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## Lesson 0 install root and software on your compute

*"If you get the THU's computer cluster account, use following commands to get into."*

```
$ ssh -XY -p 48571 -o ServerAliveInterval=5 yourname@hepthu.com
```

*You can also run code on your pc if you have installed root, it's up to you. "*

[homebrew](#) Click this link to go to the Homebrew page, follow the instructions to install Homebrew on your Mac. Homebrew is a software package manager that allows you to download many applications on your Mac! After finishing the installation, paste the following command in a macOS terminal to install CERN ROOT software: `$ brew install root`. This way, you can also install applications like `firefox` which you can't find in the App Store.

Additionally, `$` indicates a shell command, so drop the `$` sign when you copy the command.

## Lesson 1 base commands for Linux

Some simple commands you can have a try!

```
1 | pwd    #print work directory
2 | cd /path/to/directory #change directory
3 | cd ..  #back to parent directory
4 | ls     #list directory contents
5 | mkdir test #make a directory
6 | touch test.txt #creat a new txt file
7 | cp test.txt copy.txt #copy and rename a file
8 | mv copy.txt copy1.txt #move and rename a file
9 | rm copy.txt #remove
10 | rm -r test  #delete a directory
11 | vi filename    #open or make a file with vim editor
```

Vim editor

```
1 | i      #insert, edit mode
2 | Esc    #exit edit mode
3 | :wq    #save and exit
4 | :q     #exit, will mention you if you have modified the file
5 | :q!    #exit !without! save
```

you will use the next commands from time to time

vi somefile -> press i into edit mode -> do something -> esc exit edit mode -> :wq

## Lesson 2 root 基础练习

进入root环境

```
$ root
```

```
% root

-----
| Welcome to ROOT 6.32.06                               https://root.cern |
| (c) 1995–2024, The ROOT Team; conception: R. Brun, F. Rademakers |
| Built for macosxarm64 on Sep 21 2024, 18:21:53 |
| From tags/6-32-06@6-32-06 |
| With Apple clang version 15.0.0 (clang-1500.1.0.2.5) |
| Try '.help'/'.'?', '.demo', '.license', '.credits', '.quit'/'.'q' |
|-----|

root [0] █
```

```
root [0] .q 退出root
```

root能输入一句解释一句

```
[root [0] 1+1
(int) 2
```

也可以边解释边执行或者编译后执行一个程序文件，用 `root yourprogram.C`

例如：可以在root中输入下面的程序用来创建一个空白的直方图

```
TH1F* graph=new TH1F("name","title",200,2.97,3.03);
graph->Draw();
```

但一个空白的直方图是很无趣的，你还需要用 `Fill` 来填入数据

```
% root

-----
| Welcome to ROOT 6.32.06                               https://root.cern |
| (c) 1995–2024, The ROOT Team; conception: R. Brun, F. Rademakers |
| Built for macosxarm64 on Sep 21 2024, 18:21:53 |
| From tags/6-32-06@6-32-06 |
| With Apple clang version 15.0.0 (clang-1500.1.0.2.5) |
| Try '.help'/'.'?', '.demo', '.license', '.credits', '.quit'/'.'q' |
|-----|

[root [0] TH1F* graph=new TH1F("name","title",200,2.97,3.03);
[root [1] graph->Draw();
Info in <TCanvas::MakeDefCanvas>:  created default TCanvas with name c1
[root [2] graph->Fill(2.99);
[root [3] graph->Draw();
[root [4] █
```

此外我们还能直接创建一个程序文件，以放入更长的程序

Get start!

```
$ vi test.C
```

```
//push i to enter the insert mode//
```

```

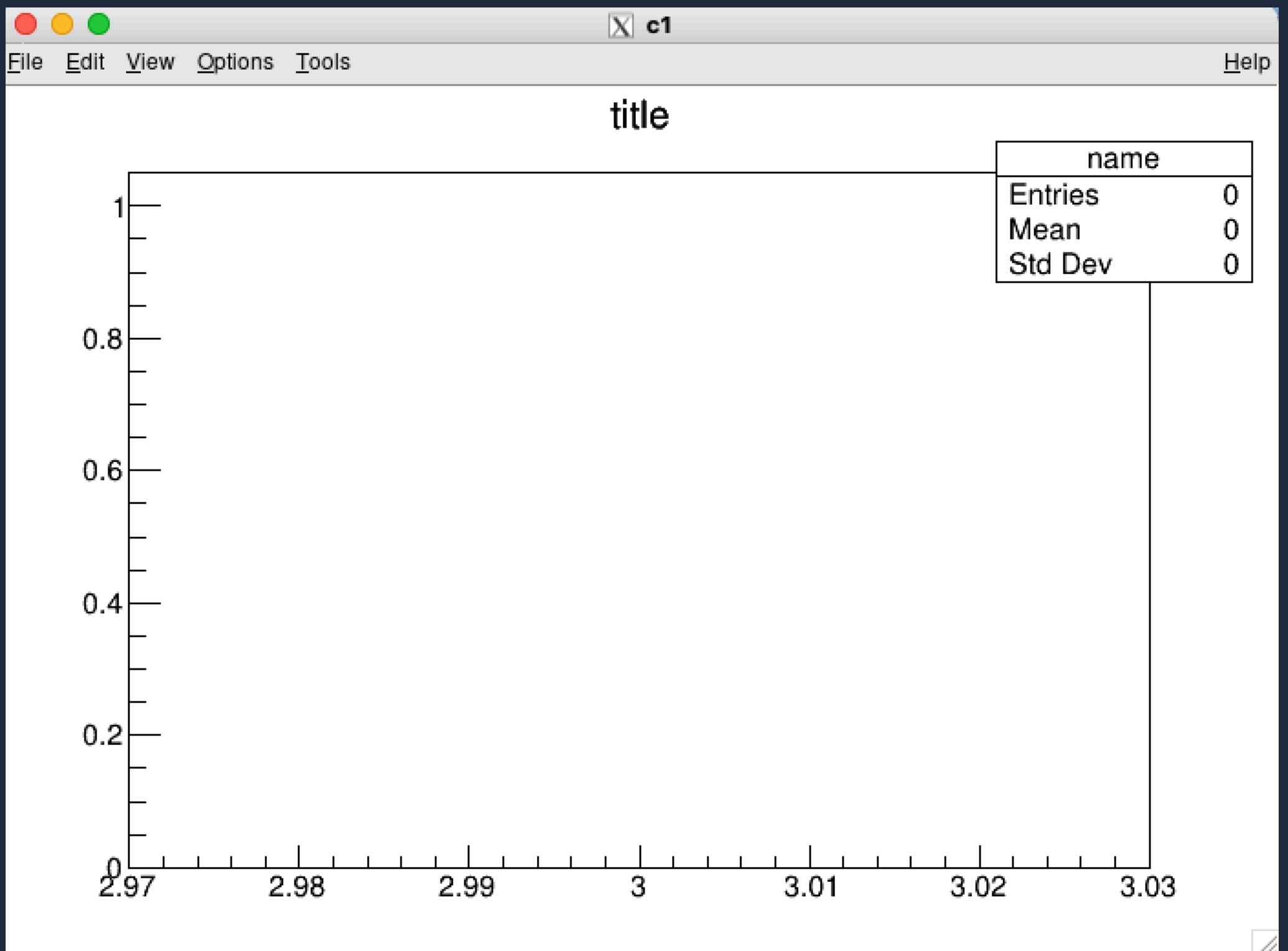
1 void test() //be sure it is similar with your file name
2
3 {
4
5     TH1F* graph=new TH1F("name","title",200,2.97,3.03);
6     //TH1F* graph name=new TH1F("name","title",bins, low, high)
7
8     graph->Draw(); //draw your graph
9
10 }

