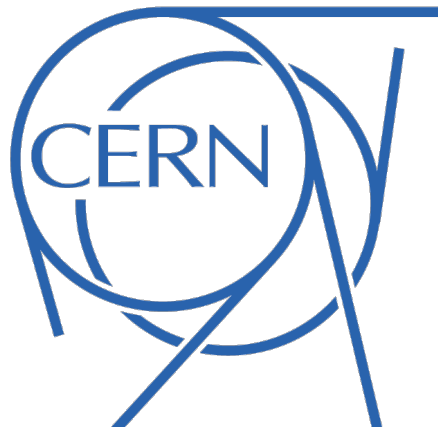# Report on test of Eltos micromegas boards

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on behalf of the MAMMA collaboration

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10th RD51 Collaboration meeting

Overview
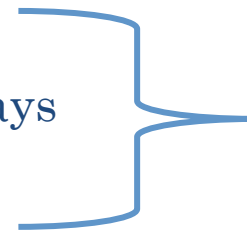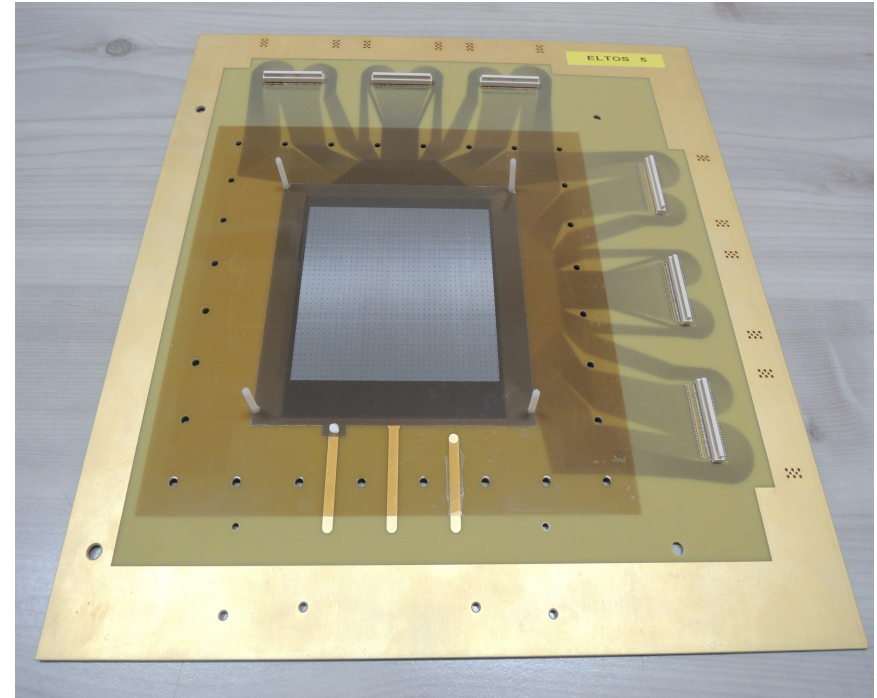
Five boards produced by Eltos

- Resistive bulks, *xy* readout
- Active area: 9×9 cm^2
- Pitch: 250 μm
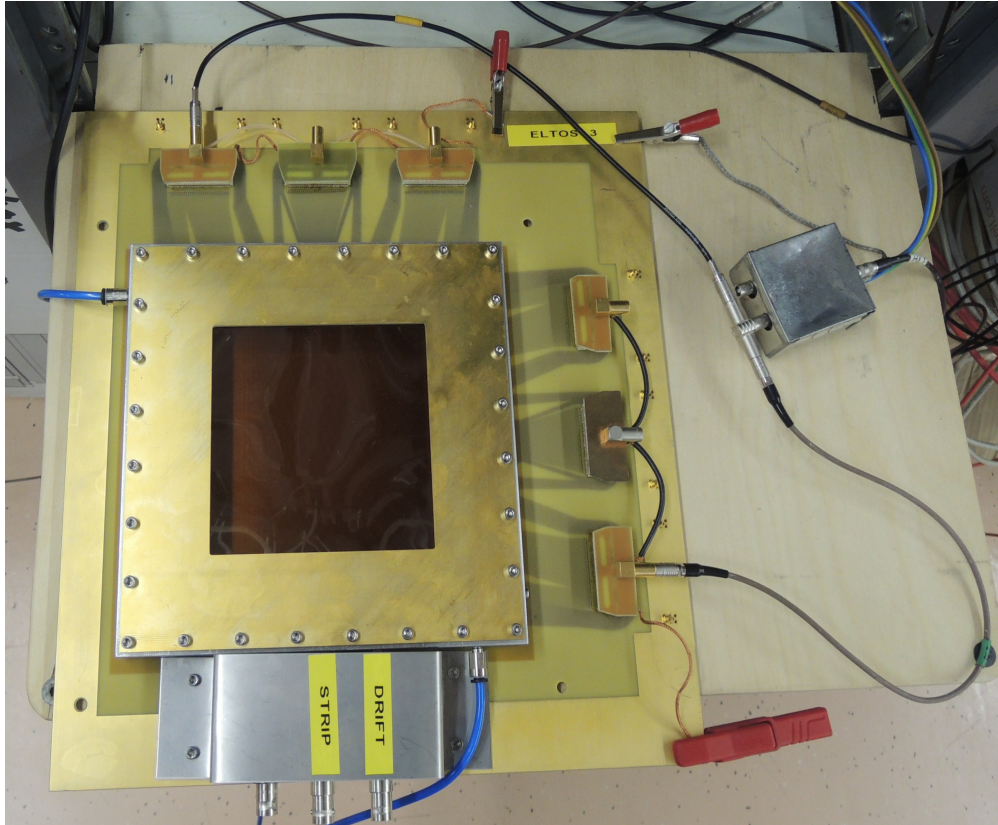- Strip width: *x* 150 μm, *y* 50 μm

Characterization of chambers

- Basic functionality
  - detector response from ^{55}Fe source
- Homogeneity of response
  - surface scan with collimated Cu X-rays
- Gain measurement

