Spurious Signal - Check on S+B Fit

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Dibjet Meet

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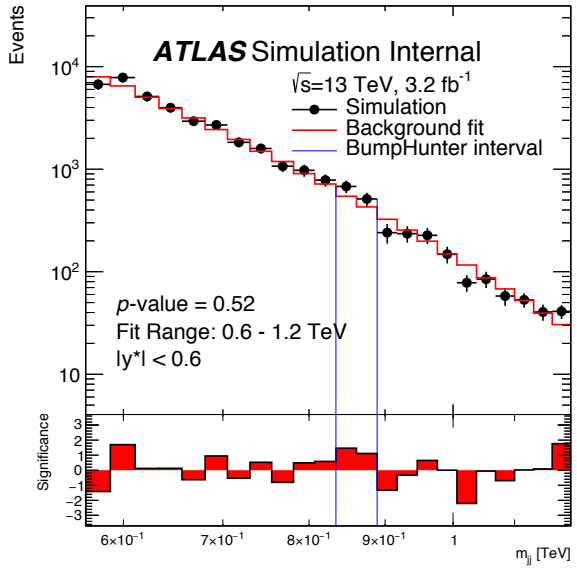
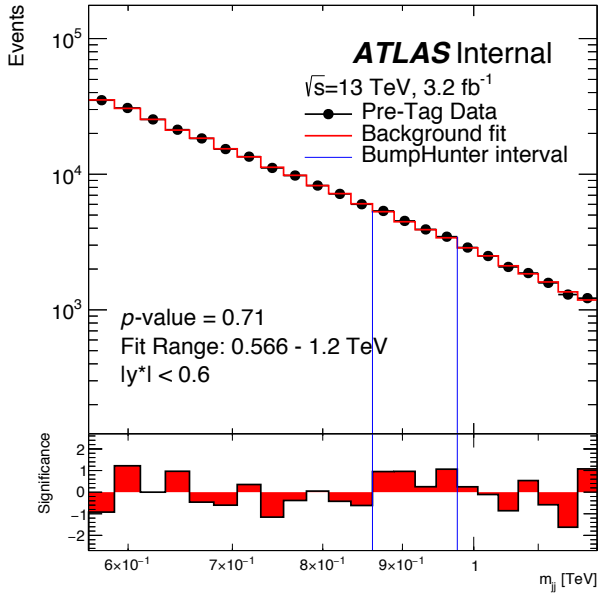
- **Spurious Signal**
  - Shape discrepancies between fit and bkgr. only
  - Done tests on MC and trigger only data
  - No large discrepancies seen in background only
  - pValues: Trigger only data = 0.71, MC = 0.52
  - No spurious signal in background only data

- **S+B Fit**
  - Comment from Koji:

‘ l.304 / More relevant is spurious signal from signal+background fit to the background-only data (or MC) for limit setting. Has this been considered? '

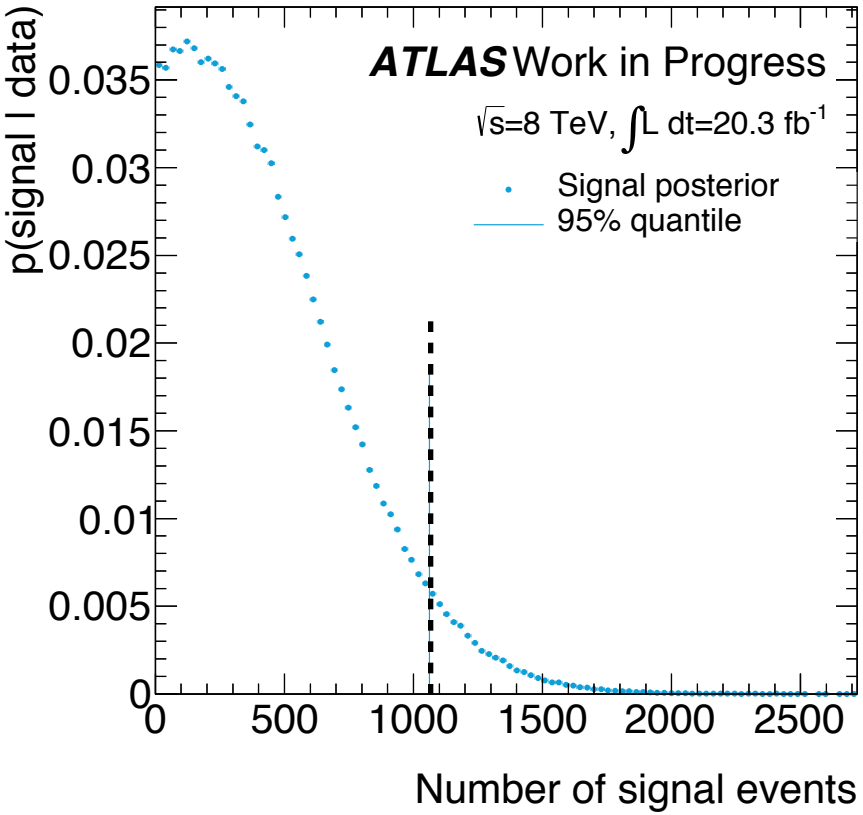
  - S+B fit performed in limit setting procedure.
  - Can we probe this?





S+B Fit

- **Signal + Background fit performed in Limit setting**
  - Floating background and signal normalisation
  - Other nuisance parameters appear here
  - Likelihood distribution can be found for each mass point.
    - From this distribution 95% C.L limit can be found



