New tool to find z_{tgt} position

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Aug 27, 2018

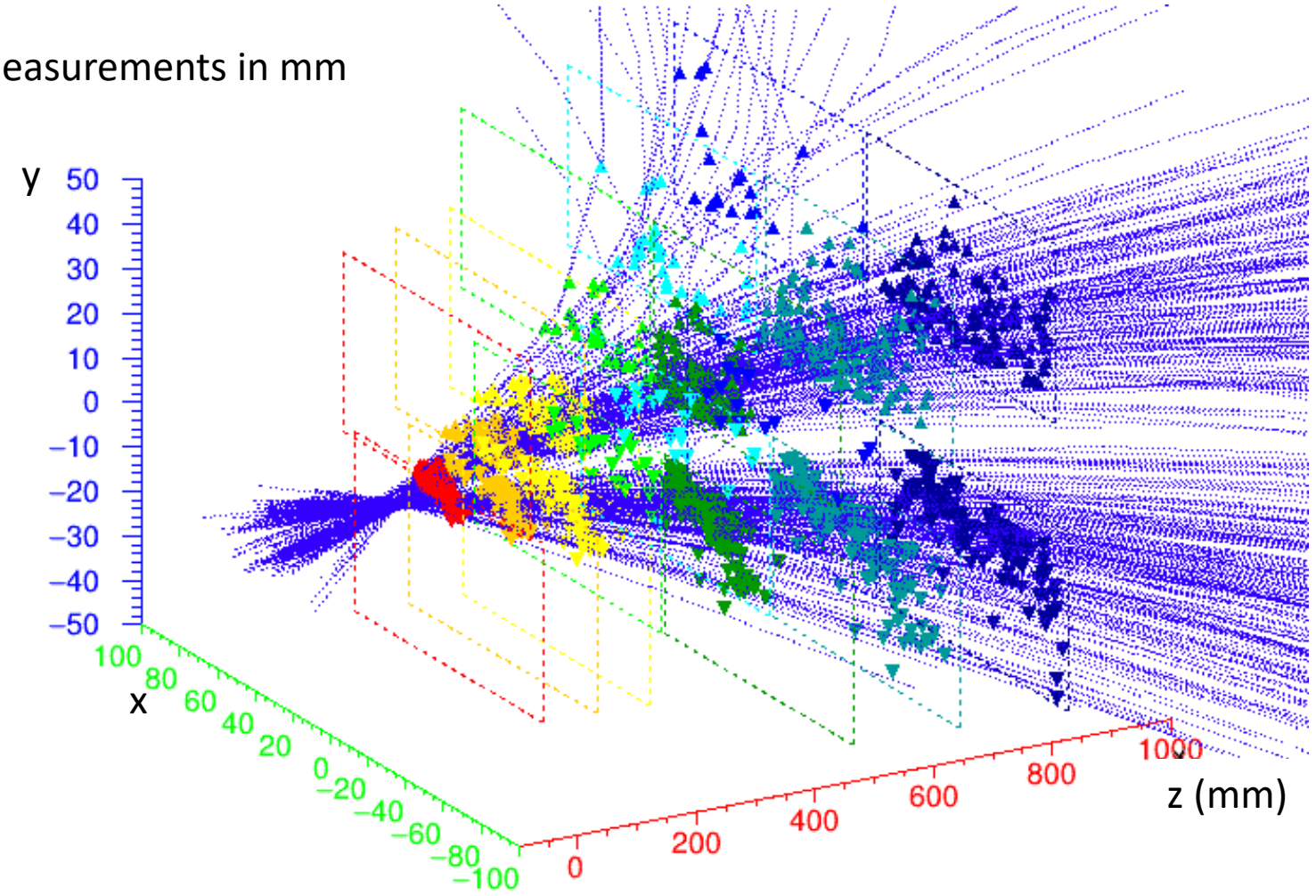
New tool to find the target position

- Based on helices visualization: helices parameters obtained from the reconstruction (of python script to run alignment)
- All helices must come from a common vertex
- Nice tool to visualize the quality of the reconstruction and tracks distribution (svt occupancy) in space
- Too coarse to view microscopic changes in alignment parameters
- Good to identify the location of the vertex given a bunch of curved tracks – and the precision of the reconstruction
- Also available for straight tracks (see plots on Slack)

