

Searches for strong production of supersymmetry in CMS

Joe Pastika
on behalf of the CMS Collaboration

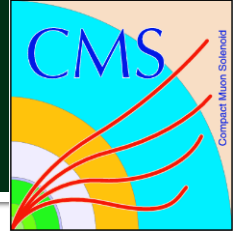


BAYLOR
UNIVERSITY

- SUSY in the fully hadronic final state
- SUSY with top tagging
- Single lepton results
- Double lepton results
- In this time slot I can only cover some of the results from CMS – find all SUSY results [here](#)

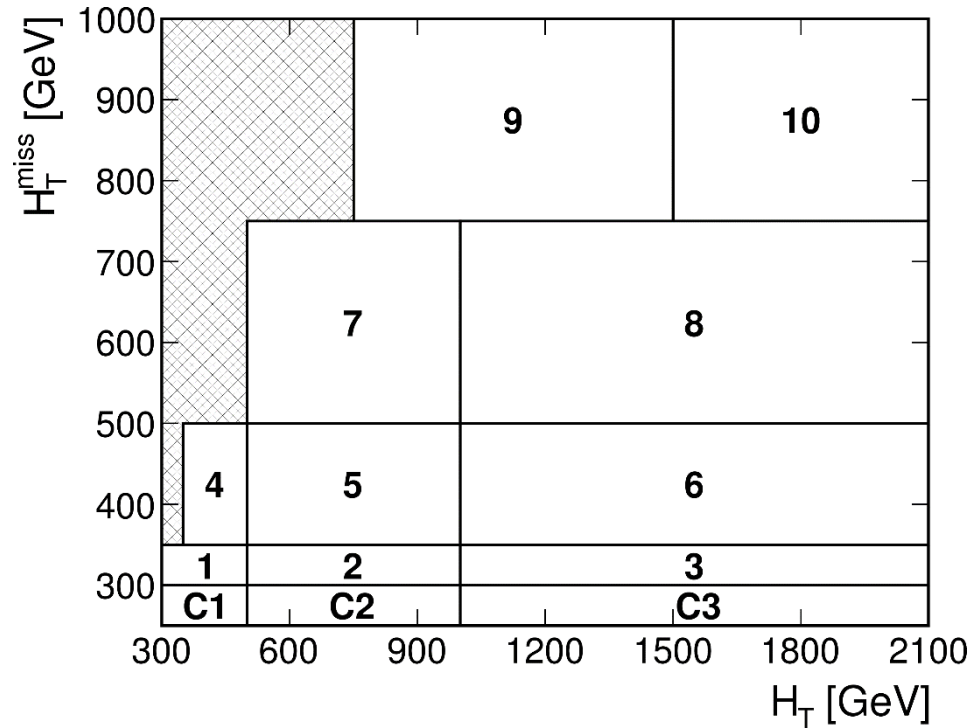


Hadronic SUSY search



[arXiv:1704.07781](https://arxiv.org/abs/1704.07781)

- Search for SUSY in the fully hadronic final state
- Targeting wide range of SUSY models
- Events categorized by
 - H_T
 - H_T^{miss}
 - N jets
 - N b jets



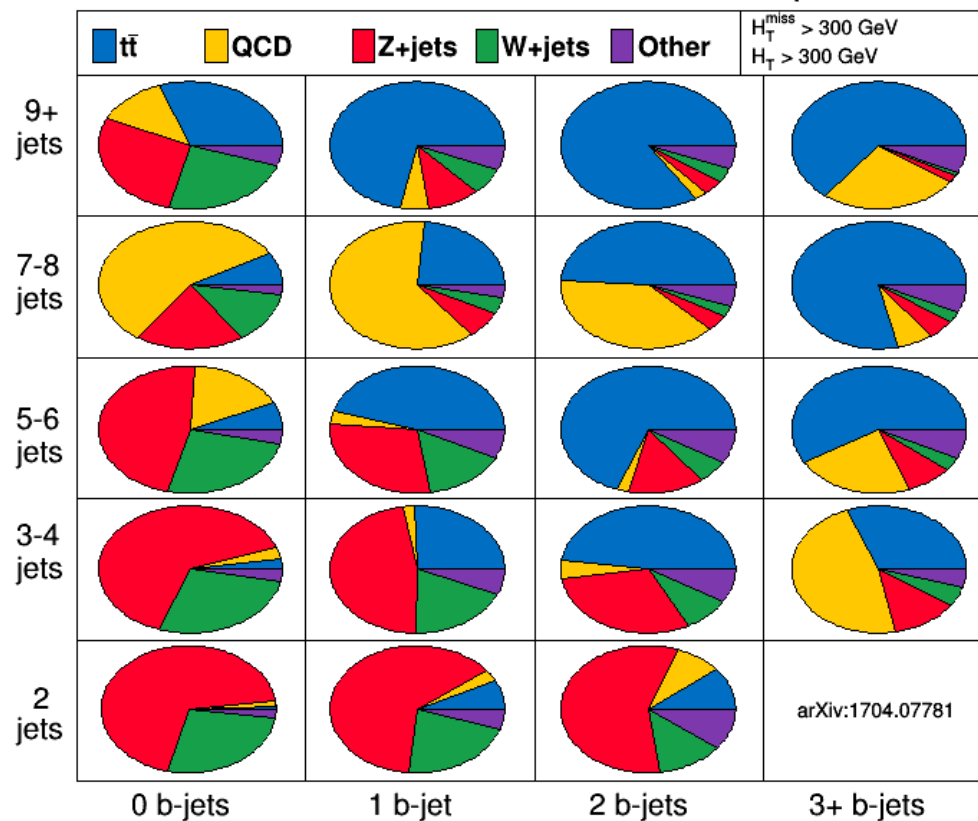


Hadronic Backgrounds



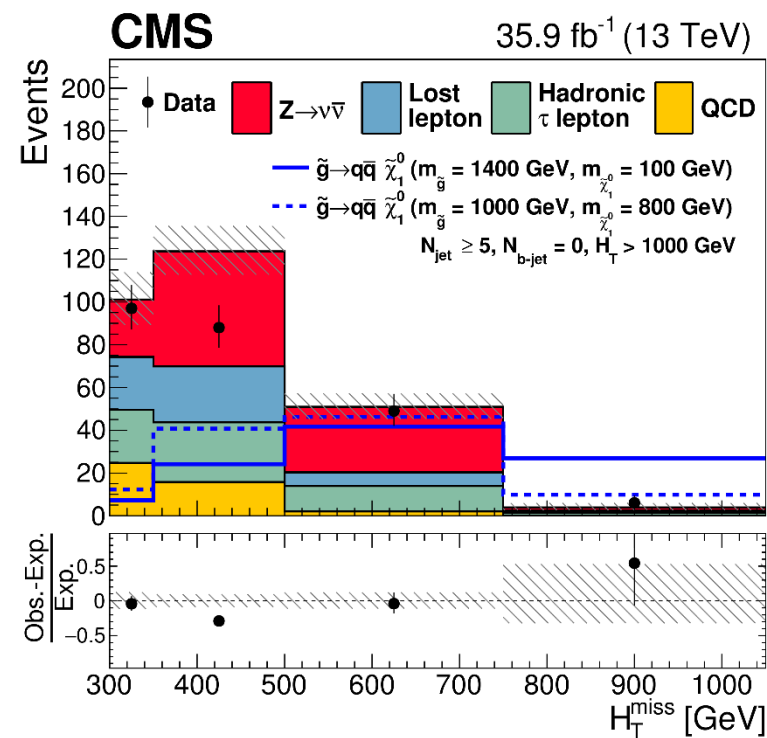
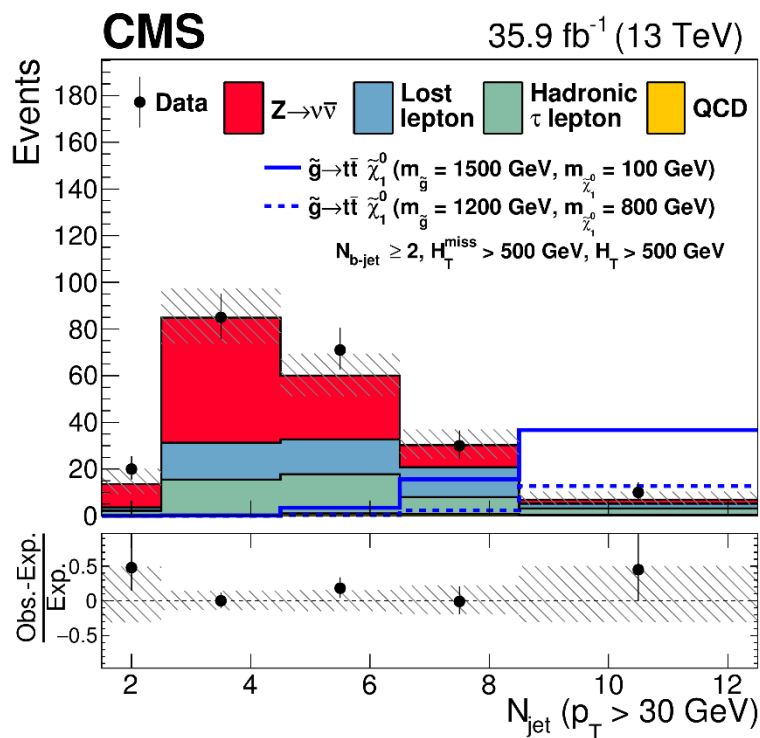
- Major backgrounds
 - $t\bar{t}$ – Estimated via transfer factor form CR
 - QCD – Estimated from data
 - $Z(\nu\nu) + \text{jets}$ – Estimated from $\gamma + \text{jets}$ CR

CMS Simulation Supplementary (13 TeV)



