



INTT cosmic analysis update

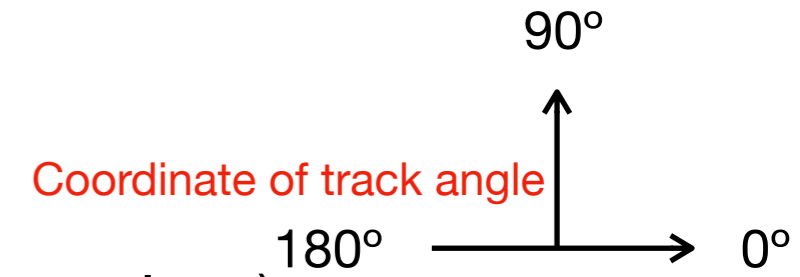
Wei-Che Tang, NCU

2024/12/12 INTT weekly meeting

Cosmic Analysis status

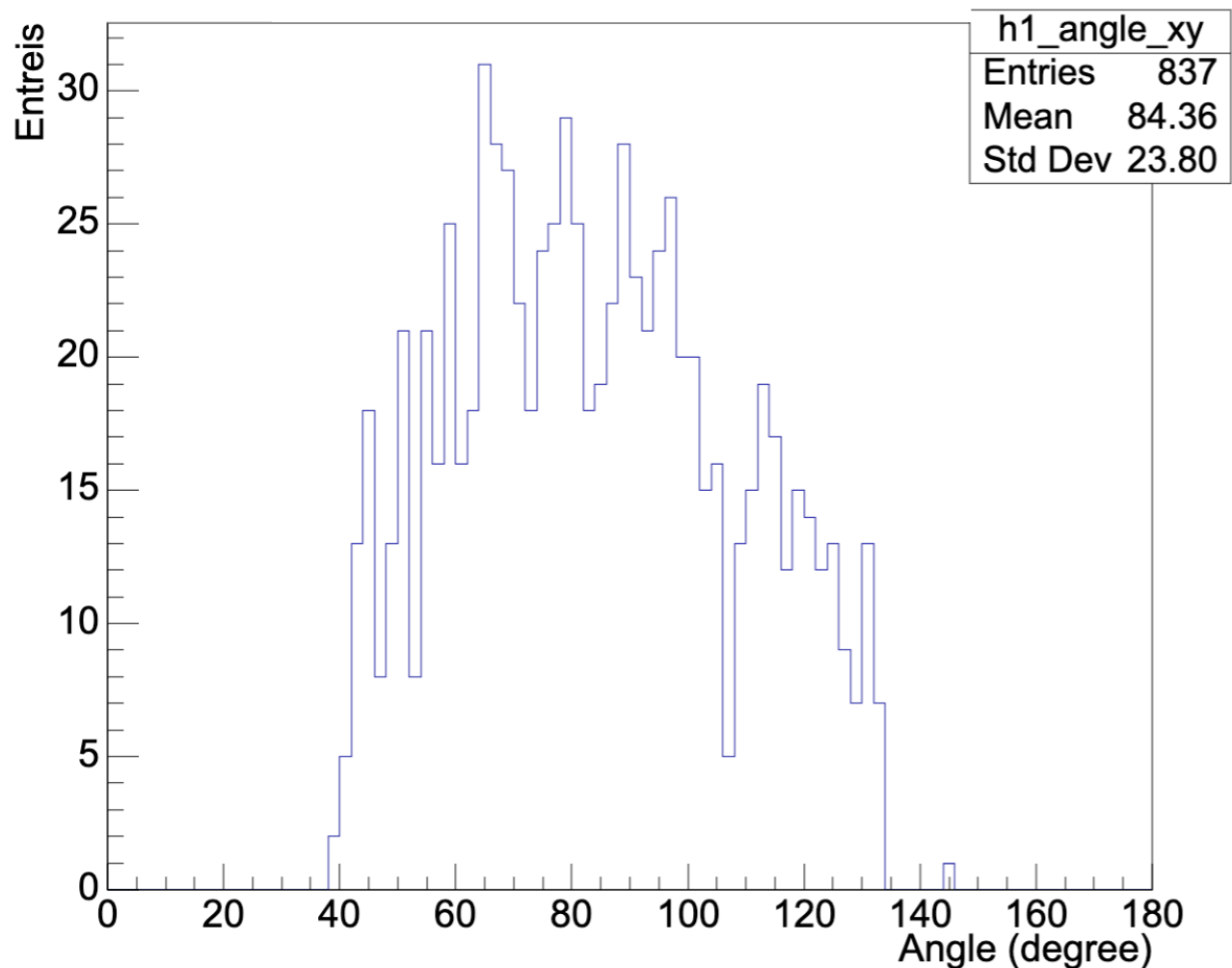
- Multiple runs have been analyzed.
 - Run number: 39365~39530, ~25 runs (Run2024 cosmic data)
 - Trigger used: HCal Vertical trigger
 - The raw cluster DST is checked and some pre-selections are applied before the cosmic analysis:
 - Hot channel mask
 - Good clusters required
 - Requirements : '*cluster Adc > 15*' (Adc0 is set to be 15) & '*cluster size < 9*'
- Cosmic track reconstruction
 - Focus on the events whose total clusters equal to 4.
 - Fit the clusters with a straight line (0 field cosmic).
 - Reduced residual is used to evaluate the fitting quality (to minimize the track angle dependence)
 - Residual cut applied:
 - *xy residual < 0.02 cm*, applied fitting line coverage check on z-axis

