# Status of FTK Simulation

F. Crescioli, M. Dell'Orso, P Giannetti, G. Punzi, **G. Volpi**

# Recent news

- Introduction of Majority-Logic.
- Fixed some problem with angle definition around $\pi$.

The latest release of FTKSim was realeased last month.
Can be dowanloaded at
`http://www.pi.infn.it/~orso/ftksim_distr`.
Documentation at `http://fcrescio.home.cern.ch`.
Performance summary at
**http://fcdfhome.fnal.gov/.../ftk/results071.html**.

# Majority-logic (1)

- Using majority logic we can accept also 5/6 tracks instead only 6/6.
- The linear-fit method requires a fix number of variables.
- Two methods
  1. calculate a set of constants for any 5/6 combination (like in CDF),
  2. evaluate the missing coordinates to use a single set of constant for 6/6.

  The first method have an important problem: increase of a factor 7 the constants number; in our case $150K\ sectors \cdot 7 > 1M\ sectors$.

We used the last method.

# Majority-logic (2)

How work:

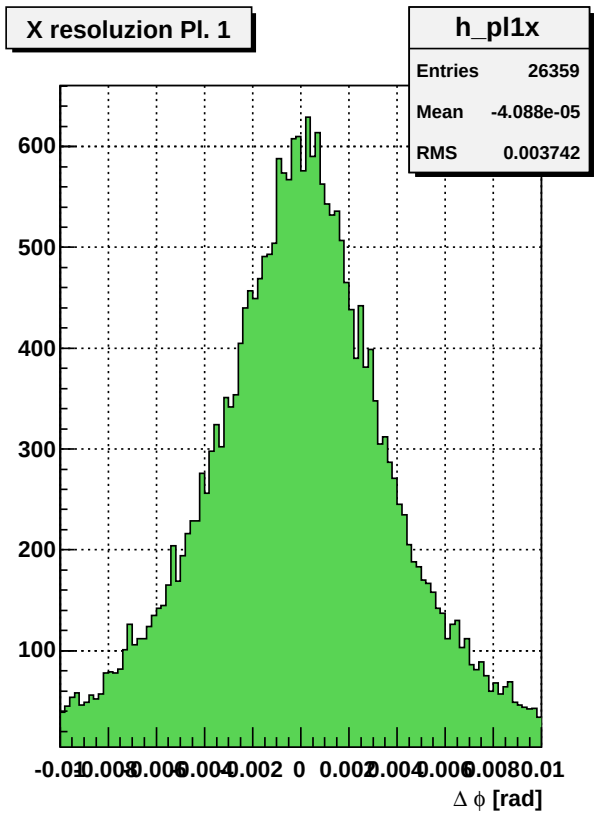
- To fit the tracks we need of $6 \cdot 2$ measures per track.
- During constants calculation we generate also the covariance matrix kernel, used to evaluate $\chi^2$ of the tracks

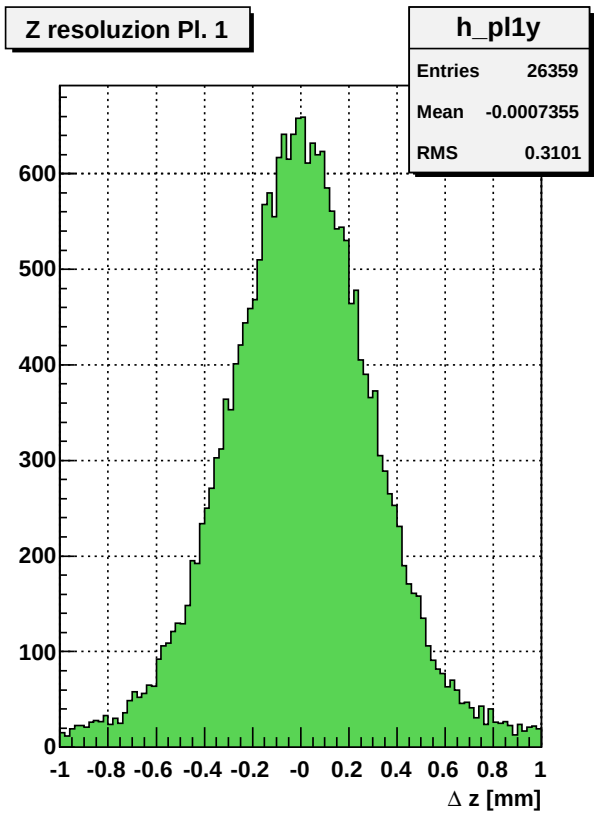
$$\chi^2 = \vec{x} \cdot \hat{K} \cdot \vec{x}$$

  $\vec{x}$ is the coods vector
- When a track match on 5 planes we can calculate the coordinates over the missing plane minimizing the $\chi^2$ of track.

# Majority-logic: performance (1)

Using a 6/6 sample we can evaluate the performance of majority logic vs complete fit.
The plot sequence show the performance of alghoritm recostracting the local x, y in any module.



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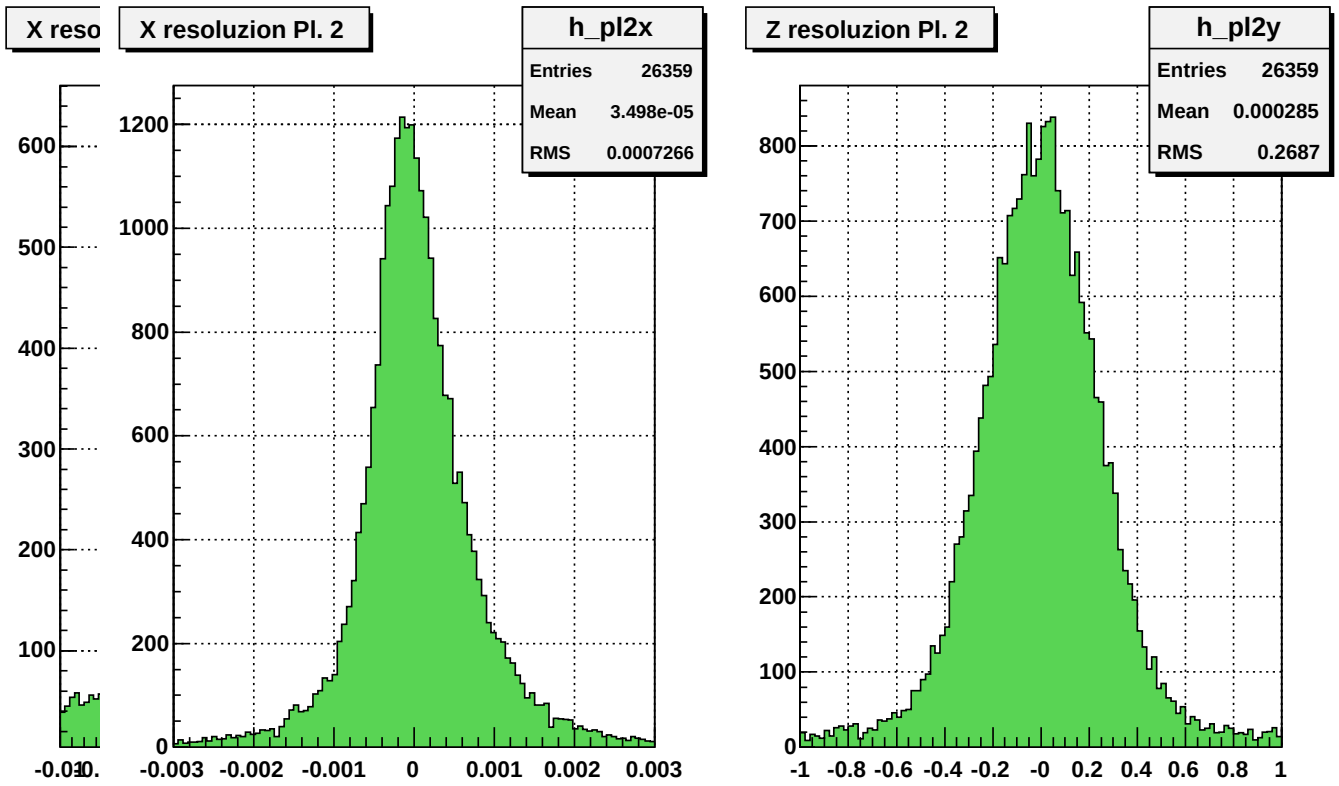

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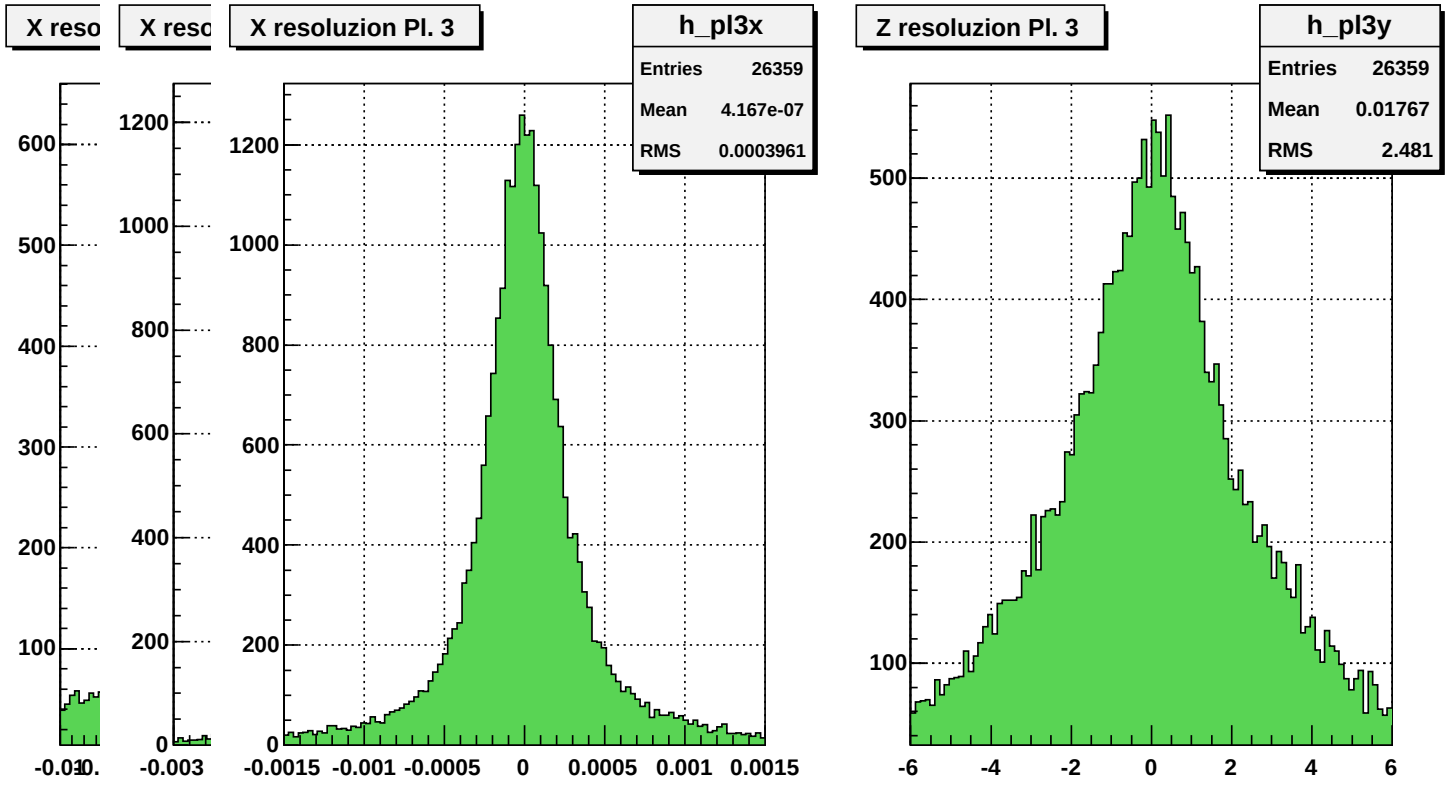

