

Real data and MC comparison

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Monte Carlo Data

Second pair of stations -> Target 1 (second target) Monte Carlo

Produced files: MCsignalJob_target2_1.root

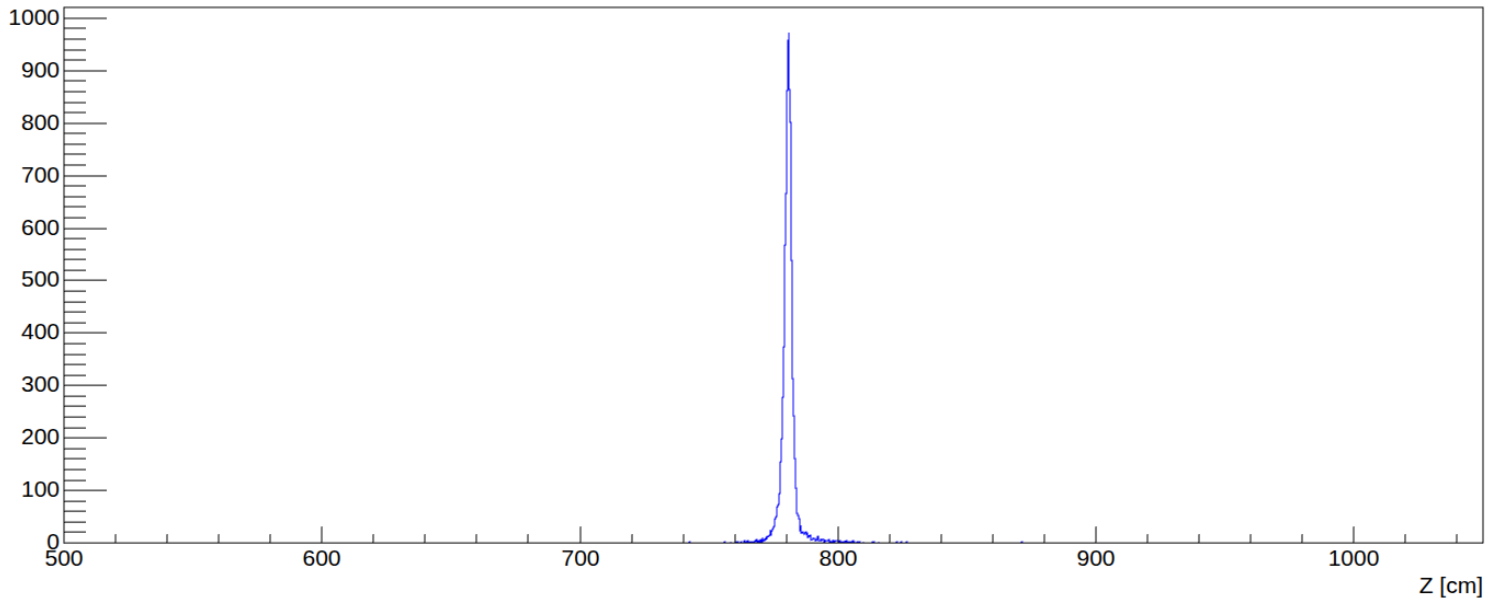
requested: 200k events

-> in the production included trigger (on the hit level)

