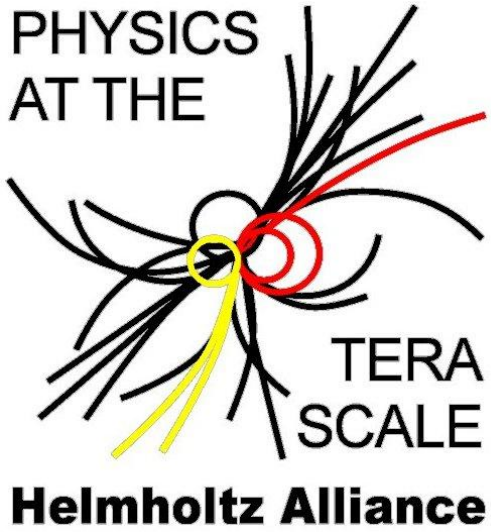

ROOT Tutorial

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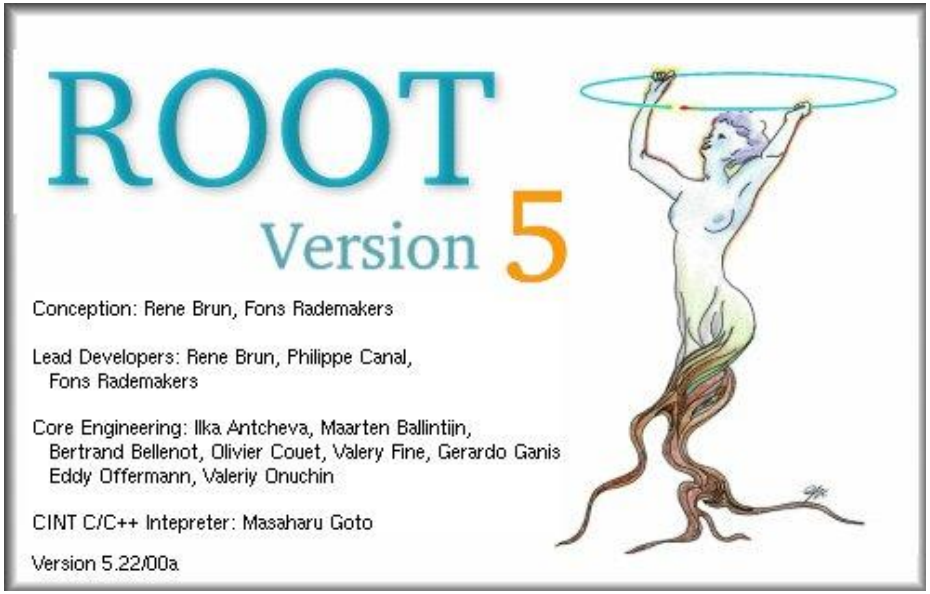
Universität Göttingen

Introductory School to Terascale Physics 2010

ROOT

- Framework for data analysis in Particle Physics
- Based on C++

Tutorial: 7 exercises



Getting started

- Definition of type double variable

  root[0] Double_t x
- Some functions

  π: root[1] TMath::Pi( ) sin: root[2] TMath::Sin( )
- Definition of Lorentz vector

  root[3] TLorentzVector x1

  (with contents x1=(px,py,pz,E))
- Filling the vector

  root[4] x1.SetPxPyPzE(1,2,3,4)
- Function for invariant mass

  root[5] x1.M( )

Histogram

- Definition of a histogram

  root[0] TH1D histo(“name“, “title“ ,binsize, xlow, xup)

- Filling

  root[1] histo.Fill(1.0)

