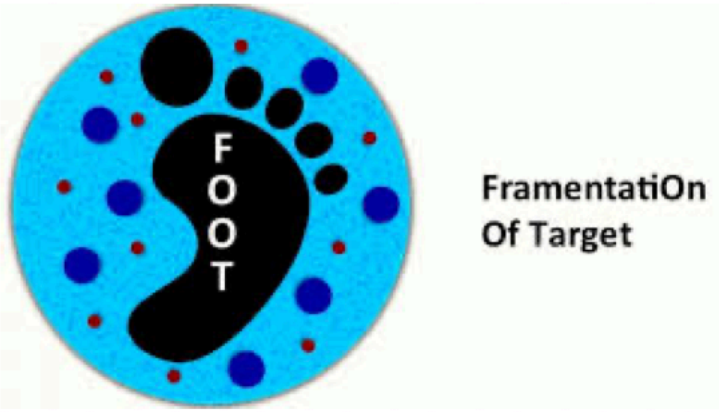
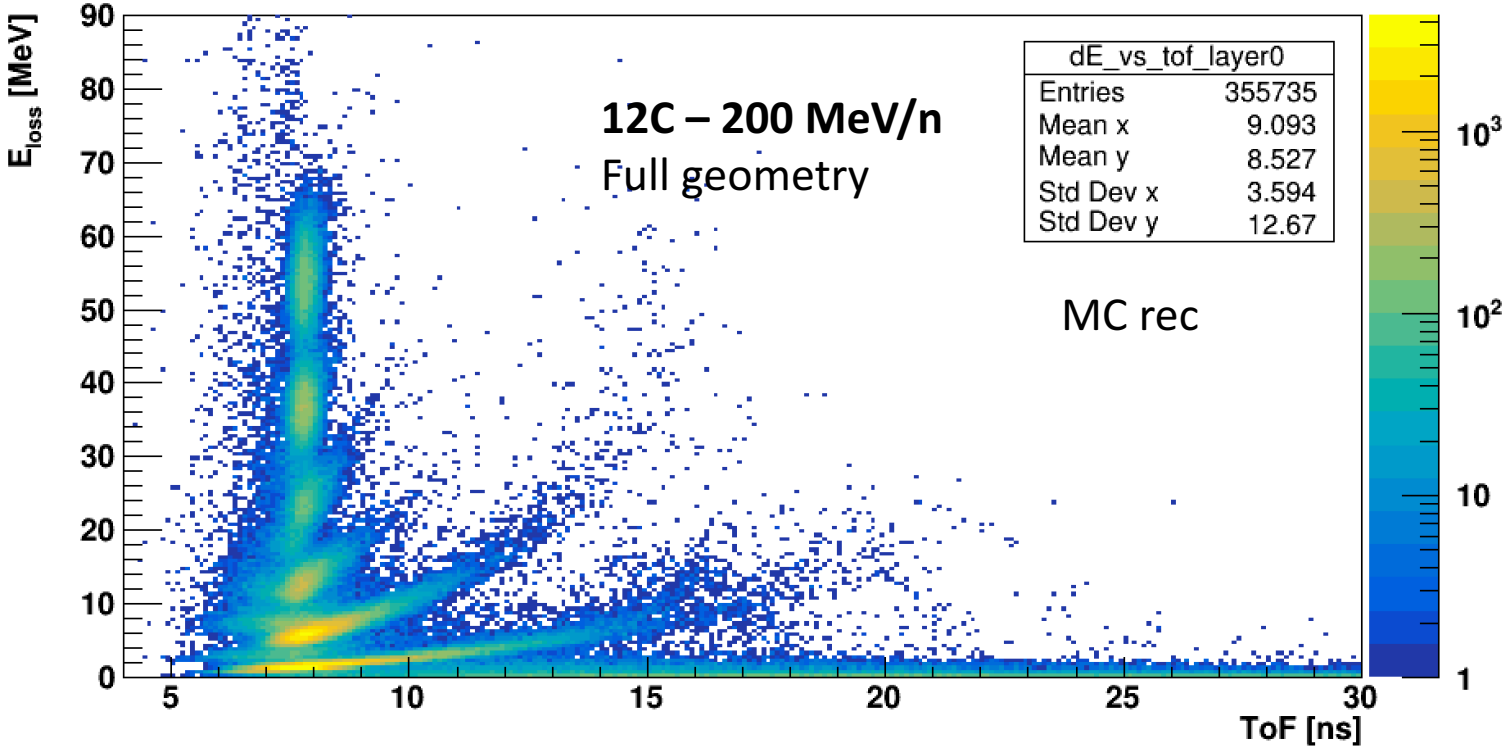