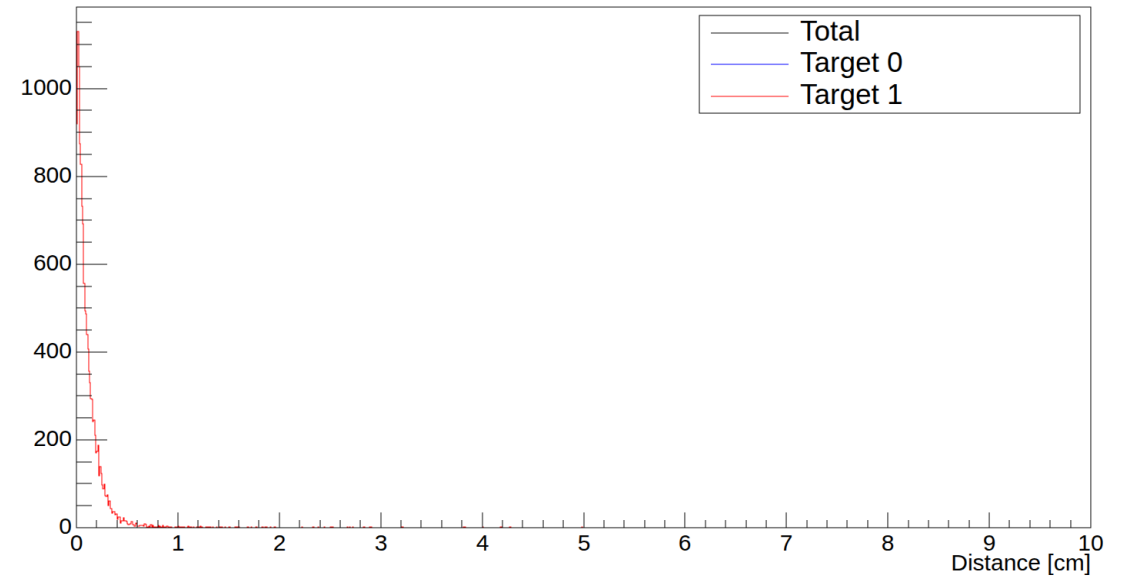
total events in the output file: 15 077

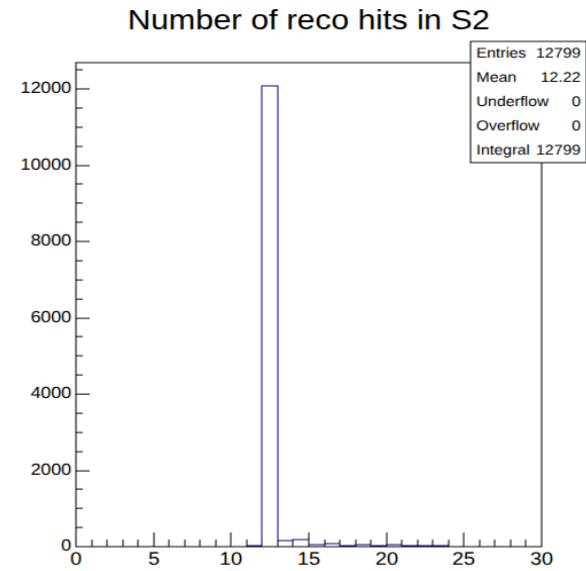
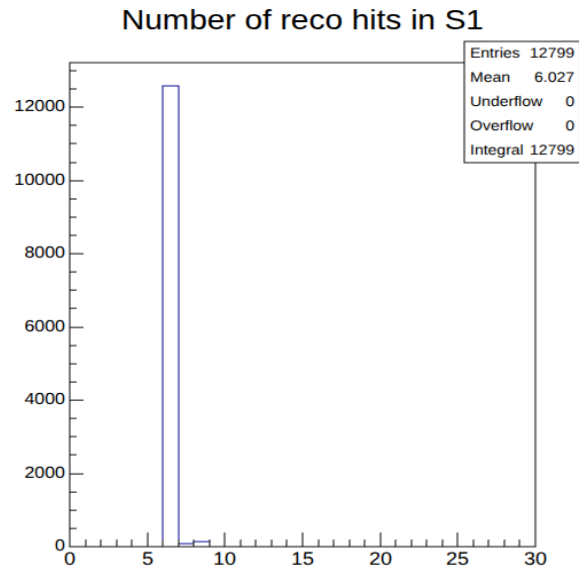
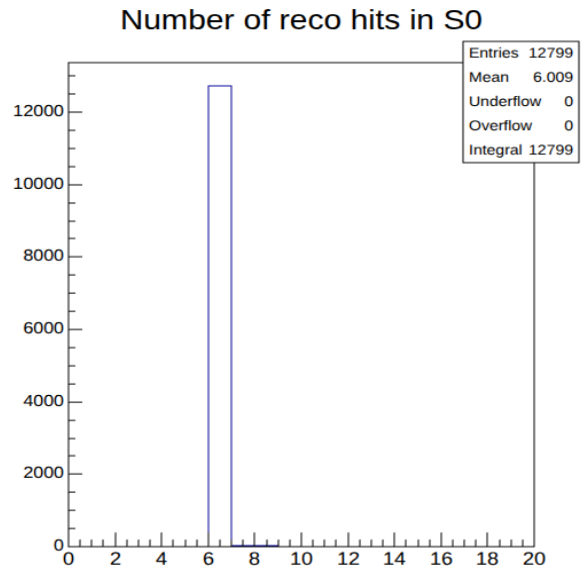
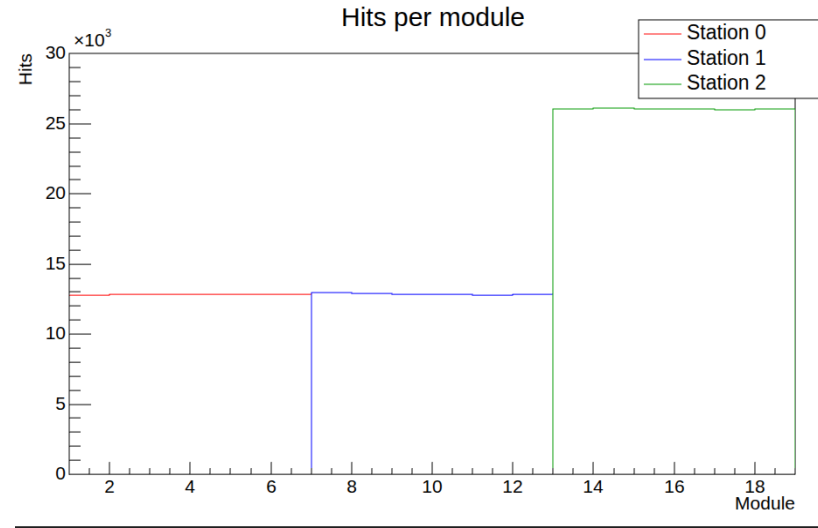
Monte Carlo data – MESMER – NNLO Target 1	
Total events	15 077
Reconstructed	85 %

Z position fit: No cut



Distance between tracks at target

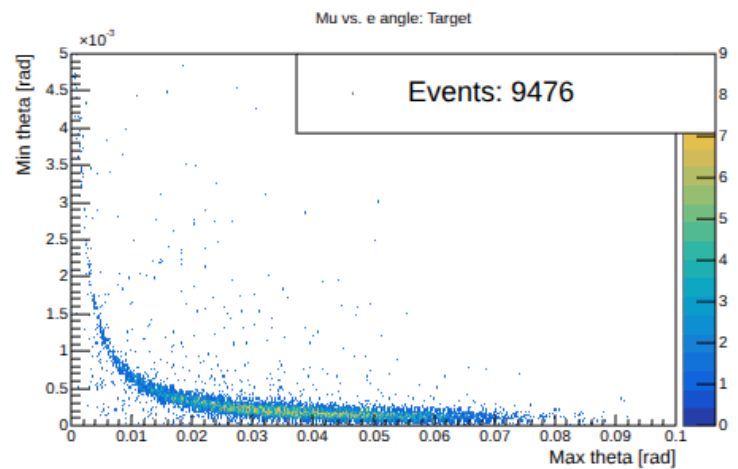
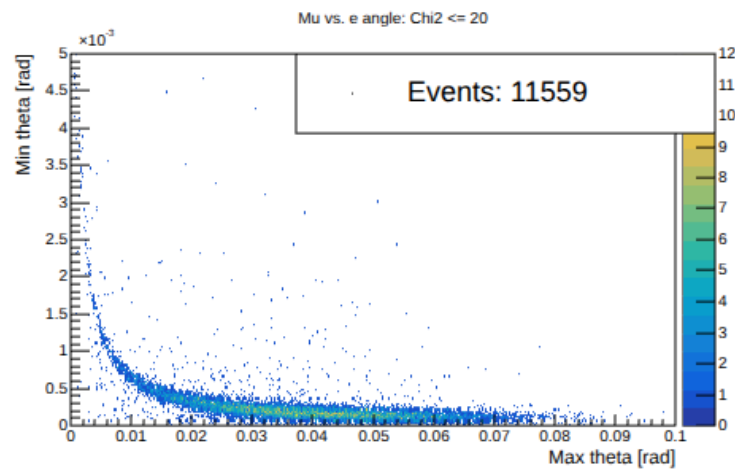
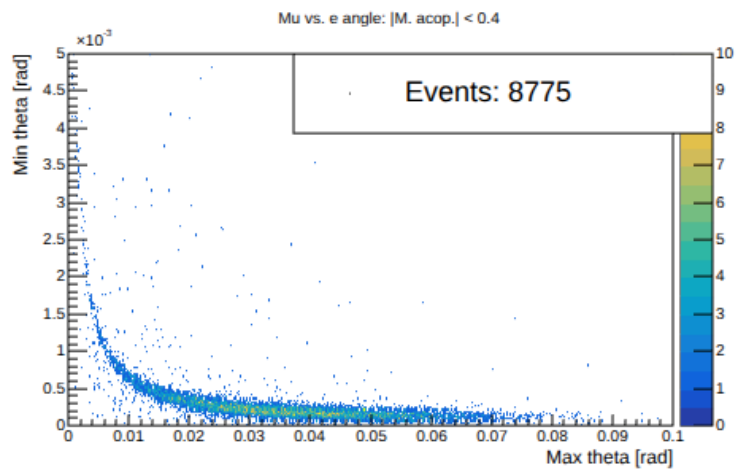
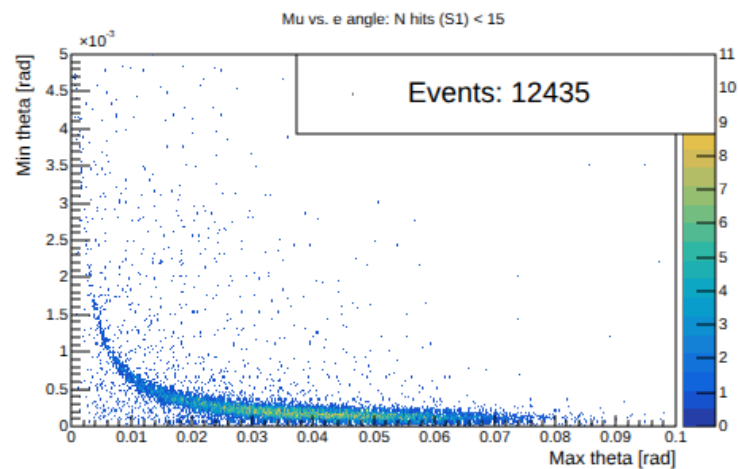
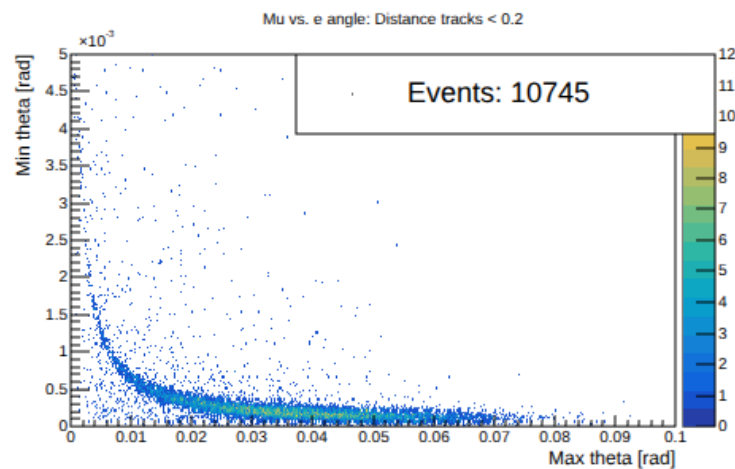
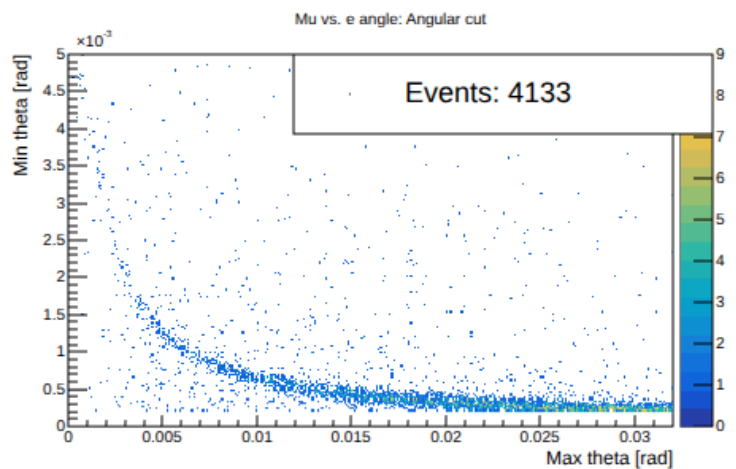




