



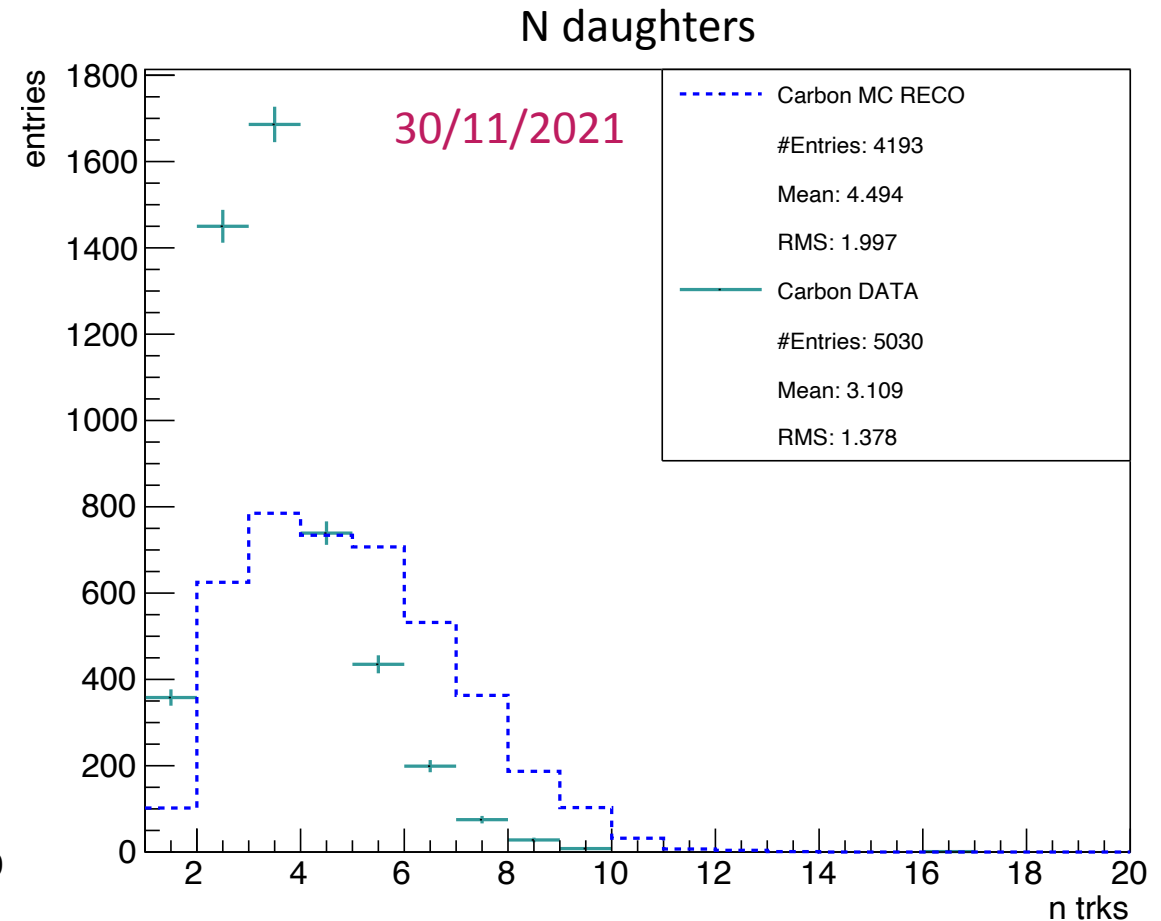
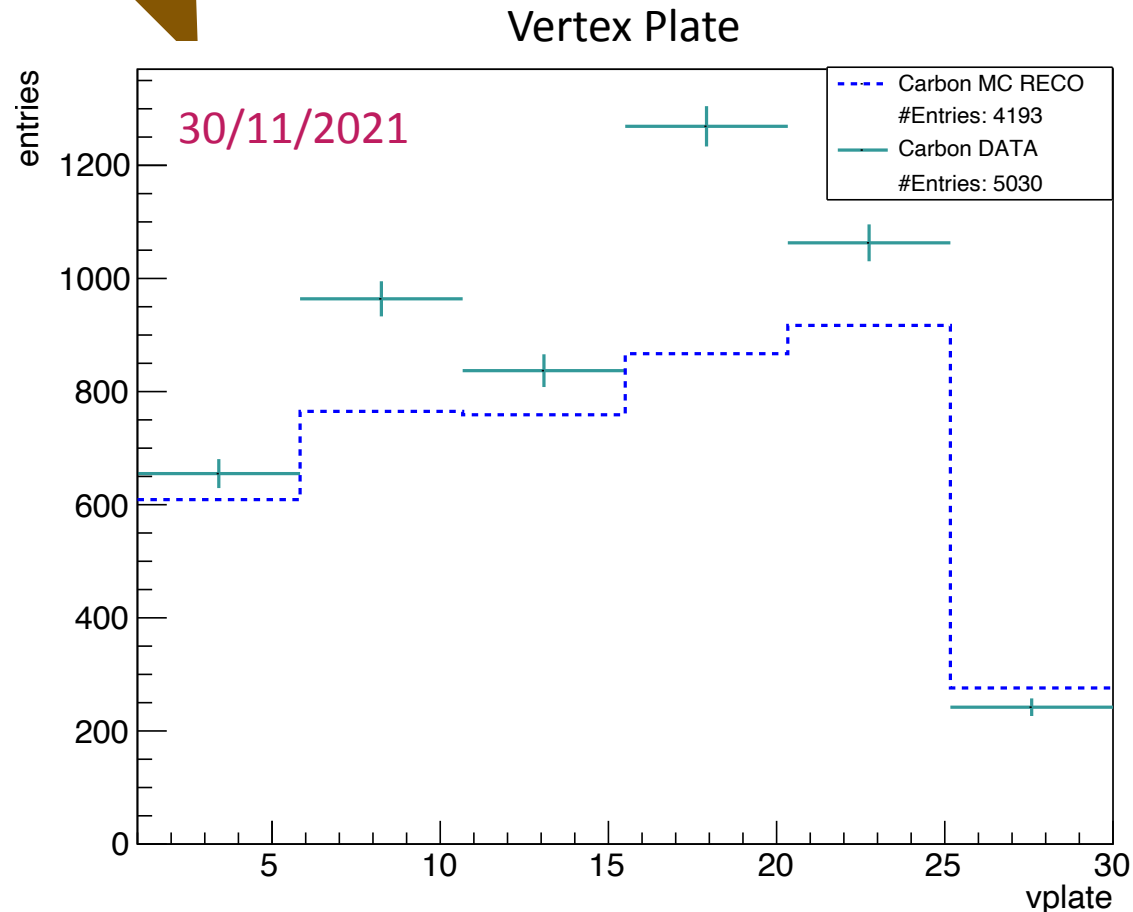
UPDATE ON THE ANALYSIS OF GSI1 ^{16}O (200 MeV ON C AND C_2H_4)

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Physics Meeting, ZOOM, 02/02/2022

GSI1 DATA vs MC RECO Comparison @ General Meeting



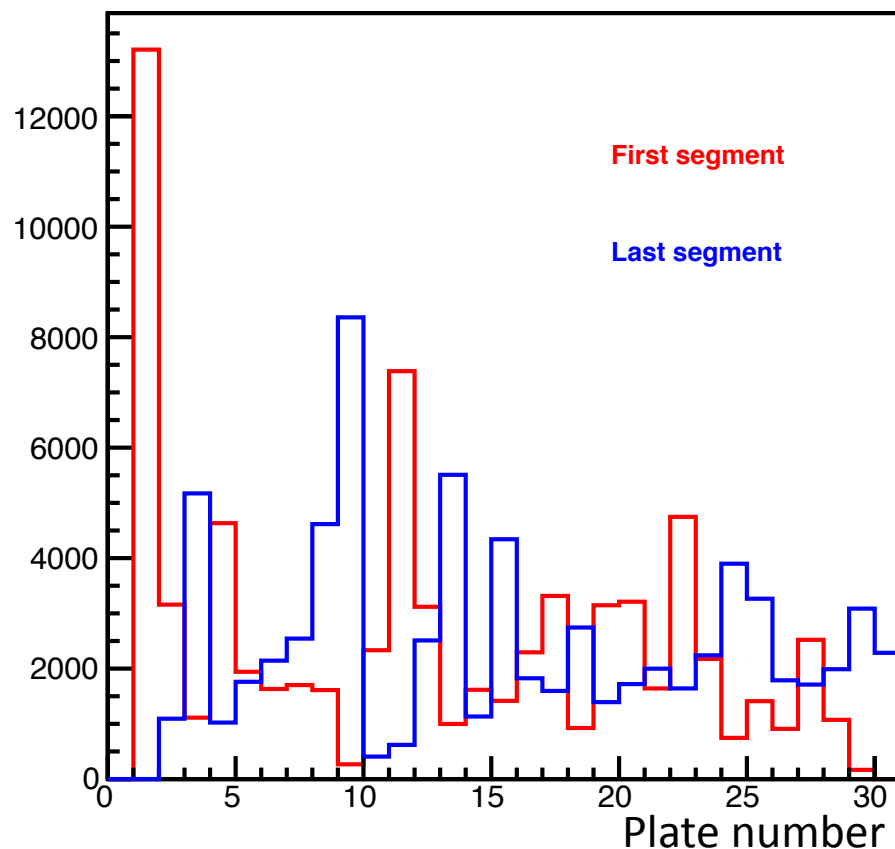
Distributions normalized to beam particles,
requirement of at least 3 tracks in the vertex.

