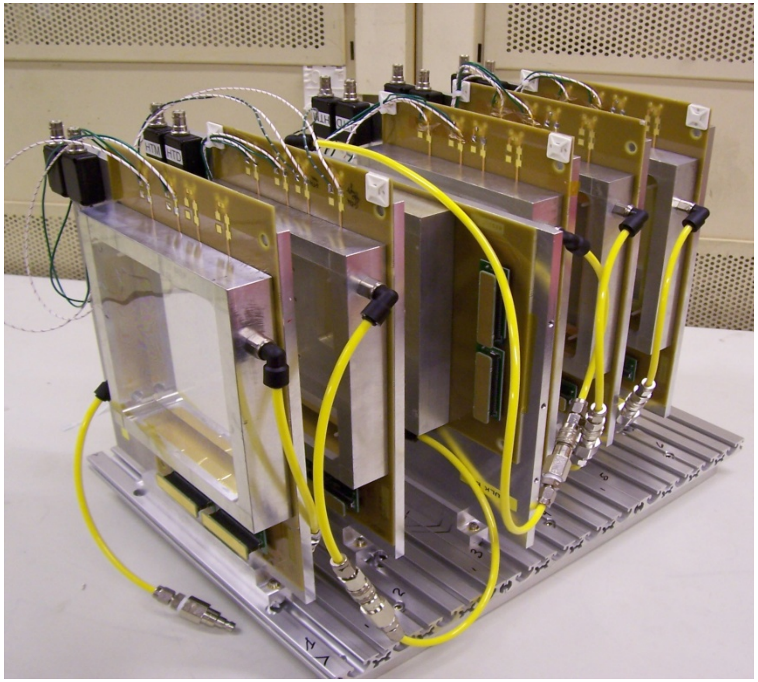
Micromegas detector studies for CLAS12 and COMPASS

Very preliminary results



D. Neyret **(for the Saclay CLAS12 and COMPASS groups)**

RD51 coll. meeting WG7

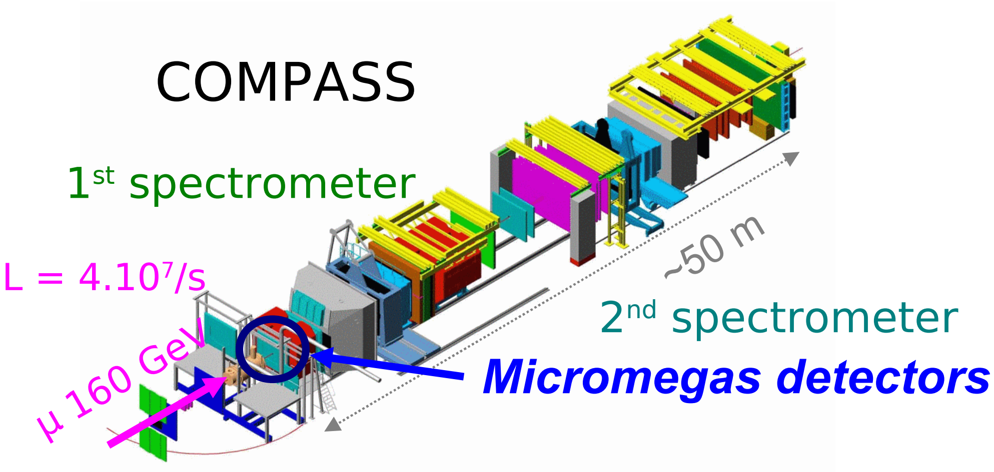
Micromegas detectors studies for CLAS12 and COMPASS

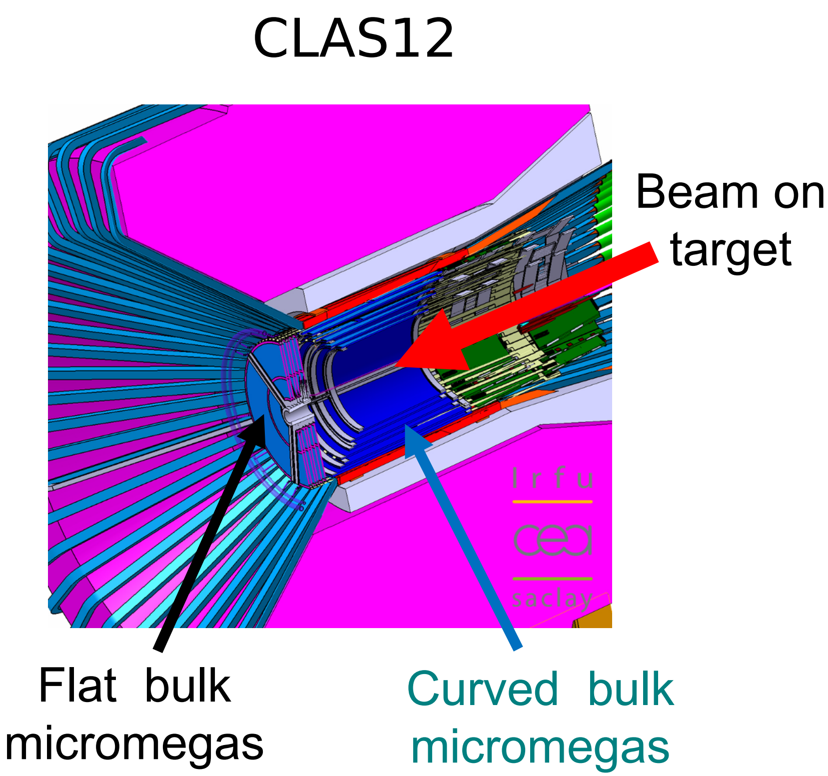
- Introduction
- First preliminary results
- Conclusions

R&D in progress for future Micromegas at CLAS12 and COMPASS

Compass: tracking with high hadron flux, including in beam area

Clas12: high particle flux, important magnetic field (parallel and perpendicular)





