Geant4 Tutorial

African School of Fundamental Physics and Applications
Windhoek (Namibia) 3rd July 2018

African School of Fundamental
Physics and Applications

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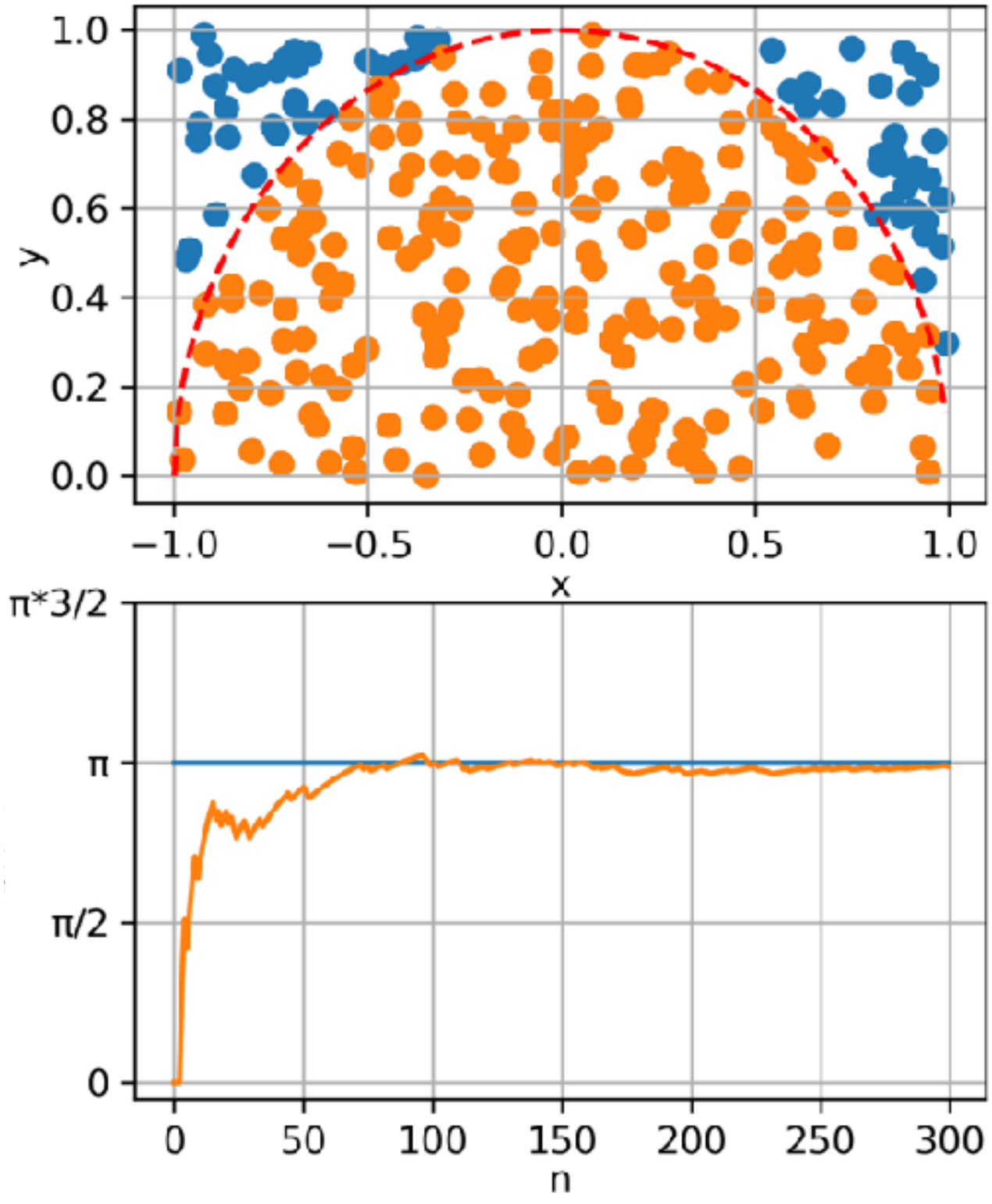
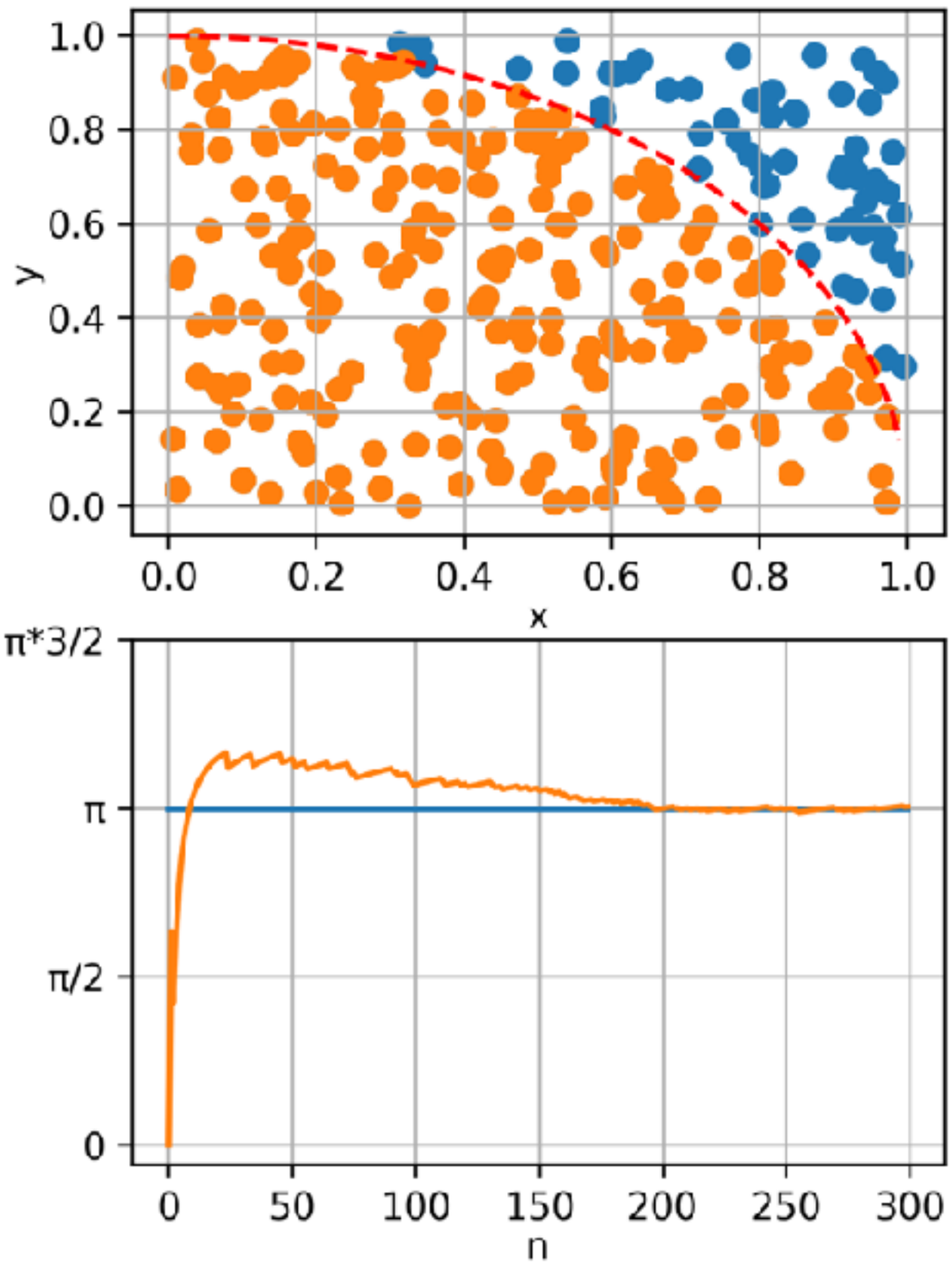
Use the simmetry!