Z identification with TW

Federica Murtas, Alessio Sarti,
Marco Toppi

SAPIENZA
UNIVERSITÀ DI ROMA

What we want to do

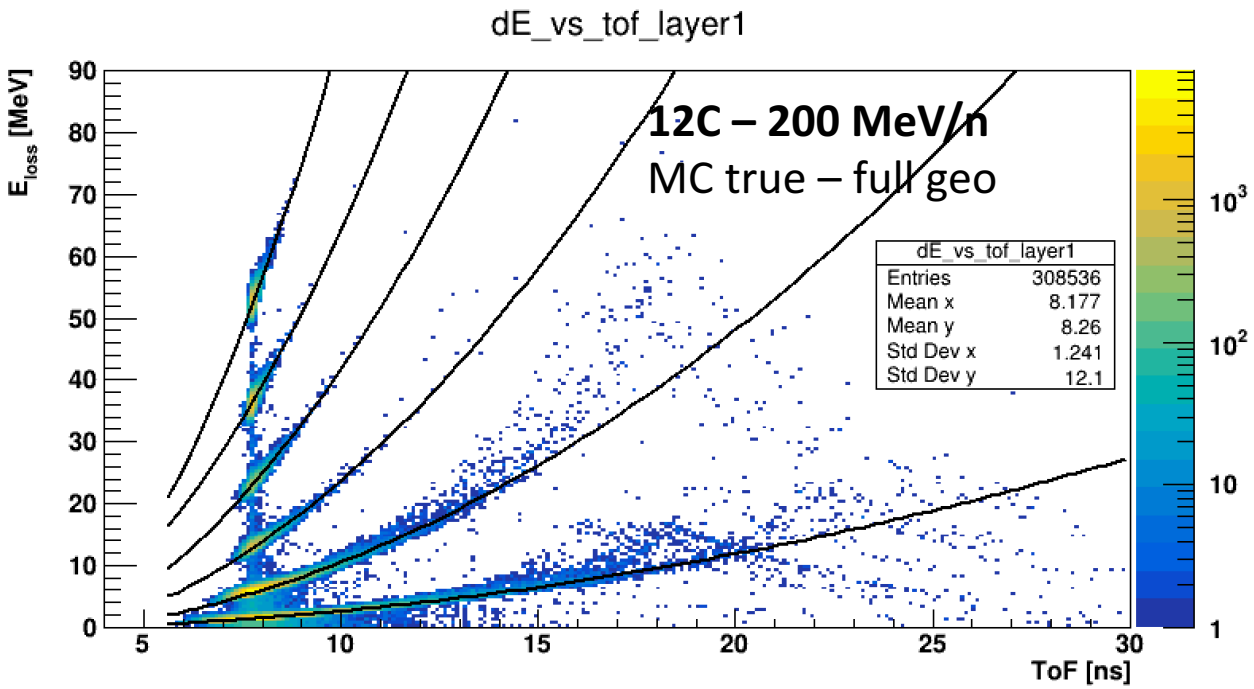


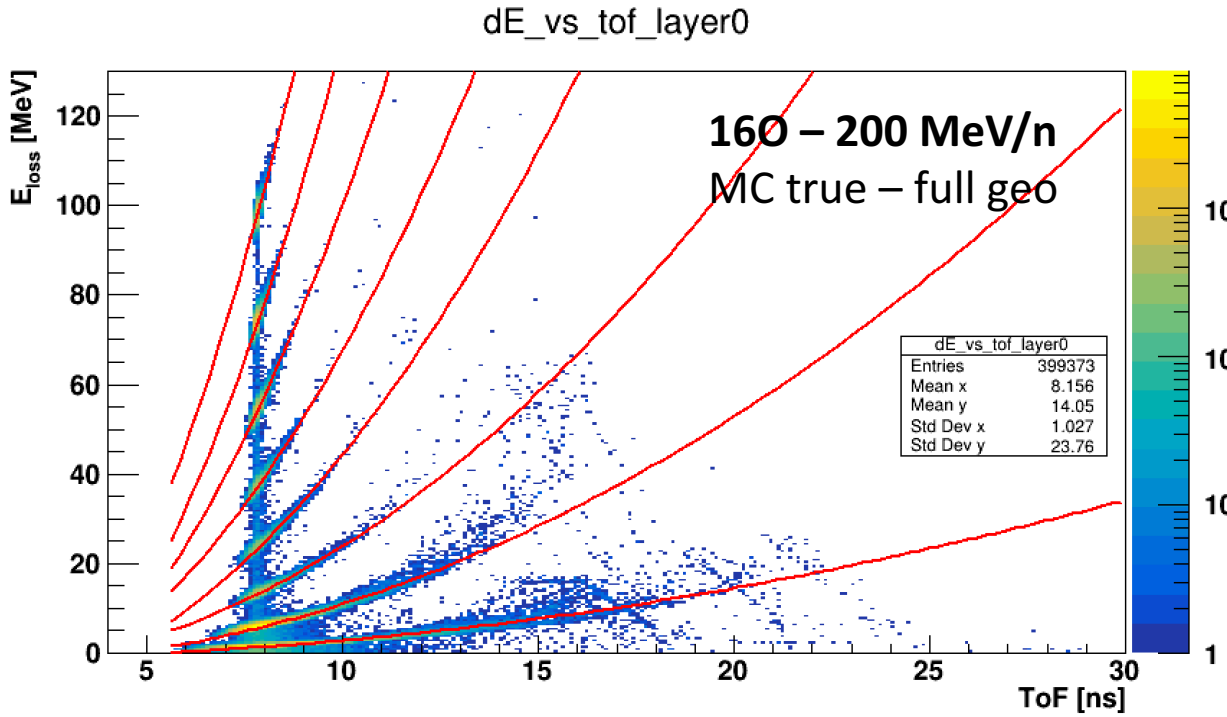
The energy loss in the TW as a function of the time of flight information, can be used to assign the Z to each track (TW hit) in order to identify the fragment produced by the beam on the target.

The idea (FIRST) is to parametrize Bethe-Bloch curves as a function of ToF and assign to each TW hit (ToF,Eloss) the Z corresponding to the closest BB curve

Bethe-Bloch parametrization

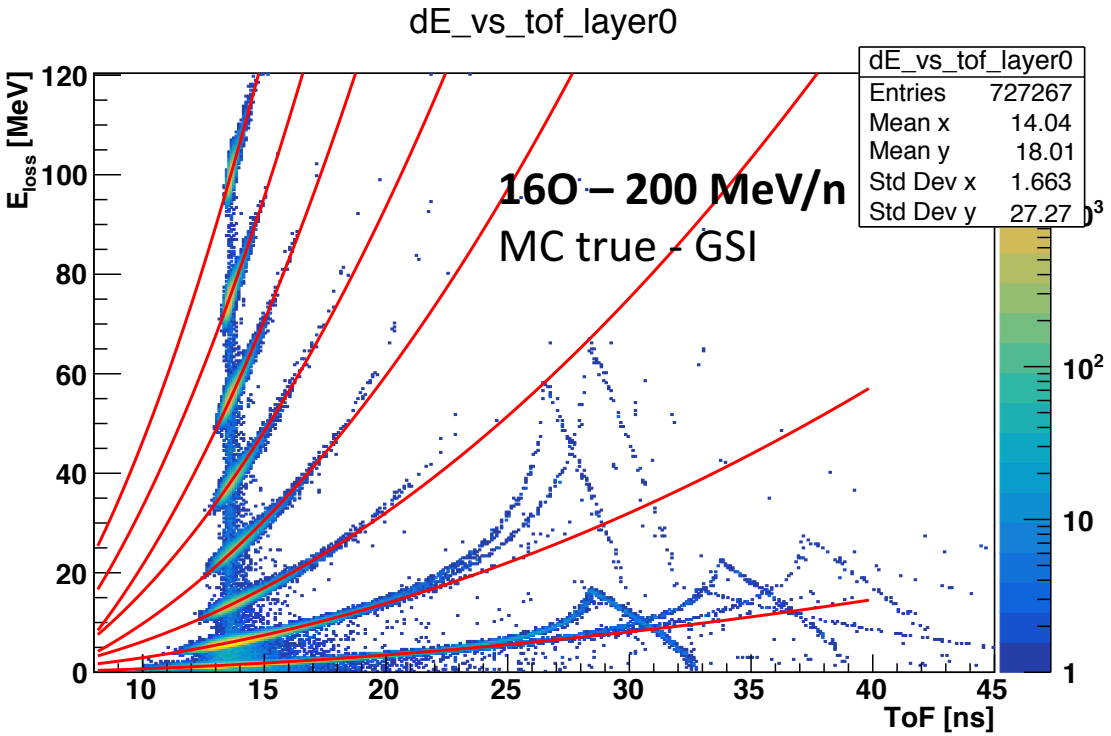
- Bethe-Bloch parametrization from **Monte Carlo truth**, asking for primary fragmentation and Z_MC

