

Index toy=82

Root tag v6-12-06, 9 February 2018

Roofit 3.60

(checked that problems remain with latest root version : 6.18.00)

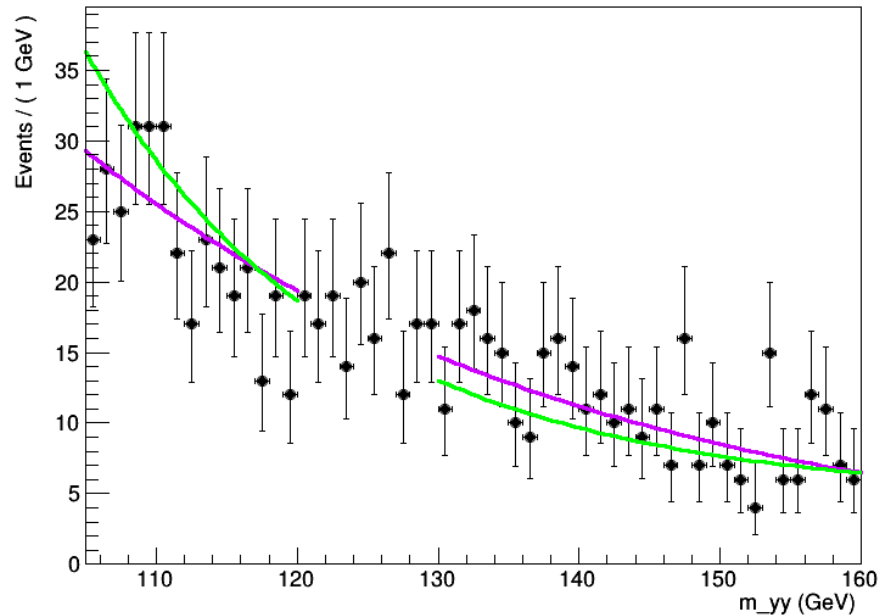
violet: nominal model: exp
green: higher model: exp pol2

Chi2fit (chi2FitTo)

info nominal: chi2/ndf=0.722915 (31.8082 / 44)

info higher_order: chi2/ndf=1.02733 (44.1751 / 43)

How is that possible ?



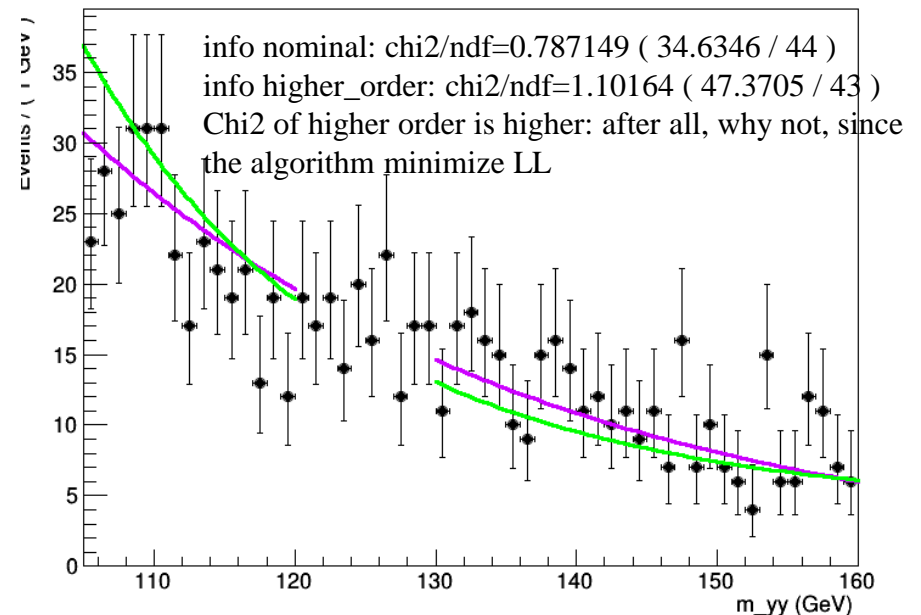
Likelihood fit (fitTo)