Let’s run the example

- enable python 2.7:
  scl enable python27 bash

- install the library for the plots:
  pip2.7 install matplotlib —user

- create a folder:
  mkdir example

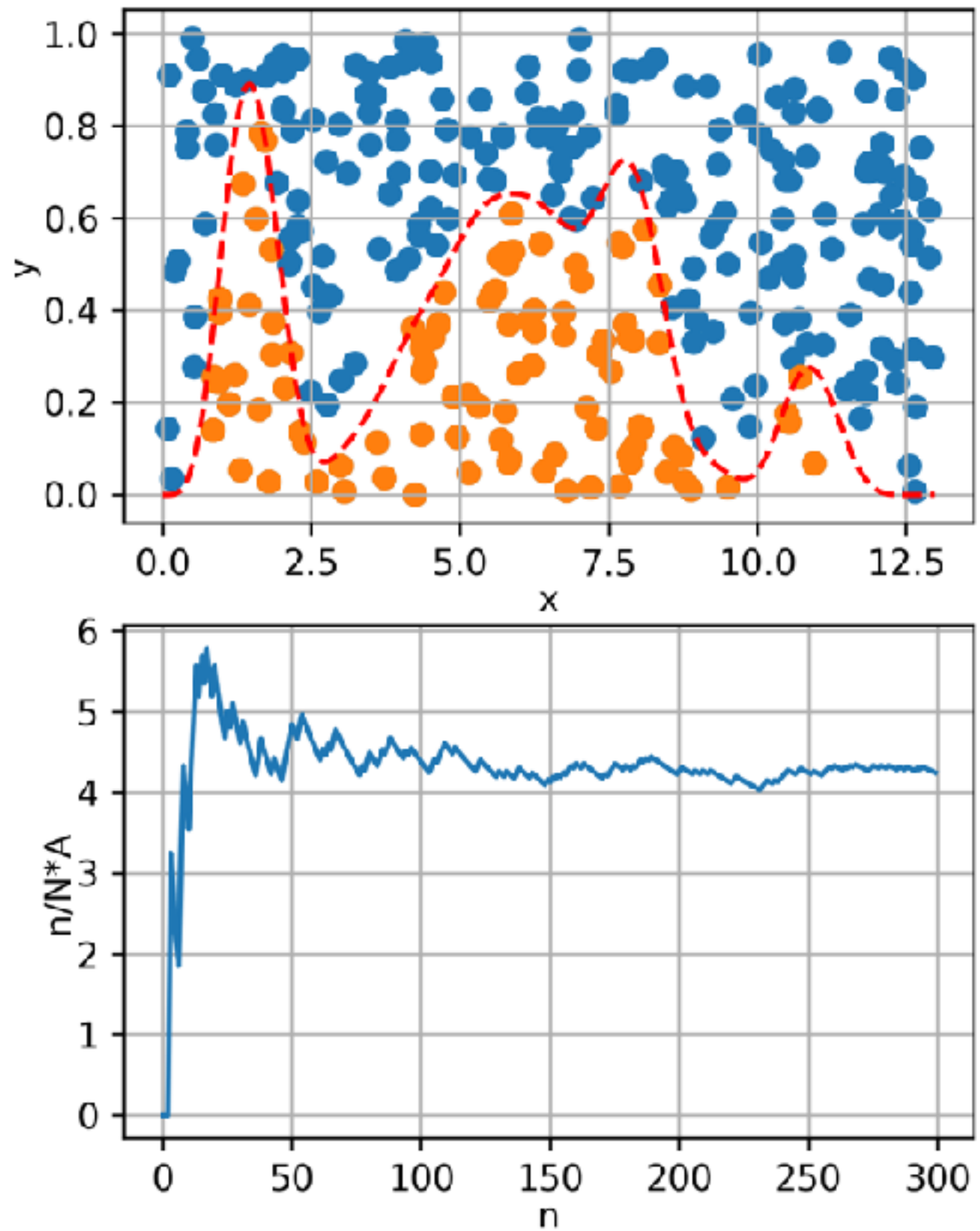
- go inside the folder:
  cd example

- download the example:
  wget http://www.roma1.infn.it/~mancinit/Teaching/ASP2018/integral.py

