SUSY: news from Run 2 searches

PLANCK 2017

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on behalf of the ATLAS Collaboration

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Feynment digmentality that $\langle H \rangle$ is approximately 1.4 GV for the point of the potential. This occurs if $\lambda \geq 0$ and m_{H} are the second of the potential. This occurs if $f \lambda \geq 0$ and m_{H} are the second of the potential. This occurs if $f \lambda \geq 0$ and m_{H} are the second of the potential. This occurs if $f \lambda \geq 0$ and m_{H} are the second of the potential. This occurs if $f \lambda \geq 0$ and m_{H} are the second of the potential. This occurs if $f \lambda \geq 0$ and m_{H} are the second of the potential of the potential. This occurs if $f \lambda \geq 0$ and m_{H} are the second of the potential of the potential. This occurs if $f \lambda \geq 0$ and m_{H} are the second of the potential of the potentis of the potential of the potential of



- Fundamental symmetry between fermions Figure 1.1: One-loop quantum corrections to the Higgs sequence in the standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the Higgs sequence in the standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the Higgs sequence in the standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the Higgs sequence in the standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the Higgs sequence in the standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the Standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the Standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the Standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the Standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the Standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the Standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the Standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the electroweak scale, rather than the standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the electroweak scale, rather than the standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the electroweak scale, rather than the standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the electroweak scale, rather than the standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the electroweak scale, rather than the standard Model Higgs field, here in Figure 1.1: One-loop quantum corrections to the electroweak scale, rather than the standard Model Higgs field fi
 - SUSY particles provide opposite-sign loop³ corrections to the Higgs mass, canceling out quadratic divergencies
 - If R-parity = (-1)^{3(B-L)+2s} conserved, Lightest SUSY particle (LSP) is stable and natural Dark Matter candidate
 - Achieve unification of gauge couplings at $M_{GUT}\approx 10^{16}~GeV$

ATLAS: A Toroidal LHC ApparatuS



- Major upgrades for Run 2 detectors, trigger, DAQ, reconstruction
- Excellent performance under challenging LHC conditions
 - peak lumi 1.38 x 10³⁴ cm⁻² s⁻¹
 - up to 50 interactions per crossing

36 fb⁻¹ of good 13 TeV pp collision data collected in 2015 and 2016

How to search for SUSY



- Make assumptions on mass spectra and use simplified models to define signatures and guide searches
 - *R-parity conservation RPC*: pairproduced SUSY particles decaying to LSP
 - *R-parity violation RPV*: LSP decays to SM particles
- Signal regions built with high S/B using discriminating variables
- Backgrounds:
 - Irreducible predicted from MC or normalized in control regions
 - Reducible estimated from datadriven methods
 - Checked in validation regions

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Inclusive searches for squarks and gluinos





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Multijets

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- $N_{\text{iets}} \ge 7-11$ and leptons vetoed
- Sensitivity to gluino pair production with cascade decays
- Discrimination from $MET/\sqrt{H_T}$
- 27 non-exclusive SRs based on $N_{\text{b-jets}}$ and mass of "fat jets" \rightarrow large gluino masses and boosted topologies
- Template for dominant multijet bkg MET/ $\sqrt{H_T}$ distribution extracted from $N_{\text{jets}} = 6$ data
- Leptonic control regions used normalize W+jets and ttbar

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Multijet

- No significant excesses observed over background expectation
- Gluino masses up to 1.8 TeV excluded for light LSPs assuming a two-step cascade decay



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see A





2ℓ same sign / 3ℓ + (b-)iets $\tilde{g} \tilde{g}$ production, $\tilde{g} \rightarrow t\bar{t}\chi^0$, $m(\tilde{t},) >> m(\tilde{g})$

- Observed no significant excess over SM expectation
- Previous 95% CL exclusion limits greatly extended,

ATLAS Preliminary

s=13 TeV , 36.1 fb

1000

[GeV]

