Tracking of micromegas telescope (Status Report)

RD51 Collaboration

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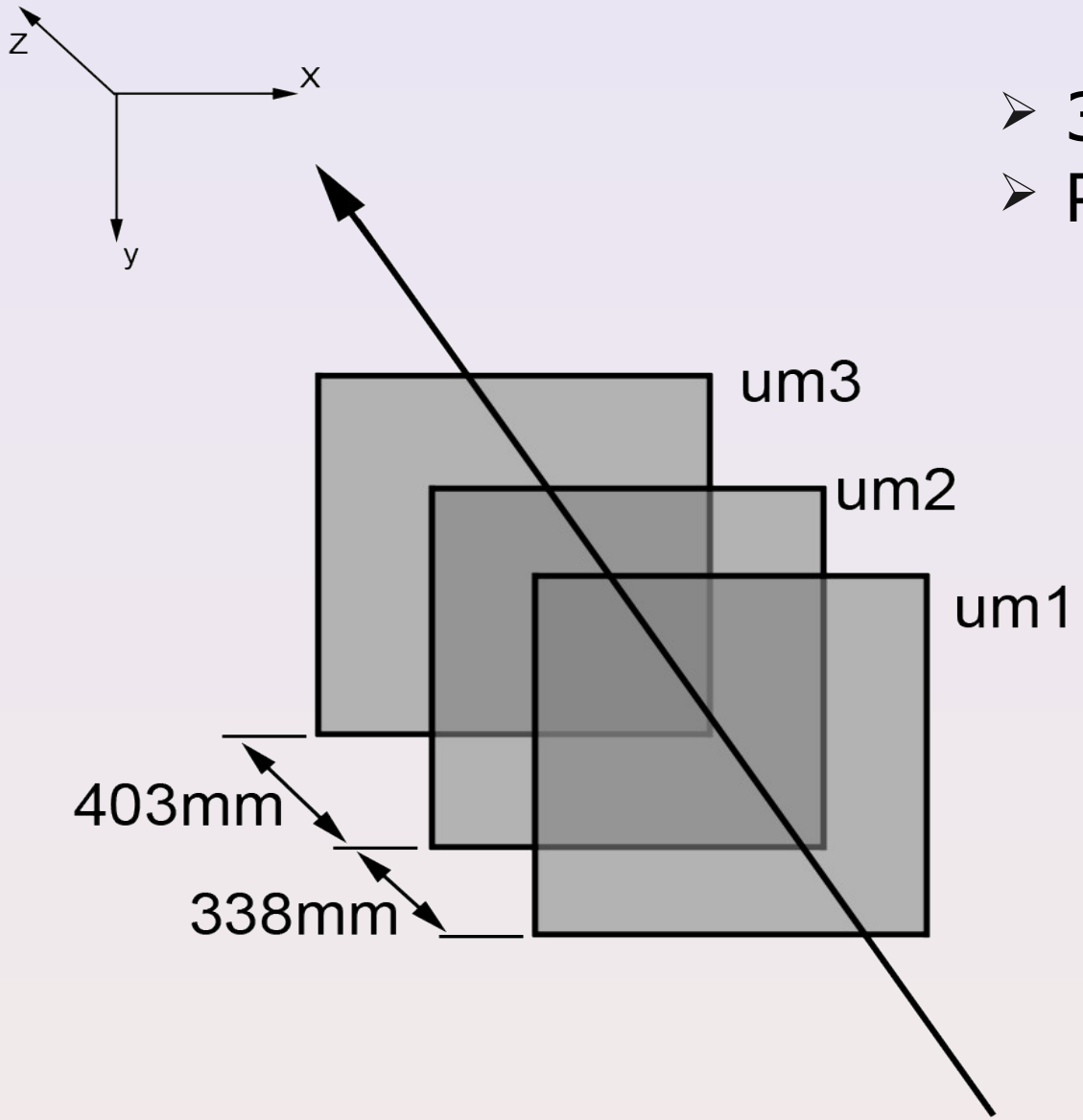
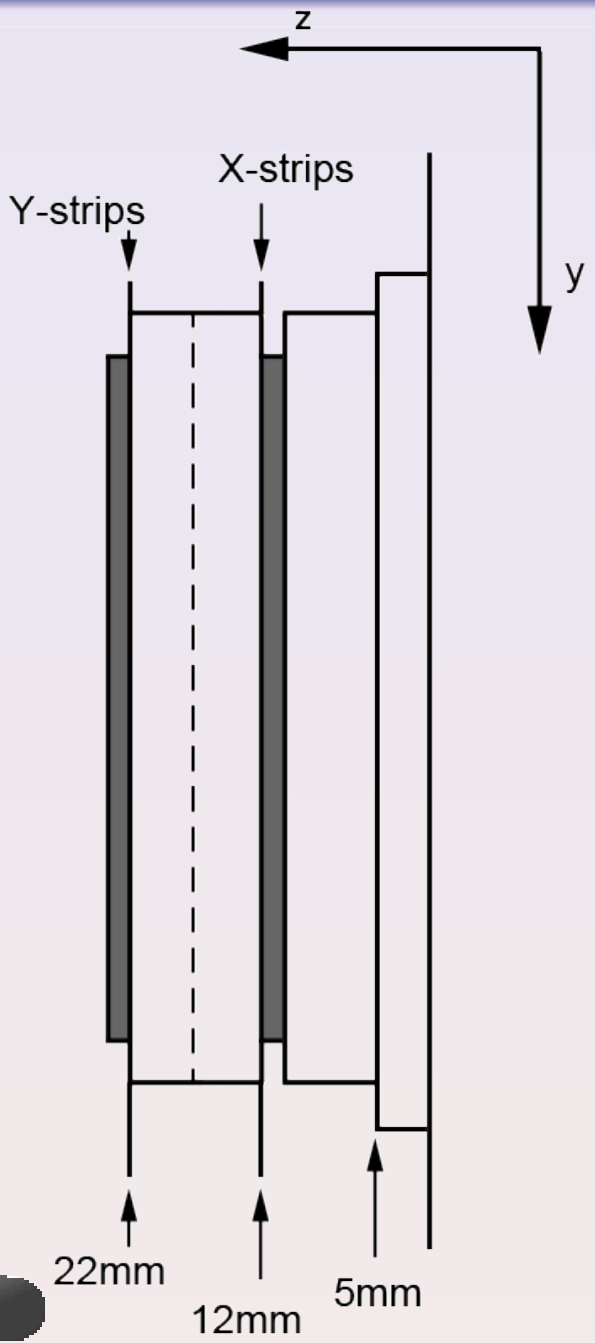
Tracking of micromegas telescope