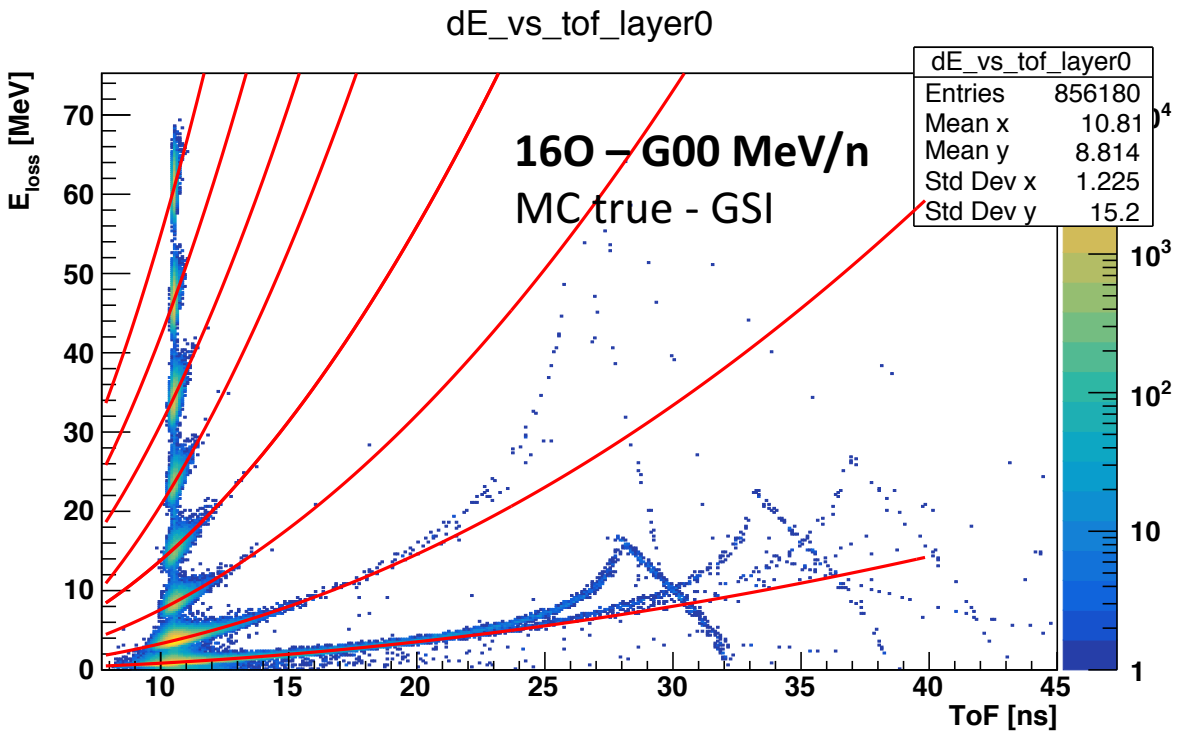




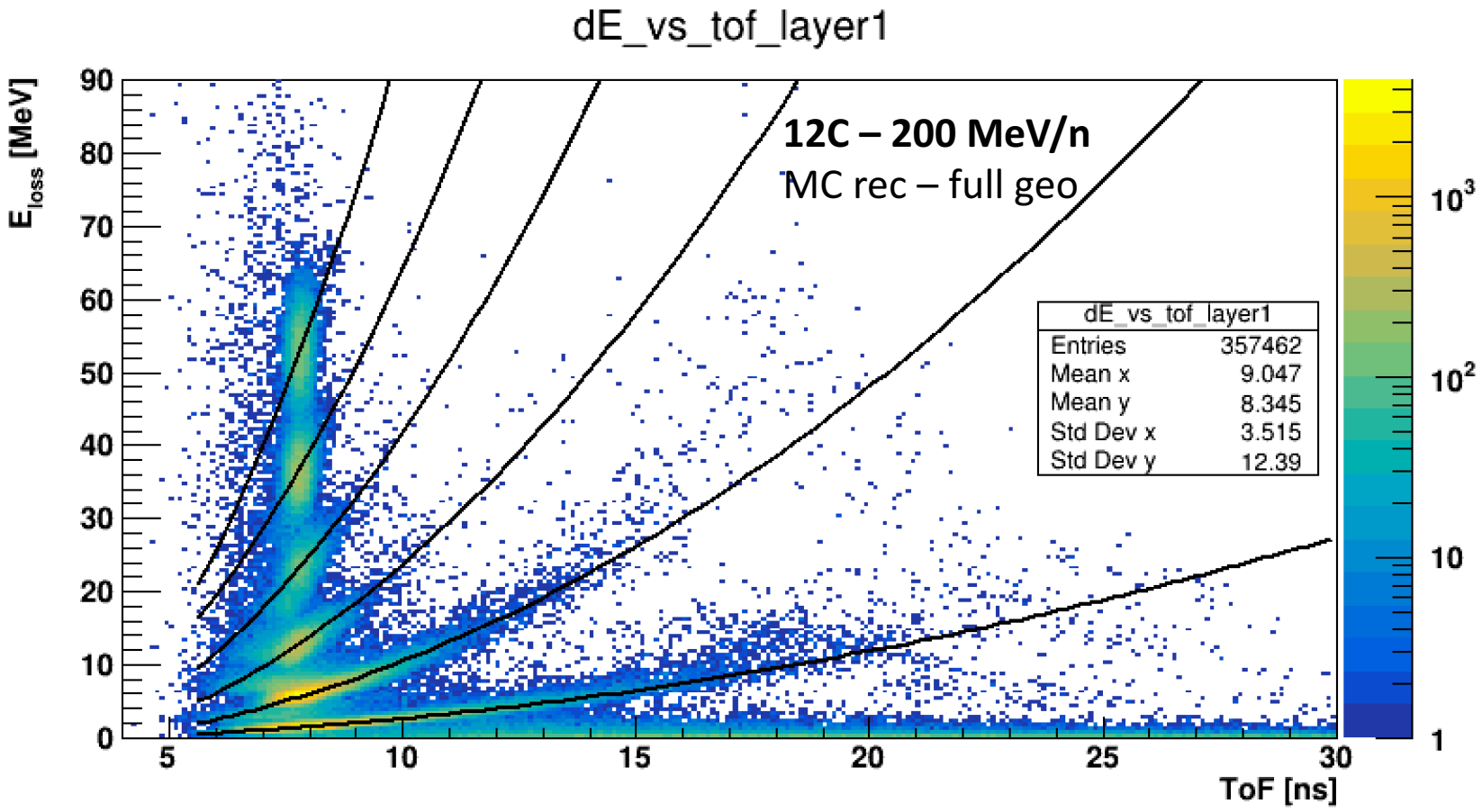
Bethe-Bloch parametrization

- Bethe-Bloch parametrization from **Monte Carlo truth**, asking for primary fragmentation and Z_MC → next: parameters from FLUKA to have a better descriptin at low energy (for more abundant isotopes)





In MC reco…



- The Bethe Bloch, curves obtained are superimposed on the **reconstructed MC**.
- Resolutions implemented in shoe are not tuned on data yet:

1. Energy resolution 10% (reasonable),
2. ToF 0.5-9% according to some exponential dependence with Eloss: A*exp(-B*Eloss)+C from TW paper

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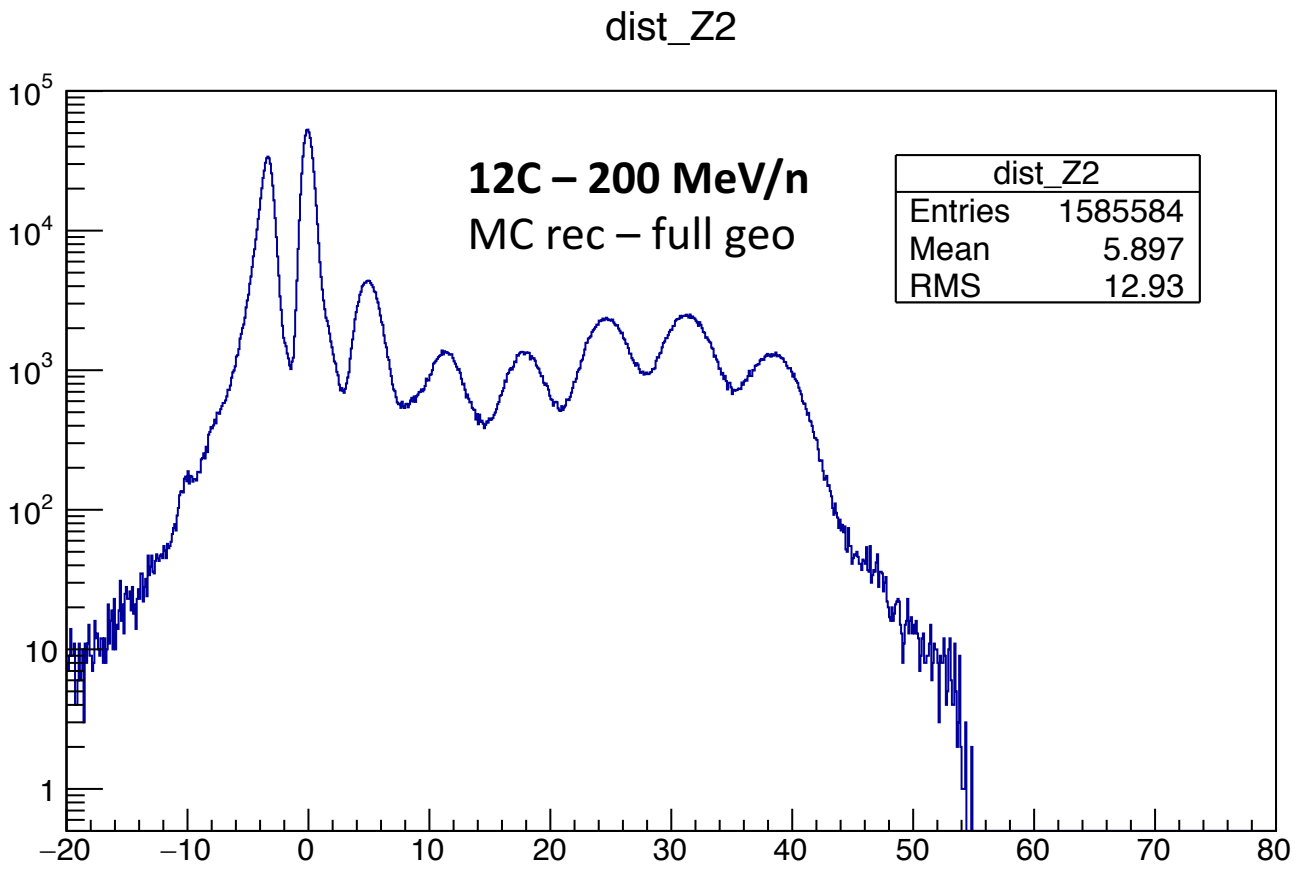