Number of jets

Missing transverse hadronic momentum



Events from selected search bins with high signal significance



Hadronic Interpretations

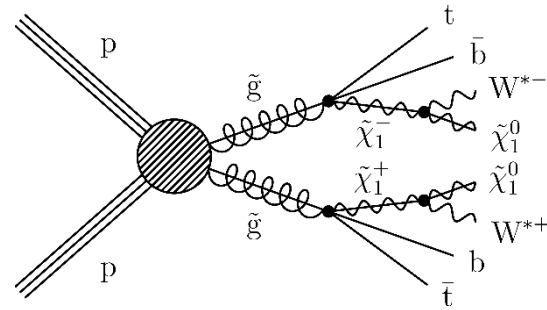
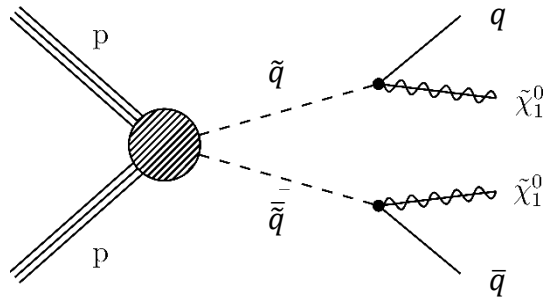
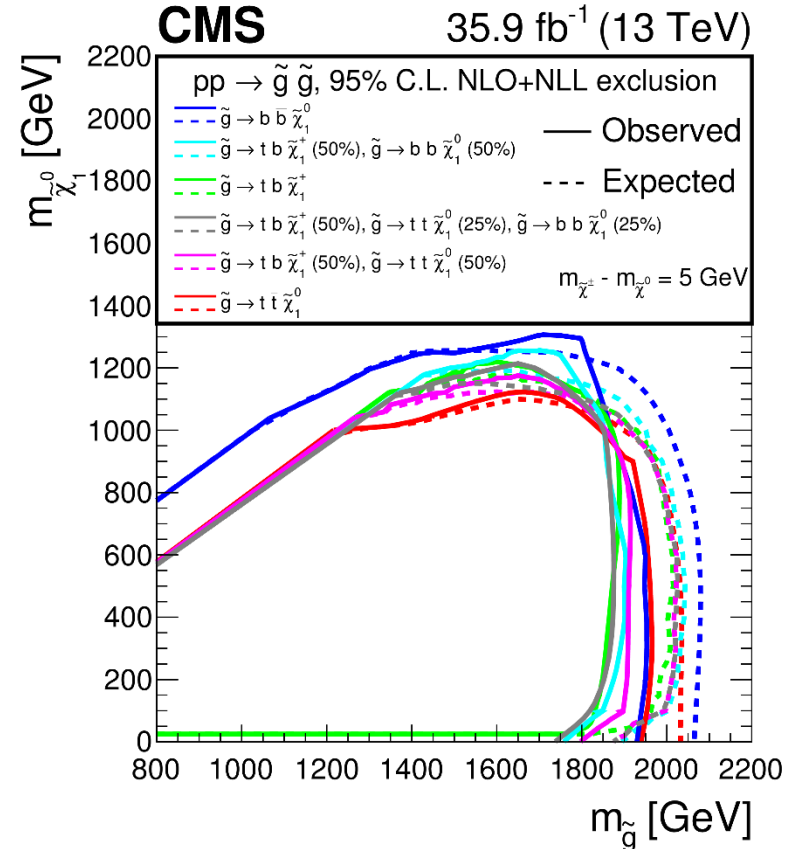
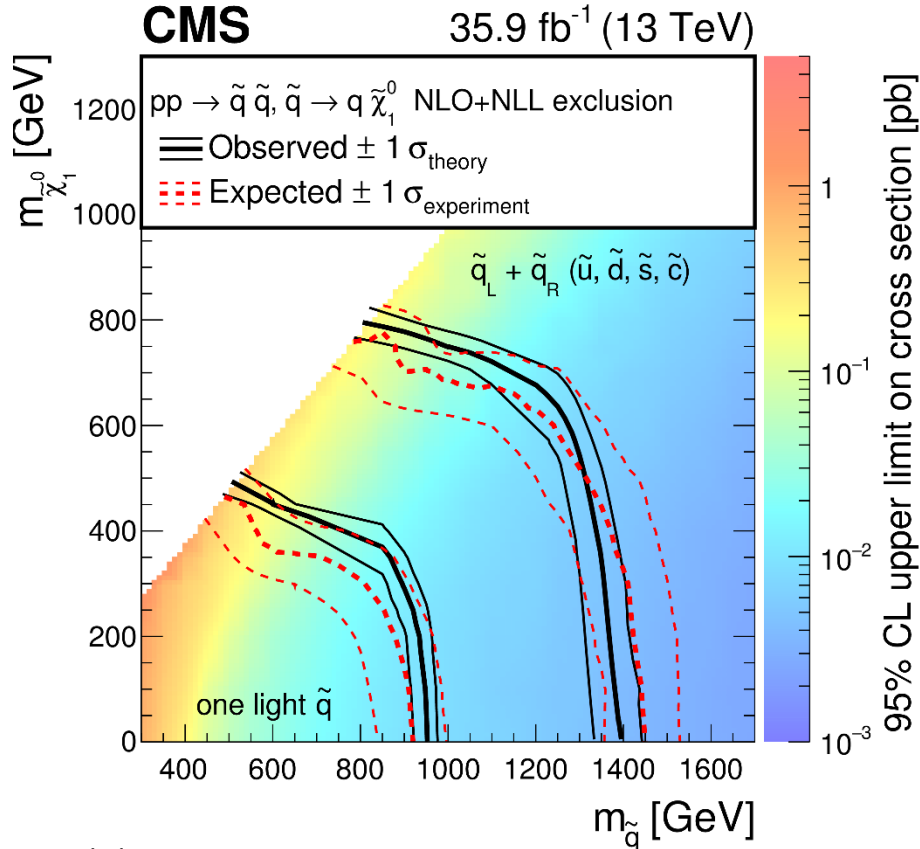
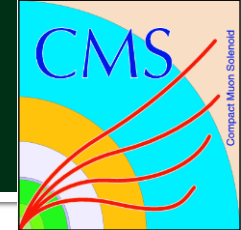


Diagram corresponds to green line



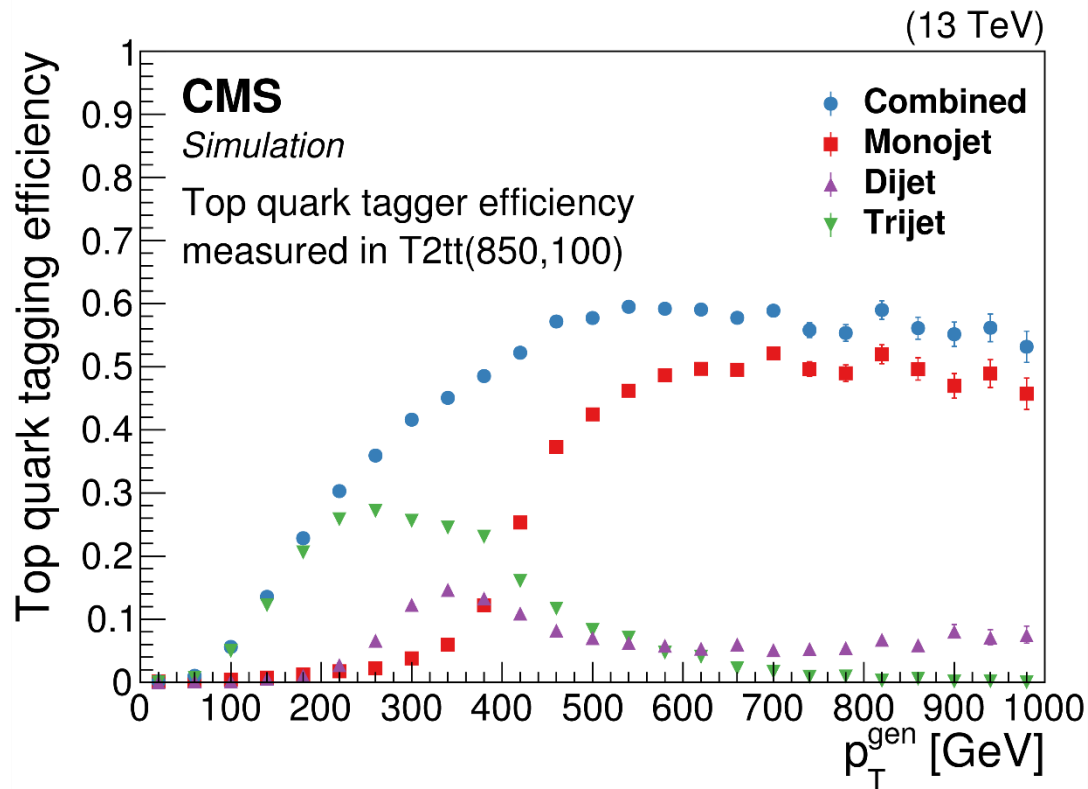
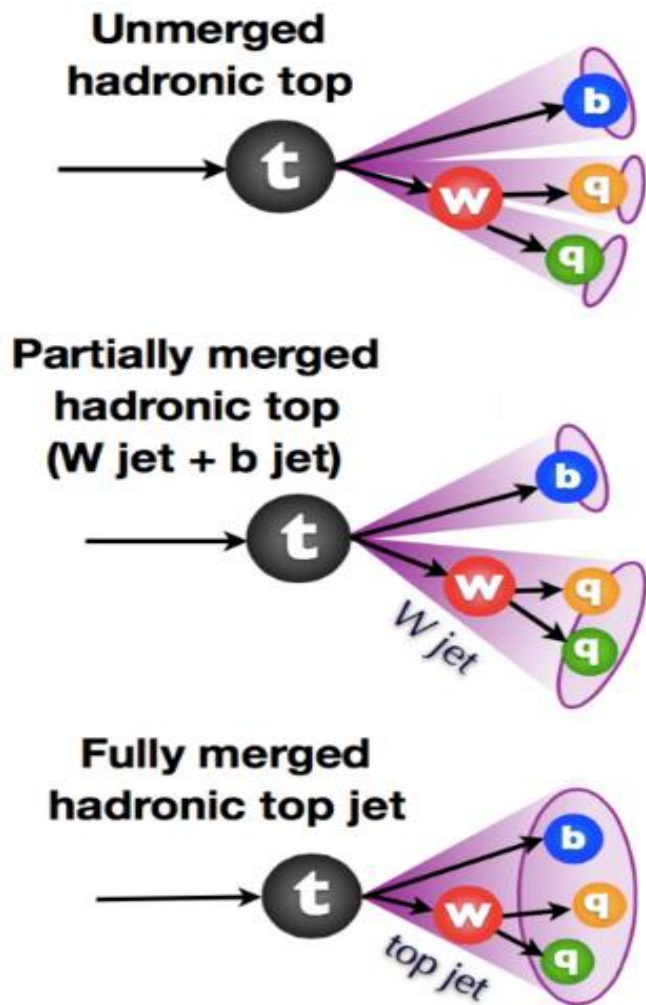


