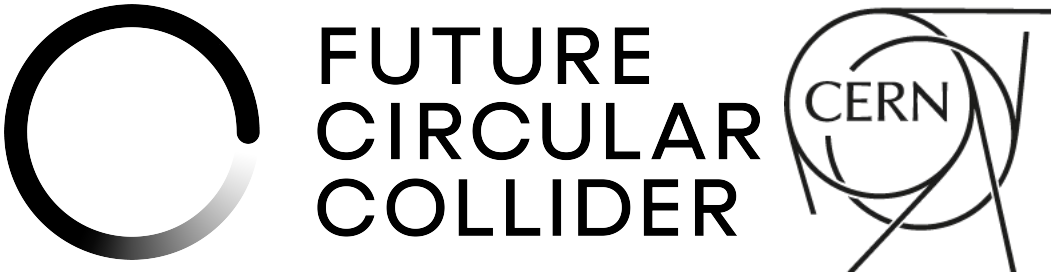
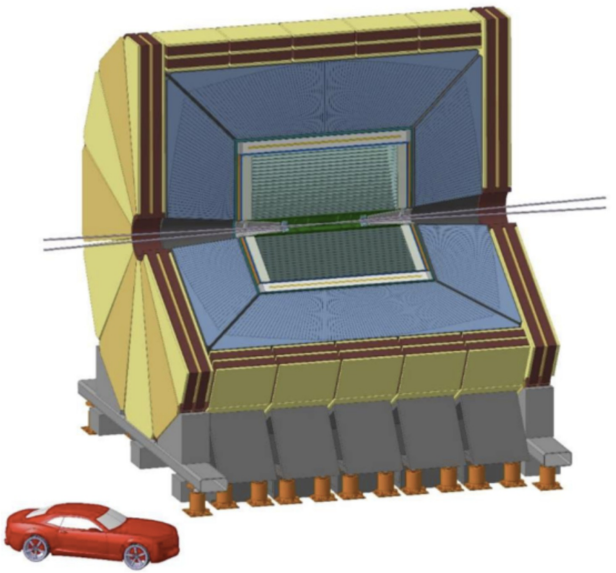
# IDEA Drift Chamber in DD4hep

## Hit Simulation



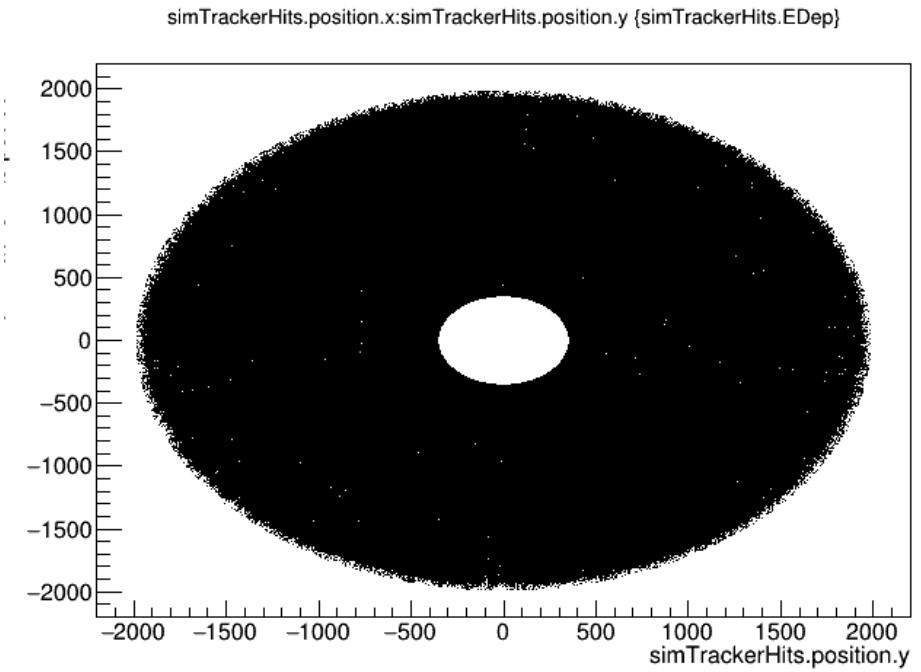
# Reminder

- Goal: implement the IDEA drift chamber (DC) geometry in DD4hep and its reconstruction in Key4hep
  - Will allow us to perform detailed full sim studies with the IDEA detector (e.g. including a realistic beam pipe and vertex detector which are also implemented in DD4hep)
  - It will in addition allow us to use the IDEA DC in other detector concepts e.g. Noble Liquid based
- The geometry was implemented by Lorenzo earlier this year
  - Now we need to be able to extract hits from it and validate the implementation