- Developed with a randomly chosen tracks set – don't look at results!
  - Don't judge alignment and tracking quality from the following plots (data not available for tests)
- All plots obtained from a Moller selected sample, 2016 alignment (not the best one), very strict selection on track quality ($\chi^2 < 10$)
- 200 tracks (t&&b) fairly good number to evaluate the primary vertex position
- Reasonably fast

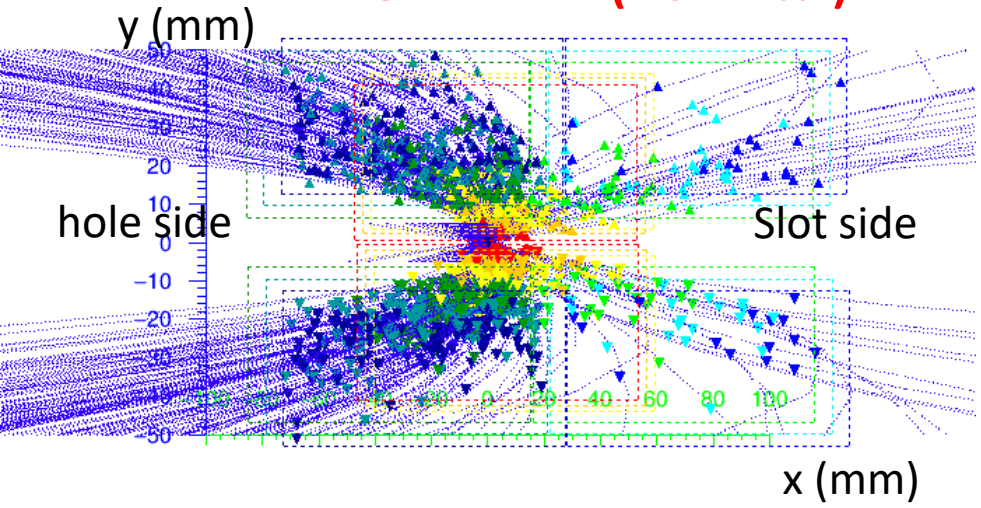
2016 Moller tracks, after GBL refit

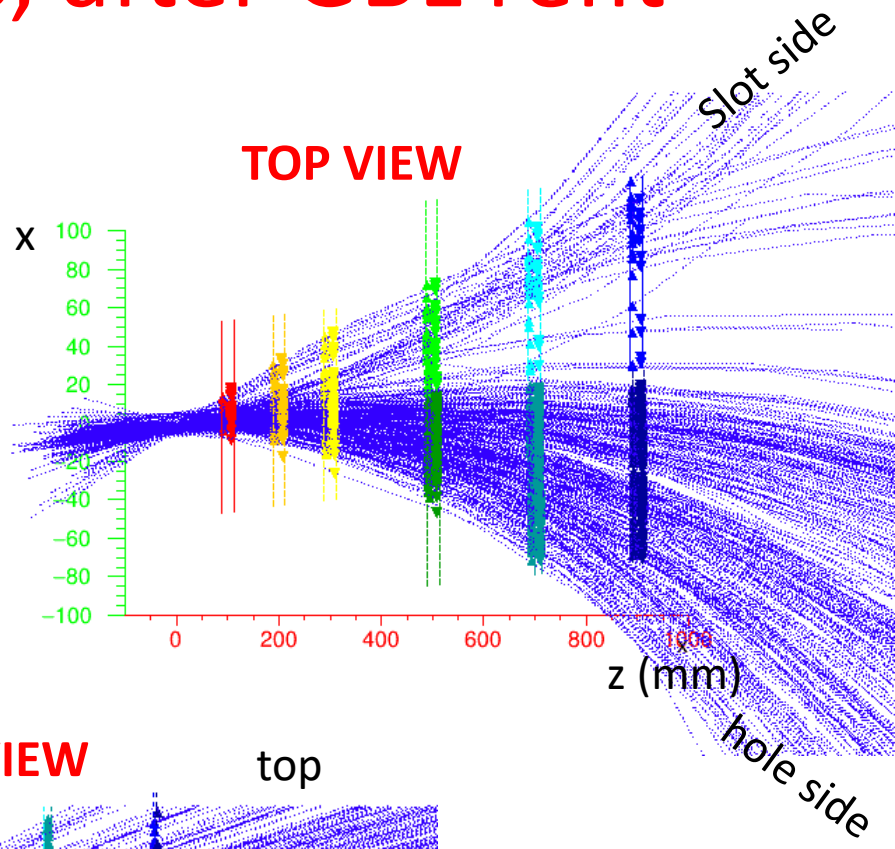
All measurements in mm

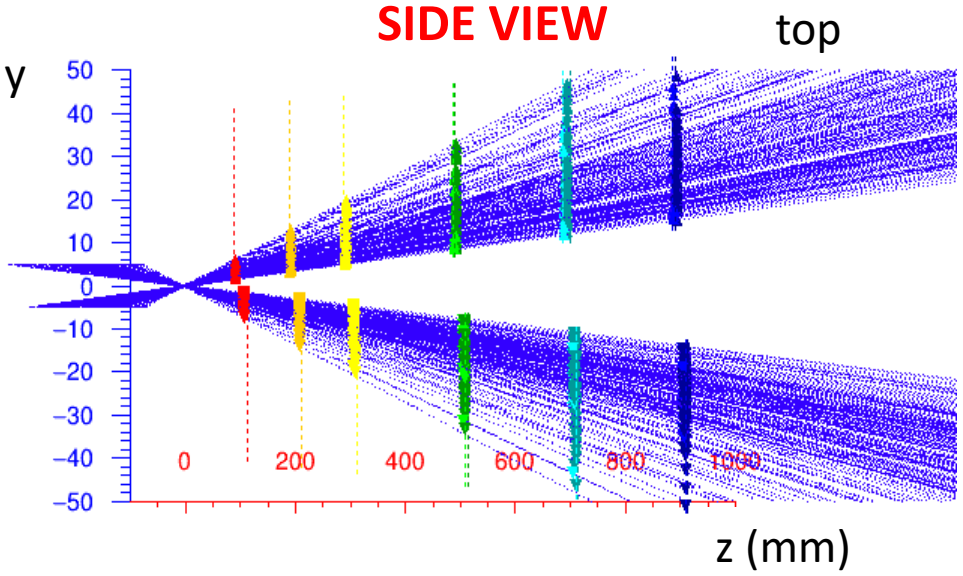


Darker markers: hits on the hole side (negative x)
Less tracks on the slot side (positive x): positrons

