Trigger, GEM and Medipix at H8

Roma and Frascati Team

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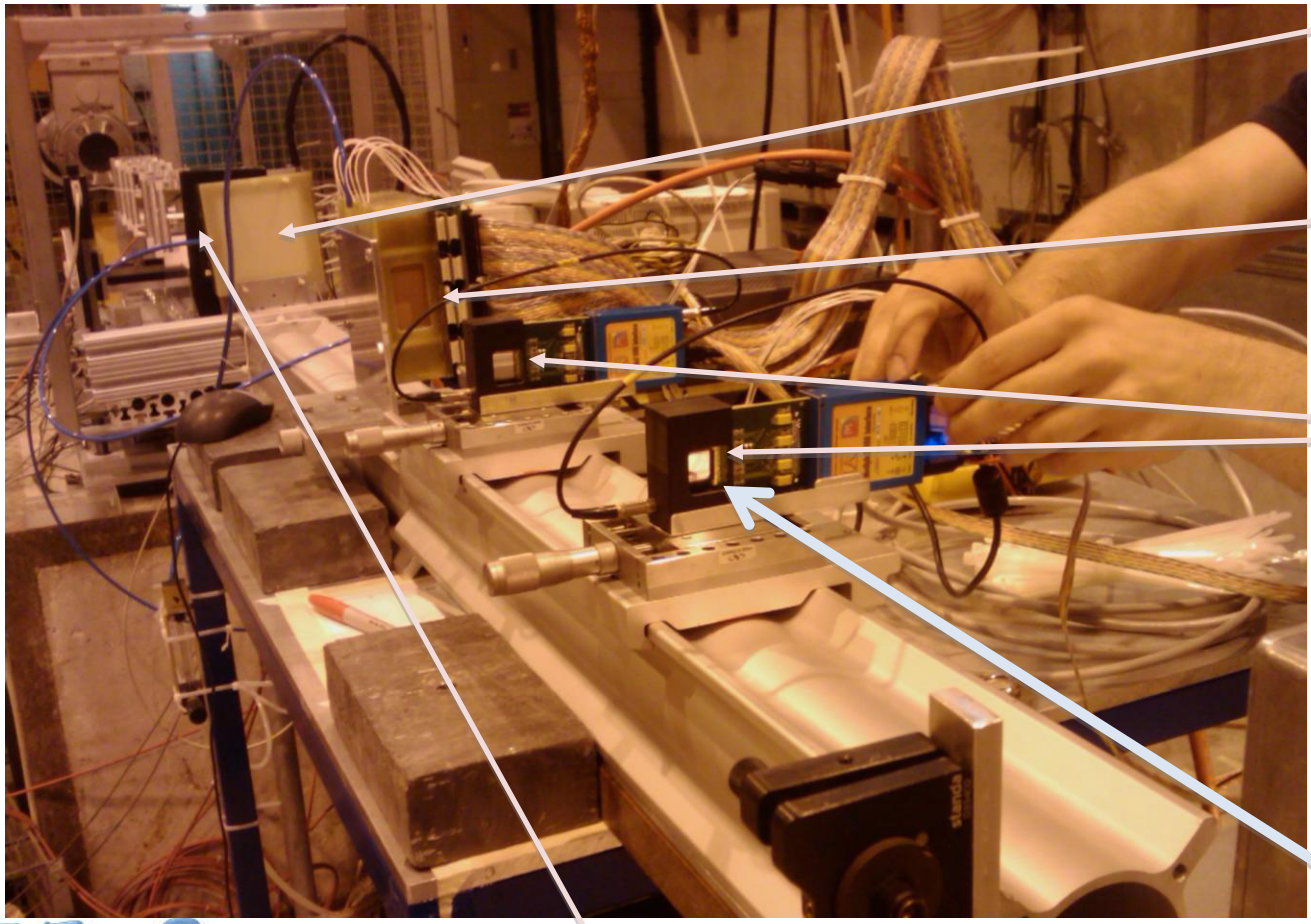
Complete apparatus (Jun 2010)



Trigger

Coincidence from pair of plastic scintillators after tracking system.

Active area of 10x10 cm^2.

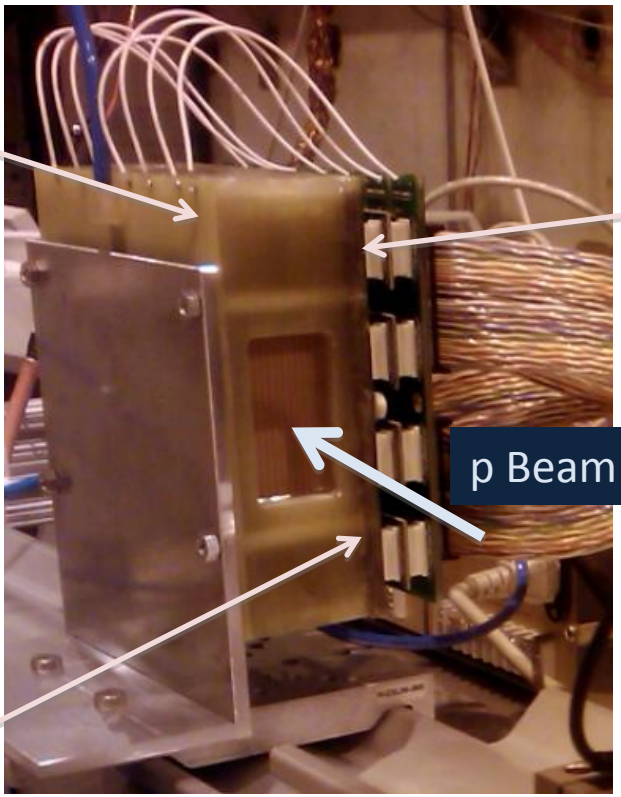
Gated over spill signal.