Supposed to minimize LL

minNll_nominal=2001.96

minNll_higher_order=2001.01

→Indeed



violet: nominal model: exp

green: higher model: exp pol2

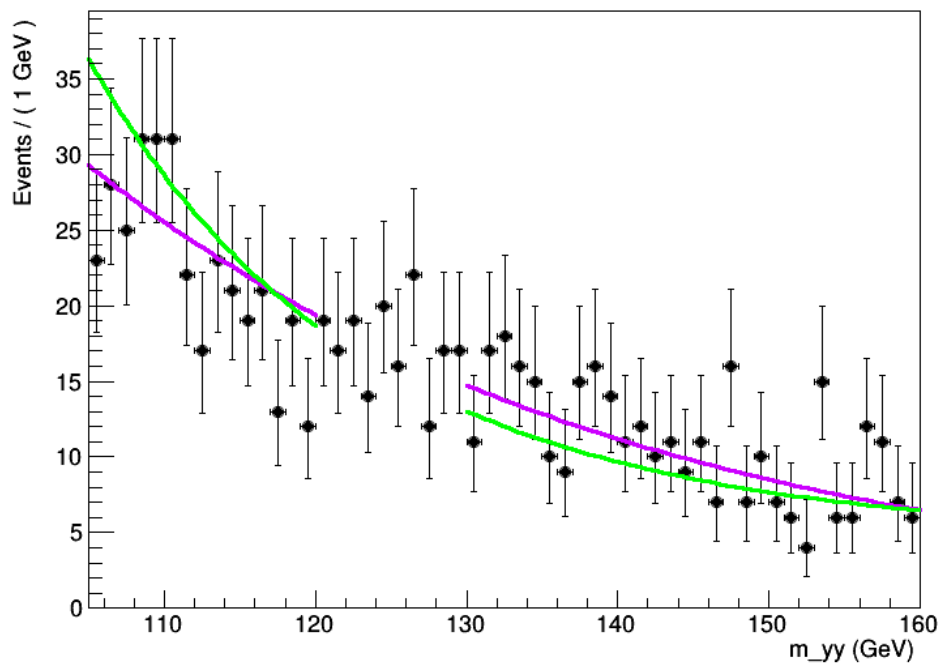
Take result of nominal as initial value for fit on higher order

Likelihood fit (fitTo)

info nominal: chi2/ndf=0.722915 (31.8082 / 44)

info higher_order: chi2/ndf=1.02701 (44.1614 / 43)

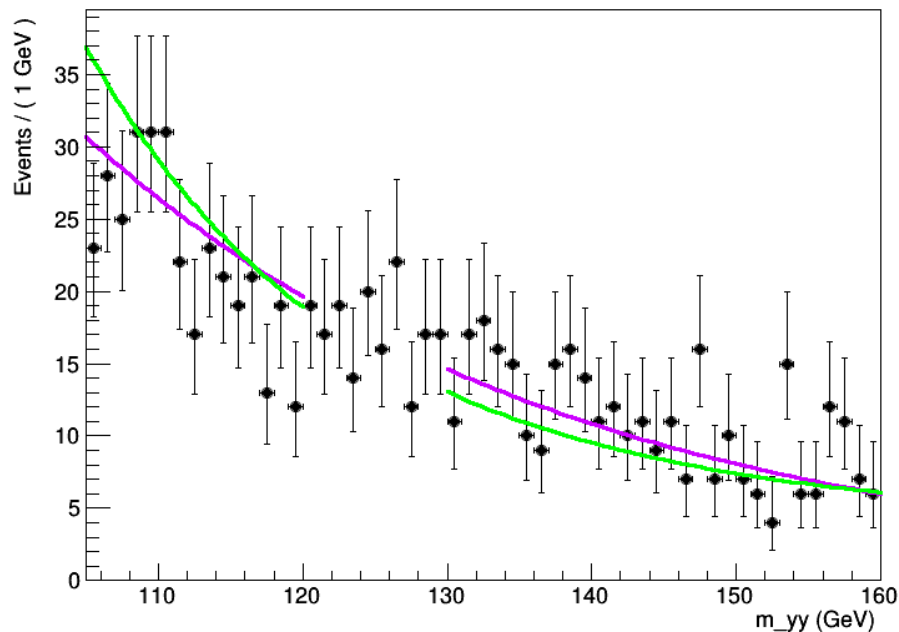
tiny numerical improvement, but still high



