Local 5.1
kick-off

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Søgaard

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Local 5.1 kick-off

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Overview

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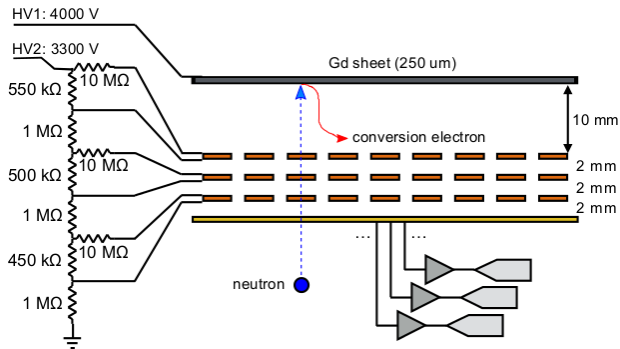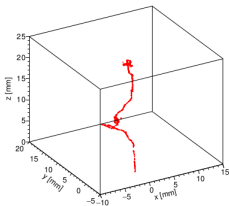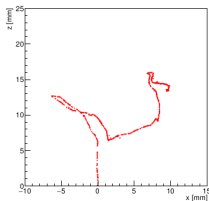Local 5.1
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GEM principle

70 keV electron in Ar/CO_2 (70/30) atmosphere

(a) 3D

(b) Projection zx

(c) Projection zy

Two beam-tests have been performed by Dorothea Pfeiffer et al.

Two different drift volumes have been tried:

- 10 mm drift volume
- 5 mm drift volume

Single events can be displayed graphically using 'uTPCViewer' written by Dorothea. The program also performs an analysis of the tracks and determines the origin. The found origin can occasionally be questioned.
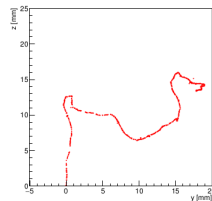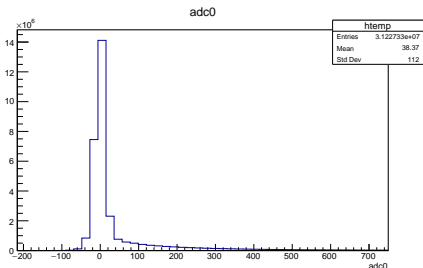
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Negative ADC-values

A puzzling discovery is that a substantial part of the
ADC-values are negative. Would expect positive integer values.

I have contacted Dorothea about his matter and she has
forwarded the question. The answer agrees with my own
thoughts - the negative values are a result of subtracting the
pedestal.

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A look at data and the current analysis
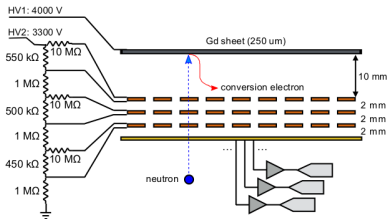
Two beam tests were performed last year in Oslo. One in February and one in November.

The two datasets have different conditions:

1. 10mm drift space - no zero suppression
2. 5 mm drift space - zero suppressed

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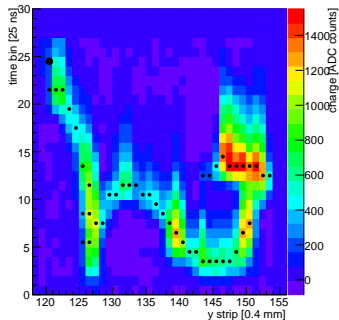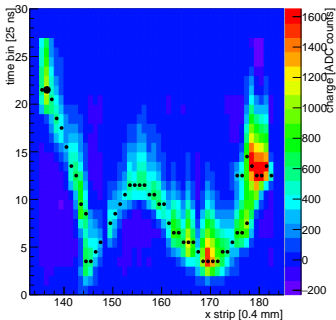Introduction

