SUSY SEARCHES AT ATLAS

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Workshop on the Standard Model and Beyond, 2 - 10 September
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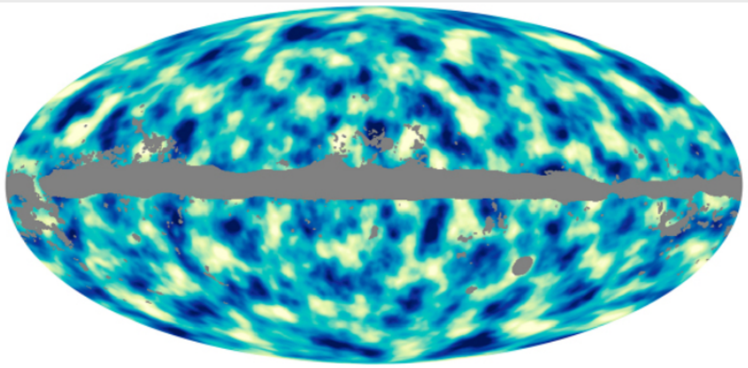
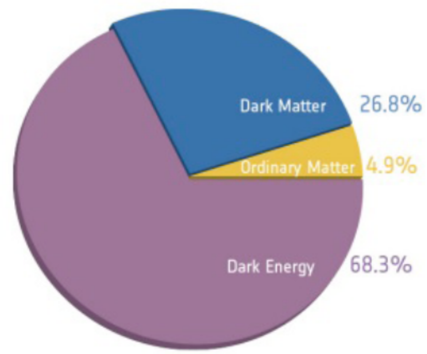
IFIC INSTITUT DE FÍSICA CORPUSCULAR · CSIC CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS · EXCELENCIA SEVERO OCHOA · VNIVERSITAT DE VALÈNCIA · ATLAS EXPERIMENT

CONTENTS

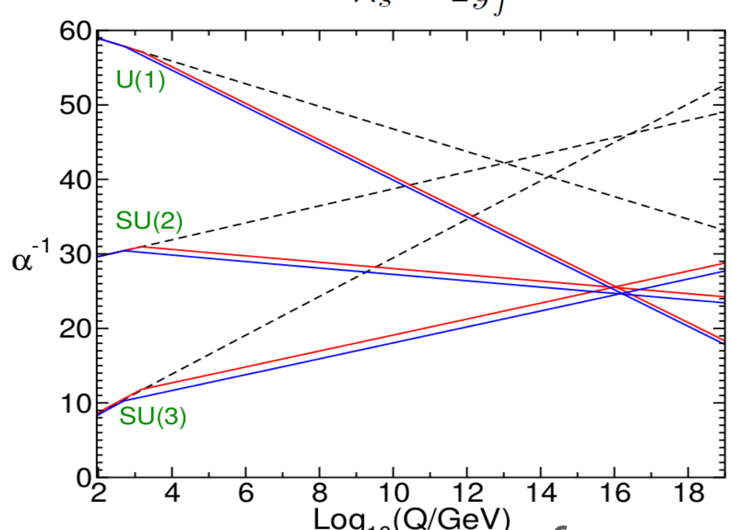
- Supersymmetry
- SUSY searches at ATLAS
- 13 TeV SUSY analyses:
    - Strong production
    - Third generation production
    - Electroweak production
    - Long Lived and R-parity violation (RPV)
- Conclusion

SUPERSYMMETRY





$\lambda_s = 2y_f^2$



Dark Matter candidate

Supersymmetry offers a Weakly Interacting Massive Particle (WIMP) candidate.

Hierarchy problem and Naturalness

Divergent radiative corrections to the Higgs mass cancel out if for each fermionic loop there is a scalar loop.

Gauge couplings unification

New physics can be introduced between the electroweak and Grand Unified Theory (GUT) scale, which modifies the running of gauge couplings.

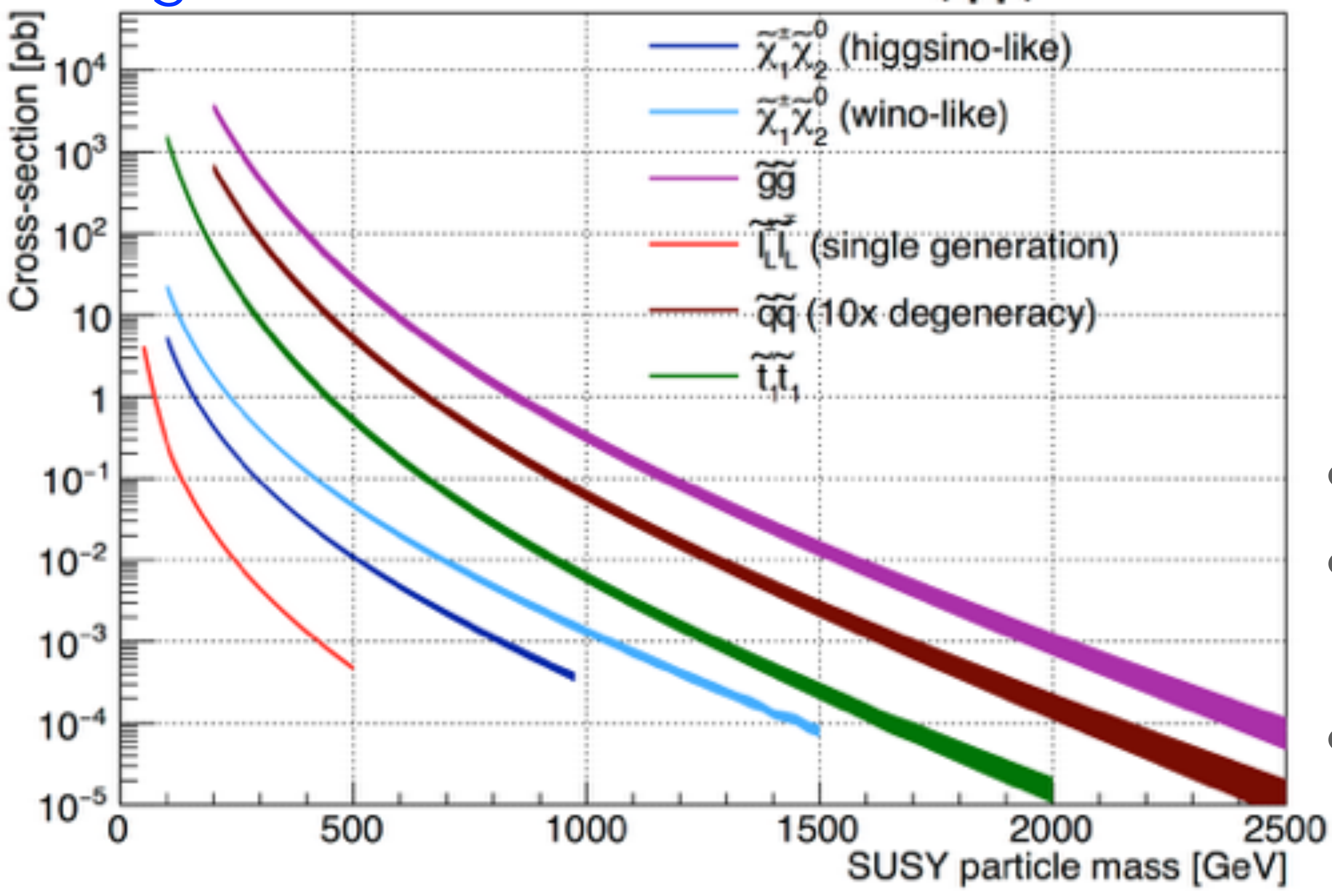
Supersymmetry operator of transformation turns a bosonic state into a fermionic state, and vice versa.

$$Q|Boson\rangle = |Fermion\rangle$$
$$Q|Fermion\rangle = |Boson\rangle$$

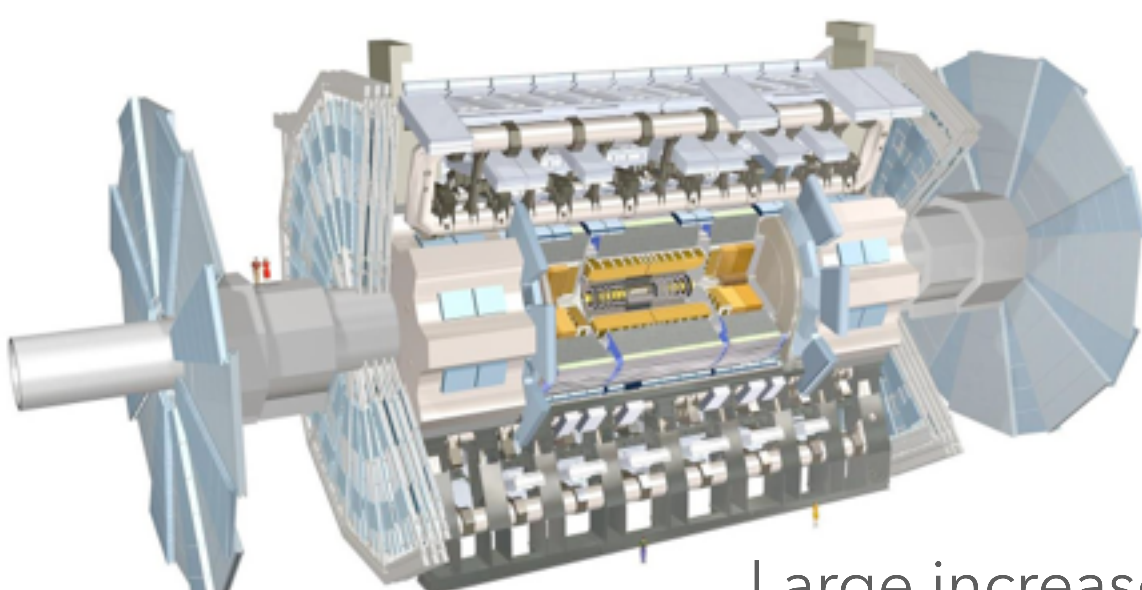
- Supermultiplet consists of:
  - Chiral supermultiplet: SM (quarks, leptons) and SUSY partners ('squarks', 'sleptons').
  - Gauge supermultiplet: SM gauge bosons and SUSY partners 'gauginos'.
- Soft SUSY breaking, large sparticle masses.
- R-parity (for R-parity conservation (RPC), sparticles produced in pairs, long decay chains).

SUSY SEARCHES AT ATLAS

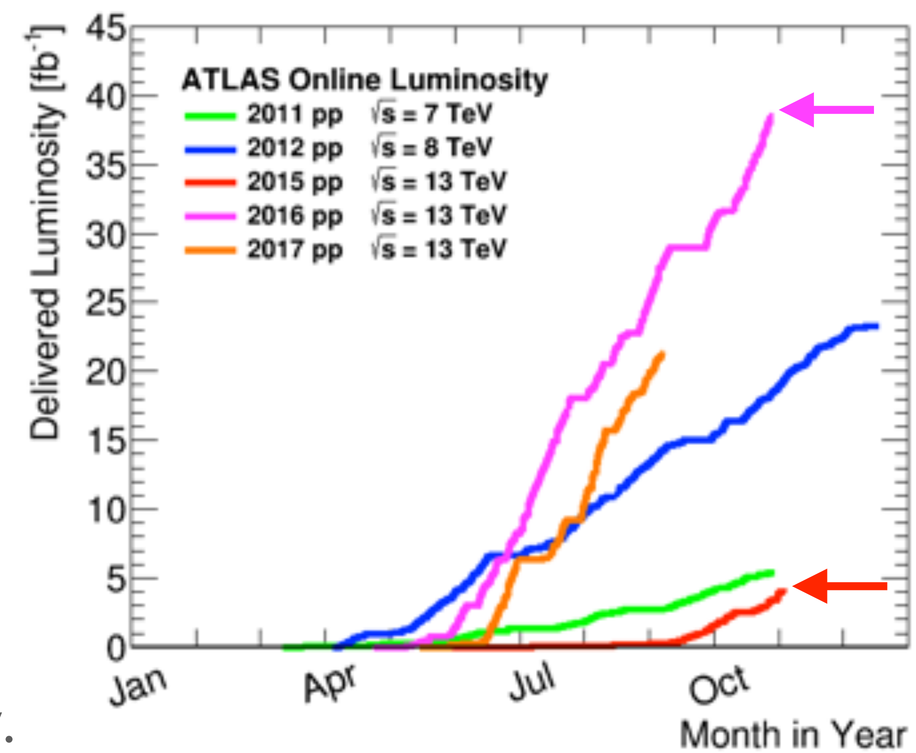
SUSYSignalCrossSections **NLO + NLL, pp, $\sqrt{s}$ = 13 TeV**



- SUSY Analyses grouped around production channels (**RPC**):
  - **Strong production**
  - **Third generation**
  - **Electroweak**
  - ✳ **RPV and Long Lived**
- Target broad range of final states.
- Each analysis defines a set of selections with high sensitivity for considered models.
- Presented results using **13 TeV 2015**+**2016** ATLAS data, 36.1 fb^{-1}.



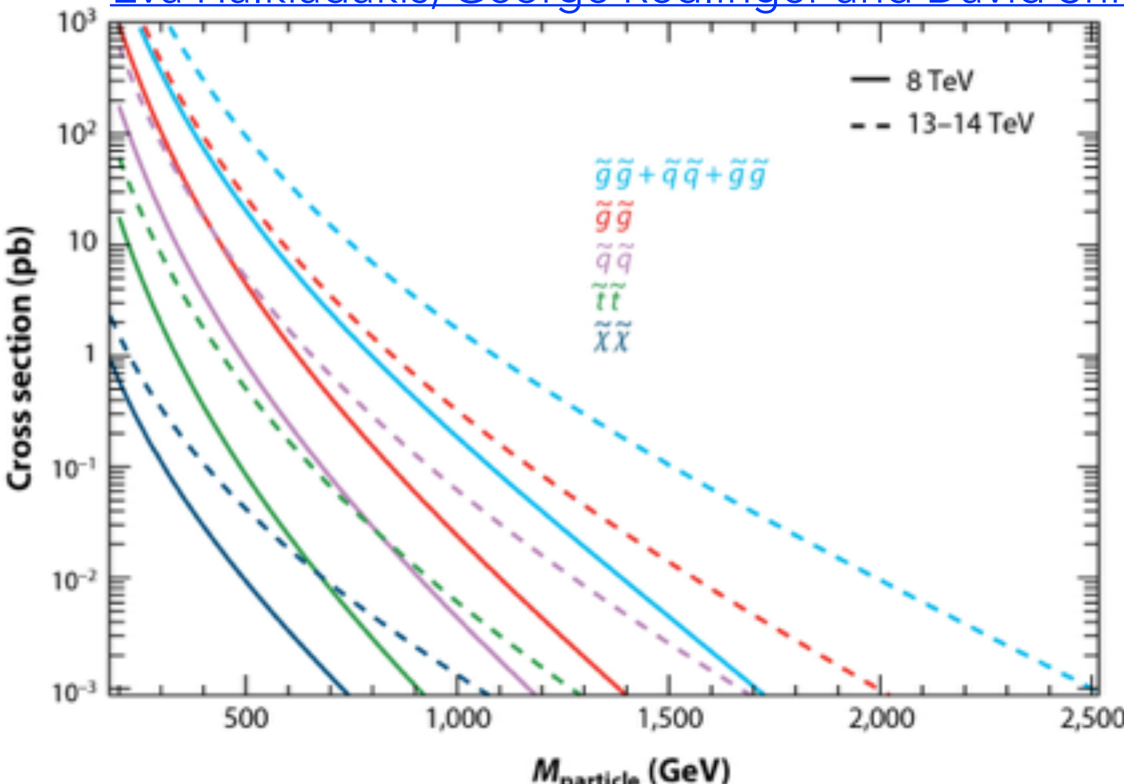
Large increase in c.m.e. and integrated luminosity.



LuminosityPublicResultsRun2

STRONG PRODUCTION

[Eva Halkiadakis, George Redlinger and David Shih]

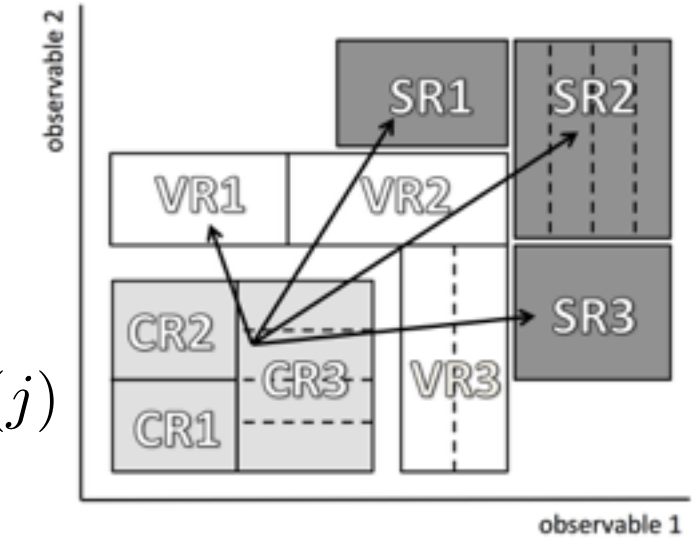


- Largest increase in the cross-section for gluino and squark production when going from 8 to 13 TeV.
- Important as early analysis, it has high sensitivity to different models even with low luminosity.

CONVENTIONAL

Discriminating variable:

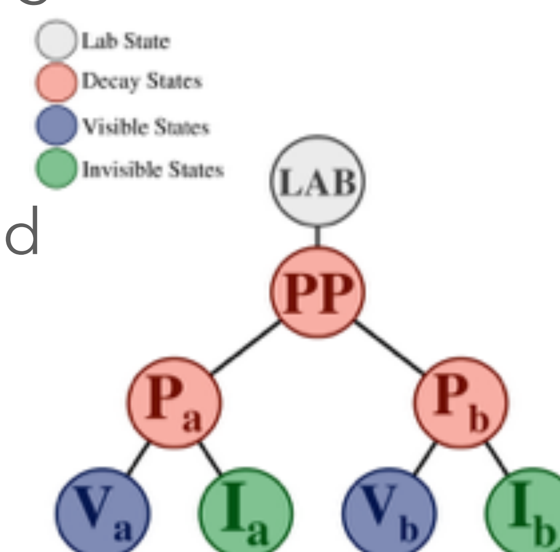
$$Meff = E_T^{miss} + \sum_j p_T(j)$$



arXiv:1410.1280

RECURSIVE JIGSAW RECONSTRUCTION (RJR)

- Kinematic variables defined on an event-by-event level.
- Gives new observables, by using approximations of the rest frames of invisible particles in each event (using momenta and energy of different objects in new rest frames).
- Pair produced strong particles, each decay into visible standard model particles and invisible LSP.