1800

1400

1200

1000

800

600

400

200

800

ຣຶ×໌1600



q Rpc2Lohi

-Rpc3LOhs

Rpc2Ls

PPC2L2h

Rpc2L

Rpc2Lsof

Rpc

Rpc3LObL

Rpc3Lins

Rpc3L1h

Rpc2Libs

Rpc3LSS

Rpc2L Th

Rpv2LOh"

Rpv2L2hL

Rpv2L2h"

Rpv2L1h

Rpv2L ths

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1200

Summary of gluino searches



Searches for direct production of 3rd generation squarks



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- *N*_{jets}≤4, 2 b-jets and MET
- Target sbottom and stop pair production with exclusive and mixed decays
- SRs A, B and C target large, intermediate and compressed mass splittings (*m*_{sbottom} - *m*_{LSP})
- 0ℓ and 1ℓ SRs defined and combined
- W+jets, ttbar, single top and Z+jets normalized in dedicated CRs

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b-jets + MET



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- Stop search in ttbar +
 MET with 1ℓ final states
- Different stop decays and LSP scenarios considered
- 16 SRs optimized
- BDTs and soft leptons for small mass splittings
- Hadronic top reconstruction essential for boosted topologies
- ttbar, W+jets, single top and ttV normalized in CRs



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SUSY: news from Run 2 searches

Events / 10 GeV

Data / SM

14

Observed limit $(\pm 1\sigma_{tb})$

Expected limit $(\pm 1\sigma_{exp})$

ATLAS 8 TeV, 20.3 fb⁻¹

ATLAS t1L 13 TeV, 3.2 fb⁻¹

Pure Bino LSP model: $\tilde{t}_1\tilde{t}_1$ production, $\tilde{t}_1 \rightarrow bff \tilde{\chi}_1^0$, $\tilde{t}_1 \rightarrow Wb \tilde{\chi}_1^0$, $\tilde{t}_1 \rightarrow t \tilde{\chi}_1^0$

 $\int \mathbf{A}TLAS$ Preliminary $\int \sqrt{s} = 13 \text{ TeV}, 36.1 \text{ fb}^{-1}$

600 Limit at 95% CL

1ℓ

 $m_{\chi_1^0}$ [GeV]

700

500

400

300

200

100

- No significant excesses observed
- Exclusion limits set on different simplified, pMSSM and dark matter models
- Stop masses up to 920 GeV excluded for massless LSPs



Summary of stop searches



Contours of different analyses (with different assumptions) are overlayed, but overall ATLAS is searching for stops with masses up to 1 TeV!

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Searches for electroweak production of gauginos and sleptons





2l/3l

- Multilepton analyses searching for wino and slepton pair production (bino LSP)
- 17 exclusive 2l+0jet
 SRs binned in m_{T2}
 and m_l
- 3 inclusive 2l+2jet
 SRs targetting low, intermediate and high mass splittings
- 11 exclusive 3ℓ SRs using m_{ℓℓ}, m_T, N_{jets} and MET

G G

Events / 25

Data / SM

E_T^{miss} [GeV]

104







Z+jets in 2ℓ +2jet modelled with γ +jets data

signal at high MET dominant WZ background normalized in CR

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100

150

10

SN

 $2\ell/3\ell$



No significant excesses, limits extended compared to Run 1

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Summary of EWK searches



- Probing production of winos with masses up to 1.2 TeV decaying via intermediate sleptons to a bino-like LSP
- Probing production of winos with masses up to 580 GeV decaying via intermediate gauge bosons to a bino-like LSP (sleptons decoupled)

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Dedicated searches for RPV SUSY

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B-L



- 2ℓ , $N_{\text{jets}} = 2$, $N_{b\text{-jets}} \ge 1$
- Sensitivity to stop pair production with RPV decay under minimal B-L model violating lepton number but not baryon number
- 2 inclusive SRs defined using *H*_T, *m*_b_l and *m*_l
- ttbar, Z+jets and single top normalized in dedicated CRs