Dedicated 3rd Generation Search

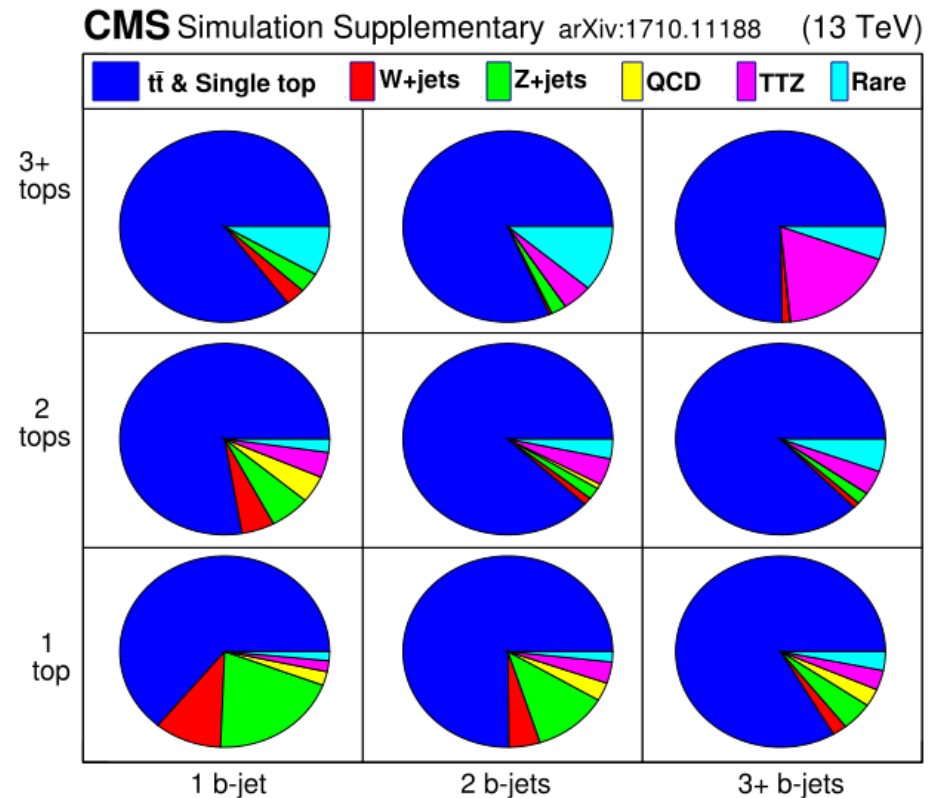


[arXiv:1710.11188](https://arxiv.org/abs/1710.11188)

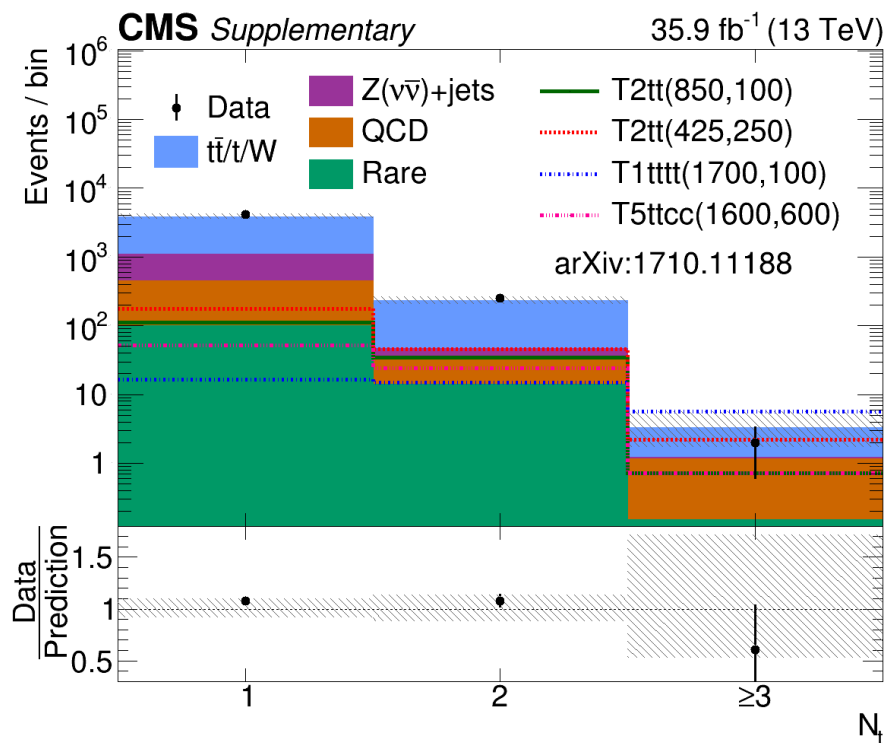
Target final state with tops using dedicated top tagging algorithm



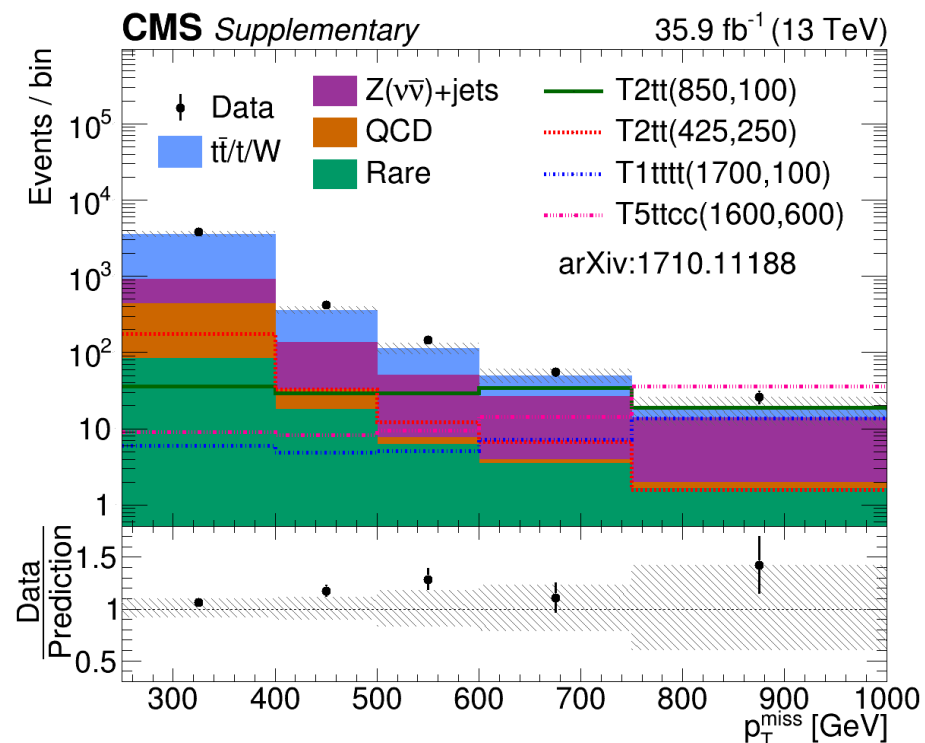
- Dominant background from events with real top quarks
 - Top background estimated using transfer factor method in 1-lepton CR
- Other background sources heavily reduced by application of top and b tagging