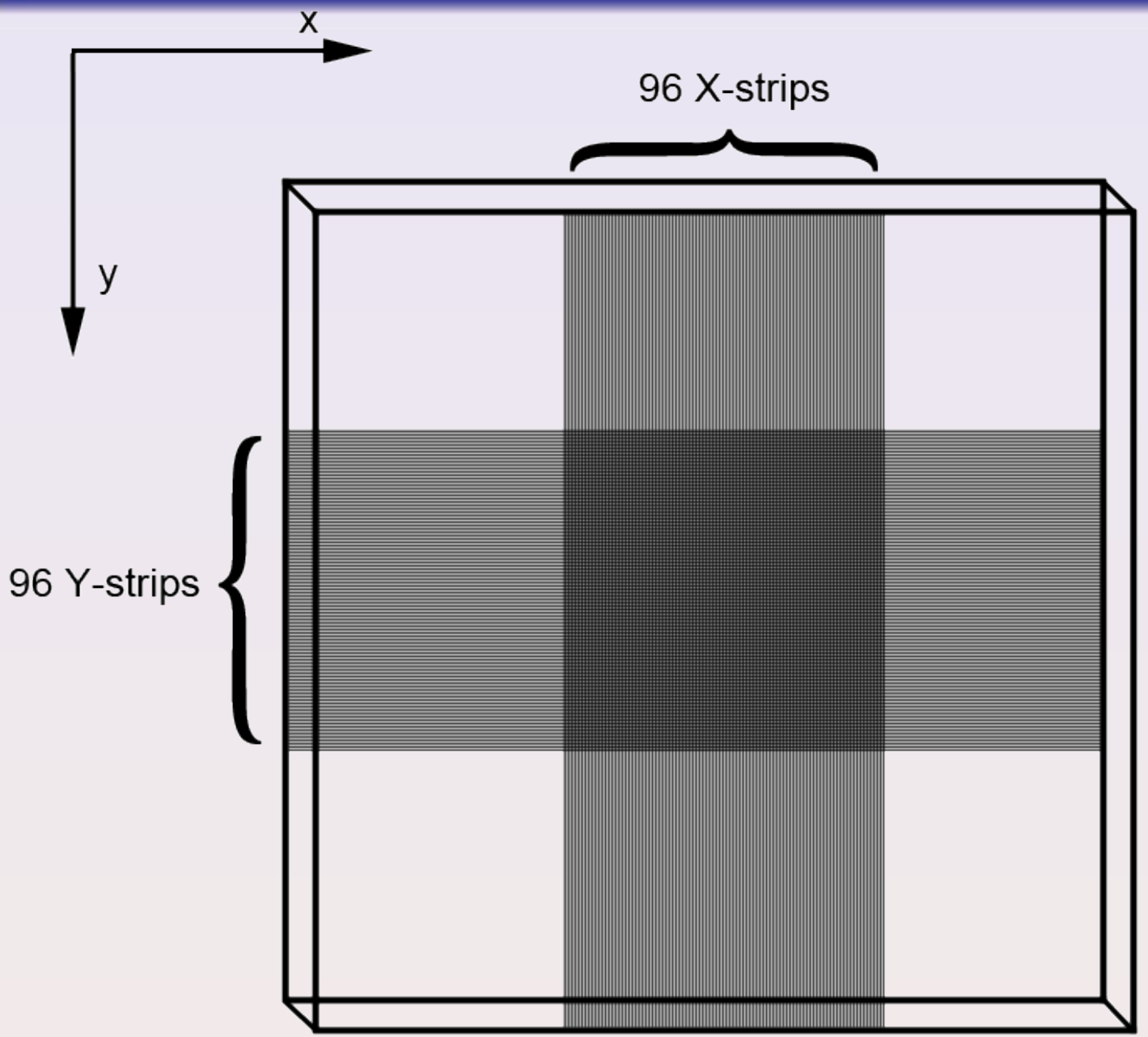
- 3 Sets of uM detectors.
- Parallel and movable.

Tracking of micromegas telescope



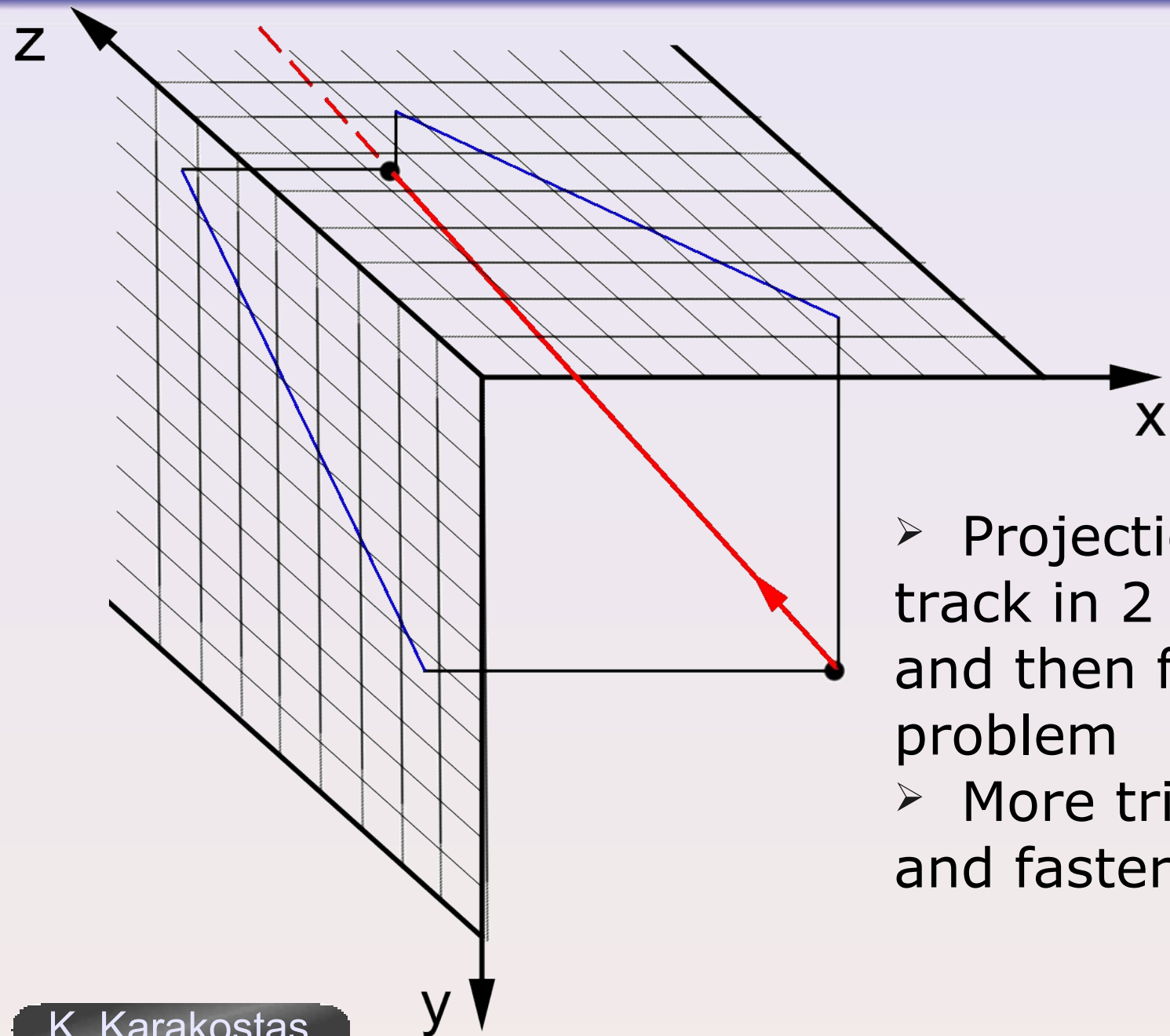
- 2 PCBs per detector (one with the X-strips and the other with the Y-strips).
- Common drift and different mesh for each direction.
- All 3 detector are identical.

Tracking of micromegas telescope



- 10cm x 10cm but only 2.5cm x 2.5cm active area (96 stripsx250um).
- 96 strips for each direction.
- The beam first cross the X-plane and afterwards the Y-plane.

Tracking of micromegas telescope



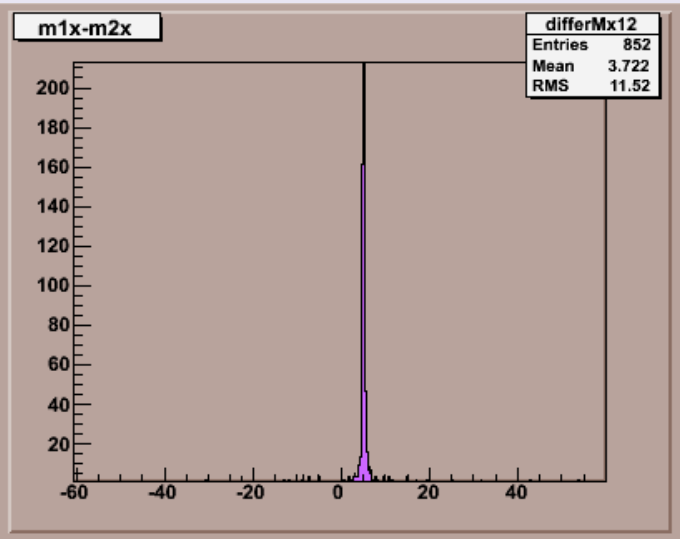
- Projection of the real track in 2 planes (xz, yz) and then facing a 2D problem
- More trivial approaches and faster algorithms.