```

//push **ESC** to end the insert mode//

**:wq** //save and exit

**\$ root test.C** //run your code

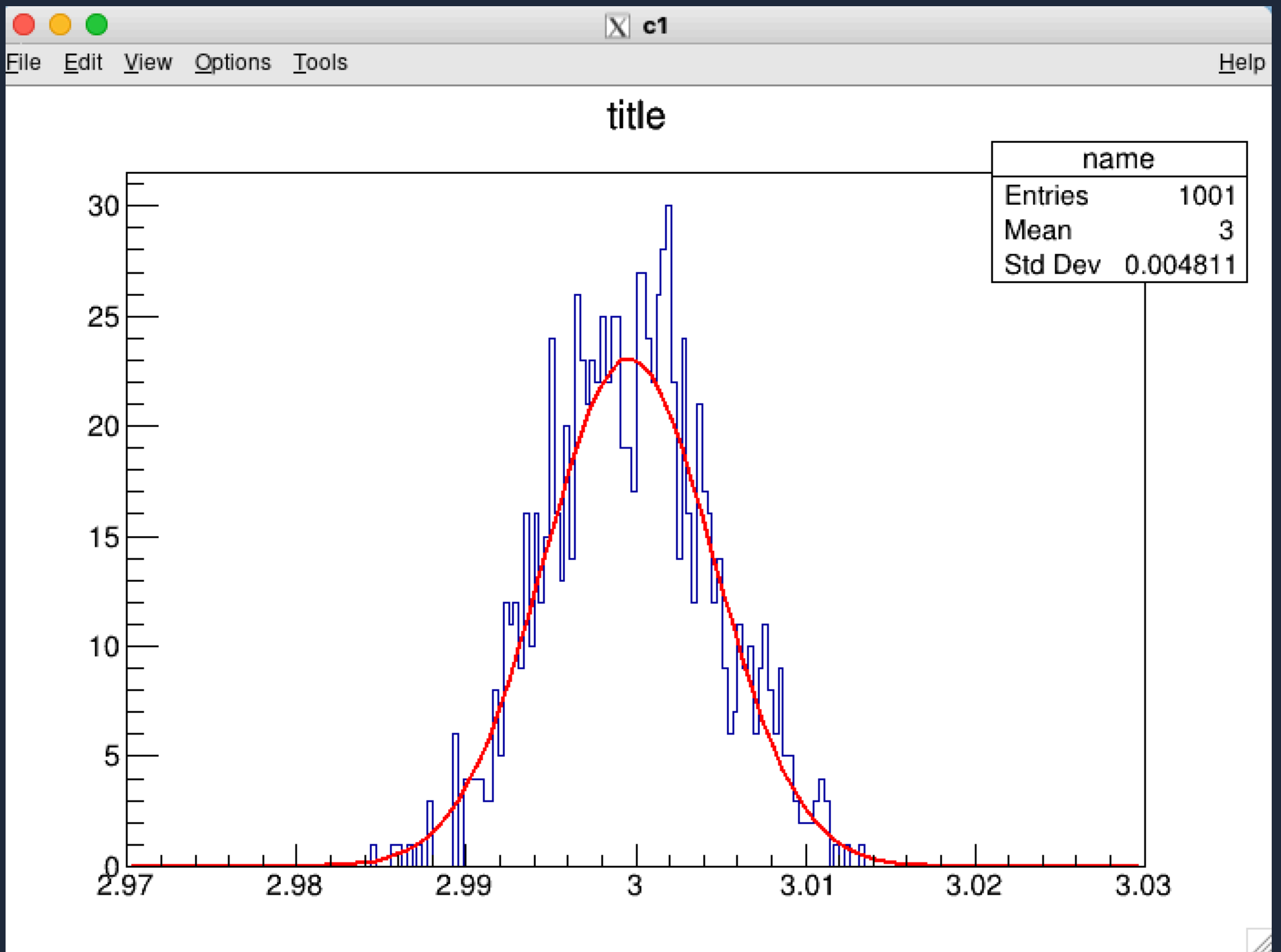


///successful!///

**.q** //exit the program

Let's add something into your graph!

```
1 void test(){
2
3 //TCanvas* c1=new TCanvas("c1","fitting with Gaussian function"); //if you don't set the
canvas's name, it will created default canvas with name c1
4
5 //c1->SetGrid(); // set grid
6
7 TH1F* graph=new TH1F("name","title",200,2.97,3.03);
8
9 graph->Fill(2.99); // you can add just one data in your graph using "Fill" command and try
to draw your graph.It's boring, right? We need more!
10
11 TRandom n; // define a random variable n
12
13 for (int i=0;i<1000;++i){
14
15 graph->Fill(n.Gaus(3,0.005)); //Determine variable n using Gaussian distribution and fill
to graph
16
17 }
18
19 graph->Draw();
20
21 graph->Fit("gaus"); //fit your graph with Gaussian function
22
23 }
```



Wow! now you can use root to do some simple fit works. but we usually use RooFit to do more complex job! So, ready for more programs!