- Drawing

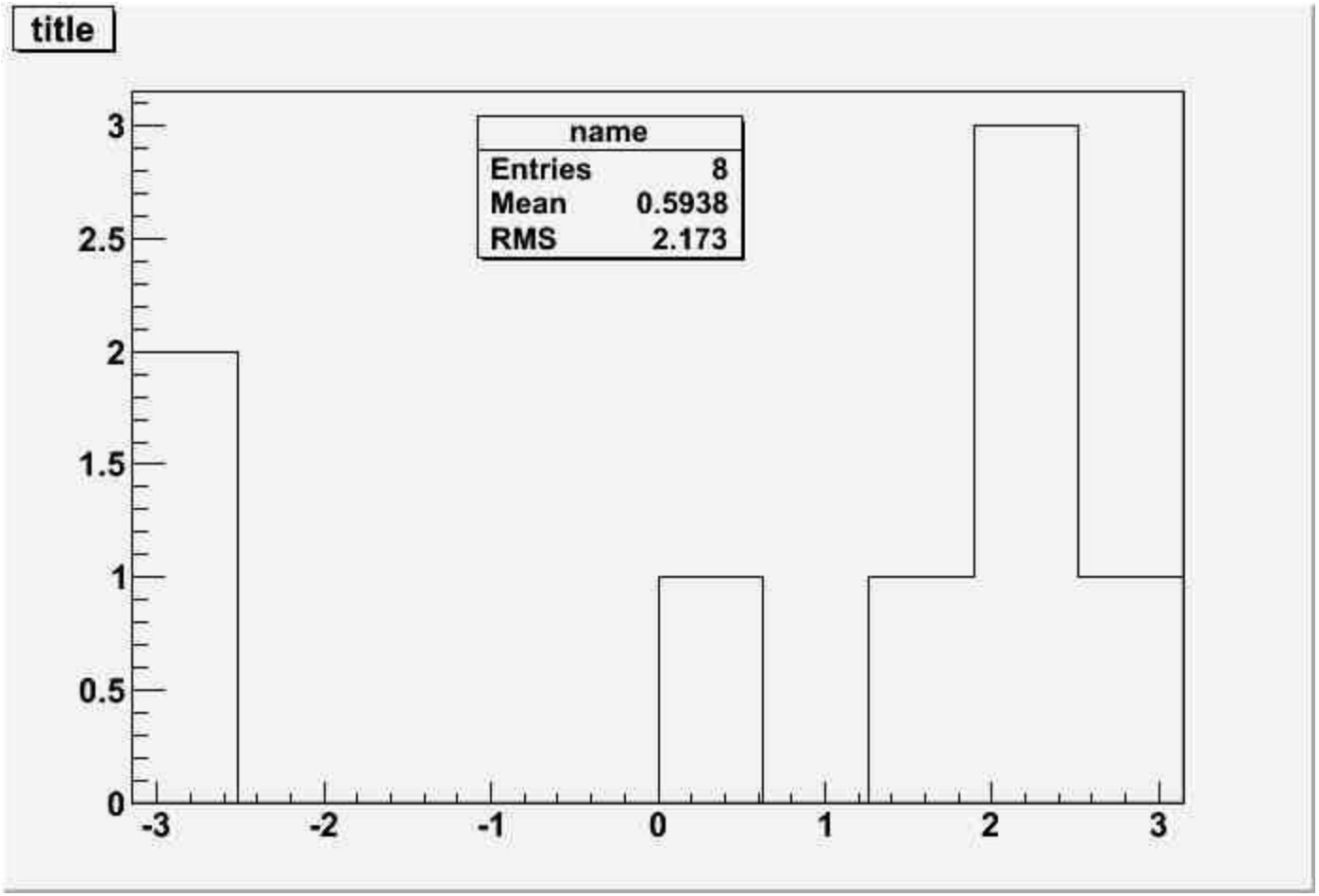
  root[2] histo.Draw( )

- Useful functions

  root[3] histo.GetMean( )

  root[4] histo.GetMaximumBin( )

  root[5] histo.Integral( )


title
name
Entries 8
Mean 0.5938
RMS 2.173
3
2.5
2
1.5
1
0.5
0
-3
-2
-1
0
1
2
3

Functions

- Definition of an one dimensional function

  root[0] TF1 f("name", "formula e.g. sin(x)/x+[0]",
  xmin, xmax)

- Parameter

  root[1] f.SetParameter(0,5)

- Useful functions

  root[2] f.Eval(5)

  root[3] f.Integral(0,3)

  root[4] f.SetNpx(1000)

- Drawing

  root[5] f.Draw( )

Graphs and fitting functions

- Definition of an one dimensional graph with errors

  root[0] TGraphErrors graph(numberofpoints)
- Filling

  root[1] graph.SetPoint(0, x, y)

  root[2] graph.SetPointError(0, xerr, yerr)
- Drawing

  root[3] graph.Draw("APE")
- Fitting

  root[4] TF1 f("name", "formula")

  root[5] graph.Fit("f")