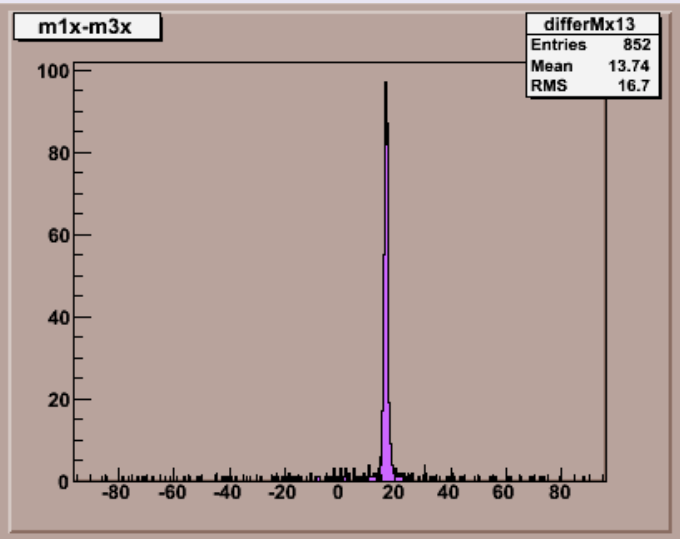
Tracking of micromegas telescope

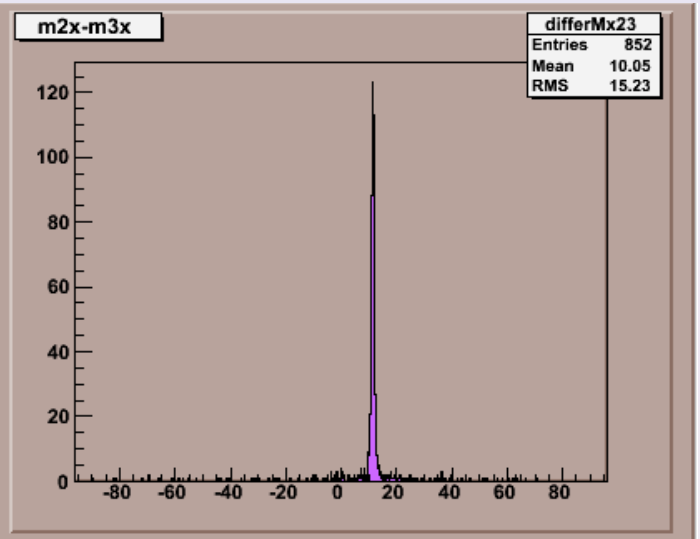
- Geometric approach based on construction of the telescope.
- Similar triangles provide one-line formula based on 2 points to extrapolated the third.
- Need to get better aligned detectors for the tracking.
- Ability to use the offset correction on the offline analysis.

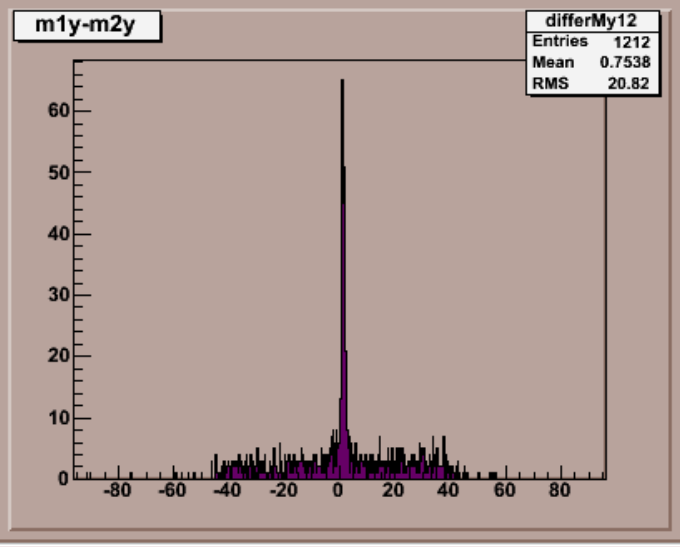
Tracking of micromegas telescope

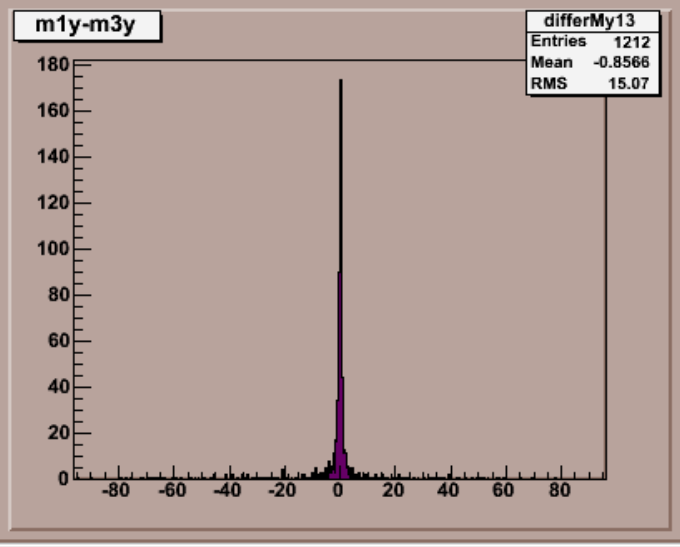
- Displacements for all planes, for each direction before alignment.

