



# Flavour Composition Studies

Laurie McClymont, Andreas Korn

27 Nov 2015



### 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/MC15\_20151104 and MC15a\_DiJet\_20151005

Use DijetHelpersPackage:

Create Histograms and merge slices

- *makeStandardHistograms.py*
- *plotStandardPlots.py*

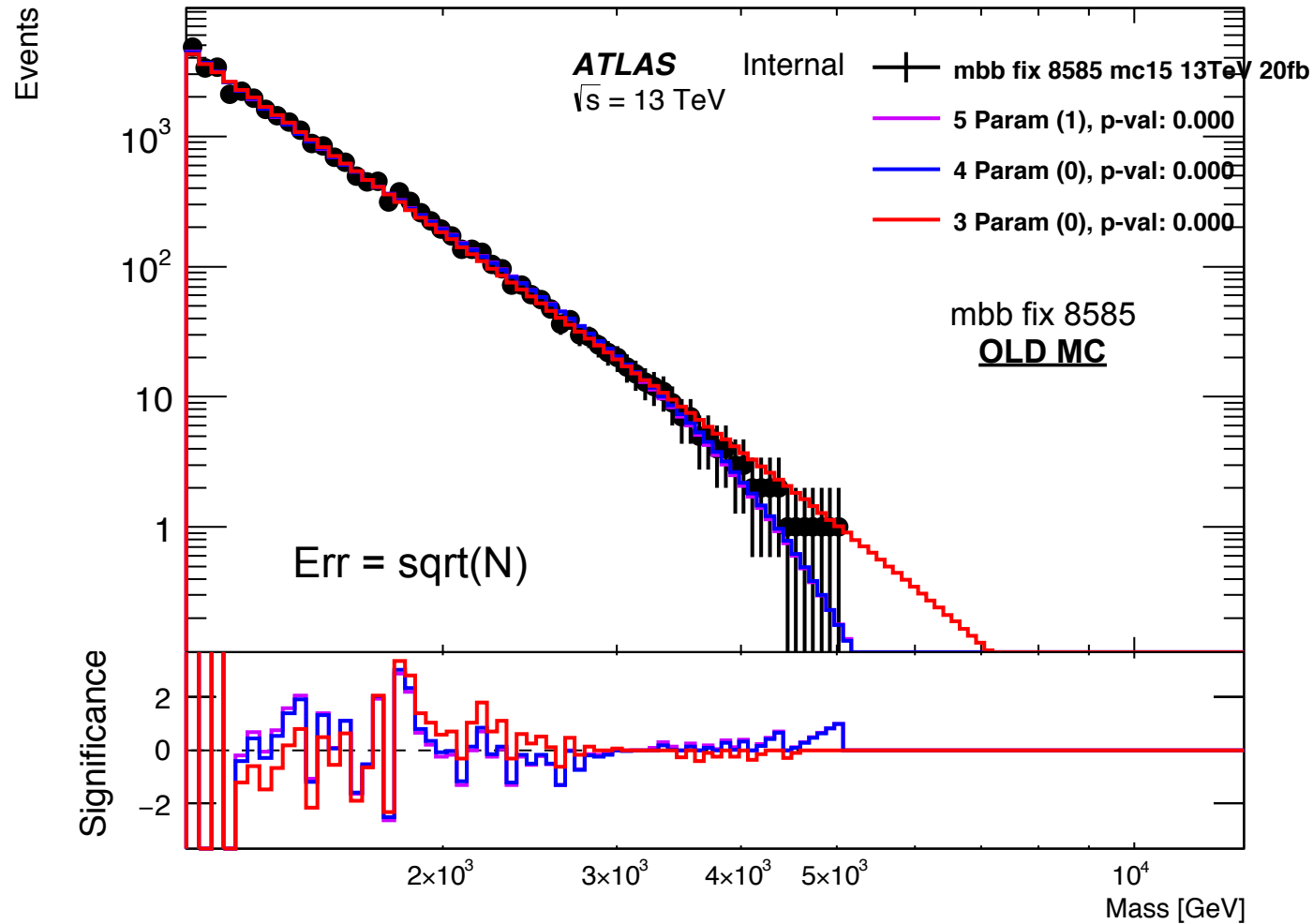
Patch Process:

- 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. **(I used 4 Parameter)**  
(Done this by hacking *makeDataLikeHistograms.py*)

Fit spectrums and make some plots

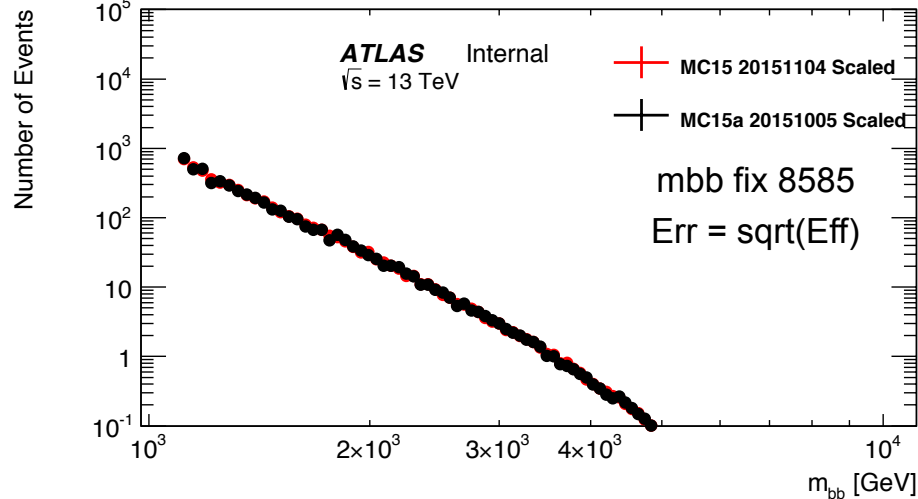
- *singleFit.py*
- *plotSingleFit.py*

## Observed features in mbb spectrum





# 4 Moving to New MC?



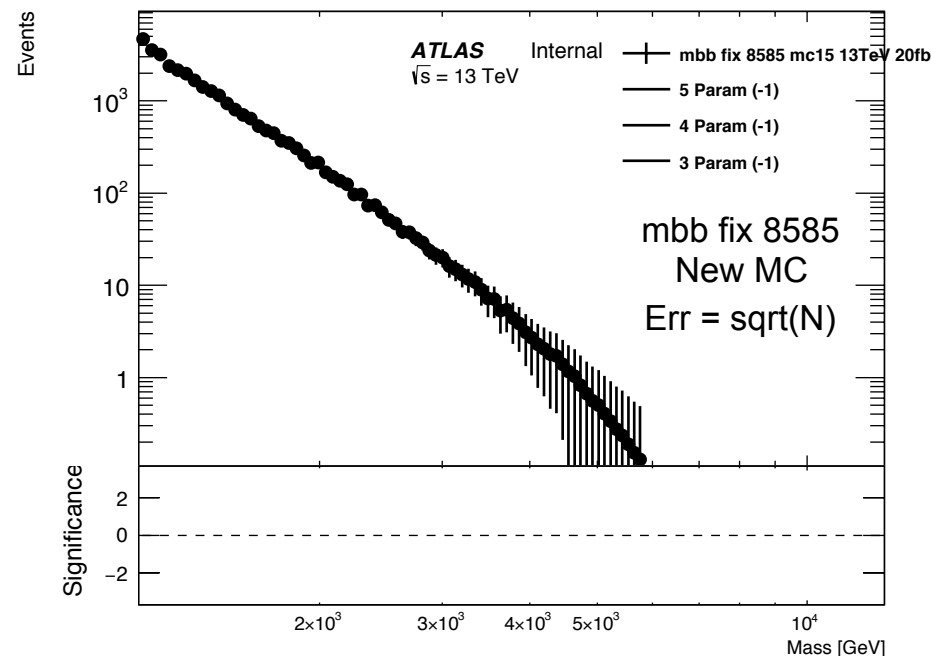
MC15 20151104 Scaled

Old MC = MC15a\_20151005

New MC = MC15\_20151104

Moving to new MC does help  
- (See above)

But still not quite perfect  
- (See right)