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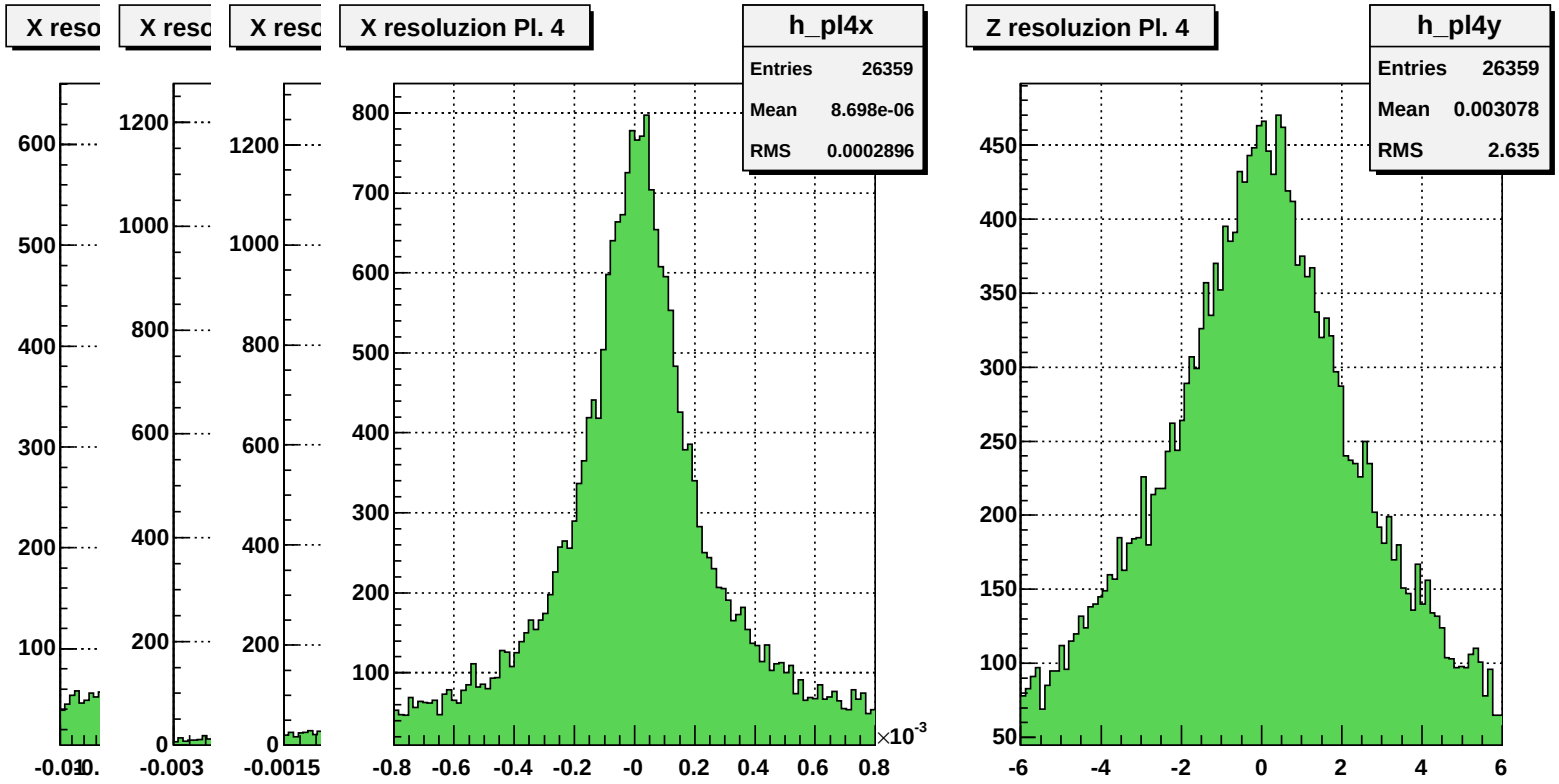

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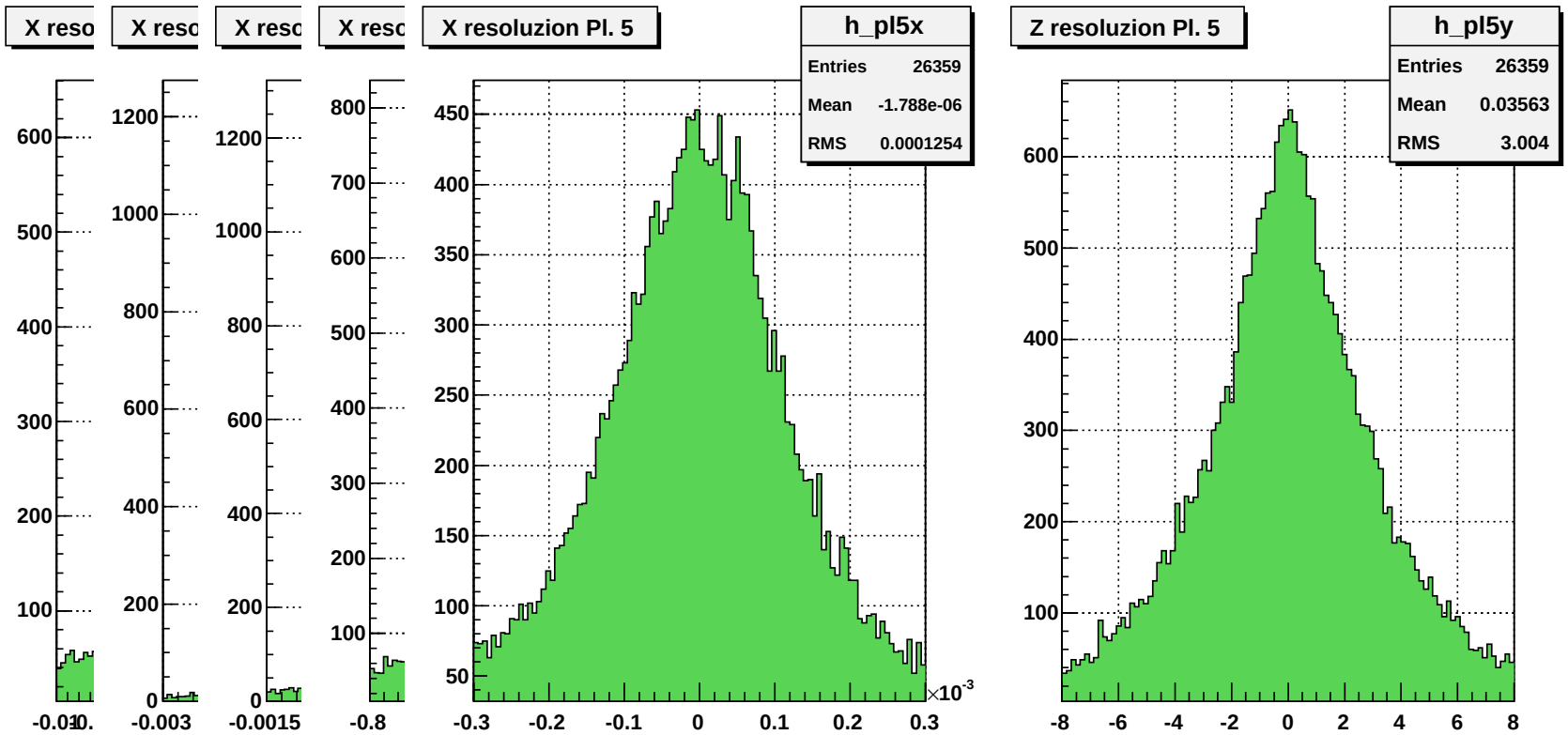