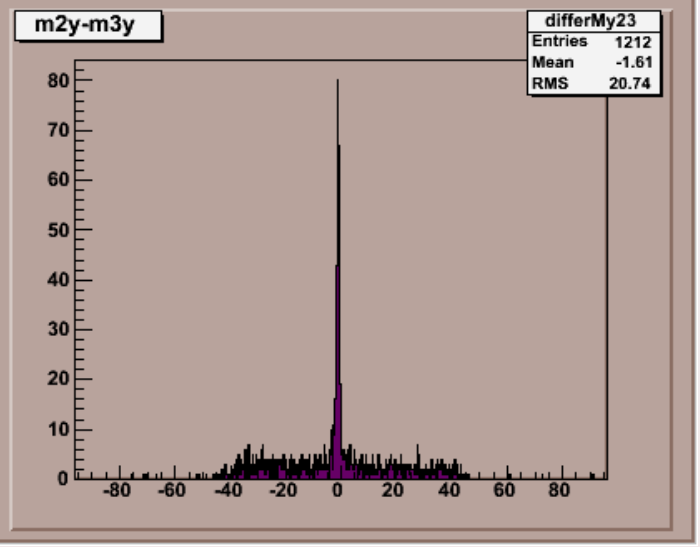








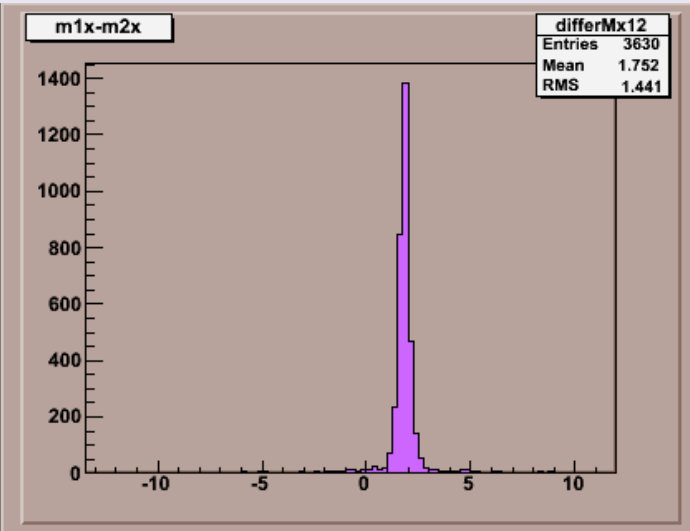


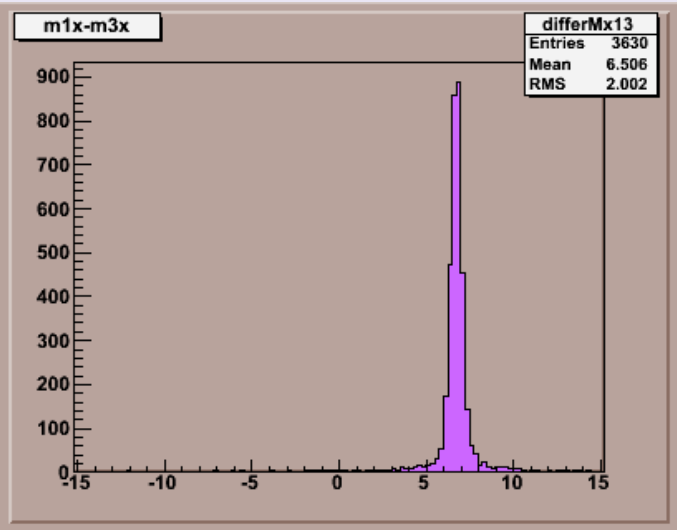


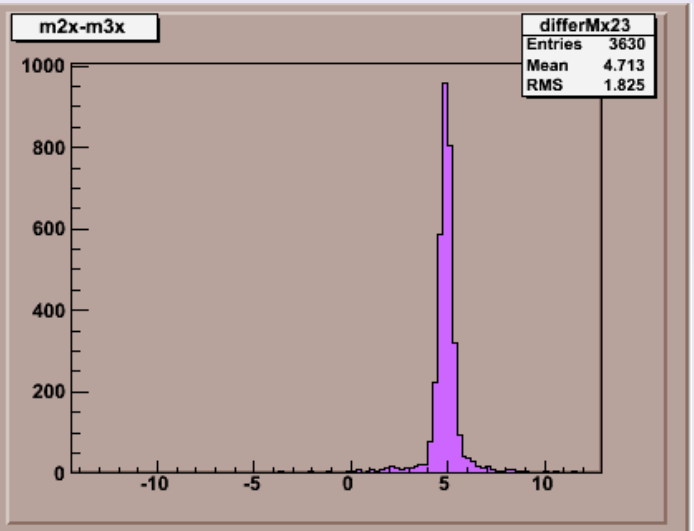
- All X-Axis are in strips.

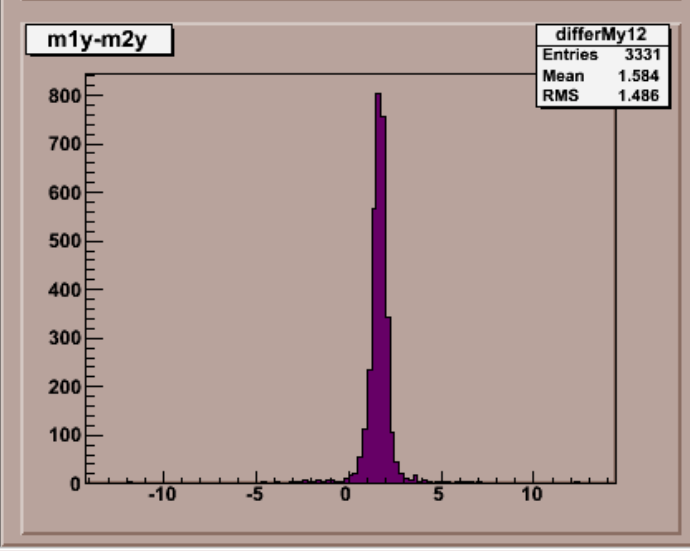
Tracking of micromegas telescope

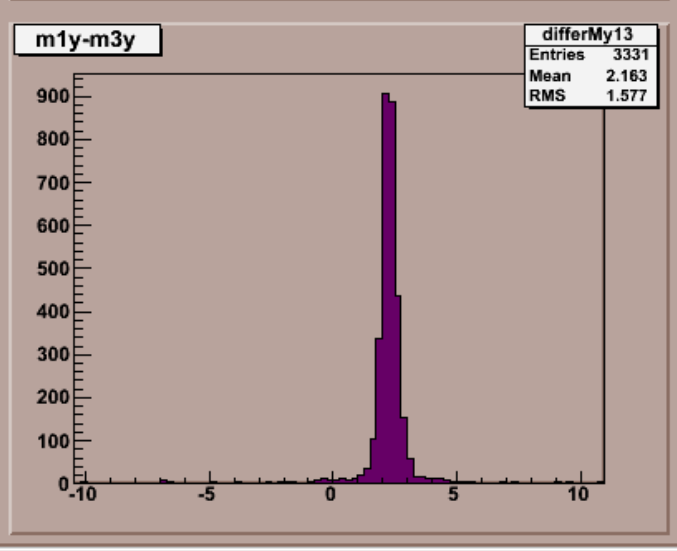
- Displacements for all planes, for each direction after alignment.

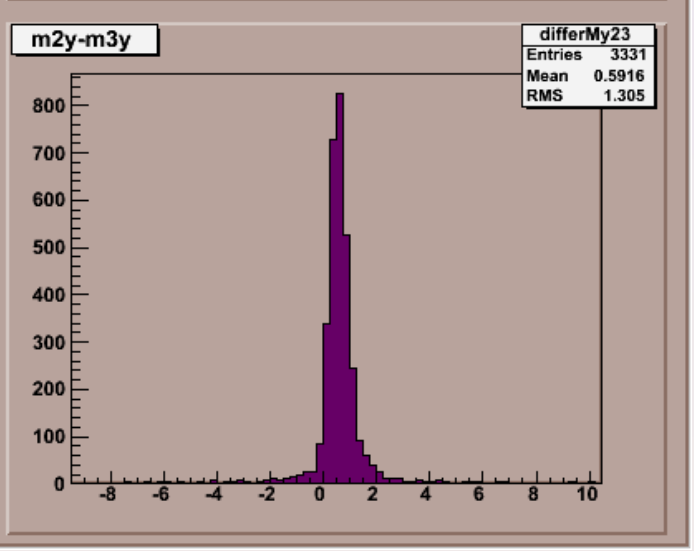








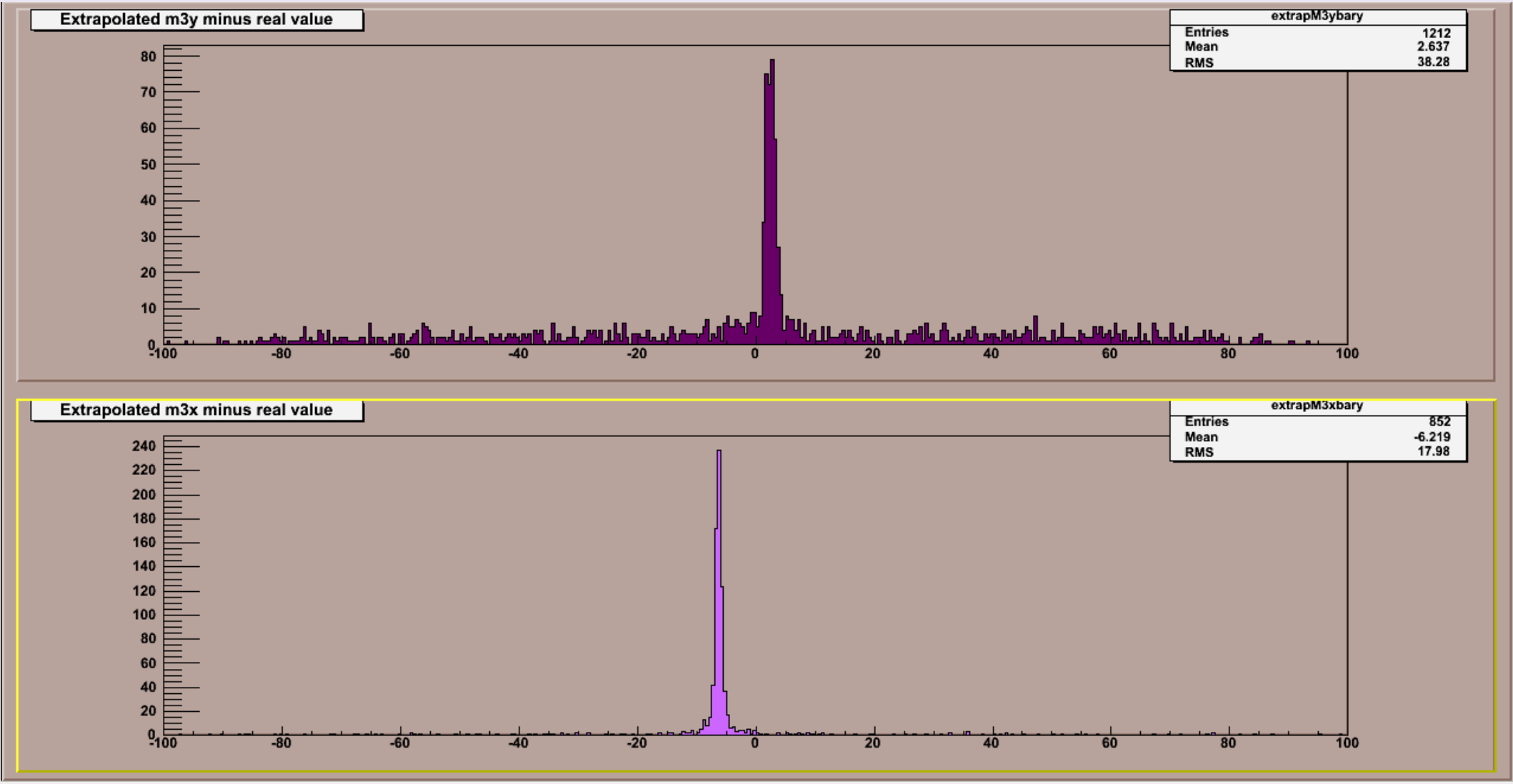




- All X-Axis are in strips.