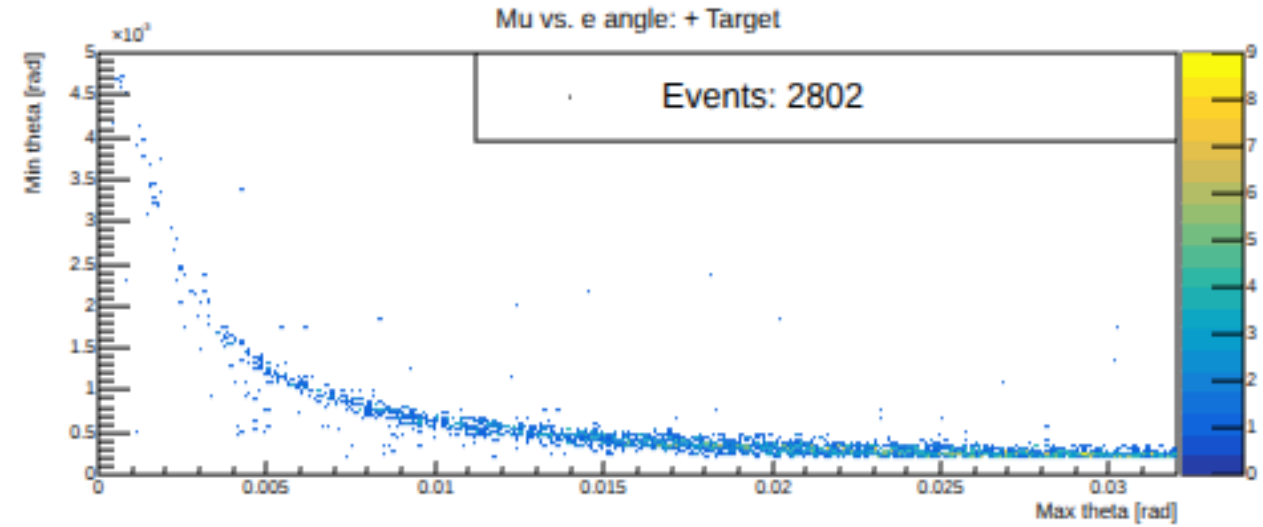
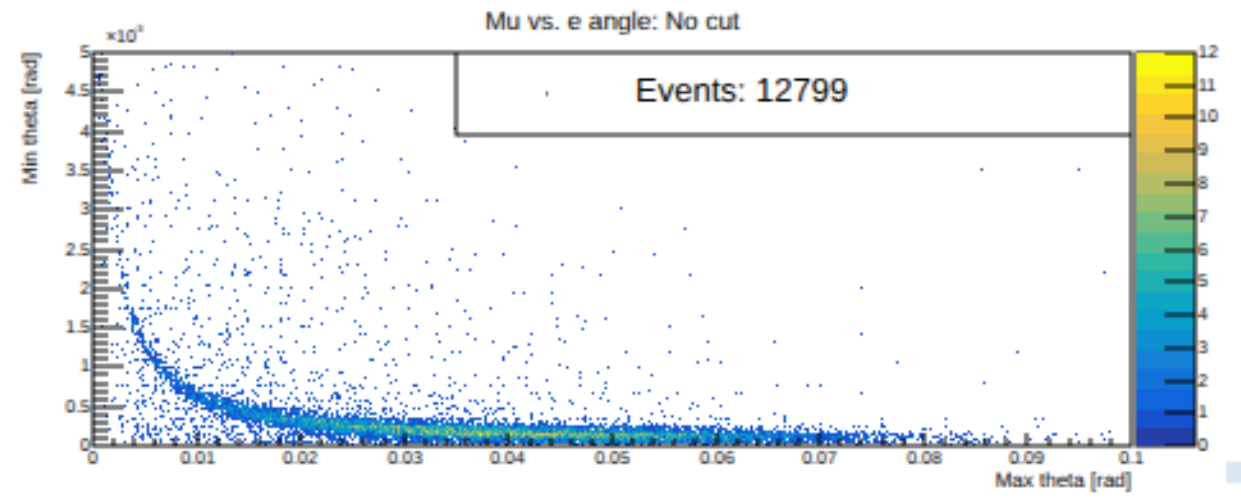
Second pair of stations -> Target 1 (second target) Monte Carlo