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Summary and conclusions

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SUSY ATLAS summary

ATLAS SUSY Searches* - 95% CL Lower Limits

A	TLAS SUSY Sea	rches*	- 95%	% C l	L Lo	ver Limits		ATLAS Preliminary
IV	Model	e, μ, τ, γ	⁄ Jets	$E_{\rm T}^{\rm miss}$	∫ <i>L dt</i> [fl	⁻¹] Mass limit	$\sqrt{s} = 7, 8 \text{ TeV}$ $\sqrt{s} = 13 \text{ TeV}$	$\sqrt{s} = 7, 8, 13 \text{ lev}$ Reference
Inclusive Searches	$ \begin{array}{c} MSUGRA/CMSSM \\ \tilde{q}\tilde{q}, \tilde{q} \rightarrow q \tilde{\chi}_{1}^{0} \\ \tilde{q}\tilde{q}, \tilde{q} \rightarrow q \tilde{\chi}_{1}^{0} \\ \tilde{q}\tilde{q}, \tilde{q} \rightarrow q \tilde{\chi}_{1}^{0} \\ \tilde{g}\tilde{s}, \tilde{s} \rightarrow q \tilde{\chi}_{1}^{0} \\ \tilde{g}\tilde{s}, \tilde{s} \rightarrow q \tilde{\chi}_{1}^{0} \\ \tilde{g}\tilde{s}, \tilde{s} \rightarrow q \mathcal{W}^{1} \rightarrow q \mathcal{W}^{\pm} \tilde{\chi}_{1}^{0} \\ \tilde{g}\tilde{s}, \tilde{s} \rightarrow q \mathcal{W}^{1} \mathcal{W}^{1} \\ \tilde{g}\tilde{s}, \tilde{s} \rightarrow q \mathcal{W}^{1} \mathcal{W}^{1} \\ GMSB(\ell NLSP) \\ GGM (hiog sino-bino NLSP) \\ GGM (higgsino-bino NLSP) \\ GGM (higgsino-bino NLSP) \\ GGM (higgsino-NLSP) \\ GGM (higgsino-NLSP) \\ Gravitino LSP \end{array} $	$\begin{array}{c} 0.3 \ e, \mu/1-2 \ \tau \\ 0 \\ mono-jet \\ 0 \\ 3 \ e, \mu \\ 0 \\ 1-2 \ \tau + 0-1 \\ 2 \ \gamma \\ \gamma \\ 2 \ e, \mu \left(Z \right) \\ 0 \end{array}$	2-10 jets/3 2-6 jets 1-3 jets 2-6 jets 2-6 jets 4 jets 7-11 jets ℓ 0-2 jets 2 jets 2 jets mono-jet	b Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	20.3 36.1 3.2 36.1 36.1 36.1 36.1 3.2 3.2 20.3 13.3 20.3 20.3	\$\bar{q}\$ \$\bar{q}\$ \$\bar{q}\$ \$\bar{q}\$ \$\bar{q}\$ \$\bar{q}\$ \$\bar{q}\$ \$\bar{q}\$ \$\bar{q}\$ \$\bar{g}\$ \$\bar{g}\$ <t< td=""><td>$\begin{array}{c c} \textbf{1.85 TeV} & m(\tilde{q}) = m(\tilde{g}) \\ \textbf{1.57 TeV} & m(\tilde{\chi}_1^0) < 200 \mbox{ GeV}, m(1^{14} \ g \\ m(\tilde{\chi}_1^0) < 200 \mbox{ GeV}, m(1^{14} \ g \\ m(\tilde{\chi}_1^0) < 200 \mbox{ GeV} \\ \textbf{2.02 TeV} & m(\tilde{\chi}_1^0) < 200 \mbox{ GeV}, m(\tilde{\chi}_1^+) < 200 \mbox{ GeV} \\ \textbf{1.825 TeV} & m(\tilde{\chi}_1^0) < 400 \mbox{ GeV} \\ \textbf{1.8 TeV} & m(\tilde{\chi}_1^0) < 400 \mbox{ GeV} \\ \textbf{2.0 TeV} \\ \textbf{1.65 TeV} & cr(NLSP) < 0.1 \mbox{ mm} \\ \textbf{TeV} & m(\tilde{\chi}_1^0) < 950 \mbox{ GeV}, cr(NI \\ \textbf{1.8 TeV} & m(\tilde{\chi}_1^0) > 680 \mbox{ GeV}, cr(NI \\ m(NLSP) > 430 \mbox{ GeV} \\ m(\tilde{G}) > 1.8 \times 10^{-4} \mbox{ eV}, m(\tilde{q}) \\ \end{array}$</td><td>$\begin{array}{c} 1507.05525 \\ (m, \tilde{q}) = m(2^{nd} \ gen. \tilde{q}) \\ = 0.5(m(\tilde{k}_1^0) + m(\tilde{g})) \\ = 0.5(m(\tilde{k}_1^0) + m(\tilde{k})) \\ = 0.5(m(\tilde{k})) \\ = 0.5(m(\tilde{k})$</td></t<>	$\begin{array}{c c} \textbf{1.85 TeV} & m(\tilde{q}) = m(\tilde{g}) \\ \textbf{1.57 TeV} & m(\tilde{\chi}_1^0) < 200 \mbox{ GeV}, m(1^{14} \ g \\ m(\tilde{\chi}_1^0) < 200 \mbox{ GeV}, m(1^{14} \ g \\ m(\tilde{\chi}_1^0) < 200 \mbox{ GeV} \\ \textbf{2.02 TeV} & m(\tilde{\chi}_1^0) < 200 \mbox{ GeV}, m(\tilde{\chi}_1^+) < 200 \mbox{ GeV} \\ \textbf{1.825 TeV} & m(\tilde{\chi}_1^0) < 400 \mbox{ GeV} \\ \textbf{1.8 TeV} & m(\tilde{\chi}_1^0) < 400 \mbox{ GeV} \\ \textbf{2.0 TeV} \\ \textbf{1.65 TeV} & cr(NLSP) < 0.1 \mbox{ mm} \\ \textbf{TeV} & m(\tilde{\chi}_1^0) < 950 \mbox{ GeV}, cr(NI \\ \textbf{1.8 TeV} & m(\tilde{\chi}_1^0) > 680 \mbox{ GeV}, cr(NI \\ m(NLSP) > 430 \mbox{ GeV} \\ m(\tilde{G}) > 1.8 \times 10^{-4} \mbox{ eV}, m(\tilde{q}) \\ \end{array}$	$\begin{array}{c} 1507.05525 \\ (m, \tilde{q}) = m(2^{nd} \ gen. \tilde{q}) \\ = 0.5(m(\tilde{k}_1^0) + m(\tilde{g})) \\ = 0.5(m(\tilde{k}_1^0) + m(\tilde{k})) \\ = 0.5(m(\tilde{k})) \\ = 0.5(m(\tilde{k})$
3 rd gen ẽ med.	$\begin{array}{l} \tilde{g}\tilde{g}, \ \tilde{g} \rightarrow b \bar{b} \tilde{\chi}_{1}^{0} \\ \tilde{g}\tilde{g}, \ \tilde{g} \rightarrow t \bar{t} \tilde{\chi}_{1}^{0} \\ \tilde{g}\tilde{g}, \ \tilde{g} \rightarrow b \bar{t} \tilde{\chi}_{1}^{+} \end{array}$	0 0-1 <i>e</i> ,μ 0-1 <i>e</i> ,μ	3 b 3 b 3 b	Yes Yes Yes	36.1 36.1 20.1	ğ ğ ğ 1.37	1.92 TeV m($\tilde{\chi}_1^0)$ <600 GeV 1.97 TeV m($\tilde{\chi}_1^0)$ <200 GeV	ATLAS-CONF-2017-021 ATLAS-CONF-2017-021 1407.0600