K. Pachal - Chapter 9

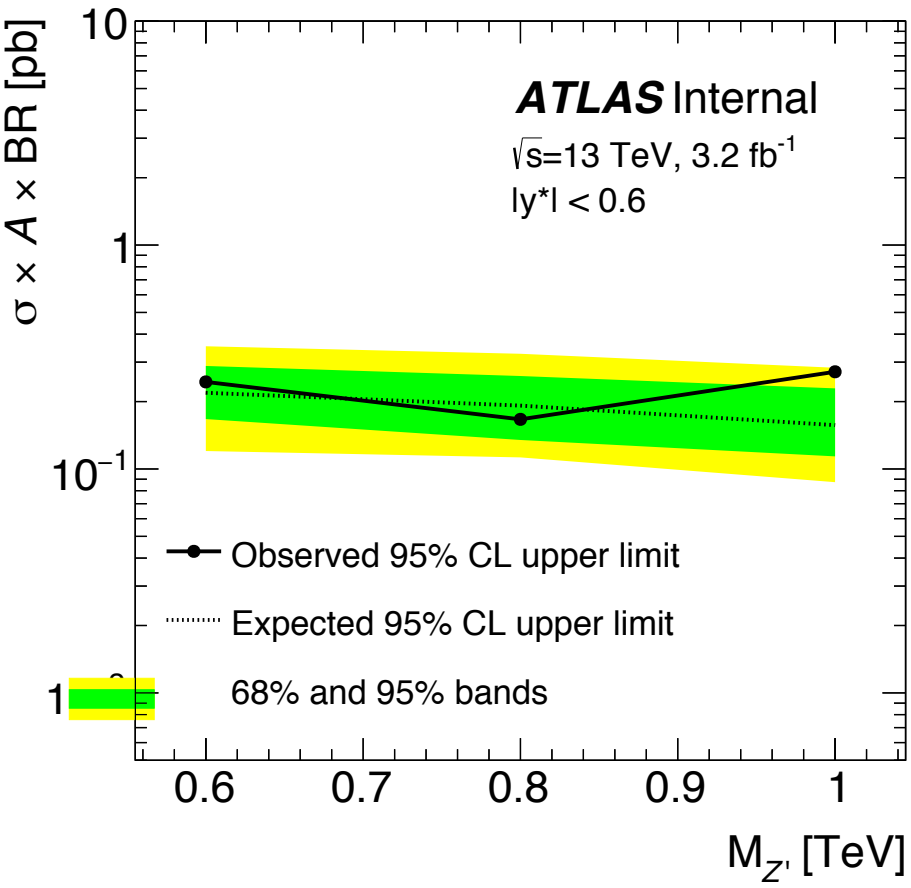
- **Spurious Signal**
  - Real signal, spurious signal and stats could cause fluctuations in data.
  - Up/down fluctuations morph the shape
  - We get more aggressive/conservative limits depending on fluctuations

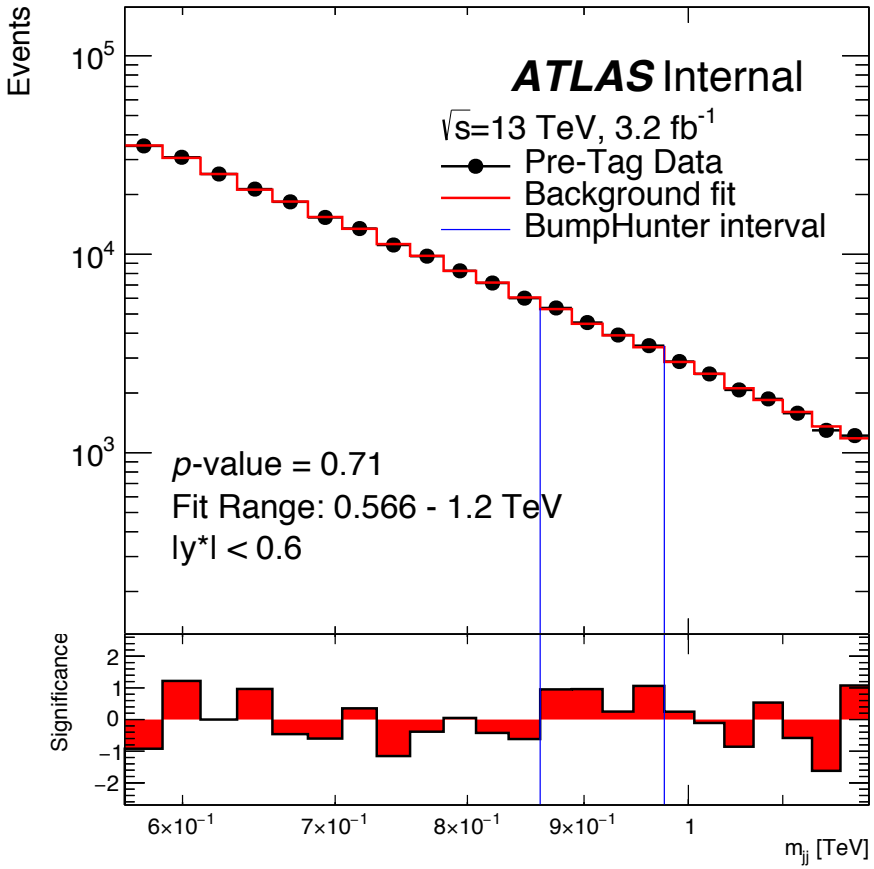
- **Expected Limits**
  - Limits taken from many pseudo-experiments thrown from fit.
  - These give distribution of expected limits
  - No fit bias in expected limits
  - So we can compare observed to expected

Statistics: Spurious Signal - Trigger Data

- **Data:** Trigger but no offline tagging
- **Signal:** Z' bb post-tag

- **Hence, these are not real limits!!!!!!**
- No systematics!
- But we can compare exp. to obs.