Compared with a CERN produced chamber

Setup

Detector configuration

- HV drift/strips: -300/500
- Mesh grounded
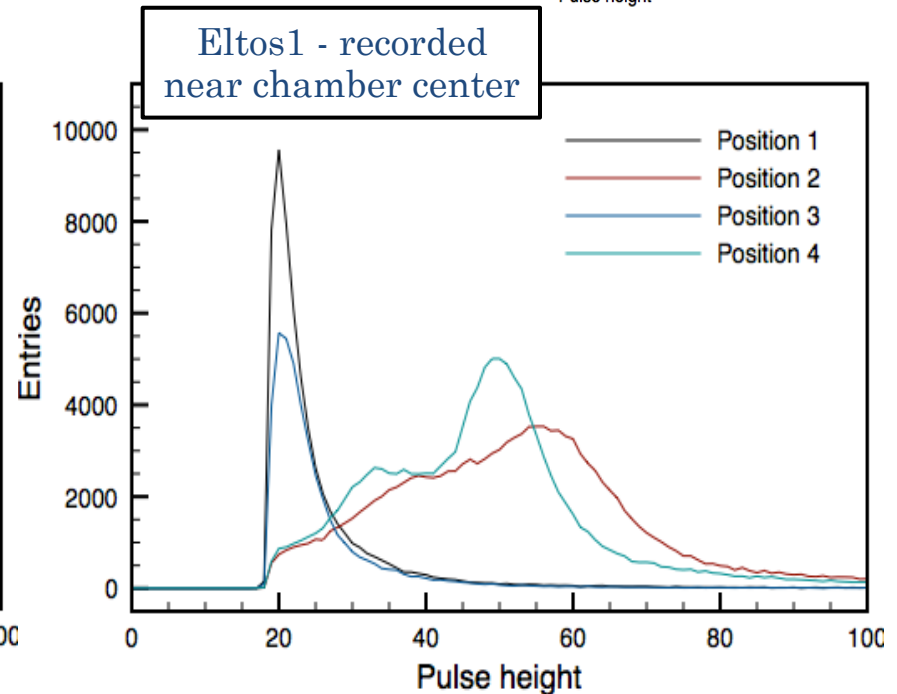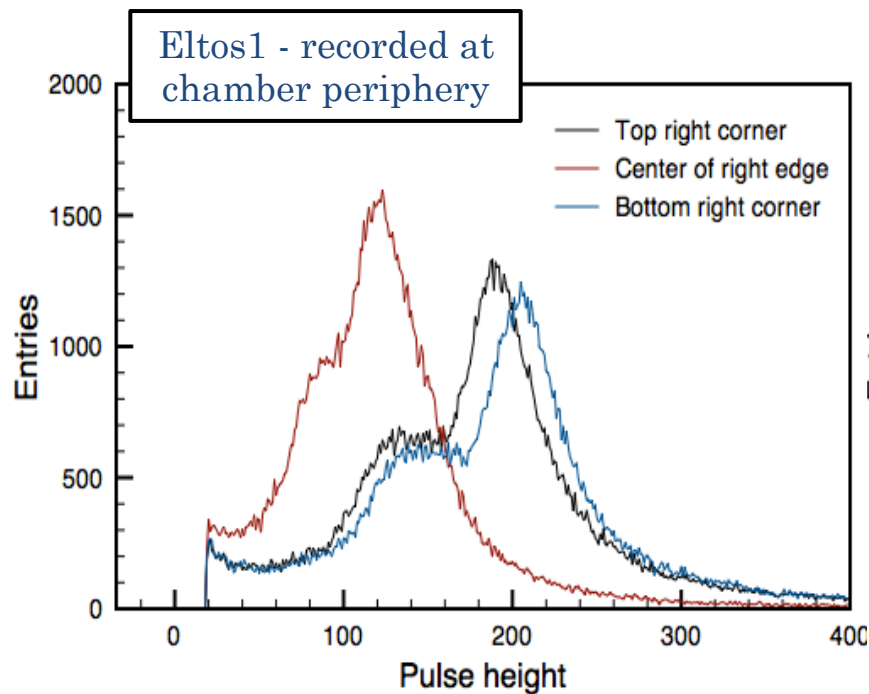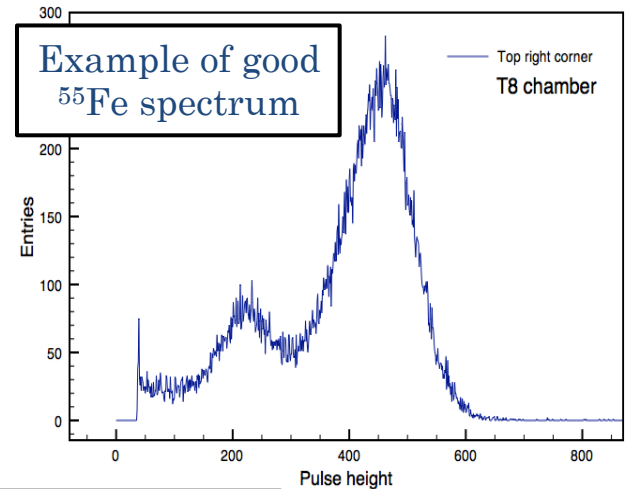- Gas mix: 93% Ar, 7% CO_2

Electronics

- All strips in parallel connected to charge pre-amp
  - 250 ns integration time, gain ~20 mV/fC
- Connected to Amptek MCA

Basic functionality – response from ^{55}Fe

First chamber: good ^{55}Fe spectra only from the periphery

- Indistinct spectra from the central part of the chamber
- ➔ pillars detached in the center
- Same effect seen in three other boards

Example of good ^{55}Fe spectrum

Eltos1 - recorded at chamber periphery

Eltos1 - recorded near chamber center

Functional chamber – response from ^{55}Fe

One chamber functional

- Reasonable ^{55}Fe spectra from all areas of the chamber
- Fairly large variations seen in shape and peak position
  - More tests to characterize performance
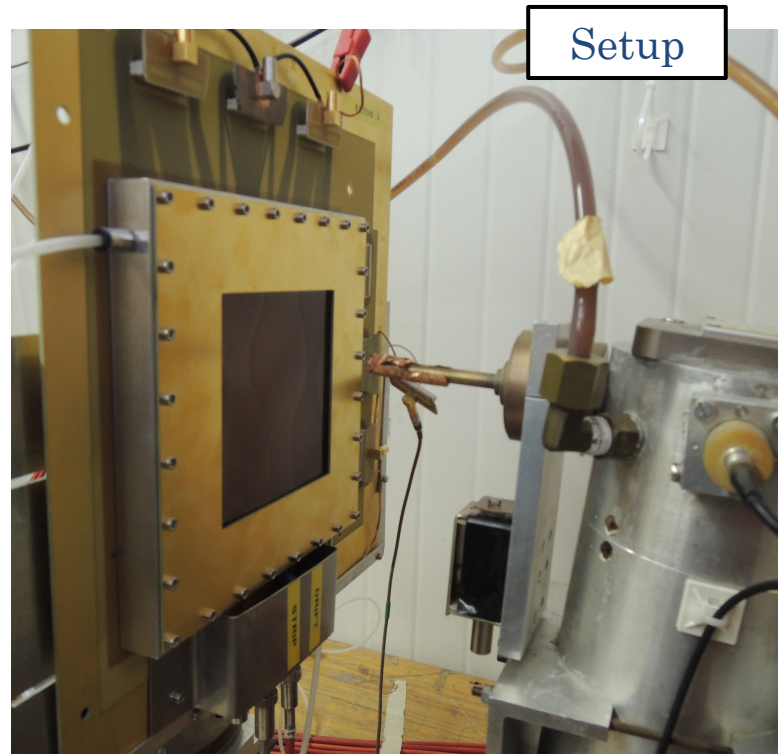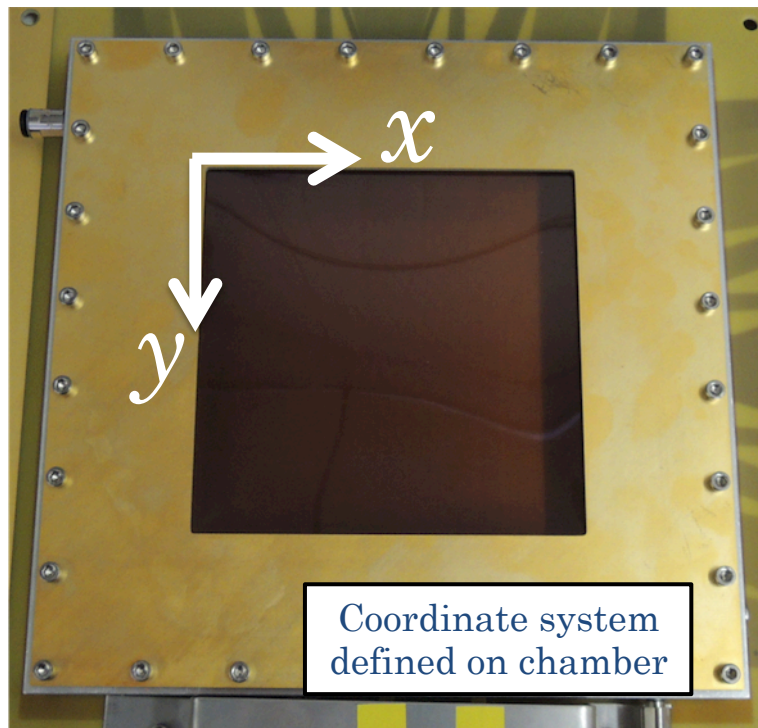   - homogeneity
    - gain

