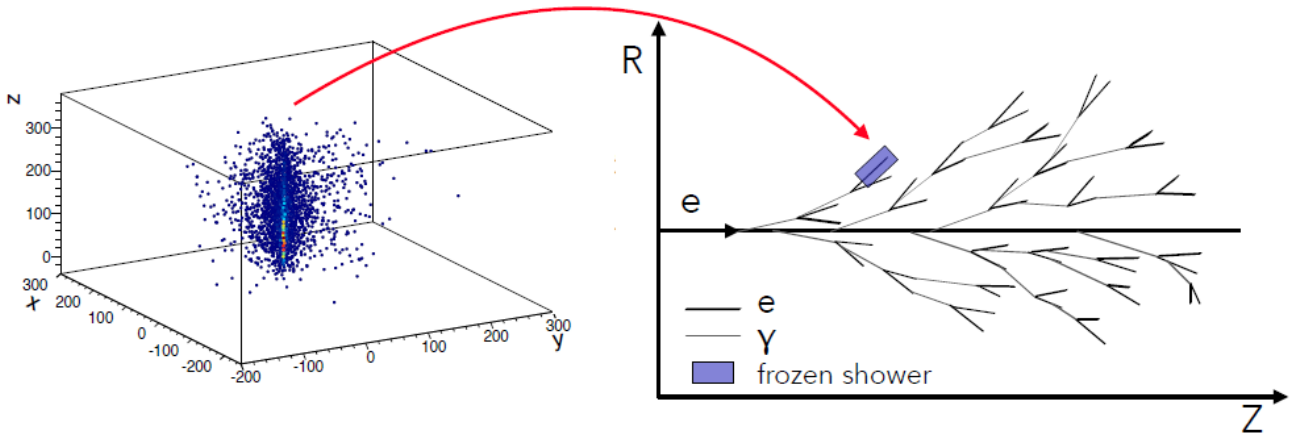
Fast calorimeter simulation

- Developing frozen shower (FS) method for calorimeter fast simulation
- During the FS simulation the low-energy particle are substituted with pre-generated shower from the library
- The purpose of the FS library is to store the shower and the condition, with which this shower was generated
- When asked, the library should return the shower with the generation conditions as close to the required, as possible
- FS in steps:
  - Library creation: Need to be performed only ones. Library is created with respect of the shower properties
  - Fast simulation: Showers from the library is used instead of filly simulated showers