In GSI1 (1mm C target) there were several discrepancies between data and reconstructed MC, that we didn't see in GSI2 (2mm C₂H₄ target).

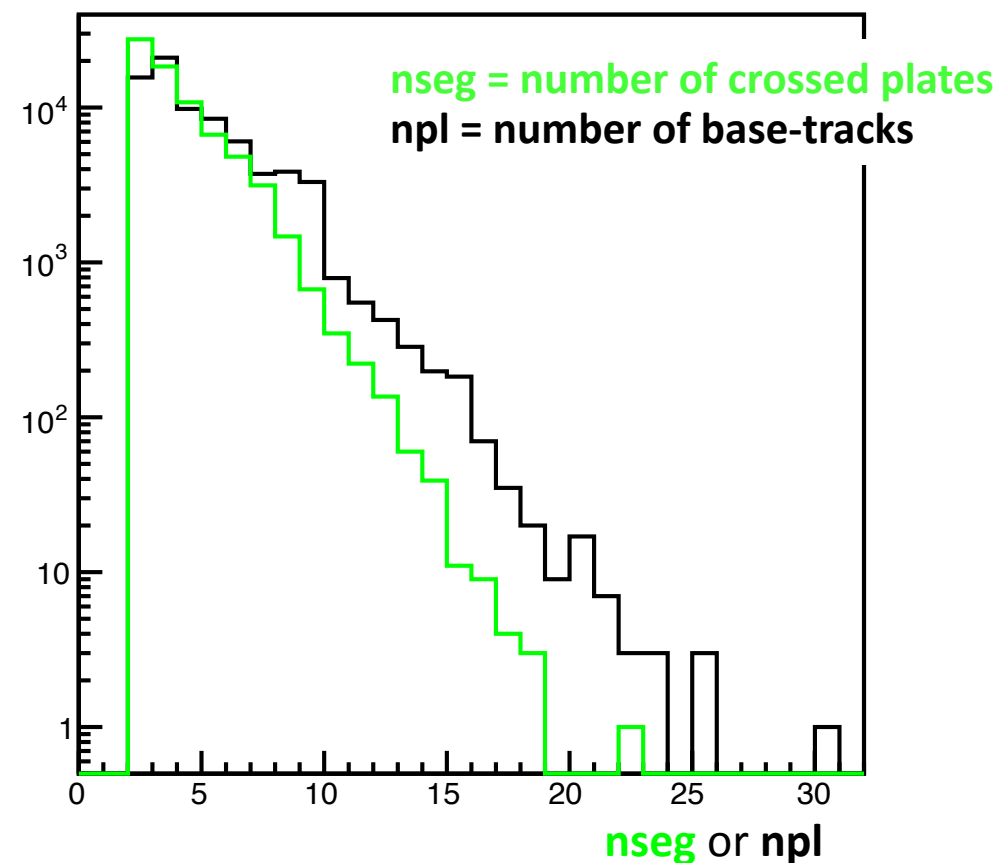
Hypothesis was that these discrepancies were due to alignment problems

GSI1 - S1 / BEFORE

First and last segment for “signal” tracks ($\theta_{X/Y} < 0.05rad$)

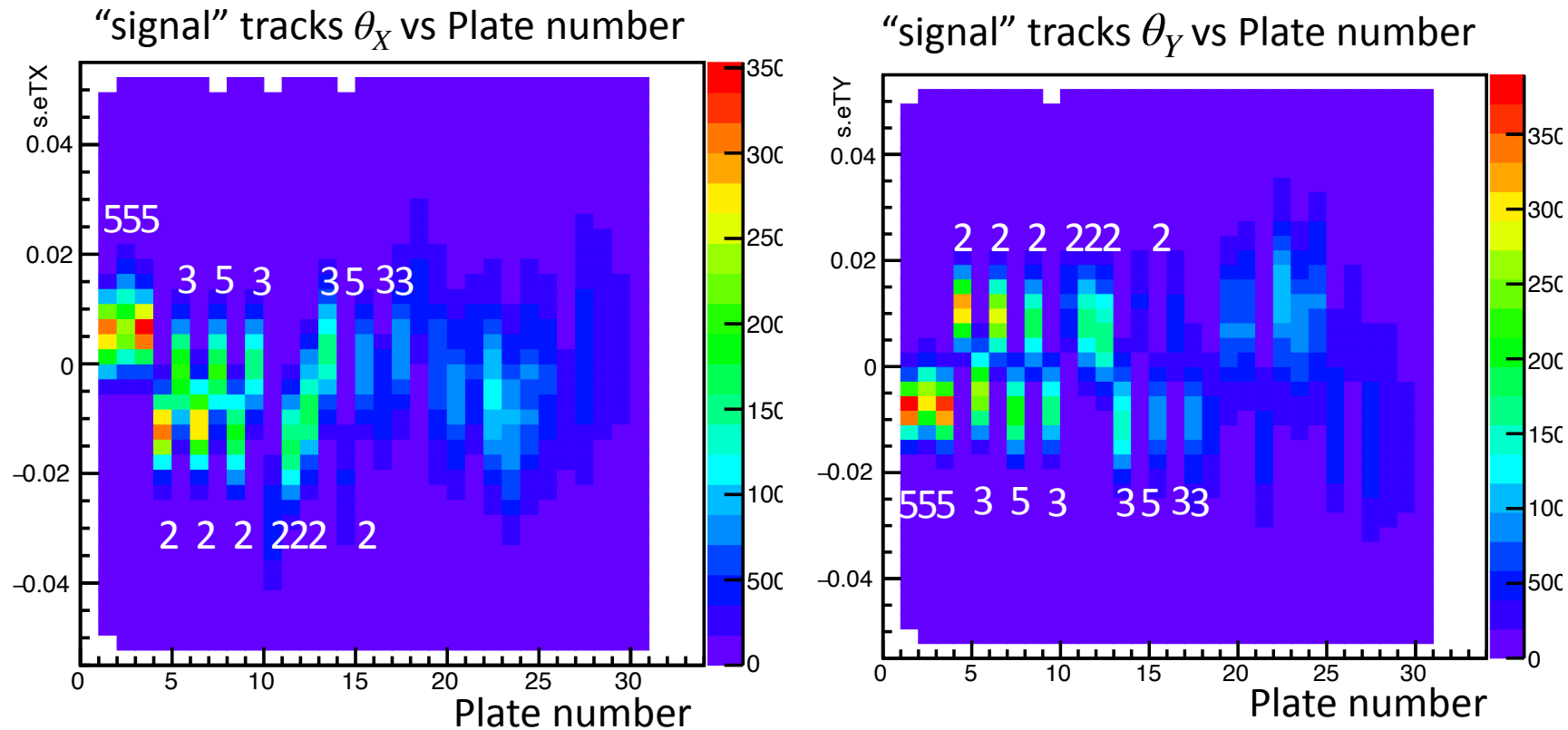


Number of segments or crossed plates for “signal” tracks ($\theta_{X/Y} < 0.05rad$)



- Several tracks interrupting and starting again even though alignment seemed to be fine
- Many short tracks ($\sim 10^4$ of only 2 base-tracks, ~ 10 of 15 base-tracks)