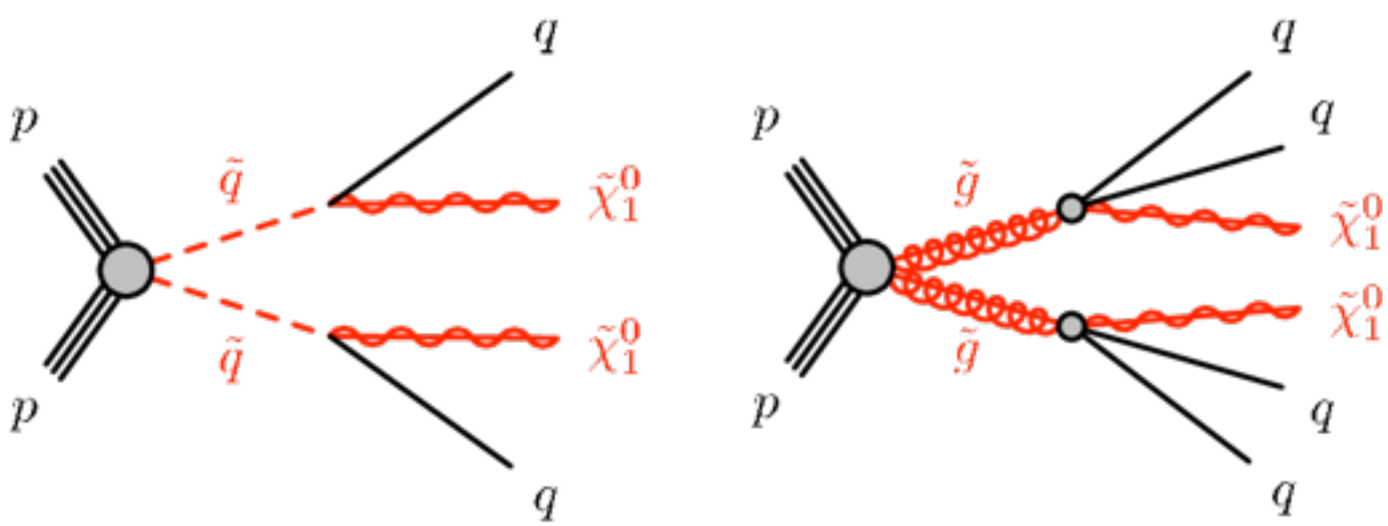


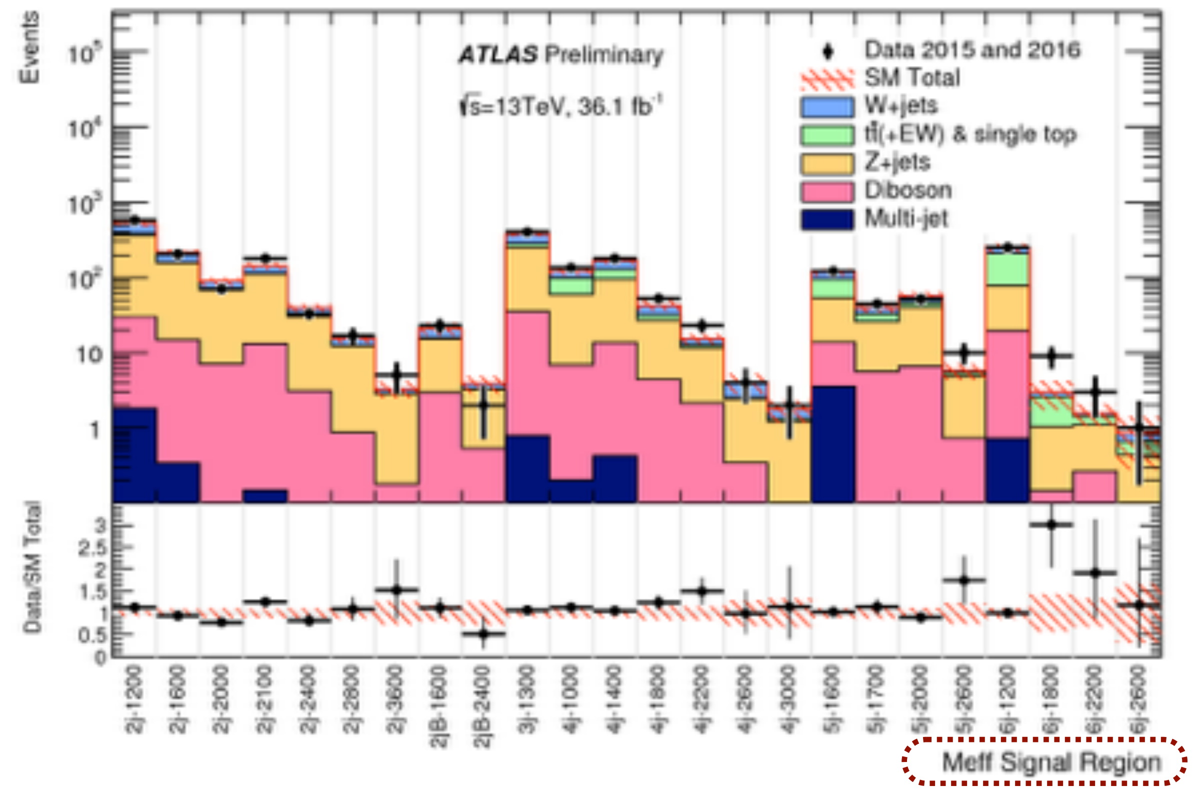
PhysRevD.95.035031

SQUARK AND GLUINO PRODUCTION
0L + 2-6 JETS + MET

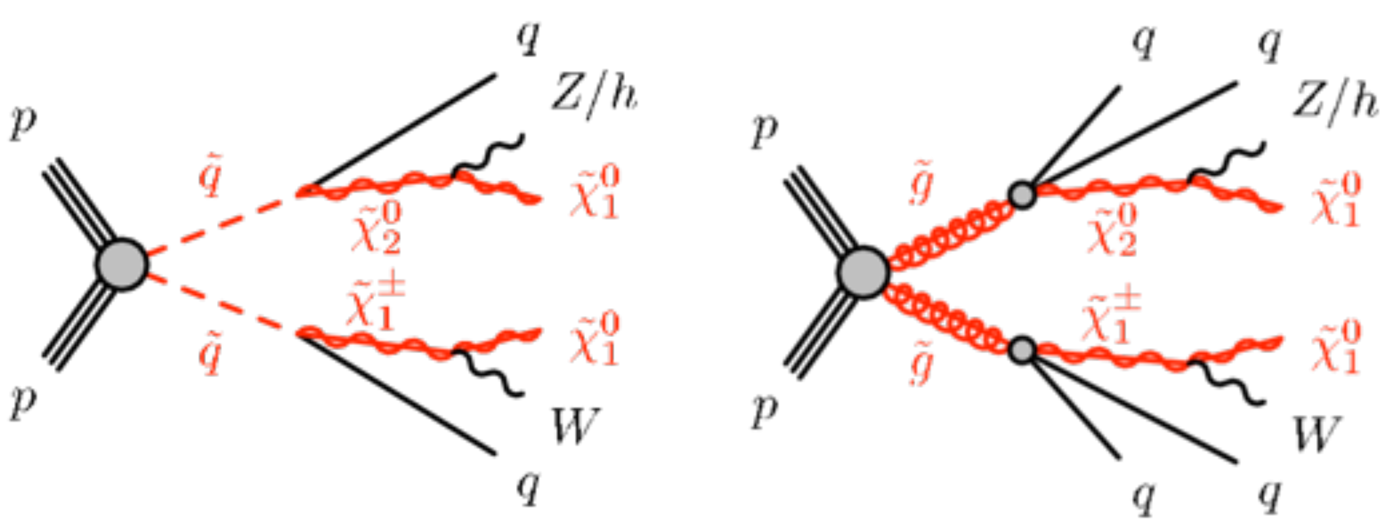
Direct decays:
0L + 2-6 jets + MET

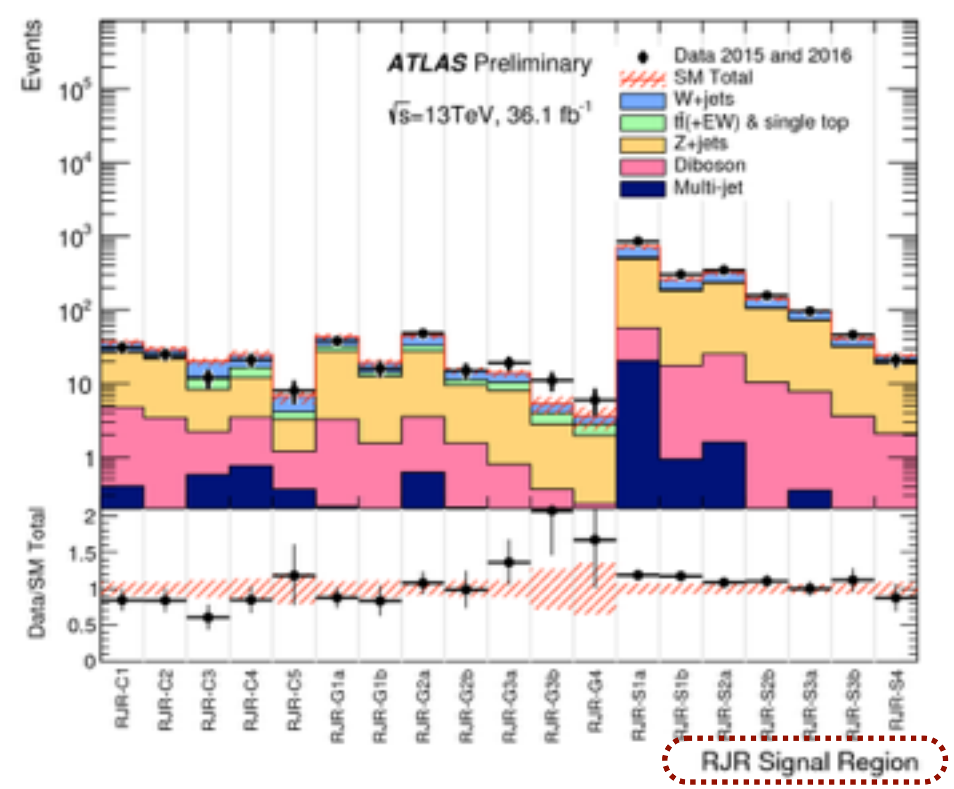
[ATLAS-CONF-2017-022]





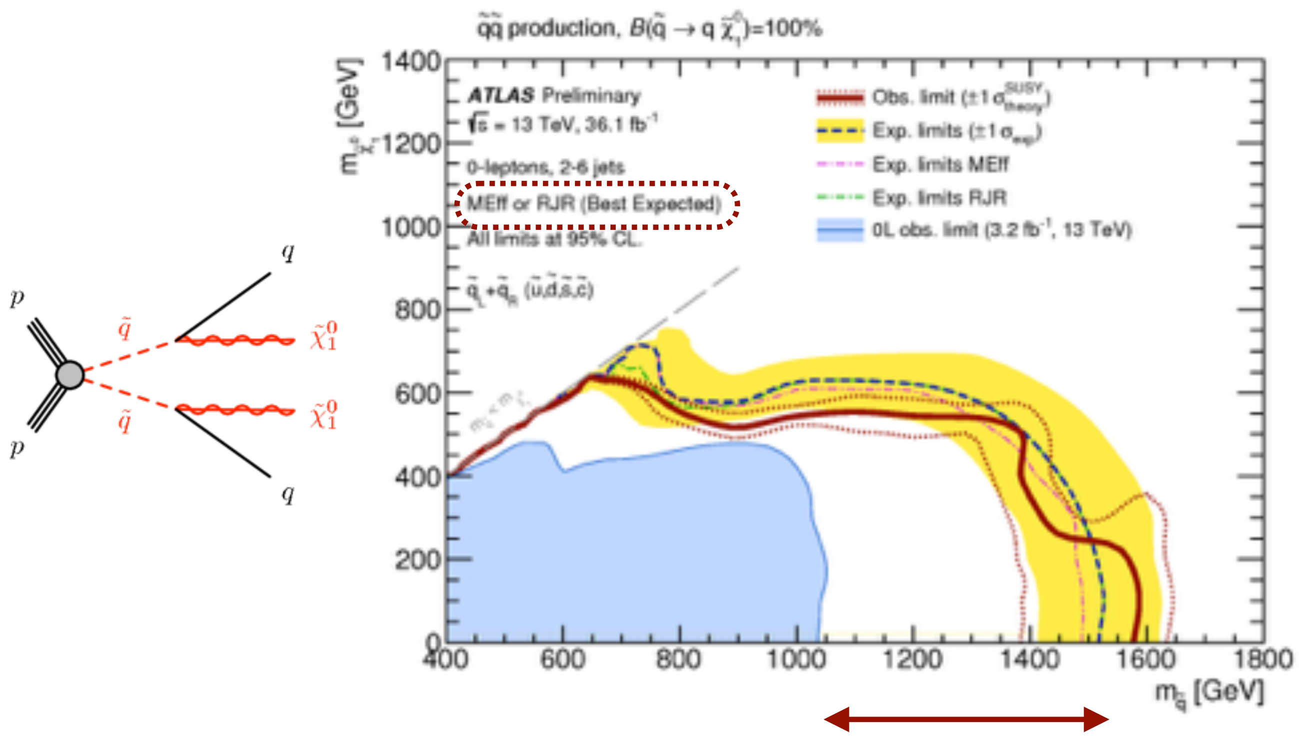
One-step decays:
0/1L + 2-6 jets + MET

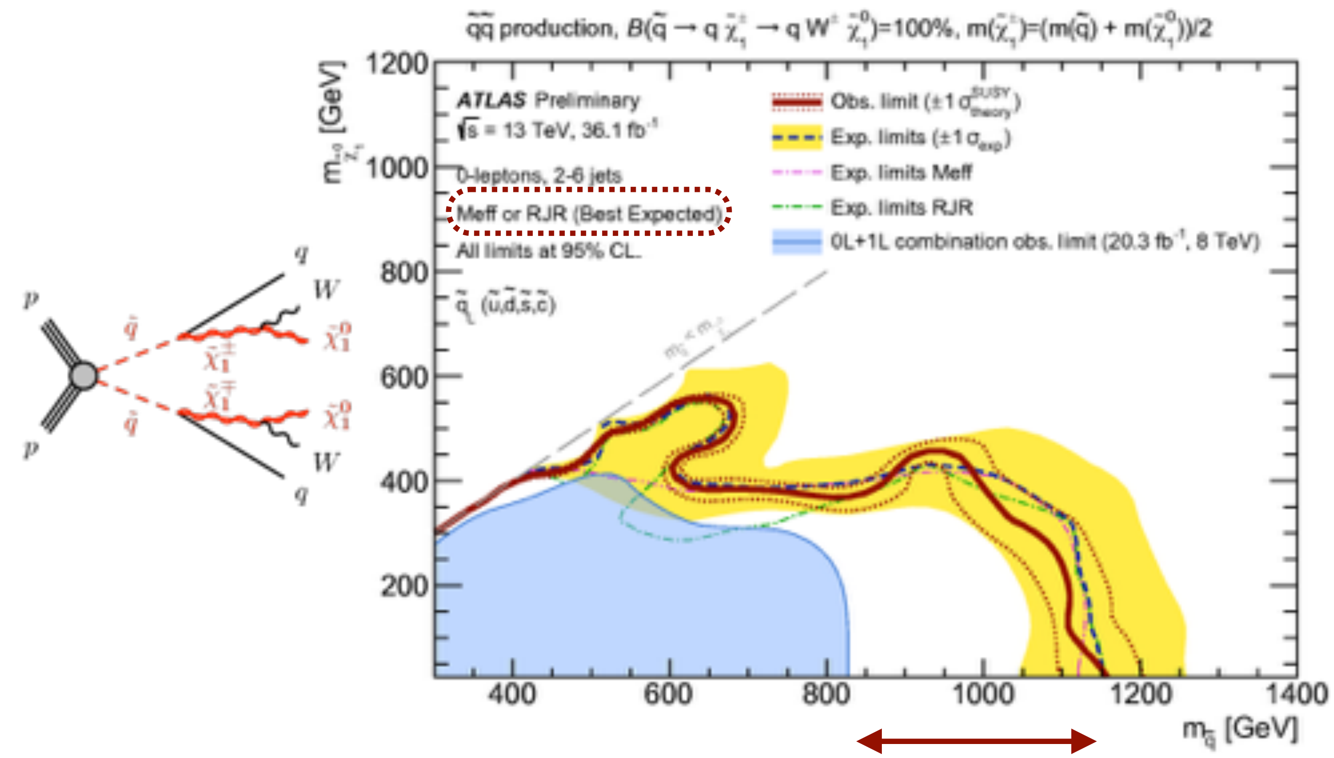


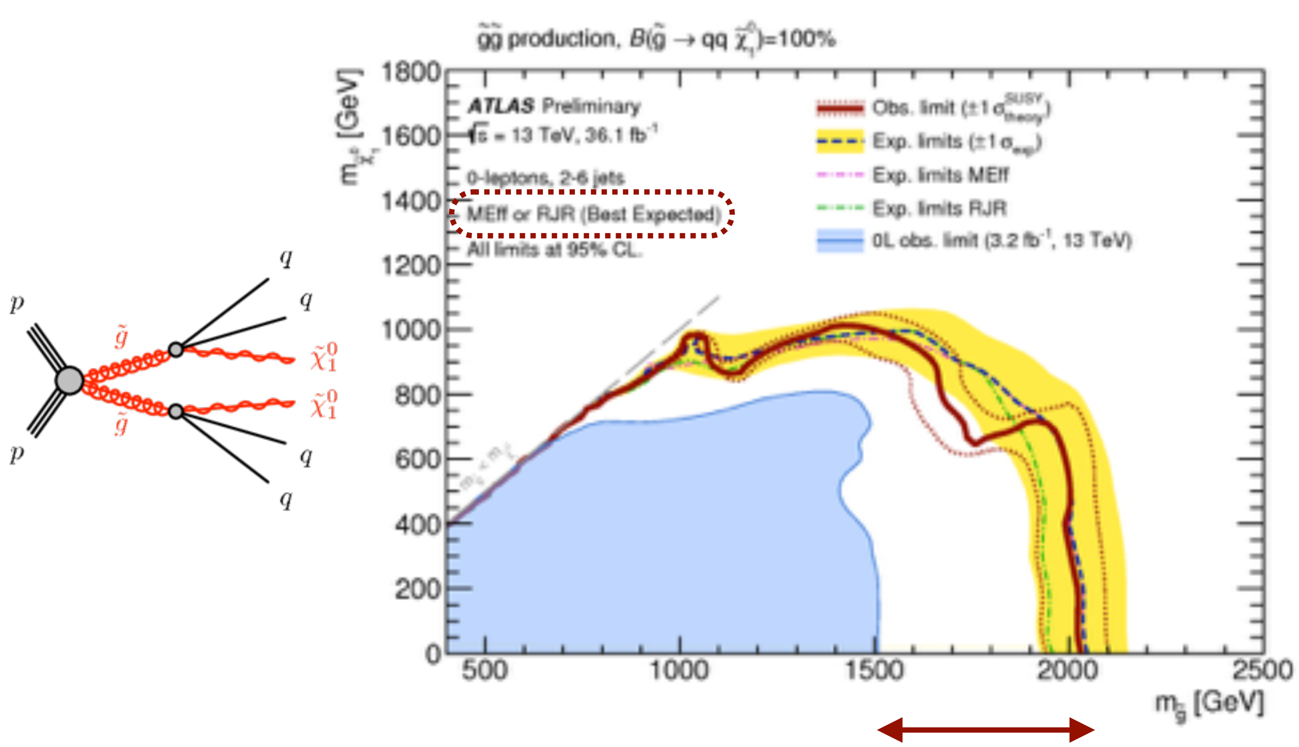


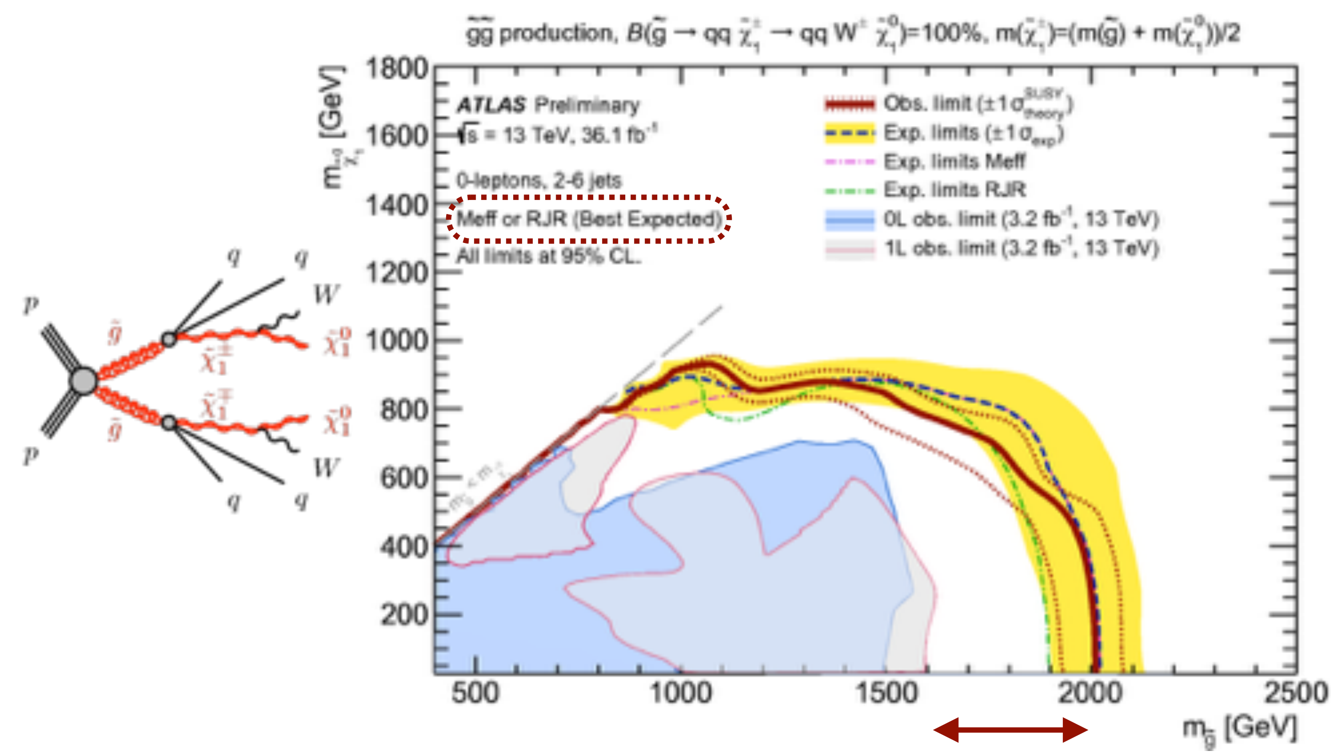
No significant excess in any of the signal regions.

SQUARK AND GLUINO PRODUCTION
0L + 2-6 JETS + MET



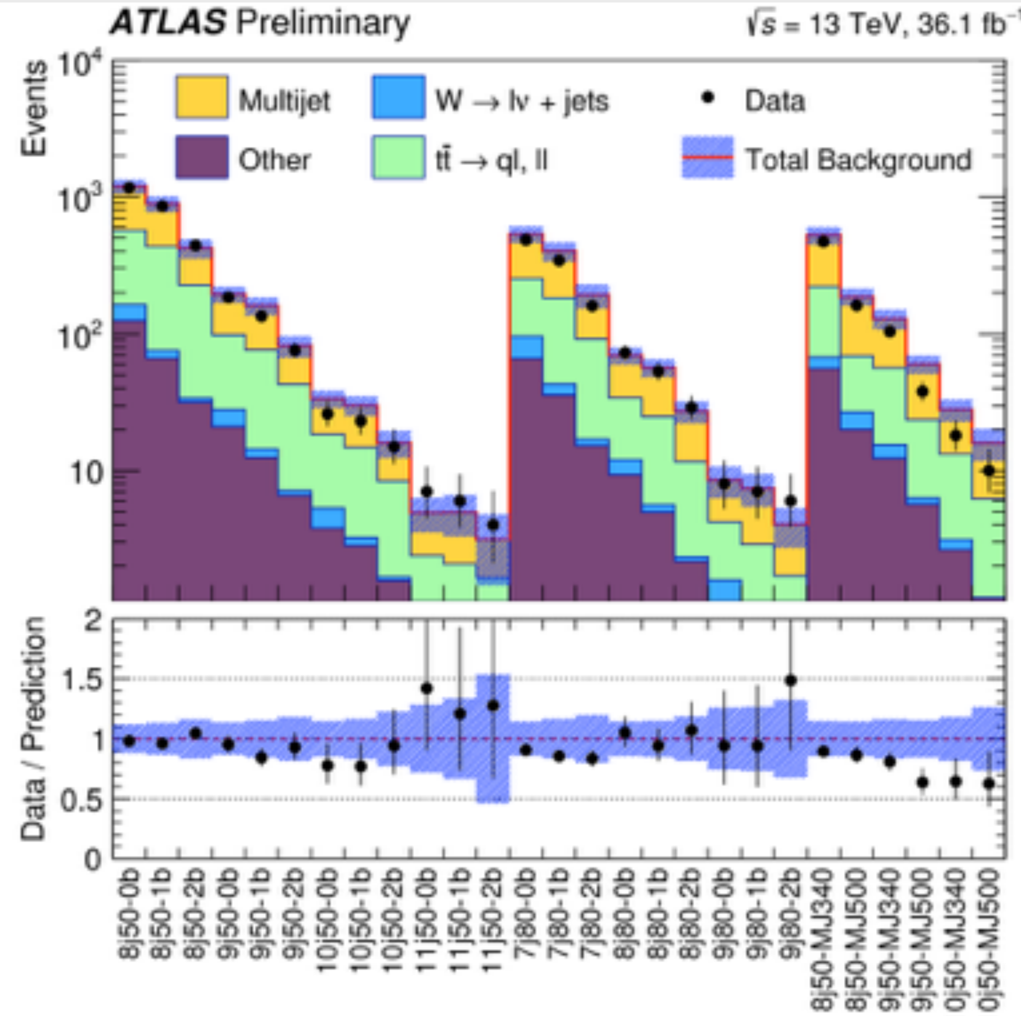




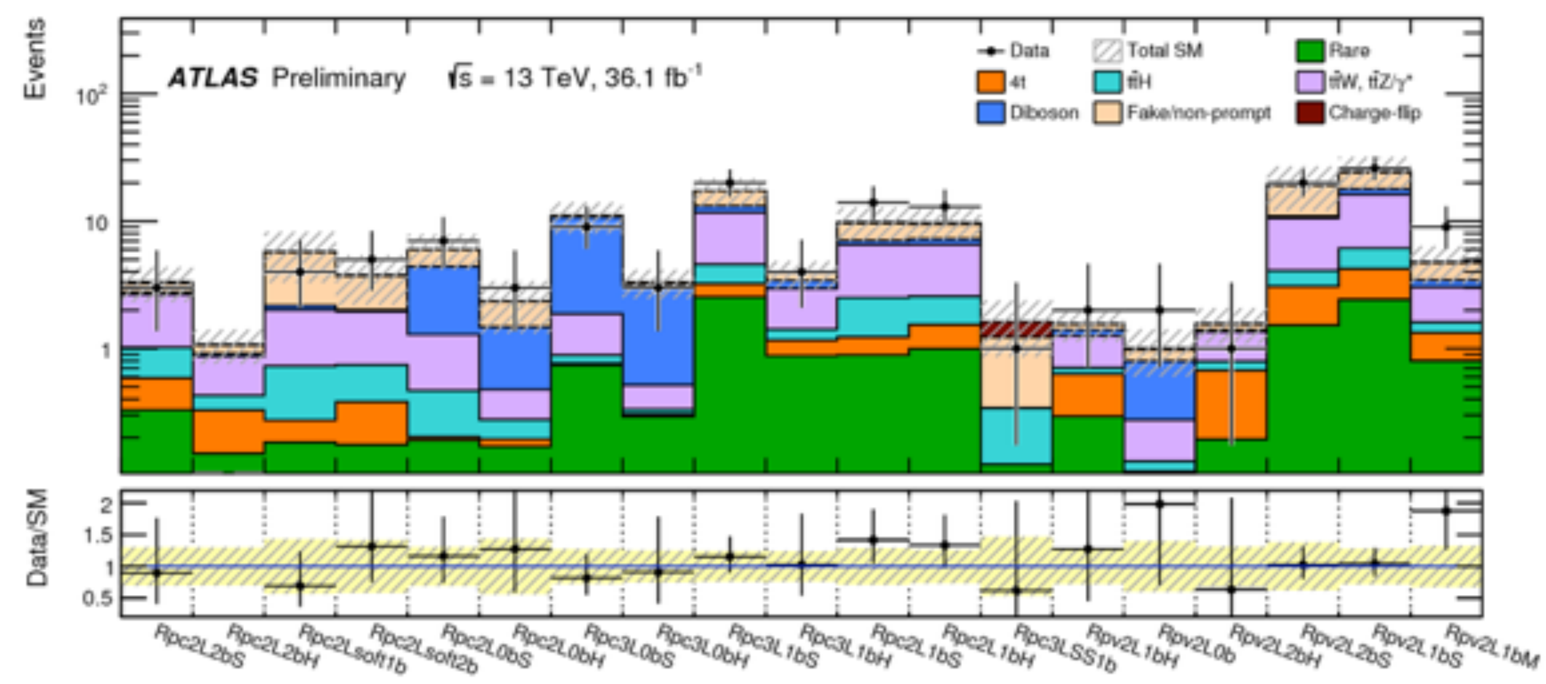


Large increase in the reach compared to early 13 TeV analyses. [ATLAS-CONF-2017-022]

