K. Rosbach on behalf of the ATLAS SUSY WG
LHC Reinterpretation Workshop, CERN, 15 June 2016

ATLAS Run 2 SUSY Searches

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Outline

- Basic strategy considerations
- Overview of available Run 2 results
- Auxiliary material: HepData and Analysis Preservation

Strategy

- No major changes foreseen from run 1 ATLAS SUSY search and publication strategies.
- Important difference between early run 2 and late run 1: Designing searches for high discovery sensitivity, not for maximal exclusion reach.
- Driven by the rapid increase in collected luminosity.

SUSY Models

- Full SUSY models: mSUGRA, GMSB, nGM, …
  - Can scan parameter ranges if #parameters small.
  - Benchmark scenarios can serve as guidelines.
- **Simplified models**: limited sparticle content, branching ratios 100% (or at most two competing decays).
  - Very common approach, usually not realistic scenario on its own, but often motivated within framework of more complete model.
  - More practical to work with for experimentalists.
  - Results can be shown in (relatively) simple plots and provided as signal-model independent limits – easy to (re)interpret.
  - Usually only lightest sparticle of each type considered ($\tilde{t}_1$, $\tilde{\chi}^0_1$, …).
- Meta studies: pMSSM survey to identify gaps in coverage.
- Not covered today: general searches (model-independent search for deviations from SM in many final states).
  - Helps to close gaps, but less sensitive to any specific model.

Organisation

- ATLAS SUSY Searches can be categorised in terms of the SUSY **production mode** and the final state **signature**.
- Production modes:
  - Strong production: squark and/or gluino production
  - 3rd generation: direct stop or sbottom pair production
  - Electroweak: chargino and/or neutralino production
- Final states (examples):
  - Multi-(b)jets + ETmiss (typically strong production)
  - 1 Lepton + jets + ETmiss (e.g. direct stop production)
  - 2 Taus + ETmiss
  - 2 same-sign leptons, 3 leptons, 4 leptons (e.g. EWK)
  - Disappearing Tracks / Displaced Vertex (RPV / long-lived)

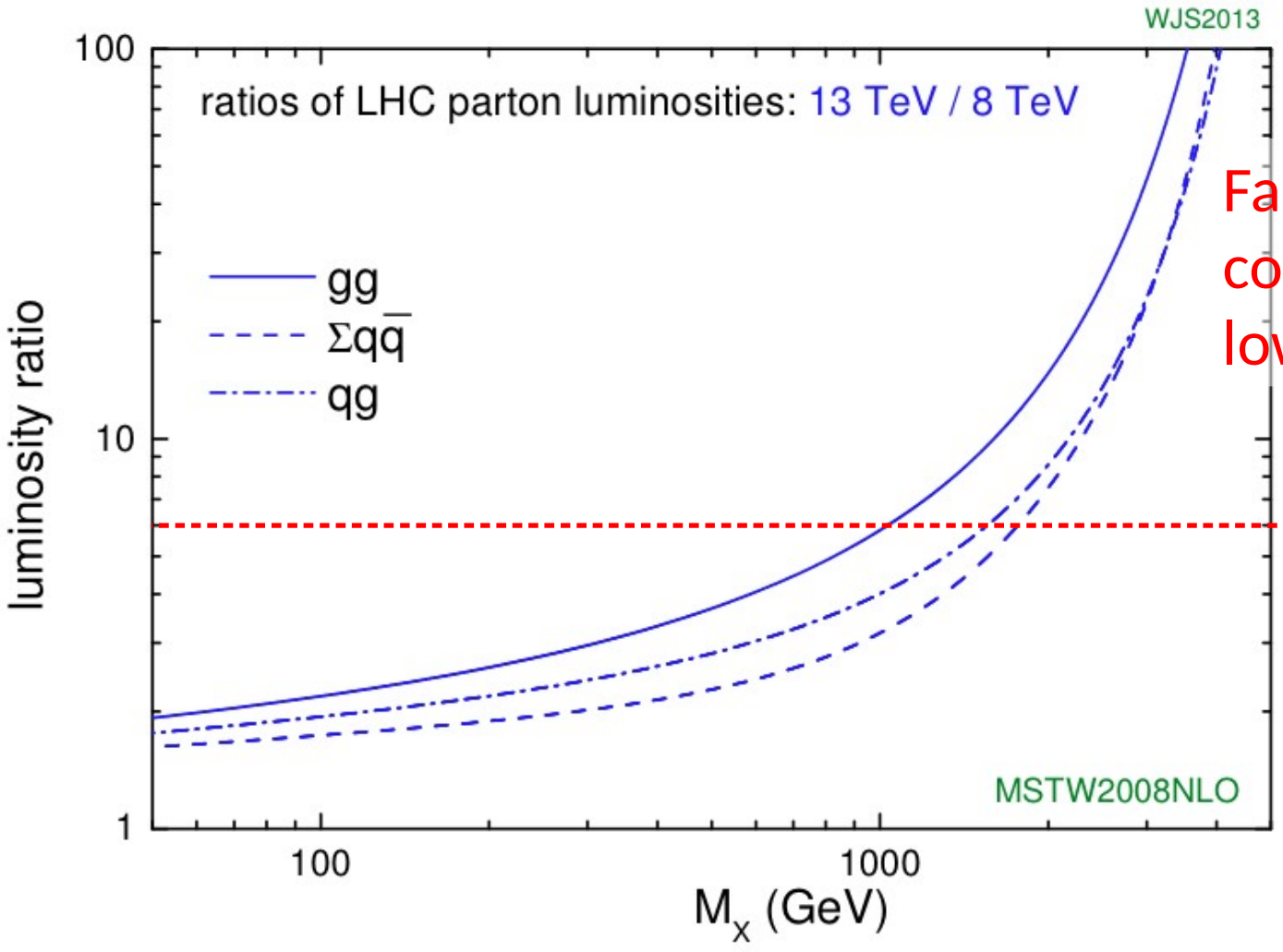
In which order?

- Want to target scenarios with highest sensitivity first.
- Run 2 strategy initially driven by available luminosity:

  $\mathcal{L}_{int}$= 20.3 fb^{-1} at $\sqrt{s}$= 8 TeV in 2012,
  $\mathcal{L}_{int}$= 3.2 fb^{-1} at $\sqrt{s}$=13 TeV in 2015.

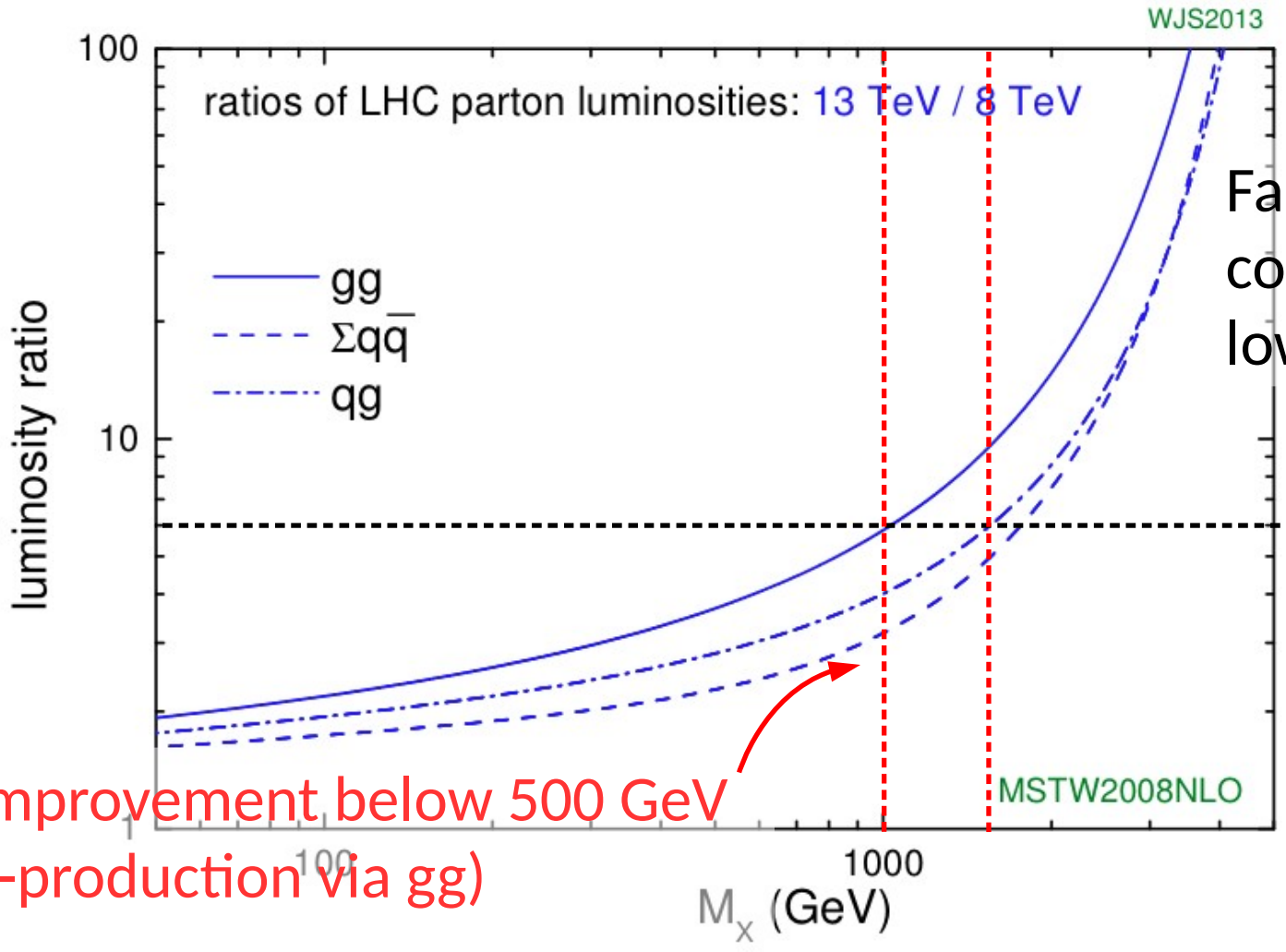
- Ratio 2015/2012 ≈ 1/6th of int. lumi … but at higher energy!

Strong production first!



Factor 6 to compensate lower lumi

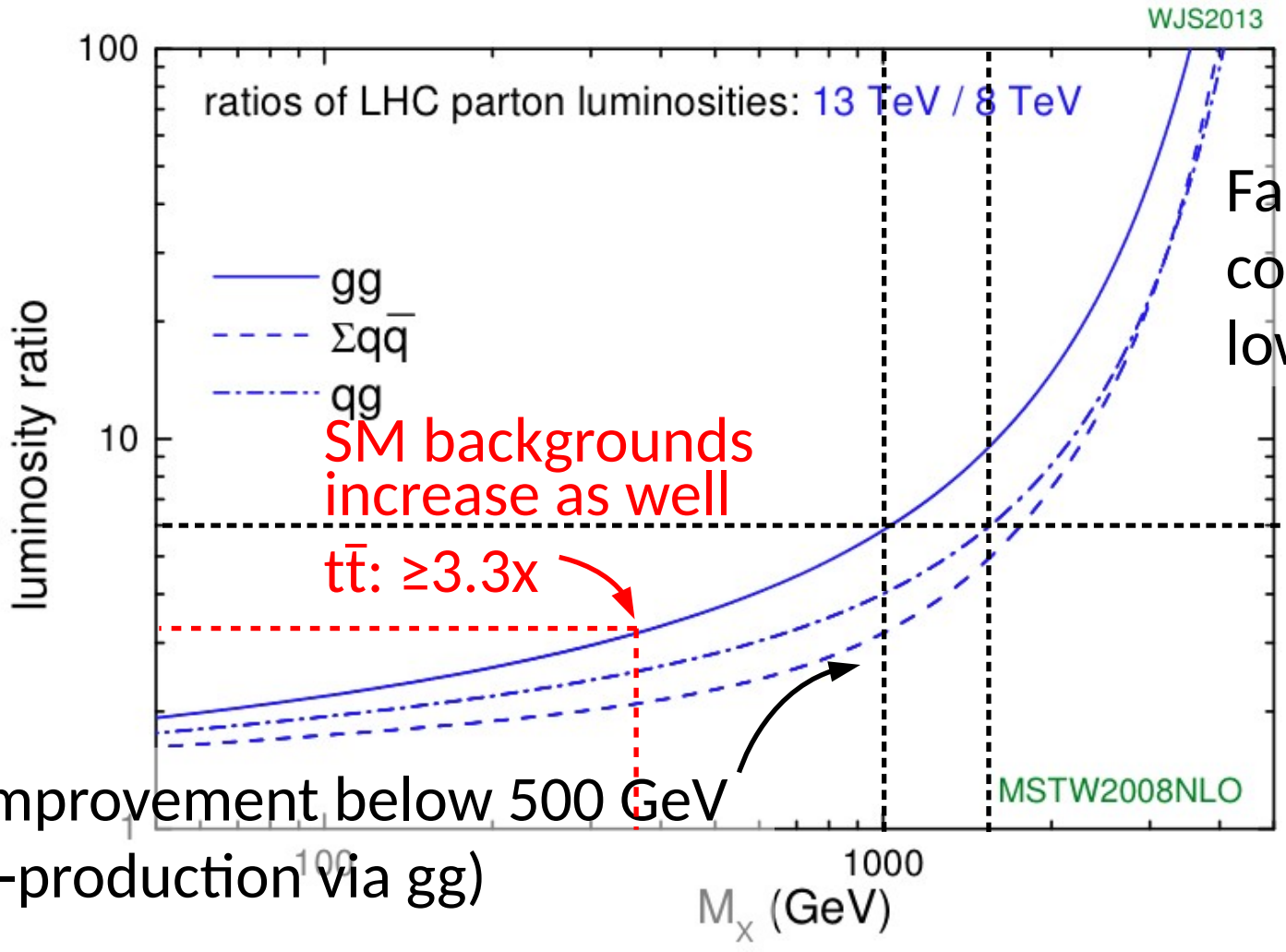
Strong production first!