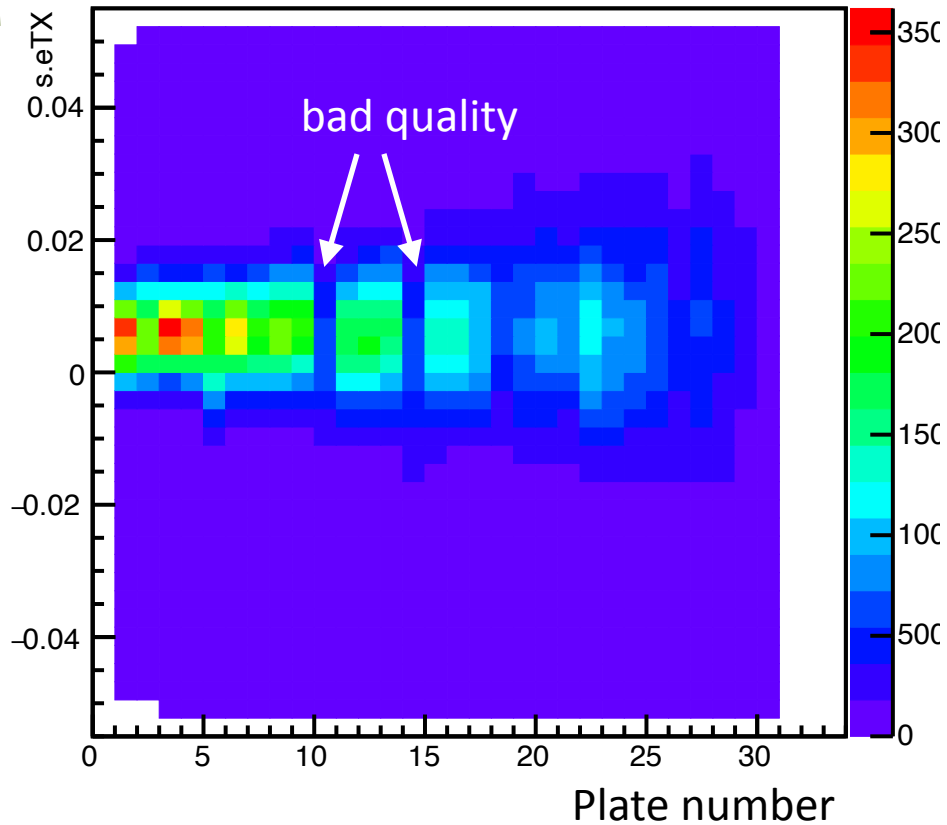
GSI1 - S1 / BEFORE



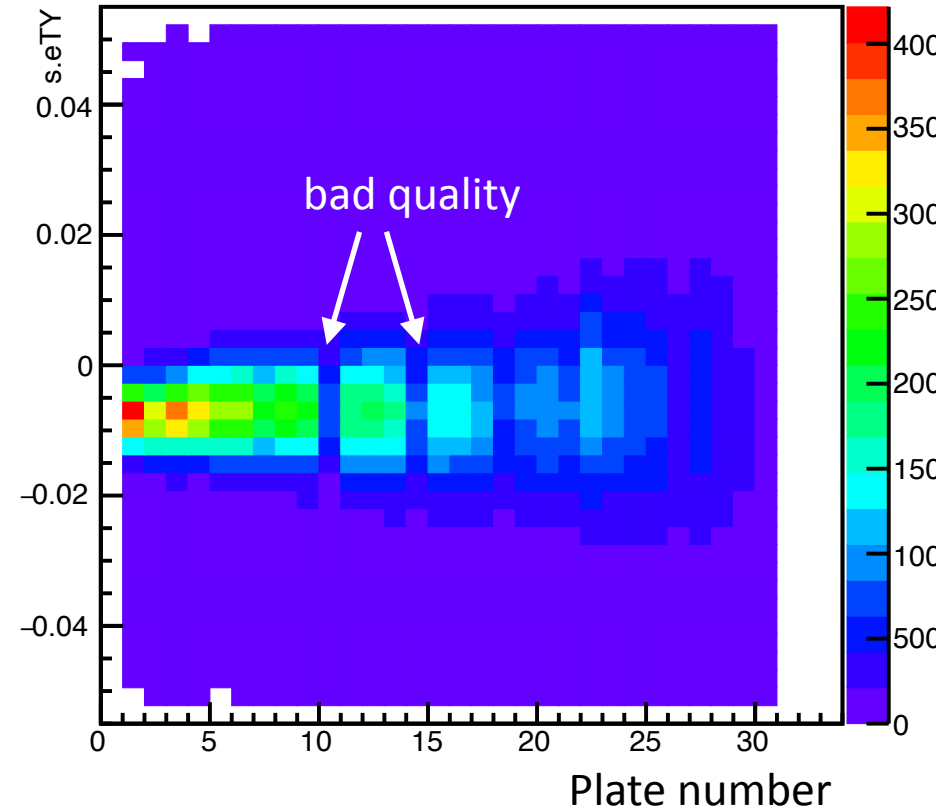
- Problem not with coordinates alignment, but with angle distributions! The distribution of $\theta_{X/Y}$ of “signal” tracks seemed to be centered on a different mean angle in each plate, probably due to scanning done on different microscopes
- Differences between consecutive base-tracks up to ~ 20 mrad, out of tolerances $\rightarrow$ match between consecutive base-tracks not found

GSI1 - S1 / AFTER θ CORRECTION

“signal” tracks θ_X vs Plate number



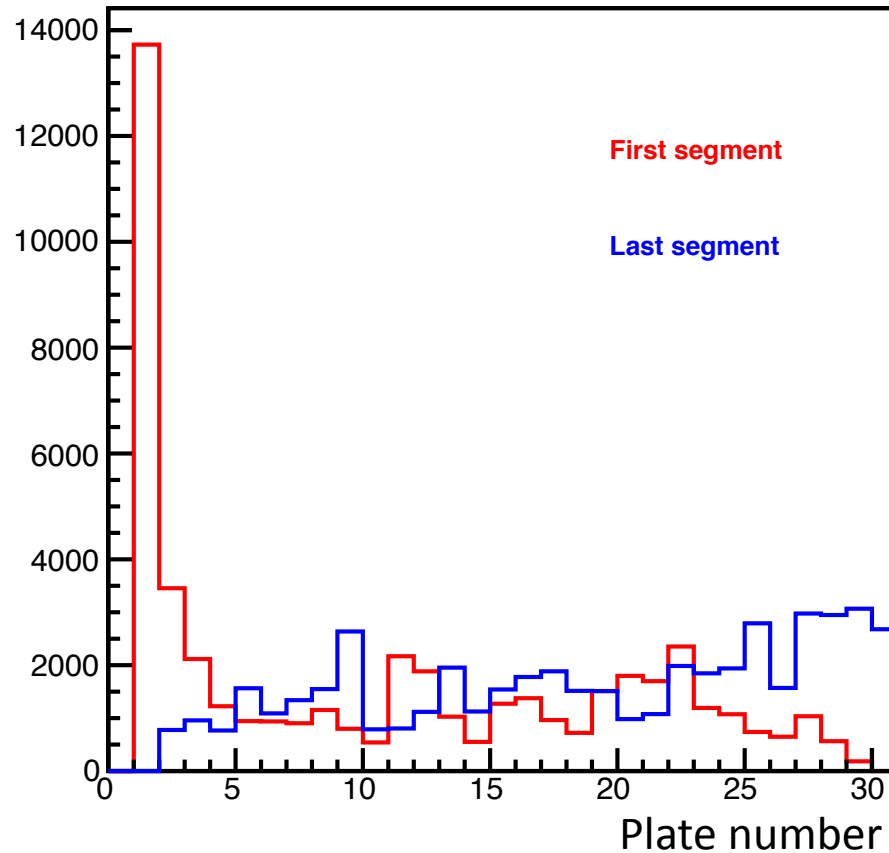
“signal” tracks θ_Y vs Plate number



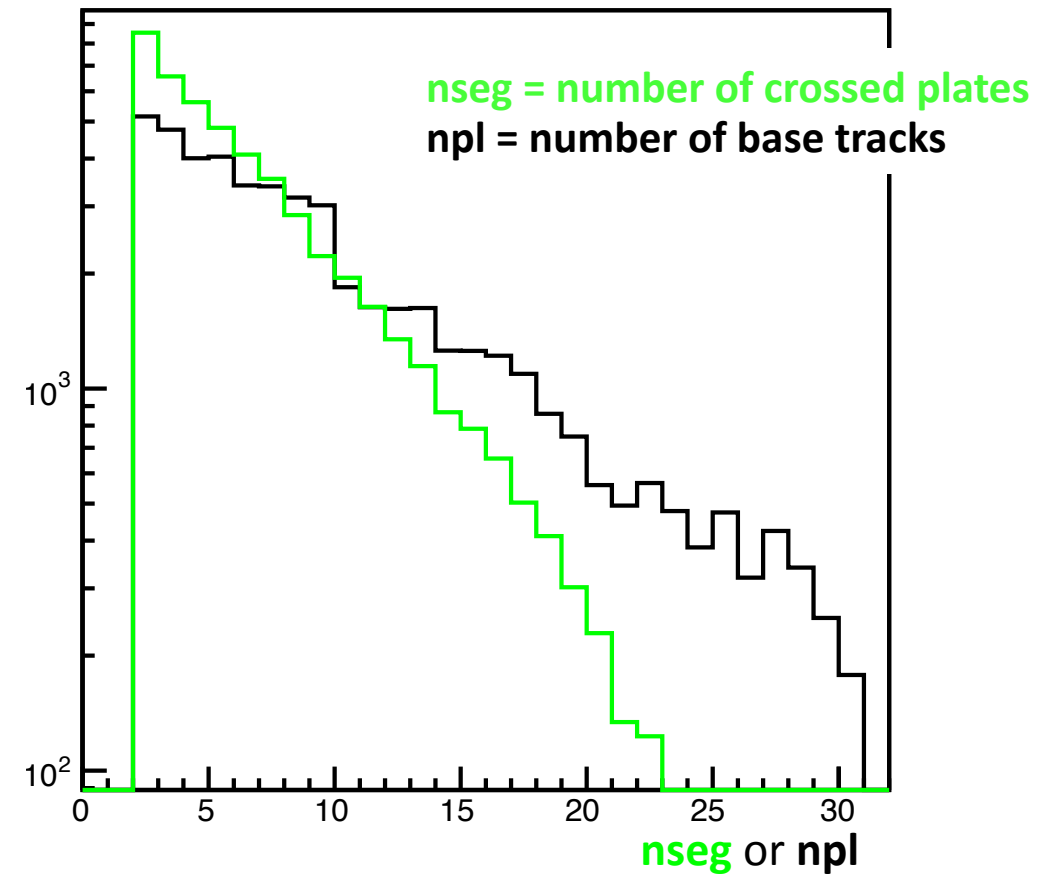
- Angles correction implemented in the last step of global alignment
- Now all distributions are centered to the mean of the first plate

GSI1 - S1 / AFTER θ CORRECTION

First and last segment for “signal”
tracks ($\theta_{X/Y} < 0.05rad$)



Number of segments or crossed plates
for “signal” tracks ($\theta_{X/Y} < 0.05rad$)