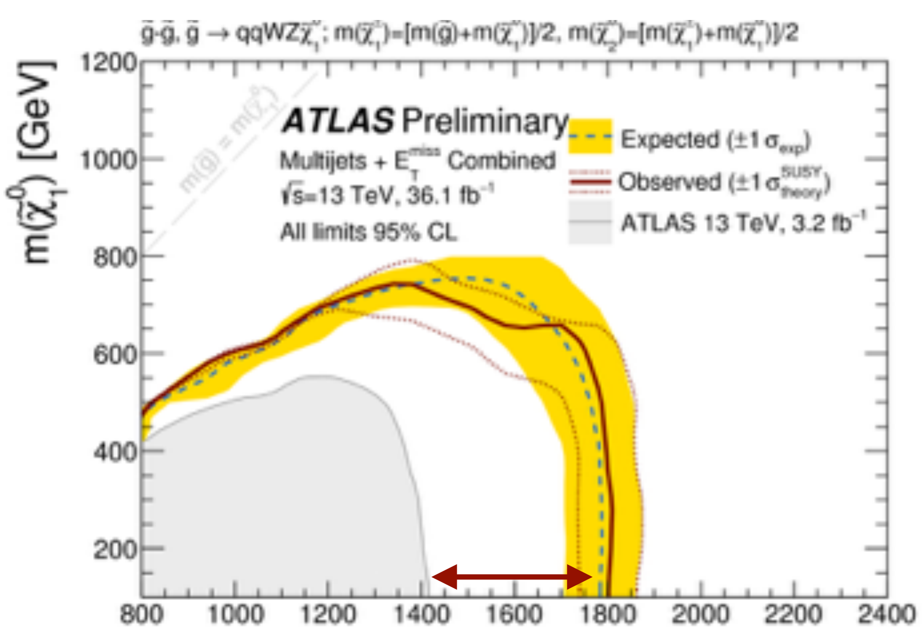
0L + 7-11 JETS + MET AND SS/3L



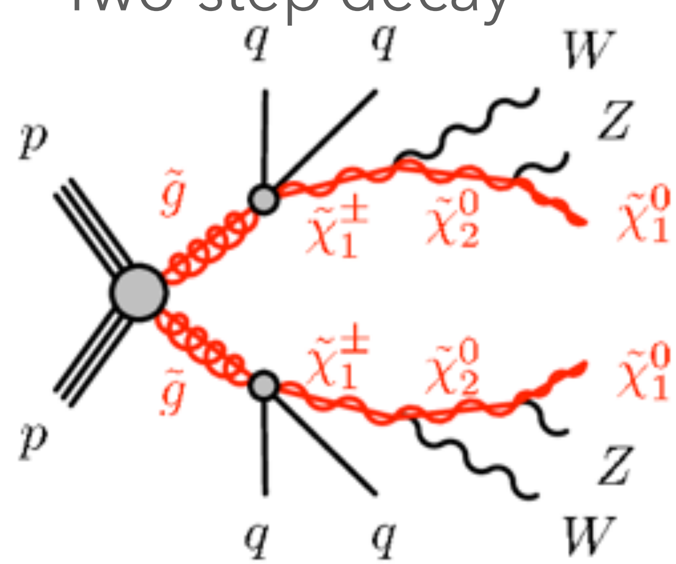
ATLAS-CONF-2017-030

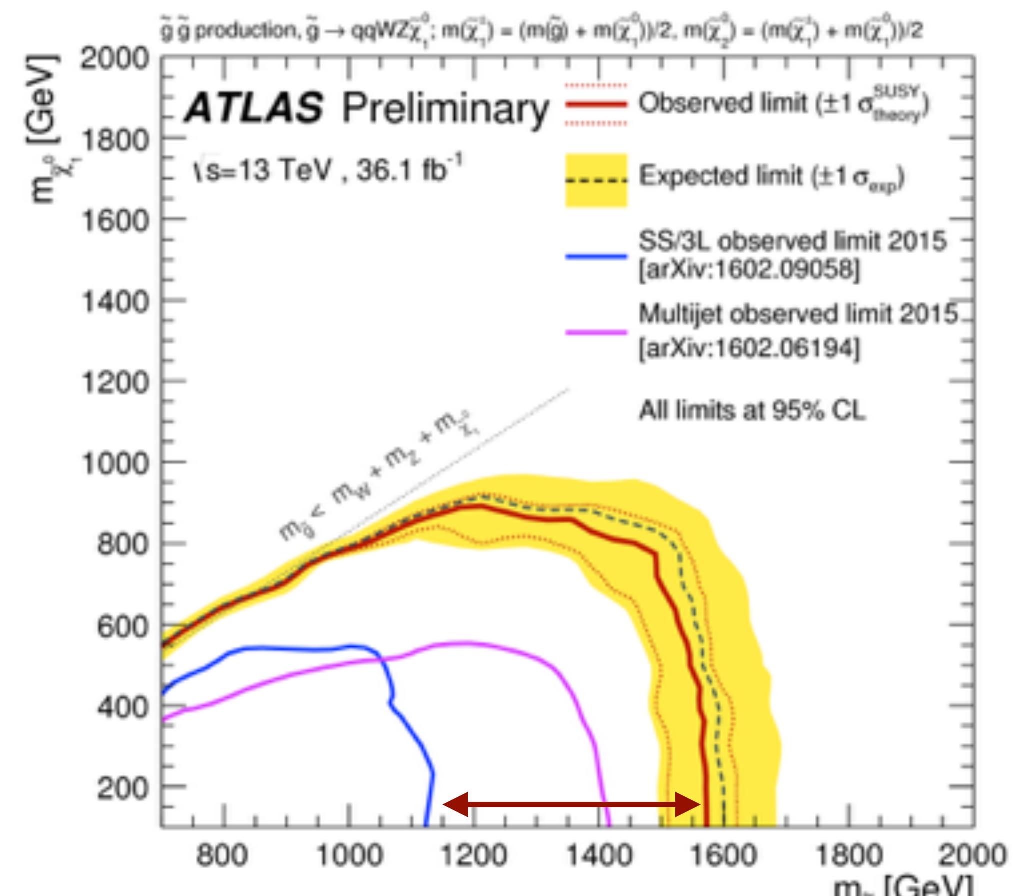


Analyses for a large number of models.



Two-step decay





ATLAS-CONF-2017-033

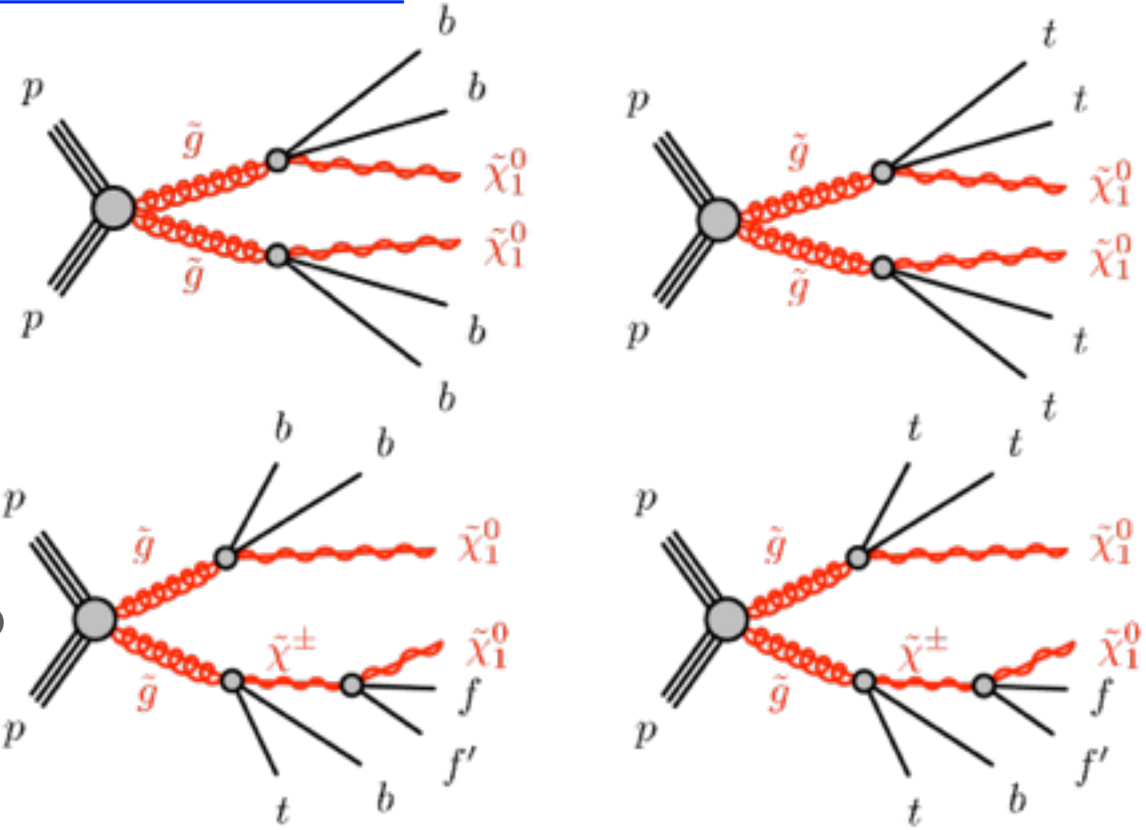
No significant excess, large increase in the exclusion reach.

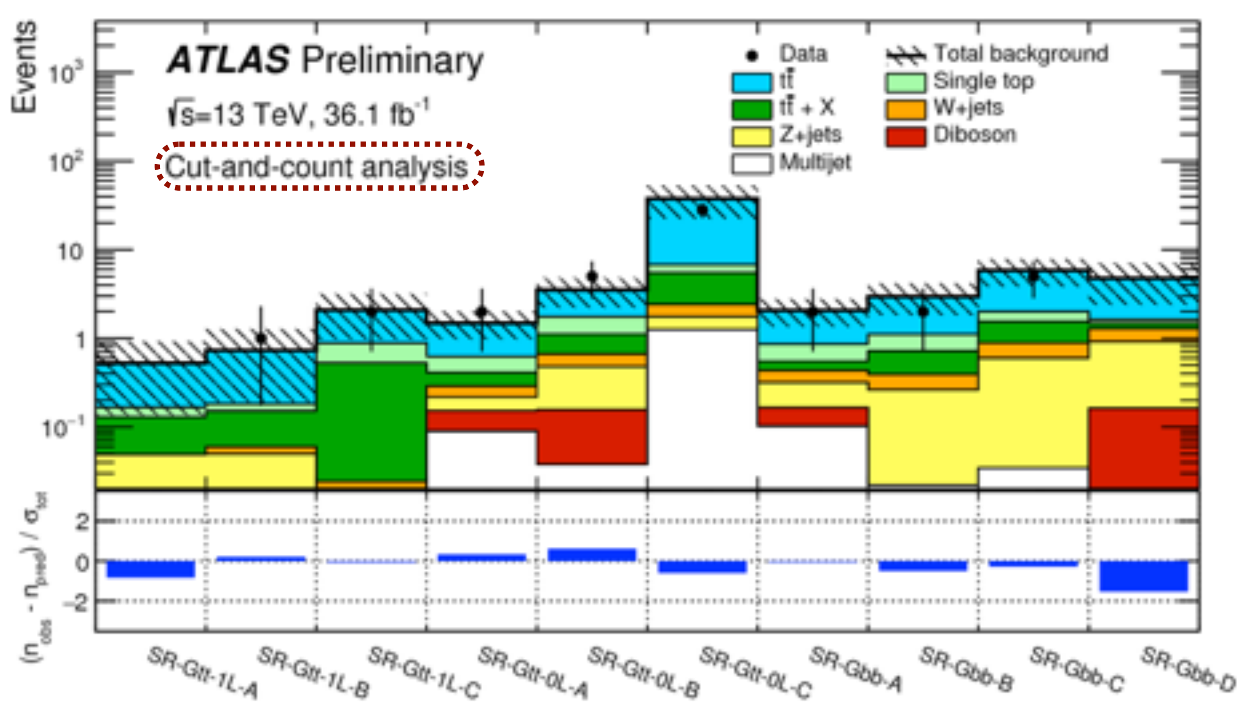
THIRD GENERATION GLUINO MEDIATED

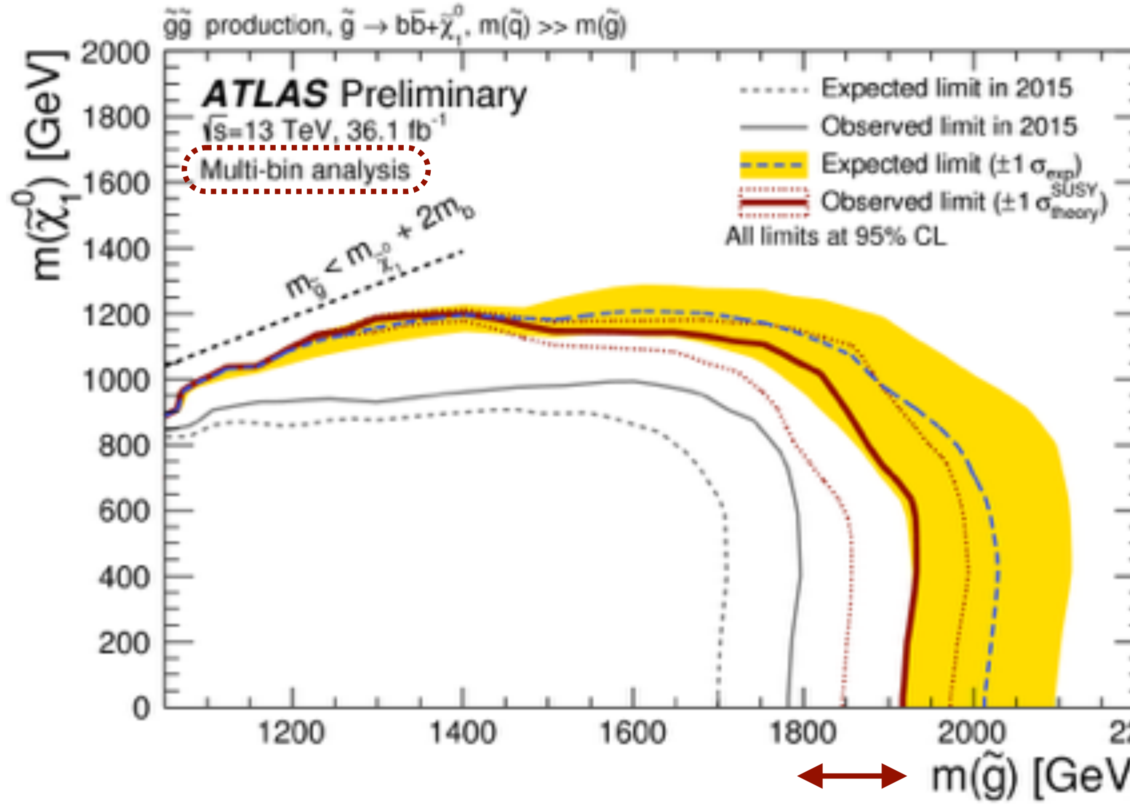
ATLAS-CONF-2017-021

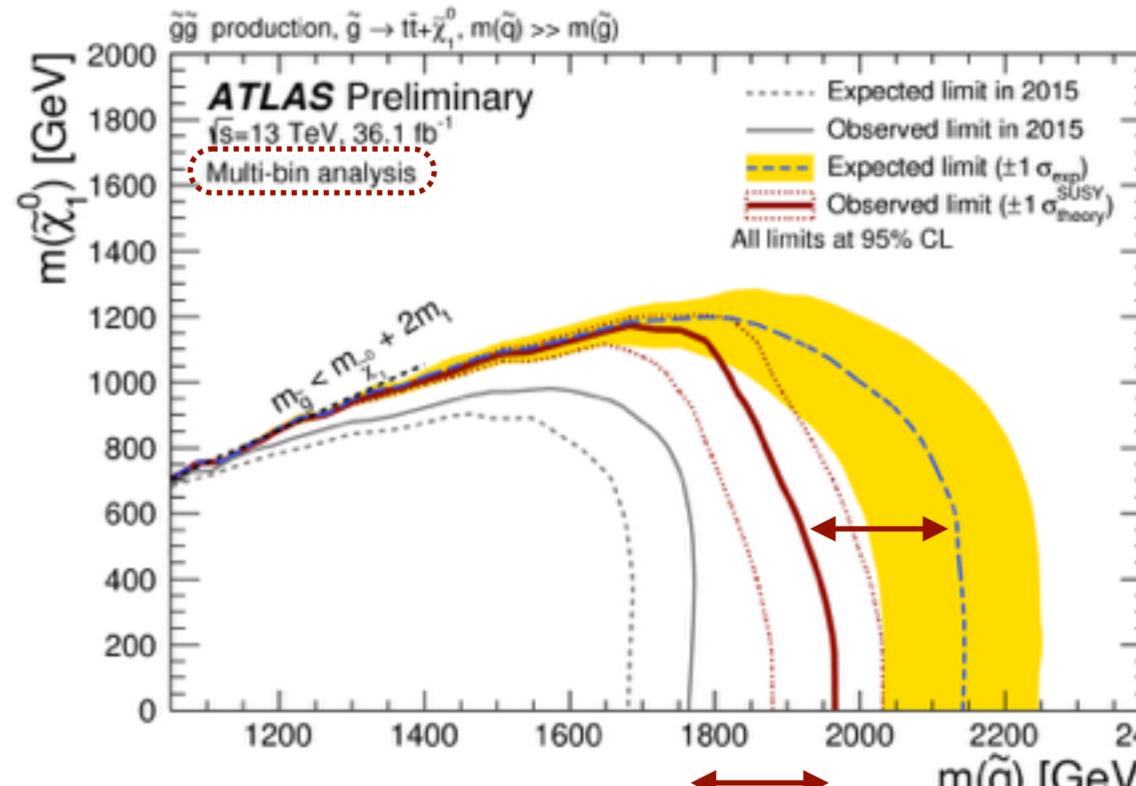
Direct

One-step



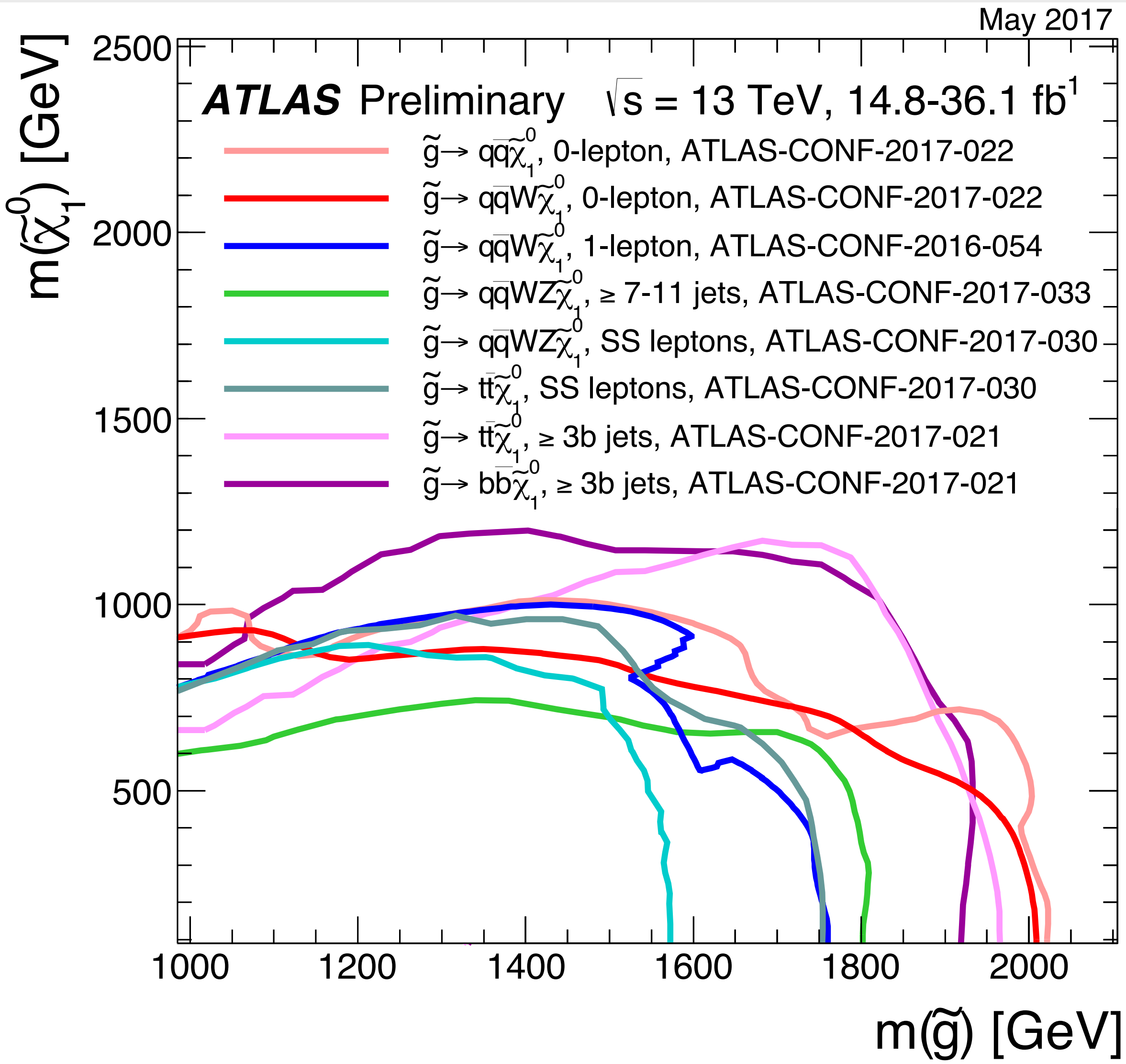






No significant excess for model independent hypothesis test.

