



Based on results in:
CERN-EP-2017-199 (arXiv:1709.07242)



Search for $A/H/Z' \rightarrow \tau\tau$ at 13 TeV —Interpretation

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Terascale workshop in Hamburg, 27-29 Nov. 2017

H/A/Z' $\rightarrow \tau\tau$

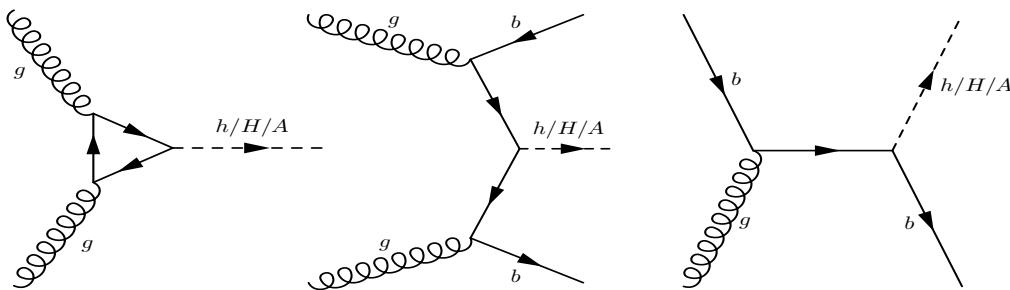
B \rightarrow D^(*) $\tau\nu$ anomalies in B-factories, Babar, Belle, etc.

Analysis goal

- Heavy resonance decaying to a pair of τ , the 3rd generation and heaviest lepton

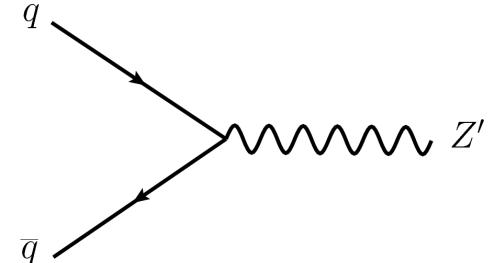
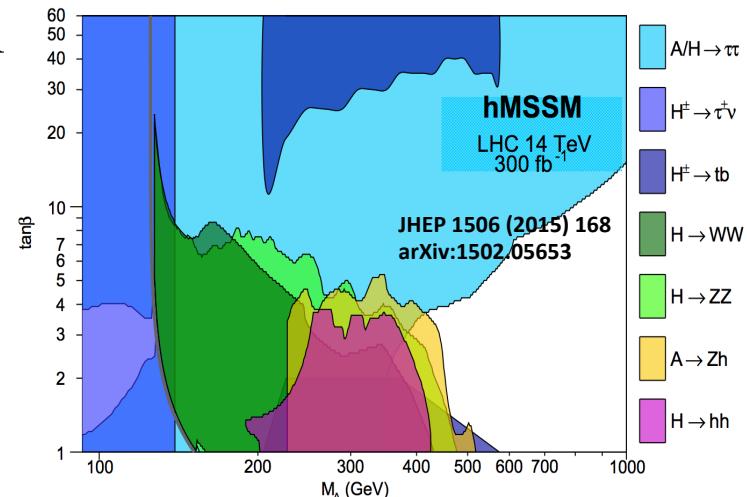
Flagship search for MSSM Higgs