Number of tops



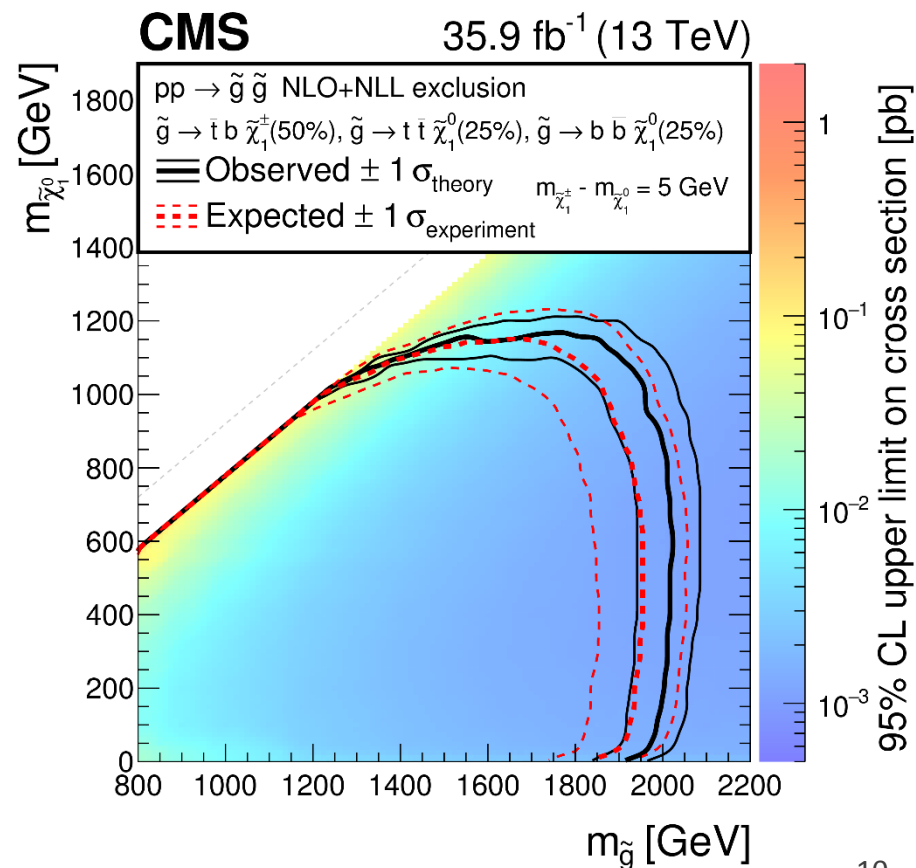
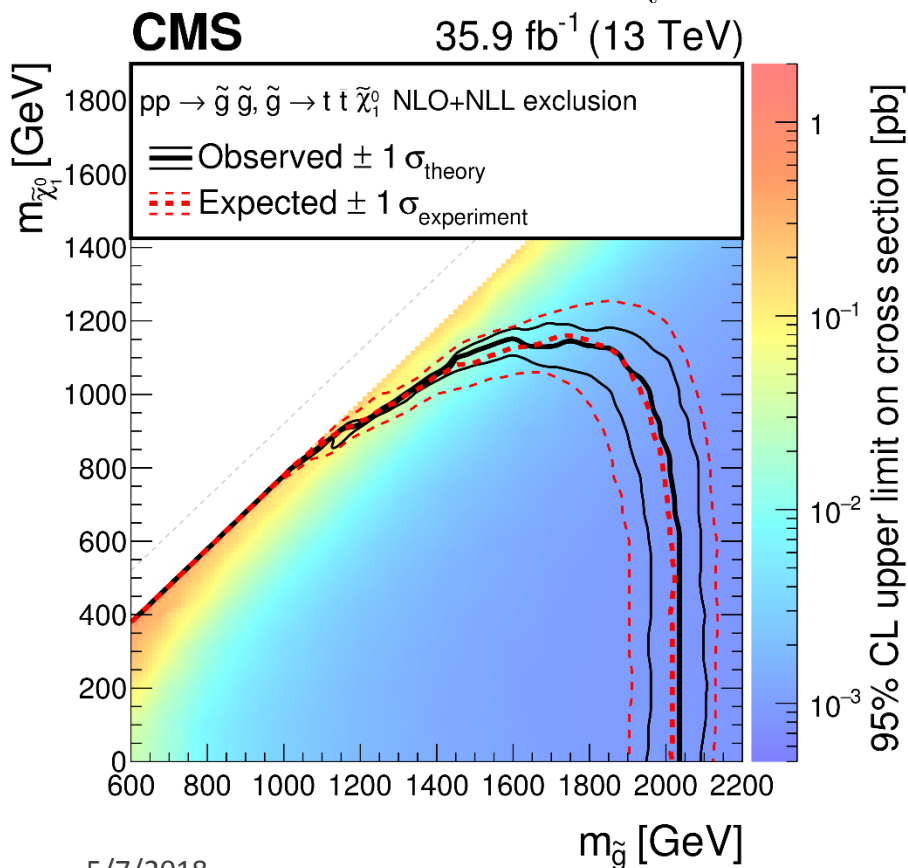
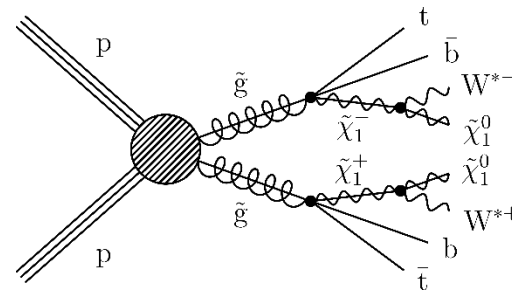
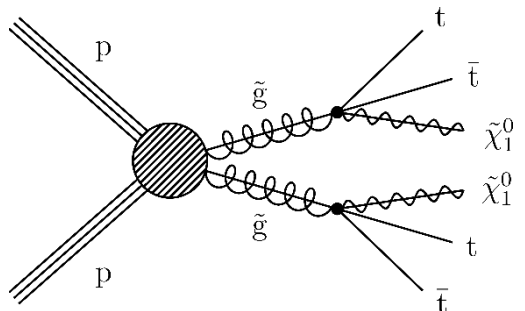
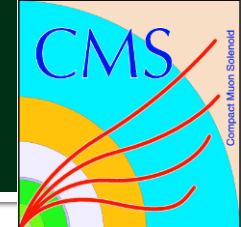
Missing transverse momentum



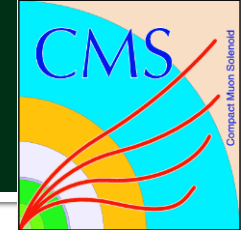
Events from search region



3rd Generation Interpretation



B 1 – lepton search

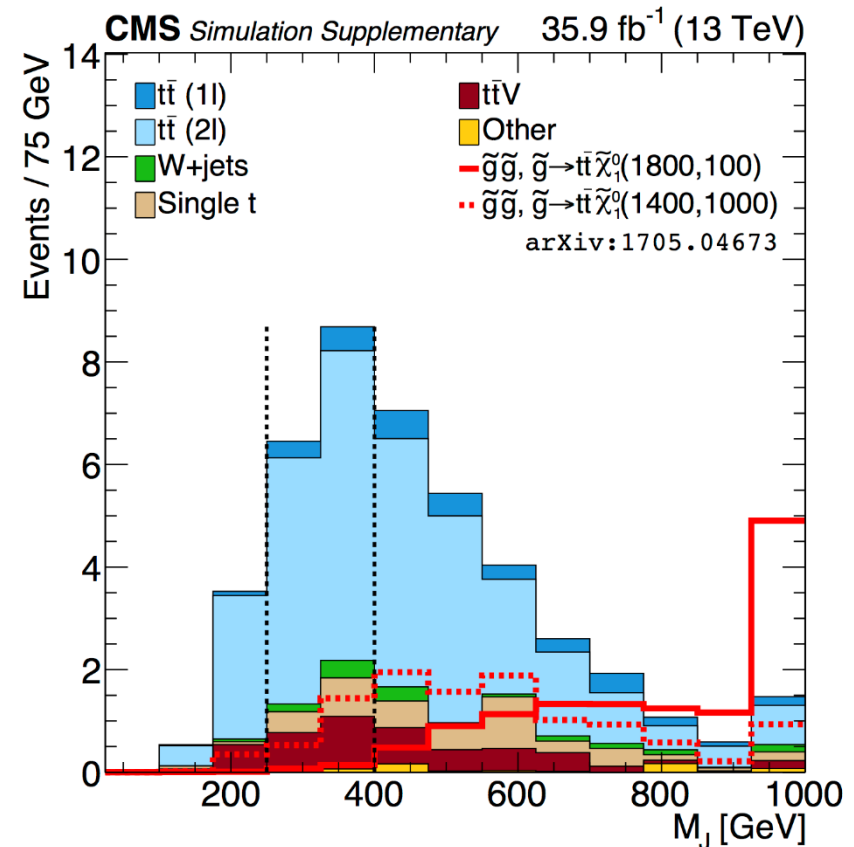


[arXiv:1705.04673](https://arxiv.org/abs/1705.04673)

- Require exactly 1 e or μ
- Categorize events based on: p_T^{miss} , N small-R jets, N b jets, $m_T(lep)$, M_J

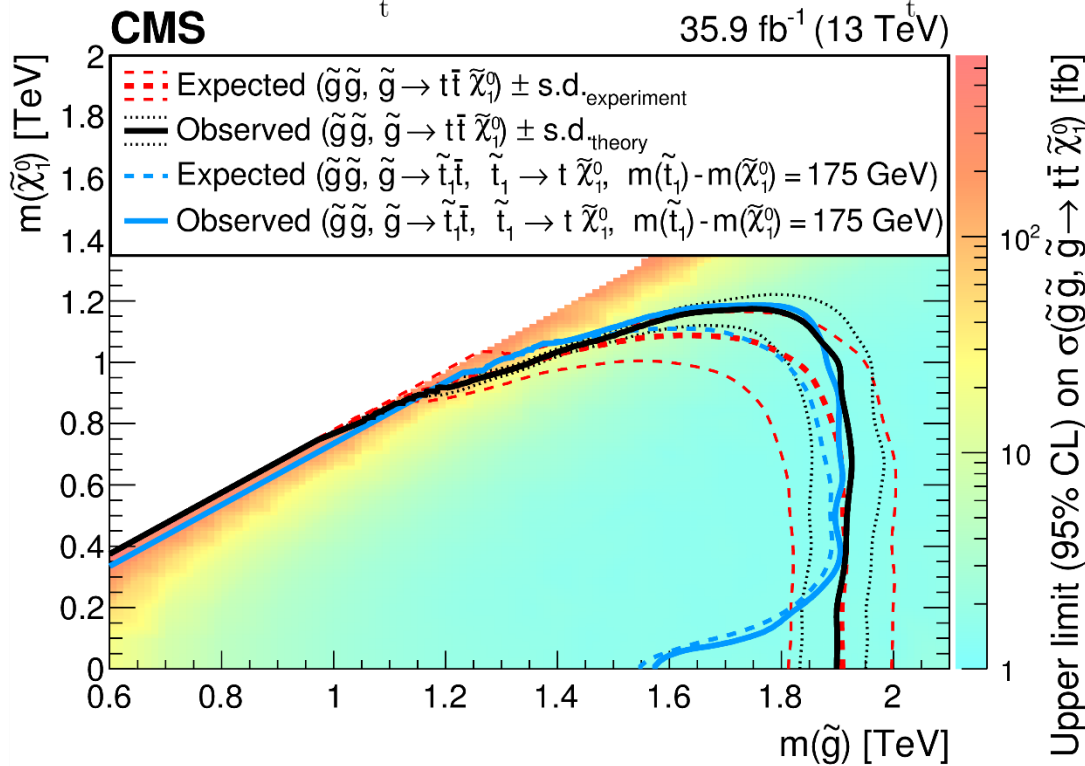
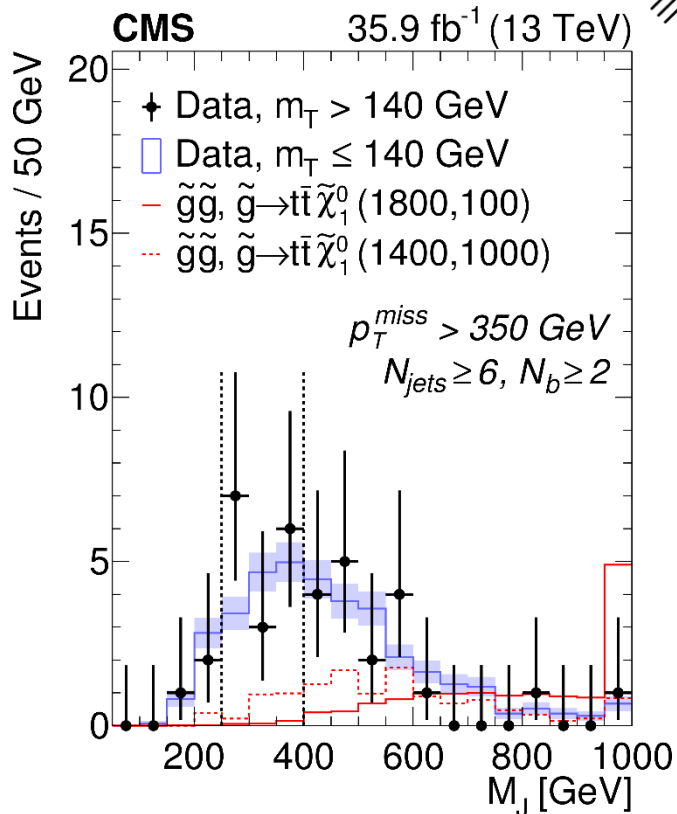
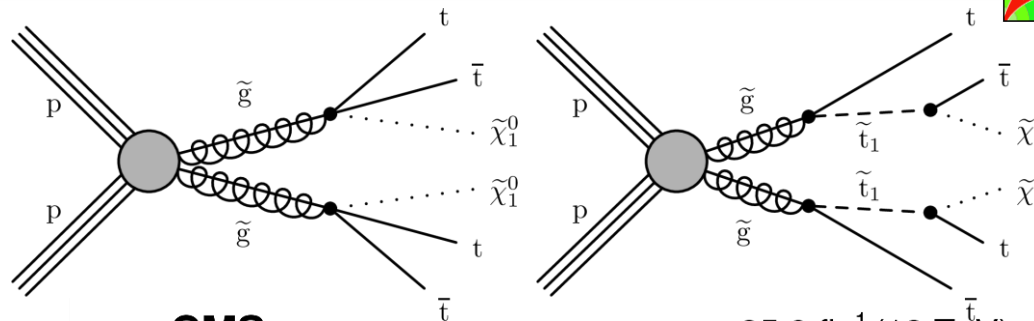
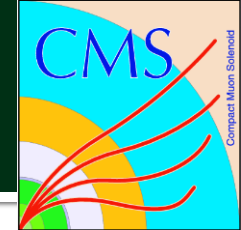
$$M_J = \sum_{\text{large-R jets}} m(j_i)$$

- Main background from dileptonic $t\bar{t}$



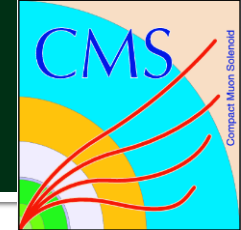


1l - Results & Interpretations





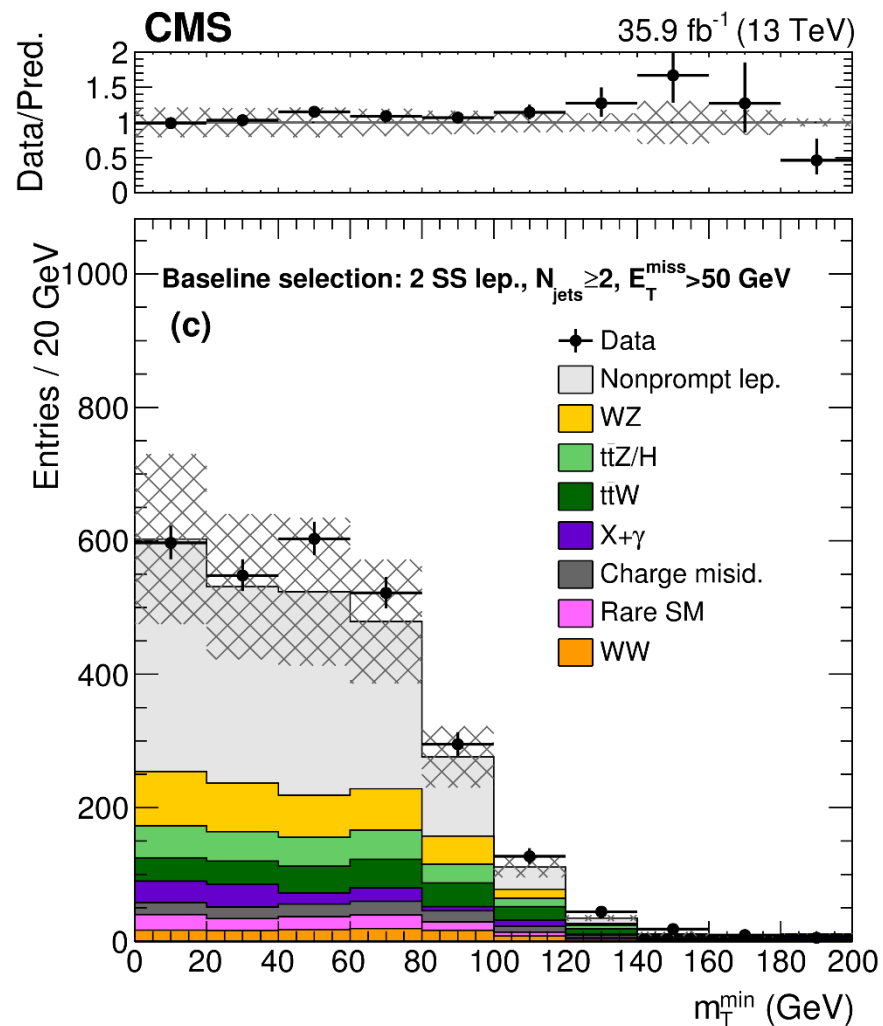
Dilepton SUSY search



[arXiv:1704.07323](https://arxiv.org/abs/1704.07323)

- Search for same sign e or μ pairs
 - $e/\mu p_T > 15/10$ GeV
 - $E_T^{miss} > 50$ GeV

- Events split by
 - Lepton p_T range
 - Number of b jets
 - Number of jets
 - E_T^{miss}
 - H_T
 - $\min m_T(lep)$