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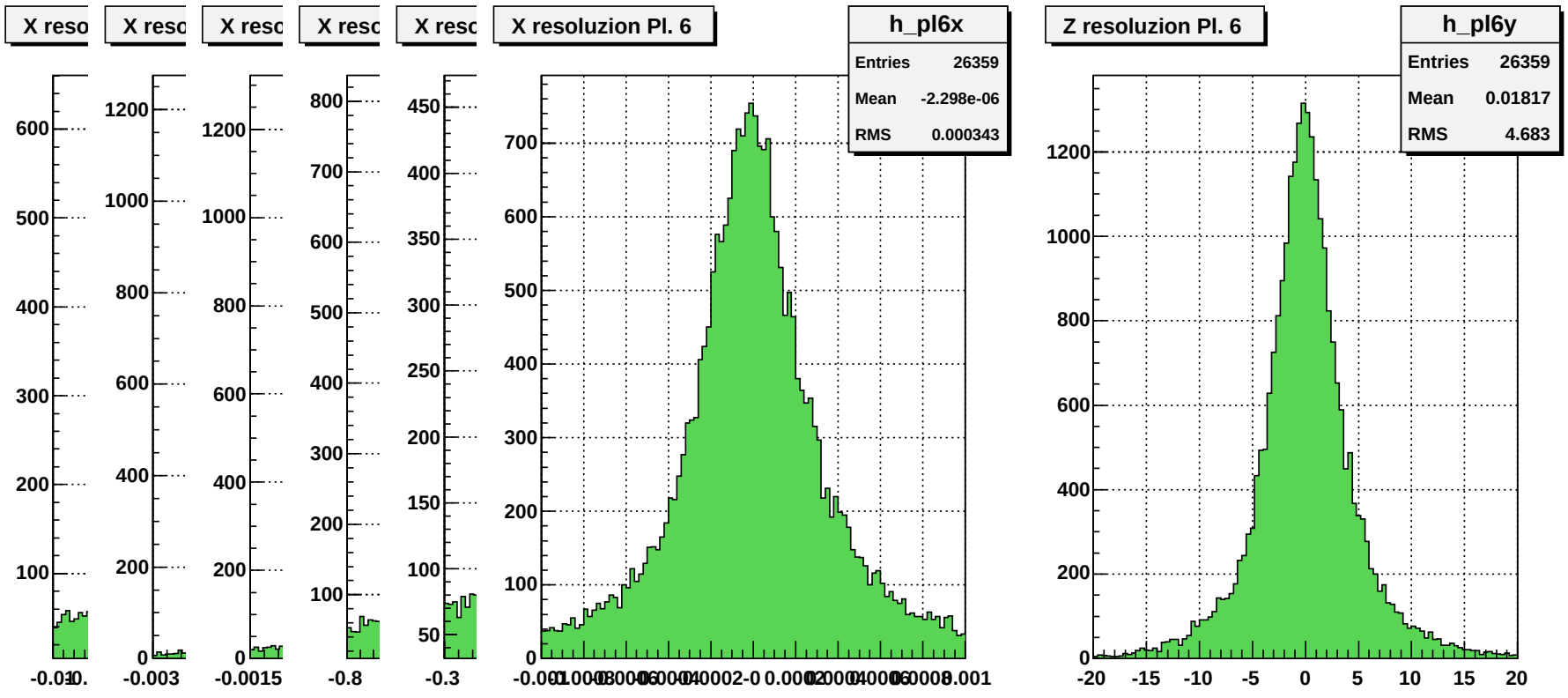
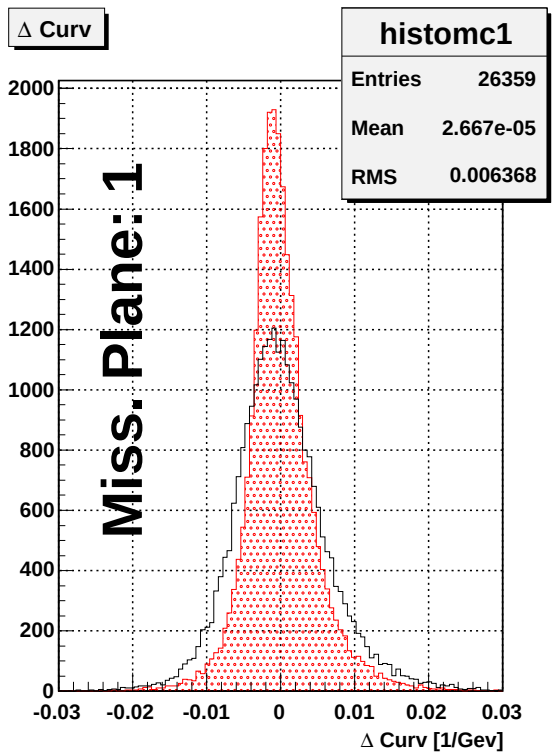
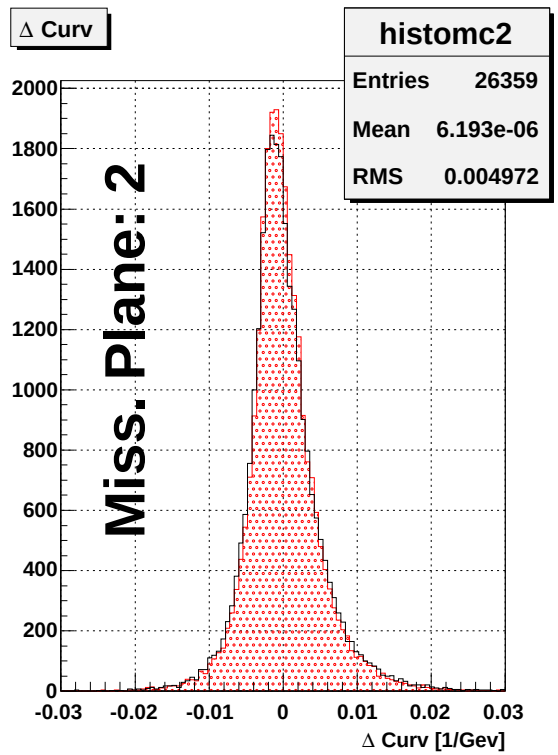


# Majority-logic: performance (2)

We can also evaluate the resolution on track parameters when some coordinate is missing:

## Curvature

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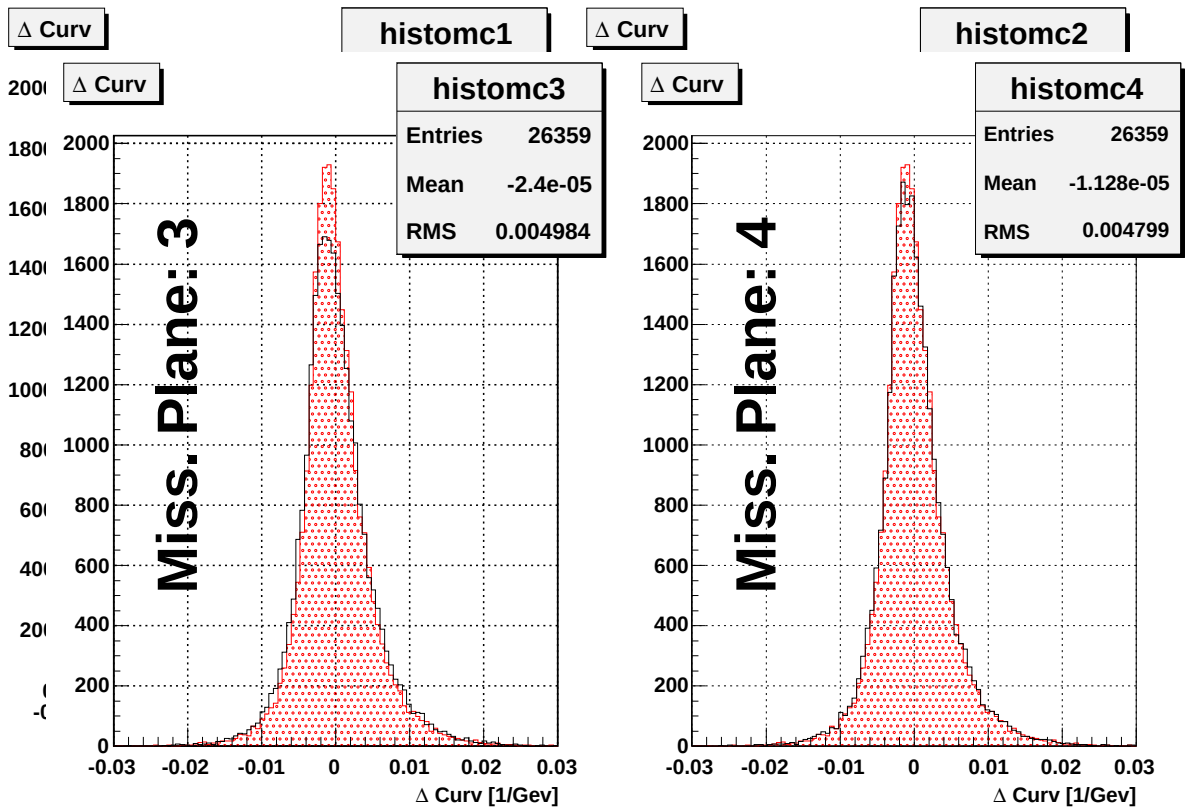


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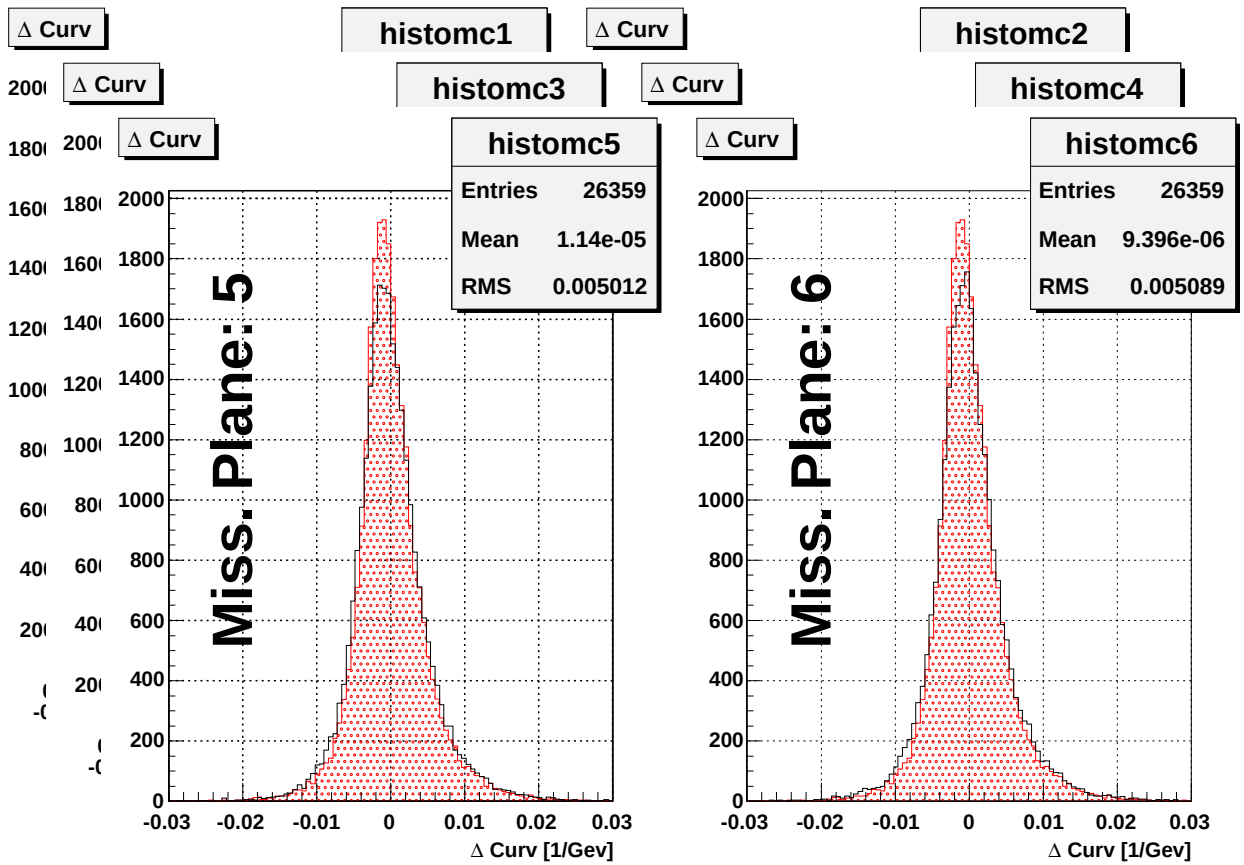


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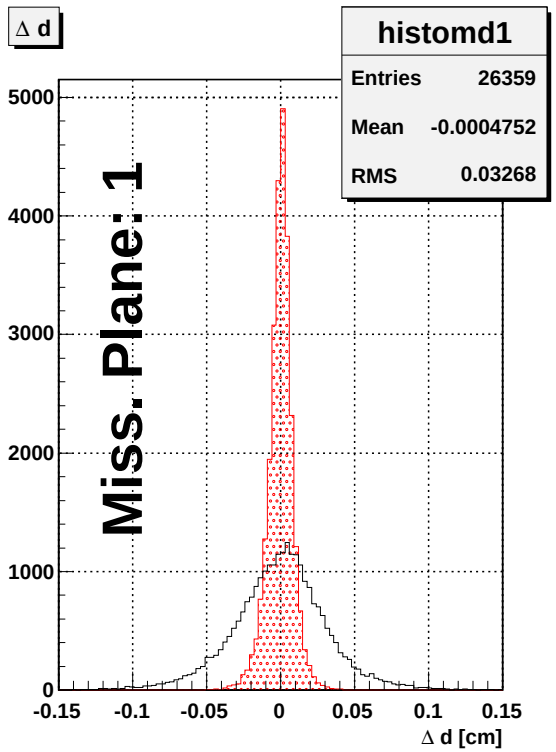