info nominal: chi2/ndf=0.787149 (34.6346 / 44)

info higher_order: chi2/ndf=1.10259 (47.4113 / 43)

tiny deterioration



violet: nominal model: exp

green: higher model: exp pol2

Use Offset(1) for likelihood fit (not available in chi2FitTo)

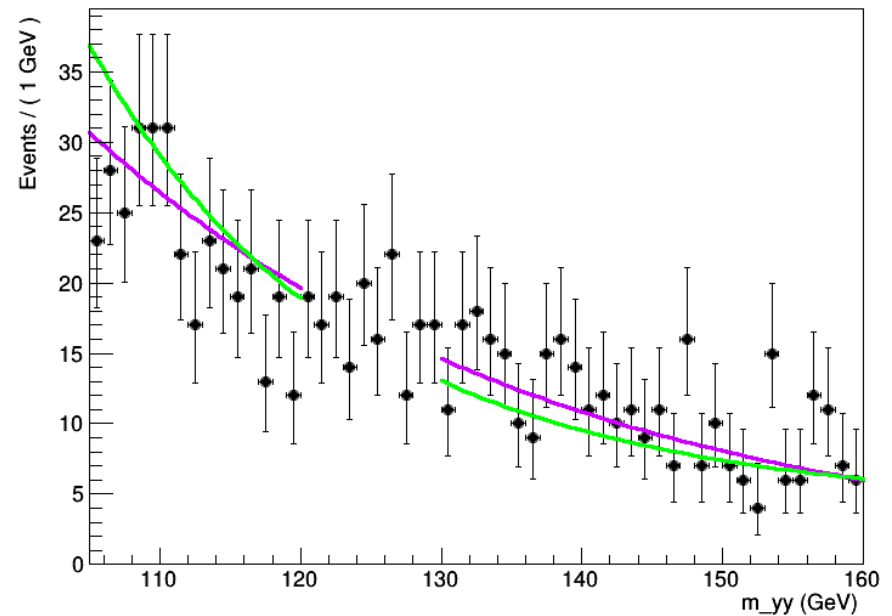
Likelihood fit (fitTo)

info nominal: chi2/ndf=0.787148 (34.6345 / 44)

info higher_order: chi2/ndf=1.10164 (47.3706 / 43)

tiny improvement for nominal

tiny deterioration for higher order



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violet: nominal model: exp

green: higher model: exp pol2

**Use Offset(1) for likelihood fit (not available in chi2FitTo)
+Strategy(2)**

Likelihood fit (fitTo)

info nominal: chi2/ndf=0.722907 (31.8079 / 44)

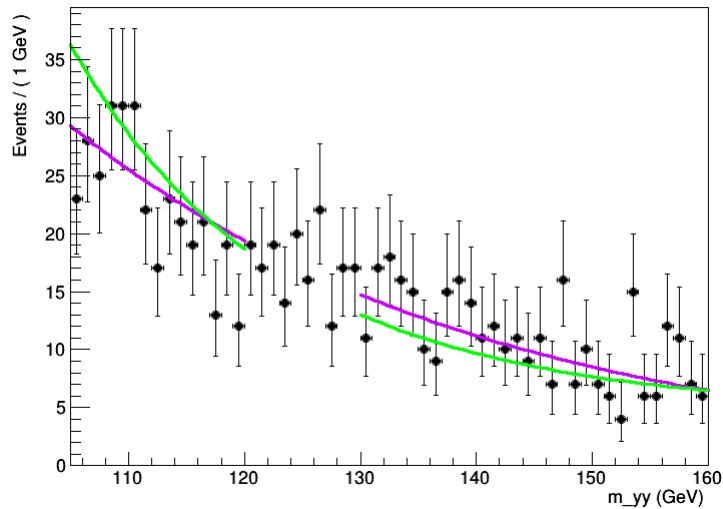
info higher_order: chi2/ndf=1.0267 (44.1481 / 43)

