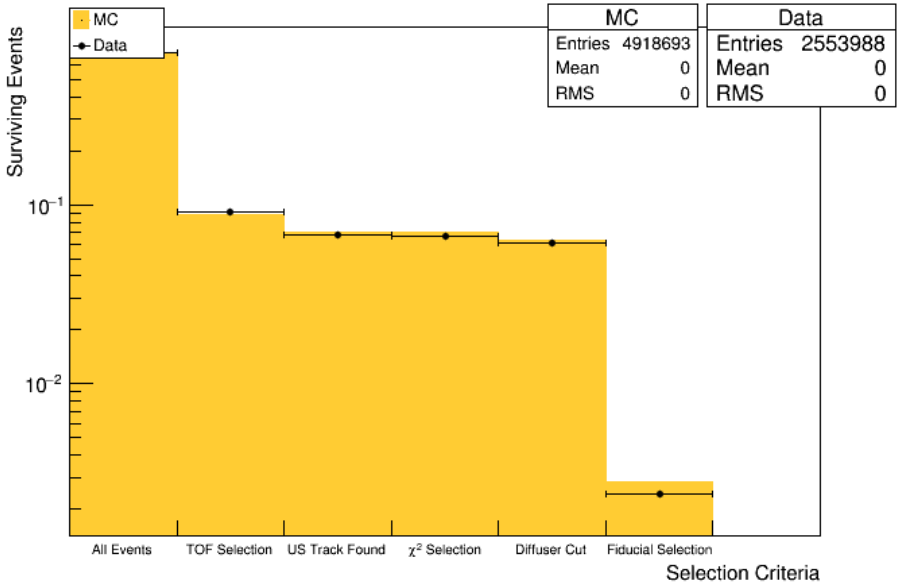
MCS in LH_2, Field-off

Outline

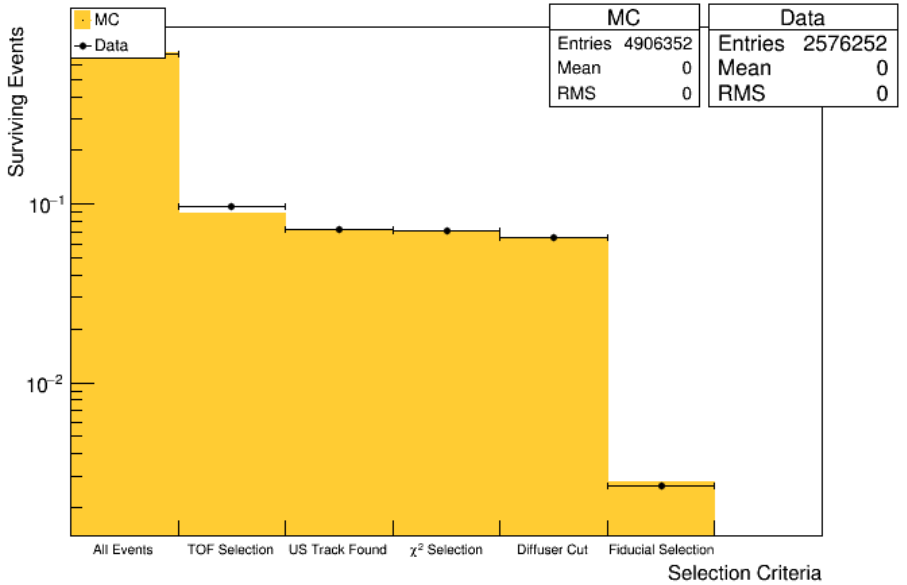
- Selection, MC/Data
- Final sample, tracker parameters for MC/Data
- Energy calculations
- Alignment, Data

Selection, 170 MeV/c set

Empty



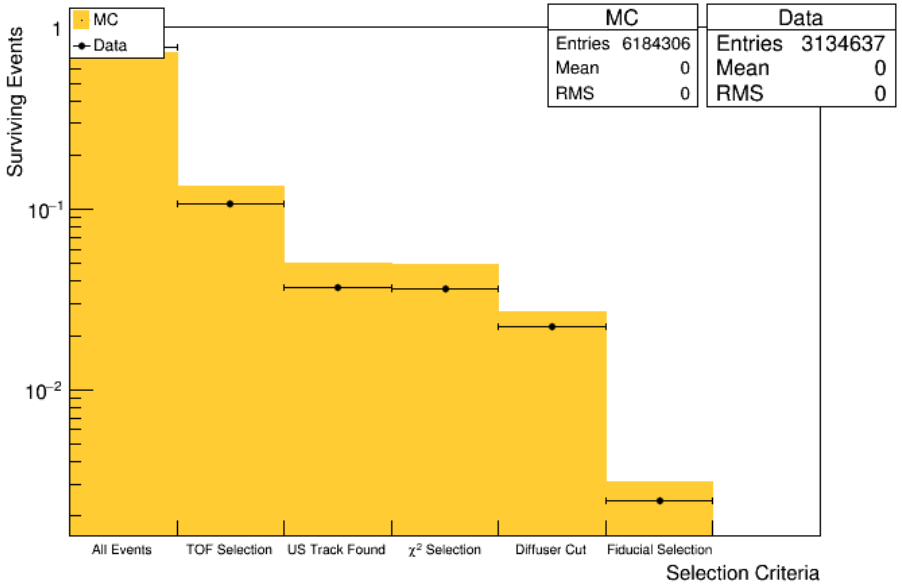
Full



- Single TOF0 & TOF1 SP. dt_{TOF10} within 300ps of muon peak.
- Single US track
- UST track $\chi^2/NDF < 4$
- track projection at diffuser pos. $<$ 90mm radius.
- track projection at DST st. 5 $<$ 100mm radius.

Selection, 200 MeV/c set

Empty



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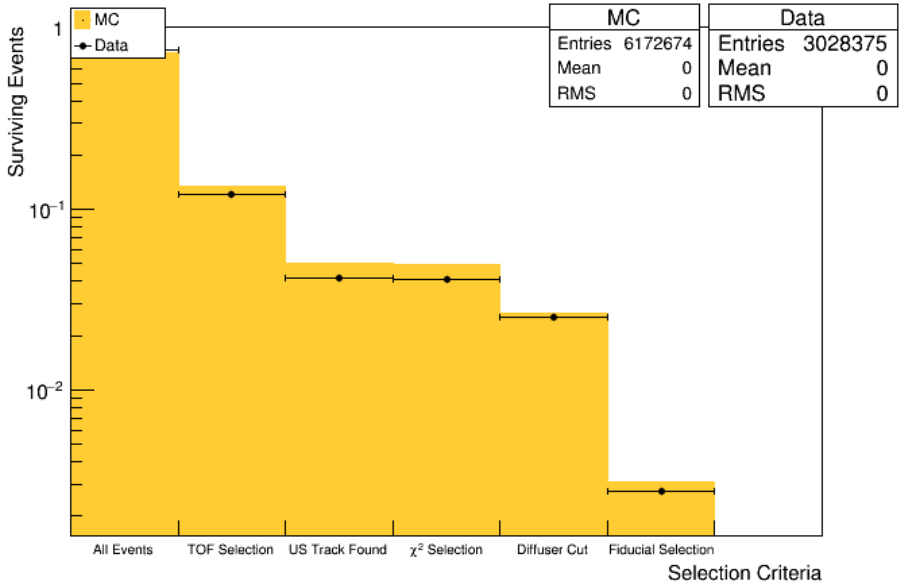
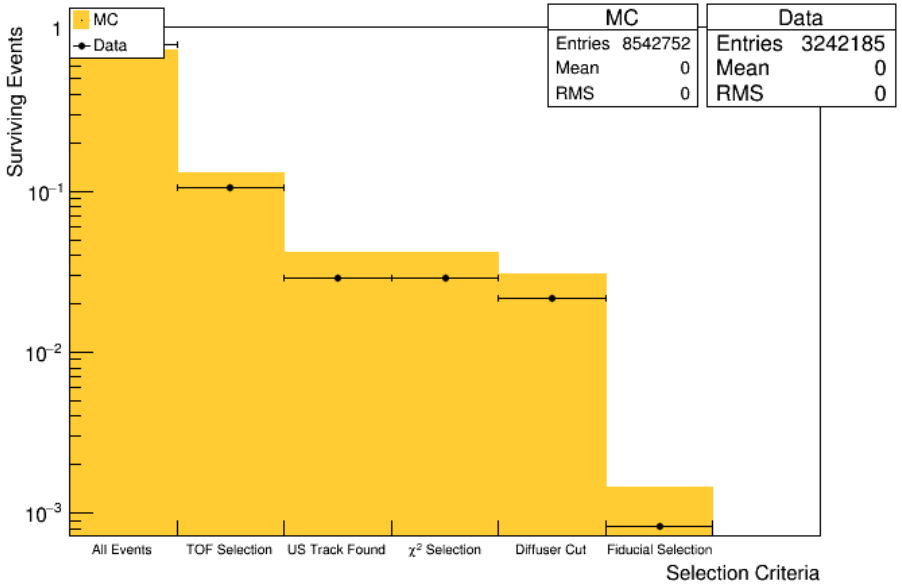


- Single TOF0 & TOF1 SP. dt_{TOF10} within 300ps of muon peak.
- Single US track
- UST track $\chi^2/NDF < 4$
- track projection at diffuser pos. $<$ 90mm radius.
- track projection at DST st. 5 $<$ 100mm radius.

Selection, 240 MeV/c set

Empty



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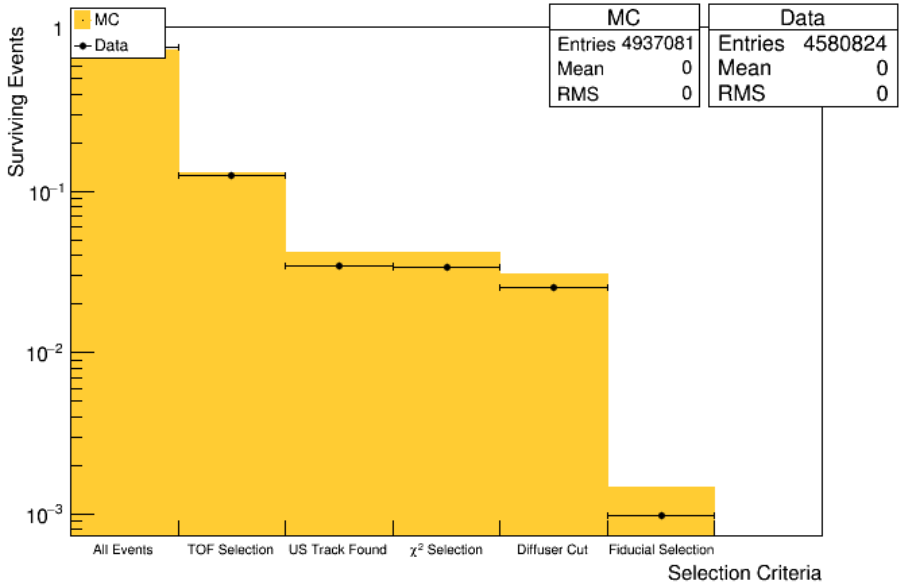
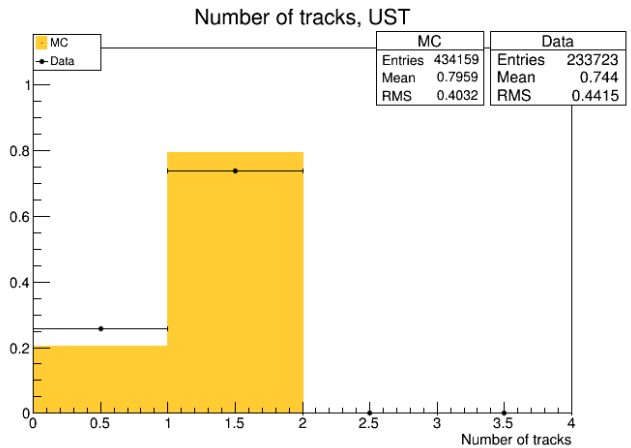
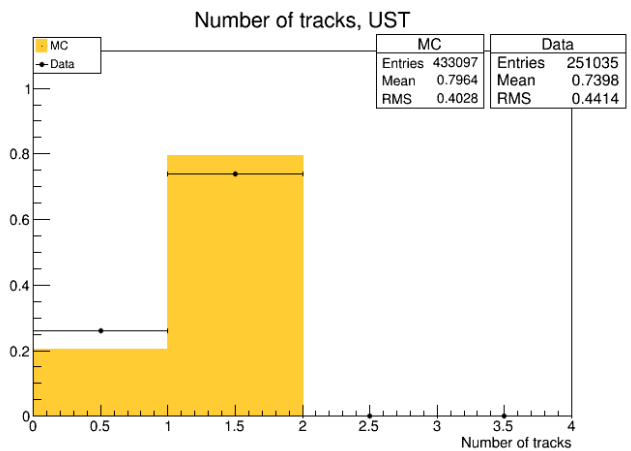


- Single TOF0 & TOF1 SP. dt_{TOF10} within 300ps of muon peak.
- Single US track
- UST track $\chi^2/NDF < 4$
- track projection at diffuser pos. $<$ 90mm radius.
- track projection at DST st. 5 $<$ 100mm radius.

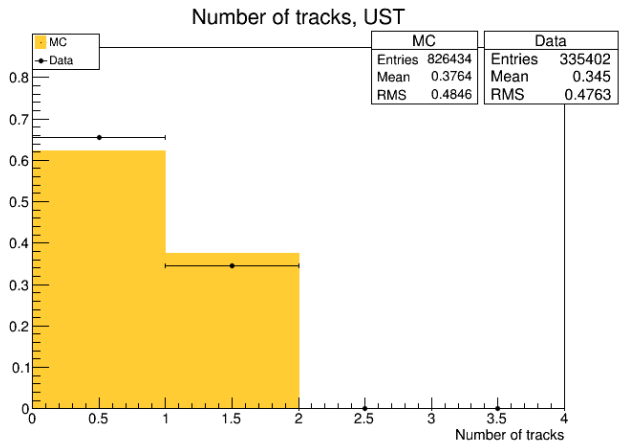
number of UST tracks.