- Down type fermion coupling enhanced at moderate and high tan beta



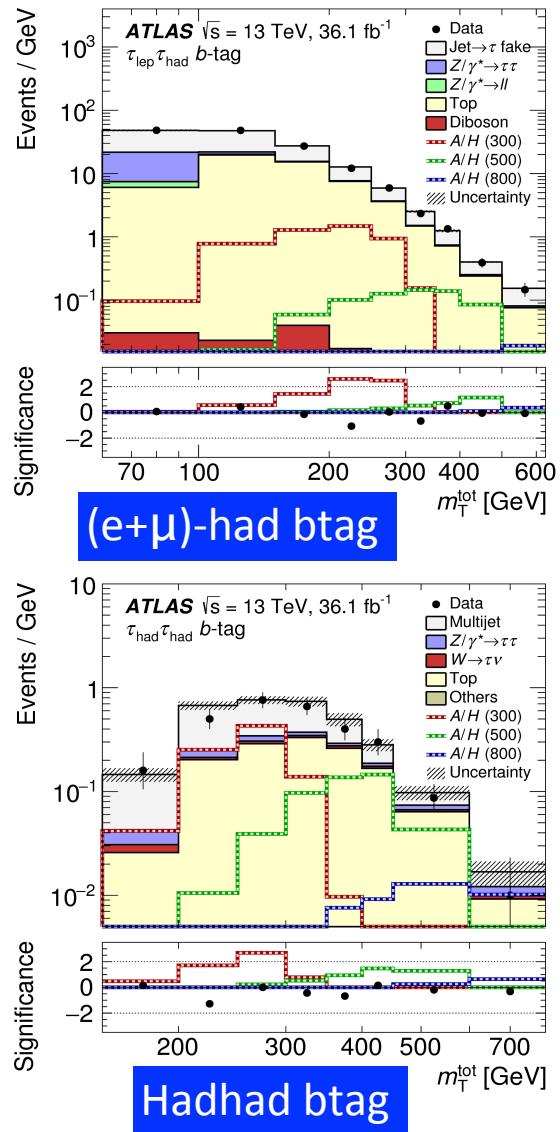
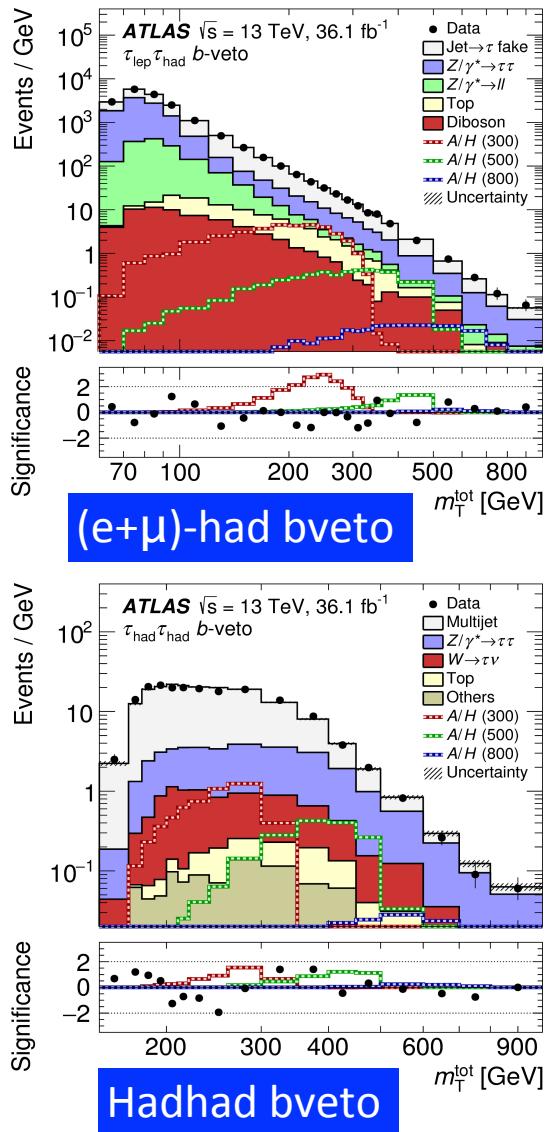
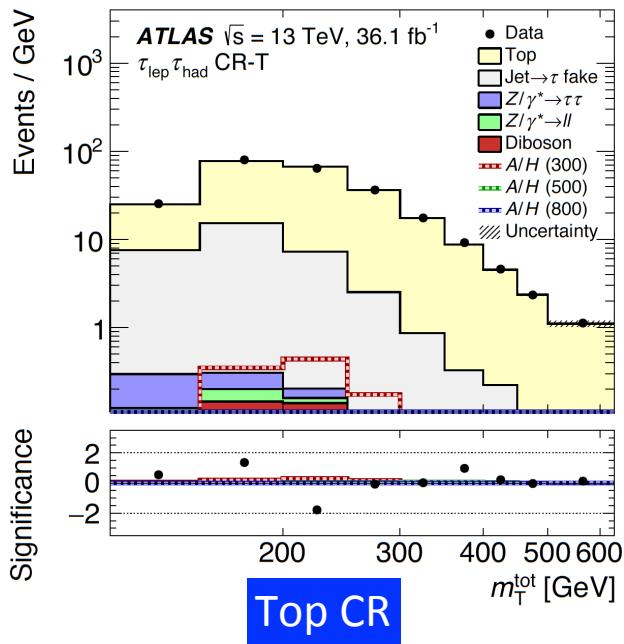
Sensitive to an extra gauge boson Z'