Monte Carlo data – MESMER – NNLO Target 1	
Total events	15 077
Reconstructed	12 799 - 85 %
Events left after the cuts (applied separately) - considering reconstructed	
Angle cut- theta min ≥ 0.0002 && theta max < 0.032	32 %
Distance between the two tracks at target < 0.2	84 %
N hits in Station 2 < 15	97 %
M. acop. < 0.4	68 %
Chi2 of the vertex ≤ 20	90 %
Target	74 %
Events left after all the cuts	2 802 - 21 %

Separate cuts



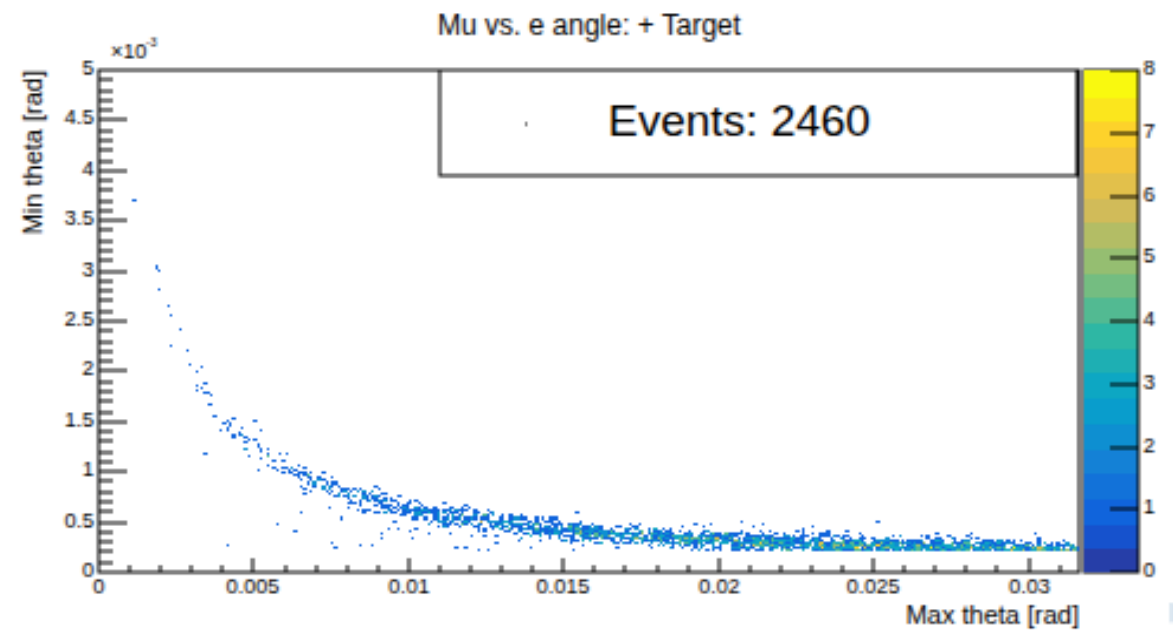
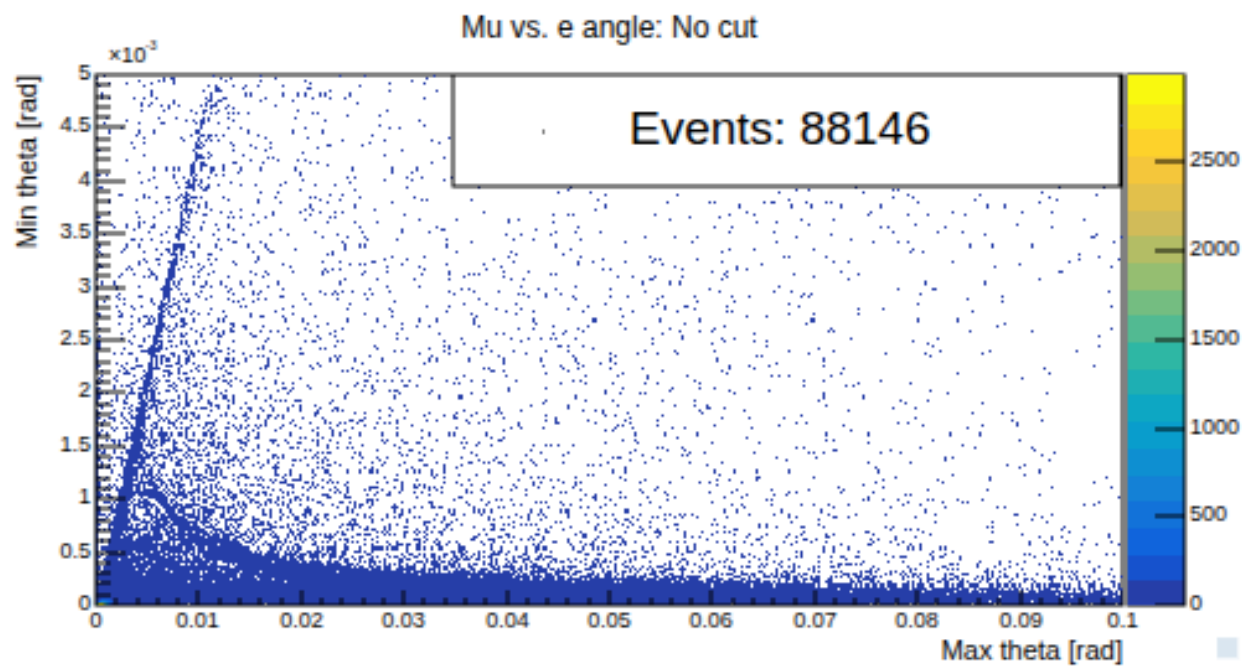
After applying all the cuts



