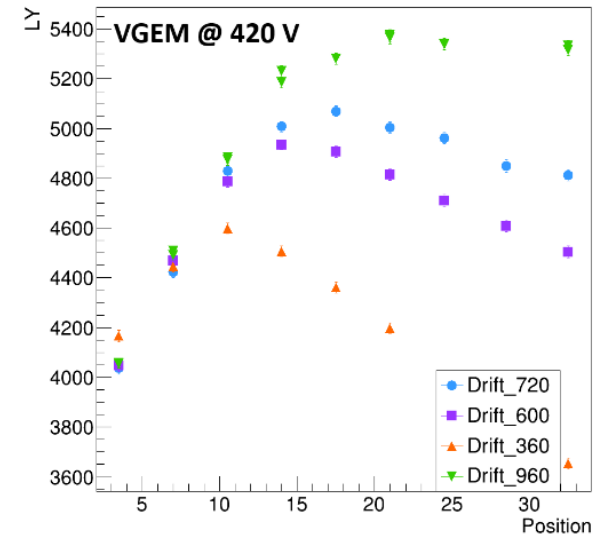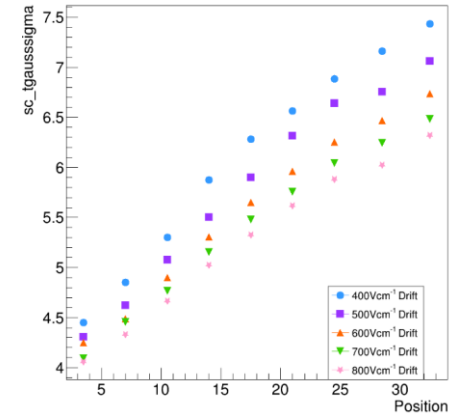
https://agenda.infn.it/event/41032/contributions/229073/attachments/118495/171432/SaturationScouting_V0.pdf

GEM signal analysis (D. Fiorina)

- A first look at the GEM signals suggested a reflection could riun the charge measurement

- A couple of attempts to estimate the ^{55}Fe charge resulted in likely overestimated gain 2*10^4 for first GEM
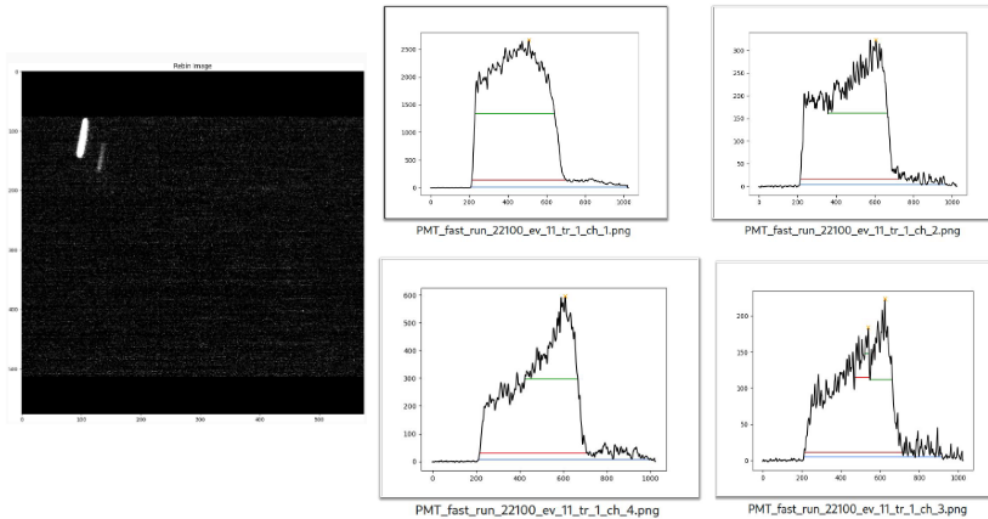

- Better check on connection and reflection required

https://agenda.infn.it/event/41615/contributions/232161/attachments/119256/172828/somthingaboutGEMsignlas.pdf

PMT reco Analysis on PMT (D. Marques)

- Analysis on LIME alpha tracks

- Study on how shape and intensity of PMT signals can return information of direction and head-tail of alphas

- Bayesian fit to match portions of tracks and waveforms will heelp improving this phenomenological characterization

Trigger image selection (I. Pains)

- Study on simulated data of a machine learning technique to make a selection at image level to save or discard.