- Some scenarios favor the 3rd generation



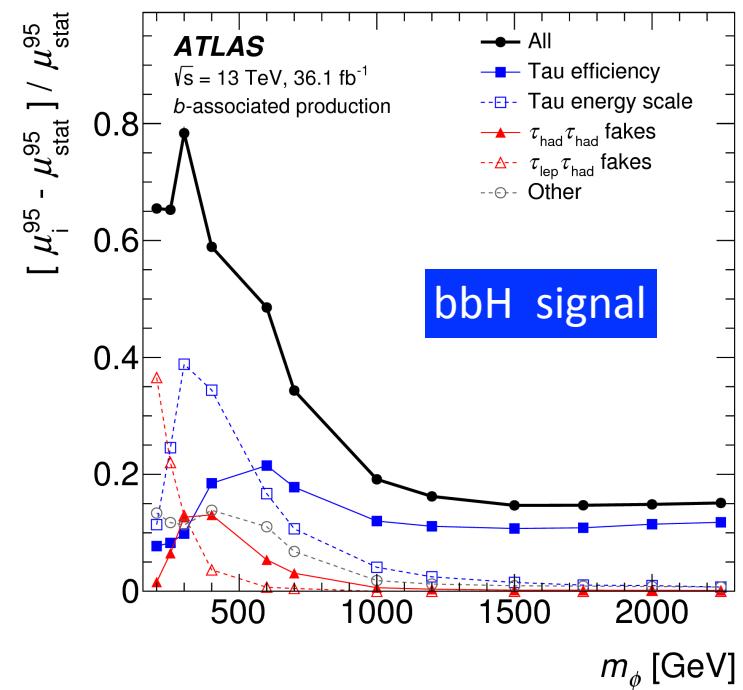
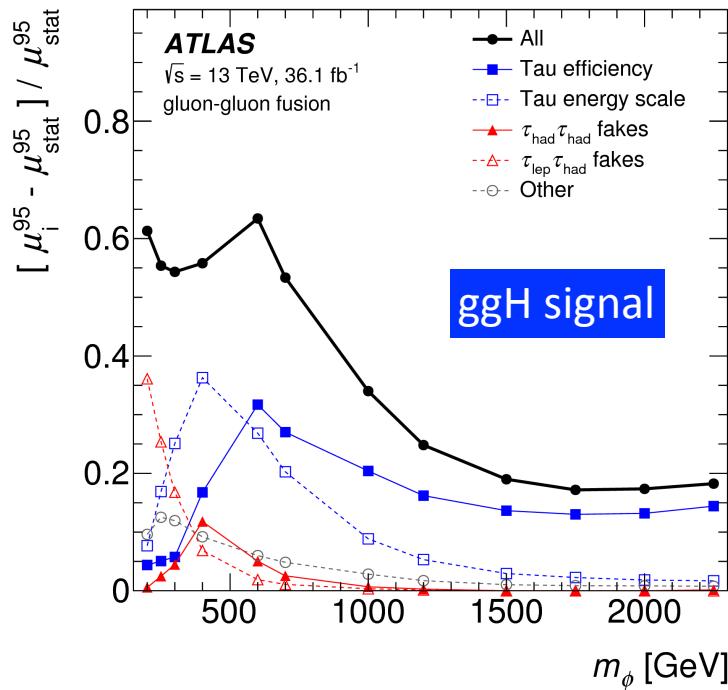
Fit model