以上只是一些基础的拟合，很多参数我们并不能自己去定义，没有灵活性，**RooFit** 中则提供了更加专业的拟合函数。

## Lesson 2 Gaussian fitting using RooFit

```

1 #include "RooAbsReal.h"
2 #include "RooRealVar.h"
3 #include "RooGaussian.h"
4 #include "RooChebychev.h"
5 #include "RooAddPdf.h"
6 // #include "RooProdPdf.h"
7 #include "RooDataSet.h"
8 // #include "RooDataHist.h"
9 // #include "RooFitResult.h"
10 #include "RooPlot.h"
11 // #include "RooArgList.h"
12 // #include "RooArgSet.h"
13 // #include "RooRandom.h"
14 // #include "RooPrintable.h"
15 using namespace RooFit;
```

```

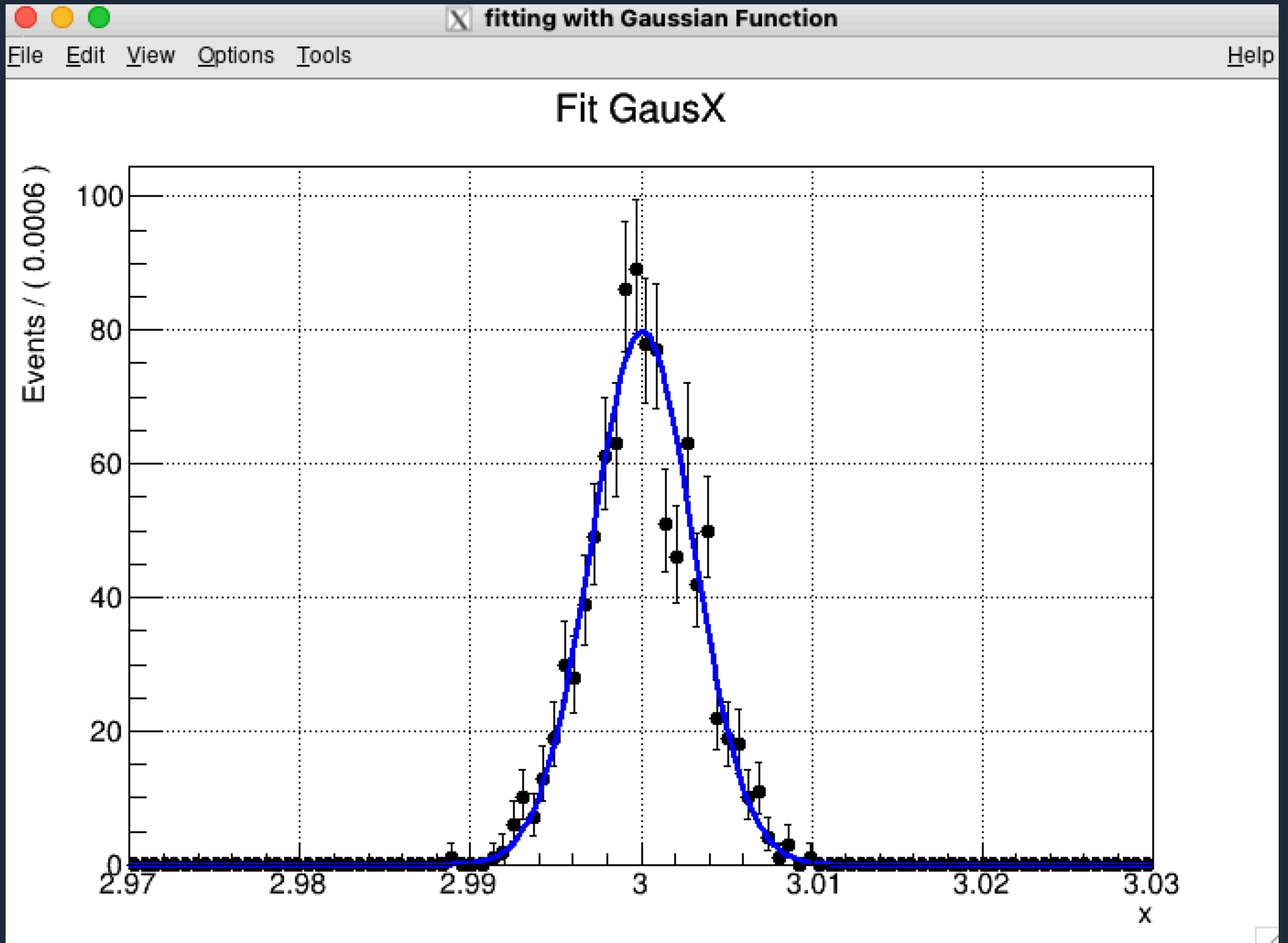
16 void test() {
17     RooRealVar x("x", "x", 2.97, 3.03);
18     // Declares a real-valued variable 'x' with a range from 2.97 to 3.03.
19
20     RooRealVar mean("mean", "mean", 3.0, 2.8, 3.2);
21     // Declares a real-valued variable 'mean' with an initial value of 3.0 and a range from
22     2.8 to 3.2.
23
24     RooRealVar sigma("sigma", "sigma", 0.003, 0.002, 0.003);
25     // Declares a real-valued variable 'sigma' with an initial value of 0.003 and a range
26     from 0.002 to 0.003.
27
28     RooAbsPdf* gaus = new RooGaussian("gaus", "gaus", x, mean, sigma);
29     // Creates a Gaussian probability density function (PDF) named 'gaus' with 'x' as the
30     observable, 'mean' as the mean, and 'sigma' as the standard deviation.
31
32     RooRealVar n("n", "n", 0, 0, 50000);
33     // Declares a real-valued variable 'n' with an initial value of 0 and a range from 0 to
34     50000.
35
36     RooExtendPdf* exp = new RooExtendPdf("exp", "exp", *gaus, n);
37     // Creates an extended PDF named 'exp' that combines the Gaussian PDF 'gaus' with the
38     variable 'n'.
39
40     RooAddPdf total("total", "total", RooArgList(*exp), RooArgList(n));
41     // Creates a composite PDF named 'total' that consists of the extended PDF 'exp' and
42     the variable 'n'.
43
44     RooDataSet* data;
45     // Declares a pointer to a RooDataSet object named 'data'.
46
47     data = gaus->generate(RooArgSet(x), 1000);
48     // Generates a dataset 'data' with 1000 events based on the Gaussian PDF 'gaus' and the
49     observable 'x'.
50
51     RooFitResult* result = total.fitTo(*data, Save());
52     // Fits the composite PDF 'total' to the dataset 'data' and saves the fit result in
53     'result'.
54
55     TCanvas* c1 = new TCanvas("c1", "fitting with Gaussian function");
56     // Creates a new canvas named 'c1' with the title "fitting with Gaussian function" for
57     plotting.
58
59     RooPlot* xframe = x.frame(RooFit::Title("Fit GausX"));
60     // Creates a frame for the observable 'x' with the title "Fit GausX".
61
62     data->plotOn(xframe);
63     // Plots the dataset 'data' on the frame 'xframe'.
64
65 }

```

```

56     total.plotOn(xframe);
57     // Plots the composite PDF 'total' on the frame 'xframe'.
58
59     xframe->Draw();
60     // Draws the frame 'xframe' on the canvas.
61 }