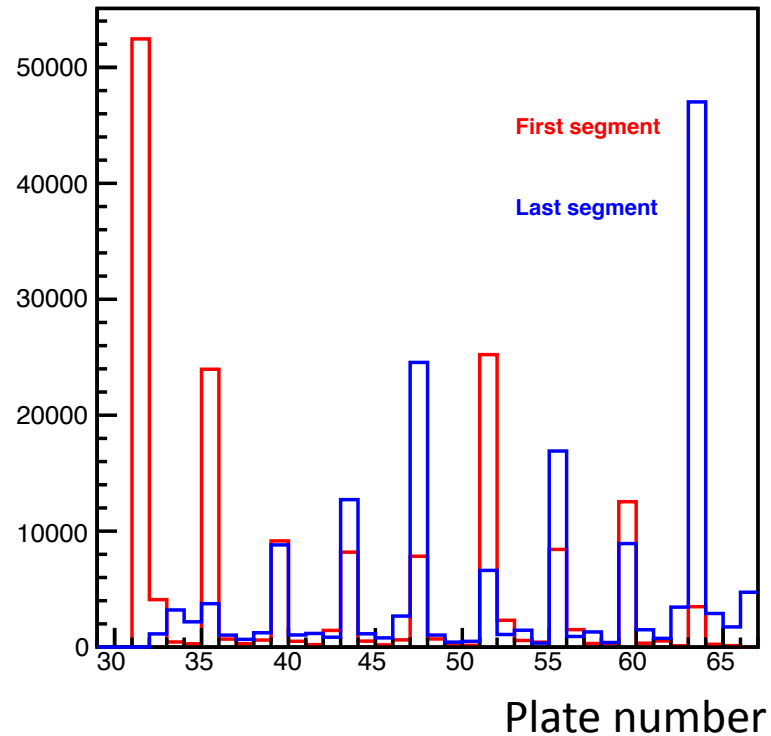
- Tracking significantly improved!
- $\sim 10^3$ tracks made of 15 base-tracks

GSI1 - S2 / Another example of improvements

BEFORE



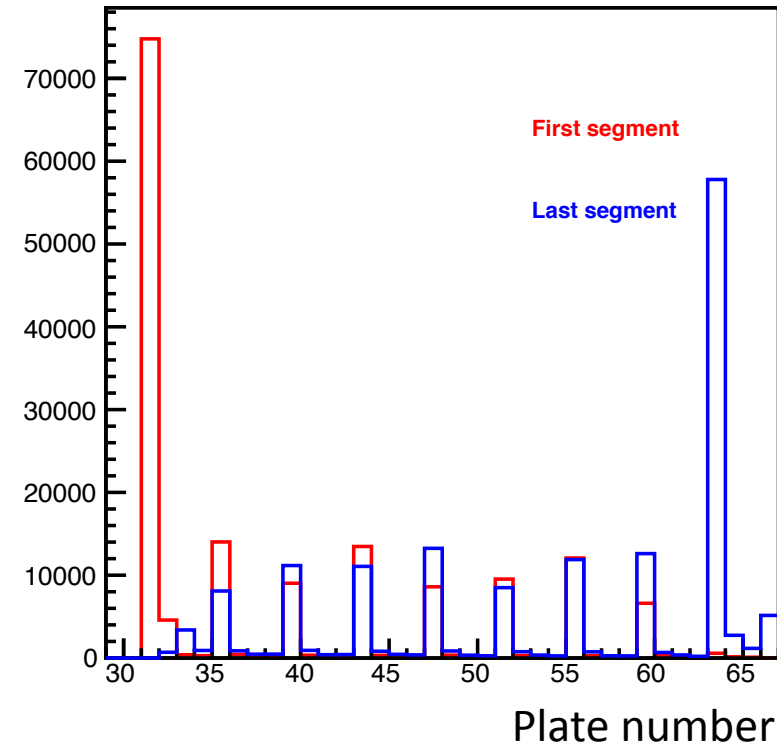
First and last segment for all tracks



AFTER



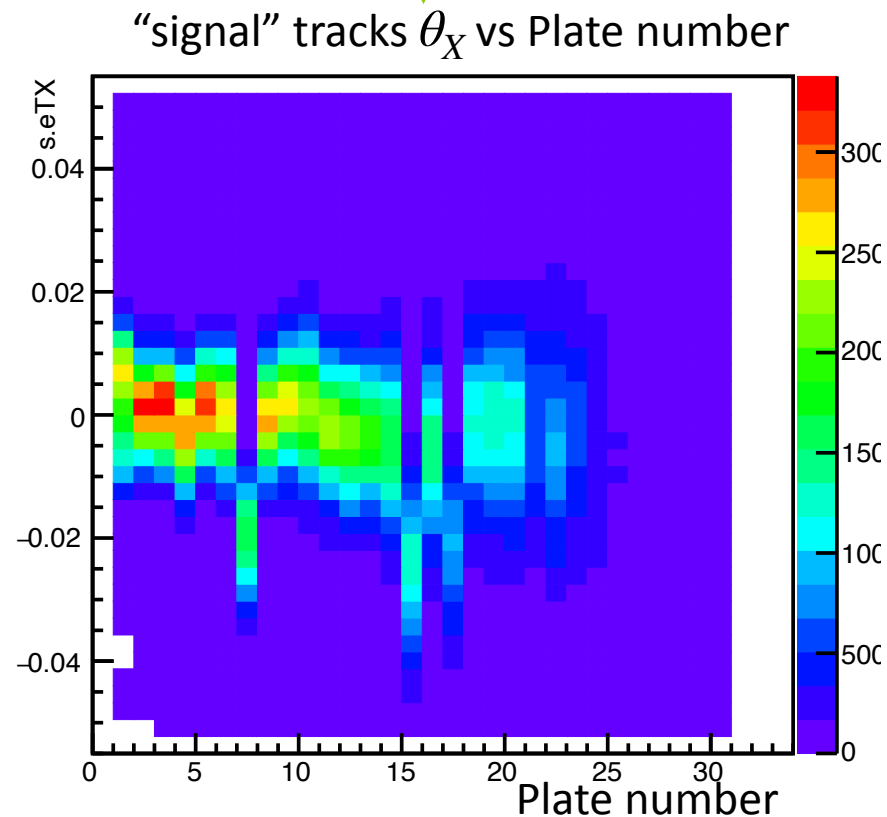
First and last segment for all tracks



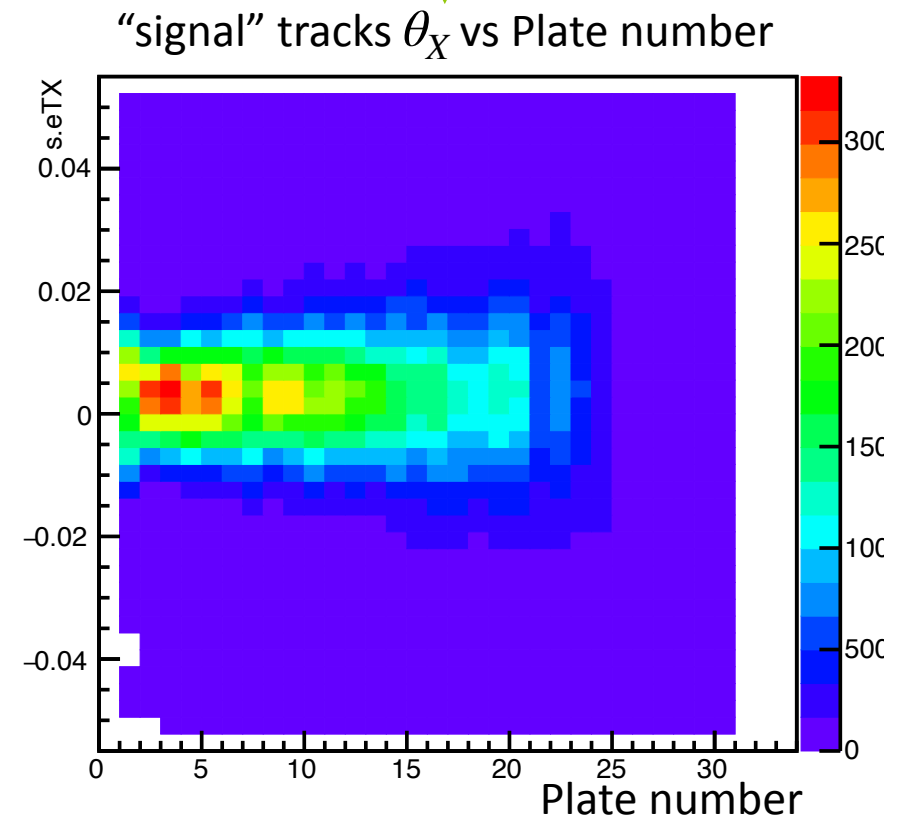
GSI2 - S1

- The same effect was less critical in GSI2 (2mm C₂H₄) because the emulsion films were scanned all on the same microscope with few exceptions

BEFORE



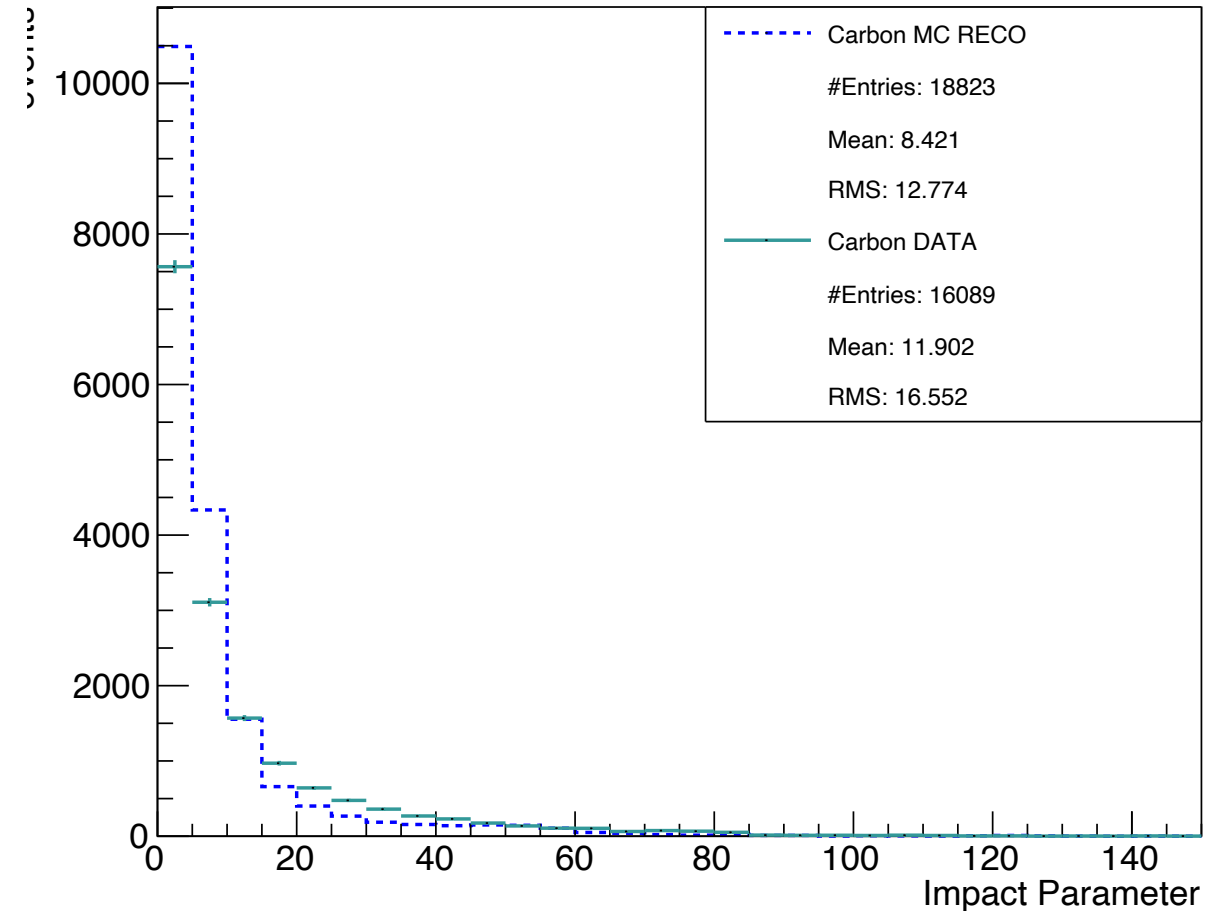
AFTER



GSI1 - Number of reconstructed vertices ($n \geq 3$) and IP

n = number of tracks (parent + daughters)

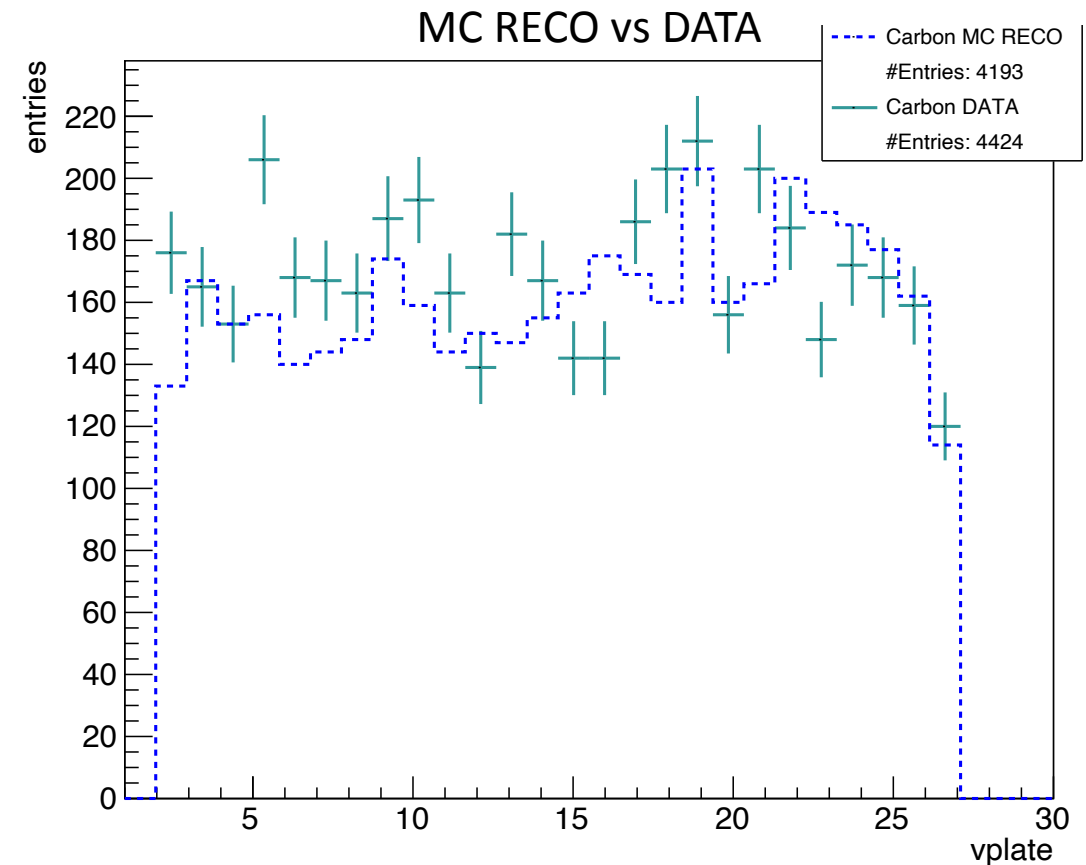
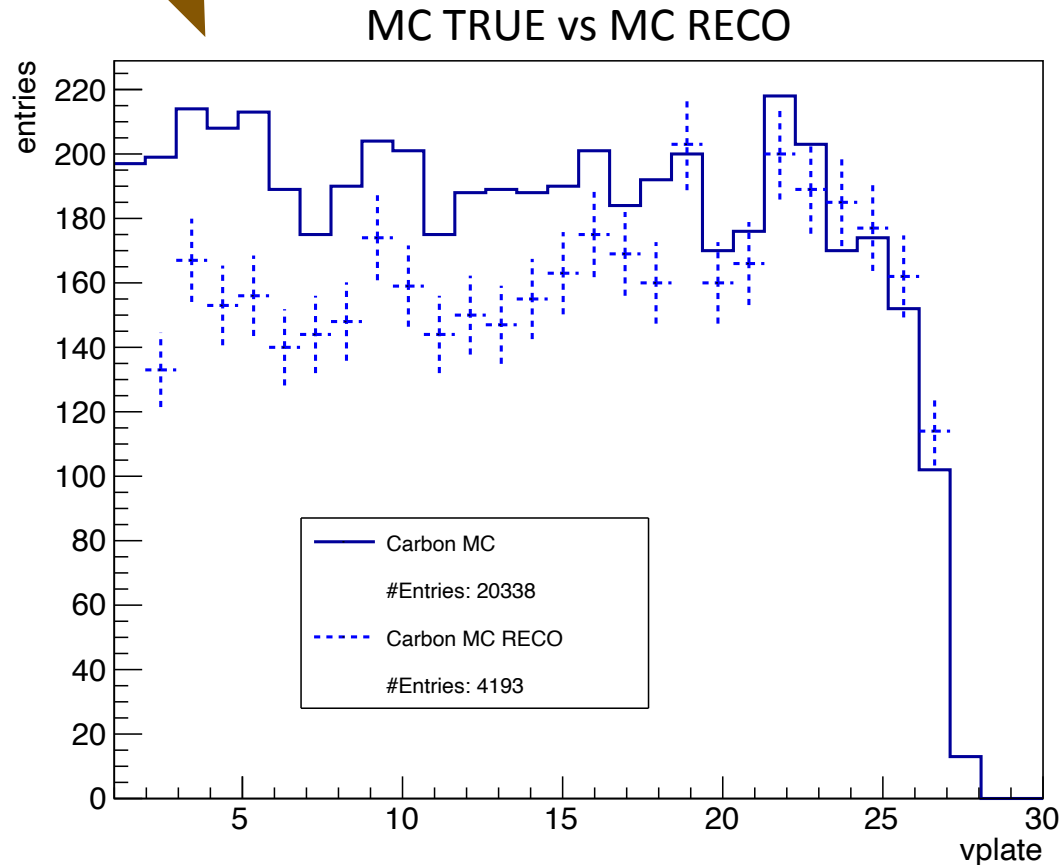
		GSI1 C target
MC	Beam particles	18990
	True vertices	5031
	Reco vertices	4193
DATA	Beam particles	19375
	Data vertices	4424



- Fine tuning MC: smearing effects to be implemented in MC to reproduce small misalignments in positions

GSI1 - Vertex Plate distribution

Distributions normalized to beam particles, requirement of at least 3 tracks in the vertex.