tiny improvement

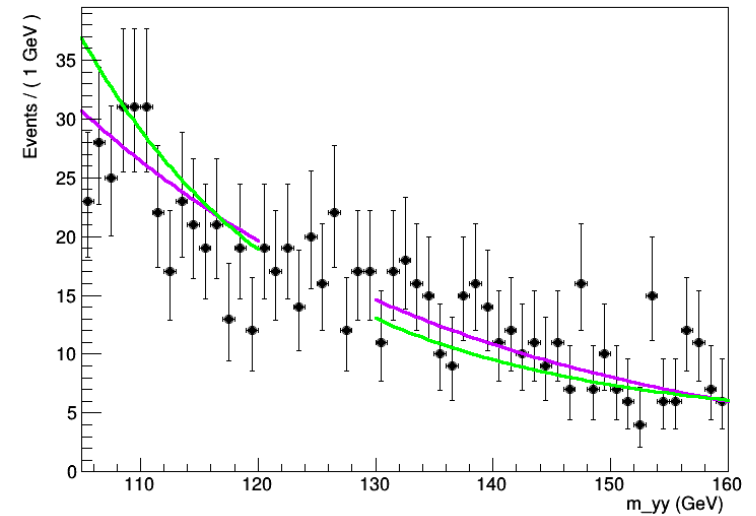
info nominal: chi2/ndf=0.787152 (34.6347 / 44)

info higher_order: chi2/ndf=1.1019 (47.3817 / 43)

tiny improvement



If do fits twice, tiny deterioration



If do fits twice, tiny improvement

violet: nominal model: exp
green: higher model: exp pol2

Using 22 bins

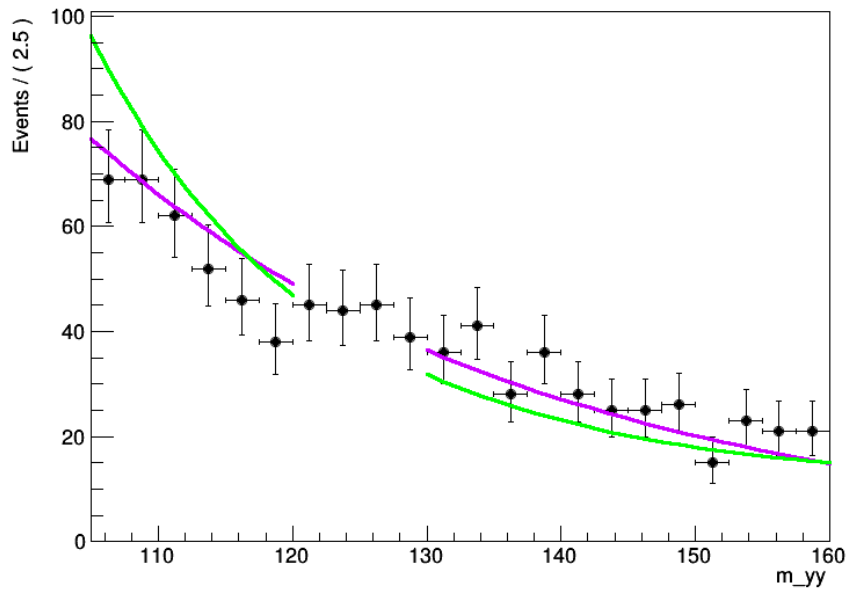
Chi2fit (chi2FitTo)

info nominal: chi2/ndf=0.874574 (14.8678 / 17)

info higher_order: chi2/ndf=2.06143 (32.9829 / 16)

How is that possible ?

