



Flavour Composition and Spurious Signal

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Di-bjet (non)-Meet

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Last time:

- Studied flavour composition of offline b-tagging only - (*slide 3*)
- Performed some spurious signal checks - (*slide 4*)

Problems:

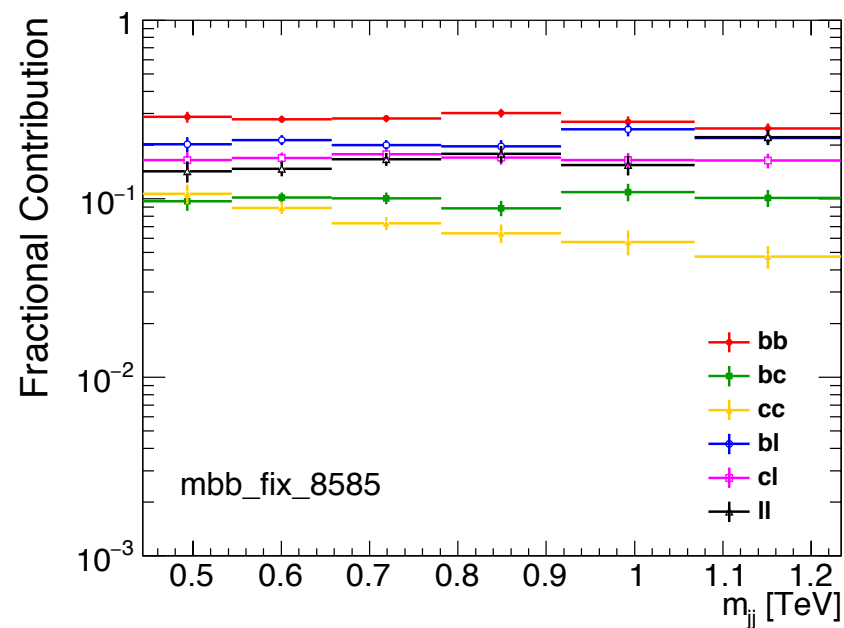
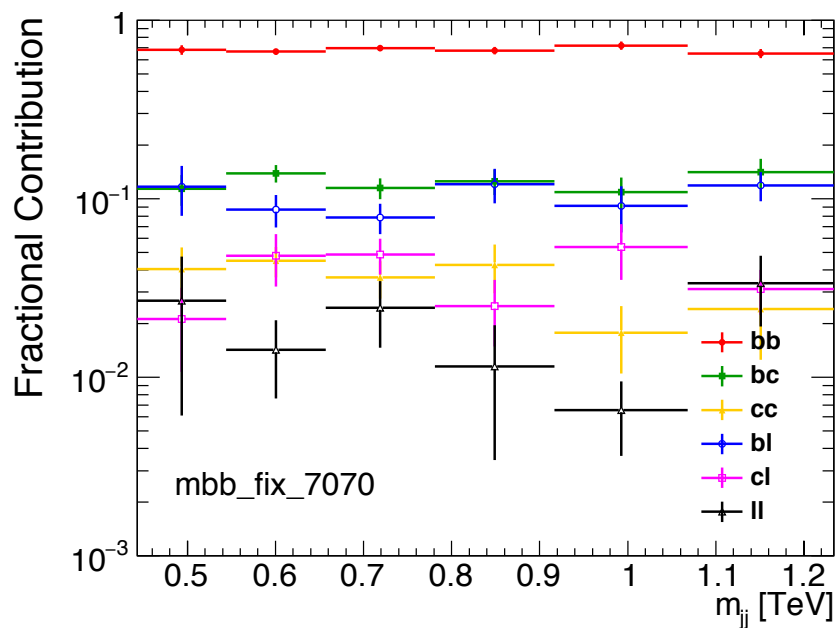
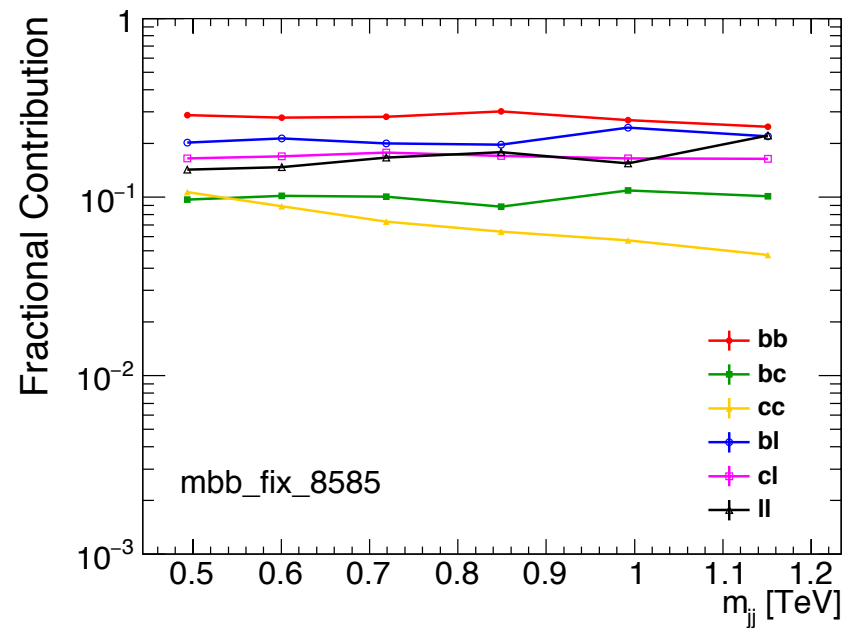
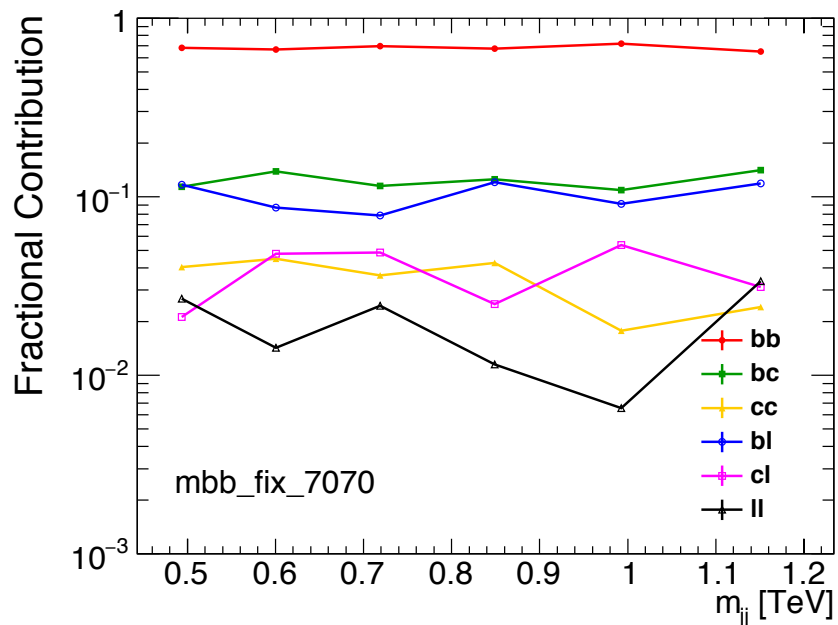
- For flavour composition, not considered effect of online b-tagging on c/l-jets
- For spurious signal, effective entries are smaller than scaled distribution
 - Hence, MC errors > poisson errors.
 - (*slide 5*)