Tracking of micromegas telescope

- Extrapolated value for um3 – real value, before alignment.



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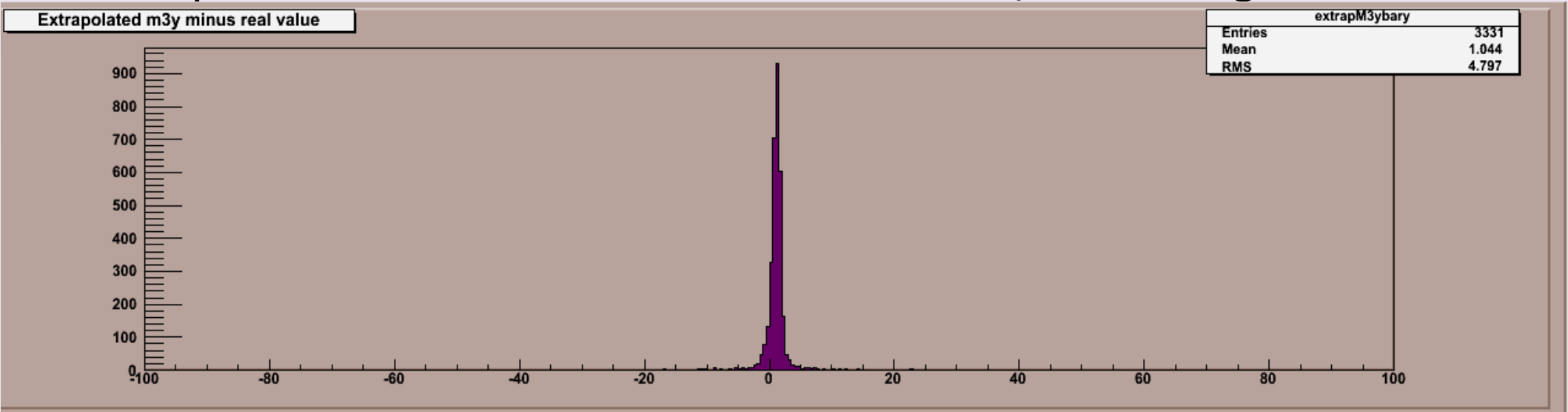
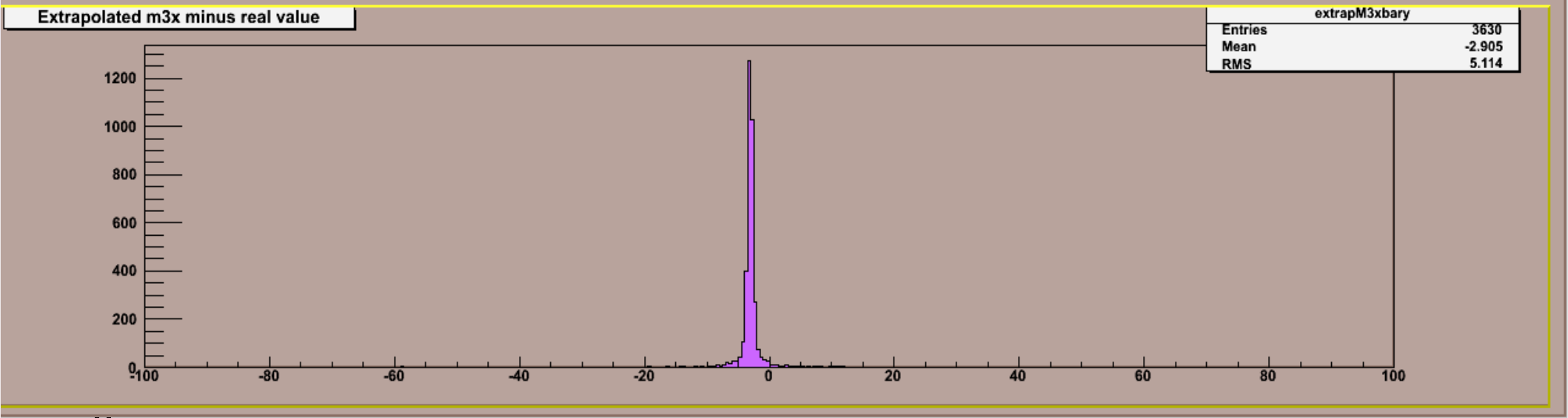




- All X-Axis are in strips.

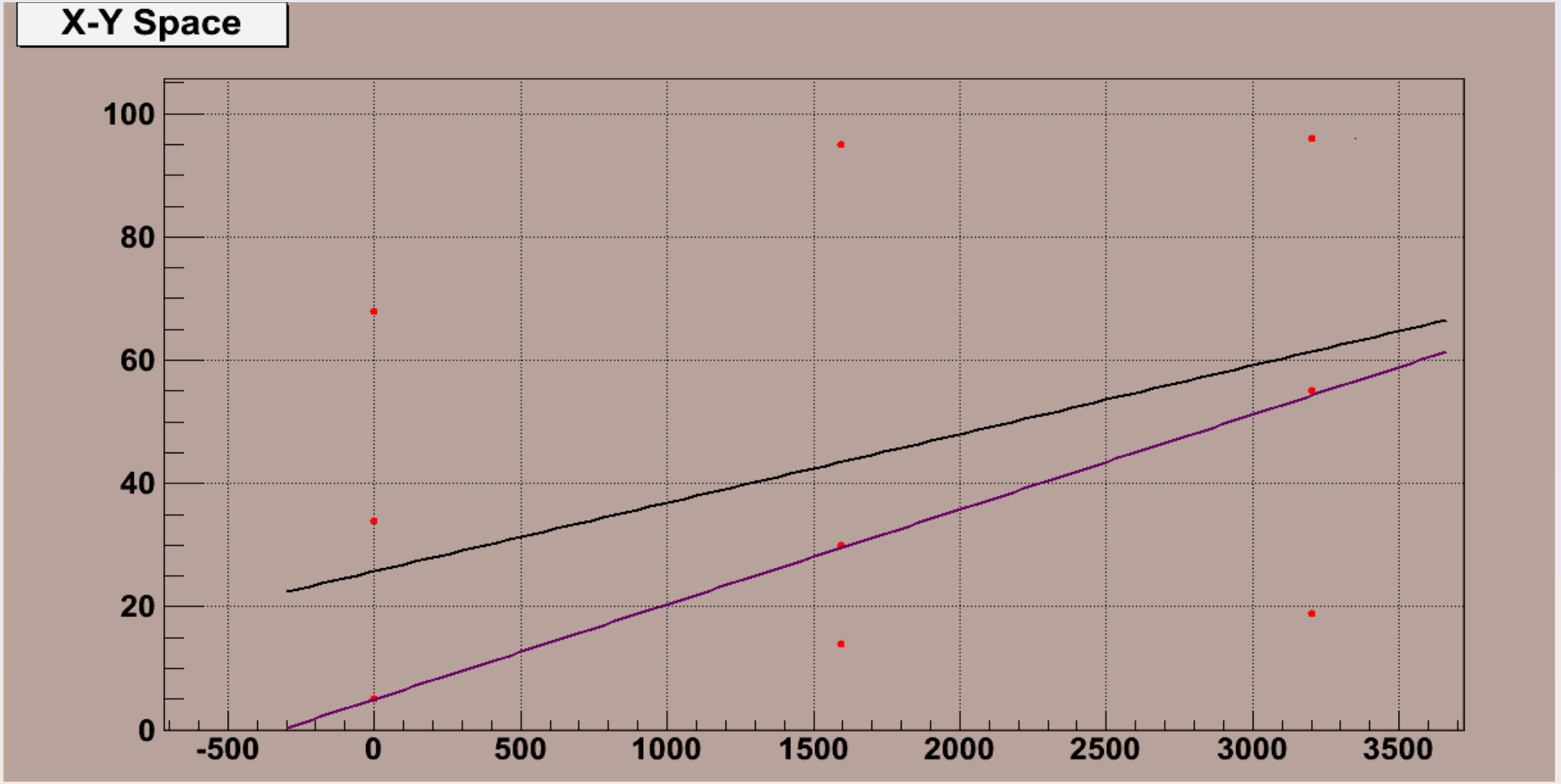
Tracking of micromegas telescope

- Disadvantage of geometric tracking it works only for a given set of 3 points (1 per detector).
- Need for an algorithm that can handle more points.

