Status of the MC Simulations

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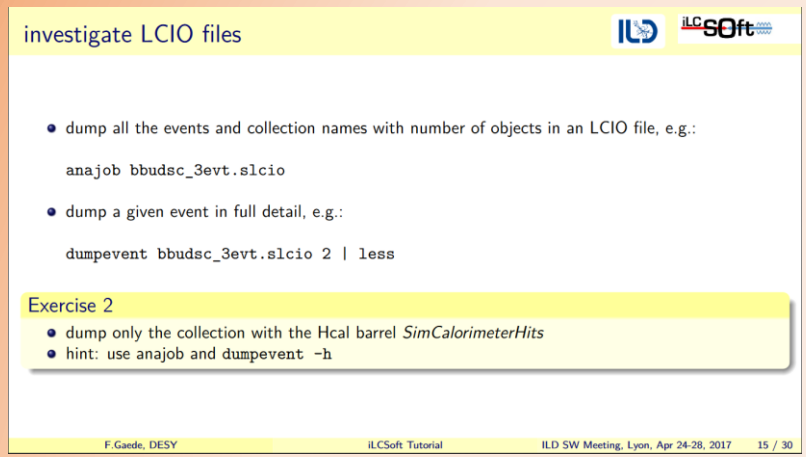
Monte Carlo. First steps

Thanks to the previous work done by Camilo and this tutorial:

https://agenda.linearcollider.org/event/7520/contributions/38806/attachments/31480/47409/gaede_ilcsoft_tutorial.pdf

I was able to setup all the software needed.



investigate LCIO files

- dump all the events and collection names with number of objects in an LCIO file, e.g.:

```
anajob bbudsc_3evt.slcio
```

- dump a given event in full detail, e.g.:

```
dumpevent bbudsc_3evt.slcio 2 | less
```

Exercise 2

- dump only the collection with the Hcal barrel *SimCalorimeterHits*
- hint: use anajob and `dumpevent -h`

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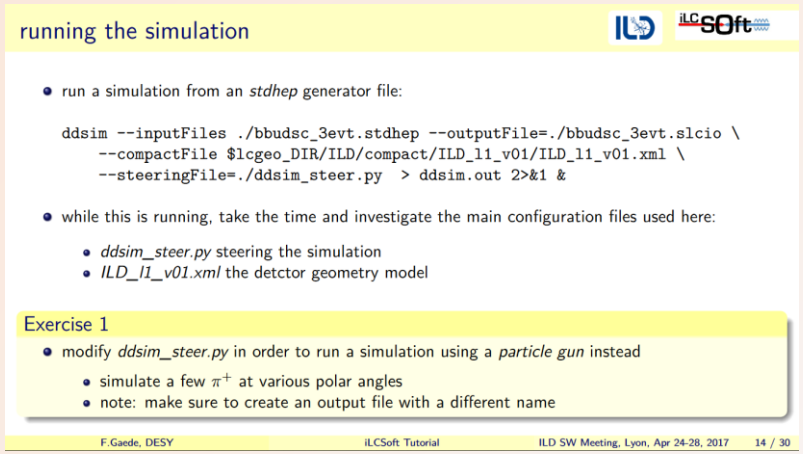

running the simulation

- run a simulation from an *stdhep* generator file:

```
ddsim --inputFiles ./bbudsc_3evt.stdhep --outputFile=./bbudsc_3evt.slcio \
    --compactFile $lcgeo_DIR/ILD/compact/ILD_l1_v01/ILD_l1_v01.xml \
    --steeringFile=./ddsim_steer.py  > ddsim.out 2>&1 &
```

- while this is running, take the time and investigate the main configuration files used here:
  - *ddsim_steer.py* steering the simulation
  - *ILD_l1_v01.xml* the detctor geometry model

Exercise 1

- modify *ddsim_steer.py* in order to run a simulation using a *particle gun* instead
  - simulate a few π^+ at various polar angles
  - note: make sure to create an output file with a different name