3 rd gen. squarks direct production	$ \begin{split} \tilde{b}_{1}\tilde{b}_{1}, & \tilde{b}_{1} \rightarrow b\tilde{\chi}_{1}^{0} \\ \tilde{b}_{1}\tilde{b}_{1}, & \tilde{b}_{1} \rightarrow t\tilde{\chi}_{1}^{+} \\ \tilde{i}_{1}\tilde{c}_{1}, & \tilde{i}_{1} \rightarrow t\tilde{\chi}_{1}^{+} \\ \tilde{i}_{1}\tilde{c}_{1}, & \tilde{i}_{1} \rightarrow b\tilde{\chi}_{1}^{+} \\ \tilde{i}_{1}\tilde{c}_{1}, & \tilde{i}_{1} \rightarrow b\tilde{\chi}_{1}^{0} \\ \tilde{i}_{1}\tilde{c}_{1}, & \tilde{i}_{1} \rightarrow t\tilde{\chi}_{1}^{0} \\ \tilde{i}_{1}\tilde{c}_{1}, & \tilde{i}_{1} \rightarrow t\tilde{\chi}_{1}^{0} \\ \tilde{i}_{2}\tilde{c}_{2}, & \tilde{i}_{2} \rightarrow \tilde{i}_{1} + Z \\ \tilde{i}_{2}\tilde{c}_{2}, & \tilde{i}_{2} \rightarrow \tilde{i}_{1} + h \end{split} $	$\begin{matrix} 0 \\ 2 \ e, \mu \ (SS) \\ 0-2 \ e, \mu \\ 0-2 \ e, \mu \\ 0 \\ 2 \ e, \mu \ (Z) \\ 3 \ e, \mu \ (Z) \\ 1-2 \ e, \mu \end{matrix}$	2 b 1 b 1-2 b 0-2 jets/1-2 mono-jet 1 b 1 b 4 b	Yes Yes Yes Yes Yes Yes Yes	36.1 36.1 4.7/13.3 20.3/36.1 3.2 20.3 36.1 36.1	b1 950 GeV \$\bar{b}_1\$ 275-700 GeV \$\bar{t}_1\$ 200-720 GeV \$\bar{t}_1\$ 90-198 GeV 205-950 GeV \$\bar{t}_1\$ 90-323 GeV \$\bar{t}_1\$ \$\bar{t}_1\$ 90-323 GeV \$\bar{t}_2\$ \$\bar{t}_2\$ \$\bar{t}_2\$ \$\bar{t}_2\$ \$\bar{t}_2\$ \$\bar{t}_2\$ \$\bar{t}_2\$	$\begin{array}{c} m(\tilde{k}_{1}^{0}){<}420GeV\\ m(\tilde{k}_{1}^{0}){<}200GeV,m(\tilde{k}_{1}^{+})\\ m(\tilde{k}_{1}^{-}){=}2m(\tilde{k}_{1}^{0}),m(\tilde{k}_{1}^{0})\\ m(\tilde{k}_{1}^{0}){=}1GeV\\ m(\tilde{k}_{1}^{0}){=}5GeV\\ m(\tilde{k}_{1}^{0}){=}150GeV\\ m(\tilde{k}_{1}^{0}){=}0GeV\\ m(\tilde{k}_{1}^{0}){=}0GeV\\ \end{array}$)= m(ℓ ₁ ⁰)+100 GeV =55 GeV ATLAS-CONF-2017-038 1209.2102, ATLAS-CONF-2017-030 1209.2102, ATLAS-CONF-2017-077 1506.08616, ATLAS-CONF-2017-020 1604.07773 1403.5222 ATLAS-CONF-2017-019 ATLAS-CONF-2017-019
EW direct	$ \begin{split} \tilde{\ell}_{L,R} \tilde{\ell}_{L,R}, \tilde{\ell} \rightarrow \ell \tilde{\chi}_1^0 \\ \tilde{\chi}_1^+ \tilde{\chi}_1^-, \tilde{\chi}_1^+ \rightarrow \tilde{\ell} \nu(\ell \tilde{\nu}) \\ \tilde{\chi}_1^+ \tilde{\chi}_1^-, \tilde{\chi}_2^0 \rightarrow \tilde{\tau} \nu(\ell \tilde{\nu}) \\ \tilde{\chi}_1^+ \tilde{\chi}_2^0, \tilde{\chi}_1^+ \rightarrow \tilde{\tau} \nu(\ell \tilde{\nu}), \ell \tilde{\nu}_{L} \ell(\tilde{\nu} \nu) \\ \tilde{\chi}_1^+ \tilde{\chi}_2^0 \rightarrow \tilde{\chi}_L \nu_{L}^0 \ell(\tilde{\nu} \nu), \ell \tilde{\nu}_{L} \ell(\tilde{\nu} \nu) \\ \tilde{\chi}_1^+ \tilde{\chi}_2^0 \rightarrow \tilde{W} \tilde{\chi}_1^0 \tilde{\chi}_L^0 \\ \tilde{\chi}_2^+ \tilde{\chi}_2^0 \rightarrow \tilde{W} \tilde{\chi}_1^0 h \tilde{\chi}_1^0, h \rightarrow b \tilde{b} f W W / \tau \tau / \gamma \gamma \\ \tilde{\chi}_2^+ \tilde{\chi}_3^0, \tilde{\chi}_{2,3}^0 \rightarrow \tilde{R} \ell \\ \text{GGM (wino NLSP) weak prod., } \tilde{\chi}_1^0 - \\ \text{GGM (bino NLSP) weak prod., } \tilde{\chi}_1^0 - \end{split} $	$\begin{array}{c} 2 \ e, \mu \\ 2 \ e, \mu \\ 2 \ \tau \\ 3 \ e, \mu \\ 2 \ 3 \ e, \mu \\ 2 \ 3 \ e, \mu \\ e, \mu, \gamma \\ 4 \ e, \mu \\ \gamma \gamma \tilde{G} 1 \ e, \mu + \gamma \\ \gamma \gamma \tilde{G} 2 \ \gamma \end{array}$	0 0 - 0-2 jets 0-2 <i>b</i> 0 -	Yes Yes Yes Yes Yes Yes Yes Yes	36.1 36.1 36.1 36.1 20.3 20.3 20.3 20.3	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{split} m(\bar{k}_{1}^{0}) = 0 \\ m(\bar{k}_{1}^{0}) = 0, \ m(\bar{\ell}, \bar{\nu}) = 0.5(r \\ m(\bar{k}_{1}^{0}) = 0, \ m(\bar{\ell}, \bar{\nu}) = 0.5(r \\ m(\bar{k}_{1}^{0}) = 0, \ m(\bar{k}, \bar{\nu}) = 0, \\ m(\bar{k}_{1}^{0}) = m(\bar{k}_{2}^{0}), \ m(\bar{k}_{1}^{0}) = 0, \\ m(\bar{k}_{1}^{0}) = m(\bar{k}_{2}^{0}), \ m(\bar{k}_{1}^{0}) = 0, \\ m(\bar{k}_{1}^{0}) = m(\bar{k}_{2}^{0}), \ m(\bar{k}_{1}^{0}) = 0, \\ m(\bar{k}_{2}^{0}) = m(\bar{k}_{3}^{0}), \ m(\bar{k}_{1}^{0}) = 0, \\ m(\bar{\ell}, \bar{\nu}) = cr < 1 mm \\ cr < 1 mm \end{split}$	$\begin{array}{c c} \text{ATLAS-CONF-2017-039} \\ \hline \text{ATLAS-CONF-2017-039} \\ \text{ATLAS-CONF-2017-039} \\ \text{ATLAS-CONF-2017-039} \\ \text{ATLAS-CONF-2017-039} \\ \text{O.5(m}(\tilde{k}_1^n) + m(\tilde{k}_1^0)) \\ \text{ATLAS-CONF-2017-039} \\$