Efficiency ~1 checked by H8 line scintillators.

Trigger number in one spill ~$1.3 \cdot 10^6$ ➡ ~30KHz
Out of the spill ~1Hz

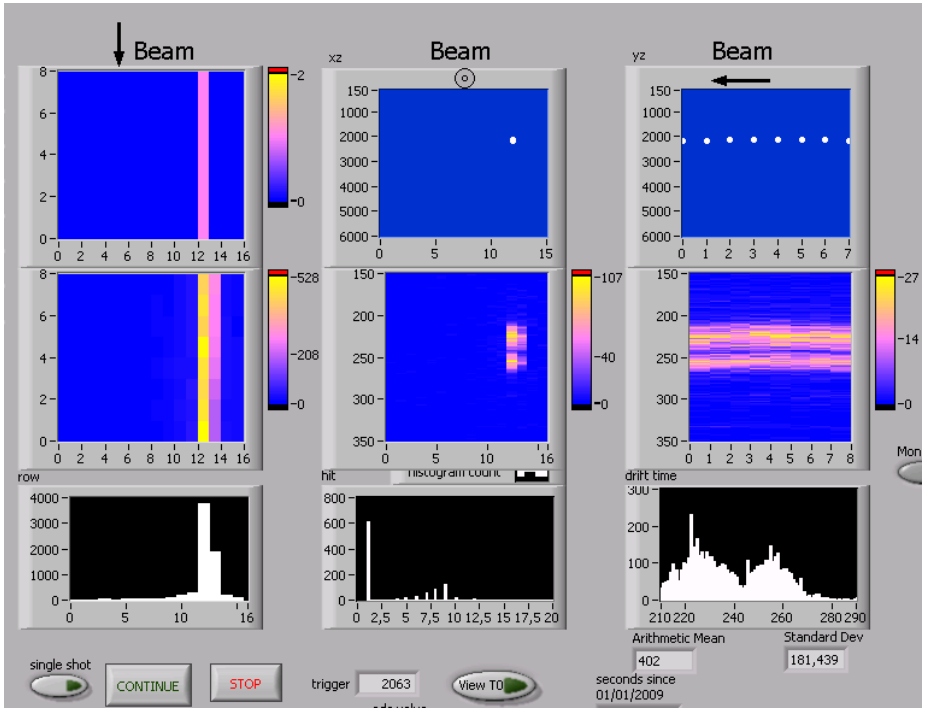
TPC-GEM

cathode



Anode:
5×5 cm^2
16×8 pads, 3×6 mm^2

Electronics:
readout (CARIOCA-GEM) + thresholds + HV supplies

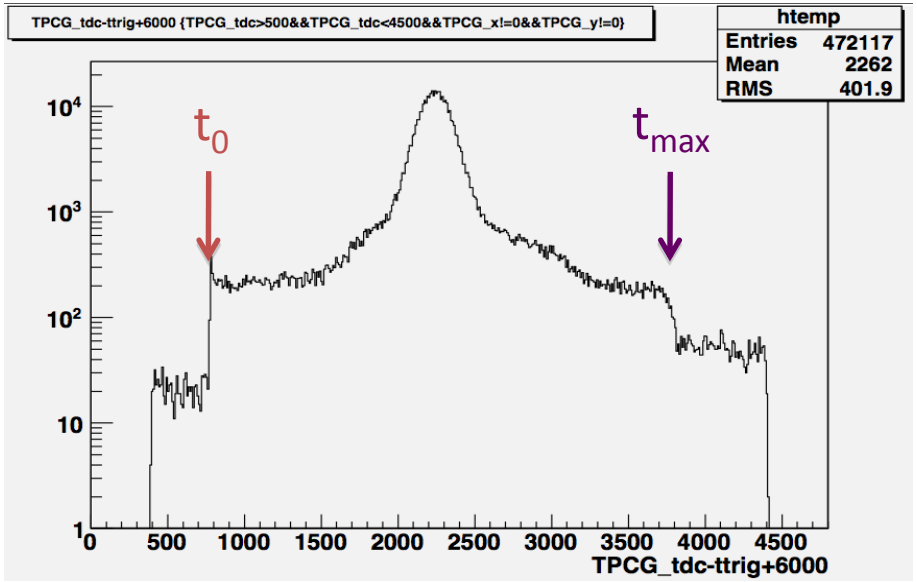


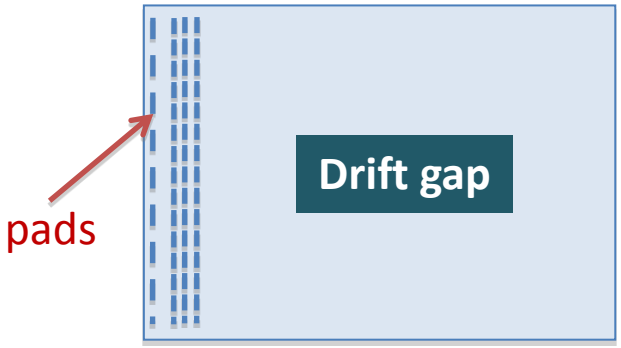
128 LVDS outputs from CARIOCA-GEM to TDC (V1190 CAEN) for **drift time measurement**