October beam tests at CERN

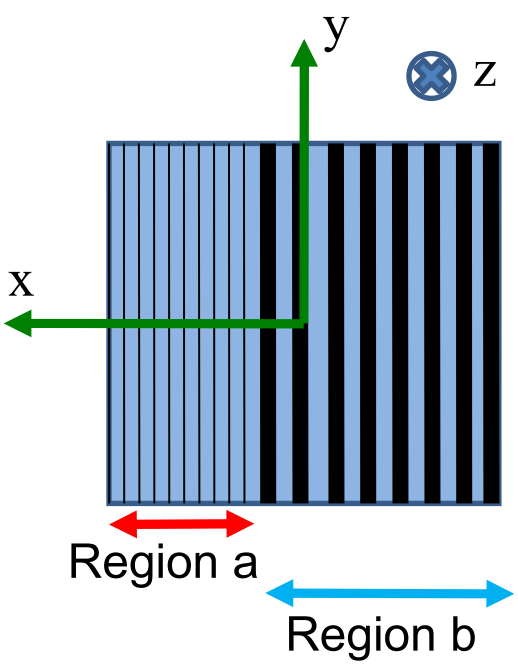
Goals of October beam test studies

- discharge rate reduction at high hadron flux (resistive layer, GEM foil)
- increase of cluster size for spatial resolution with larger strips (resistive layer)
- performances and discharge rates with large lateral magnetic field (small ionization gap with large electric field)

10 detectors to be tested

- 1 classic Micromegas with 5µm copper mesh
- 2 standard bulks as reference
- 1 bulk with 2mm drift gap + 1 bulk with inox drift electrode
- 1 bulk with an GEM foil
- 4 resistive bulks: 1 kapton foil, 1 paste on strips, 2 pastes over isolating layer (20 and 300 MOhm/²)