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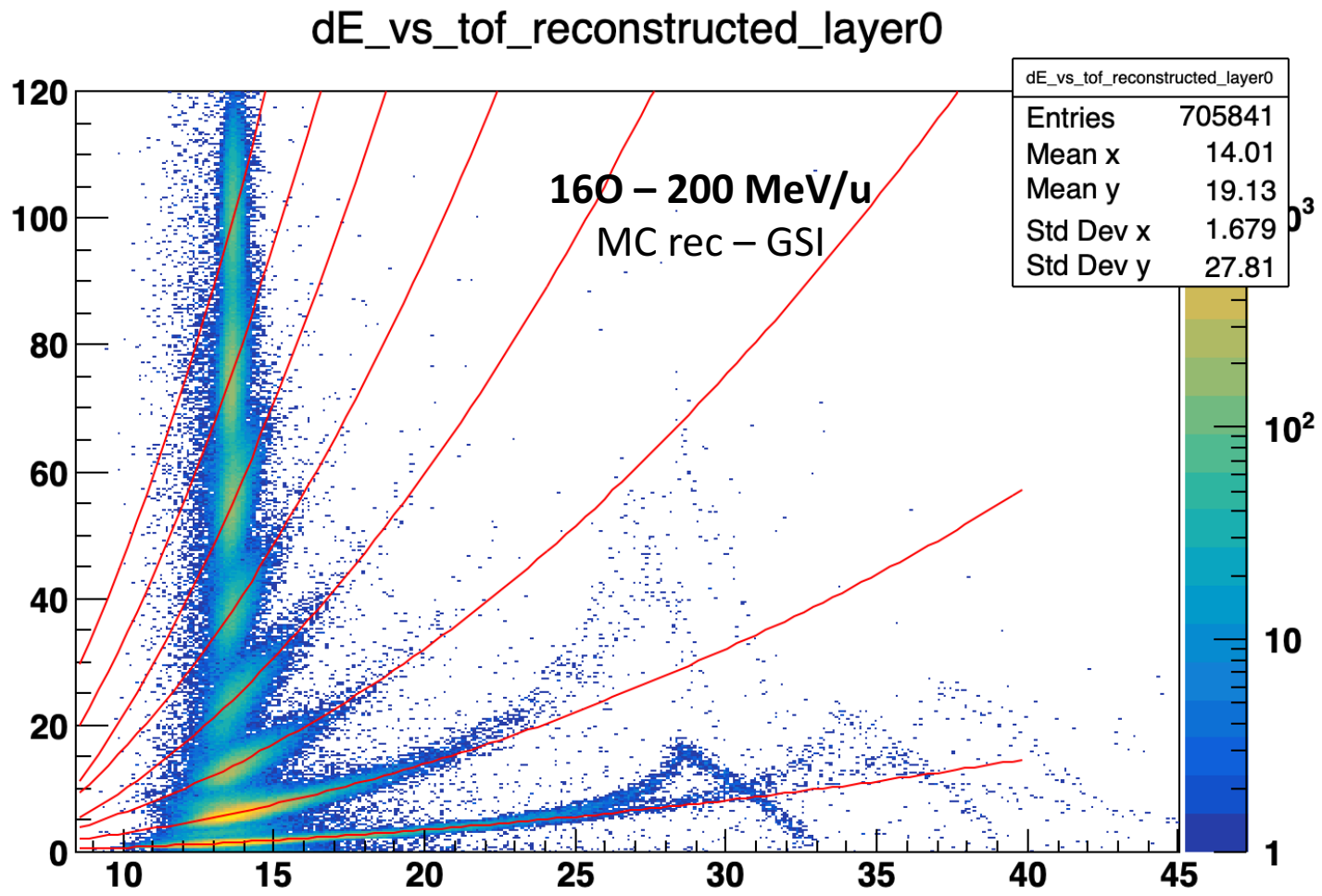
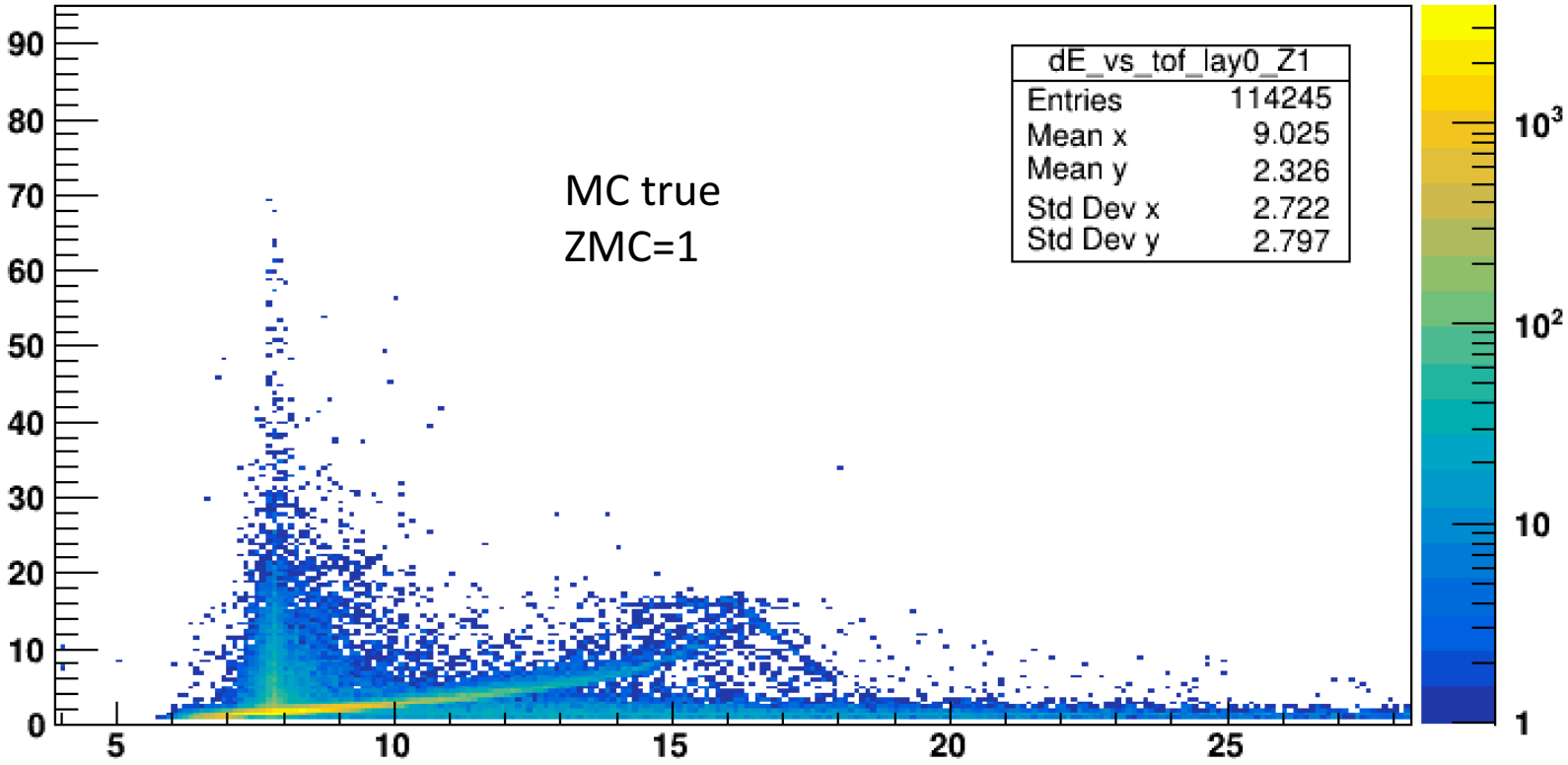
Critical Aspects