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Successful origin

Run 1 - 10mm drift space - no zero suppression

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Questionable origin

Run 1 - 10mm drift space - no zero suppression

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Wrong origin

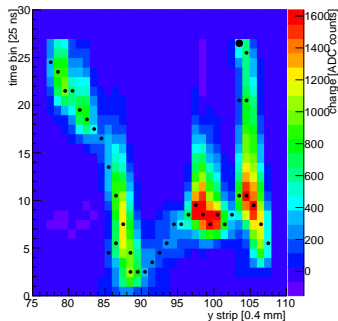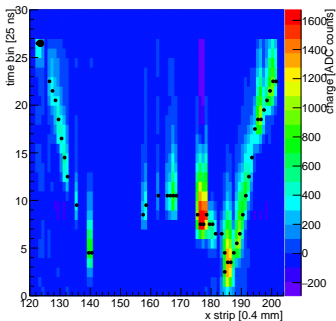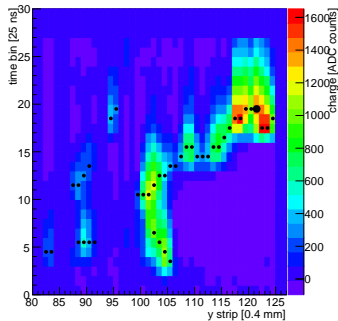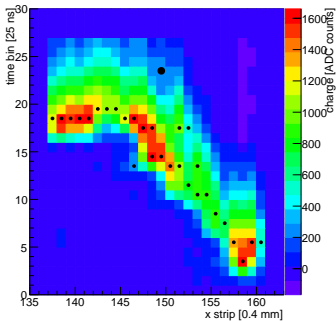Run 1 - 10mm drift space - no zero suppression
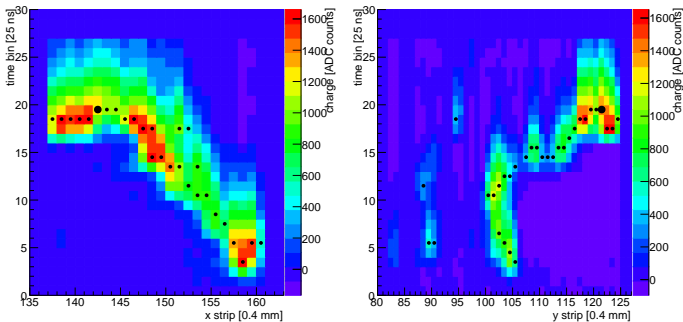
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Wrong origin

Run 1 - 10mm drift space - no zero suppression

Better result by increasing threshold to 200 (150 default)

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Gamma events

Run 1 - 10mm drift space - no zero suppression

Typical event from run, where gamma's from an Am-source were detected by the GEM.
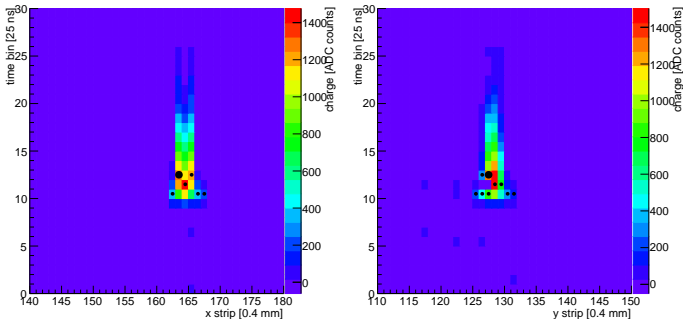
Gamma's produce 'tracks' which in general are narrow and never 'begin' at high time-bin values.
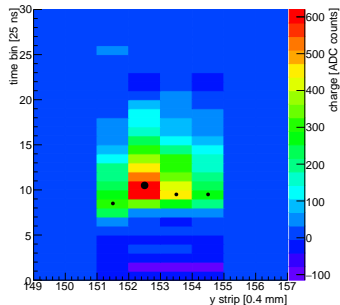
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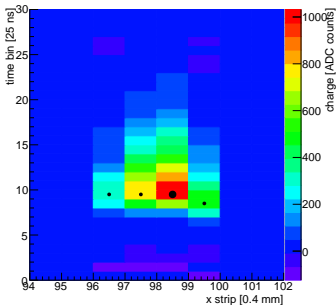Søgaard