6 Signal Region
+ 1 Control Region



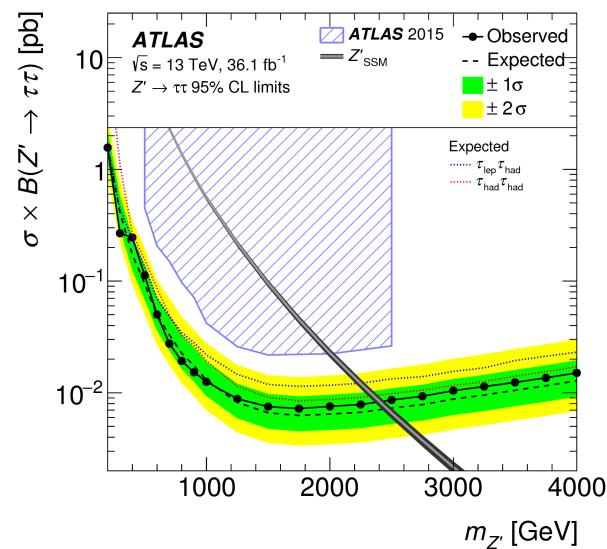
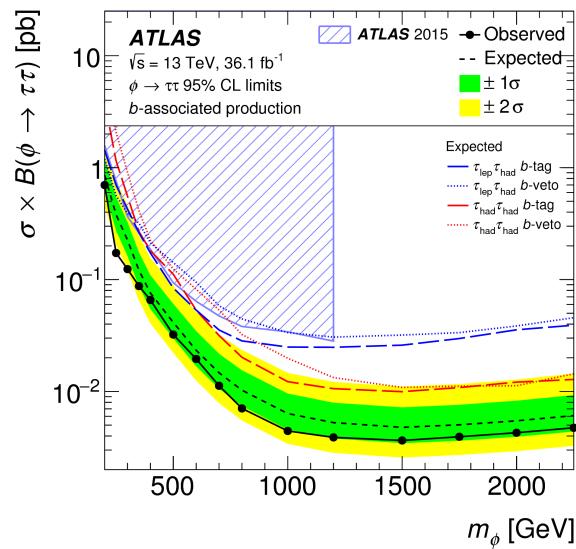
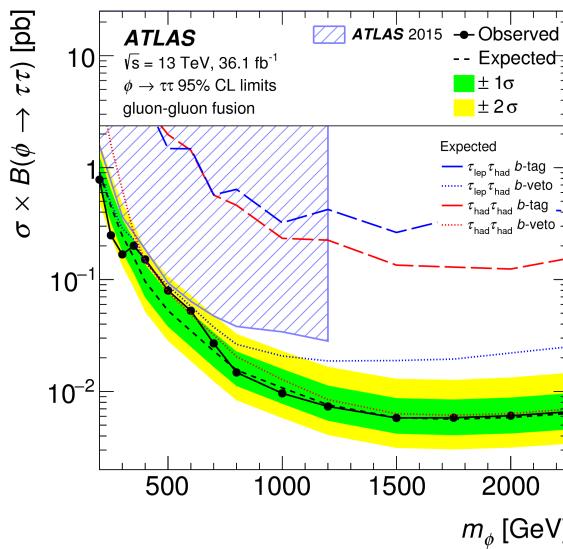
Systematic uncertainties

- Systematics input on expected limits
- Major ones:
 - Tau ID, energy scale, jet fake
 - Tau sys. dominant at the high mass regime