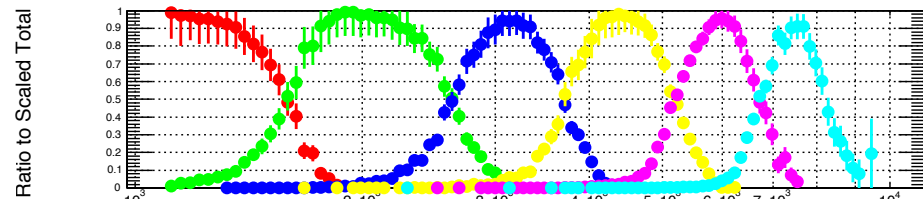
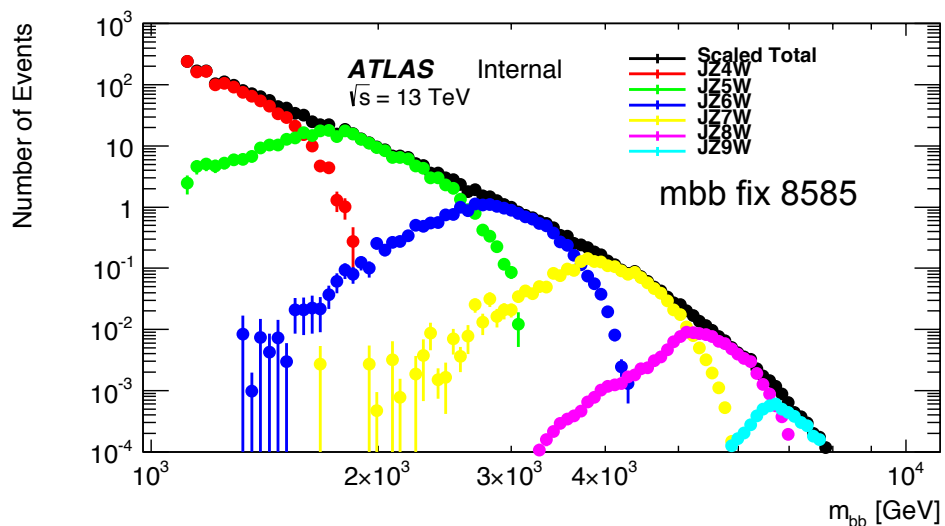
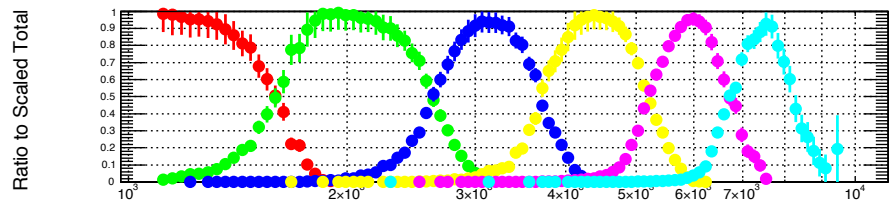
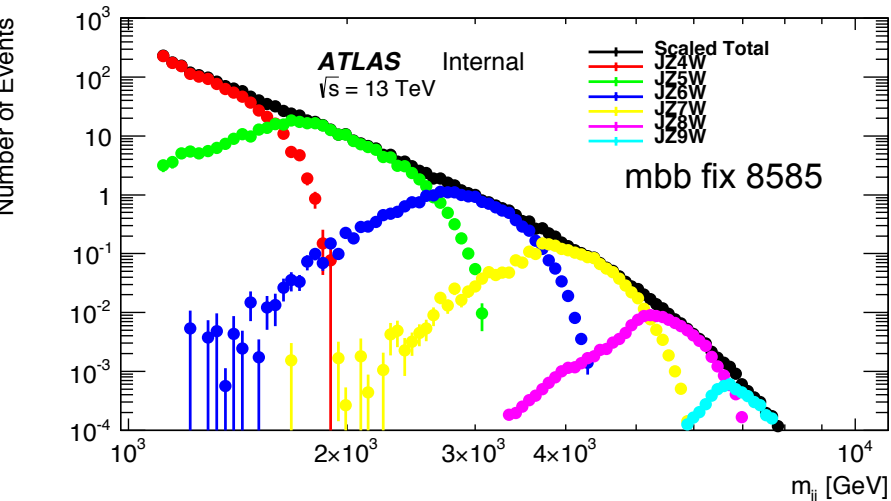


## 5 Check JZ Slices to merged

Appears Features are in JZ Slices  
- Problem not in merging

New MC

MC15a\_20151104



Old MC

MC15a\_20151005



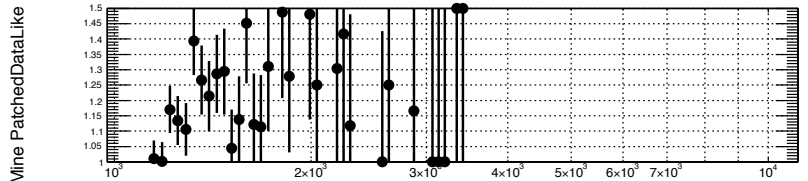
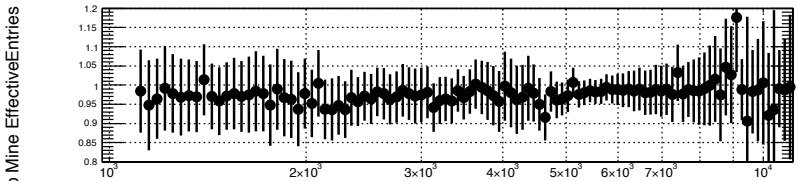
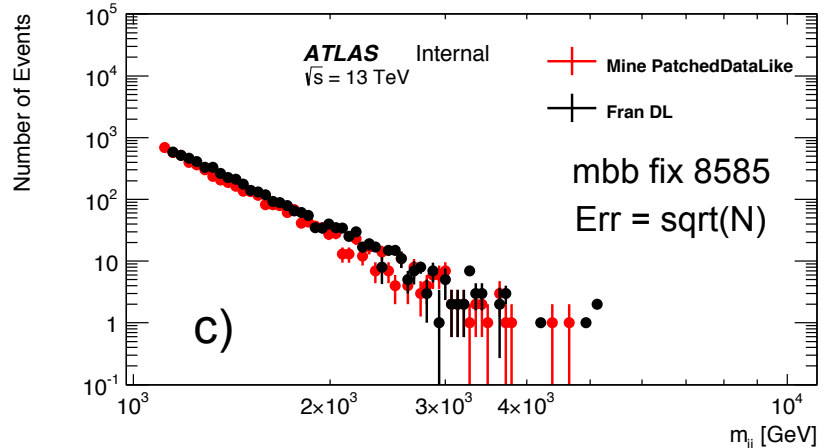
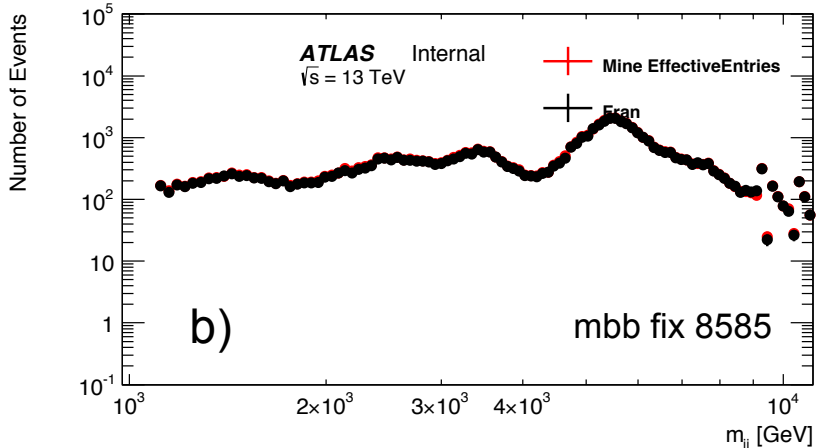
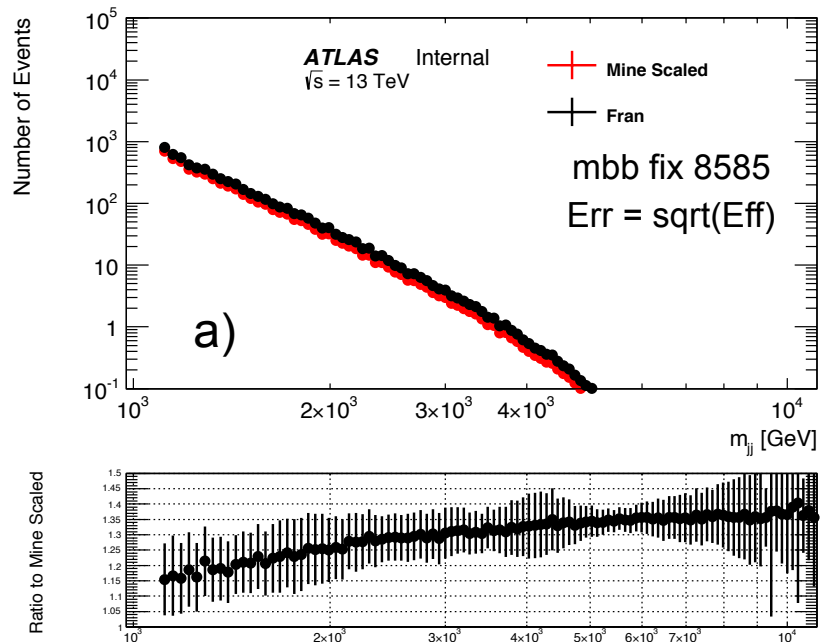
- a) Scaled distributions
- b) Effective entries
- c) Patched Data Like