- Goal of reducing the data output of CYGNO-04

- To match the reconstruction performances of the standard reconstruction code it was found a ~82% background image rejection at 0,5 keV

- Less than 1 s of run time for selection

Energy performance - ER

ER signal detection per energy - SP based threshold
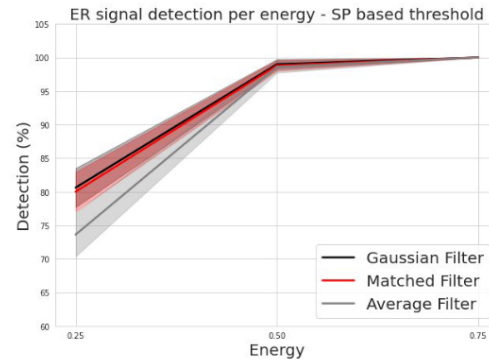
Gaussian Filter noise rejection = 91.6%
Matched Filter noise rejection = 92.0%
Average Filter noise rejection = 96.8%

ER signal detection per energy - Reco based threshold
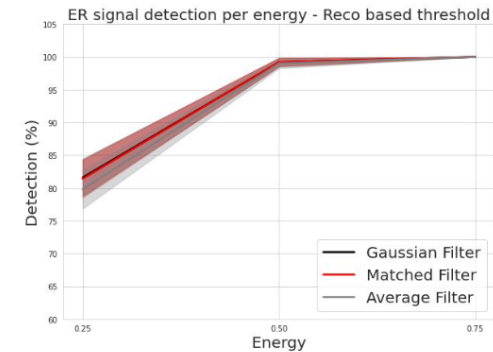
Gaussian Filter Noise rejection = 82.4%
Matched Filter Noise rejection = 84.8%
Average Filter noise rejection = 80.4%

https://agenda.infn.it/event/41735/contributions/233423/attachments/119575/173355/Trigger%20Proposal%20Status.pdf

Polarimetry first results (D. Fiorina)

- He:CF4 60/40 Fusion camera with ^{90}Sn e- source for polarimetry studies

- Geant4 simulation of the setup to estimate energy and angular distribution of the beta electron reconstructed in the MNGOlino detector

- General angular resolution estimated about 20 deg

- Issues on energy calibration under study
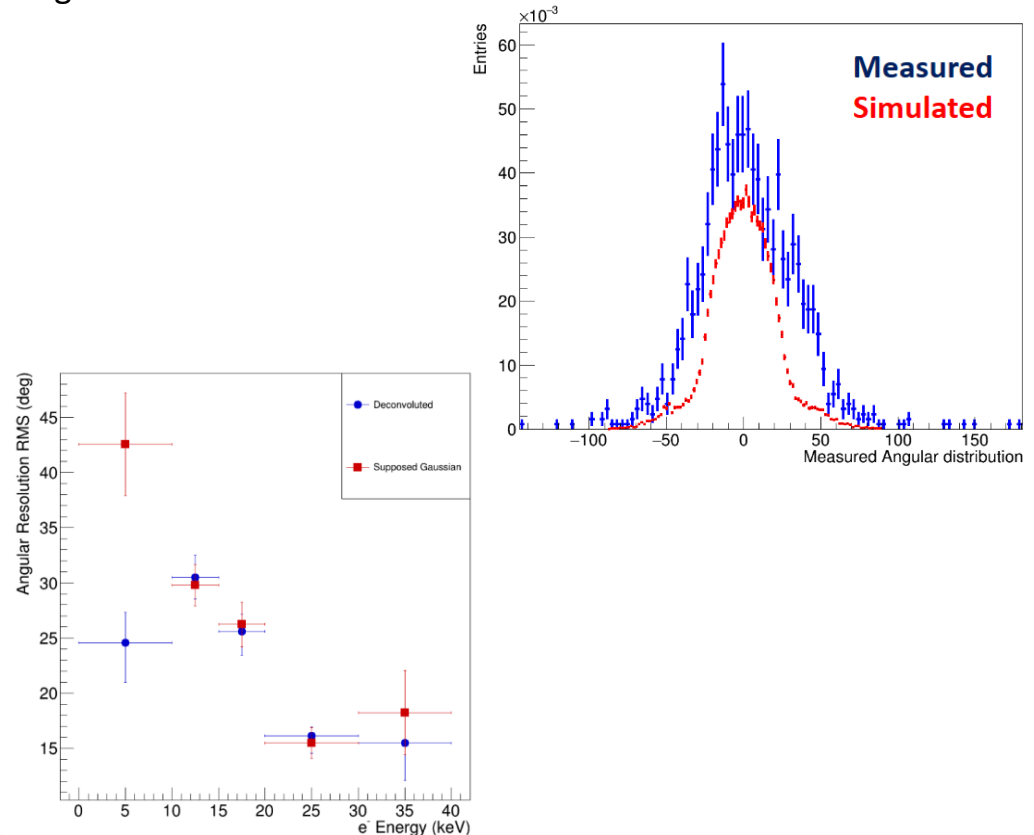
https://agenda.infn.it/event/41615/contributions/232160/attachments/
119254/172826/90SrDirectionality_08052024.pdf