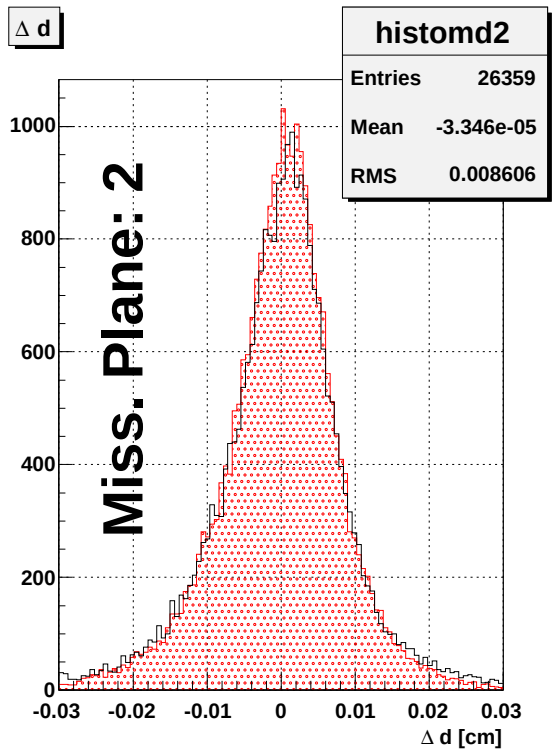


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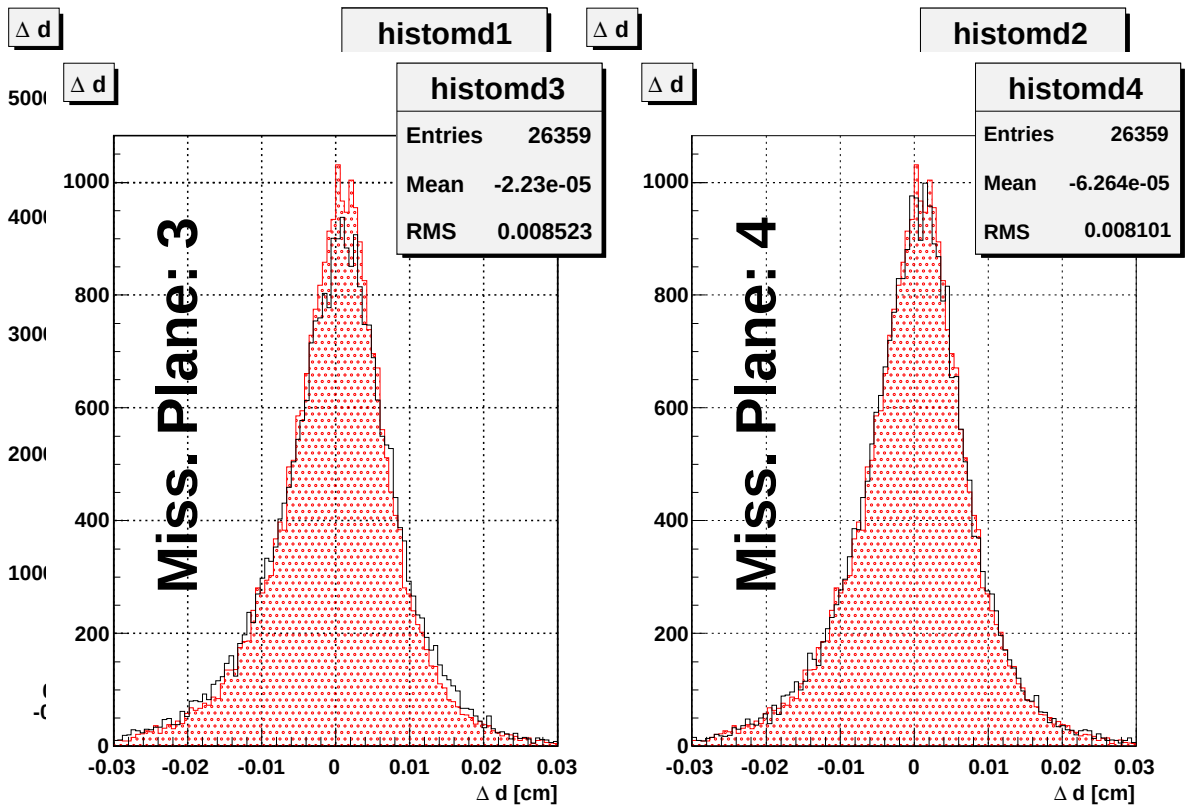


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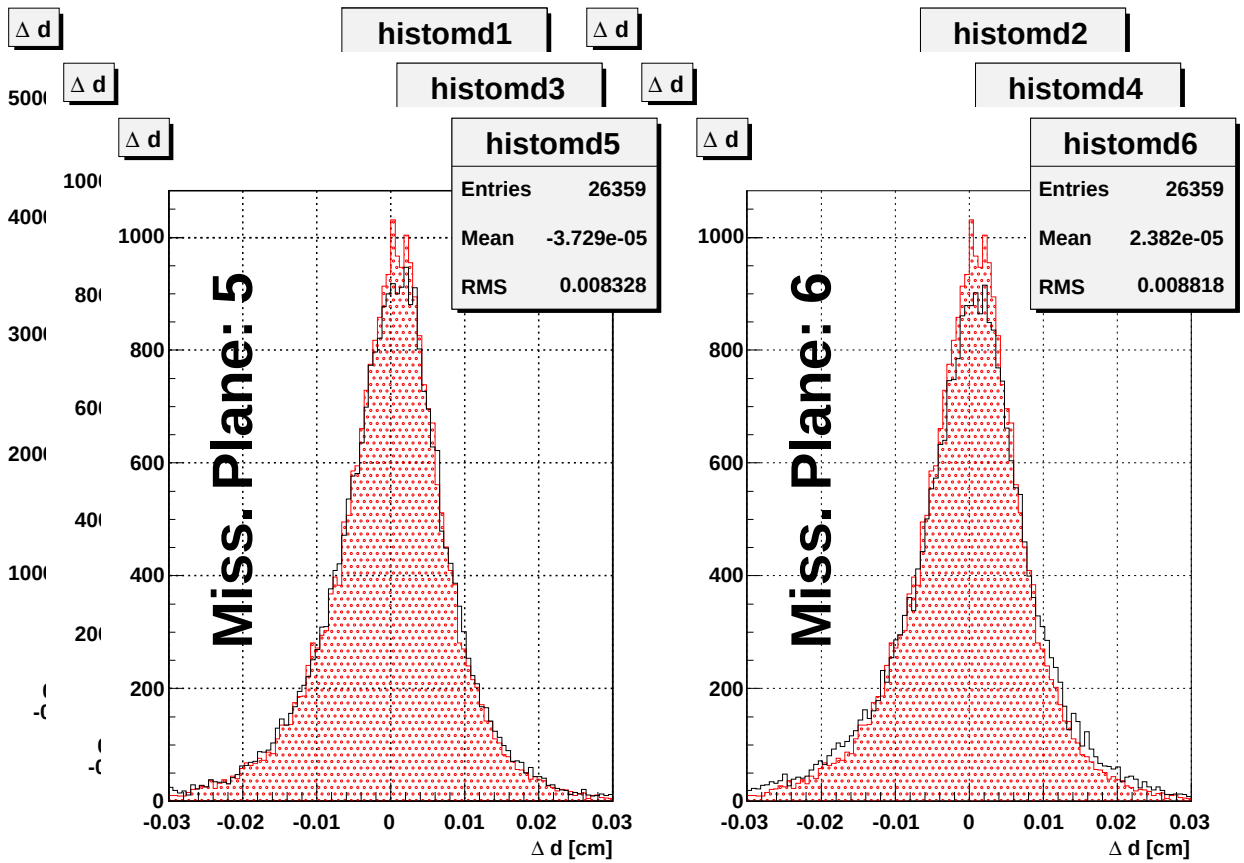


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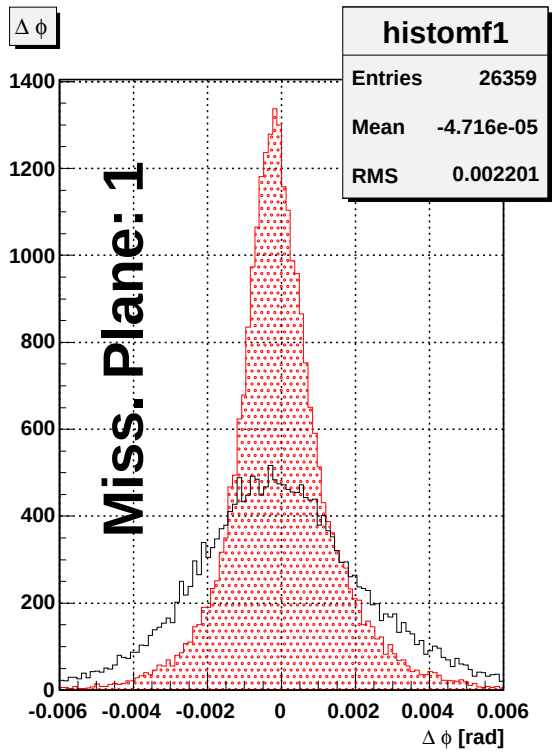


