ATLAS SUSY Searches* - 95% CL Lower Limits

ATLAS Preliminary

December 2017 \sqrt{s} = 7, 8, 13 TeV e,μ, au,γ Jets $E_{_{
m T}}^{
m miss}$ $\int\!\!\mathcal{L}\,dt[{
m fb}^{-1}]$ Model Mass limit \sqrt{s} = 7, 8 TeV $\sqrt{s} = 13 \text{ TeV}$ Reference $\tilde{q}\tilde{q}, \, \tilde{q} \rightarrow q\tilde{\chi}_1^0$ 2-6 jets $m(\tilde{\chi}_1^0)$ <200 GeV, $m(1^{st} \text{ gen. } \tilde{q})=m(2^{nd} \text{ gen. } \tilde{q})$ 1712.02332 0 Yes 36.1 1.57 TeV $\tilde{q}\tilde{q}, \tilde{q} \rightarrow q\tilde{\chi}_{1}^{0}$ (compressed) mono-iet 1-3 jets Yes 36.1 710 GeV $m(\tilde{q})-m(\tilde{\chi}_1^0)<5 \text{ GeV}$ 1711.03301 $\tilde{g}\tilde{g}, \, \tilde{g} \rightarrow q\bar{q}\tilde{\chi}_1^0$ 2-6 jets Yes 36.1 **2.02 TeV** $m(\tilde{\chi}_1^0) < 200 \text{ GeV}$ 1712.02332 **2.01 TeV** $m(\tilde{\chi}_1^0) < 200 \text{ GeV}, m(\tilde{\chi}^{\pm}) = 0.5 (m(\tilde{\chi}_1^0) + m(\tilde{g}))$ $\tilde{g}\tilde{g}, \tilde{g} \rightarrow qq\tilde{\chi}_1^{\pm} \rightarrow qqW^{\pm}\tilde{\chi}_1^0$ 0 2-6 jets Yes 36.1 1712.02332 $\tilde{g}\tilde{g}, \tilde{g} \rightarrow q\bar{q}(\ell\ell)\tilde{\chi}_1^0$ ee, $\mu\mu$ 2 jets 14.7 1.7 TeV $m(\tilde{\chi}_1^0)$ <300 GeV, Yes 1611.05791 $3e, \mu$ $\tilde{g}\tilde{g}, \, \tilde{g} \rightarrow qq(\ell\ell/\nu\nu)\tilde{\chi}_1^0$ 4 jets 36.1 1.87 TeV $m(\tilde{\chi}_1^0)=0 \text{ GeV}$ 1706.03731 Inclusive $\tilde{g}\tilde{g}, \tilde{g} \rightarrow qqWZ\tilde{\chi}_1^0$ 0 7-11 jets Yes 36.1 1.8 TeV $m(\tilde{\chi}_1^0)$ <400 GeV 1708.02794 GMSB (NLSP) 0-2 jets Yes 3.2 2.0 TeV 1607.05979 $1-2 \tau + 0-1$ **2.15 TeV** cτ(NLSP)<0.1 mm GGM (bino NLSP) 2γ Yes 36.1 ATLAS-CONF-2017-080 GGM (higgsino-bino NLSP) **2.05 TeV** $m(\tilde{\chi}_1^0) = 1700 \text{ GeV}, c\tau(NLSP) < 0.1 \text{ mm}, \mu > 0$ 2 jets Yes 36.1 ATLAS-CONF-2017-080 Gravitino LSP Yes 20.3 $F^{1/2}$ scale 865 GeV $m(\tilde{G}) > 1.8 \times 10^{-4} \text{ eV}, m(\tilde{g}) = m(\tilde{q}) = 1.5 \text{ TeV}$ 0 mono-jet 1502.01518 $\tilde{g}\tilde{g}, \tilde{g} \rightarrow b\bar{b}\tilde{\chi}^0$ 0 3 b Yes 36.1 1.92 TeV $m(\tilde{\chi}_1^0)$ <600 GeV 1711.01901 0-1 e, μ 1.97 TeV $m(\tilde{\chi}_1^0)$ <200 GeV $\tilde{g}\tilde{g}, \tilde{g} \rightarrow t\bar{t}\tilde{\chi}_1^0$ 3 b Yes 36.1 1711.01901 $\tilde{b}_1 \tilde{b}_1, \tilde{b}_1 \rightarrow b \tilde{\chi}_1^0$ 0 36.1 950 GeV $m(\tilde{\chi}_1^0)$ <420 GeV 2 b Yes 1708.09266 $2e, \mu$ (SS) $\tilde{b}_1 \tilde{b}_1, \, \tilde{b}_1 \rightarrow t \tilde{\chi}_1^{\pm}$ 1 b Yes 36.1 275-700 GeV $m(\tilde{\chi}_{1}^{0}) < 200 \text{ GeV}, m(\tilde{\chi}_{1}^{\pm}) = m(\tilde{\chi}_{1}^{0}) + 100 \text{ GeV}$ 1706.03731 \tilde{t}_1 117-170 GeV 200-720 GeV $m(\tilde{\chi}_{\perp}^{\pm}) = 2m(\tilde{\chi}_{\perp}^{0}), m(\tilde{\chi}_{\perp}^{0}) = 55 \text{ GeV}$ 1209.2102, ATLAS-CONF-2016-077 $\tilde{t}_1\tilde{t}_1, \tilde{t}_1 \rightarrow b\tilde{\chi}_1^{\pm}$ 0-2 e, μ 1-2 b Yes 4.7/13.3 $0-2 e, \mu$ $\tilde{t}_1\tilde{t}_1, \, \tilde{t}_1 {\rightarrow} Wb\tilde{\chi}_1^0 \text{ or } t\tilde{\chi}_1^0$ 0-2 jets/1-2 b Yes 20.3/36.1 90-198 GeV 0.195-1.0 TeV $m(\tilde{\chi}_1^0)=1 \text{ GeV}$ 1506.08616. 1709.04183. 1711.11520 \tilde{t}_1 90-430 GeV $m(\tilde{t}_1)-m(\tilde{\chi}_1^0)=5 \text{ GeV}$ 1711.03301 $\tilde{t}_1 \tilde{t}_1, \, \tilde{t}_1 \rightarrow c \tilde{\chi}_1^0$ 0 mono-jet Yes 36.1 $\tilde{t}_1\tilde{t}_1$ (natural GMSB) \tilde{t}_1 $m(\tilde{\chi}_1^0) > 150 \,\text{GeV}$ $2e, \mu(Z)$ Yes 20.3 150-600 GeV 1403.5222 1 b $\tilde{t}_2\tilde{t}_2, \tilde{t}_2 \rightarrow \tilde{t}_1 + Z$ 290-790 GeV $m(\tilde{\chi}_1^0)=0 \text{ GeV}$ $3e, \mu(Z)$ 36.1 1 b Yes \tilde{t}_2 1706.03986 $m(\tilde{\chi}_1^0)=0 \text{ GeV}$ $\tilde{t}_2\tilde{t}_2, \tilde{t}_2 \rightarrow \tilde{t}_1 + h$ 1-2 e, μ 36.1 \tilde{t}_2 320-880 GeV 4 b Yes 1706.03986 $\tilde{\ell}_{L,R}\tilde{\ell}_{L,R},\,\tilde{\ell}{
ightarrow}\ell\tilde{\chi}_{1}^{0}$ $2e, \mu$ 36.1 90-500 GeV $m(\tilde{\chi}_1^0)=0$ 0 Yes ATLAS-CONF-2017-039 $\tilde{\chi}_{1}^{+}\tilde{\chi}_{1}^{-}, \tilde{\chi}_{1}^{+} \rightarrow \tilde{\ell}\nu(\ell\tilde{\nu})$ $2e, \mu$ 36.1 750 GeV $m(\tilde{\chi}_{1}^{0})=0, m(\tilde{\ell}, \tilde{\nu})=0.5(m(\tilde{\chi}_{1}^{\pm})+m(\tilde{\chi}_{1}^{0}))$ 0 Yes ATLAS-CONF-2017-039 $\tilde{\chi}_{1}^{\pm}\tilde{\chi}_{1}^{\mp}/\tilde{\chi}_{2}^{0}, \tilde{\chi}_{1}^{+} \rightarrow \tilde{\tau}\nu(\tau\tilde{\nu}), \tilde{\chi}_{2}^{0} \rightarrow \tilde{\tau}\tau(\nu\tilde{\nu})$ 2 τ Yes 36.1 760 GeV $m(\tilde{\chi}_{1}^{0})=0, m(\tilde{\tau}, \tilde{\nu})=0.5(m(\tilde{\chi}_{1}^{\pm})+m(\tilde{\chi}_{1}^{0}))$ 1708.07875 $\tilde{\chi}_{1}^{\pm}\tilde{\chi}_{2}^{0} \rightarrow \tilde{\ell}_{L}\nu\tilde{\ell}_{L}\ell(\tilde{\nu}\nu), \ell\tilde{\nu}\tilde{\ell}_{L}\ell(\tilde{\nu}\nu)$ $3e, \mu$ 0 Yes 36.1 1.13 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 $\tilde{\chi}_{1}^{\pm}\tilde{\chi}_{2}^{\bar{0}} \rightarrow W\tilde{\chi}_{1}^{0}Z\tilde{\chi}_{1}^{0}$ $2-3e, \mu$ 0-2 jets $\tilde{\chi}_1^{\pm}, \tilde{\chi}_2^0$ 580 GeV $m(\tilde{\chi}_{1}^{\pm})=m(\tilde{\chi}_{2}^{0}), m(\tilde{\chi}_{1}^{0})=0, \tilde{\ell} \text{ decoupled}$ Yes 36.1 ATLAS-CONF-2017-039 $\tilde{\chi}_{1}^{\pm}\tilde{\chi}_{2}^{0} \rightarrow W\tilde{\chi}_{1}^{0}h\tilde{\chi}_{1}^{0}, h \rightarrow b\bar{b}/WW/\tau\tau/\gamma\gamma$ e, μ, γ Yes 20.3 $\tilde{\chi}_{1}^{\pm}, \tilde{\chi}_{2}^{0}$ 270 GeV $m(\tilde{\chi}_{1}^{\pm})=m(\tilde{\chi}_{2}^{0}), m(\tilde{\chi}_{1}^{0})=0, \tilde{\ell} \text{ decoupled}$ 1501.07110 0-2 b $\tilde{\chi}_{2}^{0}\tilde{\chi}_{3}^{0}, \tilde{\chi}_{2,3}^{0} \rightarrow \tilde{\ell}_{R}\ell$ ${ ilde \chi}^0_{2,3}$ 20.3 $m(\tilde{\chi}_{2}^{0})=m(\tilde{\chi}_{3}^{0}), m(\tilde{\chi}_{1}^{0})=0, m(\tilde{\ell}, \tilde{\nu})=0.5(m(\tilde{\chi}_{2}^{0})+m(\tilde{\chi}_{1}^{0}))$ $4e, \mu$ Yes 635 GeV 1405.5086 GGM (wino NLSP) weak prod., $\tilde{\chi}_1^0 \rightarrow \gamma \tilde{G}^{-1} e, \mu + \gamma$ 20.3 \tilde{W} 115-370 GeV Yes $c\tau$ <1 mm 1507.05493 GGM (bino NLSP) weak prod. $\tilde{\chi}_1^0 \rightarrow \gamma \tilde{G}$ 36.1 1.06 TeV 2γ Yes $c\tau$ <1 mm ATLAS-CONF-2017-080 Direct $\tilde{\chi}_1^+ \tilde{\chi}_1^-$ prod., long-lived $\tilde{\chi}_1^{\pm}$ Disapp. trk 1 jet 36.1 460 GeV $m(\tilde{\chi}_1^{\pm})$ - $m(\tilde{\chi}_1^{0})$ ~160 MeV, $\tau(\tilde{\chi}_1^{\pm})$ =0.2 ns Yes 1712.02118 Direct $\tilde{\chi}_1^+ \tilde{\chi}_1^-$ prod., long-lived $\tilde{\chi}_1^{\pm}$ 495 GeV $m(\tilde{\chi}_{\perp}^{\pm})$ - $m(\tilde{\chi}_{\perp}^{0})$ ~160 MeV, $\tau(\tilde{\chi}_{\perp}^{\pm})$ <15 ns dE/dx trk Yes 18.4 1506.05332 Stable, stopped \tilde{g} R-hadron 1-5 jets 27.9 850 GeV $m(\tilde{\chi}_1^0)=100 \text{ GeV}, 10 \mu s < \tau(\tilde{g}) < 1000 \text{ s}$ 0 Yes 1310.6584 Stable § R-hadron trk 3.2 1.58 TeV 1606.05129 Metastable \tilde{g} R-hadron dE/dx trk 3.2 1.57 TeV $m(\tilde{\chi}_1^0) = 100 \text{ GeV}, \ \tau > 10 \text{ ns}$ 1604.04520 displ. vtx **2.37 TeV** $\tau(\tilde{g})=0.17 \text{ ns, } m(\tilde{\chi}_1^0)=100 \text{ GeV}$ Metastable \tilde{g} R-hadron, $\tilde{g} \rightarrow qq\tilde{\chi}_1^0$ Yes 32.8 1710.04901 GMSB, stable $\tilde{\tau}, \tilde{\chi}_1^0 \rightarrow \tilde{\tau}(\tilde{e}, \tilde{\mu}) + \tau(e, \mu)$ $1-2 \mu$ 537 GeV 10<tanβ<50 19.1 1411.6795 GMSB, $\tilde{\chi}_1^0 \rightarrow \gamma \tilde{G}$, long-lived $\tilde{\chi}_1^0$ 2γ 20.3 440 GeV Yes 1409.5542 $1 < \tau(\tilde{\chi}_1^0) < 3$ ns, SPS8 model $\tilde{g}\tilde{g}, \tilde{\chi}_{1}^{0} \rightarrow eev/e\mu v/\mu\mu v$ displ. $ee/e\mu/\mu\mu$ 20.3 1.0 TeV 1504.05162 $7 < c\tau(\tilde{\chi}_{1}^{0}) < 740 \text{ mm, m}(\tilde{g}) = 1.3 \text{ TeV}$ LFV $pp \rightarrow \tilde{v}_{\tau} + X, \tilde{v}_{\tau} \rightarrow e\mu/e\tau/\mu\tau$ $\lambda'_{311}=0.11, \lambda_{132/133/233}=0.07$ $e\mu$, $e\tau$, $\mu\tau$ 3.2 1.9 TeV 1607.08079 Bilinear RPV CMSSM $2e, \mu$ (SS) 0-3 b 20.3 $\tilde{q},\,\tilde{g}$ 1.45 TeV $m(\tilde{q})=m(\tilde{g}), c\tau_{LSP}<1 \text{ mm}$ 1404.2500 Yes $\tilde{\chi}_{1}^{+}\tilde{\chi}_{1}^{-}, \tilde{\chi}_{1}^{+} \rightarrow W\tilde{\chi}_{1}^{0}, \tilde{\chi}_{1}^{0} \rightarrow eev, e\mu\nu, \mu\mu\nu$ $4e, \mu$ Yes 13.3 1.14 TeV $m(\tilde{\chi}_1^0) > 400 \text{GeV}, \lambda_{12k} \neq 0 \ (k = 1, 2)$ ATLAS-CONF-2016-075 $\tilde{\chi}_{1}^{+}\tilde{\chi}_{1}^{-}, \tilde{\chi}_{1}^{+} \rightarrow W \tilde{\chi}_{1}^{0}, \tilde{\chi}_{1}^{0} \rightarrow \tau \tau \nu_{e}, e \tau \nu_{\tau}$ 20.3 450 GeV $m(\tilde{\chi}_{1}^{0}) > 0.2 \times m(\tilde{\chi}_{1}^{\pm}), \lambda_{133} \neq 0$ $3e, \mu + \tau$ Yes 1405.5086 $\tilde{g}\tilde{g}, \tilde{g} \rightarrow qq\tilde{\chi}_1^0, \tilde{\chi}_1^0 \rightarrow qqq$ 1.875 TeV 4-5 large-R jets 36.1 $m(\tilde{\chi}_{1}^{0})=1075 \text{ GeV}$ SUSY-2016-22 $\tilde{g}\tilde{g}, \tilde{g} \rightarrow t\bar{t}\tilde{\chi}_1^0, \tilde{\chi}_1^0 \rightarrow qqq$ 8-10 jets/0-4 b 36.1 **2.1 TeV** $m(\tilde{\chi}_1^0) = 1$ TeV, $\lambda_{112} \neq 0$ 1704.08493 $\tilde{g}\tilde{g}, \tilde{g} \rightarrow \tilde{t}_1 t, \tilde{t}_1 \rightarrow bs$ 8-10 jets/0-4 b 36.1 1.65 TeV $m(\tilde{t}_1)= 1 \text{ TeV}, \lambda_{323} \neq 0$ 1704.08493 $\tilde{t}_1\tilde{t}_1, \tilde{t}_1 \rightarrow bs$ 2 iets + 2 b 36.7 100-470 GeV 480-610 GeV 1710.07171 $\tilde{t}_1\tilde{t}_1, \tilde{t}_1 \rightarrow b\ell$ $2e, \mu$ 0.4-1.45 TeV BR($\tilde{t}_1 \rightarrow be/\mu$)>20% 2 b 36.1 1710.05544 \tilde{t}_1 20.3 $m(\tilde{\chi}_{\perp}^{0})$ <200 GeV Scalar charm, $\tilde{c} \rightarrow c\tilde{\chi}_1^0$ Yes 510 GeV 1501.01325

*Only a selection of the available mass limits on new states or phenomena is shown. Many of the limits are based on simplified models, c.f. refs. for the assumptions made.

 10^{-1}

Mass scale [TeV]