TPC-GEM

Measurement of drift velocity, essential for tracks reconstruction

Take run without channeling:

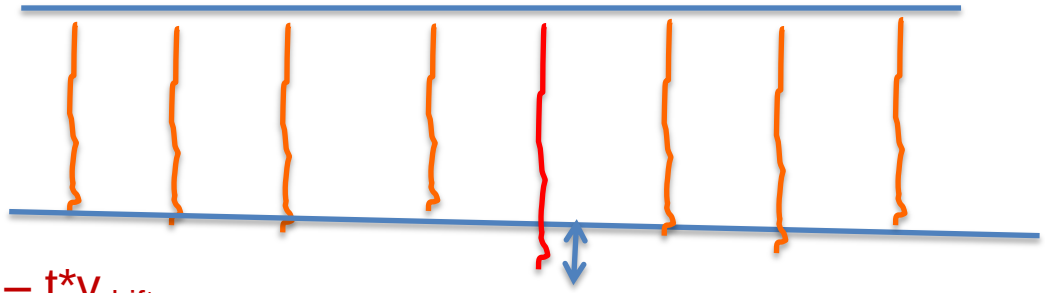




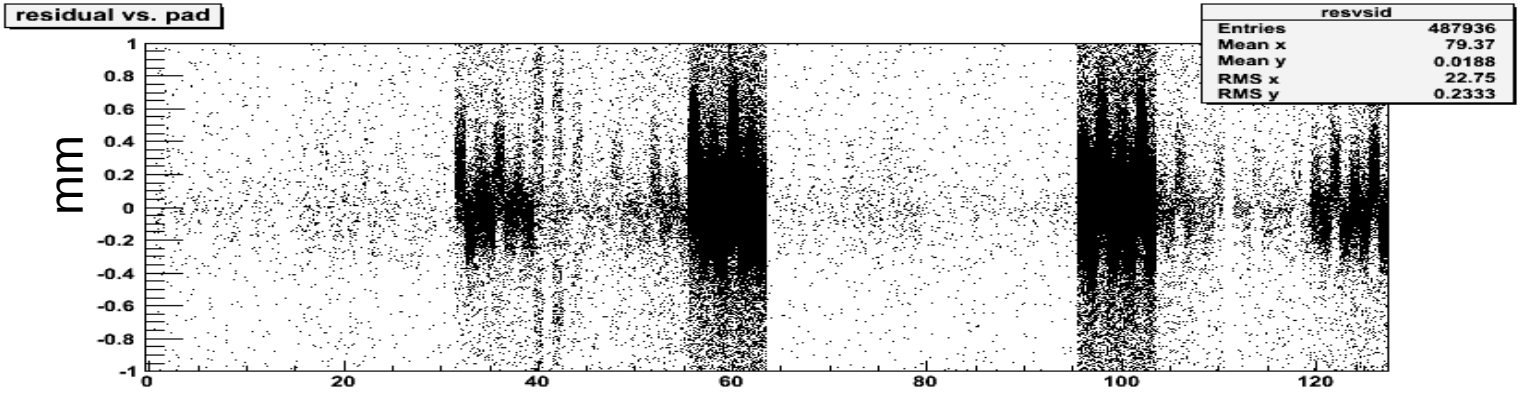
Knowledge of drift gap

V_{drift}=1.34cm/μs

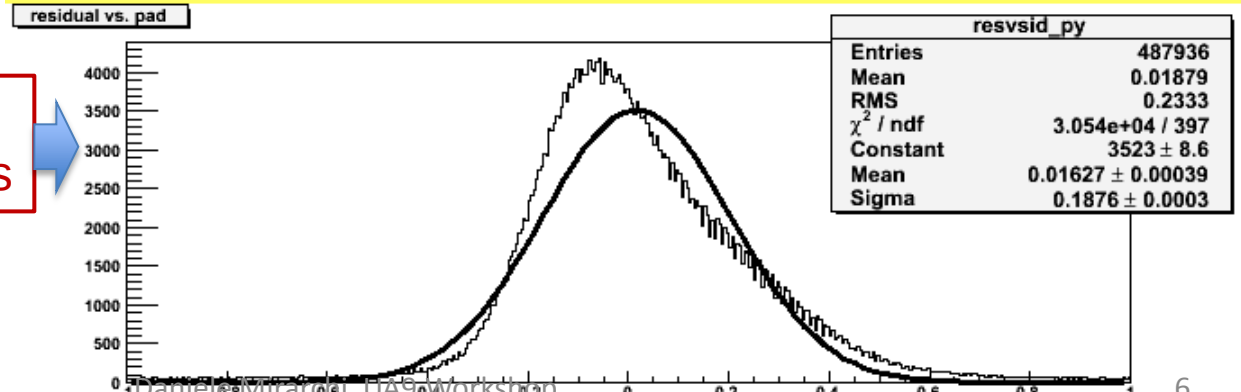
TPC-GEM



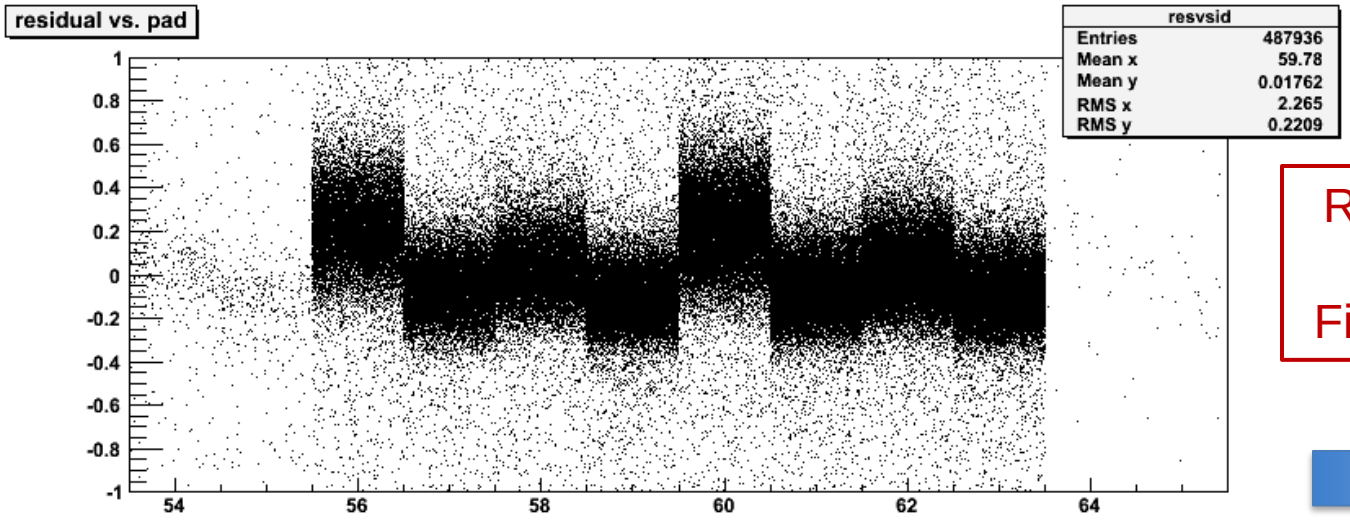