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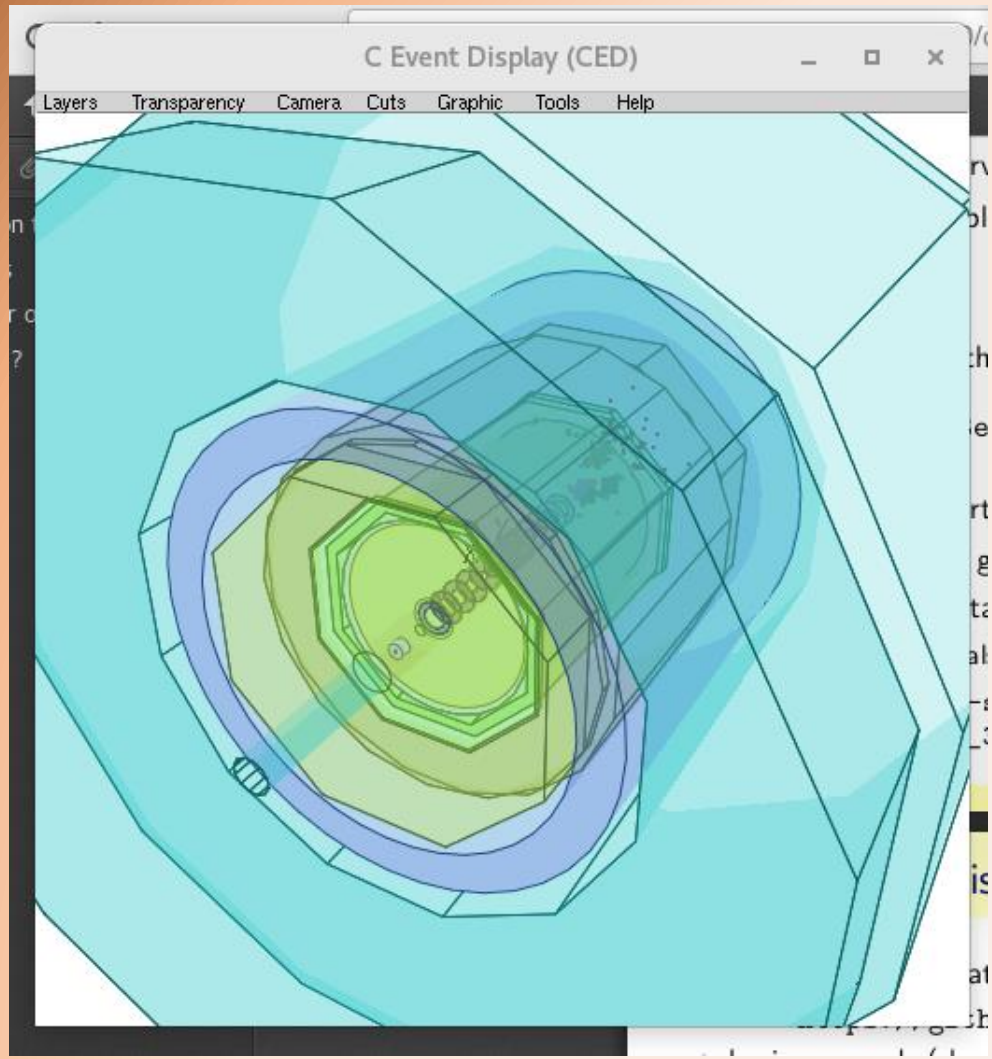
The repository with the new code have been updated:

https://gitlab.cern.ch/hegarcia/mc-higgs-channel

Monte Carlo. Event display



ILCSoft has a default event display called CED. It shows the detector geometry and each point represents a hit in the subdetectors.