- run it:
  python2.7 integral.py

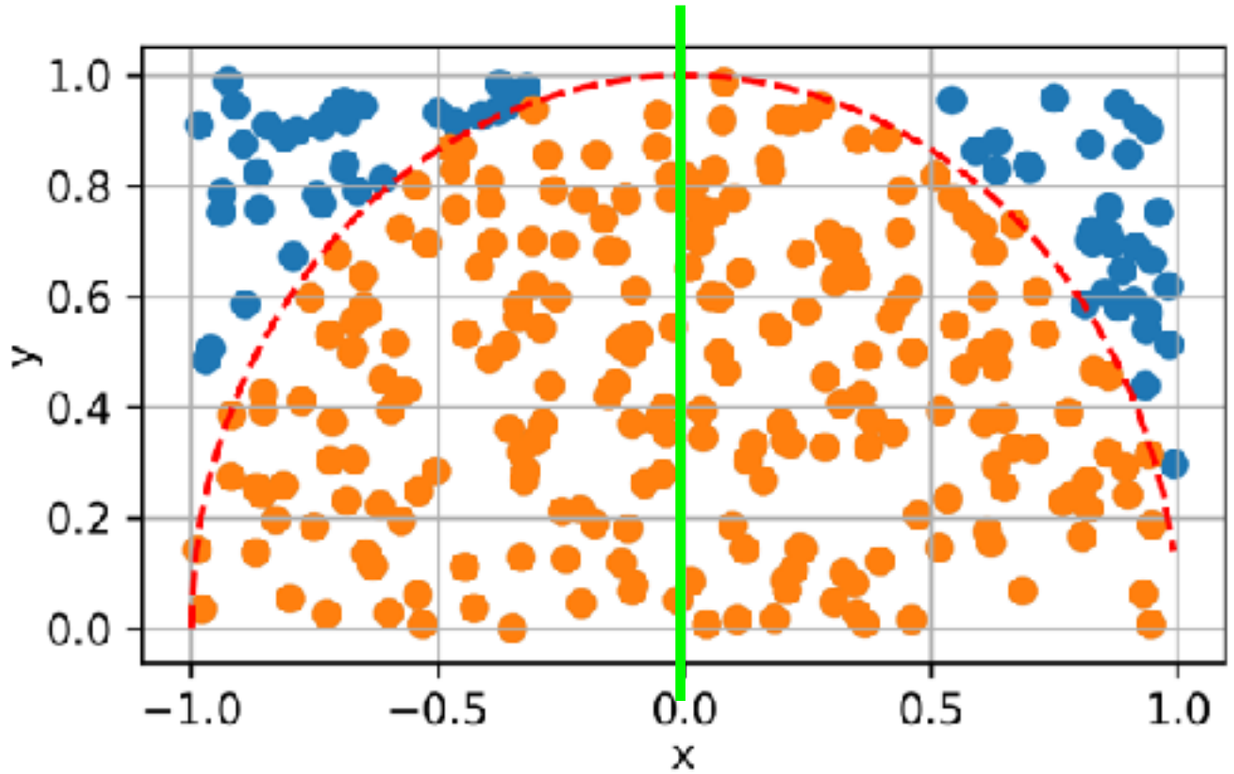
Example of an integral

- Have a look of the code:
  emacs integral.py &
- How to increase the number of random points extracted?



Let’s calculate π

- Is there a way to speed up the convergence of the computation?
- Use the symmetry!



- This is the method for calculating π was proposed by Laplace in “Théorie Analytique des Probabilitiés” (1825)!

Let’s use the symmetry!

- download the example:
  wget http://www.roma1.infn.it/~mancinit/Teaching/ASP2018/calculatepi.py

- run the example to see how it works:
  python2.7 calculatepi.py

- edit the code:
  emacs calculatepi.py &

- find the variable that defines the extremes of integration

- change it to integrate from 0 to 1

- run the example and check:
  python2.7 calculatepi.py

How to compile the Geant4 example

- set all the Geant4 variables:
  source /opt/geant/geant4.10.04.p01-install/bin/geant4.sh

- download the code from the repository:
  git clone https://github.com/carlomt/AnaEx01.git