```



```

1 void test(){
2 using namespace RooFit;
3 //build gaussian and shev pdf
4 RooRealVar x("x","x",2.97,3.03);
5 RooRealVar mean("mean","mean",3.0,2.8,3.2);
6 RooRealVar sigma("sigma","sigma",0.005,0.003,0.007);
7 RooRealVar a0("a0","a0",0.005,0.004,0.006);
8 RooAbsPdf* gaus=new RooGaussian("gaus","gaus",x,mean,sigma);
9 RooAbsPdf* shev=new RooChebychev("shev","shev",x,a0);
10 RooRealVar n1("n1","n1",0,0,50000);
11 RooRealVar n2("n2","n2",0,0,50000);
12 RooExtendPdf* signal1=new RooExtendPdf("sig1","sig1",*gaus,n1);
13 RooExtendPdf* signal2=new RooExtendPdf("sig2","sig2",*shev,n2);

```

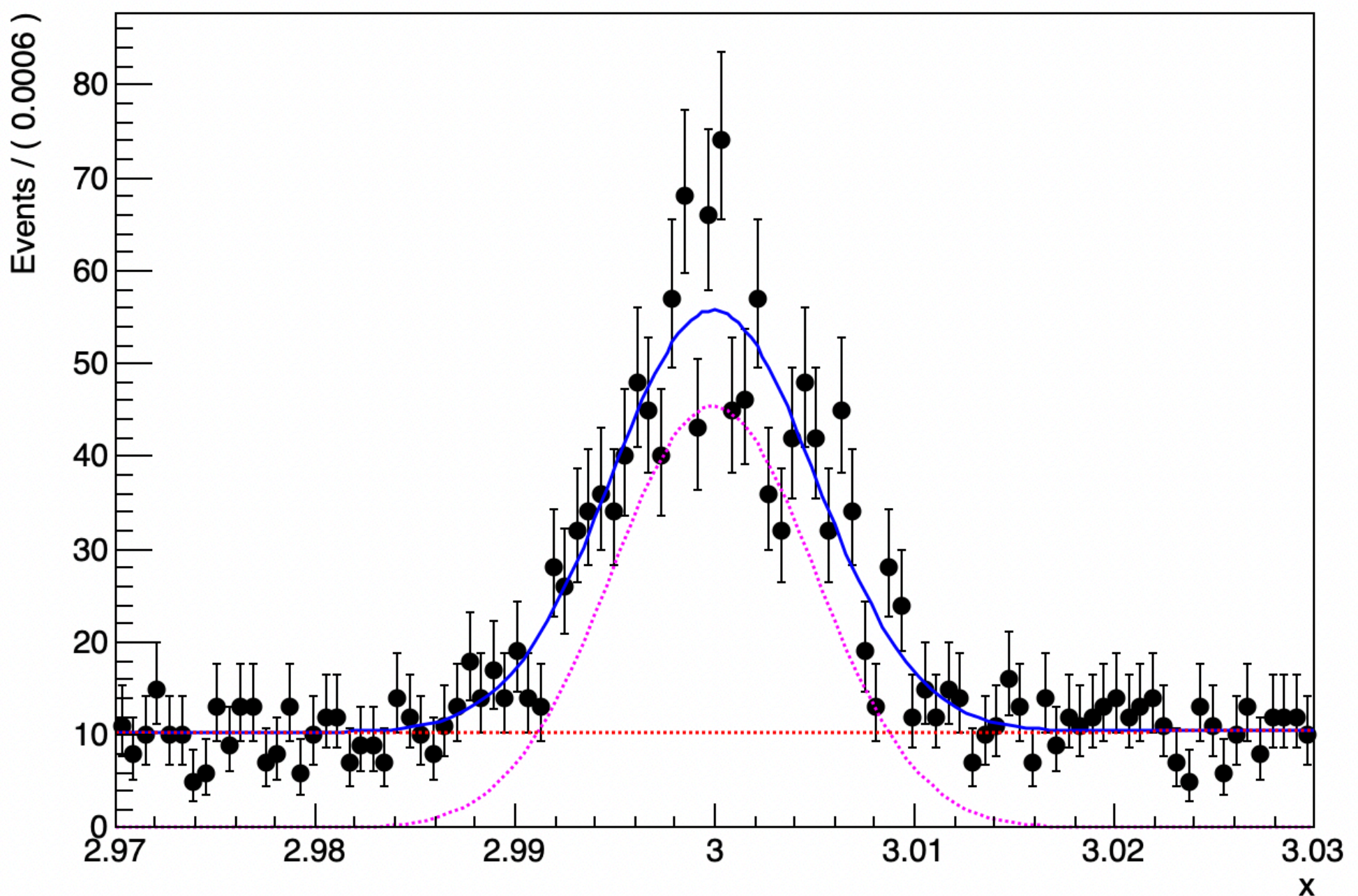


```

14 RooAddPdf
totalPdf("total","total",RooArgList(*signal1,*signal2),RooArgList(n1,n2)); //totalPdf(x)=sig
nal1(x)+signal2(x)
15
16 //generate data point
17 RooDataSet*data1;
18 RooDataSet*data2;
19 data1=gaus->generate(RooArgSet(x),1000);
20 data2=shev->generate(RooArgSet(x),1000);
21 data1->append(*data2);
22
23 //fit
24 RooFitResult*result= totalPdf.fitTo(*data1,Save());
25 RooPlot*xframe=x.frame();
26 data1->plotOn(xframe);
27 totalPdf.plotOn(xframe);
28 totalPdf.plotOn(xframe, Components(*signal1),LineStyle(kDashed),LineColor(6));
29 totalPdf.plotOn(xframe, Components("sig2"),LineStyle(kDashed),LineColor(2)); //two different
ways set the Components name
30 xframe->Draw();
31 }

```

## A RooPlot of "x"





"以上是一维拟合，但很多时候我们会研究两个不同组分，这样就需要进行二维拟合。二维拟合就不单单是把两个PDF加和在一起了，而是需要乘积，可以理解为同时出现两个组分的概率。"