See similar structure as Francesco

- Also see some structure in eff entries

Patched don't match to well

- Different slope (3 para to 4 para fit?)
- One extra bin in mine (easy to check)

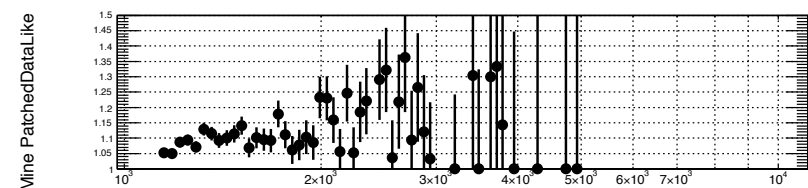
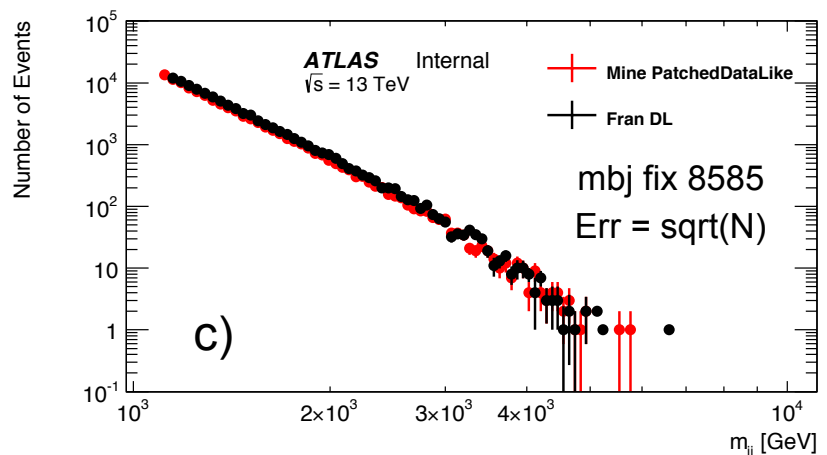
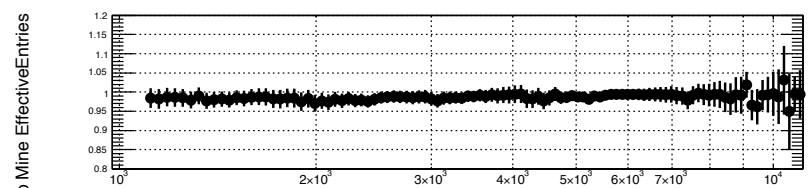
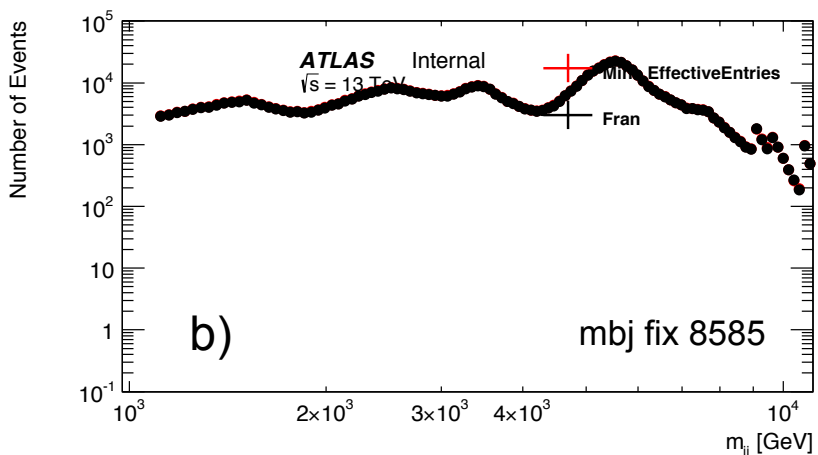
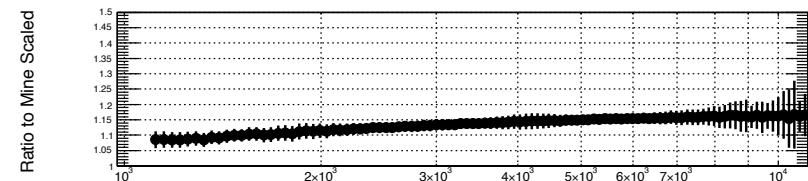
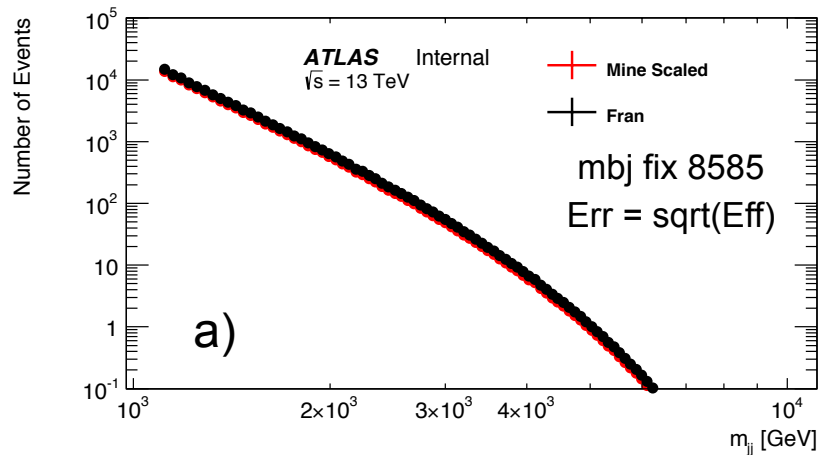




- a) Scaled distributions
- b) Effective entries
- c) Patched Data Like

Both are smooth

Slight difference in two scaled distribution.  
- Francesco has ~10% extra events.