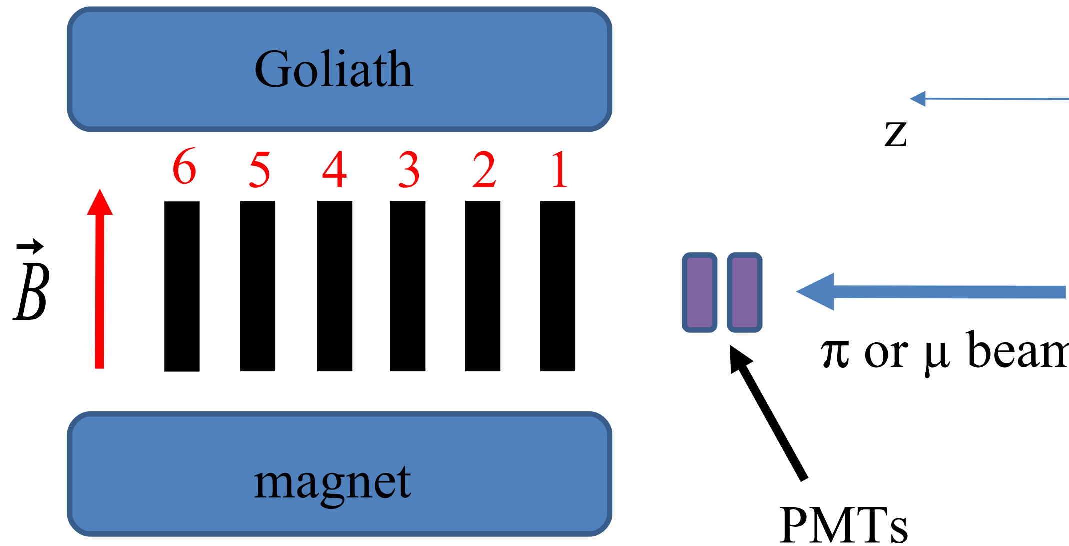
Description of the set-up

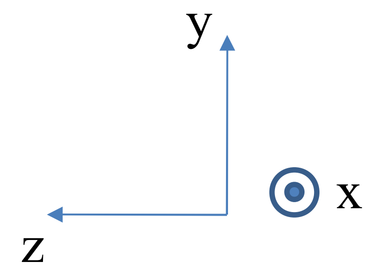


Picth: region a → 400µm
region b → 1mm

Distance between strips: 100µm

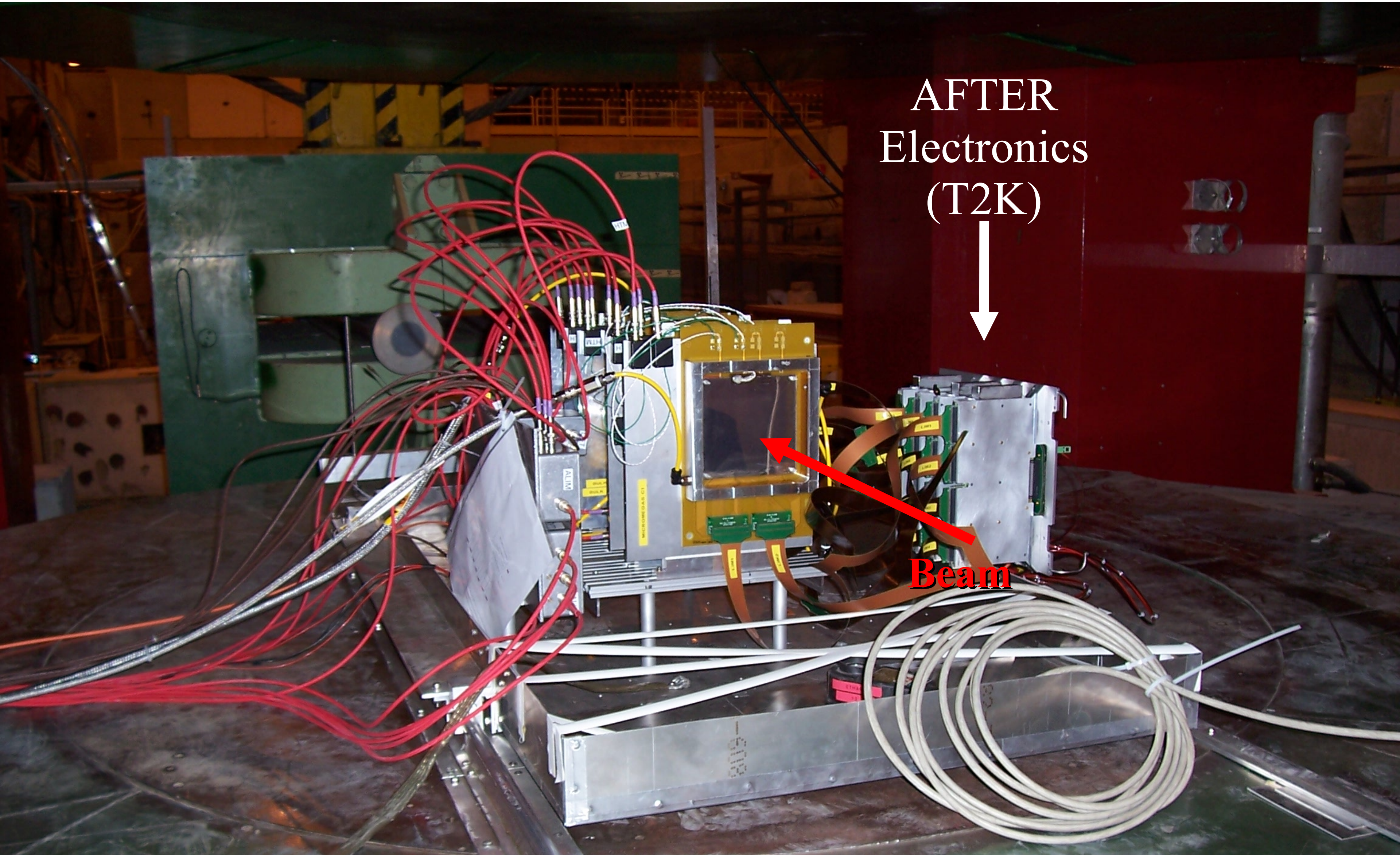
Gaz: Ar + 5% Isobutane



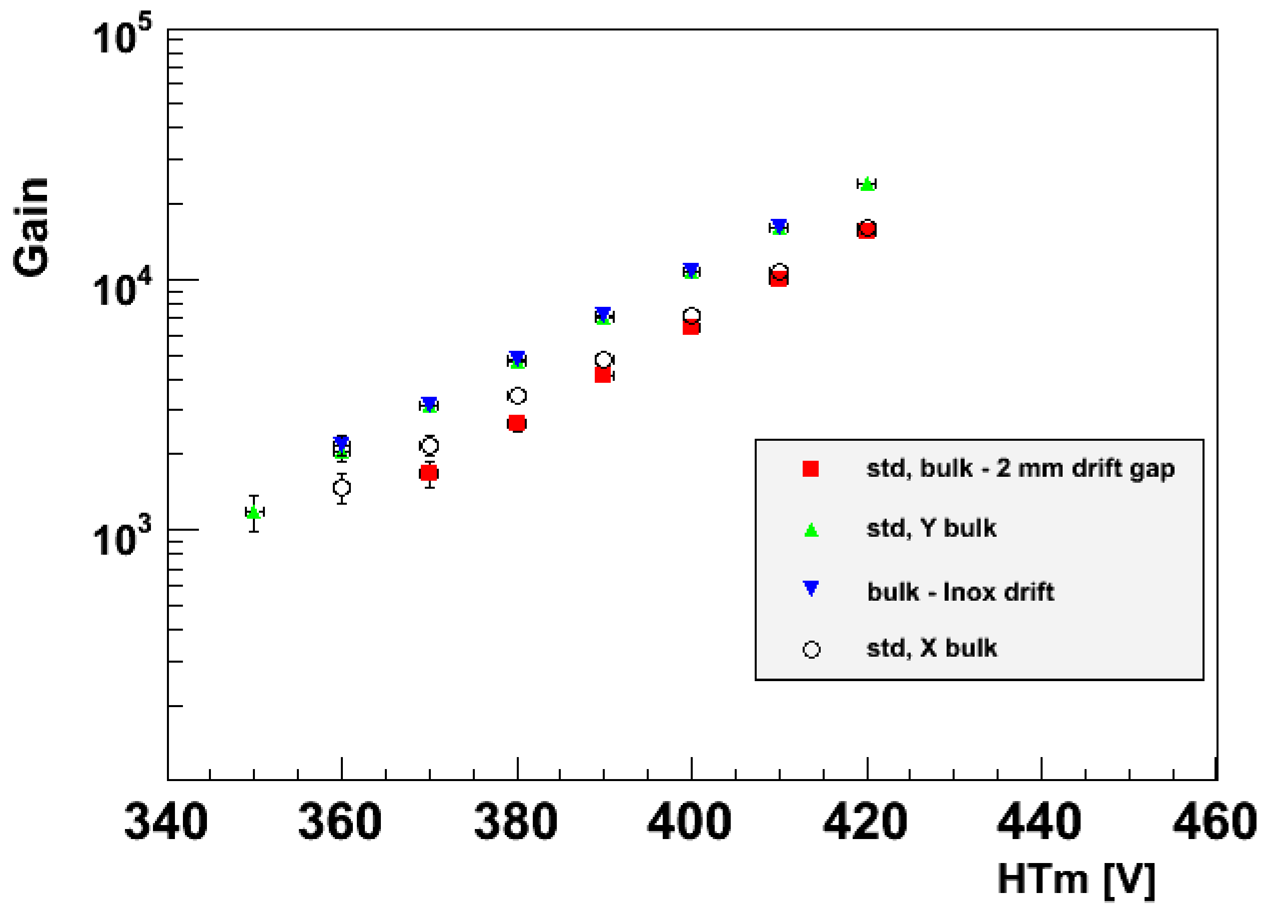


	MM Type	Drift gap	Orientation
1	classic	5 mm	X
2	bulk + GEM	2.6 + 5 mm	X
3	bulk	5 mm	Y
4	bulk or resist	2 or 5 mm	X
5	bulk or resist	5 mm	X
6	bulk	5 mm	X