2016 Moller tracks, after GBL refit



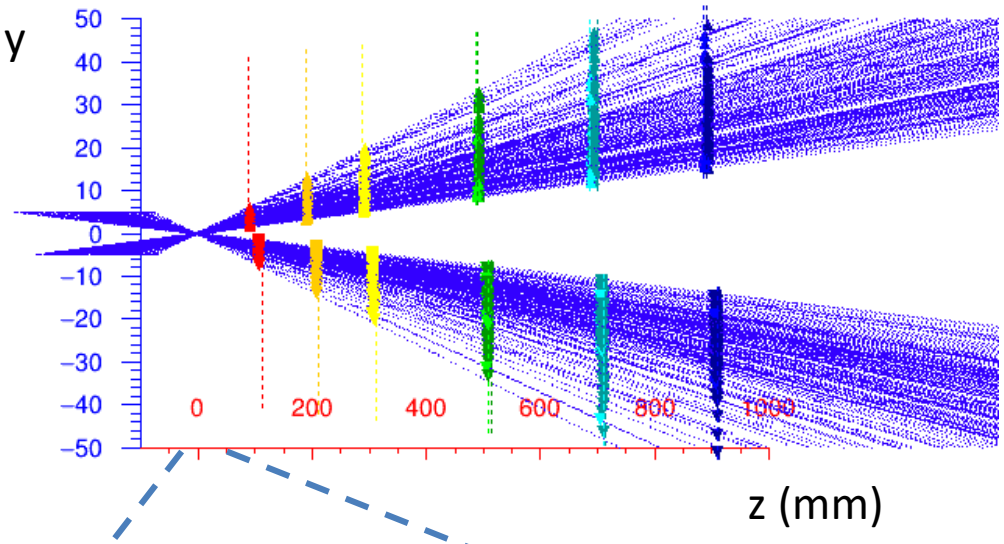




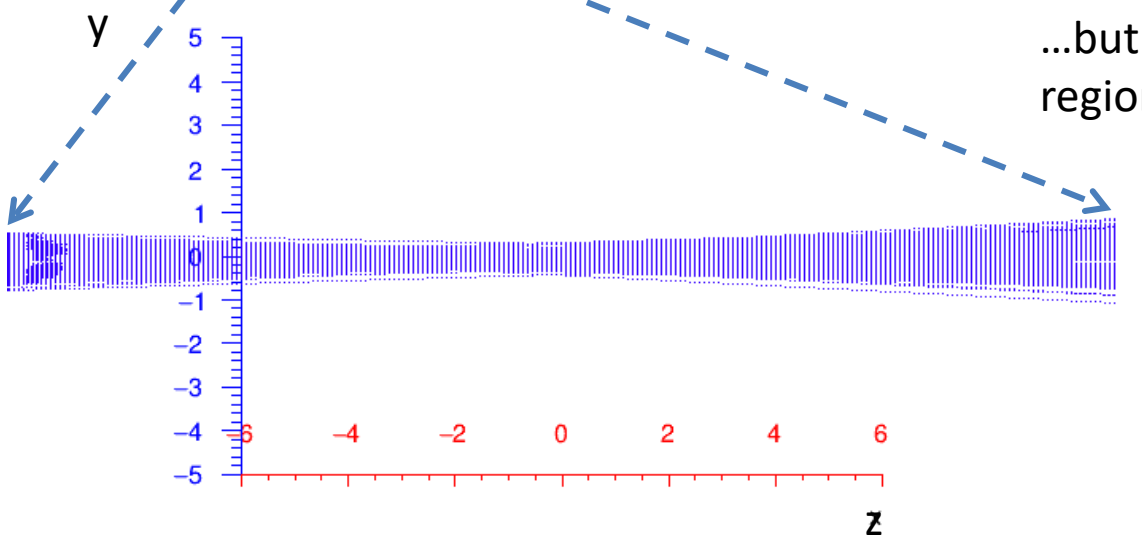
In the side view (zy) the tracks are straight lines

Looking for bunches intersection

Zooming the region around the track intersection one might get information on the crossing point coordinates