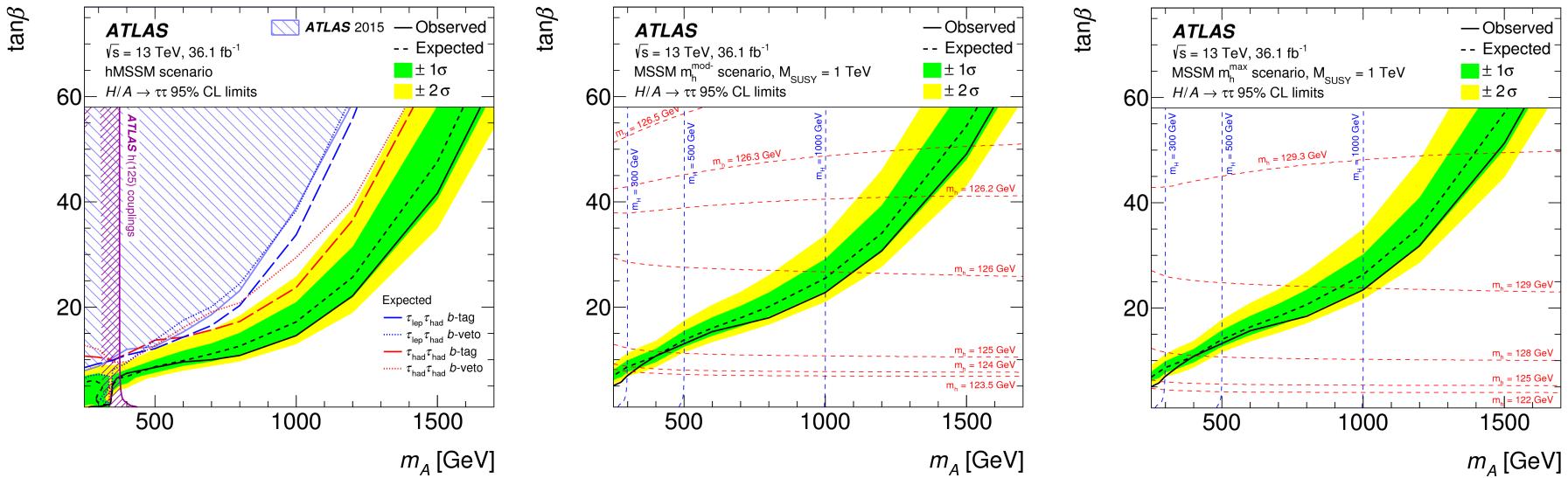
Model independent limit

- Model independent limit: ggH, bbH, Z'



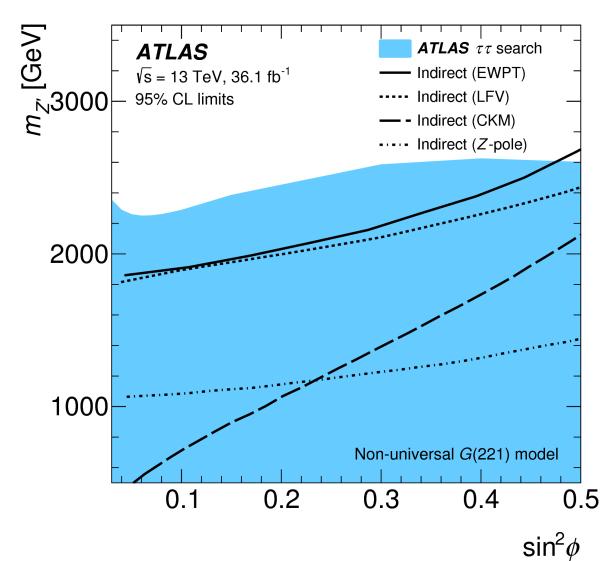
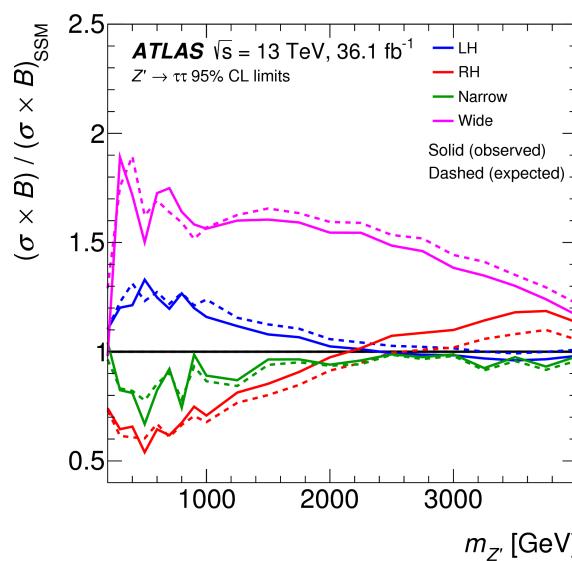
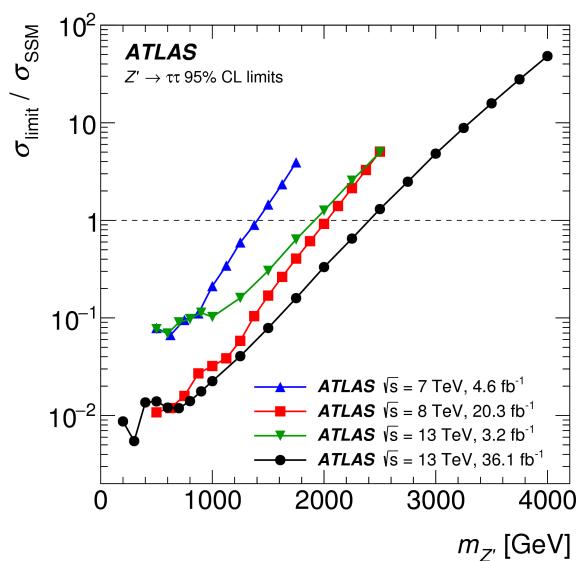
MSSM Higgs sector

