UCL

Flavour Composition Studies

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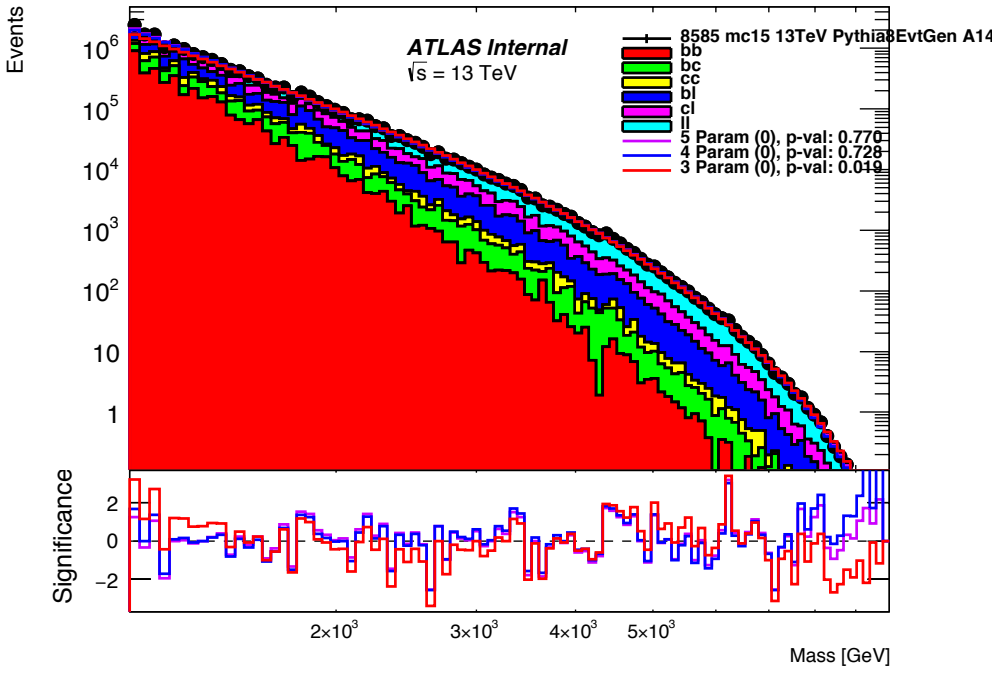
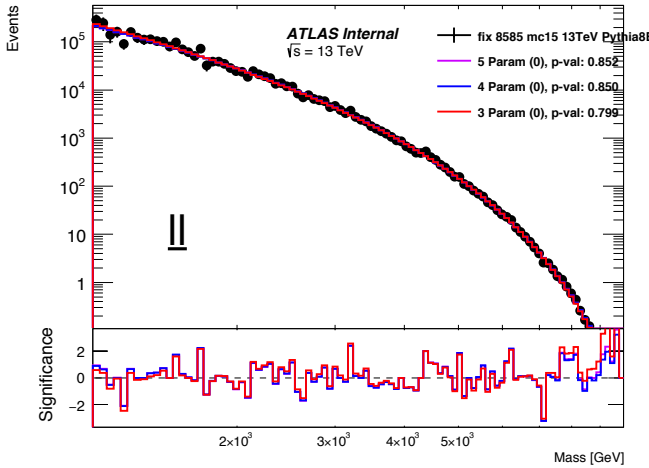
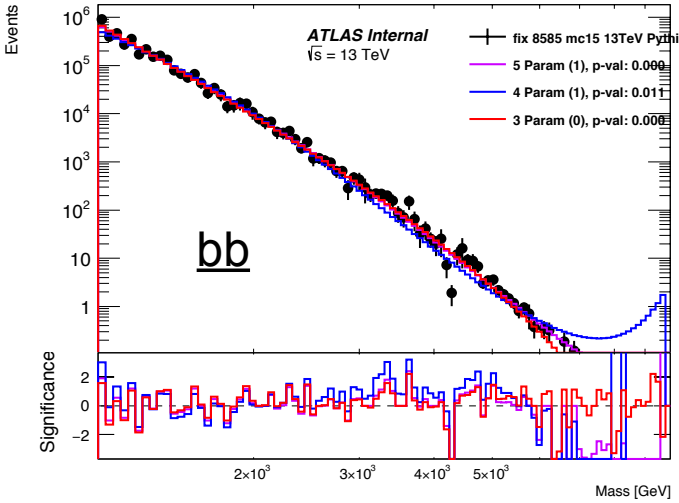
Introduction and last time...