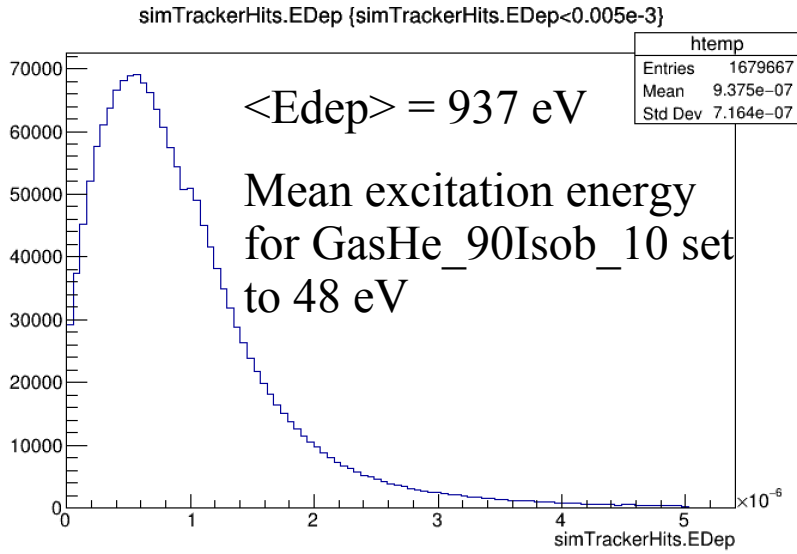


# Debugging

- The Drift Chamber (DC) implementation in DD4hep was tested with geoDisplay
  - This builds the "ROOT::TGeo" geometry in DD4hep but not the Geant4
  - Trying to run the full simulation lead to a segfault due to missing material parameters
    - Fixed in PR#47
- No part of the detector was made sensitive → no Geant4 hit kept in the output file
  - Fixed locally, will be pushed once finalized