Residual=$z_{extrap} - t*v_{drift}$



Residual for all pads



TPC-GEM

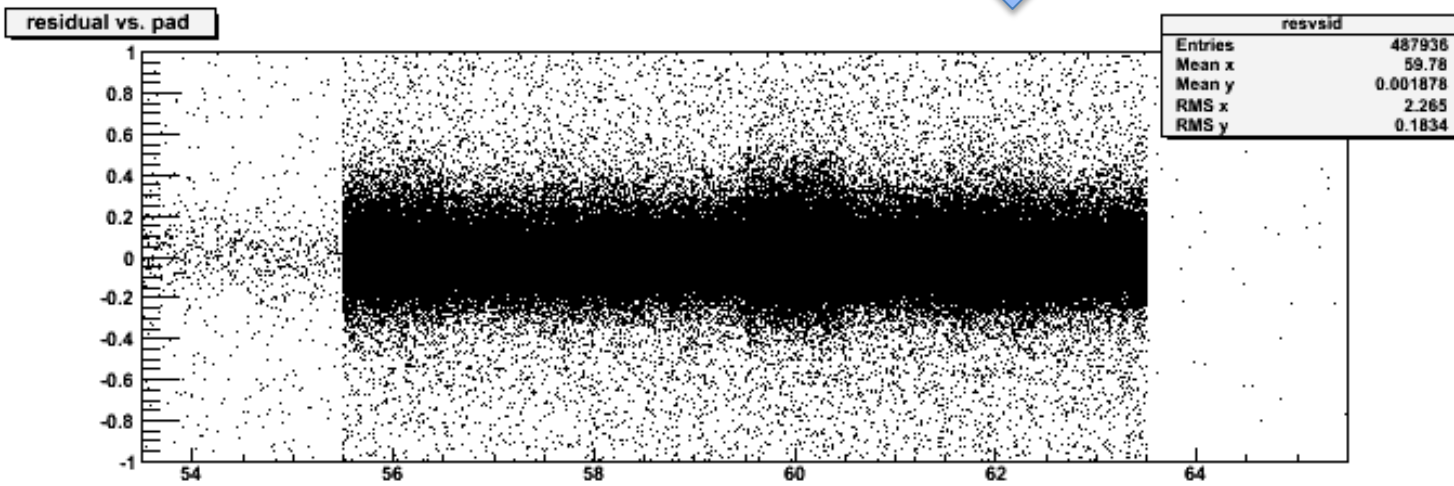


Residual vs. pad number

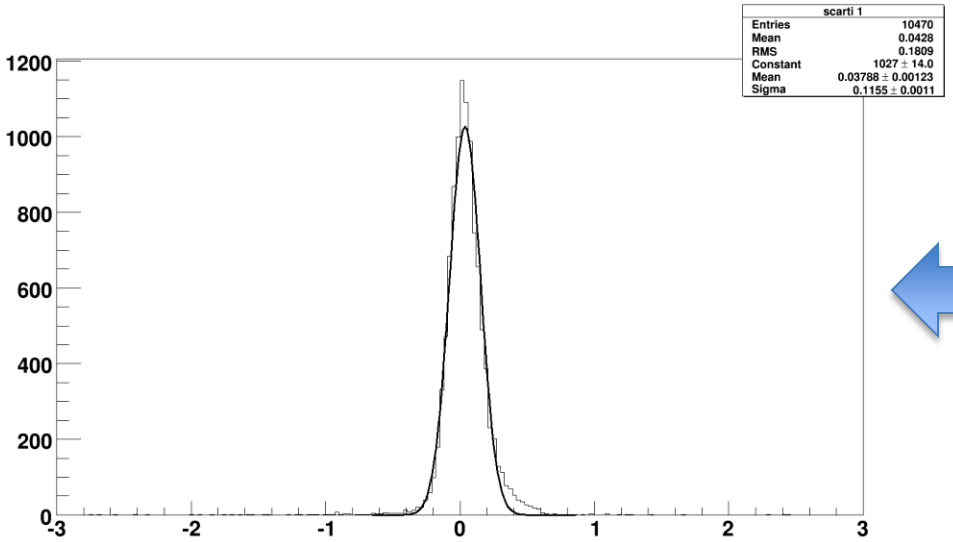
Fit Gaussian for each pad

After 4 iteration

Correct drift distance with average residual, and fit again



TPC-GEM