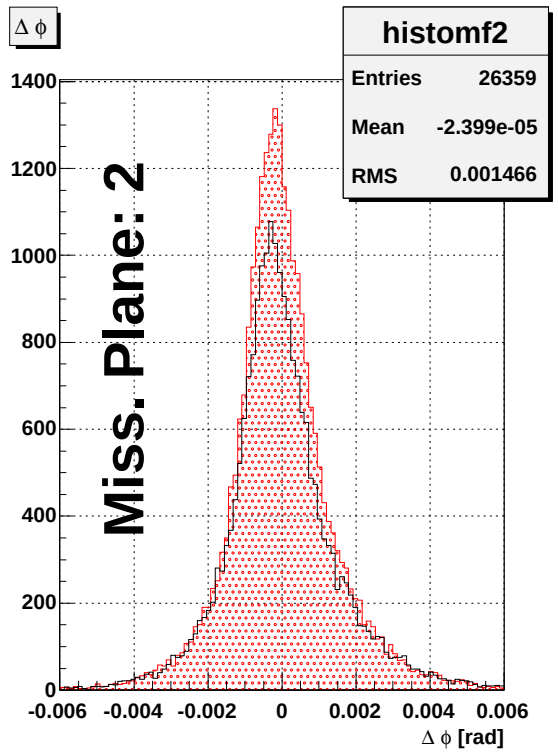


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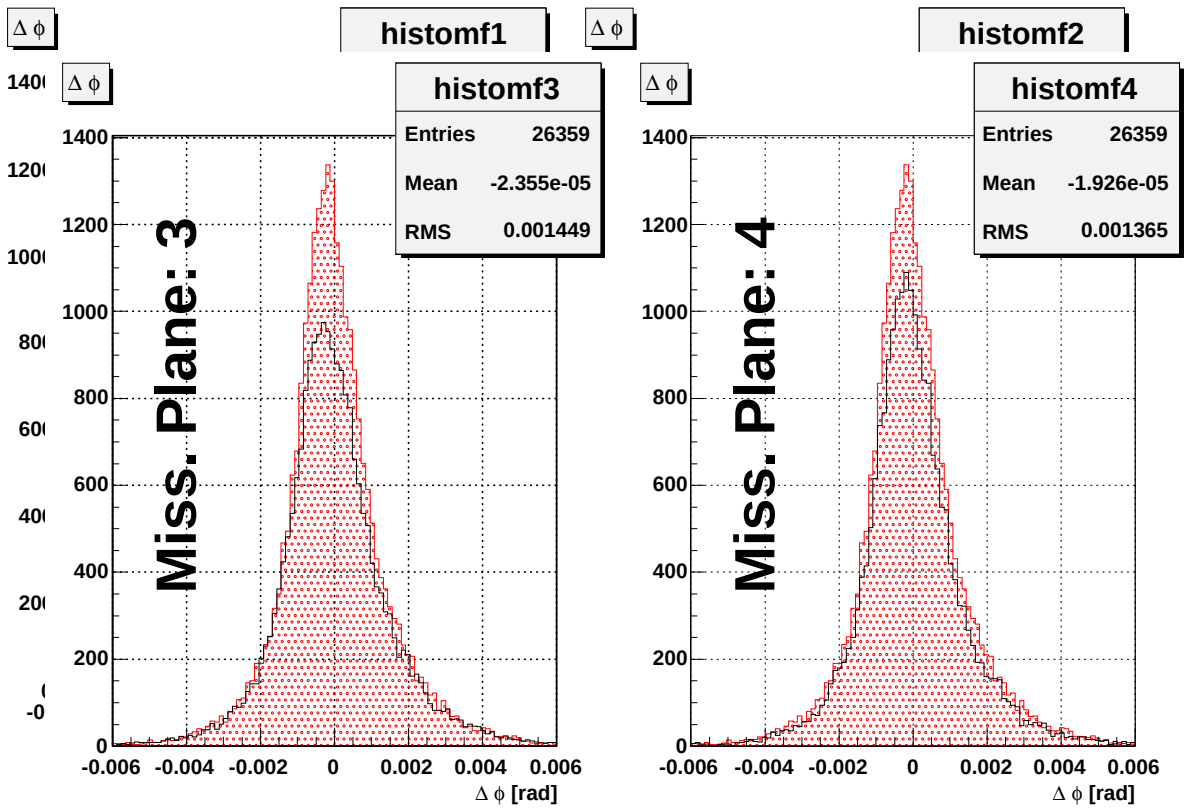


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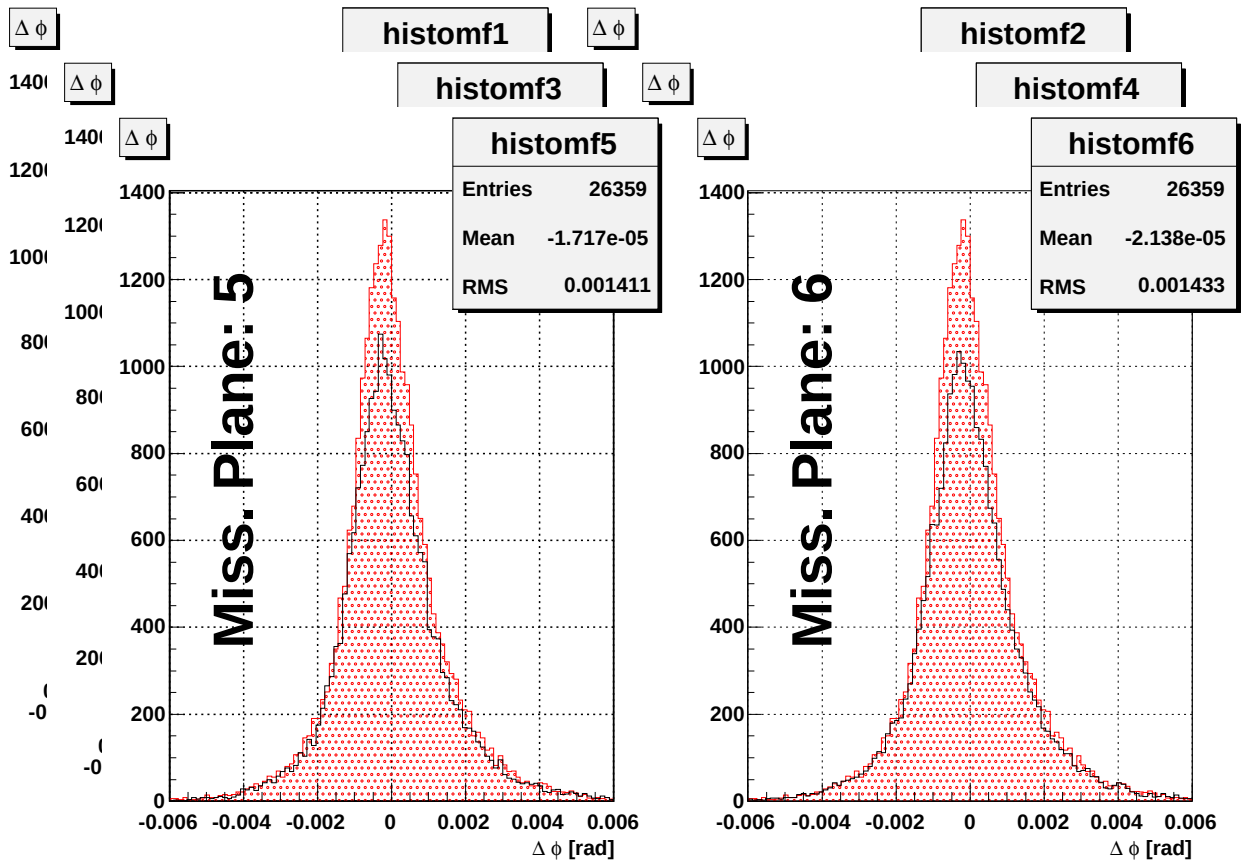


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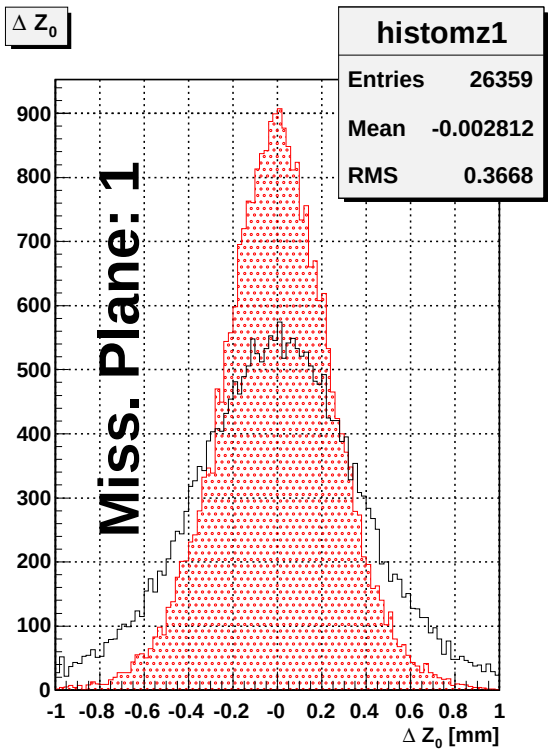
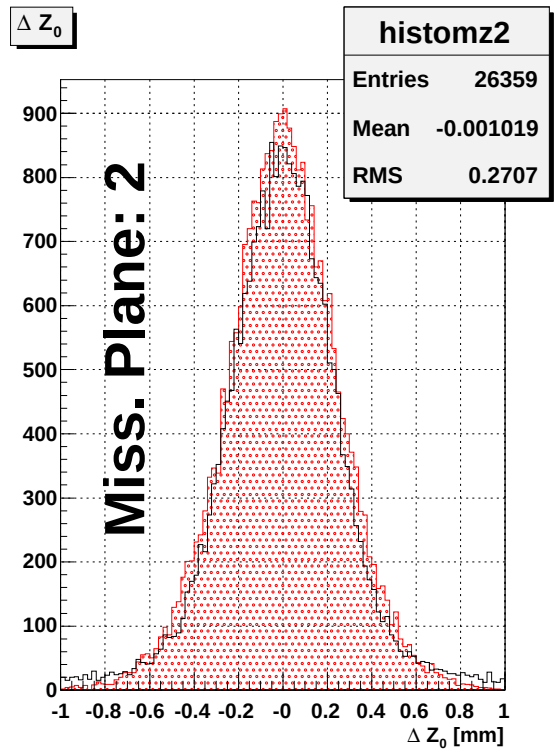
## $Z_0$ Parameter

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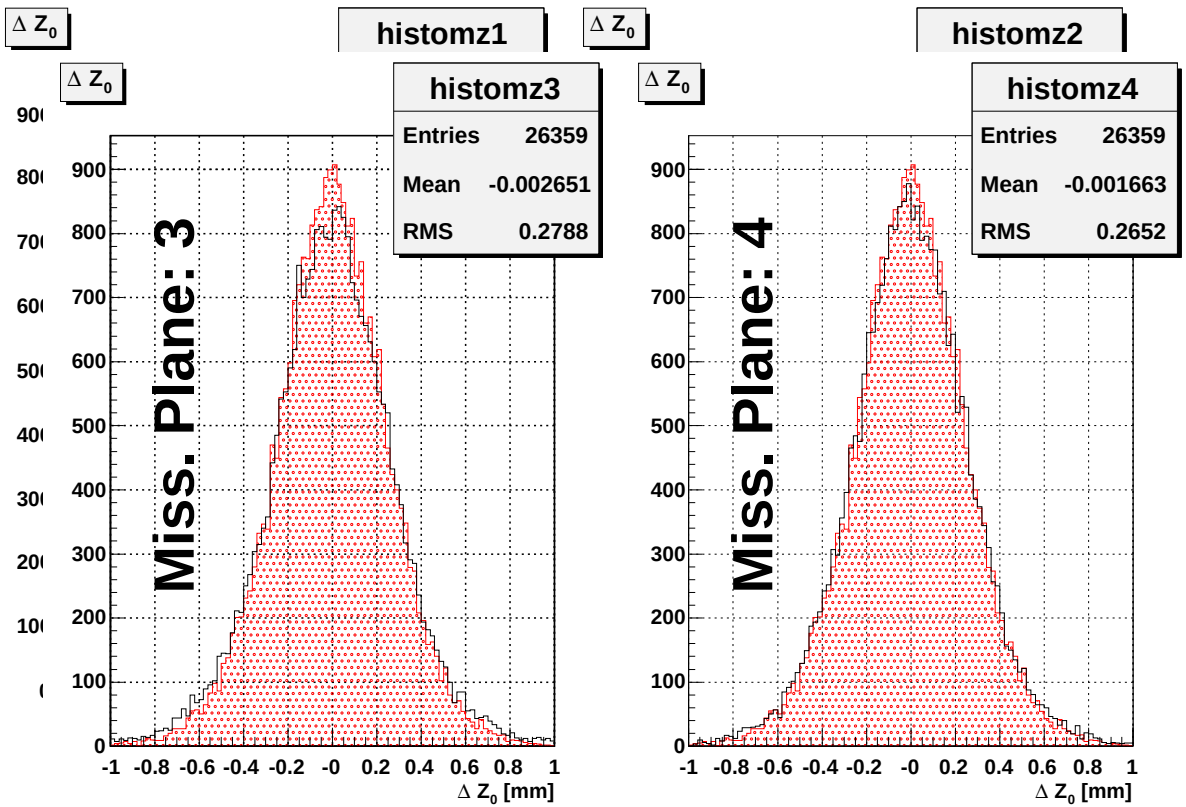


