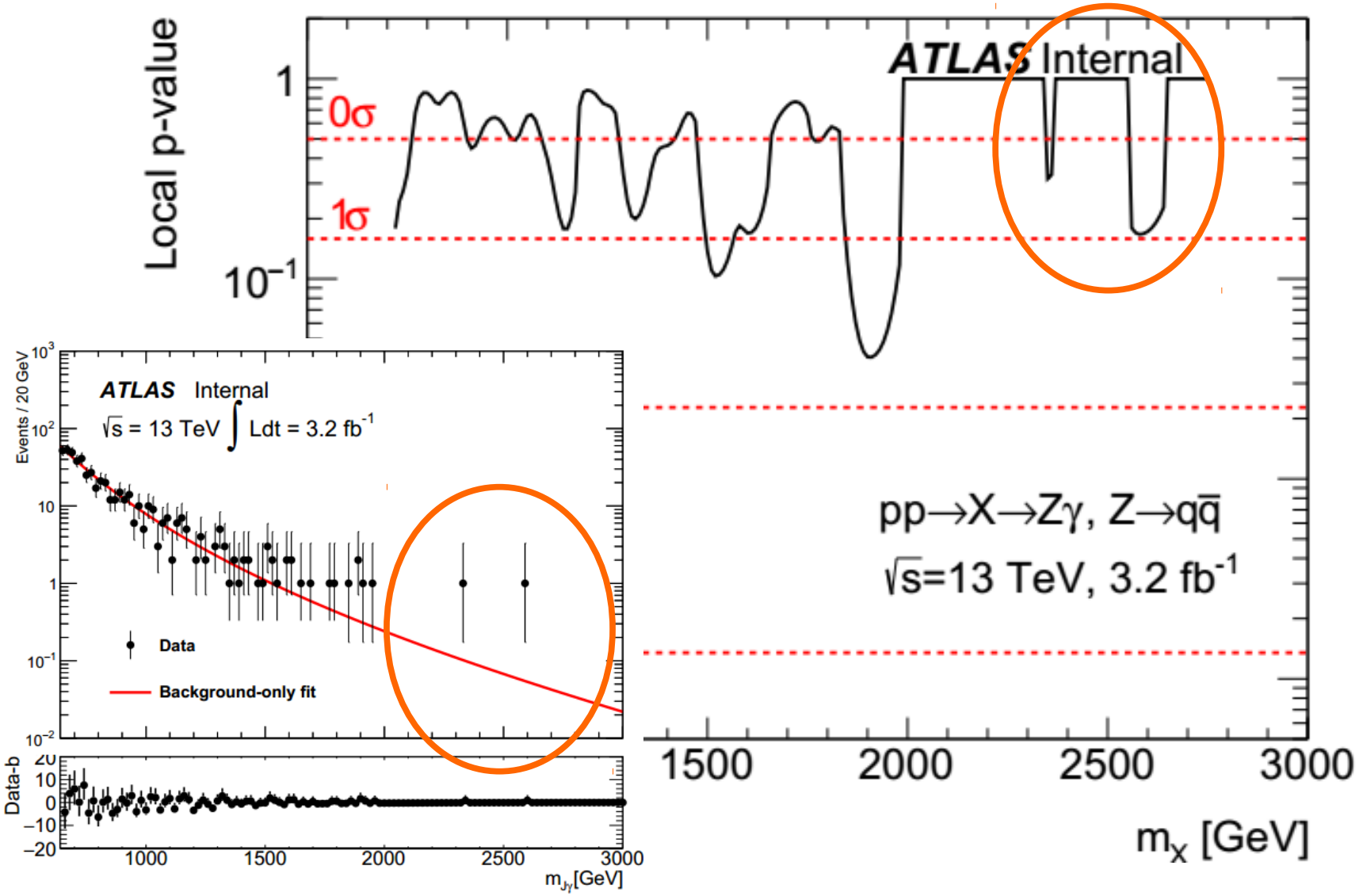
Unbinned fit
in Zy boosted analysis

Xiaohu SUN
IHEP
2016-06-13

p0 issue @ 2.6TeV

Bill asked:

Fig 13 b shows p-values where the event at 2.35 TeV makes a delta-function spike, while that at 2.6 TeV is much broader.