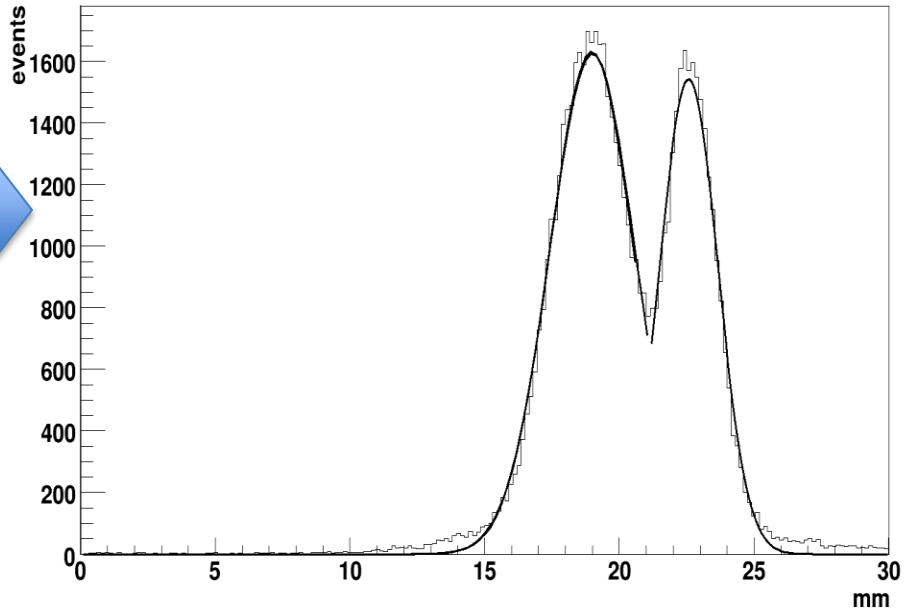
Run without channeling

Residual distribution for one pad :115μm

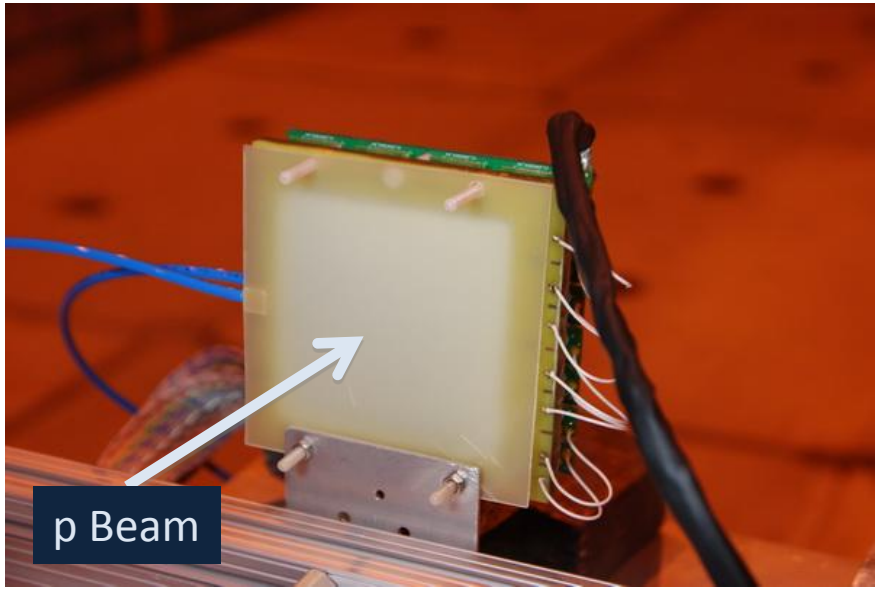
Run with channeling

Mean distribution of 8 pads time along the track.

Separation between peaks ~3.6mm
Distance from crystal ~50m
Deflection angle ~72μrad (exp 70μrad)