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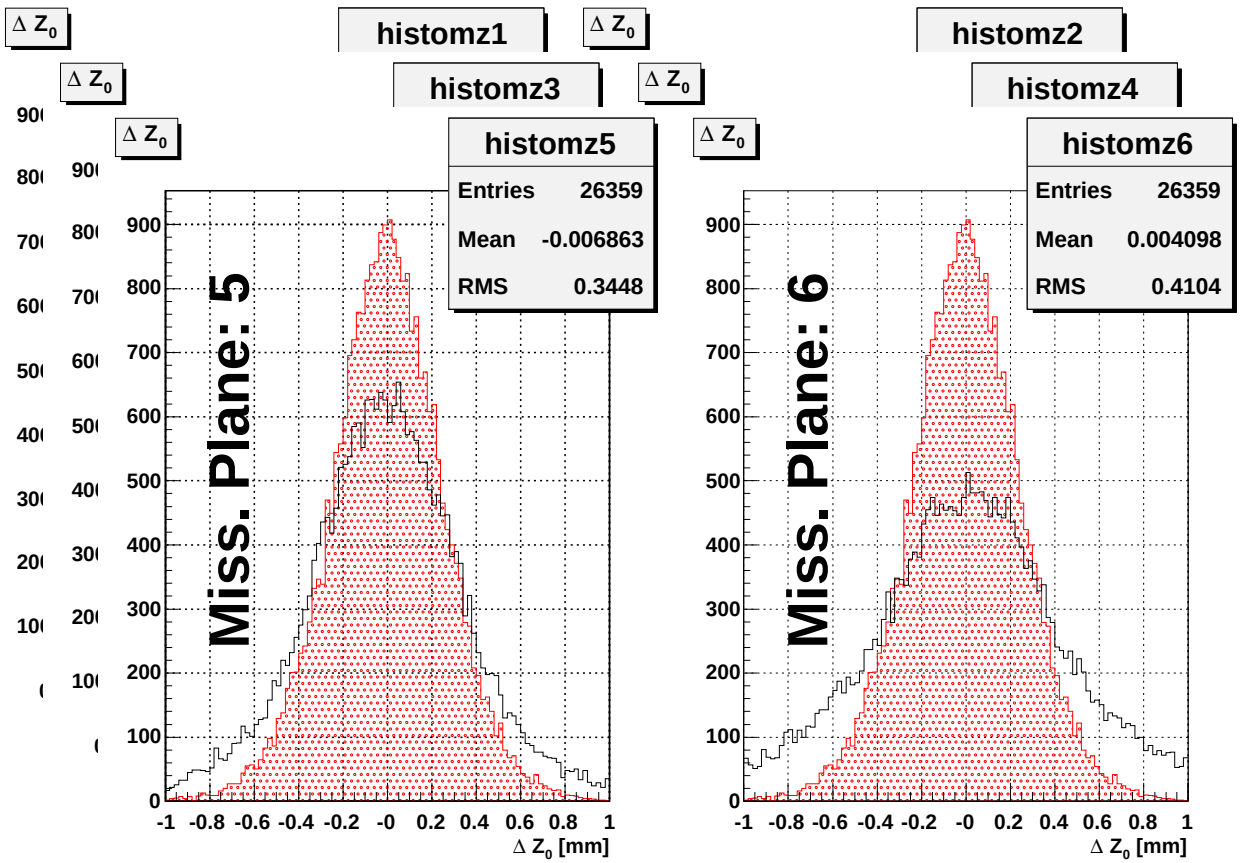


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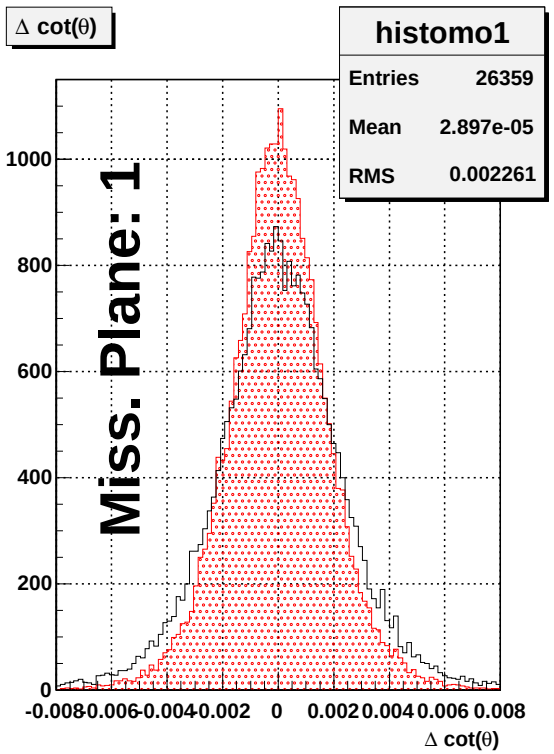
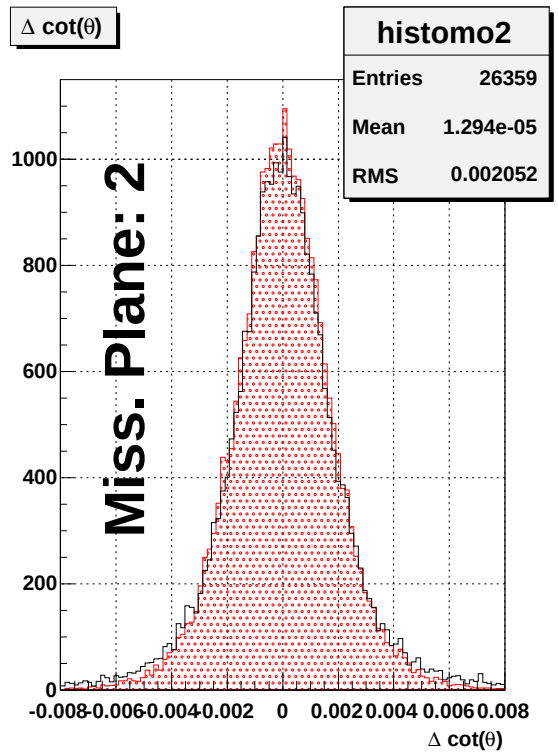
$cot(\theta)$ **Parameter**

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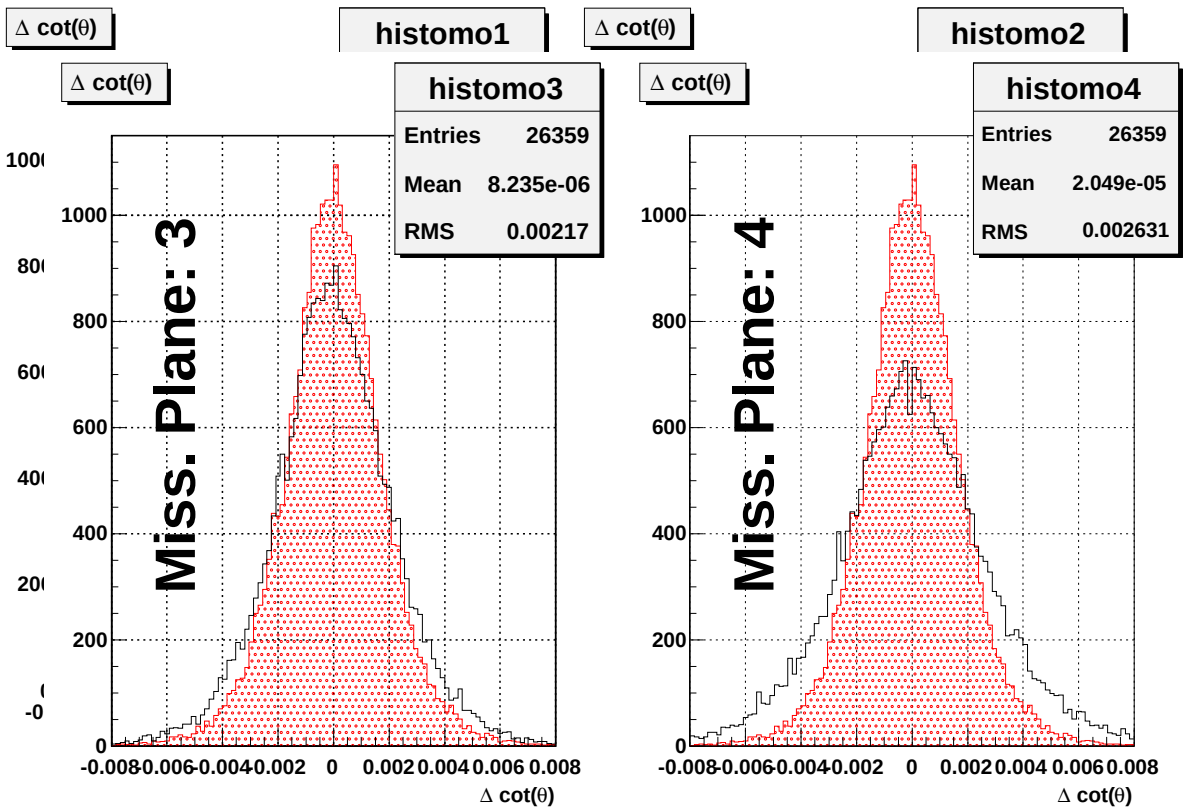