Eltos3 - recorded at chamber periphery

Eltos3 - recorded near chamber center
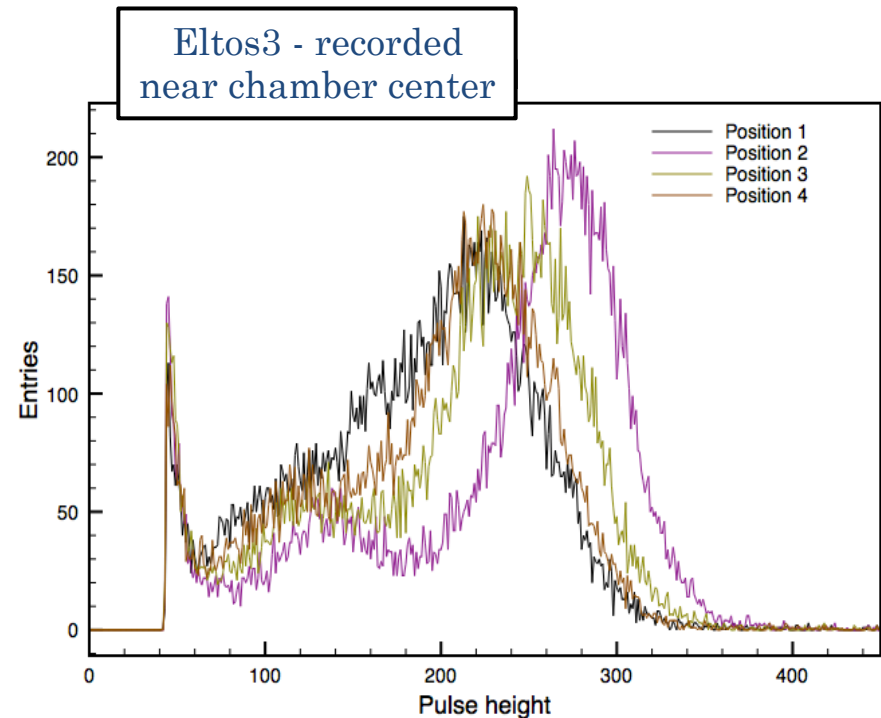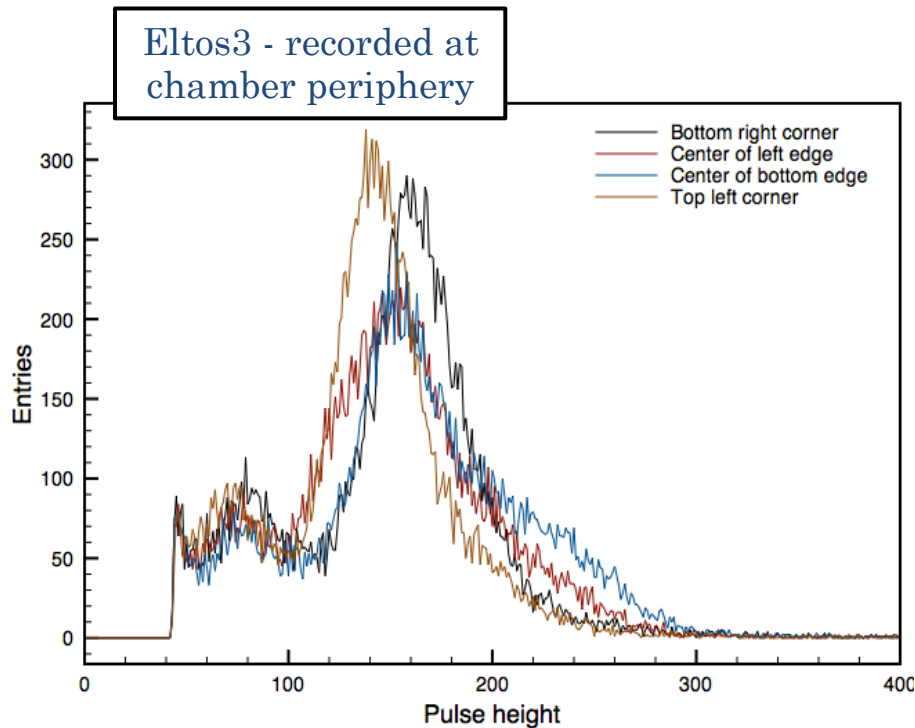
Functional chamber - setup
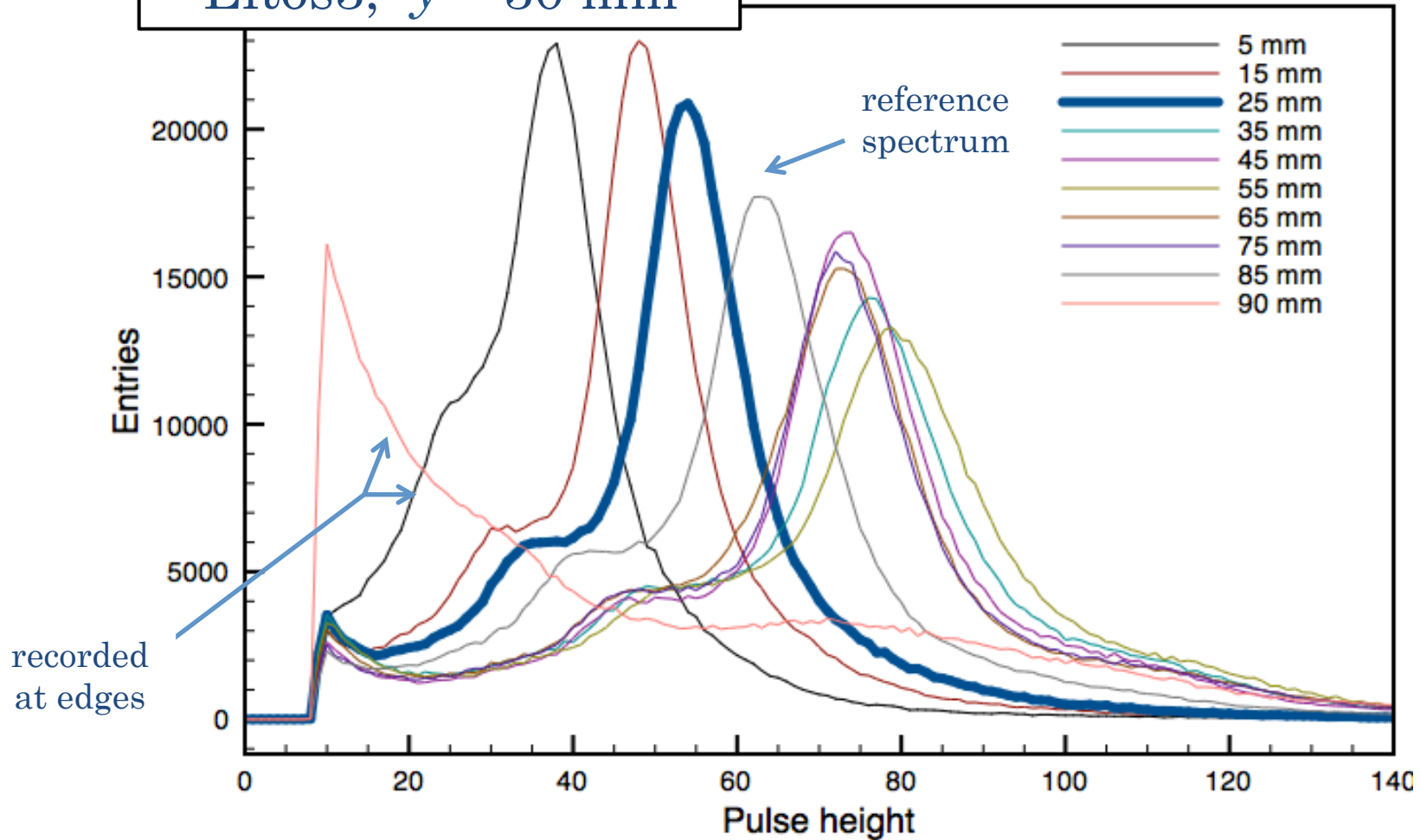
Homogeneity of Eltos3