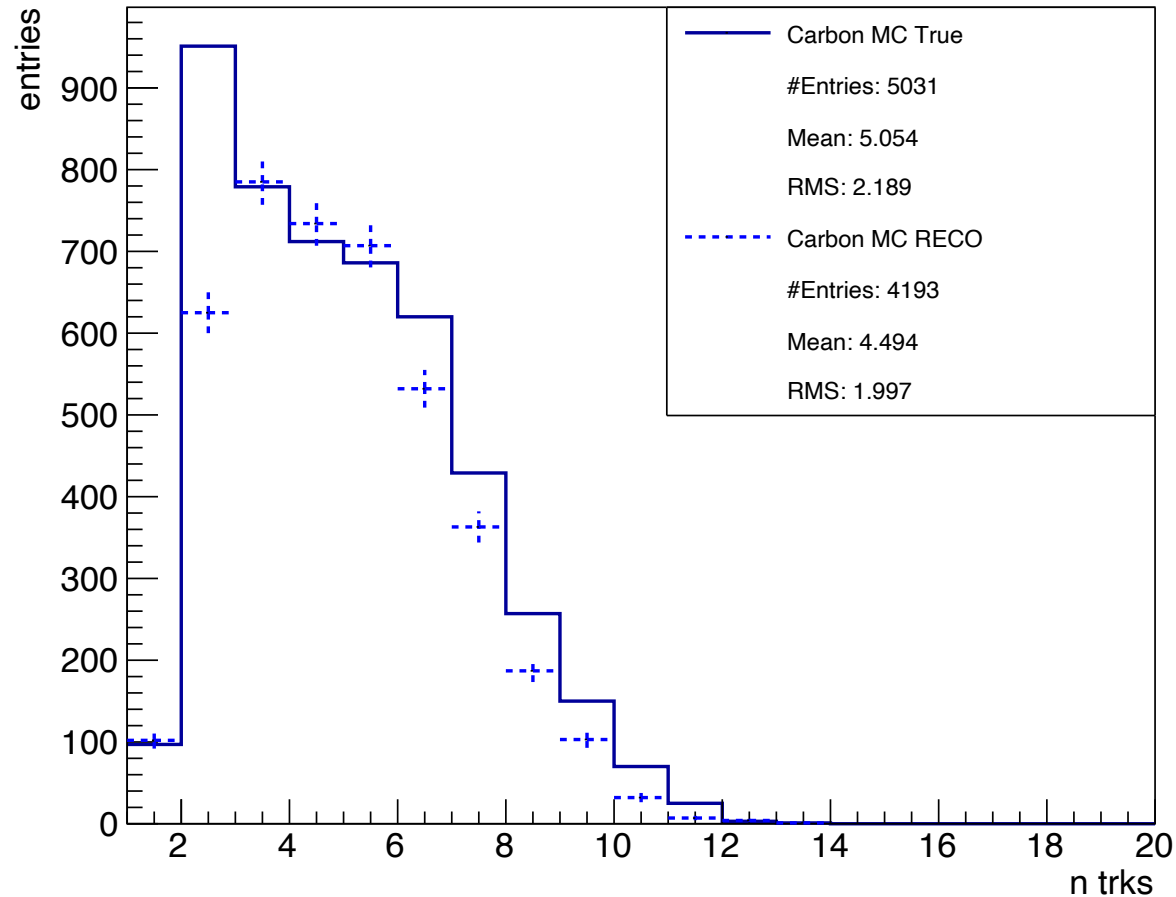


- Since at least 3 tracks are required, efficiencies increases when the probability of fully reconstruct the incoming oxygen is higher.

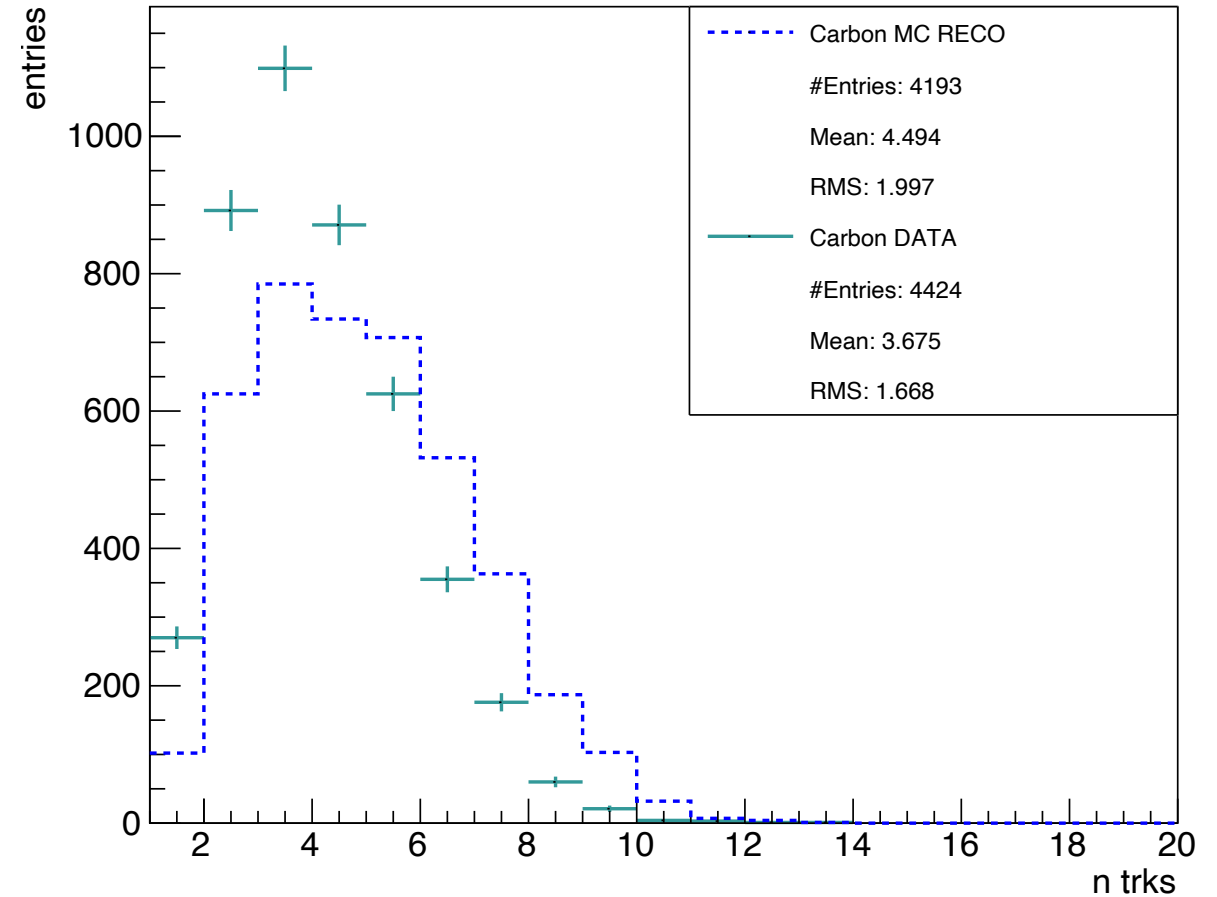
GSI1 - Fragments' multiplicity distribution

Distributions normalized to beam particles, requirement of at least 3 tracks in the vertex.

MC TRUE vs MC RECO



MC RECO vs DATA

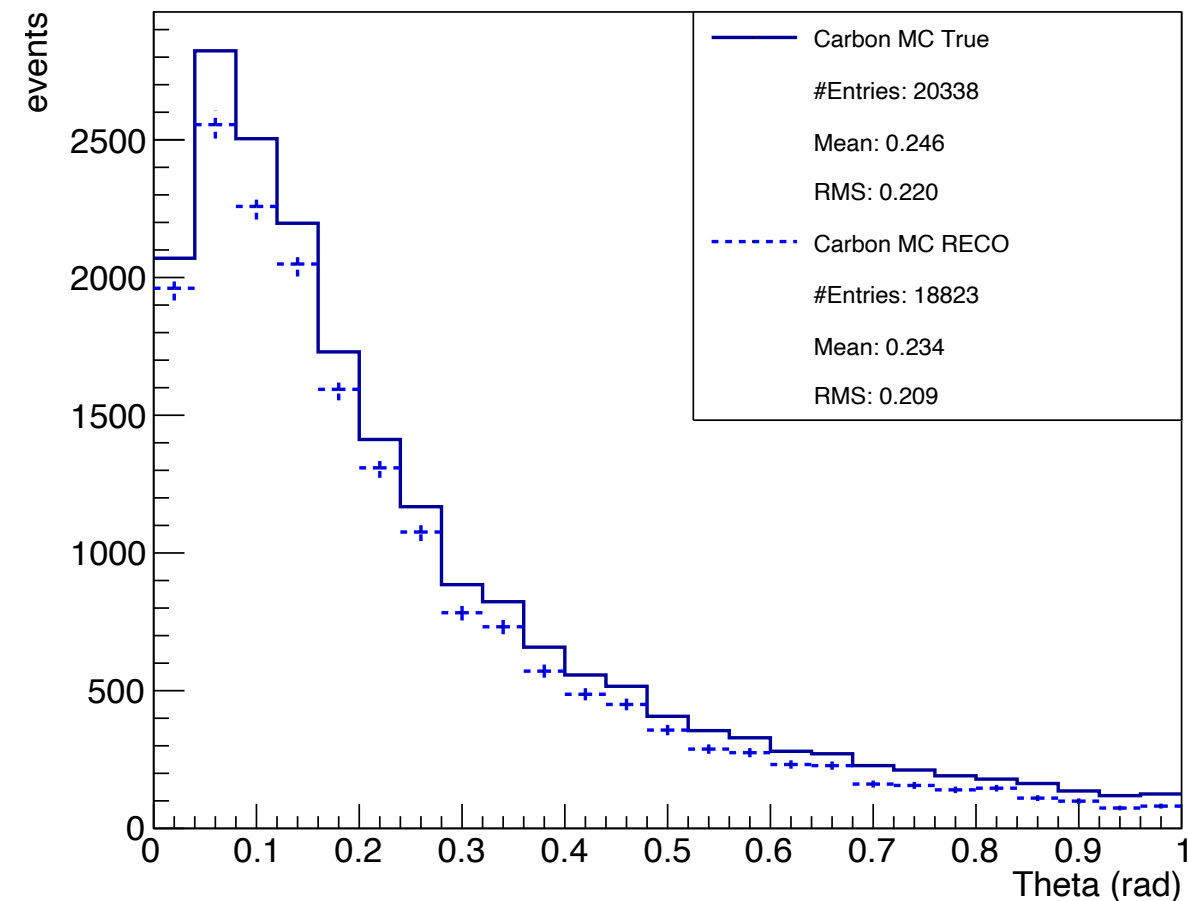


- The number of reconstructed vertices is near to the expected one, but there's still space to improve vertex multiplicity