SUMMARY STRONG PRODUCTION



Gluino production 0/1L + 2-6 jets + MET

Gluino production 0L +7-11 jets + MET, SS/3L

Third generation gluino mediated

Note: Not a direct comparison, different analyses use different decays.

$\sqrt{s}$ = 7, 8 TeV | $\sqrt{s}$ = 13 TeV

	Model	e,μ,τ,γ	Jets	E_T^{miss}	$\int \mathcal{L}\,dt[fb^{-1}]$	Mass limit			Reference
Inclusive Searches	MSUGRA/CMSSM	0-3 e,μ/1-2 τ	2-10 jets/3 b	Yes	20.3	$\tilde{q},\tilde{g}$	1.85 TeV	$m(\tilde{q})=m(\tilde{g})$	1507.05525
	$\tilde{q}\tilde{q}$, $\tilde{q}\to q\tilde{\chi}_1^0$	0	2-6 jets	Yes	36.1	$\tilde{q}$	1.57 TeV	$m(\tilde{\chi}_1^0)$<200 GeV, $m(1^{st}$ gen. $\tilde{q})=m(2^{nd}$ gen. $\tilde{q})$	ATLAS-CONF-2017-022
	$\tilde{q}\tilde{q}$, $\tilde{q}\to q\tilde{\chi}_1^0$ (compressed)	mono-jet	1-3 jets	Yes	3.2	$\tilde{q}$	608 GeV	$m(\tilde{q})-m(\tilde{\chi}_1^0)$<5 GeV	1604.07773
	$\tilde{g}\tilde{g}$, $\tilde{g}\to q\bar{q}\tilde{\chi}_1^0$	0	2-6 jets	Yes	36.1	$\tilde{g}$	2.02 TeV	$m(\tilde{\chi}_1^0)$<200 GeV	ATLAS-CONF-2017-022
	$\tilde{g}\tilde{g}$, $\tilde{g}\to qq\tilde{\chi}_1^{\pm}\to qqW^{\pm}\tilde{\chi}_1^0$	0	2-6 jets	Yes	36.1	$\tilde{g}$	2.01 TeV	$m(\tilde{\chi}_1^0)$<200 GeV, $m(\tilde{\chi}^{\pm})=0.5(m(\tilde{\chi}_1^0)+m(\tilde{g}))$	ATLAS-CONF-2017-022
	$\tilde{g}\tilde{g}$, $\tilde{g}\to qq(\ell\ell/\nu\nu)\tilde{\chi}_1^0$	3 e,μ	4 jets	-	36.1	$\tilde{g}$	1.825 TeV	$m(\tilde{\chi}_1^0)$<400 GeV	ATLAS-CONF-2017-030
	$\tilde{g}\tilde{g}$, $\tilde{g}\to qqWZ\tilde{\chi}_1^0$	0	7-11 jets	Yes	36.1	$\tilde{g}$	1.8 TeV	$m(\tilde{\chi}_1^0)$ <400 GeV	ATLAS-CONF-2017-033
	GMSB ($\tilde{\ell}$ NLSP)	1-2 τ + 0-1 ℓ	0-2 jets	Yes	3.2	$\tilde{g}$	2.0 TeV		1607.05979
	GGM (bino NLSP)	2 γ	-	Yes	3.2	$\tilde{g}$	1.65 TeV	$c\tau$(NLSP)<0.1 mm	1606.09150
	GGM (higgsino-bino NLSP)	γ	1 b	Yes	20.3	$\tilde{g}$	1.37 TeV	$m(\tilde{\chi}_1^0)$<950 GeV, $c\tau$(NLSP)<0.1 mm, μ<0	1507.05493
	GGM (higgsino-bino NLSP)	γ	2 jets	Yes	13.3	$\tilde{g}$	1.8 TeV	$m(\tilde{\chi}_1^0)$>680 GeV, $c\tau$(NLSP)<0.1 mm, μ>0	ATLAS-CONF-2016-066
	GGM (higgsino NLSP)	2 e,μ (Z)	2 jets	Yes	20.3	$\tilde{g}$	900 GeV	m(NLSP)>430 GeV	1503.03290
	Gravitino LSP	0	mono-jet	Yes	20.3	$F^{1/2}$ scale	865 GeV	$m(\tilde{G})>1.8\times10^{-4}$ eV, $m(\tilde{g})=m(\tilde{q})$=1.5 TeV	1502.01518
3^{rd} gen. $\tilde{g}$ med.	$\tilde{g}\tilde{g}$, $\tilde{g}\to b\bar{b}\tilde{\chi}_1^0$	0	3 b	Yes	36.1	$\tilde{g}$	1.92 TeV	$m(\tilde{\chi}_1^0)$<600 GeV	ATLAS-CONF-2017-021
	$\tilde{g}\tilde{g}$, $\tilde{g}\to t\bar{t}\tilde{\chi}_1^0$	0-1 e,μ	3 b	Yes	36.1	$\tilde{g}$	1.97 TeV	$m(\tilde{\chi}_1^0)$<200 GeV	ATLAS-CONF-2017-021
	$\tilde{g}\tilde{g}$, $\tilde{g}\to b\bar{t}\tilde{\chi}_1^+$	0-1 e,μ	3 b	Yes	20.1	$\tilde{g}$	1.37 TeV	$m(\tilde{\chi}_1^0)$<300 GeV	1407.0600

Exclusion of gluino mass up to ~2 TeV.

ATLAS_SUSY_Summary

THIRD GENERATION

HIERARCHY PROBLEM

ATLAS-CONF-2017-037

The Higgs is unnaturally light:

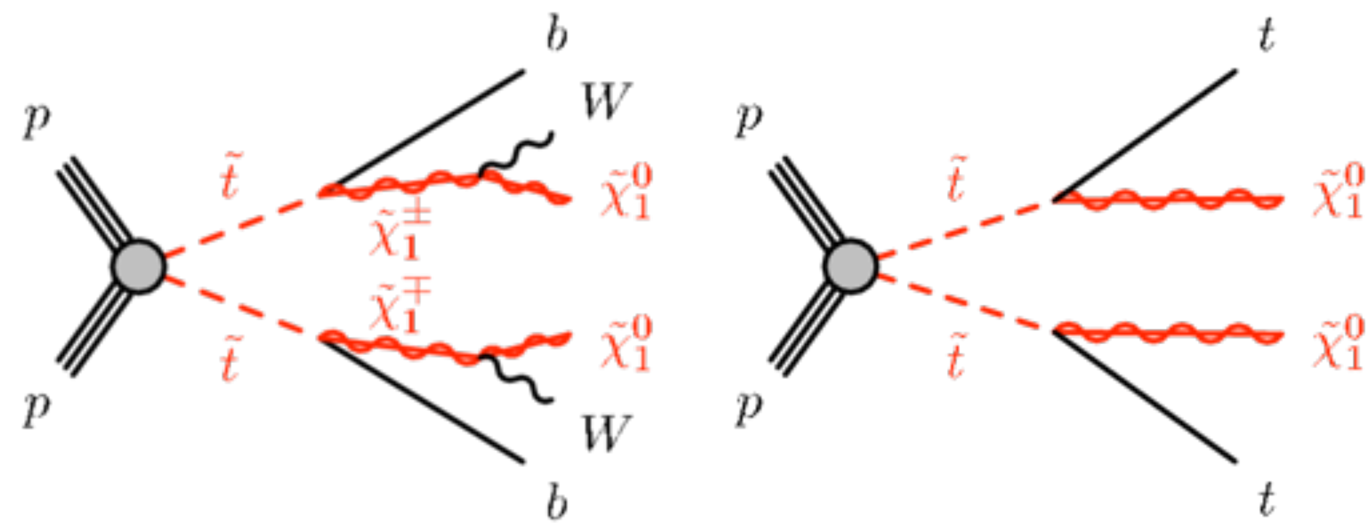
$$m_H^2 = (m_H^2)_{bare} + \delta m_H^2$$

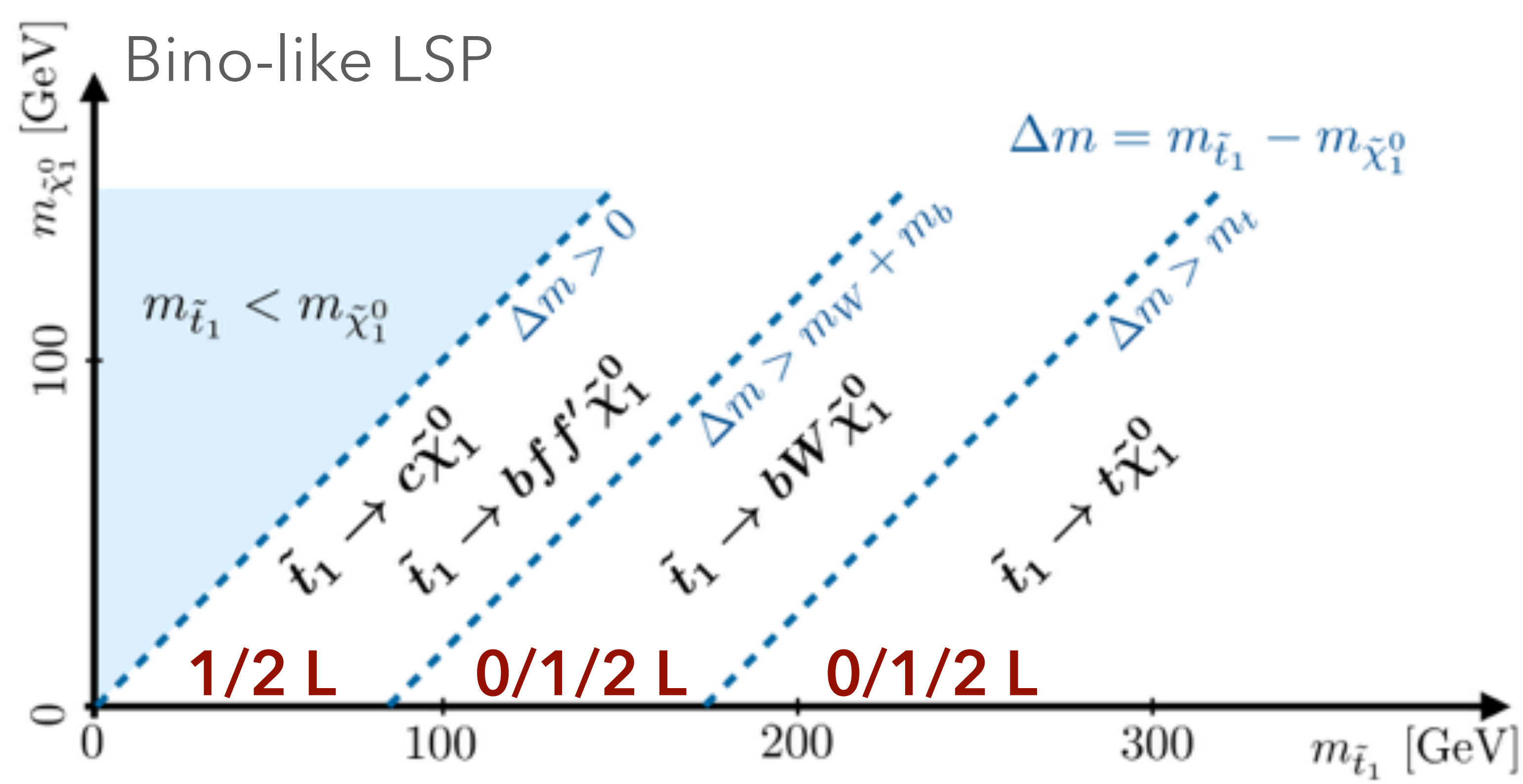
$$\delta m_H^2 \sim -y_t^2 m_{\tilde{t}_1}^2 \ln(\frac{\Lambda}{m_{\tilde{t}_1}})$$

Remaining contribution after SUSY breaking at one loop level. Lambda is the energy scale up to which the theory is renormalizable.

"Natural" SUSY requires:

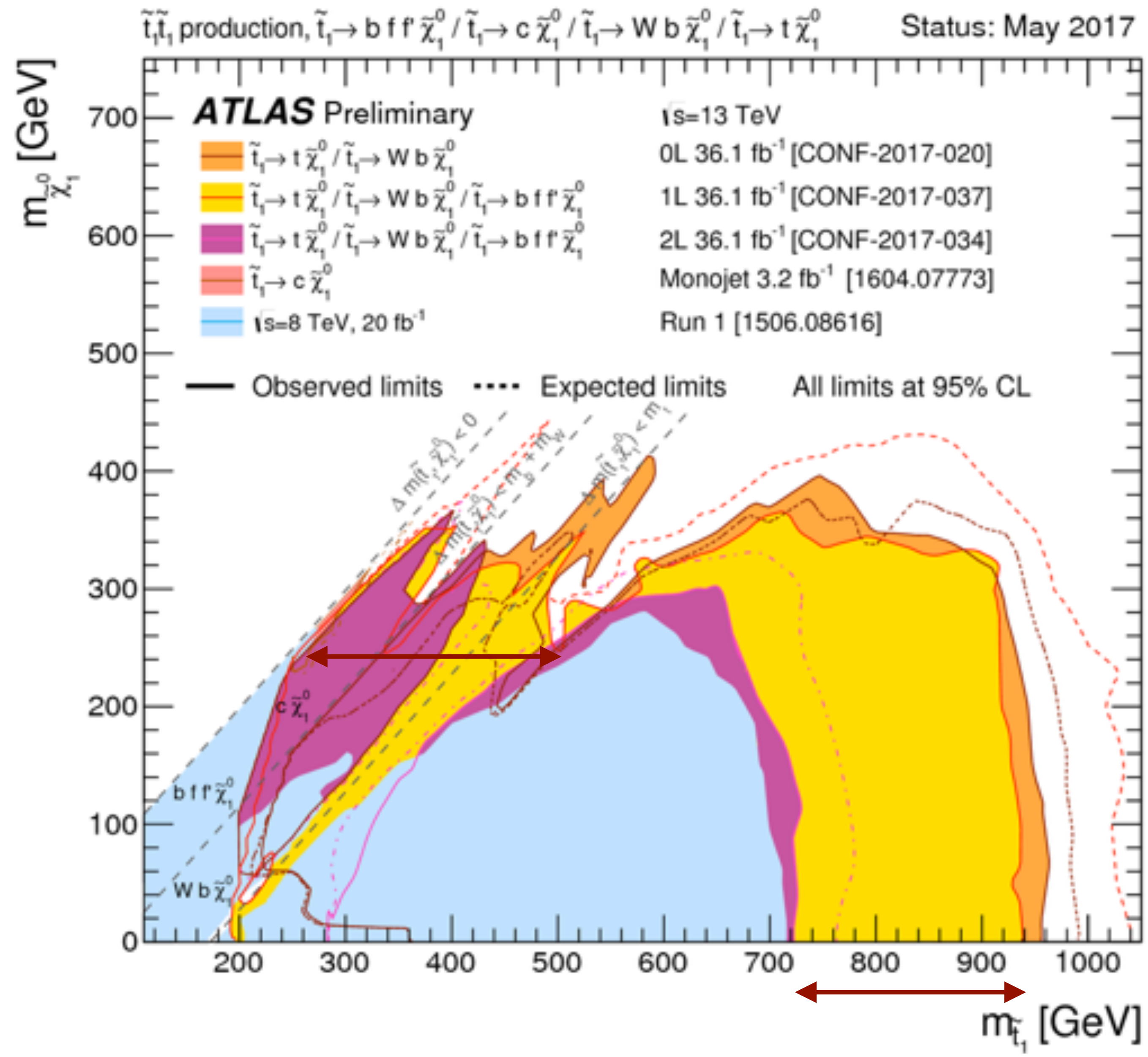
- Stops in the TeV range
- Maximal mixing





SUMMARY THIRD GENERATION

ATLAS_SUSY_Summary

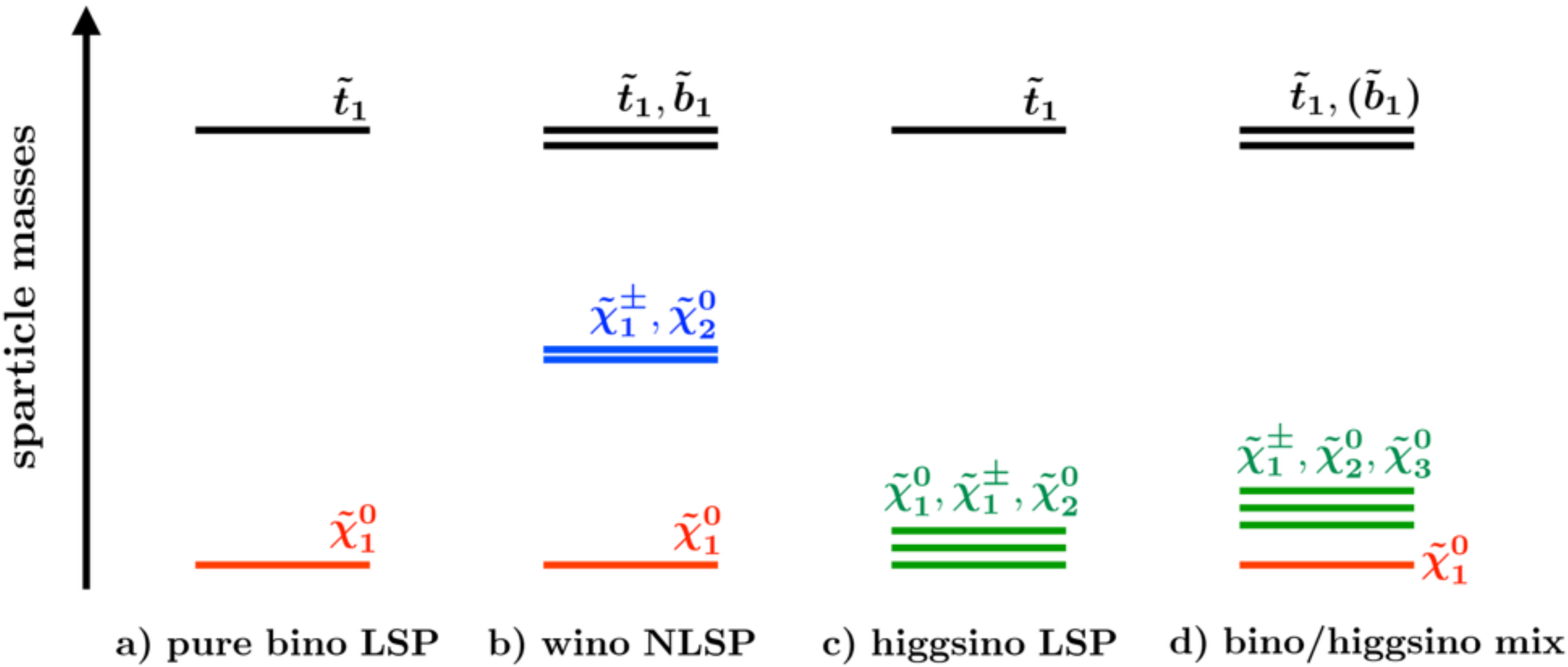


3rd gen. squarks direct production	$\tilde{b}_1\tilde{b}_1$, $\tilde{b}_1 \to b\tilde{\chi}^0_1$	0	2 b	Yes	36.1	$\tilde{b}_1$ 950 GeV	m($\tilde{\chi}^0_1$)<420 GeV	ATLAS-CONF-2017-038
	$\tilde{b}_1\tilde{b}_1$, $\tilde{b}_1 \to t\tilde{\chi}^\pm_1$	2 e,μ (SS)	1 b	Yes	36.1	$\tilde{b}_1$ 275-700 GeV	m($\tilde{\chi}^0_1$)<200 GeV, m($\tilde{\chi}^\pm_1$)= m($\tilde{\chi}^0_1$)+100 GeV	ATLAS-CONF-2017-030
	$\tilde{t}_1\tilde{t}_1$, $\tilde{t}_1 \to b\tilde{\chi}^\pm_1$	0-2 e,μ	1-2 b	Yes	4.7/13.3	$\tilde{t}_1$ 117-170 GeV, 200-720 GeV	m($\tilde{\chi}^\pm_1$) = 2m($\tilde{\chi}^0_1$), m($\tilde{\chi}^0_1$)=55 GeV	1209.2102, ATLAS-CONF-2016-077
	$\tilde{t}_1\tilde{t}_1$, $\tilde{t}_1 \to Wb\tilde{\chi}^0_1$ or $t\tilde{\chi}^0_1$	0-2 e,μ	0-2 jets/1-2 b	Yes	20.3/36.1	$\tilde{t}_1$ 90-198 GeV, 205-950 GeV	m($\tilde{\chi}^0_1$)=1 GeV	1506.08616, ATLAS-CONF-2017-020
	$\tilde{t}_1\tilde{t}_1$, $\tilde{t}_1 \to c\tilde{\chi}^0_1$	0	mono-jet	Yes	3.2	$\tilde{t}_1$ 90-323 GeV	m($\tilde{t}_1$)-m($\tilde{\chi}^0_1$)=5 GeV	1604.07773
	$\tilde{t}_1\tilde{t}_1$ (natural GMSB)	2 e,μ (Z)	1 b	Yes	20.3	$\tilde{t}_1$ 150-600 GeV	m($\tilde{\chi}^0_1$)>150 GeV	1403.5222
	$\tilde{t}_2\tilde{t}_2$, $\tilde{t}_2 \to \tilde{t}_1 + Z$	3 e,μ (Z)	1 b	Yes	36.1	$\tilde{t}_2$ 290-790 GeV	m($\tilde{\chi}^0_1$)=0 GeV	ATLAS-CONF-2017-019
	$\tilde{t}_2\tilde{t}_2$, $\tilde{t}_2 \to \tilde{t}_1 + h$	1-2 e,μ	4 b	Yes	36.1	$\tilde{t}_2$ 320-880 GeV	m($\tilde{\chi}^0_1$)=0 GeV	ATLAS-CONF-2017-019

Significant improvement in exclusion for a large number of physics scenarios.