Files and the GUI

- Open Browser

  root[0] TBrowser b

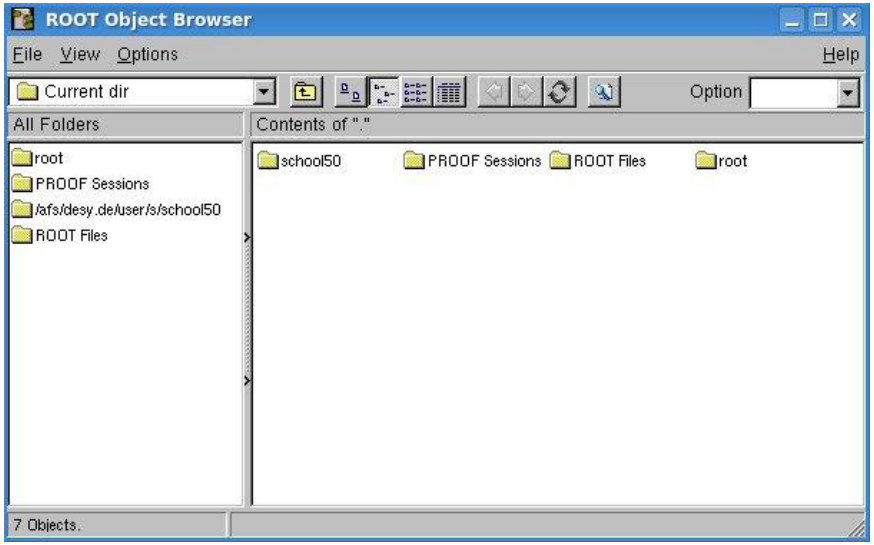
- Fitting of histogram

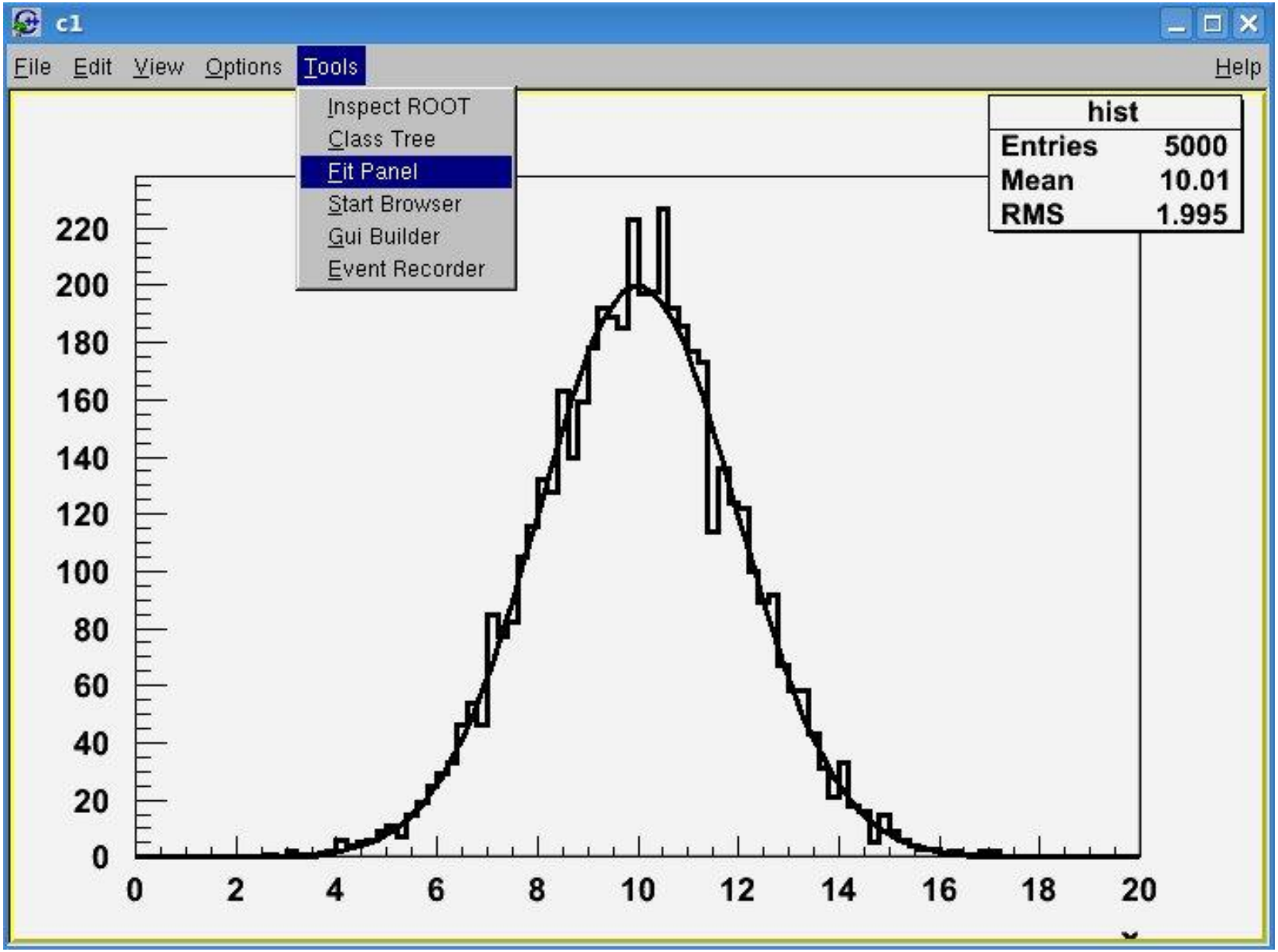
  with “Tools“ -> “Fit Panel“ -> “gaus“

- Saving the histogram

  root[1] TFile myfile(“myhist.root“, “RECREATE“)