1. This approach suffers more once energy and tof resolution are taken into accout.

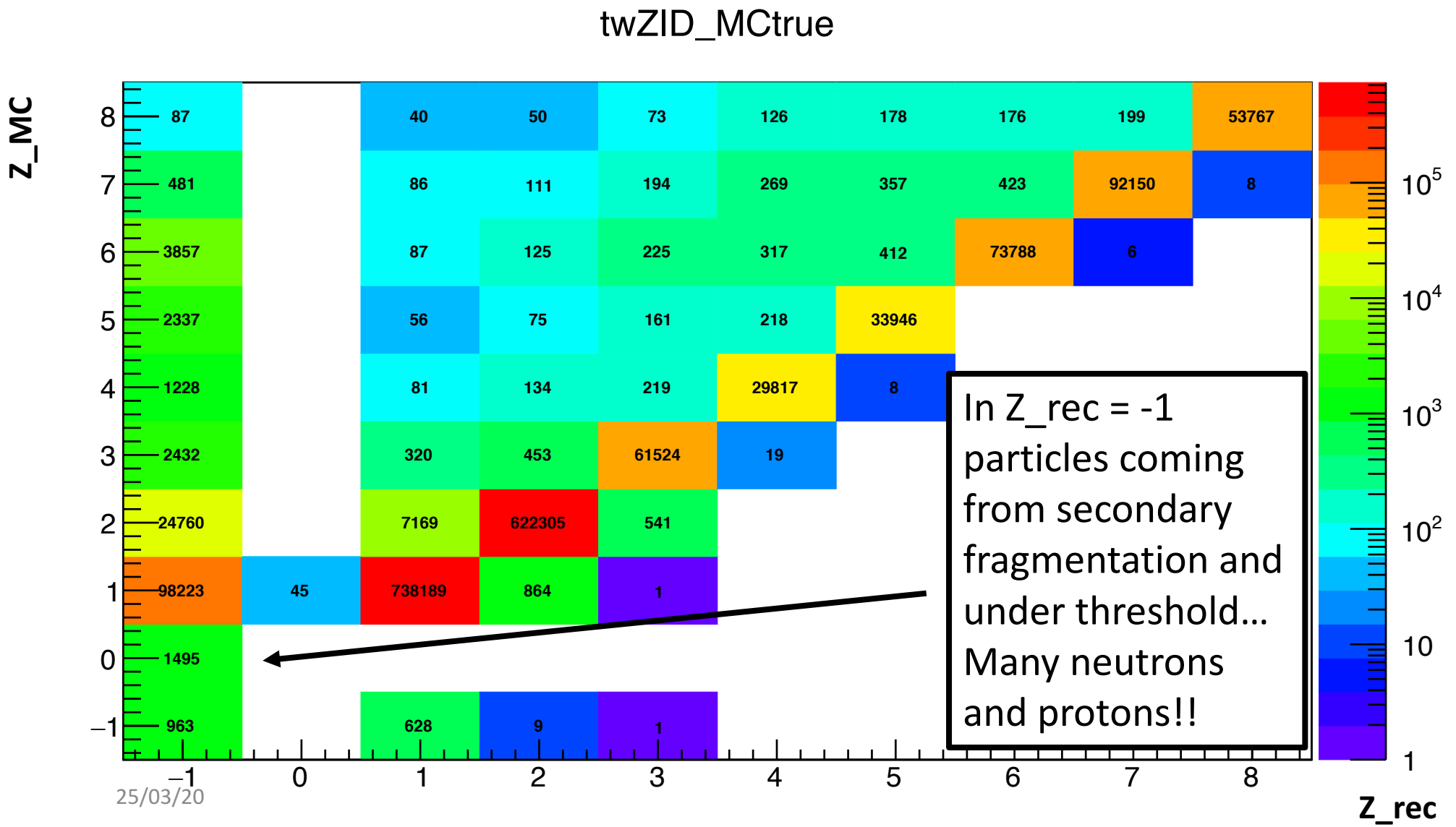
Critical Aspects



1. This approach suffers more once energy and tof resolution are taken into accout.

2. Contamination from neutrons and secondary fragmentation (expecially of the protons at very low Eloss)

Algorithm performances: MC true



Algorithm implemented in shoe master branch (TATWparCal)…

Tested in true MC: **wrong ZID~1.2%** N(ZID!=Zrec>0)/N(Zrec>0)