- Cu X-ray gun, 8 keV, collimator ~2 mm^2
- Matrix of 5 values in y and 10 in x chosen
- Each point exposed to radiation, pulse height spectra recorded
- Homogeneity determined by comparing the spectra

Coordinate system defined on chamber

Setup

Functional chamber - homogeneity

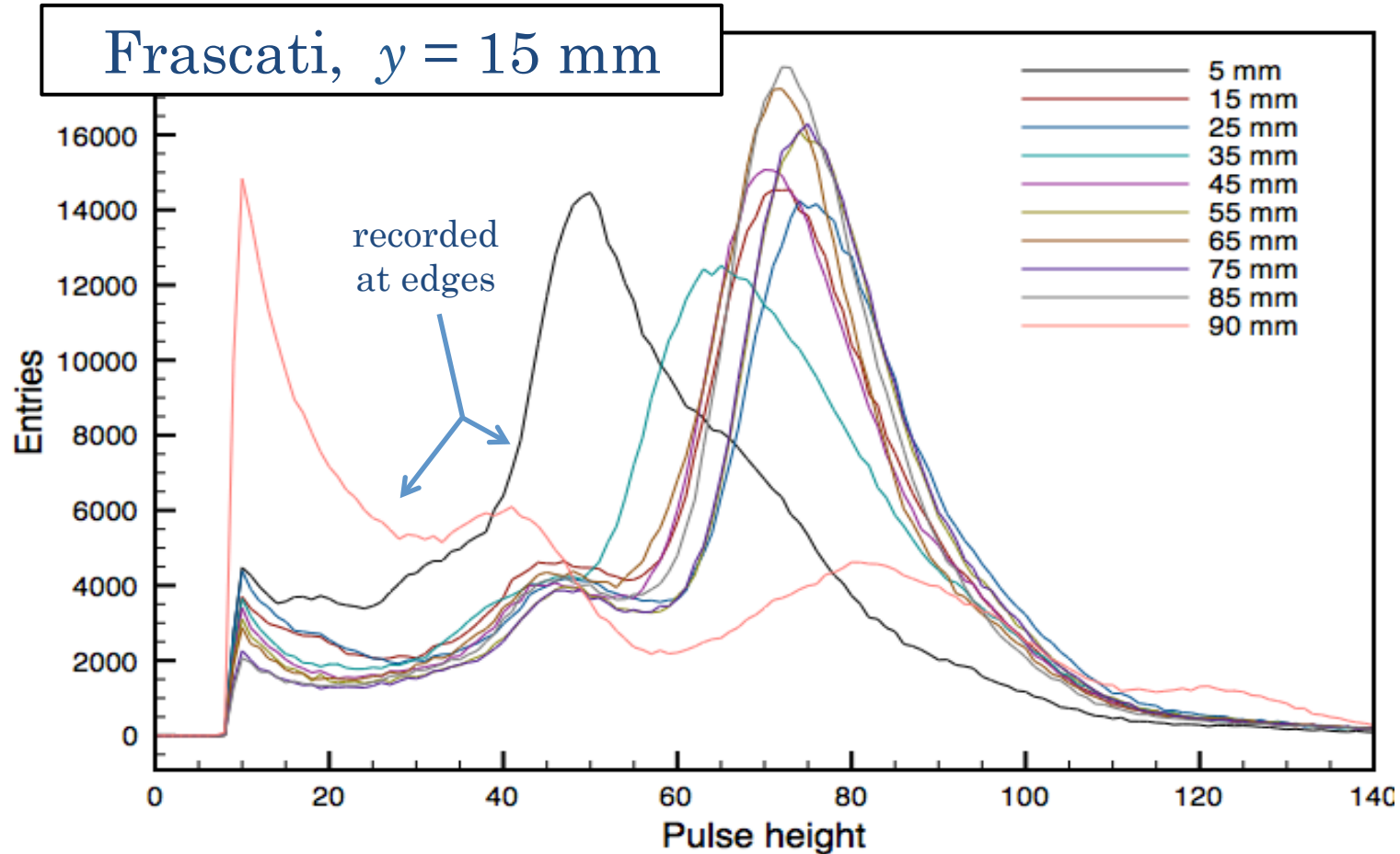Eltos3, $y = 30$ mm

Compare to CERN produced chamber

Referred to as the Frascati chamber

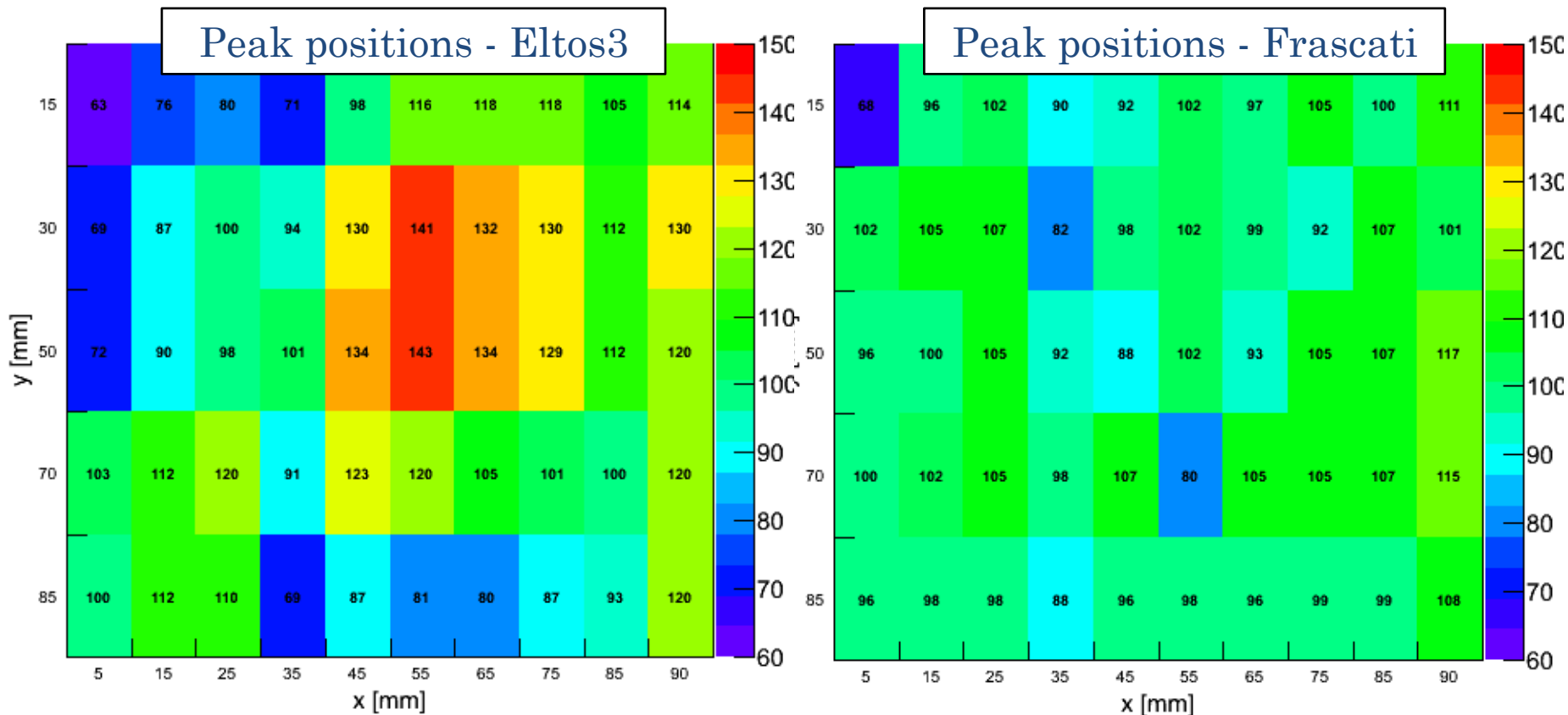- Performance known to be of good quality

Frascati, $y = 15$ mm