- We want to understand how varying the flavour composition will affect the fitting function.
  -Are the fitting functions robust to flavour composition?

- Vary the amount that different flavour combinations contribute.
- Then fit to the new mjj spectrum
- We want to see if we can break the fit...







But last time...

- Scaled to 9999ifb, maybe a little optimistic
- Not poisson fluctuated data-like data.

Details

Pythia8EvtGen MC Di-Jet Sample
- di-b-jet Ntuple production

Standard Dijet Resonance Cuts
- Leading Jet p_T > 410 GeV
- Sublead Jet p_T > 50 GeV
- |y*| < 0.6
- m_{jj} > 1100 GeV

Using fixed cut 85% for both jets.
- mbb_fix_8585

Cone matching truth flavour
- jetHadronConeExclTruthLabelID

Work Flow

Samples from Andrea:
- `phys-exotics/jdm/dijet/inputs/Btag/MC15a_DiJet_20151005`

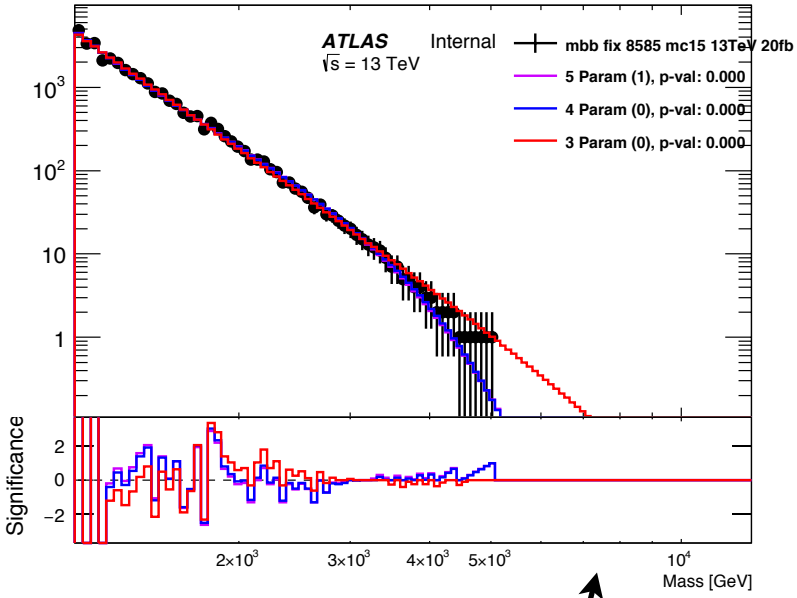
Use DijetHelpersPackage:

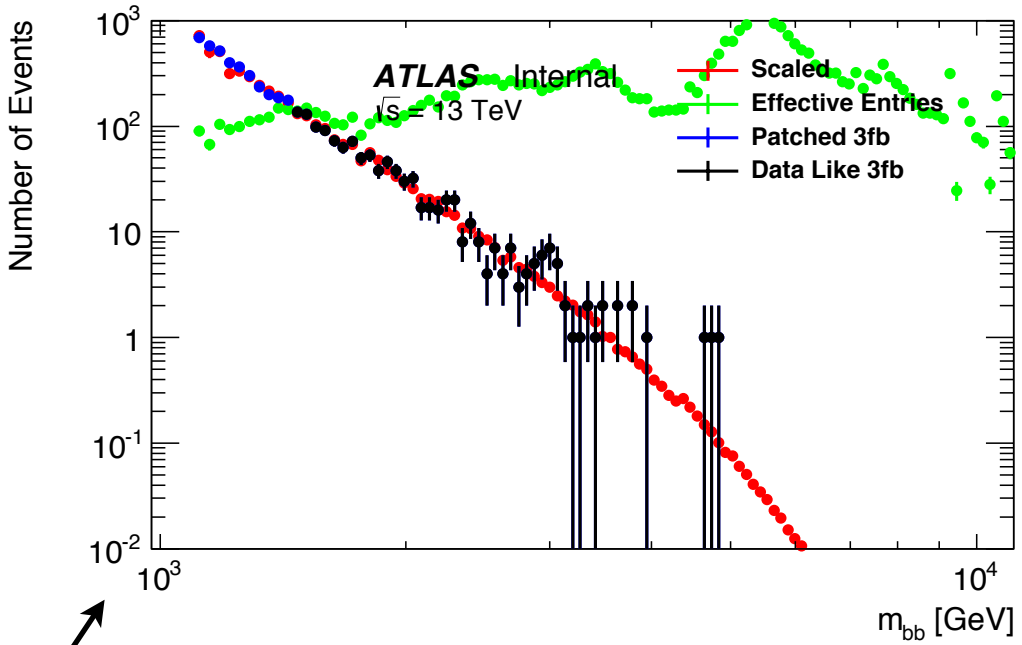
Create Histograms and merge slices
- *makeStandardHistograms.py*
- *plotStandardPlots.py*

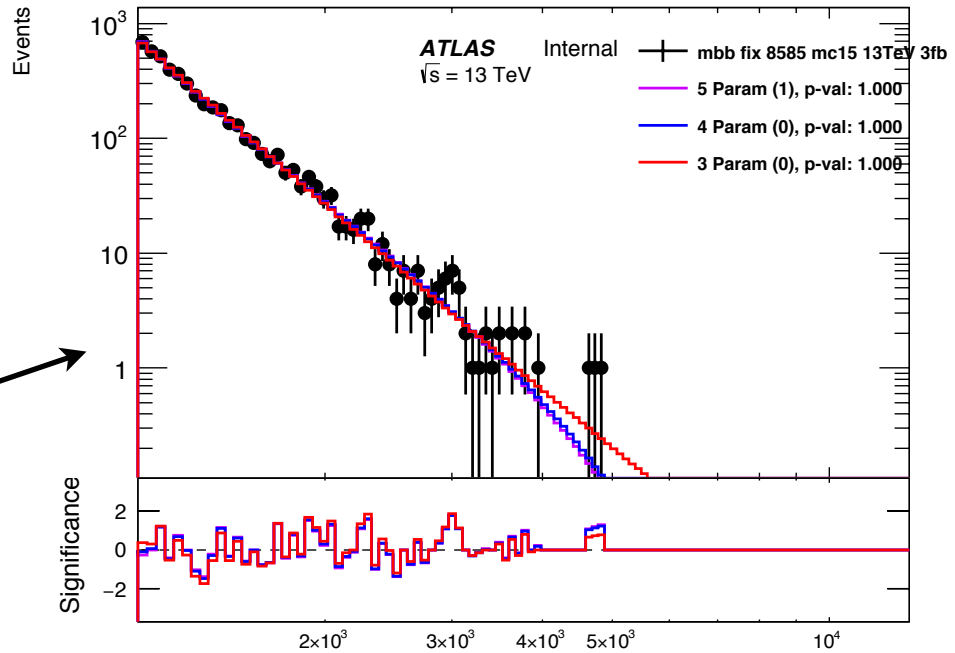
Patch Process:
- Fit 20ifb smooth histos using *singleFit.py*
- Create data-like using *makeDataLikeHistograms.py*
- Apply patch from Francesco to truncated part of spectrum using 20ifb fit.
 (Done this by hacking *makeDataLikeHistograms.py)*