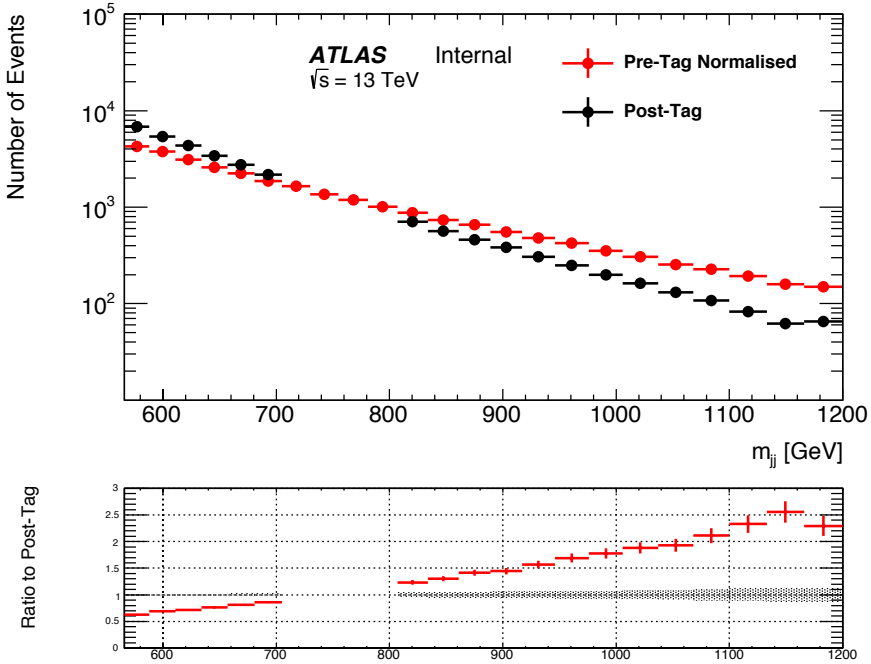


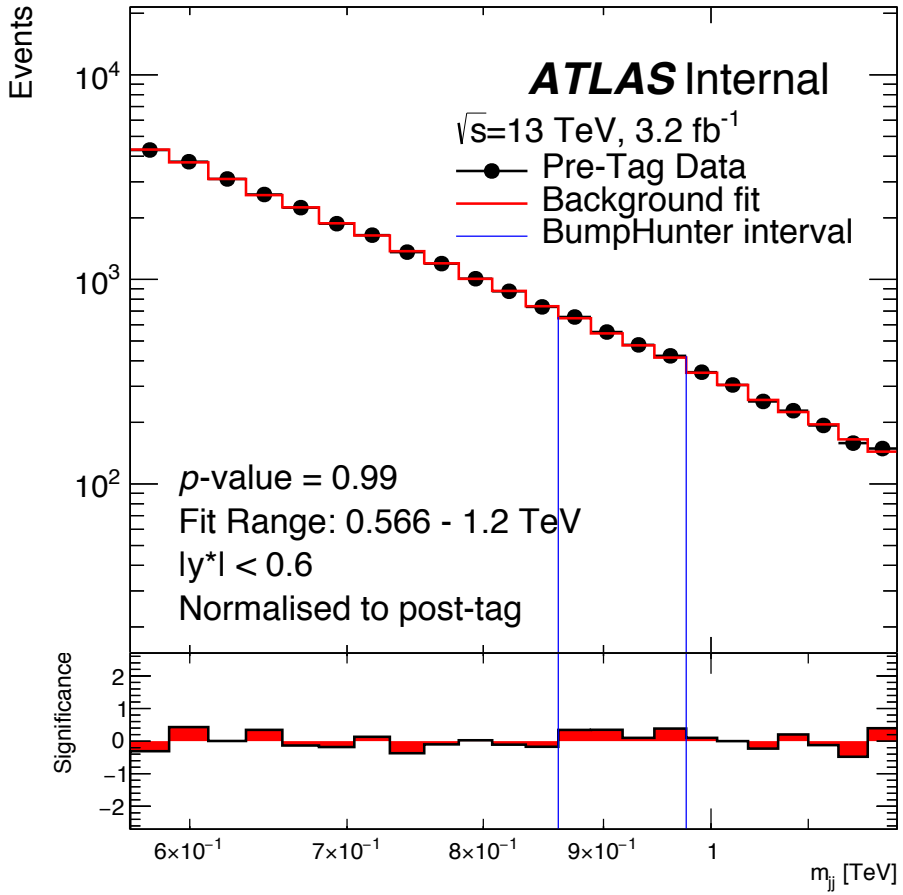


- Expected matches observed within statistical fluctuations
- This is consisted with what we found in spurious signal test

Spurious Signal: Scaled Down

- **Scale Pre-Tag to Post-Tag**
  - Actual Fluctuations in Data
    ~ 1/sqrt($N_{Pre\text{-}Tag}$)
  - Toys for p-value fluctuations
    ~ 1/sqrt($N_{Post\text{-}Tag}$) {Larger fluctuations}
  - Fit and search for bumps





We see that at post-tag scale:

fit discrepancies <<
poisson fluctuations of post-tag

99% of toys have **worse** fit

Statistics: Spurious Signal - Trigger Data Norm

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  - Normalised to post-tag scale
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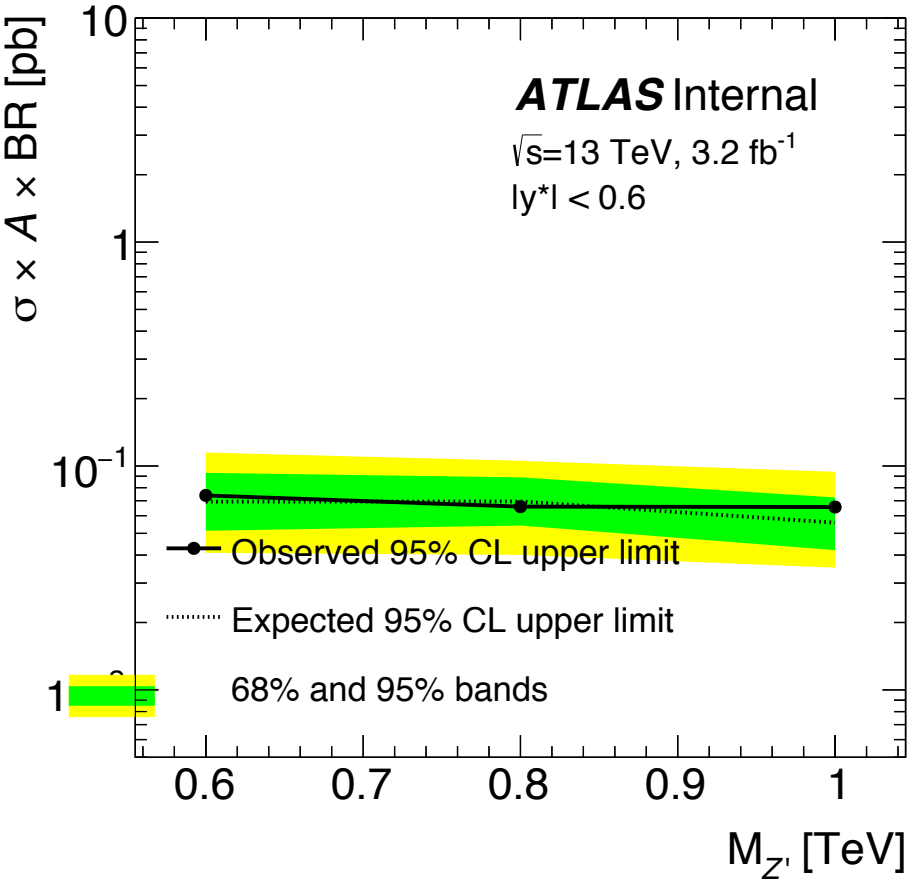