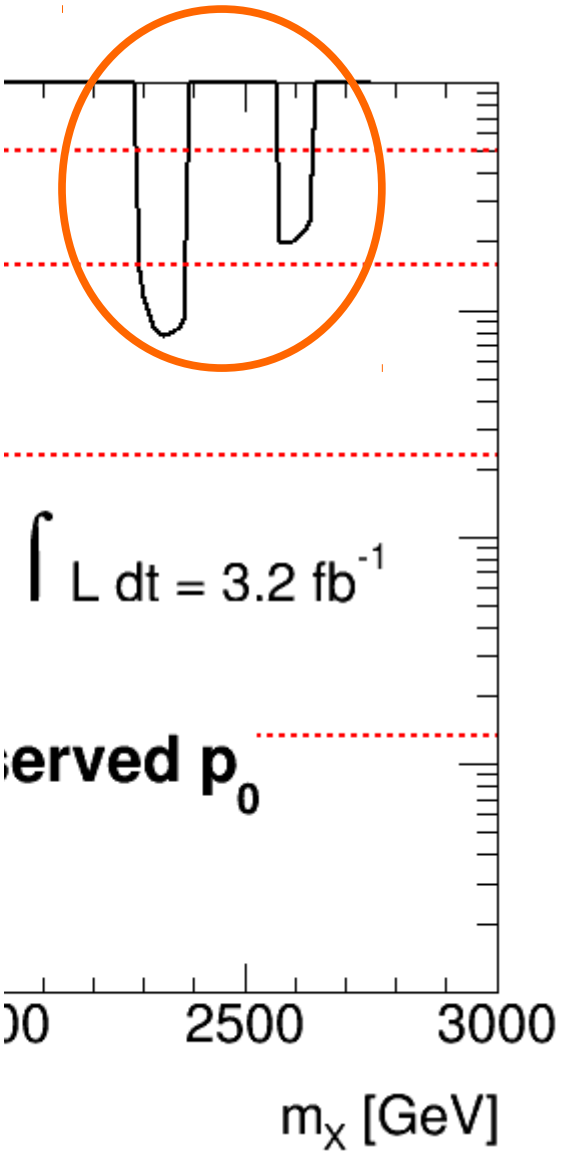


Add ghost events at 2339GeV

@ ~2339GeV, there is only one event in data

Test with larger data excess

Add one ghost event @ 2339 