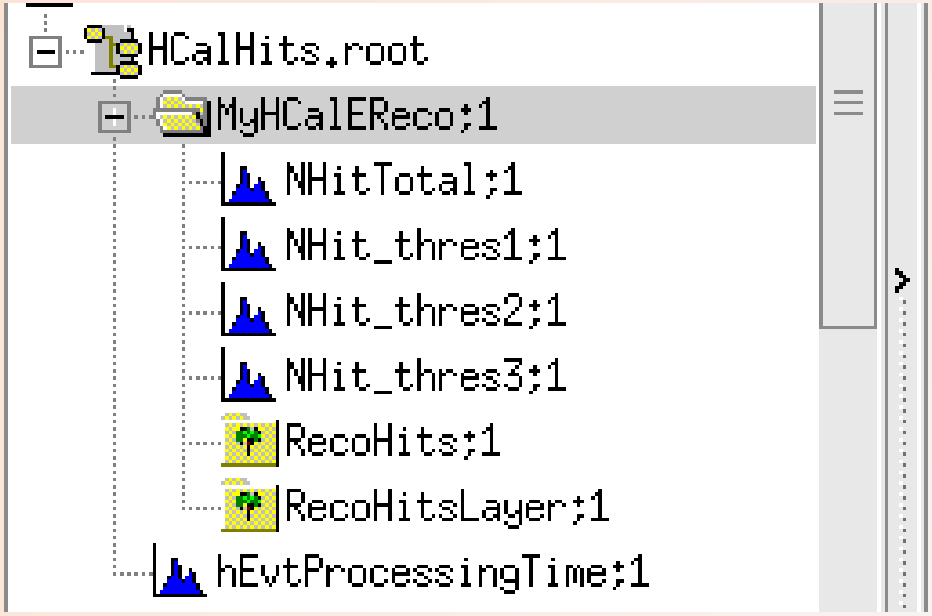
However, there is a yet undefined bug that makes the program crash trying to rotate the display.

Currently there is an open ticket for the software experts in github, waiting for a response.

