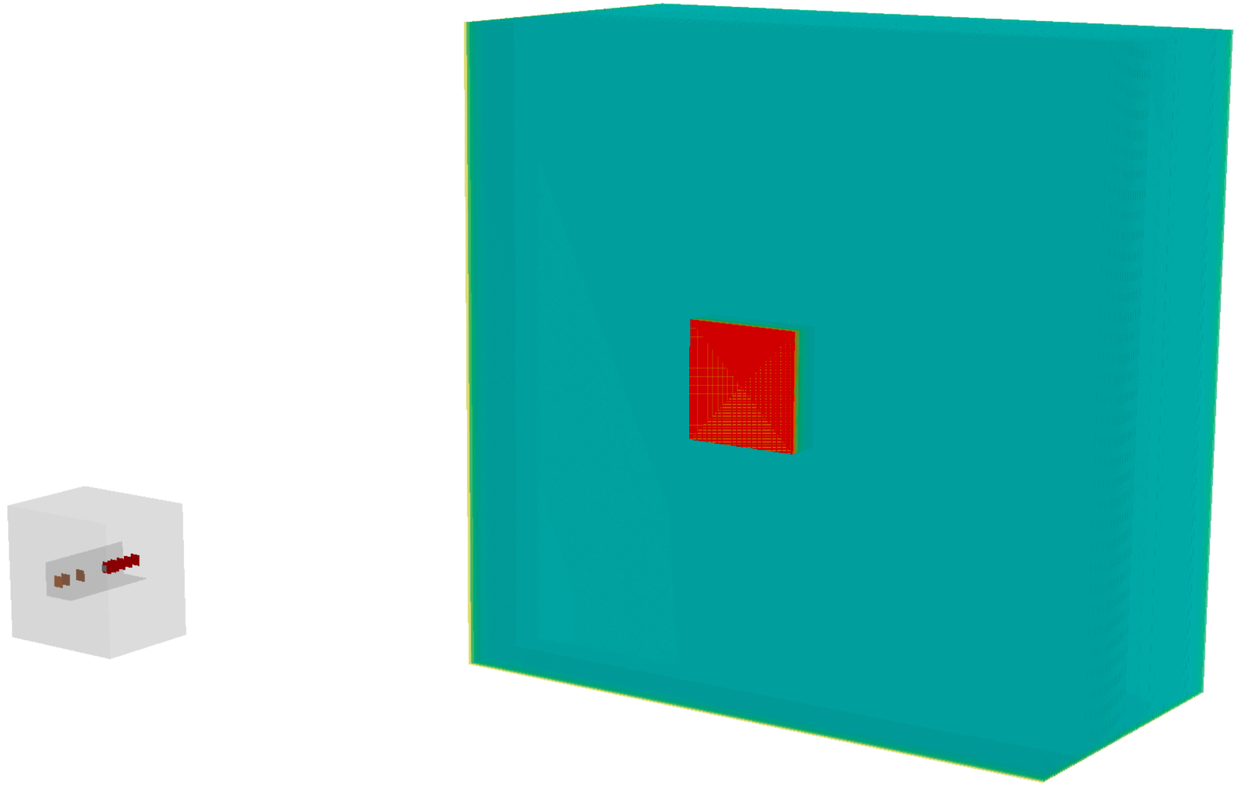
Simulations

Geometry implementation



Simulations
Target Interaction

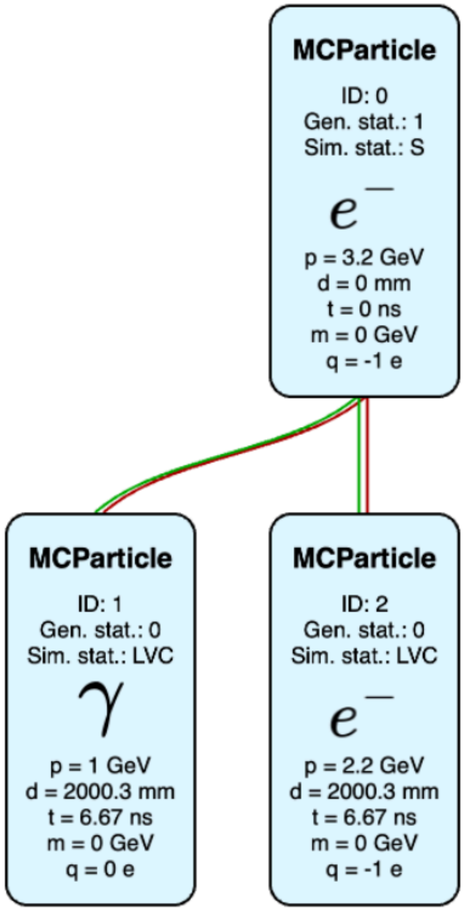
- Geant4: *Geant4FastSimShowerModel*
- Access to that in DD4hep and applicable in specified region. 3 Functions:
  - **isApplicable**: Apply the FastSim to the current Particle?
  - **ModelTrigger**: Are given trigger criteria fulfilled by the current track
    - If trigger criteria is not met, the “normal” Geant4 simulation seems to run
  - **DoIt:** Do the actual simulation (access to primary particle, create secondaries,…)
- Easy enough, isn’t it?

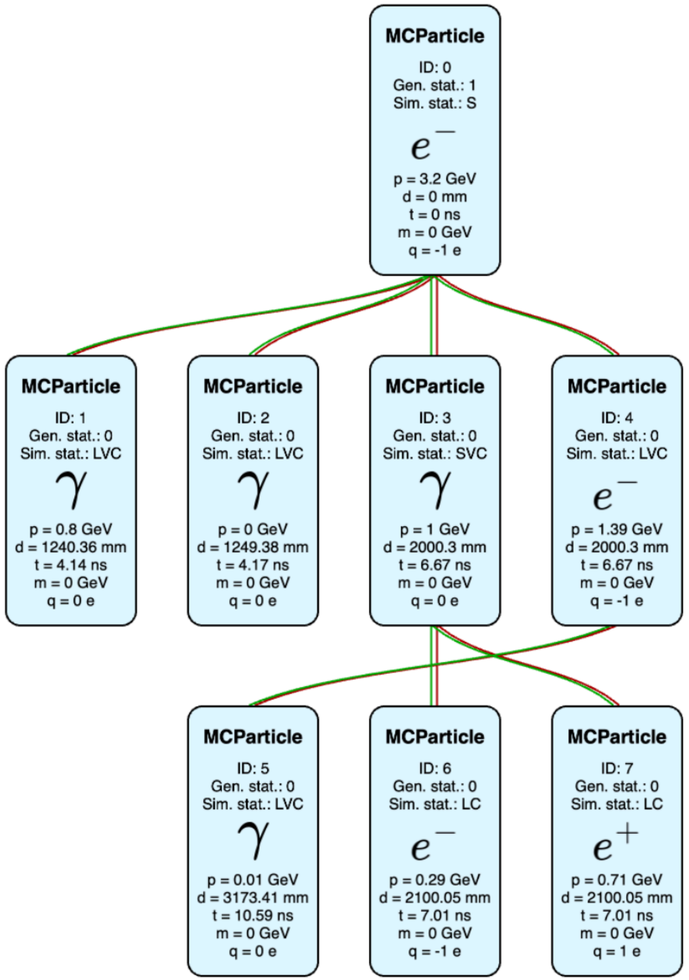
Simulations

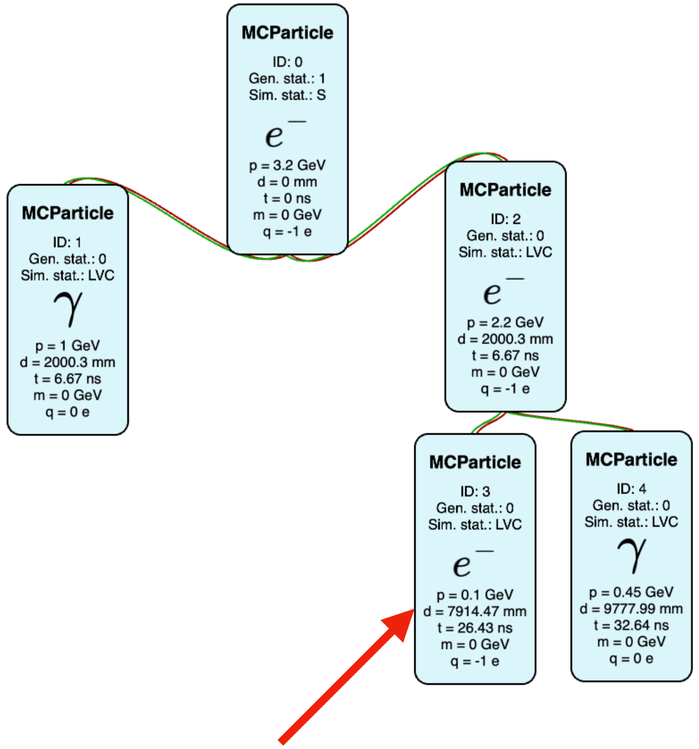
Problems with the target interaction

- Primary electron has multiple steps in target -> Implemented interaction happens multiple times
  - Trigger does not really help, just lets the normal Geant4 sim run if trigger fails
  - Current workaround:
    - Create recoil electron as secondary particle and kill primary
    - Set the vertex of the secondary particle to the end of the target
  - Need to think about: Multiple interactions, multiple electrons

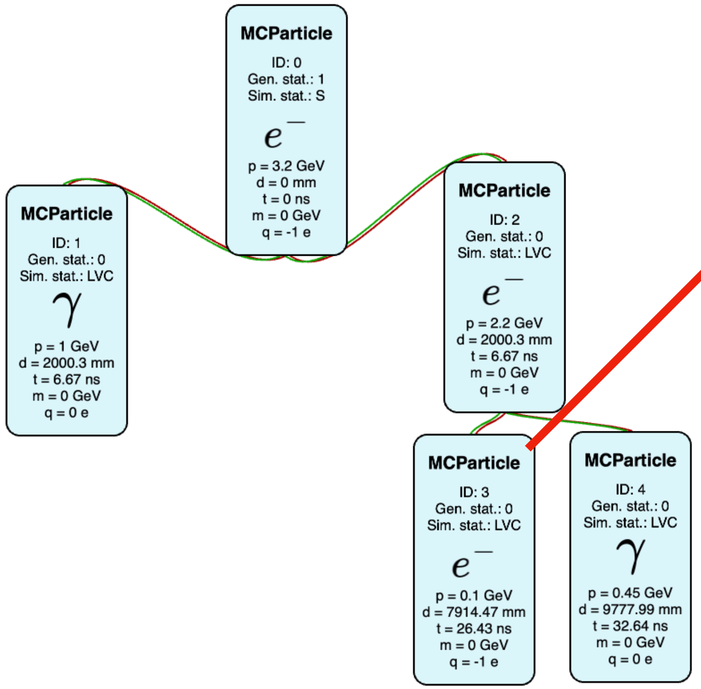
Example test interaction:
Electron is deflected (drawn from normal distribution), looses 1 GeV and photon is created to account for momentum/energy conservation
No magnetic field, only target (at d=2000mm) and recoil tracker







Where does this guy come from?



Going through all the Geant4 steps:

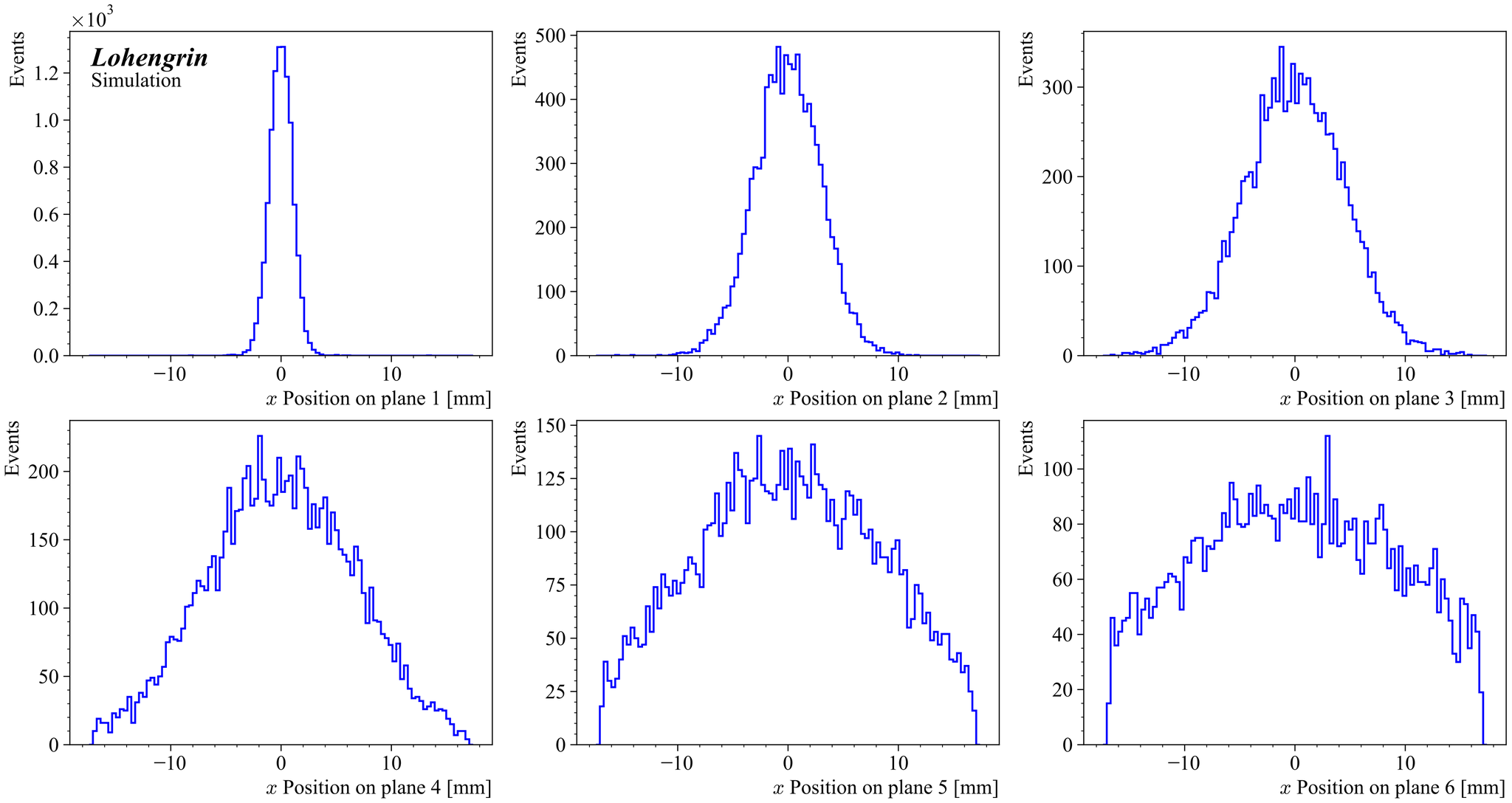
```
Track 85 | Particle PDG 11 | Energy [MeV] 0.00182235 | Created through eIo
Track 85 | Particle PDG 11 | Energy [MeV] 0 | Created through eIoni
Track 84 | Particle PDG 11 | Energy [MeV] 100.579 | Created through eIoni
Track 84 | Particle PDG 11 | Energy [MeV] 100.575 | Created through eIoni
Track 84 | Particle PDG 11 | Energy [MeV] 100.478 | Created through eIoni
Track 84 | Particle PDG 11 | Energy [MeV] 100.474 | Created through eIoni
Track 84 | Particle PDG 11 | Energy [MeV] 100.419 | Created through eIoni
Track 84 | Particle PDG 11 | Energy [MeV] 100.396 | Created through eIoni
Track 84 | Particle PDG 11 | Energy [MeV] 100.355 | Created through eIoni
Track 84 | Particle PDG 11 | Energy [MeV] 100.342 | Created through eIoni
```

eloni -> electron ionisation (world volume is air)

Actually: There are way more electrons created

But: Most of them just above m_e which is cut by Geant4

A small sanity check of the “gauss interaction”



Simulations

Next up

- Detector simulation with YAML config, i.e. translate the YAML to the steering file
  - Provide easy access to the basic settings but also enable to write your own steering file and call that
- Get/Clone/… the modules (beam, detector, reco) and run them with the given configs through PERCEVAL
- Reco/Digitization
- Further work on Target interaction (get distributions, combine them, multiple interactions,…)