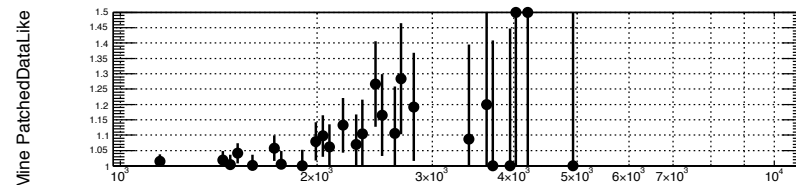
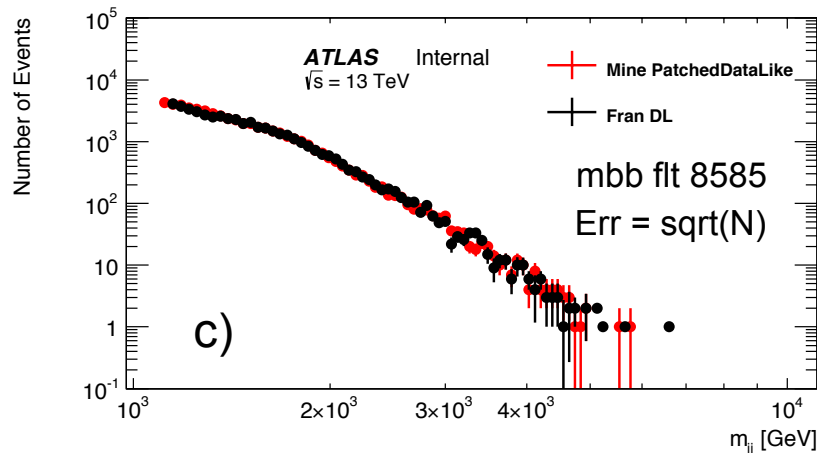
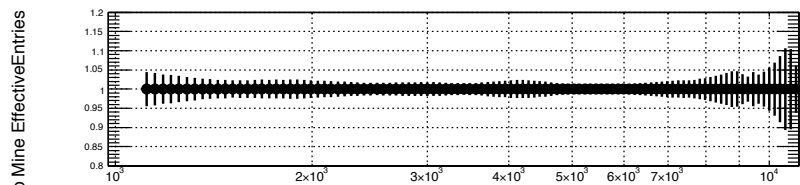
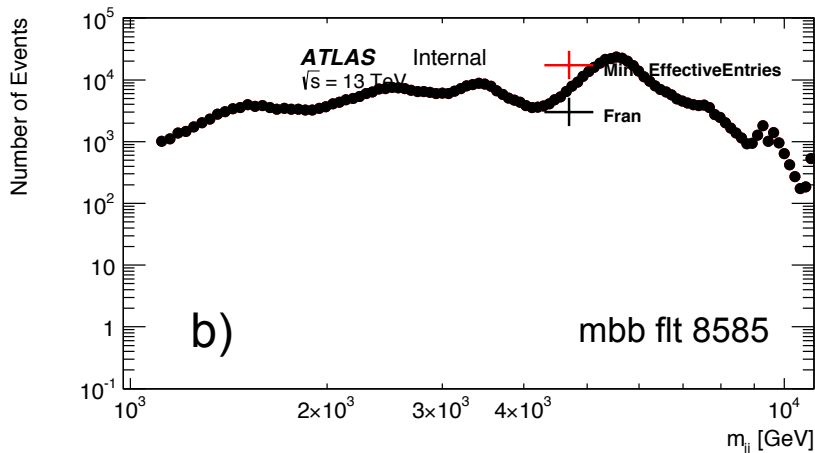
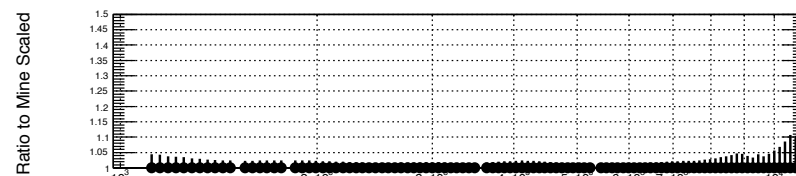
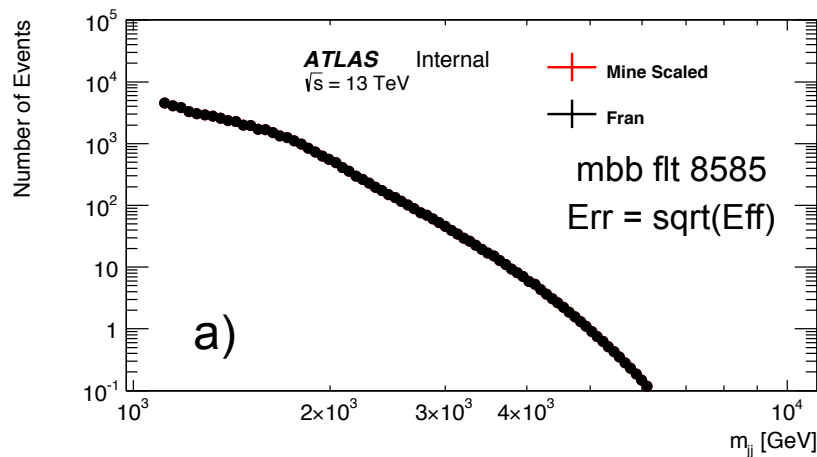




- a) Scaled distributions
- b) Effective entries
- c) Patched Data Like

Identical plots!

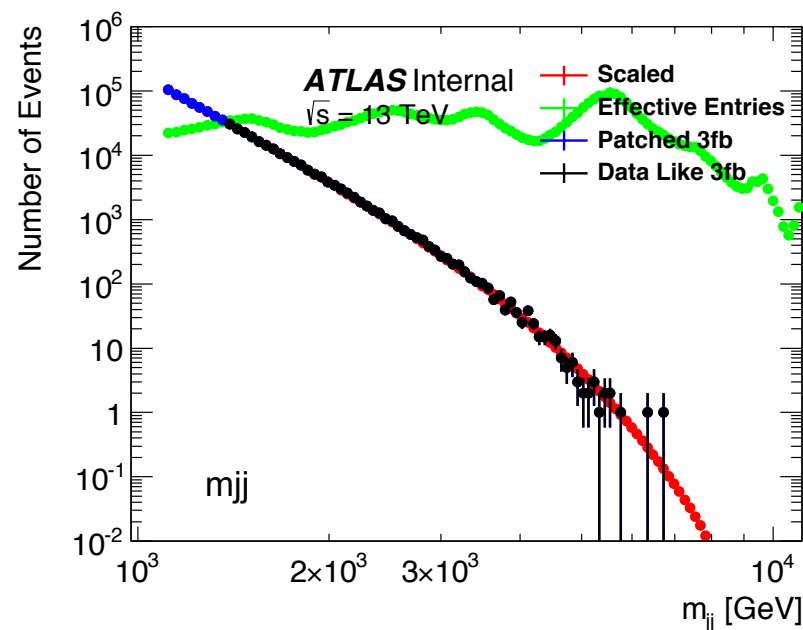
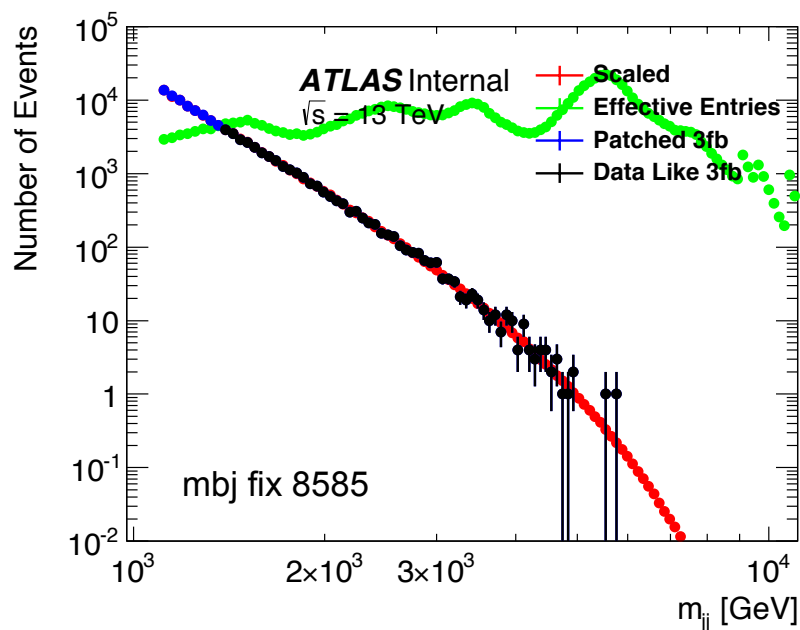
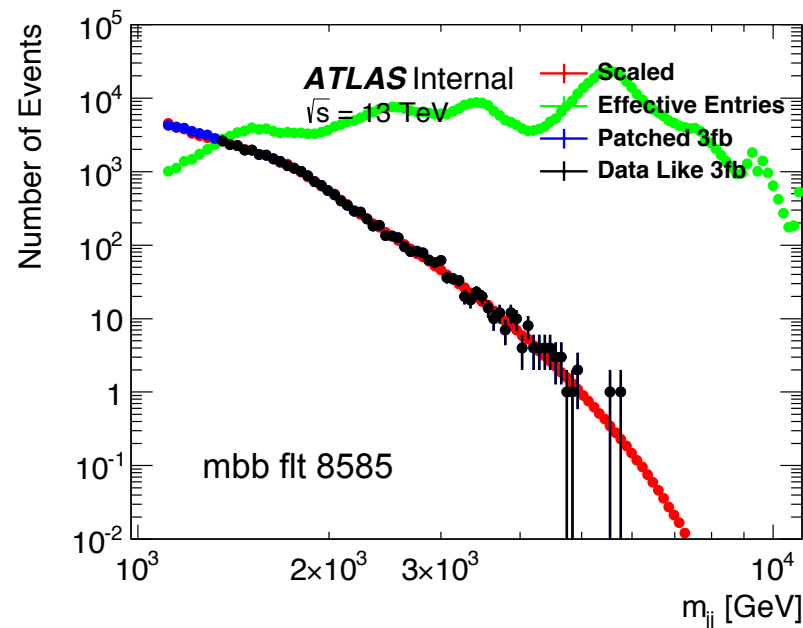
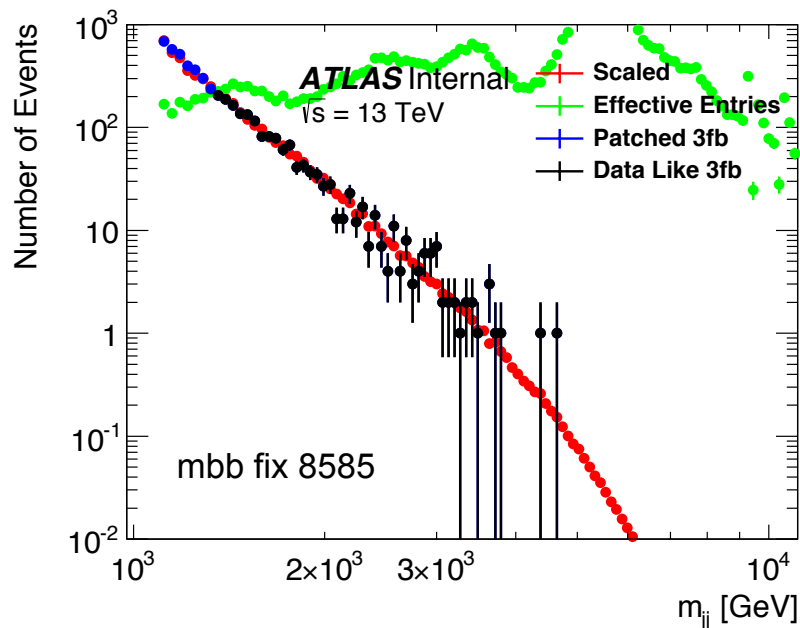
Broad peak @ 1.2-2.2 TeV  
- seen by both of us