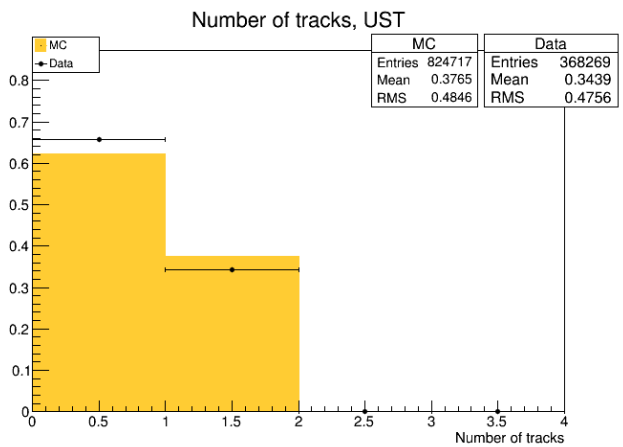
170 MeV/c



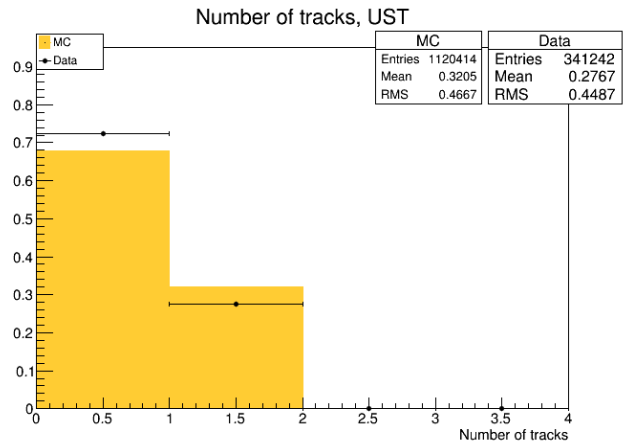


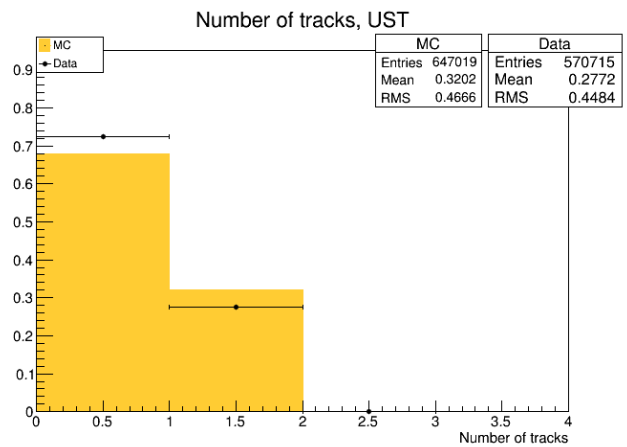
200 MeV/c





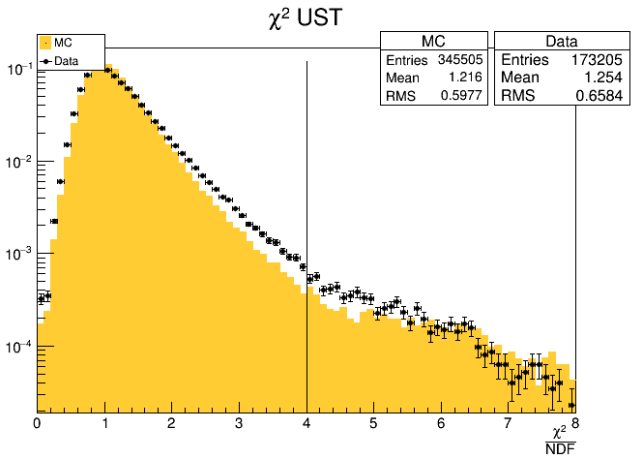
240 MeV/c

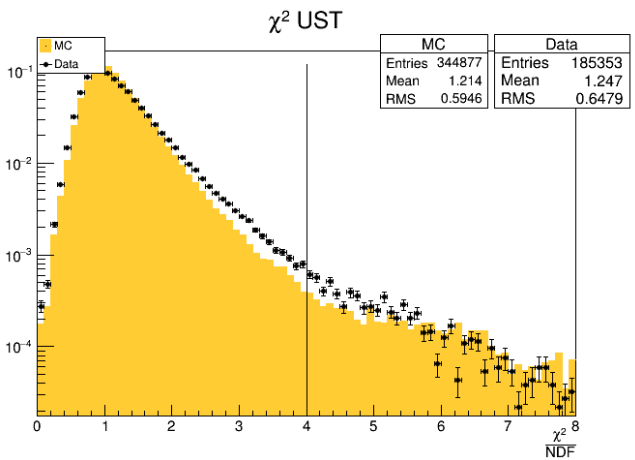




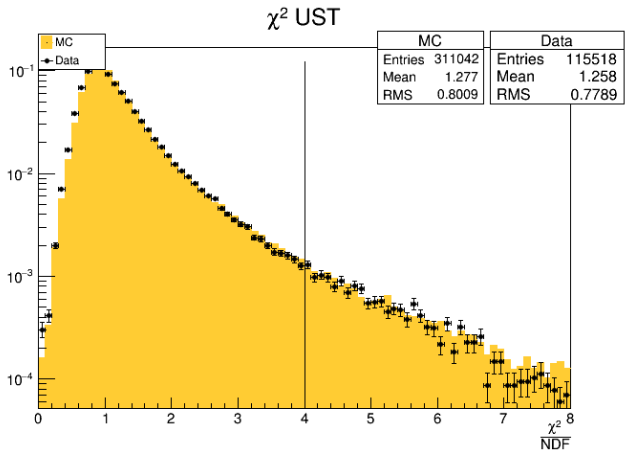
UST track χ^2 cut

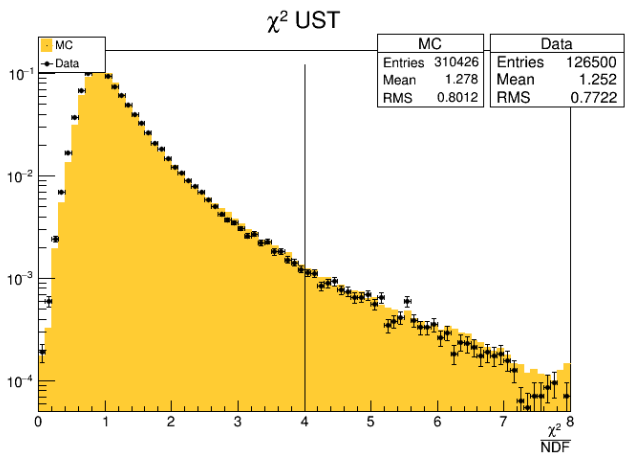
170 MeV/c



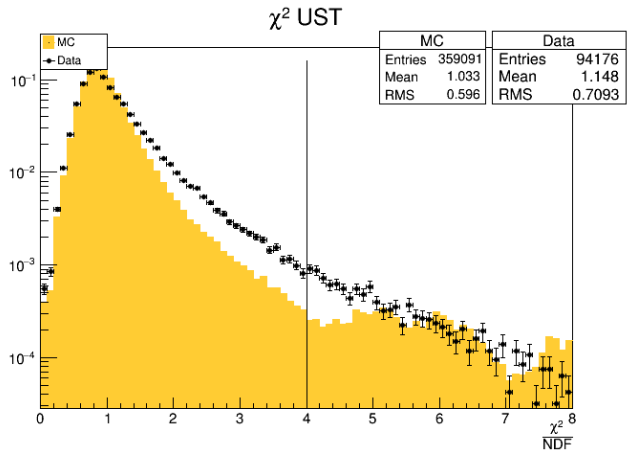


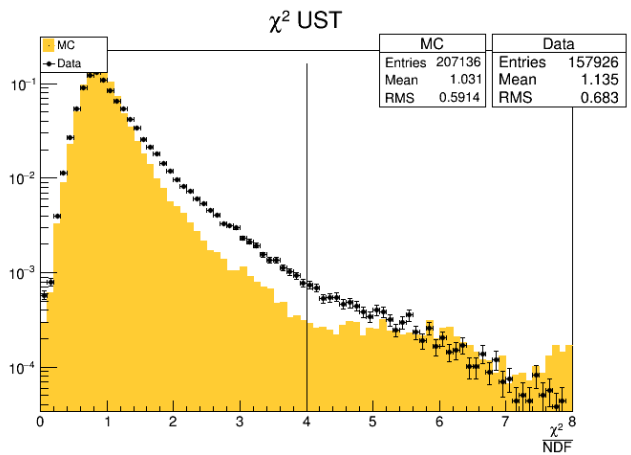
200 MeV/c





240 MeV/c



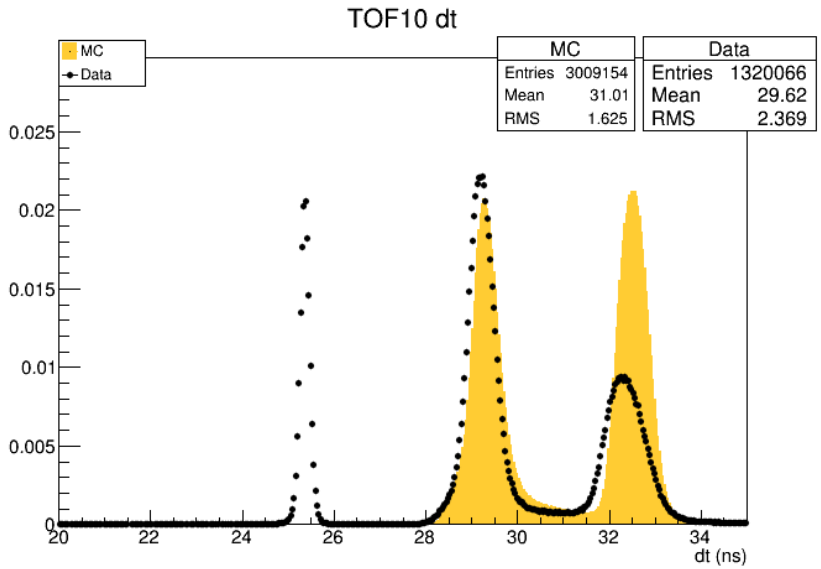


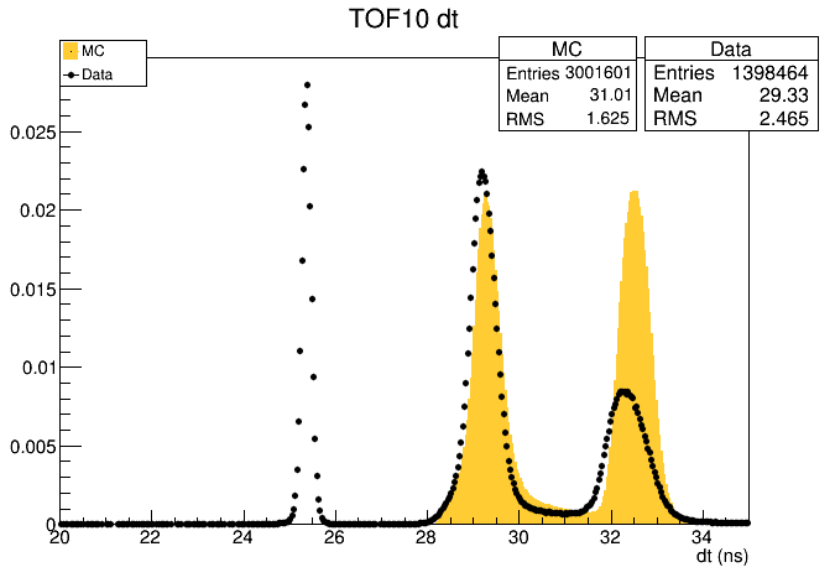
TOF selection, 170MeV/c

Empty

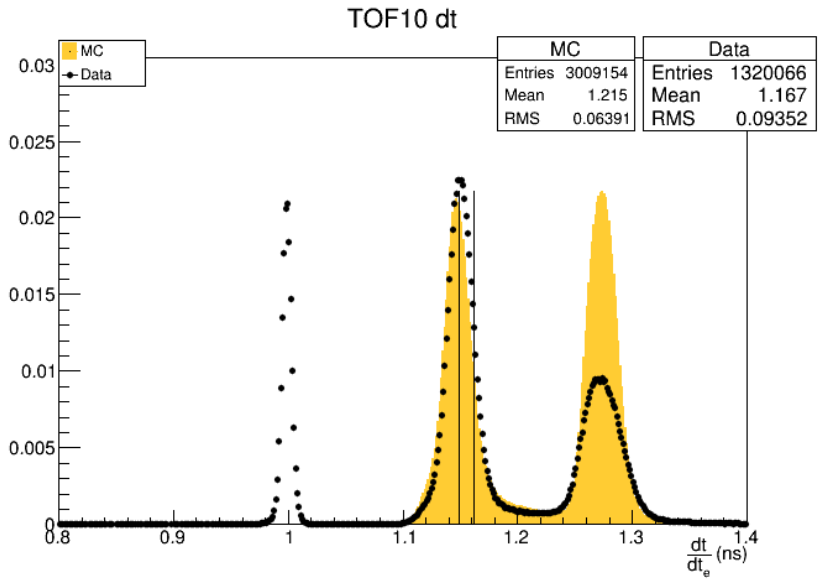
Full

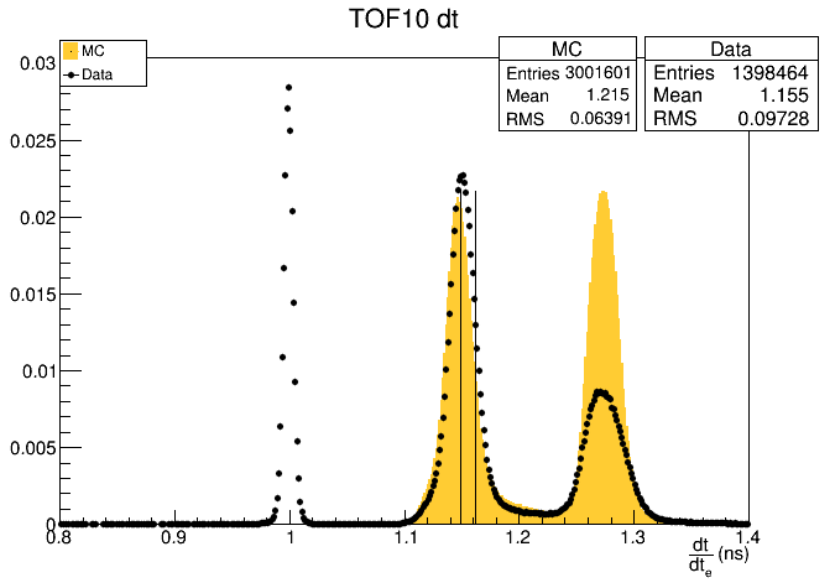
no normalisation





normilised by $\frac{1}{dt_e}$





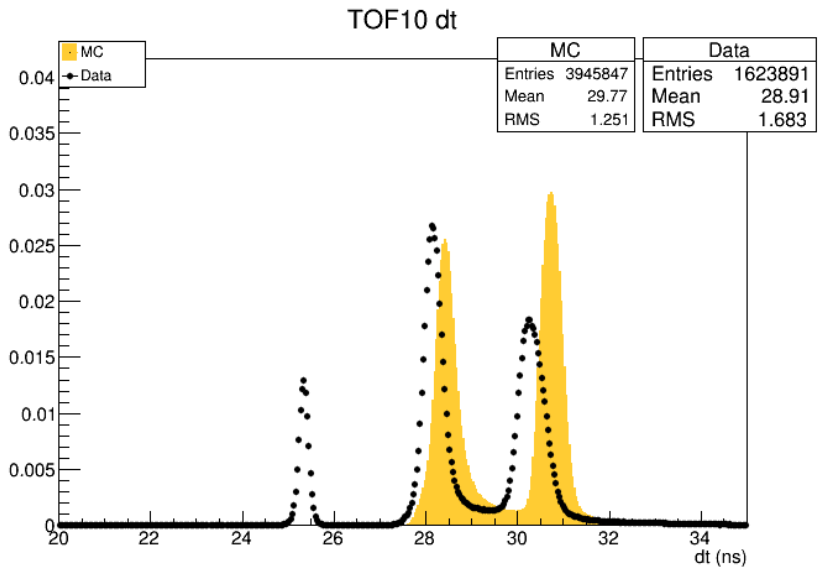
TOF selection, 200MeV/c

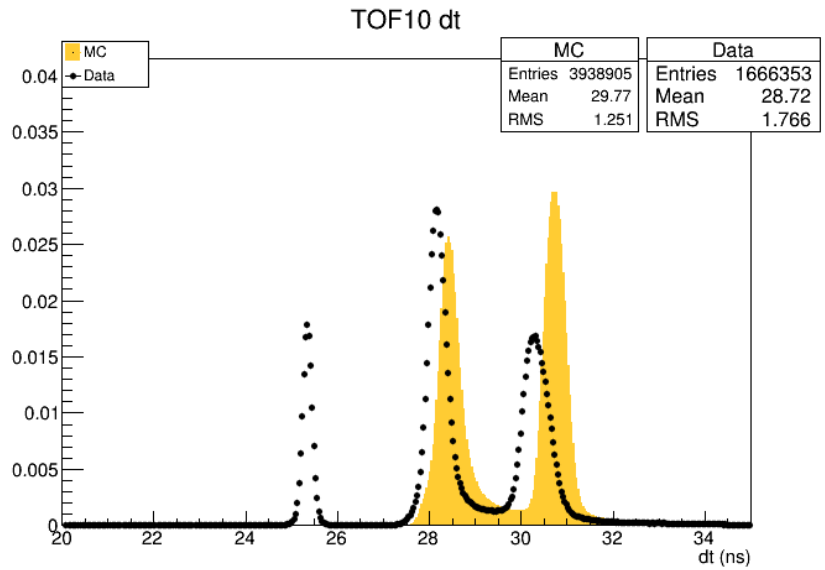
Empty

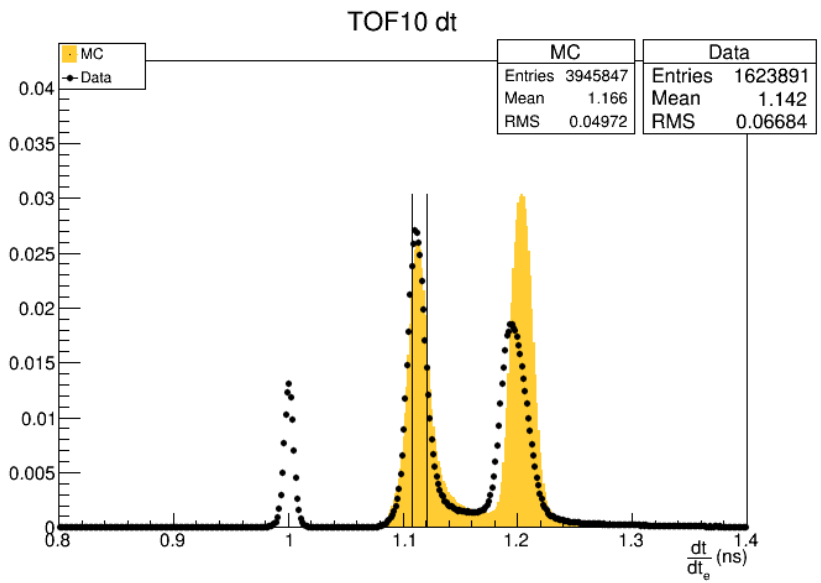
Full

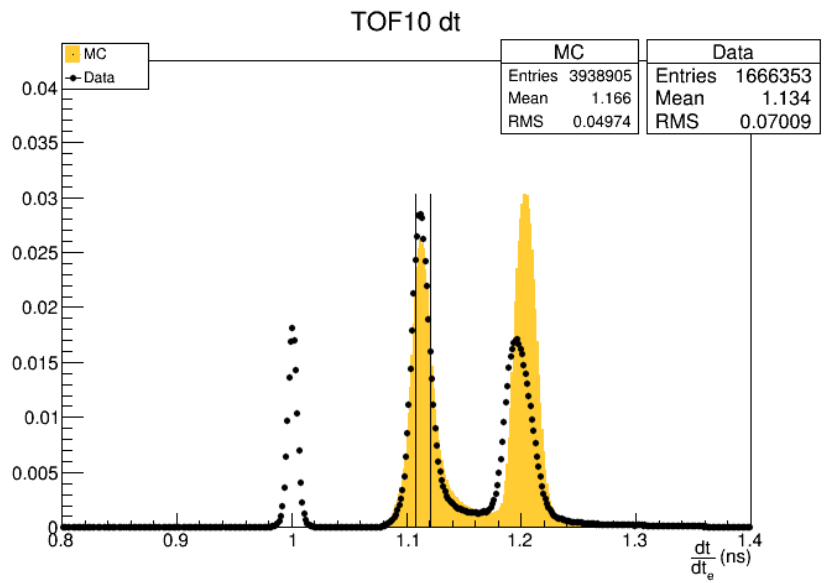
no normalisation

normilised by $\frac{1}{dt_e}$







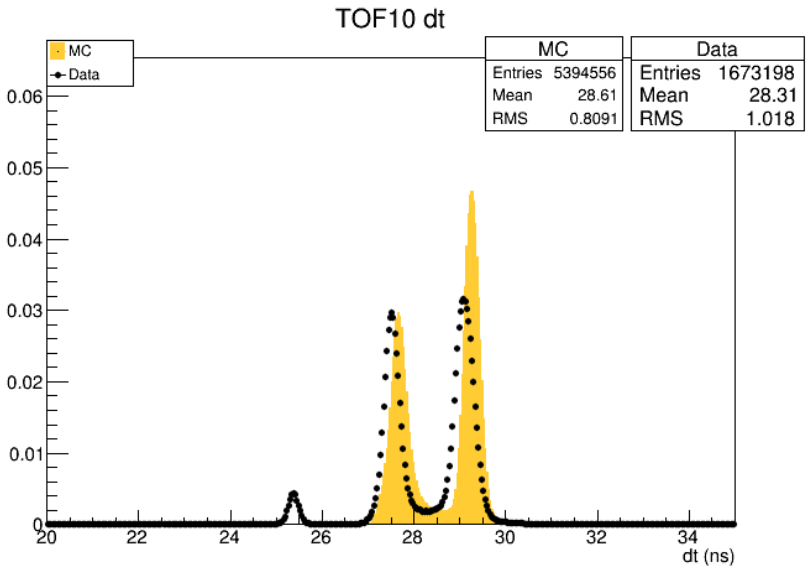


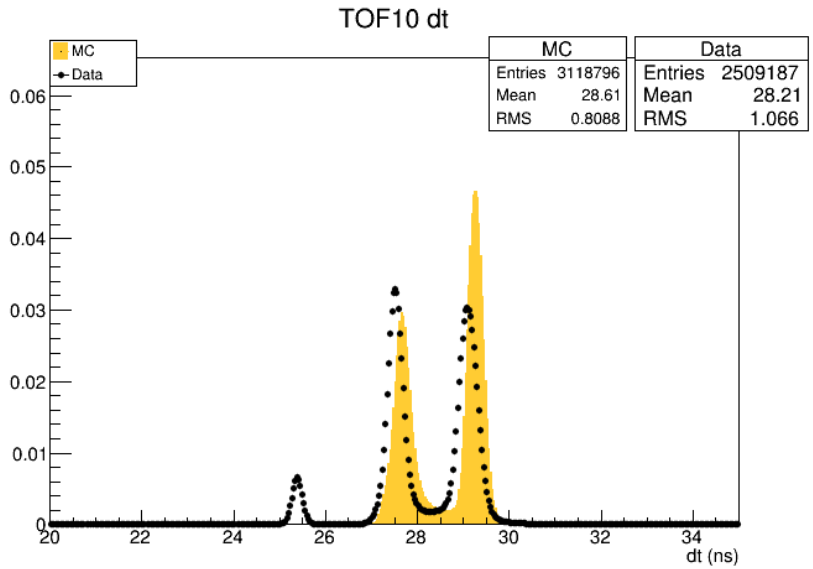