Setup in the Goliath magnet

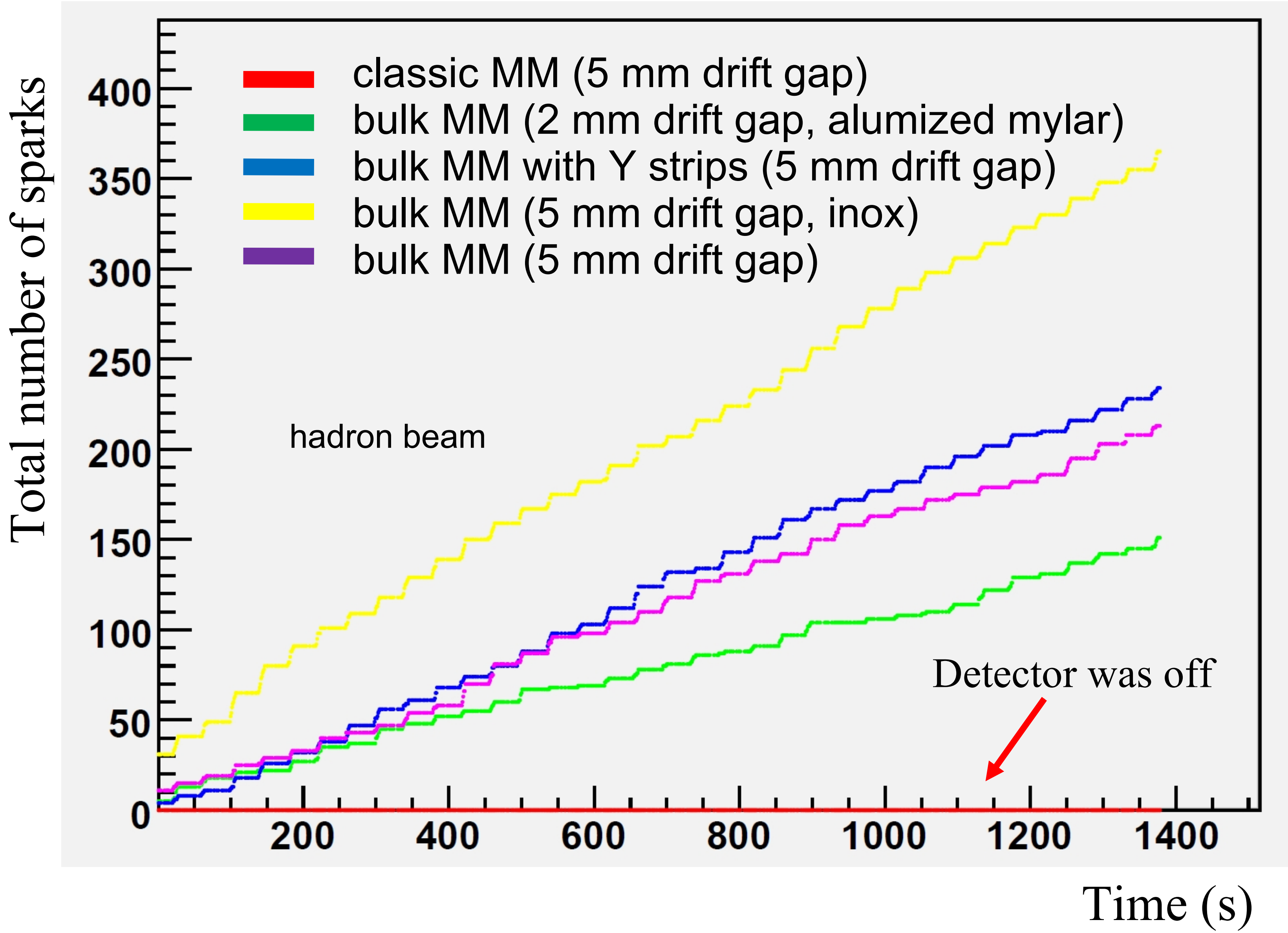


Preliminary results: Gain with ^{55}Fe source

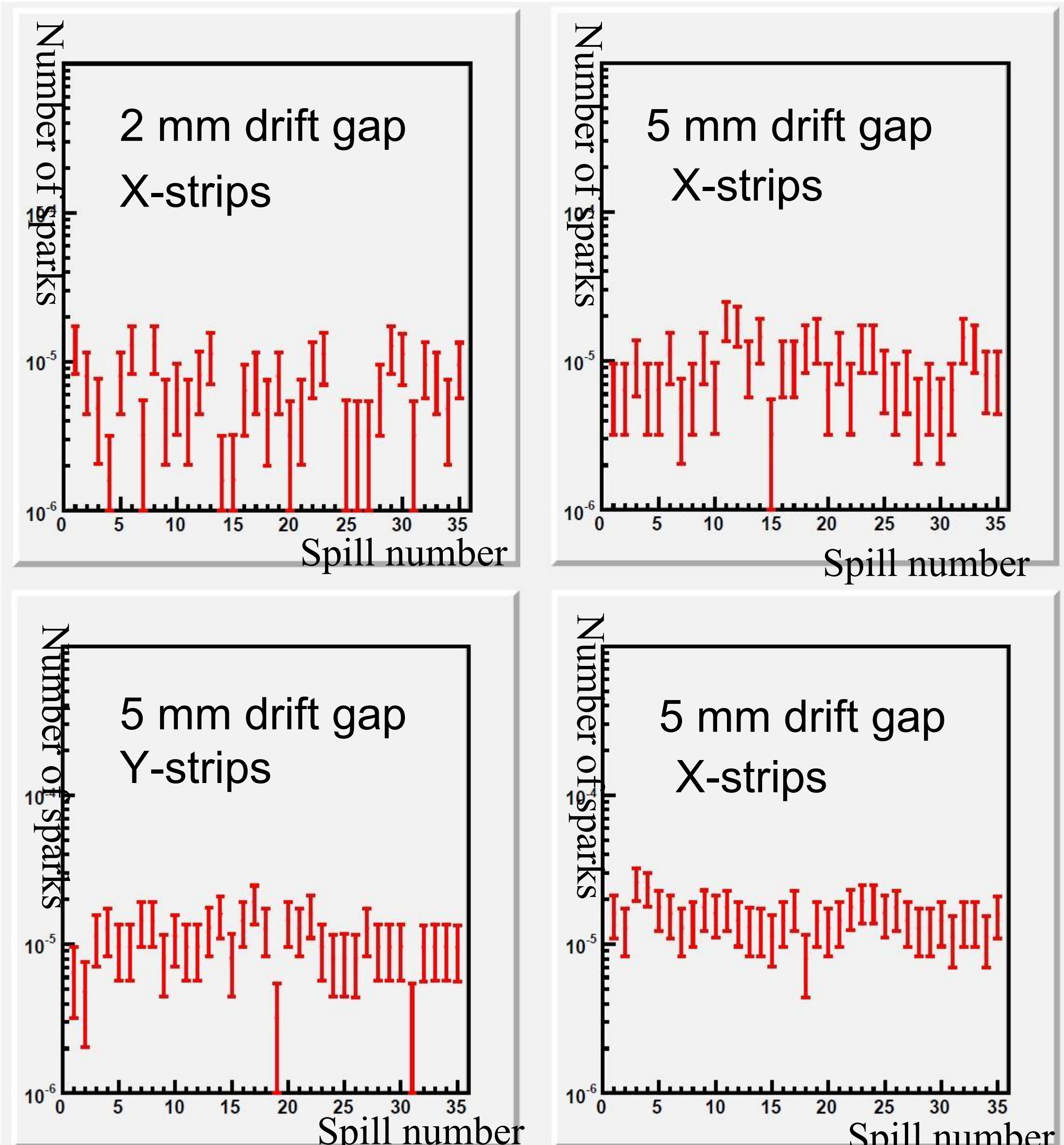


Preliminary results: output of sparks DAQ

Sparks counter for each detector



Preliminary results: sparks DAQ (2)