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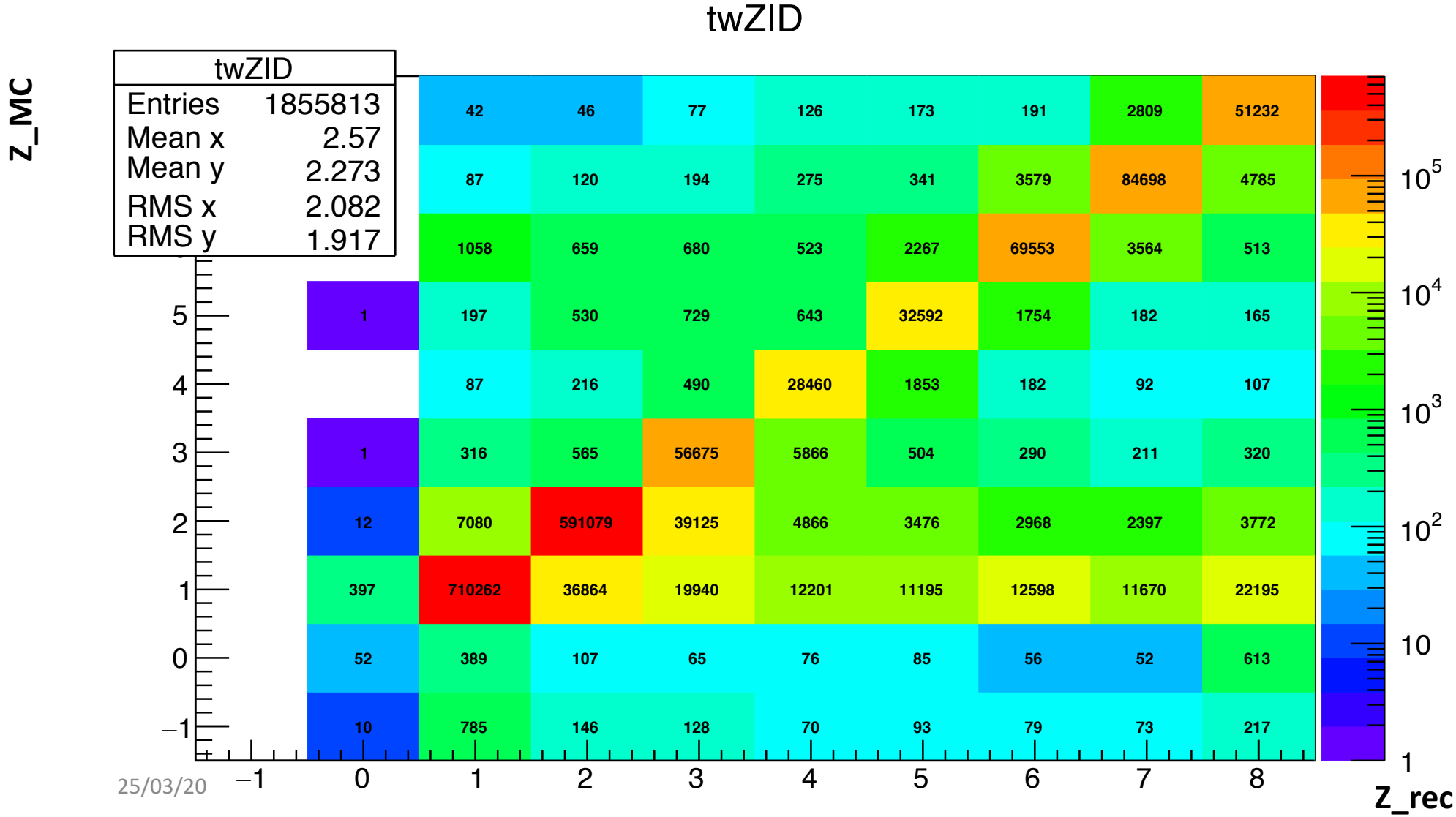

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