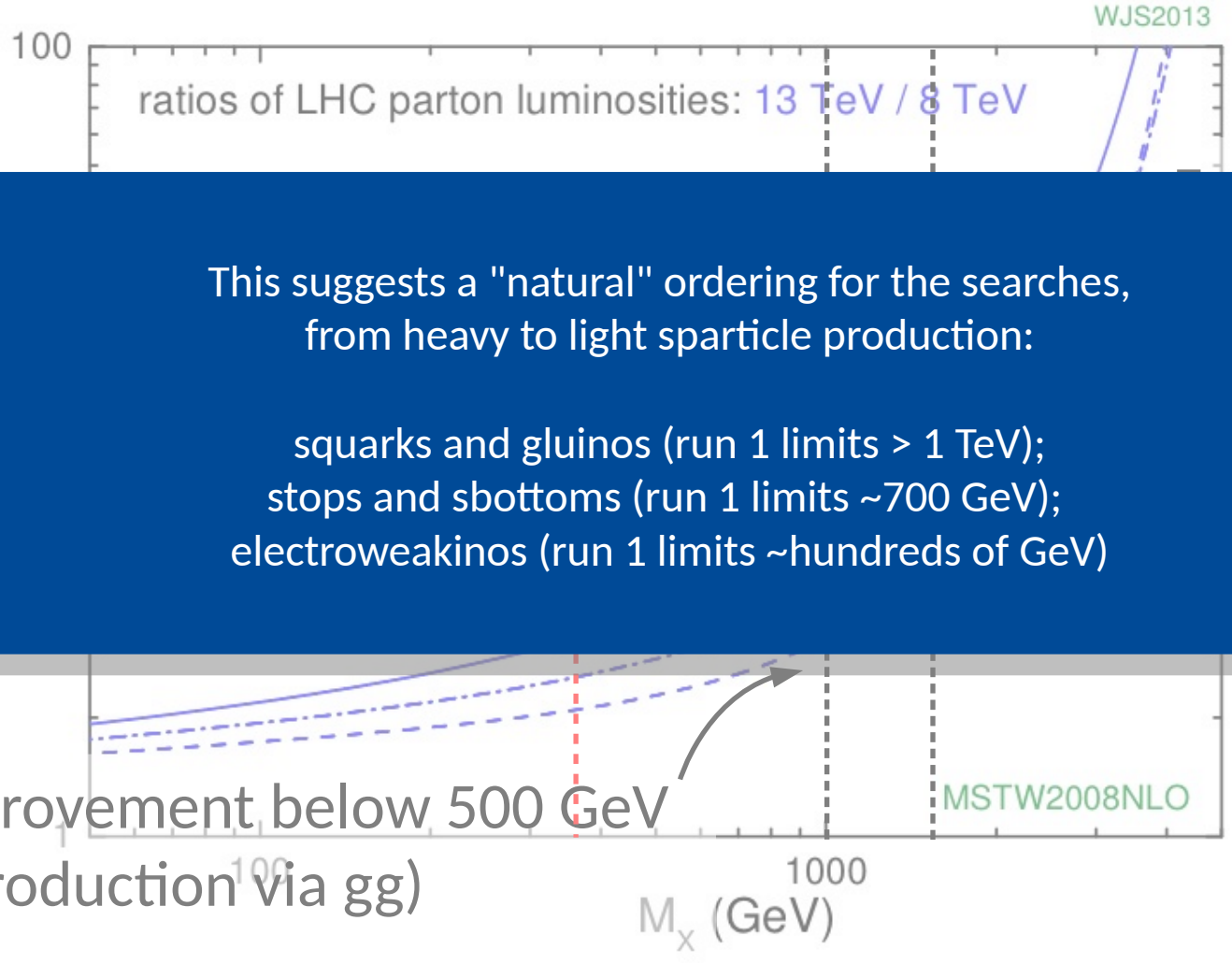
Factor 6 to compensate lower lumi

No improvement below 500 GeV (pair-production via gg)

Strong production first!



Strong production first!

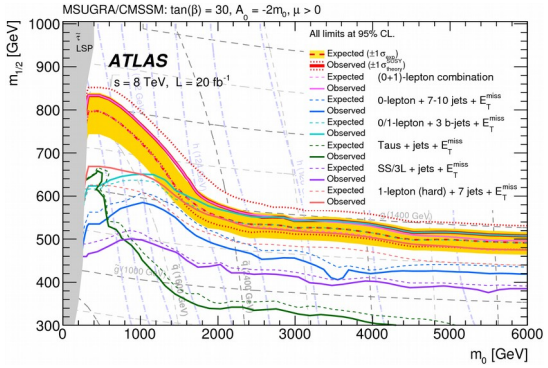


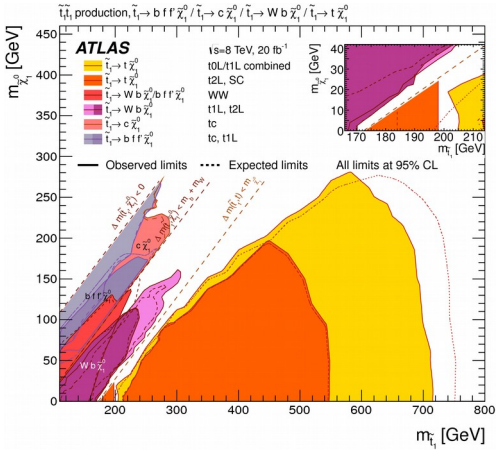
This suggests a "natural" ordering for the searches, from heavy to light sparticle production:

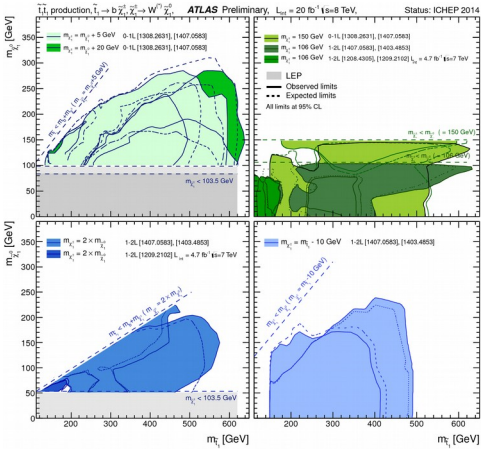
squarks and gluinos (run 1 limits > 1 TeV);
stops and sbottoms (run 1 limits ~700 GeV);
electroweakinos (run 1 limits ~hundreds of GeV)

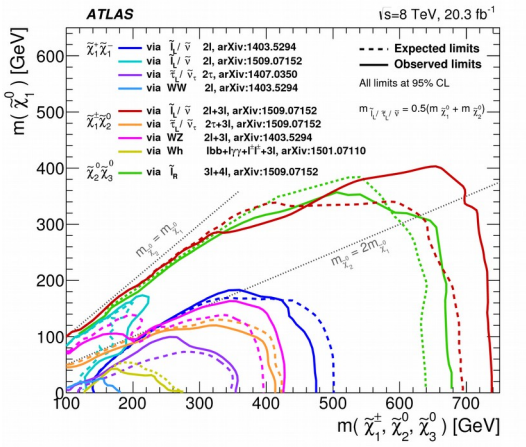
No improvement below 500 GeV (pair-production via gg)

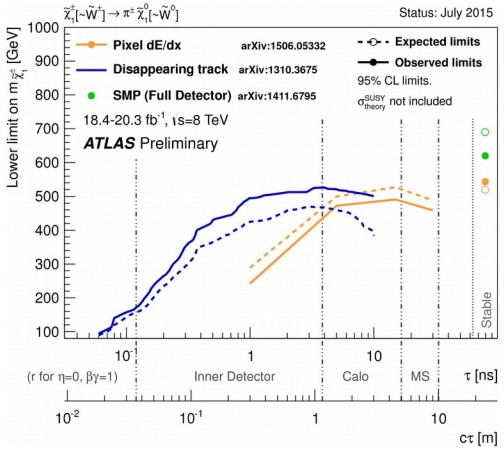
Run 1 results

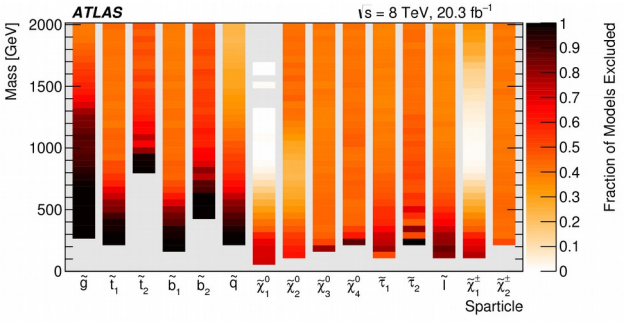












https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/CombinedSummaryPlots/SUSY/