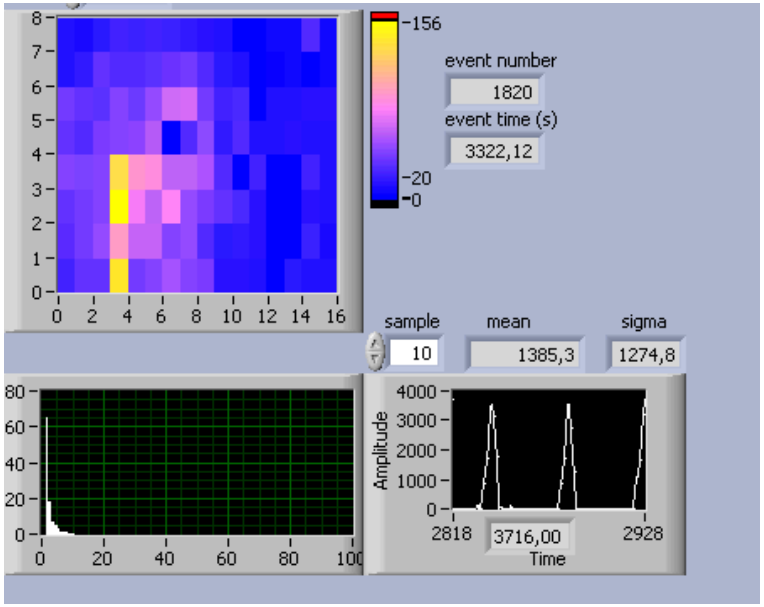
Planar GEM



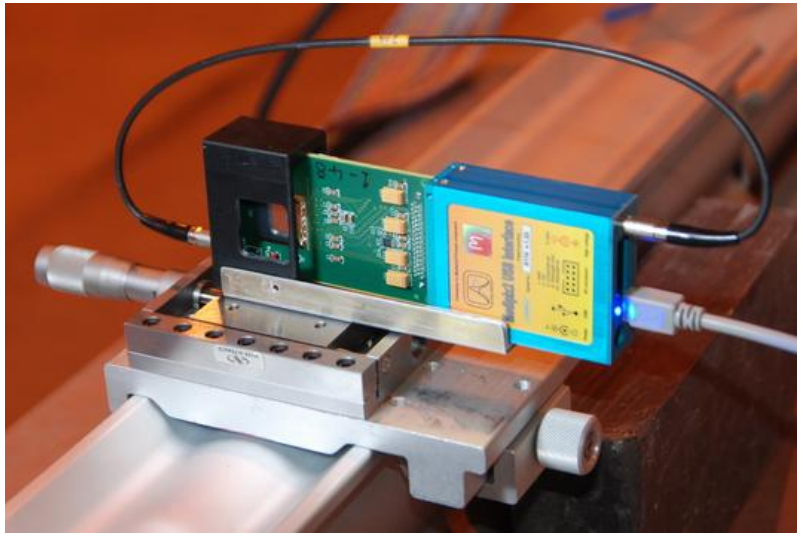
Anode:
5×5 cm^2
16×8 pads, 3×6 mm^2

Electronics:
readout (CARIOCA-GEM) + thresholds + HV supplies

Mounted on a rail for studying the inelastic interactions on the crystal