## Lesson 3 2D fitting

下面展示了两个二维拟合

```

1  #include <TH2.h>
2  #include <TStyle.h>
3  #include <TCanvas.h>
4  #include <iostream>
5  #include <fstream>
6  #include "TF1.h"
7  #include "TText.h"
8  #include "TLorentzVector.h"
9  #include "TVector3.h"
10 #include "TLorentzRotation.h"
11 #include "RooNumIntConfig.h" //no matter what, copy directly!
12
13 using namespace RooFit;
14 void test(){
15 //build gaussian pdf in two dimension
16 RooRealVar x("x","x",2.7,4);
17
18 RooRealVar meanx("meanx","meanx",3.0967,2.9,3.2);
19 RooRealVar sigmax("sigmax","sigmax",0.03,0.01,0.06);
20 RooAbsPdf* gausx=new RooGaussian("gausx","gausx",x,meanx,sigmax);
21
22 RooRealVar ax0("ax0","ax0",0.005,0.004,0.006);
23 RooRealVar ax1("ax1","ax1",0.01,0.01,0.02);
24 RooAbsPdf* shevx=new RooChebychev("shevx","shevx",x,RooArgSet(ax0,ax1));
25
26 RooRealVar y("y","y",2.7,4);
27
28 RooRealVar meany("meany","meany",3.0967,2.9,3.2);
29 RooRealVar sigmay("sigmay","sigmay",0.03,0.01,0.06);
30 RooAbsPdf* gausy=new RooGaussian("gausy","gausy",y,meany,sigmay);
31
32 RooRealVar ay0("ay0","ay0",0.005,0.004,0.006);
33 RooRealVar ay1("ay1","ay1",0.01,0.01,0.02);
34 RooAbsPdf* shevy=new RooChebychev("shevy","shevy",y,RooArgSet(ay0,ay1));
35
36 //constructor with 2 pdf
37 RooProdPdf* sigxsigy=new RooProdPdf("sigxsigy","sigxsigy",*gausx,*gausy);
38 RooProdPdf* bkgxsigy=new RooProdPdf("bkgxsigy","bkgxsigy",*shevx,*gausy);
39 RooProdPdf* sigxbkgy=new RooProdPdf("sigxbkgy","sigxbkgy",*gausx,*shevy);
40 RooProdPdf* bkgxbkgy=new RooProdPdf("bkgxbkgy","bkgxbkgy",*shevx,*shevy);