ATLAS SUSY Searches* - 95% CL Lower Limits

Status: July 2015

ATLAS Preliminary

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

	Model	e, μ, τ, γ	Jets	E_T^{miss}	$\int \mathcal{L}\, dt$[fb^{-1}]	Mass limit	$\sqrt{s}$ = 7 TeV	$\sqrt{s}$ = 8 TeV	Reference
Inclusive Searches	MSUGRA/CMSSM	0-3 e, μ/1-2 τ	2-10 jets/3 b	Yes	20.3	$\tilde{q}, \tilde{g}$	1.8 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	20.3	$\tilde{q}$	850 GeV	m($\tilde{\chi}_1^0$)=0 GeV, m(1st gen. $\tilde{q}$)=m(2nd gen. $\tilde{q}$)	1405.7875
	$\tilde{q}\tilde{q}, \tilde{q}\to q\tilde{\chi}_1^0$ (compressed)	mono-jet	1-3 jets	Yes	20.3	$\tilde{q}$	100-440 GeV	m($\tilde{q}$)-m($\tilde{\chi}_1^0$)<10 GeV	1507.05525
	$\tilde{q}\tilde{q}, \tilde{q}\to q(\ell\ell/\ell\nu/\nu\nu)\tilde{\chi}_1^0$	2 e, μ (off-Z)	2 jets	Yes	20.3	$\tilde{q}$	780 GeV	m($\tilde{\chi}_1^0$)=0 GeV	1503.03290
	$\tilde{g}\tilde{g}, \tilde{g}\to q\bar{q}\tilde{\chi}_1^0$	0	2-6 jets	Yes	20.3	$\tilde{g}$	1.33 TeV	m($\tilde{\chi}_1^0$)=0 GeV	1405.7875
	$\tilde{g}\tilde{g}, \tilde{g}\to qq\tilde{\chi}_1^\pm\to qqW^\pm\tilde{\chi}_1^0$	0-1 e, μ	2-6 jets	Yes	20	$\tilde{g}$	1.26 TeV	m($\tilde{\chi}_1^0$)<300 GeV, m($\tilde{\chi}^\pm$)=0.5(m($\tilde{\chi}_1^0$)+m($\tilde{g}$))	1507.05525
	$\tilde{g}\tilde{g}, \tilde{g}\to qq(\ell\ell/\ell\nu/\nu\nu)\tilde{\chi}_1^0$	2 e, μ	0-3 jets	-	20	$\tilde{g}$	1.32 TeV	m($\tilde{\chi}_1^0$)=0 GeV	1501.03555
	GMSB ($\tilde{\ell}$ NLSP)	1-2 τ + 0-1 ℓ	0-2 jets	Yes	20.3	$\tilde{g}$	1.6 TeV	tanβ >20	1407.0603
	GGM (bino NLSP)	2 γ	-	Yes	20.3	$\tilde{g}$	1.29 TeV	$c\tau$(NLSP)<0.1 mm	1507.05493
	GGM (higgsino-bino NLSP)	γ	1 b	Yes	20.3	$\tilde{g}$	1.3 TeV	m($\tilde{\chi}_1^0$)<900 GeV, $c\tau$(NLSP)<0.1 mm, μ<0	1507.05493
	GGM (higgsino-bino NLSP)	γ	2 jets	Yes	20.3	$\tilde{g}$	1.25 TeV	m($\tilde{\chi}_1^0$)<850 GeV, $c\tau$(NLSP)<0.1 mm, μ>0	1507.05493
	GGM (higgsino NLSP)	2 e, μ (Z)	2 jets	Yes	20.3	$\tilde{g}$	850 GeV	m(NLSP)>430 GeV	1503.03290
	Gravitino LSP	0	mono-jet	Yes	20.3	$F^{1/2}$ scale	865 GeV	m($\tilde{G}$)>1.8×10^{-4} eV, m($\tilde{g}$)=m($\tilde{q}$)=1.5 TeV	1502.01518
3rd gen. $\tilde{g}$ med.	$\tilde{g}\tilde{g}, \tilde{g}\to b\bar{b}\tilde{\chi}_1^0$	0	3 b	Yes	20.1	$\tilde{g}$	1.25 TeV	m($\tilde{\chi}_1^0$)<400 GeV	1407.0600
	$\tilde{g}\tilde{g}, \tilde{g}\to t\bar{t}\tilde{\chi}_1^0$	0	7-10 jets	Yes	20.3	$\tilde{g}$	1.1 TeV	m($\tilde{\chi}_1^0$) <350 GeV	1308.1841
	$\tilde{g}\tilde{g}, \tilde{g}\to t\bar{t}\tilde{\chi}_1^0$	0-1 e, μ	3 b	Yes	20.1	$\tilde{g}$	1.34 TeV	m($\tilde{\chi}_1^0$)<400 GeV	1407.0600
	$\tilde{g}\tilde{g}, \tilde{g}\to b\bar{t}\tilde{\chi}_1^+$	0-1 e, μ	3 b	Yes	20.1	$\tilde{g}$	1.3 TeV	m($\tilde{\chi}_1^0$)<300 GeV	1407.0600
3rd gen. squarks direct production	$\tilde{b}_1\tilde{b}_1, \tilde{b}_1\to b\tilde{\chi}_1^0$	0	2 b	Yes	20.1	$\tilde{b}_1$	100-620 GeV	m($\tilde{\chi}_1^0$)<90 GeV	1308.2631
	$\tilde{b}_1\tilde{b}_1, \tilde{b}_1\to t\tilde{\chi}_1^\pm$	2 e, μ (SS)	0-3 b	Yes	20.3	$\tilde{b}_1$	275-440 GeV	m($\tilde{\chi}_1^\pm$)=2 m($\tilde{\chi}_1^0$)	1404.2500
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1\to b\tilde{\chi}_1^\pm$	1-2 e, μ	1-2 b	Yes	4.7/20.3	$\tilde{t}_1$ 110-167 GeV	230-460 GeV	m($\tilde{\chi}_1^\pm$) = 2m($\tilde{\chi}_1^0$), m($\tilde{\chi}_1^0$)=55 GeV	1209.2102, 1407.0583
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1\to Wb\tilde{\chi}_1^0$ or $t\tilde{\chi}_1^0$	0-2 e, μ	0-2 jets/1-2 b	Yes	20.3	$\tilde{t}_1$ 90-191 GeV	210-700 GeV	m($\tilde{\chi}_1^0$)=1 GeV	1506.08616
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1\to c\tilde{\chi}_1^0$	0	mono-jet/c-tag	Yes	20.3	$\tilde{t}_1$ 90-240 GeV		m($\tilde{t}_1$)-m($\tilde{\chi}_1^0$)<85 GeV	1407.0608
	$\tilde{t}_1\tilde{t}_1$(natural GMSB)	2 e, μ (Z)	1 b	Yes	20.3	$\tilde{t}_1$	150-580 GeV	m($\tilde{\chi}_1^0$)>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	20.3	$\tilde{t}_2$	290-600 GeV	m($\tilde{\chi}_1^0$)<200 GeV	1403.5222
EW direct	$\tilde{\ell}_{L,R}\tilde{\ell}_{L,R}, \tilde{\ell}\to\ell\tilde{\chi}_1^0$	2 e, μ	0	Yes	20.3	$\tilde{\ell}$	90-325 GeV	m($\tilde{\chi}_1^0$)=0 GeV	1403.5294
	$\tilde{\chi}_1^+\tilde{\chi}_1^-, \tilde{\chi}_1^+\to\tilde{\ell}\nu(\tilde{\ell}\tilde{\nu})$	2 e, μ	0	Yes	20.3	$\tilde{\chi}_1^\pm$	140-465 GeV	m($\tilde{\chi}_1^0$)=0 GeV, m($\tilde{\ell}, \tilde{\nu}$)=0.5(m($\tilde{\chi}_1^\pm$)+m($\tilde{\chi}_1^0$))	1403.5294
	$\tilde{\chi}_1^+\tilde{\chi}_1^-, \tilde{\chi}_1^+\to\tilde{\tau}\nu(\tau\tilde{\nu})$	2 τ	-	Yes	20.3	$\tilde{\chi}_1^\pm$	100-350 GeV	m($\tilde{\chi}_1^0$)=0 GeV, m($\tilde{\tau}, \tilde{\nu}$)=0.5(m($\tilde{\chi}_1^\pm$)+m($\tilde{\chi}_1^0$))	1407.0350
	$\tilde{\chi}_1^+\tilde{\chi}_2^0\to\tilde{\ell}_L\nu\tilde{\ell}_L\ell(\tilde{\nu}\nu), \ell\tilde{\nu}\tilde{\ell}_L\ell(\tilde{\nu}\nu)$	3 e, μ	0	Yes	20.3	$\tilde{\chi}_1^\pm, \tilde{\chi}_2^0$	700 GeV	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($\tilde{\chi}_1^0$))	1402.7029
	$\tilde{\chi}_1^\pm\tilde{\chi}_2^0\to W\tilde{\chi}_1^0 Z\tilde{\chi}_1^0$	2-3 e, μ	0-2 jets	Yes	20.3	$\tilde{\chi}_1^\pm, \tilde{\chi}_2^0$	420 GeV	m($\tilde{\chi}_1^\pm$)=m($\tilde{\chi}_2^0$), m($\tilde{\chi}_1^0$)=0, sleptons decoupled	1403.5294, 1402.7029
	$\tilde{\chi}_1^\pm\tilde{\chi}_2^0\to W\tilde{\chi}_1^0 h\tilde{\chi}_1^0$, $h\to b\bar{b}/WW/\tau\tau/\gamma\gamma$	e, μ, γ	0-2 b	Yes	20.3	$\tilde{\chi}_1^\pm, \tilde{\chi}_2^0$	250 GeV	m($\tilde{\chi}_1^\pm$)=m($\tilde{\chi}_2^0$), m($\tilde{\chi}_1^0$)=0, sleptons 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	$\tilde{\chi}_{2,3}^0$	620 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.	1 $e, \mu + \gamma$	-	Yes	20.3	$\tilde{W}$	124-361 GeV	$c\tau$<1 mm	1507.05493
Long-lived particles	Direct $\tilde{\chi}_1^+\tilde{\chi}_1^-$ prod., long-lived $\tilde{\chi}_1^\pm$	Disapp. trk	1 jet	Yes	20.3	$\tilde{\chi}_1^\pm$	270 GeV	m($\tilde{\chi}_1^+$)-m($\tilde{\chi}_1^0$)~160 MeV, $\tau(\tilde{\chi}_1^\pm)$=0.2 ns	1310.3675
	Direct $\tilde{\chi}_1^+\tilde{\chi}_1^-$ prod., long-lived $\tilde{\chi}_1^\pm$	dE/dx trk	-	Yes	18.4	$\tilde{\chi}_1^\pm$	482 GeV	m($\tilde{\chi}_1^+$)-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	$\tilde{g}$	832 GeV	m($\tilde{\chi}_1^0$)=100 GeV, 10 μs<$\tau(\tilde{g})$<1000 s	1310.6584
	Stable $\tilde{g}$ R-hadron	trk	-	-	19.1	$\tilde{g}$	1.27 TeV		1411.6795
	GMSB, stable $\tilde{\tau}, \tilde{\chi}_1^0\to\tilde{\tau}(\tilde{e}, \tilde{\mu})+\tau(e, \mu)$	1-2 μ	-	-	19.1	$\tilde{\chi}_1^0$	537 GeV	10<tanβ<50	1411.6795
	GMSB, $\tilde{\chi}_1^0\to\gamma\tilde{G}$, long-lived $\tilde{\chi}_1^0$	2 γ	-	Yes	20.3	$\tilde{\chi}_1^0$	435 GeV	2<$\tau(\tilde{\chi}_1^0)$<3 ns, SPS8 model	1409.5542
	$\tilde{g}\tilde{g}, \tilde{\chi}_1^0\to eev/e\mu\nu/\mu\mu\nu$	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 $\tilde{g}\tilde{g}, \tilde{\chi}_1^0\to Z\tilde{G}$	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
RPV	LFV $pp\to\tilde{\nu}_\tau+X, \tilde{\nu}_\tau\to e\mu/e\tau/\mu\tau$	$e\mu, e\tau, \mu\tau$	-	-	20.3	$\tilde{\nu}_\tau$	1.7 TeV	λ'_{311}=0.11, $\lambda_{132/133/233}$=0.07	1503.04430
	Bilinear RPV CMSSM	2 e, μ (SS)	0-3 b	Yes	20.3	$\tilde{q}, \tilde{g}$	1.35 TeV	m($\tilde{q}$)=m($\tilde{g}$), $c\tau_{LSP}$<1 mm	1404.2500
	$\tilde{\chi}_1^+\tilde{\chi}_1^-, \tilde{\chi}_1^+\to W\tilde{\chi}_1^0, \tilde{\chi}_1^0\to ee\tilde{\nu}_\mu, e\mu\tilde{\nu}_e$	4 e, μ	-	Yes	20.3	$\tilde{\chi}_1^\pm$	750 GeV	m($\tilde{\chi}_1^0$)>0.2×m($\tilde{\chi}_1^\pm$), $\lambda_{121}\neq0$	1405.5086
	$\tilde{\chi}_1^+\tilde{\chi}_1^-, \tilde{\chi}_1^+\to W\tilde{\chi}_1^0, \tilde{\chi}_1^0\to\tau\tau\tilde{\nu}_e, e\tau\tilde{\nu}_\tau$	3 $e, \mu + \tau$	-	Yes	20.3	$\tilde{\chi}_1^\pm$	450 GeV	m($\tilde{\chi}_1^0$)>0.2×m($\tilde{\chi}_1^\pm$), $\lambda_{133}\neq0$	1405.5086
	$\tilde{g}\tilde{g}, \tilde{g}\to qqq$	0	6-7 jets	-	20.3	$\tilde{g}$	917 GeV	BR(t)=BR(b)=BR(c)=0%	1502.05686
	$\tilde{g}\tilde{g}, \tilde{g}\to q\tilde{\chi}_1^0, \tilde{\chi}_1^0\to qqq$	0	6-7 jets	-	20.3	$\tilde{g}$	870 GeV	m($\tilde{\chi}_1^0$)=600 GeV	1502.05686
	$\tilde{g}\tilde{g}, \tilde{g}\to t\tilde{t}, \tilde{t}\to bs$	2 e, μ (SS)	0-3 b	Yes	20.3	$\tilde{g}$	850 GeV		1404.250
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1\to bs$	0	2 jets + 2 b	-	20.3	$\tilde{t}_1$	100-308 GeV		ATLAS-CONF-2015-026
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1\to b\ell$	2 e, μ	2 b	-	20.3	$\tilde{t}_1$	0.4-1.0 TeV	BR($\tilde{t}_1\to be/\mu$)>20%	ATLAS-CONF-2015-015
Other	Scalar charm, $\tilde{c}\to c\tilde{\chi}_1^0$	0	2 c	Yes	20.3	$\tilde{c}$	490 GeV	m($\tilde{\chi}_1^0$)<200 GeV	1501.01325