Fit spectrums and make some plots
- *singleFit.py*
- *plotSingleFit.py*

Fitting to the Mbb spectrum





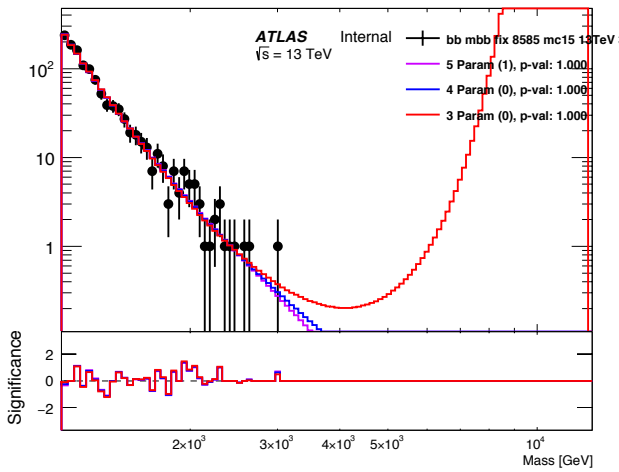


1) Fit to 20ifb Smooth

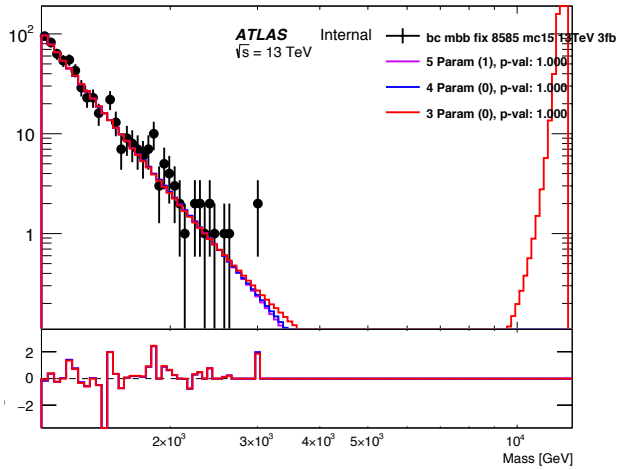
2) Create Patched Data-Like Plot

3) Fit to Patched Data-Like Spectrum

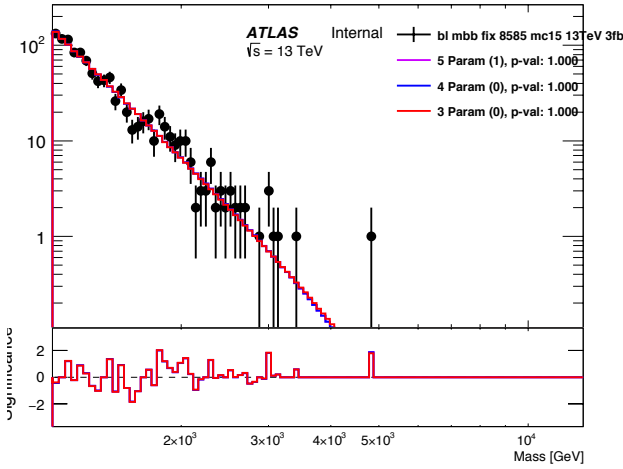
Flavour Fractions



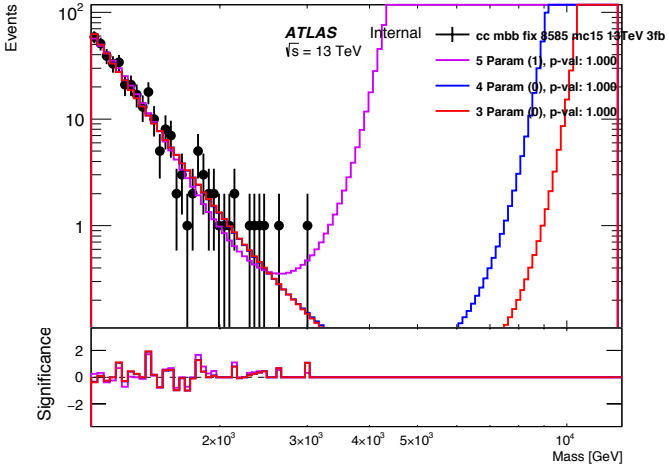
bb



bc



bl:



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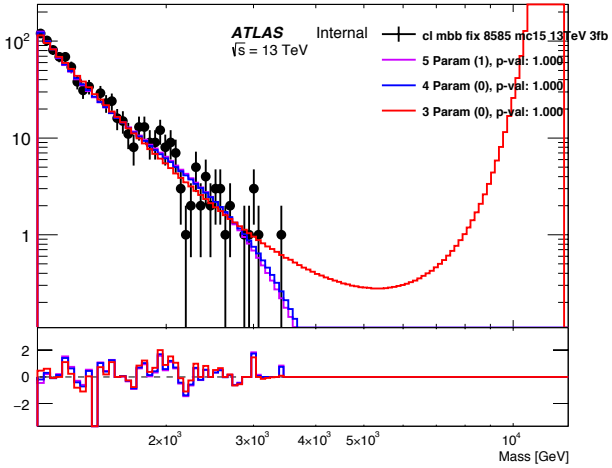

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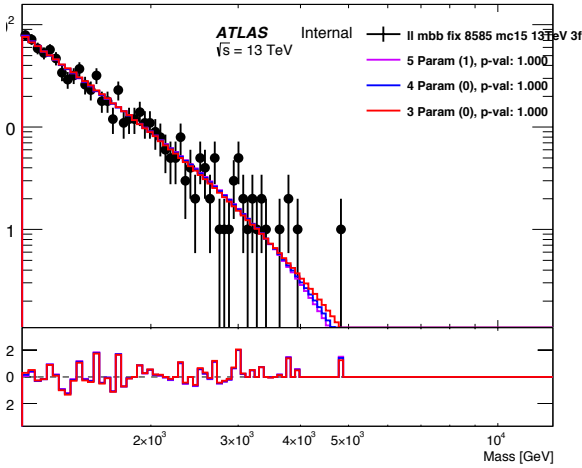


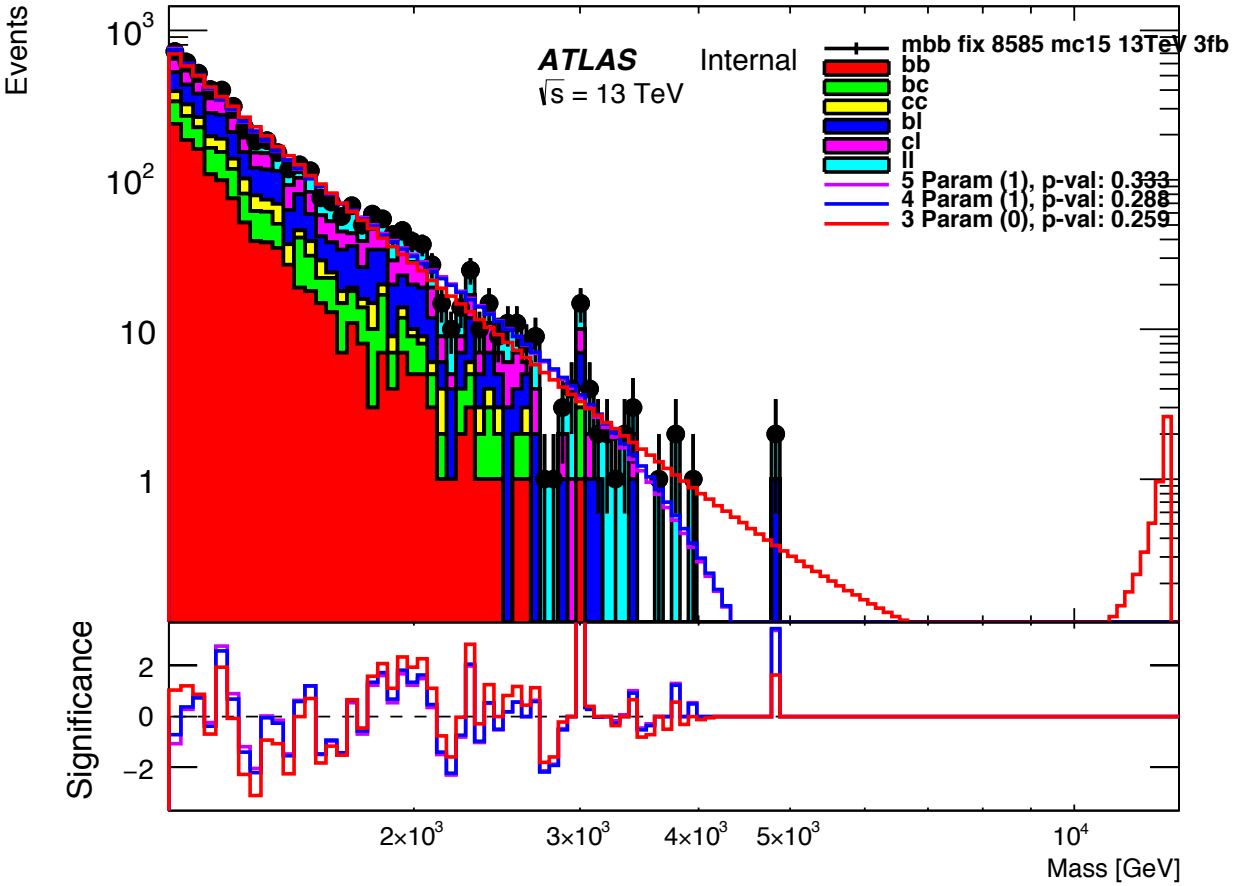
ll:

Combining Flavour Composition

- We can make patched data-like distributions for each of the flavour contributions.

- By merging them we can create a combined data-like histogram and see it's flavour components.

- Then by increasing the amount of data-like we give to one component we can test our fit
  (This is effectively done by increasing the luminosity for say bb)

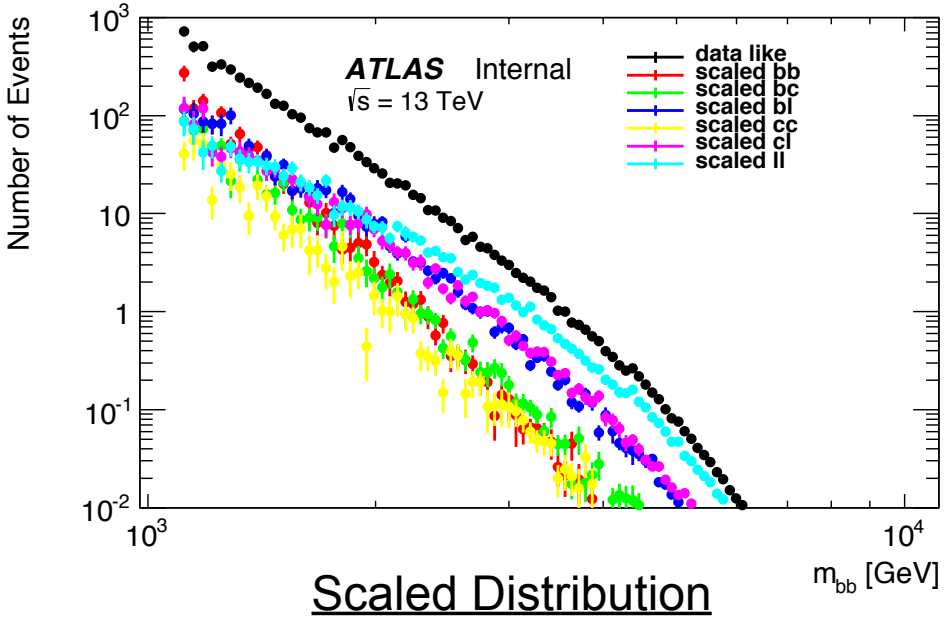


Problems

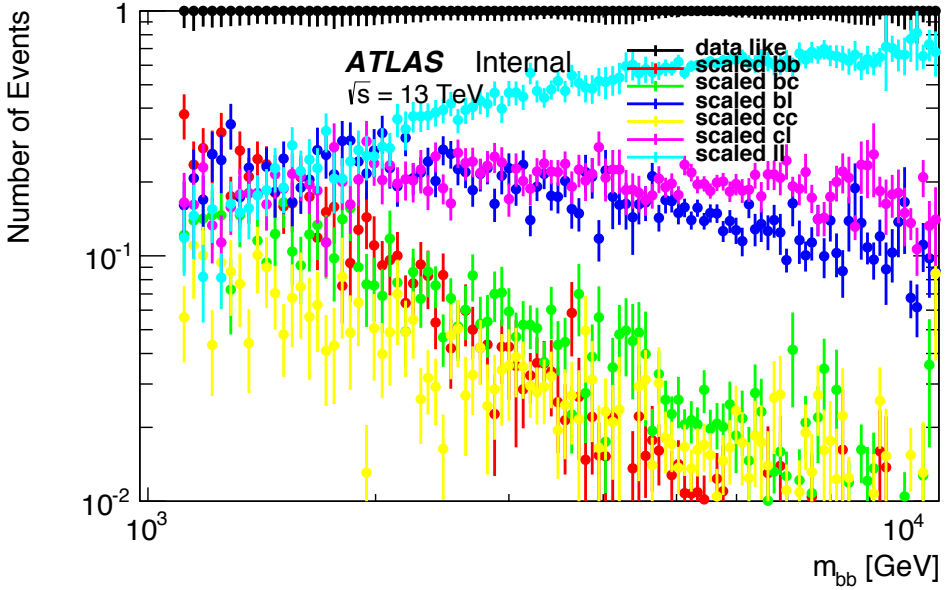
- Large Fluctuations

- Hence poor fitting

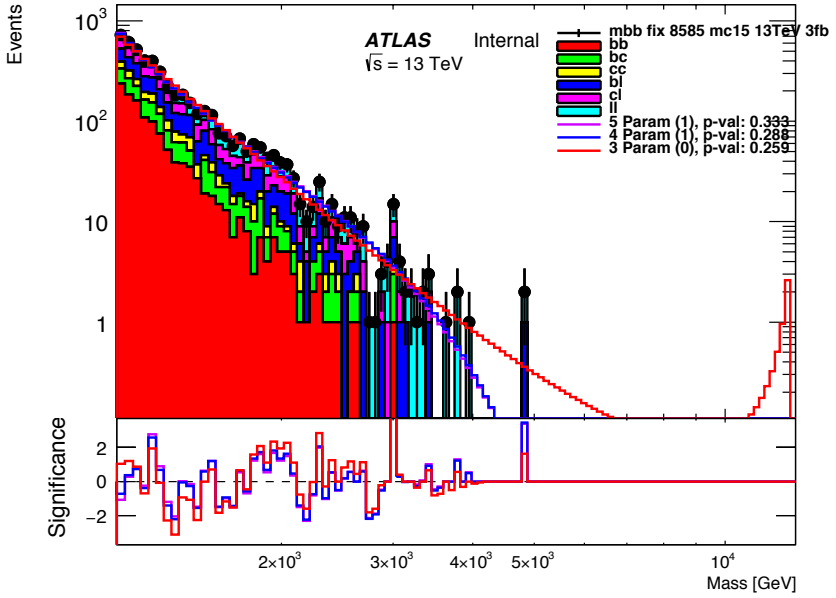
Why Do We Have Large Fluctuations?



Scaled Distribution



- The poisson fluctuations calculates a seed for each bin.
- It then uses the bin seed and the scaled distribution to calculate the poisson fluctuations.
- But the flavour fractions have similar scaled mbb distributions.
  - In particular bl (blue) and cl (purple)
- This means there are unintended correlations between the data-like spectra
  - This shows in the overall mjj spectrum



Next Steps - Two Ideas

1) Use a different seed for each of the flavour fractions.
- This should resolve the correlations.
- Then combine the spectrums and fit
- From there use different luminosities for different flavour fractions to alter the flavour contribution of the mbb spectra.

2) Use the 20ifb fits as templates for the spectra of the flav. comp.

- Come up with a “scaled-like” distribution from combining the 20ifb fits to each of the different flavour component spectrums.

- Then from that create a apply poisson fluctuations to create a data-like distribution.

- By combining the flavour components with different weights we can test robustness.