TOF selection, 240MeV/c

Empty

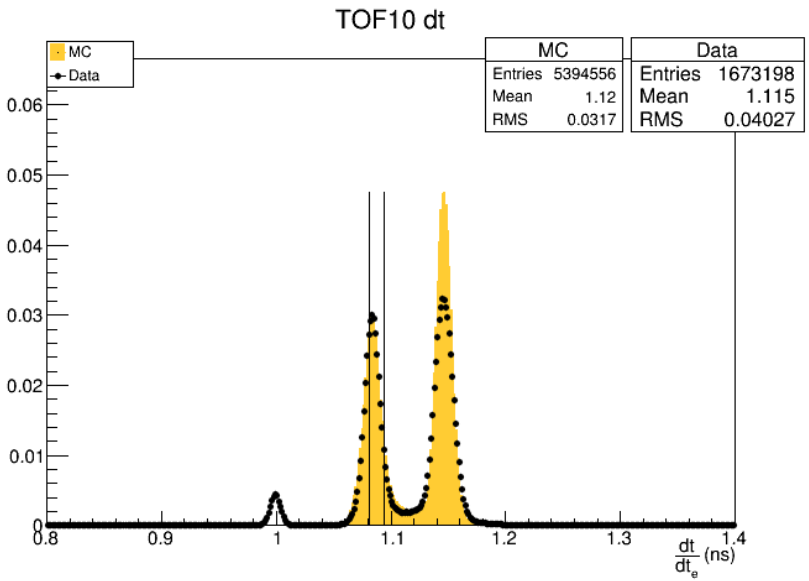
Full

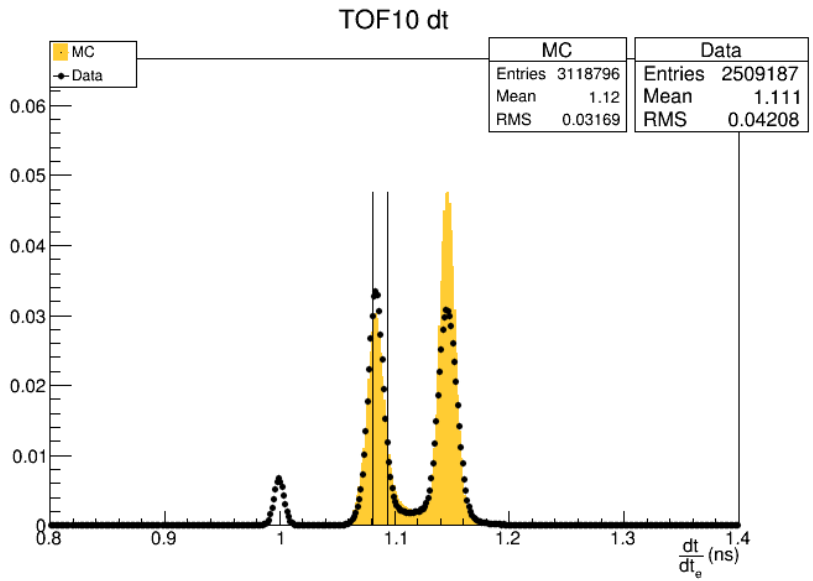
no normalisation



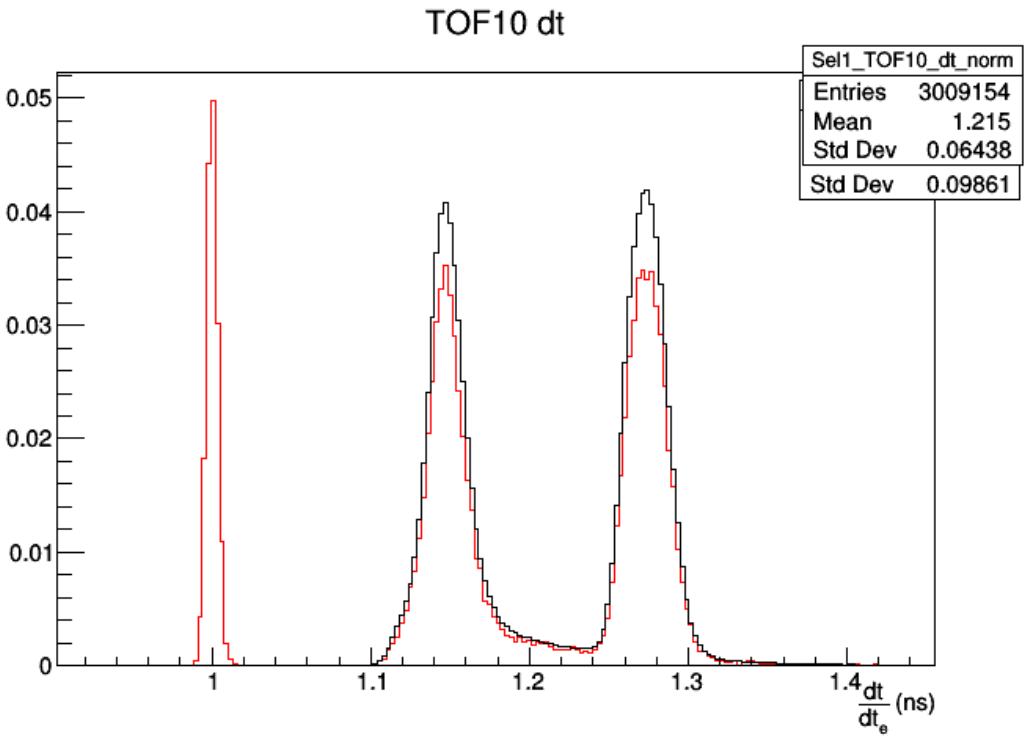


normilised by $\frac{1}{dt_e}$



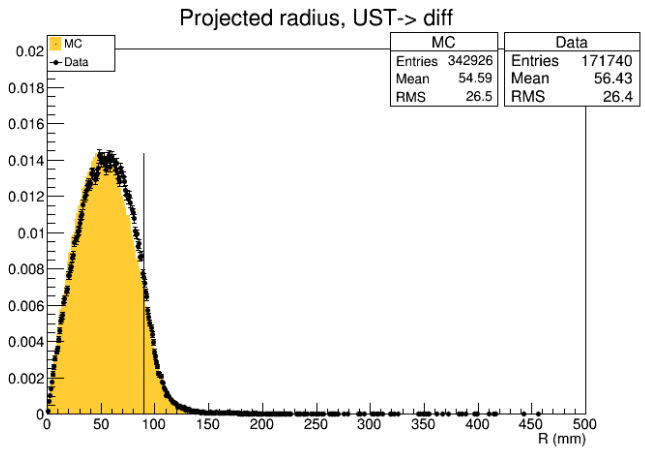


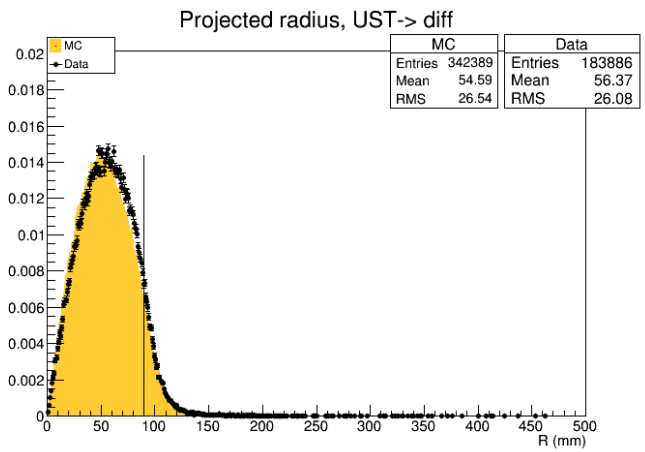
New MC production with positrons



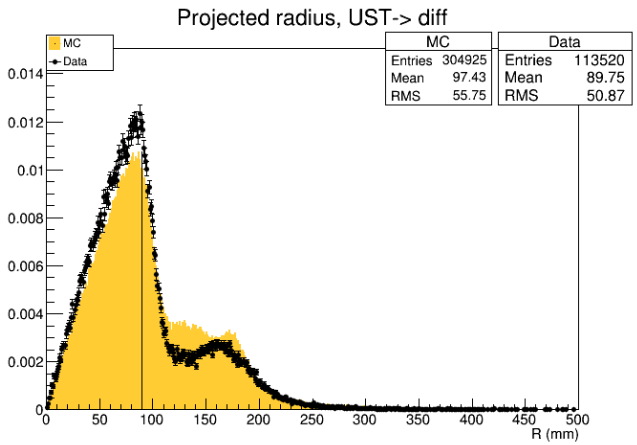
Projected R(mm) at diffuser

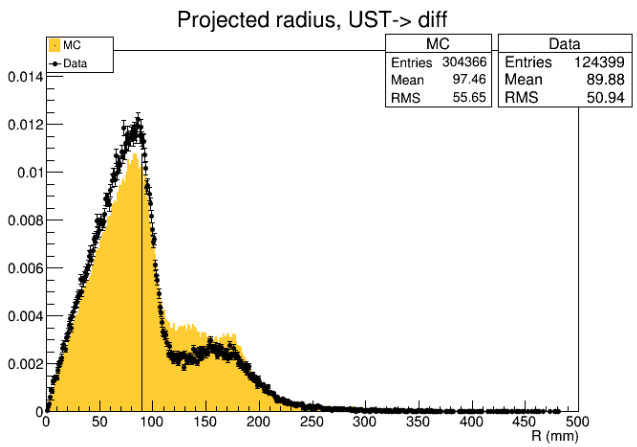
170 MeV/c



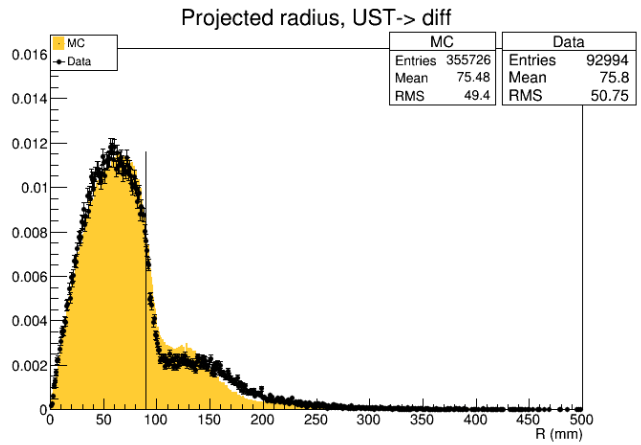


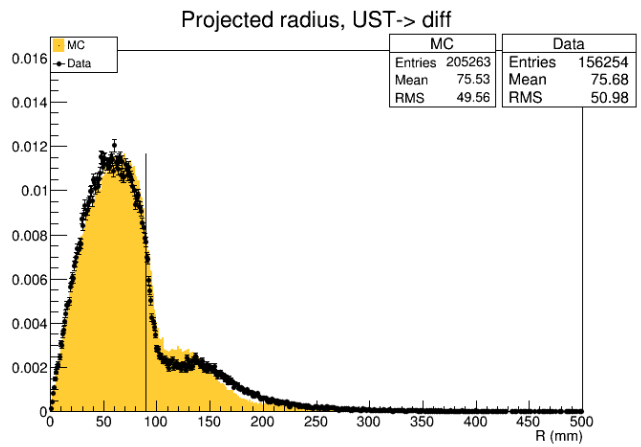
200 MeV/c





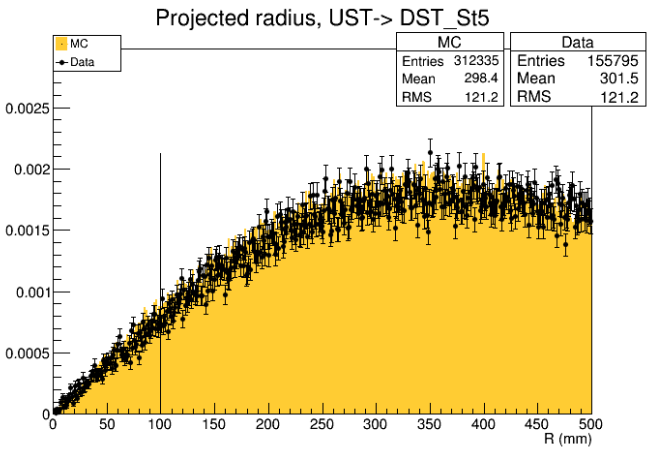
240 MeV/c

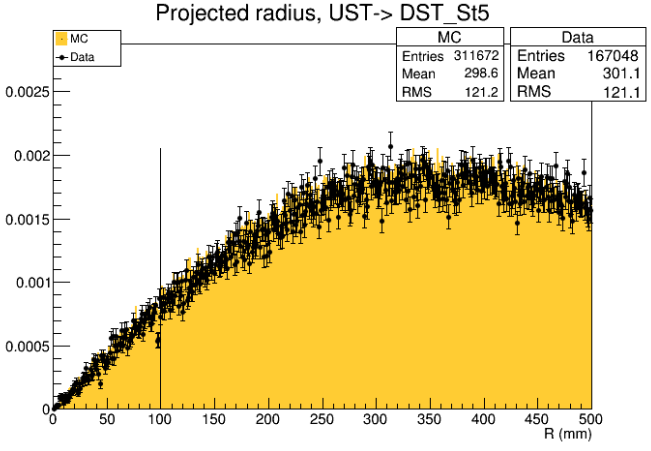




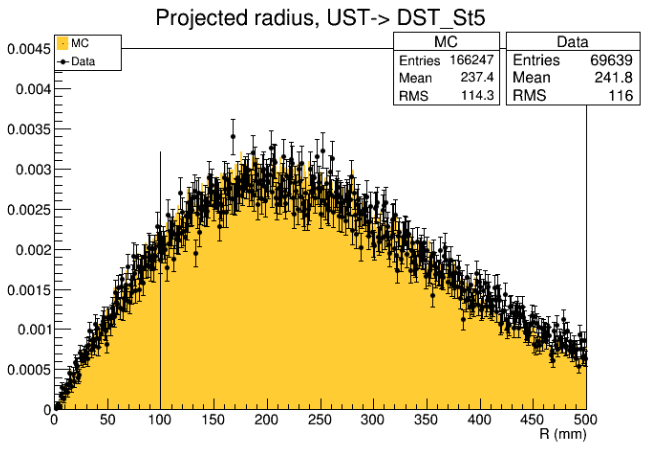
Projected R(mm) at DST st. 5

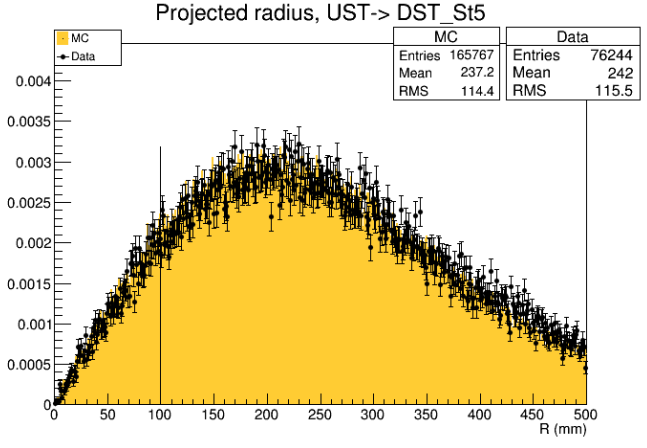
170 MeV/c



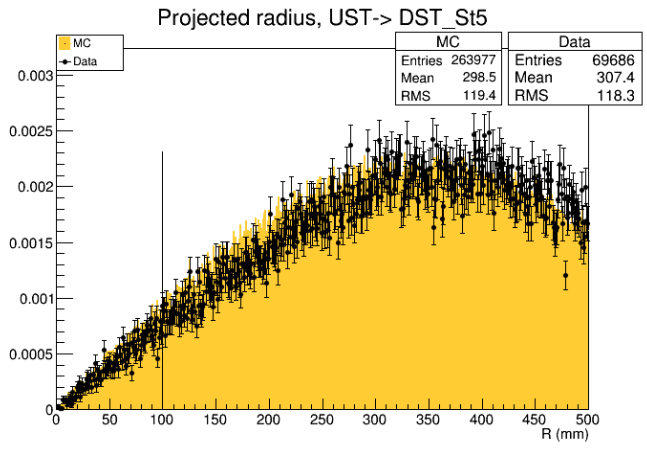


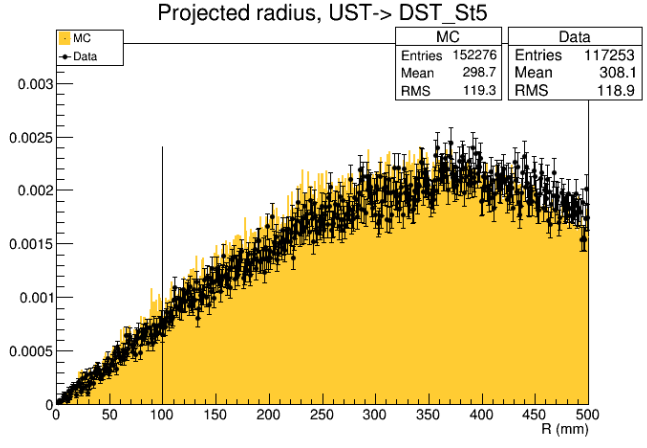
200 MeV/c



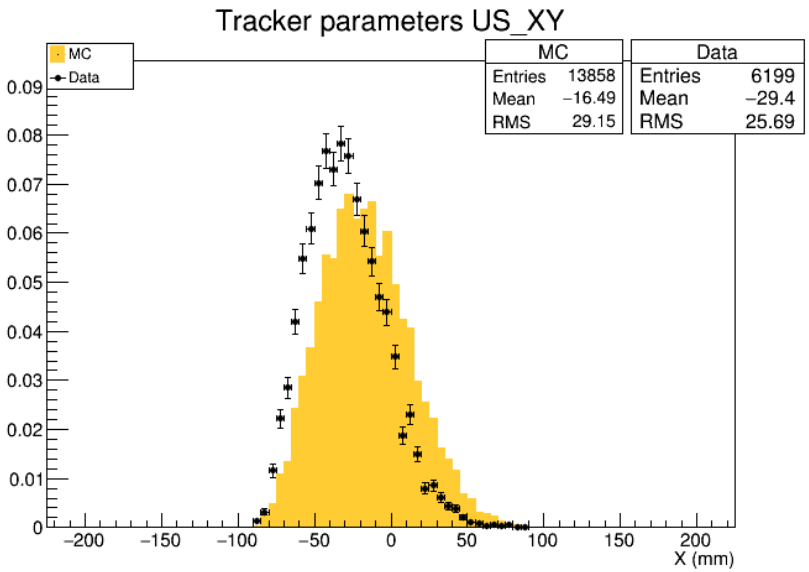


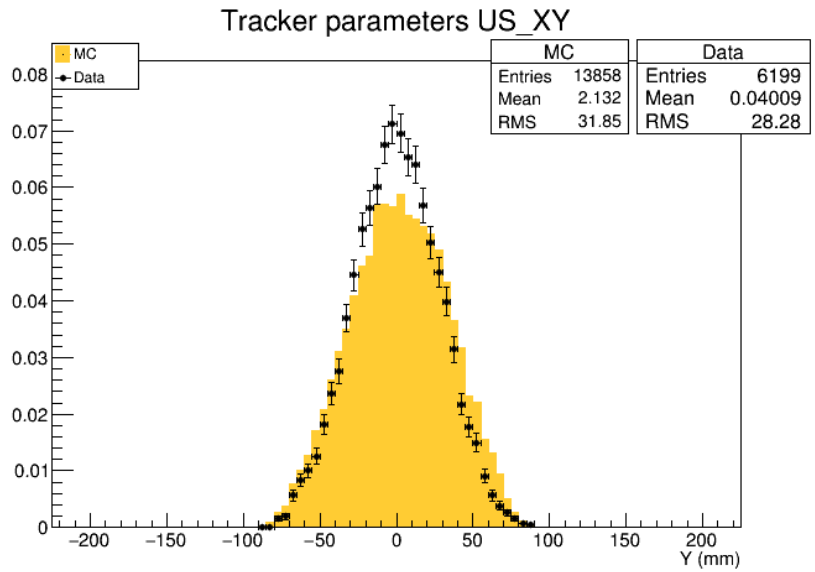
240 MeV/c

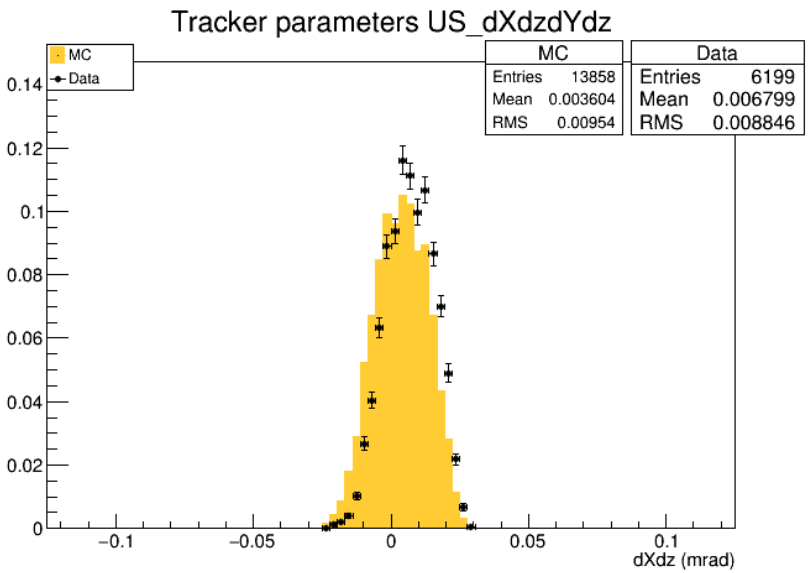


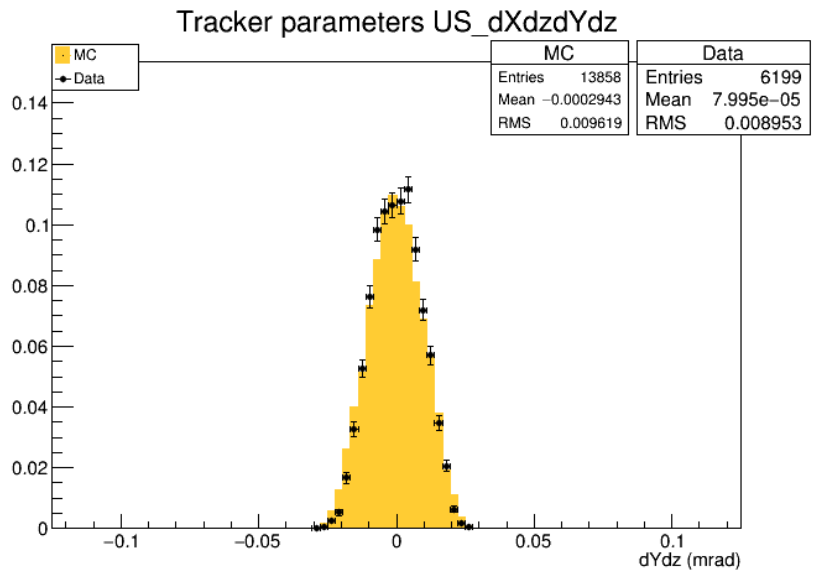