```

```

41
42 RooRealVar n_sigxsigy("n_sigxsigy","n_sigxsigy",0,0,50000);
43 RooRealVar n_bkgxsigy("n_bkgxsigy","n_bkgxsigy",0,0,50000);
44 RooRealVar n_sigxbkgy("n_sigxbkgy","n_sigxbkgy",0,0,50000);
45 RooRealVar n_bkgxbkgy("n_bkgxbkgy","n_bkgxbkgy",0,0,50000);
46
47
48 RooExtendPdf*signal1=new RooExtendPdf("signal1","signal1",*sigxsigy,n_sigxsigy);
49 RooExtendPdf*signal2=new RooExtendPdf("signal2","signal2",*sigxbkgy,n_sigxbkgy);
50 RooExtendPdf*signal3=new RooExtendPdf("signal3","signal3",*bkgxsigy,n_bkgxsigy);
51 RooExtendPdf*signal4=new RooExtendPdf("signal4","signal4",*bkgxbkgy,n_bkgxbkgy);
52
53 RooAddPdf
totalPdf("total","total",RooArgList(*signal1,*signal2,*signal3,*signal4),RooArgList(n_sigx
sigy,n_sigxbkgy,n_bkgxsigy,n_bkgxbkgy));
54
55 //generate data point
56
57 RooDataSet*data1;
58 RooDataSet*data2;
59 RooDataSet*data3;
60 RooDataSet*data4;
61 data1=sigxsigy->generate(RooArgSet(x,y),1000);
62 data2=sigxbkgy->generate(RooArgSet(x,y),2000);
63 data3=bkgxsigy->generate(RooArgSet(x,y),2000);
64 data4=bkgxbkgy->generate(RooArgSet(x,y),4000);
65
66 data1->append(*data2);
67 data1->append(*data3);
68 data1->append(*data4);
69
70 //fit
71 RooFitResult*result= totalPdf.fitTo(*data1,Save());
72 //x dimension
73
74 //create two canvases, because you have to know two dimensions fitting.
75 TCanvas*c1 =new TCanvas("c1","Fitting X");
76 c1->cd();
77 RooPlot*xframe=x.frame(RooFit::Title("Fit GausX"));
78 data1->plotOn(xframe);
79 totalPdf.plotOn(xframe,Name("fullModel"));
80 totalPdf.plotOn(xframe,Components(*signal1),LineColor(2),LineStyle(1),Name("JpsiJpsi"));
81 totalPdf.plotOn(xframe,Components(*signal2),LineColor(6),LineStyle(1),Name("BkgJpsi"));
82 totalPdf.plotOn(xframe,Components(*signal3),LineColor(7),LineStyle(1),Name("JpsiBkg"));
83 totalPdf.plotOn(xframe,Components(*signal4),LineColor(8),LineStyle(1),Name("BkgBkg"));
84
85 TLegend leg(0.7, 0.7, 0.9, 0.9);
86 leg.AddEntry(xframe->findObject("fullModel"), "Full Model", "L");
87 leg.AddEntry(xframe->findObject("JpsiJpsi"), "J/#psi_{#mu1#mu2}J/#psi_{#mu3#mu4}", "L");

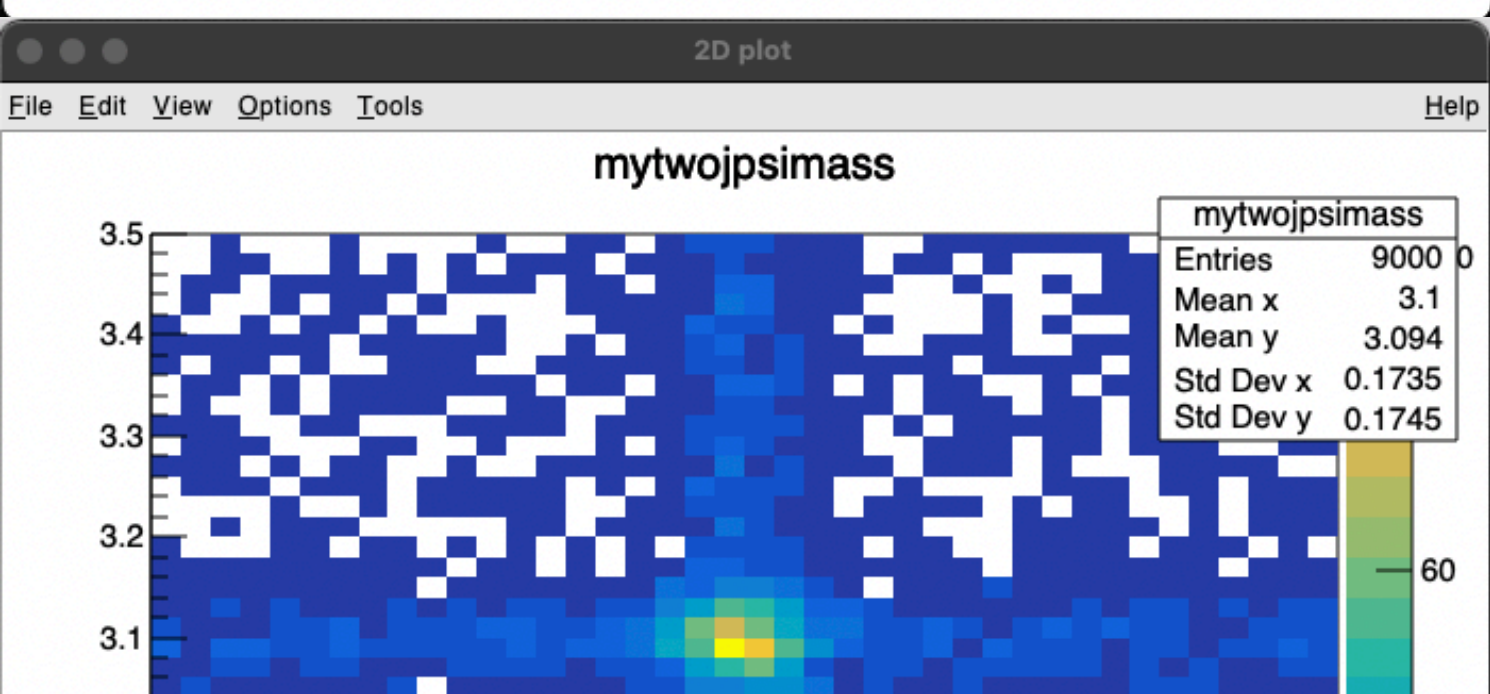
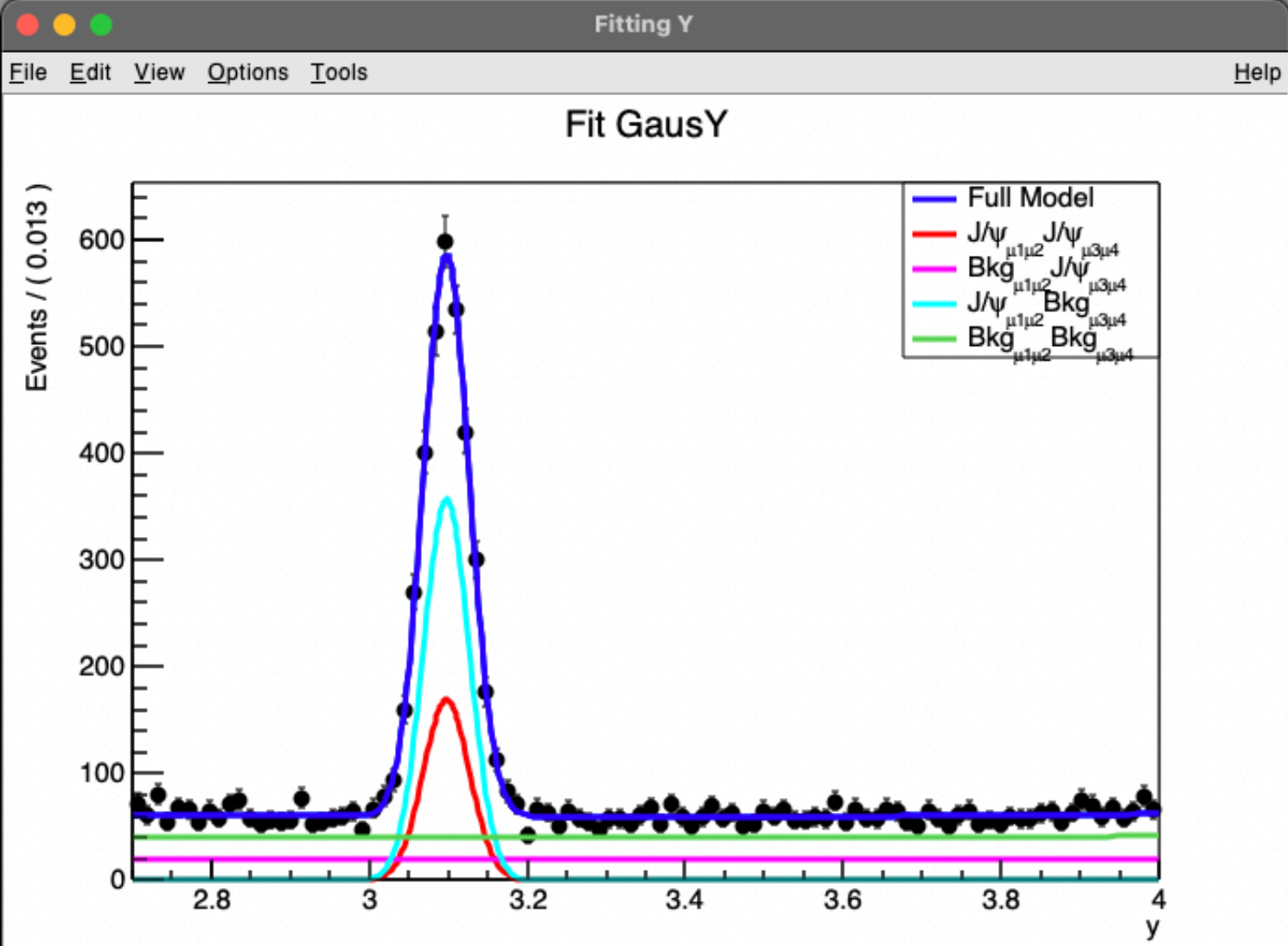
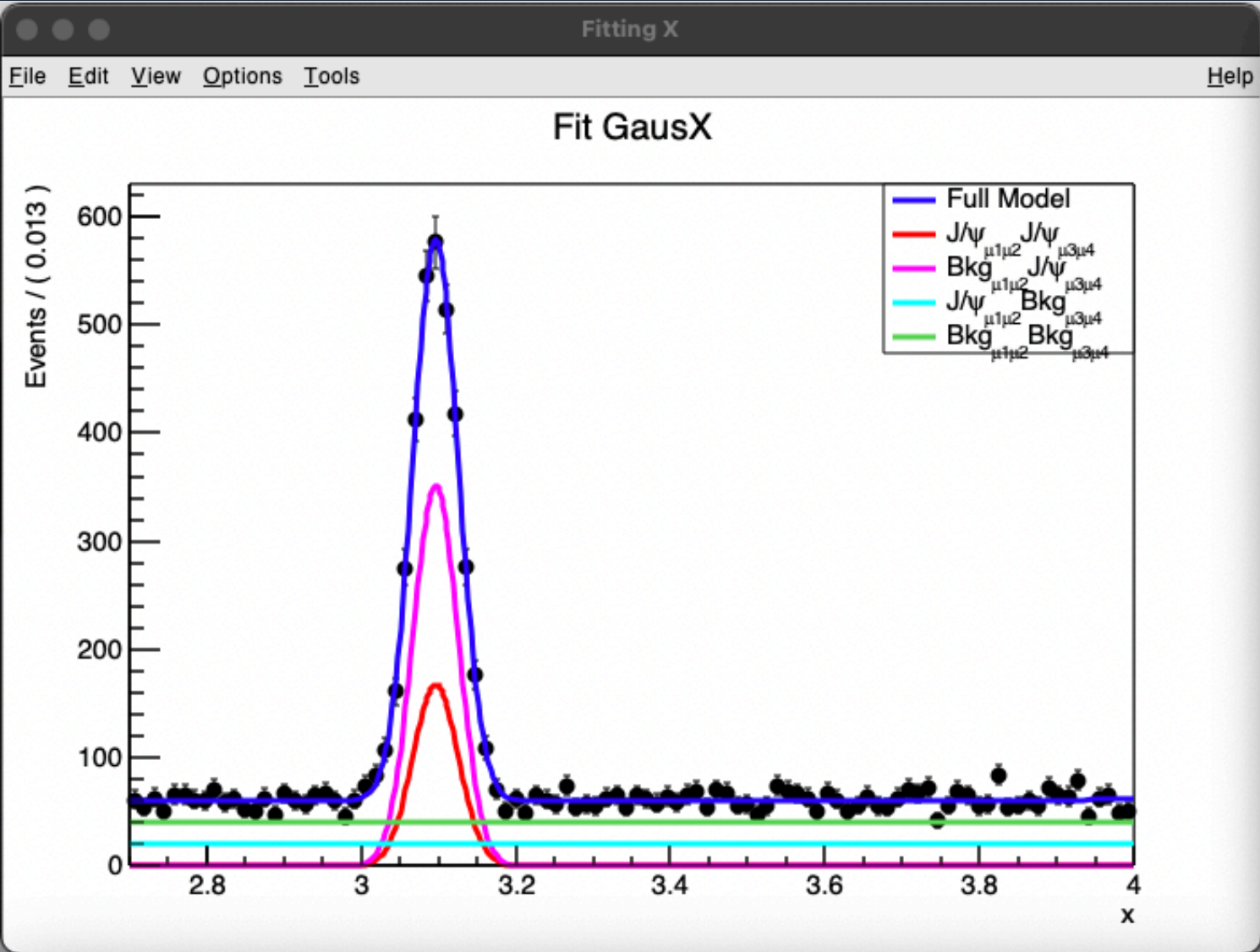
```