GeV, width and height increase



Check on nuisance parameters

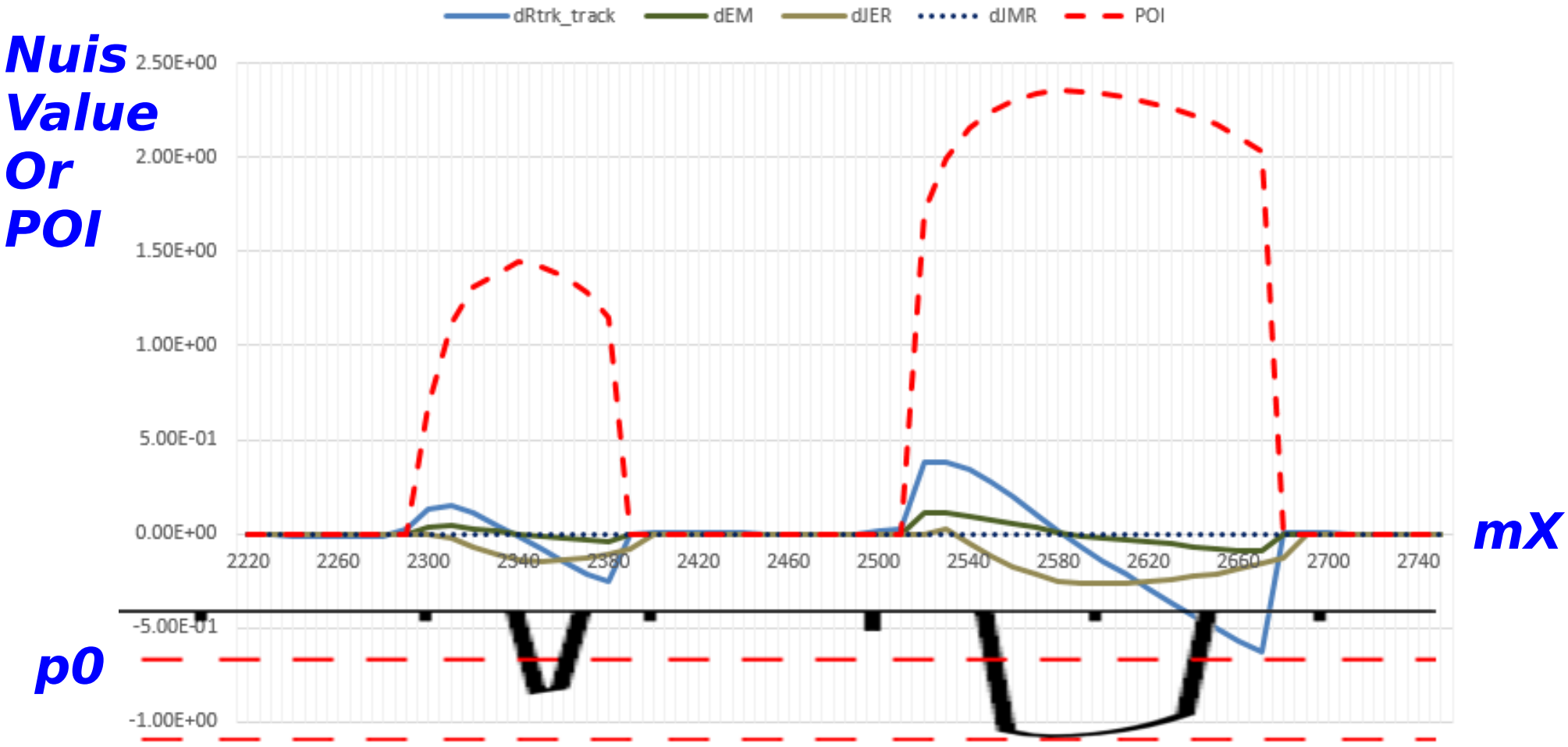
Following experts' suggestions, check best fitted nuis value vs mX