SIDE view



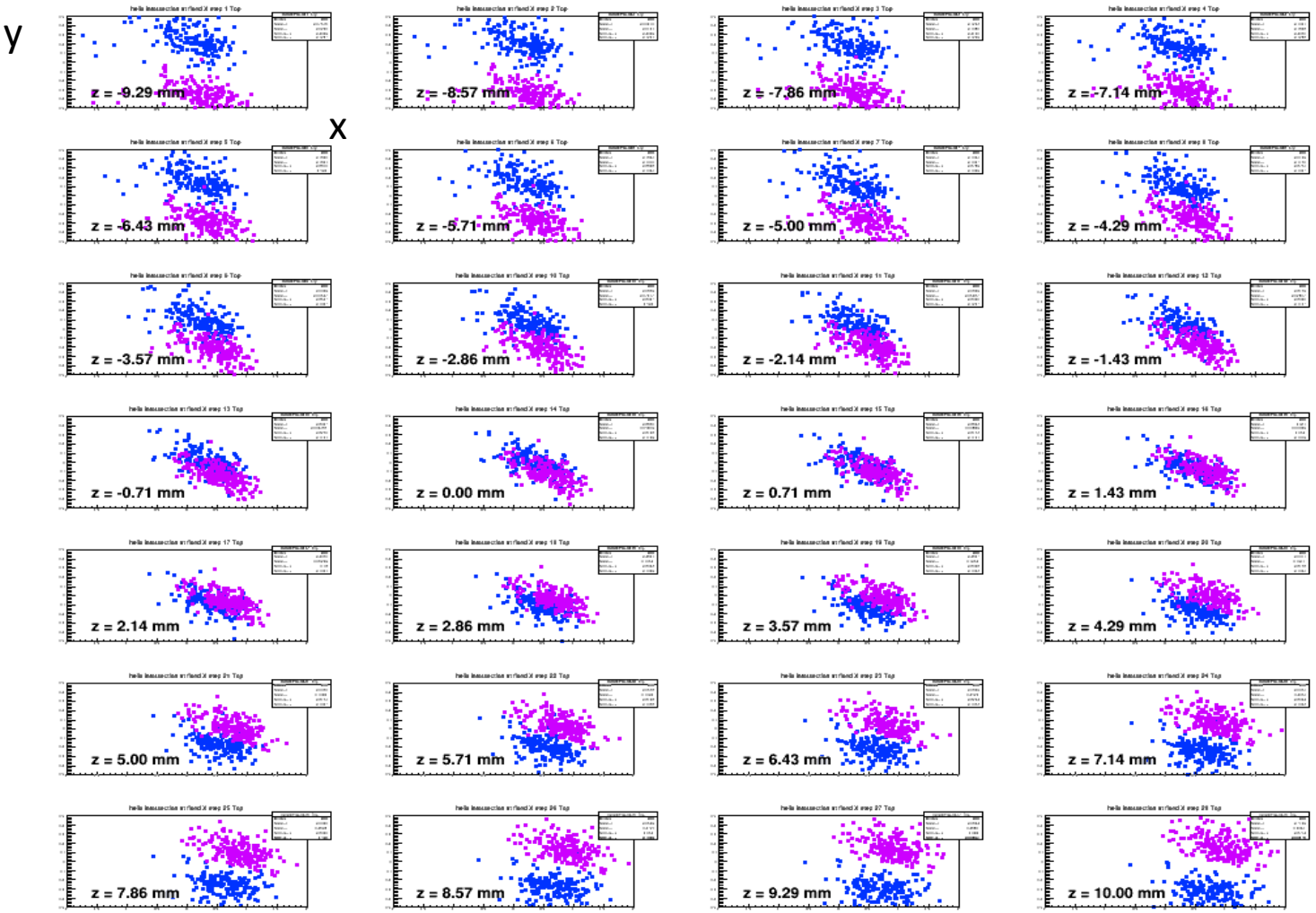
…but the crossing region is wide

Scan in z to find the location of minimum cross section (for each bunch) and maximum overlap of the two bunches