A RooPlot of "m_YY"



violet: nominal model: exp

green: higher model: exp pol2

(do first an unbinned fit for each pdf, to help converging)

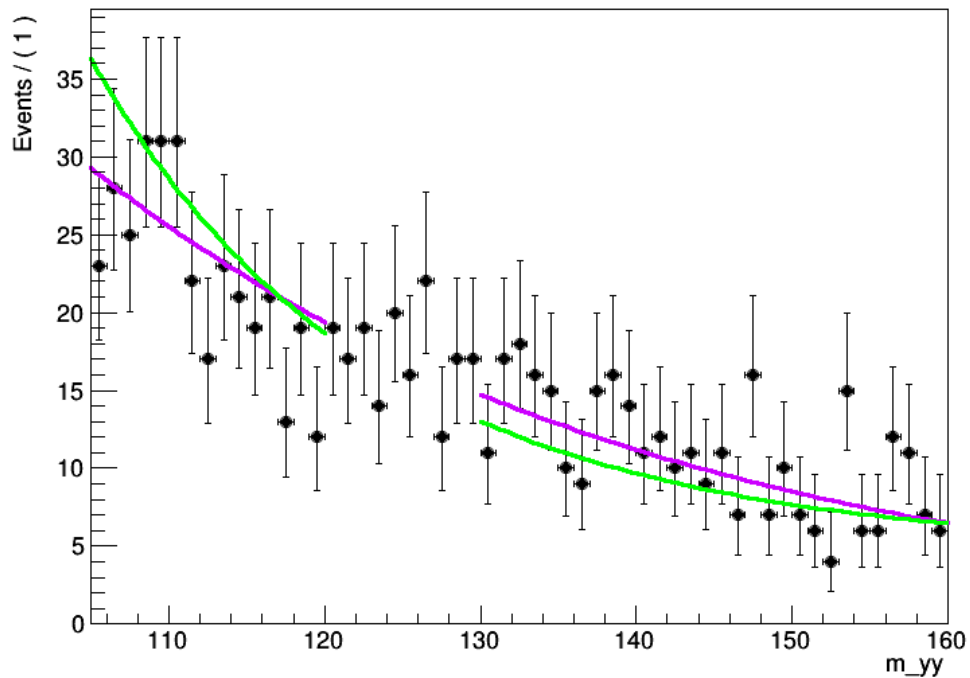
Chi2fit (chi2FitTo)

info nominal: chi2/ndf=0.722956 (31.8101 / 44)

info higher_order: chi2/ndf=1.02706 (44.1635 / 43)

How is that possible ?

A RooPlot of "m_yy"



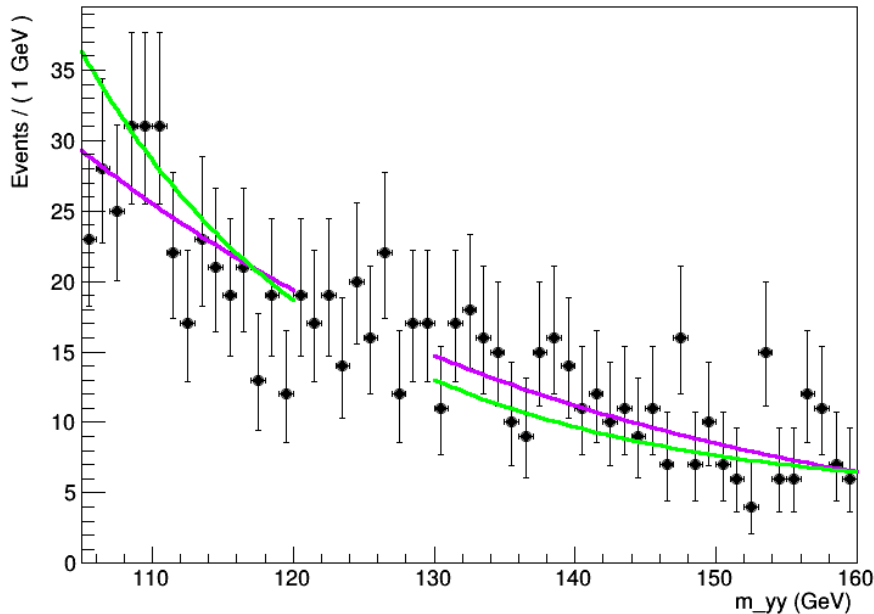
Check whether the core is used for unknown reason in the fit. → NO