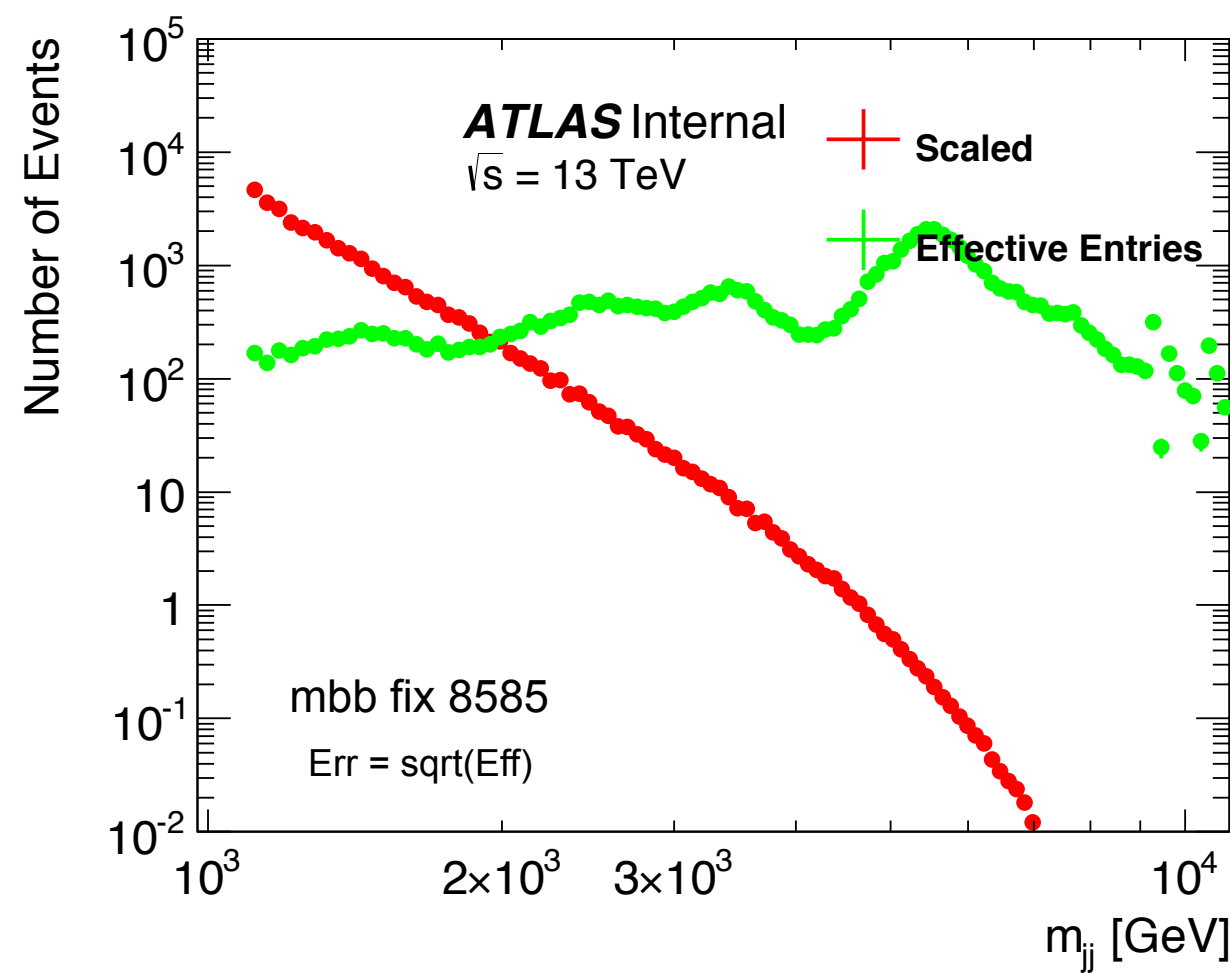


## 9 Look at m<sub>jj</sub> spectra





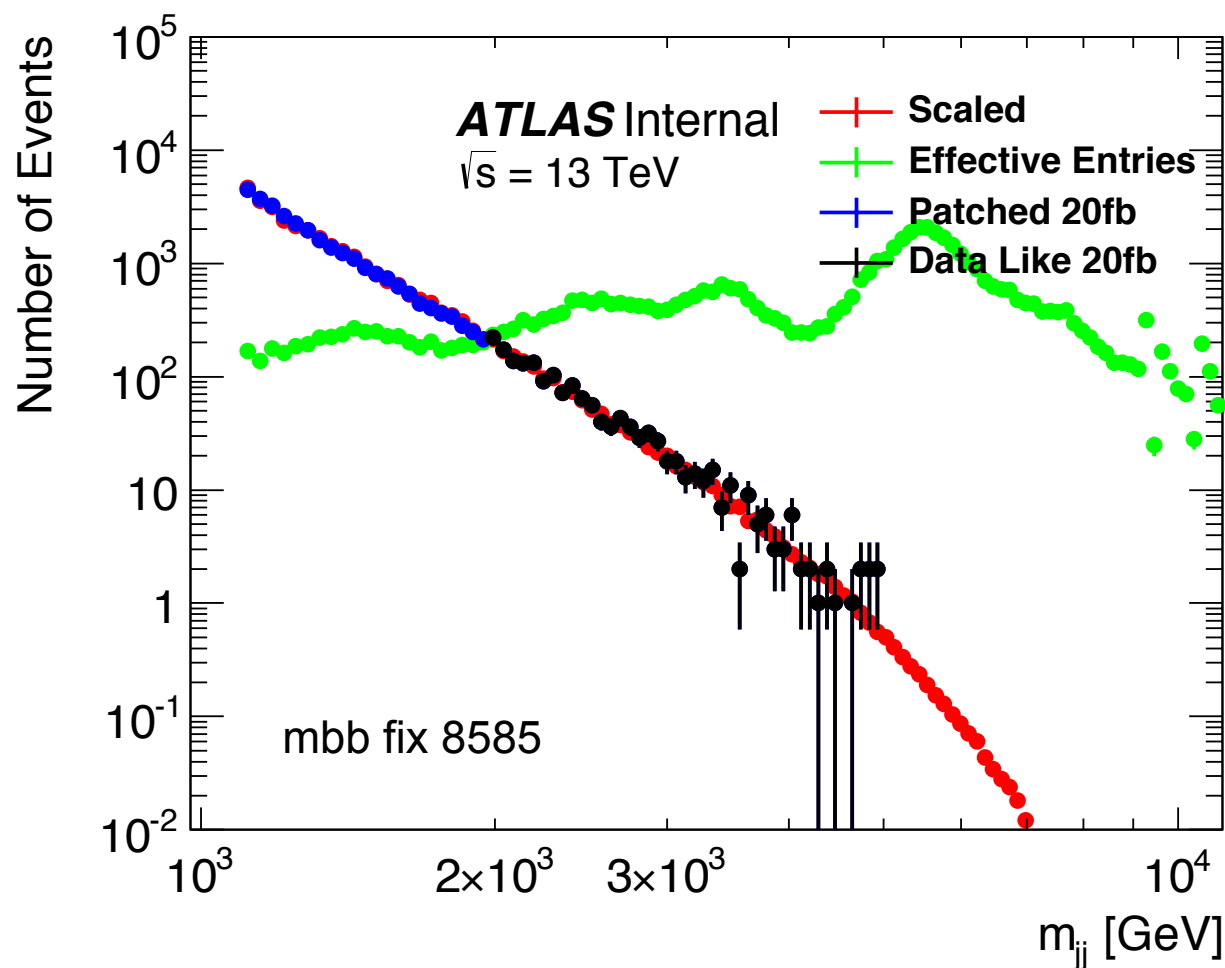
Are the fluctuations in the mbb spectrum within errors?