Bunches “radiography” (x,y) in z steps

Blue: top tracks Violet: bottom tracks

Looking for: maximum overlap bw the spots

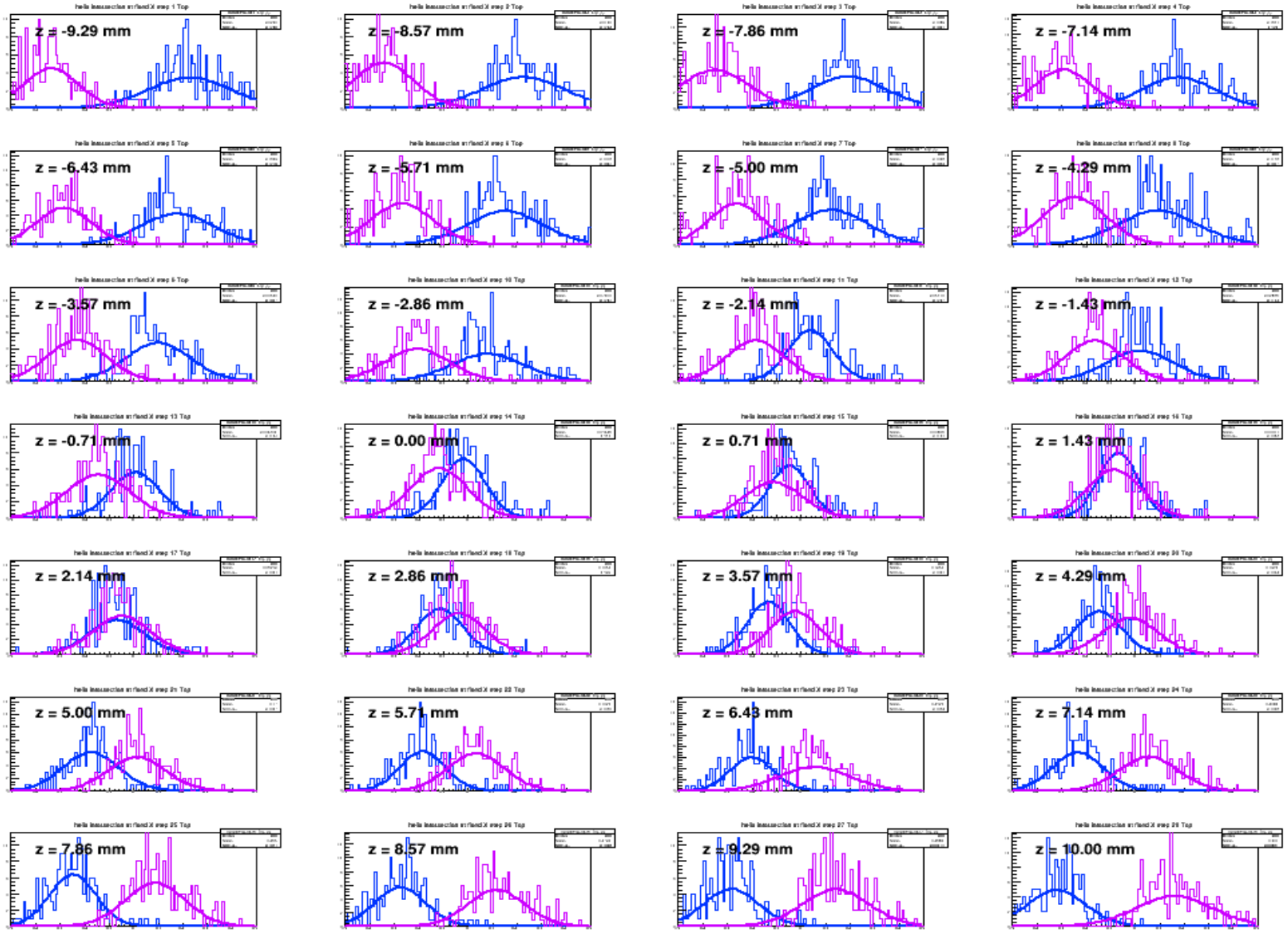


The skewness of the spots might give information about the beam angle

Y of the beamspot center in z steps

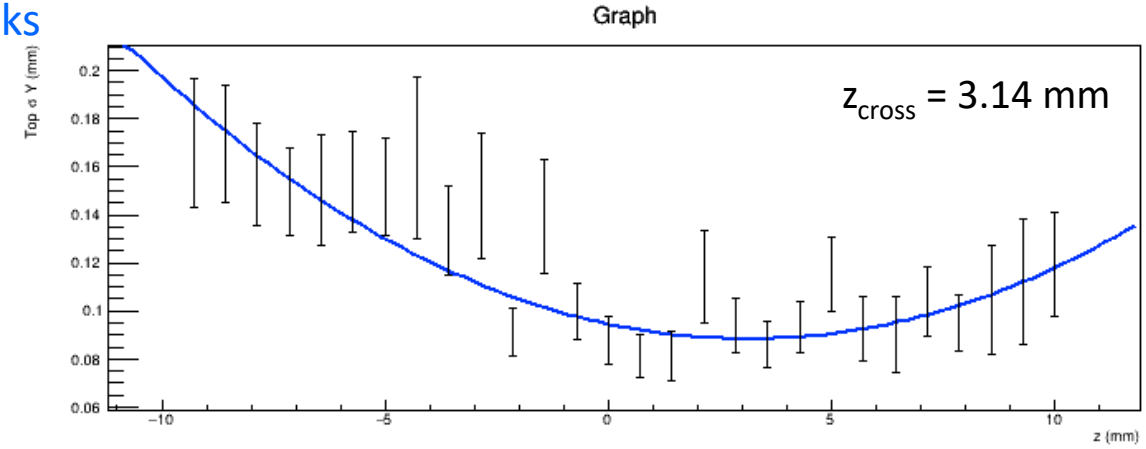
Blue: top tracks Violet: bottom tracks

Looking for: maximum overlap
minimum width



Bunch “width” (beamspot σ, y coordinate) in z steps

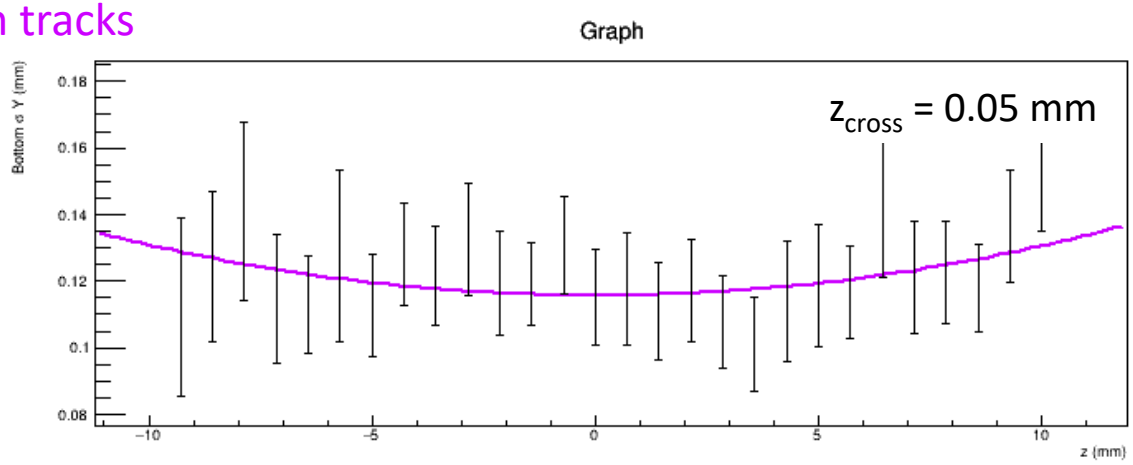