Event Selection

- **No Trigger**
- **Trigger Eff. Applied**
 - *HLT_j175_bmedium_j60_bmedium*
 - Emulate trigger using bTrig Effs.
 - Histograms from John
 - Same Landau Fits as Karol
- 70% Eff. WP
- Leading jet $p_T > 200$ GeV, $|\eta| < 2.5$
- Subleading jet $p_T > 80$ GeV, $|\eta| < 2.5$
- $|y^*| < 0.6$
- $500 < m_{jj} < 1200$ GeV

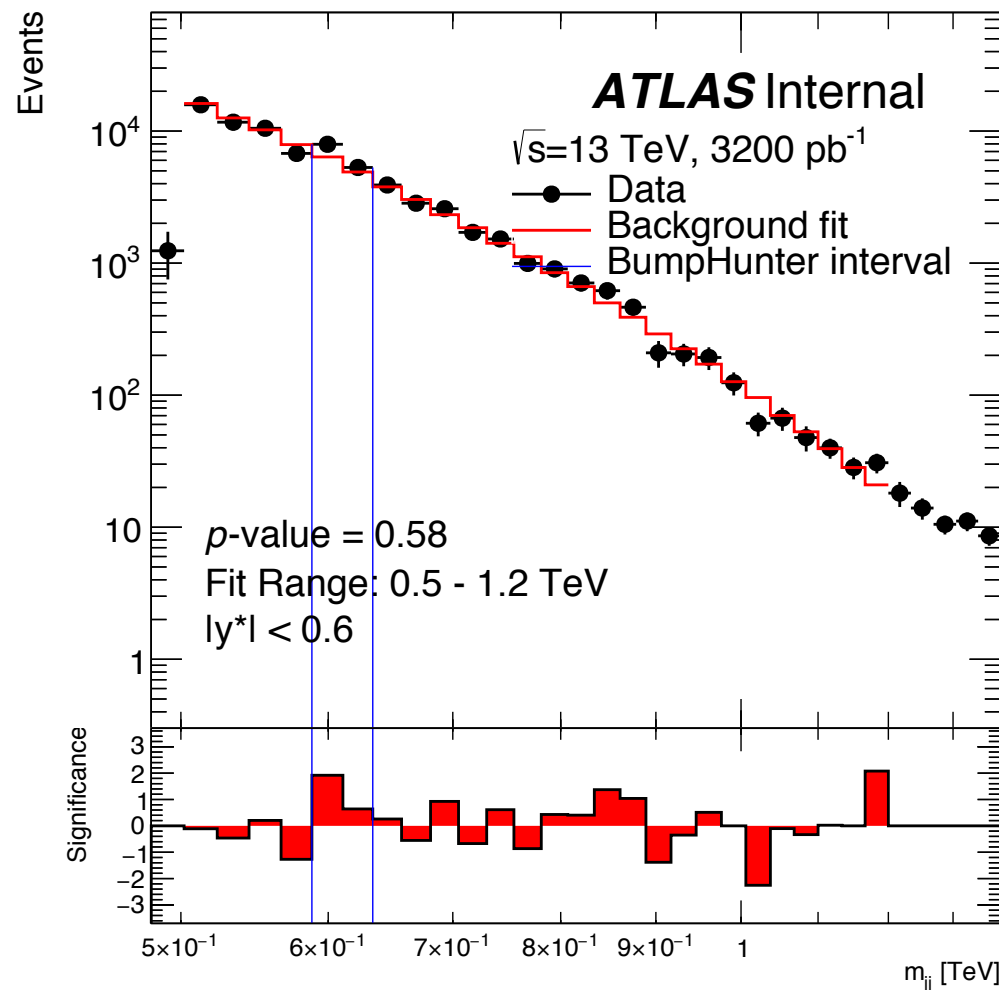
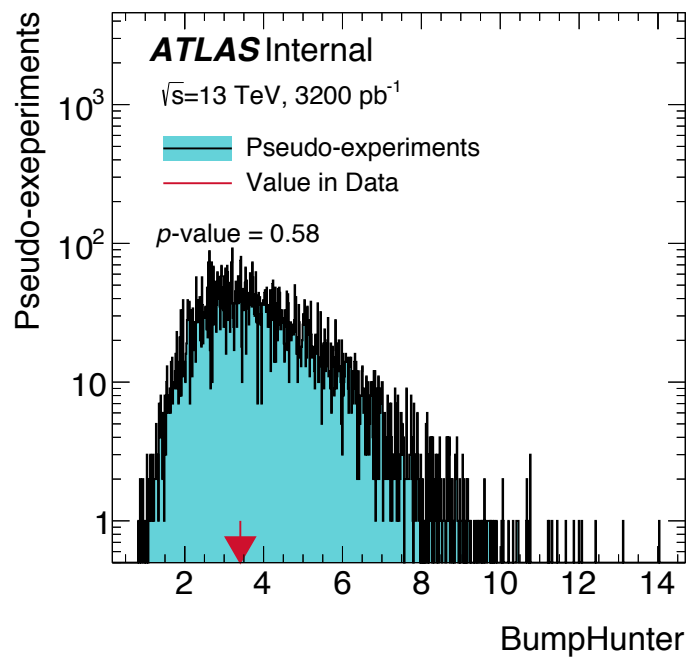
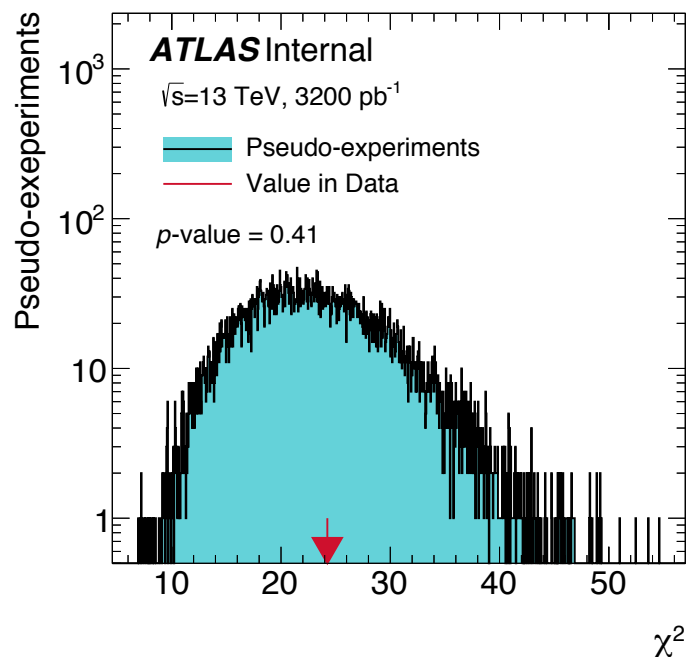