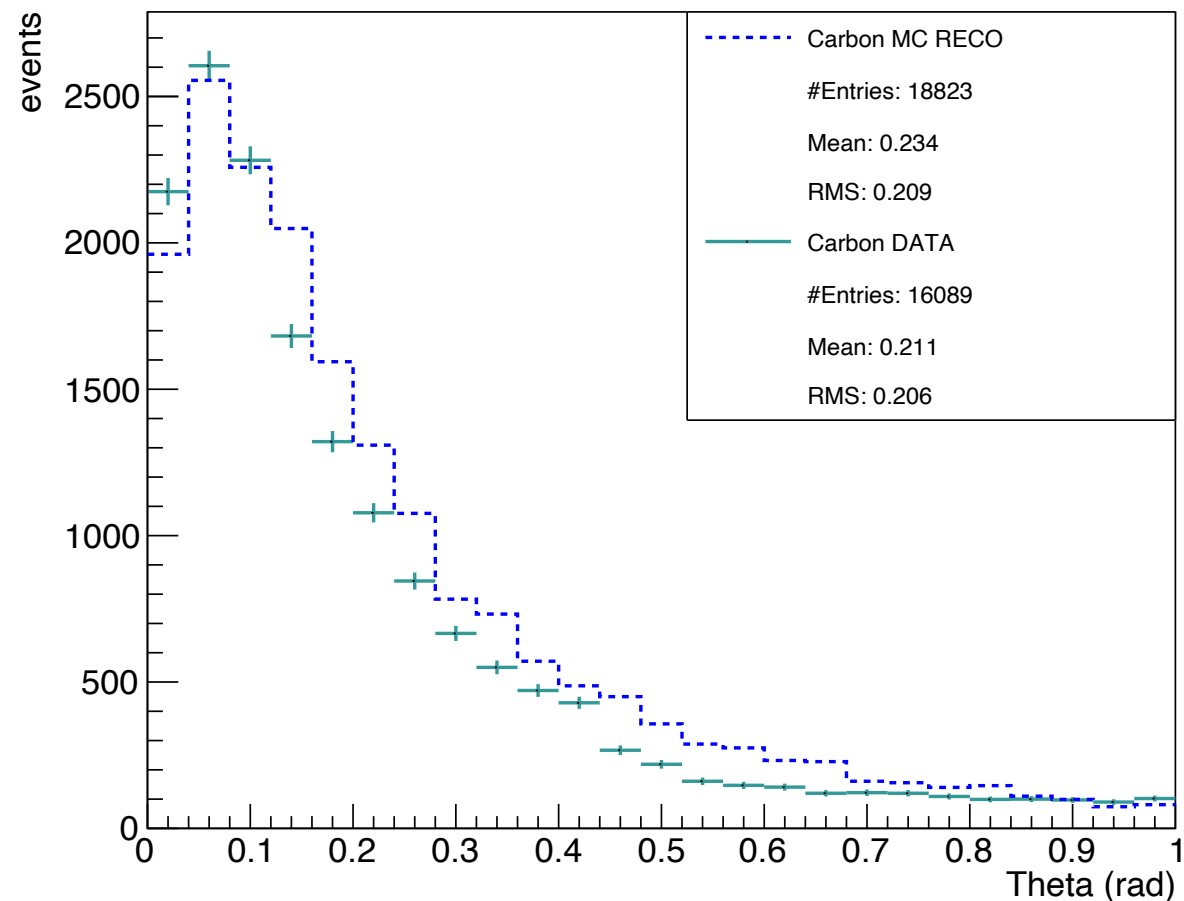
GSI1 - Fragments' angular distribution

Distributions normalized to beam particles, requirement of at least 3 tracks in the vertex.

