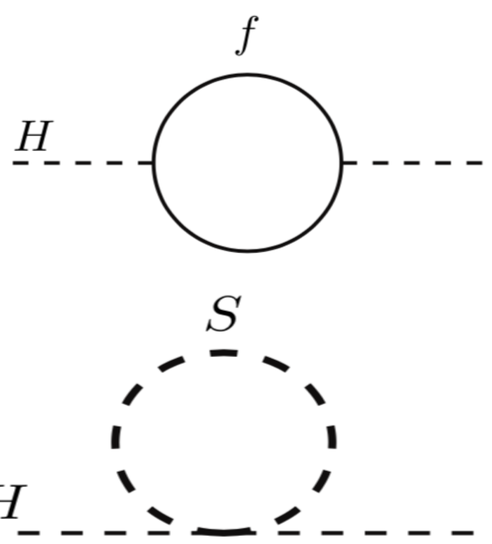
CAP Poster Session – SFU, Burnaby, BC June 3-7 2019

Search for SUSY with Missing Transverse Momentum and Multiple b-jets at 13 TeV with the ATLAS Detector

SUSY motivation

Supersymmetry (SUSY) is a space-time symmetry that predicts new bosonic partners to the fermions of the Standard Model and vice versa. SUSY can suppress the **hierarchy problem** if the masses of the 3rd generation squarks, along with the masses of the gluinos, are at low TeV scale. If R-parity is conserved, SUSY particles are produced in pairs and the lightest SUSY particle is stable.

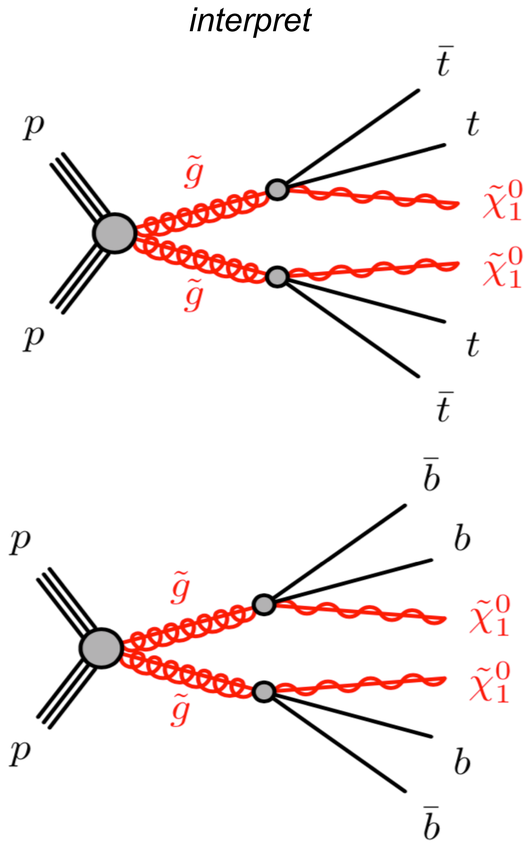
One-loop quantum correction to the Higgs mass (squared) Δm_H^2



Strong multi-b Model

In terms of experimental signature, they all feature at least **four b-jets**, originating from either the gluino or top quark decays, and **high $E_{\mathrm{T}}^{\mathrm{miss}}$**, steaming from the two neutralinos which escape the detector unseen.

Simplified models to optimize & interpret



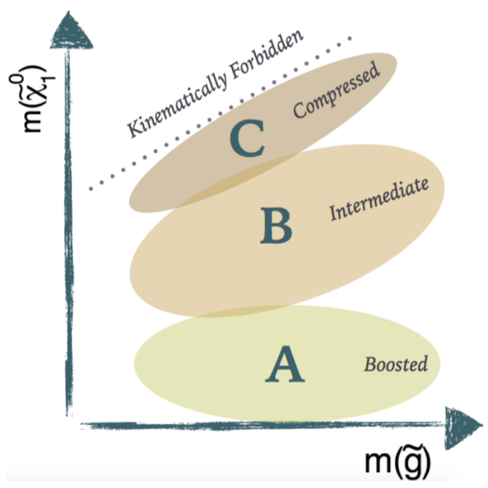
Region Definition and Analysis Strategy

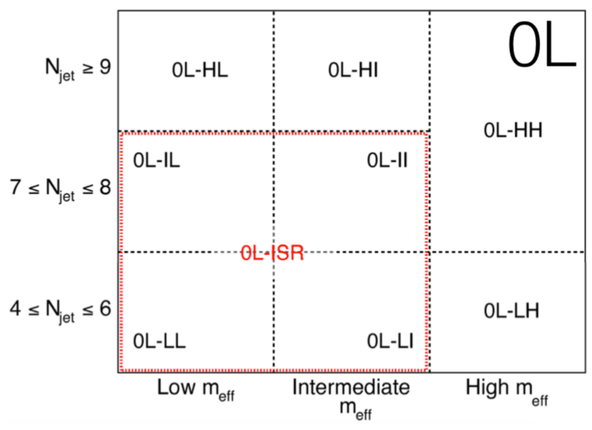
Cut-and-Count

- Overlapping bins.
- Optimized for maximum expected significance.
- Assess discovery or model-independent limits.