  root[2] hist->Write( )

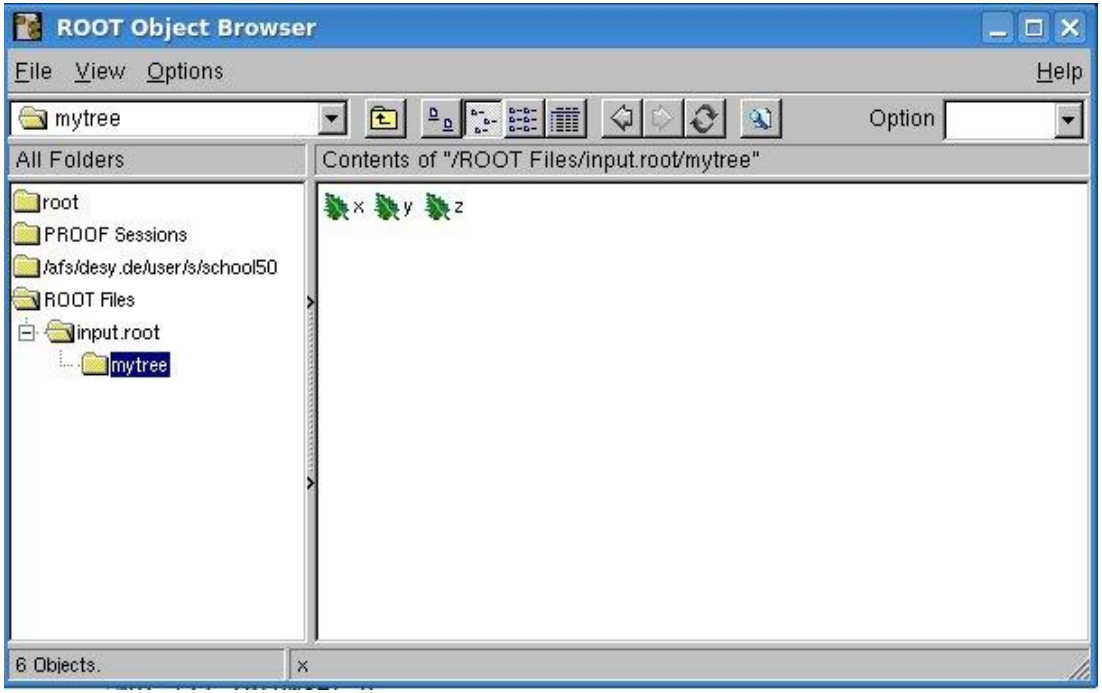



c1
File Edit View Options Tools Help
Inspect ROOT
Class Tree
Fit Panel
Start Browser
Gui Builder
Event Recorder
hist
Entries 5000
Mean 10.01
RMS 1.995
220
200
180
160
140
120
100
80
60
40
20
0
0 2 4 6 8 10 12 14 16 18 20