Recap previous results

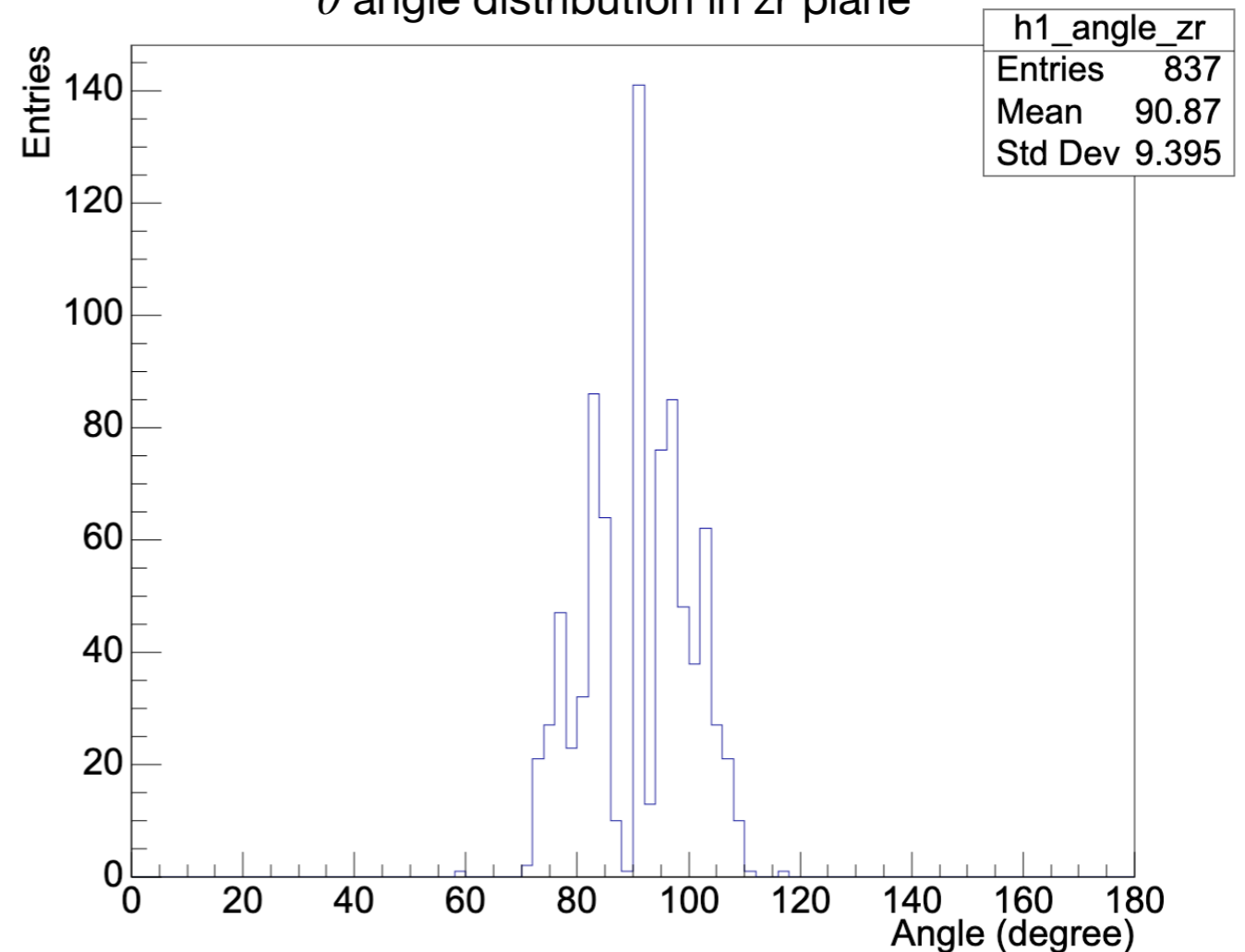


- The distribution of the ϕ angle (in xy plane) and θ angle (in zr plane)
 \Rightarrow **Try to enlarge the statistic & do more check on cosmic data**

ϕ angle distribution in xy plane



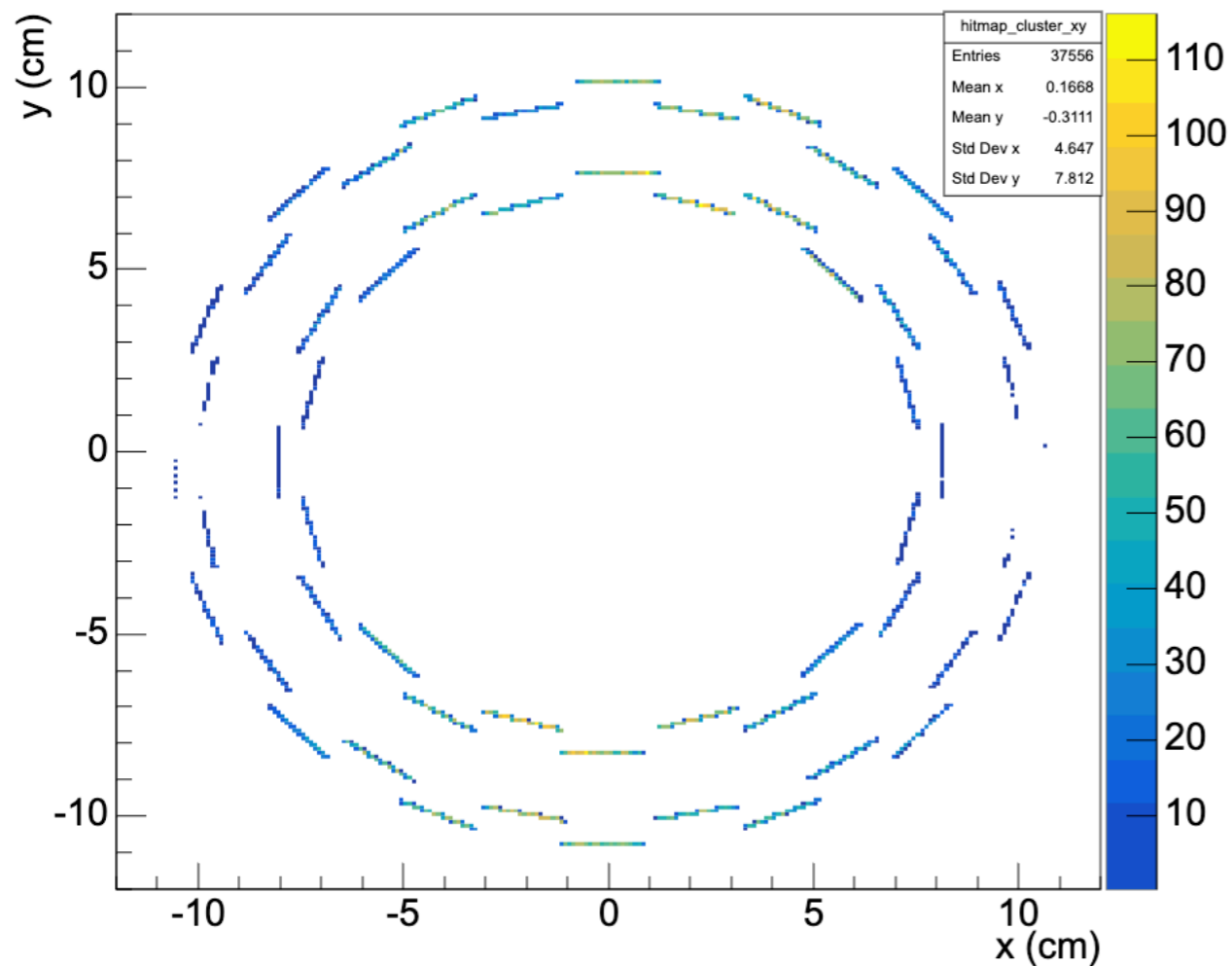
θ angle distribution in zr plane



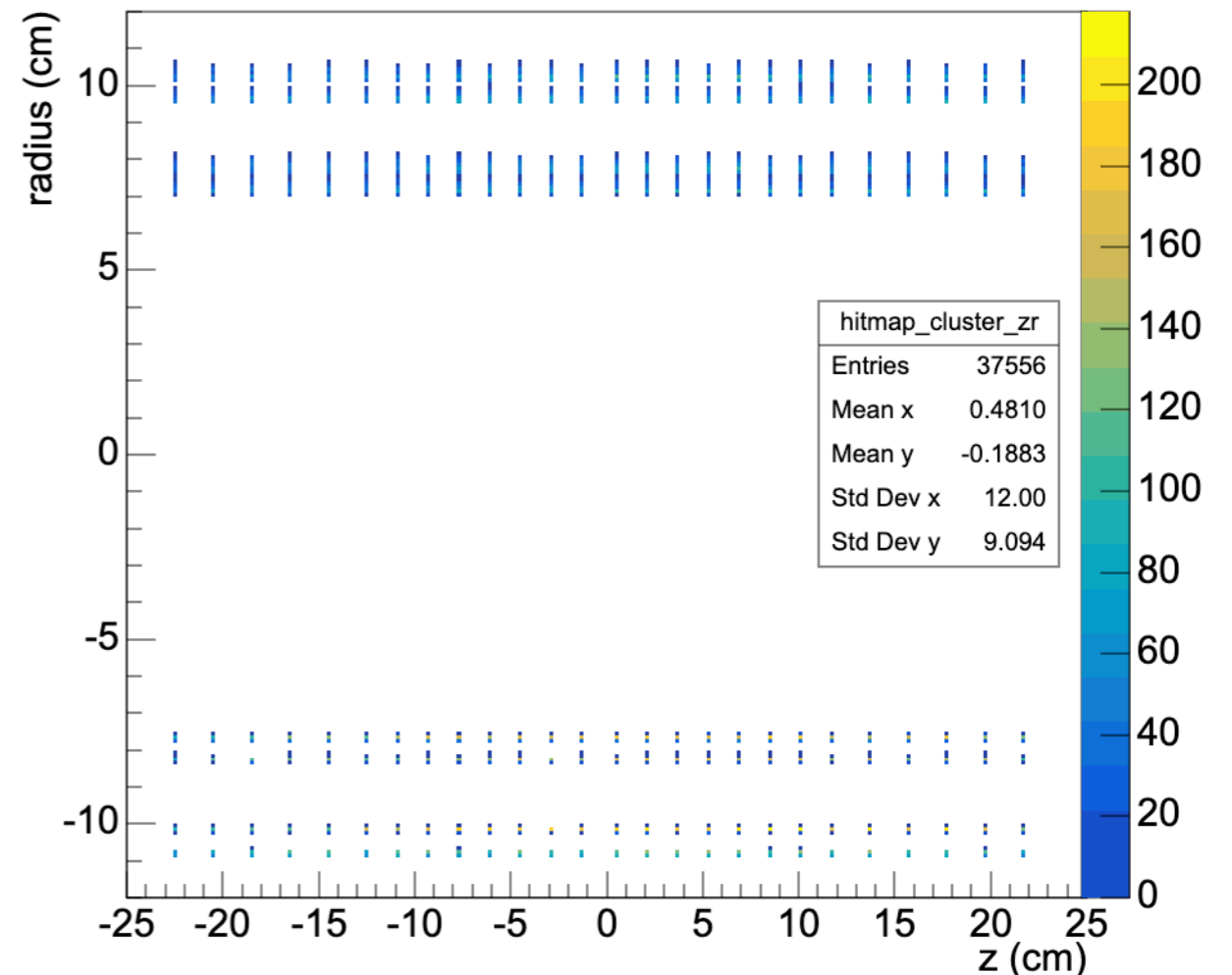
Clusters Hitmap

- The cluster hitmap in both xy and zr plane
 - There is a hot region on xy plane. → This also implies the track distribution.
 - No hot region on zr plane.