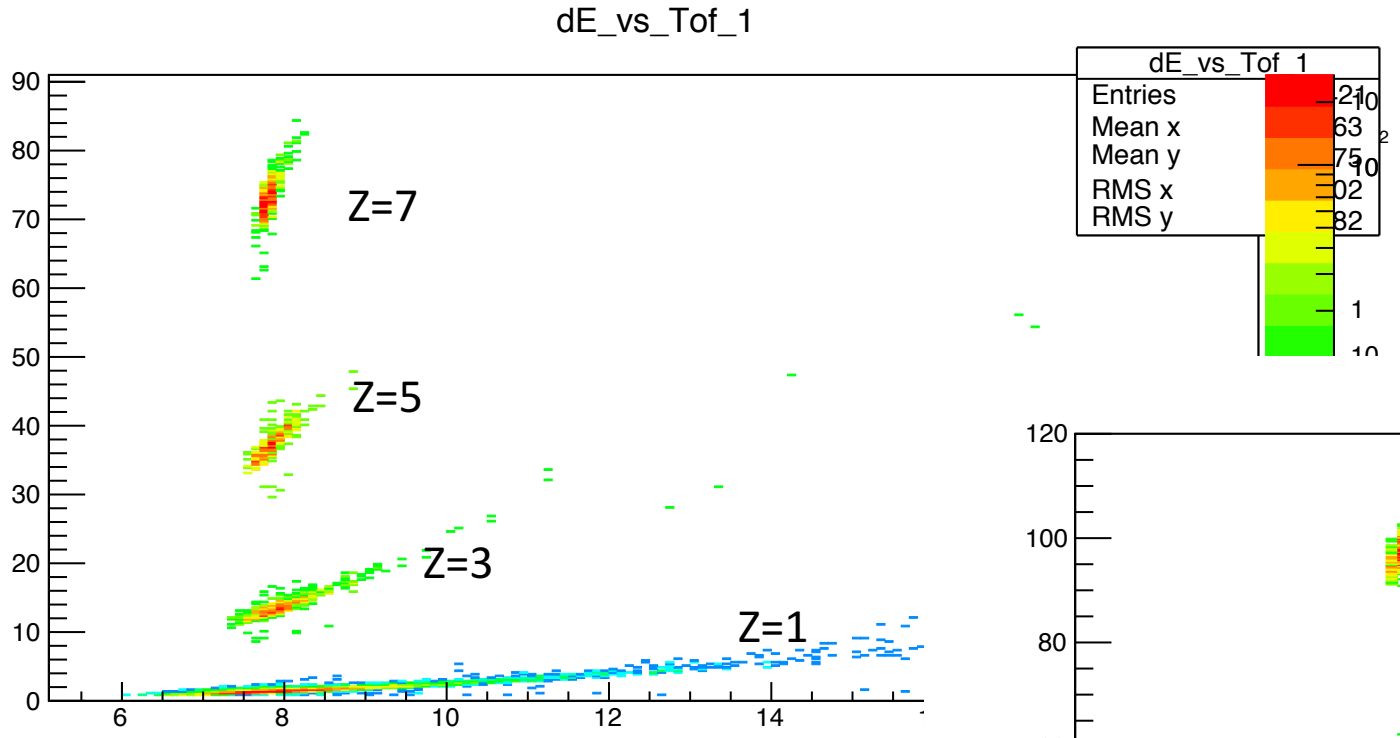
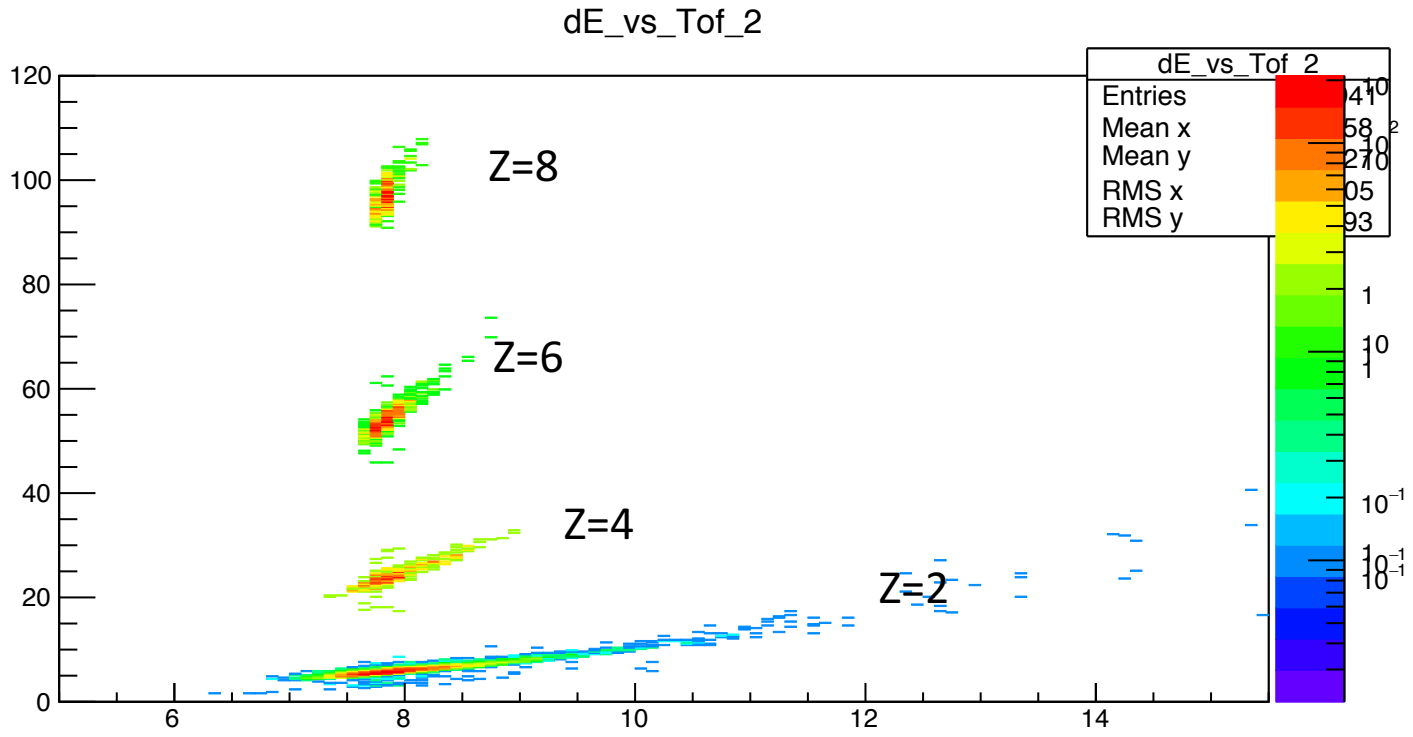
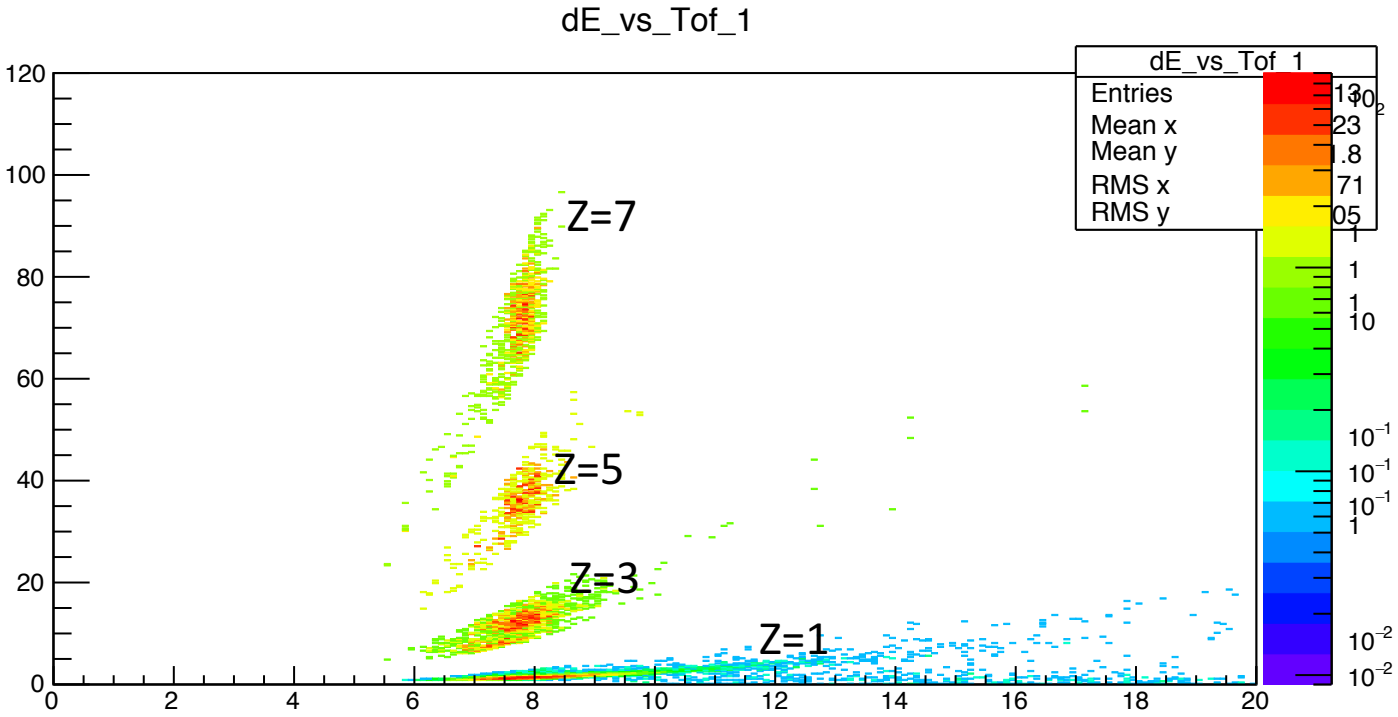