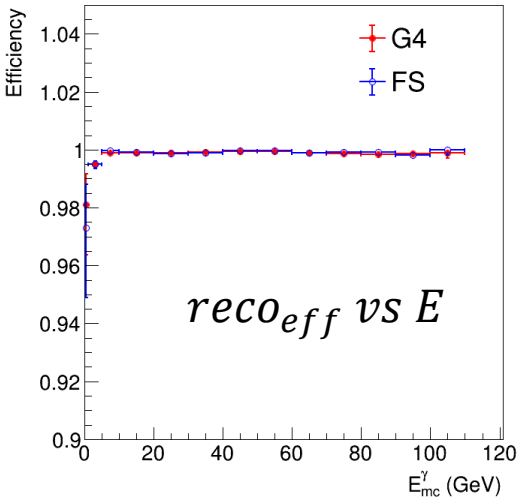


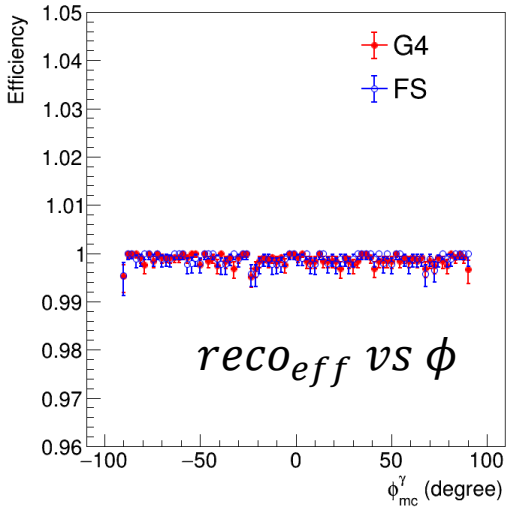
FS fast calorimeter simulation

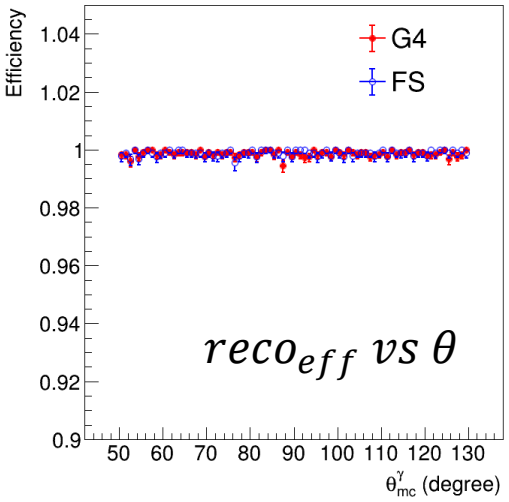
- First try with making the frozen shower library of electron (or positron) for ECAL barrel
- Getting start point (x, p_x, p_y, p_z) of shower particle using Geant4 simulation from single γ (1-100 GeV) events
- Doing Geant4 simulation according to the obtained start points and save the simulated hits
- Shower library: energy range (100 MeV to 1 GeV), θ range($50^\circ$to 90°), ϕ range (-25° to 25°), x range (1850 to 2000 mm)
- Library size is ~ 50 GB, saved in uncompressed ROOT file.

FS fast calorimeter simulation

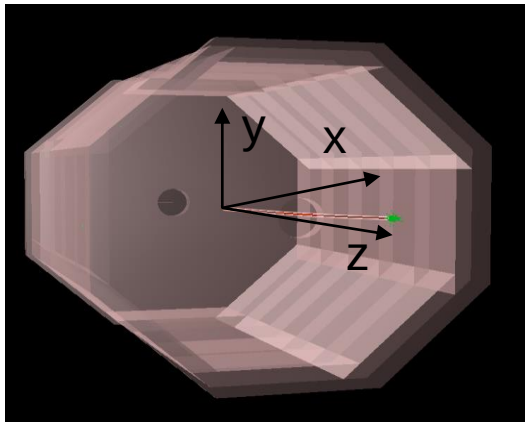
- Check physics performance of γ for the FS simulation





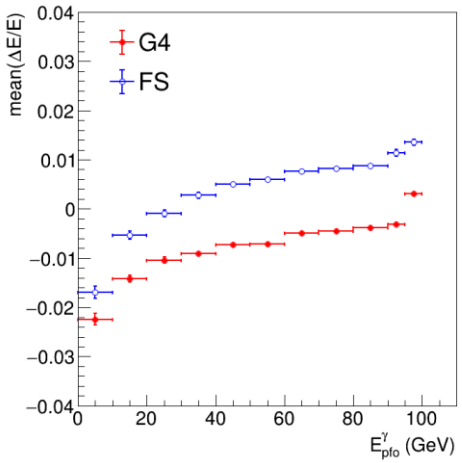


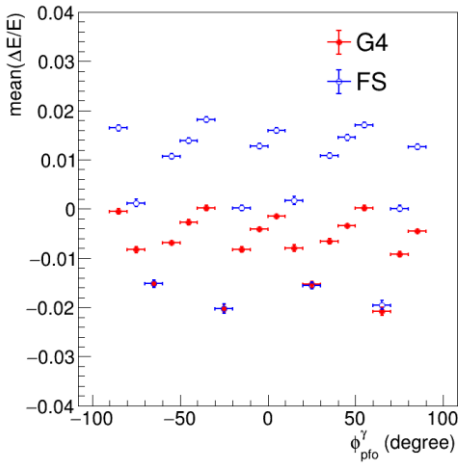
The concatenate regions for different staves are still simulated by Geant4