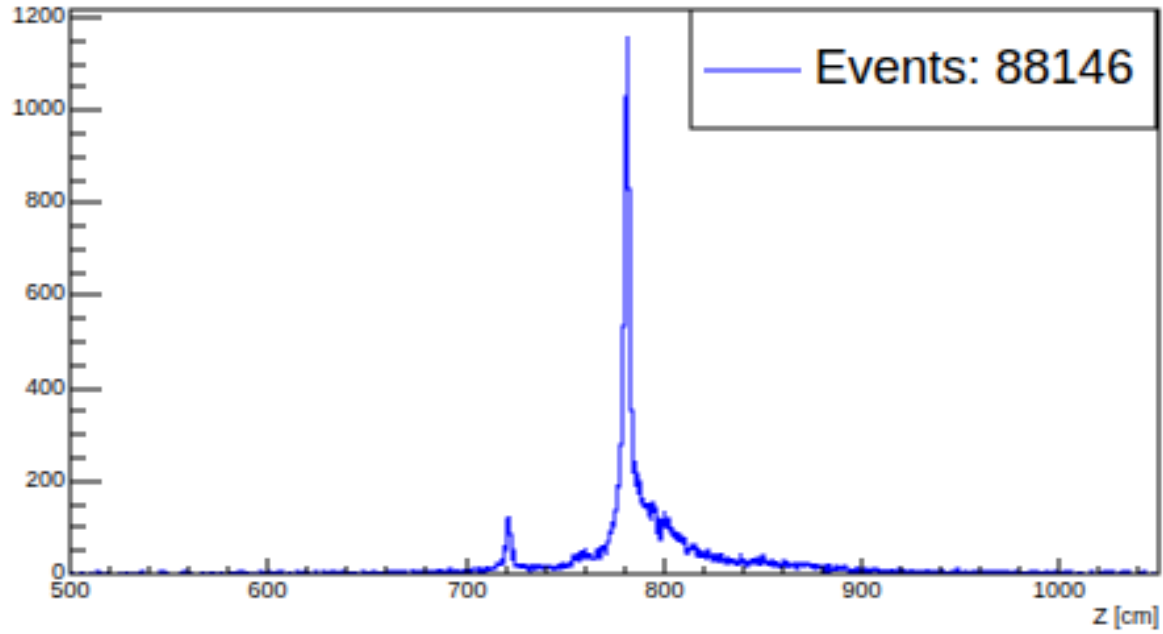
Real Data

Second pair of stations -> Target 1 (second target) Real Data

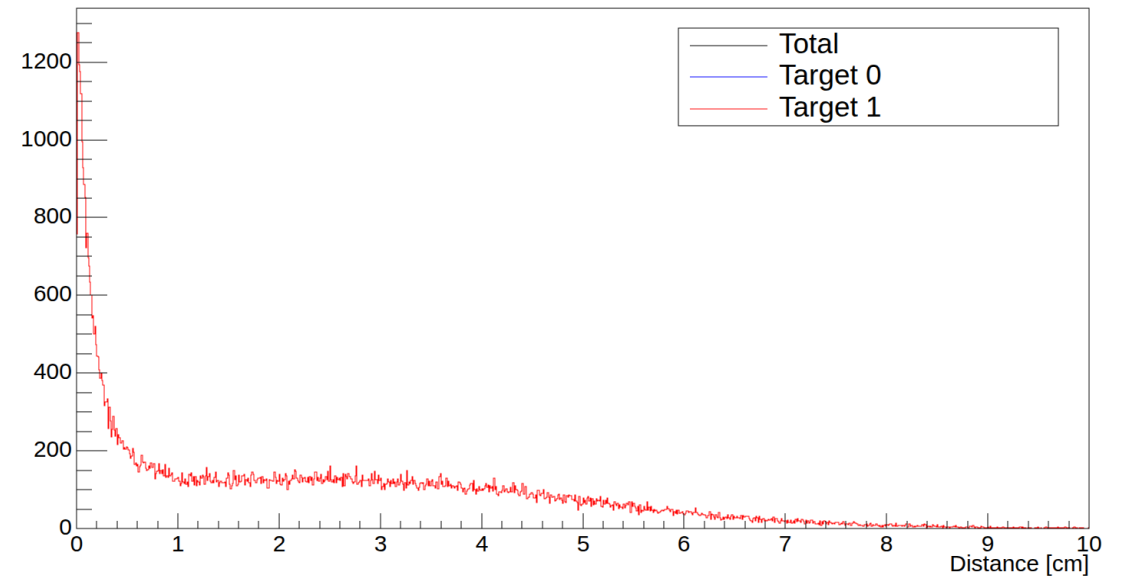
Monte Carlo data – Real Data Target 1	
Total events	1 211 428
Reconstructed	88146 - 7 %
Events left after the cuts (applied separately) - considering reconstructed	
Angle cut- theta min ≥ 0.0002 && theta max < 0.032	18 %
Distance between the two tracks at target < 0.2	17 %
N hits in Station 2 < 15	76 %
M. acop. < 0.4	23 %
Chi2 of the vertex ≤ 20	51 %
Target	13 %
Events left after all the cuts	3 %

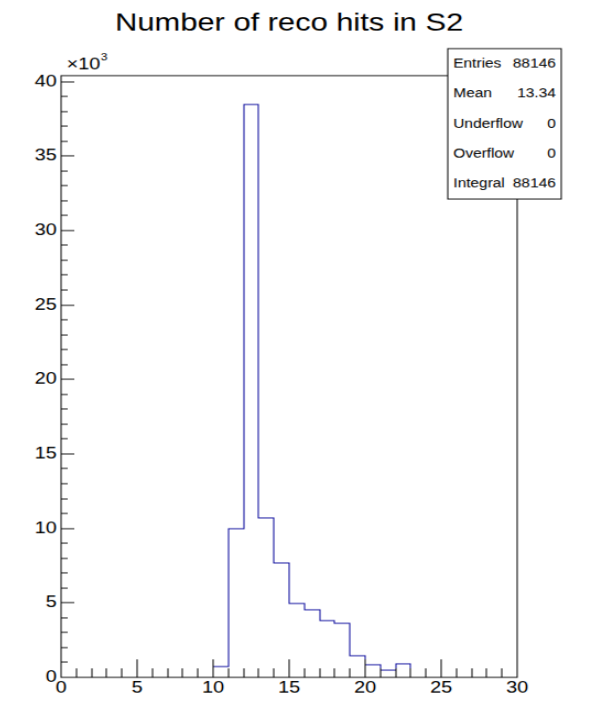
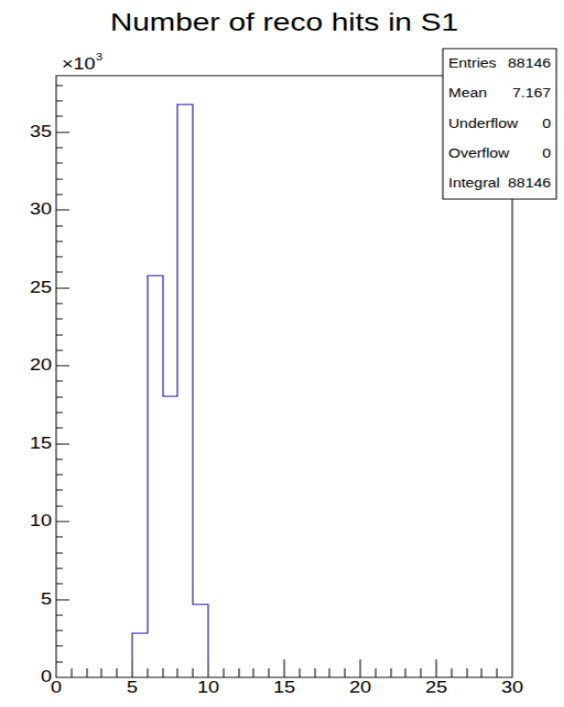
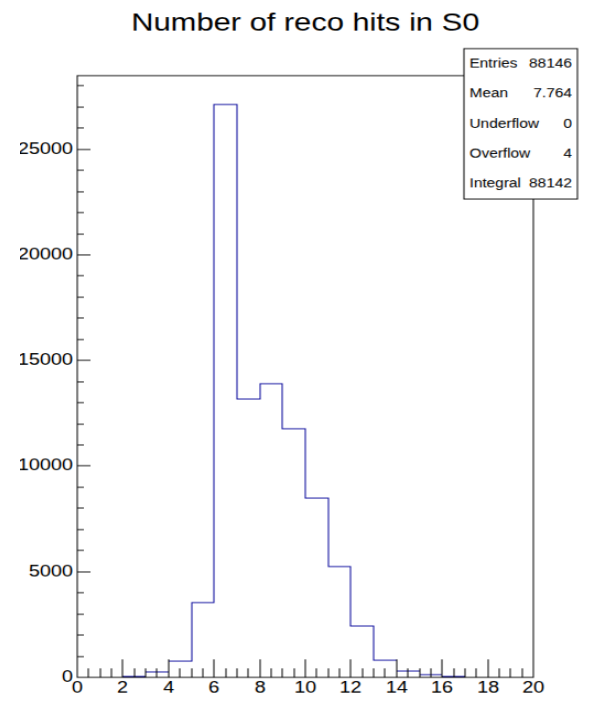
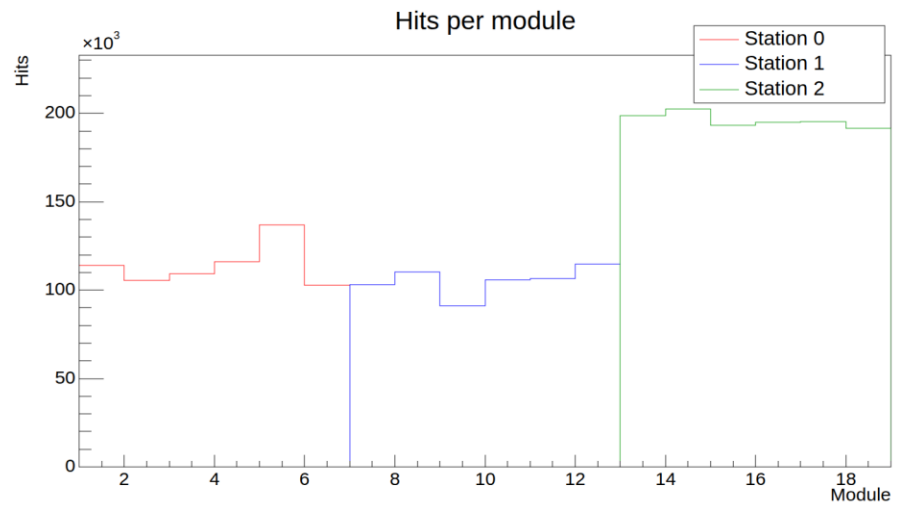