The clusters hitmap of xy plane

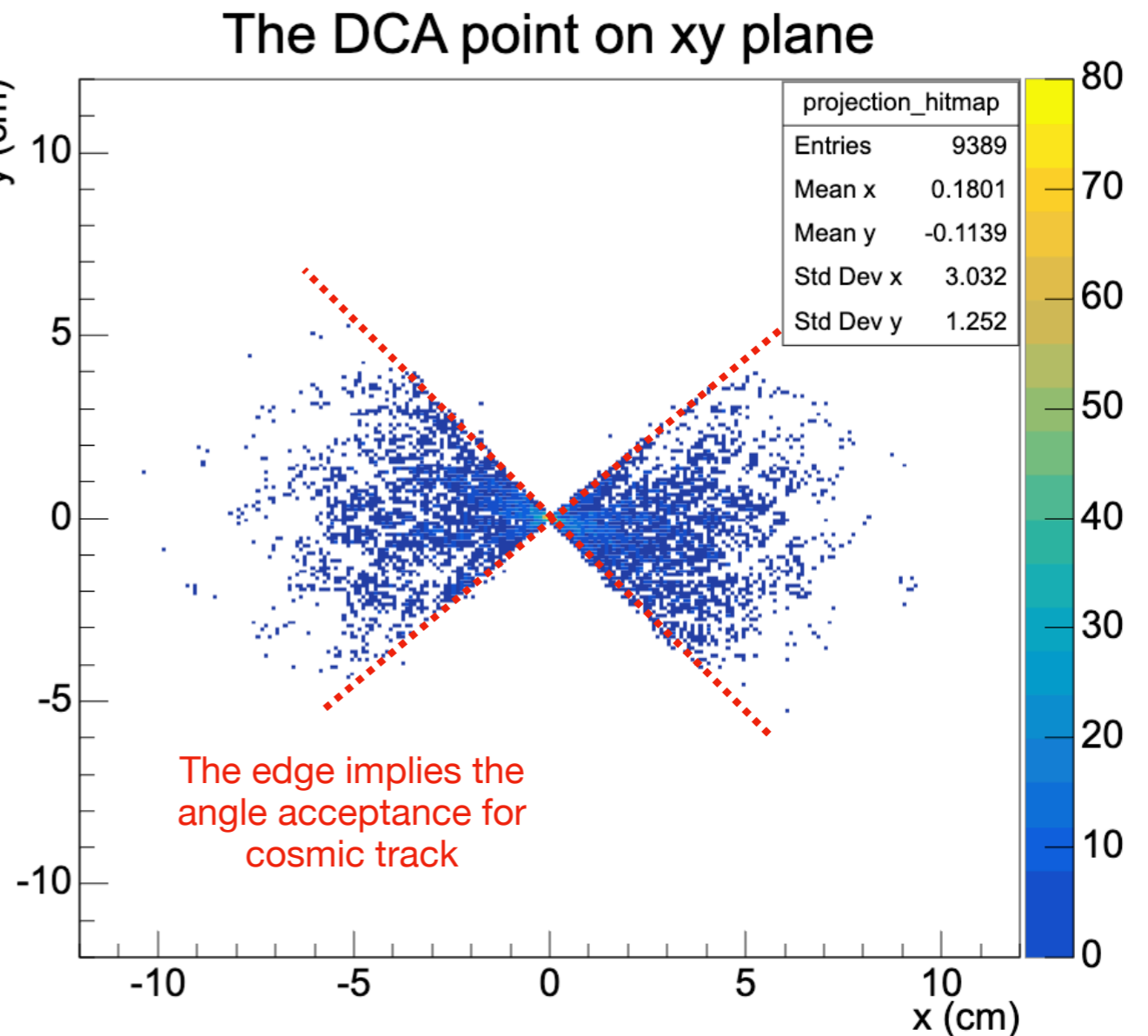
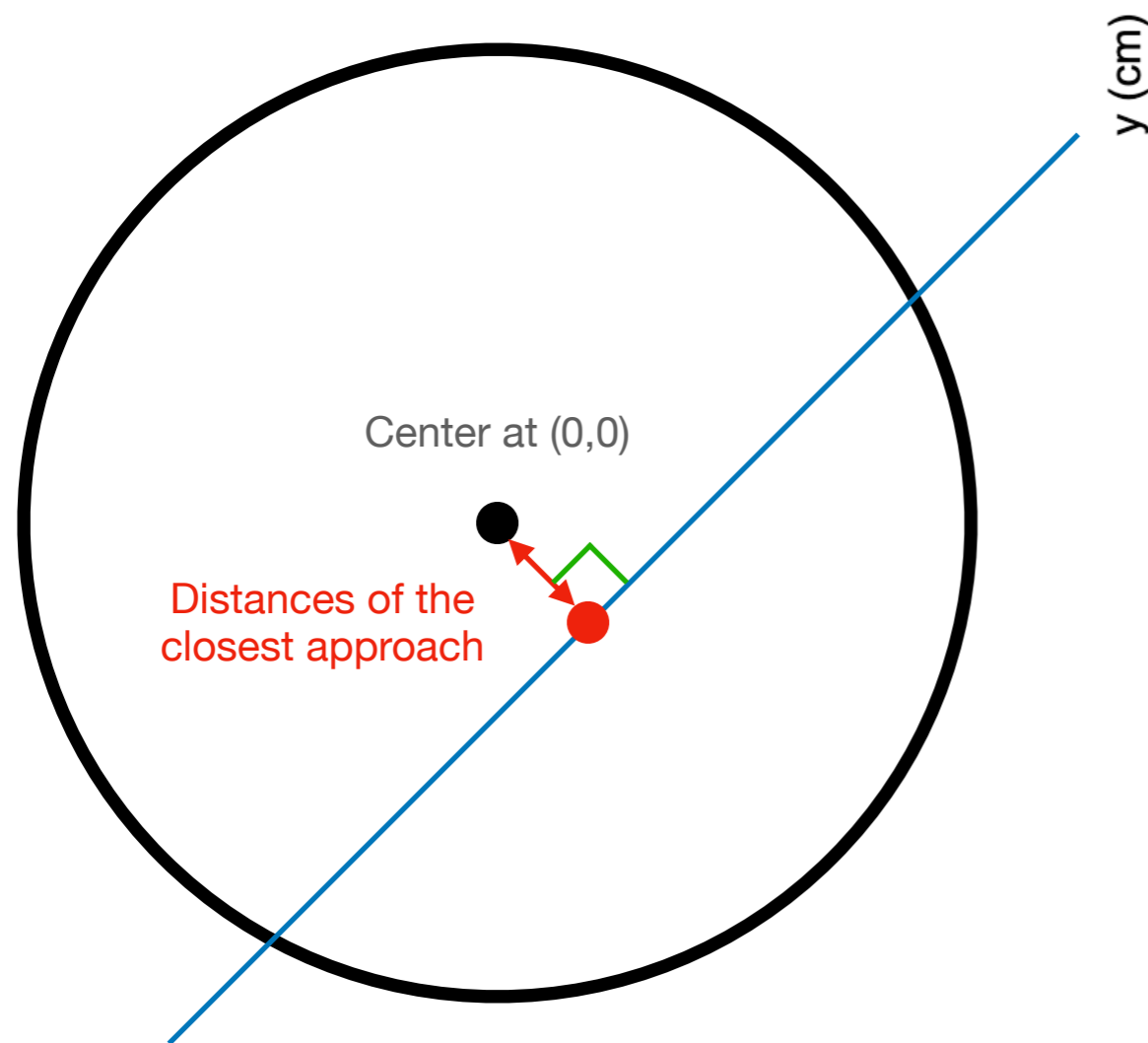