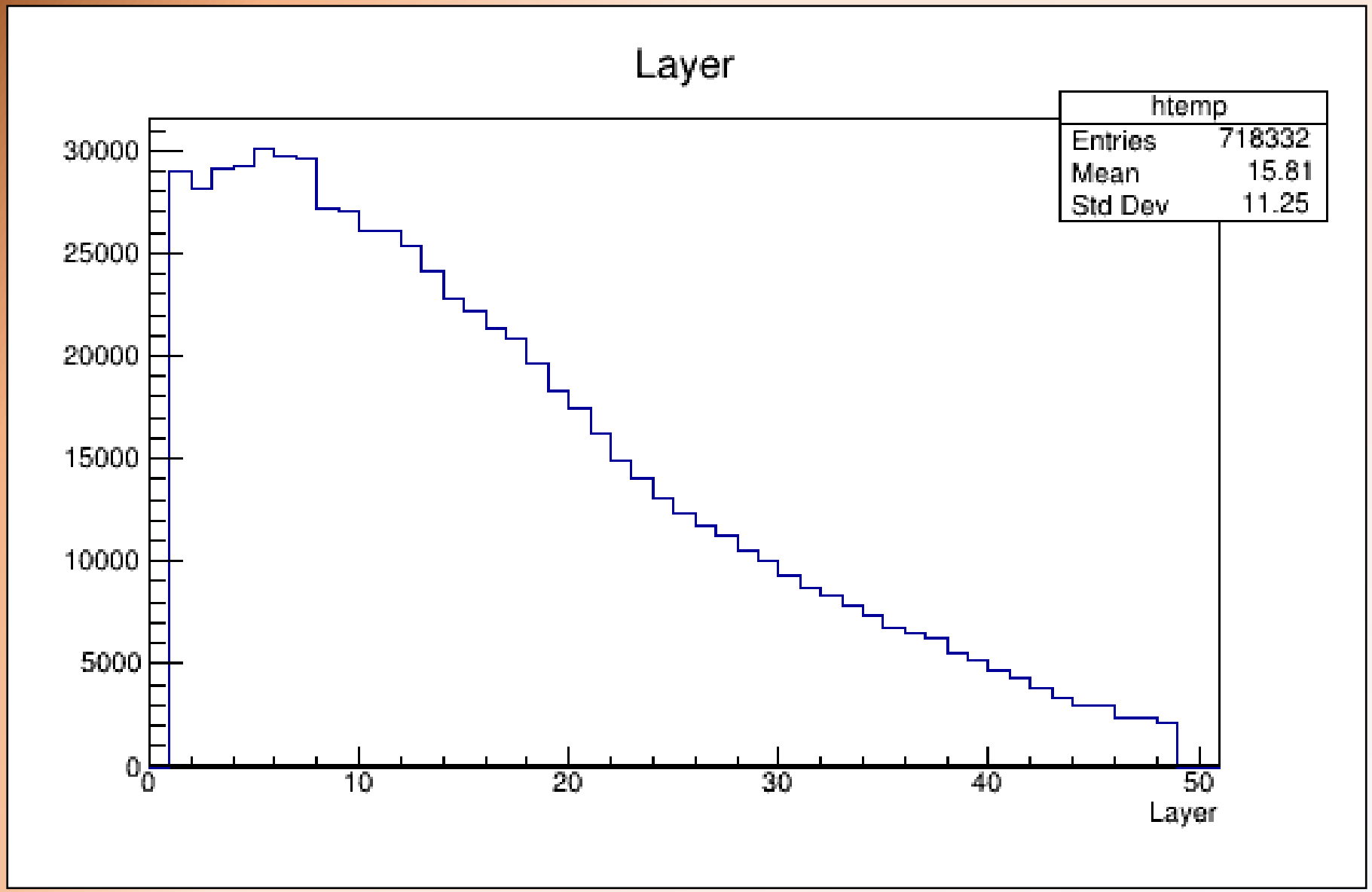
Monte Carlo. Marlin processor

To have more flexibility I have created a Marlin processor (HCalEReco) which takes a REC.slcio file as input and reads the hits from the HCal Calorimeters: Barrel, EndCaps and EndCapRing (check with event display).

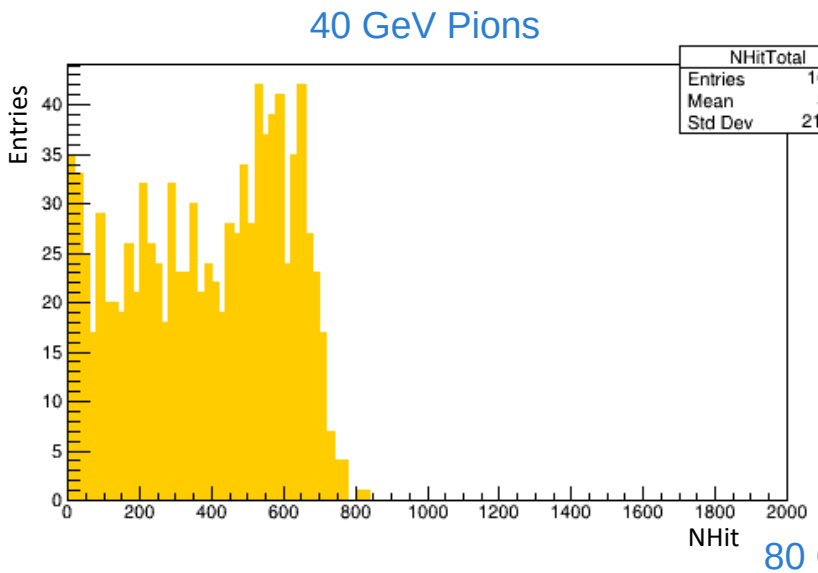
```
hectorgc@localhost:~/Physics/mc-higgs-channel/Marlin/HCalEReco
File  Edit  View  Search  Terminal  Help
[hectorgc@localhost HCalEReco]$ export MARLIN_DLL=$MARLIN_DLL:$PWD/lib/libHCalEReco.so
[hectorgc@localhost HCalEReco]$ Marlin HCalEReco.xml --global.LCIOInputFiles=/home/hectorgc/Physics/Data/MC/REC/pi_80GeV_1000evt_REC.slcio
```