- Chi square line fitting.
- Disadvantage: the fitting line depends on all given points.
- example...

Tracking of micromegas telescope

- Chi square fitting (black), for 9 points (red) with purple the real line.



Tracking of micromegas telescope

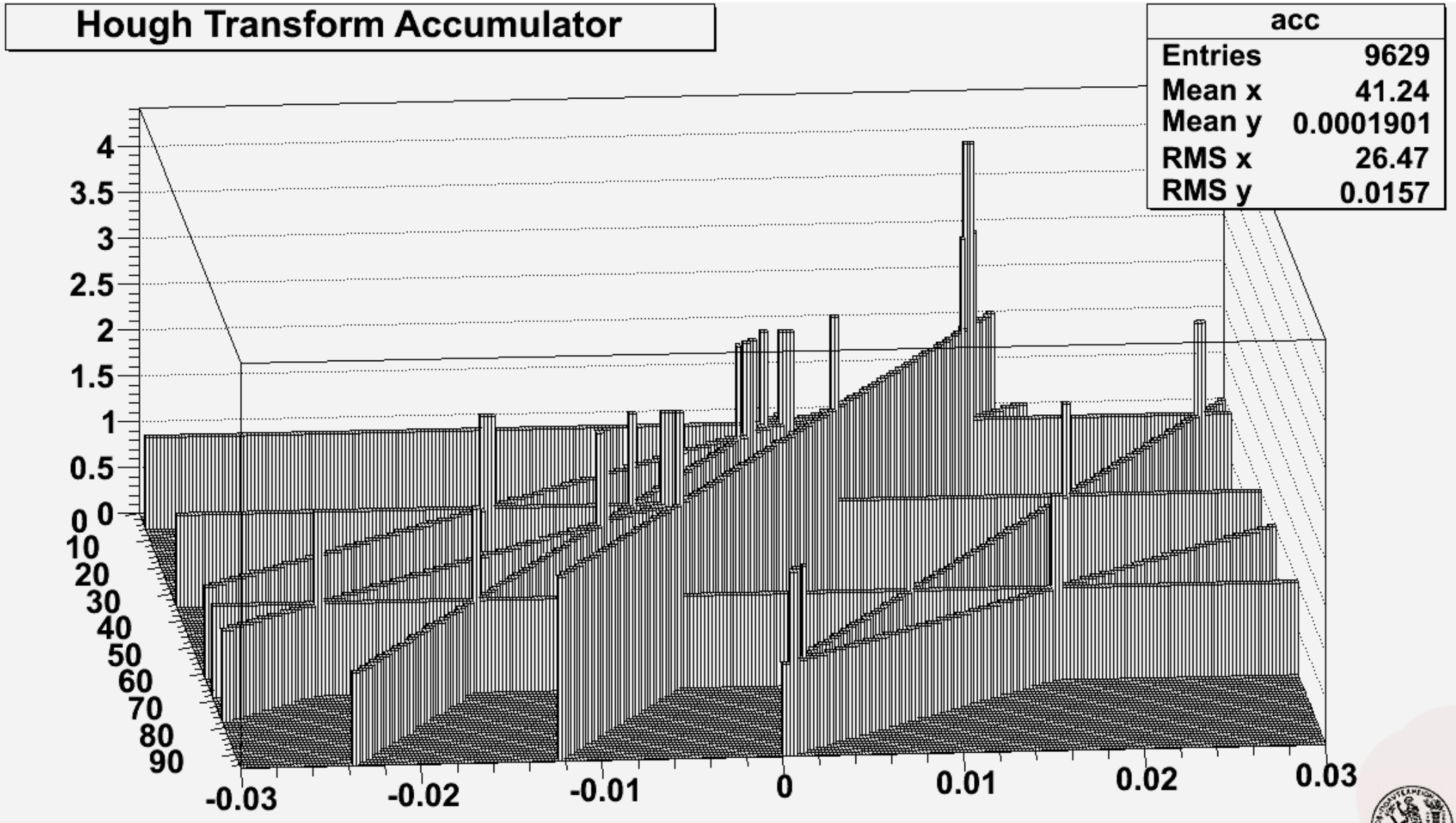
- Hough Transformation for line detection.
- Basic concept

  eq. line: y=ax+b

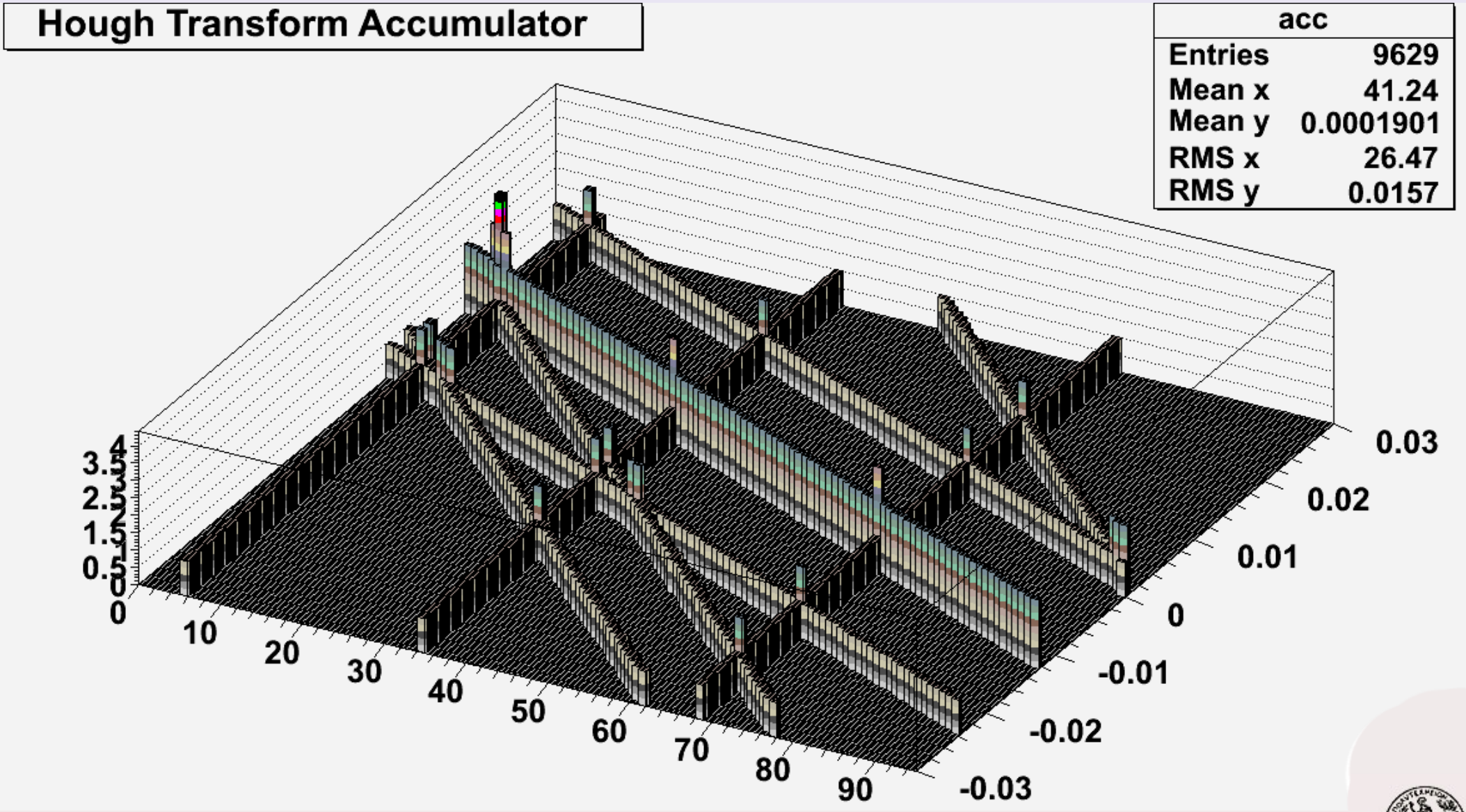
  b=y-ax scanning on our range for a.
- From X-Y space ~ Hough Space (a,b).
- It does not depend on noisy points or points irrelevant to the line.
- Filling a 2D histogram for the Hough space where 2 (or more) lines are crossed is a potential candidate for our track.
- example...