The clusters hitmap of zr plane

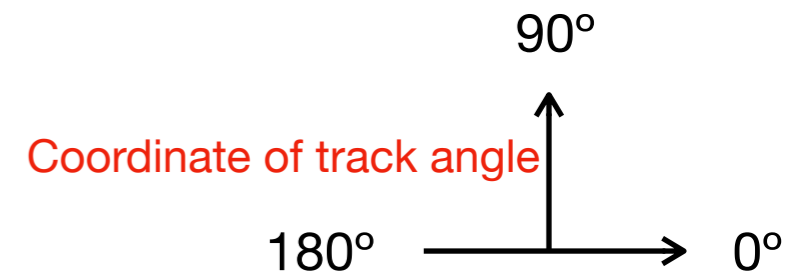


The DCA point for tracks

- The sketch shows the DCA definition.
- The figure shows the DCA points projected on xy plane.
 - The plot also implies the acceptance angle of cosmic tracks.

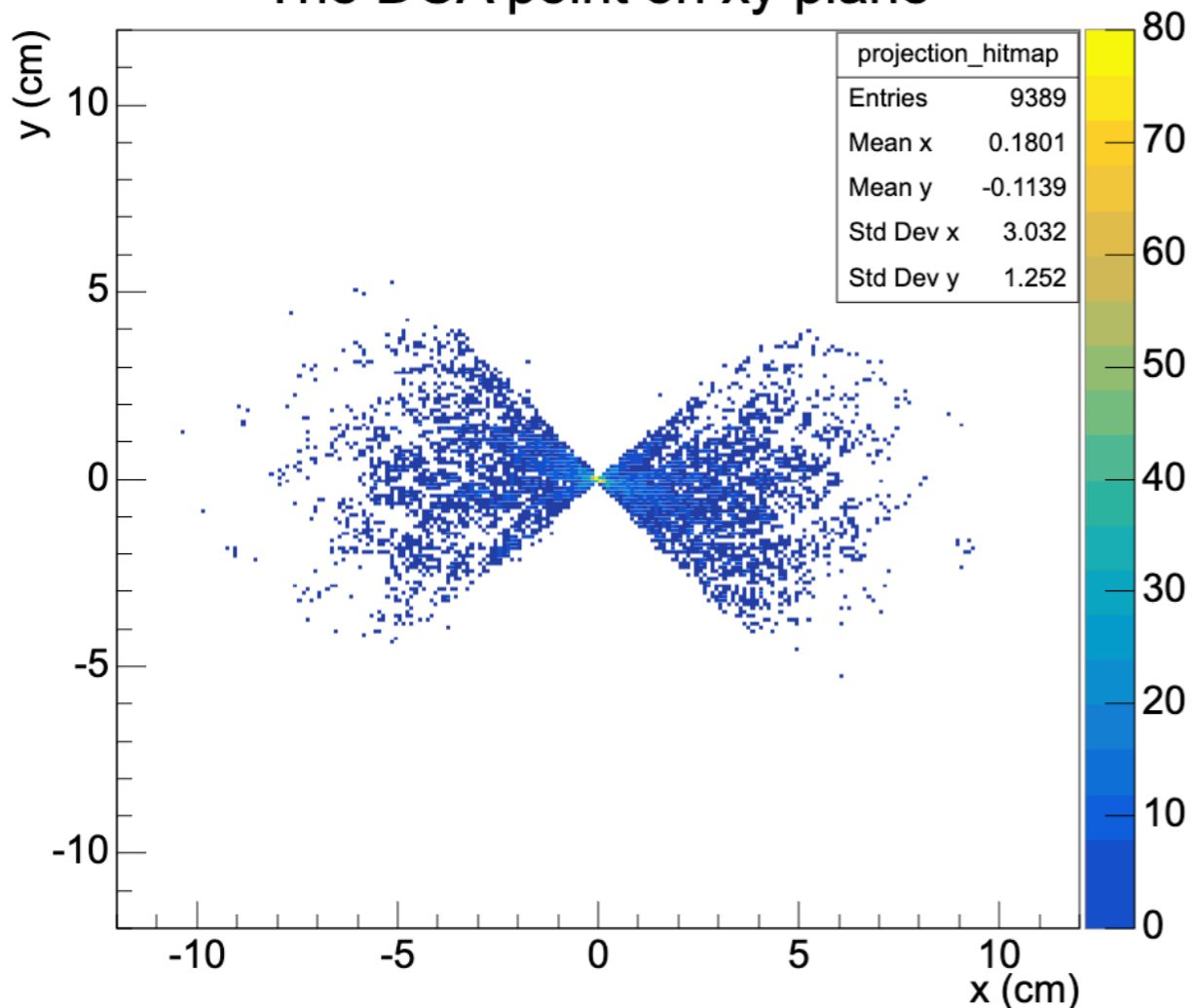


DCA point

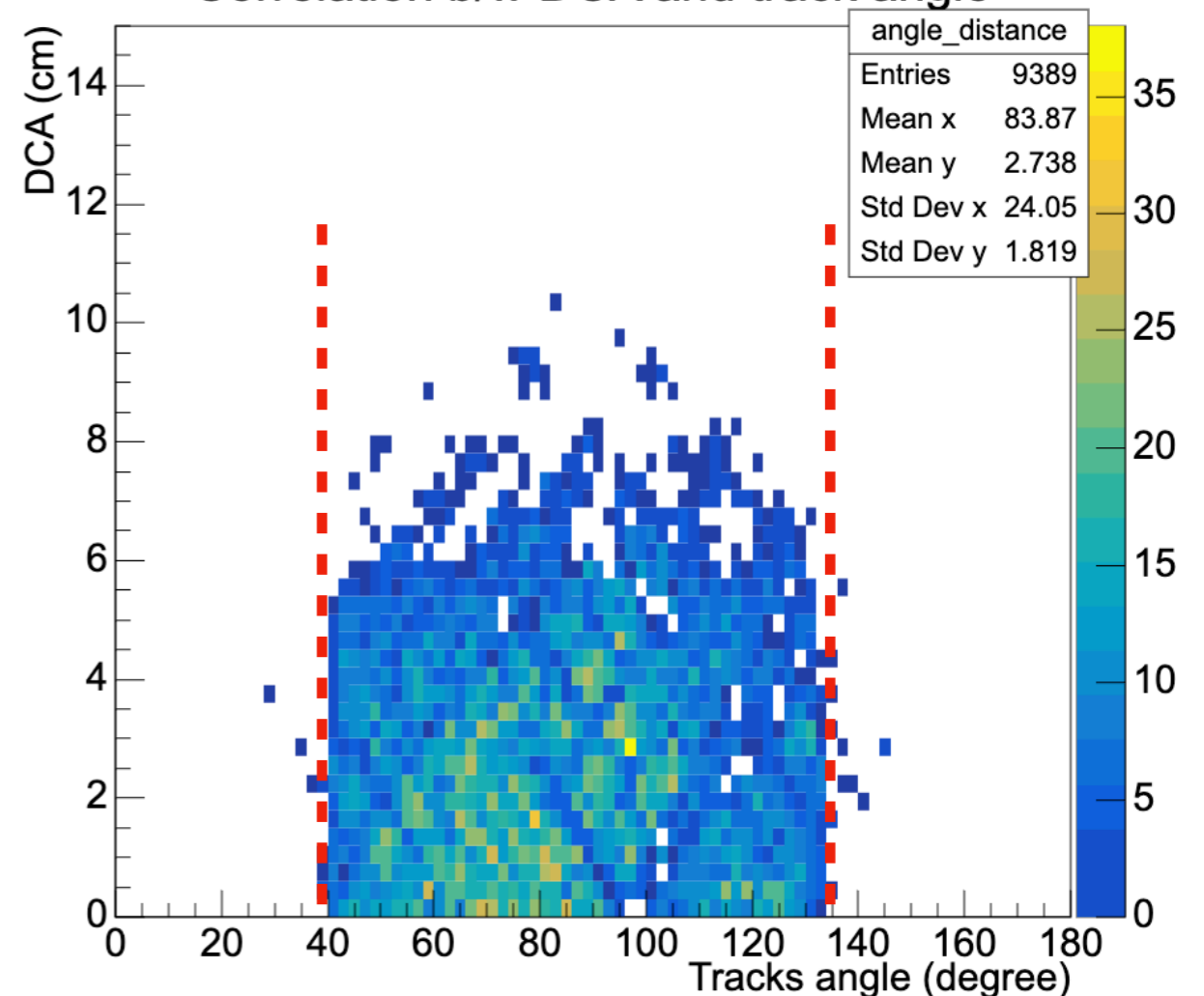


- The right figure shows the correlation between DCA and tracking angle.
 - Also shows the acceptance angle.
 - The more track angle close to 90 degrees, the larger DCA range can have.
- Expected geometry. Those plots can check whether the trigger conditions (high correlation with track angle acceptance) have been changed or not.