*Onl

From https://twiki.cern.ch/twiki/bin/view/AtlasPublic/SupersymmetryPublicResults

ATLAS SUSY Searches* - 95% CL Lower Limits

Status: March 2016

ATLAS Preliminary

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

	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
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	3.2	$\tilde{q}$ 980 GeV	$m(\tilde{\chi}_1^0)$=0 GeV, $m(1^{st}$ gen. $\tilde{q})=m(2^{nd}$ gen. $\tilde{q})$	ATLAS-CONF-2015-062
	$\tilde{q}\tilde{q}, \tilde{q}\to q\tilde{\chi}_1^0$ (compressed)	mono-jet	1-3 jets	Yes	3.2	$\tilde{q}$ 610 GeV	$m(\tilde{q})$-$m(\tilde{\chi}_1^0)$<5 GeV	*To appear*
	$\tilde{q}\tilde{q}, \tilde{q}\to q(\ell\ell/\ell\nu/\nu\nu)\tilde{\chi}_1^0$	2 e, μ (off-Z)	2 jets	Yes	20.3	$\tilde{q}$ 820 GeV	$m(\tilde{\chi}_1^0)$=0 GeV	1503.03290
	$\tilde{g}\tilde{g}, \tilde{g}\to q\bar{q}\tilde{\chi}_1^0$	0	2-6 jets	Yes	3.2	$\tilde{g}$ 1.52 TeV	$m(\tilde{\chi}_1^0)$=0 GeV	ATLAS-CONF-2015-062
	$\tilde{g}\tilde{g}, \tilde{g}\to qq\tilde{\chi}_1^\pm\to qqW^\pm\tilde{\chi}_1^0$	1 e, μ	2-6 jets	Yes	3.3	$\tilde{g}$ 1.6 TeV	$m(\tilde{\chi}_1^0)$<350 GeV, $m(\tilde{\chi}^\pm)=0.5(m(\tilde{\chi}_1^0)+m(\tilde{g}))$	ATLAS-CONF-2015-076
	$\tilde{g}\tilde{g}, \tilde{g}\to qq(\ell\ell/\ell\nu/\nu\nu)\tilde{\chi}_1^0$	2 e, μ	0-3 jets	-	20	$\tilde{g}$ 1.38 TeV	$m(\tilde{\chi}_1^0)$=0 GeV	1501.03555
	$\tilde{g}\tilde{g}, \tilde{g}\to qqWZ\tilde{\chi}_1^0$	0	7-10 jets	Yes	3.2	$\tilde{g}$ 1.4 TeV	$m(\tilde{\chi}_1^0)$ =100 GeV	1602.06194
	GMSB ($\tilde{\ell}$ NLSP)	1-2 τ + 0-1 ℓ	0-2 jets	Yes	20.3	$\tilde{g}$ 1.63 TeV	tanβ >20	1407.0603
	GGM (bino NLSP)	2 γ	-	Yes	20.3	$\tilde{g}$ 1.34 TeV	$c\tau$(NLSP)<0.1 mm	1507.05493
	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	20.3	$\tilde{g}$ 1.3 TeV	$m(\tilde{\chi}_1^0)$<850 GeV, $c\tau$(NLSP)<0.1 mm, μ>0	1507.05493
	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
3rd gen. $\tilde{g}$ med.	$\tilde{g}\tilde{g}, \tilde{g}\to b\bar{b}\tilde{\chi}_1^0$	0	3 b	Yes	3.3	$\tilde{g}$ 1.78 TeV	$m(\tilde{\chi}_1^0)$<800 GeV	ATLAS-CONF-2015-067
	$\tilde{g}\tilde{g}, \tilde{g}\to t\bar{t}\tilde{\chi}_1^0$	0-1 e, μ	3 b	Yes	3.3	$\tilde{g}$ 1.76 TeV	$m(\tilde{\chi}_1^0)$=0 GeV	*To appear*
	$\tilde{g}\tilde{g}, \tilde{g}\to b\bar{t}\tilde{\chi}_1^+$	0-1 e, μ	3 b	Yes	20.1	$\tilde{g}$ 1.37 TeV	$m(\tilde{\chi}_1^0)$<300 GeV	1407.0600
3rd gen. squarks direct production	$\tilde{b}_1\tilde{b}_1, \tilde{b}_1\to b\tilde{\chi}_1^0$	0	2 b	Yes	3.2	$\tilde{b}_1$ 840 GeV	$m(\tilde{\chi}_1^0)$<100 GeV	ATLAS-CONF-2015-066
	$\tilde{b}_1\tilde{b}_1, \tilde{b}_1\to t\tilde{\chi}_1^\pm$	2 e, μ (SS)	0-3 b	Yes	3.2	$\tilde{b}_1$ 325-540 GeV	$m(\tilde{\chi}_1^0)$=50 GeV, $m(\tilde{\chi}_1^\pm)$= $m(\tilde{\chi}_1^0)$+100 GeV	1602.09058
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1\to b\tilde{\chi}_1^\pm$	1-2 e, μ	1-2 b	Yes	4.7/20.3	$\tilde{t}_1$ 117-170 GeV, 200-500 GeV	$m(\tilde{\chi}_1^\pm)$ = 2$m(\tilde{\chi}_1^0)$, $m(\tilde{\chi}_1^0)$=55 GeV	1209.2102, 1407.0583
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1\to Wb\tilde{\chi}_1^0$ or $t\tilde{\chi}_1^0$	0-2 e, μ	0-2 jets/1-2 b	Yes	20.3	$\tilde{t}_1$ 90-198 GeV, 205-715 GeV, 745-785 GeV	$m(\tilde{\chi}_1^0)$=1 GeV	1506.08616, ATLAS-CONF-2016-007
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1\to c\tilde{\chi}_1^0$	0	mono-jet/c-tag	Yes	20.3	$\tilde{t}_1$ 90-245 GeV	$m(\tilde{t}_1)$-$m(\tilde{\chi}_1^0)$<85 GeV	1407.0608
	$\tilde{t}_1\tilde{t}_1$(natural GMSB)	2 e, μ (Z)	1 b	Yes	20.3	$\tilde{t}_1$ 150-600 GeV	$m(\tilde{\chi}_1^0)$>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	20.3	$\tilde{t}_2$ 290-610 GeV	$m(\tilde{\chi}_1^0)$<200 GeV	1403.5222
	$\tilde{t}_2\tilde{t}_2, \tilde{t}_2\to\tilde{t}_1+h$	1 e, μ	6 jets + 2 b	Yes	20.3	$\tilde{t}_2$ 320-620 GeV	$m(\tilde{\chi}_1^0)$=0 GeV	1506.08616
EW direct	$\tilde{l}_{LR}\tilde{l}_{LR}, \tilde{l}\to l\tilde{\chi}_1^0$	2 e, μ	0	Yes	20.3	$\tilde{l}$ 90-335 GeV	$m(\tilde{\chi}_1^0)$=0 GeV	1403.5294
	$\tilde{\chi}_1^+\tilde{\chi}_1^-, \tilde{\chi}_1^+\to\tilde{l}\nu(l\tilde{\nu})$	2 e, μ	0	Yes	20.3	$\tilde{\chi}_1^\pm$ 140-475 GeV	$m(\tilde{\chi}_1^0)$=0 GeV, $m(\tilde{l},\tilde{\nu})=0.5(m(\tilde{\chi}_1^+)+m(\tilde{\chi}_1^0))$	1403.5294
	$\tilde{\chi}_1^+\tilde{\chi}_1^-, \tilde{\chi}_1^+\to\tilde{\tau}\nu(\tau\tilde{\nu})$	2 τ	-	Yes	20.3	$\tilde{\chi}_1^\pm$ 355 GeV	$m(\tilde{\chi}_1^0)$=0 GeV, $m(\tilde{\tau},\tilde{\nu})=0.5(m(\tilde{\chi}_1^+)+m(\tilde{\chi}_1^0))$	1407.0350
	$\tilde{\chi}_1^\pm\tilde{\chi}_2^0\to\tilde{l}_L\nu\tilde{l}_L\ell(\tilde{\nu}\nu), \ell\tilde{\nu}\tilde{l}_L\ell(\tilde{\nu}\nu)$	3 e, μ	0	Yes	20.3	$\tilde{\chi}_1^\pm,\tilde{\chi}_2^0$ 715 GeV	$m(\tilde{\chi}_1^\pm)=m(\tilde{\chi}_2^0)$, $m(\tilde{\chi}_1^0)$=0, $m(\tilde{l},\tilde{\nu})=0.5(m(\tilde{\chi}_1^\pm)+m(\tilde{\chi}_1^0))$	1402.7029
	$\tilde{\chi}_1^\pm\tilde{\chi}_2^0\to W\tilde{\chi}_1^0Z\tilde{\chi}_1^0$	2-3 e, μ	0-2 jets	Yes	20.3	$\tilde{\chi}_1^\pm,\tilde{\chi}_2^0$ 425 GeV	$m(\tilde{\chi}_1^\pm)=m(\tilde{\chi}_2^0)$, $m(\tilde{\chi}_1^0)$=0, sleptons decoupled	1403.5294, 1402.7029
	$\tilde{\chi}_1^\pm\tilde{\chi}_2^0\to W\tilde{\chi}_1^0h\tilde{\chi}_1^0$, $h\to b\bar{b}/WW/\tau\tau/\gamma\gamma$	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, sleptons decoupled	1501.07110
	$\tilde{\chi}_2^0\tilde{\chi}_{3,}^0\tilde{\chi}_{2,3}^0\to\tilde{l}_R\ell$	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, $m(\tilde{l},\tilde{\nu})=0.5(m(\tilde{\chi}_2^0)+m(\tilde{\chi}_1^0))$	1405.5086
	GGM (wino NLSP) weak prod.	1 $e, \mu+\gamma$	-	Yes	20.3	$\tilde{W}$ 115-370 GeV	$c\tau$<1 mm	1507.05493
Long-lived particles	Direct $\tilde{\chi}_1^+\tilde{\chi}_1^-$ prod., long-lived $\tilde{\chi}_1^\pm$	Disapp. trk	1 jet	Yes	20.3	$\tilde{\chi}_1^\pm$ 270 GeV	$m(\tilde{\chi}_1^+)$-$m(\tilde{\chi}_1^0)$~160 MeV, $\tau(\tilde{\chi}_1^+)$=0.2 ns	1310.3675
	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	$m(\tilde{\chi}_1^+)$-$m(\tilde{\chi}_1^0)$~160 MeV, $\tau(\tilde{\chi}_1^+)$<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
	Metastable $\tilde{g}$ R-hadron	dE/dx trk	-	-	3.2	$\tilde{g}$ 1.54 TeV	$m(\tilde{\chi}_1^0)$=100 GeV, τ>10 ns	*To appear*
	GMSB, stable $\tilde{\tau}$, $\tilde{\chi}_1^0\to\tilde{\tau}(\tilde{e},\tilde{\mu})+\tau(e,\mu)$	1-2 μ	-	-	19.1	$\tilde{\chi}_1^0$ 537 GeV	10<tanβ<50	1411.6795
	GMSB, $\tilde{\chi}_1^0\to\gamma\tilde{G}$, 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
	$\tilde{g}\tilde{g}, \tilde{\chi}_1^0\to eev/e\mu\nu/\mu\mu\nu$	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 $\tilde{g}\tilde{g}, \tilde{\chi}_1^0\to Z\tilde{G}$	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
RPV	LFV $pp\to\tilde{\nu}_\tau+X, \tilde{\nu}_\tau\to e\mu/e\tau/\mu\tau$	$e\mu, e\tau, \mu\tau$	-	-	20.3	$\tilde{\nu}_\tau$ 1.7 TeV	λ'_{311}=0.11, $\lambda_{132/133/233}$=0.07	1503.04430
	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
	$\tilde{\chi}_1^+\tilde{\chi}_1^-, \tilde{\chi}_1^+\to W\tilde{\chi}_1^0, \tilde{\chi}_1^0\to ee\tilde{\nu}_\mu, e\mu\tilde{\nu}_e$	4 e, μ	-	Yes	20.3	$\tilde{\chi}_1^\pm$ 760 GeV	$m(\tilde{\chi}_1^0)$>0.2×$m(\tilde{\chi}_1^\pm)$, $\lambda_{121}\neq0$	1405.5086
	$\tilde{\chi}_1^+\tilde{\chi}_1^-, \tilde{\chi}_1^+\to W\tilde{\chi}_1^0, \tilde{\chi}_1^0\to\tau\tau\tilde{\nu}_e, e\tau\tilde{\nu}_\tau$	3 $e, \mu+\tau$	-	Yes	20.3	$\tilde{\chi}_1^\pm$ 450 GeV	$m(\tilde{\chi}_1^0)$>0.2×$m(\tilde{\chi}_1^\pm)$, $\lambda_{133}\neq0$	1405.5086
	$\tilde{g}\tilde{g}, \tilde{g}\to qqq$	0	6-7 jets	-	20.3	$\tilde{g}$ 917 GeV	BR(t)=BR(b)=BR(c)=0%	1502.05686
	$\tilde{g}\tilde{g}, \tilde{g}\to qq\tilde{\chi}_1^0, \tilde{\chi}_1^0\to qqq$	0	6-7 jets	-	20.3	$\tilde{g}$ 980 GeV	$m(\tilde{\chi}_1^0)$=600 GeV	1502.05686
	$\tilde{g}\tilde{g}, \tilde{g}\to t\bar{t}l, \tilde{t}_1\to bs$	2 e, μ (SS)	0-3 b	Yes	20.3	$\tilde{g}$ 880 GeV		1404.2500
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1\to bs$	0	2 jets + 2 b	-	20.3	$\tilde{t}_1$ 320 GeV		1601.07453
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1\to b\ell$	2 e, μ	2 b	-	20.3	$\tilde{t}_1$ 0.4-1.0 TeV	BR($\tilde{t}_1\to be/\mu$)>20%	ATLAS-CONF-2015-015
Other	Scalar charm, $\tilde{c}\to c\tilde{\chi}_1^0$	0	2 c	Yes	20.3	$\tilde{c}$ 510 GeV	$m(\tilde{\chi}_1^0)$<200 GeV	1501.01325

*O
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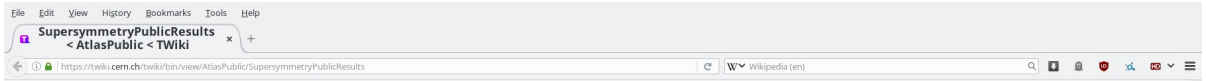
From https://twiki.cern.ch/twiki/bin/view/AtlasPublic/SupersymmetryPublicResults

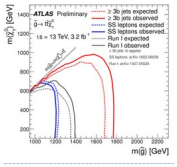
SupersymmetryPublicResults Twiki



2015 data (13 TeV)

summary plots


General Summary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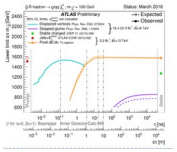
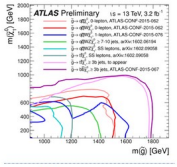
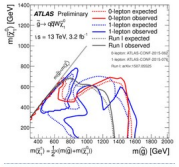
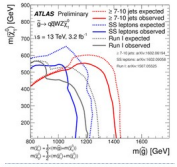

Long-lived R-hadron production


Many strong production results


1-step grid


2-step grid

papers

Short Title of Paper	Date	√s (TeV)	L (fb^{-1})	Document	Plots+Aux. Material	Journal
1L stop	6/2016	13	3.2	1606.03903	Link	Submitted to PRD
multi b-jets	5/2016	13	3.2	1605.09318	Link	Submitted to PRD
1L 2-6 jets NEW	5/2016	13	3.2	1605.04285	Link	Submitted to EPJC
0L 2-6 jets NEW	5/2016	13	3.2	1605.03814	Link	Accepted by EPJC
monojet (compressed squarks) NEW	4/2016	13	3.2	1604.07773	Link	Submitted to PRD
LLP with pixel dE/dx NEW	4/2016	13	3.2	1604.04520	Link	Accepted by PRD
2 same sign or 3 leptons	2/2016	13	3.2	1602.09058	Link (+data)	EPJ C, 76(5), 1-26
0L 7-10 jets	2/2016	13	3.2	1602.06194	Link (+data)	Phys. Lett. B 757 (2016) 334

conference notes

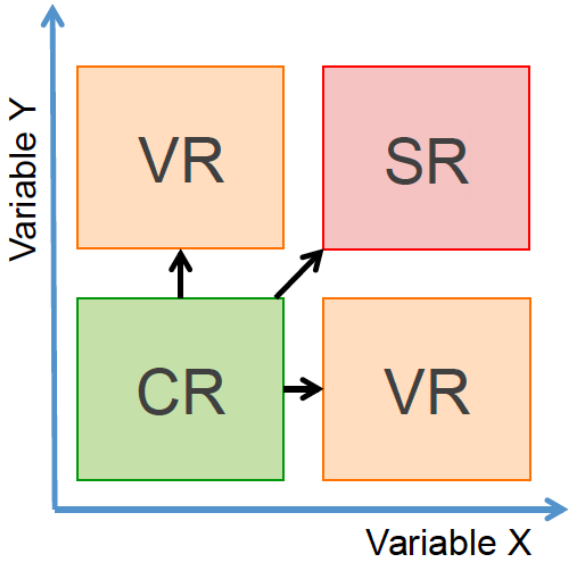
Short Title of preliminary conference note	*Date*	*√s (TeV)*	*L (fb^{-1})*	*Document*	*Plots*
Stop to bs (RPV) NEW	5/2016	13	3.2	ATLAS-CONF-2016-022	Link
2L stop	3/2016	13	3.2	ATLAS-CONF-2016-009	Link
2L Z+jets+MET	12/2015	13	3.2	ATLAS-CONF-2015-082	Link
2b + MET	12/2015	13	3.2	ATLAS-CONF-2015-066	Link

Strong: Z + ≥2 jets + E_T^{miss} (1/2)

ATLAS-CONF-2015-082 (December)

- Gluino pair production, $\chi^0_2 \rightarrow \chi^0_1 + Z$; $Z \rightarrow e^+e^-$ or $\mu^+\mu^-$
- Event selection: E_T^{miss}, H_T, m(ℓ,ℓ) (only 1 signal region)
- 3 control regions: low E_T^{miss} (Z normalisation), Z veto (top normalisation), different lepton flavour (various flavour symmetric backgrounds).
- 7 validation regions.

	VRS	VR-WZ	VR-ZZ	VR-3L
Observed events	56	89	20	7
Total expected background events	52.6 ± 9.1	87 ± 10	15.5 ± 3.4	6.5 ± 1.6
Flavour symmetric ($t\bar{t}$, Wt, WW and $Z \rightarrow \tau\tau$) events	18.9 ± 4.8	1.3 ± 0.4	0	0.3 ± 0.2
WZ/ZZ events	7.5 ± 1.7	82 ± 10	15.5 ± 3.4	4.9 ± 1.6
Z/γ^* + jets events	24.8 ± 7.6	2.7 ± 2.8	0	0.2 ± 0.2
Rare top events	1.4 ± 0.2	0.9 ± 0.4	0.04 ± 0.02	1.0 ± 0.1

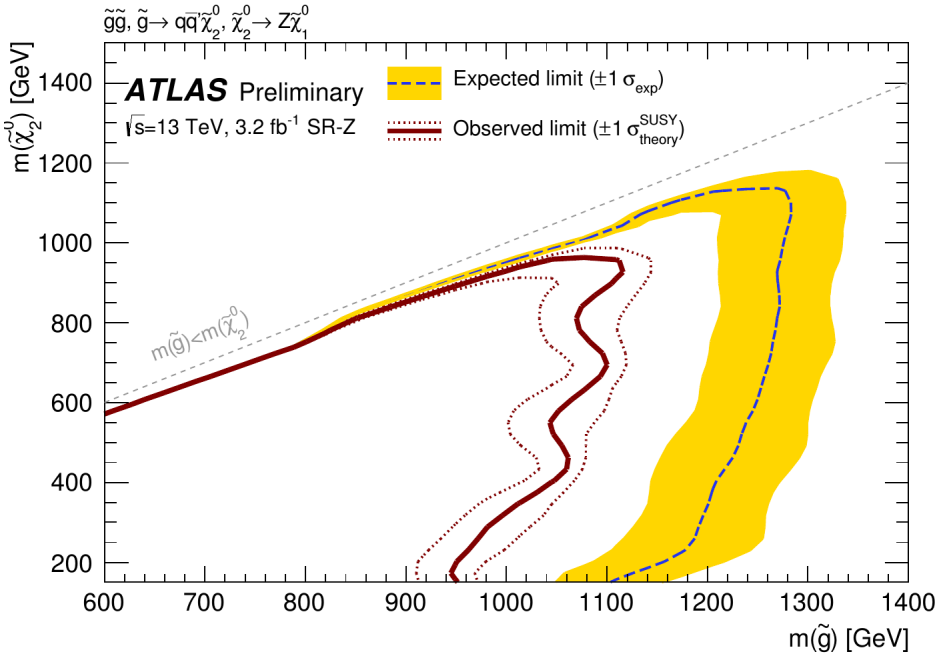


Strong: Z + ≥2 jets + E_T^{miss} (2/2)

ATLAS-CONF-2015-082 (December)

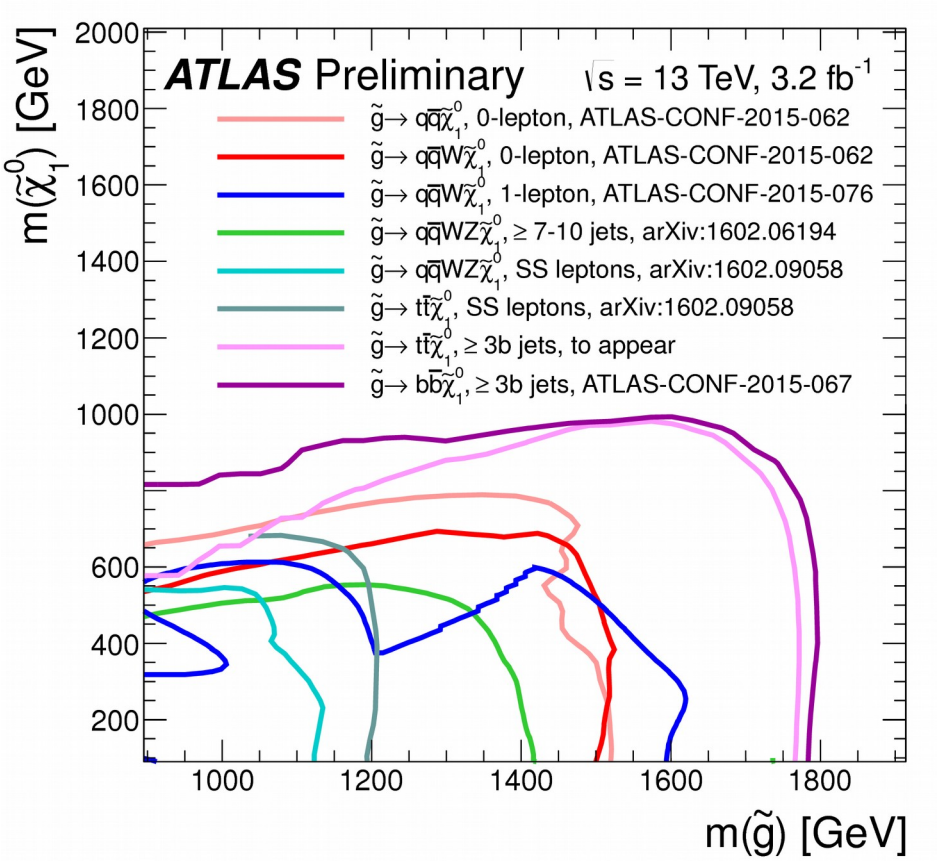
- Observed significant excess (2.2σ).
- Computed cross-section limit.
- Expected and observed exclusion deviate due to excess.