Are the fluctuations in the mbb spectrum within errors?

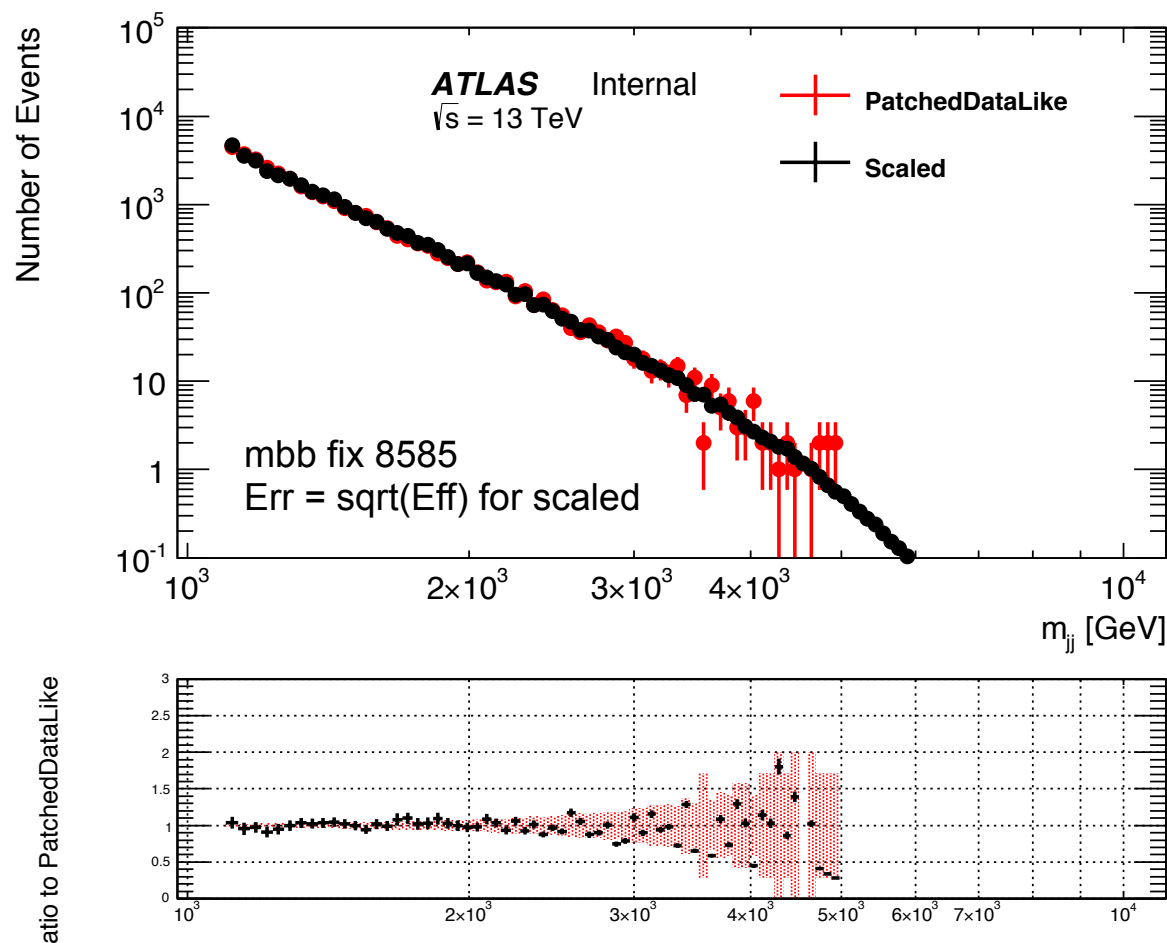
Try and use patched as a proxy to true position.





Let's try!!

- Ratio plot at bottom shows scaled divided by patched data like
- Errors of the two are close to accounting for fluctuations
- To be clear these are not poisson like errors for scaled, instead  $\sqrt{\text{eff. entries}}$

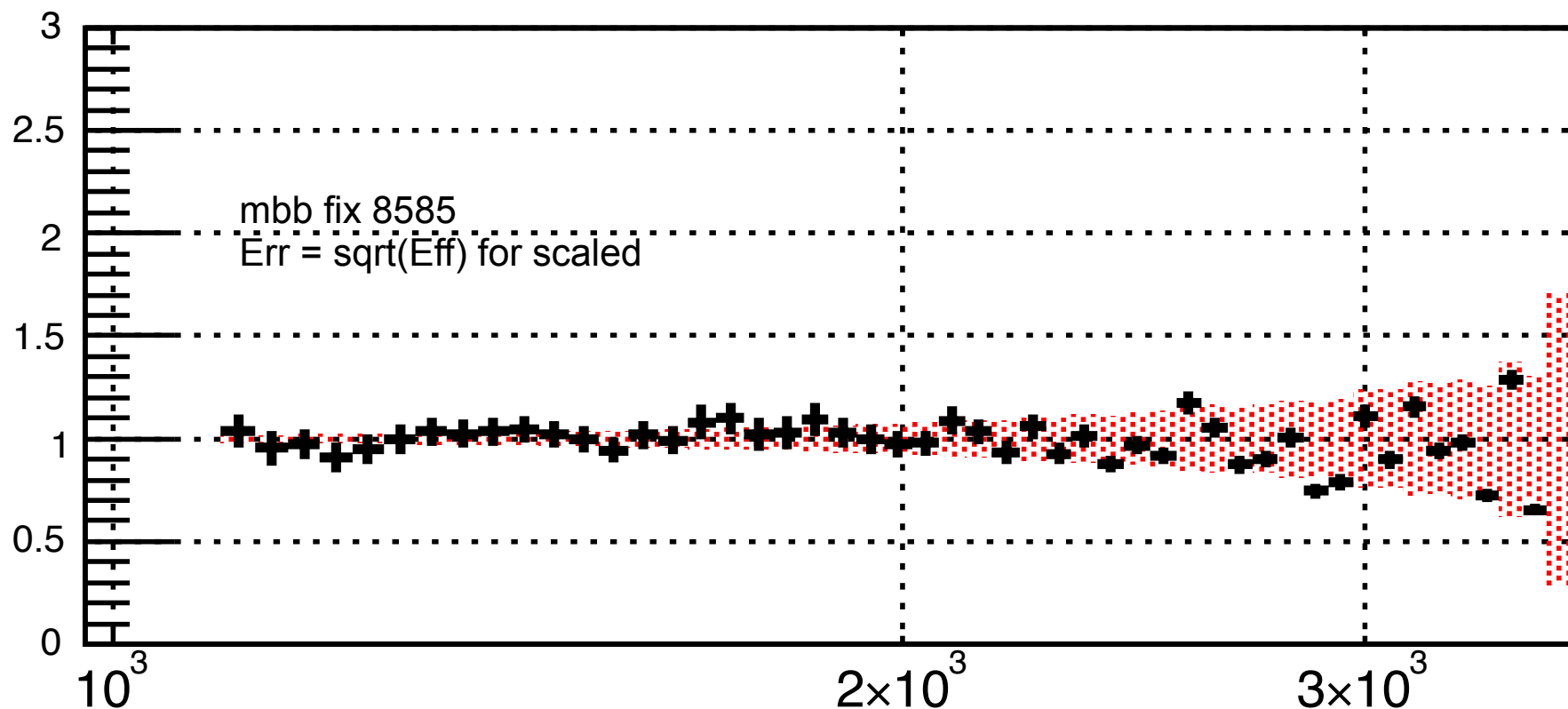




Zoom in on ratio plot, errors are approximately size of fluctuations.