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Run 2
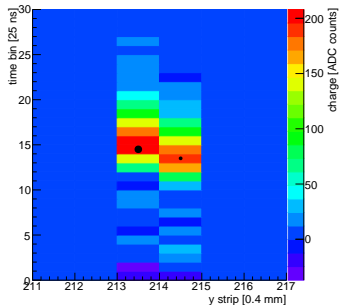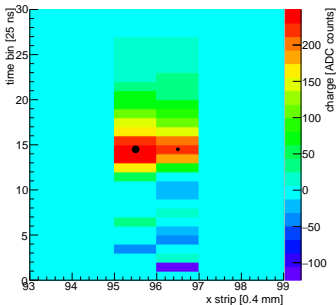
Run 2 - 5 mm drift space - zero suppressed

Run 2 - 5 mm drift space - zero suppressed
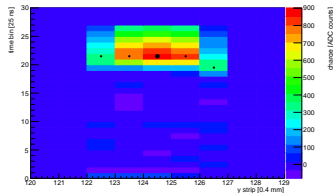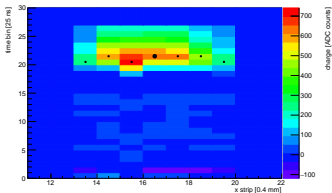
Run 2 - 5 mm drift space - zero suppressed

Gamma events appear to spread over more strips than neutron
events !

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The code

The code is generally doing what we expect. Improvements can probably be made. There should be an investigation of the impact of tuning thresholds etc.

I have started analysing the code provided by Dorothea in order to understand how the algorithm is implemented.

The current code is very monolithic (main analysis function $\sim$400 lines long). This has some consequences:

- Difficult to read and get an overview of the code
- Cumbersome to maintain and improve
- To some extent error prone (copy-paste code x-y directions)

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Understanding of the code so far

The main analysis function consists of a major loop running over all hit strips (some filtering has happened).

The main function loops over all strips:

1. A loop 'backwards' over time bins finds the 'latest' time bin over a threshold
2. The local maximas are determined. A maximum must be a maximum over more than 3 time bins
3. Then the first time bin over $\frac{1}{2}$ the maximum amplitude is located - at present unclear to me for what purpose
4. Time bin no, amplitude and other values are stored i relation to the above
5. Several quantities are calculated
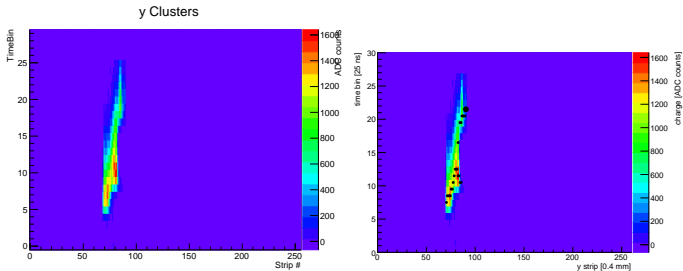6. A final algorithm does some searching - presumably for the entry point

I have written a class which can read the root-files.

Current and tentative plan - suggestions are more than welcome

- Fully understand the current algorithm and its implementation
- Adjust the algorithm and rewrite the entire code omitting ROOT classes
- Setup test environment and begin running the algorithm in a realistic setup

- Complete code for simulating tracks of low energy electrons in a narrow volume

The two tested conditions of the GEM's provide quite different data.

The VMM3 chip will provide less information - only time-stamp and amplitude per strip (possible a little more information)

Since no final decision on the detector has been made, we should pin point a small number of 'most likely scenarios' and produce the required algorithms and code.