	SRZ
Observed events	21
Total expected background events	10.3 ± 2.3
Flavour symmetric ($t\bar{t}$, Wt, WW and $Z \rightarrow \tau\tau$)	5.1 ± 2.0
WZ/ZZ events	2.9 ± 0.8
Z/γ^* + jets events	1.9 ± 0.8
Rare top events	0.4 ± 0.1
p-value	0.013
Significance	2.2
Observed (Expected) S^{95}	20.0 ($10.2^{+4.4}_{-3.0}$)



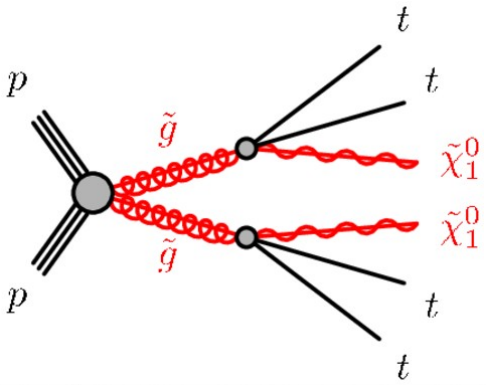
Many more strong production searches!

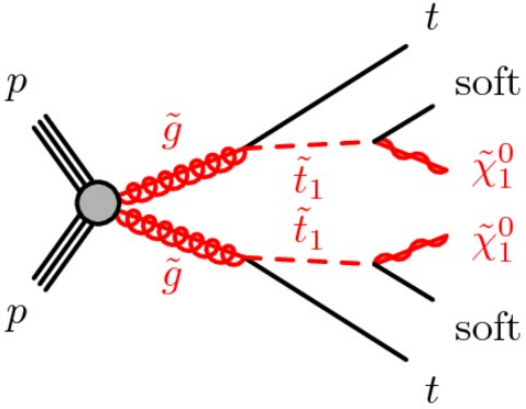
- 0 lepton, 2-6 jets 1605.03814
- 0 lepton, 7-10 jets 1602.06194
- 1 lepton, 2-6 jets 1605.04285
- 2 same-sign leptons 1602.09058
- ≥3 b-jets 1605.09318

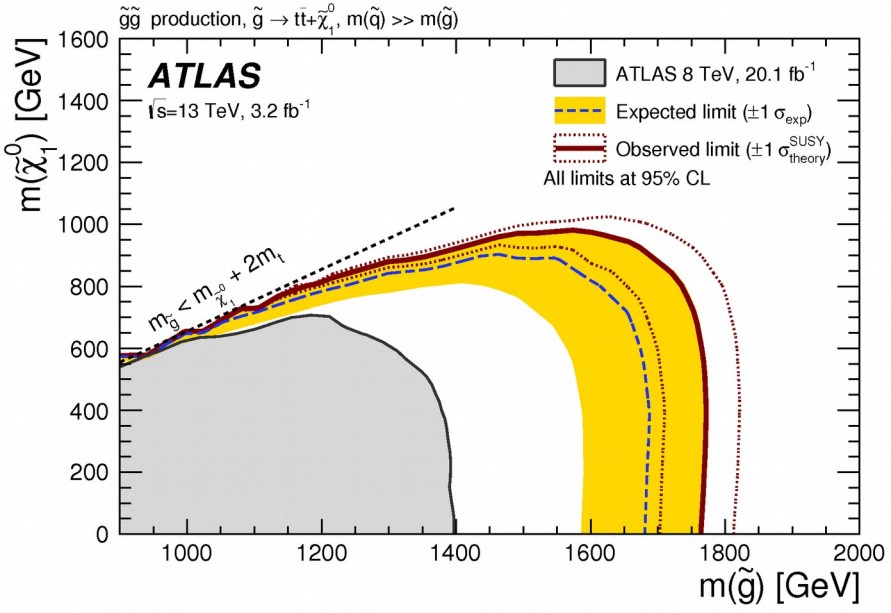


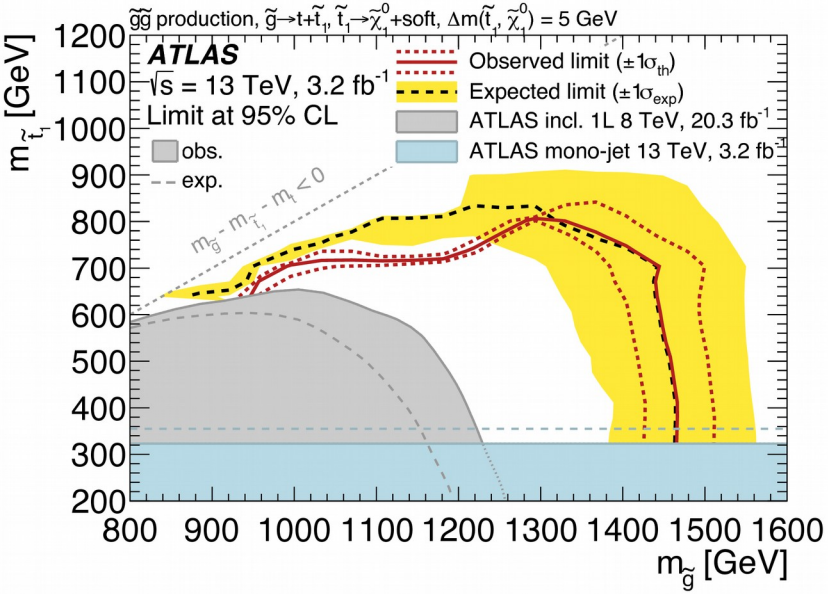
Gaugino-mediated stop + sbottom

≥3 b-jets: 1605.09318; stop 1 lepton: 1606.03903





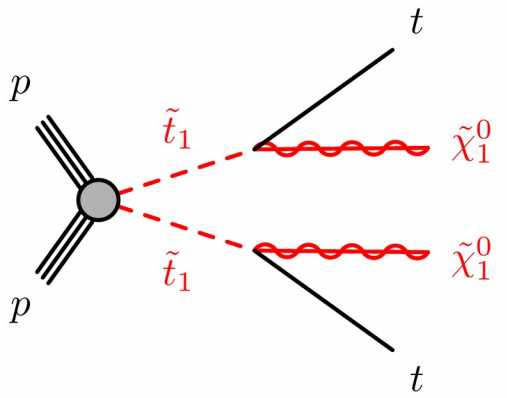


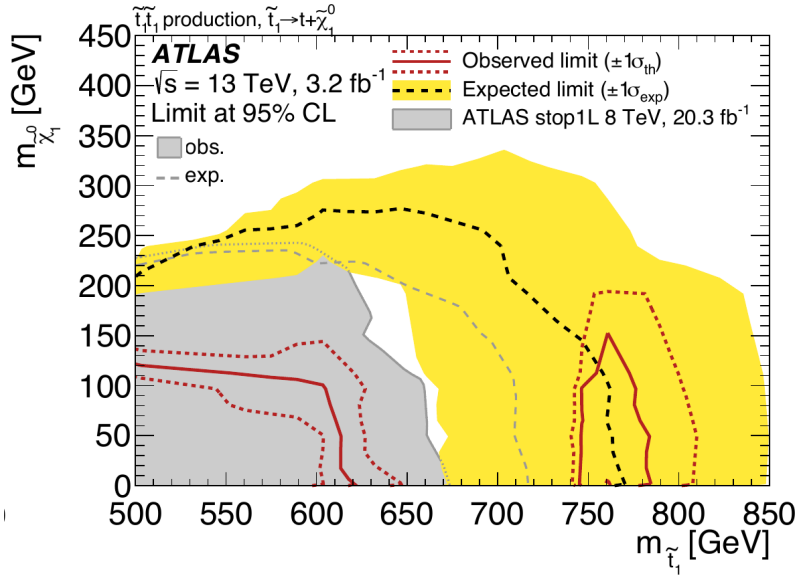


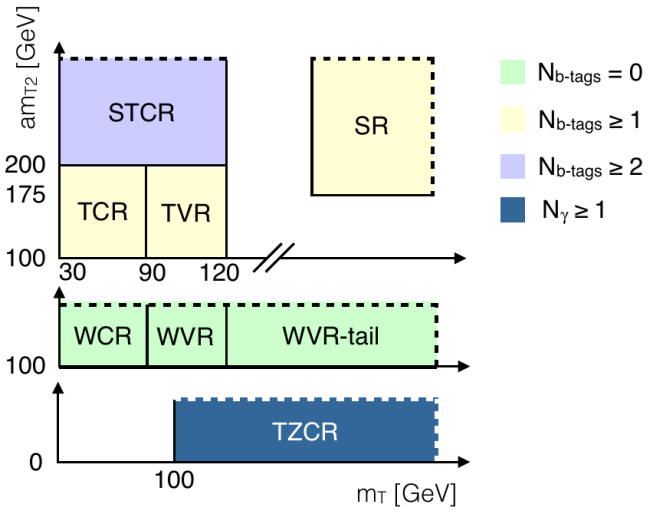
Direct stop (1 lepton)

1 lepton: 1606.03903; 2 leptons: ATLAS-CONF-2016-009 (March)

- Stop pair-production, $\tilde{t}_1 \rightarrow$ t+LSP
- 3 signal regions, increasingly tight requirements
- Elaborate setup of CRs and VRs
- Dedicated kinematic variables: m_{jjj}, *topness*, am_{T2}
- Expected 5.5±0.7 events, observed 12 (2.3σ).





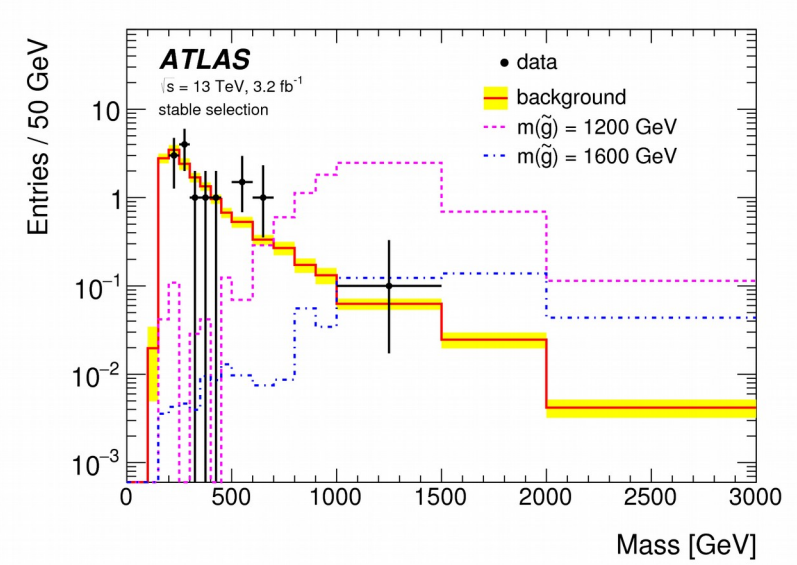


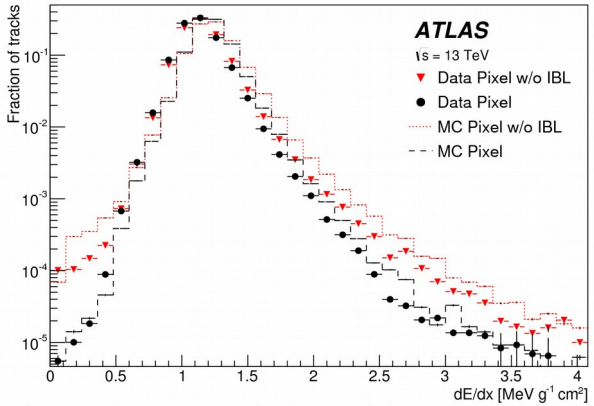
Long-lived Particles

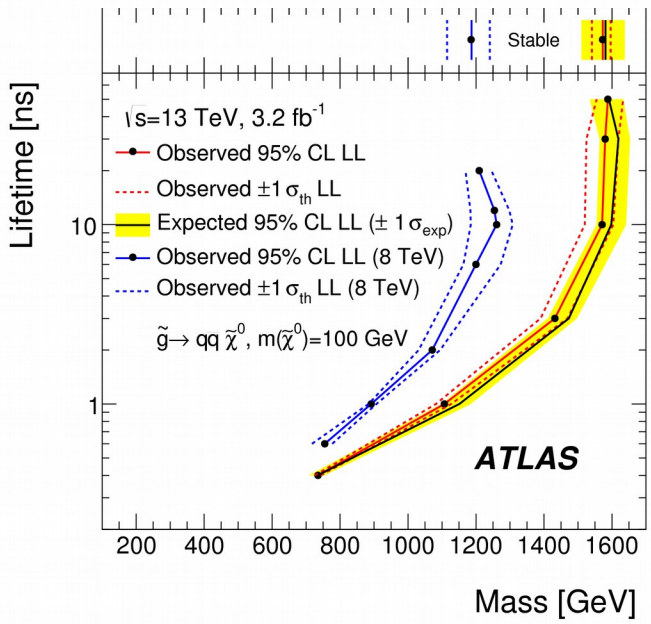
1604.04520

- "Pixel dE/dx": mass reconstructed from energy loss and momentum of tracks.
- Using parametric function:

$$(\mathrm{d}E/\mathrm{d}x)_{\mathrm{MPV}}(\beta\gamma) = \frac{p_1}{\beta^{p_3}}\ln(1 + [p_2\beta\gamma]^{p_5}) - p_4$$





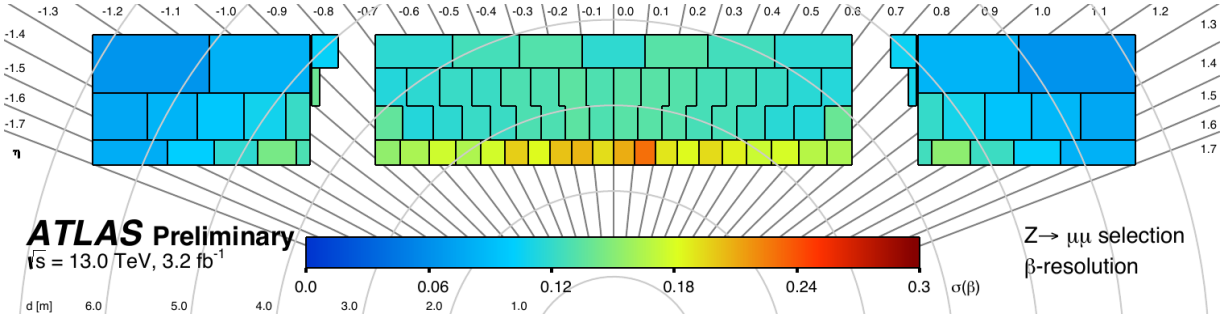


- Stable R-hadrons excluded up to m=1.57 TeV
- Poses interesting challenges for re-interpretation!

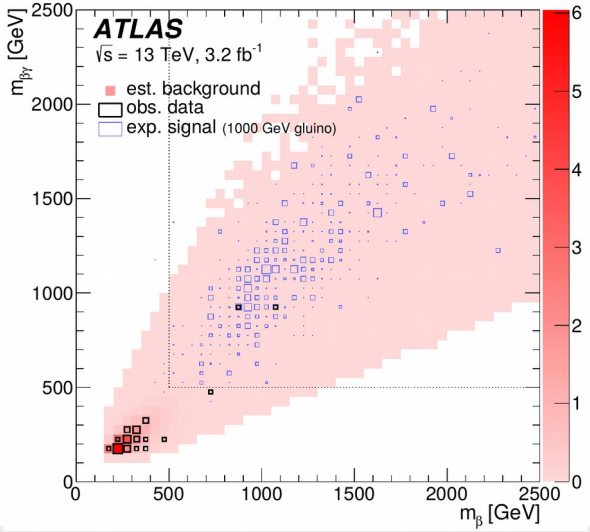
Slow massive particles ($\tilde{g}$,$\tilde{t}$,$\tilde{b}$)

CONF note to appear; run 1 result: 1601.07453

- Large ionisation losses (dE/dx in tracker → βγ), slow propagation velocities (time of flight in calorimeter → β).



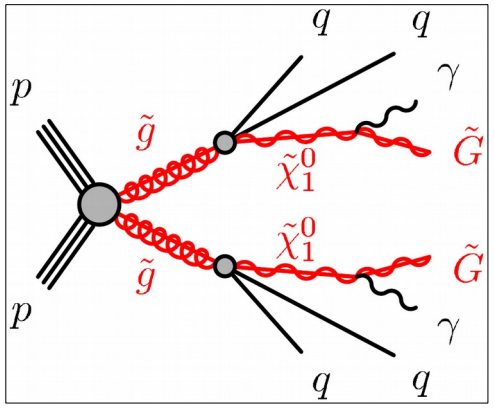
- Together with momentum measurement → 2 independent mass measurements.
- SMPs should have high values in both.
- Excluding slow gluinos up to ~1.6 TeV, stops and sbottoms up to ~800 GeV.

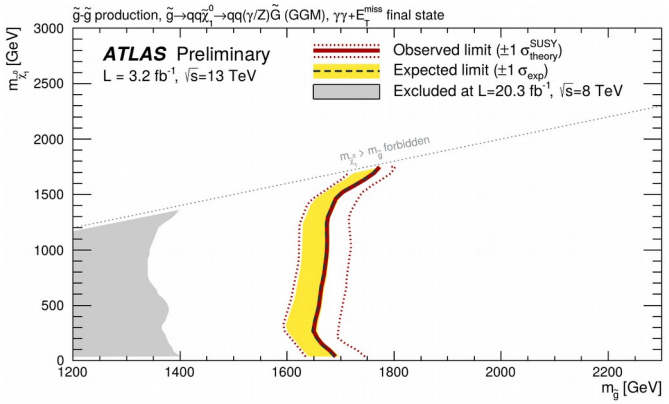


γγ+E_T^{miss}

CONF note to appear

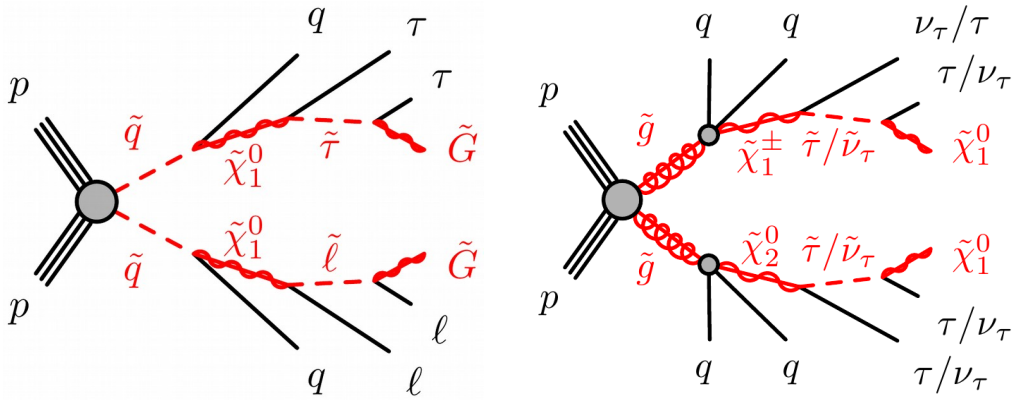
- GMSB, gravitino LSP: looking for photons from $\tilde{\chi}^0 \rightarrow \tilde{G}+\gamma$.
- Reducible backgrounds from SM γγ, γ+jet, multi-jet with instrumental E_T^{miss} and jets misidentified as photons.
- Irreducible backgrounds from top and W/Z (genuine E_T^{miss} from ν).
- Extended run 1 limit on gluino mass (~1.3 TeV → ~1.6 TeV).

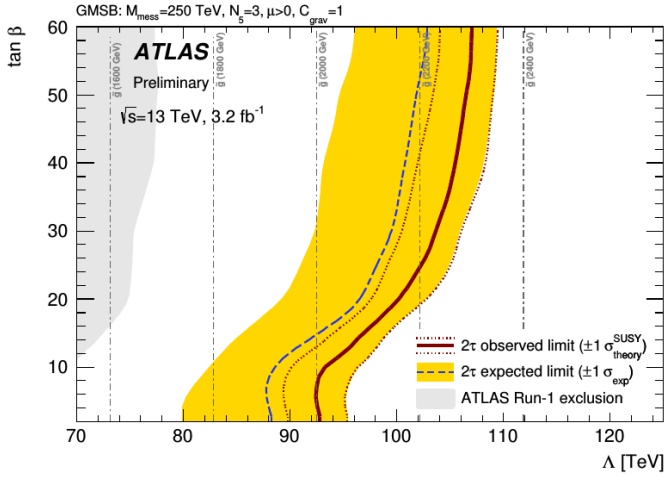




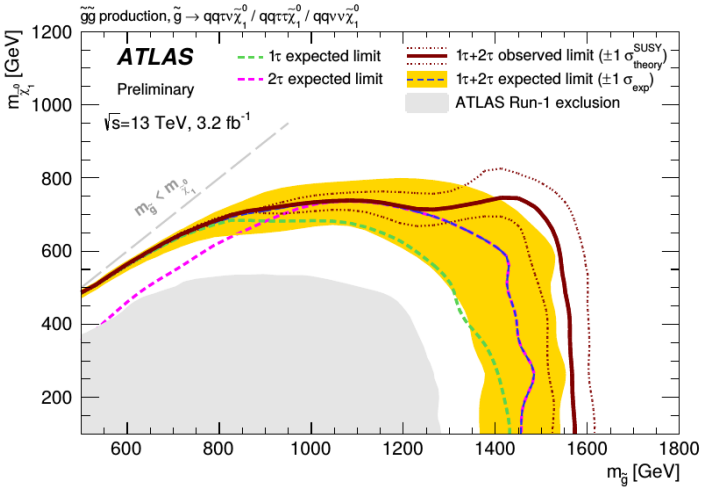
$\tau+E_T^{miss}$

CONF note to appear





- Two scenarios (GMSB / simplified model) with ≥1 tau final state.
- Event selection uses: m_T, H_T, E_T^{miss}, $m_{T2}(\tau,\tau)$; three signal regions for different assumptions and mass splittings.
- Main backgrounds: top events, $W\rightarrow\tau\nu$, $Z\rightarrow\tau\tau$, diboson.



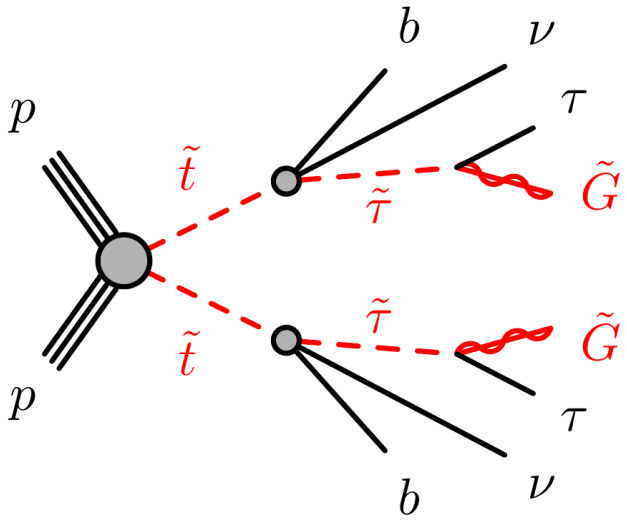
What's Next?

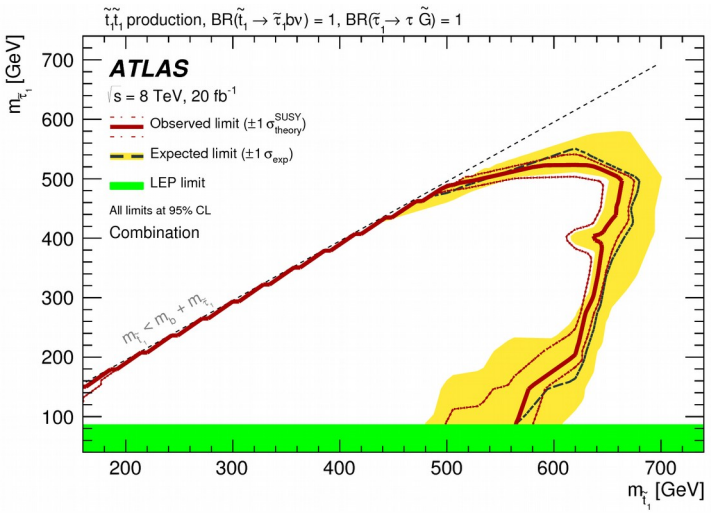
- Based on run 1 strategy, some things are obviously under consideration also for run 2 (summer 2016 and beyond):
  - Stop search in all hadronic final state
  - Electroweak searches in final states of different lepton multiplicity
  - Searches in tau final states
  - … and updates as collected luminosity increases.
- Question to theory community: which models from run 1 are most interesting for an update?
  - Which models are missing?
    - Reminder: focus on discovery, not maximal number of interpretations, at this stage.
  - Are there models which don't need to be pursued further?
  - How much harmonisation with CMS is useful?
- No specific plans yet for meta-studies (pMSSM survey).

$\tilde{t}_1 \to \tilde{\tau}\nu_\tau b$ with $\tilde{\tau} \to \tau + \tilde{G}$

EPJ C (2016) 76:81; arXiV:1509.04976

- Relatively recent run 1 result.
- Model originally motivated within GMSB and nGM.
- Stop and stau masses are free parameters; gravitino is ~massless (<1 GeV). Branching ratios are 100%.
- Experimentally interesting final state – interesting for theory as well?





Auxiliary Material on HepData

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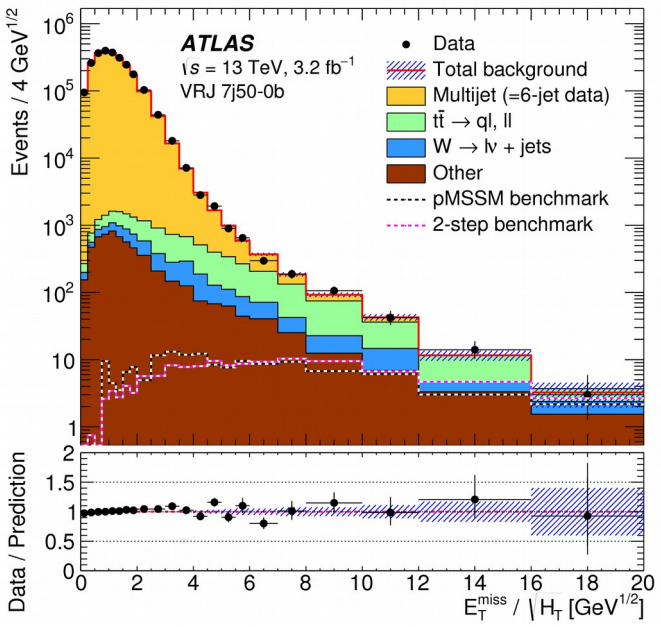
- ATLAS typically prepares auxiliary material only for papers, which appear towards end of a major data taking period, while notes are used for partial year results.
  - Preparing auxiliary material is often a lot of additional effort; exceptions can be made for material which is easy to provide.
- Generally positive feedback concerning what data was shared and the format it was provided in for run 1 analyses.
- No changes to current approach foreseen in near future.
- Have not had an opportunity to test the new HepData.

HepData Example: strong 0 lepton, 7-10 jets

- Auxiliary material: https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/PAPERS/SUSY-2015-06/
- HepData record: http://hepdata.cedar.ac.uk/view/ins1422615
- HepData record provides 70 tables, including:
  - Kinematic distributions of variables used in event selection.