dRtrk_track,dEM affect CB mean

dJER affects CB sigma

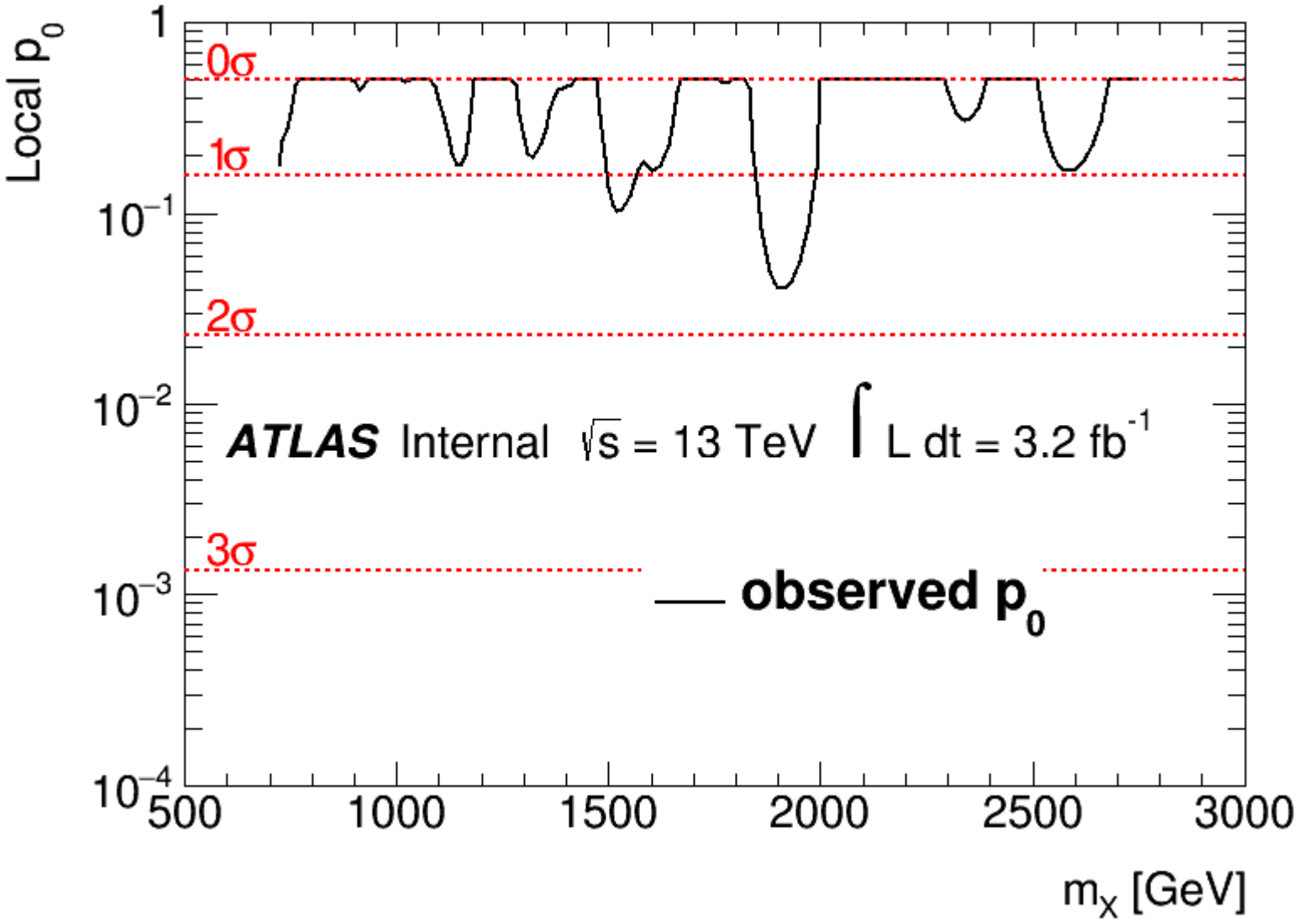
dJMR affects CB acceptance

Nuisance parameters behave expected



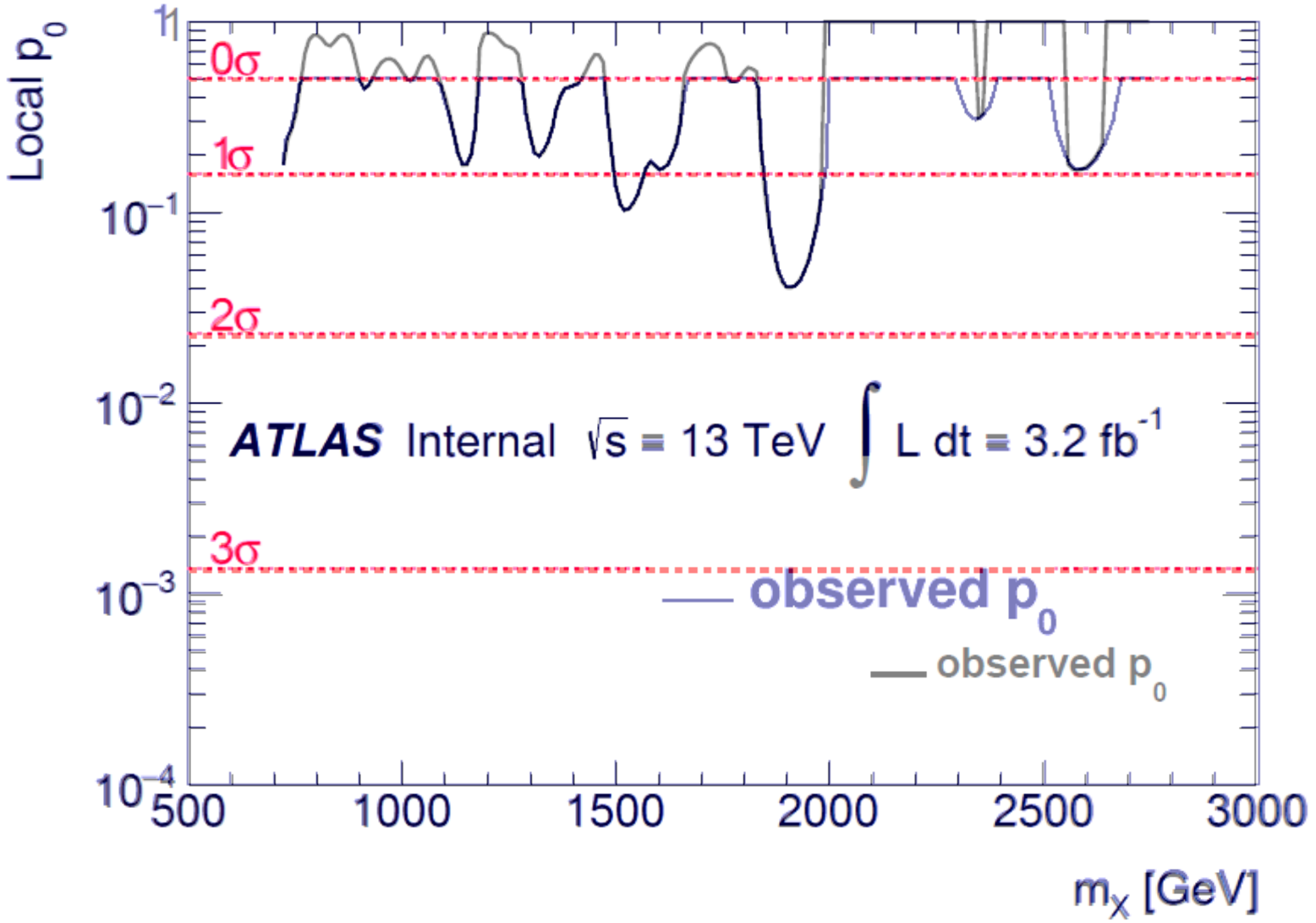
Yet another script

Use a simple script to get p0 (capped)
Run AsymptoticCalculator
Much more stable in low stats region



Compare the two scripts

The previous fancy script (uncapped p0) is on bottom in black
The new simply script (capped p0) is on top in blue



SM Higgs coupling combination

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2016-06-13

Structure

People start to play with workspaces separately
Had first EB meeting last Tuesday morning
Had first presents last Wednesday afternoon

Currently:

Using Stefan's tool:
Carsten
Lydia
Xiaohu
Kaili

Using Haoshuang's tool
Jared
Jana

Introduction

- First looks at the available workspaces and try to understand
- Modify POIs for mu scheme tests
- Make 2D likelihood contours

HGam workspace

- Version: /afs/cern.ch/atlas/project/HSG7/Run2/Kickoff2016/ HGam/WS-HGam-Coupling.root