Hadron beam
150 GeV

HT mesh: 370V
HT drift: 600V

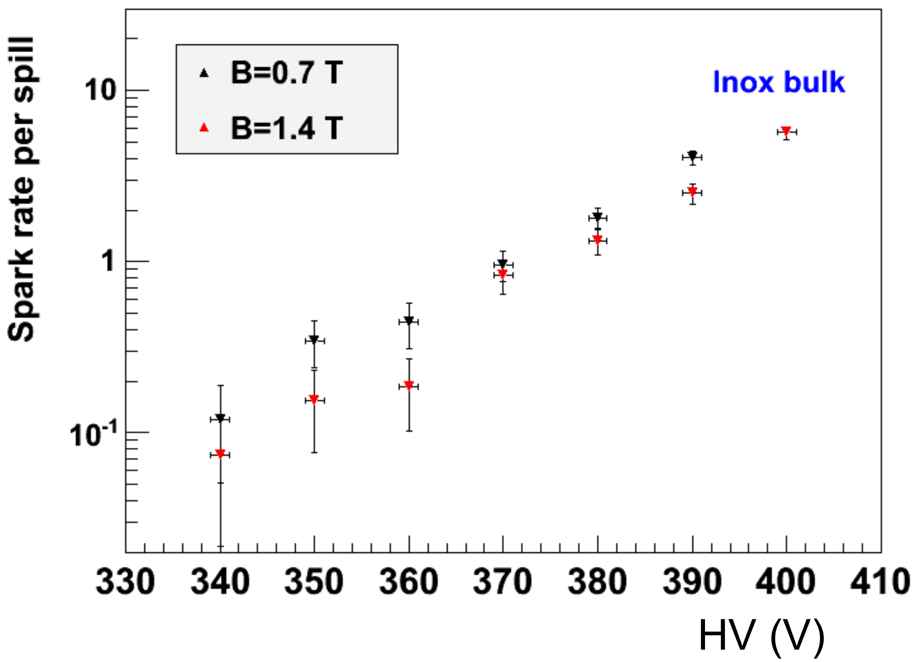
Number of sparks normalized to PMTs coincidences

Sparks rates stable over time
~10^{-5} sparks/event

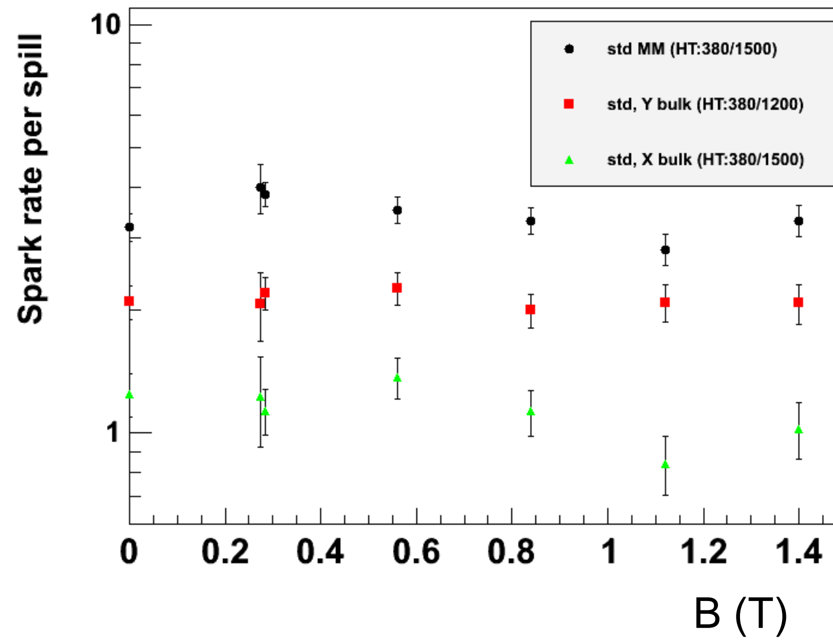
Preliminary results: discharge rates vs conditions