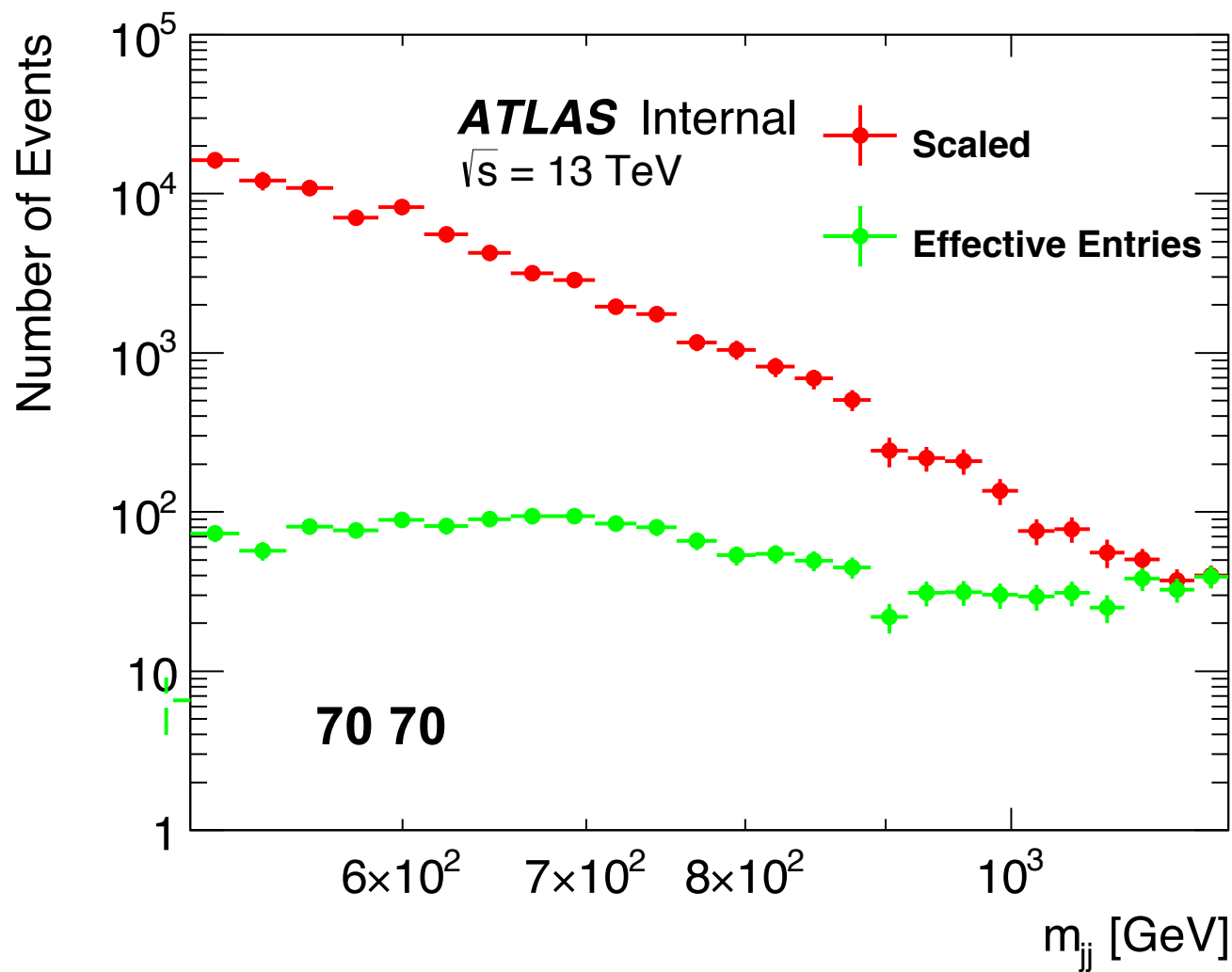
3 Flavour Composition 750 GeV - no Trigger





- Trigger Eff. Applied - Emulate Trigger
- Smooth Landau fit function
- 70% Eff. Point





Scaled > Effective Entries
Thus, MC drives errors

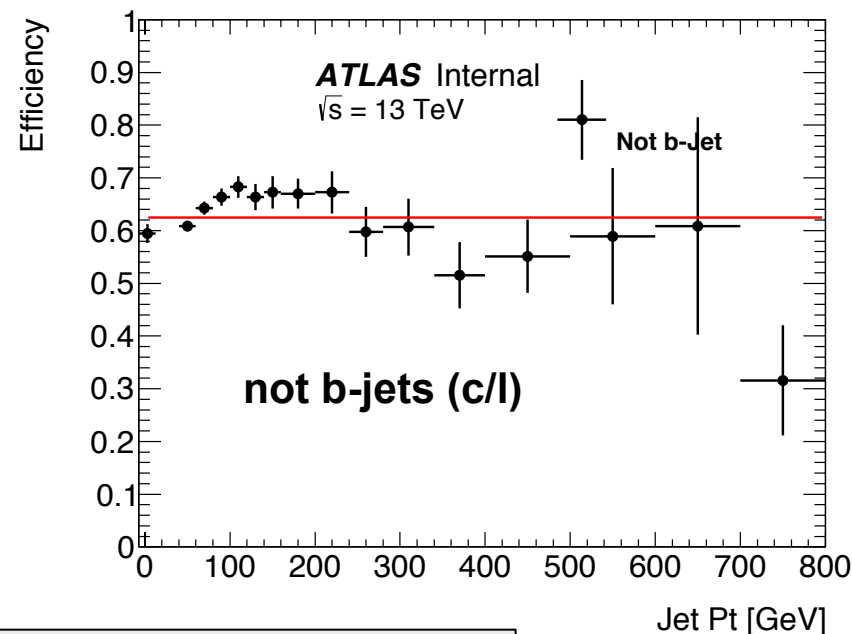
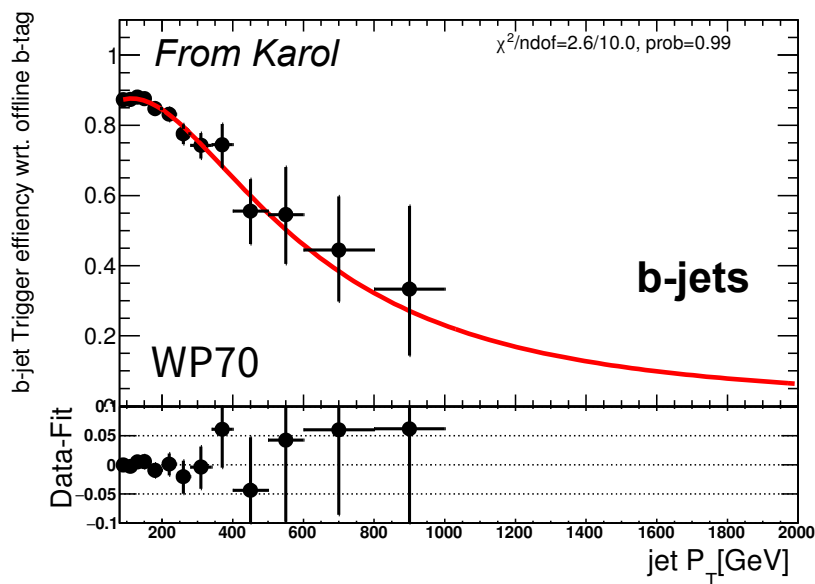


Problem 1:

- For flavour composition, not considered effect of online b-tagging on c/l-jets

We will try:

- Non truth b-jet trigger efficiency measured in fully leptonic ttbar sample
 - These are likely to be gluons
- We can fit to this and use this to estimate non-b-jet online efficiency
- For first iteration fit with flat line



$$\text{X-Jet Trig Eff. wrt offline} = \frac{\# \text{ X-Jets pass offline and online b-tagging}}{\# \text{ X-Jets online b-tagging}}$$



7 Flavour Dependant Trigger Eff.



b-Jet Trigger Eff. Applied

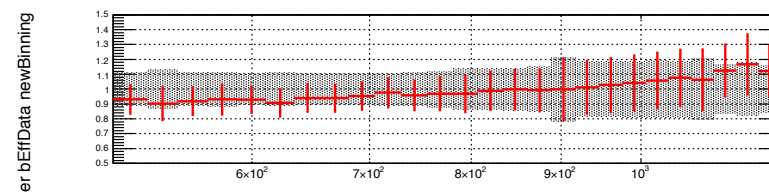
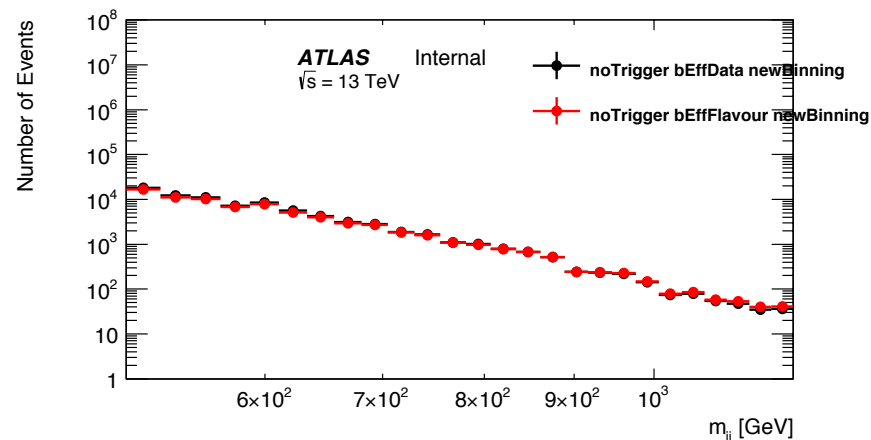
- b-jet trigger efficiency applied to all jets
- As was done before

Flavour Dependant Trigger Eff.

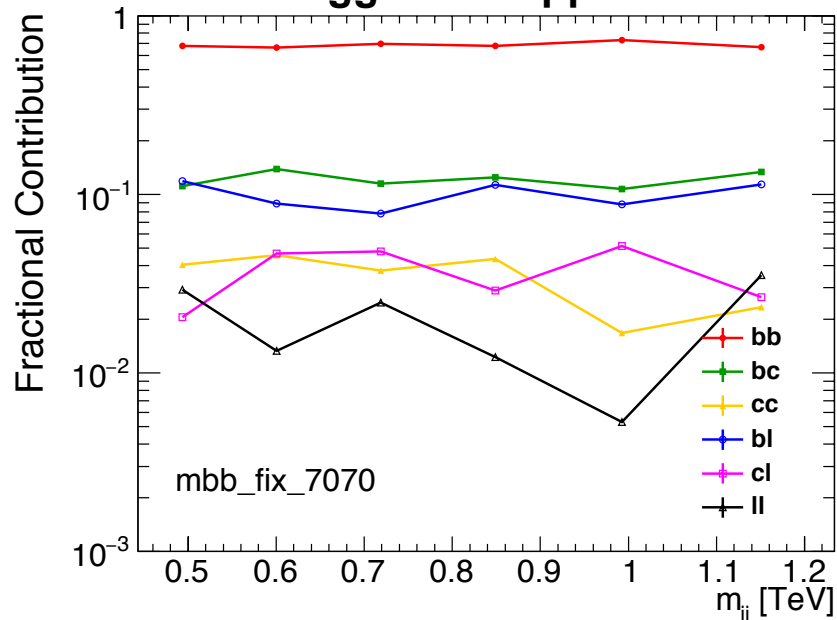
- b-jet trigger eff. applied to b-jets
- Not b-jet trigger eff. applied to not b-jets

Doesn't really change too much!

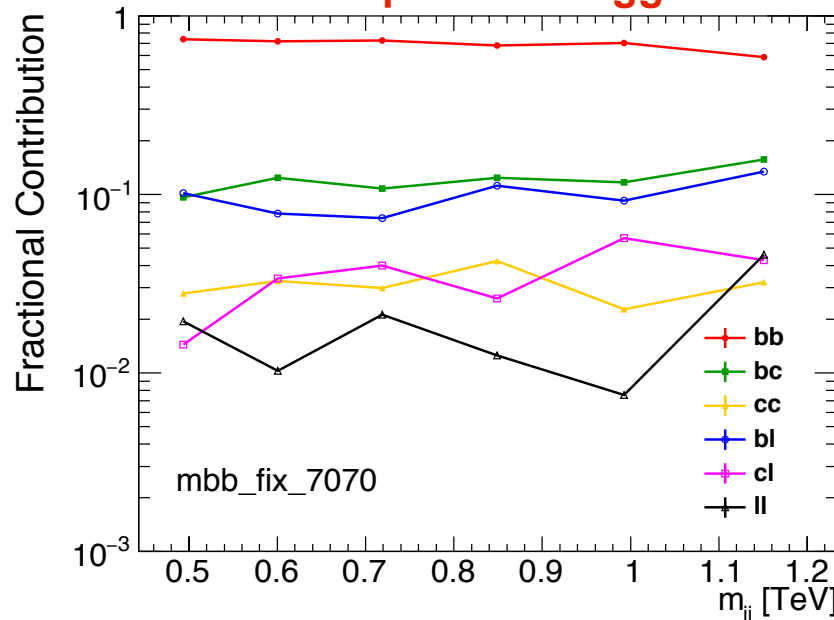
- Still smooth



b-Jet Trigger Eff. Applied



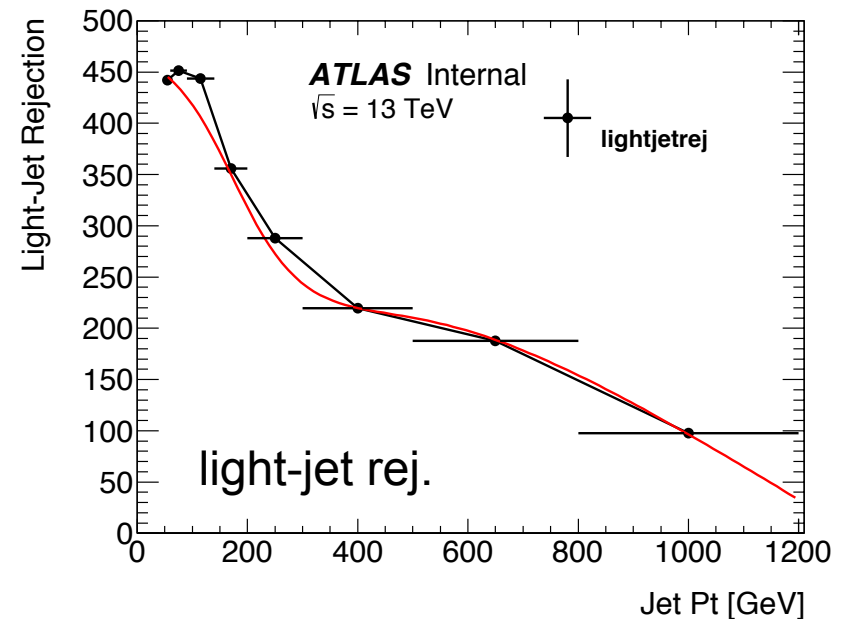
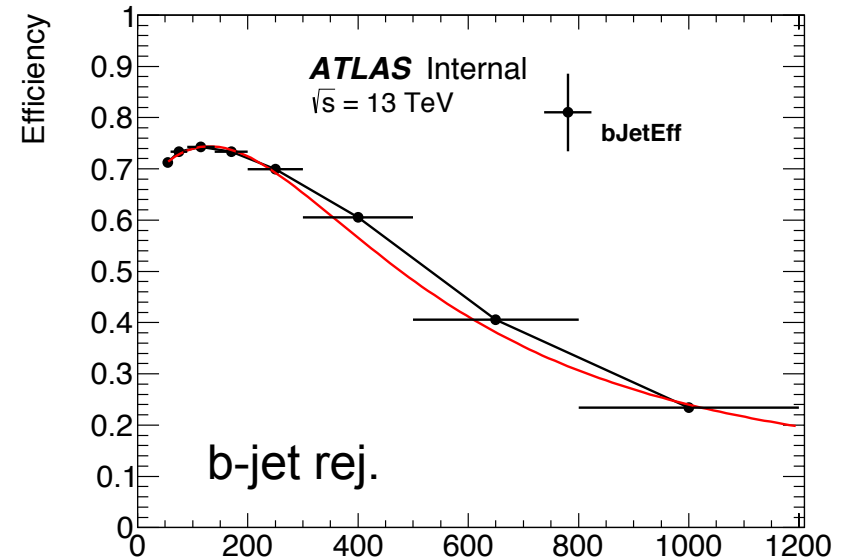
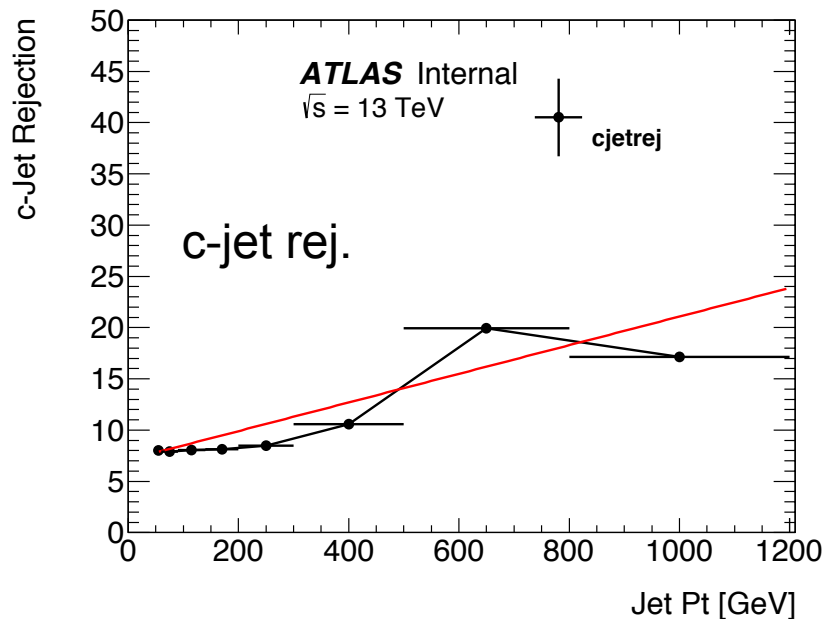
Flavour Dependant Trigger Eff.



Problem 2: For spurious signal, eff. entries < scaled dist. => MC drives errors

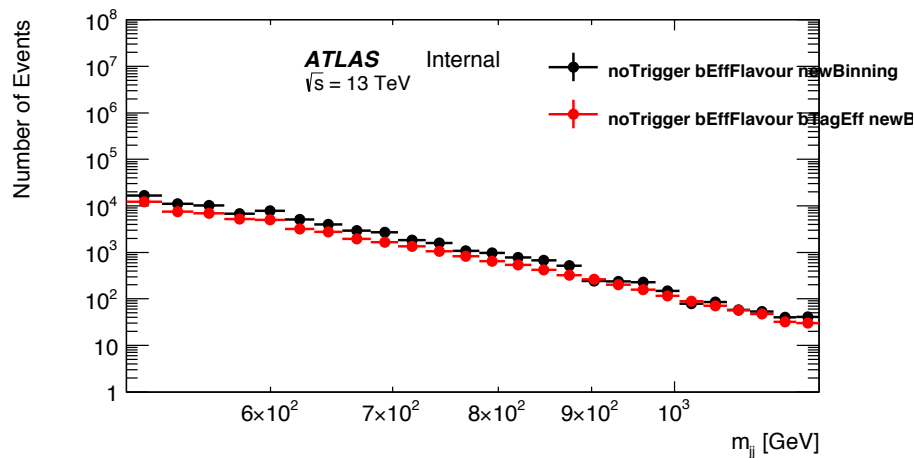
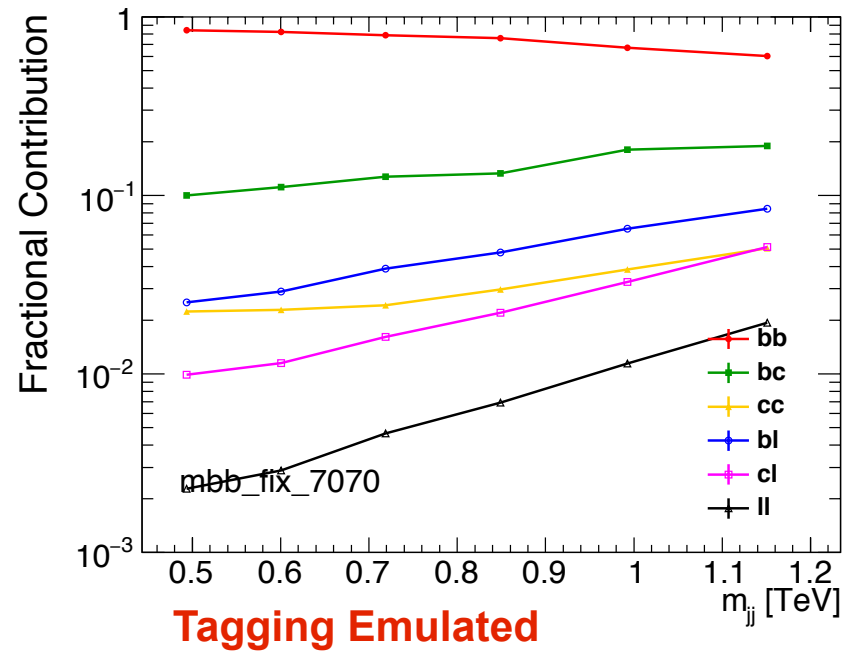
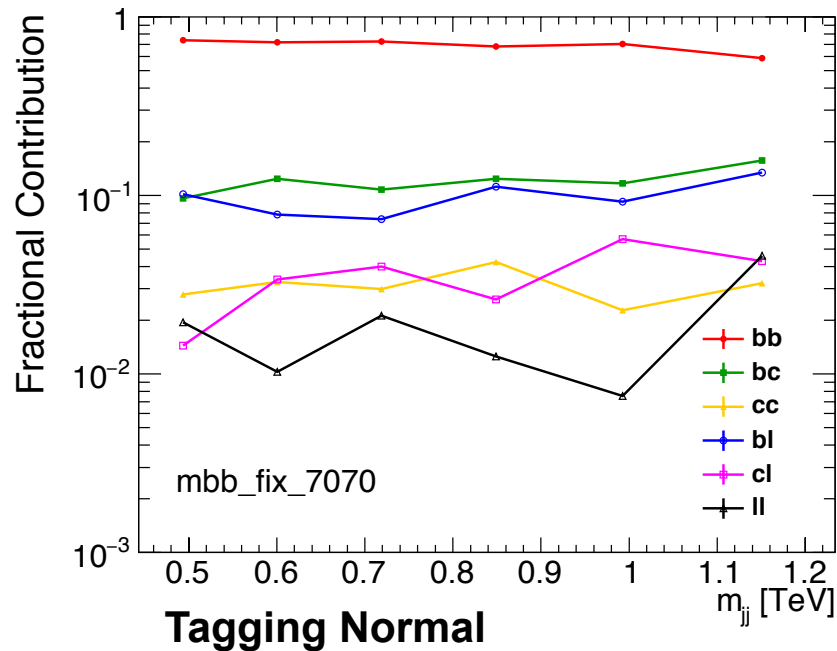
We will try:

- Don't tag, this throws away stats.
- Instead reweight jets by tagging efficiency
 - Flavour dependant
- Efficiencies taken from ttbar event
 - (*Moriond note: Appendix G*)
- Fit to these
 - (*fits are not perfect*)

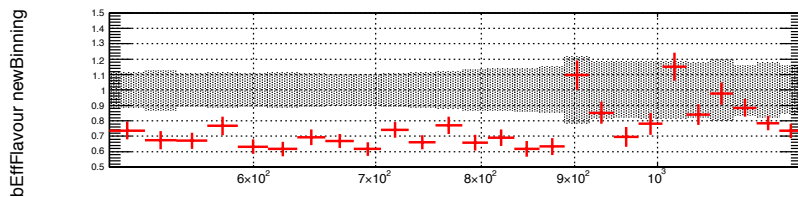


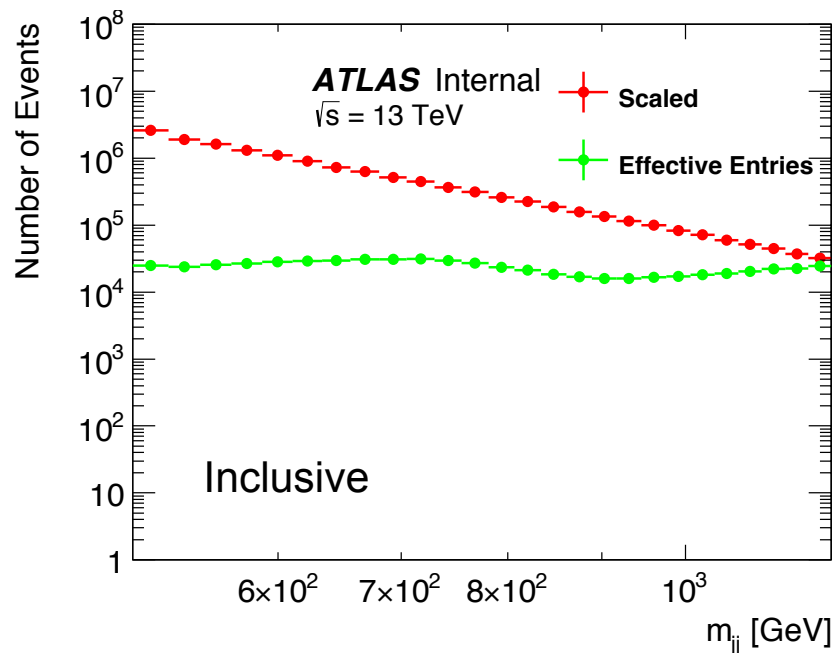
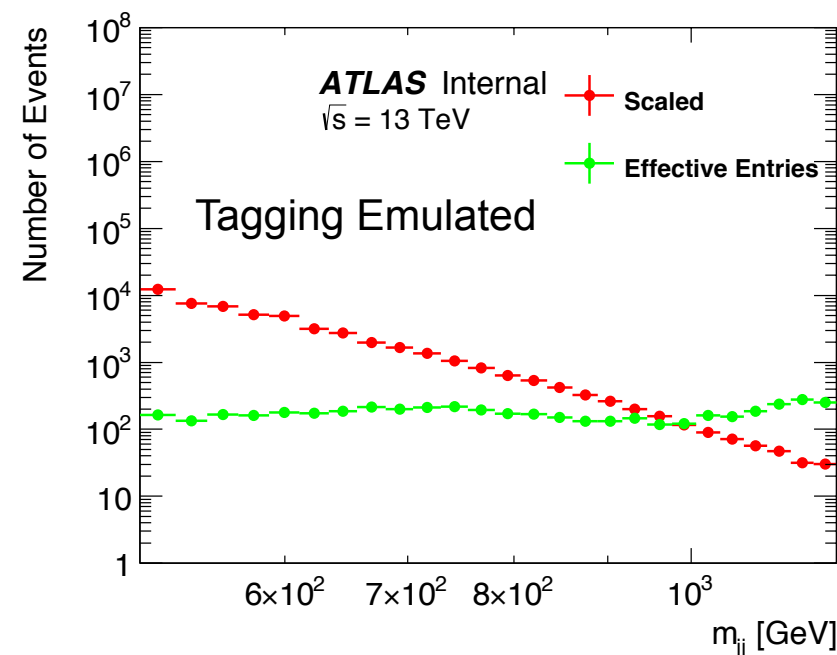
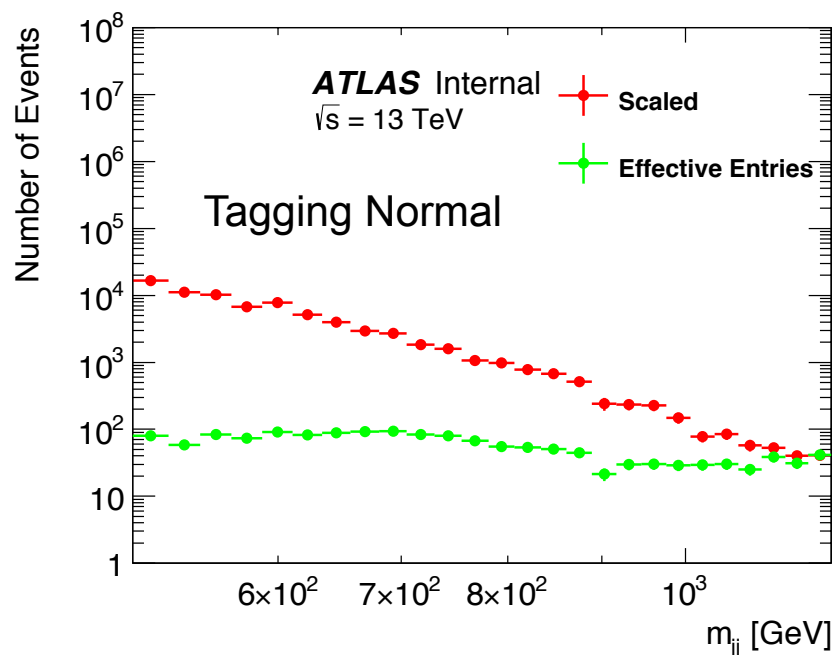


9 Flavour Composition and M_{jj} Spectrum



- **Emulated** not matching **Normal**
- Could improve
 - Play with fits - (*Particularly light*)
 - Include eta dependant eff.s





- Gain in effective entries is small
 - Sum of weights dominated by bb
 - This is because bb has largest weights
 - I think N_{bb} limits us!
- I don't think this is worth continuing
- Another possibility to try:
 - Find average weight per m_{jj} bin
 - Reweight all events by this
 - Not flavour dependant
 - Need a think...

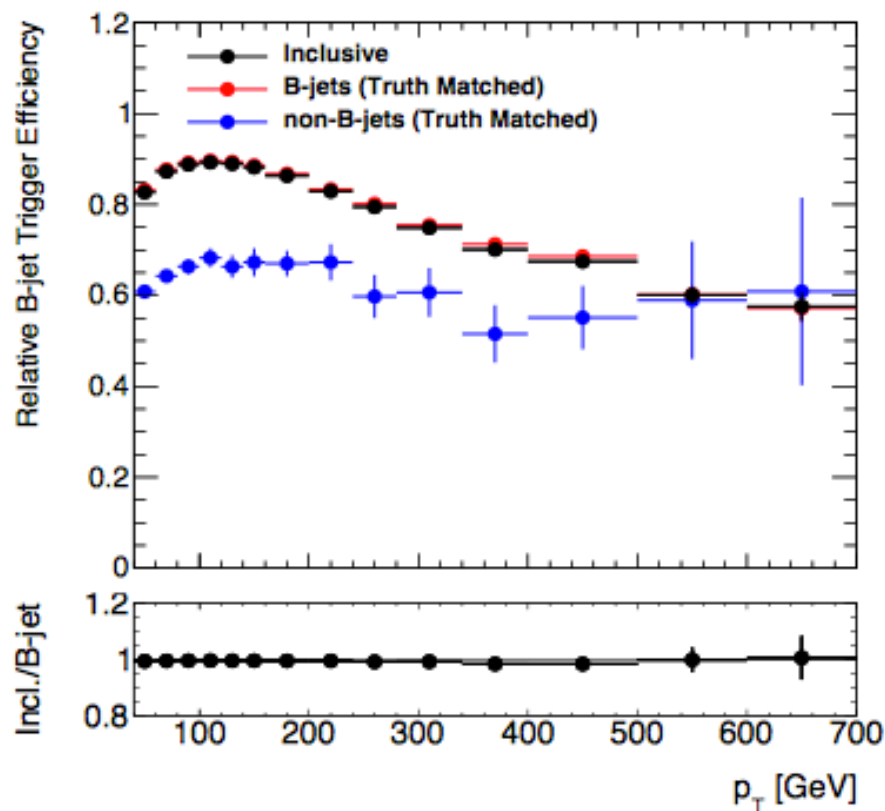


UCL

Backup



- Study online tagging's effect on flavour composition
- From John we have an estimate online efficiencies w.r.t offline for non-B jets