- POIs (in ModelConfig):
  - mu (handler of all CATs and production modes)
  - mu_XS_ggH
  - mu_XS_VBF
  - mu_XS_WH
  - mu_XS_ZH
  - mu_XS_ttH
  - mH (125.09 Constant)
- Other POIs (not in ModelConfig):
  - mu_XS_tHjb
  - mu_XS_WtH
  - mu_XS_bbH
- Categories: 10 in total
- Very complicated workspace, print out pdf in tree mode ~26K lines

HLepton workspace

- Version /afs/cern.ch/atlas/project/HSG7/Run2/Kickoff2016/HLeptons/125.root
- POIs (in ModelConfig):
  - SigXsecOverSM (overall handler)
- Other POIs (not in ModelConfig):
  - mu_XS13_ggH_tautau
  - mu_XS13_VBF_tautau
- Categories: 11 in total

Hbb workspace

- Version /afs/cern.ch/atlas/project/HSG7/Run2/Kickoff2016/Hbb/125.root
- POIs (in ModelConfig):
  - SigXsecOverSM (overall handler)
- Other POIs (not in ModelConfig):
  - Not found
- Categories: 18 in total
- Only VH production

Test upper limits (asymptotics)

HGam
(fit to AsimovSB)

+2sigma: 1.74951
+1sigma: 1.1711
-1sigma: 0.580113
-2sigma: 0.432113
Median: 0.805091