- Various scenarios: hMSSM, m_h^{mod} , m_h^{max}



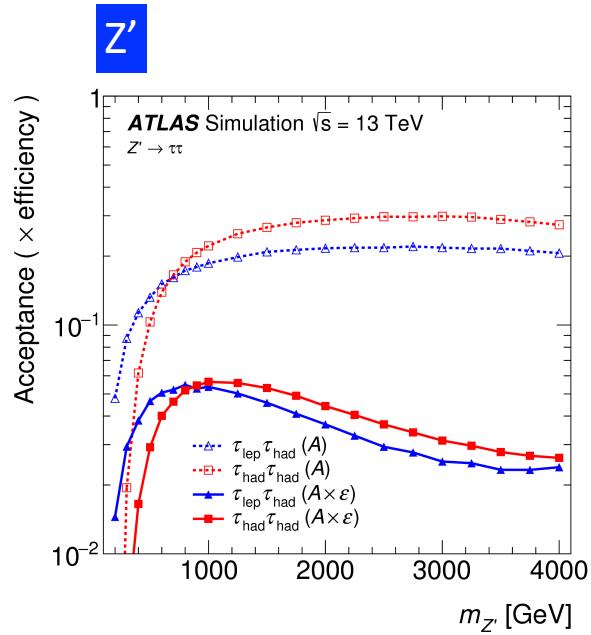
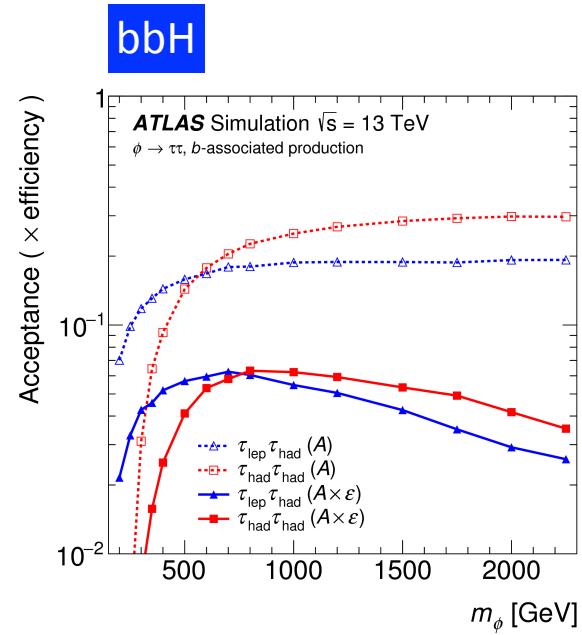
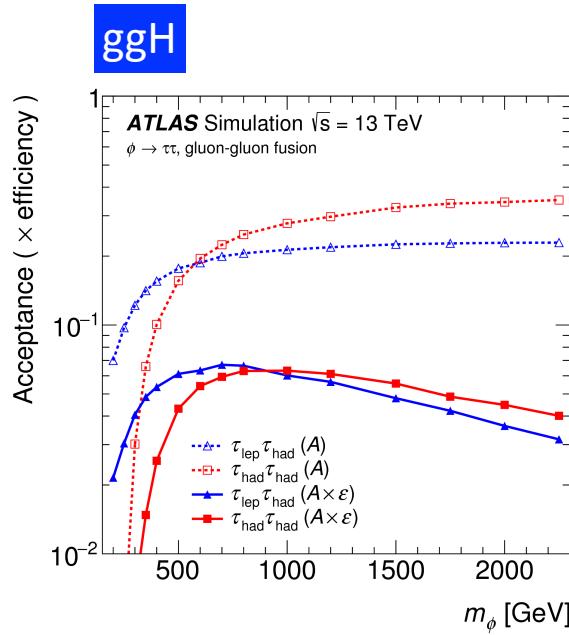
Extra gauge boson Z'