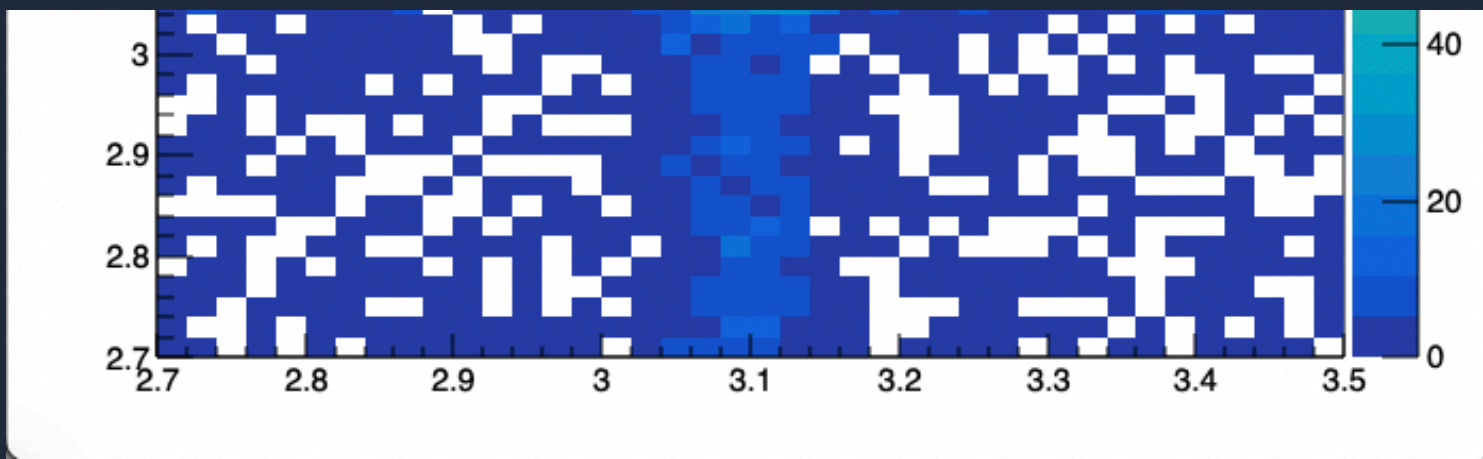
```

88 leg.AddEntry(xframe->findObject("BkgJpsi"), "Bkg_{#mu1#mu2}J/#psi_{#mu3#mu4}", "L");
89 leg.AddEntry(xframe->findObject("JpsiBkg"), "J/#psi_{#mu1#mu2}Bkg_{#mu3#mu4}", "L");
90 leg.AddEntry(xframe->findObject("BkgBkg"), "Bkg_{#mu1#mu2}Bkg_{#mu3#mu4}", "L");
91
92 xframe->Draw();
93 leg.DrawClone();
94
95 //y dimension
96 TCanvas*c2 =new TCanvas("c2","Fitting Y");
97 c2->cd();
98 RooPlot*yframe=y.frame(RooFit::Title("Fit GausY"));
99 data1->plotOn(yframe);
100 totalPdf.plotOn(yframe);
101 totalPdf.plotOn(yframe,Name("fullModel"));
102 totalPdf.plotOn(yframe,Components(*signal1),LineColor(2),LineStyle(1),Name("JpsiJpsi"));
103 totalPdf.plotOn(yframe,Components(*signal2),LineColor(6),LineStyle(1),Name("BkgJpsi"));
104 totalPdf.plotOn(yframe,Components(*signal3),LineColor(7),LineStyle(1),Name("JpsiBkg"));
105 totalPdf.plotOn(yframe,Components(*signal4),LineColor(8),LineStyle(1),Name("BkgBkg"));
106
107 TLegend leg2(0.7, 0.7, 0.9, 0.9);
108 leg2.AddEntry(yframe->findObject("fullModel"), "Full Model", "L");
109 leg2.AddEntry(yframe->findObject("JpsiJpsi"), "J/#psi_{#mu1#mu2}J/#psi_{#mu3#mu4}", "L");
110 leg2.AddEntry(yframe->findObject("BkgJpsi"), "Bkg_{#mu1#mu2}J/#psi_{#mu3#mu4}", "L");
111 leg2.AddEntry(yframe->findObject("JpsiBkg"), "J/#psi_{#mu1#mu2}Bkg_{#mu3#mu4}", "L");
112 leg2.AddEntry(yframe->findObject("BkgBkg"), "Bkg_{#mu1#mu2}Bkg_{#mu3#mu4}", "L");
113
114 yframe->Draw();
115 leg2.DrawClone();
116
117 TCanvas*c3 =new TCanvas("c3","2D plot");
118 c3->cd();
119 TH2F* mytwojpsimass = new TH2F("mytwojpsimass","mytwojpsimass",40,2.7,3.5,40,2.7,3.5);
120 data1->fillHistogram(mytwojpsimass,RooArgList(x,y));
121 mytwojpsimass->Draw("colz");
122
123 }