Final sample at trackers, 170 MeV/c UST, Empty

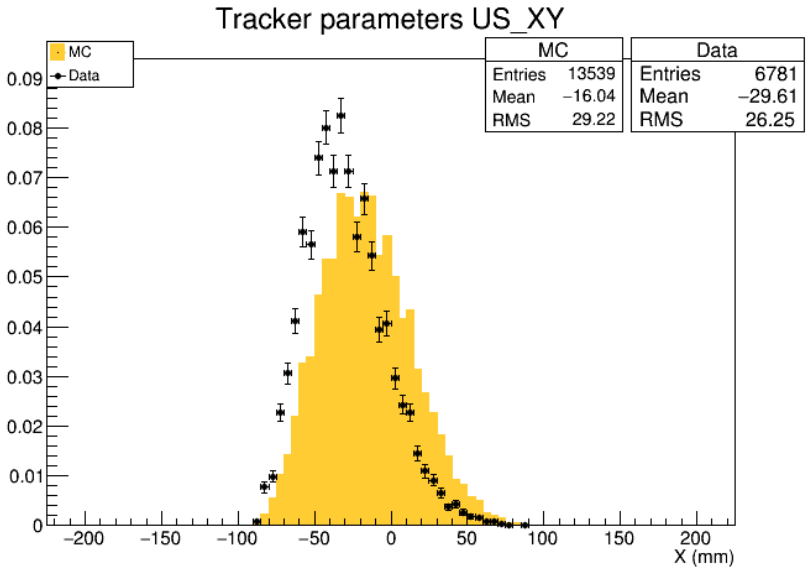


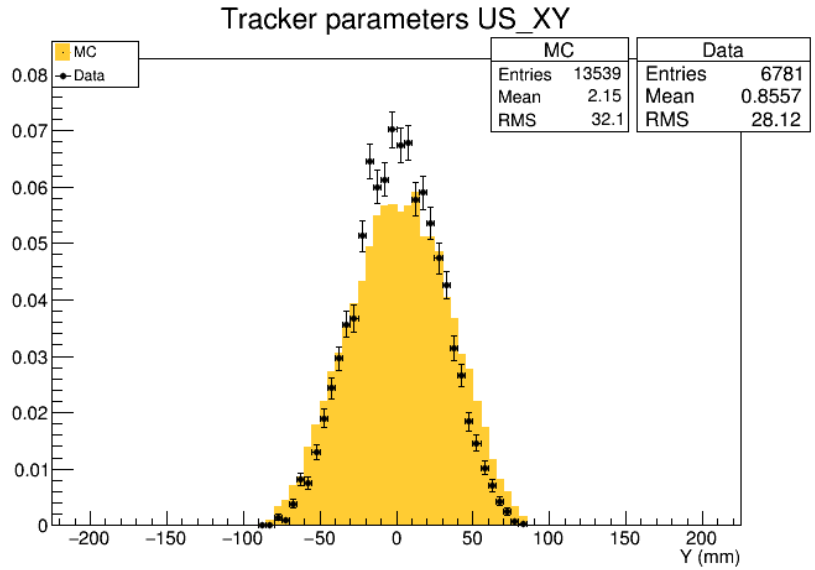


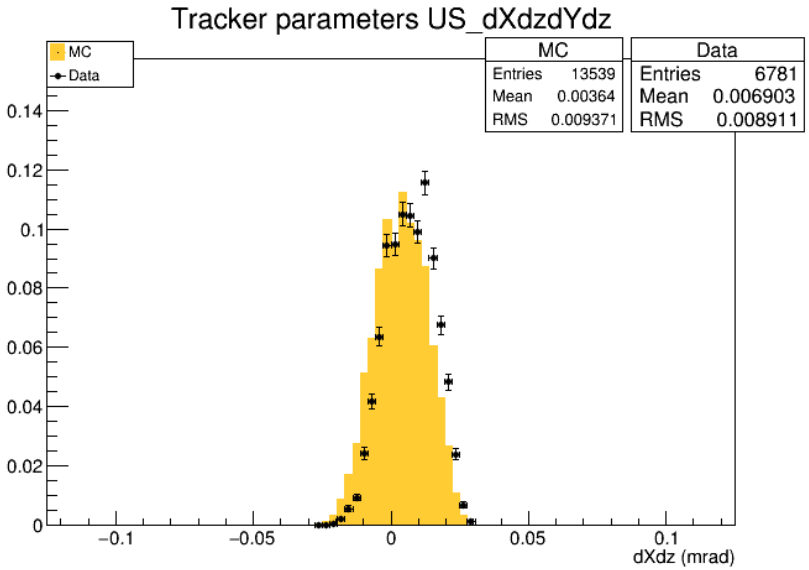


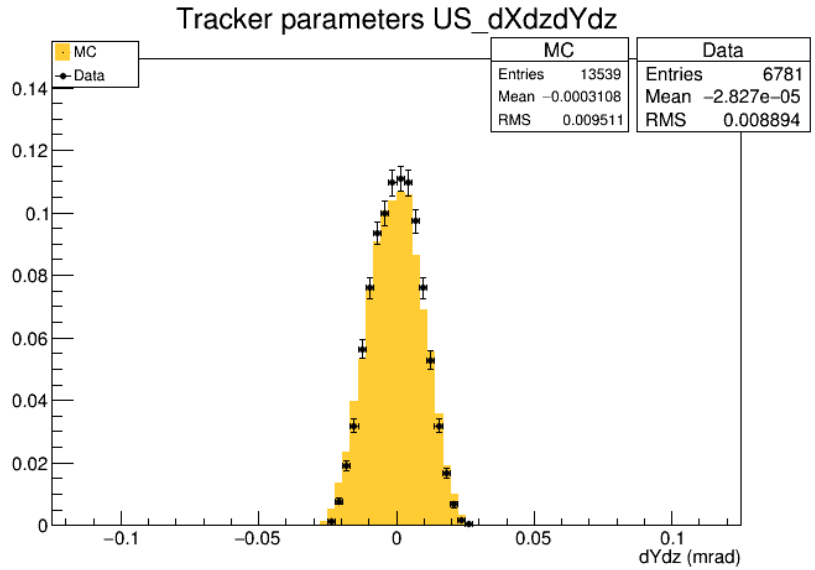


Final sample at trackers, 170 MeV/c UST, Full

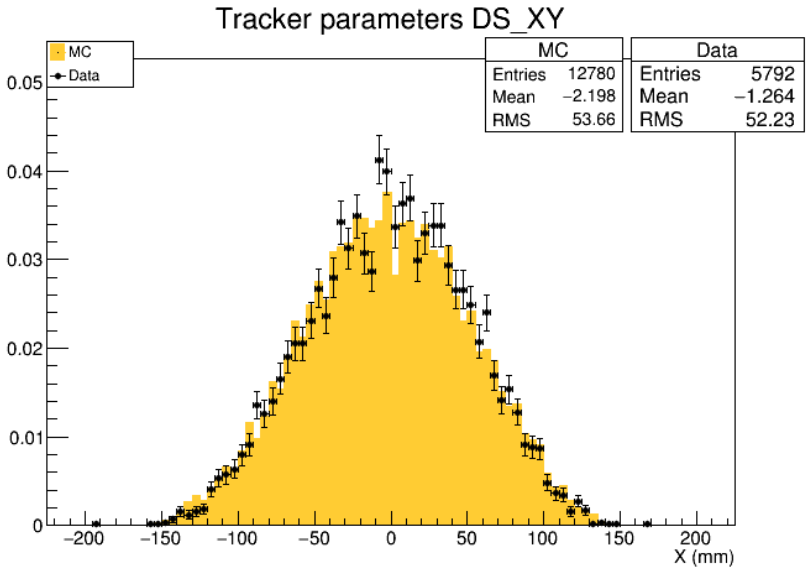


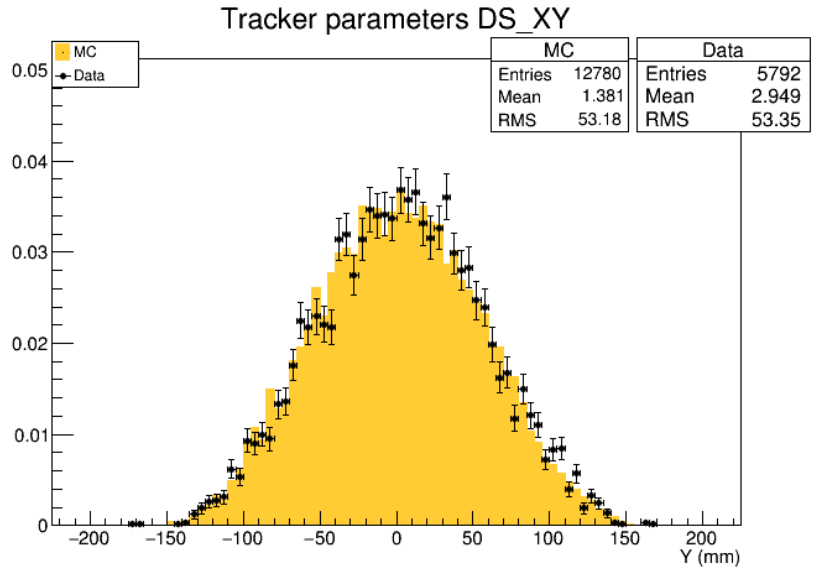


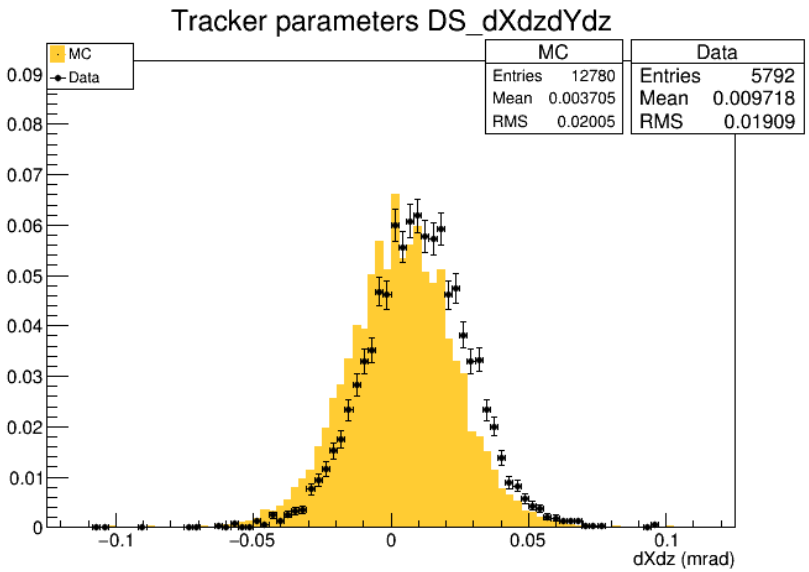


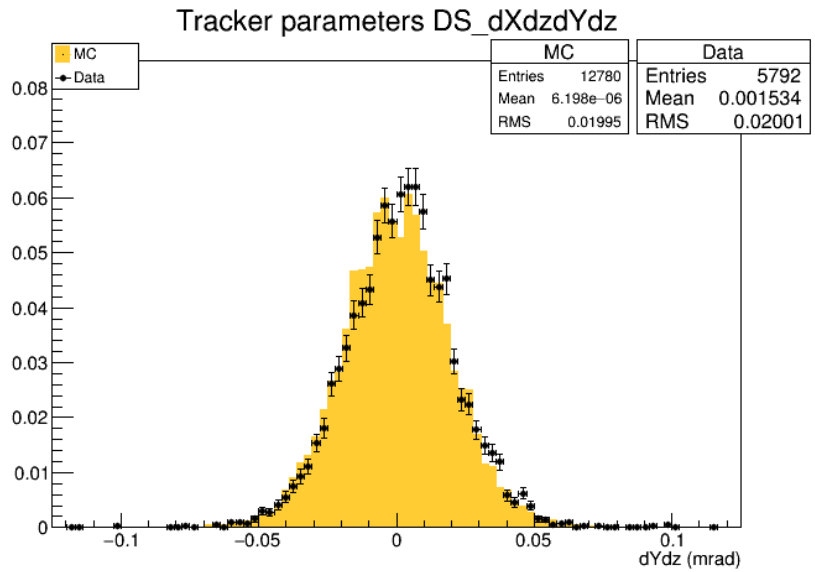


Final sample at trackers, 170 MeV/c DST, Empty

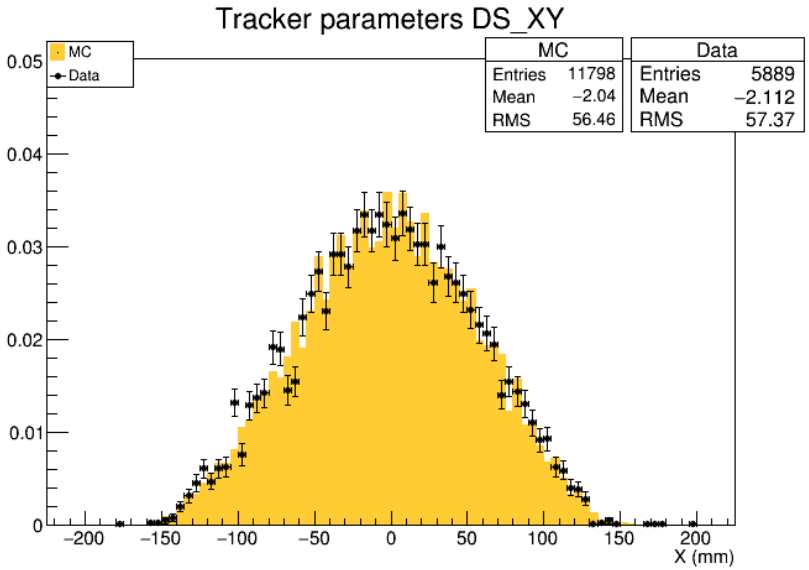


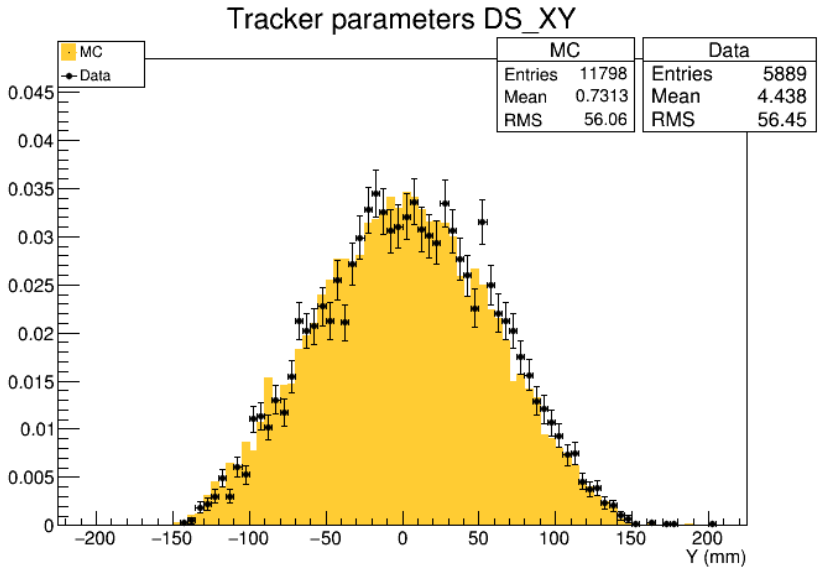


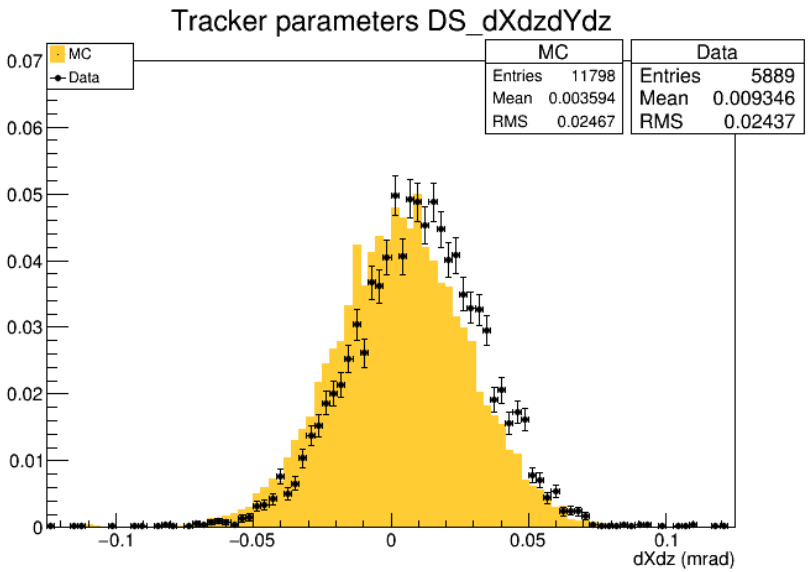


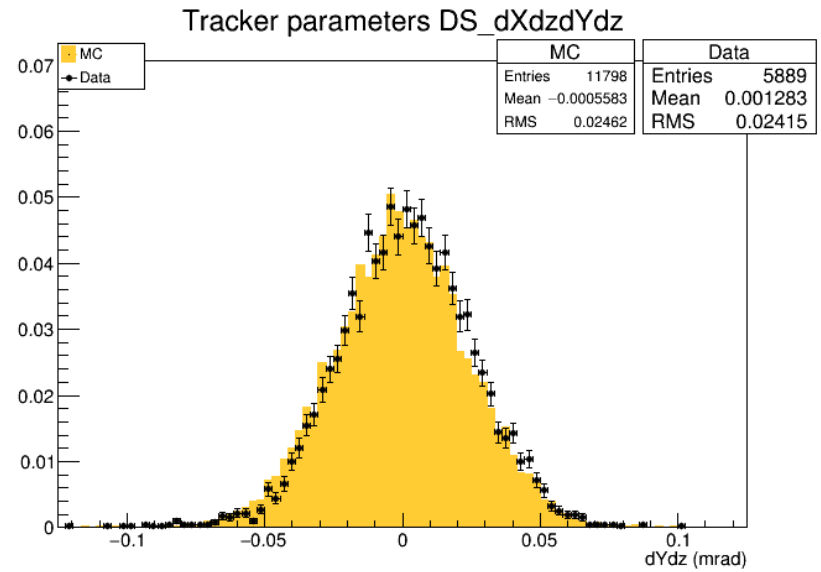


Final sample at trackers, 170 MeV/c DST, Full

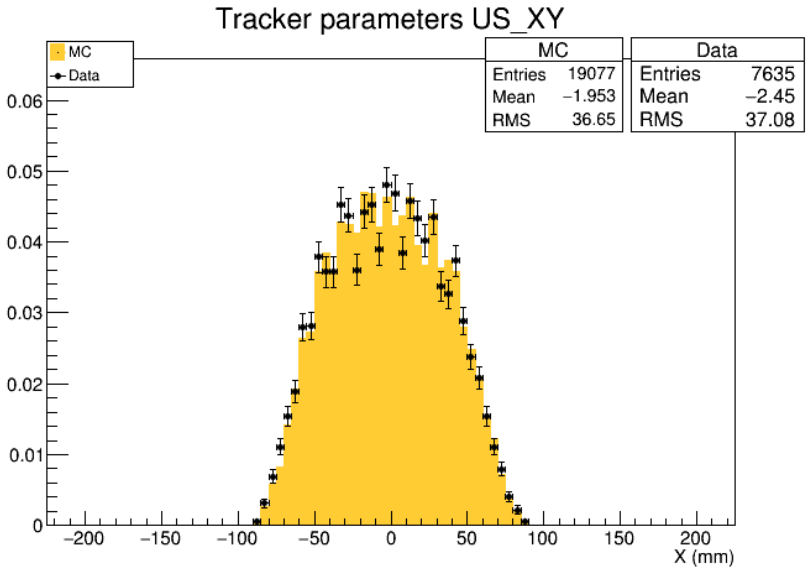


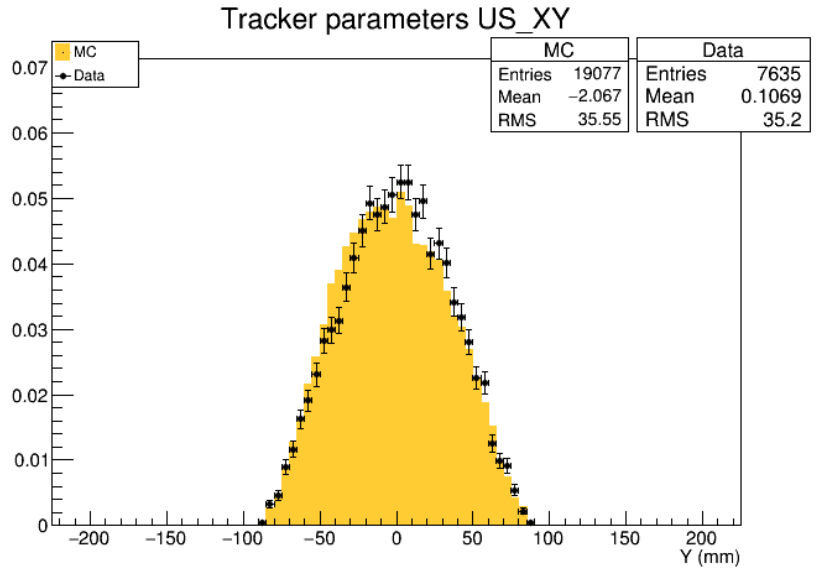


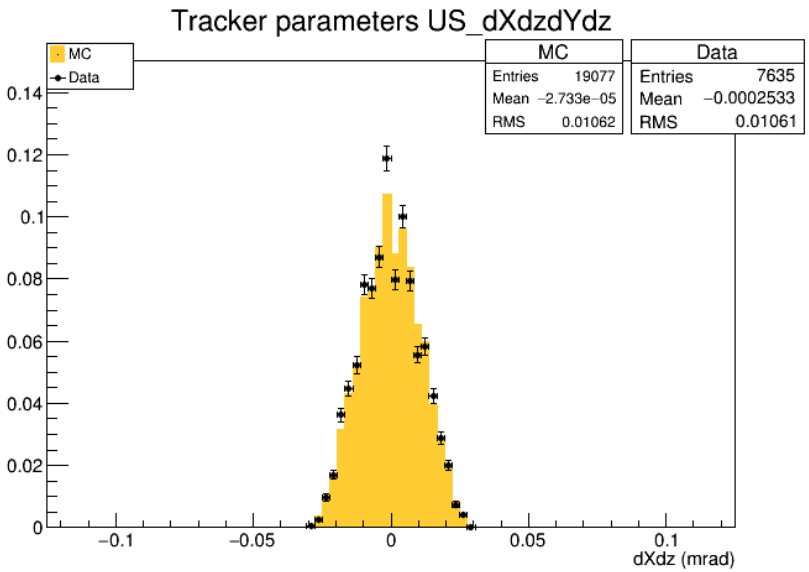


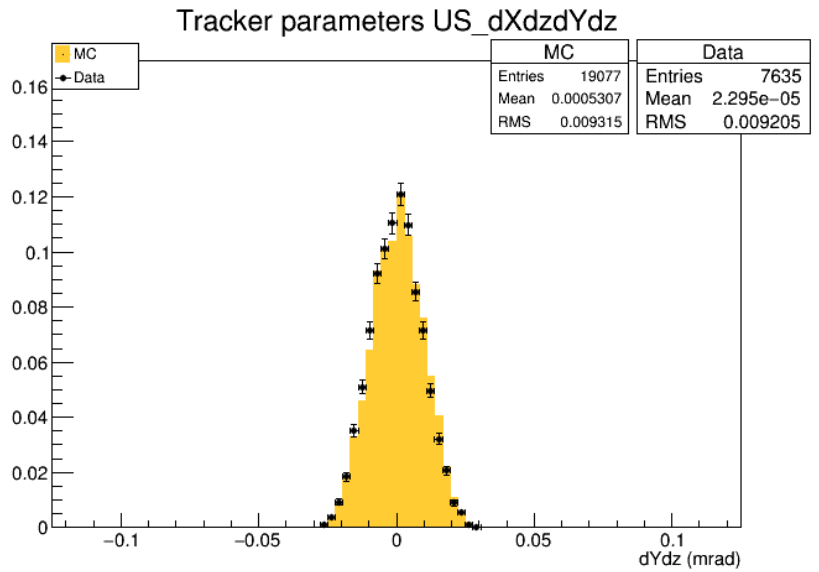


Final sample at trackers, 200 MeV/c UST, Empty

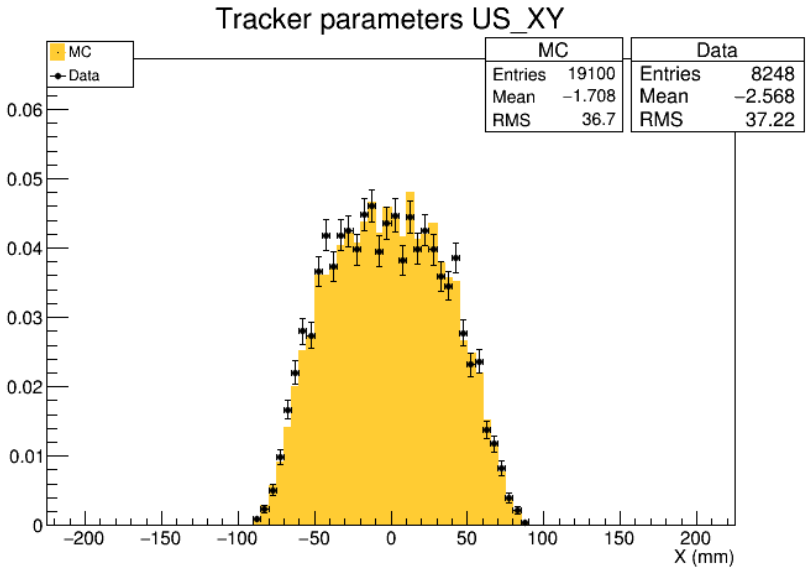


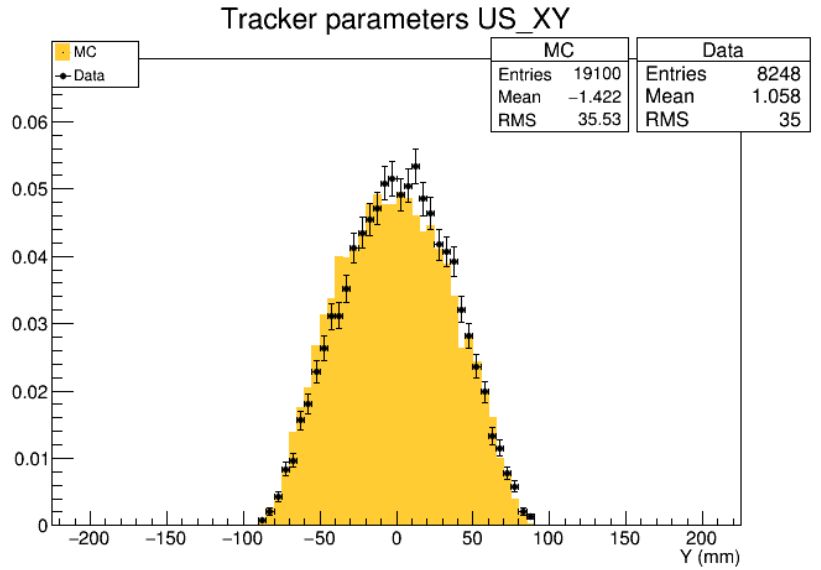


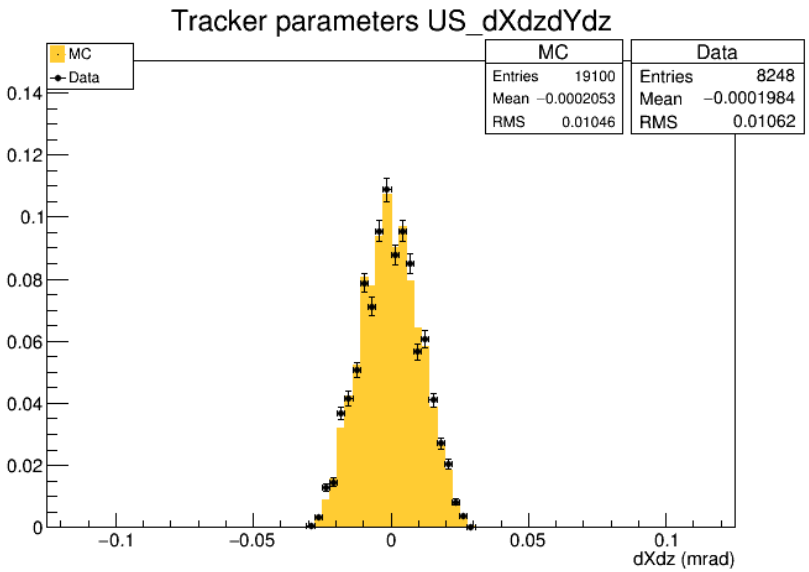