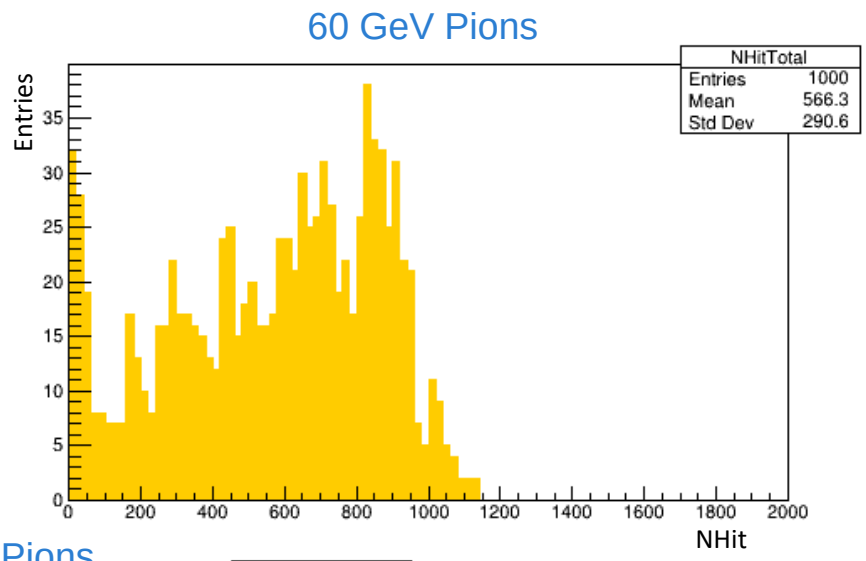


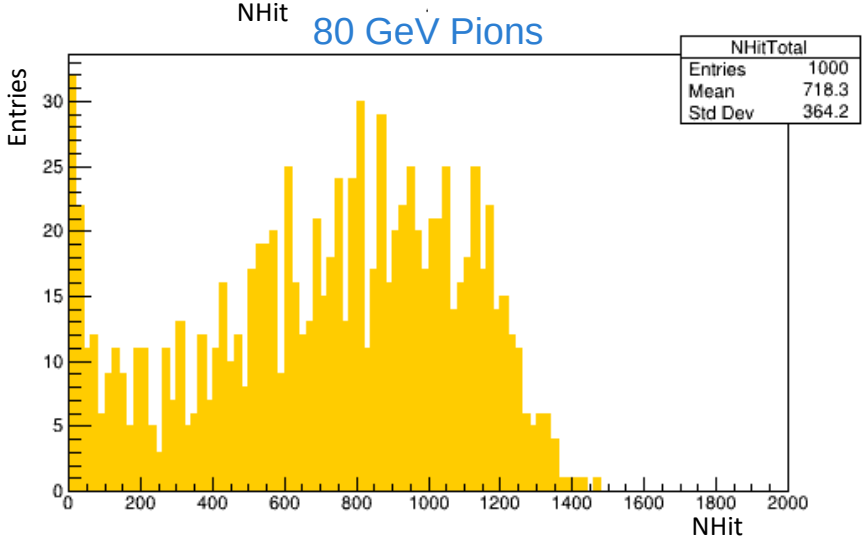
Monte Carlo. Geometry information



Monte Carlo. NHit distributions

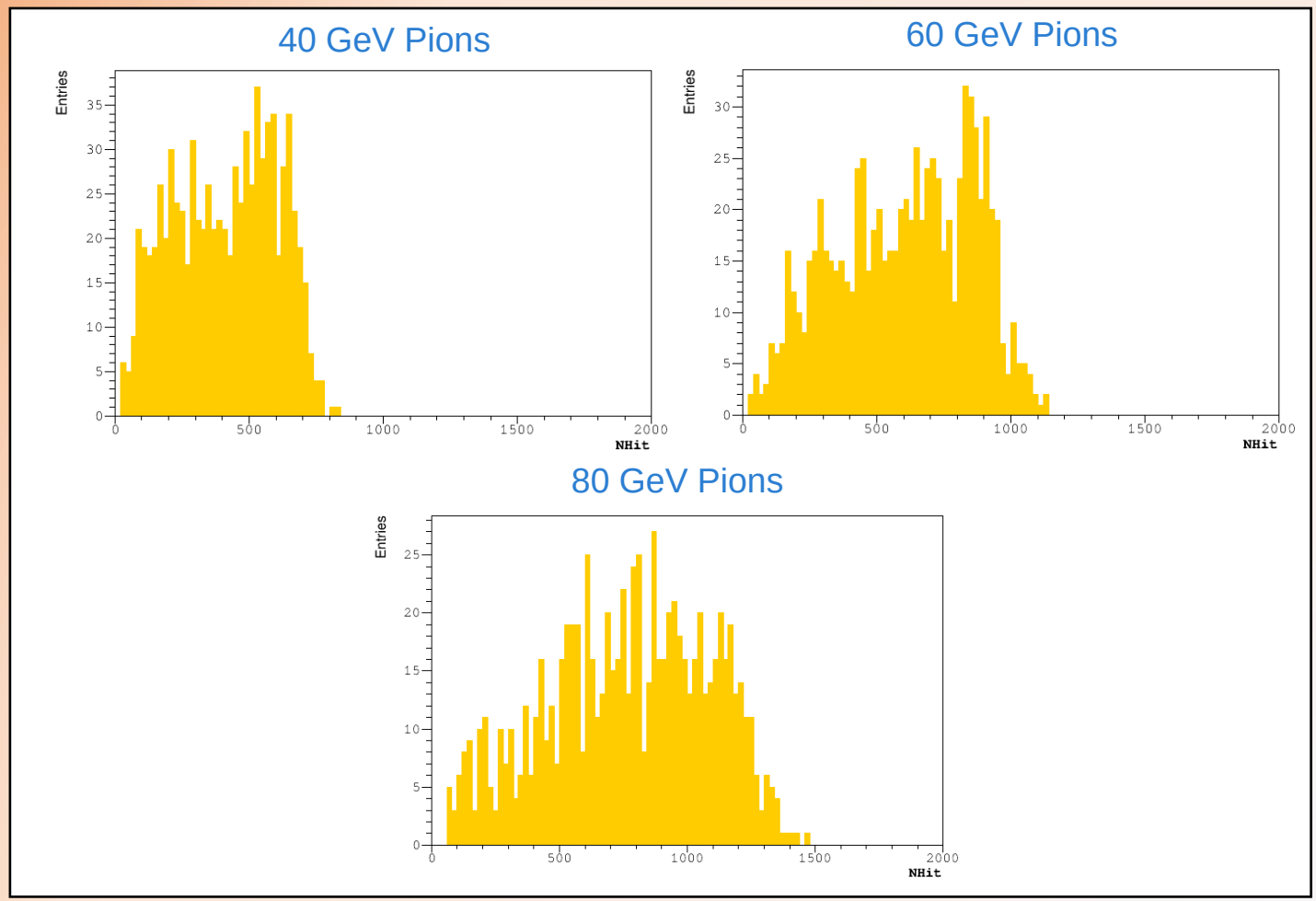






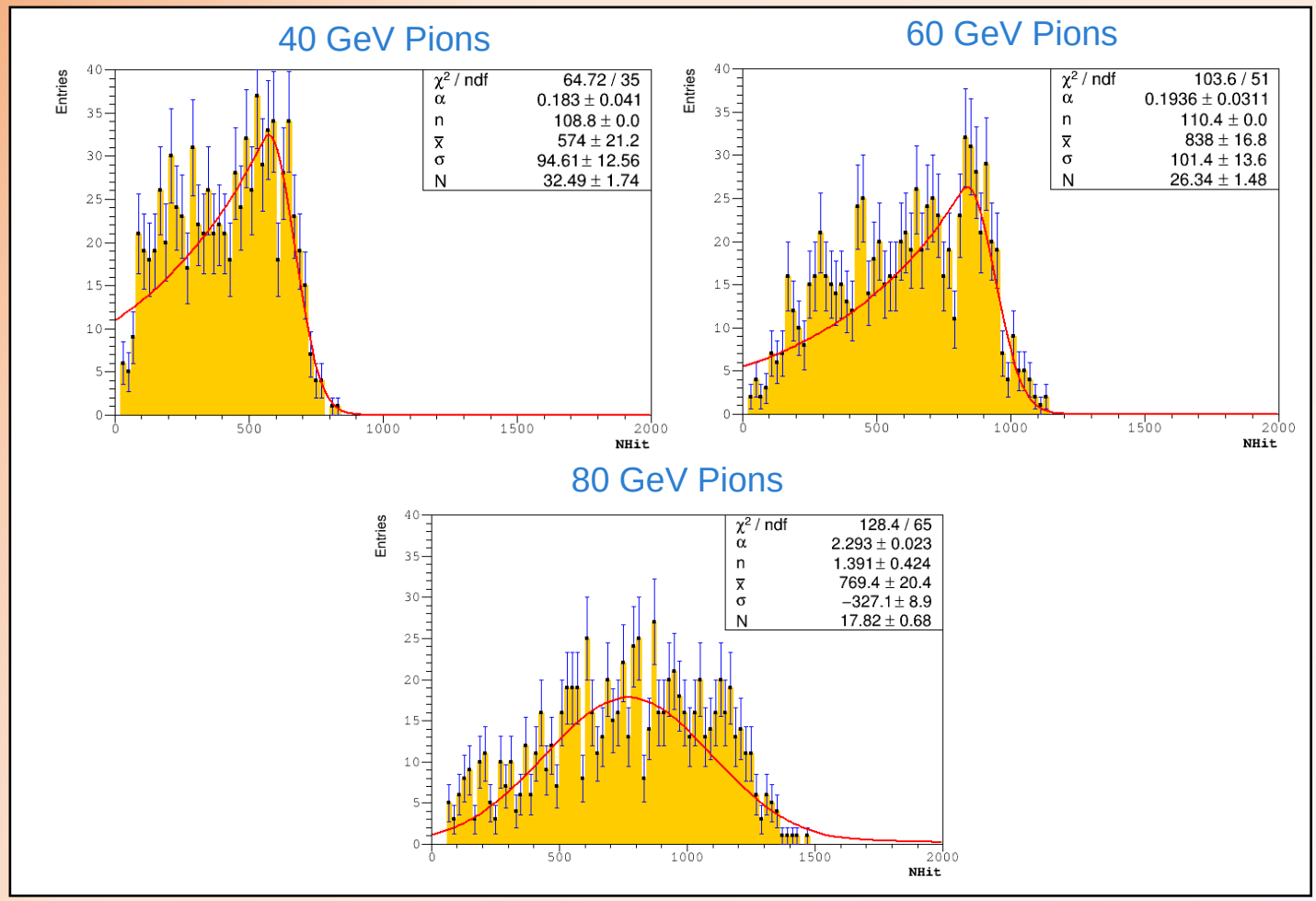
Monte Carlo. Contained showers

Similar than with the TB Data: Compute the layer where the shower starts in the SDHCal as the first layer in a set of 3 layers with more than 4 hits. Then require: $ipStart < 10$ (ECal not taken into account yet)



Monte Carlo. Distribution fits

Following the steps of energy reconstruction the distributions are fitted to a Crystal-Ball. The code works fine but we need more statistics.



Summary

Once we get a response from the software experts and with the events display working we will be able to properly understand the geometry of the detector and analyse the shapes of the showers.

The simulation, detector and energy reconstruction have been tested and ready for the proposed next steps:

- New production of simulations (10.000 evts) for the whole range of energies.
- Compute the linearity and energy reconstruction.
- Compare the results from the TB of 2012 and propose as validation.

Back-up