Tracking of micromegas telescope

- 2D Hough accumulator for 9 points.

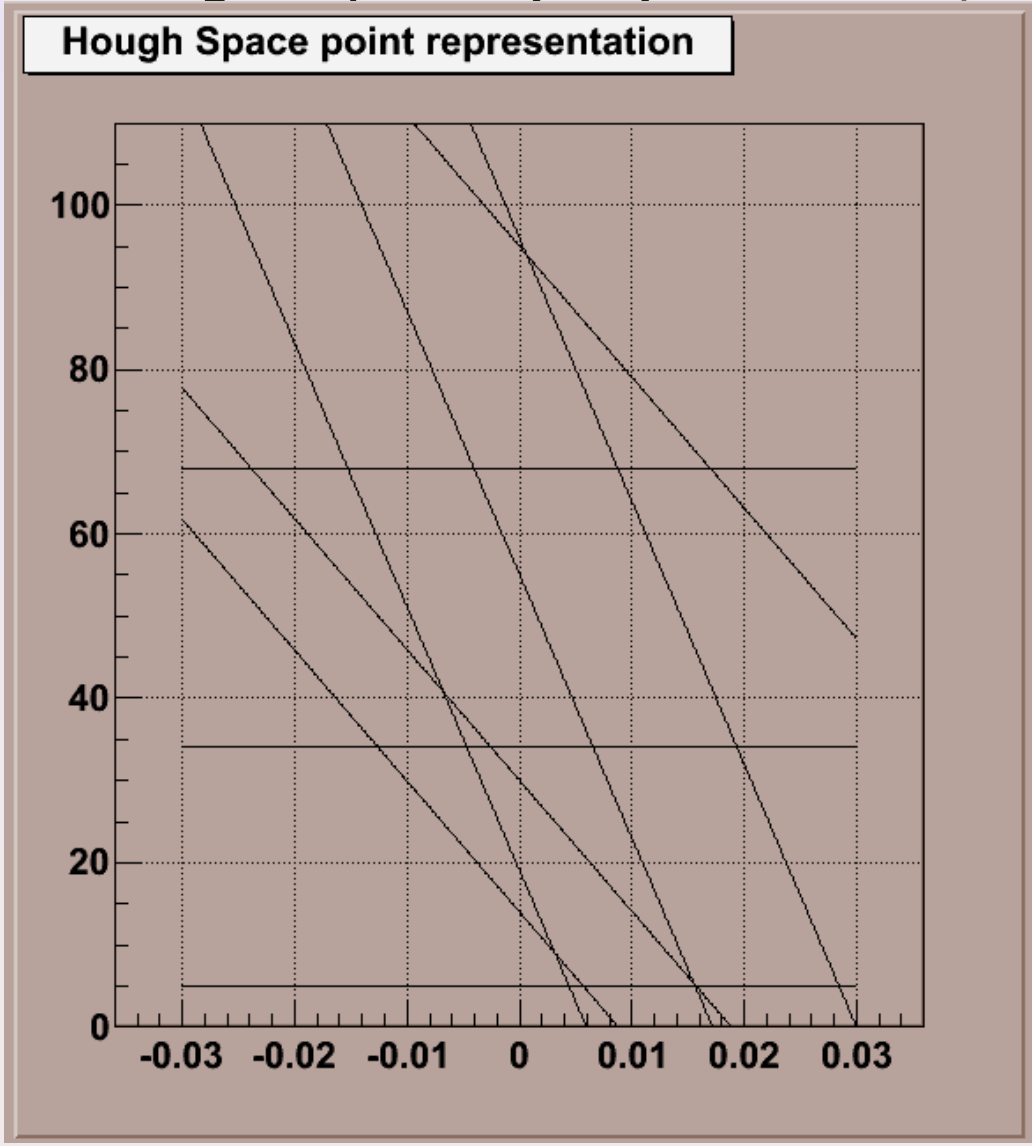


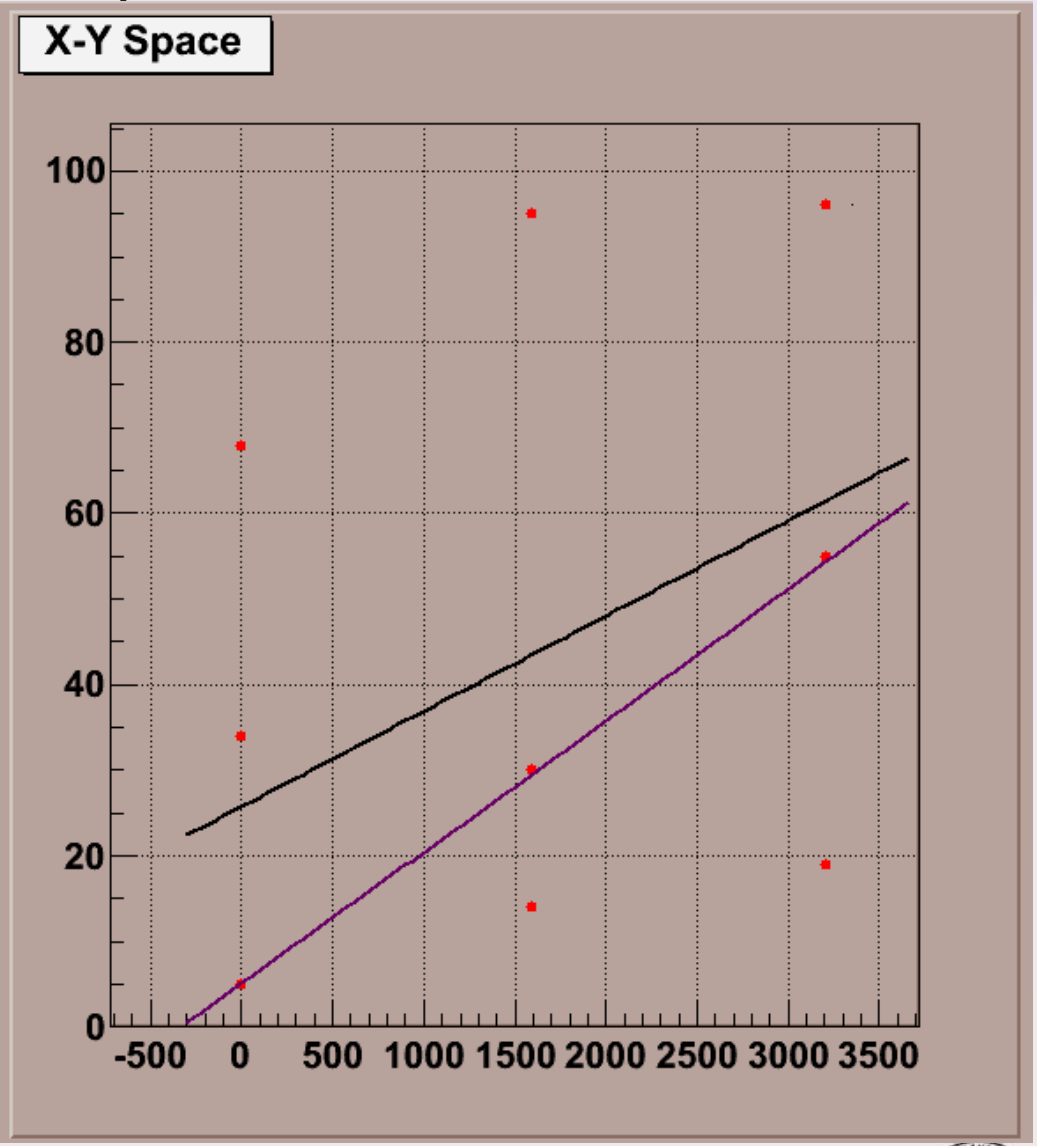
- ...from different angle and colorful.