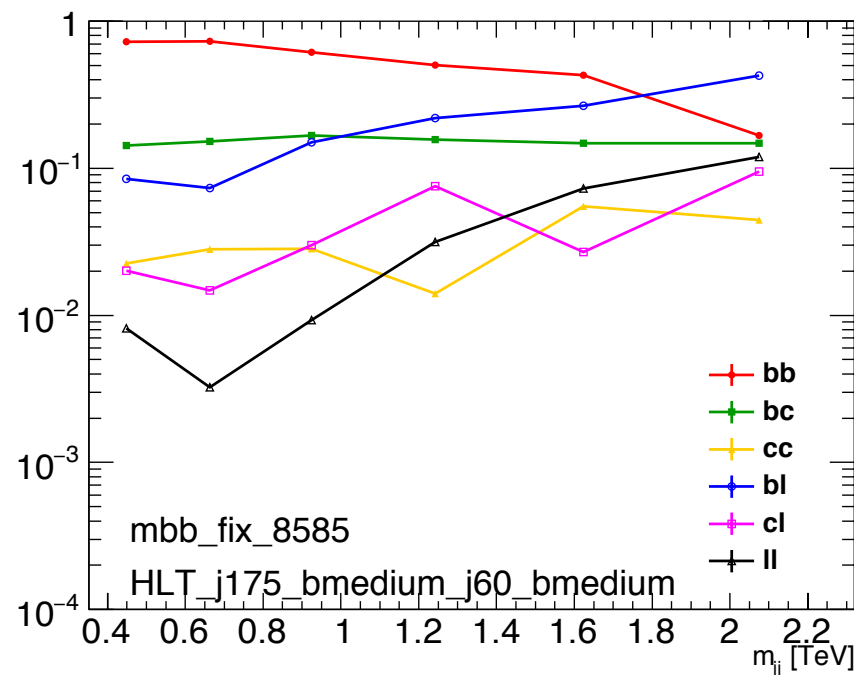
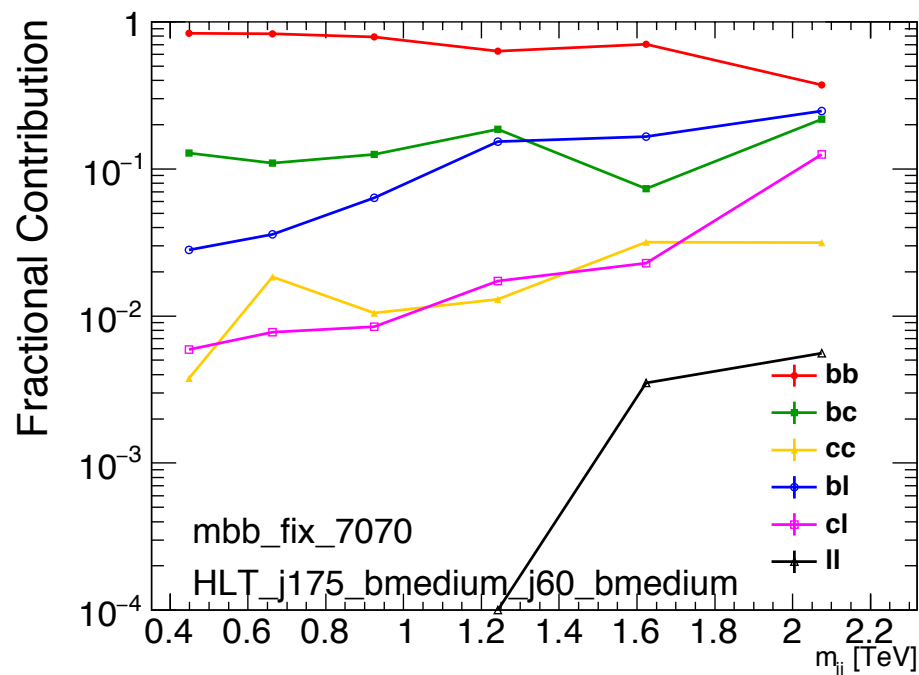


- Apply this to non-B jets to emulate effect of online trigger on flavour fraction

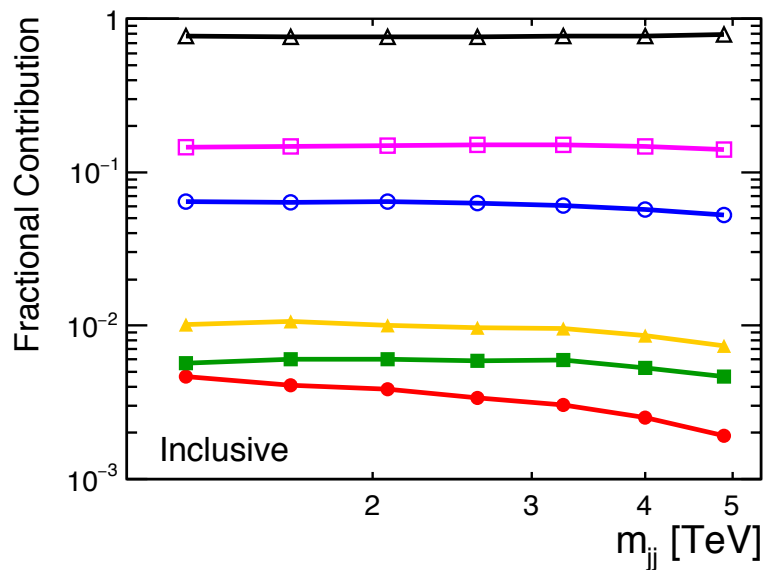


- HLT_j175_bmedium_j60_bmedium
- Leading jet $p_T > 200$ GeV, $|\eta| < 2.5$
- Subleading jet $p_T > 80$ GeV, $|\eta| < 2.5$
- $|y^*| < 0.6$

- No Trigger Eff. Applied
- 70% / 85% Eff. Point



- Dominant bb contribution
- Different Trigger WP in MC and Data

**ATLAS** Simulation $\sqrt{s} = 13$ TeV