# Homogeneity of Eltos3 vs. Frascati

- Peak positions relative to reference value (in %)
- Frascati chamber more uniform

Peak positions - Eltos3

Peak positions - Frascati

Gain of Eltos3 vs. Frascati

Study gain as function of HV

- X-rays fixed at x=45mm, y=50mm
- Gain calculated from detector current and rate
  - larger collimator, area exposed ~10 mm^2
  - current monitored from HV supply
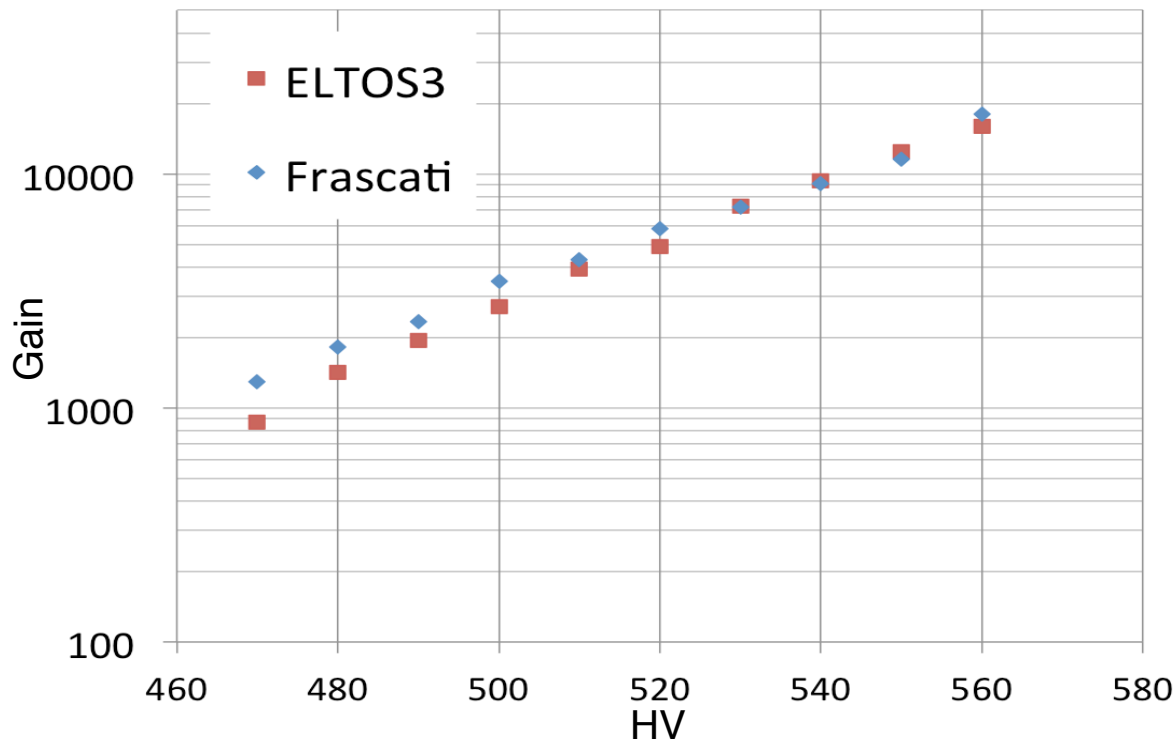
- Similar behavior of the chambers
- Stable operation lost for HV > 560 due to sparking
- Difference in gain at lower HV explained by different resistivity of the strips