- create a directory where compile the code:
  mkdir anaEx01build

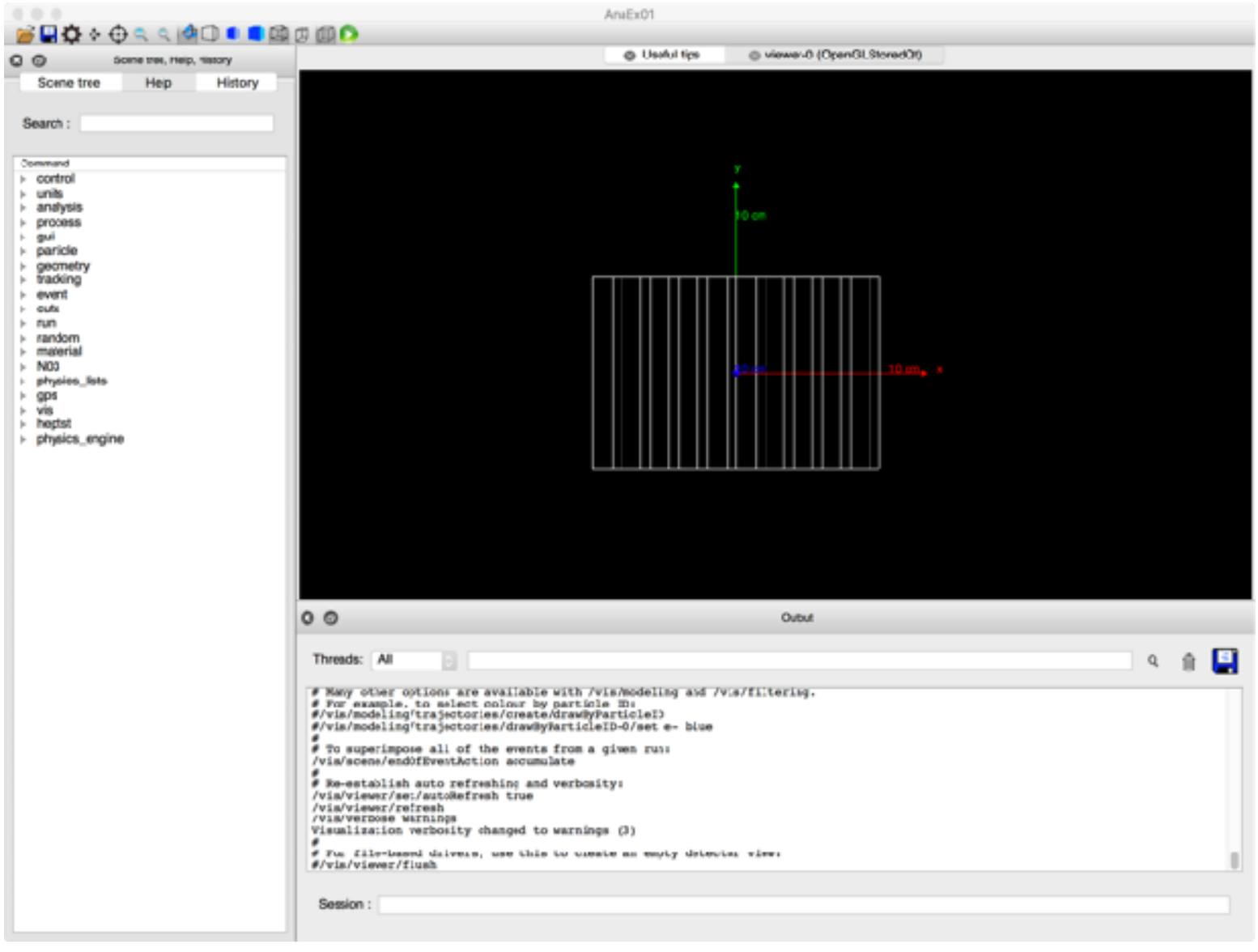
- go inside such directory:
  cd anaEx01build

- run cmake to copy all the needed files and create the Makefile:
  cmake -DGeant4_DIR=/opt/geant/geant4.10.04.p01-install ../AnaEx01

