Spatial and momentum resolution as a function of track angle

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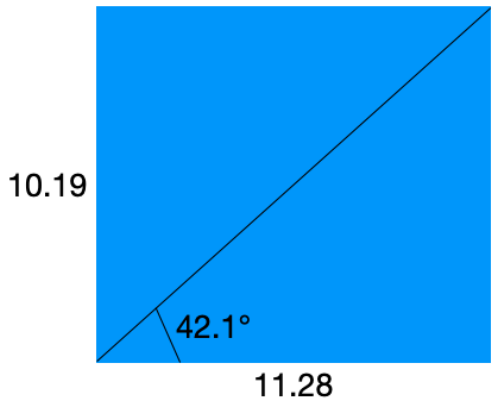
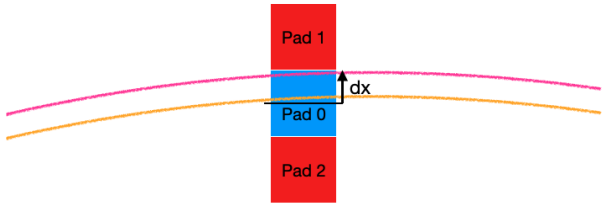
Introduction

- For the reconstruction, we consider 4 different track orientations:
  - Horizontal tracks (vertical clustering) for $\theta \in [-22.5, 22.5]^o \rightarrow [-28, 28]^o$
  - Diagonal up tracks (diagDown clustering) for $\theta \in [22.5, 67.5]^o \rightarrow [28, 60]^o$
  - Vertical tracks (horizontal clustering) for $\theta \in [67.5, 112.5]^o \rightarrow [60, 120]^o$
  - Diagonal down tracks (diaUp clustering) for $\theta \in [-67.5, -22.5]^o \rightarrow [-60, -28]^o$
- Old values have been updated since pads are not perfect squares:

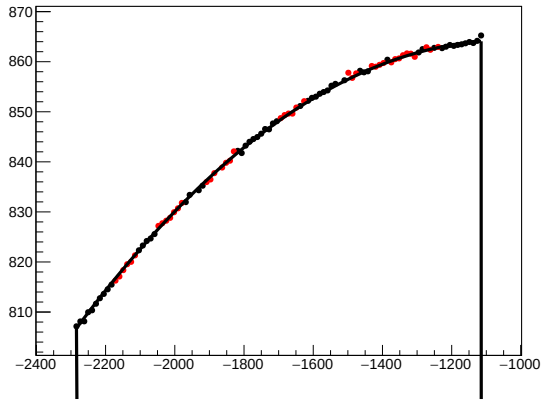


Simulation and reconstruction

- Sets of 1000 μ^- were simulated with $T = 700$MeV at a 78cm drift distance and with various angles
  - In each cluster, position of the track is reconstructed thanks to the $\ln \frac{Q_0}{Q_1}$ or $\ln \frac{Q_1}{Q_2}$ information[1]:



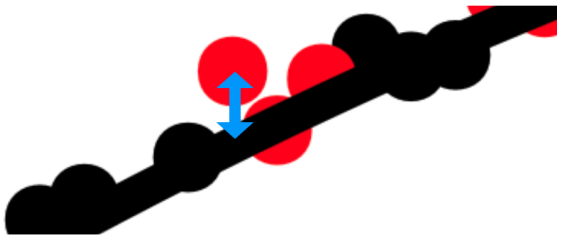
  - All the points obtained are then fitted with a parabola or a circle:

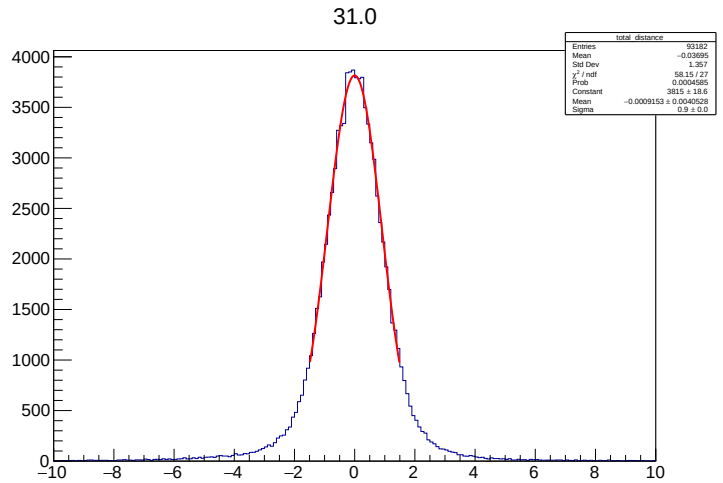


[1] where Q_i is the maximum of the waveform in the i-th pad

Spatial resolution obtained

- To compute the spatial resolution, one can take for each cluster the different between the reconstructed position and the position given by the fit:

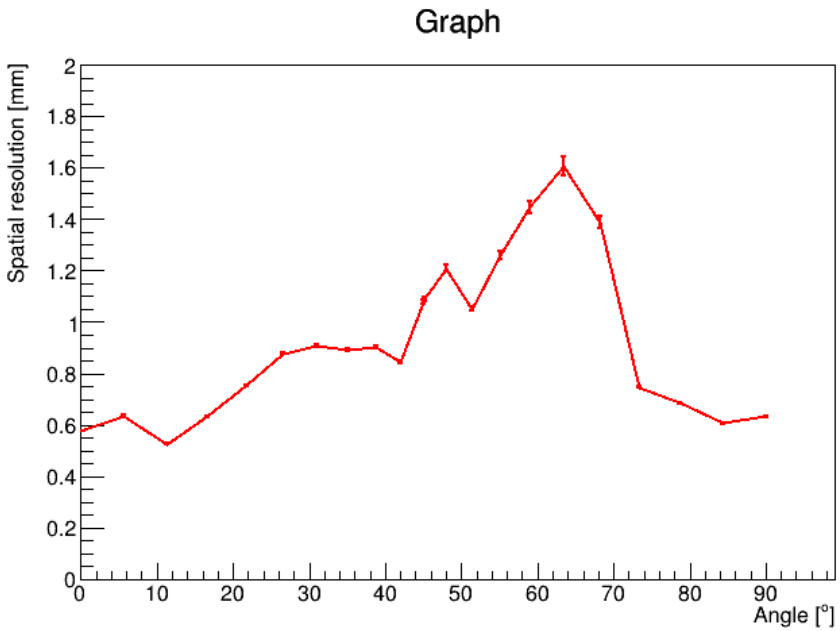


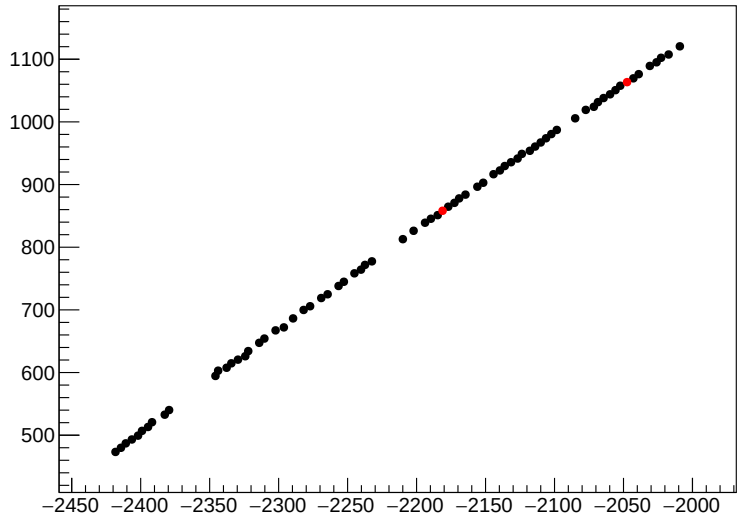


- Spatial resolution for a given track angle is the standard deviation of the 1D distribution obtained when combining all the clusters of the set of 1000 tracks

Spatial resolution obtained

- Weird behaviour was observed for tracks with $\theta > 42^o$:





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212 -1987.01 1059.82 -1987.01 1059.12
212 -1972.59 1077.35 -1972.59 1077.83
212 -1978.43 1072.44 -1978.43 1070.26
212 -1963.52 1089.54 -1963.52 1089.57
212 -2338.7 569.455 -2348.48 -16906.2
212 -2351.11 559.265 -2355.68 -16896.1
212 -2301.84 620.405 -2312.27 -16957.2
212 -2303.2 630.595 -2304.99 -16967.4
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- (Part of the) issue fixed when changing the track curvature condition to choose between circular and parabolic fit

Spatial resolution obtained

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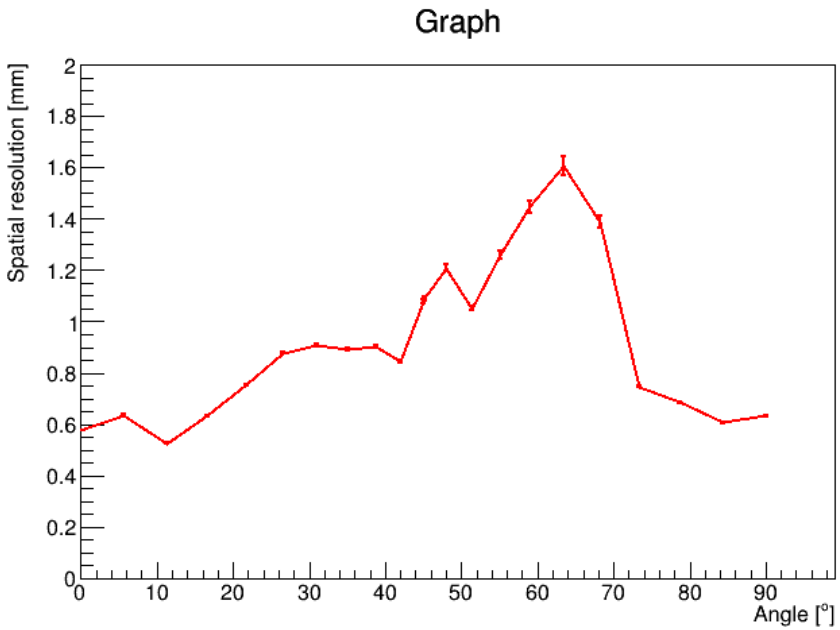

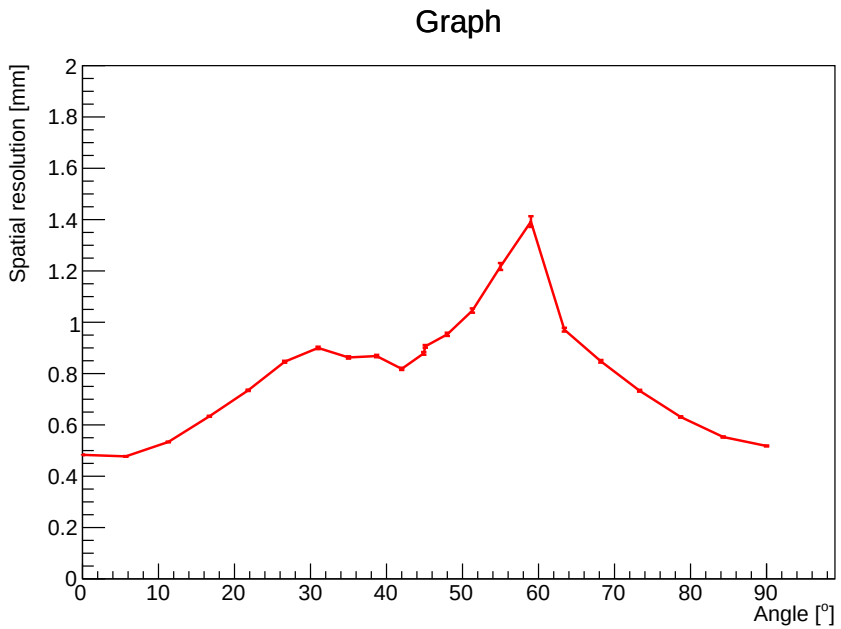

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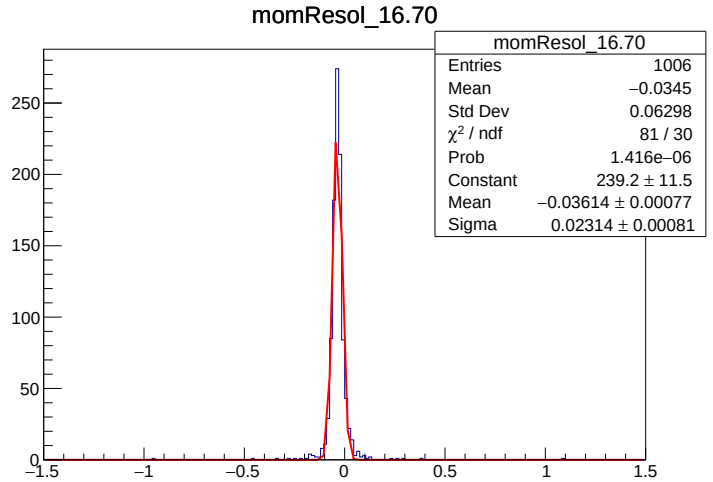
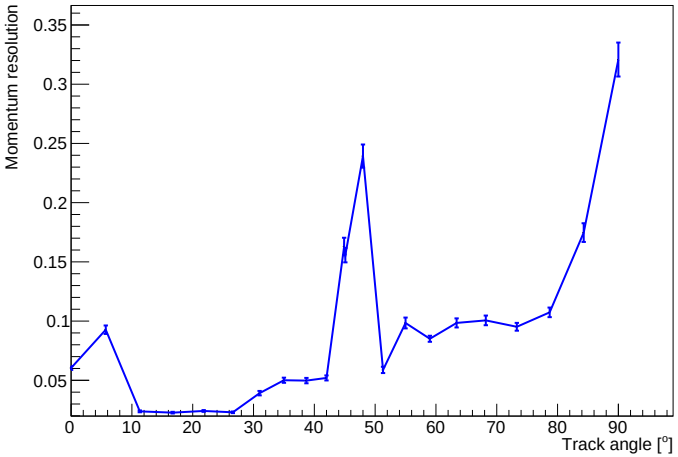
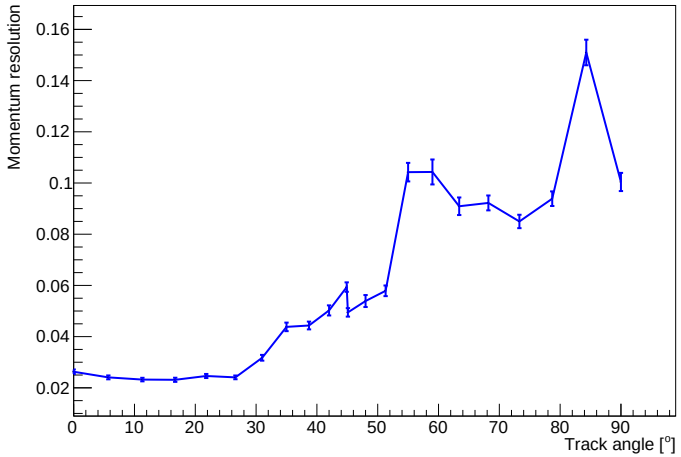
Momentum resolution

- $\frac{p_{reco} - p_{true}}{p_{true}}$

  σ of gaussian fit of the 1D distribution

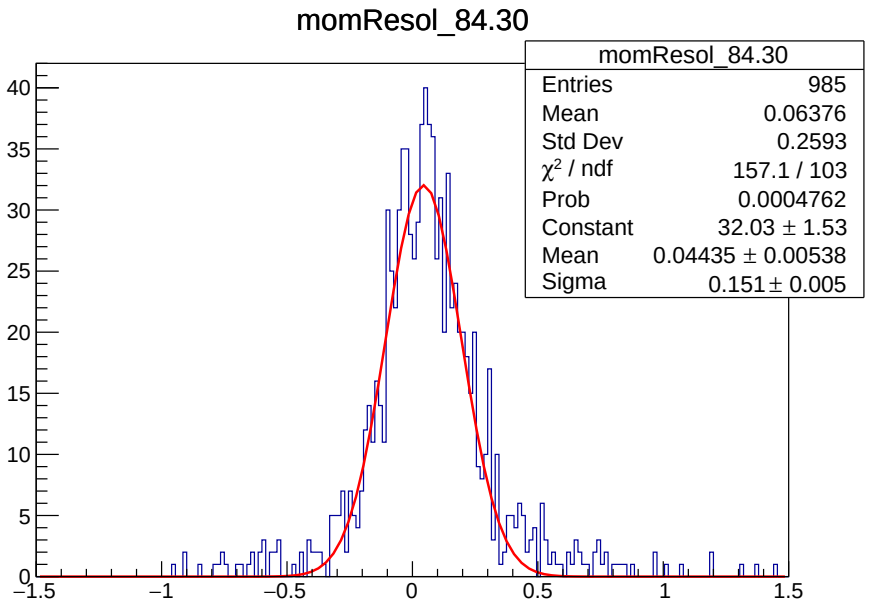






Summary and perspectives

- Spatial and momentum resolutions studied at various angles
- Good precision for tracks with $\theta \in [0, 42]^o$
- A bit less good for tracks with $\theta > 42^o$
- Weird behaviour for some angles



– Thank you ! –