THIRD GENERATION PMSSM INSPIRED

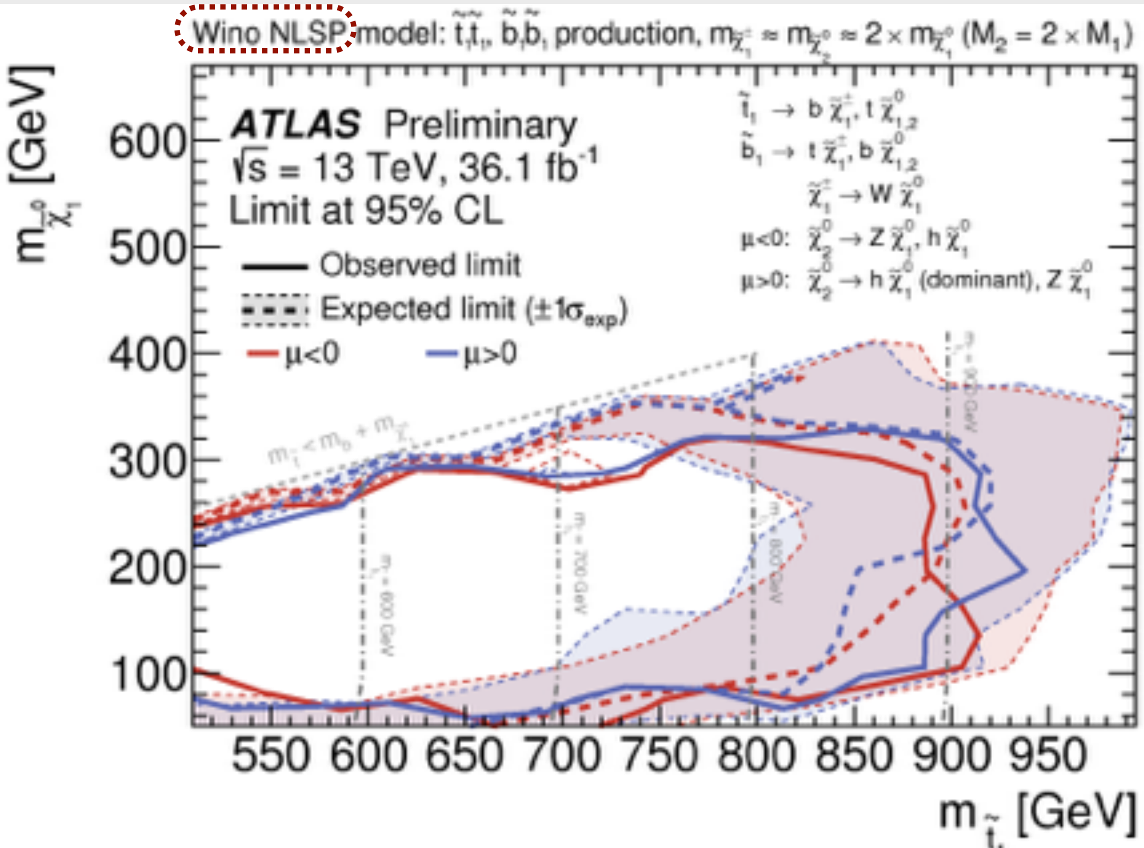
Consider a large variety of stop1 decays.

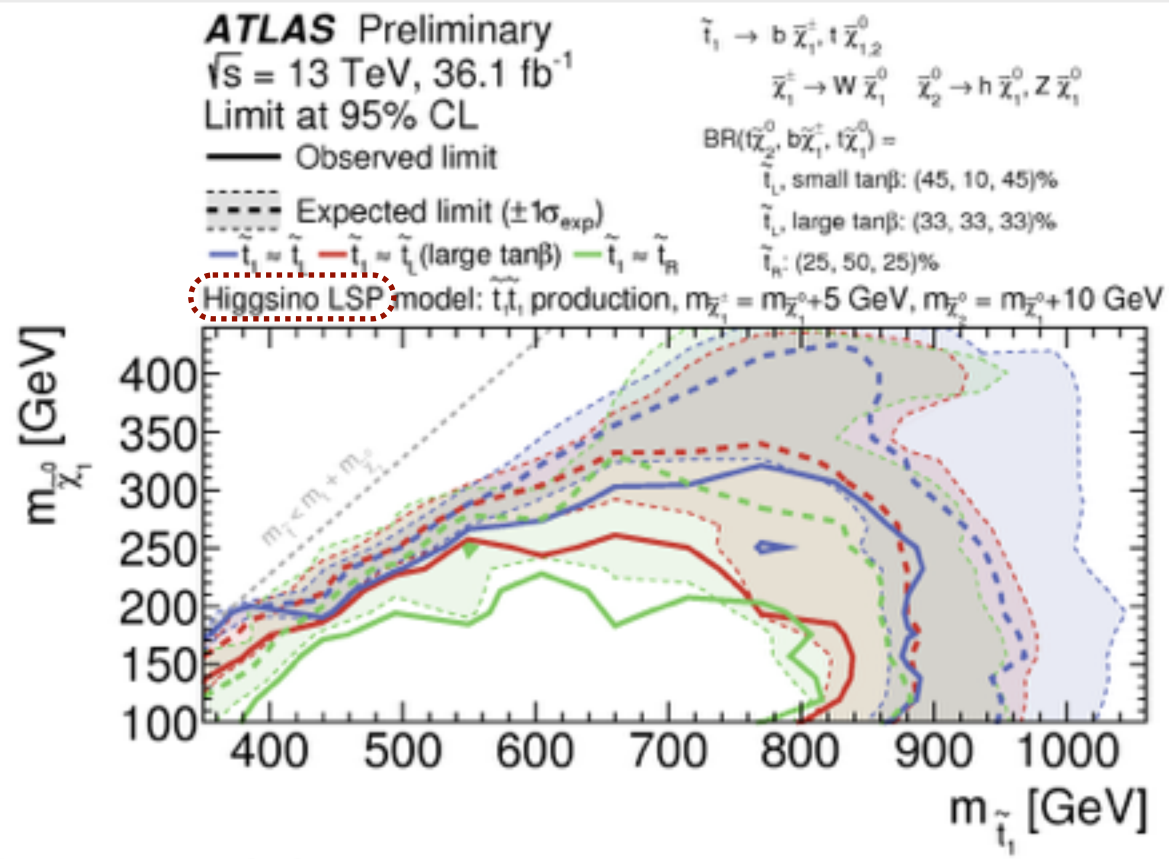


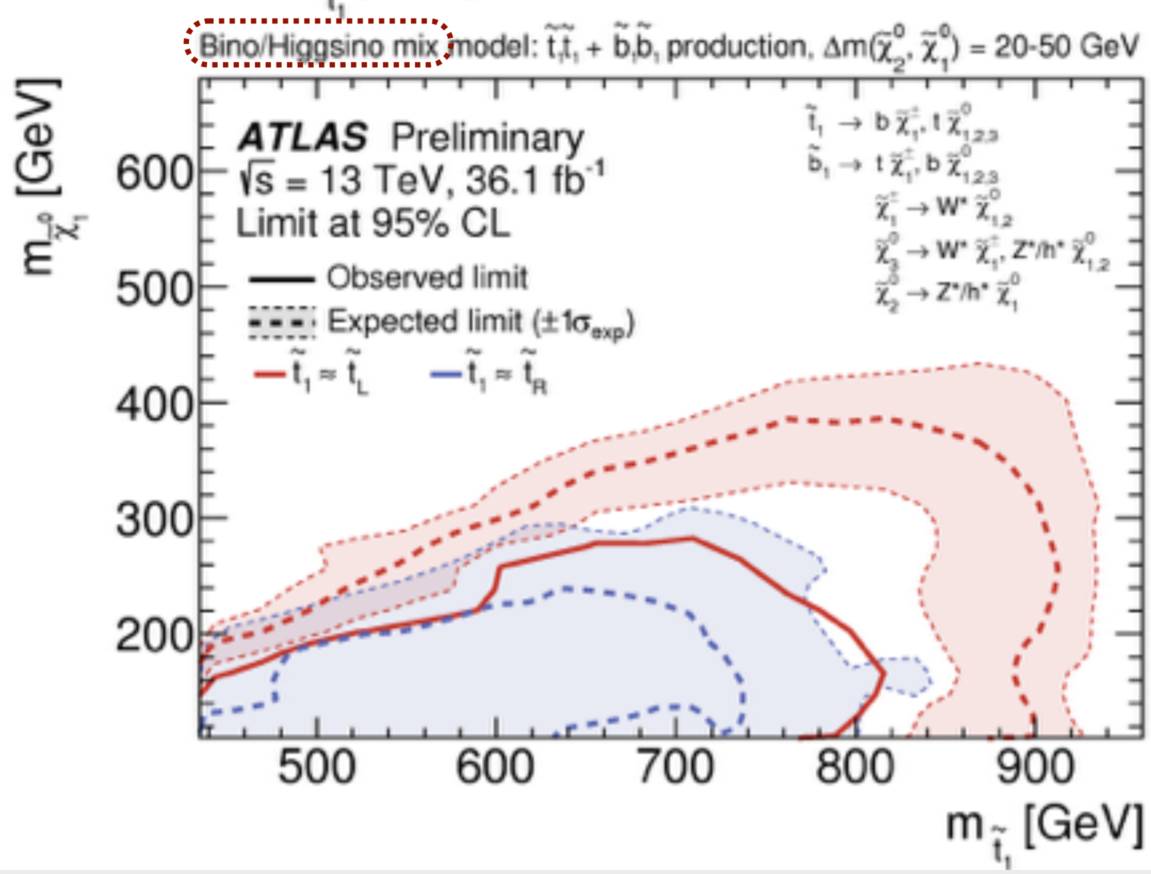
Motivation:	Gauge unification at GUT scale	Natural SUSY	Dark matter candidate

ATLAS-CONF-2017-037

THIRD GENERATION PMSSM INSPIRED 1L



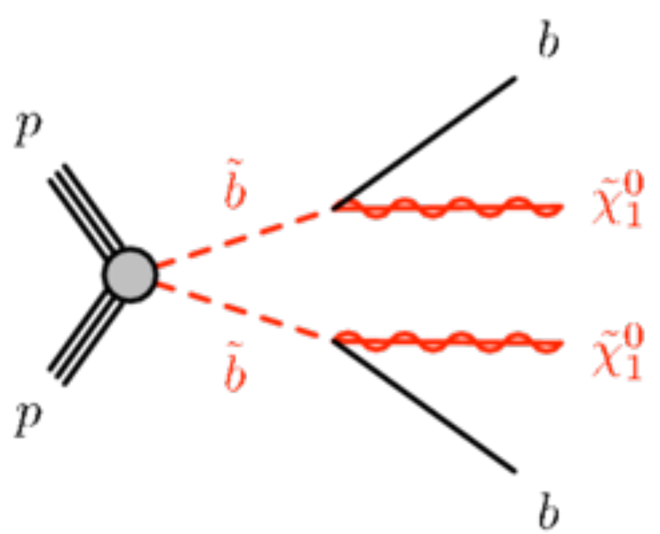


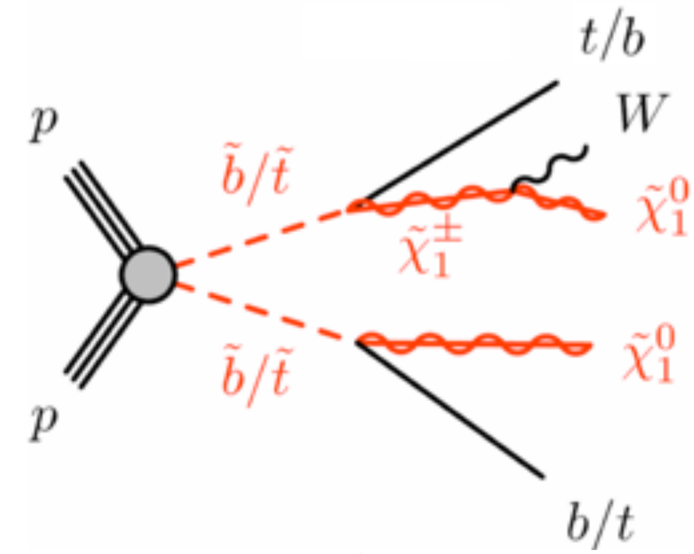


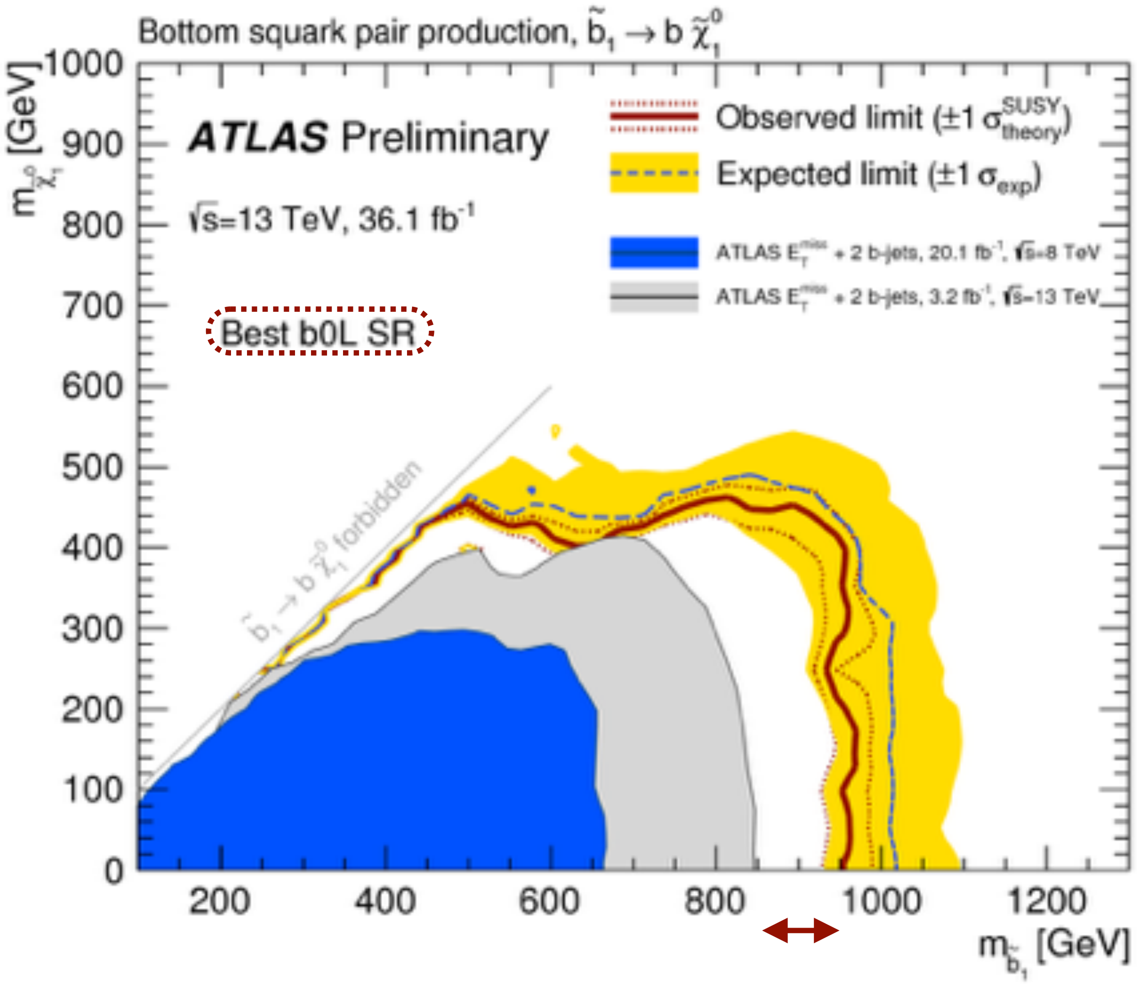
ATLAS-CONF-2017-037

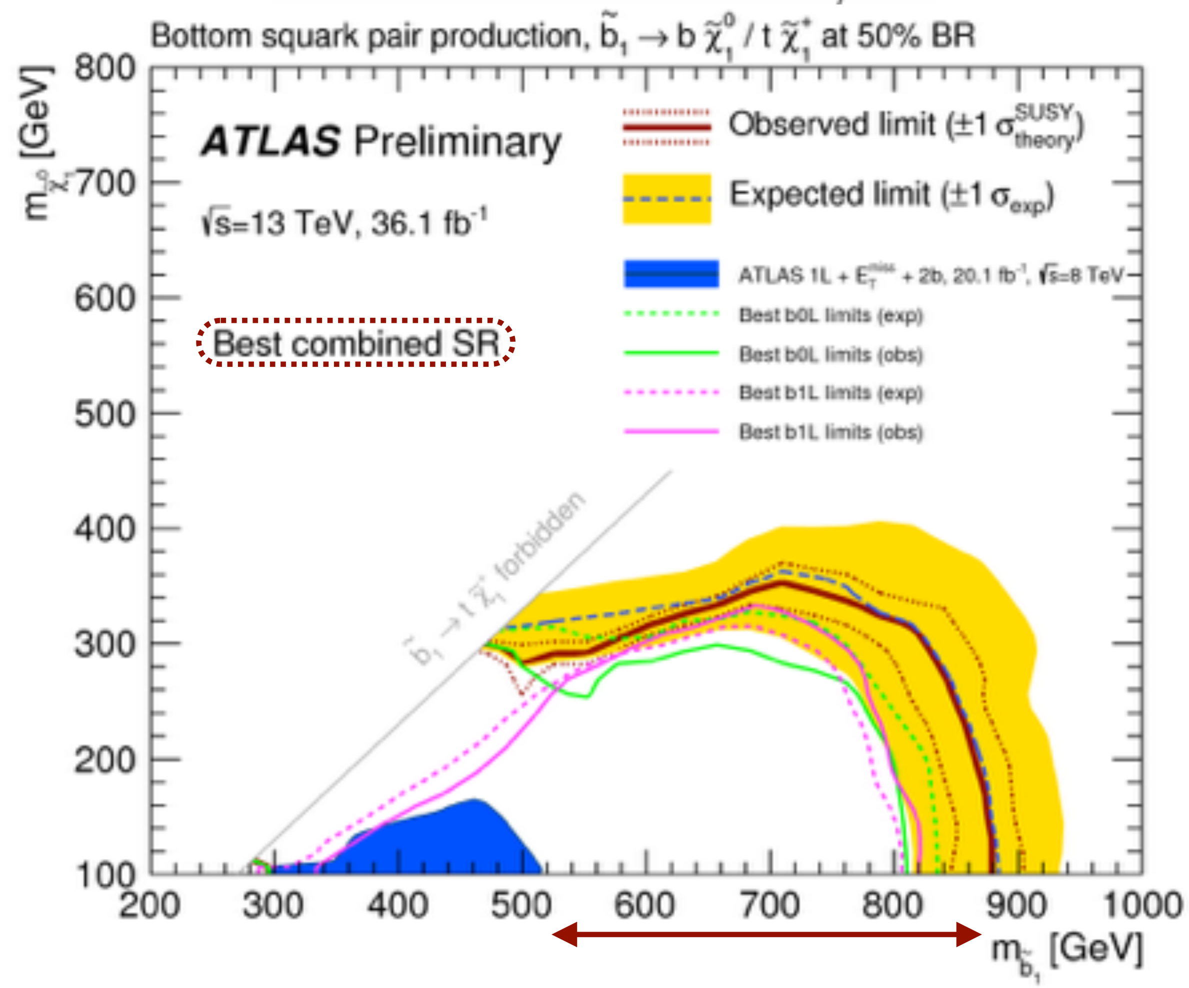
DIRECT S-BOTTOM PRODUCTION

ATLAS-CONF-2017-038







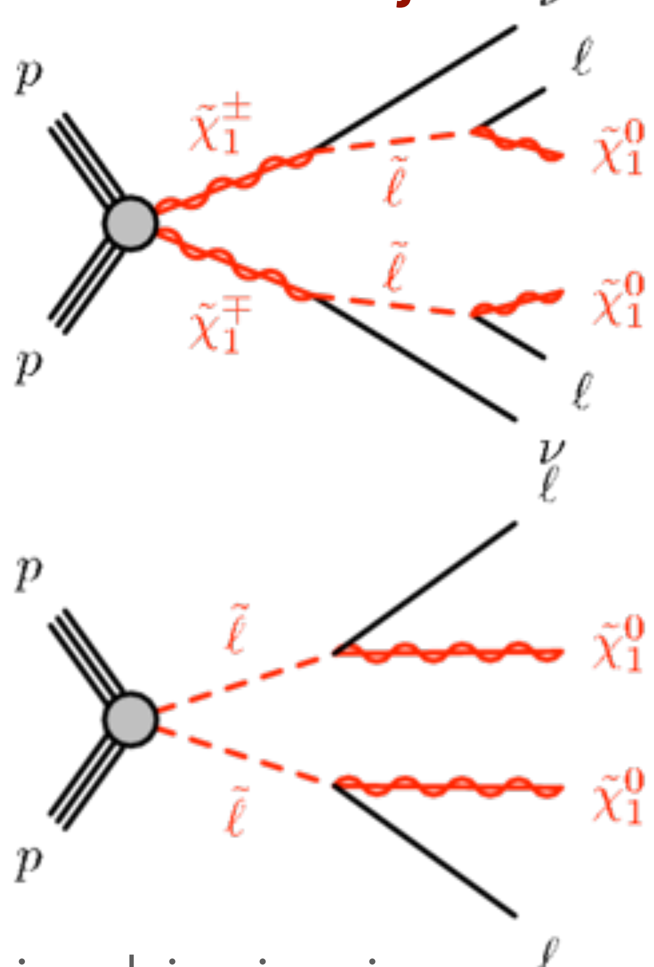


Large improvement in the exclusion for different physics scenarios.

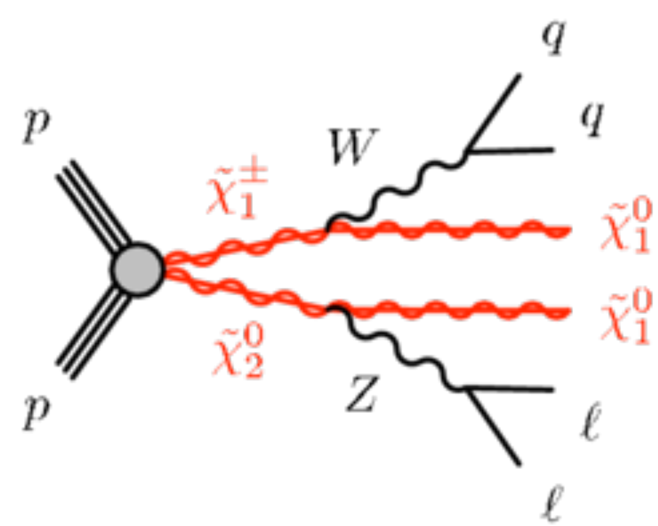
ELECTROWEAK PRODUCTION

- Production of electroweakinos and sleptons can dominate the LHC if masses of squarks and gluinos are significantly large.
- As the limits on strong production reaches scales of ~2 TeV, studies of electroweak production becomes very well motivated.

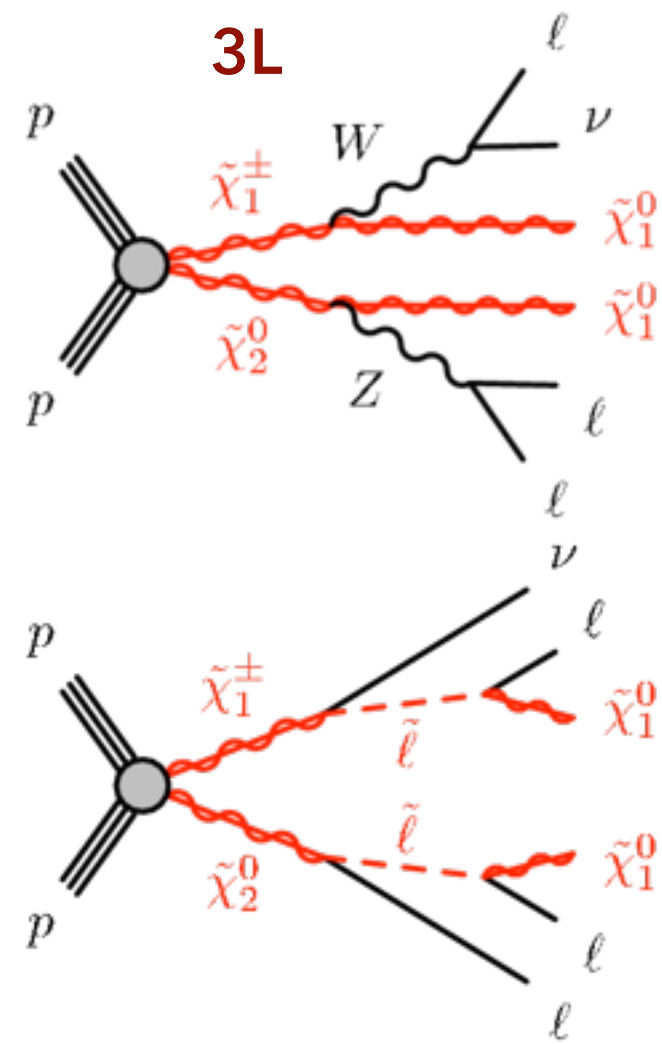
2L + 0 jets



2L + 2 jets



3L

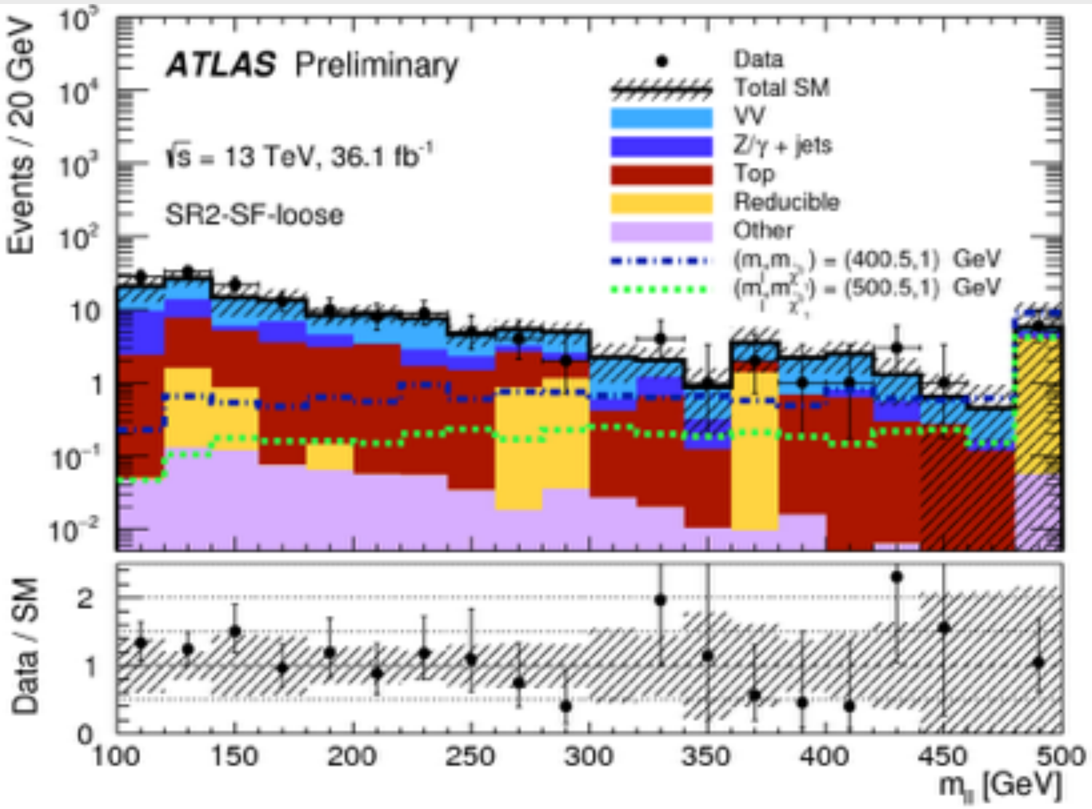


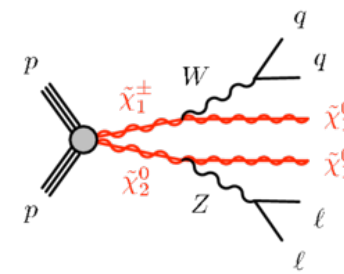
Using binning in:

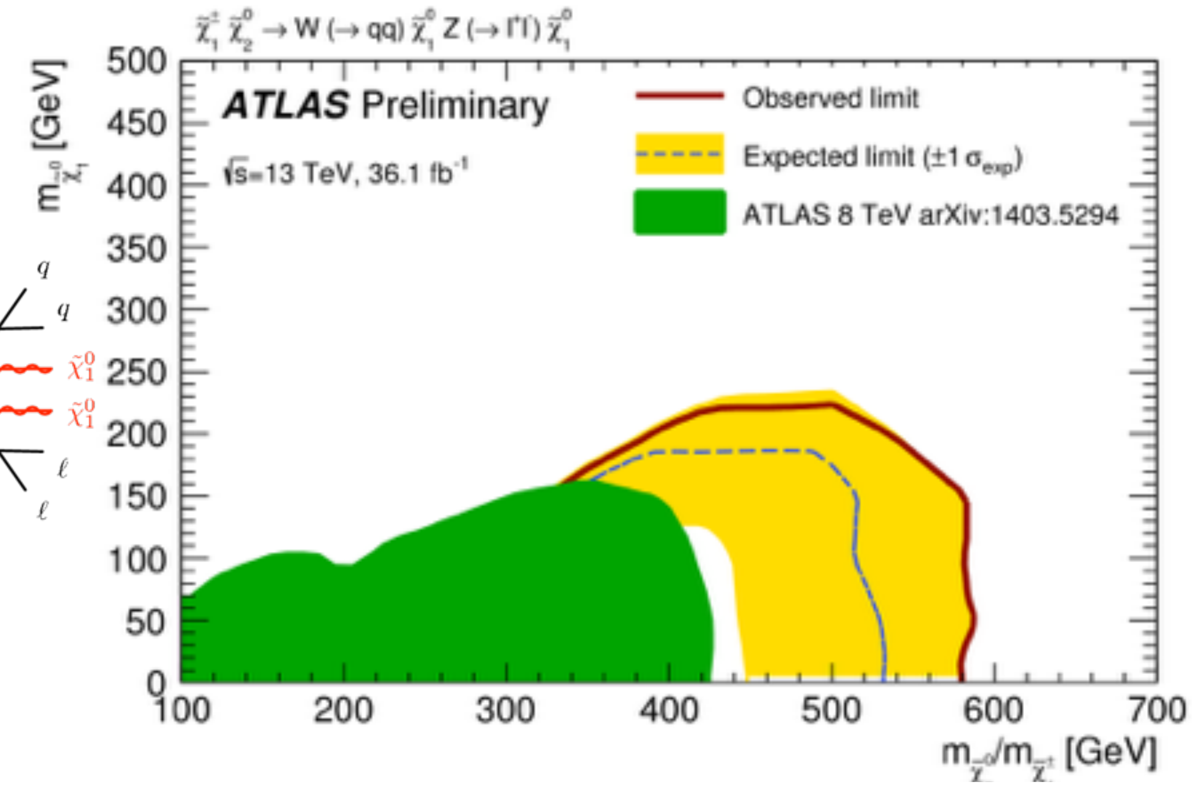
- m_{ll}
- $m_{T2} = \min_{\mathbf{q}_T}\left[\max\left(m_T(\mathbf{p}_T^{\ell 1}, \mathbf{q}_T), m_T(\mathbf{p}_T^{\ell 2}, \mathbf{p}_T^{\text{miss}} - \mathbf{q}_T)\right)\right]$

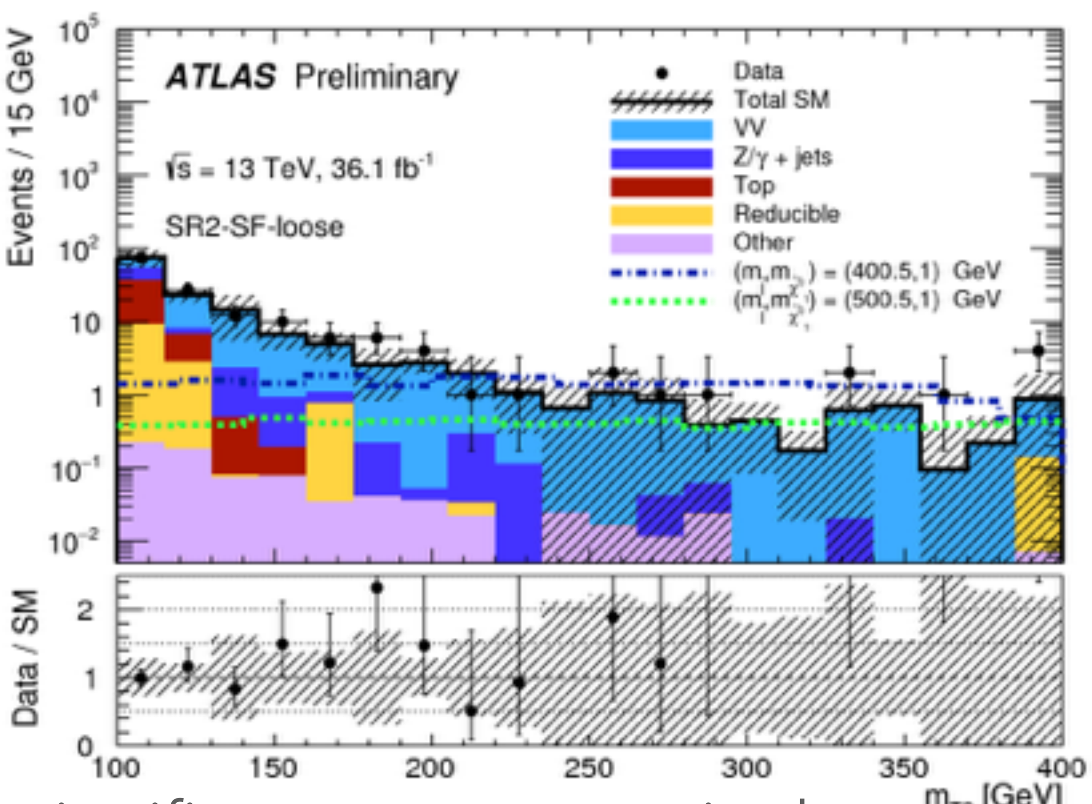
ATLAS-CONF-2017-039

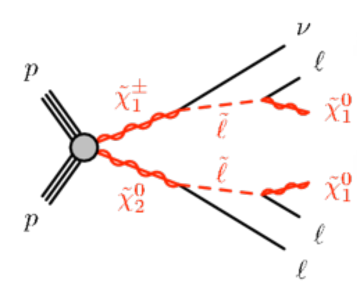
ELECTROWEAK PRODUCTION

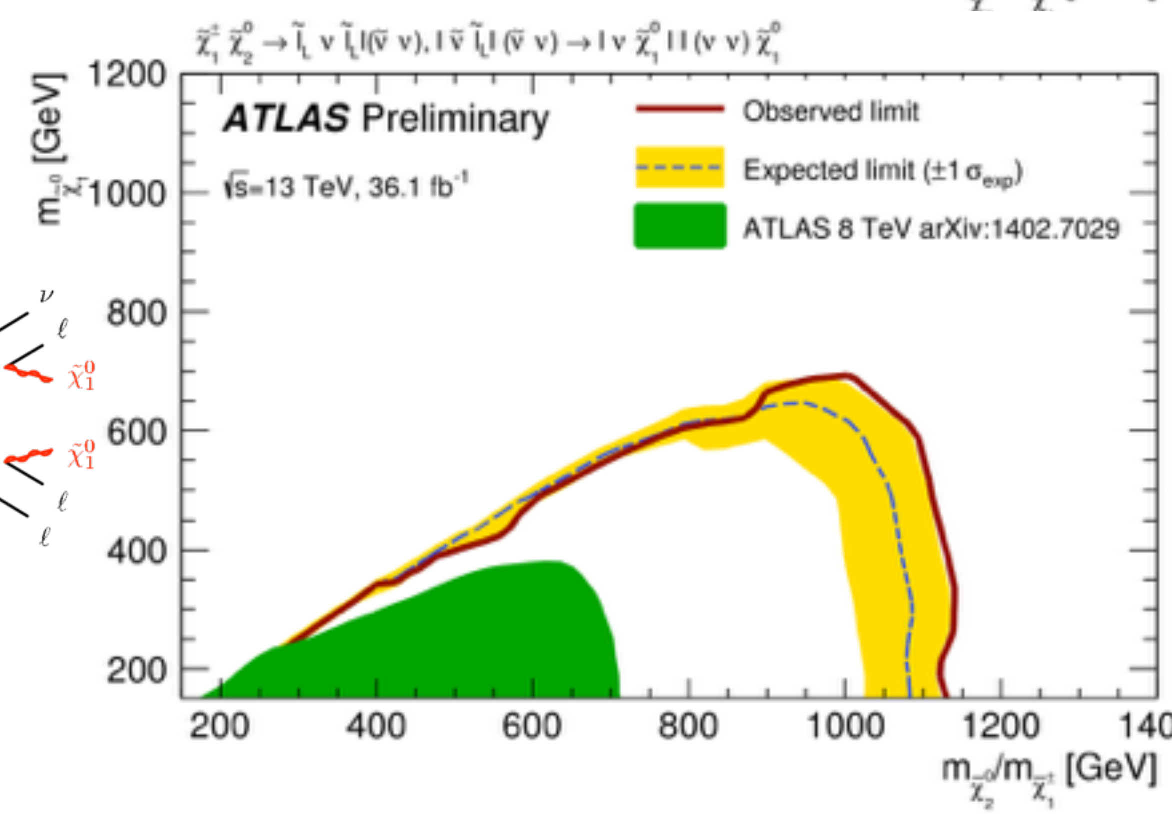










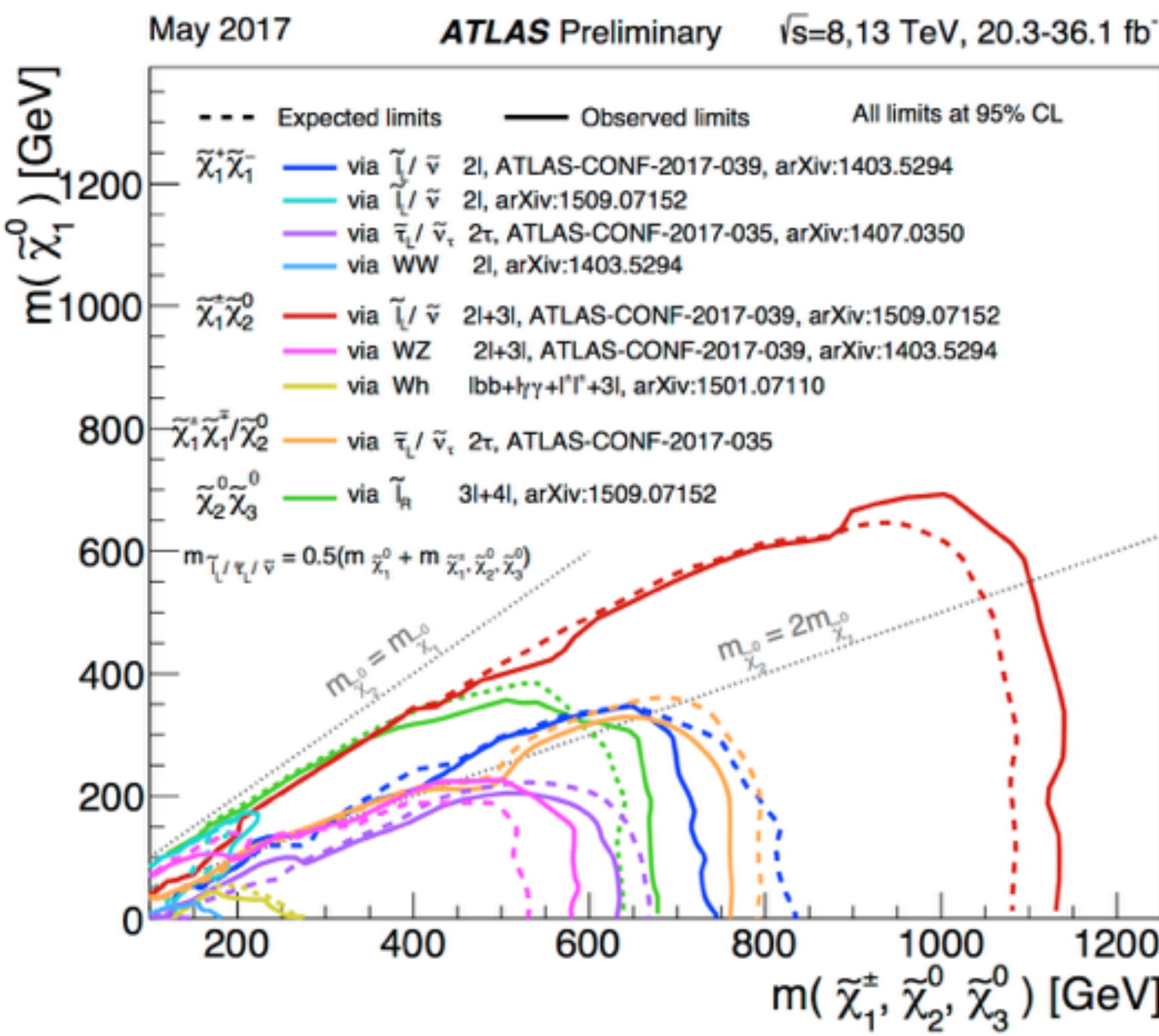


No significant excess seen in data.

ATLAS-CONF-2017-039

SUMMARY ELECTROWEAK PRODUCTION

ATLAS_SUSY_Summary

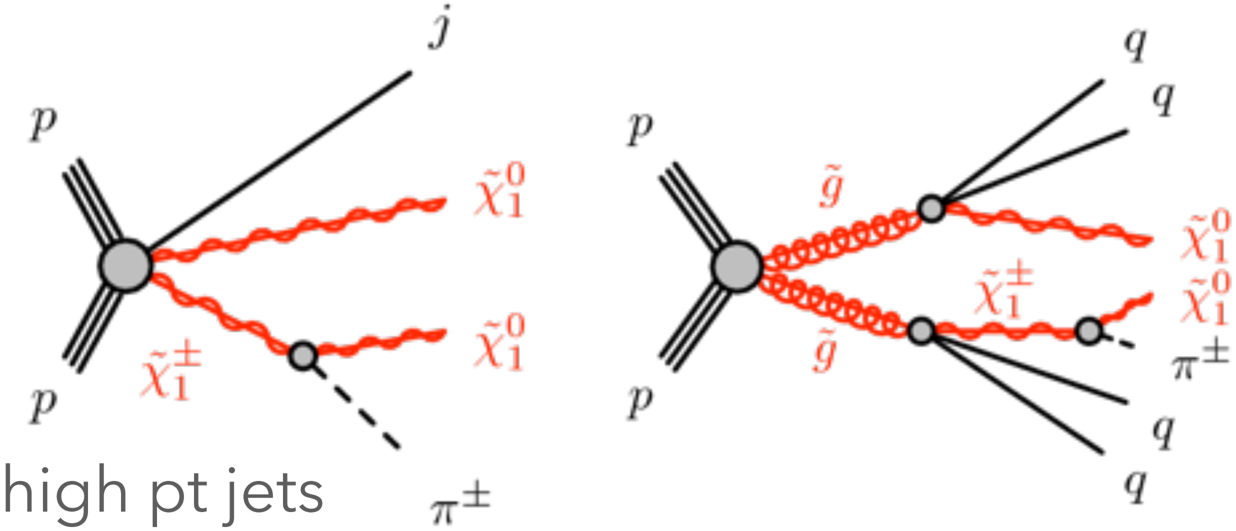


Note: Not a direct comparison, different analyses use different decays.