- compile:
  make

How to run the example

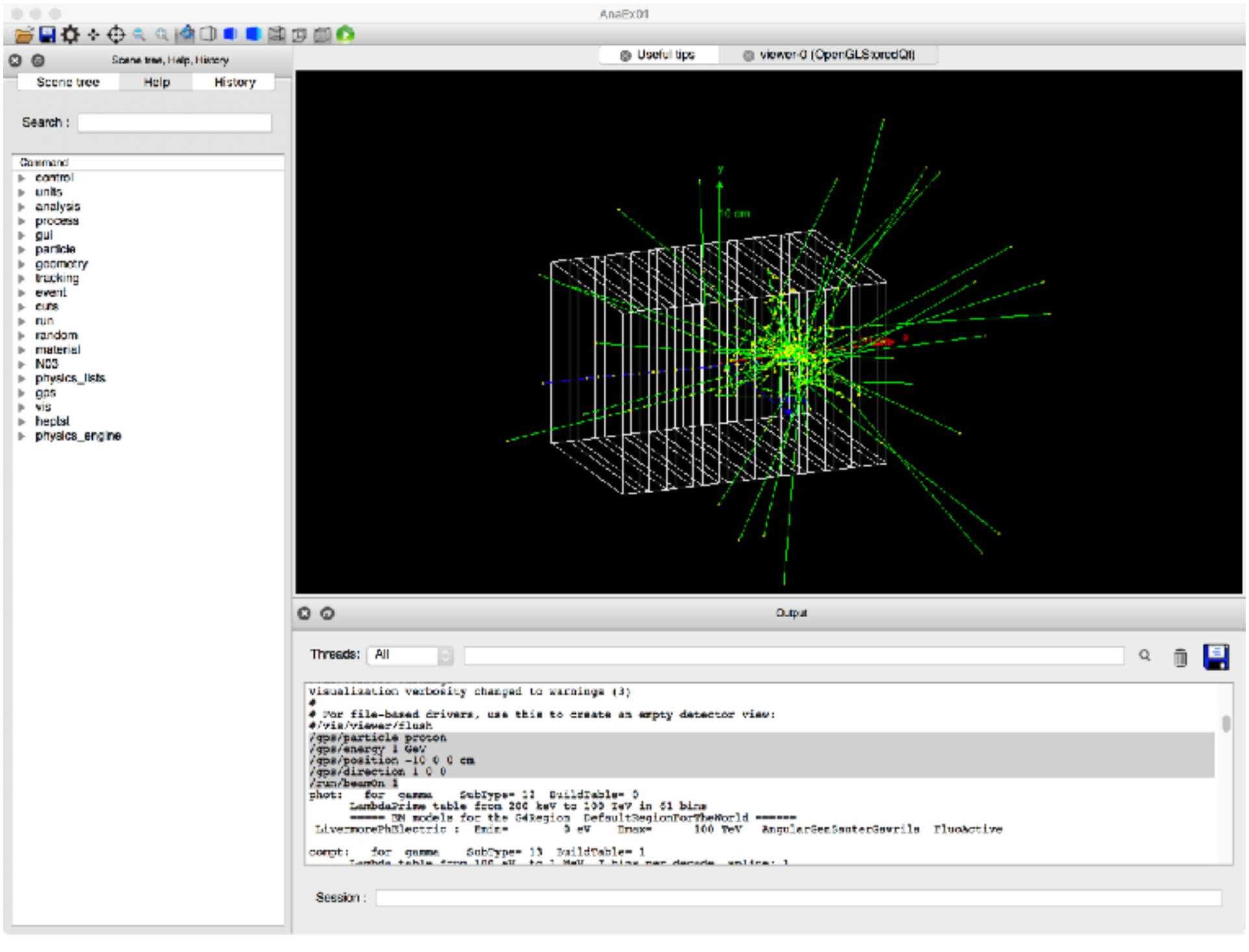
- just run the executable:
  ./AnaEx01



Shot a proton on the detector

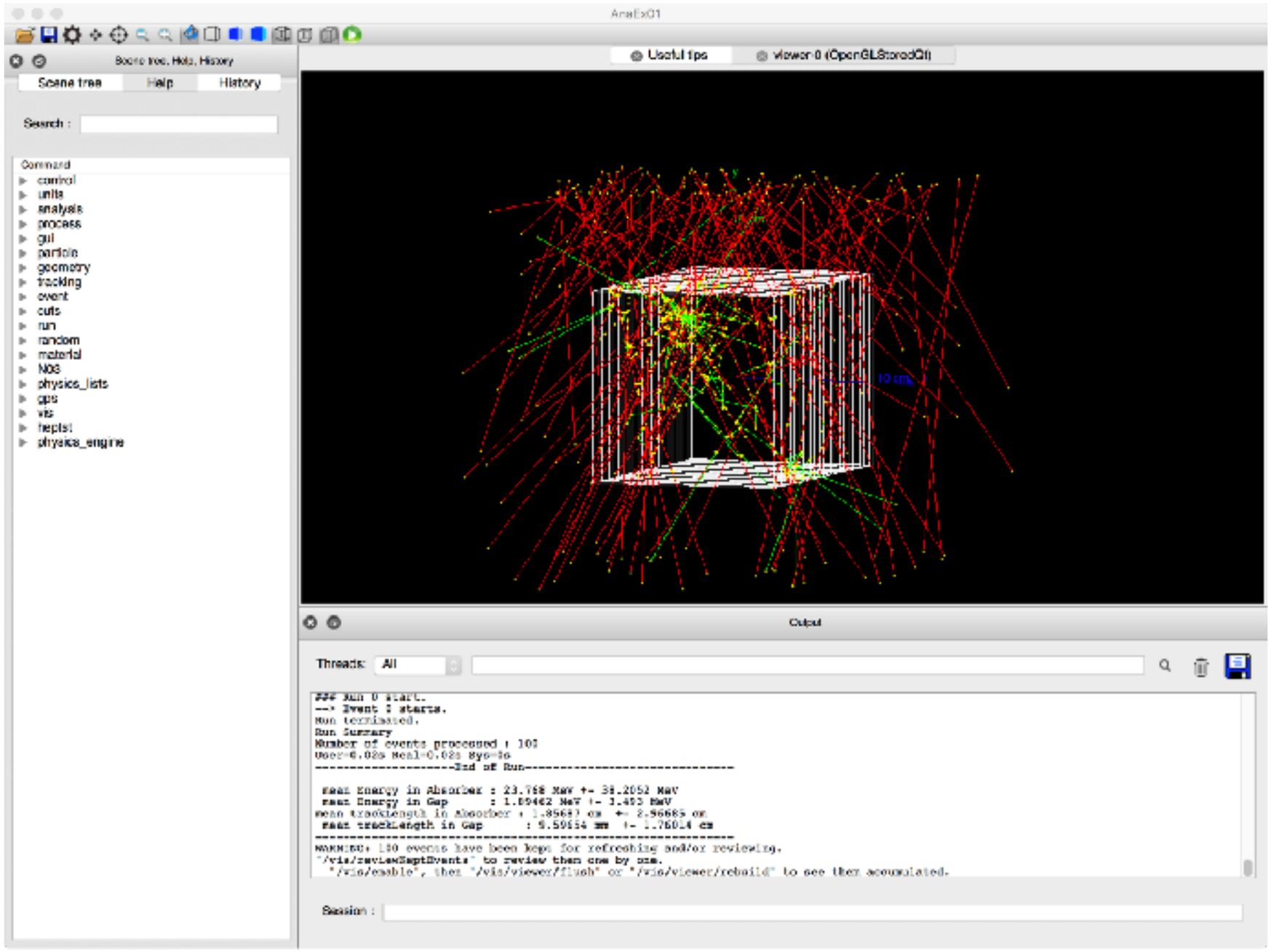
- /gps/particle proton
- /gps/energy 1 GeV
- /gps/position -10 0 0 cm
- /gps/direction 1 0 0
- /run/beamOn 1

Shot another one…



Simulate cosmic muons

- /control/execute cosmicMuons.mac



Lets see how Geant4 track a photon

- have a look of the script gamma.mac:
  emacs gamma.mac &

- what is it simulating?

- run it:
  ./AnaEx01 gamma.mac

Let’s run a simulation with protons!

- copy the gamma.mac script:
  cp gamma.mac proton.mac

- edit the new script:
  emacs proton.mac &

- decrease verbosity:
  /tracking/verbose 0
  /gps/verbose 0

- change the primary and its energy:
  /gps/particle proton
  /gps/energy 300 MeV

- simulate 1000 events:
  /run/beamOn 1000

- run it:
  ./AnaEx01 proton.mac

Check the output

- open the root file:
  root -l AnaEx01.root

- open a TBrowser:
  root [1] TBrowser tb

- plot the energy deposited in the lAr gaps: