ATLAS SUSY Summary

pMSSM scanning results

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第十一届中国LHC物理会议

The 11th China LHC Physics Conference

Overview

- Intro of SUSY and pMSSM scan
- pMSSM scanning results
- Run3 perspective
- Summary and outlook

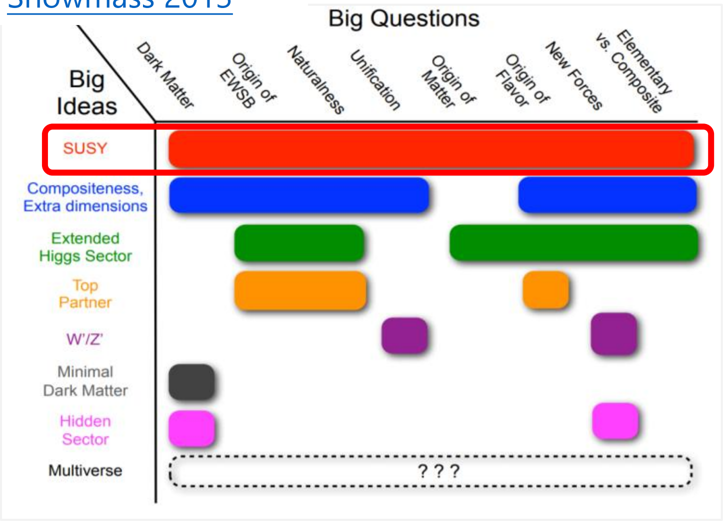

A little girl was looking for pearls on the beach…
Where is ~~pearl~~? SUSY
I don't know yet, but the search is still ongoing !

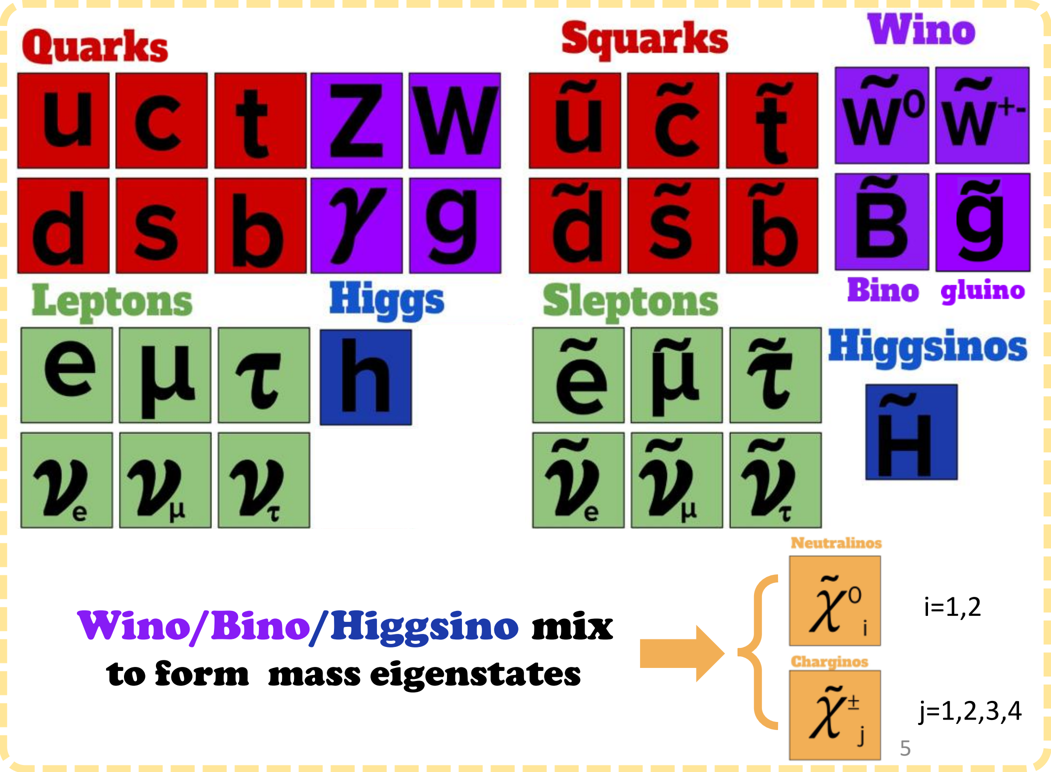
Intro of SUSY and pMSSM scan

Supersymmetry(SUSY)

- **What is SUSY?**
  - A high-energy-scale **symmetry between fermions and bosons** breaks at low energies, giving rise to SM particles and their superpartners (sparticles).
- **Why do we care about SUSY?**
  - Can (or partially) **solve a list of big questions**.
  - Predict a wealth of new particles to search for experimentally.

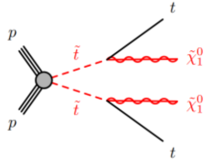
[Snowmass 2013]



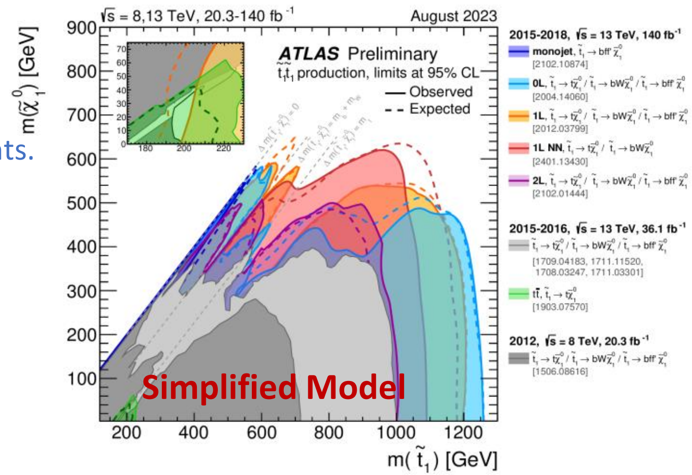


pMSSM scan

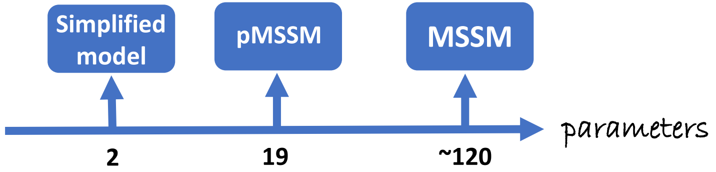
- What is the idea behind the **Scan?**
  - Summarize the current results more comprehensively
  - Aim to identify regions that are consistent with experimental, theoretical constraints.
  - Find models that could explain DM, or other SUSY signatures…



SUSY July 2024 Summary Plot



- Why **pMSSM scan?**
  - **pMSSM** (phenomenological Minimal SUSY Standard Model), between Simplified model(2~3 free parameters, limited) and MSSM(~120 free parameters, complex)
  - MSSM + simplifying assumptions based on experimental constraints and general features of SUSY breaking mechanisms = pMSSM(19 free parameters)



pMSSM Parameter	Meaning
$\tan\beta$	Ratio of the Higgs vacuum expectation values for the two doublets
M_A	Pseudoscalar (CP-odd) Higgs boson mass parameter
μ	Higgsino mass parameter
M_1, M_2, M_3	Bino, wino and gluino mass parameters
A_t, A_b, A_τ	Third generation trilinear couplings
$M_{\tilde{q}}$, $M_{\tilde{u}_R}$, $M_{\tilde{d}_R}$, $M_{\tilde{l}}$, $M_{\tilde{e}_R}$	First/second generation sfermion mass parameters
$M_{\tilde{Q}}$, $M_{\tilde{t}_R}$, $M_{\tilde{b}_R}$, $M_{\tilde{L}}$, $M_{\tilde{\tau}_R}$	Third generation sfermion mass parameters

pMSSM scan helps us …

Re-interpret result in higher dimensions

2D Simplified model study
- Strong SUSY Summary in ATLAS: [Shiyi's report]
- EW SUSY Summary in ATLAS: [Jiarong's report]

pMSSM study
- This report

pMSSM scan Workflow

Sample pMSSM → **Generate Models** → **"Interesting" models** → **Simulate events** → **Evaluate CL_s** → **Exclusion**

Sample pMSSM
- Random flat prior

Generate Models
- SPheno, FeynHiggs, micrOMEGAs & SuperIso

"Interesting" models
- m_h, $m(\tilde{\chi}_1^{\pm})$ LEP limit

Simulate events
- Truth-level: SimpleAnalysis
- Detector-level: RECAST for models with unclear excl.

Evaluate CL_s
- Using pyHF
- Use $CL_s^{\text{best,exp.}}$ to pick $CL_s^{\text{obs.}}$

Exclusion
- Uncovered models?

pMSSMFactory

- For non-ATLAS pMSSM: Rivet 、 GAMBIT 、 SModelS …
- For ATLAS pMSSM: A common framework named **pMSSMFactory** was under development for ~ten years (~2016-2025)
  - Model generation (random flat prior) & Model selection
  - SimpleAnalysis to evaluate CLs at truth level
  - RECAST*(REANA) to evaluate CLs at recon level
  - Analyses inventory:

Mar 02, 2016
Initial import of pMSSM factory framework to git
Brian Petersen authored Mar 02, 2016

Legend:
Fully implemented
Planning to implement
Partially implemented

EW

Name	Truth-level in factory	RECAST	RECAST in factory
FullHad	☑	ana-susy-2018-41	☑
1Lbb	☑	ana-susy-2019-08	☑
2L0J first wave	☑	ana-susy-2018-32	☑
EW 2L2J	☑	ana-susy-2018-05	☑
Compressed first wave	☑	ana-susy-2018-16	☑
3L onshell WZ	☑	ana-susy-2019-09-onshell	☑
3L onshell Wh	☑	ana-susy-2019-09-onshell	☑
3L offshell	☑	ana-susy-2019-09-offshell	☑
4L	☑	ana-susy-2018-02	☑
Disappearing track	☑	ana-susy-2018-19	☐
EWKino -> stau 2nd wave	☑	ana-susy-2019-17	☑
Multi-b	☐	ana-susy-2020-16	☑
yybb	☐	ana-susy-2020-17	☑
Direct stau 2nd wave	☑	EMPTY REPO	☐

Strong

Name	Truth-level in factory	RECAST	RECAST in factory
3G			
Stoph	☑	ana-susy-2018-21	☑
tt(0L)+MET	☑	ana-susy-2018-12	☑
tt(1L)+MET	☑	ana-susy-2018-07	☑
tt(2L)+MET	☑	ana-susy-2018-08	☑
Sbottom multi-b	☑	ana-susy-2018-31	☑
bb+MET	☐	ana-susy-2018-34	☐
StopZ	☑	ana-susy-2018-21	☐
StopStau	☑	ana-susy-2019-18	☐
Multi-b with taus	☑	ana-susy-2018-40	☐
Strong			
Strong multi-b / 3-b-jets	☑	ana-susy-2018-30	☑
0L 2-6 jets	☑	ana-susy-2018-22	☑
Strong 2L2J	☑	ana-susy-2018-05	☑
SS/3L second wave	☑	ana-susy-2020-27	☑
Strong 1L	☑	ana-susy-2018-10	☑
0L multijet	☑	ana-susy-2018-17	☐
MonoJet	☐	ANA-EXOT-2018-006	☐

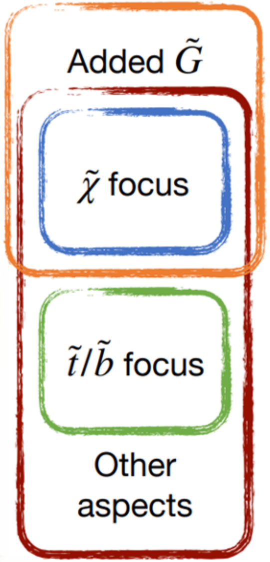
*RECAST: Request Efficiency for Alternative Signal Theories, a **re**producible analysis platform

pMSSM scanning results

We have four scans:

- **Currently, we have four great pMSSM scans for ATLAS Run2.**
  - All of scans:
    - SUSY has to be broken
    - Dark matter, flavor and EW precision constraints considered
    - Reinterpreted ATLAS Run 2 SUSY searches, included ATLAS Higgs constraints
  - The four scans **are not in a sequential list, but "complementary"**
    - **EWK scan** has been finished
    - **3G**, **General**, **GMSB** are still working in progress…

- ATLAS Run1 paper: JHEP10(2015)134
- ATLAS Run2: SUSY-2014-08, SUSY-2015-12
- CMS Run2: CMS-PAS-SUS-24-004

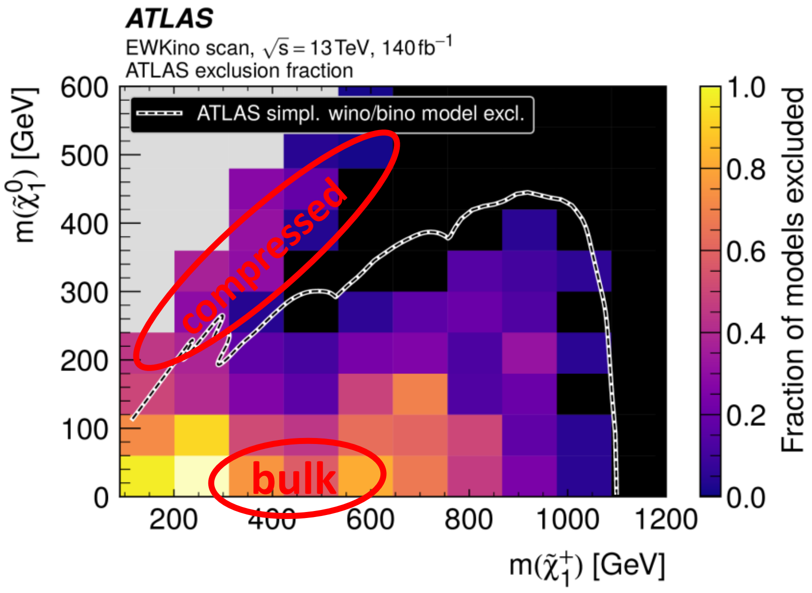


EW scanning: DONE

JHEP05(2024)106

- Scan configuration
  - 20k models sampled
  - Focus on electroweakinos (squarks, sleptons & gluino decoupled)
  - **5D EWKino scan**; **Include 3[rd] gen**

Parameter	Min	Max	Note
$M_{\tilde{L}_1}$ $(=M_{\tilde{L}_2})$	10 TeV	10 TeV	Left-handed slepton (first two gens.) mass
$M_{\tilde{e}_1}$ $(=M_{\tilde{e}_2})$	10 TeV	10 TeV	Right-handed slepton (first two gens.) mass
$M_{\tilde{L}_3}$	10 TeV	10 TeV	Left-handed stau doublet mass
$M_{\tilde{e}_3}$	10 TeV	10 TeV	Right-handed stau mass
$M_{\tilde{Q}_1}$ $(=M_{\tilde{Q}_2})$	10 TeV	10 TeV	Left-handed squark (first two gens.) mass
$M_{\tilde{u}_1}$ $(=M_{\tilde{u}_2})$	10 TeV	10 TeV	Right-handed up-type squark (first two gens.) mass
$M_{\tilde{d}_1}$ $(=M_{\tilde{d}_2})$	10 TeV	10 TeV	Right-handed down-type squark (first two gens.) mass
$M_{\tilde{Q}_3}$	2 TeV	5 TeV	Left-handed squark (third gen.) mass
$M_{\tilde{u}_3}$	2 TeV	5 TeV	Right-handed top squark mass
$M_{\tilde{d}_3}$	2 TeV	5 TeV	Right-handed bottom squark mass
M_1	−2 TeV	2 TeV	Bino mass parameter
M_2	−2 TeV	2 TeV	Wino mass parameter
μ	−2 TeV	2 TeV	Bilinear Higgs boson mass parameter
M_3	1 TeV	5 TeV	Gluino mass parameter
A_t	−8 TeV	8 TeV	Trilinear top coupling
A_b	−2 TeV	2 TeV	Trilinear bottom coupling
A_τ	−2 TeV	2 TeV	Trilinear τ-lepton coupling
M_A	0 TeV	5 TeV	Pseudoscalar Higgs boson mass
$\tan\beta$	1	60	Ratio of the Higgs vacuum expectation values



- Some sensitivity to **compressed** scenarios through heavier electroweakino decays
- Even **low mass** bins don't have 100% exclusion
- Important to improve depth of sensitivity as well as target new regions!

EW scanning: DONE

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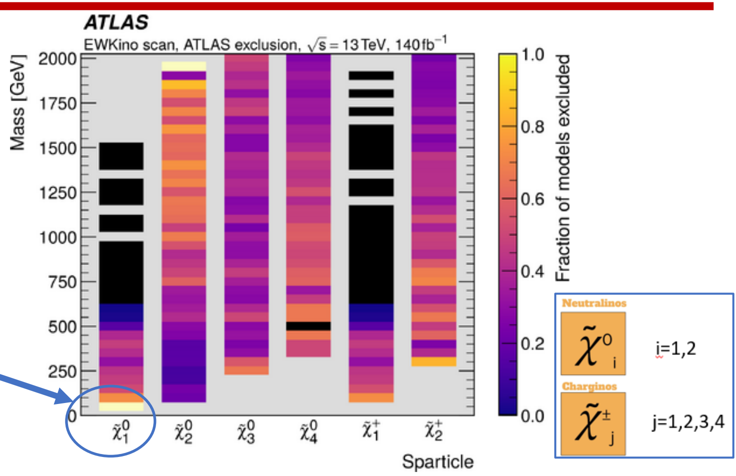
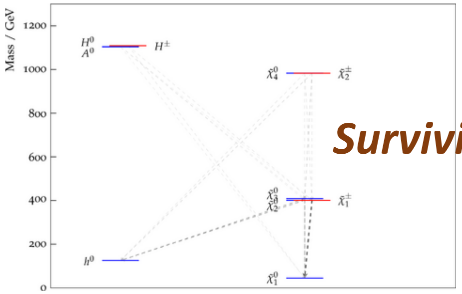
- Electroweak SUSY is challenging
  - Broad coverage of pMSSM scenarios with 8 Run2 analyses
  - Room to improve depth of sensitivity and target compressed scenarios
  - Viable models remain right up to the LEP limits

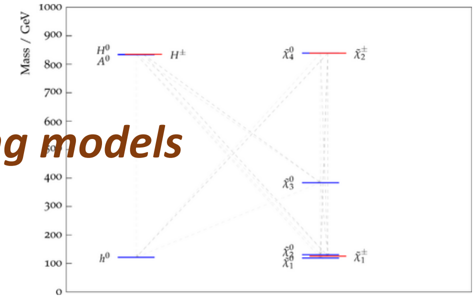


- Feature of unexcluded models
  - Higgsino-like $\tilde{\chi}_1^{\pm}/\tilde{\chi}_2^0$
    - 3x smaller production cross-section than typical wino simplified models
  - Mixed neutralino decays
    - Need statistical combinations
  - More complex decay chains
    - Lighter $\tilde{\chi}_2^{\pm}$ / $\tilde{\chi}_{3,4}^0$ and/or BSM Higgs' could be in reach

Surviving models



Higgsino-Bino scenario
small x-section, complex decays



Compressed Higgsino scenario
radiative decays

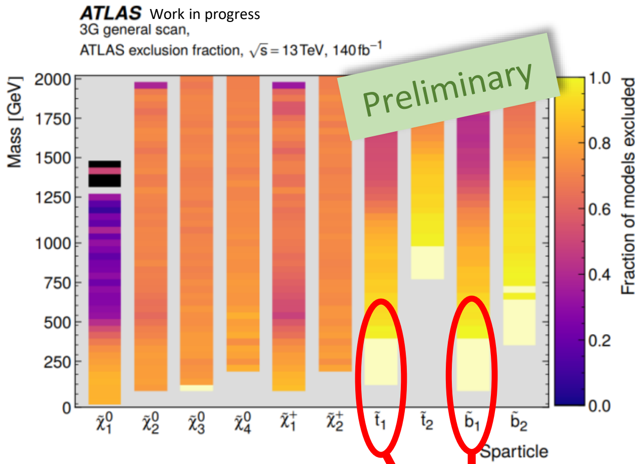
3G scanning:

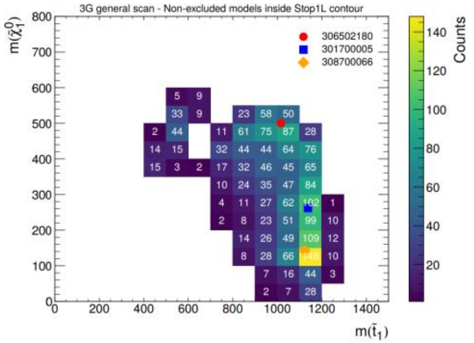
Ref: [link]

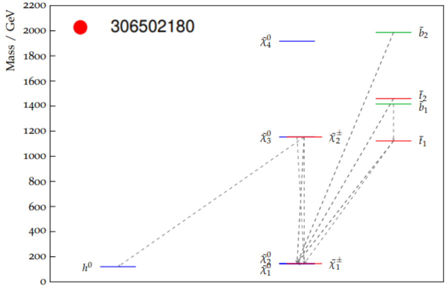
- Scan configuration & Preliminary results
  - The scans includes a set of models enhanced in low-mass stop and sbottom quarks

Parameter	min	max	Note
$m_{\tilde{L}_1}$ $(=m_{\tilde{L}_2})$	0 TeV	2 TeV	Left-handed slepton (first two gens.) mass
$m_{\tilde{e}_1}$ $(=m_{\tilde{e}_2})$	0 TeV	2 TeV	Right-handed slepton (first two gens.) mass
$m_{\tilde{L}_3}$	0 TeV	2 TeV	Left-handed stau doublet mass
$m_{\tilde{e}_3}$	0 TeV	2 TeV	Right-handed stau mass
$m_{\tilde{Q}_1}$ $(=m_{\tilde{Q}_2})$	5 TeV	5 TeV	Left-handed squark (first two gens.) mass
$m_{\tilde{u}_1}$ $(=m_{\tilde{u}_2})$	5 TeV	5 TeV	Right-handed up-type squark (first two gens.) mass
$m_{\tilde{d}_1}$ $(=m_{\tilde{d}_2})$	5 TeV	5 TeV	Right-handed down-type squark (first two gens.) mass
$m_{\tilde{Q}_3}$	0 TeV	2 TeV	Left-handed squark (third gen.) mass
$m_{\tilde{u}_3}$	0 TeV	2 TeV	Right-handed top squark mass
$m_{\tilde{d}_3}$	0 TeV	2 TeV	Right-handed bottom squark mass
M_1	-2 TeV	2 TeV	Bino mass parameter
M_2	-2 TeV	2 TeV	Wino mass parameter
μ	-2 TeV	2 TeV	Bilinear Higgs mass parameter
M_3	3 TeV	3 TeV	Gluino mass parameter
A_t	-8 TeV	8 TeV	Trilinear top coupling
A_b	-2 TeV	2 TeV	Trilinear bottom coupling
A_τ	-2 TeV	2 TeV	Trilinear τ lepton coupling
M_A	0 TeV	5 TeV	Pseudoscalar Higgs boson mass
$\tan\beta$	1	60	Ratio of the Higgs vacuum expectation values

$\tilde{t}/\tilde{b}$







Almost all models with $\tilde{t}/\tilde{b}$ masses below 300 GeV are excluded

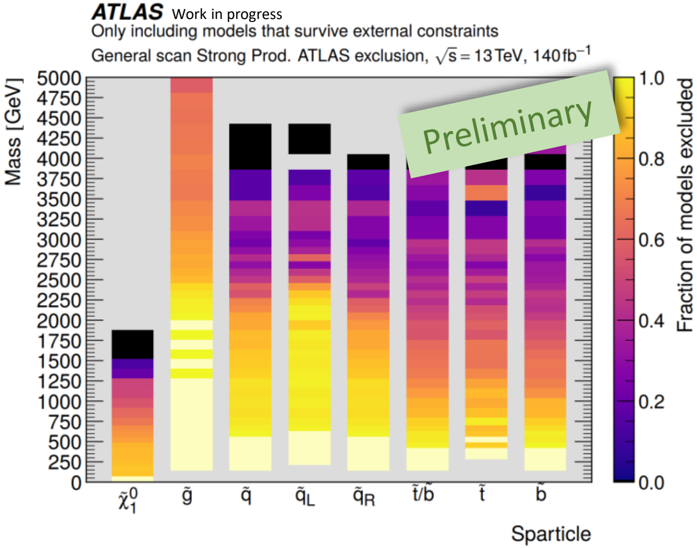
- Ongoing & Todo
  - [Ongoing] Reco-level study
  - [Todo] Summarize the results and publish the paper

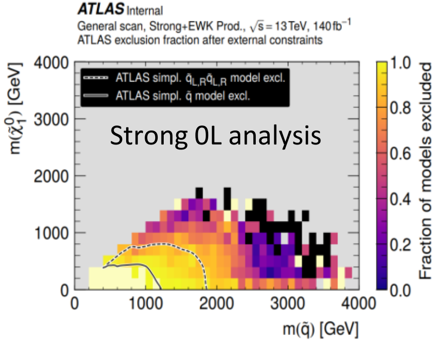
General scanning:

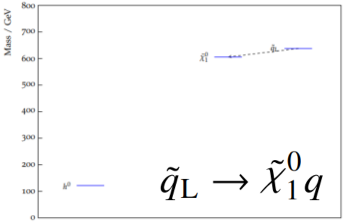
Ref: link

- Scan configuration & Preliminary results
  - The scans includes models where **all sparticles** from both the strong and electroweak sector are accessible, and in various mass orderings

Parameter	min	max	Note
$m_{\tilde{L}_1}$ $(=m_{\tilde{L}_2})$	0 TeV	5 TeV	Left-handed slepton (first two gens.) mass
$m_{\tilde{e}_1}$ $(=m_{\tilde{e}_2})$	0 TeV	5 TeV	Right-handed slepton (first two gens.) mass
$m_{\tilde{L}_3}$	0 TeV	5 TeV	Left-handed stau doublet mass
$m_{\tilde{e}_3}$	0 TeV	5 TeV	Right-handed stau mass
$m_{\tilde{Q}_1}$ $(=m_{\tilde{Q}_2})$	0 TeV	5 TeV	Left-handed squark (first two gens.) mass
$m_{\tilde{u}_1}$ $(=m_{\tilde{u}_2})$	0 TeV	5 TeV	Right-handed up-type squark (first two gens.) mass
$m_{\tilde{d}_1}$ $(=m_{\tilde{d}_2})$	0 TeV	5 TeV	Right-handed down-type squark (first two gens.) mass
$m_{\tilde{Q}_3}$	0 TeV	5 TeV	Left-handed squark (third gen.) mass
$m_{\tilde{u}_3}$	0 TeV	5 TeV	Right-handed top squark mass
$m_{\tilde{d}_3}$	0 TeV	5 TeV	Right-handed bottom squark mass
M_1	-5 TeV	5 TeV	Bino mass parameter for "General scan" **bino**
M_1	-2 TeV	2 TeV	Bino mass parameter for "BinoDM scan"
M_2	-5 TeV	5 TeV	Wino mass parameter
μ	-5 TeV	5 TeV	Bilinear Higgs mass parameter
M_3	0 TeV	5 TeV	Gluino mass parameter
A_t	-8 TeV	8 TeV	Trilinear top coupling
A_b	-8 TeV	8 TeV	Trilinear bottom coupling
A_τ	-8 TeV	8 TeV	Trilinear τ lepton coupling
M_A	0 TeV	5 TeV	Pseudoscalar Higgs boson mass
$\tan\beta$	1	60	Ratio of the Higgs vacuum expectation values







- Ongoing & Todo
  - [Ongoing] Reco-level study
  - [Todo] Summarize the results and publish the paper

- $m(\tilde{q}) \leq 550$ GeV is almost completely excluded
- $m(\tilde{g}) \leq 1.5$ TeV is almost completely excluded
- The LSP $m(\tilde{\chi}_1^0)$ mass below 400 GeV is almost excluded

GMSB scanning:

- EWKinos: $\tilde{\chi}^0_{1/2} \to h/Z/\gamma\tilde{G}$, $\tilde{\chi}^\pm_1 \to W\tilde{G}$.
- sleptons: $\tilde{l} \to l\tilde{G}$, $\tilde{\nu} \to \nu\tilde{G}$.

- Scan configuration & Preliminary results
  - The scans focus on EWK production, extended by a near-massless $\tilde{G}$ as LSP. 600k models generated in 9-dim scan.

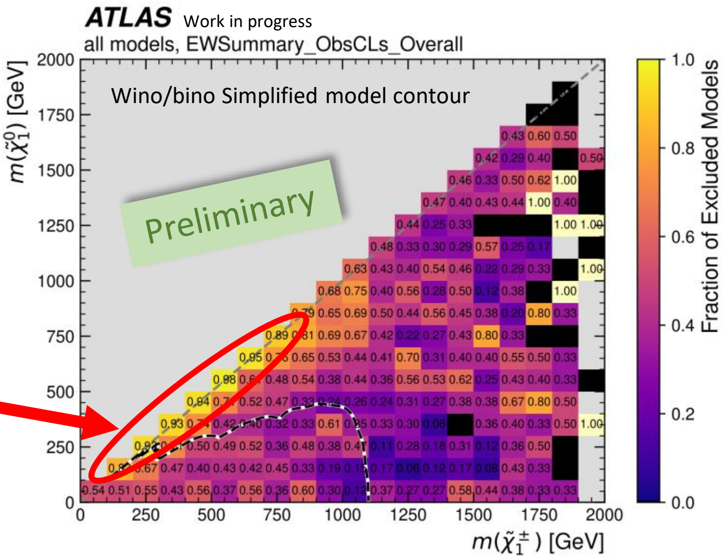
Parameter	min	max	Note
$m_{\tilde{L}_1}$ $(=m_{\tilde{L}_2})$	0 TeV	2 TeV	Left-handed slepton (first two gens.) mass
$m_{\tilde{e}_1}$ $(=m_{\tilde{e}_2})$	0 TeV	2 TeV	Right-handed slepton (first two gens.) mass
$m_{\tilde{L}_3}$	2 TeV	2 TeV	Left-handed stau doublet mass
$m_{\tilde{e}_3}$	2 TeV	2 TeV	Right-handed stau mass
$m_{\tilde{Q}_1}$ $(=m_{\tilde{Q}_2})$	4 TeV	4 TeV	Left-handed squark (first two gens.) mass
$m_{\tilde{u}_1}$ $(=m_{\tilde{u}_2})$	4 TeV	4 TeV	Right-handed up-type squark (first two gens.) mass
$m_{\tilde{d}_1}$ $(=m_{\tilde{d}_2})$	4 TeV	4 TeV	Right-handed down-type squark (first two gens.) mass
$m_{\tilde{Q}_3}$	4 TeV	4 TeV	Left-handed squark (third gen.) mass
$m_{\tilde{u}_3}$	4 TeV	4 TeV	Right-handed top squark mass
$m_{\tilde{d}_3}$	4 TeV	4 TeV	Right-handed bottom squark mass
M_1	-2 TeV	2 TeV	Bino mass parameter
M_2	-2 TeV	2 TeV	Wino mass parameter
μ	-2 TeV	2 TeV	Bilinear Higgs mass parameter
M_3	4 TeV	4 TeV	Gluino mass parameter
A_t	-8 TeV	8 TeV	Trilinear top coupling
A_b	-2 TeV	2 TeV	Trilinear bottom coupling
A_τ	-2 TeV	2 TeV	Trilinear τ lepton coupling
M_A	2 TeV	2 TeV	Pseudoscalar Higgs boson mass
$\tan\beta$	1	60	Ratio of the Higgs vacuum expectation values

$\tilde{e},\tilde{\mu}$

$\tilde{\tau}$

Scan name	fixed stau	floating stau
$m_{\tilde{L}_3}$, $m_{\tilde{e}_3}$ ranges	2 TeV	0 – 2 TeV
Number of models generated:		
Sampled	600,000	600,000
Successful generation	576,142	500,987
Pass LEP constraint	533,569	463,627
120 GeV < m(h) < 130 GeV	486,108	415,309
a_μ constraint	1,379	1,143
Number of models processed:		
Selected for event generation	4,355	4,120
Pass pre-filter	4,125	4,014
Successful truth-level evaluation	4,104	3,972
Low statistics truth-production	229	188
Reco-level evaluation	730	618

Surprisingly good exclusion

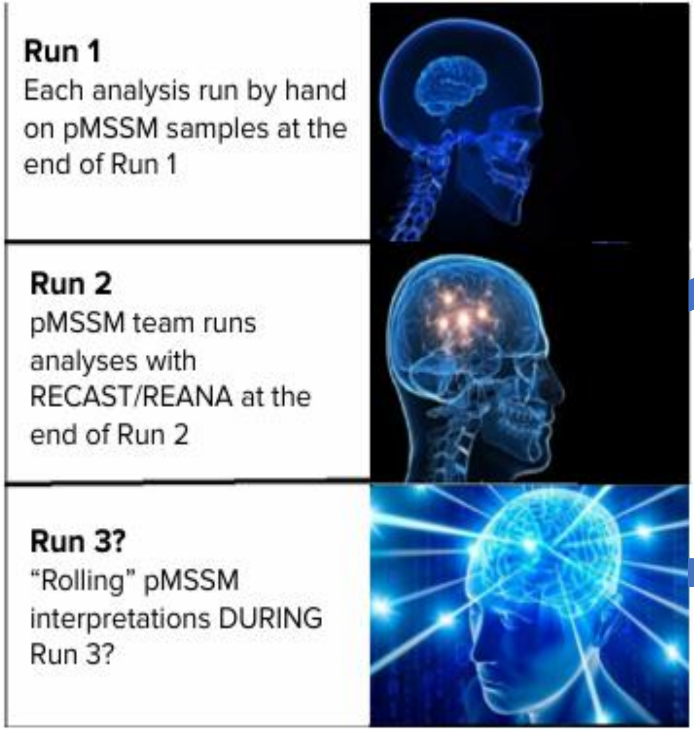


Lower exclusion in bulk, larger at higher masses

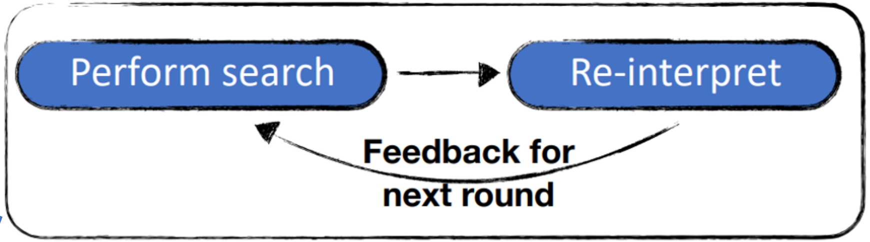
- Ongoing & Todo
  - [Ongoing] Reco-level study
  - [Todo] Summarize the results and publish the paper

Run3 perspective

pMSSM scan overview

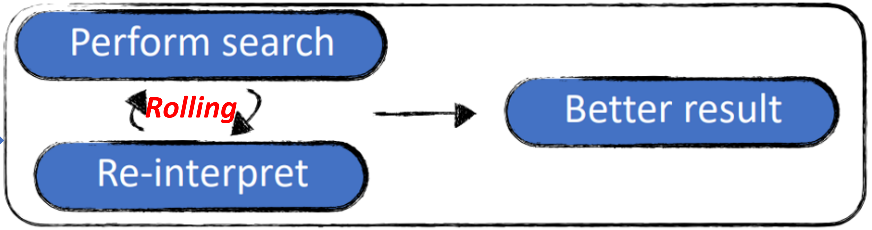


Now:



- Feedback comes quite late (~5 years)
- No in-time feedback, recasting finished analyses is painful!

Could be:

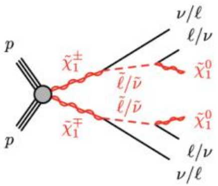


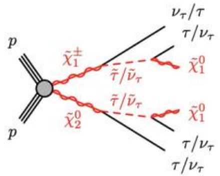
- Your search in SimpleAnalysis→ compare to previous results in-time
- Avoid over-optimization, harmonies pipeline early, full recasting

Run3 pMSSM scan ideas

EW + Sleptons/Staus

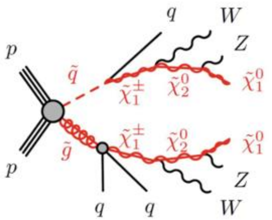
- Muon g-2
- DM co-annihilation
- Longer decay chains
- Limited statements on staus so far due to a lack of analysis input





Mixed EWKinos

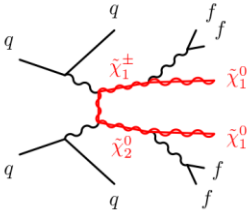
- Not sampled well in flat scans

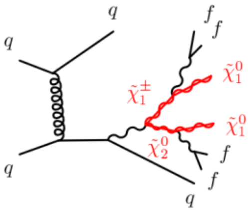


EW Compressed

Interesting excesses and favoured by DM constraints but:

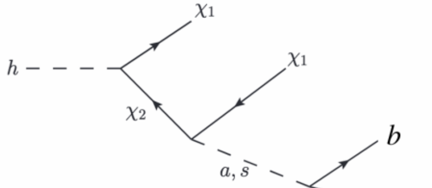
- Poorly sampled in flat scans
- Limited MC stats in Run 2 scans
- Poorly modelled (truth-smearing, no MadSpin for soft-2L, cross-section limits only for DT)





Higgs → SUSY

Include exotics and HDBS analyses



[JHEP 01 (2022) 063]

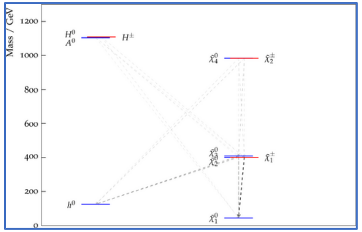
……

More Run3 pMSSM scan ideas are also welcome!

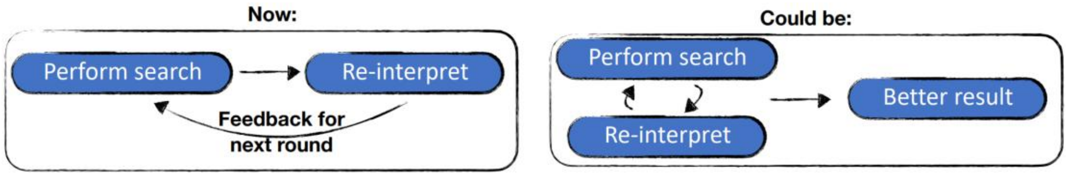
Summary and outlook

Where is SUSY?

- **We are making really good progress, but we need to do more!**
  - The pMSSM is a more **“realistic”** model with fewer parameters, offering a streamlined approach for summarizing analyses
  - Built **pMSSMFactory**. We have conducted four pMSSM scans. The **reinterpretation** provides a comprehensive overview of ATLAS Run2 constraints on SUSY particles, with complementary insights from external experimental results
  - Models not excluded offer valuable directions for future experimental investigations, e.g. Survival model
  - More Run3 pMSSM scan ideas are welcome!



- **Model files and results from ATLAS pMSSM scans are available here**
- **In-time reinterpretation is extremely important!**



Thanks for your attention!

Backup

Lei Guo on behalf of pMSSM Group

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11th CLHCP 2025, Oct. 29-Nov.2, Xinxiang, Henan, China.

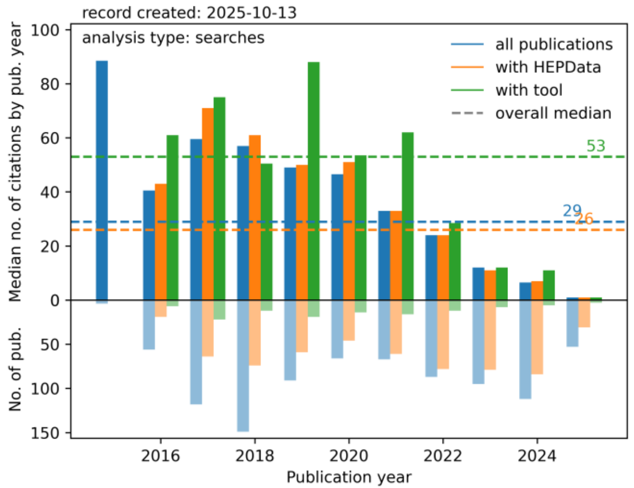
Backup

Category	Criteria
Likely excluded	Both $CL_s^{Exp.} < 0.001$ and $CL_s^{Obs.} < 0.001$ for at least one analysis.
Likely not excluded	Both $CL_s^{Exp.} > 0.1$ and $CL_s^{Obs.} > 0.1$ for every analysis.
Ambiguous	$0.001 \leq CL_s^{Exp.} \leq 0.1$ or $0.001 \leq CL_s^{Obs.} \leq 0.1$ for at least one analysis and $CL_s^{Exp.} \geq 0.001$ or $CL_s^{Obs.} \geq 0.001$ for every analysis.

Table 3.6: Both the expected ($CL_s^{Exp.}$) and observed $CL_s^{Obs.}$) CLs values are used to categorise models. Only models in the 'ambiguous' category are run through the detector-level production chain.

- Analysis preservation & reinterpretation increase impact: 85% more citations when reinterpret. material available ("with tool") for searches

https://gitlab.cern.ch/mhabedan/reinterpretation-metadata-analysis

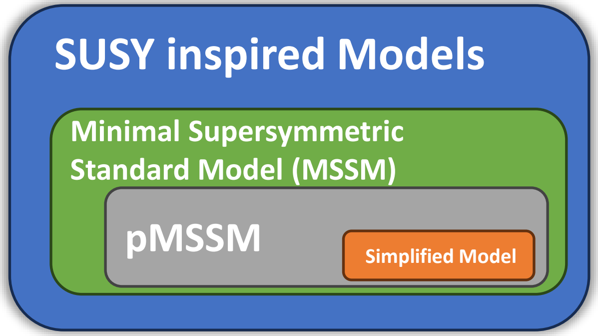


pMSSM-19 model [arxiv:0812.0980]

- no new CP violation.
- minimal flavour violation.
- The first two generations of sfermions are degenerate.
- Reduced to 19 parameters:
  - Gaugino masses $M_{1,2,3}$
  - Higgsino mass parameter μ
  - Ratio of vacuum expectation value $\tan\beta$
  - Pseudoscalar Higgs mass m_A
  - 10 squared masses of sfermions
  - 3 A-parameters for trilinear couplings of $b/t/\tau$.

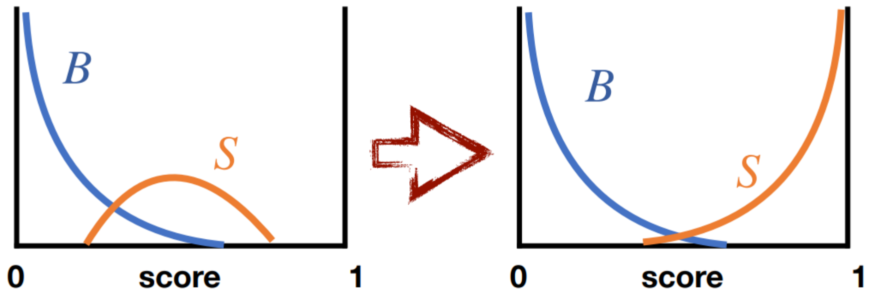
Why flat prior:

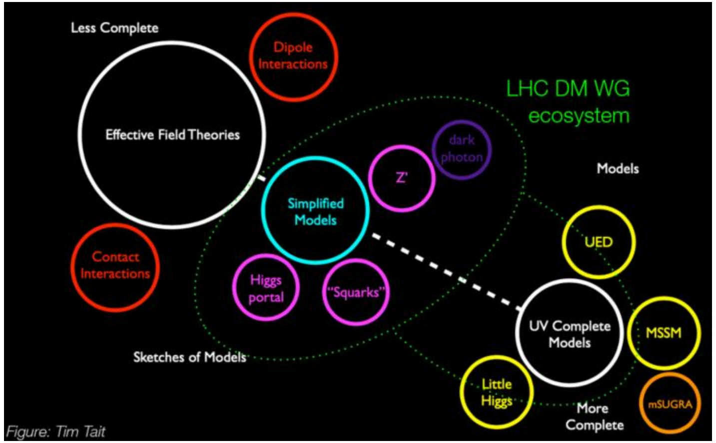
- Indeed, some of the criticism last time was that the external constraints(which is already a prior, just top-hat prior instead of Gaussian) should not have been applied.
- The use of uniform prior is really just a choice and I am not sure one can say one is better or not. The latest CMS MSSM results also started from flat priors, but then did MC sampling according to external constraints.



Backup

- [Ben: *IoP: The SUSY landscape]
- Recast:https://indico.cern.ch/event/1524083/contributions/6584240/attachments/3106151/5505212/2025-07-17_RECAST_Contur_v3.pdf
- Reinterpretation with Machine Learning: Examples of ATLAS searches



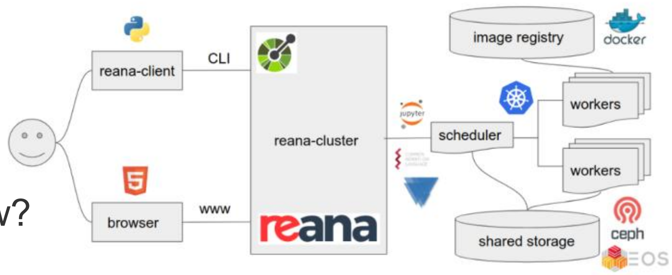


Backup Tooling

Tool Name	Primary Purpose	Advantages
Rivet	Validate theoretical models against experimental data	Standardized analysis framework, supports multiple experimental datasets
GAMBIT	Global fitting, combining multiple experimental constraints	Powerful parameter scanning capabilities, modular design
MadGraph5	Generate Monte Carlo events	Supports custom models, flexible and easy to use
Pythia	Simulate particle fragmentation and hadronization processes after collisions	Widely used, supports various models
Delphes	Fast simulation of detector response	Simplified detector simulation, suitable for large-scale simulations
SModelS	Decompose complex models and apply simplified model constraints	Rapid evaluation of model feasibility
CheckMATE	Verify if a model is consistent with LHC experimental limits	Intuitive exclusion limit assessment
micrOMEGAs	Calculate dark matter-related properties	Focuses on dark matter research, easy to integrate with other tools

- Third-generation squarks (like the top squark) are more easily produced and detected at colliders due to stronger couplings, so their masses are scanned in a lower range (2–5 TeV).
- First- and second-generation squarks have weaker couplings and larger backgrounds, making them harder to constrain experimentally—hence fixed at 10 TeV as a conservative assumption.
- This setup balances theoretical naturalness with current LHC sensitivity, focusing scans on the most relevant parameters for electroweakino phenomenology.