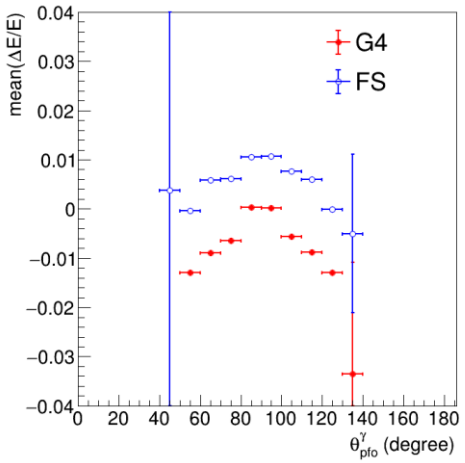


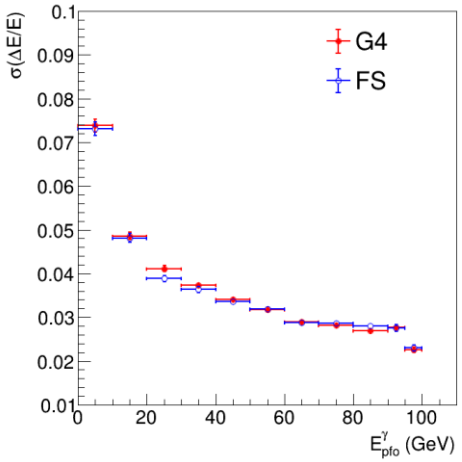
physics performance check (reco E)

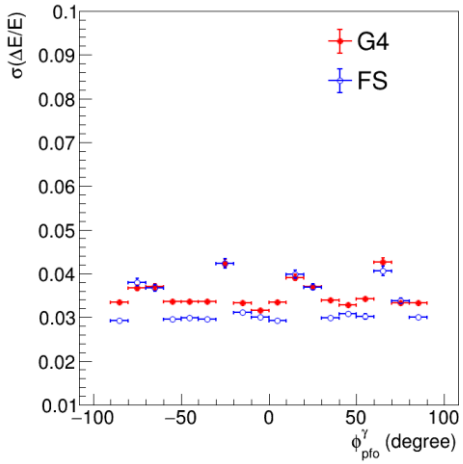
- Check physics performance of γ for the FS simulation