Trees

- Drawing a tree

```
root[0] mytree.Draw("x")
root[1] mytree.Draw("x:y")
root[2] mytree.Draw("x:z", "z>0")
```

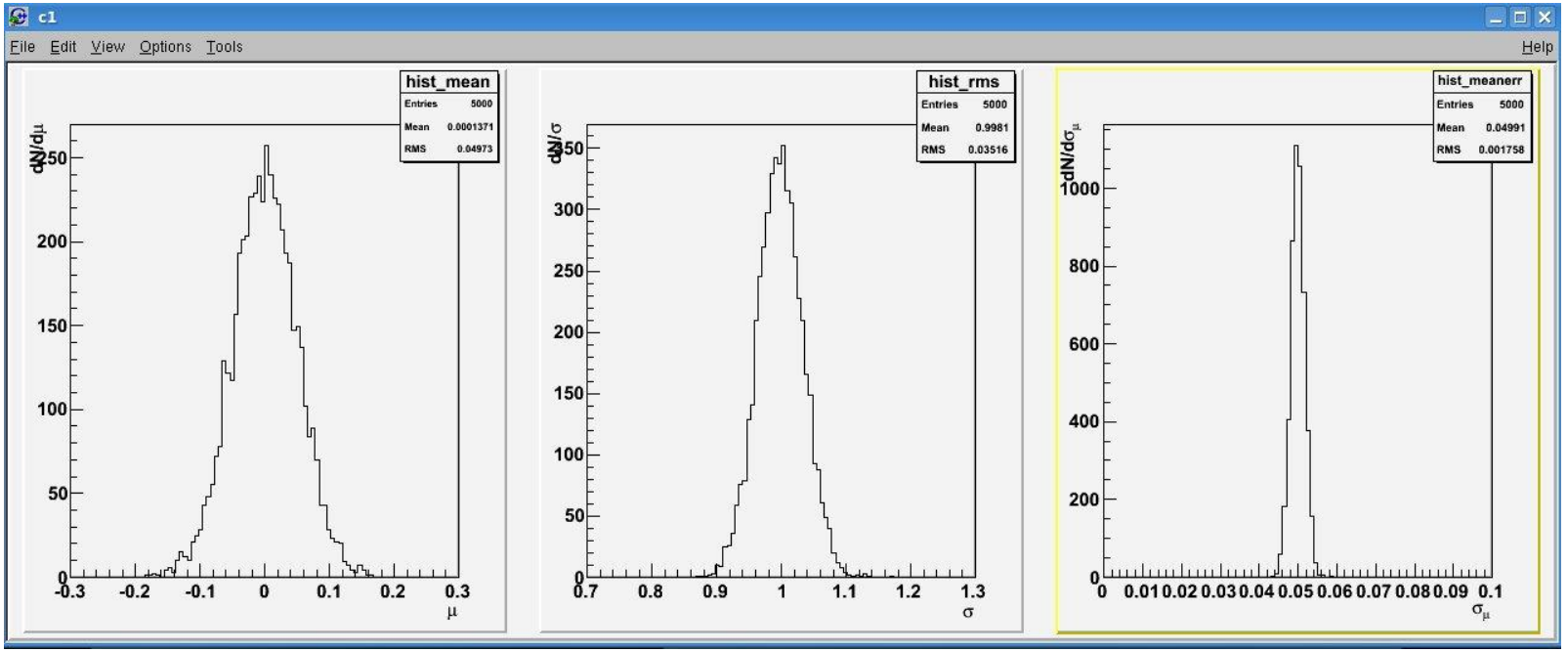


A simple script

- Loading a script

  root[0] .L script.c

  root[1] .x script.c



Usefull links

- http://root.cern.ch
- http://physik2.uni-goettingen.de/~kkroeni/tutorial_ROOT/

Summary

- Short survey of the main functions of ROOT
- Good solutions
- Easy to understand for beginners
- Too easy for persons with advanced skills