Long-lived particles	$\begin{array}{l} \mbox{Direct} \tilde{\chi}_1^+ \tilde{\chi}_1^- \mbox{ prod., long-lived } \tilde{\chi}_1^+ \\ \mbox{Direct} \tilde{\chi}_1^+ \tilde{\chi}_1^- \mbox{ prod., long-lived } \tilde{\chi}_1^+ \\ \mbox{Stable, stopped } \tilde{g} \mbox{ R-hadron} \\ \mbox{Stable } \tilde{g} \mbox{ R-hadron} \\ \mbox{Metastable } \tilde{g} \mbox{ R-hadron} \\ \mbox{GMSB, stable } \tilde{\tau}, \tilde{\chi}_1^0 {\rightarrow} \tilde{\tau}(\tilde{e}, \tilde{\mu}) {+} \tau(e, \mu) \\ \mbox{GMSB, } \tilde{\chi}_1^0 {\rightarrow} \gamma \tilde{G}, \mbox{ long-lived } \tilde{\chi}_1^0 \\ \tilde{g}, \tilde{\chi}_1^0 {\rightarrow} eev/e\mu \nu/\mu\nu \\ \mbox{ GGM } \tilde{g}\tilde{g}, \tilde{\chi}_1^0 {\rightarrow} Z \tilde{G} \end{array}$	Disapp. trk dE/dx trk 0 trk dE/dx trk $1-2 \mu$ 2γ displ. $ee/e\mu//$ displ. vtx + je	x 1 jet - 1-5 jets - - - μμ - ets -	Yes Yes - - Yes - -	36.1 18.4 27.9 3.2 19.1 20.3 20.3 20.3	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{split} & m[\tilde{\chi}_1^+)\cdotm[\tilde{\chi}_1^0]{\sim}-160 \; \mathrm{Me}^1 \\ & m[\tilde{\chi}_1^+)\cdotm[\tilde{\chi}_1^0]{\sim}-160 \; \mathrm{Me}^1 \\ & m[\tilde{\chi}_1^0]{=}100 \; \mathrm{GeV}, \; 10 \; \mu\mathrm{s} \\ & 1.58 \; TeV \\ & 1.57 \; TeV \\ & m[\tilde{\chi}_1^0]{=}100 \; \mathrm{GeV}, \; \tau{>}10 \\ & 10{<} tan_{\mathcal{P}{<}50} \\ & 1{<} r(\tilde{\chi}_1^0){<}3 \; \mathrm{ns}, \; \mathrm{SPS8 \; n} \\ & 1{<} cr(\tilde{\chi}_1^0){<}3 \; \mathrm{ns}, \; \mathrm{SPS8 \; n} \\ & 7{<} crr(\tilde{\chi}_1^0){<}740 \; \mathrm{mm}, \; \mathrm{n} \\ & 6{<} crr(\tilde{\chi}_1^0){<}480 \; \mathrm{mm}, \; \mathrm{n} \end{split}$	$\begin{array}{llllllllllllllllllllllllllllllllllll$
RPV	$ \begin{array}{l} LFV pp \rightarrow \tilde{v}_\tau + X, \tilde{v}_\tau {\rightarrow} e\mu/e\tau/\mu\tau \\ Bilinear RPV CMSSM \\ \tilde{\chi}_1^+ \tilde{\chi}_1^-, \tilde{\chi}_1^+ {\rightarrow} W \tilde{\chi}_1^0, \tilde{\chi}_1^0 {\rightarrow} eev, e\mu v, \mu\mu v \\ \tilde{\chi}_1^+ \tilde{\chi}_1^-, \tilde{\chi}_1^+ {\rightarrow} W \tilde{\chi}_1^0, \tilde{\chi}_1^0 {\rightarrow} eev, e\mu v, \mu\mu v \\ \tilde{g}_s^+, \tilde{g} {\rightarrow} qqq \\ \tilde{g}_s^-, \tilde{g} {\rightarrow} qq \tilde{\chi}_1^0, \tilde{\chi}_1^0 {\rightarrow} qqq \\ \tilde{g}_s^-, \tilde{g} {\rightarrow} q \tilde{\chi}_1^0, \tilde{\chi}_1^0 {\rightarrow} qqq \\ \tilde{g}_s^-, \tilde{g} {\rightarrow} \tilde{\chi}_1^0, \tilde{\chi}_1^0 {\rightarrow} qqq \\ \tilde{g}_s^-, \tilde{g} {\rightarrow} \tilde{\chi}_1^0, \tilde{\chi}_1^0 {\rightarrow} gqq \\ \tilde{g}_s^-, \tilde{g} {\rightarrow} \tilde{\chi}_1^0, \tilde{\chi}_1^0 {\rightarrow} bs \\ \tilde{\iota}_1^-, \tilde{\iota}_1 {\rightarrow} bs \\ \tilde{\iota}_1^-, \tilde{\iota}_1 {\rightarrow} b\ell \end{array} $	$\begin{array}{c} e\mu, e\tau, \mu\tau \\ 2 \ e, \mu \ (SS) \\ 4 \ e, \mu \\ 3 \ e, \mu + \tau \\ 0 \ 2 \\ 1 \ e, \mu \\ 1 \ e, \mu \\ 0 \\ 2 \ e, \mu \end{array}$	- 0-3 b 1-5 large-R j 1-5 large-R j 8-10 jets/0-4 8-10 jets/0-4 2 jets + 2 l 2 b	Yes Yes Yes ets - ets - 4 b - b -	3.2 20.3 13.3 20.3 14.8 14.8 36.1 36.1 15.4 36.1	\$\vec{v}_r\$ 1.4 \$\vec{k}_1^*\$ 1.14 TeV \$\vec{k}_1^*\$ 450 GeV \$\vec{k}_2^*\$ 1.08 TeV \$\vec{k}_2^*\$ 1.08 TeV \$\vec{k}_2^*\$ 1.08 TeV \$\vec{k}_2^*\$ 1	$\begin{array}{c c} \textbf{1.9 TeV} & \lambda_{311}'=0.11, \lambda_{132/133/23} \\ \textbf{IS TeV} & \textbf{m}(\vec{q})=\textbf{m}(\vec{g}), c\tau_{LSP}<\textbf{1} \textbf{m} \\ \textbf{m}(\vec{k}^0)>400 \text{GeV}, \lambda_{122} \neq \\ \textbf{m}(\vec{k}^0)>0.2\times\textbf{m}(\vec{k}^1), \lambda_{(13)} \\ \textbf{BR}(i)=B$	a=0.07 im 1607.08079 im 1404.2500 0 (k = 1, 2) 3≠0 % ATLAS-CONF-2016-075 1405.5086 ATLAS-CONF-2016-057 ATLAS-CONF-2016-057 ATLAS-CONF-2017-013 ATLAS-CONF-2017-013 ATLAS-CONF-2016-022, ATLAS-CONF-2016-08 ATLAS-CONF-2017-036
Othe	Scalar charm, $\tilde{c} \rightarrow c \tilde{\chi}_1^0$	0	2 c	Yes	20.3	ε 510 GeV	$m(\tilde{\chi}_{1}^{0})$ <200 GeV	1501.01325
*Only phei simp	a selection of the available ma nomena is shown. Many of the lified models, c.f. refs. for the a	ass limits on limits are ba assumptions	new state ased on s made.	es or	1	0 ⁻¹ 1	Mass so	cale [TeV]

- ATLAS has produced plenty of new searches for SUSY particles using the full 2015 + 2016 dataset
- Only presented a small selection of new results but many more available!
- Sadly no significant deviations from the SM have been observed
- Stronger limits are putting SUSY under more and more stress
- But many corners of phase space are still being explored and a lot more data is on the way so stay tuned!

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SUSY: news from Run 2 searches



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