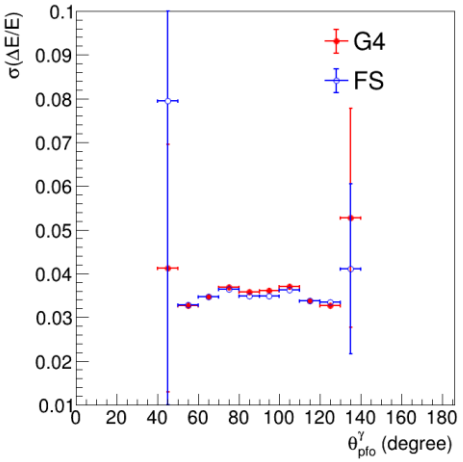






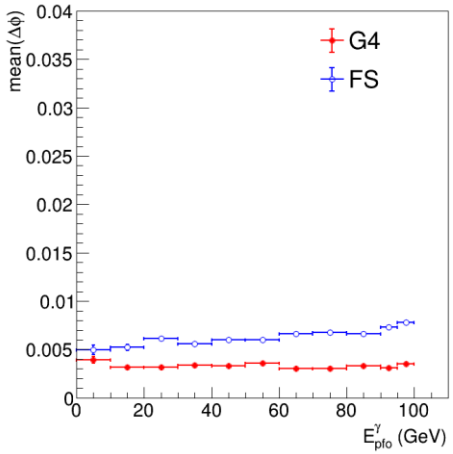


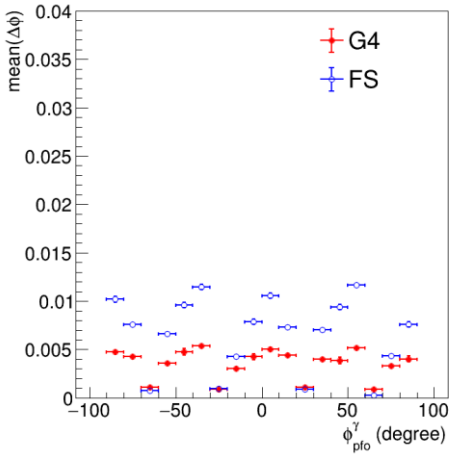


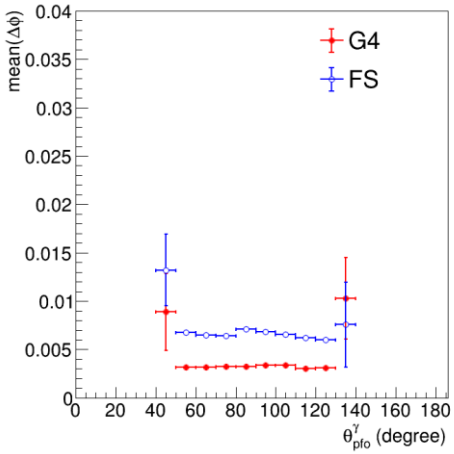


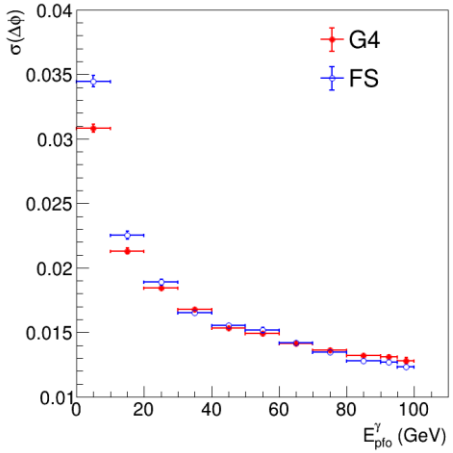
physics performance check (reco ϕ)

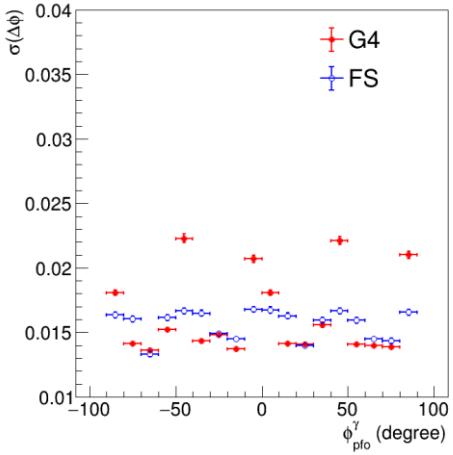
- Check physics performance of γ for the FS simulation