SQRT(S)	13000.0 GeV			
	DATA	BACKGROUND	pMSSM-1300-200	2Step-1300-200
$E_T^{miss}/\sqrt{H_T}$ IN GeV$^{1/2}$	EVENTS / 4 GeV$^{1/2}$			
0.0 - 0.25	94752	97302.51 ± 662.86	0.002	0.000
0.25 - 0.5	260304	263827.62 ± 1289.09	0.031	0.748
0.5 - 0.75	365680	366730.66 ± 1644.79	0.344	0.357
0.75 - 1.0	396672	396836.41 ± 1738.04	9.459	2.607
1.0 - 1.25	373168	369123.66 ± 1633.55	4.467	3.421
1.25 - 1.5	311536	308291.16 ± 1416.37	3.526	2.749
1.5 - 1.75	245328	237817.83 ± 1164.58	6.552	4.063
1.75 - 2.0	176752	172629.58 ± 924.77	7.751	3.190
2.0 - 2.5	103184	98742.00 ± 504.02	4.942	5.665
2.5 - 3.0	44024	42109.64 ± 284.63	11.584	5.728
3.0 - 3.5	18064	16528.98 ± 162.50	13.108	8.226
3.5 - 4.0	7152	6974.43 ± 111.80	11.830	7.764
4.0 - 4.5	2816	3058.12 ± 68.86	12.236	7.994
4.5 - 5.0	1928	1664.03 ± 52.68	8.423	9.562
5.0 - 5.5	896	988.21 ± 41.67	7.656	8.260
5.5 - 6.0	648	588.96 ± 32.02	9.543	8.672
6.0 - 7.0	296	369.70 ± 19.13	8.639	9.272
7.0 - 8.0	188	185.70 ± 13.54	9.289	10.327
8.0 - 10.0	106	92.22 ± 6.85	6.746	9.494
10.0 - 12.0	42	42.61 ± 4.73	6.090	6.702
12.0 - 16.0	14	11.59 ± 1.98	3.018	4.676
16.0 - 20.0	3	3.23 ± 1.30	2.160	2.662
	Plot SelectPlot	Plot SelectPlot	Plot SelectPlot	Plot SelectPlot

HepData Example: strong 0 lepton, 7-10 jets

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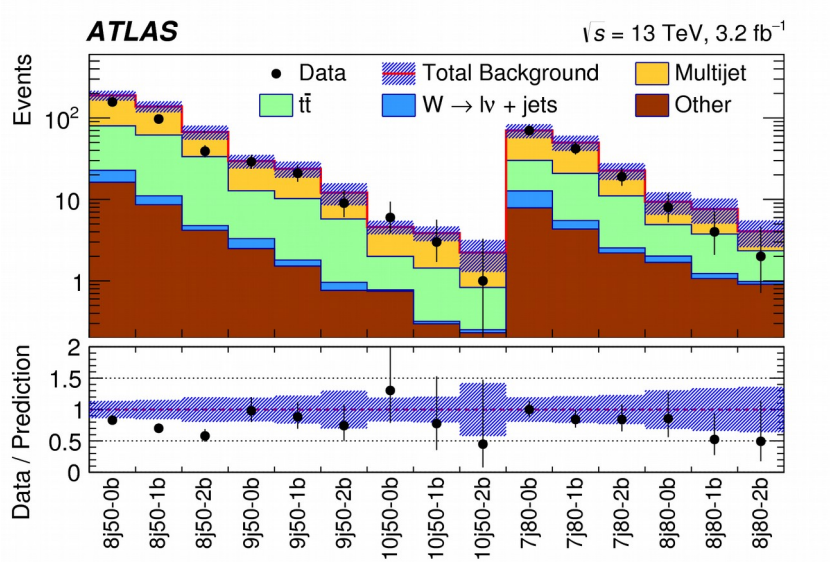

SQRT(S)	13000.0 GeV	
	DATA	BACKGROUND
SIGNAL REGION	NUMBER OF EVENTS	
8j50-0b	157.0	188.93 ± 55.16
8j50-1b	97.0	138.30 ± 43.35
8j50-2b	39.0	67.27 ± 26.27
9j50-0b	29.0	29.57 ± 11.16
9j50-10b	21.0	23.75 ± 10.57
9j50-2b	9.0	12.11 ± 7.25
10j50-0b	6.0	4.60 ± 1.68
10j50-10b	3.0	3.86 ± 1.60
10j50-2b	1.0	2.23 ± 1.87
7j80-0b	70.0	69.99 ± 27.57
7j80-10b	42.0	49.90 ± 21.22
7j80-2b	19.0	22.55 ± 10.36
8j80-0b	8.0	9.35 ± 5.60
8j80-10b	4.0	7.64 ± 5.07
8j80-2b	2.0	4.05 ± 2.70

HepData Example: strong 0 lepton, 7-10 jets

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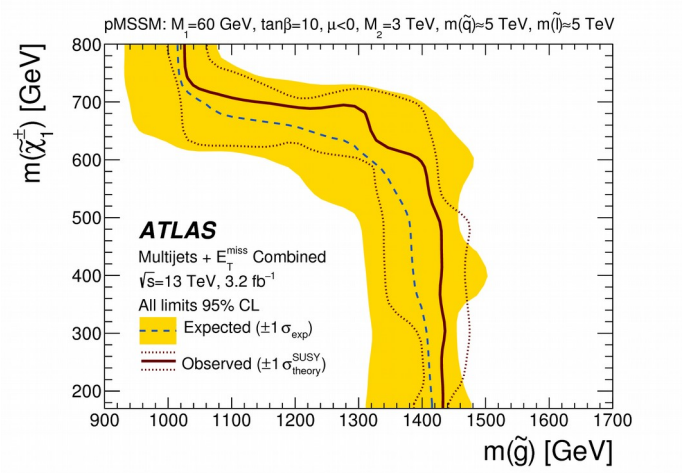
  - Kinematic distributions of variables used in event selection.
  - Signal region event yields.
  - Observed exclusion contours, ±1σ cross-section uncertainty.



SQRT(S)	13000.0 GeV
$m(\tilde{g})$ IN GEV	$m(\tilde{\chi}_1^{\pm})$ IN GEV
1415.6	177.9
1414.6	193.6
1413.3	209.4
1412.2	225.1
1411.2	240.9
1410.3	256.6
1409.4	272.4
1408.4	288.1
1406.7	303.9
1404.1	319.6
1400.9	335.4
1398.8	345.6
1396.8	351.1
1391.5	366.9
1388.4	382.6
1386.7	398.4
1385.1	414.1
1384.0	429.9
1383.2	445.6
1382.5	461.4
1381.7	477.1
1381.2	481.8
1380.0	492.9
1375.6	508.6
1368.5	524.4
1363.8	533.7
1360.3	540.1
1352.2	555.9
1346.2	567.8
1344.4	571.6
1333.5	587.4
1328.8	590.9
1315.5	603.1
1311.2	606.5
1297.6	618.9
1293.8	623.8
1276.2	633.7
1272.5	634.6
1258.8	637.7
1241.2	643.1
1223.8	649.4

SQRT(S)	13000.0 GeV
$m(\tilde{g})$ IN GEV	$m(\tilde{\chi}_1^{\pm})$ IN GEV
1311.2	177.9
1311.2	178.4
1313.0	193.6
1314.2	209.4
1315.0	225.1
1316.1	240.9
1317.8	256.6
1319.7	272.4
1321.3	288.1
1321.3	303.9
1319.5	319.6
1317.5	335.4
1315.8	351.1
1314.5	366.9
1313.2	382.6
1312.0	398.4
1311.2	408.1
1310.6	414.1
1309.0	429.9
1307.6	445.6
1306.4	461.4
1304.9	477.1
1301.3	492.9
1293.8	506.4
1291.4	508.6
1276.2	517.7
1258.8	524.0
1258.0	524.4
1241.2	531.8
1230.5	540.1
1223.8	548.0
1217.5	555.9
1206.8	571.6
1206.2	572.4
1188.9	587.4
1188.8	587.5
1171.2	594.6
1153.8	602.3
1151.9	603.1
1136.2	606.8

SQRT(S)	13000.0 GeV
$m(\tilde{g})$ IN GEV	$m(\tilde{\chi}_1^{\pm})$ IN GEV
1478.2	177.9
1471.3	193.6
1468.8	200.8
1466.0	209.4
1462.3	225.1
1459.3	240.9
1457.1	256.6
1455.8	272.4
1455.1	288.1
1454.6	303.9
1454.6	319.6
1457.2	335.4
1467.4	351.1
1468.8	352.2
1486.2	365.1
1487.5	366.9
1497.5	382.6
1503.1	398.4
1500.5	414.1
1492.7	429.9
1486.2	441.3
1480.9	445.6
1468.8	458.5
1466.4	461.4
1459.6	477.1
1457.1	492.9
1456.5	508.6
1457.1	524.4
1459.5	540.1
1464.8	555.9
1468.8	563.6
1473.0	571.6
1480.5	587.4
1481.5	603.1
1473.4	618.9
1468.8	624.7
1460.1	634.6
1451.2	644.9
1446.9	650.4
1435.8	666.1
1433.8	668.6
1422.4	681.9
1416.2	686.1
1403.3	697.6
1398.8	701.3

HepData Example: strong 0 lepton, 7-10 jets

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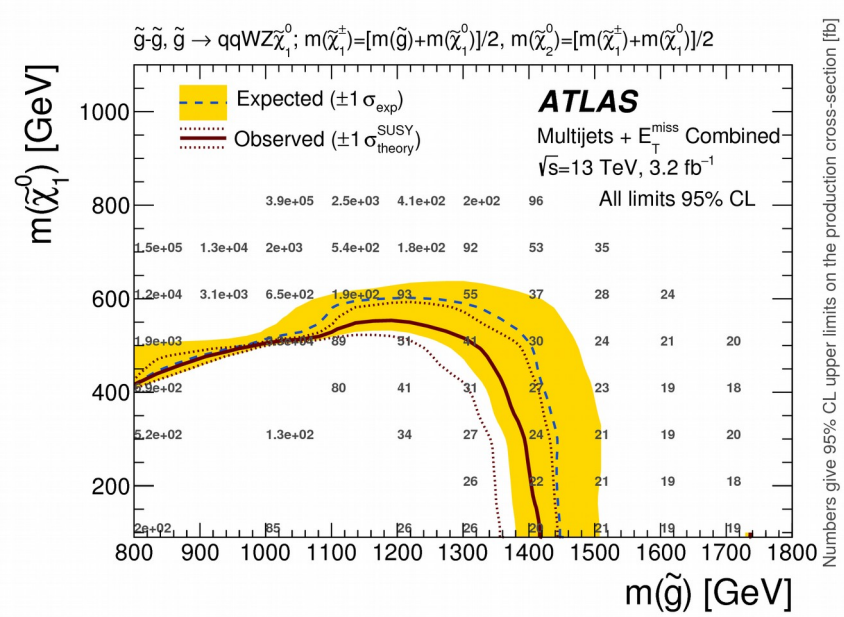
- HepData record provides 70 tables, including:
  - Kinematic distributions of variables used in event selection.
  - Signal region event yields.
  - Observed exclusion contours, ±1σ cross-section uncertainty.
  - Observed upper limits on model cross-section.

	SQRT(S)	13000.0 GeV
M(GLUINO) IN GEV	M(NEUTRALINO1) IN GEV	95% CLS OBSERVED CROSS-SECTION UPPER LIMIT IN FB
800.	100.	200
800.	300.	520
800.	400.	690
800.	500.	1900
800.	600.	12000
800.	700.	150000
900.	600.	3100
900.	700.	13000
1000.	100.	85
1000.	300.	130
1000.	500.	33000
1000.	600.	650
1000.	700.	3000



HepData Example: strong 0 lepton, 7-10 jets

- Auxiliary material: https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/PAPERS/SUSY-2015-06/
- HepData record: http://hepdata.cedar.ac.uk/view/ins1422615
- HepData record provides 70 tables, including:
  - Kinematic distributions of variables used in event selection.
  - Signal region event yields.
  - Observed exclusion contours, ±1σ cross-section uncertainty.
  - Observed upper limits on model cross-section.
  - Best expected signal region per point.

	SQRT(S)	13000.0 GeV
M(GLUINO) IN GEV	M(NEUTRALINO1) IN GEV	BEST EXPECTED SR
800.	100.	7j80-0b
800.	300.	7j80-0b
800.	400.	10j50-0b
800.	500.	9j50-0b
800.	600.	9j50-0b
800.	700.	8j50-0b
900.	600.	10j50-0b
900.	700.	9j50-0b
1000.	100.	7j80-0b
1000.	300.	7j80-0b
1000.	500.	9j50-0b
1000.	600.	10j50-0b
1000.	700.	10j50-0b
1000.	800.	7j80-2b
1100.	400.	8j80-0b
1100.	500.	10j50-0b

HepData Example: strong 0 lepton, 7-10 jets

- Auxiliary material: https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/PAPERS/SUSY-2015-06/
- HepData record: http://hepdata.cedar.ac.uk/view/ins1422615
- HepData record provides 70 tables,
  - Kinematic distributions of variables used in event selection.
  - Signal region event yields.
  - Observed exclusion contours, ±1σ cross-section uncertainty.
  - Observed upper limits on model cross-section.
  - Best expected signal region per point.
- Complemented by limits on visible cross-section and discovery probability, and benchmark cutflows.