MC TRUE vs MC RECO

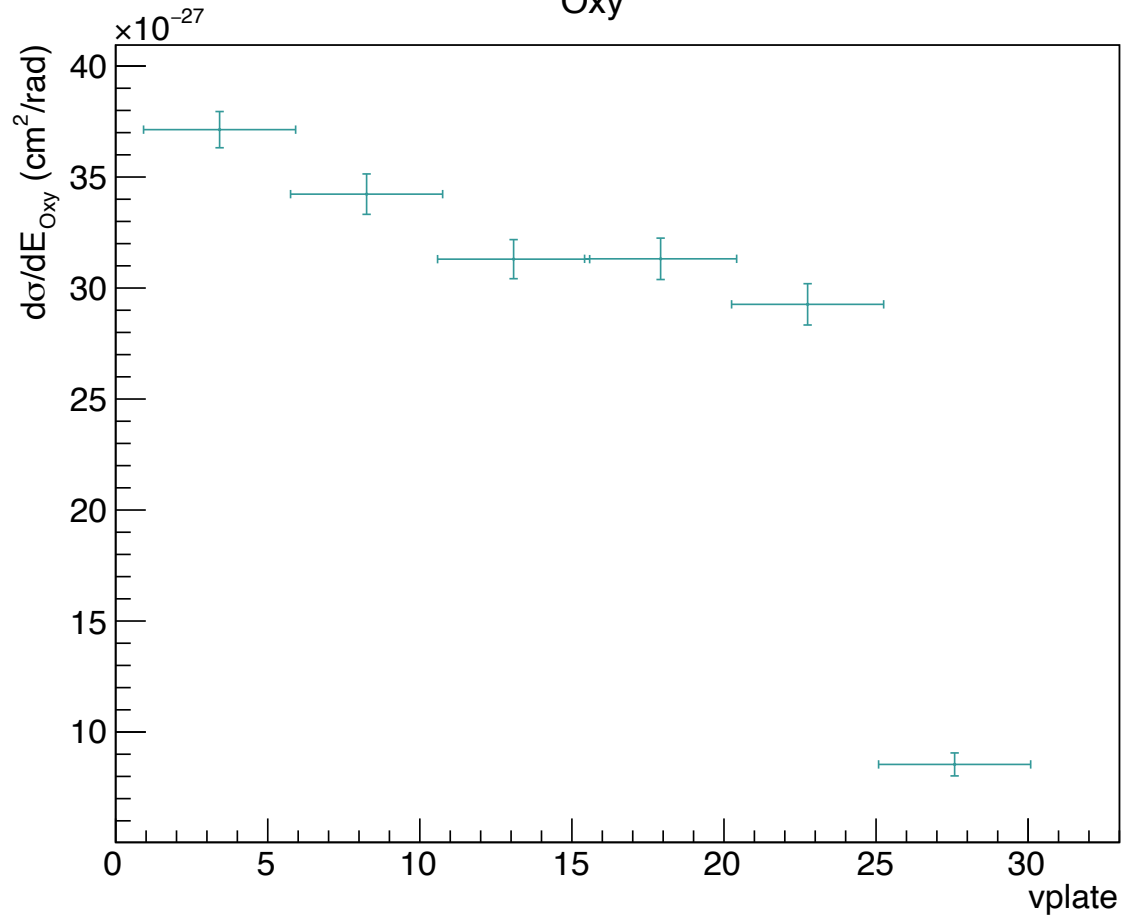


MC RECO vs DATA

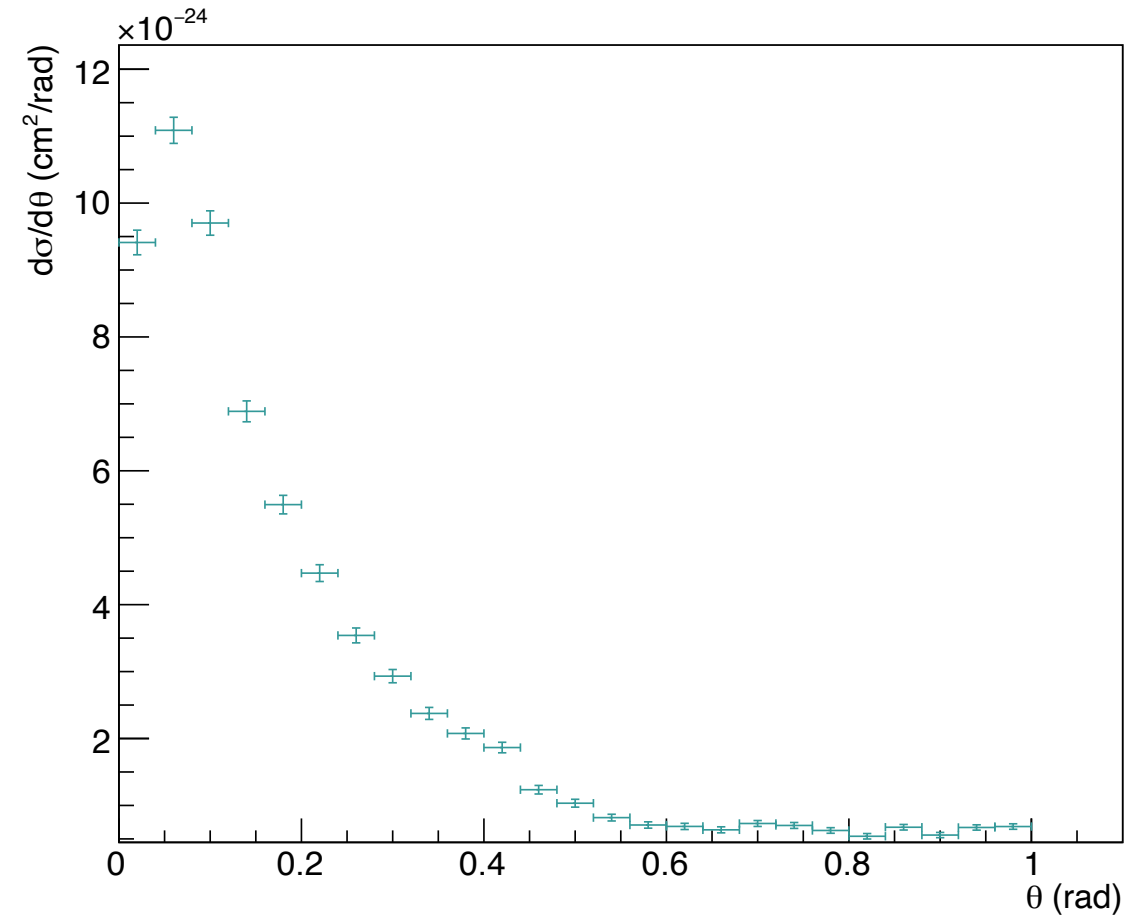


GSI1 - Preliminary Cross Section evaluation

$d\sigma/dE_{\text{Oxy}}$ Carbon



$d\sigma/d\theta$ Carbon



Conclusions

- Found the reason of reconstruction problems in GSI1
 - New procedure to correct angles
 - Procedure applied to GSI1: **tracking significantly improved**
- Work in progress on MC and DATA for efficiency evaluation in order to provide the first **cross section measurement**

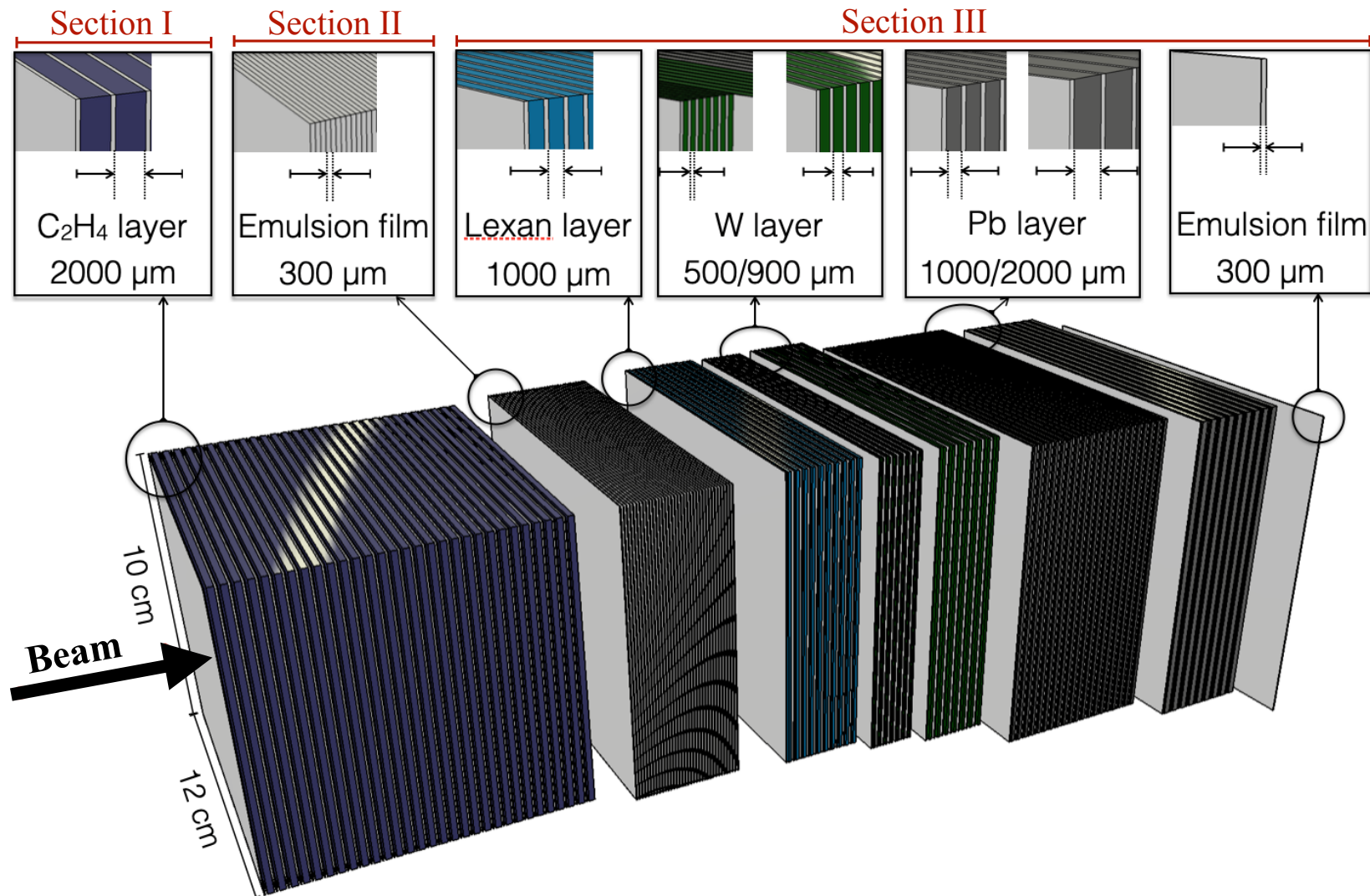


THANK **Y**OU!



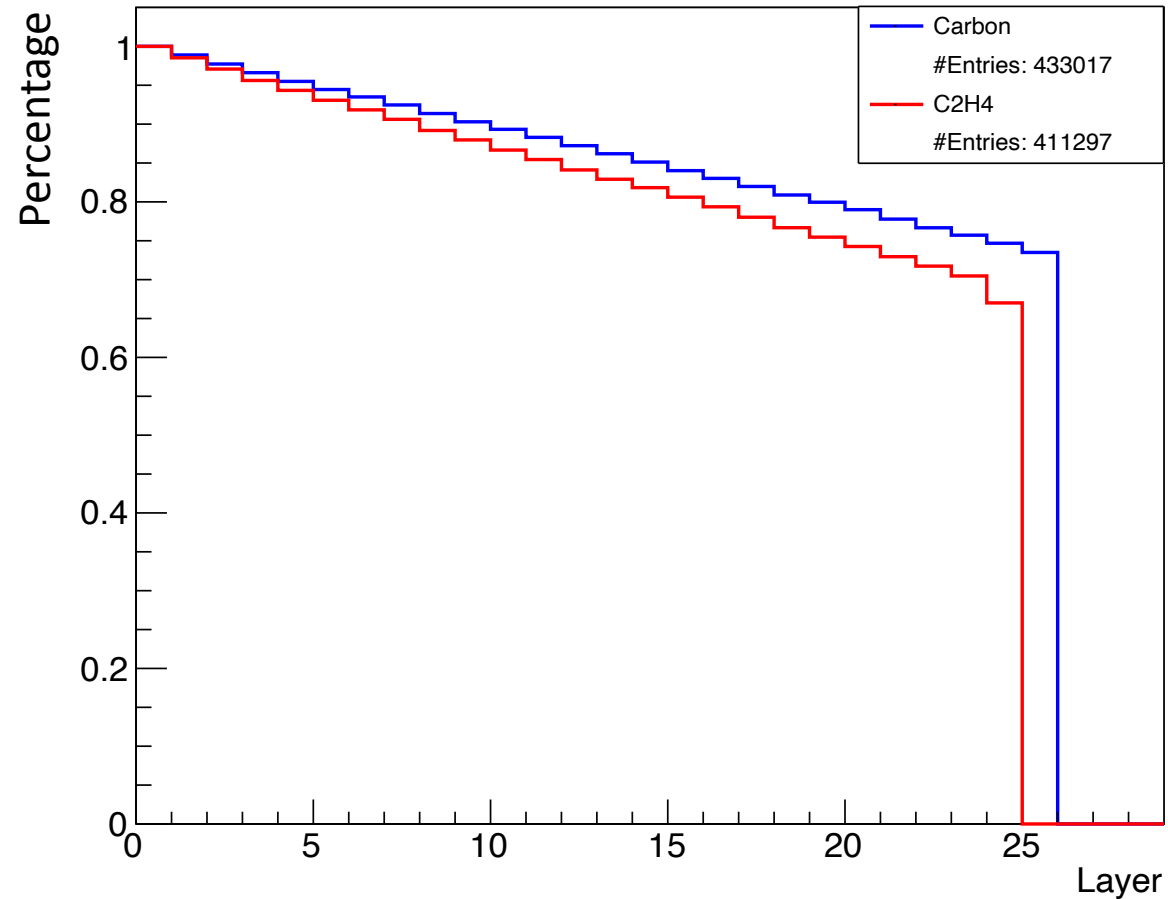
BACK UP SLIDES

Detector Structure



Mean Oxygen Kinetic Energy per layer distribution (MC)

Surviving Oxygens per layer



Mean Oxy Ekin per nucleon in each layer