Hadron beam 150 GeV

Discharge rate vs mesh HV



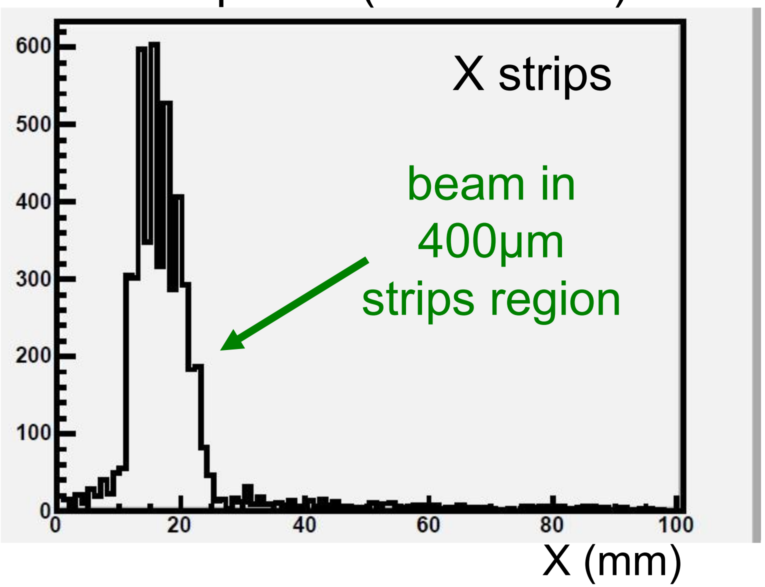
Discharge rate vs B field



No strong effect of B field seen on discharge rate

Preliminary results: beam profiles

Beam profile (classic MM)

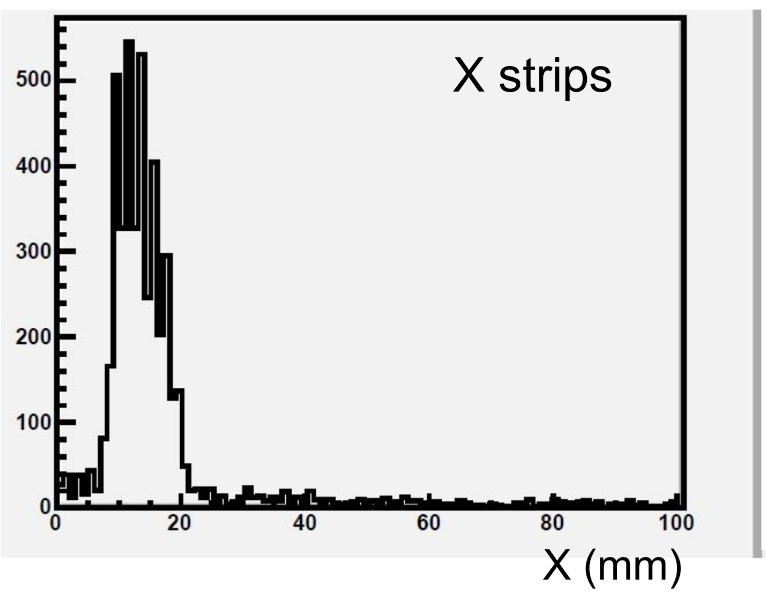


Run with beam spread in Y

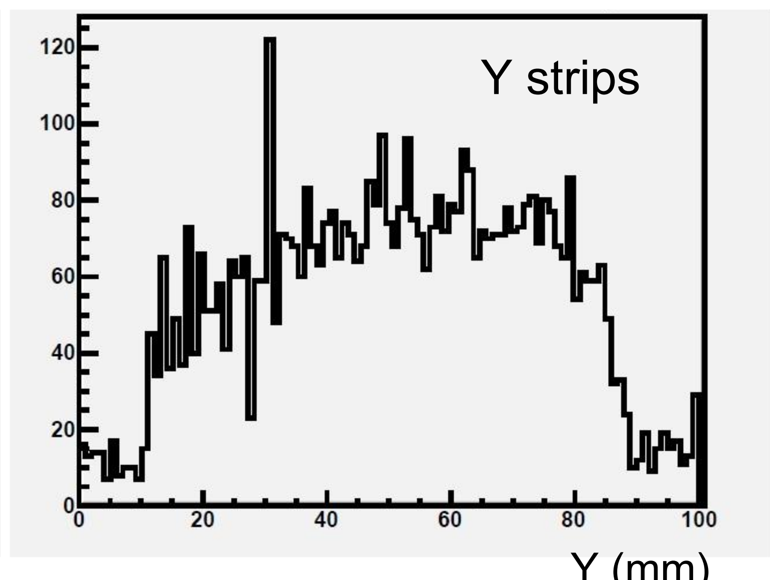
Online monitoring

Muon beam (~150 GeV)