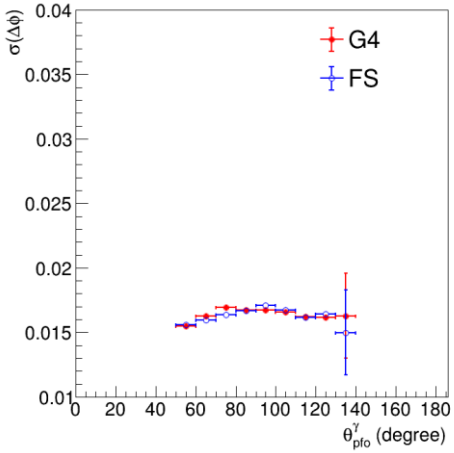






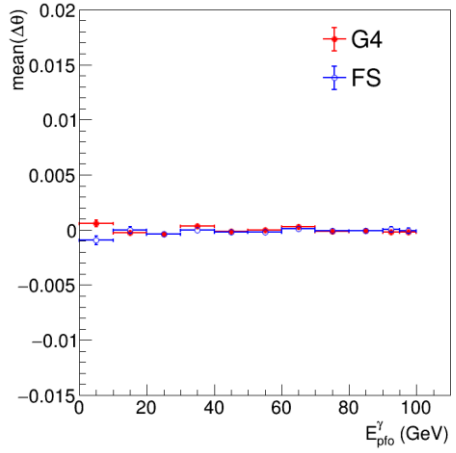


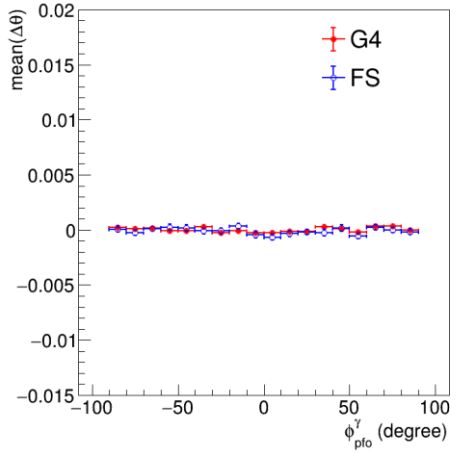


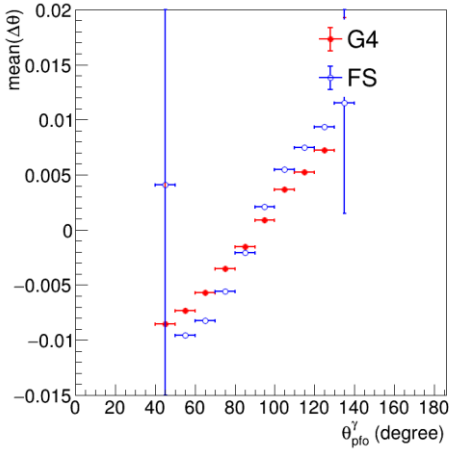


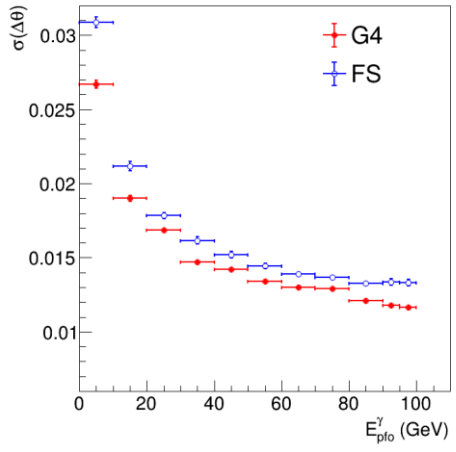
physics performance check (reco θ)

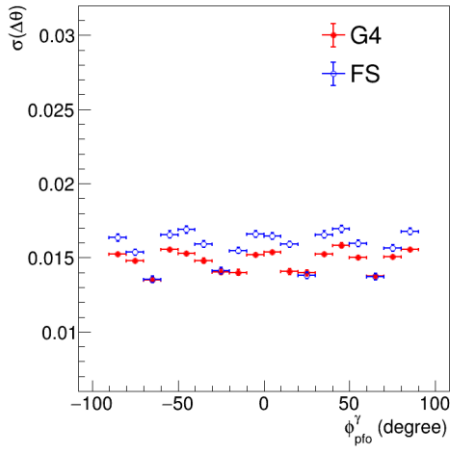
- Check physics performance of γ for the FS simulation

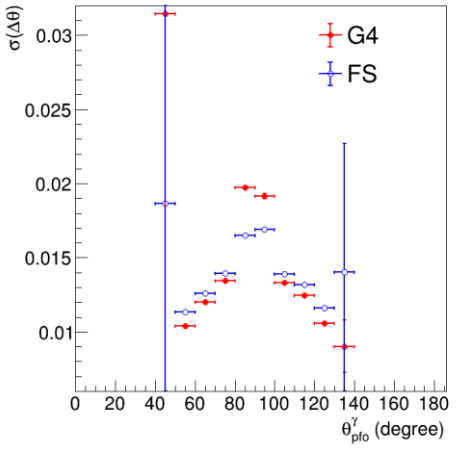






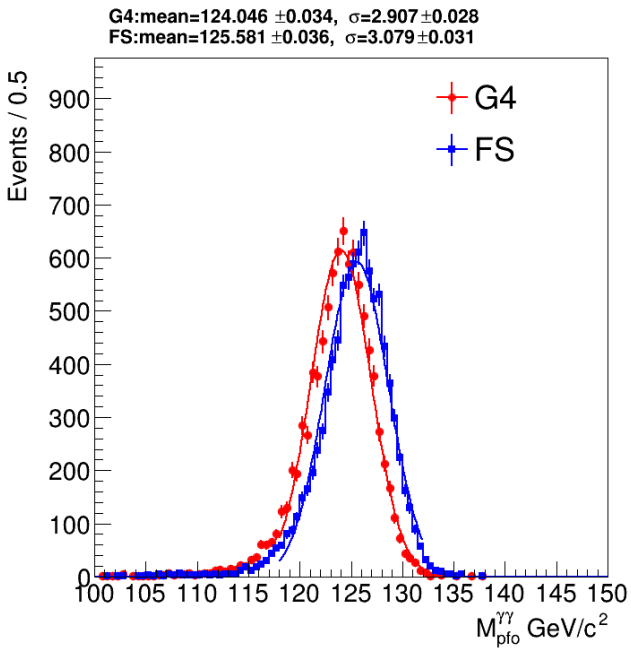


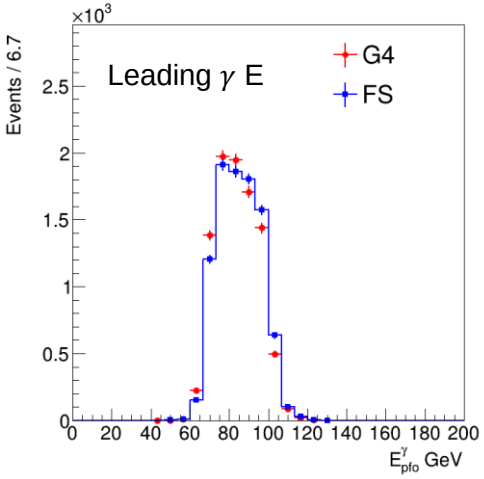


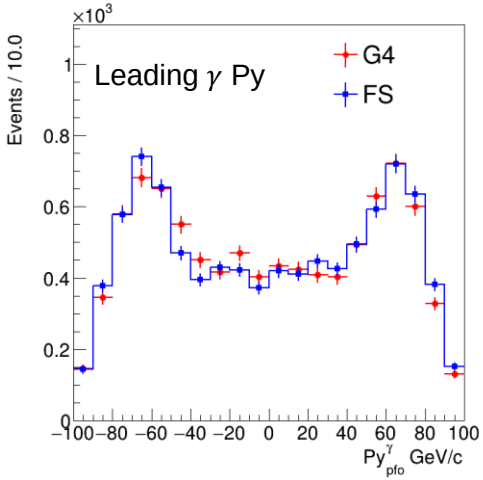


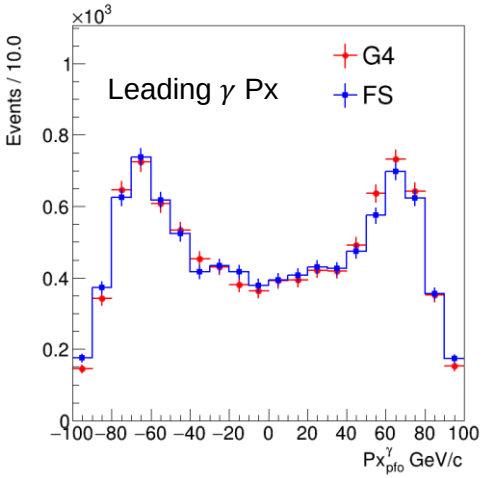
physics performance check

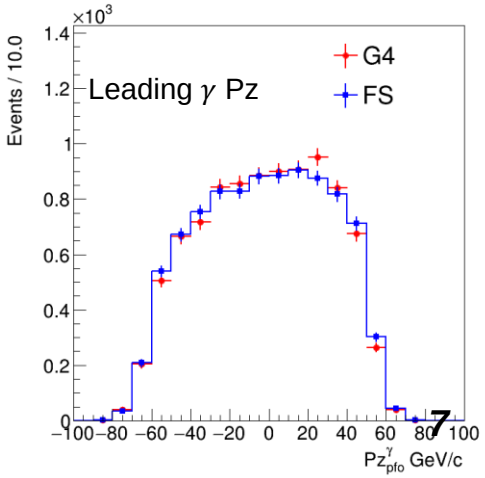
- Check physics performance using $e^+e^- \to ZH \to \nu\nu\gamma\gamma$ events in barrel-barrel region





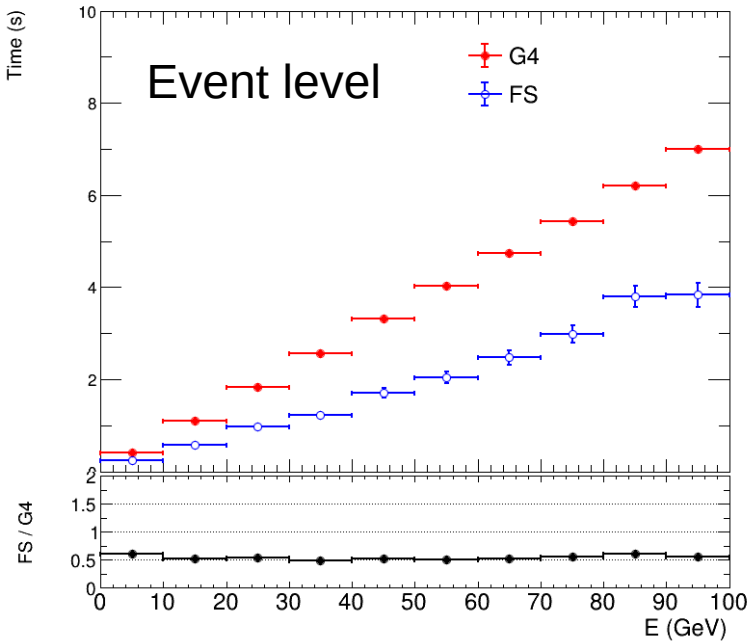


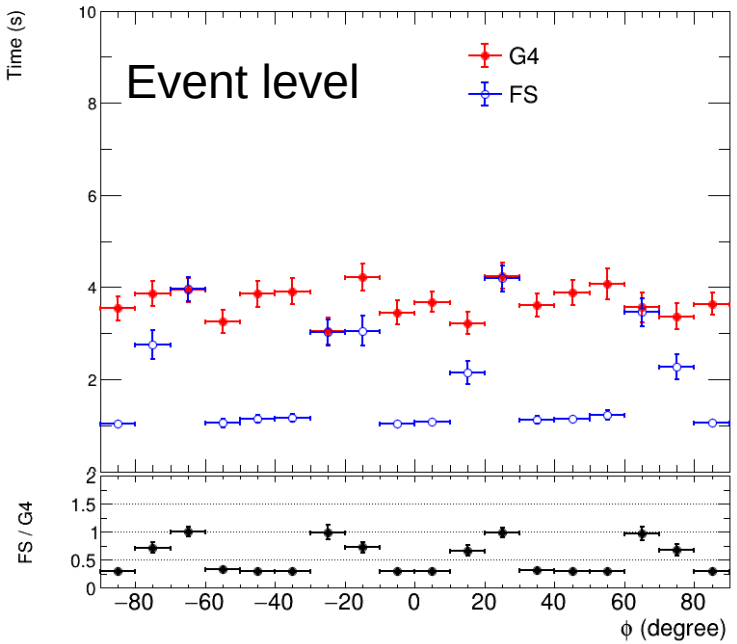




Time performance check

- Check time performance of single γ event simulation





Next: making a similar library for ECAL endcap part.

Pandora for key4hep

- Make a git repository for pandora
  https://github.com/wenxingfang/CEPCSW_Pandora
- The repository includes:
  - Pandora: source code for pandora client
  - Service: provide gear service
  - Examples: option file example