Conclusion on Eltos boards

Four boards dysfunctional

- Pillars not attached properly

One chamber functional

- Gain measured
  - similar behavior as Frascati chamber
- Homogeneity estimated
  - Eltos3 less uniform than Frascati chamber
- Performance of chamber overall seems reasonable, however, the fluctuation in the response indicates local problems with attachment of pillars
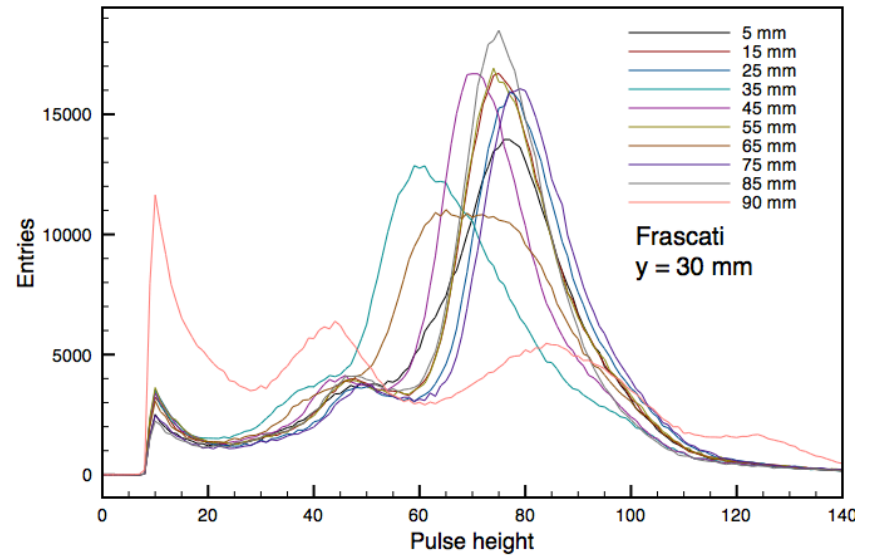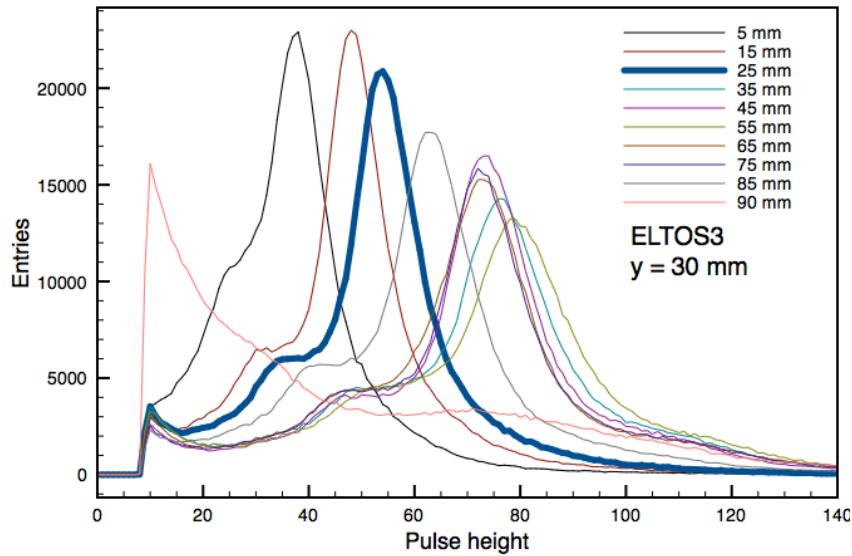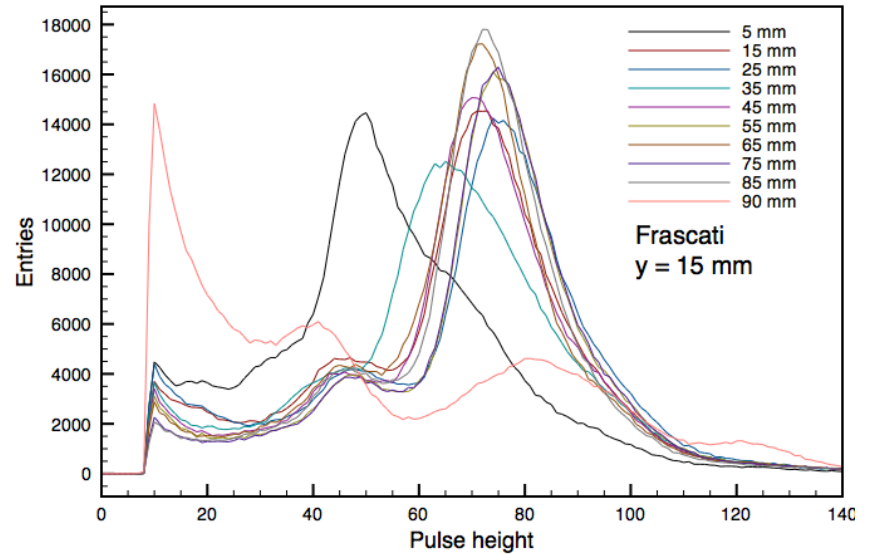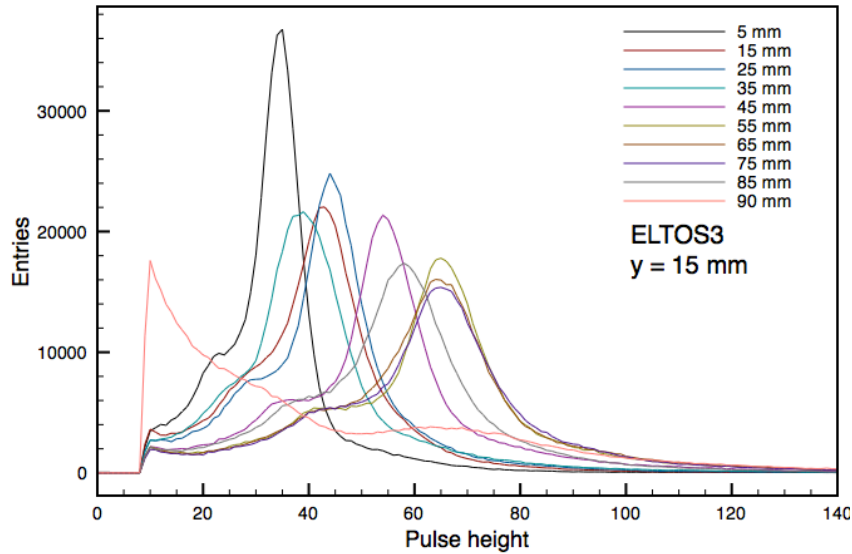
Explanation from Rui