TW Front and Rear layer together

NOT full statistics:
3k evt 16O @200 MeV/n



Algorithm performances: MC rec



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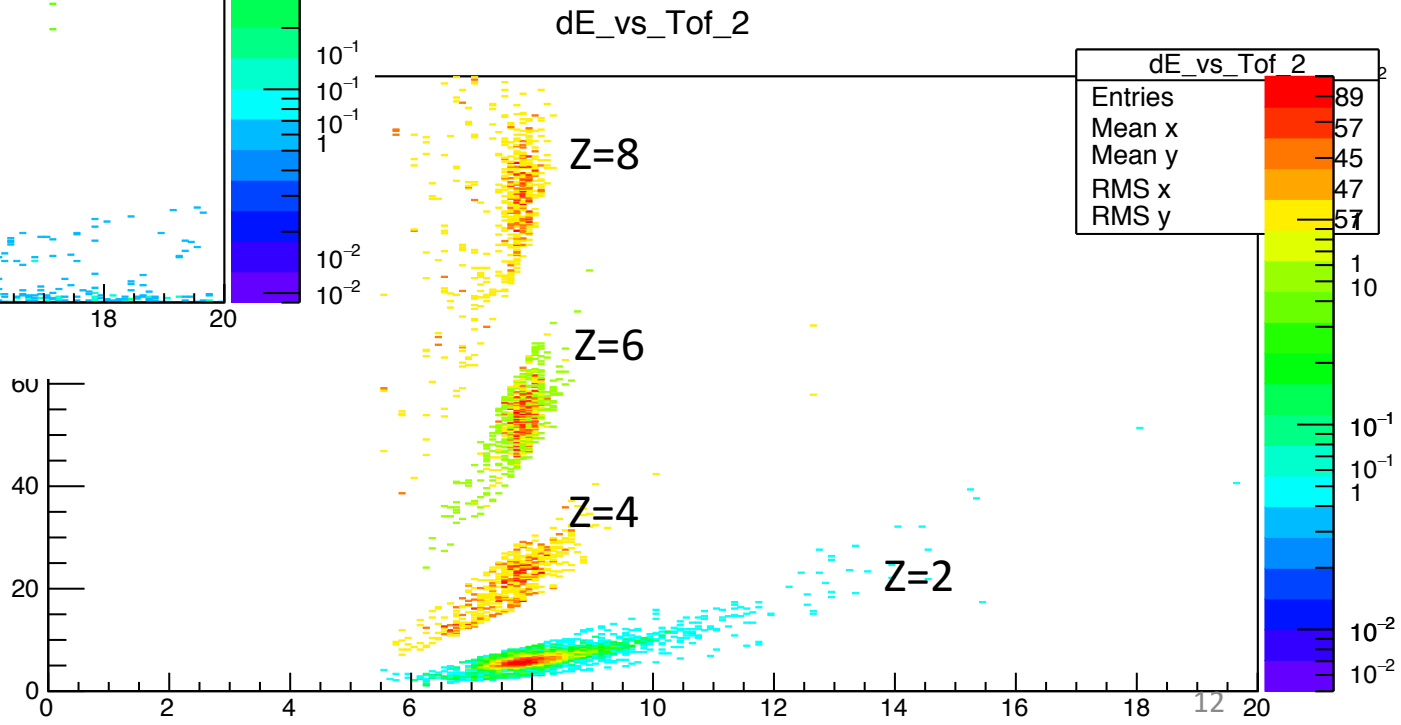
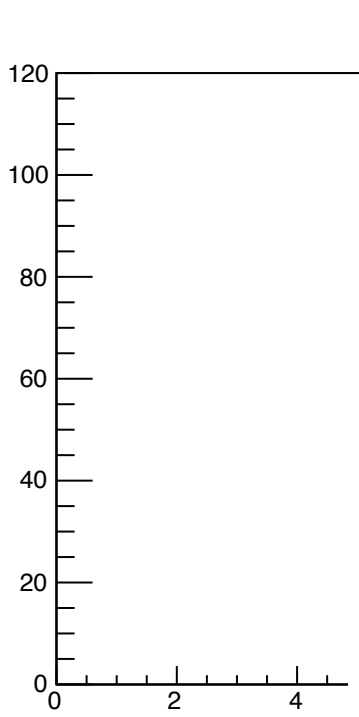
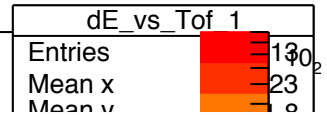
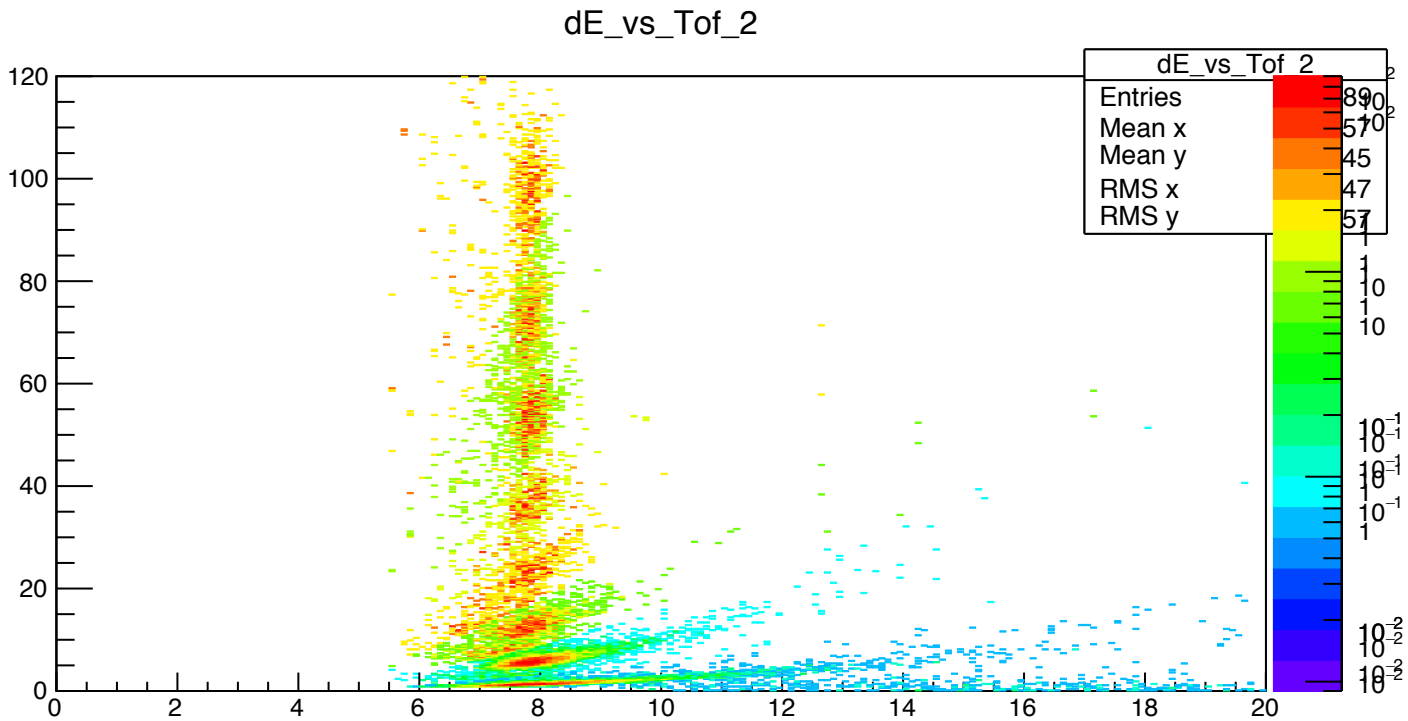


Front and rear layer together

Algorithm performances







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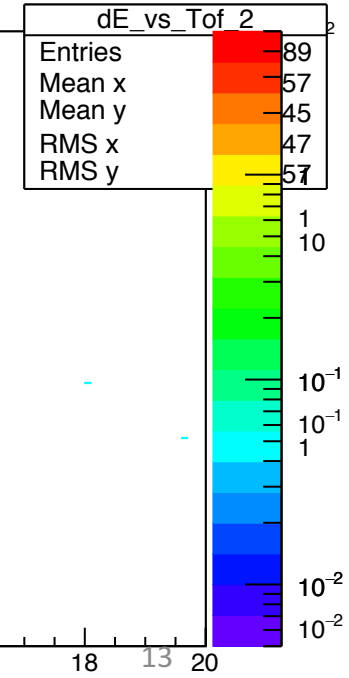
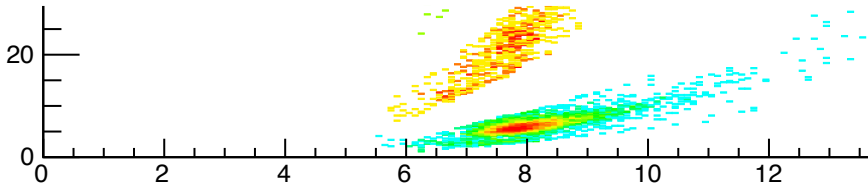
16O @200 MeV/n

Fron





ZID in shoe

Everything implemented in TATWparCal.*
Methods to retrieve the reconstructed Charge therein: GetCharzeZ()

ZID optimized for different energy/ion/geometry set-up.
Needed config file for BB.
Need to set-up the right beam variables in geomaps(/GSI/)TAGdetector.map
Message in the output to remind to change beam parameters accordingly with input

!!!! ATTENTION ATTENTION ATTENTION !!!
In file ./geomaps/GSI/TAGdetector.map the following beam parameters for a 16O beam have been set:
BeamEnergy: 0.200 GeV/u
BeamAtomicMass: 16
BeamAtomicNumber: 8
BeamMaterial: "O"
Change such parameters in ./geomaps/GSI/TAGdetector.map accordingly to the input file

Conclusions

- Implemented in shoe a new algorithm for Z identification.
- Algorithm performances: wrong assigment ~ 1.2% (overall)
- On MC reco~ 18% (overall)

Next steps:

- Implement in shoe Pisa group TW calibration to be applied to GSI data
- Tuning of MC resolution and threshold on calibrated data
- Trying different BB parametrization to improve Zid (from MC)