- Searched range and sensitivity improved significantly
- Various scenarios interprated



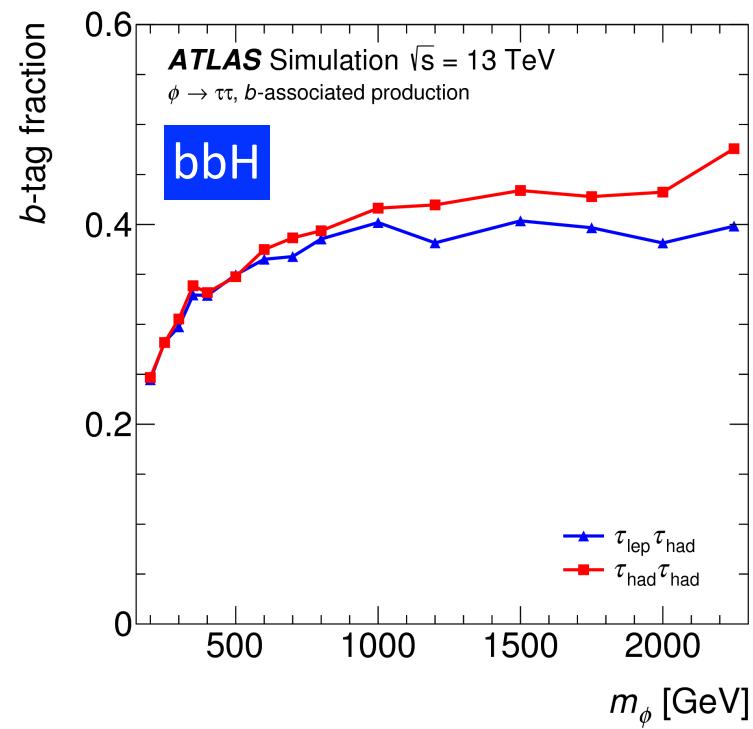
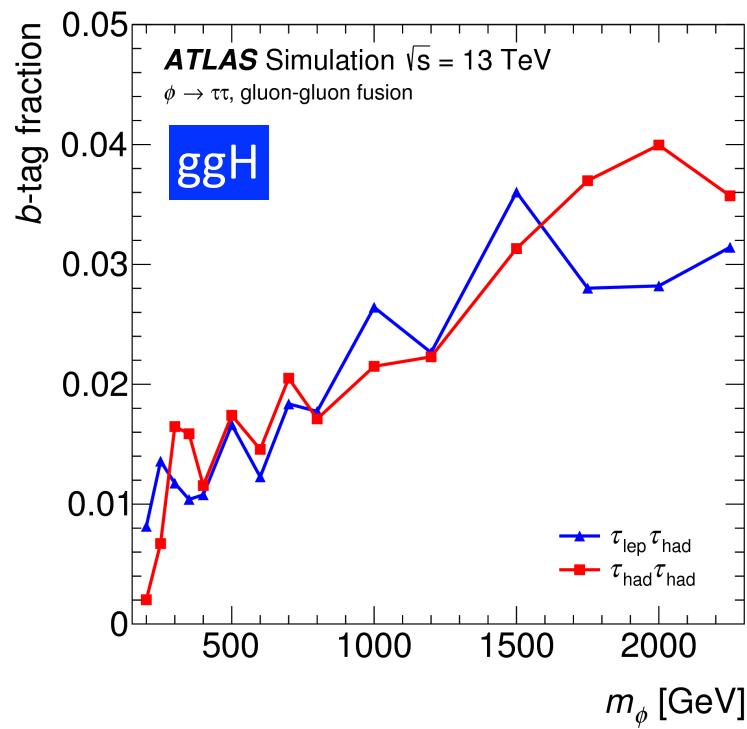
Acceptance and efficiency