- Pillars detached from underlying surface, most likely due to the underexposure of the coverlay during the pillar production
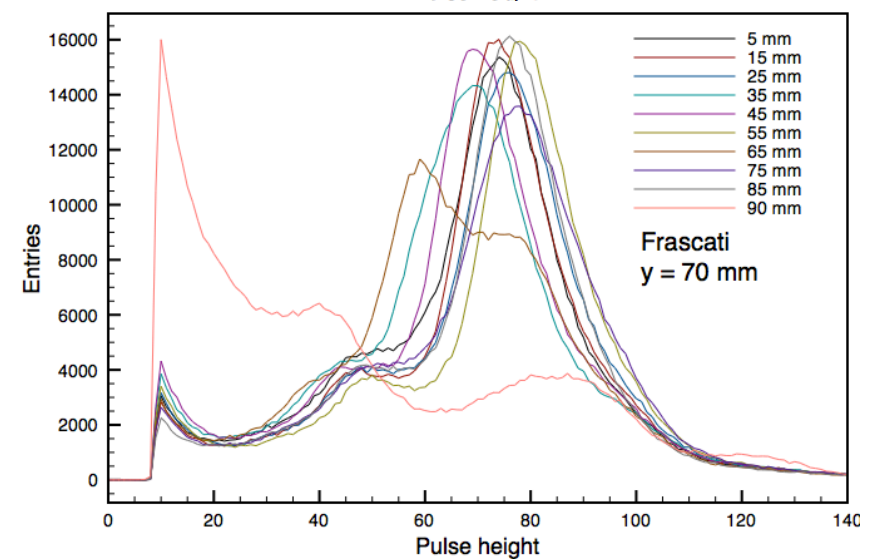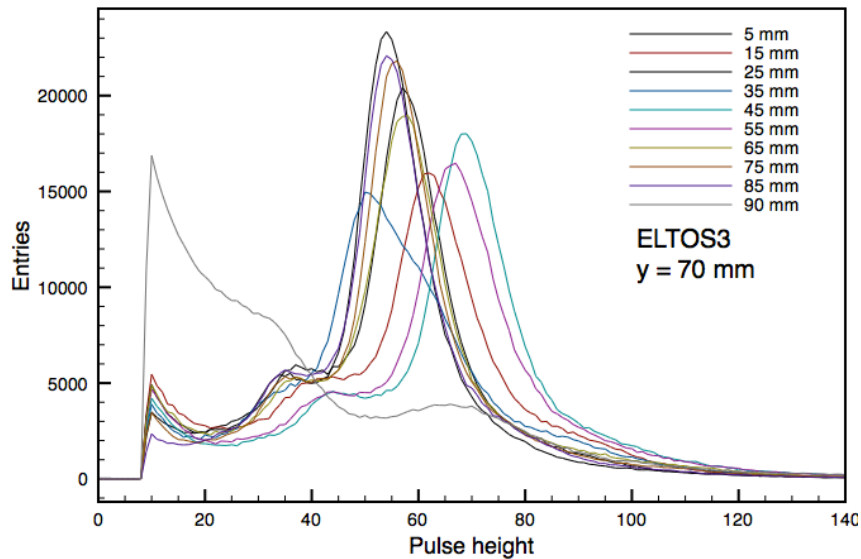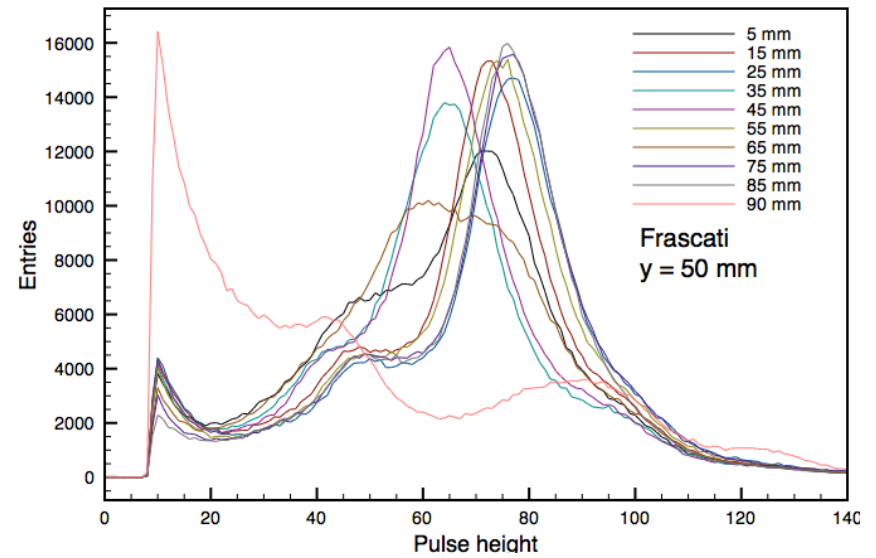