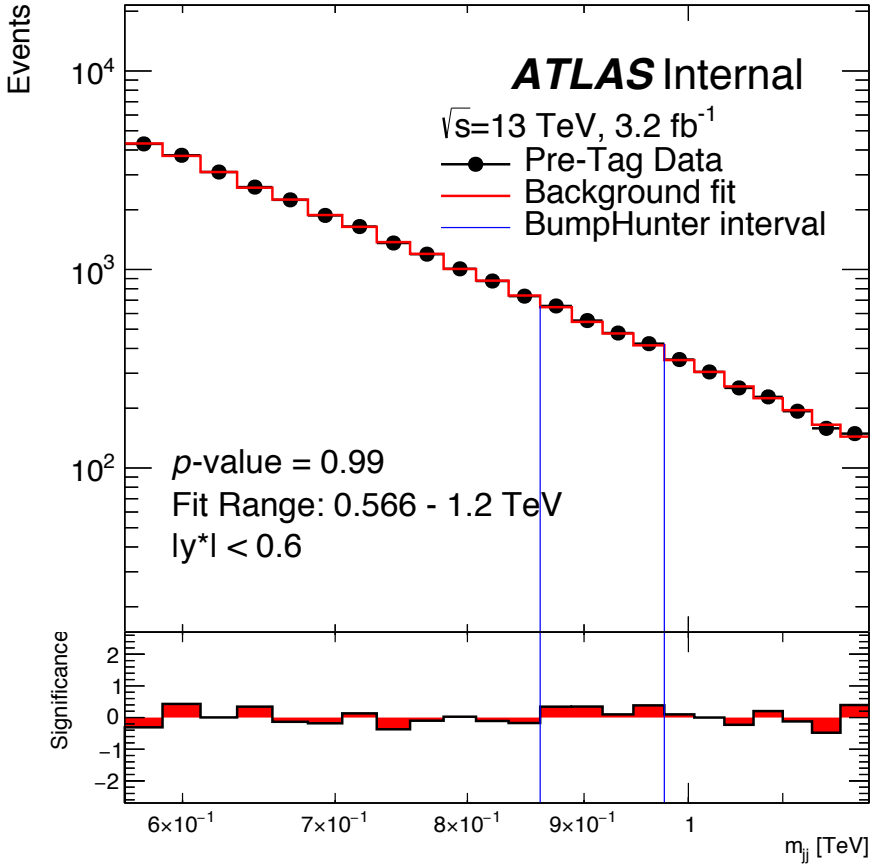

- Expected matches observed within statistical fluctuations
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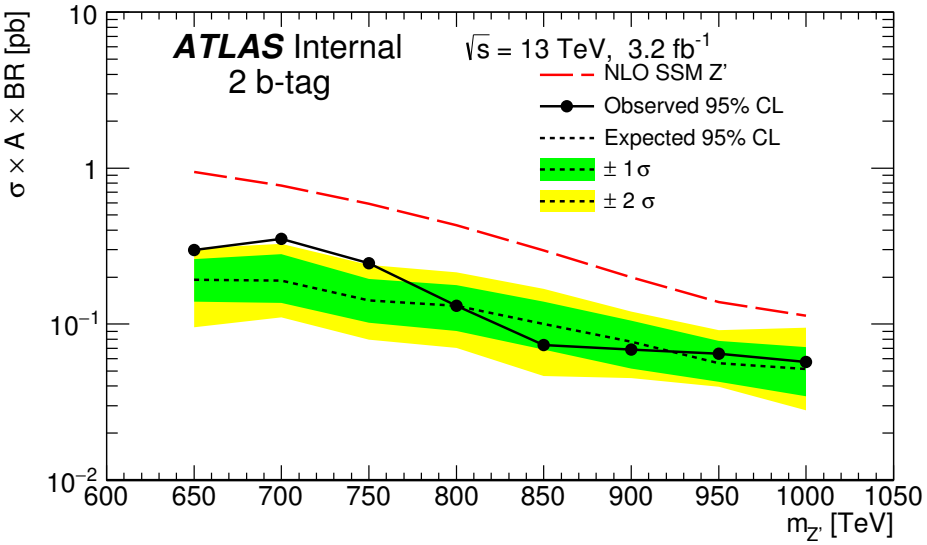
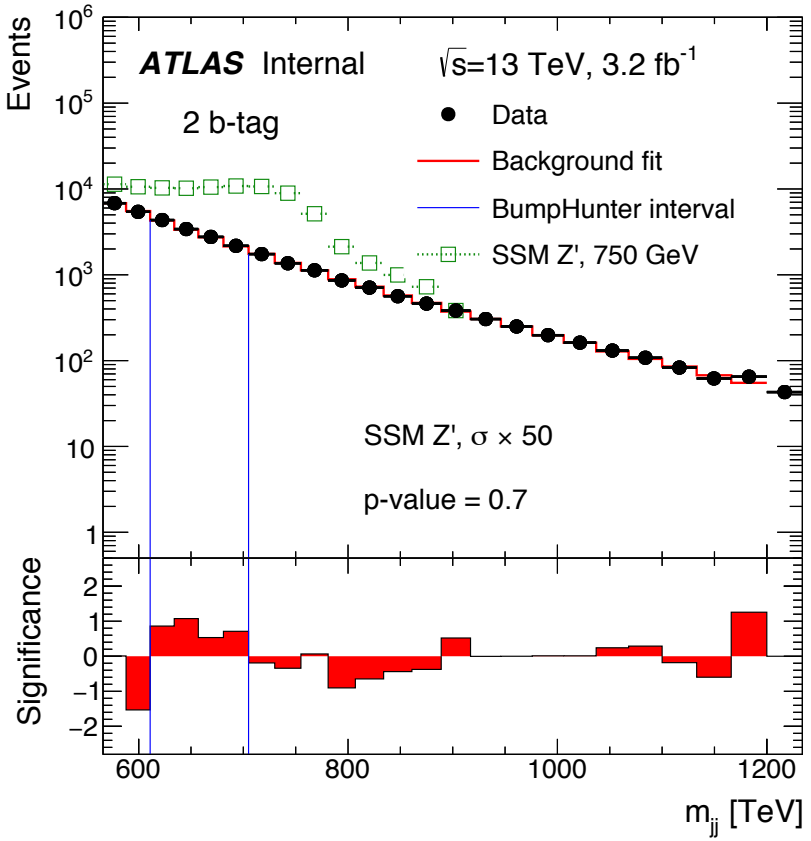
Final Data Set

- **Data:** Full data Set
- **Signal:** Z' bb post-tag

- **Hence, these are not real limits!!!!!!**
- But we can compare exp. to obs.





- Observed within expectations for data set

Conclusions

‘ l.304 / More relevant is spurious signal from signal+background fit to the background-only data (or MC) for limit setting. Has this been considered? '

1) The background only fit sees only small discrepancies, so we wouldn’t expect to see large deviations in the S+B fit

2) By comparing the expected and observed in the high-stat background only CR (and in the final data sample) we can see that there are no large effects due to fit discrepancies (within error bands)

3) We already have systematics to account for fit function choice and fit parameters, so fit discrepancies are accounted for in systs.

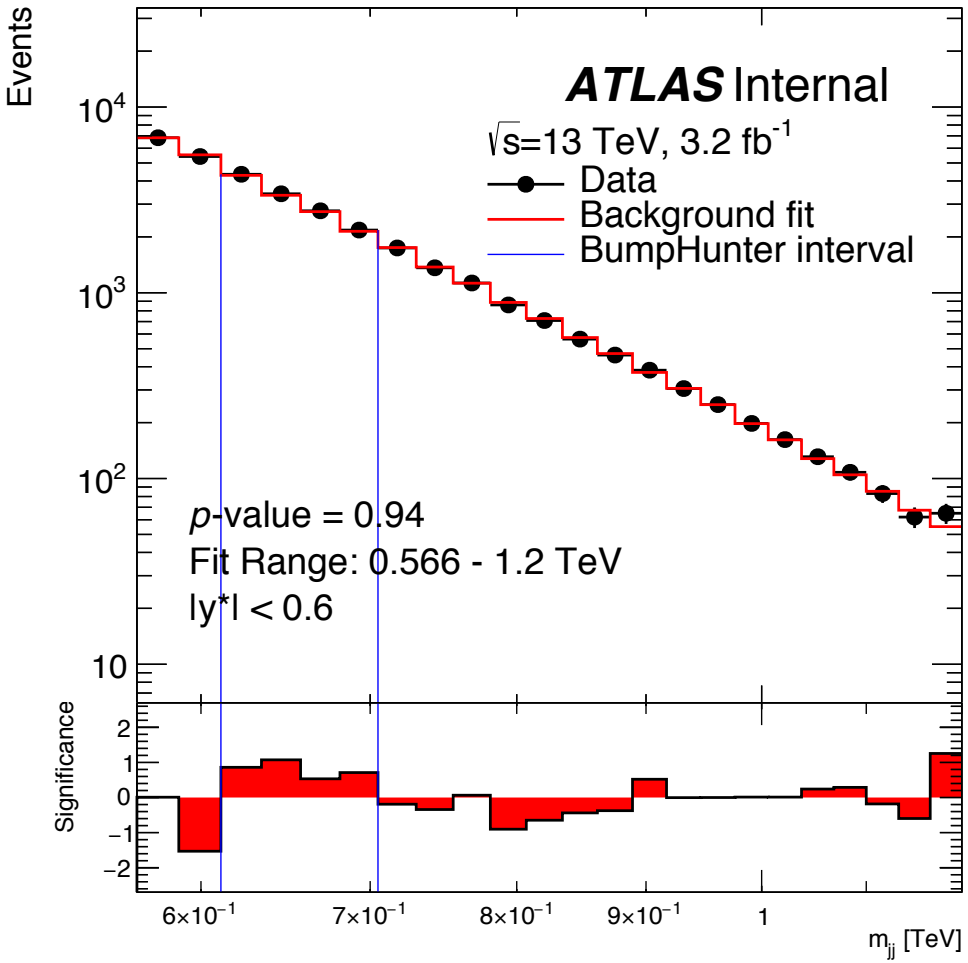
Other possible tests

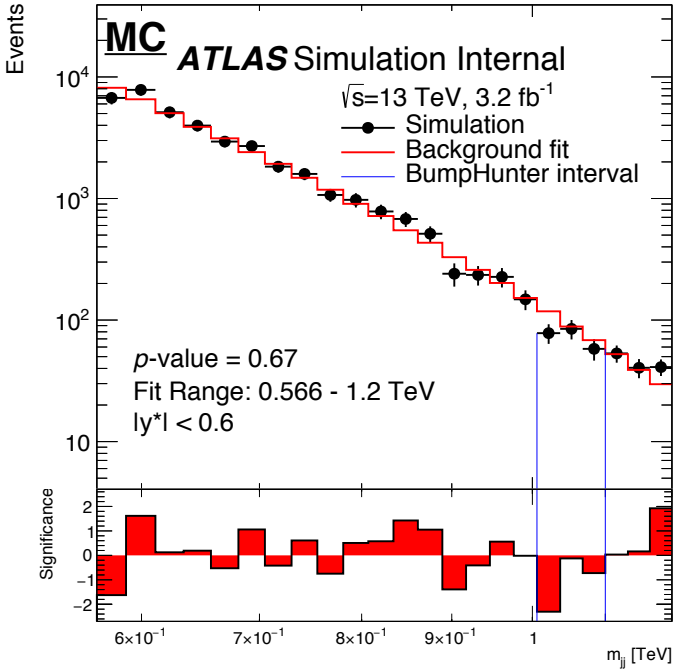
- Add in morphed signal points (working on this!)
- Maybe compare median values from L fit of pseudo-exp. and data (We are effectively comparing 95% point)

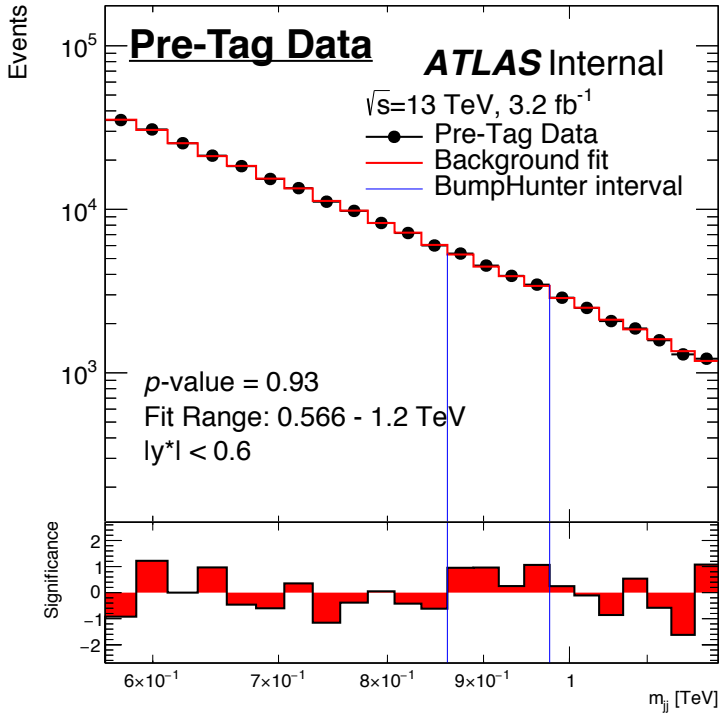
Deficit Hunter

- **Also look for deficits**
  - Most discrepant deficit or excess
  - Reports p-value of this!
  - No significant deficits…

Final Data Set





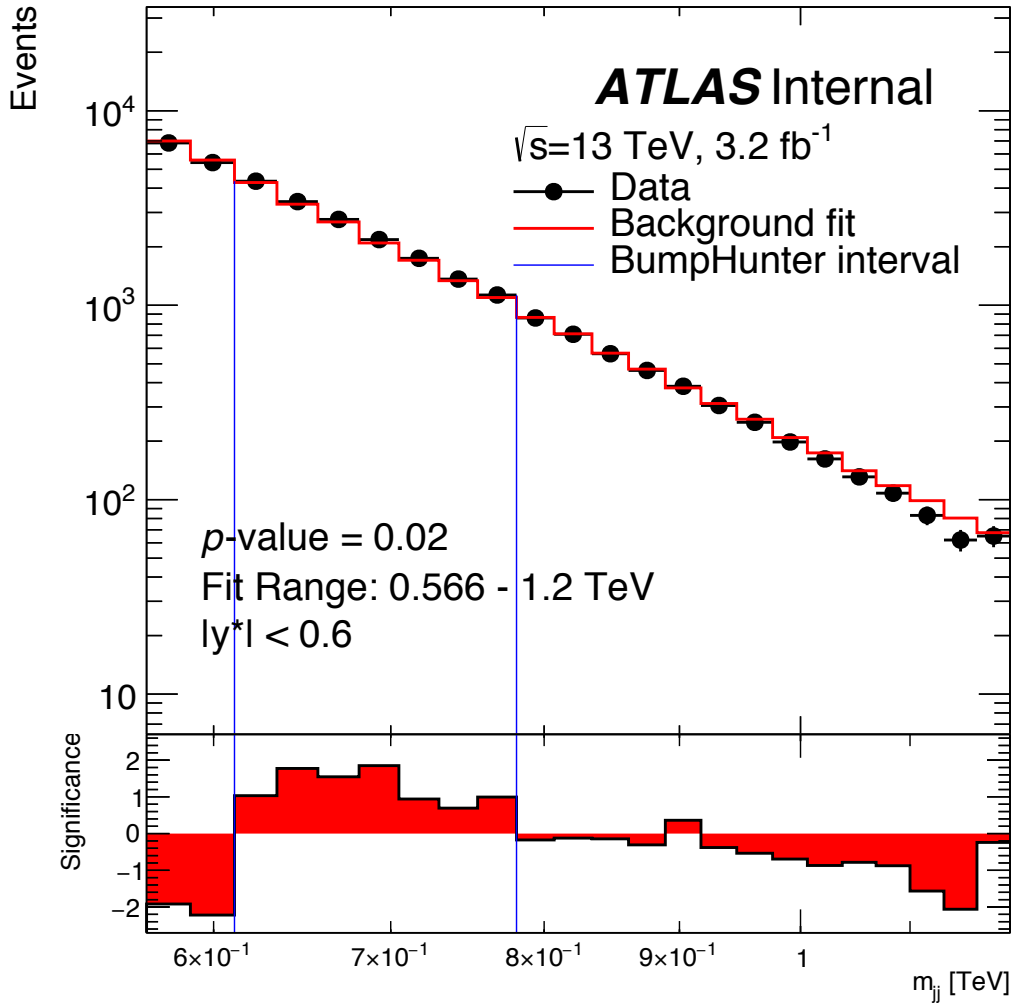


Setting p2 = 0

** I277 / P2 is much larger than typical suppression exponents in PDFs.*

How good is the fit if you force p2=0?

$$f(x) = (p1) * x^{(p3)}$$

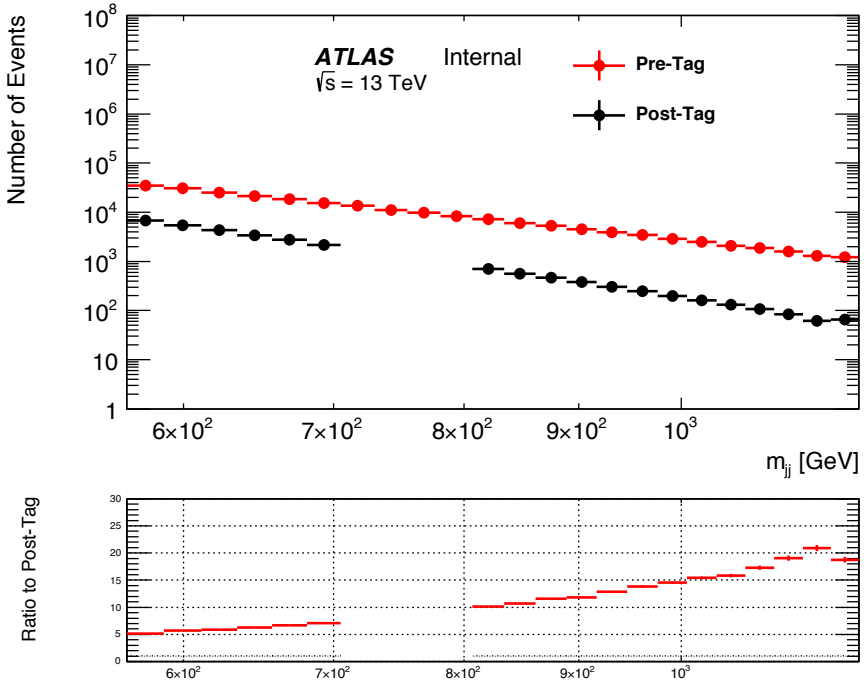


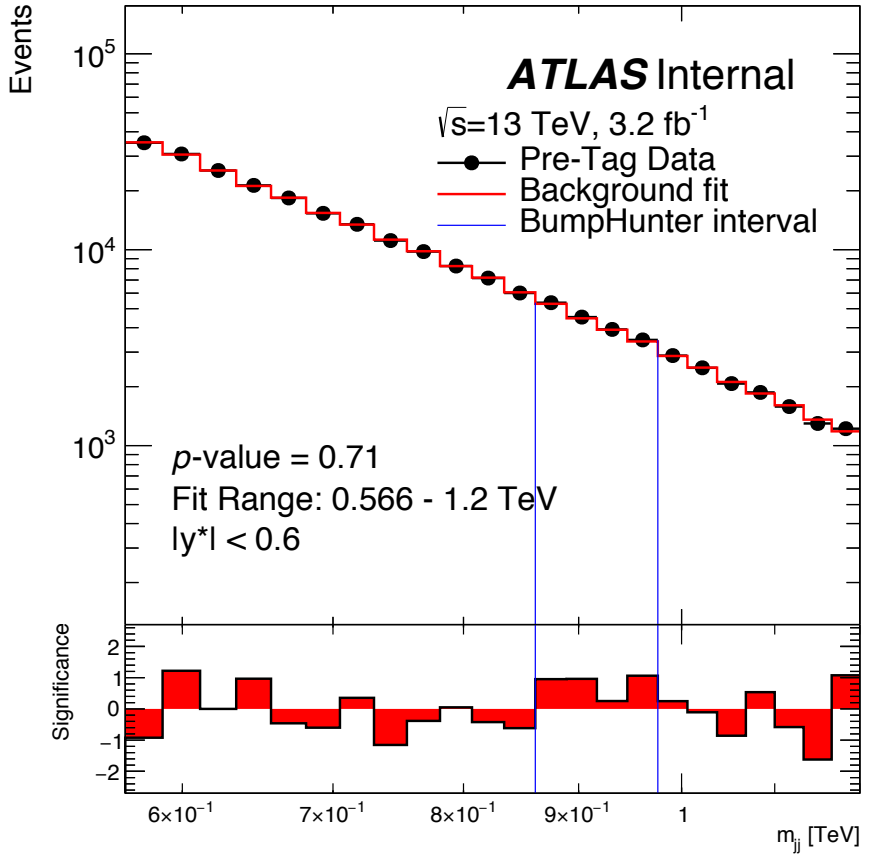
Backup

Statistics: Spurious Signal - Data, Trigger Only

- **Fit to Data with Trigger Applied**
  - b-Tagging not applied.
  - Dominated by bl, but this give us a similar, but different control region to test fitting

- **Overall fit is good quality**
  - No significant discrepancies
  - Possible structure in ratio





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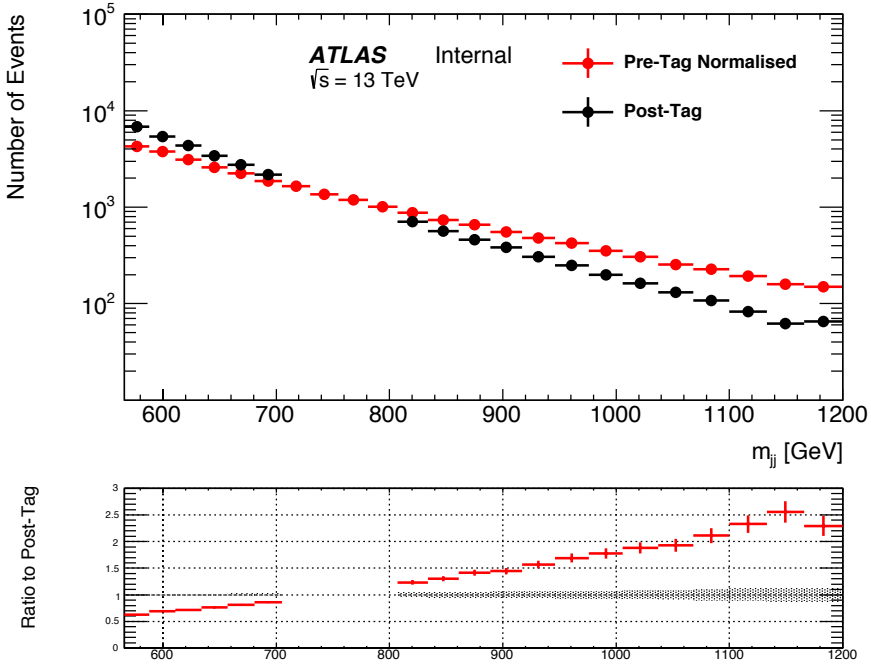

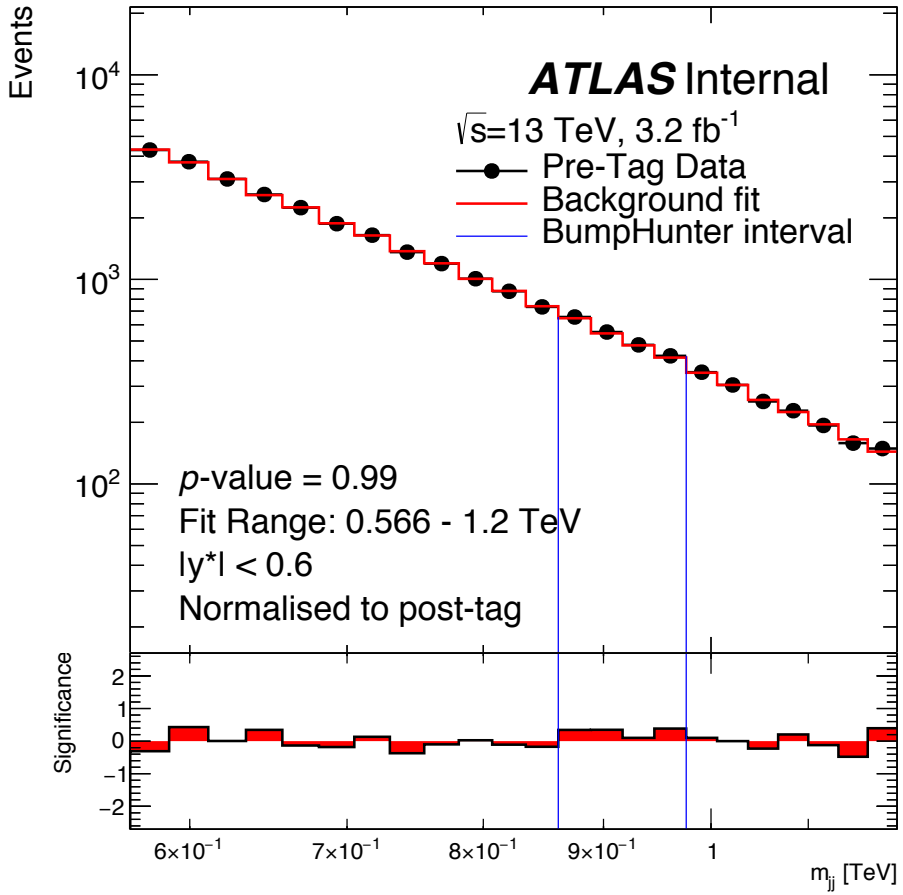

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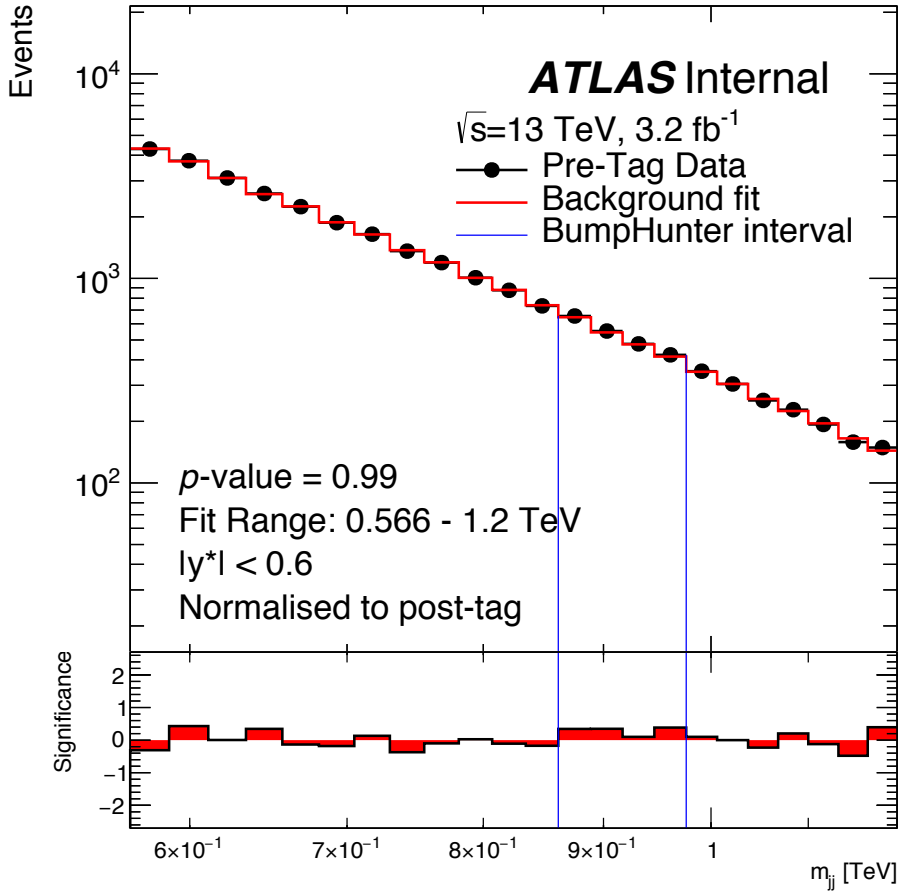

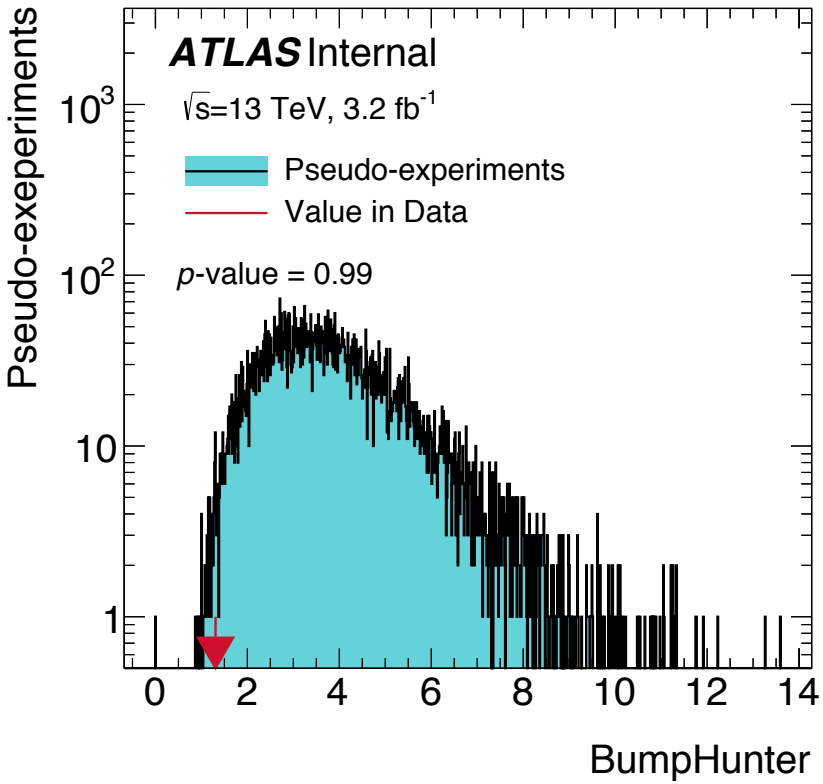

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