Z position fit: No cut



Distance between tracks at target





Comparison

- Mesmer

MCsignalJob_target2_3.root

MCsignalJob_target2_4.root

- Total number of MC events in all files: 45492

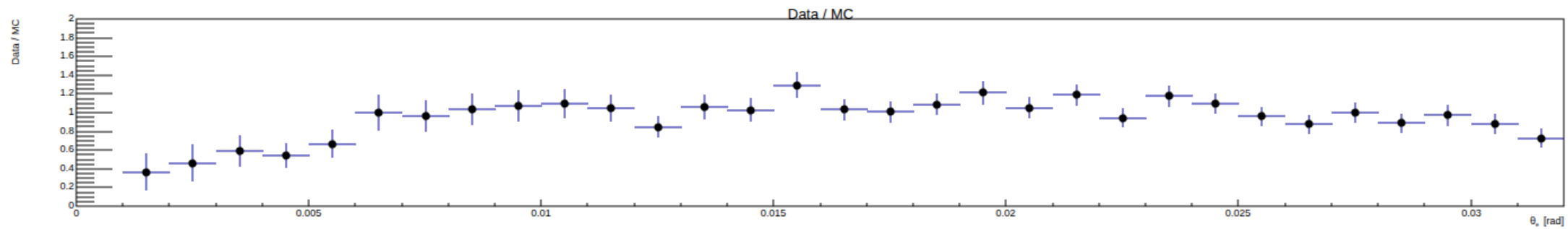
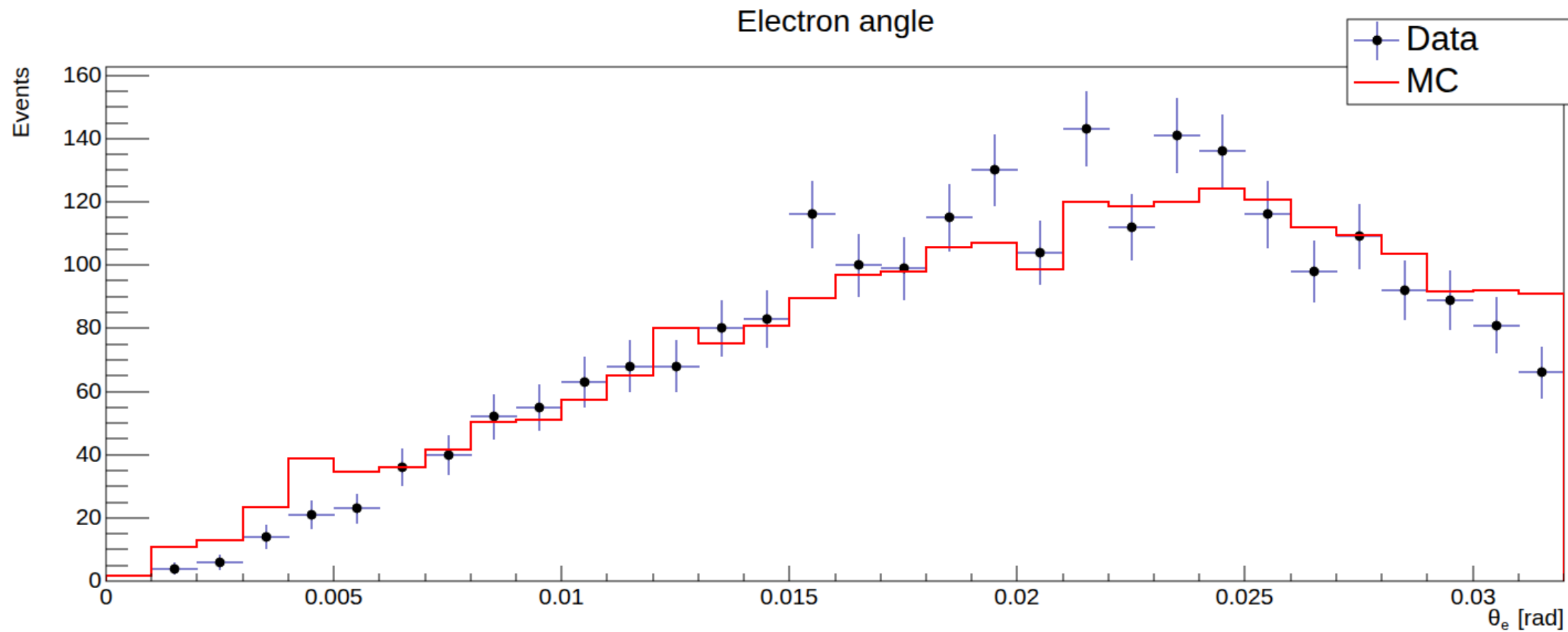
- Data