HLeptons
(fit to asimovData)

+2sigma: 7.39782
+1sigma: 5.47943
-1sigma: 2.82468
-2sigma: 2.10404
Median: 3.92015

Hbb
(fit to asimovData)

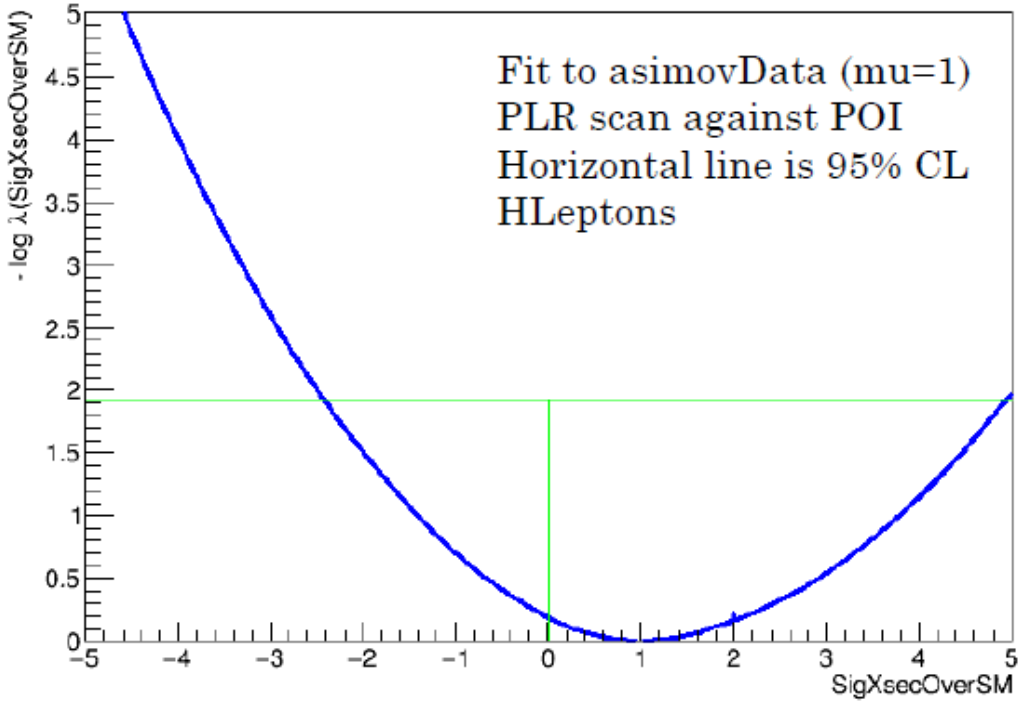
+2sigma: 4.32901
+1sigma: 3.13592
-1sigma: 1.5975
-2sigma: 1.18994
Median: 2.21704

Set one POI in each channel
Only use ***overall handler*** to get the upper limits
Remove any production-mode mu_XXX parameters in POI

Use Aaron's iterative method to extract limits with asymptotic approx.

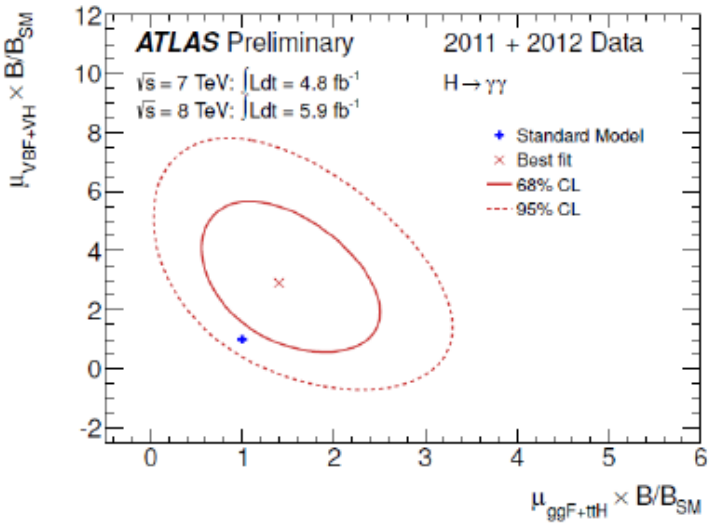
1D PLR scan

- So far only HLeptons succeeded
- In HLeptons, use only one overall handler as POI to make PLR scan