Chi2fit (chi2FitTo)

Baseline

1 exp_slope -2.74640e+00 5.57746e-01 4.02837e-06 -2.74674e-02

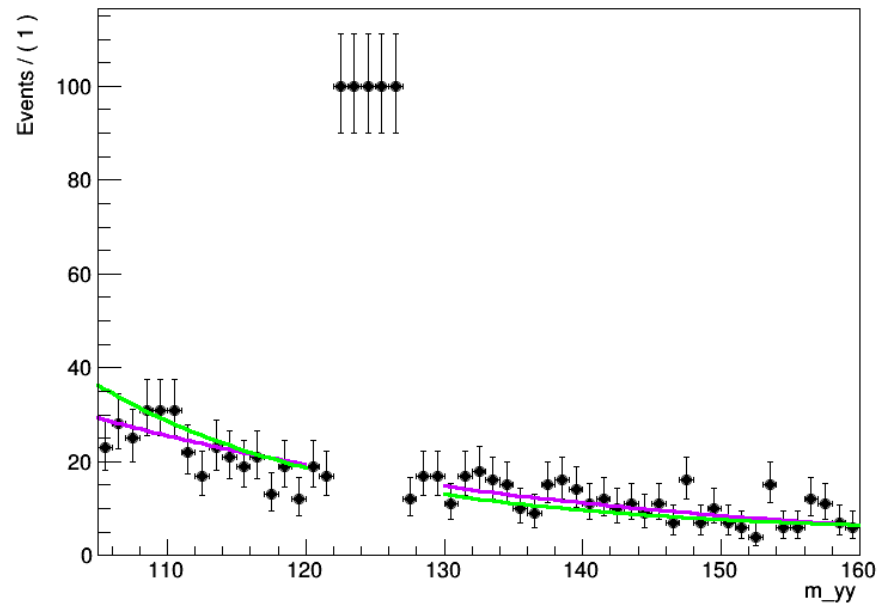
1 exppol2_p1 -5.23761e+00 1.75589e+00 3.36970e-06 -5.24001e-02
 2 exppol2_p2 3.23777e+00 2.16272e+00 4.14566e-06 3.23834e-02



Force events $m_{gg} > 122$ & < 127 to be 100

1 exp_slope -2.74640e+00 5.57746e-01 4.02837e-06 -2.74674e-02

1 exppol2_p1 -5.23761e+00 1.75589e+00 3.36970e-06 -5.24001e-02
 2 exppol2_p2 3.23777e+00 2.16272e+00 4.14566e-06 3.23834e-02
 A RooPlot of "m_yy"



Proof that this is a bug in roofit

After the macro :

```
Pdf_Bkg_expData_binned->Print()
```

```
RoodataHist::Pdf_Bkg_expData_binned[m_yy] = 55 bins (834 weights)
```

```
Pdf_Bkg_expData_binned->reduce(CutRange("sideband_low_m_yy"))->Print()
```

```
RoodataHist::Pdf_Bkg_expData_binned[m_yy] = 55 bins (336 weights)
```

```
Pdf_Bkg_expData_binned->reduce(CutRange("sideband_high_m_yy"))->Print()
```

```
RoodataHist::Pdf_Bkg_expData_binned[m_yy] = 55 bins (325 weights)
```

```
Pdf_Bkg_expData_binned->reduce(CutRange("sideband_low_m_yy,sideband_high_m_yy"))->Print()
```

```
RoodataHist::Pdf_Bkg_expData_binned[m_yy] = 55 bins (834 weights)
```