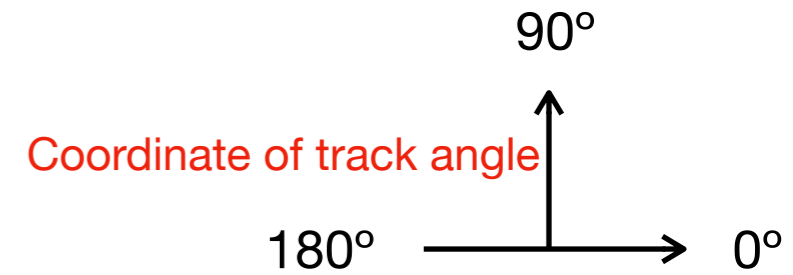
The DCA point on xy plane



Correlation b/w DCA and track angle

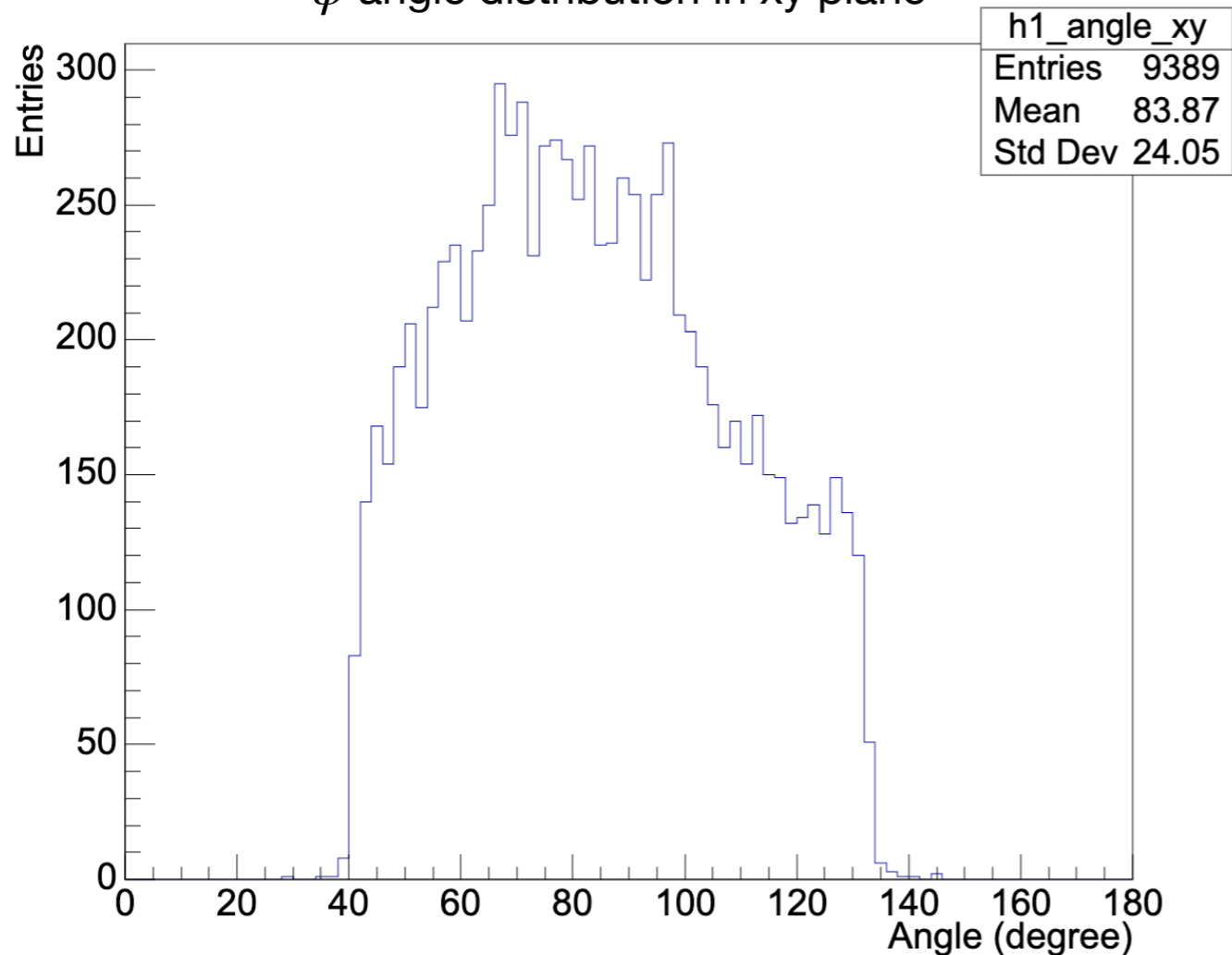


Angle distribution

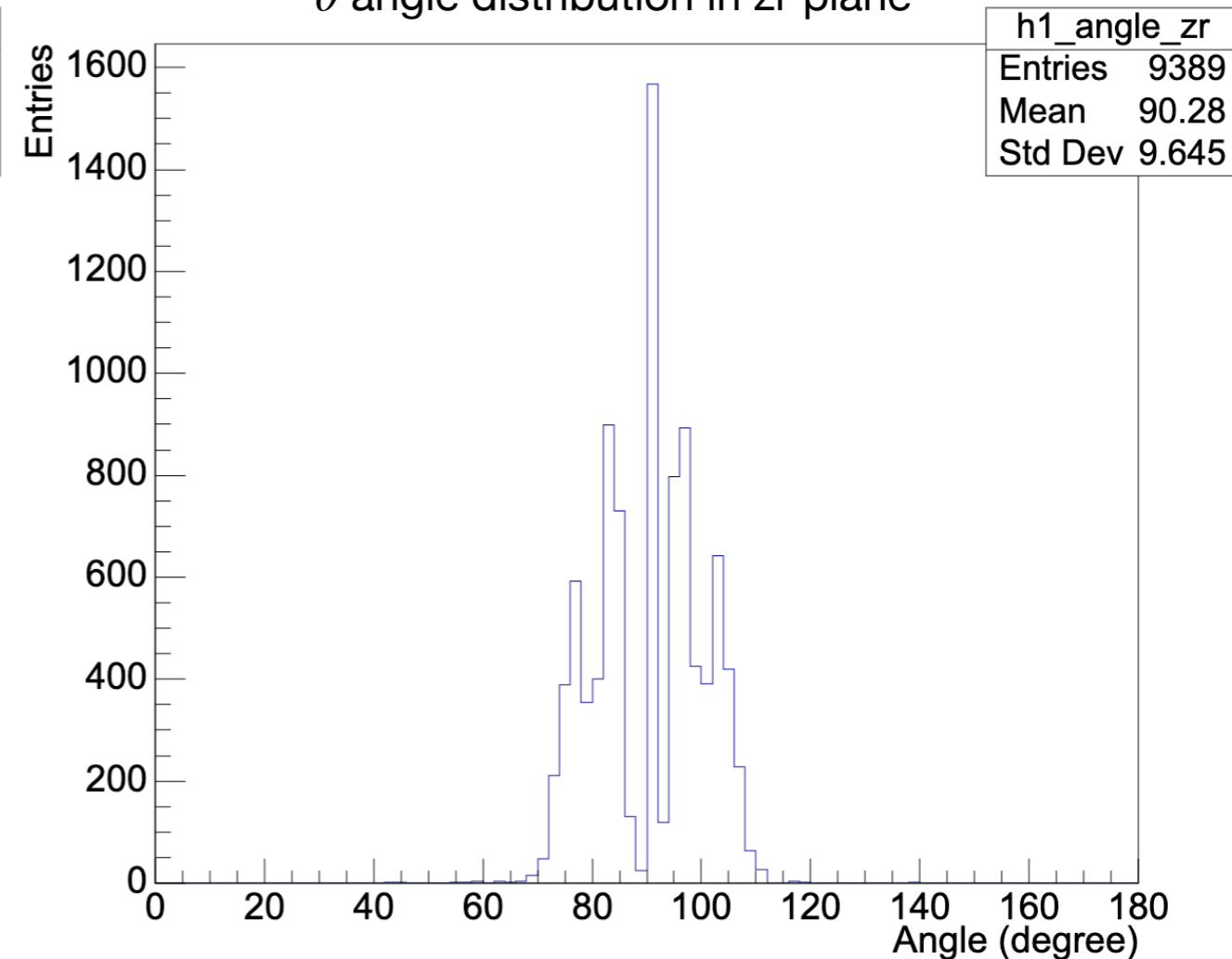


- The distribution of the ϕ angle (in xy plane) and θ angle (in zr plane).
- The angle acceptance agree with the cluster hitmap.

ϕ angle distribution in xy plane



θ angle distribution in zr plane



Summary

- Adding more statistic into the analysis.
- Check the cluster hitmap on xy and zr plane. → Looks pretty normal.
- Check the DCA points projected on xy plane.
 - The hitmap implies the angle acceptance for cosmic track.
 - One can check those DCA plots to make sure the trigger condition.
- The angle distribution agrees with the clusters and DCA checks.

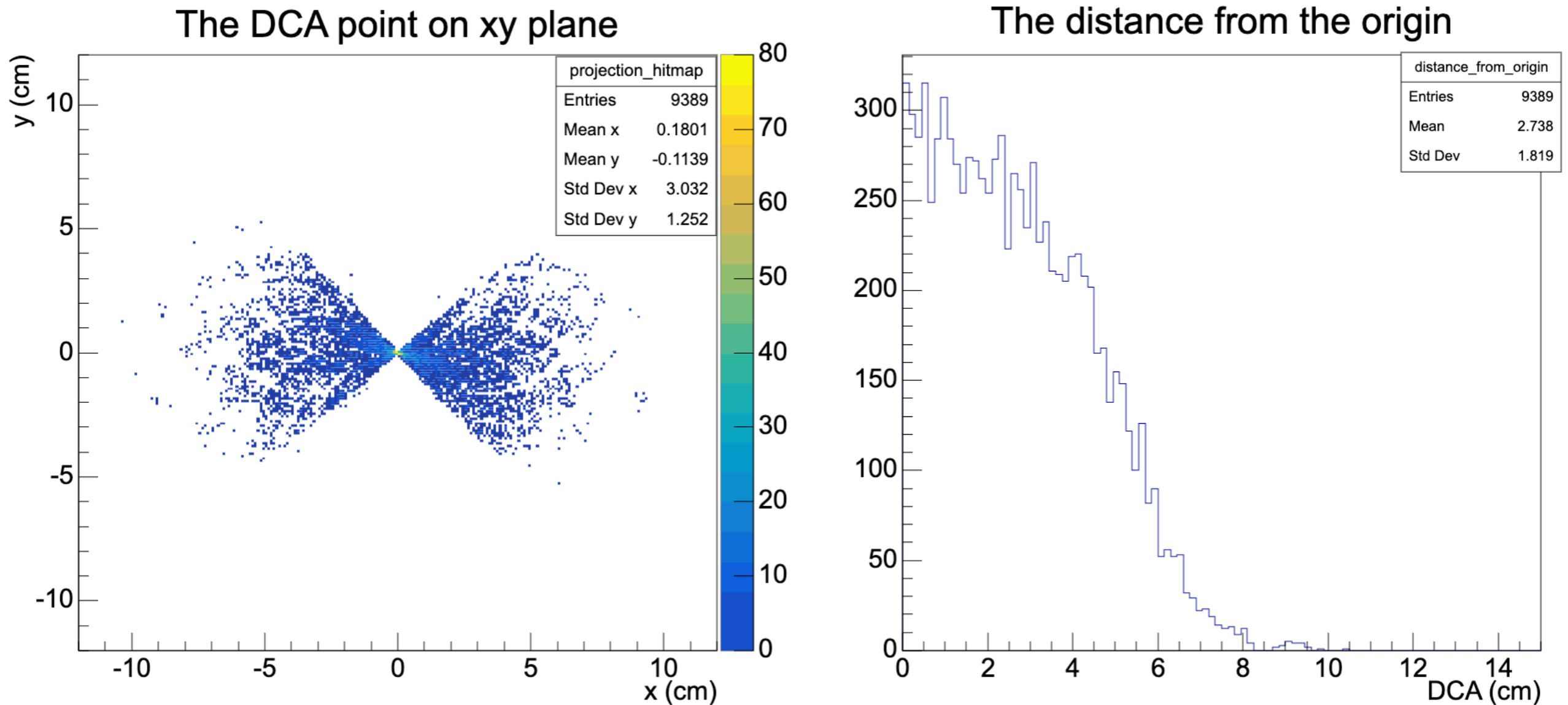
To do:

- Next step:
 - More statics!
 - Polish the algorithm and workflow to obtain more than 4 clusters tracks.
 - Giving out a set of good cosmic data. (Further step)
 - Could help people to do geometry study with good cosmic data.
- There will be TPS in the coming Jan., I would like to show some status for the cosmic study in TPS...
- Showing “Working in progress” on the plots (?)

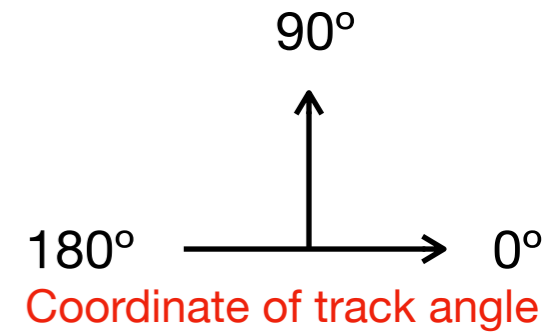
Back up

The DCA point of tracks

- The distribution of DCA point.