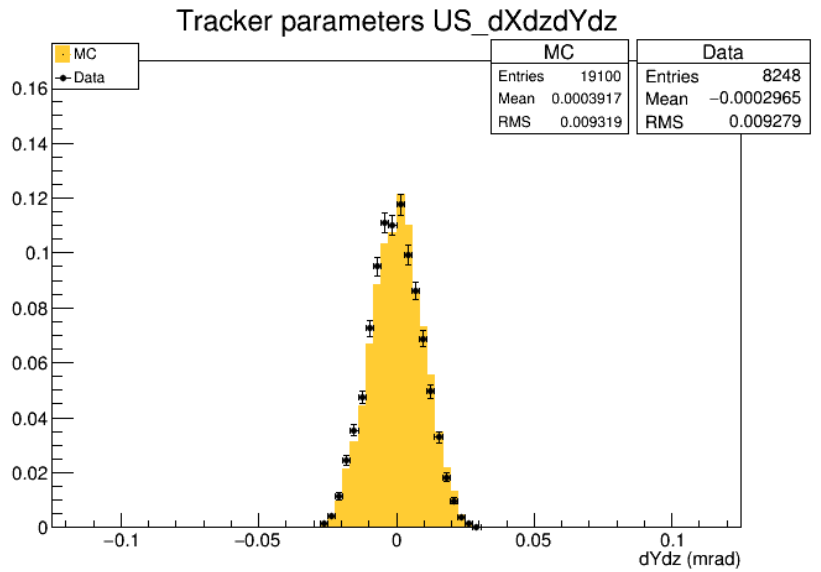


Final sample at trackers, 200 MeV/c UST, Full

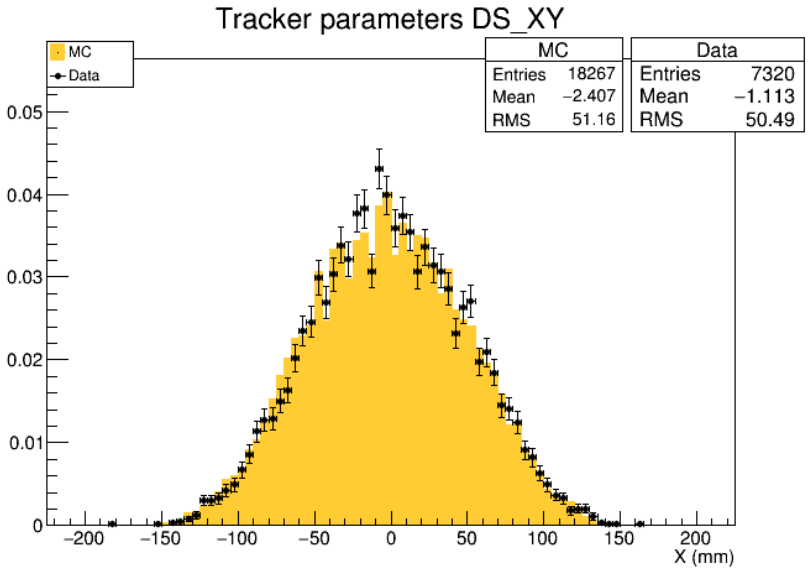


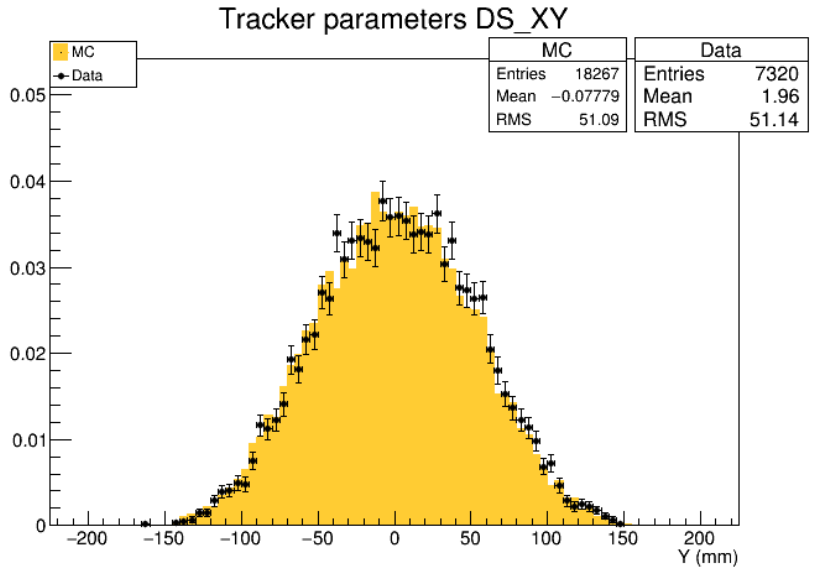


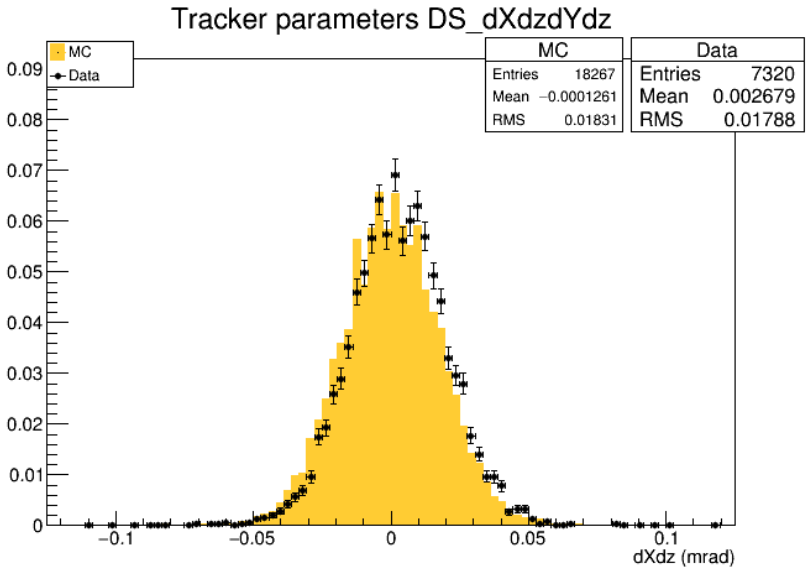


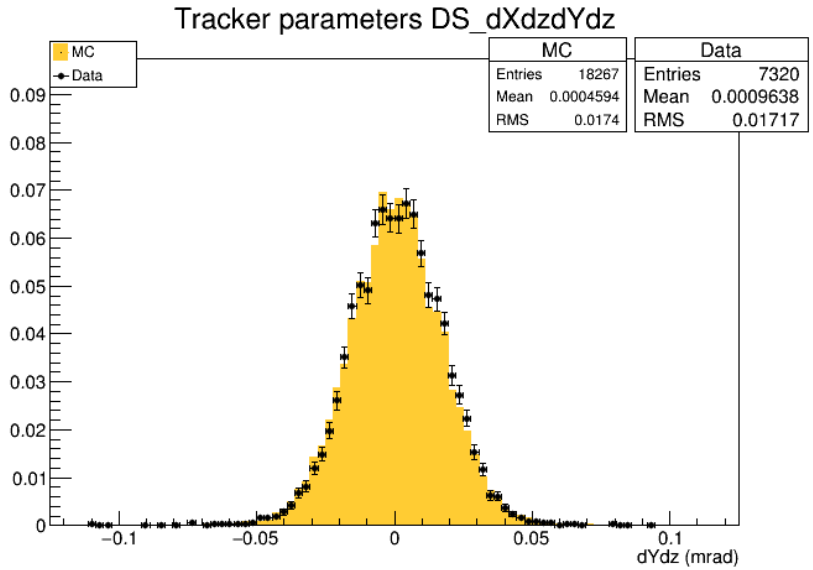


Final sample at trackers, 200 MeV/c DST, Empty

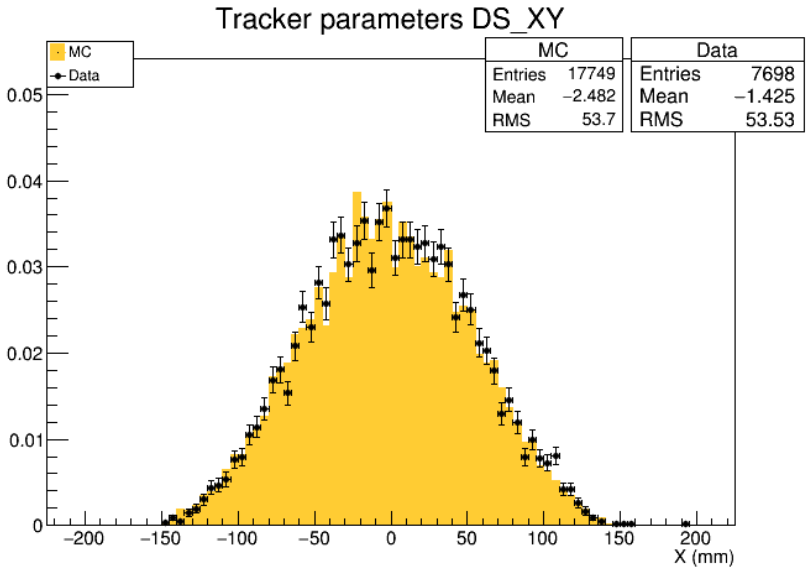


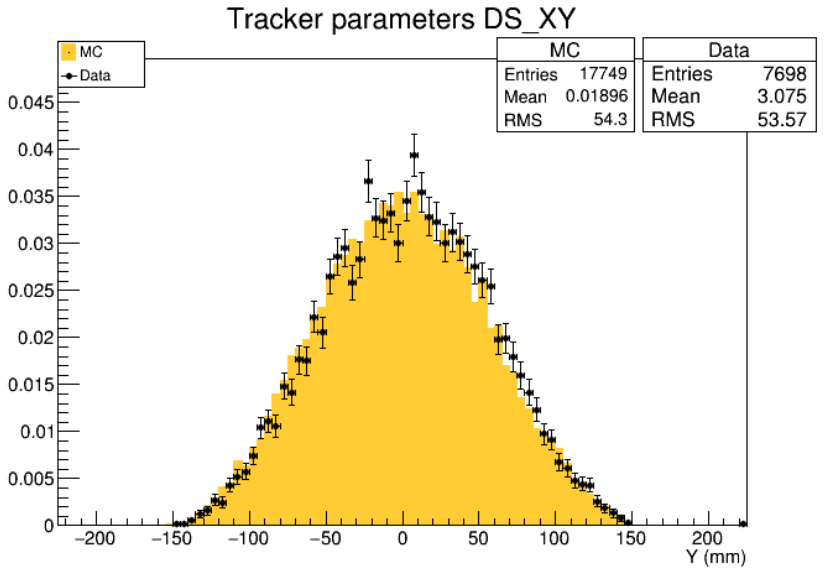


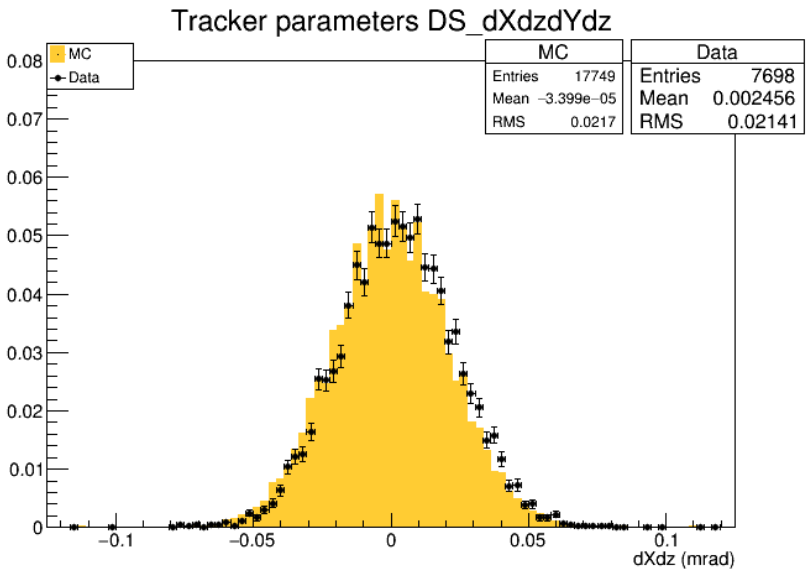


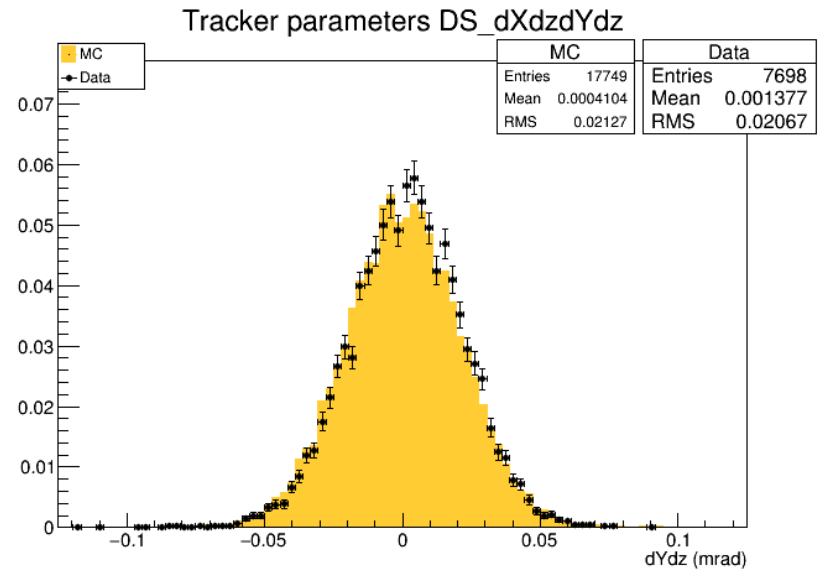


Final sample at trackers, 200 MeV/c DST, Full

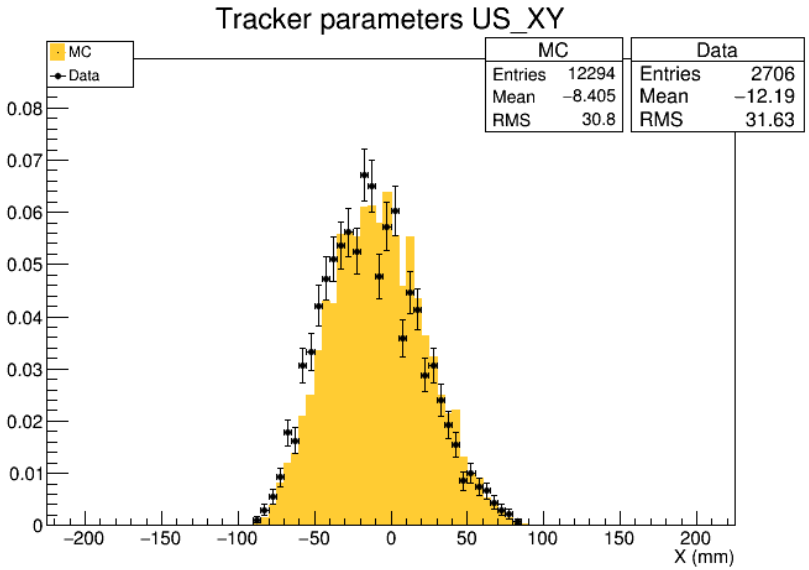


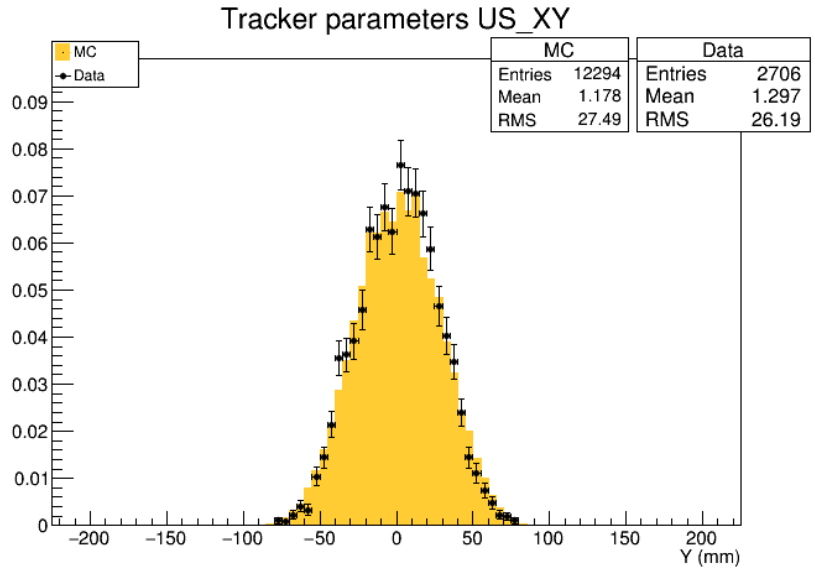


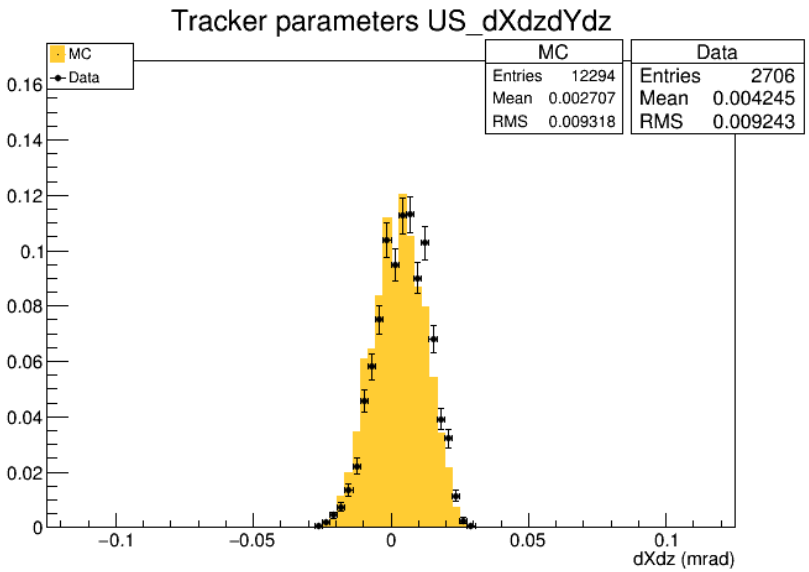


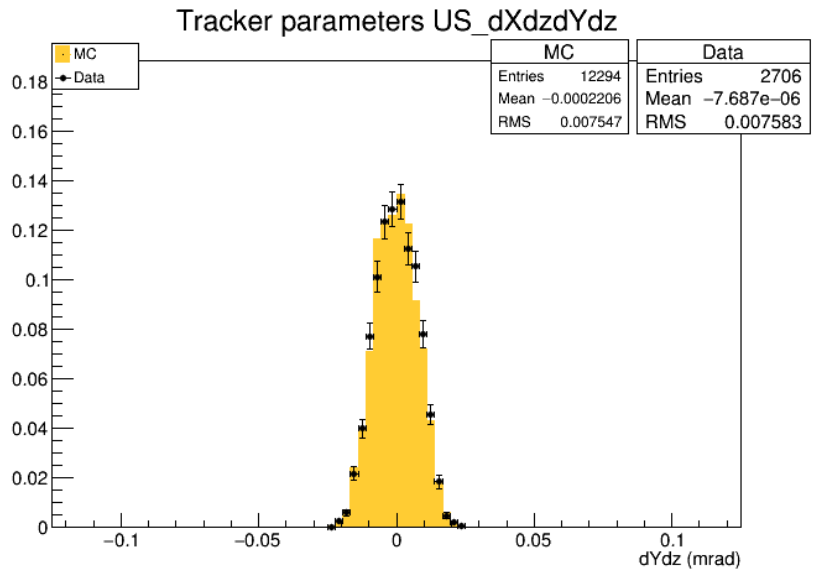


Final sample at trackers, 240 MeV/c UST, Empty

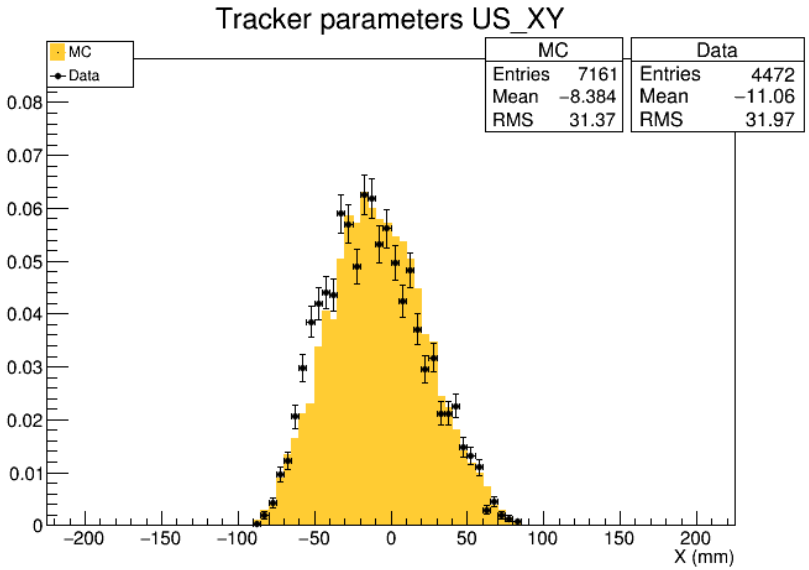


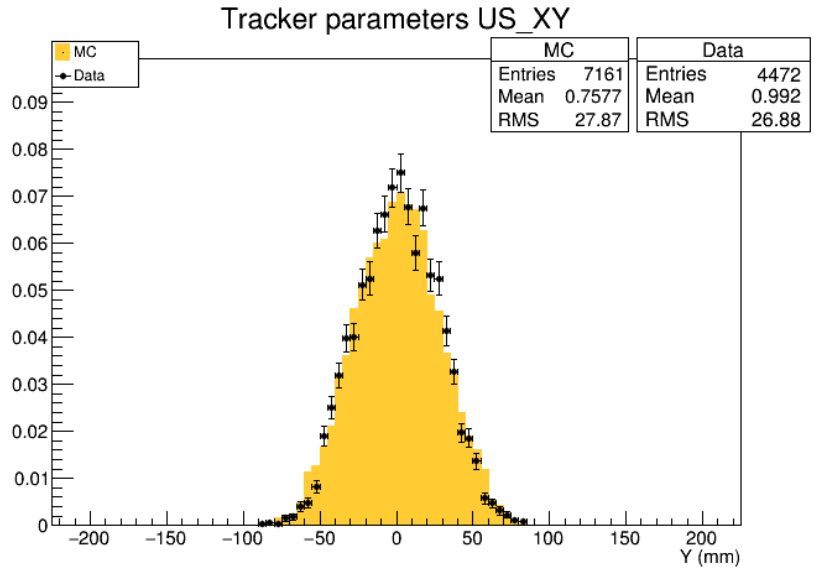


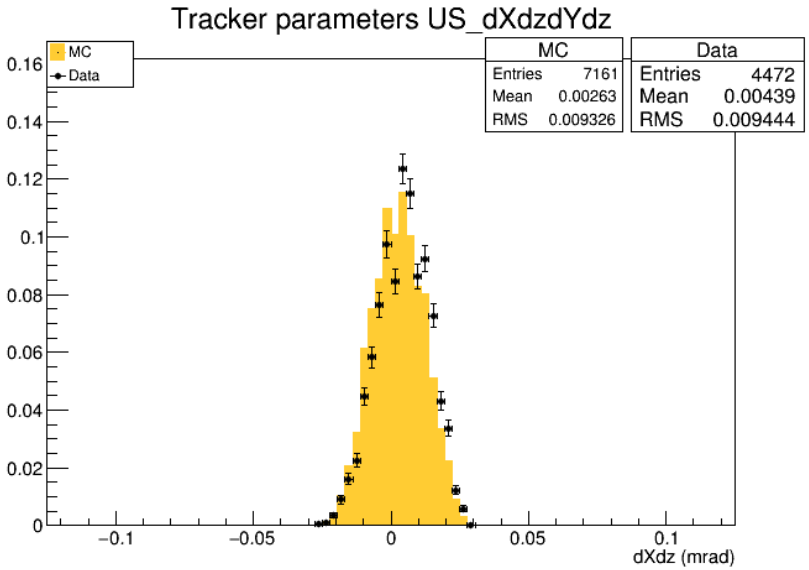


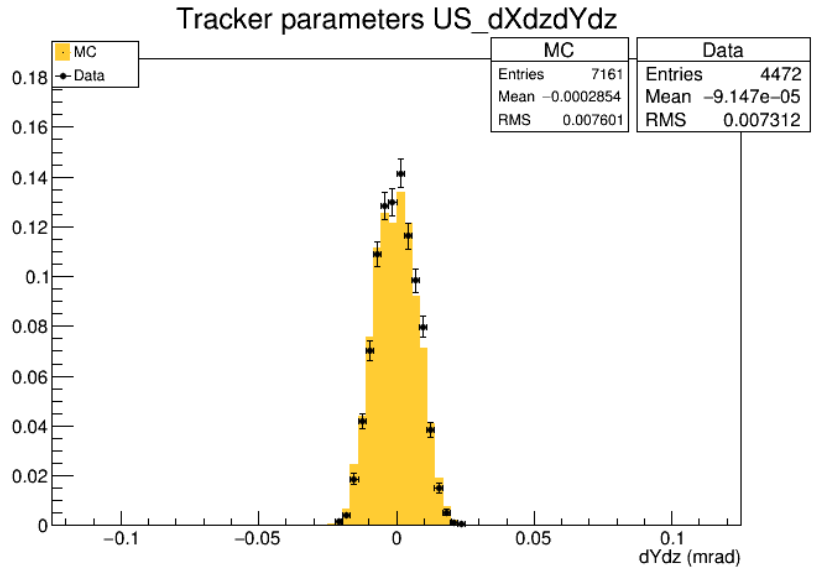


Final sample at trackers, 240 MeV/c UST, Full

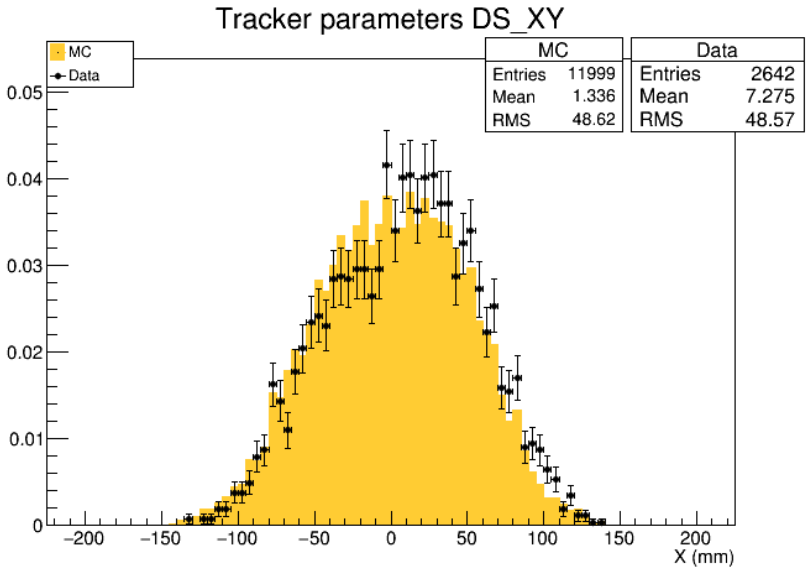


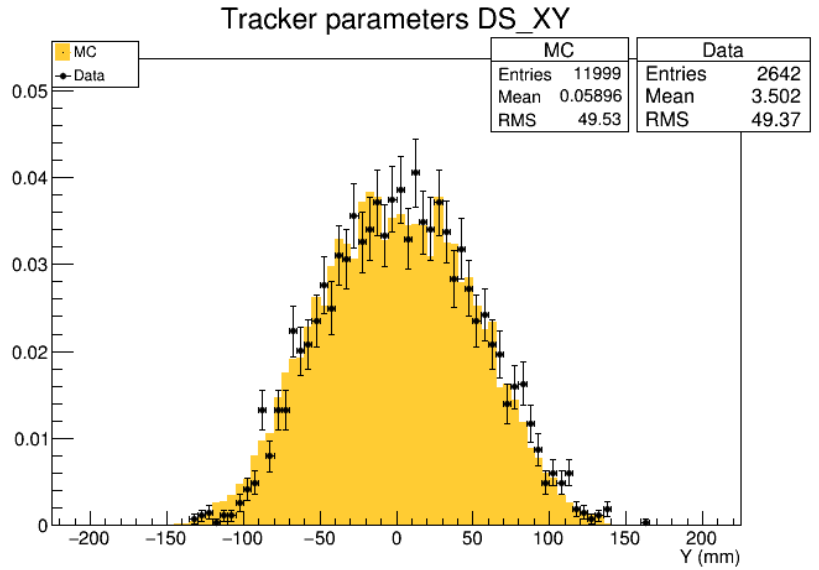