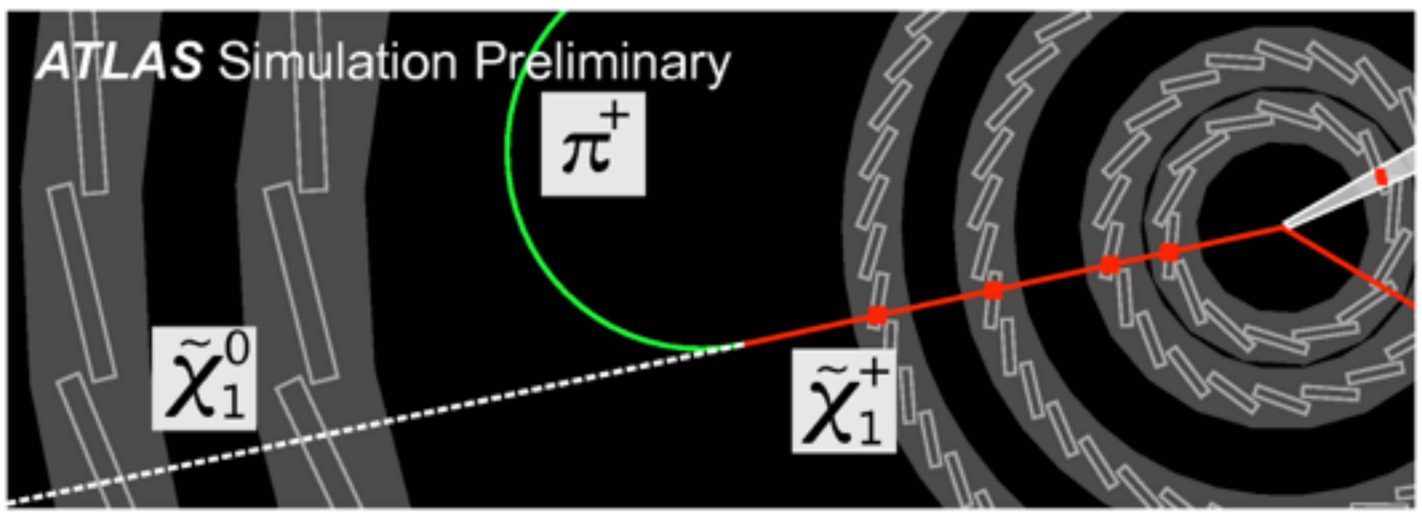
	Model	e,μ,τ,γ	Jets	E_T^{miss}	$\int\mathcal{L}\,dt[fb^{-1}]$	Mass limit ($\sqrt{s}$ = 7, 8 TeV / $\sqrt{s}$ = 13 TeV)		Reference
EW direct	$\tilde{\ell}_{L,R}\tilde{\ell}_{L,R}, \tilde{\ell}\to\ell\tilde{\chi}_1^0$	2 e,μ	0	Yes	36.1	$\tilde{\ell}$ 90-440 GeV	m($\tilde{\chi}_1^0$)=0	ATLAS-CONF-2017-039
	$\tilde{\chi}_1^+\tilde{\chi}_1^-, \tilde{\chi}_1^+\to\tilde{\ell}\nu(\ell\tilde{\nu})$	2 e,μ	0	Yes	36.1	$\tilde{\chi}_1^\pm$ 710 GeV	m($\tilde{\chi}_1^0$)=0, m($\tilde{\ell},\tilde{\nu}$)=0.5(m($\tilde{\chi}_1^\pm$)+m($\tilde{\chi}_1^0$))	ATLAS-CONF-2017-039
	$\tilde{\chi}_1^\pm\tilde{\chi}_1^\mp/\tilde{\chi}_2^0, \tilde{\chi}_1^+\to\tilde{\tau}\nu(\tau\tilde{\nu}), \tilde{\chi}_2^0\to\tilde{\tau}\tau(\nu\tilde{\nu})$	2 τ	-	Yes	36.1	$\tilde{\chi}_1^\pm$ 760 GeV	m($\tilde{\chi}_1^0$)=0, m($\tilde{\tau},\tilde{\nu}$)=0.5(m($\tilde{\chi}_1^\pm$)+m($\tilde{\chi}_1^0$))	ATLAS-CONF-2017-035
	$\tilde{\chi}_1^\pm\tilde{\chi}_2^0\to\tilde{\ell}_L\nu\tilde{\ell}_L\ell(\tilde{\nu}\nu), \ell\tilde{\nu}\tilde{\ell}_L\ell(\tilde{\nu}\nu)$	3 e,μ	0	Yes	36.1	$\tilde{\chi}_1^\pm,\tilde{\chi}_2^0$ 1.16 TeV	m($\tilde{\chi}_1^\pm$)=m($\tilde{\chi}_2^0$), m($\tilde{\chi}_1^0$)=0, m($\tilde{\ell},\tilde{\nu}$)=0.5(m($\tilde{\chi}_1^\pm$)+m($\tilde{\chi}_1^0$))	ATLAS-CONF-2017-039
	$\tilde{\chi}_1^\pm\tilde{\chi}_2^0\to W\tilde{\chi}_1^0 Z\tilde{\chi}_1^0$	2-3 e,μ	0-2 jets	Yes	36.1	$\tilde{\chi}_1^\pm,\tilde{\chi}_2^0$ 580 GeV	m($\tilde{\chi}_1^\pm$)=m($\tilde{\chi}_2^0$), m($\tilde{\chi}_1^0$)=0, $\tilde{\ell}$ decoupled	ATLAS-CONF-2017-039
	$\tilde{\chi}_1^\pm\tilde{\chi}_2^0\to W\tilde{\chi}_1^0 h\tilde{\chi}_1^0, h\to b\bar{b}/WW/\tau\tau/\gamma\gamma$	e,μ,γ	0-2 b	Yes	20.3	$\tilde{\chi}_1^\pm,\tilde{\chi}_2^0$ 270 GeV	m($\tilde{\chi}_1^\pm$)=m($\tilde{\chi}_2^0$), m($\tilde{\chi}_1^0$)=0, $\tilde{\ell}$ decoupled	1501.07110
	$\tilde{\chi}_2^0\tilde{\chi}_3^0, \tilde{\chi}_{2,3}^0\to\tilde{\ell}_R\ell$	4 e,μ	0	Yes	20.3	$\tilde{\chi}_{2,3}^0$ 635 GeV	m($\tilde{\chi}_2^0$)=m($\tilde{\chi}_3^0$), m($\tilde{\chi}_1^0$)=0, m($\tilde{\ell},\tilde{\nu}$)=0.5(m($\tilde{\chi}_2^0$)+m($\tilde{\chi}_1^0$))	1405.5086
	GGM (wino NLSP) weak prod., $\tilde{\chi}_1^0\to\gamma\tilde{G}$	1 $e,\mu+\gamma$	-	Yes	20.3	$\tilde{W}$ 115-370 GeV	$c\tau$<1 mm	1507.05493
	GGM (bino NLSP) weak prod., $\tilde{\chi}_1^0\to\gamma\tilde{G}$	2 γ	-	Yes	20.3	$\tilde{W}$ 590 GeV	$c\tau$<1 mm	1507.05493

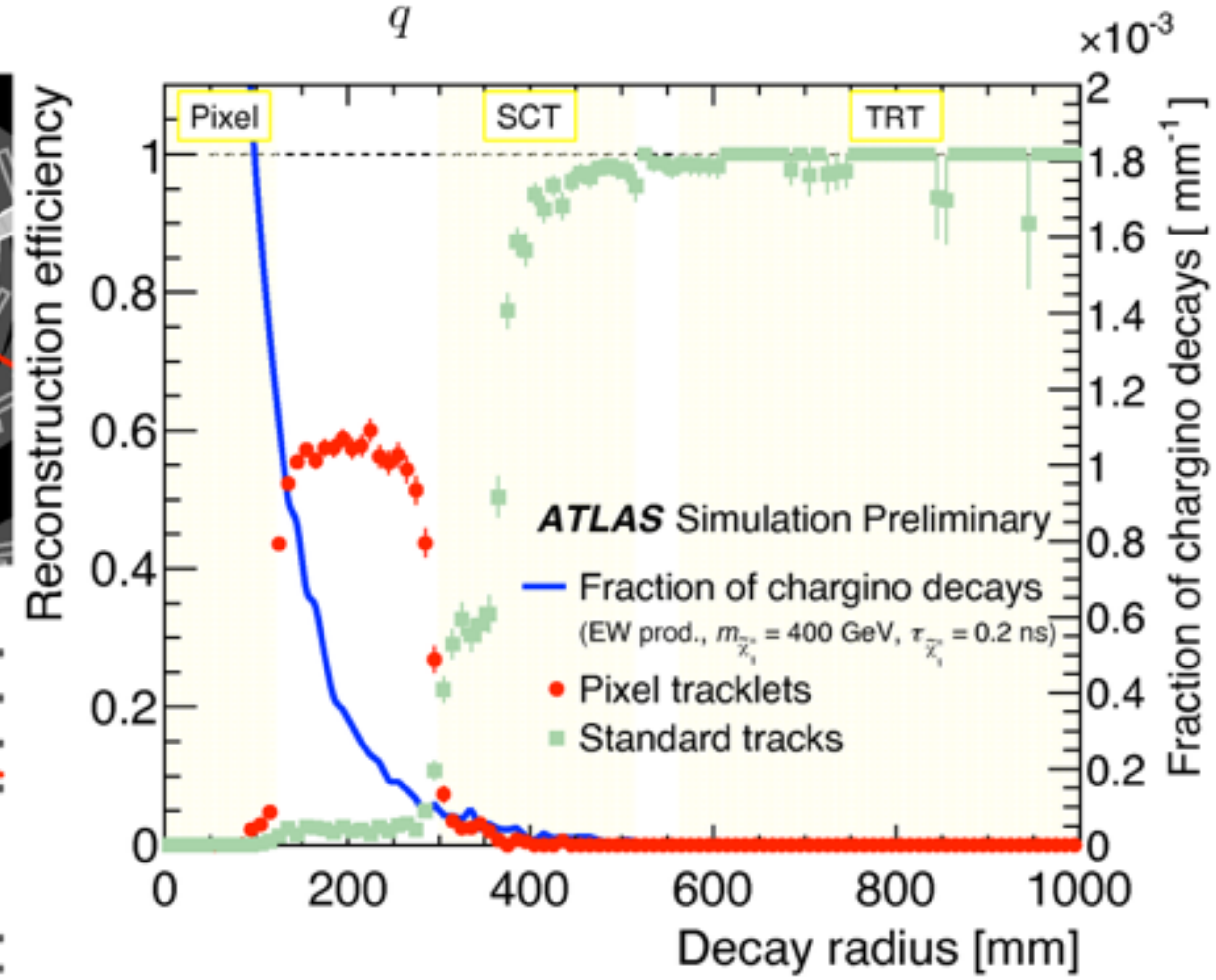
High reach in exclusion of electroweak production.

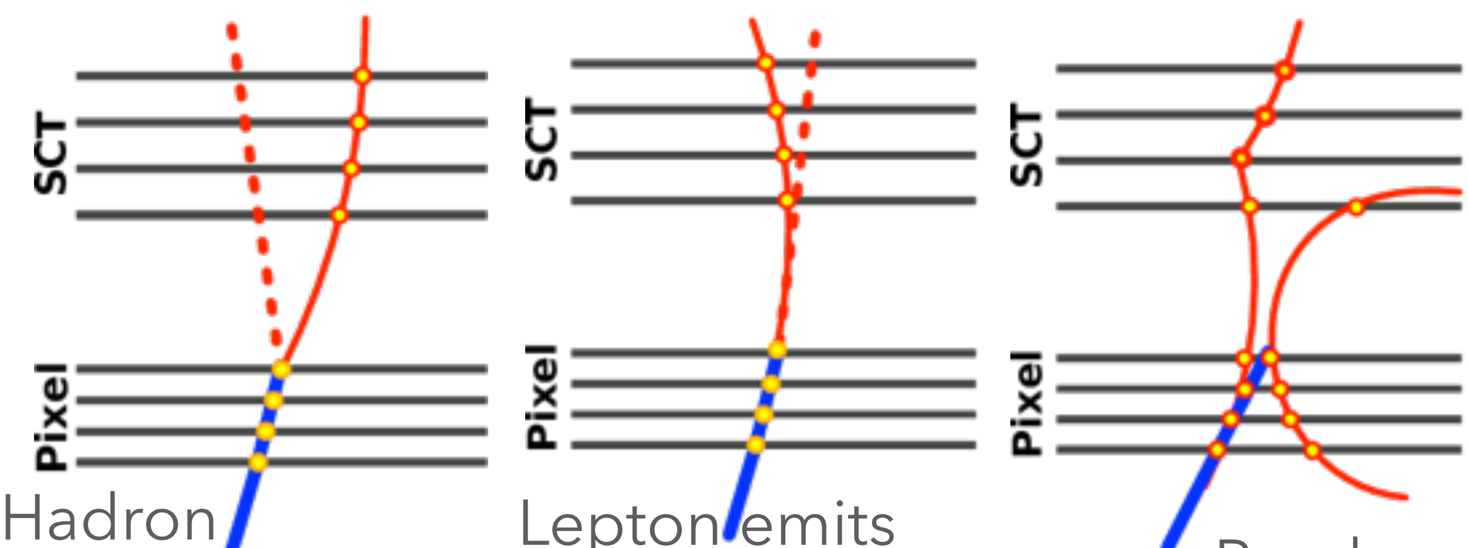
LONG LIVED



Short track, large MET, high pt jets







Hadron hard scatter

Lepton emits a hard photon radiation

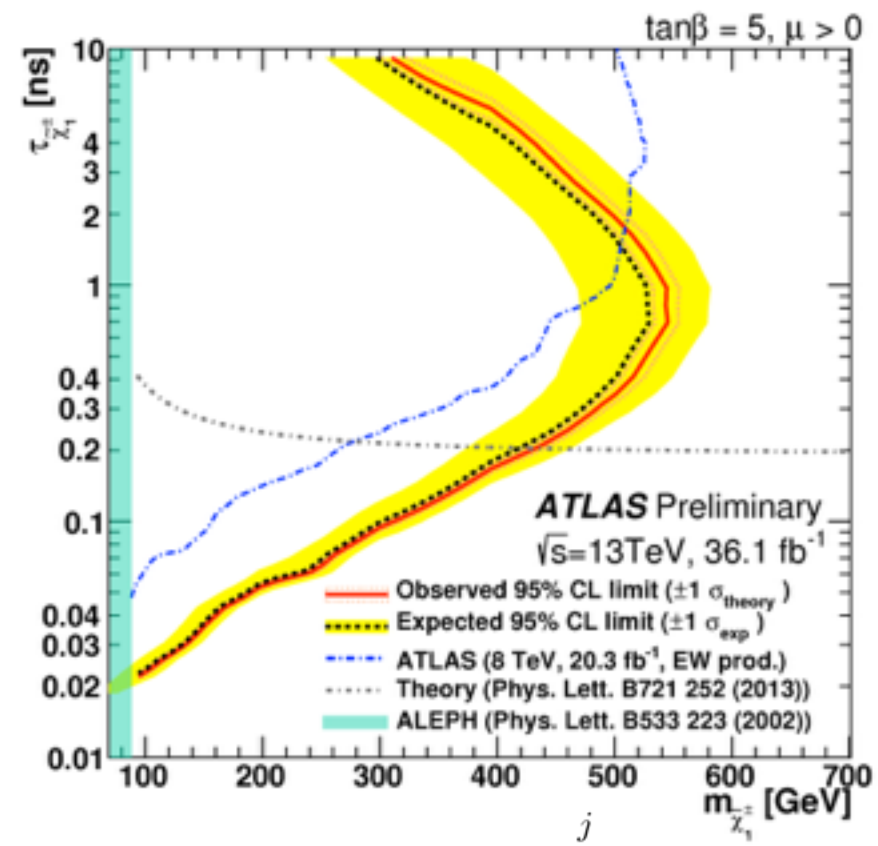
Random

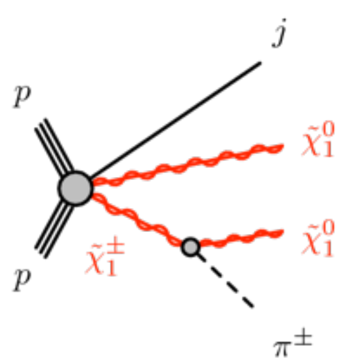
ATLAS-CONF-2017-017

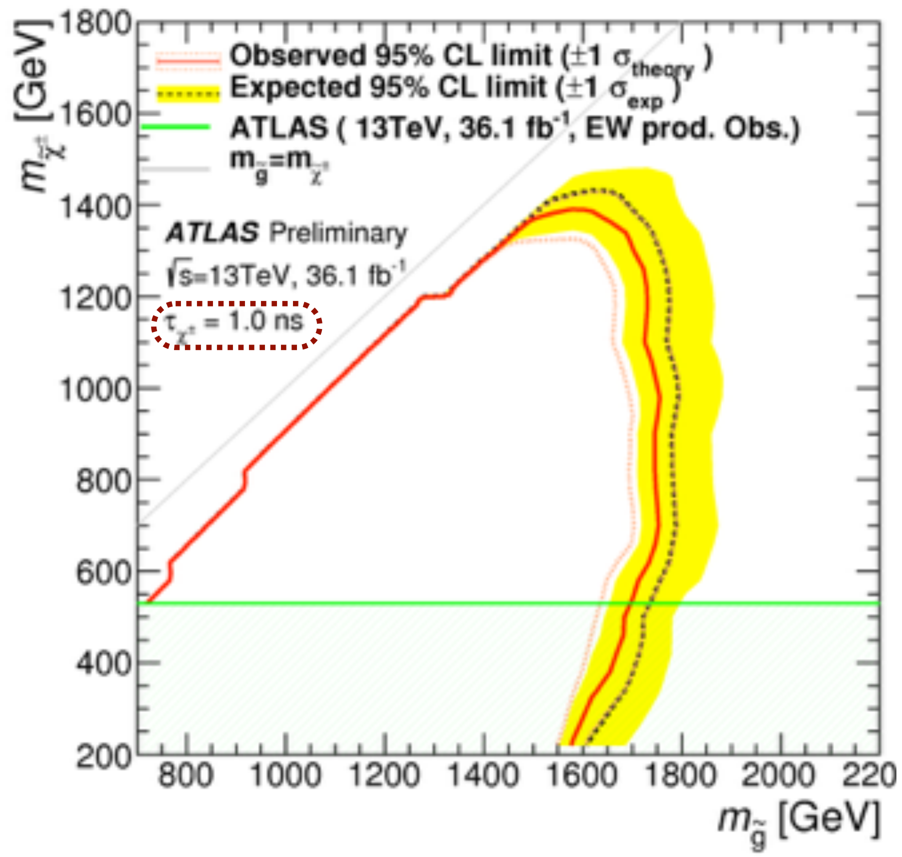
LONG LIVED

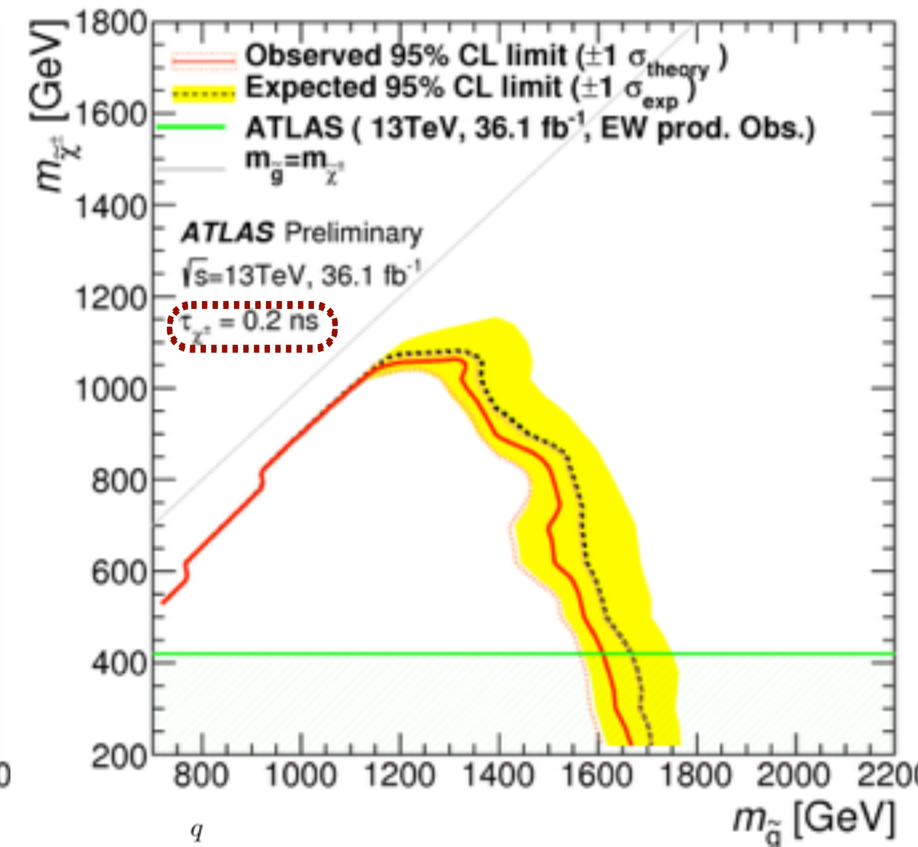
Electroweak channel

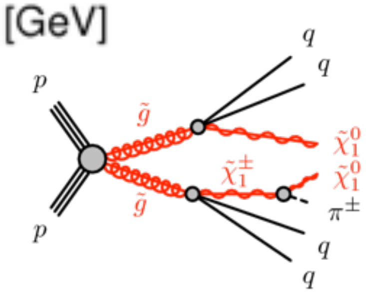
Strong production channel









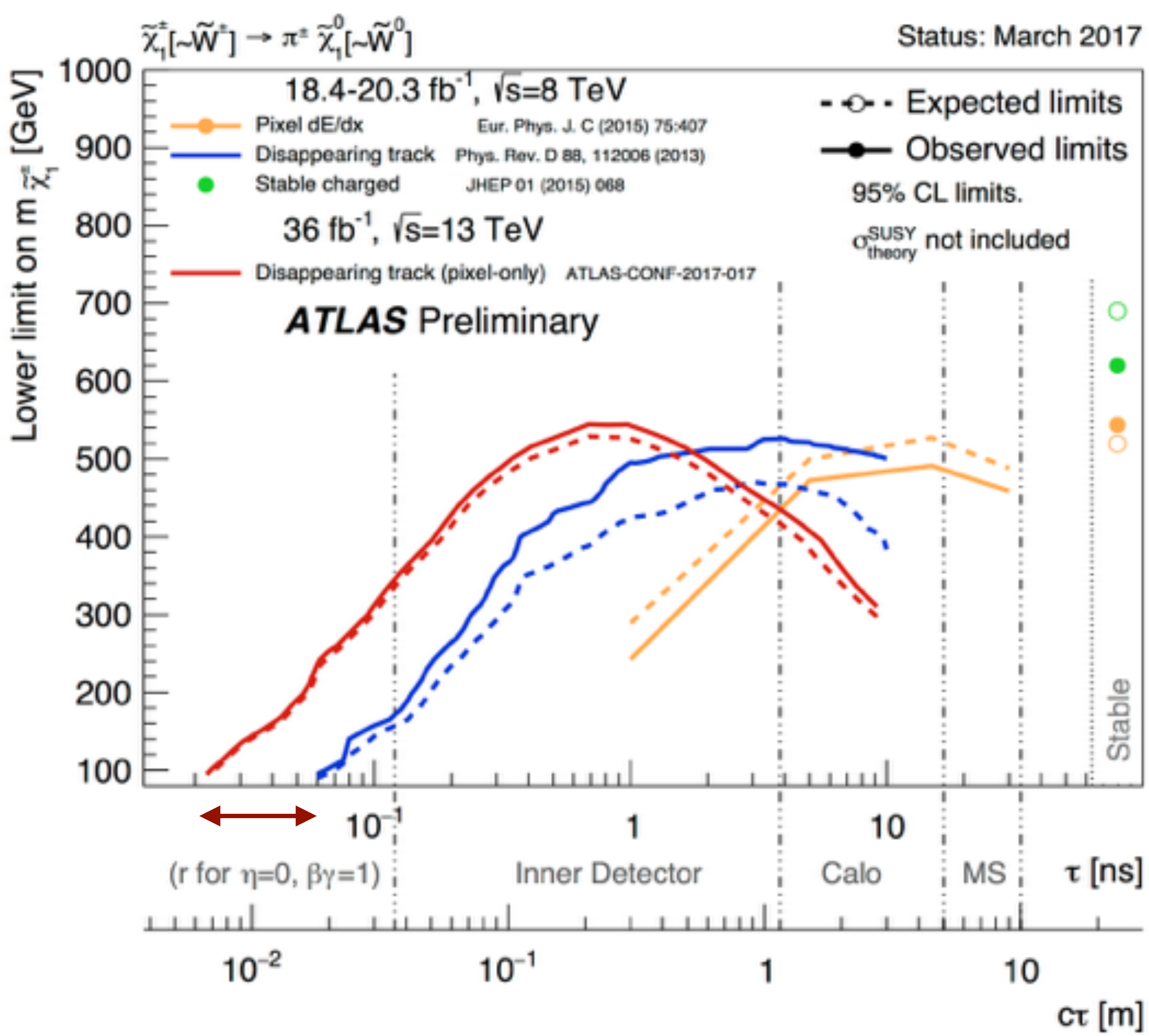


No significant excess found in strong and electroweak channel.