/eos/experiment/mu-
e/reco/2025/ReVal/v0.17.6/Data2025_run32_singleMu1_sharedHit0_recov0.17.6.root

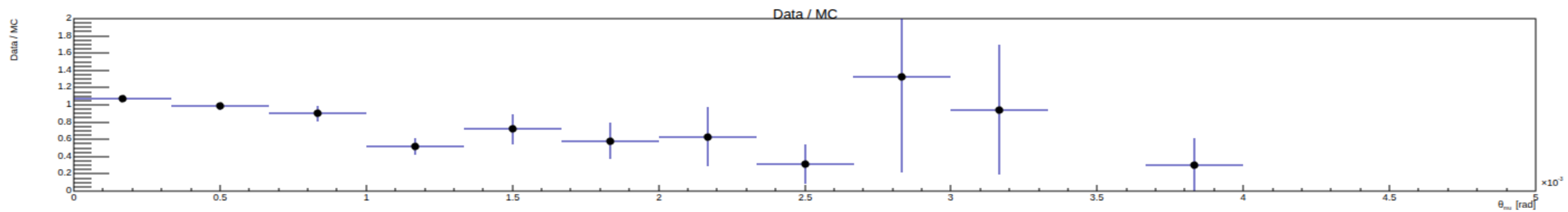
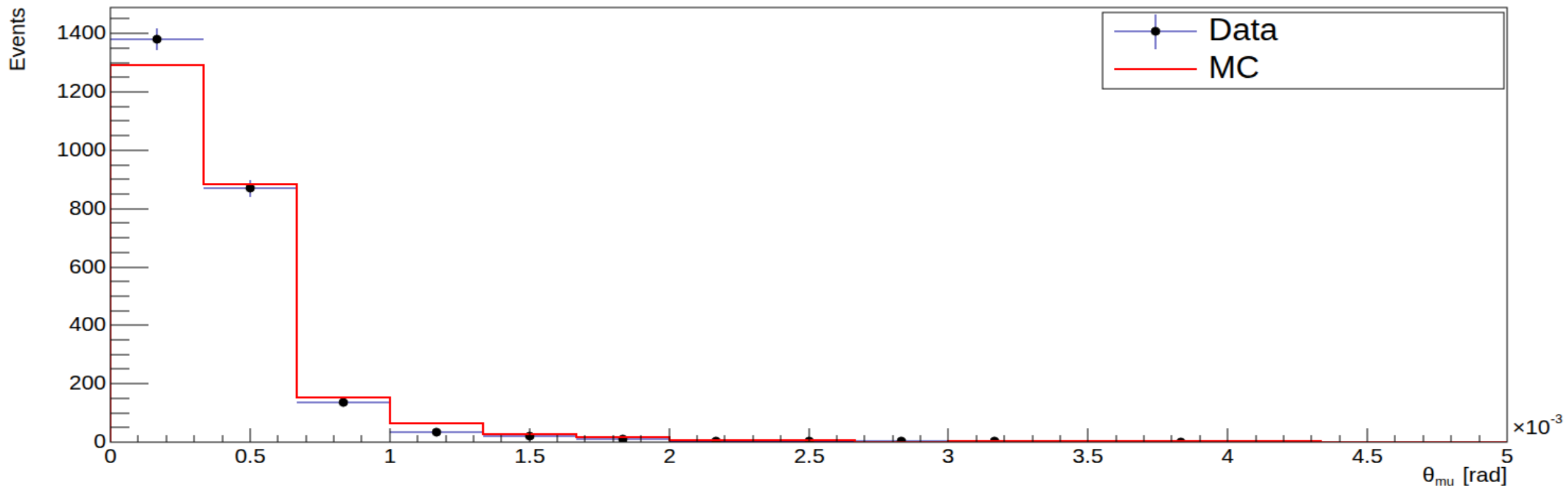
- Total number of real data events in all files: 1211428

- Reconstructed MC events: 38554 --> 84.749 %

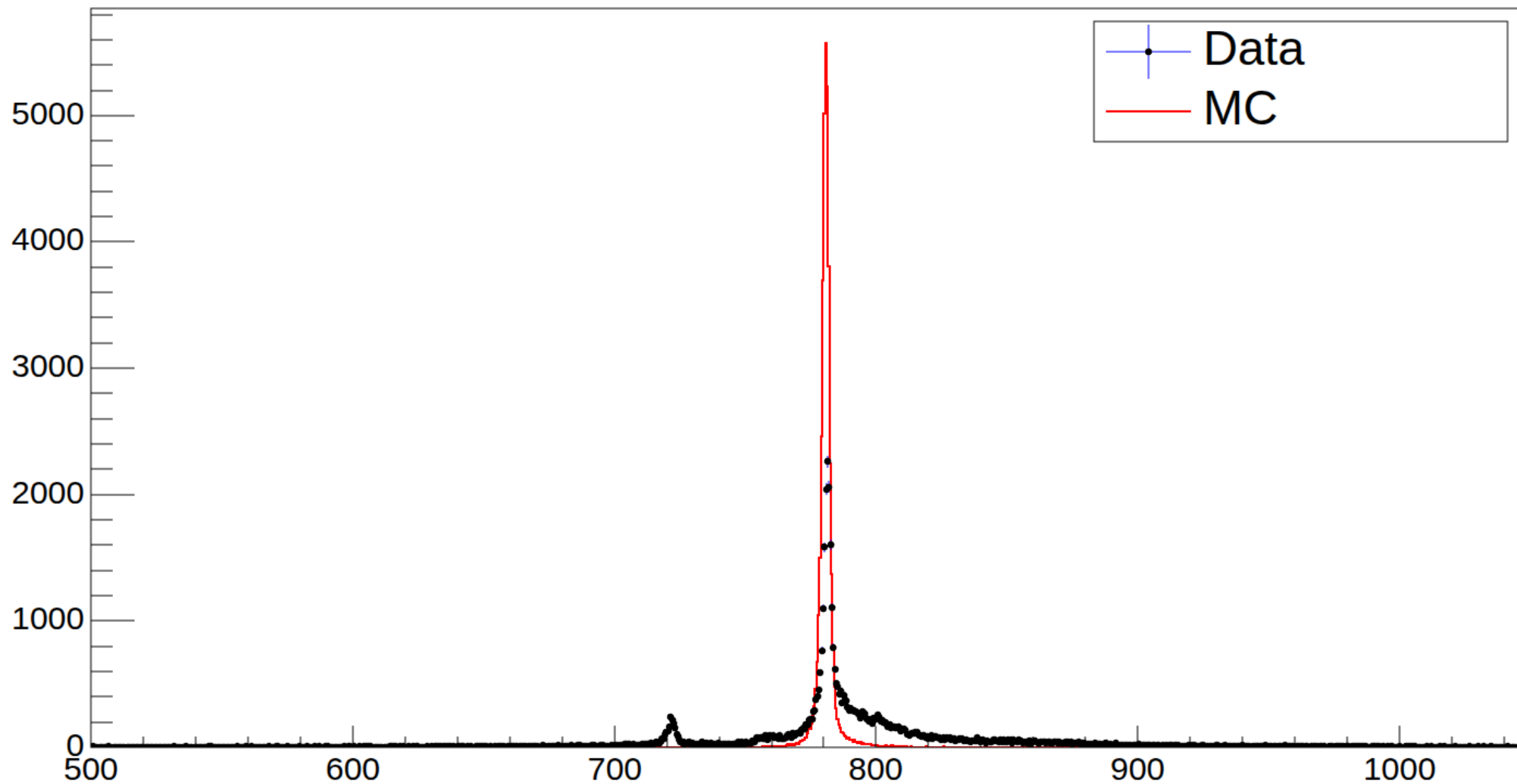
- Reconstructed DATA events: 88146 --> 7.27621 %