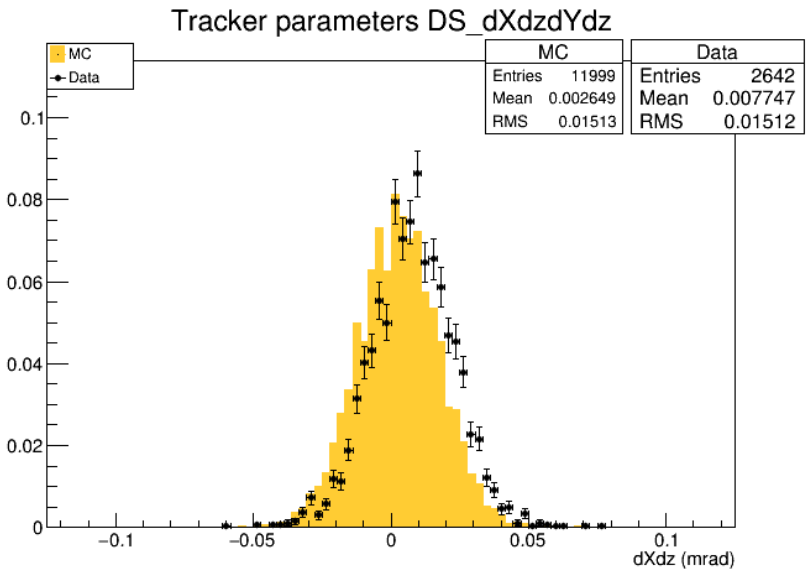


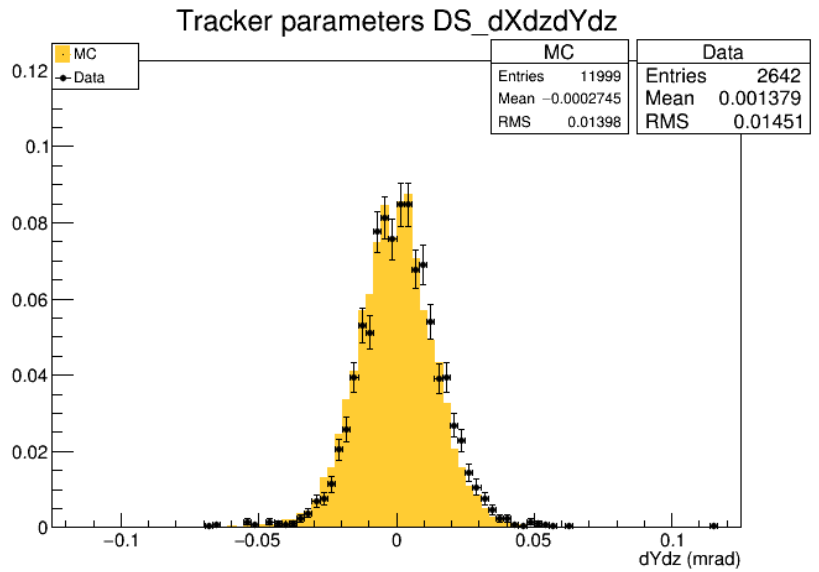


Final sample at trackers, 240 MeV/c DST, Empty

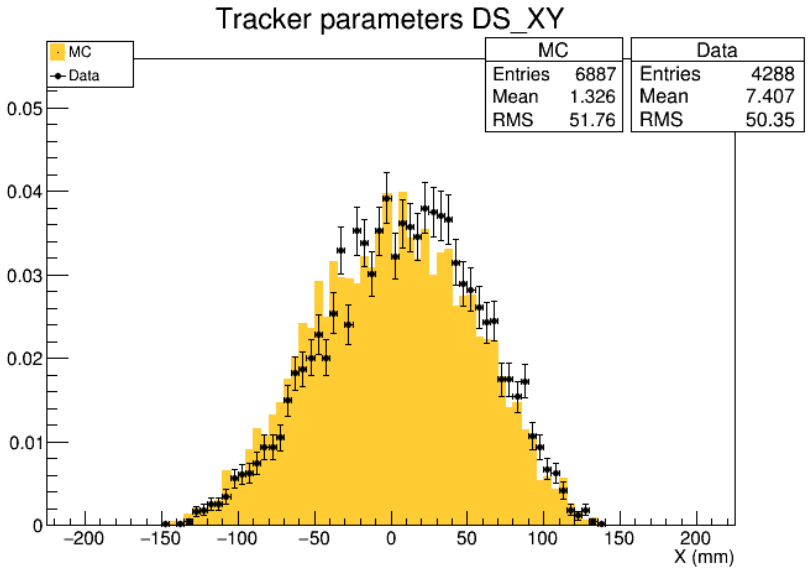


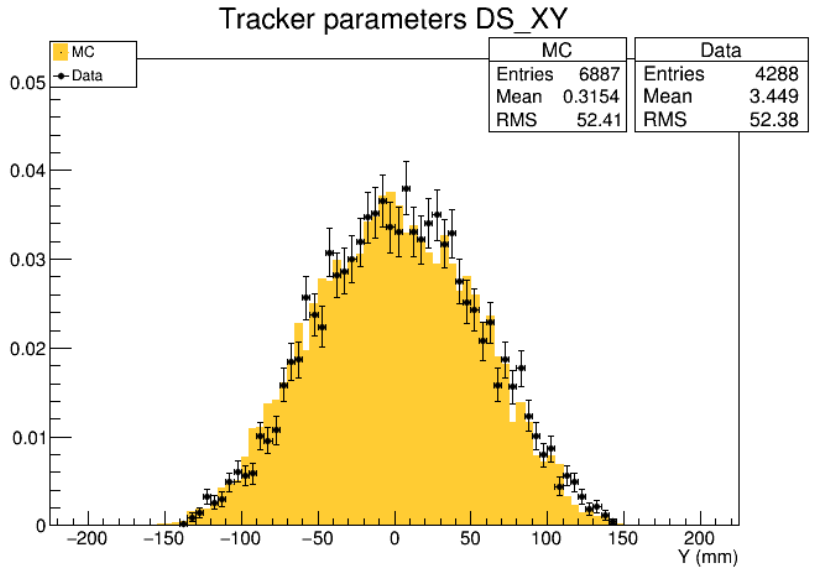


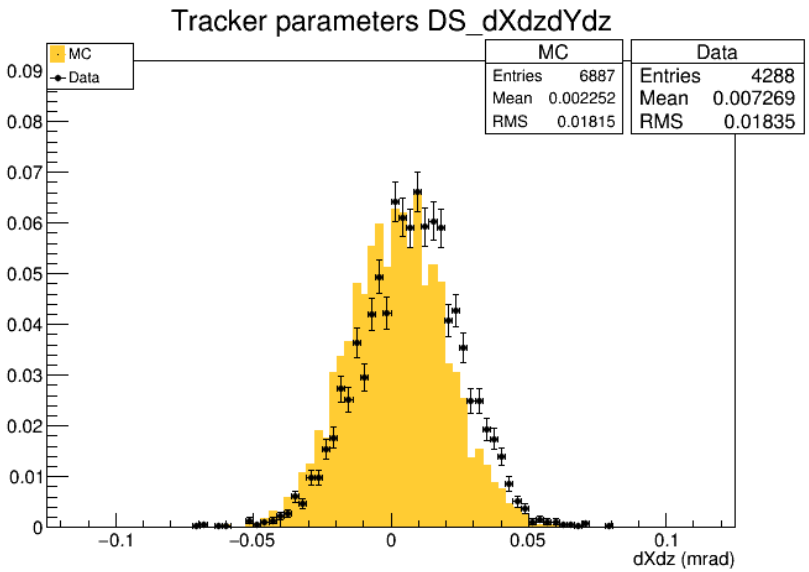


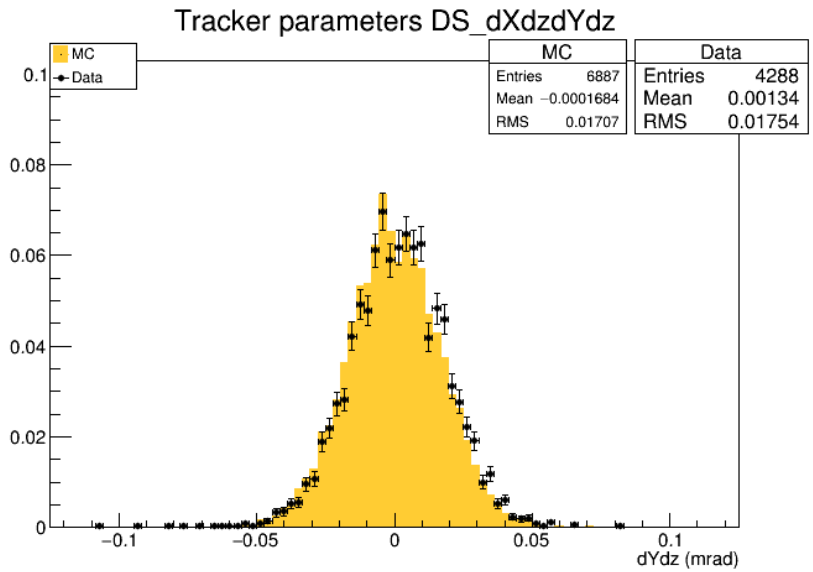


Final sample at trackers, 240 MeV/c DST, Full



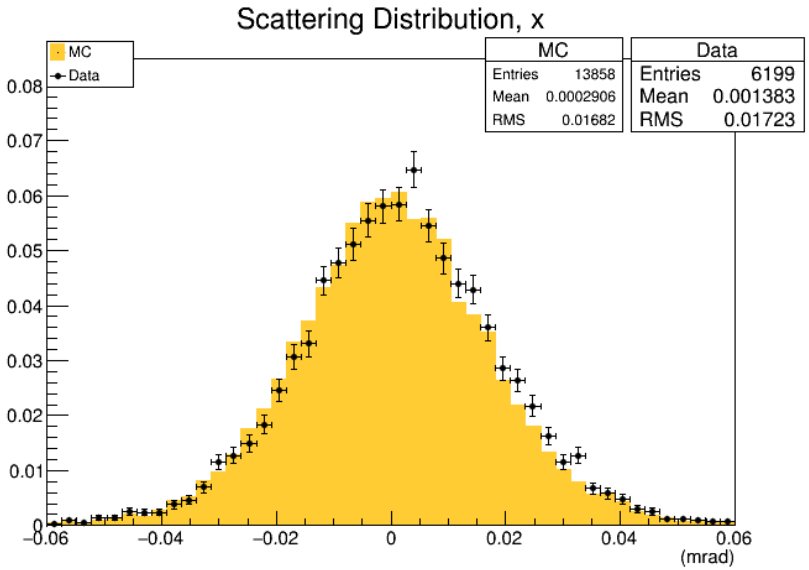


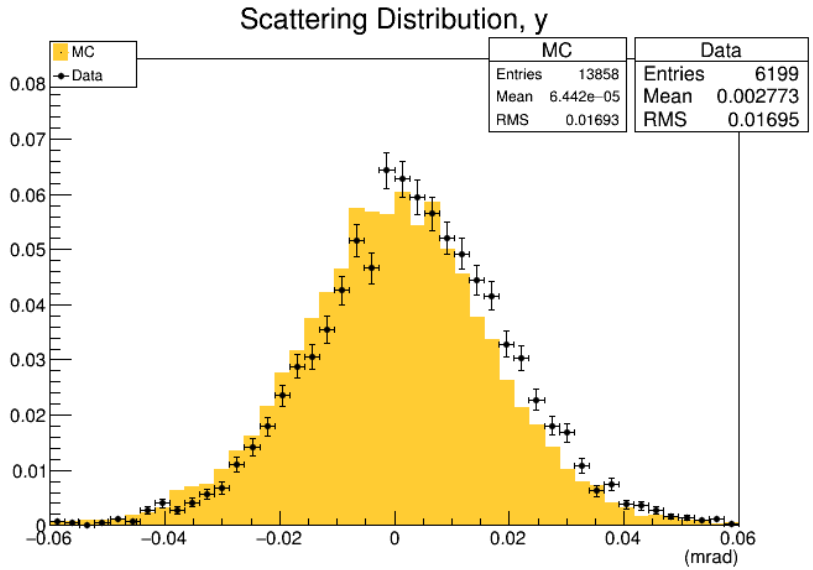




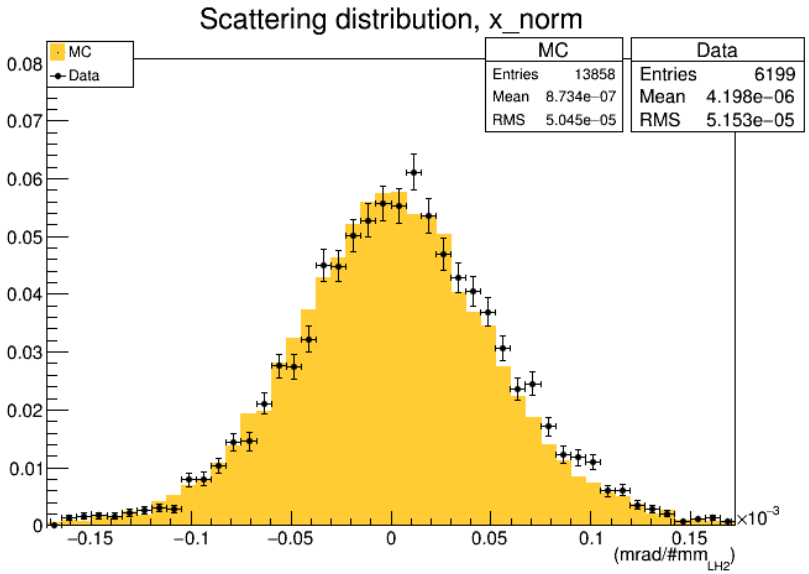
Scattering distributions, 170 MeV/c Empty

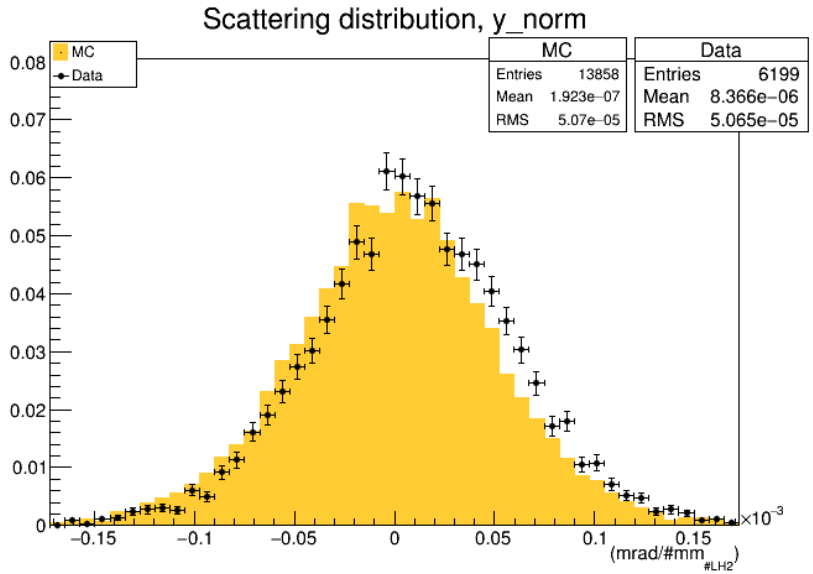
no normalisation





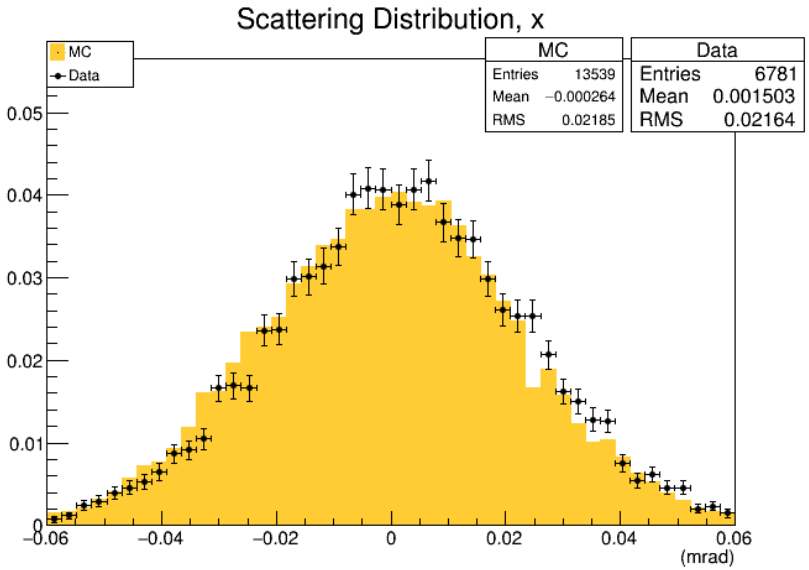
$\theta * \frac{1}{\sqrt{LH_2(mm)}}$

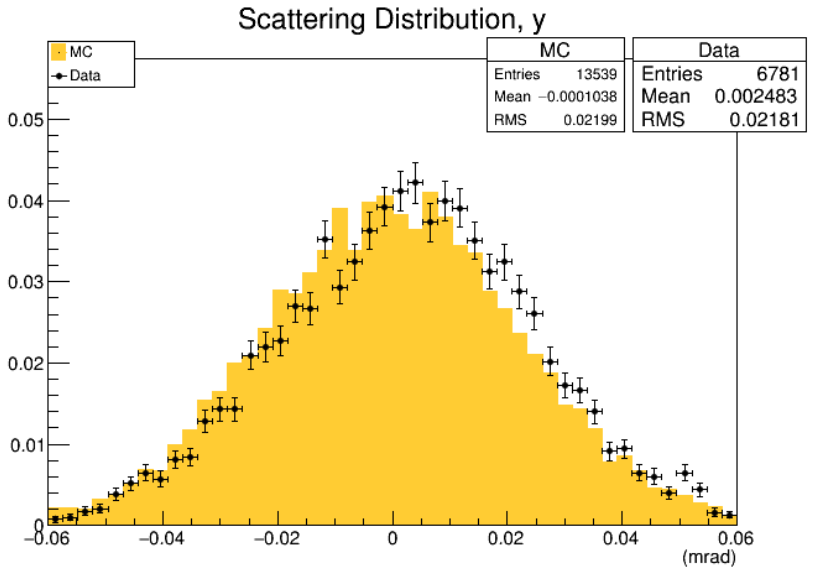




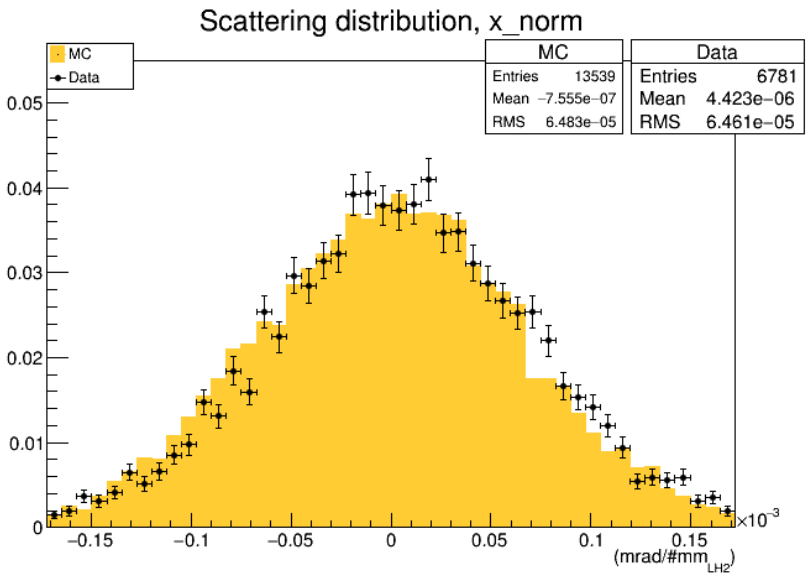
Scattering distributions, 170 MeV/c Full

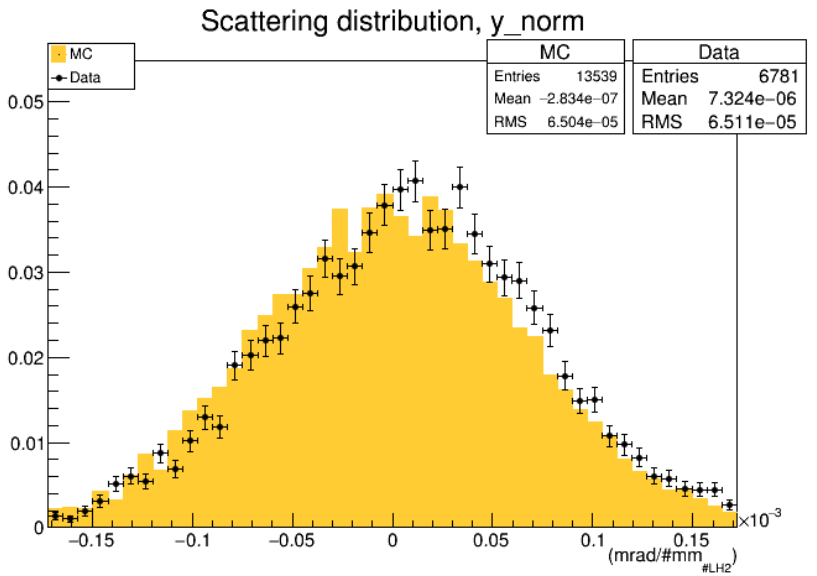
no normalisation





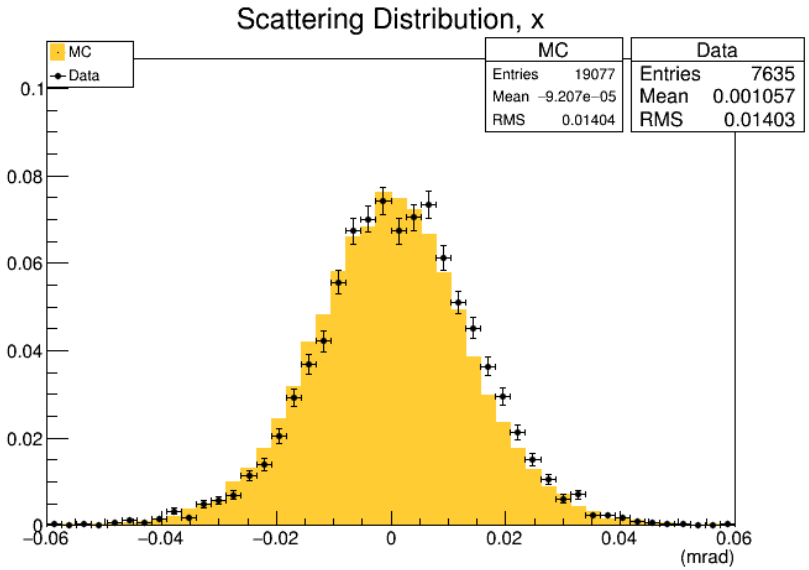
$\theta * \frac{1}{\sqrt{LH_2(mm)}}$

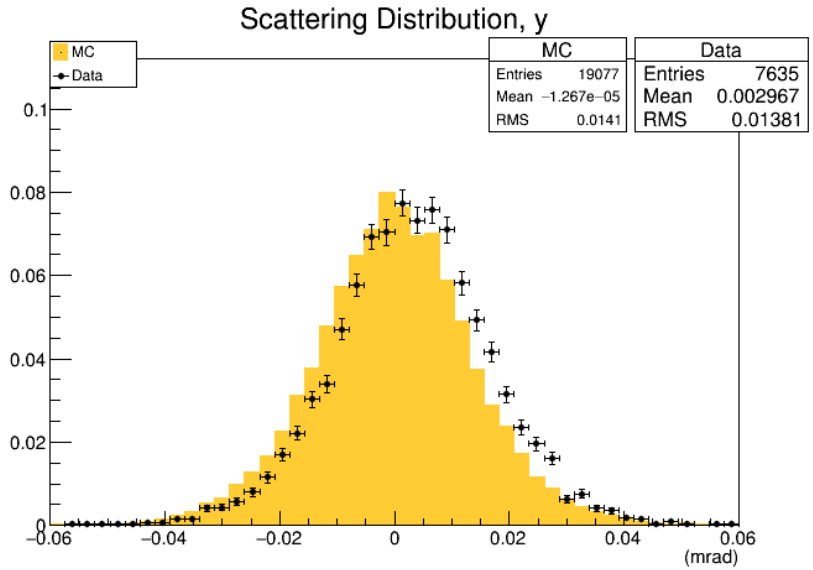




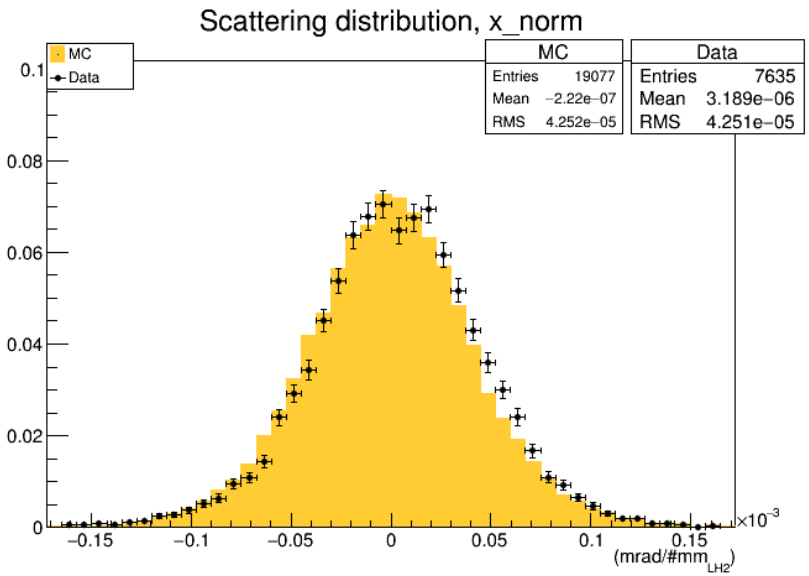
Scattering distributions, 200 MeV/c Empty