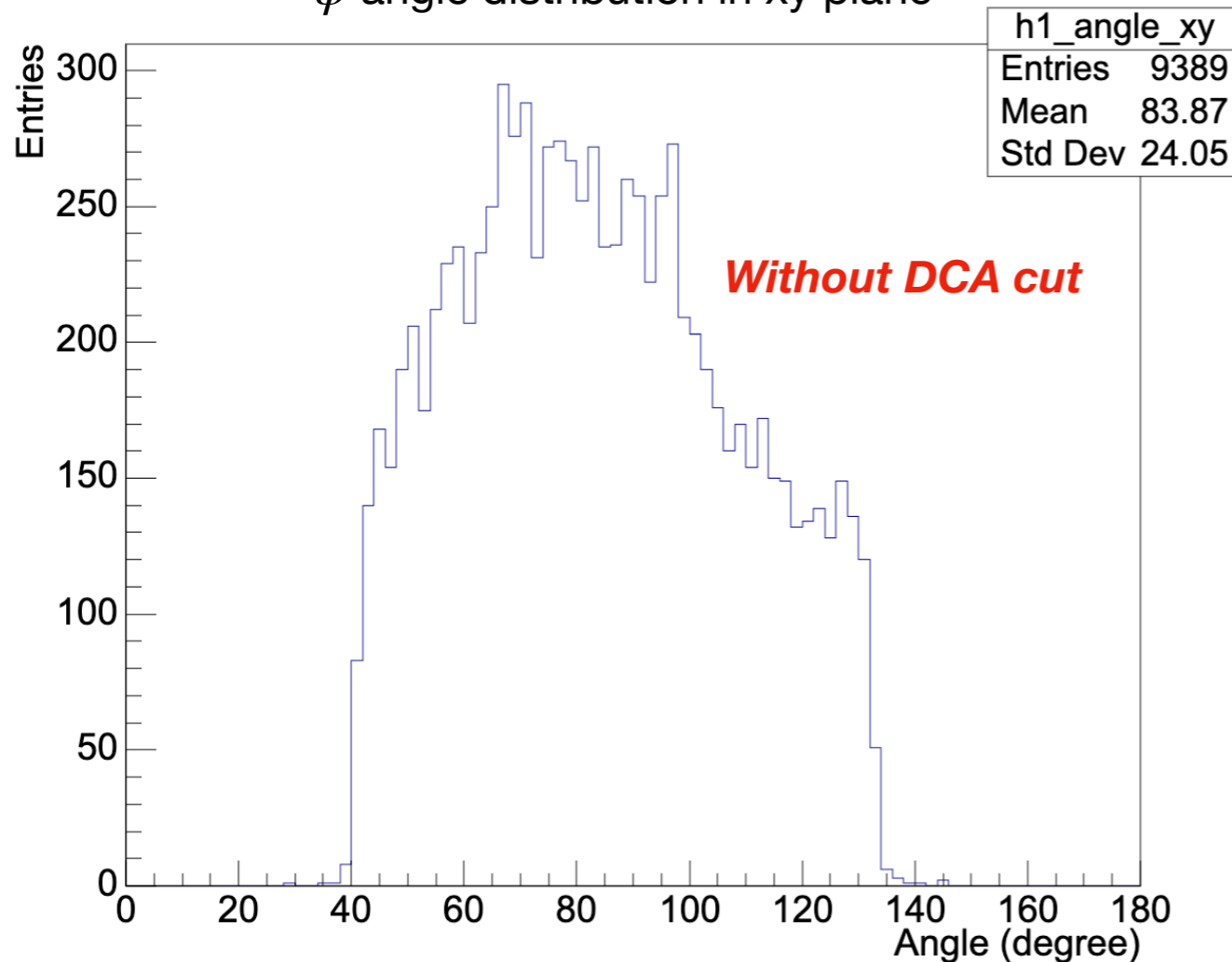


More on angle distribution

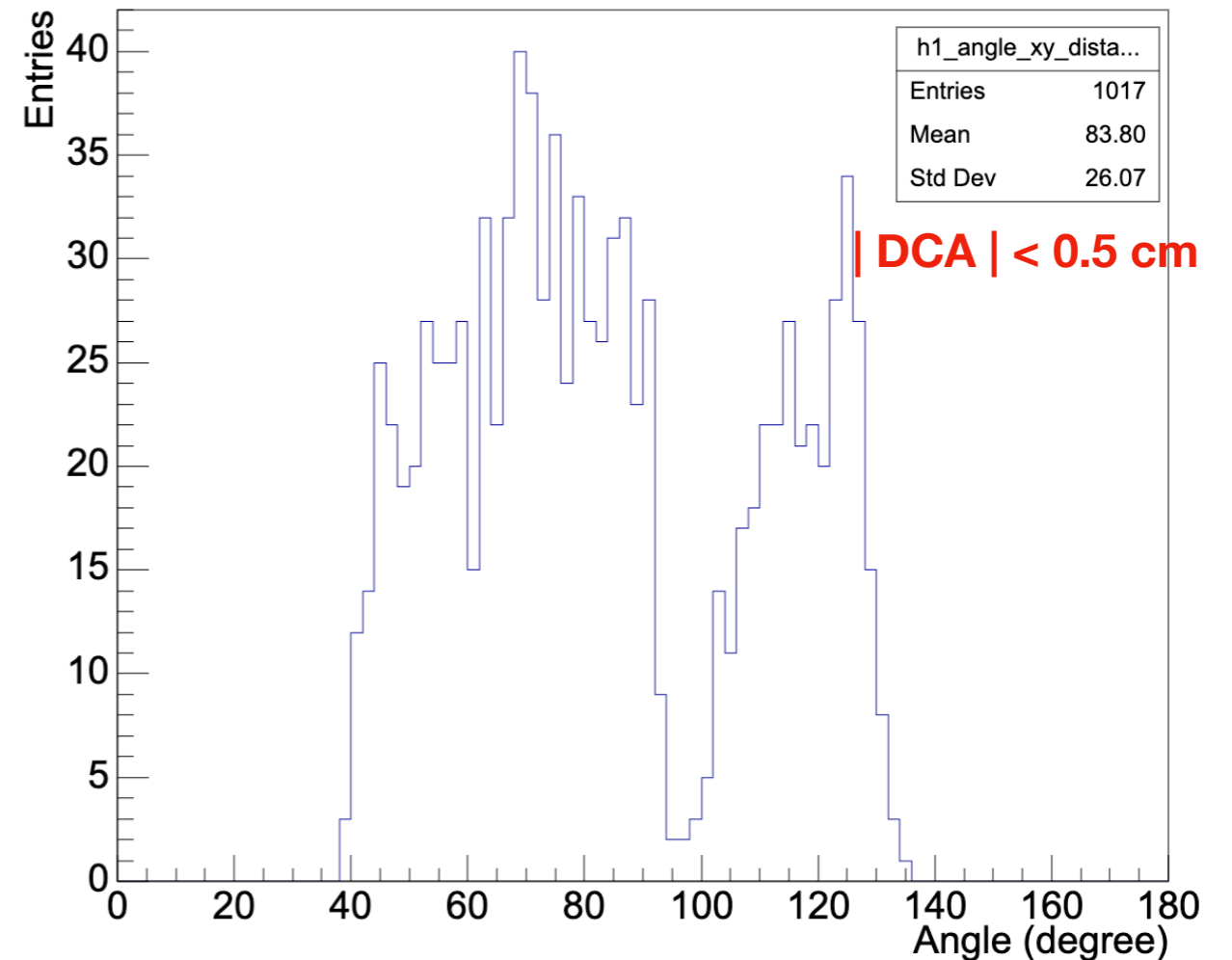


- The distribution of the ϕ angle (in xy plane) with a DCA cut.
 - $|DCA| < 0.5 \text{ cm}$