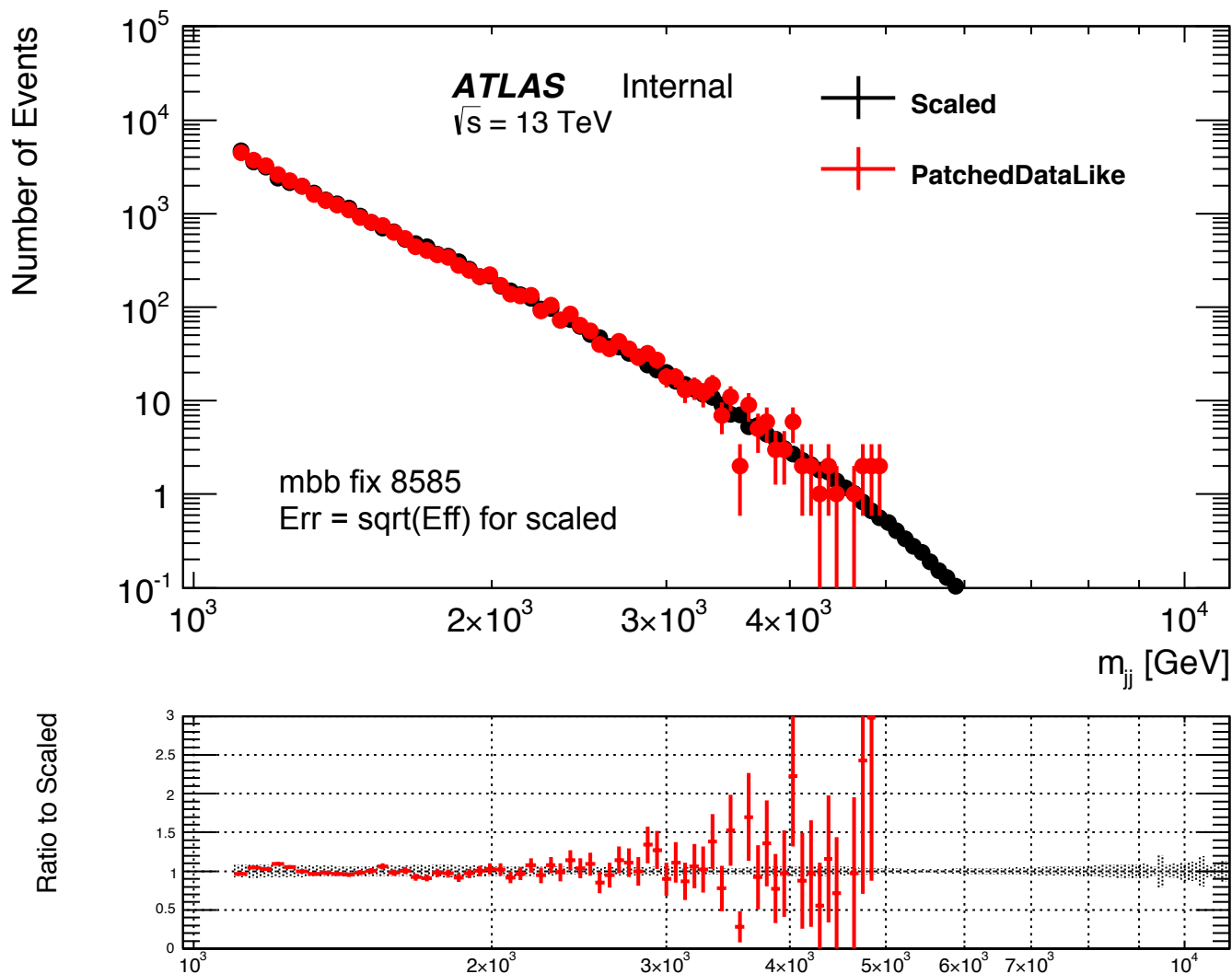
=> Here errors are relatively large as effective entries are less than scaled distribution

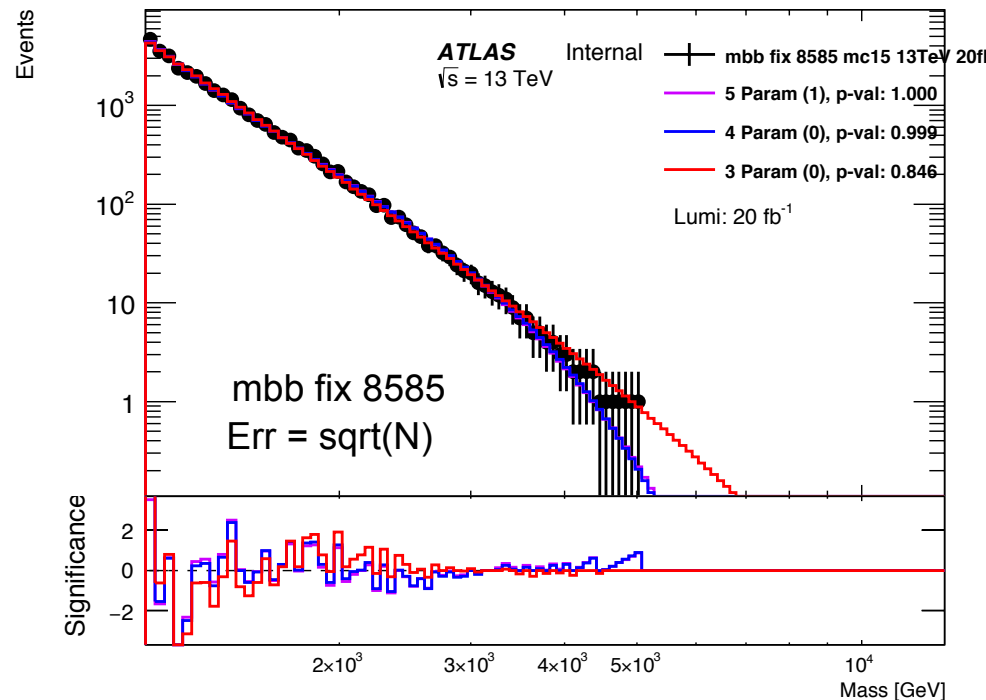
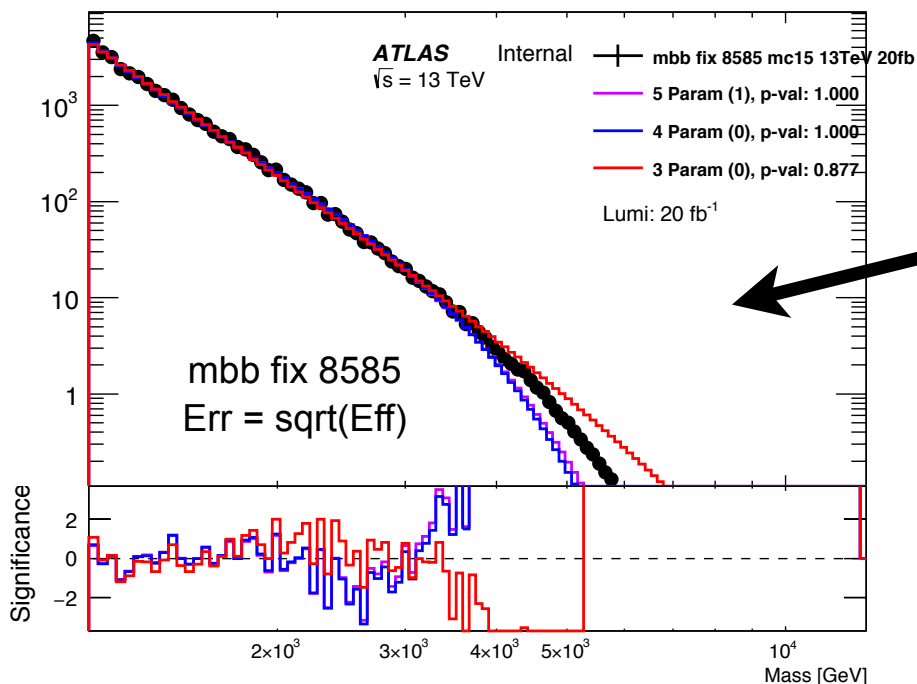
### Scaled divided by patched like





Other way around, patched divided by scaled in ratio!





This is our replacement to original plot on slide 3

Compared to slide 3 it has:

=> Better errors

=> Updated MC

It is not “smooth” like slide 3 is, which means it is not rounded to integer values  
- but this doesn’t matter in low mass region where we saw discrepancy.