- Acceptance calculated with respect to all ditau final states



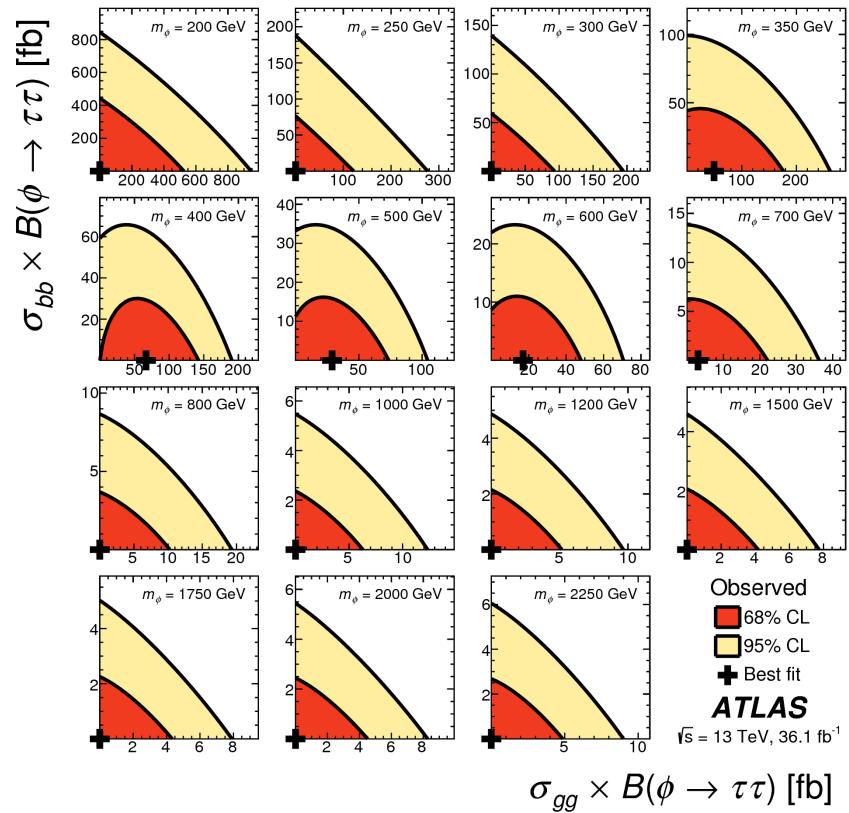
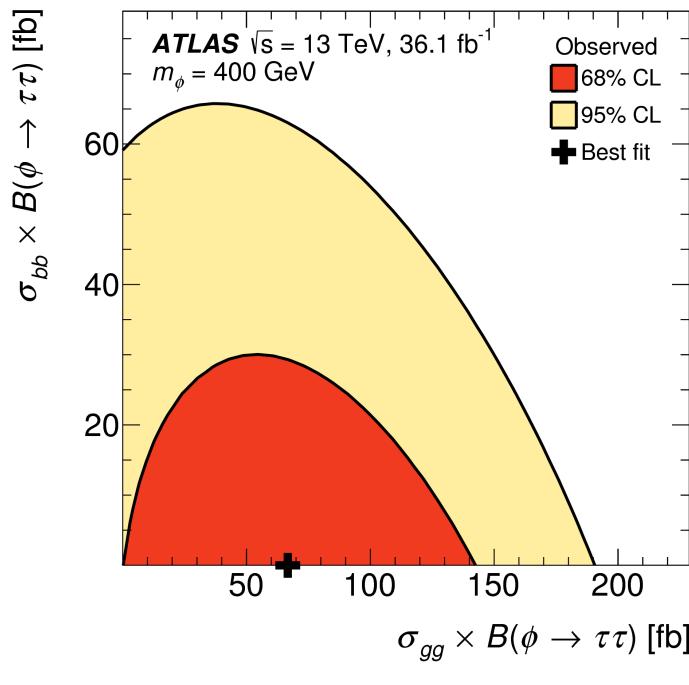
Fraction of events in b-tag category

- Fraction of events entering b-tag category for a scalar boson



Likelihood scan: ggH VS bbH

- Negative-Log-Likelihood of ggH VS bbH cross section for each mass point
- Useful for theorists to re-interpret our data



Summary

- MSSM A/H/Z' $\rightarrow \tau\tau$ search with 2015+2016 data has been published
 - Provides fruitful physics information
- By 2018, data size will increase by a factor of 3
 - More exciting results ahead, stay tuned!