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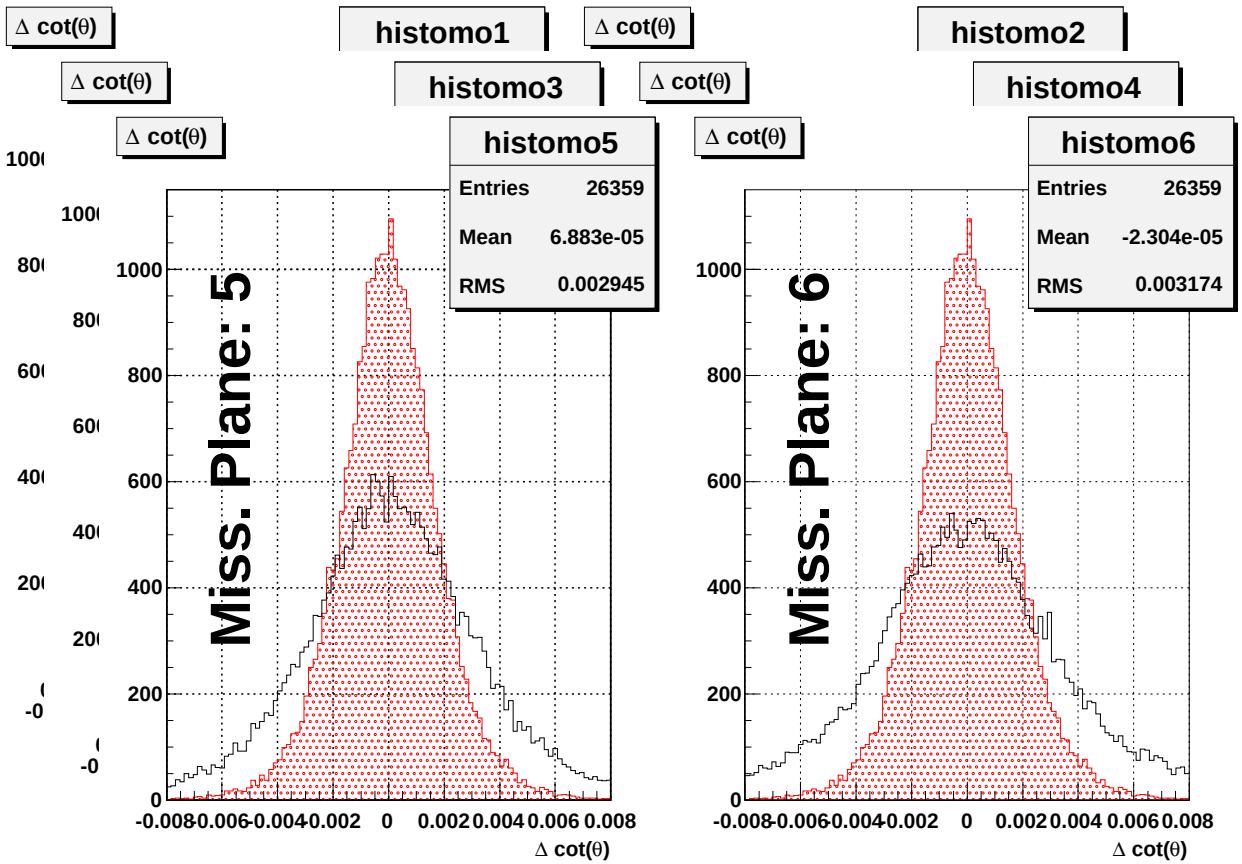


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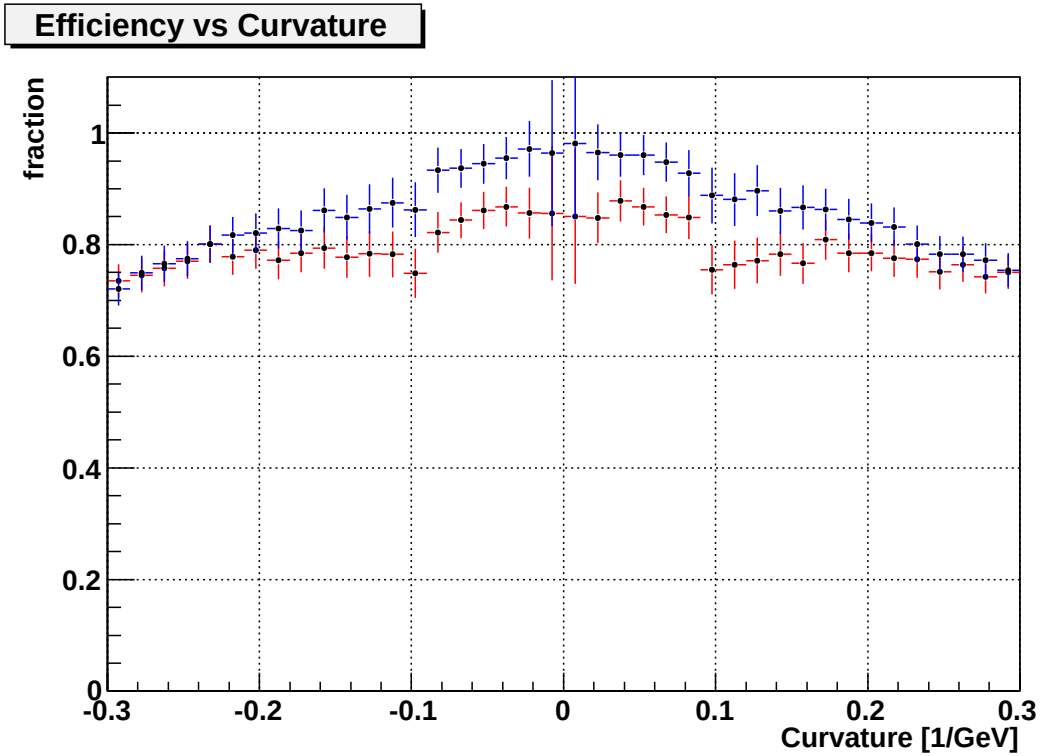
# FTK efficiency

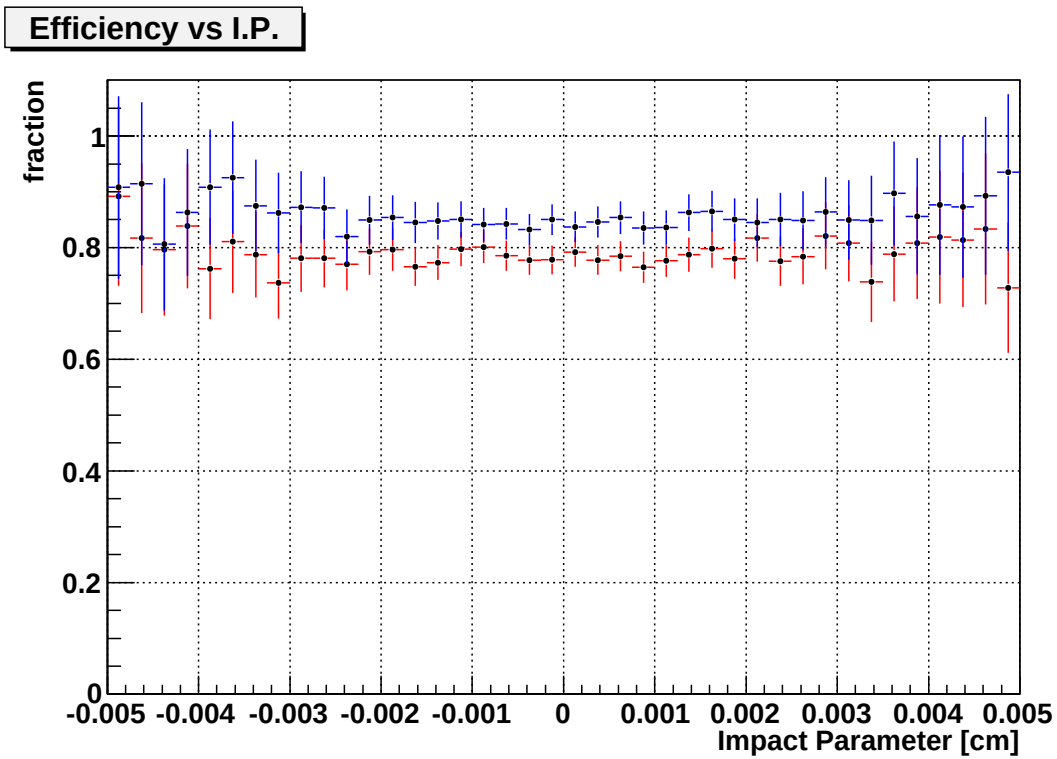
We can evaluate the efficiency using the majority logic as function of various parameters: Curvature




The plots show efficiency of IPatRec end FTK.

# FTK efficiency

We can evaluate the efficiency using the majority logic as function of various parameters: Curvature, Impact Parameter

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# FTK efficiency

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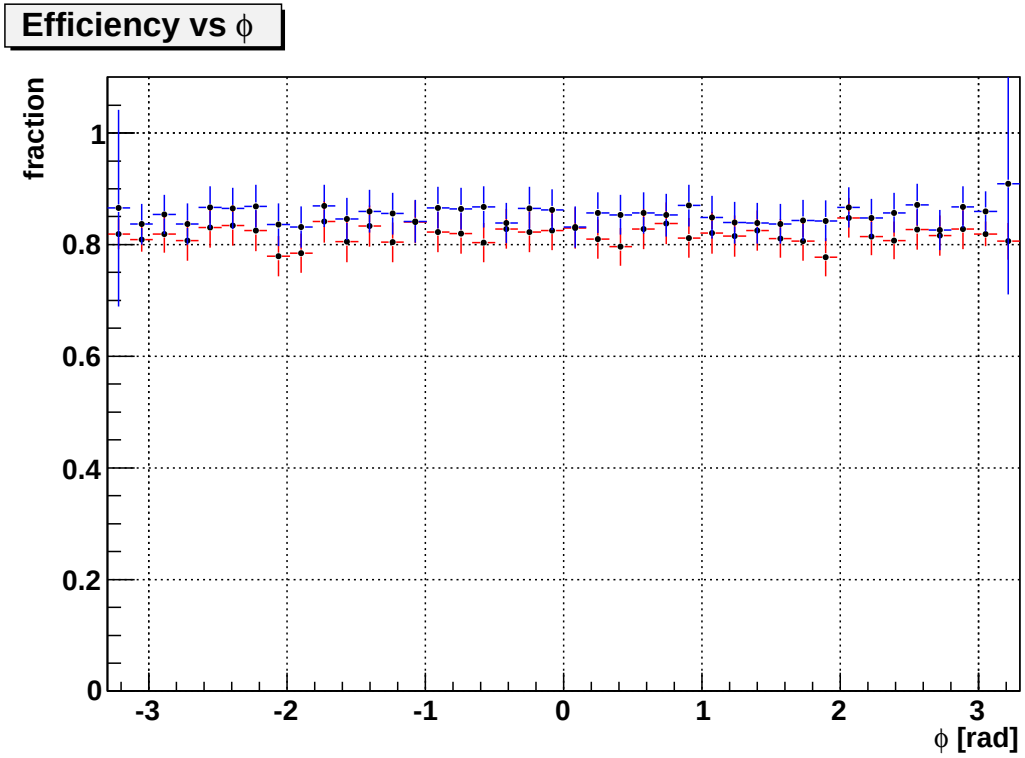