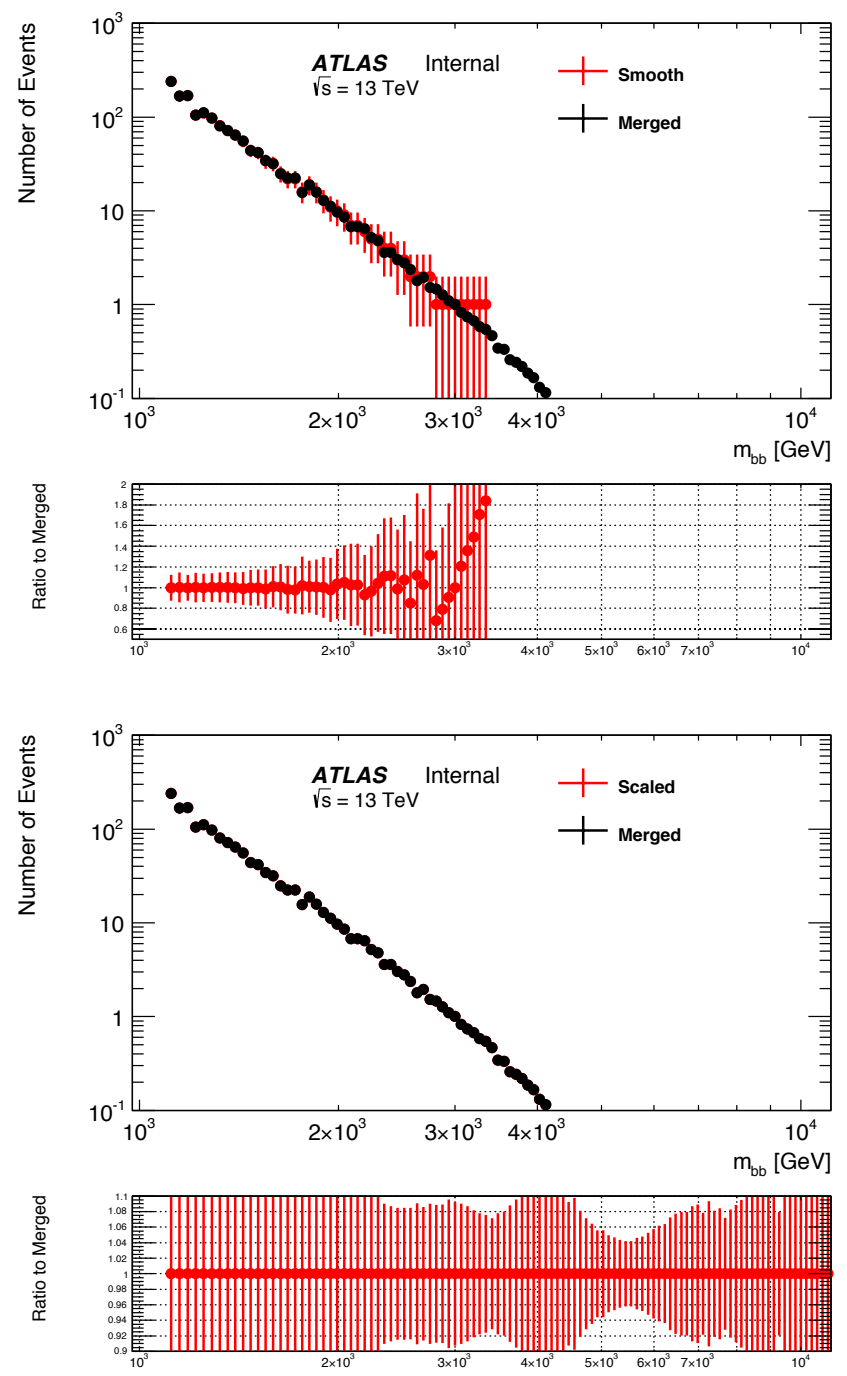
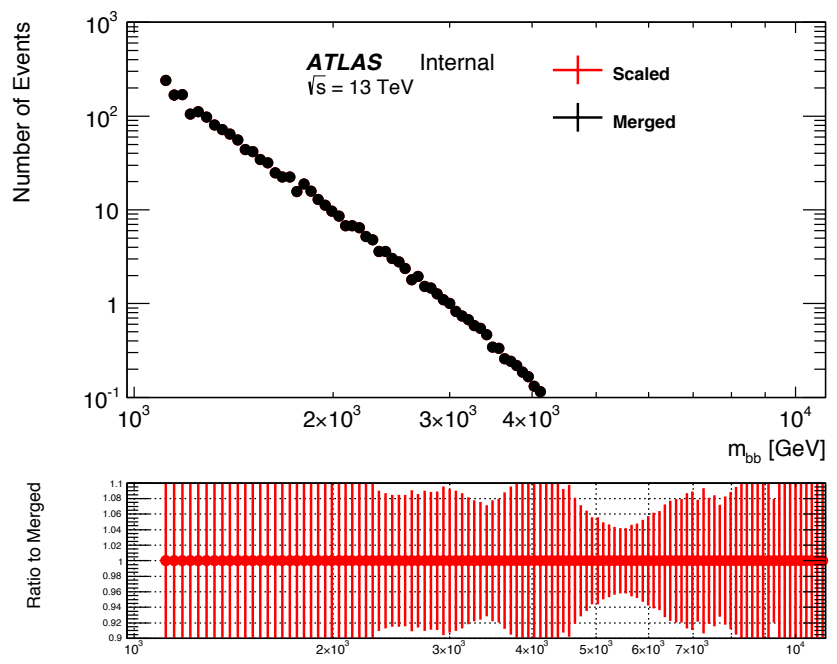
- I want to see errors on this, is it possible that these are just statistical fluctuations?
  - This is in the area where scaled > eff entries
- Want to understand that bin in the scaled.
  - Check no events < 1100 GeV is the way of doing this.
- Other suggestions welcome!

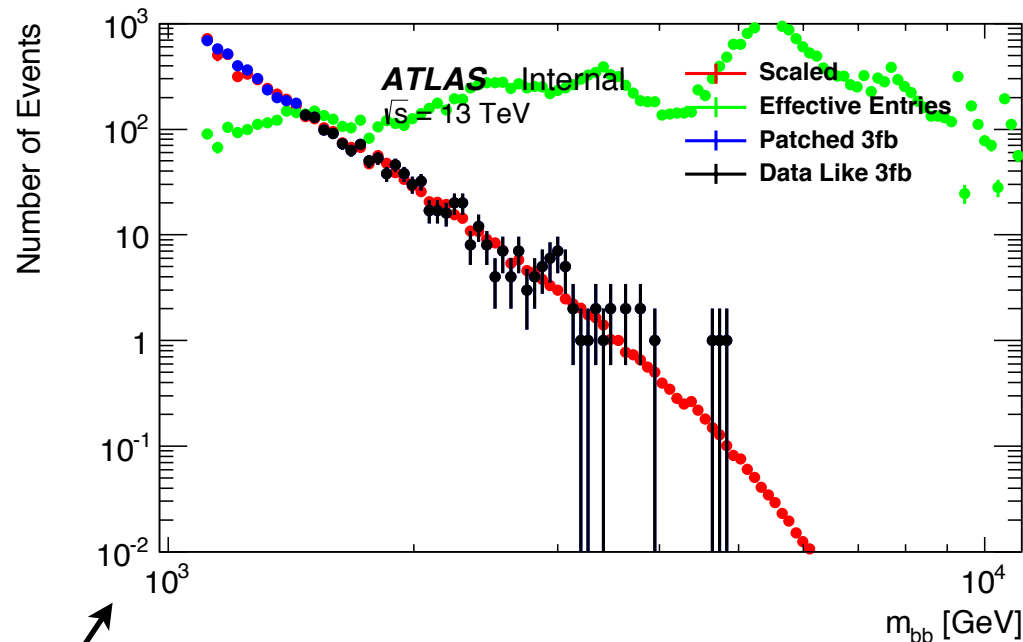
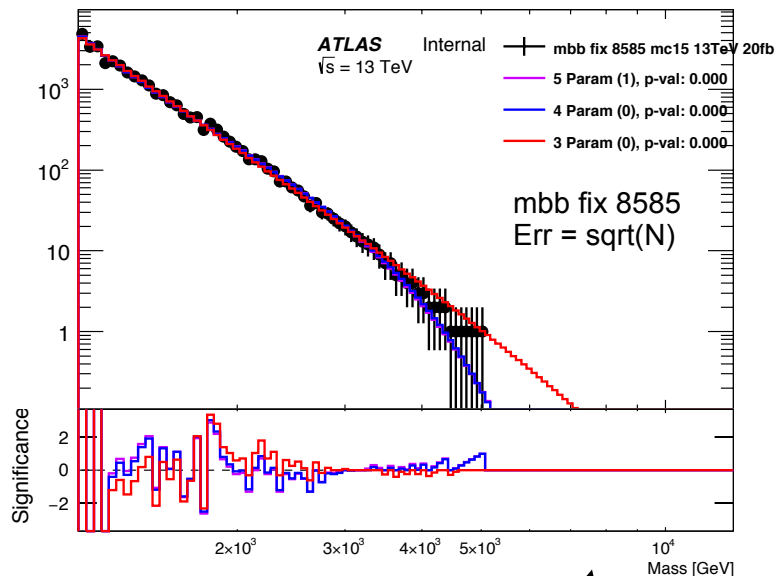


# 17 Data-Like Making Procedure?

All different types of plots show same type of structure...

Not in dataLikeMaking process!





1) Fit to 20fb Smooth

2) Create Patched Data-Like Plot

3) Fit to Patched Data-Like Spectrum