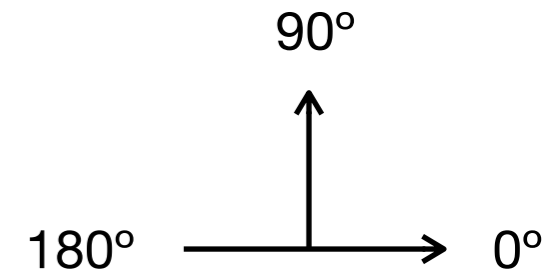
ϕ angle distribution in xy plane



ϕ angle distribution in xy plane w/ DCA cut

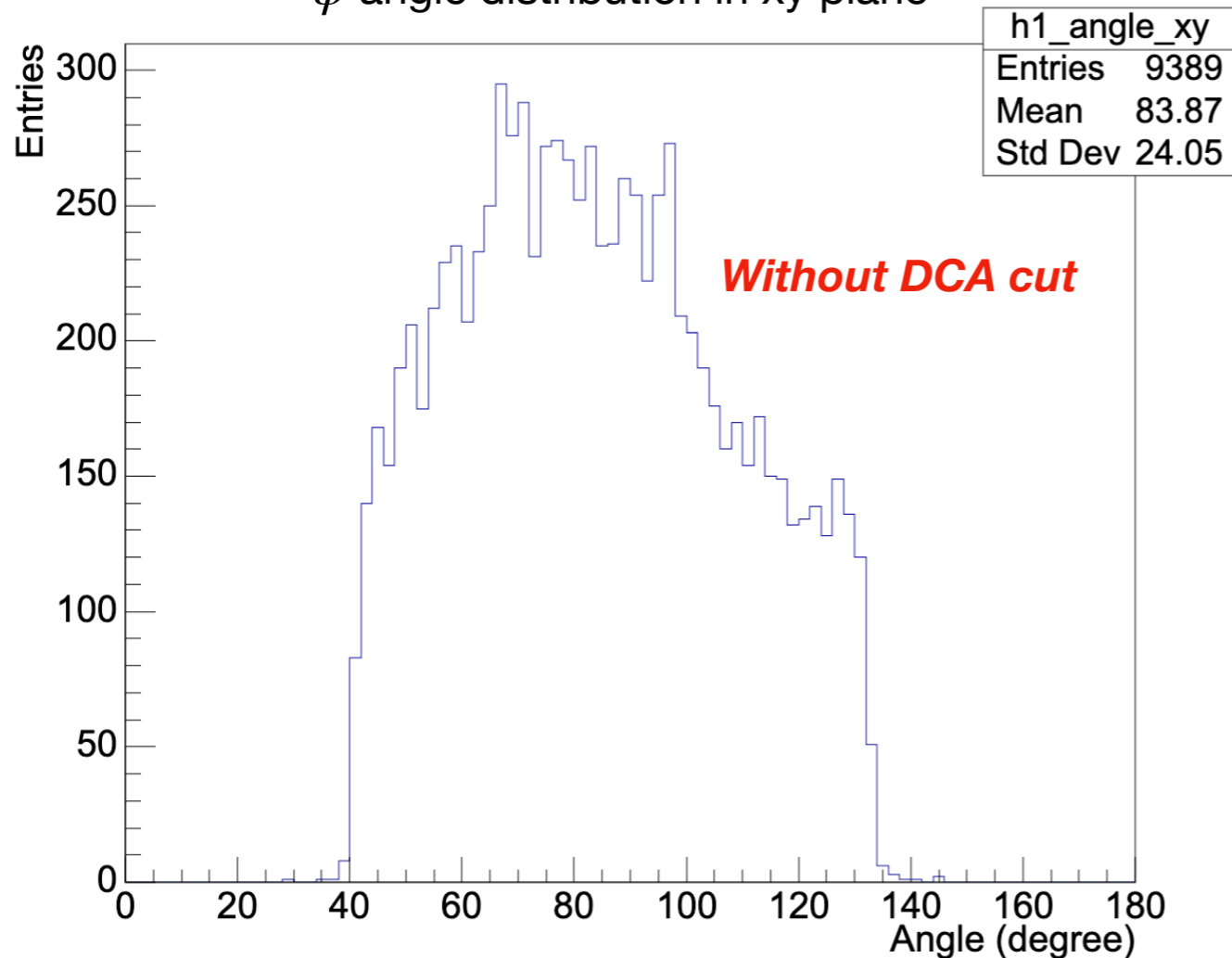


More on angle distribution

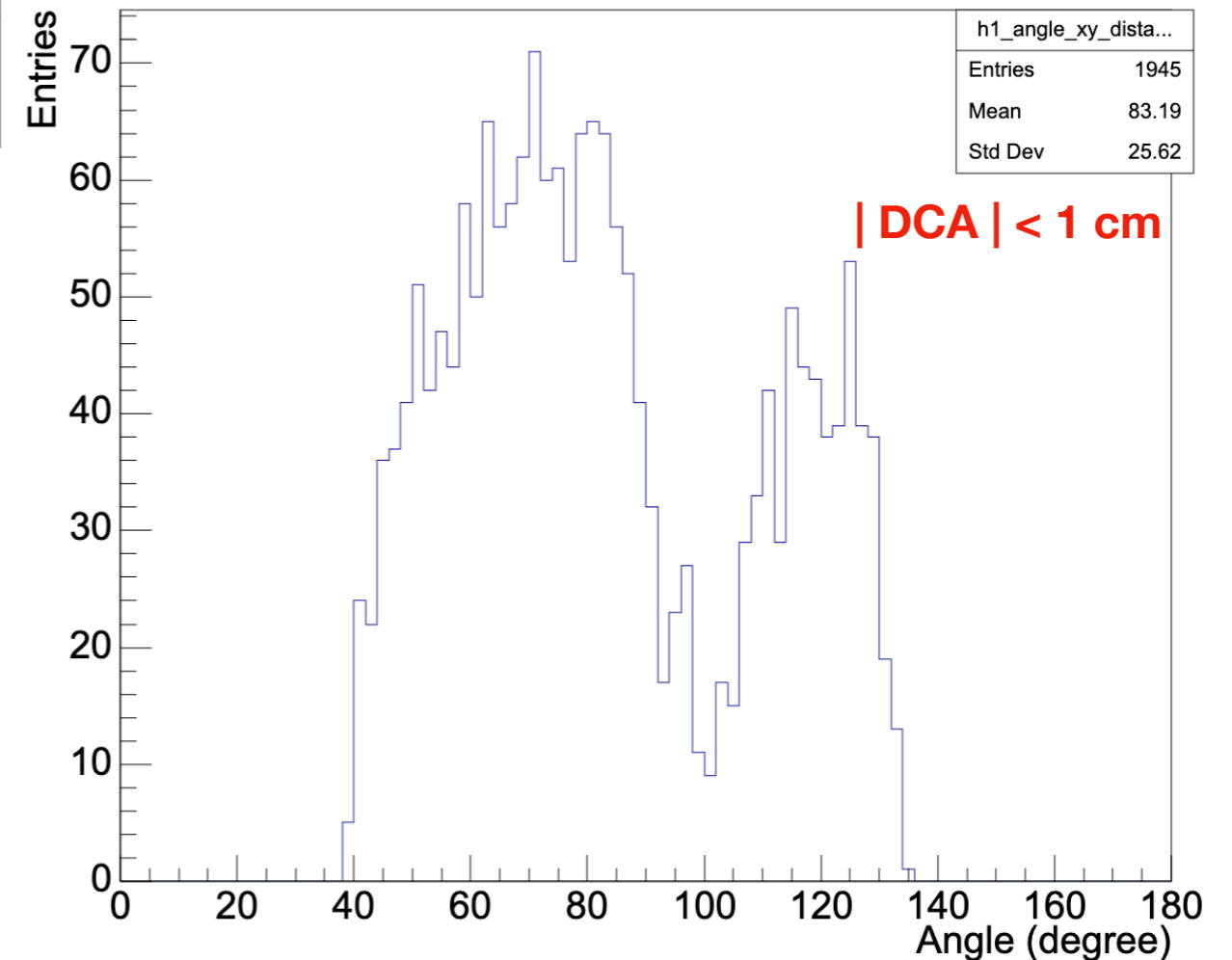


- The distribution of the ϕ angle (in xy plane) with a DCA cut.
 - $|DCA| < 1 \text{ cm}$

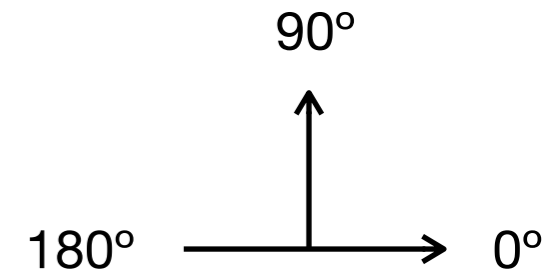
ϕ angle distribution in xy plane



ϕ angle distribution in xy plane w/ DCA cut



More on angle distribution



- The distribution of the ϕ angle (in xy plane) with a DCA cut.
 - $|DCA| < 2 \text{ cm}$
- Leak of