→impossible : $336+325 \neq 834$

CutRange with several ranges is buggy

Solution: uses a pdf that encodes the blinding
(pdf =0 in the blinding region)

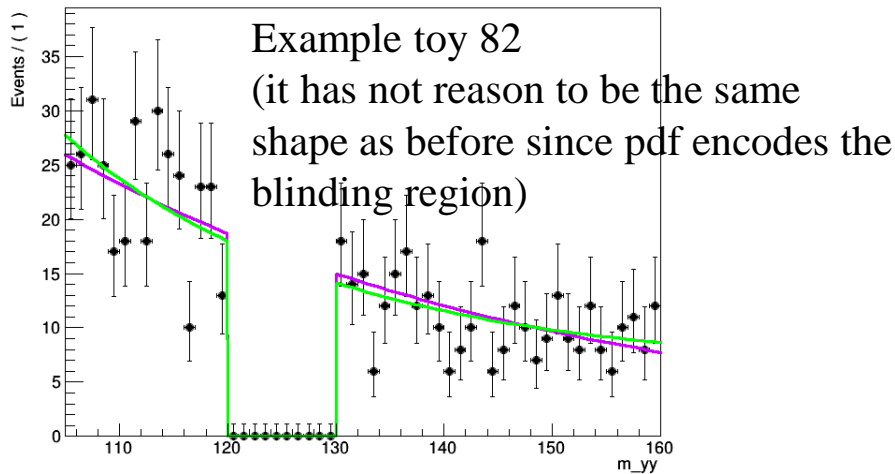
But... this new pdf changes the generated dataset since generated events depends on pdf form, so, the fact that it works for this one is not yet a proof : one needs to loop on many seeds to see if a pathological configuration appears (as for the previous part)

Tried on 100 toys: no more anomaly !

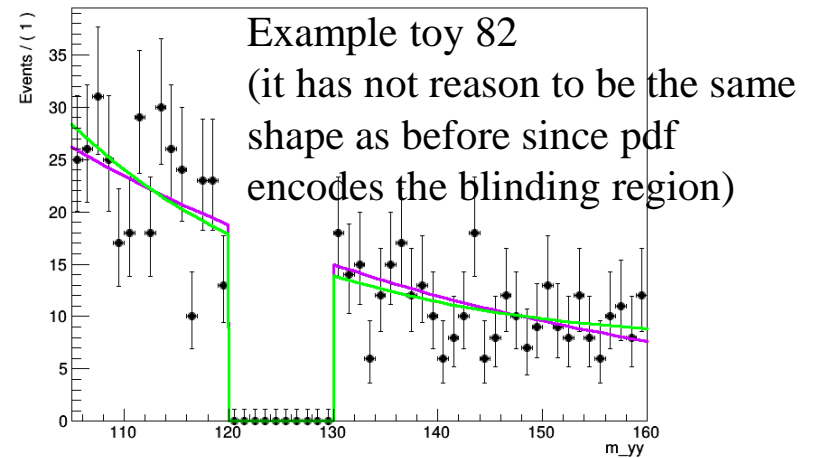
info nominal: chi2/ndf=0.898646 (39.5404 / 44)
info higher_order: chi2/ndf=0.880324 (37.8539 / 43)

info nominal: chi2/ndf=0.898603 (39.5385 / 44)
info higher_order: chi2/ndf=0.877341 (37.7257 / 43)

A RooPlot of "m_yy"



A RooPlot of "m_yy"



Conclusion: bug in roofit for CutRange command with multiple range
For fits commands (fitTo and Chi2FitTo with multiple range)
RooFit experts may fix it (?)