Tracking of micromegas telescope

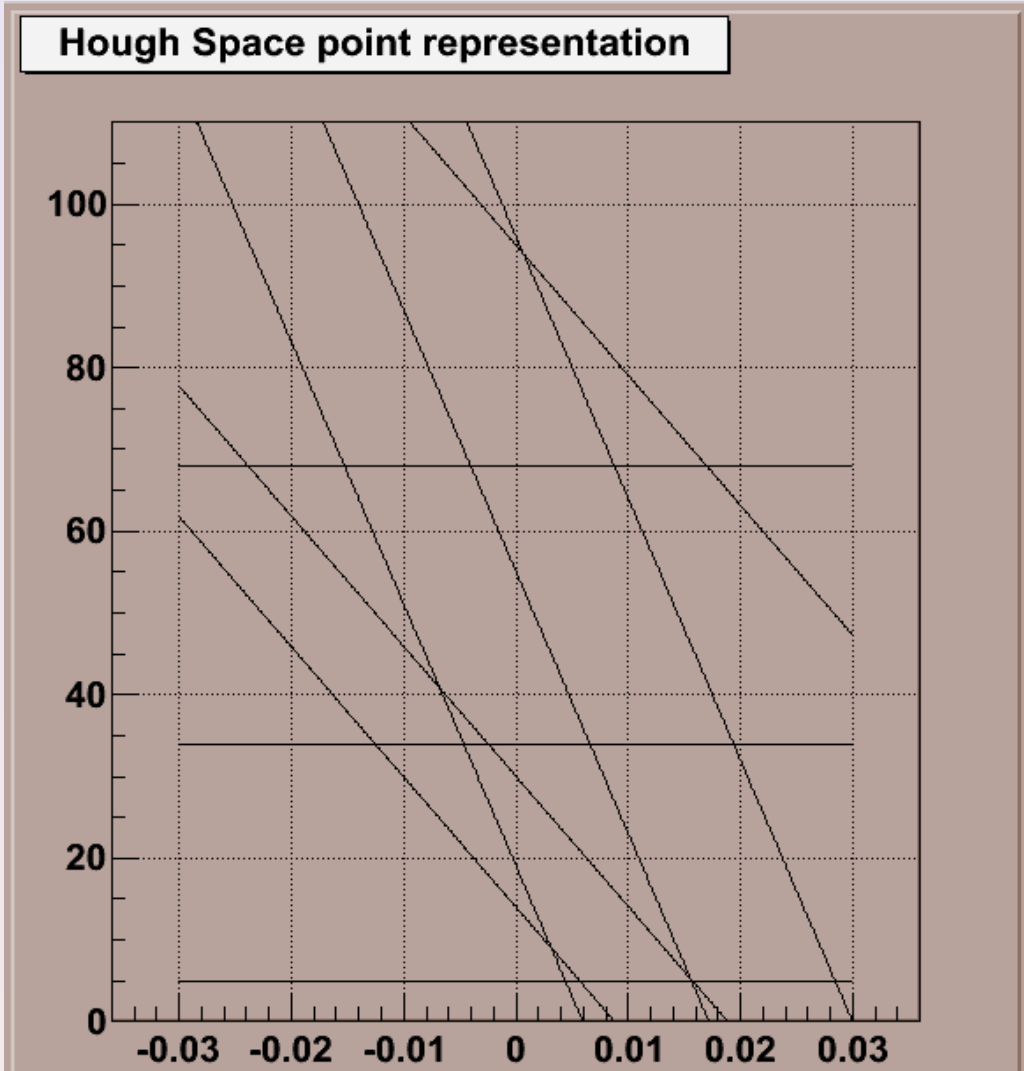
- Hough Space (2D). HT line , chi square line.

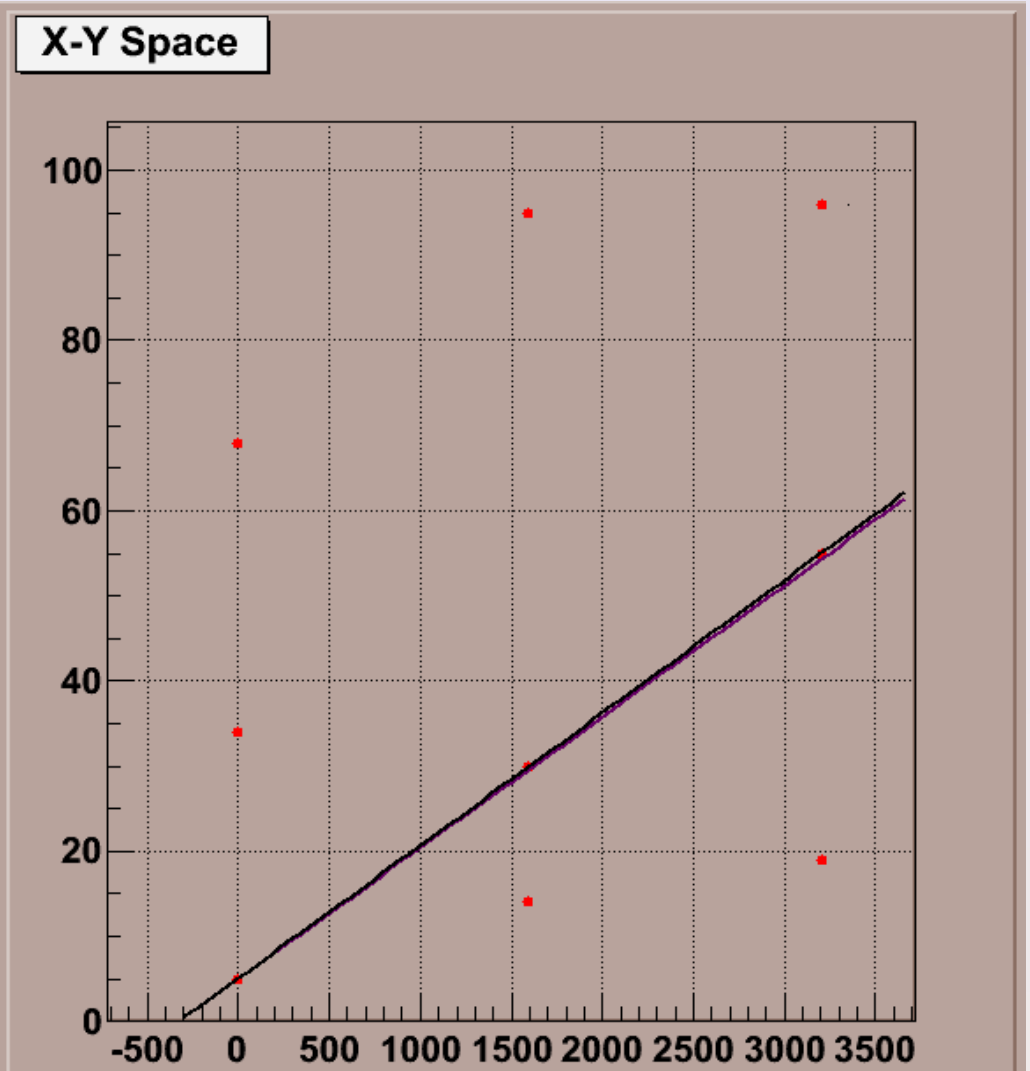




Tracking of micromegas telescope

- Hough transform and then chi square for "close" points.





Tracking of micromegas telescope

- Preliminary Status Report.
  - The algorithm is under development and our purpose is to provide to user the best tracks from the micromegas telescope to use for the detector under test.