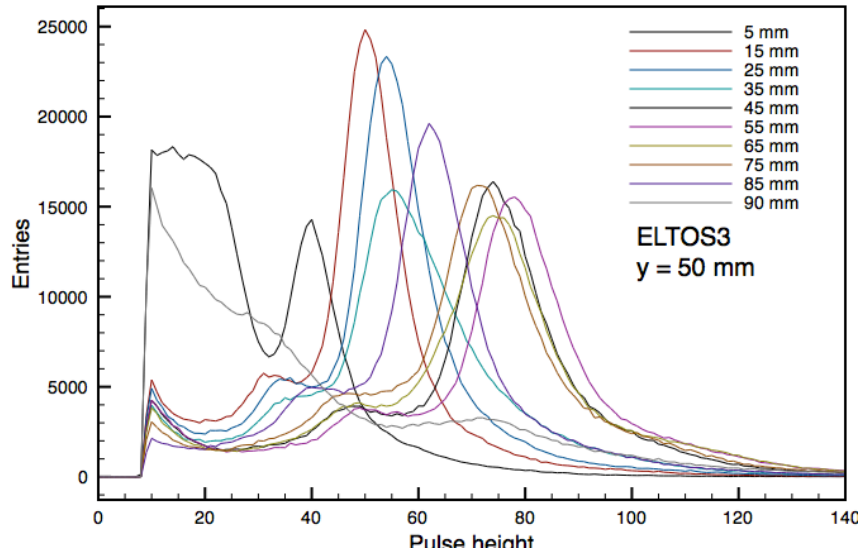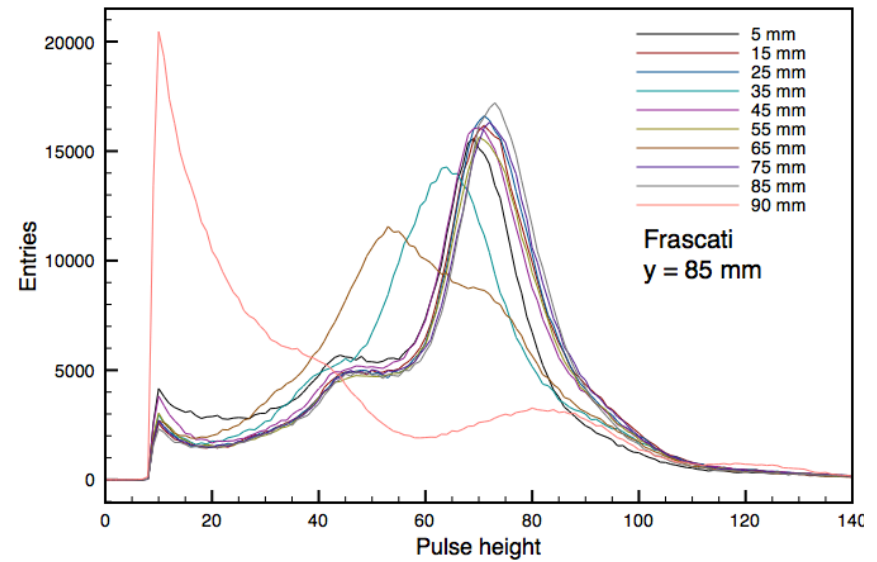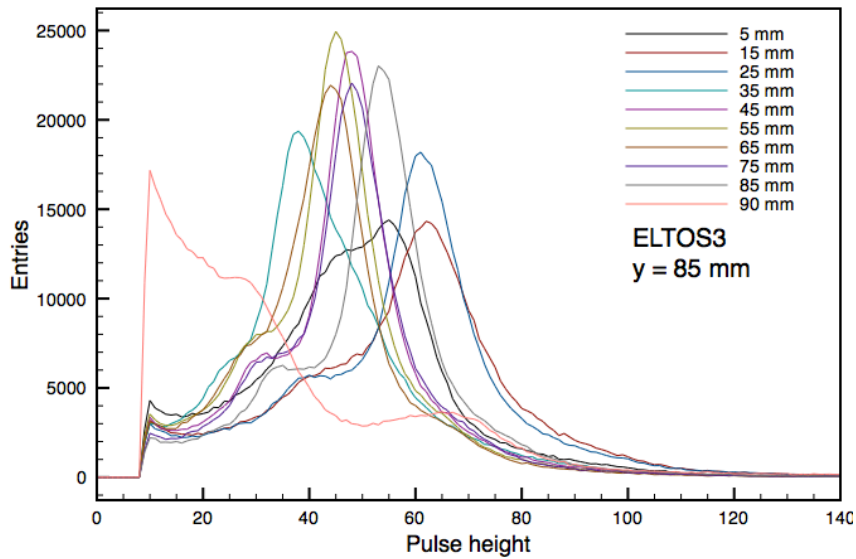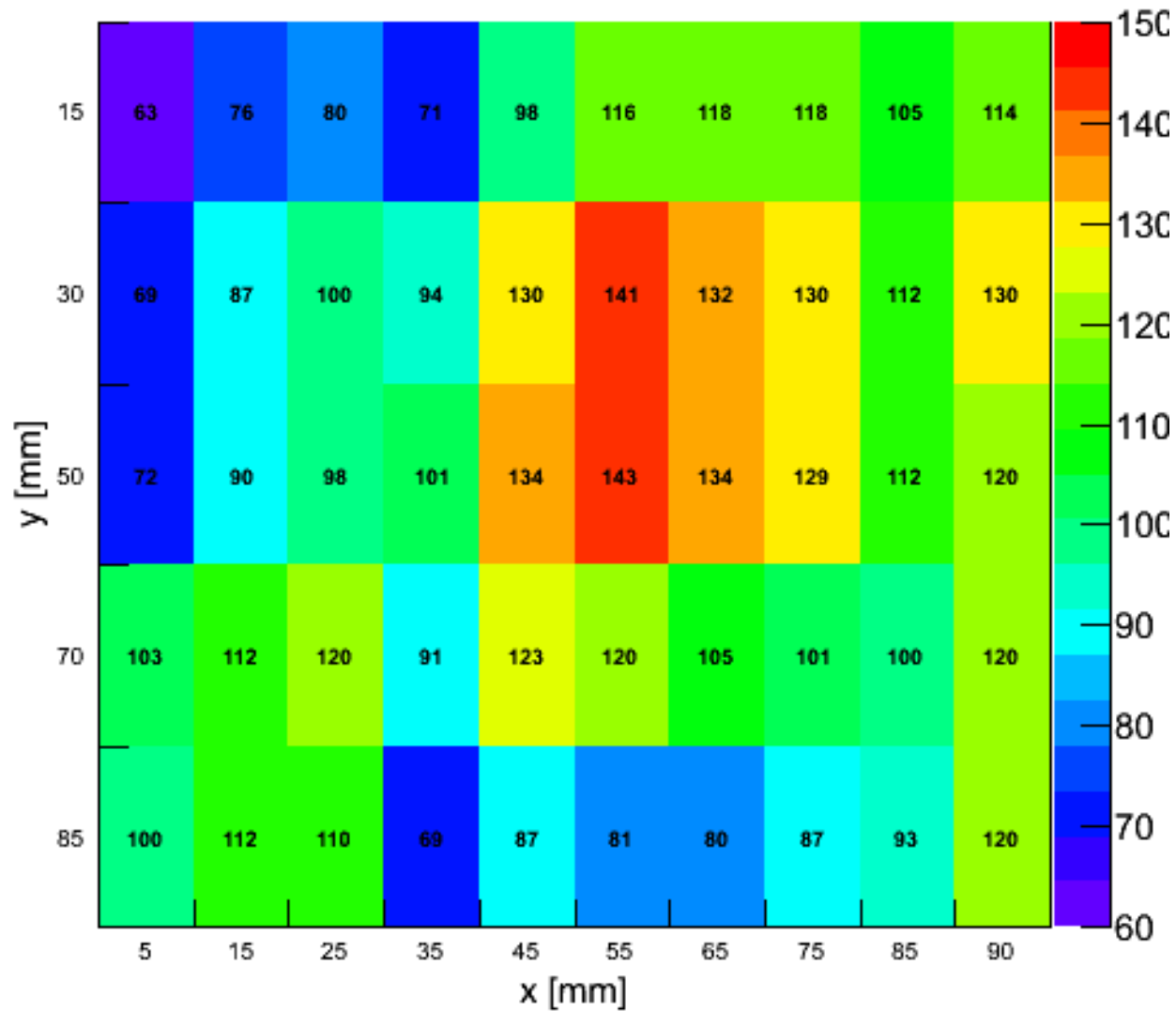
Backup

Spectra

Spectra

Spectra

Eltos3 peak positions

Frascati peak positions