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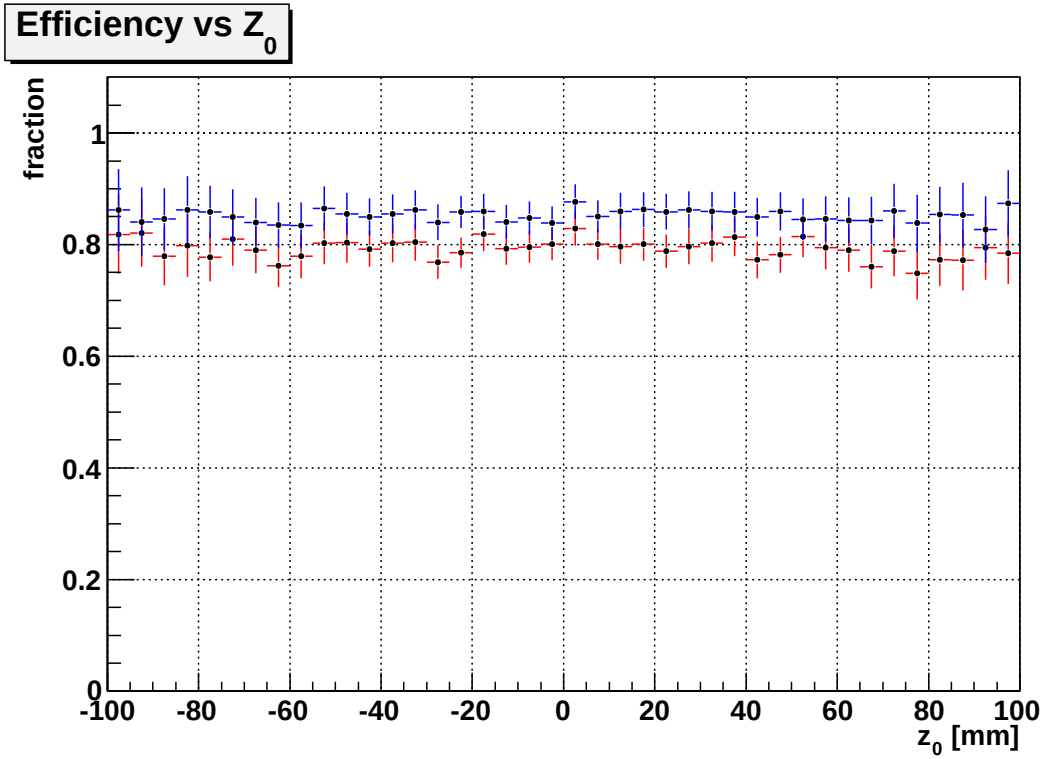


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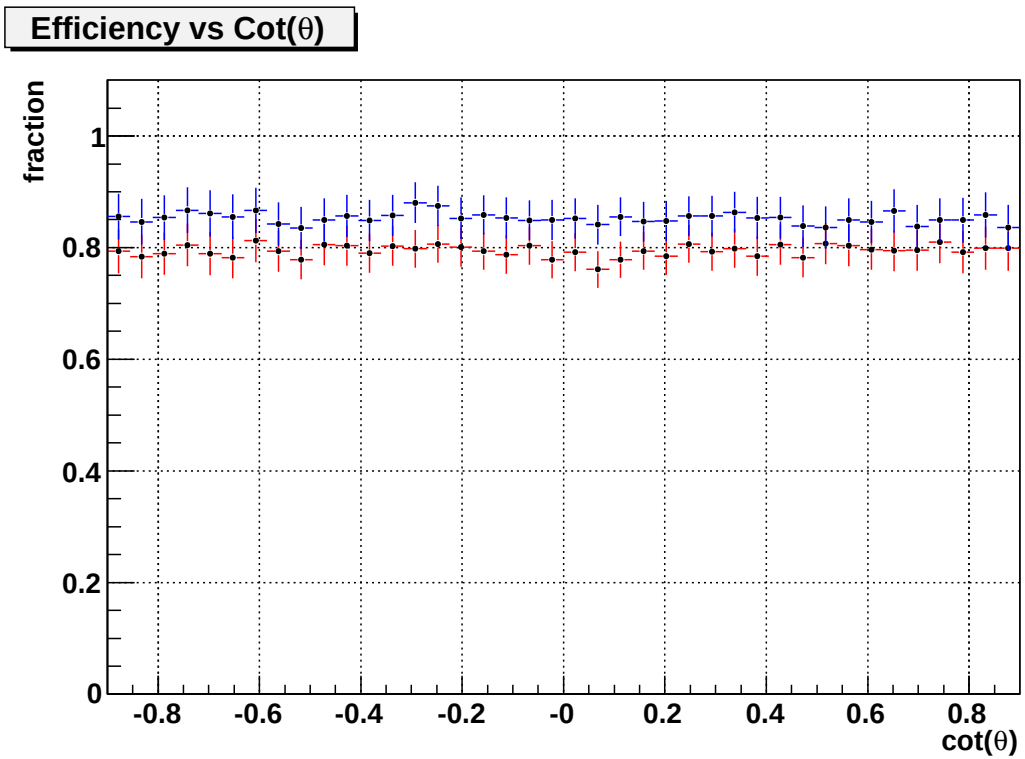
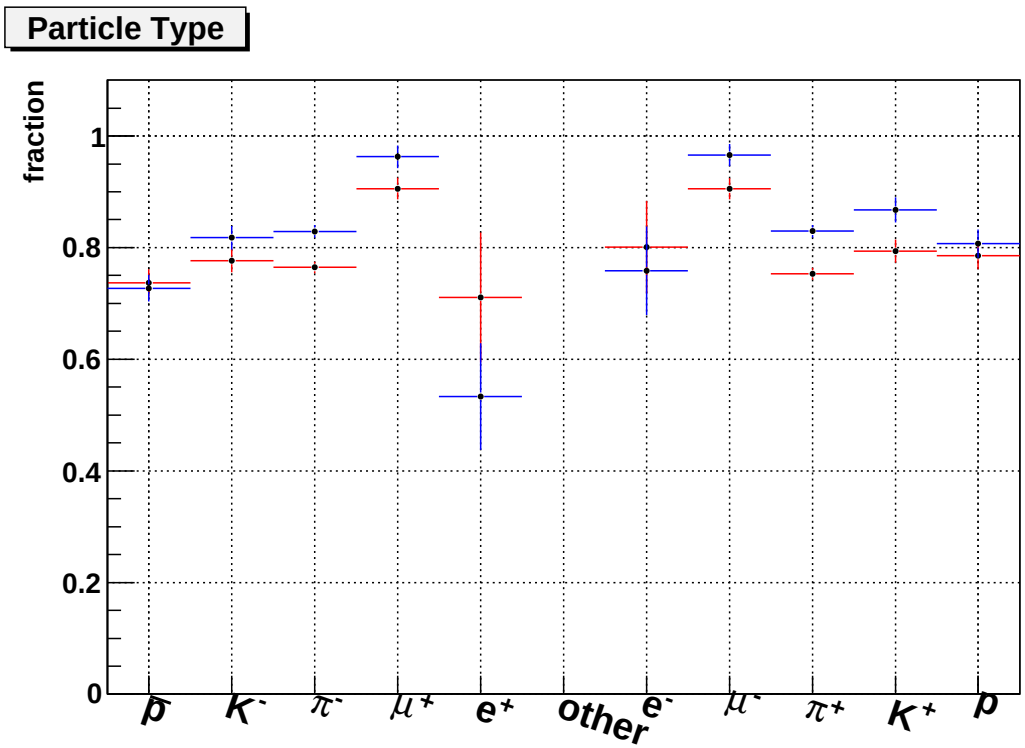



The plots show efficiency of IPatRec end FTK.

# FTK efficiency

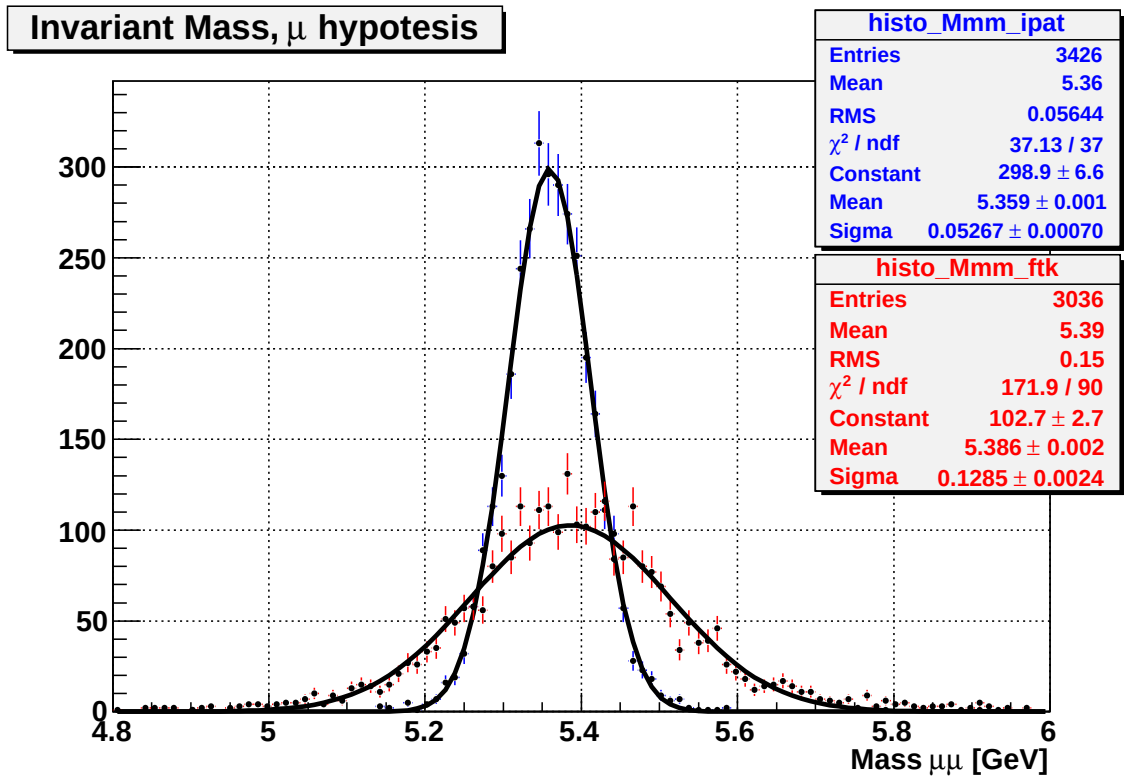
We can evaluate the efficiency using the majority logic as function of various parameters: Curvature, Impact Parameter, $\phi$, $Z_0$, $cot(\theta)$, Particle type.




The plots show efficiency of IPatRec end FTK.

# Invariant Mass resolution

Using the $B_s \rightarrow \mu\mu$ we can evaluate the resolution obtained for 2 muons.




The mass resolution in FTK is 2.5 times greater than iPatRed ($128\ MeV$ vs $53\ MeV$).

# Conclusions

- The introduction of majority logic solve the efficency problem.
- The implementation of ML don't increase the number of sectors or constants used for the fits.
- We can have an average efficiency $\sim 80\%$ using:
  - 8 regions
  - 160K sectors
  - 8M patterns