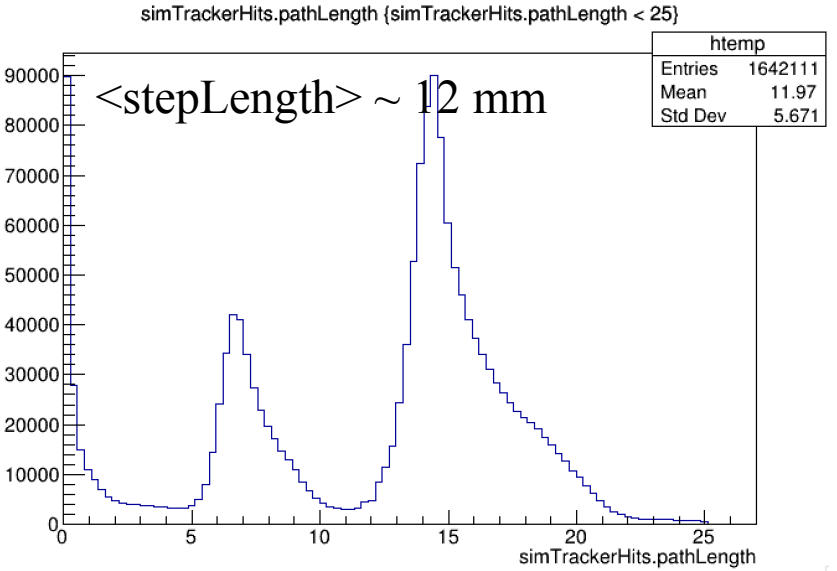


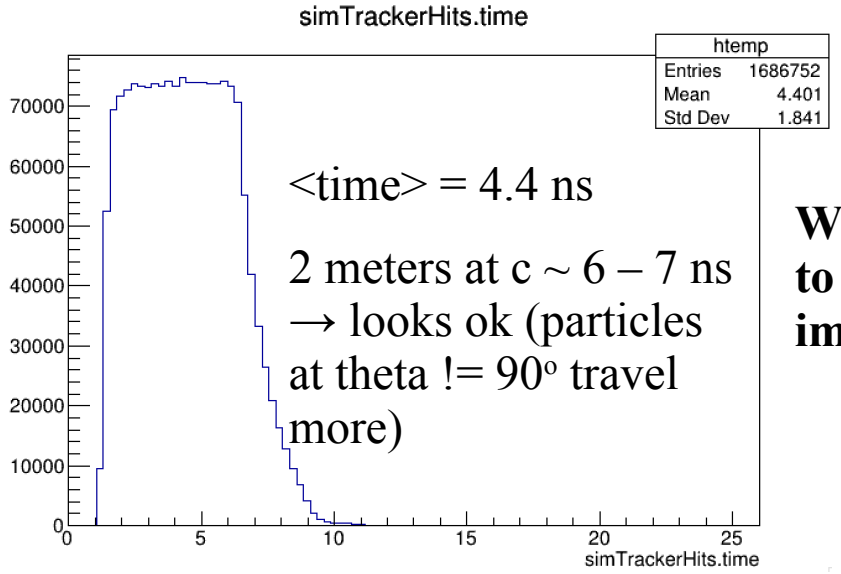
# First look at physics plots



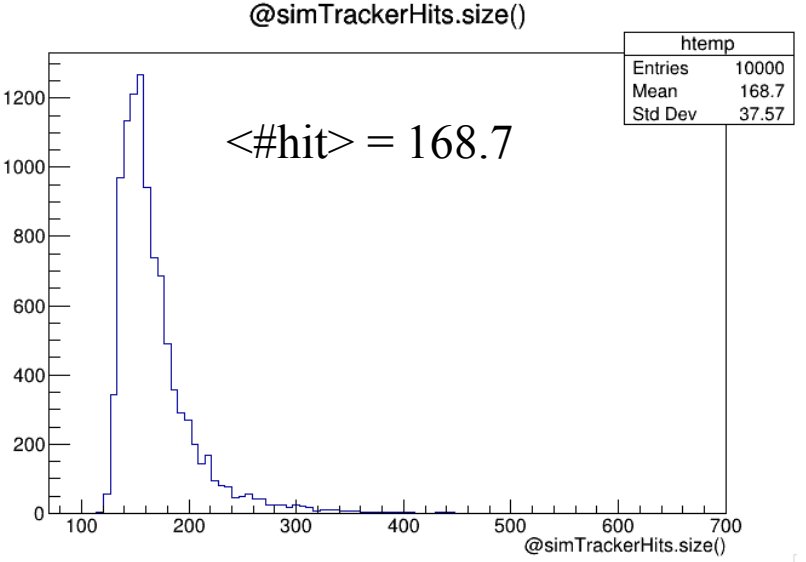

**10k muons at 10 GeV**

- **0 – 2π in phi**
- **45 – 135 in theta**
- **Using k4SimGeant4**



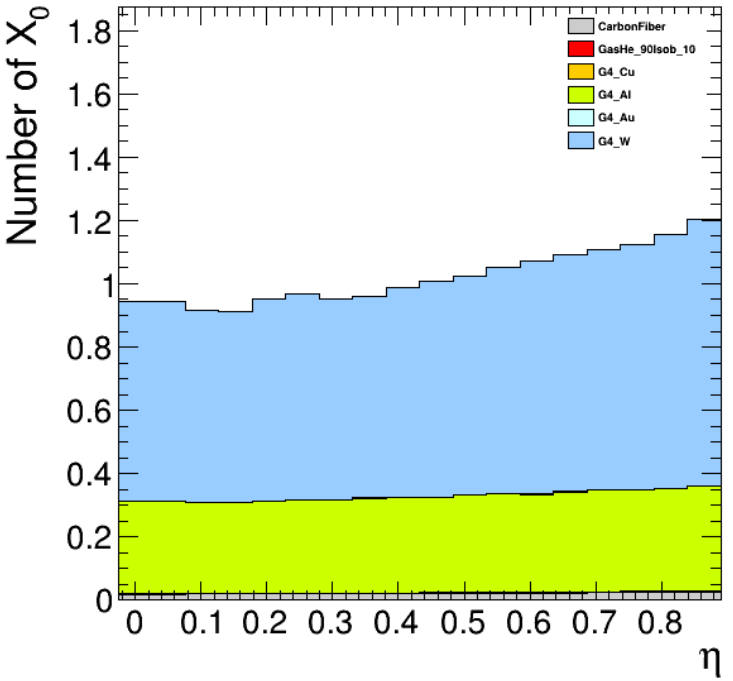




**We should compare to the plain Geant4 implementation!**



# Material budget

- Material budget seem to be completely off w.r.t. the announced target (2% of $X_0$)
  - Problem in the detector implementation? In the material budget code? In the estimation?
  - Can someone run the material budget on the plain Geant4 implementation?



# Digitization/Reconstruction

- Tools for drift chamber Geant4 hit storage in edm4hep format already exist
  - LINK
  - Developed for the simplified version of the drift chamber
  - One should first check whether they are suitable or not
    - E.g. hits with energy deposited < 10 eV or step length < 5 μm are dropped

# Additional material