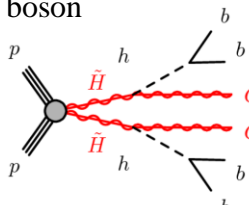


# Search for Higgsinos with the ATLAS Detector

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## Introduction

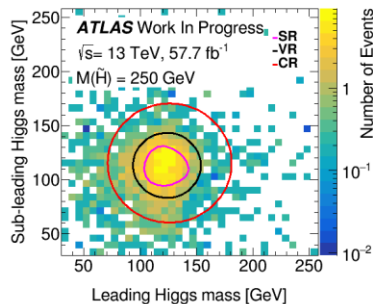
- SUSY predicts supersymmetric partners to the Higgs boson
- Search for higgsinos with **low  $m_{\tilde{H}}$** , gravitino LSP
- Use  $\tilde{H} \rightarrow h\tilde{G}$ ,  $h \rightarrow bb$  decay channel



Reference: [1]

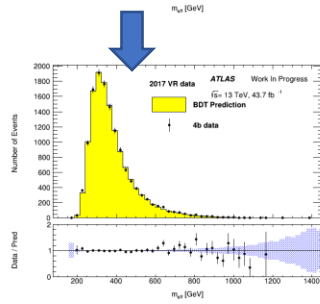
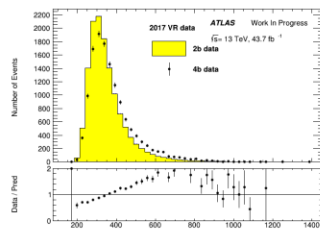
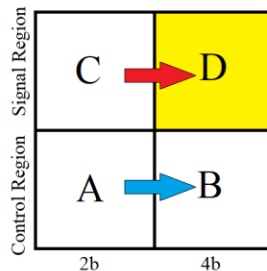
## Event Selection

- Trigger on b-jets
- Require  $\geq 4$  jets,  $\geq 2$  b-jets
- Main backgrounds **QCD,  $t\bar{t}$**
- Veto leptons, top quarks
- Define Control, Validation, and Signal Regions using reconstructed Higgs masses



## Background Estimation

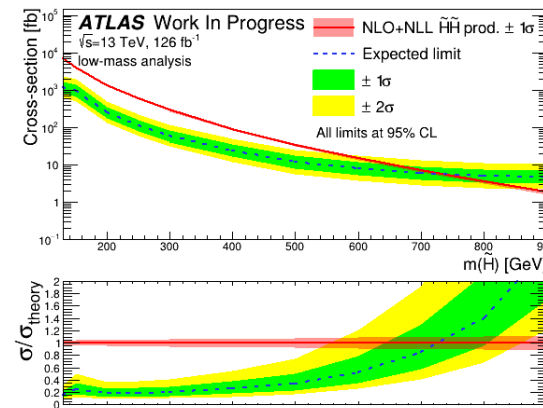
- Difficult to estimate with MC
- Fully **data-driven**
- Divide into 2b,  $\geq 4b$  samples
- ABCD method: final estimate  $D=C*B/A$
- Train a Boosted Decision Tree to **reweight kinematics**  $A \rightarrow B$
- Use this to correct  $C \rightarrow D$



- $m_{eff} = E_T^{miss} + \sum_{jets} p_T(jet)$
- Test reweighting in VRs
- Excellent 2b/4b agreement
- Holds across variables/years

## Sensitivity

- 2d fit in  $E_T^{miss}, m_{eff}$
- Expected limits
- Sensitive up to **700 GeV**
- Exclude signal strengths as low as **0.2**
- Complementary analyses target other possibilities
  - High-mass higgsinos
  - $\tilde{H} \rightarrow Z\tilde{G}$



## References

- M. Aaboud *et al.* [ATLAS], Phys. Rev. D **98**, no.9, 092002 (2018) doi:10.1103/PhysRevD.98.092002 [arXiv:1806.04030 [hep-ex]].