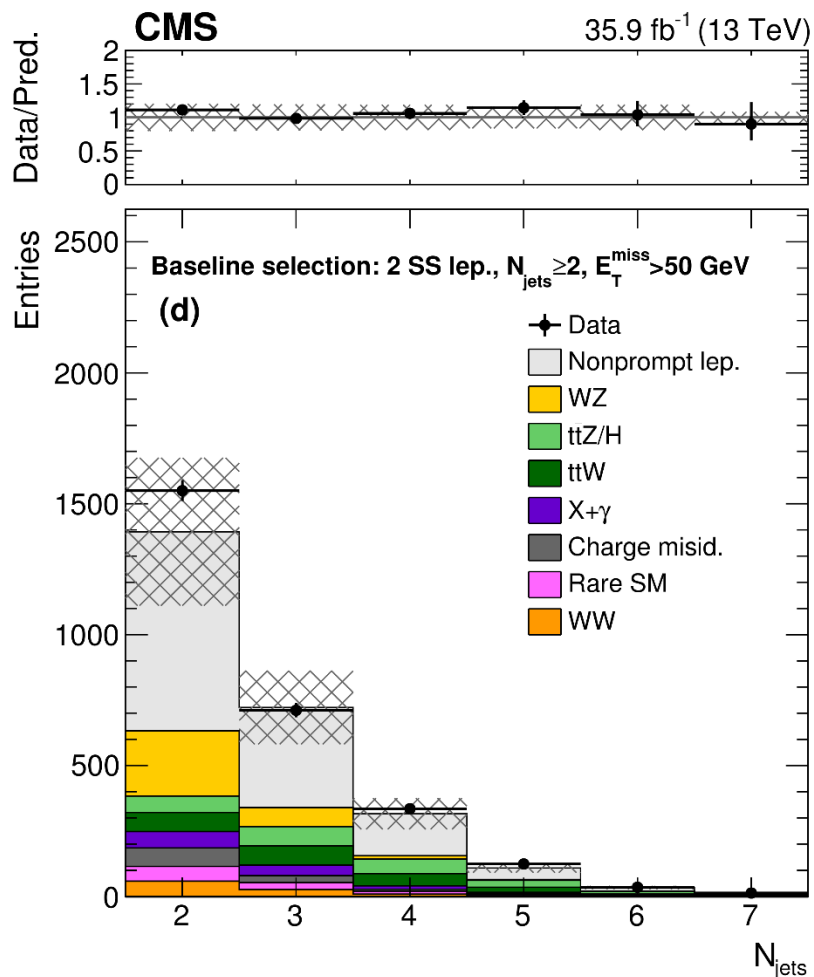




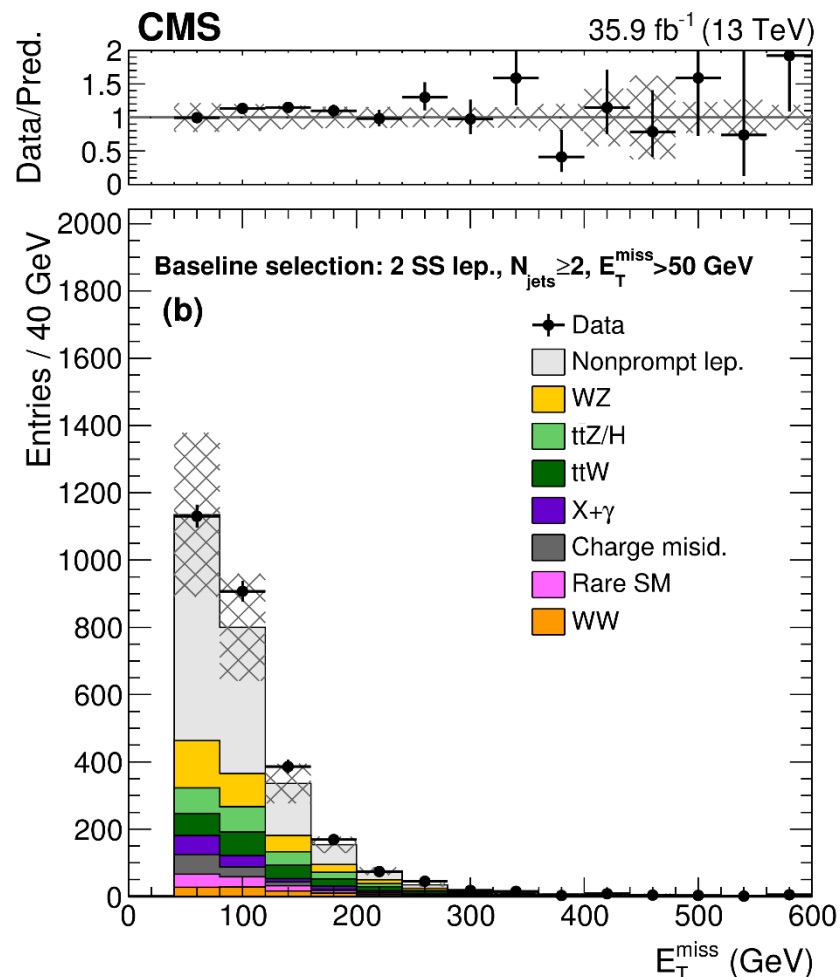
Dilepton SUSY Results



Number of jets

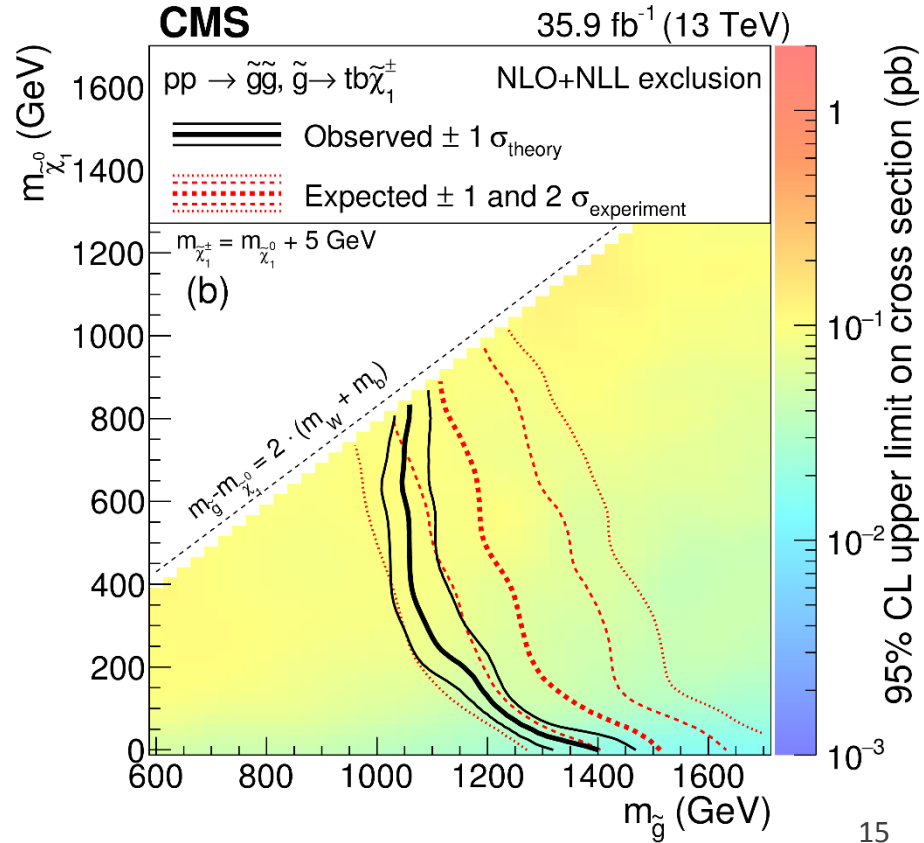
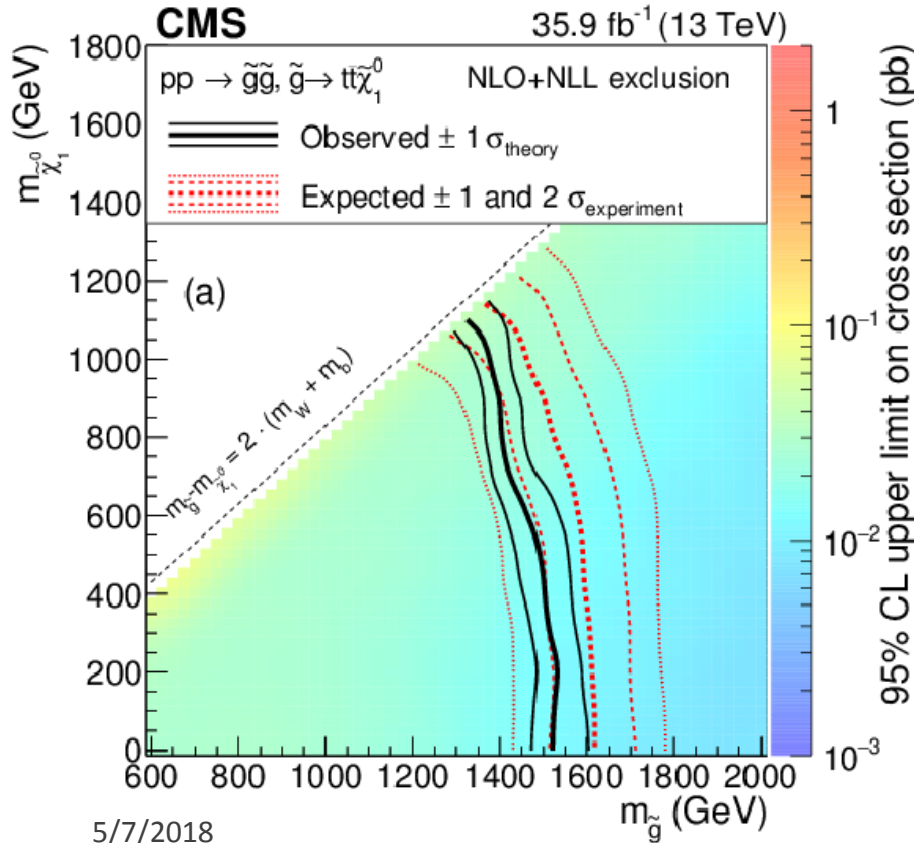
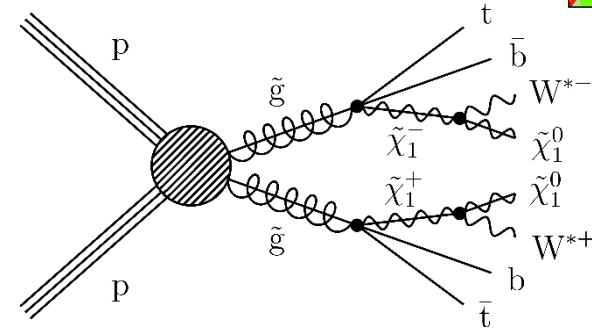
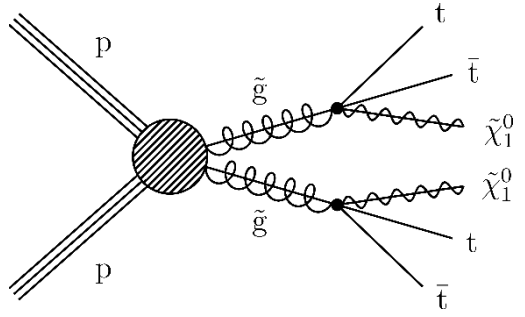


Missing transverse momentum



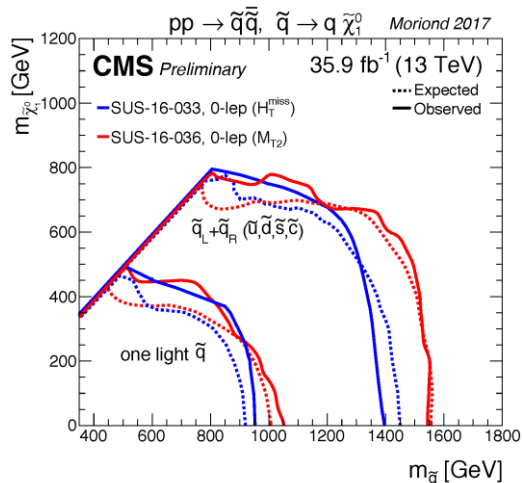


Dilepton SUSY Interpretation

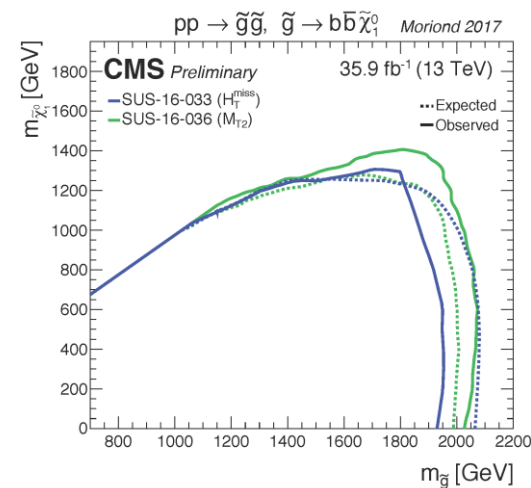
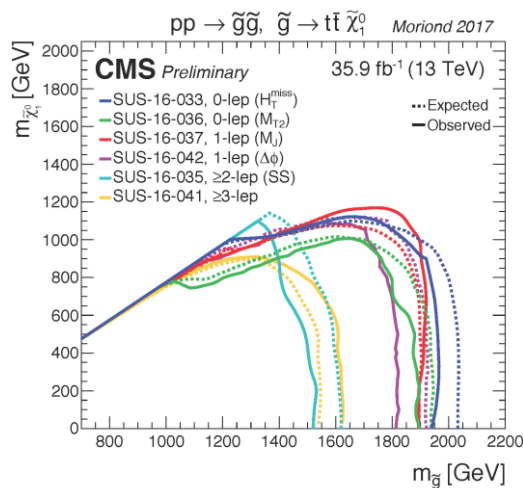
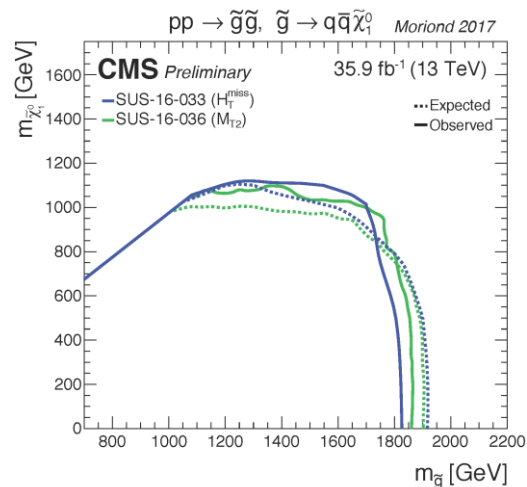


- CMS has many excellent searches for strongly produced SUSY: [All CMS SUSY Results](#)
- Stay tuned for more results!