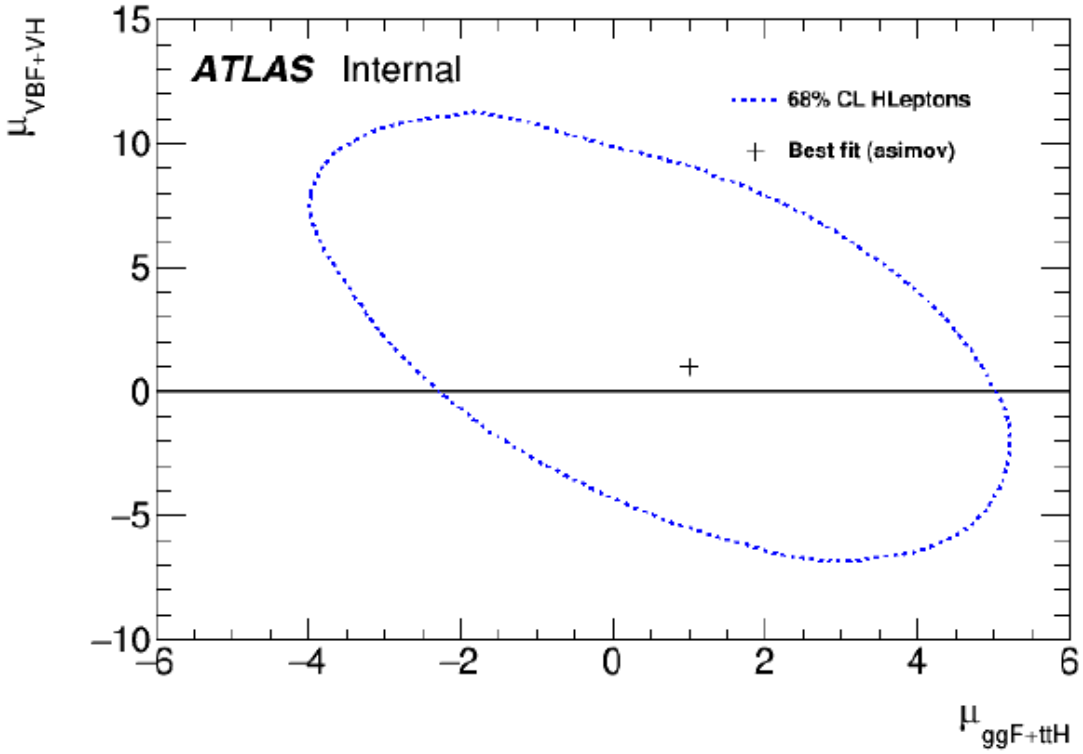


2D contour

- Likelihood contour @ 68% CL
- Below is from ATLAS-CONF-2012-127
- Group mu_ggF & mu_ttH
- Group mu_VBF & mu_VH



- Test with only Hleptons
  - Switch off overall handler: SigXsecOverSM
  - Switch on channels handlers (**use 2 POIs**):
    mu_XS13_ggH_tautau
    mu_XS13_VBF_tautau
- asimovData (mu=1) is used
- Tried HGam+HLeptons and Hbb+HLeptons, fit failure



Summary

- First looks at available workspaces
- Tested modifying POIs: switch on/off, rename/correlate
- Tested making 2D likelihood contour with mu grouping
- **Need workspaces without systematics**: essential to make combination and test POI parametrization detaching huge amount of nuisance parameters
- **Need domain analyzers to provide knowledge:** POI and categories; Datasets
- **Need to think how to parametrize** current POI to accommodate our plan (mu scheme, SXS); mu scheme example as below

Combination parametrization	HGam	HLepton	Hbb
mu_ggH_ttH	mu_XS_ggH, mu_XS_ttH	mu_XS13_ggH_tautau	-
mu_VBF_VH	mu_XS_VBF, mu_XS_WH, mu_XS_ZH	mu_XS13_VBF_tautau	SigXsecOverSM

Backup