[ATLAS-CONF-2017-017]

SUMMARY LONG LIVED

ATLAS_SUSY_Summary



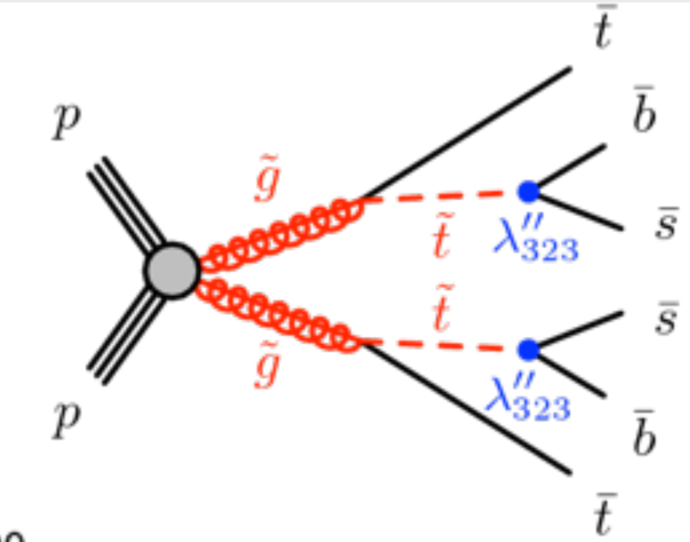
	Model	e, μ, τ, γ	Jets	E_T^{miss}	$\int \mathcal{L}\, dt[\mathrm{fb}^{-1}]$	Mass limit		Reference
Long-lived particles	Direct $\tilde{\chi}_1^+\tilde{\chi}_1^-$ prod., long-lived $\tilde{\chi}_1^{\pm}$	Disapp. trk	1 jet	Yes	36.1	$\tilde{\chi}_1^{\pm}$ 430 GeV	m($\tilde{\chi}_1^{\pm}$)-m($\tilde{\chi}_1^0$)~160 MeV, $\tau(\tilde{\chi}_1^{\pm})$=0.2 ns	ATLAS-CONF-2017-017
	Direct $\tilde{\chi}_1^+\tilde{\chi}_1^-$ prod., long-lived $\tilde{\chi}_1^{\pm}$	dE/dx trk	-	Yes	18.4	$\tilde{\chi}_1^{\pm}$ 495 GeV	m($\tilde{\chi}_1^{\pm}$)-m($\tilde{\chi}_1^0$)~160 MeV, $\tau(\tilde{\chi}_1^{\pm})$<15 ns	1506.05332
	Stable, stopped $\tilde{g}$ R-hadron	0	1-5 jets	Yes	27.9	$\tilde{g}$ 850 GeV	m($\tilde{\chi}_1^0$)=100 GeV, 10 μs<$\tau(\tilde{g})$<1000 s	1310.6584
	Stable $\tilde{g}$ R-hadron	trk	-	-	3.2	$\tilde{g}$ 1.58 TeV		1606.05129
	Metastable $\tilde{g}$ R-hadron	dE/dx trk	-	-	3.2	$\tilde{g}$ 1.57 TeV	m($\tilde{\chi}_1^0$)=100 GeV, τ>10 ns	1604.04520
	GMSB, stable $\tilde{\tau}$, $\tilde{\chi}_1^0 \rightarrow \tilde{\tau}(\tilde{e}, \tilde{\mu})+\tau(e, \mu)$	1-2 μ	-	-	19.1	$\tilde{\chi}_1^0$ 537 GeV	10<tanβ<50	1411.6795
	GMSB, $\tilde{\chi}_1^0 \rightarrow \gamma\tilde{G}$, long-lived $\tilde{\chi}_1^0$	2 γ	-	Yes	20.3	$\tilde{\chi}_1^0$ 440 GeV	1<$\tau(\tilde{\chi}_1^0)$<3 ns, SPS8 model	1409.5542
	$\tilde{g}\tilde{g}$, $\tilde{\chi}_1^0 \rightarrow ee\nu/e\mu\nu/\mu\mu\nu$	displ. $ee/e\mu/\mu\mu$	-	-	20.3	$\tilde{\chi}_1^0$ 1.0 TeV	7 <$c\tau(\tilde{\chi}_1^0)$< 740 mm, m($\tilde{g}$)=1.3 TeV	1504.05162
	GGM $\tilde{g}\tilde{g}$, $\tilde{\chi}_1^0 \rightarrow Z\tilde{G}$	displ. vtx + jets	-	-	20.3	$\tilde{\chi}_1^0$ 1.0 TeV	6 <$c\tau(\tilde{\chi}_1^0)$< 480 mm, m($\tilde{g}$)=1.1 TeV	1504.05162

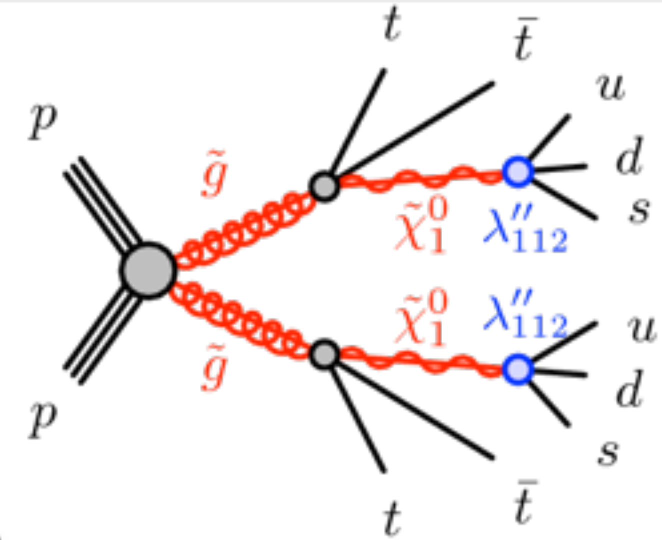
$\sqrt{s}$ = 7, 8 TeV $\sqrt{s}$ = 13 TeV

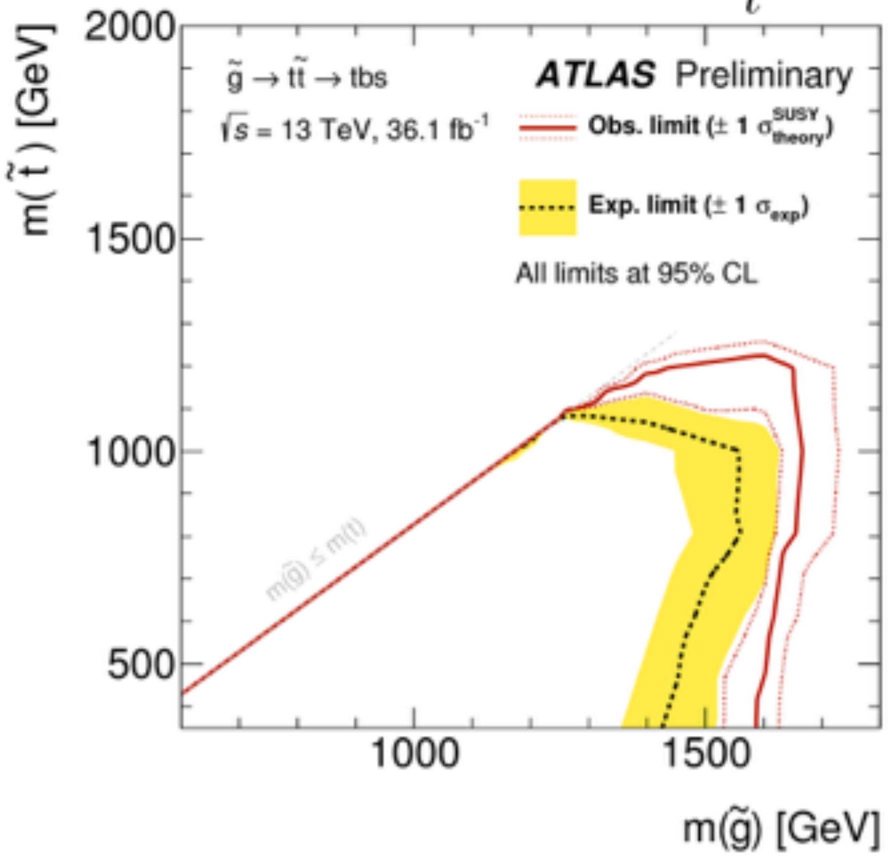
Improvement in chargino exclusion reach towards shorter lifetimes.

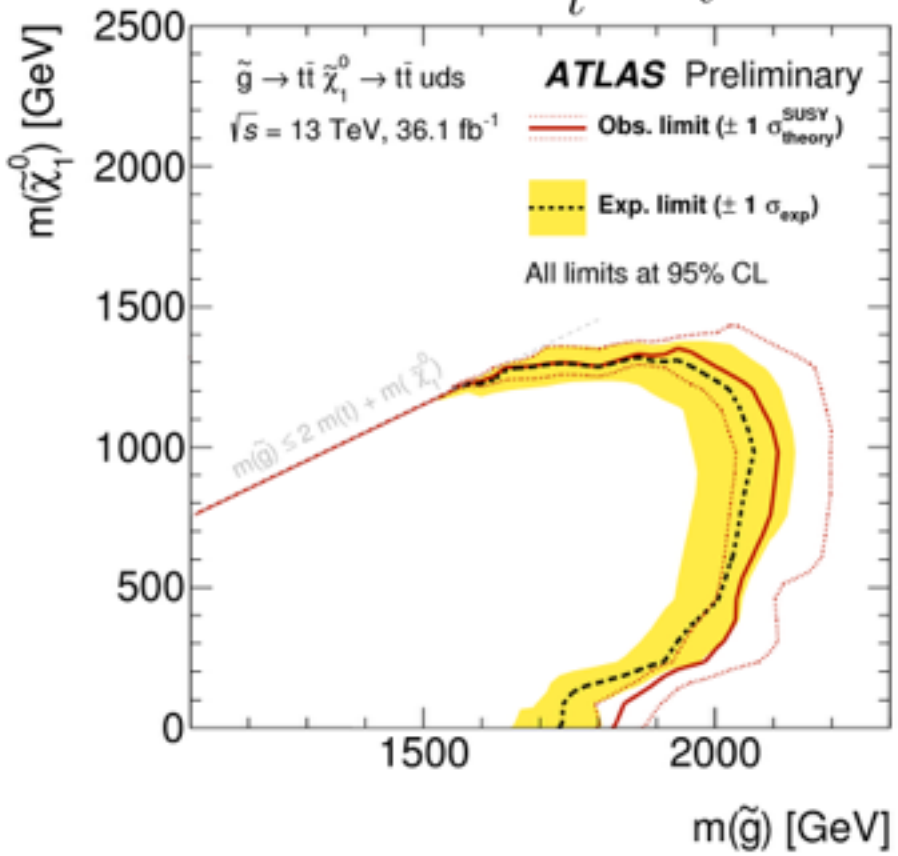
SUMMARY RPV

[ATLAS-CONF-2017-013](#)
[ATLAS_SUSY_Summary](#)



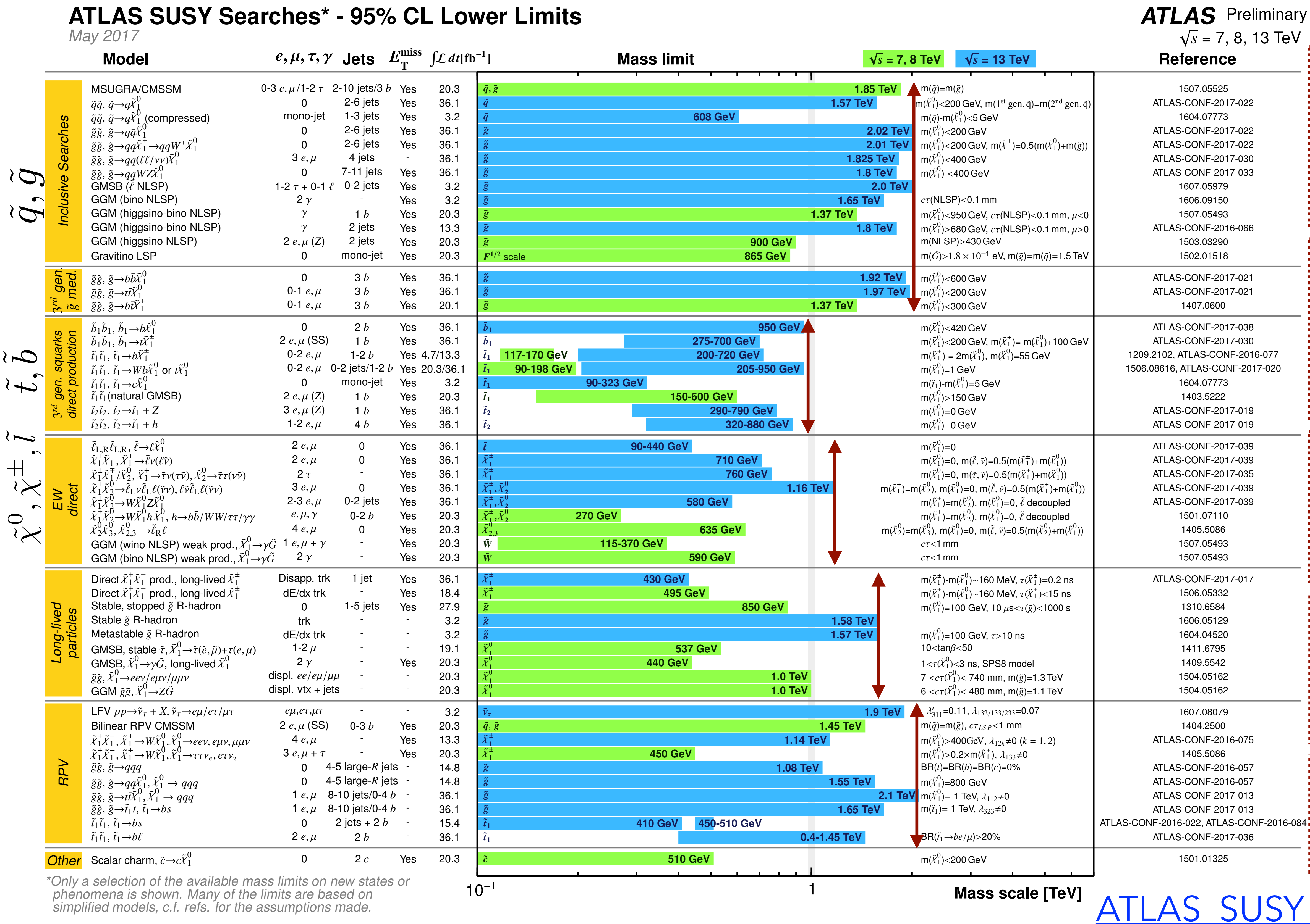






	Model	e, μ, τ, γ	Jets	E_T^{miss}	$\int \mathcal{L}\, dt$[fb^{-1}]	Mass limit ($\sqrt{s}$ = 7, 8 TeV / $\sqrt{s}$ = 13 TeV)			Reference
RPV	LFV $pp \to \tilde{\nu}_\tau + X, \tilde{\nu}_\tau \to e\mu/e\tau/\mu\tau$	$e\mu,e\tau,\mu\tau$	-	-	3.2	$\tilde{\nu}_\tau$	1.9 TeV	λ'_{311}=0.11, $\lambda_{132/133/233}$=0.07	1607.08079
	Bilinear RPV CMSSM	2 e,μ (SS)	0-3 b	Yes	20.3	$\tilde{q}, \tilde{g}$	1.45 TeV	m($\tilde{q}$)=m($\tilde{g}$), $c\tau_{LSP}$<1 mm	1404.2500
	$\tilde{\chi}_1^+\tilde{\chi}_1^-, \tilde{\chi}_1^+ \to W\tilde{\chi}_1^0, \tilde{\chi}_1^0 \to ee\nu, e\mu\nu, \mu\mu\nu$	4 e,μ	-	Yes	13.3	$\tilde{\chi}_1^\pm$	1.14 TeV	m($\tilde{\chi}_1^0$)>400GeV, $\lambda_{12k}\neq 0$ ($k = 1, 2$)	ATLAS-CONF-2016-075
	$\tilde{\chi}_1^+\tilde{\chi}_1^-, \tilde{\chi}_1^+ \to W\tilde{\chi}_1^0, \tilde{\chi}_1^0 \to \tau\tau\nu_e, e\tau\nu_\tau$	3 $e,\mu + \tau$	-	Yes	20.3	$\tilde{\chi}_1^\pm$	450 GeV	m($\tilde{\chi}_1^0$)>0.2×m($\tilde{\chi}_1^\pm$), $\lambda_{133}\neq 0$	1405.5086
	$\tilde{g}\tilde{g}, \tilde{g} \to qqq$	0	4-5 large-R jets	-	14.8	$\tilde{g}$	1.08 TeV	BR(t)=BR(b)=BR(c)=0%	ATLAS-CONF-2016-057
	$\tilde{g}\tilde{g}, \tilde{g} \to qq\tilde{\chi}_1^0, \tilde{\chi}_1^0 \to qqq$	0	4-5 large-R jets	-	14.8	$\tilde{g}$	1.55 TeV	m($\tilde{\chi}_1^0$)=800 GeV	ATLAS-CONF-2016-057
	$\tilde{g}\tilde{g}, \tilde{g} \to t\bar{t}\tilde{\chi}_1^0, \tilde{\chi}_1^0 \to qqq$	1 e,μ	8-10 jets/0-4 b	-	36.1	$\tilde{g}$	2.1 TeV	m($\tilde{\chi}_1^0$)= 1 TeV, $\lambda_{112}\neq 0$	ATLAS-CONF-2017-013
	$\tilde{g}\tilde{g}, \tilde{g} \to \tilde{t}_1 t, \tilde{t}_1 \to bs$	1 e,μ	8-10 jets/0-4 b	-	36.1	$\tilde{g}$	1.65 TeV	m($\tilde{t}_1$)= 1 TeV, $\lambda_{323}\neq 0$	ATLAS-CONF-2017-013
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1 \to bs$	0	2 jets + 2 b	-	15.4	$\tilde{t}_1$	410 GeV; 450-510 GeV		ATLAS-CONF-2016-022, ATLAS-CONF-2016-084
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1 \to b\ell$	2 e,μ	2 b	-	36.1	$\tilde{t}_1$	0.4-1.45 TeV	BR($\tilde{t}_1 \to be/\mu$)>20%	ATLAS-CONF-2017-036

SUSY SEARCHES SUMMARY



Direct, one-step and two-step decays

Simplified and pMSSM inspired models

Higher reach for electro-weakinos

Limits on the long lived chargino

Limits for RPV models

ATLAS_SUSY_Summary

CONCLUSION

- Large increase in c.m.e, integrated luminosity and improvements of analyses enable for:
  - Much higher reach for existing analyses.
  - Studies of new physics scenarios.
- Recent results in SUSY searches using 13 TeV and 36.1 fb^{-1} of ATLAS data:
  - Strong production - extends the reach in squark and gluino masses up to 2 TeV.
  - Third generation - direct stop limits up to 950 GeV, sbottom limits up to 950 GeV.
  - Electroweak production - chargino limits 600 - 1100 GeV.
  - Limits set for long lived chargino and RPV models.
- Future analyses will have new improvements and use much higher integrated luminosity.

STAY TUNED FOR THE 2018 RESULTS!