Light squark pair-production

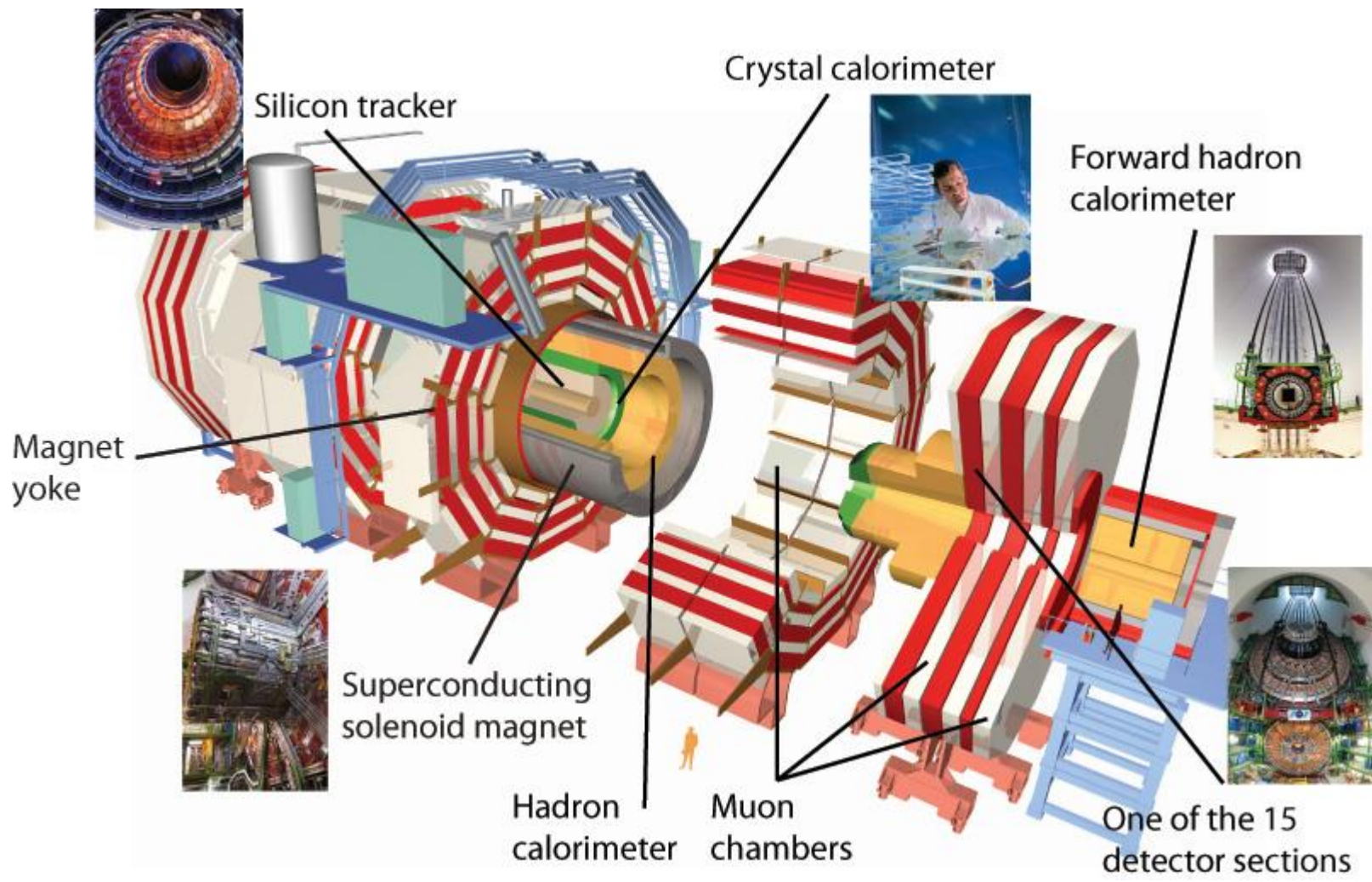
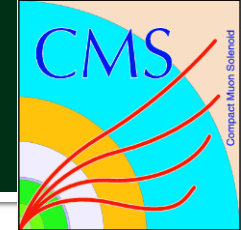


Glauino pair-production



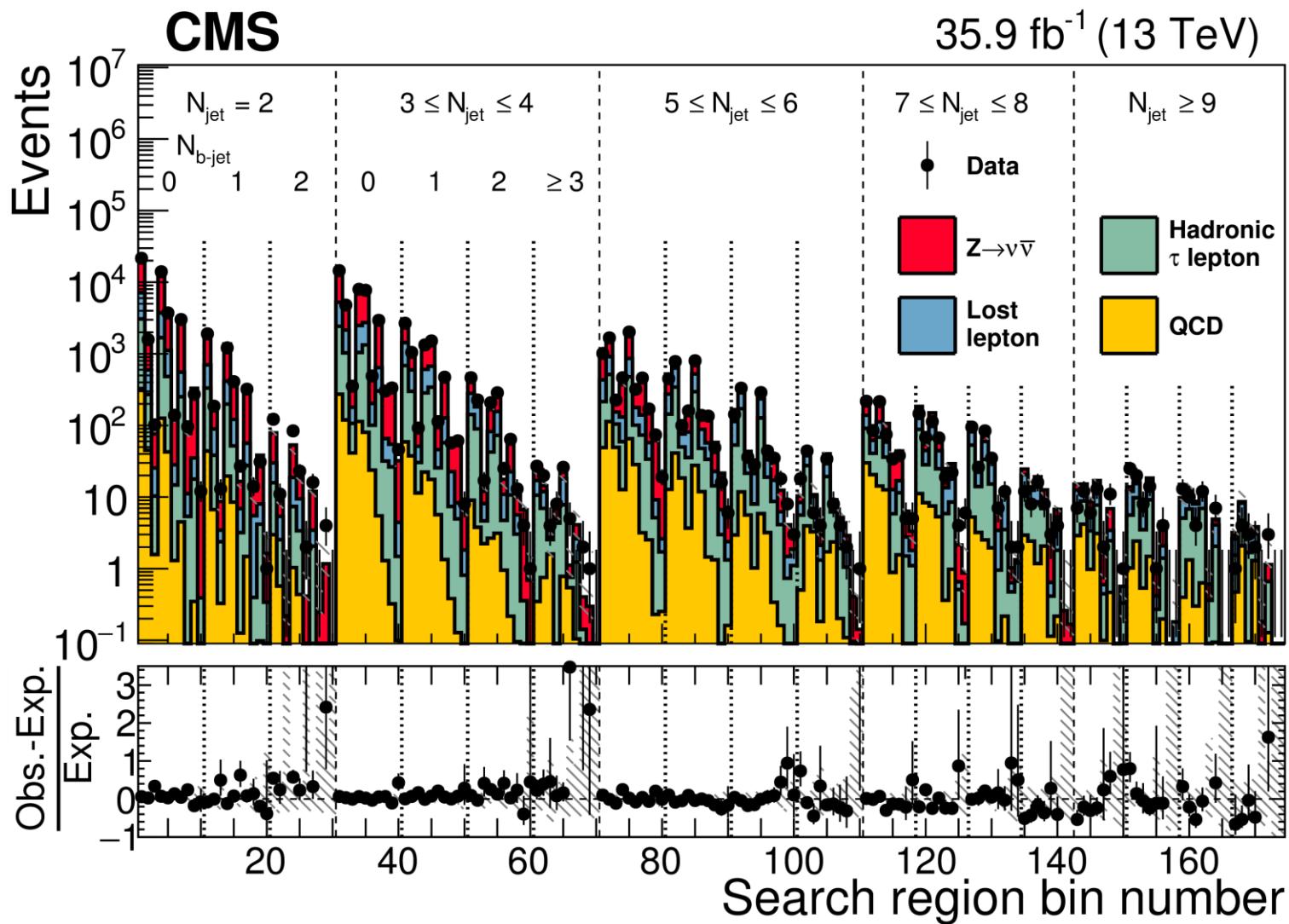
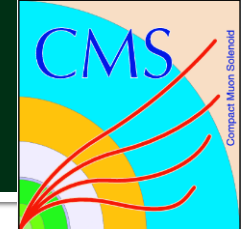
Backup Slides