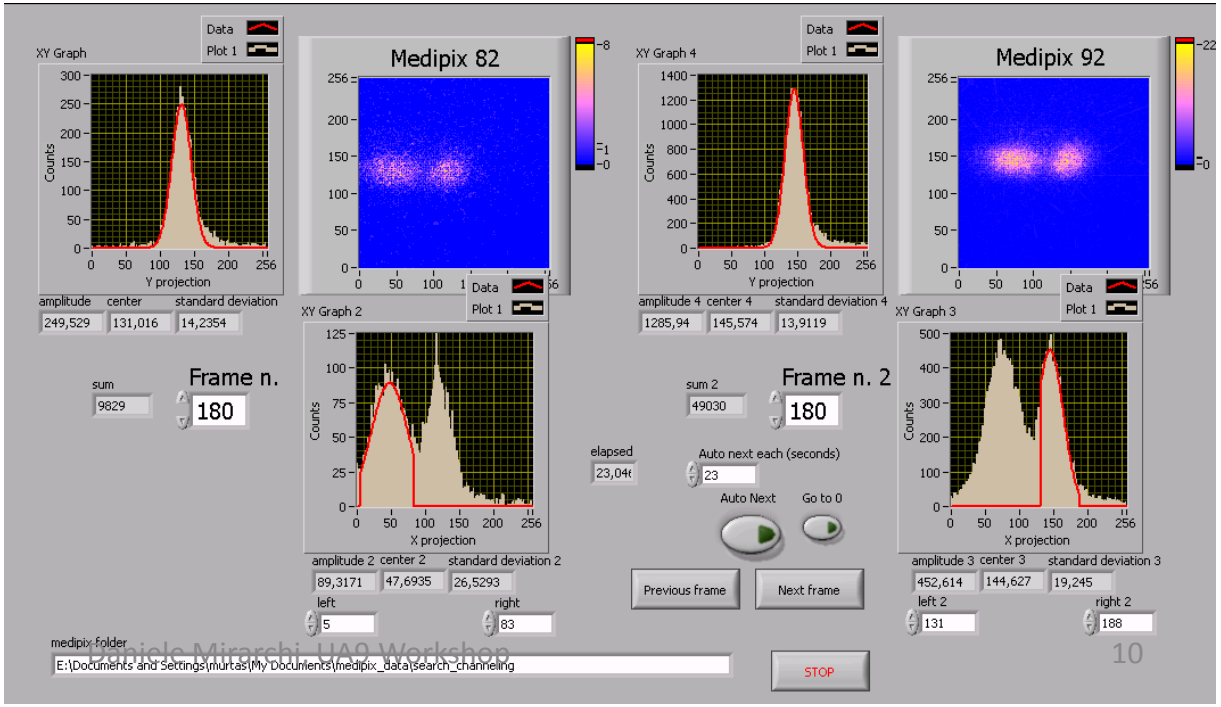


Medipix



Medipix2 Silicon detectors
256×256pixels, 55 μm pitch

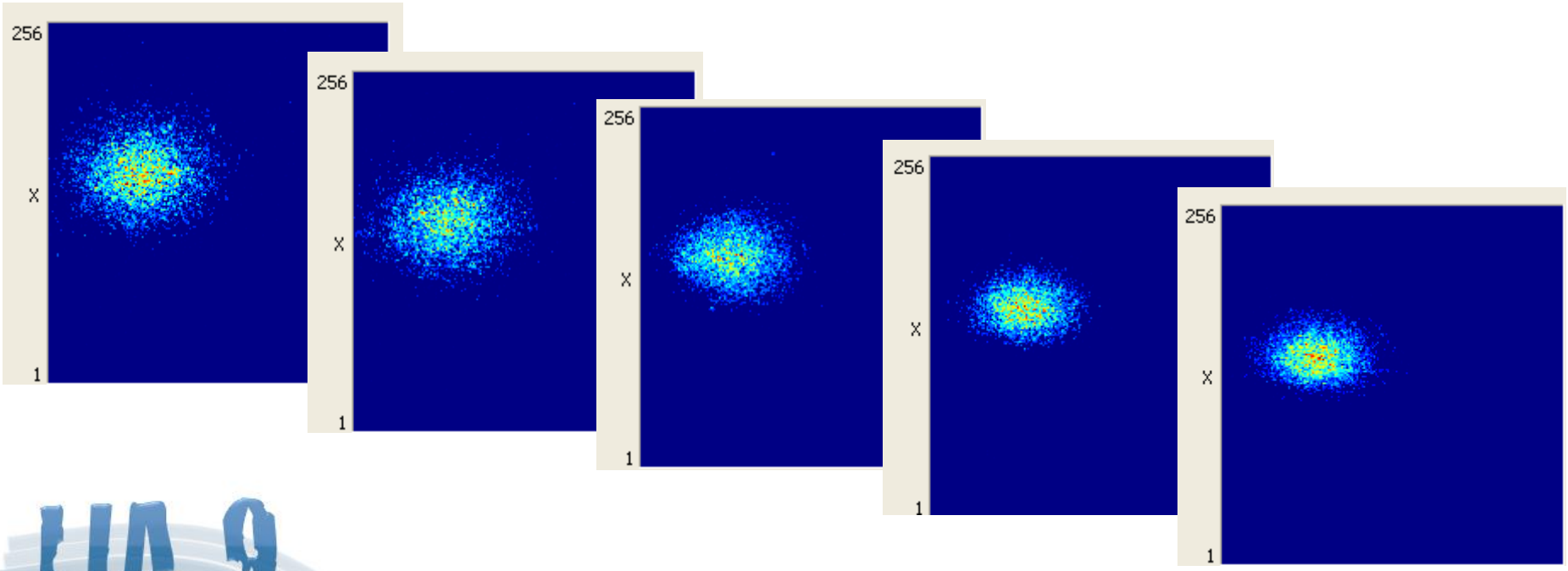
- Maximum acquisition rate via USB interface: few Hz
- Record 1 frame/4 sec, read back in LabVIEW & profile fitting



