

Students Project

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Content:

- Introduction
- Macro Based Exercises
- Simple Code Based Exercises
- More Advance Exercises



How to install/compile the example

Installation:

- Use firefox (Applications → Favorites) to download <https://www-zeuthen.desy.de/~kuhl/StudentProject.tgz>
<https://www-zeuthen.desy.de/~kuhl/StudentProject.tgz>
- Unpack the tar ball in the home directory:
`tar -zxvf StudentProject.tgz`
- Compile:
open a Terminal (Application → Favorites)
`cd Studentproject/buildCalo`
`cmake`
`make`

First time run the interactive session

Installation:

- Type in terminal
`./example`

a interactive window will open, you see a simple sandwich structure of Liquid Argon (Lar) and Lead

- you can use the buttons at the top and the mice to get different views of the structure and to pick on the different parts to see , what is Lar and what is Lead

- First time shoot a particle into the structure
type into the console of the interactive window (where is written "Session:")
`/control/execute run1.mac`

you should see a high energetic electron coming from left and produce a electron/photon cascade called shower.

Exercises I: Interactive macro run1.mac

You should use this macro to make interactive visualization. You should always change the macro and the do.

- Running: Type in terminal
`./example`

`/control/execute run1.mac`
- Open the macro with a editor
(you can find emacs and a simpel texteditor under accessories)
 - Change the energy of the incoming electron and compare it with what you expect from the lectures
 - Change the magnetic field and repeat
 - Change the type of the incoming particle and compare again (e+, e-, mu+, mu-, pi+, pi-, p+, p-)
- In case you calorimeter is too small: you can adjust by reducing the energy of the incoming particle to adjust, you will learn in exercise III how to change the dimension of the calorimeter

Exercises II: Statist. exercise with run2.mac

This macro will produce a root tree with the energy entry in the Lar and Lead and fill some histograms

- Running: Type in terminal
`./example -m run2.mac`

Open the macro with a editor

Repeat the steps in Example I, now you get always entries for 1000 events:

- Try to estimate the resolution of the calorimeter (for example by using the root fit panel), what will change when you change the energy or particle type, compare it with the what you expect
- How does this change with particle energy

Further exercises which need change of the source code

This exercises need changes in the source code, which you can find in the Calo directory.

- what will change when you repeat the Exercise II with different absorber materials (you can change the material typ in `DetectorConstruction.cc`)
- by editing the same file you can test what will change when you change thickness/number of layers in absorber and/or active region

When you are a geant “expert” you could try to change the calorimeter that you can separate electrons from pions. Files which you amybe want to modify:

`B4DetectorConstruction.cc` : detector geometry
`B4bRunAction.cc` : creating histograms, ntuple columns, print out at the end of run
`B4bRunData.cc` : filling of Ntuple, histos
`B4bSteppingAction.cc` : lop to add up energies
`B4bRunData.hh` : fkt to add up energies