Blue: top tracks



Points: σ f the y gaussian distribution

Errors: error on σ provided by the fit

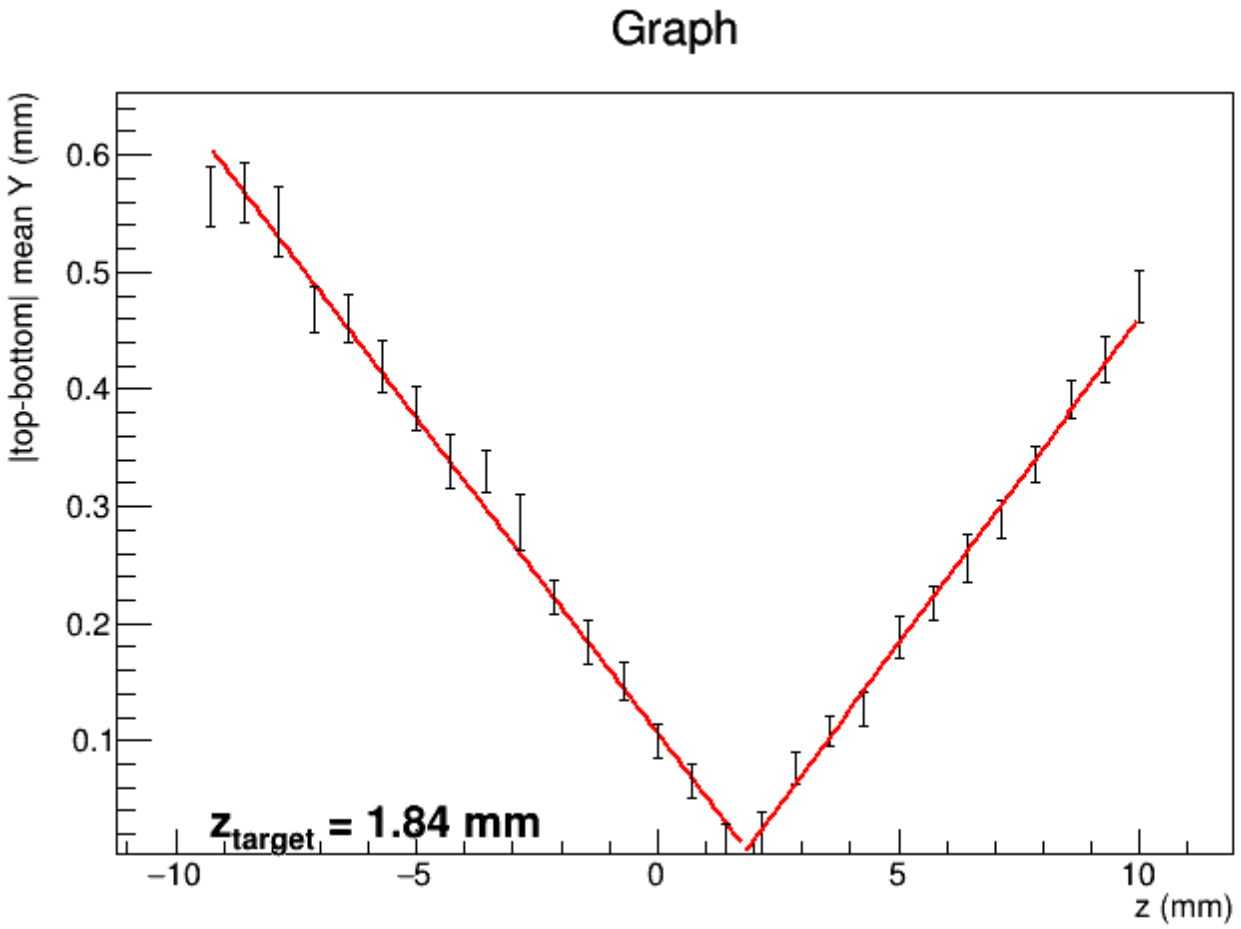
Violet: bottom tracks



The minimum should provide the vertex position of the two bunches, separately

This information can be inserted in the geometry to tune the alignment (after beam rotation?)

Bunch position (difference of beamspot y center coordinates, |top-bottom|) in z steps



Evaluation of vertex z from the crossing of the two linear fits

To-do list

- Run the tool on “best detectors”
  - Needed: the .gbl ascii file used for alignment
  - Use more statistics (1000 tracks?)
- Evaluate the beam rotation angle from spot shapes (it should be a constant for every z value)
- Insert vertex position for top/bottom separately in compact.xml file (not sure about beam angle information)
- Test reconstruction quality inserting these corrections in the geometry description
- Iterate (not too much)
- Same for straight tracks