REANA is a **re**producible **ana**lysis platform allowing scientists to run containerised data analysis pipelines on remote compute clouds.

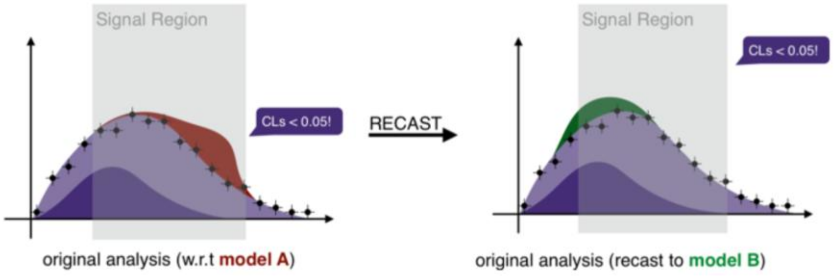


- What is RECAST and why is it useful?
- What is needed to fully automate and preserve the analysis workflow?

- RECAST (Request Efficiency Computation for Alternative Signal Theories)
- Preservation: saving the software environment, workflow and data files needed to reproduce an analysis. 因为每个单独的分析都花费大量时间精力来定义信号区
- Reinterpretation: using a preserved analysis to analyze signal samples from a new theoretical model. Since the cuts and standard model background estimates won't be affected by considering different signal models in the same phase space, it would probably be way faster for them just to make some tweaks to the original analysis to re-run

- recast-atlas utilizes full atlas simulation and can be used for the best reinterpretation accuracy.
- recast-cli utilizes fast simulation tools and can be used to get a quick reinterpretation result to guide future efforts.

- Three Key Components of RECAST
  - Analysis code preservation
  - Environment preservation: docker
  - Automated re-interpretation



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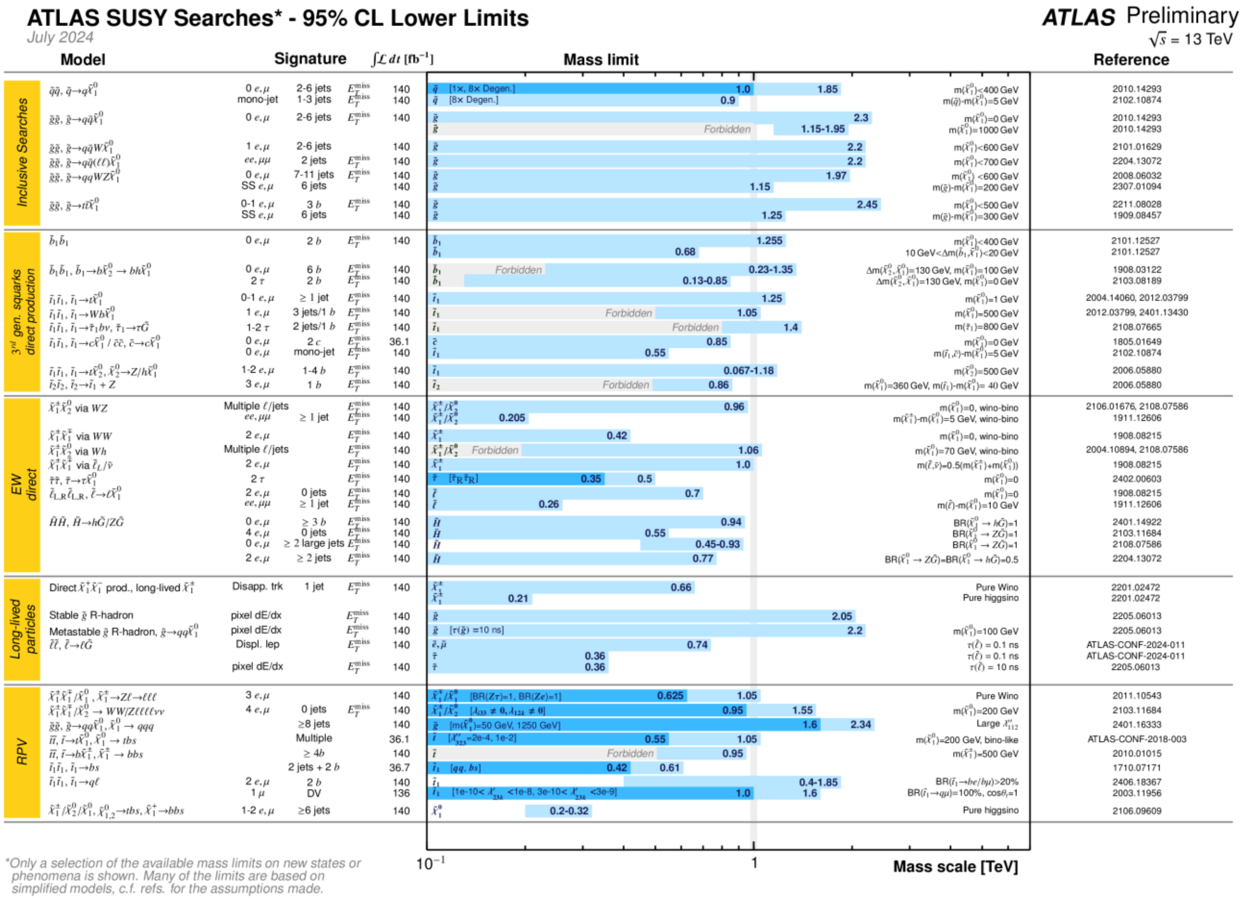
ATLAS SUSY Searches* - 95% CL Lower Limits
July 2024
ATLAS Preliminary
$\sqrt{s}$ = 13 TeV
Model
Signature
$\int \mathcal{L}\, dt$ [fb^{-1}]
Mass limit
Reference
Inclusive Searches
3rd gen. squarks direct production
EW direct
Long-lived particles
RPV
10^{-1}
1
Mass scale [TeV]
*Only a selection of the available mass limits on new states or phenomena is shown. Many of the limits are based on simplified models, c.f. refs. for the assumptions made.