```







```

1  #include <TH2.h>
2  #include <TStyle.h>
3  #include <TCanvas.h>
4  #include <iostream>
5  #include <fstream>
6  #include "TF1.h"
7  #include "TText.h"
8  #include "TLorentzVector.h"
9  #include "TVector3.h"
10 #include "TLorentzRotation.h"
11 #include "RooNumIntConfig.h" //no matter what, copy directly!
12 using namespace RooFit;
13 void test(){
14 //build gaussian pdf in two dimension
15 RooRealVar x("x","x",2.7,4);
16 RooRealVar meanx1("meanx1","meanx1",3.0967,2.9,3.2);
17 RooRealVar sigmax1("sigmax1","sigmax1",0.03,0.01,0.06);
18 RooAbsPdf* gausx1=new RooGaussian("gaux1","gaux1",x,meanx1,sigmax1);
19
20 RooRealVar meanx2("meanx2","meanx2",3.686,3.5,3.8);
21 RooRealVar sigmax2("sigmax2","sigmax2",0.1,0.01,0.2);
22 RooAbsPdf* gausx2=new RooGaussian("gaux2","gaux2",x,meanx2,sigmax2);
23
24 RooRealVar y("y","y",2.7,4);
25
26 RooRealVar meany1("meany1","meany1",3.0967,2.9,3.2);
27 RooRealVar sigmay1("sigmay1","sigmay1",0.03,0.01,0.06);
28 RooAbsPdf* gausy1=new RooGaussian("gausy1","gausy1",y,meany1,sigmay1);
29
30 RooRealVar meany2("meany2","meany2",3.686,3.5,3.8);
31 RooRealVar sigmay2("sigmay2","sigmay2",0.1,0.01,0.2);
32 RooAbsPdf* gausy2=new RooGaussian("gausy2","gausy2",y,meany2,sigmay2);
33
34 //constructor with 2 pdf
35 RooProdPdf* gausx1y1=new RooProdPdf("gaux1y1","gaux1y1",*gaux1,*gausy1);
36 RooProdPdf* gausx1y2=new RooProdPdf("gaux1y2","gaux1y2",*gaux1,*gausy2);
37 RooProdPdf* gausx2y1=new RooProdPdf("gaux2y1","gaux2y1",*gaux2,*gausy1);
38
39 RooRealVar n_x1y1("n1","n1",0,0,50000);
40 RooRealVar n_x1y2("n2","n2",0,0,50000);

```

```

41 RooRealVar n_x2y1("n3","n3",0,0,50000);
42
43 RooAddPdf
totalPdf("total","total",RooArgList(*gausx1y1,*gausx1y2,*gausx2y1),RooArgList(n_x1y1,n_x1y
2,n_x2y1));
44
45 //generate data point
46
47 RooDataSet*data1;
48 RooDataSet*data2;
49 RooDataSet*data3;
50 data1=gausx1y1->generate(RooArgSet(x,y),1000);
51 data2=gausx1y2->generate(RooArgSet(x,y),1000);
52 data3=gausx2y1->generate(RooArgSet(x,y),1000);
53
54 data1->append(*data2);
55 data1->append(*data3);
56
57 //fit
58 RooFitResult*result= totalPdf.fitTo(*data1,Save());
59 //x dimension
60 //create two canvases, because you have to know two dimensions fitting.
61 TCanvas*c1 =new TCanvas("c1","Fitting X");
62 c1->cd();
63 RooPlot*xframe=x.frame(RooFit::Title("Fit GausX"));
64 data1->plotOn(xframe,Name("data1"));
65 totalPdf.plotOn(xframe,Name("fullModel"));
66 totalPdf.plotOn(xframe,Components(*gausx1y1),LineColor(2),LineStyle(1),Name("JpsiJpsi"));
67 totalPdf.plotOn(xframe,Components(*gausx1y2),LineColor(6),LineStyle(1),Name("JpsiPsi2S"));
68 totalPdf.plotOn(xframe,Components(*gausx2y1),LineColor(7),LineStyle(1),Name("Psi2SJpsi"));
69
70 TLegend* leg= new TLegend(0.7, 0.7, 0.9, 0.9);
71 leg->AddEntry(xframe->findObject("data1"), "Data", "pe");
72 leg->AddEntry(xframe->findObject("fullModel"), "Total Fit", "L");
73 leg->AddEntry(xframe->findObject("JpsiJpsi"), "J/#psi_{#mu1#mu2}J/#psi_{#mu3#mu4}", "L");
74 leg->AddEntry(xframe->findObject("JpsiPsi2S"), "J/#psi_{#mu1#mu2}#psi(2S)_{#mu3#mu4}",
"L");
75 leg->AddEntry(xframe->findObject("Psi2SJpsi"), "#psi(2S)_{#mu1#mu2}J/#psi_{#mu3#mu4}",
"L");
76
77 xframe->Draw();
78 leg->Draw();
79
80
81
82 //y dimension
83 TCanvas*c2 =new TCanvas("c2","Fitting Y");
84 c2->cd();
85 RooPlot*yframe=y.frame(RooFit::Title("Fit GausY"));

```



```

86 data1->plotOn(yframe,Name("data1"));
87 totalPdf.plotOn(yframe,Name("fullModel"));
88 totalPdf.plotOn(yframe,Components(*gausx1y1),LineColor(2),LineStyle(1),Name("JpsiJpsi"));
89 totalPdf.plotOn(yframe,Components(*gausx1y2),LineColor(6),LineStyle(1),Name("JpsiPsi2S"));
90 totalPdf.plotOn(yframe,Components(*gausx2y1),LineColor(7),LineStyle(1),Name("Psi2SJpsi"));
91
92
93 TLegend leg2(0.7, 0.7, 0.9, 0.9);
94 leg2.AddEntry(yframe->findObject("data1"), "Data", "pe");
95 leg2.AddEntry(yframe->findObject("fullModel"), "Total Fit", "L");
96 leg2.AddEntry(yframe->findObject("JpsiJpsi"), "J/#psi_{#mu1#mu2}J/#psi_{#mu3#mu4}", "L");
97 leg2.AddEntry(yframe->findObject("JpsiPsi2S"), "J/#psi_{#mu1#mu2}psi(2S)_{#mu3#mu4}",
98 "L");
99
100 yframe->Draw();
101 leg2.DrawClone();
102
103 TCanvas*c3 =new TCanvas("c3","2D plot");
104 c3->cd();
105 TH2F* mytwojpsimass = new TH2F("mytwojpsimass","mytwojpsimass",40,2.7,4,40,2.7,4);
106 data1->fillHistogram(mytwojpsimass,RooArgList(x,y));
107 mytwojpsimass->Draw("colz");

```