Muon angle

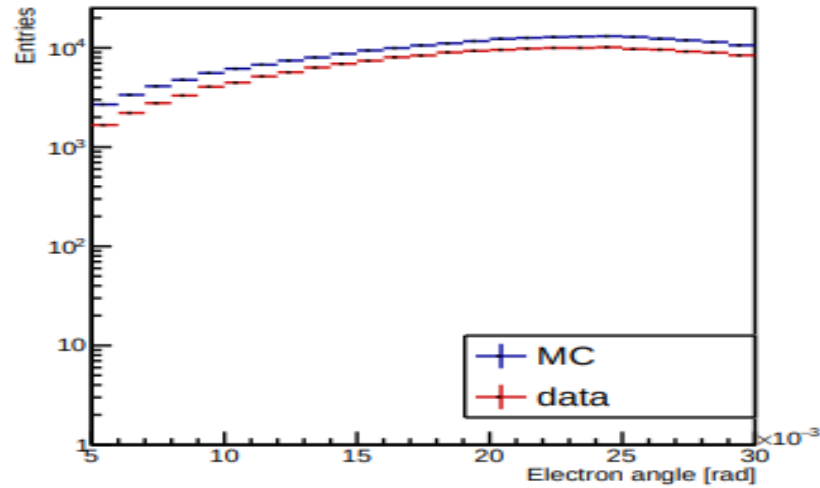


Best vertex: Z position fit

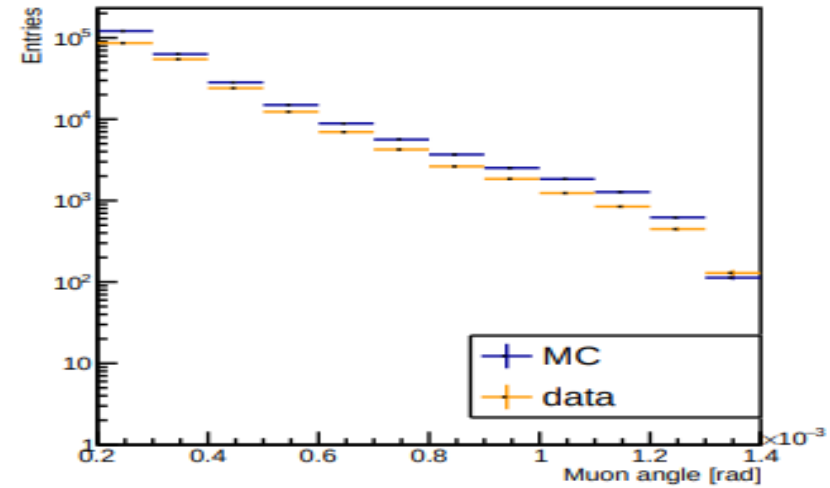


Eugenia thesis

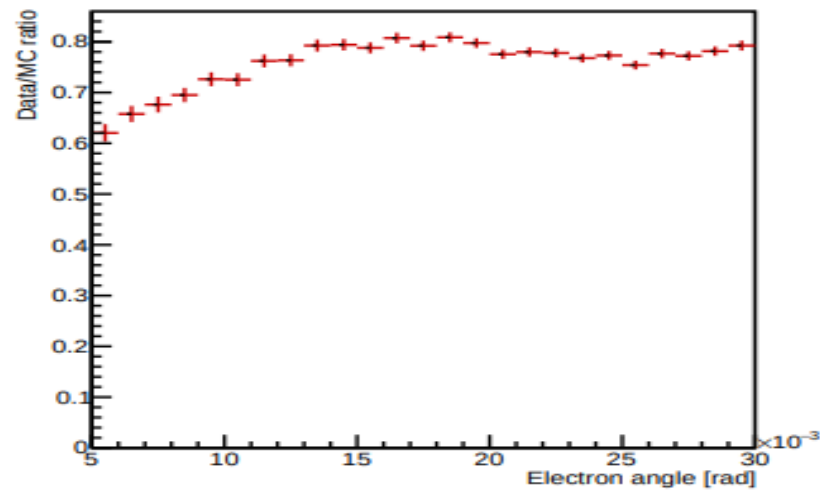
Electron scattering angle



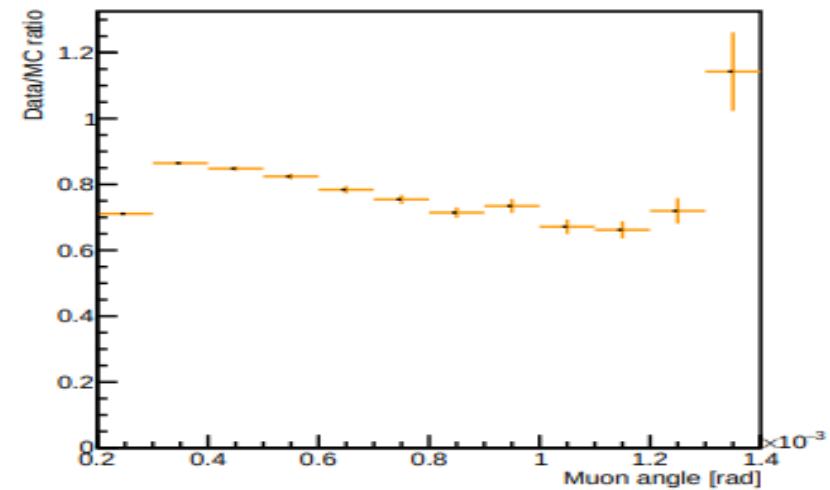
Muon scattering angle



Electron scattering angle



Muon scattering angle



TO DO:

- Repeat the analysis for target0
- Do the further analysis for the cuts

Backup

- https://web.infn.it/MUonE/wp-content/uploads/2025/04/2025.03_Eugenia.Spedicato_PhD-thesis.pdf
- 74

Target 2 MC