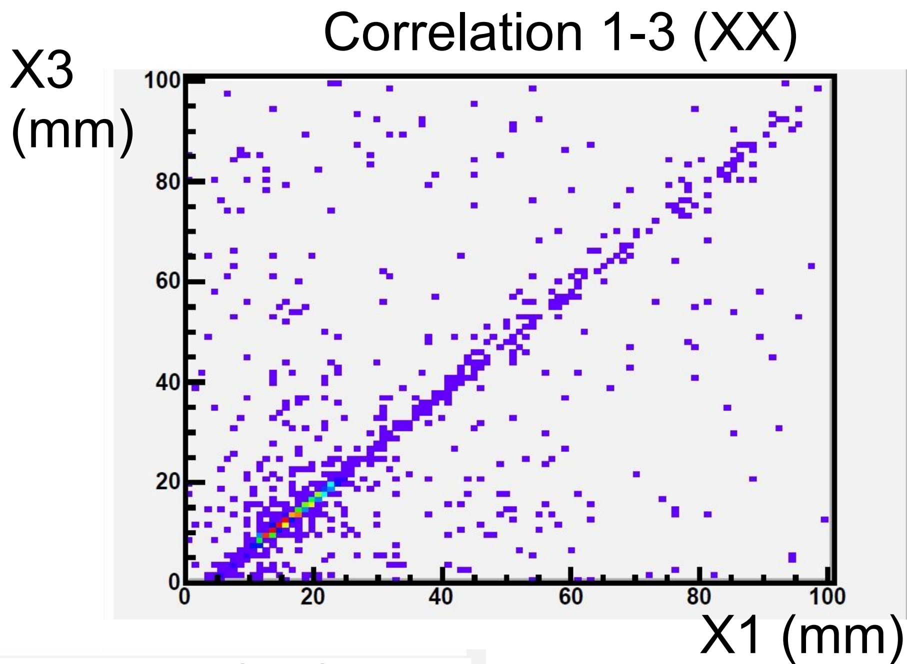
Beam profile (bMM 2mm drift)

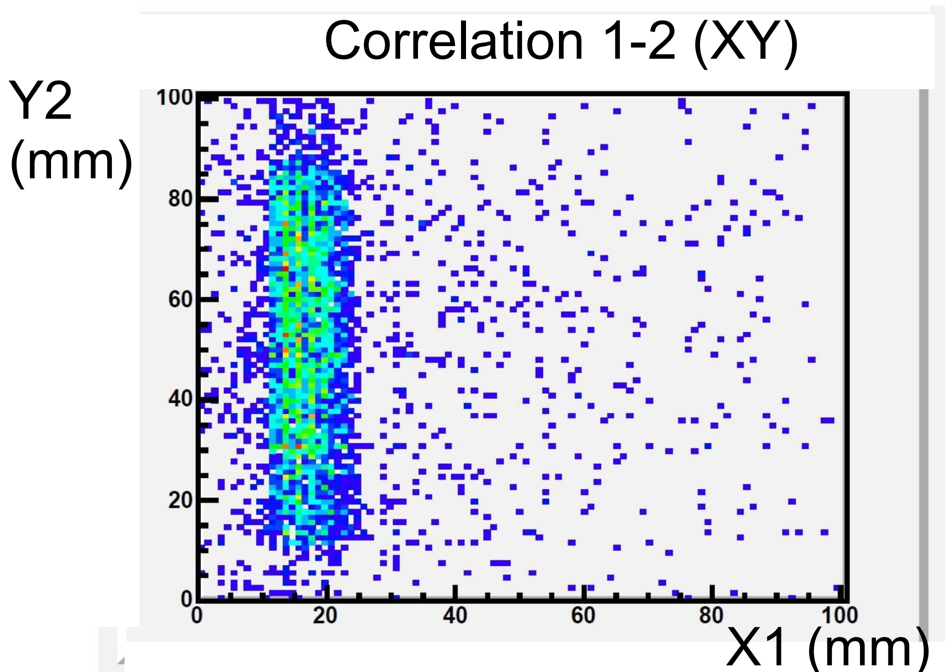


Beam profile (bMM 5mm drift)



Preliminary results: correlations between detectors





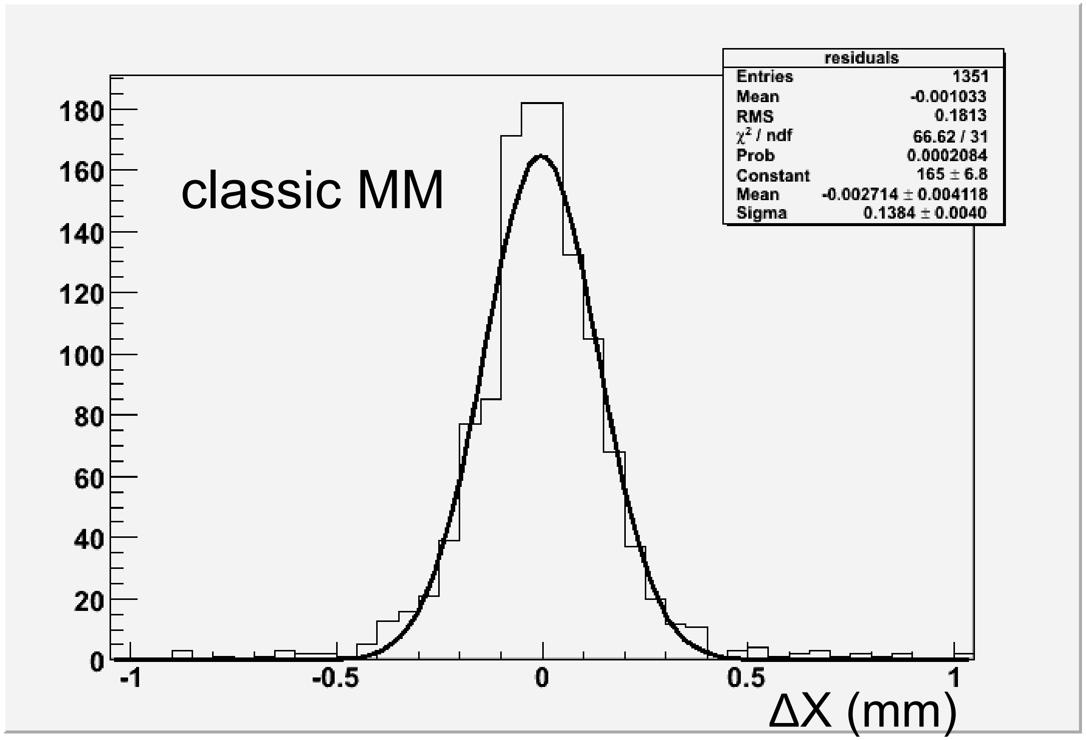
2D beam profiles

Run with beam spread in Y

Muon beam (~150 GeV)