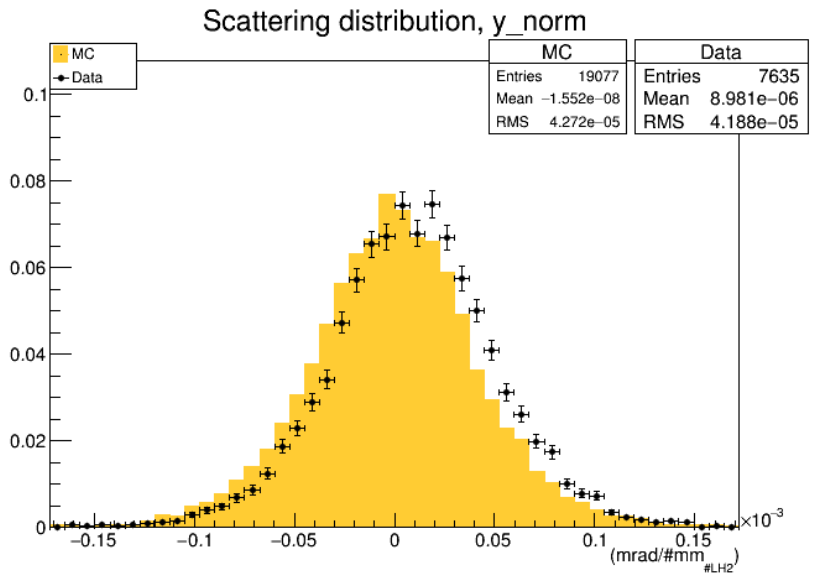
no normalisation





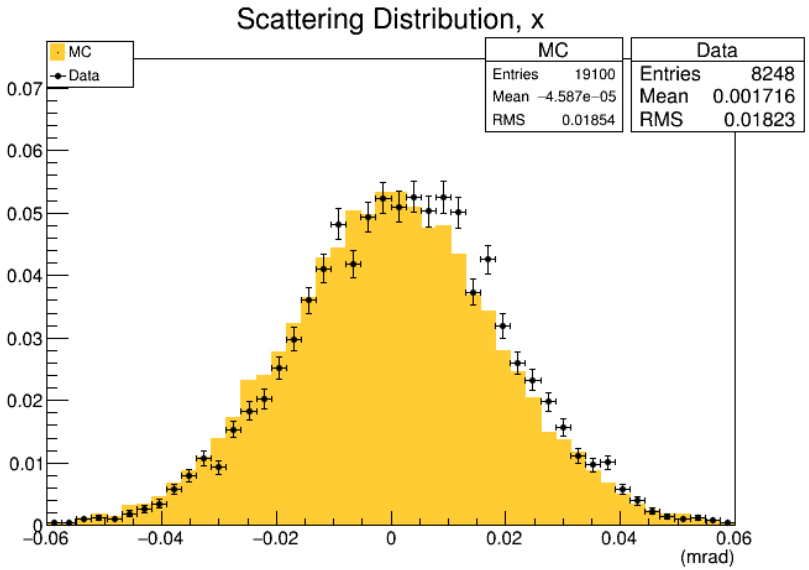
$\theta * \frac{1}{\sqrt{LH_2(mm)}}$

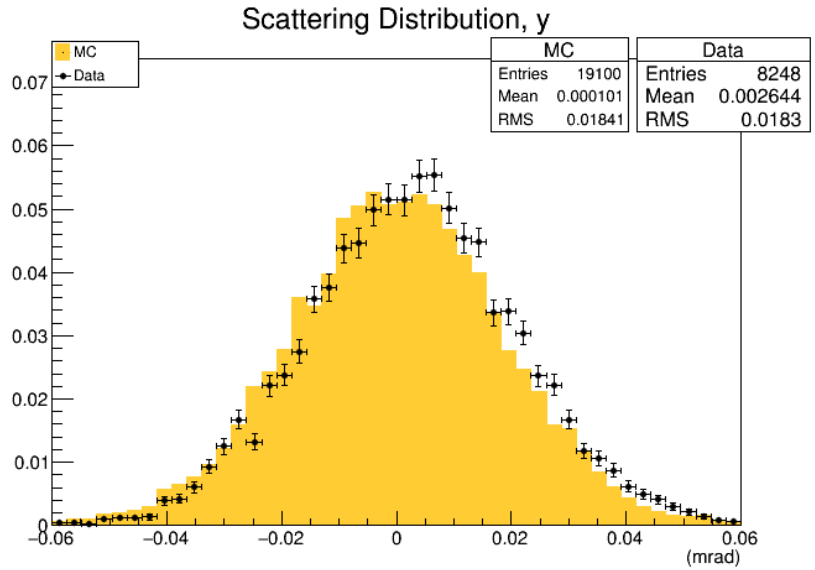




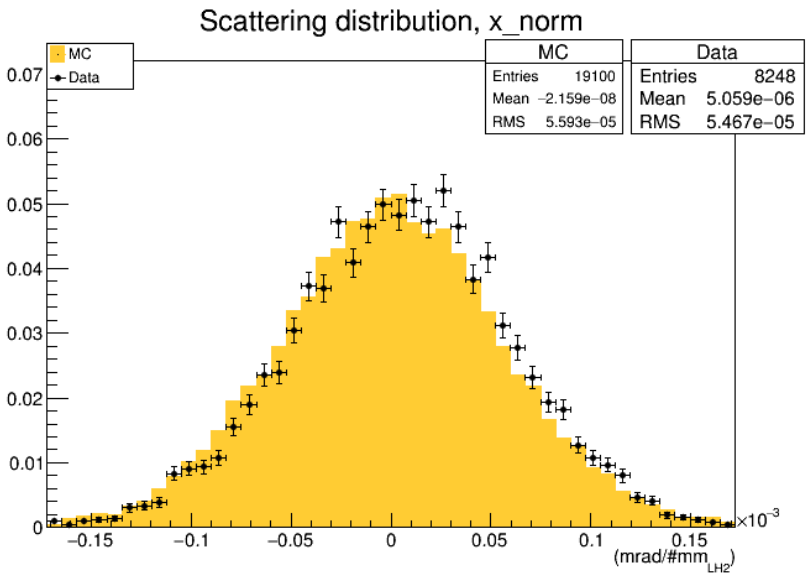
Scattering distributions, 200 MeV/c Full

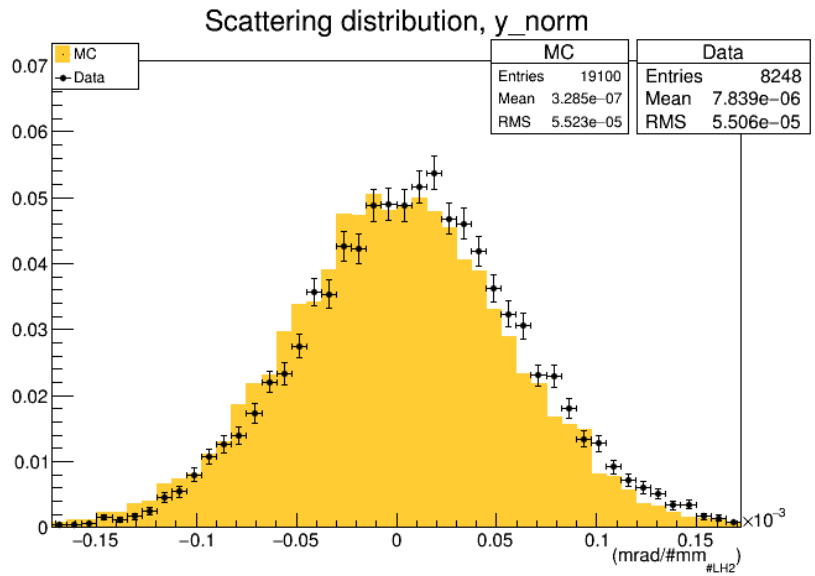
no normalisation





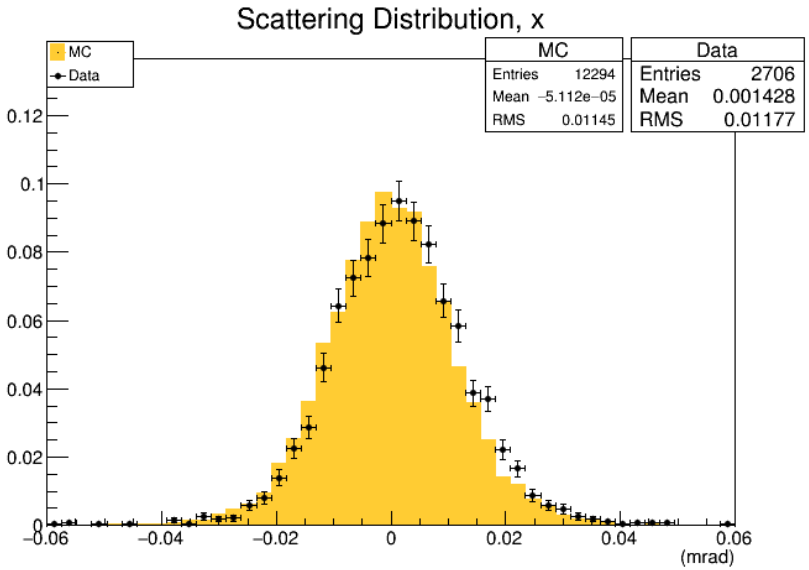
$\theta * \frac{1}{\sqrt{LH_2(mm)}}$

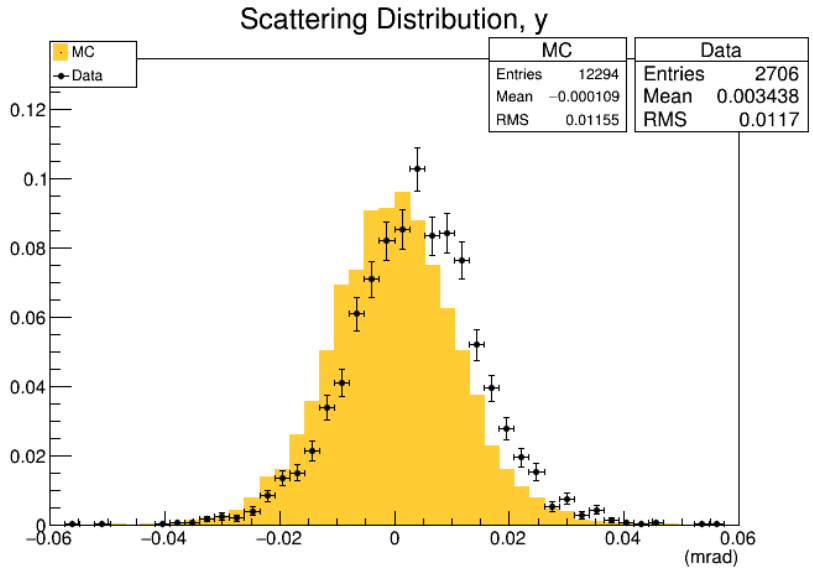




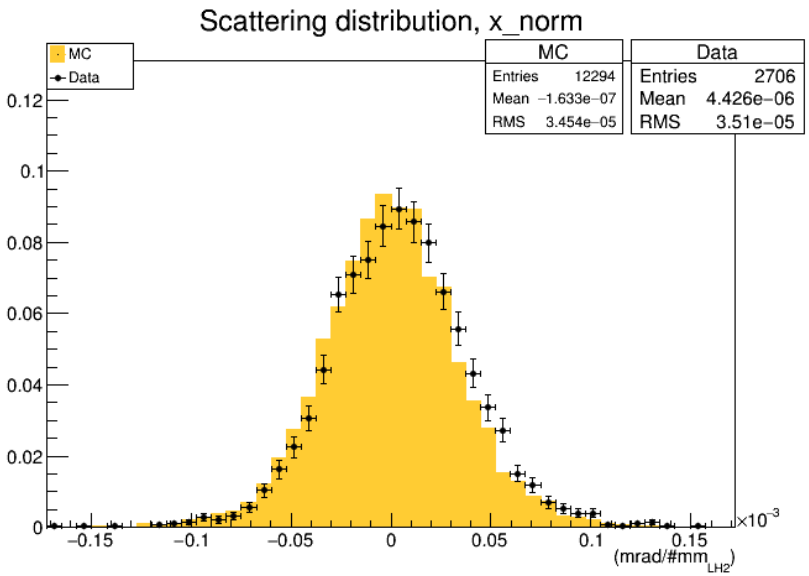
Scattering distributions, 240 MeV/c Empty

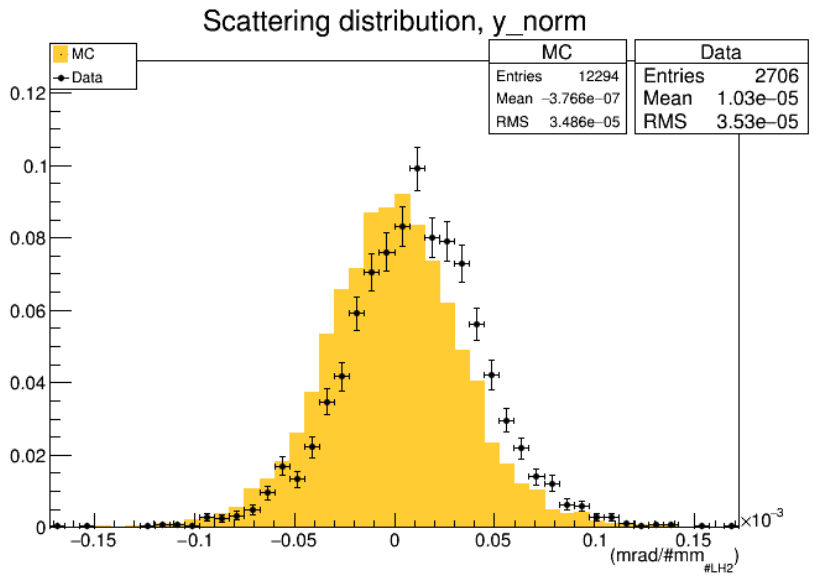
no normalisation





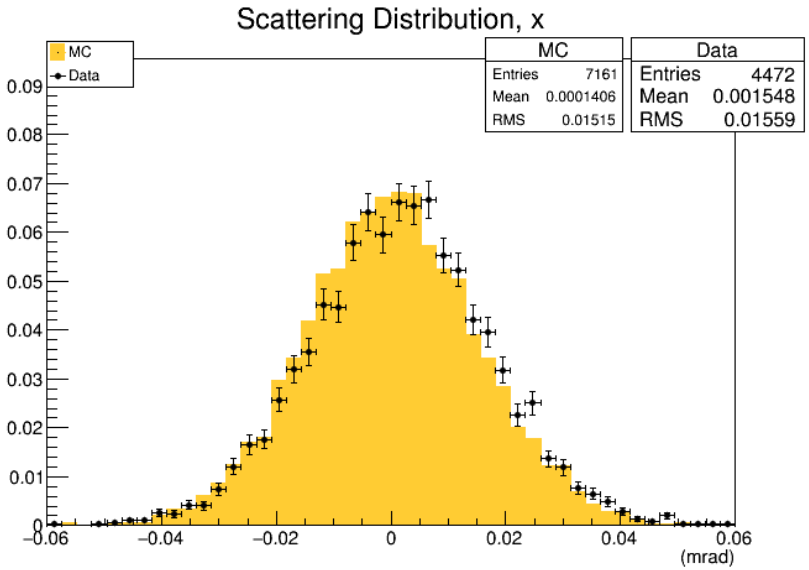
$\theta * \frac{1}{\sqrt{LH_2(mm)}}$

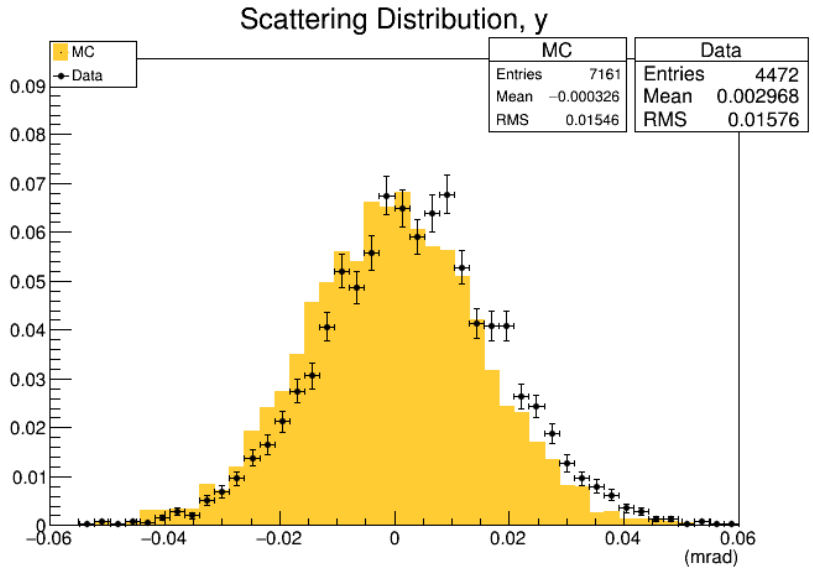




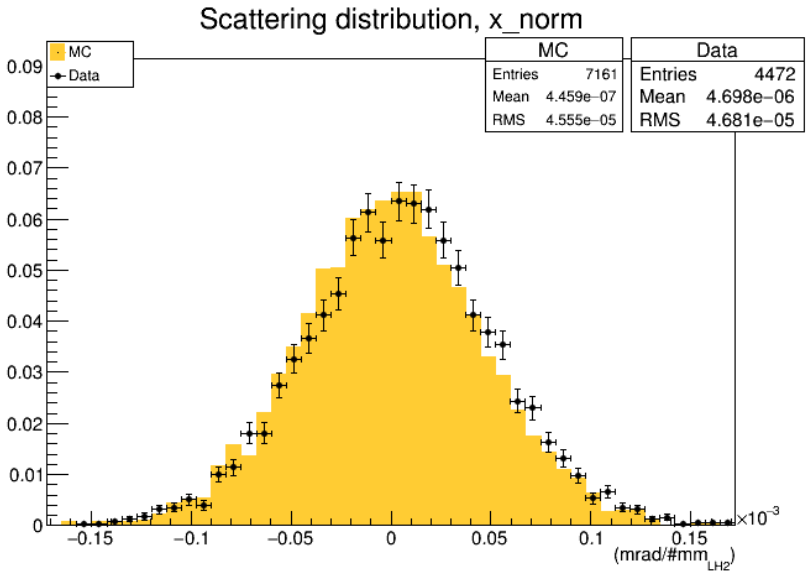
Scattering distributions, 240 MeV/c Full

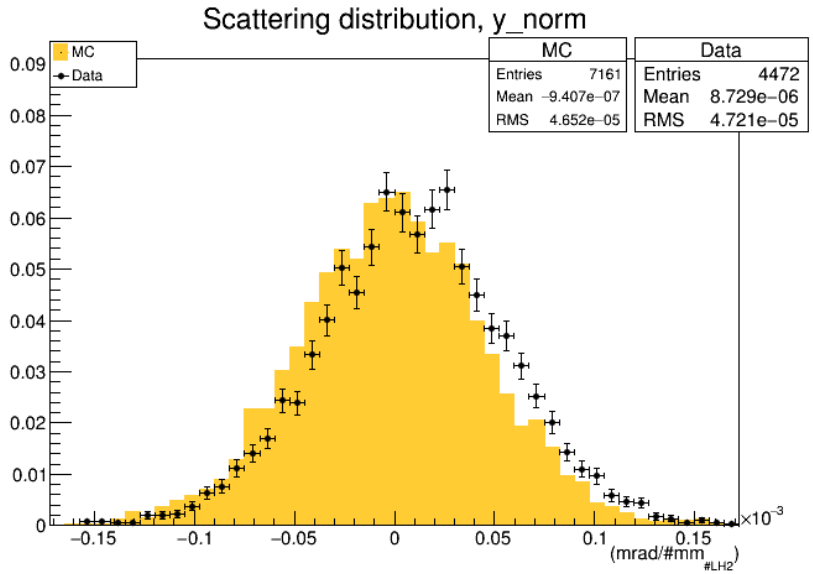
no normalisation





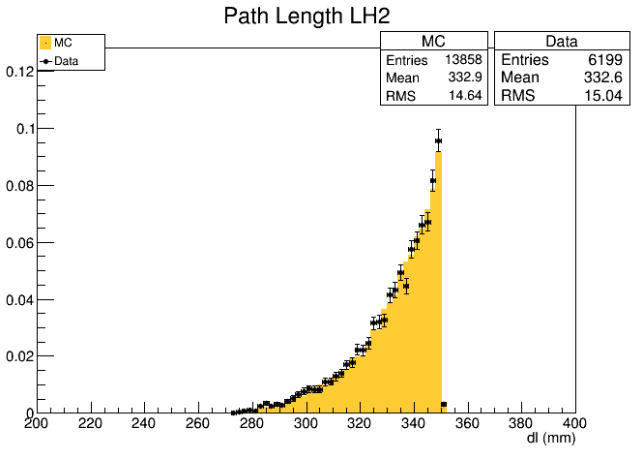
$\theta * \frac{1}{\sqrt{LH_2(mm)}}$

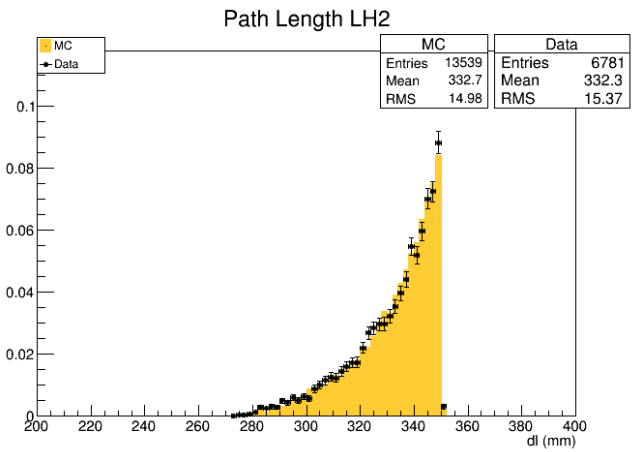




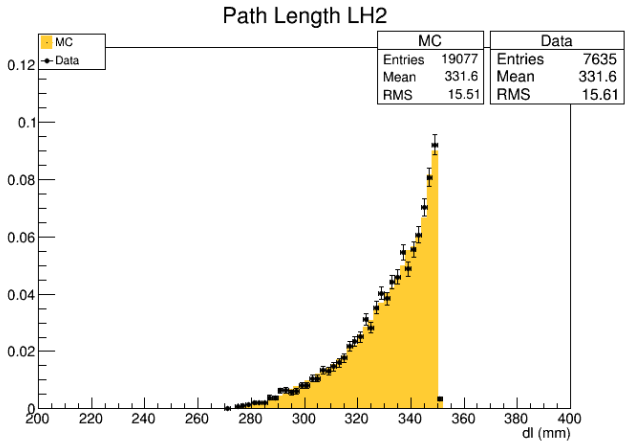
LH_2 Path length estimation

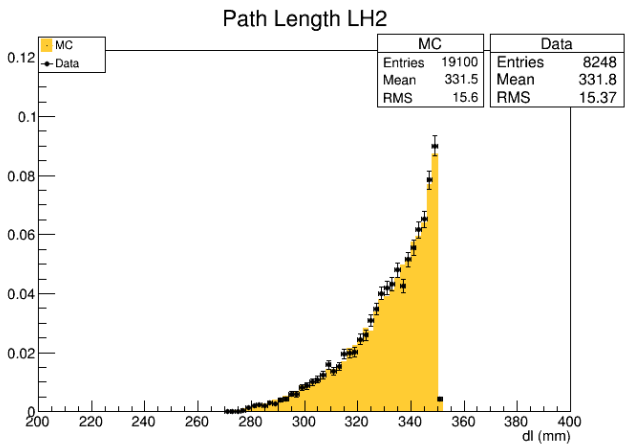
170 MeV/c



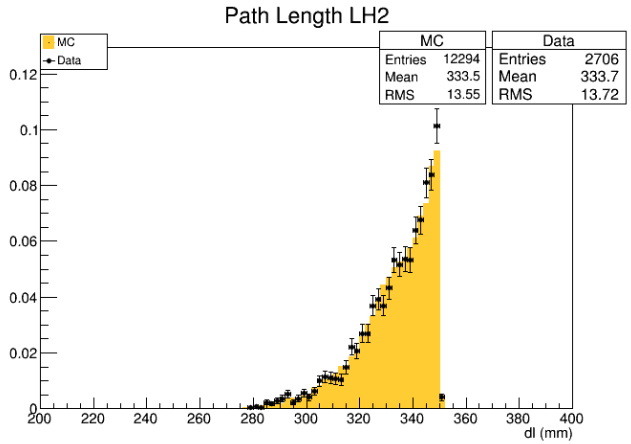


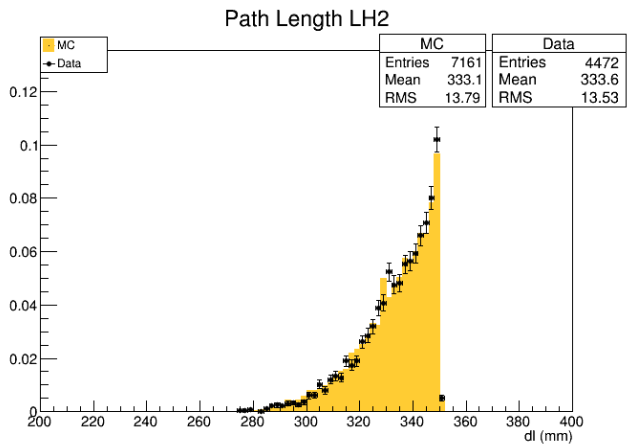
200 MeV/c





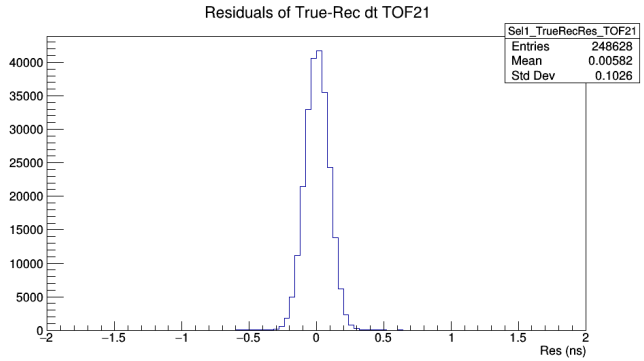
240 MeV/c

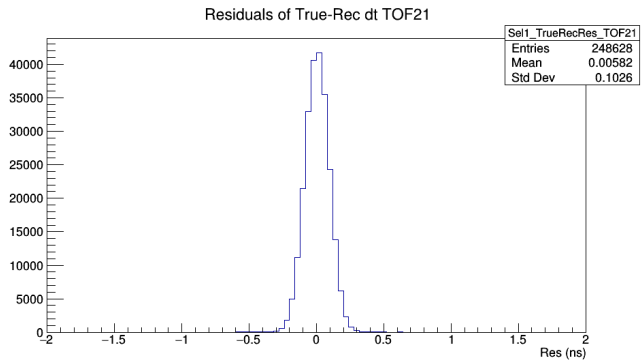




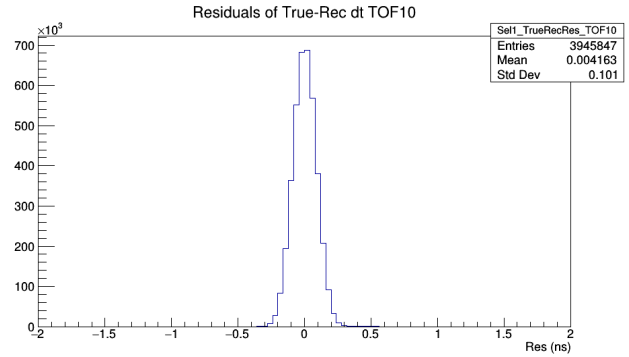
MC Empty, TOF Residuals $dt_{True} - dt_{recon}$