Multi- Bin

- Orthogonal bins. Slicing in number of leptons, jets and m_{eff}.
- Optimized for max exclusion.
- Placing exclusion or model-dependent limits.





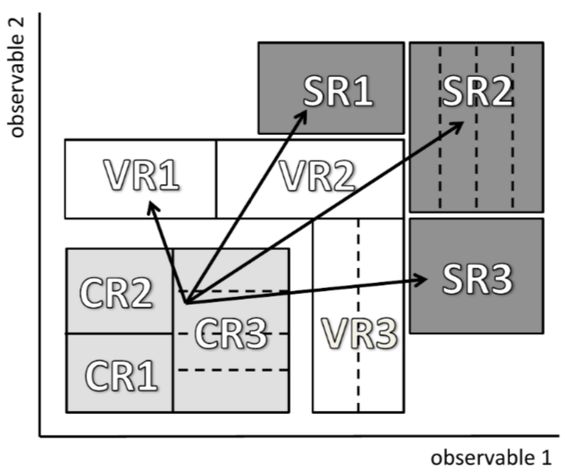
Strategy

A. Control Regions (CR) extracting the normalization of the dominant $t\bar{t}$ background.

B. The prediction is extrapolated and verified in Validation Regions (VR).

C. Multiple Signal Regions (SR) designed to enhance sensitivity to the signal.

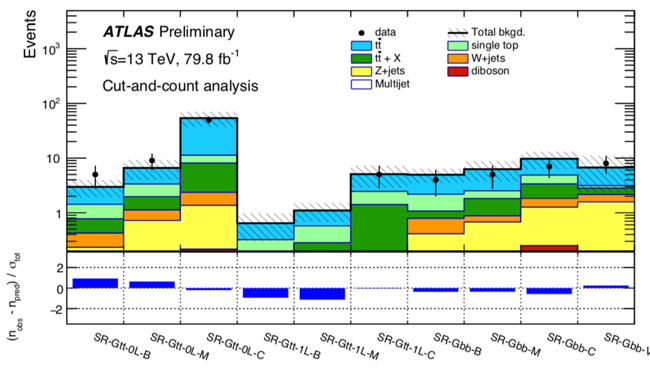
D. Compare the background estimation to the data yield in SRs.



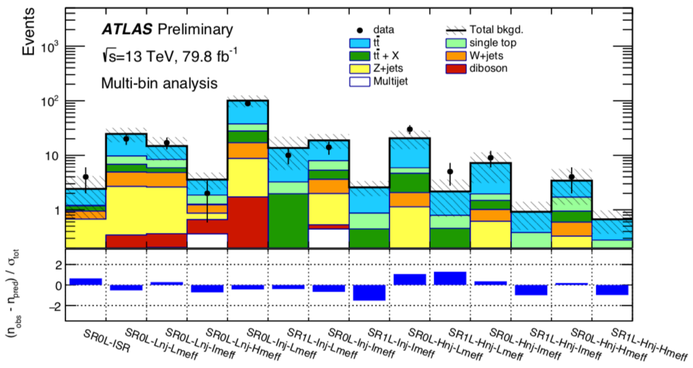
Results

No significant excess above the predicted background is observed.