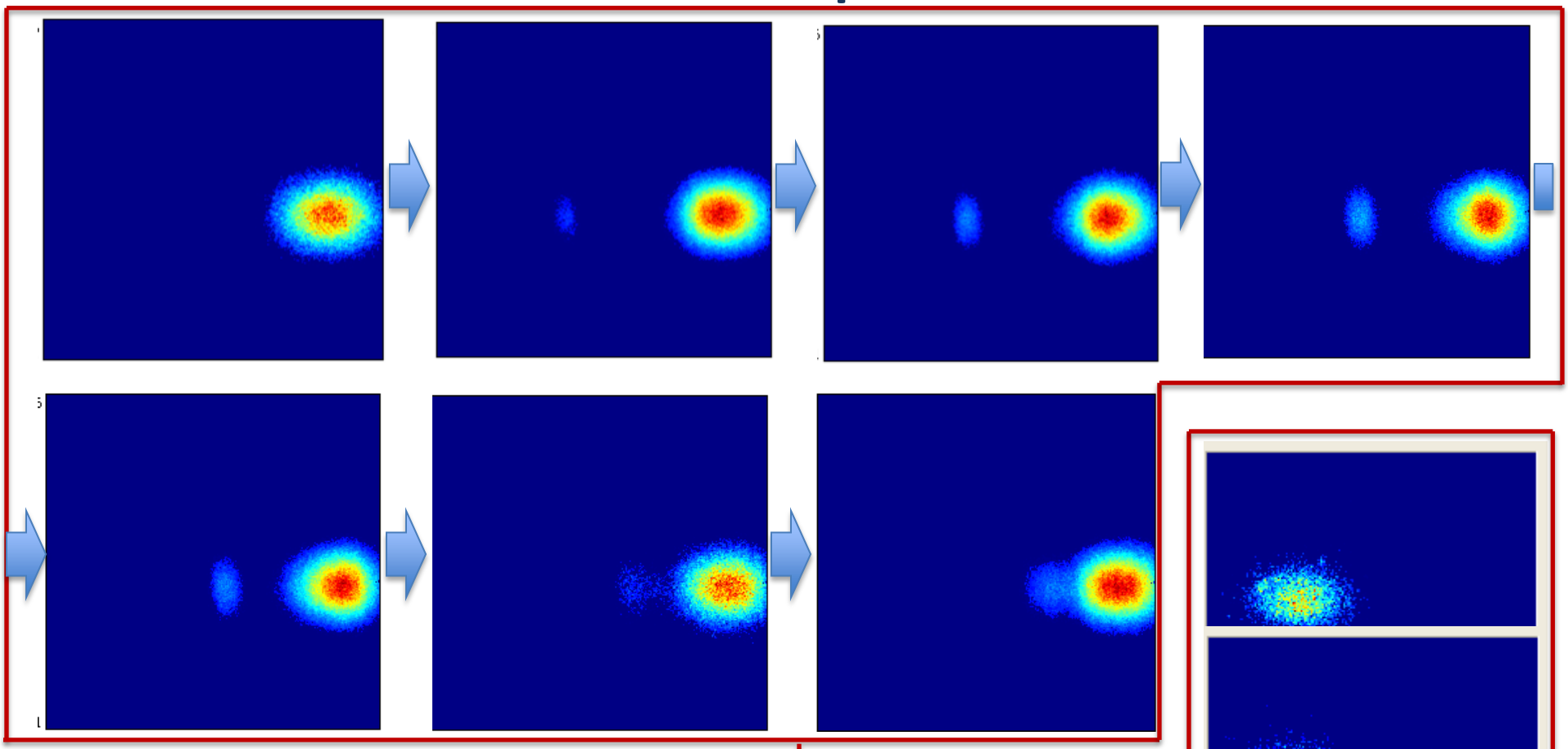
Medipix

Handy device

- To **find crystal position with respect to the beam**:
  Simply by seeing the beam squeeze, since multiple scattering reduces when beam no longer hits the crystal-holder frame (transverse position scan)



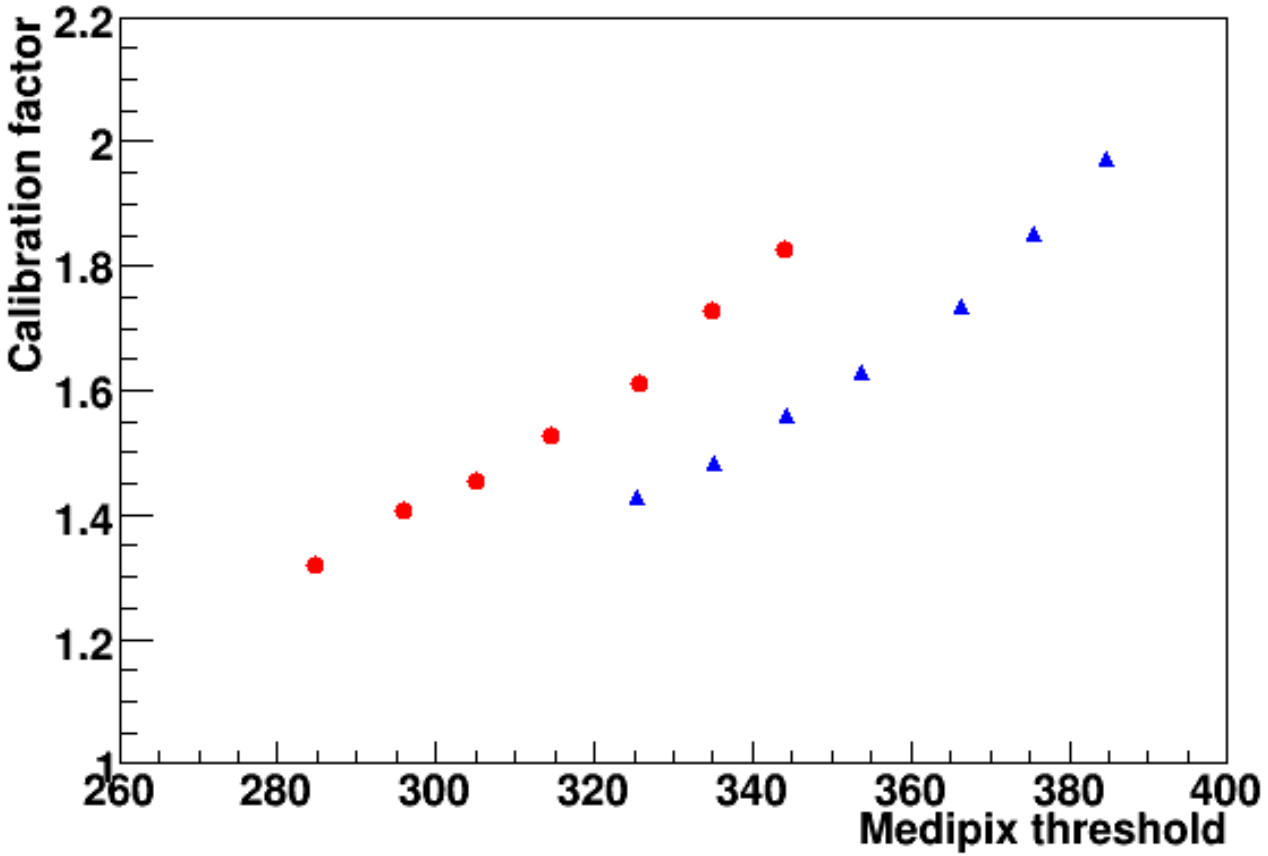
Medipix



Handy device

- To **find channeling** angle (fast angular scan)
- Even volume reflection!

Medipix calibration



Calibration factor calculated by Medipix counts/Scintillators counts in one spill.

Strongly dependence from threshold:

- Need characterization of Medipix in SPS for a better estimation of collimation efficency

Conclusions

- Scintillators works well, and make very good trigger signal.
- TPC-GEM is able to see channeling and tracks reconstruction with good resolution (115μm). Useful for ions run.
- Planar GEM work well, but is not yet analyzed.
- Medipix is very handy device.
  It's very useful for:
  - ✓ Fast search of the beam with crystal.
  - ✓ Fast angular scan for searching channeling angle.
  - ✓ Can also see the Volume Reflection effect.