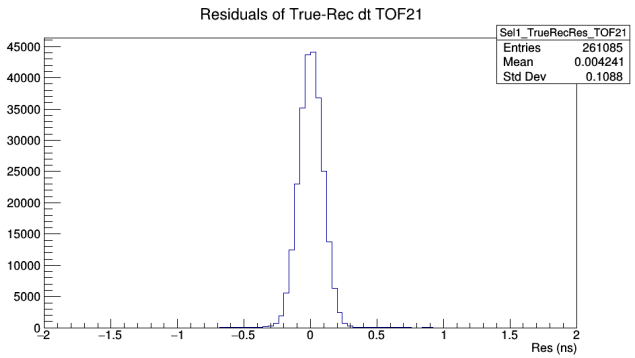
170 MeV/c



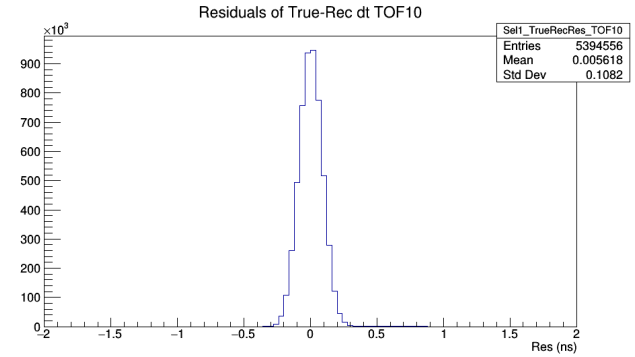


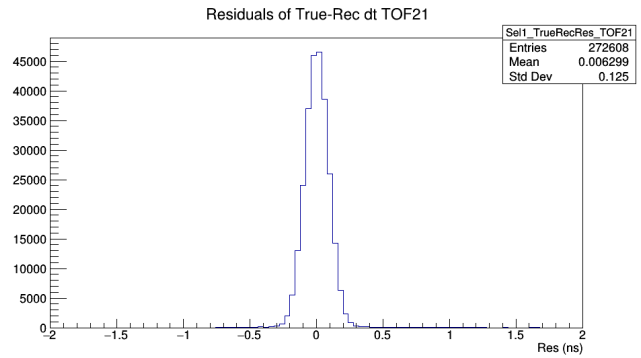
200 MeV/c





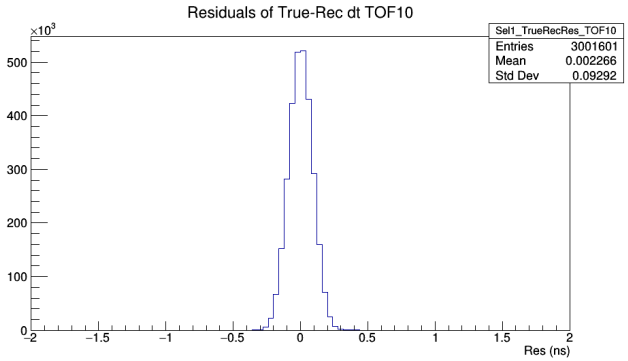
240 MeV/c

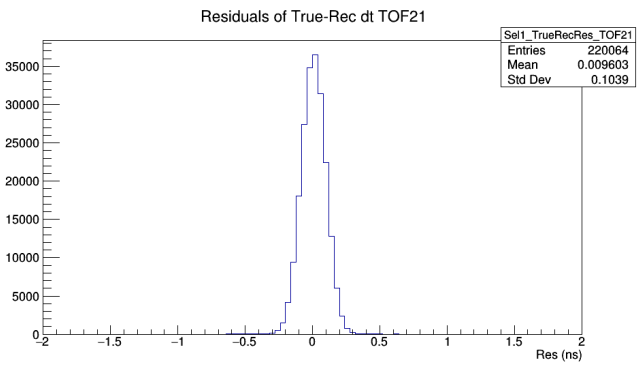




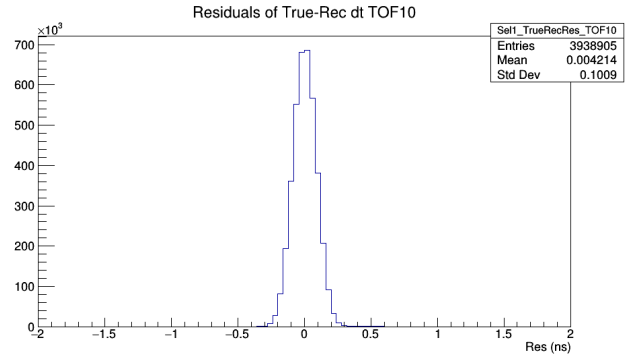
MC Full, TOF Residuals $dt_{True} - dt_{recon}$

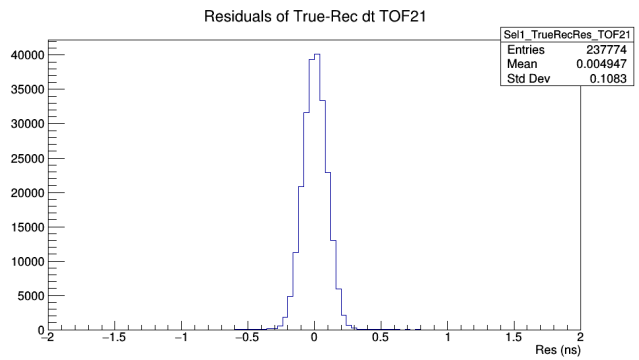
170 MeV/c



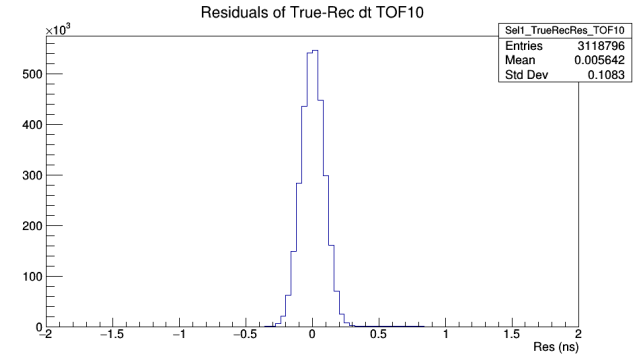


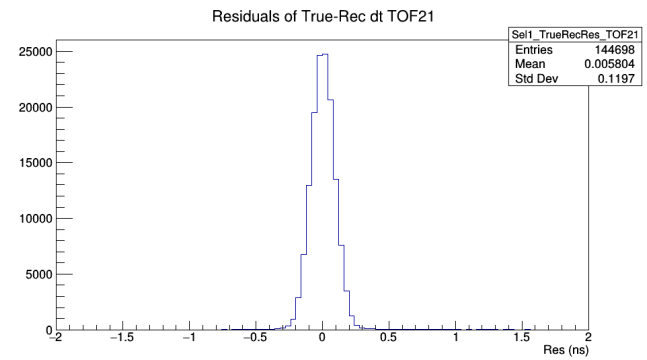
200 MeV/c





240 MeV/c





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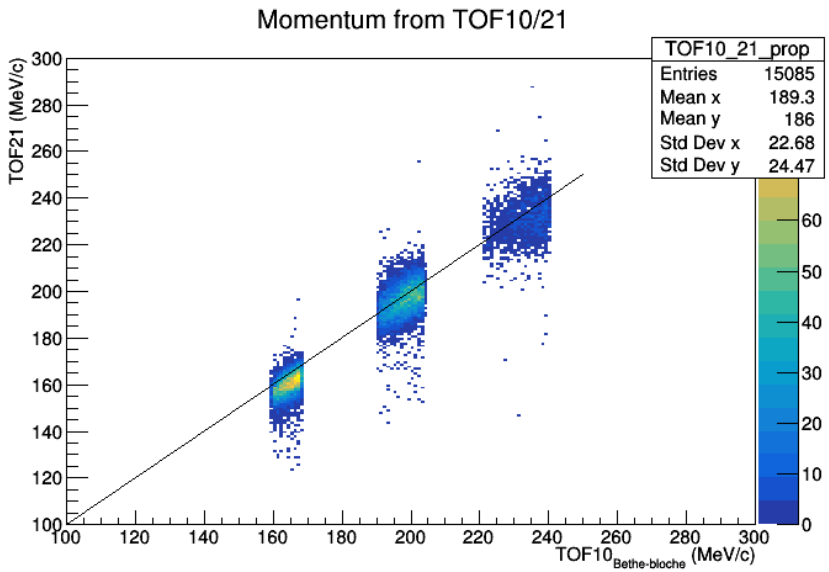
$Pz_{TOF_{21}}$ vs $Pz^{Bethe}_{TOF_{10}}$

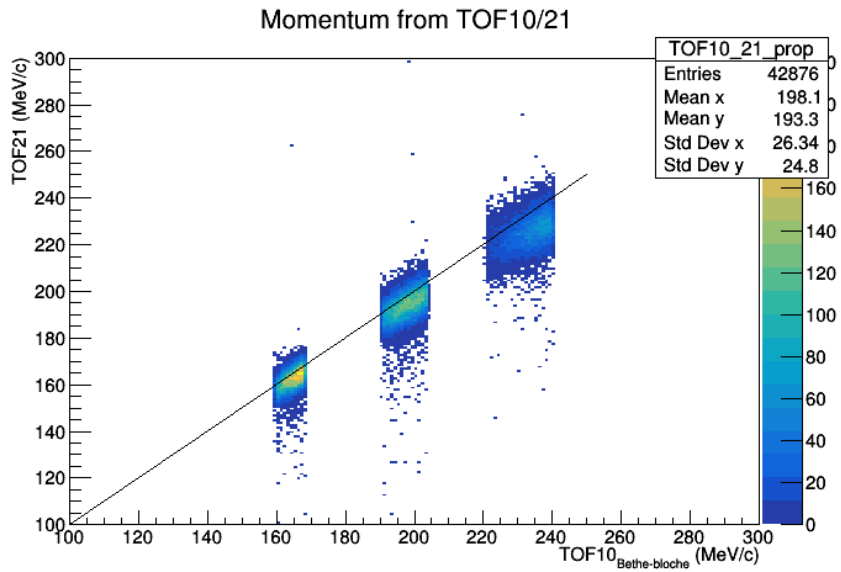
MICE

Data

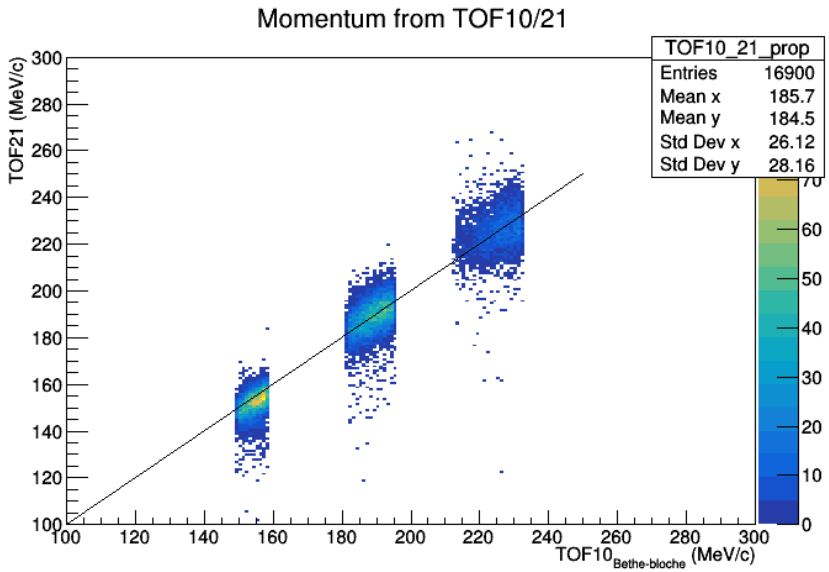
MC

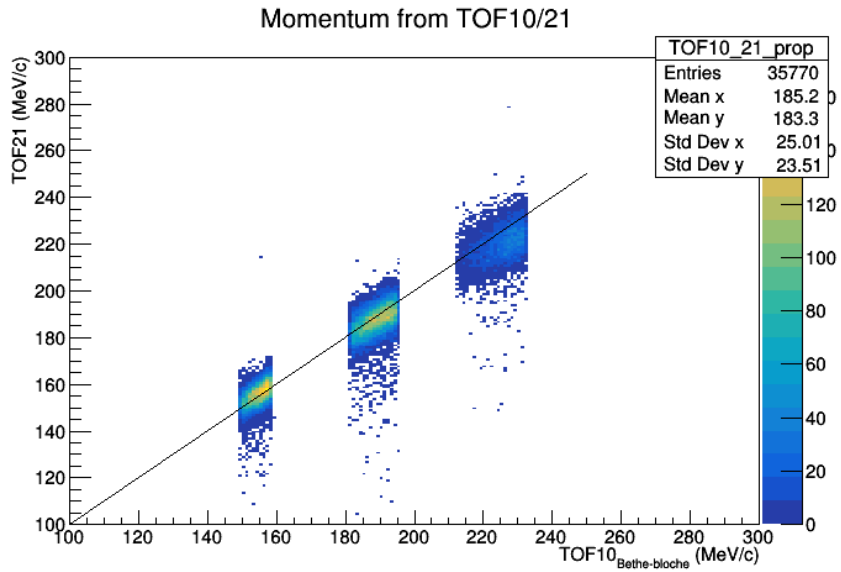
Empty





Full

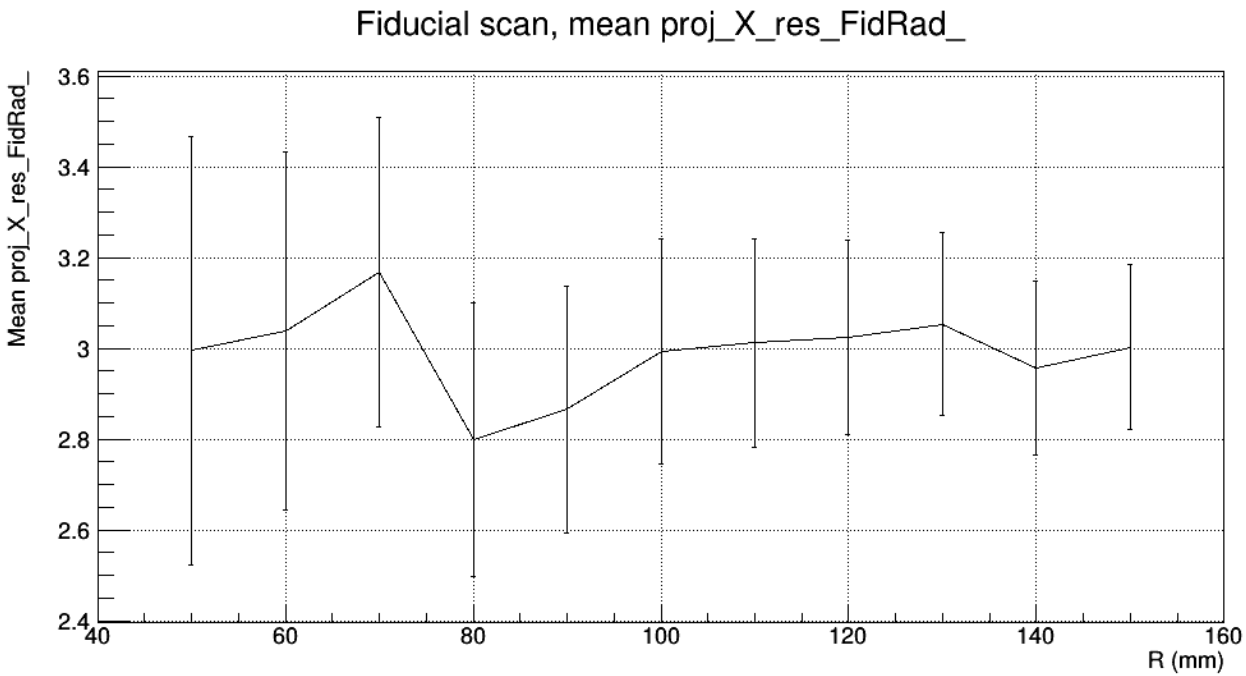




Assymetric beam loss / scraping check

Mean X_{US}-X_{DS} (at absorber center)

- UST and DST tracks are projected to the center of the absorber,
- Mean residuals of the UST and DST projections are plotted as selection criteria are used to select a sample, with a changing (50mm $\rightarrow$ 150mm) minimum projected radius at DST st.5.
- We are looking for correlation (or lack of) between the alignment parameters and the radial selection



Assymetric beam loss / scraping check

Mean Y_{US}-Y_{DS} (at absorber center)

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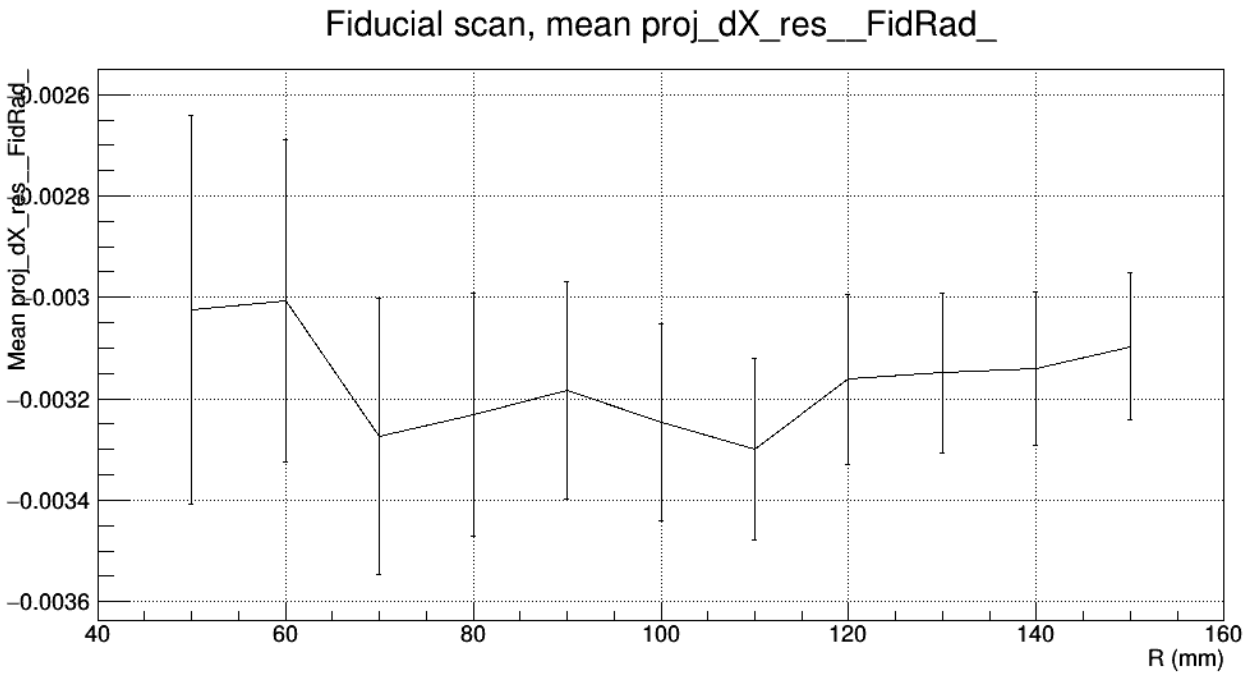
Assymetric beam loss / scraping check

Mean $\frac{dX}{dz}_{US}$-$\frac{dX}{dz}_{DS}$ (at absorber center)

- UST and DST tracks are projected to the center of the absorber,
- Mean residuals of the UST and DST projections are plotted as selection criteria are used to select a sample, with a changing (50mm $\rightarrow$ 150mm) minimum projected radius at DST st.5.
- We are looking for correlation (or lack of) between the alignment parameters and the radial selection



Assymetric beam loss / scraping check

Mean $\frac{dY}{dz}_{US}$-$\frac{dY}{dz}_{DS}$ (at absorber center)

- UST and DST tracks are projected to the center of the absorber,
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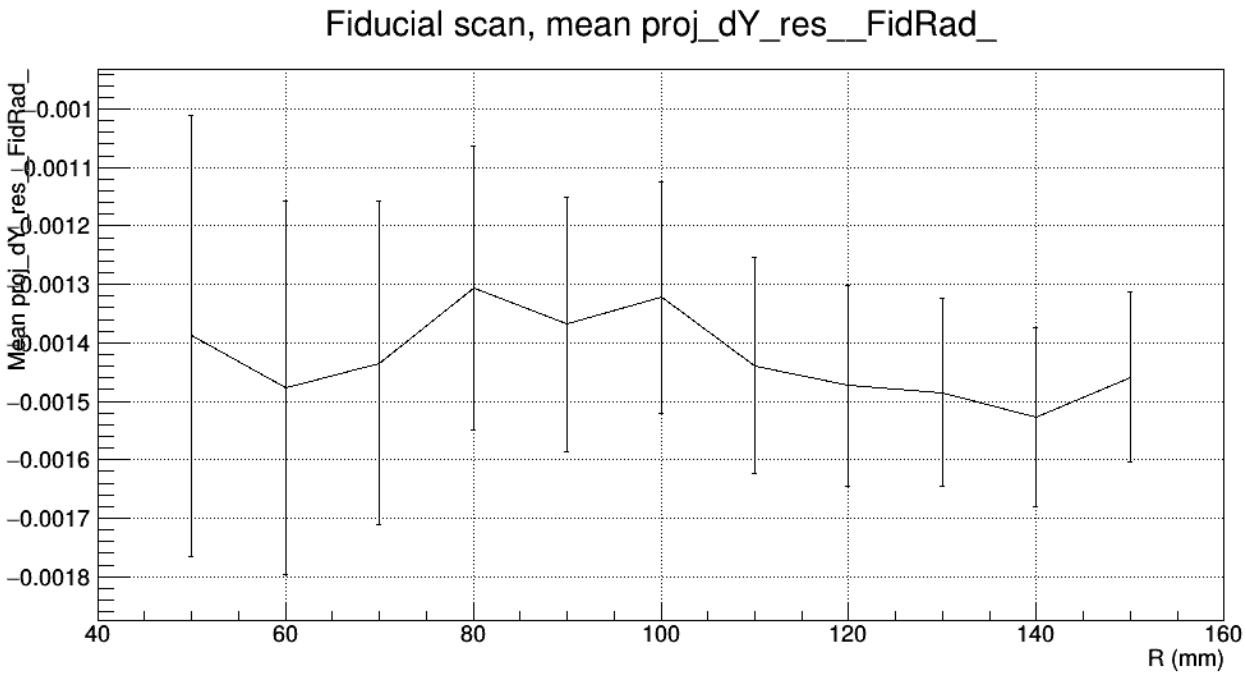

MCS in LH_2, Field-off

Conclusion/Future work

- MC/Data comparisson looks good except for small discrepancies in UST χ^2 (240MeV/c), and spatial & directional tracker parameters in the 170 (MeV/c) dataset.
- TOF comparisson will improve with the increased no. of positrons,
- Good agreement for energy calculations (?)
- Selection seems to be mitigating any scraping effects and also there might be "room" to loosen the radial selection,
- Secure that any bias in the scattering distributions is only due to alignment between trackers (looks like it is) and correct for it.
- Estimate pion contamination.