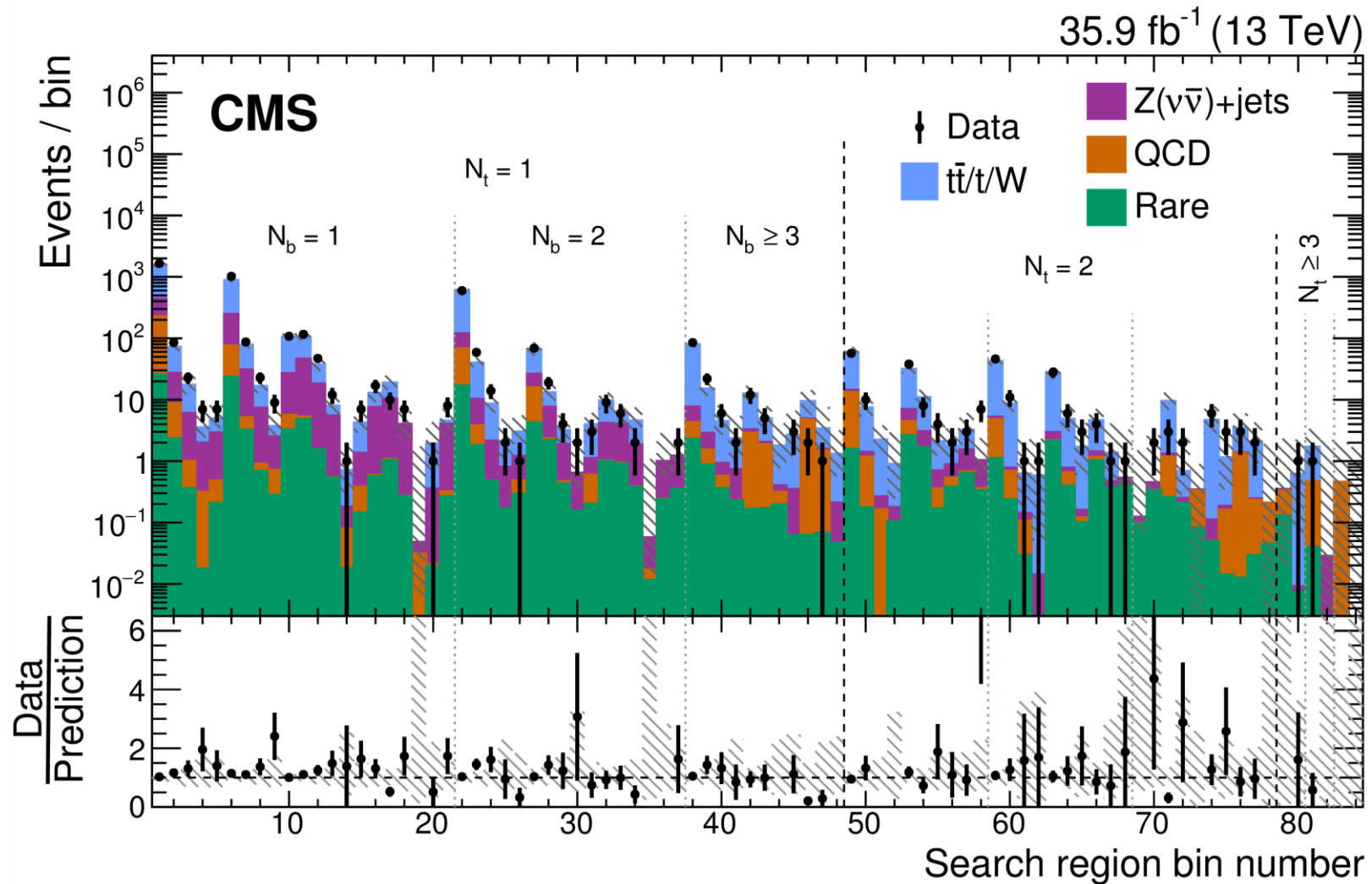
B CMS Experiment



<http://www.tifr.res.in/~indiacms/images/cms-det9.jpg>

B Hadronic Results

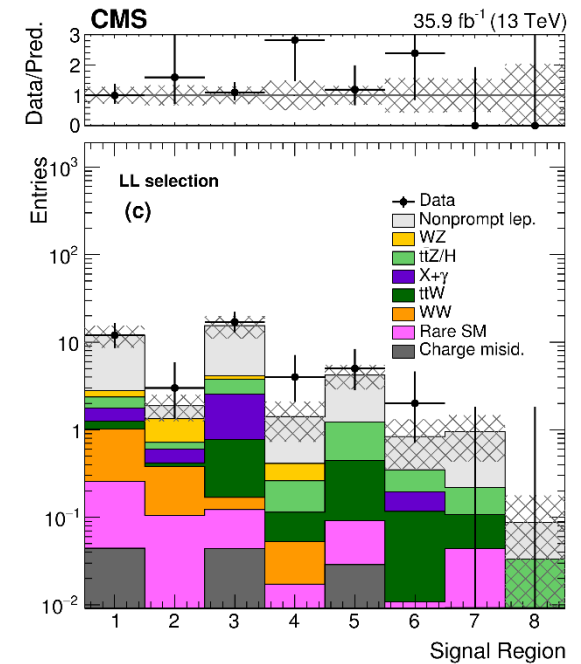
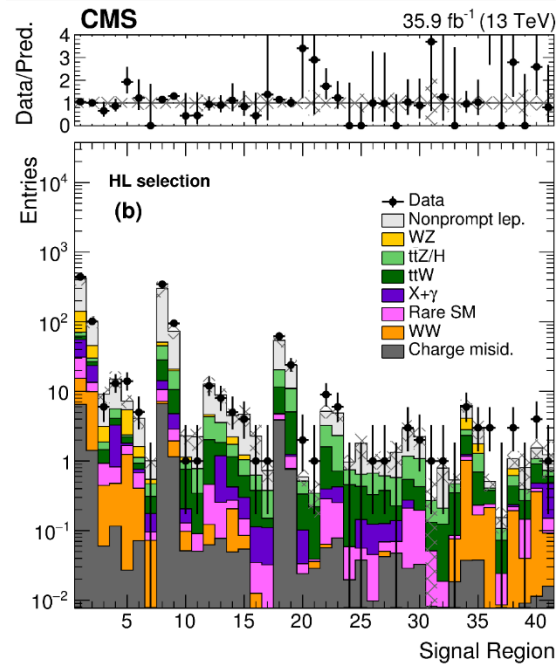
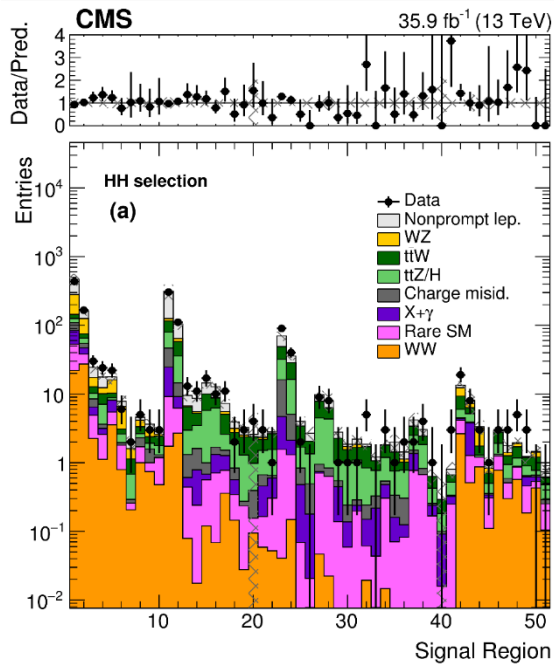




2 high- p_T leptons

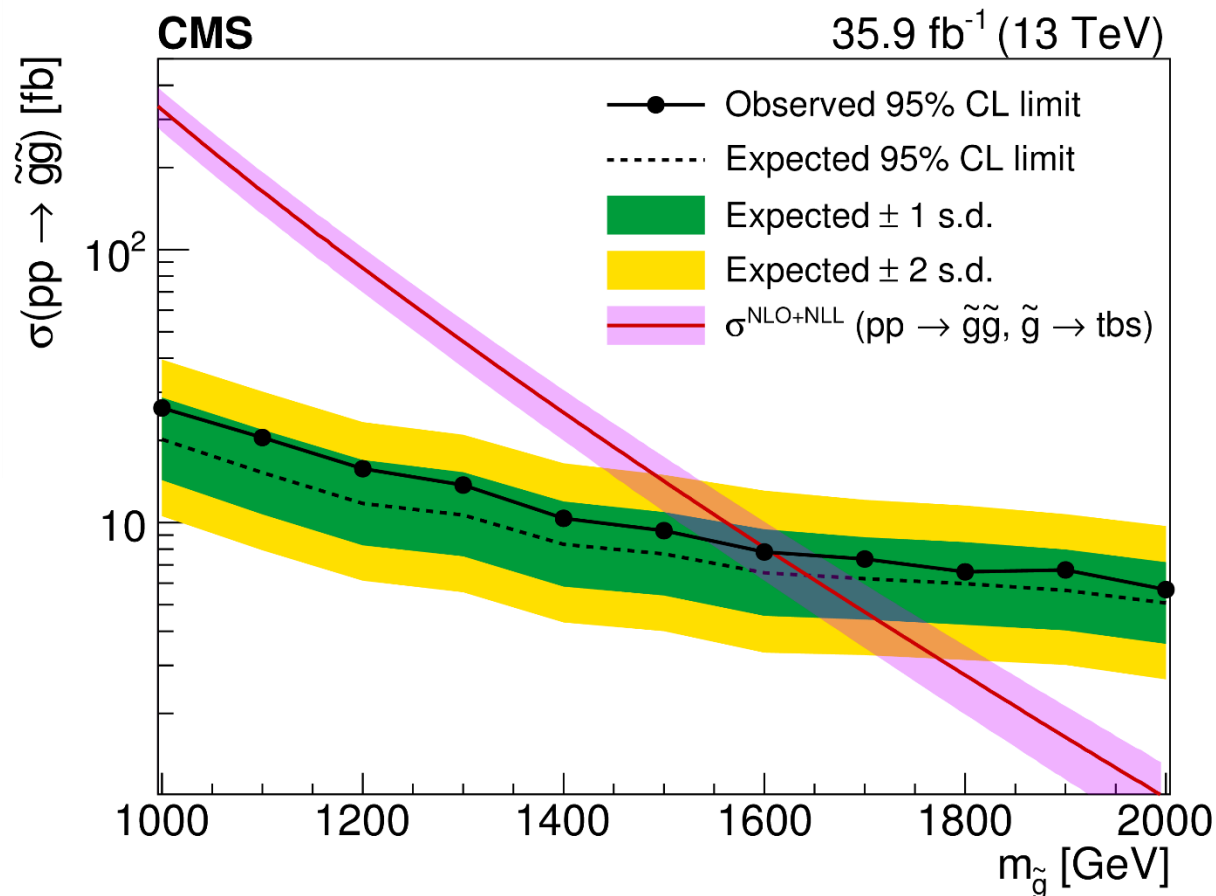
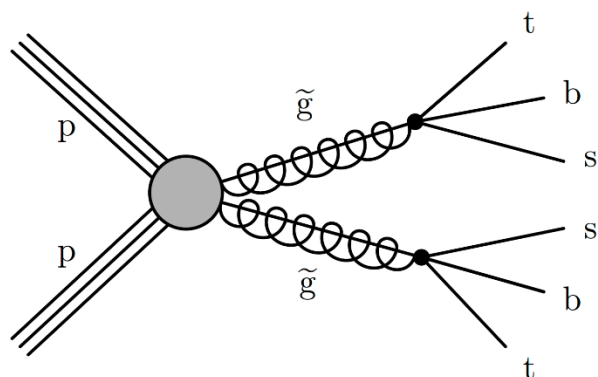
1 high- p_T & 1 low- p_T lepton

2 low- p_T leptons



- Use similar techniques to M_j based RPC SUSY search
- No p_T^{miss} requirements

[arXiv:1712.08920](https://arxiv.org/abs/1712.08920)





Dilepton Heavy Scalar Interpret.