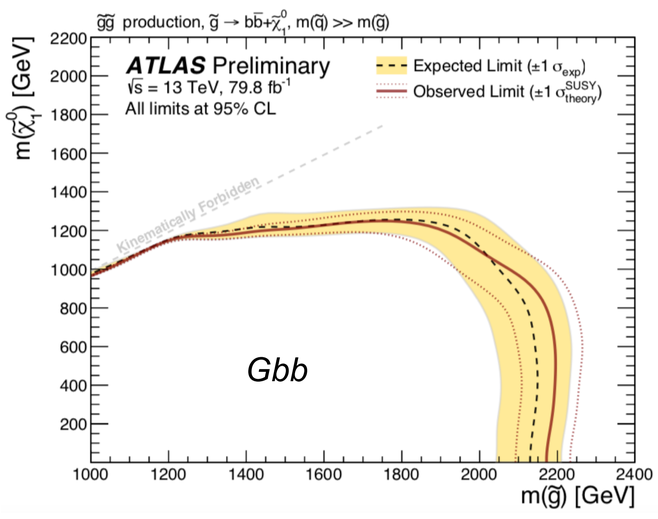
Cut-and-count SR result

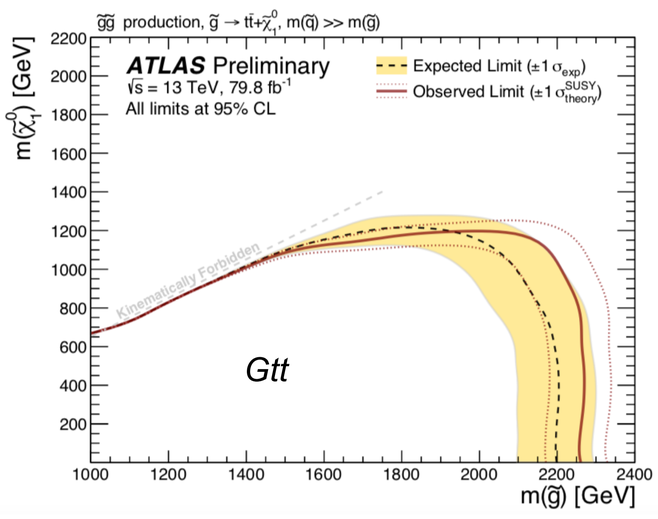


Multi-bin SR result



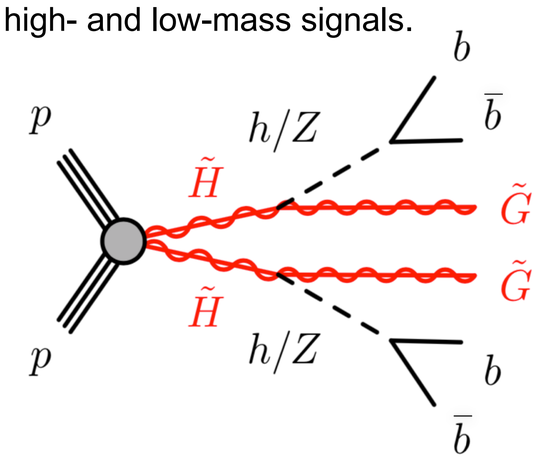
The data are used to derive **exclusion limits** on the simplified models.





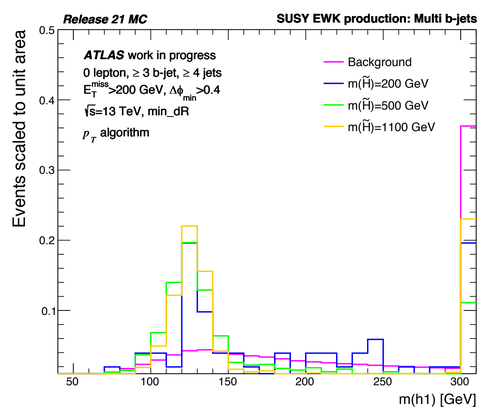
Electroweak multi-b Model

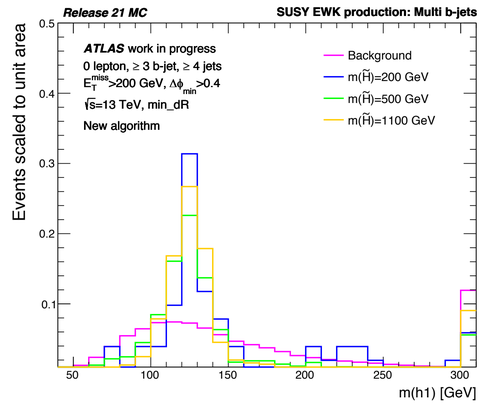
Targeting pair production of Higgsino (the superpartner of Higgs) with at least **four *b*-tagged jets**. Two complementary analyses, targeting high- and low-mass signals.



Higgs Reconstruction R&D

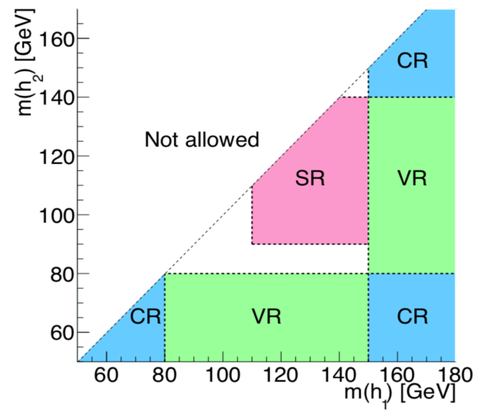
For Higgs reconstruction two different algorithms (p_{T} and New) are used. They are different in *b*-tagging. Smaller overflow bin and higher signal statistics in the signal region observed for “New” algorithm.





Region Definition

All Electroweak regions (CRs, VRs and SRs) are defined based on Higgs invariant mass (m_{h1} and m_{h2}). normalization of the dominant $t\bar{t}$ background extracted in CRs and extrapolated to VRs and SRs. Unblinding for full Run2 is ongoing.



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Reference: CERN-CONF-2018-041, CERN-EP-2018-050

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ATLAS EXPERIMENT