Signal region	$\langle\epsilon\sigma\rangle^{95}_{\text{obs}}$ [fb]	S^{95}_{obs}	S^{95}_{exp}	CL_B	$p(s=0)$
8j50	11	36	49^{+19}_{-13}	0.14	0.50
8j50-1b	6.8	22	37^{+13}_{-10}	0.04	0.50
8j50-2b	3.8	12	22^{+8}_{-6}	0.03	0.50
9j50	5.8	19	19^{+4}_{-5}	0.49	0.50
9j50-1b	5	16	17^{+2}_{-6}	0.38	0.50
9j50-2b	2.6	8	10^{+3}_{-2}	0.31	0.50
10j50	2.5	8	6^{+3}_{-1}	0.74	0.26
10j50-1b	1.6	5	6^{+2}_{-1}	0.37	0.50
10j50-2b	1.1	4	4^{+2}_{-1}	0.27	0.50
7j80	10	32	32^{+11}_{-9}	0.51	0.50
7j80-1b	6.2	20	24^{+6}_{-5}	0.29	0.50
7j80-2b	4.2	14	14^{+6}_{-2}	0.33	0.50
8j80	3.2	10	11^{+2}_{-4}	0.41	0.50
8j80-1b	1.7	5	7^{+3}_{-2}	0.20	0.50
8j80-2b	1.4	4	5^{+2}_{-1}	0.24	0.50

	Two-step $[\tilde{g},\tilde{\chi}^0_1]$: [1300,200] [GeV]	pMSSM $[\tilde{g},\tilde{\chi}^\pm_1]$: [1300,200]
Number of Events ($L_{\text{int}} = 3.21\,\text{fb}^{-1}$)	147.8	147.8
Preselection	147.0	147.6
Event Cleaning	144.7	146.3
Additional $E_{\text{T}}^{\text{miss}}$ Cleaning	139.9	141.6
Lepton Veto	77.9	70.7
6j50 $\lvert\eta\rvert < 2.0$	73.5	62.6
Trigger (6 jets with $E_{\text{T}} > 45\,\text{GeV}$, $\lvert\eta\rvert < 2.4$)	73.4	62.6
8j50, $\lvert\eta\rvert < 2.0$	50.9	37.0
$E_{\text{T}}^{\text{miss}}/\sqrt{H_{\text{T}}} > 4.0\,\text{GeV}^{1/2}$	39.7	26.4
& ≥ 0 bjet	39.7	26.4
& ≥ 1 bjet	19.2	25.5
& ≥ 2 bjet	6.9	21.0
9j50, $\lvert\eta\rvert < 2.0$	33.5	24.4
$E_{\text{T}}^{\text{miss}}/\sqrt{H_{\text{T}}} > 4.0\,\text{GeV}^{1/2}$	25.8	16.7
& ≥ 0 bjet	25.8	16.7
& ≥ 1 bjet	12.9	16.3
& ≥ 2 bjet	4.8	13.8
10j50, $\lvert\eta\rvert < 2.0$	17.6	13.5
$E_{\text{T}}^{\text{miss}}/\sqrt{H_{\text{T}}} > 4.0\,\text{GeV}^{1/2}$	13.1	8.8
& ≥ 0 bjet	13.1	8.8
& ≥ 1 bjet	6.9	8.6

ANALYSIS PRESERVATION ACTIVITIES

ATLAS is putting effort into analysis preservation in order to

- ensure reproducibility of published results,
- streamline extension of analysis to new data as graduate students transition,
- reinterpret existing analysis in the context of new theories (aka "recasting")

To test the tools being developed, one of the Run-1 SUSY analyses was integrated into the CERN Analysis Preservation tool

- this was used internally for the ATLAS pMSSM reinterpretation
- the analysis processed ~5000 pMSSM parameter points
- similar tests are ongoing

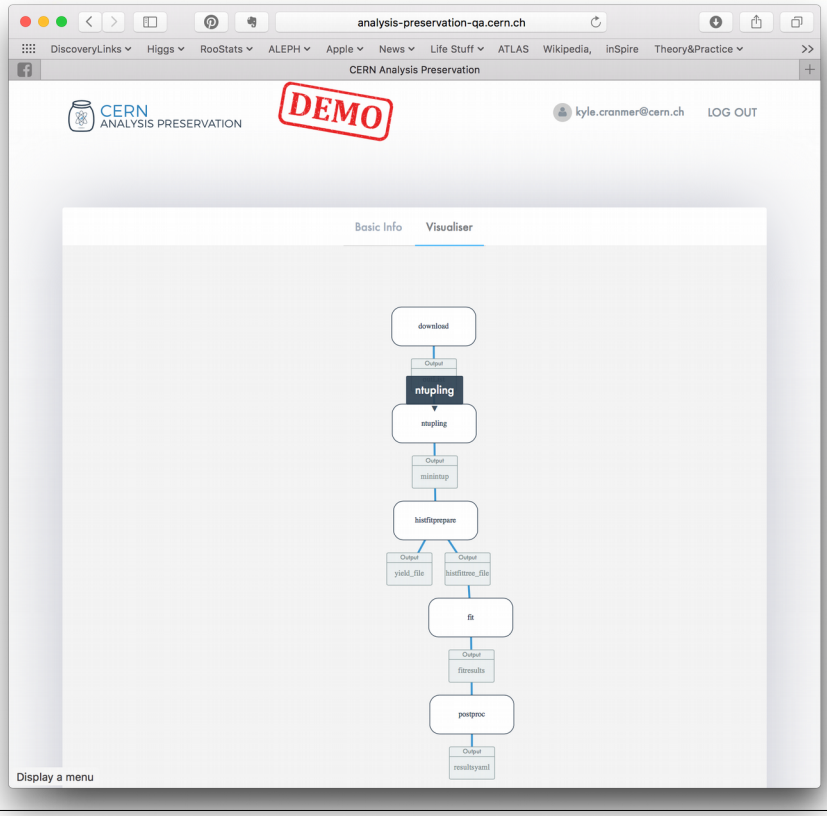
K. Cranmer

ATL-CB-PUB-2015-001
17 March 2015

Level-1. Published results

All scientific output is published in journals, and preliminary results are made available in Conference Notes. All are openly available, without restriction on use by external parties beyond copyright law and the standard conditions agreed by CERN.

Data associated with journal publications are also made available: tables and data from plots (e.g. cross section values, likelihood profiles, selection efficiencies, cross section limits, ...) are stored in appropriate repositories such as HEPDATA[2]. ATLAS also strives to make additional material related to the paper available that allows a reinterpretation of the data in the context of new theoretical models. For example, an extended encapsulation of the analysis is often provided for measurements in the framework of RIVET [3]. For searches information on signal acceptances is also made available to allow reinterpretation of these searches in the context of models developed by theorists after the publication. ATLAS is also exploring how to provide the capability for reinterpretation of searches in the future via a service such as RECAST [4]. RECAST allows theorists to evaluate the sensitivity of a published analysis to a new model they have developed by submitting their model to ATLAS.



Summary / Conclusions

- Run 2 analyses have started, ambitious program ahead; will largely follow run 1 strategy.
  - Mainly simplified models, progressing from high to low production cross-sections.
- Many results already with 2015 data:
  - Mostly strong production, various decay chains, with exclusion limits in $m(\tilde{q})$-$m(\tilde{\chi}^0)$ or $m(\tilde{g})$-$m(\tilde{\chi}^0)$ plane.
  - Some results on 3rd generation sparticles.
  - Several recent results on long-lived particle SUSY models.
- All of these are freely accessible from https://twiki.cern.ch/twiki/bin/view/AtlasPublic/SupersymmetryPublicResults
- Paper results and auxiliary material will continue to be provided on HepData.

UNI FREIBURG

Thank you for your attention!

… looking forward to an interesting discussion!

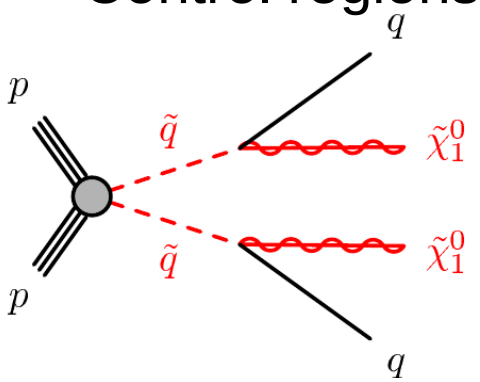
UNI FREIBURG

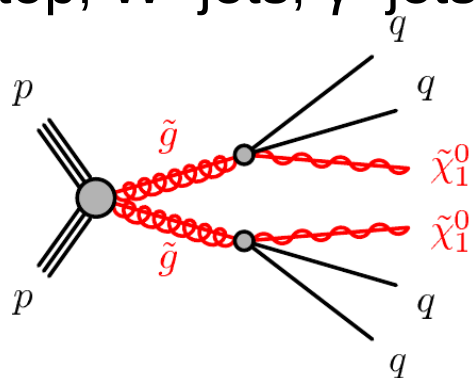
BACKUP

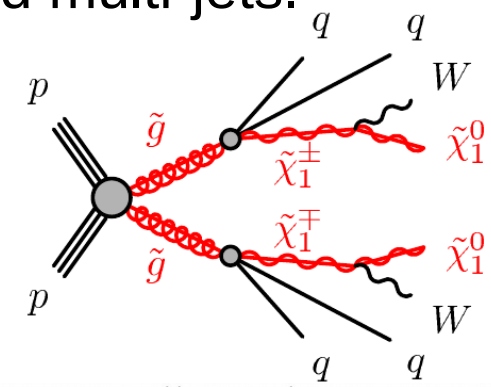
Strong: 0 or 1 lepton, 2-6 jets

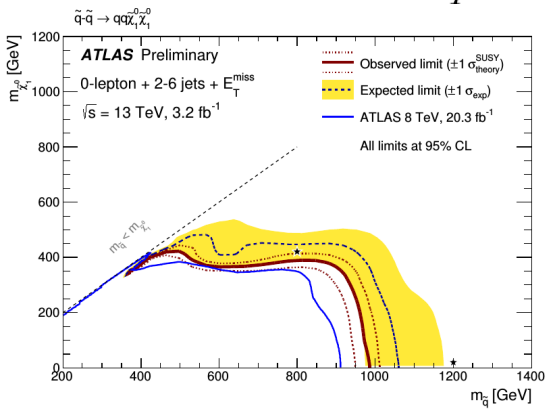
1605.03814 and 1605.04285

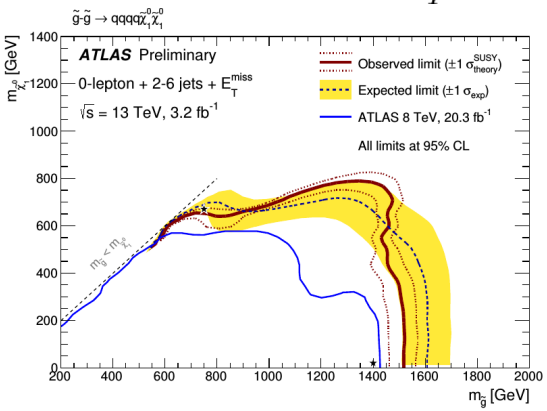
- q̃/g̃ pair, decay to quark(s) + $\tilde{\chi}^0$ (optional intermediate $\tilde{\chi}^{\pm}$)
- Selection on jet p_T, E_T^{miss}, m_T, m_{eff}, and aplanarity.
- Control regions for top, W+jets, γ+jets, and multi-jets.

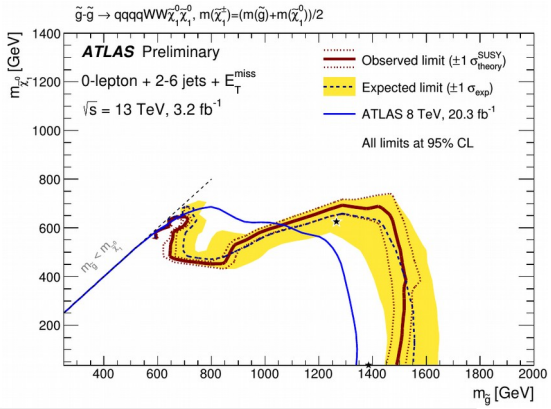










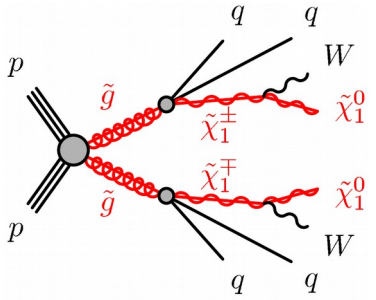


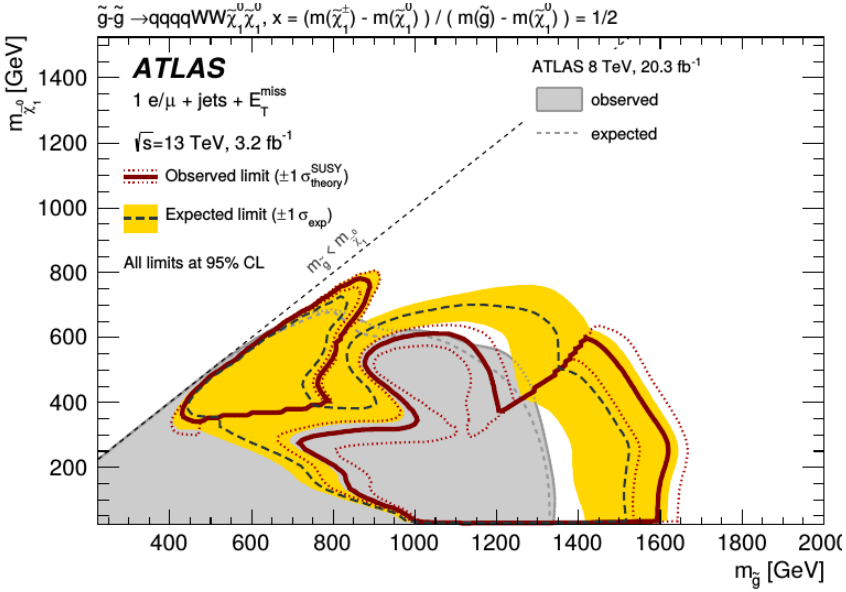
Strong: 1 e/μ, 2-6 jets

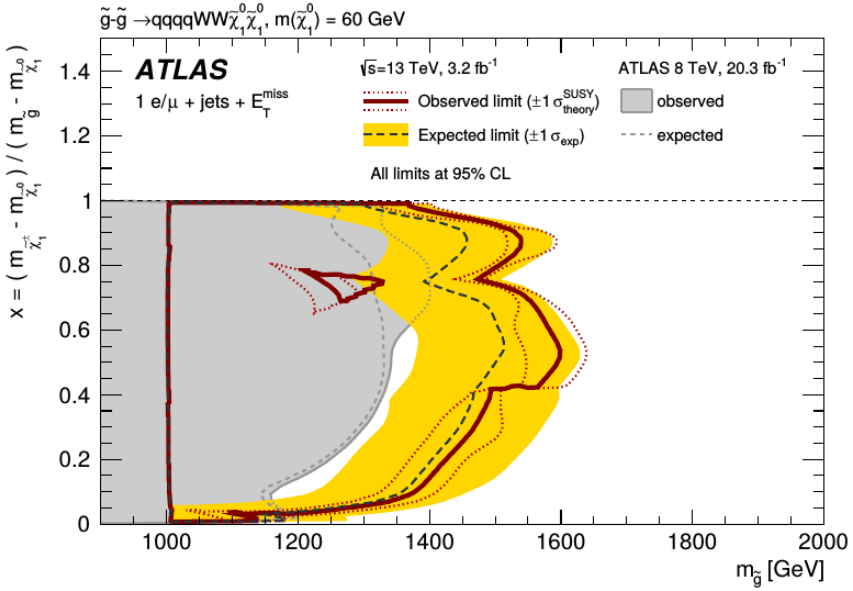
ATLAS-CONF-2015-076 (December?)

Meanwhile: 1605.04285

- Again $\tilde{g}\tilde{g}$ prod., $\tilde{g} \rightarrow q\bar{q}'\tilde{\chi}^{\pm}$, with $\tilde{\chi}^{\pm} \rightarrow \tilde{\chi}^{0}$.
- Signal regions with different jet multiplicity and lepton p_T requirements (soft leptons <35 GeV).
- Event selection: m_T, m_{eff}, H_T, E_T^{miss}, aplanarity.
- Control regions for top and W+jets.







R-parity Violation / Long-lived Particles

$\tilde{t}_1 \rightarrow$ bs: ATLAS-CONF-2016-022 (May)