1 = classic MM (X-strips)
2 = bulk MM (Y-strips)
3 = bulk MM (X-strips)

Preliminary results: first residuals



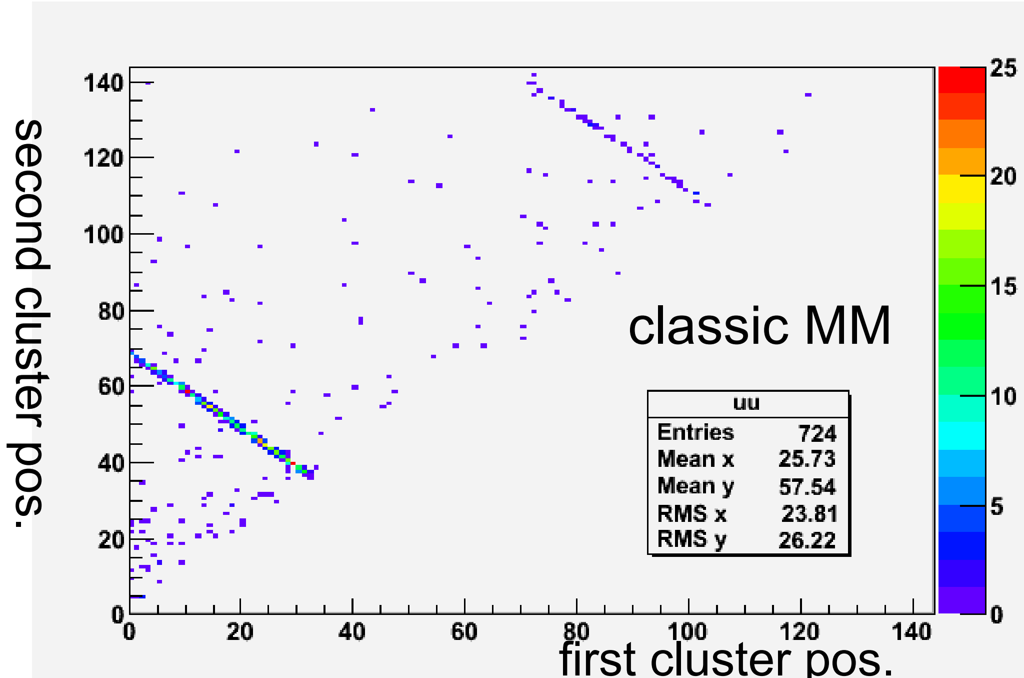
Muon beam

Residuals dominated by small pitch region

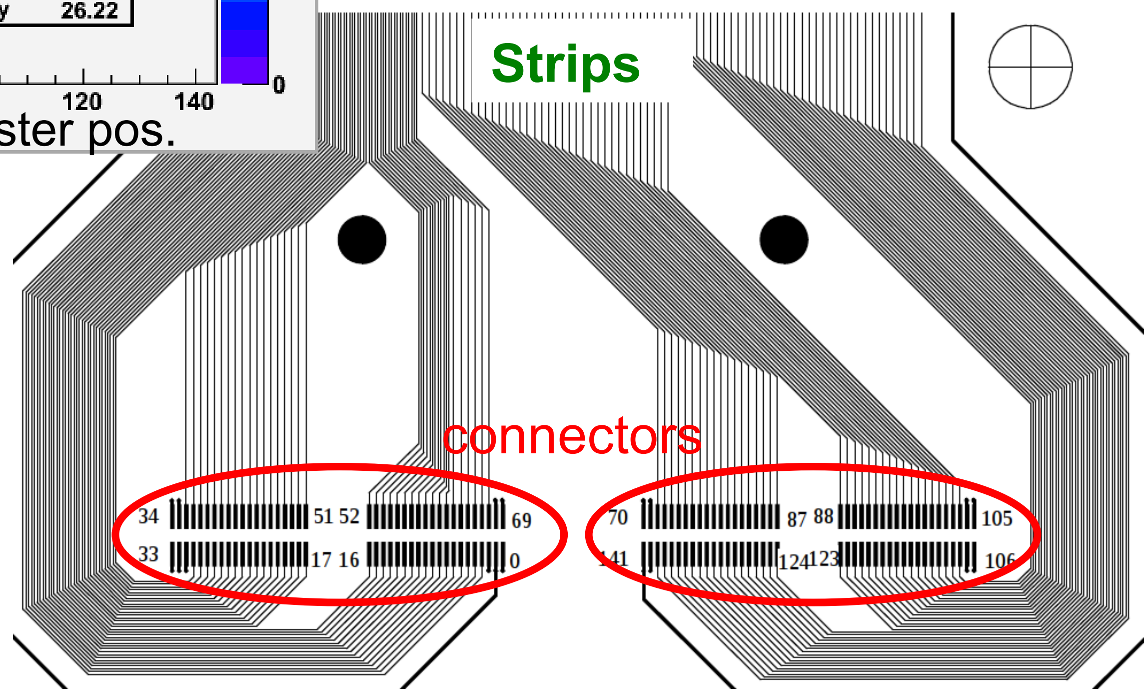
Data reconstruction still to be improved

ΔX (strip) = difference between expected and measured hit position

Preliminary results: cross-talk effects



Can be probably corrected by cut on the second cluster amplitude



Conclusions and outlook

A lot of data to analyse !

- all detectors tested (sparks and performances)
- sparks DAQ: discharge rate vs mesh HV, drift HV, GEM HV, B field, beam currents, ...
- also discharge rates from HV power supply data
- AFTER DAQ: residuals, amplitudes, efficiencies to extract from data
- then synthesis of detector characteristics vs conditions
- a few weeks to complete the analysis...

Expectations for next year

- 1 or 2 periods in autumn and may be summer
- more resistive detectors to test
- different gas mixtures ?
- still with B field